

2007-2010



# SERVICE MANUAL

**TRX420**  
**FE/FM/TE/TM/FPE/FPM**  
**FourTrax Rancher®**



## 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 practice, we recommended 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 TRX420TM/TE/FM/FE/FPM/FPE.

Follow the Maintenance Schedule (Section 4) recommendations to ensure that the vehicle is in peak operating condition and the emission levels are within the standards set by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (CARB) and Environment Canada (EC).

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

Sections 1 and 4 apply to the whole vehicle. Section 3 illustrates procedures for removal/installation of components that may be required to perform service described in the following sections. Sections 5 through 24 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 procedure.


If you are not familiar with this vehicle, read Technical Features in Section 2.

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  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.












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## 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 the 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 medium strength locking agent unless otherwise specified.
	Apply sealant.
	Use DOT 4 brake fluid. Use the recommended brake fluid unless otherwise specified.
	Use fork or suspension fluid.



# 1. GENERAL INFORMATION

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## GENERAL INFORMATION

### 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 vehicle.
2. Use the special tools designed for this product to avoid damage and incorrect assembly.
3. Use only metric tools when servicing the vehicle. 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 in the Cable & Harness routing (page 1-28).

### ABBREVIATION

Throughout this manual, the following abbreviation are used to identify the respective parts or systems.

Abbrev. term	Full term
CKP sensor	Crankshaft Position sensor
LCD	Liquid Crystal Display
DLC	Data Link Connector
DTC	Diagnostic Trouble Code
PCM (TE/FE/FPE models)	Powertrain Control Module
ECM (TM/FM/FPM models)	Engine Control Module
ECT sensor	Engine Coolant Temperature sensor
EEPROM	Electrically Erasable Programmable Read Only Memory
EPS	Electric Power Steering
ESP	Electric Shift Program
FP	Fuel Pump
HDS	Honda Diagnostic System
IACV	Idle Air Control Valve
IAT sensor	Intake Air Temperature sensor
MAP sensor	Manifold Absolute Pressure sensor
MIL	Malfunction Indicator Lamp
PGM-FI	Programmed Fuel Injection
SCS connector	Service Check Short connector
TP sensor	Throttle Position sensor
VS sensor	Vehicle Speed sensor
4WD	4 Wheel Drive



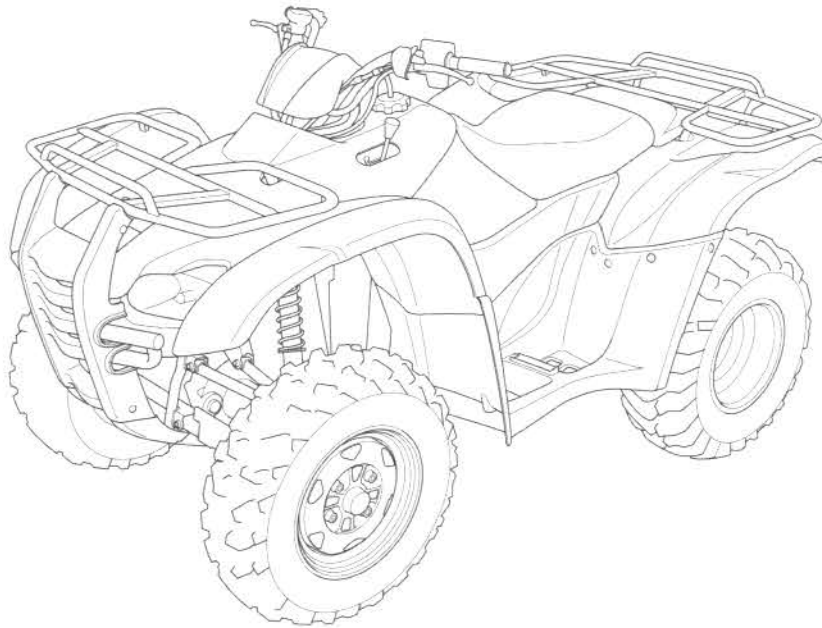
## MODEL IDENTIFICATION

This manual covers 4 types of TRX420 models:

- TM – 2WD/Left foot operated gearshift
- TE – 2WD/Electric shift program (ESP)
- FM – 4WD/Left foot operated gearshift
- FE – 4WD/Electric shift program (ESP)
- FPM – 4WD/Left foot operated gearshift/Electric Power Steering (EPS)
- FPE – 4WD/Electric shift program (ESP)/Electric Power Steering (EPS)

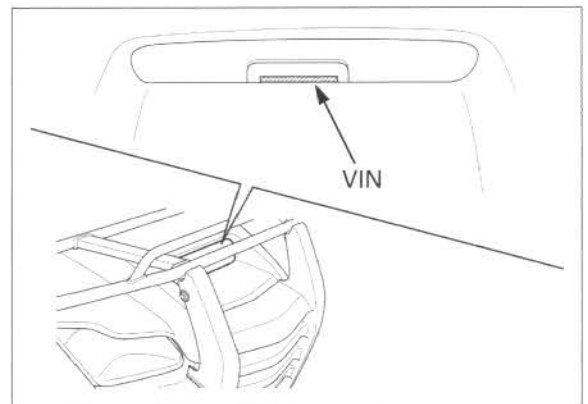
Be sure to refer to the procedure that pertains to the appropriate version of the TRX420.

**TRX420FE model shown:**



## SERIAL NUMBERS

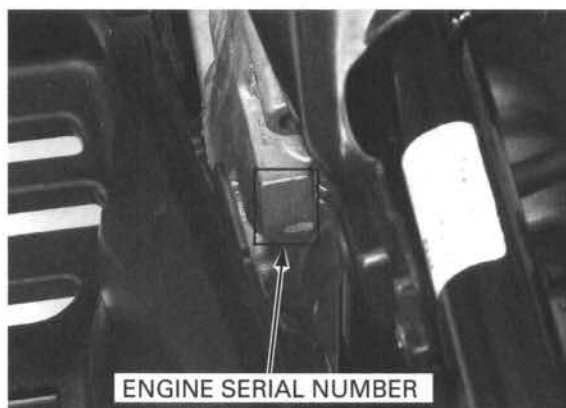
The Vehicle Identification Number (VIN) is stamped on the front side of the frame through the front fender.





## GENERAL INFORMATION

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



The throttle body identification number is stamped on the upper side of the throttle body.

THROTTLE BODY IDENTIFICATION NUMBER

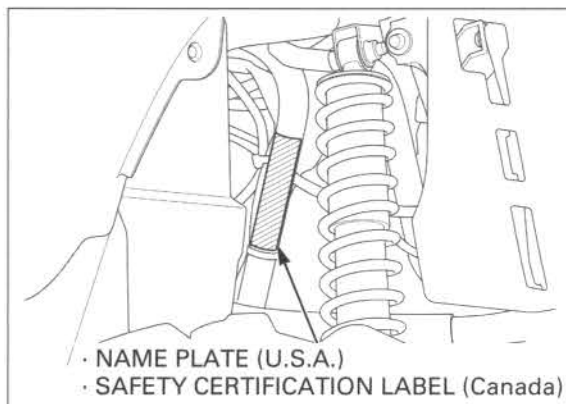


## LABELS

'07: The name plate (U.S.A. type) or safety certification label (Canada type) is attached on the left front frame down pipe.



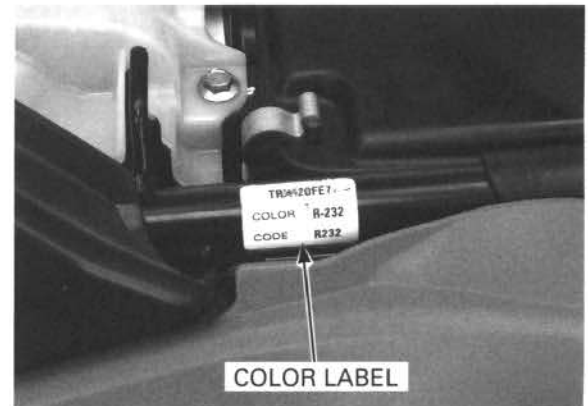
After '07: The name plate (U.S.A. type) or safety certification label (Canada type) is attached on the right front frame down pipe.





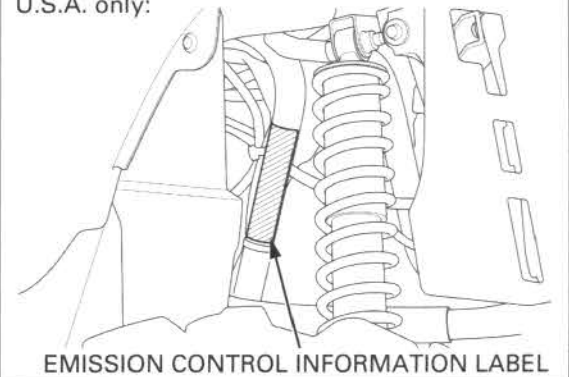
## GENERAL INFORMATION

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



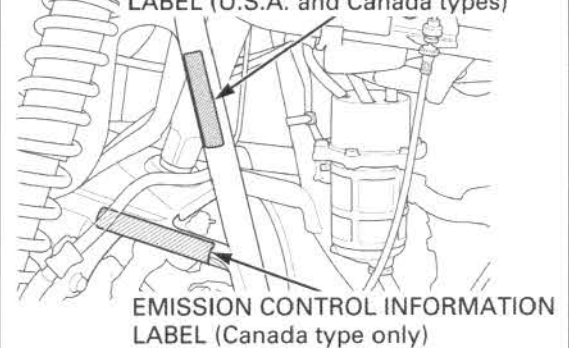
'07: The vehicle emission control information label is attached on the right front frame pipe.

U.S.A. only:



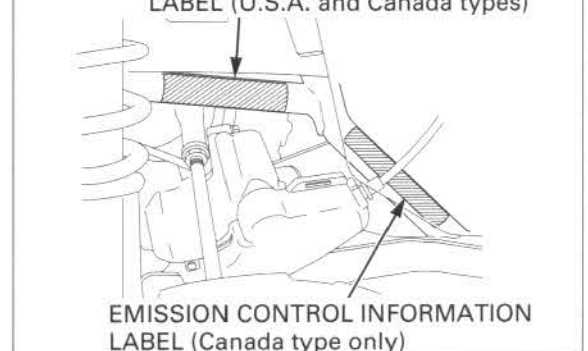
'08: The vehicle emission control information label is attached on the left front frame pipe.

EMISSION CONTROL INFORMATION LABEL (U.S.A. and Canada types)



After '08: The vehicle emission control information label is attached on the left front frame pipe.

EMISSION CONTROL INFORMATION LABEL (U.S.A. and Canada types)





## GENERAL INFORMATION

# GENERAL SPECIFICATIONS

## TRX420TM/TE

ITEM		SPECIFICATIONS
DIMENSIONS	Overall length	2,055 mm (80.9 in)
	Overall width	1,172 mm (46.1 in)
	Overall height	1,148 mm (45.2 in)
	Wheelbase	1,256 mm (49.4 in)
	Front tread	847 mm (33.3 in)
	Rear tread	880 mm (34.6 in)
	Seat height	823 mm (32.4 in)
	Footpeg height	TM: 346 mm (13.6 in) TE: 336 mm (13.2 in)
	Ground clearance	165 mm (6.5 in)
	Curb weight	TM: 248 kg (547 lbs) TE: 249 kg (549 lbs)
	Maximum weight capacity	220 kg (485 lbs)
FRAME	Frame type	Double cradle
	Front suspension	Double wishbone
	Front wheel travel	160 mm (6.3 in)
	Front damper	Double tube
	Rear suspension	Swingarm (trailing type)
	Rear wheel travel	160 mm (6.3 in)
	Rear damper	Double tube
	Front tire size	AT24 x 8-12 ★★
	Rear tire size	AT24 x 10-11 ★★
	Front rim size	12 x 6.0 AT
	Rear rim size	11 x 7.5 AT
	Front tire brand	M977 (Maxxis)
	Rear tire brand	M978 (Maxxis)
	Front brake	Hydraulic disc brake
	Rear brake	Mechanical drum brake
	Caster angle	6.34°
	Trail length	25.1 mm (0.99 in)
	Camber angle	0°
	Fuel tank capacity	'07: 13.7 liters (3.62 US gal, 3.01 Imp gal) After '07: 13.3 liters (3.51 US gal, 2.93 Imp gal)
	Fuel tank reserve capacity	'07: 2.8 liters (0.74 US gal, 0.62 Imp gal) After '07: 2.6 liters (0.69 US gal, 0.57 Imp gal)
ENGINE	Cylinder arrangement	Single cylinder, longitudinally installed
	Bore and stroke	86.5 x 71.5 mm (3.41 x 2.81 in)
	Displacement	420 cm <sup>3</sup> (25.6 cu-in)
	Compression ratio	'07 - '08: 9.8 : 1 After '08: 9.9 : 1
	Valve train	OHV
	Intake valve opens	'07 - '08: 6° BTDC (at 1 mm lift) After '08: 7° BTDC (at 1 mm lift)
	Intake valve closes	'07 - '08: 45° ABDC (at 1 mm lift) After '08: 32° ABDC (at 1 mm lift)
	Exhaust valve opens	'07 - '08: 45° BBDC (at 1 mm lift) After '08: 35° ABDC (at 1 mm lift)
	Exhaust valve closes	'07 - '08: 2° ATDC (at 1 mm lift) After '08: 4° ATDC (at 1 mm lift)
	Lubrication system	Forced pressure and wet sump
	Oil pump type	Trochoid
	Cooling system	Liquid cooled
	Air filtration	Oiled double urethane foam
	Engine dry weight	TM: '07 - '08: 48.6 kg (107.1 lbs) After '08: 48.5 kg (106.9 lbs) TE: '07 - '08: 49.6 kg (109.3 lbs) After '08: 49.5 kg (109.1 lbs)



## GENERAL INFORMATION

ITEM		SPECIFICATIONS
FUEL DELIVERY SYSTEM	Type Throttle bore	PGM-FI (Programmed Fuel Injection) 34 mm (1.3 in)
DRIVE TRAIN	Clutch system Clutch operation system Transmission Primary reduction Secondary reduction Final reduction Gear ratio 1st 2nd 3rd 4th 5th Reverse  Gearshift pattern	Centrifugal and multi-plate, wet Automatic Constant mesh, 5-speeds with reverse 2.103 (61/29) 1.818 (40/22) 3.153 (41/13) 3.857 (54/14) 2.235 (38/17) 1.571 (33/21) 1.178 (33/28) 0.848 (28/33) 4.831 (46/14 x 25/17) R - N - 1 - 2 - 3 - 4 - 5 TM: Left foot operated return system TE: Electric shift (left hand operated) return system
ELECTRICAL	Ignition system Starting system Charging system Regulator/rectifier Lighting system	Full transistorized ignition Electric starter motor Triple phase output alternator SCR shorted, triple phase full wave rectification Battery



## GENERAL INFORMATION

### TRX420FM/FE

ITEM		SPECIFICATIONS
DIMENSIONS	Overall length	2,055 mm (80.9 in)
	Overall width	1,172 mm (46.1 in)
	Overall height	1,146 mm (45.1 in)
	Wheelbase	1,249 mm (49.2 in)
	Front tread	840 mm (33.1 in)
	Rear tread	880 mm (34.6 in)
	Seat height	822 mm (32.4 in)
	Footpeg height	FM: 345 mm (13.6 in) FE: 335 mm (13.2 in)
	Ground clearance	165 mm (6.5 in)
	Curb weight	FM: '07 – '08 U.S.A. and Canada: 266 kg (586 lbs) After '08 U.S.A.: 265 kg (584 lbs) FE: '07 – '08: 267 kg (589 lbs) After '08: 266 kg (586 lbs)
	Maximum weight capacity	220 kg (485 lbs)
FRAME	Frame type	Double cradle
	Front suspension	Double wishbone
	Front wheel travel	160 mm (6.3 in)
	Front damper	Double tube
	Rear suspension	Swingarm (trailing type)
	Rear wheel travel	160 mm (6.3 in)
	Rear damper	Double tube
	Front tire size	AT24 x 8-12 ★★
	Rear tire size	AT24 x 10-11 ★★
	Front rim size	12 x 6.0 AT
	Rear rim size	11 x 7.5 AT
	Front tire brand	M977 (Maxxis)
	Rear tire brand	M978 (Maxxis)
	Front brake	Hydraulic disc brake
	Rear brake	Mechanical drum brake
	Caster angle	3°
	Trail length	'07 – '08: 9.5 mm (0.37 in) After '08: 9 mm (11/32 in)
	Camber angle	0°
	Fuel tank capacity	'07: 13.7 liters (3.62 US gal, 3.01 Imp gal) After '07: 13.3 liters (3.51 US gal, 2.93 Imp gal)
	Fuel tank reserve capacity	'07: 2.8 liters (0.74 US gal, 0.62 Imp gal) After '07: 2.6 liters (0.69 US gal, 0.57 Imp gal)
ENGINE	Cylinder arrangement	Single cylinder, longitudinally installed
	Bore and stroke	86.5 x 71.5 mm (3.41 x 2.81 in)
	Displacement	420 cm <sup>3</sup> (25.6 cu-in)
	Compression ratio	'07 – '08: 9.8 : 1 After '08: 9.9 : 1
	Valve train	OHV
	Intake valve	opens '07 – '08: 6° BTDC (at 1 mm lift) After '08: 7° BTDC (at 1 mm lift)
		closes '07 – '08: 45° ABDC (at 1 mm lift) After '08: 32° ABDC (at 1 mm lift)
	Exhaust valve	opens '07 – '08: 45° BBDC (at 1 mm lift) After '08: 35° BBDC (at 1 mm lift)
		closes '07 – '08: 2° ATDC (at 1 mm lift) After '08: 4° ATDC (at 1 mm lift)
	Lubrication system	Forced pressure and wet sump
	Oil pump type	Trochoid
	Cooling system	Liquid cooled
	Air filtration	Oiled double urethane foam
	Engine dry weight	FM: '07 – '08: 49.0 kg (108.0 lbs) After '08: 48.9 kg (107.8 lbs) FE: '07 – '08: 49.9 kg (110.0 lbs) After '08: 49.8 kg (109.8 lbs)



## GENERAL INFORMATION

ITEM		SPECIFICATIONS
FUEL DELIVERY SYSTEM	Type Throttle bore	PGM-FI (Programmed Fuel Injection) 34 mm (1.3 in)
DRIVE TRAIN	Clutch system Clutch operation system Transmission Primary reduction Secondary reduction Final reduction  Gear ratio     Gearshift pattern	Centrifugal and multi-plate, wet Automatic Constant mesh, 5-speeds with reverse 2.103 (61/29) 1.818 (40/22) 3.230 (42/13) 3.153 (41/13) 3.857 (54/14) 2.235 (38/17) 1.571 (33/21) 1.178 (33/28) 0.848 (28/33) 4.831 (46/14 x 25/17) R – N – 1 – 2 – 3 – 4 – 5 FM: Left foot operated return system FE: Electric shift (left hand operated) return system
ELECTRICAL	Ignition system Starting system Charging system Regulator/rectifier Lighting system	Full transistorized ignition Electric starter motor Triple phase output alternator SCR shorted, triple phase full wave rectification Battery



## GENERAL INFORMATION

### TRX420FPM/FPE

ITEM		SPECIFICATIONS
DIMENSIONS	Overall length	2,055 mm (80.9 in)
	Overall width	1,172 mm (46.1 in)
	Overall height	1,146 mm (45.1 in)
	Wheelbase	1,249 mm (49.2 in)
	Front tread	840 mm (33.1 in)
	Rear tread	880 mm (34.6 in)
	Seat height	822 mm (32.4 in)
	Footpeg height	FPM: 345 mm (13.6 in) FPE: 335 mm (13.2 in)
	Ground clearance	165 mm (6.5 in)
	Curb weight	FPM U.S.A.: 274 kg (604 lbs) FPE and FPM Canada: 275 kg (606 lbs)
	Maximum weight capacity	220 kg (485 lbs)
FRAME	Frame type	Double cradle
	Front suspension	Double wishbone
	Front wheel travel	160 mm (6.3 in)
	Front damper	Double tube
	Rear suspension	Swingarm (trailing type)
	Rear wheel travel	160 mm (6.3 in)
	Rear damper	Double tube
	Front tire size	AT24 x 8-12 ★★
	Rear tire size	AT24 x 10-11 ★★
	Front rim size	12 x 6.0 AT
	Rear rim size	11 x 7.5 AT
	Front tire brand	M977 (Maxxis)
	Rear tire brand	M978 (Maxxis)
	Front brake	Hydraulic disc brake
	Rear brake	Mechanical drum brake
	Caster angle	3°
	Trail length	9 mm (11/32 in)
	Camber angle	0°
ENGINE	Fuel tank capacity	13.3 liters (3.51 US gal, 2.93 Imp gal)
	Fuel tank reserve capacity	2.6 liters (0.69 US gal, 0.57 Imp gal)
	Cylinder arrangement	Single cylinder, longitudinally installed
	Bore and stroke	86.5 x 71.5 mm (3.41 x 2.81 in)
	Displacement	420 cm <sup>3</sup> (25.6 cu-in)
	Compression ratio	9.9 : 1
	Valve train	OHV
	Intake valve	7° BTDC (at 1 mm lift)
		32° ABDC (at 1 mm lift)
	Exhaust valve	35° BBDC (at 1 mm lift)
		4° ATDC (at 1 mm lift)
	Lubrication system	Forced pressure and wet sump
	Oil pump type	Trochoid
FUEL DELIVERY SYSTEM	Cooling system	Liquid cooled
	Air filtration	Oiled double urethane foam
	Engine dry weight	FPM: 48.9 kg (107.8 lbs) FPE: 49.8 kg (109.8 lbs)
	Type	PGM-FI (Programmed Fuel Injection)
	Throttle bore	34 mm (1.3 in)



## GENERAL INFORMATION

ITEM		SPECIFICATIONS
DRIVE TRAIN	Clutch system	Centrifugal and multi-plate, wet
	Clutch operation system	Automatic
	Transmission	Constant mesh, 5-speeds with reverse
	Primary reduction	2.103 (61/29)
	Secondary reduction	1.818 (40/22)
	Final reduction	3.230 (42/13)
	Front	3.153 (41/13)
	Rear	3.857 (54/14)
	1st	2.235 (38/17)
	2nd	1.571 (33/21)
	3rd	1.178 (33/28)
	4th	0.848 (28/33)
	5th	4.831 (46/14 x 25/17)
	Reverse	R - N - 1 - 2 - 3 - 4 - 5
	Gearshift pattern	FPM: Left foot operated return system
		FPE: Electric shift (left hand operated) return system
ELECTRICAL	Ignition system	Full transistorized ignition
	Starting system	Electric starter motor
	Charging system	Triple phase output alternator
	Regulator/rectifier	SCR shorted, triple phase full wave rectification
	Lighting system	Battery



## GENERAL INFORMATION

# LUBRICATION SYSTEM SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	2.7 liters (2.9 US qt, 2.4 Imp qt)	–
	After draining/filter change	2.8 liters (3.0 US qt, 2.5 Imp qt)	–
	After disassembly	3.1 liters (3.3 US qt, 2.7 Imp qt)	–
Recommended engine oil		Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-30	–
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.21 (0.00 – 0.008)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.11 (0.004)

## FUEL SYSTEM (PGM-FI) SPECIFICATIONS

ITEM		SPECIFICATIONS
Throttle body identification number	'07 – '08 models	GQB1A
	After '08 models	GQB6A
Idle speed		1,400 ± 100 rpm
Throttle lever freeplay		3 – 8 mm (1/8 – 1/3 in)
IAT sensor resistance (20°C/68°F)		2.2 – 2.7 kΩ
ECT sensor resistance (20°C/68°F)		2.3 – 2.6 kΩ
Fuel injector resistance (20°C/68°F)		11.6 – 12.4 Ω
Fuel pressure at idle		336 – 350 kPa (3.43 – 3.57 kgf/cm <sup>2</sup> , 49 – 51 psi)
Fuel pump flow (at 12 V)		50 cm <sup>3</sup> (1.7 US oz, 1.8 Imp oz) minimum/10 seconds

## COOLING SYSTEM SPECIFICATIONS

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.5 liters (1.6 US qt, 1.3 Imp qt)
	Reserve tank	0.3 liter (0.3 US qt, 0.3 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 at 95°C (203°F)
Recommended antifreeze		Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors
Standard coolant concentration		1:1 mixture with distilled water



## CYLINDER HEAD/VALVE SPECIFICATIONS

Unit: mm (in)

ITEM				STANDARD	SERVICE LIMIT
Cylinder compression at 400 rpm				500 kPa (5.1 kgf/cm <sup>3</sup> , 73 psi)	—
Valve clearance			IN	0.15 ± 0.02 (0.006 ± 0.001)	—
			EX	0.23 ± 0.02 (0.009 ± 0.001)	—
Valve, valve guide	Valve stem O.D.	'07 – '08 models	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)
		After '08 models	IN	5.975 – 5.990 (0.2352 – 0.2358)	5.95 (0.234)
			EX	5.955 – 5.970 (0.2344 – 0.2350)	5.93 (0.233)
	Valve guide I.D.	'07 – '08 models	IN/EX	5.500 – 5.512 (0.2165 – 0.2170)	5.53 (0.218)
		After '08 models	IN/EX	6.000 – 6.012 (0.2362 – 0.2366)	6.02 (0.237)
	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/EX	15.0 – 15.2 (0.59 – 0.60)	—
	Valve seat width		IN/EX	1.2 (0.05)	1.5 (0.06)
Valve spring	Free length	'07 – '08 models	Inner	37.8 (1.49)	37.0 (1.46)
			Outer	42.7 (1.68)	41.8 (1.65)
		After '08 models	Inner	42.94 (1.691)	42.08 (1.657)
			Outer	43.63 (1.718)	42.76 (1.683)
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	'07 – '08 models	IN	35.9400 – 36.1800 (1.41496 – 1.42441)	35.74 (1.407)
			EX	35.6811 – 35.9211 (1.40476 – 1.41421)	35.48 (1.397)
		After '08 models	IN	35.4723 – 35.7123 (1.39654 – 1.40599)	35.27 (1.388)
			EX	35.3009 – 35.5409 (1.38980 – 1.39925)	35.10 (1.382)
	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 SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		86.500 – 86.510 (3.4055 – 3.4059)	86.60 (3.409)
	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		86.470 – 86.490 (3.4043 – 3.4051)	86.42 (3.402)
	Piston pin hole I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.04 (0.750)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	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)	0.9 (0.04)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
		Second	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
Cylinder-to-piston clearance			0.010 – 0.040 (0.0004 – 0.0016)	0.10 (0.004)
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.751)
Connecting rod-to-piston pin clearance			0.020 – 0.047 (0.0008 – 0.0019)	0.10 (0.004)



## GENERAL INFORMATION

# CLUTCH/GEARSHIFT LINKAGE SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Centrifugal clutch	Drum I.D.		140.0 – 140.2 (5.512 – 5.520)	140.4 (5.53)
	Weight lining thickness		2.0 (0.08)	1.3 (0.05)
	Clutch spring height		3.8 (0.15)	3.68 (0.145)
	Clutch weight spring free length		24.65 (0.970)	25.6 (1.01)
Change clutch	Spring free length	TM/FM/FPM	47.3 (1.86)	45.8 (1.80)
		TE/FE/FPE	48.7 (1.92)	47.2 (1.86)
	Disc thickness		2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage		–	0.20 (0.008)
	Outer I.D.		29.000 – 29.021 (1.1417 – 1.1426)	29.05 (1.144)
	Outer guide	I.D.	22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
		O.D.	28.959 – 28.980 (1.1401 – 1.1409)	28.93 (1.139)
	Mainshaft O.D. at clutch outer guide		21.967 – 21.980 (0.8648 – 0.8654)	21.93 (0.863)
Primary drive gear	Gear I.D.		29.000 – 29.021 (1.1417 – 1.1426)	29.05 (1.144)
	Crankshaft O.D. at drive gear		28.959 – 28.980 (1.1401 – 1.1409)	28.93 (1.139)

## ALTERNATOR/STARTER CLUTCH SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Starter driven gear boss	O.D.	51.705 – 51.718 (2.0356 – 2.0361)	51.69 (2.035)
	I.D.	31.946 – 31.962 (1.2577 – 1.2583)	31.90 (1.256)
Crankshaft O.D. at starter driven gear		31.884 – 31.900 (1.2553 – 1.2559)	31.85 (1.254)

# CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Shift fork	I.D.		13.000 – 13.021 (0.5118 – 0.5126)	13.04 (0.513)
	Claw thickness		4.93 – 5.00 (0.194 – 0.197)	4.5 (0.18)
	Shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.96 (0.510)
Transmission	Gear I.D.	M3	25.000 – 25.021 (0.9843 – 0.9851)	25.05 (0.986)
		M5	20.000 – 20.021 (0.7874 – 0.7882)	20.05 (0.789)
		C1, C2, C4, CR	28.020 – 28.041 (1.1031 – 1.1040)	28.07 (1.105)
		Reverse idle	13.000 – 13.021 (0.5118 – 0.5126)	13.04 (0.513)
	Gear bushing O.D.	M3	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
		M5	19.966 – 19.984 (0.7861 – 0.7868)	19.94 (0.785)
		C2	27.984 – 28.005 (1.1017 – 1.1026)	27.94 (1.100)
		C1, C4, CR	27.979 – 28.000 (1.1015 – 1.1024)	27.93 (1.100)
	Gear-to-bushing clearance	M3	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.016 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
		C2	0.015 – 0.057 (0.0006 – 0.0022)	0.08 (0.003)
		C1, C4, CR	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
	Gear bushing I.D.	M3	22.000 – 22.021 (0.8661 – 0.8670)	22.04 (0.868)
		M5	17.016 – 17.034 (0.6699 – 0.6706)	17.06 (0.672)
		C4	25.000 – 25.021 (0.9843 – 0.9851)	25.05 (0.986)
	Mainshaft O.D.	at M3	21.959 – 21.980 (0.8645 – 0.8654)	21.93 (0.863)
		at M5	16.976 – 16.987 (0.6683 – 0.6688)	16.93 (0.667)
	Countershaft O.D.	at C4	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
	Reverse idle shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.94 (0.509)
	Bushing-to-shaft clearance	M3	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.029 – 0.058 (0.0011 – 0.0023)	0.10 (0.004)
		C4	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
	Reverse idle gear-to-shaft clearance		0.016 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
Crankshaft	Runout		–	0.15 (0.006)
	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)



## FRONT WHEEL/SUSPENSION/STEERING SPECIFICATIONS

Unit: mm (in)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Minimum tire tread depth			—	4.0 (0.16)
Cold tire pressure	TM/TE/FM/FE	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
		With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	FPM/FPE	Standard	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)	—
		With cargo	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)	—
Tie-rod distance between the ball joints		TM/TE	358.5 (14.11)	—
		FM/FE/FPM/FPE	342.9 (13.50)	—
Toe		TM/TE	Toe-in: 10 ± 15 (0.4 ± 0.6)	—
		FM/FE/FPM/FPE	Toe-out: 9 ± 15 (0.4 ± 0.6)	—

## REAR WHEEL/SUSPENSION SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Minimum tire tread depth			—	4.0 (0.16)
Cold tire pressure	Standard		25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	With cargo		25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—

## BRAKE SYSTEM SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	Honda DOT 4 brake fluid	—
	Disc thickness	3.8 – 4.2 (0.15 – 0.17)	3.0 (0.12)
	Disc runout	—	0.30 (0.012)
	Master cylinder I.D.	14.000 – 14.043 (0.5512 – 0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957 – 13.984 (0.5495 – 0.5506)	13.945 (0.5490)
	Caliper cylinder I.D.	32.030 – 32.080 (1.2610 – 1.2630)	32.090 (1.2634)
	Caliper piston O.D.	31.984 – 31.998 (1.2578 – 1.2598)	31.94 (1.257)
Rear brake	Drum I.D.	160.0 – 160.2 (6.30 – 6.31)	161.0 (6.34)
	Shoe lining thickness	5.3 (0.21)	To index mark

## FRONT DRIVING MECHANISM SPECIFICATIONS (FM/FE/FPM/FPE models)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Front final drive	Oil capacity	After draining	230 cm <sup>3</sup> (7.8 US oz, 8.1 Imp oz)	—
		After disassembly	310 cm <sup>3</sup> (10.5 US oz, 10.9 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)	12 N·m (1.2 kgf·m, 9 lbf·ft)
	Face cam-to-housing distance		3.3 – 3.7 (0.13 – 0.15)	3.3 (0.13)
	Differential ring gear depth		6.55 – 6.65 (0.258 – 0.262)	6.55 (0.258)
	Cone spring free height		2.8 (0.11)	2.6 (0.10)



## GENERAL INFORMATION

### REAR DRIVING MECHANISM SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Axle runout			—	3.0 (0.12)
Rear final drive	Oil capacity	After draining	75 cm <sup>3</sup> (2.5 US oz, 2.6 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 SPECIFICATIONS

ITEM			SPECIFICATIONS
Battery	Capacity		12 V – 12 Ah
	Current leakage		0.01 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	'07 – '08 models	0.343 kW/5,000 rpm
		After '08 models	0.359 kW/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω

### IGNITION SYSTEM SPECIFICATIONS

ITEM	SPECIFICATIONS
Spark plug	BKR5E-11 (NGK), K16PR-U11 (DENSO)
Spark plug gap	1.0 – 1.1 mm (0.039 – 0.043 in)
Ignition coil primary peak voltage	100 V minimum
Ignition pulse generator peak voltage	0.7 V minimum
Ignition timing ("F" mark)	10° BTDC at idle

### ELECTRIC STARTER SPECIFICATIONS

Unit: mm (in)

ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.0 (0.47)	6.5 (0.26)

### LIGHTS/METERS/SWITCHES SPECIFICATIONS

'07 TM/FM and After '07 U.S.A. TM/FM models

ITEM		SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Brake/taillight	LED
	Neutral indicator	12 V-1.7 W
	Reverse indicator	12 V-1.7 W
	Coolant temperature indicator	12 V-1.7 W
	MIL	12 V-1.7 W
	4WD indicator (FM only)	12 V-1.7 W
Fuse	Main fuse	30 A
	Sub-fuse	15 A, 10 A x 3



**TE/FE and After '07 Canada FM/FE models**

ITEM			SPECIFICATIONS
Bulbs	Headlight (high/low beam)		12 V - 30/30 W x 2
	Brake/taillight		LED
	Neutral indicator		LED
	Reverse indicator		LED
	Coolant temperature indicator		LED
	MIL		LED
	4WD indicator (FE/FM only)		LED
	Meter light		LED
Fuse	Main fuse	TE/FE	30 A x 2
		TM/FM	30 A
	Sub-fuse		15 A, 10 A x 3

**FPM/FPE models**

ITEM			SPECIFICATIONS
Bulbs	Headlight (high/low beam)		12 V - 30/30 W x 2
	Brake/taillight		LED
	Neutral indicator		LED
	Reverse indicator		LED
	Coolant temperature indicator		LED
	MIL		LED
	4WD indicator		LED
	Meter light		LED
	EPS indicator		LED
Fuse	Main fuse	FPE	30 A x 2
		FPM	30 A
	Sub-fuse		15 A, 10 A x 3
	EPS fuse		40 A



## GENERAL INFORMATION

### STANDARD TORQUE VALUES

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, 3.7)	5 mm screw	4 (0.4, 3.0)
6 mm bolt and nut	10 (1.0, 7)	6 mm screw	9 (0.9, 6.6)
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	27 (2.8, 20)
		10 mm flange bolt and nut	39 (4.0, 29)

### ENGINE & FRAME TORQUE VALUES

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

#### ENGINE

##### MAINTENANCE

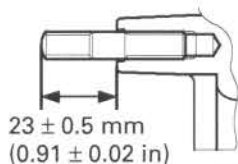
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Spark plug	1	14	22 (2.2, 16)	
Valve adjusting lock nut	2	6	17 (1.7, 13)	
Valve adjusting hole cap	2	36	12 (1.2, 9)	
Timing hole cap	1	14	10 (1.0, 7)	
Engine oil drain bolt	1	12	25 (2.5, 18)	

##### FUEL SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Throttle body insulator band screw	1	5	—	page 6-47
Throttle drum cover screw	1	4	1.8 (0.18, 1.3)	
TP sensor/MAP sensor torx screw (T25)	3	5	3.4 (0.35, 2.5)	
Wire harness clamp stay screw	1	5	3.4 (0.35, 2.5)	
Fuel injector mounting bolt	2	5	5.1 (0.53, 3.8)	
IACV torx screw (T20)	2	4	2.1 (0.21, 1.5)	
ECT sensor	1	10	12 (1.2, 9)	
Bank angle sensor mounting bolt	2	4	1.5 (0.15, 1.1)	

##### CYLINDER HEAD/VALVE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Cylinder head nut	4	10	39 (4.0, 29)	Apply engine oil.
Cam chain tensioner pivot bolt	1	6	12 (1.2, 9)	Apply locking agent.
Exhaust pipe stud bolt	2	8	6 (0.6, 4.4)	



##### CYLINDER/PISTON

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Crankcase stud bolt	4	10	12 (1.2, 9)	page 10-7



## CLUTCH/GEARSHIFT LINKAGE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Clutch spring bolt	4	6	12 (1.2, 9)	
Centrifugal clutch lock nut	1	20	118 (12.0, 87)	Lock nut: replace with a new one. Apply engine oil. Stake.
Change clutch lock nut	1	18	108 (11.0, 80)	Lock nut: replace with a new one. Apply engine oil. Stake.
Shift drum stopper arm pivot bolt	1	6	12 (1.2, 9)	Apply locking agent.
Gearshift cam bolt	1	6	16 (1.6, 12)	Apply locking agent.
Gearshift spindle return spring pin	1	8	22 (2.2, 16)	Apply locking agent.
Gearshift spindle A stopper bolt (TM/FM/FPM model only)	1	8	27 (2.8, 20)	Apply locking agent.

## ALTERNATOR/STARTER CLUTCH

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Starter clutch bolt	6	8	37 (3.8, 27)	Apply locking agent.
Flywheel bolt	1	12	108 (11.0, 80)	Apply engine oil.
CKP sensor bolt	2	5	6 (0.6, 4.4)	Apply locking agent.

## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Mainshaft bearing setting bolt	2	6	12 (1.2, 9)	Apply locking agent.

## LIGHTS/METERS/SWITCHES

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Gear position switch wire clamp bolt	2	6	12 (1.2, 9)	Apply locking agent.

## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Shift angle sensor bolt	2	5	6 (0.6, 4.4)	Apply locking agent.



## GENERAL INFORMATION

### FRAME

#### FRAME/BODY PANELS/EXHAUST SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear carrier bolt	4	10	54 (5.5, 40)	
Mudguard bracket nut	8	8	32 (3.3, 24)	
Muffler band bolt	2	8	23 (2.3, 17)	
Muffler cover bolt	2	6	22 (2.2, 16)	
Exhaust pipe cover band bolt	3	—	2 (0.2, 1.5)	
Muffler cover band bolt (front side)	1	—	2 (0.2, 1.5)	
Muffler cover band bolt (rear side)	1	—	3.2 (0.33, 2.4)	

#### MAINTENANCE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Front final gear case oil filler cap (FM/FE/FPM/FPE only)	1	30	12 (1.2, 9)	
Front final gear case oil drain bolt (FM/FE/FPM/FPE only)	1	8	12 (1.2, 9)	
Rear final gear case oil check bolt	1	8	12 (1.2, 9)	
Rear final gear case oil filler cap	1	30	12 (1.2, 9)	
Rear final gear case oil drain bolt	1	8	12 (1.2, 9)	
Tie-rod lock nut (knuckle side)	2	12	54 (5.5, 40)	
Tie-rod lock nut (steering arm side)	2	12	54 (5.5, 40)	Left hand threads.

#### FUEL SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Throttle body cover bolt	1	5	5.2 (0.53, 3.8)	

#### COOLING SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Cooling fan nut	1	5	2.7 (0.27, 2.0)	Apply locking agent.
Fan motor bolt	3	5	5.2 (0.53, 3.8)	
Fan motor stay bolt	3	6	8.4 (0.86, 6.2)	

#### ENGINE REMOVAL/INSTALLATION

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Lower engine hanger nut (left and right)	2	10	54 (5.5, 40)	
Upper engine hanger nut (frame side)	1	10	54 (5.5, 40)	
Upper engine hanger bolt (engine side)	2	8	32 (3.3, 24)	
Gearshift pedal pinch bolt (TM/FM/FPM only)	1	6	20 (2.0, 15)	



## FRONT WHEEL/SUSPENSION/STEERING

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Throttle housing cover screw	3	4	1.5 (0.15, 1.1)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Front wheel nut	8	10	64 (6.5, 47)	
Front wheel hub nut (TM/TE)	2	18	78 (8.0, 58)	
Front wheel hub nut (FM/FE/FPM/FPE)	2	16	78 (8.0, 58)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Front brake disc bolt	8	8	42 (4.3, 31)	ALOC bolt: replace with a new one.
Splash guard bolt	6	6	11 (1.1, 8)	ALOC bolt: replace with a new one.
Shock absorber mounting nut	4	10	30 (3.1, 22)	Lock nut: replace with a new one.
Upper and lower arm pivot nut	8	10	44 (4.5, 32)	Lock nut: replace with a new one.
Upper and lower arm ball joint nut	4	12	29 (3.0, 21)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Brake hose clamp bolt	7	6	12 (1.2, 9)	ALOC bolt: replace with a new one.
Tie-rod joint nut	4	12	54 (5.5, 40)	Lock nut: replace with a new one.
Steering shaft end nut	1	14	108 (11.0, 80)	Lock nut: replace with a new one.
Steering shaft holder bolt	2	8	32 (3.3, 24)	ALOC bolt: replace with a new one.
Steering shaft pinch bolt (FPM/FPE)	1	10	60 (6.1, 44)	
EPS unit mounting nut (FPM/FPE)	2	8	22 (2.2, 16)	
EPS motor mounting bolt (FPM/FPE)	2	8	20 (2.0, 15)	

## REAR WHEEL/SUSPENSION

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear wheel nut	8	10	64 (6.5, 47)	Lock nut: replace with a new one.
Shock absorber upper mounting nut	1	10	44 (4.5, 32)	
Shock absorber lower mounting nut	1	10	64 (6.5, 47)	Lock nut: replace with a new one.
Universal joint guard bolt	2	6	10 (1.0, 7)	ALOC bolt: replace with a new one.
Swingarm pivot nut	2	12	79 (8.1, 58)	Lock nut: replace with a new one.



## GENERAL INFORMATION

### BRAKE SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Brake hose oil bolt	3	10	34 (3.5, 25)	ALOC bolt: replace with a new one. Apply locking agent.
Front brake caliper bleed valve	2	8	5.4 (0.55, 4.0)	
Front master cylinder reservoir cap screw	2	4	2 (0.2, 1.5)	
Pad pin	2	10	17 (1.7, 13)	
Pad pin plug	2	10	2.4 (0.24, 1.8)	
Front brake lever pivot bolt	1	6	5.9 (0.60, 4.4)	
Front brake lever pivot nut	1	6	5.9 (0.60, 4.4)	
Front master cylinder holder bolt	2	6	12 (1.2, 9)	
Front brake caliper mounting bolt	4	8	30 (3.1, 22)	
Front brake caliper slide pin	2	8	22 (2.2, 16)	
Front brake caliper bracket pin	2	8	17 (1.7, 13)	
Rear brake arm pinch bolt	1	8	20 (2.0, 15)	
Rear brake panel skid plate bolt	2	8	32 (3.3, 24)	
Rear wheel hub nut	2	20	137 (14.0, 101)	ALOC bolt: replace with a new one. Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Rear brake panel drain bolt	1	8	12 (1.2, 9)	
Brake pipe joint bolt	2	10	14 (1.4, 10)	

### FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Front final gear pinion bearing lock nut	1	64	98 (10.0, 72)	Lock nut: replace with a new one. Stake.
Differential ring gear bolt	10	8	49 (5.0, 36)	ALOC bolt: replace with a new one. Apply locking agent.
Front final gear case cover bolt	2	10	47 (4.8, 35)	ALOC bolt: replace with a new one.
	4	8	25 (2.5, 18)	
Front final clutch shift fork bolt	1	6	10 (1.0, 7)	
Front final clutch housing bolt	3	8	25 (2.5, 18)	Lock nut: replace with a new one.
Front final gear case mounting bolt	1	10	44 (4.5, 32)	
Front final gear case mounting nut	1	10	44 (4.5, 32)	
4WD select switch	1	10	12 (1.2, 9)	
Final clutch arm cover bolt	3	6	10 (1.0, 7)	

### REAR DRIVING MECHANISM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear final gear pinion bearing lock nut	1	64	98 (10.0, 72)	Lock nut: replace with a new one. Stake.
Rear final gear case cover bolt	2	10	47 (4.8, 35)	Apply locking agent.
	6	8	25 (2.5, 18)	Lock nut: replace with a new one.
Rear final gear case/brake panel mounting nut	12	10	44 (4.5, 32)	
Final gear case skid plate bolt	3	8	32 (3.3, 24)	ALOC bolt: replace with a new one.
Axle nut (inner)	2	32	39 (4.0, 29)	Apply locking agent.
Axle lock nut (outer)	2	32	127 (13.0, 94)	Apply locking agent.



## LIGHTS/METERS/SWITCHES

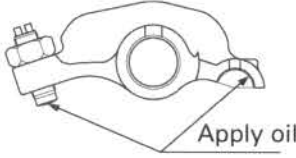
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear brake lever pivot bolt	1	6	10 (1.0, 0.7)	Apply locking agent.
Rear brake lever pivot nut	1	6	10 (1.0, 0.7)	
Parking brake lever pivot screw	1	4	6.9 (0.70, 0.5.1)	
Brake light switch screw (rear brake lever bracket)	1	4	1.2 (0.12, 0.9)	
Front brake light/inhibitor switch screw	1	4	1.2 (0.12, 0.9)	



## GENERAL INFORMATION

# LUBRICATION & SEAL POINTS

## ENGINE

MATERIAL	LOCATION	REMARKS
Molybdenum oil solution (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	Camshaft cam lobes Rocker arm shaft sliding surface Valve stem (valve guide sliding surface) Change clutch outer guide inner and outer surfaces Crankshaft starter driven gear sliding surfaces Piston pin outer surface Starter reduction gear shaft whole surface Water pump shaft journal Mainshaft gear and bushing sliding surfaces Countershaft gear and bushing sliding surfaces Starter motor shaft end	
Engine oil	Inside of oil filter cover Rocker arm followers and adjusting screw  Cam chain whole surfaces Cam follower whole surfaces Cylinder head nut threads and seating surfaces Connecting rod small end inner surface Piston outer surface and piston pin hole Piston ring whole surfaces Cylinder bore Clutch adjusting plate boss outer surface Change clutch disc lining whole surfaces Change clutch lock nut threads and seating surface Centrifugal clutch drum sprag clutch contacting surface Centrifugal clutch drive plate sprag clutch contacting surface Centrifugal clutch lock nut threads and seating surface Starter reduction gear teeth Reverse stopper shaft journal surface Flywheel bolt threads Starter sprag clutch whole surface Mainshaft and countershaft journal surfaces Shift fork shaft whole surface Shift drum grooves Collar and bushing journal surfaces Each bearing rotating area Each O-ring whole surface Each oil seal lip	



MATERIAL	LOCATION	REMARKS
Locking agent	Cam chain tensioner lifter bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Cam chain tensioner pivot bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Camshaft bearing setting plate bolt threads	Coating width: 5 – 8 mm ( $0.20 \pm 0.31$ in)
	Shift drum stopper arm pivot bolt threads	Coating width: $6.5 \pm 2$ mm ( $0.26 \pm 0.08$ in)
	Gearshift cam bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Gearshift spindle return spring pin threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Gearshift spindle A stopper bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Starter clutch bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	CKP sensor bolt threads	Coating width: $6 \pm 1$ mm ( $0.24 \pm 0.04$ in)
	Mainshaft bearing setting bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Gear position switch retaining bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Gear position switch wire clamp bolt threads	Coating width: $6.5 \pm 1$ mm ( $0.26 \pm 0.04$ in)
	Shift angle sensor bolt threads	TE/FE/FPE only Coating width: $5 \pm 1$ mm ( $0.20 \pm 0.04$ in)
Liquid sealant	Front crankcase cover mating surface	page 11-23
	Alternator/CKP sensor wire grommet seating surface	page 12-6
	Gear position switch wire grommet seating surface	page 22-15
	Rear crankcase cover mating surface	page 12-7
	Crankcase mating surface	page 13-21
	Reduction gear cover mating surface	TE/FE/FPE only page 23-34
Templex N3 grease (ESSO)	Electric shift reduction gear teeth and journals (front crankcase cover)	TE/FE/FPE only 2 – 4 g page 23-33



## GENERAL INFORMATION

### FRAME

MATERIAL	LOCATION	REMARKS
Multi-purpose grease	Throttle cable end (lever side)	
	Throttle cable outer threads (each end)	
	Throttle lever pivot and dust seal lip	
	Rear (parking) brake lever pivot	
	Parking arm pin	
	Knuckle inner and outer dust seal lips	FM/FE/FPM/FPE only 2.5 – 3 g per each seal
	Front wheel hub inner and outer dust seal lips	TM/TE only 2 – 3 g
	Steering shaft bushing sliding surface	
	Steering shaft dust seal lips	
	Rear brake cam dust seal lips	
	Rear brake cam spindle	0.2 – 0.3 g
	Rear brake cam shoe contacting surfaces	0.2 – 0.3 g
	Rear brake panel anchor pin shoe contacting surfaces	0.2 – 0.3 g
	Rear brake drum cover dust seal lips	3 – 4 g
	Rear brake drum seal ring	
	Rear brake panel O-ring	
	Rear brake panel dust seal lips	
	Rear brake pedal pivot	
	Rear brake pedal pivot dust seal lips	
	Rear brake cable ends (lever and pedal side)	
	Front final gear case oil seal lips (for drive shafts)	FM/FE/FPM/FPE only
	Front final gear case cover O-ring	FM/FE/FPM/FPE only
	Front final gear oil filler cap O-ring	FM/FE/FPM/FPE only
	Front final clutch arm shaft oil seal	FM/FE/FPM/FPE only
	Front final clutch arm shaft O-ring	FM/FE/FPM/FPE only
	Front final clutch arm shaft outer surface	FM/FE/FPM/FPE only
	Front final clutch joint oil seal lips	FM/FE/FPM/FPE only
	Front final clutch case O-ring	FM/FE/FPM/FPE only
	Rear final gear case oil seal lips (for propeller shaft)	
	Rear final gear case oil seal lips (for ring gear)	
	Rear final gear case O-ring (axle housing side)	
	Rear final gear oil filler cap O-ring	Left side: 2.5 – 3 g
Molybdenum disulfide grease	Front drive shaft splines (wheel side)	FM/FE/FPM/FPE only
	Front shock absorber lower pivot bushing and dust seal lips	
	Steering shaft spline	TM/TE/FM/FE only
	EPS unit output shaft spline	FPM/FPE only
	Rear shock absorber lower pivot bushing and dust seal lips	
	Swingarm pivot bearing	
	Swingarm pivot dust seal lips	
	Front propeller shaft boot lip	FM/FE/FPM/FPE only
	Front propeller shaft joint splines (both sides)	FM/FE/FPM/FPE only Propeller shaft side: 5 – 8 g
	Front final clutch pinion joint splines	FM/FE/FPM/FPE only 5 – 8 g
	Front propeller shaft end (final clutch joint contacting area)	FM/FE/FPM/FPE only
	Universal joint splines (both sides)	
	Rear propeller shaft splines (gear case side)	
	Output shaft O-ring	
	Rear propeller shaft O-ring	
	Rear axle splines	
NKG708 (Kyodo Yushi)	Front drive shaft outboard joint inside	FM/FE/FPM/FPE only 30 – 50 g
	Front drive shaft inboard joint inside	FM/FE/FPM/FPE only 40 – 60 g



## GENERAL INFORMATION

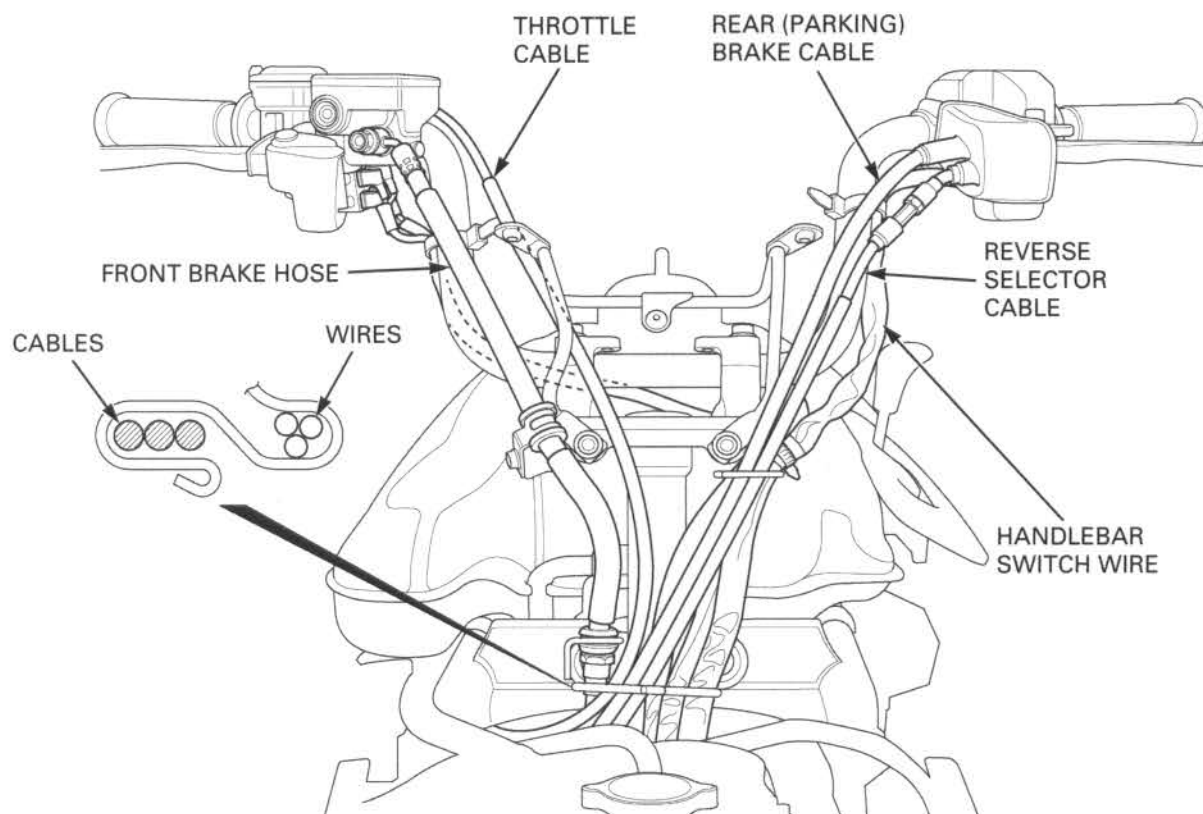
MATERIAL	LOCATION	REMARKS
Honda Bond A or Pro Honda Handgrip Cement (U.S.A. only) or equivalent	Handlebar grip rubber inside Air cleaner housing-to-connecting tube mating area Air cleaner housing-to-duct tube mating area Air cleaner housing-to-IAT sensor grommet mating area Air cleaner housing breather hose joint grommet mating areas (inner and outer surfaces)	
Engine oil	Rear brake cam felt seal	
Silicone grease	EPS motor O-ring Front brake lever-to-master piston contacting area Front brake lever pivot Front brake caliper piston boot inside Front brake caliper slide pin groove Front brake caliper bracket pin boot inside	FPM/FPE only
DOT 4 brake fluid	Brake master cylinder piston and cups Brake caliper piston and piston seal	
WR-S (Nippon Grease)	EPS unit worm gear splines	0.5 g FPM/FPE only
Cable lubricant	Throttle inner cable Rear brake inner cables 2WD/4WD selector inner cable	FM/FE/FPM/FPE only
Liquid sealant	Rear final gear case cover mating surface	
Locking agent	Cooling fan nut threads Front brake caliper slide pin Front final gear case cover 10 mm bolt Rear final gear case cover 10 mm bolt Rear axle nut Rear axle lock nut Front brake light/inhibitor switch screw	



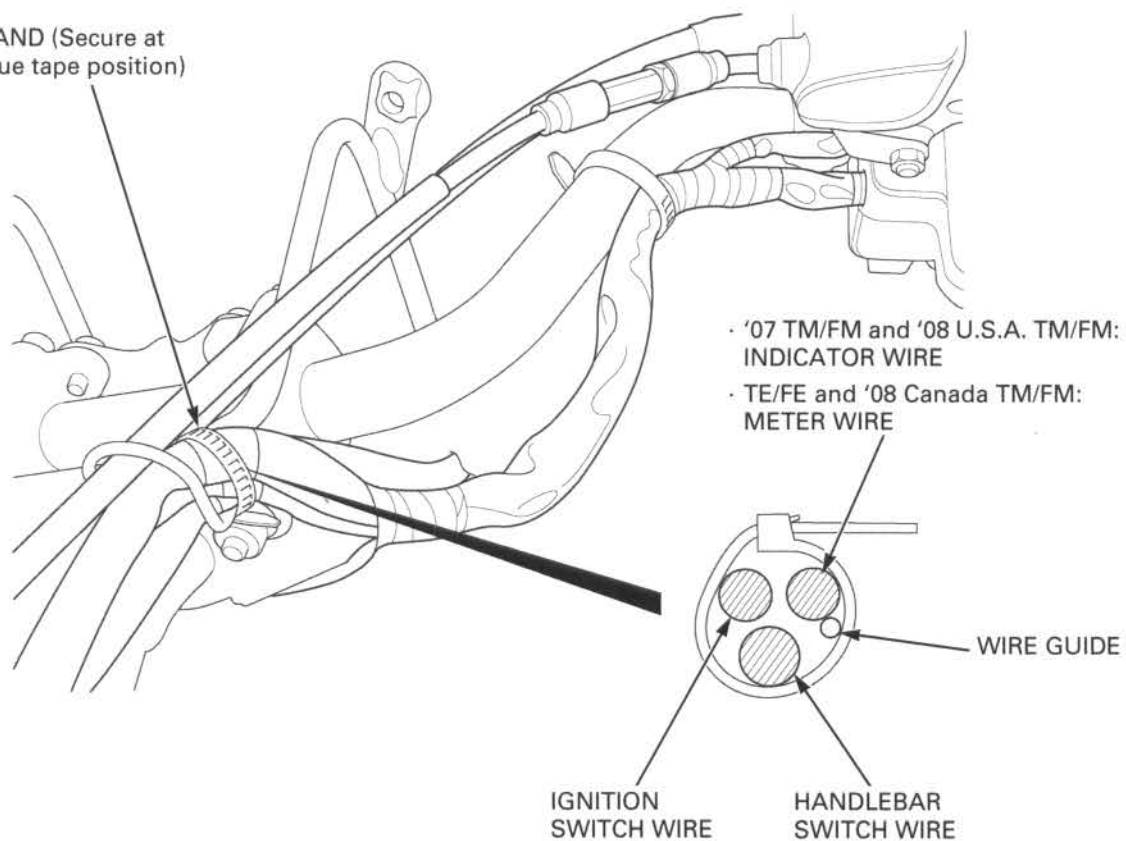
## GENERAL INFORMATION

### CABLE & HARNESS ROUTING ('07 - '08 model)

All models:

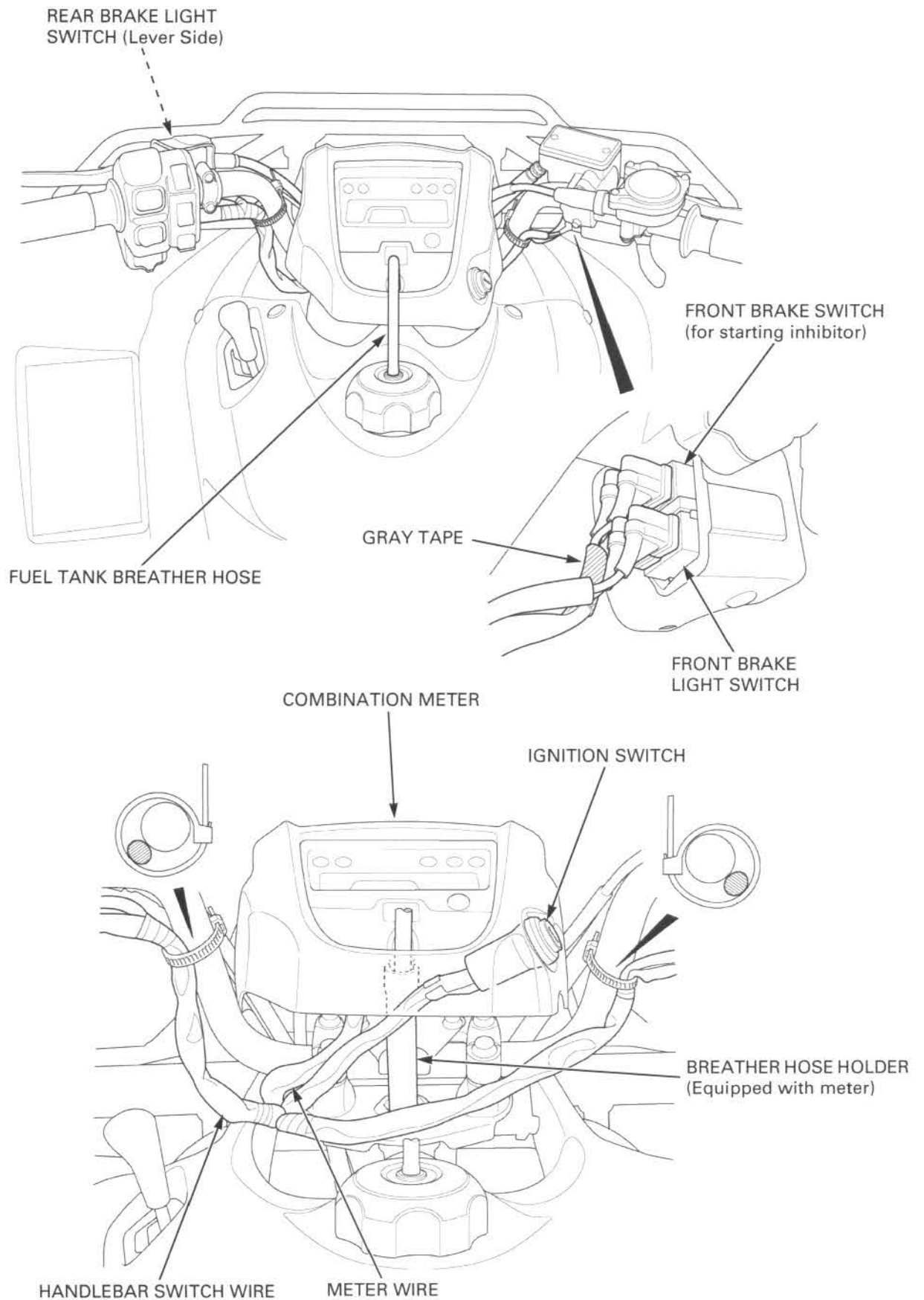


BAND (Secure at blue tape position)





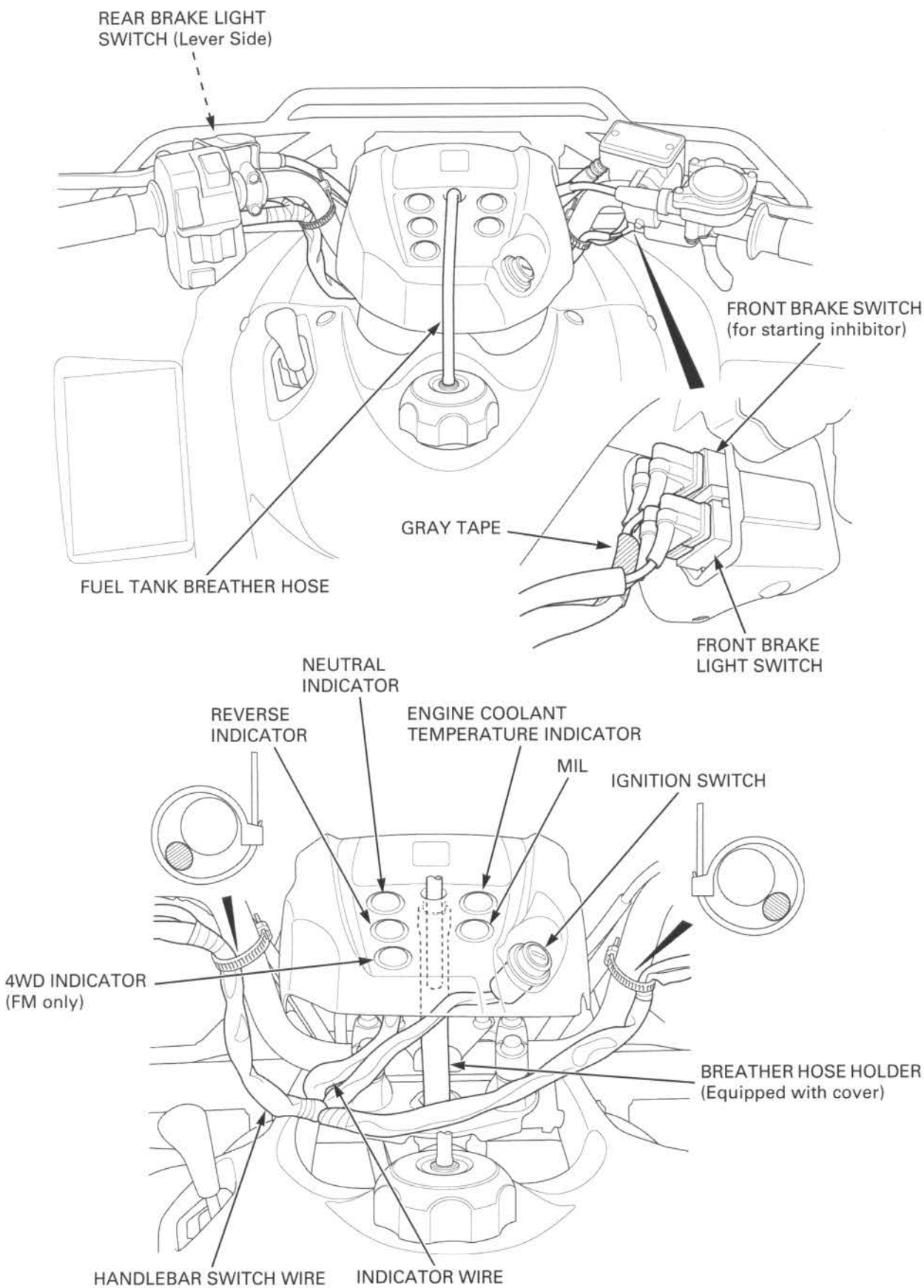
TE/FE and '08 Canada TM/FM:





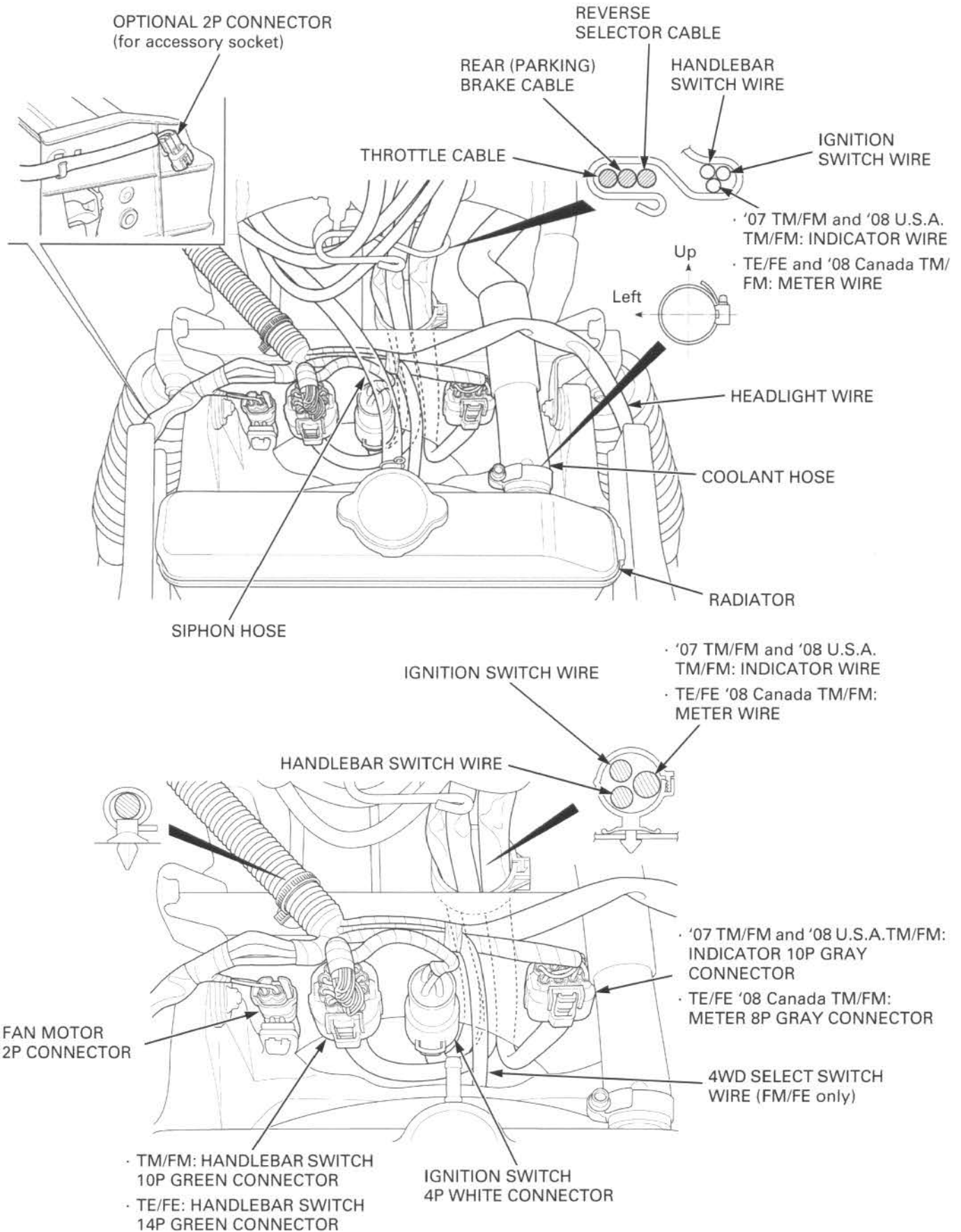
**GENERAL INFORMATION**

'07 TM/FM and '08 U.S.A. TM/FM:





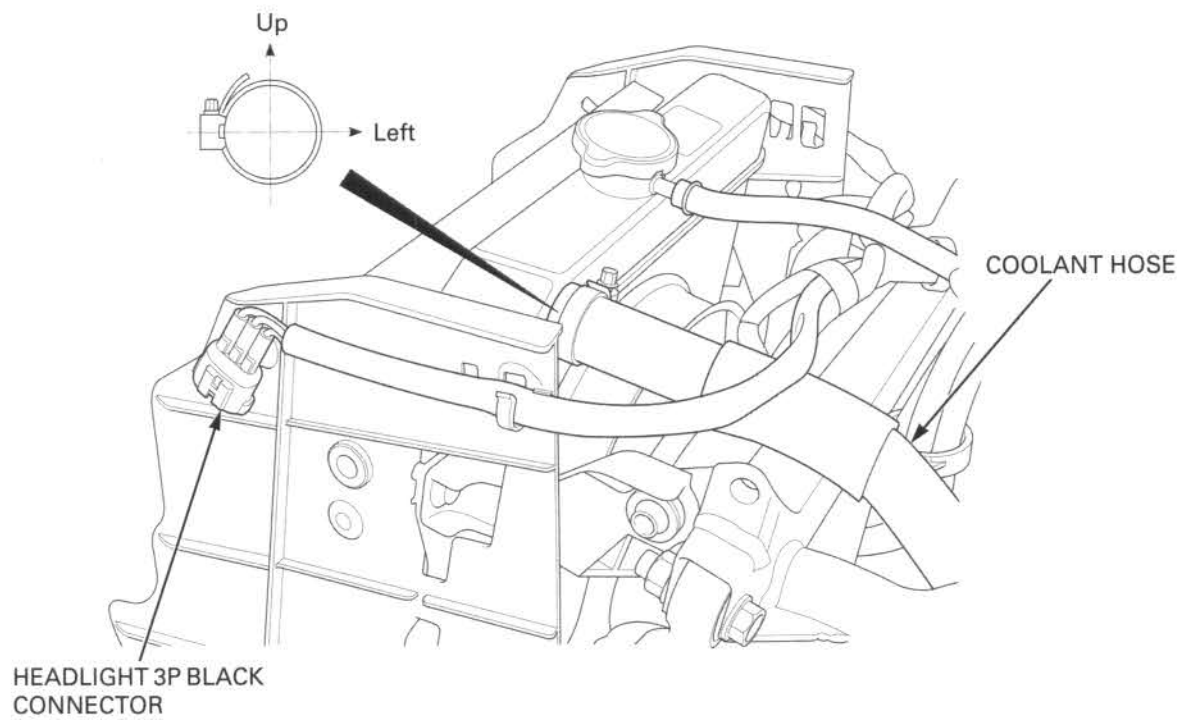
All models:



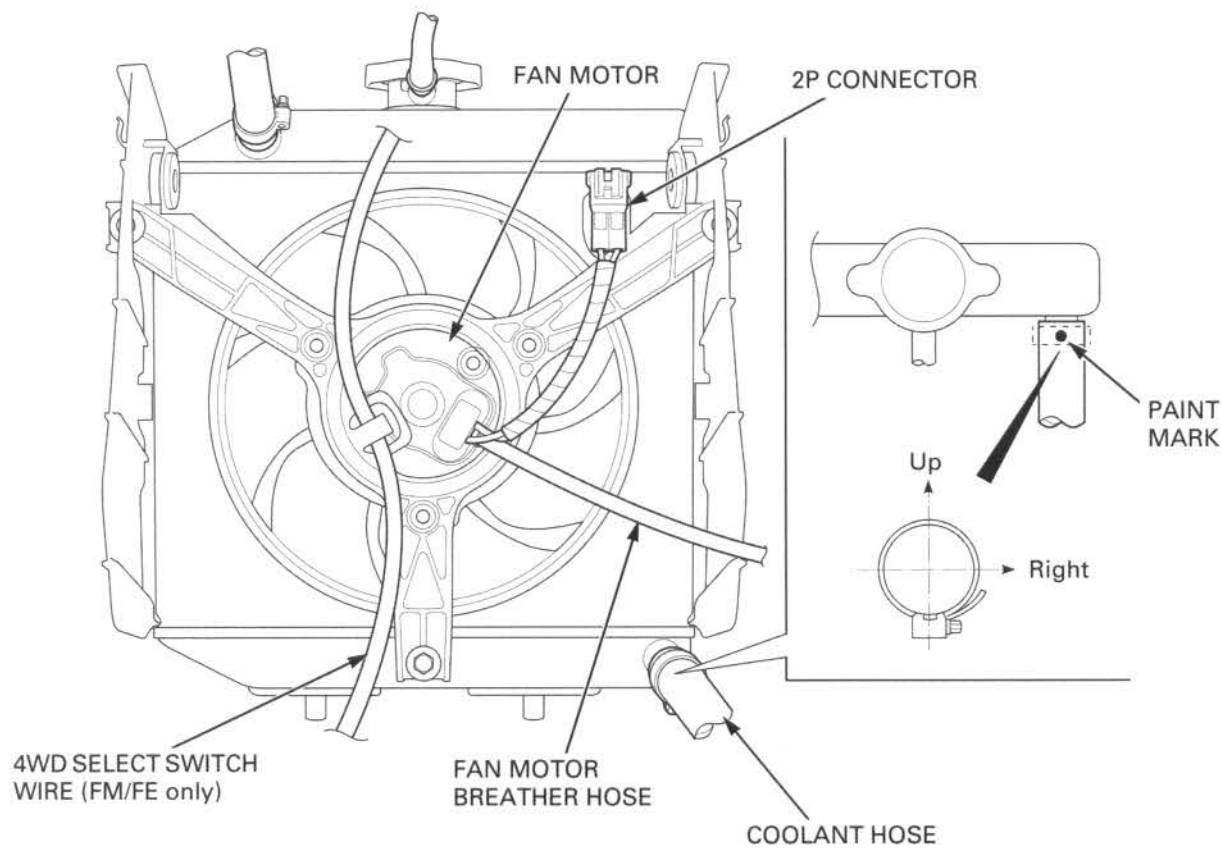


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All models:

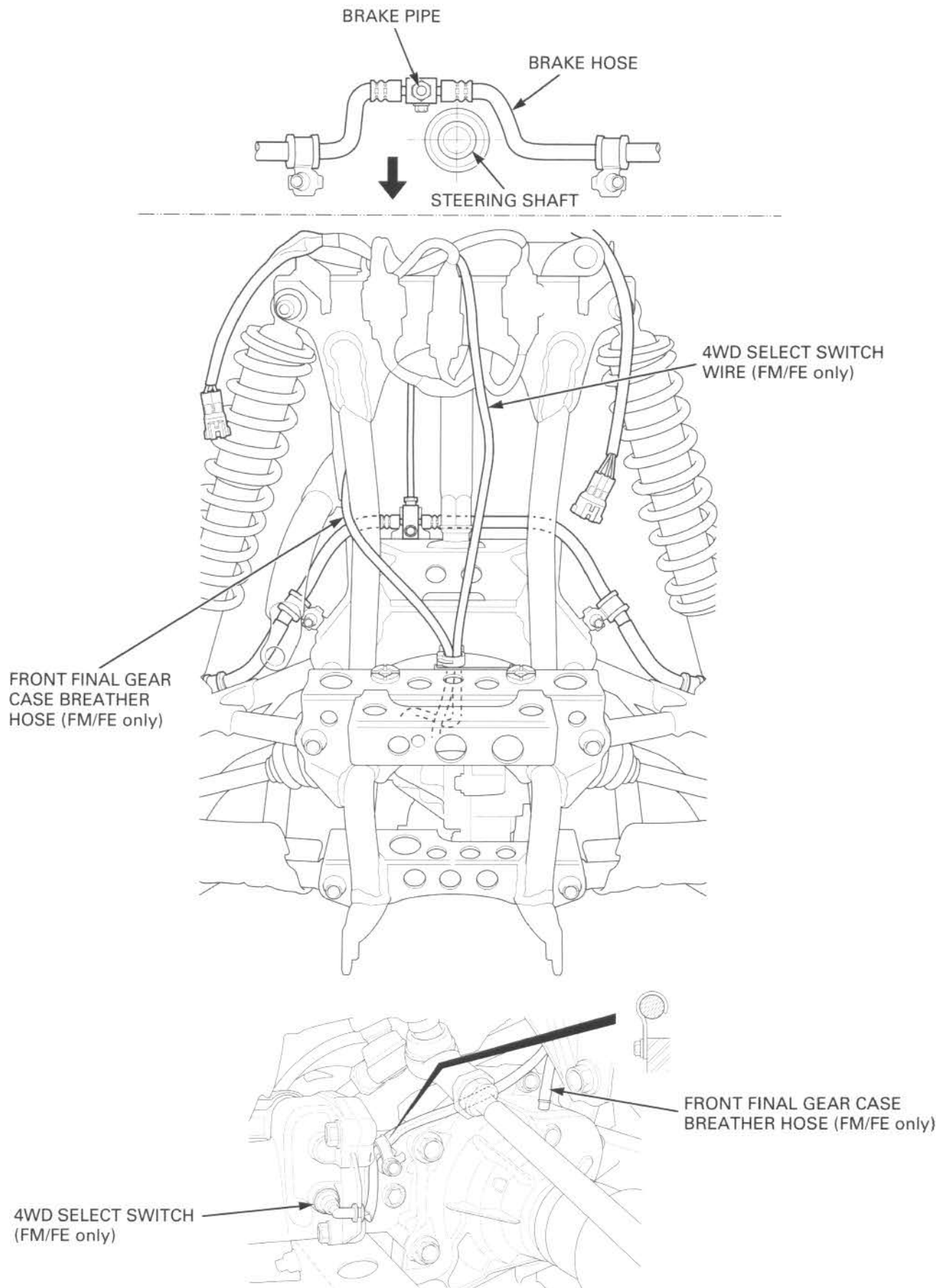


Reverse side of radiator:





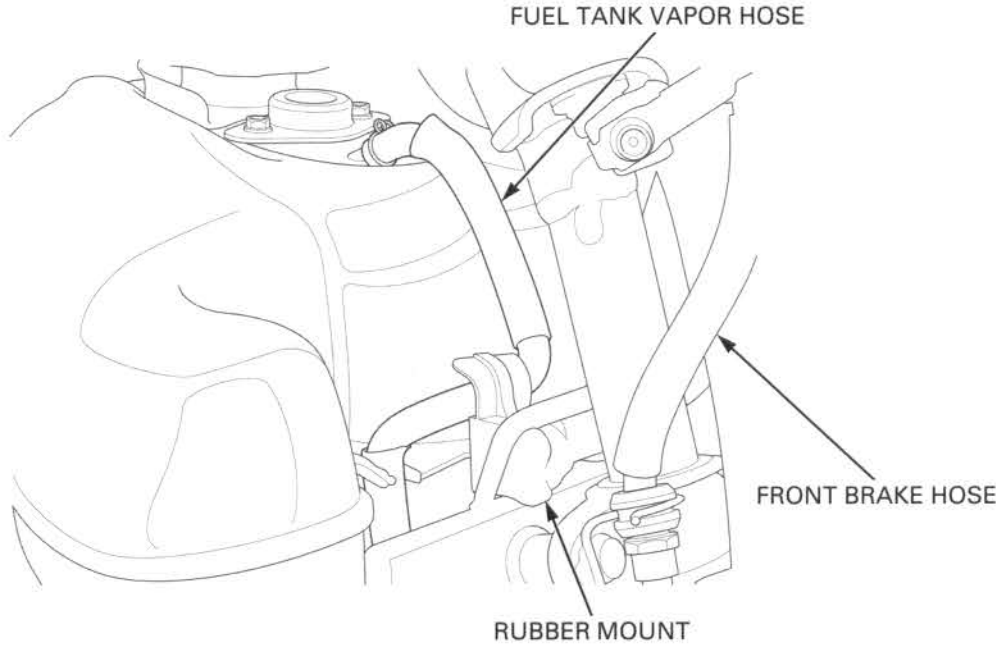
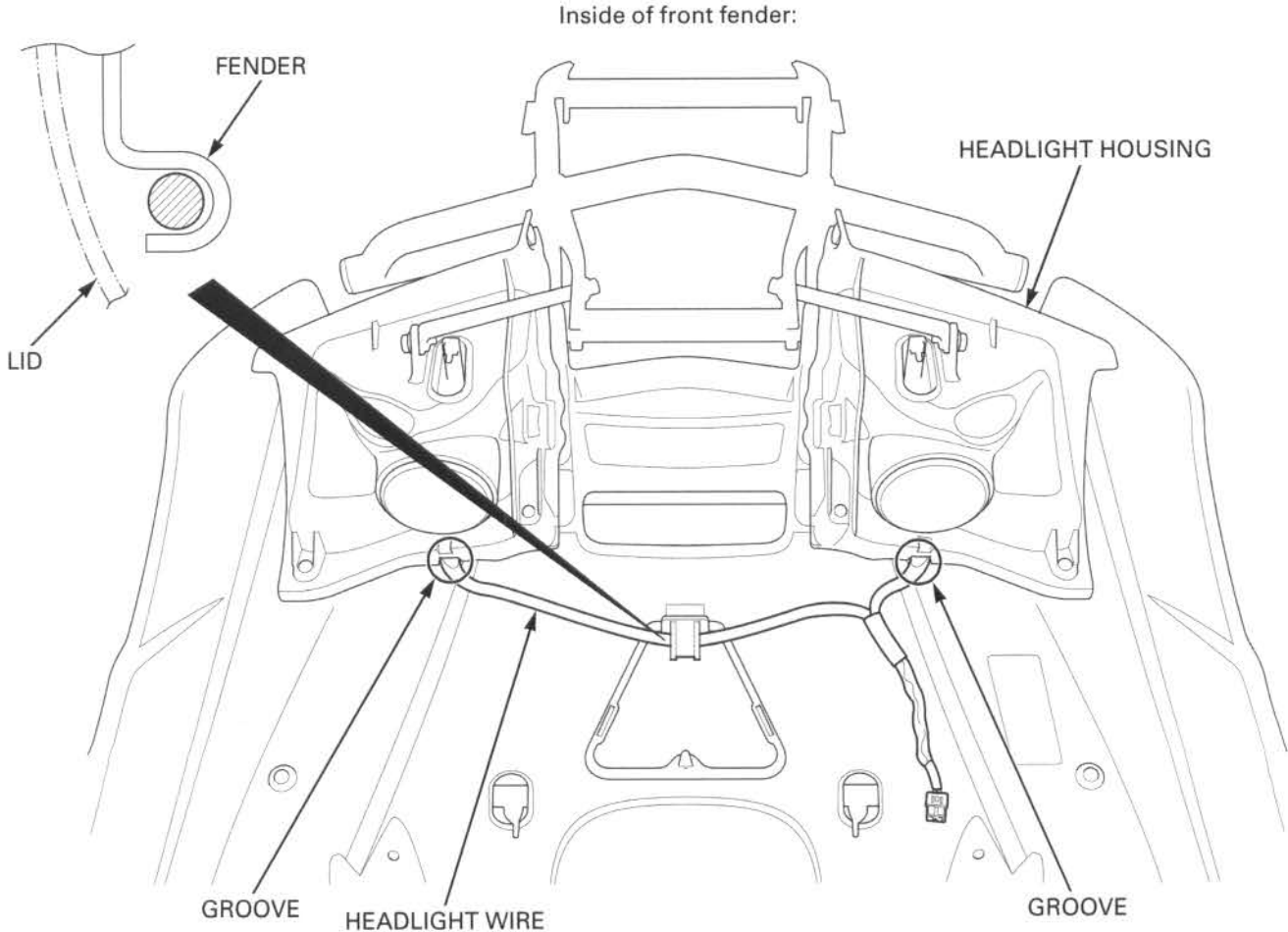
All models:





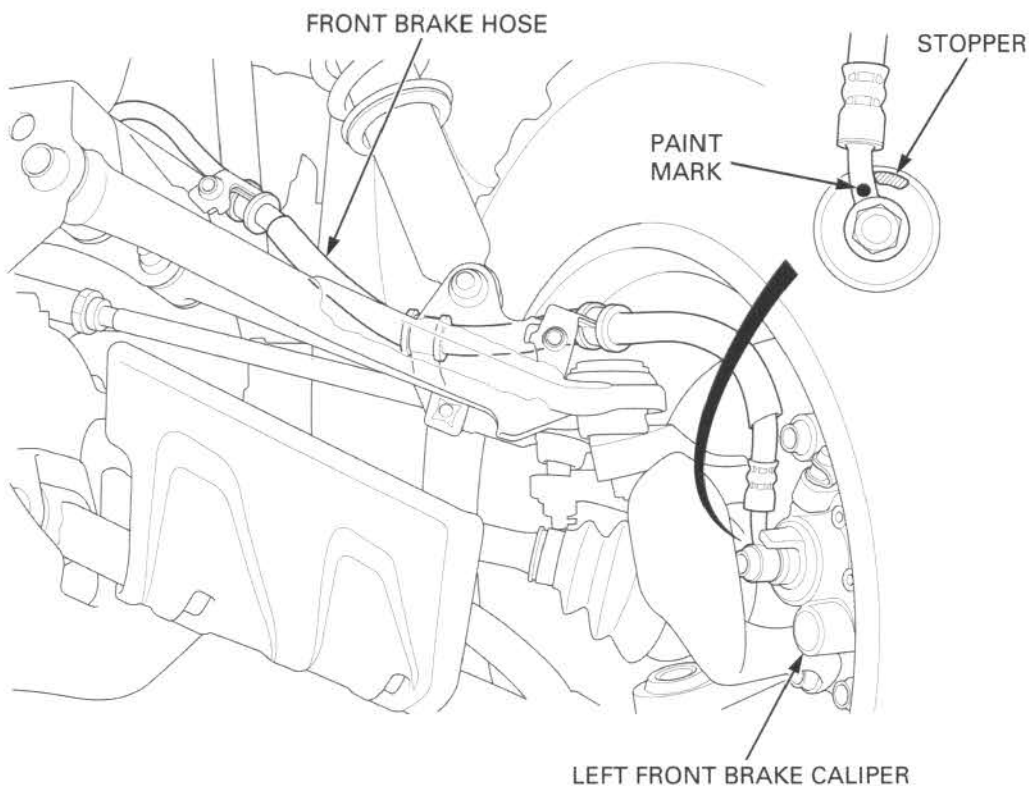
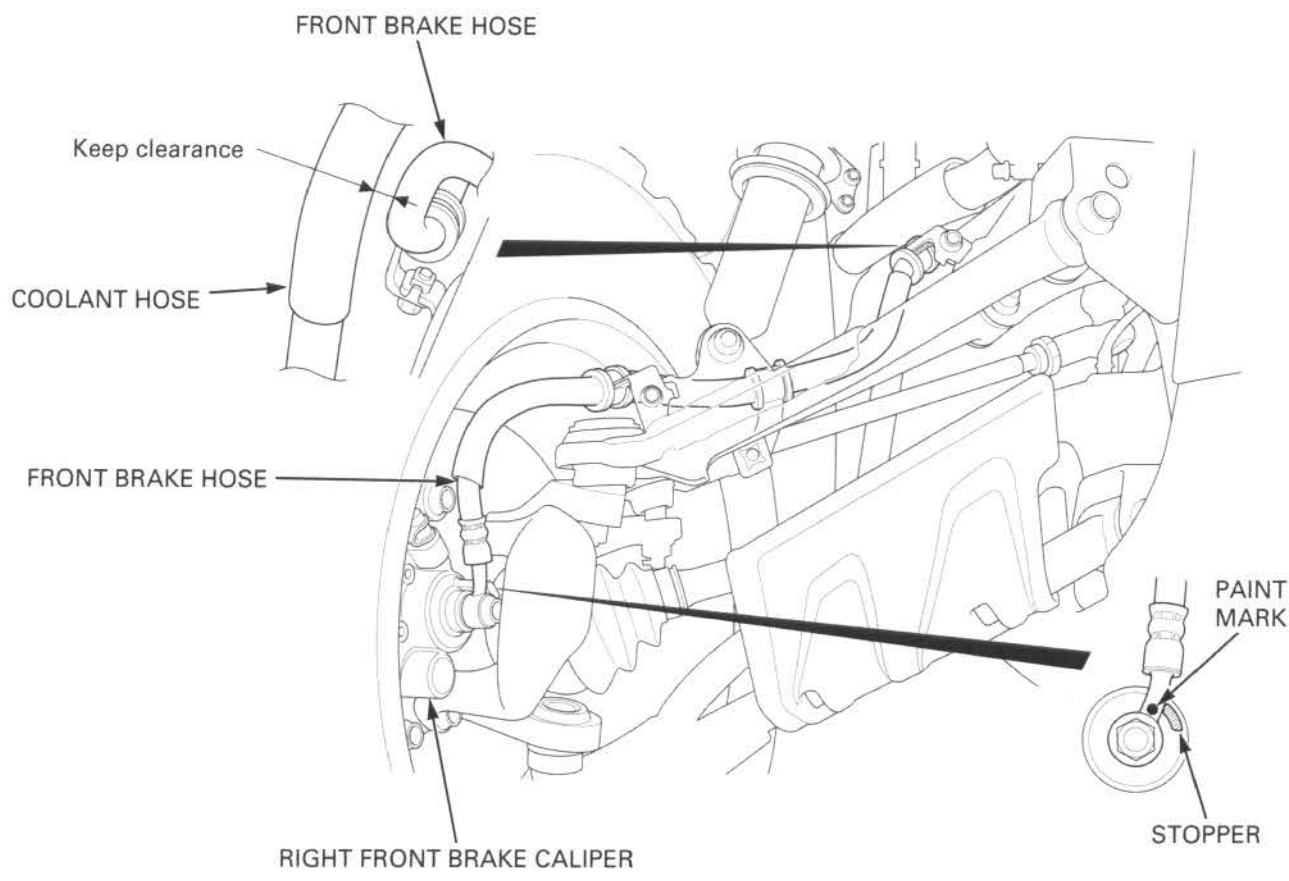
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All models:





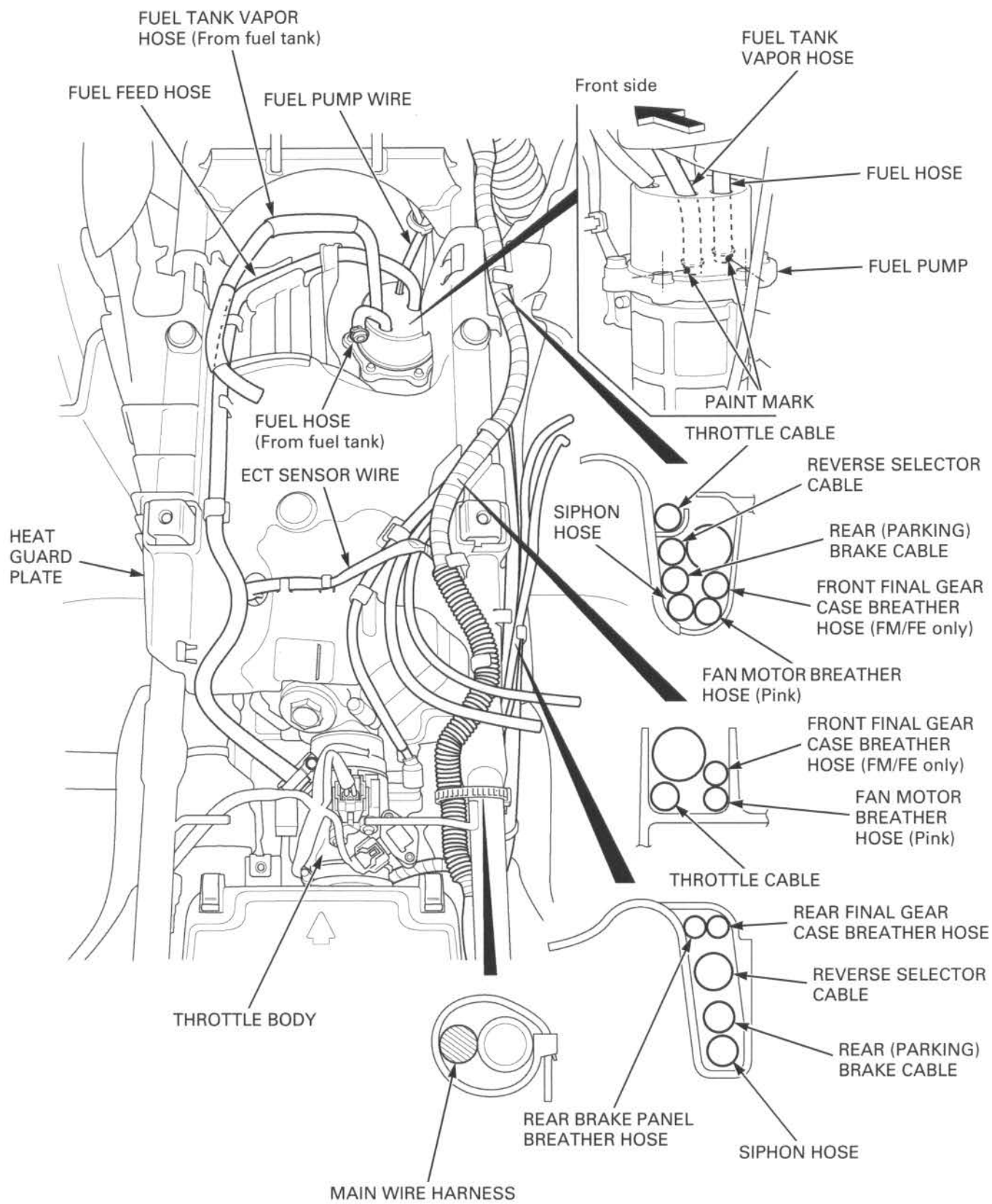
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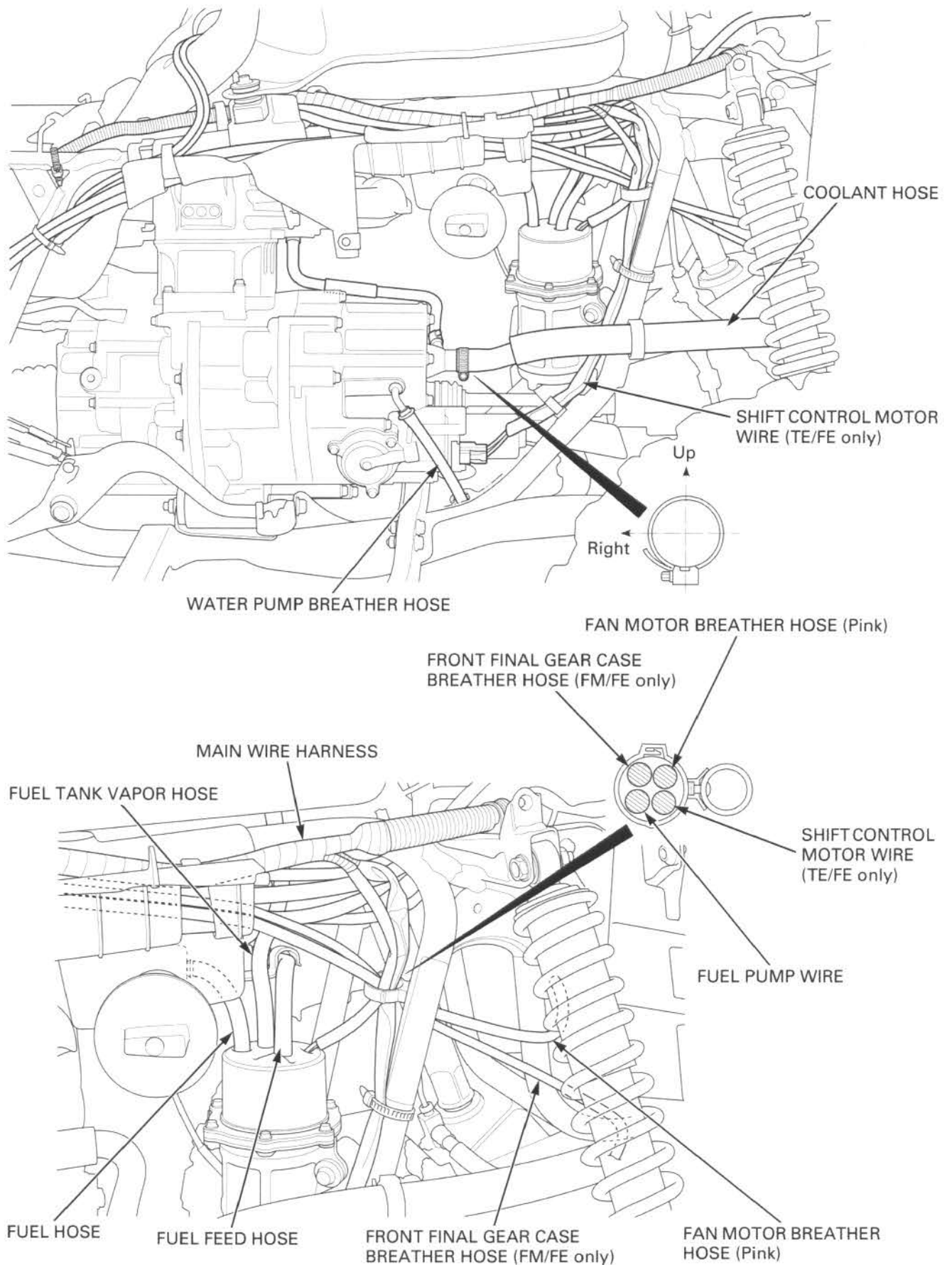
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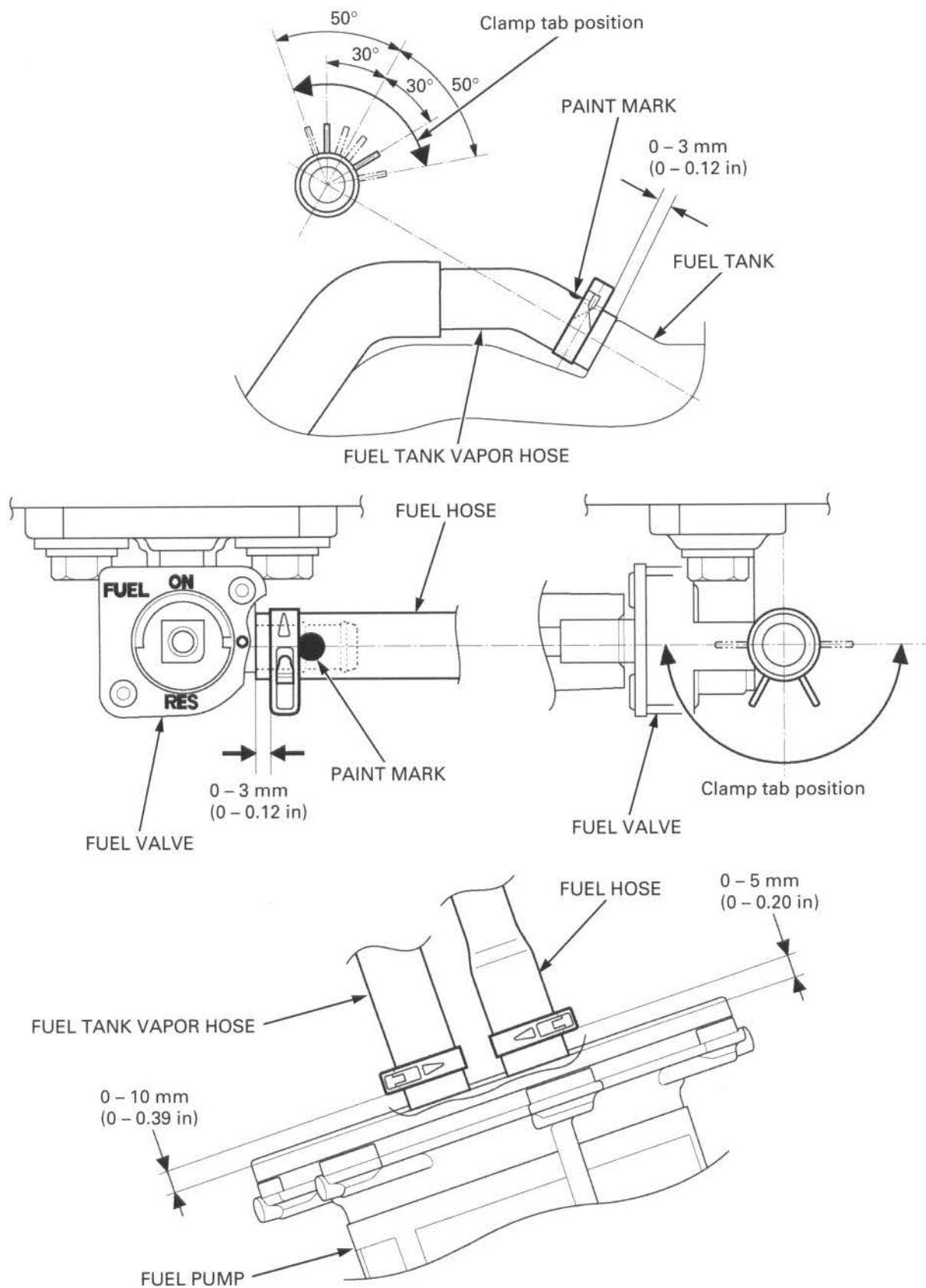
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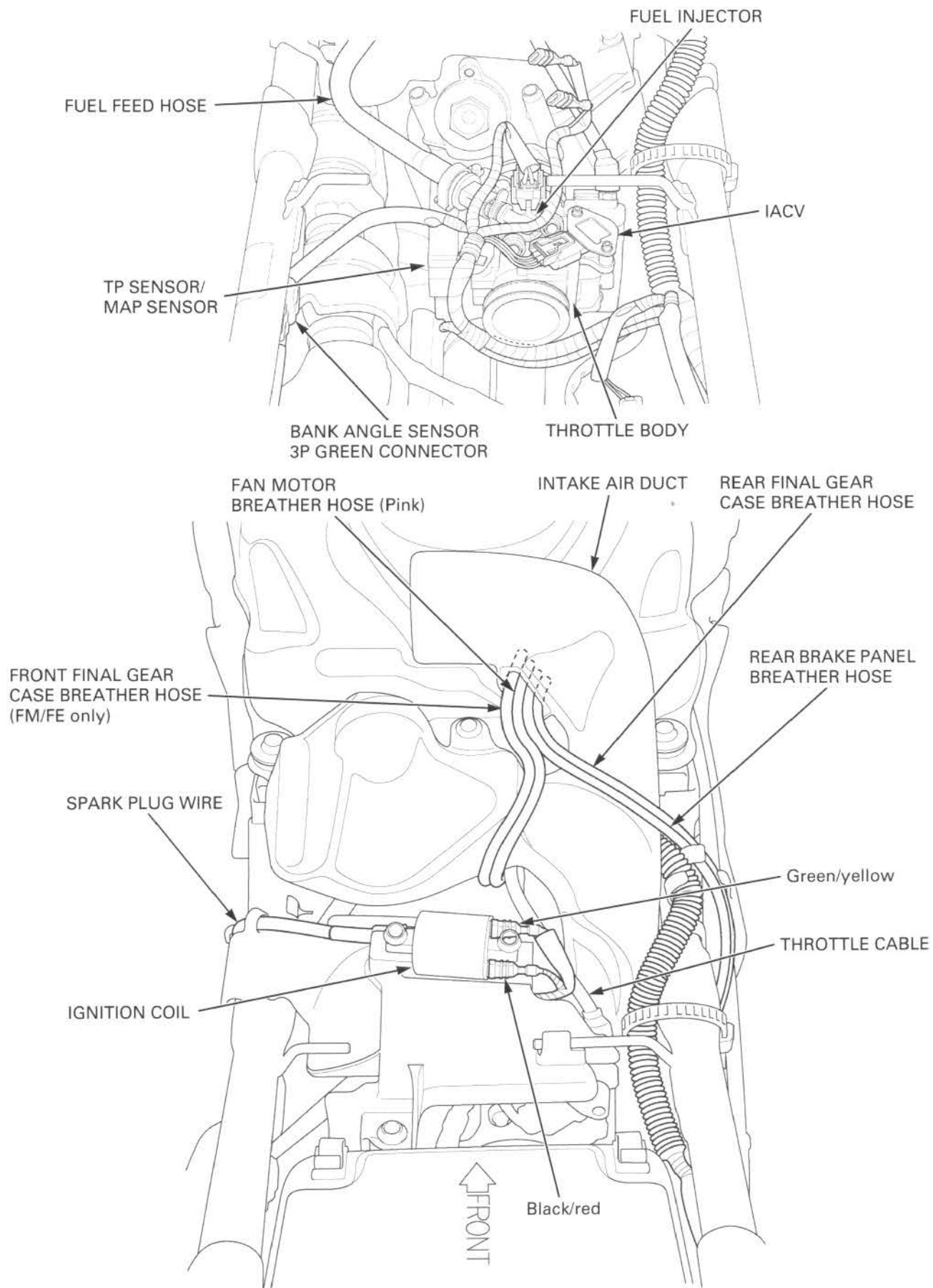
## GENERAL INFORMATION

'08:





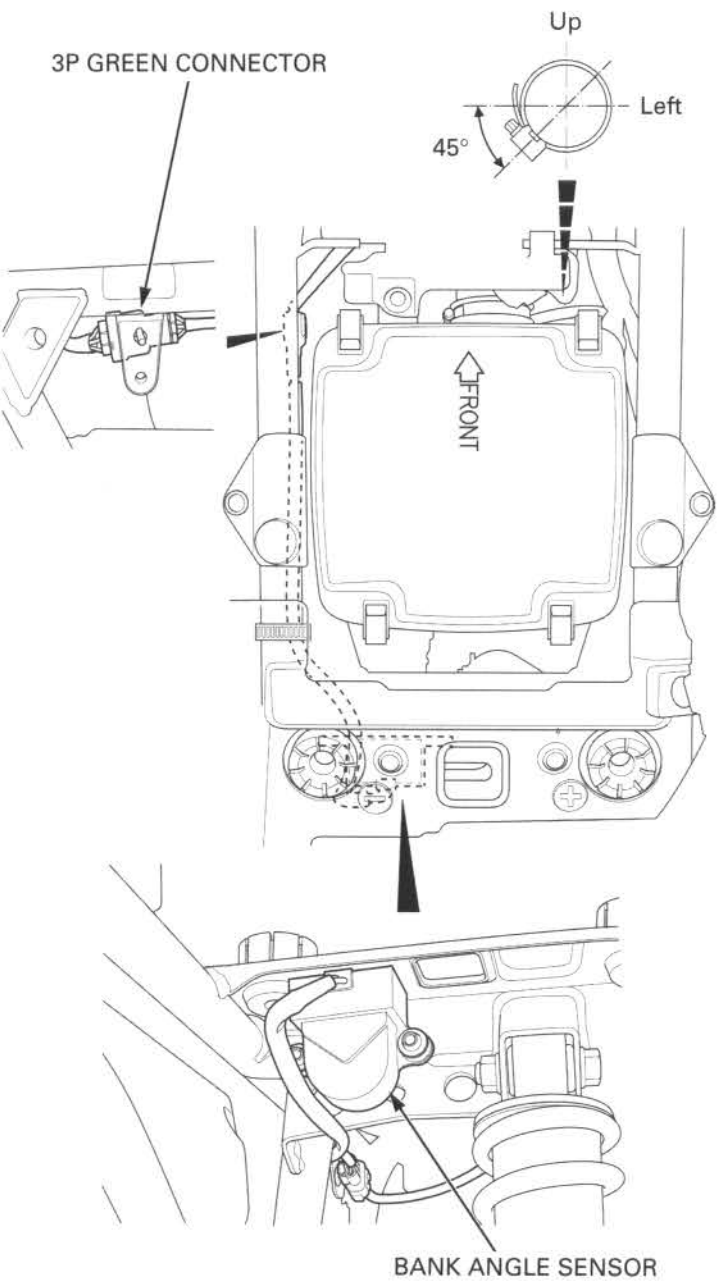
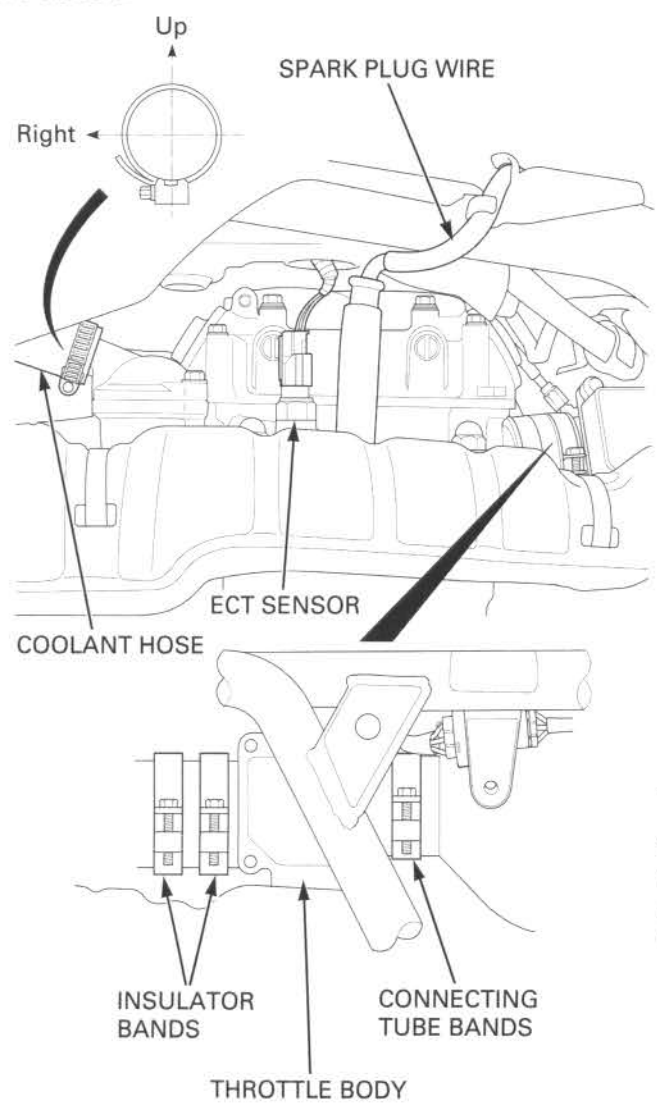
All models:





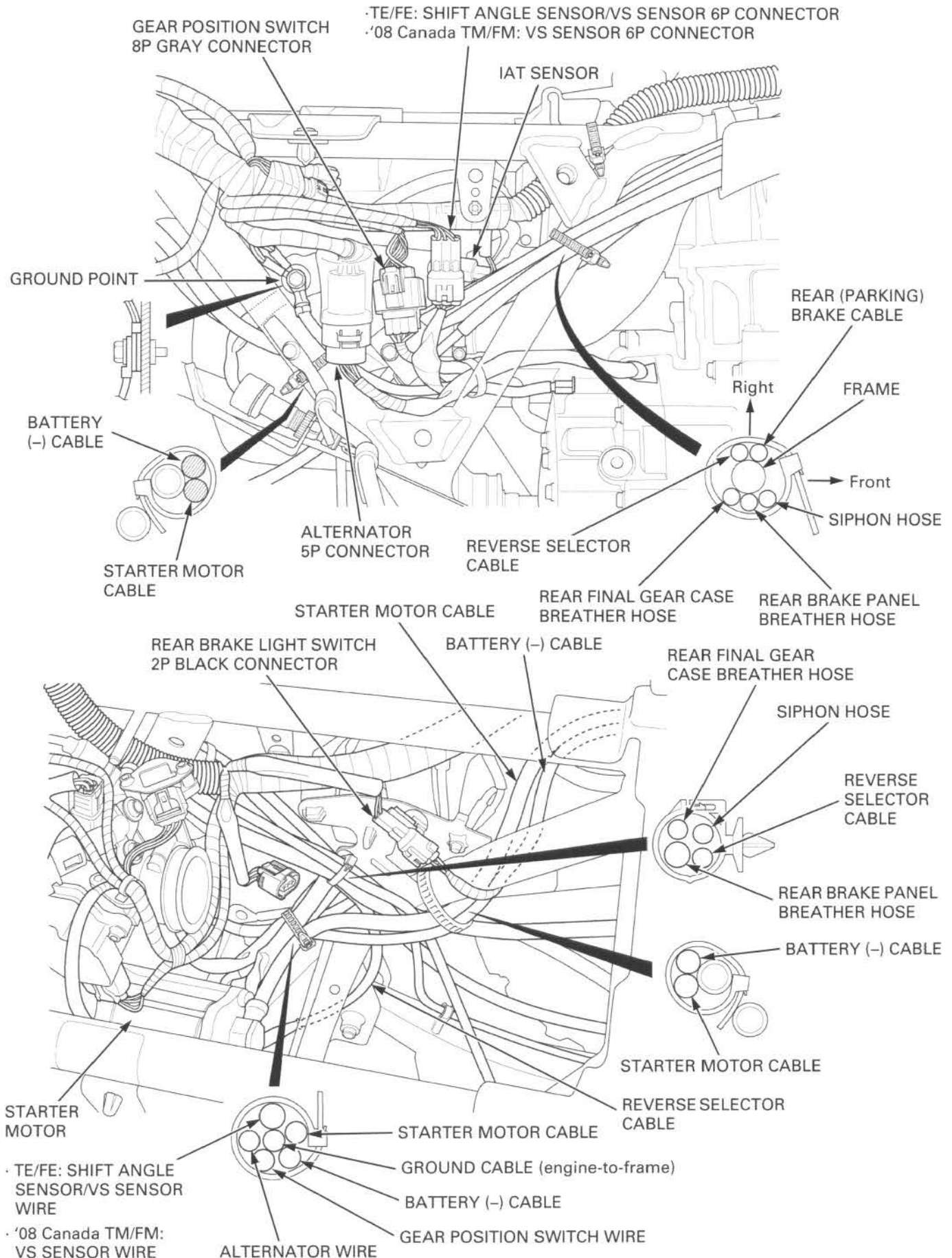
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All models:





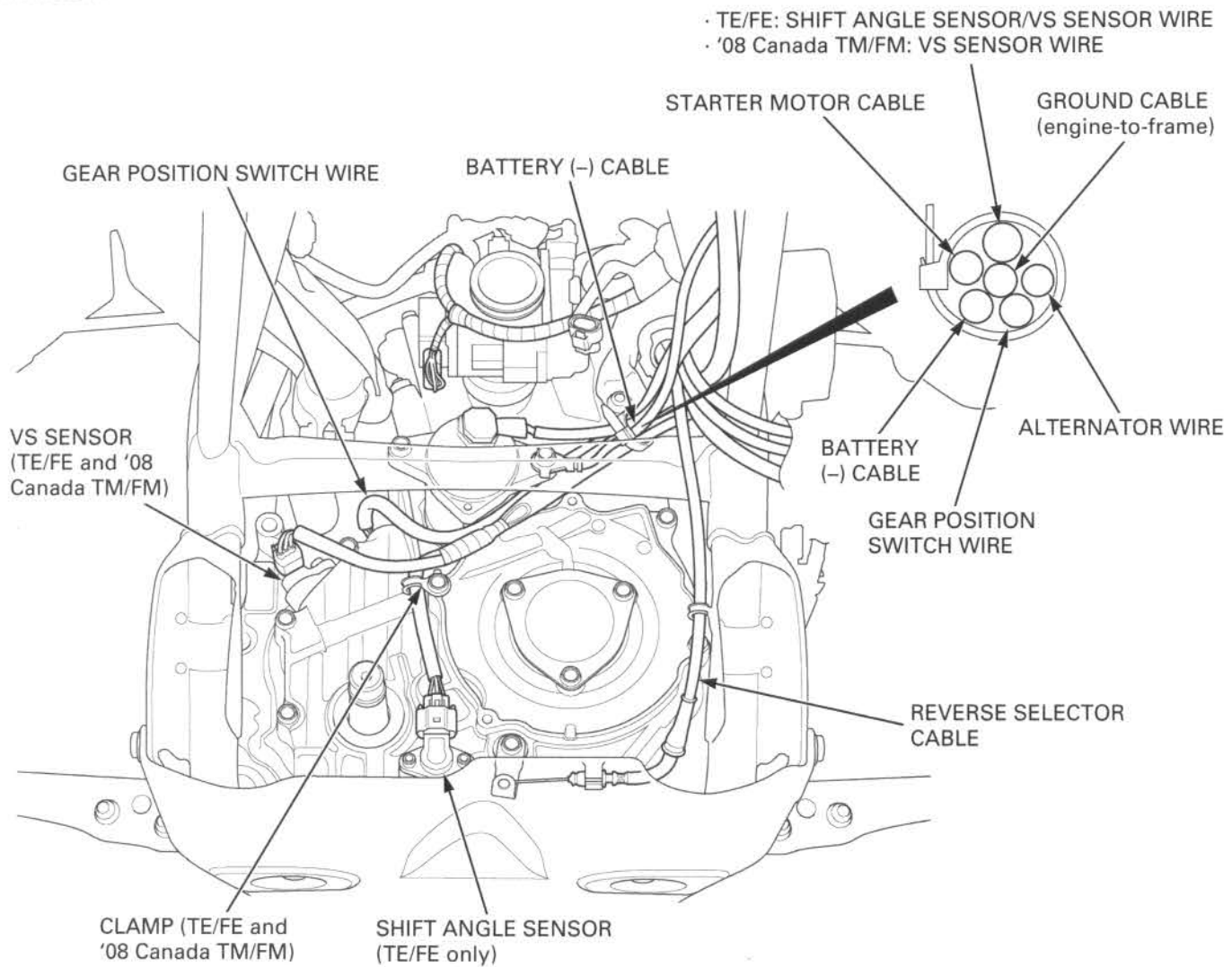
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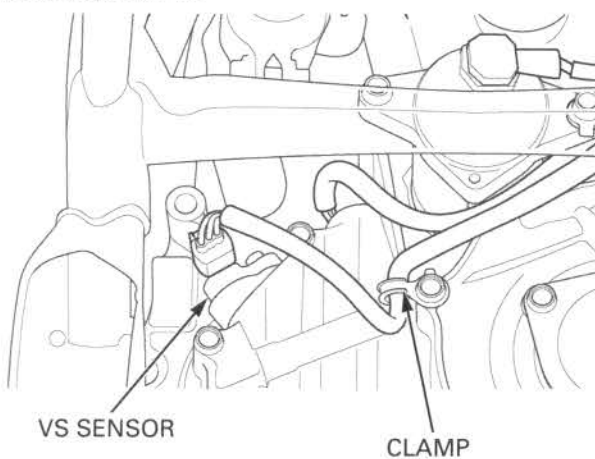


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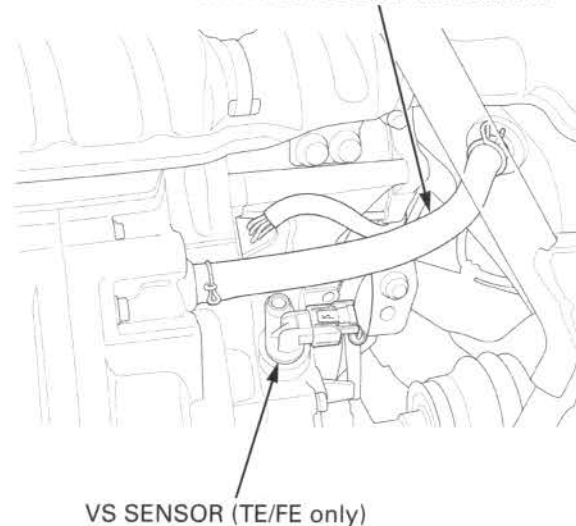
All models:



'08 Canada TM/FM:

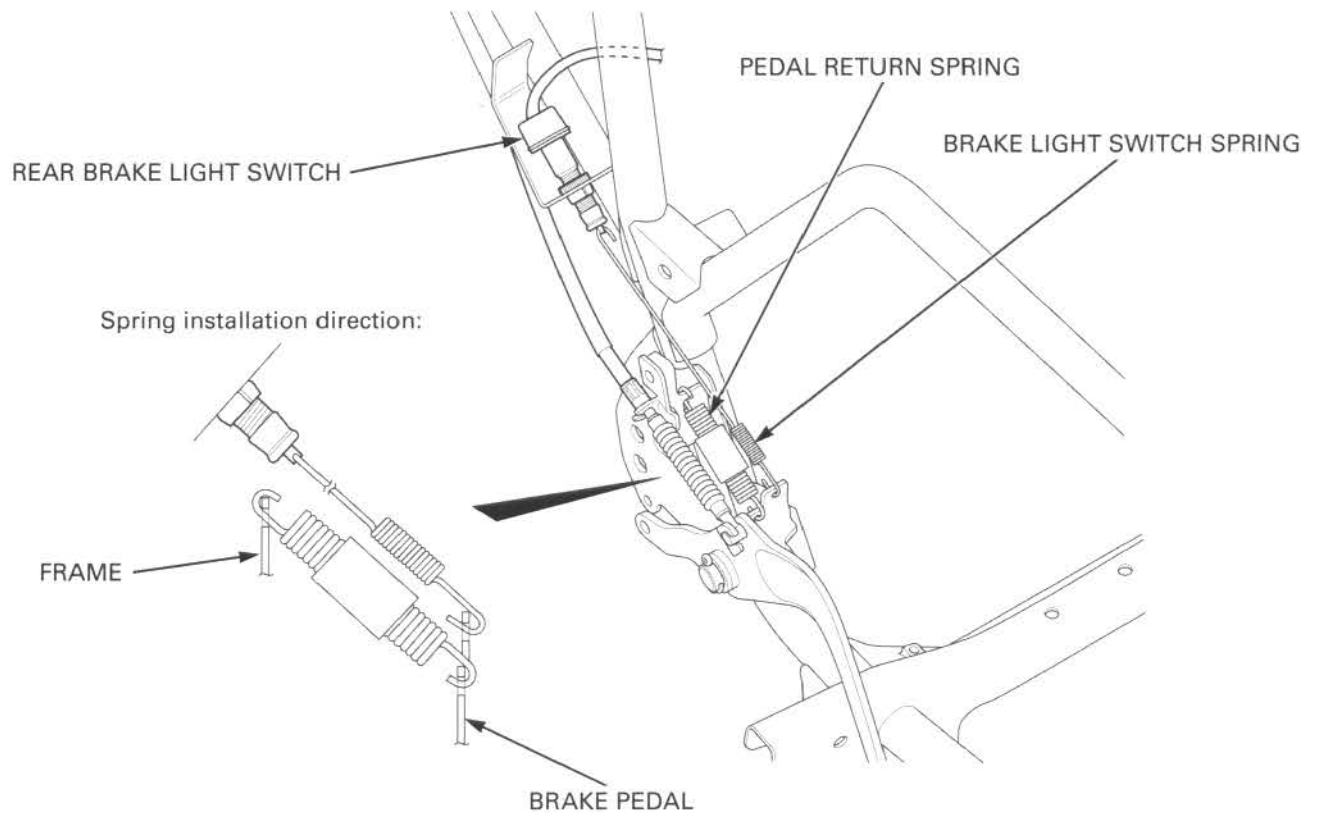
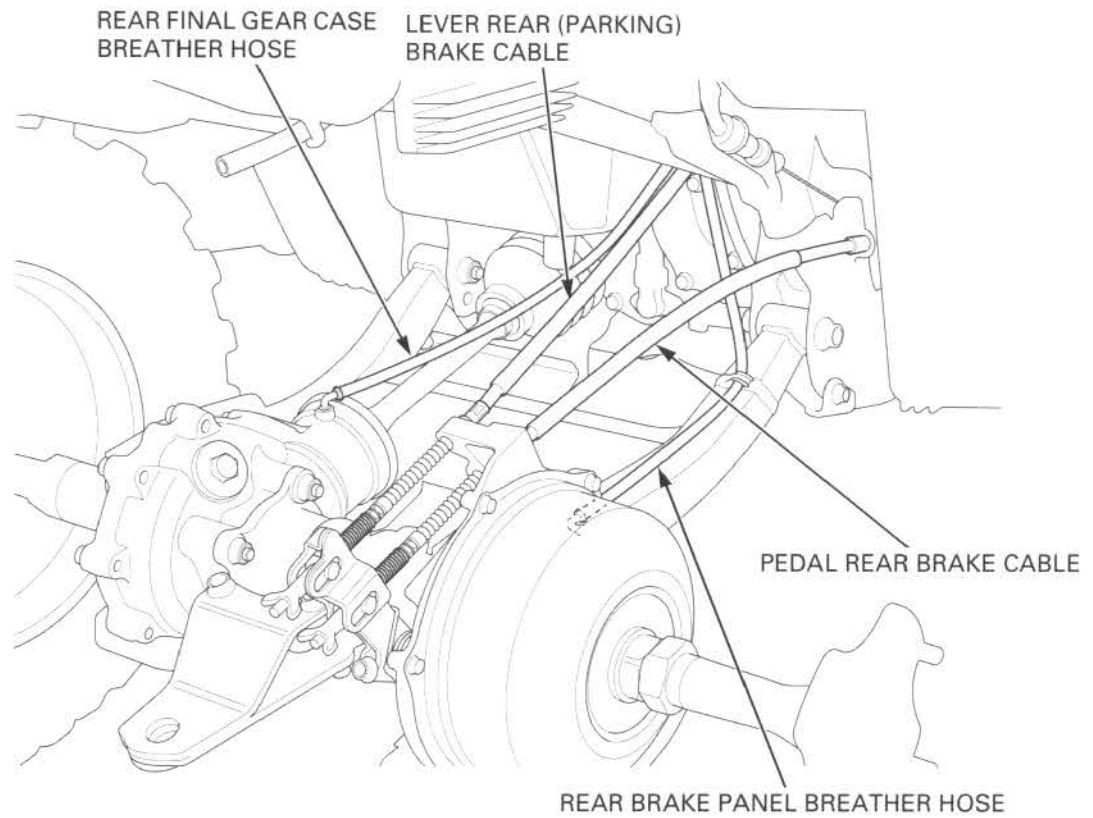


CRANKCASE BREATHER HOSE





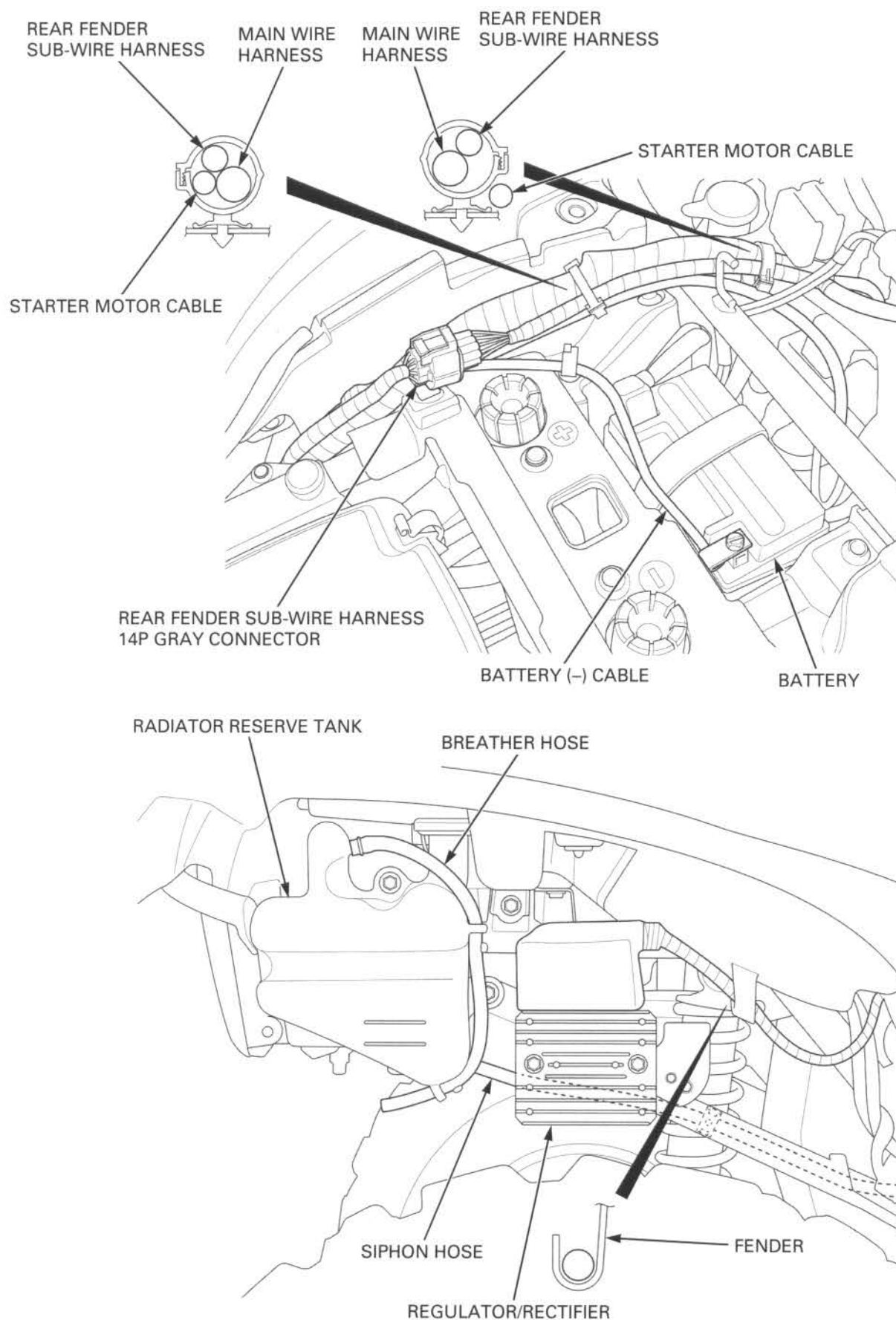
All models:





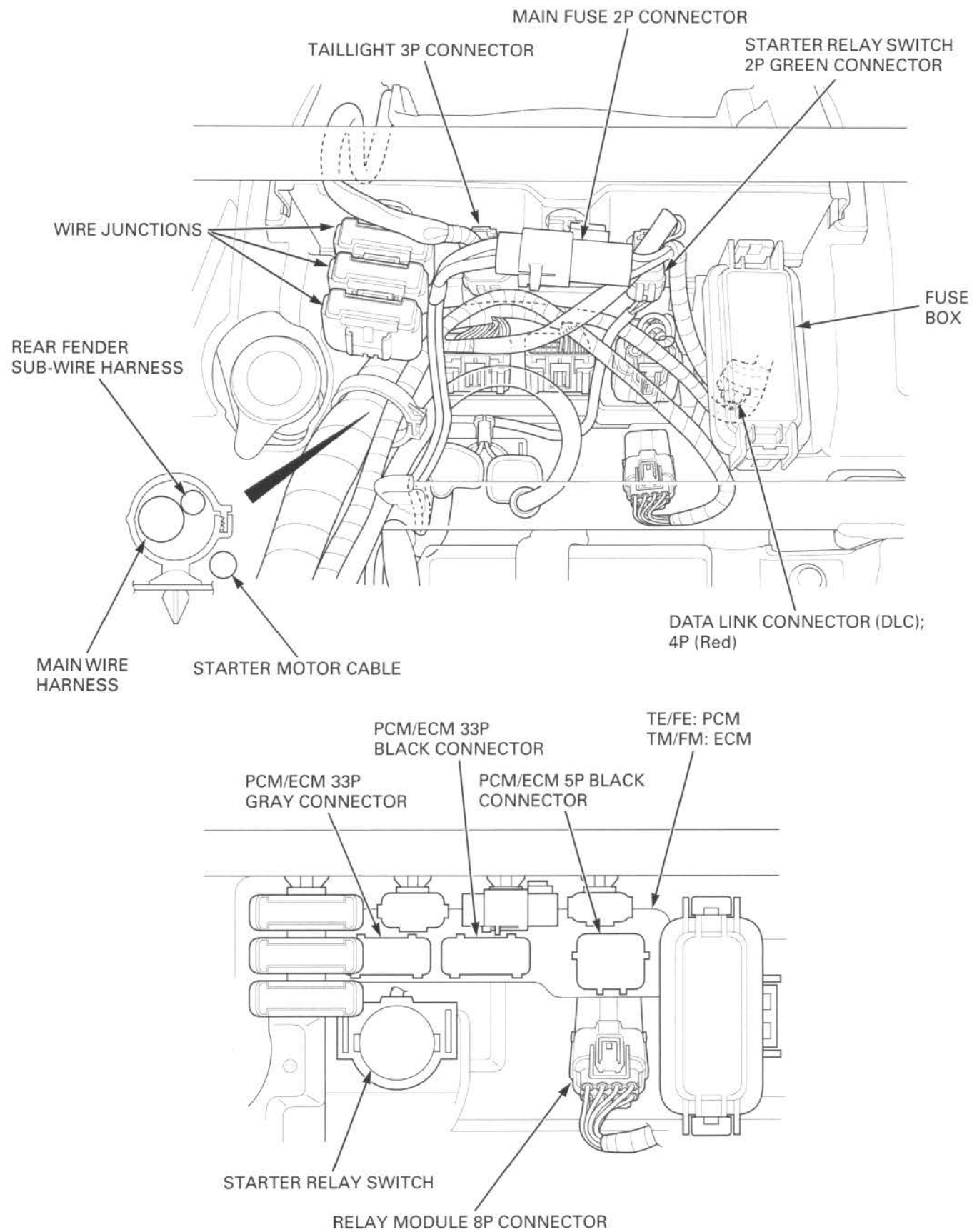
## GENERAL INFORMATION

All models:





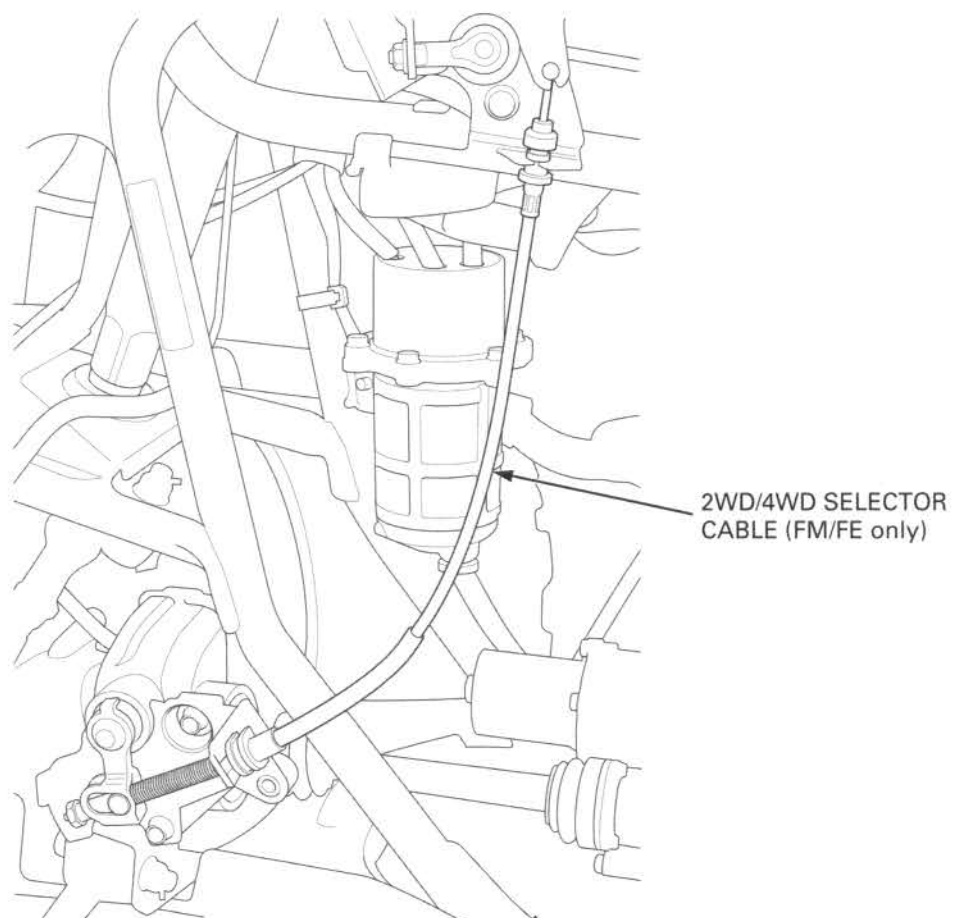
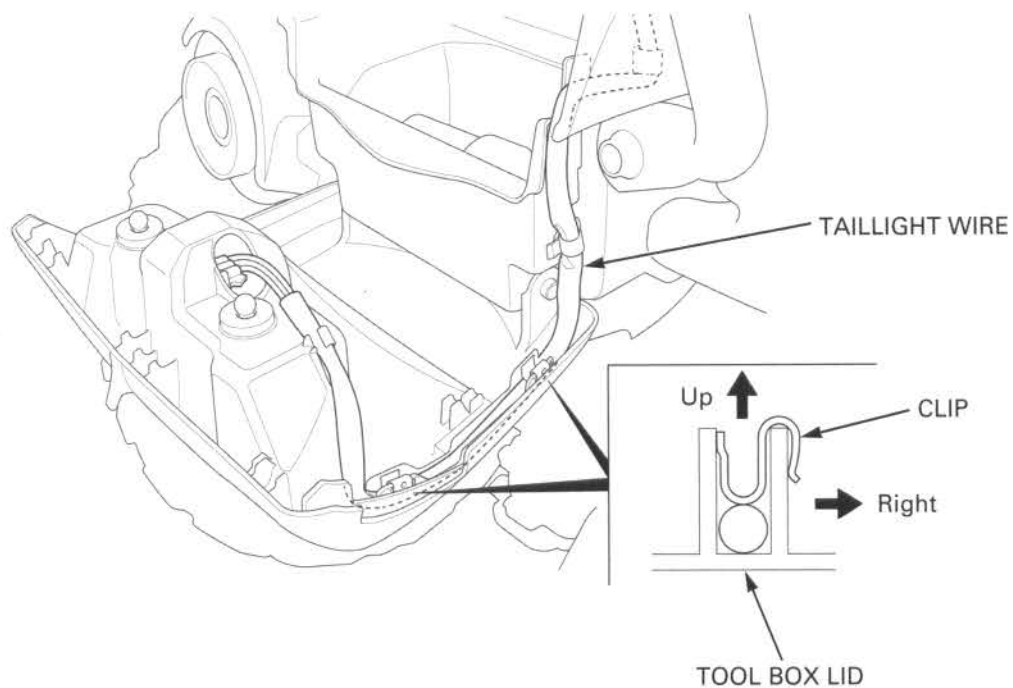
All models:





## GENERAL INFORMATION

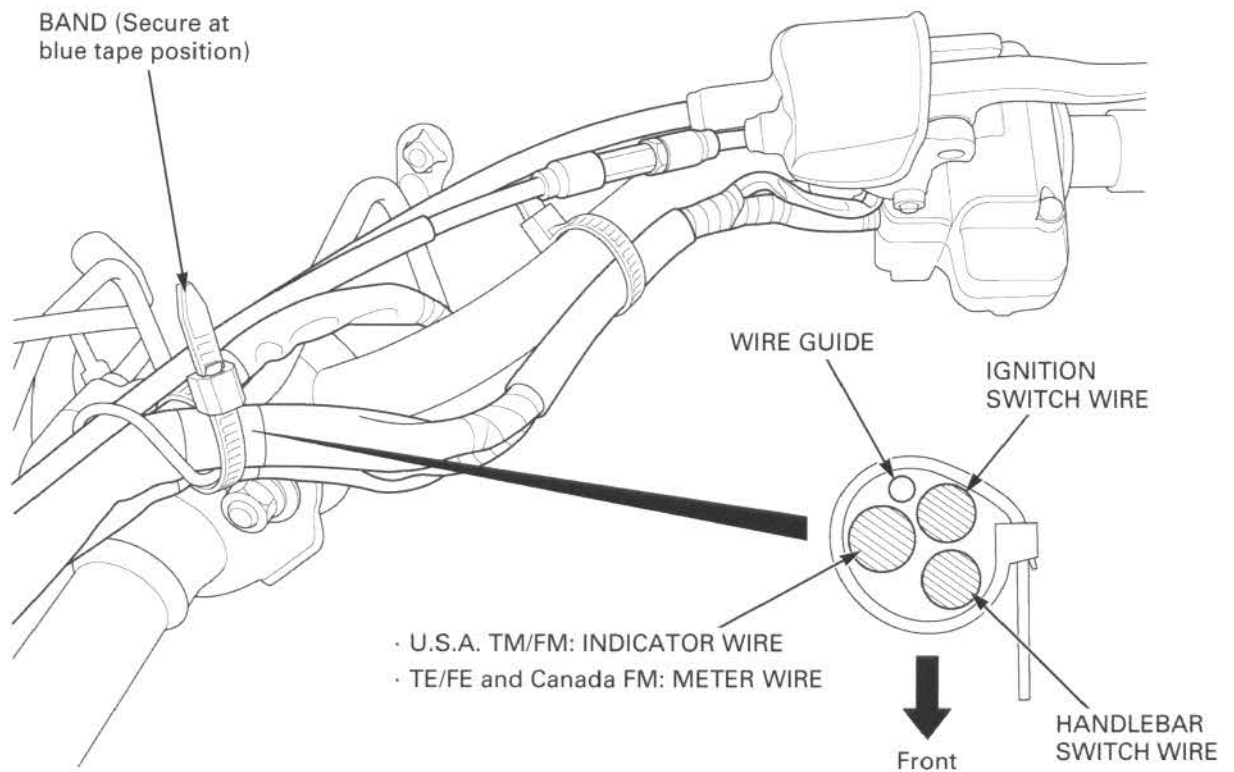
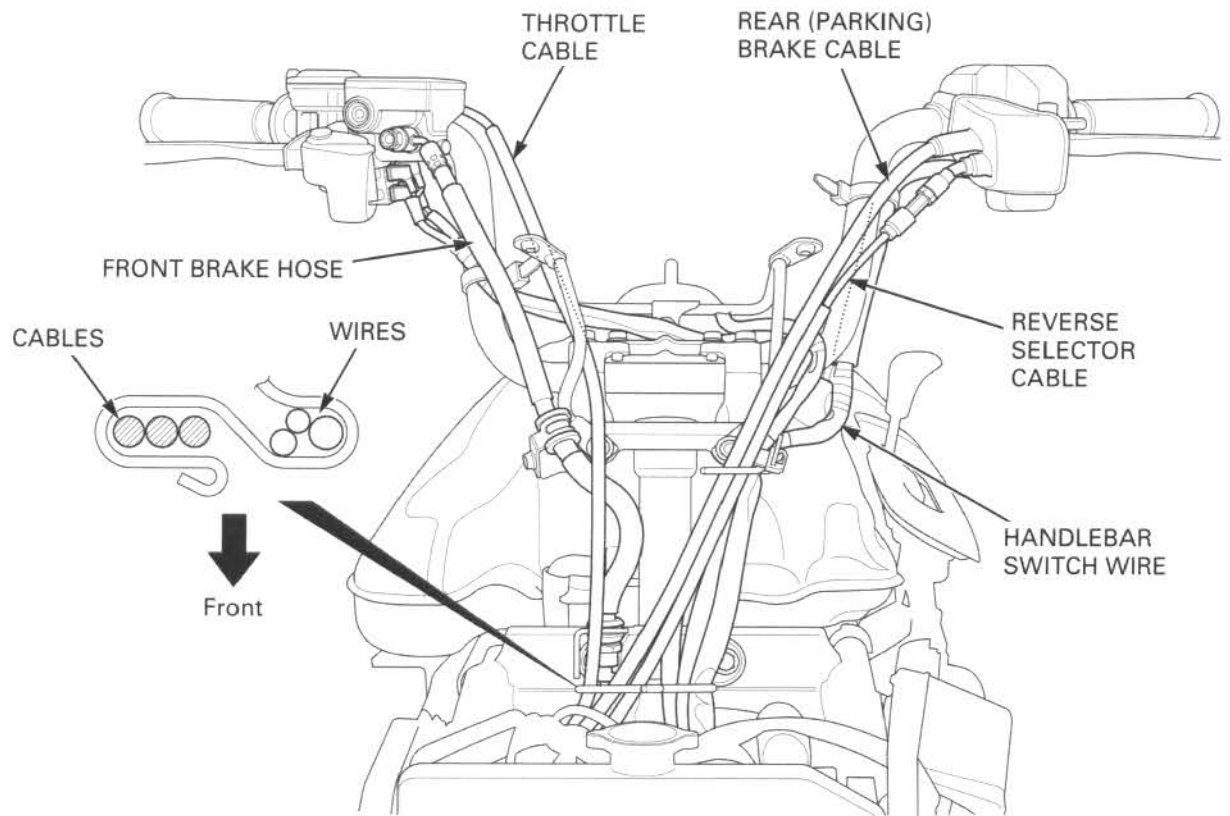
All models:





# CABLE & HARNESS ROUTING (After '08 model)

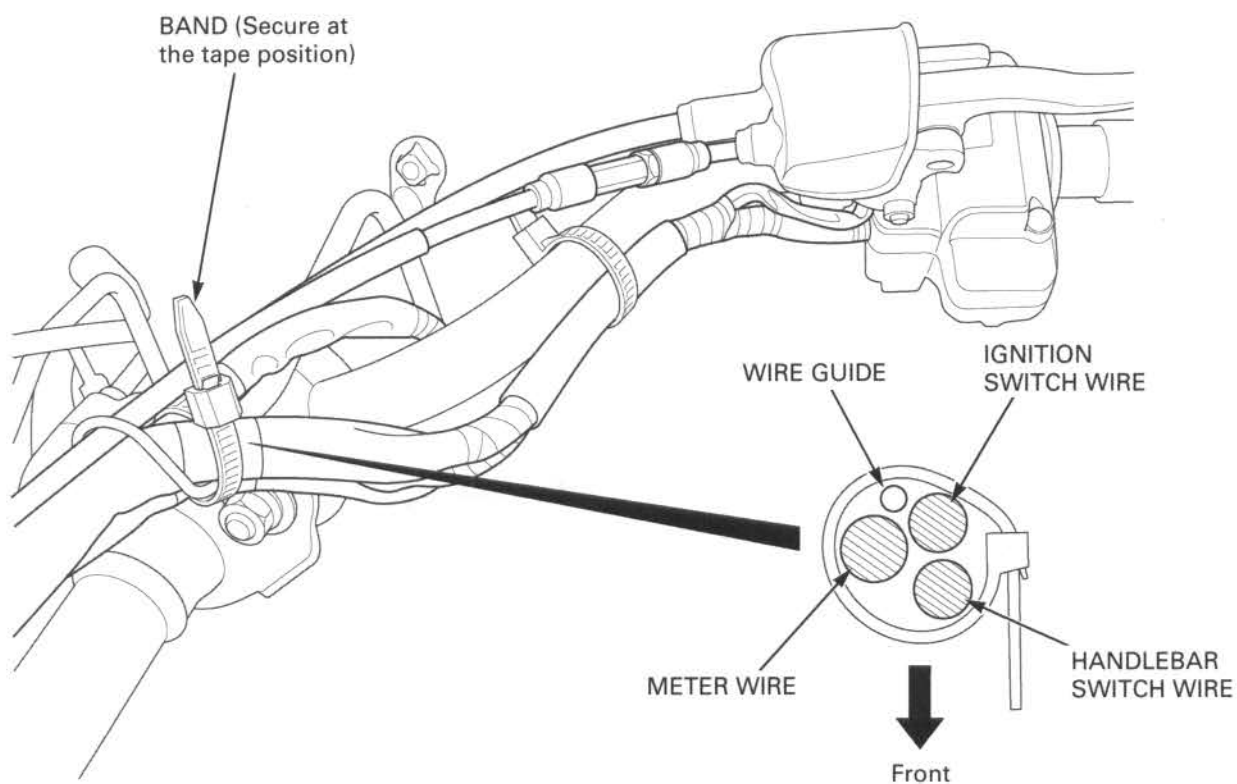
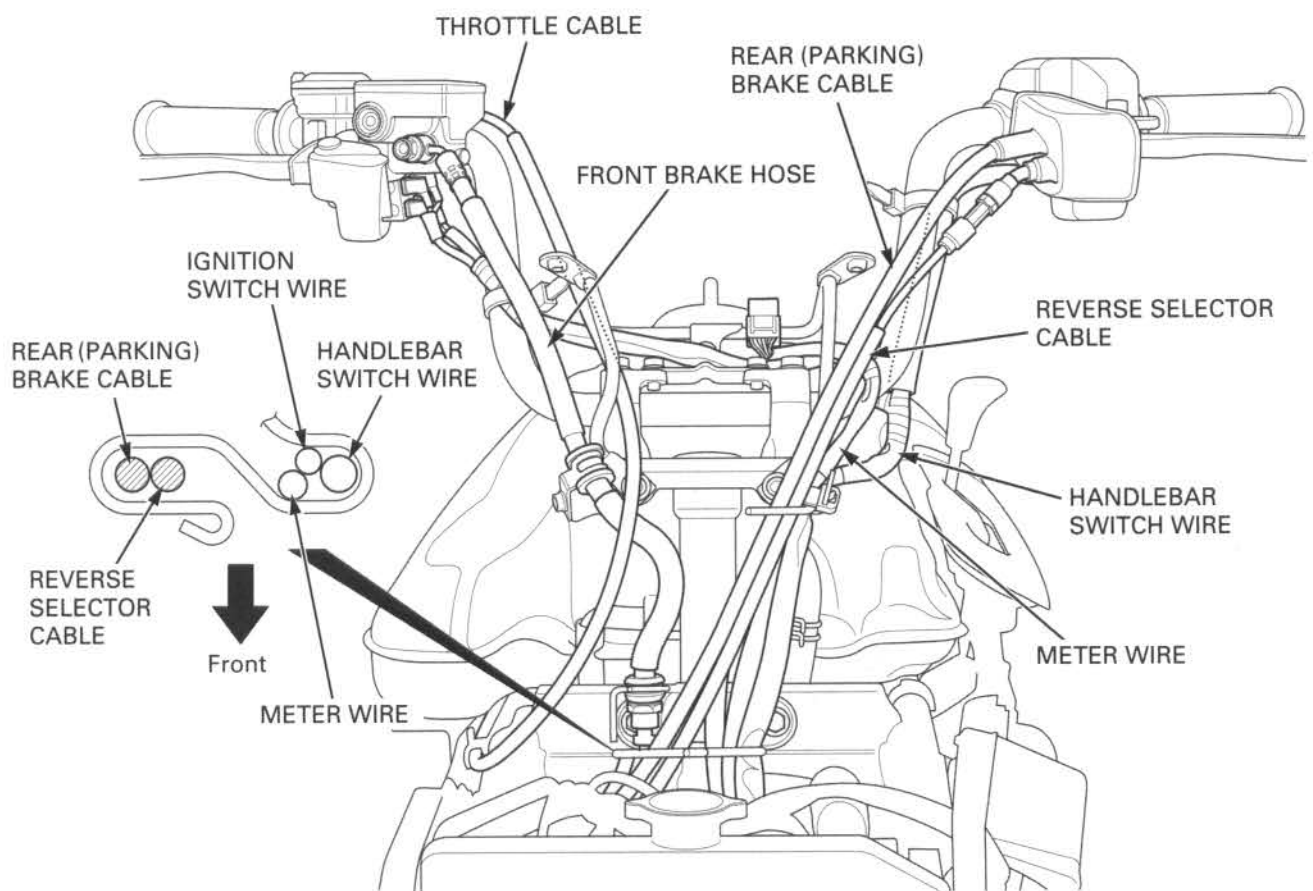
TM/TE/FM/FE:





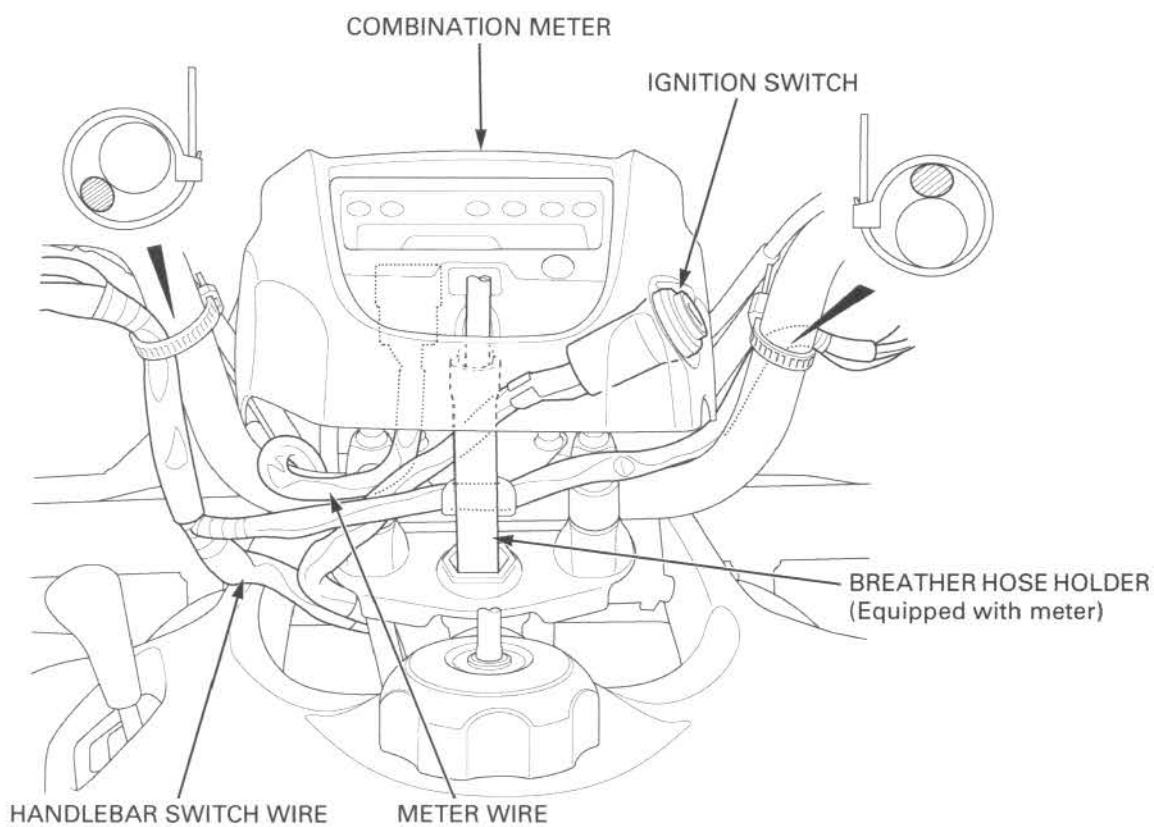
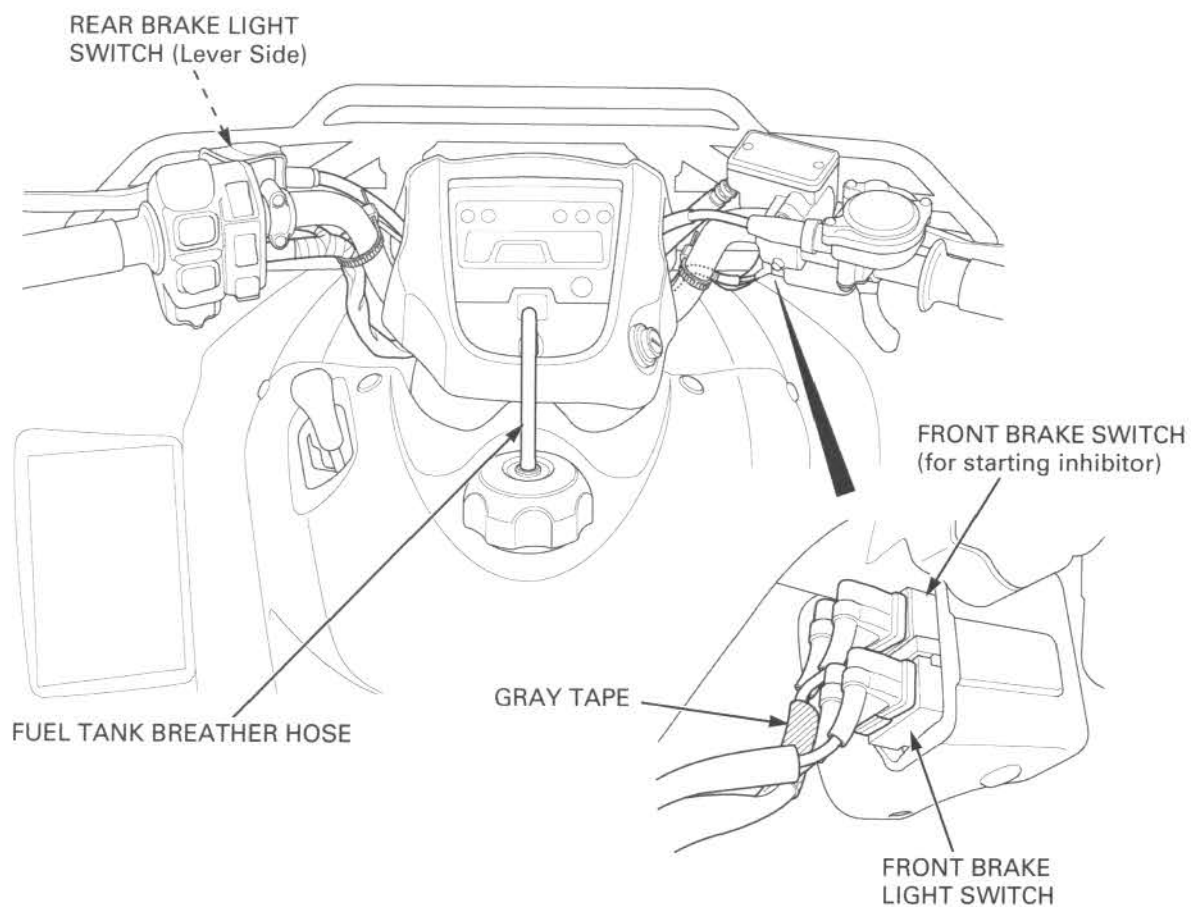
## GENERAL INFORMATION

FPE/FPM:





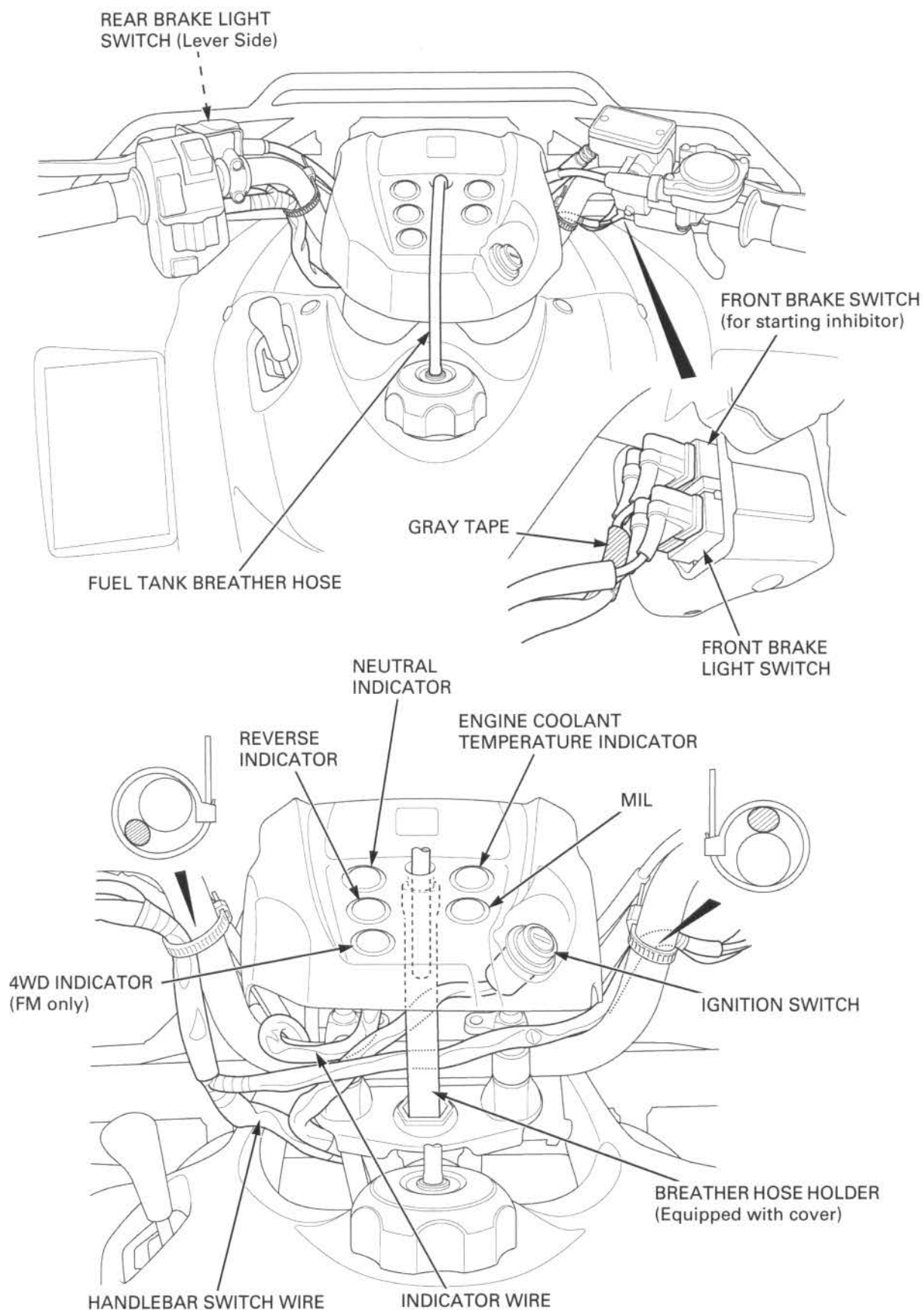
TE/FE/FPE/FPM and Canada FM:





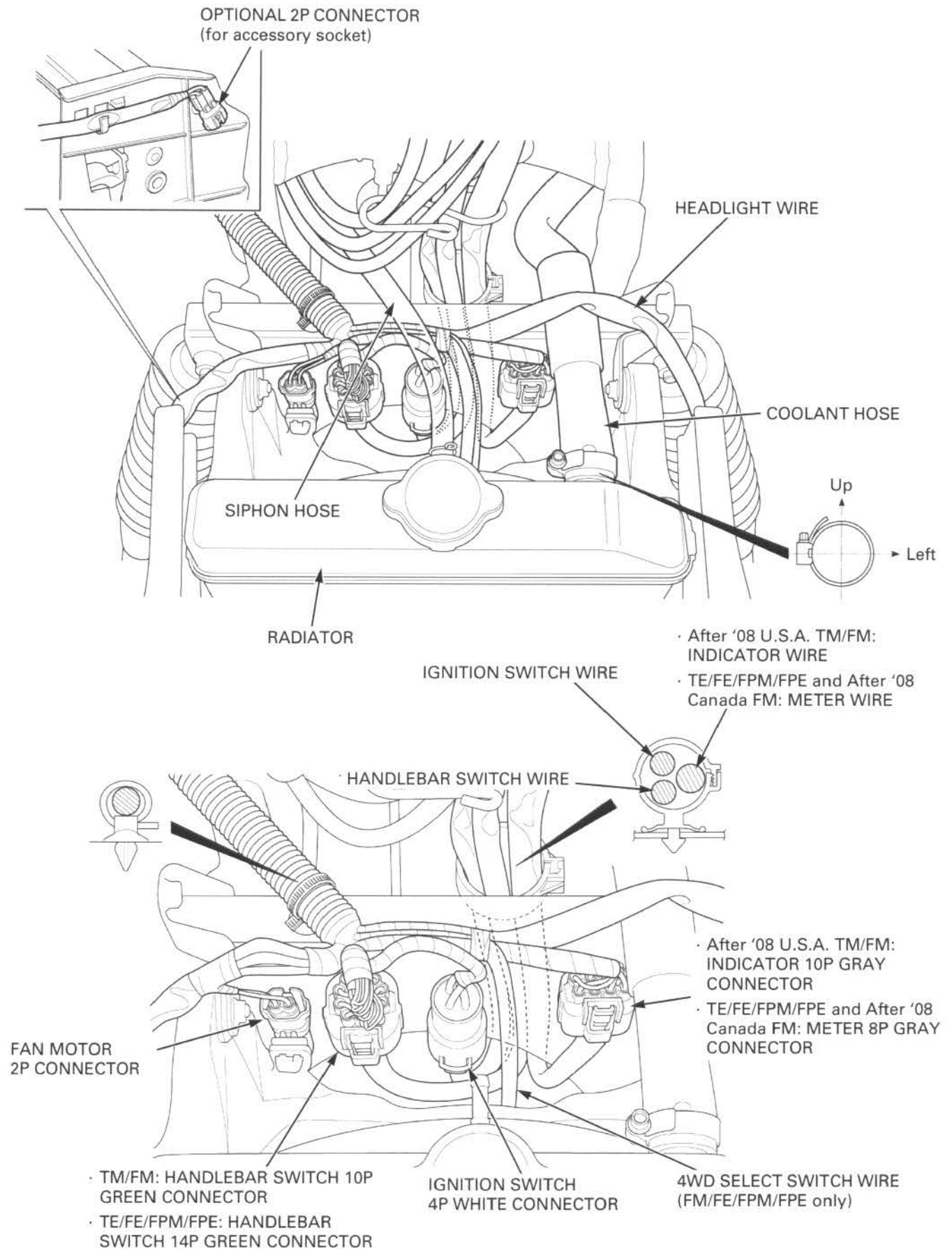
## GENERAL INFORMATION

U.S.A. TM/FM:





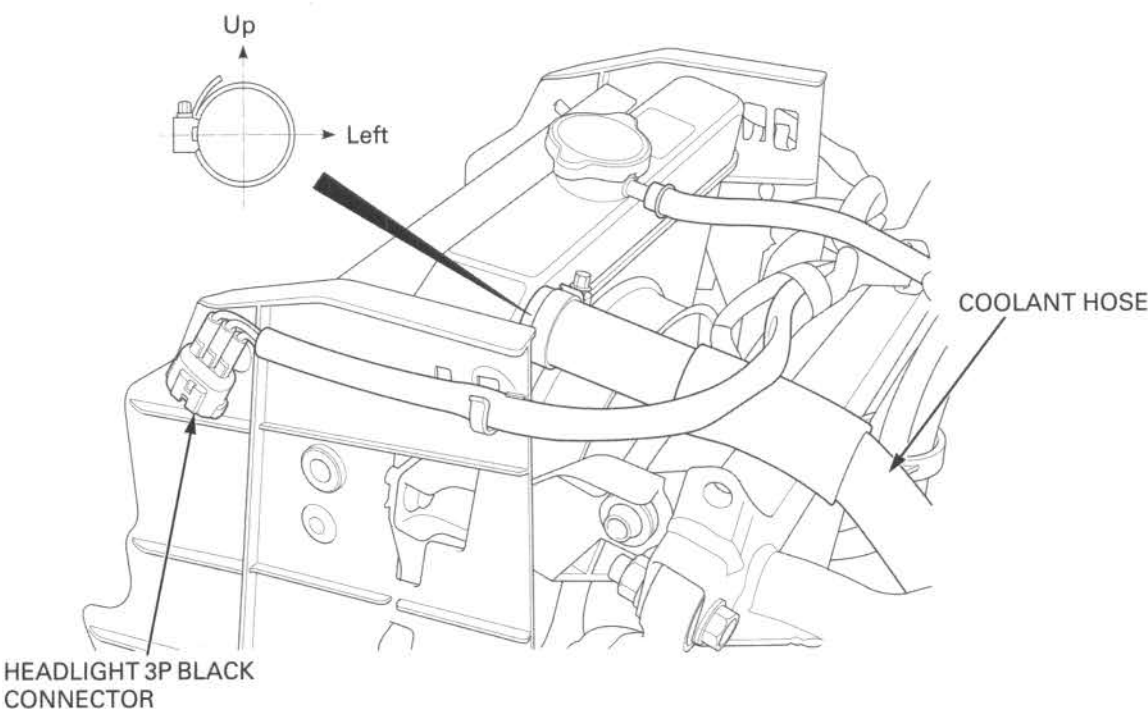
All models:



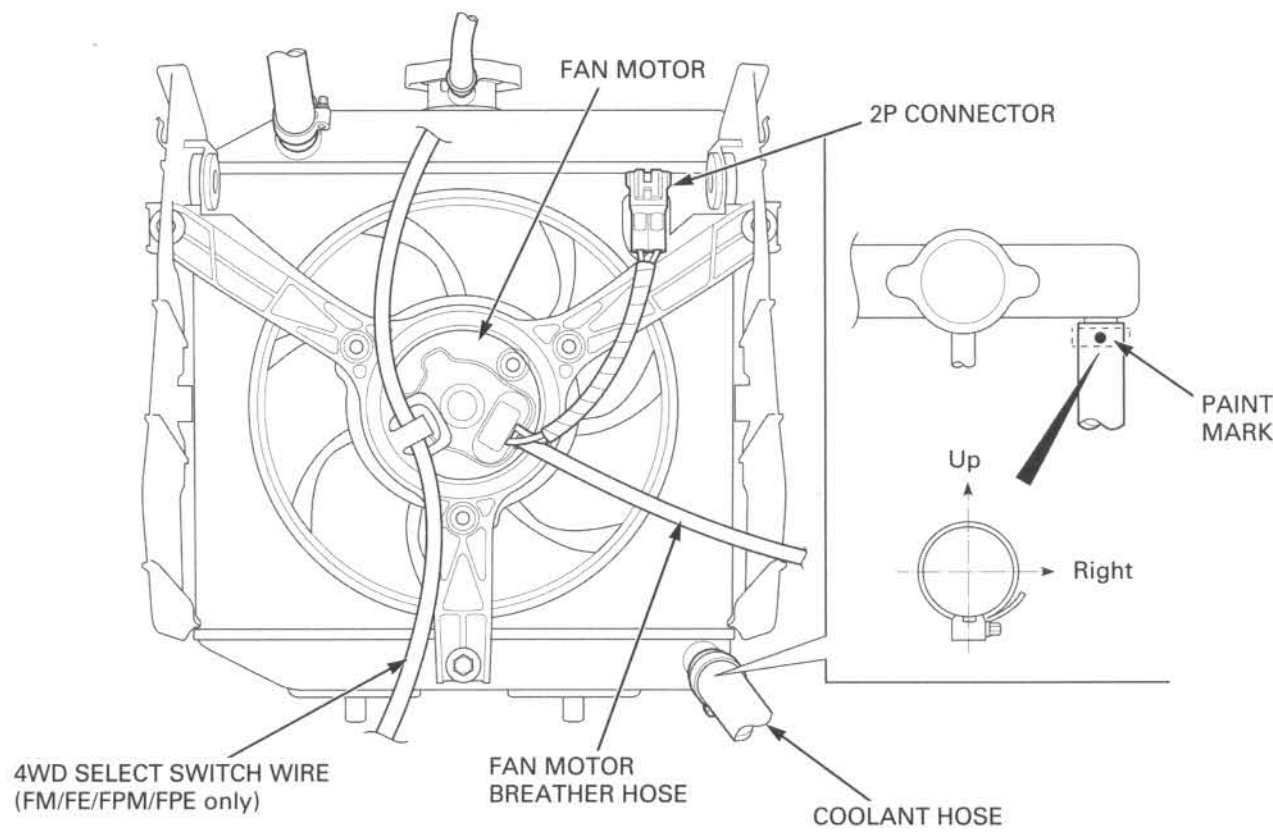


GENERAL INFORMATION

All models:

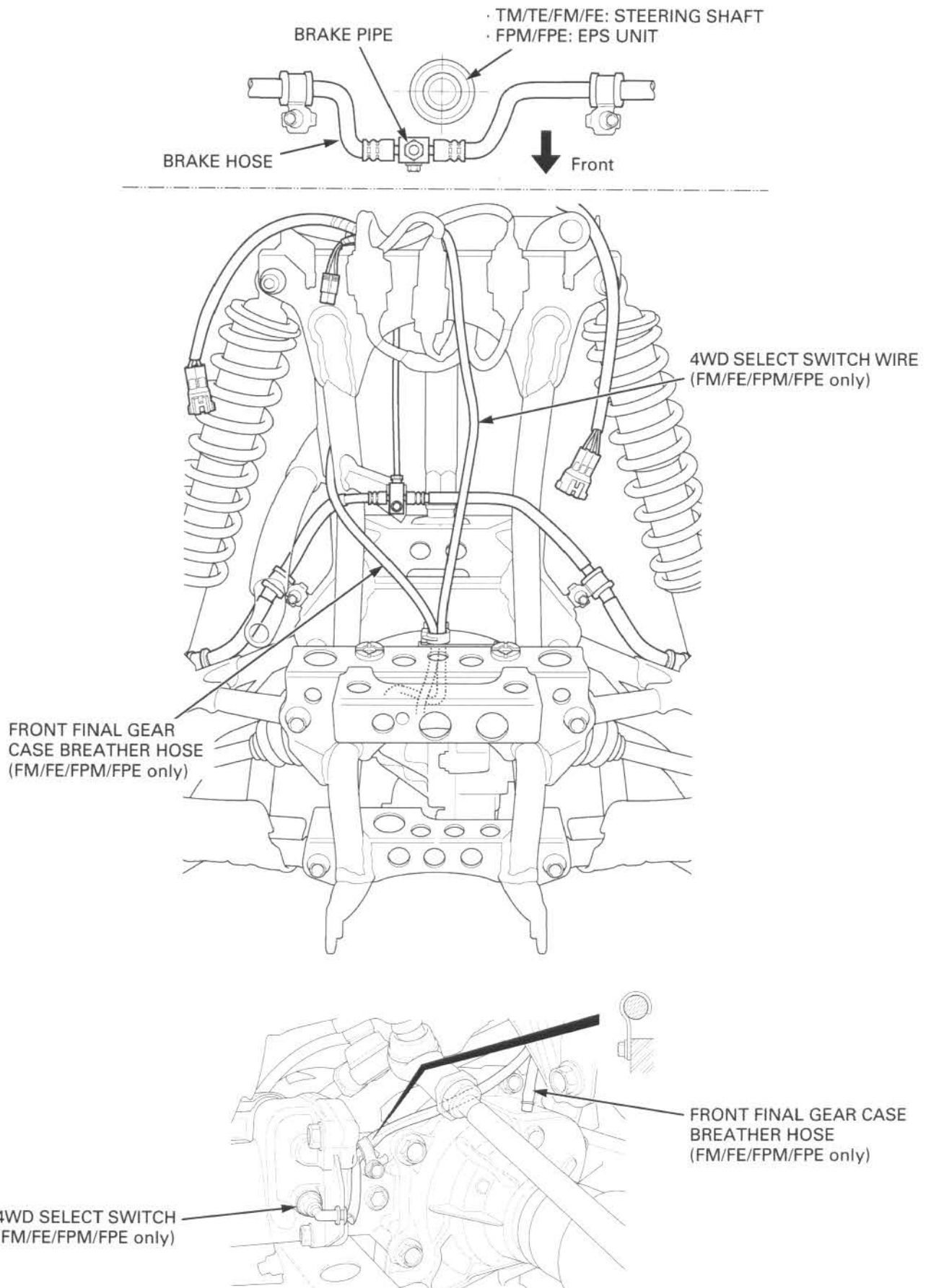


Reverse side of radiator:





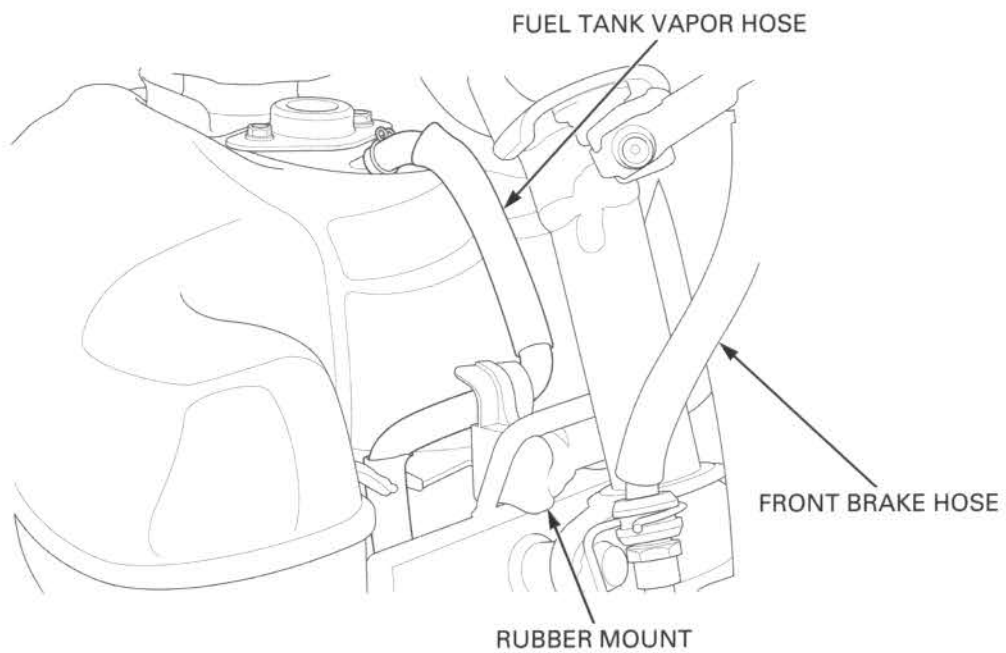
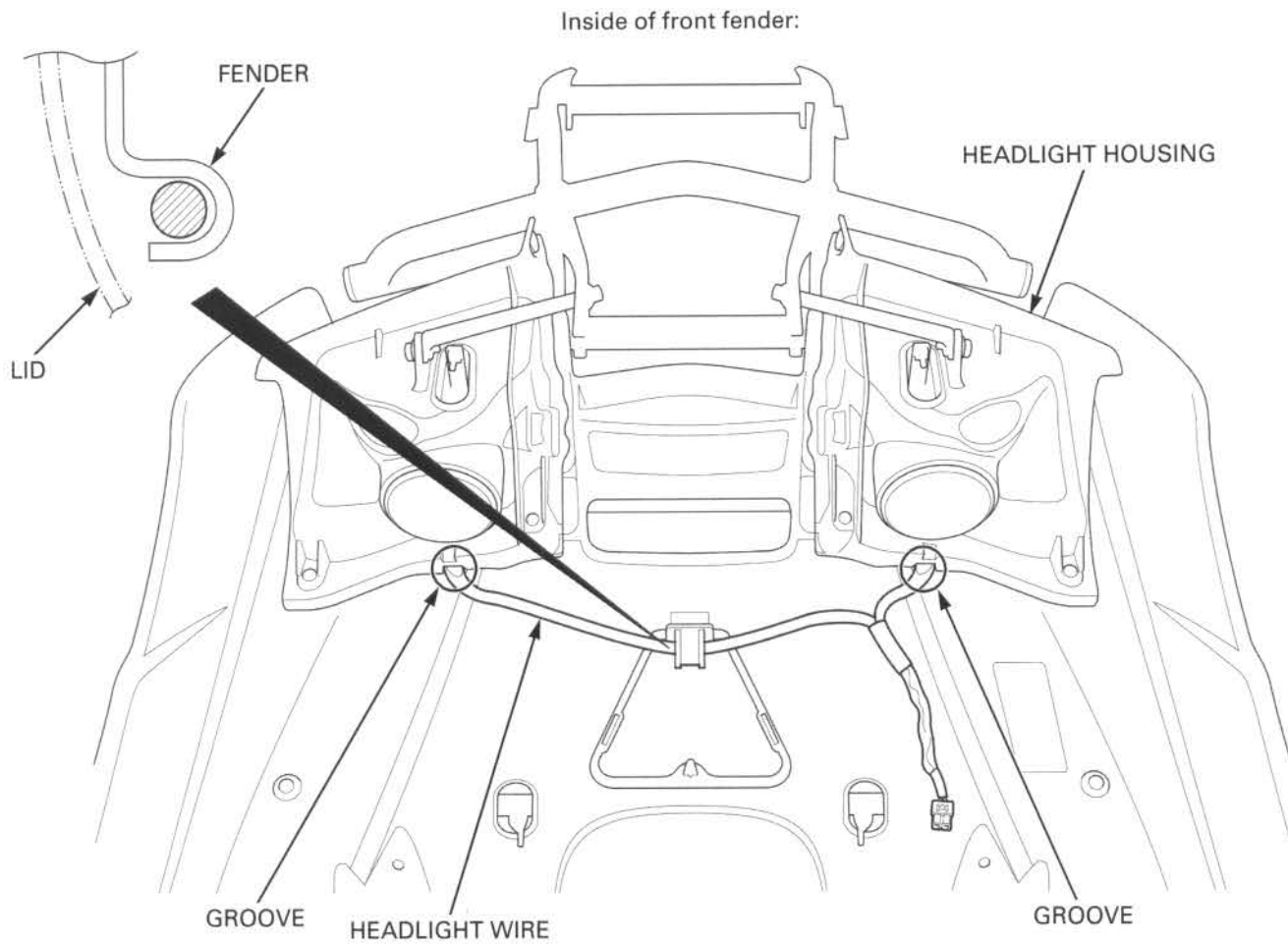
All models:





## GENERAL INFORMATION

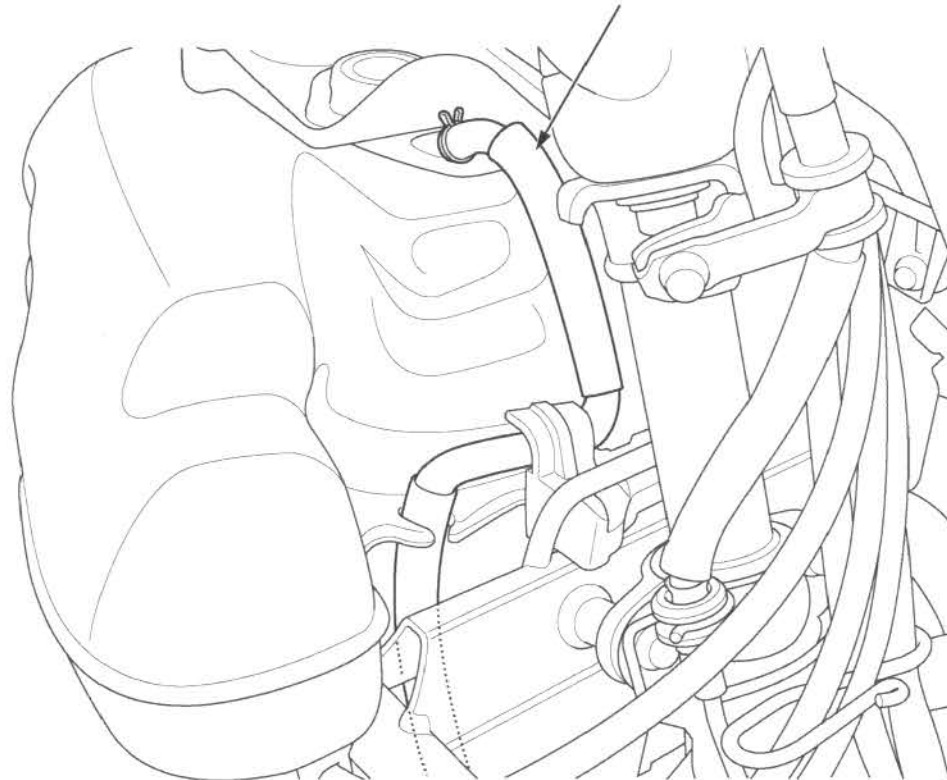
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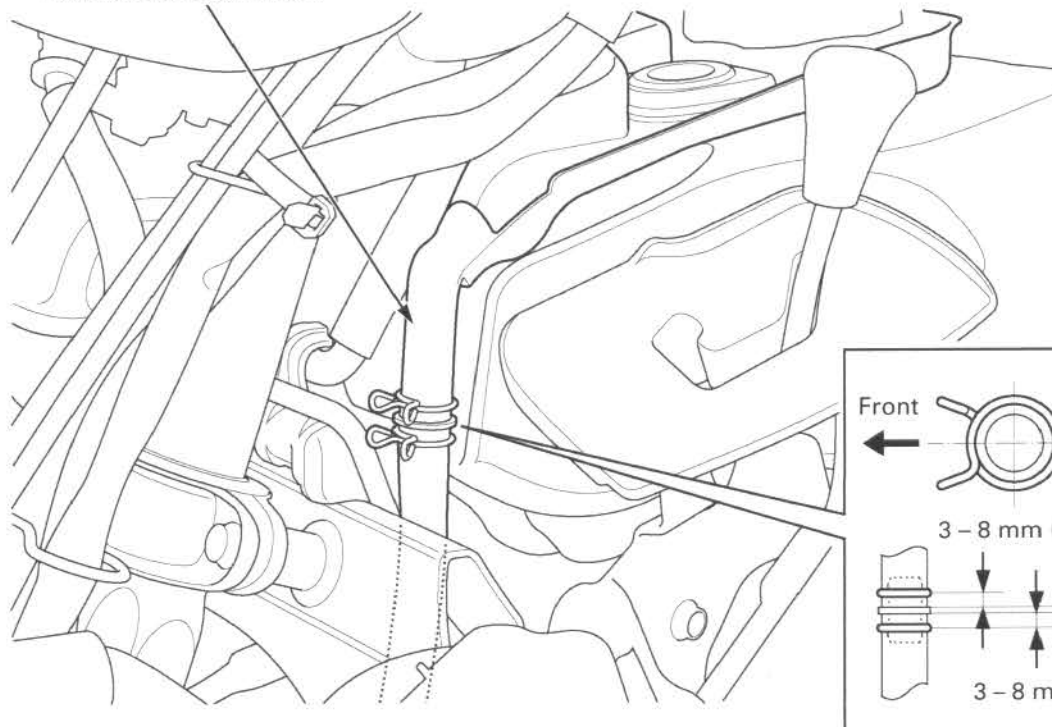


FPM/FPE:

FUEL TANK VAPOR HOSE



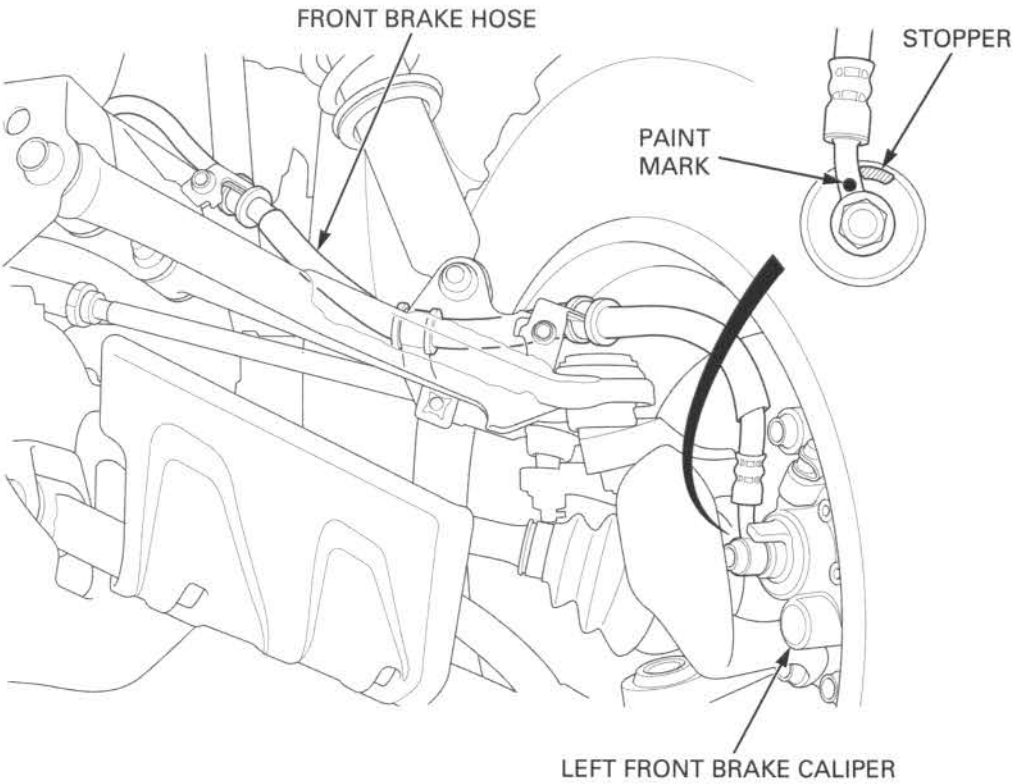
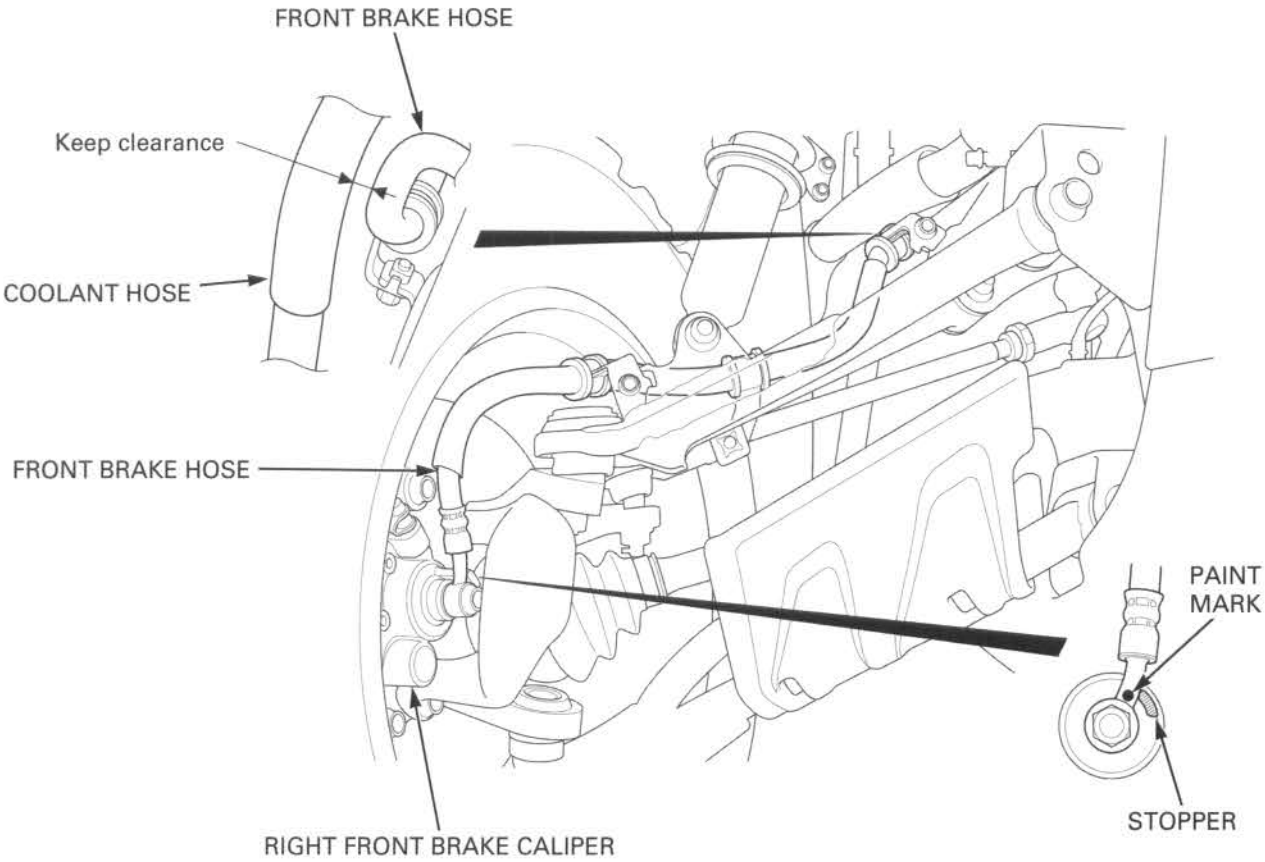
FUEL OVERFLOW HOSE





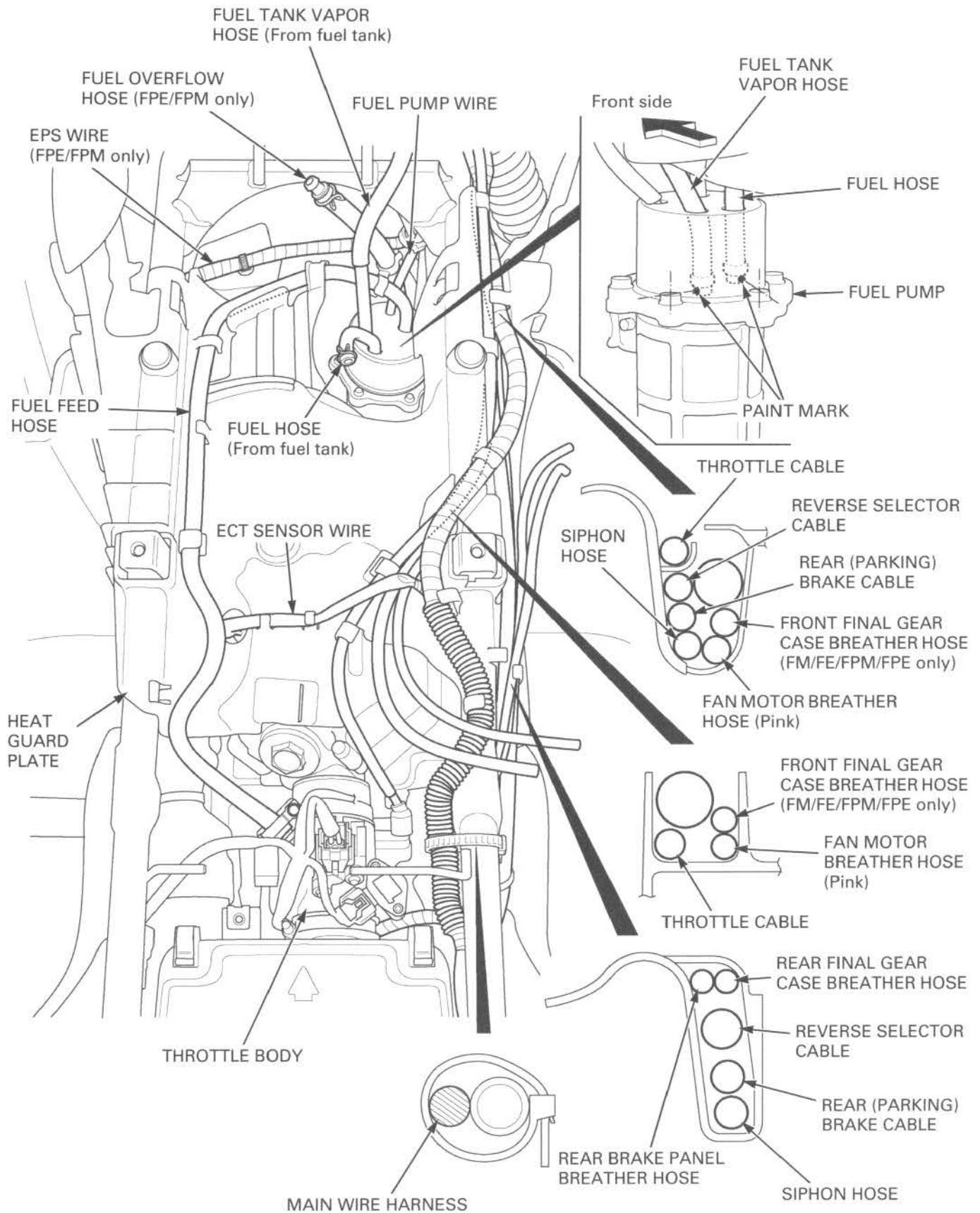
**GENERAL INFORMATION**

All models:





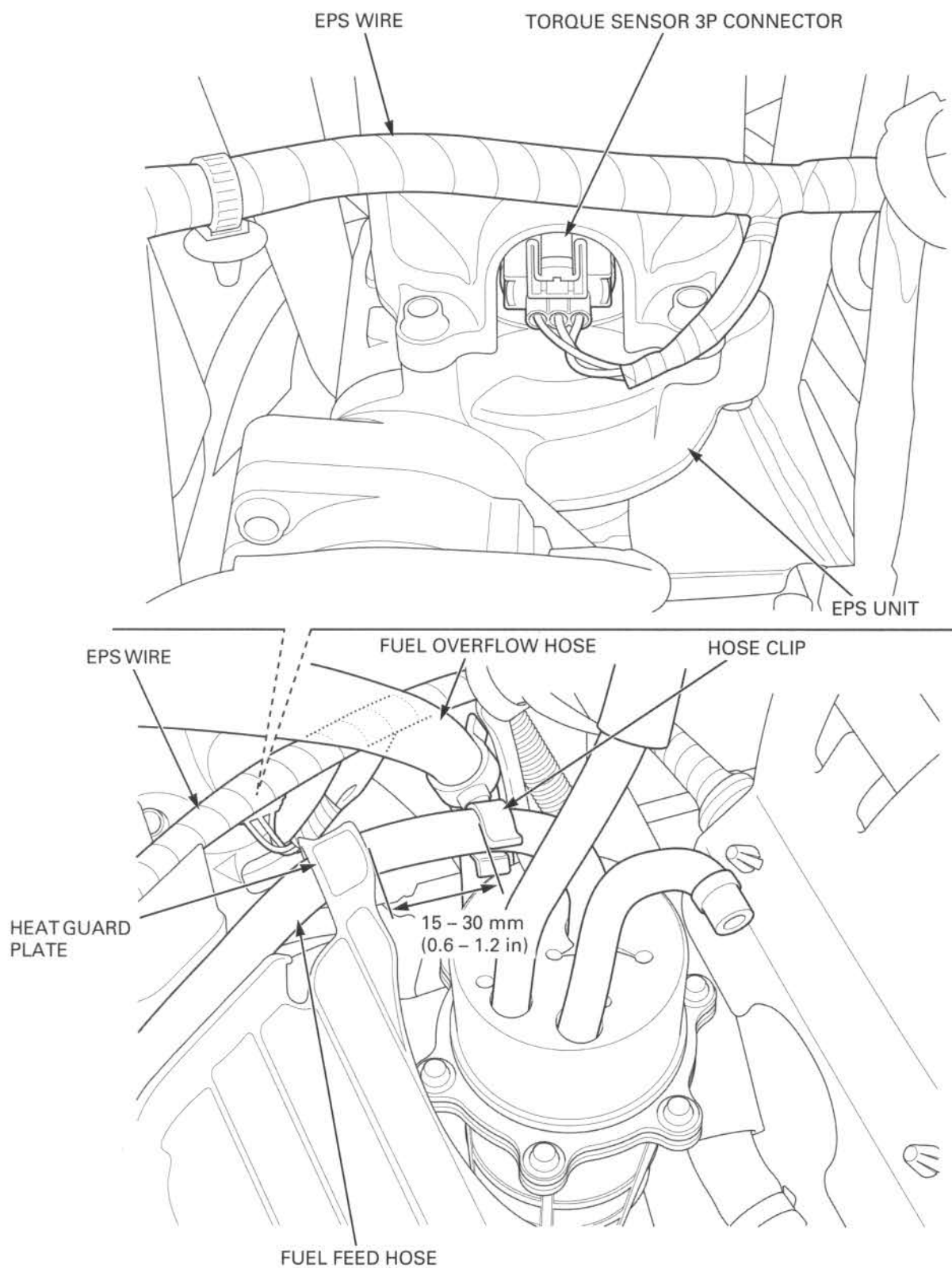
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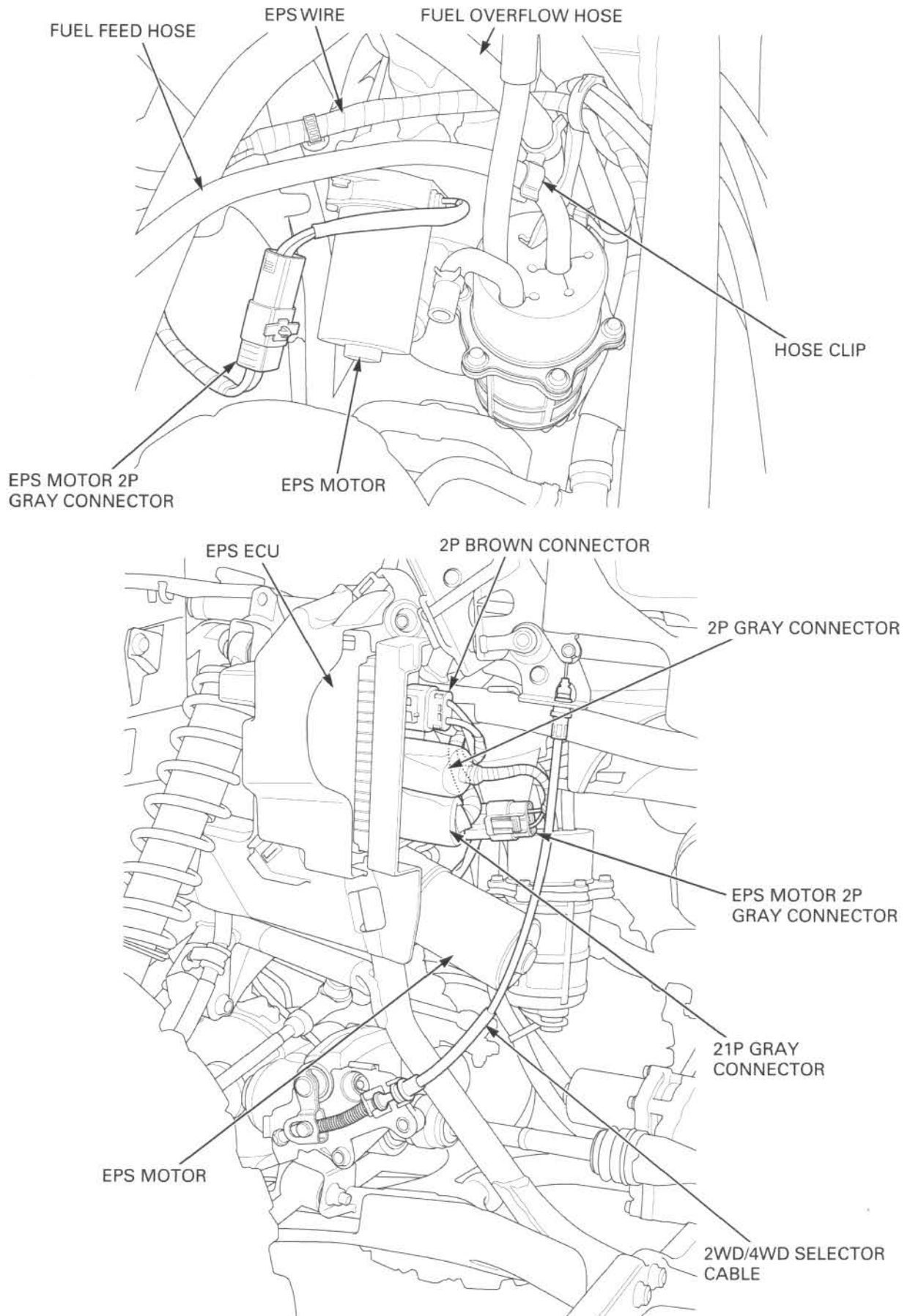
## GENERAL INFORMATION

FPM/FPE:





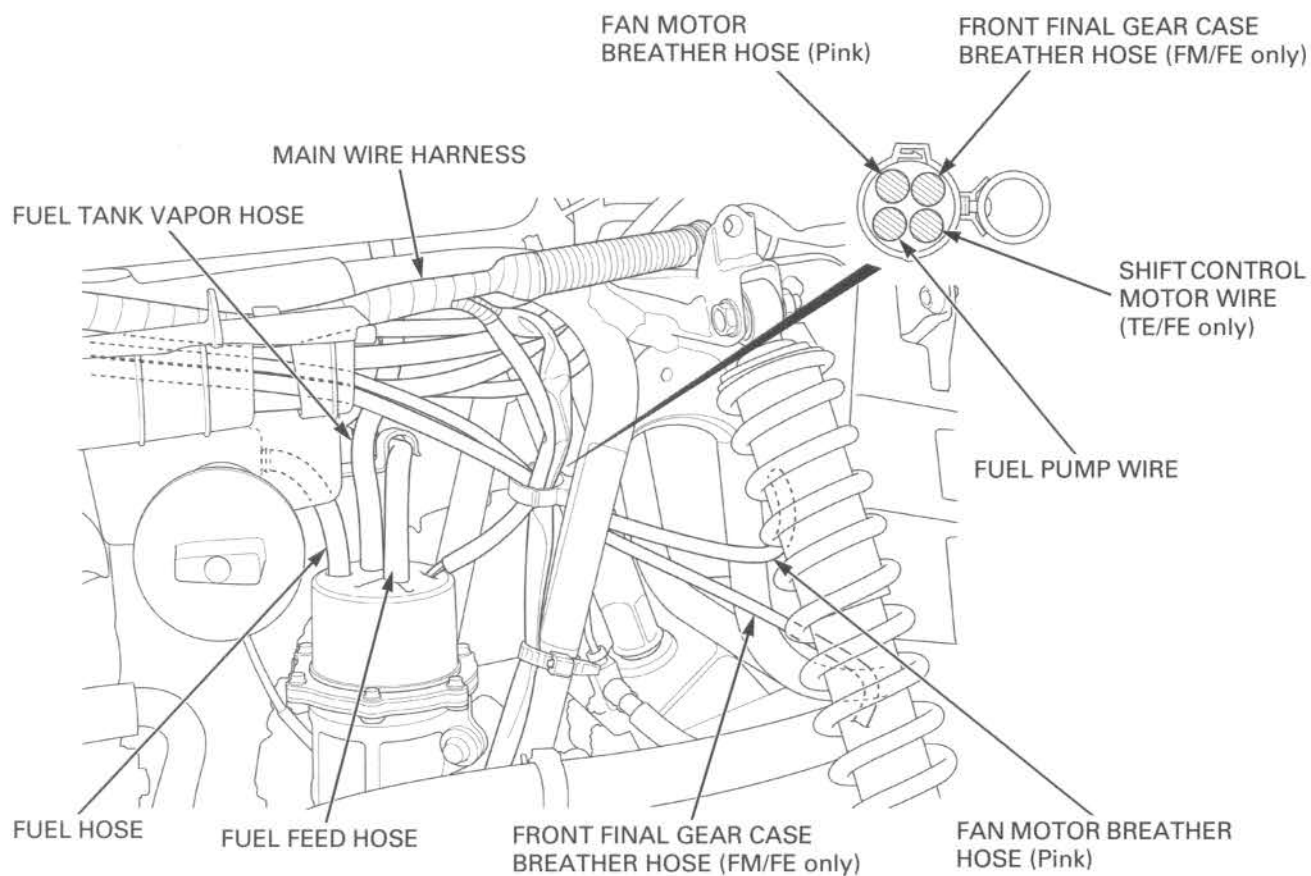
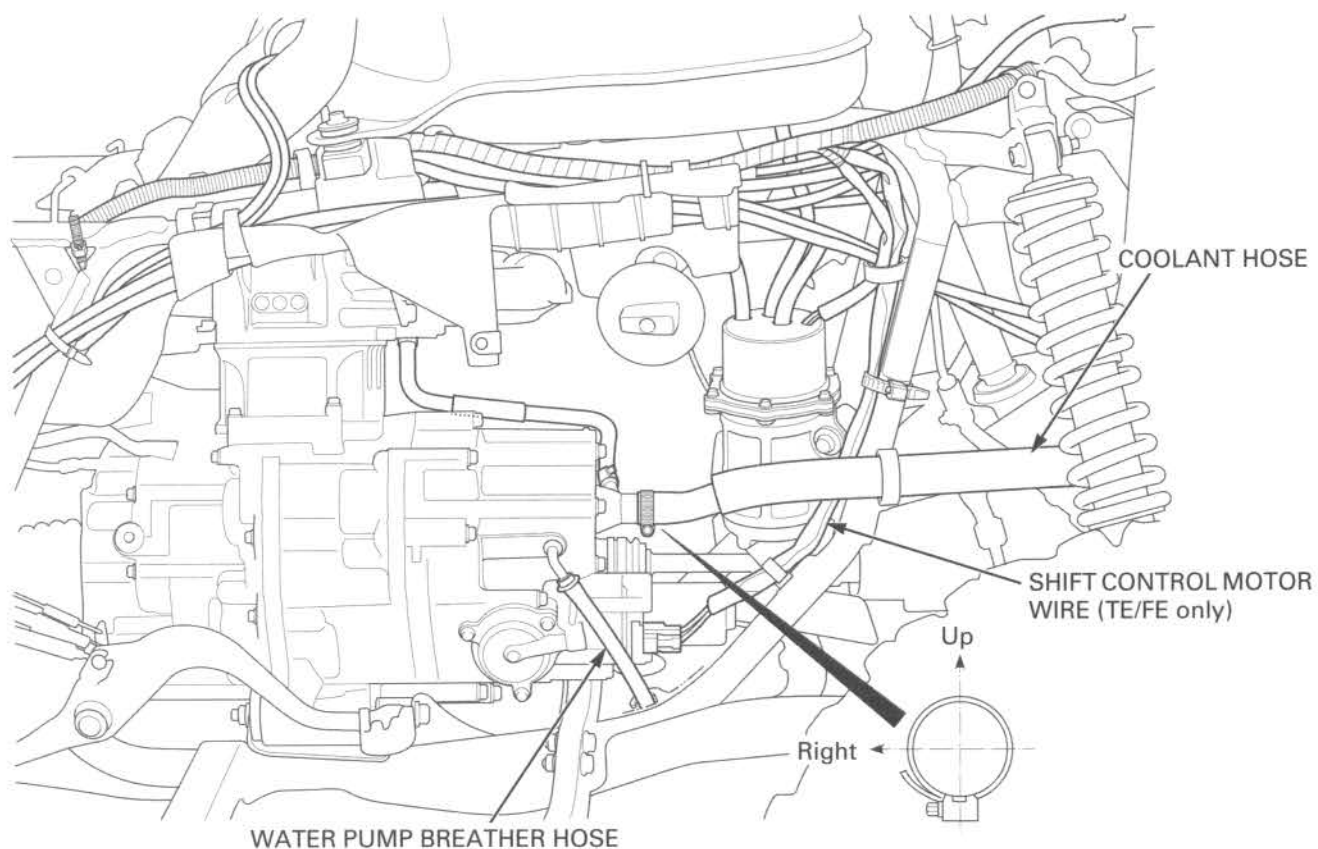
FPE/FPM:





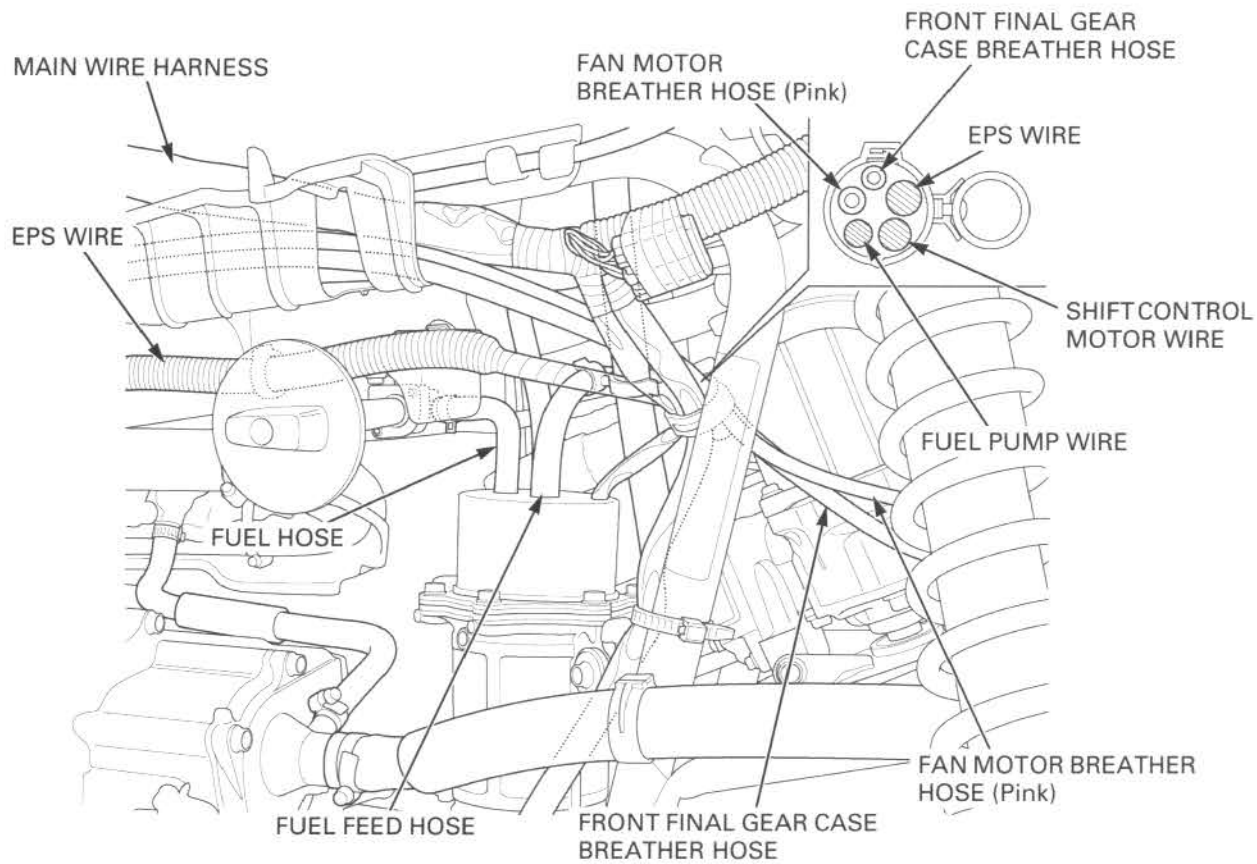
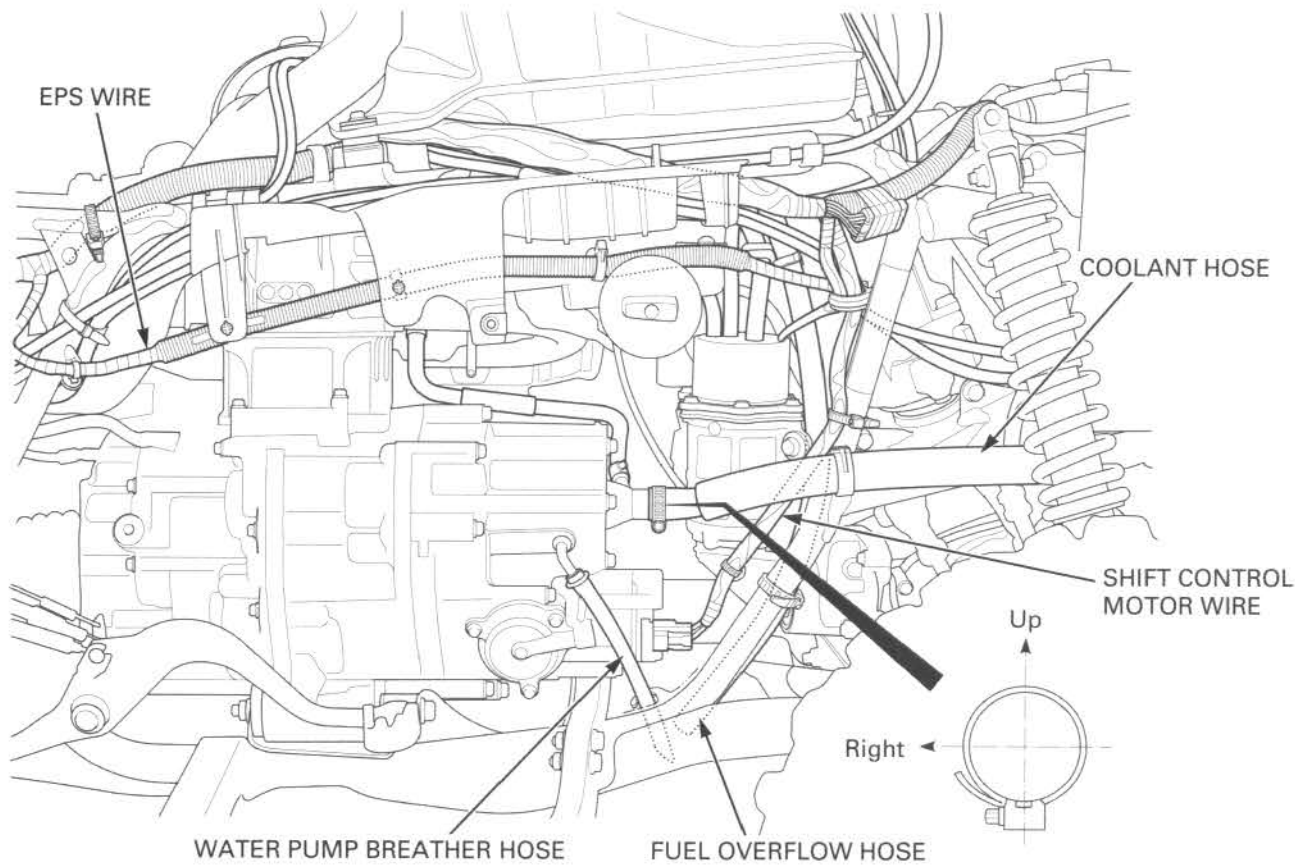
## GENERAL INFORMATION

TE/TM/FE/FM:





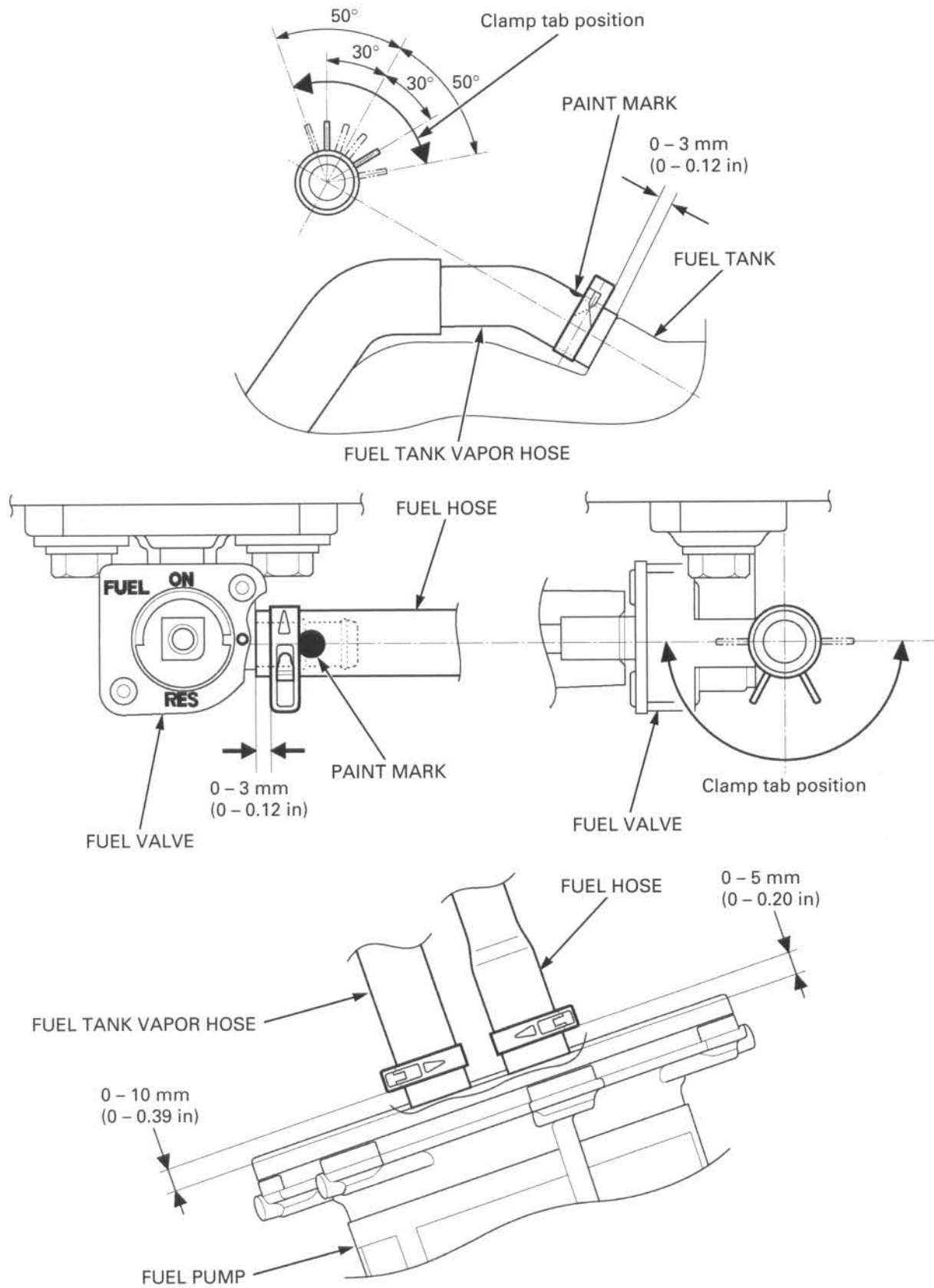
FPE/FPM:





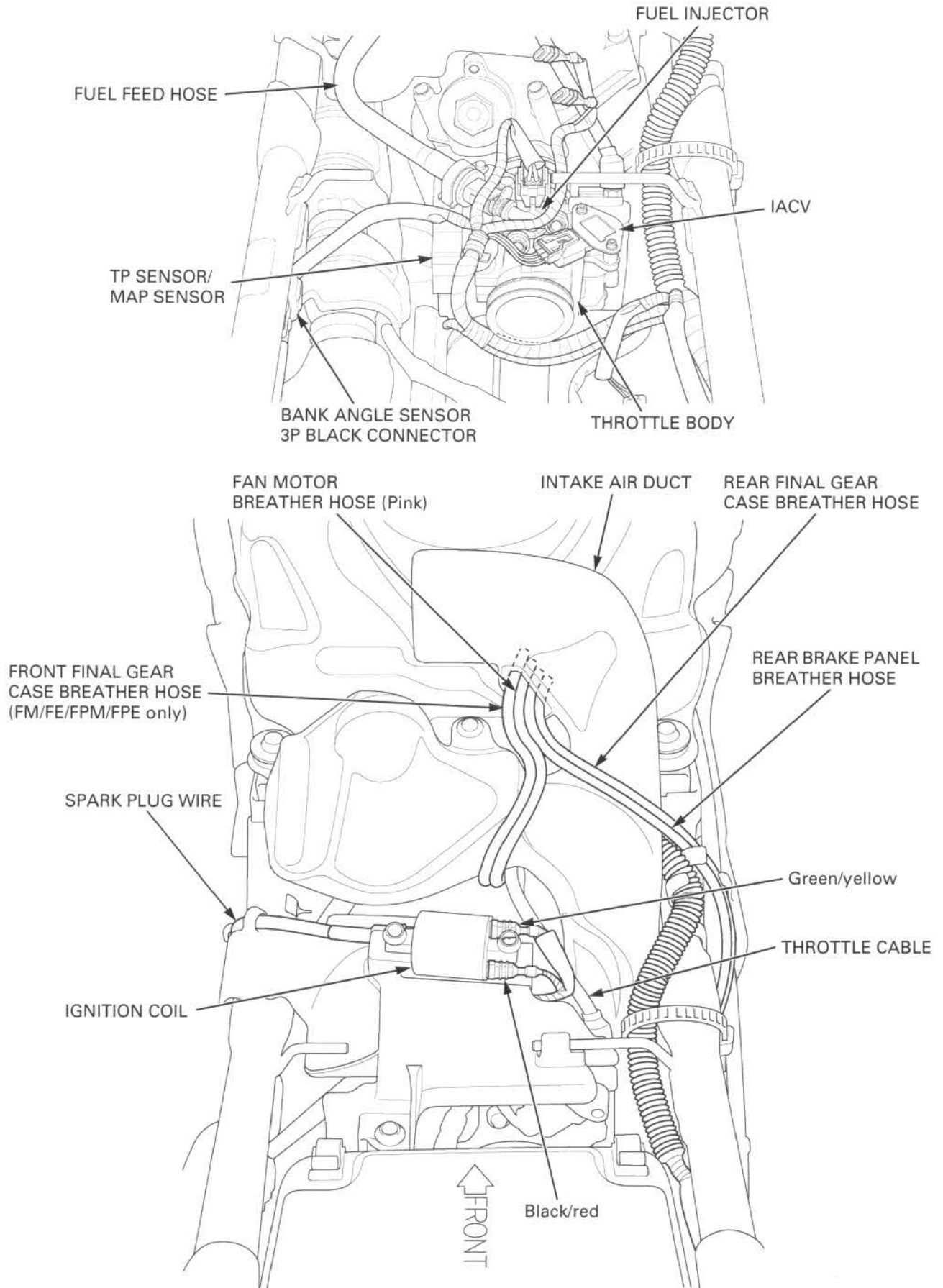
GENERAL INFORMATION

All models:





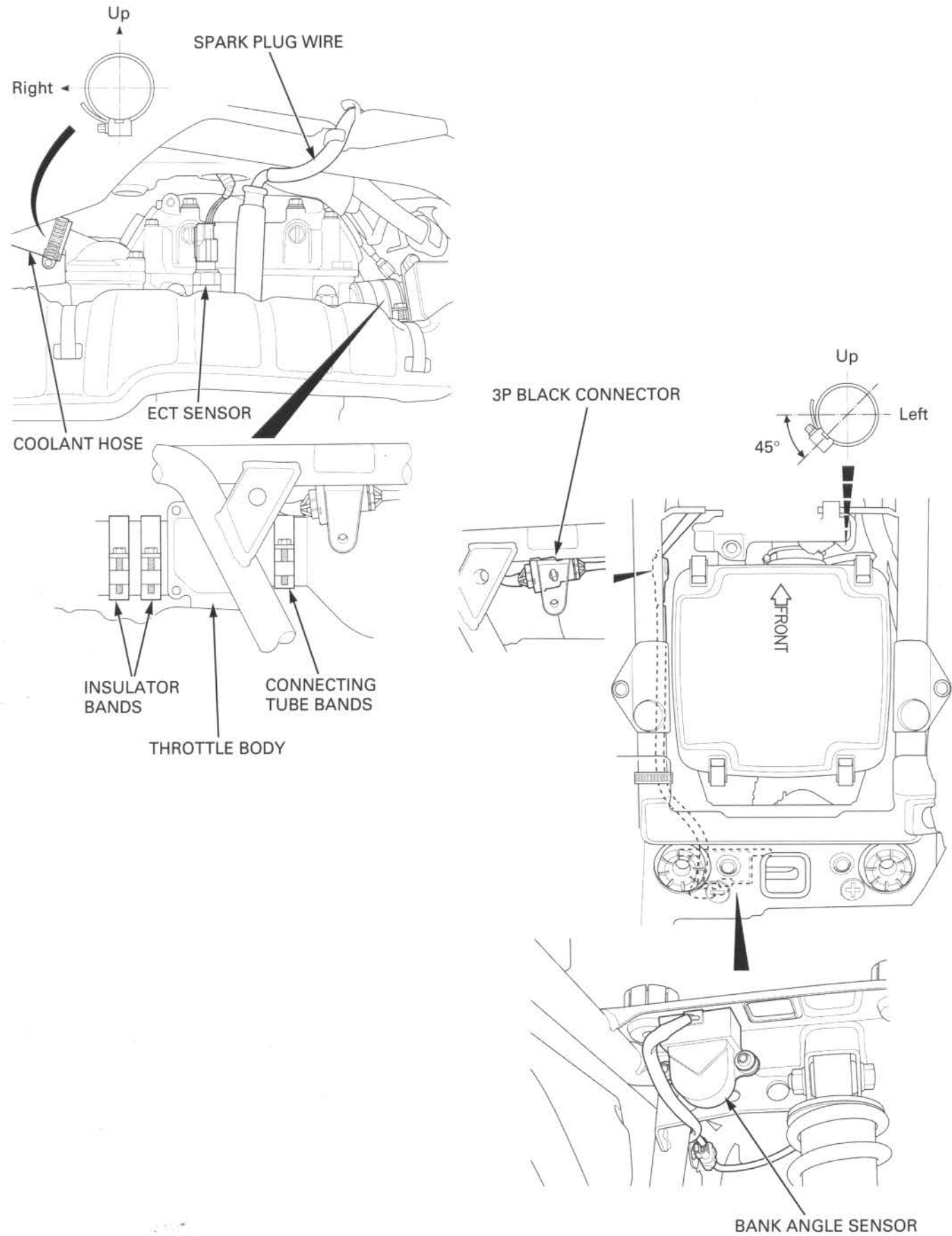
All models:





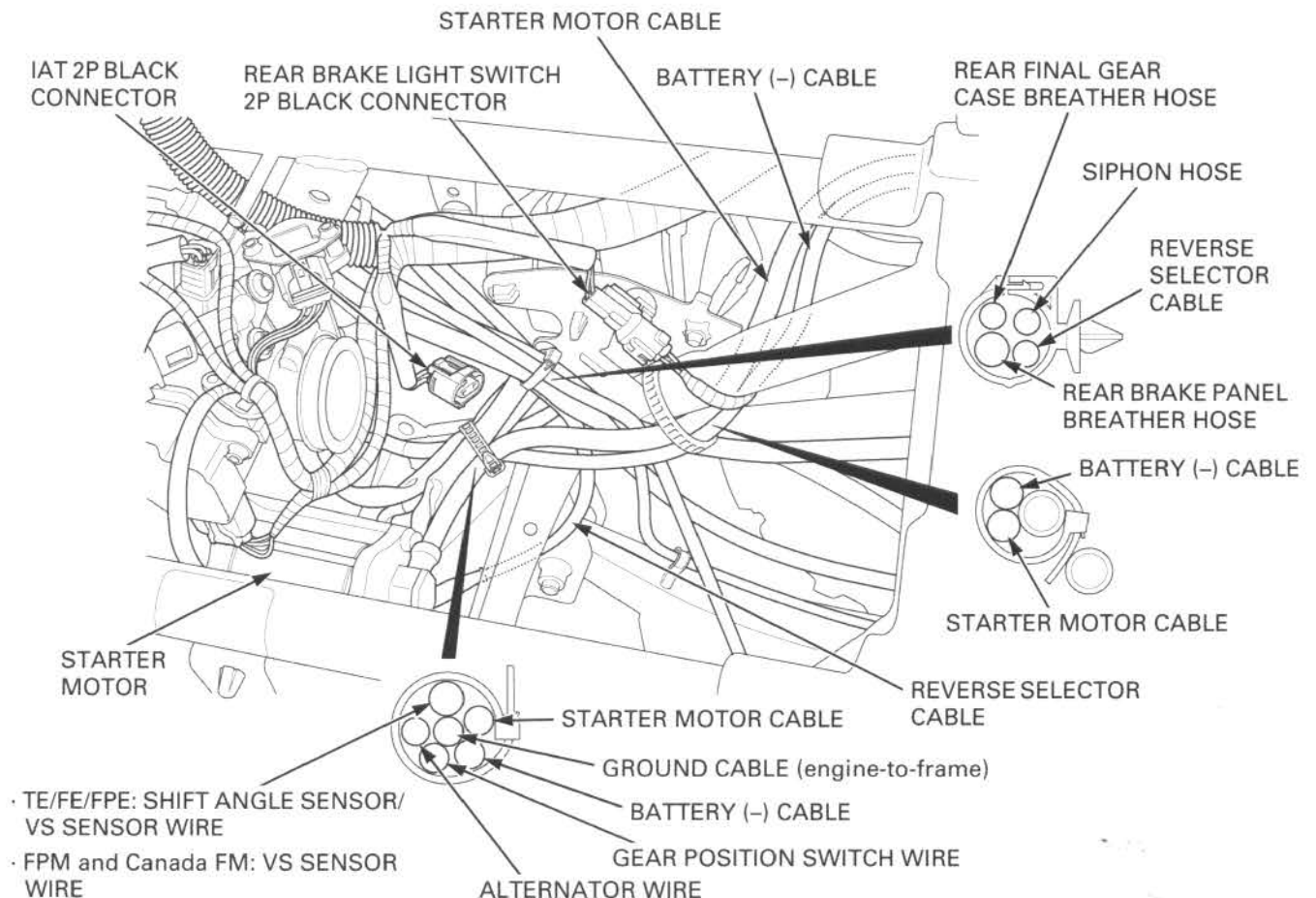
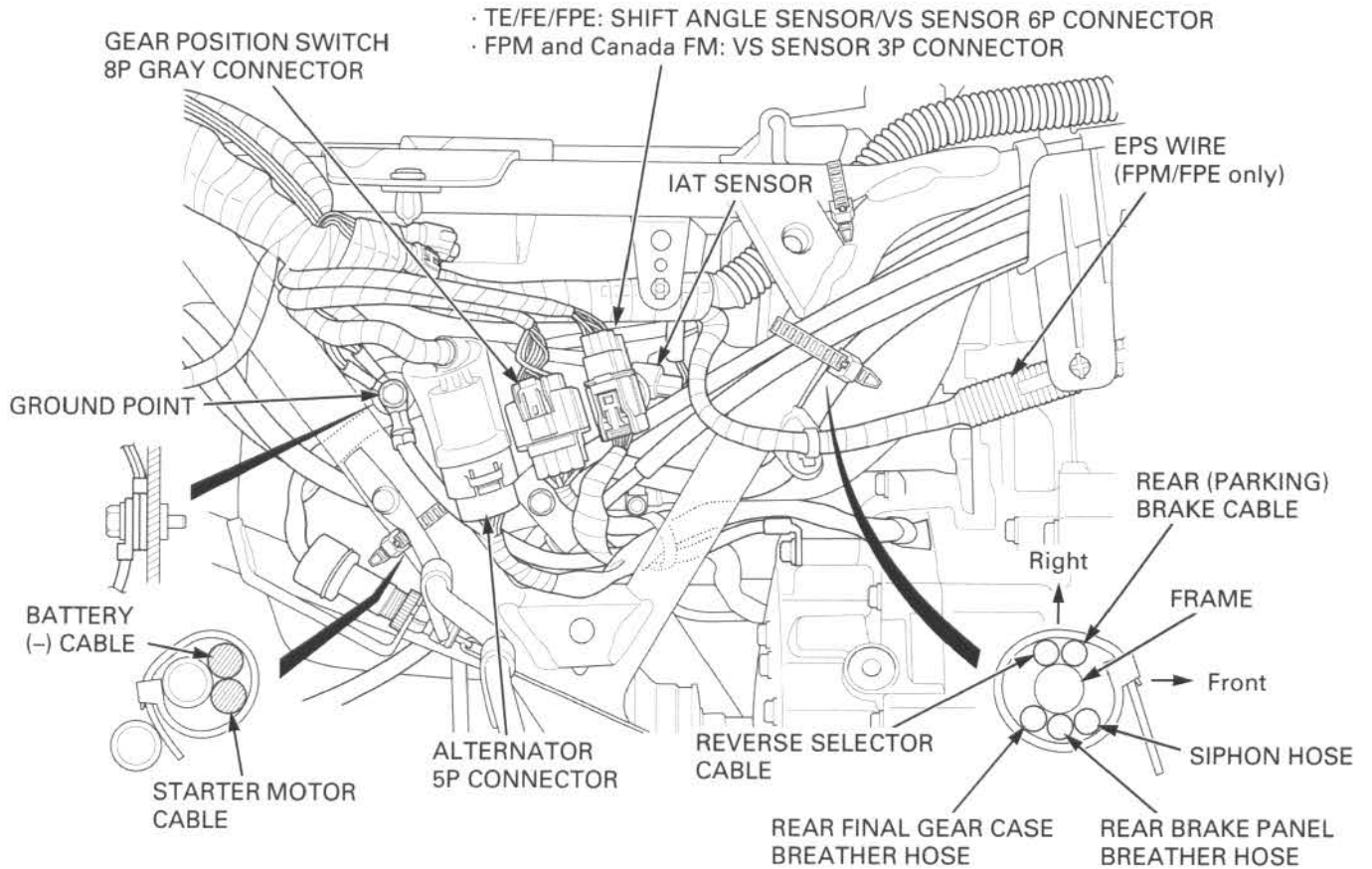
GENERAL INFORMATION

All models:





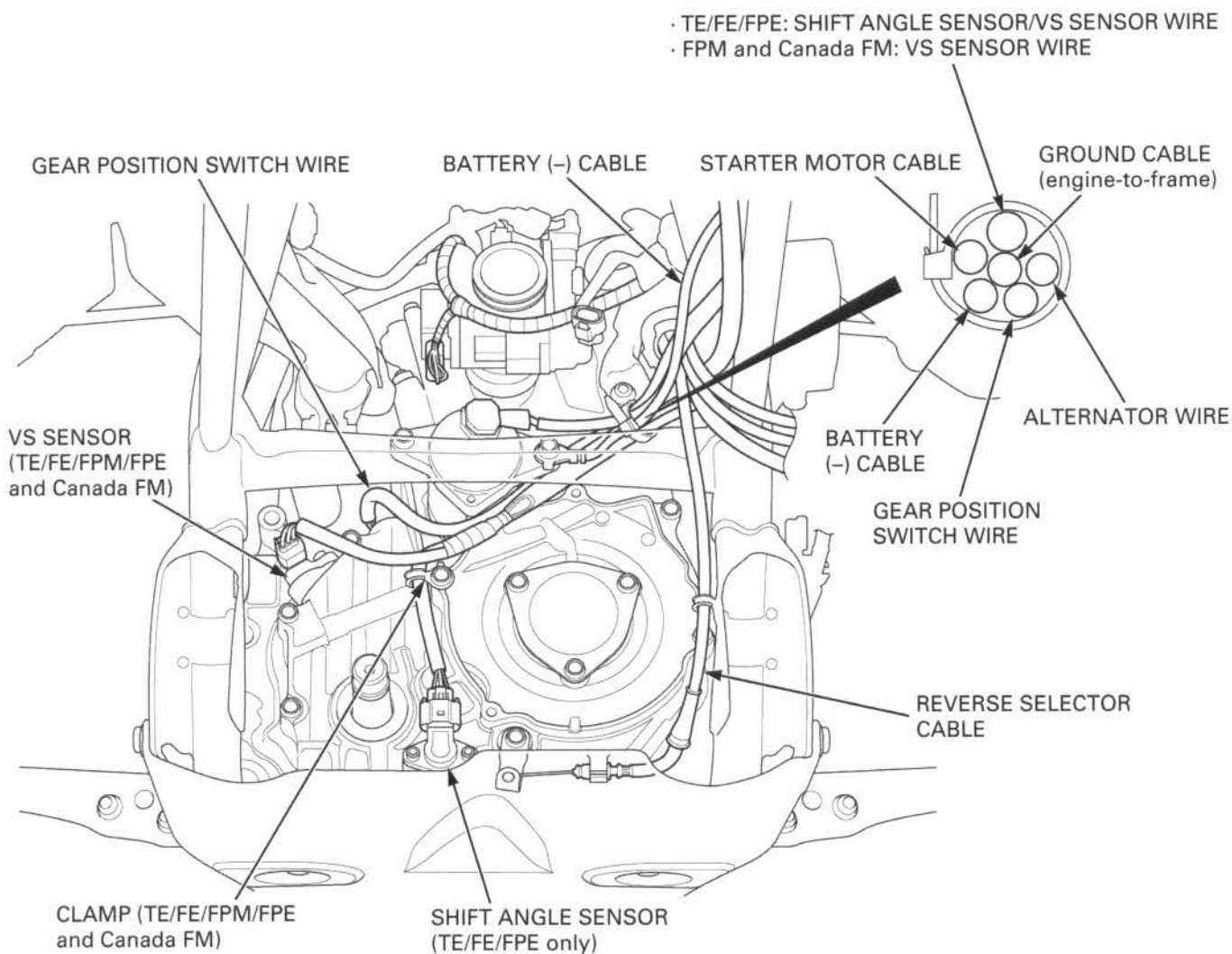
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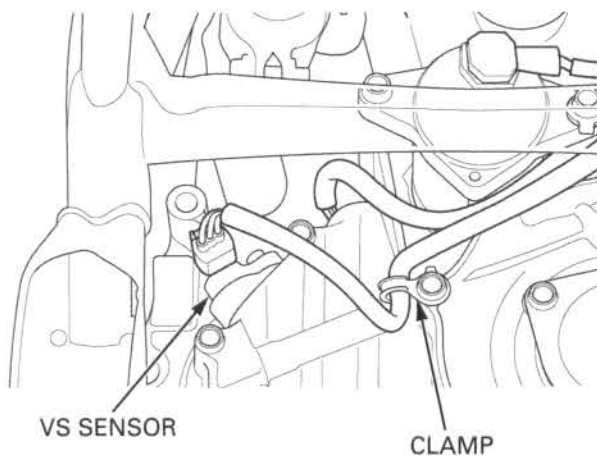


## GENERAL INFORMATION

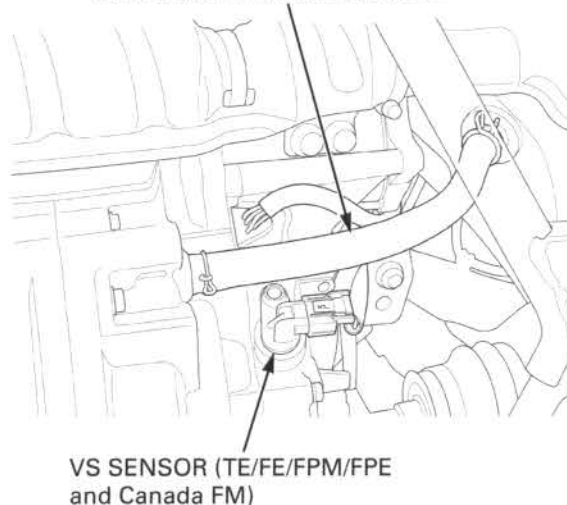
All models:



FPM and Canada FM:

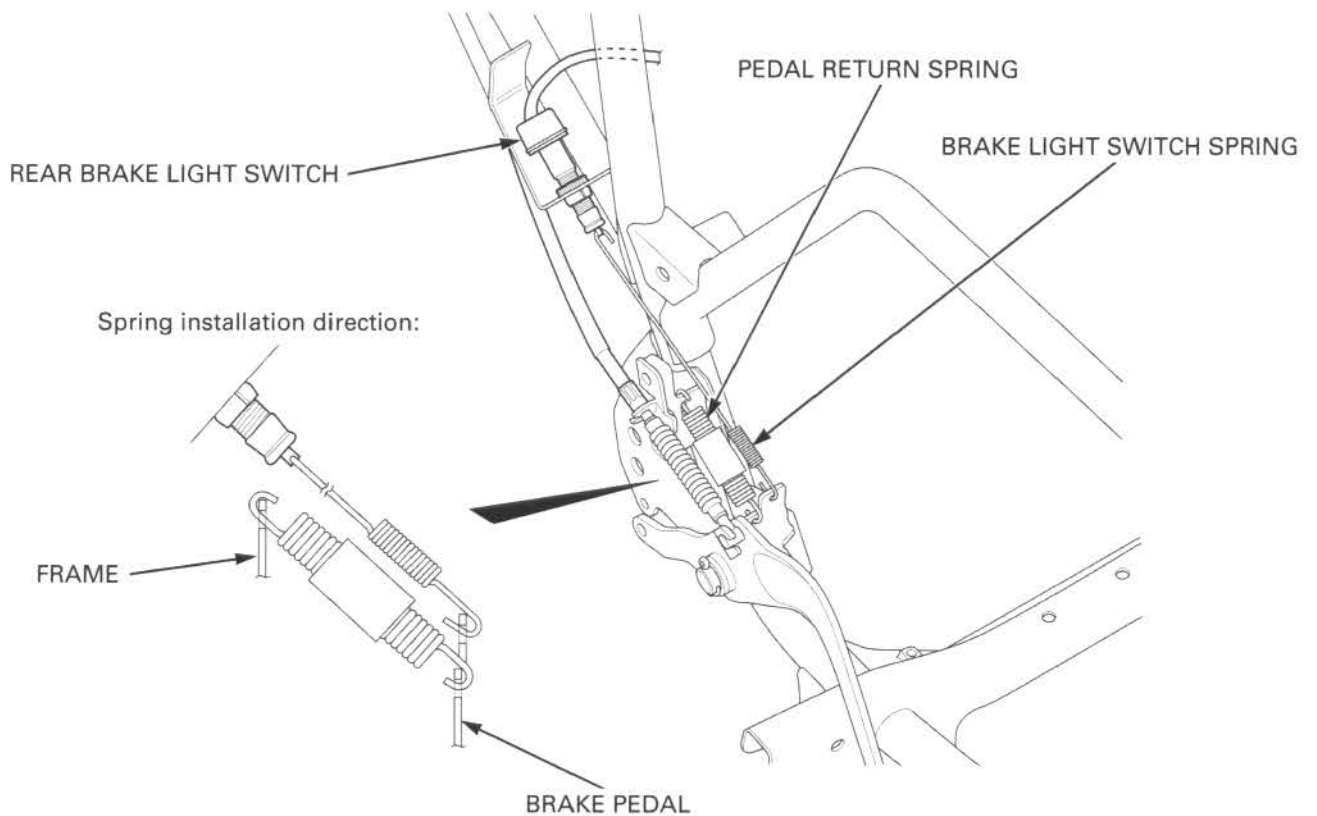
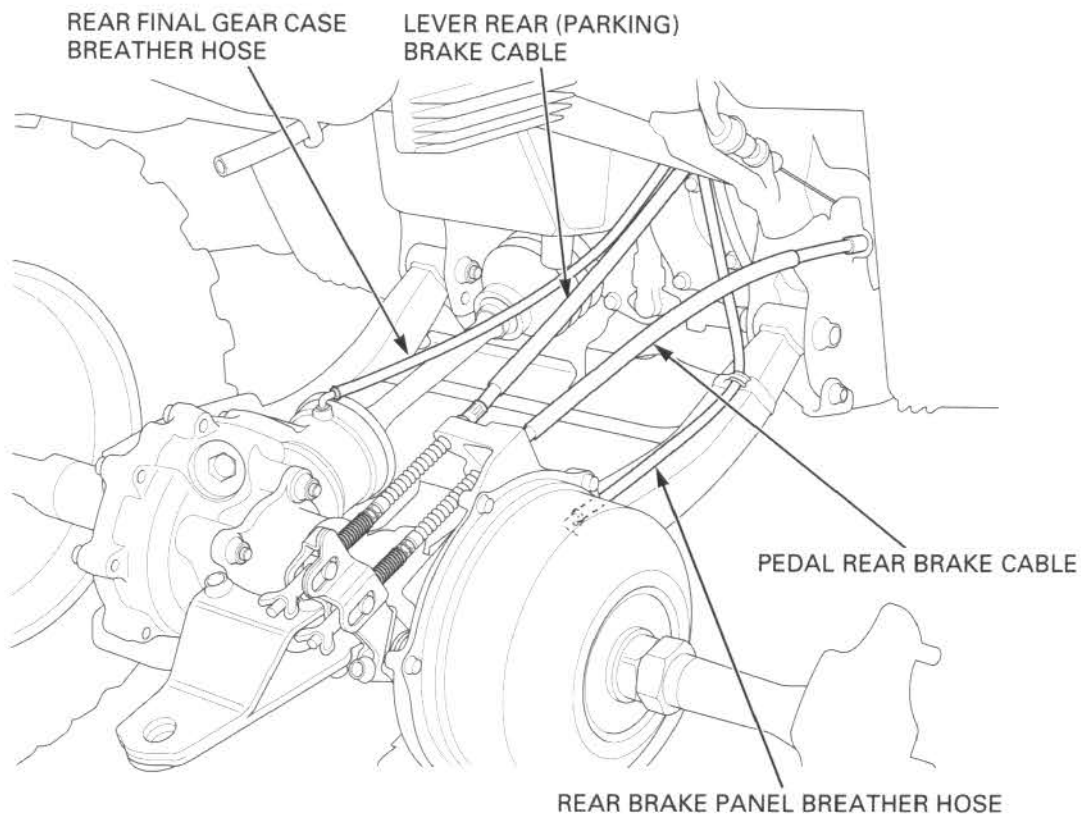


CRANKCASE BREATHER HOSE





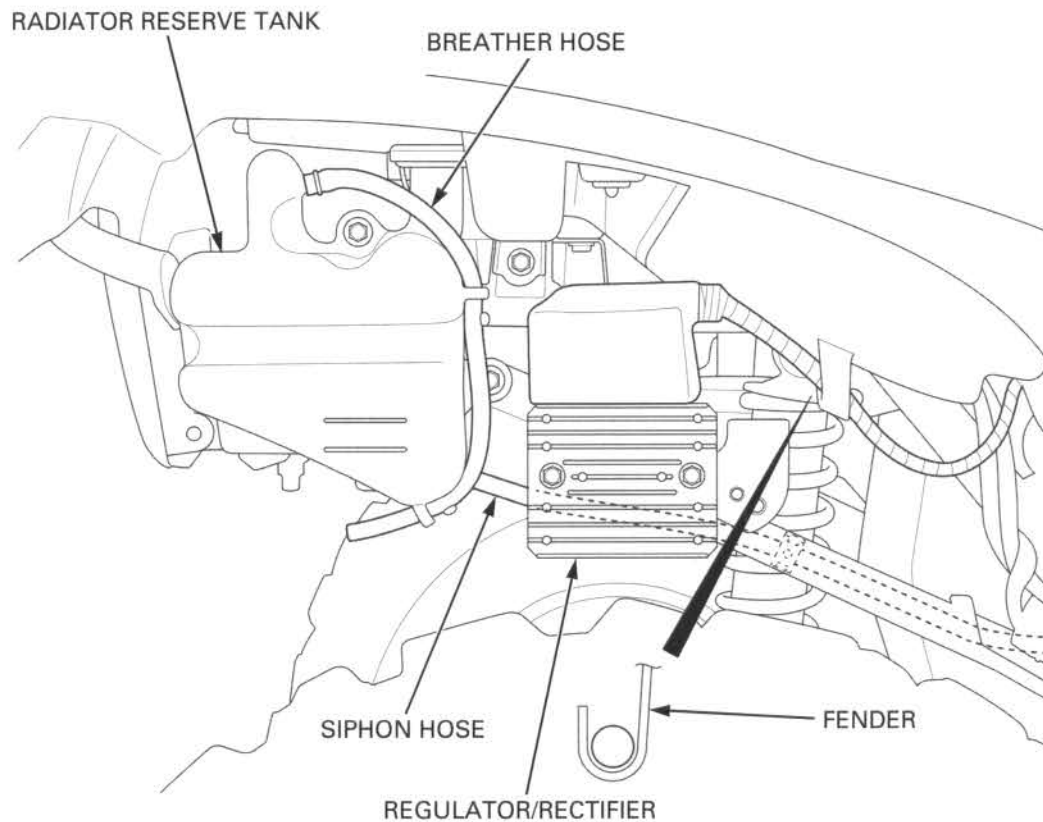
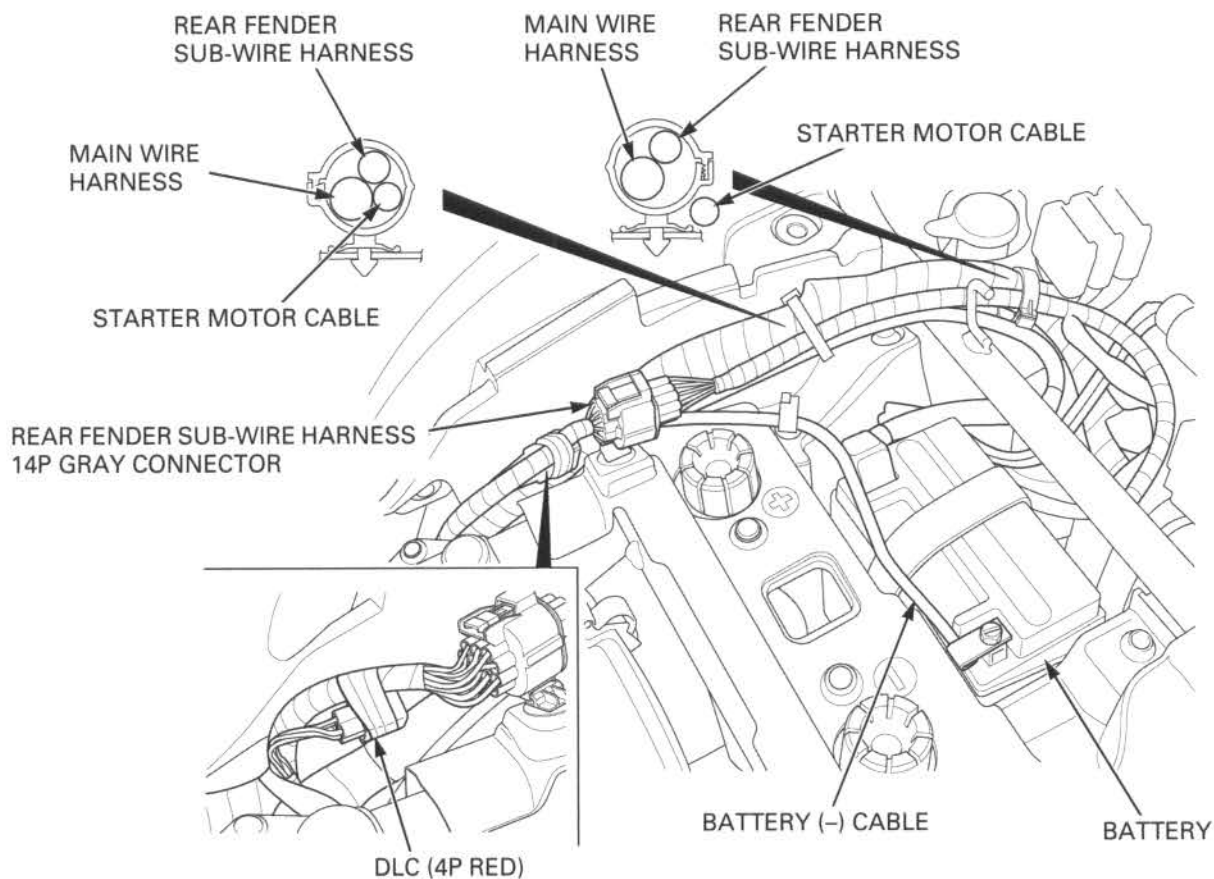
All models:





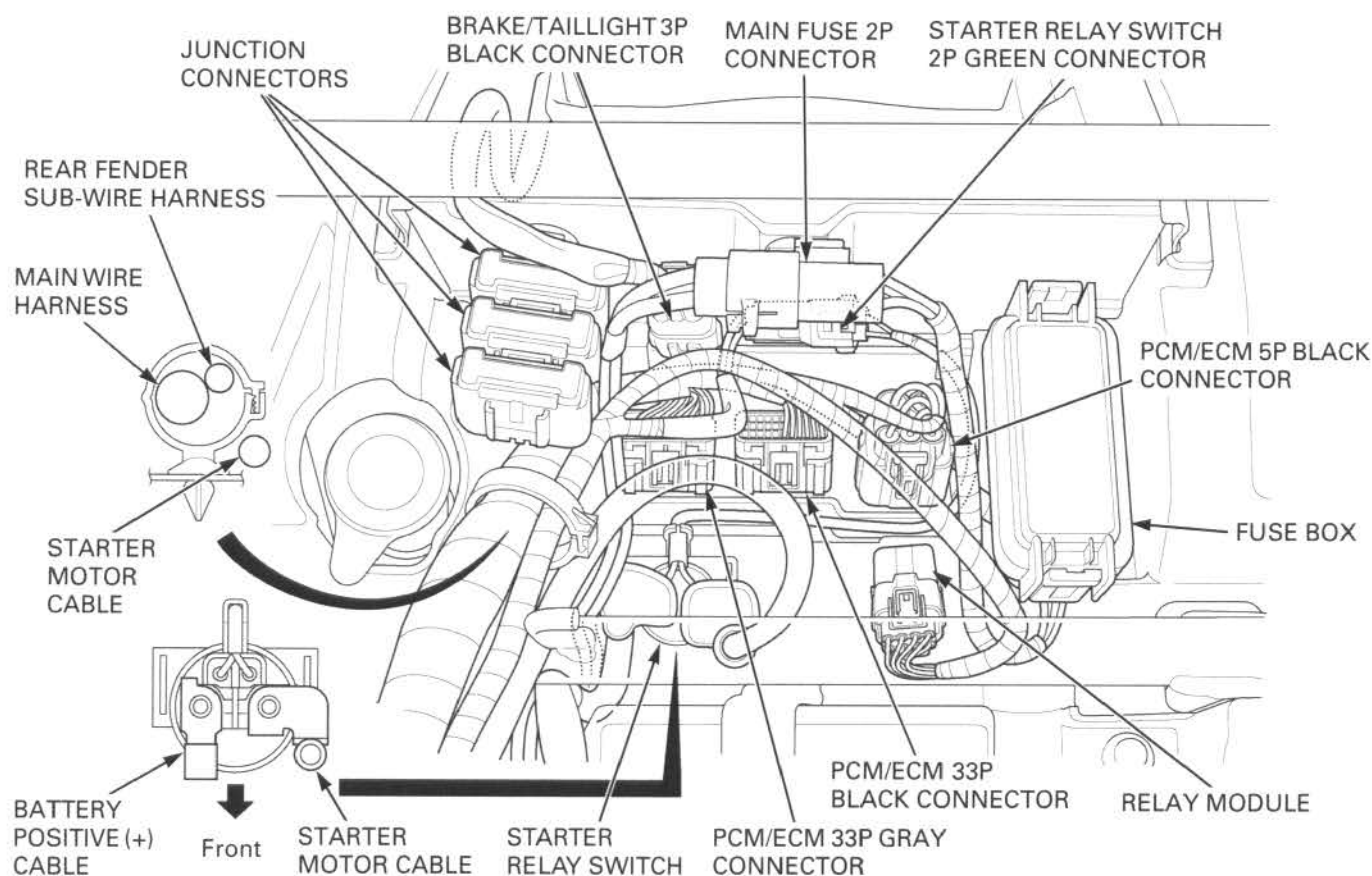
## GENERAL INFORMATION

All models:

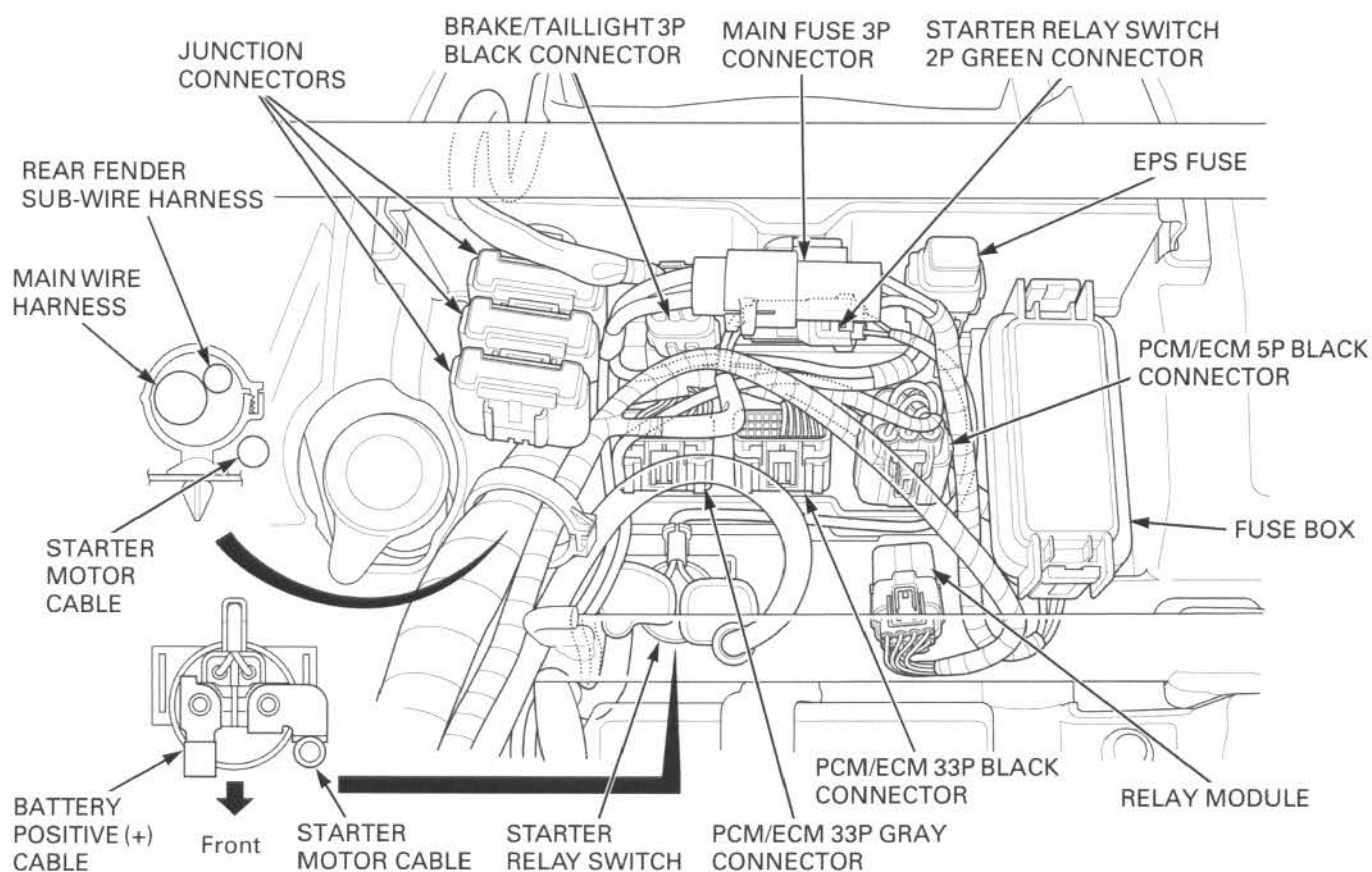




TE/TM/FE/FM:



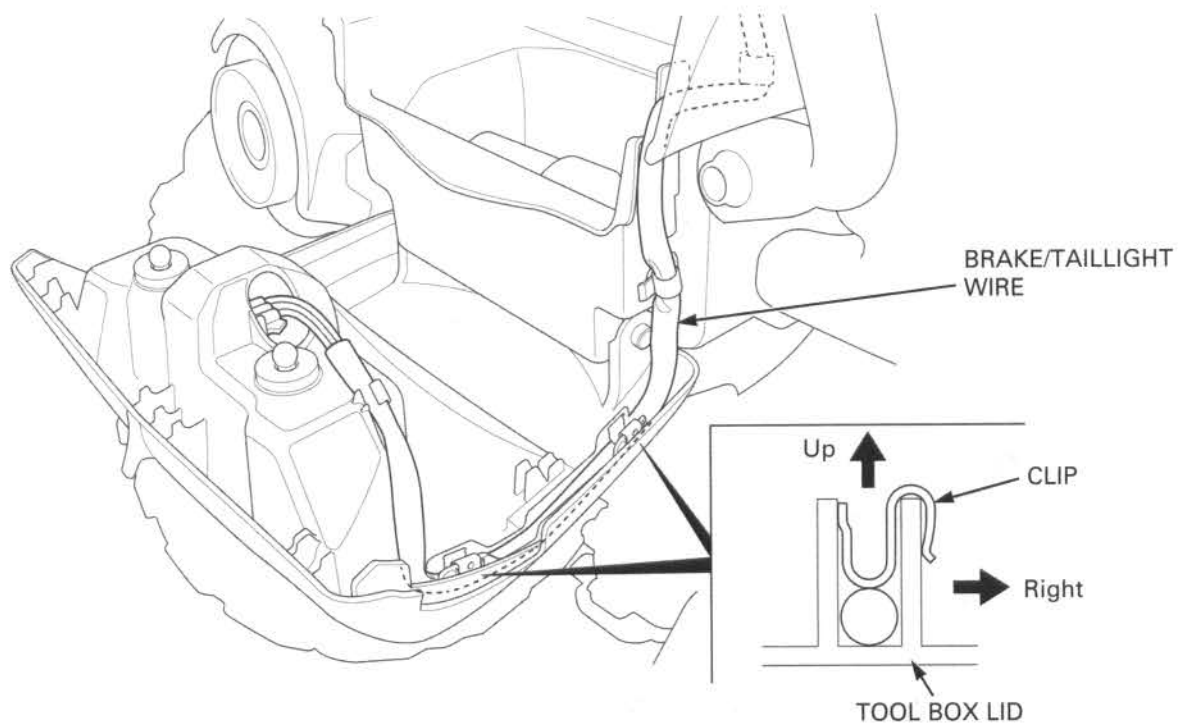
FPE/FPM:





## GENERAL INFORMATION

All models:





## EMISSION CONTROL SYSTEMS

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Environment Canada (EC) require that off-road 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 oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO) and hydrocarbons (HC). Controlling oxides of nitrogen and 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.

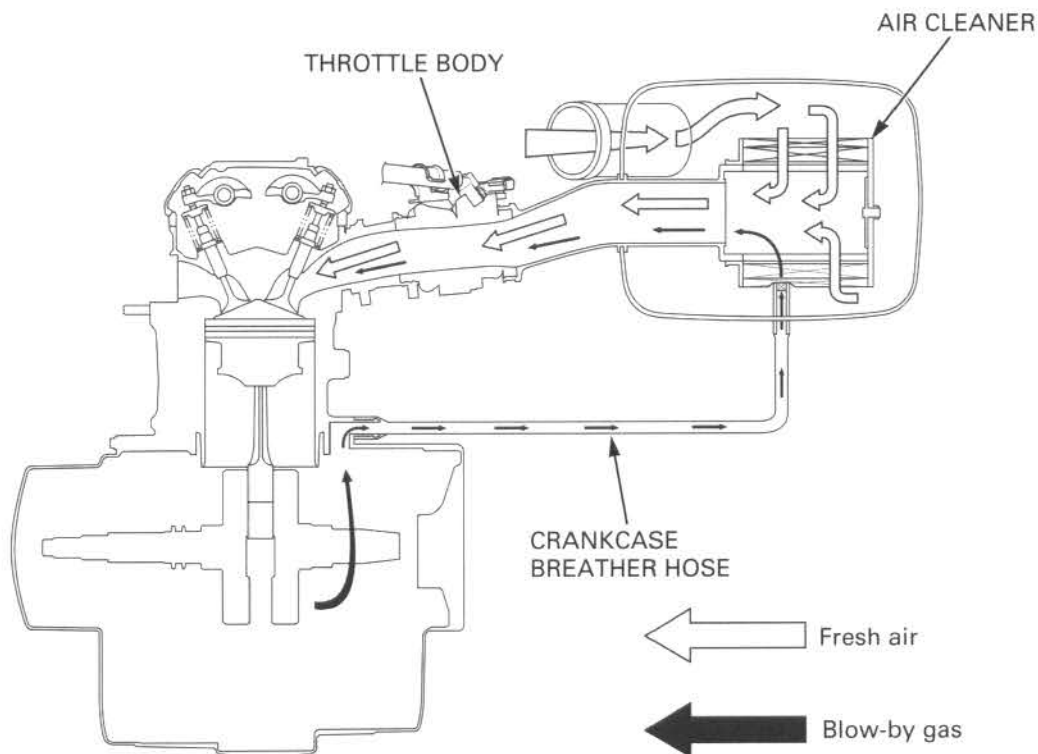
Honda Motor Co., Ltd. utilizes various systems to reduce carbon monoxide, oxides of nitrogen, and hydrocarbons.

### EXHAUST EMISSION CONTROL SYSTEM

The exhaust emission control system is composed of the PGM-FI system, and no adjustments should be made. 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 throttle body.



## SERVICING THE HONDA

U.S.A. Only

Maintenance, replacement or repair of the emission control devices and systems may be performed by any ATV repair establishment or individual using parts that are "certified" to EPA standards.

### PROHIBITED ACTIONS

The following prohibitions apply to everyone with respect to the engine's emission control system.

You may not remove or disable any device or element of design that may affect an engine's emission levels. This restriction applies before and after the engine is placed in service.



## GENERAL INFORMATION

---

### NOISE EMISSION CONTROL SYSTEM

TAMPERING WITH THE NOISE EMISSION CONTROL SYSTEM IS PROHIBITED: U.S. Federal law prohibits, or Canadian provincial law may prohibit 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 vehicle for the purpose of noise control prior to its sale or delivery to the ultimate customer or while it is in use; or (2) the use of any 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 FOLLOWING ACTS:

1. Removal of, or puncturing 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.

### FUEL PERMEATION EMISSION CONTROL SYSTEM (After '07)

This ATV complies with the Fuel Permeation Emission Control regulations of the U.S. Environmental Protection Agency (EPA). The fuel tank, fuel hoses, and fuel vapor charge hoses used on this ATV incorporate fuel permeation control technologies. Tampering with the fuel tank, fuel hoses, or fuel vapor charge hoses to reduce or defeat the effectiveness of the fuel permeation technologies is prohibited by federal regulations.

### REBUILT ENGINE

When you rebuild the engine including a major overhaul in which you replace the engine's piston or power assemblies or make other changes that significantly increase the service life of the engine, the vehicle will continue to comply with all emissions regulations if you:

- Make sure you are technically qualified to rebuild the engine and have the proper tools
- Diagnose and respond to all Diagnostic Trouble Codes (DTC), and erase all DTCs after addressing their cause
- Use only Genuine Honda parts or equivalents
- Make sure to maintain all specifications as described in this Service Manual



## 2. TECHNICAL FEATURES

---

PCM (POWERTRAIN CONTROL  
MODULE) ..... 2-2

PCM/ECM-to-COMBINATION METER  
SERIAL COMMUNICATION LINE ..... 2-3

SELECTABLE 4WD SYSTEM ..... 2-3



## TECHNICAL FEATURES

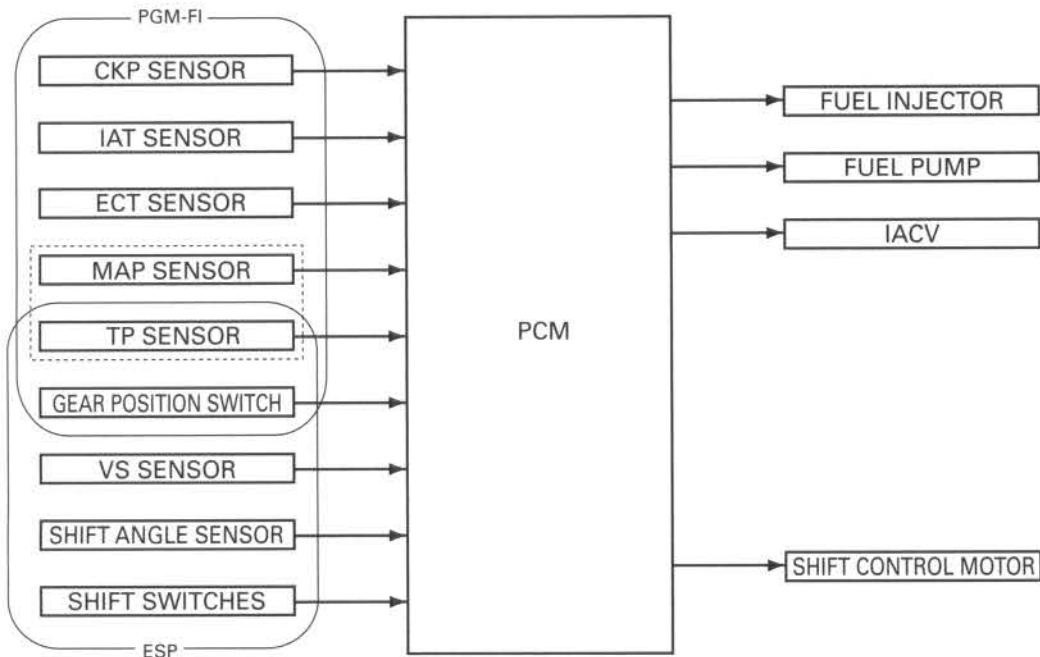
# PCM (POWERTRAIN CONTROL MODULE)

The TE/FE/FPE models are equipped with an ESP (Electric Shift Program).

The engine management and ESP systems are controlled by the PCM; the ECM (Engine Control Module) and ESP control unit are integrated into the PCM.

The following systems are controlled by one CPU (Central Processing Unit) in the PCM:

- Engine management
  - PGM-FI system
  - Ignition system
  - Cooling fan control system
- ESP (Electric Shift Program)



## PGM-FI SYSTEM

This PGM-FI system is composed of the fuel pump, fuel injector and IACV (Idle Air Control Valve) and the input sensors. This system controls and manages the engine operation. PGM-FI enhances the emission control performance, fuel economy, starting performance and driveability when compared to a conventional carburetor.

## ESP (TE/FE/FPE models)

ESP is designed to make gear shift operation easier by replacing foot-operated gear change with the gear shift switch. The PCM controls this system by processing signals from each switch and sensor, it operates the control motor to activate the shift drum.

## SELF-DIAGNOSTIC FUNCTION

The PCM has a fail-safe function and also a self-diagnostic function for the PGM-FI and ESP systems. Some detection items (sensors, etc....) are shared by the PGM-FI and ESP systems and so their failure may affect the operation of both systems. If both DTCs are indicated at the same time, troubleshoot the PGM-FI system first then check the DTC again.



# PCM/ECM-to-COMBINATION METER SERIAL COMMUNICATION LINE

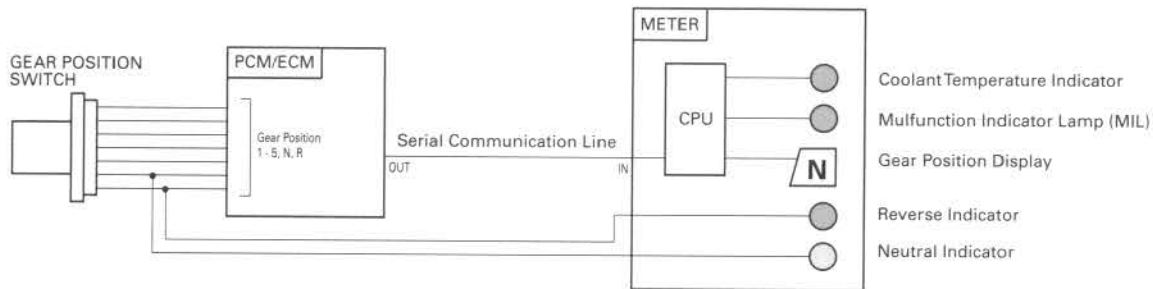
Some TRX420 models are equipped with the combination meter. The following indicators are controlled by the PCM/ECM.

- Gear position indication ("N", "R" and "1" thru "5") in LCD (Liquid Crystal Display)
- Coolant temperature indicator
- MIL (Malfunction Indicator Lamp)
- Reverse indicator (After '08 only)

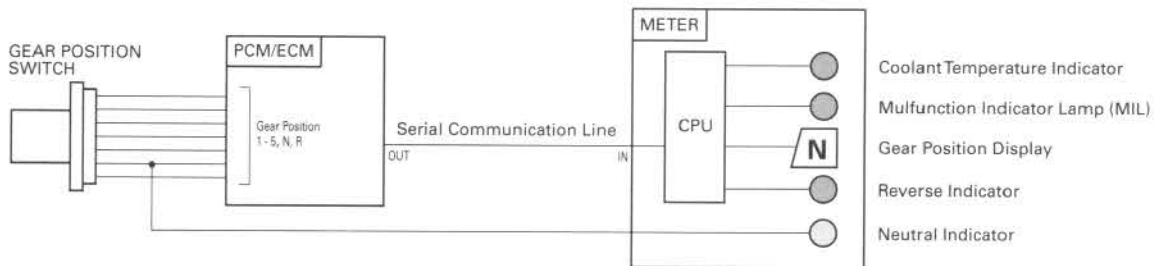
These controlled signals are forwarded to the combination meter via one wire. This wire is called the serial communication line.

When an open or short circuit occurs in the serial communication line, the gear position indicator starts to blink "-" in the LCD, follow the troubleshooting for the serial communication line (page 22-8).

'07 - '08:

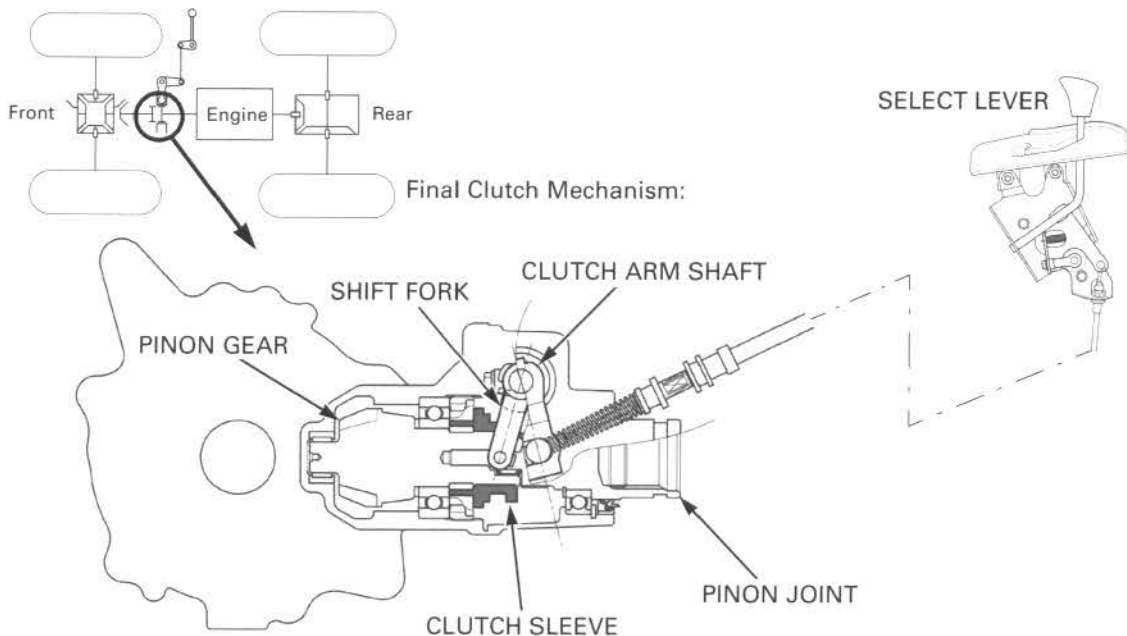


After '08:



## SELECTABLE 4WD SYSTEM

FE/FM/FPE/FPM models are equipped with a mechanical-select 4WD system that is composed of the select lever, control cable, front final clutch, and front differential. The select lever and cable engage/disengage the front final clutch to control drive torque to the front differential.





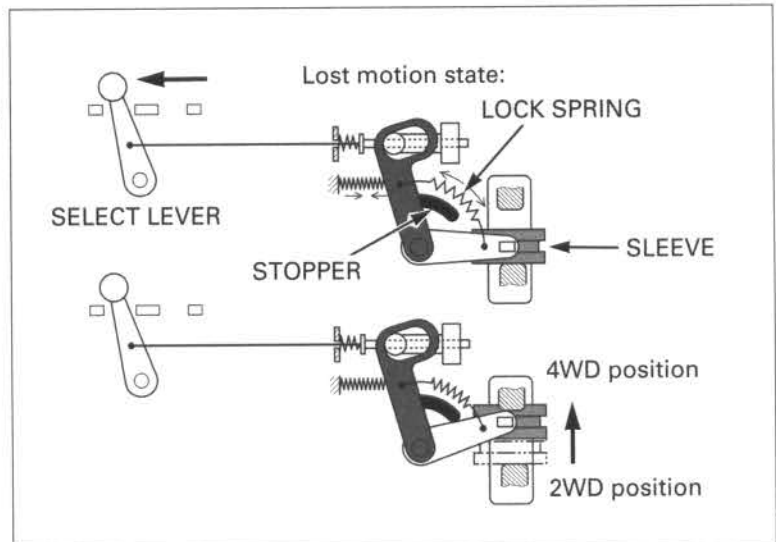
## TECHNICAL FEATURES

### OPERATION

To select 2WD/4WD, the shift fork slides the clutch sleeve to engage the pinion joint with the pinion gear. In case the spline between the pinion joint and pinion gear is not engaged, this system needs a stand-by position. For this purpose, this system has a lost motion mechanism to engage the pinion joint.

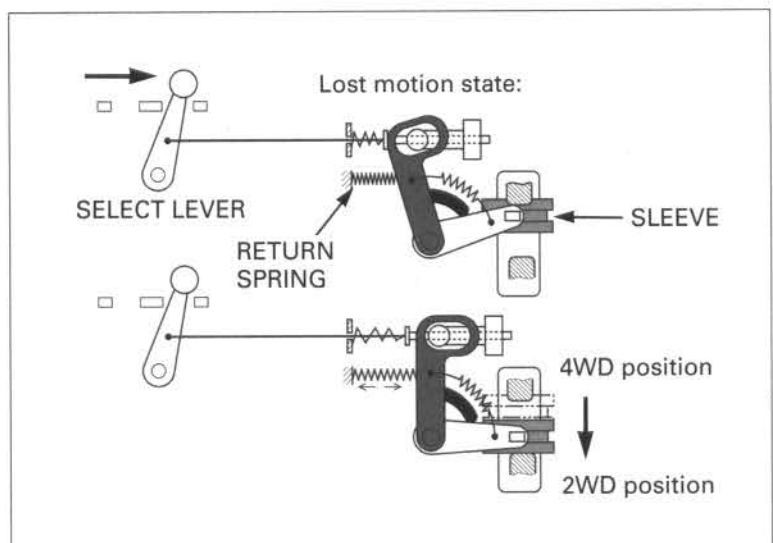
#### 2WD to 4WD

Pushing the select lever to 4WD pulls the clutch arm shaft and loads the clutch lock spring. In lost motion state, the clutch sleeve stays on the pinion gear. When the spline is engaged, the clutch sleeve slides onto the pinion joint, engaging 4WD by the tension of the clutch lock spring.



#### 4WD to 2WD

Pulling the select lever to 2WD returns the clutch arm shaft. In lost motion state, the clutch arm shaft stays in the 2WD position with the clutch sleeve. When the spline is engaged, the clutch sleeve returns from the pinion joint, for 2WD mode, by the tension of the return spring.





### 3. FRAME/BODY PANELS/EXHAUST SYSTEM

---

SERVICE INFORMATION .....	3-2	FRONT GRILLE .....	3-7
TROUBLESHOOTING .....	3-2	FRONT FENDER/CARRIER .....	3-7
BODY PANEL LOCATIONS .....	3-3	ENGINE GUARD .....	3-8
SEAT .....	3-4	REAR FENDER COVER .....	3-9
SIDE COVER .....	3-4	TOOL BOX LID .....	3-9
FUEL TANK SIDE COVER .....	3-5	REAR FENDER/CARRIER .....	3-10
FUEL TANK COVER .....	3-6	MUDGUARD BRACKET .....	3-12
MUDGUARD .....	3-6	EXHAUST SYSTEM .....	3-13



SERVICE INFORMATION

GENERAL

- This section covers removal and installation of the body panels and exhaust system.
- For handlebar cover removal/installation, refer to "Lights/Meters/Switch" section (page 22-12).
- Always replace the gaskets when removing the exhaust system.
- Always inspect the exhaust system for leaks after installation.

TORQUE VALUES

Rear carrier bolt	54 N·m (5.5 kgf·m, 40 lbf·ft)
Mudguard bracket nut	32 N·m (3.3 kgf·m, 24 lbf·ft)
Muffler band bolt	23 N·m (2.3 kgf·m, 17 lbf·ft)
Muffler cover bolt	22 N·m (2.2 kgf·m, 16 lbf·ft)
Exhaust pipe cover band bolt	2 N·m (0.2 kgf·m, 1.5 lbf·ft)
Muffler cover band bolt (front side)	2 N·m (0.2 kgf·m, 1.5 lbf·ft)
Muffler cover band bolt (rear side)	3.2 N·m (0.33 kgf·m, 2.4 lbf·ft)

TROUBLESHOOTING

Excessive exhaust noise

- Broken exhaust system
- Exhaust gas leaks

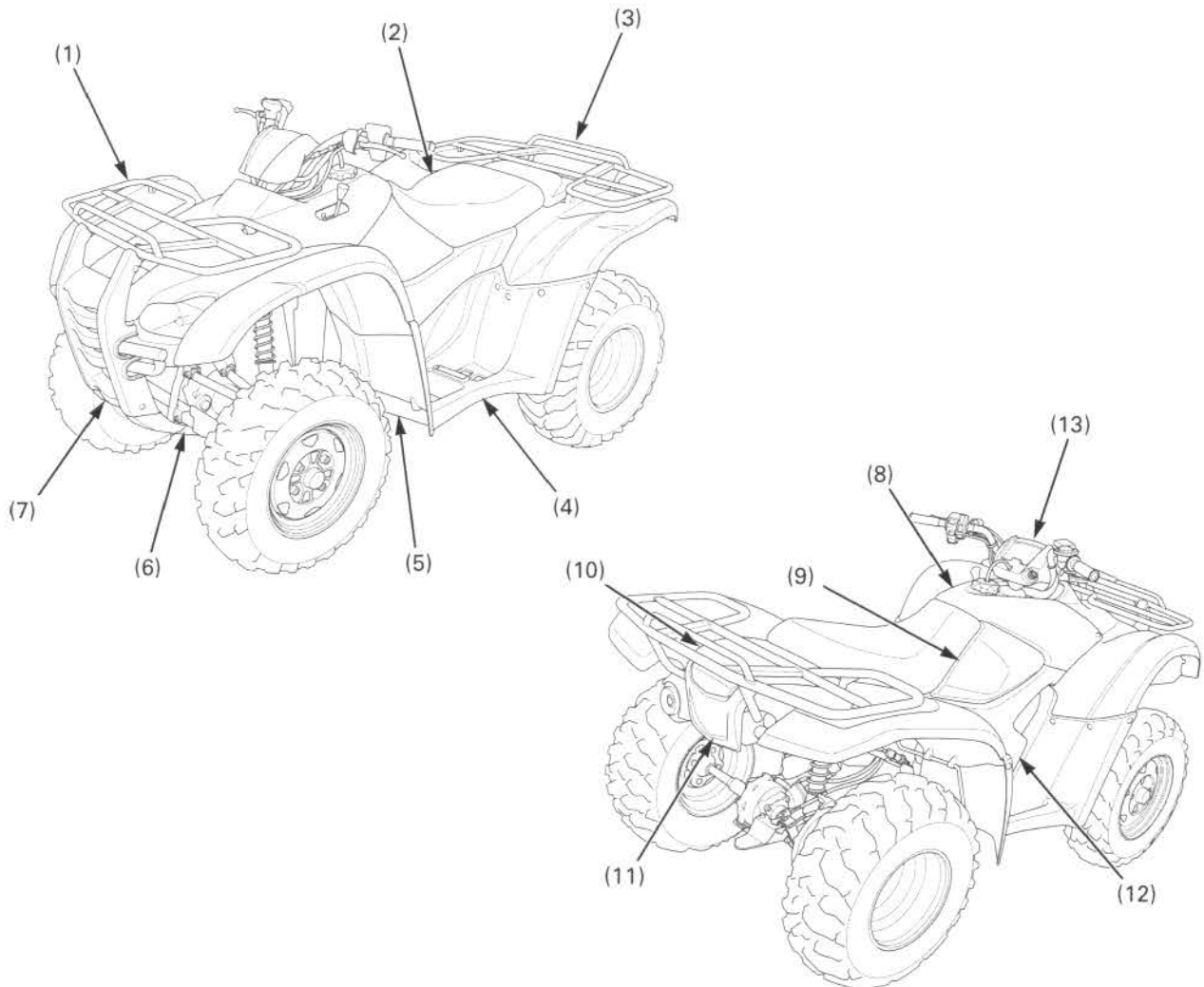
Poor performance

- Deformed exhaust system
- Exhaust gas leaks
- Clogged muffler



## BODY PANEL LOCATIONS

TRX420FE model shown:



- (1) FRONT FENDER/CARRIER (page 3-7)
- (2) SEAT (page 3-4)
- (3) REAR FENDER/CARRIER (page 3-10)
- (4) MUDGUARD (page 3-6)
- (5) MUDGUARD BRACKET (page 3-12)
- (6) ENGINE GUARD (page 3-8)
- (7) FRONT GRILLE (page 3-7)

- (8) FUEL TANK COVER (page 3-6)
- (9) FUEL TANK SIDE COVER (page 3-5)
- (10) REAR FENDER COVER (page 3-9)
- (11) TOOL BOX LID (page 3-9)
- (12) SIDE COVER (page 3-4)
- (13) METER COVER (page 22-12)

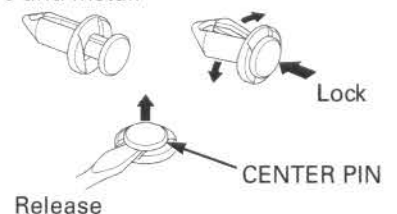
### TRIM CLIP REMOVAL AND RETAINING PROCEDURE:

Release by pulling the center pin up using a snap ring pliers or a flat blade screwdriver and remove the trim clip.

*Carefully align the clip holes in the covers to avoid damaging the clip.*

Install the clip and lock it by pushing the center pin securely.

Remove and install





## SEAT

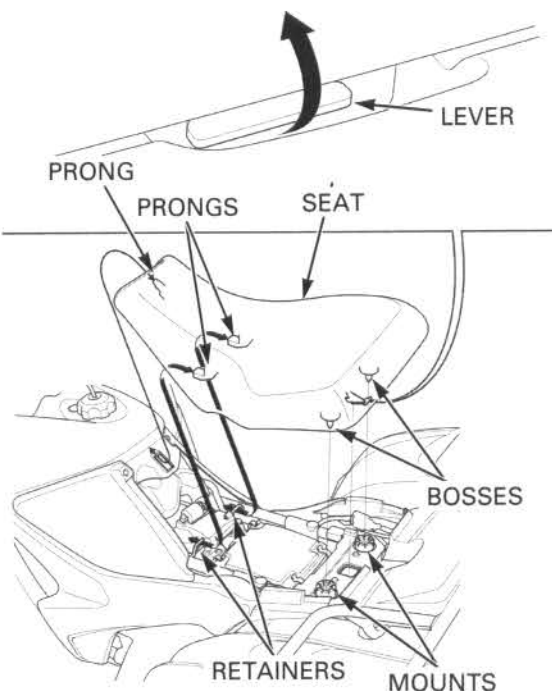
### REMOVAL

Unlock the seat by turning the release lever up. Raise the rear of the seat, slide it rearward and remove it.

### INSTALLATION

Install the seat by inserting the front prong into the fuel tank cover and hooking the center prongs to the seat retainers of the frame.

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



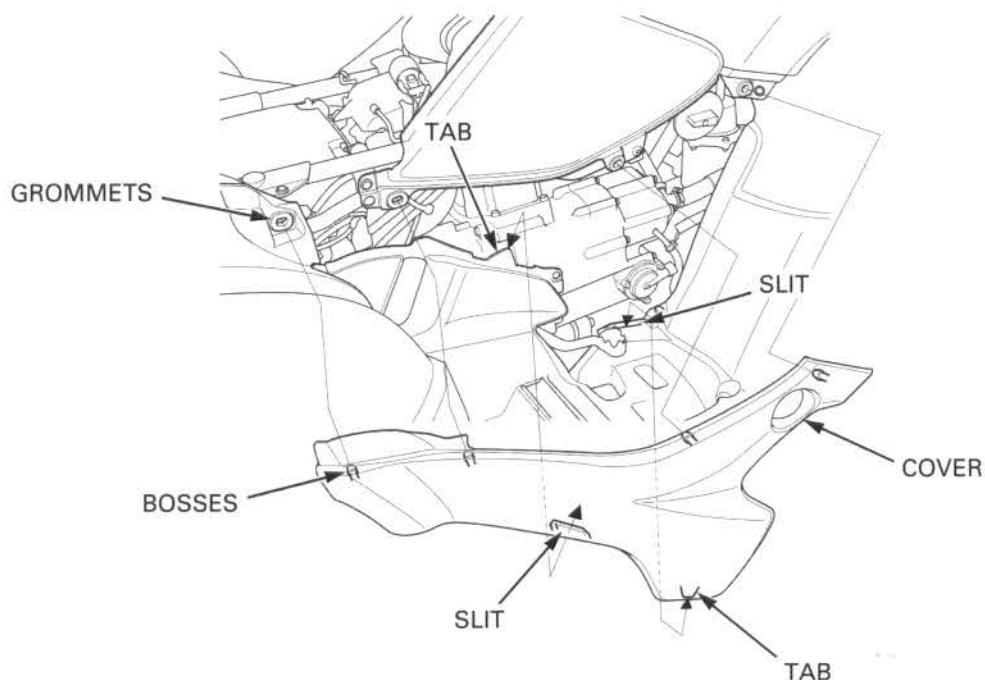
## SIDE COVER

Remove the seat (page 3-4).

Release the four bosses from the grommets, then release the two tabs of the mudguard and side cover to remove the side cover.

*Be careful not to dislodge the grommets.*

Installation is in the reverse order of removal.





## FUEL TANK SIDE COVER

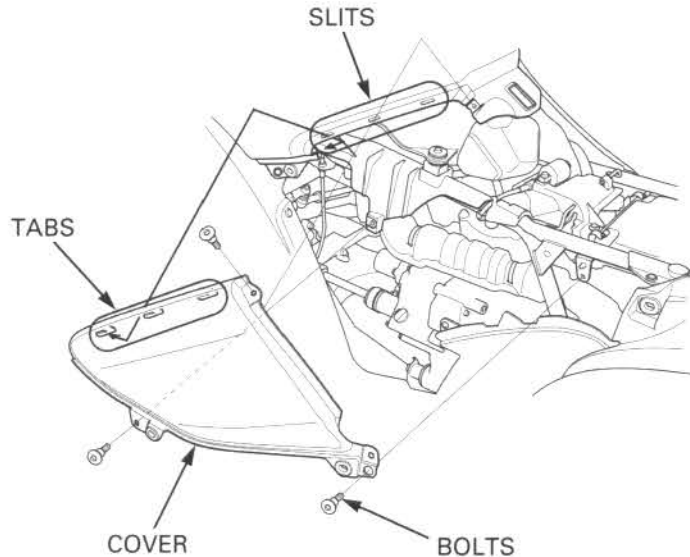
### LEFT COVER

Remove the side cover (page 3-4).

Remove the following:

- three socket bolts
- left fuel tank side cover (release the three tabs by sliding the cover rearward)

Installation is in the reverse order of removal.



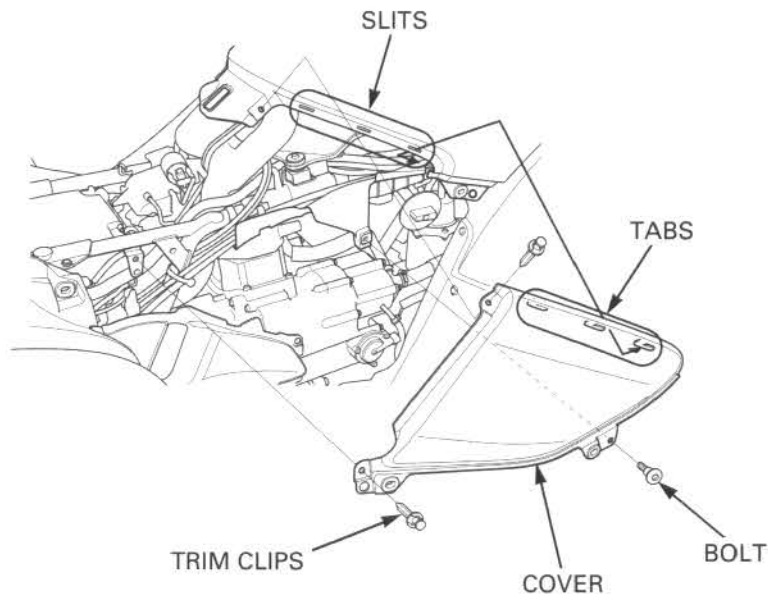
### RIGHT COVER

Remove the side cover (page 3-4).

Remove the following:

- two trim clips
- socket bolt
- right fuel tank side cover (release the three tabs by sliding the cover rearward)

Installation is in the reverse order of removal.





## FUEL TANK COVER

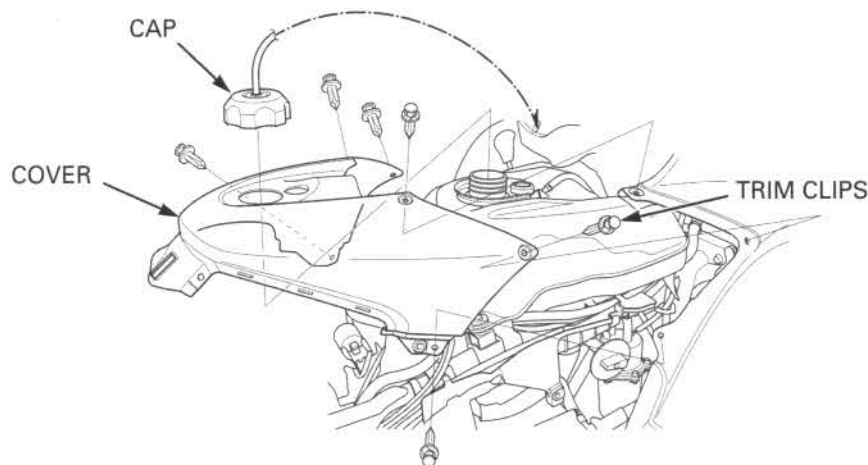
Remove the fuel tank side covers (page 3-5).

Remove the following:

- six trim clips
- fuel fill cap
- fuel tank cover

Install the fuel fill cap after removing the tank cover.

Installation is in the reverse order of removal.



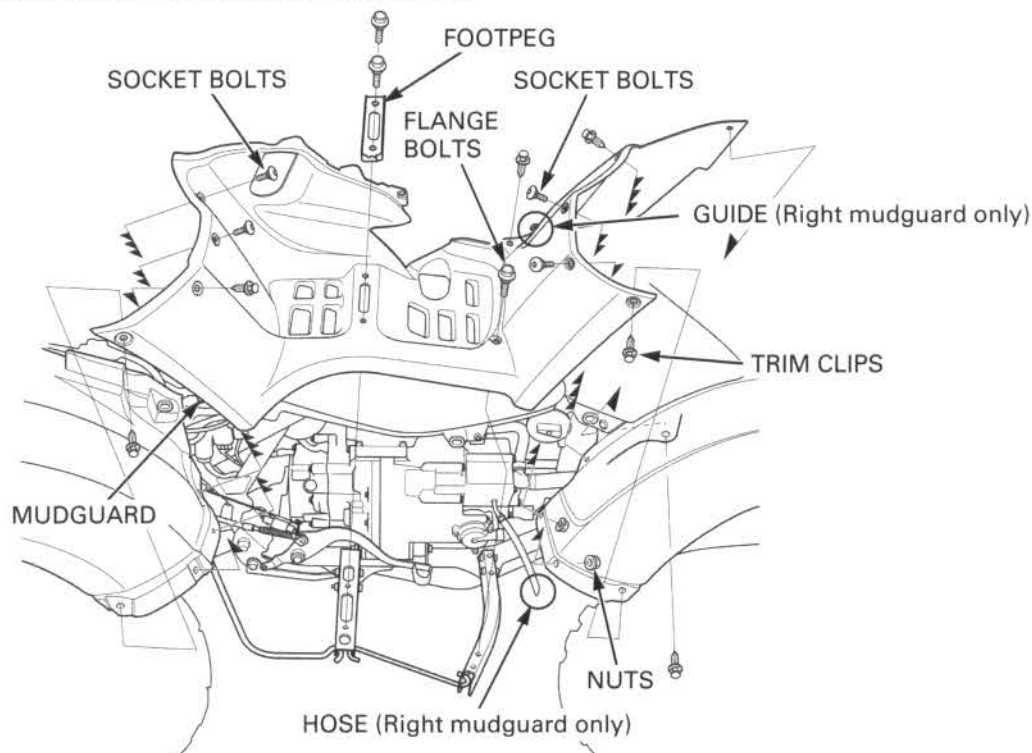
## MUDGUARD

Remove the side cover (page 3-4).

Remove the following:

- six trim clips
- two nuts (front side) and four socket bolts
- three flange bolts and footpeg
- Right mudguard only: water pump breather hose (from the hose guide of the mudguard)
- mudguard

Installation is in the reverse order of removal.



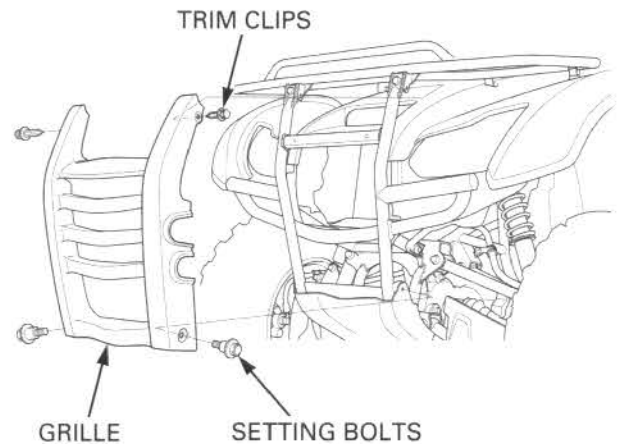


## FRONT GRILLE

Remove the following:

- two trim clips
- two setting bolts
- front grille

Installation is in the reverse order of removal.



## FRONT FENDER/CARRIER

### REMOVAL/INSTALLATION

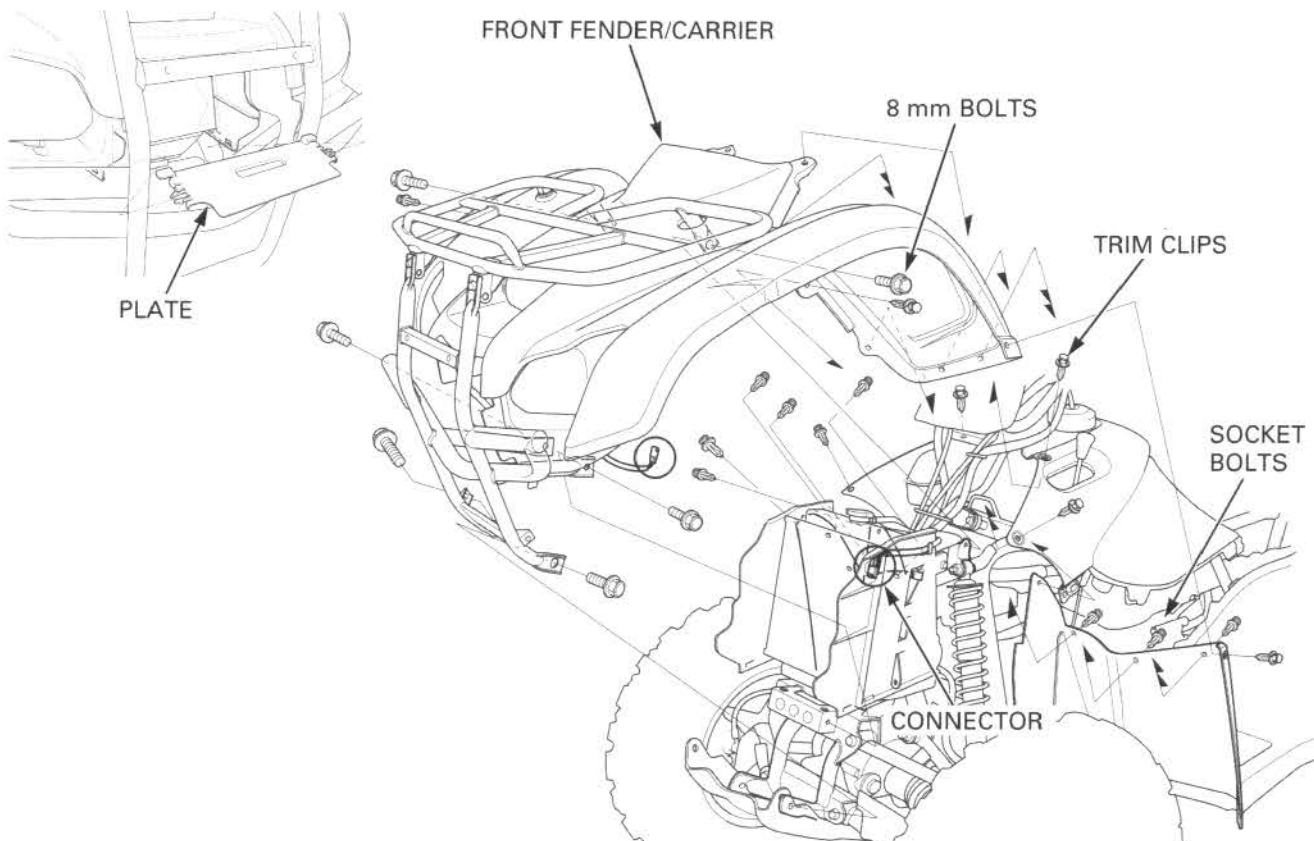
Remove the side covers (page 3-4).

Remove the front grille (page 3-7).

Remove the following:

- lower air guide plate (by releasing the four tabs)
- headlight 3P connector (release from the side air guide plate and disconnect it)
- 12 trim clips
- four nuts and socket bolts
- six 8-mm bolts
- front fender/carrier assembly

Installation is in the reverse order of removal.





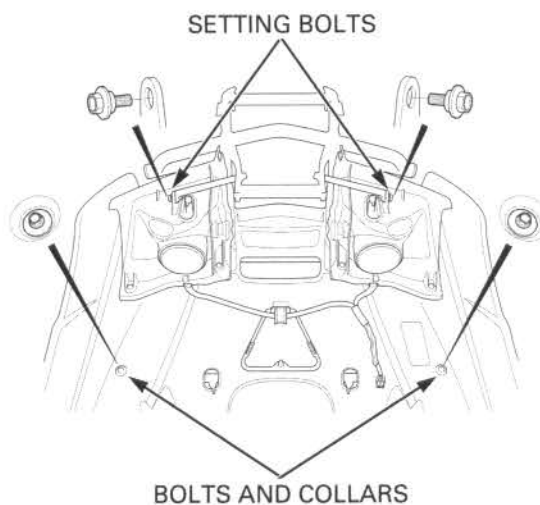
### DISASSEMBLY/ASSEMBLY

Remove the following fasteners and separate the front fender and carrier.

- two bolts and collars
- two setting bolts (securing each headlight housing)

Installation is in the reverse order of removal.

For headlight removal/installation, see "Lights/meters/Switches" section (page 22-5).

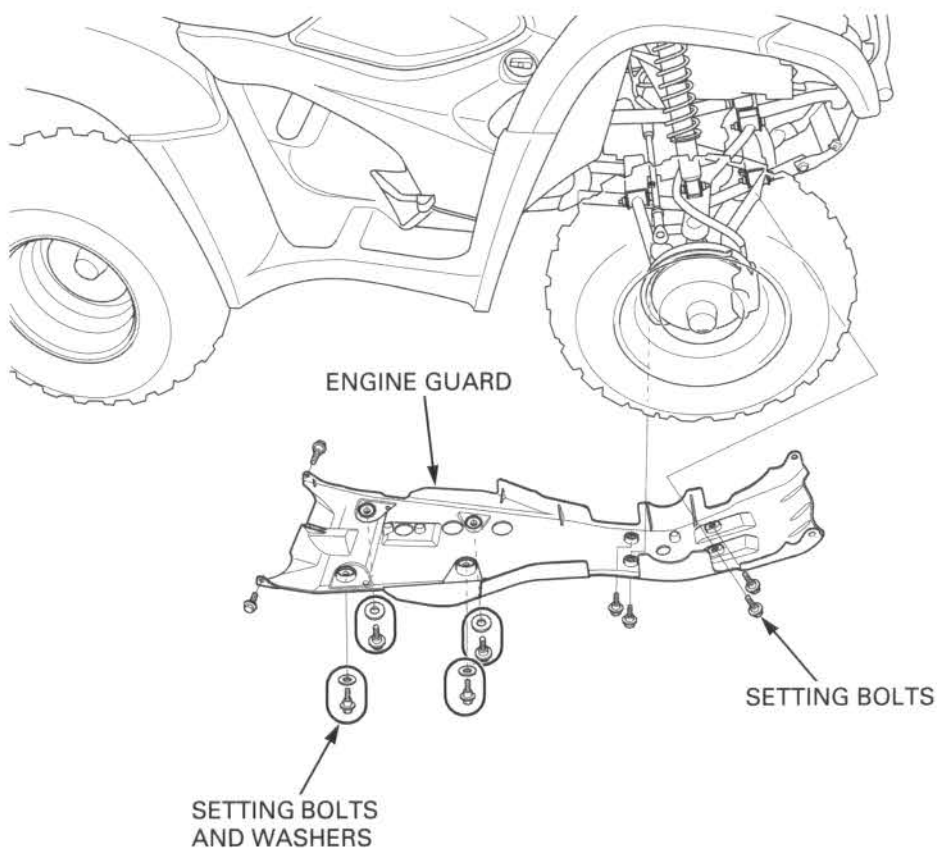


### ENGINE GUARD

Remove the front grille (page 3-7).

Remove the ten setting bolts and four washers, and the engine guard.

Installation is in the reverse order of removal.





## REAR FENDER COVER

Remove the seat (page 3-4).

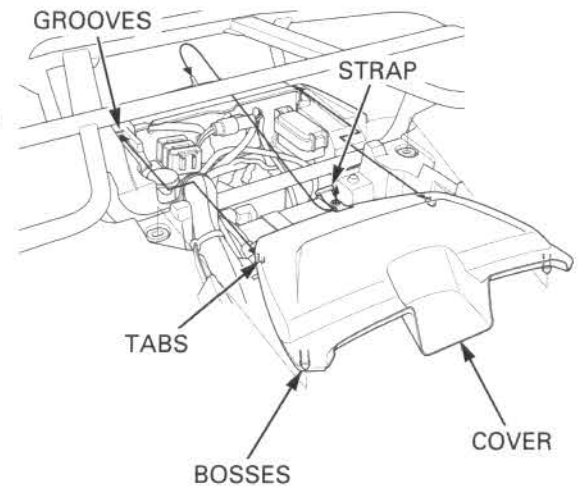
*Be careful not to scratch the cover with the carrier pipe.*

Remove the following:

- retaining strap (from the tool box lid)
- two bosses
- rear fender cover (release the two tabs by sliding the cover forward)

*Be careful not to dislodge the grommets.*

Installation is in the reverse order of removal.



## TOOL BOX LID

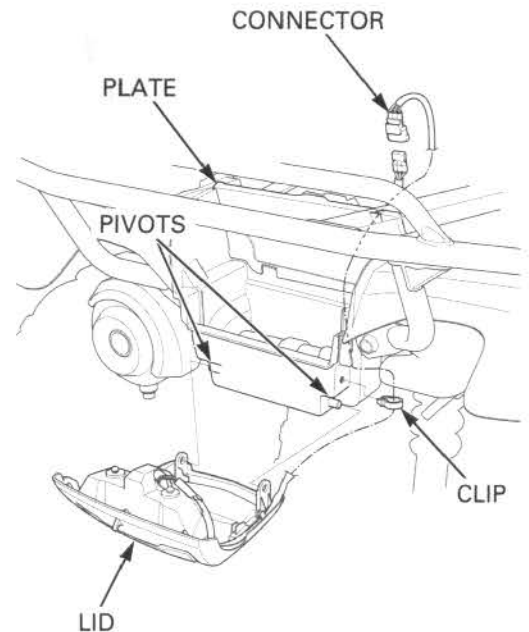
Remove the rear fender cover (page 3-9).

Remove the following:

- 3P connector (release from the holder plate and disconnect it)
- wire clip
- taillight wire (from the wire guides)
- tool box lid (from the pivots)

*Route the taillight wire properly (page 1-28).*

Installation is in the reverse order of removal.





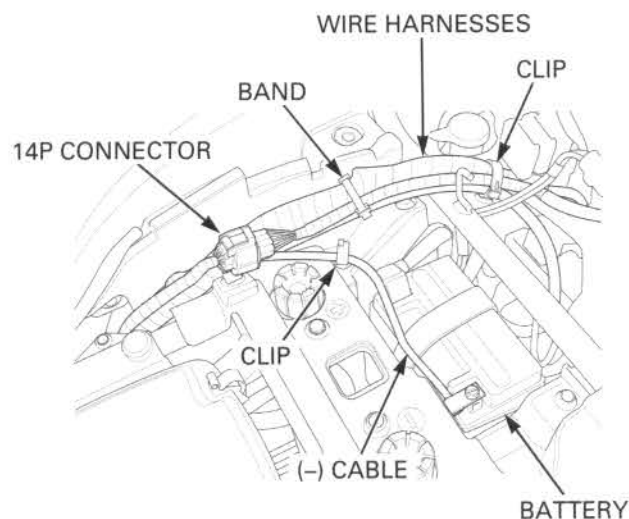
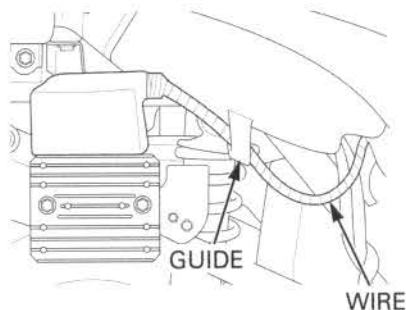
## REAR FENDER/CARRIER

Remove the following:

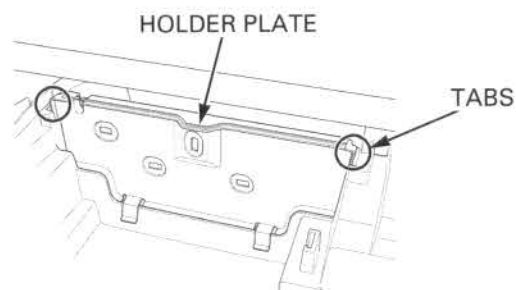
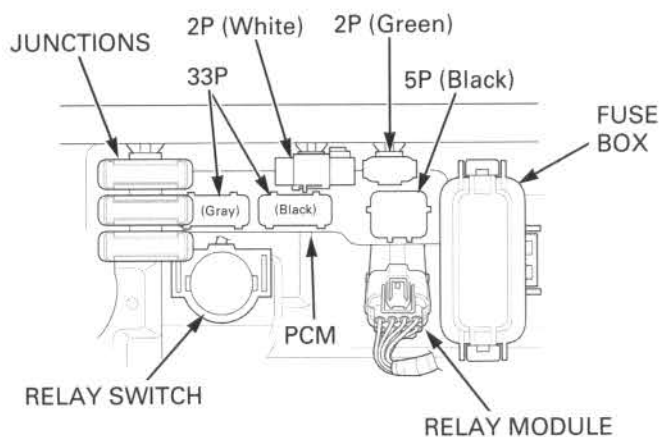
- side covers (page 3-4)
- tool box lid (page 3-9)
- battery (page 19-6)

Remove the following from the rear fender:

- regulator/rectifier wire (from the wire guide)
- battery (-) cable (by releasing the cable clip)
- wire harnesses (by releasing the wire clip and band)
- 14P (gray) connector



- wire junction
- 2P (white) connector
- 2P (green) connector
- relay module
- connector holder plate (by releasing the two tabs)
- fuse box
- starter relay switch
- PCM 5P and 33P connectors
- powertrain control module (PCM)





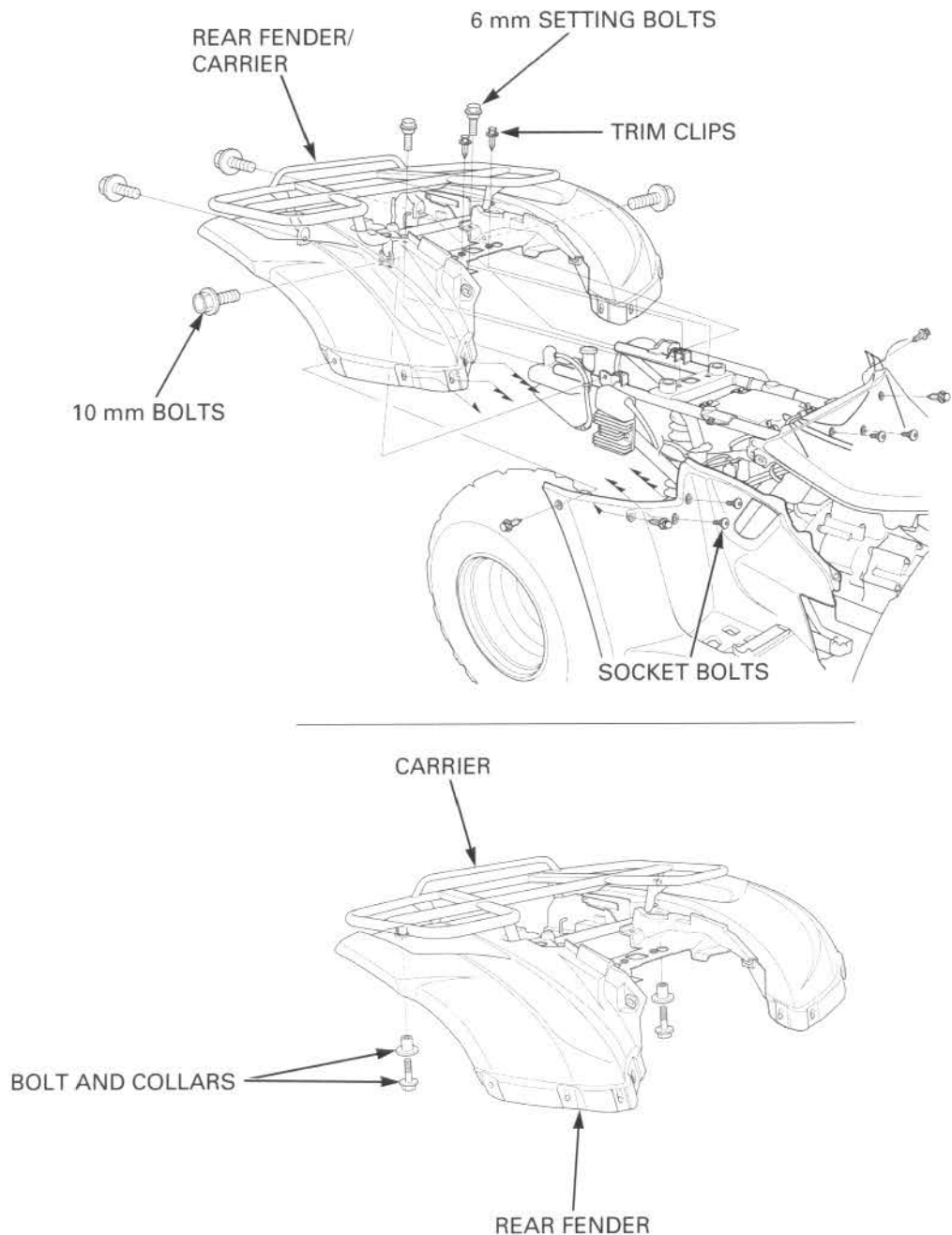
Remove the following fasteners and remove the rear fender/carrier assembly:

- six trim clips
- four socket bolts
- two 6-mm setting bolts
- four 10-mm bolts

Remove the two bolts and collars, and separate the rear fender and carrier.

Installation is in the reverse order of removal.

**TORQUE: 10 mm bolt: 54 N·m (5.5 kgf·m, 40 lbf·ft)**





## MUDGUARD BRACKET

Remove the mudguard (page 3-6).

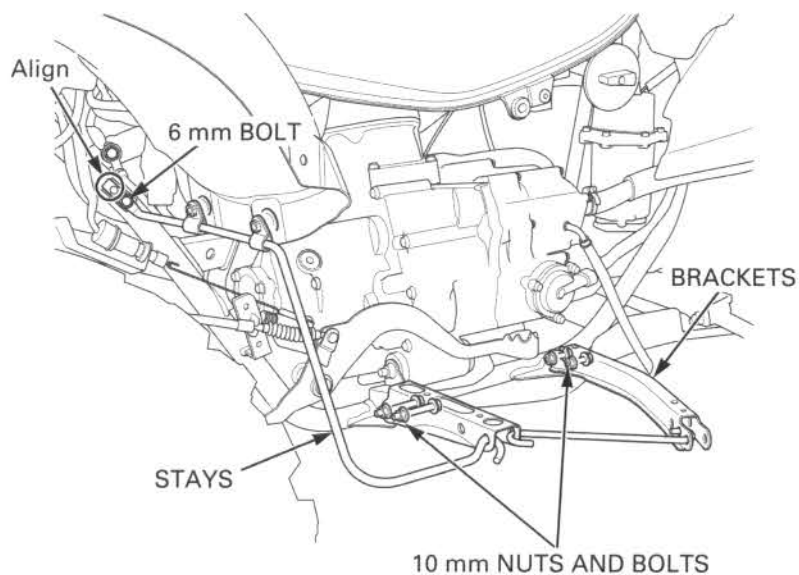
Remove the following:

- 6-mm bolt
- rear stay
- four 10-mm nuts and bolts
- mudguard brackets
- center stay

*When installing the rear stay, align the locating pin with the hole in the frame.*

Installation is in the reverse order of removal.

**TORQUE: 10 mm bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)**





## EXHAUST SYSTEM

### REMOVAL

Remove the fuel tank side covers (page 3-5).

Loosen the two muffler band bolts.

Remove the following:

- two joint nuts
- exhaust pipe
- gaskets
- mounting bolt
- muffler

### INSTALLATION

Install a new joint gasket and muffler gasket.

Install the following by loosely tightening all the fasteners:

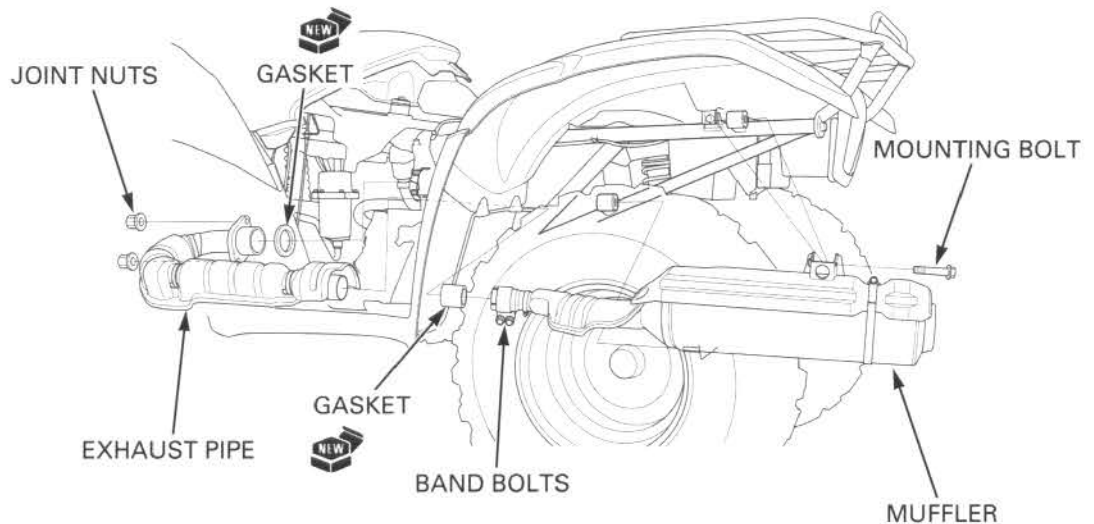
- muffler (onto the stays)
- mounting bolt
- exhaust pipe (into the muffler and onto the cylinder head)
- two joint nuts (by setting the exhaust pipe flange properly)

Tighten the joint nuts first, then tighten the mounting bolt.

Tighten the muffler band bolts.

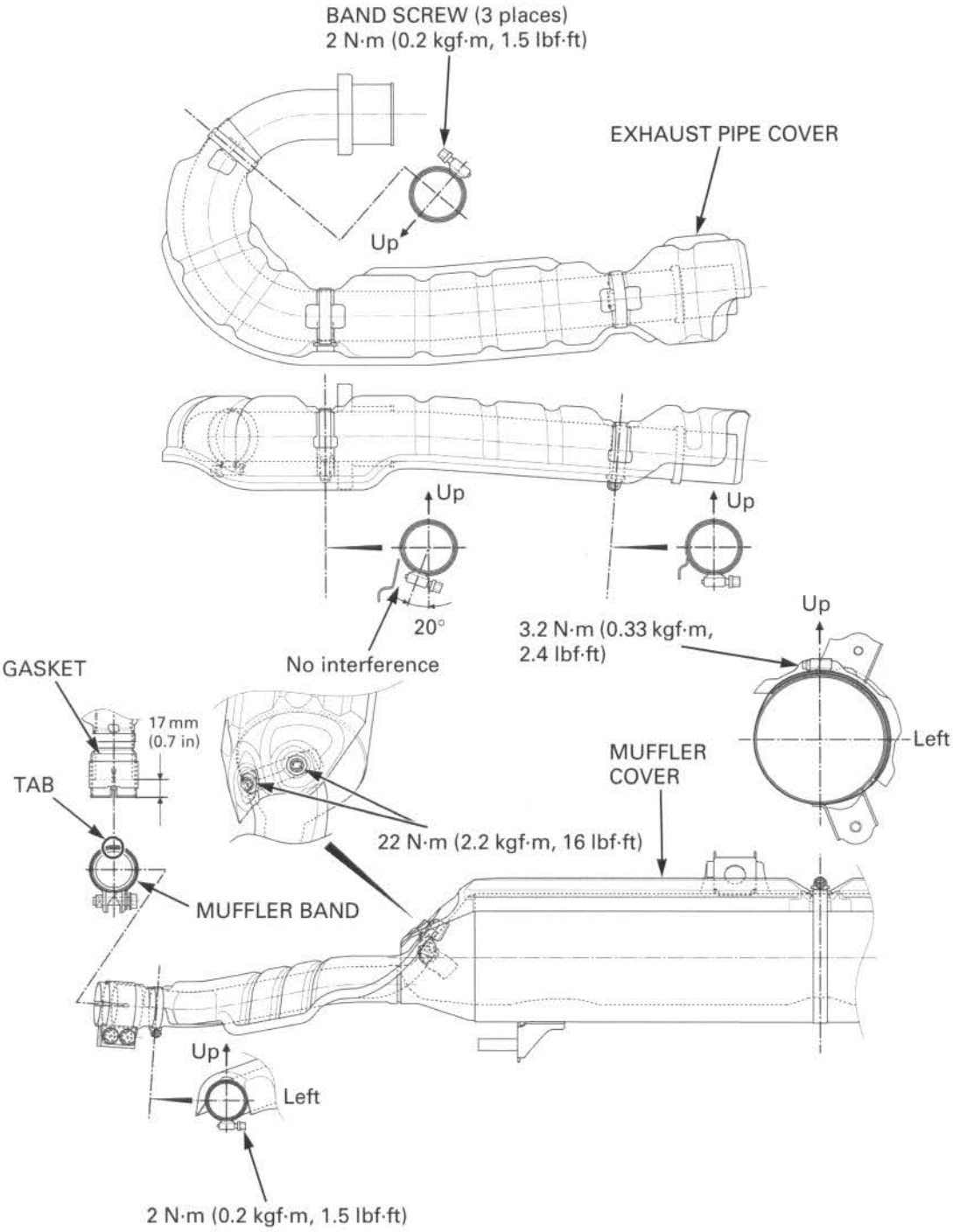
**TORQUE: 23 N·m (2.3 kgf·m, 17 lbf·ft)**

After installation, inspect the exhaust system for leaks.





**FRAME/BODY PANELS/EXHAUST SYSTEM**  
**DISASSEMBLY/ASSEMBLY**





SERVICE INFORMATION .....	4-2	2WD/4WD SELECT SYSTEM (FM/FE/FPM/FPE models).....	4-21
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REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL .....	4-19	TIE-ROD AND JOINT BOOTS .....	4-28
		STEERING SHAFT HOLDER BEARING ...	4-29
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## MAINTENANCE

# SERVICE INFORMATION

## GENERAL

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

## SPECIFICATIONS

ITEM			SPECIFICATIONS	
Throttle lever freeplay			3 – 8 mm (1/8 – 1/3 in)	
Spark plug			BKR5E-11 (NGK), K16PR-U11 (DENSO)	
Spark plug gap			1.0 – 1.1 mm (0.039 – 0.043 in)	
Valve clearance	IN		0.15 ± 0.02 mm (0.006 ± 0.001 in)	
	EX		0.23 ± 0.02 mm (0.009 ± 0.001 in)	
Engine oil capacity	After draining		2.7 liters (2.9 US qt, 2.4 Imp qt)	
	After draining/filter change		2.8 liters (3.0 US qt, 2.5 Imp qt)	
	After disassembly		3.1 liters (3.3 US qt, 2.7 Imp qt)	
Recommended engine oil			Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-30	
Rear final gear case oil capacity	After draining		75 cm <sup>3</sup> (2.5 US oz, 2.6 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	
Front differential oil capacity (FM/FE/FPM/FPE models)	After draining		230 cm <sup>3</sup> (7.8 US oz, 8.1 Imp oz)	
	After disassembly		310 cm <sup>3</sup> (10.5 US oz, 10.9 Imp oz)	
Recommended differential oil (FM/FE/FPM/FPE models)			Hypoid gear oil, SAE #80	
Recommended brake fluid			Honda DOT 4 brake fluid	
Rear (parking) brake lever freeplay			15 – 20 mm (3/5 – 4/5 in)	
Rear brake pedal freeplay			15 – 20 mm (3/5 – 4/5 in)	
Reverse selector lever freeplay			2 – 4 mm (1/12 – 1/6 in)	
Cold tire pressure	TM/TE/FM/FE (Front/Rear)		Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
			With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
	FPM/FPE	Front	Standard	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)
			With cargo	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)
		Rear	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
			With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
Tire size		Front	AT24 x 8-12 ★★	
		Rear	AT24 x 10-11 ★★	
Tire brand		Front	M977 (Maxxis)	
		Rear	M978 (Maxxis)	
Minimum tread depth (Front/Rear)			4.0 mm (0.16 in)	
Toe	TM/TE models		Toe-in: 10 ± 15 mm (0.4 ± 0.6 in)	
	FM/FE/FPM/FPE models		Toe-out: 9 ± 15 mm (0.4 ± 0.6 in)	



# TORQUE VALUES

Spark plug	22 N·m (2.2 kgf·m, 16 lbf·ft)
Valve adjusting lock nut	17 N·m (1.7 kgf·m, 13 lbf·ft)
Valve adjusting hole cap	12 N·m (1.2 kgf·m, 9 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)
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)
Rear final gear case skid plate bolt	32 N·m (3.3 kgf·m, 24 lbf·ft) ALOC bolt: replace with a new one.
Front final gear case oil filler cap (FM/FE/FPM/FPE only)	12 N·m (1.2 kgf·m, 9 lbf·ft)
Front final gear case oil drain bolt (FM/FE/FPM/FPE only)	12 N·m (1.2 kgf·m, 9 lbf·ft)
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m, 1.5 lbf·ft)
Tie-rod lock nut (knuckle side)	54 N·m (5.5 kgf·m, 40 lbf·ft)
Tie-rod lock nut (steering arm side)	54 N·m (5.5 kgf·m, 40 lbf·ft) Left hand threads.



## MAINTENANCE

# MAINTENANCE SCHEDULE

### TRX420TM/TE models:

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 ↓	→	INITIAL MAINTENANCE	REGULAR MAINTENANCE INTERVAL		REFER TO PAGE
					mi	1,200	
					km	2,000	
					HOURS	200	
* FUEL LINE						I	4-7
* THROTTLE OPERATION						I	4-7
AIR CLEANER	NOTE 1				C	C	4-8
AIR CLEANER HOUSING DRAIN TUBE	NOTE 2				I	I	4-10
SPARK PLUG					I	I	4-11
* VALVE CLEARANCE				I	I	I	4-12
ENGINE OIL			INITIAL = 100 mi (150 km), 20 operating hours or 1 month: R REGULAR = Every 600 mi (1,000 km), 100 operating hours or 12 months: R				4-14
ENGINE OIL FILTER				R	R	R	4-15
RADIATOR COOLANT	NOTE 3				I	I	4-16
* COOLING SYSTEM	NOTE 2				I	I	4-17
REAR FINAL GEAR CASE OIL					(R: Every 2 years)	I	4-19
* BRAKE FLUID	NOTE 3				I	I	4-22
* BRAKE SHOES WEAR	NOTE 1					I	4-23
* BRAKE PADS WEAR	NOTE 1, 2					I	4-23
* BRAKE LIGHT SWITCH				I	I	I	4-23
BRAKE SYSTEM				I	I	I	4-24
* REVERSE LOCK SYSTEM				I	I	I	4-25
SKID PLATE, ENGINE GUARD					I	I	4-25
* CLUTCH SYSTEM				I	I	I	4-26
* SUSPENSION					I	I	4-26
* SPARK ARRESTER					C	C	4-27
* NUTS, BOLTS, FASTENERS				I		I	4-28
** WHEELS/TIRES				I	I	I	4-28
** TIE-ROD AND JOINT BOOTS				I	I	I	4-28
** STEERING SHAFT HOLDER BEARING						I	4-29
** STEERING SYSTEM						I	4-29

\* Should be serviced by an authorized 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 an authorized 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.



**TRX420FM/FE models:**

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	↓	→	INITIAL MAINTENANCE	REGULAR MAINTENANCE INTERVAL		REFER TO PAGE
					mi	1,200	
					km	2,000	
					HOURS	200	
* FUEL LINE						I	4-7
* THROTTLE OPERATION						I	4-7
AIR CLEANER	NOTE 1				C	C	4-8
AIR CLEANER HOUSING DRAIN TUBE	NOTE 2				I	I	4-10
SPARK PLUG					I	I	4-11
* VALVE CLEARANCE				I	I	I	4-12
ENGINE OIL				INITIAL = 100 mi (150 km), 20 operating hours or 1 month: R REGULAR = Every 600 mi (1,000 km), 100 operating hours or 12 months: R			4-14
ENGINE OIL FILTER				R	R	R	4-15
RADIATOR COOLANT	NOTE 3				I	I	4-16
* COOLING SYSTEM	NOTE 2				I	I	4-17
DRIVE SHAFT BOOTS					I	I	4-18
REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL					(R: Every 2 years)	I	4-19
* 2WD/4WD SELECT SYSTEM						I	4-21
* BRAKE FLUID	NOTE 3				I	I	4-22
* BRAKE SHOES WEAR	NOTE 1					I	4-23
* BRAKE PADS WEAR	NOTE 1, 2					I	4-23
* BRAKE LIGHT SWITCH				I	I	I	4-23
BRAKE SYSTEM				I	I	I	4-24
* REVERSE LOCK SYSTEM				I	I	I	4-25
SKID PLATE, ENGINE GUARD					I	I	4-25
* CLUTCH SYSTEM				I	I	I	4-26
* SUSPENSION					I	I	4-26
* SPARK ARRESTER					C	C	4-27
* NUTS, BOLTS, FASTENERS				I	I	I	4-28
** WHEELS/TIRES				I	I	I	4-28
** TIE-ROD AND JOINT BOOTS				I	I	I	4-28
** STEERING SHAFT HOLDER BEARING						I	4-29
** STEERING SYSTEM						I	4-29

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**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

### After '08 models:

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	→	INITIAL MAINTENANCE		REGULAR MAINTENANCE INTERVAL		REFER TO PAGE
				mi	100	600	1,200	
				km	150	1,000	2,000	
				HOURS	20	100	200	
* FUEL LINE							I	4-7
* THROTTLE OPERATION							I	4-7
AIR CLEANER		NOTE 1				C	C	4-8
AIR CLEANER HOUSING DRAIN TUBE		NOTE 2				I	I	4-10
SPARK PLUG						I	I	4-11
* VALVE CLEARANCE					I	I	I	4-12
ENGINE OIL				INITIAL = 100 mi (150 km), 20 operating hours or 1 month: R REGULAR = Every 600 mi (1,000 km), 100 operating hours or 12 months: R				4-14
ENGINE OIL FILTER					R	R	R	4-15
RADIATOR COOLANT		NOTE 3				I	I	4-16
* COOLING SYSTEM		NOTE 2				I	I	4-17
DRIVE TRAIN BOOTS						I	I	4-18
REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL (FM/FE/FPM/FPE models)						(R: Every 2 years)	I	4-19
REAR FINAL GEAR CASE OIL (TM/TE models)						(R: Every 2 years)	I	4-19
* 2WD/4WD SELECT SYSTEM (FM/FE/FPM/FPE models)							I	4-21
* BRAKE FLUID		NOTE 3				I	I	4-22
* BRAKE SHOES WEAR		NOTE 1, 2					I	4-23
* BRAKE PADS WEAR		NOTE 1, 2					I	4-23
* BRAKE LIGHT SWITCH					I	I	I	4-23
BRAKE SYSTEM					I	I	I	4-24
* REVERSE LOCK SYSTEM					I	I	I	4-25
GUARDS						I	I	4-26
* CLUTCH SYSTEM					I	I	I	4-26
* SUSPENSION						I	I	4-26
* SPARK ARRESTER						C	C	4-27
* NUTS, BOLTS, FASTENERS					I		I	4-28
** WHEELS/TIRES					I	I	I	4-28
** TIE-ROD AND JOINT BOOTS					I	I	I	4-28
** STEERING SHAFT HOLDER BEARING							I	4-29
** STEERING SYSTEM							I	4-29

\* Should be serviced by an authorized Honda dealer, unless the owner has proper tools and service data and is mechanically qualified.

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#### 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.

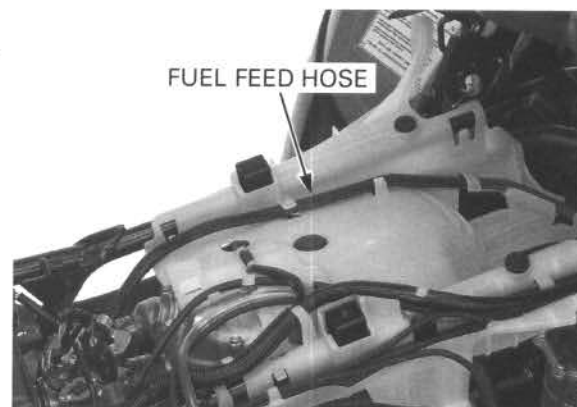


## FUEL LINE

Remove the fuel tank (page 6-41).

Check the fuel lines for deterioration, cracks, damage or leakage.

Replace the fuel hose 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.

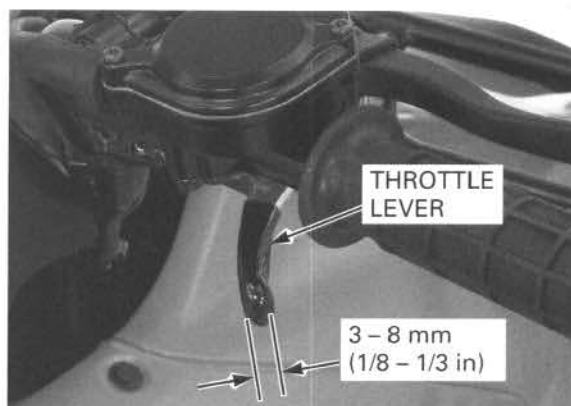
If the throttle lever does not return properly, lubricate the throttle cable and overhaul and lubricate the throttle housing (page 14-12).

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 freeplay and the throttle cable connections.

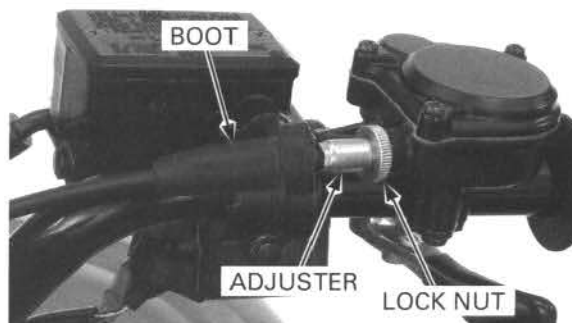
Measure the throttle lever freeplay at the tip of the throttle lever.

**THROTTLE LEVER FREEPLAY:**  
3 – 8 mm (1/8 – 1/3 in)



Throttle lever freeplay 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.





## MAINTENANCE

Major adjustments are made with the lower adjuster.

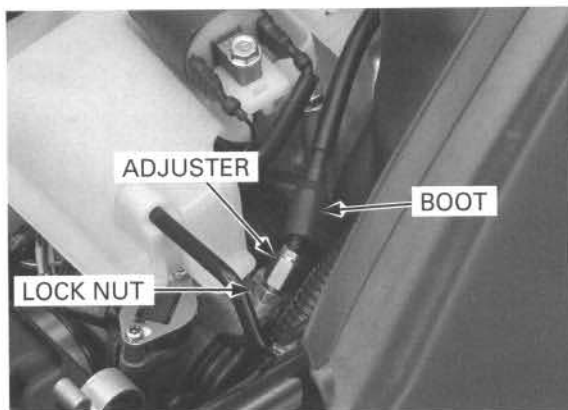
Remove the seat (page 3-4).

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 3-4).



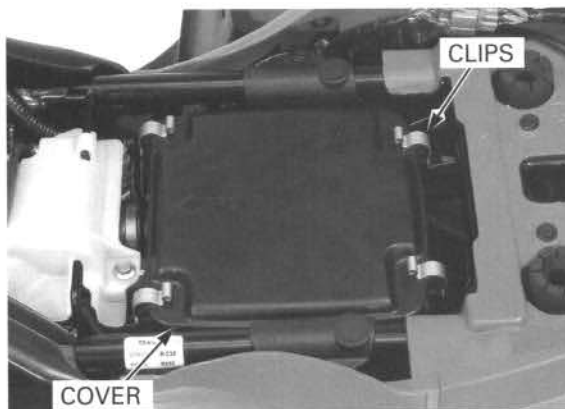
## AIR CLEANER

### NOTE:

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

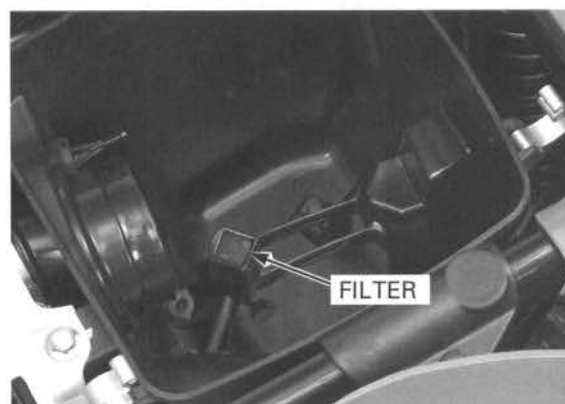
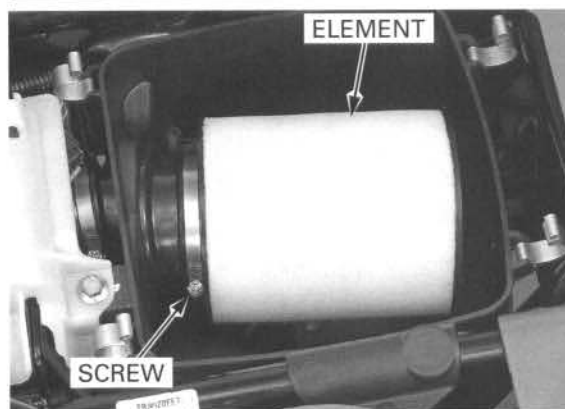
Remove the seat (page 3-4).

Release the four retaining clips and remove the air cleaner cover.



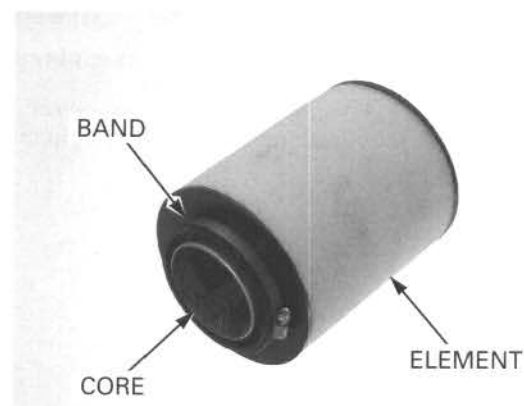
Loosen the band screw and remove the air cleaner element assembly.

Remove the dust filter from the element holder in the air cleaner housing.

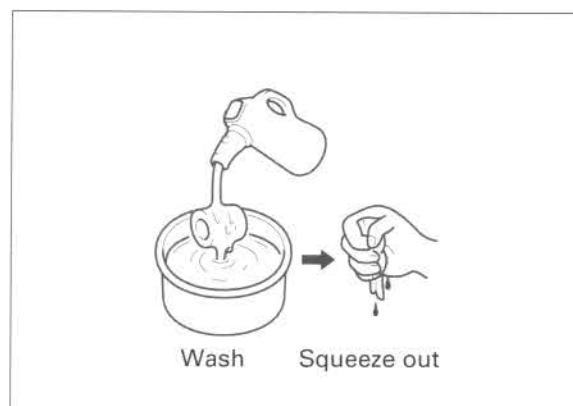




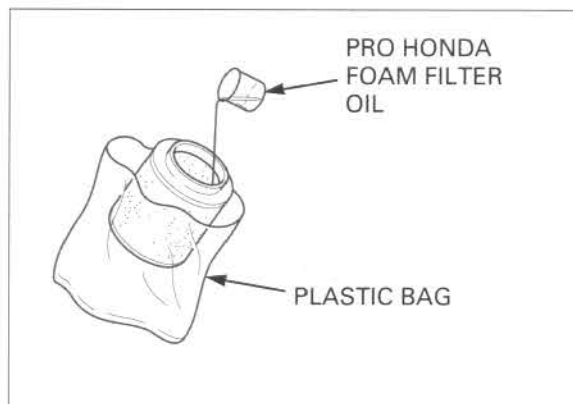
Remove the element band and the element core from the air cleaner element.



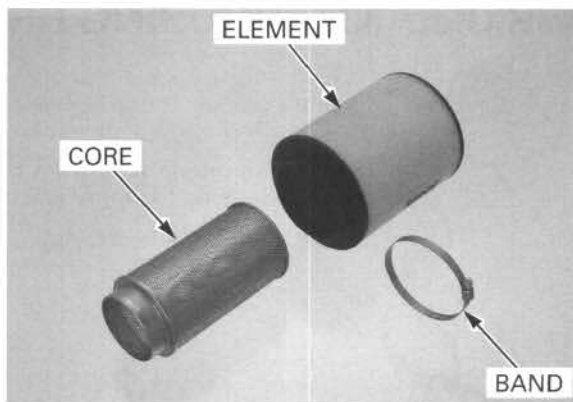
Wash the element and filter in non-flammable or high flash point solvent. Squeeze out the solvent thoroughly, and allow the element and filter to dry.



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 element flange.



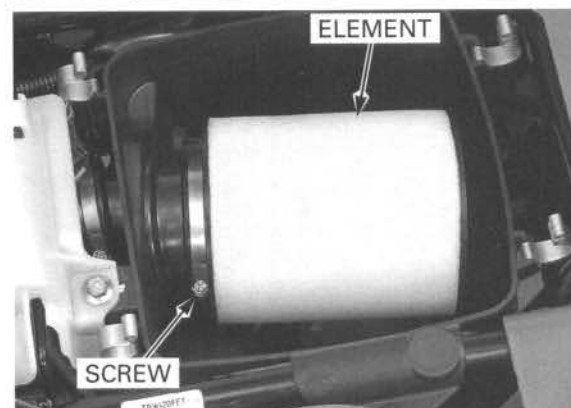
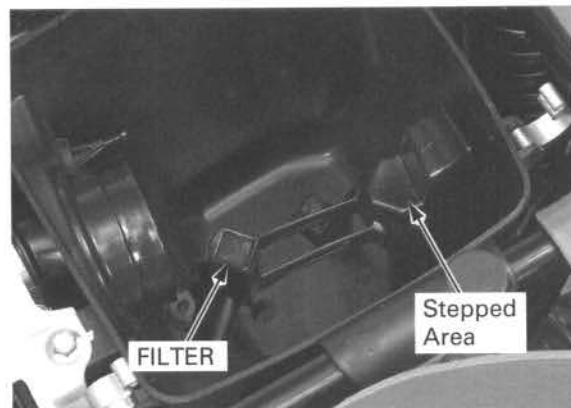


## MAINTENANCE

Install the dust filter into the element holder.

Install the element assembly over the connecting tube on the housing.

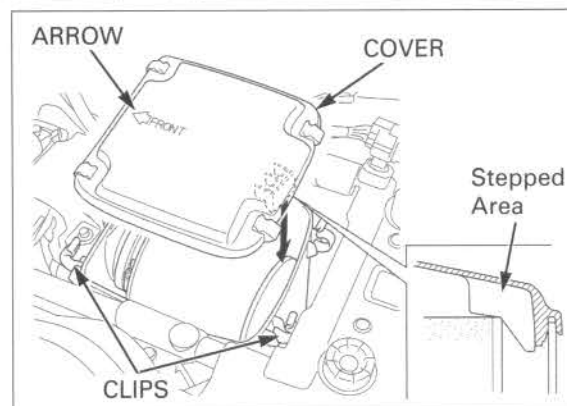
Be sure to rest the element onto the stepped area of the element holder and tighten the band screw.



Install the air cleaner cover with the arrow facing forward by aligning the stepped area with the element.

Secure the cover with the four retaining clips.

Install the seat (page 3-4).



## AIR CLEANER HOUSING DRAIN TUBE

### NOTE:

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

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

Install the drain tube securely.





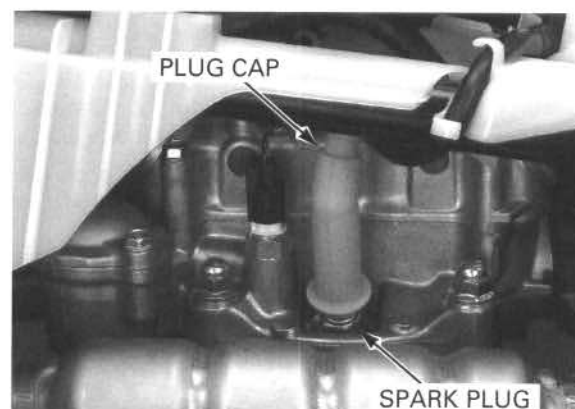
# SPARK PLUG

Remove the left fuel tank side cover (page 3-5).

*Clean with compressed air before removing the plug, and be sure that no debris is allowed to enter into the combustion chamber.*

Disconnect the spark plug cap and clean around the spark plug base.

Remove the spark plug.

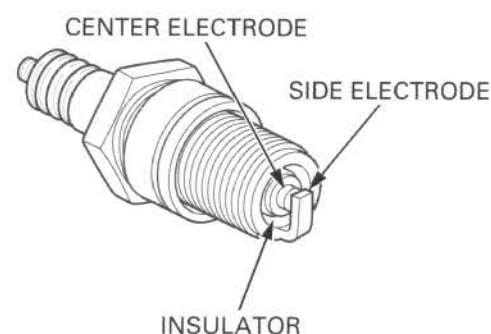


Check the insulator for cracks or damage, and the electrodes for wear, fouling or discoloration. Replace the plug if necessary.

## RECOMMENDED SPARK PLUG:

**BKR5E-11 (NGK), K16PR-U11 (DENSO)**

Clean the spark plug electrodes with a wire type brush or special plug cleaner.



Check the gap between the center and side electrodes with a wire-type feeler gauge.

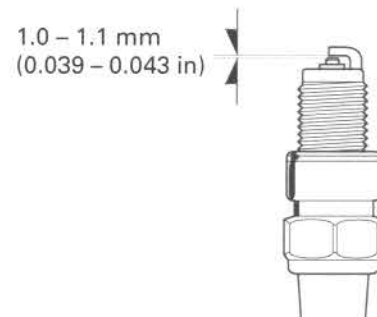
**SPARK PLUG GAP: 1.0 – 1.1 mm (0.039 – 0.043 in)**

If necessary, adjust the gap by bending the side electrode carefully.

Thread the spark plug in by hand to prevent cross-threading and tighten it with a spark plug wrench.

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

Connect the spark plug cap and install the fuel tank side cover (page 3-5).





## VALVE CLEARANCE

### NOTE:

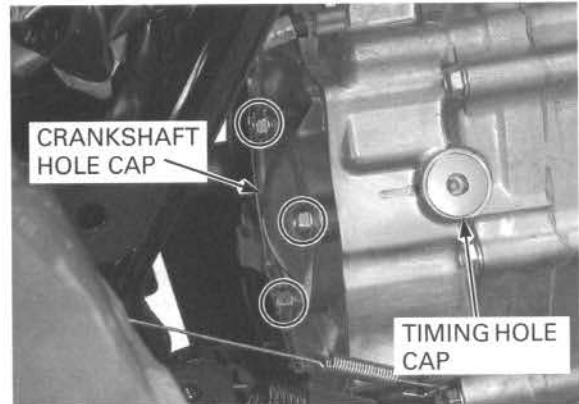
- Inspect and adjust the valve clearance while the engine is cold (below 35°C/95°F).
- Check the engine idle speed after the valve clearance inspection (page 6-58).

Remove the fuel tank (page 6-41).

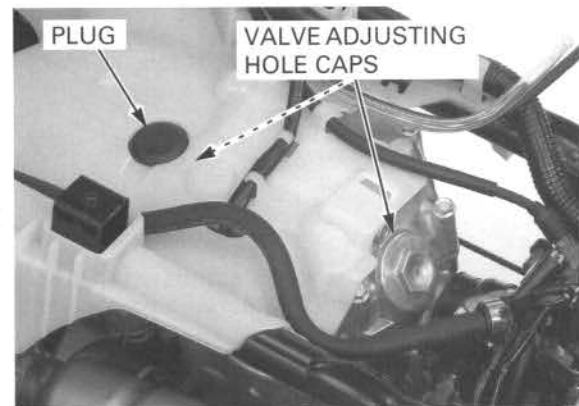
Remove the right mudguard (page 3-6).

Remove the following:

- three bolts
- crankshaft hole cap
- timing hole cap



- rubber plug (from the heat guard plate)
- valve adjusting hole caps

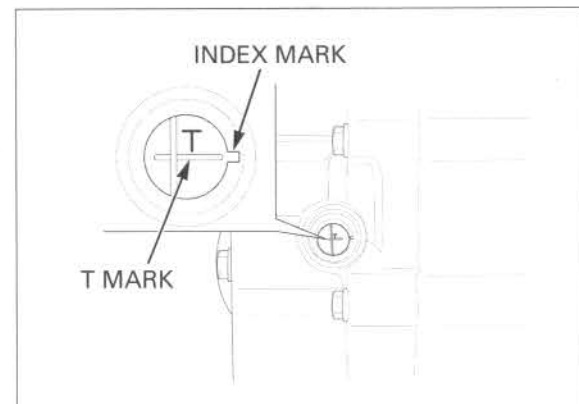


*If the T mark is passed when trying to align it with the index notch, rotate the crankshaft only clockwise again and align. This must be done to prevent the one-way decompressor system from functioning and to obtain the correct valve clearance.*

Rotate the crankshaft clockwise to align the T mark on the flywheel with the index mark on the crankcase.

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

This position can be obtained by confirming that there is slack in both rocker arms. If there is no slack, rotate the crankshaft one full turn and match up the T mark again.



*When checking the clearance, slide the feeler gauge between the adjusting screw and valve stem.*

Check the valve clearances by inserting a feeler gauge between the adjusting screw and valve stem.

### VALVE CLEARANCE:

IN:  $0.15 \pm 0.02$  mm ( $0.006 \pm 0.001$  in)

EX:  $0.23 \pm 0.02$  mm ( $0.009 \pm 0.001$  in)



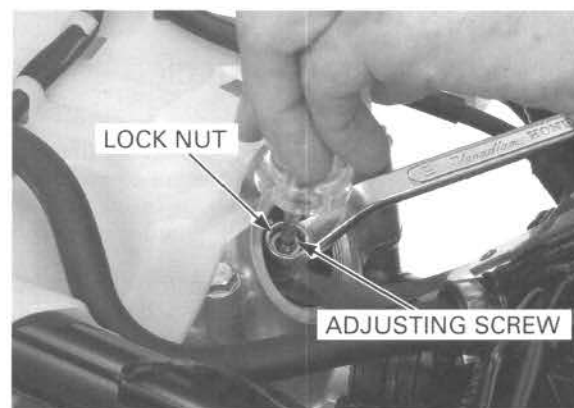


Adjust by loosening the lock nut and turning the adjusting screw until there is a slight drag on the feeler gauge.

Hold the adjusting screw and tighten the lock nut.

**TORQUE: 17 N·m (1.7 kgf·m, 13 lbf·ft)**

After tightening the lock nut, recheck the valve clearance.



Coat new O-rings with engine oil and install them into the groove in each valve adjusting hole cap. Install the valve adjusting hole caps and tighten them.

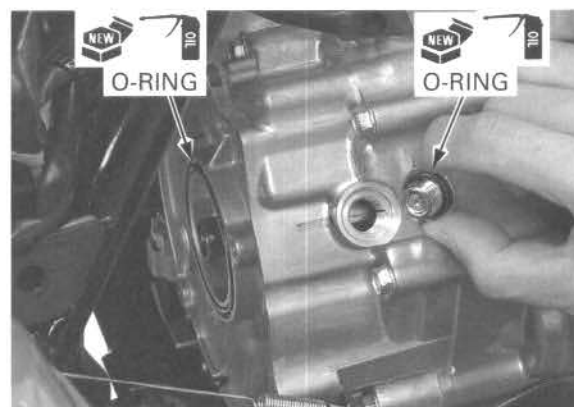
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**



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)**

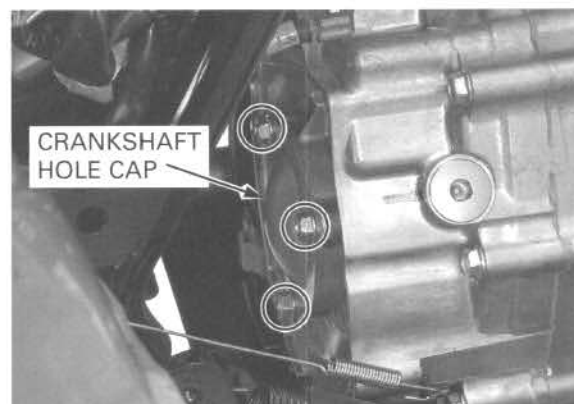
Coat a new O-ring with engine oil and install it into the crankcase cover groove.



Install the crankshaft hole cap and tighten the three bolts.

Install the following:

- right mudguard (page 3-6)
- fuel tank (page 6-41)





# ENGINE OIL

## LEVEL CHECK

**NOTE:**

- Check the oil level after starting the engine and allowing the oil to circulate through the engine thoroughly. It is especially important on a dry sump engine, due to the comparatively large volume of oil.
- Do not snap the throttle while idling or the oil level reading will be inaccurate.

Remove the left side cover (page 3-4).

Place the vehicle on level ground.

Start the engine and let it idle for 3 – 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).

Stop the engine and wait 2 – 3 minutes.

Remove the oil filler cap/dipstick and wipe it clean. Check the oil level by inserting the oil filler cap/dipstick into the engine without screwing it in.

The engine 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, add the recommended engine oil to the upper level mark.

**RECOMMENDED ENGINE OIL:**

**Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motor oil**

**API service classification: SG or higher**

**JASO T 903 standard: MA**

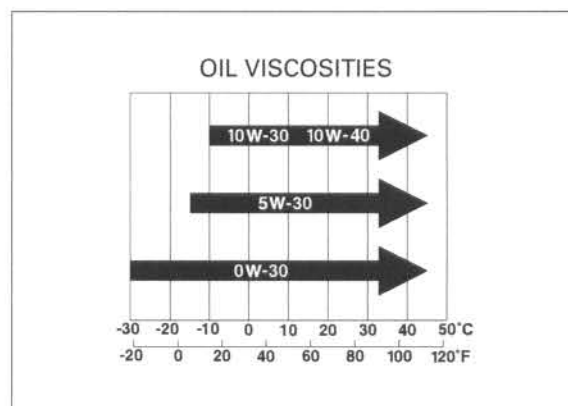
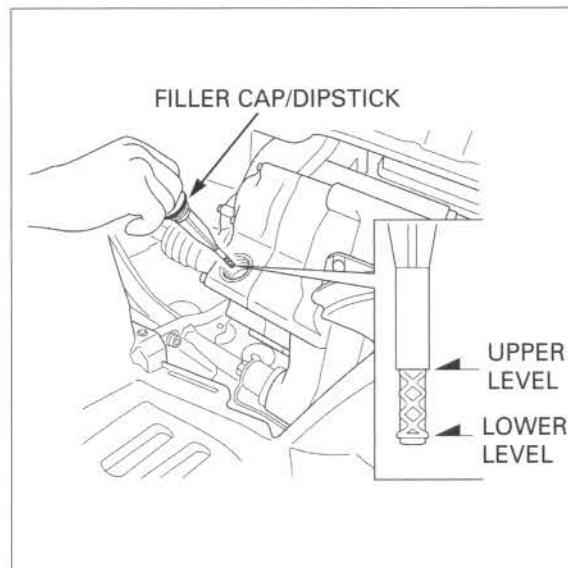
**Viscosity: SAE 10W-30**

**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/dipstick.

Install the left side cover (page 3-4).





## OIL CHANGE

### NOTE:

- Change the oil with the engine warm to assure complete and rapid draining.

Remove the left side cover (page 3-4).

Place the vehicle on level ground.

Start the engine and let it idle for a few minutes.

Stop the engine.

Remove the drain bolt and the oil filler cap/dipstick to drain the engine oil.

After the oil has drained, install the drain bolt with a new sealing washer.

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

Pour the recommended oil (page 4-14) into the engine to the upper level mark on the dipstick.

### OIL CAPACITY:

2.7 liters (2.9 US qt, 2.4 Imp qt) after draining

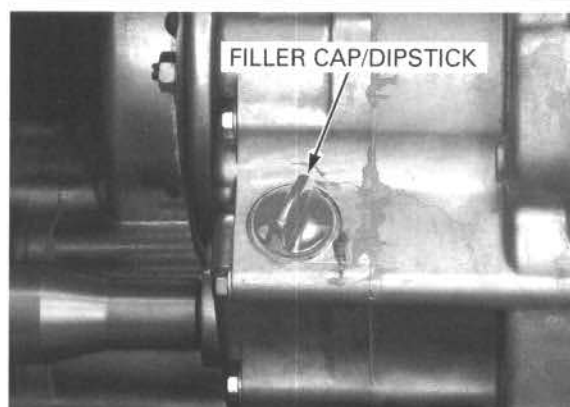
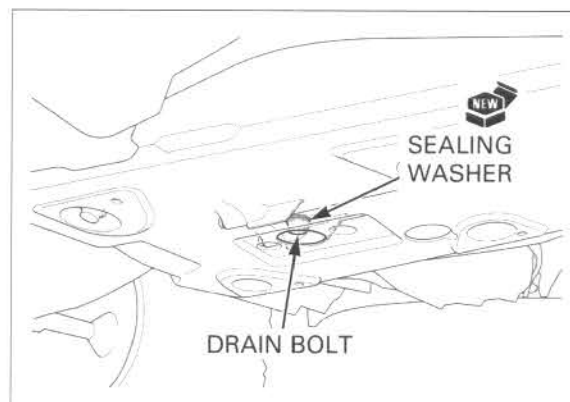
2.8 liters (3.0 US qt, 2.5 Imp qt) after draining/filter change

3.1 liters (3.3 US qt, 2.7 Imp qt) after disassembly

Install the filler cap/dipstick.

Check the oil level (page 4-14).

Reset the oil change indicator after changing the engine oil.



## ENGINE OIL FILTER

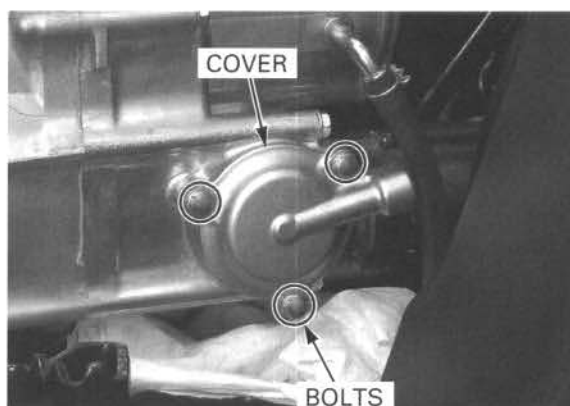
Remove the right mudguard (page 3-6).

Drain the engine oil (page 4-15).

*Place shop towels under the filter cover because oil will flow out.*

Remove the following:

- three bolts
- filter cover and O-ring





## MAINTENANCE

- oil filter
- setting spring
- o-ring

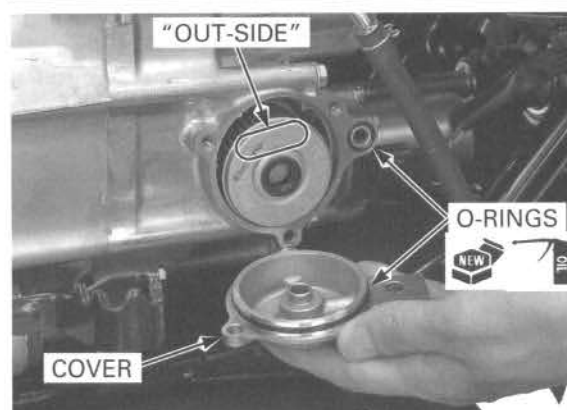
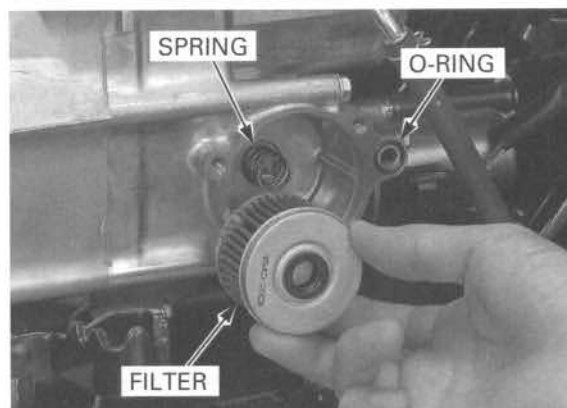
*Installing the oil filter backwards will result in severe engine damage.*

Coat new O-rings with engine oil and install them into each groove in the filter cover and crankcase cover.

Install the spring onto the lugs and a new oil filter with the "OUT-SIDE" mark facing out, then set the filter cover onto the filter and tighten the bolts while holding the cover.

Fill the crankcase with the engine oil (page 4-15).

Install the right mudguard (page 3-6).



## 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 rear fender cover (page 3-9) and reserve tank cap, and fill the tank up to the upper level line with a 1:1 mixture of distilled water and antifreeze (coolant preparation: page 7-6).

### RECOMMENDED ANTIFREEZE:

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

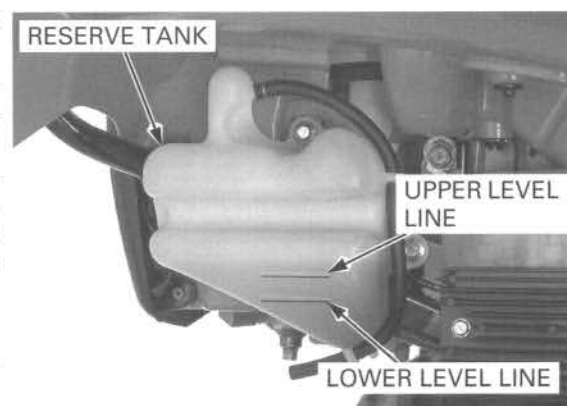
### NOTICE

*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 the reserve tank becomes completely empty, there is a possibility of air getting into the cooling system.

Be sure to remove any air from the cooling system (page 7-7).





# COOLING SYSTEM

## NOTE:

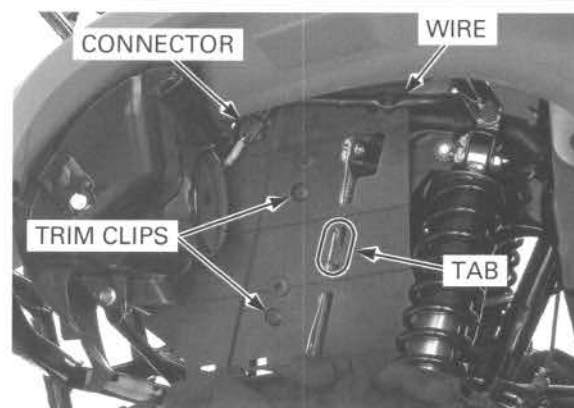
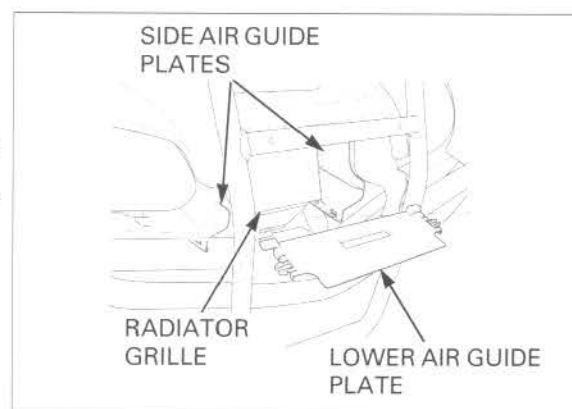
- If the vehicle is used in very wet or muddy conditions, more frequent inspections are required.

Remove the fuel tank side covers (page 3-5).

*Be careful not to damage the radiator fins.*

Remove the following:

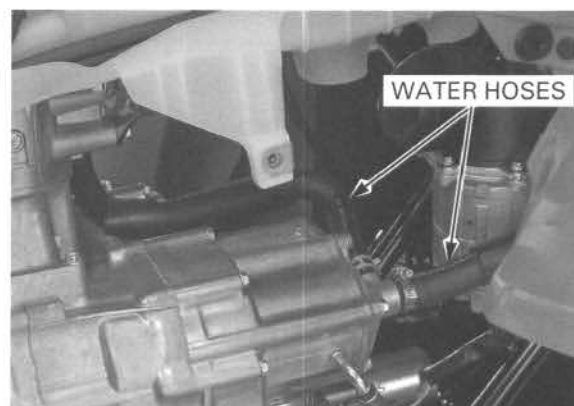
- front grille (page 3-7)
- lower air guide plate (by releasing the four tabs)
- connector and wire (from each side air guide plate)
- two trim clips (from each side air guide plate by pushing the center pin)
- side air guide plates (by releasing each tab)
- radiator grille (by releasing the two tabs)



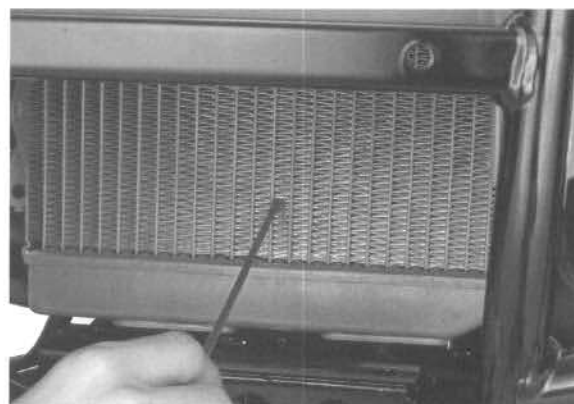
Check for any coolant leakage from the water pump, water hoses and hose joints.

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

Check that all hose clamps are tight.



Check the radiator air passage for clogs 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. Also, clean the radiator grille thoroughly. Replace the radiator if the air flow is restricted over more than 20% of the radiating surface.



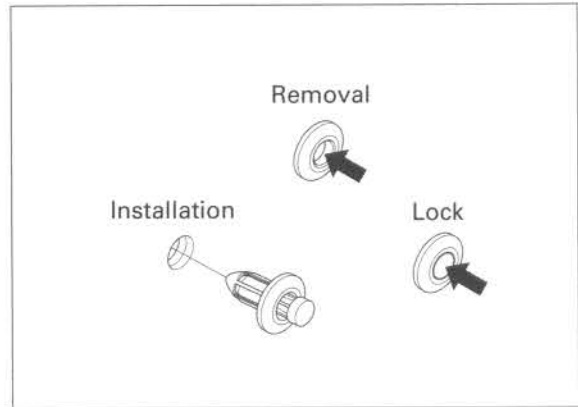


## MAINTENANCE

Install the removed parts in the reverse order of removal.

### NOTE:

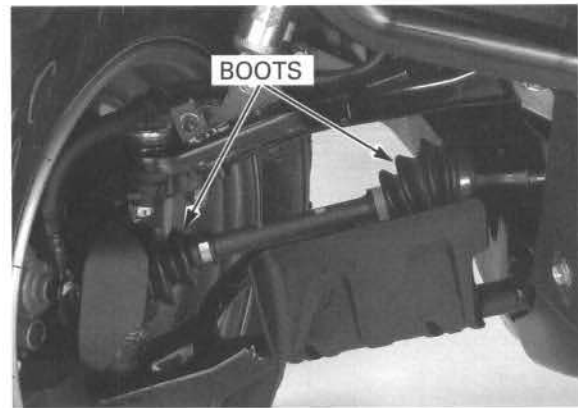
- When installing the trim clip, carefully align the clip holes in the radiator, grille and air guide plate.
- Before installing the trim clip, raise the center pin by pushing the pin tip back. Install each trim clip and lock it by pushing the center pin flush.



## DRIVE SHAFT BOOTS ('07 – '08 FM/FE models)

Check the drive shaft boots for cuts or other damage.

If a boot is damaged, replace it (page 17-7).



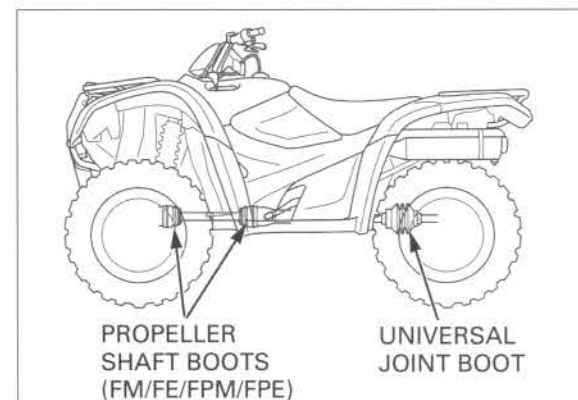
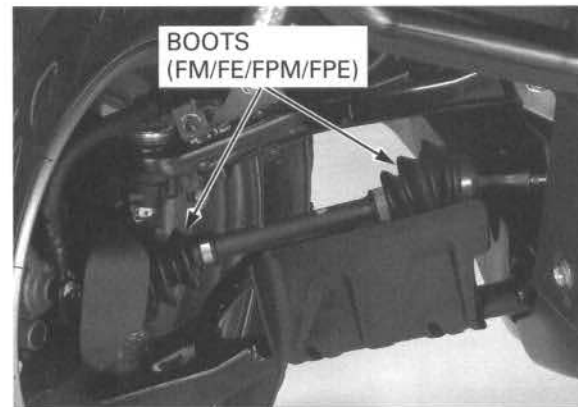
## DRIVE TRAIN BOOTS (After '08 models)

Raise all the wheels off the ground by supporting the frame securely.

Remove the left side cover (page 3-4).

Check the drive shaft, propeller shaft and universal joint boots for cuts, damage or leaking grease.

- If the boot is damaged, replace it
- front driving mechanism (page 17-2)
  - rear driving mechanism (page 18-2)





# REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL

## FINAL GEAR CASE OIL (All models)

### 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 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 the cap groove.

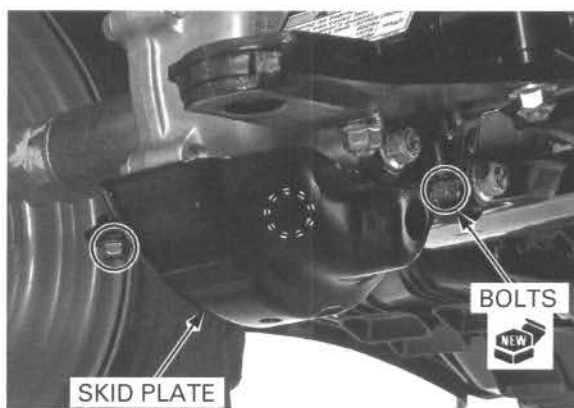
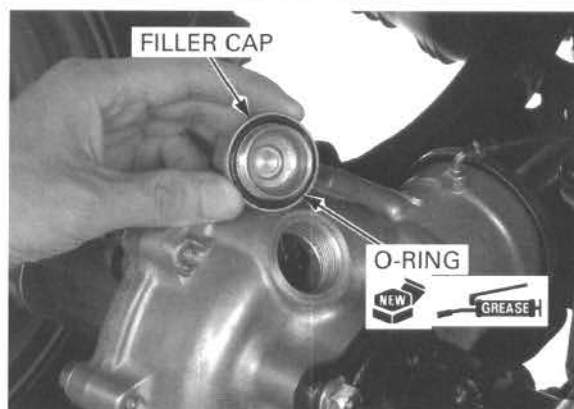
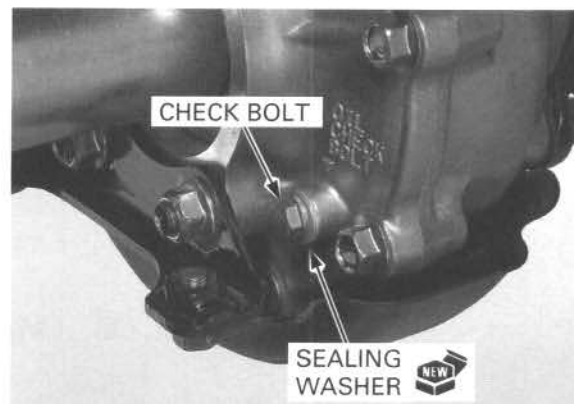
Install the filler cap and tighten it.

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

### OIL CHANGE

Place the vehicle on a level surface.

Remove the three bolt and skid plate.





## MAINTENANCE

Remove the drain bolt and the filler cap 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 gear case with the recommended oil (page 4-19).

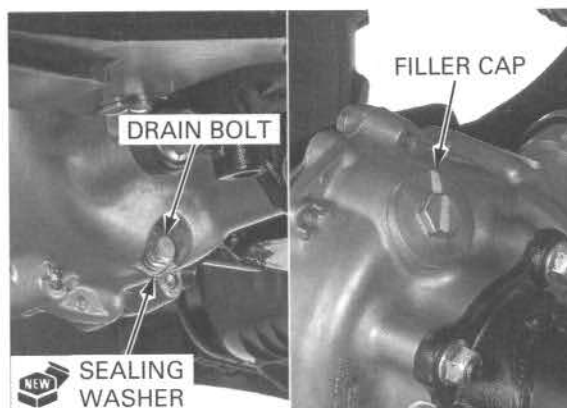
### OIL CAPACITY:

75 cm<sup>3</sup> (2.5 US oz, 2.6 Imp oz) after draining

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

Install the skid plate with new three bolts and tighten the bolts.

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



## DIFFERENTIAL OIL (FM/FE/FPM/FPE only)

### LEVEL CHECK

Place the vehicle on a level surface.

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

Check for leaks if the oil level is low.

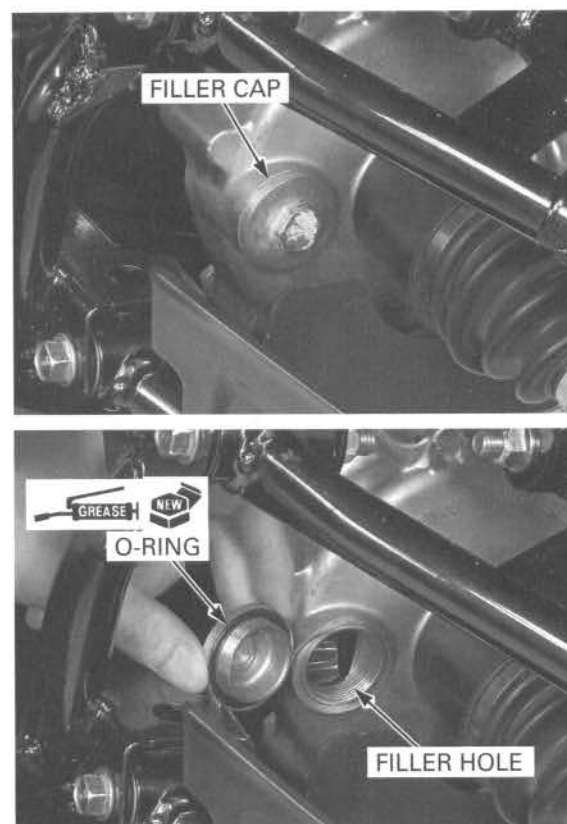
Pour the oil into the filler hole until it reaches the lower edge of the hole.

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

Coat a new O-ring with grease and install it into the 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 drain bolt and the oil filler cap to drain the oil.

When the oil is completely drained, install the drain bolt with a new sealing washer.

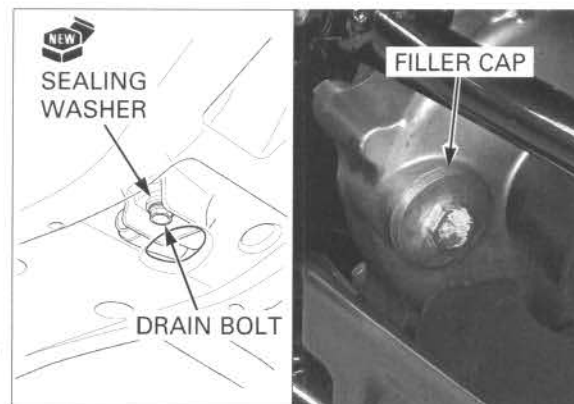
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Fill the gear case with the recommended oil (page 4-20).

## OIL CAPACITY:

230 cm<sup>3</sup> (7.8 US oz, 8.1 Imp oz) after draining

310 cm<sup>3</sup> (10.5 US oz, 10.9 Imp oz) after disassembly



## 2WD/4WD SELECT SYSTEM (FM/FE/FPM/FPE models)

### 2WD/4WD SELECTOR CABLE ADJUSTMENT

Remove the bolt and the clutch arm cover by releasing the two tabs.

Shift the select lever to the 2WD position.

Be sure the clutch arm position is between the 2WD marks.

Temporarily loosen the adjusting nut by turning it counterclockwise.

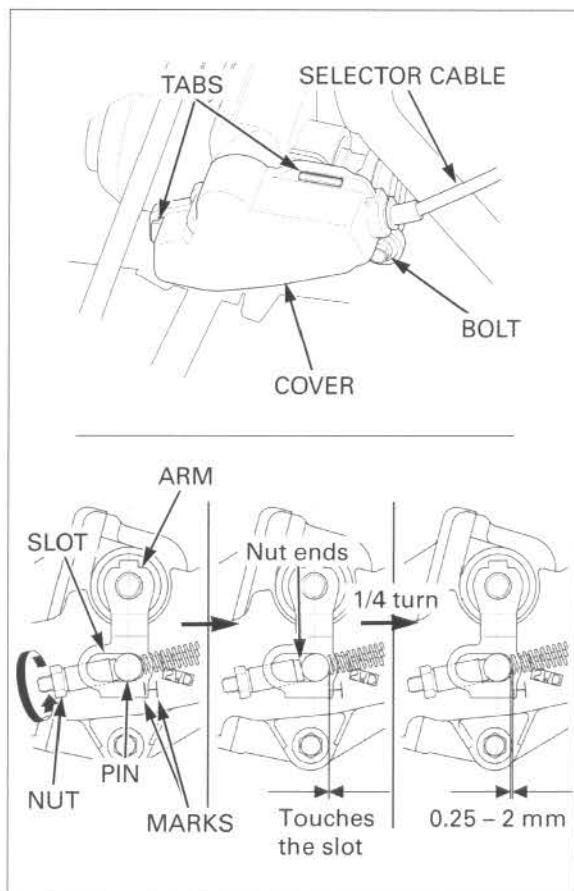
Turn the adjusting nut clockwise until the joint pin just touches the clutch arm slot with the nut ends are contacted the joint pin (cutout is not seated). Then further turn it clockwise 1/4 of a turn to seat the cutout in the nut onto the joint pin.

Make sure that the clearance between the joint pin and arm slot is 0.25 – 2 mm.

After adjustment, check the select lever for smooth operation.

Install the arm cover by aligning the slits with the tabs and tighten the bolt.

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





# BRAKE FLUID

### NOTICE

- *Spilling fluid can damage painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.*

#### NOTE:

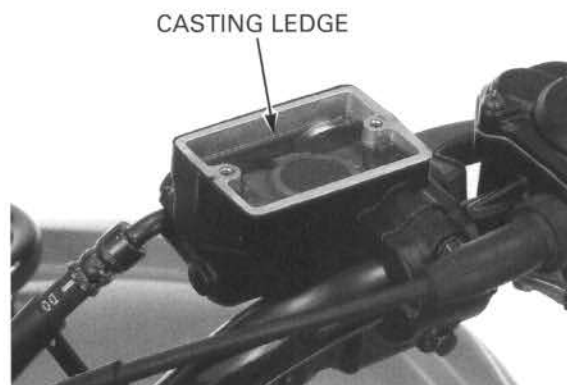
- Do not mix different types of fluid, as they may not be compatible with each other.
- Do not allow foreign material to enter the system when filling the reservoir.
- When the fluid level is low, check the brake pads for wear (page 4-23). A low fluid level may be due to wear of the brake pads. If the brake pads are worn and the caliper pistons are pushed out, this accounts for a low reservoir level. If the brake pads are not worn and the fluid level is low, check the entire system for leaks (page 4-24).

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

If the fluid level is near the "LOWER" level mark, remove the reservoir cap, set plate and diaphragm and fill the reservoir with 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, 1.5 lbf·ft)**

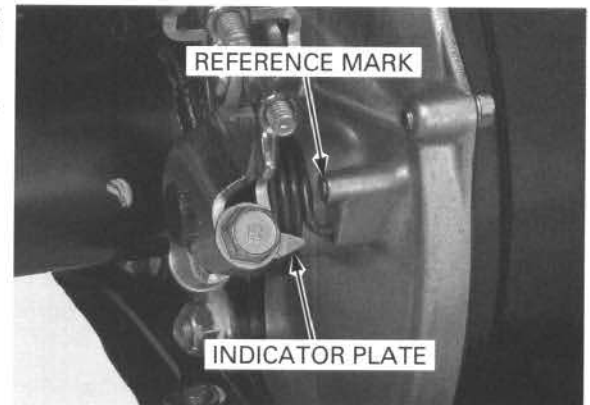




## BRAKE SHOES WEAR

Replace the brake shoes if the wear indicator plate aligns with the reference mark on the brake panel when the rear brake lever or brake pedal is applied.

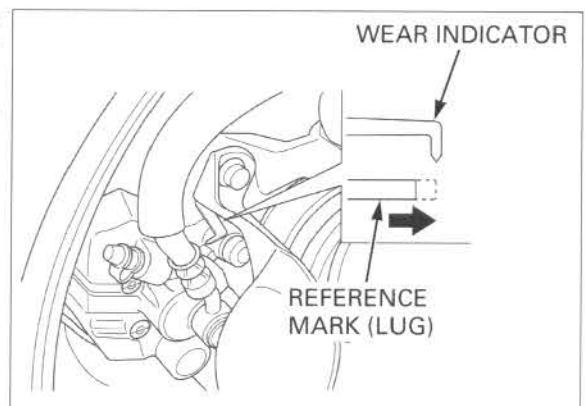
See Hydraulic Brake section for brake shoe replacement (page 16-18).



## BRAKE PADS WEAR

Replace the brake pads if the wear indicator aligns with the reference mark (lug) on the caliper body when the front brake is applied.

See Brake System section for brake pad replacement (page 16-8).



## BRAKE LIGHT SWITCH

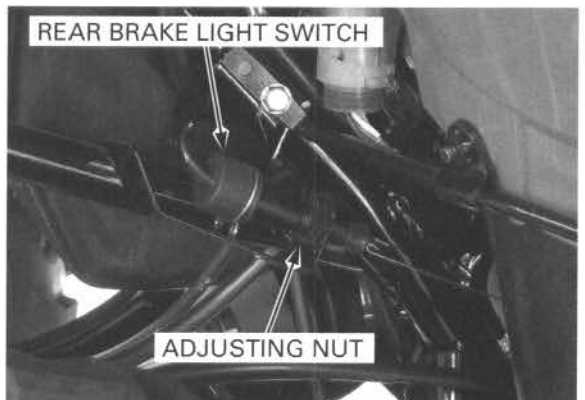
### NOTE:

- The front brake light switch cannot be adjusted. If the front brake light switch actuation and brake engagement are out of synchronization, either replace the switch unit or the malfunctioning parts of the system.

Check that the brake light comes on just prior to the brake actually being engaged.

If the light fails to come on, adjust the rear brake light switch so that the light comes on at the proper time.

Hold the switch body and turn the adjusting nut. Do not turn the switch body.



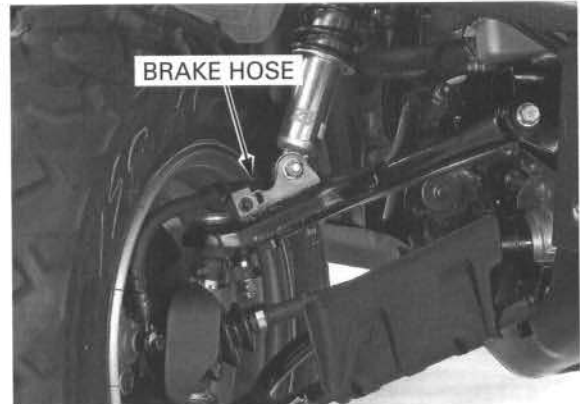


## BRAKE SYSTEM

### FRONT BRAKE

Firmly apply the front brake lever and check that no air has entered the system.  
If the brake lever feels soft or spongy when operated, bleed the system.  
See Brake System section for air bleeding procedures (page 16-7).

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

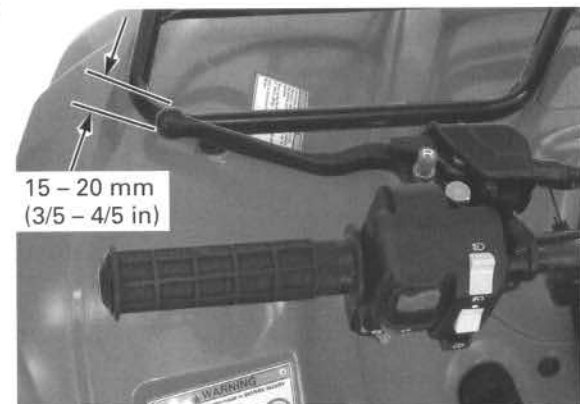
*Make sure the brake pedal operate smoothly and that the brake pedal position is correct.  
Make sure the brakes do not drag.*

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 lightweight oil.

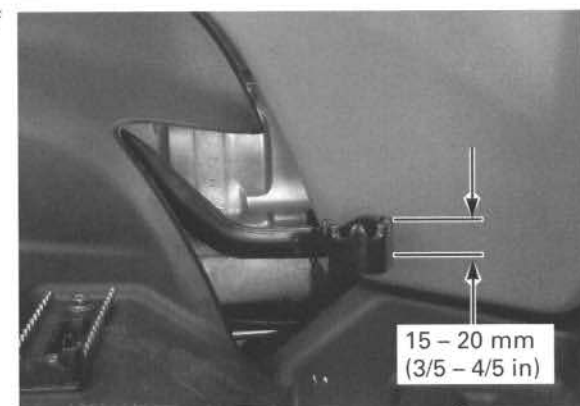
Measure the rear brake lever freeplay at the end of the lever.

**FREEPLAY: 15 – 20 mm (3/5 – 4/5 in)**



Measure the rear brake pedal freeplay at the end of the pedal.

**FREEPLAY: 15 – 20 mm (3/5 – 4/5 in)**

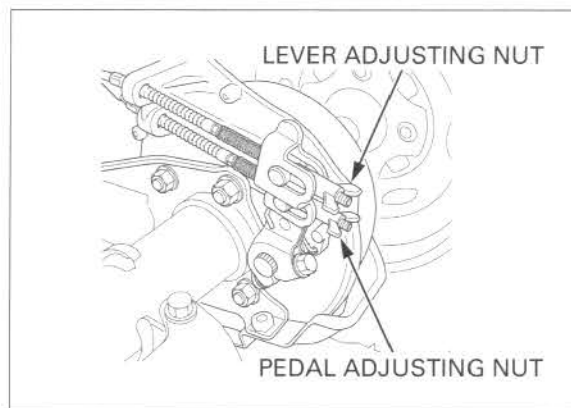




Make sure the cutout in the adjusting nut is seated on the brake arm pin.

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

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



## REVERSE LOCK SYSTEM

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

Release the dust cover.

Measure the lever freeplay at the lever end near the cable.

**FREEPLAY: 2 – 4 mm (1/12 – 1/6 in)**

**NOTE:**

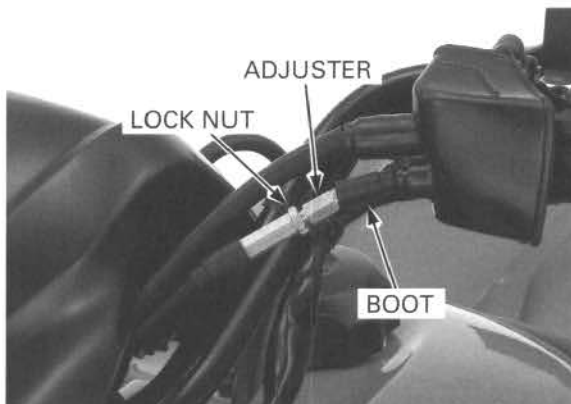
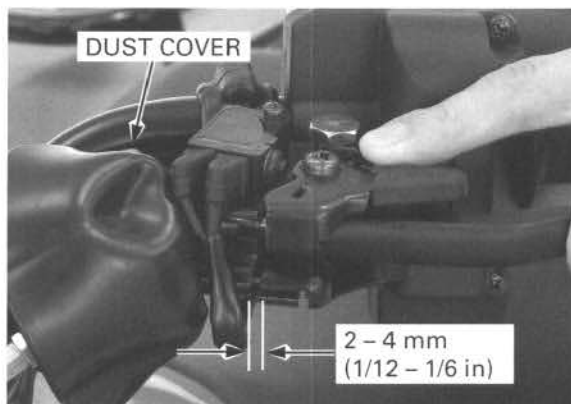
- If necessary, watch the reverse selector arm on the crankcase to see when it moves while determining freeplay.

Slide the rubber boot off the adjuster.

Adjust by loosening the lock nut and turning the adjuster.

Tighten the lock nut.

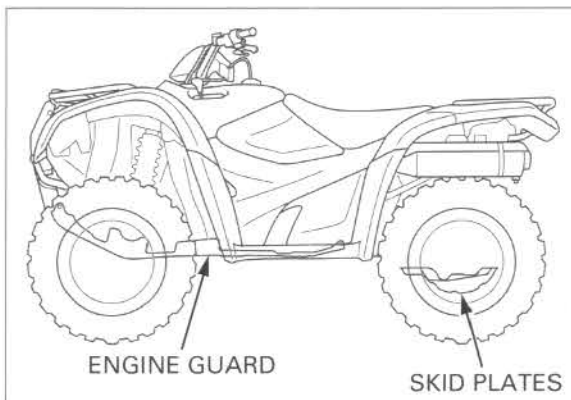
Install the dust cover properly.



## SKID PLATE, ENGINE GUARD ('07 – '08)

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

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



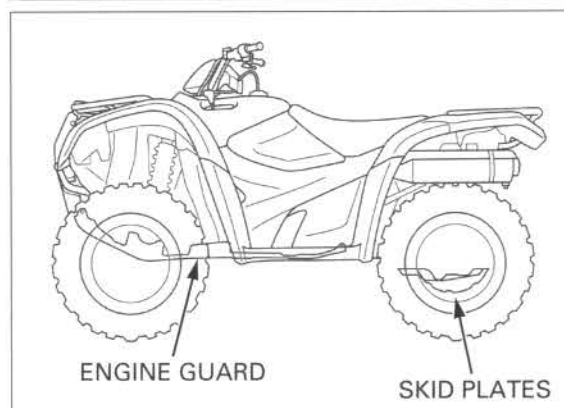


## MAINTENANCE

### GUARDS (After '08)

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

Tighten any loose fasteners. Replace the skid plates or guard as required.



### CLUTCH SYSTEM

Remove the left side cover (page 3-4).

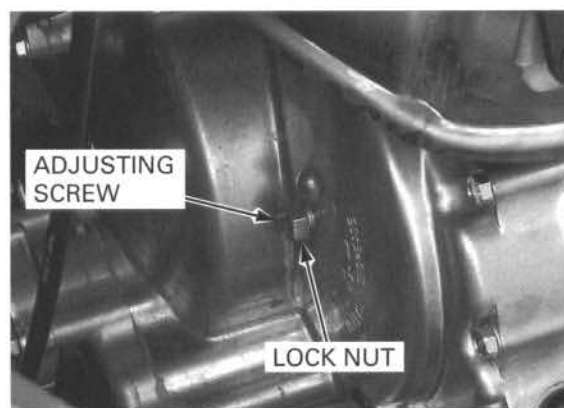
Loosen the lock nut and turn the adjusting screw one full turn clockwise.

Slowly turn the adjusting screw counterclockwise until resistance is felt, then turn the adjusting screw 1/4 turn clockwise.

Hold the adjusting screw and tighten the lock nut.

Start the engine and check for proper clutch operation.

Install the side cover (page 3-4)



### SUSPENSION

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

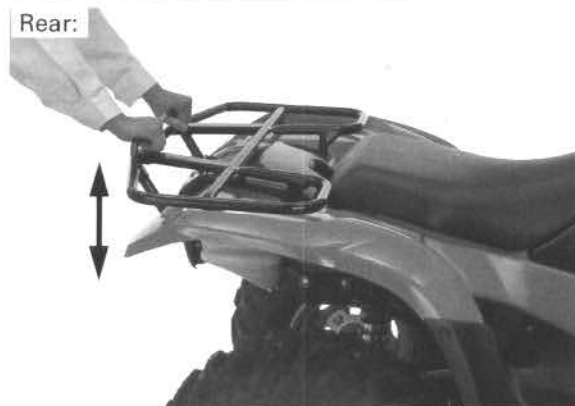


Check the action of the front and rear shock absorbers by compressing them several times.  
Check the entire shock absorber assembly for signs of leaks, damage or loose fasteners.  
Replace damaged components which cannot be repaired.  
Tighten all nuts and bolts.

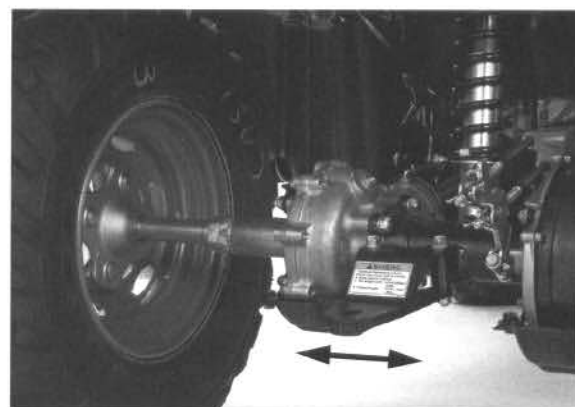
Front:



Rear:



Raise the rear wheel off the ground by supporting the frame securely.  
Check for worn swingarm bearings by grabbing the rear axle and attempting to move the wheels side to side.  
Replace the bearings if any looseness is noted (page 15-8).



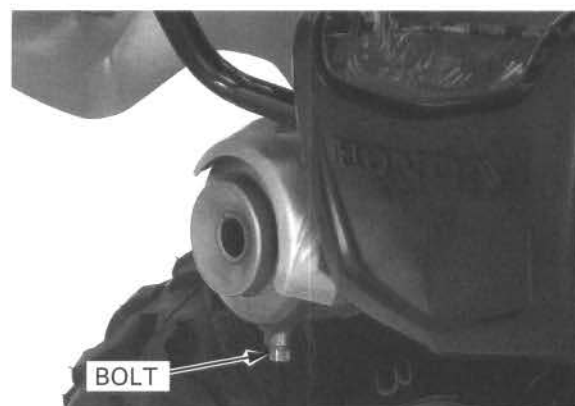
## SPARK ARRESTER

Remove the arrester bolt.

Block the end of the muffler with a shop towel.  
Start the engine with the transmission in neutral, and purge accumulated carbon from the muffler by momentarily revving the engine several times.

Stop the engine and allow the exhaust system to cool.

Install the bolt and tighten it securely.





## MAINTENANCE

### NUTS, BOLTS, FASTENERS

Check that all chassis nuts and bolts are tightened to their correct torque values (page 1-18).  
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 a tire pressure gauge.

#### RECOMMENDED TIRE PRESSURE

##### TM/TE/FM/FE (Front/Rear):

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

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

##### FPM/FPE:

Front: Standard: 30 kPa (0.30 kgf/cm<sup>2</sup>, 4.4 psi)

With cargo: 30 kPa (0.30 kgf/cm<sup>2</sup>, 4.4 psi)

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

With cargo: 25 kPa (0.25 kgf/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 bearings in the hub or knuckle for excessive play or abnormal noise.



### TIE-ROD AND JOINT BOOTS

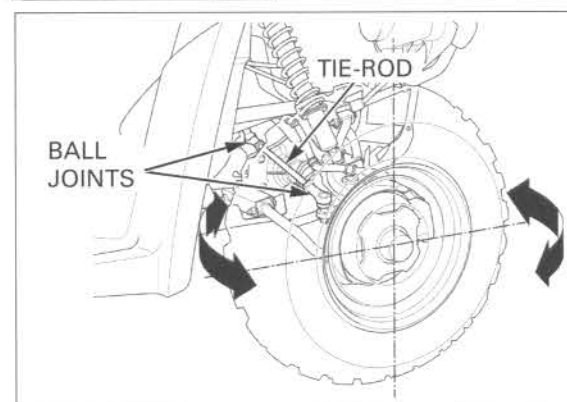
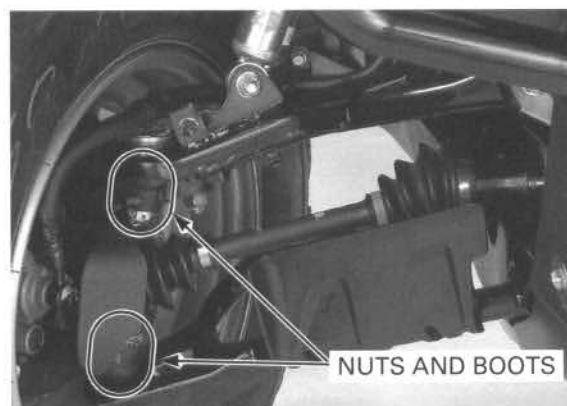
Check the tie-rod joint nuts and the suspension arm ball joint nuts for looseness.

Check the ball joint boots of the tie-rod and suspension arm for tears or other damage.

Check for looseness of the tie-rod ball joints or bearings by grabbing each front wheel side to side with the wheels on the ground.

If any looseness is noted, inspect the following.

- tie-rod (page 14-44)
- hub or knuckle bearing (page 14-17)





## STEERING SHAFT HOLDER BEARING

*Make sure the cables do not interfere with the rotation of the handlebar.*

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 or vertical movement, inspect the steering shaft holder bushing and bearing (page 14-29).



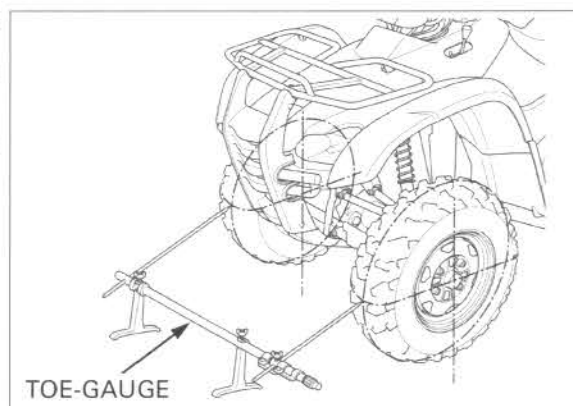
## STEERING SYSTEM

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 turned 180° so the marks on the tires are aligned with the gauge height on the rear side.

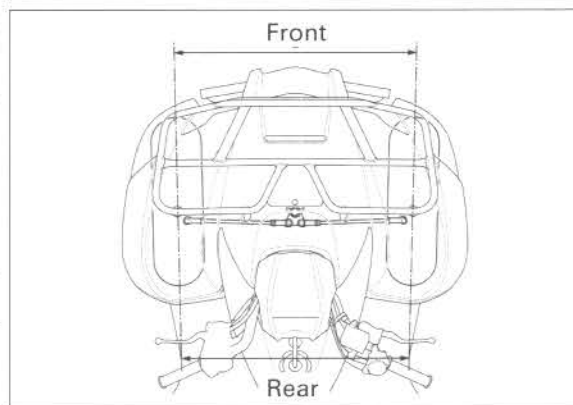
Measure the toe on the rear part of the tires at the same points with no load on the vehicle.

**TM/TE: Toe-in:  $10 \pm 15$  mm ( $0.4 \pm 0.6$  in)**

**FM/FE/FPM/FPE: Toe-out:  $9 \pm 15$  mm ( $0.4 \pm 0.6$  in)**

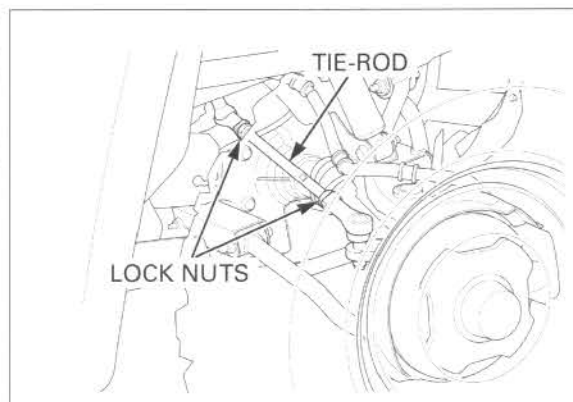
### NOTE:

- Toe-in means the rear measurement is greater than the front measurement.
- 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, along the tie-rod axis until they stop against the ball joint stud.



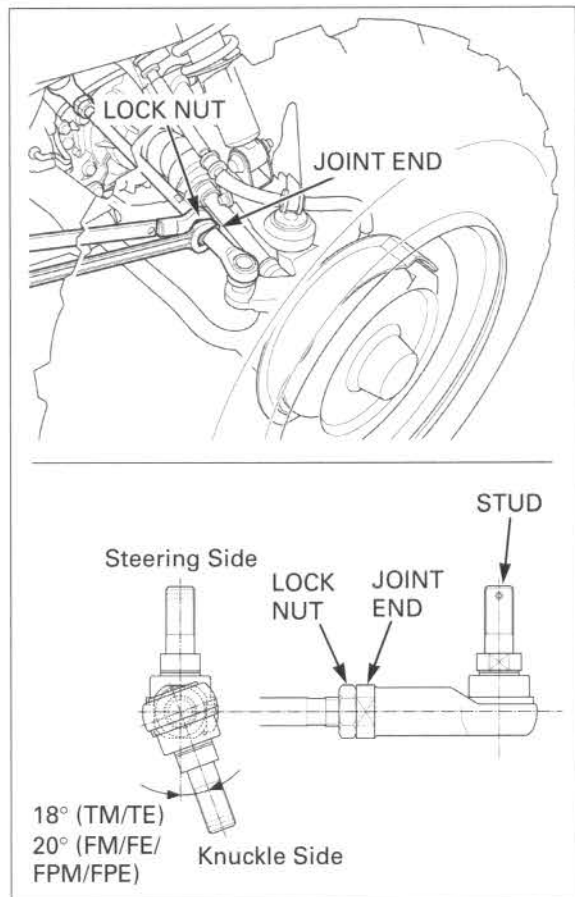


## MAINTENANCE

Using a 22 mm wrench, hold the ball joint ends (flats) so that the relative angle of both ball joints may turn into specified angle. Then, tighten each lock nut, making sure not to force the ball joint end against the ball joint stud.

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

After tightening the lock nuts, rotate the tie-rods to make sure the ball joints have operate properly and have an equal range of movement.





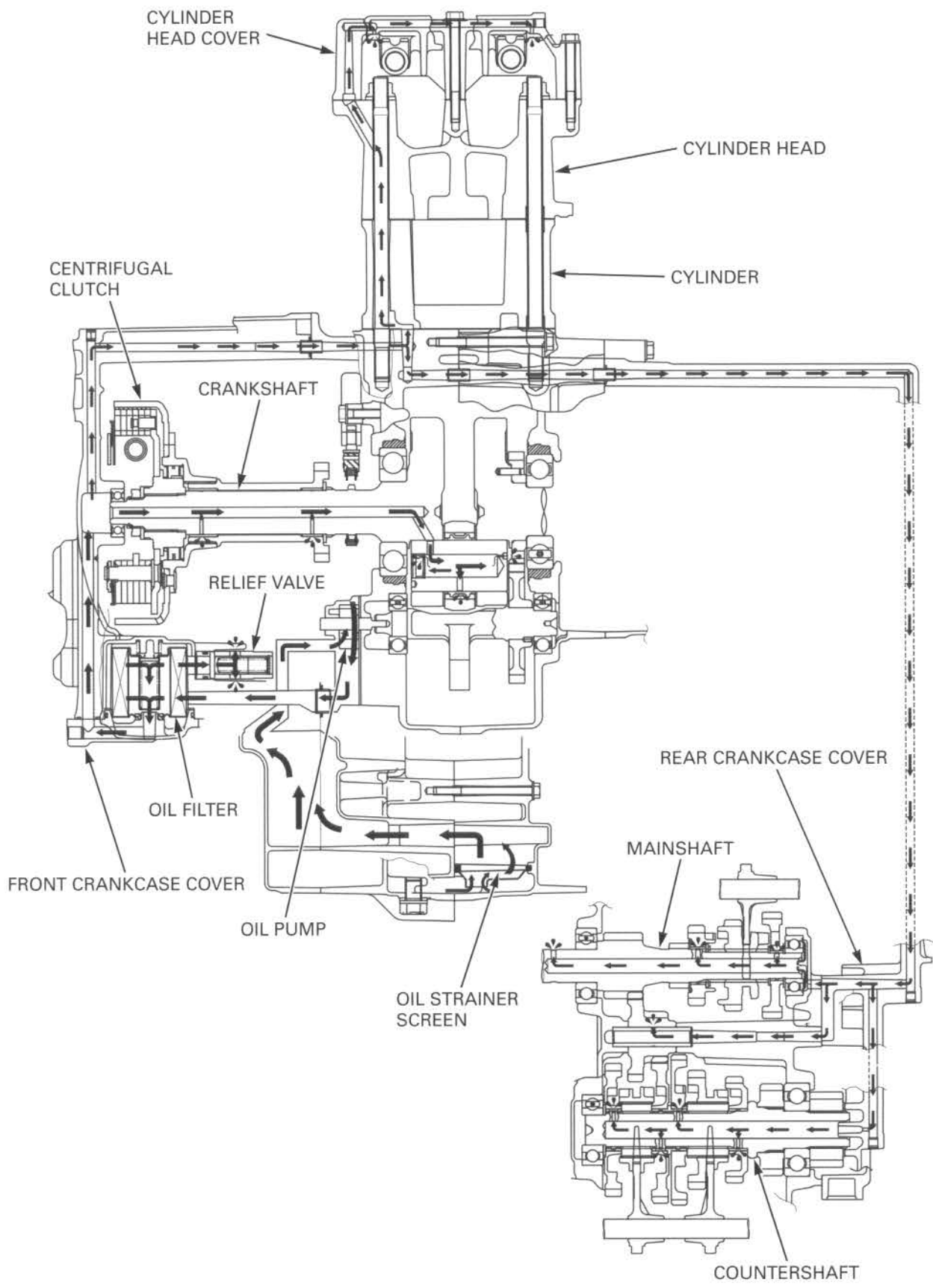
# 5. LUBRICATION SYSTEM

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LUBRICATION SYSTEM DIAGRAM .....	5-2	OIL PUMP .....	5-4
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TROUBLESHOOTING .....	5-3		



LUBRICATION SYSTEM DIAGRAM





## SERVICE INFORMATION

### GENERAL

#### ⚠ 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 and relief valve. The service procedures in this section can be performed with the engine installed in the frame.
- When removing and installing the oil pump, use care not to allow dust or dirt to enter the engine.
- If any portion of the oil pump is worn beyond the specified service limits, replace the oil pump as an assembly.
- Oil level check and oil change (page 4-14)
- Oil filter replacement (page 4-15)

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	2.7 liters (2.9 US qt, 2.4 Imp qt)	–
	After draining/filter change	2.8 liters (3.0 US qt, 2.5 Imp qt)	–
	After disassembly	3.1 liters (3.3 US qt, 2.7 Imp qt)	–
Recommended engine oil		Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-30	–
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.21 (0.00 – 0.008)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.11 (0.004)

## TROUBLESHOOTING

#### Oil level too low – high oil consumption

- Normal oil consumption
- External oil leak
- Worn piston rings or incorrect piston ring installation
- Worn cylinder
- Worn valve guides or stem seals

#### Oil contamination

- Oil or filter not changed often enough
- Worn piston rings or incorrect piston ring installation
- Worn valve guides or stem seals
- Clogged oil strainer screen

#### Oil emulsification

- Blown cylinder head gasket
- Leaky coolant passage
- Water entry

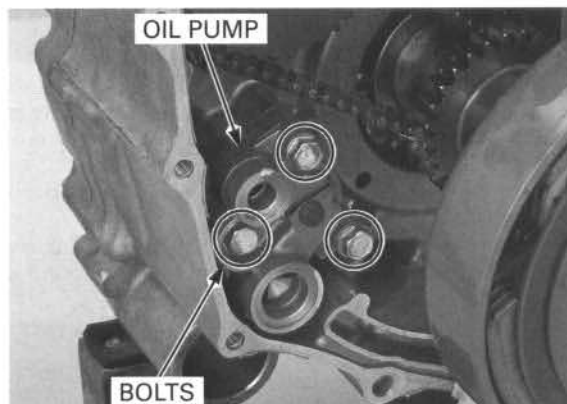


### OIL PUMP

#### REMOVAL

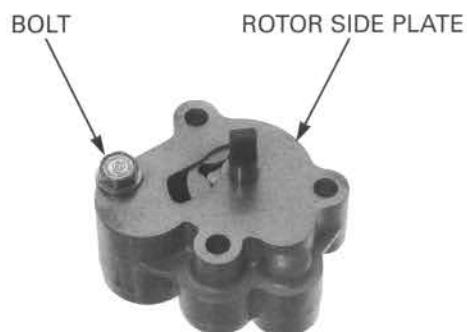
Remove the front crankcase cover (page 11-6).

Remove the three bolts and oil pump.



#### DISASSEMBLY/INSPECTION

Remove the bolt and rotor side plate.



Measure the rotor tip clearance.

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



Measure the pump body clearance.

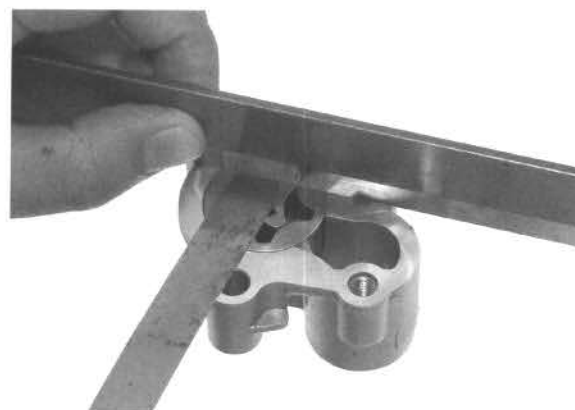
**SERVICE LIMIT: 0.25 mm (0.010 in)**





Remove the oil pump shaft and drive pin, and measure the pump side clearance.

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

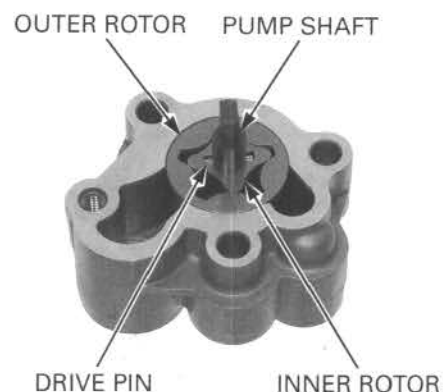


## ASSEMBLY

Dip all parts in clean engine oil.

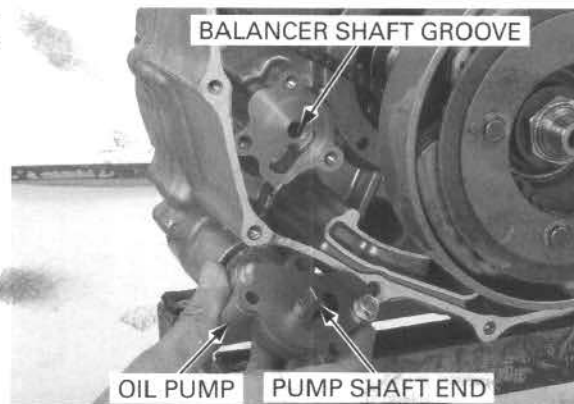
Install the outer and inner rotors into the pump body.

Install the drive pin into the pump shaft, and install the shaft into the inner rotor and pump body by aligning the drive pin with the inner rotor groove.



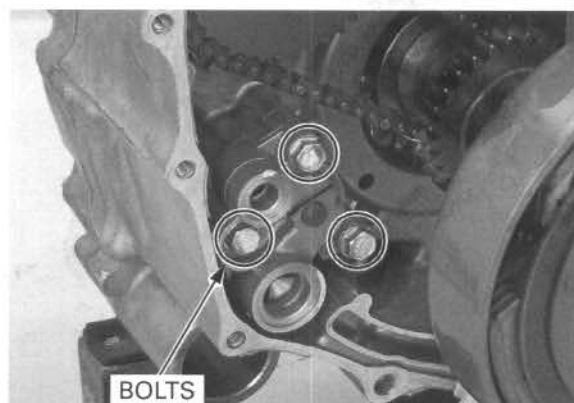
## INSTALLATION

Install the oil pump onto the crankcase while aligning the pump shaft end with the balancer shaft groove.



Install the three bolts and tighten them securely.

Install the front crankcase cover (page 11-23).





### RELIEF VALVE

#### DISASSEMBLY/INSPECTION

Remove the front crankcase cover (page 11-6).

Remove the relief valve assembly from the front crankcase cover.

Remove the O-ring from the relief valve body.

RELIEF VALVE ASSEMBLY



Remove the snap ring, washer, spring and relief valve.

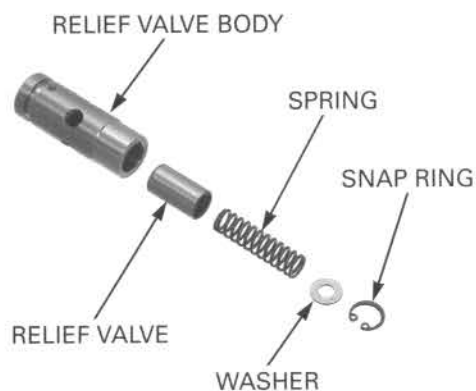
Check the relief valve and spring for wear or damage.

Replace the relief valve assembly if necessary.

#### ASSEMBLY

Install the relief valve into the body with the open end facing to the spring.

Install the relief valve spring, washer and snap ring.



Coat a new O-ring with oil and install it into the relief valve body groove.

Install the relief valve assembly into the front crankcase cover.

Install the front crankcase cover (page 11-23).

RELIEF VALVE ASSEMBLY





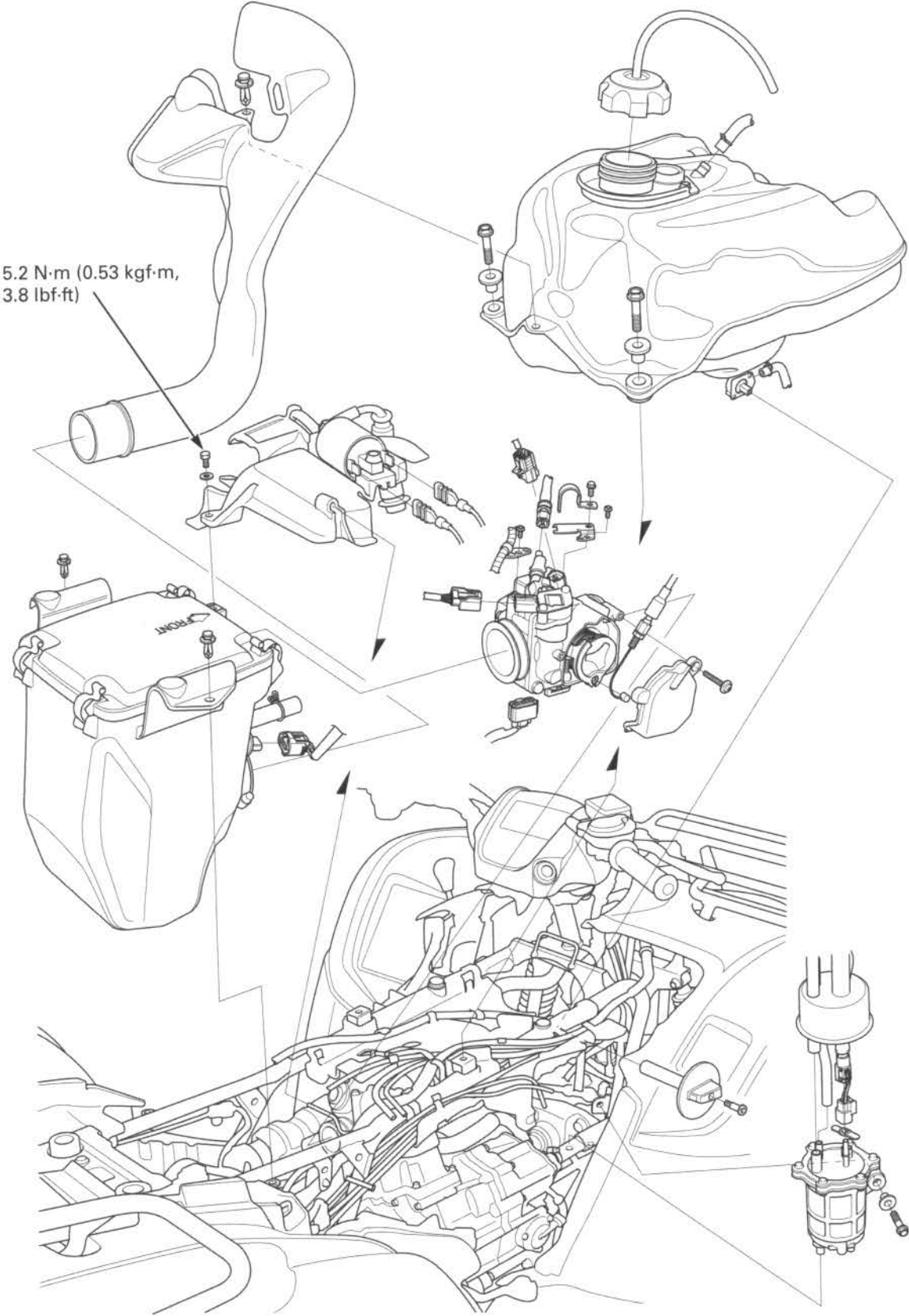
# 6. FUEL SYSTEM (PGM-FI)

6

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FUEL SYSTEM (PGM-FI)  
SYSTEM COMPONENTS





## SERVICE INFORMATION

### GENERAL

- This FUEL SYSTEM section covers service of the electrical and mechanical system of the PGM-FI system, fuel supply system and air cleaner.
- Before disconnecting the fuel feed hose, relieve pressure from the system (page 6-33).
- Bending or twisting the control cable will impair smooth operation and could cause the cable to stick or bend, resulting in loss of vehicle control.
- 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.
- Do not snap the throttle valve from full open to full close after the throttle cable has been removed. It may cause incorrect idle operation.
- Seal the cylinder head intake port with tape or a clean cloth to keep dirt and debris from entering the intake port after the throttle body has been removed.
- Do not damage the throttle body. It may cause incorrect throttle valve operation.
- Prevent dirt and debris from entering the throttle bore, IACV, sensor hole and fuel feed hose. Clean them using compressed air.
- The throttle body is factory pre-set. Do not disassemble in a way other than shown in this manual.
- Do not loosen or tighten the white painted bolts, nuts and screws of the throttle body. Loosening or tightening them can cause throttle body malfunction.
- Tighten the yellow painted bolts of the throttle body to the specified torque.
- A faulty PGM-FI system is often related to poorly connected or corroded connectors. Check those connections before proceeding.
- When disassembling the PGM-FI parts, note the location of the O-rings. Replace them with new ones upon reassembly.
- Use a digital tester for PGM-FI system inspection.
- When servicing the fuel feed hose, be careful not to bend or kink it.
- The engine stop switch line is connected to the PCM/ECM on this vehicle. Its signal permits the PCM/ECM to control the fuel pump, injector and ignition coil.

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Throttle body identification number	'07 – '08 models	GQB1A
	After '08 models	GQB6A
Idle speed		1,400 ± 100 rpm
Throttle lever freeplay		3 – 8 mm (1/8 – 1/3 in)
IAT sensor resistance (20°C/68°F)		2.2 – 2.7 kΩ
ECT sensor resistance (20°C/68°F)		2.3 – 2.6 kΩ
Fuel injector resistance (20°C/68°F)		11.6 – 12.4 Ω
Fuel pressure at idle		336 – 350 kPa (3.43 – 3.57 kgf/cm <sup>2</sup> , 49 – 51 psi)
Fuel pump flow (at 12 V)		50 cm <sup>3</sup> (1.7 US oz, 1.8 Imp oz) minimum/10 seconds

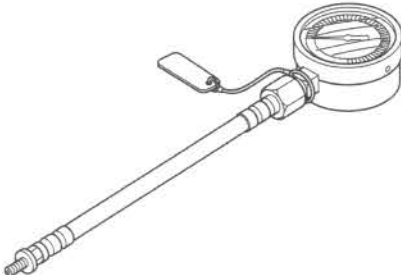
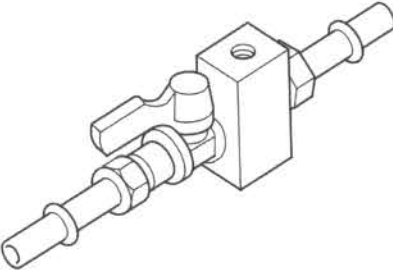
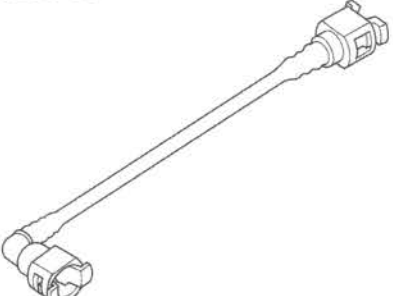
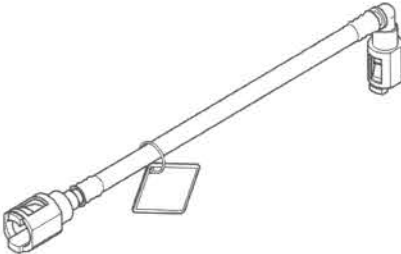

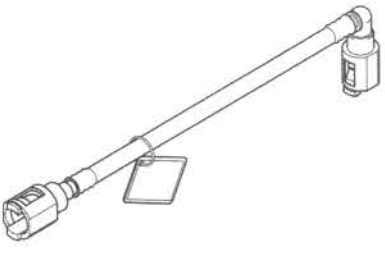

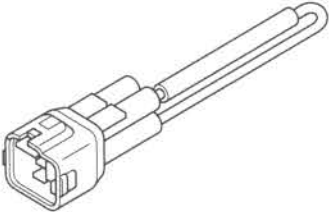

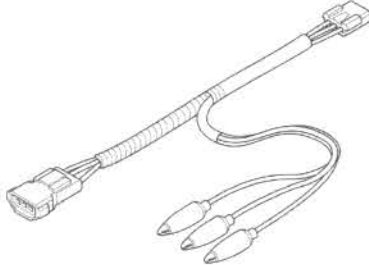
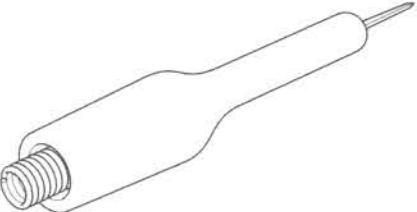
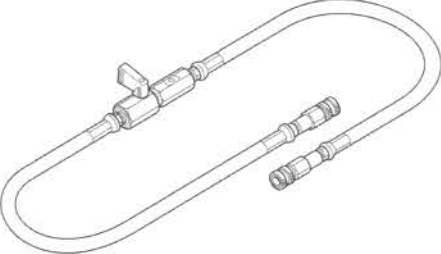
### TORQUE VALUES

Insulator band screw	See page 6-46
Throttle drum cover screw	1.8 N·m (0.18 kgf·m, 1.3 lbf·ft)
TP sensor/MAP sensor torx screw (T25)	3.4 N·m (0.35 kgf·m, 2.2 lbf·ft)
Wire harness clamp stay screw	3.4 N·m (0.35 kgf·m, 2.2 lbf·ft)
Fuel Injector mounting bolt	5.1 N·m (0.53 kgf·m, 3.8 lbf·ft)
IACV torx screw (T20)	2.1 N·m (0.21 kgf·m, 1.5 lbf·ft)
ECT sensor	12 N·m (1.2 kgf·m, 9 lbf·ft)
Bank angle sensor mounting bolt	1.5 N·m (0.15 kgf·m, 1.1 lbf·ft)
Throttle body cover bolt	5.2 N·m (0.53 kgf·m, 3.8 lbf·ft)



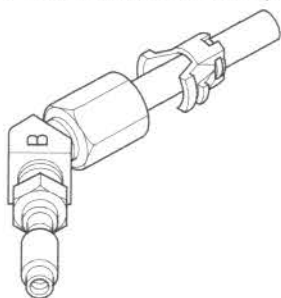
## FUEL SYSTEM (PGM-FI)

### TOOLS

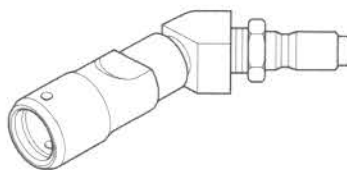
<p>Fuel pressure gauge 07406-0040004</p>  <p>or 07406-004000B (U.S.A. only)</p>	<p>Pressure gauge manifold 07ZAJ-S5A0111</p>  <p>Not available in U.S.A.</p>	<p>Hose attachment, 9 mm/9 mm 07ZAJ-S5A0120</p>  <p>Not available in U.S.A.</p>
<p>Hose attachment, 6 mm/9 mm 07ZAJ-S5A0130</p>  <p>Not available in U.S.A.</p>	<p>Attachment joint, 6 mm/9 mm 07ZAJ-S5A0150</p>  <p>Not available in U.S.A.</p>	<p>Hose attachment, 6 mm/9 mm 07ZAJ-S7C0100</p>  <p>Not available in U.S.A.</p>
<p>Attachment joint, 8 mm/9 mm 07ZAJ-S7C0200</p>  <p>Not available in U.S.A.</p>	<p>SCS connector 070PZ-ZY30100</p> 	<p>HDS pocket tester TDS 3557-0112-01 (U.S.A. Only)</p> 
<p>Inspection test harness 07GMJ-ML80100</p> 	<p>Test probe 07ZAJ-RDJA110</p> 	<p>Pressure manifold hose 07AMJ-HW3A100 (U.S.A. only)</p> 



Adapter, male  
07AAJ-S6MA200 (U.S.A. only)



Adapter, female  
07AAJ-S6MA400 (U.S.A. only)





# **SYMPTOM TROUBLESHOOTING**

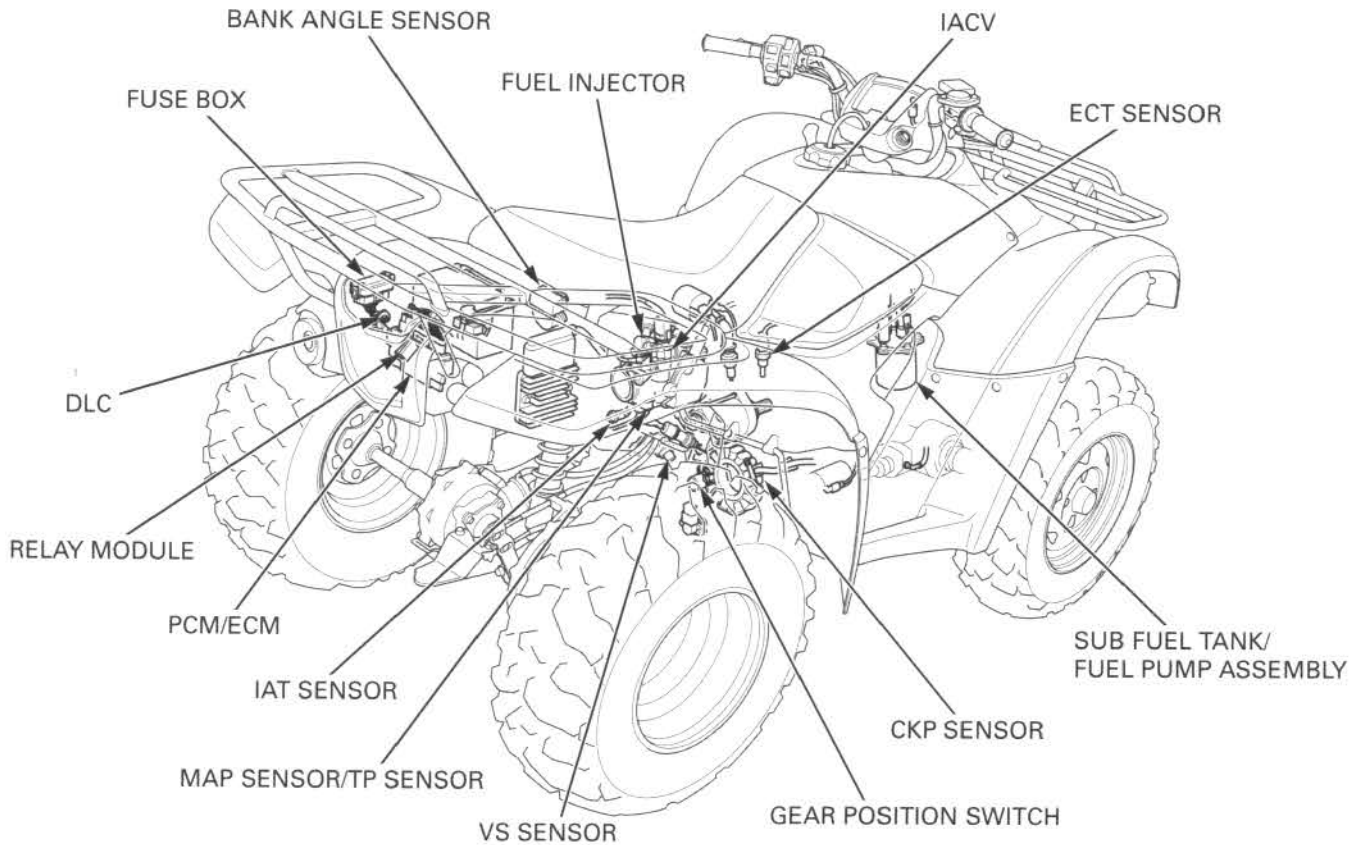
When the vehicle has one of these symptoms, check the DTC or MIL blinking, refer to the DTC index (page 6-18) and begin the appropriate troubleshooting procedure. If there are no DTC/MIL blinking stored in the PCM/ECM memory, do the diagnostic procedure for the symptom, in the sequence listed below, until you find the cause.

Symptom	Diagnosis procedure	Also check for
Engine cranks but won't start (No DTC and MIL blinking)	<ol style="list-style-type: none"> <li>1. Inspect the ignition system (page 20-5).</li> <li>2. Inspect the fuel supply system (page 6-39).</li> </ol>	<ul style="list-style-type: none"> <li>• No fuel to fuel injector <ul style="list-style-type: none"> <li>– Clogged fuel filter</li> <li>– Pinched or clogged fuel feed hose</li> <li>– Pinched or clogged fuel tank breather hose</li> </ul> </li> <li>– Faulty fuel pump</li> <li>– Faulty fuel pump circuits</li> <li>• Intake air leak</li> <li>• Contaminated/deteriorated fuel</li> <li>• Faulty fuel injector</li> <li>• IACV stuck closed</li> </ul>
Engine cranks but won't start (Gear position indicator continuously blinking "–")	<ol style="list-style-type: none"> <li>1. PCM/ECM power/ground circuits malfunction (page 6-55).</li> </ol>	<ul style="list-style-type: none"> <li>• Open circuit in the power input and/or ground wire of the PCM/ECM</li> <li>• Faulty bank angle sensor or related circuit</li> <li>• Faulty engine stop relay (relay module) or related circuit</li> <li>• Blown IGN fuse (10 A)</li> </ul>
Engine cranks but won't start (No fuel pump operation sound when turning the ignition switch to ON and engine stop switch to "O")	<ol style="list-style-type: none"> <li>1. PCM/ECM engine stop switch circuit malfunction (page 6-55).</li> <li>2. Inspect the fuel supply system (page 6-39).</li> </ol>	<ul style="list-style-type: none"> <li>• Open circuit in the engine stop switch wire of the PCM/ECM</li> <li>• Faulty fuel pump relay (relay module) or related circuit</li> <li>• Faulty fuel pump or related circuits</li> </ul>
Engine stalls, hard to start, rough idling	<ol style="list-style-type: none"> <li>1. Check the idle speed (page 6-58).</li> <li>2. Check the IACV (page 6-48).</li> <li>3. Inspect the fuel supply system (page 6-39).</li> </ol>	<ul style="list-style-type: none"> <li>• Restricted fuel feed hose</li> <li>• Contaminated/deteriorated fuel</li> <li>• Intake air leak</li> <li>• Restricted fuel tank breather hose</li> <li>• Faulty ignition system</li> </ul>
Backfiring or misfiring during acceleration	Check the ignition system.	<ul style="list-style-type: none"> <li>• Faulty ignition system</li> </ul>
Poor performance (driveability) and poor fuel economy	Inspect the fuel supply system (page 6-39).	<ul style="list-style-type: none"> <li>• Pinched or clogged fuel feed hose</li> <li>• Faulty fuel injector</li> <li>• Faulty ignition system</li> </ul>
Idle speed is below specifications or fast idle too low (No DTC and MIL blinking)	<ol style="list-style-type: none"> <li>1. Check the idle speed (page 6-58).</li> <li>2. Check the IACV (page 6-48).</li> </ol>	<ul style="list-style-type: none"> <li>• IACV stuck closed</li> <li>• Faulty fuel supply system</li> <li>• Faulty ignition system</li> </ul>
Idle speed is above specifications or fast idle too high (No DTC and MIL blinking)	<ol style="list-style-type: none"> <li>1. Check the idle speed (page 6-58).</li> <li>2. Check the throttle operation and lever free play (page 4-7).</li> <li>3. Check the IACV (page 6-48).</li> </ol>	<ul style="list-style-type: none"> <li>• IACV stuck opened</li> <li>• Faulty ignition system</li> <li>• Intake air leak</li> <li>• Engine top end problem</li> <li>• Air cleaner condition</li> </ul>
MIL stays on but no DTCs set, or MIL never comes ON at all	Troubleshoot the MIL circuit (page 6-31).	<ul style="list-style-type: none"> <li>• Faulty MIL circuit</li> </ul>
MIL stays on at all times (No DTC set)	Check the DLC circuit (Brown/red wire) for short circuit.	<ul style="list-style-type: none"> <li>• Short circuit in the DLC related wire</li> </ul>

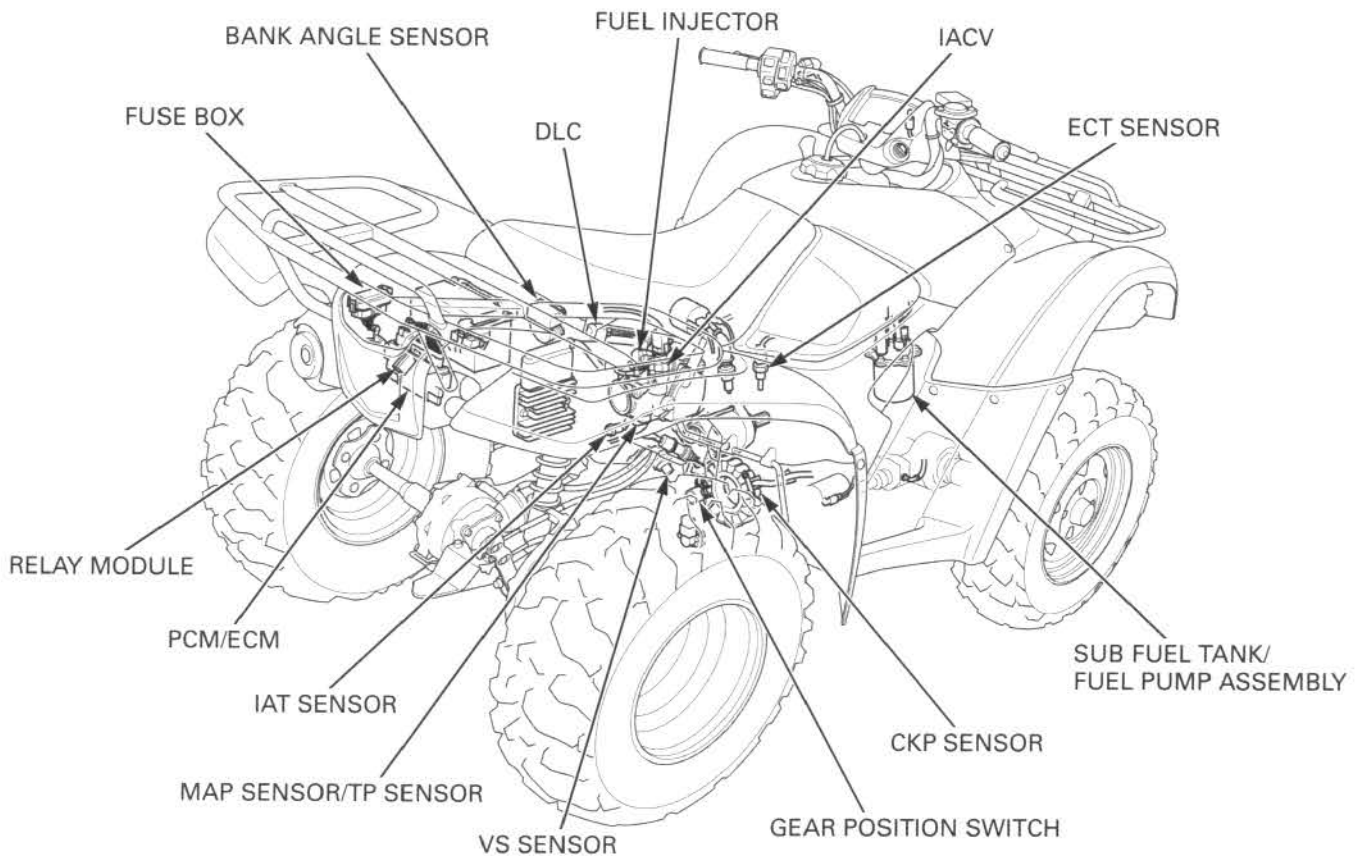


# PGM-FI COMPONENT LOCATION

'07 - '08:



After '08:

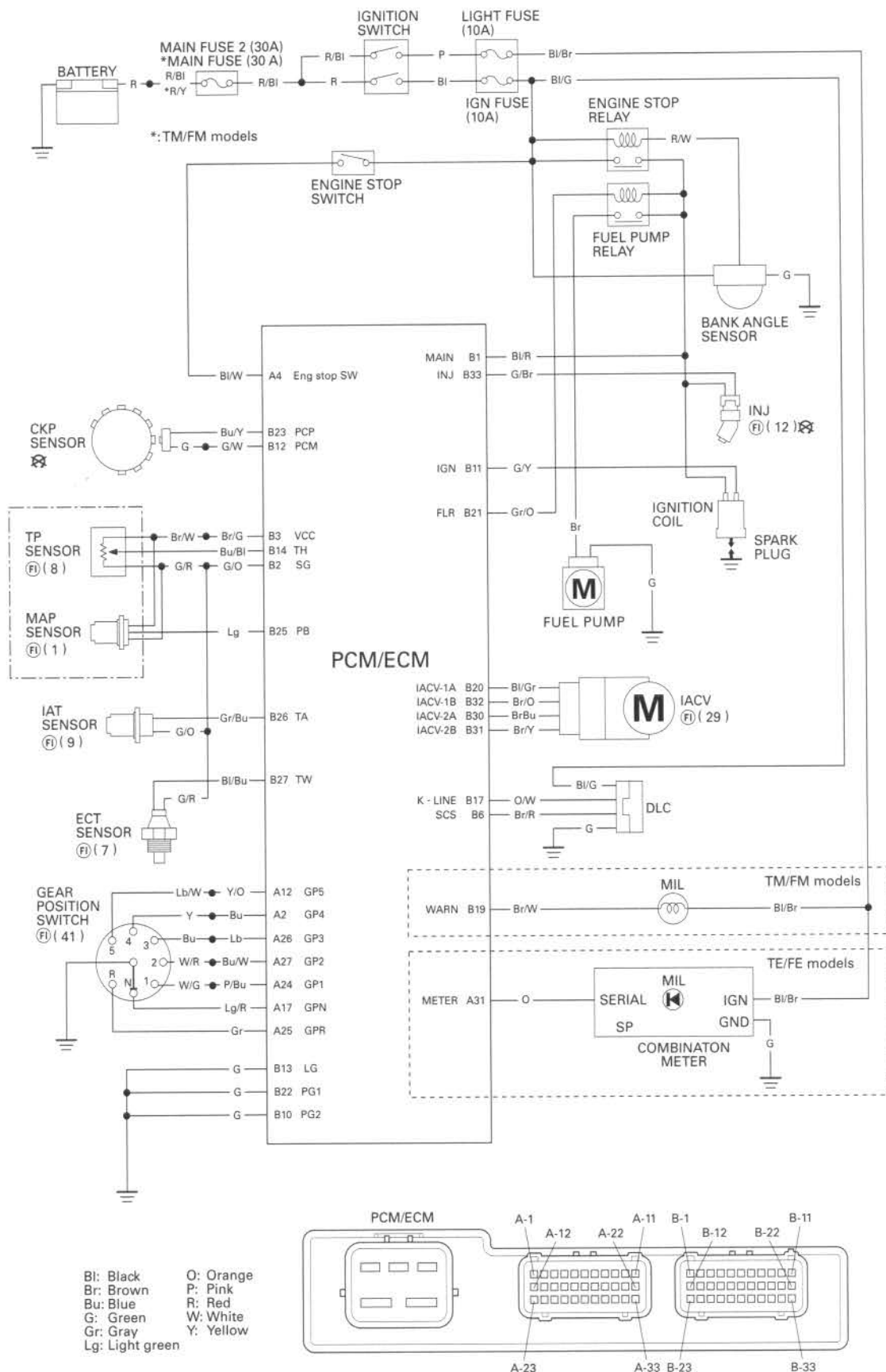




# FUEL SYSTEM (PGM-FI)

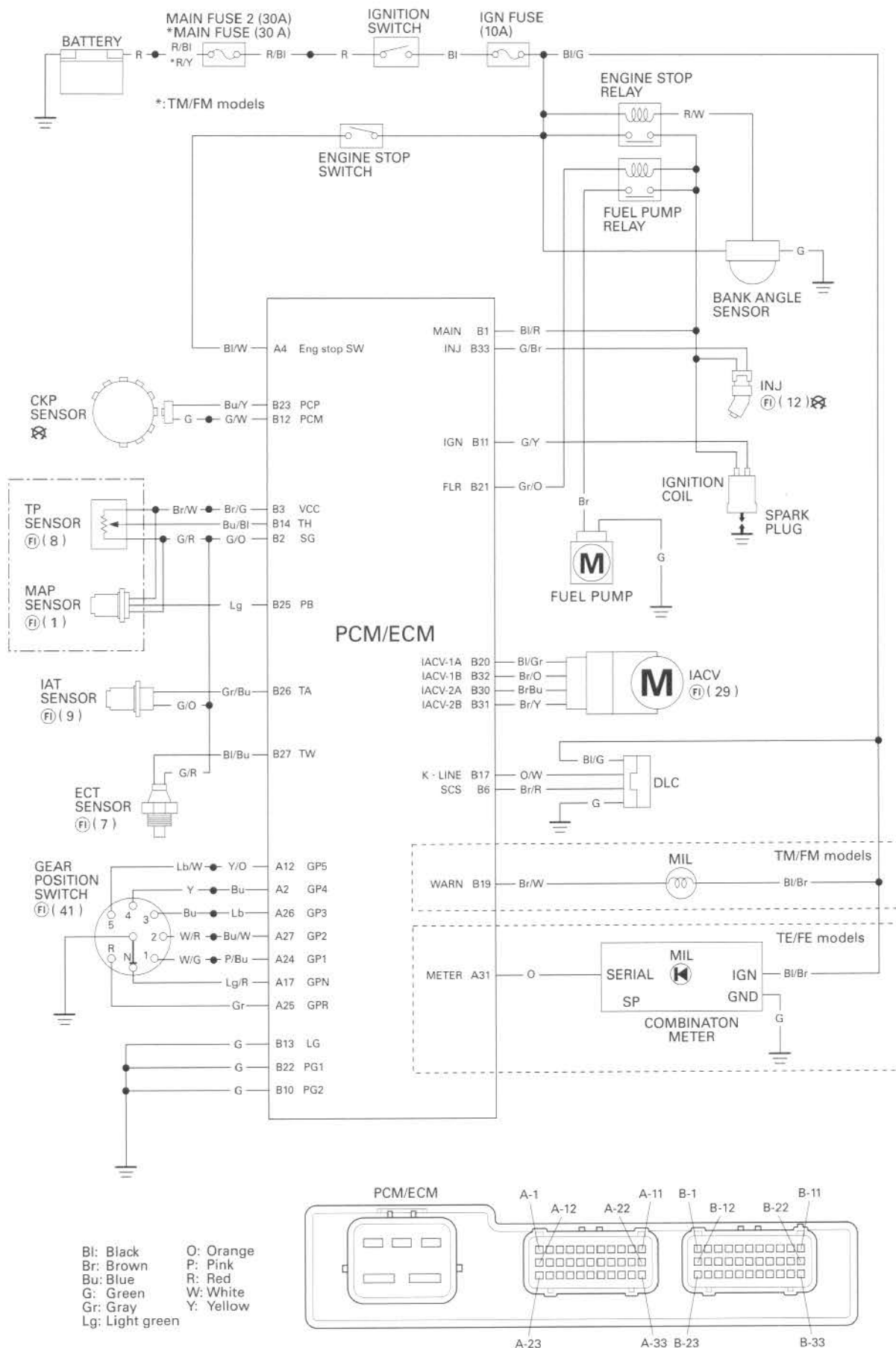
## PGM-FI SYSTEM DIAGRAM

'07:





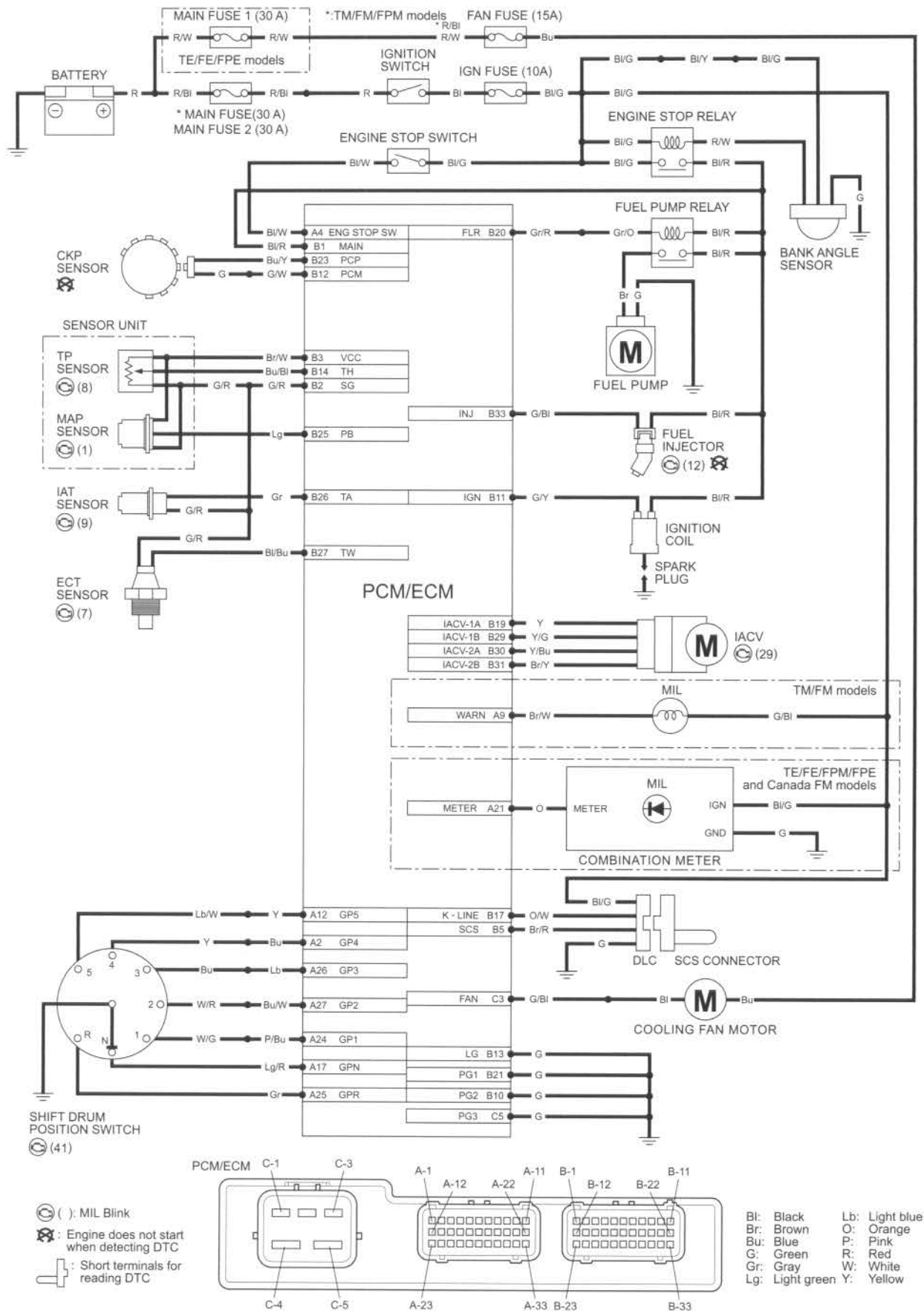
'08:





# FUEL SYSTEM (PGM-FI)

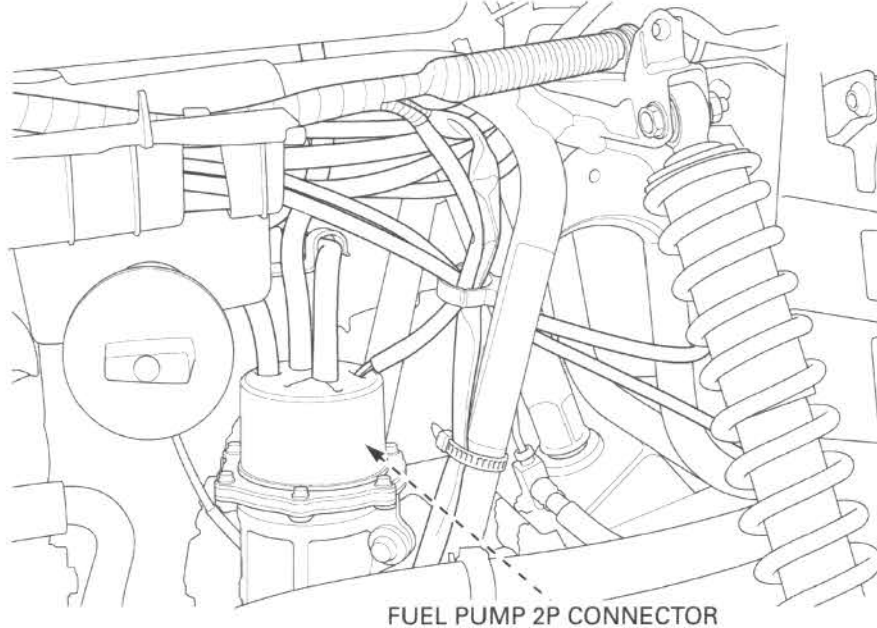
After '08:



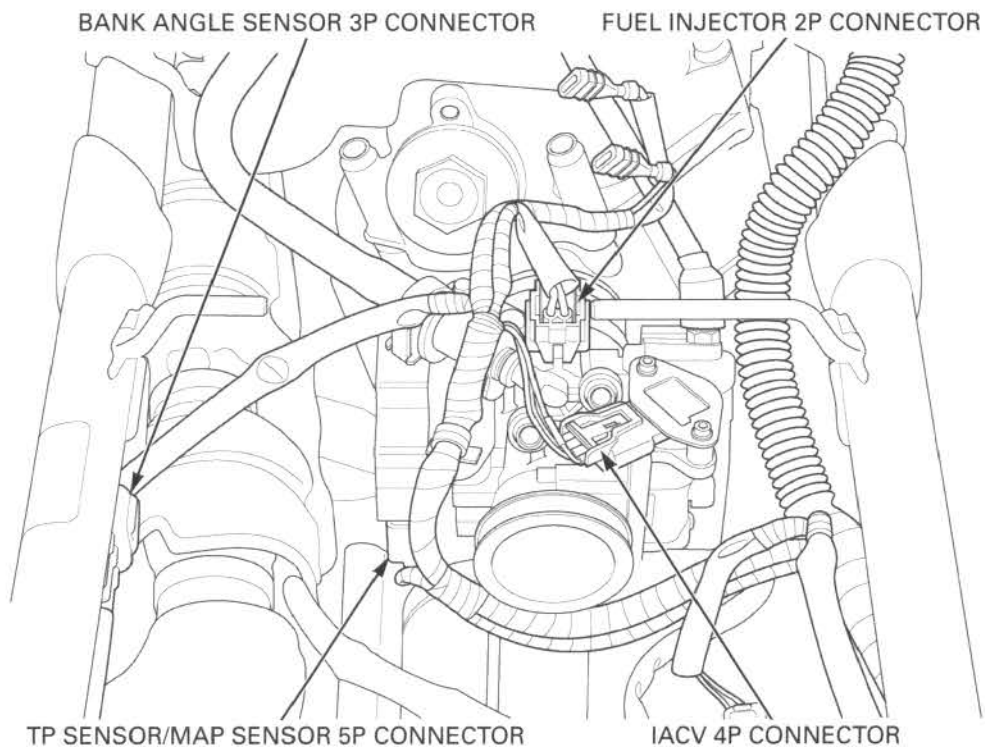


## PGM-FI CONNECTOR LOCATION

The parts listed below the connector must be removed to disconnect the connector.



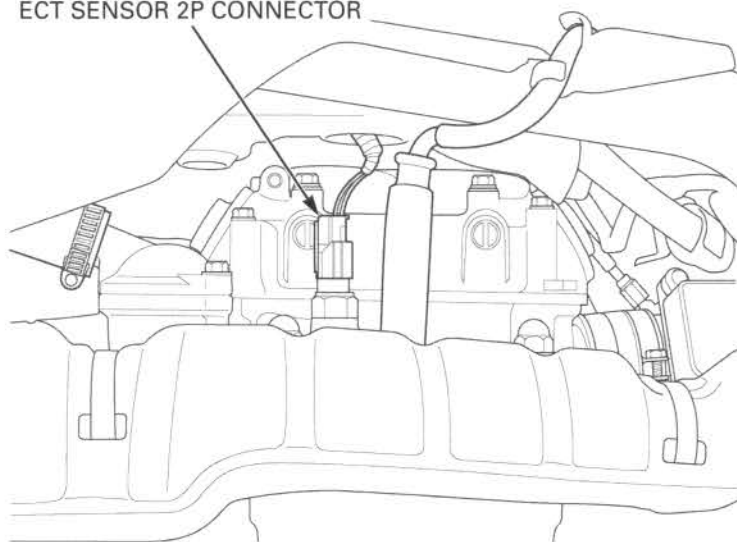
- Fuel pump 2P connector  
– right mudguard (page 3-6)



- Fuel Injector 2P connector  
– throttle body cover (page 6-35)
- IACV 4P connector  
– throttle body cover (page 6-35)
- TP sensor/MAP sensor 5P connector  
– left fuel tank side cover (page 3-5)
- Bank angle sensor 3P connector  
– left side cover (page 3-4)



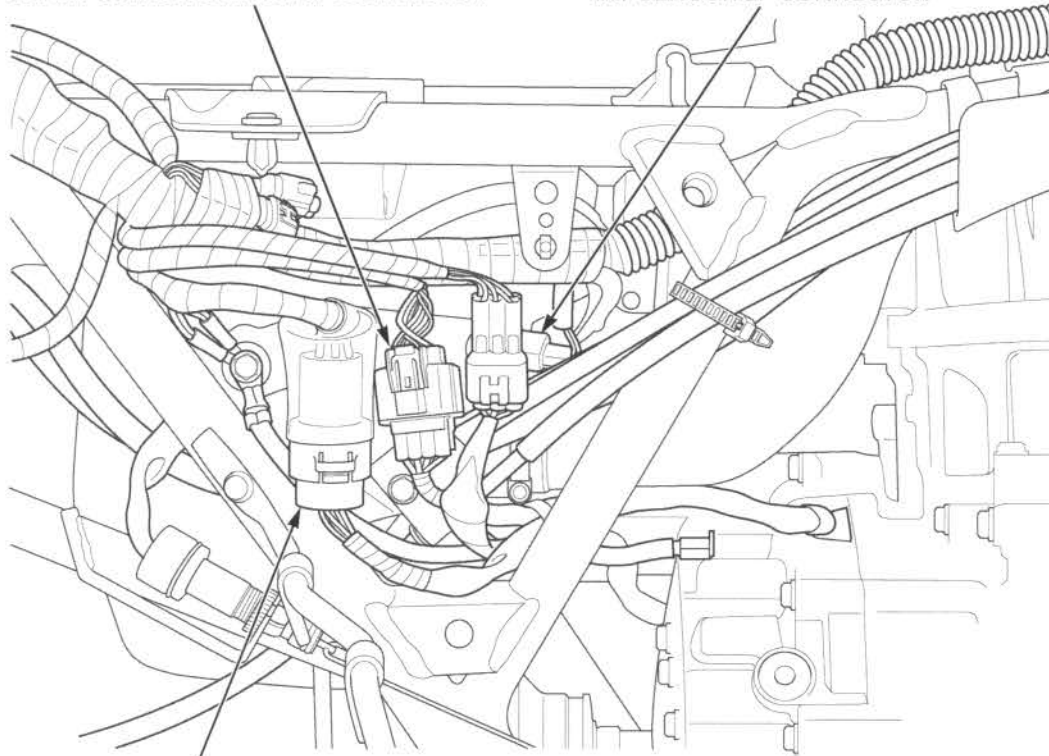
ECT SENSOR 2P CONNECTOR



- ECT sensor 2P connector  
– left fuel tank side cover (page 3-5)

GEAR POSITION SWITCH 8P CONNECTOR

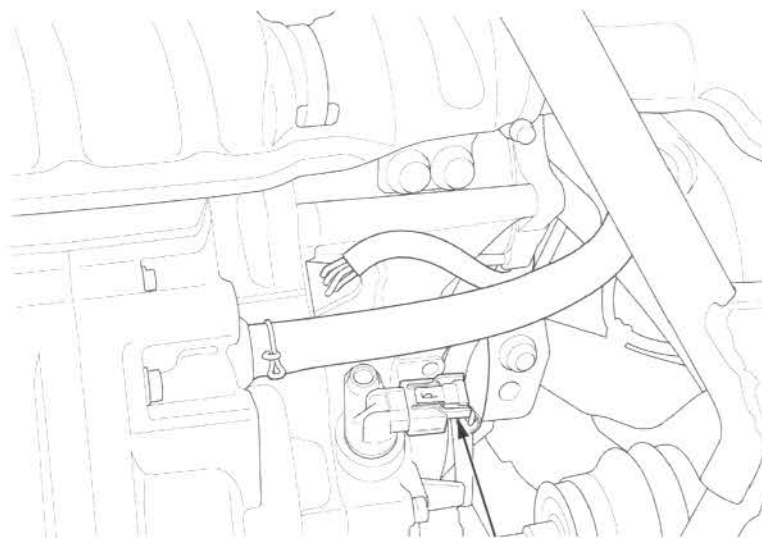
IAT SENSOR 2P CONNECTOR



CKP SENSOR/ALTERNATOR STATOR 5P CONNECTOR

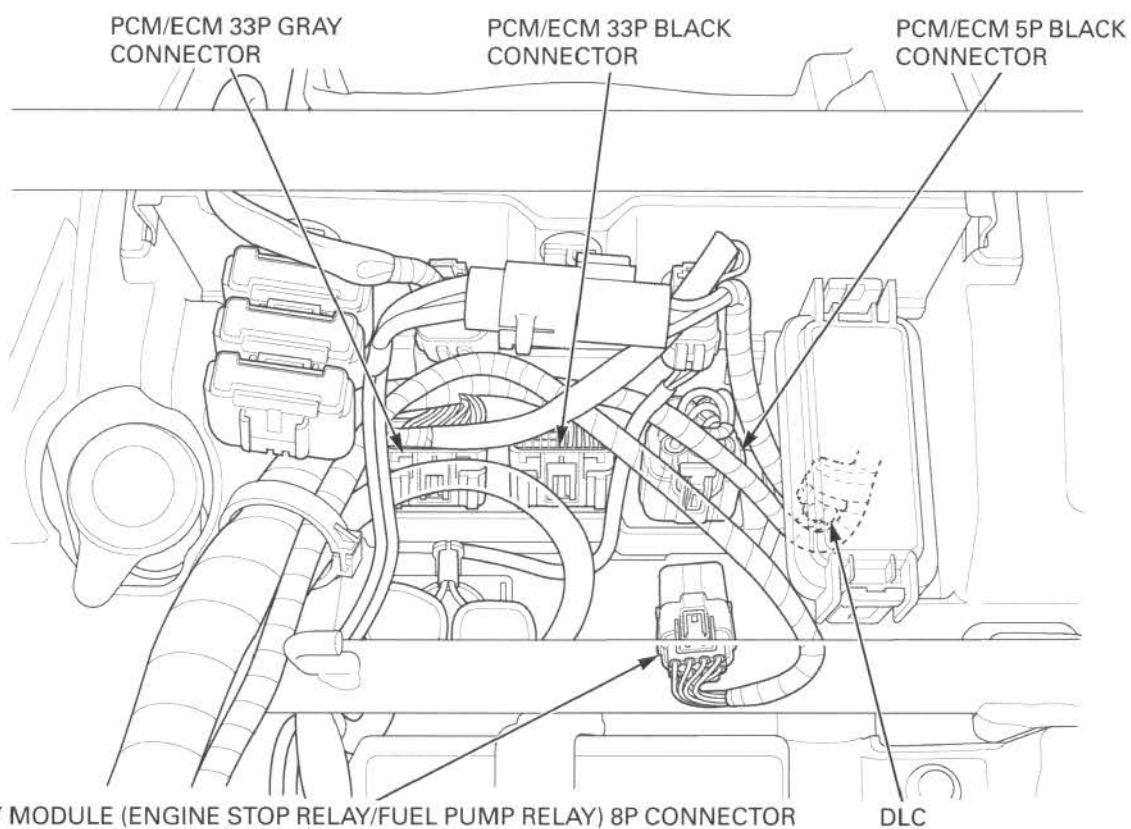
- CKP sensor/alternator stator 5P connector  
– right side cover (page 3-4)
- Gear position switch 8P connector  
– right side cover (page 3-4)
- IAT sensor 2P connector  
– right mudguard (page 3-6)





VS SENSOR 3P CONNECTOR (TE/FE models only)

- VS sensor 3P connector (TE/FE models only)  
– left side cover (page 3-4)



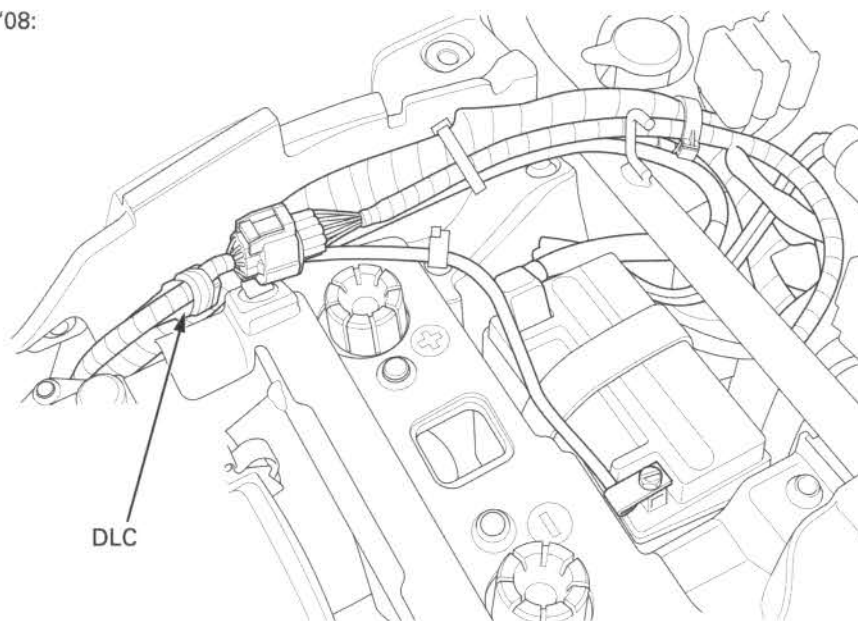
- PCM/ECM connectors  
– rear fender cover (page 3-9)
- Relay module (engine stop relay/fuel pump relay) 8P connector  
– rear fender cover (page 3-9)
- DLC  
– '07 – '08: rear fender cover (page 3-9)



## FUEL SYSTEM (PGM-FI)

---

After '08:



- DLC
  - After '08: seat (page 3-4)



# PGM-FI TROUBLESHOOTING INFORMATION

## GENERAL TROUBLESHOOTING

### Intermittent Failure

The term "intermittent failure" means a system may have had a failure, but it checks OK now. If the MIL does not come on, check for poor contact or loose pins at all connectors related to the circuit with the trouble. If the MIL was on, but then went out, the original problem may be intermittent.

### Opens and Shorts

"Opens" and "Shorts" are common electrical terms. An open is a break in a wire or at a connection. A short is an accidental connection of a wire to ground or to another wire. In simple electronics, this usually means something will not work at all. With PCM/ECMs this can mean something will work, but not the way it's supposed to.

### If the MIL has come on

Refer to DTC READ OUT (page 6-17).

### If the MIL did not stay on

If the MIL did not stay on, but there is a driveability problem, do the SYMPTOM TROUBLESHOOTING (page 6-6).

## SYSTEM DESCRIPTION

### SELF-DIAGNOSIS SYSTEM

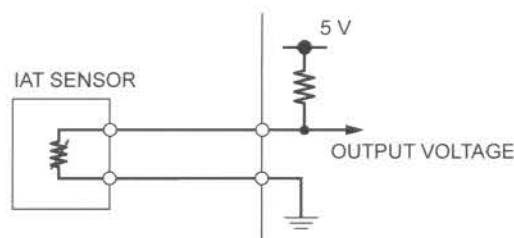
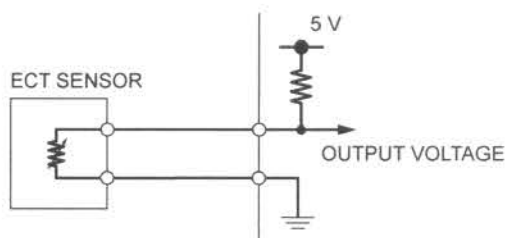
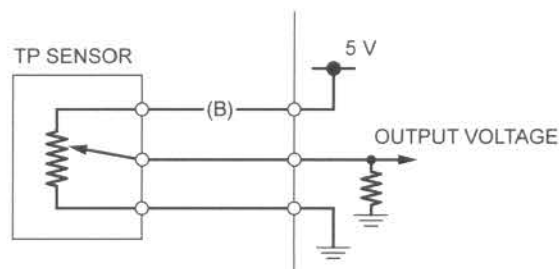
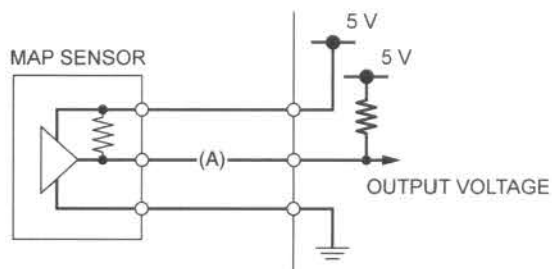
The PGM-FI system is equipped with the self-diagnostic system. When any abnormality occurs in the system, the PCM/ECM turns on the MIL and stores a DTC in its erasable memory.

### FAIL-SAFE FUNCTION

The PGM-FI system is provided with a fail-safe function to secure a minimum running capability even when there is trouble in the system. When any abnormality is detected by the self-diagnosis function, running capability is maintained by pre-programmed value in the simulated program map. When any abnormality is detected in the fuel injector and crankshaft position (CKP) sensor, the fail-safe function stops the engine to protect it from damage.

### DTC (Diagnostic Trouble Code)

- The DTC is composed of a main code and a sub code and it is displayed as a hyphenated number when retrieved from the PCM/ECM with the HDS pocket tester.  
The digits in front of the hyphen are the main code, they indicate the component of function failure.  
The digits behind the hyphen are the sub code, they detail the specific symptom of the component or function failure.  
For example, in the case of the TP sensor:  
 - DTC 08 - 1 = (TP sensor voltage) - (lower than the specified value)  
 - DTC 08 - 2 = (TP sensor voltage) - (higher than the specified value).
- The MAP, ECT, TP and IAT sensor diagnosis will be made according to the voltage output of the affected sensor.  
If a failure occurs, the PCM/ECM determines the Function Failure, compares the sensor voltage output to the standard value, and then outputs the corresponding DTC to the HDS Pocket Tester.  
For example:  
 - If the output voltage line (A) on the MAP sensor is opened, the PCM/ECM detects the output voltage is about 5 V, then the DTC 1-2 (MAP sensor circuit high voltage) will be displayed.  
 - If the input voltage line (B) on the TP sensor is opened, the PCM/ECM detects the output voltage is 0 V, then the DTC 8-1 (TP sensor circuit low voltage) will be displayed.

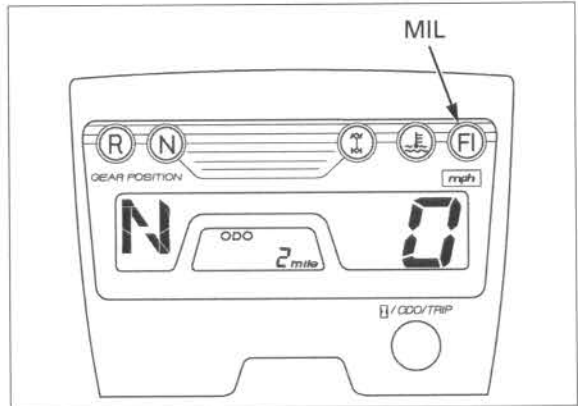




## FUEL SYSTEM (PGM-FI)

### MIL Blink Pattern

- If the HDS pocket tester is not available, DTC can be read from the PCM/ECM memory by the MIL blink pattern.
- The number of MIL blinks is the equivalent of the main code of the DTC (the sub code cannot be displayed by the MIL).
- The MIL will blink the current DTC, in case the PCM/ECM detects the problem at present, when the ignition switch ON or idling. The MIL will stay ON when driving.
- The MIL has two types of blinks, a long blink and short blink. The long blinking lasts for 1.3 seconds, the short blinking lasts for 0.5 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by five short blinks, the MIL is 25 (two long blinks = 20 blinks, plus five short blinks).
- When the PCM/ECM stores more than one DTC, the MIL will indicate them by blinking in the order from the lowest number to highest number.



### MIL Check

When the ignition switch is turned ON, the MIL will stay on for a few seconds, then go off. If the MIL does not come on, troubleshoot the MIL circuit (page 6-31).

### CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- In case the PCM/ECM detects the problem at present, the MIL will come on and the MIL will start to blink as its DTC. It is possible to readout the MIL blink pattern as the current DTC.
- In case the PCM/ECM does not detect any problem at present but has a problem stored in its memory, the MIL will not light and blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure.

## HDS POCKET TESTER INFORMATION

- The HDS can readout the DTC, stored data, current data and other PCM/ECM condition.

### How to connect the HDS Pocket Tester

Turn the ignition switch to OFF.

'07 - '08: Remove the rear fender cover (page 3-9).

After '08: Remove the seat (page 3-4).

Remove the dummy connector from the DLC.

Connect the HDS pocket tester to the DLC.

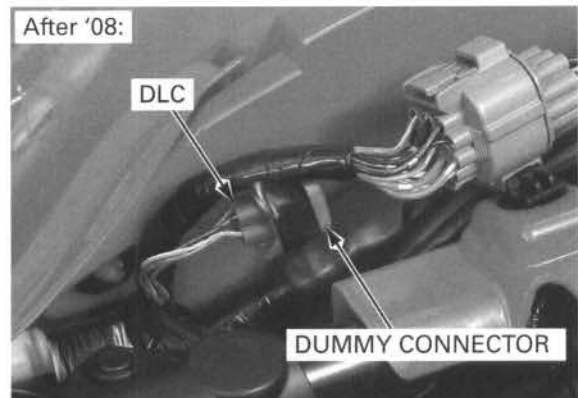
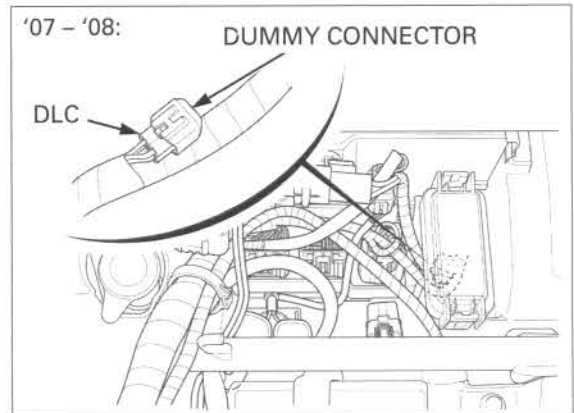
Turn the ignition switch to ON, and check the DTC and stored data.

#### NOTE:

- Stored data indicates the engine conditions when the first malfunction was detected.

### PCM/ECM reset

The HDS can reset the PCM/ECM data including the DTC, stored data and some learning memory.





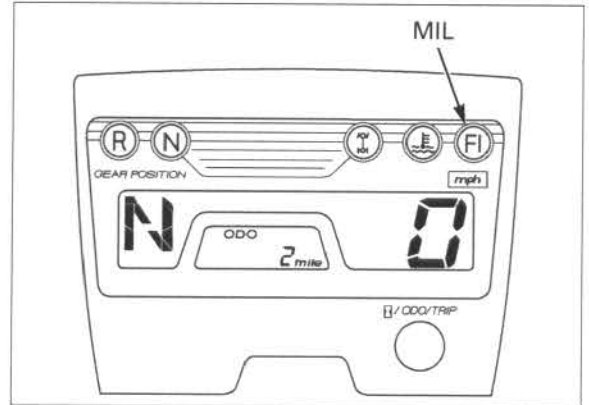
## DTC READOUT

- When the ignition switch is turned to ON, the MIL will stay on for a few seconds, then go off.
- After performing diagnostic troubleshooting, erase the problem code(s) (page 6-17) and test-ride the vehicle to be sure that the problem(s) have been removed.

If the MIL stays on or blinks, connect the HDS Pocket Tester to the DLC (page 6-16).

Then read the DTC, stored data and follow the troubleshooting index (page 6-18).

To read the DTC with the MIL blinking, use the following procedure.



### Reading DTC with the MIL

Start the engine and let it idle. Read the MIL blinking that is indicated as the current DTC and refer to the troubleshooting index (page 6-18). When retrieving the stored DTC, refer to the following procedure.

Remove the dummy connector (page 6-16).  
Short DLC terminals using the special tool.

#### TOOL:

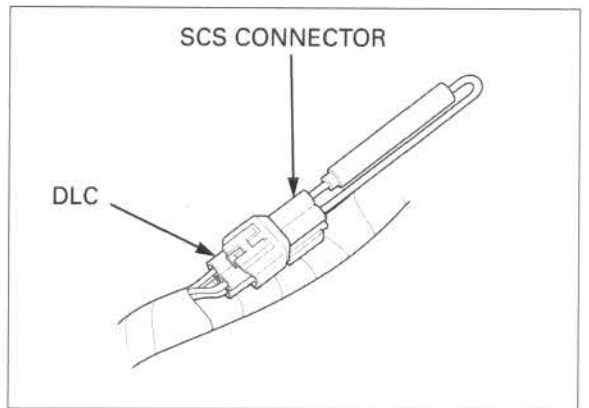
**SCS connector** 070PZ-ZY30100

**CONNECTION:** Brown/red – Green

Turn the ignition switch to ON, read, note the MIL blinks and refer to the troubleshooting index (page 6-18).

#### NOTE:

If the PCM/ECM has any DTC in its memory, the MIL will start blinking.



## ERASING DTC

Connect the HDS Pocket Tester to the DLC (page 6-16).

Erase the DTC with the HDS while the engine is stopped.

To erase the DTC without HDS, use the following procedure.

### How to erase the DTC without HDS

1. Remove the dummy connector (page 6-16).
2. Short the DLC using the special tool.

#### TOOL:

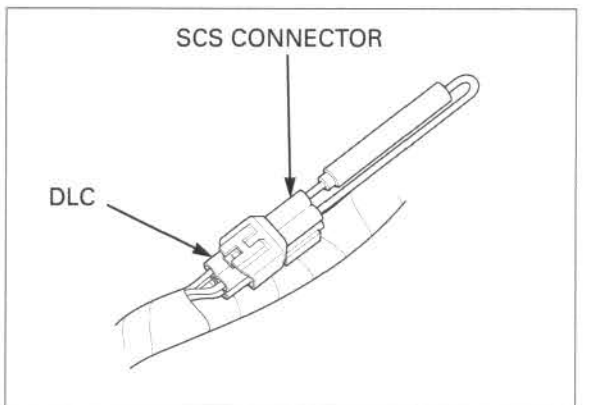
**SCS connector** 070PZ-ZY30100

**CONNECTION:** Brown/red – Green

3. Turn the ignition switch to ON.
4. Remove the special tool from the DLC.
5. The MIL will light for approximately 5 seconds. While the MIL lights, short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the malfunction indicator goes off and starts blinking.

#### NOTE:

- The DLC must be shorted while the MIL lights. If not, the MIL will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the MIL starts blinking.





## FUEL SYSTEM (PGM-FI)

### CIRCUIT INSPECTION

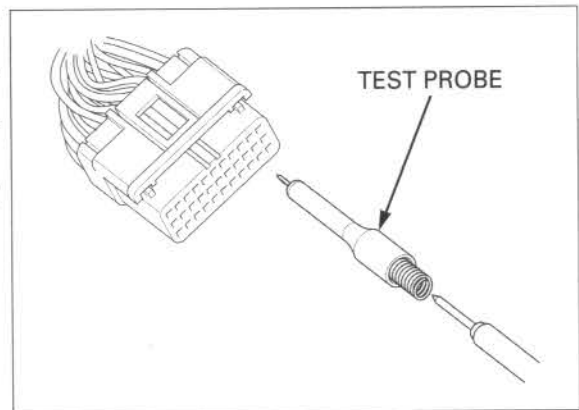
#### INSPECTION AT PCM/ECM CONNECTOR

- Always clean around and keep any foreign material away from the PCM/ECM connector before disconnecting it.
- A faulty PGM-FI system is often related to poorly connected or corroded connections. Check those connections before proceeding.
- Do not pull the wire harness while disconnecting the PCM/ECM connectors.
- In testing at PCM/ECM connector (wire harness side) terminal, always use the test probe. Insert the test probe into the connector terminal, then attach the digital multimeter probe to the test probe.

#### TOOL:

Test probe

07ZAJ-RDJA110



### PGM-FI DTC INDEX

DTC (MIL blinks)	Function Failure	Symptom/Fail-safe function	Refer to
1-1 (1)	MAP sensor circuit low voltage (less than 0.19 V) <ul style="list-style-type: none"><li>• MAP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine operates normally</li><li>• Fail-safe value: 29 kPa</li></ul>	6-19
1-2 (1)	MAP sensor circuit high voltage (more than 3.9 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the MAP sensor connector</li><li>• MAP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine operates normally</li><li>• Fail-safe value: 29 kPa</li></ul>	6-20
7-1 (7)	ECT sensor circuit low voltage (less than 0.07 V) <ul style="list-style-type: none"><li>• ECT sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Hard to start at a low temperature</li><li>• Fail-safe value: 78.6°C/173.5°F</li><li>• Cooling fan turns on</li></ul>	6-21
7-2 (7)	ECT sensor circuit high voltage (more than 4.93 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the ECT sensor connector</li><li>• ECT sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Hard to start at a low temperature</li><li>• Fail-safe value: 78.6°C/173.5°F</li><li>• Cooling fan turns on</li></ul>	6-22
8-1 (8)	TP sensor circuit low voltage (less than 0.22 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the TP sensor connector</li><li>• TP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Poor engine acceleration</li><li>• Fail-safe value: 0°</li></ul>	6-23
8-2 (8)	TP sensor circuit high voltage (more than 4.93 V) <ul style="list-style-type: none"><li>• TP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Poor engine acceleration</li><li>• Fail-safe value: 0°</li></ul>	6-25
9-1 (9)	IAT sensor circuit low voltage (less than 0.07 V) <ul style="list-style-type: none"><li>• IAT sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine operates normally</li><li>• Fail-safe value: 25°C/77°F</li></ul>	6-26
9-2 (9)	IAT sensor circuit high voltage (more than 4.93 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the IAT sensor connector</li><li>• IAT sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine operates normally</li><li>• Fail-safe value: 25°C/77°F</li></ul>	6-27
12-1 (12)	Fuel Injector circuit malfunction <ul style="list-style-type: none"><li>• Loose or poor contact of the fuel injector connector</li><li>• Fuel Injector or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine does not start</li><li>• Fuel Injector, fuel pump and ignition shut down</li></ul>	6-28
29-1 (29)	IACV circuit malfunction <ul style="list-style-type: none"><li>• Loose or poor contact of the IACV connector</li><li>• IACV or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine stalls, hard to start, rough idling</li></ul>	6-29
33-2 (-)	PCM/ECM EEPROM malfunction	<ul style="list-style-type: none"><li>• Engine operates normally</li></ul>	6-55
41-1 (41)	Gear position switch malfunction <ul style="list-style-type: none"><li>• Loose or poor contact of the gear position switch connector</li><li>• Gear position switch or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Engine operates normally</li></ul>	23-24



## DTC TROUBLESHOOTING

### DTC 1-1 (MAP SENSOR LOW VOLTAGE)

#### 1. MAP Sensor System Inspection

Turn the ignition switch to ON.  
Check the MAP sensor with the HDS pocket tester.

*Is about 0 V indicated?*

**YES** – GO TO STEP 2.

**NO** – Intermittent failure.

#### 2. MAP Sensor Input Voltage Inspection

Turn the ignition switch to OFF.  
Disconnect the TP sensor/MAP sensor 5P connector.  
Turn the ignition switch ON.  
Measure the voltage at the wire harness side 5P connector terminals.

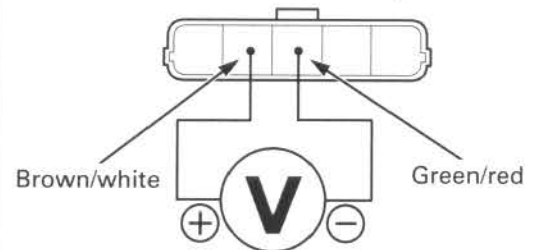
**Connection: Brown/white (+) – Green/red (–)**

*Is the voltage within 4.75 – 5.25V?*

**YES** – GO TO STEP 4.

**NO** – GO TO STEP 3.

TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)



#### 3. MAP Sensor Input Line Open Circuit Inspection

Turn the ignition switch to OFF.  
Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the wire harness side 5P connector and 33P gray connector terminals.

**Connection:**

'07 – '08: Brown/green (B3) – Brown/white

After '08: Brown/white (B3) – Brown/white

**TOOL:**

Test probe 07ZAJ-RDJA110

*Is there continuity?*

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Open circuit in the wire between the 5P connector and 33P connector.

#### 4. MAP Sensor Output Line Short Circuit Inspection

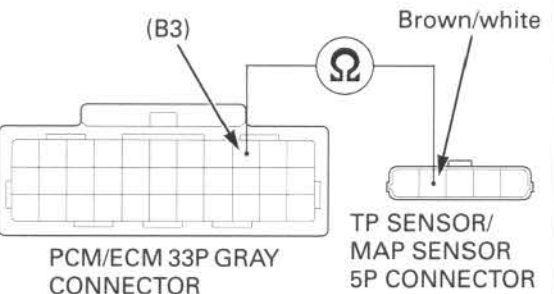
Turn the ignition switch to OFF.  
Check for continuity between the wire harness side 5P connector terminal and ground.

**Connection: Light green – ground**

*Is there continuity?*

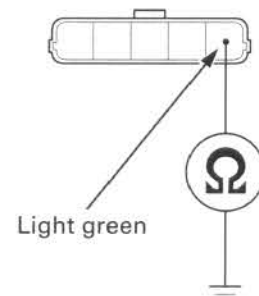
**YES** – Short circuit in Light green wire.

**NO** – GO TO STEP 5.



(Viewed from the terminal side)

TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)





### 5. MAP Sensor Inspection

Replace the TP sensor/MAP sensor with a known good one.  
Erase the DTC (page 6-16).  
Turn the ignition switch to OFF and ON.  
Check the MAP sensor with the HDS pocket tester.

#### *Is DTC 1-1 indicated?*

- YES** – Replace the PCM/ECM with a known good one, and recheck.  
**NO** – Faulty original MAP/TP sensor.

### DTC 1-2 (MAP SENSOR HIGH VOLTAGE)

- Before starting the troubleshooting, check the TP sensor/MAP sensor 5P connector for loose contacts or corroded terminals, and recheck the DTC.

#### 1. MAP Sensor System Inspection

Turn the ignition switch to ON.  
Check the MAP sensor with the HDS pocket tester.

#### *Is about 5 V indicated?*

- YES** – GO TO STEP 2.  
**NO** –
  - Intermittent failure
  - Loose or poorly connected TP sensor/MAP sensor 5P connector.

#### 2. MAP Sensor Inspection

Turn the ignition switch to OFF.  
Disconnect the TP sensor/MAP sensor 5P connector.  
Connect the wire harness side 5P connector terminals with a jumper wire.

**Connection: Light green – Green/red**

Turn the ignition switch to ON.  
Check the MAP sensor with the HDS pocket tester.

#### *Is about 0 V indicated?*

- YES** – Faulty TP sensor/MAP sensor.  
**NO** – GO TO STEP 3.

#### 3. MAP Sensor Input Voltage Inspection

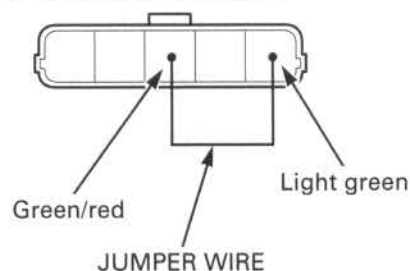
Turn the ignition switch to OFF.  
Remove the jumper wire.  
Turn the ignition switch to ON.  
Measure the voltage between the wire harness side 5P connector terminals.

**Connection: Brown/white (+) – Green/red (-)**

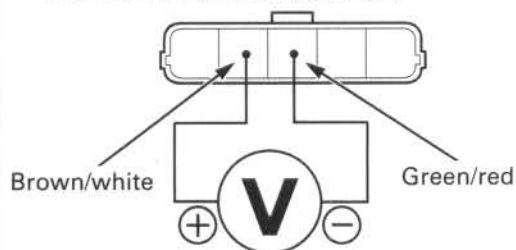
#### *Is the voltage within 4.75 – 5.25V?*

- YES** – GO TO STEP 4.  
**NO** – Open circuit in the Green/red or Green/orange wire.

TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)



TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)





#### 4. MAP Sensor Output Line Open Circuit Inspection

Turn the ignition switch to OFF.  
Disconnect the PCM/ECM 33P gray connector.  
Check the Light green wire for continuity between the wire harness side 5P connector and 33P gray connector terminals.

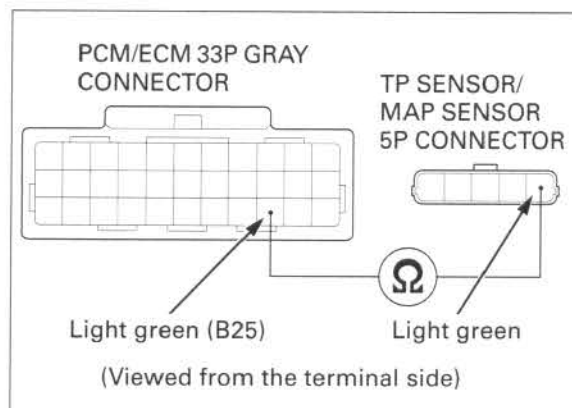
##### TOOL:

Test probe 07ZAJ-RDJA110

##### Is there continuity?

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Open circuit in Light green wire.



### DTC 7-1 (ECT SENSOR LOW VOLTAGE)

#### 1. ECT Sensor System Inspection

Turn the ignition switch to ON.  
Check the ECT sensor with the HDS pocket tester.

##### Is about 0 V indicated?

**YES** – GO TO STEP 2.

**NO** – Intermittent failure.

#### 2. ECT Sensor Inspection

Turn the ignition switch to OFF.  
Disconnect the ECT sensor 2P connector.  
Turn the ignition switch to ON.  
Check the ECT sensor with the HDS pocket tester.

##### Is about 0 V indicated?

**YES** – GO TO STEP 4.

**NO** – GO TO STEP 3.

#### 3. ECT Sensor Resistance Inspection

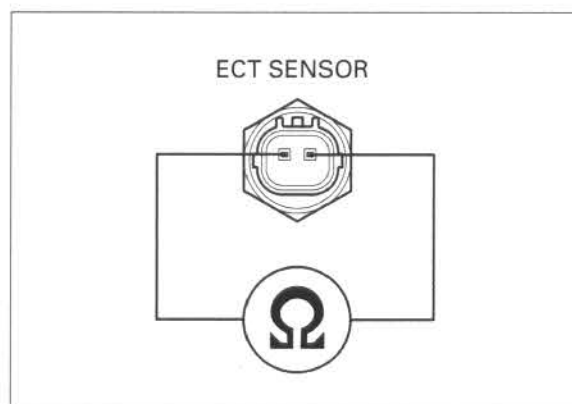
Turn the ignition switch OFF.  
Measure the resistance between the ECT sensor terminals.

**Standard: 2.3 – 2.6 kΩ (20°C/68°F)**

##### Is the resistance within standard value?

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Faulty ECT sensor.





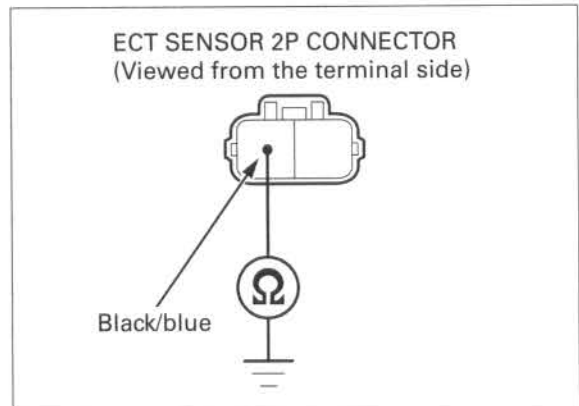
### 4. ECT Sensor Short Circuit Inspection

Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the wire harness side ECT sensor 2P connector terminal and ground.

**Connection: Black/blue – ground**

*Is there continuity?*

- YES** – Short circuit in the Black/blue wire.  
**NO** – Replace the PCM/ECM with a known good one, and recheck.



### DTC 7-2 (ECT SENSOR HIGH VOLTAGE)

- Before starting the troubleshooting, check the ECT sensor 2P connector for loose contacts or corroded terminals, and recheck the DTC.

#### 1. ECT Sensor System Inspection

Turn the ignition switch to ON.  
Check the ECT sensor with the HDS pocket tester.

*Is about 5 V indicated?*

- YES** – GO TO STEP 2.  
**NO** –
  - Intermittent failure.
  - Loose or poorly connected ECT sensor 2P connector.

#### 2. ECT Sensor Inspection

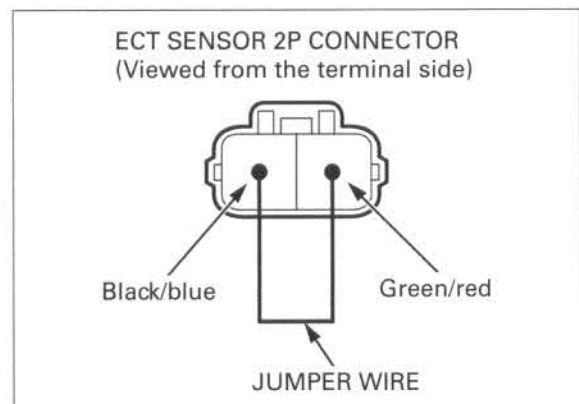
Turn the ignition switch to OFF.  
Disconnect the ECT sensor 2P connector.  
Connect the wire harness side 2P connector terminals with a jumper wire.

**Connection: Black/blue – Green/red**

Turn the ignition switch to ON.  
Check the ECT sensor with the HDS pocket tester.

*Is about 0 V indicated?*

- YES** – Faulty ECT sensor.  
**NO** – GO TO STEP 3.





### 3. ECT Sensor Line Open Circuit Inspection

Turn the ignition switch to OFF.  
Remove the jumper wire.  
Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the ECT sensor 2P connector and PCM/ECM 33P gray connector terminals.

#### Connection:

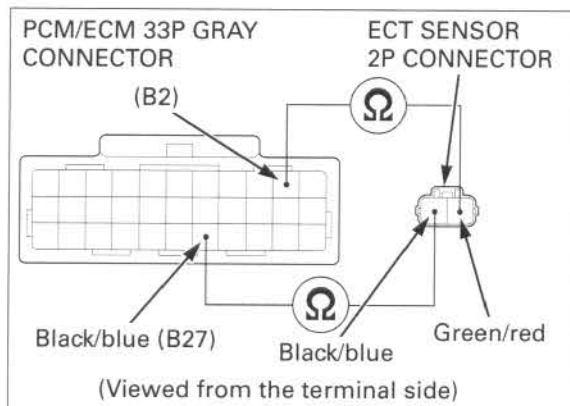
Black/blue (B27) – Black/blue  
'07 – '08: Green/orange (B2) – Green/red  
After '08: Green/red (B2) – Green/red

#### TOOL:

Test probe 07ZAJ-RDJA110

#### Is there continuity?

- YES** – Replace the PCM/ECM with a known good one, and recheck.
- NO** – Open circuit in the wire between the 2P connector and 33P connector.



## DTC 8-1 (TP SENSOR LOW VOLTAGE)

- Before starting the troubleshooting, check the TP sensor/MAP sensor 5P connector for loose contacts or corroded terminals, and recheck the DTC.

### 1. TP Sensor System Inspection

Turn the ignition switch to ON.  
Check the TP sensor with the HDS pocket tester with the throttle fully closed.

#### Is about 0 V indicated?

- YES** – GO TO STEP 3.
- NO** – GO TO STEP 2.

### 2. TP Sensor Inspection

Check that the TP sensor voltage increases continuously when the throttle is moved to fully closed position to fully open position, using the data list menu of the HDS pocket tester.

#### Does the voltage increase continuously?

- YES** –
- Intermittent failure.
  - Loose or poorly connected TP sensor/MAP sensor 5P connector.
- NO** – Faulty TP sensor.

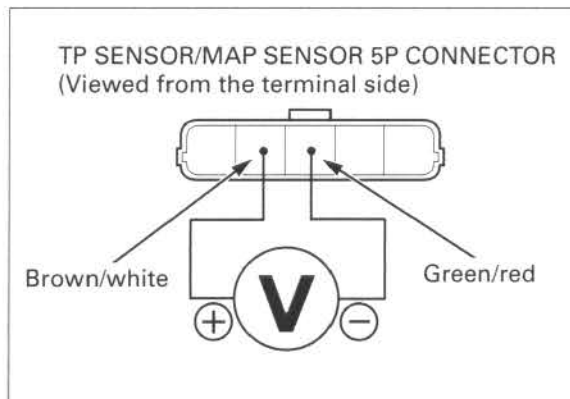
### 3. TP Sensor Input Voltage Inspection

Turn the ignition switch to OFF.  
Disconnect the TP sensor/MAP sensor 5P connector.  
Turn the ignition switch to ON.  
Measure the voltage between the wire harness side 5P connector terminals.

**Connection:** Brown/white (+) – Green/red (–)

#### Is the voltage within 4.75 – 5.25 V?

- YES** – GO TO STEP 5.
- NO** – GO TO STEP 4.





## 4. TP Sensor Input Line Open Circuit Inspection

Turn the ignition switch to OFF.  
Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the wire harness side 5P connector and 33P gray connector terminals.

### Connection:

'07 - '08: Brown/green (B3) - Brown/white

After '08: Brown/white (B3) - Brown/white

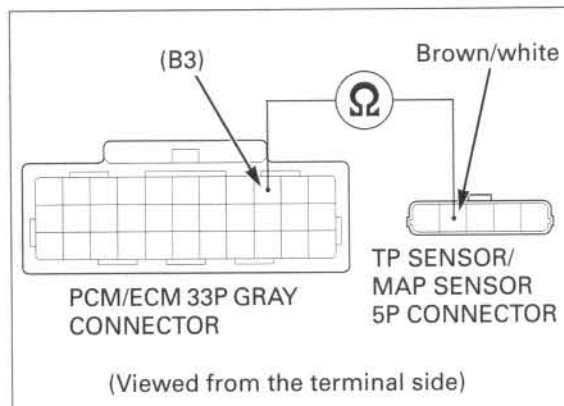
### TOOL:

Test probe 07ZAJ-RDJA110

### Is there continuity?

**YES** - Replace the PCM/ECM with a known good one, and recheck.

**NO** - Open circuit in the wire between the 5P connector and 33P connector.



## 5. TP Sensor Output Line Open Circuit Inspection

Turn the ignition switch to OFF.  
Disconnect the PCM/ECM 33P gray connector.  
Check the Blue/Black wire for continuity between the wire harness side 5P connector and 33P gray connector terminals.

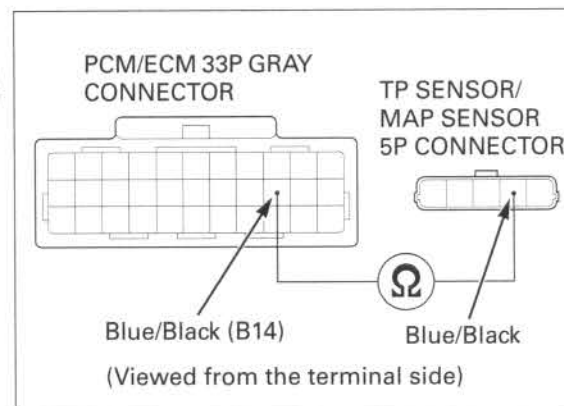
### TOOL:

Test probe 07ZAJ-RDJA110

### Is there continuity?

**YES** - GO TO STEP 6.

**NO** - Open circuit in the Blue/Black wire.



## 6. TP Sensor Output Line Short Circuit Inspection

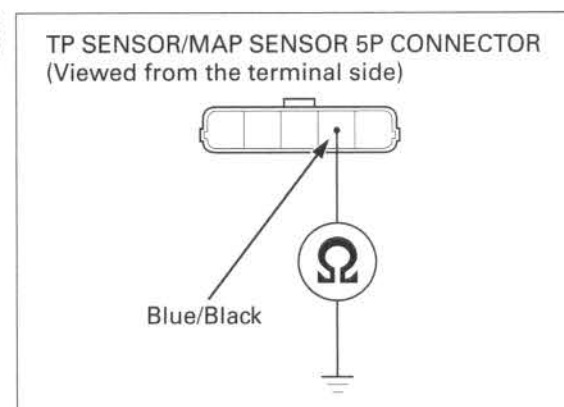
Check the Blue/Black wire for continuity between the wire harness side 5P connector terminal and ground.

**Connection:** Blue/Black - ground

### Is there continuity?

**YES** - Short circuit in the Blue/Black wire.

**NO** - GO TO STEP 7.



## 7. TP Sensor Inspection

Replace the TP sensor/MAP sensor with a known good one (page 6-50).  
Reset the PCM/ECM (page 6-16).  
Turn the ignition switch to ON.  
Check the TP sensor with the HDS pocket tester.

### Is DTC 8-1 indicated?

**YES** - Replace the PCM/ECM with a known good one, and recheck.

**NO** - Faulty original TP sensor/MAP sensor.



**DTC 8-2 (TP SENSOR HIGH VOLTAGE)****1. TP Sensor System Inspection**

Turn the ignition switch to ON.  
Check the TP sensor with the HDS pocket tester with the throttle fully closed.

**Is about 5 V indicated?**

**YES** – GO TO STEP 3.

**NO** – GO TO STEP 2.

**2. TP Sensor Inspection**

Check that the TP sensor voltage increases continuously when the throttle is moved to fully closed position to fully open position, using the data list menu of the HDS pocket tester.

**Does the voltage increase continuously?**

**YES** – Intermittent failure.

**NO** – Faulty TP sensor.

**3. TP Sensor Resistance Inspection**

Turn the ignition switch to OFF.  
Disconnect the TP sensor/MAP sensor 5P connector.

Measure the resistance between the TP sensor side connector terminals.

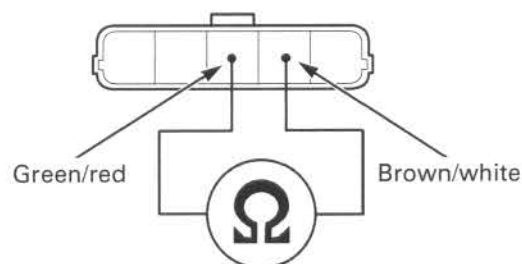
**Connection: Brown/white – Green/red**

**Is the resistance within 1.0 – 3.0 k $\Omega$**

**YES** – GO TO STEP 4.

**NO** – Faulty TP sensor.

TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)

**4. TP Sensor Input Voltage Inspection**

Turn the ignition switch to ON.  
Measure the voltage between the wire harness side 5P connector terminals.

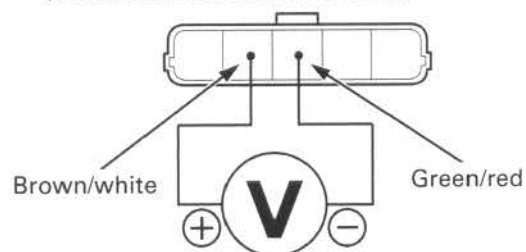
**Connection: Brown/white (+) – Green/red (–)**

**Is the voltage within 4.75 – 5.25 V?**

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Open circuit in the Green/red or Green/orange wire.

TP SENSOR/MAP SENSOR 5P CONNECTOR  
(Viewed from the terminal side)





### DTC 9-1 (IAT SENSOR LOW VOLTAGE)

#### 1. IAT Sensor System Inspection

Turn the ignition switch to ON.  
Check the IAT sensor with the HDS pocket tester.

**Is about 0 V indicated?**

**YES** – GO TO STEP 2.

**NO** – • Intermittent failure

#### 2. IAT Sensor Inspection

Turn the ignition switch to OFF.  
Disconnect the IAT sensor 2P connector.  
Turn the ignition switch to ON.  
Check the IAT sensor with the HDS pocket tester.

**Is about 0 V indicated?**

**YES** – GO TO STEP 4.

**NO** – GO TO STEP 3.

#### 3. IAT Sensor Resistance Inspection

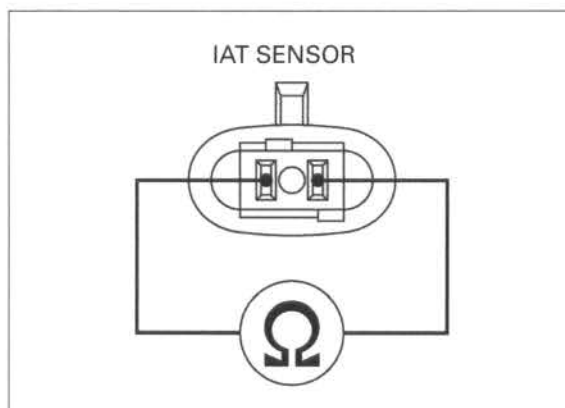
Turn the ignition switch OFF.  
Measure the resistance between the IAT sensor terminals.

**Standard: 2.2 – 2.7 k $\Omega$  (20°C/68°F)**

**Is the resistance within standard value?**

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Faulty IAT sensor.



#### 4. IAT Sensor Output Line Short Circuit Inspection

Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the wire harness side IAT sensor 2P connector terminal and ground.

**Connection:**

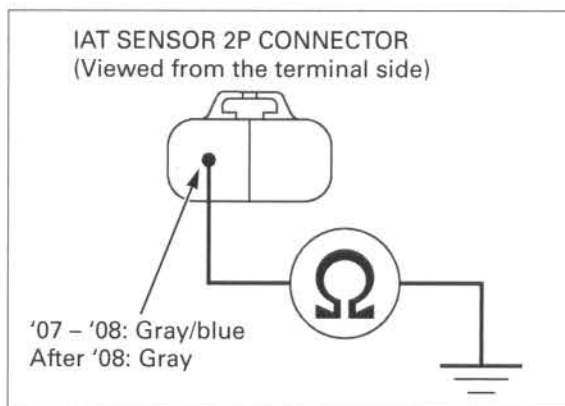
**'07 – '08: Gray/blue – ground**

**After '08: Gray – ground**

**Is there continuity?**

**YES** – Short circuit in the wire between the 2P connector and PCM/ECM.

**NO** – Replace the PCM/ECM with a known good one, and recheck.





**DTC 9-2 (IAT SENSOR HIGH VOLTAGE)**

- Before starting the troubleshooting, check the IAT sensor 2P connector for loose contacts or corroded terminals, and recheck the DTC.

**1. IAT Sensor System Inspection**

Turn the ignition switch to ON.  
Check the IAT sensor with the HDS pocket tester.

**Is about 5 V indicated?**

**YES** – GO TO STEP 2.

**NO** –

- Intermittent failure
- Loose or poorly connected IAT sensor 2P connector.

**2. IAT Sensor Inspection**

Turn the ignition switch to OFF.  
Disconnect the IAT sensor 2P connector.  
Connect the wire harness side 2P connector terminals with a jumper wire.

**Connection:**

'07 – '08: Gray/blue – Green/orange

After '08: Gray – Green/red

Turn the ignition switch to ON.  
Check the IAT sensor with the HDS pocket tester.

**Is about 0 V indicated?**

**YES** – Faulty IAT sensor

**NO** – GO TO STEP 3.

**3. IAT Sensor Open Circuit Inspection**

Turn the ignition switch to OFF.  
Remove the jumper wire.  
Disconnect the PCM/ECM 33P gray connector.  
Check for continuity between the IAT sensor 2P connector and PCM/ECM 33P gray connector terminals.

**Connection:**

'07 – '08: Green/orange (B2) – Green/orange

Gray/blue (B26) – Gray/blue

After '08: Green/red (B2) – Green/red

Gray (B26) – Gray

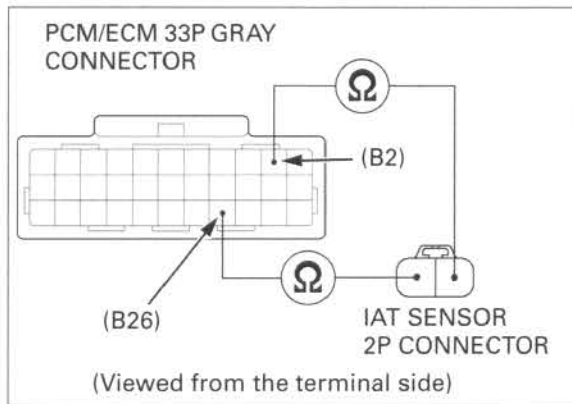
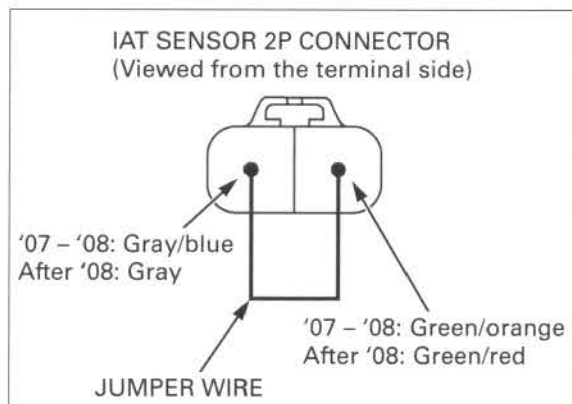
**TOOL:**

Test probe 07ZAJ-RDJA110

**Is there continuity?**

**YES** – Replace the PCM/ECM with a known good one, and recheck.

**NO** – Open circuit in the wire between the 33P connector and 2P connector.





## DTC 12-1 (FUEL INJECTOR)

- Before starting the troubleshooting, check the fuel injector 2P connector for loose contacts or corroded terminals, and recheck the DTC.

### 1. Fuel Injector System Inspection

Erase the DTC (page 6-17).

Turn the ignition switch to OFF and ON, and check the fuel injector with the HDS pocket tester.

**Is the DTC 12-1 indicated?**

**YES** – GO TO STEP 2.

- NO** –
- Intermittent failure.
  - Loose or poorly connected fuel injector 2P connector.

### 2. Fuel Injector Resistance Inspection

Turn the ignition switch to OFF.

Disconnect the fuel injector 2P connector.

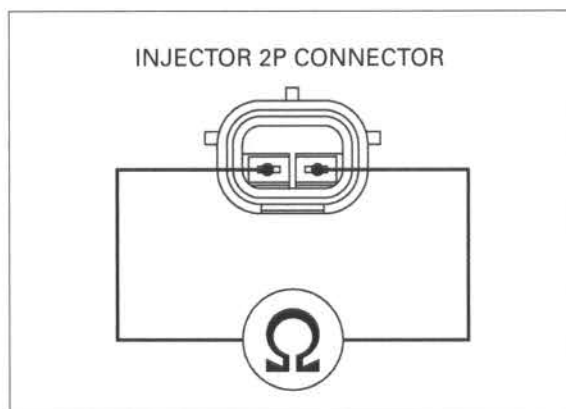
Measure the resistance between the injector connector terminals.

**Standard: 11.6 – 12.4  $\Omega$  (20°C/68°F)**

**Is the resistance within the standard values?**

**YES** – GO TO STEP 3.

**NO** – Faulty fuel injector.



### 3. Fuel Injector Input Voltage Inspection

Turn the ignition switch to ON.

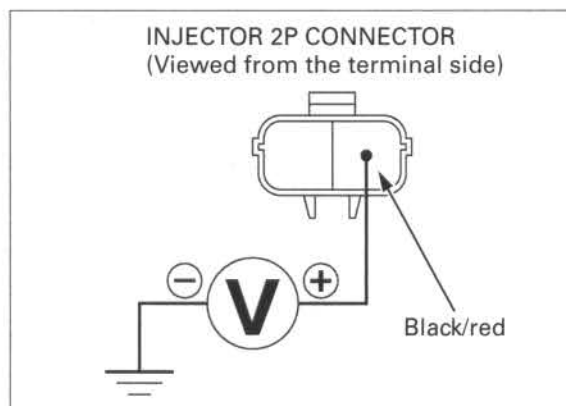
Measure the voltage between the wire harness side 2P connector terminal and ground.

**Connection: Black/red(+) – ground (–)**

**Is there battery voltage?**

**YES** – GO TO STEP 4.

**NO** – Open circuit in the Black/red wire.



### 4. Fuel Injector Signal Line Open Circuit Inspection

Turn the ignition switch to OFF.

Disconnect the PCM/ECM 33P gray connector.

Check the Green/black wire for continuity between the wire harness side injector 2P connector and PCM/ECM 33P gray connector terminals.

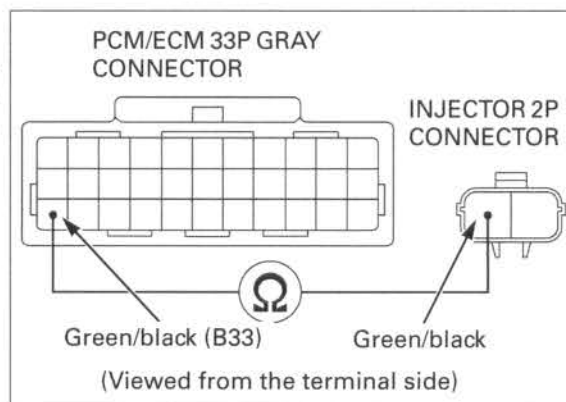
**TOOL:**

**Test probe 07ZAJ-RDJA110**

**Is there continuity?**

**YES** – GO TO STEP 5.

**NO** – Open circuit in the Green/black wire.





## 5. Fuel Injector Signal Line Short Circuit Inspection

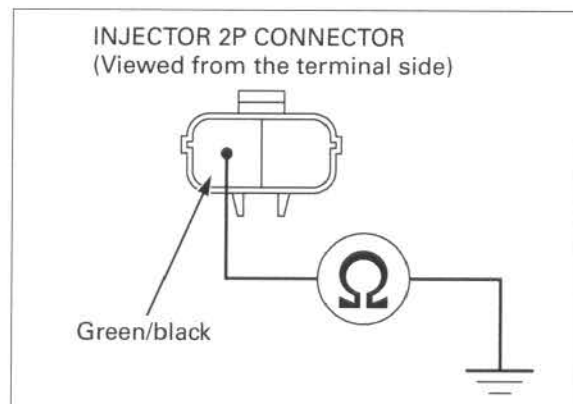
Check for continuity between the injector connector terminal and ground.

**Connection: Green/black – Ground**

*Is there continuity?*

**YES** – Short circuit in the Green/black wire.

**NO** – Replace the PCM/ECM with a known good one, and recheck.



## DTC 29-1 (IACV)

- Before starting the troubleshooting, check the IACV 4P connector for loose contacts or corroded terminals, and recheck the DTC.

### 1. DTC Recheck

Erase the DTC (page 6-17).

Start the engine and recheck the DTC with the HDS pocket tester.

*Is the DTC 29-1 indicated?*

**YES** – GO TO STEP 2.

**NO** – • Intermittent failure.  
• Loose or poorly connected IACV 2P connector.

### 2. IACV Short Circuit Inspection

Turn the ignition switch to OFF.

Disconnect the IACV 4P connector.

Check for continuity between the wire harness side 4P connector terminals and ground.

**Connection:**

**'07 – '08:** Black/gray – Ground  
Brown/blue – Ground  
Brown/yellow – Ground  
Brown/orange – Ground

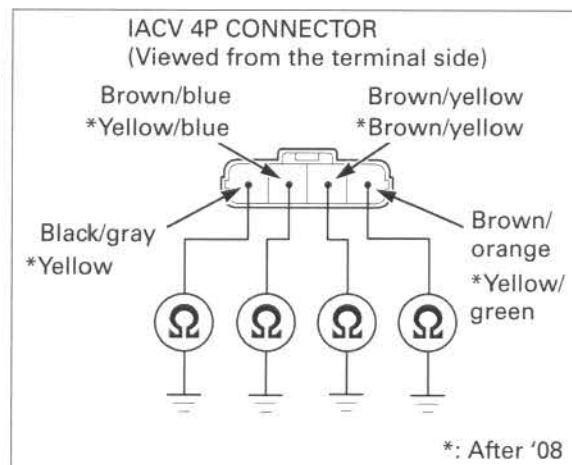
**After '08:** Yellow – Ground  
Yellow/blue – Ground  
Brown/yellow – Ground  
Yellow/green – Ground

*Is there continuity?*

**YES** – Short circuit in the following:

- '07 – '08:
  - Black/gray or Brown/orange wire.
  - Brown/blue or Brown/yellow wire.
- After '08:
  - Yellow or Yellow/green wire.
  - Yellow/blue or Brown/yellow wire.

**NO** – GO TO STEP 3.





## FUEL SYSTEM (PGM-FI)

### 3. IACV Circuit Continuity Inspection

Disconnect the PCM/ECM 33P gray connector. Check the IACV wires for continuity between the wire harness side 33P gray connector and 4P connector terminals.

**TOOL:**

**Test probe** 07ZAJ-RDJA110

**Connection:**

'07 - '08: Black/gray (B20) - Black/gray  
Brown/orange (B32) - Brown/orange  
Brown/blue (B30) - Brown/blue  
Brown/yellow (B31) - Brown/yellow

After '08: Yellow (B19) - Yellow  
Yellow/green (B29) - Yellow/green  
Yellow/blue (B30) - Yellow/blue  
Brown/yellow (B31) - Brown/yellow

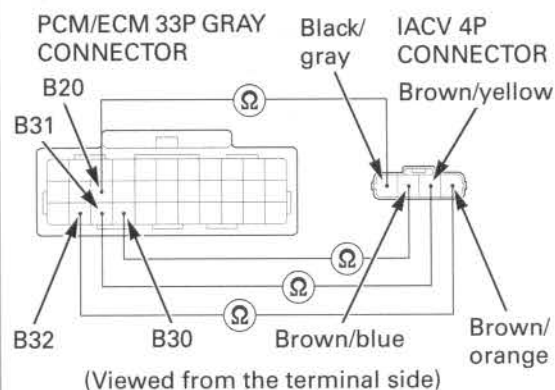
**Are there continuities?**

**YES** - GO TO STEP 4.

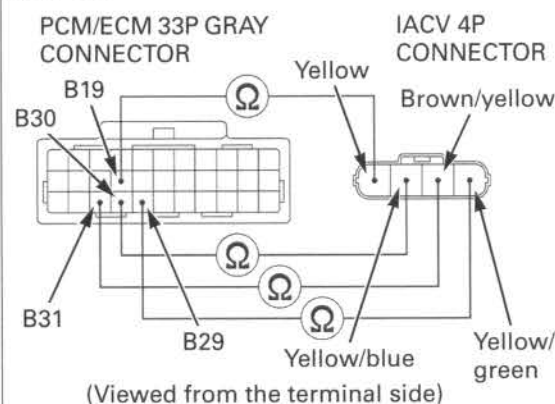
**NO** - Open circuit in the following:

- '07 - '08:
  - Black/gray or Brown/orange wire.
  - Brown/blue or Brown/yellow wire.
- After '08:
  - Yellow or Yellow/green wire.
  - Yellow/blue or Brown/yellow wire.

'07 - '08:



After '08:



### 4. IACV Resistance Inspection

Measure the resistance between the wire harness side IACV 4P connector terminals.

**Connection:**

'07 - '08: Black/gray - Brown/red  
Brown/blue - Brown/yellow

After '08: Yellow - Yellow/green  
Yellow - Brown/yellow

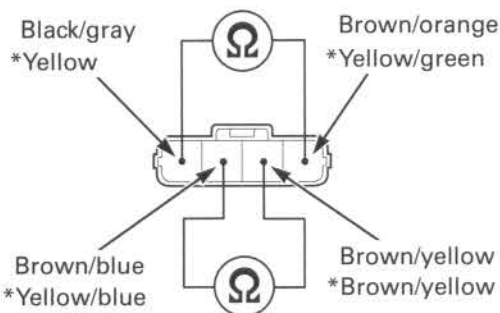
**Standard:** 120 - 140 Ω (20°C/68°F)

**Is the resistance within the standard values?**

**YES** - Replace the PCM/ECM with a known good one, and recheck.

**NO** - Faulty IACV.

IACV 4P CONNECTOR  
(Viewed from the terminal side)





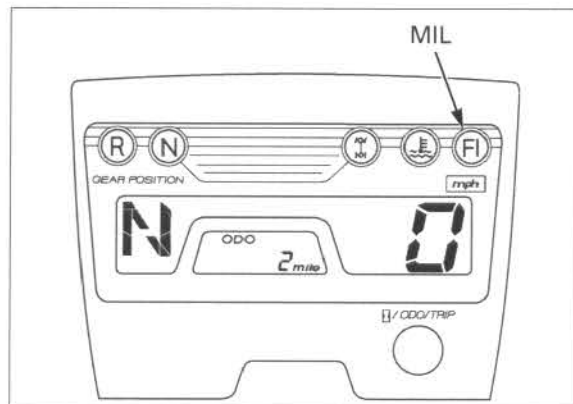
## MIL CIRCUIT INSPECTION

### TE/FE/FPM/FPE and After '07 Canada TM/FM models:

Check that the MIL comes on when the ignition switch is turned to ON.

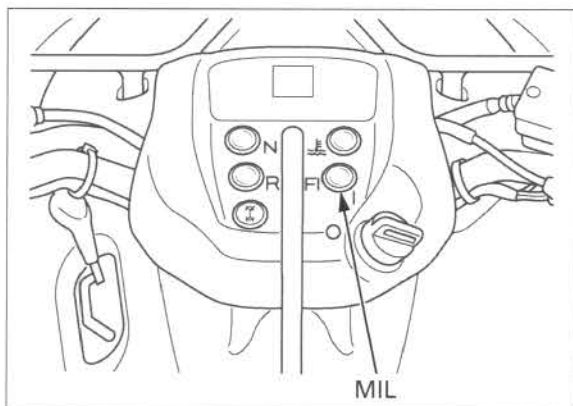
If the MIL does not come on at all, inspect the combination meter (page 22-7).

If the MIL comes on for few seconds, then goes off with the gear position indicator continuously blinking "-", check the serial communication line (page 22-8).



### '07 TM/FM and After '07 U.S.A. TM/FM models:

If the engine can be started but the MIL does not come on when the ignition switch is turned to ON, check as follows:



#### 1. Indicator Power Input Line Inspection

Check the other indicator operation.

**Do they operate properly?**

**YES** – GO TO STEP 2.

**NO** – • '07:

- Blown LIGHT fuse (10 A).
- Open circuit in the Black/brown wire between the fuse box and indicator.

• After '07:

- Blown IGN fuse (10 A).
- Open circuit in the wire between the fuse box and indicator.



## FUEL SYSTEM (PGM-FI)

### 2. MIL Line Open Circuit Inspection

Turn the ignition switch to OFF.

'07 - '08: Disconnect the ECM 33P gray connector.

After '08: Disconnect the ECM 33P black connector.

Ground the Brown/white wire terminal of the wire harness side 33P connector with a jumper wire.

**TOOL:**

**Test probe**                      **07ZAJ-RDJA110**

Turn the ignition switch to ON and check the MIL.

**Does the MIL come on?**

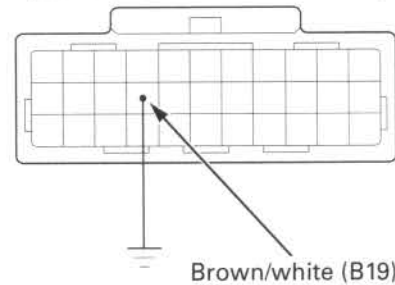
**YES** - Replace the ECM with a known good one, and recheck.

**NO** -

- Open circuit in the Brown/white wire between the ECM and MIL.
- Faulty MIL bulb.
- Open circuit in the wire between the MIL and junction connector.

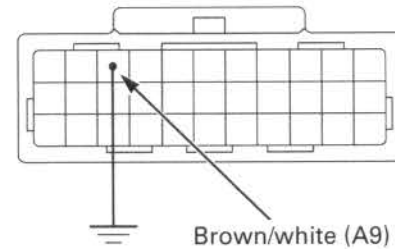
'07 - '08:

**ECM 33P GRAY CONNECTOR**  
(Viewed from the terminal side)



After '08:

**ECM 33P BLACK CONNECTOR**  
(Viewed from the terminal side)



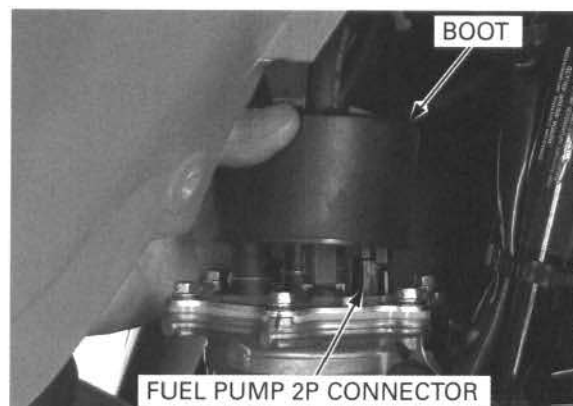


## FUEL LINE INSPECTION

### FUEL PRESSURE RELIEVING

#### NOTE:

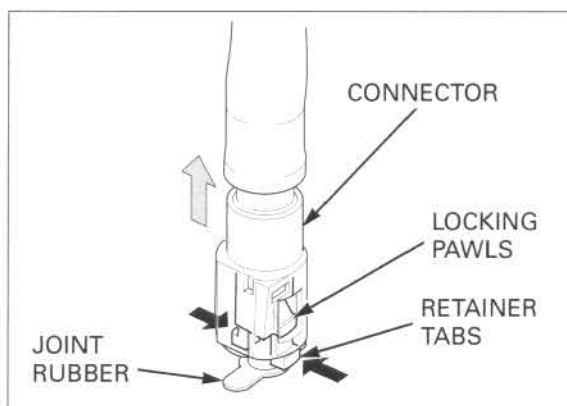
- Do not bent or kink the fuel feed hose.
1. Remove the right mudguard (page 3-6).
  2. Turn the ignition switch to OFF.
  3. Pull the rubber boot off the sub fuel tank/fuel pump assembly and disconnect the fuel pump 2P connector.
  4. Start the engine, and let it idle until it stalls.
  5. Turn the ignition switch to OFF.



### QUICK CONNECT FITTING REMOVAL

#### NOTE:

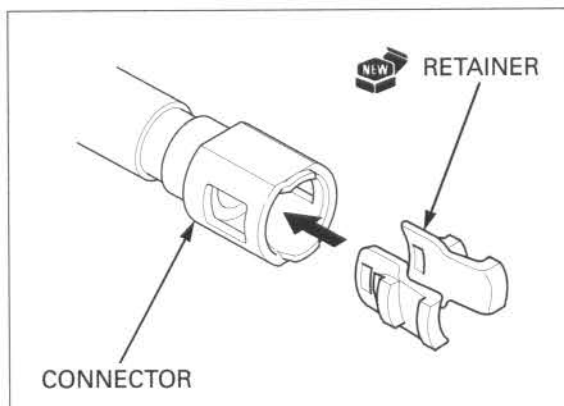
- Before removing the quick connect fitting, relieve fuel pressure from the system (page 6-33).
  - Do not bent or kink the fuel feed hose.
1. Disconnect the battery cables (page 19-6).
  2. Clean the quick connect fitting if necessary, and place a shop towel over the quick connect fitting.
  3. Hold the connector with one hand, squeeze the retainer tabs with the other hand to release the locking pawls from the connector and pull the connector off the fuel pipe.
    - Prevent the remaining fuel in the fuel feed hose from flowing out with a shop towel.
    - Be careful not to damage the feed hose, connector and fuel pipe.
    - Do not use tools.
    - If the connector does not move, keep the retainer tabs pressed down, and alternately pull and push the connector until it releases.
  4. Remove the retainer and joint rubber from the fuel pipe.
  5. To prevent damage and keep foreign matter out, cover the connector and fuel pipe with plastic bags.





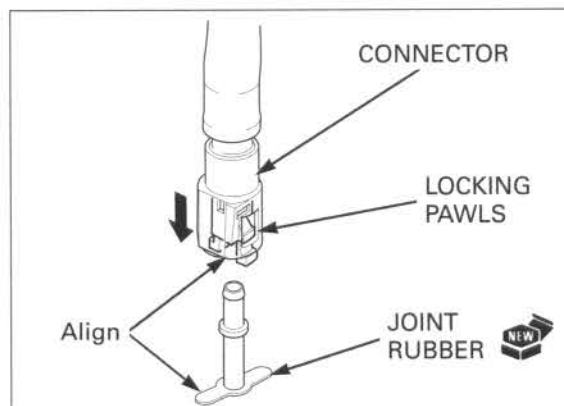
### QUICK CONNECT FITTING INSTALLATION

- Always replace the retainer and joint rubber of the quick connect fitting when the fuel feed hose is disconnected.
  - Use the same manufacture's retainer as the removed one.
  - Do not bent or kink the fuel feed hose.
1. Insert a new retainer into the connector.

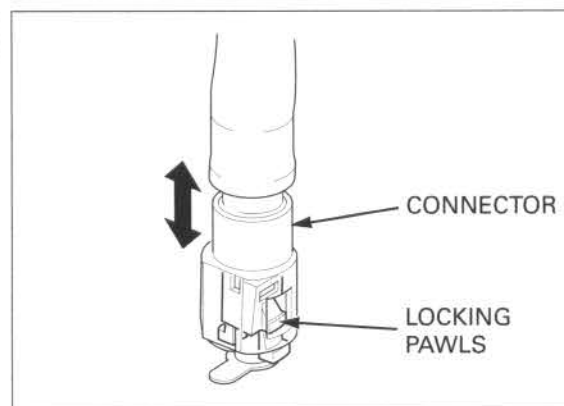


2. Install a new joint rubber to the fuel pipe.
3. Install the connector on the fuel pipe straight and align the retainer grooves with the joint rubber tabs as shown. Then press the connector onto the fuel pipe until both locking pawls click.

*If it is hard to connect the fitting, put a small amount of engine oil on the fuel pipe end.*



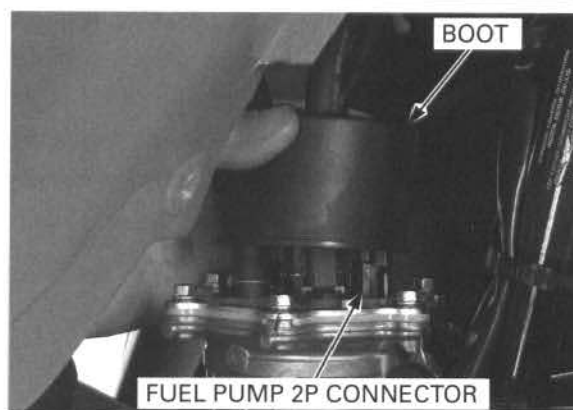
4. Make sure that the quick connect fitting is connected securely and the locking pawls are locked firmly by pulling the connector.





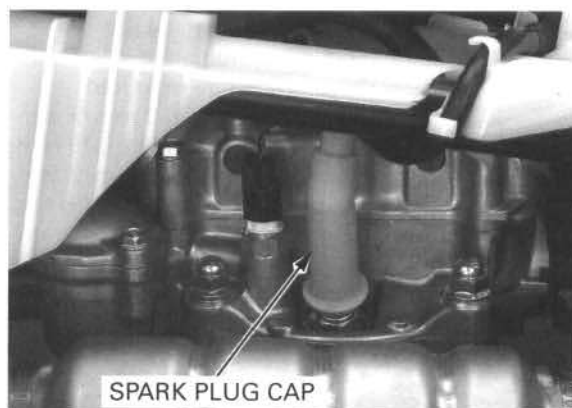
5. Connect the fuel pump 2P connector.
6. Connect the battery cables (page 19-6).
7. Make sure that the engine stop switch is turned to "O" and turn the ignition switch to ON. The fuel pump will run for about 2 seconds, and fuel pressure will rise. Turn the ignition switch to OFF.
8. Repeat step 7 two or three times, and check that there is no leakage in the fuel supply system.
9. Pull the rubber boot on the sub fuel tank/fuel pump assembly properly.
10. Install the right mudguard (page 3-6).

*Do not start the engine.*



## THROTTLE BODY COVER REMOVAL/INSTALLATION

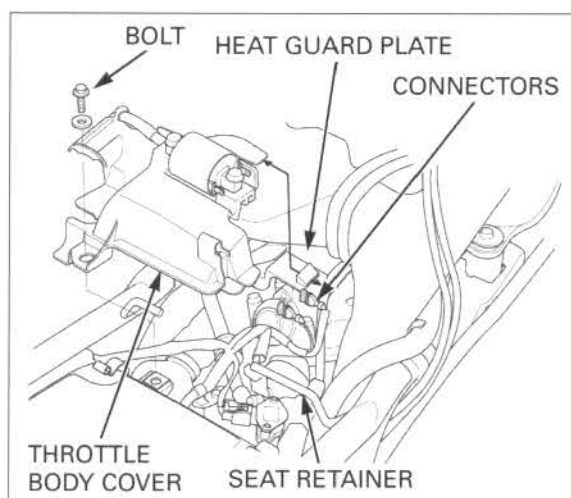
Remove the left fuel tank side cover (page 3-5).  
Disconnect the spark plug cap from the plug.



Disconnect the primary wire connectors from the ignition coil.  
Remove the bolt, washer and the throttle body cover from the heat guard plate and seat retainer.  
Installation is in the reverse order of removal.

### TORQUE:

Cover bolt: 5.2 N·m (0.53 kgf·m, 3.8 lbf·ft)





## FUEL SYSTEM (PGM-FI)

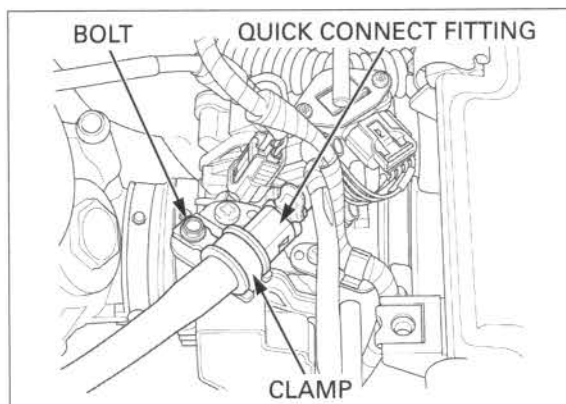
### FUEL PRESSURE INSPECTION

Relieve the fuel pressure (page 6-33).

Remove the throttle body cover (page 6-35).

Remove the bolt and fuel feed hose clamp.

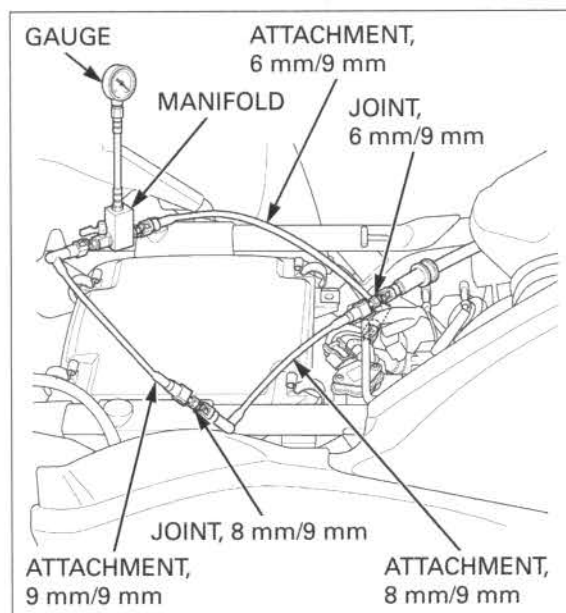
Disconnect the quick connect fitting from the fuel injector (page 6-33).



Attach the special tools between the injector and fuel feed hose.

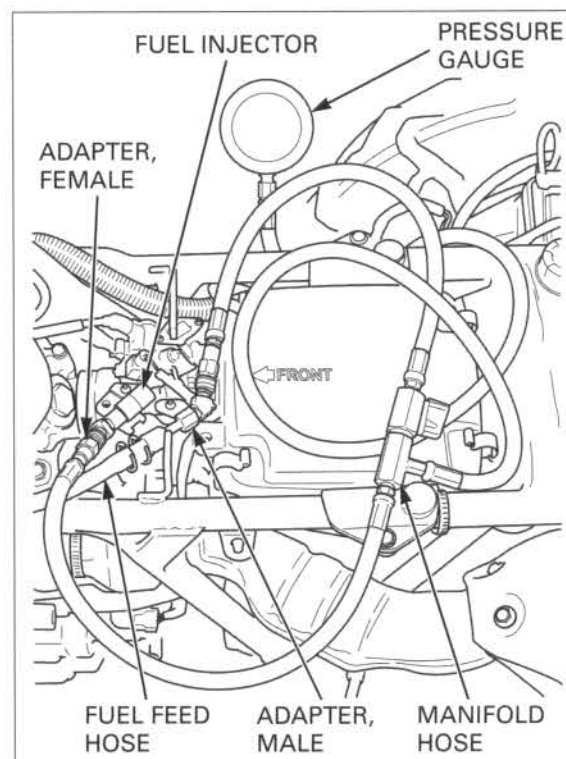
#### Except U.S.A. TOOLS:

Fuel pressure gauge	07406-0040004
Pressure gauge manifold	07ZAJ-S5A0111
Hose attachment, 9 mm/9 mm	07ZAJ-S5A0120
Hose attachment, 6 mm/9 mm	07ZAJ-S5A0130
Hose attachment, 8 mm/9 mm	07ZAJ-S7C0100
Attachment joint, 6 mm/9 mm	07ZAJ-S5A0150
Attachment joint, 8 mm/9 mm	07ZAJ-S7C0200



#### U.S.A. TOOLS:

Fuel pressure gauge, 100 psi	07406-004000B
Pressure manifold hose	07AMJ-HW3A100
Adapter, male	07AAJ-S6MA200
Adapter, female	07AAJ-S6MA400





Connect the fuel pump 2P connector.

Temporarily install the throttle body cover (page 6-35)

Connect the battery cables (page 19-6).

Start the engine and let it idle.  
Read the fuel pressure.

**Standard: 336 – 350 kPa (3.43 – 3.57 kgf/cm<sup>2</sup>,  
49 – 51 psi)**

If the fuel pressure is higher than specified pressure, replace the fuel sub tank/fuel pump assembly (faulty fuel pump or fuel pressure regulator).

If the fuel pressure is lower than specified pressure, inspect the following:

- fuel flow (page 6-37)
- pinched or clogged fuel feed hose
- fuel pump (page 6-39)

After inspection, disconnect the fuel pump 2P connector, start the engine and let it idle until it stalls to relieve the fuel pressure.

Disconnect the battery cables (page 19-6).

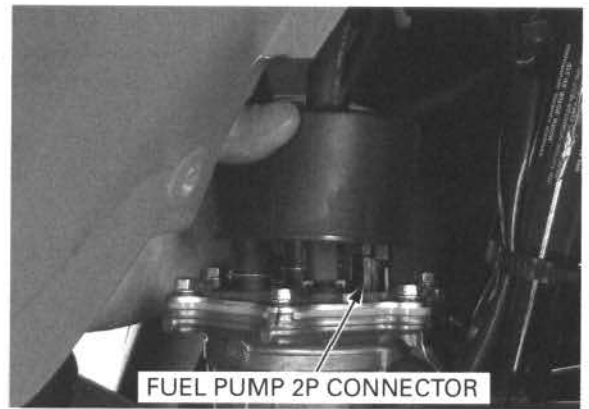
Remove the throttle body cover (page 6-35).

Remove the special tools from the fuel injector and fuel feed hose.

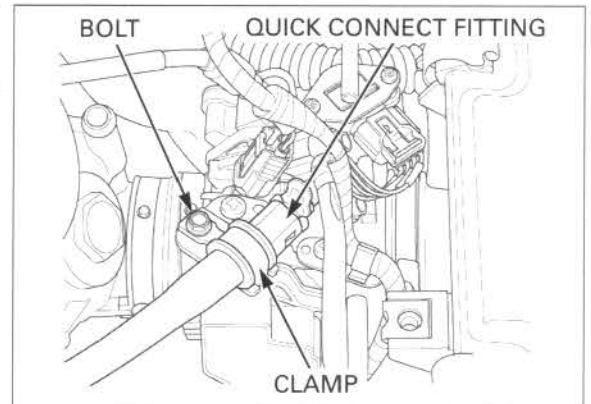
Connect the quick connect fitting to the injector (page 6-34).

Install the fuel feed hose clamp and tighten the bolt.

Install the throttle body cover (page 6-35).



*Wrap a shop towel around the attachment to soak up any spilled fuel.*



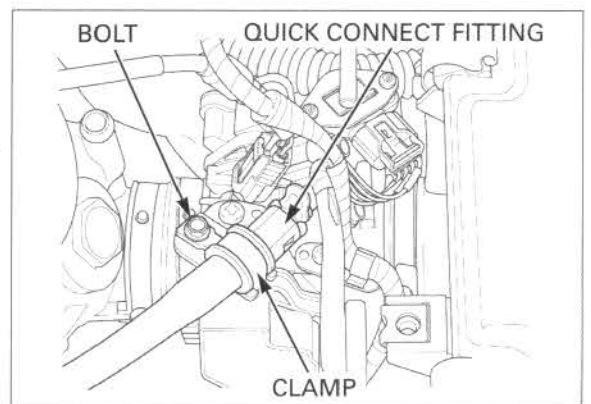
## FUEL FLOW INSPECTION

Relieve the fuel pressure (page 6-33).

Remove the throttle body cover (page 6-35).

Remove the bolt and fuel feed hose clamp.

Disconnect the quick connect fitting from the fuel injector (page 6-33).

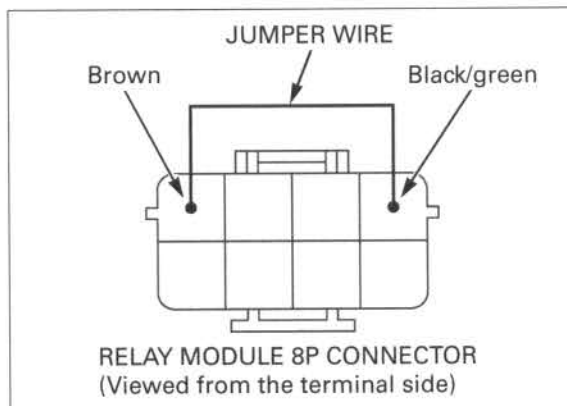




## FUEL SYSTEM (PGM-FI)

Disconnect the relay module 8P connector.

Jump the Black/green and Brown wire terminals of the wire harness side connector using a jumper wire.



Connect the special tools to the fuel feed hose.

### TOOLS:

Hose attachment, 6 mm/9 mm 07ZAJ-S5A0130

Attachment joint, 6 mm/9 mm 07ZAJ-S5A0150

Place the end of the hose attachment into an approved gasoline container.

Connect the battery cables (page 19-6).

Make sure that the engine stop switch is turned to "O" and turn the ignition switch to ON for 10 seconds.

Measure the amount of fuel flow.

### Amount of fuel flow:

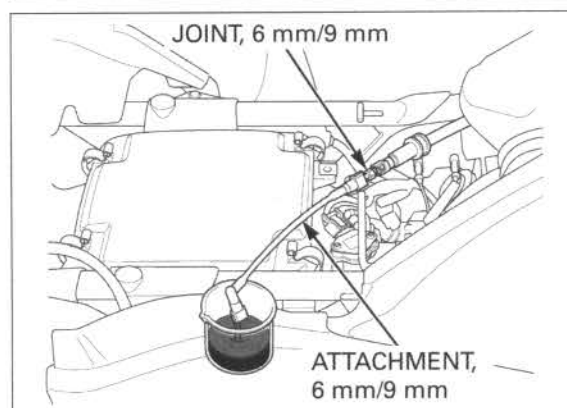
**50 cm<sup>3</sup> (1.7 US oz, 1.8 Imp oz) minimum/10 seconds at 12 V**

If the fuel flow is less than specified volume, inspect the following:

- fuel pump (page 6-39).
- pinched or clogged fuel feed hose

Turn the ignition switch to OFF.

Remove the jumper wire from the relay module 8P connector, and connect the connector.

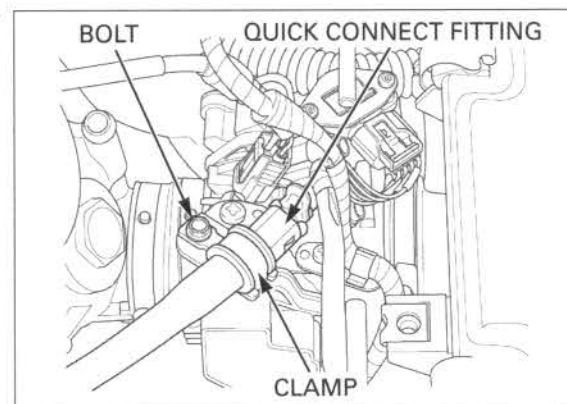


Remove the special tools from the fuel feed hose.

Connect the quick connect fitting to the injector (page 6-34).

Install the fuel feed hose clamp and tighten the bolt.

Install the throttle body cover (page 6-35).



*Wrap a shop towel around the attachment to soak up any spilled fuel.*



## SUB FUEL TANK/FUEL PUMP

### INSPECTION

Remove the right mudguard (page 3-6).

Turn the engine stop switch to "O" and ignition switch to ON, and confirm that the fuel pump operates for a few seconds.

If the fuel pump does not operate, inspect as follows:

Turn the ignition switch to OFF.

Pull the rubber boot off the sub fuel tank/fuel pump assembly and disconnect the fuel pump 2P connector.

Turn the ignition switch to ON and measure the voltage between the wire harness side 2P connector terminals.

**Connection: Brown (+) – Green (–)**

There should be battery voltage for a few seconds after the ignition switch turned to ON.

If there is battery voltage, replace the sub fuel tank/fuel pump assembly.

If there is no voltage, check the following:

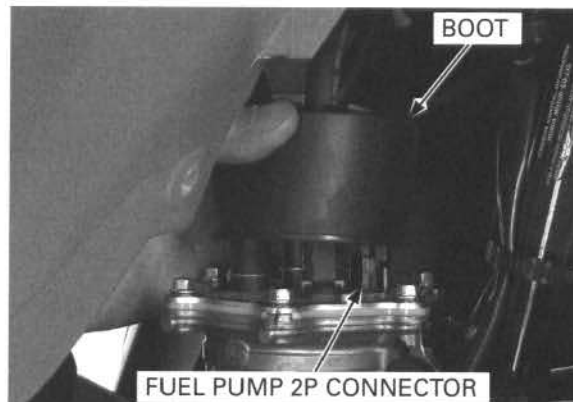
- open circuit in the Brown wire and/or Green wire
- IGN fuse (10 A)
- relay module (page 6-40) and its circuits
- bank angle sensor (page 6-54) and its circuits
- engine stop switch line of the PCM/ECM (page 6-56)
- power/ground lines of the PCM/ECM (page 6-55)

### REMOVAL

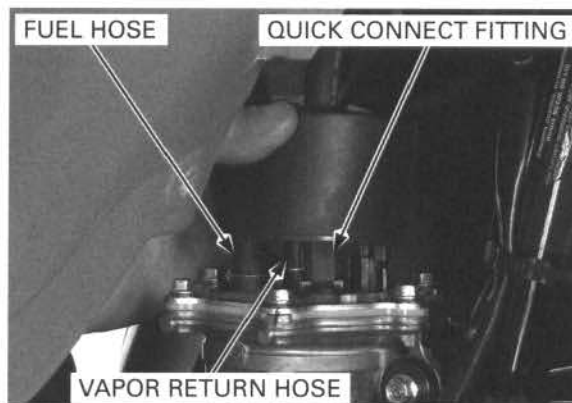
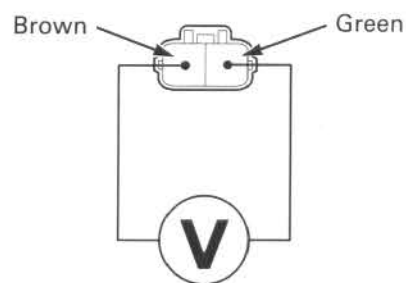
Relieve the fuel pressure (page 6-33).

Disconnect the quick connect fitting from the sub fuel tank/fuel pump assembly (page 6-33).

Disconnect the fuel hose and fuel vapor return hose.



FUEL PUMP 2P CONNECTOR  
(Viewed from the terminal side)





## FUEL SYSTEM (PGM-FI)

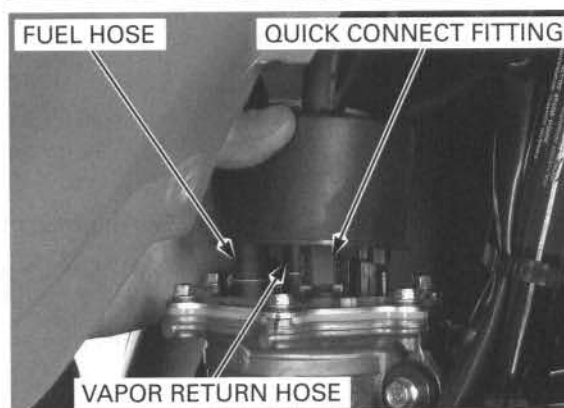
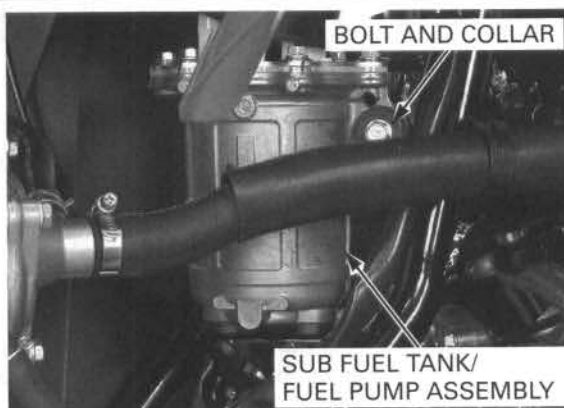
*Do not disassemble the sub fuel tank/fuel pump assembly.* Remove the bolt, collar and the sub fuel tank/fuel pump assembly from the frame.

### INSTALLATION

Install the sub fuel tank/fuel pump assembly onto the frame by aligning the bosses with the mounting grommets.

Connect the fuel vapor return hose and fuel hose to the sub fuel tank/fuel pump assembly.

Connect the quick connect fitting to the sub fuel tank/fuel pump assembly (page 6-34).

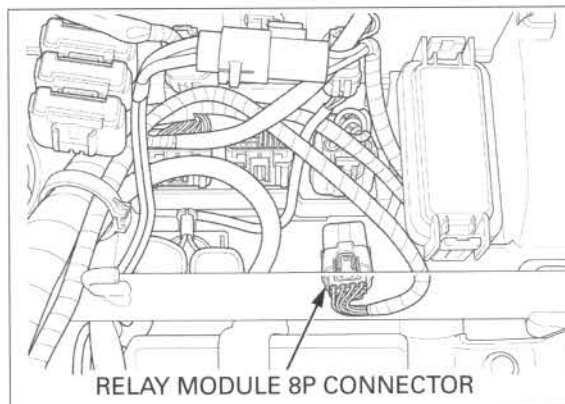


## RELAY MODULE

### INSPECTION

Remove the rear fender cover (page 3-9).

Disconnect the relay module 8P connector.

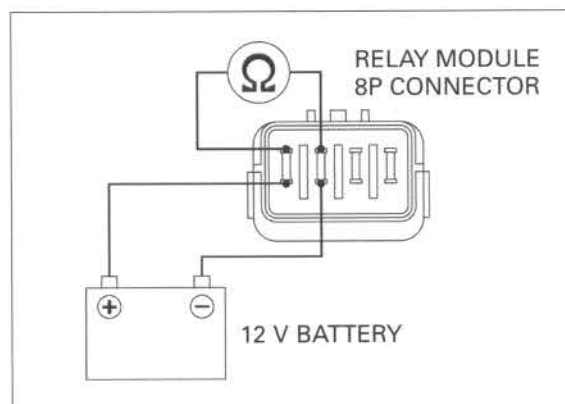


### ENGINE STOP RELAY

Connect an ohmmeter and 12 V battery to the relay module side 8P connector terminals as shown.

There should be continuity with the battery connected and no continuity with the battery disconnected.

If the test result is abnormal, replace the relay module.



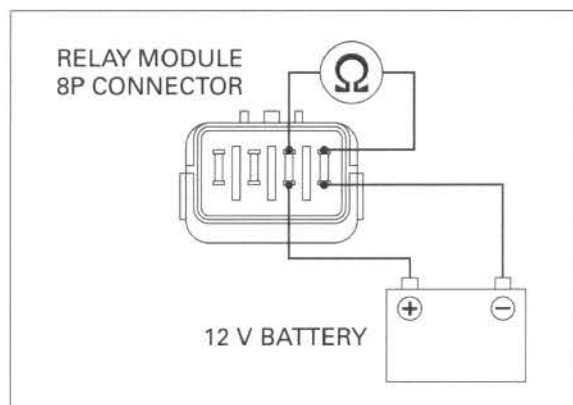


### FUEL PUMP RELAY

Connect an ohmmeter and 12 V battery to the relay module side 8P connector terminals as shown.

There should be continuity with the battery connected and no continuity with the battery disconnected.

If the test result is abnormal, replace the relay module.



## FUEL TANK

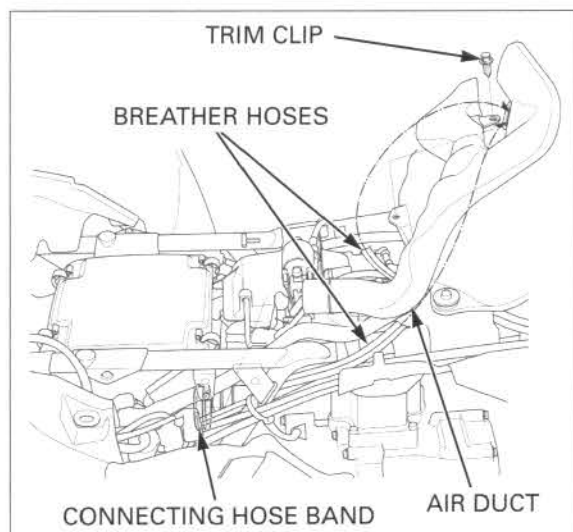
### REMOVAL

Remove the fuel tank cover (page 3-6).

Loosen the connecting hose band screw.

Remove the breather hoses from the intake air duct.

Remove the trim clip and intake air duct.



Disconnect the fuel tank breather hose from the handlebar cover.

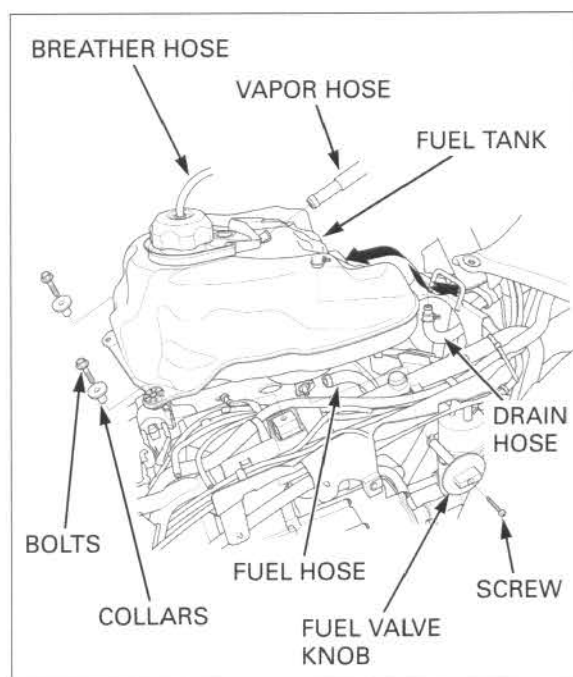
Disconnect the fuel vapor hose from the fuel tank  
FPM/FPE only: Disconnect the fuel drain hose from the fuel filler tray.

Turn the fuel valve to OFF.

Remove the screw and fuel valve knob.

Remove the two mounting bolts and flange collars.

Disconnect the fuel hose from the fuel valve and remove the fuel tank from the frame.



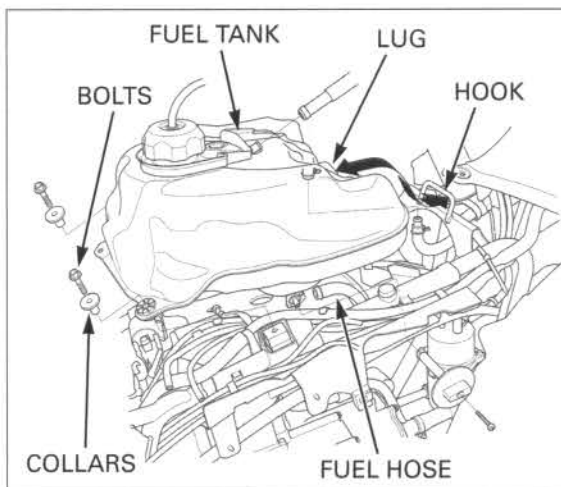


## FUEL SYSTEM (PGM-FI)

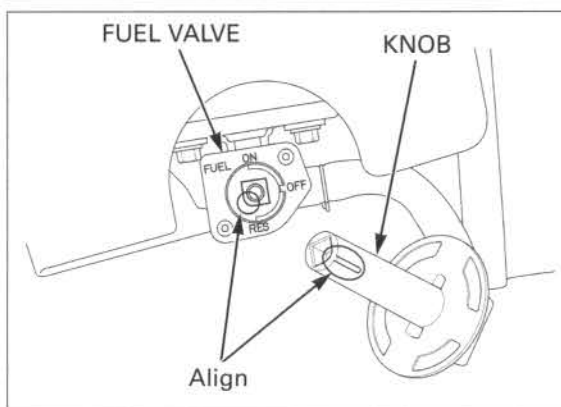
### INSTALLATION

Install the fuel tank onto the frame and connect the fuel hose to the fuel valve.

Install the two flange collars and mounting bolts, and tighten the bolts.



Install the fuel valve knob onto the fuel valve by aligning the round edges of the shaft hole and shaft.



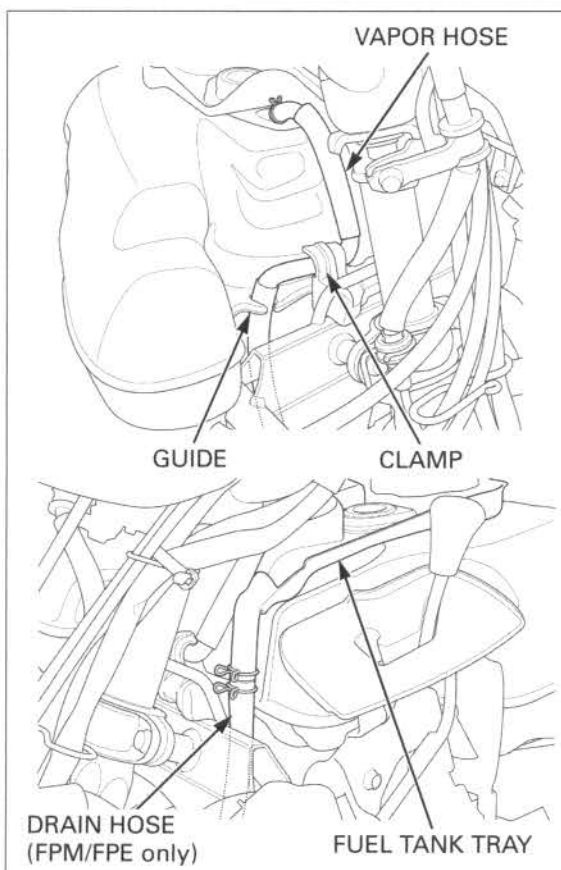
Connect the fuel vapor hose to the fuel tank and install it into the clamp and guide as shown.

FPM/FPE only: Connect the fuel drain hose to the fuel filler tray.

Install the removed parts in the reverse order of removal.

#### NOTE:

- After installing the fuel tank, turn the ignition switch ON and check that there is no fuel leak.





## FUEL STRAINER SCREEN CLEANING

Remove the fuel tank (page 6-41).

Drain the gasoline into an approved fuel container. Remove the two mounting bolts, collars and the fuel valve from the fuel tank.

Remove the O-ring and fuel strainer screen from the fuel valve.

Clean the strainer screen with non-flammable or high flash point solvent.

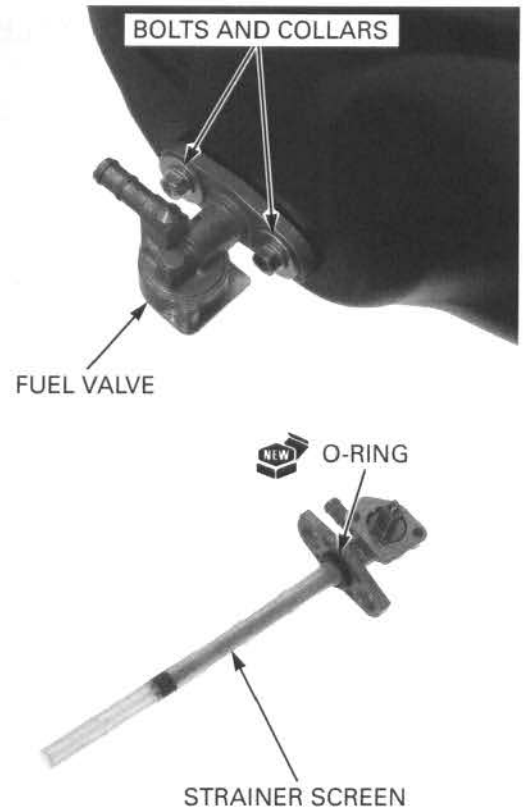
Dry the strainer screen thoroughly.

Install the strainer screen and a new O-ring onto the fuel valve.

Install the fuel valve onto the fuel tank.

Install the collars and mounting bolts, and tighten the bolts securely.

Install the fuel tank (page 6-41).



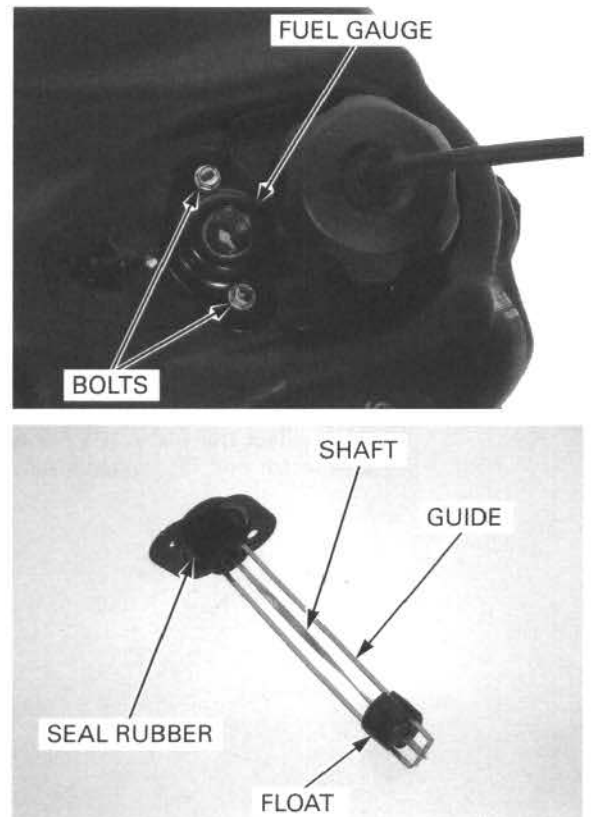
## FUEL LEVEL GAUGE INSPECTION

Remove the two bolts and fuel gauge from the fuel tank.

Check the float, guide and gauge shaft for damage.

Check the fuel gauge operation by moving the float.

Make sure that the seal rubber is in good condition, install the fuel gauge and tighten the two bolts.





## AIR CLEANER HOUSING

### REMOVAL/INSTALLATION

Remove the following:

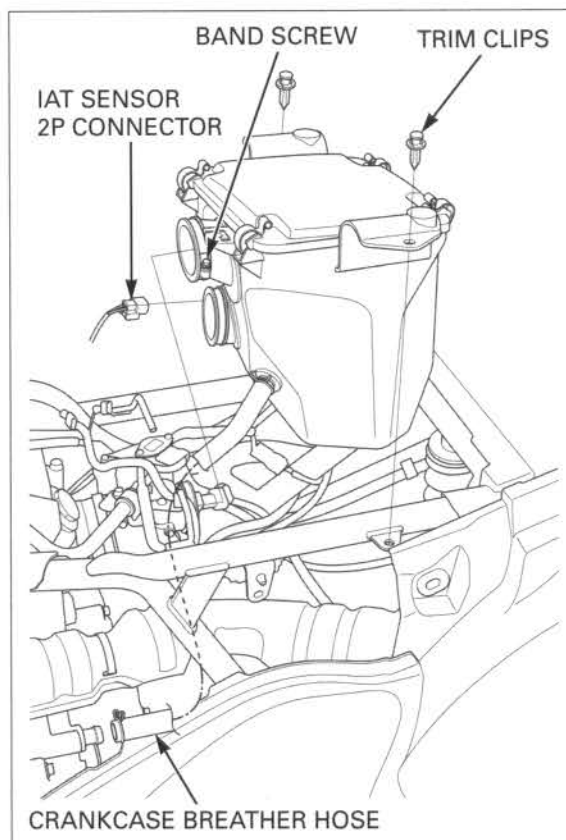
- intake air duct (page 6-41)
- throttle body cover (page 6-35)

Disconnect the IAT sensor 2P connector and crankcase breather hose.

Loosen the connecting hose band screw.

Remove the two trim clips and the air cleaner housing.

Installation is in the reverse order of removal.



## THROTTLE BODY

### NOTE:

- If the TP sensor/MAP sensor is removed from the throttle body, the TP sensor reset procedure must be performed after installing the throttle body (page 6-52).

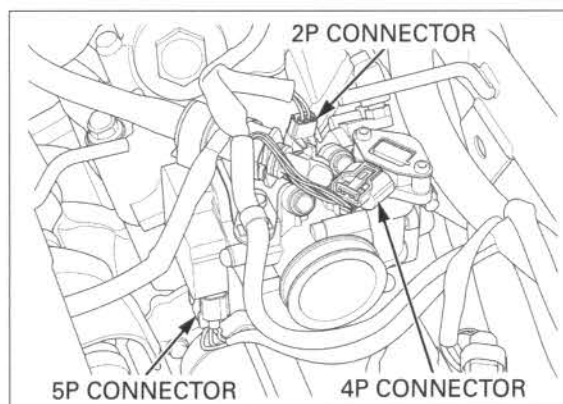
### REMOVAL

Relieve the fuel pressure (page 6-33).

Remove the following:

- throttle body cover (page 6-35)
- air cleaner housing (page 6-44)

Disconnect the IACV 4P connector, fuel injector 2P connector and TP sensor/MAP sensor 5P connector.

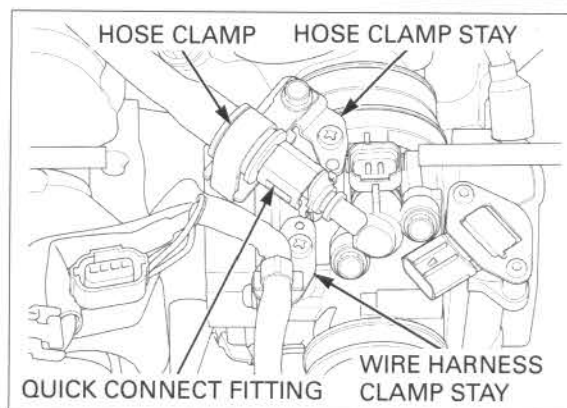




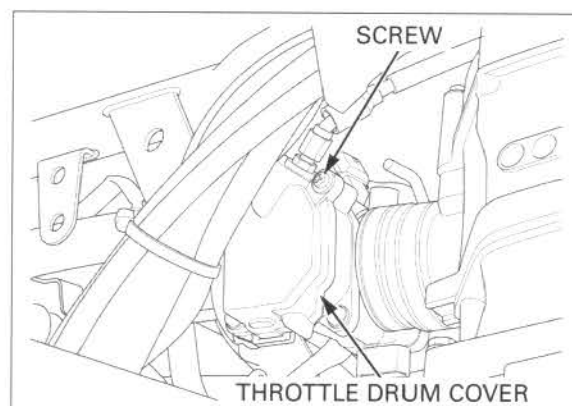
Remove the screw and wire harness clamp stay.  
Remove the bolt and fuel feed hose clamp.

Disconnect the quick connect fitting from the fuel injector (page 6-33).

Remove the screw and feed hose clamp stay.

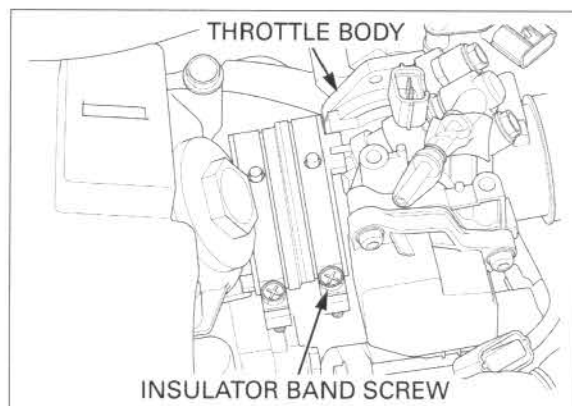


Remove the screw and throttle drum cover.

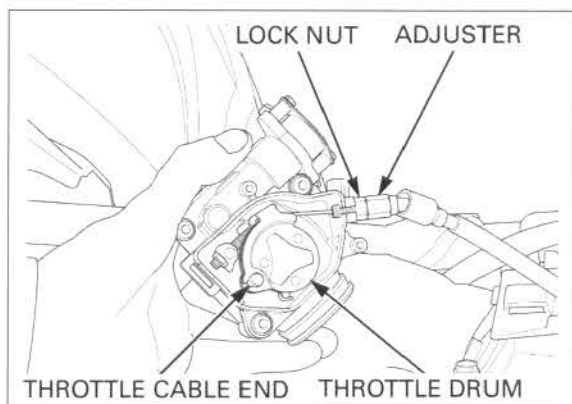


Loosen the insulator band screw.

Remove the throttle body from the insulator.



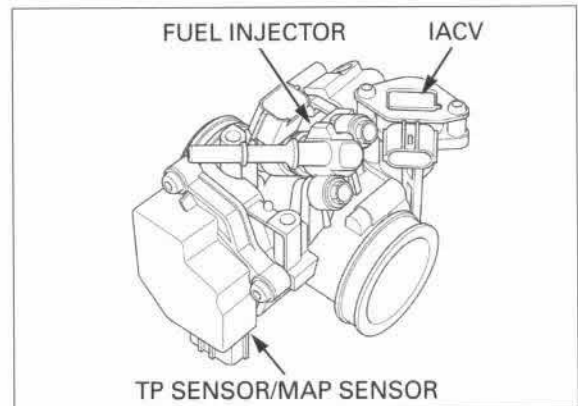
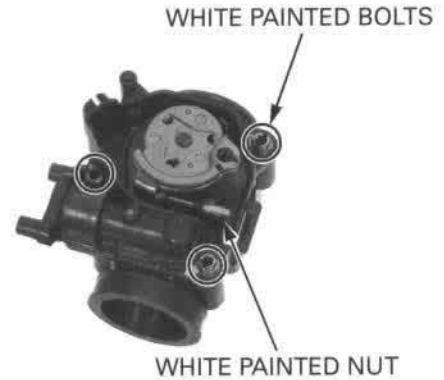
Loosen the throttle cable adjuster lock nut, remove the adjuster from the throttle body and disconnect the cable end from the throttle drum.





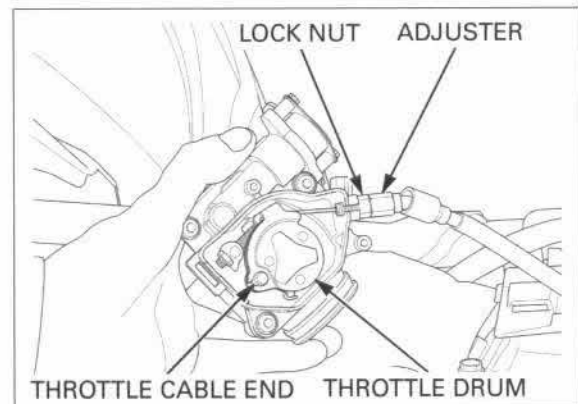
**NOTE:**

- Do not loosen or tighten the white painted bolts and nut.
- IACV replacement (page 6-48)
- fuel injector replacement (page 6-49)
- TP sensor/MAP sensor replacement (page 6-50)

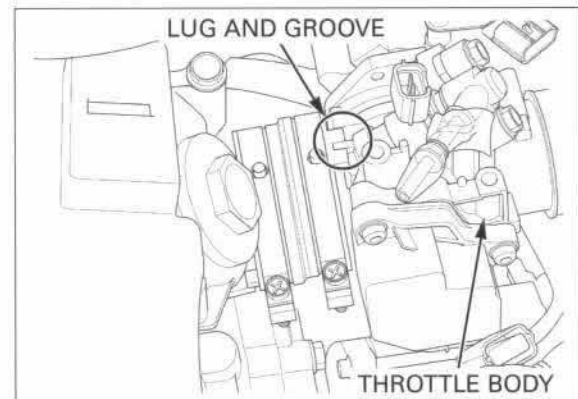


### INSTALLATION

Connect the throttle cable end to the throttle drum. Install the throttle cable adjuster into the throttle body and temporarily tighten the lock nut.

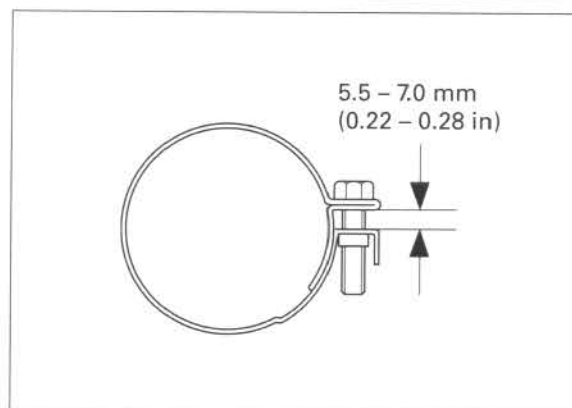


Install the throttle body into the insulator by aligning the lug with the groove.



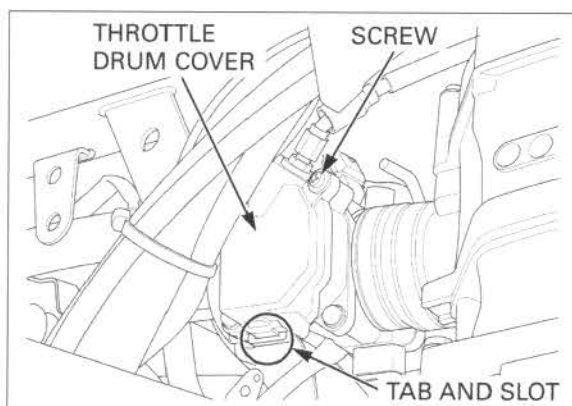


Tighten the insulator band screw so that the distance between the band tabs is as shown.



Install the throttle drum cover by aligning the locating tab with the slot in the throttle body. Install and tighten the screw.

**TORQUE: 1.8 N·m (0.18 kgf·m, 1.3 lbf·ft)**



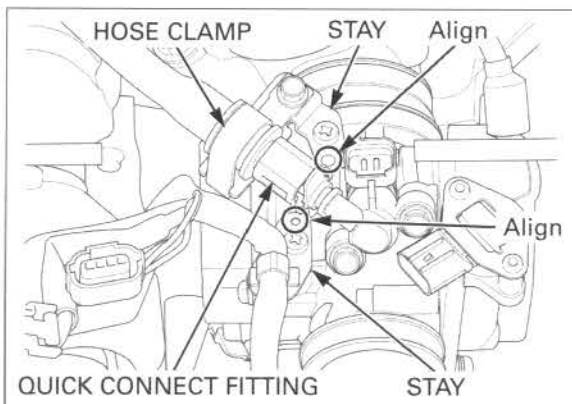
*Raise the fuel pressure after connecting the injector 2P connector.*

Connect the quick connect fitting to the fuel injector (page 6-34).

Install the fuel feed hose clamp stay by aligning the hole with the pin of the throttle body, and tighten the screw.

Install the fuel feed hose clamp and tighten the bolt. Install the wire harness clamp stay by aligning the hole with the pin of the throttle body, and tighten the screw.

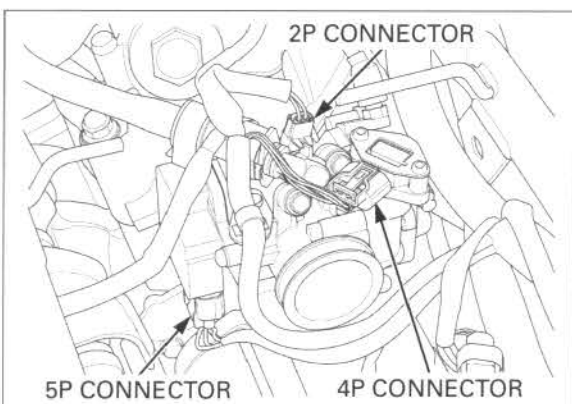
**TORQUE: 3.4 N·m (0.35 kgf·m, 2.2 lbf·ft)**



Connect the IACV 4P connector, fuel injector 2P connector and TP sensor/MAP sensor 5P connector.

Install the following:

- air cleaner housing (page 6-44)
- throttle body cover (page 6-35)





### IACV

#### INSPECTION

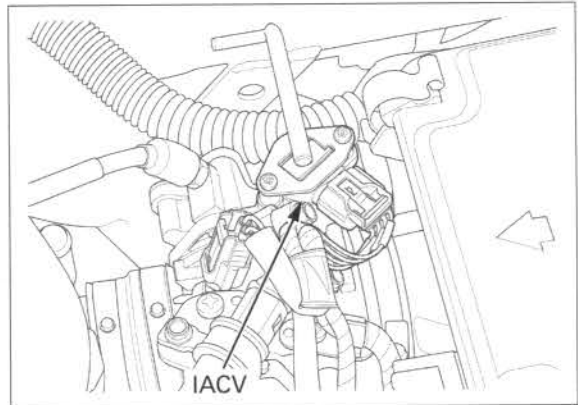
**NOTE:**

- The IACV is installed on the throttle body and is operated by the step motor. When the ignition switch is turned ON, the IACV operates for a few seconds.

Remove the throttle body cover (page 6-35).

Turn the ignition switch to ON and check the IACV. If the step motor operating (beep) sound is heard, the IACV is normal.

*The IACV operation can be checked visually by removing the IACV with the connector connected.*



#### REPLACEMENT

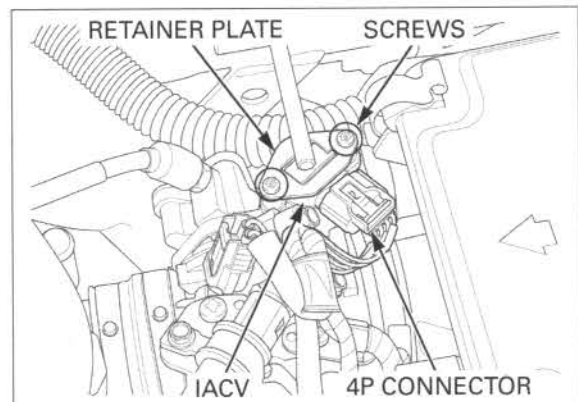
Remove the throttle body cover (page 6-35).

Clean the throttle body to prevent dirt and debris from entering the IACV passage.

Turn the ignition switch to OFF.

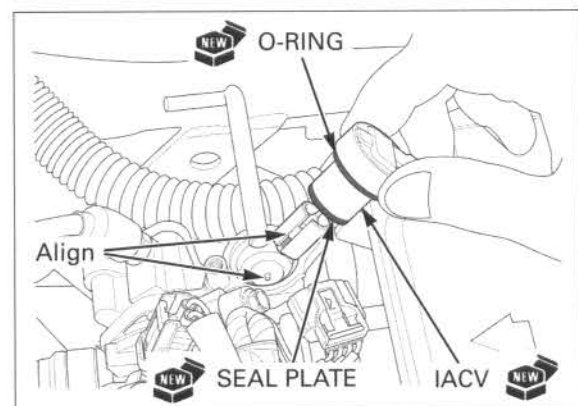
Disconnect the IACV 4P connector.

Remove the two torx screws (T20), retainer plate and IACV.



Install new O-ring and seal plate onto a new IACV.

Install the IACV into the throttle body by aligning the valve slit with the guide pin in the throttle body.





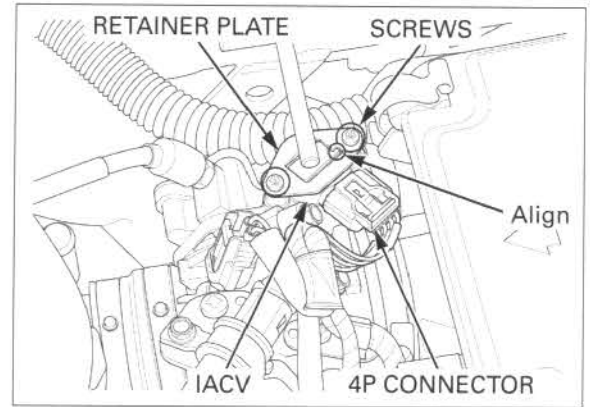
Install the retainer plate by aligning the groove with the valve boss.

Install and tighten the two torx screws (T20).

**TORQUE: 2.1 N·m (0.21 kgf·m, 1.5 lbf·ft)**

Connect the IACV 4P connector.

Install the throttle body cover (page 6-35).



## FUEL INJECTOR

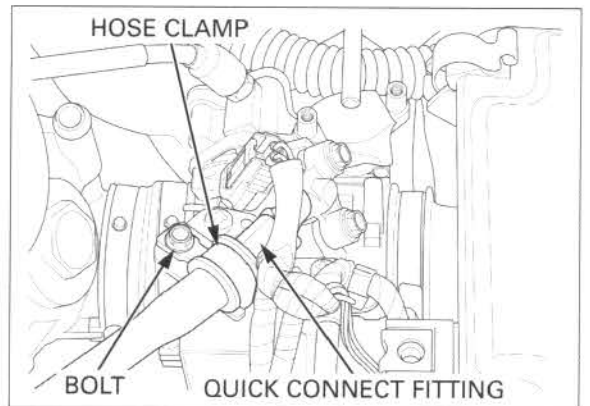
### REPLACEMENT

Relieve the fuel pressure (page 6-33).

Remove the IACV (page 6-48).

Remove the bolt and fuel feed hose clamp.

Disconnect the quick connect fitting from the fuel injector (page 6-33).

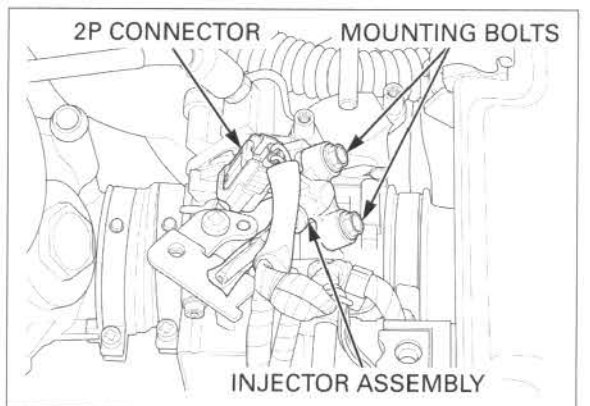


Clean around the injector base with compressed air and be sure that no debris is allowed to enter the combustion chamber.

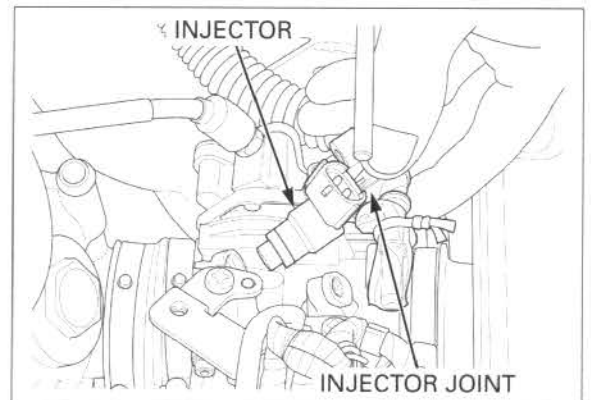
Disconnect the injector 2P connector.

Remove the injector mounting bolts.

Remove the fuel injector assembly from the throttle body.



Remove the injector joint from the injector.

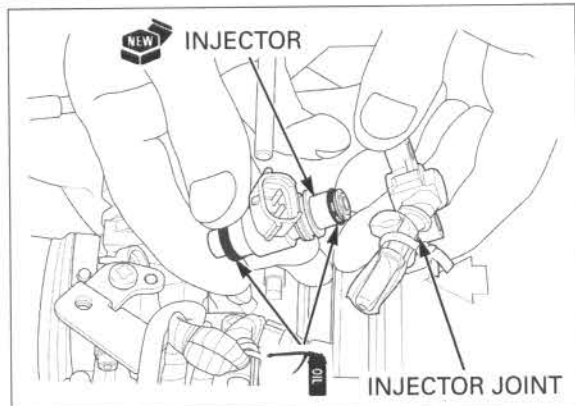




## FUEL SYSTEM (PGM-FI)

Apply engine oil to new injector O-ring and seal ring.

Install the injector joint onto the injector being careful not to damage the O-ring.

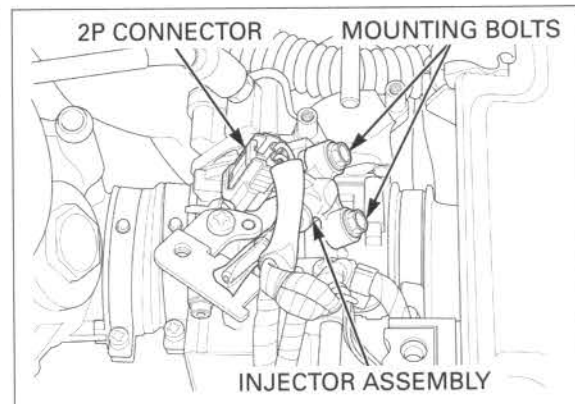


Install the fuel injector assembly into the throttle body being careful not to damage the seal ring.

Install the injector mounting bolts and tighten them.

**TORQUE: 5.1 N·m (0.53 kgf·m, 3.8 lbf·ft)**

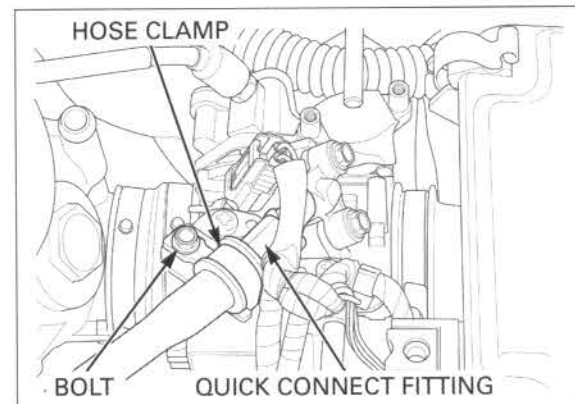
Connect the injector 2P connector.



Connect the quick connect fitting to the fuel injector (page 6-34).

Install the fuel feed hose clamp and tighten the bolt.

Remove the IACV (page 6-48).



## TP SENSOR/MAP SENSOR

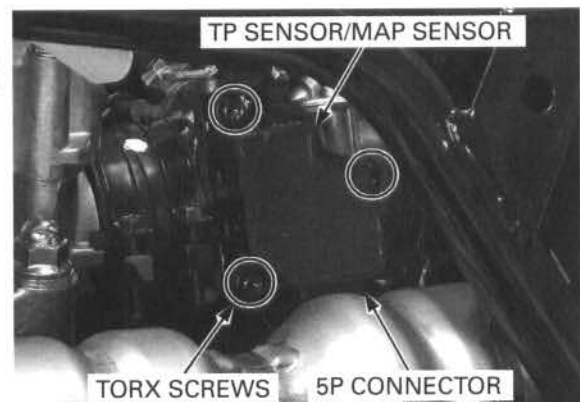
### REPLACEMENT

#### NOTE:

- After replacing the TP sensor/MAP sensor, the TP sensor reset procedure must be performed.

Remove the throttle body cover (page 6-35).

Disconnect the TP sensor/MAP sensor 5P connector. Remove the three torx screws (T25) and the TP sensor/MAP sensor from the throttle body.





Install a new O-ring into the groove of the throttle body.

Install the a new MAP sensor/TP sensor onto the throttle body by aligning the slot with the throttle shaft end.

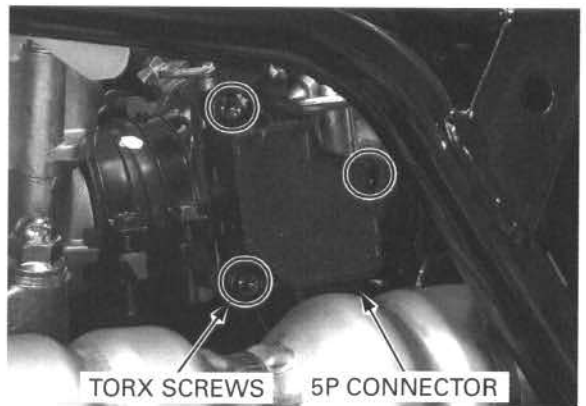
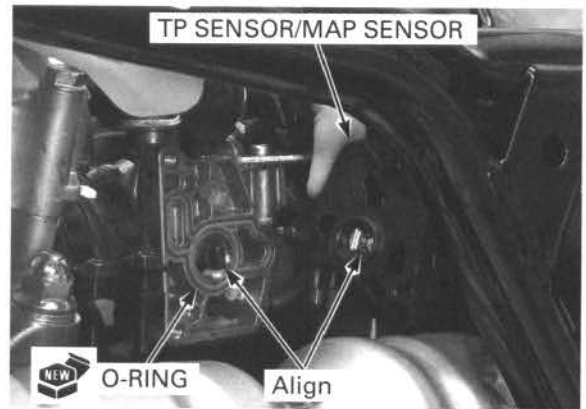
Install the torx screws (T25) and tighten them.

**TORQUE: 3.4 N·m (0.35 kgf·m, 2.2 lbf·ft)**

Connect the TP sensor/MAP sensor 5P connector.

Install the throttle body cover (page 6-35).

Perform the reset procedure (page 6-52).





### TP SENSOR RESET PROCEDURE

**NOTE:**

- Make sure that the DTC is not stored in the PCM/ECM memory. If the DTC is stored, the reset mode will not start.

Remove the following:

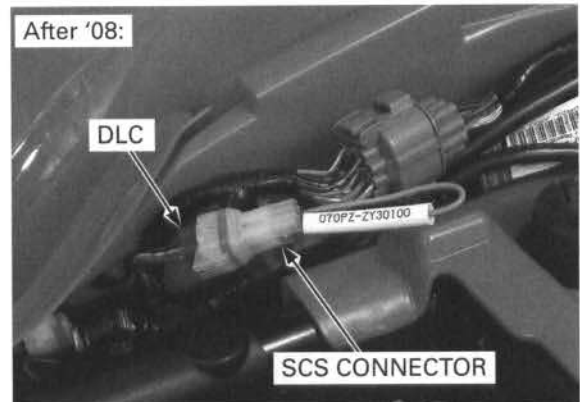
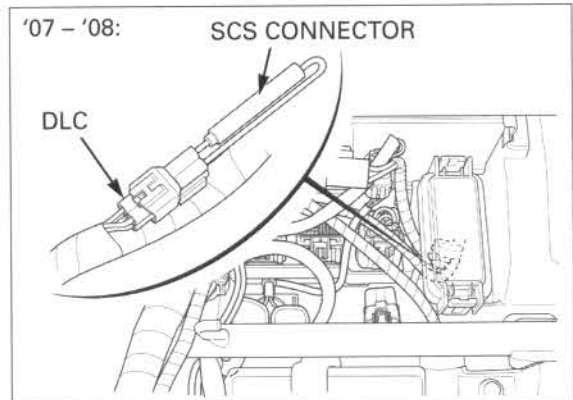
- '07 – '08: rear fender cover (page 3-9)
- After '08: seat (page 3-4)
- left fuel tank side cover (page 3-5)

1. Turn the ignition switch to OFF.  
Remove the dummy connector from the DLC.  
Short the DLC terminals using the special tool.

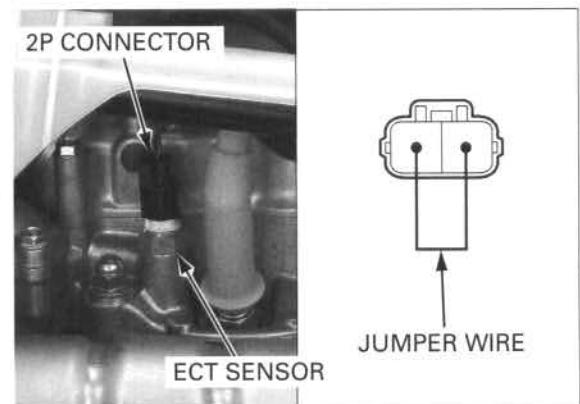
**TOOL:**

**SCS connector**                      **070PZ-ZY30100**

**CONNECTION: Brown/red – Green**



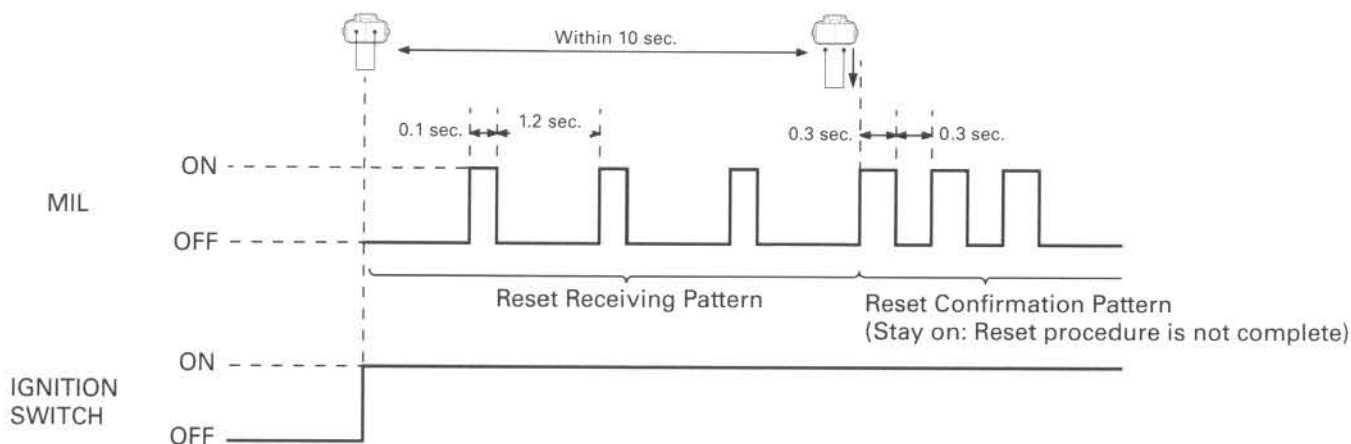
2. Disconnect the ECT sensor 2P connector.  
Short the wire harness side connector terminals with a jumper wire.
3. Turn the ignition switch to ON and the MIL starts blinking (reset receiving pattern).  
Within 10 seconds after turning the ignition switch to ON, disconnect the jumper wire from the 2P connector.





- When the reset procedure is complete, the MIL blinking changes from Reset Receiving Pattern to Confirmation Pattern.  
Turn the ignition switch to OFF.

If more than 10 seconds elapse or the procedures are incorrect, the MIL stays on. Repeat the reset procedures.



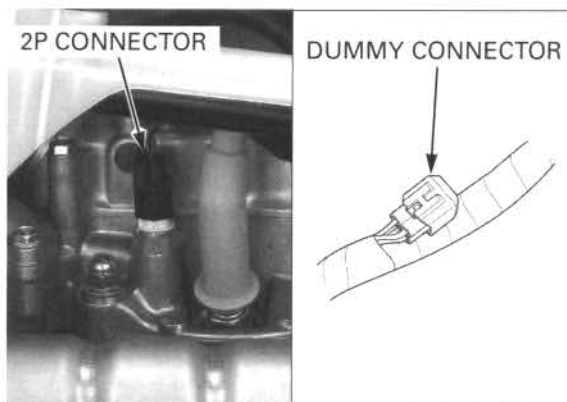
- Connect the ECT sensor connector.

Remove the SCS connector from the DLC and install the dummy connector.

Check the engine idle speed (page 6-58).

Install the following:

- '07 - '08: rear fender cover (page 3-9)
- After '08: seat (page 3-4)
- left fuel tank side cover (page 3-5)



## ECT SENSOR

### REMOVAL/INSTALLATION

Drain the coolant (page 7-6).

Remove the left fuel tank side cover (page 3-5).

Disconnect the spark plug cap and ECT sensor 2P connector.

*Replace the ECT sensor while the engine is cold.*

Remove the ECT sensor and O-ring.

Install the a new O-ring onto the ECT sensor.

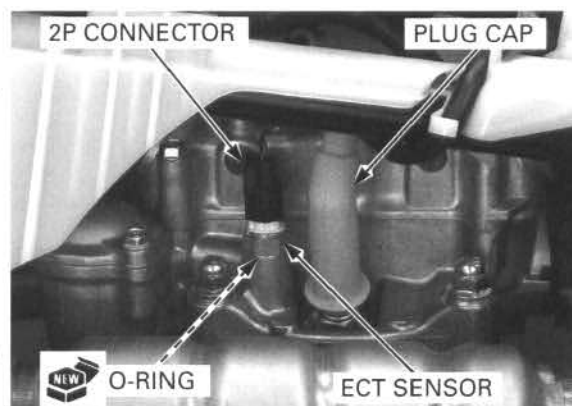
Install the ECT sensor into the cylinder head and tighten it.

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

Connect the ECT sensor 2P connector and spark plug cap.

Install the left fuel tank side cover (page 3-5).

Fill the cooling system with recommended coolant (page 7-6).





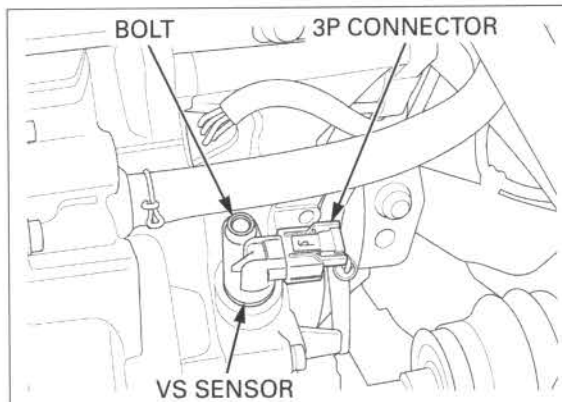
## VS SENSOR

### REMOVAL/INSTALLATION

Remove the left side cover (page 3-4).

Disconnect the VS sensor 3P connector.

Remove the bolt and VS sensor from the rear crankcase cover.

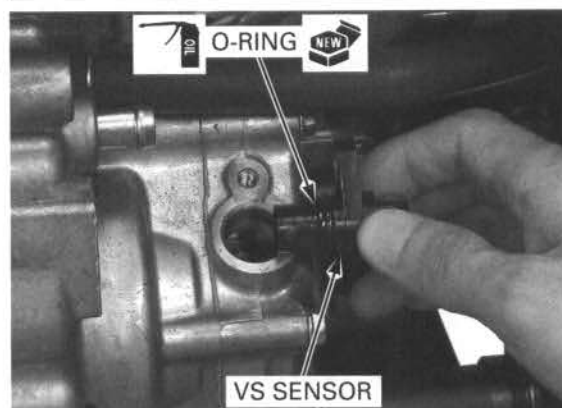


Coat a new O-ring with engine oil and install it onto the VS sensor.

Install the VS sensor into the rear crankcase cover and tighten the bolt.

Connect the VS sensor 3P connector.

Install the left side cover (page 3-4).



## BANK ANGLE SENSOR

### INSPECTION

Remove the left side covers (page 3-4).

Disconnect the bank angle sensor 3P connector, and connect the inspection adaptor between the bank angle sensor and wire harness.

#### TOOL:

Inspection adaptor 07GMJ-ML80100

Turn the ignition switch to ON.

Measure the voltage between the inspection adaptor terminals.

CONNECTION	STANDARD
White(+) – Red(-)	Battery voltage
Red(+) – Green(-)	0 – 1 V



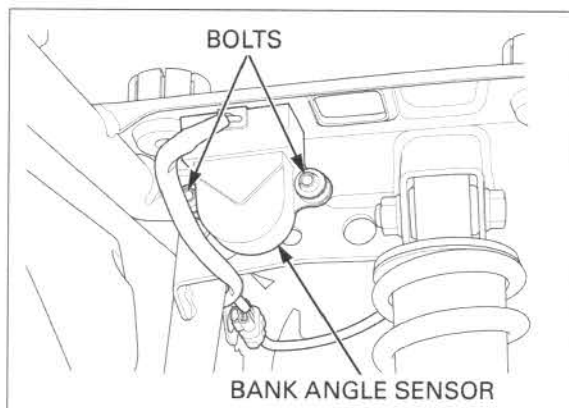


Turn the ignition switch to OFF.

*Do not disconnect the electric connectors.*

Remove the rear fender/carrier mounting fasteners (page 3-10) and raise the rear fender/carrier to remove the bank angle sensor.

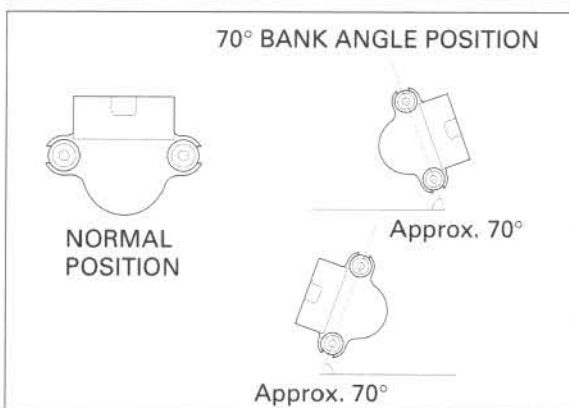
Remove the two mounting bolts and bank angle sensor from the frame.



*If you repeat this test, first turn the ignition switch to OFF, then back to ON before you try the test again.*

Measure the voltage between the Red clip (+) and Green clip (-) of the inspection adaptor.

- Place the bank angle sensor horizontal and turn the ignition switch to ON. There should be 0 – 1 V.
- Angle the sensor approximately 70° to the left or right with the ignition switch turned to ON. There should be battery voltage.



## REPLACEMENT

Remove the rear fender/carrier (page 3-10).

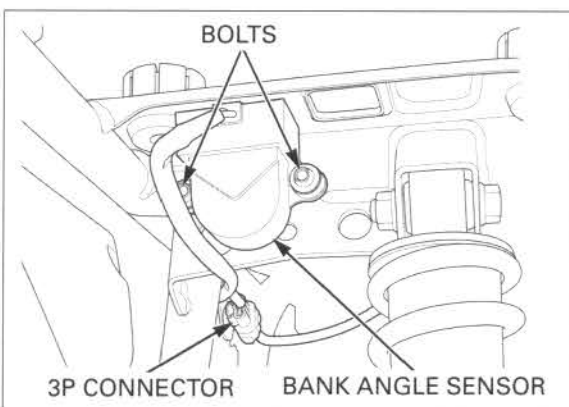
Disconnect the bank angle sensor 3P connector. Remove the two mounting bolts and bank angle sensor from the frame.

Install the bank angle sensor and two mounting bolts, and tighten the bolts.

**TORQUE: 1.5 N·m (0.15 kgf·m, 1.1 lbf·ft)**

Connect the bank angle sensor 3P connector.

Install the rear fender/carrier (page 3-10).



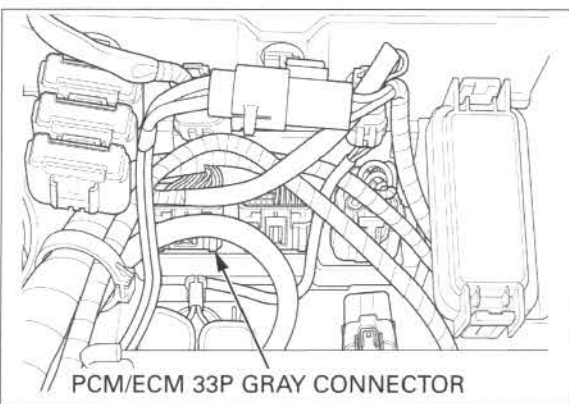
## PCM/ECM

### POWER/GROUND LINE INSPECTION

Remove the rear fender cover (page 3-9).

Turn the ignition switch to OFF.

Disconnect the PCM/ECM 33P gray connector.





## FUEL SYSTEM (PGM-FI)

### POWER GROUND LINE

Check for continuity between the wire harness side 33P connector terminals and ground.

#### TOOL:

Test probe 07ZAJ-RDJA110

#### Power Ground:

##### Connection:

- '07 - '08: Green (B10) - ground
- Green (B22) - ground
- After '08: Green (B10) - ground
- Green (B21) - ground

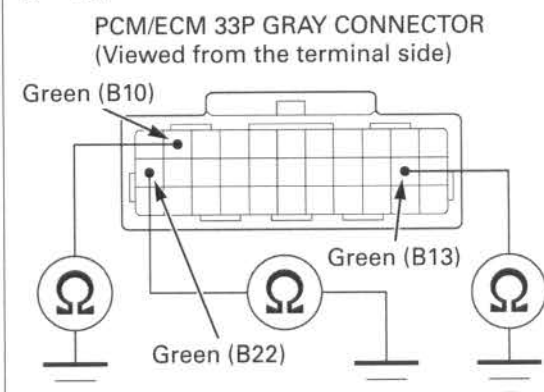
#### Logic Ground:

Connection: Green (B13) - ground

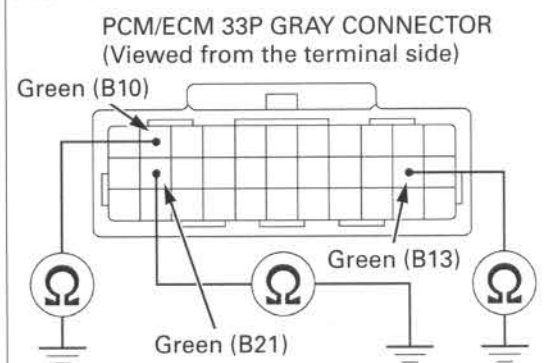
There should be continuity at all times.

If there is no continuity, check for an open circuit in the green wires.

'07 - '08:



After '08:



### POWER INPUT LINE

Turn the ignition switch to ON.

Measure the voltage between the wire harness side 33P connector terminal and ground.

#### TOOL:

Test probe 07ZAJ-RDJA110

Connection: Black/red (B1) (+) - ground (-)

There should be battery voltage.

If there is no voltage, check the following;

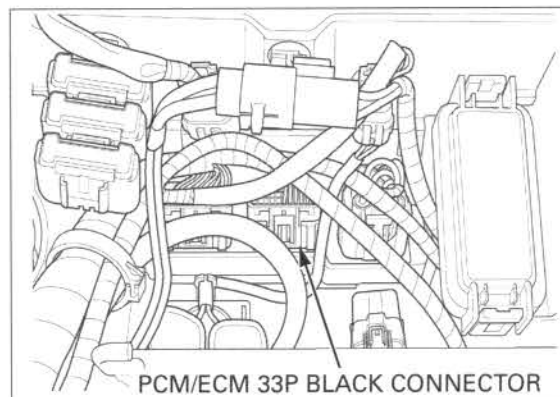
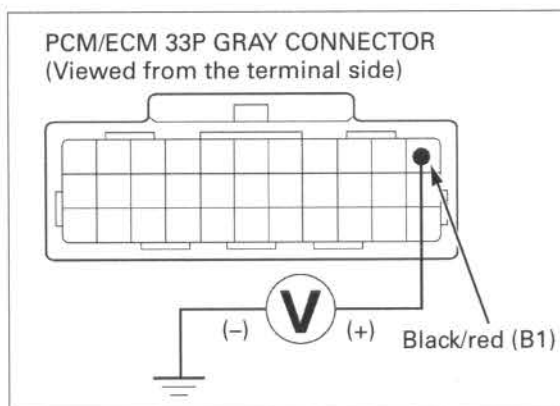
- Black/red wire for open circuit between the PCM/ECM and the relay module
- engine stop relay (page 6-40) and its circuits
- bank angle sensor (page 6-54) and its circuits

### ENGINE STOP SWITCH LINE INSPECTION

Remove the rear fender cover (page 3-9).

Turn the ignition switch to OFF.

Disconnect the PCM/ECM 33P black connector.





Turn the engine stop switch to "O" and ignition switch to ON,

Measure the voltage between the wire harness side 33P connector terminal and ground.

## TOOL:

Test probe 07ZAJ-RDJA110

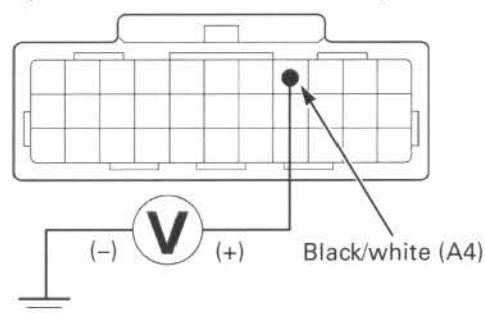
Connection: Black/white (A4) (+) – ground (-)

There should be battery voltage.

If there is no voltage, check the following;

- Black/white wire for open circuit between the PCM/ECM and the engine stop switch
- engine stop switch (page 22-12) and its circuits

PCM/ECM 33P BLACK CONNECTOR  
(Viewed from the terminal side)



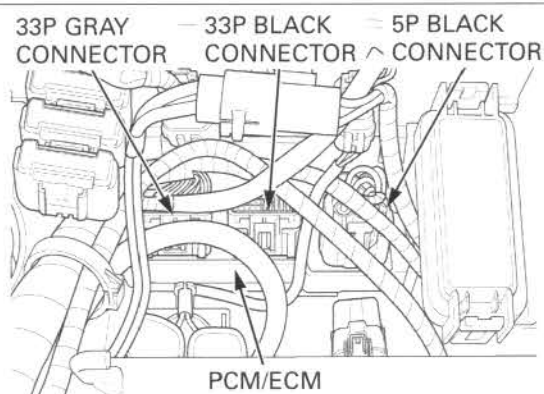
## REMOVAL/INSTALLATION

Remove the rear fender cover (page 3-9).

Turn the ignition switch to OFF.

Disconnect the 33P gray connector, 33P black connector and 5P black connector from the PCM/ECM, and remove the PCM/ECM from the rear fender.

Install the PCM/ECM in the reverse order of removal.





## ENGINE IDLE SPEED

### INSPECTION

NOTE:

- Inspect the idle speed after all other engine maintenance items have been performed and are within specifications.
- Before checking the idle speed, check the following:
  - DTC or MIL blinking (page 6-17)
  - spark plug condition (page 4-11)
  - air cleaner condition (page 4-8)
- The engine must be warm for accurate idle speed inspection.
- This system eliminates the need for manual idle speed adjustment compared to previous designs.
- Use a tachometer with graduations of 50 rpm or smaller that will accurately indicate a 50 rpm change.

Remove the left fuel tank side cover (page 3-5).

Start the engine and warm it up until the coolant temperature rises to 80°C (176°F).

Stop the engine and connect a tachometer according to the tachometer manufacturer's instructions.

Start the engine and let it idle. Check the idle speed.

**ENGINE IDLE SPEED: 1,400 ± 100 rpm**

If the idle speed is out of the specification, check the following:

- throttle operation and throttle lever free play (page 4-7).
- intake air leak
- engine top-end problem (page 9-7)
- IACV operation (page 6-48)

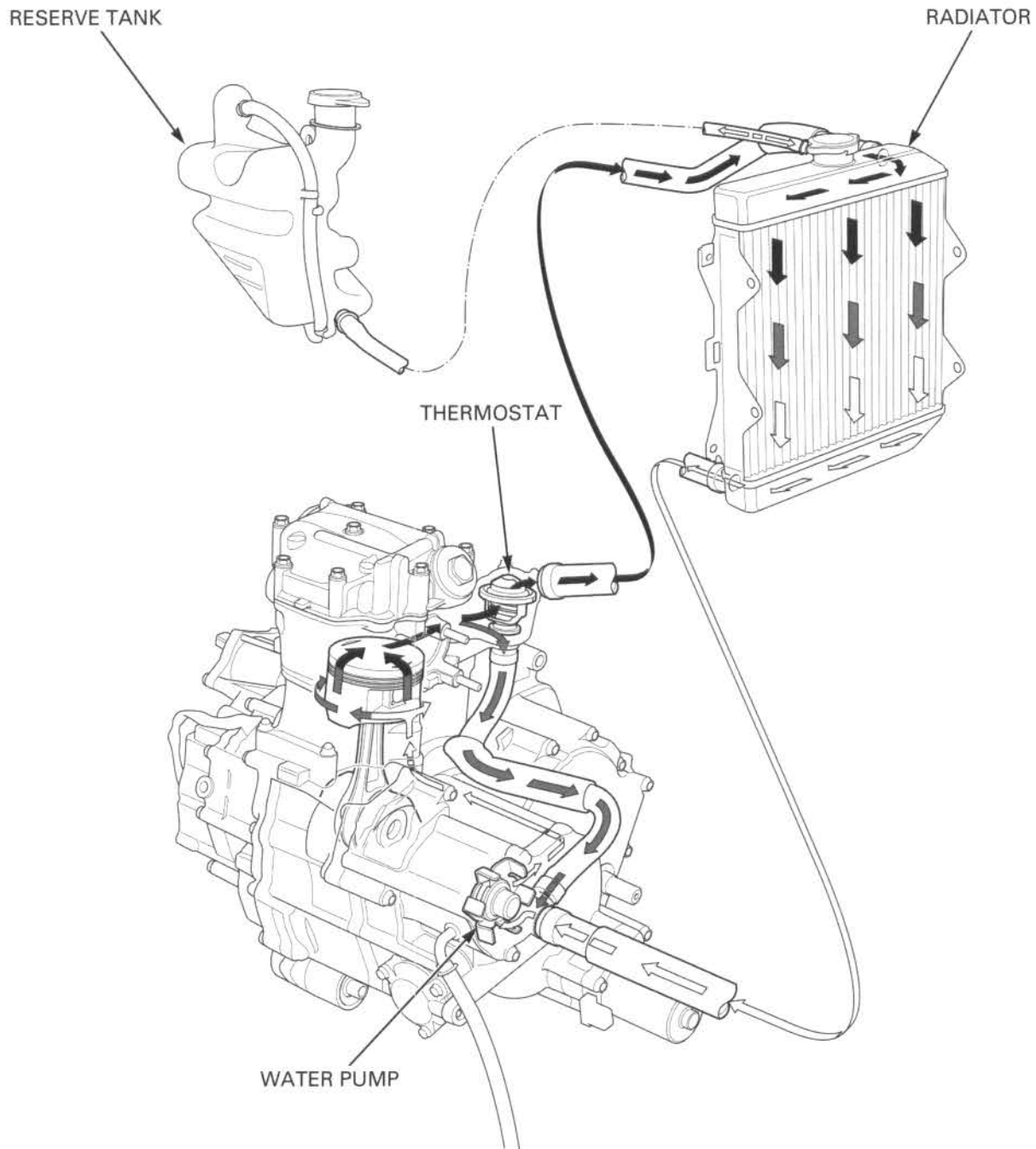


# 7. COOLING SYSTEM

SYSTEM FLOW PATTERN .....	7-2	THERMOSTAT .....	7-8
SERVICE INFORMATION .....	7-3	RADIATOR/COOLING FAN .....	7-10
TROUBLESHOOTING .....	7-4	RADIATOR RESERVE TANK .....	7-11
SYSTEM TESTING .....	7-5	WATER PUMP .....	7-12
COOLANT REPLACEMENT .....	7-6		



SYSTEM FLOW PATTERN





## 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.

#### 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.*

- Add coolant to the system at the reserve tank. Do not remove the radiator cap except to refill or drain the system.
- Avoid spilling coolant on painted surfaces.
- After servicing the system, check for leaks with a cooling system tester.
- For cooling fan motor inspection, see Lights/Meters/Switches section (page 22-15).

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.5 liters (1.6 US qt, 1.3 Imp qt)
	Reserve tank	0.3 liter (0.3 US qt, 0.3 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 at 95°C (203°F)
Recommended antifreeze		Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors
Standard coolant concentration		1:1 mixture with distilled water

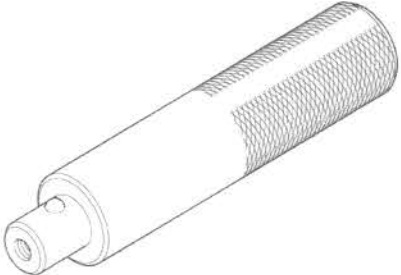

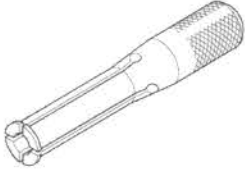

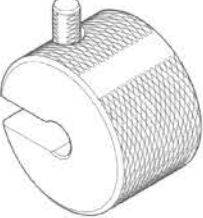
### TORQUE VALUES

Cooling fan nut	2.7 N·m (0.27 kgf·m, 2.0 lbf·ft)	Apply locking agent to the threads.
Fan motor bolt	5.2 N·m (0.53 kgf·m, 3.8 lbf·ft)	
Fan motor stay bolt	8.4 N·m (0.86 kgf·m, 6.2 lbf·ft)	



## COOLING SYSTEM

### TOOLS

<p>Driver 07749-0010000</p> 	<p>Mechanical seal driver attachment 07945-4150400</p>  <p>or 07965-415000A (U.S.A. only)</p>	<p>Bearing remover head, 15 mm 07936-KC10200</p>  <p>or 07936-KC10500</p>
<p>Bearing remover shaft, 15 mm 07936-KC10100</p>  <p>or 07936-KC10500</p>	<p>Remover weight 07741-0010201</p>  <p>or 07936-371020A or 07936-3710200 (U.S.A. only)</p>	

## TROUBLESHOOTING

### Engine temperature too high

- Thermostat stuck closed
- Faulty radiator cap
- Insufficient coolant
- Passage blocked in radiator, hoses or water jacket
- Air in system
- Faulty cooling fan motor
- Faulty water pump

### Engine temperature too low

- Thermostat stuck open

### 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



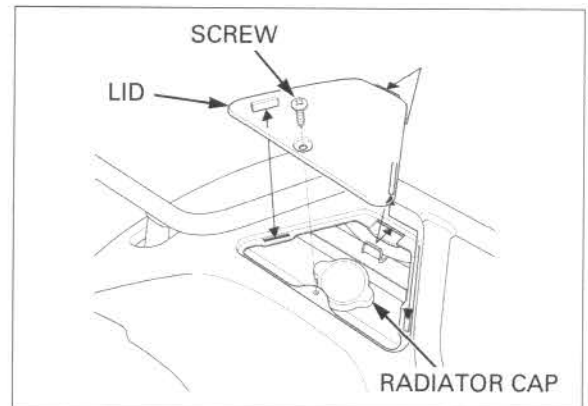
## SYSTEM TESTING

### COOLANT (HYDROMETER TEST)

Remove the screw and the maintenance lid.

*The engine must be cool before removing the radiator cap.*

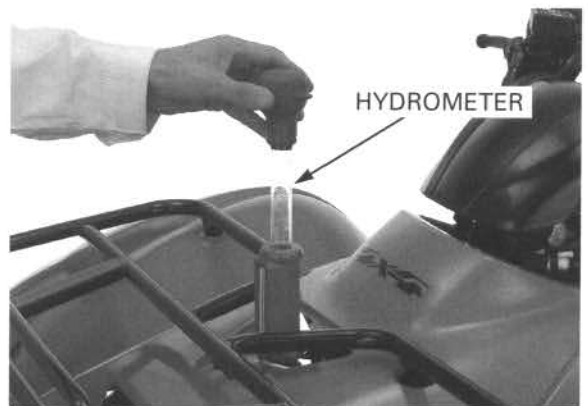
Remove the radiator cap.



Test the coolant gravity using a hydrometer.

**STANDARD COOLANT CONCENTRATION:**  
1:1 mixture of distilled water and antifreeze

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	1.047	1.046	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
Coolant ratio%	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

Remove the radiator cap (page 7-5).

Wet the sealing surfaces of the cap, then install the cap onto tester.

#### TOOLS:

Cooling system pressure tester SVTS4AH  
Cooling system adaptor OTCJ33984A

Pressurize 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 the 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)

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

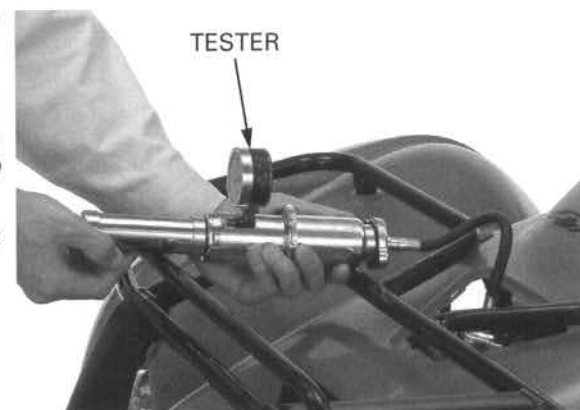
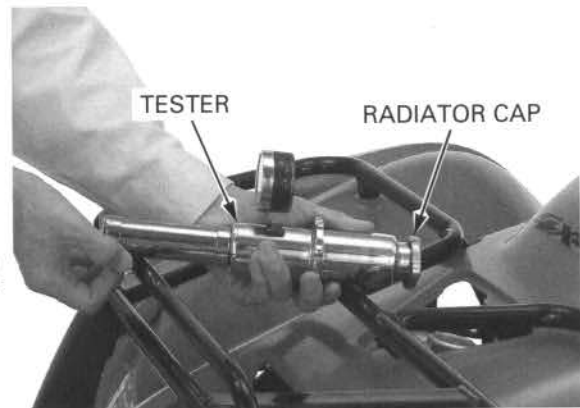
#### NOTICE

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

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

Remove the tester and install the radiator cap.

Install the lid in the reverse order of removal.



## COOLANT REPLACEMENT

### PREPARATION

#### 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.*

#### 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.

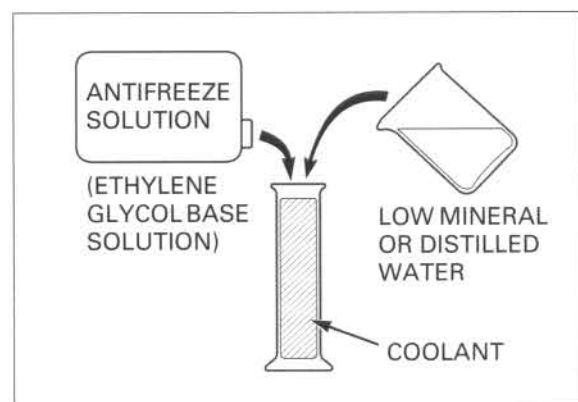
Mix only distilled, low mineral water with the recommended antifreeze.

#### RECOMMENDED ANTIFREEZE:

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

#### RECOMMENDED MIXTURE:

1:1 (distilled water and recommended antifreeze)





## REPLACEMENT/AIR BLEEDING

## NOTE:

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

*The engine must be cool before removing the cooling system.*

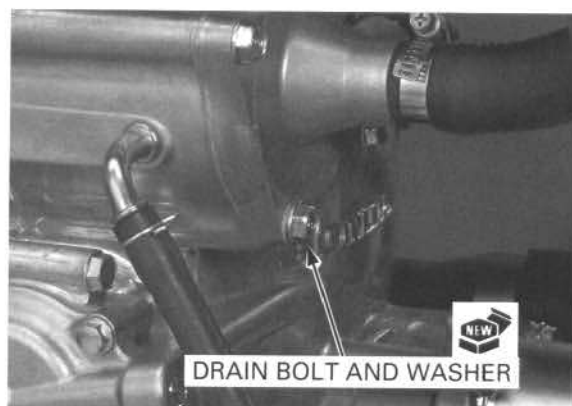
Remove the following:

- right mudguard (page 3-6)
- rear fender cover (page 3-9)
- maintenance lid (page 7-5)

*Place a funnel under the water pump to catch coolant with the container.*

Drain the coolant from the system by removing the drain bolt and sealing washer on the water pump, and the radiator cap.

Reinstall the drain bolt with a new sealing washer securely.

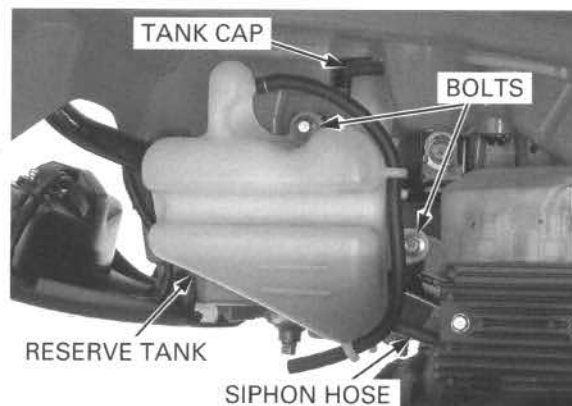


Remove the two bolts and reserve tank, then open the tank cap to drain the tank.

Disconnect the siphon hose to remove the tank.

Rinse the inside of the reserve tank with water.

Reconnect the siphon hose and install the reserve tank with the two bolts.



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

Bleed air from the system as follows:

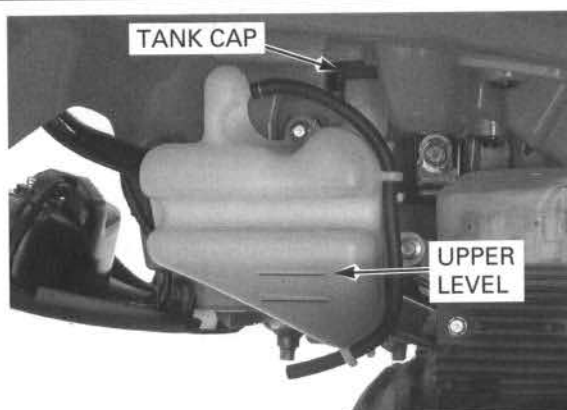
1. Shift the transmission into neutral.  
Start the engine and let it idle for 2 – 3 minutes.
2. Snap the throttle 3 – 4 times to bleed air from the system.
3. Stop the engine and add coolant up to the filler neck.
4. Install the radiator cap.





## COOLING SYSTEM

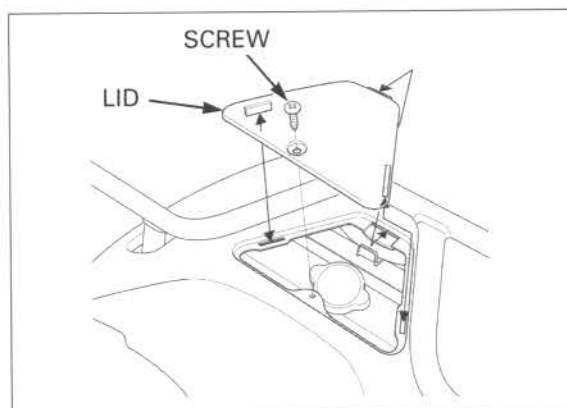
Fill the reserve tank to the upper level line and install the tank cap.



Install the maintenance lid and tighten the screw.

Install the following:

- rear fender cover (page 3-9)
- mudguard (page 3-6)



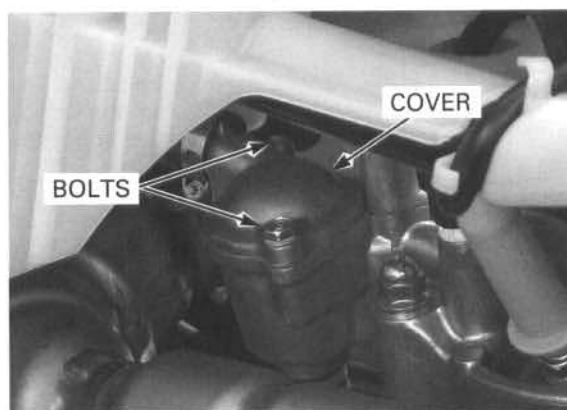
## THERMOSTAT

### REMOVAL

Drain the coolant from the system (page 7-7).

Remove the left fuel tank side cover (page 3-5).

Remove the two bolts and thermostat cover.



Remove the thermostat from the housing.





## INSPECTION

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

*Do not let the thermostat or thermometer touch the pan, or you will get a false reading.*

Heat a container of water with an electric heating element for 5 minutes.

Suspend the thermostat in heated water to check its operation.

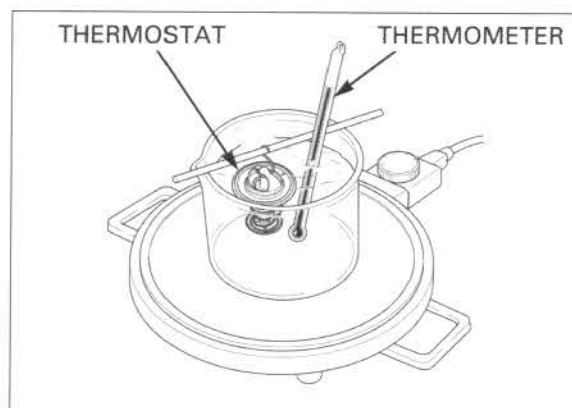
### THERMOSTAT BEGIN TO OPEN:

**80 – 84°C (176 – 183°F)**

### VALVE LIFT:

**8 mm (0.3 in) minimum at 95°C (203°F)**

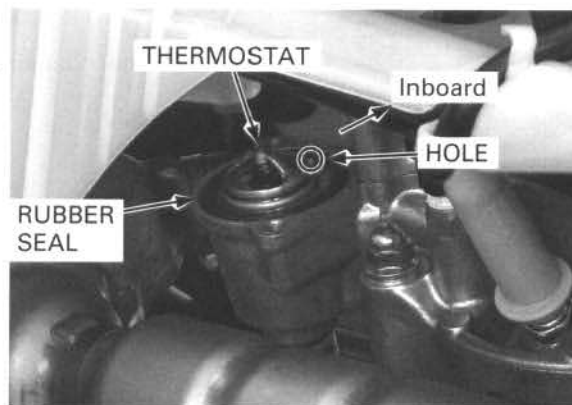
Replace the thermostat if the valve opens at a temperature other than those specified.



## INSTALLATION

Make sure the rubber seal on the thermostat is in good condition.

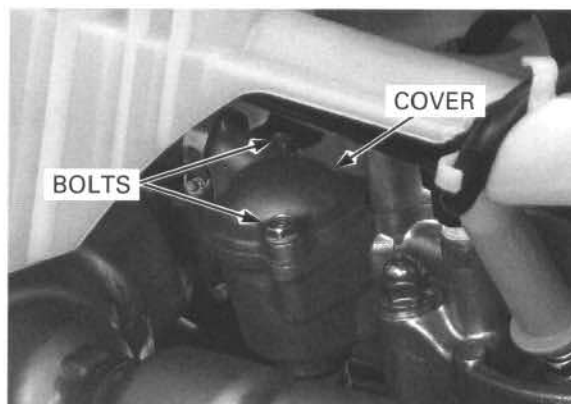
Apply coolant to the rubber seal and install the thermostat into the housing with the bleed hole facing inboard.



Install the thermostat cover and tighten the two bolts securely.

Install the fuel tank side cover (page 3-5).

Fill and bleed the cooling system (page 7-6).





# RADIATOR/COOLING FAN

### RADIATOR REMOVAL/INSTALLATION

#### NOTE:

- Take care not to damage the radiator fins while servicing the radiator.

Remove the front fender/carrier (page 3-7).

Drain the coolant from the system (page 7-7).

Remove the following:

- optional 2P (black) connector and wire (from right side air guide plate)
- two trim clips (from each side air guide plate by pushing the center pin)
- side air guide plates (by releasing each tab)
- radiator grille (by releasing the two tabs)

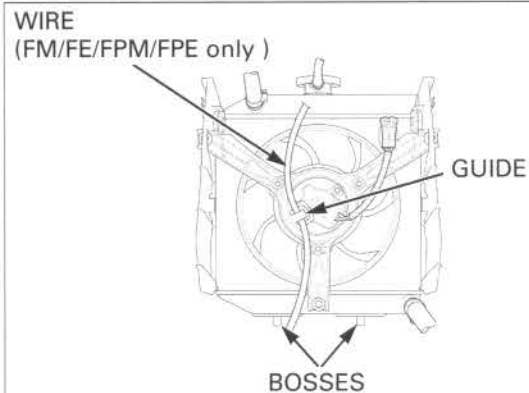
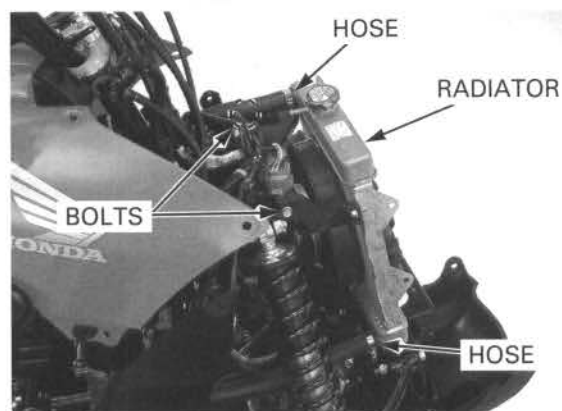
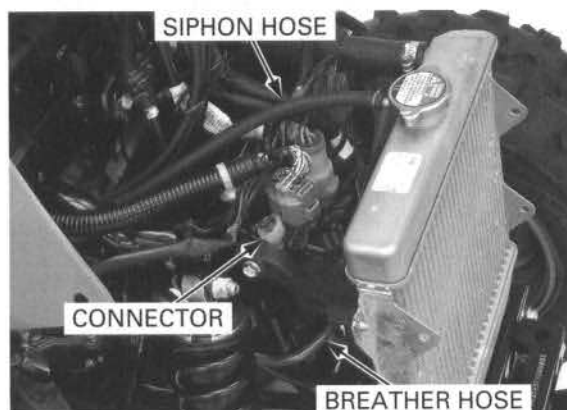
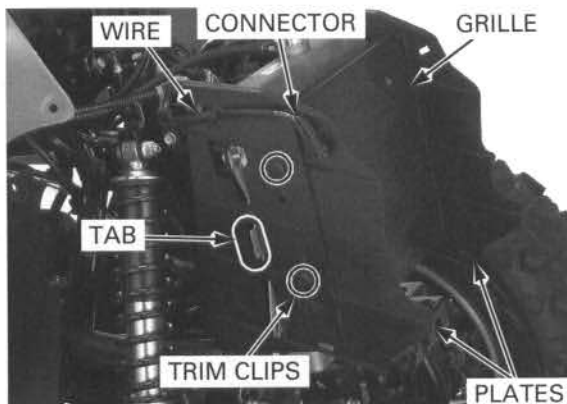
- fan motor 2P (white) connector (disconnect)
- siphon hose
- breather hose (pink)

- water hoses
- two bolts
- FM/FE/FPM/FPE only: 4WD select switch wire (from the wire guide)
- radiator assembly (release the mounting bosses from the grommets)

*Route the hoses and wires properly (page 1-28).*

Installation is in the reverse order of removal.

Fill and bleed the cooling system (page 7-6).

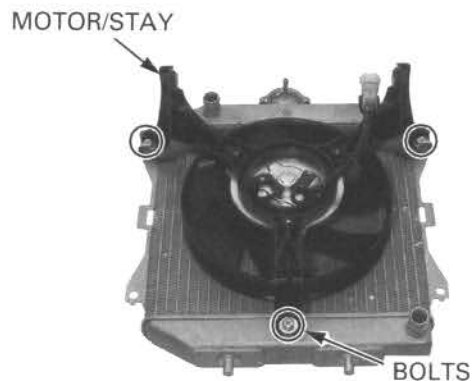




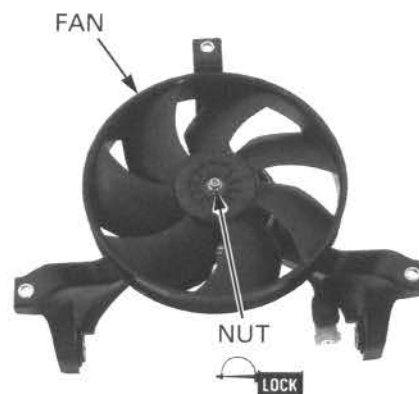
## COOLING FAN REMOVAL/ INSTALLATION

Remove the following:

- three washer-bolts
- motor/stay assembly



- nut
- cooling fan



- connector
- three bolts
- fan motor

*Apply locking agent  
to the fan nut  
threads.*

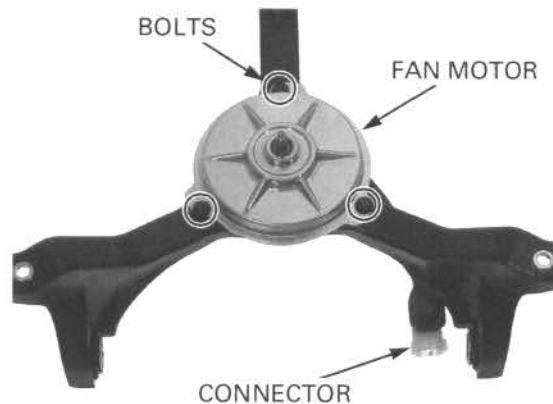
Installation is in the reverse order of removal.

### TORQUE:

Cooling fan nut: 2.7 N·m (0.27 kgf·m, 2.0 lbf·ft)

Fan motor bolt: 5.2 N·m (0.53 kgf·m, 3.8 lbf·ft)

Motor stay bolt: 8.4 N·m (0.86 kgf·m, 6.2 lbf·ft)



## RADIATOR RESERVE TANK

### REMOVAL/INSTALLATION

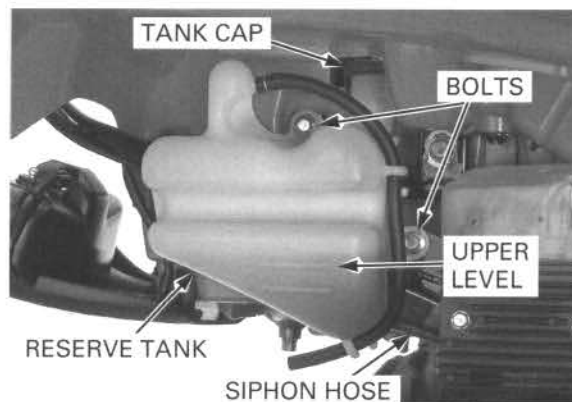
Remove the rear fender cover (page 3-9).

Remove the two bolts and reserve tank from the frame, then open the tank cap to drain the tank. Disconnect the siphon hose to remove the tank.

Connect the siphon hose and install the reserve tank with the two bolts.

Fill the reserve tank to the upper level line and install the tank cap.

Install the rear fender cover (page 3-9).





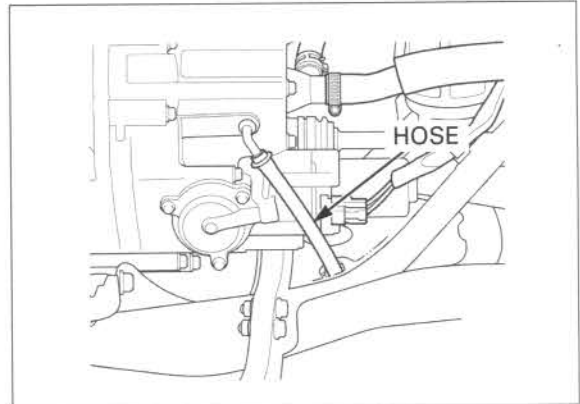
### WATER PUMP

#### MECHANICAL SEAL INSPECTION

Remove the right side cover (page 3-4).

Check the breather hose for signs of coolant leakage.

If there is leakage, the mechanical seal is defective, and the mechanical seal should be replaced.



#### MECHANICAL SEAL REPLACEMENT

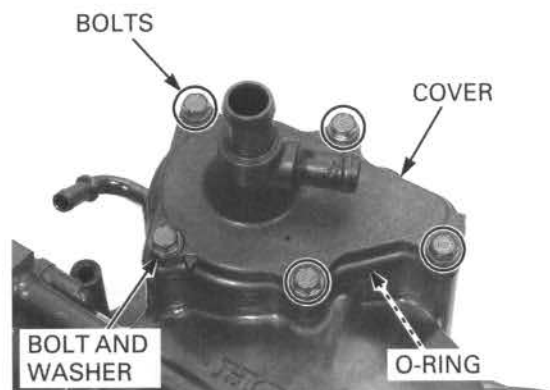
##### NOTE:

- When replacing the mechanical seal, the impeller and pump shaft must be replaced with new ones.

Remove the front crankcase cover (page 11-6).

Remove the following:

- five bolts and sealing washer
- pump cover
- O-ring (from the cover)

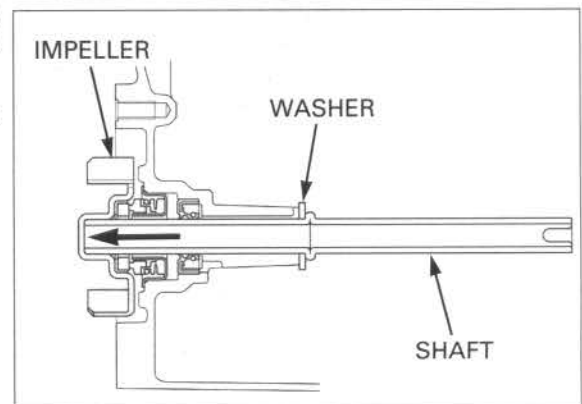


Remove the impeller assembly from the pump shaft by tapping the inside of the impeller through the pump shaft, using a screwdriver or equivalent.

Remove the mating ring and cup gasket of the mechanical seal from the impeller.

Remove the following:

- pump shaft
- thrust washer

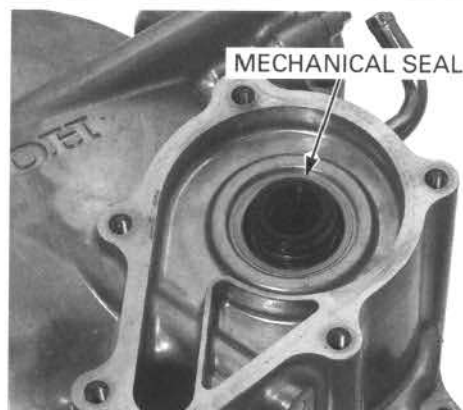




– mechanical seal

## TOOLS:

Remover head, 15 mm	07936-KC10200
Remover shaft, 15 mm	07936-KC10100
Remover weight	07741-0010201
U.S.A. TOOLS:	
Bearing remover, 15 mm	07936-KC10500
Remover weight	07936-371020A or 07936-3710200



– oil seal

Apply molybdenum oil solution to the lips of a new oil seal.  
Install the oil seal with the flat side facing out until it is fully seated.

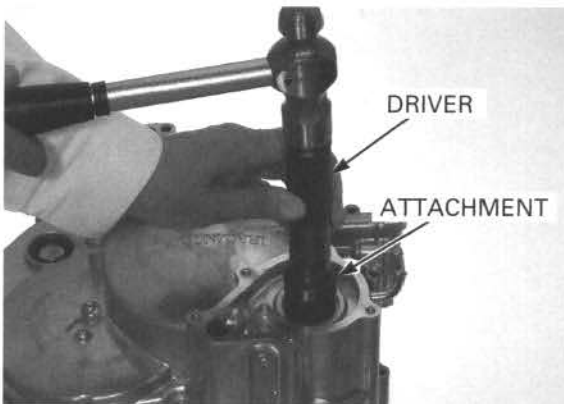


*Be careful not to damage the sliding surface of the mechanical seal.*

Drive a new mechanical seal in until it is seated.

## TOOLS:

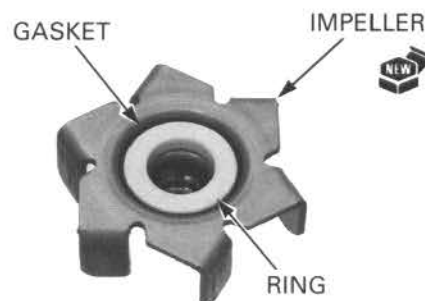
Driver	07749-0010000
Mechanical seal driver attachment	07945-4150400 or
Mechanical seal installer	07965-415000A (U.S.A. only)



*Be careful not to damage the sliding surface of the mating ring.*

Install a new cup gasket over a new mating ring.

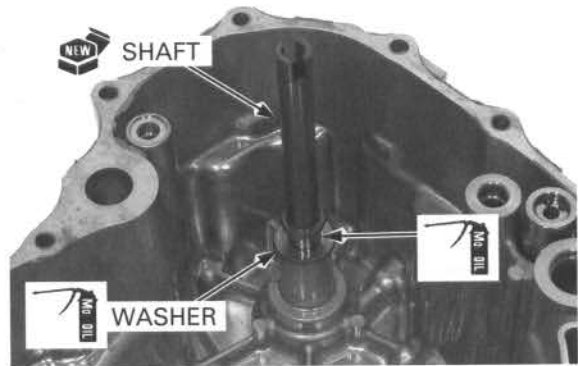
Apply coolant around the cup gasket. Install the gasket/ring assembly into a new impeller with the gasket facing the impeller until it is fully seated.



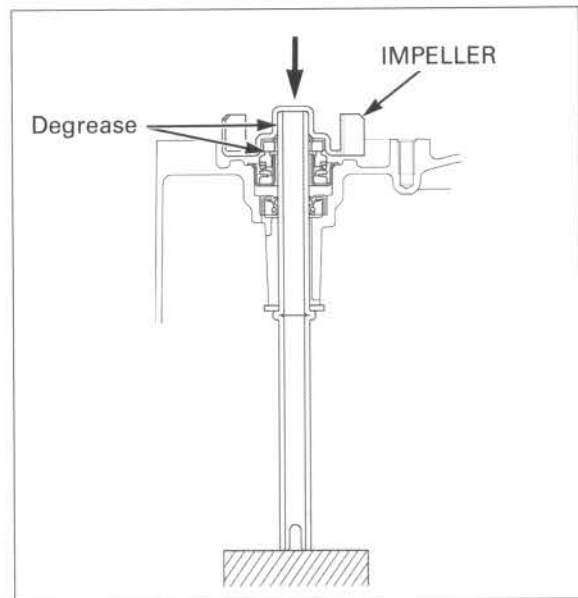


## COOLING SYSTEM

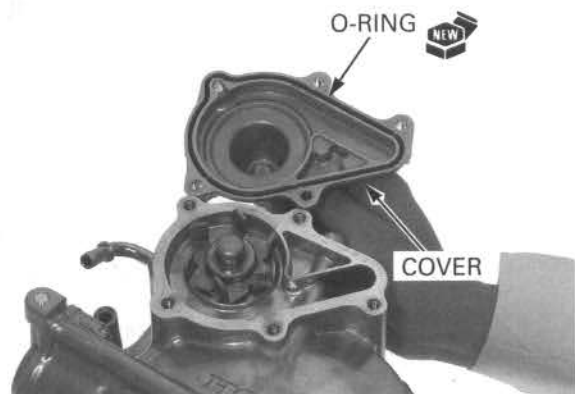
*Do not get oil on the mechanical seal.* Apply molybdenum oil solution to the thrust washer and the journal of a new pump shaft. Install the washer onto the pump shaft, and insert the shaft into the crankcase cover.



*Never allow dirt or dust to get onto the sliding surfaces of the mechanical seal and mating ring.* Degrease the press fitting areas of the impeller and shaft, and the sliding surfaces of the mechanical seal and mating ring. Press the impeller assembly onto the shaft. Check that the pump shaft turns smoothly without binding.

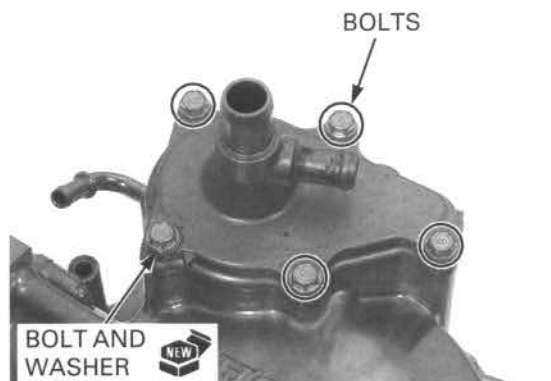


Install a new O-ring into the cover groove.



Install the pump and the five bolts with a new sealing washer in position as shown (triangular mark). Tighten the bolts in a crisscross pattern in several steps.

Install the front crankcase cover (page 11-23).





# 8. ENGINE REMOVAL/INSTALLATION

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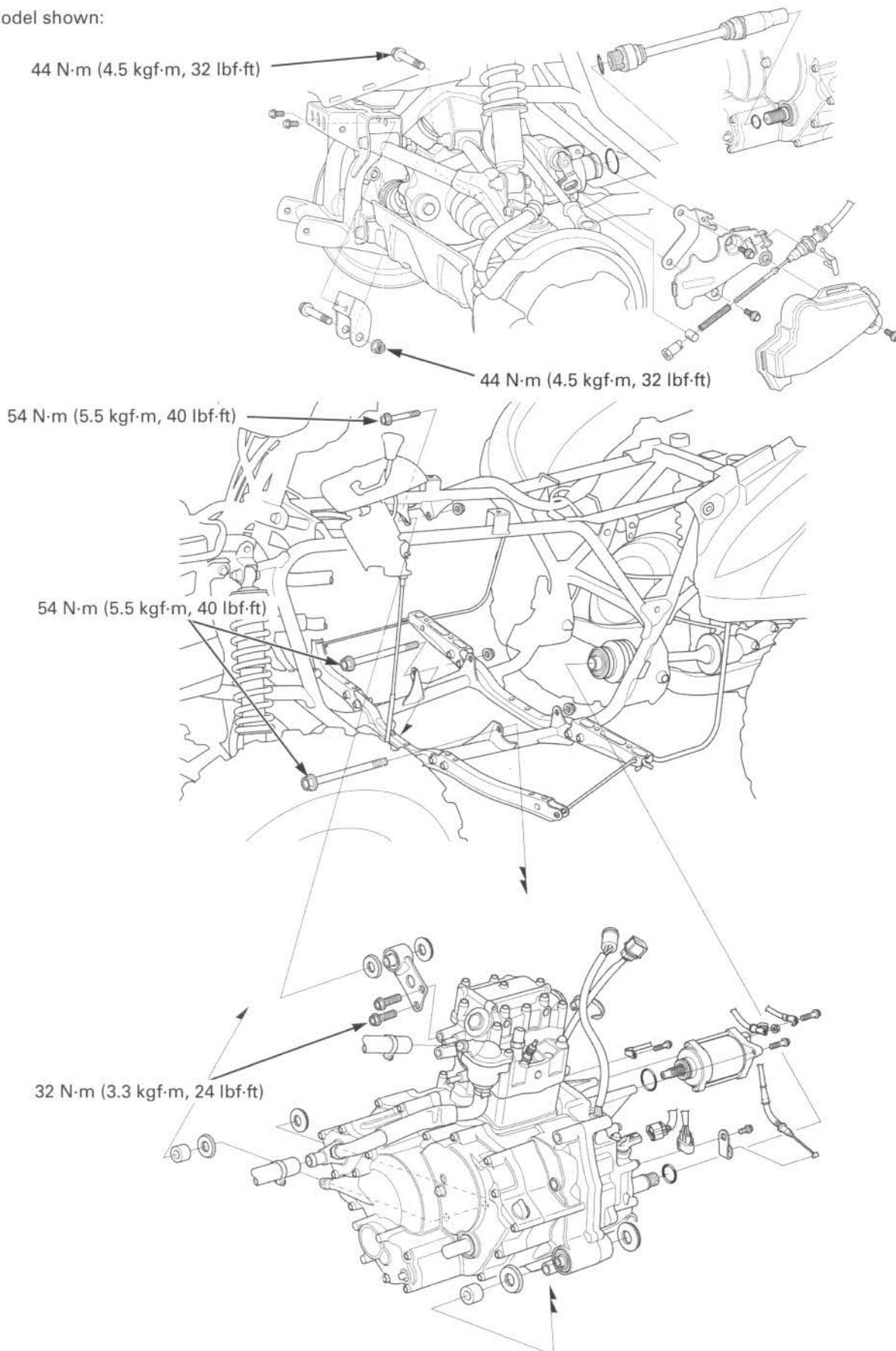
SYSTEM COMPONENTS .....	8-2	ENGINE REMOVAL .....	8-4
SERVICE INFORMATION .....	8-3	ENGINE INSTALLATION.....	8-8



## ENGINE REMOVAL/INSTALLATION

### SYSTEM COMPONENTS

FE model shown:





## SERVICE INFORMATION

### GENERAL

- When removing and installing the engine, tape the frame around the engine beforehand for frame protection.
- The transmission/crankshaft/balancer require engine removal for service (page 13-2).

### SPECIFICATIONS

ITEM			SPECIFICATIONS
Engine dry weight	TM model	'07 – '08	48.6 kg (107.1 lbs)
		After '08	48.5 kg (106.9 lbs)
	TE model	'07 – '08	49.6 kg (109.3 lbs)
		After '08	49.5 kg (109.1 lbs)
	FM model	'07 – '08	49.0 kg (108.0 lbs)
		After '08	48.9 kg (107.8 lbs)
	FE model	'07 – '08	49.9 kg (110.0 lbs)
		After '08	49.8 kg (109.8 lbs)
Engine oil capacity	FPM model		48.9 kg (107.8 lbs)
	FPE model		49.8 kg (109.8 lbs)
	After draining		2.7 liters (2.9 US qt, 2.4 Imp qt)
	After draining/filter change		2.75 liters (2.91 US qt, 2.42 Imp qt)
		After disassembly	3.1 liters (3.3 US qt, 2.7 Imp qt)
Coolant capacity (radiator and engine)			1.5 liters (1.6 US qt, 1.3 Imp qt)

### TORQUE VALUES

Lower engine hanger nut (left and right)	54 N·m (5.5 kgf·m, 40 lbf·ft)
Upper engine hanger nut (frame side)	54 N·m (5.5 kgf·m, 40 lbf·ft)
Upper engine hanger bolt (engine side)	32 N·m (3.3 kgf·m, 24 lbf·ft)
Front final gear case lower mounting bolt	44 N·m (4.5 kgf·m, 32 lbf·ft)
Front final gear case upper mounting nut	44 N·m (4.5 kgf·m, 32 lbf·ft)
Gearshift pedal pinch bolt (TM/FM/FPM only)	20 N·m (2.0 kgf·m, 15 lbf·ft)

Lock nut: replace with a new one.



### ENGINE REMOVAL

Remove the following:

- mudguards (page 3-6)
- engine guard (page 3-8)

Drain the engine oil (page 4-15).

Drain the coolant (page 7-7).

Remove the following:

- heat guard plate (page 9-8)
- front fender/carrier (page 3-7)
- brake pedal (page 16-25)
- fuel pump (page 6-39)
- TE/FE/FPE only: shift control motor (page 23-32)
- throttle body (page 6-44)
- exhaust system (page 3-13)
- battery (-) cable (page 19-6)

TM/FM/FPM only: Remove the pinch bolt and the gearshift pedal.

Disconnect the following:

- TE/FE/FPE/FPM and After '07 Canada TM/FM: vehicle speed (VS) sensor 3P black connector
- TE/FE/FPE only: shift angle sensor 3P gray connector (and release the wire from the clamp)

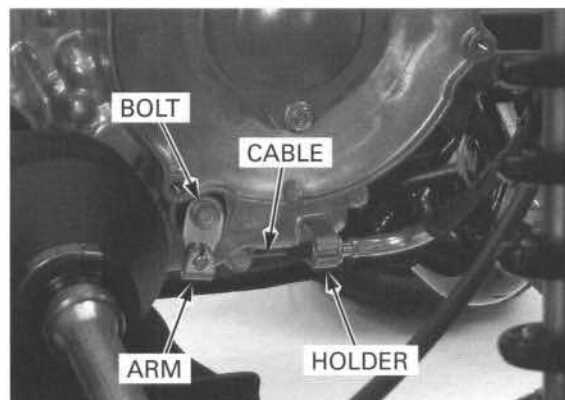
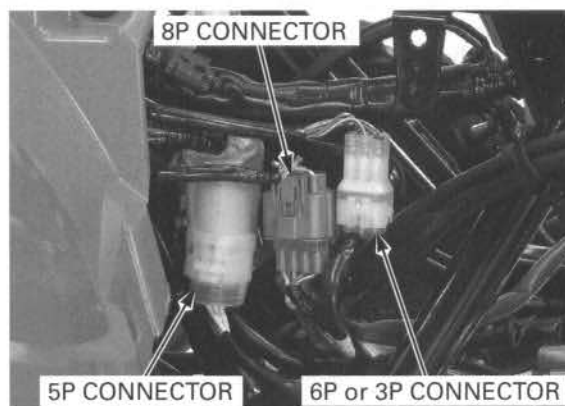
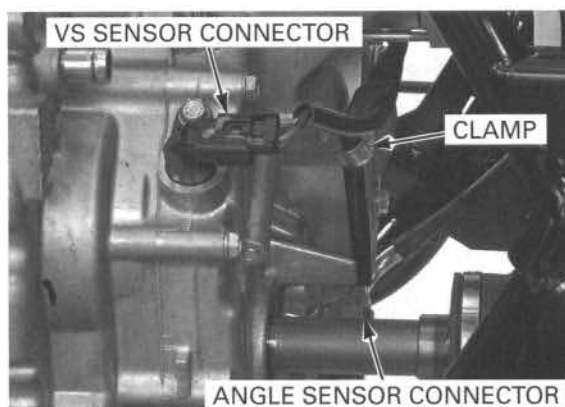
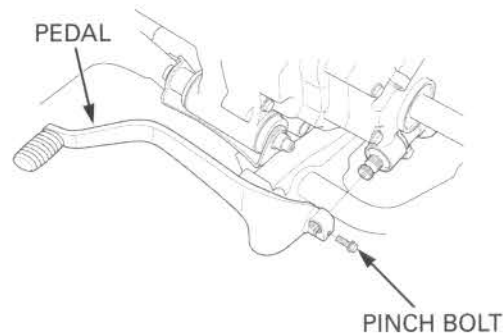
- TE/FE/FPE and '08 Canada TM/FM: engine sub-wire harness 6P connector (remove from the frame)
- FPM and Canada After '08 FM: engine sub-wire harness 3P connector (remove from the frame)
- gear position switch 8P gray connector (remove from the frame and disconnect it)
- alternator 5P connector (remove from the frame and disconnect it)

Loosen the adjuster of the reverse selector cable (page 4-25).

Remove the following:

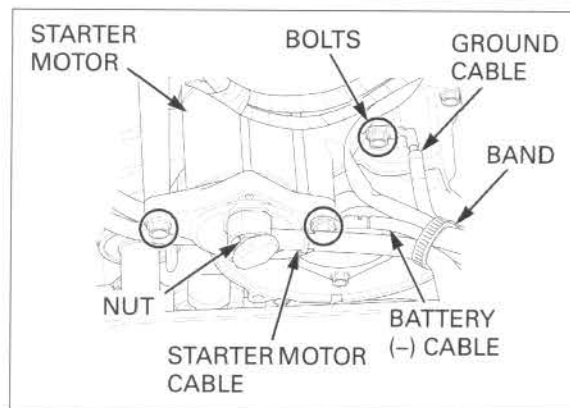
- bolt and selector arm (to disconnect the selector cable)
- selector cable (from the cable holder of the engine)

TM/FM/FPM models:

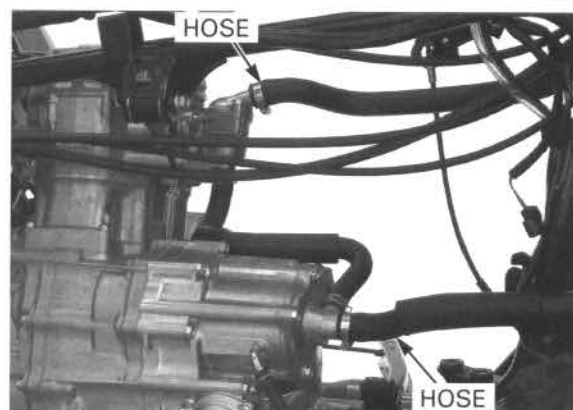




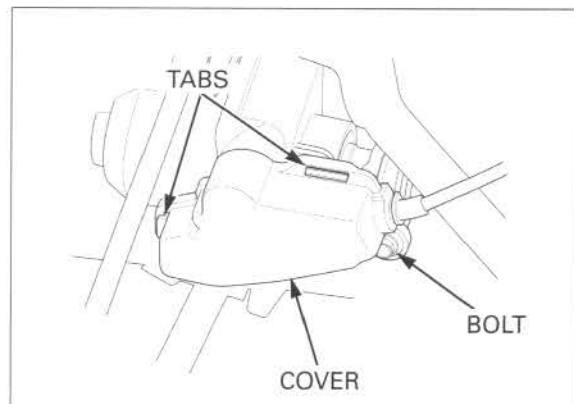
- wire band
- bolt and ground cable
- nut and starter motor cable
- two bolts and battery (-) cable
- starter motor



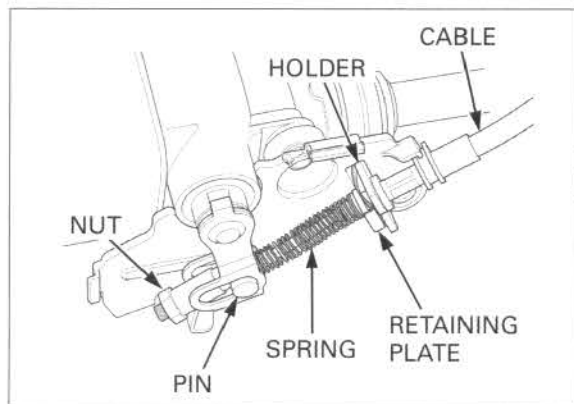
- water hoses



- FM/FE/FPM/FPE only:*
- bolt and clutch arm cover (release from the two tabs)



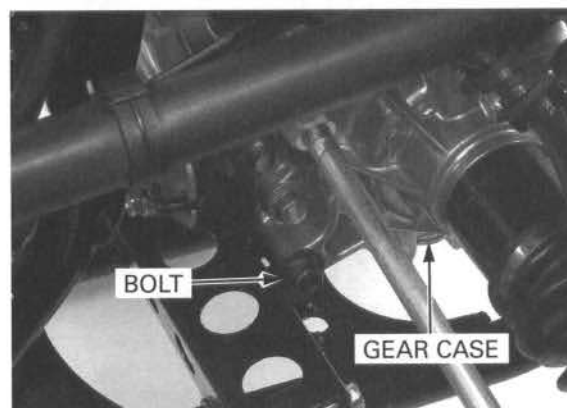
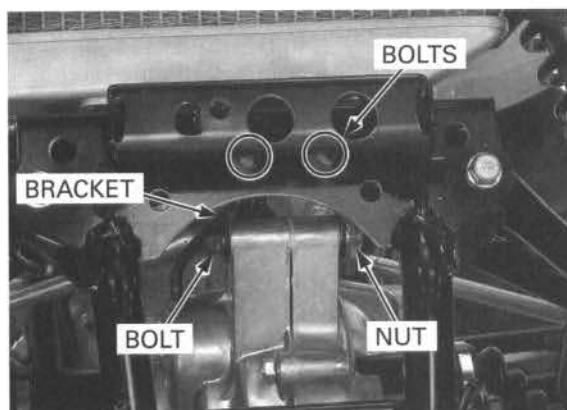
- FM/FE/FPM/FPE only:*
- adjusting nut
  - cable retaining plate
  - 2WD/4WD selector cable (remove from the cable holder and joint pin)
  - cable spring
  - joint pin





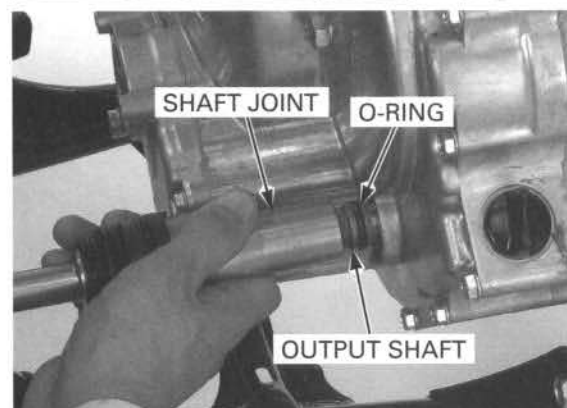
## ENGINE REMOVAL/INSTALLATION

- FM/FE/FPM/FPE* – final gear case mounting nut and bolts  
*only:* – two bolts and mounting bracket



*FM/FE/FPM/FPE only:* Move the gear case assembly forward for maximum clearance between the propeller shaft joint and engine.

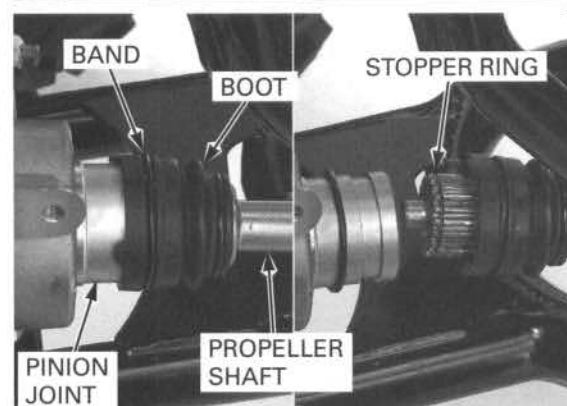
Pull the shaft joint out of the output shaft of the engine.



*FM/FE/FPM/FPE only:* Remove the boot band and release the propeller shaft boot off the pinion joint of the gear case assembly.

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

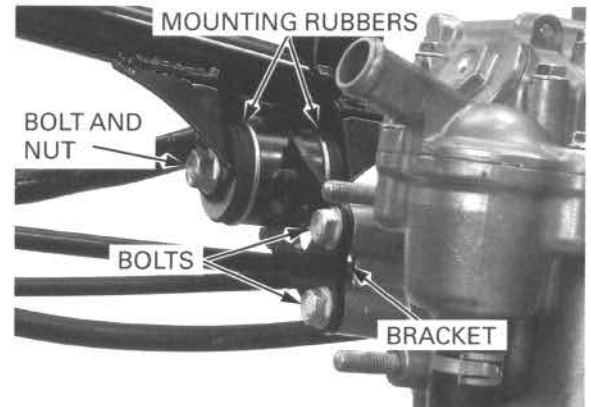
Remove the stopper ring from the propeller shaft.  
Remove the O-ring from the output shaft.





Remove the following from the engine upper mount:

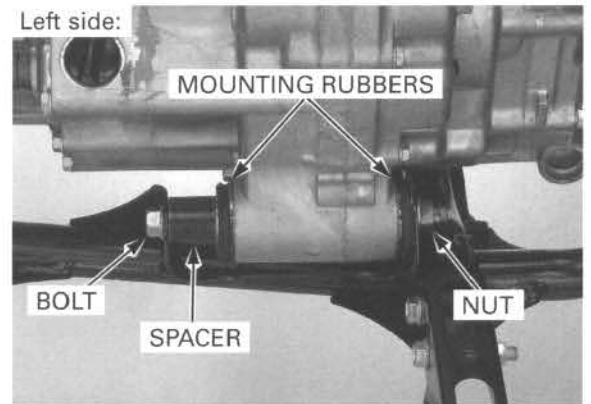
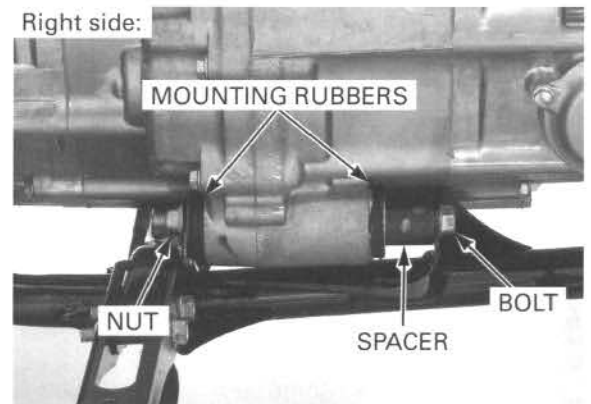
- two engine hanger bolts (engine side)
- engine hanger nut and bolt (frame side)
- hanger bracket
- mounting rubbers



*Set suitable wooden blocks between the engine and lower frame pipe to support the engine.*

Remove the following from each engine lower mount:

- engine hanger nut and bolt
- spacer
- mounting rubbers

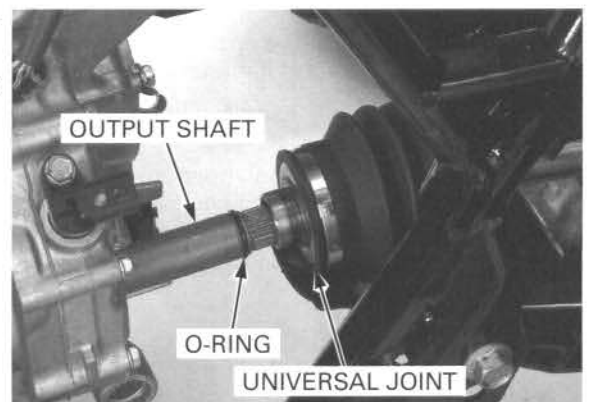


Move the engine forward and disconnect the output shaft from the universal joint.

*Hold the engine securely and take care not to damage the frame and engine.*

Remove the engine out of the frame from the left side.

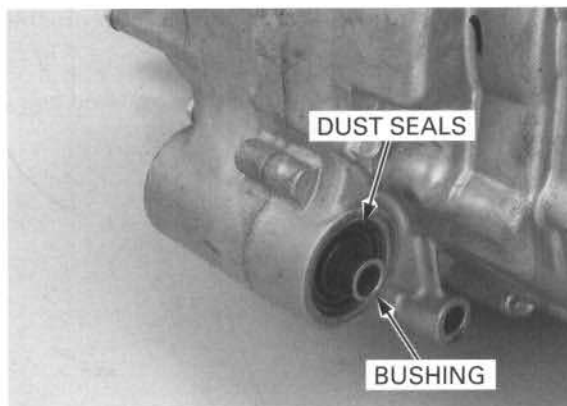
Remove the O-ring from the output shaft.



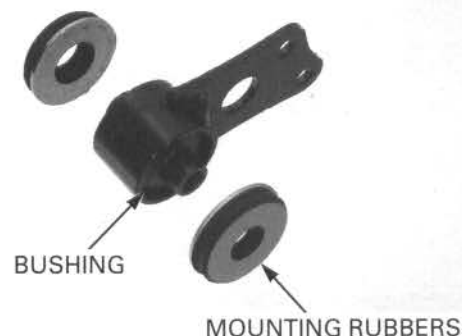


## ENGINE REMOVAL/INSTALLATION

Remove the engine mounting bushings and dust seals.



Check the mounting rubber, bushings and dust seals for deterioration, wear or damage.



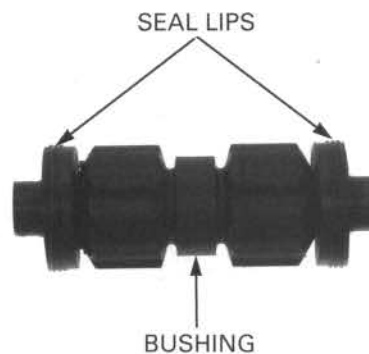
## ENGINE INSTALLATION

### NOTE:

- Route the wires, cables and hoses properly (page 1-28).

Install the lower engine mounting bushings into the engine.

Install the dust seals with the lip side facing out.



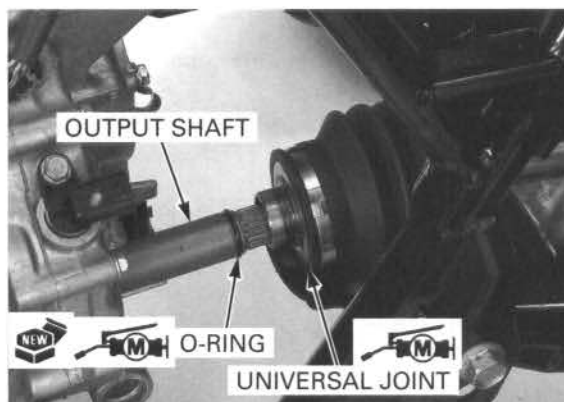
*Hold the engine securely and be careful not to damage the frame and engine.*

Place the engine in the frame from the left side and support it with suitable wooden blocks.

Coat a new O-ring with molybdenum disulfide grease and install it into the output shaft groove.

Apply molybdenum disulfide grease to the universal joint splines.

Carefully move the engine and engage the output shaft with the universal joint.



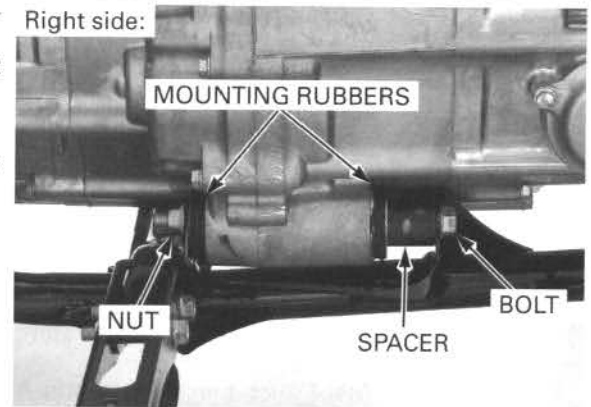


*Be sure the universal joint is not disengaged.*

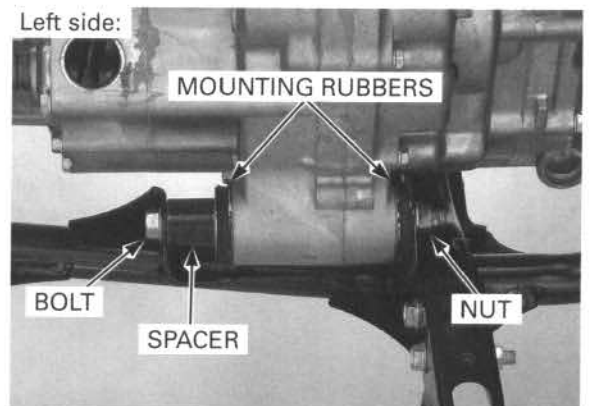
Install the mounting rubbers onto the lower mounting bushing with the large I.D. side facing in. Install the spacer and the hanger bolt (from the front side) while aligning the bolt holes carefully. Loosely install the hanger nut.

Install the other side mounting fasteners in the same manner as above.

Right side:



Left side:



Install the mounting rubbers onto the upper mounting bushing in the hanger bracket with the large I.D. side facing in.

Install the hanger bracket with the 10-mm hanger bolt (from the front side) and nut. Install the two 8-mm hanger bolts.

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

- left and right lower engine hanger nut

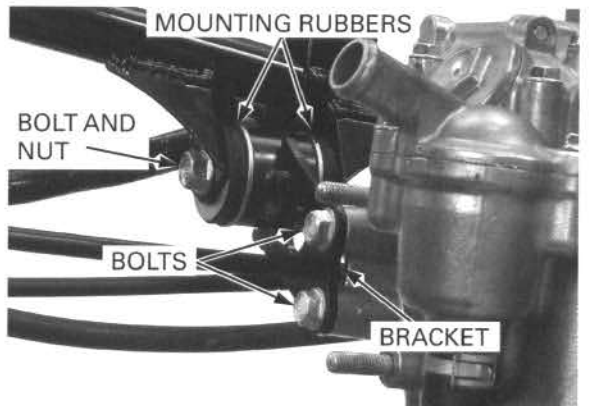
**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

- engine side upper engine hanger bolts

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

- frame side upper engine hanger nut

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





## ENGINE REMOVAL/INSTALLATION

*FM/FE/FPM/FPE only:* Coat a new O-ring with molybdenum disulfide grease and install it into the output shaft groove. Install a new stopper ring into the groove in the propeller shaft end.

Apply 5 – 8 g of molybdenum disulfide grease to the pinion joint splines.

Apply molybdenum disulfide grease to the front end of the propeller shaft.

Place the boot band over the pinion joint temporarily.

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

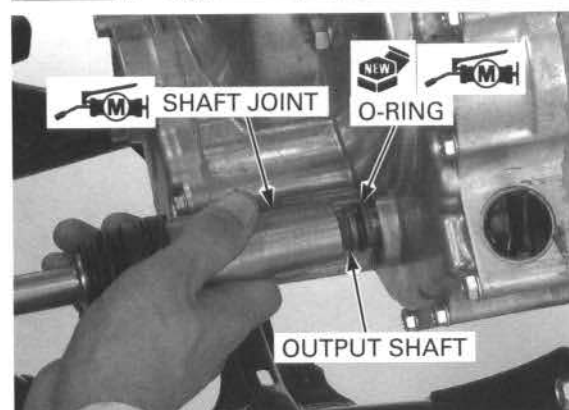
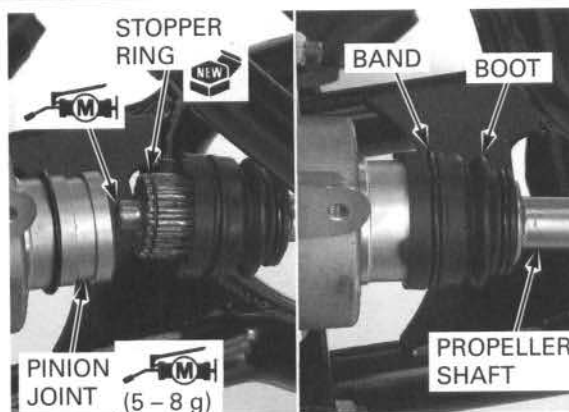
Make sure the stopper ring is seated properly by pulling the propeller shaft lightly.

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

Apply molybdenum disulfide grease to the propeller shaft joint splines.

Move the gear case assembly forward for maximum clearance between the shaft joint and output shaft.

Engage the shaft joint over the output shaft and move the gear case assembly rearward.



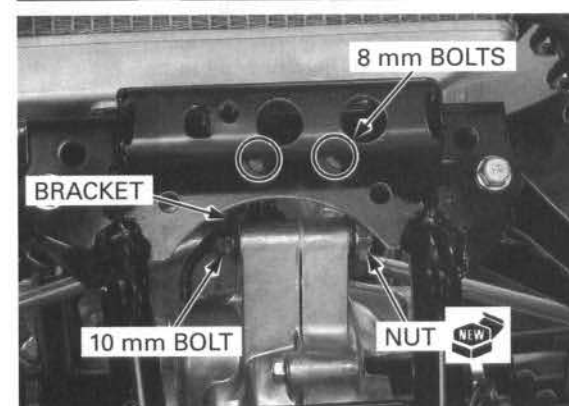
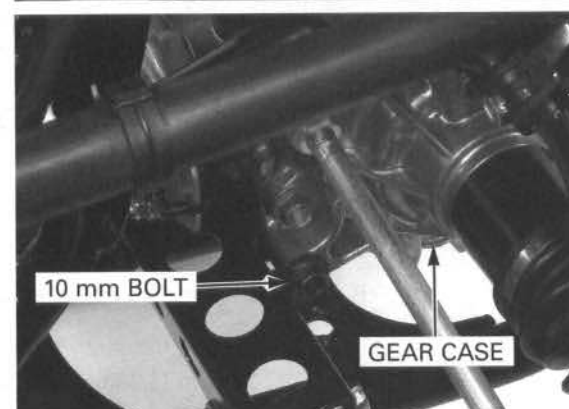
*FM/FE/FPM/FPE only:* Align the lower mounting bolt holes in the gear case and frame, then install the mounting bolt.

Install the mounting bracket with the two bolts.

Install the upper mounting bolt from the right side and a new mounting nut.

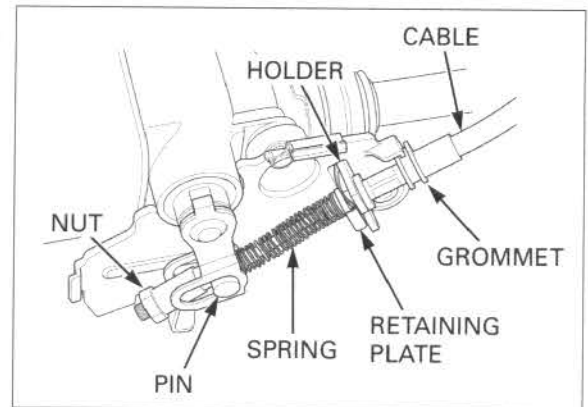
Tighten all the gear case mounting fasteners.

**TORQUE: 10 mm: 44 N·m (4.5 kgf·m, 32 lbf·ft)**

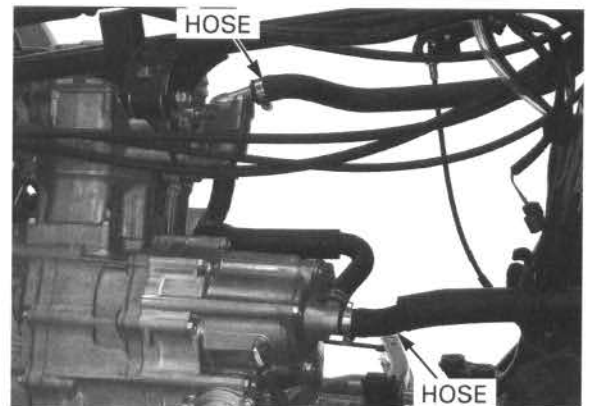




FM/FE/FPM/FPE only: Install the spring onto the selector cable. Insert the cable into the cable holder and connect it to the clutch arm with the joint pin and adjusting nut. Set the groove in the cable grommet onto the cover base end properly. Install the retaining plate onto the cable with the concave facing the cable holder to secure the cable.



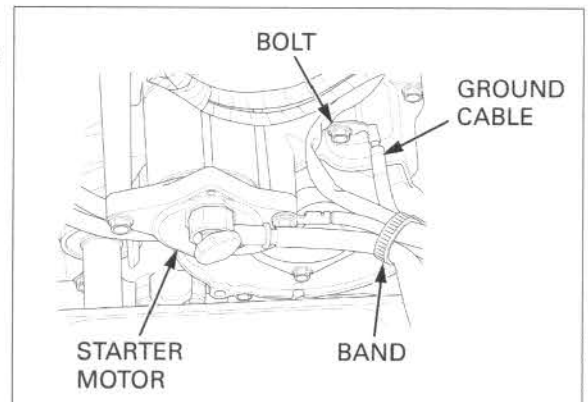
Connect the water hoses.



Install the starter motor (page 21-6).

Connect the ground cable to the engine with the bolt.

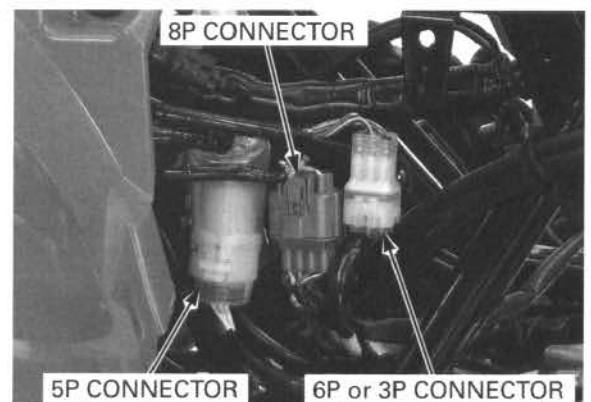
Secure the wires and cables with the wire band.



Connect the following and install them onto the frame:

- alternator 5P connector
- gear position switch 8P gray connector

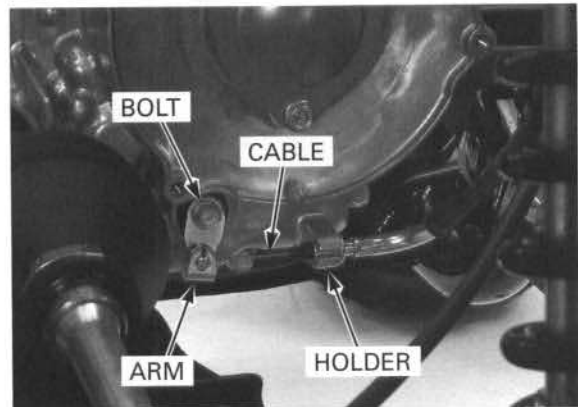
TE/FE/FPE and '08 Canada TM/FM: Install the engine sub-wire harness 6P connector onto the frame.  
FPM and After '08 Canada FM: Install the engine sub-wire harness 3P connector onto the frame.





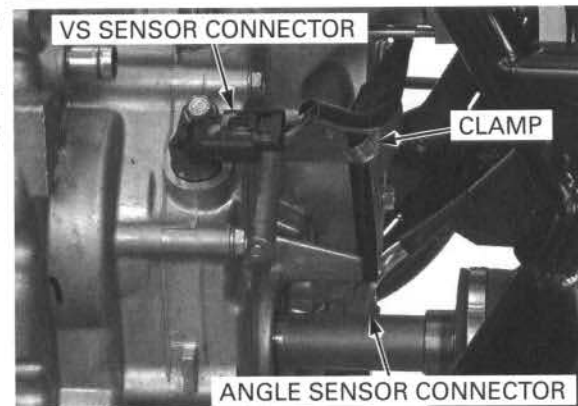
## ENGINE REMOVAL/INSTALLATION

Install the reverse selector cable into the cable holder of the engine.  
Connect the cable to the selector arm and install the arm by aligning the flat surfaces, and tighten the bolt.



Connect the following and secure the wire with the clamp:

- TE/FE/FPE only: shift angle sensor 3P gray connector
- TE/FE/FPE/FPM and After '07 Canada TM/FM: vehicle speed (VS) sensor 3P black connector



*TM/FM/FPM only:* Install the gearshift pedal so that the bottom surface of the pedal joint is parallel with the frame pipe. Install the pinch bolt and tighten it.

**TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)**

Adjust the following:

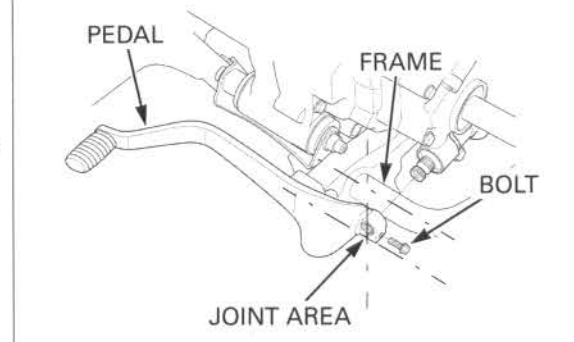
- reverse selector cable (page 4-25).
- FM/FE/FPM/FPE only: 2WD/4WD selector cable (page 4-21)

Install the following:

- exhaust system (page 3-13)
- throttle body (page 6-46)
- TE/FE/FPE only: shift control motor (page 23-34)
- fuel pump (page 6-40)
- brake pedal (page 16-25)
- engine guard (page 3-8)
- mudguards (page 3-6)
- front fender/carrier (page 3-7)
- heat guard plate (page 9-23)
- battery (-) cable (page 19-6)

Fill the engine with recommended oil (page 4-15).  
Fill and bleed the cooling system (page 7-6).  
Check the engine oil level (page 4-14).

TM/FM/FPM models:





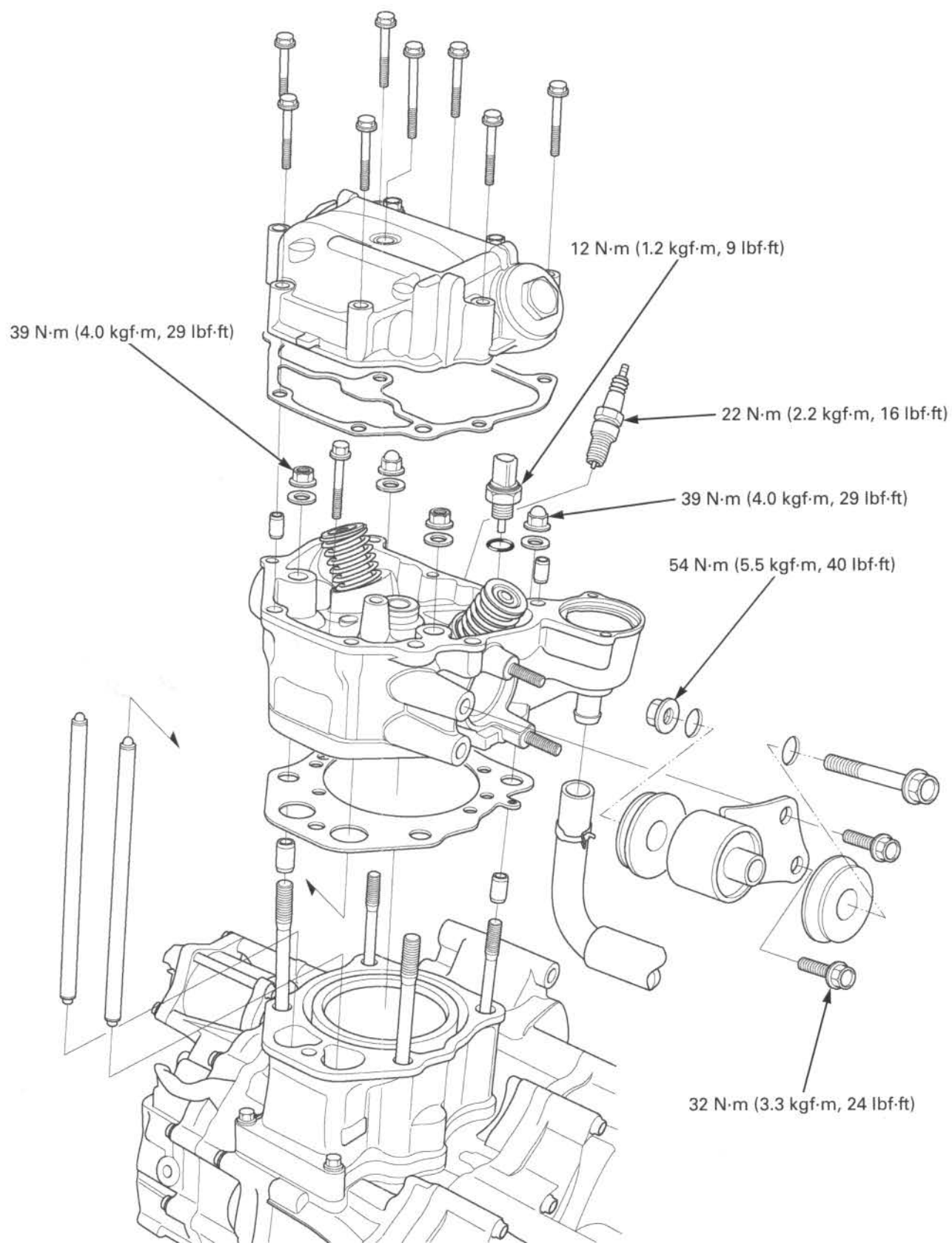
# 9. CYLINDER HEAD/VALVE

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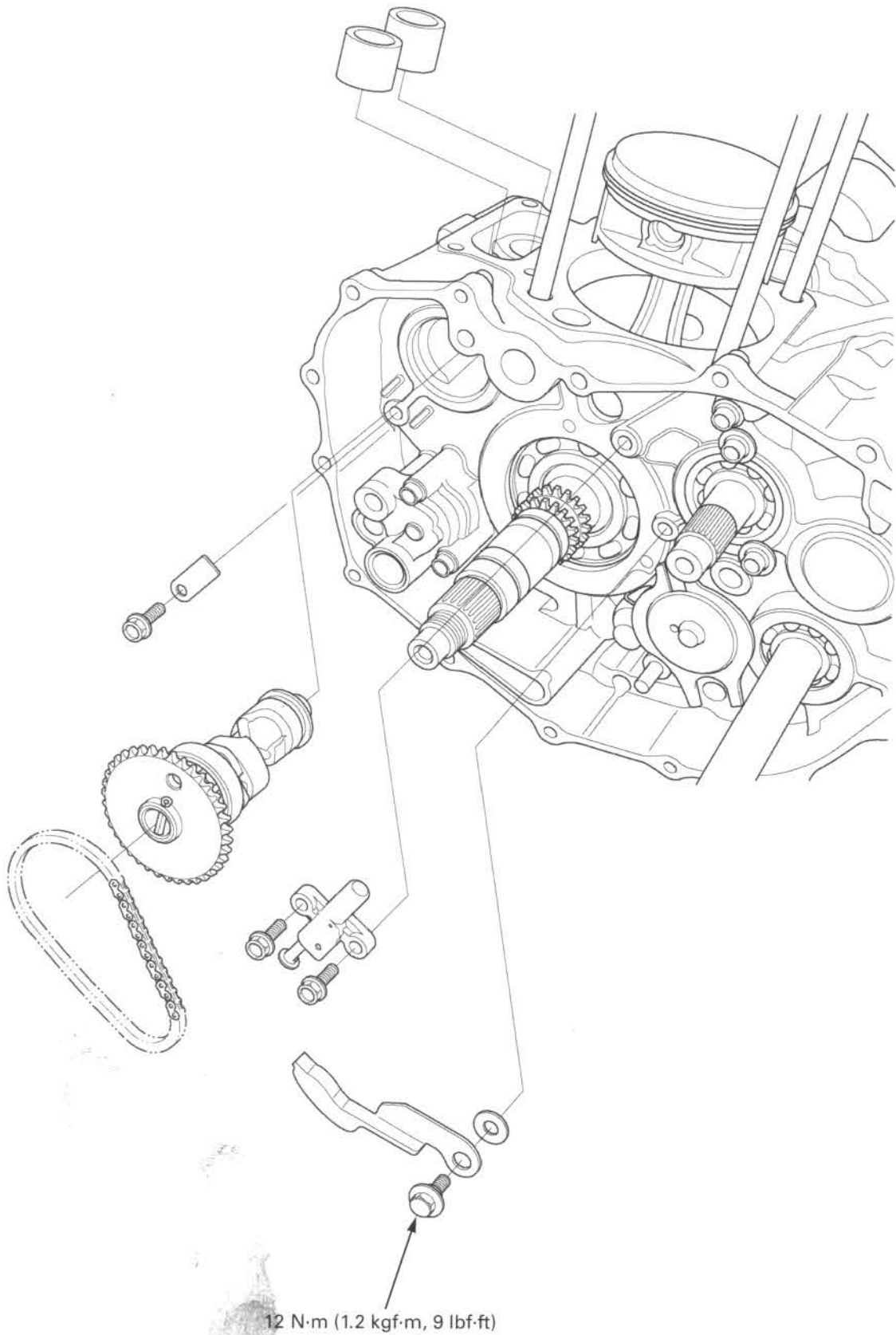
SYSTEM COMPONENTS .....	9-2	VALVE GUIDE REPLACEMENT .....	9-14
SERVICE INFORMATION .....	9-4	VALVE SEAT INSPECTION/ REFACING.....	9-15
TROUBLESHOOTING .....	9-7	CYLINDER HEAD ASSEMBLY .....	9-18
CYLINDER COMPRESSION.....	9-8	CYLINDER HEAD INSTALLATION.....	9-19
CYLINDER HEAD COVER REMOVAL/ DISASSEMBLY .....	9-8	CYLINDER HEAD COVER ASSEMBLY/ INSTALLATION .....	9-21
CYLINDER HEAD REMOVAL .....	9-11	CAMSHAFT REMOVAL.....	9-24
CYLINDER HEAD DISASSEMBLY.....	9-12	CAMSHAFT INSTALLATION .....	9-27



## CYLINDER HEAD/VALVE SYSTEM COMPONENTS









## SERVICE INFORMATION

## GENERAL

- This section covers service of the rocker arms, cylinder head, valves and camshaft. These services 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 and valve lubricating oil is fed through oil passages in the cylinder head and head cover. Clean the oil passages before assembling cylinder head.
- Be careful not to damage the mating surfaces when removing the cylinder head cover and cylinder head. Do not strike the cylinder head too hard during removal.

## SPECIFICATIONS

Unit: mm (in)

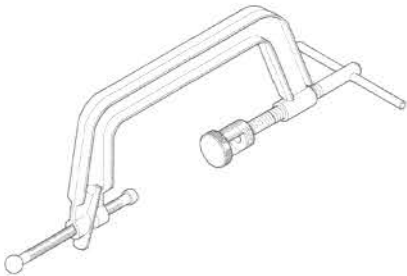

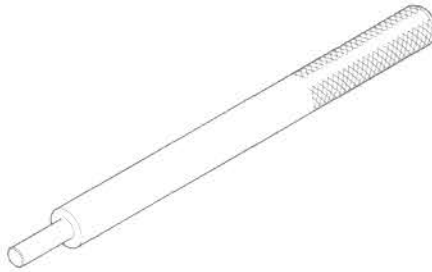


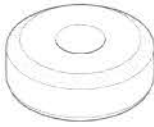
ITEM				STANDARD	SERVICE LIMIT
Cylinder compression at 400 rpm				500 kPa (5.1 kgf/cm <sup>3</sup> , 73 psi)	—
Valve clearance			IN	0.15 ± 0.02 (0.006 ± 0.001)	—
			EX	0.23 ± 0.02 (0.009 ± 0.001)	—
Valve, valve guide	Valve stem O.D.	'07 – '08 models	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.45 (0.215)
			EX	5.455 – 5.470 (0.2148 – 0.2154)	5.43 (0.214)
		After '08 models	IN	5.975 – 5990 (0.2352 – 0.2358)	5.95 (0.234)
			EX	5.955 – 5.970 (0.2344 – 0.2350)	5.93 (0.233)
	Valve guide I.D.	'07 – '08 models	IN/EX	5.500 – 5.512 (0.2165 – 0.2170)	5.53 (0.218)
		After '08 models	IN/EX	6.000 – 6.012 (0.2362 – 0.2366)	6.02 (0.237)
	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/EX	15.0 – 15.2 (0.59 – 0.60)	—
	Valve seat width		IN/EX	1.2 (0.05)	1.5 (0.06)
Valve spring	Free length	'07 – '08 models	Inner	37.8 (1.49)	37.0 (1.46)
			Outer	42.7 (1.68)	41.8 (1.65)
		After '08 models	Inner	42.94 (1.691)	42.08 (1.657)
			Outer	43.63 (1.718)	42.76 (1.683)
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	'07 – '08 models	IN	35.9400 – 36.1800 (1.41496 – 1.42441)	35.74 (1.407)
			EX	35.6811 – 35.9211 (1.40476 – 1.41421)	35.48 (1.397)
		After '08 models	IN	35.4723 – 35.7123 (1.39654 – 1.40599)	35.27 (1.388)
			EX	35.3009 – 35.5409 (1.38980 – 1.39925)	35.10 (1.382)
	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 clear- ance		IN/EX	0.028 – 0.059 (0.0011 – 0.0023)	0.07 (0.003)
Cylinder head warpage				—	0.10 (0.004)



## TORQUE VALUES

Cylinder head nut	39 N·m (4.0 kgf·m, 29 lbf·ft) Apply engine oil to the threads and seating surface.
Spark plug	22 N·m (2.2 kgf·m, 16 lbf·ft)
Upper engine hanger nut (frame side)	54 N·m (5.5 kgf·m, 40 lbf·ft)
Upper engine hanger bolt (engine side)	32 N·m (3.3 kgf·m, 24 lbf·ft)
Cam chain tensioner pivot bolt	12 N·m (1.2 kgf·m, 9 lbf·ft) Apply locking agent to the threads.
ECT sensor	12 N·m (1.2 kgf·m, 9 lbf·ft)

## TOOLS

Valve spring compressor 07757-0010000 	Valve guide driver, 5.5 mm 07742-0010100 	Valve guide driver, 6 mm 07942-6570100 
Valve guide reamer, 5.5 mm 07984-2000001 	Valve guide reamer, 6 mm 07VMH-MBB0200 	Valve seat cutter, 40 mm (IN 45°) 07780-0010500   or equivalent commercially available in U.S.A.



CYLINDER HEAD/VALVE

<p>Valve seat cutter, 33 mm (EX 45°) 07780-0010800</p> <p>or equivalent commercially available in U.S.A.</p>	<p>Flat cutter, 38.5 mm (IN 32°) 07780-0012400</p> <p>or equivalent commercially available in U.S.A.</p>	<p>Flat cutter, 33 mm (EX 32°) 07780-0012900</p> <p>or equivalent commercially available in U.S.A.</p>
<p>Interior cutter, 37.5 mm (IN 60°) 07780-0014100</p> <p>or equivalent commercially available in U.S.A.</p>	<p>Interior cutter, 34 mm (EX 60°) 07780-0014700</p> <p>or equivalent commercially available in U.S.A.</p>	<p>Cutter holder, 5.5 mm 07781-0010101</p> <p>or equivalent commercially available in U.S.A.</p>
<p>Cutter holder, 6 mm 07VMH-MBB0100</p> <p>or equivalent commercially available in U.S.A.</p>		



## TROUBLESHOOTING

- Engine top-end problems usually affect engine performance. These problems 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 hose. If the hose is smoky, check for seized piston ring (page 10-2).

### **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 (page 10-3)

### **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 (page 10-3)

### **Excessive noise**

- Incorrect valve clearance
- Sticking valve or broken valve spring
- Excessively 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 (page 10-3)

### **Rough idle**

- Low cylinder compression



### CYLINDER COMPRESSION

Warm up the engine to normal operating temperature.

Stop the engine and remove the spark plug (page 4-11).

Install the compression gauge into the spark plug hole.

Shift the transmission into 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.

*The cylinder compression specification is comparatively low because the camshaft has a decompression device installed.*

#### COMPRESSION PRESSURE:

**500 kPa (5.1 kgf/cm<sup>2</sup>, 73 psi) at 400 rpm**

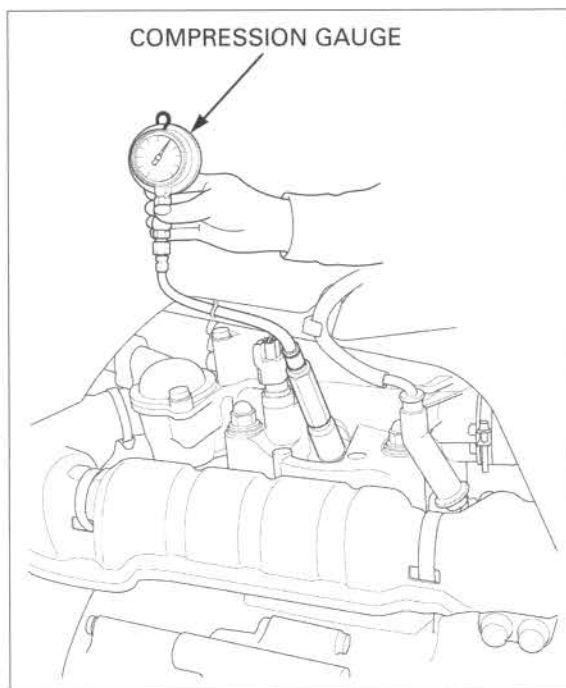
Check that there is no leakage at the gauge connection.

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



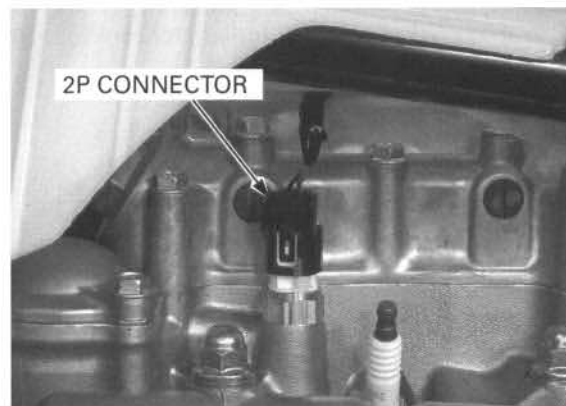
### CYLINDER HEAD COVER REMOVAL/DISASSEMBLY

#### REMOVAL

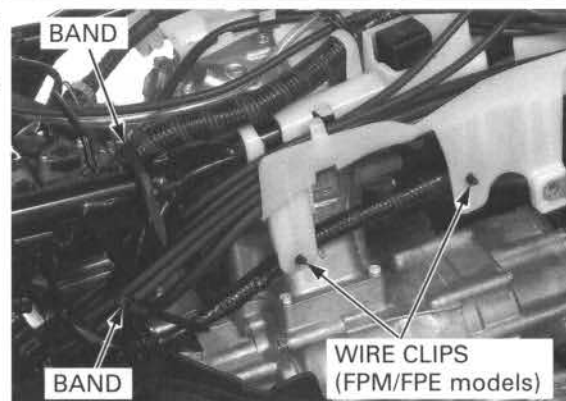
Remove the following:

- fuel tank (page 6-41)
- throttle body cover (page 6-35)

Disconnect the ECT sensor 2P connector.



Remove the two wire bands from the frame to free the main wire harness, cables and hoses.



*FPM/FPE only:*

Release the four wire clips from the right side of the head guard plate.



*FPM/FPE only:* Remove the hose clip from the fuel feed and drain hoses.

*FPM/FPE only:* Release the wire band and EPS motor 2P connector from the plate.

Remove the fuel feed hose from the injector (page 6-33).

*Be careful not to bend or kink the fuel feed hose.*

Release the wires, cables and hoses from the clamps of the heat guard plate.

Remove the heat guard plate from the frame.

Set the piston position to Top Dead Center on the compression stroke (page 4-12).

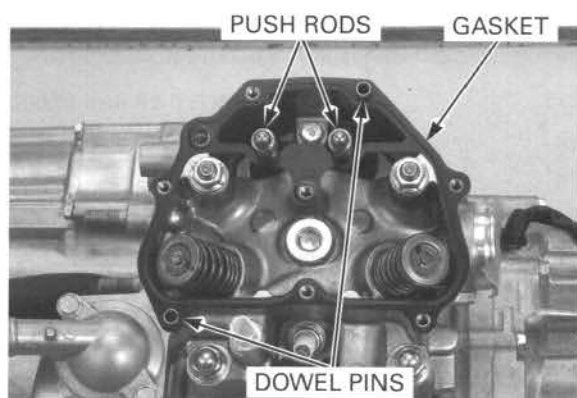
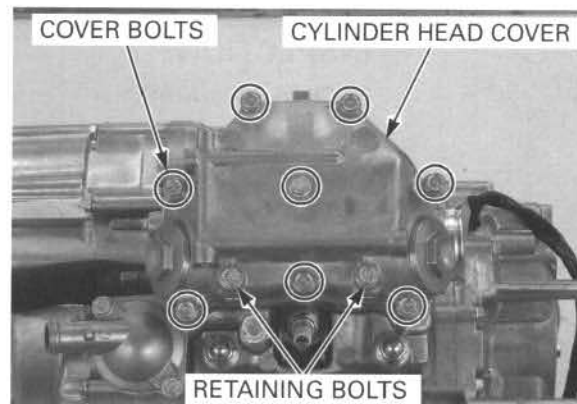
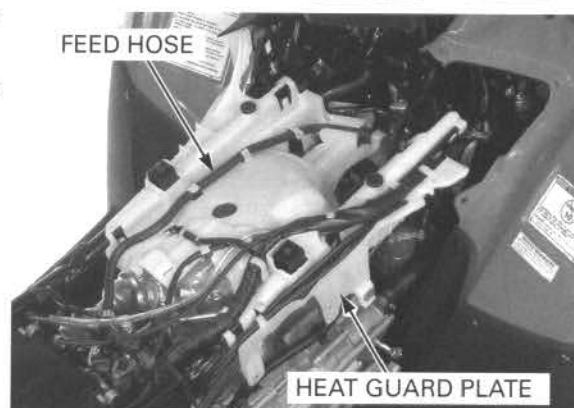
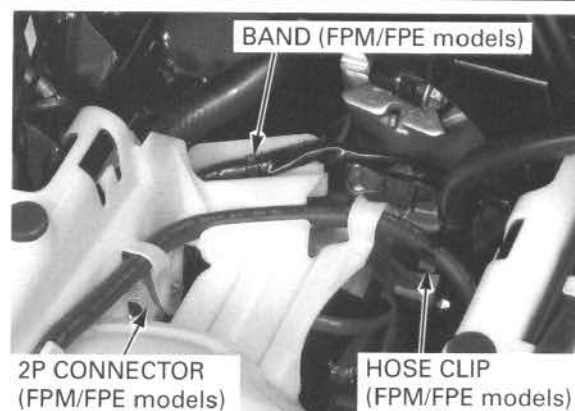
If you plan to remove the rocker arms, loosen the two rocker arm shaft retaining bolts.

Remove the following:

- eight cylinder head cover bolts
- cylinder head cover

*Mark the push rods so they can be placed back in their original locations.*

- push rods
- gasket
- two dowel pins

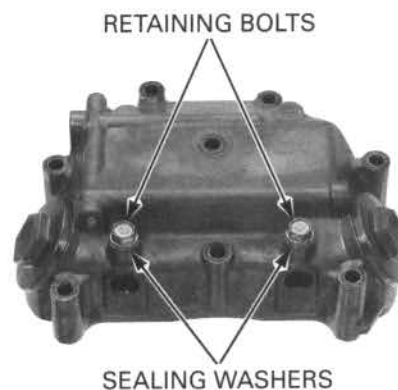




## CYLINDER HEAD/VALVE

### DISASSEMBLY

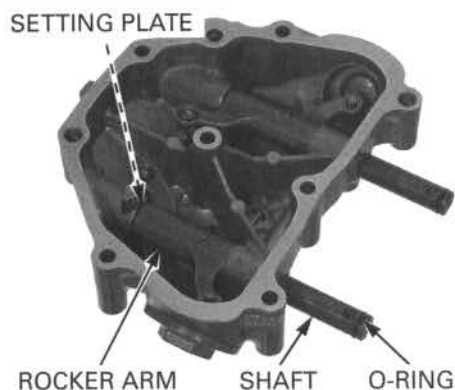
Remove the two rocker arm shaft retaining bolts and sealing washers.



Push each rocker arm shaft with a small screwdriver through the bolt hole until the O-ring on the shaft is removed out of the head cover.

Remove the following:

- rocker arm shafts
- rocker arms
- setting plates
- O-rings



### 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 passage.

Measure the each rocker arm shaft O.D.

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

Measure each rocker arm I.D.

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

Subtract the 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 (page 9-24).





## CYLINDER HEAD REMOVAL

Remove the following:

- throttle body (page 6-44)
- exhaust system (page 3-13)
- thermostat (page 7-8)
- upper engine hanger nut and bolt (frame side)
- upper engine hanger bolts (engine side)
- engine hanger bracket and mounting rubbers
- cylinder head cover (page 9-8)

- spark plug
- ECT sensor and O-ring

Disconnect the water hose from the cylinder head.

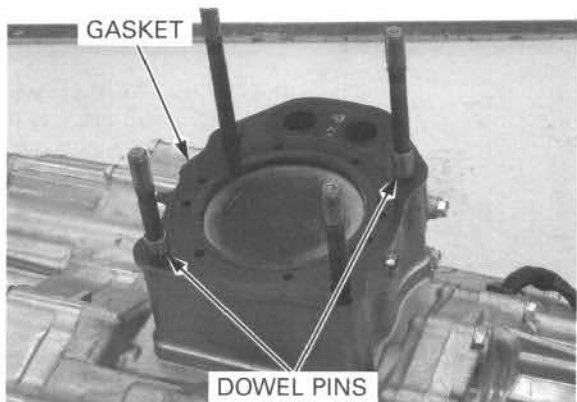
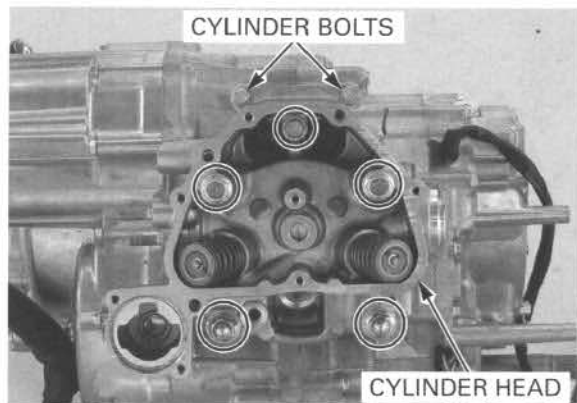
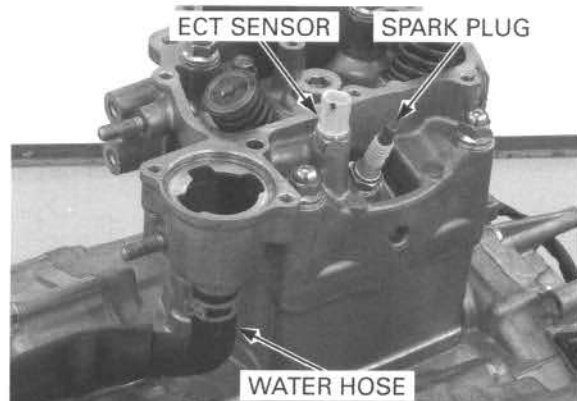
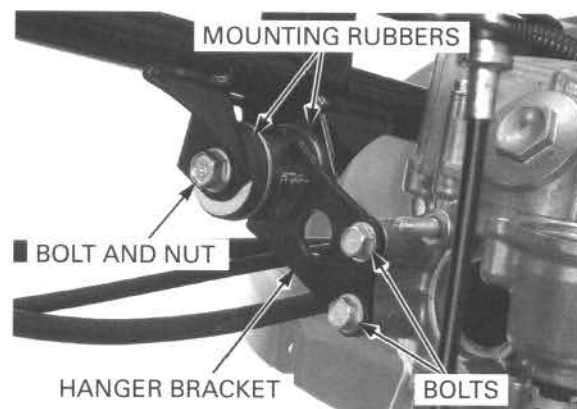
Loosen the two cylinder bolts.

*Be careful not to let the nuts and washers fall into the crankcase.*

Loosen the cylinder head bolt and nuts in a criss-cross pattern in several steps, and remove the bolt, nuts and washers.

Remove the cylinder head, being careful not to damage the mating surfaces.

Remove the gasket and two dowel pins.





## CYLINDER HEAD/VALVE

### CYLINDER HEAD DISASSEMBLY

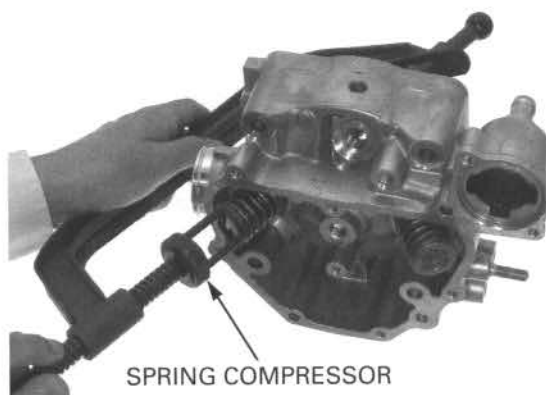
Remove the cylinder head (page 9-11).

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

Remove the valve spring cotters using the valve spring compressor.

**TOOL:**

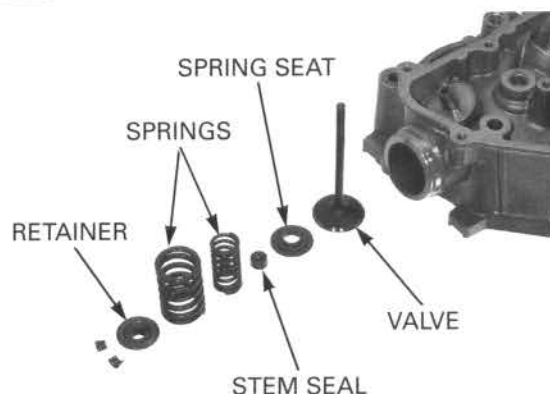
**Valve spring compressor 07757-0010000**



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

Remove the following:

- spring retainer
- outer and inner valve springs
- valve
- stem seal
- spring seat



### INSPECTION

#### CYLINDER HEAD

*Be careful not to damage the valve seat and gasket surfaces.*

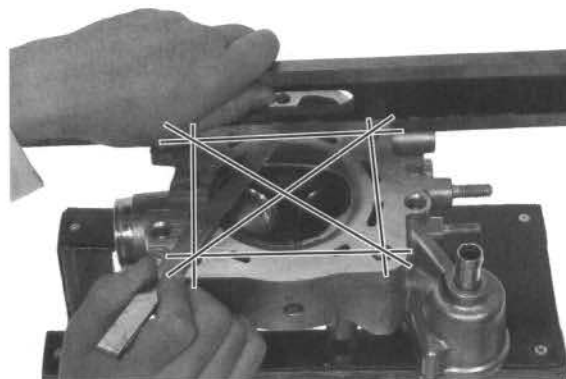
Remove the carbon deposits from the combustion chamber.

Check the spark plug hole and valve areas for cracks.



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

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





**VALVE SPRING**

Check the valve springs for fatigue or damage.  
Measure the valve spring free length.

**SERVICE LIMITS:**

'07 – '08 models:	Inner: 37.0 mm (1.46 in) Outer: 41.8 mm (1.65 in)
After '08 models:	Inner: 42.08 mm (1.657 in) Outer: 42.76 mm (1.683 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:**

'07 – '08 models:	IN: 5.45 mm (0.215 in) EX: 5.43 mm (0.214 in)
After '08 models:	IN: 5.95 mm (0.234 in) EX: 5.93 mm (0.233 in)

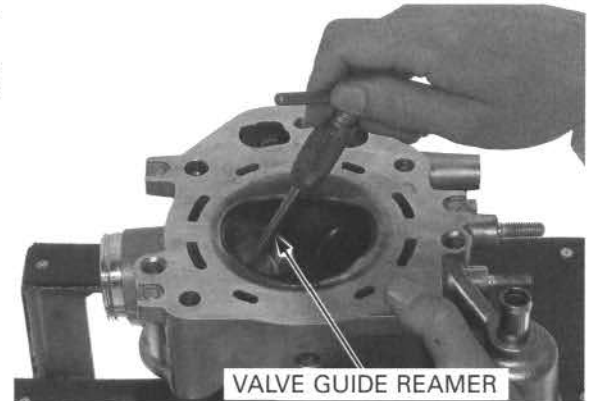


Ream the valve guides to remove any carbon build-up before measuring the guide.

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

**TOOL:**

'07 – '08 models:	
Valve guide reamer, 5.5 mm	07984-2000001
After '08 models:	
Valve guide reamer, 6 mm	07VMH-MBB0200



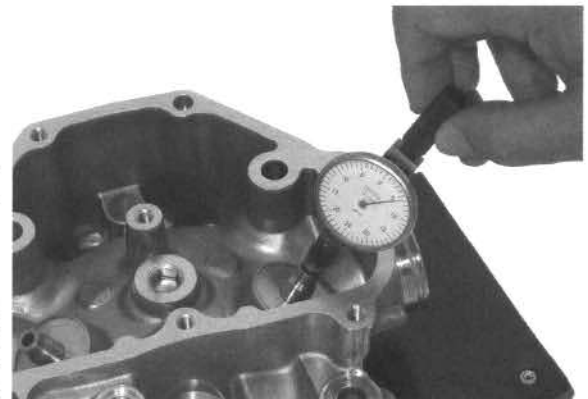
Measure each valve guide I.D. and record it.

**SERVICE LIMIT:**

'07 – '08 models:	IN/EX: 5.53 mm (0.218 in)
After '08 models:	IN/EX: 6.02 mm (0.237 in)

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

<b>SERVICE LIMITS:</b>	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 9-15).*

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

Mark new valve guide at the specified height indicated below, using a maker.  
Chill the new valve guides in a freezer for about an hour.

*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.*

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:

'07 – '08 models:

Valve guide driver, 5.5 mm      07742-0010100

After '08 models:

Valve guide driver, 6 mm      07942-6570100

Remove the new valve guides from the freezer. While the cylinder head is still heated, drive each valve guide in the cylinder head from the rocker arm side until the exposed height is at the specified value (at the mark).

### TOOL:

'07 – '08 models:

Valve guide driver, 5.5 mm      07742-0010100

After '08 models:

Valve guide driver, 6 mm      07942-6570100

### VALVE GUIDE PROJECTION:

IN/EX: 15.0 – 15.2 mm (0.59 – 0.60 in)

Let the cylinder head cool to room temperature.

*Use cutting oil on the reamer during this operation. Take care not to tilt or lean the reamer in the guide while reaming.*

Ream the new valve guides. Insert the reamer from the combustion chamber side of the cylinder head and always rotate the reamer clockwise.

### TOOL:

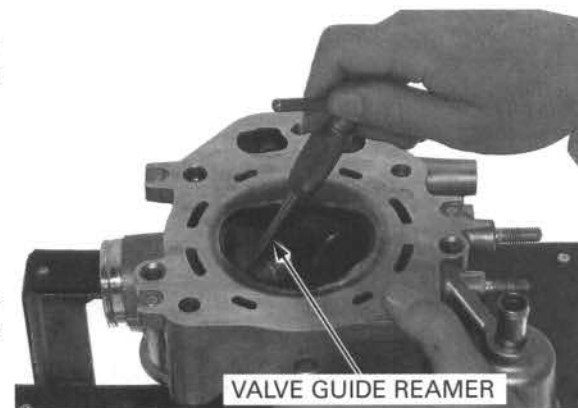
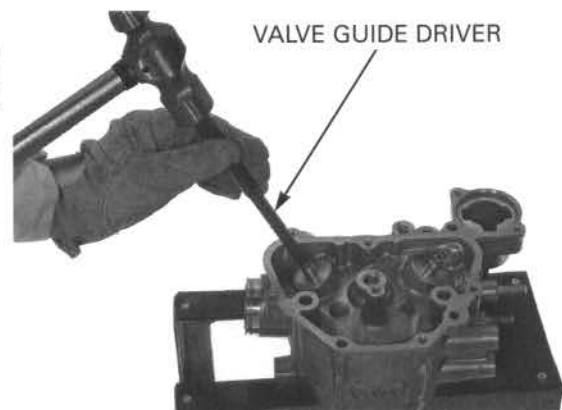
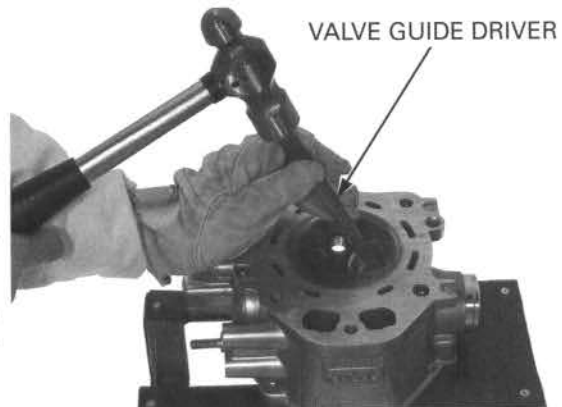
'07 – '08 models:

Valve guide reamer, 5.5 mm      07984-2000001

After '08 models:

Valve guide reamer, 6 mm      07VMH-MBB0200

Clean the cylinder head thoroughly to remove any metal particles after reaming and reface the valve seat (page 9-15).





## VALVE SEAT INSPECTION/REFACING

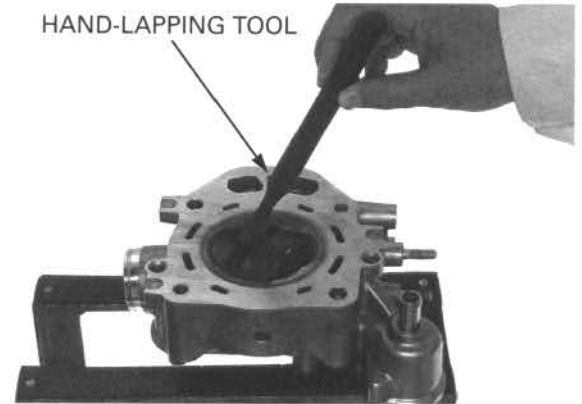
### INSPECTION

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.

HAND-LAPPING TOOL



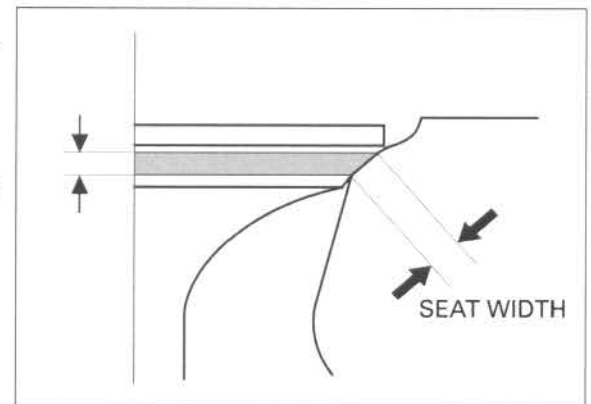
*The valve cannot be ground. If the valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.*

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:** 1.2 mm (0.05 in)

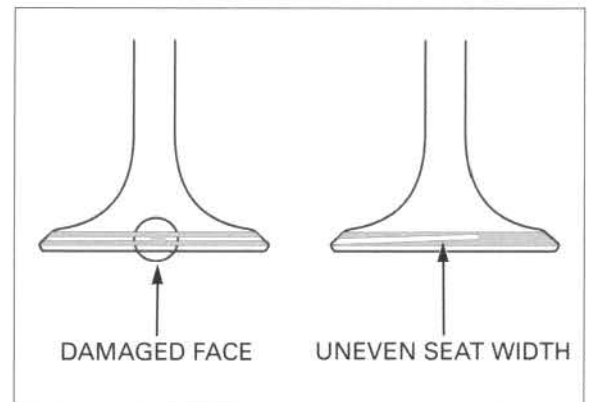
**SERVICE LIMIT:** 1.5 mm (0.06 in)

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

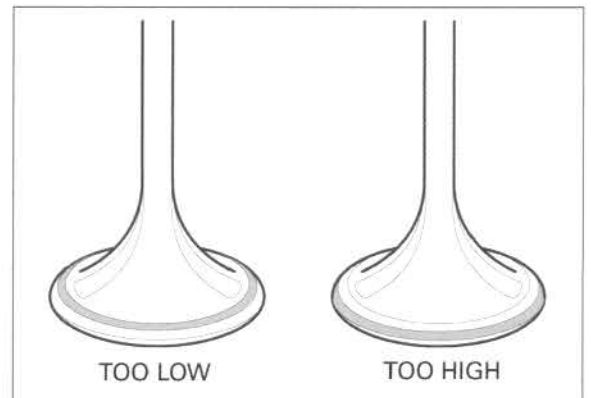


Inspect the valve seat face for:

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



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



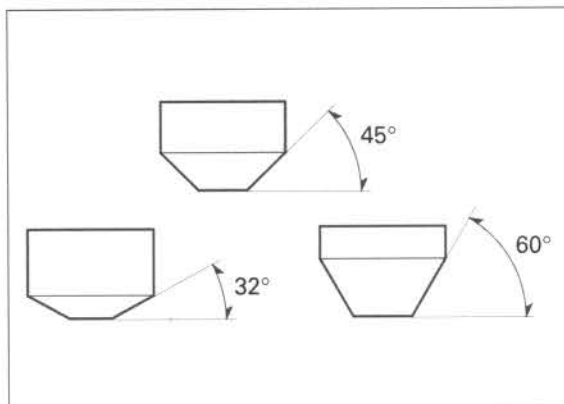


## CYLINDER HEAD/VALVE

### REFACING

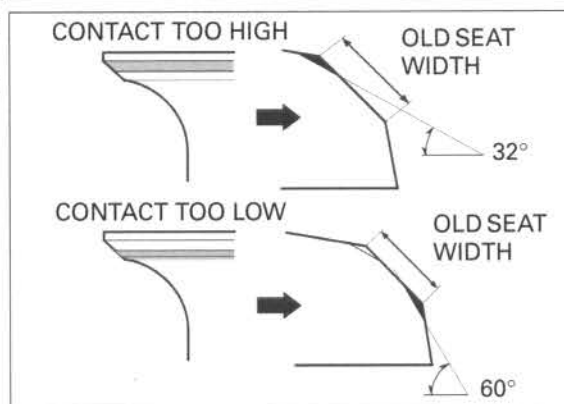
Follow the refacing manufacturer's operating instructions.

Valve seat cutters/grinders or equivalent valve seat refacing equipment are recommended to correct worn valve seats.



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.



Reface the seat with a 45° cutter whenever a valve guide is replaced.

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

#### TOOLS:

Seat cutter, 40 mm (45° IN) 07780-0010500

Seat cutter, 33 mm (45° EX) 07780-0010800

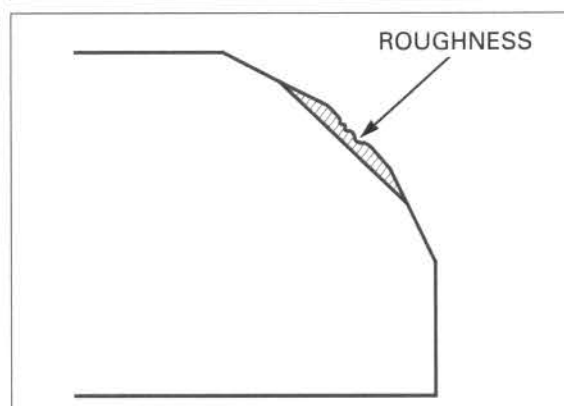
'07 - '08 models:

Cutter holder, 5.5 mm 07781-0010101

After '08 models:

Cutter holder, 6 mm 07VMH-MBB0100

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, 38.5 mm (32° IN) 07780-0012400

Flat cutter, 33 mm (32° EX) 07780-0012900

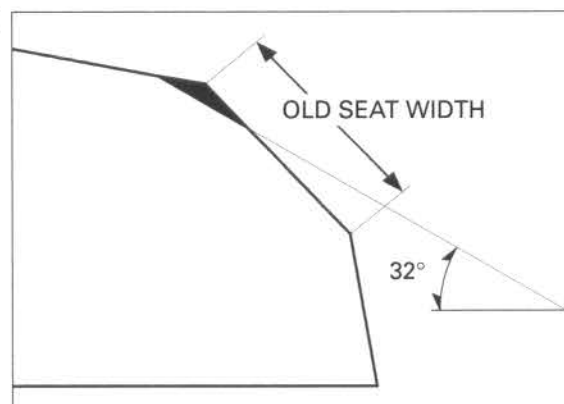
'07 - '08 models:

Cutter holder, 5.5 mm 07781-0010101

After '08 models:

Cutter holder, 6 mm 07VMH-MBB0100

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, 37.5 mm (60° IN) 07780-0014100

Interior cutter, 34 mm (60° EX) 07780-0014700

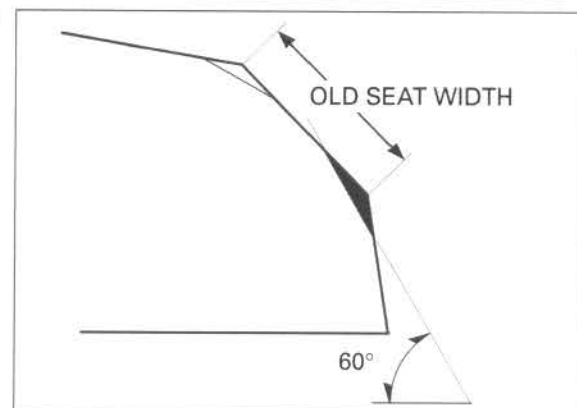
'07 - '08 models:

Cutter holder, 5.5 mm 07781-0010101

After '08 models:

Cutter holder, 6 mm 07VMH-MBB0100

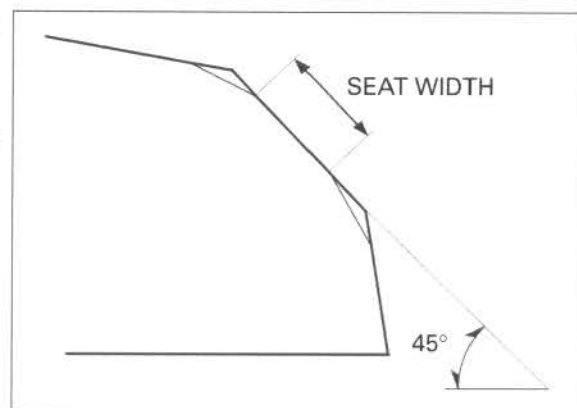
or equivalent commercially available in U.S.A.



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

**VALVE SEAT WIDTH: 1.2 mm (0.05 in)**

Make sure that all pitting and irregularities are removed.

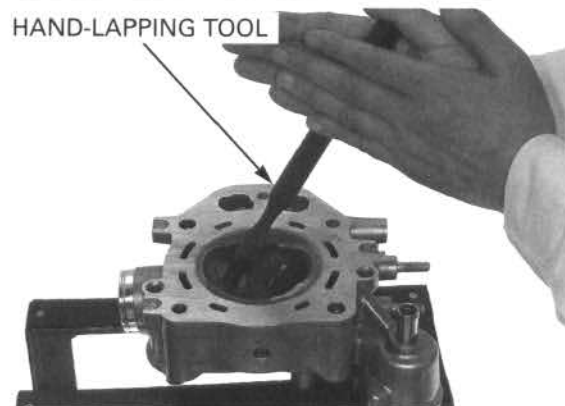


After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

**NOTE:**

- Excessive lapping pressure may deform or damage the seat.
- Change the angle of the lapping tool frequently to prevent uneven seat wear.
- Do not allow lapping compound to enter the guides.

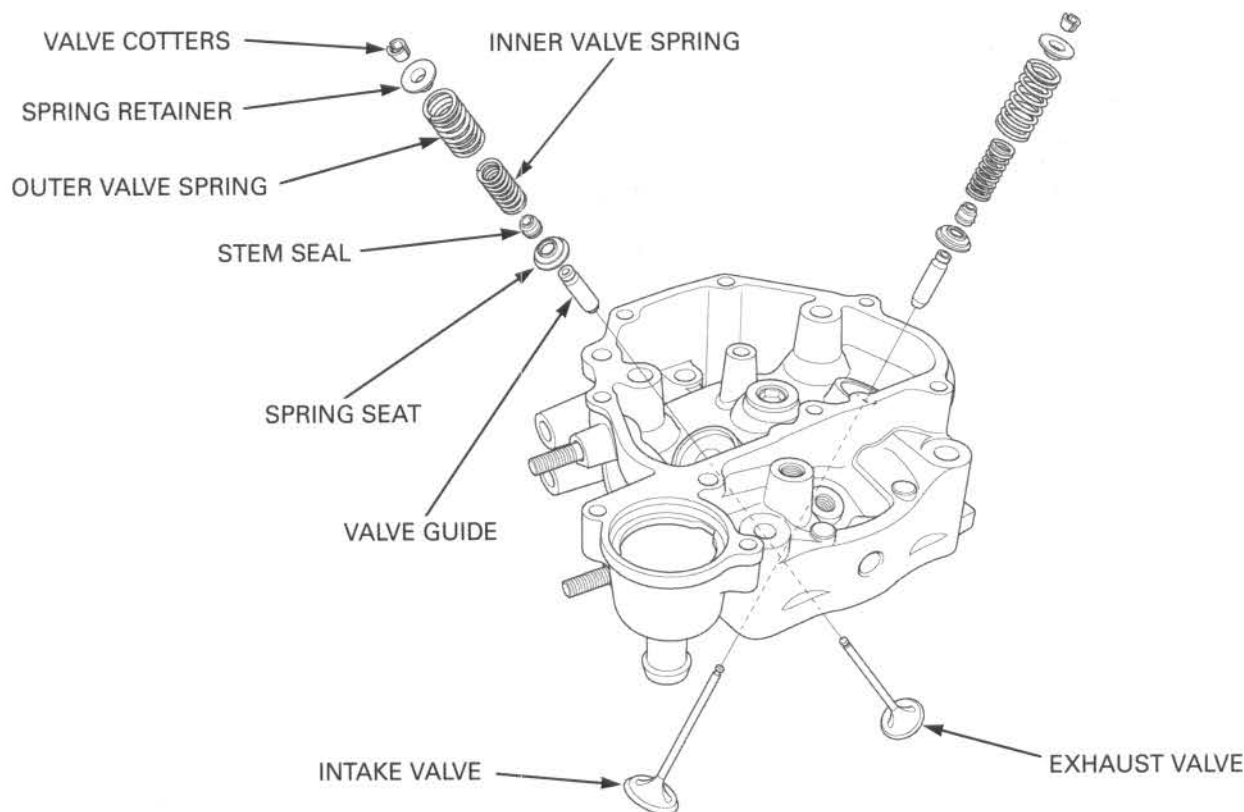
After lapping, wash any residual compound off the cylinder head and valve and recheck the seat contact.



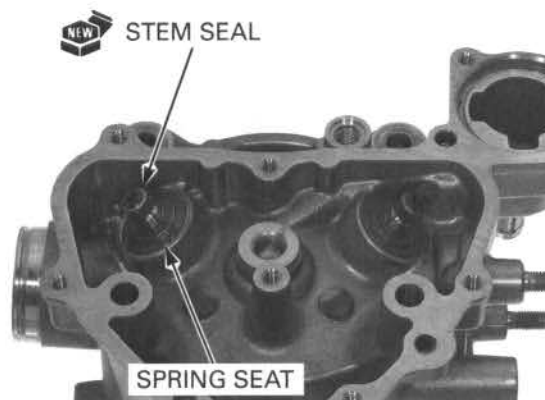


CYLINDER HEAD/VALVE

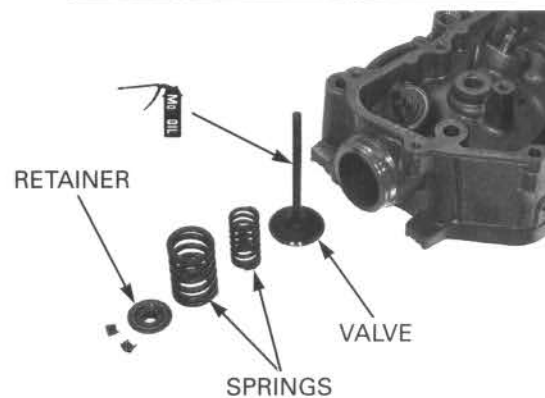
**CYLINDER HEAD ASSEMBLY**



Blow through the oil passage in the cylinder head with compressed air.  
Install the spring seats and new stem seals.

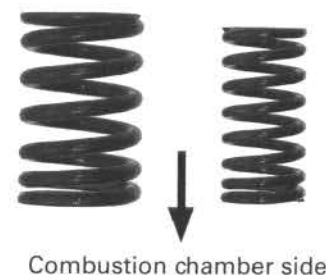


Lubricate the valve stem sliding surface with molybdenum oil solution.  
Insert the valve into the guide while turning it slowly to avoid damaging the stem seal.





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

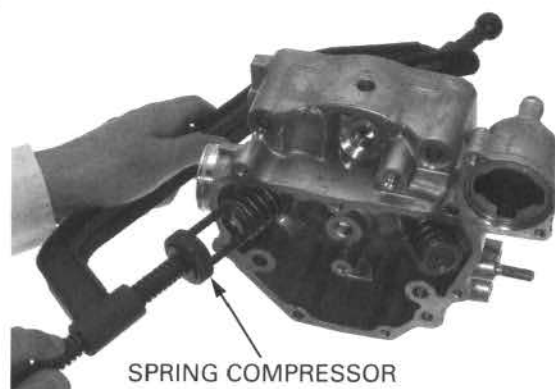


*Grease the cotters to ease installation. To prevent loss of tension, do not compress the valve springs more than necessary.*

Install the valve spring cotters using the valve spring compressor.

**TOOL:**

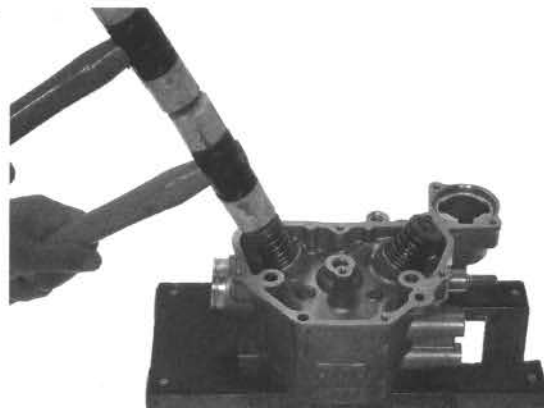
**Valve spring compressor** 07757-0010000



*Support the cylinder head so 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.

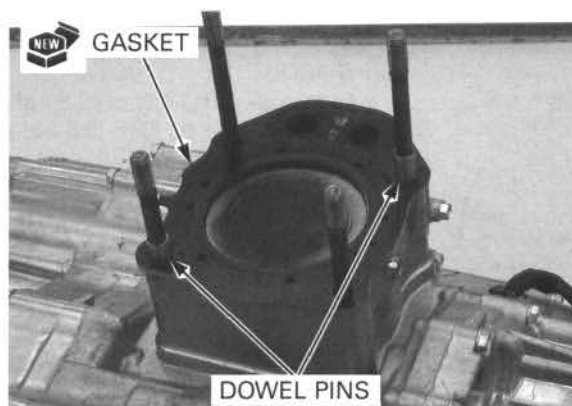
Install the cylinder head (page 9-19).



## CYLINDER HEAD INSTALLATION

Clean the mating surfaces of the cylinder and cylinder head, being careful not to damage them.

Install the two dowel pins and a new gasket with the mark facing up.





## CYLINDER HEAD/VALVE

Install the cylinder head on the cylinder.

*Be careful not to let the nuts and washers fall into the crankcase.*

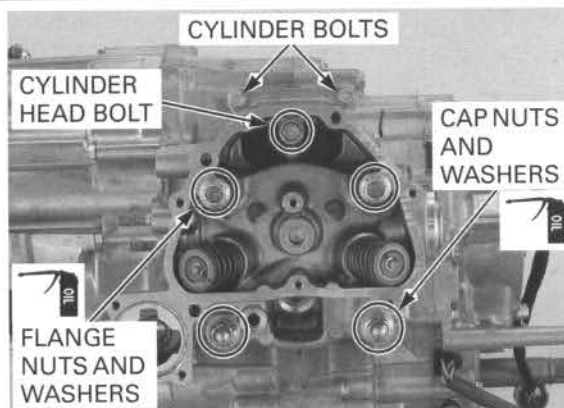
Apply engine oil to the threads and seating surface of the cap nuts and flange nuts, and install the washers and nuts.

Tighten the nuts in a crisscross pattern in several steps.

**TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)**

Install the cylinder head bolt and tighten it.

Tighten the two cylinder bolts.



Connect the water hose to the cylinder head.

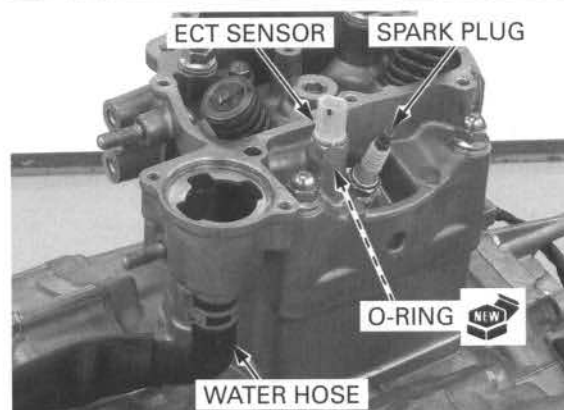
Coat a new O-ring with engine oil and install it onto the ECT sensor.

Install the ECT sensor and tighten it.

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

Install the spark plug and tighten it.

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



Install the mounting rubbers onto the hanger bracket bushing with the large I.D. side facing in.



*Insert the 10 mm (frame side) bolt from the front side.*

Install the engine hanger bracket with the 8-mm bolts, 10-mm bolt and nut.

Tighten the engine hanger bolts and nut.

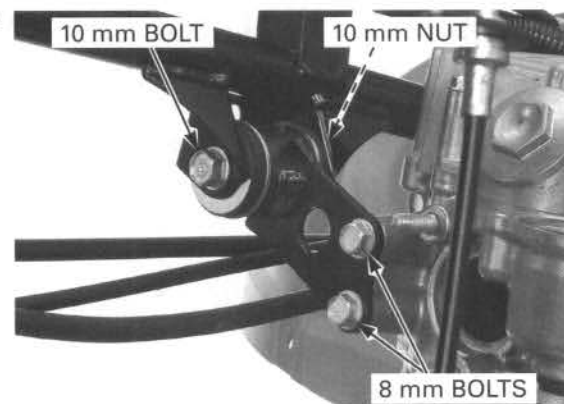
**TORQUE:**

**10 mm nut: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

**8 mm bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

Install the following:

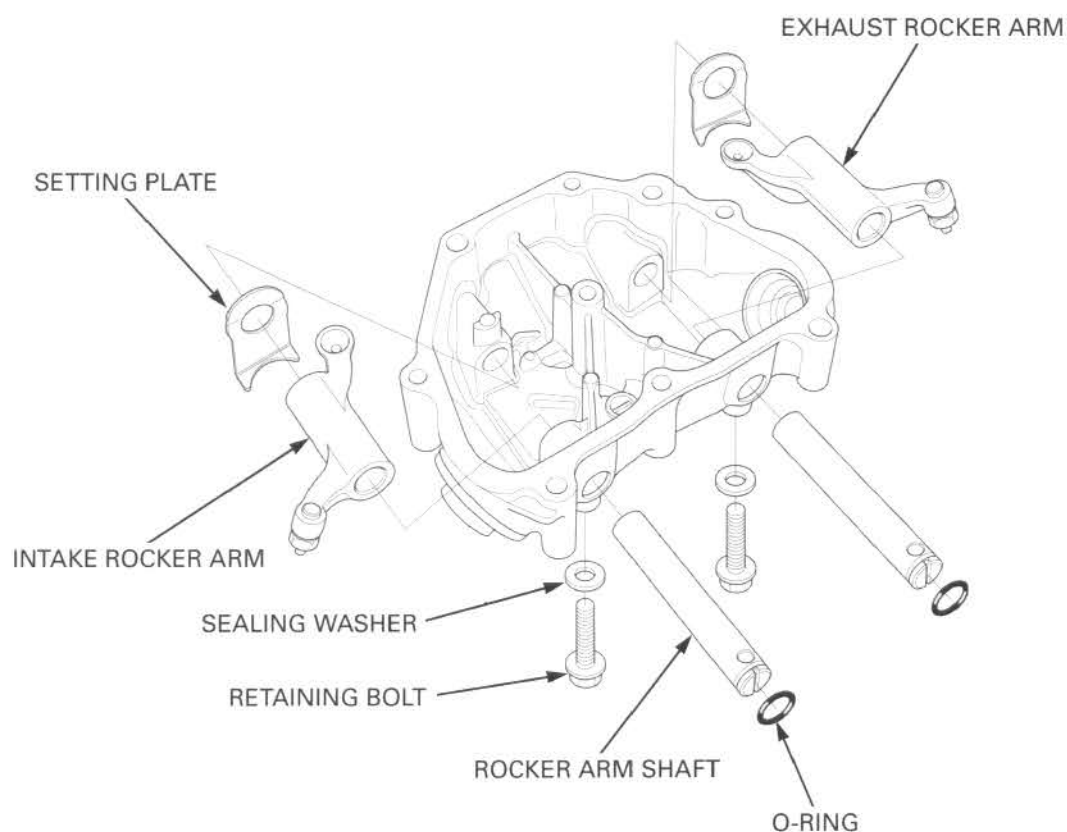
- cylinder head cover (page 9-21)
- throttle body (page 6-46)
- exhaust system (page 3-13)
- thermostat (page 7-9)





# CYLINDER HEAD COVER ASSEMBLY/ INSTALLATION

## ASSEMBLY



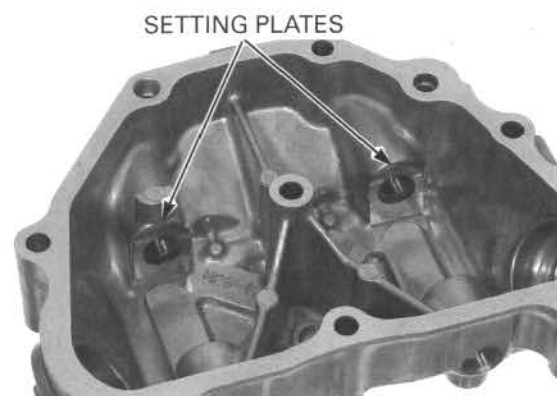
Blow through the oil passages in the cylinder head cover with compressed air.

Coat new O-rings with engine oil and install them into the grooves in the rocker arm shafts.

Apply molybdenum oil solution to the sliding surfaces of the rocker arm shafts.



Place the setting plates on the cylinder head cover as shown.





## CYLINDER HEAD/VALVE

*Intake rocker arm has "IN" mark and exhaust rocker arm has "EX" mark.*

Install the intake and exhaust rocker arms properly, and insert the rocker arm shafts.

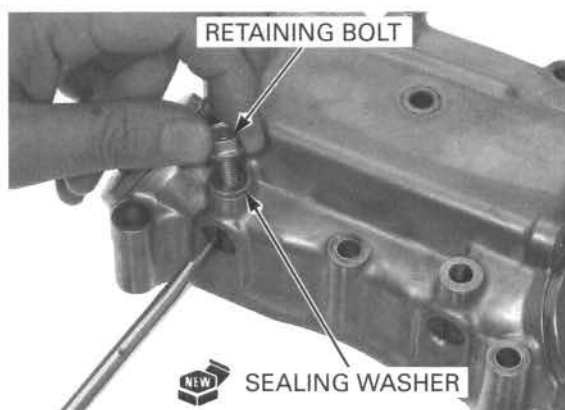
EXHAUST ROCKER ARM "EX" MARK



INTAKE ROCKER ARM "IN" MARK

Align the bolt holes in the cylinder head cover and rocker arm shaft by turning the shaft with a screwdriver.

Install the rocker arm shaft retaining bolts with new sealing washers.



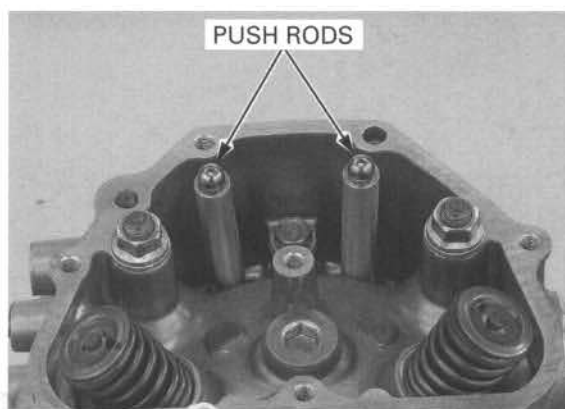
### INSTALLATION

Clean the mating surfaces of the head cover and cylinder head, being careful not to damage them.

Install the push rods onto the cam followers.

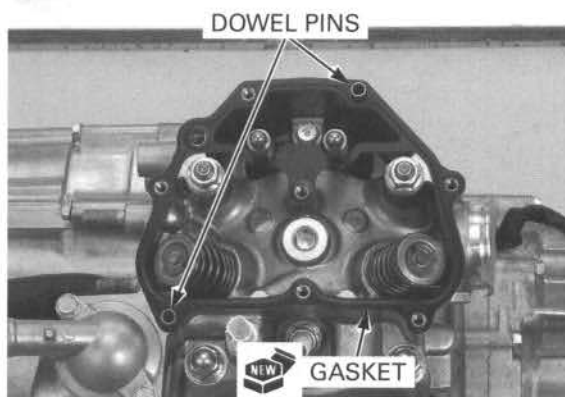
Make sure the piston is TDC (Top Dead Center) on the compression stroke by checking the push rod height.

If the exhaust side push rod height is high, rotate the crankshaft clockwise one full turn and align the "T" mark with the index mark again.



Install the two dowel pins and a new gasket.

Rest the push rods onto the gasket grooves as shown.



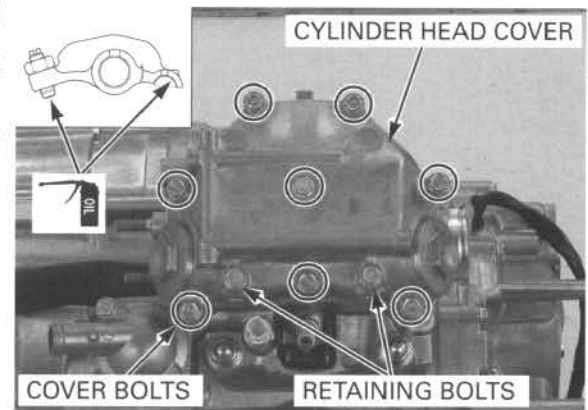


Apply engine oil to the rocker arm followers and adjusting screw, and install the cylinder head cover. Make sure there is no clearance at the mating surface of the cylinder head and cover.

Install the eight bolts and tighten them in a criss-cross pattern in several steps.

Tighten the rocker arm shaft retaining bolts.

Adjust the valve clearance (page 4-12).

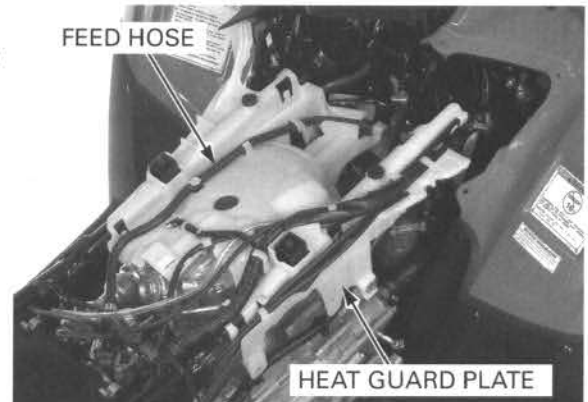


*Be careful not to damage the fuel feed hose.*

Install the heat guard plate onto the frame.

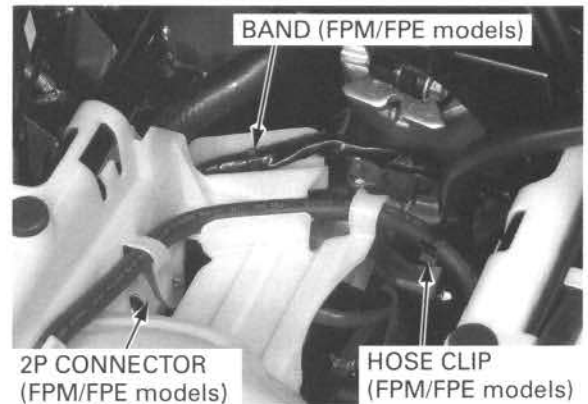
Route the hoses, cables and wires into the clamps of the heat guard plate properly (page 1-28).

Install the fuel feed hose to the injector (page 6-34).



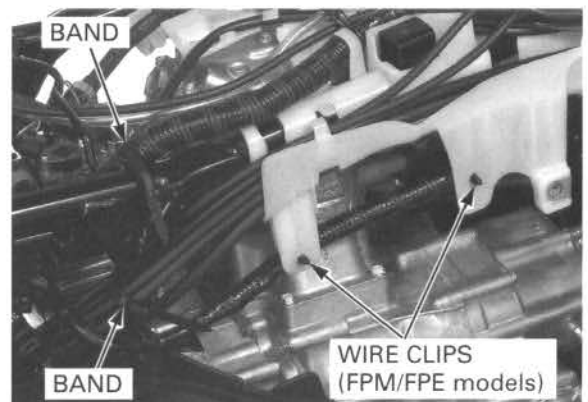
*FPM/FPE only:* Install the hose clip onto the fuel feed and drain hoses.

*FPM/FPE only:* Install the EPS motor 2P connector and wire band onto the plate.



Install the two wire bands to secure the main wire harness, cables and hoses.

*FPM/FPE only:* Install the four wire clips onto the right side of the plate.



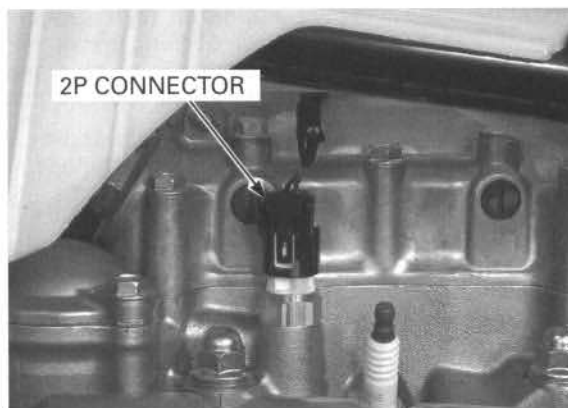


## CYLINDER HEAD/VALVE

Connect the ECT sensor 2P connector.

Install the following:

- throttle body cover (page 6-35)
- fuel tank (page 6-42)



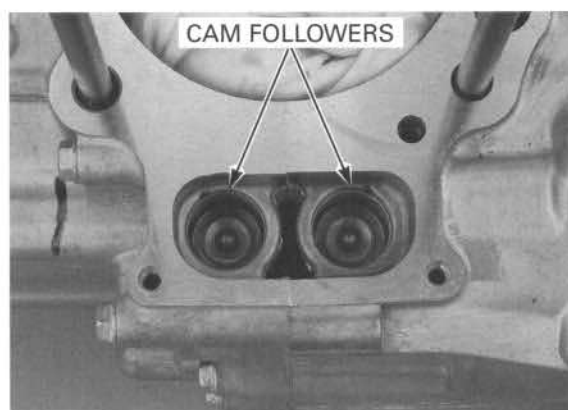
## CAMSHAFT REMOVAL

Remove the following:

- cylinder (page 10-4)
- primary drive gear (page 11-13)

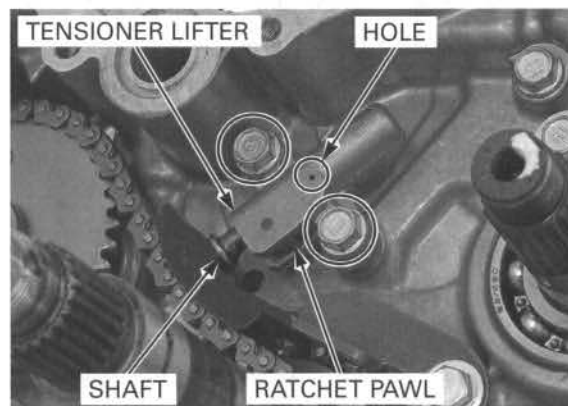
*Mark the followers  
so they can be  
placed back in their  
original locations.*

Remove the cam followers from the crankcase.



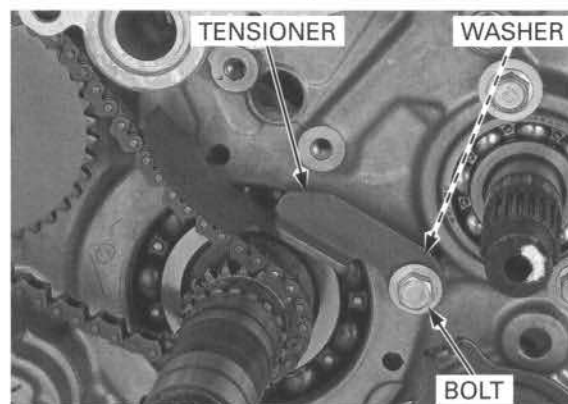
Push in the tensioner lifter shaft while pressing the ratchet pawl and insert a pin into the hole to hold the tensioner lifter shaft.

Remove the two bolts and cam chain tensioner lifter.



Remove the following:

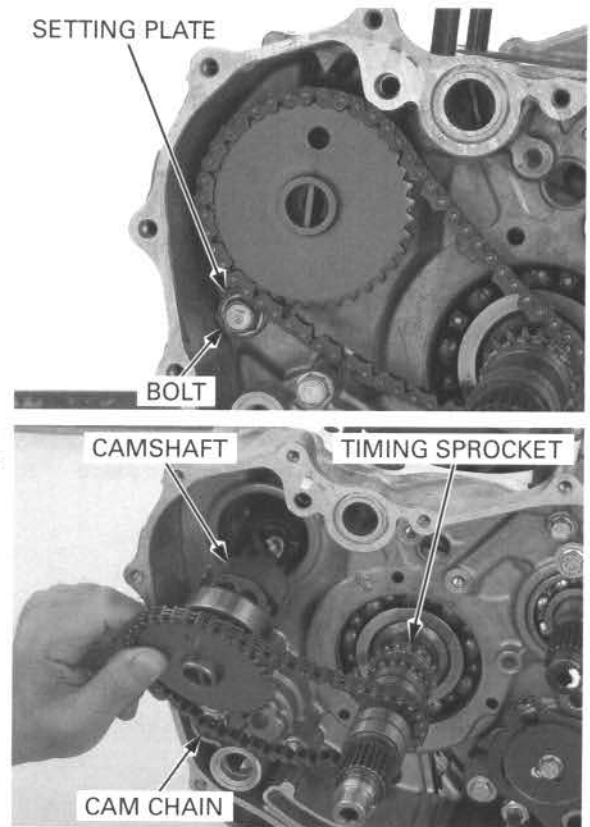
- tensioner pivot bolt
- cam chain tensioner
- washer





- bolt and bearing setting plate

Remove the bearing of the camshaft from the crankcase, derail the cam chain from the timing sprocket of the crankshaft, and remove the camshaft and cam chain.



## INSPECTION

### CAMSHAFT

Check the cam surfaces for scoring, scratches or evidence of insufficient lubrication.

Check the cam sprocket teeth for wear or damage.

Turn the outer race of the bearing with your finger. The bearing should turn smoothly and quietly.

Replace the camshaft assembly if the bearing does not turn smoothly and quietly.



Measure each cam lobe height.

### SERVICE LIMITS:

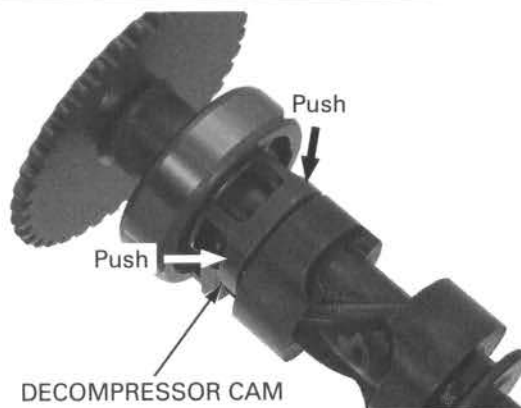
'07 – '08 models:	IN: 35.74 mm (1.407 in)
	EX: 35.48 mm (1.397 in)
After '08 models:	IN: 35.27 mm (1.388 in)
	EX: 35.10 mm (1.382 in)





## CYLINDER HEAD/VALVE

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 circle of the exhaust cam lobe.  
As you press on other side, the decompressor lobe will drop below the base circle of the exhaust cam lobe.



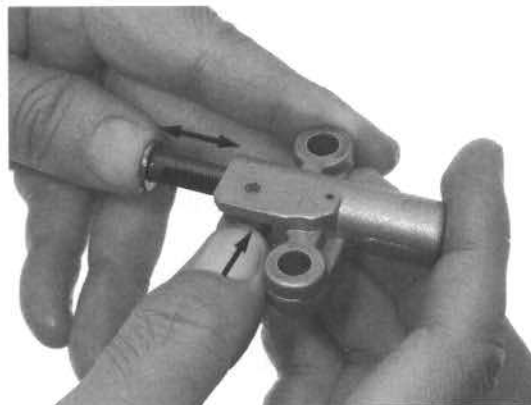
### CAM CHAIN TENSIONER

Check the slipper surface of the tensioner for wear or damage.



Check the tensioner lifter operation:

- The tensioner lifter shaft should not go into the body when it is pushed.
- When the ratchet pawl is pressed in, the tensioner shaft should be pushed into the lifter body and the shaft springs out of the body.



### CAM FOLLOWER

Check the cam follower and follower bore for scoring, scratches or damage.

Measure each follower O.D.

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



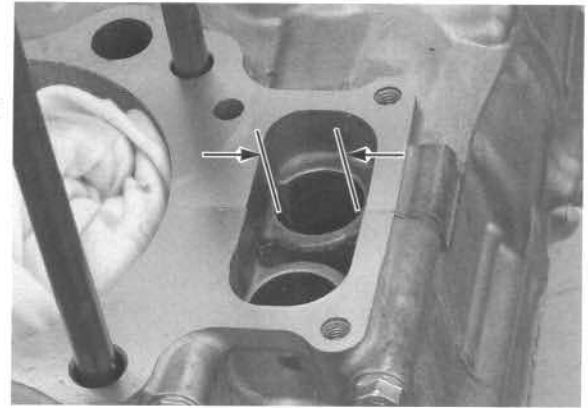


Measure each follower bore I.D.

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

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

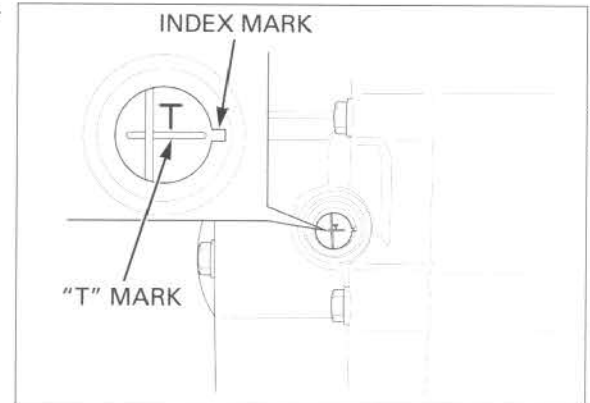
**SERVICE LIMIT: 0.07 mm (0.003 in)**



## CAMSHAFT INSTALLATION

*Cover the piston with a shop towel or equivalent to protect it from damage.*

Rotate the crankshaft to align the T mark on the flywheel with the index mark on the crankcase cover.



Lubricate the camshaft bearing and journal with engine oil.

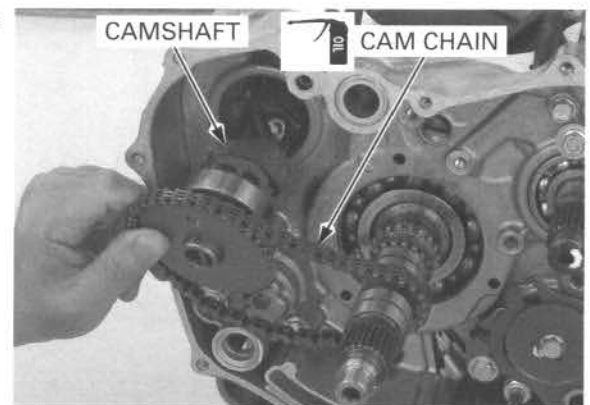
Apply molybdenum oil solution to the cam lobes.

Install the camshaft into the crankcase.



Lubricate the cam chain whole surface with engine oil and install it on the cam sprocket.

Loosely install the camshaft into the crankcase.

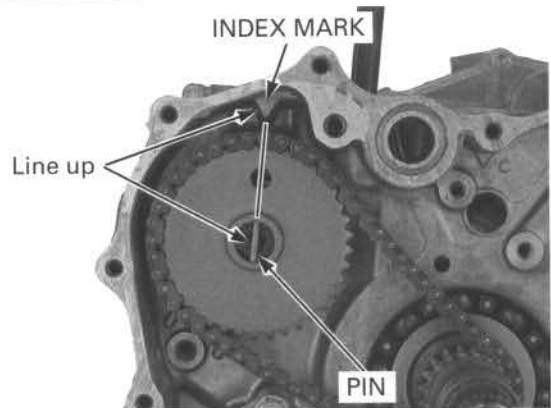




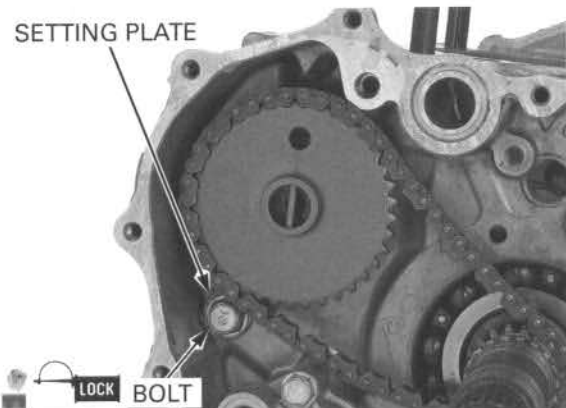
## CYLINDER HEAD/VALVE

*Do not turn the crankshaft during installation.*

Line up the camshaft pin and index mark (▽) on the crankcase and install the cam chain over the timing sprocket on the crankshaft. Install the camshaft into the crankcase completely and make sure that the camshaft pin and index mark (▽) line up.

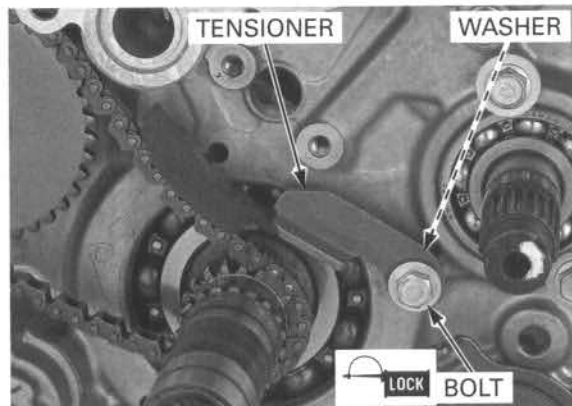


Apply locking agent to the setting plate bolt threads. Install the bearing setting plate onto the crankcase and tighten the bolt.

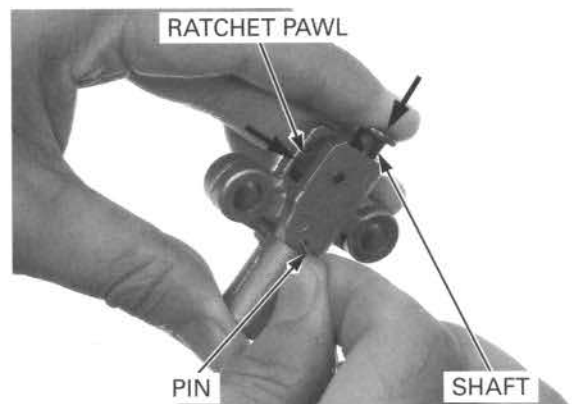


Apply locking agent to the tensioner pivot bolt threads. Install the washer, cam chain tensioner and pivot bolt, and tighten the bolt.

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



Push in the tensioner lifter shaft while pressing the ratchet pawl and insert a pin into the hole to hold the tensioner lifter shaft.





Apply locking agent to the tensioner lifter bolt threads.

Install the tensioner lifter and tighten the bolts.

Remove the pin from the tensioner lifter.

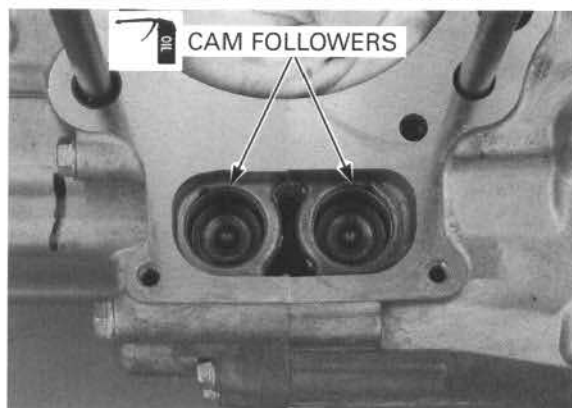
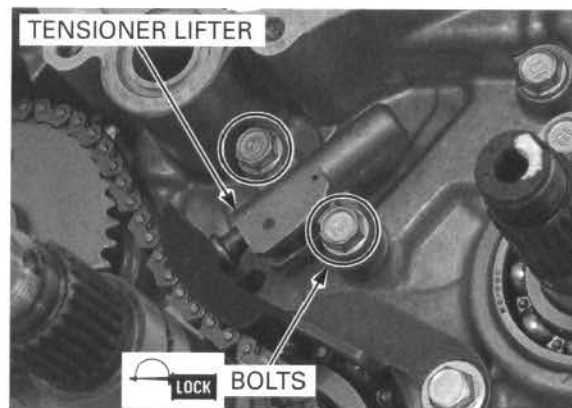
Make sure that the camshaft pin and index mark (▽) line up when the "T" mark on the flywheel is aligned with the index mark on the crankcase cover.

*Be careful not to scratch the sliding surfaces of the followers and bores.*

Apply engine oil to the whole surfaces of the cam followers and install them into the crankcase with the opening facing up.

Install the following:

- change clutch (page 11-17)
- cylinder (page 10-9)





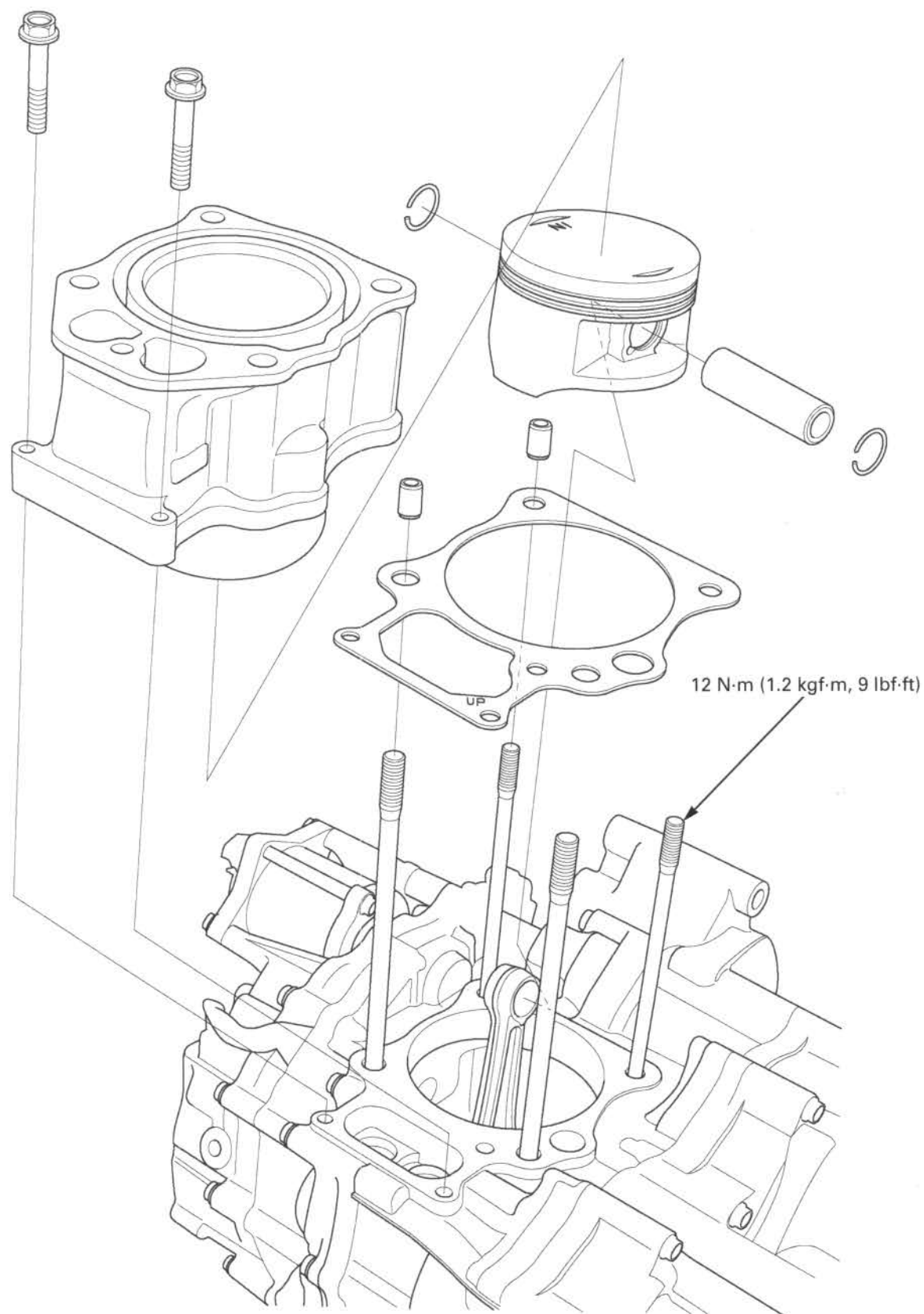
# 10. CYLINDER/PISTON

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SYSTEM COMPONENTS .....	10-2	CYLINDER/PISTON REMOVAL .....	10-4
SERVICE INFORMATION .....	10-3	CYLINDER/PISTON INSTALLATION.....	10-8
TROUBLESHOOTING .....	10-3		



# SYSTEM COMPONENTS





## 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)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		86.500 – 86.510 (3.4055 – 3.4059)	86.60 (3.409)
	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		86.470 – 86.490 (3.4043 – 3.4051)	86.42 (3.402)
	Piston pin hole I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.04 (0.750)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	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)	0.9 (0.04)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
		Second	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
Cylinder-to-piston clearance			0.010 – 0.040 (0.0004 – 0.0016)	0.10 (0.004)
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.751)
Connecting rod-to-piston pin clearance			0.020 – 0.047 (0.0008 – 0.0019)	0.10 (0.004)

### TORQUE VALUE

Cylinder stud bolt

12 N·m (1.2 kgf·m, 9 lbf·ft) See page 10-7

## 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 build-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

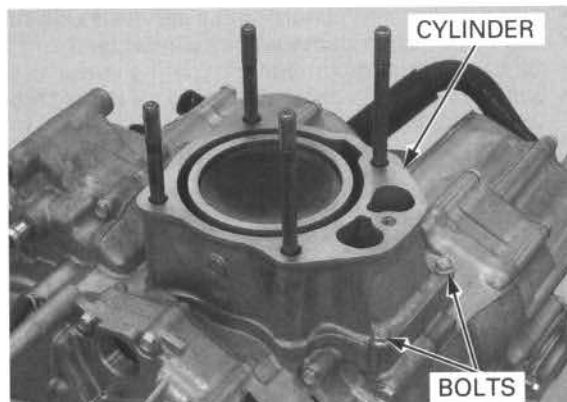
#### CYLINDER REMOVAL

Remove the cylinder head (page 9-8)

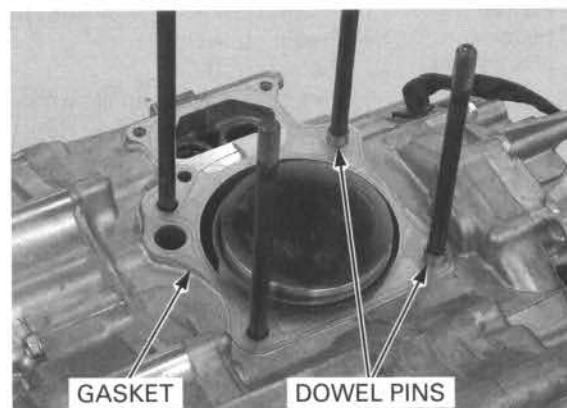
Remove the two bolts.

*Do not damage the mating surface with a screwdriver.*

Lift the cylinder and remove it, being careful not to damage the piston and piston rings with the stud bolts.



Remove the gasket and the two dowel pins.

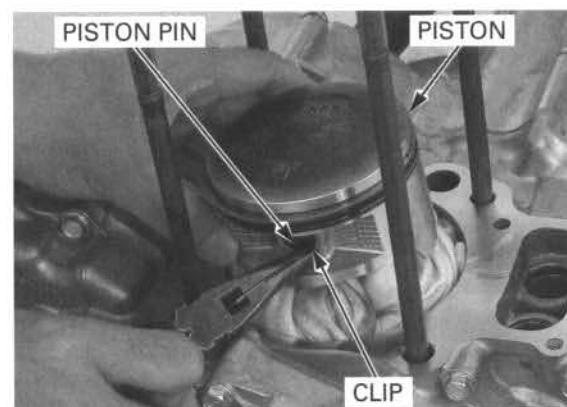


#### PISTON REMOVAL

Place a clean shop towel over the crankcase to prevent the piston pin 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.*

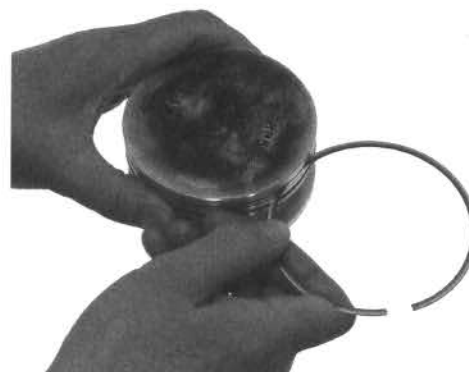
Spread each piston ring and remove it by lifting up at a point opposite the gap.





*Never use a wire brush; it will scratch the grooves.*

Clean carbon deposits from the ring grooves with a ring that will be discarded.



## INSPECTION

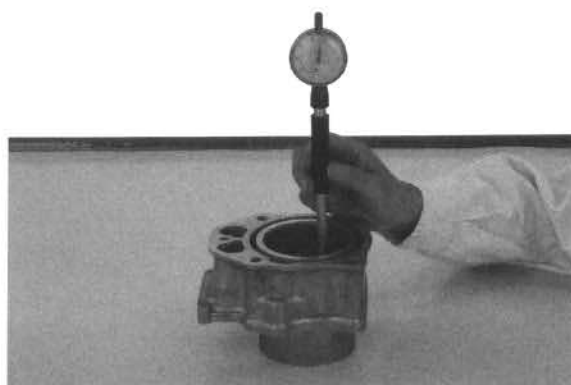
### CYLINDER

Inspect the cylinder bore for scoring or scratches. 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: 86.60 mm (3.409 in)**

Calculate the cylinder-to-piston clearance. Refer to page 10-6 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 LIMIT: Taper: 0.10 mm (0.004 in)**

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

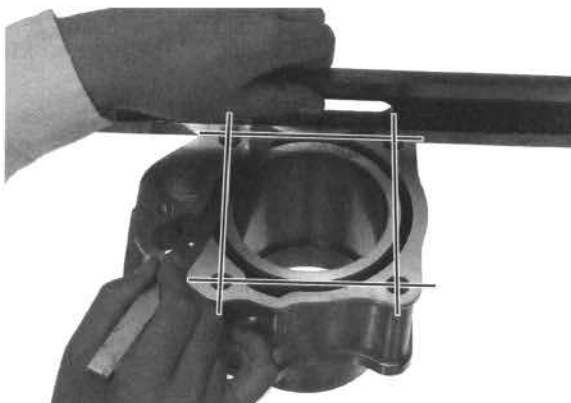
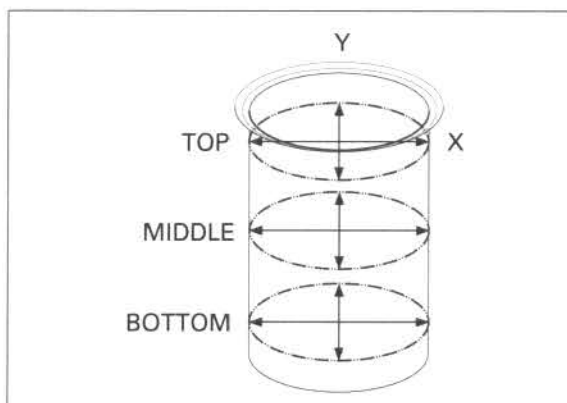
The cylinder must be rebored and an oversize piston fitted if the service limits are exceeded.

The 0.25 mm and 0.5 mm oversize pistons are available.

The cylinder must be rebored so the clearance for an oversize piston is 0.010 – 0.040 mm (0.0004 – 0.0016 in).

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

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





## CYLINDER/PISTON

### PISTON/PISTON RING

Inspect the piston rings for smooth movement by rotating them. 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 LIMIT: Top/Second: 0.09 mm (0.004 in)**

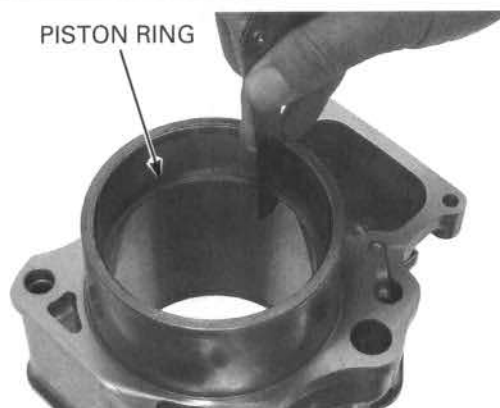


Insert each piston ring into the bottom of the cylinder squarely using the piston. Measure the ring end gap.

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

**Second: 0.6 mm (0.02 in)**

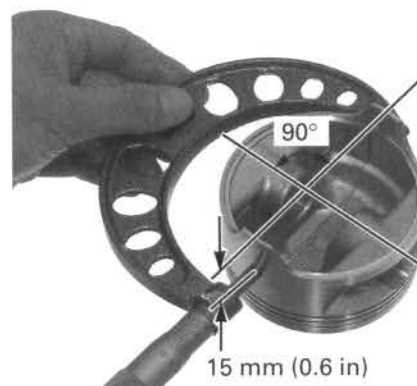
**Oil (side rail): 0.9 mm (0.04 in)**



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

**SERVICE LIMIT: 86.42 mm (3.402 in)**

Compare this measurement against the maximum cylinder I.D. measurement and calculate the piston-to-cylinder clearance (page 10-5).



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

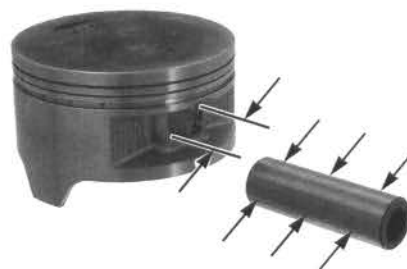
**SERVICE LIMIT: 19.04 mm (0.750 in)**

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

**SERVICE LIMIT: 18.96 mm (0.746 in)**

Calculate the piston-to-piston pin clearance.

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





Measure the connecting rod small end I.D.

**SERVICE LIMIT: 19.07 mm (0.751 in)**

Calculate the connecting rod-to-piston pin clearance.

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



## CYLINDER STUD BOLT REPLACEMENT

Thread two nuts onto the stud and tighten them together, and use a wrench on them to turn the stud bolt out.

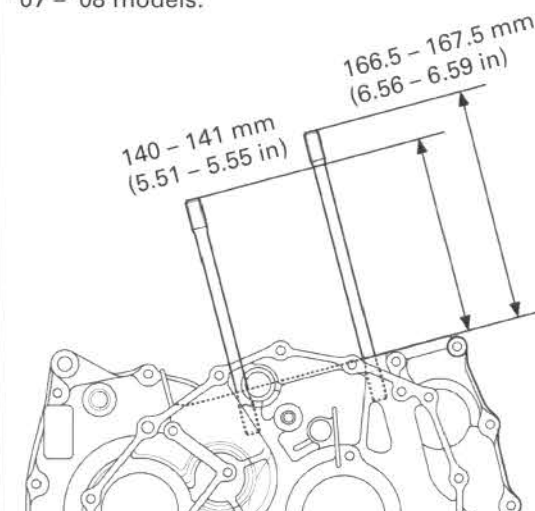
Install new stud bolts and tighten them.

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

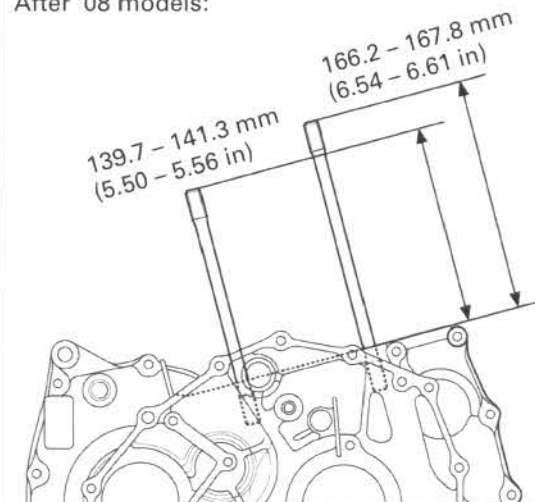
Be sure to verify the stud height from the cylinder mating surface of the crankcase.

Adjust the height if necessary.

'07 - '08 models:



After '08 models:





## CYLINDER/PISTON INSTALLATION

## PISTON RING INSTALLATION

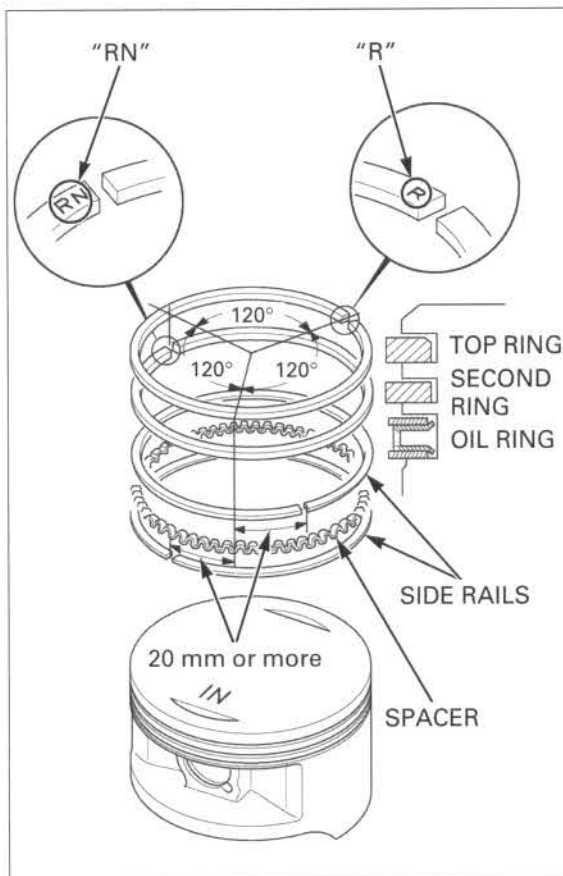
Carefully install the piston rings into the piston ring grooves with the markings facing up.

## 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.



## PISTON INSTALLATION

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

Apply engine oil to the piston pin hole and connecting rod inner surface.

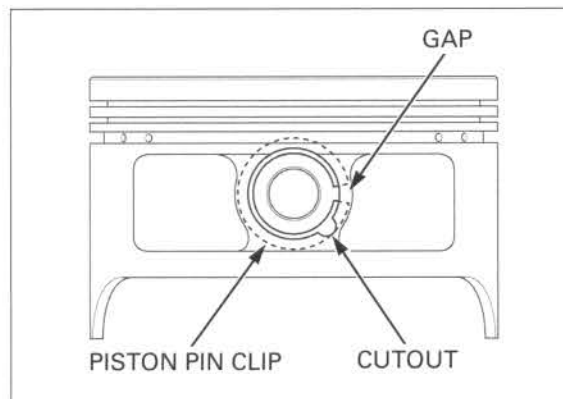
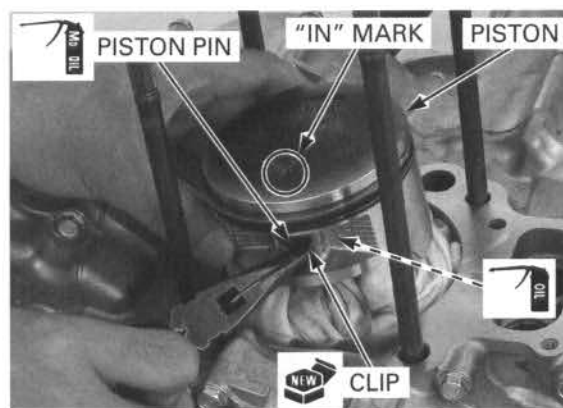
Apply molybdenum oil solution to the piston pin outer surface.

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 mating surfaces of the cylinder and crankcase thoroughly, being careful not to damage them, and being careful not to allow gasket material to enter the crankcase.

Blow through the oil passage in the cylinder with compressed air.

Install the two dowel pins and a new gasket.

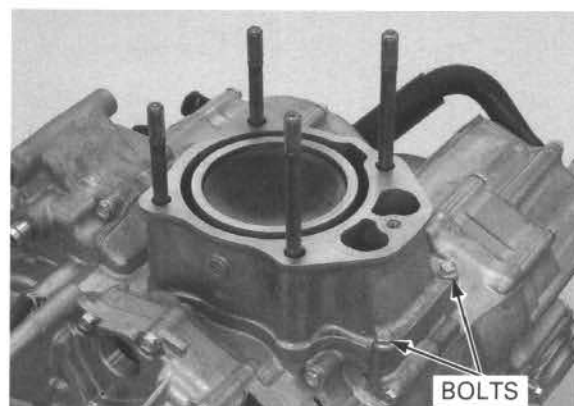
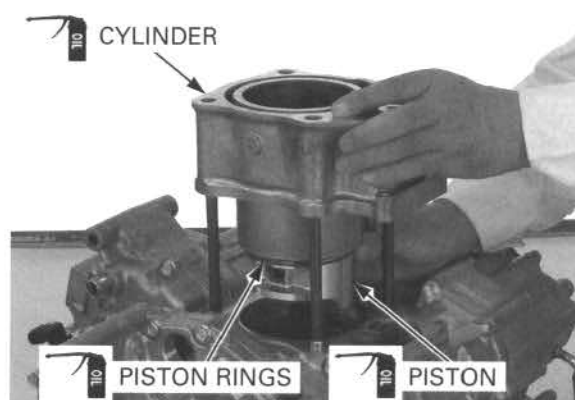
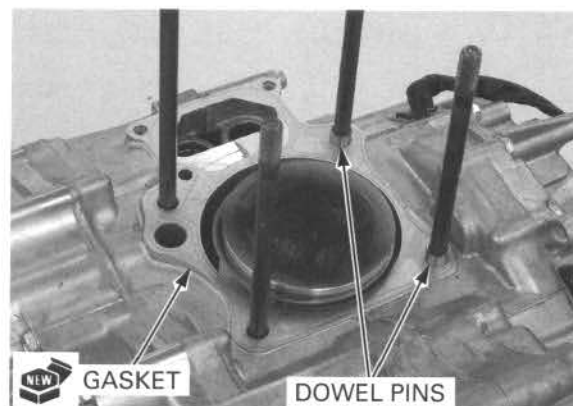
Apply engine oil to the cylinder wall, piston outer surface and piston rings.

Install the cylinder over the piston while compressing the piston rings with your fingers.

Make sure that the cylinder touches the crankcase evenly.

Install the two bolts.

Install the cylinder head (page 9-19).





# 11. CLUTCH/GEARSHIFT LINKAGE

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SYSTEM COMPONENTS .....	11-2	CENTRIFUGAL CLUTCH .....	11-8
SERVICE INFORMATION .....	11-3	CHANGE CLUTCH .....	11-13
TROUBLESHOOTING .....	11-5	GEARSHIFT LINKAGE .....	11-20
FRONT CRANKCASE COVER REMOVAL .....	11-6	FRONT CRANKCASE COVER INSTALLATION .....	11-23

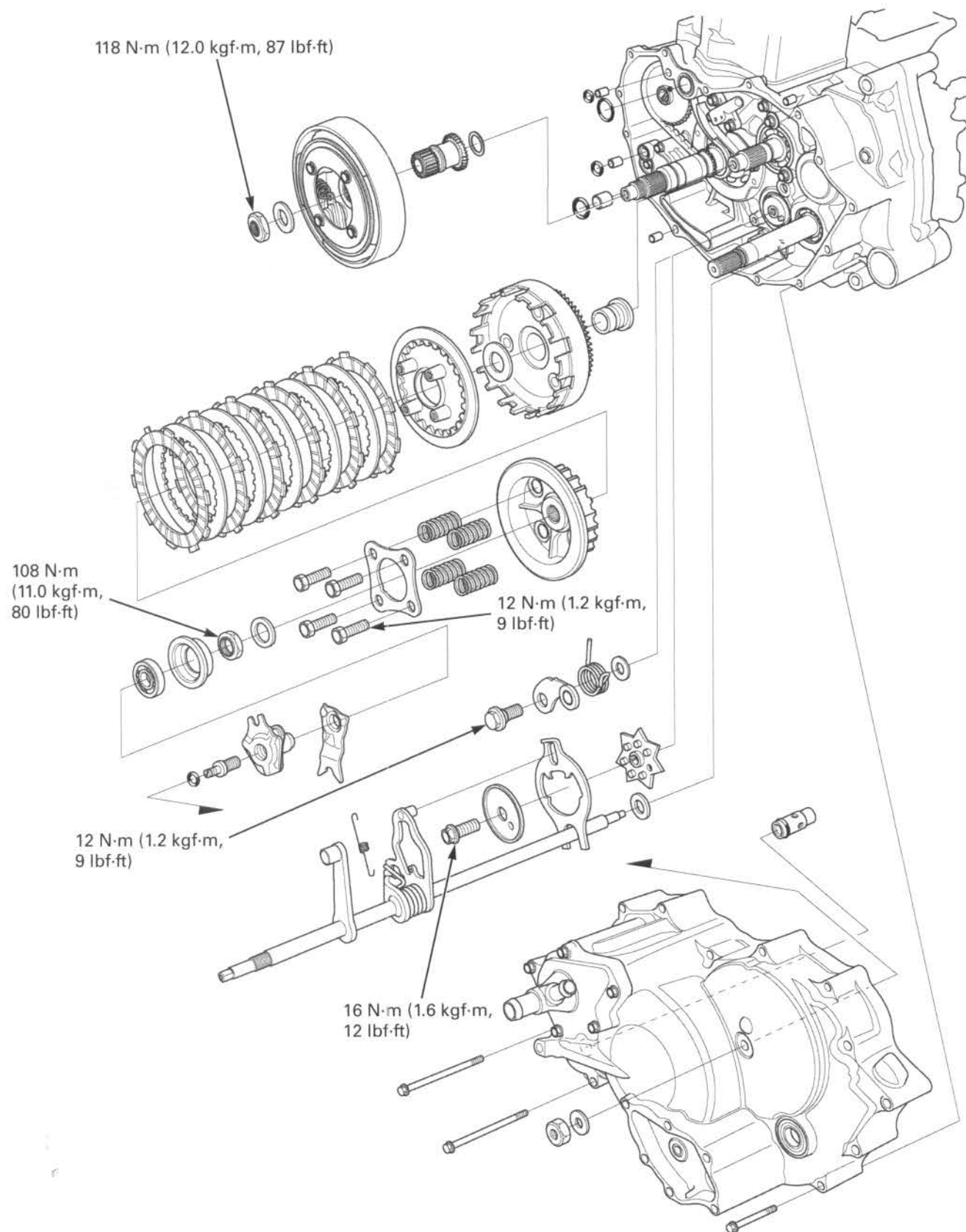


**CLUTCH/GEARSHIFT LINKAGE**

---

**SYSTEM COMPONENTS**

TE/FE/FPE models shown:





## SERVICE INFORMATION

### GENERAL

- This section covers service of the clutch (centrifugal clutch and change clutch) and gearshift linkage. To service the reverse stopper shaft and gearshift spindles, the engine must be removed from the frame.
- The crankcase must be separated when the sub-gearshift spindle, transmission, shift drum and shift forks require service (page 13-2).
- Engine oil viscosity and level and the use of oil additives have an effect on clutch operation. Oil additives of any kind are specifically not recommended. When the clutch does not disengage or the vehicle creeps, inspect the engine oil and oil level before servicing the clutch system.
- Engine lubricating oil is fed through the oil passages in the front crankcase cover. Clean the oil passages before installing the crankcase cover.
- The TE/FE/FPE models are equipped with the electric shift program (ESP). ESP service (page 23-32)

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Centrifugal clutch	Drum I.D.	140.0 – 140.2 (5.512 – 5.520)	140.4 (5.53)
	Weight lining thickness	2.0 (0.08)	1.3 (0.05)
	Clutch spring height	3.8 (0.15)	3.68 (0.145)
	Clutch weight spring free length	24.65 (0.970)	25.6 (1.01)
Change clutch	Spring free length	TM/FM/FPM	47.3 (1.86)
		TE/FE/FPE	48.7 (1.92)
	Disc thickness	2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage	–	0.20 (0.008)
	Outer I.D.	29.000 – 29.021 (1.1417 – 1.1426)	29.05 (1.144)
	Outer guide	I.D.	22.000 – 22.021 (0.8661 – 0.8670)
		O.D.	28.959 – 28.980 (1.1401 – 1.1409)
	Mainshaft O.D. at clutch outer guide	21.967 – 21.980 (0.8648 – 0.8654)	21.93 (0.863)
Primary drive gear	Gear I.D.	29.000 – 29.021 (1.1417 – 1.1426)	29.05 (1.144)
	Crankshaft O.D. at drive gear	28.959 – 28.980 (1.1401 – 1.1409)	28.93 (1.139)

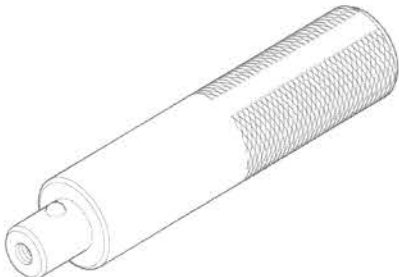


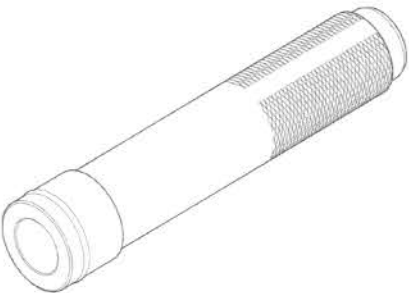
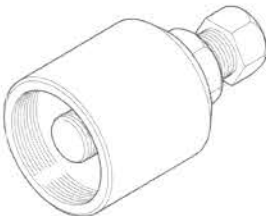
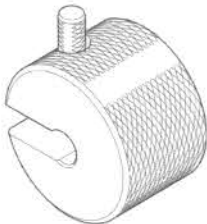

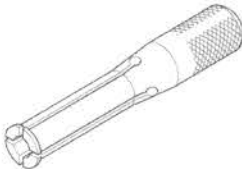
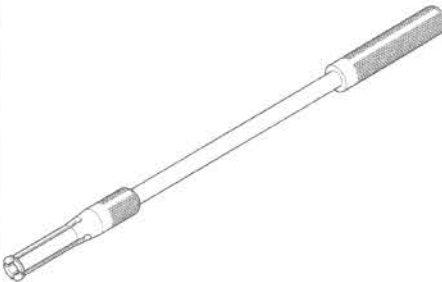
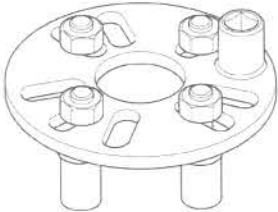
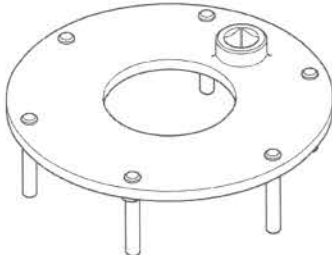
### TORQUE VALUES

Clutch spring bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Centrifugal clutch lock nut	118 N·m (12.0 kgf·m, 87 lbf·ft)	Lock nut: replace with a new one. Apply engine oil to the threads and seating surface. Stake.
Change clutch lock nut	108 N·m (11.0 kgf·m, 80 lbf·ft)	Lock nut: replace with a new one. Apply engine oil to the threads and seating surface. Stake.
Shift drum stopper arm pivot bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	Apply locking agent.
Gearshift cam bolt	16 N·m (1.6 kgf·m, 12 lbf·ft)	Apply locking agent.
Gearshift spindle return spring pin	22 N·m (2.2 kgf·m, 16 lbf·ft)	Apply locking agent.
Gearshift spindle A stopper bolt (TM/FM/FPM model only)	27 N·m (2.8 kgf·m, 20 lbf·ft)	Apply locking agent.



# CLUTCH/GEARSHIFT LINKAGE

## TOOLS

<p>Driver 07749-0010000</p> 	<p>Attachment, 32 x 35 mm 07746-0010100</p> 	<p>Pilot, 15 mm 07746-0040300</p> 
<p>Driver, 22 mm I.D. 07746-0020100</p> 	<p>Puller, 35 x 1.0 mm 07933-HA80000</p>  <p>or 07933-HB3000A (U.S.A. only)</p>	<p>Remover weight 07741-0010201</p>  <p>or 07936-3710200 or 07936-371020A (U.S.A. only)</p>
<p>Bearing remover shaft 07936-KC10100</p> 	<p>Bearing remover head, 15 mm 07936-KC10200</p> 	<p>Bearing remover, 15 mm 07936-KC10500</p> 
<p>Clutch center holder 07JMB-MN50301</p>  <p>or 07HGB-001010B or 07HGB-001010A (U.S.A. only) with 07HGB-001020B or 07HGB-001020A (U.S.A. only)</p>	<p>Clutch holder 07ZMB-HN20001</p>  <p>or 07ZMB-HN2A101</p>	



## TROUBLESHOOTING

### Clutch slips when accelerating

- Incorrect clutch adjustment (page 4-26)
- Worn clutch discs
- Weak clutch springs
- Faulty clutch lifter
- Improper oil viscosity or oil additive used

### Clutch will not disengage

- Faulty clutch lifter
- Warped clutch plates

### The vehicle creeps

- Faulty centrifugal clutch

### Clutch operating feels rough

- Worn clutch outer and center grooves
- Warped clutch plates
- Loose clutch lock nut
- Faulty clutch lifter
- Improper oil viscosity or oil level

### Hard to shift

- Incorrect clutch adjustment (page 4-26)
- Worn or damaged gearshift linkage components
- Faulty clutch lifter
- Improper engine oil viscosity
- Faulty gearshift spindle
- Faulty shift forks/shaft or shift drum (page 13-6)

### Transmission jumps out of gear

- Broken shift drum stopper arm
- Weak or broken shift linkage return springs
- Worn or damaged gearshift cam
- Faulty gearshift spindle
- Faulty shift forks/shaft or shift drum (page 13-6)
- Faulty transmission gears (page 13-6)



# FRONT CRANKCASE COVER REMOVAL

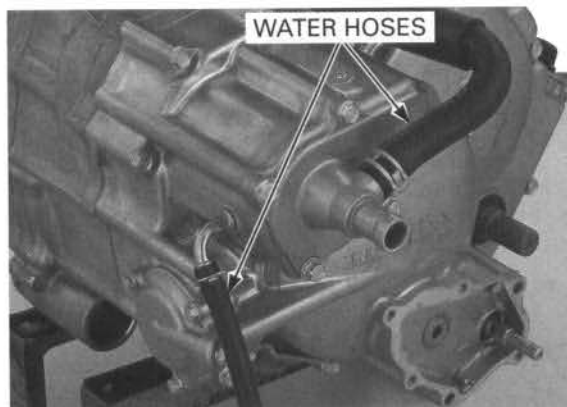
Drain the engine oil (page 4-15).

Drain the coolant (page 7-7).

Remove the following:

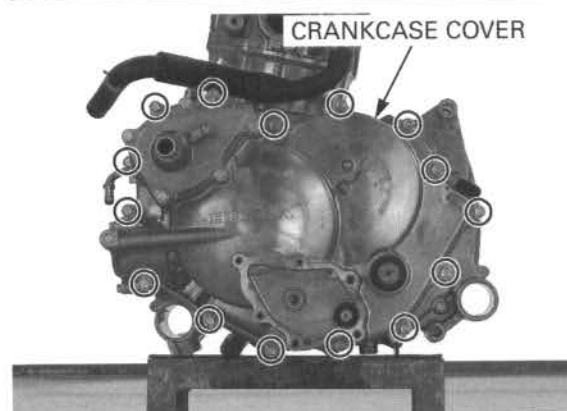
- mudguards (page 3-6)
- FM/FE/FPM/FPE models only: front propeller shaft (page 17-12)
- TE/FE/FPE models only: shift control motor and reduction gears (page 23-32)

Disconnect the water hoses from the front crankcase cover.

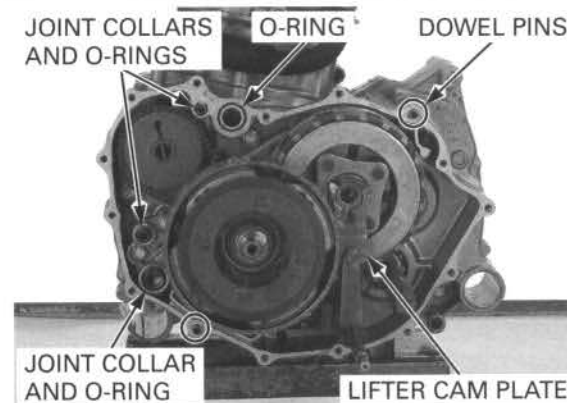


Remove the following:

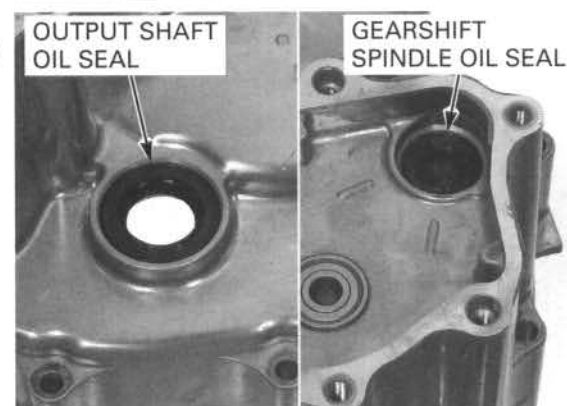
- fifteen bolts
- front crankcase cover



- lifter cam plate
- two dowel pins
- joint collars
- O-rings



- output shaft oil seal
- gearshift spindle oil seal (TE/FE/FPE models only)





## CRANKSHAFT BEARING REPLACEMENT

Check the crankshaft bearing.

If the inner race does not turn smoothly, quietly, or if the outer race fits loosely in the cover, replace the bearing as follows:

Remove the crankshaft bearing with the special tools.

### TOOLS:

Bearing remover shaft	07936-KC10100
Bearing remover head, 15 mm	07936-KC10200
Remover weight	07741-0010201

### U.S.A. TOOLS:

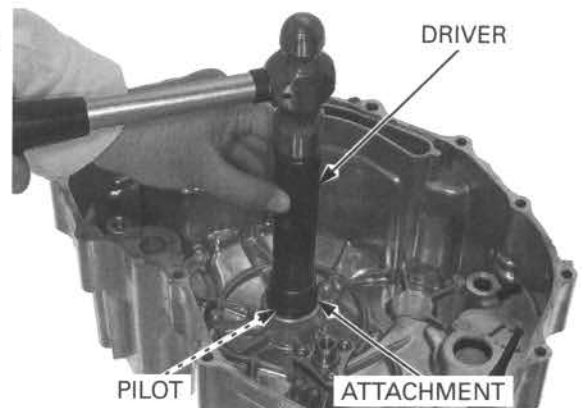
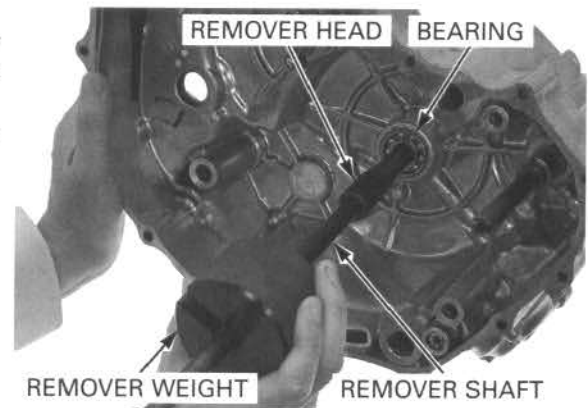
Bearing remover, 15 mm	07936-KC10500
Remover weight	07936-371020A or 07936-3710200

Apply engine oil to a new bearing.

Drive a new bearing squarely with the sealed side facing down until it is fully seated.

### TOOLS:

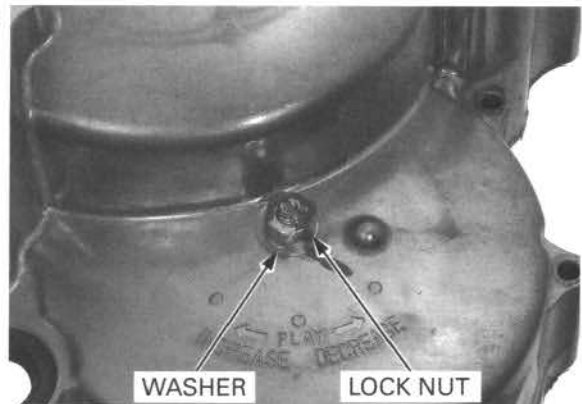
Driver	07749-0010000
Attachment, 32 x 35 mm	07746-0010100
Pilot, 15 mm	07746-0040300



## CLUTCH LIFTER

Check the clutch lifter plate assembly and cam plate for wear or damage, replace them if necessary.

Remove the lock nut and washer.



Remove the adjusting bolt/lifter plate assembly and O-ring.

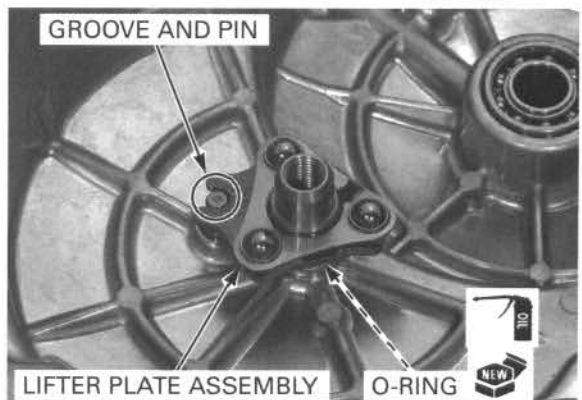
Remove the adjusting bolt from the lifter plate assembly.

Install the adjusting bolt into the lifter plate assembly.

Coat a new O-ring onto the adjusting bolt.

Install the adjusting bolt/lifter plate assembly by aligning the groove with the stopper pin.

Temporarily install the washer and lock nut.





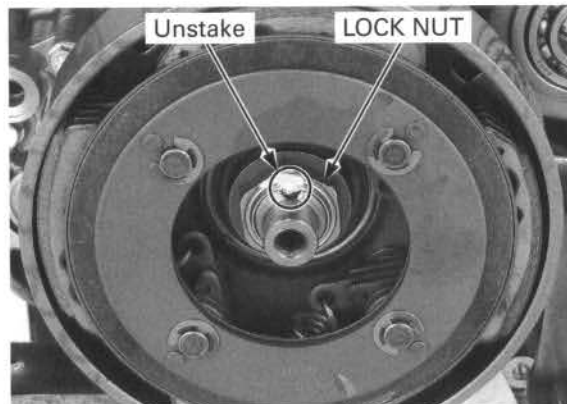
# CENTRIFUGAL CLUTCH

### REMOVAL

Remove the front crankcase cover (page 11-6).

*Be careful not to damage the crankshaft threads.*

Unstake the clutch lock nut.



Hold the clutch drive plate using the special tool and loosen the lock nut.

#### TOOL:

Clutch holder  
– holder plate  
– holder pin

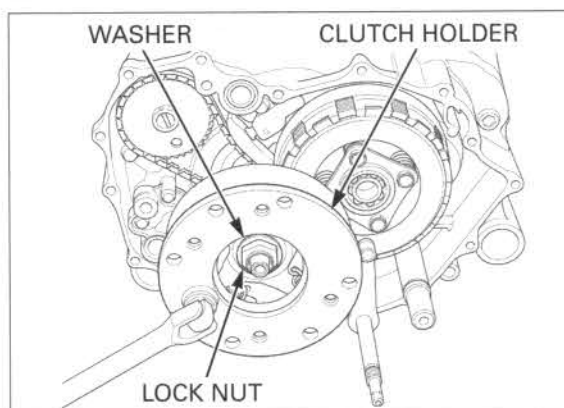
07ZMB-HN20001  
07ZMB-HN20101  
07ZMB-HN20200

#### U.S.A. TOOL:

Clutch holder

07ZMB-HN2A101

Remove the lock nut and washer.

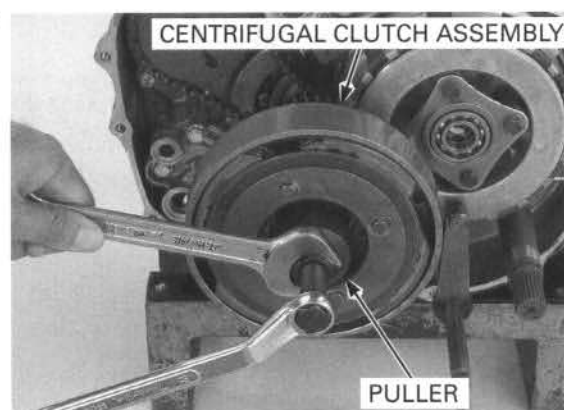


Remove the centrifugal clutch assembly using the special tool.

#### TOOL:

Puller, 35 x 1.0 mm

07933-HA80000 or  
07933-HB3000A  
(U.S.A. only)



### DISASSEMBLY/INSPECTION

#### ONE-WAY CLUTCH

You should be able to turn the clutch weight assembly counterclockwise smoothly, but the assembly should not turn clockwise.

Remove the clutch weight assembly from the clutch drum while turning it counterclockwise.

CLUTCH WEIGHT ASSEMBLY

CLUTCH DRUM





## CLUTCH DRUM

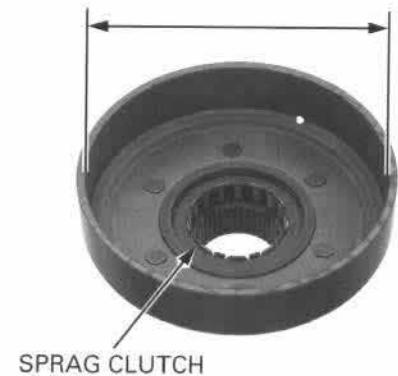
Check the weight contacting surface for scratches or abnormal wear.

Measure the drum I.D.

**SERVICE LIMIT: 140.4 mm (5.53 in)**

Check the sprag clutch for abnormal wear, damage or irregular movement.

Remove the sprag clutch from the clutch drum.



## DRIVE PLATE

Check the sprag clutch contacting surface for abnormal wear or damage.



## CLUTCH WEIGHT LINING

Measure the lining thickness.

**SERVICE LIMIT: 1.3 mm (0.05 in)**

*Replace the clutch weights as a set.*





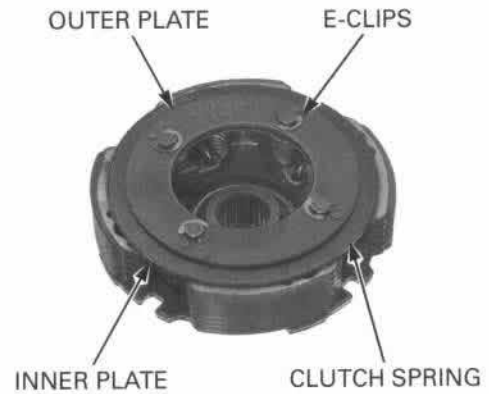
## CLUTCH/GEARSHIFT LINKAGE

### CLUTCH SPRING

Remove the E-clips using a screwdriver while compressing the clutch spring.

Remove the following:

- outer plate
- clutch spring
- inner plate



Measure the clutch spring height.

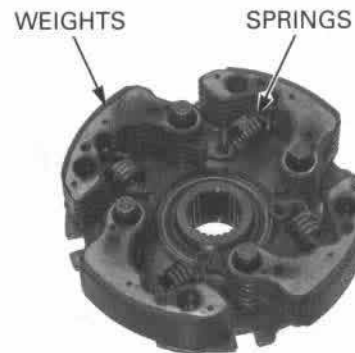
**SERVICE LIMIT: 3.68 mm (0.145 in)**



### WEIGHT SPRING

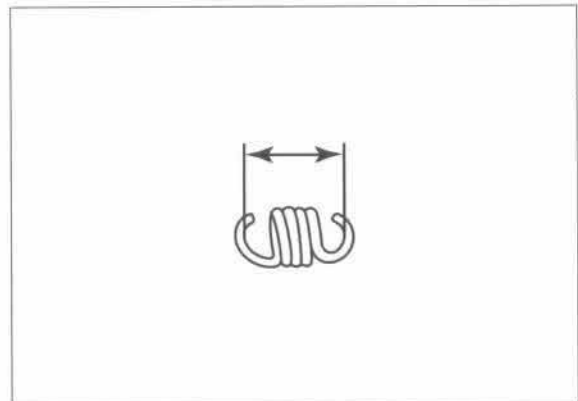
*Replace the springs  
as a set.*

Check the weight springs for wear or damage. Remove the clutch weights and springs from the drive plate.



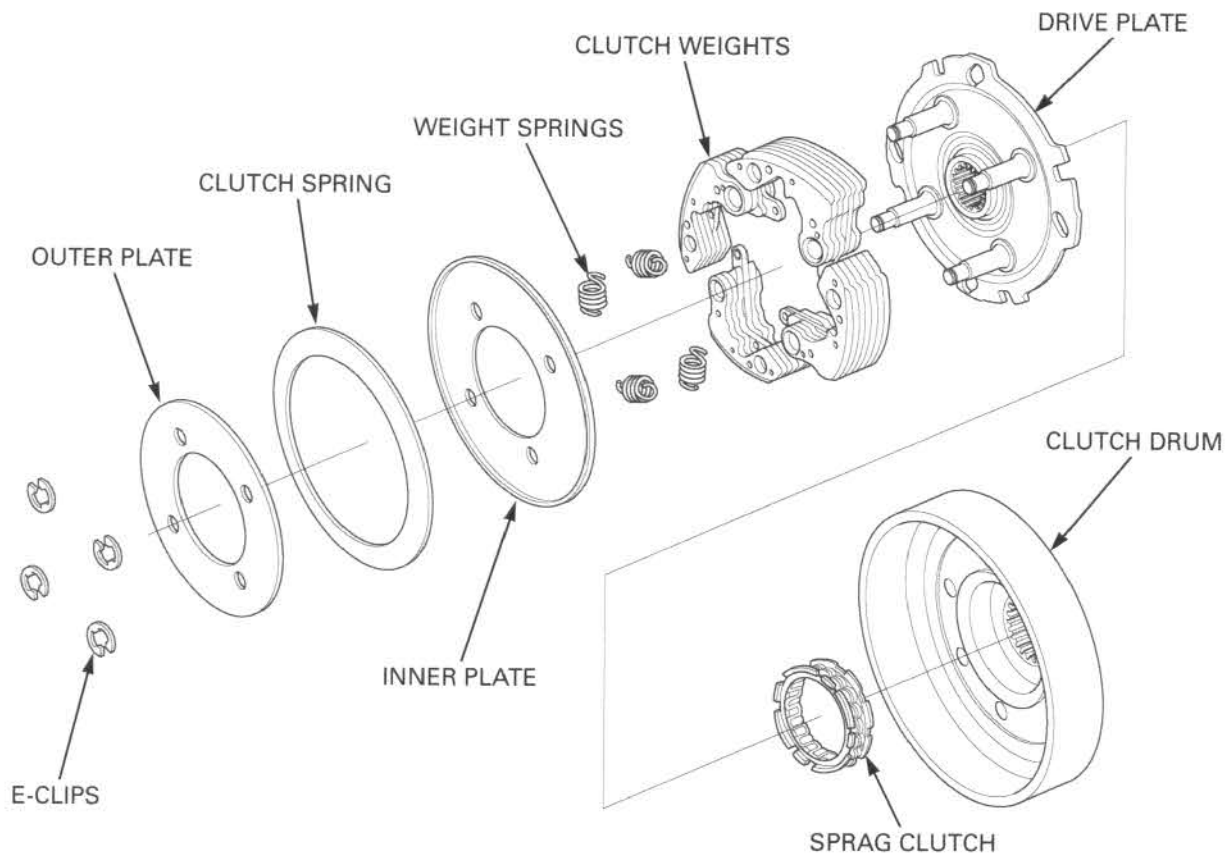
Measure the spring length.

**SERVICE LIMIT: 25.6 mm (1.01 in)**



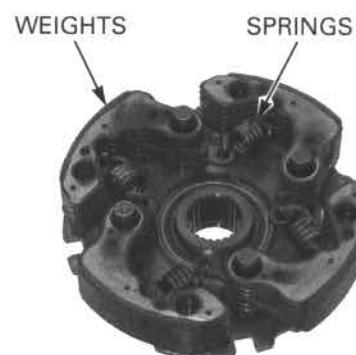


## ASSEMBLY

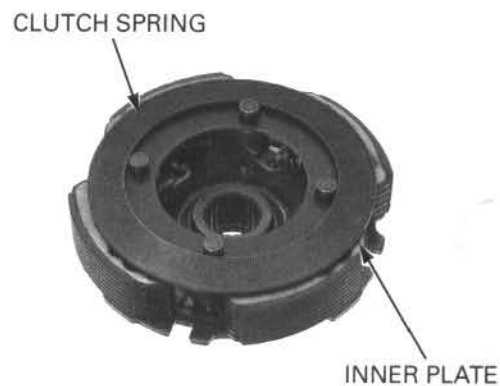


Install with the  
spring's open ends  
facing in.

Install the clutch weights and springs onto the drive plate as shown.



Install the inner plate with flange side facing up.  
Install the clutch spring with concavity side facing down.



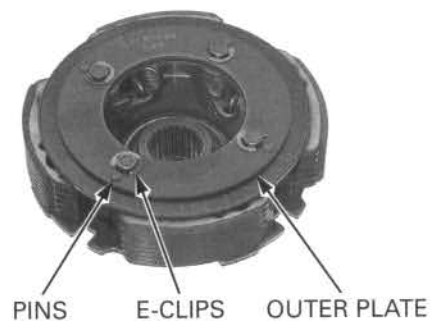


## CLUTCH/GEARSHIFT LINKAGE

Install the outer plate with the pins facing up.

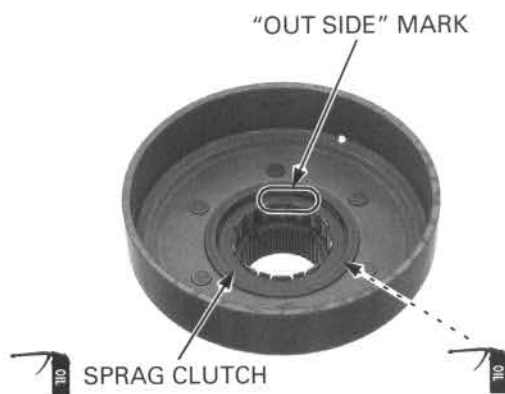
*Be careful not to damage the clutch weights while compressing.*

Install the E-clips into the spindle grooves with its gap facing towards the pin by using the pliers while compressing the clutch spring.



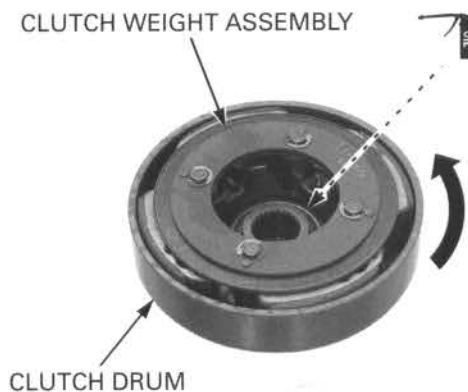
Apply engine oil to the sprag clutch whole surface and the sprag clutch contacting surface of the clutch drum.

Install the sprag clutch into the clutch drum with the "OUT SIDE" mark facing up.



Apply engine oil to the sprag clutch contacting surface of the drive plate boss.

Install the clutch weight assembly while turning it counterclockwise.



### INSTALLATION

Set the centrifugal clutch assembly onto the crankshaft by aligning the splines of the drive plate and crankshaft, and the splines of the clutch drum and primary drive gear.

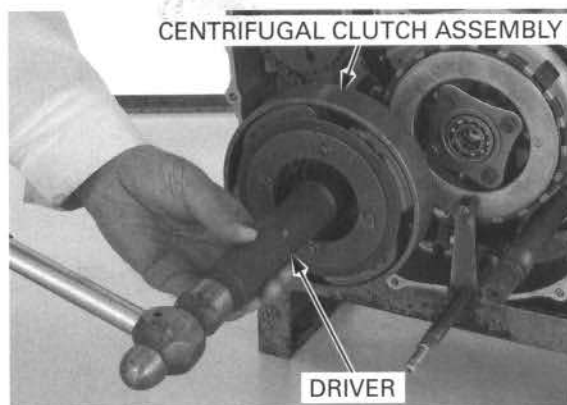
Tap the drive plate to seat it.

#### TOOL:

Driver, 22 mm I.D.

07746-0020100

*Be careful not to damage the crankshaft threads.*





Apply engine oil to the threads and seating surface of a new lock nut.

Hold the drive plate of the centrifugal clutch assembly with the special tool and tighten the lock nut.

## TOOL:

**Clutch holder** 07ZMB-HN20001  
 – holder plate 07ZMB-HN20101  
 – holder pin 07ZMB-HN20200

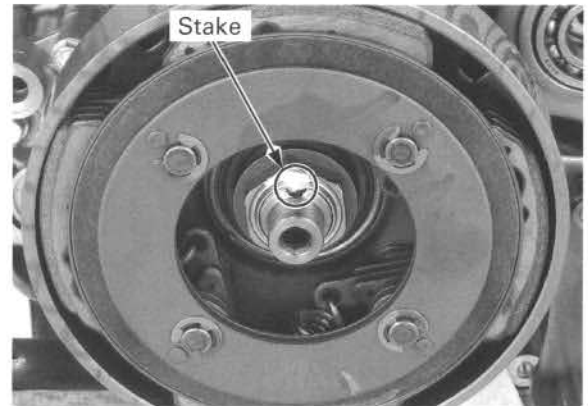
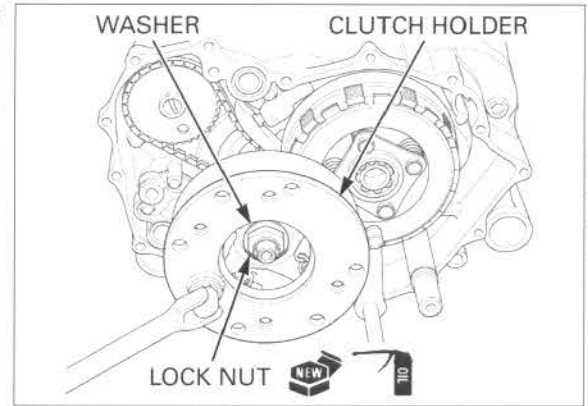
## U.S.A. TOOL:

**Clutch holder** 07ZMB-HN2A101

**TORQUE:** 118 N·m (12.0 kgf·m, 87 lbf·ft)

*Be careful not to damage the crankshaft threads.*

Stake the lock nut into the crankshaft groove.  
 Install the front crankcase cover (page 11-23).



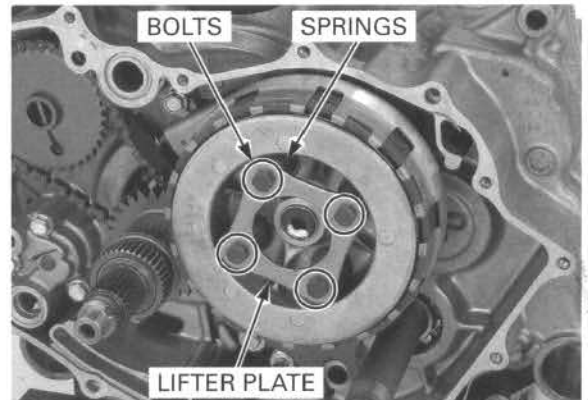
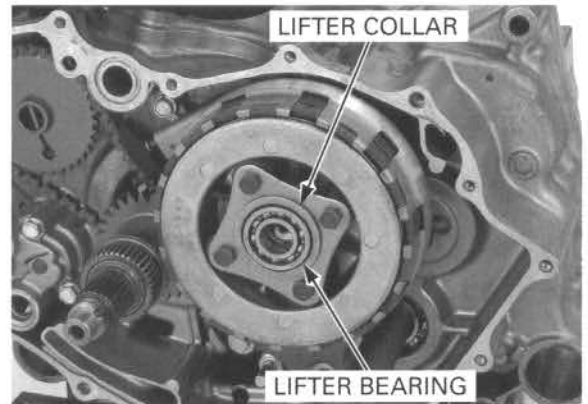
## CHANGE CLUTCH

### DISASSEMBLY

Remove the following:

- centrifugal clutch assembly (page 11-8)
- TE/FE/FPE models: shift arm spring, gearshift spindle and washer (page 11-20)
- TM/FM/FPM models: clutch lifter lever (page 11-20)
- lifter bearing and collar

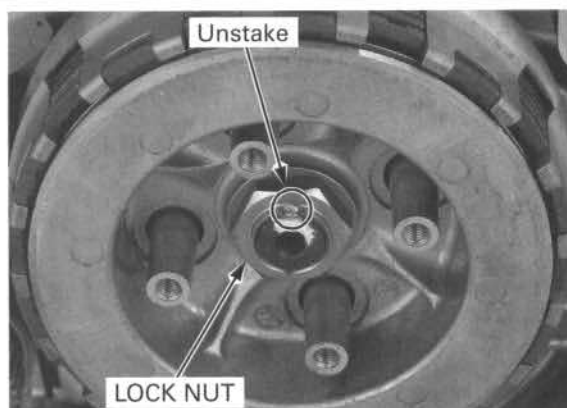
Loosen the clutch spring bolts in a crisscross pattern in several steps, and remove the bolts, lifter plate and clutch springs.





## CLUTCH/GEARSHIFT LINKAGE

Be careful not to damage the mainshaft threads.  
Unstake the clutch center lock nut.



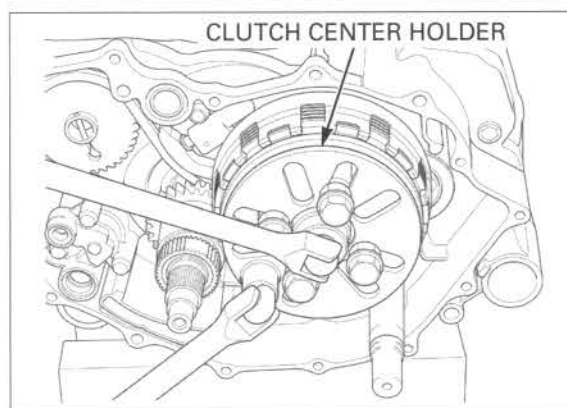
Install the clutch center holder onto the pressure plate bosses with the four clutch spring bolts.

### TOOL:

Clutch center holder 07JMB-MN50301

### U.S.A. TOOLS:

Holder plate 07HGB-001010B or 07HGB-001010A  
with  
Holder collar A 07HGB-001020B or 07HGB-001020A

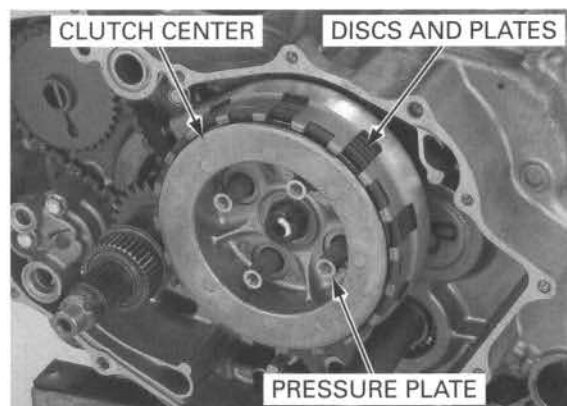


Hold the clutch center and loosen the clutch center lock nut.

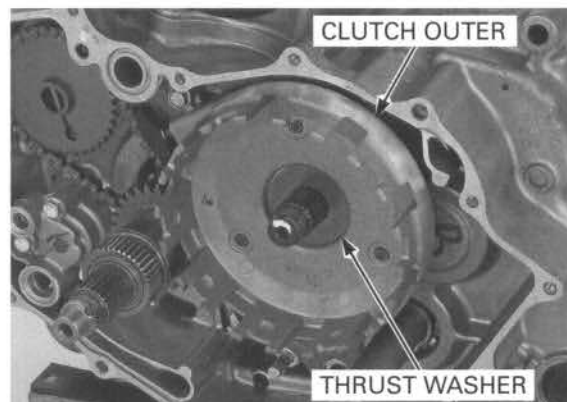
Remove the lock nut and washer.

Remove the following:

- clutch center
- TE/FE/FPE models: six discs and five plates
- TM/FM/FPM models: seven discs and six plates
- pressure plate



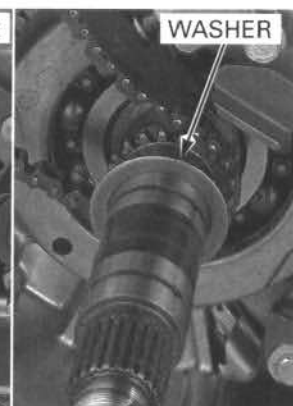
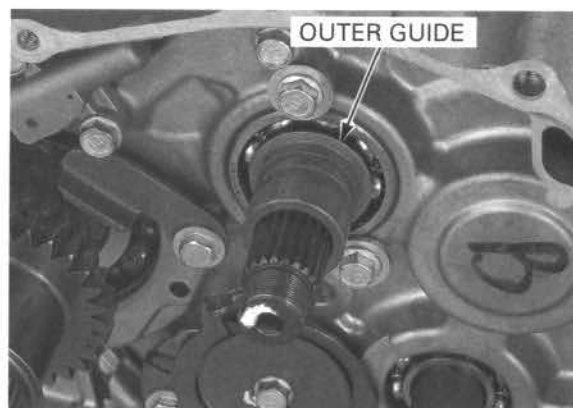
- thrust washer
- clutch outer





- clutch outer guide

Remove the primary drive gear and washer from the crankshaft.

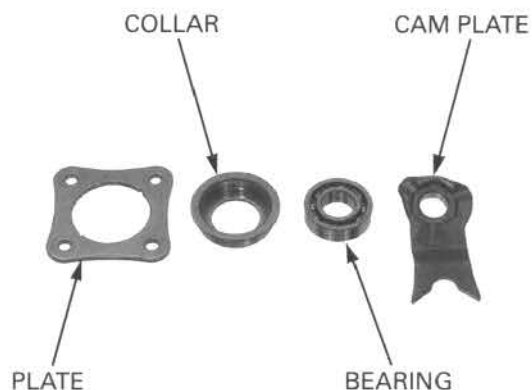


## INSPECTION

### CLUTCH LIFTER

Turn the inner race of the lifter bearing with your finger.  
The bearing should turn smoothly and quietly.  
Replace if necessary.

Check the lifter cam plate, lifter plate and collar for deformation or damage.

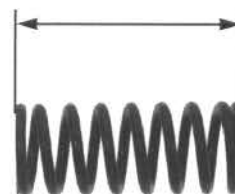


### CLUTCH SPRING

*Replace the clutch springs as a set.*

Measure the clutch spring free length.

**SERVICE LIMITS:** TE/FE/FPE: 47.2 mm (1.86 in)  
TM/FM/FPM: 45.8 mm (1.80 in)





## CLUTCH/GEARSHIFT LINKAGE

### CLUTCH DISC

*Replace the clutch discs and plates as a set.*

Check the clutch discs for signs of scoring or discoloration.

Measure the clutch disc thickness.

**SERVICE LIMIT: 2.3 mm (0.09 in)**



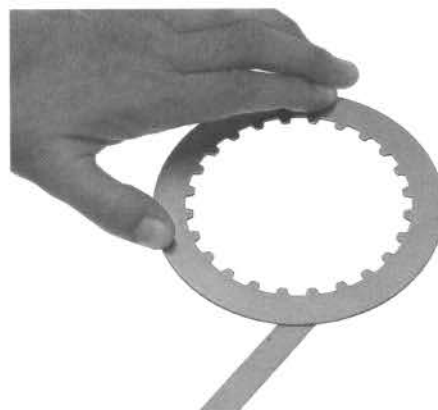
### CLUTCH PLATE

*Replace the clutch discs and plates as a set.*

Check the plates for discoloration.

Check the plate warpage on a surface plate using a feeler gauge.

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



### CLUTCH CENTER

Check the clutch center and pressure plate for nicks, indentations or abnormal wear made by the plates.



### CLUTCH OUTER

Check the primary driven gear teeth for wear or damage.

Check the slots in the clutch outer for nicks, indentation or abnormal wear made by the clutch discs.

Measure the clutch outer I.D.

**SERVICE LIMIT: 29.05 mm (1.144 in)**





**CLUTCH OUTER GUIDE**

Check the outer guide for wear or damage.  
Measure the clutch outer guide I.D. and O.D.

**SERVICE LIMITS:** I.D.: 22.05 mm (0.868 in)  
O.D.: 28.93 mm (1.139 in)

**PRIMARY DRIVE GEAR**

Check the gear teeth for wear or damage.  
Measure the drive gear I.D.

**SERVICE LIMIT:** 29.05 mm (1.144 in)

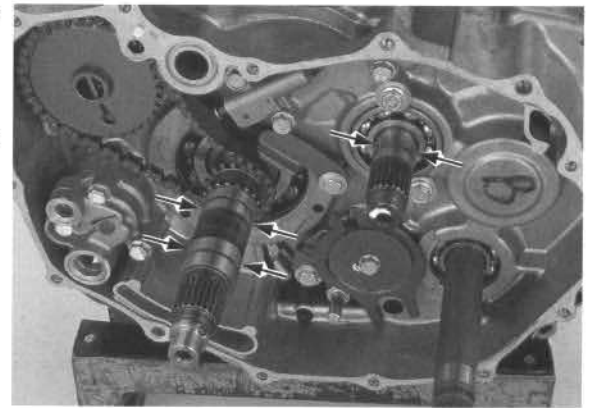
**MAINSHAFT AND CRANKSHAFT**

Measure the mainshaft O.D. at the clutch outer guide.

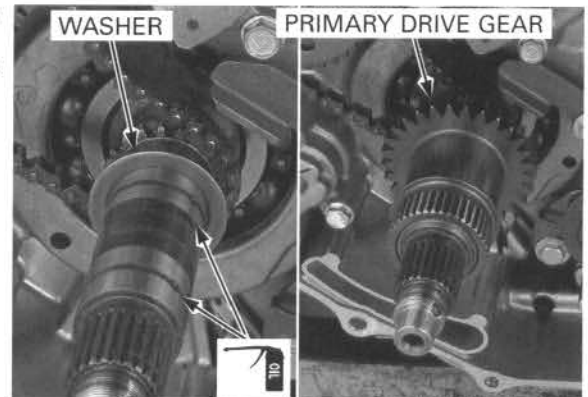
**SERVICE LIMIT:** 21.93 mm (0.863 in)

Measure the crankshaft O.D. at the primary drive gear.

**SERVICE LIMIT:** 28.93 mm (1.139 in)

**ASSEMBLY**

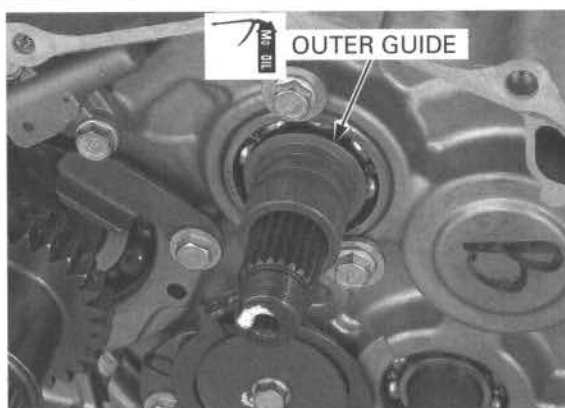
Apply engine oil to the primary drive gear sliding surface of the crankshaft.  
Install the thrust washer and the drive gear onto the crankshaft.



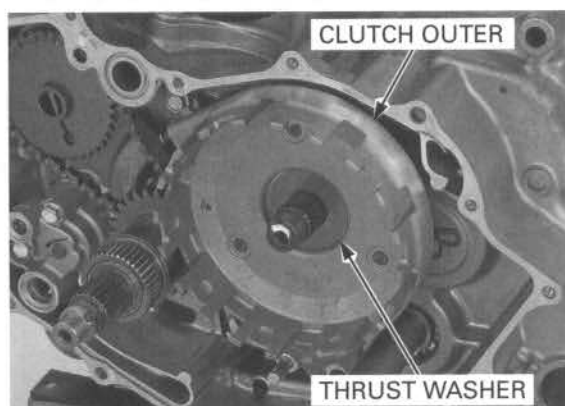


## CLUTCH/GEARSHIFT LINKAGE

Apply molybdenum oil solution to the inner and outer surfaces of the clutch outer guide.  
Install the outer guide onto the mainshaft.



Install the clutch outer and thrust washer.



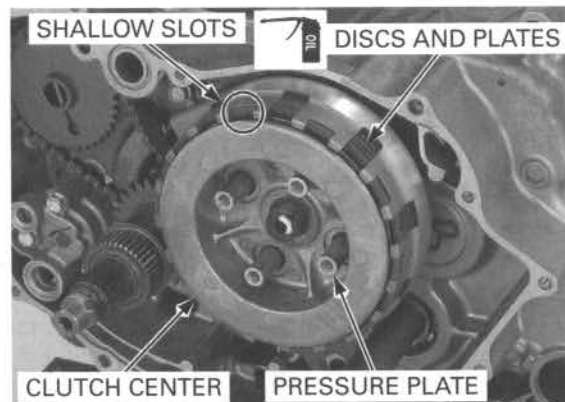
Coat the clutch discs with clean engine oil.

*Install the discs and plate alternately, starting with the disc.*

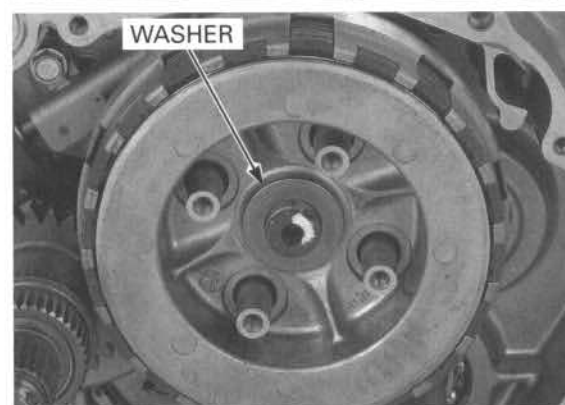
*Set the outside clutch disc tabs into the shallow slots in the clutch outer.*

Install the following:

- pressure plate
- TE/FE/FPE models: six discs and five plates
- TM/FM/FPM models: seven discs and six plates
- clutch center



Install the washer.





Apply engine oil to the threads and seating surface of a new lock nut, and install it.

Install the clutch center holder onto the pressure plate bosses with the four clutch spring bolts.

**TOOL:**

**Clutch center holder** 07JMB-MN50301

**U.S.A. TOOLS:**

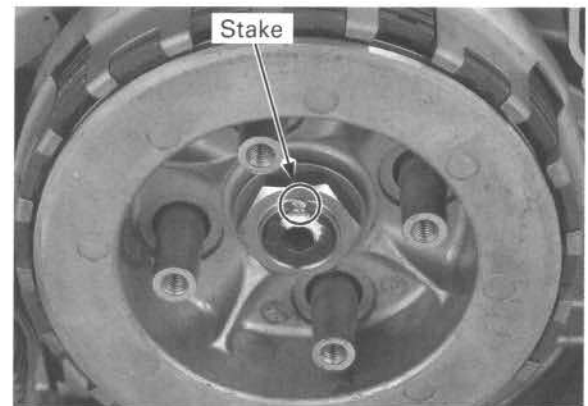
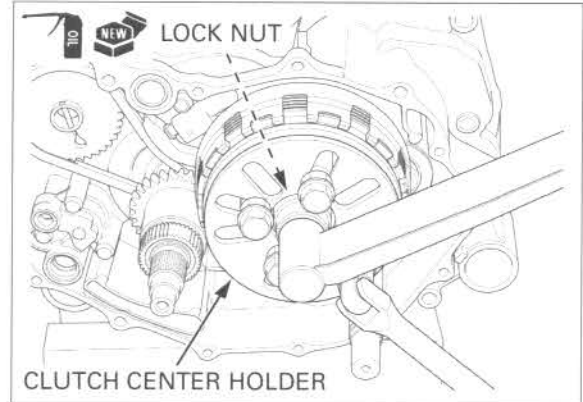
**Holder plate** 07HGB-001010B or  
07HGB-001010A  
with  
**Holder collar A** 07HGB-001020B or  
07HGB-001020A

Hold the clutch center holder and tighten the lock nut.

**TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)**

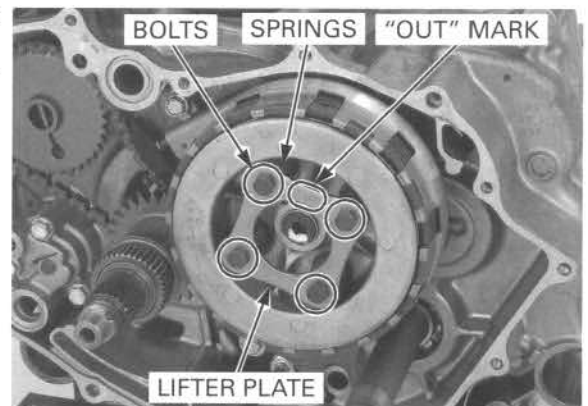
Stake the lock nut into the mainshaft groove.

*Be careful not to  
damage the  
mainshaft threads.*



Install the clutch springs and the lifter plate with the "OUT" mark facing out.  
Install the clutch bolts and tighten them in a criss-cross pattern in several steps.

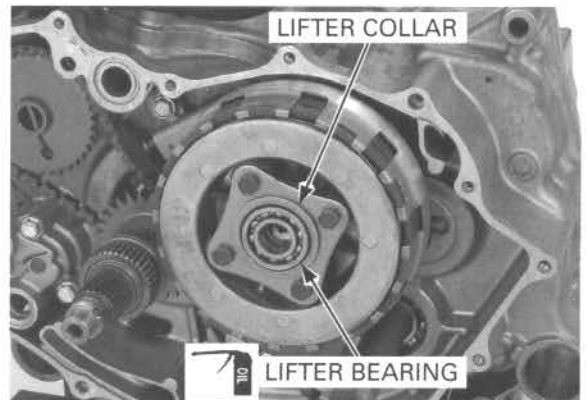
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**



Apply engine oil to the lifter bearing, and install the lifter collar and bearing.

Install the following:

- TE/FE/FPE models: washer, gearshift spindle and shift arm spring (page 11-22)
- TM/FM/FPM models: lifter lever (page 11-22)
- lifter bearing and collar
- centrifugal clutch assembly (page 11-12)





## GEARSHIFT LINKAGE

### REMOVAL

Remove the centrifugal clutch (page 11-8).

Remove the following:

- TE/FE/FPE models:*
- angle sensor (page 23-29)
  - shift arm spring
  - gearshift spindle assembly and washer

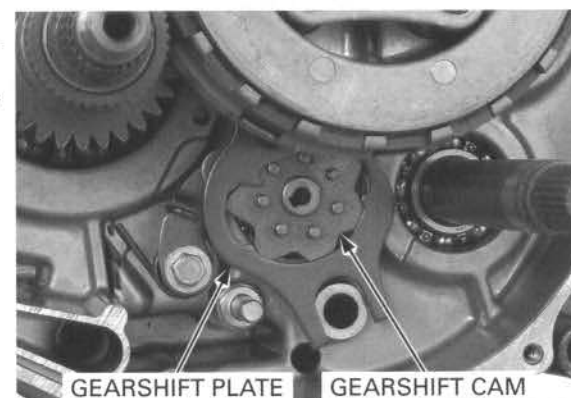
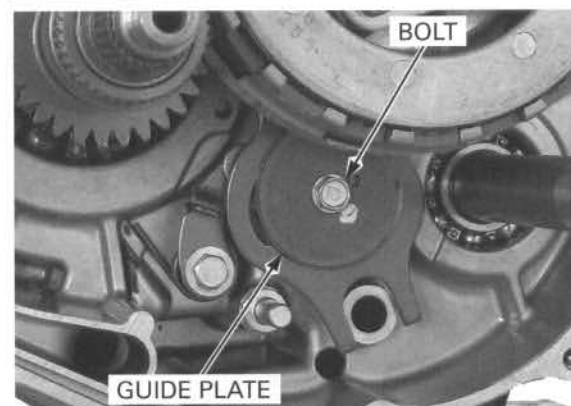
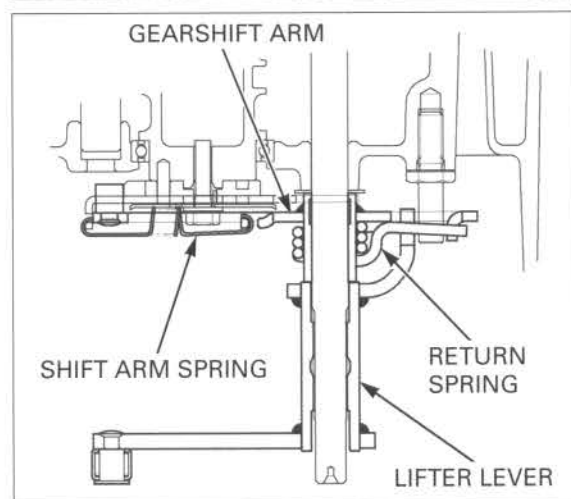
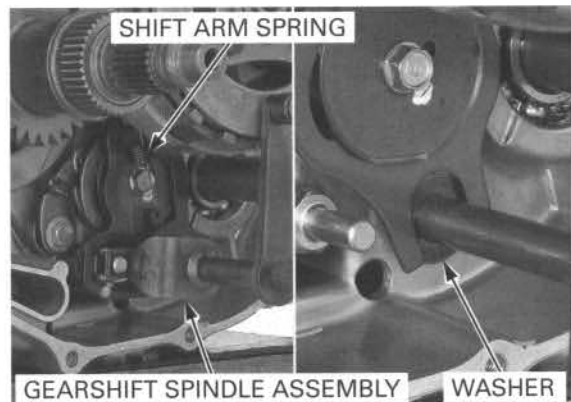
- TM/FM/FPM models:*
- clutch lifter lever
  - shift arm spring
  - return spring and gearshift arm

#### NOTE:

- For gearshift spindle service (page 13-8)

- bolt
- guide plate

- gearshift plate
- TM/FM/FPM models only: washer from the gearshift spindle
- gearshift cam (while holding stopper arm with a screwdriver)





- bolt
- stopper arm
- washer
- return spring

## INSTALLATION

Apply locking agent to the stopper arm bolt threads. Install the return spring, washer (between the arm and crankcase), stopper arm and bolt, and tighten the bolt.

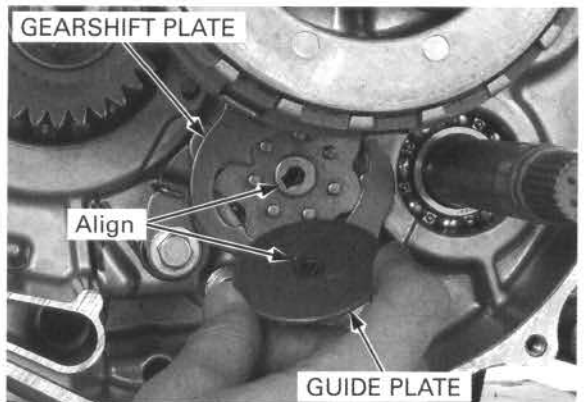
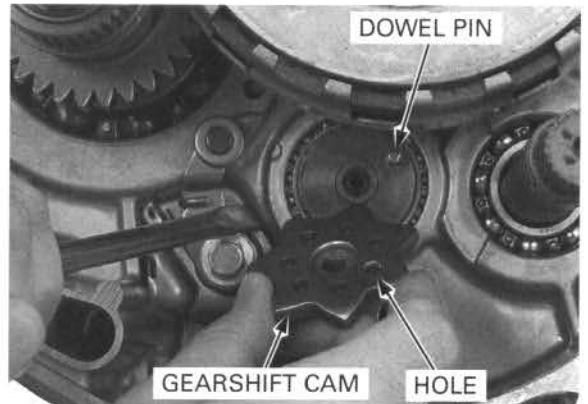
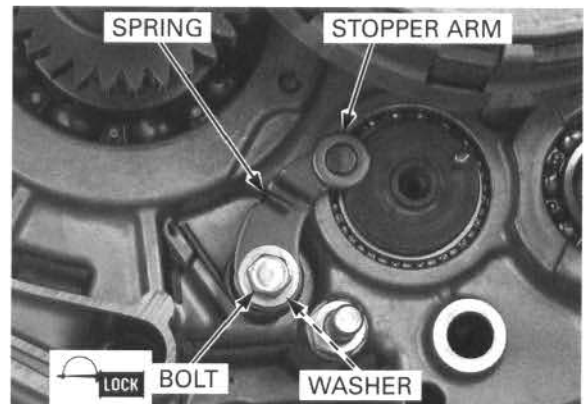
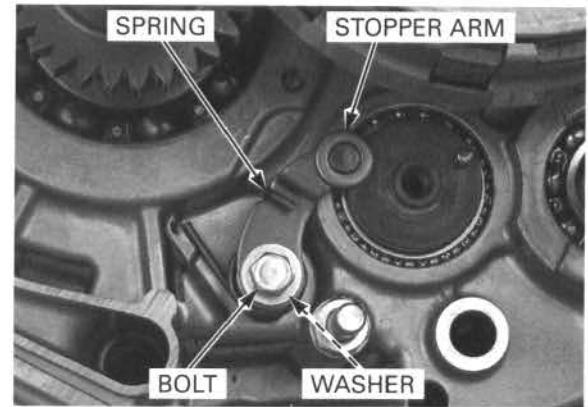
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Hold the stopper arm with a screwdriver and install the gearshift cam by aligning the pin hole with the dowel pin.

TM/FM/FPM models only: Install the washer onto the gearshift spindle.

Install the gearshift plate onto the cam as shown.

Install the guide plate by aligning the tab with the groove in the cam.

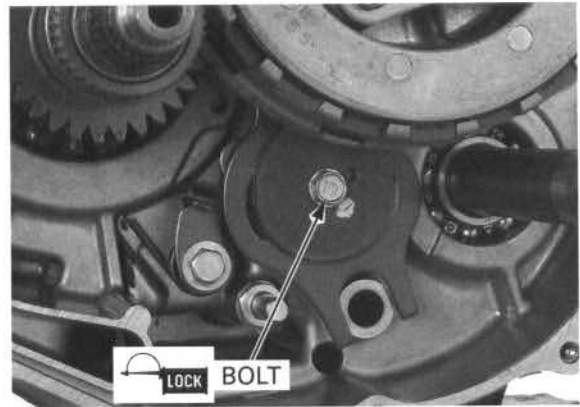




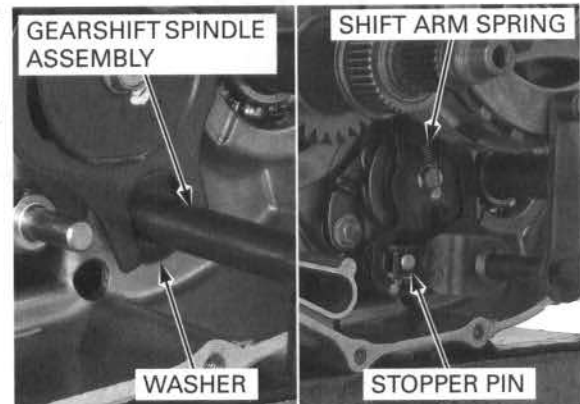
## CLUTCH/GEARSHIFT LINKAGE

Apply locking agent to the cam bolt threads  
Install the cam bolt and tighten it.

**TORQUE: 16 N·m (1.6 kgf·m, 12 lbf·ft)**

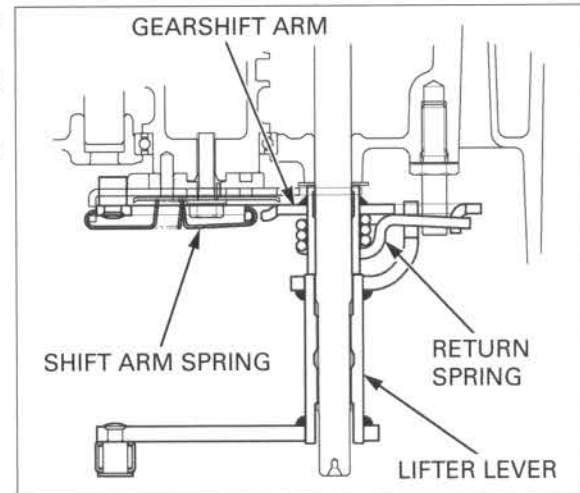


*TE/FE/FPE models:* Install the washer and insert the gearshift spindle assembly into the crankcase.  
Align the return spring ends with the stopper pin.  
Hook the shift arm spring to the gearshift arm and plate.  
Install the angle sensor (page 23-30).



*TM/FM/FPM models:* Install the gearshift arm and return spring, aligning the spring ends with the stopper pin.  
Hook the shift arm spring to the gearshift arm and plate.  
Install the lifter lever by aligning the wide groove with the wide tooth of the splines.

*All models:* Install the centrifugal clutch (page 11-12).



### GEARSHIFT SPINDLE A (TM/FM/FPM models only)

Remove the rear crankcase cover (page 12-5)

Remove the stopper bolt, washer and gearshift spindle A from the rear crankcase cover.  
Remove the oil seal from the rear crankcase cover.

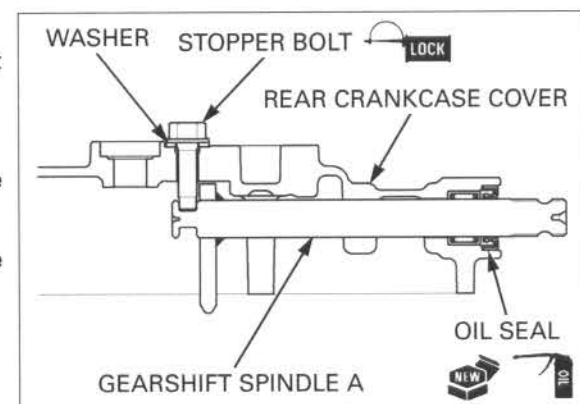
Install a new oil seal.

Apply engine oil to the oil seal lip and install the gearshift spindle A.

Apply locking agent to the stopper bolt threads.  
Install the washer and stopper bolt, and tighten the bolt.

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

Install the rear crankcase cover (page 12-6)





## FRONT CRANKCASE COVER INSTALLATION

Clean the mating surfaces of the front crankcase cover and crankcase thoroughly, being careful not to damage them.

Blow through the oil passages in the front crankcase cover with compressed air.

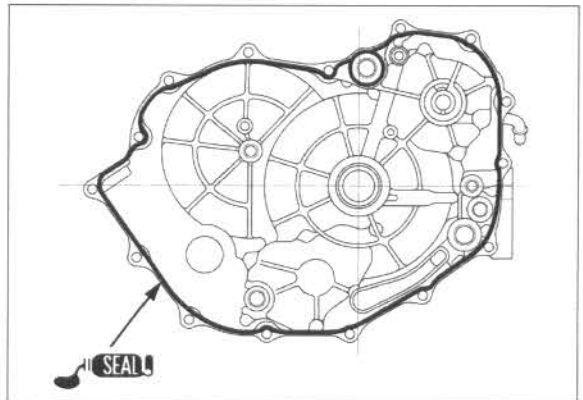
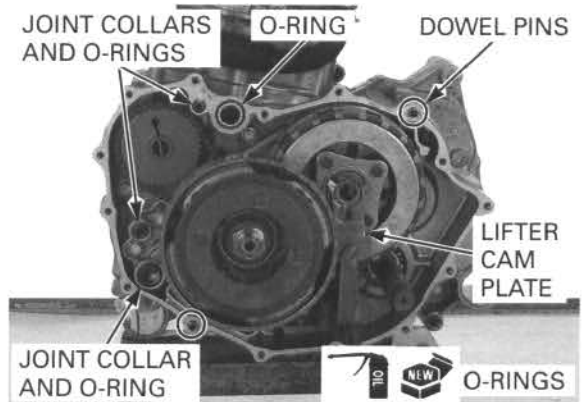
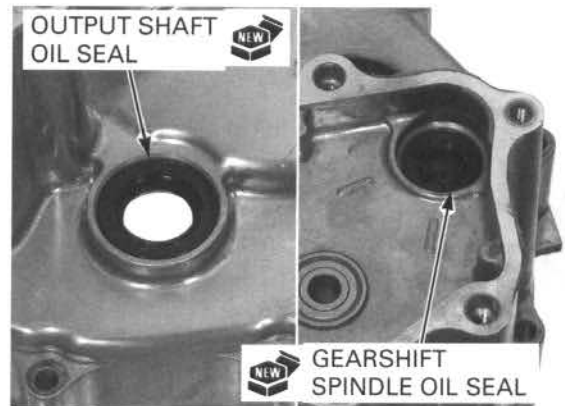
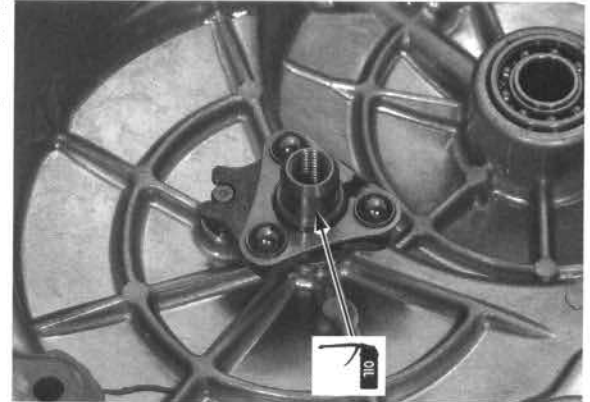
Apply engine oil to the boss of the adjusting plate.

Install a new output shaft oil seal into the front crankcase cover.

TE/FE/FPE models only: Install a new gearshift spindle oil seal into the front crankcase cover.

Install the joint collars and dowel pins  
Coat new O-rings with engine oil and install them.

Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the front crankcase cover as shown.





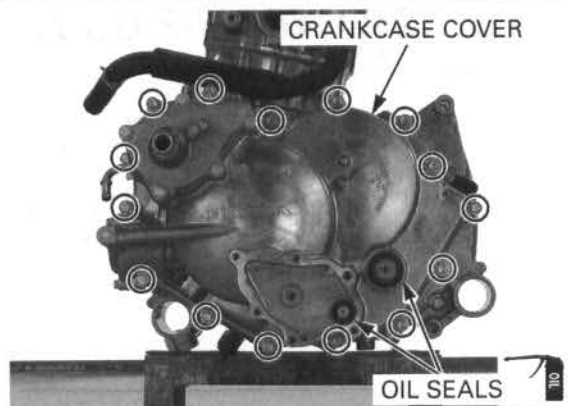
## CLUTCH/GEARSHIFT LINKAGE

Apply engine oil to the oil seal lips.

*Be careful not to drop the lifter cam plate.*

Install the crankcase cover, being careful not to damage the oil seal lips.

Install the fifteen bolts and tighten them in a criss-cross pattern in several steps.



Connect the water hoses to the crankcase cover.

Install the following:

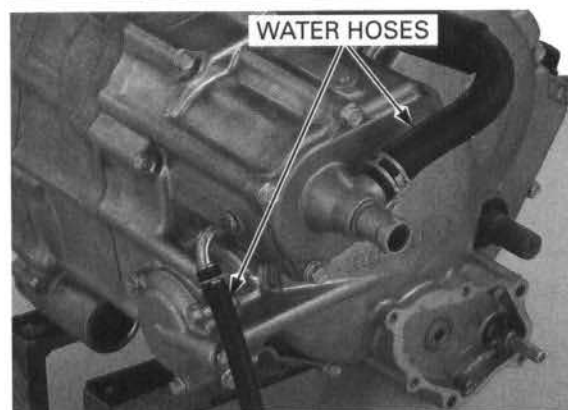
- TE/FE/FPE models only: reduction gears and shift control motor (page 23-33)
- FM/FE/FPM models only: front propeller shaft (page 17-36)
- mudguards (page 3-6)

Adjust the clutch system (page 4-26).

Fill the engine with recommended oil (page 4-15).

Fill and bleed the cooling system (page 7-6).

Check the engine oil level (page 4-14).





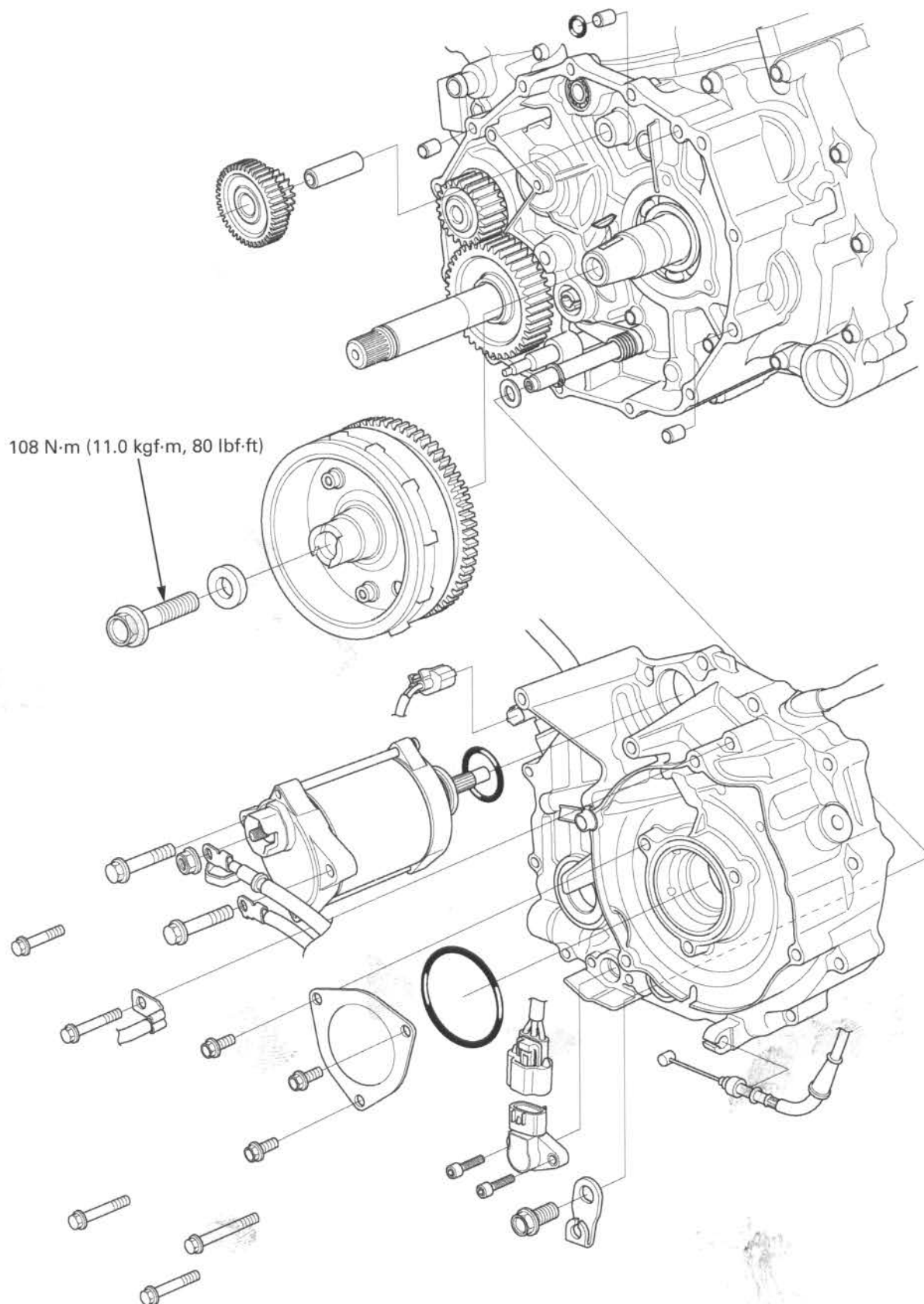
# 12. ALTERNATOR/STARTER CLUTCH

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SYSTEM COMPONENTS .....	12-2	ALTERNATOR STATOR .....	12-5
SERVICE INFORMATION .....	12-3	FLYWHEEL/STARTER CLUTCH .....	12-8
TROUBLESHOOTING .....	12-4		



## ALTERNATOR/STARTER CLUTCH SYSTEM COMPONENTS





## SERVICE INFORMATION

### GENERAL

- This section covers service of the alternator stator, flywheel and starter clutch. The engine must be removed from the frame to service these parts.
- Transmission lubricating oil is fed through the oil passages in the rear crankcase cover. Clean the oil passages before installing the cover.
- Alternator stator inspection (page 19-8)
- Starter motor servicing (page 21-6)

### SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Starter driven gear boss	O.D.	51.705 – 51.718 (2.0356 – 2.0361)	51.69 (2.035)
	I.D.	31.946 – 31.962 (1.2577 – 1.2583)	31.90 (1.256)
Crankshaft O.D. at starter driven gear		31.884 – 31.900 (1.2553 – 1.2559)	31.85 (1.254)

Unit: mm (in)

### TORQUE VALUES

Starter clutch bolt

37 N·m (3.8 kgf·m, 27 lbf·ft) Apply locking agent to the threads.

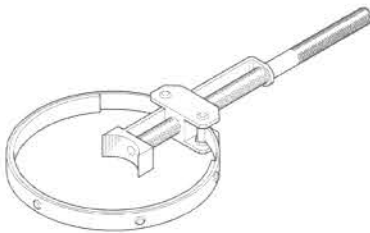
Flywheel bolt

108 N·m (11.0 kgf·m, 80 lbf·ft) Apply engine oil to the threads and seating surface.

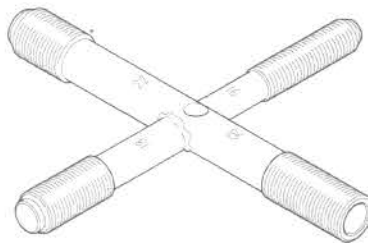
CKP sensor bolt

6 N·m (0.6 kgf·m, 4.4 lbf·ft) Apply locking agent to the threads

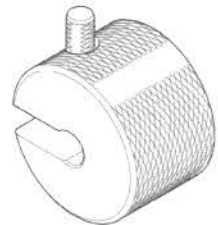
### TOOLS

Flywheel holder  
07725-0040000

or equivalent commercially available in U.S.A.


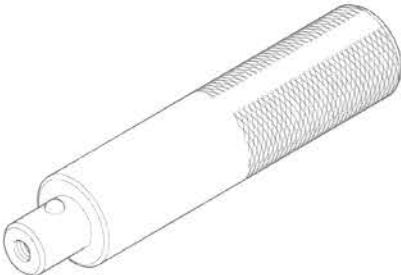



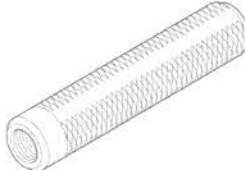
Rotor puller  
07733-0020001

or 07933-3950000

Remover weight  
07741-0010201Attachment, 52 x 55 mm  
07746-0010400Attachment, 24 x 26 mm  
07746-0010700Pilot, 10 mm  
07746-0040100



## ALTERNATOR/STARTER CLUTCH

<p>Pilot, 25 mm 07746-0040600</p> 	<p>Driver 07749-0010000</p> 	<p>Bearing remover shaft, 10 mm 07936-GE00100</p> 
<p>Bearing remover head, 10 mm 07936-GE00200</p> 	<p>Bearing remover, 10 mm 07936-GE0A000</p> 	<p>Remover handle 07936-3710100</p> 

## TROUBLESHOOTING

### Starter motor turns, but engine does not turn

- Faulty starter clutch
- Damaged starter reduction gear and/or driven gear



# ALTERNATOR STATOR

## REAR CRANKCASE COVER REMOVAL

*The cover (stator) is magnetically attracted to the flywheel, be careful during removal.*

Remove the following:

- engine from the frame (page 8-4)
- TE/FE/FPE only: shift angle sensor (page 23-29)
- thirteen bolts
- rear crankcase cover

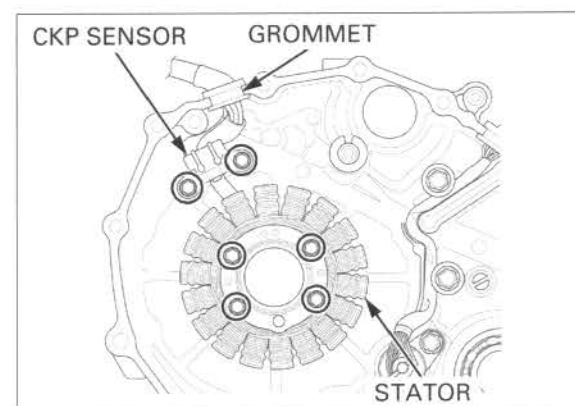
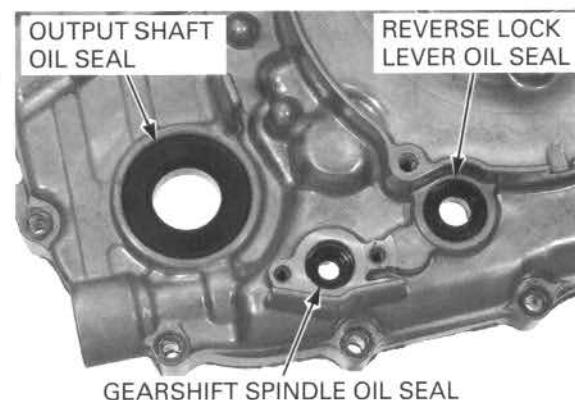
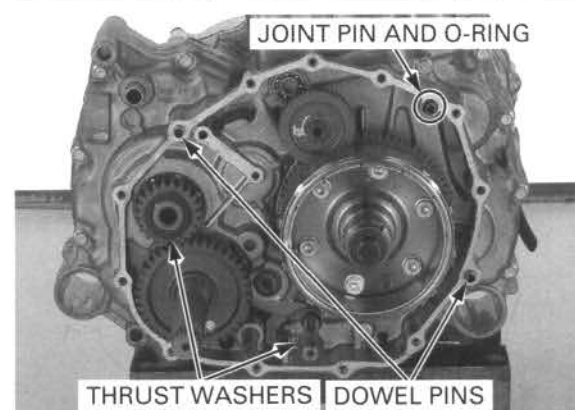
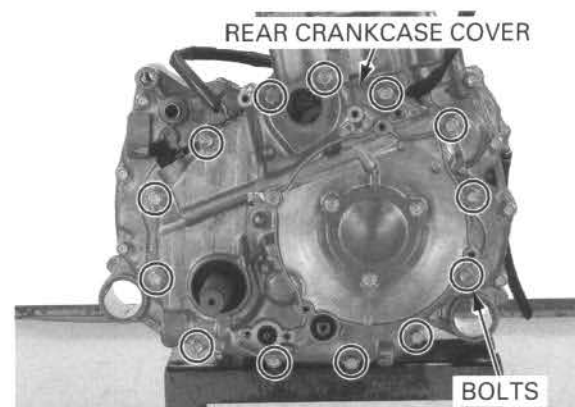
- two dowel pins
- oil joint pipe and O-ring
- countershaft thrust washer
- reverse stopper shaft thrust washer

- output shaft oil seal
- reverse lock lever oil seal
- TE/FE/FPE models only: gearshift spindle oil seal

## STATOR AND CKP SENSOR REMOVAL

Remove the following:

- two CKP sensor bolts
- four stator bolts
- grommet
- stator/CKP sensor assembly





### STATOR AND CKP SENSOR INSTALLATION

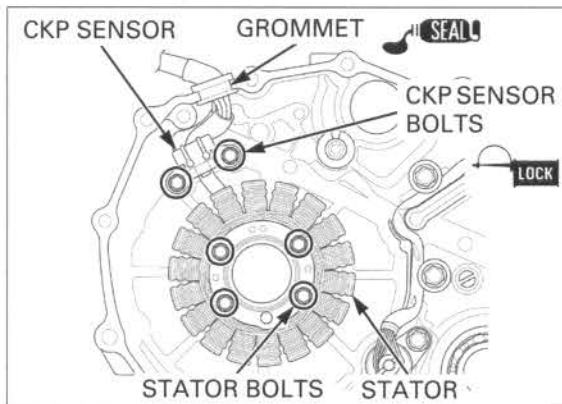
Set the stator/CKP sensor assembly onto the alternator cover.

Apply sealant to the grommet seating surface and install the grommet into the cover groove securely.

Apply locking agent to the CKP sensor bolt threads. Install the stator bolts and CKP sensor bolts, and tighten them.

#### TORQUE:

CKP sensor bolt: 6 N·m (0.6 kgf·m, 4.4 lbf·ft)



### OUTPUT SHAFT BEARING REPLACEMENT

Turn the inner race of the bearing with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the rear crankcase cover.

Replace the bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the cover.

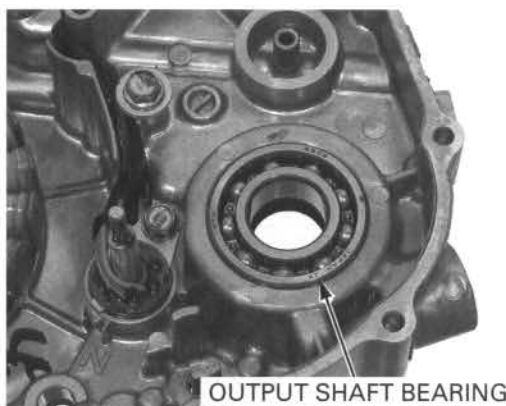
Drive the bearing out of the cover.

Apply engine oil to a new bearing.

Drive the bearing into the cover with the marked side facing up.

#### TOOLS:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 25 mm	07746-0040600



### REAR CRANKCASE COVER INSTALLATION

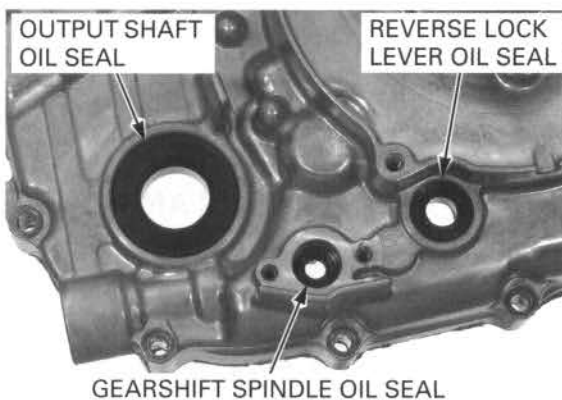
Clean the mating surfaces of the crankcase and rear crankcase cover thoroughly, being careful not to damage them.

Blow through the oil passage in the rear crankcase cover with compressed air.

Install the following:

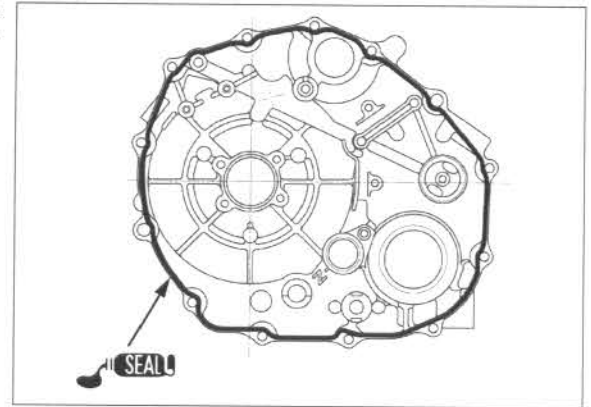
- new output shaft oil seal
- new reverse lock lever oil seal
- TE/FE/FPE models only: new gearshift spindle oil seal

Apply engine oil to the oil seal lips.

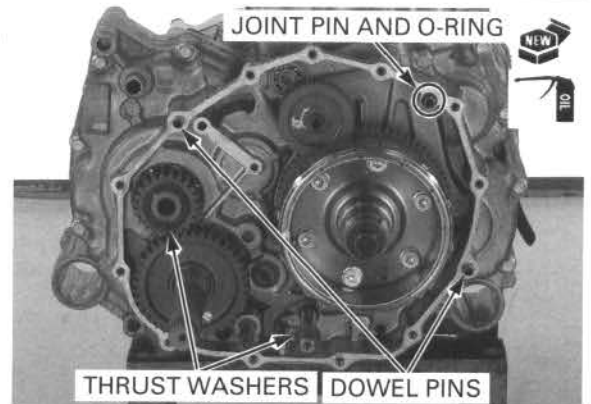




Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the rear crankcase cover as shown.



Install the two dowel pins and oil joint pipe. Coat a new O-ring with engine oil and install it onto the oil joint pipe. Install the thrust washers onto the countershaft and reverse stopper shaft.



Shift the transmission into neutral to align the groove in the shift drum with the lug on the crankcase.

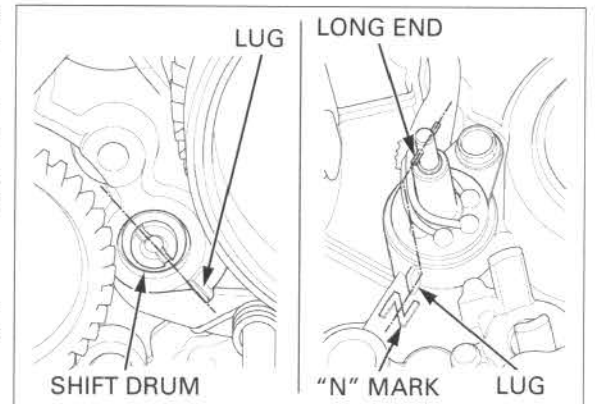
Align the long end of the gear position switch pin with the "N" mark (lug) on the rear crankcase cover.

Install the rear crankcase cover aligning the switch pin with the shift drum groove, being careful not to damage the oil seal lips.

## NOTE:

- TM/FM/FPM models only: Align the arm of gearshift spindle A with the arm hole in the gearshift spindle when installing the cover.

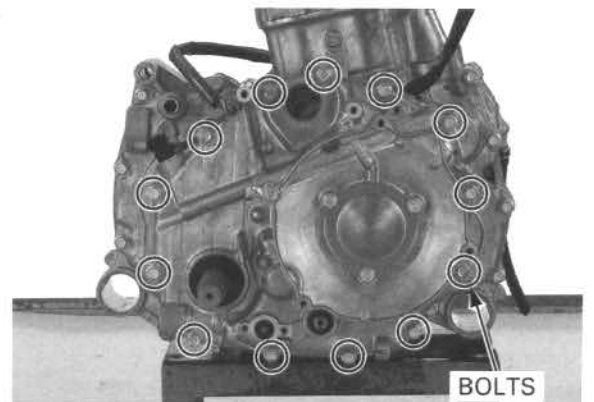
*The cover (stator) is magnetically attracted to the flywheel, be careful not to get anything caught between these parts when installing.*



Install the thirteen bolts and tighten them in a criss-cross pattern in 2 or 3 steps.

Install the following:

- TE/FE/FPE only: shift angle sensor (page 23-30)
- engine into the frame (page 8-8)



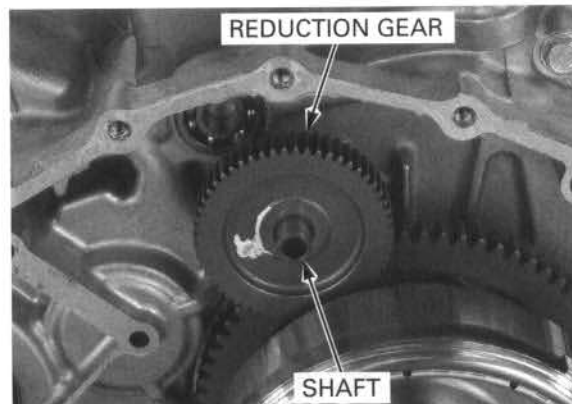


## FLYWHEEL/STARTER CLUTCH

### REMOVAL

Remove the rear crankcase cover (page 12-5).

Remove the starter reduction gear shaft and gear.

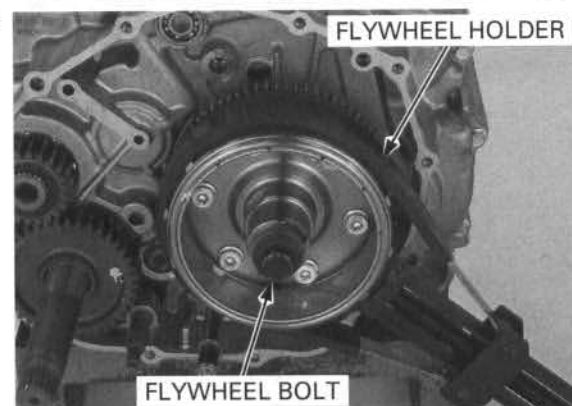


Hold the flywheel using the special tool and remove the flywheel bolt.

**TOOL:**

Flywheel holder

07725-0040001 or  
equivalent commercially  
available in U.S.A.



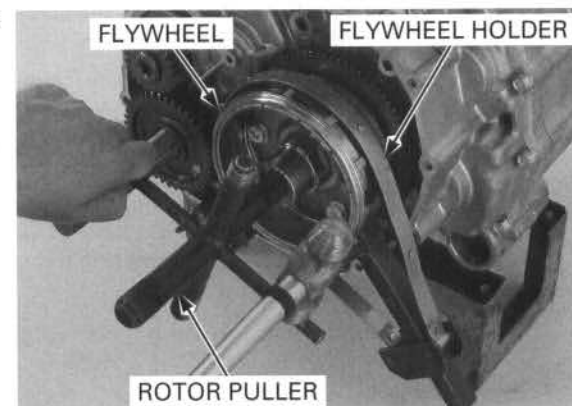
Hold the flywheel and remove it from the crankshaft using the special tools.

**TOOL:**

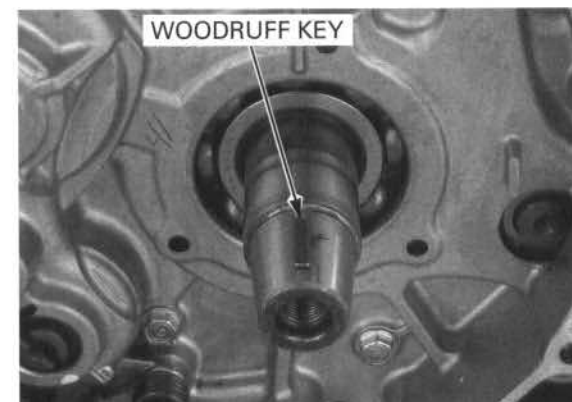
Flywheel holder

07725-0040001 or  
equivalent commercially  
available in U.S.A.  
07733-0020001 or  
07933-3950000

Rotor puller



Remove the woodruff key from the crankshaft.





## STARTER CLUTCH DISASSEMBLY

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 (T40).

### TOOL:

Flywheel holder

07725-0040000 or  
equivalent commercially  
available in U.S.A.

Remove the starter clutch assembly from the flywheel.



## INSPECTION

Check the starter driven gear teeth for wear or damage.

Measure the driven gear boss O.D. and I.D.

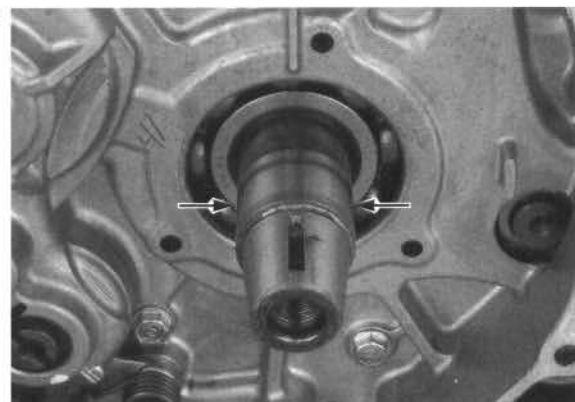
**SERVICE LIMITS:** O.D.: 51.69 mm (2.035 in)

I.D.: 31.90 mm (1.256 in)



Measure the crankshaft O.D. at the starter driven gear.

**SERVICE LIMIT:** 31.85 mm (1.254 in)





## ALTERNATOR/STARTER CLUTCH

Remove the sprag clutch from the clutch outer.

Check the starter clutch outer and sprag clutch for abnormal wear or damage.

CLUTCH OUTER



SPRAG CLUTCH



Check the starter reduction gear and shaft for wear or damage.

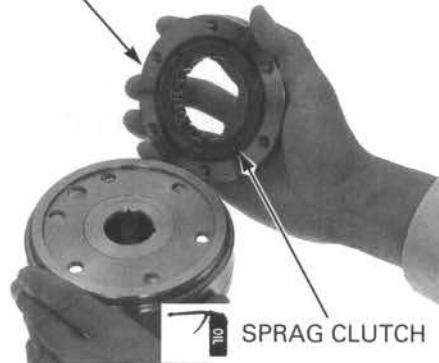


### STARTER CLUTCH ASSEMBLY

Lubricate the sprag clutch with engine oil and install it into the clutch outer with the flange facing the flywheel side.

Install the starter clutch onto the flywheel.

CLUTCH OUTER



SPRAG CLUTCH

Apply locking agent to the starter clutch (T40) bolt threads.

Align the bolt holes in the flywheel and starter clutch, 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: 37 N·m (3.8 kgf·m, 27 lbf·ft)

LOCK BOLTS (T40)



FLYWHEEL HOLDER



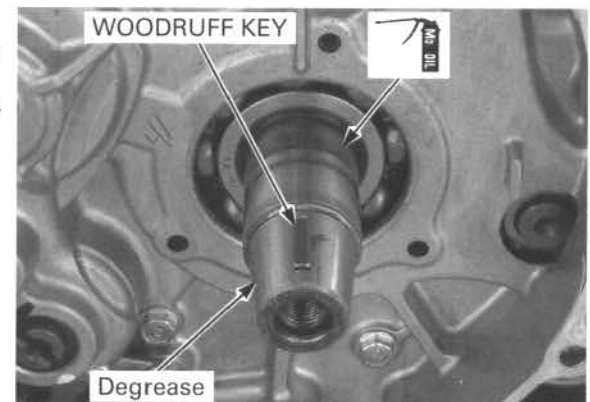
Install the starter driven gear while turning it clockwise.



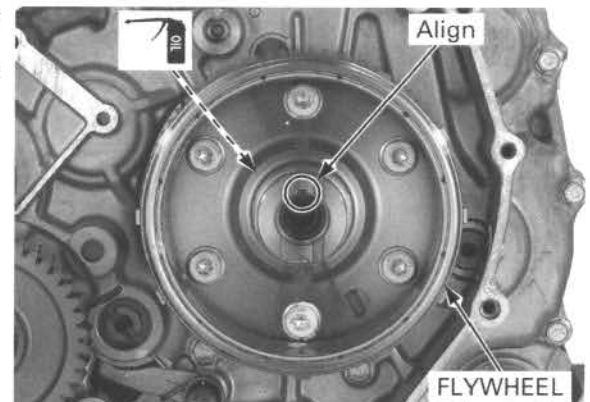
## INSTALLATION

Install the woodruff key into the key groove.

Apply molybdenum oil solution to the starter driven gear sliding surface of the crankshaft.  
Clean any oil from the tapered portions of the crankshaft and flywheel.



Apply engine oil to the starter driven gear boss inner surface.  
Install the flywheel aligning the key way with the key on the crankshaft.



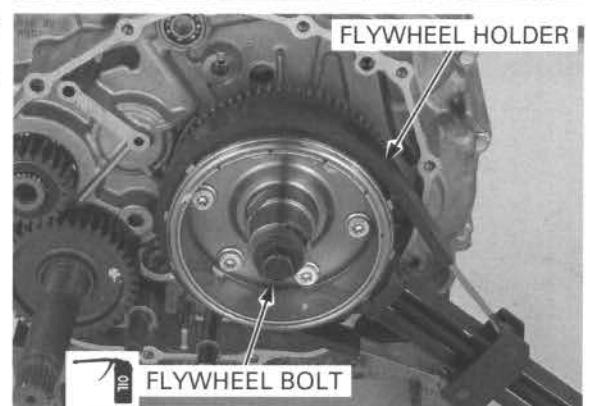
Apply engine oil to the flywheel bolt threads and seating surface and install it.  
Hold the flywheel using the special tool and tighten the flywheel bolt.

### TOOL:

Flywheel holder

07725-0040001 or  
equivalent commercially  
available in U.S.A.

**TORQUE:** 108 N·m (11.0 kgf·m, 80 lbf·ft)

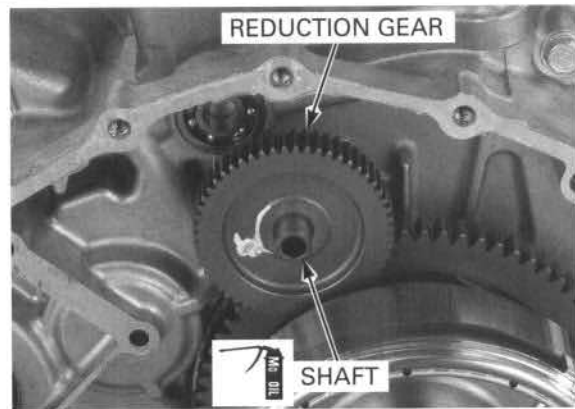




## ALTERNATOR/STARTER CLUTCH

Apply molybdenum oil solution to the starter reduction gear shaft, and install the gear and shaft.

Install the rear crankcase cover (page 12-6).



### STARTER MOTOR BEARING REPLACEMENT

Remove the rear crankcase cover (page 12-5).

Remove the starter reduction gear shaft and gear.

Turn the inner race of the bearing with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the rear crankcase cover.

Replace the bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the cover.

Remove the bearing using the special tools.

#### TOOLS:

Bearing remover shaft, 10 mm	07936-GE00100
Bearing remover head, 10 mm	07936-GE00200
Remover weight	07741-0010201

#### U.S.A. TOOLS:

Bearing remover, 10 mm	07936-GE0A000
Remover weight	07936-371020A or 07936-3710200

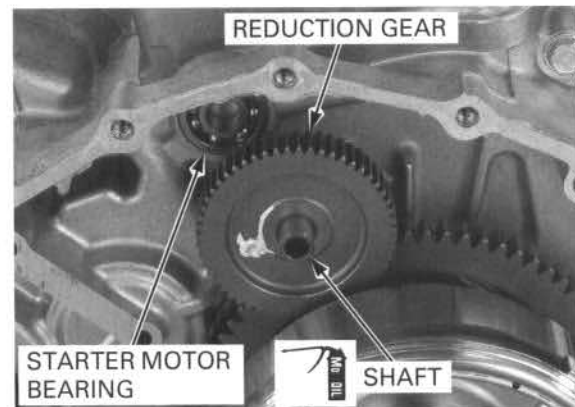
Apply engine oil to a new bearing.  
Drive a new bearing into the crankcase with the marked side facing out, using the special tools.

#### TOOLS:

Driver	07749-0010000
Attachment, 24 x 26 mm	07746-0010700
Pilot, 10 mm	07746-0040100

Apply molybdenum oil solution to the starter reduction gear shaft, and install the gear and shaft.

Install the rear crankcase cover (page 12-6).





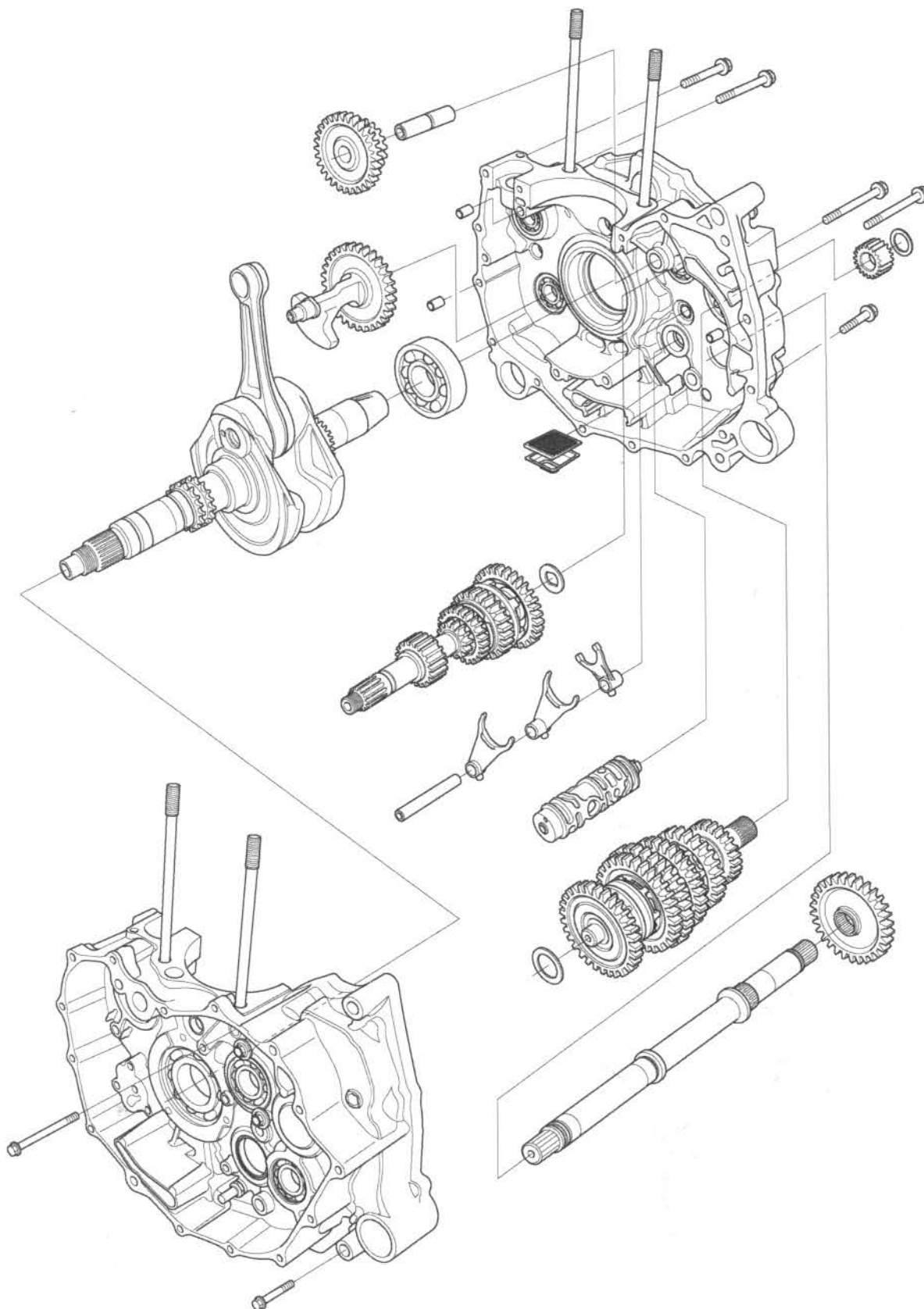
## 13. CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

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SYSTEM COMPONENTS .....	13-2	TRANSMISSION .....	13-8
SERVICE INFORMATION .....	13-3	CRANKSHAFT/BALANCER .....	13-15
TROUBLESHOOTING .....	13-6	CRANKCASE BEARING .....	13-18
CRANKCASE SEPARATION .....	13-7	CRANKCASE ASSEMBLY .....	13-21



SYSTEM COMPONENTS





## SERVICE INFORMATION

### GENERAL

- The crankcase halves must be separated to service the transmission and crankshaft. To service these parts, the engine must be removed from the frame (page 8-4).
- Be careful not to damage the crankcase mating surfaces when servicing.
- Engine lubricating oil is fed through the oil passages in the crankcase. Clean the oil passages before assembling the crankcase halves.

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Shift fork	I.D.		13.000 – 13.021 (0.5118 – 0.5126)	13.04 (0.513)
	Claw thickness		4.93 – 5.00 (0.194 – 0.197)	4.5 (0.18)
	Shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.96 (0.510)
Transmission	Gear I.D.	M3	25.000 – 25.021 (0.9843 – 0.9851)	25.05 (0.986)
		M5	20.000 – 20.021 (0.7874 – 0.7882)	20.05 (0.789)
		C1, C2, C4, CR	28.020 – 28.041 (1.1031 – 1.1040)	28.07 (1.105)
		Reverse idle	13.000 – 13.021 (0.5118 – 0.5126)	13.04 (0.513)
	Gear bushing O.D.	M3	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
		M5	19.966 – 19.984 (0.7861 – 0.7868)	19.94 (0.785)
		C2	27.984 – 28.005 (1.1017 – 1.1026)	27.94 (1.100)
		C1, C4, CR	27.979 – 28.000 (1.1015 – 1.1024)	27.93 (1.100)
	Gear-to-bushing clearance	M3	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.016 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
		C2	0.015 – 0.057 (0.0006 – 0.0022)	0.08 (0.003)
		C1, C4, CR	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
	Gear bushing I.D.	M3	22.000 – 22.021 (0.8661 – 0.8670)	22.04 (0.868)
		M5	17.016 – 17.034 (0.6699 – 0.6706)	17.06 (0.672)
		C4	25.000 – 25.021 (0.9843 – 0.9851)	25.05 (0.986)
	Mainshaft O.D.	at M3	21.959 – 21.980 (0.8645 – 0.8654)	21.93 (0.863)
		at M5	16.976 – 16.987 (0.6683 – 0.6688)	16.93 (0.667)
	Countershaft O.D.	at C4	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
	Reverse idle shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.94 (0.509)
	Bushing-to-shaft clearance	M3	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.029 – 0.058 (0.0011 – 0.0023)	0.10 (0.004)
		C4	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
	Reverse idle gear-to-shaft clearance		0.016 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
Crankshaft	Runout		–	0.15 (0.006)
	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)

### TORQUE VALUE

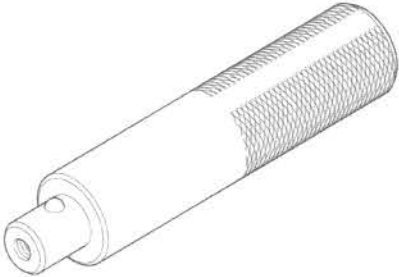





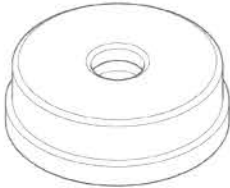
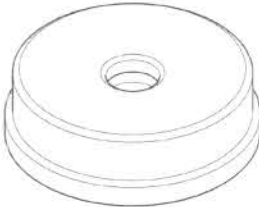




Mainshaft bearing setting bolt

12 N·m (1.2 kgf·m, 9 lbf·ft) Apply locking agent to the threads.





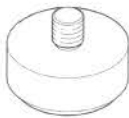


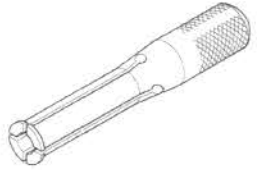

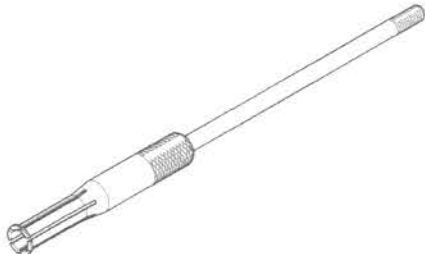
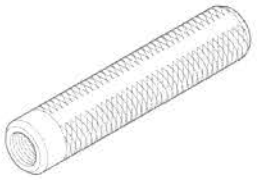
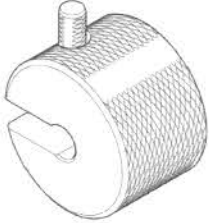

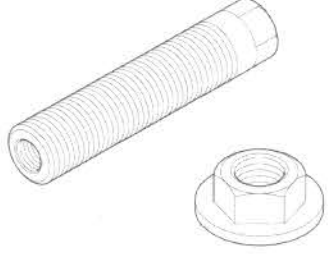
CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

TOOLS

<p>Driver 07749-0010000</p> 	<p>Attachment, 24 x 26 mm 07746-0010700</p> 	<p>Attachment, 32 x 35 mm 07746-0010100</p> 
<p>Attachment, 37 x 40 mm 07746-0010200</p> 	<p>Attachment, 42 x 47 mm 07746-0010300</p> 	<p>Attachment, 52 x 55 mm 07746-0010400</p> 
<p>Attachment, 62 x 68 mm 07746-0010500</p> 	<p>Attachment, 72 x 75 mm 07746-0010600</p> 	<p>Pilot, 15 mm 07746-0040300</p> 
<p>Pilot, 17 mm 07746-0040400</p> 	<p>Pilot, 20 mm 07746-0040500</p> 	<p>Pilot, 22 mm 07746-0041000</p> 



# CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

<p>Pilot, 25 mm 07746-0040600</p> 	<p>Pilot, 32 mm 07MAD-PR90200</p> 	<p>Pilot, 35 mm 07746-0040800</p> 
<p>Pilot, 40 mm 07746-0040900</p> 	<p>Bearing remover shaft, 15 mm 07936-KC10100</p> 	<p>Bearing remover head, 15 mm 07936-KC10200</p> 
<p>Bearing remover, 17 mm 07936-3710300</p> 	<p>Bearing remover, 20 mm 07936-3710600</p> 	<p>Remover handle 07936-3710100</p> 
<p>Remover weight 07741-0010201</p>  <p>or 07936-3710200 or 07936-371020A (U.S.A. only)</p>	<p>Assembly collar 07965-VM00100</p> 	<p>Assembly shaft 07965-VM00200</p>  <p>or 07931-ME4010B and 07931-HB3020A (U.S.A. only)</p>

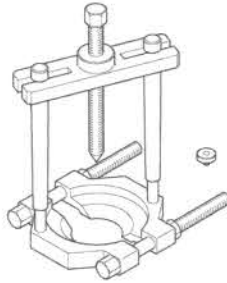


Threaded adapter  
07965-VM00300



or 07931-KF00200

Universal bearing puller  
07631-0010000



or equivalent commercially available in U.S.A.

## TROUBLESHOOTING

### Excessive engine noise

- Worn, seized or chipped transmission gears
- Worn transmission bearings
- Worn connecting rod big end bearing
- Worn crankshaft main journal bearing
- Worn balancer bearing
- Improper balancer installation

### Transmission jumps out of gear

- Worn gear dogs or dog holes
- Worn shift drum guide groove
- Worn shift fork guide pin
- Worn gear shifter groove
- Worn shift fork
- Bent shift fork shaft
- Faulty gearshift linkage (page 11-5)

### Hard to shift

- Damaged shift fork
- Bent shift fork shaft
- Damaged shift fork guide pin
- Damaged shift drum guide groove
- Bent gearshift spindle
- Faulty gearshift linkage (page 11-5)

### Abnormal vibration

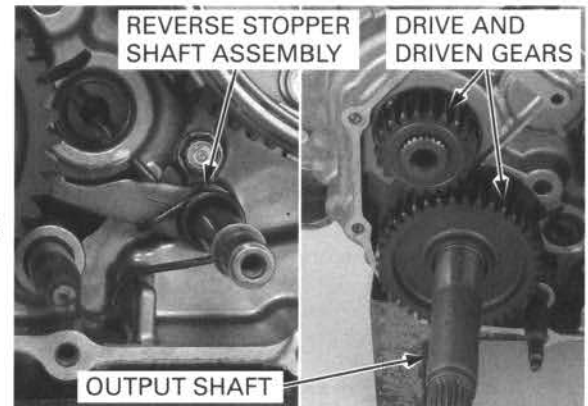
- Improper balancer timing



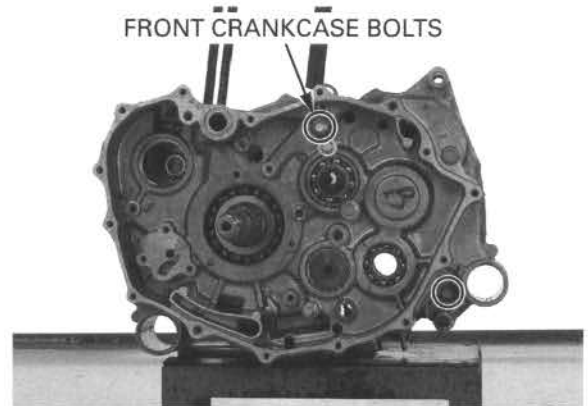
## CRANKCASE SEPARATION

Remove the following:

- engine (page 8-4)
- cylinder head (page 9-11)
- cylinder and piston (page 10-4)
- gearshift linkage (page 11-20)
- change clutch (page 11-13)
- oil pump (page 5-4)
- flywheel and starter clutch (page 12-8)
- reverse stopper shaft assembly
- output shaft drive gear, driven gear and output shaft



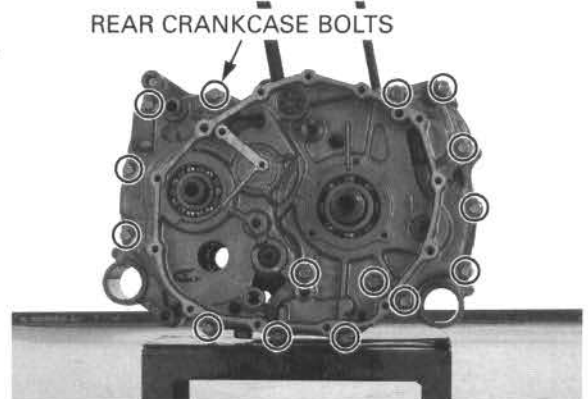
- two front crankcase bolts



*Loosen the crankcase bolts in a crisscross pattern in several steps.*

- fifteen rear crankcase bolts

Place the crankcase assembly with the rear crankcase down.

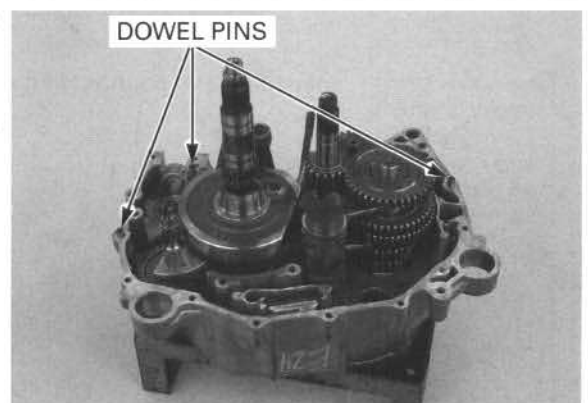


*Do not pry the crankcase apart with a screwdriver.*

Remove the front crankcase while tapping it at several locations with a soft hammer.

Remove the three dowel pins.

Remove any sealant material from the crankcase mating surfaces.





### OIL STRAINER CLEANING

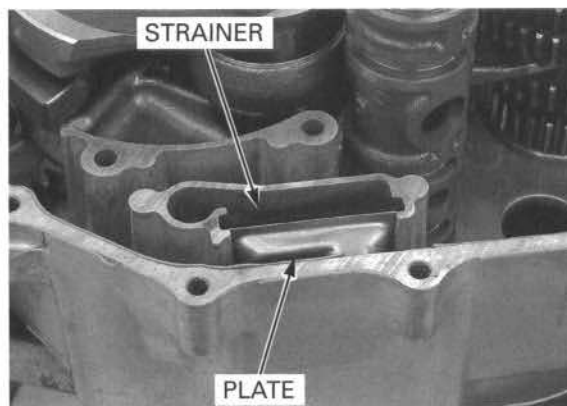
Remove the oil strainer and strainer plate.

Wash the strainer thoroughly in non-flammable or high flash point solvent until all accumulated dirt has been removed.

Blow dry the strainer with compressed air completely.

Before installing the strainer, the screen mesh should be examined closely for damage.

Install the strainer and plate with the wedge facing the crankcase.



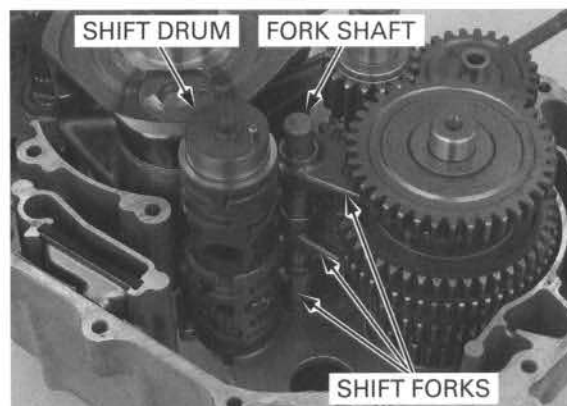
## TRANSMISSION

### DISASSEMBLY

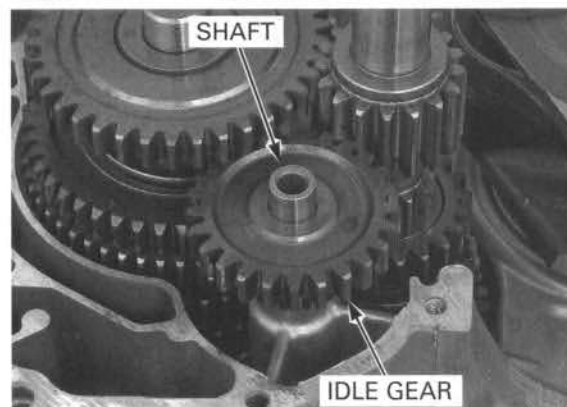
Separate the crankcase (page 13-7).

Remove the following:

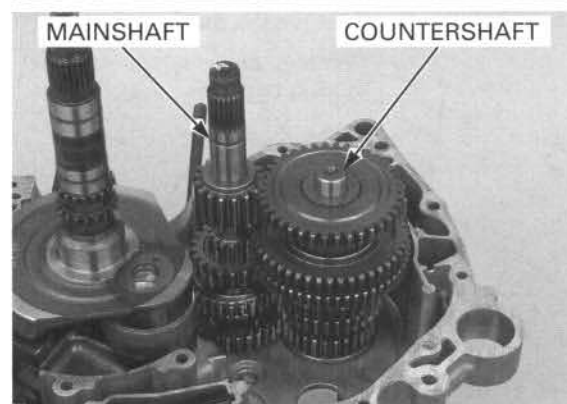
- TM/FM/FPM models only: gearshift spindle
- shift fork shaft
- shift forks
- shift drum



- reverse idle shaft and idle gear



- Position the crank weights so that they do not interfere with the mainshaft gears.
- mainshaft and countershaft as an assembly





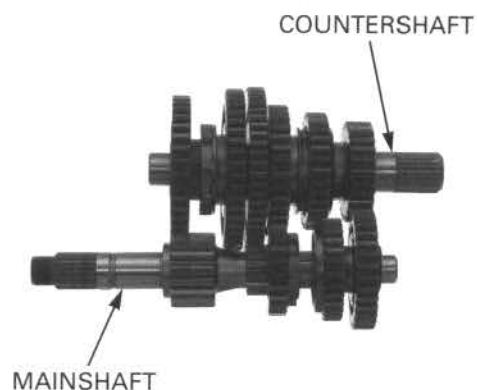
*Do not expand the snap ring more than necessary for removal.*

Disassemble the mainshaft and countershaft.

Clean all disassembled parts in solvent thoroughly.

## NOTE:

- Keep track of the disassembled parts (gears, bushings, washers and snap ring) by sliding them onto a tool or slipping them onto a piece of wire.

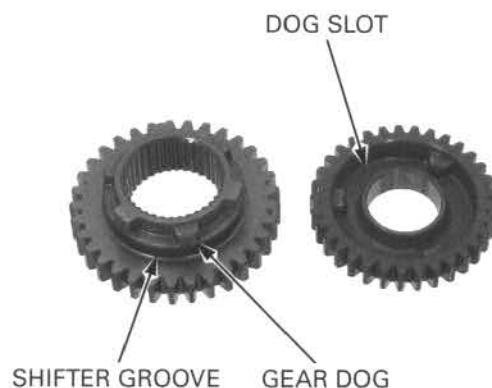


## INSPECTION

### GEAR/BUSHING/SHAFT

Check the shifter groove for abnormal wear or damage.

Check the gear dogs, dog slots and teeth for abnormal wear or damage.



Measure the I.D. of each gear.

### SERVICE LIMITS:

M3: 25.05 mm (0.986 in)

M5: 20.05 mm (0.789 in)

C1, C2, C4, CR: 28.07 mm (1.105 in)

Reverse idle: 13.04 mm (0.513 in)



Measure the gear bushing O.D.

### SERVICE LIMITS:

M3: 24.93 mm (0.981 in)

M5: 19.94 mm (0.785 in)

C2: 27.94 mm (1.100 in)

C1, C4, CR: 27.93 mm (1.100 in)

Calculate the gear-to-bushing clearance.

### SERVICE LIMITS:

M3, M5, C1, C4, CR: 0.10 mm (0.004 in)

C2: 0.08 mm (0.003 in)

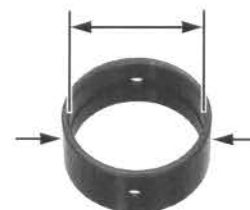
Measure the gear bushing I.D.

### SERVICE LIMITS:

M3: 22.04 mm (0.868 in)

M5: 17.06 mm (0.672 in)

C4: 25.05 mm (0.986 in)





## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

Check the mainshaft and countershaft for abnormal wear or damage.

Measure the shaft O.D.

### SERVICE LIMITS:

At M3: 21.93 mm (0.863 in)

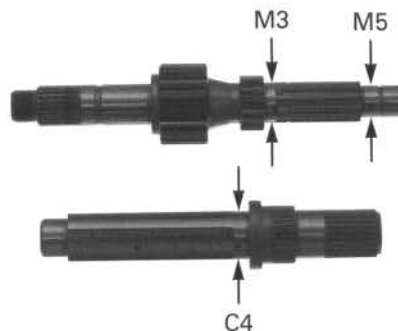
At M5: 16.93 mm (0.667 in)

At C4: 24.93 mm (0.981 in)

Reverse idle: 12.94 mm (0.509 in)

Calculate the bushing-to-shaft clearance.

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



### OUTPUT SHAFT/GEAR

Check the teeth and splines for abnormal wear or damage.



### SHIFT FORK/SHAFT

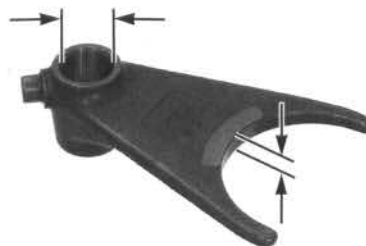
Check the shift forks for abnormal wear or damage.

Measure each shift fork I.D.

**SERVICE LIMIT: 13.04 mm (0.513 in)**

Measure the claw thickness of each shift fork.

**SERVICE LIMIT: 4.5 mm (0.18 in)**



Check the shift fork shaft for damage or bending.

Measure the shift fork shaft O.D.

**SERVICE LIMIT: 12.96 mm (0.510 in)**





### SHIFT DRUM

Check the guide grooves for abnormal wear or damage.

Check the shift drum journals for scoring, scratches or evidence of insufficient lubrication.



### ASSEMBLY

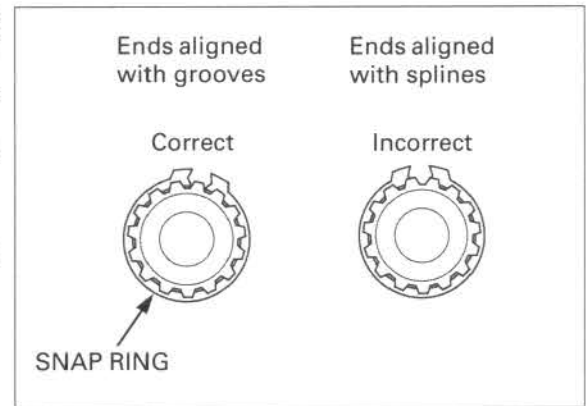
#### NOTE:

- Always install the thrust washers and snap ring with the chamfered (rolled) edge facing away from the thrust load.
- Install the snap ring so its ends align with the grooves in the splines.
- Make sure the snap ring is fully seated in the shaft groove after installing it.

Clean all parts in solvent and dry them thoroughly.

Apply molybdenum oil solution to the gear and bushing sliding surfaces.

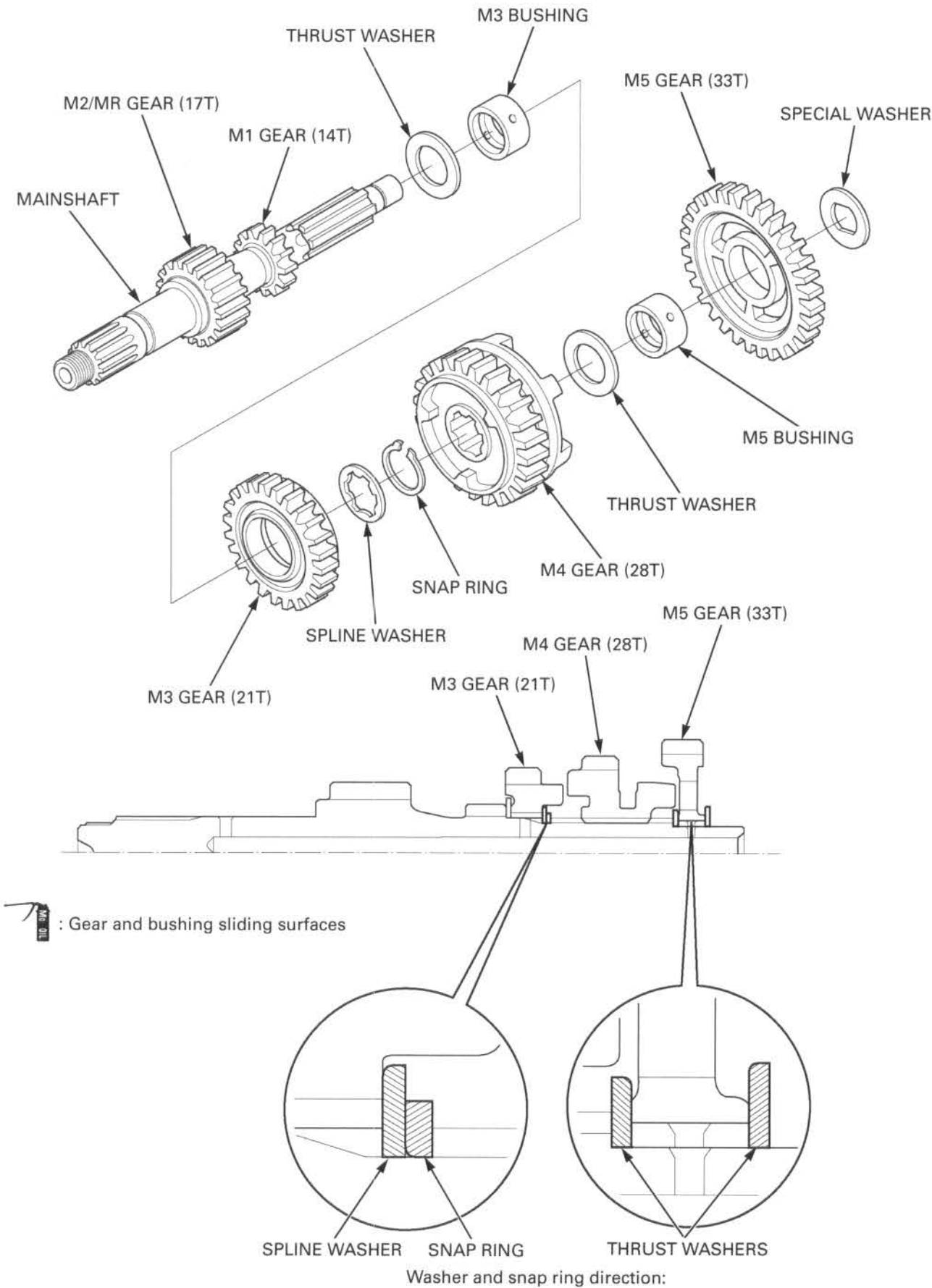
Assemble the mainshaft and countershaft.





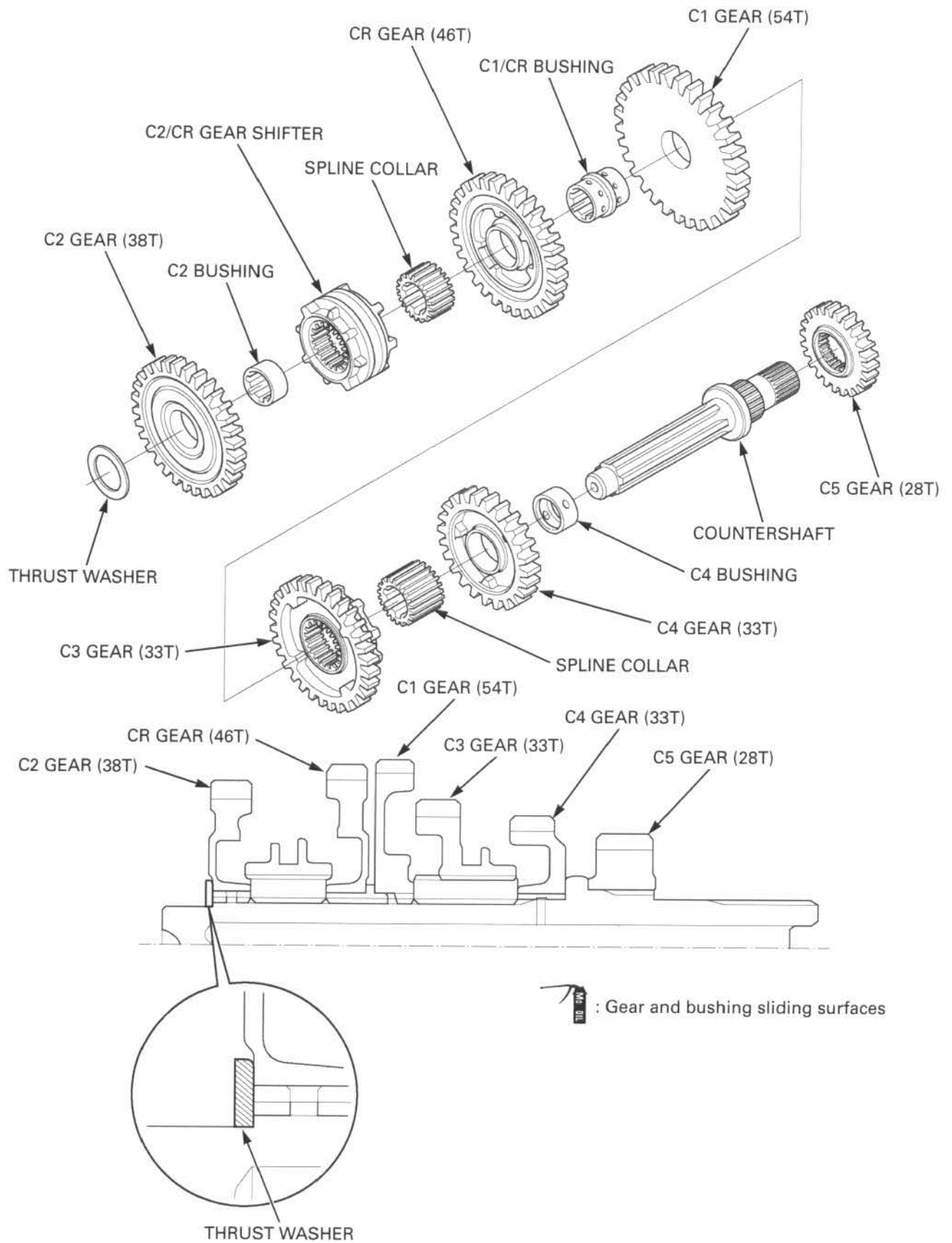
CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

MAINSHAFT





## COUNTERSHAFT



 : Gear and bushing sliding surfaces

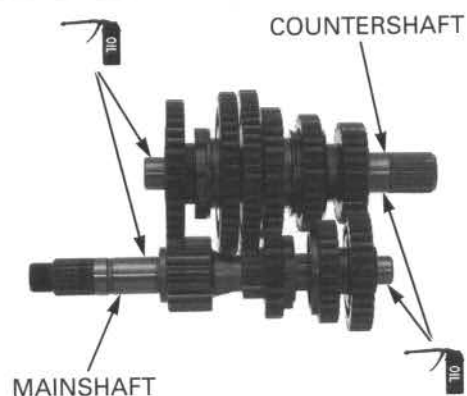


## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

Check the gears for freedom of movement or rotation on the shaft.

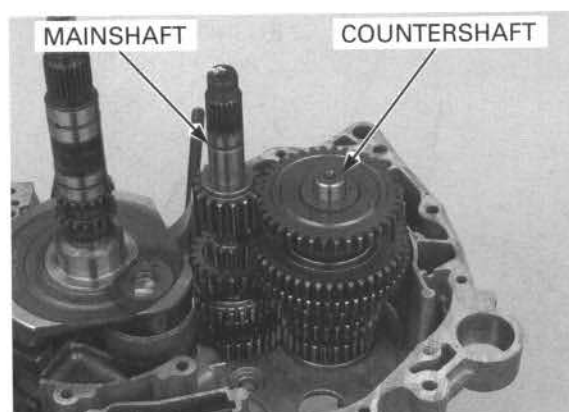
Apply engine oil to the mainshaft and countershaft journals.

Engage the mainshaft and countershaft gears.



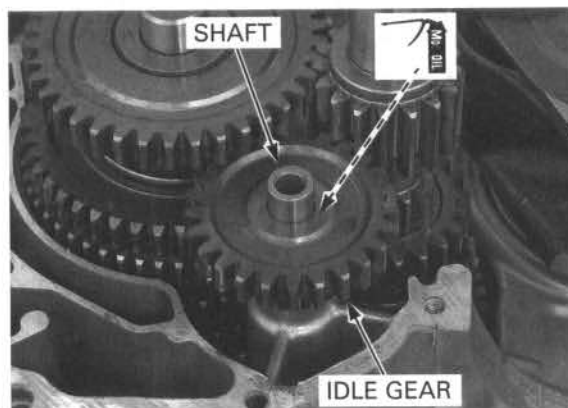
Position the crank weights so that they do not interfere with the mainshaft.

Install the mainshaft and countershaft assemblies as a set into the rear crankcase.

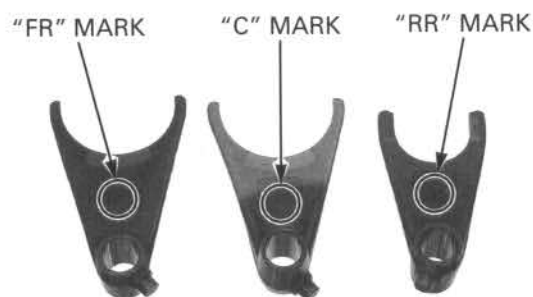


Apply molybdenum oil solution to the reverse idle gear sliding surface.

Install the reverse idle gear and shaft.



Each shift fork has an identification mark; "RR" for the rear fork, "C" for the center fork and "FR" for the front fork.





Apply engine oil to the shift drum guide pin grooves and install the shift drum.

Install each shift fork into the gear shifter grooves and shift drum groove with their identification marks facing up (front crankcase side).

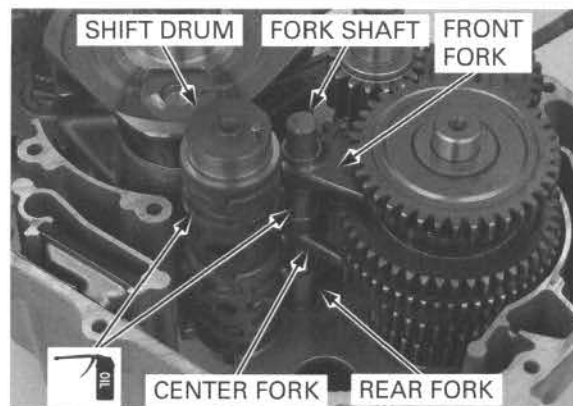
- rear shift fork into the M4 gear
- center shift fork into the C3 gear
- front shift fork into the reverse/C2 gear shifter

Apply engine oil to the fork shaft.

Install the fork shaft through the shift forks and into the crankcase.

TM/FM/FPM models only: Install the gearshift spindle.

Assemble the crankcase halves (page 13-21).



## CRANKSHAFT/BALANCER

### REMOVAL

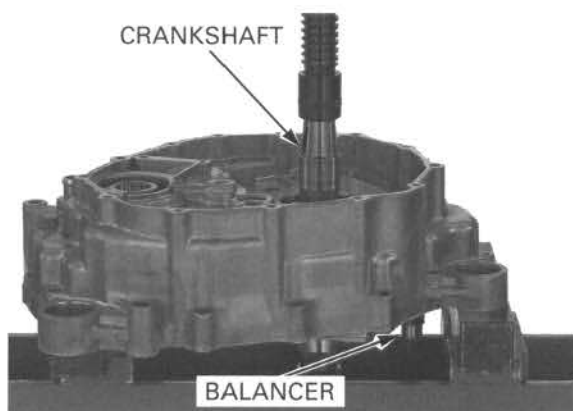
Separate the crankcase halves (page 13-7).

Remove the transmission (page 13-8).

*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.



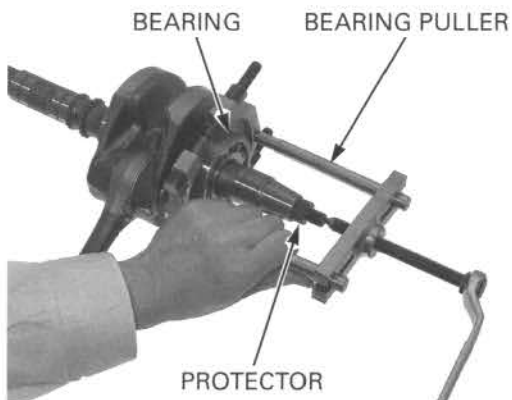
Remove the rear crankshaft bearing using the bearing puller with a suitable protector. Discard the bearing.

### 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.





## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

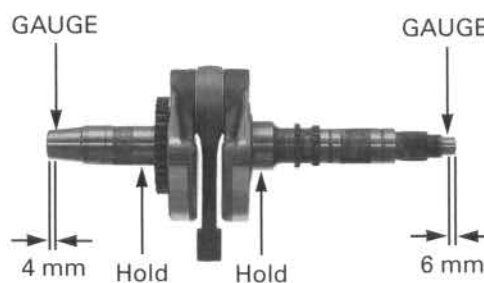
### INSPECTION

Check the balancer drive and driven gears for wear or damage.



Set the crankshaft in a stand or V-blocks and measure the runout using a dial indicator.

**SERVICE LIMIT: 0.15 mm (0.006 in)**



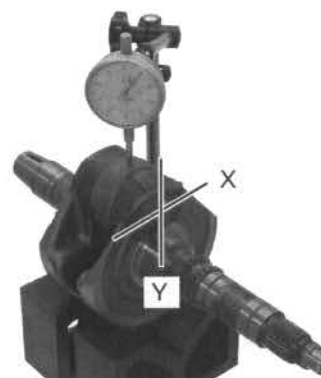
Measure the side clearance between the connecting rod big end and crank weight with a feeler gauge.

**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)**





## 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:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 72 x 75 mm</b>	<b>07746-0010600</b>
<b>Pilot, 32 mm</b>	<b>07MAD-PR90200</b>

Other bearing replacement in the crankcase halves (page 13-18)

*Be careful not to disengage the gears.*

Engage the balancer and crankshaft by aligning the index lines on the crank weight and balancer driven gear, and install them together into the rear crankcase.

*Take care that the crankshaft and balancer do not fall out of the crankcase when installing the special tools.*

Install the special tool onto the rear crankshaft end.

### TOOL:

<b>Threaded adaptor</b>	<b>07965-VM00300 or 07931-KF00200 (U.S.A. only)</b>
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Install the special tools onto the crankshaft and crankshaft bearing.

### TOOLS:

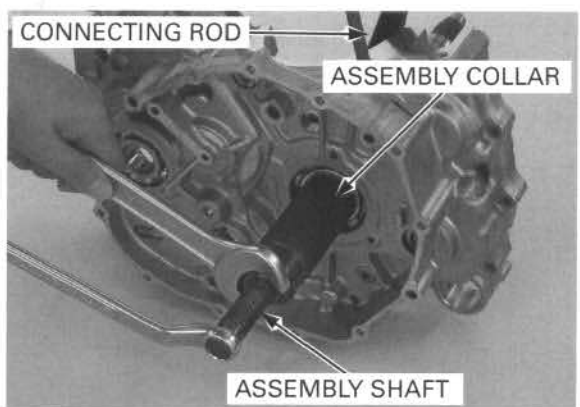
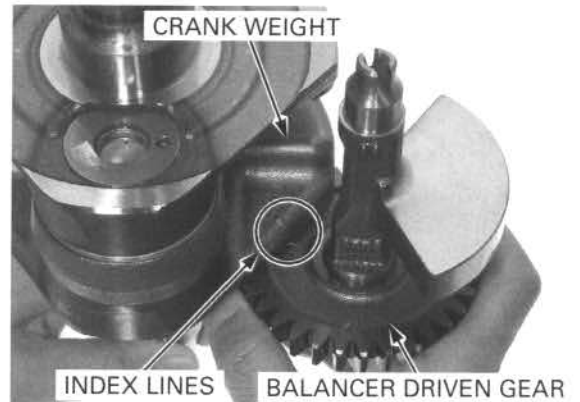
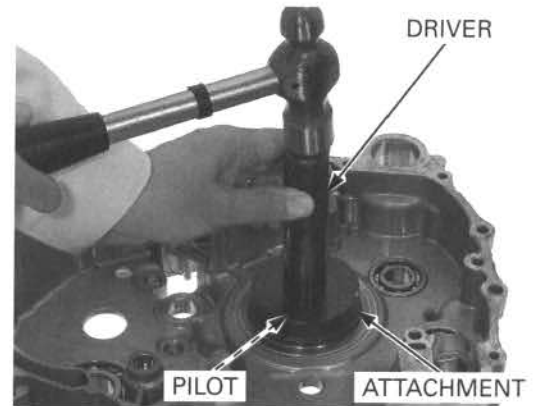
<b>Assembly collar</b>	<b>07965-VM00100</b>
<b>Assembly shaft</b>	<b>07965-VM00200</b>

### U.S.A. TOOLS:

<b>Assembly collar</b>	<b>07965-VM00100</b>
<b>Assembly shaft</b>	<b>07931-ME4010B</b>
<b>Special nut</b>	<b>07931-HB3020A</b>

*Be careful not to let the connecting rod press against the crankcase mating surface.*

Draw the crankshaft into the bearing inner race.



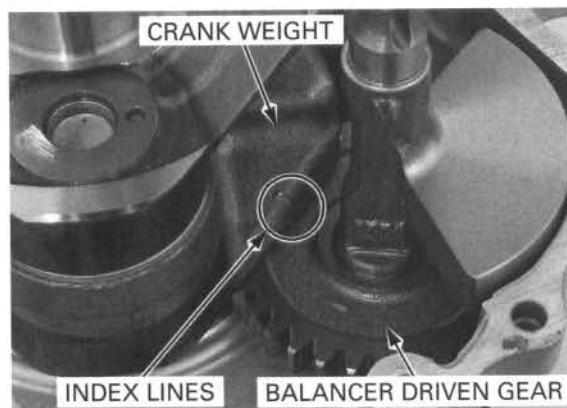


## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

After installing the crankshaft, make sure the index lines on the crank weight and balancer driven gear are aligned.

Install the transmission (page 13-11).

Assemble the crankcase halves (page 13-21).



## CRANKCASE BEARING

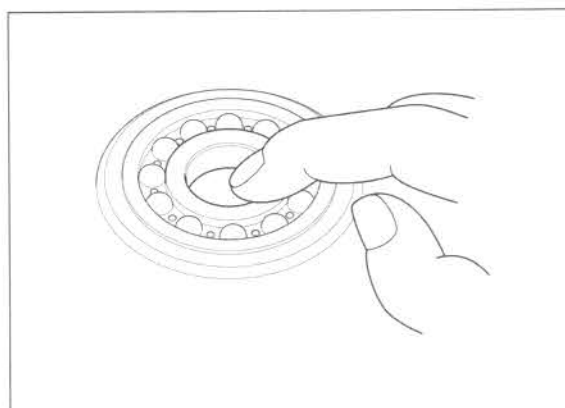
### INSPECTION

Remove the crankshaft and balancer (page 13-15).

Turn the inner race of each crankcase bearing with your finger. The bearing should turn smoothly and quietly.

Also check that the bearing outer race fits tightly in the crankcase.

Replace any bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the crankcase.



### FRONT CRANKCASE BEARING REPLACEMENT

Remove the balancer and countershaft bearing with the special tools.

#### TOOLS:

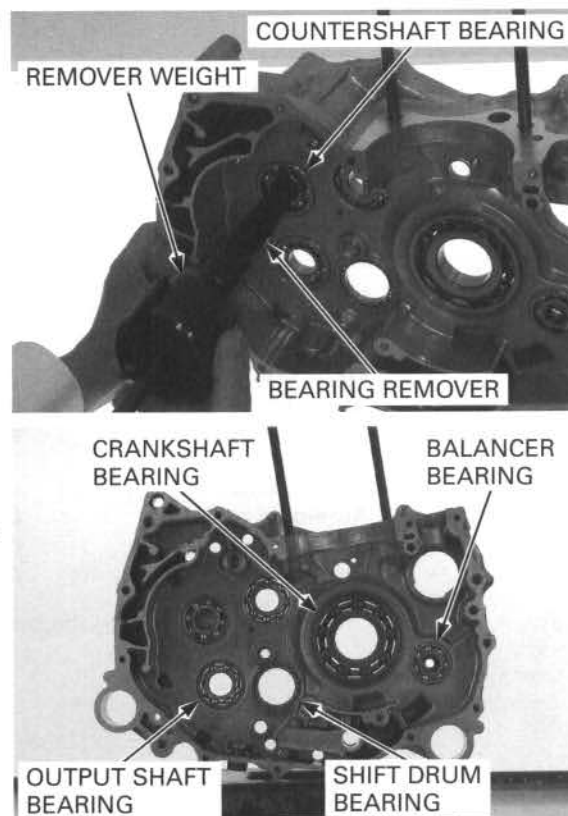
##### Countershaft bearing:

Remover handle	07936-3710100
Remover shaft, 20 mm	07936-3710600
Remover weight	07741-0010201 or 07936-3710200 or 07936-371020A (U.S.A. only)

##### Balancer bearing:

Remover handle	07936-3710100
Bearing remover, 17 mm	07936-3710300
Remover weight	07741-0010201 or 07936-3710200 or 07936-371020A (U.S.A. only)

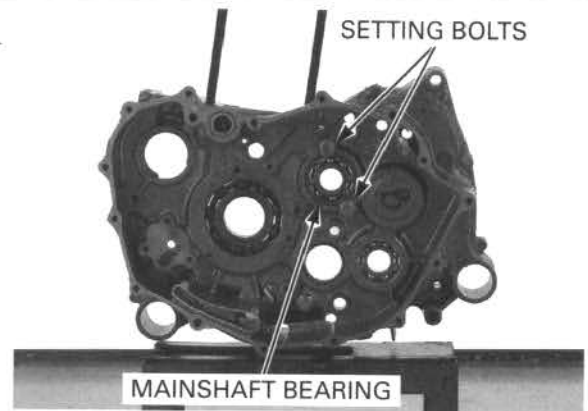
Drive the crankshaft, output shaft and shift drum bearings out of the front crankcase.





## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

Remove the two mainshaft bearing setting bolts.  
Drive the mainshaft bearing out of the front crankcase.



Apply engine oil to new bearings.

Drive the bearings in with the marked side facing up.

### TOOLS:

#### Crankshaft bearing:

Driver	07749-0010000
Attachment, 78 x 90 mm	07GAD-SD40101
Pilot, 40 mm	07746-0040900

#### Balancer bearing:

Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400

#### Mainshaft bearing:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 22 mm	07746-0041000

#### Countershaft bearing:

Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500

#### Output shaft bearing:

Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300
Pilot, 22 mm	07746-0041000

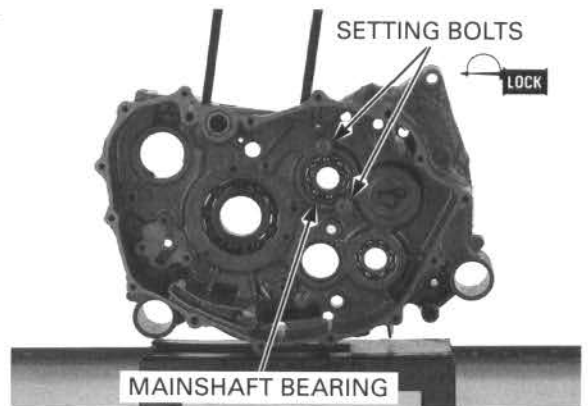
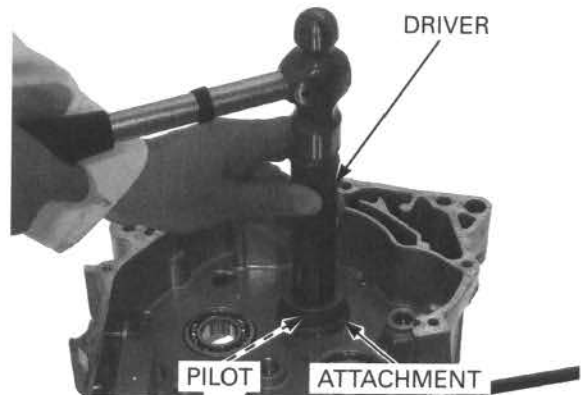
#### Shift drum bearing:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 35 mm	07746-0040800

Apply locking agent to the mainshaft bearing setting bolt threads.

Install the setting bolts and tighten them.

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





## REAR CRANKCASE BEARING REPLACEMENT

Remove the mainshaft and camshaft bearings with the special tools.

### TOOLS:

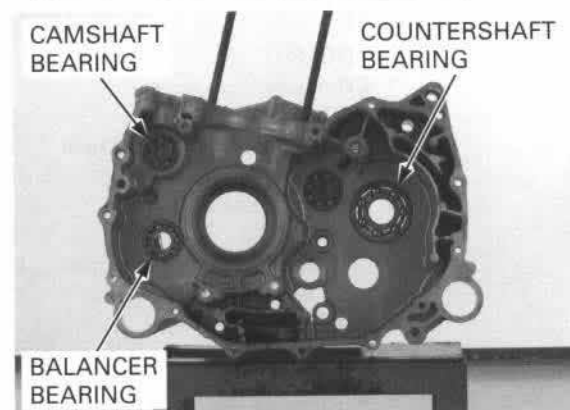
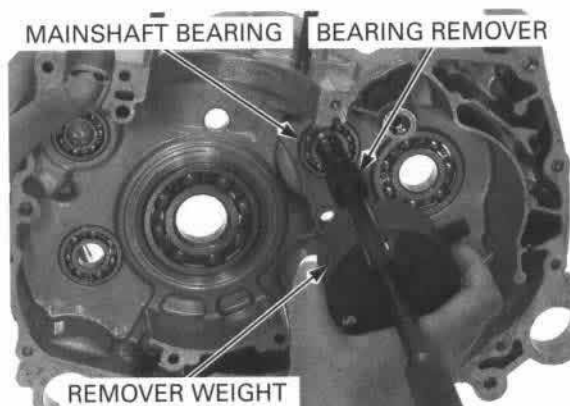
#### Mainshaft bearing:

Bearing remover, 17 mm	07936-3710300
Remover handle	07936-3710100
Remover weight	07741-0010201 or 07936-3710200 or 07936-371020A (U.S.A. only)

#### Camshaft bearing:

Bearing remover shaft, 15 mm	07936-KC10100
Bearing remover head, 15 mm	07936-KC10200
Remover weight	07741-0010201 or 07936-3710200 or 07936-371020A (U.S.A. only)

Drive the countershaft and balancer bearings out of the rear crankcase.



Apply engine oil to new bearings.

Drive the bearings in with the marked side facing up.

### TOOLS:

#### Balancer and mainshaft bearings:

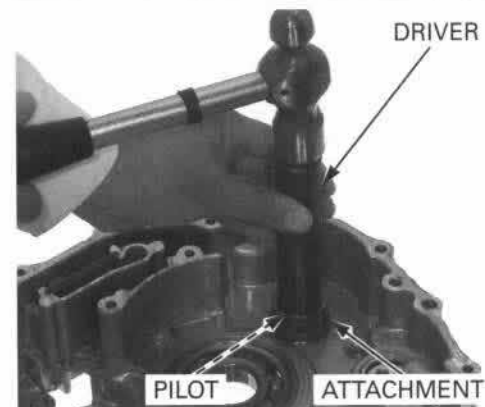
Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400

#### Countershaft bearing:

Driver	07749-0010000
Attachment, 62 x 68 mm	07746-0010500
Pilot, 25 mm	07746-0040600

#### Camshaft bearing:

Driver	07749-0010000
Attachment, 32 x 35 mm	07746-0010100
Pilot, 15 mm	07746-0040300



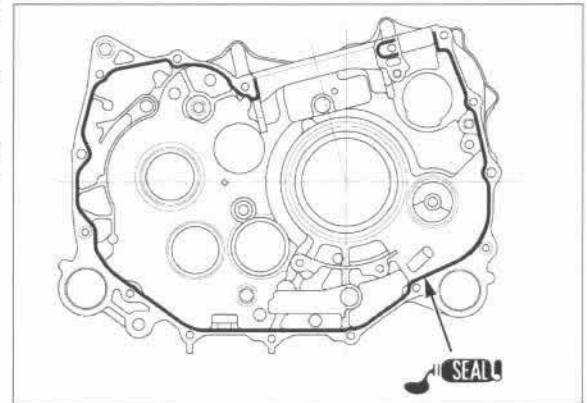


## CRANKCASE ASSEMBLY

Clean the front and rear crankcase mating surfaces thoroughly, being careful not to damage them.

Blow through the oil passages in the crankcases with compressed air.

Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the front crankcase as shown.



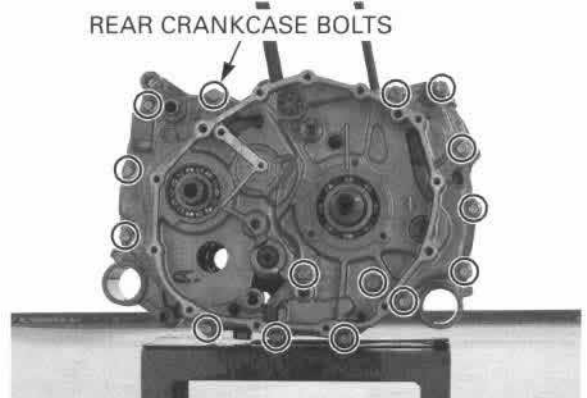
Install the three dowel pins.

Make sure all the parts are installed in the rear crankcase.

Install the front crankcase over the rear crankcase.

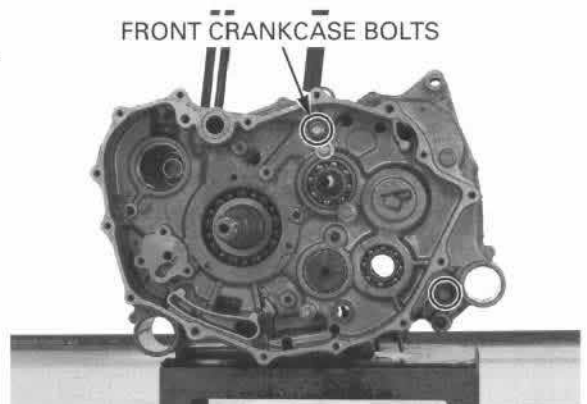


Install the fifteen rear crankcase bolts.



Install the two front crankcase bolts.

Tighten all the bolts in a crisscross pattern in several steps.





## CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

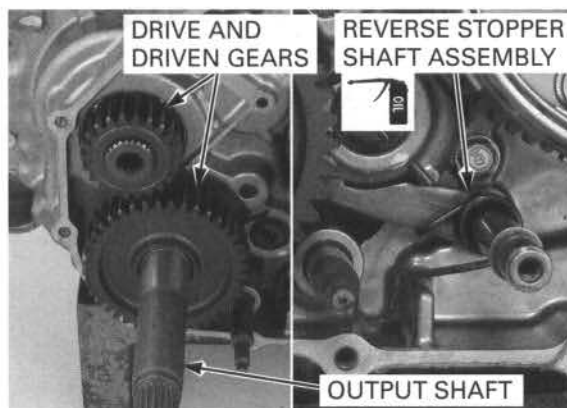
Insert the output shaft into the crankcase until it seats against the bearing in the front crankcase. Install the output shaft drive and driven gears.

Apply engine oil to the reverse stopper shaft journal surface.

Install the reverse stopper shaft assembly into the crankcase as shown.

Install the following:

- flywheel and starter clutch (page 12-11)
- oil pump (page 5-5)
- change clutch (page 11-17)
- gearshift linkage (page 11-21)
- cylinder and piston (page 10-8)
- cylinder head (page 9-19)
- engine (page 8-8)





# 14. FRONT WHEEL/SUSPENSION/STEERING

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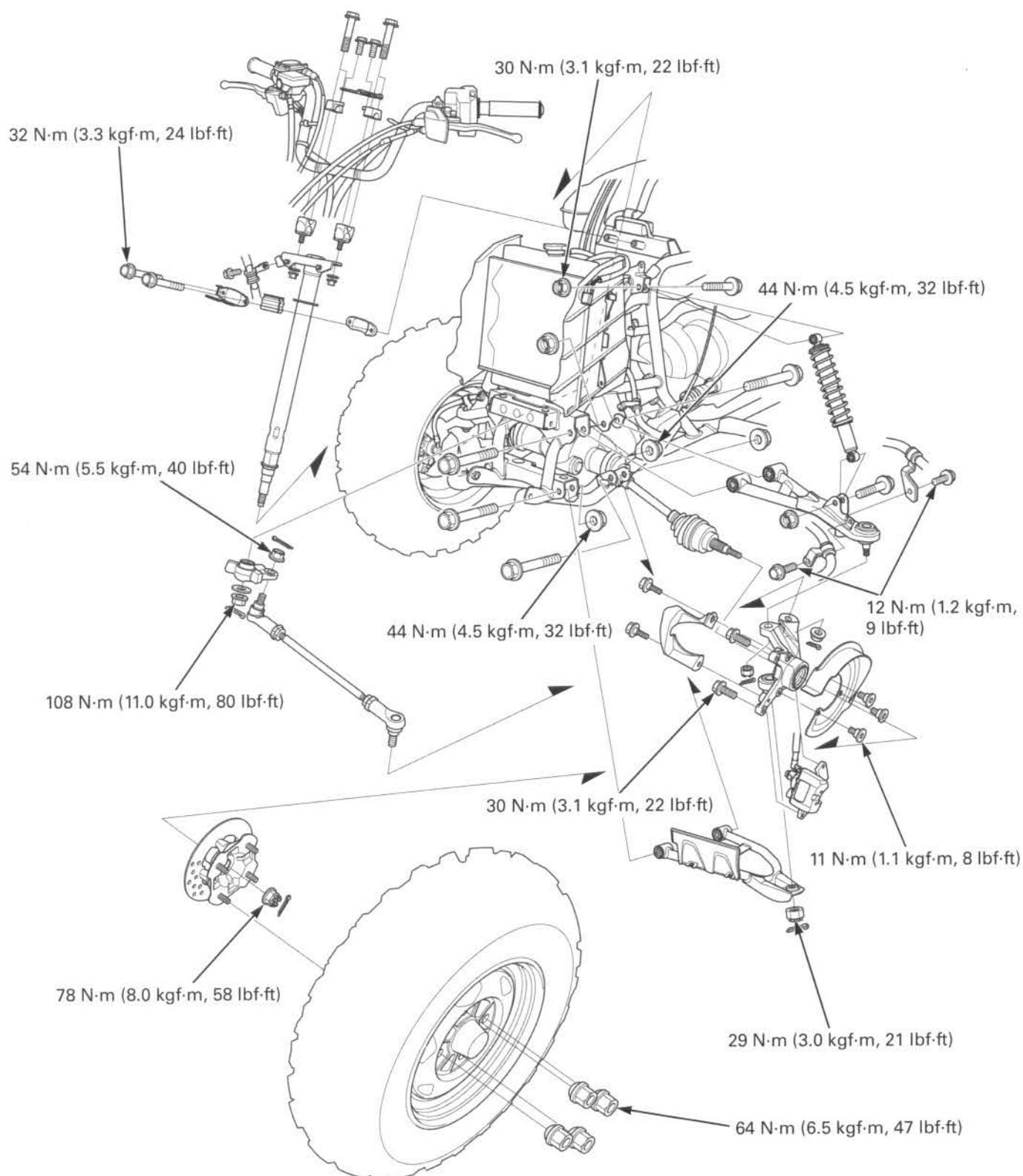
SYSTEM COMPONENTS .....	14-2	WHEEL HUB AND KNUCKLE .....	14-17
SERVICE INFORMATION .....	14-4	SUSPENSION ARM.....	14-25
TROUBLESHOOTING .....	14-8	FRONT SHOCK ABSORBER .....	14-28
HANDLEBAR .....	14-9	STEERING SHAFT (TM/TE/FM/FE models).....	14-29
THROTTLE HOUSING .....	14-12	STEERING SHAFT/EPS UNIT (FPM/FPE models) .....	14-35
FRONT WHEEL .....	14-13	TIE-ROD .....	14-44
TIRES .....	14-14		



## SYSTEM COMPONENTS

TM/TE/FM/FE models

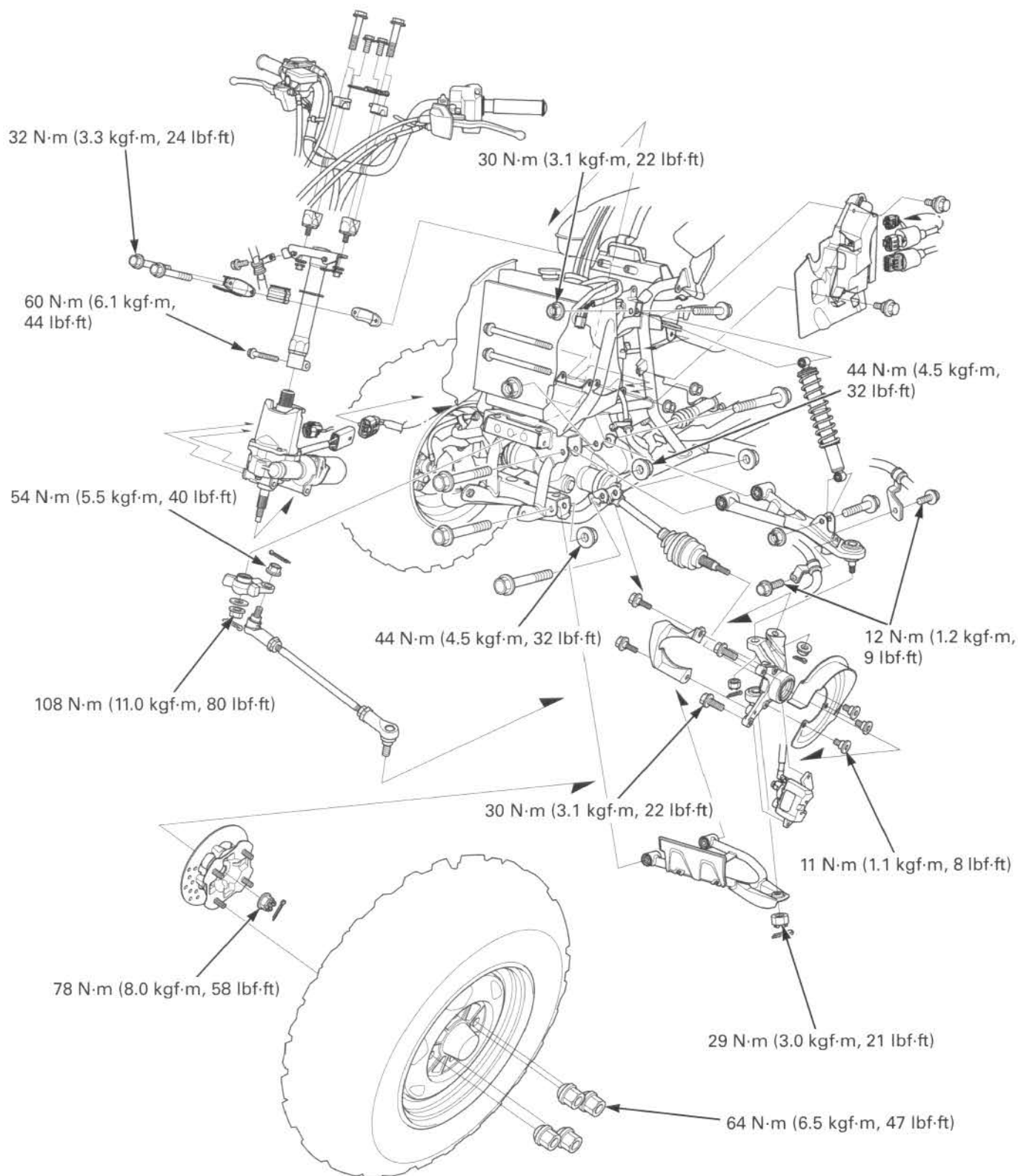
FE model shown:





FPM/FPE models (equipped with electric power steering)

FPE model shown:





## SERVICE INFORMATION

## GENERAL

- This section covers service of the front wheel, suspension and steering (including EPS unit; FPM/FPE models). For electrical system service of the EPS, see Electric Power Steering (EPS) section (page 24-2).
- A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean a contaminated disc 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 4-29).
- Do not twist or bend the brake hose when servicing.
- Use genuine Honda replacement bolts and nuts for all suspension pivots and mounting points.
- For brake system service, see Brake System section (page 16-2).
- For each switch inspection, see Lights/Meters/Switches section.
  - handlebar switch (page 22-12)
  - front brake switch (page 22-13)
  - rear brake light switch (page 22-14)
- FPM/FPE model only: Perform the torque sensor initialization when you service the following components (page 24-12)

Service Location	Replacement	Removal/Installation
Cables and harness around handlebar	INITIALIZE	INITIALIZE
Handlebar	INITIALIZE	INITIALIZE
Steering shaft and steering shaft bushing	INITIALIZE	INITIALIZE
Steering arm and nut	INITIALIZE	INITIALIZE
EPS unit	INITIALIZE	INITIALIZE
EPS ECU	INITIALIZE	NO NEED

## SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Minimum tire tread depth			–	4.0 (0.16)
Cold tire pressure	TM/TE/FM/FE	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	–
		With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	–
	FPM/FPE	Standard	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)	–
		With cargo	30 kPa (0.30 kgf/cm <sup>2</sup> , 4.4 psi)	–
Tie-rod distance between the ball joints		TM/TE	358.5 (14.11)	–
		FM/FE/FPM/FPE	342.9 (13.50)	–
Toe		TM/TE	Toe-in: 10 ± 15 (0.4 ± 0.6)	–
		FM/FE/FPM/FPE	Toe-out: 9 ± 15 (0.4 ± 0.6)	–



## TORQUE VALUES

Front master cylinder holder bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Throttle housing cover screw	1.5 N·m (0.15 kgf·m, 1.1 lbf·ft)
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)

Front brake disc bolt	42 N·m (4.3 kgf·m, 31 lbf·ft)
Splash guard bolt	11 N·m (1.1 kgf·m, 8 lbf·ft)
Shock absorber mounting nut	30 N·m (3.1 kgf·m, 22 lbf·ft)
Upper and lower arm pivot nut	44 N·m (4.5 kgf·m, 32 lbf·ft)
Upper and lower arm ball joint nut	29 N·m (3.0 kgf·m, 21 lbf·ft)

Brake hose clamp bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Tie-rod joint nut	54 N·m (5.5 kgf·m, 40 lbf·ft)
Steering shaft end nut	108 N·m (11.0 kgf·m, 80 lbf·ft)
Steering shaft holder bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)
Steering shaft pinch bolt (FPM/FPE)	60 N·m (6.1 kgf·m, 44 lbf·ft)
EPS unit mounting nut (FPM/FPE)	22 N·m (2.2 kgf·m, 16 lbf·ft)
EPS motor mounting bolt (FPM/FPE)	20 N·m (2.0 kgf·m, 15 lbf·ft)

Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.

ALOC bolt: replace with a new one.

ALOC bolt: replace with a new one.

Lock nut: replace with a new one.

Lock nut: replace with a new one.

Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.

ALOC bolt: replace with a new one.

Lock nut: replace with a new one.


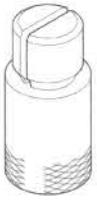
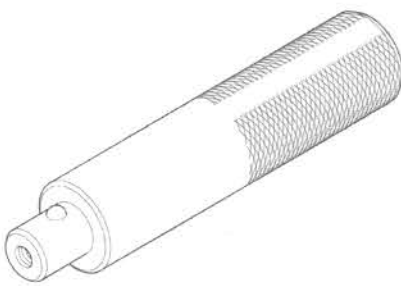









Lock nut: replace with a new one.

ALOC bolt: replace with a new one.



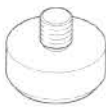

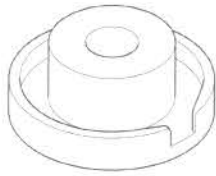
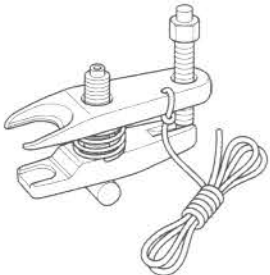
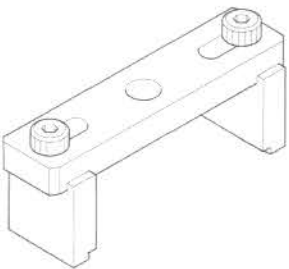
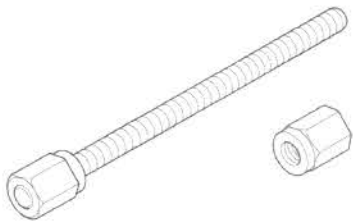


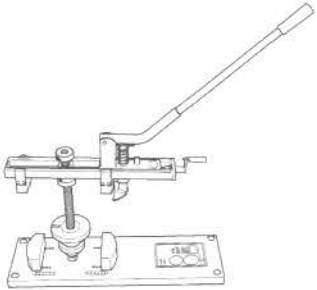
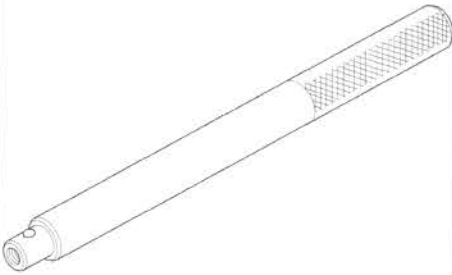
## FRONT WHEEL/SUSPENSION/STEERING

### TOOLS

<p>Bearing remover shaft 07746-0050100</p>  <p>TM/TE only</p>	<p>Bearing remover head, 20 mm 07746-0050600</p>  <p>TM/TE only</p>	<p>Driver 07749-0010000</p>  <p>FM/FE/FPM/FPE only</p>
<p>Attachment, 28 x 30 mm 07946-1870100</p> 	<p>Attachment, 32 x 35 mm 07746-0010100</p> 	<p>Attachment, 40 x 42 mm 07746-0010900</p>  <p>FM/FE/FPM/FPE only</p>
<p>Attachment, 45 x 50 mm 07946-6920100</p>  <p>FM/FE/FPM/FPE only</p>	<p>Attachment, 42 x 47 mm 07746-0010300</p> 	<p>Attachment, 20 mm I.D. 07746-0020400</p> 
<p>Attachment, 35 mm I.D. 07746-0030400</p> 	<p>Pilot, 20 mm 07746-0040500</p>  <p>TM/TE only</p>	<p>Pilot, 25 mm 07746-0040600</p>  <p>TM/TE only</p>



# FRONT WHEEL/SUSPENSION/STEERING

<p>Pilot, 30 mm 07746-0040700</p>  <p>FM/FE/FPM/FPE only</p>	<p>Fork seal driver weight 07947-KF00100</p> 	<p>Oil seal driver attachment 07JAD-PH80101</p>  <p>FM/FE/FPM/FPE only</p>
<p>Ball joint remover, 28 mm 07MAC-SL00201</p> 	<p>Clutch compressor attachment 07LAE-PX40100</p> 	<p>Compressor bolt assembly 07GAE-PG40200</p>  <p>or 07GAE-PG4020A (U.S.A. only)</p>
<p>Ball joint remover/installer 07WMF-HN00100</p> 	<p>Ball joint remover/installer 07JMF-HC50110</p> 	<p>ATV Bead Buster KLS379024</p> 
<p>Driver 07949-3710001</p> 		



### TROUBLESHOOTING

#### Hard steering

- Steering shaft holder too tight
- Damaged steering shaft bearing/bushing
- Insufficient tire pressure
- Faulty EPS (FPM/FPE models) (page 24-7)

#### 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 wheel hub bearing
- Weak shock absorber

#### Front wheel wobbling

- Bent rim
- Worn or damaged knuckle bearing or wheel hub bearing
- Faulty tire
- Loose wheel hub nut

#### Soft suspension

- Weak shock absorber spring
- Oil leakage from damper unit

#### Stiff suspension

- Damaged shock absorber damper
- Faulty shock absorber pivot bushings
- Improperly installed suspension arms
- Faulty suspension arm bushings

#### Front suspension noise

- Faulty front shock absorber
- Loose front suspension fasteners
- Worn front suspension pivot bushings
- Damaged suspension components



# HANDLEBAR

## REMOVAL

Remove the handlebar cover from the handlebar.

- '07 TM/FM and After '07 U.S.A. TM/FM: (page 22-11)
- TE/FE/FPM/FPE and After '07 Canada TM/FM: (page 22-6)

Remove the following:

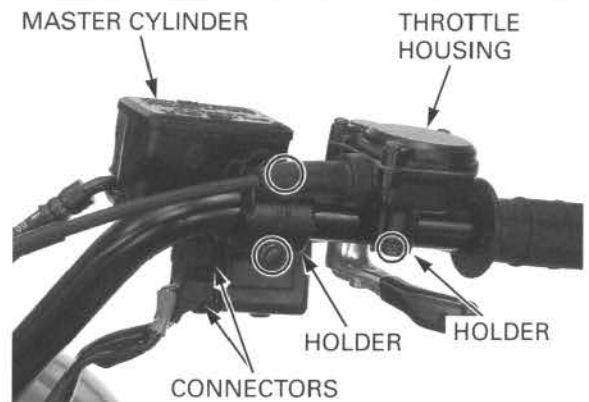
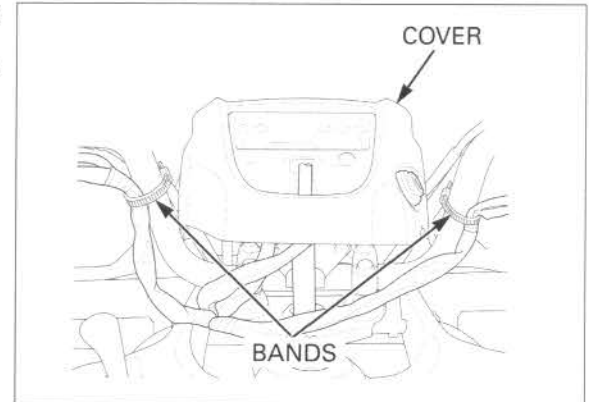
- two wire bands

*Keep the master cylinder upright to prevent air from entering the hydraulic system.*

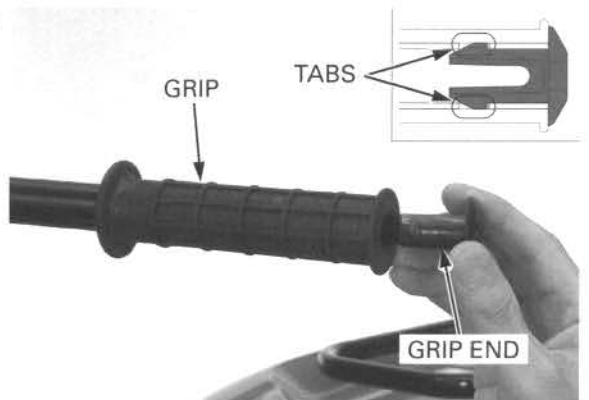
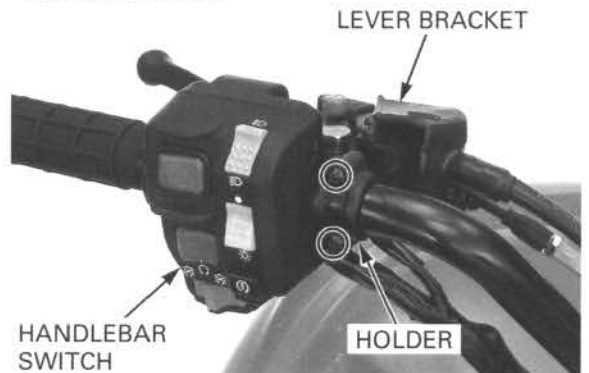
- two screws
- throttle housing holder
- throttle housing
- connectors
- two bolts
- master cylinder holder
- brake master cylinder

- two screws
- bracket holder
- rear brake lever bracket
- two screws (TM/FM/FPM models)
- three screws (TE/FE/FPE models)
- handlebar switch

- grip ends (turn the grip end to release the setting tabs and pry it using a screwdriver)
- handlebar grips



TE/FE/FPE shown:





## FRONT WHEEL/SUSPENSION/STEERING

- four bolts
- upper holders
- handlebar

### INSTALLATION

#### NOTE:

- Route the wires and cables properly (page 1-28).

*Align the punch mark on the handlebar with the top edge of the lower holder.*

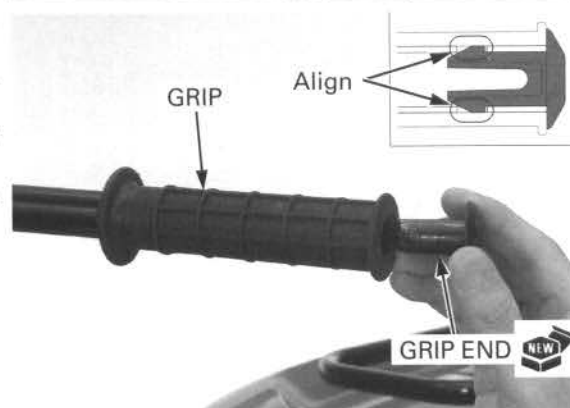
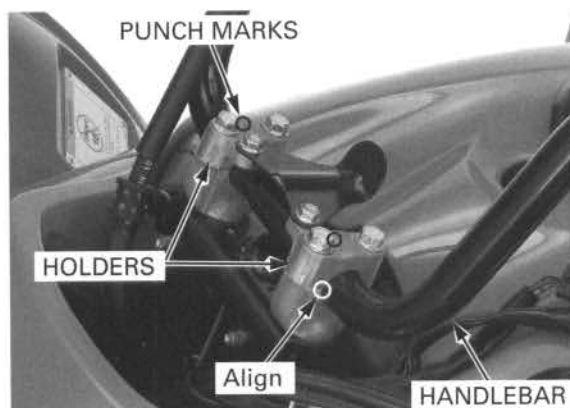
Install the handlebar and upper holders with the punch mark facing forward. Tighten the front bolts first, then tighten the rear bolts.

Apply Honda Bond A or Pro Honda Handgrip Cement (U.S.A. only) to the inside surface of each handlebar grip and to the clean surfaces of the handlebar.

*Allow the adhesive to dry for an hour before using.*

Wait 3 – 5 minutes and install the grips. Rotate the grip for even application of the adhesive.

Install new grip ends by aligning the tabs with the holes in the handlebar.



TM/FM/FPM models:

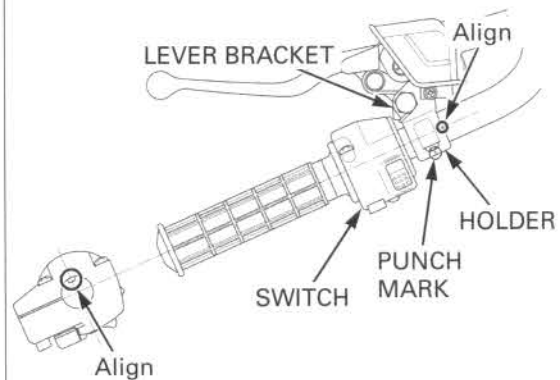
*Align the locating pin on the switch housing with the hole in the handlebar.*

Install the handlebar switch. Tighten the upper screw first, then tighten the lower screw.

*Align the edge of the bracket with the punch mark on the handlebar.*

Install the brake lever bracket and holder with the punch mark facing up. Tighten the upper screw first, then tighten the lower screw.

TM/FM/FPM models:

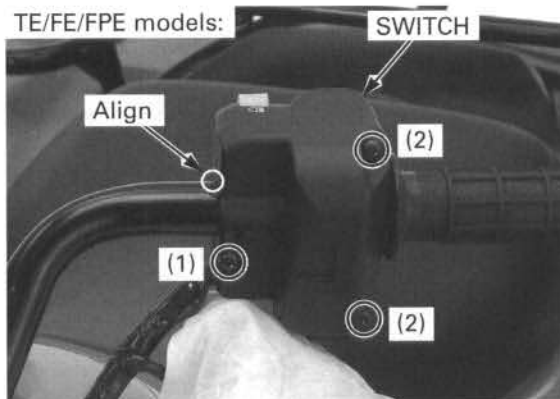


TE/FE/FPE models:

*Align the seam of the switch with the punch mark on the handlebar.*

Install the handlebar switch. Tighten the inside screw (1) first, then tighten the outside screws (2).

TE/FE/FPE models:

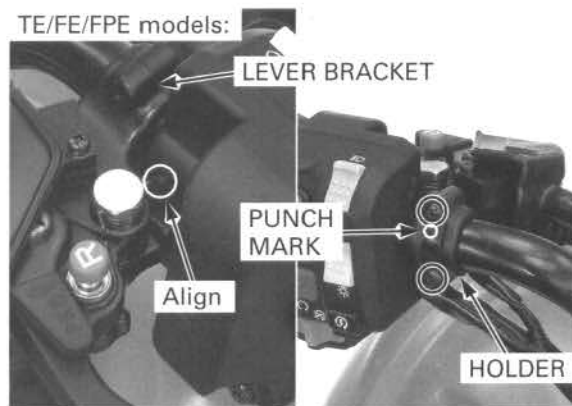




TE/FE/FPE models:  
Align the locating pin on the bracket with the hole in the switch housing.

Install the brake lever bracket and holder with the punch mark facing up. Tighten the upper screw first, then tighten the lower screw.

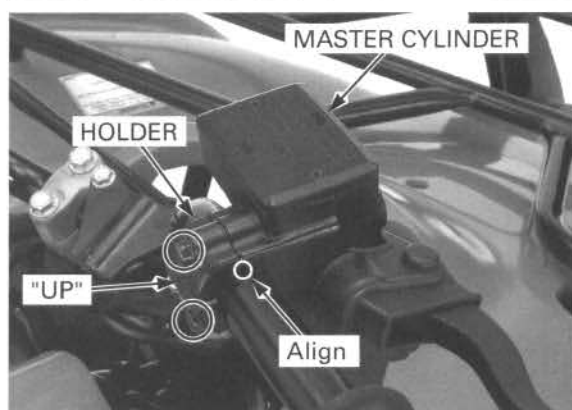
TE/FE/FPE models:



Align the edge of the master cylinder with the punch mark on the handlebar.

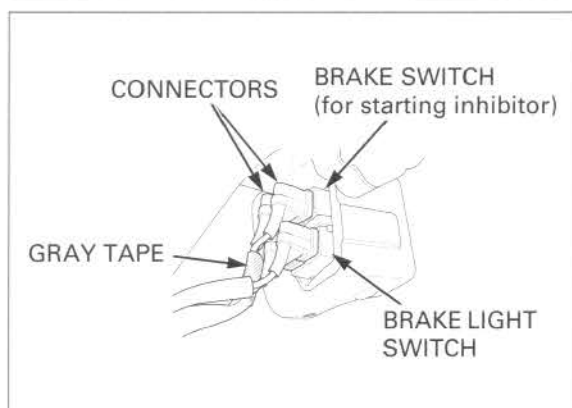
Install the brake master cylinder and holder with the "UP" mark facing up. Tighten the upper bolt first, then tighten the lower bolt.

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



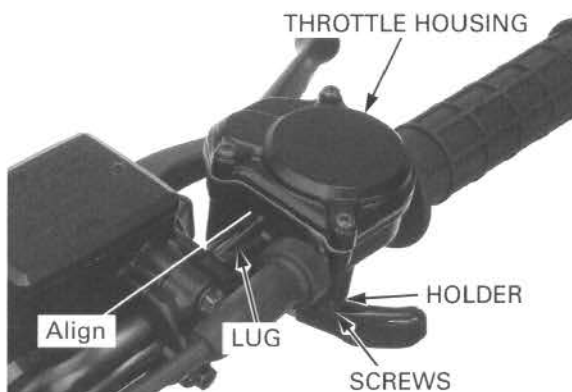
Connect the gray tape wire connectors to the upper terminals.

Connect the connectors to the brake and brake light switches.



Align the lug on the throttle housing with the mating line of the master cylinder and holder.

Install the throttle housing and holder against the master cylinder. Tighten the front screw first, then tighten the rear screw.





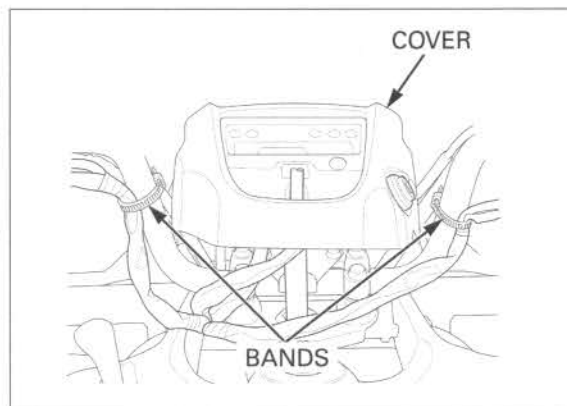
## FRONT WHEEL/SUSPENSION/STEERING

Secure the wires with the wire bands.

Install the handlebar cover.

- '07 TM/FM and After '07 U.S.A. TM/FM: (page 22-11)
- TE/FE/FPM/FPE and After '07 Canada TM/FM: (page 22-6)

*FPM/FPE only:* Perform the torque sensor initialization (page 24-12).  
*Refer to "Service Information" for service location of the initialization (page 14-4).*



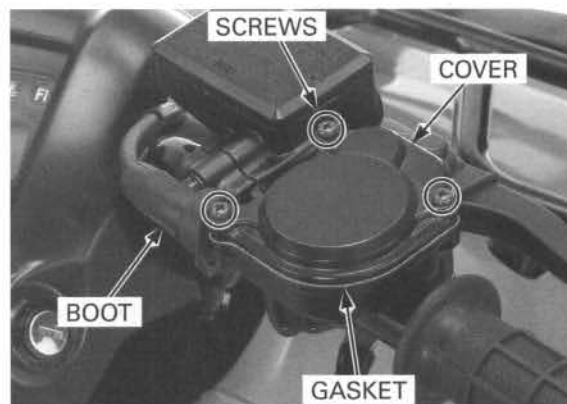
## THROTTLE HOUSING

### DISASSEMBLY

Remove the following:

- three screws
- throttle housing cover
- gasket

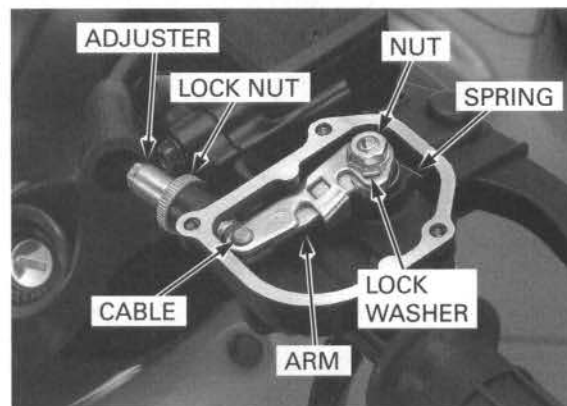
Slide the boot off the throttle cable adjuster.



Loosen the lock nut and cable adjuster.

Bend down the lock washer tab and remove the following:

- pivot nut
- lock washer
- throttle lever and plastic washer
- return spring
- throttle arm (by disconnecting the cable)
- dust seal (from the housing)





## ASSEMBLY

Coat a new dust seal lip with grease and install it into the housing until it is fully seated.

Apply grease to the throttle lever pivot in the housing and to the throttle cable end.

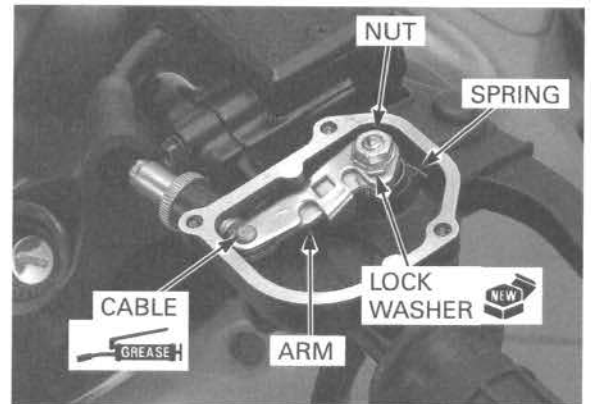
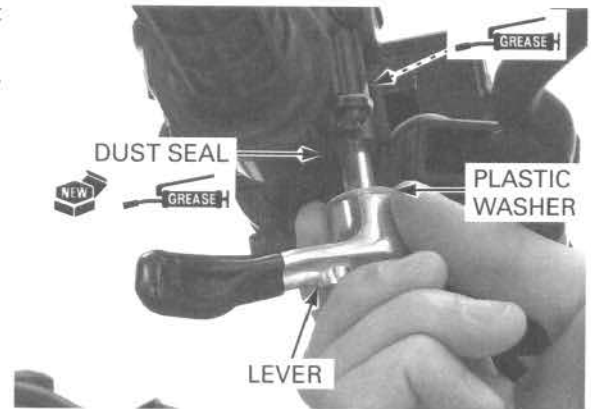
Connect the cable to the throttle arm.

Insert the throttle lever with the plastic washer into the housing.

Install the throttle arm with the spring over the throttle lever pivot by aligning the flat surfaces as shown.

Install a new lock washer and the nut, and tighten the it.

Bend up the lock washer tab against the nut.



Install the housing cover with a new gasket and tighten the three screws.

**TORQUE: 1.5 N·m (0.15 kgf·m, 1.1 lbf·ft)**

Adjust the throttle lever freeplay (page 4-7).



## FRONT WHEEL

### REMOVAL

Loosen the wheel nuts.

Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.

Remove the wheel nuts and wheel.

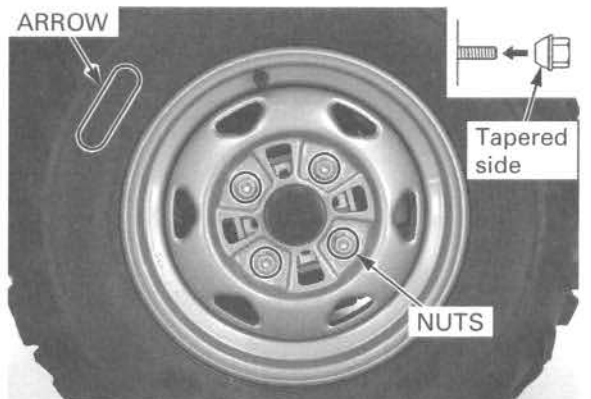
### INSTALLATION

*Do not interchange the left and right wheels*

Install the front wheel with the tire valve facing out and the arrow mark facing in the normal rotating direction.

Install the wheel nuts with the tapered side facing inward and tighten them.

**TORQUE: 64 N·m (6.5 kgf·m, 47 lbf·ft)**





## TIRES

### REMOVAL

#### NOTE:

- This service requires the ATV Bead Buster (KLS379024).
- Remove and install the tire from the rim side opposite the valve stem.

Remove the core from the valve stem.

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.

Adjust the bottom rim supports to the proper rim size. Align the flat side of the support with the corresponding rim size indicator.

*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 tire pressure during riding.*

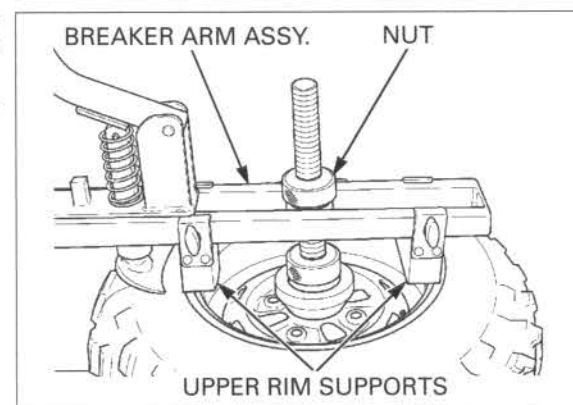
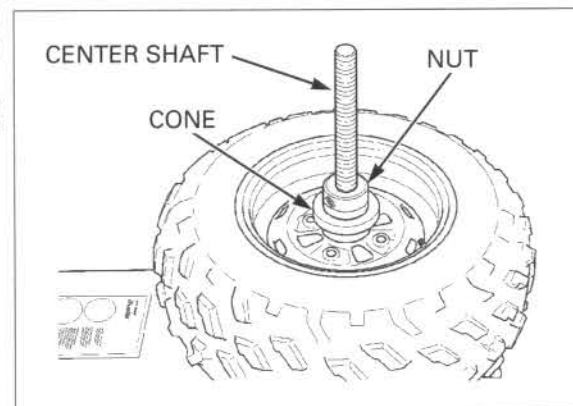
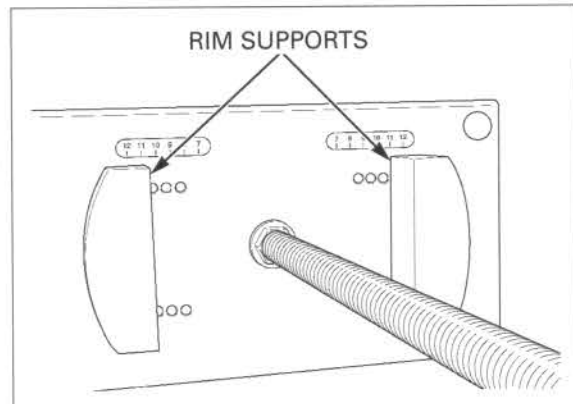
Lube the bead area of the tire with water, pressing down on the tire sidewall/bead area in several places to allow the water to run into and around the bead.

Place the wheel assembly over the center shaft and use the correct size cone to keep the wheel centered during operation.

Install the bottom hold down nut, bearing side down, and finger tighten it so the wheel can rotate freely during operation.

Install the breaker arm assembly over the center shaft and adjust the upper rim supports to fit the outside rim diameter.

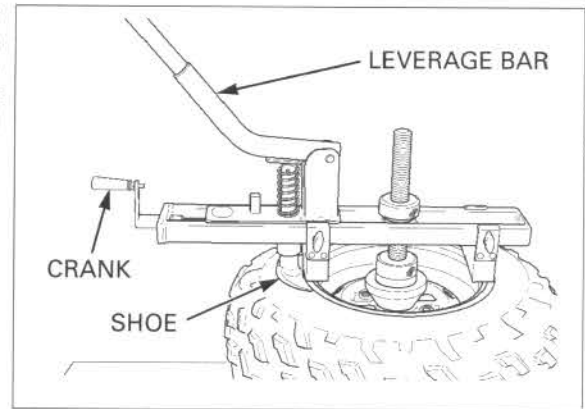
Install the top hold down nut and tighten it finger tight.





*Failure to back out the breaker shoe two turns will cause the shoe to scratch the bead lock, which may cause the tire to leak.*

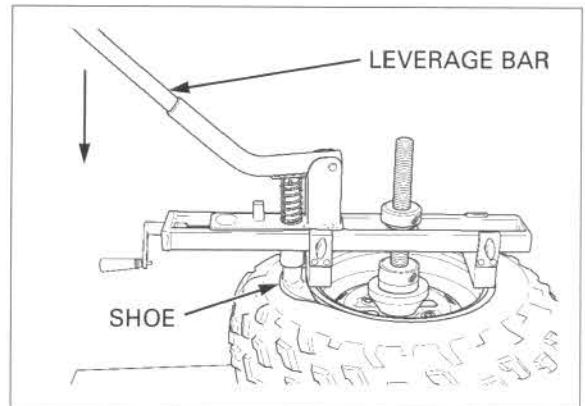
Pull the leverage bar down so the breaker shoe is just below the rim lip. Turn the crank to fully push the breaker shoe between the tire bead and rim. Once the shoe contacts the rim, back the crank out two turns to allow the shoe to clear the rim's bead lock.



Push down on the leverage bar to push the tire bead over the bead lock. Use only short strokes on the handle. While the shoe is still engaged, turn the wheel as far as it will go between strokes as you break the bead around the rim.

Remove the breaker arm assembly and flip the wheel over. Install the breaker arm assembly, adjust the shoe properly and break the other bead by following the above procedures.

Remove the tire from the rim using a tire changing machine or tire irons and rim protectors.



## 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.

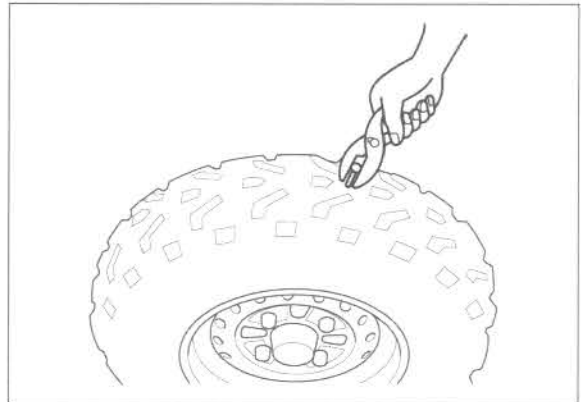
Chalk mark the punctured area and remove the puncturing object.

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.

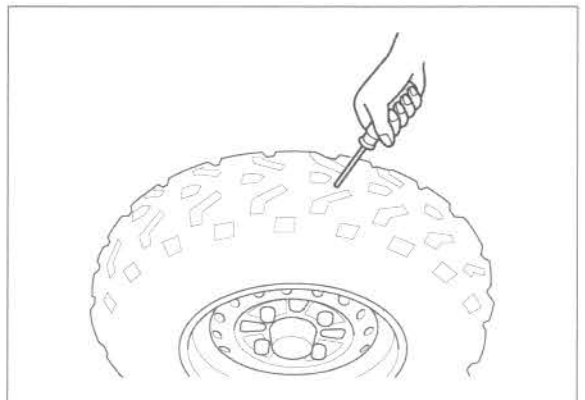
Do not let the cement dry.

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.



*Be careful not to push the plug all the way into the tire to prevent it from falling inside.*

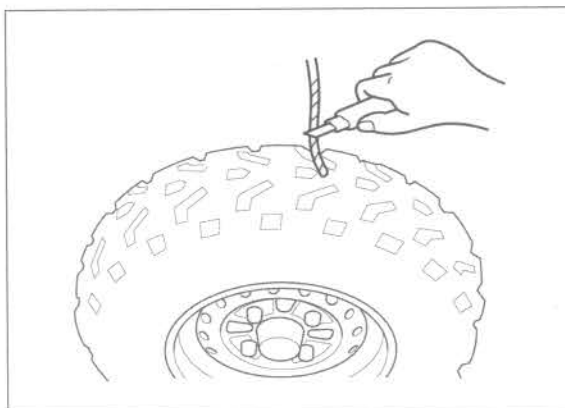


## FRONT WHEEL/SUSPENSION/STEERING

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.

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 14-13) and apply a cold patch to the inside of the tire as described below.



If a plug has been inserted, trim it even with the inner tire surface.

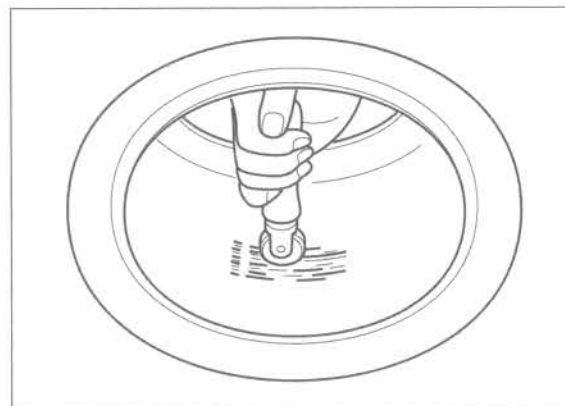
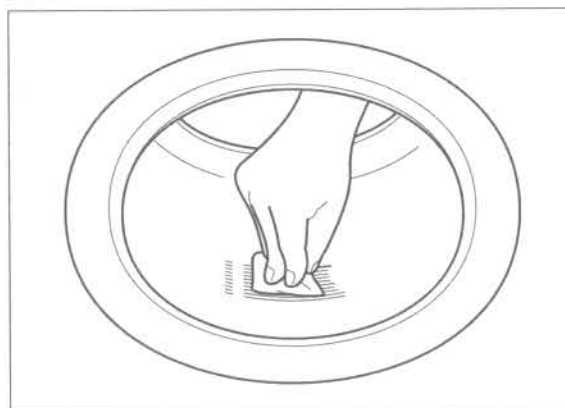
Temporarily place a rubber patch that is at least twice the size of the puncture over the injury. Make a mark around the patch, slightly larger than the patch itself.

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

TM/TE/FM/FE (Front/Rear):

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

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

FPM/FPE:

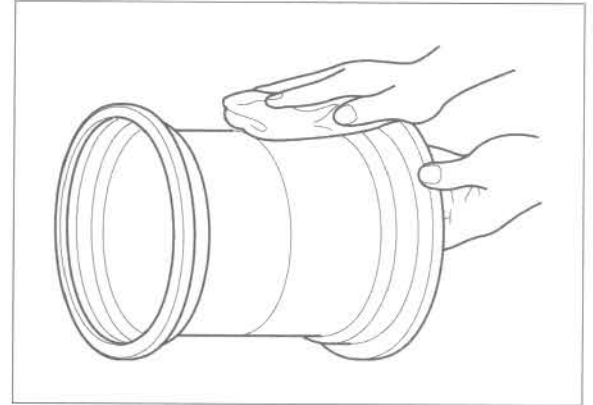
Front: Standard: 30 kPa (0.30 kgf/cm<sup>2</sup>, 4.4 psi)

With cargo: 30 kPa (0.30 kgf/cm<sup>2</sup>, 4.4 psi)

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

With cargo: 25 kPa (0.25 kgf/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 AND KNUCKLE

### REMOVAL

Remove the engine guard if the suspension arm will be removed (page 3-8).

Remove the front wheel (page 14-13).

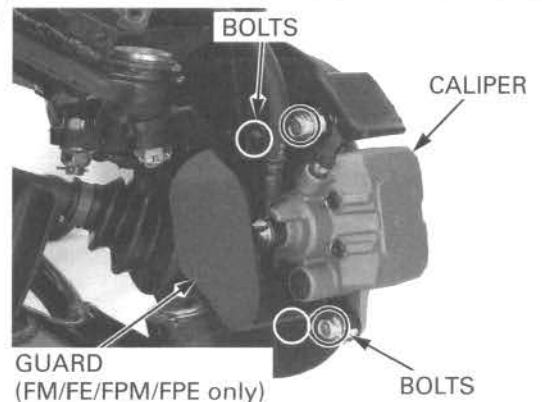
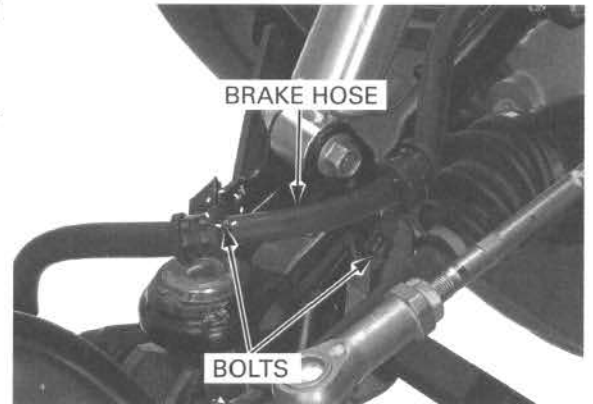
Remove the two hose clamp bolts from the upper arm.

FM/FE/FPM/FPE only: Remove the two setting bolts and drive shaft guard.

Remove the following:

- two mounting bolts
- brake caliper

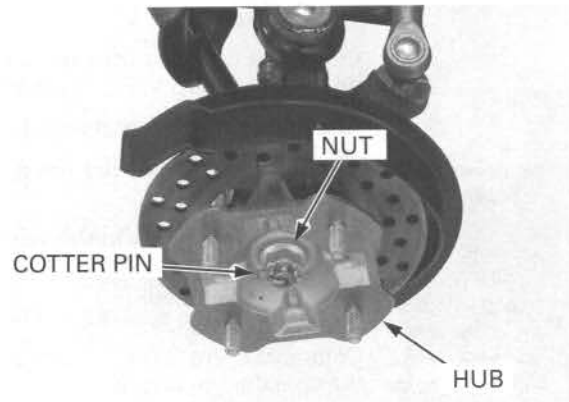
*Support the caliper so that it does not hang from the brake hose. Do not twist or bend the brake hose.*



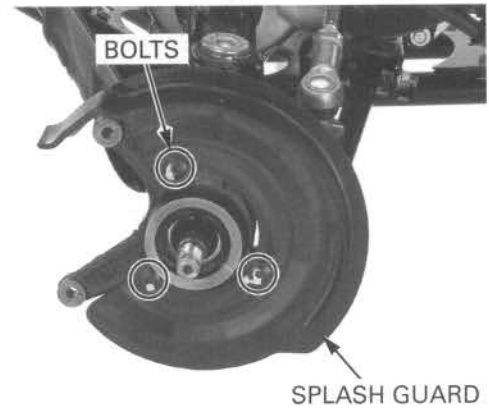


## FRONT WHEEL/SUSPENSION/STEERING

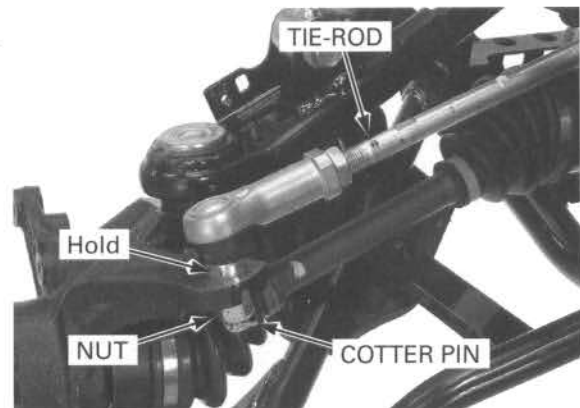
- cotter pin
- hub nut
- wheel hub



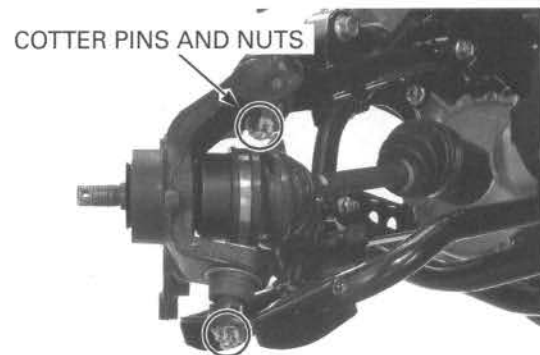
- three socket bolts
- splash guard



- cotter pin (from the tie-rod ball joint stud)
- ball joint nut (by holding the joint stud flat surfaces)
- tie-rod



- cotter pins
- Loosen the ball joint nuts, but do not remove them yet.





Release the ball joints, using the special tool according to the following instructions.

## TOOL:

**Ball joint remover, 28 mm      07MAC-SL00201**



BALL JOINT REMOVER

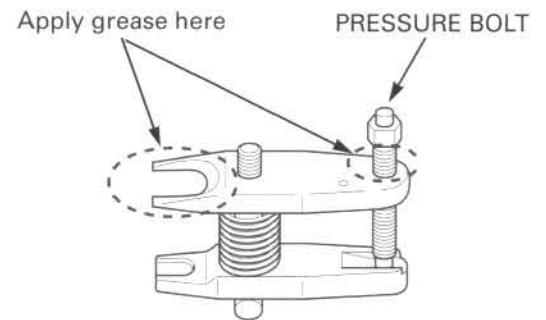
Apply grease to the ball joint remover at the point shown.

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.

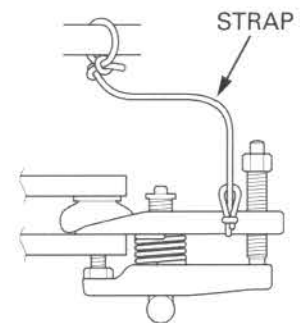
*If necessary, apply penetrating type lubricant to loosen the ball joint.*



To prevent the tool from dropping, tie the strap on a neighboring solid part such as the lower arm, tie-rod, etc. before operation.

## NOTE:

- Do not tie the strap on the brake hose, brake pipe, rubber boot, and other parts that can be damaged easily.

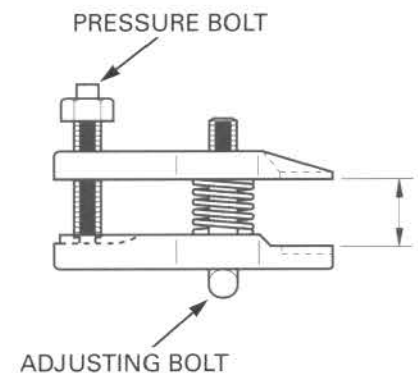


Once the tool is in place, turn the adjusting bolt as necessary to make the jaws parallel.

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.

Remove the ball joint nuts and the knuckle from the upper and lower arms.





## FRONT WHEEL/SUSPENSION/STEERING

### INSPECTION

FM/FE/FPM/FPE models: Remove the dust seals from the knuckle.

TM/TE models: Remove the side collar and dust seals from the wheel hub.

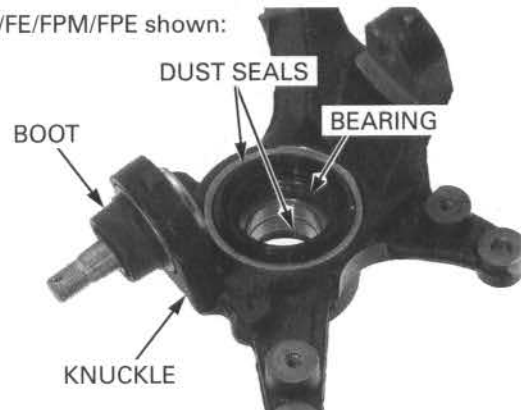
Turn the inner race of each bearing in the knuckle (FM/FE/FPM/FPE models) or wheel hub (TM/TE models) with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the hub or knuckle.

Inspect the knuckle for damage or cracks.

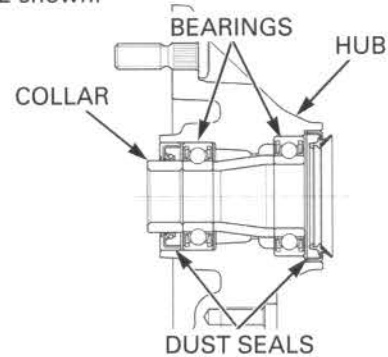
Inspect the ball joint boot for tears or other damage by moving the ball joint stud.

It should move freely and smoothly.

FM/FE/FPM/FPE shown:



TM/TE shown:



### BRAKE DISC REPLACEMENT

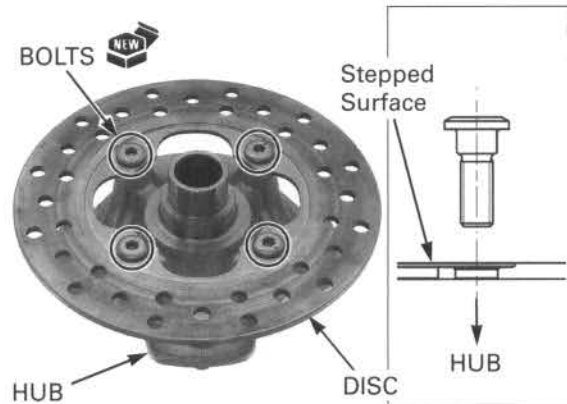
Remove the four disc bolts and brake disc from the wheel hub.

*Do not get grease on the brake disc or stopping power will be reduced.*

Install a new brake disc with the stepped surface facing up (knuckle side).

Install new disc bolts and tighten them.

**TORQUE: 42 N·m (4.3 kgf·m, 31 lbf·ft)**





## BEARING REPLACEMENT

### FM/FE/FPM/FPE models:

Remove the snap ring and drive the bearings out of the knuckle.

#### TOOLS:

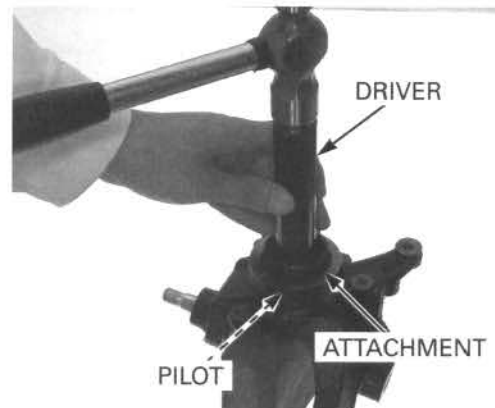
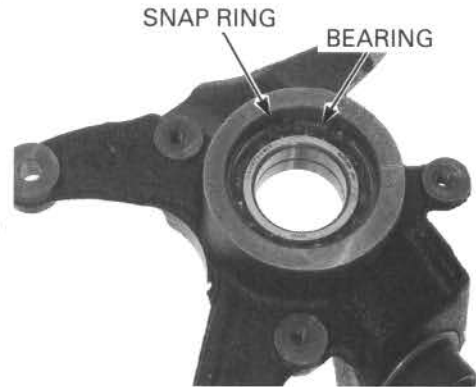
Driver	07749-0010000
Attachment, 40 x 42 mm	07746-0010900
Pilot, 30 mm	07746-0040700

Pack the cavities of a new bearings with grease. Drive in the bearing squarely with the marked side facing up until they are fully seated.

#### TOOLS:

Driver	07749-0010000
Attachment, 45 x 50 mm	07946-6920100
Pilot, 30 mm	07746-0040700

Install the snap ring into the knuckle groove with the chamfered side facing in.



### TM/TE models:

*Replace the bearings in pairs.*

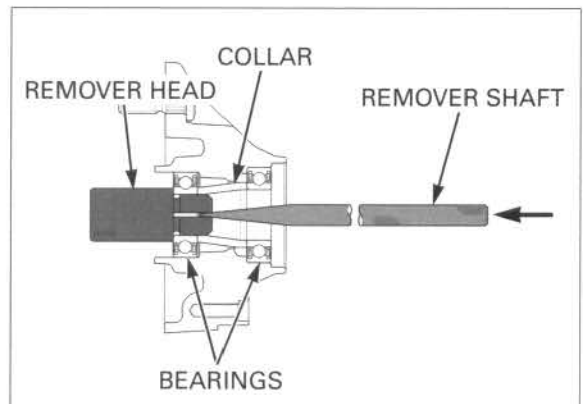
Install the remover head into the outer (wheel side) bearing.

From opposite side, install the remover shaft and drive the bearing out of the wheel hub.

#### TOOLS:

Bearing remover shaft	07746-0050100
Bearing remover head, 20 mm	07746-0050600

Remove the distance collar and drive out the other bearing.



Drive a new inner (disc side) bearing in the hub squarely until it is fully seated.

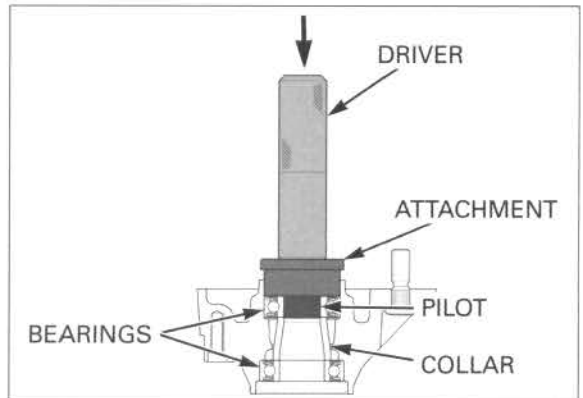
#### TOOLS:

Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300
Pilot, 25 mm	07746-0040600

Install the distance collar with the large diameter side facing the inner bearing. Drive a new outer (wheel side) bearing squarely until they are fully seated.

#### TOOLS:

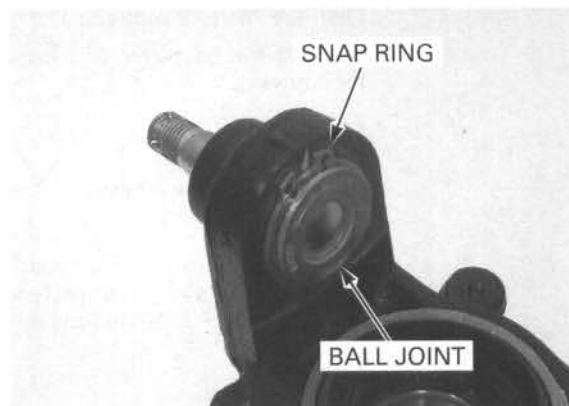
Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500





### BALL JOINT REPLACEMENT

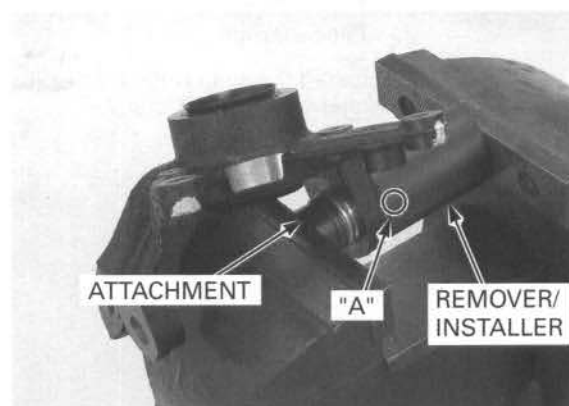
Remove the snap ring from the ball joint.



Set the knuckle and special tools with "A" mark side of the remover/installer facing to the ball joint in the vise as shown.  
Press the ball joint out of the knuckle.

#### TOOLS:

Ball joint remover/installer	07JMF-HC50110
Attachment, 28 x 30 mm	07946-1870100



Set the knuckle and special tools with "A" mark side of the remover/installer facing to the ball joint in the vise as shown.  
Press the ball joint into the knuckle until it is fully seated.

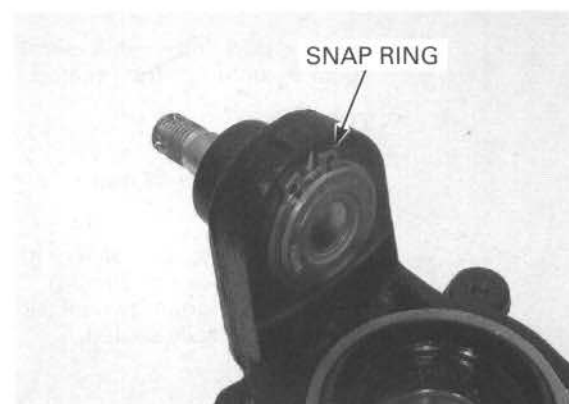
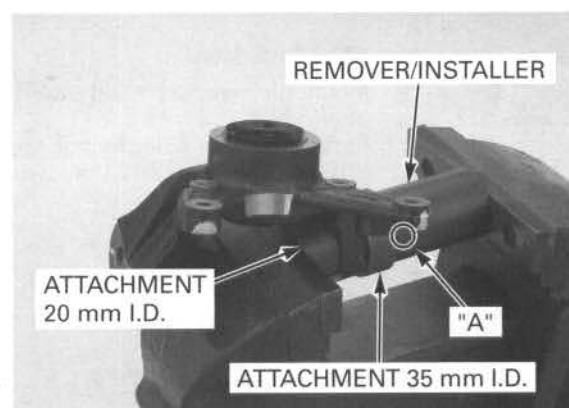
#### TOOLS:

Ball joint remover/installer	07JMF-HC50110
Attachment, 35 mm I.D.	07746-0030400
Attachment, 20 mm I.D.	07746-0020400

#### NOTICE

*If you feel strong resistance when compressing the vise, 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.





## INSTALLATION

FM/FE/FPM/FPE only: Apply grease to the lips of new inner and outer dust seals and install each seal until it is flush with the knuckle, being careful not to damage the lip.

### TOOLS:

#### Inner dust seal:

Driver 07749-0010000

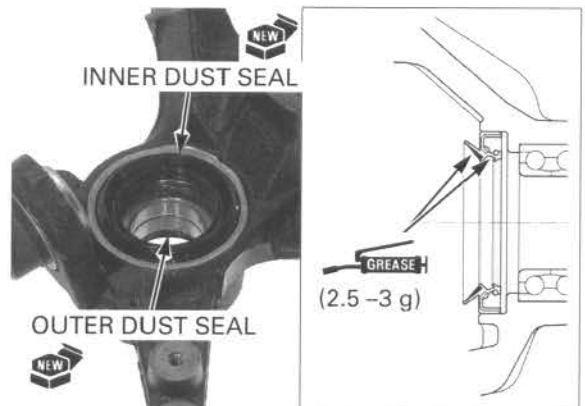
Oil seal driver attachment 07JAD-PH80101

#### Outer dust seal:

Fork seal driver attachment 07947-KF00100

Pack the seal lips of the inner dust seal with 2.5 –3 g of grease.

FM/FE/FPM/FPE models:



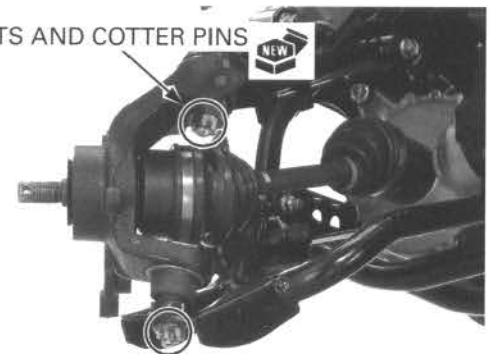
Install the knuckle onto the drive shaft (FM/FE/FPM/FPE models), and lower and upper arms with the ball joint nuts.

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, 21 lbf·ft)**

Install new cotter pins.

NUTS AND COTTER PINS

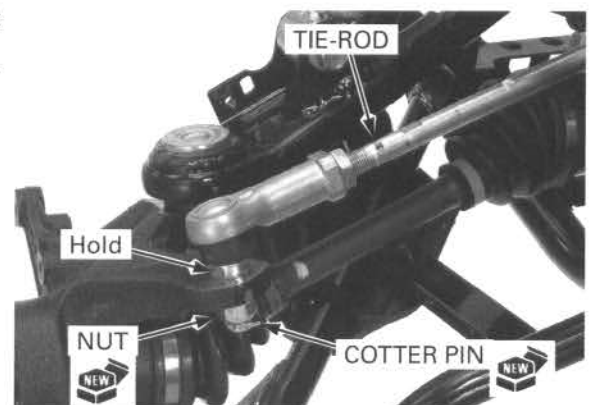


Install the tie-rod into the knuckle with a new joint nut.

Tighten the nut by holding the joint stud flat surfaces.

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

Install a new cotter pin.

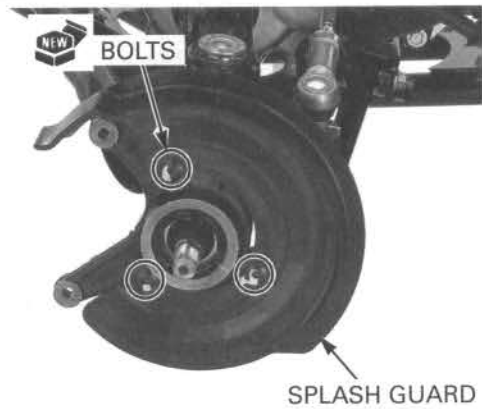




## FRONT WHEEL/SUSPENSION/STEERING

Install the splash guard with new bolts and tighten them.

**TORQUE:** 11 N·m (1.1 kgf·m, 8 lbf·ft)



*TM/TE only:* Pack the seal lips of new inner and outer dust seals with grease.

Install the outer dust seal so that it is flush with the wheel hub.

Install the inner dust seal so that it is flush with the hub using the special tool, being careful not to damage it.

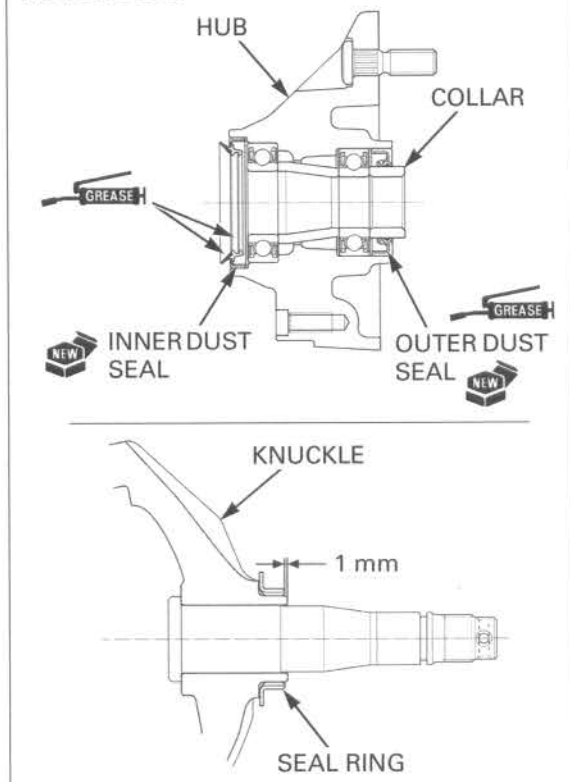
**TOOL:**

**Fork seal driver attachment 07947-KF00100**

Install the side collar into the hub.

Install the side seal ring onto the knuckle until the depth from the stepped surface is 1 mm.

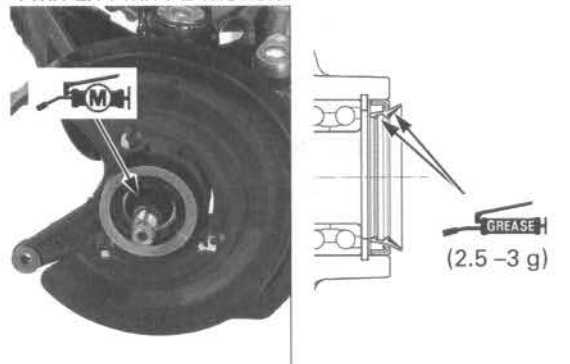
**TM/TE models:**



*FM/FE/FPM/FPE only:* Apply molybdenum disulfide grease to the drive shaft splines.

Pack the dust seal lips with 2.5 –3 g of grease.

**FM/FE/FPM/FPE models:**

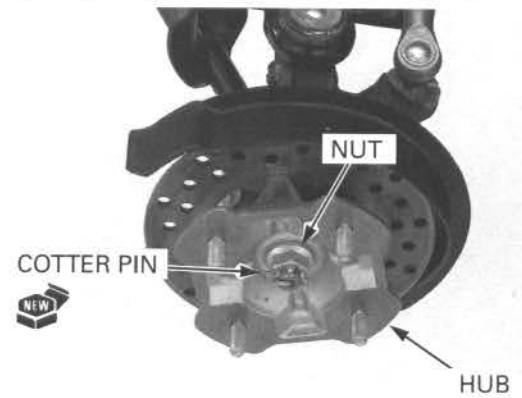




Install the wheel hub and hub nut.  
Tighten the nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

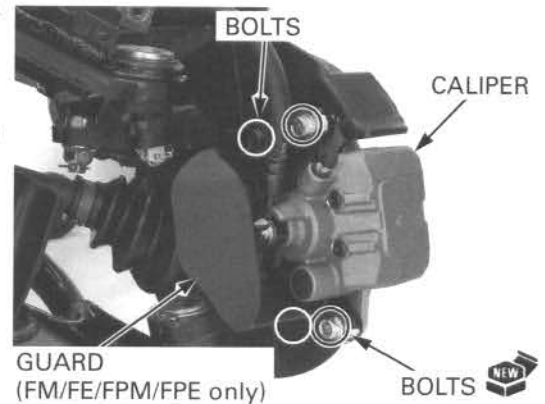
Install a new cotter pin.



Install the brake caliper with new mounting bolts and tighten them.

**TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)**

FM/FE/FPM/FPE only: Install the drive shaft guard and tighten the bolts.

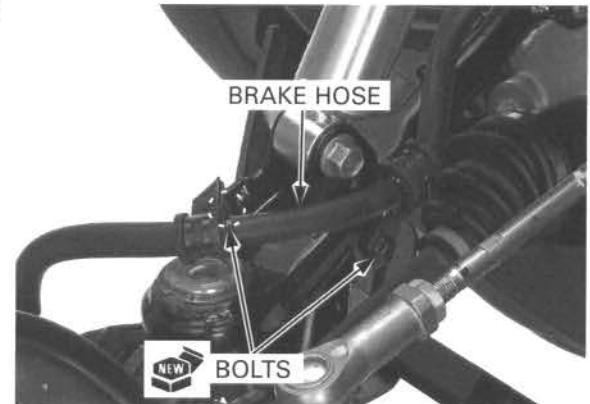


*Align the clamp tab with the hole in the upper arm.*

Install the hose clamps with new clamp bolts and tighten them.

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

Install the front wheel (page 14-13).

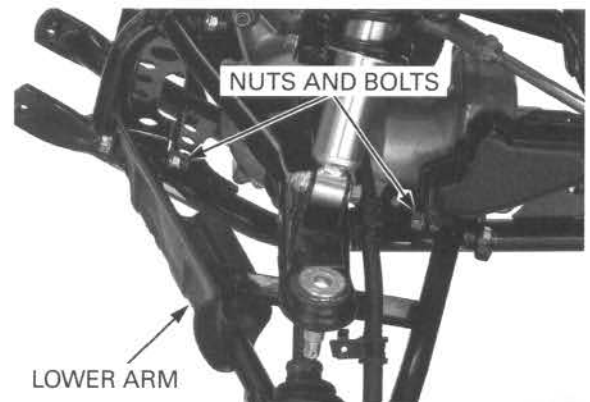


## SUSPENSION ARM

### REMOVAL

Remove the wheel hub and knuckle (page 14-17).

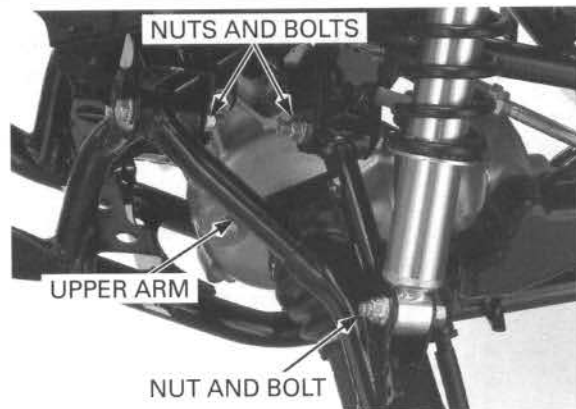
- Remove the following:
- pivot nuts and bolts
  - lower arm





## FRONT WHEEL/SUSPENSION/STEERING

- shock absorber lower mounting nut and bolt
- pivot nuts and bolts
- upper arm



### INSPECTION

Check the pivot bushings for wear or damage.

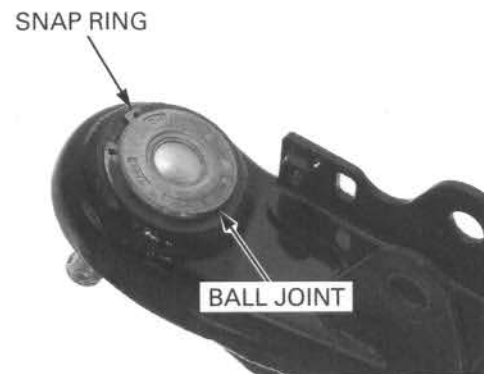
Inspect the ball joint boot on the upper arm for tears or other damage by moving the ball joint stud. It should move freely and smoothly.

FM/FE/FPM/FPE only: Remove the bolt and drive shaft guard from the lower arm if necessary.



### BALL JOINT REPLACEMENT

Remove the snap ring from the ball joint.

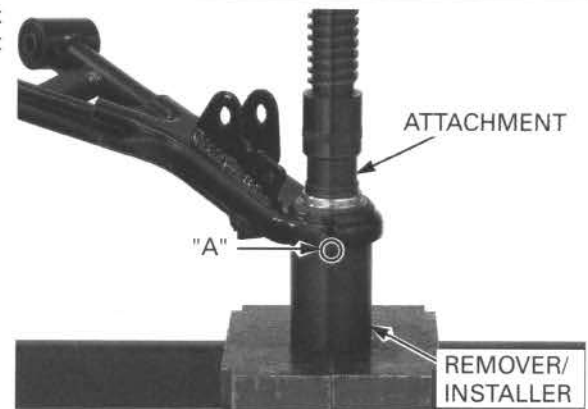




Set the upper arm and special tools with "A" mark side of the remover/installer facing to the ball joint in the hydraulic press as shown.  
Press the ball joint out of the upper arm.

## TOOLS:

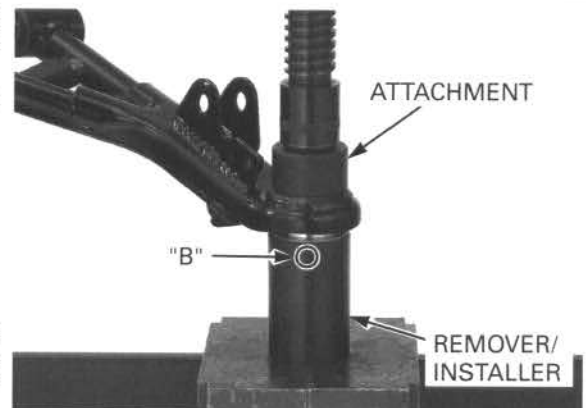
Ball joint remover/installer 07WMF-HN00100  
Attachment, 28 x 30 mm 07946-1870100



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.

SNAP RING



## INSTALLATION

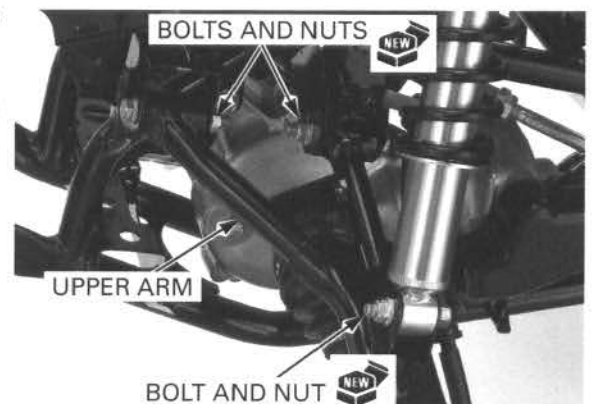
*Insert the bolts from the outside of the upper arm.*

Install the upper arm into the frame with the bolts (10 x 65 mm) and new nuts.

*Insert the bolt from the rear side.*

Connect the shock absorber to the upper arm with the bolt (10 x 45 mm) and a new nut.

Loosely tighten the fasteners.





## FRONT WHEEL/SUSPENSION/STEERING

*Insert the bolts from the front side.* Install the lower arm with the pivot bolts and new nuts, and loosely tighten them.

Install the knuckle and wheel hub (page 14-23).

Install the front wheel (page 14-13).

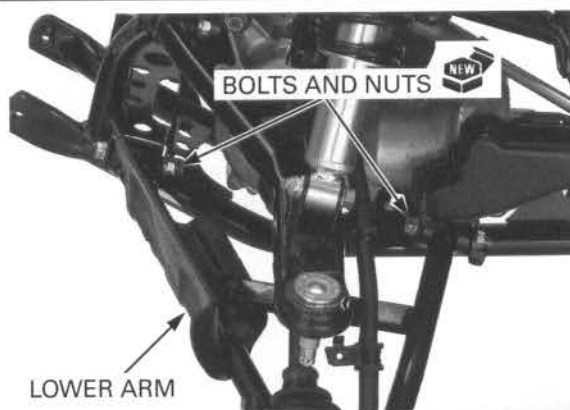
Place the vehicle on level ground and tighten the fasteners to the specified torque.

### TORQUE:

Upper and lower arm: 44 N·m (4.5 kgf·m, 32 lbf·ft)

Shock absorber: 30 N·m (3.1 kgf·m, 22 lbf·ft)

Install the engine guard (page 3-8).

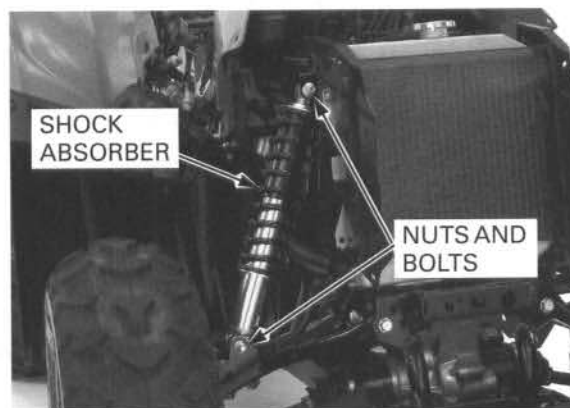


## FRONT SHOCK ABSORBER

### REMOVAL

Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.

Support the lower arm. Remove the mounting nuts, bolts and front shock absorber.



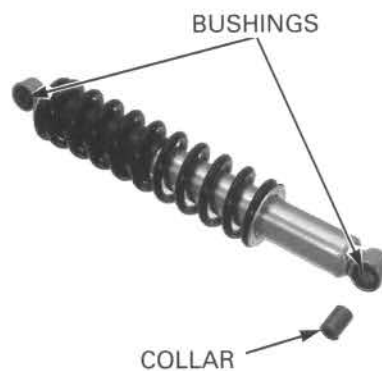
### INSPECTION

Remove the pivot collar.

Check the pivot bushings for wear or damage.

Check the damper unit for leakage or other damage.

Replace the shock absorber assembly if necessary.

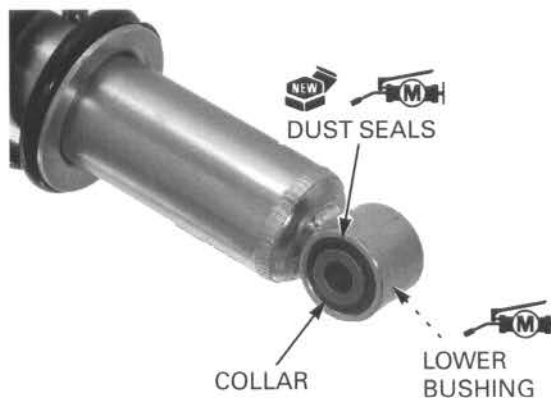


### INSTALLATION

Install new dust seals into the lower pivot with the lip side facing out until they are fully seated.

Apply molybdenum disulfide grease to the lower pivot bushing and dust seal lips.

Install the pivot collar.



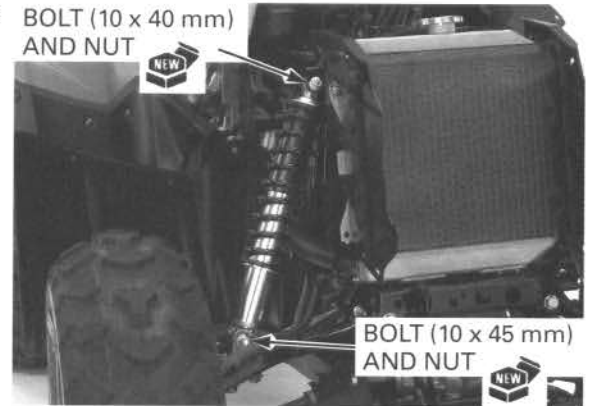


Insert the bolts from the rear side.

Install the shock absorber with the mounting bolts and new nuts, and tighten them.

**TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)**

BOLT (10 x 40 mm) AND NUT



## STEERING SHAFT (TM/TE/FM/FE models)

### REMOVAL

Remove the following:

- mudguards (page 3-6)
- front fender/carrier (page 3-7)
- handlebar cover
- '07 TM/FM and After '07 U.S.A. TM/FM: (page 22-11)
- TE/FE and After '07 Canada TM/FM: (page 22-6)

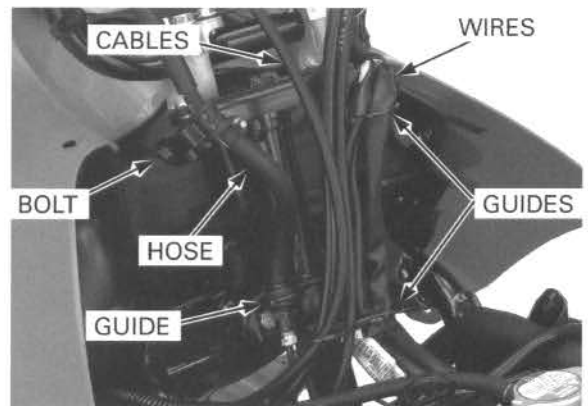
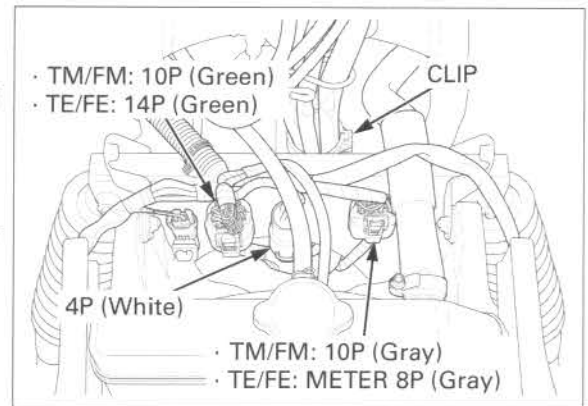
Release the wire clip.

Remove the following connectors from the frame and disconnect them:

- TM/FM: 10P (Gray)
- TE/FE: 8P (Gray)
- ignition switch 4P (White)
- TM/FM: 10P (Green)
- TE/FE: 14P (Green)

Remove the following:

- cables (from the lower guide)
- wires (from the upper and lower guides)
- hose clamp bolt
- brake hose (from the hose guide)



Hang the handlebar with strings securely and keep the master cylinder reservoir upright.

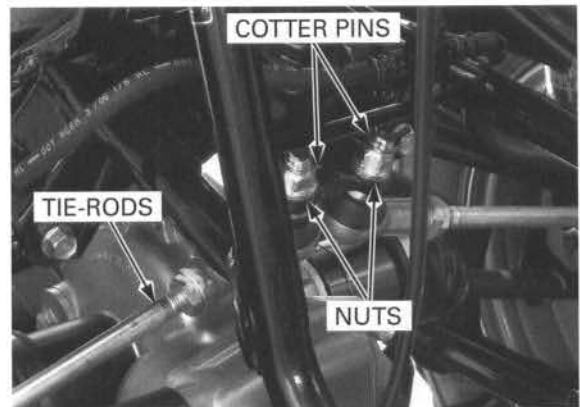
- two nuts and washers
- handlebar assembly (from the steering shaft)



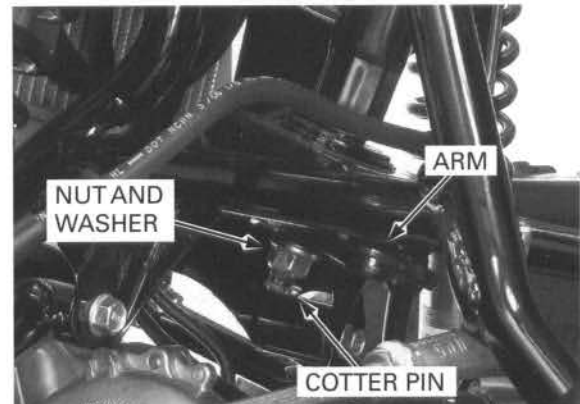


## FRONT WHEEL/SUSPENSION/STEERING

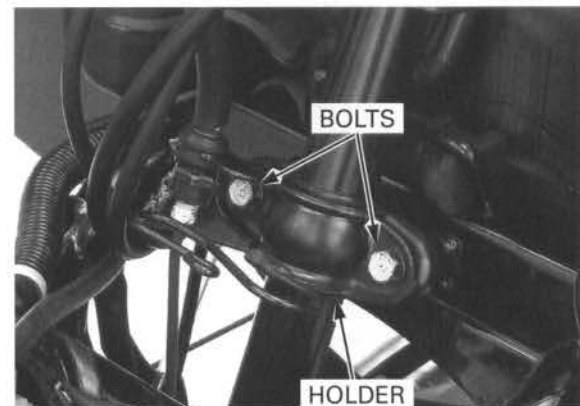
- cotter pins
- joint nuts (by holding the joint stud flat surfaces)
- tie-rods (from the steering arm)



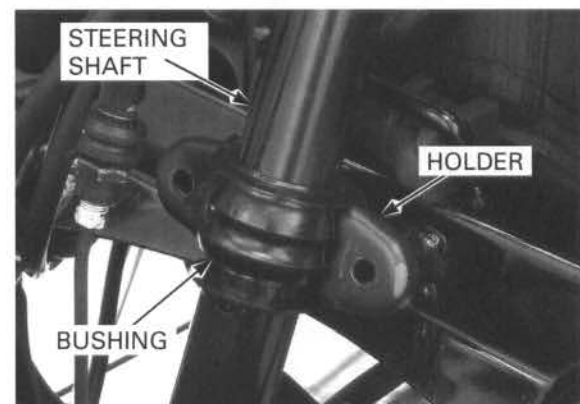
- cotter pin
- shaft end nut and washer
- steering arm



- two holder bolts
- front shaft holder

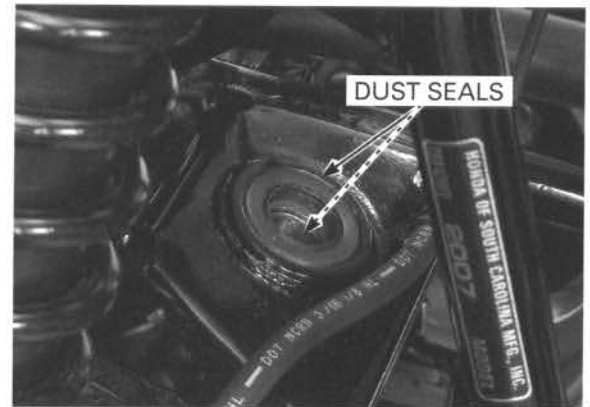


- steering shaft (from the shaft bearing)
- rear shaft holder
- shaft bushing





- dust seals



## INSPECTION

Check the shaft bushing for wear or damage.



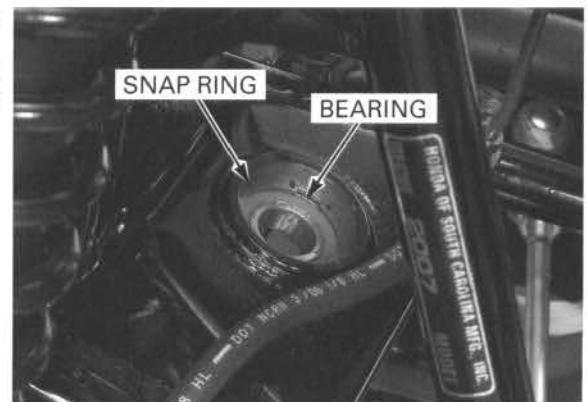
Check the steering shaft for distortion or damage.



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.

## BEARING REPLACEMENT

Remove the snap ring.





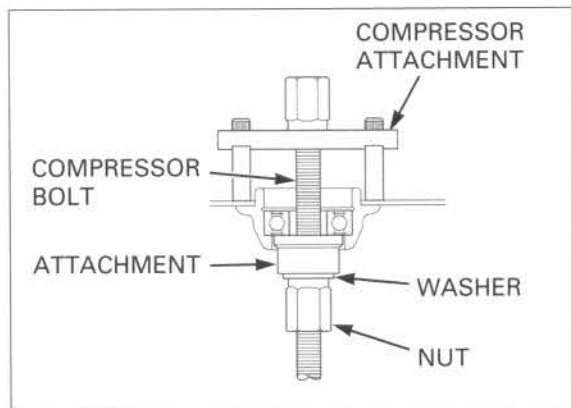
## FRONT WHEEL/SUSPENSION/STEERING

Assemble the special tools and a 10 mm washer onto the steering shaft bearing.  
Remove the bearing by tightening the nut

### TOOLS:

Clutch compressor attachment 07LAE-PX40100  
Compressor bolt assembly 07GAE-PG40200 or  
07GAE-PG4020A  
(U.S.A. only)

Attachment, 32 x 35 mm 07746-0010100

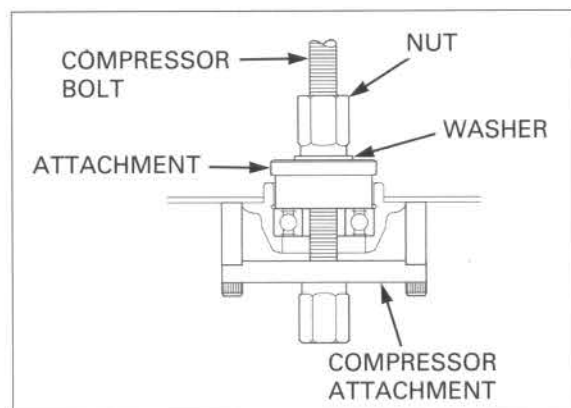


Draw a new bearing with the marked side facing up until it is fully seated, using the special tools and a 10 mm washer.

### TOOLS:

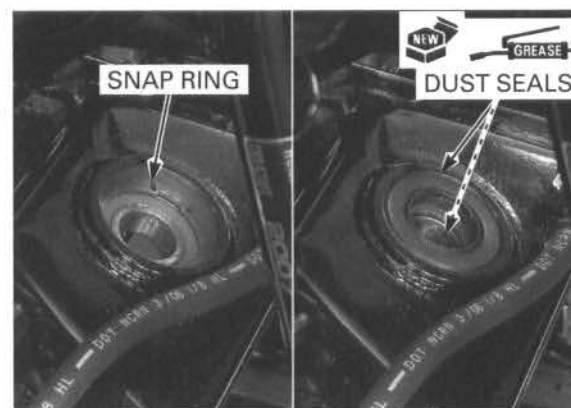
Clutch compressor attachment 07LAE-PX40100  
Compressor bolt assembly 07GAE-PG40200 or  
07GAE-PG4020A  
(U.S.A. only)

Attachment, 42 x 47 mm 07746-0010300



Install the snap ring into the groove properly with the chamfered edge facing down.

Coat the lips of new dust seals with grease.  
Install each dust seal with the flat side facing out so that it is flush with the frame edge.



## INSTALLATION

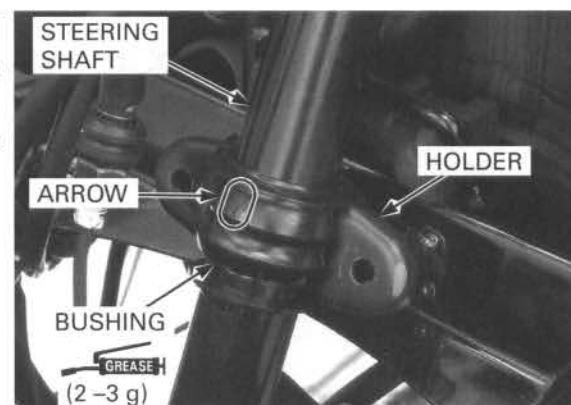
### NOTE:

- Route the hose, cables and wires properly (page 1-28).

Apply 2 – 3 g of grease to the shaft bushing inner surface.

Install the shaft bushing onto the steering shaft with the arrow mark facing up.

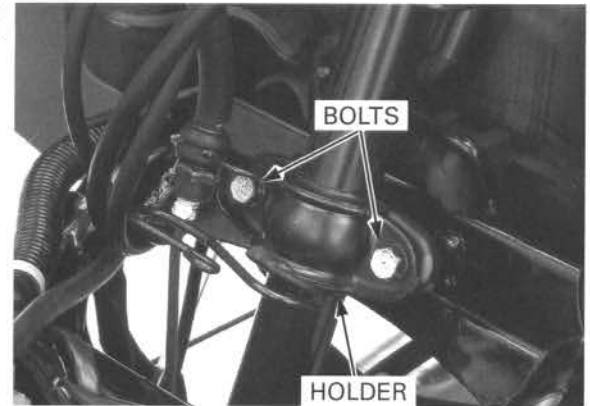
Install the rear shaft holder onto the frame and the steering shaft into the bearing.





Install the front shaft holder with the hose guide facing the right side and tighten the two bolts alternately, then tighten to the specified torque.

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

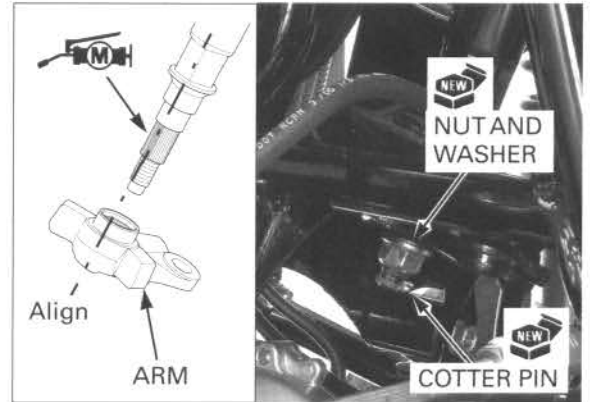


Apply molybdenum disulfide grease to the steering shaft spline.

Install the steering arm over the steering shaft by aligning the wide tooth with the wide groove. Install the washer and a new end nut, and tighten the nut.

**TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)**

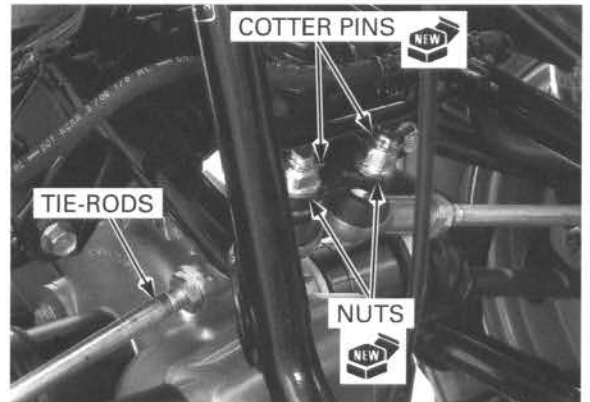
Install a new cotter pin.



Install the tie-rods into the steering arm. Install new joint nuts and tighten them by holding the joint stud flat surfaces.

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

Install new cotter pins into the ball joint studs.



Install the handlebar assembly onto the steering shaft with the washers and new lower holder nuts. Tighten the nuts.



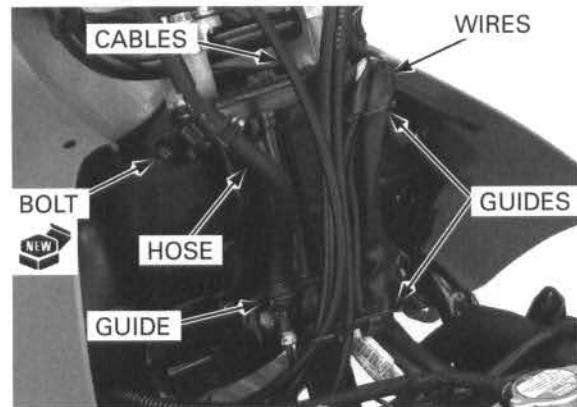


## FRONT WHEEL/SUSPENSION/STEERING

Install the brake hose into the guide.  
Install the hose clamp with a new clamp bolt and tighten it.

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

Install the wires and cables into the guides.



Connect the following connectors and install them onto the frame.

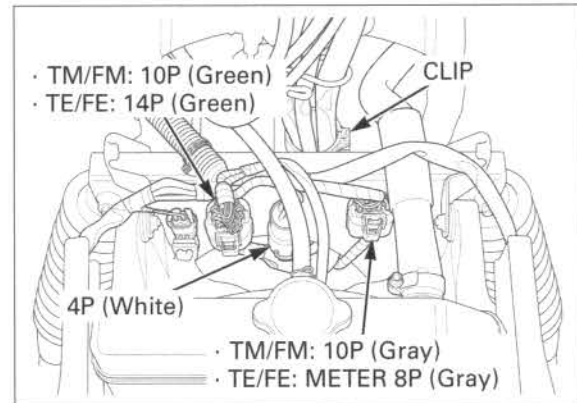
- TM/FM: 10P (Green)  
TE/FE: 14P (Green)
- ignition switch 4P (White)
- TM/FM: 10P (Gray)  
TE/FE: 8P (Gray)

Secure the wires with the wire clip.

Make sure all the hose, cables and wires are properly routed (page 1-28).

Install the following:

- handlebar cover
  - '07 TM/FM and After '07 U.S.A. TM/FM: (page 22-11)
  - TE/FE and After '07 Canada TM/FM: (page 22-6)
- front fender/carrier (page 3-7)
- mudguards (page 3-6)



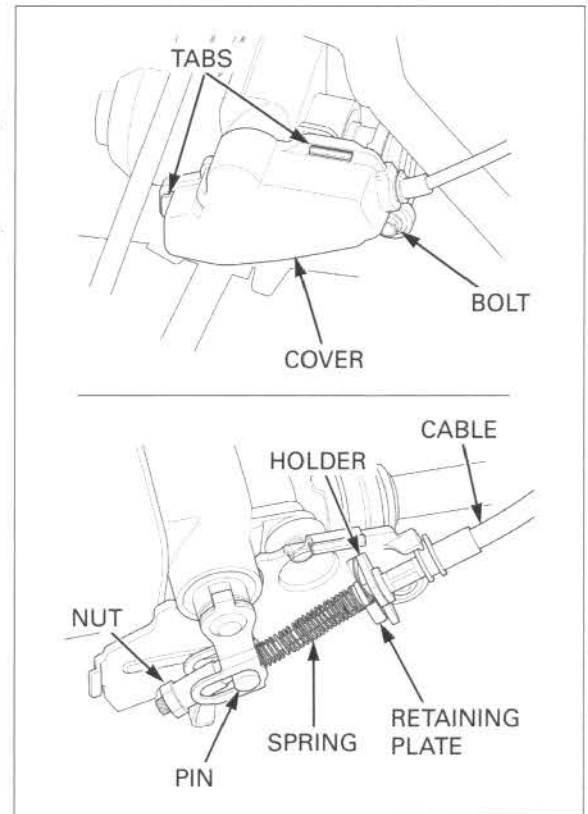


# STEERING SHAFT/EPS UNIT (FPM/FPE models)

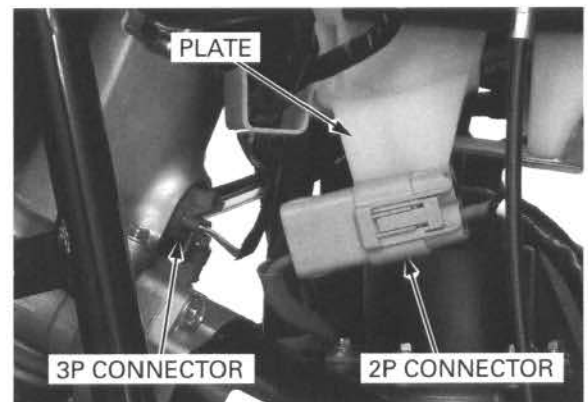
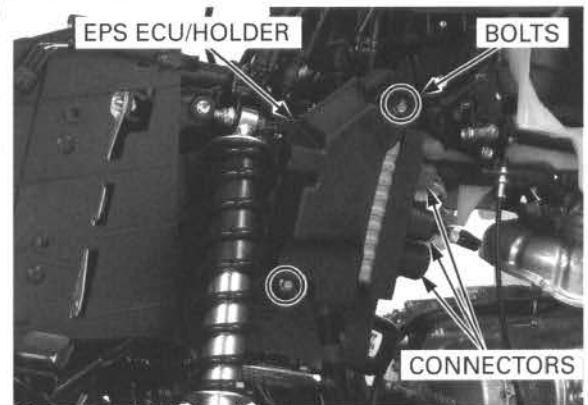
## REMOVAL

Remove the following:

- front fender/carrier (page 3-7)
- left mudguard (page 3-6)
- front wheels (page 14-13)
- handlebar cover (page 22-6)
- bolt and clutch arm cover (release from the two tabs)
- adjusting nut
- cable retaining plate
- 2WD/4WD selector cable (remove from the cable holder and joint pin)
- cable spring
- joint pin



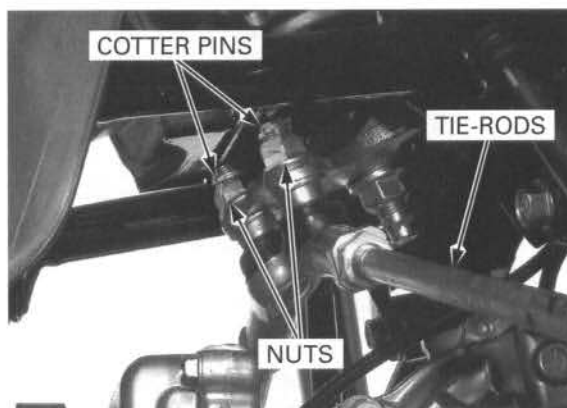
- EPS ECU connectors (2P brown, 2P gray and 21P gray)
- two setting bolts
- EPS ECU/holder assembly (by releasing two guides of the holder from the frame pipe)
- EPS motor 2P (gray) connector (remove from the heat guard plate and disconnect it)
- torque sensor 3P (gray) connector



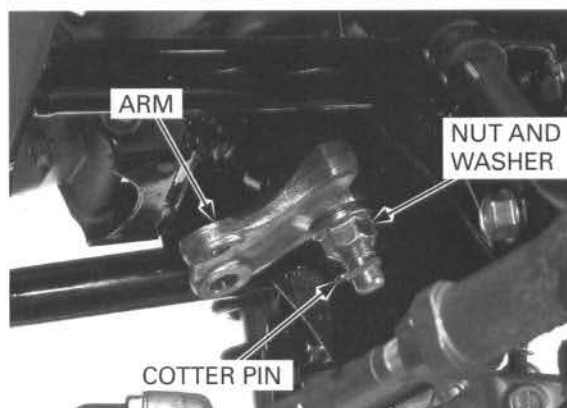


## FRONT WHEEL/SUSPENSION/STEERING

- cotter pins
- joint nuts (by holding the joint stud flat surfaces)
- tie-rods (from the steering arm)

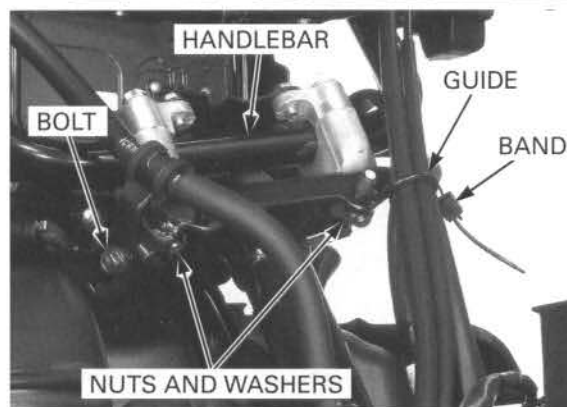


- cotter pin
- shaft end nut and washer
- steering arm



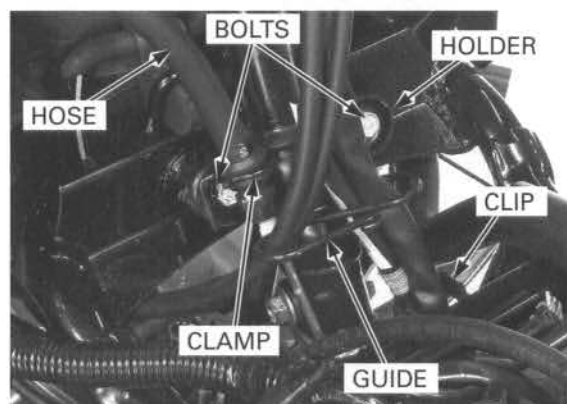
*Hang the handlebar with straps securely and keep the master cylinder reservoir upright.*

- wire band
- cables and wires (from the guide)
- hose clamp bolt
- two nuts and washers
- handlebar assembly (from the steering shaft)



*Be careful not to damage the brake pipe.*

- wire clip (from the frame)
- brake hose (from the clamp)
- two holder bolts
- front shaft holder (release the cables and wires from the guide on the holder)



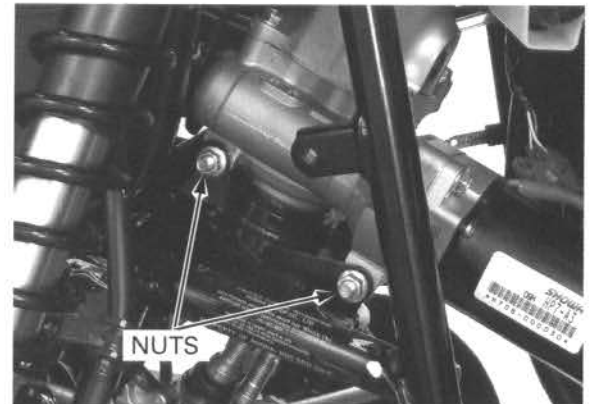
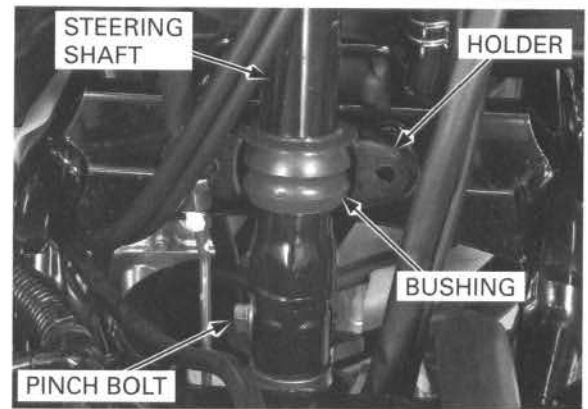


- steering shaft pinch bolt

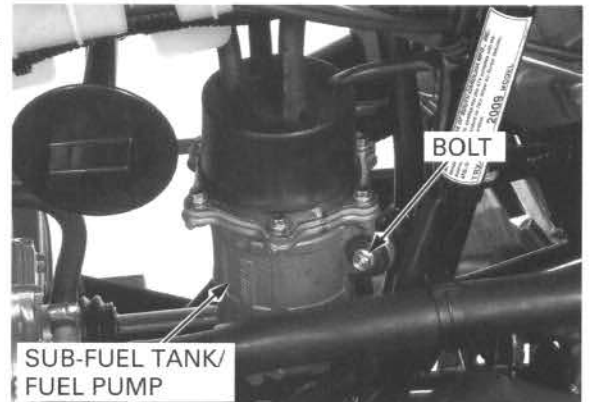
Loosen the EPS unit mounting nuts.

Remove the following:

- steering shaft
- rear shaft holder
- shaft bushing

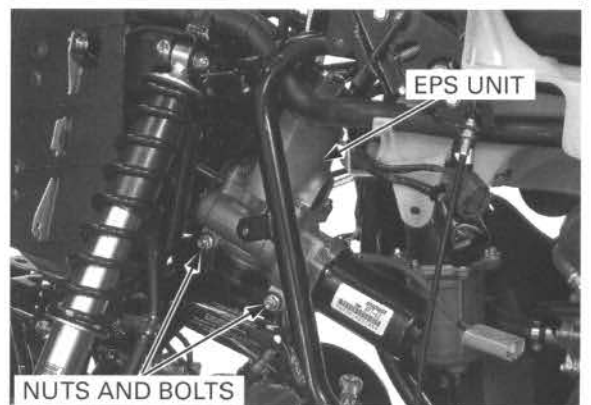


- sub-fuel tank/fuel pump mounting bolt
- sub-fuel tank/fuel pump assembly (from the frame to gain space for EPS unit removal)



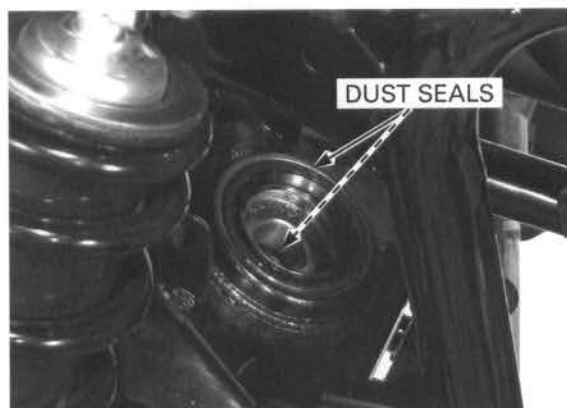
*Hold the EPS unit securely and maneuver it out of the frame to the left side, being careful not to damage the shaft splines.*

- nuts and bolts
- EPS unit





- dust seals



### INSPECTION

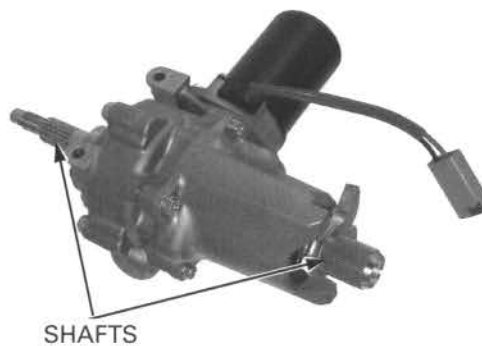
Check the steering shaft for distortion or damage.



Check the shaft bushing for wear or damage.



Check each shaft of the EPS unit for wear 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.

## BEARING REPLACEMENT

Remove the snap ring.

Assemble the special tools and a 10 mm washers onto the steering bearing.  
Remove the bearing by tightening the nut

### TOOLS:

Clutch compressor attachment	07LAE-PX40100
Compressor bolt assembly	07GAE-PG40200 or 07GAE-PG4020A (U.S.A. only)
Attachment, 34 mm	07ZMD-MBW0100

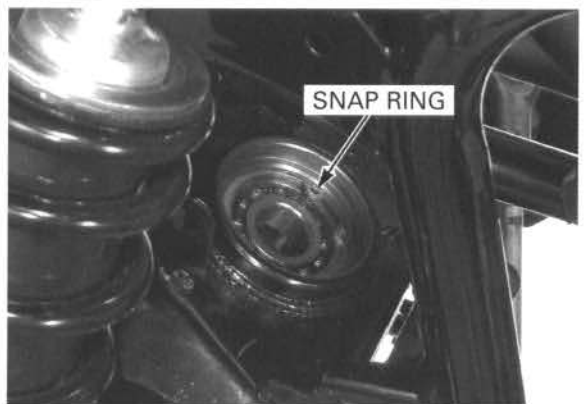
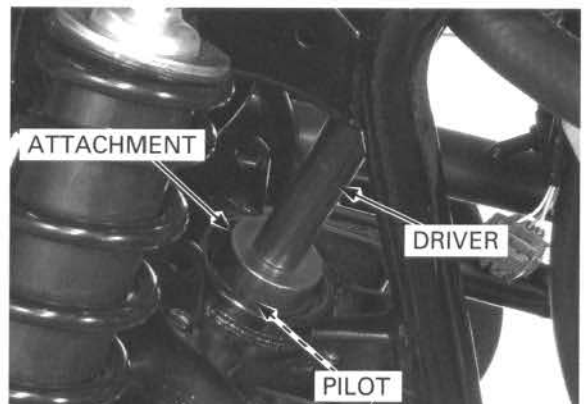
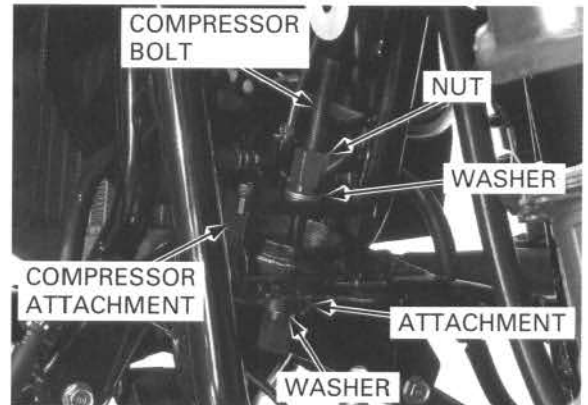
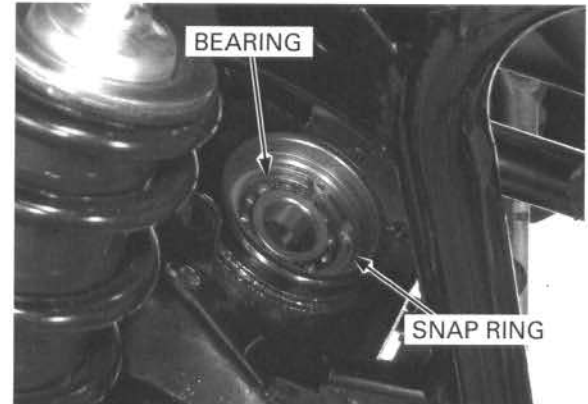
Drive a new bearing into the frame with the marked side facing up.

### TOOLS:

Driver	07949-3710001
Attachment, 42 x 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500

*Make sure the snap ring is firmly seated in the groove.*

Install the snap ring into the groove properly with the chamfered edge facing down.





## FRONT WHEEL/SUSPENSION/STEERING

### EPS UNIT LUBRICATION

Remove the two bolts and EPS motor.  
Remove the O-ring.

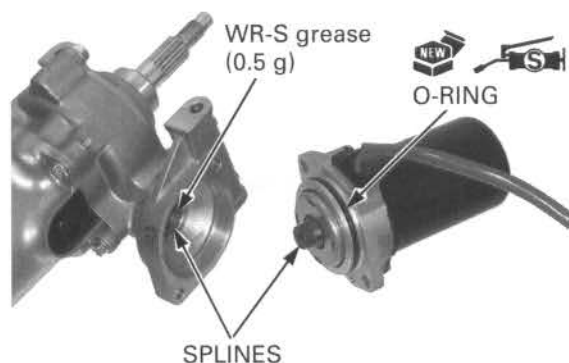
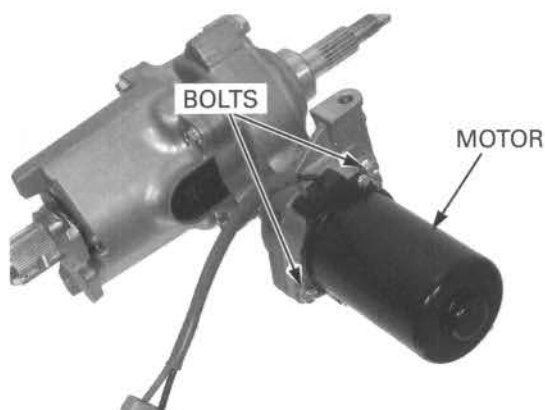
Clean the mating surfaces of the EPS unit and motor  
and wipe off any grease from the splines.

Coat a new O-ring with silicone grease and install it  
into the groove in the motor.

Apply 0.5 g of WR-S grease (Nippon Grease) to the  
worm gear splines.

Install the EPS motor and tighten the two bolts.

**TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)**



### INSTALLATION

#### NOTE:

- Route the hose, cables and wires properly (page 1-47).

Pack the seal lips of new dust seals with grease.  
Install each dust seal with the flat side facing out so  
that it is flush with the frame edge.

#### TOOLS (Upper dust seal):

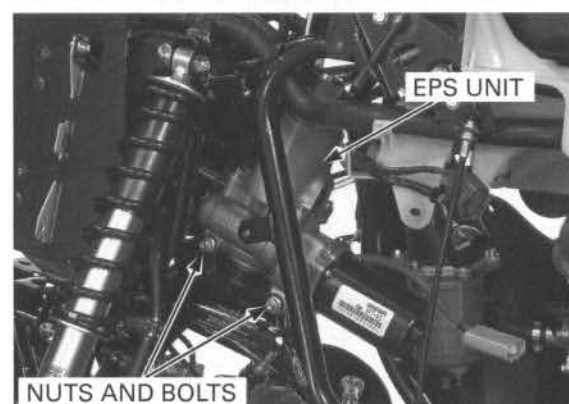
Driver	07949-3710001
Oil seal driver attachment	07JAD-PH80101



*Hold the EPS unit  
securely and  
carefully maneuver  
it into place, being  
careful not to  
damage the dust  
seal in the frame  
and shaft splines.*

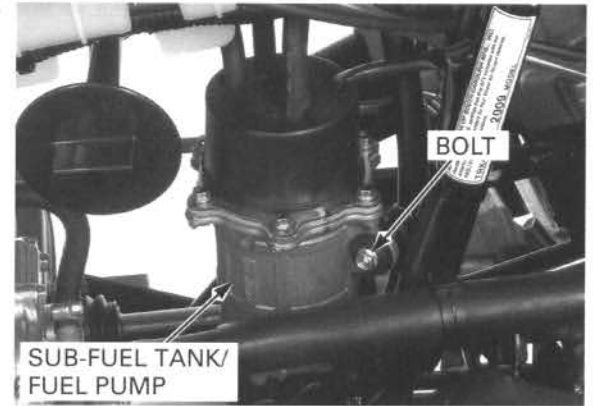
Place the EPS unit into the frame and install it into  
the bearing.

Install the mounting bolts from the right side and  
the nuts, but do not tighten them yet.





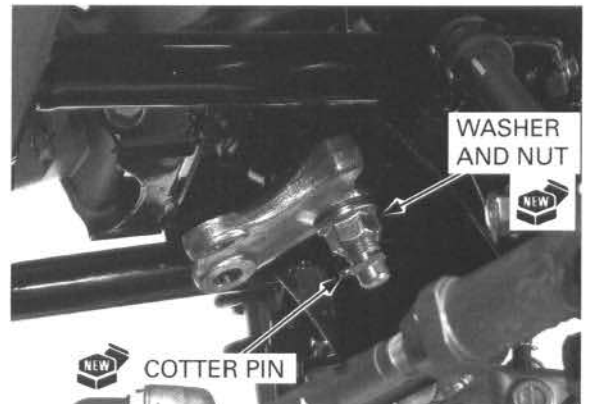
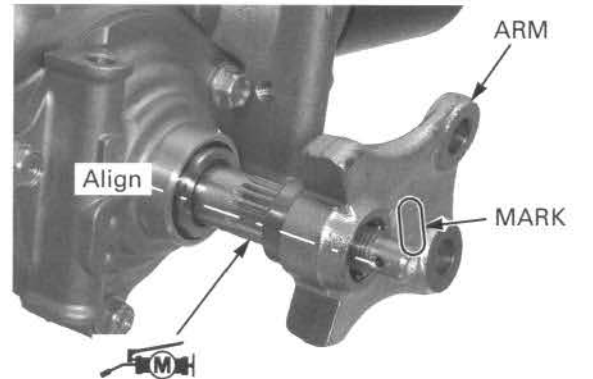
Install the sub-fuel tank/fuel pump assembly onto the frame by aligning the bosses with the mounting grommets. Install the mounting bolt and tighten it.



Apply molybdenum disulfide grease to the splines. Install the steering arm with the marked side facing down by aligning the wide tooth with the wide groove in the shaft. Install the washer and a new end nut, and tighten it.

**TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)**

Install a new cotter pin.



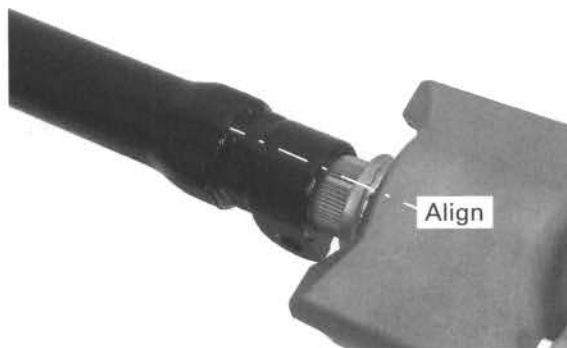
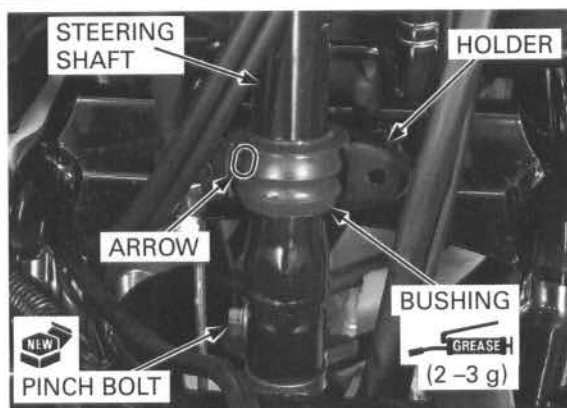


## FRONT WHEEL/SUSPENSION/STEERING

Apply 2 – 3 g of grease to the shaft bushing inner surface.

Install the shaft bushing onto the steering shaft with the arrow mark facing up.

Place the rear shaft holder onto the frame, then install the steering shaft over the input shaft of the EPS unit by aligning the wide tooth with the wide groove. Install a new pinch bolt.



*Temporarily install the handlebar assembly onto the steering shaft.*

Install the front shaft holder with the guide facing down while routing the wires and cables into the guide. Install the two holder bolts.

Install the brake hose into the clamp.

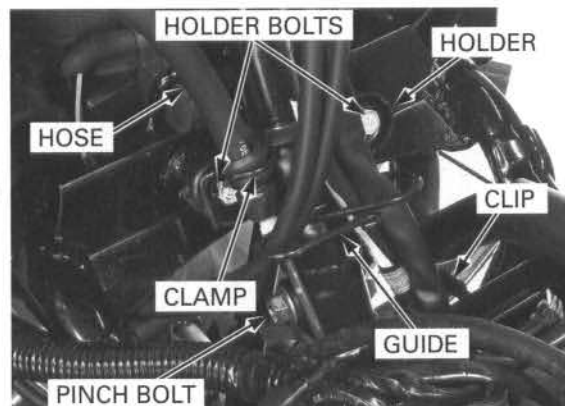
Install the wire clip onto the frame.

Be sure the steering shaft is fully seated onto the EPS unit and tighten the pinch bolt.

**TORQUE: 60 N·m (6.1 kgf·m, 44 lbf·ft)**

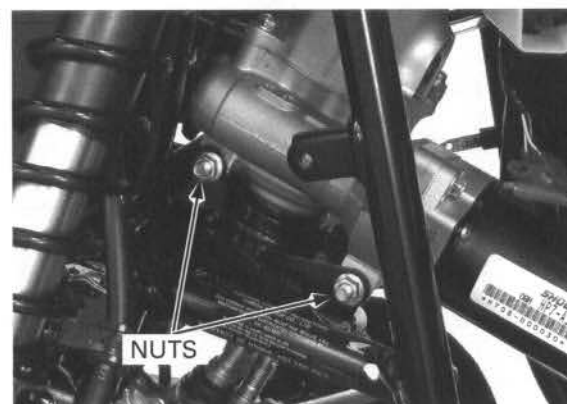
Tighten the holder bolts alternately in several steps.

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



Tighten the EPS unit mounting nut to the specified torque.

**TORQUE: 22 N·m (2.3 kgf·m, 16 lbf·ft)**

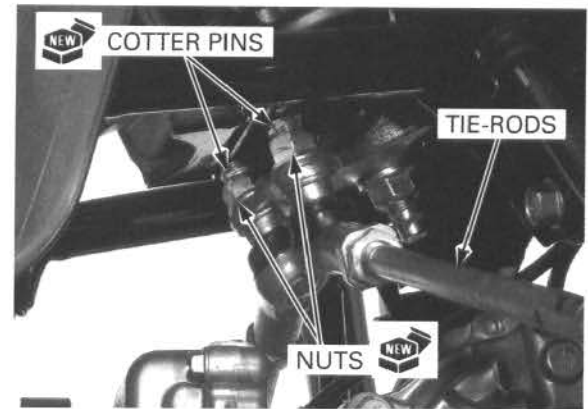




Install the tie-rods into the steering arm.  
Install new joint nuts and tighten them by holding the joint stud flat surfaces.

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

Install new cotter pins into the ball joint studs.



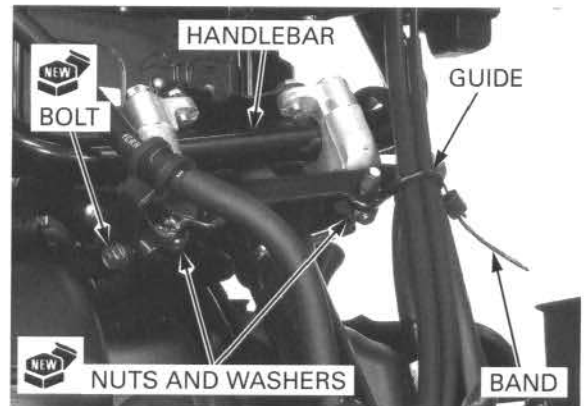
Install the handlebar assembly onto the steering shaft with the washers and new lower holder nuts. Tighten the nuts.

Install the hose clamp with a new clamp bolt and tighten it.

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

Install the wires and cables into the guide.

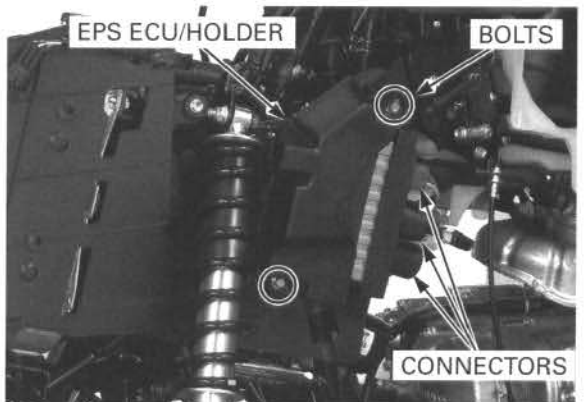
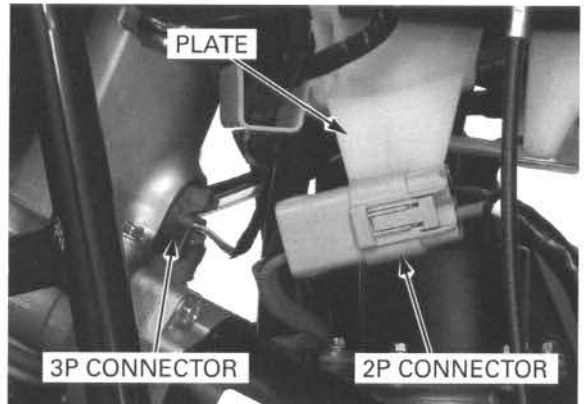
Secure the wires to the guide with the wire band.



Connect the torque sensor 3P (gray) connector and the EPS motor 2P (gray) connector and install it onto the heat guard plate.

Install the EPS ECU/holder assembly by hooking the holder guides onto the frame pipe.  
Install the two setting bolts and tighten them.

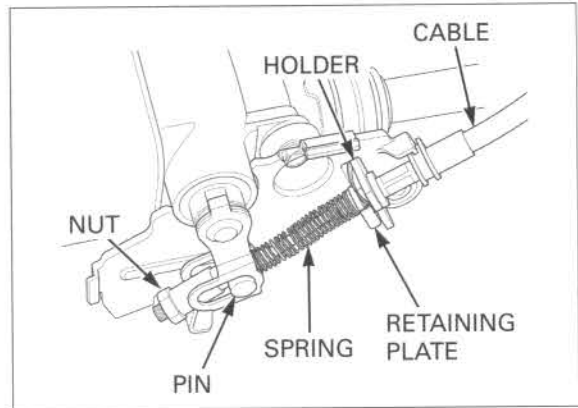
Connect the EPS ECU connectors (2P brown, 2P gray and 21P gray).





## FRONT WHEEL/SUSPENSION/STEERING

Install the spring onto the selector cable.  
Insert the cable into the cable holder and connect it to the clutch arm with the joint pin and adjusting nut.  
Set the groove in the cable grommet onto the cover base end properly.  
Install the retaining plate onto the cable with the concave facing the cable holder to secure the cable.  
Adjust the 2WD/4WD selector cable (page 4-21).



Make sure all the hose, cables and wires are properly routed (page 1-47).

Install the following:

- handlebar cover (page 22-6)
- front wheels (page 14-13)
- front fender/carrier (page 3-7)
- mudguard (page 3-6)

*Refer to "Service Information" for service location of the initialization (page 14-4).*

Perform the torque sensor initialization (page 24-12).

## TIE-ROD

### REMOVAL

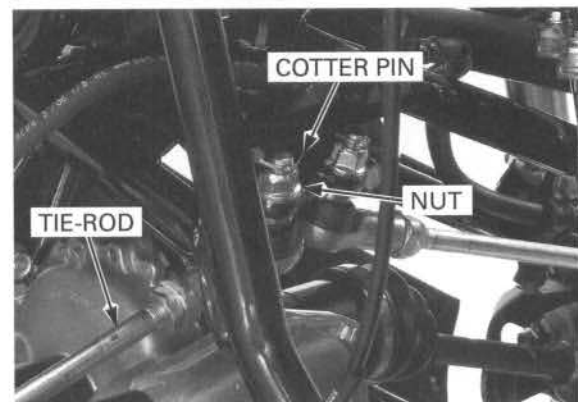
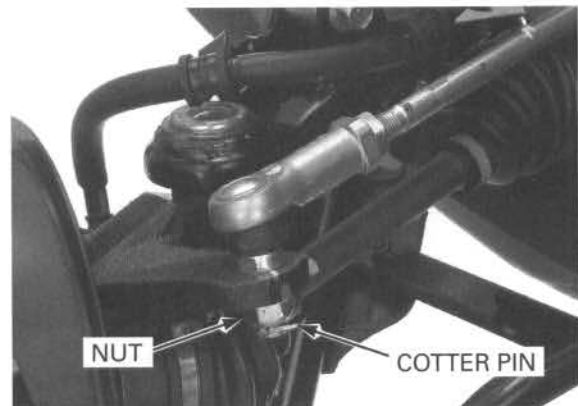
Remove the following:

- mudguards (page 3-6)
- front fender/carrier (page 3-7)
- front wheel (page 14-13)

Remove the cotter pins.

Remove the joint nuts by holding the joint stud flat surfaces with an open end wrench.

Remove the tie-rod from the steering arm and knuckle.





## INSPECTION

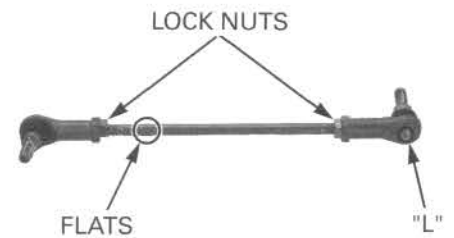
Inspect the tie-rod for distortion or damage.  
Inspect the ball joint boots for tears or other damage and the ball joints for looseness by moving the ball joint studs.  
They should move freely and smoothly without binding.



## DISASSEMBLY/ASSEMBLY

Loosen the lock nuts, and remove the ball joints and lock nuts from the tie-rod.

Install the right-hand threads nut and unmarked ball joint on the flat (wrench holding area for toe adjustment) side of the tie-rod, and the left-hand threads nut and "L" marked ball joint on the opposite side.

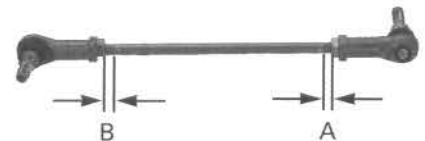


Note the reference distances (between the lock nut and thread end).

### REFERENCE DISTANCES:

TM/TE models:	A: 5.25 mm (0.207 in)
	B: 5.25 mm (0.207 in)
FM/FE/FPM/FPE models:	A: 5.45 mm (0.215 in)
	B: 5.45 mm (0.215 in)

A difference between distances A and B should be 3 mm (0.12 in) max.



*Tighten these nuts after installing the tie-rod and adjusting the toe.*

Temporarily tighten the lock nuts while the ball joint positions are approximately 180° from each other.



## FRONT WHEEL/SUSPENSION/STEERING

Install the tie-rod with the flats of the rod toward the knuckle.

Install new joint nuts and tighten them by holding the joint stud flat surfaces.

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

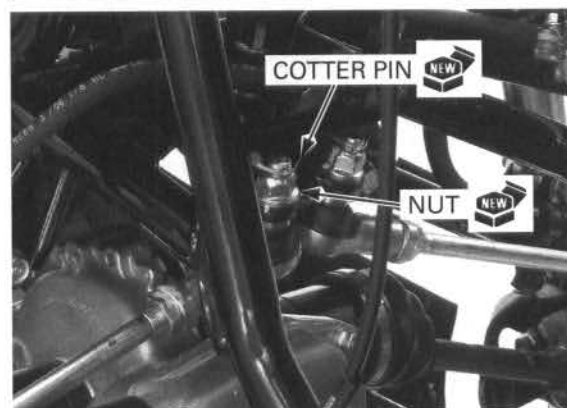
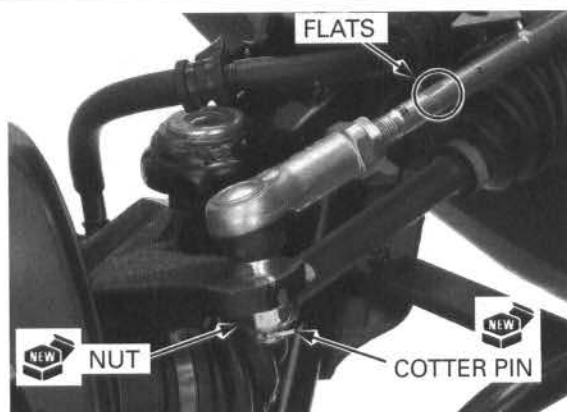
Install new cotter pins.

Install the front wheel (page 14-13).

Adjust the toe (page 4-29).

Install the following:

- front fender/carrier (page 3-7)
- mudguards (page 3-6)





# 15. REAR WHEEL/SUSPENSION

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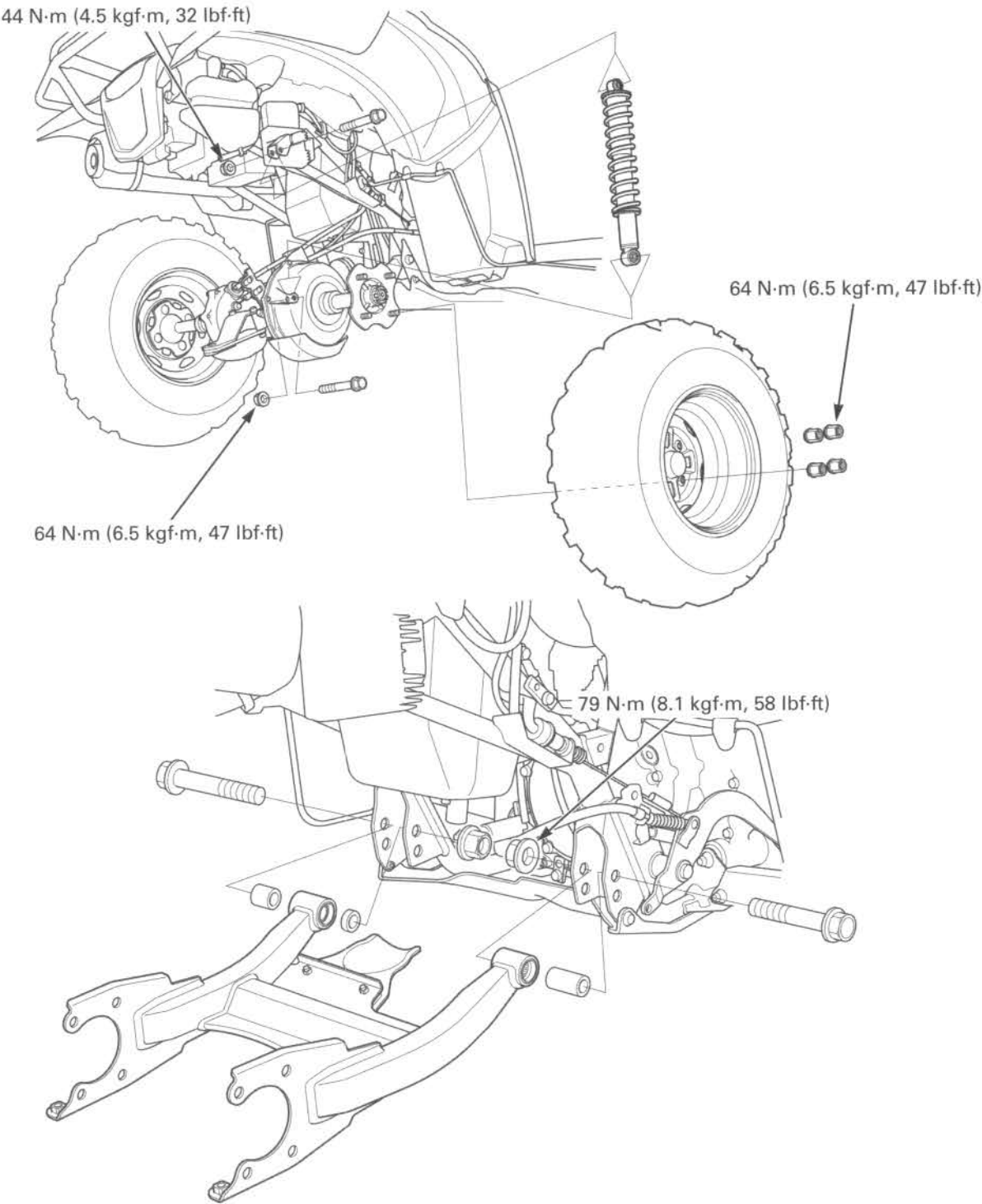
SYSTEM COMPONENTS .....	15-2	REAR WHEEL.....	15-6
SERVICE INFORMATION .....	15-3	REAR SHOCK ABSORBER .....	15-6
TROUBLESHOOTING .....	15-5	SWINGARM.....	15-8



REAR WHEEL/SUSPENSION

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SYSTEM COMPONENTS





## SERVICE INFORMATION

### GENERAL

- This section covers service of the rear wheel, rear shock absorber and swingarm.
- 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.
- For tire information, see Front Wheel/Suspension/Steering section (page 14-14).
- For brake system service, see Brake System section (page 16-2).
- For driving mechanism service, see Rear Driving Mechanism section (page 17-2).

### 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)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—

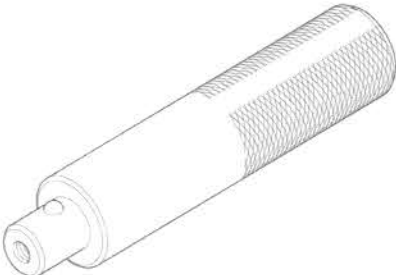
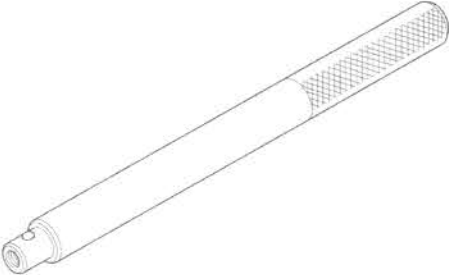





### TORQUE VALUES

Rear wheel nut	64 N·m (6.5 kgf·m, 47 lbf·ft)
Shock absorber upper mounting nut	44 N·m (4.5 kgf·m, 32 lbf·ft) Lock nut: replace with a new one.
Shock absorber lower mounting nut	64 N·m (6.5 kgf·m, 47 lbf·ft) Lock nut: replace with a new one.
Universal joint guard bolt	10 N·m (1.0 kgf·m, 7 lbf·ft) ALOC bolt: replace with a new one.
Swingarm pivot nut	79 N·m (8.1 kgf·m, 58 lbf·ft) Lock nut: replace with a new one.



REAR WHEEL/SUSPENSION

TOOLS

<p>Driver 07749-0010000</p> 	<p>Driver 07949-3710001</p> 	<p>Attachment, 24 x 26 mm 07746-0010700</p> 
<p>Attachment, 28 x 30 mm 07946-1870100</p> 	<p>Pilot, 12 mm 07746-0040200</p> 	<p>Pilot, 20 mm 07746-0040500</p> 
<p>Pilot, 25 mm 07746-0040600</p> 		



## TROUBLESHOOTING

### Rear wheel wobbling

- Bent rim
- Worn or damaged rear axle bearings
- Faulty tire
- Axle fastener not tightened properly
- Loose wheel hub nut
- Faulty swingarm pivot bearings

### Rear wheel hard to turn

- Faulty rear axle bearings
- Bent rear axle
- Rear brake drag

### Soft suspension

- Weak shock absorber spring
- Oil leakage from damper unit

### Stiff suspension

- Damaged shock absorber damper
- Faulty shock absorber pivot bushings
- Damaged swingarm pivot bearing

### Rear suspension noise

- Faulty rear shock absorber
- Loose rear suspension fasteners
- Worn rear suspension pivot bearings or bushings



## REAR WHEEL/SUSPENSION

### REAR WHEEL

#### REMOVAL

Loosen the wheel nuts.

Support the vehicle using a hoist or equivalent and raise the rear wheels off the ground.

Remove the wheel nuts and rear wheel.

For tire removal/installation and repair, see Front Wheel/Suspension/Steering section (page 14-14).

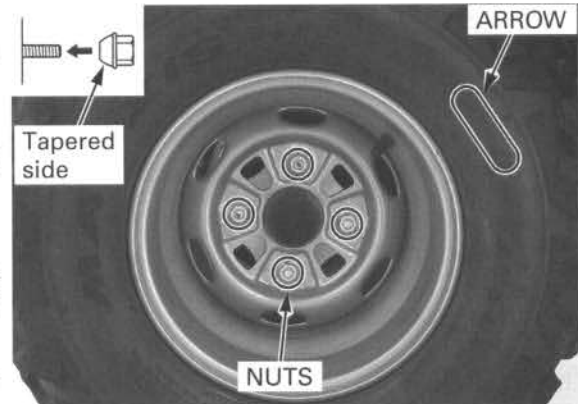
#### INSTALLATION

*Do not interchange  
the left and right  
wheels*

Install the rear wheel with the tire valve facing out and the arrow mark facing in the normal rotating direction.

Install the wheel nuts with the tapered side facing inward and tighten them.

**TORQUE:** 64 N·m (6.5 kgf·m, 47 lbf·ft)

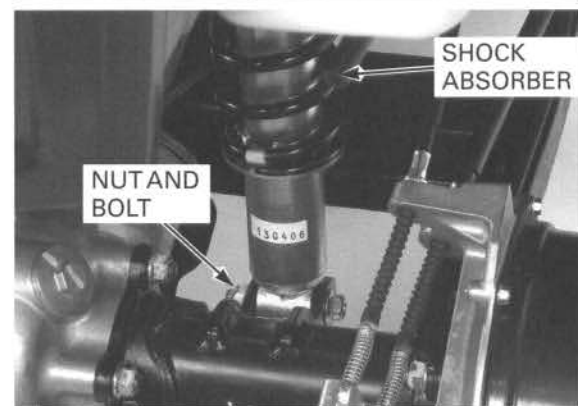


### REAR SHOCK ABSORBER

#### REMOVAL

Support the vehicle using a hoist or equivalent and raise the rear wheels off the ground.

Support the swingarm. Remove the nuts and bolts, and the shock absorber.

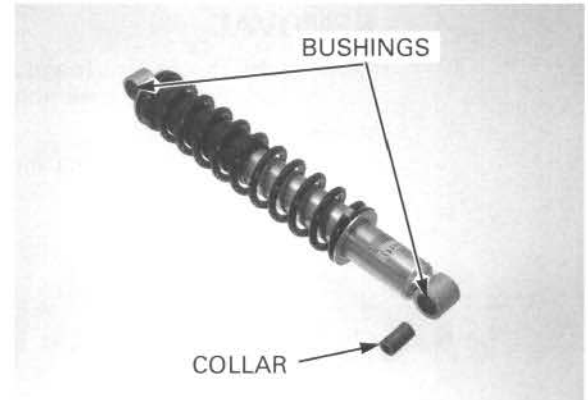




## INSPECTION

Remove the pivot collar.

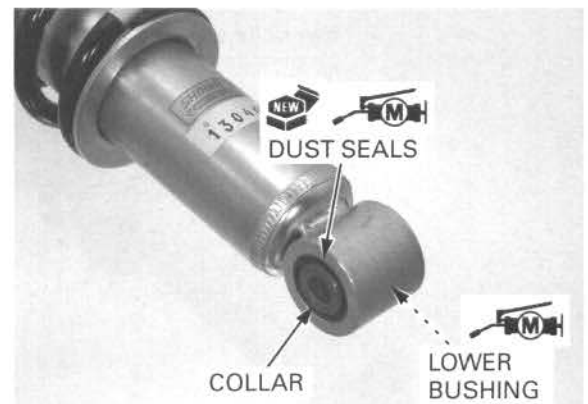
Check the pivot bushings for wear or damage.  
Check the damper unit for leakage or other damage.  
Replace the shock absorber assembly if necessary.



## INSTALLATION

Install new dust seals into the lower pivot with the lip side facing out until they are fully seated.  
Apply molybdenum disulfide grease to the lower pivot bushing and dust seal lips.

Install the pivot collar.



*Insert the bolts from the right side.*

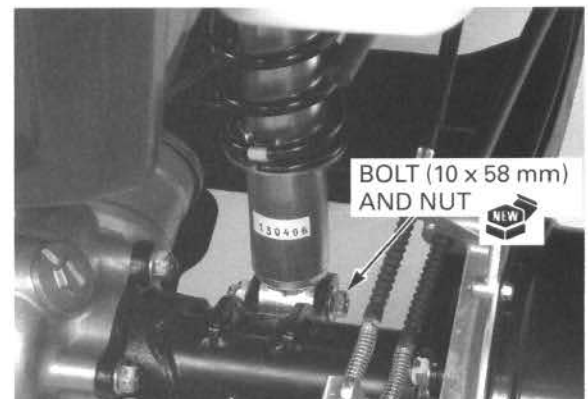
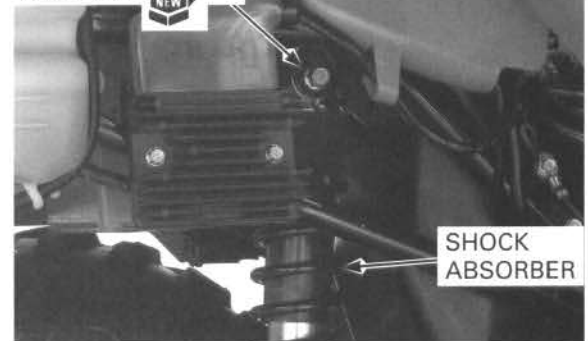
Install the shock absorber with the mounting bolts and new nuts, and tighten them.

### TORQUE:

Upper: 44 N·m (4.5 kgf·m, 32 lbf·ft)

Lower: 64 N·m (6.5 kgf·m, 47 lbf·ft)

BOLT (10 x 50 mm) AND NUT





## SWINGARM

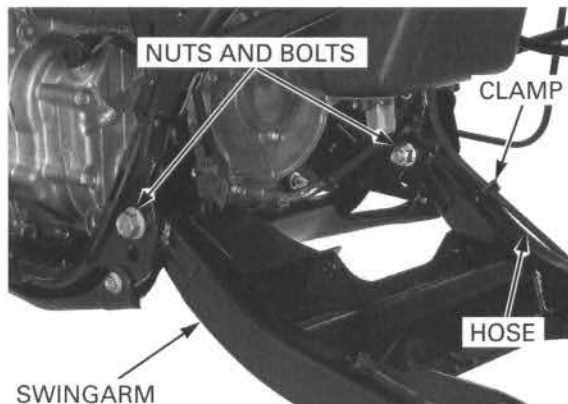
### REMOVAL

Remove the mudguards (page 3-6)

Remove the final gear assembly (page 18-8).

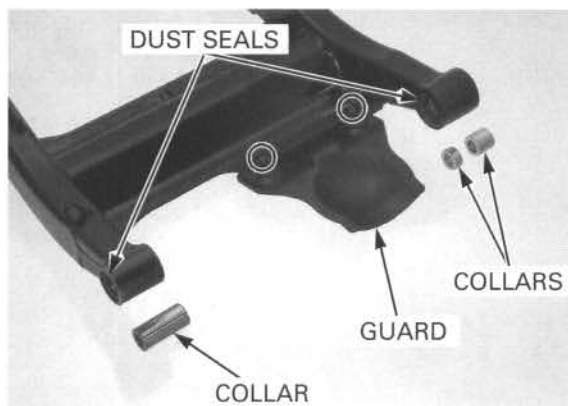
Remove the following:

- breather hose (from the clamp)
- pivot nuts and bolts
- swingarm



- two bolts and universal joint guard
- pivot collars
- dust seals

Check the bearings in the pivots for wear or damage.



### BEARING REPLACEMENT

#### REMOVAL

Press the needle bearing out of the right pivot using the special tool.

#### TOOLS:

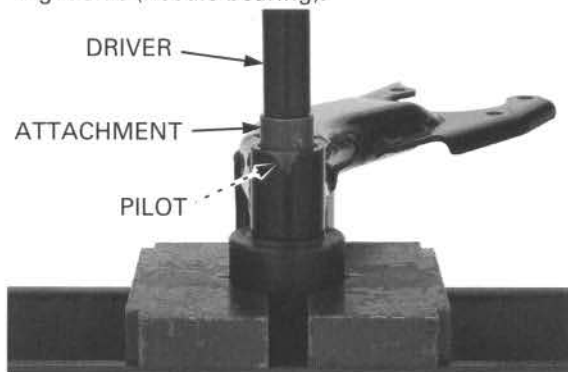
Driver	07949-3710001
Attachment, 24 x 26 mm	07746-0010700
Pilot, 20 mm	07746-0040500

Press the ball bearing and setting collar out of the left pivot.

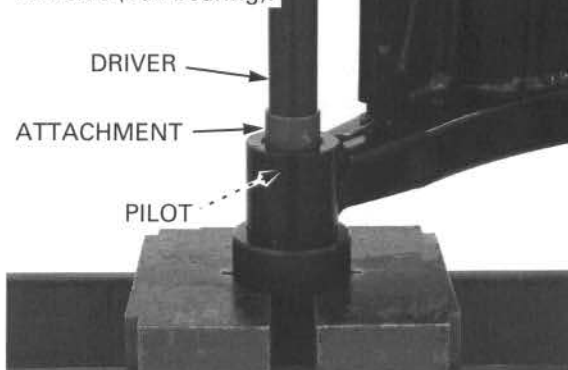
#### TOOLS:

Driver	07949-3710001
Attachment, 24 x 26 mm	07746-0010700
Pilot, 12 mm	07746-0040200

Right side (needle bearing):



Left side (ball bearing):





## INSTALLATION

Apply molybdenum disulfide grease to the rollers of a new needle bearing.

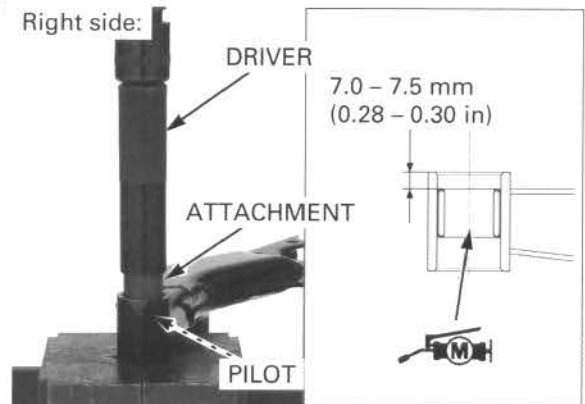
*Press in the bearing with the marked side facing up.*

Press the needle bearing into the right pivot until the depth from the outer surface is 7.0 – 7.5 mm (0.28 – 0.30 in).

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 24 x 26 mm</b>	<b>07746-0010700</b>
<b>Pilot, 20 mm</b>	<b>07746-0040500</b>

Pack grease into the cavity of a new ball bearing.



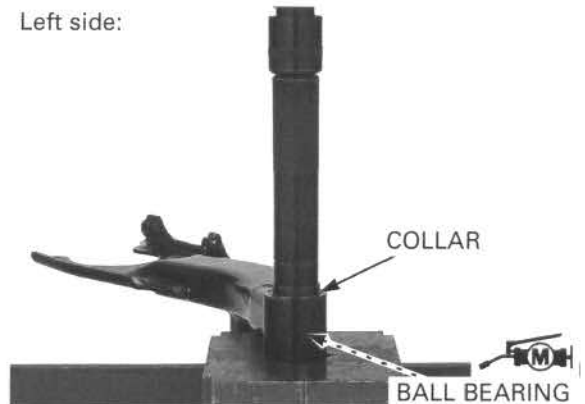
Pack molybdenum disulfide grease into the cavity of a new ball bearing.

*Press in the bearing with the marked side facing up.*

Press the ball bearing and the collar into the left pivot until they are fully seated.

### TOOLS:

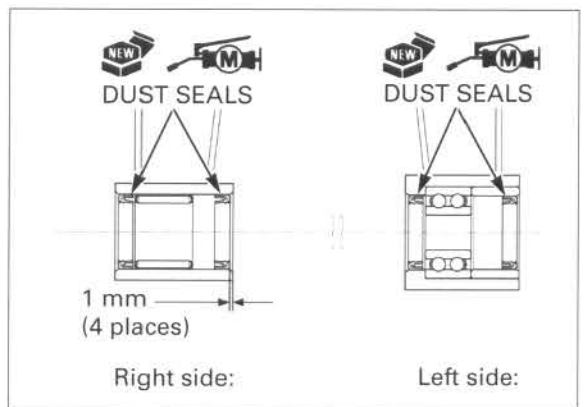
<b>Bearing:</b>	
Driver	07749-0010000
Attachment, 28 x 30 mm	07946-1870100
Pilot, 12 mm	07746-0040200
<b>Collar:</b>	
Driver	07749-0010000
Attachment, 28 x 30 mm	07946-1870100
Pilot, 25 mm	07746-0040600



## INSTALLATION

Pack molybdenum disulfide grease into the seal lip cavity of each new dust seal.

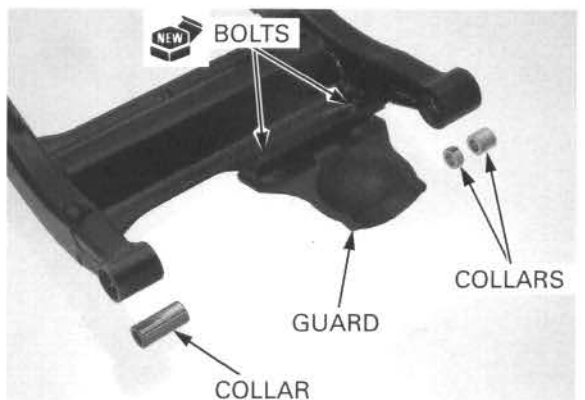
Install the dust seals until the depth from the outer surface is 1 mm.



Install the pivot collars in position as shown.

Install the universal joint guard with new bolts and tighten them.

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





## REAR WHEEL/SUSPENSION

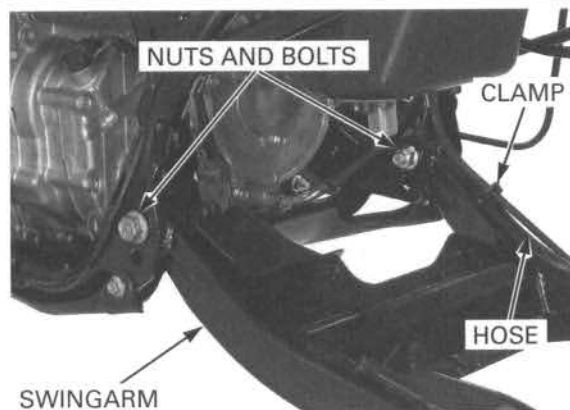
*Insert the bolts from the outside.* Install the swingarm with the pivot bolts and new nuts, and tighten them.

**TORQUE: 79 N·m (8.1 kgf·m, 58 lbf·ft)**

Install the breather hose into the clamp.

Install the following:

- final gear assembly (page 18-21)
- mudguards (page 3-6)





## 16. BRAKE SYSTEM

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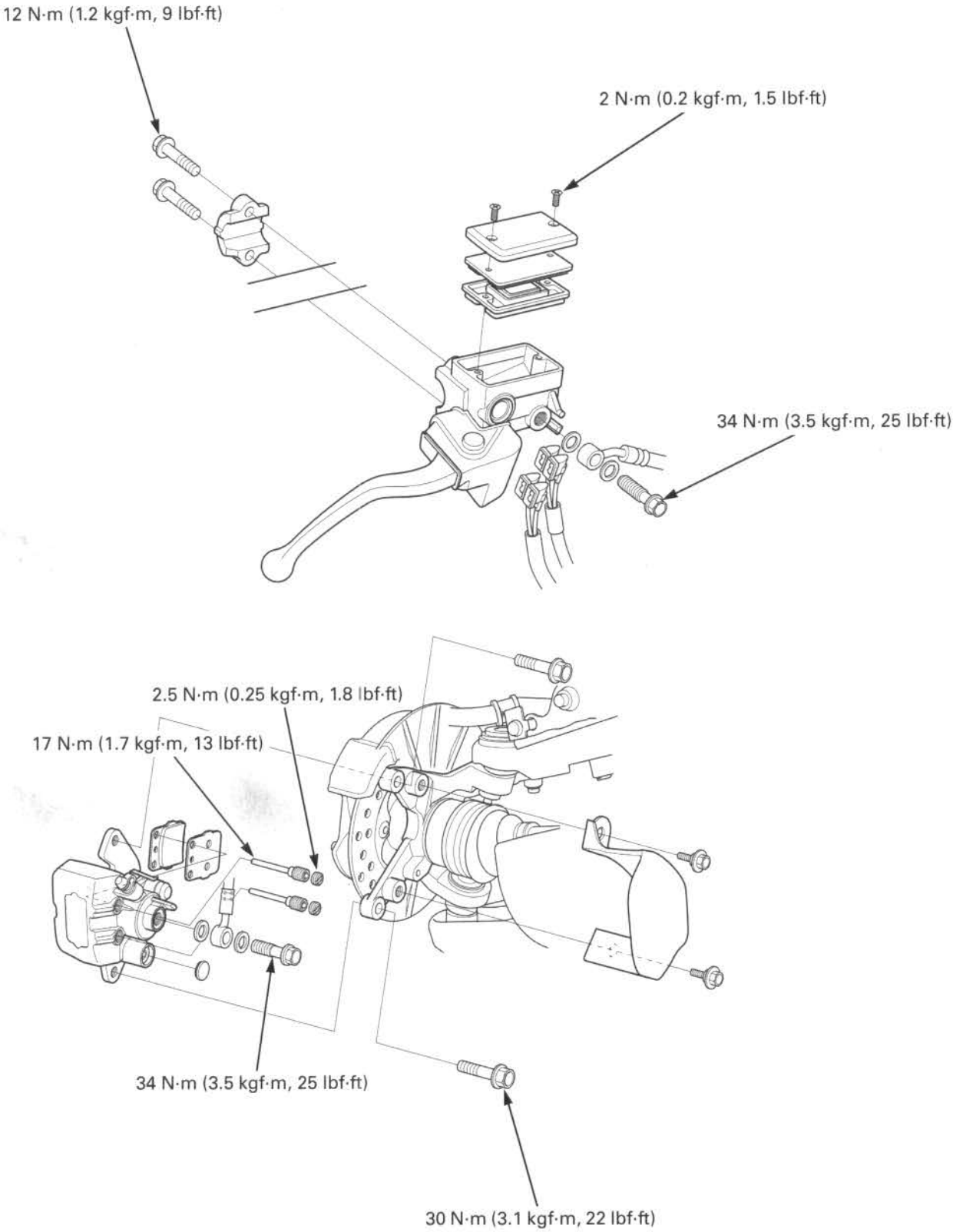
SYSTEM COMPONENTS .....	16-2	BRAKE PAD/DISC .....	16-8
SERVICE INFORMATION .....	16-4	FRONT MASTER CYLINDER.....	16-10
TROUBLESHOOTING .....	16-6	FRONT BRAKE CALIPER.....	16-14
BRAKE FLUID REPLACEMENT/ AIR BLEEDING .....	16-7	REAR BRAKE DRUM/SHOES .....	16-18
		REAR BRAKE PEDAL.....	16-25



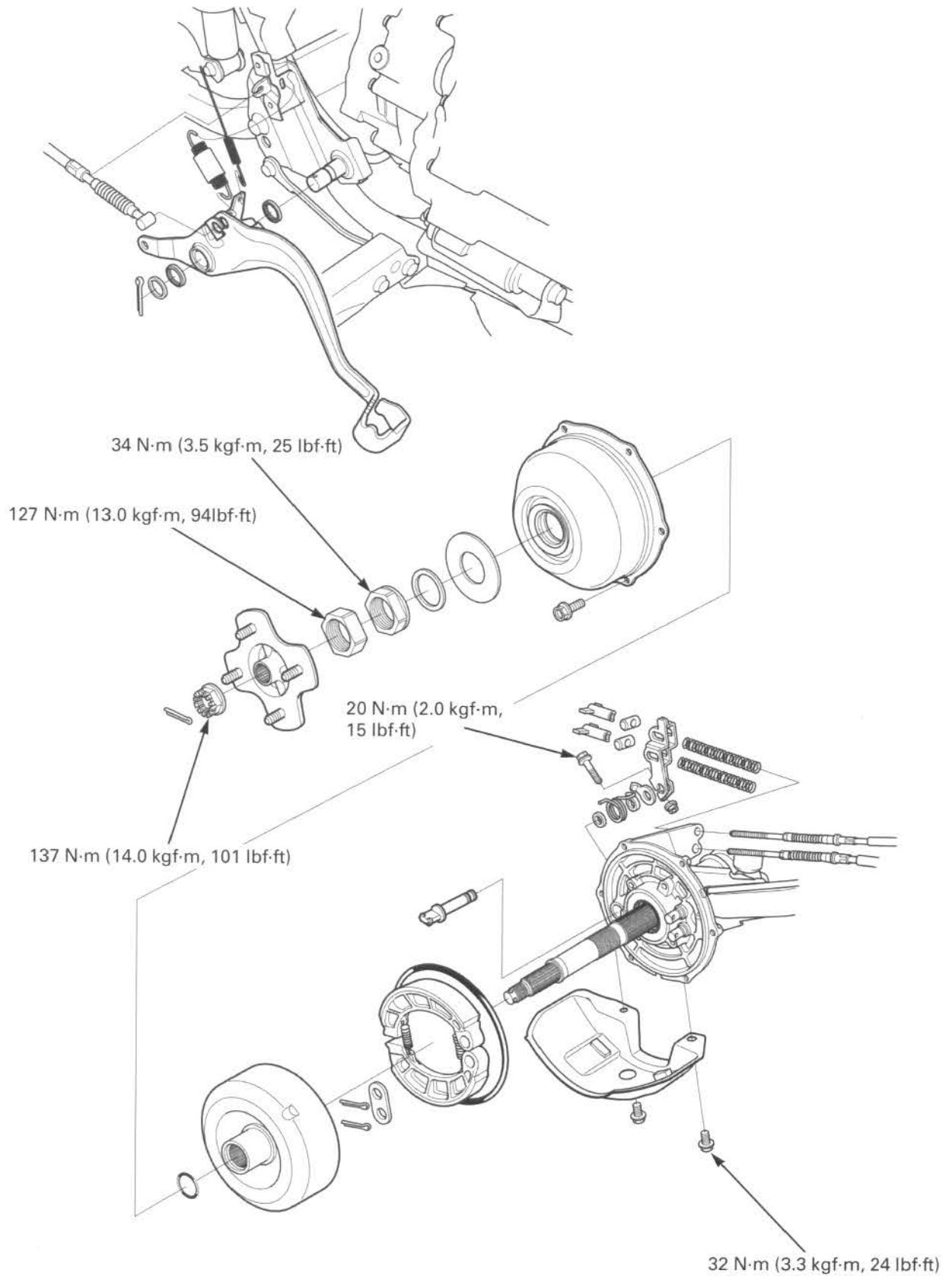
**BRAKE SYSTEM**

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**SYSTEM COMPONENTS**









## BRAKE SYSTEM

# SERVICE INFORMATION

## GENERAL

### ⚠ CAUTION

Frequent inhalation of brake pad or 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.

### NOTICE

*Spilled brake fluid will severely damage instrument lenses and painted surfaces. It is also harmful to some rubber parts. Be careful whenever you remove the reservoir cap; make sure the front reservoir is horizontal first.*

- A contaminated brake disc, pad, drum or shoe reduces stopping power. Discard contaminated pads or shoes, and clean a contaminated disc or drum with a high quality brake degreasing agent.
- 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 riding the vehicle.
- When using the torque wrench adaptor, use a deflecting beam type torque wrench 20-inches long. The wrench adaptor increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the nut. The specification given is the actual torque applied to the 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

		Unit: mm (in)	
ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	Honda DOT 4 brake fluid	—
	Disc thickness	3.8 – 4.2 (0.15 – 0.17)	3.0 (0.12)
	Disc runout	—	0.30 (0.012)
	Master cylinder I.D.	14.000 – 14.043 (0.5512 – 0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957 – 13.984 (0.5495 – 0.5506)	13.945 (0.5490)
	Caliper cylinder I.D.	32.030 – 32.080 (1.2610 – 1.2630)	32.090 (1.2634)
	Caliper piston O.D.	31.984 – 31.998 (1.2578 – 1.2598)	31.94 (1.257)
Rear brake	Drum I.D.	160.0 – 160.2 (6.30 – 6.31)	161.0 (6.34)
	Shoe lining thickness	5.3 (0.21)	To index mark

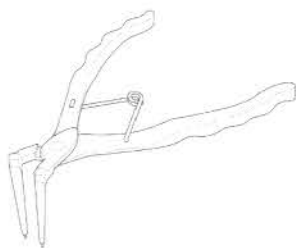
## TORQUE VALUES

Brake hose oil bolt	34 N·m (3.5 kgf·m, 25 lbf·ft)
Front brake caliper bleed valve	5.4 N·m (0.55 kgf·m, 4.0 lbf·ft)
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m, 1.5 lbf·ft)
Pad pin	17 N·m (1.7 kgf·m, 13 lbf·ft)
Pad pin plug	2.4 N·m (0.24 kgf·m, 1.8 lbf·ft)
Front brake light/inhibitor switch screw	1.2 N·m (0.12 kgf·m, 0.9 lbf·ft) Apply locking agent to the threads.
Front brake lever pivot bolt	5.9 N·m (0.60 kgf·m, 4.4 lbf·ft)
Front brake lever pivot nut	5.9 N·m (0.60 kgf·m, 4.4 lbf·ft)
Front master cylinder holder bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Front brake caliper mounting bolt	30 N·m (3.1 kgf·m, 22 lbf·ft) ALOC bolt: replace with a new one.
Front brake caliper slide pin	22 N·m (2.2 kgf·m, 16 lbf·ft) Apply locking agent to the threads.
Front brake caliper bracket pin	17 N·m (1.7 kgf·m, 13 lbf·ft)
Rear brake arm pinch bolt	20 N·m (2.0 kgf·m, 15 lbf·ft)
Axle nut (inner)	39 N·m (4.0 kgf·m, 29 lbf·ft) Apply locking agent to the threads.
Axle lock nut (outer)	127 N·m (13.0 kgf·m, 94 lbf·ft) Apply locking agent to the threads.
Rear brake panel skid plate bolt	32 N·m (3.3 kgf·m, 24 lbf·ft) ALOC bolt: replace with a new one.
Rear wheel hub nut	137 N·m (14.0 kgf·m, 101 lbf·ft) Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Rear brake panel drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Brake pipe joint bolt	14 N·m (1.4 kgf·m, 10 lbf·ft)



## TOOLS

Snap ring pliers  
07914-SA50001

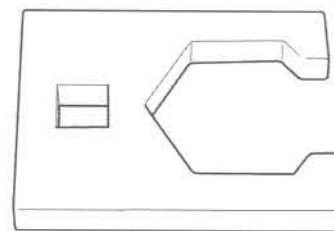


Attachment  
07965-MC70100

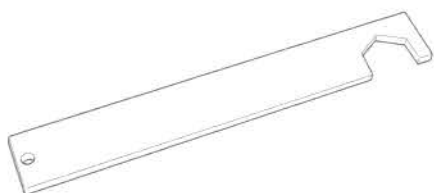


or 070MF-MEC0300

Axle nut torque wr. adaptor, 41 mm  
07916-958010B



Axle nut holder wrench, 41 mm  
07916-958020B





## BRAKE SYSTEM

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### TROUBLESHOOTING

#### FRONT DISC BRAKE

##### Brake lever soft or spongy

- Air in hydraulic system
- Leaking hydraulic system
- Contaminated brake pad/disc
- Worn caliper piston seal
- Worn master cylinder piston cups
- Worn brake pad/disc
- Contaminated caliper
- Contaminated master cylinder
- Caliper not sliding properly
- Low brake fluid level
- Clogged fluid passage
- Warped/deformed brake disc
- Sticking/worn caliper piston
- Sticking/worn master cylinder piston
- Bent brake lever

##### Brake lever hard

- Clogged/restricted brake system
- Sticking/worn caliper piston
- Sticking/worn master cylinder piston
- Caliper not sliding properly
- Bent brake lever

##### Brake drags

- Contaminated brake pad/disc
- Badly worn brake pad/disc
- Warped/deformed brake disc
- Caliper not sliding properly
- Clogged/restricted fluid passage
- Sticking caliper piston

#### REAR DRUM BRAKE

##### Poor brake performance

- Brake not adjusted properly
- Worn or contaminated brake shoes
- Worn or contaminated brake drum
- Water in brake drum
- Incorrectly installed rear brake arm
- Worn rear brake cam

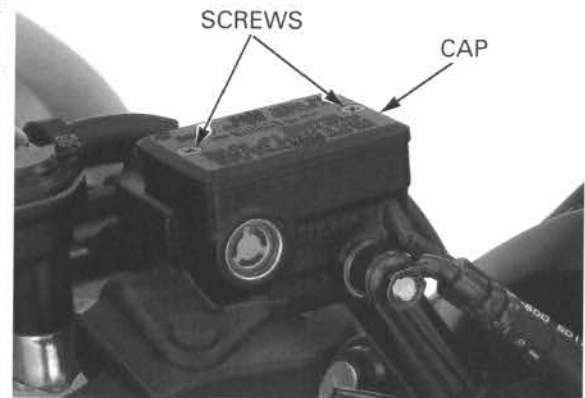


## BRAKE FLUID REPLACEMENT/AIR BLEEDING

### BRAKE FLUID DRAINING

Turn the handlebar to the left until the reservoir is level before removing the reservoir cap.

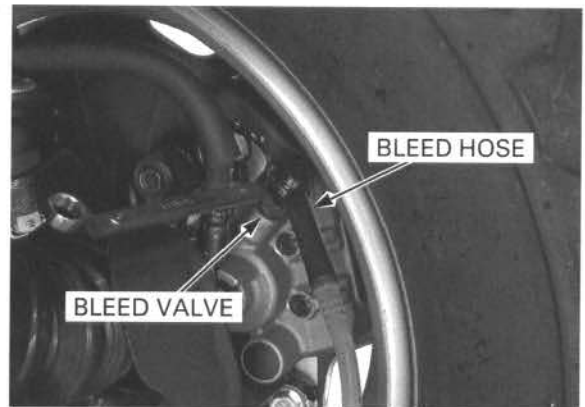
Remove the screws, reservoir cap, set plate and diaphragm.



Connect a bleed hose to the front brake caliper bleed valve.

Loosen the bleed valve and pump the front brake lever until no more fluid flows out of the bleed valve.

Perform above procedure for the other side bleed valve.



### BRAKE FLUID FILLING/BLEEDING

Close each brake caliper bleed valve.

Fill the master cylinder reservoir with DOT 4 brake fluid from a sealed container.

*Follow the manufacturer's operating instructions.*

Connect a commercially available brake bleeder to the bleed valve.

Operate the brake bleeder and loosen the bleed valve.

*Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.*

If an automatic refill system is not used, add fluid when the fluid level in the reservoir is low.

*If air enters the bleeder from around the bleed valve threads, seal the threads with teflon tape.*

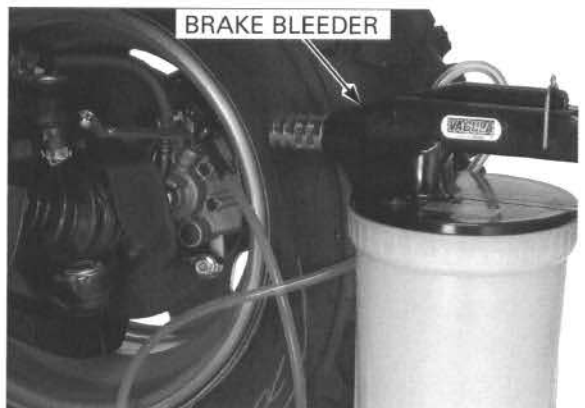
Perform the bleeding procedure until the system is completely flushed/bled.

Tighten the bleed valve.

**TORQUE: 5.4 N·m (0.55 kgf·m, 4.0 lbf·ft)**

Perform air bleeding for the other side bleed valve.

After bleeding air, operate the front brake lever. If it still feels spongy, bleed the system again.





## BRAKE SYSTEM

If the brake bleeder is not available, perform the following procedure:

Pump up the system pressure with the front brake lever until the lever resistance is felt.

Connect a bleed hose to the front brake caliper bleed valve and bleed the system as follows:

*Do not release the brake lever until the bleed valve has been closed.*

1. Squeeze the brake lever all the way and loosen the bleed valve 1/4 of a turn. Wait several seconds and then close the bleed valve.
2. Release the brake lever slowly and wait several seconds after it reaches the end of its travel.
3. Repeat the steps 1 and 2 until there are no air bubbles in the bleed hose.

Tighten the bleed valve.

**TORQUE: 5.4 N·m (0.55 kgf·m, 4.0 lbf·ft)**

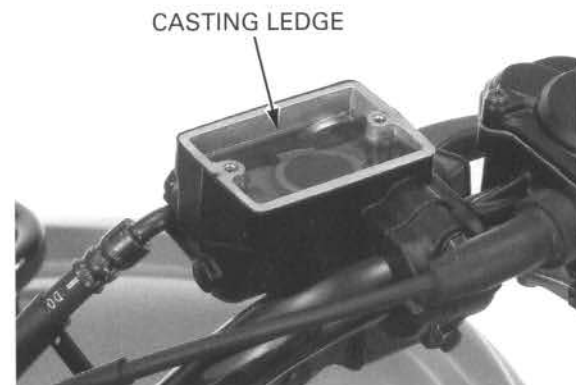
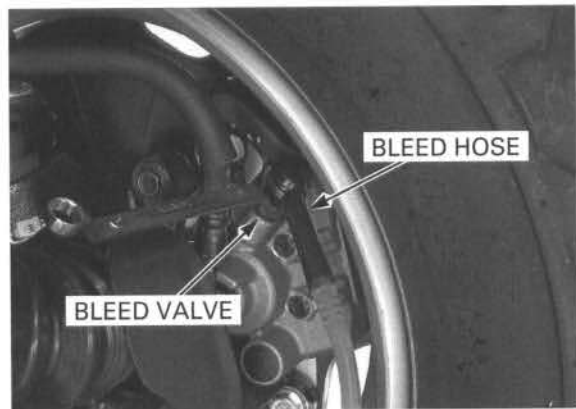
Perform air bleeding for the other side bleed valve.

After bleeding air, operate the front brake lever. If it still feels spongy, bleed the system again.

Fill the master cylinder reservoir to the casting ledge with 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, 1.5 lbf·ft)**



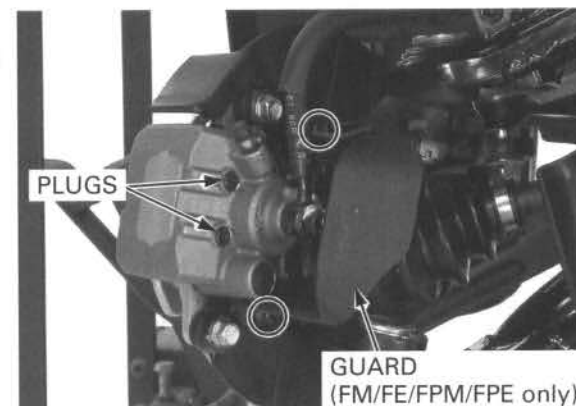
## BRAKE PAD/DISC

### BRAKE PAD REPLACEMENT

Remove the front wheel (page 14-13).

FM/FE/FPM/FPE only: Remove the two bolts and drive shaft guard.

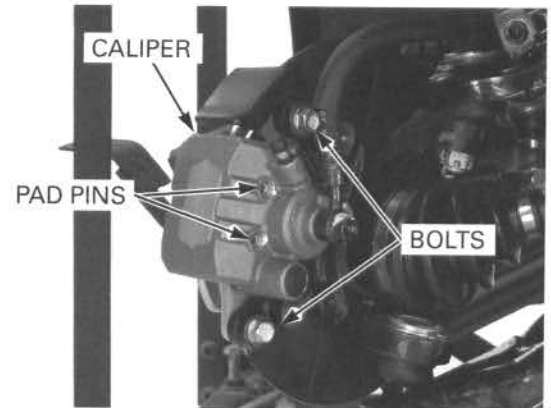
Remove the pad pin plugs.





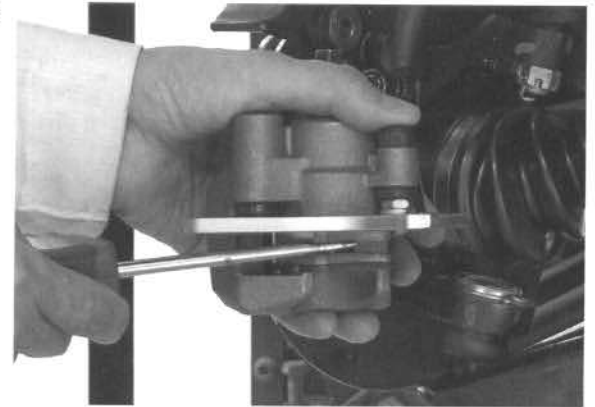
Loosen the pad pins.

Remove the two mounting bolts and brake caliper.



*Check the fluid level in the master cylinder reservoir as this operation causes the fluid level to rise.*

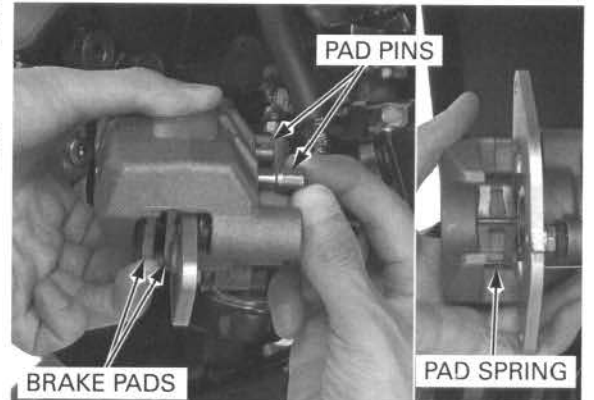
Push the caliper piston all the way in by prying the brake pads to allow installation of new pads.



Pull the pad pins out of the caliper while pushing the brake pads in against the pad spring, and remove the pads.

*Make sure the pad spring is installed correctly. Always replace the brake pads in pairs to ensure even disc pressure.*

Install new brake pads into the caliper body. Align the pad pin holes in the caliper body and pads by pushing the pads in against the pad spring, and install the pad pins.



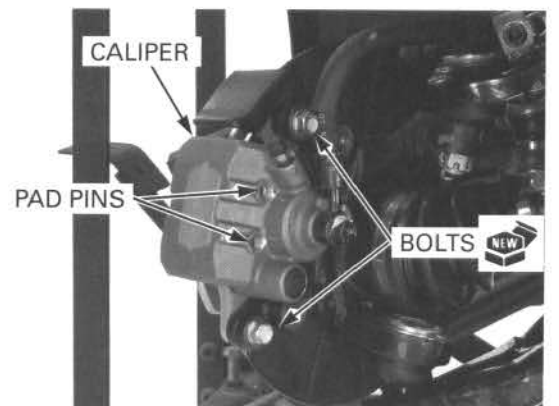
Install the brake caliper so the disc is positioned between the pads, being careful not to damage the pads.

Install new mounting bolts and tighten them.

**TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)**

Tighten the pad pins.

**TORQUE: 17 N·m (1.7 kgf·m, 13 lbf·ft)**





## BRAKE SYSTEM

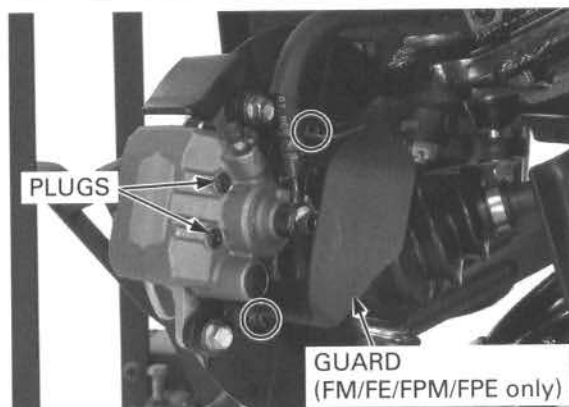
Install the pad pin plugs and tighten them.

**TORQUE: 2.4 N·m (0.24 kgf·m, 1.8 lbf·ft)**

FM/FE/FPM/FPE only: Install the drive shaft guard and tighten the bolts.

Squeeze the front brake lever to seat the caliper piston against the pad.

Install the rear wheel (page 14-13).



### BRAKE DISC INSPECTION

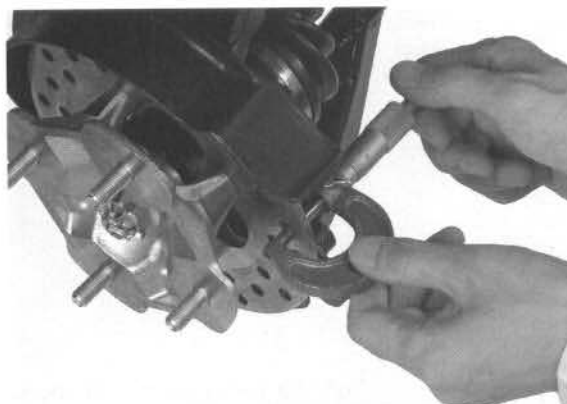
Remove the brake caliper without disconnecting the brake hose (page 16-14).

Visually inspect the brake disc for damage or crack.

Measure the brake disc thickness at several points.

**SERVICE LIMIT: 3.0 mm (0.12 in)**

Replace the brake disc if the smallest measurement is less than service limit.



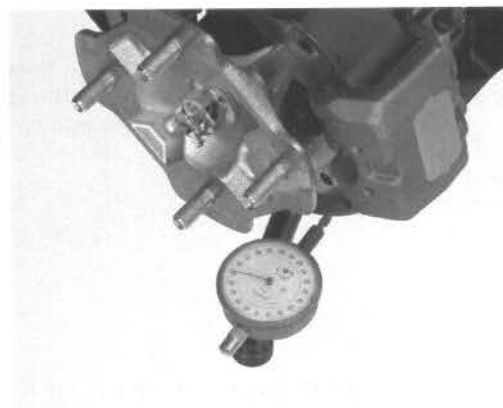
Check the brake disc for warpage.

**SERVICE LIMIT: 0.30 mm (0.012 in)**

Check the front wheel hub bearings or knuckle bearing for excessive play, if the warpage exceeds the service limit.

Replace the brake disc if the bearings are normal.

Brake disc replacement (page 14-20)



## FRONT MASTER CYLINDER

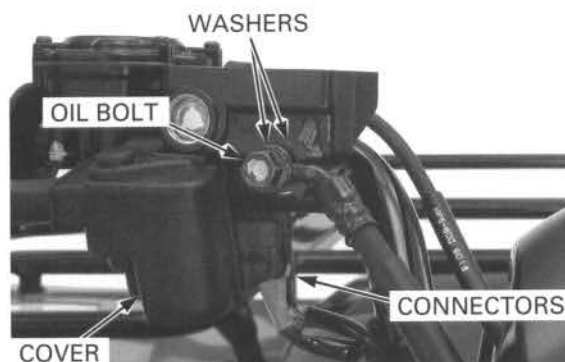
### DISASSEMBLY

Drain the brake fluid (page 16-7).

Remove the dust cover and disconnect the connectors from the brake and brake light switches.

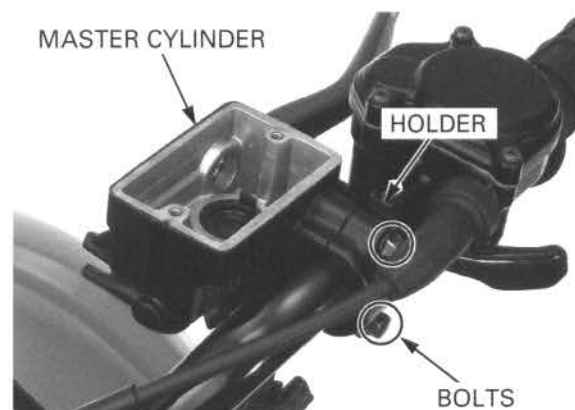
Disconnect the brake hose by removing the oil bolt and sealing washers.

*When removing the oil bolt, cover the end of the hose to prevent contamination.*



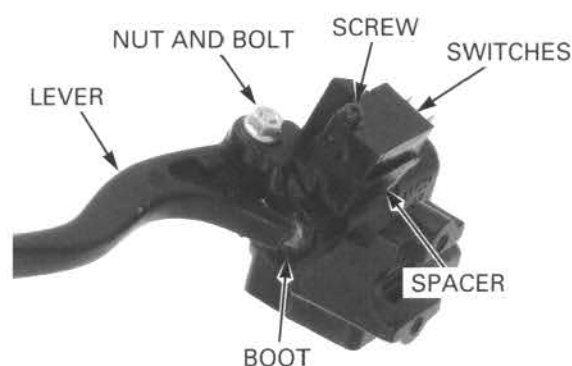


Remove the two bolts, holder and master cylinder.



Remove the following from the master cylinder:

- switch screw
- switches and spacer
- pivot nut and bolt
- brake lever
- piston boot

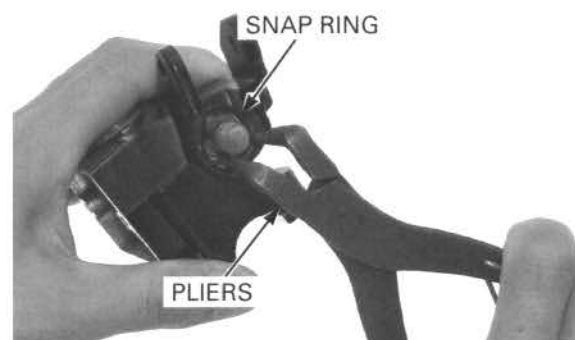


- snap ring

**TOOL:**

Snap ring pliers

07914-SA50001

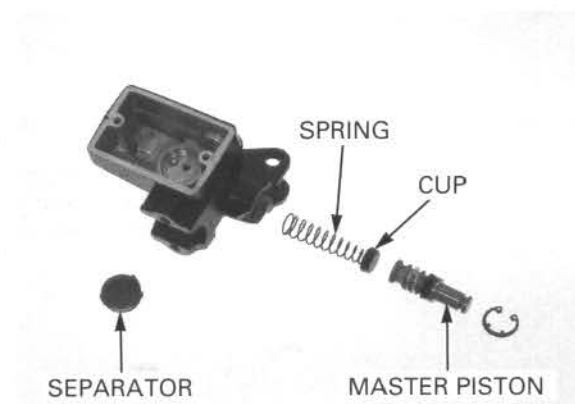


- master piston
- primary cup
- spring
- separator

Clean the master cylinder, reservoir and master piston in clean brake fluid.

## INSPECTION

Check the piston cups and boot for wear, deterioration or damage.  
Check the spring for damage.  
Check the master cylinder and piston for scoring, scratches or damage.





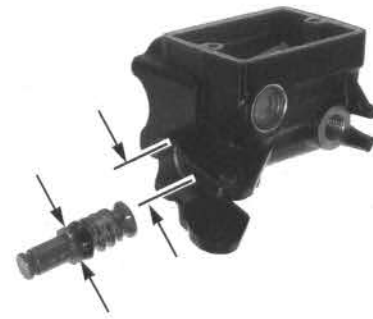
## BRAKE SYSTEM

Measure the master cylinder I.D.

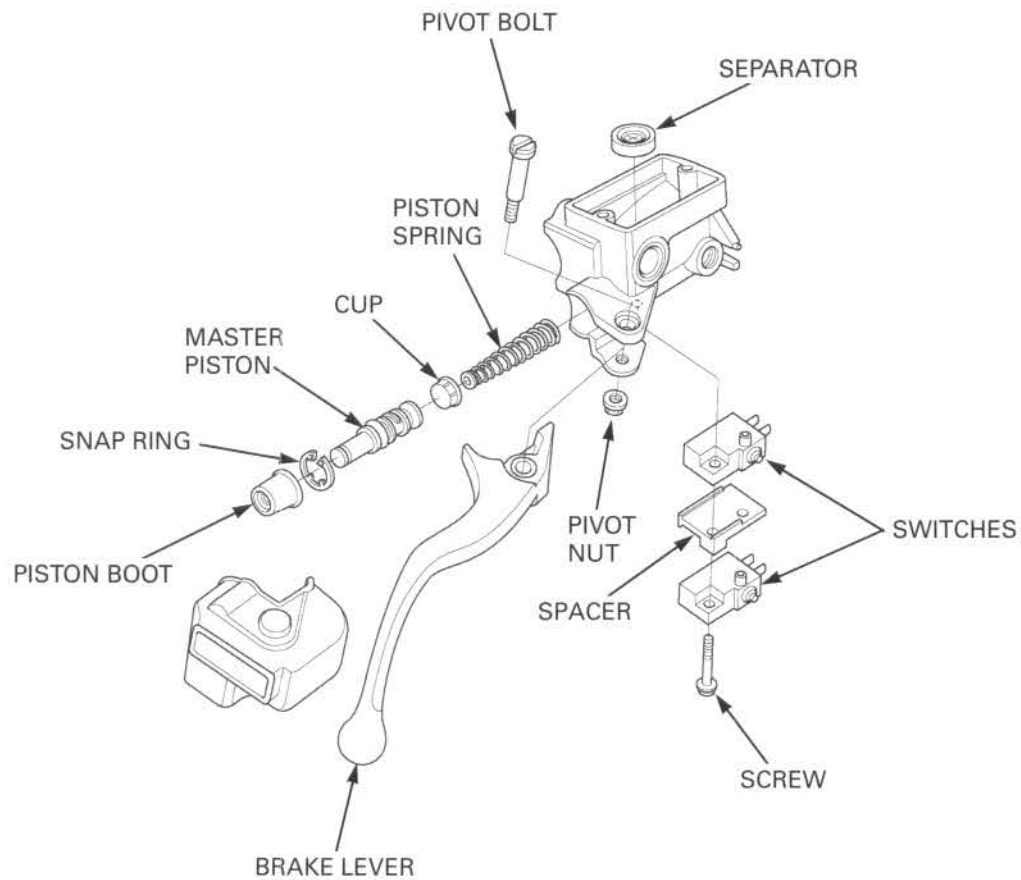
**SERVICE LIMIT: 14.055 mm (0.5533 in)**

Measure the master piston O.D.

**SERVICE LIMIT: 13.945 mm (0.5490 in)**

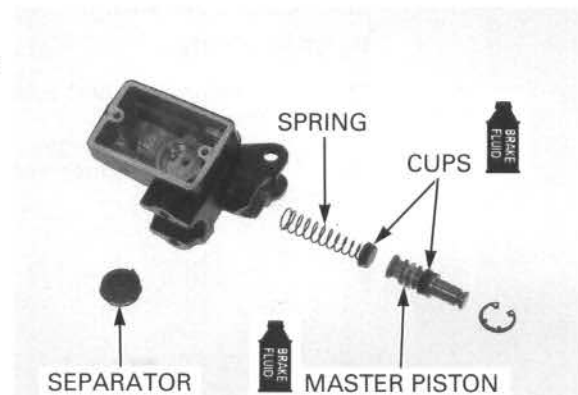


## ASSEMBLY



*Do not allow the piston cup lips to turn inside out.*

Coat the master piston and piston cups with clean brake fluid.  
Install the separator into the master cylinder.  
Install the primary cup onto the spring.  
Install the spring and master piston into the master cylinder.





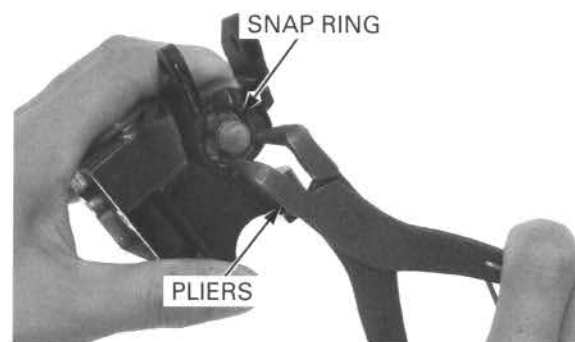
*Make sure the snap ring is firmly seated in the groove.*

Install the snap ring into the groove in the master cylinder using the special tool.

**TOOL:**

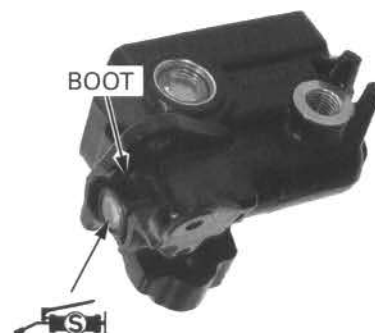
Snap ring pliers

07914-SA50001



Install the boot into the master cylinder and the piston groove.

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.

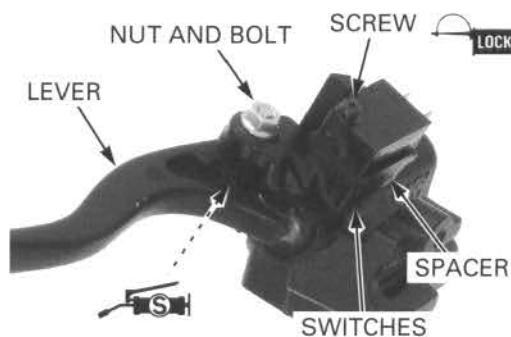
**TORQUE: 5.9 N·m (0.60 kgf·m, 4.4 lbf·ft)**

Install the pivot nut and tighten it.

**TORQUE: 5.9 N·m (0.60 kgf·m, 4.4 lbf·ft)**

Apply locking agent to the switch screw threads. Install the spacer, brake and brake light switches with the screw.

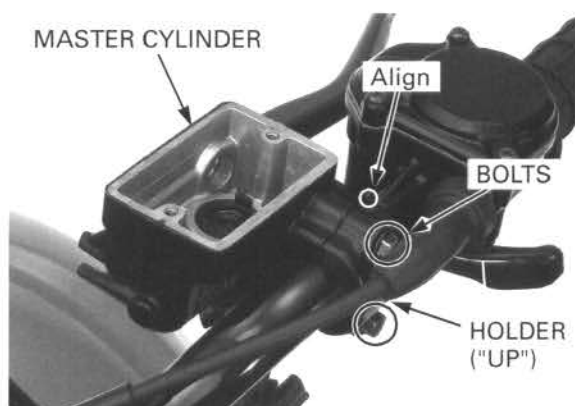
**TORQUE: 1.2 N·m (0.12 kgf·m, 0.9 lbf·ft)**



*Align the edge of the master cylinder with the punch mark on the handlebar.*

Install the brake master cylinder and holder with the "UP" mark facing up. Tighten the upper bolt first, then tighten the lower bolt.

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





## BRAKE SYSTEM

Set the brake hose joint between the stopper groove in the master cylinder.  
Connect the brake hose with the oil bolt and new sealing washers, and tighten the oil bolt.

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

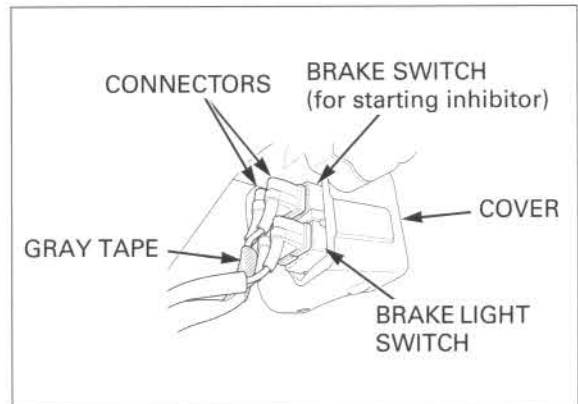


*Connect the gray tape wire connectors to the upper terminals.*

Connect the connectors to the brake and brake light switches.

Install the dust cover properly.

Fill and bleed the hydraulic system (page 16-7).



## FRONT BRAKE CALIPER

### DISASSEMBLY

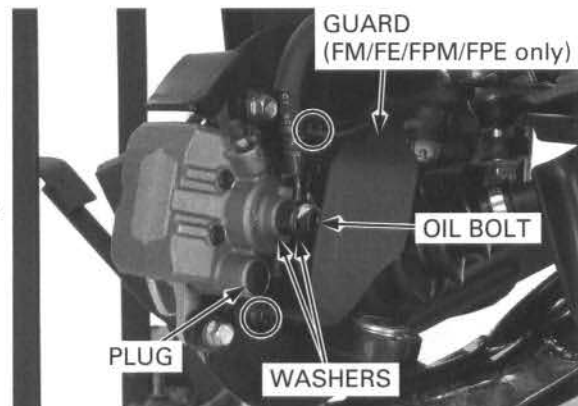
Remove the front wheel (page 14-13).

Drain the brake fluid (page 16-7).

FM/FE/FPM/FPE only: Remove the two bolts and drive shaft guard.

Remove the slide pin plug.

Disconnect the brake hose by removing the oil bolt and sealing washer.



Loosen the slide pin.

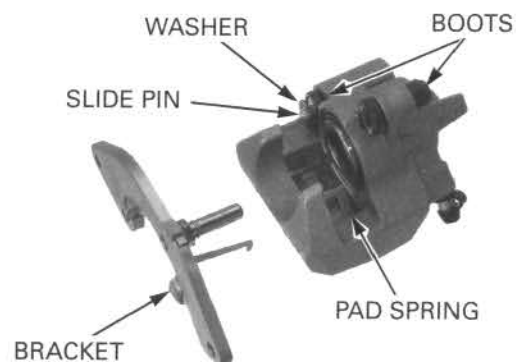
Remove the brake pads (page 16-8).





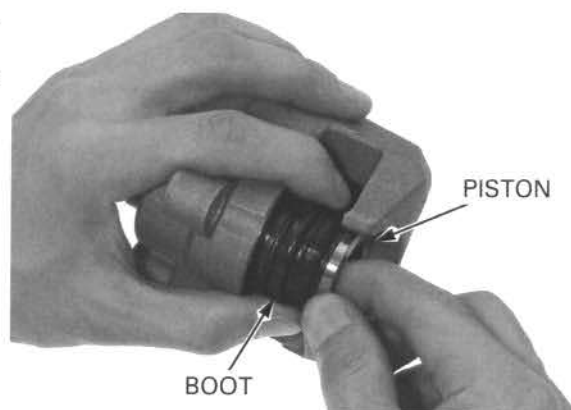
Remove the following:

- caliper bracket (loosen the slide pin)
- spring washer
- pad spring
- slide pin (by releasing the boot rib from the pin groove)
- slide pin boot
- bracket pin boot



*Take care not to damage the piston with the caliper body.*

Remove caliper piston out of the cylinder by pushing it through the fluid inlet. Release the piston boot from the piston groove to remove them.



*Be careful not to damage the piston sliding surface.*

Push the piston seal in and lift it out.

Clean the seal and boot grooves, caliper cylinder, and piston with clean brake fluid.



## INSPECTION

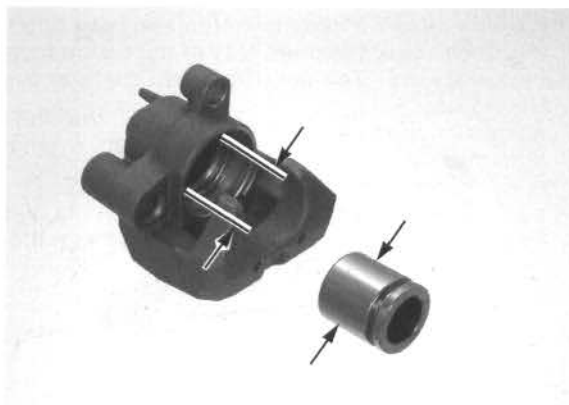
Check the caliper cylinder and piston for scoring, scratches or damage.

Measure the caliper cylinder I.D.

**SERVICE LIMIT: 32.090 mm (1.2634 in)**

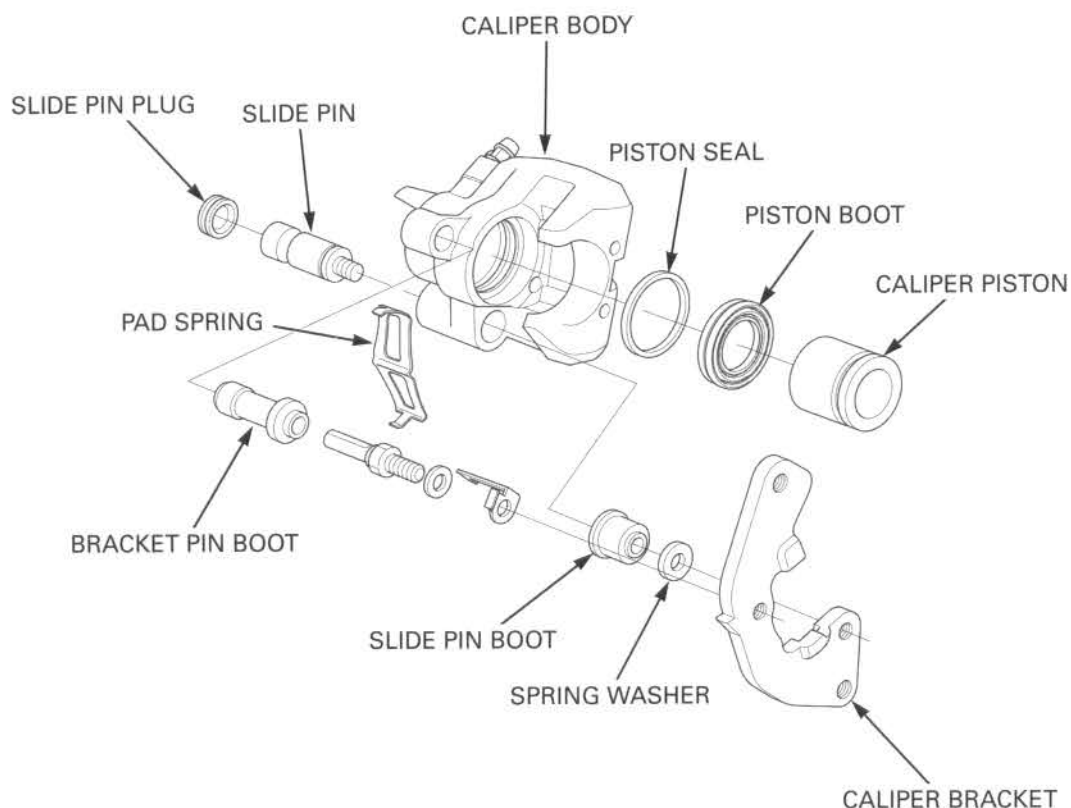
Measure the caliper piston O.D.

**SERVICE LIMIT: 31.94 mm (1.257 in)**





## ASSEMBLY



Coat a new piston seal with clean brake fluid and install it into the seal groove in the caliper cylinder.

Apply silicone grease to the inside of a new piston boot.

Coat the caliper piston with clean brake fluid.



*Cover the caliper body with protective tape or a shop towel to prevent damaging the piston.*

Place the piston and boot into the caliper body with the open side of the piston toward the brake pad. Temporarily install the boot over the piston end.

Set the inside boot rib into the groove in the caliper cylinder properly with a small, flat blade screwdriver.

Push the piston and set the outside boot rib into the groove in the piston to seat the piston.

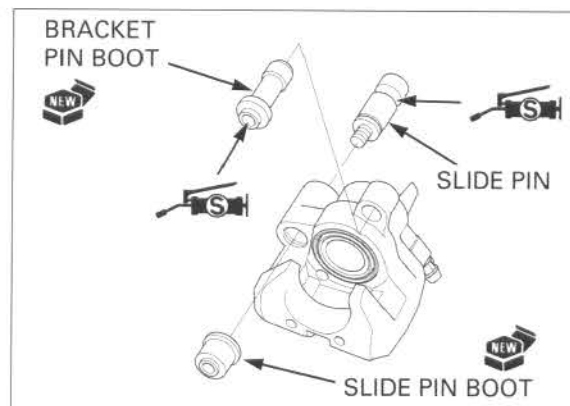




Install a new bracket pin boot into the caliper body and pack the silicone grease to the inside of the boot.

Install a new slide pin boot into the groove in the caliper body.

Apply silicone grease to the grease groove in the slide pin. Install the slide pin and set the boot rib into the boot groove in the slide pin.



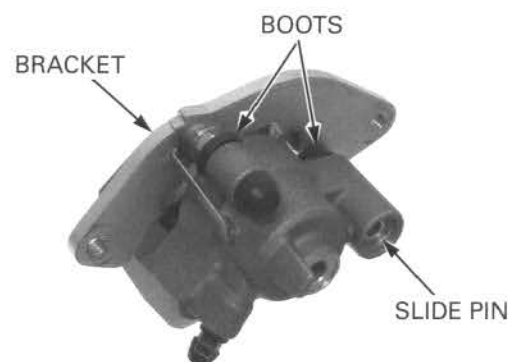
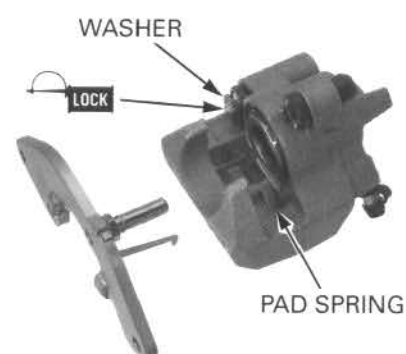
Install the pad spring as shown.

Install the spring washer onto the slide pin with the concavity toward the bracket side.

Apply locking agent to the slide pin threads. Install the caliper bracket over the caliper body and thread the slide pin into the bracket, being careful not damage the slide pin boot.

Make sure the boot ribs are seated into the boot grooves in the slide and bracket pins properly.

Install the brake pads (page 16-9).



Tighten the slide pin.

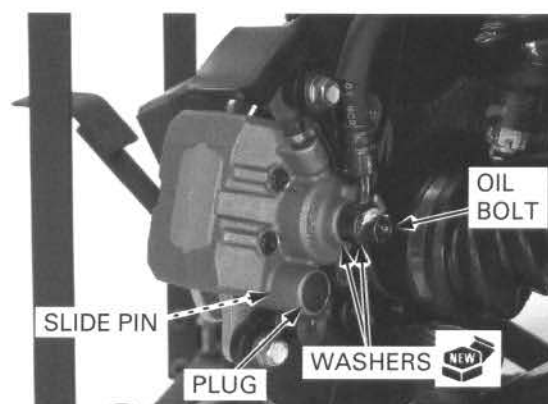
**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**

Install the slide pin plug.

Rest the brake hose joint onto the stopper on the caliper body.

Connect the brake hose with the oil bolt and new sealing washers, and tighten the oil bolt.

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



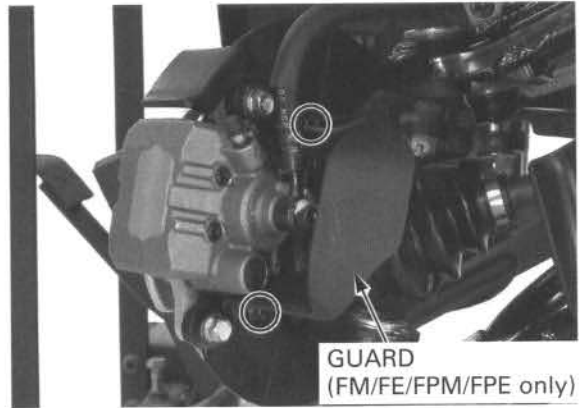


## BRAKE SYSTEM

FM/FE/FPM/FPE only: Install the drive shaft guard and tighten the bolts.

Fill and bleed the hydraulic system (page 16-7).

Install the front wheel (page 14-13).



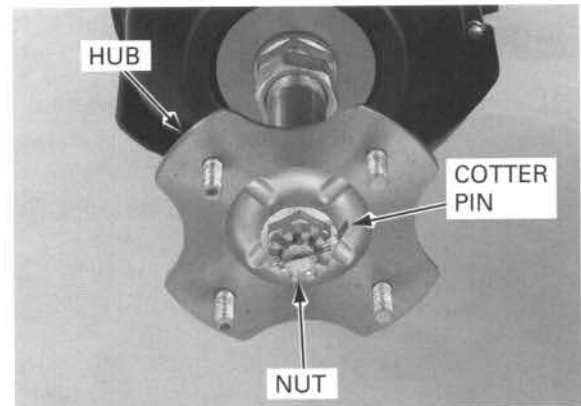
## REAR BRAKE DRUM/SHOES

### BRAKE DRUM REMOVAL

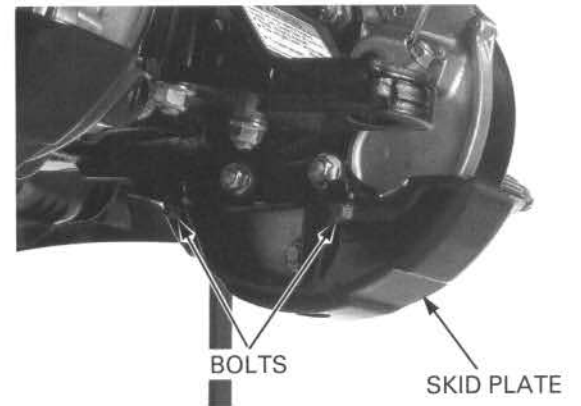
Remove the right rear wheel (page 15-6).

Remove the following:

- cotter pin
- hub nut
- wheel hub



- two bolts
- skid plate



Set the parking brake.

Hold the axle nut and loosen the lock nut.

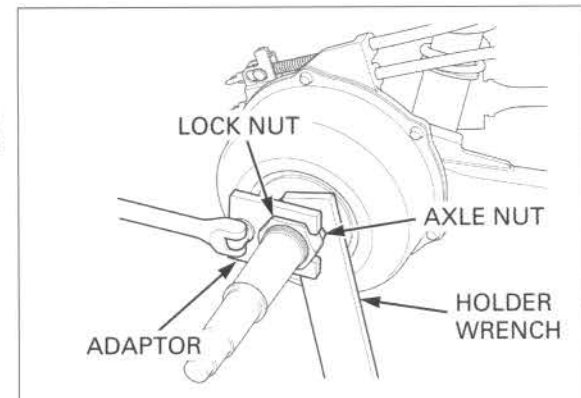
#### TOOLS:

Axle nut torque wr. adaptor, 41 mm 07916-958010B

Axle nut holder wrench, 41 mm 07916-958020B

Loosen the axle nut using the same tool.

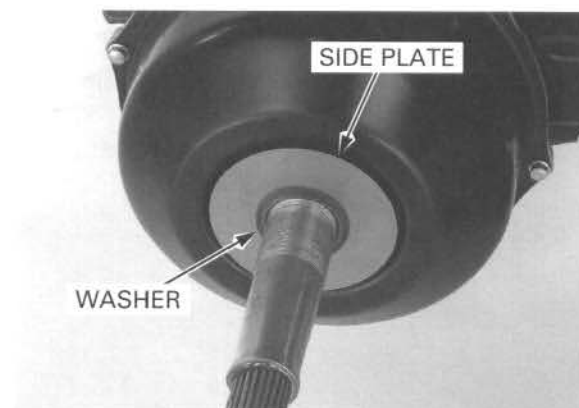
Remove the lock nut and axle nut.



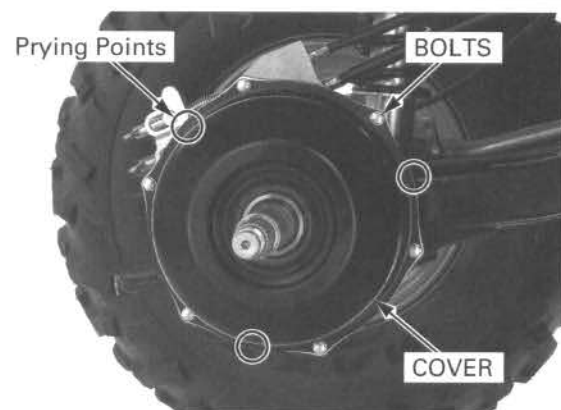


Remove the following:

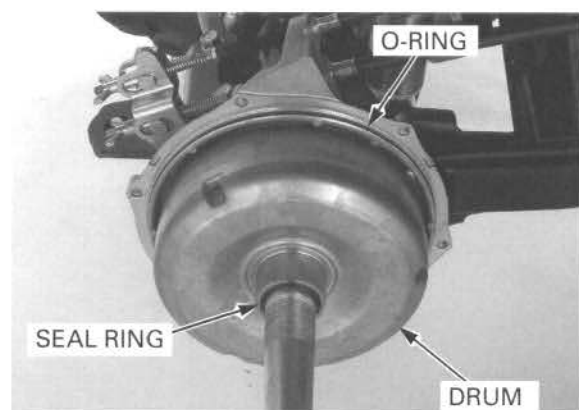
- spring washer
- side plate



- six bolts
- drum cover



- O-ring
- brake drum
- seal ring



- dust seal



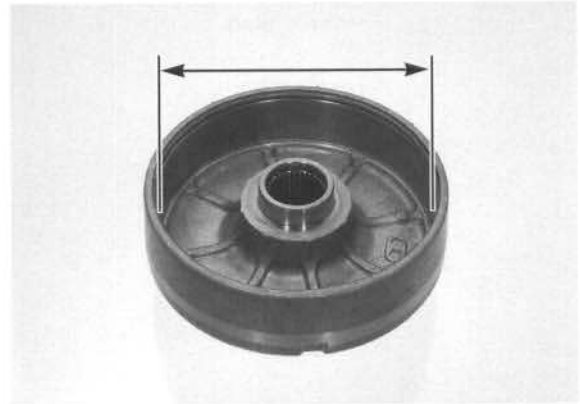


## BRAKE SYSTEM

### INSPECTION

Measure the brake drum I.D.

**SERVICE LIMIT: 161.0 mm (6.34 in)**



Check the dust seal in the brake panel for wear or damage.

For dust seal replacement, see Rear Driving Mechanism section (page 18-8).

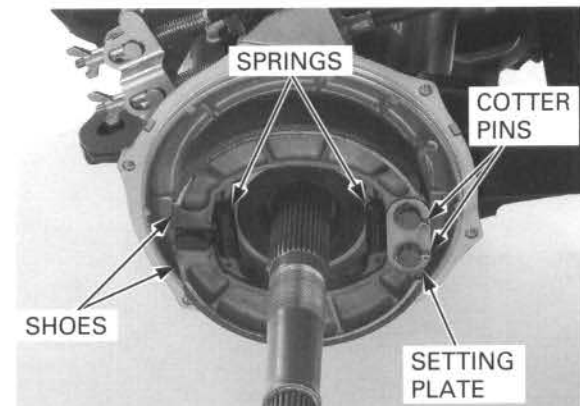


### DISASSEMBLY

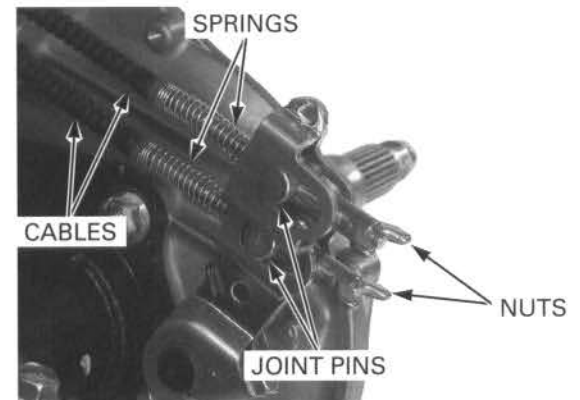
*Always replace the brake shoes in pairs.*

Remove the following:

- cotter pins
- setting plate
- brake shoes
- springs



- adjusting nuts
- brake cables
- joint pins
- springs





- nut and bolt
- brake arm
- wear indicator
- return spring
- brake cam
- felt seal
- dust seal

### ASSEMBLY

Apply 0.5 – 1 g of grease to the lips of a new 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.

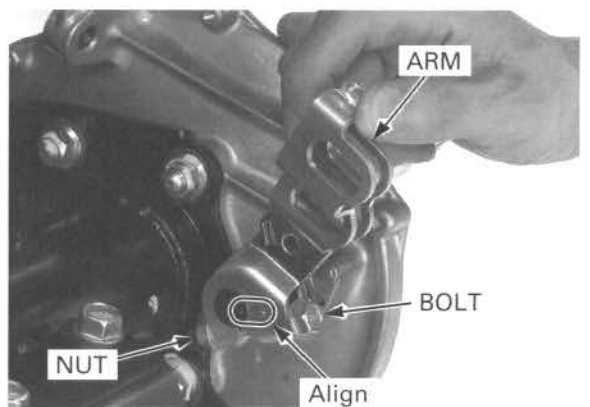
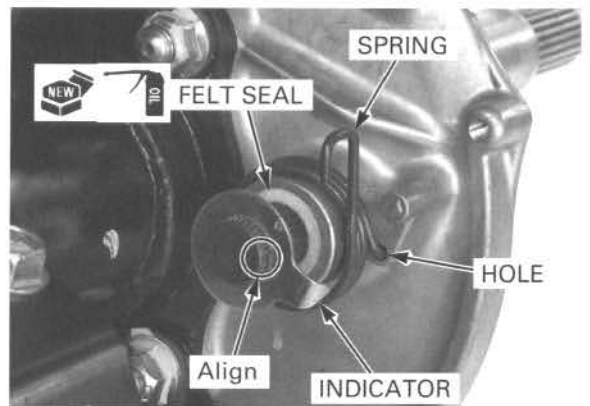
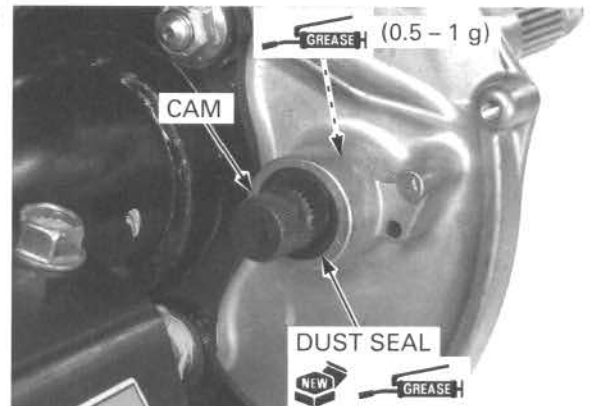
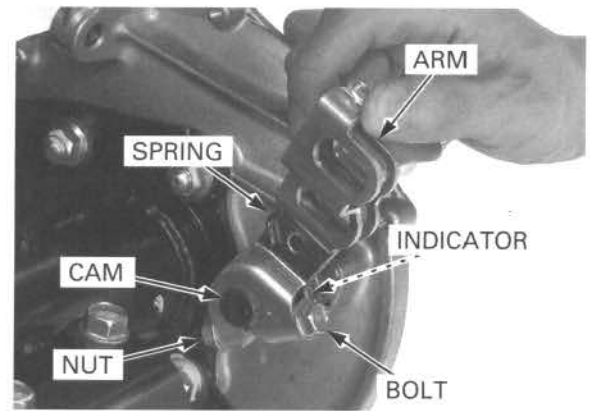
Install the return spring by aligning its end with the hole.

Install the wear indicator by aligning the wide teeth with the wide groove.

Install the brake arm by aligning the punch marks.

Install the pinch bolt from the punch mark side and the nut, and tighten it.

**TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)**

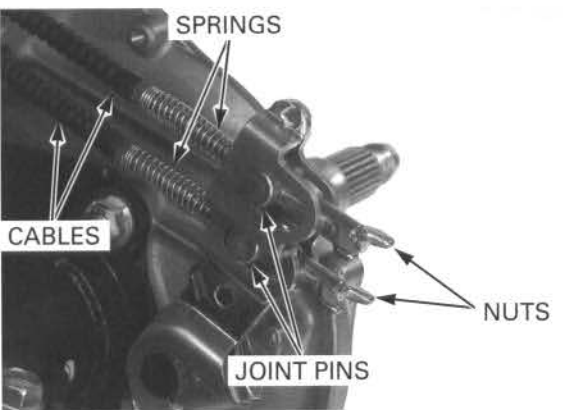




**BRAKE SYSTEM**

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).

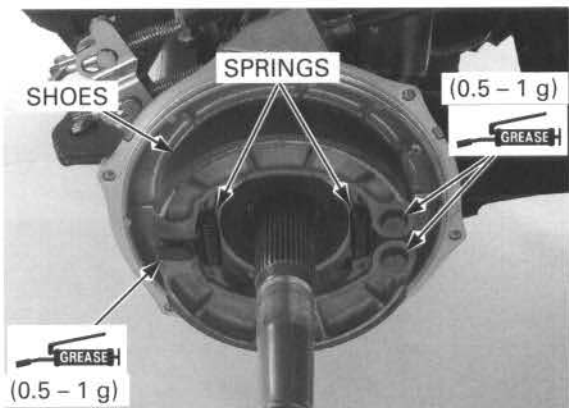
Install the cable springs onto the cables and the joint pins into the brake arm. Connect the brake cables to the brake arm with the adjusting nuts.



Apply 0.5 – 1 g of grease to each anchor pin groove and brake cam sliding surfaces.

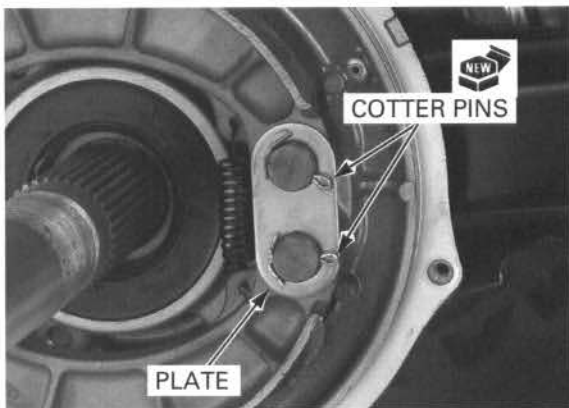
*Do not get grease onto the shoe linings.*

Assemble the brake shoes and springs so that the spring ends are facing outside as shown and install the assembly onto the brake panel.



*The cotter pins are installed from the front side.*

Install the setting plate with the chamfered side facing toward the brake shoe and secure it with new cotter pins.



**BRAKE DRUM INSTALLATION**

Pack the seal lips of a new dust seal with 3 – 4 g of grease.

Install the dust seal into the drum cover so that it is flush with the cover surface.

**TOOL:**

Attachment 07965-MC70100 or  
Assembly base, 56 x 65 mm 070MF-MEC0300



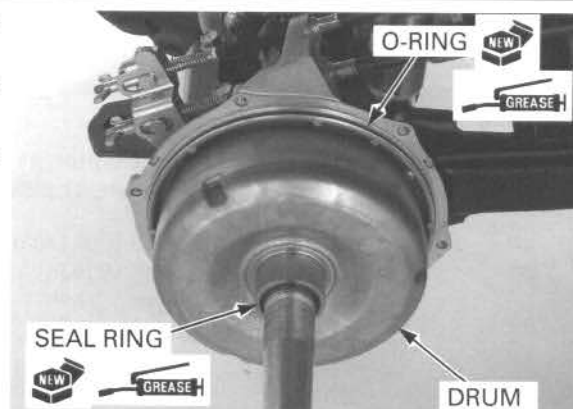


Do not get grease to the brake drum and shoes.

Install the brake drum onto the axle until it is fully seated.

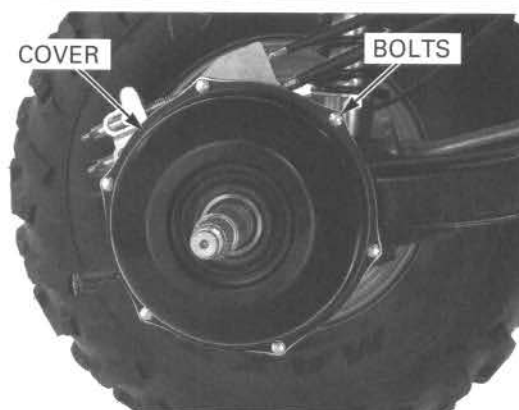
Coat a new seal ring with grease and install it into the groove in the drum sleeve.

Coat a new O-ring with grease and install it into the groove in the brake panel.

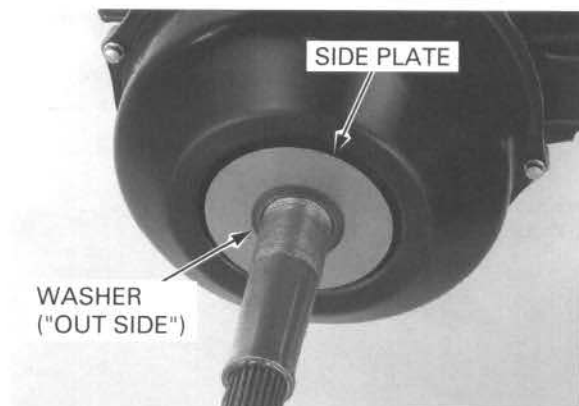


Install the drum cover, aligning the bolt holes. Install the six bolts and tighten them.

Adjust the rear brake (page 4-24).



Install the side plate and the spring washer with the "OUT SIDE" mark facing out.



Apply locking agent to the threads of the axle and install the axle nut with the flange side facing in. Set the parking brake and tighten the axle nut.

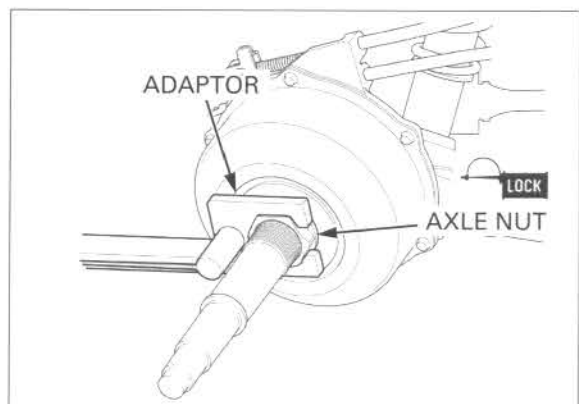
## TOOL:

Axle nut torque wr. adaptor, 41 mm 07916-958010B

**TORQUE:** Actual: 39 N·m (4.0 kgf·m, 29 lbf·ft)

Indicated: 36 N·m (3.7 kgf·m, 27 lbf·ft)

Refer to "Service Information" for torque wrench reading information (page 16-4).





## BRAKE SYSTEM

Apply locking agent to the threads of the axle and install the lock nut.

*Take care not to turn the axle.*

Hold the axle nut and tighten the lock nut.

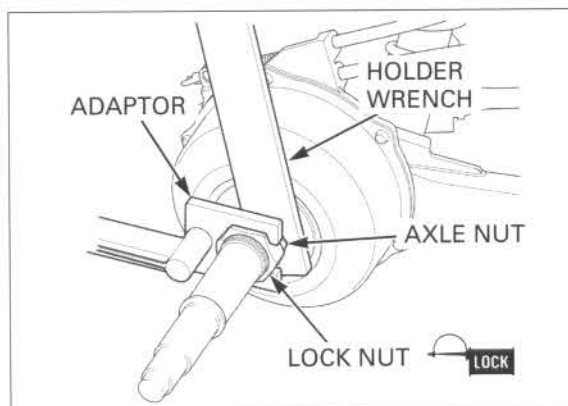
### TOOLS:

Axle nut torque wr. adaptor, 41 mm 07916-958010B

Axle nut holder wrench, 41 mm 07916-958020B

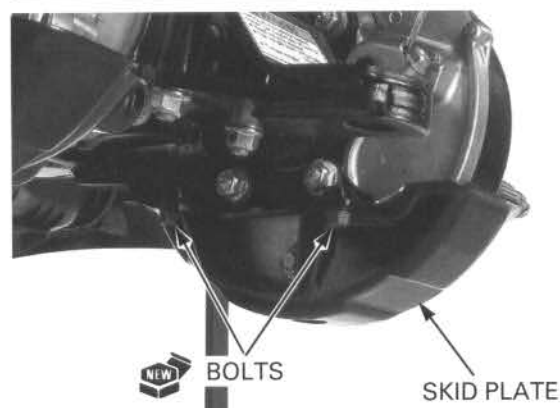
**TORQUE:** Actual: 127 N·m (13.0 kgf·m, 94 lbf·ft)

Indicated: 119 N·m (12.1 kgf·m, 88 lbf·ft)



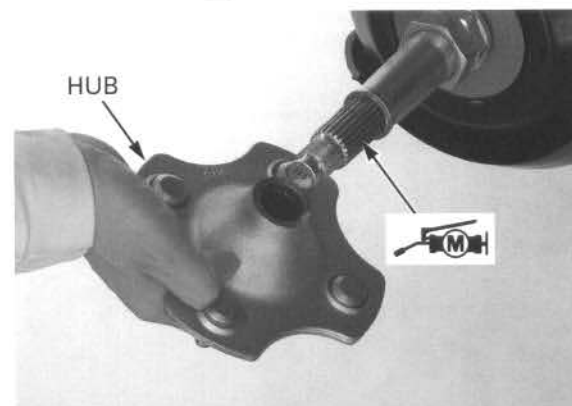
Install the skid plate with new bolts and tighten the bolts.

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



Apply molybdenum disulfide grease to the axle spline.

Install the wheel hub onto the axle.

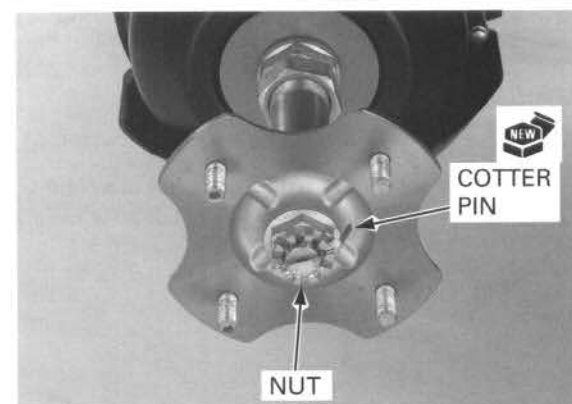


Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE:** 137 N·m (14.0 kgf·m, 101 lbf·ft)

Install a new cotter pin.

Install the rear wheel (page 15-6).





## REAR BRAKE PEDAL

### REMOVAL

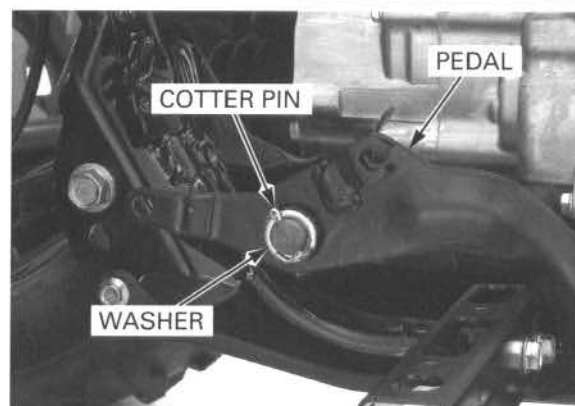
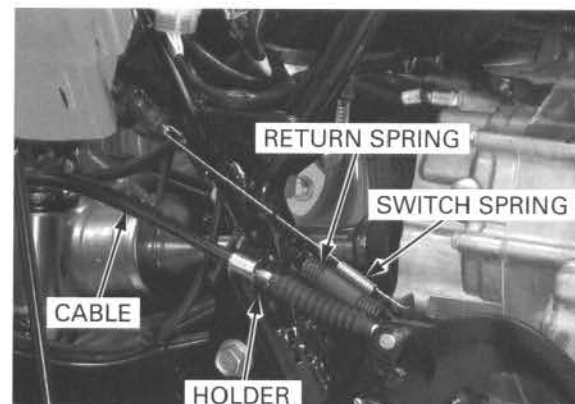
Remove the right mudguard (page 3-6).

Disconnect the pedal brake cable from the brake arm (page 16-20).

Remove the following:

- switch spring
- return spring
- brake cable (from the cable holder and pedal)

- cotter pin
- washer
- brake pedal
- dust seals



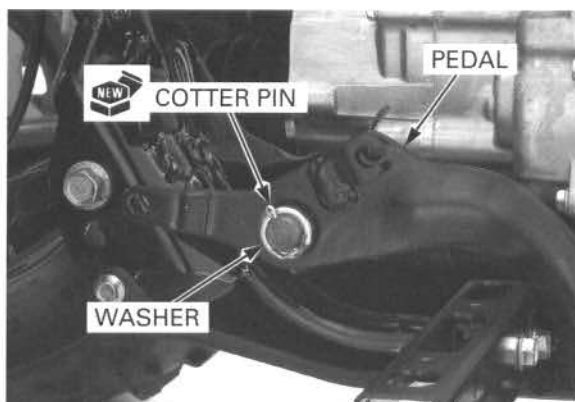
### INSTALLATION

Apply grease to the lips of new dust seals. Install the dust seals with the flat side facing out so that they are flush with the pedal.

Apply grease to the groove in the pivot shaft and install the brake pedal.



Install the washer and a new cotter pin.





## BRAKE SYSTEM

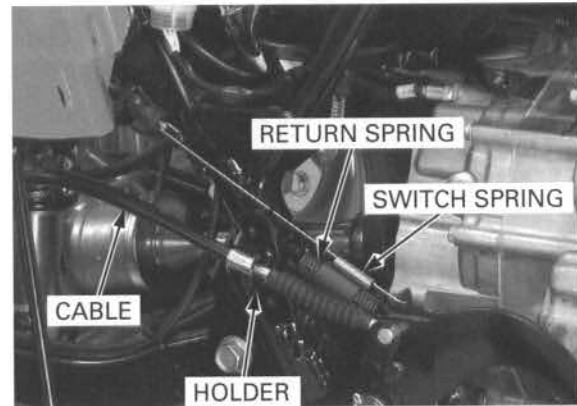
Install the brake cable into the pedal the cable holder.

Install the return spring and switch spring in the direction as shown.

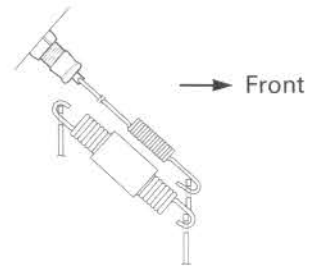
Connect the brake cable to the brake arm (page 16-22).

Adjust the brake pedal freeplay (page 4-24).

Install the mudguard (page 3-6).



Spring installation direction:





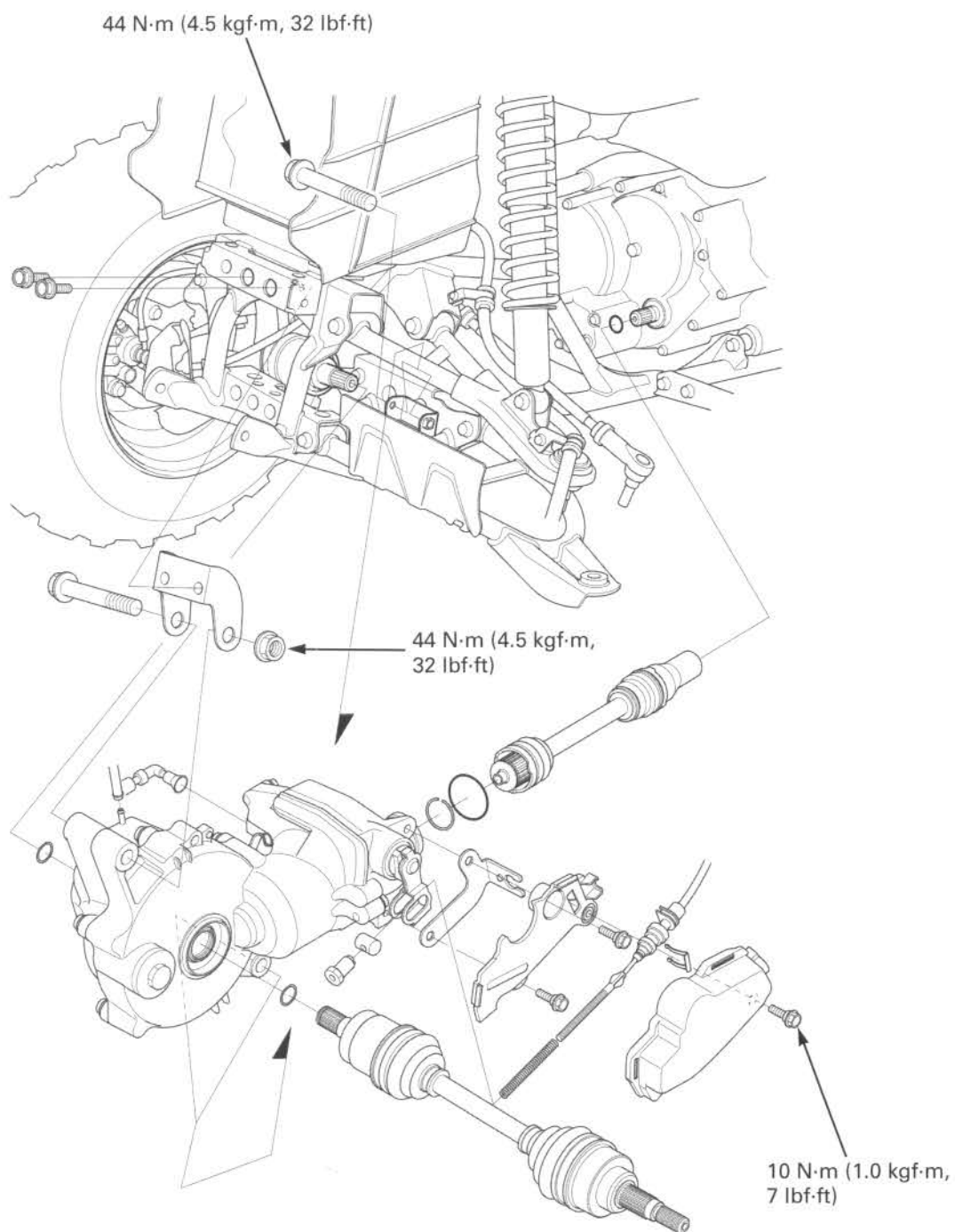
## 17. FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

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SYSTEM COMPONENTS .....	17-2	FRONT FINAL CLUTCH .....	17-16
SERVICE INFORMATION .....	17-3	FRONT FINAL GEAR DISASSEMBLY/ INSPECTION .....	17-22
TROUBLESHOOTING .....	17-6	GEAR CASE BEARING REPLACEMENT .....	17-30
FRONT DRIVE SHAFT .....	17-7	FRONT FINAL GEAR ASSEMBLY .....	17-32
FRONT FINAL DRIVE REMOVAL .....	17-12	FRONT FINAL DRIVE INSTALLATION .....	17-36
FRONT PROPELLER SHAFT .....	17-14		



## SYSTEM COMPONENTS





## 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 overtighten 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 as an assembly if the face cam or differential housing is faulty.

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Front final drive	Oil capacity	After draining	230 cm <sup>3</sup> (7.8 US oz, 8.1 Imp oz)	—
		After disassembly	310 cm <sup>3</sup> (10.5 US oz, 10.9 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)	12 N·m (1.2 kgf·m, 9 lbf·ft)
	Face cam-to-housing distance		3.3 – 3.7 (0.13 – 0.15)	3.3 (0.13)
	Differential ring gear depth		6.55 – 6.65 (0.258 – 0.262)	6.55 (0.258)
	Cone spring free height		2.8 (0.11)	2.6 (0.10)

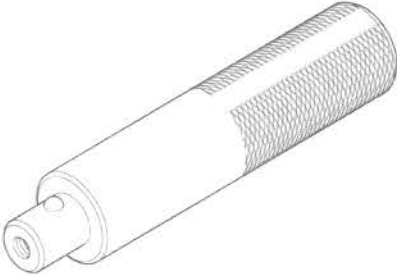
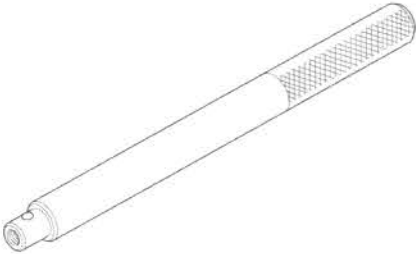








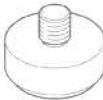

### TORQUE VALUES

Front final gear pinion bearing lock nut	98 N·m (10.0 kgf·m, 72 lbf·ft)	Lock nut: replace with a new one. Stake
Differential ring gear bolt	49 N·m (5.0 kgf·m, 36 lbf·ft)	ALOC bolt: replace with a new one.
Front final gear case cover bolt (10 mm)	47 N·m (4.8 kgf·m, 35 lbf·ft)	Apply locking agent to the threads.
Front final gear case cover bolt (8 mm)	25 N·m (2.5 kgf·m, 18 lbf·ft)	
Front final clutch shift fork bolt	10 N·m (1.0 kgf·m, 7 lbf·ft)	ALOC bolt: replace with a new one.
Front final clutch housing bolt	25 N·m (2.5 kgf·m, 18 lbf·ft)	
Front final gear case mounting bolt	44 N·m (4.5 kgf·m, 32 lbf·ft)	
Front final gear case mounting nut	44 N·m (4.5 kgf·m, 32 lbf·ft)	Lock nut: replace with a new one.
4WD select switch	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Final clutch arm cover bolt	10 N·m (1.0 kgf·m, 7 lbf·ft)	



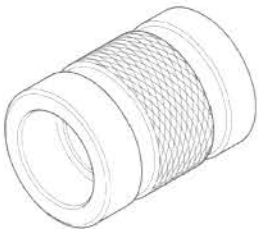
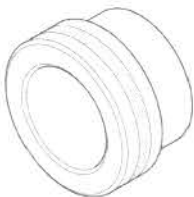

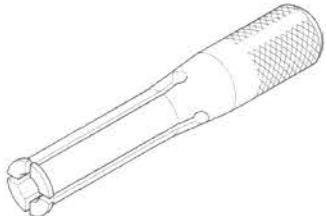


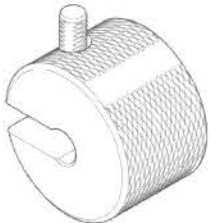

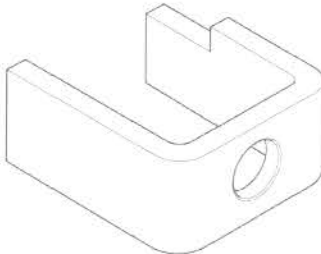
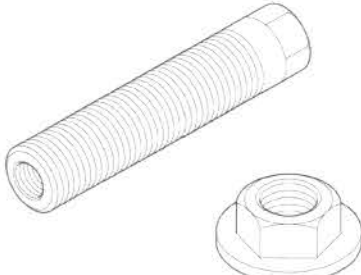
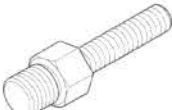
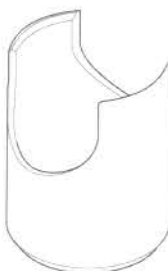
FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

TOOLS

<p>Driver 07749-0010000</p> 	<p>Driver 07949-3710001</p> 	<p>Attachment, 22 x 24 mm 07746-0010800</p> 
<p>Attachment, 24 x 26 mm 07746-0010700</p> 	<p>Attachment, 42 x 47 mm 07746-0010300</p> 	<p>Attachment, 52 x 55 mm 07746-0010400</p> 
<p>Attachment, 20 mm I.D. 07746-0020400</p> 	<p>Attachment, 35 mm I.D. 07746-0030400</p> 	<p>Pilot, 12 mm 07746-0040200</p> 
<p>Pilot, 16 mm 07746-0041300</p> 	<p>Pilot, 28 mm 07746-0041100</p> 	<p>Pilot, 32 mm 07MAD-PR90200</p> 

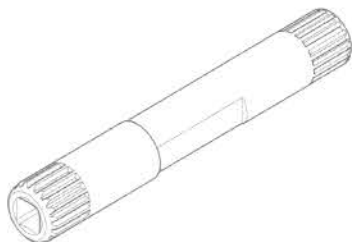


# FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

<p>Fork seal driver weight 07747-0010100</p> 	<p>Fork seal driver attachment, 33 mm I.D. 07747-0010501</p> 	<p>Bearing remover head, 12 mm 07936-1660110</p> 
<p>Bearing remover head, 16 mm 07936-MK50100</p> 	<p>Bearing remover shaft, 12 mm 07936-1660120  or 07936-166010A (U.S.A. only)</p> 	<p>Bearing remover shaft, 15 mm 07936-KC10100</p> 
<p>Remover weight 07741-0010201  or 07936-371020A or 07936-3710200 (U.S.A. only)</p> 	<p>Lock nut wrench, 30 x 64 mm 07916-MB00002</p> 	<p>Pinion puller base 07HMC-MM80110  or 07HMC-MM8011A (U.S.A. only)</p> 
<p>Puller shaft and nut 07965-VM00200  or 07931-ME4010B and 07931-HB3020A (U.S.A. only)</p> 	<p>Threaded adaptor 070MF-HP50100  or 070MF-HP5A100 (U.S.A. only) (Newly designed tool)</p> 	<p>Bearing clip compressor, 26 mm 070ME-HP50100  (Newly designed tool)</p> 



Differential inspection tool  
07KMK-HC50101



or 07KMK-HC5010A (U.S.A. only)

## 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 gear 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

- Chipped or damaged gears

### Abnormal noises when turning

- Worn or damaged ring gear bearing
- Worn or damaged face cams and cam followers
- Worn or damaged differential housing grooves
- 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

### Overheating

- Oil level too low
- Insufficient backlash between ring gear and pinion gear



## FRONT DRIVE SHAFT

### REMOVAL

Remove the knuckle (page 14-17)

*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 on the inboard joint end past the groove while prying with a screwdriver.



Remove the stopper ring from the inboard joint.

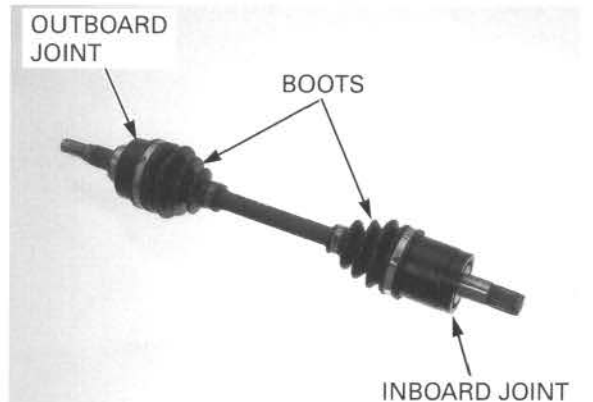


### DISASSEMBLY/INSPECTION

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:

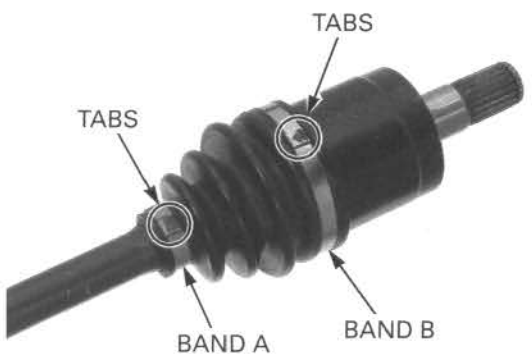
- To replace the outboard boot, first remove the inboard boot as described in following steps. Then remove bands and the outboard boot off the inboard end of the shaft.
- The outboard joint can not be disassembled.



*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 band B.

Remove the boot from the inboard joint.





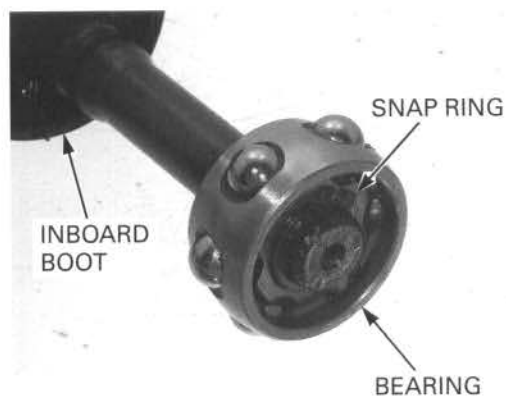
## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Remove the following:

- stopper ring
- inboard joint



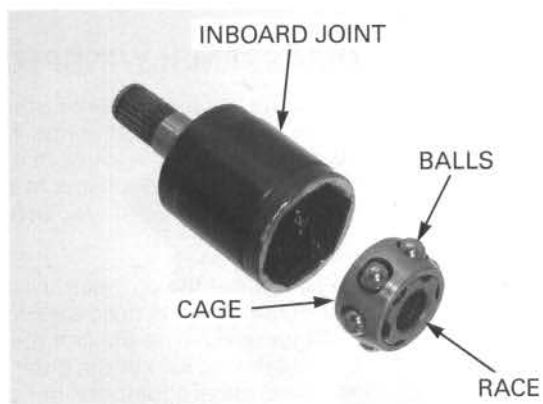
- snap ring
- bearing
- inboard boots
- boot band A



*Replace these components as an assembly.*

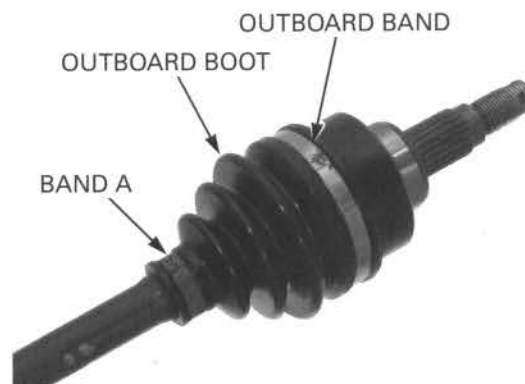
Check the following for wear or damage.

- bearing cage
- race
- steel balls
- inboard joint



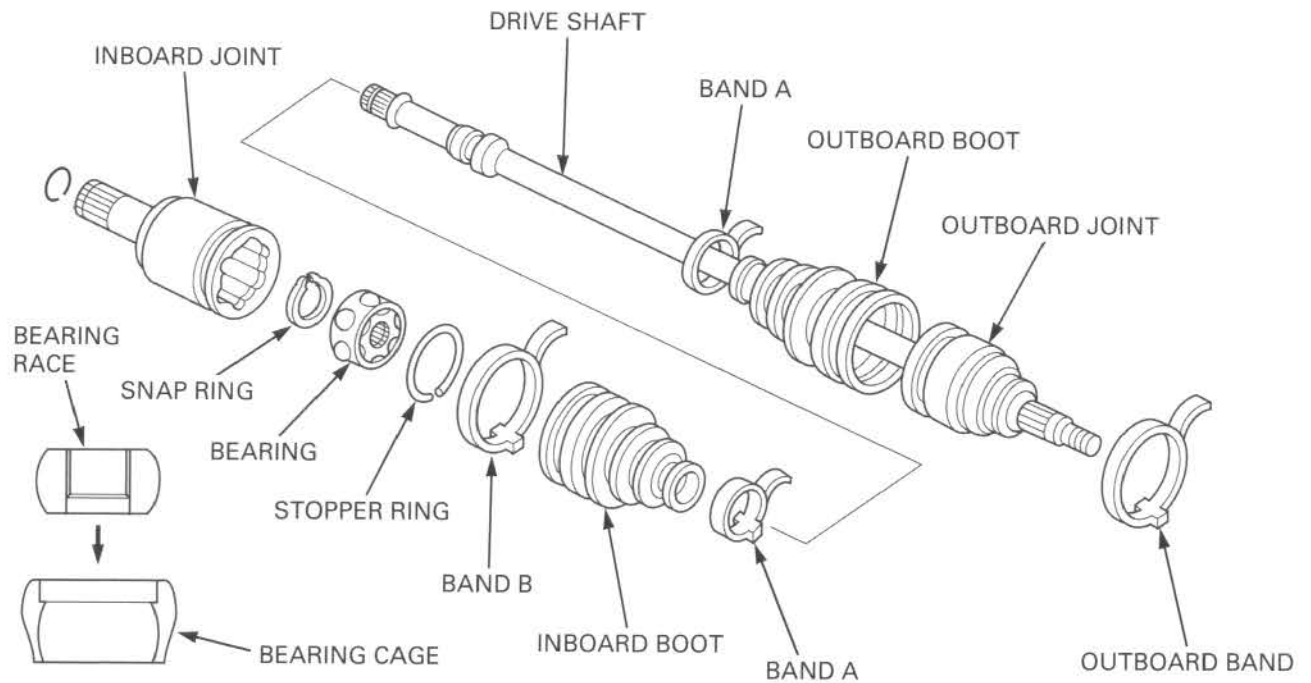
Remove the following:

- boot band A
- outboard band
- outboard boot

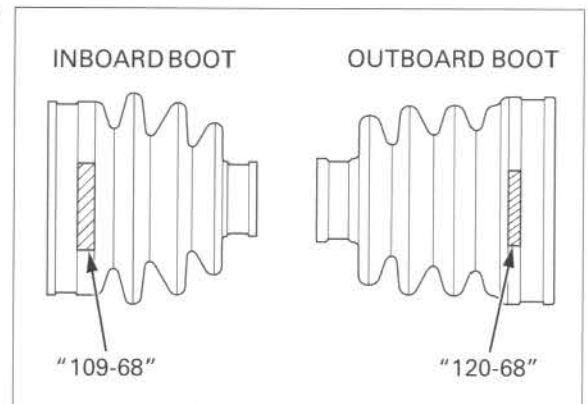




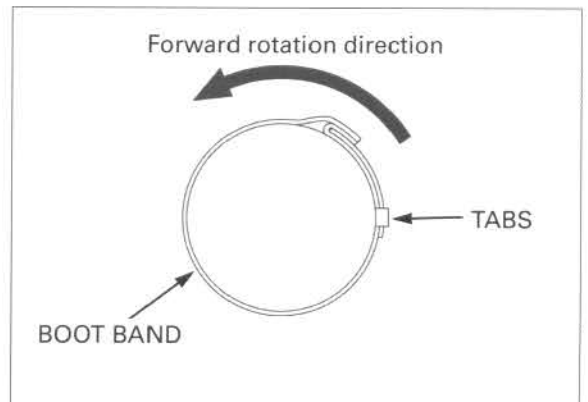
ASSEMBLY



The outboard boot is large and the inboard boot is small. Do not interchange them.



Note the installation direction of the boot bands.





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

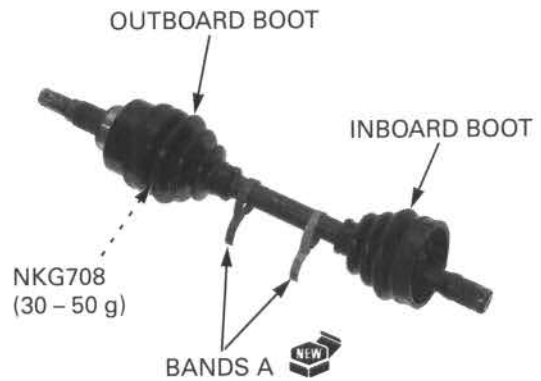
Pack the outboard joint with 30 – 50 g of specified grease.

**SPECIFIED GREASE: NKG708 (KYODO YUSHI)**

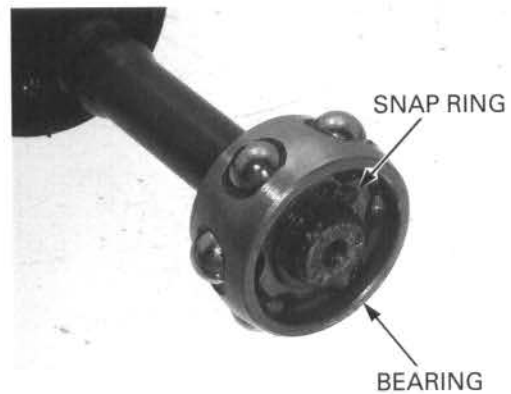
Install the following:

- outboard boot
- new bands A
- inboard boot

Do not tighten the bands at this time.



Install the bearing with the small O.D. facing the drive shaft.  
Install the snap ring with the chamfered side facing the bearing.



Pack the inboard joint with 40 – 60 g of specified grease.

**SPECIFIED GREASE: NKG708 (KYODO YUSHI)**

Install the inboard joint over the bearing.  
Install the stopper ring into the groove in the inboard joint properly.  
Install the boot over the inboard joint.



Adjust the length of the drive shaft to the figure given below.

**DRIVE SHAFT LENGTH: 353.6 mm (13.92 in)**

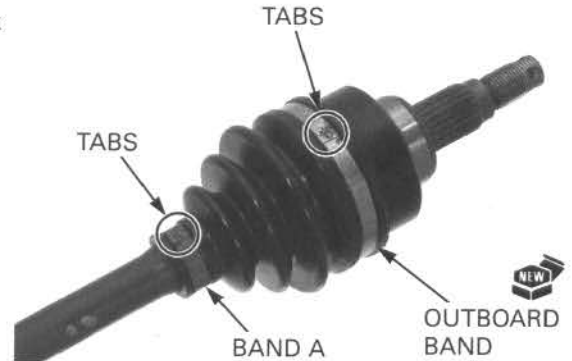




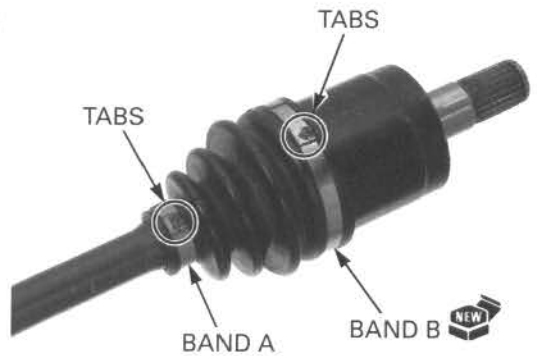
## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

*Note the installation direction of the band (page 17-9).*

Install the band A and a new outboard band onto the outboard boot.  
Bend down the band end and secure it with the lock tabs. Tap the lock tabs with a plastic hammer.



Install band A 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 spline.

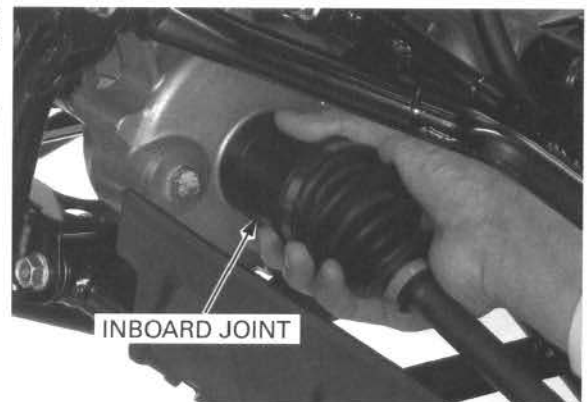


*Be careful not to damage the oil seal in the gear case.*

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.

Install the knuckle (page 14-23).





## FRONT FINAL DRIVE REMOVAL

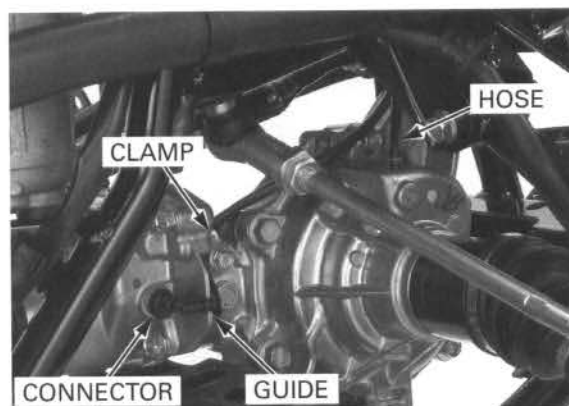
Remove the following:

- mudguards (page 3-6)
- engine guard (page 3-8)
- front fender/carrier (page 3-7)
- left drive shaft (page 17-7)

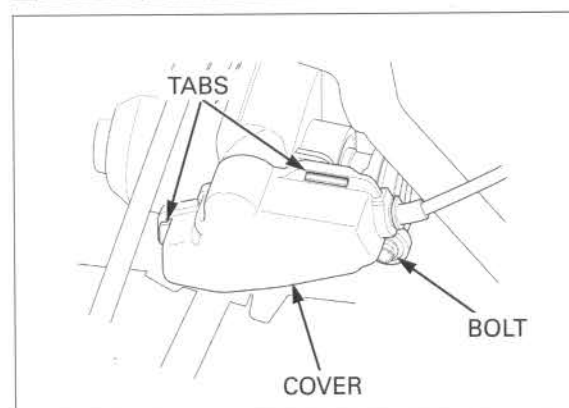
Drain the differential oil (page 4-21).

Remove the following from the final gear case:

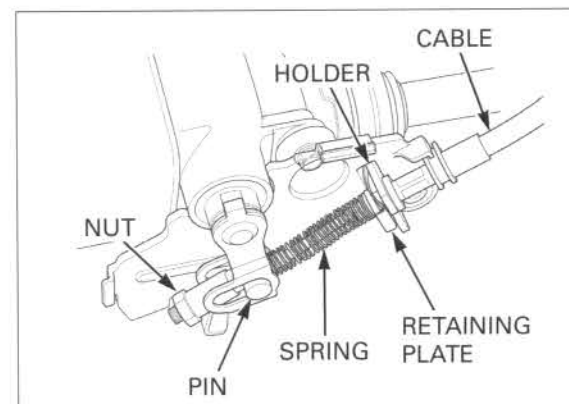
- breather hose
- select switch connector (disconnect it and remove its wire from the guide and clamp)



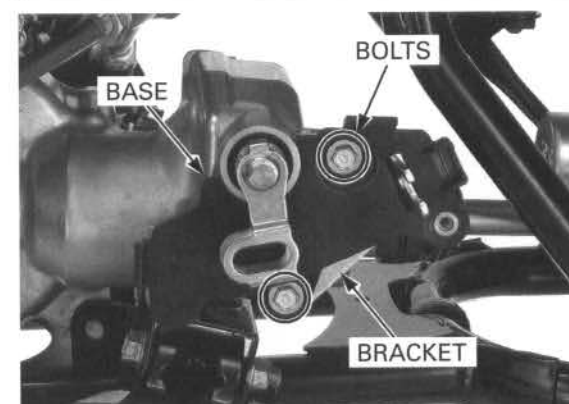
- cover bolt
- clutch arm cover (by releasing the two tabs)



- adjusting nut
- cable retaining plate
- selector cable (remove from the cable holder and joint pin)
- cable spring
- joint pin



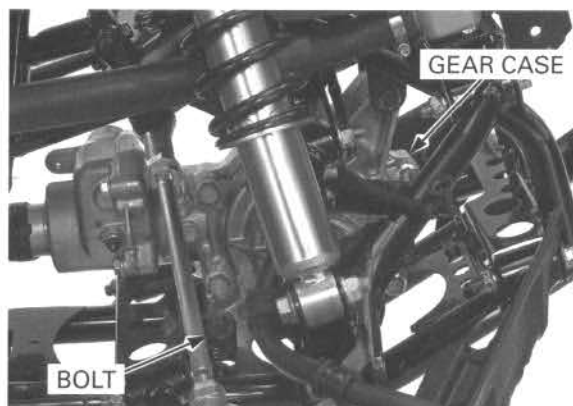
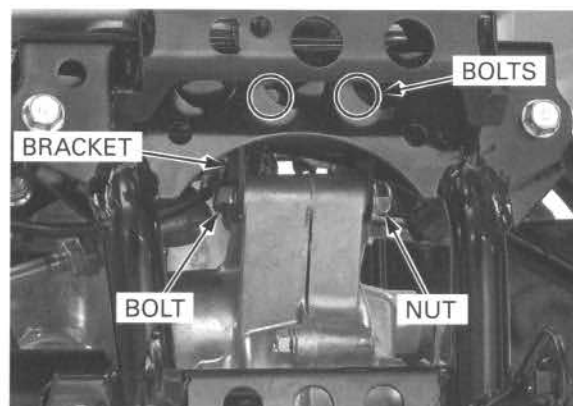
- base bolts
- arm cover base
- holder bracket





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

- final gear case mounting nut and bolts
- two bolts and mounting bracket



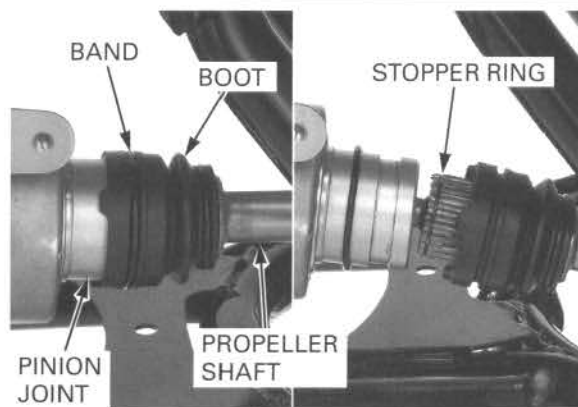
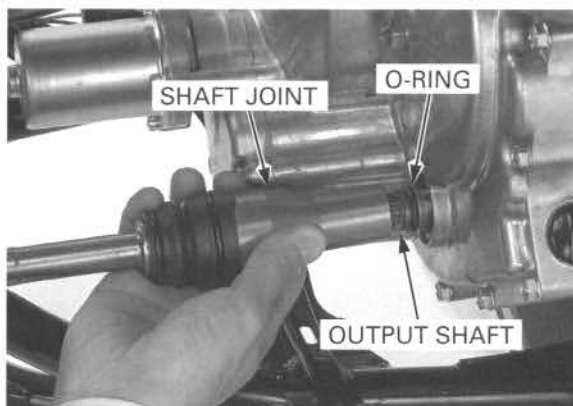
Move the gear case assembly forward for maximum clearance between the propeller shaft joint and engine.

Pull the shaft joint out of the output shaft of the engine.

Remove the boot band and release the propeller shaft boot off the pinion joint of the gear case assembly.

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

Remove the stopper ring from the propeller shaft.  
Remove the O-ring from the output shaft.





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Loosen the left lower arm pivot nuts and lower the lower arm.

Separate the right drive shaft from the final gear case assembly by tapping the right drive shaft end lightly through the gear case, using a screwdriver or equivalent.

Remove the gear case assembly from the frame.

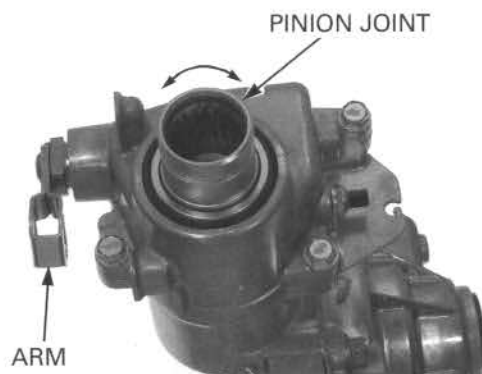


### OPERATION CHECK

Turn the pinion joint while the clutch arm is set to the rear (4WD position), and check that the gear turns smoothly and quietly without binding.

If the gear does not turn smoothly or quietly, the pinion gear, ring gear, bearing and/or clutch components may be damaged or faulty. They must be checked after disassembly; replace them if necessary.

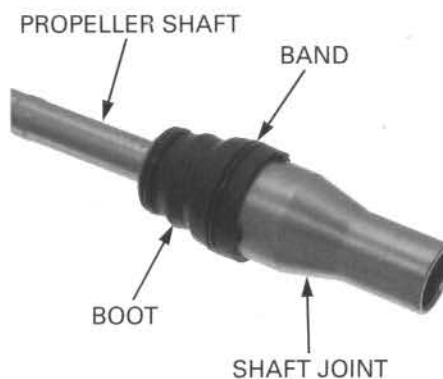
Operate the change-over mechanism while turning the pinion joint, check for smooth engagement/disengagement.



## FRONT PROPELLER SHAFT

### DISASSEMBLY/INSPECTION

Remove the outer boot band and the shaft boot from the propeller shaft joint to remove the shaft joint.



Remove the following:

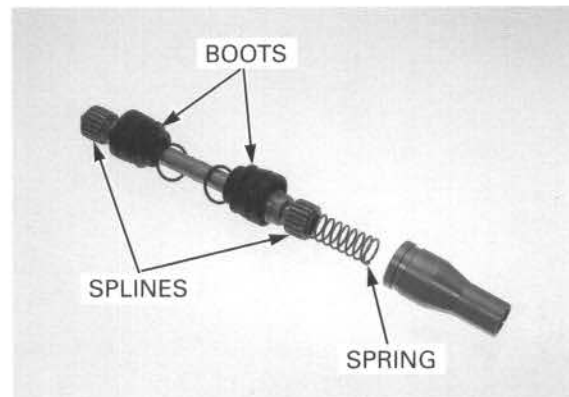
- joint spring
- inner boot bands
- shaft boots

Check the splines of the propeller shaft and joint for wear or damage.

If they are damaged, check the splines of the output shaft and pinion joint.

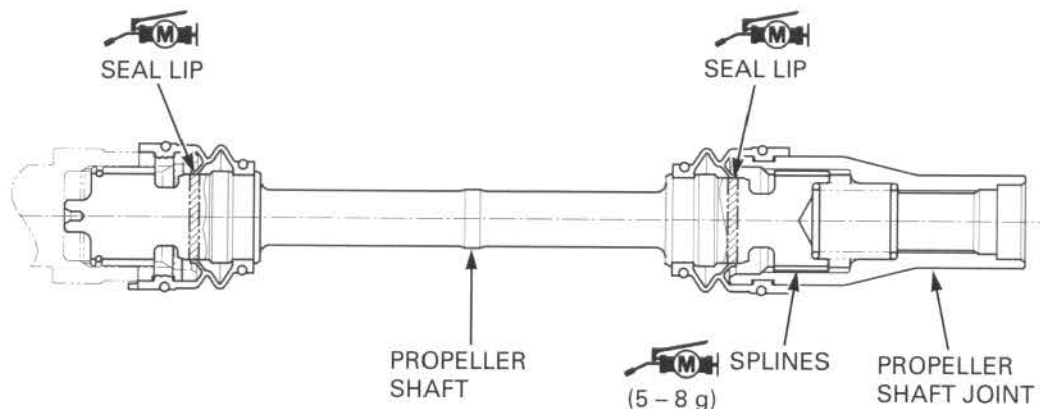
Check the boots for cuts, deterioration or damage.

Check the seal lip in each boots for damage.





# ASSEMBLY



Place the inner boot bands on the propeller shaft.

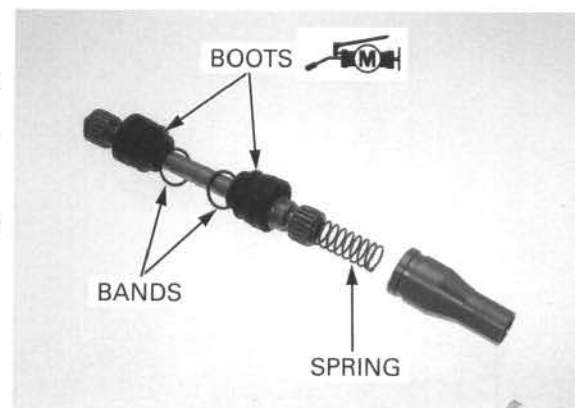
*Do not allow the seal lip to turn outside in*

Apply molybdenum disulfide grease to the seal lip of each boot.

Install the boots onto the shaft grooves, being careful not to damage the seal lip.

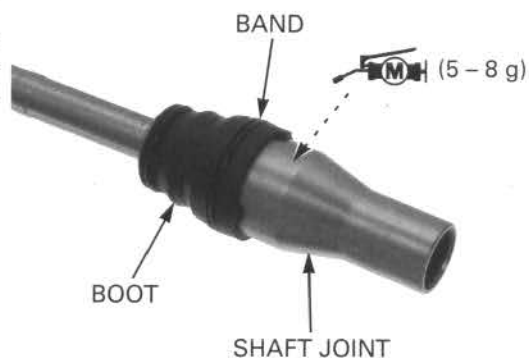
Install the boot bands into the each boot groove.

Install the joint spring into the propeller shaft securely.



Apply 5 – 8 g of molybdenum disulfide grease to the propeller shaft joint splines.

Set the shaft joint onto the propeller shaft while compressing the spring, then install the boot over the shaft joint groove and the outer boot band into the boot groove to secure it.





## FRONT FINAL CLUTCH

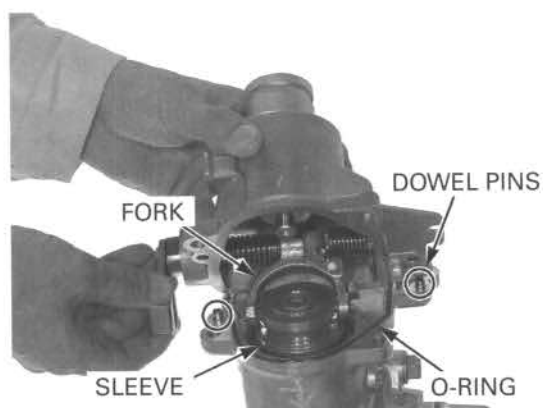
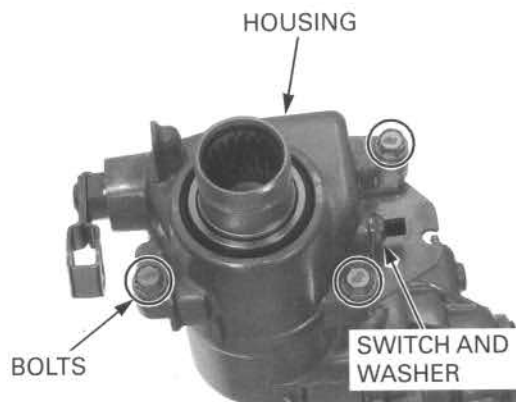
### DISASSEMBLY/INSPECTION

*The housing is under spring pressure; hold the housing when loosening the bolt.*

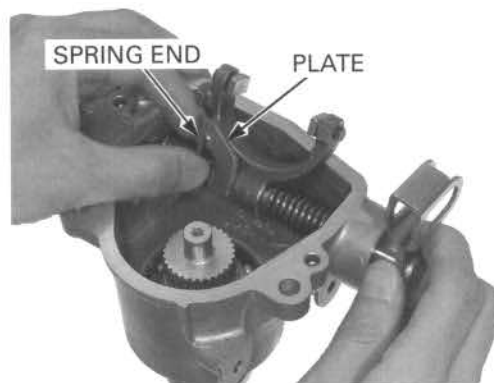
Remove the following:

- select switch and sealing washer
- three bolts
- final clutch housing (by releasing the shift fork from the sleeve)
- clutch sleeve
- O-ring
- dowel pins

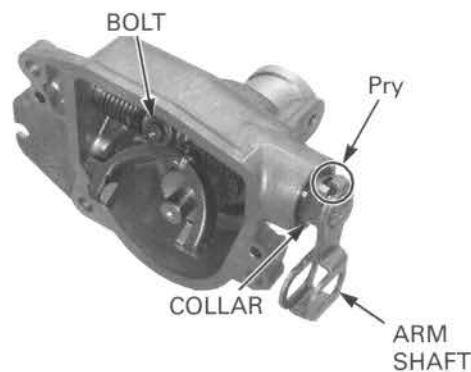
Check the splines of the pinion joint, clutch sleeve and pinion gear shaft for wear or damage.  
Check the needle bearing in the pinion gear shaft for wear or damage.



Release the clutch spring end from the stopper plate by pulling the arm shaft.



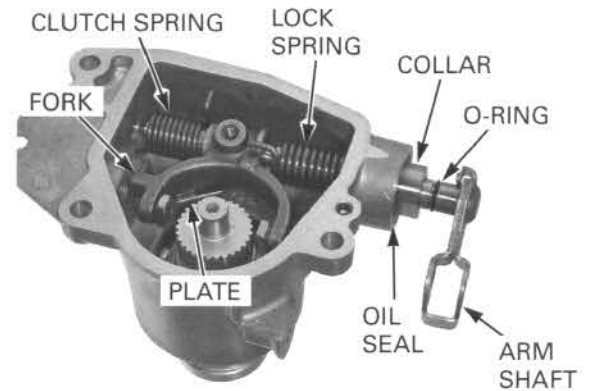
Remove the fork bolt.  
Pry the clutch arm tab to release it from the collar and slide the shaft outward.





Remove the following:

- clutch spring
- stopper plate
- shift fork
- clutch arm shaft
- lock spring
- collar
- O-ring
- oil seal

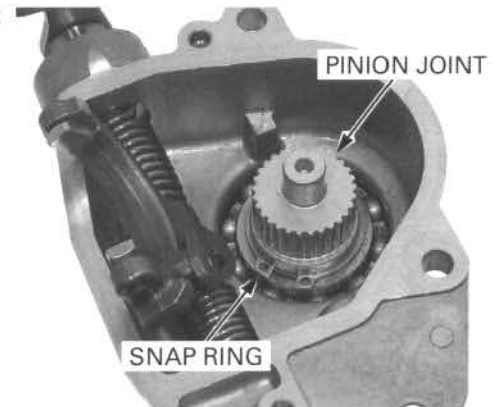


Check the shift fork cranks for wear or damage.  
Check the arm shaft and stopper plate for deformation or damage.  
Check the each spring for fatigue or damage.

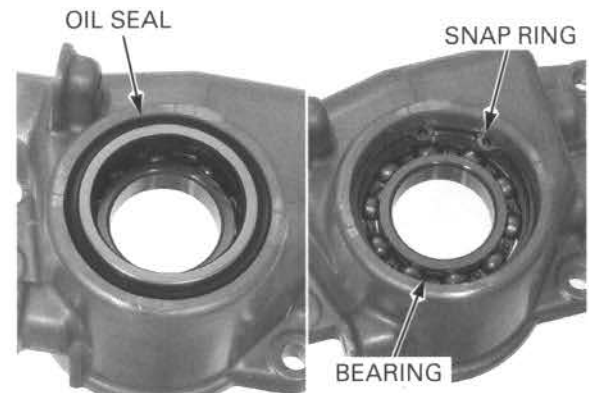


### PINION JOINT BALL BEARING REPLACEMENT

Remove the snap ring and drive the pinion joint out of the bearing.



Remove the oil seal and the snap ring.  
Drive the bearing out of the housing.





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Drive a new bearing into the housing.

### TOOLS:

Driver

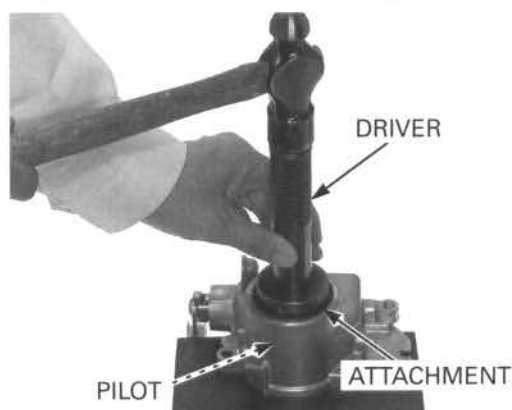
07749-0010000

Attachment, 52 x 55 mm

07746-0010400

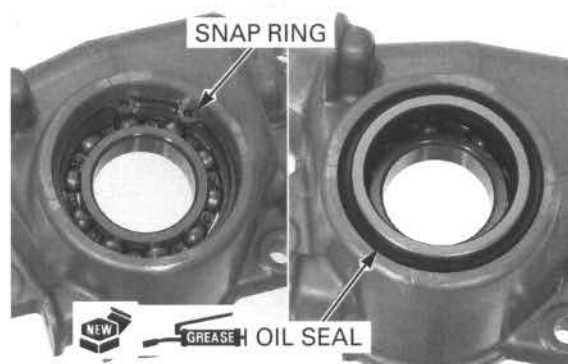
Pilot, 32 mm

07MAD-PR90200



Install the snap ring into the housing groove securely with the chamfered edge facing the bearing.

Pack the seal lips of a new oil seal with grease. Install the oil seal so that its rubber area flush with the housing end.



*Be careful not to damage the oil seal lips.*

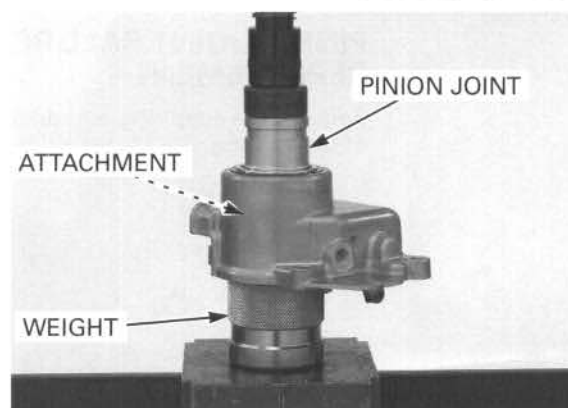
Hold the bearing inner race and press the pinion joint into the bearing until it is fully seated.

### TOOLS:

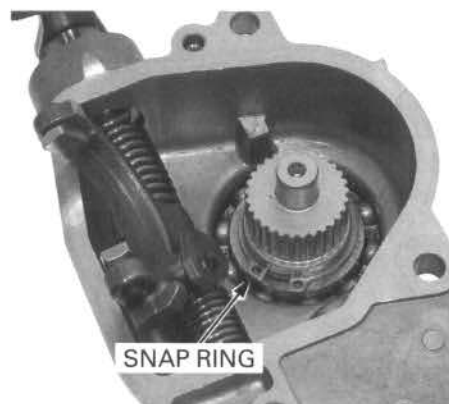
Fork seal driver weight

07747-0010100

Driver attachment, 33 mm I.D. 07747-0010501

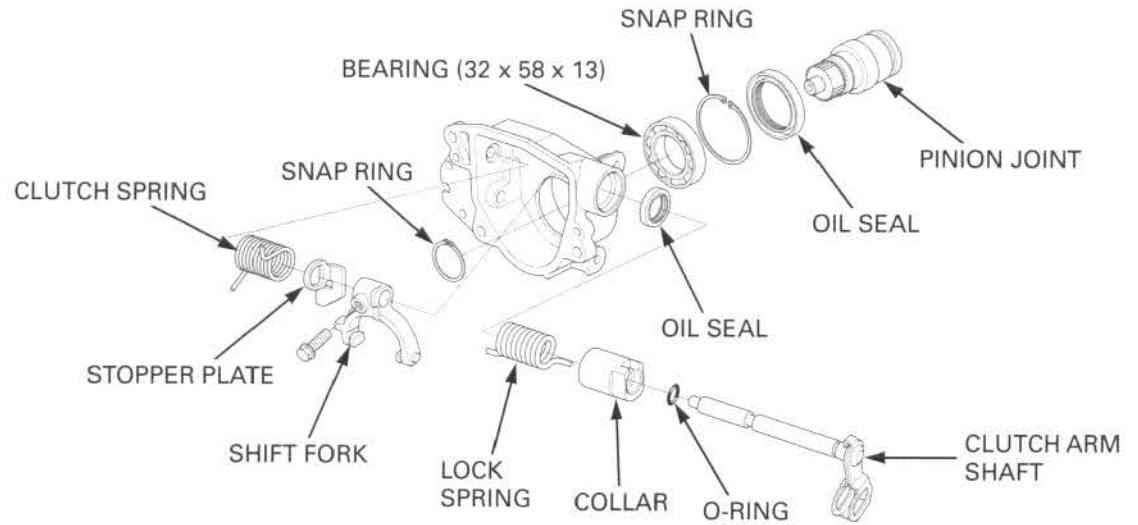


Install the snap ring into the pinion joint groove securely with the chamfered edge facing the bearing.



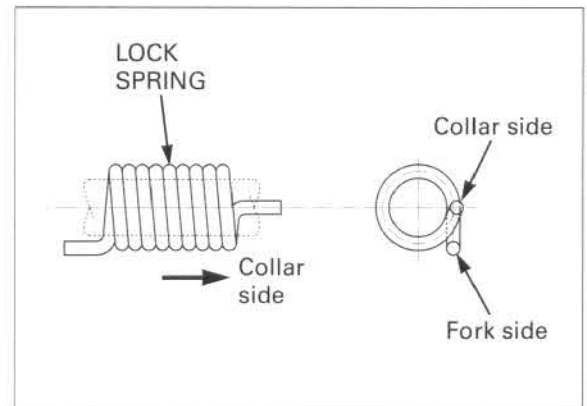
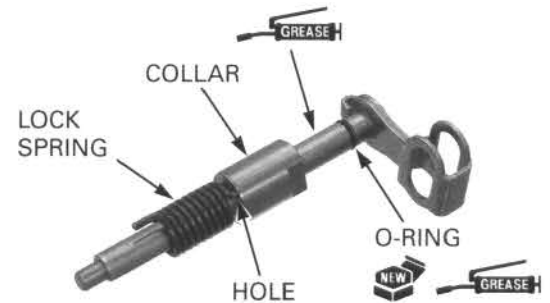


ASSEMBLY



Coat a new O-ring with grease and install it into the arm shaft groove.  
Apply grease to the arm shaft outer surface.

Install the collar and the lock spring with the short end toward the collar, and set the spring end into the hole in the collar.



Apply grease to the lips of a new oil seal and install it into the clutch housing until it is fully seated.

Install the arm shaft assembly, being careful not to damage the oil seal.

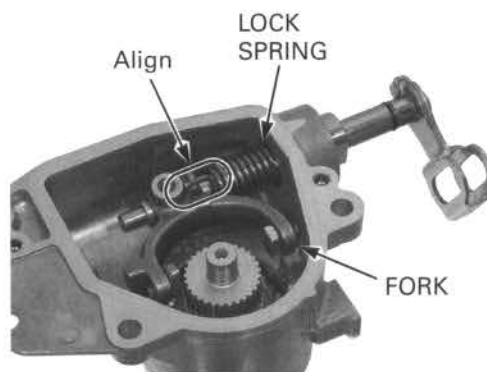
*Take care not to let the lock spring come off the collar during assembly.*





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

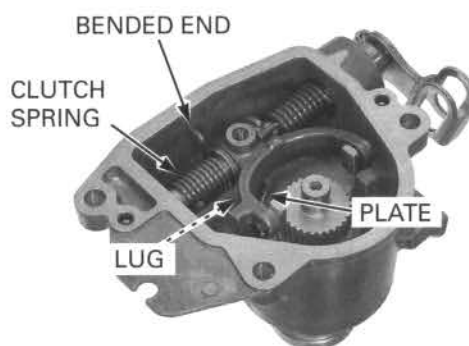
Install the shift fork and align the groove with the lock spring end.



*While holding the shift fork, push the arm shaft to slide it inward and install the shaft end into the pivot hole in the housing.*

Install the stopper plate by aligning the flat surfaces so the plate is attached onto the fork lug.

Install the clutch spring with the bended end toward the shift fork.

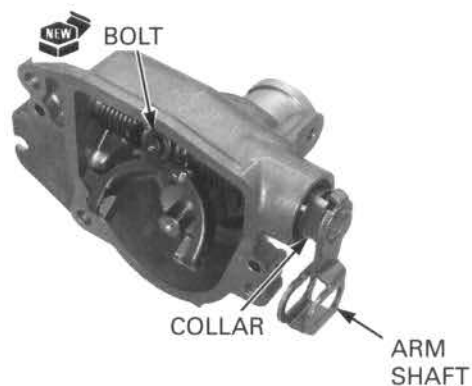
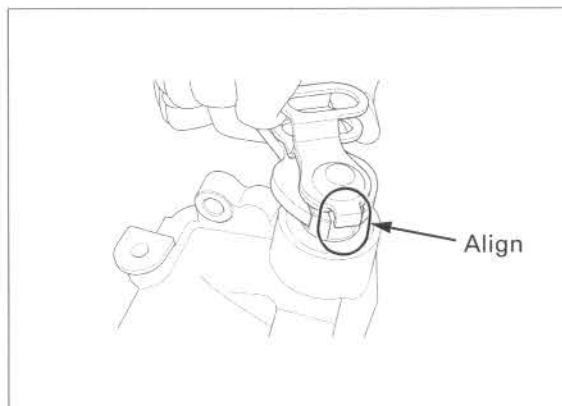


Turn the arm shaft clockwise by holding the collar with a open end wrench and align the arm tab with the collar groove, then tap the shaft to fit them securely.

Align the bolt hole in the fork with the groove in the shaft and install a new fork bolt.

Tighten the fork bolt.

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

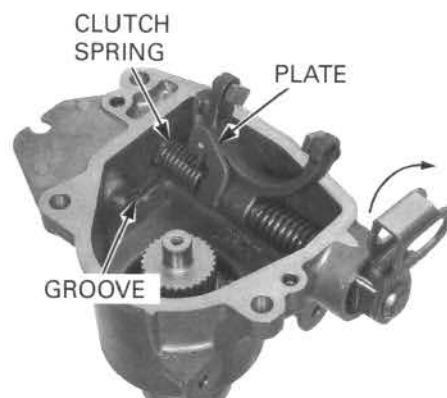




## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Turn the arm shaft and set the clutch spring ends onto the housing groove and the reverse side of the stopper plate as shown.

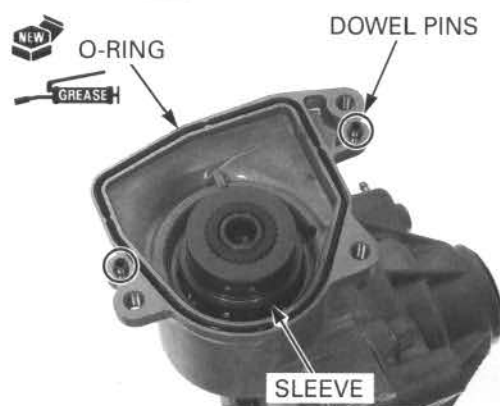
Check the arm shaft for smooth operation.



Install the clutch sleeve with the large O.D. side facing the inside.

Coat a new O-ring with grease and install it into the case groove.

Install the two dowel pins.

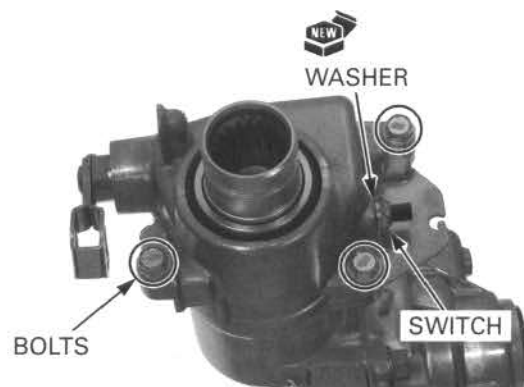
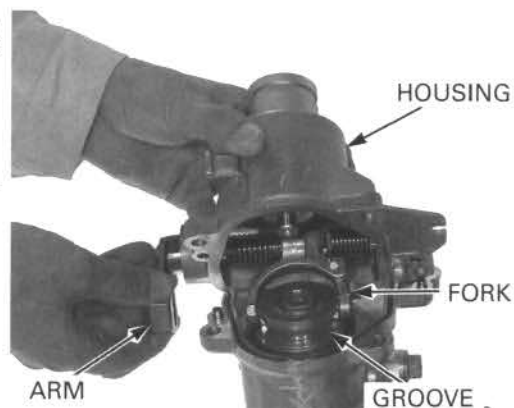


Aligning the fork claws with the sleeve groove, install the final clutch housing while turning the clutch arm, then secure it with the bolts. Tighten the three bolts.

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

Install the select switch with a new sealing washer and tighten it.

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





## FRONT FINAL GEAR DISASSEMBLY/ INSPECTION

Remove the final clutch housing (page 17-16).

### BACKLASH INSPECTION

Set the final gear case into a jig or vise with soft jaws.

Remove the oil filler cap.

*Cover the clutch housing mating surface with protective tape or an equivalent to prevent damaging it.*

Hold the pinion gear with the special tools.

#### TOOLS:

**Pinion puller base**

**07HMC-MM80110**

**Puller shaft and nut**

**07965-VM00200**

**Threaded adaptor**

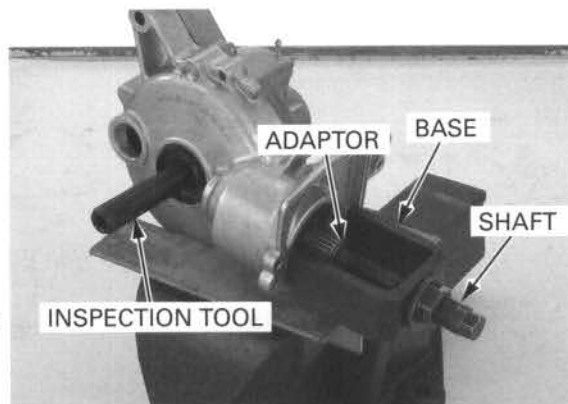
**070MF-HP50100**

Install the differential inspection tool into the left side of the gear case.

#### TOOL:

**Differential inspection tool**

**07KMK-HC50101 or  
07KMK-HC5010A  
(U.S.A. only)**



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.

The backlash is changed by about 0.06 mm (0.002 in) when the 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.

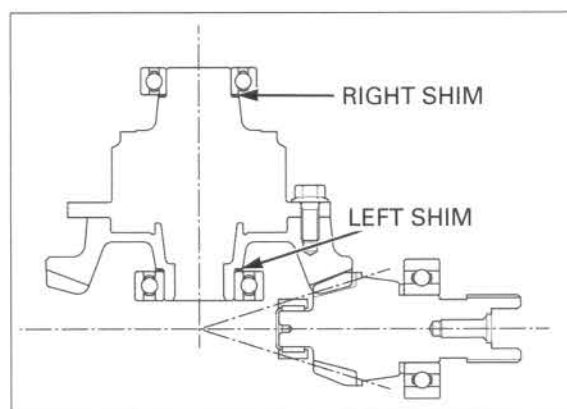
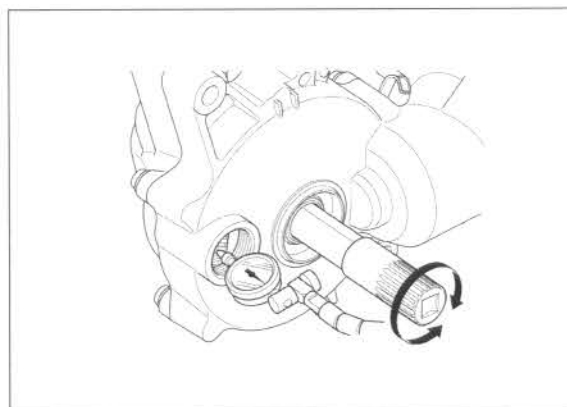
#### Ring gear shims:

**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 as follows: 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**.

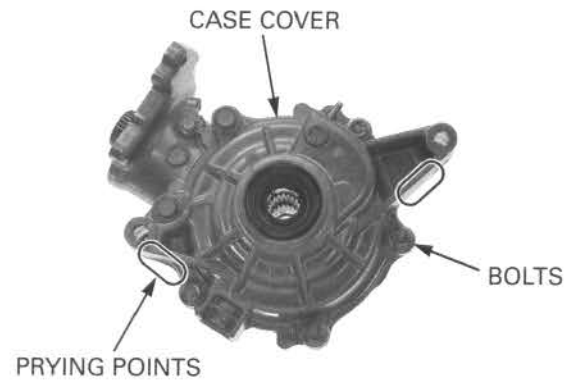




### DIFFERENTIAL REMOVAL

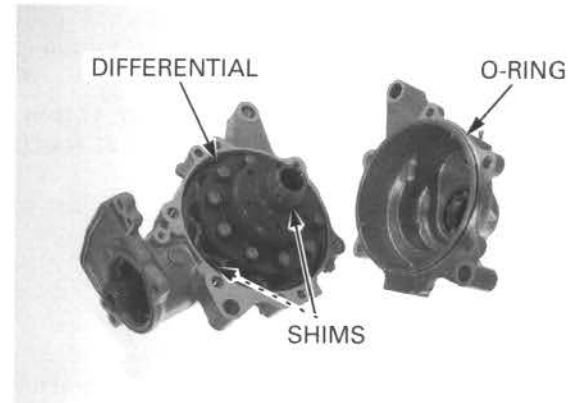
Loosen the six cover bolts in a crisscross pattern in several steps and remove them.

Pry the final gear case cover at the points as shown by using a screwdriver and remove it.



Remove the O-ring.

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.



### GEAR TOOTH CONTACT PATTERN CHECK

*Keep dust and dirt out of the case and cover.*

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

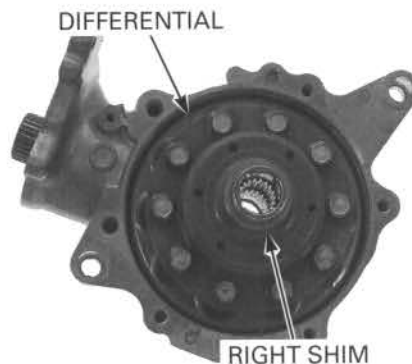
Install the ring gear shims onto the differential assembly.





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

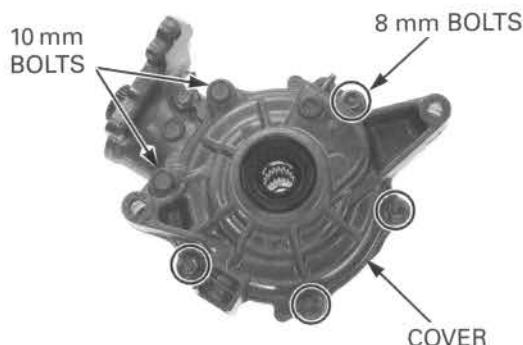
Install the differential assembly into the gear case.



*It is important to turn the pinion gear 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: 47 N·m (4.8 kgf·m, 35 lbf·ft)  
8 mm bolt: 25 N·m (2.5 kgf·m, 18 lbf·ft)



Rotate the ring gear several times in both directions of rotation.

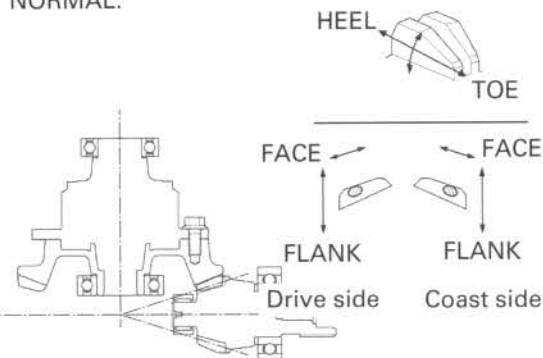
Check the gear tooth contact pattern through the oil filler hole.

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.

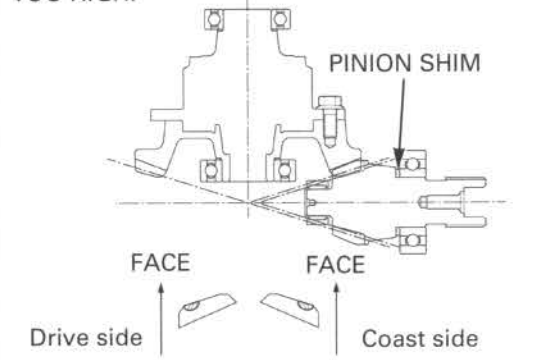
If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.

**NORMAL:**



Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

**TOO HIGH:**





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).

**NOTE:**

- Fifteen different thickness shims are available from the thinnest (1.64 mm thickness: A) shim to the thickest (2.48 mm thickness: O) in intervals of 0.06 mm.

**Pinion shims:**

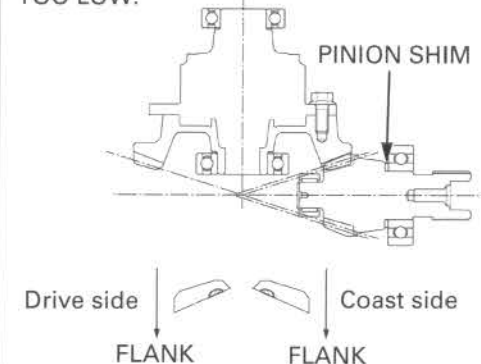
**A: (thinnest): 1.64 mm (0.065 in)**

**G: (standard): 2.00 mm (0.079 in)**

**O: (thickest): 2.48 mm (0.098 in)**

Pinion shim replacement (page 17-28).

**TOO LOW:**



## 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)**

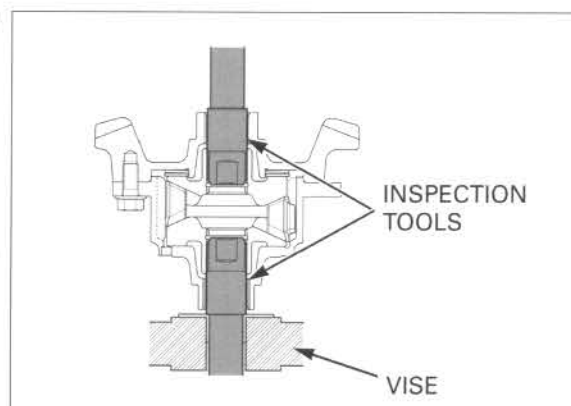
Hold the flat surface of the tool with a bench vise. Attach a torque wrench to the other tool and measure the limited slip torque.

**STANDARD:**

**14 – 17 N·m (1.45 – 1.75 kgf·m, 10 – 13 lbf·ft)**

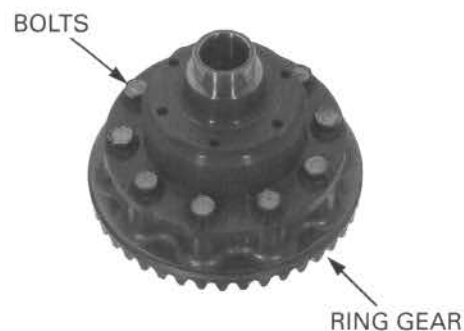
**SERVICE LIMIT: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

If the slip torque is out of specification, disassemble the differential and perform the components inspection (page 17-26) since the differential may be faulty.



## DIFFERENTIAL DISASSEMBLY

Remove the ten bolts, then place the differential assembly with the ring gear side up.

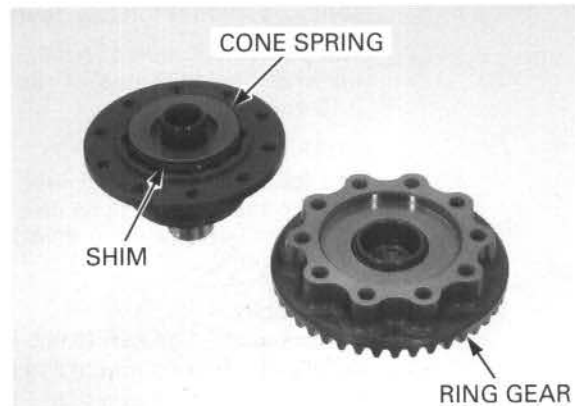




## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Remove the following:

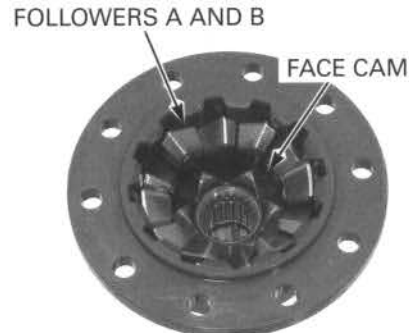
- ring gear
- side cone spring
- shim



- face cam



- six cam followers A and six cam followers B
- face cam

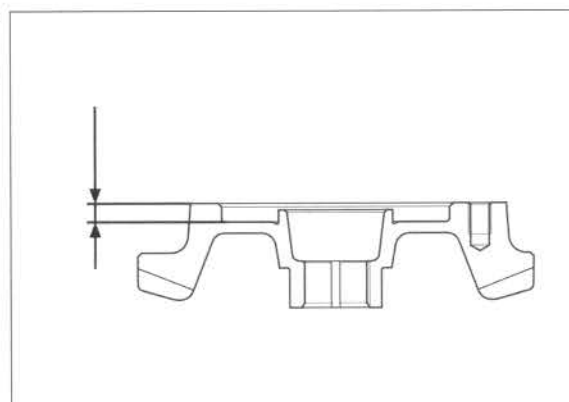


## DIFFERENTIAL COMPONENTS INSPECTION

### RING GEAR

Check the sliding surface of the ring gear for damage or discoloration. Measure the depth of the ring gear from the mating surface as shown.

**SERVICE LIMIT: 6.55 mm (0.258 in)**





## DIFFERENTIAL HOUSING/FACE CAM/ CAM FOLLOWER

*If the differential housing or face cam are faulty, replace the differential as an assembly.*

Check the sliding surface and grooves of the housing for damage or discoloration.

HOUSING



*Replace the cam followers as a set (12 pieces).*

Check the shim, face cams and followers for damage.

FACE CAM



CAM FOLLOWERS

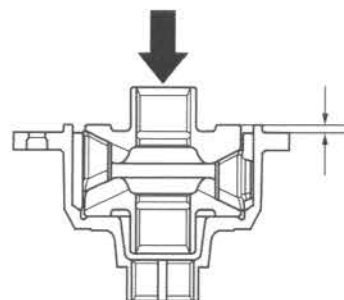
Temporarily assemble the differential housing, face cams and cam followers (page 17-33).

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: 3.3 mm (0.13 in)**

If the height is less than the limit, replace the differential as an assembly.

1.47 kN (150 kgf)



## SIDE CONE SPRING

Check the cone spring for damage. Measure the height of the spring.

**SERVICE LIMIT: 2.6 mm (0.10 in)**



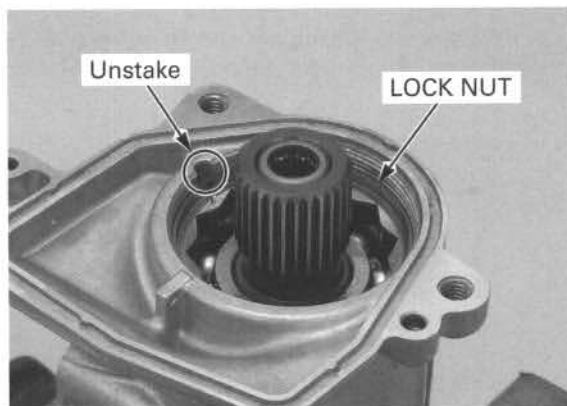


## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

### PINION GEAR REMOVAL

*Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.*

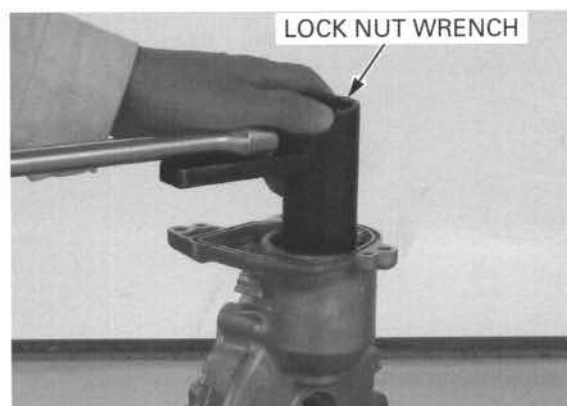
Unstake the bearing lock nut with a drill or grinder.



Remove the lock nut and discard it.

#### TOOL:

Lock nut wrench, 30 x 64 mm 07916-MB00002



*Cover the clutch housing mating surface with aluminum shims or an equivalent to prevent damaging it.*

Install the special tools with a washer onto the pinion gear shaft and gear case.

#### TOOLS:

Pinion puller base  
Puller shaft and nut  
Threaded adaptor

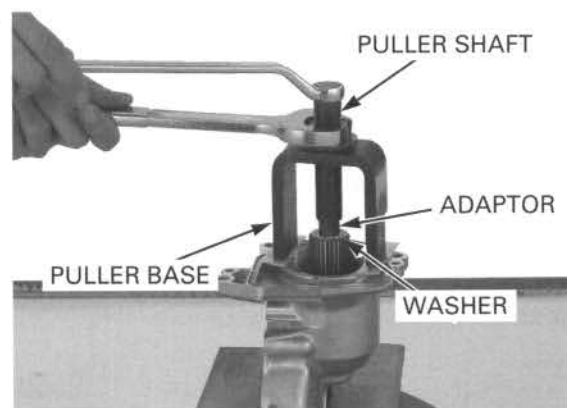
07HMC-MM80110  
07965-VM00200  
070MF-HP50100

#### U.S.A. TOOLS:

Pinion puller base  
Puller shaft  
Special nut  
Threaded adaptor

07HMC-MM8011A  
07931-ME4010B  
07931-HB3020A  
070MF-HP5A100

Pull the pinion assembly out from the gear case.



### PINION BALL BEARING AND SHIM REPLACEMENT

*Protect the shaft end with the pilot or an equivalent.*

Pull the bearing from the shaft with a commercially available bearing puller.

Remove the bearing and shim.

Replace the pinion joint needle bearing in the shaft end if necessary (page 17-29).





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Install the shim and bearing onto the pinion gear.

**NOTE:**

- When the gear set, differential bearing, differential housing and/or gear case has been replaced, use a 2.00 mm (0.079 in) thick shim for initial reference.



Press the pinion gear into a new bearing until it is fully seated by supporting the bearing inner race.

**TOOL:**

Attachment, 35 mm I.D.

07746-0030400



### PINION JOINT NEEDLE BEARING REPLACEMENT

Remove the pinion ball bearing (page 17-28).

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

Heat the pinion gear to about 80°C (176°F) and remove the needle bearing, using the special tools.

**TOOLS:**

Remover head, 12 mm

07936-1660110

Remover shaft, 12 mm

07936-1660120 or  
07936-166010A  
(U.S.A. only)

Remover weight

07741-0010201 or  
07936-371020A or  
07936-3710200  
(U.S.A. only)



Press a new bearing into the pinion gear with the marking facing up so that it is flush with the shaft end.

**TOOLS:**

Driver

07749-0010000

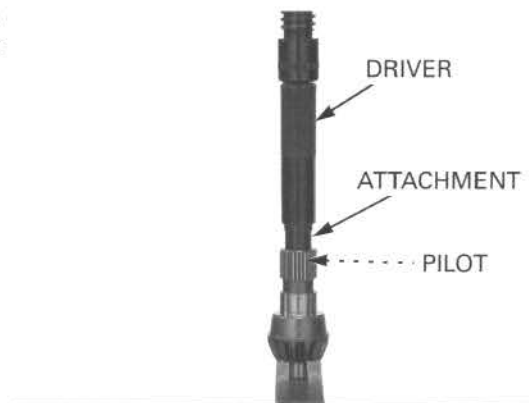
Attachment, 22 x 24 mm

07746-0010800

Pilot, 12 mm

07746-0040200

Install the pinion ball bearing (page 17-29).





## GEAR CASE BEARING REPLACEMENT

### DIFFERENTIAL BEARING

Remove the oil seals from the gear case and cover.

Drive the bearings out of the case and cover.



Drive the bearings into the gear case and cover.

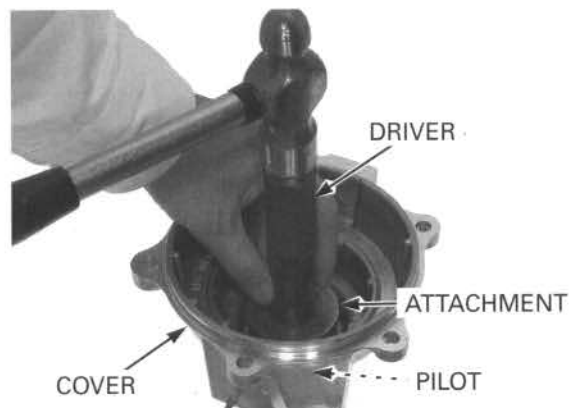
#### TOOLS:

##### Cover Side:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 28 mm	07746-0041100

##### Case Side:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 32 mm	07MAD-PR90200

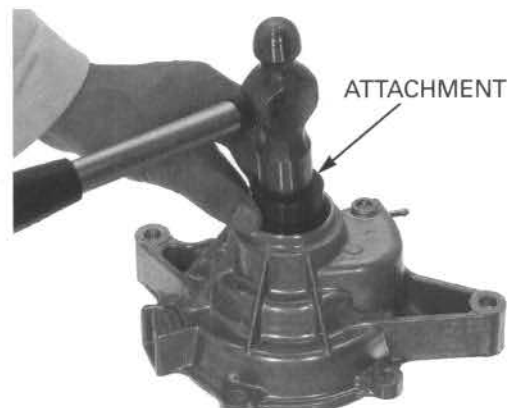


Apply grease to the seal lips of new dust seals.

Install each dust seal into the case and cover with the metal side facing out.

#### TOOL:

Attachment, 20 mm I.D.	07746-0020400
------------------------	---------------





## PINION NEEDLE BEARING

Rotate the stopper ring until its end appears in the access hole.

Strike gently near the end of the ring with a punch to bend the end upward.

Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.

Remove the oil filler cap.

Heat the gear case to about 80°C (176°F) and remove the needle bearing, using the special tools.

### TOOLS:

**Remover head, 16 mm**

**07936-MK50100**

**Remover shaft, 15 mm**

**07936-KC10100**

**Remover weight**

**07741-0010201 or**

**07936-371020A or**

**07936-3710200**

**(U.S.A. only)**

*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.*

Install a new stopper ring into the groove in a new bearing.

*Make sure the stopper ring stays in the groove.*

Install the bearing into the compressor until the stopper ring is flush with the end of the tool.

### TOOL:

**Bearing clip compressor, 26 mm 070ME-HP50100**

Place the driver, attachment and pilot on the top of the bearing and tape the driver to the compressor.

### TOOLS:

**Driver**

**07949-3710001**

**Attachment, 24 x 26 mm**

**07746-0010700**

**Pilot, 16 mm**

**07746-0041300**

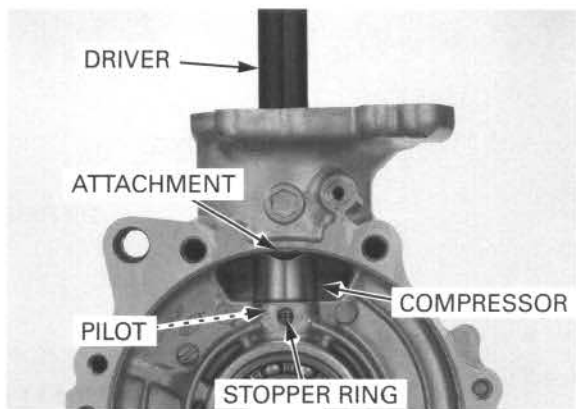
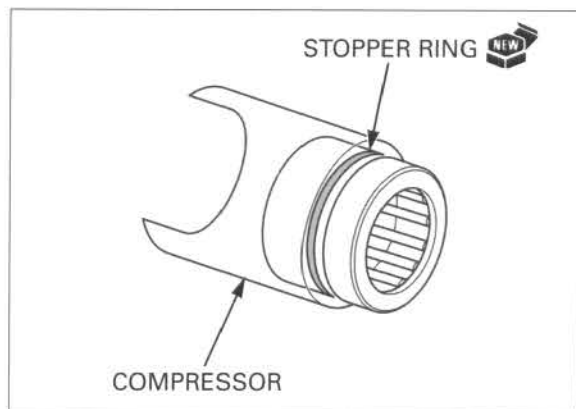
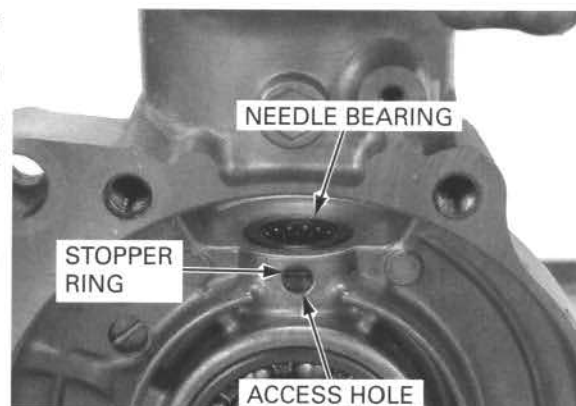
Place the bearing and tool assembly into a freezer for at least 30 minutes.

Heat the gear case to 80°C (176°F).

Remove the bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

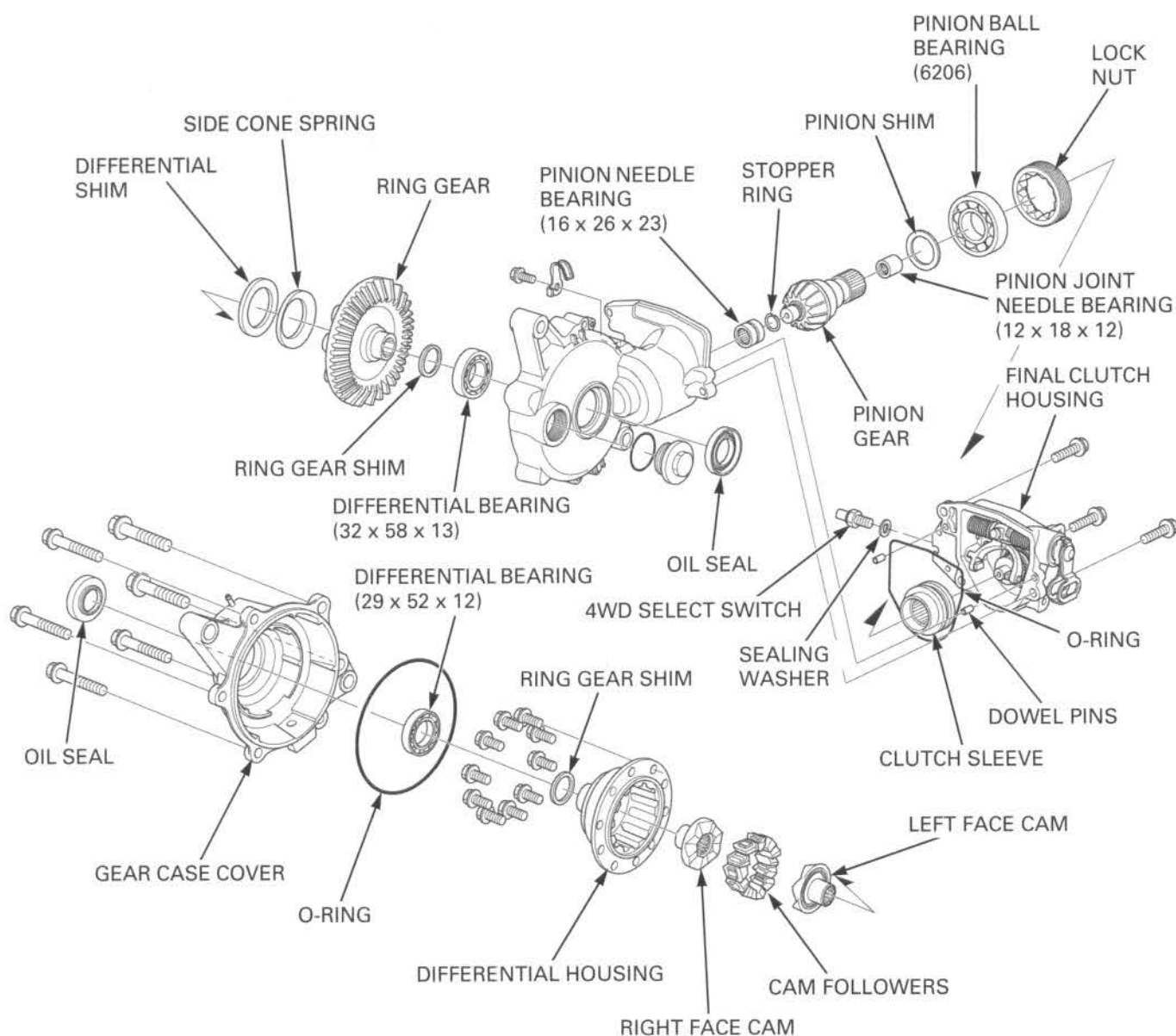
Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new ring.

Make sure the stopper ring is securely set in the groove of the gear case.





## FRONT FINAL GEAR ASSEMBLY



### PINION GEAR INSTALLATION

Drive the pinion gear assembly into the gear case.

#### TOOLS:

Driver

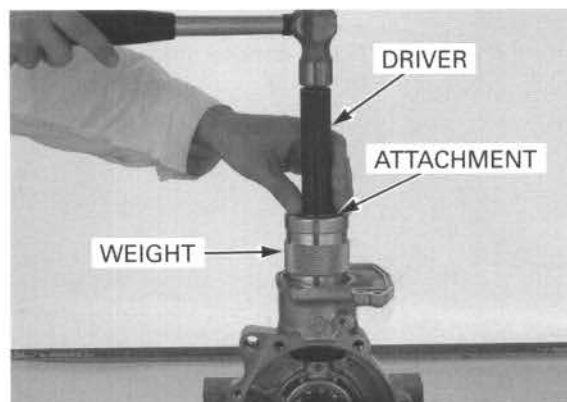
Attachment, 42 x 47 mm

Fork seal driver weight

07749-0010000

07746-0010300

07747-0010100





Install a new lock nut and tighten it.

## TOOL:

Lock nut wrench, 30 x 64 mm 07916-MB00002

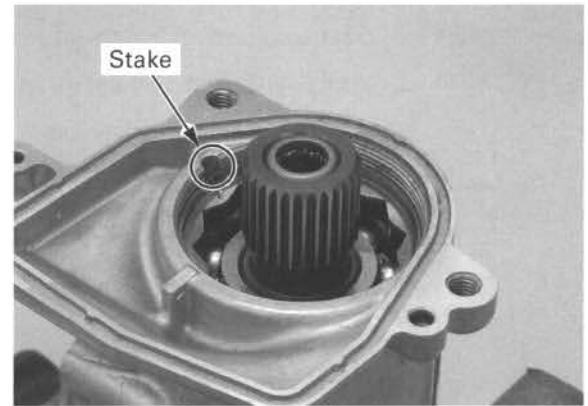
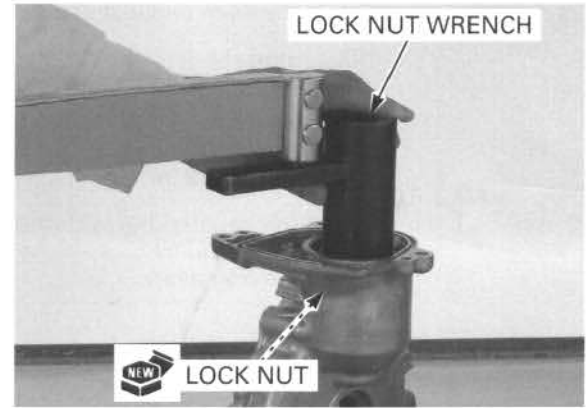
**TORQUE:** Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)

Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)

Refer to "Service Information" for torque wrench reading information (page 17-3).

Be careful not to damage the threads of the case.

Stake the lock nut into the case groove.

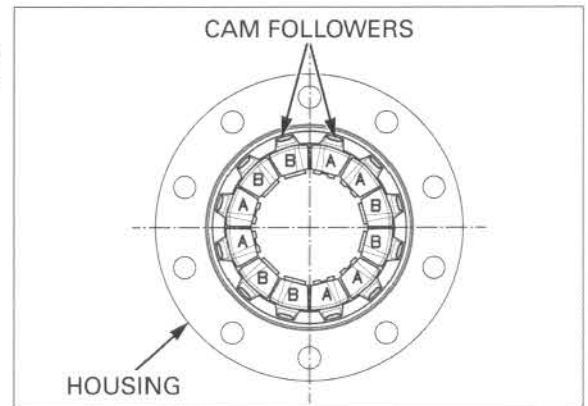


## DIFFERENTIAL ASSEMBLY

Keep dust and dirt out of the differential housing.

Install the face cam into the differential housing.

Install 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 ring gear (page 17-26) and the height of the housing-to-cam (page 17-27), and record them.

Calculate the shim thickness using the equation below. The correct shim is nearly this dimension.

$$A = B - C - 1.6 \text{ mm}$$

A: New shim thickness

B: Recorded ring gear depth

C: Recorded cam height





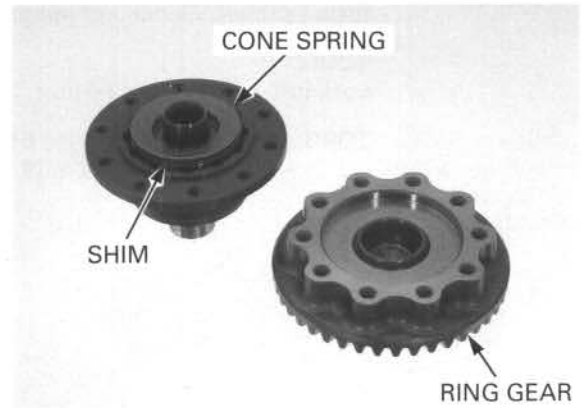
## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Select the shim and install it onto the face cam.

### Differential shims:

A: 1.3 mm (0.051 in)	E: 1.7 mm (0.067 in)
B: 1.4 mm (0.055 in)	F: 1.8 mm (0.071 in)
C: 1.5 mm (0.059 in)	G: 1.9 mm (0.075 in)
D: 1.6 mm (0.063 in)	

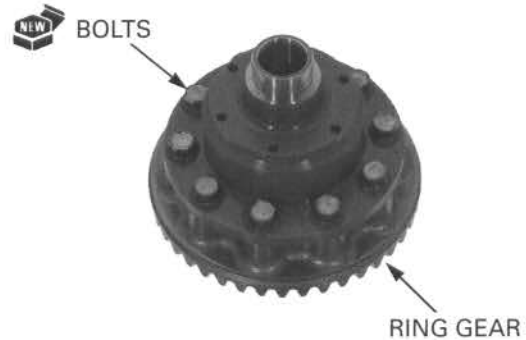
Install the cone spring with the concave side facing up (ring gear side).  
Install the ring gear.



Install new ring gear bolts and tighten them in a crisscross pattern in several steps.

**TORQUE: 49 N·m (5.0 kgf·m, 36 lbf·ft)**

Inspect the slip torque (page 17-25).  
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.



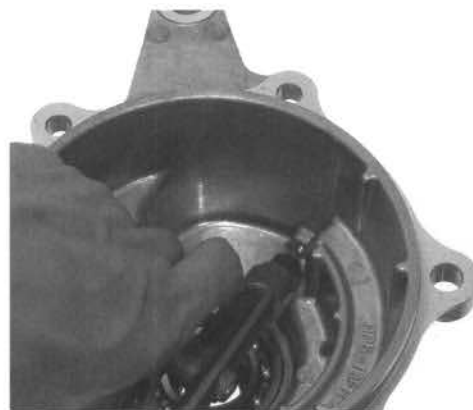
## FINAL GEAR CASE ASSEMBLY

### NOTE:

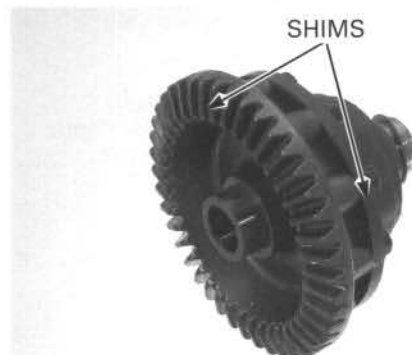
- When the gear set, bearing, differential housing and/or gear case has been replaced, check the tooth contact pattern (page 17-23) and gear backlash (page 17-22).

*Keep dust and dirt out of the case and cover.*

Blow compressed air through the breather hole in the case cover.



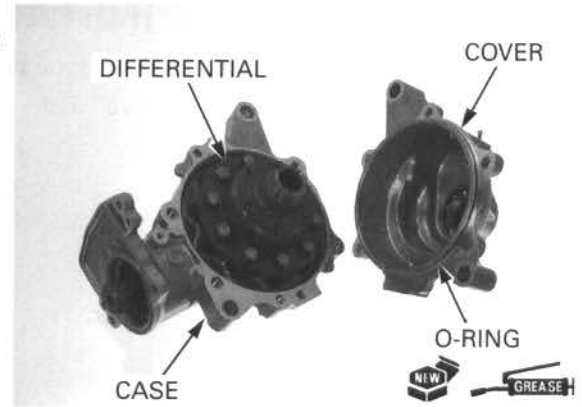
Install the proper ring gear shims onto the differential assembly.





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Install the differential assembly into the gear case.  
Coat a new O-ring with grease and install it into the case cover groove.  
Install the cover over the gear case.



*It is important to turn the pinion gear 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 six 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: 47 N·m (4.8 kgf·m, 35 lbf·ft)  
8 mm bolt: 25 N·m (2.5 kgf·m, 18 lbf·ft)

Make sure that the gear assembly rotates smoothly without binding.

Install the final clutch housing (page 17-21).





## FRONT FINAL DRIVE INSTALLATION

Place the final gear case assembly into the frame.

Install the right drive shaft into the gear case (page 17-11).

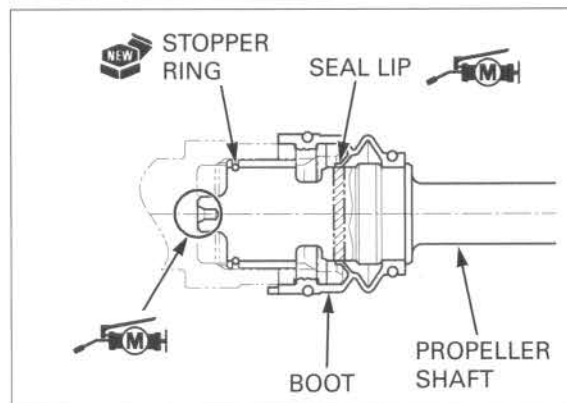


Install a new stopper ring into the groove in the propeller shaft.

Apply molybdenum disulfide grease to the seal lip of the front side boot.

Make sure the seal lip is not turned outside in.

Apply molybdenum disulfide grease to the front end of the propeller shaft



Coat a new O-ring with molybdenum disulfide grease and install it into the output shaft groove.

Apply 5 – 8 g of molybdenum disulfide grease to the pinion joint splines.

Place the boot band over the pinion joint temporarily.

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

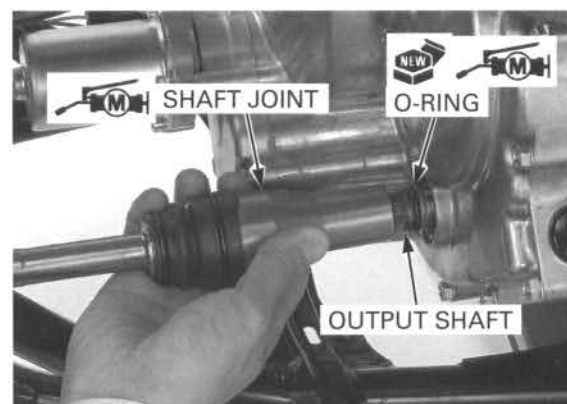
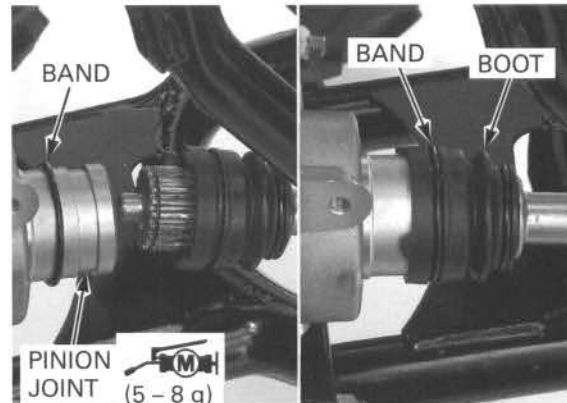
Make sure the stopper ring is seated properly by pulling the propeller shaft lightly.

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

Apply molybdenum disulfide grease to the propeller shaft joint splines.

Move the gear case assembly forward for maximum clearance between the shaft joint and output shaft.

Engage the shaft joint over the output shaft and move the gear case assembly rearward.





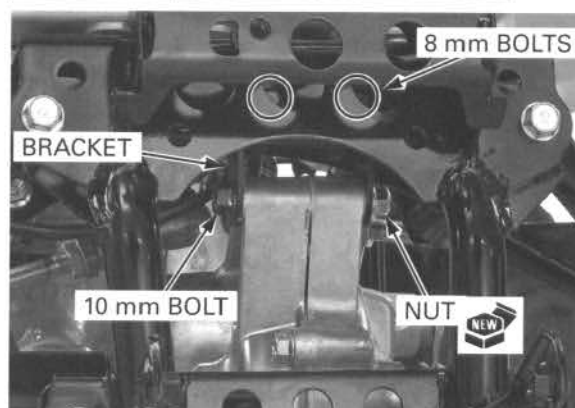
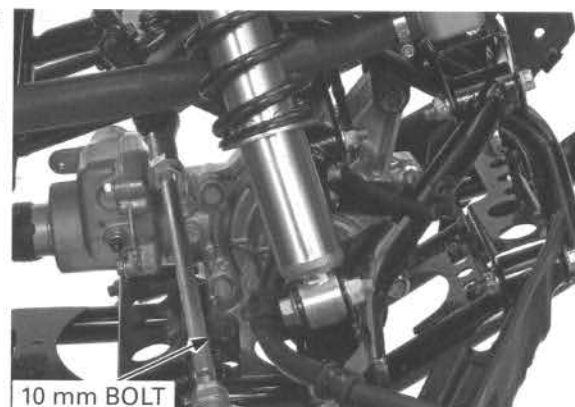
## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Align the lower mounting bolt holes in the gear case and frame, then install the mounting bolt.

Install the mounting bracket with the two bolts. Install the upper mounting bolt from the right side and a new mounting nut.

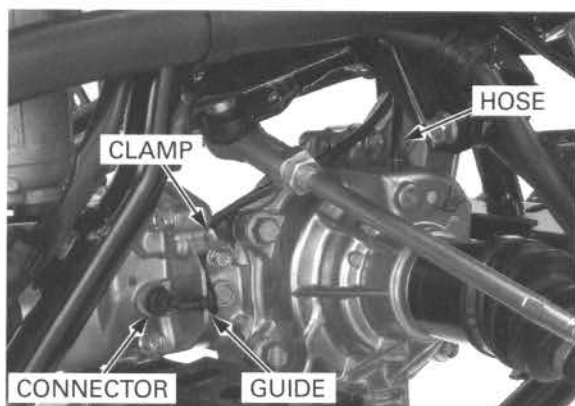
Tighten the all the gear case mounting fasteners.

**TORQUE: 10 mm: 44 N·m (4.5 kgf·m, 32 lbf·ft)**



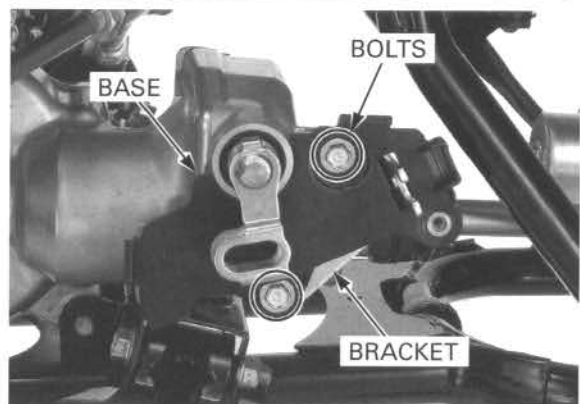
Connect the switch connector and install the wire grommet into the holder in the gear case. Secure the wire with the clamp.

Connect the breather hose.



Install the holder bracket and cover base with the two bolts, and tighten them.

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





## FRONT DRIVING MECHANISM (FM/FE/FPM/FPE models)

Install the spring onto the selector cable.

Insert the cable into the cable holder and connect it to the clutch arm with the joint pin and adjusting nut.

Set the groove in the cable grommet onto the cover base end properly.

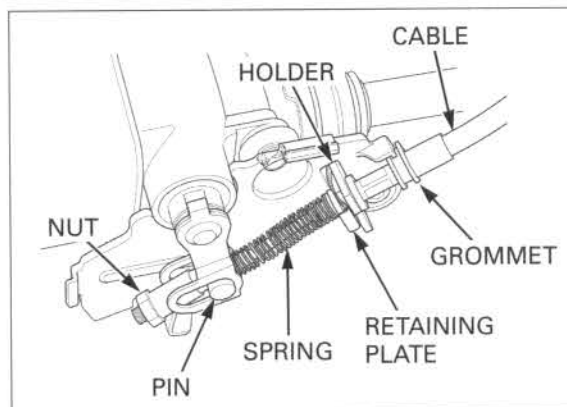
Install the retaining plate onto the cable with the concave facing the cable holder to secure the cable.

Adjust the selector cable (page 4-21).

Install the following:

- left drive shaft (page 17-11)
- front fender/carrier (page 3-7)
- engine guard (page 3-8)
- mudguards (page 3-6)

Fill the gear case with the recommended oil (page 4-21).



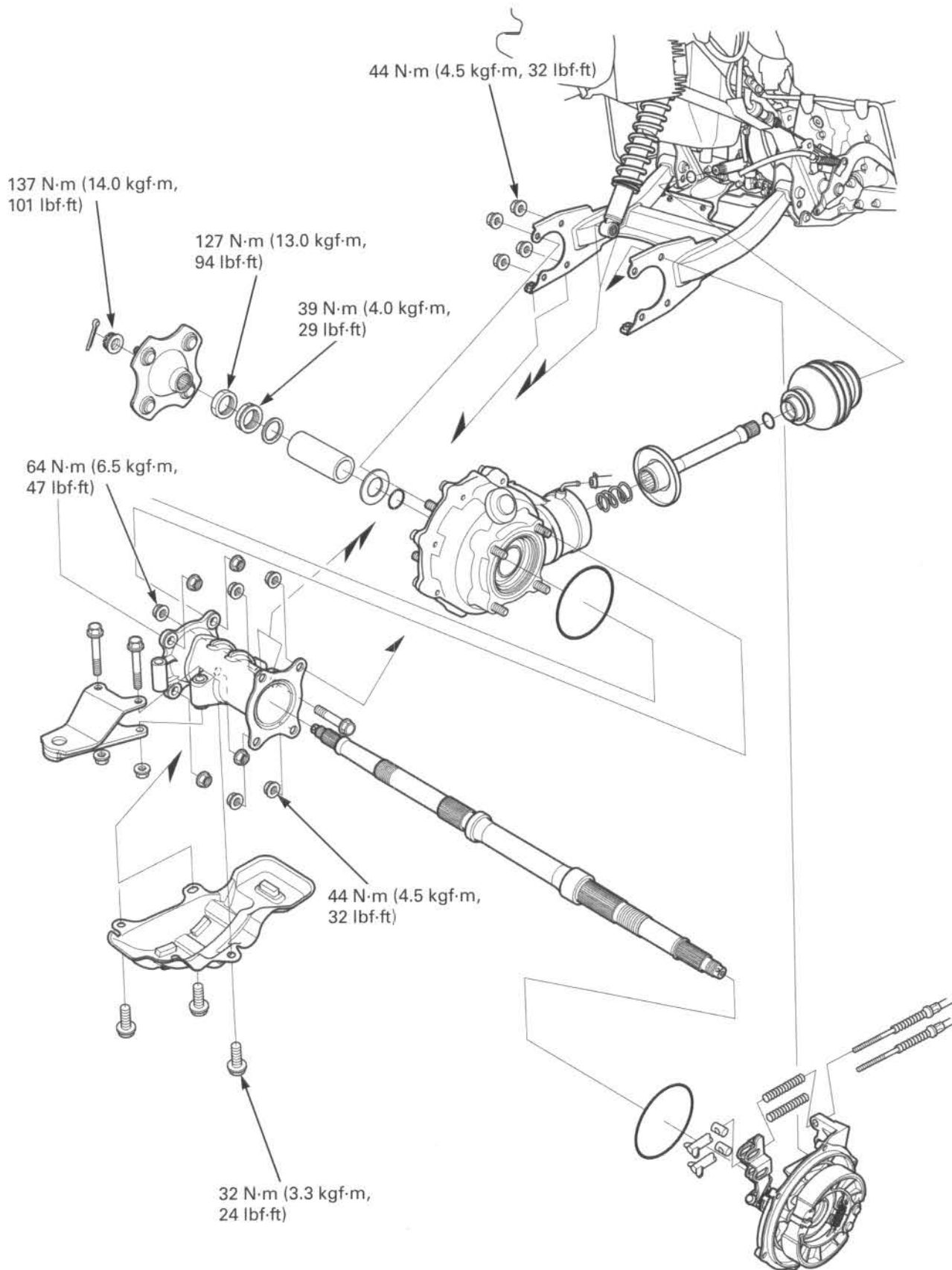


# 18. REAR DRIVING MECHANISM

SYSTEM COMPONENTS .....	18-2	REAR FINAL GEAR DISASSEMBLY/ INSPECTION .....	18-11
SERVICE INFORMATION .....	18-3	GEAR CASE BEARING REPLACEMENT .....	18-16
TROUBLESHOOTING .....	18-5	REAR FINAL GEAR ASSEMBLY .....	18-18
REAR AXLE REMOVAL .....	18-6	REAR FINAL DRIVE INSTALLATION .....	18-21
REAR FINAL DRIVE REMOVAL .....	18-8	REAR AXLE INSTALLATION .....	18-23



## REAR DRIVING MECHANISM SYSTEM COMPONENTS





# 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 and torque wrench adaptor, use a deflecting beam type torque wrench 20 inches long. The tool increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the nut. The specification given is the actual torque applied to the nut, not the reading on the torque wrench. Do not overtighten the 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	75 cm <sup>3</sup> (2.5 US oz, 2.6 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)	—

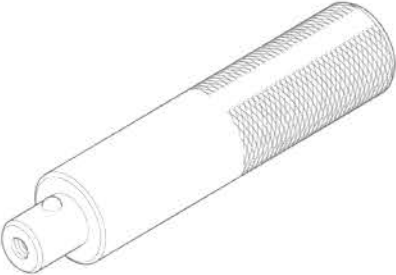
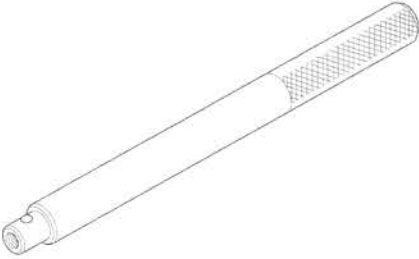






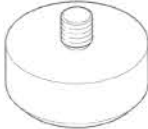

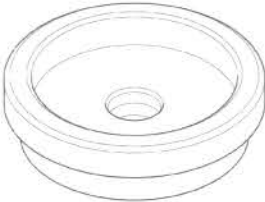
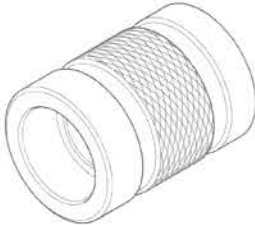
## TORQUE VALUES

Rear final gear pinion bearing lock nut	98 N·m (10.0 kgf·m, 72 lbf·ft)	Lock nut: replace with a new one. Stake.
Rear final gear case cover bolt (10 mm)	47 N·m (4.8 kgf·m, 35 lbf·ft)	Apply locking agent to the threads.
Rear final gear case cover bolt (8 mm)	25 N·m (2.5 kgf·m, 18 lbf·ft)	
Rear final gear case/brake panel mounting nut	44 N·m (4.5 kgf·m, 32 lbf·ft)	Lock nut: replace with a new one.
Shock absorber lower mounting nut	64 N·m (6.5 kgf·m, 47 lbf·ft)	Lock nut: replace with a new one.
Final gear case skid plate bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	ALOC bolt: replace with a new one.
Axle nut (inner)	39 N·m (4.0 kgf·m, 29 lbf·ft)	Apply locking agent to the threads.
Axle lock nut (outer)	127 N·m (13.0 kgf·m, 94 lbf·ft)	Apply locking agent to the threads.
Rear wheel hub nut	137 N·m (14.0 kgf·m, 101 lbf·ft)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.

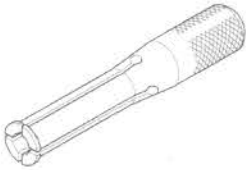

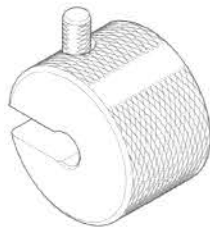

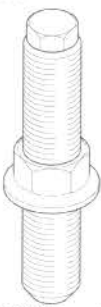
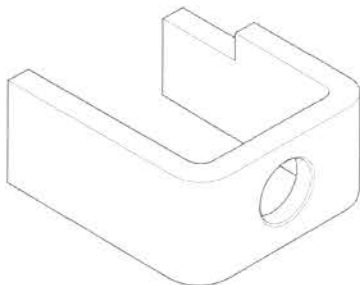
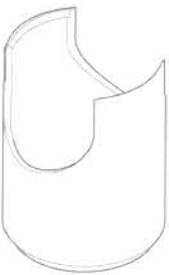
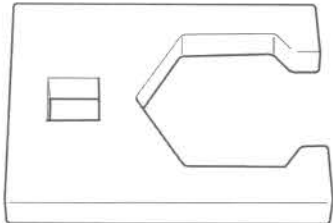
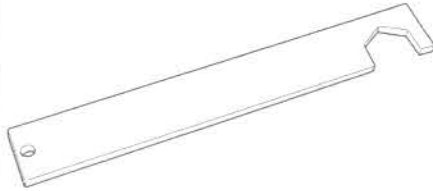


REAR DRIVING MECHANISM

TOOLS

<p>Driver 07749-0010000</p> 	<p>Driver 07949-3710001</p> 	<p>Attachment, 22 x 24 mm 07746-0010800</p> 
<p>Attachment, 42 x 47 mm 07746-0010300</p> 	<p>Attachment, 52 x 55 mm 07746-0010400</p> 	<p>Attachment, 72 x 75 mm 07746-0010600</p> 
<p>Attachment, 35 mm I.D. 07746-0030400</p> 	<p>Pilot, 15 mm 07746-0040300</p> 	<p>Pilot, 40 mm 07746-0040900</p> 
<p>Oil seal driver attachment 07JAD-PH80101</p> 	<p>Oil seal driver attachment 07965-SA00600</p> 	<p>Fork seal driver weight 07747-0010100</p> 



<p>Bearing remover head, 15 mm 07936-KC10200</p>  <p>or 07936-KC10500</p>	<p>Bearing remover shaft, 15 mm 07936-KC10100</p>  <p>or 07936-KC10500</p>	<p>Remover weight 07741-0010201</p>  <p>or 07936-371020A or 07936-3710200 (U.S.A. only)</p>
<p>Lock nut wrench, 30 x 64 mm 07916-MB00002</p> 	<p>Puller shaft and nut 07931-ME40000</p>  <p>or 07931-ME4010B and 07931-HB3020A (U.S.A. only)</p>	<p>Pinion puller base 07HMC-MM80110</p>  <p>or 07HMC-MM8011A (U.S.A. only)</p>
<p>Bearing clip compressor, 25 mm 070ME-HN80100</p> 	<p>Axle nut torque wr. adaptor, 41 mm 07916-958010B</p> 	<p>Axle nut holder wrench, 41 mm 07916-958020B</p> 

## TROUBLESHOOTING

### Excessive noise

- Worn or scored ring gear and axle splines
- Worn or scored pinion gear and propeller shaft splines
- Worn or damaged bearing
- 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

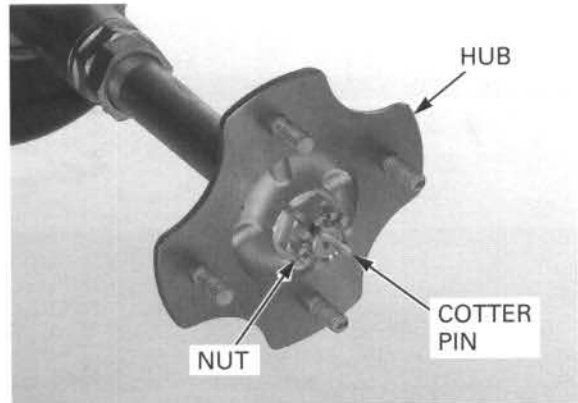


## REAR DRIVING MECHANISM

### REAR AXLE REMOVAL

Remove the rear wheels (page 15-6).

Remove the cotter pin and hub nut and remove each wheel hub from the axle.



Set the parking brake.

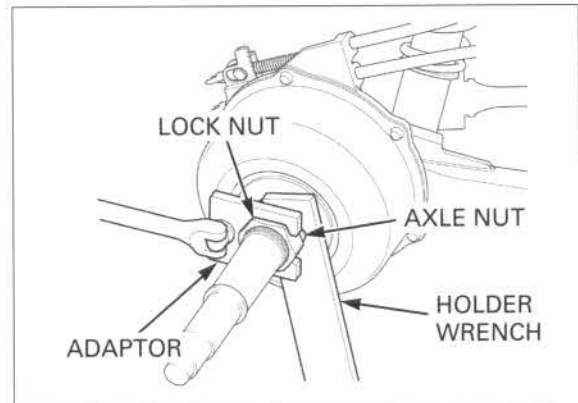
Loosen the lock nut of the brake drum side by holding the axle nut, using the special tools.

#### TOOLS:

**Axle nut torque wr. adaptor, 41 mm 07916-958010B**

**Axle nut holder wrench, 41 mm 07916-958020B**

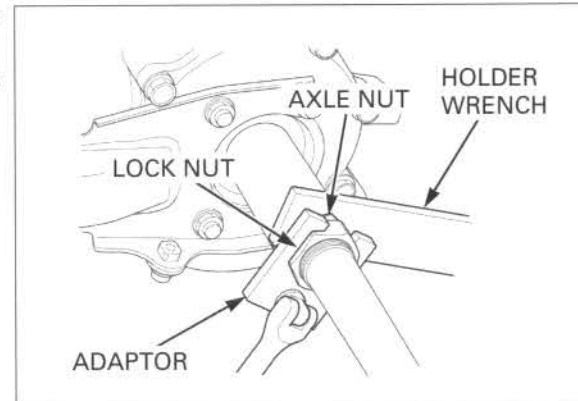
Loosen the axle nut using the same tool.



Loosen the lock nut and axle nut of the gear case side in the same manner as above.

Remove the lock nuts and axle nuts from both sides of the axle.

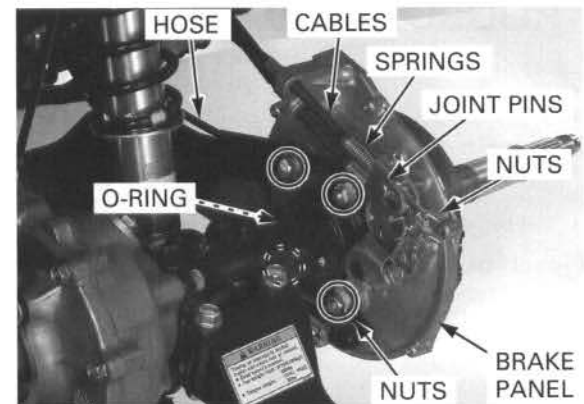
Remove the brake drum (page 16-18).



*Do not get grease onto the brake shoe linings.*

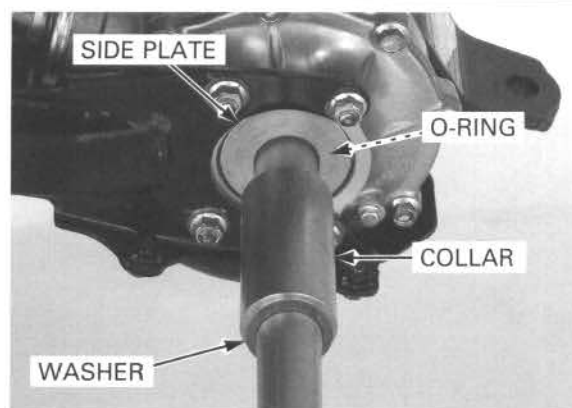
Support the swingarm and remove the following:

- breather hose
- adjusting nuts
- joint pins
- springs
- brake cables
- four panel nuts
- brake panel assembly
- O-ring (from the brake panel)

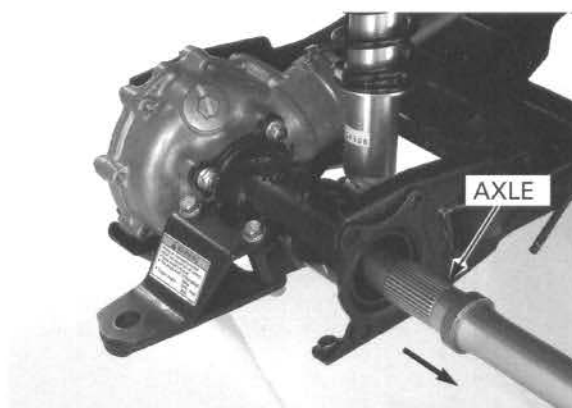




- spring washer
- axle collar
- side plate
- O-ring



Remove the rear axle by driving it from the left side using a rubber mallet.



## INSPECTION

### 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 seal from the brake panel. Turn the inner race of the bearing with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the panel.





## REAR DRIVING MECHANISM

### BEARING REPLACEMENT

Remove the dust seal and the snap ring.  
Drive the axle bearing out of the brake panel.

*Support the bearing housing section of the brake panel when installing.*

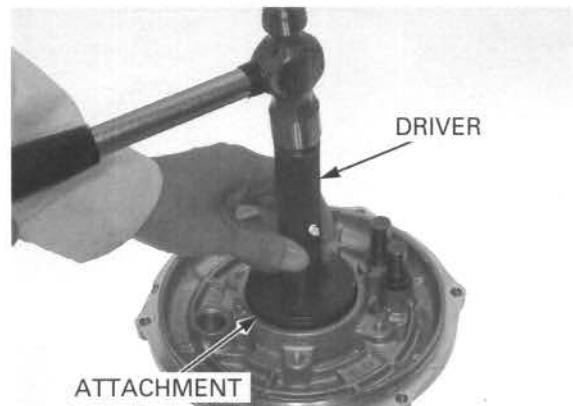
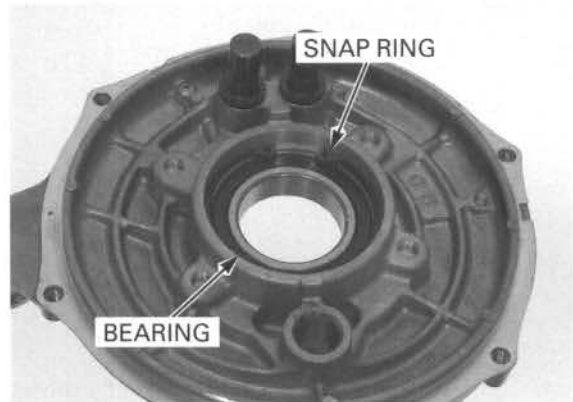
Drive a new bearing squarely until it is fully seated.

#### TOOLS:

**Driver** 07749-0010000  
**Attachment, 72 x 75 mm** 07746-0010600

Install the snap ring with the chamfered edge facing the bearing securely.

Apply grease to the lips of a new dust seal.  
Install the dust seal with the flat side facing up so that it is flush with the panel.



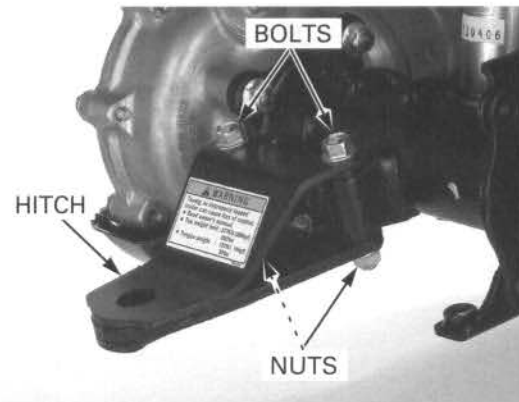
### REAR FINAL DRIVE REMOVAL

Drain the gear case oil if the final gear case will be disassembled (page 4-19).

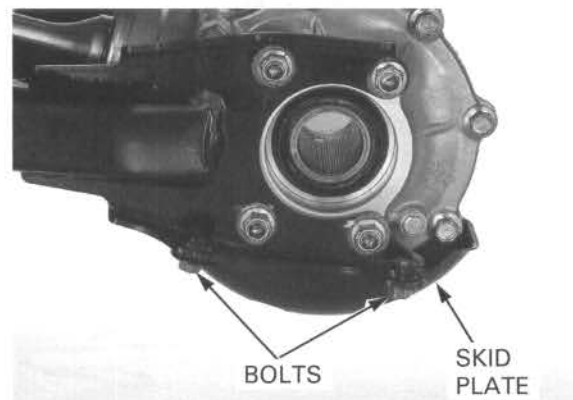
Remove the rear axle (page 18-6).

Support the swingarm and remove the following:

- two nuts and bolts
- trailer hitch

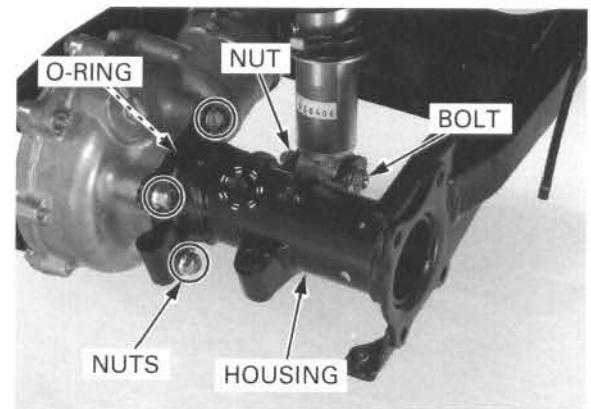


- three bolts
- skid plate

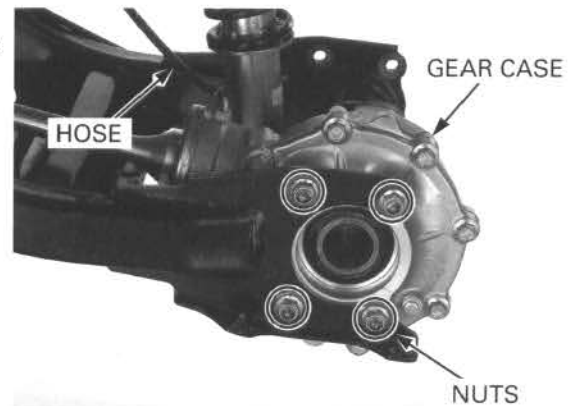




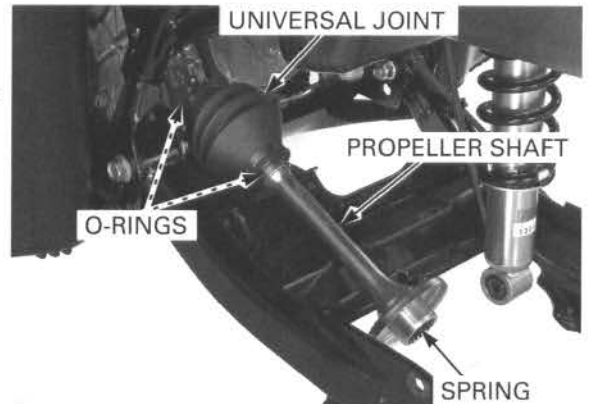
- shock absorber lower mounting nut and bolt
- four nuts
- axle housing
- O-ring



- breather hose
- four nuts (while supporting the gear case securely)
- gear case assembly



- joint spring
- propeller shaft
- universal joint
- O-rings (from the propeller shaft and output shaft)

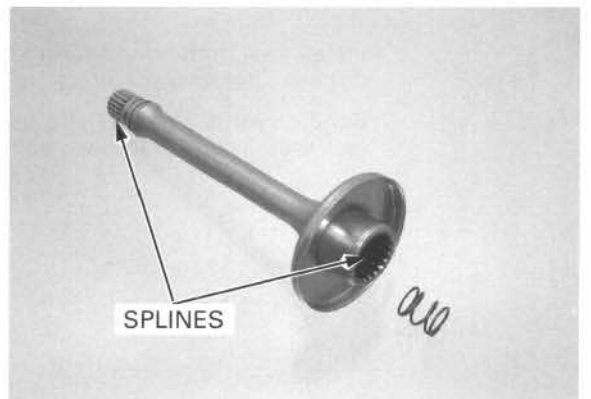


## INSPECTION

### PROPELLER SHAFT

Check the splines of the drive shaft for wear or damage.

If the they are damaged, check the pinion and universal joint splines also.





## REAR DRIVING MECHANISM

### UNIVERSAL JOINT

Check the boot for cuts or other damage.  
Check that the joint moves smoothly without binding or noise.



### OPERATION CHECK

Temporarily install the propeller shaft.  
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.

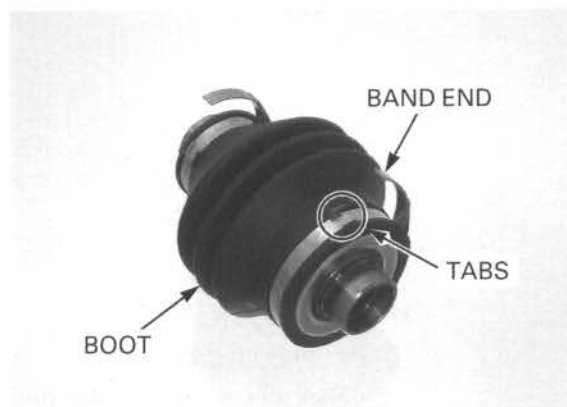


### JOINT BOOT REPLACEMENT

Bend up the lock tabs and raise each band end to loosen the boot bands.

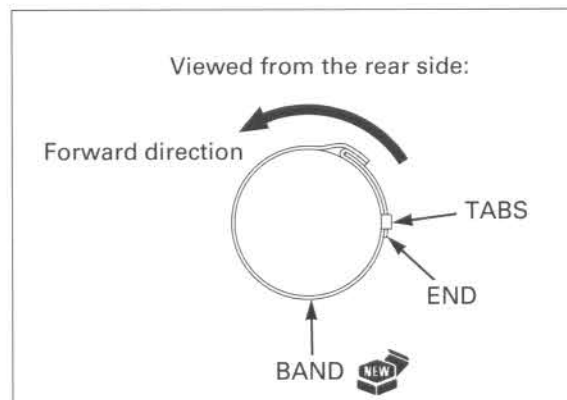
Remove the joint boot.

Install the boot and set it onto the universal joint properly.



Install new boot bands so the band ends are facing opposite the forward direction.

Bend down each band end and secure it with the lock tabs. Tap the lock tabs with a plastic hammer.





# REAR FINAL GEAR DISASSEMBLY/ INSPECTION

## BACKLASH INSPECTION

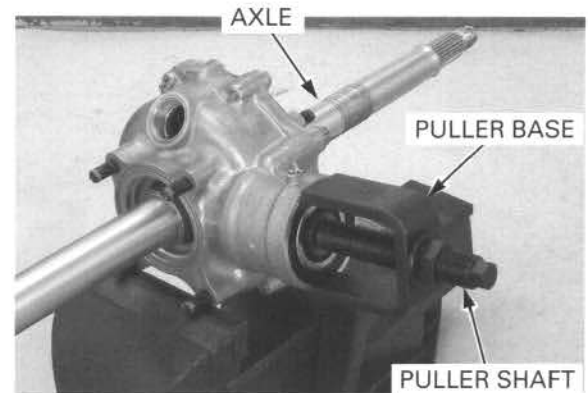
Remove the oil filler cap.

Set the gear case assembly in a vise.  
Hold the pinion gear with the special tools.

### TOOLS:

Puller shaft and nut	07931-ME40000
Pinion puller base	07HMC-MM80110
U.S.A. TOOL:	
Puller shaft	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base	07HMC-MM8011A

Install the axle into the gear case 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)**

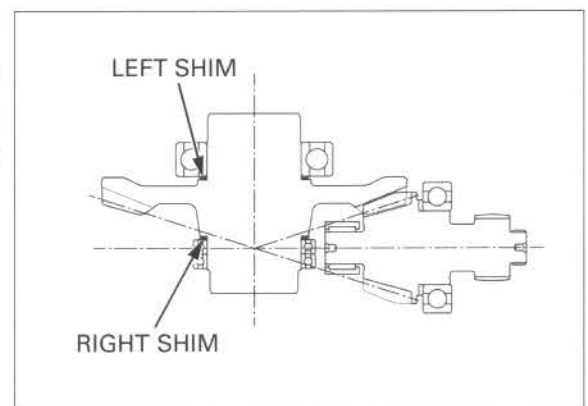
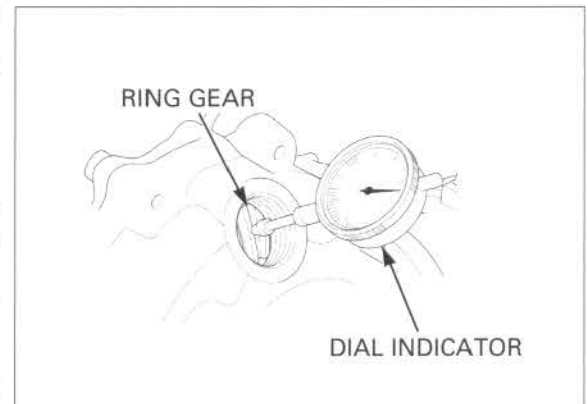
If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.

If the backlash is excessive, replace the ring gear right side shim with a thinner one.  
If the backlash is too small, replace the ring gear right side shim with a thicker one.  
Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.12 mm (0.005 in).

### Ring gear shims:

A: 1.26 mm (0.050 in)	G: 1.62 mm (0.064 in)
B: 1.32 mm (0.052 in)	H: 1.68 mm (0.066 in)
C: 1.38 mm (0.054 in)	I: 1.74 mm (0.069 in)
D: 1.44 mm (0.057 in)	J: 1.80 mm (0.071 in)
E: 1.50 mm (0.059 in)	K: 1.86 mm (0.073 in)
F: 1.56 mm (0.061 in)	

Change the left side shim as follows: If the right shim was replaced with a 0.12 mm (0.005 in) **thicker** shim, replace the left shim with one that is 0.12 mm (0.005 in) **thinner**.





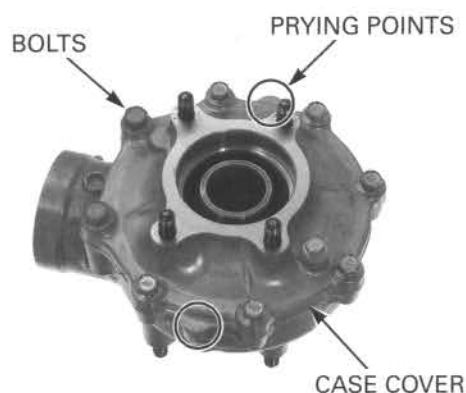
## REAR DRIVING MECHANISM

### REAR FINAL GEAR CASE DISASSEMBLY

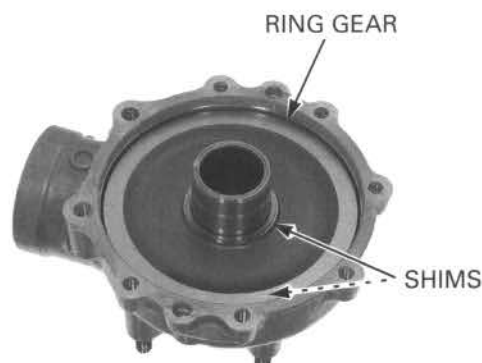
Loosen the eight cover bolts in a crisscross pattern in several steps and remove them.

*Be careful not to damage the mating surfaces.*

Pry the case cover at the prying points using a screwdriver and remove it.



Remove the ring gear and shims.



### BEARING INSPECTION

Turn the inner race of each bearing in the gear case and 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.

Ring gear bearing replacement (page 18-16).



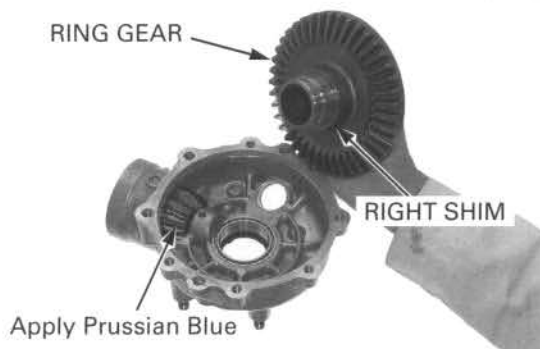
### GEAR TOOTH CONTACT PATTERN CHECK

*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.

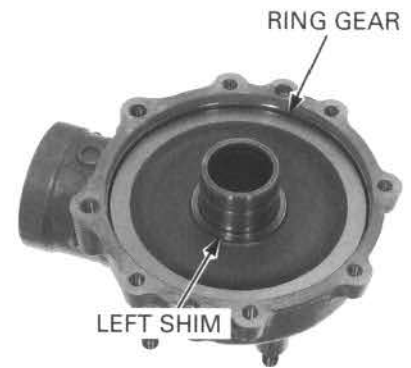
Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the right shim onto the ring gear.





Install the ring gear with the shim into the gear case.  
Install the left shim onto the ring gear.



*It is important to turn the pinion gear 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: 47 N·m (4.8 kgf·m, 35 lbf·ft)  
8 mm bolt: 25 N·m (2.5 kgf·m, 18 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.

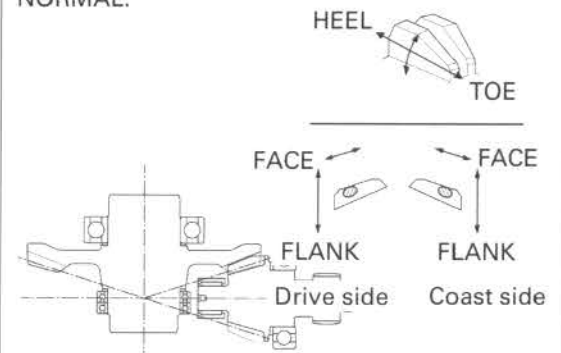
The pattern is indicated by the Prussian Blue applied to the pinion gear.

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.

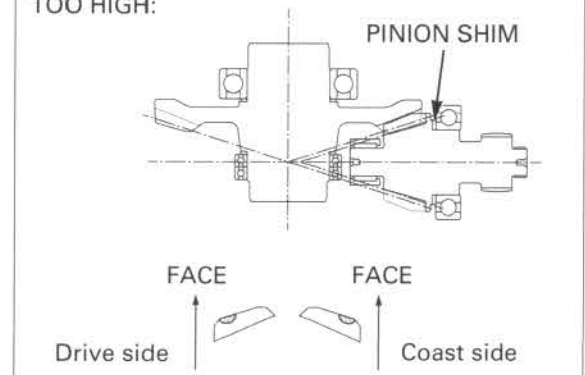
If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.

Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

**NORMAL:**



**TOO HIGH:**





## REAR DRIVING MECHANISM

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:

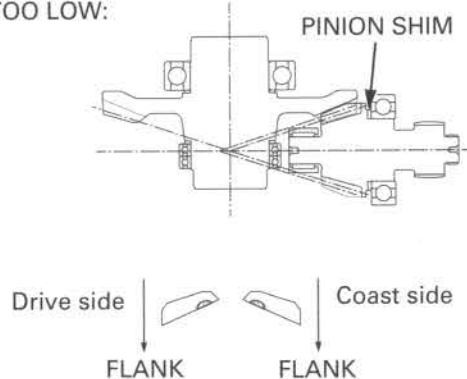
A: 1.82 mm (0.072 in)	F: 2.12 mm (0.083 in)
B: 1.88 mm (0.074 in)	G: 2.18 mm (0.086 in)
C: 1.94 mm (0.076 in)	H: 2.24 mm (0.088 in)
D: 2.00 mm (0.079 in)	I: 2.30 mm (0.091 in)
E: 2.06 mm (0.081 in)	

Pinion shim replacement (page 18-15).

## PINION GEAR REMOVAL

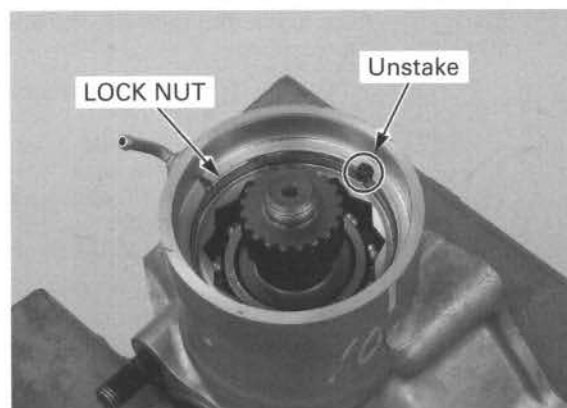
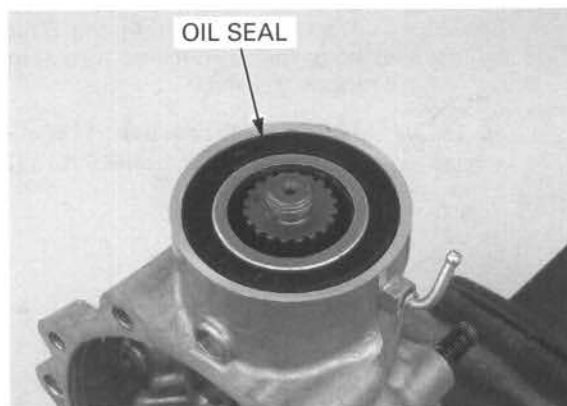
Remove the oil seal from the gear case.

TOO LOW:



*Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.*

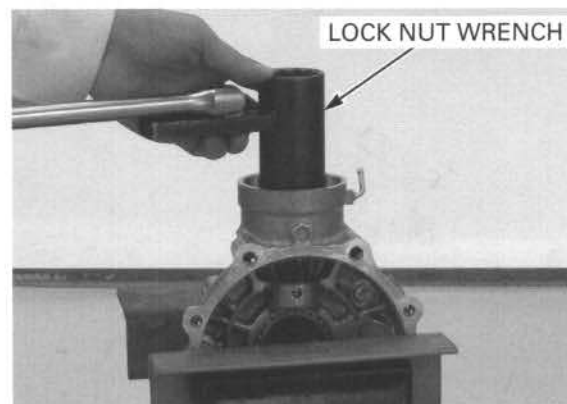
Unstake the bearing lock nut with a drill or grinder.



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.

**TOOLS:**

**Puller shaft and nut**

07931-ME40000

**Pinion puller base**

07HMC-MM80110

**U.S.A. TOOL:**

**Puller shaft**

07931-ME4010B

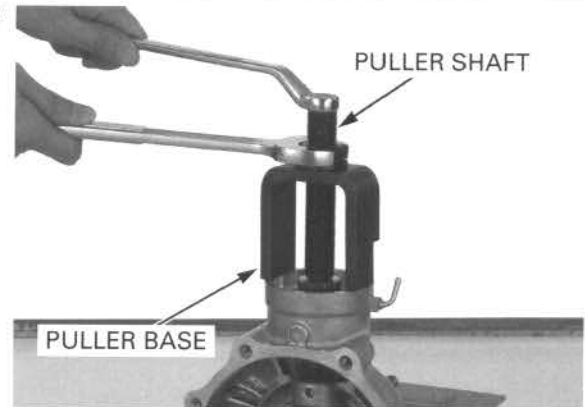
**Special nut**

07931-HB3020A

**Pinion puller base**

07HMC-MM8011A

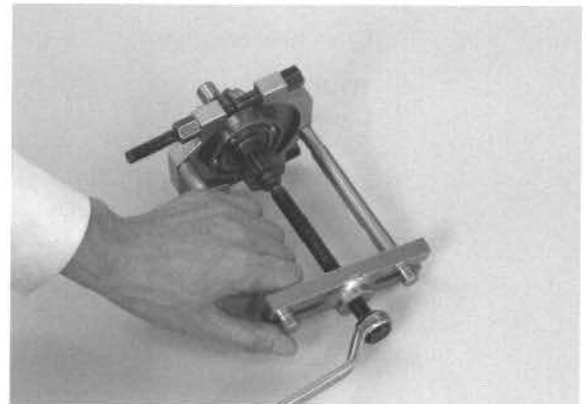
Pull the pinion assembly out from the gear case.



### PINION BEARING AND SHIM REPLACEMENT

Pull the bearing from the shaft with a commercially available bearing puller.

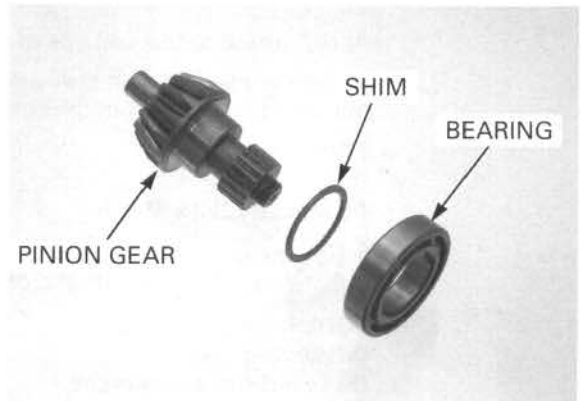
Remove the bearing and shim.



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 (0.079 in) thick shim for initial reference.



Press the pinion gear into a new bearing until it is fully seated by supporting the bearing inner race.

**TOOL:**

**Attachment, 35 mm I.D.**

07746-0030400





## GEAR CASE BEARING REPLACEMENT

### RING GEAR BEARING

Remove the oil seals from the gear case and cover.  
Drive the bearings out of the gear case and cover.



Drive new bearings into the gear case and cover.

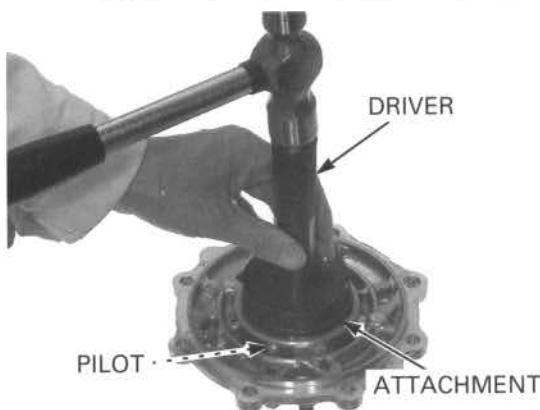
#### TOOLS:

##### Cover Side:

Driver	07749-0010000
Attachment, 72 x 75 mm	07746-0010600
Pilot, 40 mm	07746-0040900

##### Case Side:

Driver	07749-0010000
Oil seal driver attachment	07JAD-PH80101



Apply grease to the seal lips of new oil seals.

Install the case side oil seal with the flat side facing out until the depth from the case is 0.5 – 1 mm.

#### TOOLS:

Driver:	07749-0010000
Attachment, 52 x 55 mm	07746-0010400

Install the cover side oil seal with the lip side facing out so that it is flush with the cover.

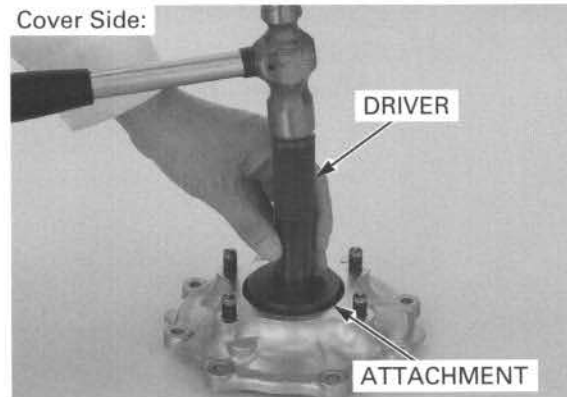
#### TOOLS:

Driver	07749-0010000
Oil seal driver attachment	07965-SA00600

##### Case Side:



##### Cover Side:





## PINION NEEDLE BEARING

Rotate the stopper ring until its end appears in the access hole.

Strike gently near the end of the ring with a punch to bend the end upward.

Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.

Remove the oil filler cap.

Heat the gear case to about 80°C (176°F) and remove the needle bearing, using the special tools.

### TOOLS:

**Remover head, 15 mm** 07936-KC10200

**Remover shaft, 15 mm** 07936-KC10100

**Remover weight** 07741-0010201

### U.S.A. TOOLS:

**Bearing remover, 15 mm** 07936-KC10500

**Remover weight** 07936-371020A or

07936-3710200

Install a new stopper ring into the groove in a new bearing.

Install the bearing into the compressor until the stopper ring is flush with the end of the tool.

### TOOL:

**Bearing clip compressor, 25 mm** 070ME-HN80100

*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.*

*Make sure the stopper ring stays in the groove.*

Place the driver, attachment and pilot on the top of the bearing and tape the driver to the compressor.

### TOOLS:

**Driver** 07949-3710001

**Attachment, 22 x 24 mm** 07746-0010800

**Pilot, 15 mm** 07746-0040300

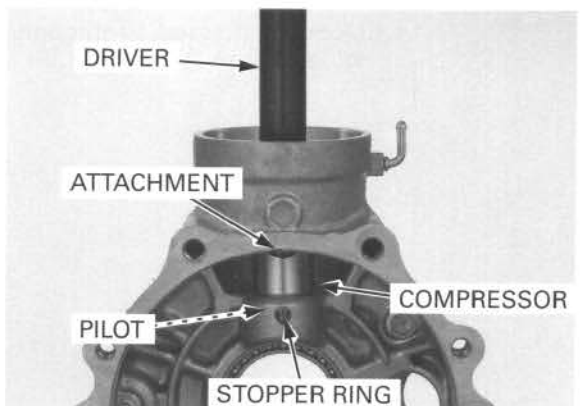
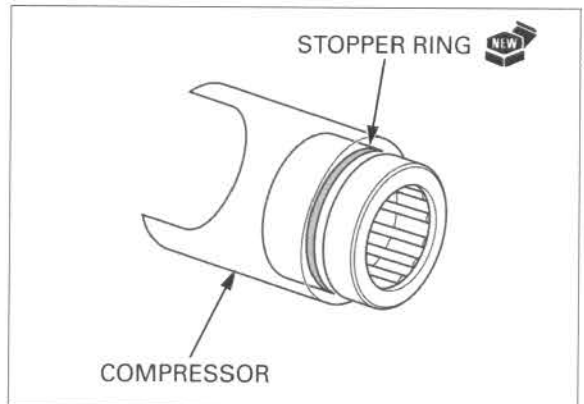
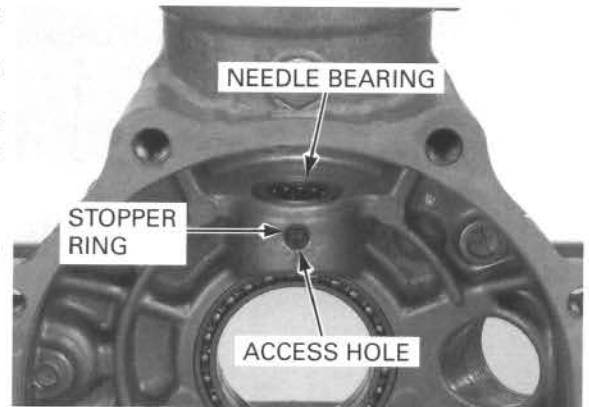
Place the bearing and tool assembly into a freezer for at least 30 minutes.

Heat the gear case to 80°C (176°F).

Remove the bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

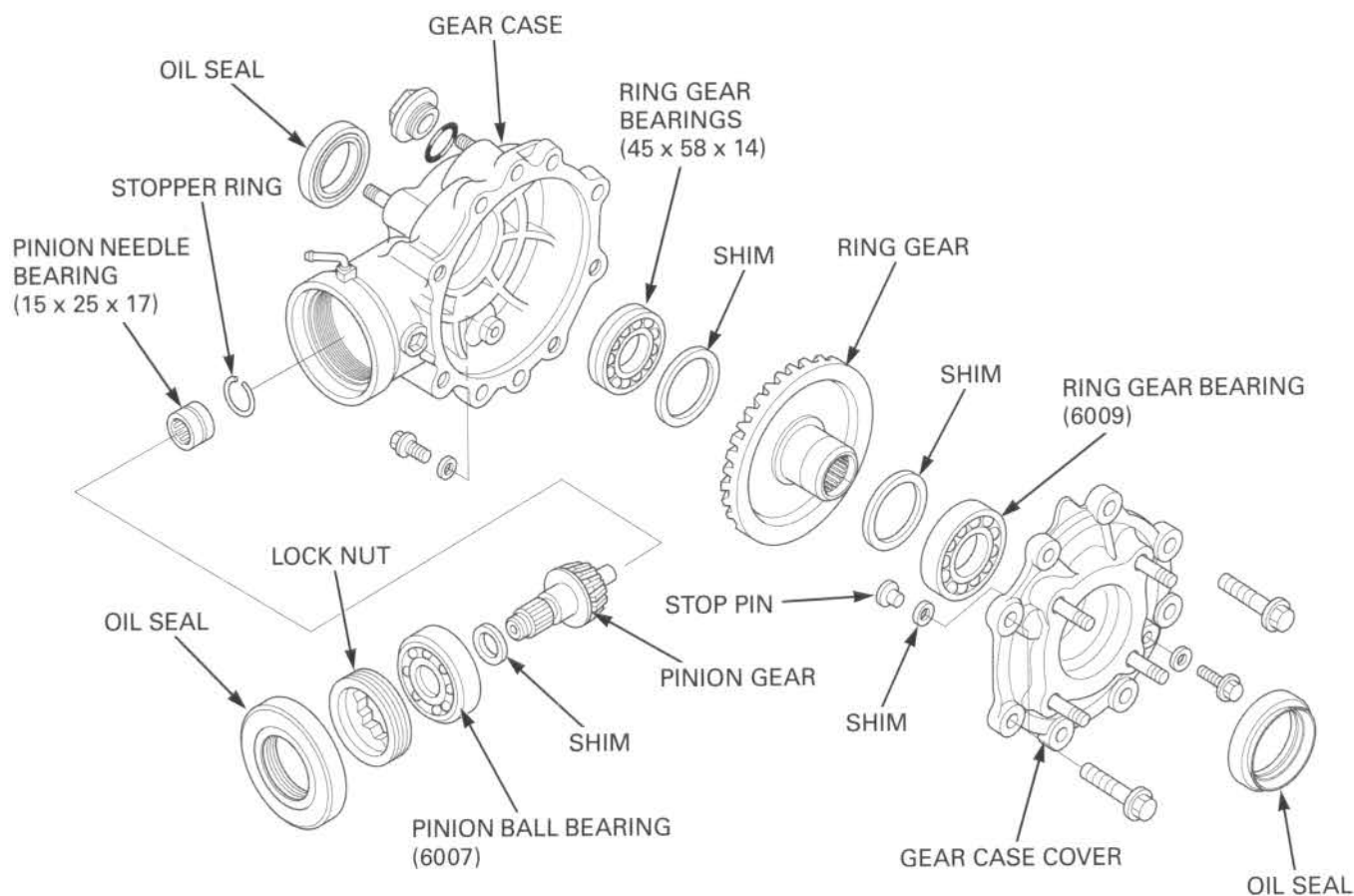
Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new ring.

Make sure the stopper ring is securely set in the groove of the gear case.





## REAR FINAL GEAR ASSEMBLY



### PINION GEAR INSTALLATION

Blow compressed air through the breather hole in the gear case.

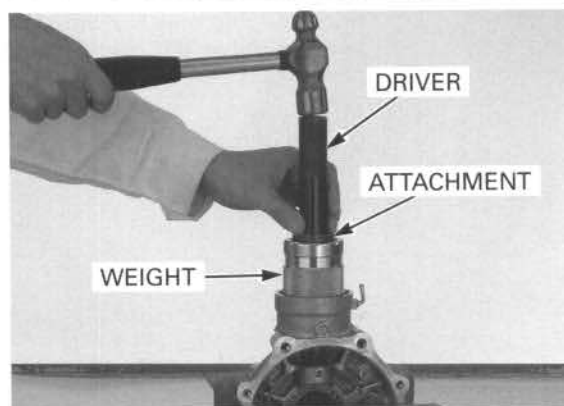


Drive the pinion gear assembly into the gear case.

#### TOOLS:

Driver  
Attachment, 42 x 47 mm  
Fork seal driver weight

07749-0010000  
07746-0010300  
07747-0010100





Install a new lock nut and tighten it.

## TOOL:

Lock nut wrench, 30 x 64 mm 07916-MB00002

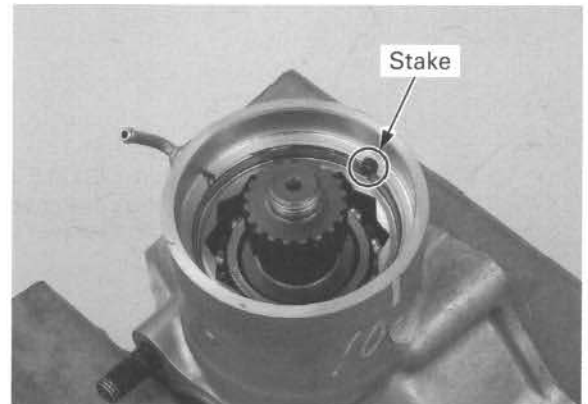
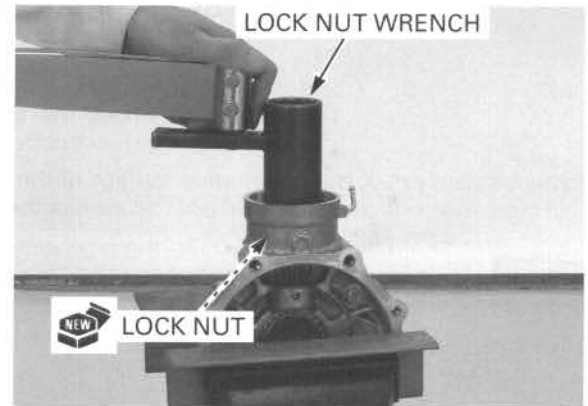
**TORQUE:** Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)

Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)

Refer to "Service Information" for torque wrench reading information (page 18-3).

Be careful not to damage the threads of the case.

Stake the lock nut into the case groove.



Apply grease to the lips of a new oil seal and install it so that it is flush with the gear case.



## RING GEAR CLEARANCE INSPECTION

Install the ring gear with the left 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 exceeds 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.

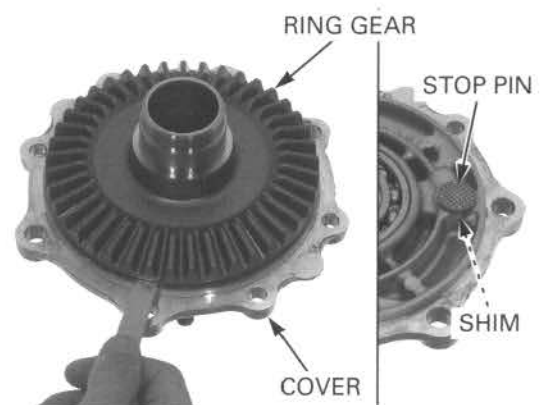
**Stop pin shims:**

**A:** 0.10 mm (0.004 in)

**B:** 0.15 mm (0.006 in)

Install the shim and drive the stop pin into the case cover.

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





REAR DRIVING MECHANISM

FINAL GEAR CASE ASSEMBLY

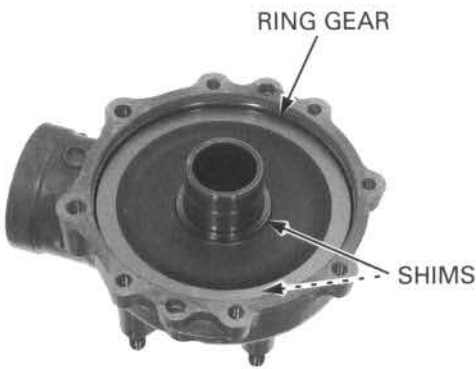
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the tooth contact pattern (page 18-12) and gear backlash (page 18-11).

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.

Install the proper ring gear shims onto the ring gear and install them into the gear case.



Apply liquid sealant (TB1215 or equivalent) to the mating surface of the case cover. Install the cover onto 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 eight 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: 47 N·m (4.8 kgf·m, 35 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.

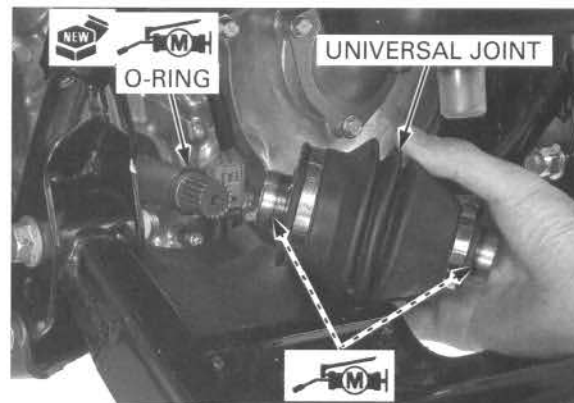




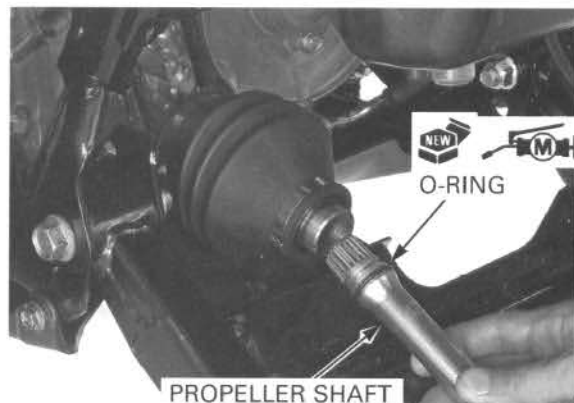
# REAR FINAL DRIVE INSTALLATION

Coat a new O-ring with molybdenum disulfide grease and install it into the groove in the output shaft.

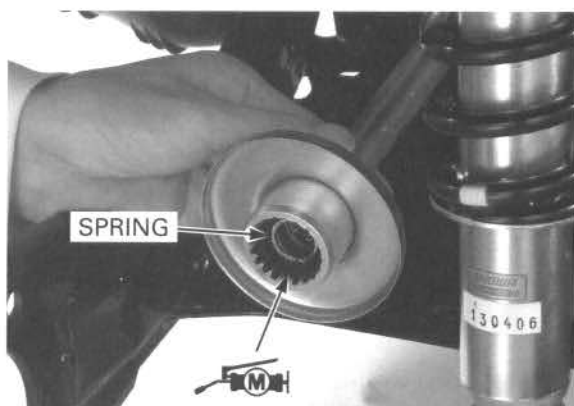
Apply molybdenum disulfide grease to the splines of both sides in the universal joint.  
Install the universal joint onto the output shaft until it is fully seated.



Coat a new O-ring with molybdenum disulfide grease and install it into the groove in the propeller shaft.  
Install the propeller shaft into the universal joint until it is fully seated.

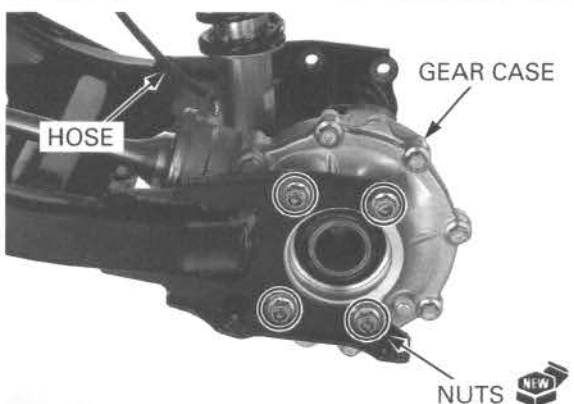


Install the joint spring into the propeller shaft firmly.  
Apply molybdenum disulfide grease to the splines of the propeller shaft.



Support the swingarm securely.  
Install the gear case assembly onto the swingarm while connecting the propeller shaft, then install new mounting nuts. Temporarily tighten the four nuts.

Connect the breather hose.

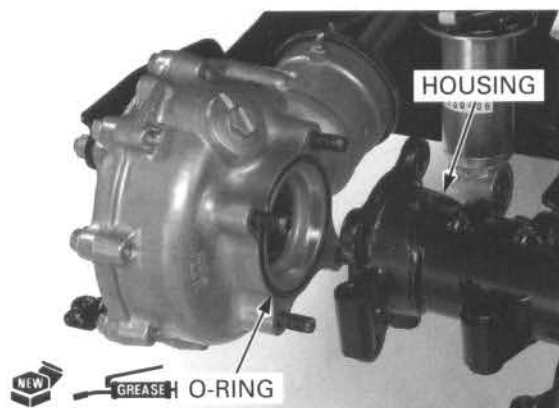




## REAR DRIVING MECHANISM

Coat a new O-ring with grease and install it into the gear case groove.

Install the axle housing onto the gear case and onto the swingarm.



*Insert the mounting bolt from the right side.*

Install new gear case mounting nuts.

Connect the shock absorber with the bolt and a new nut.

Temporarily install the brake panel to align the bolt holes in the axle housing and swingarm, and tighten the following fasteners.

### TORQUE:

**Gear case mounting nut:**

**44 N·m (4.5 kgf·m, 32 lbf·ft)**

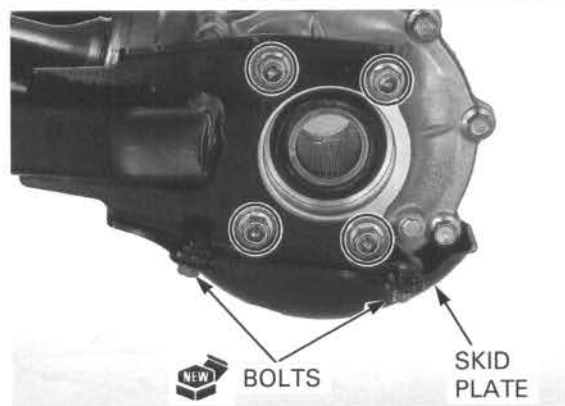
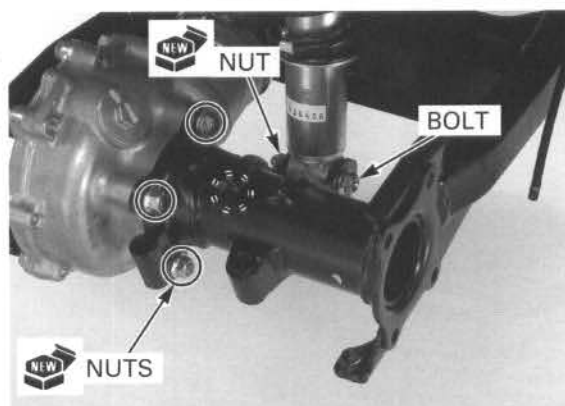
**Shock absorber lower mounting nut:**

**64 N·m (6.5 kgf·m, 47 lbf·ft)**

Remove the brake panel.

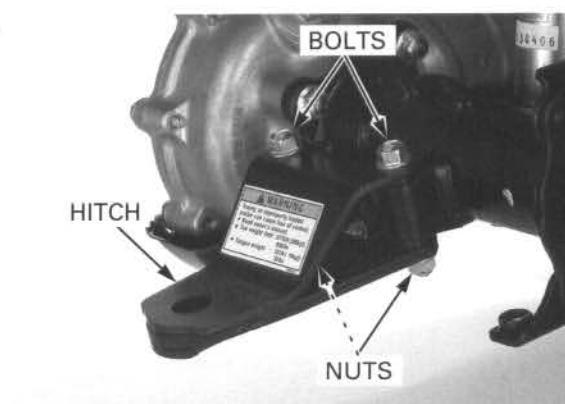
Install the skid plate with new three bolts and tighten the bolts.

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



Install the trailer hitch with the two bolts and nut, and tighten them.

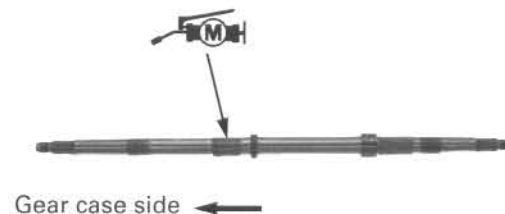
Install the rear axle (page 18-23).





# REAR AXLE INSTALLATION

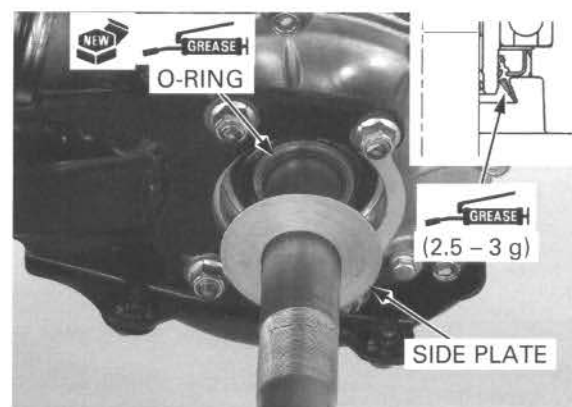
Apply molybdenum disulfide grease to the left spline (ring gear contacting area) of the axle.  
Install the axle into the final gear case from the right side until it is fully seated.



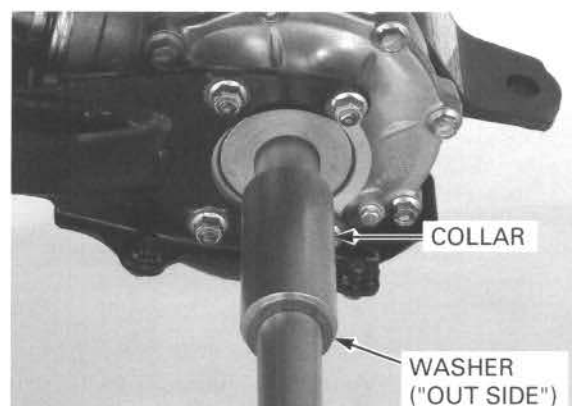
Coat a new O-ring with grease and install it into the ring gear groove of the gear case securely.

Apply 2.5 – 3 g of grease to the seal lip of the gear case.

Install the side plate.



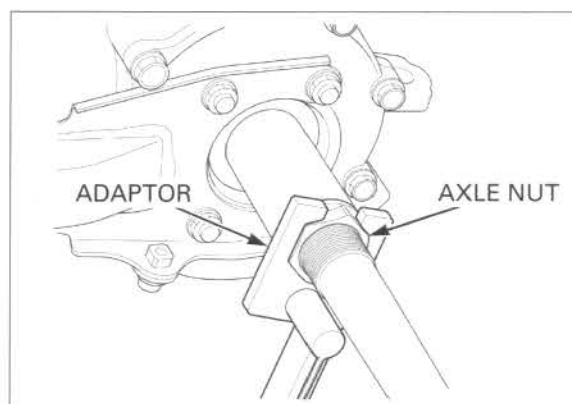
Install the axle collar and the spring washer with the "OUT SIDE" mark facing out.



Install the axle nut with the flange side facing in.  
Temporarily tighten the axle nut.

## TOOL:

Axle nut torque wr. adaptor, 41 mm 07916-958010B





## REAR DRIVING MECHANISM

*Do not get grease onto the brake shoe linings.*

Apply grease to the lips of a new dust seal.  
Install the dust seal into the brake panel with the flat side facing up so that it is flush with the panel.

Coat a new O-ring with grease and install it into the panel groove.

Install the panel assembly onto the swingarm.



Install new brake panel nuts and tighten them.

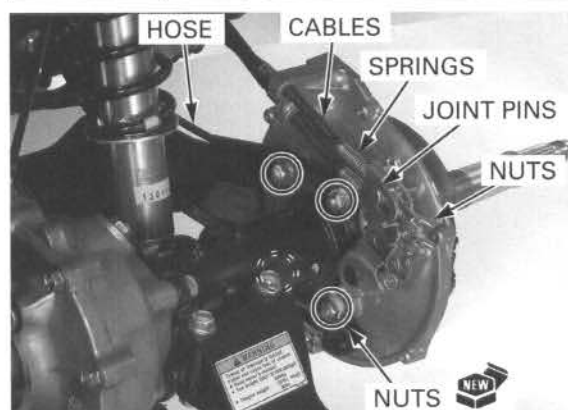
**TORQUE: 44 N·m (4.5 kgf·m, 32 lbf·ft)**

Install the brake cables into the cable holders of the brake panel (upper holder for lever brake cable and lower holder for pedal brake cable).

Install the cable springs onto the cables.

Connect each brake cable to the brake arm with the joint pin and adjusting nut.

Connect the breather hose to the hose joint on the brake panel.



*Tighten the drum side nuts after tightening the gear case side nuts.*

Install the brake drum, but do not tighten the axle nut and lock nut yet (page 16-22).

Temporarily loosen the axle nut of the gear case side and apply locking agent to the axle threads. Set the parking brake and tighten the axle nut.

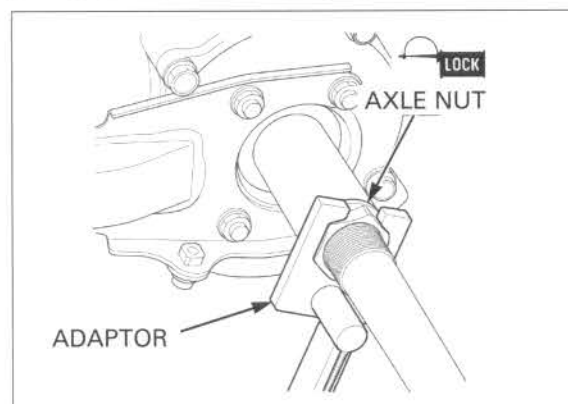
### TOOL:

**Axle nut torque wr. adaptor, 41 mm 07916-958010B**

**TORQUE: Actual: 39 N·m (4.0 kgf·m, 29 lbf·ft)**

**Indicated: 36 N·m (3.7 kgf·m, 27 lbf·ft)**

*Refer to "Service Information" for torque wrench reading information (page 18-3).*



Apply locking agent to the axle threads and install the lock nut.

*Take care not to turn the axle.*

Hold the axle nut and tighten the lock nut.

### TOOLS:

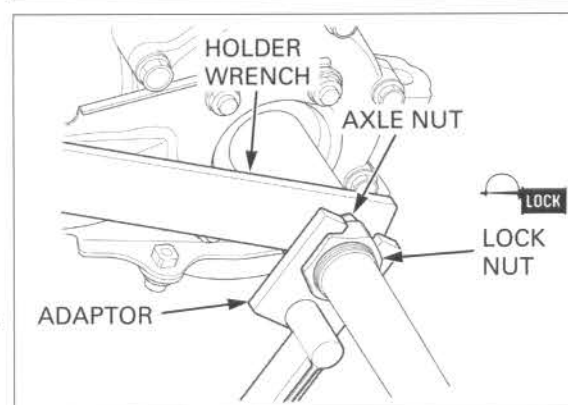
**Axle nut torque wr. adaptor, 41 mm 07916-958010B**

**Axle nut holder wrench, 41 mm 07916-958020B**

**TORQUE: Actual: 127 N·m (13.0 kgf·m, 94 lbf·ft)**

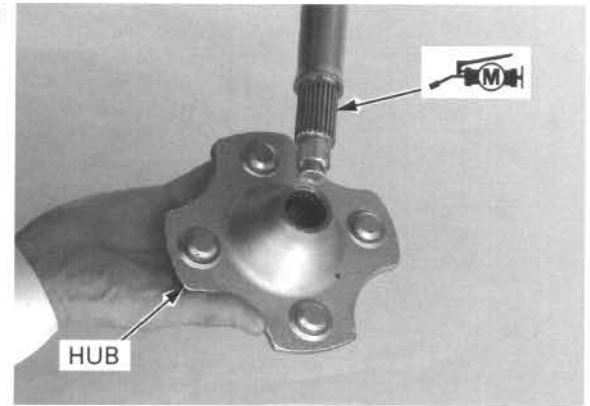
**Indicated: 119 N·m (12.1 kgf·m, 88 lbf·ft)**

Tighten the axle nut and lock nut of the brake drum side (page 16-23).





Apply molybdenum disulfide grease to the axle spline.  
Install the wheel hub onto the axle.



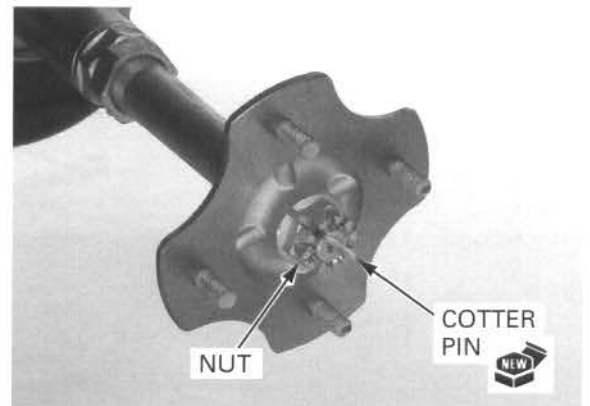
Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 137 N·m (14.0 kgf-m, 101 lbf-ft)**

Install a new cotter pin.

Install the rear wheels (page 15-6).

Fill the gear case with the recommended oil if the gear case was disassembled (page 4-19).





# 19. BATTERY/CHARGING SYSTEM

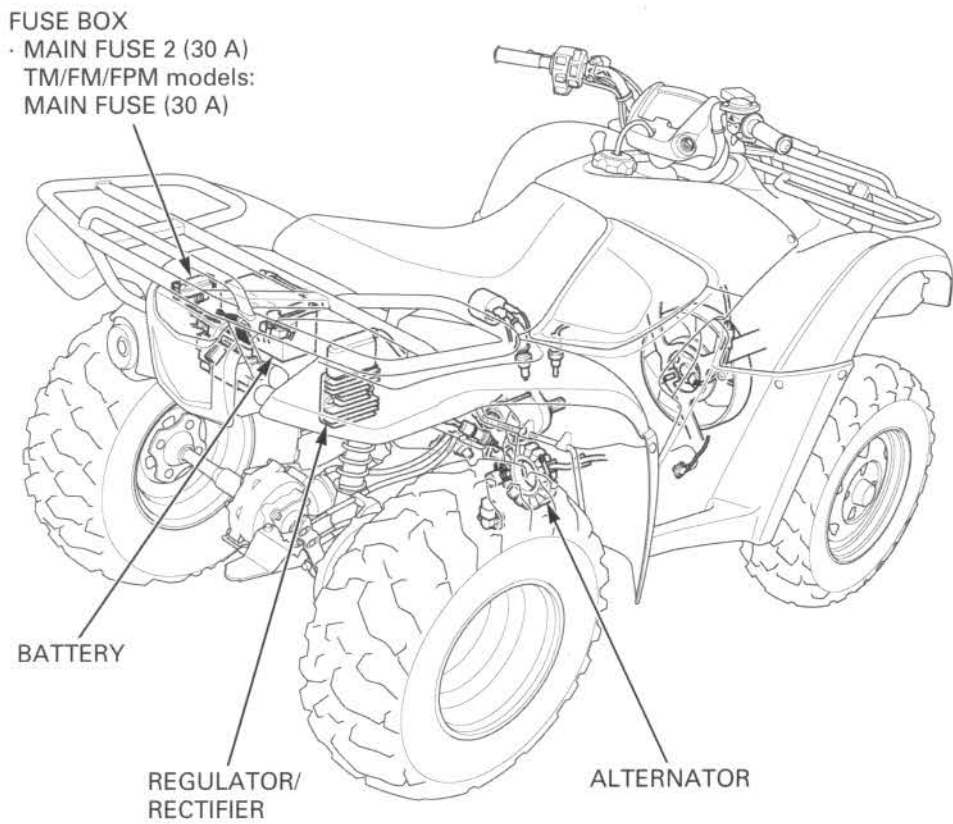
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COMPONENT LOCATION .....	19-2	BATTERY .....	19-6
SYSTEM DIAGRAM .....	19-2	CHARGING SYSTEM INSPECTION.....	19-7
SERVICE INFORMATION .....	19-3	ALTERNATOR CHARGING COIL .....	19-8
TROUBLESHOOTING .....	19-5	REGULATOR/RECTIFIER .....	19-8

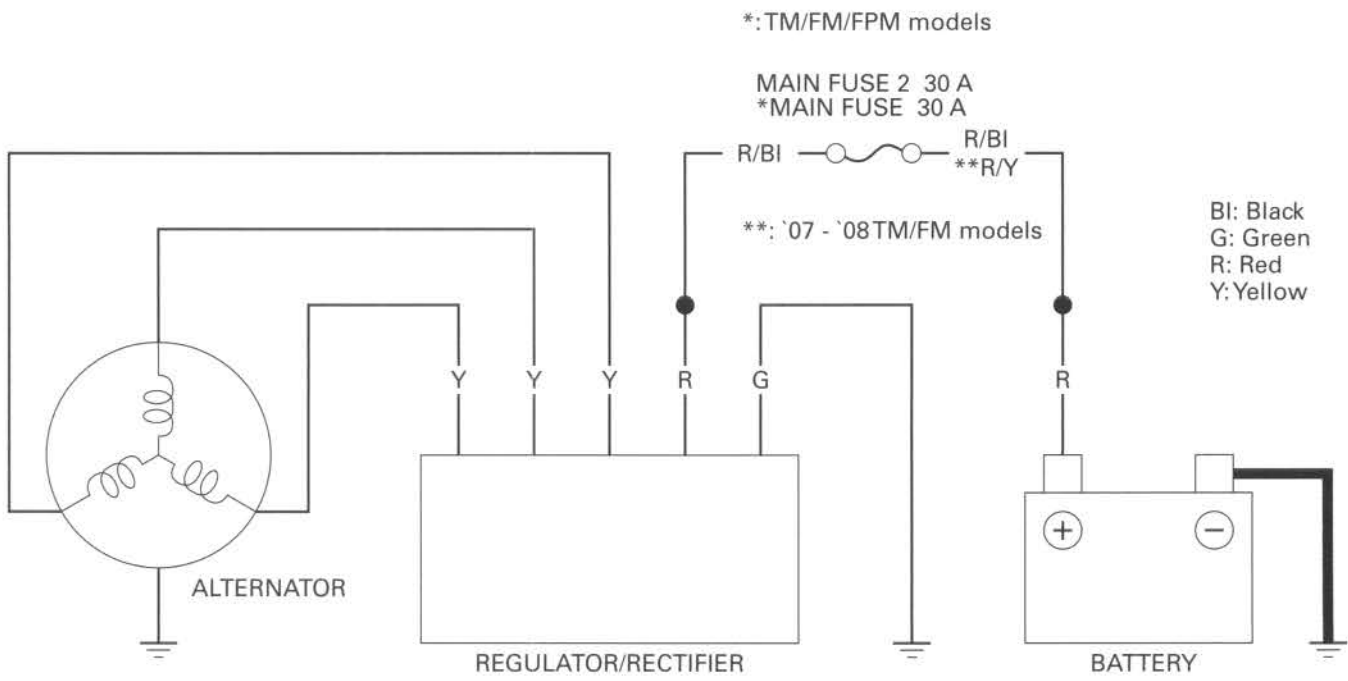


BATTERY/CHARGING SYSTEM

COMPONENT LOCATION



SYSTEM DIAGRAM





## 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.

#### NOTICE

- *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 space.
- For a battery remaining in a stored vehicle, disconnect the negative battery cable from 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 (page 19-5).
- Alternator removal/installation (page 12-5).

#### BATTERY CHARGING

- Turn power ON/OFF at the charger, not at the battery terminal.
- 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.
- Quick charging should only be done in an emergency; slow charging is preferred.

#### BATTERY TESTING

Refer to the instructions in the Operation Manual for the recommended battery tester for details about battery testing. The recommended battery tester puts a "load" on the battery so that the actual battery condition can be measured.

**Recommended Battery Tester: Micro 404XL (U.S.A. only), BM-210 or equivalent**



BATTERY/CHARGING SYSTEM

SPECIFICATIONS

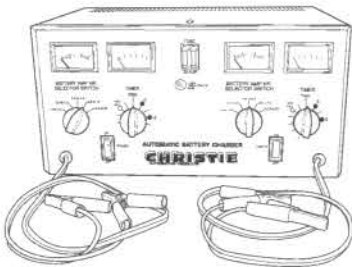
ITEM			SPECIFICATIONS
Battery	Capacity		12 V – 12 Ah
	Current leakage		0.01 mA max.
	Voltage (20°C/68°F)	Fully charged	13.0 – 13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.4 A x 5 – 10 h
		Quick	6.0 A x 1.0 h
Alternator	Capacity	'07 – '08 models	0.343 kW/5,000 rpm
		After '08 models	0.359 kW/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω

TOOLS

Motorcycle battery analyzer  
Micro 404XL (U.S.A. only)



Christie battery charger  
MC1012/2T (U.S.A. only)





## TROUBLESHOOTING

### BATTERY IS DAMAGED OR WEAK

#### 1. Battery Test

Remove the battery (page 19-6).

Check the battery condition using the recommended battery tester.

**RECOMMENDED BATTERY TESTER:** Micro 404XL (U.S.A. only), BM-210 or equivalent

*Is the battery in good condition?*

**YES** – GO TO STEP 2.

**NO** – Faulty battery.

#### 2. Current Leakage Test

Install the battery (page 19-6).

Check the battery current leakage (page 19-7).

*Is the current leakage below 1 mA?*

**YES** – GO TO STEP 4.

**NO** – GO TO STEP 3.

#### 3. Current Leakage Test With Regulator/Rectifier Connector Disconnected

Disconnect the regulator/rectifier connector and recheck the battery current leakage.

*Is the current leakage below 1 mA?*

**YES** – Faulty regulator/rectifier.

**NO** – 

- Shorted wire harness.
- Faulty ignition switch.

#### 4. Alternator Charging Coil Inspection

Measure the alternator charging coil resistance (page 19-8).

**STANDARD: 0.1 – 1.0  $\Omega$  (20°C/68°F)**

*Is the alternator charging coil resistance within the standard value?*

**YES** – GO TO STEP 5.

**NO** – Faulty charging coil.

#### 5. Charging Voltage Inspection

Measure and record the battery voltage using a digital multimeter (page 19-6).

Start the engine.

Measure the charging voltage (page 19-7).

Compare the measurements to the results of the following calculation.

**STANDARD: Measured BV < Measured CV < 15.5 V**

- **BV = Battery voltage**
- **CV = Charging voltage**

*Is the measured charging voltage within the standard voltage?*

**YES** – Faulty battery.

**NO** – GO TO STEP 6.

#### 6. Regulator/Rectifier Wire Harness Inspection

Perform the regulator/rectifier wire harness inspection (page 19-8).

*Are the measurements correct?*

**YES** – Faulty regulator/rectifier.

**NO** – 

- Open circuit in related wire.
- Loose or poor contacts of related terminal.
- Shorted wire harness.



### BATTERY

#### BATTERY REMOVAL/INSTALLATION

Remove the rear fender cover (page 3-9).

With the ignition switch turned to OFF, disconnect the negative (-) cable first, then disconnect the positive (+) cable by removing the terminal bolts.

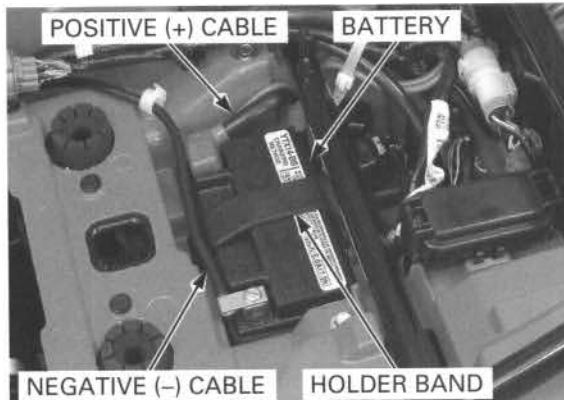
Remove the battery holder band.

Remove the battery.

*Connect the positive (+) cable first and then the negative (-) cable.*

Install the battery in the reverse order of removal with the proper wiring as shown.

After installing the battery, coat the terminals with clean dielectric grease.

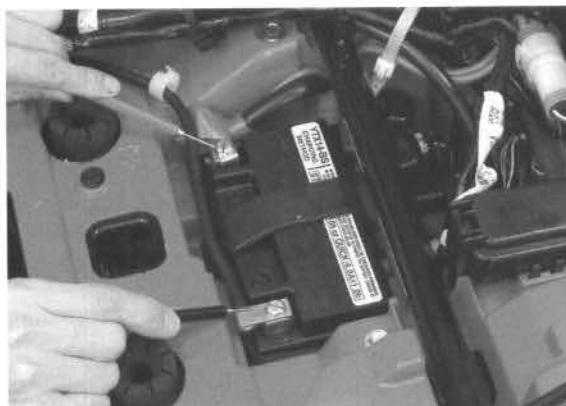


#### VOLTAGE INSPECTION

Remove the rear fender cover (page 3-9).

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 TESTING

Remove the battery (page 19-6).

Refer to the instructions that are appropriate to the battery testing equipment available to you.

##### TOOL:

**Battery tester**      **Micro 404XL (U.S.A. only), BM-210 or equivalent**

#### BATTERY CHARGING (U.S.A. only)

Remove the battery (page 19-6).

Refer to the instructions that are appropriate to the battery charging equipment available to you.

##### TOOL:

**Christie battery charger**      **MC1012/2T (U.S.A. only)**



## CHARGING SYSTEM INSPECTION

### CURRENT LEAKAGE INSPECTION

Remove the rear fender cover (page 3-9).

With the ignition switch turned to OFF, 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 turned to OFF, check for current leakage.

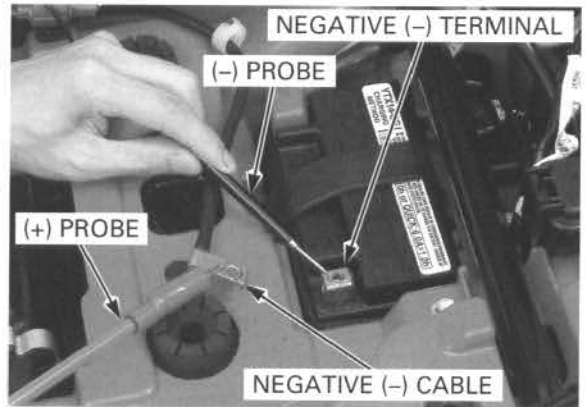
#### NOTE:

- 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 to ON. A sudden surge of current may blow out the fuse in the tester.

#### SPECIFIED CURRENT LEAKAGE: 0.01 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

Be sure the battery is in good condition before performing this test.

Remove the rear fender cover (page 3-9).

Warm up the engine to normal operating temperature.

Connect the multimeter between the battery positive (+) and negative (-) terminals.

#### NOTE:

- To prevent a short, make absolutely certain which are the positive (+) and negative (-) terminals or cables.
- 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.

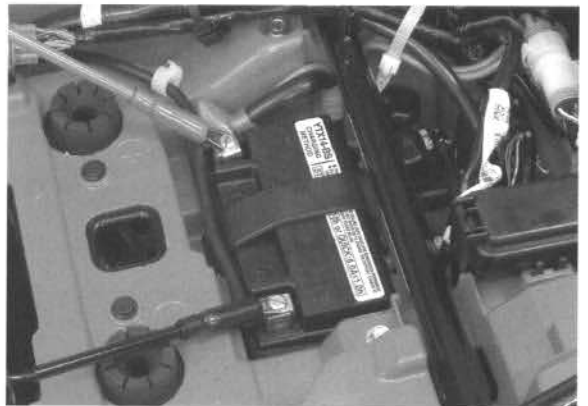
Restart the engine and turn the headlight on.

Measure the voltage on the multimeter when the engine runs at 5,000 rpm ( $\text{min}^{-1}$ ).

#### STANDARD: Measured BV < Measured CV < 15.5 V

BV = Battery voltage (page 19-6)

CV = Charging voltage





### ALTERNATOR CHARGING COIL

#### INSPECTION

Remove the right side cover (page 3-4).

Disconnect the alternator 5P connector.  
Check the connector for loose contacts or corroded terminals.

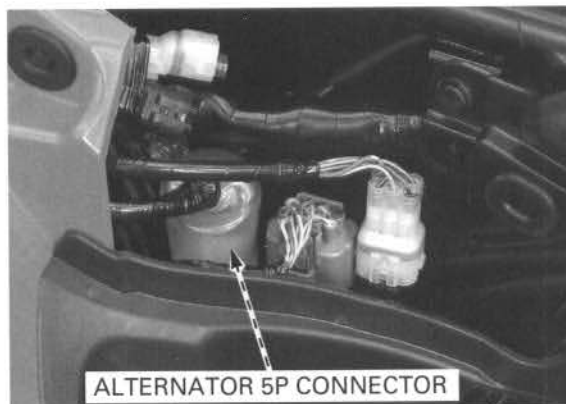
Measure the resistance between the Yellow wire terminals of the alternator side connector.

**STANDARD: 0.1 – 1.0  $\Omega$  (at 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.

Alternator stator replacement (page 12-5).



### REGULATOR/RECTIFIER

#### WIRE HARNESS INSPECTION

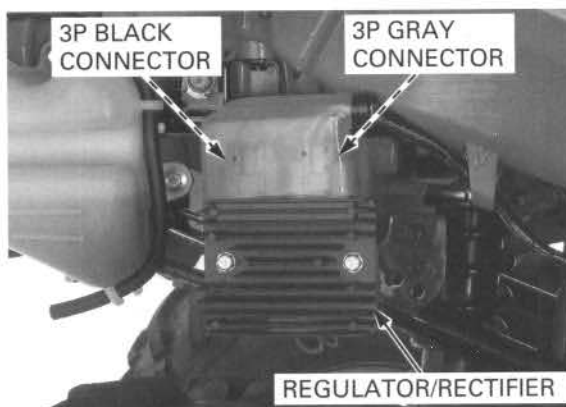
Disconnect the regulator/rectifier 3P gray and black connectors.  
Check the connectors for loose contacts or corroded terminals.

Check the following at the wire harness side connectors.

- **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  $\Omega$  (at 20°C/68°F)**

Check for continuity between each Yellow wire terminal and ground.  
There should be no continuity.





## 20. IGNITION SYSTEM

---

COMPONENT LOCATION .....	20-2	IGNITION SYSTEM INSPECTION .....	20-5
SYSTEM DIAGRAM .....	20-2	IGNITION COIL .....	20-7
SERVICE INFORMATION .....	20-3	IGNITION TIMING .....	20-7
TROUBLESHOOTING .....	20-4		



## COMPONENT LOCATION





# SERVICE INFORMATION

## GENERAL

### NOTICE

- The PCM/ECM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the PCM/ECM. Always turn the ignition switch to OFF before servicing.
- Use spark plugs with the correct heat range. Using spark plugs with an incorrect heat range can damage the engine.
- 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 checks described in the troubleshooting chart (page 20-4).
- This ignition system is controlled by PCM/ECM.
- The transistorized ignition system uses an electrically controlled ignition timing system. No adjustments can be made to the ignition timing.
- 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.
- The engine stop switch line is connected to the PCM/ECM on this vehicle. Its signal permits the PCM/ECM to control the fuel pump, injector and ignition coil.
- CKP sensor removal/installation (page 12-5).
- Ignition switch servicing (page 22-11).
- Engine stop switch inspection (page 22-12).

## SPECIFICATION

ITEM	SPECIFICATIONS
Spark plug	BKR5E-11 (NGK), K16PR-U11 (DENSO)
Spark plug gap	1.0 – 1.1 mm (0.039 – 0.043 in)
Ignition coil primary peak voltage	100 V minimum
CKP sensor peak voltage	0.7 V minimum
Ignition timing ("F" mark)	10° BTDC at idle

## TORQUE VALUES

Spark plug	22 N·m (2.2 kgf·m, 16 lbf·ft)
Timing hole cap	10 N·m (1.0 kgf·m, 7 lbf·ft)

## TOOLS

<p>IgnitionMate peak voltage tester MTP07-0286 (U.S.A. only)</p> 	<p>Peak voltage adaptor 07HGJ-0020100</p>  <p>(not available in U.S.A.) with commercially available digital multimeter (impedance 10 MΩ/DCV minimum)</p>	<p>Test probe 07ZAJ-RDJA110</p> 
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## IGNITION SYSTEM

### TROUBLESHOOTING

- Inspect the following before diagnosing the system:
  - Faulty spark plug
  - Loose spark plug cap or spark plug wire connection
  - Water got into the spark plug cap (leaking the ignition coil secondary voltage)
- "Initial voltage" of the ignition primary coil is the battery voltage with the ignition switch turned to ON. (The engine is not cranked by the starter motor.)

#### No spark at spark plug

UNUSUAL CONDITION		PROBABLE CAUSE (Check in numerical order)
Ignition coil primary voltage	No initial voltage with the ignition switch turned to ON. (Other electrical components are normal.)	1. Faulty engine stop relay and/or related circuits. 2. Faulty bank angle sensor and/or related circuits. 3. An open circuit in the Black/red wire between the ignition coil and relay module (engine stop relay). 4. Loose or poor connection of the primary terminal, or an open circuit in the primary coil. 5. Faulty PCM/ECM (in case when the initial voltage is normal with the PCM/ECM gray connector disconnected).
	Initial voltage is normal, but it drops by 2 – 4 V while cranking the engine.	1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections.) 2. Battery is undercharged. (Voltage drops largely when the engine is started.) 3. No voltage at the Black/red wire of the PCM/ECM gray connector, or loose or poorly connected PCM/ECM gray connector. 4. Loose or poor connection, or an open circuit in the Green (ground) wire of the PCM/ECM. 5. Loose or poor connection, or an open circuit in the Green/yellow wire between the ignition coil and PCM/ECM. 6. A short circuit in the ignition primary coil. 7. Faulty engine stop switch. 8. No voltage at the Black/white wire of the PCM/ECM black connector, or loose or poorly connected PCM/ECM black connector. 9. Faulty CKP sensor. (Measure the peak voltage.) 10. Faulty PCM/ECM (in case when above No. 1 through 9 are normal).
	Initial voltage is normal but there is no peak voltage while cranking the engine.	1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections.) 2. Faulty peak voltage adaptor. 3. Faulty engine stop switch. 4. Faulty CKP sensor. (Measure the peak voltage.) 5. Faulty PCM/ECM (in case when above No. 1 and 3 are normal).
	Initial voltage is normal but peak voltage is lower than the standard value.	1. The multimeter impedance is too low; below 10 M $\Omega$ /DCV. 2. Cranking speed is too slow. (Battery is undercharged.) 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.) 4. Faulty PCM/ECM (in case when above No. 1 through 3 are normal).
	Initial and peak voltages are normal but no spark jumps.	1. Faulty spark plug or leaking ignition coil secondary current. 2. Faulty ignition coil.
CKP sensor	Low peak voltage.	1. The multimeter impedance is too low; below 10 M $\Omega$ /DCV. 2. Cranking speed is too slow. (Battery is undercharged.) 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.) 4. Faulty CKP sensor (in case when above No. 1 through 3 are normal).
	No peak voltage.	1. Faulty peak voltage adaptor. 2. Faulty CKP sensor.



## IGNITION SYSTEM INSPECTION

### NOTE:

- If there is no spark at the plug, check all connections for loose or poor contact before measuring the peak voltage.
- Use a commercially available digital multimeter with an impedance of 10 M $\Omega$ /DCV minimum.
- The display value differs depending upon the internal impedance of the multimeter.

Use the peak voltage tester or connect the peak voltage adaptor to the digital multimeter.

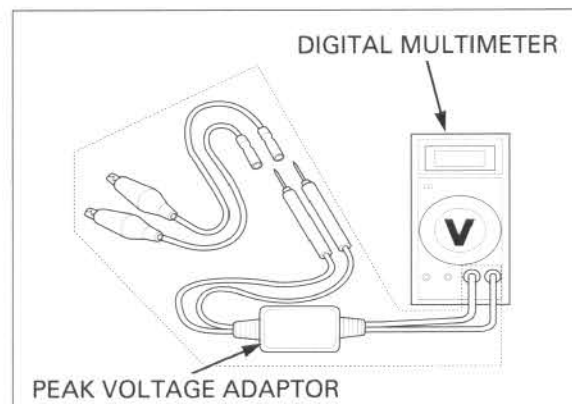
### TOOLS:

**IgnitionMate peak voltage tester (U.S.A. only)**

**MTP07-0286 or**

**Peak voltage adaptor with commercially available digital multimeter (impedance 10 M $\Omega$ /DCV minimum)**

**07HGJ-0020100 (not available in U.S.A.)**



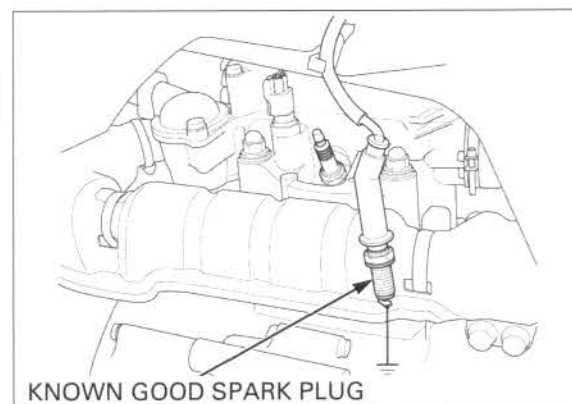
## IGNITION COIL PRIMARY PEAK VOLTAGE

### NOTE:

- Check all system connections before this inspection. Poor connected connectors can cause incorrect readings.
- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

Remove the left fuel tank side cover (page 3-5).

Disconnect the spark plug cap from the spark plug. Connect a known good spark plug to the spark plug cap and ground the spark plug to the cylinder head as done in a spark test.





## IGNITION SYSTEM

With the connector connected, connect the peak voltage tester or adaptor probes to the ignition coil primary terminal and ground.

**CONNECTION: Green/yellow (+) – ground (–)**

Turn the engine stop switch to “O” and ignition switch to ON.

Check the initial voltage at this time.

The battery voltage should be measured.

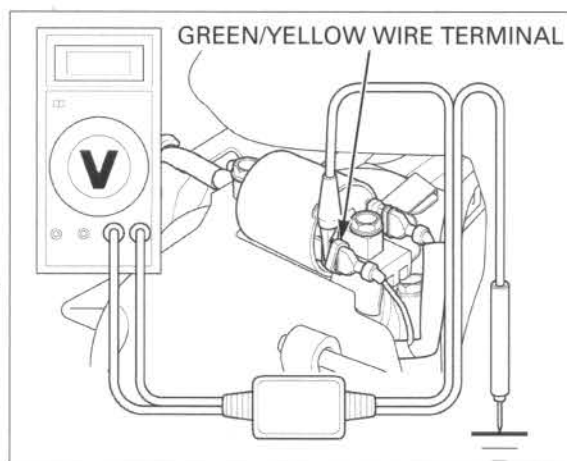
If the initial voltage cannot be measured, follow the checks in the trouble shooting chart (page 20-4).

Shift the transmission into neutral.

Crank the engine with the starter motor and read the ignition coil primary peak voltage.

**PEAK VOLTAGE: 100 V minimum**

If the peak voltage is lower than the standard value, follow the checks described in the troubleshooting chart (page 20-4).



## CKP SENSOR PEAK VOLTAGE

**NOTE:**

- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

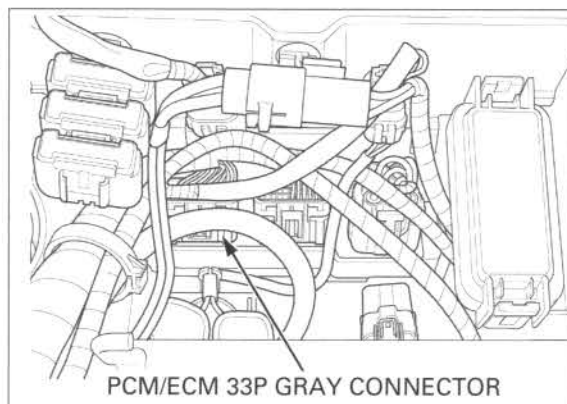
Remove the rear fender cover (page 3-9).

*Seal the PCM/ECM connector with tape to prevent dirt and oil from entering the connector after disconnecting it.*

Turn the ignition switch to OFF and disconnect the PCM/ECM 33P gray connector.

**NOTE:**

- When reconnecting the PCM/ECM connector, check that there is no dirt and oil in the connector.



Connect the peak voltage tester or adaptor probes to the wire harness side 33P connector terminals

**TOOL:**

**Test probe 07ZAJ-RDJA110**

**CONNECTION:**

**Blue/yellow (B23) (+) – Green/white (B12) (–)**

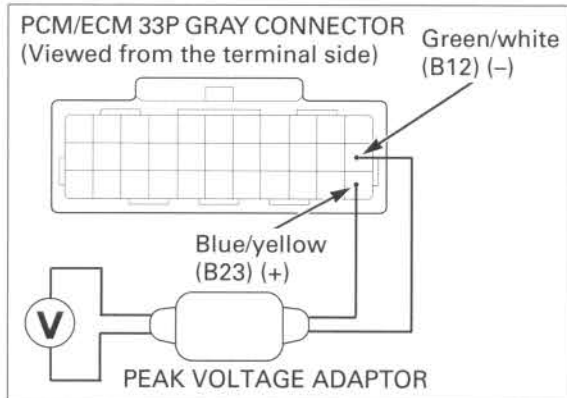
Shift the transmission into neutral.

Turn the ignition switch to ON.

Crank the engine with the starter motor and measure the CKP sensor peak voltage.

**PEAK VOLTAGE: 0.7 V minimum**

If the voltage measured at the PCM/ECM connector is abnormal, measure the peak voltage at the alternator connector.



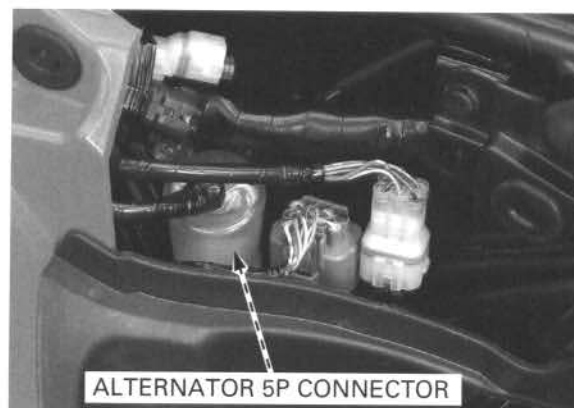


Remove the right side cover (page 3-4).

Turn the ignition switch to OFF and disconnect the alternator 5P connector.

Connect the peak voltage tester or adaptor probes to the alternator side connector terminals.

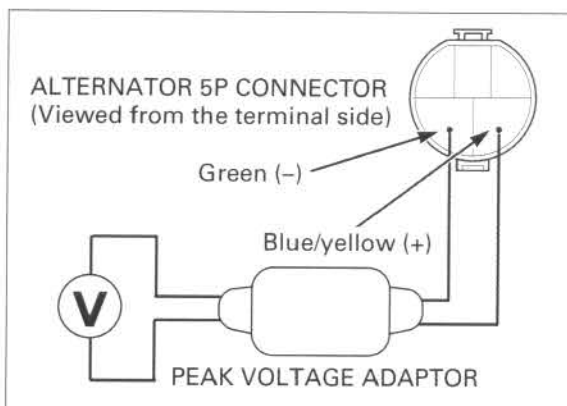
**CONNECTION: Blue/yellow (+) – Green (–)**



In the same manner as at the PCM/ECM connector, measure the peak voltage and compare it to the voltage measured at the PCM/ECM connector.

- If the peak voltage measured at the PCM/ECM connector is abnormal and the one measured at the alternator connector is normal, the Blue/yellow or Green/white wire has an open or short circuit, or loose connection.
- If both peak voltages are abnormal, follow the checks described in the troubleshooting chart (page 20-4).

If the CKP sensor is faulty, replace the alternator stator/CKP sensor assembly (page 12-5).



## IGNITION COIL

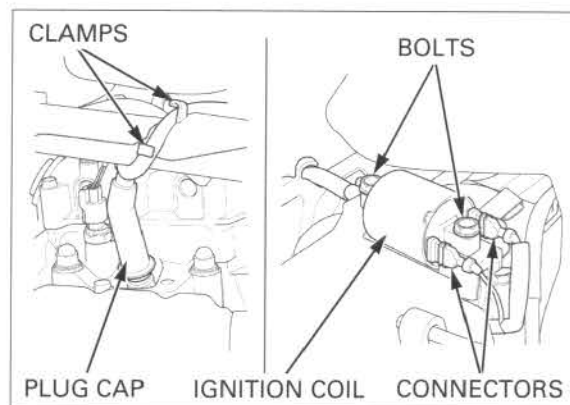
### REMOVAL/INSTALLATION

Remove the left fuel tank side cover (page 3-5).

Disconnect the plug cap from the plug and free the spark plug wire from the clamps.

Disconnect the ignition coil primary wire connector. Remove the two mounting bolts and ignition coil.

Installation is in the reverse order of removal.

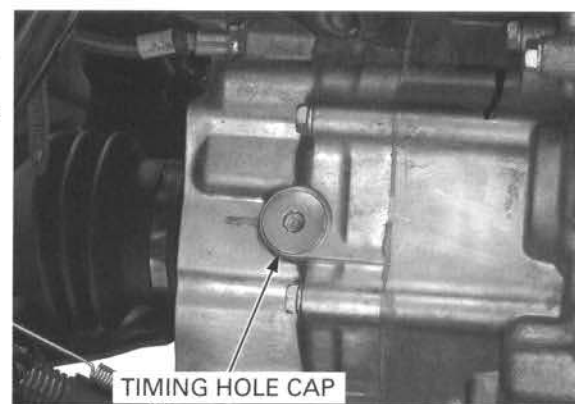


## IGNITION TIMING

Remove the right mudguard (page 3-6).

Start the engine and warm it up to operating temperature.

Stop the engine and remove the timing hole cap from the rear crankcase cover.

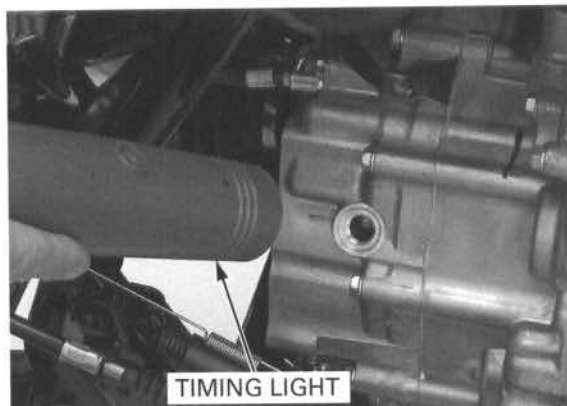




## IGNITION SYSTEM

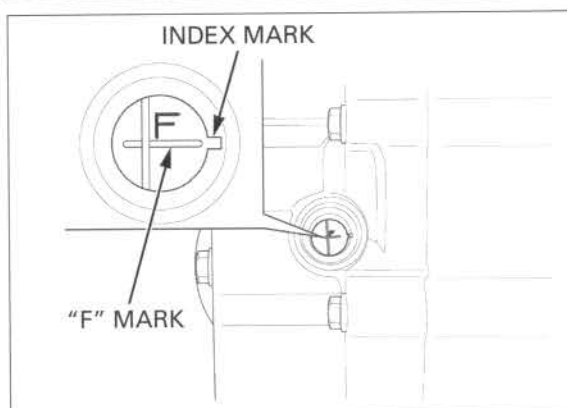
Connect the timing light and tachometer.

Start the engine, let it idle 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.

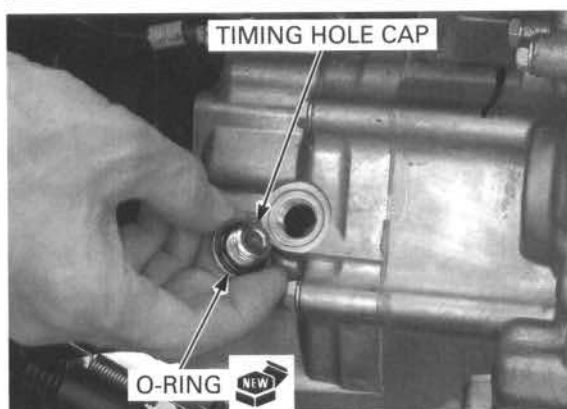


Coat a new O-ring with oil and install it onto the timing hole cap.

Install the timing hole cap and tighten it.

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

Install the right mudguard (page 3-6).





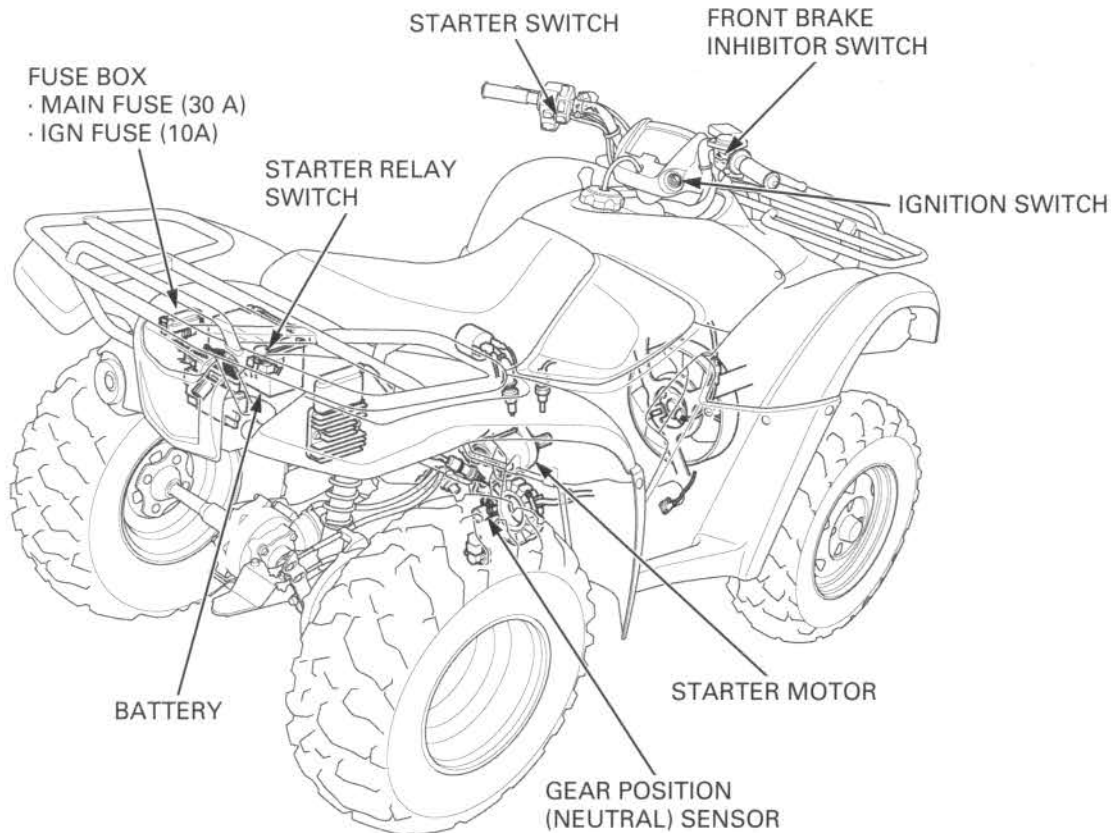
# 21. ELECTRIC STARTER

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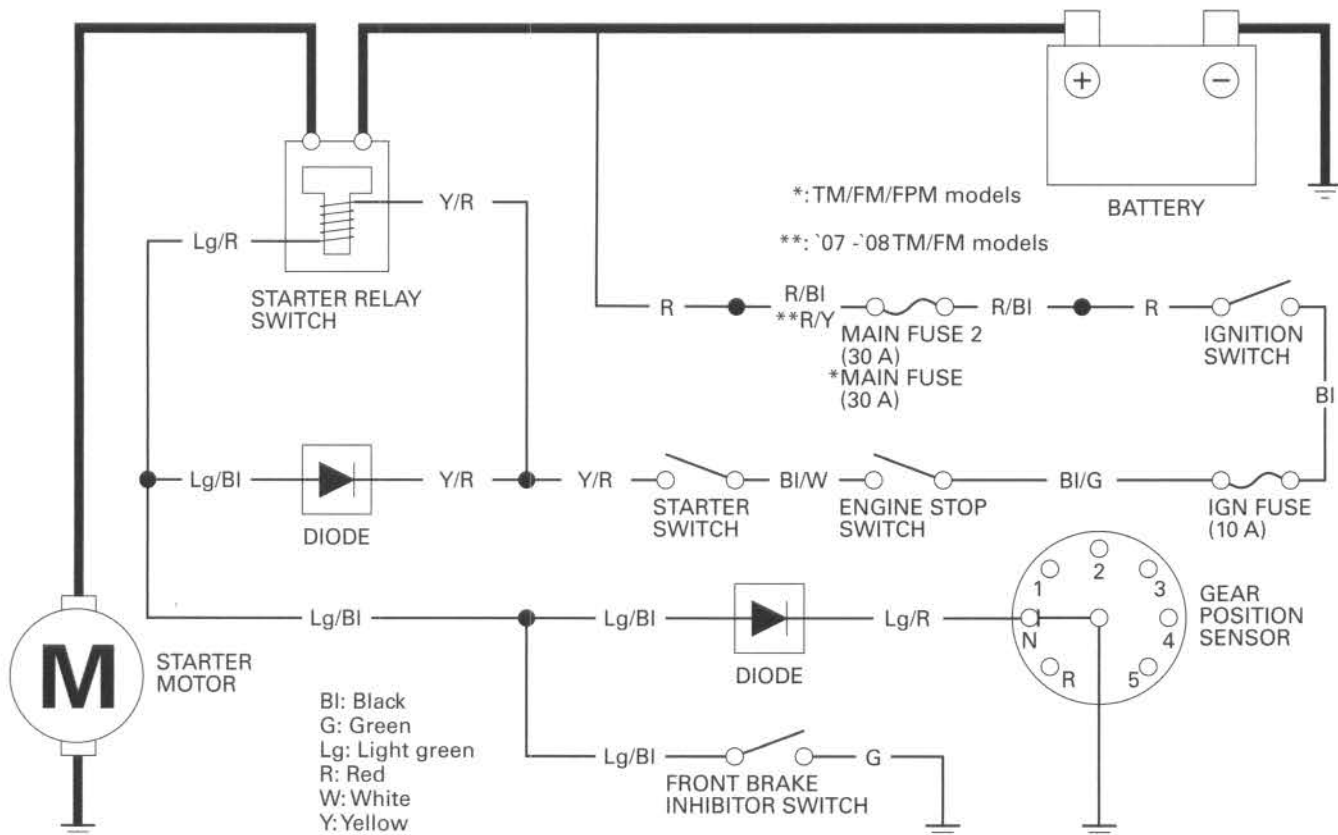
COMPONENT LOCATION .....	21-2	STARTER MOTOR .....	21-6
SYSTEM DIAGRAM .....	21-2	STARTER RELAY SWITCH .....	21-12
SERVICE INFORMATION .....	21-3	DIODE .....	21-13
TROUBLESHOOTING .....	21-4		



## COMPONENT LOCATION



## SYSTEM DIAGRAM





## SERVICE INFORMATION

### GENERAL

#### NOTICE

- 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.
- 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 (page 21-4).
- A weak battery may be unable to turn the starter motor quickly enough, or supply adequate ignition current.
- Starter clutch servicing (page 12-8).
- Ignition switch servicing (page 22-11).
- Engine stop switch and starter switch inspection (page 22-12).
- Front brake inhibitor switch servicing (page 22-13).
- Gear position switch servicing (page 22-15).

### SPECIFICATIONS

Unit: mm (in)

ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.0 (0.47)	6.5 (0.26)



# TROUBLESHOOTING

### NOTE:

- The starter motor can be operated when the transmission is in neutral or when the transmission is in gear and the front brake lever is squeezed.
- Make sure the engine stop switch is turned to "○" before starting the engine. The starter motor does not operate with the engine stop switch turned "⊗".

### **Starter motor does not turn**

#### **1. Fuse Inspection**

Check for blown main fuse (30 A) or IGN fuse (10 A).

##### ***Is the fuse blown?***

**YES** – Replace the fuse.

**NO** – GO TO STEP 2.

#### **2. Battery Inspection**

Check that the battery is fully charged and in good condition.

##### ***Is the battery in good condition?***

**YES** – GO TO STEP 3.

**NO** – Charge or replace the battery (page 19-6).

#### **3. Starter Relay Switch Operation Inspection**

Check the operation of the starter relay switch (page 21-12).

##### ***Does the starter relay switch click?***

**YES** – GO TO STEP 4.

**NO** – GO TO STEP 5.

#### **4. Starter Motor Inspection**

Turn the ignition switch to OFF.

Apply battery voltage to the starter motor directly.

##### ***Does the starter motor turn?***

**YES** – • Poorly connected battery cable or starter motor cable.  
• Faulty starter relay switch (page 21-12).

**NO** – Faulty starter motor (page 21-6).

#### **5. Relay Coil Ground Line Inspection**

Turn the ignition switch to OFF.

Check the ground line of the starter relay switch (page 21-12).

##### ***Is the ground line normal?***

**YES** – GO TO STEP 6.

**NO** – • Faulty gear position switch (page 22-15).  
• Faulty diode (page 21-13).  
• Faulty front brake inhibitor switch (page 22-13).  
• Loose or poor contact of the related connector terminal.  
• Open circuit in the wire harness.

#### **6. Relay Coil Power Input Line Inspection**

Check the power input line of the starter relay switch (page 21-12).

##### ***Is the power input line normal?***

**YES** – GO TO STEP 7.

**NO** – • Faulty ignition switch (page 22-11).  
• Faulty engine stop switch (page 22-12).  
• Faulty starter switch (page 22-12).  
• Loose or poor contact of the related connector terminal.  
• Open circuit in the wire harness.



**7. Starter Relay Switch Inspection**

Check the function of the starter relay switch (page 21-12).

***Does the starter relay switch function properly?***

**NO** – Faulty starter relay switch.

**YES** – Loose or poor contact of the starter relay switch connector terminal.

**Starter motor turns engine slowly**

- Low battery voltage
- Poorly connected battery cable
- Poorly connected starter motor cable
- Faulty starter motor
- Poorly connected ground cable terminal

**Starter motor turns, but engine does not turn**

- Faulty starter clutch
- Damaged starter gear train

**Starter relay switch clicks, but engine does not turn over**

- Crankshaft does not turn due to engine problems



### STARTER MOTOR

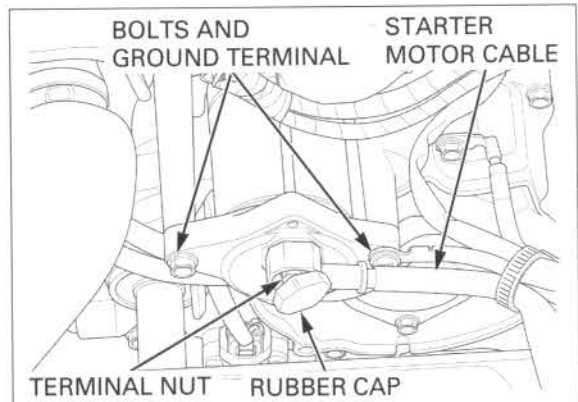
#### REMOVAL

Remove the air cleaner housing (page 6-44).

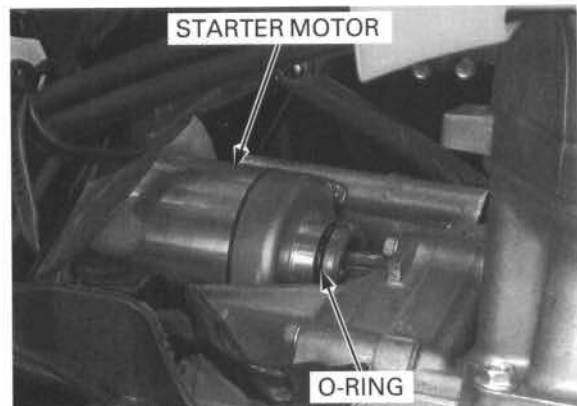
Disconnect the negative (-) cable from the battery (page 19-6).

Remove the following;

- rubber cap
- terminal nut
- starter motor cable
- two mounting bolts and ground terminal



- starter motor from the rear crankcase cover
- O-ring from the starter motor

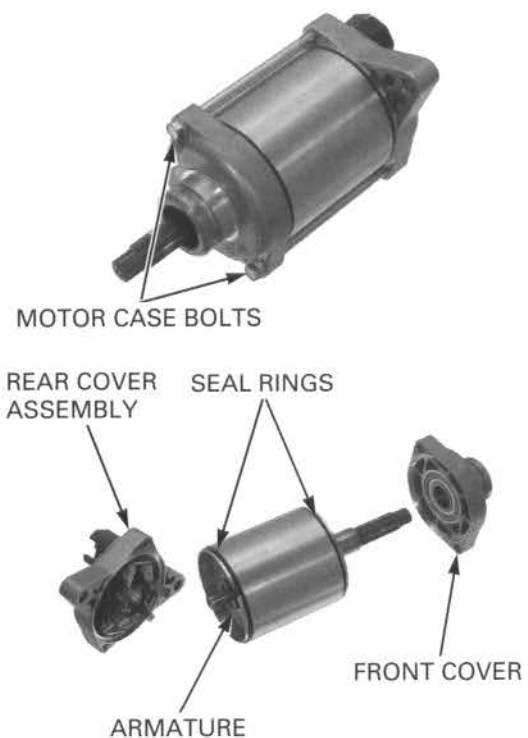


#### DISASSEMBLY/INSPECTION

Remove the following:

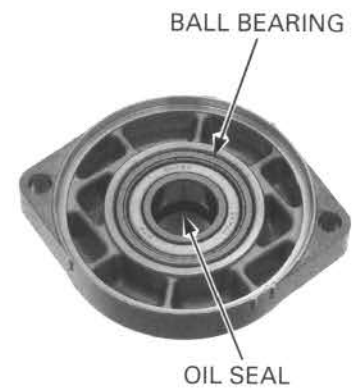
- motor case bolts

- rear cover assembly
- front cover
- seal rings
- armature





Check the oil seal and ball bearing in the front cover for wear or damage.



Check the commutator bars of the armature for discoloration.

**NOTE:**

- Do not use emery or sand paper on the commutator.



Check for continuity between pairs of commutator bars. There should be continuity.

**CONTINUITY:**



Check for continuity between each commutator bar and the armature shaft. There should be no continuity.

**NO CONTINUITY:**





## ELECTRIC STARTER

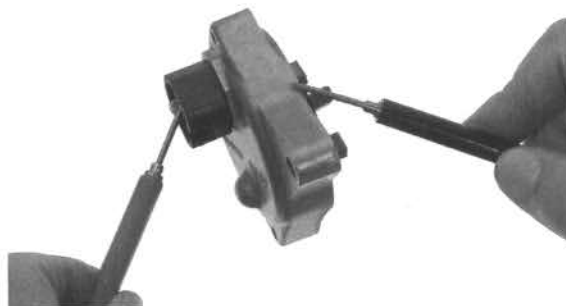
Check for continuity between the insulated brush and cable terminal.  
There should be continuity.

CONTINUITY:



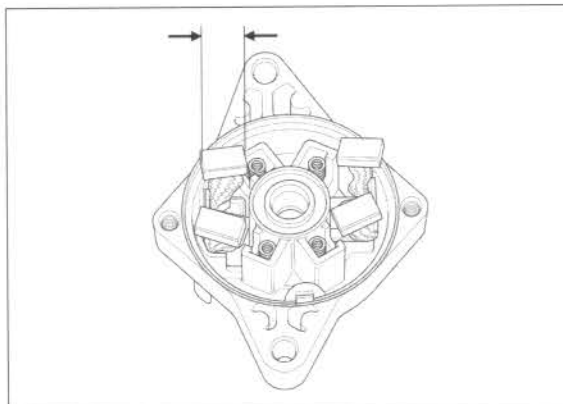
Check for continuity between the insulated brush and motor case.  
There should be no continuity.

NO CONTINUITY:



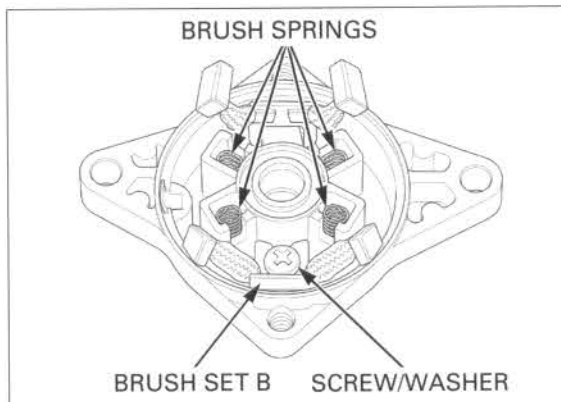
Remove the brushes from the brush holder.  
Measure the brush length.

**SERVICE LIMIT: 6.5 mm (0.26 in)**



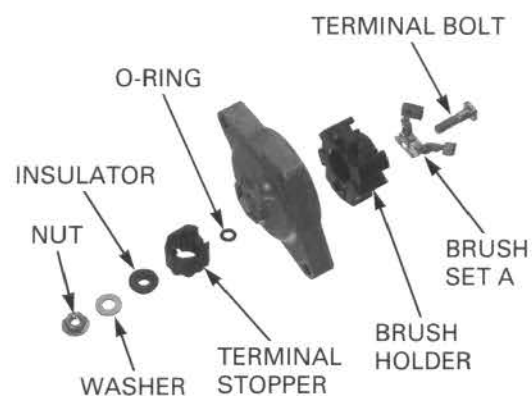
Remove the following from the rear cover:

- brush springs
- screw/washer
- brush set B

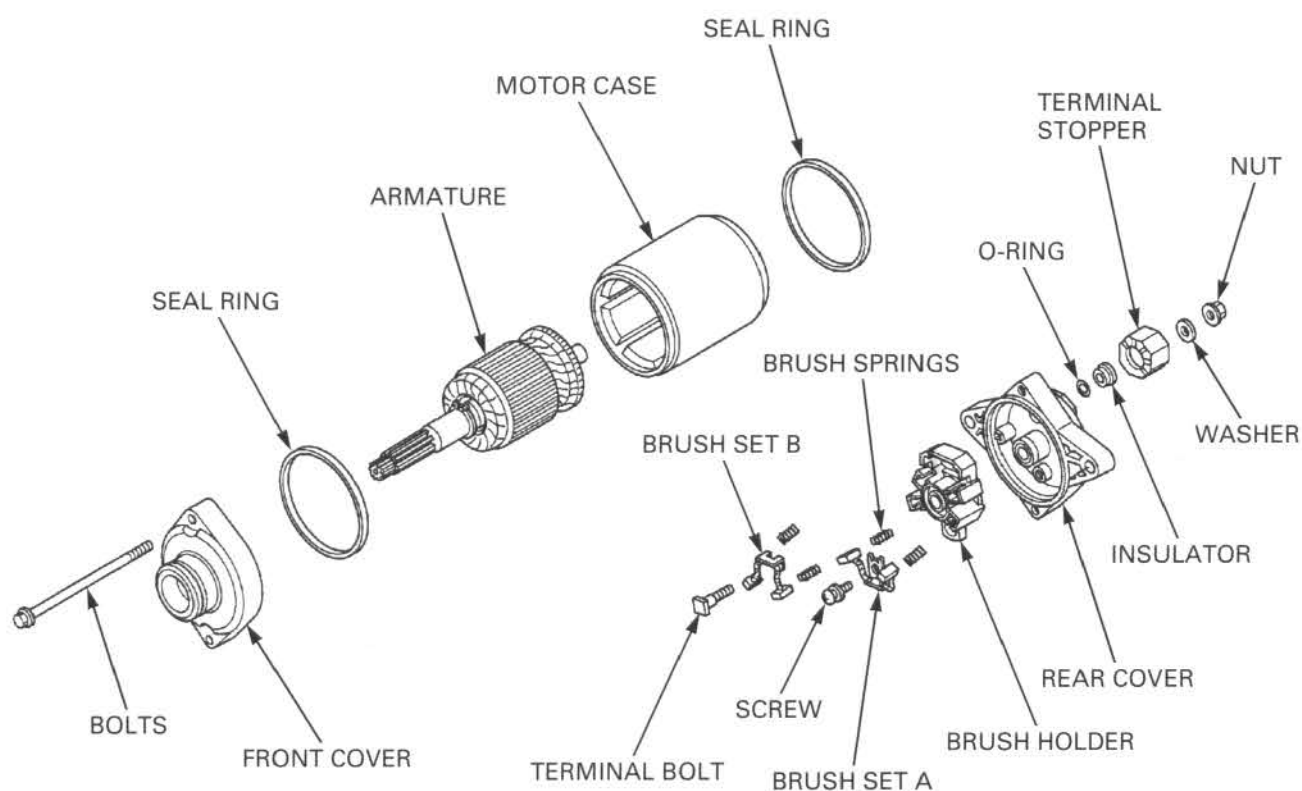




- nut
- washer
- insulator
- terminal stopper
- O-ring
- terminal bolt
- brush set A
- brush holder

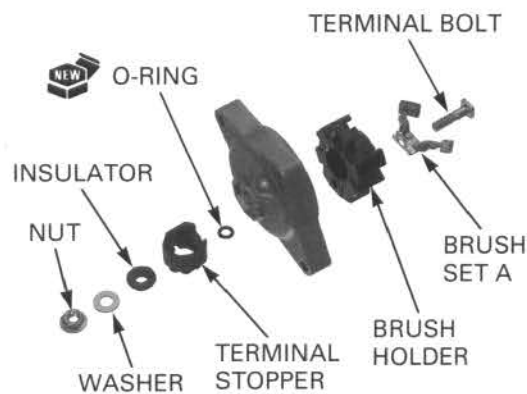


## ASSEMBLY



Install the following onto the rear cover:

- brush holder
- brush set A
- terminal bolt
- new O-ring
- terminal stopper
- insulator
- washer
- nut

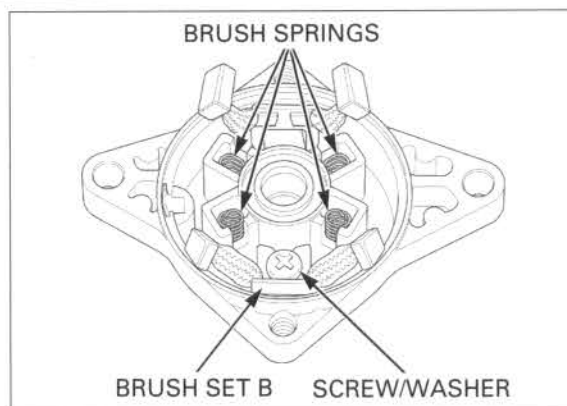




## ELECTRIC STARTER

- brush set B
- screw/washer
- brush springs

Install the brushes into the brush holder.

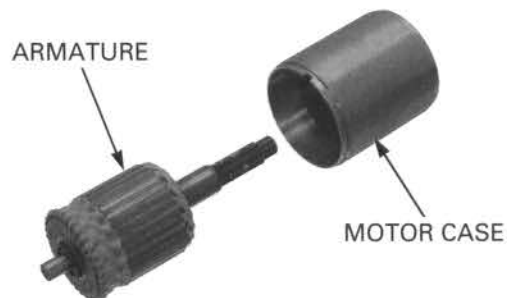


Install the armature in the motor case from the rear cover side.

When installing the armature into the motor case, hold the armature tightly to prevent the magnet of the case from pulling the armature against it.

### NOTICE

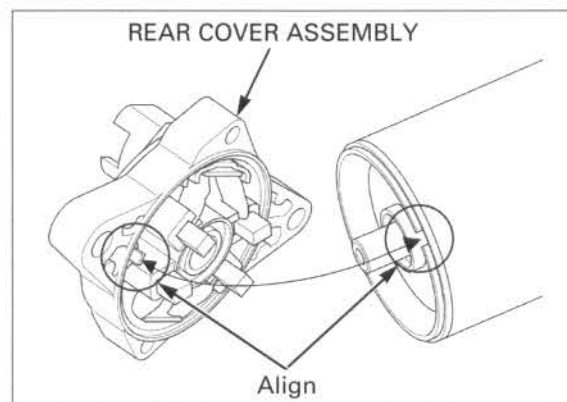
*The coil may be damaged if the magnet pulls the armature against the case.*



Install new seal rings onto the motor case.  
Install the front cover onto the armature shaft and motor case.



Install the rear cover assembly onto the motor case by aligning the lug with the groove.





Align the bolt holes in the front and rear covers, install the motor case bolts and tighten them.

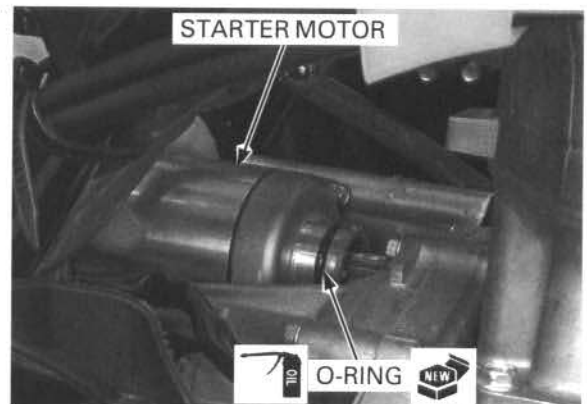


MOTOR CASE BOLTS

### INSTALLATION

Coat a new O-ring with oil and install it in the starter motor groove.

Install the starter motor into the rear crankcase cover.



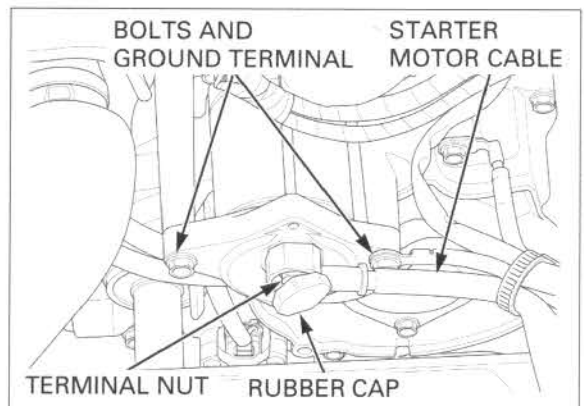
Install the two mounting bolts with the ground terminal and tighten them.

Install the starter motor cable and terminal nut, and tighten the nut.

Install the rubber cap onto the terminal stopper.

Connect the battery negative (-) cable (page 19-6).

Install the air cleaner housing (page 6-44).





# STARTER RELAY SWITCH

### OPERATION INSPECTION

Remove the rear fender cover (page 3-9).

Shift the transmission into neutral.

Make sure the engine stop switch is turned to "O".

Turn the ignition switch ON and push the starter switch.

The relay coil is normal if the starter relay switch clicks.

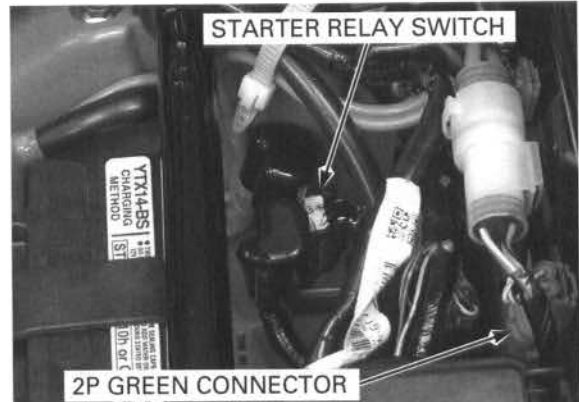
If you don't hear the switch click, inspect the relay coil circuits.

### CIRCUIT INSPECTION

Turn the ignition switch to OFF, remove the starter relay switch 2P green connector from the stay and disconnect it.

Check the following at the wire harness side connector.

- **Ground Line:**  
Check for continuity between the Light green/black wire terminal and ground.  
There should be continuity when the transmission is in neutral or when the transmission is in gear and the front brake lever is squeezed.
- **Power Input Line:**  
Turn the engine stop switch "O" and the ignition switch ON.  
Measure the voltage between the Yellow/red wire terminal (+) and ground (-).  
There should be battery voltage only when the starter switch is pushed.



### FUNCTION INSPECTION

Remove the rear fender cover (page 3-9).

Disconnect the negative (-) cable from the battery (page 19-6).

Remove the battery cable and starter motor cable from the starter relay switch.

Remove the starter relay switch 2P green connector from the stay and disconnect it.

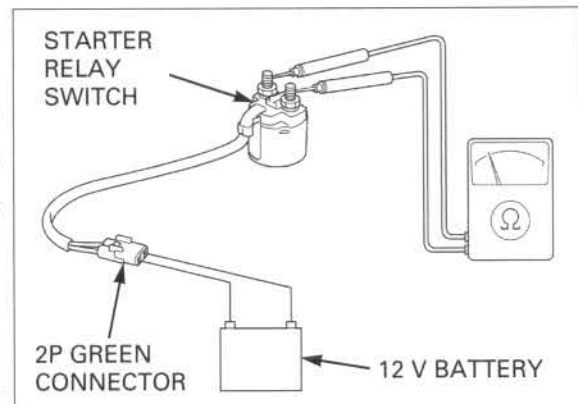
Connect the fully charged 12 V battery to the 2P green connector terminals.

#### CONNECTION:

**Battery (+) terminal – Yellow/red**

**Battery (-) terminal – Light green/red**

There should be continuity between the cable terminals while the battery is connected, and no continuity when the battery is disconnected.





## DIODE

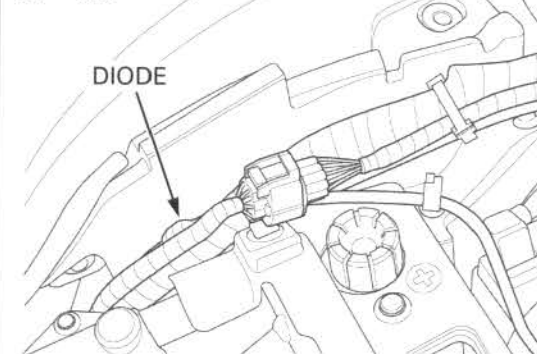
### INSPECTION

Remove the following

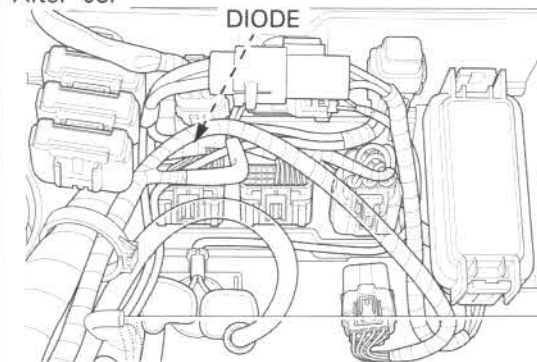
- right side cover (page 3-4)
- rear fender cover (page 3-9)

Remove the diode from the wire harness.

'07 - '08:

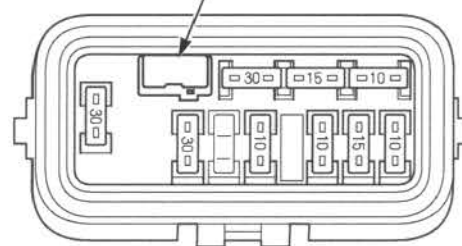


After '08:



Remove the fuse box cover and the diode from the fuse box.

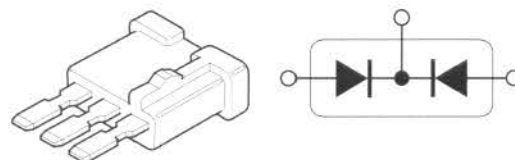
DIODE



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.





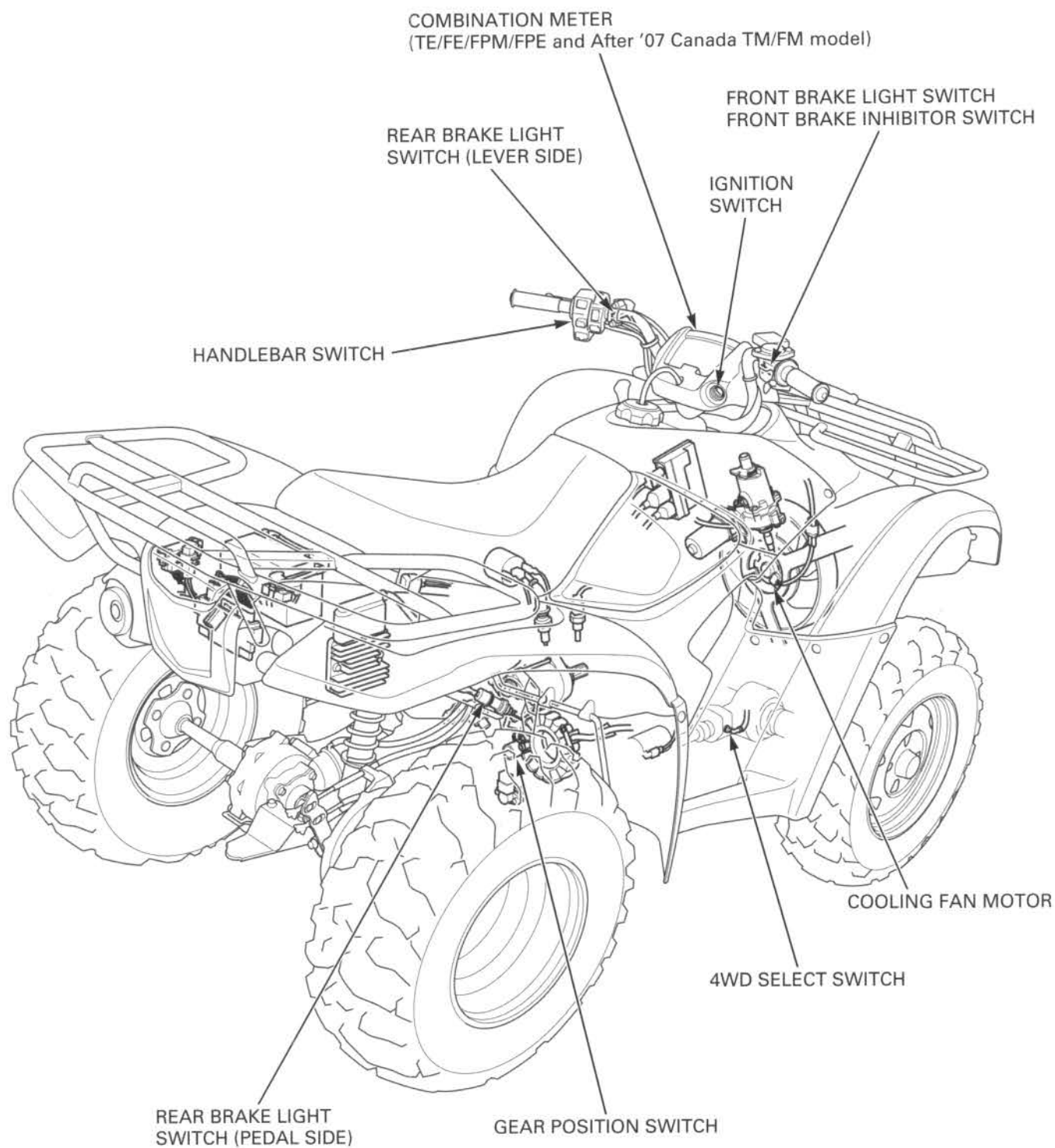
## 22. LIGHTS/METERS/SWITCHES

---

COMPONENT LOCATION .....	22-2	IGNITION SWITCH .....	22-11
SERVICE INFORMATION .....	22-3	HANDLEBAR SWITCH .....	22-12
HEADLIGHT .....	22-5	FRONT BRAKE SWITCH .....	22-13
BRAKE/TAILLIGHT .....	22-6	REAR BRAKE LIGHT SWITCH .....	22-14
COMBINATION METER (TE/FE/FPM/FPE and After '07 Canada TM/FM) .....	22-6	GEAR POSITION SWITCH .....	22-15
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		4WD SELECT SWITCH .....	22-18



## COMPONENT LOCATION





## SERVICE INFORMATION

### GENERAL

- All plastic connectors have locking tabs that must be released before disconnecting, and must be aligned when reconnecting.
- To isolate an electrical failure, check the continuity of the electrical path through the part. 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.
- The following color codes are used throughout this section.

Bl: Black	G: Green	Lg: Light Green	R: Red
Br: Brown	Gr: Gray	O: Orange	W: White
Bu: Blue	Lb: Light Blue	P: Pink	Y: Yellow

### SPECIFICATIONS

#### '07 TM/FM and After '07 U.S.A. TM/FM models

ITEM		SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Brake/taillight	LED
	Neutral indicator	12 V-1.7 W
	Reverse indicator	12 V-1.7 W
	Coolant temperature indicator	12 V-1.7 W
	MIL	12 V-1.7 W
	4WD indicator (FM only)	12 V-1.7 W
Fuse	Main fuse	30 A
	Sub-fuse	15 A, 10 A x 3

#### TE/FE and After '07 Canada FM/FE models

ITEM		SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Brake/taillight	LED
	Neutral indicator	LED
	Reverse indicator	LED
	Coolant temperature indicator	LED
	MIL	LED
	4WD indicator (FE/FM only)	LED
	Meter light	LED
Fuse	Main fuse	TE/FE 30 A x 2
		TM/FM 30 A
	Sub-fuse	15 A, 10 A x 3

#### FPM/FPE models

ITEM		SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Brake/taillight	LED
	Neutral indicator	LED
	Reverse indicator	LED
	Coolant temperature indicator	LED
	MIL	LED
	4WD indicator	LED
	Meter light	LED
	EPS indicator	LED
Fuse	Main fuse	FPE 30 A x 2
		FPM 30 A
	Sub-fuse	15 A, 10 A x 3
	EPS fuse	40 A



LIGHTS/METERS/SWITCHES

TORQUE VALUES

Gear position switch wire clamp bolt	12 N·m (1.2 kgf·m, 9 lbf·ft) Apply locking agent to the threads.
Front brake light switch/inhibitor switch screw	1.2 N·m (0.12 kgf·m, 0.9 lbf·ft) Apply locking agent to the threads.
Rear brake light (lever) switch screw	1.2 N·m (0.12 kgf·m, 0.9 lbf·ft)
4WD select switch	12 N·m (1.2 kgf·m, 9 lbf·ft)



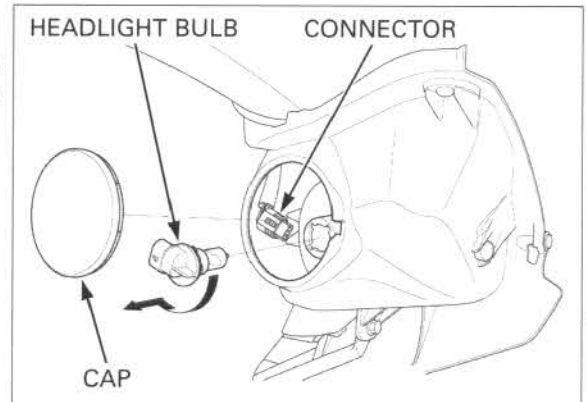
## HEADLIGHT

### BULB REPLACEMENT

Remove the headlight cover cap.  
Disconnect the headlight 3P connector.  
Remove the headlight bulb by turning it clockwise for the right headlight and counterclockwise for the left headlight.

*Align the bulb tabs with the headlight grooves properly.*

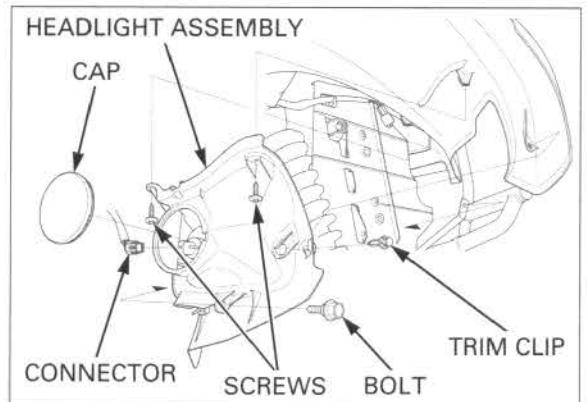
Install a new bulb in the reverse order of removal.



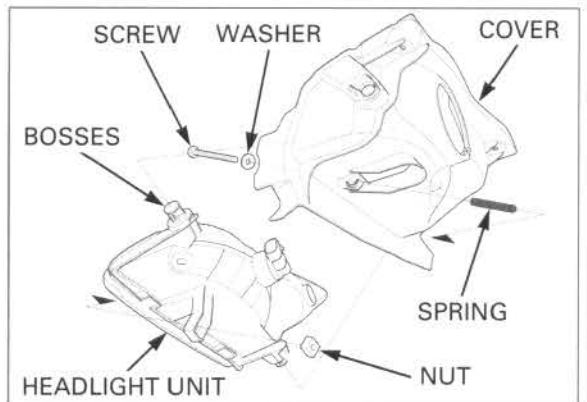
### REMOVAL/INSTALLATION

Remove the following:

- headlight cover cap
- trim clip
- two tapping screws
- mounting bolt
- headlight assembly
- headlight 3P connector from the bulb



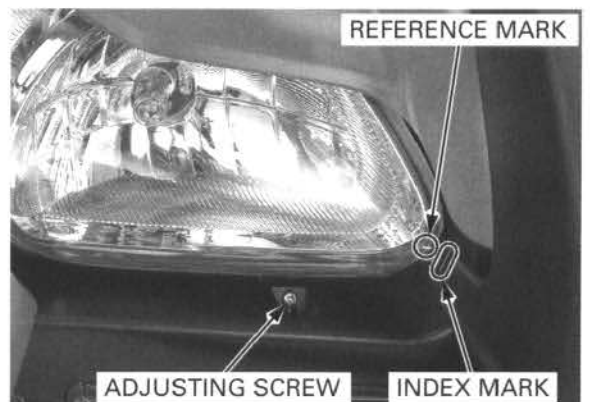
- adjusting screw
- washer
- nut
- spring
- headlight unit from the cover by releasing the bosses from the holes



*Route the headlight wire into the groove in the headlight cover properly.*

Install the headlight unit in the reverse order of removal.

After installing the headlight, align the reference mark on the headlight with the top of the index mark on the cover by turning the adjusting screw.





## BRAKE/TAILLIGHT

### REPLACEMENT

Unhook the retaining strap and open the tool box lid.

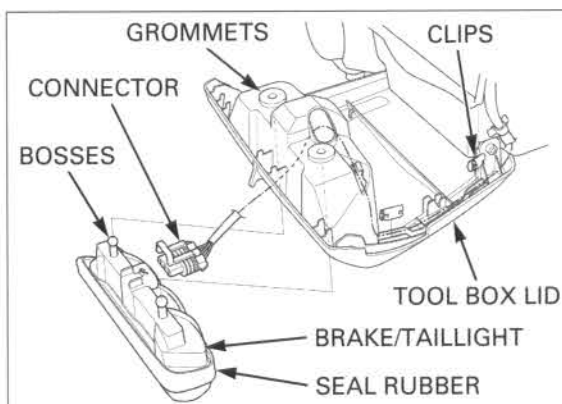
Remove the two wire clips and brake/taillight wire from the guides of the tool box lid.

Remove the brake/taillight from the tool box lid by releasing the bosses from the grommets.

Disconnect the 3P connector from the brake/taillight.

*Be careful not to damage the seal rubber.*

Install a new brake/taillight in the reverse order of removal.



## COMBINATION METER (TE/FE/FPM/ FPE and After '07 Canada TM/FM)

### REMOVAL/INSTALLATION

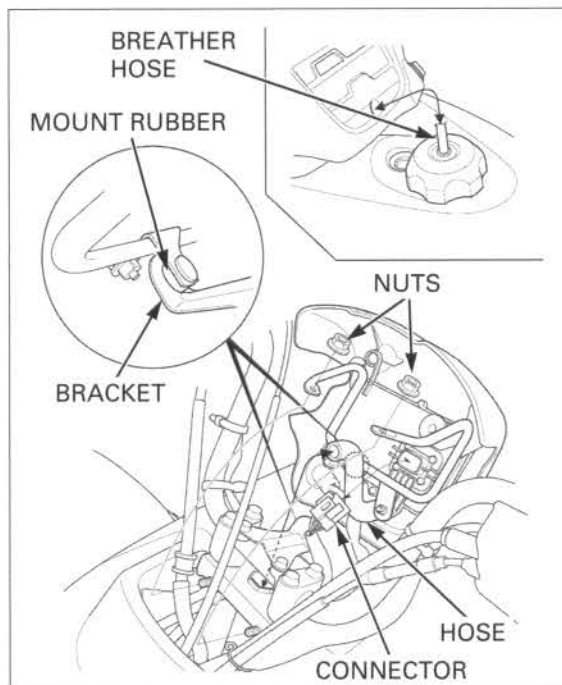
Disconnect the fuel tank breather hose from the handlebar cover.

Remove the two mounting nuts.

Remove the handlebar cover stay from the steering stem.

*When installing, place the mount rubber of the stay onto the bracket as shown.*

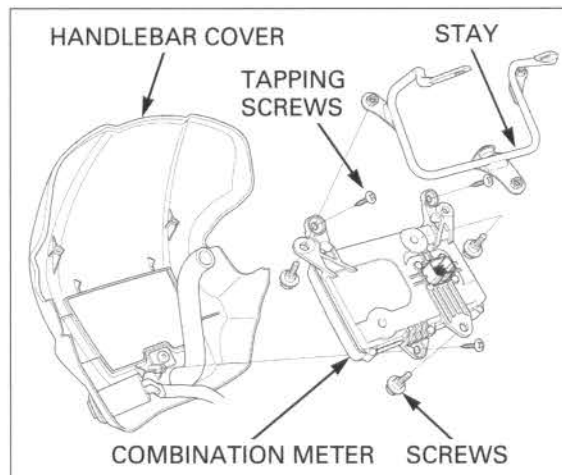
Disconnect the hose from the steering stem and the 21P connector from the combination meter.



Remove the three tapping screws and the combination meter/stay from the handlebar cover.

Remove the three screws and the combination meter from the stay.

Installation is in the reverse order of removal.





**POWER/GROUND LINE INSPECTION**

Disconnect the combination meter 21P connector (page 22-6)

Check the power and ground lines at the wire harness side connector.

**POWER INPUT LINE**

'07 - '08: Measure the voltage between the Black/brown wire terminal (+) and ground (-).

After '08: Measure the voltage between the Black/green wire terminal (+) and ground (-). There should be battery voltage with the ignition switch turned to ON.

If there is no voltage, check the following:

'07:

- LIGHT fuse (10 A)
- Black/brown wire between the combination meter and fuse box for an open circuit
- ignition switch (page 22-11)
- Pink wire between the ignition switch and fuse box for an open circuit

'08:

- IGN fuse (10 A)
- Black/brown or Black/green wire between the combination meter and fuse box for an open circuit
- ignition switch (page 22-11)
- Black wire between the ignition switch and fuse box for an open circuit

'After 08:

- IGN fuse (10 A)
- Black/green wire between the combination meter and fuse box for an open circuit
- ignition switch (page 22-11)
- Black wire between the ignition switch and fuse box for an open circuit

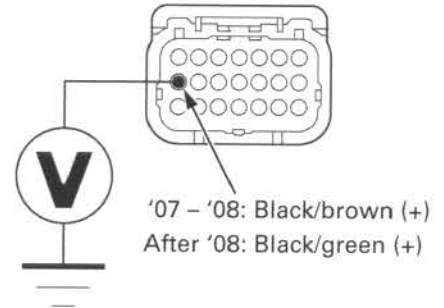
**GROUND LINE**

Check for continuity between the Green wire terminal and ground.

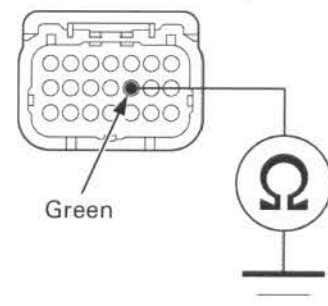
There should be continuity at all times.

If there is no voltage, check for an open circuit in the Green wire.

COMBINATION METER 21P CONNECTOR  
(Viewed from the terminal side)



COMBINATION METER 21P CONNECTOR  
(Viewed from the terminal side)





## SERIAL COMMUNICATION LINE

Gear position indicator continuously blinks "-", MIL and engine coolant temperature indicator do not come on

### 1. PCM/ECM power input

Check that the engine can be started normally.

**Can the engine start?**

**YES** – GO TO STEP 2.

**NO** – Check the PCM/ECM power/ground line (page 6-55).

### 2. Connector check

Check the combination meter 21P connector and PCM/ECM 33P connector for loose contacts or corroded terminals.

**Are the connectors in good condition?**

**YES** – GO TO STEP 3.

**NO** – Loose or poor contacts at the combination meter 21P connectors or PCM/ECM 33P connector.

### 3. Combination Meter Serial Line Short Circuit Inspection

Turn the ignition switch to OFF.  
Disconnect the PCM/ECM 33P black connector and combination meter 21P connector.  
Check for continuity between the wire harness side 33P connector terminal and ground.

**TOOL:**

Test probe 07ZAJ-RDJA110

**Connection:**

'07 – '08: Orange (A31) – ground

After '08: Orange (A21) – ground

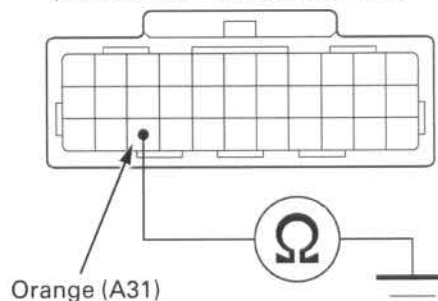
**Is there continuity?**

**YES** – Short circuit in the Orange wire.

**NO** – GO TO STEP 4.

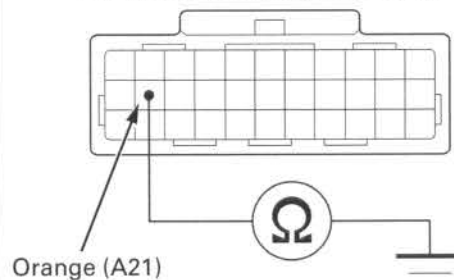
'07 – '08:

PCM/ECM 33P BLACK CONNECTOR  
(Viewed from the terminal side)



After '08:

PCM/ECM 33P BLACK CONNECTOR  
(Viewed from the terminal side)





**4. Combination Meter Serial Line Open Circuit Inspection**

Check the Orange wire and Green wire for continuity between the wire harness side 33P connector and 21P connector terminals.

**TOOL:**

Test probe 07ZAJ-RDJA110

**Is there continuity?**

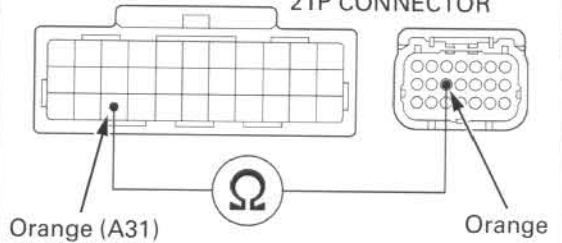
**YES** – GO TO STEP 5.

**NO** – • Open circuit in the Orange wire.  
• Open circuit in the Green wire.

'07 – '08:

PCM/ECM 33P  
BLACK CONNECTOR

COMBINATION METER  
21P CONNECTOR

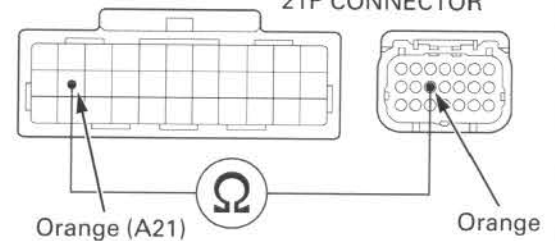


(Viewed from the terminal side)

After '08:

PCM/ECM 33P  
BLACK CONNECTOR

COMBINATION METER  
21P CONNECTOR



(Viewed from the terminal side)

**5. PCM/ECM Circuit Inspection**

Connect the PCM/ECM 33P black connector.

Turn the ignition switch to ON and wait 5 seconds or more. Measure resistance at the combination meter 21P connector terminal.

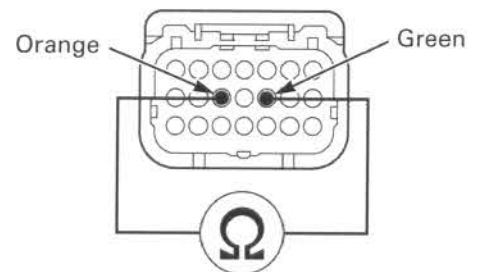
**Connection: Orange – Green**

**Is the resistance 0.1kΩ – 100kΩ?**

**YES** – Replace the combination meter with a known good one, and recheck.

**NO** – Replace the PCM/ECM with a known good one, and recheck.

COMBINATION METER 21P CONNECTOR  
(Viewed from the terminal side)





### SPEEDOMETER

Speedometer does not operate

#### 1. Combination Meter Power/Ground Line Inspection

Check the odometer/trip meter and indicators functions.

**Do they function properly?**

**YES** – GO TO STEP 2.

**NO** – Check the combination meter power/ground lines (page 22-7).

#### 2. ESP System DTC Inspection

Check the ESP system DTC (page 23-12).

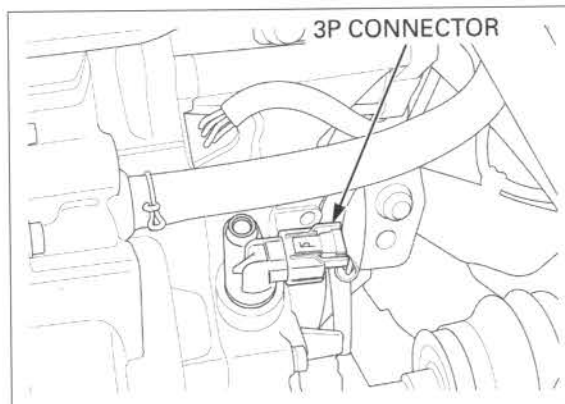
**Is DTC 11-1 indicated?**

**YES** – Perform the DTC 11-1 troubleshooting (page 23-15).

**NO** – GO TO STEP 3.

#### 3. Speedometer Line Open Circuit Inspection

Remove the left side cover (page 3-4).  
Disconnect the VS sensor 3P connector.



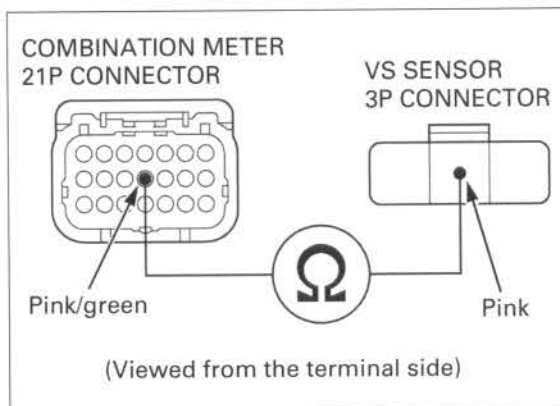
Remove the handlebar cover (page 22-6).  
Check the Pink/green and Pink wire for continuity between the combination connector and VS sensor connector terminals.

**Is there continuity?**

**YES** – Replace the combination meter (page 22-6).

**NO** –

- Open circuit in the Pink/green or Pink wire.
- Loose or poorly connected related connectors.





## INDICATORS ('07 TM/FM and After '07 U.S.A. TM/FM)

### BULB REPLACEMENT

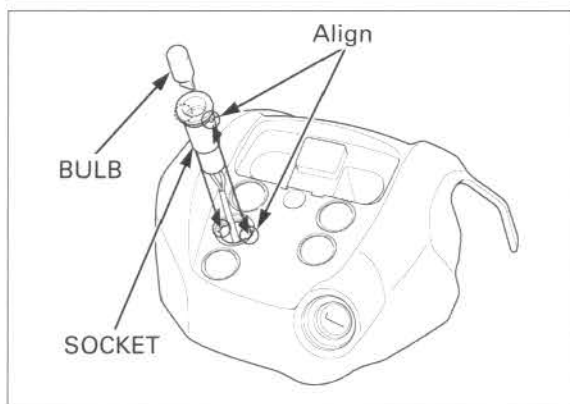
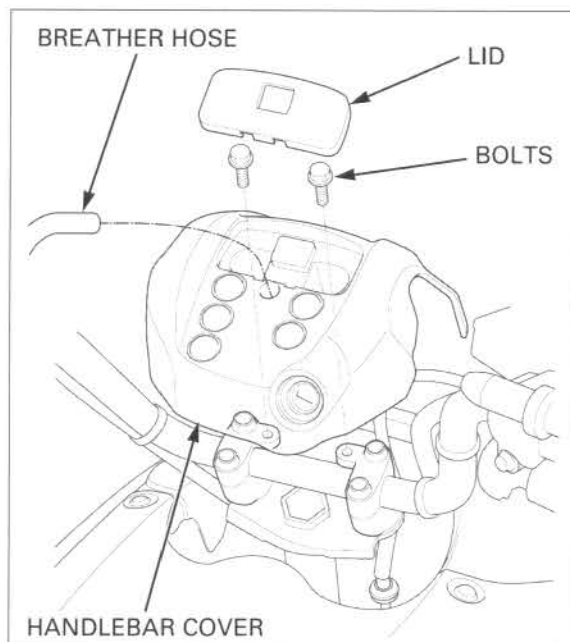
Disconnect the fuel tank breather hose from the handlebar cover.

Remove the following

- handlebar cover lid
- two bolts
- handlebar cover
- indicator lens
- indicator socket from underside of the cover
- indicator bulb from the socket by pulling it

Pass the bulb socket through the handlebar cover. Install a new bulb into the socket. Install the indicator lens into the socket. Install the socket into the handlebar cover by aligning the locating tabs with the cover grooves.

Install the removed parts in the reverse order of removal.



## IGNITION SWITCH

### INSPECTION

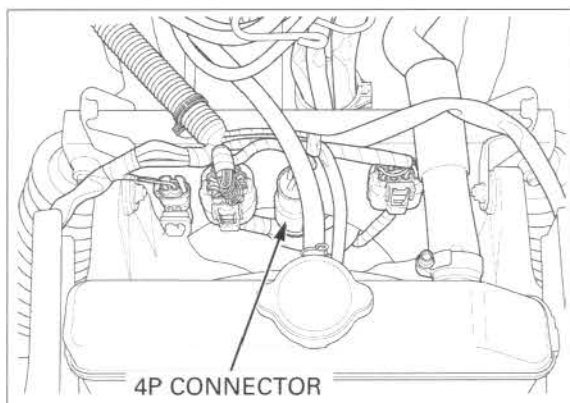
Remove the front fender/carrier (page 3-7).

Remove the ignition switch 4P connector 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:

Color Position	R/BI	P	R	BI
ON	○	○	○	○
OFF				





## REPLACEMENT

Disconnect the ignition switch 4P connector (page 22-11).

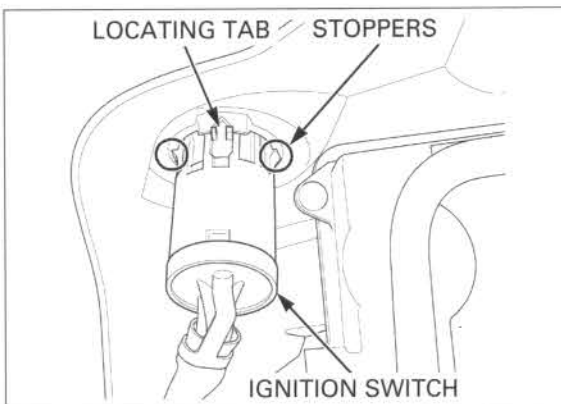
Remove the handlebar cover.

- TE/FE/FPM/FPE and After '07 Canada TM/FM models: (page 22-6)
- '07 TM/FM and After '07 U.S.A. TM/FM models: (page 22-11)

Release the ignition switch wire from the wire clip on the steering shaft holder.

Remove the ignition switch from the handlebar cover by pushing in the two stoppers.

Install a new ignition switch by aligning the locating tab with the cover groove.



Route the ignition switch wire properly (page 1-28).

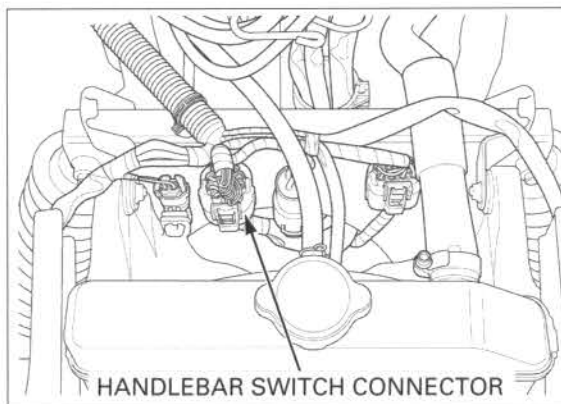
Install the removed parts in the reverse order of removal.

## HANDLEBAR SWITCH

### INSPECTION

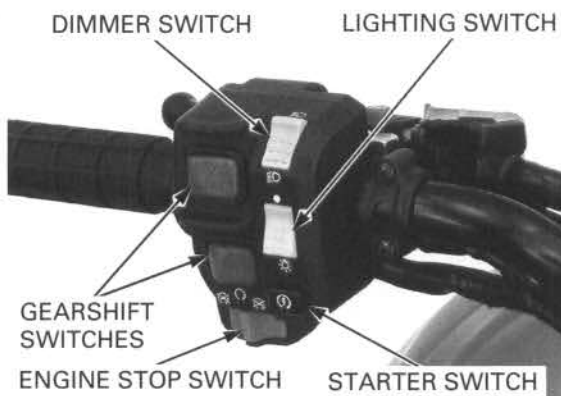
Remove the front fender/carrier (page 3-7).

Remove the handlebar switch connector from the frame and disconnect it.



For gearshift switch inspection (page 23-30).

Check for continuity between the switch side connector terminals in each switch position. Continuity should exist between the color coded wires as shown below:



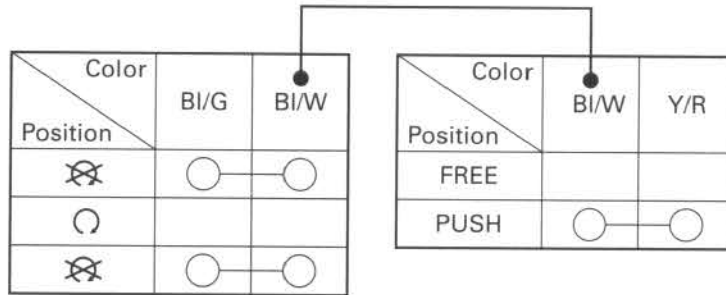
### LIGHTING SWITCH/DIMMER SWITCH

Color	Bl/Br	Br	●
Position			
●			
☀	○	○	○

Color	●	W	Bl/Bl
Position			
☸	○	○	○
(N)	○	○	○
☸	○	○	



ENGINE STOP SWITCH/STARTER SWITCH



## FRONT BRAKE SWITCH

### INSPECTION

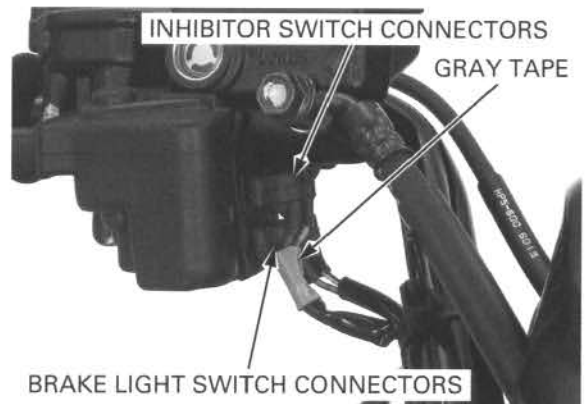
**NOTE:**

*The inhibitor switch wire has gray tape.*

- The lower switch is the brake light switch and the upper switch is the inhibitor switch.

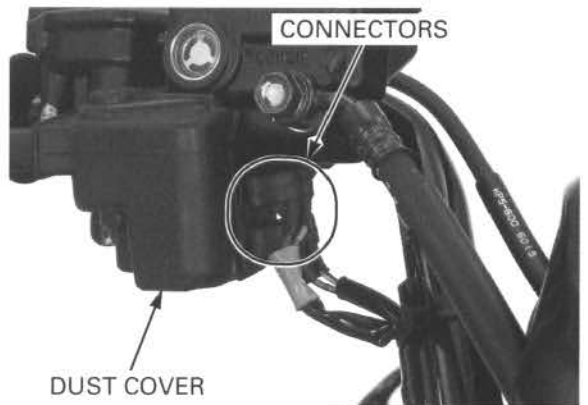
Disconnect the connectors and check for continuity between the switch terminals.

There should be continuity with the front brake lever squeezed and no continuity with the lever released.



### REPLACEMENT

Disconnect the connectors from the switches. Remove the dust cover from the switches.

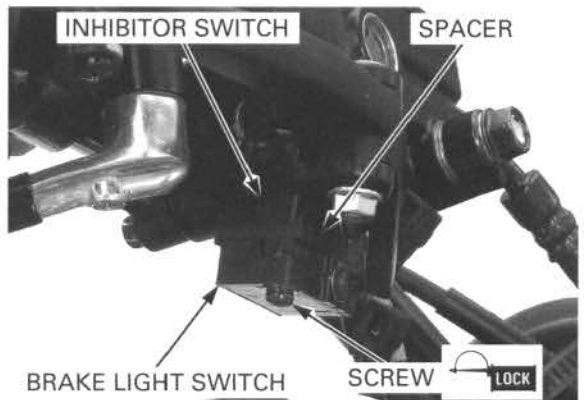


Remove the screw, switches and spacer from the master cylinder.

Apply locking agent to the screw threads. Install the switches and spacer by aligning the switch cutout with the lug of the master cylinder and spacer. Install and tighten the screw.

**TORQUE: 1.2 N·m (0.12 kgf·m, 0.9 lbf·ft)**

Install the dust cover onto the switches properly. Connect the connectors to the switches.





## REAR BRAKE LIGHT SWITCH

### LEVER SWITCH INSPECTION

Remove the dust cover from the brake light switch. Disconnect the rear brake lever switch connectors and check for continuity between the switch terminals.

There should be continuity with the rear brake lever squeezed and no continuity with the lever released.



### LEVER SWITCH REPLACEMENT

Remove the dust cover from the brake light switch. Disconnect the rear brake lever switch connectors. Remove the screw and switch from the brake lever bracket.

Install the switch by aligning the switch cutout with the lug of the brake lever bracket. Install and tighten the screw.

**TORQUE: 1.2 N·m (0.12 kgf·m, 0.9 lbf·ft)**

Connect the connectors to the switch. Install the dust cover onto the switch properly.

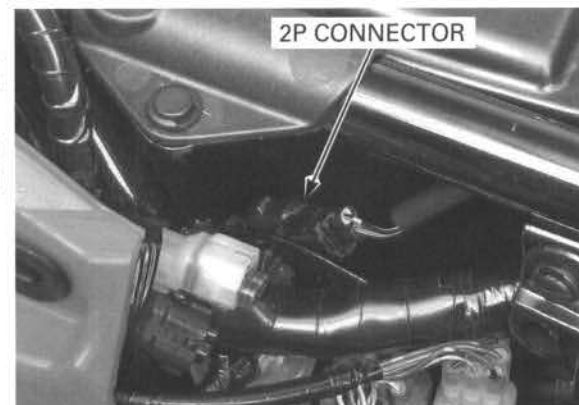


### PEDAL SWITCH INSPECTION

Remove the right side cover (page 3-4).

Disconnect the rear brake pedal switch 2P connector and check for continuity between the switch side connector terminals.

There should be continuity with the rear brake pedal depressed and no continuity with the pedal released.





## GEAR POSITION SWITCH

### INSPECTION

Remove the right side cover (page 3-4).

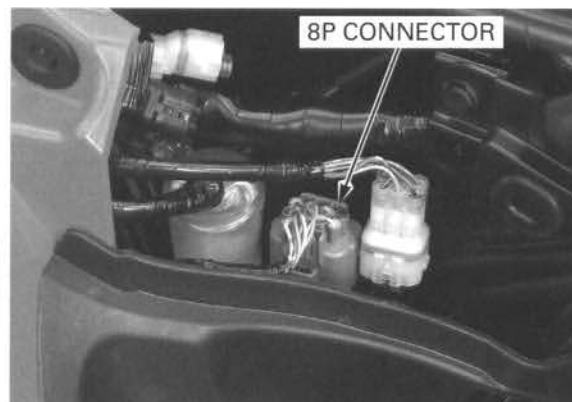
Remove the gear position switch 8P connector from the frame and disconnect it.

*If the transmission will not shift with the gearshift switches, use the manual gearshift lever located with the tool kit.*

Check for continuity at the switch side connector terminals.

There should be continuity in each gear position as follows:

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	White/green – ground
2nd	White/red – ground
3rd	Blue – ground
4th	Yellow – ground
5th	Light blue/white – ground



### REPLACEMENT

Remove the rear crankcase cover (page 12-5).

Remove the two wire clamp bolts.

Remove the wire grommet from the rear crankcase cover.

Remove the retaining bolt and gear position switch from the rear crankcase cover.

Apply locking agent to all bolt threads.

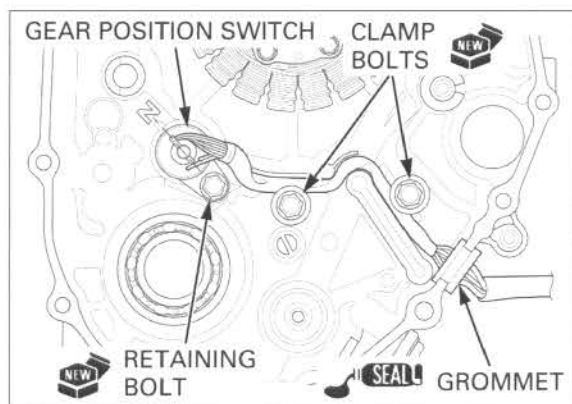
Install a new gear position switch onto the rear crankcase cover and tighten the retaining bolt.

Route the wire as shown and install the grommet into the crankcase cover groove properly.

Install the two clamp bolts and tighten them.

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

Install the rear crankcase cover (page 12-6).



## COOLING FAN

**Cooling fan does not start**

### 1. Fuse Inspection

Check the FAN fuse (15 A).

**Is the fuse blown?**

**YES** – Replace the FAN fuse.

**NO** – GO TO STEP 2.

### 2. PGM-FI System DTC Inspection

Check the PGM-FI system DTC (page 6-17).

**Is DTC 7-1 and/or 7-2 indicated?**

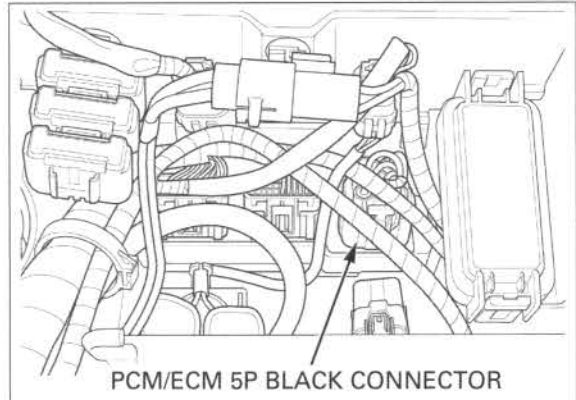
**YES** – • Perform the DTC 7-1 troubleshooting (page 6-21).  
• Perform the DTC 7-2 troubleshooting (page 6-22).

**NO** – GO TO STEP 3.



### 3. Ground Line Inspection

Remove the rear fender cover.  
Disconnect the PCM/ECM 5P black connector.

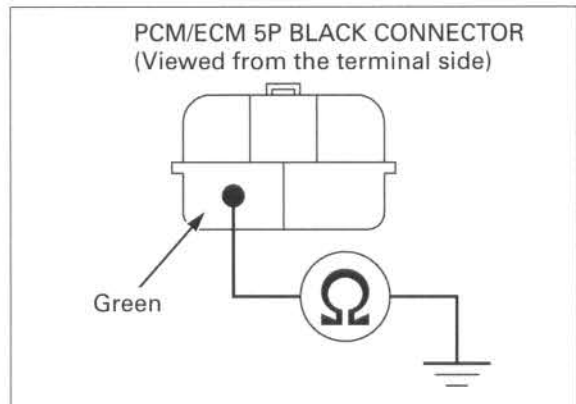


Check for continuity between the Green wire terminal of the wire harness side 5P connector and ground.

*Is there continuity?*

**YES** – GO TO STEP 4.

**NO** – Open circuit in the Green wire.



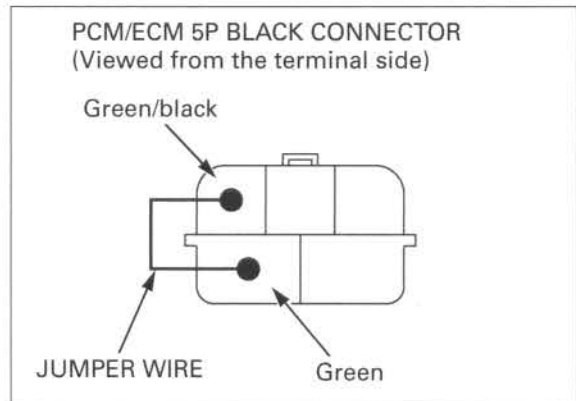
### 4. Cooling Fan Operation Inspection

Connect the Green/black and Green wire terminals of the wire harness side 5P connector with the jumper wire.  
Turn the ignition switch to ON and check the cooling fan.

*Does the cooling fan start?*

**YES** – Replace the PCM/ECM with a known good one, and recheck.

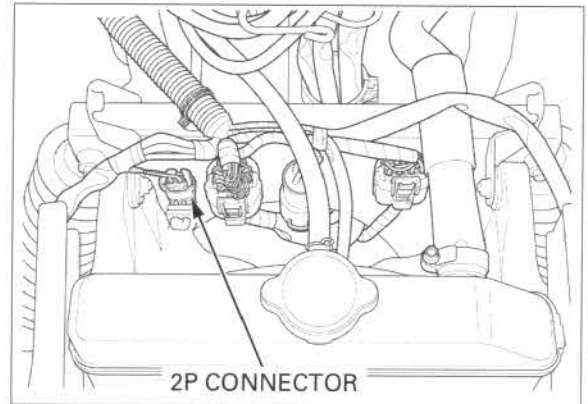
**NO** – GO TO STEP 5.





### 5. Cooling Fan Ground Line Inspection

Turn the ignition switch to OFF.  
Remove the front fender/carrier (page 3-7).  
Remove the cooling fan 2P connector from the frame and disconnect it.

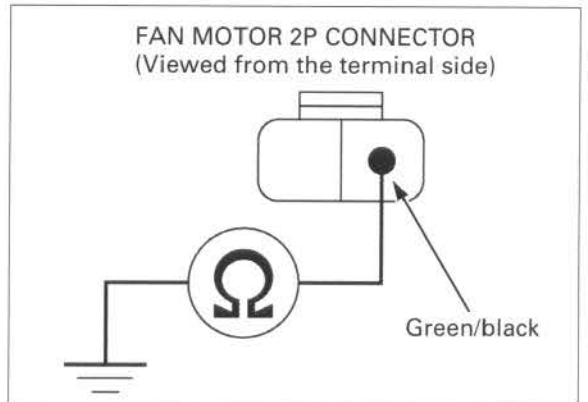


With the jumper wire connected to the PCM/ECM 5P connector, check for continuity between the Green/black wire terminal of the wire harness side 2P connector and ground.

**Is there continuity?**

**YES** – GO TO STEP 6.

**NO** – Open circuit in the Green/black wire.



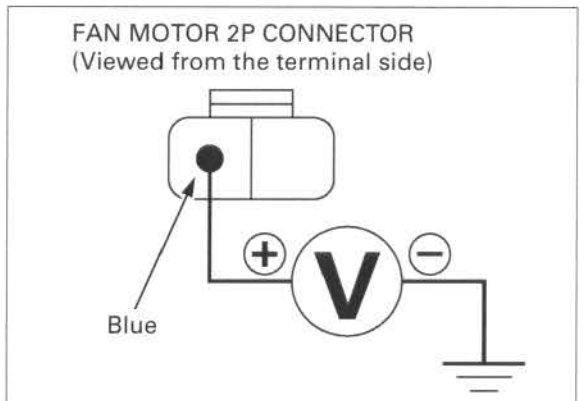
### 6. Cooling Fan Power Input Line Inspection

Turn the ignition switch to ON.  
Measure the voltage between the Blue wire terminal (+) of the wire harness side 2P connector and ground (-).

**Is there battery voltage?**

**YES** – Replace the cooling fan with a new one (page 7-10).

**NO** – Open circuit in the Blue wire between the cooling fan and fuse box.





## 4WD SELECT SWITCH

### SYSTEM INSPECTION

Release the wire grommet from the guide of the gear case and disconnect the select switch connector.

Ground the switch connector terminal with a jumper wire.

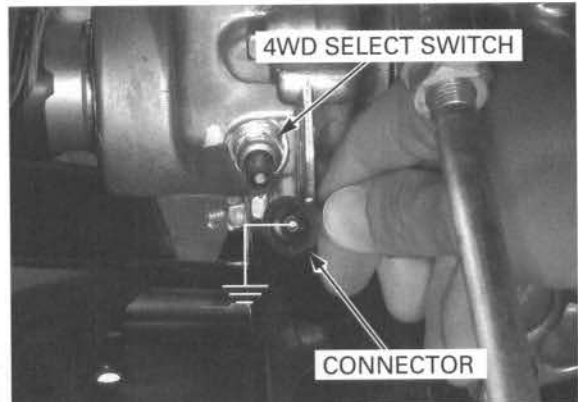
Turn the ignition switch to ON and check the 4WD indicator.

The indicator should light when the connector terminal is grounded.

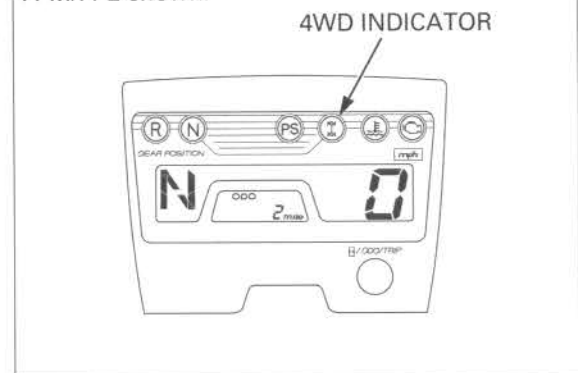
The indicator should not light when the jumper wire is removed.

*FPM/FPE models:* If the 4WD indicator operation is abnormal, check the Brown/white wire between the 4WD select switch and EPS ECU, and the Blue/white wire between the EPS ECU and combination meter.

*Except FPM/FPE:* If the 4WD indicator operation is abnormal, check the Blue wire between the 4WD select switch and combination meter.



FPM/FPE shown:

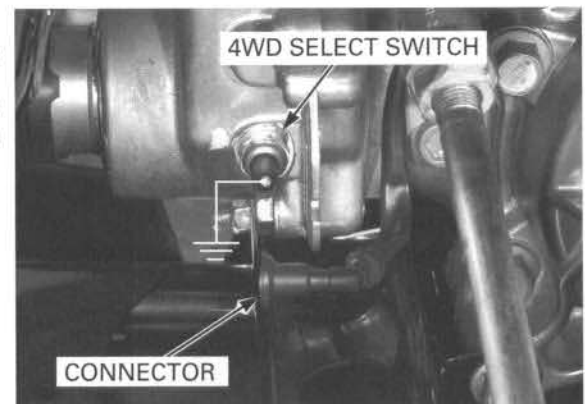


### SWITCH INSPECTION

Disconnect the select switch connector.

Check for continuity between the switch terminal and ground.

There should be continuity when the 2WD/4WD select lever is 4WD position, and no continuity when the lever is 2WD position.



### REPLACEMENT

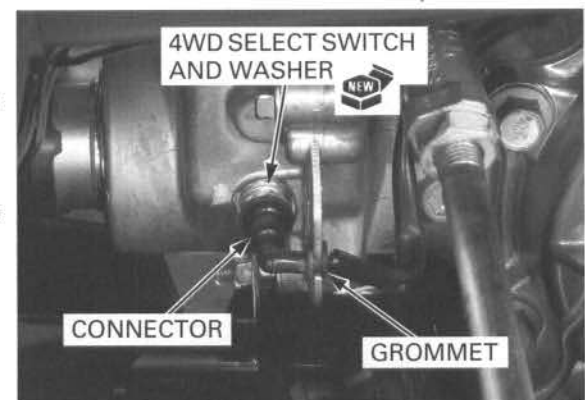
Disconnect the select switch connector.

Remove the 4WD select switch and sealing washer.

Install the 4WD select switch with a new sealing washer and tighten it.

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

Connect the switch connector and install its wire (grommet) in the wire guide.





## 23. ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

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COMPONENT LOCATION .....	23-2	ESP TROUBLESHOOTING INFORMATION .....	23-10
SYSTEM DIAGRAM .....	23-3	ESP DTC INDEX .....	23-14
SERVICE INFORMATION .....	23-6	DTC TROUBLESHOOTING .....	23-15
BEFORE TROUBLESHOOTING .....	23-7	SHIFT ANGLE SENSOR .....	23-29
SYMPTOM TROUBLESHOOTING .....	23-8	GEARSHIFT SWITCH .....	23-30
ESP CONNECTOR LOCATION .....	23-9	SHIFT CONTROL MOTOR/ REDUCTION GEARS .....	23-32

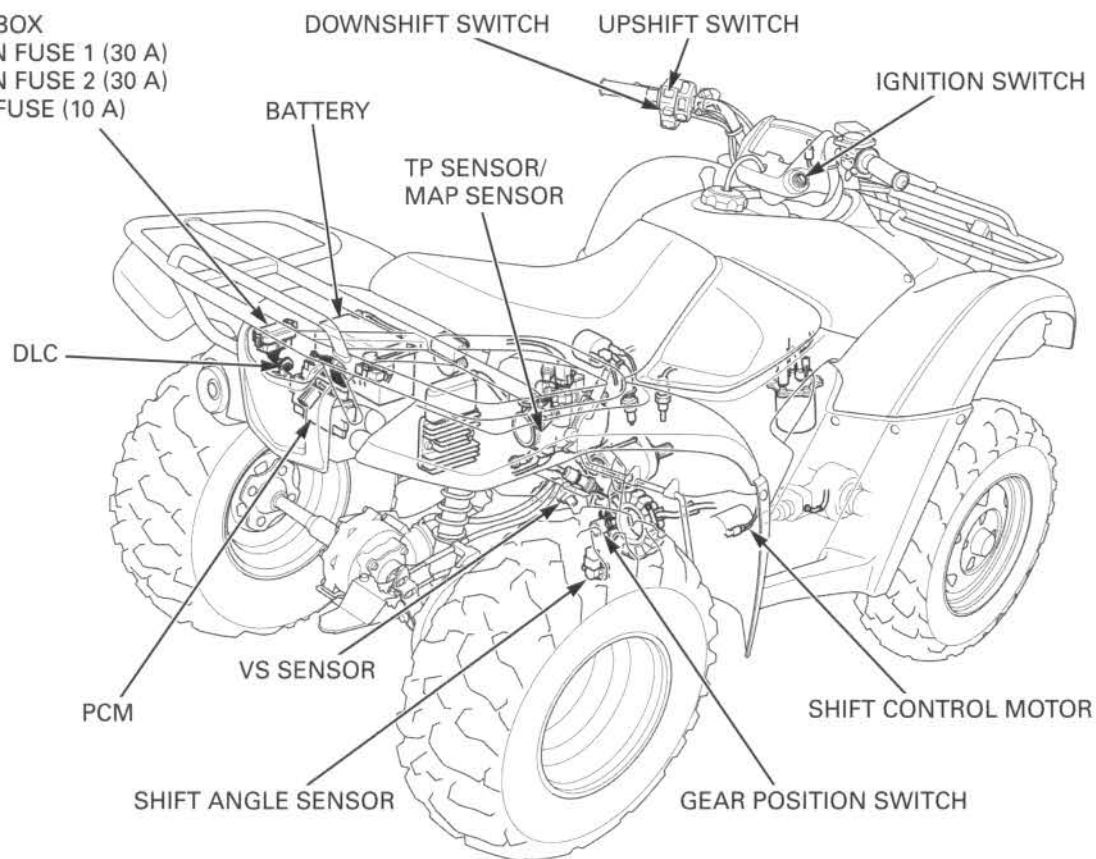


## COMPONENT LOCATION

'07 - '08:

FUSE BOX

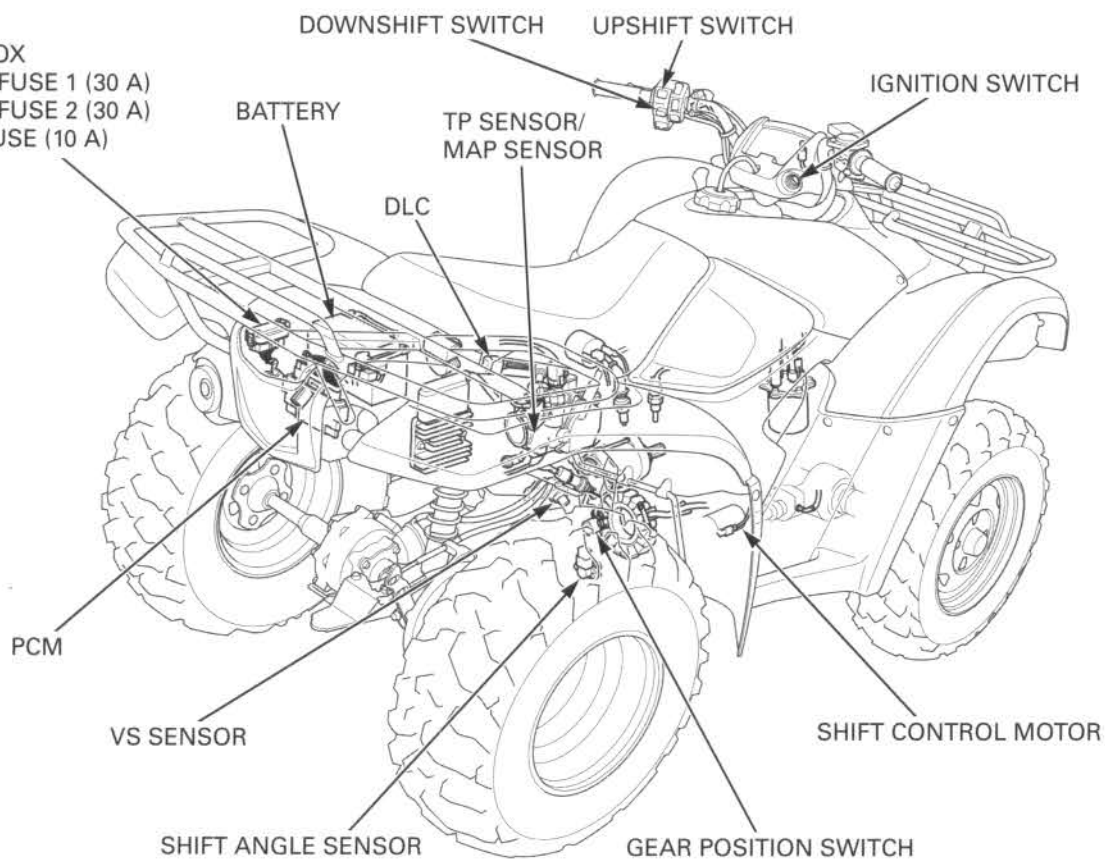
- MAIN FUSE 1 (30 A)
- MAIN FUSE 2 (30 A)
- IGN FUSE (10 A)



After '08:

FUSE BOX

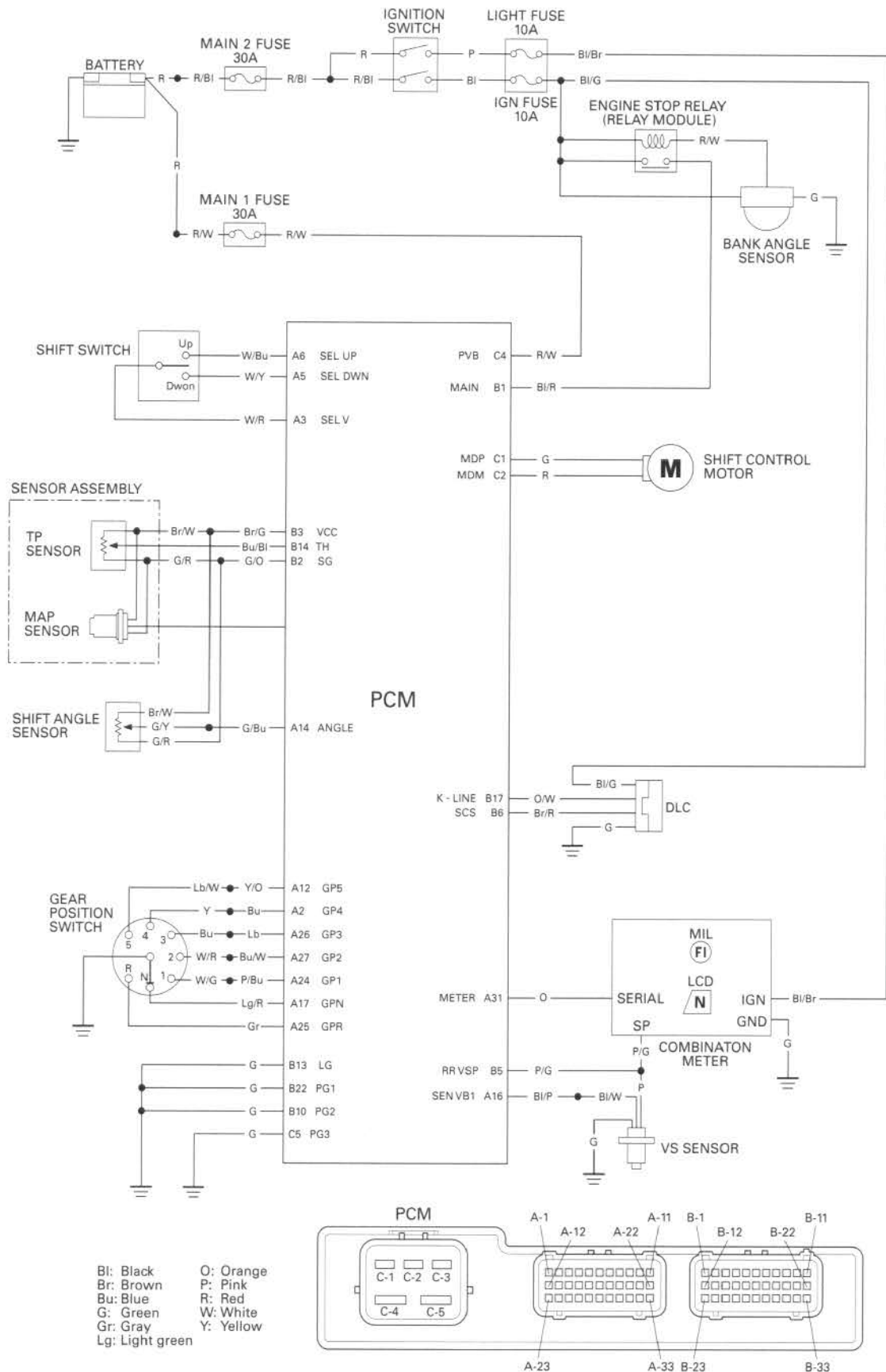
- MAIN FUSE 1 (30 A)
- MAIN FUSE 2 (30 A)
- IGN FUSE (10 A)





## SYSTEM DIAGRAM

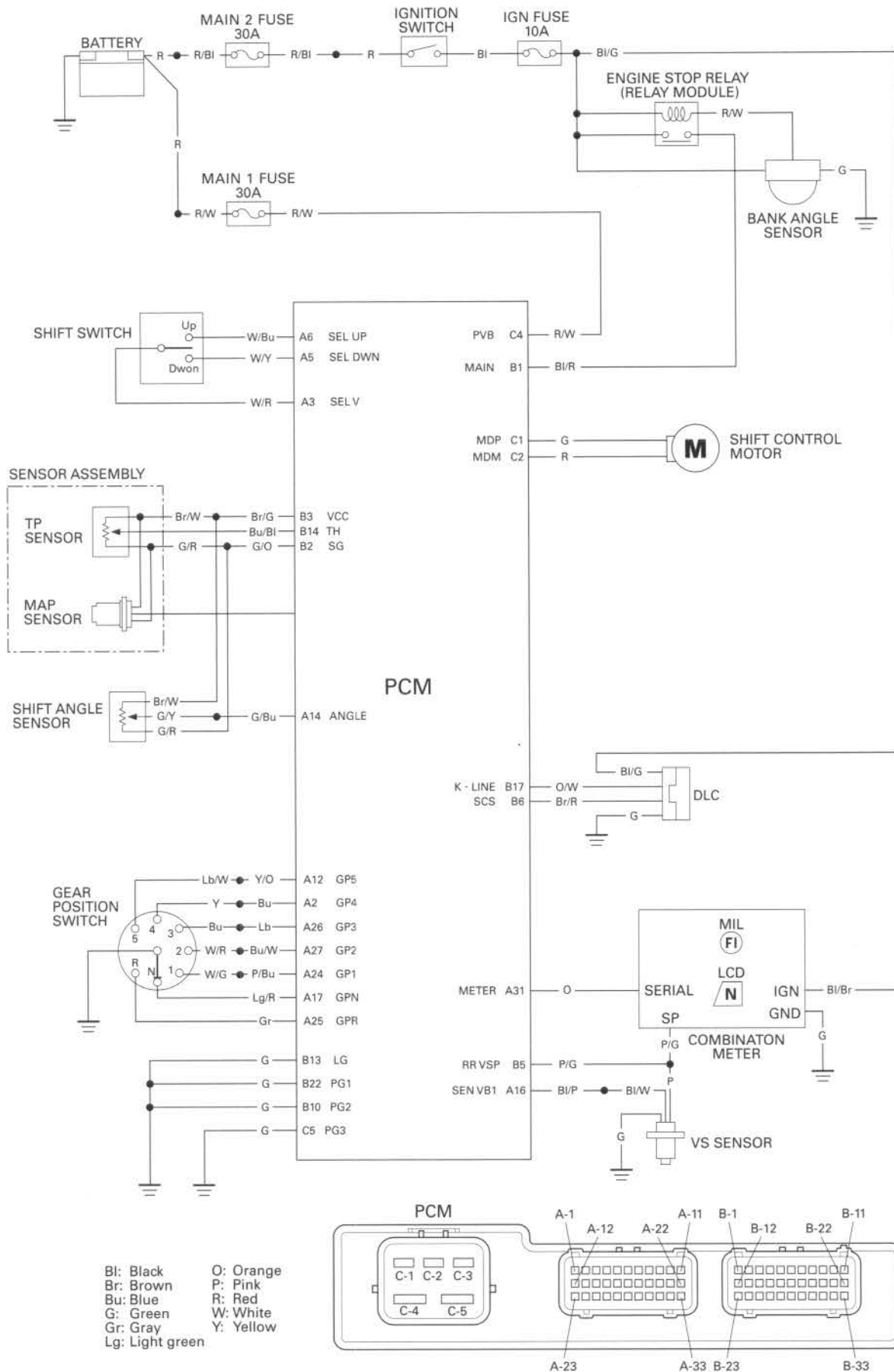
'07:





# ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

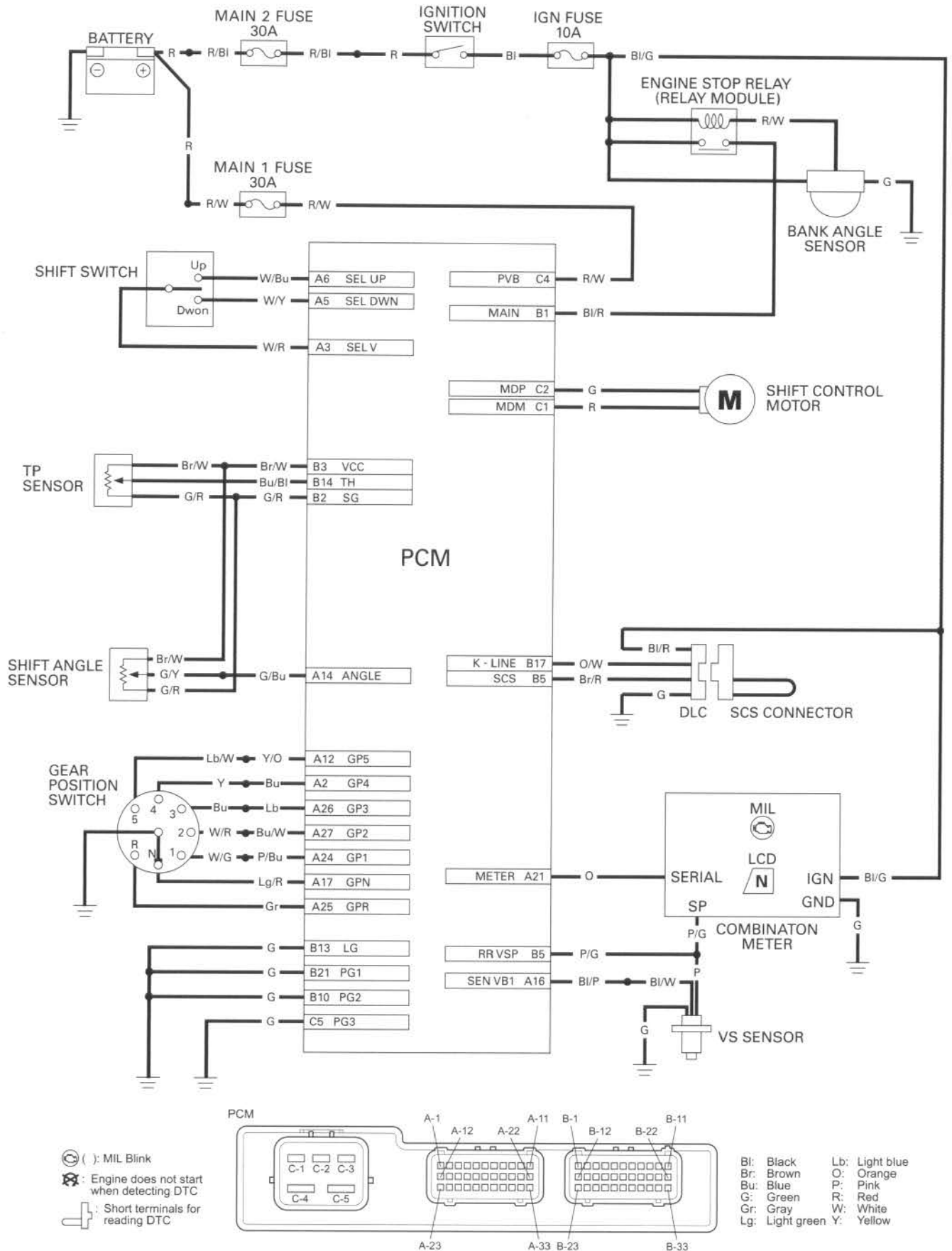
'08:





# ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

After '08:





- Refer to “Technical Features” for control and function of each component by the PCM (Powertrain Control Module) (page 2-2).
- Refer to “Before Troubleshooting” first and begin the troubleshooting (page 23-7).
- When performing the DTC troubleshooting, read “ESP Troubleshooting Information” carefully, and inspect and trouble-shoot according to the DTC. Observe each step of the procedures one by one. Note the DTC and probable faulty part before starting diagnosis and troubleshooting.
- The PCM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the PCM. Always turn off the ignition switch before disconnecting or connecting the connectors.
- Use a digital tester for ESP system inspection.

<p>Pin probe (Male) 07ZAJ-RDJA110</p> 	<p>HDS pocket tester TDS 3557-0112-01 (U.S.A. Only)</p> 	<p>SCS connector 070PZ-ZY30100</p> 
--	---	--



## **BEFORE TROUBLESHOOTING**

**NOTE:**

- If the ATV has any ESP trouble, the gear position indicator blinks to indicate the DTC (Diagnostic Trouble Code) (page 23-10). Check the DTC and refer to the DTC index and begin the appropriate troubleshooting procedure (page 23-14).
- If there are no DTC stored in the PCM memory, do the troubleshooting as "Symptom Troubleshooting" (page 23-8).

### **VERIFY THE COMPLAINT**

- Check the accuracy of the customer complaint by test riding the ATV.
- Note the symptoms.
- Do not begin disassembly or testing until you have determined if the problem is electrical or mechanical by shifting the gear manually (page 23-8).
- Temporarily failures can occur. Under certain conditions, the ESP system can "miss a shift." When this happens, the PCM may record a DTC. Be sure to note and erase any stored DTC(s) when verifying the customer's complaint. If the customer's complaint is duplicated during the test ride, and the blinking gear position indicator displays a DTC, proceed with troubleshooting.

### **PRELIMINARY ESP SYSTEM INSPECTION**

Inspect the following before diagnosing the system.

- Make sure the battery is fully charged and in good condition
- Make sure the clutch is adjusted properly
- Check for blown fuse



## SYMPTOM TROUBLESHOOTING

Symptom	Diagnosis	Also check for
Shift control failure but no DTC set	"Electric Shift Does Not Operate" (page 23-8)	Clutch adjustment (page 4-26)
Gear position indicator blinks "-" constantly (No DTC set)	Serial communication line (page 2-3)	-
Gear position indicator is no indication and MIL stays on, but no DTC is set	Short circuit in DLC (Data Link Connector) (Brown/red wire)	DLC related wire

**Electric Shift Does Not Operate****1. Shifting Operation Check**

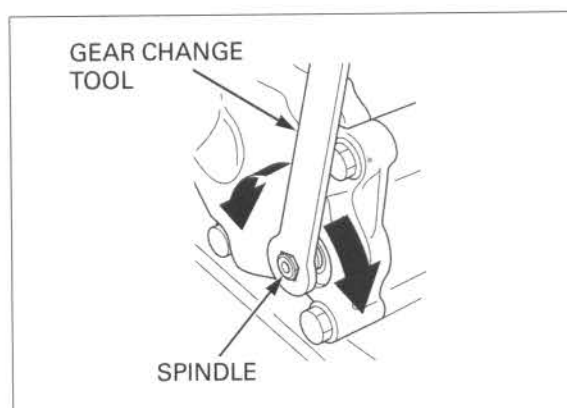
*DTC 23-1 will be indicated with the ignition switch turned to ON.*

Remove the left side cover (page 3-4).  
Turn the ignition switch to OFF.  
Shift the gear manually by moving the gearshift spindle, using the gear change tool.

**Can the gears be changed manually?**

**NO** - Check the gearshift linkage (page 11-20) and the transmission (page 13-8).

**YES** - GO TO STEP 2.

**2. Gearshift Switch Inspection at PCM Connector**

Remove the rear fender cover (page 3-9).  
Disconnect the PCM 33P (black) connector.  
Check for continuity (use the special tool) between the following terminals of the wire harness side connector while pushing the gearshift switch.

**TOOL:**

Pin probe (Male)

07ZAJ-RDJA110

**With the upshift switch pushed:**

White/red - White/blue

**With the downshift switch pushed:**

White/red - White/yellow

**Is there continuity?**

**YES** - Loose or poor contact of the connectors.

**NO** - GO TO STEP 3.

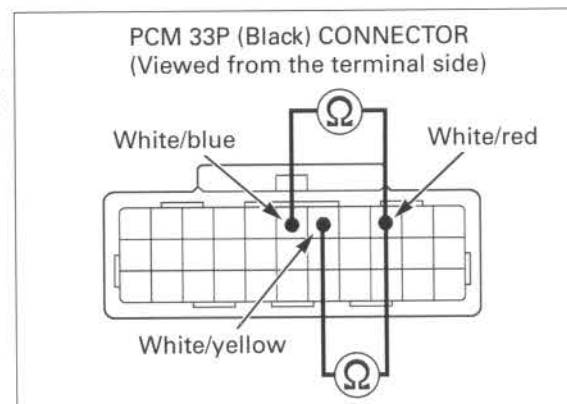
**3. Gearshift Switch Inspection**

Check the gearshift switch (page 23-30).

**Is the gearshift switch normal?**

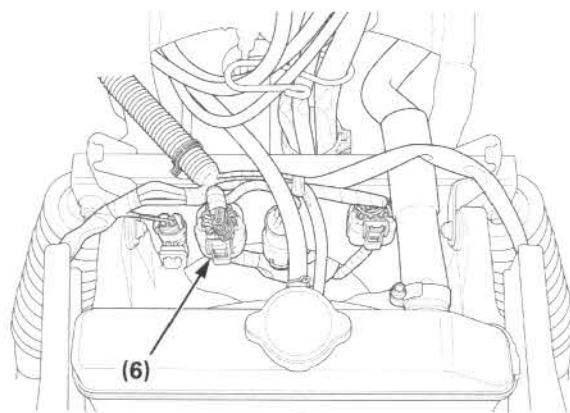
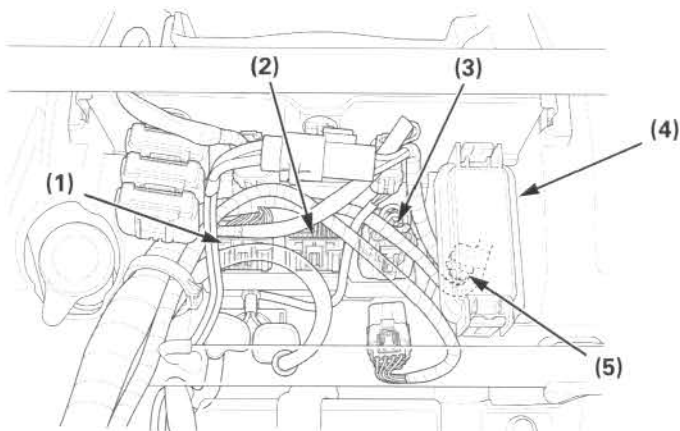
**NO** - Faulty gearshift switch.

**YES** - Open circuit in the wire between the gearshift switch and PCM.

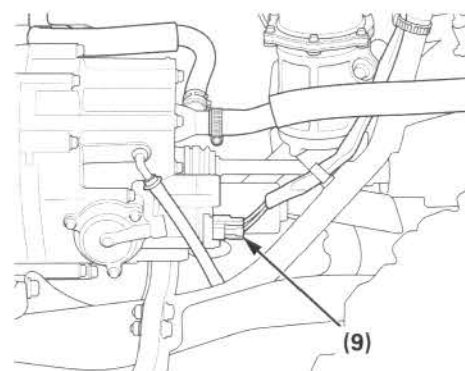
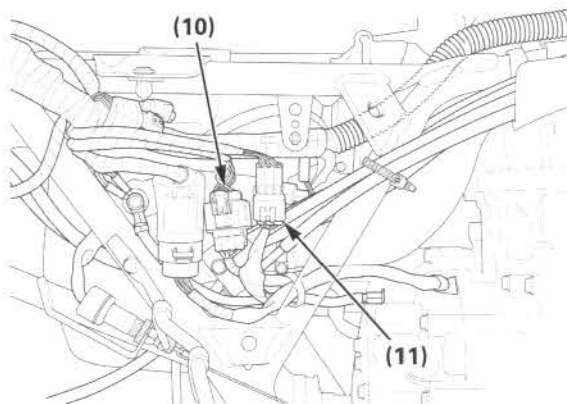
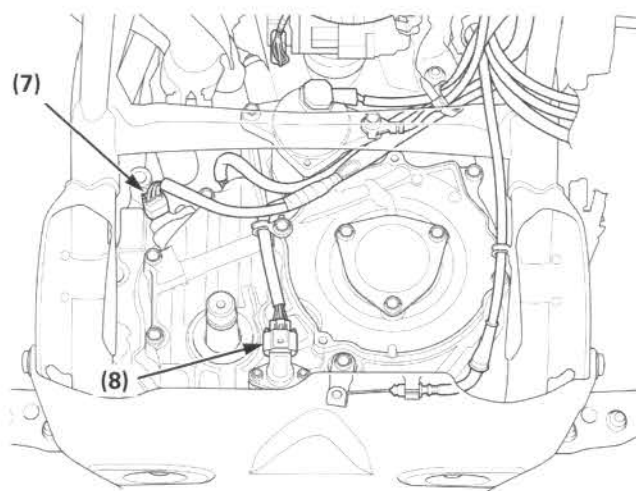
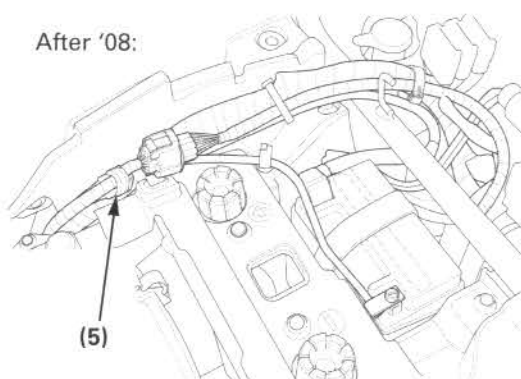




## ESP CONNECTOR LOCATION



After '08:



Refer to the secondary notes for the parts that must be removed for service.

- |  |  |
|--|--|
| (1) PCM 33P (Gray)<br>– Rear fender cover (page 3-9)                                 | (7) VS SENSOR 3P (Black)<br>– Left side cover (page 3-4)   |
| (2) PCM 33P (Black)<br>– Rear fender cover (page 3-9)                                | (8) SHIFT ANGLE SENSOR 3P (Gray)<br>– Left mudguard (page 3-6)   |
| (3) PCM 5P (Black)<br>– Rear fender cover (page 3-9)                                 | (9) SHIFT CONTROL MOTOR 2P (Black)<br>– Right mudguard (page 3-6)  |
| (4) FUSE BOX<br>– Rear fender cover (page 3-9)                                       | (10) GEAR POSITION SWITCH 8P (Gray)<br>– Right side cover (page 3-4)   |
| (5) DLC<br>– '07 – '08: Rear fender cover (page 3-9)<br>– After '08: Seat (page 3-4) | (11) ENGINE SUB-WIRE HARNESS 6P (White)<br>(for Shift Angle Sensor/VS Sensor)<br>– Right side cover (page 3-4) |
| (6) HANDLEBAR SWITCH 14P (Green)<br>– Rear fender/carrier (page 3-10)                |  |



# ESP TROUBLESHOOTING INFORMATION

Refer to Fuel System section for "General Troubleshooting" information (page 6-15).

## SYSTEM DESCRIPTION

### SELF-DIAGNOSIS SYSTEM

The PCM controls the PGM-FI and ESP systems. Therefore some detection items are shared by the PGM-FI and ESP and they may affect the operation of both systems.

The ESP system is equipped with the self-diagnostic system. If the PCM detects an ESP failure, it stops the system function and turns on the gear position indicator blinking "-" to indicate the DTC, and stores a DTC in its erasable memory for the relevant system failure.

To reset the ESP system, turn the ignition switch from ON to OFF and back to ON again. However, if the PCM still detects a problem, it will continue to stop the ESP system function. When this occurs, the gear position indicator will blink a certain number of times to indicate the DTC.

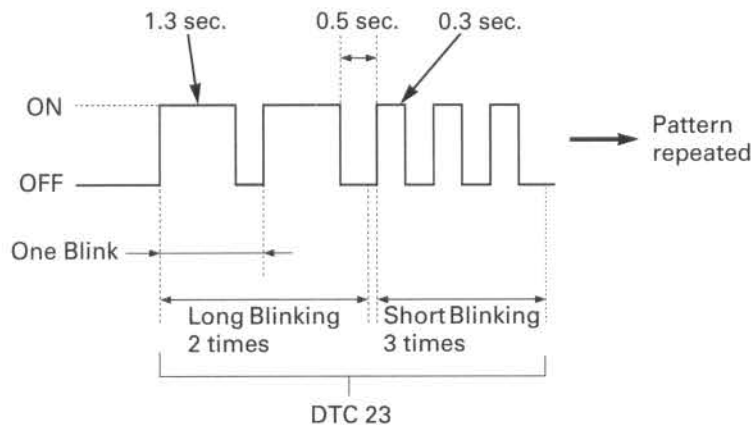
To indicate the DTC, the gear position indicator blinks "-"; depending on the kind of trouble.

### DTC (Diagnostic Trouble Code)

Refer to Fuel System section for DTC information (page 6-15).

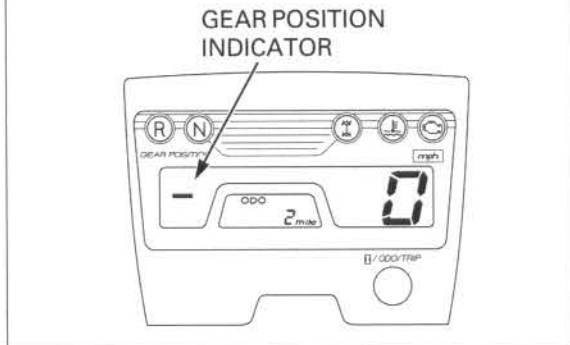
### INDICATOR BLINKING PATTERN

- The number of indicator blinks is the equivalent of the main code of the DTC (the sub code cannot be displayed by the indicator blinking).
- The indicator has two types of blinks, a long blink and short blink. The long blink lasts for 1.3 seconds, the short blink lasts for 0.3 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by three short blinks, the DTC is 23 (two long blink = 20 blinks, plus three short blinks).



- When the PCM stores more than one DTC, the indicator displays in the order from the lowest number to highest number.

After '08 shown:





### CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- If the PCM detects the problem at present, the gear position indicator will blink at all times. It is possible to readout the indicator blink pattern as the current DTC.
- If the PCM does not detect any problem at present but has a problem stored in its memory, the indicator will not blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure.

### HDS POCKET TESTER INFORMATION

- The HDS can readout the DTC, stored data, current data and other PCM condition.

#### How to connect the HDS Pocket Tester

Turn the ignition switch to OFF.

'07 - '08: Remove the rear fender cover (page 3-9).

After '08: Remove the seat (page 3-4).

Remove the dummy connector from the DLC.

Connect the HDS pocket tester to the DLC.

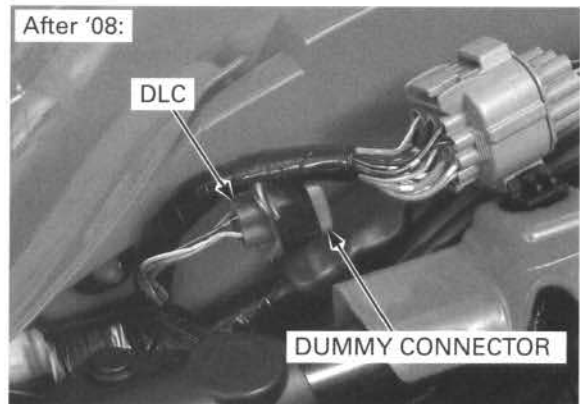
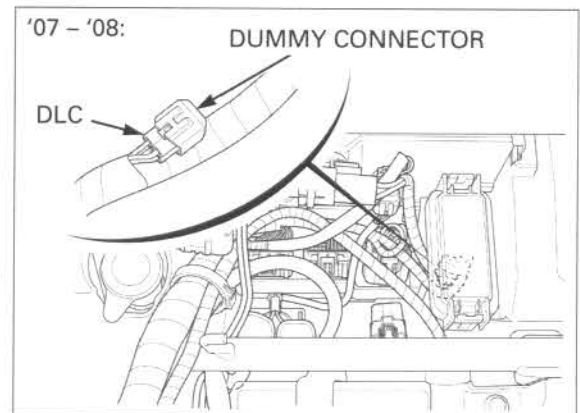
Turn the engine stop switch to "O" and the ignition switch to ON, and check the DTC and stored data.

#### NOTE:

- Stored data indicates the engine and ESP conditions when the first malfunction was detected.

#### PCM reset

The HDS can reset the PCM data including the DTC, stored data and some learning memory.





### DTC READOUT

#### NOTE:

- If the MIL blinks, refer to "PGM-FI Troubleshooting Information" and troubleshoot the PGM-FI system first. Then recheck the ESP after erasing the PGM-FI DTC.
- After performing diagnostic troubleshooting, erase the problem DTC(s) (page 23-13) and test-ride the vehicle to be sure that the problem(s) have been removed.

Connect the HDS Pocket Tester to the DLC (page 23-11).

Read the DTC and freeze data, and follow the troubleshooting index (page 23-14).

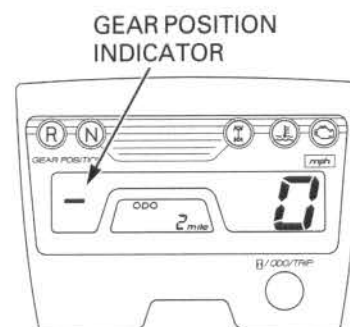
To read the DTC without the HDS pocket tester, refer to the following procedure.

#### Reading DTC with the gear position indicator

Turn the ignition switch ON, read the gear position indicator blinks "-", the number of blinks indicates the current DTC.

Refer to the troubleshooting index (page 23-14).

After '08 shown:



When retrieving the Stored DTC, refer to the following procedures.

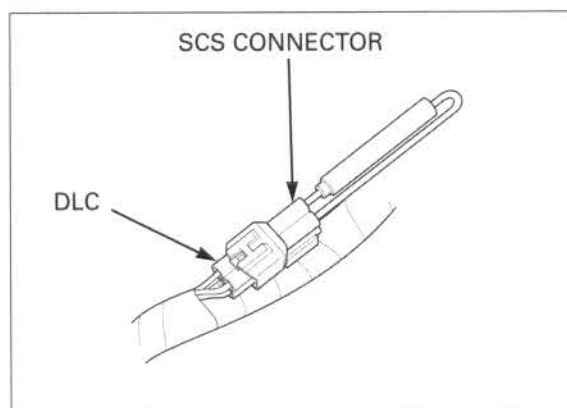
1. Turn the ignition switch to OFF.  
'07 - '08: Remove the rear fender cover (page 3-9).  
After '08: Remove the seat (page 3-4).
2. Remove the dummy connector and short the DLC terminals using the special tool.

#### TOOL:

**SCS connector 070PZ-ZY30100**

**CONNECTION: Brown/red - Green**

3. Turn the ignition switch to ON and read the gear position indicator blinks. The number of blinks indicates the Stored DTC.  
Refer to the troubleshooting index (page 23-14).





### ERASING DTC

#### NOTE:

- When erasing the ESP DTC as follows, the PGM-FI DTC would also be erased at the same time, check the MIL blinks and troubleshoot the PGM-FI system before readout/erasing the ESP DTC.

Connect the HDS Pocket Tester to the DLC (page 23-11).

Erase the DTC with the HDS while the engine is stopped.

To erase the DTC without HDS, refer to the following procedure.

#### How to erase the DTC without HDS

1. Turn the ignition switch OFF.  
'07 - '08: Remove the rear fender cover (page 3-9).  
After '08: Remove the seat (page 3-4).
2. Remove the dummy connector and short the DLC terminals using the special tool.

#### TOOL:

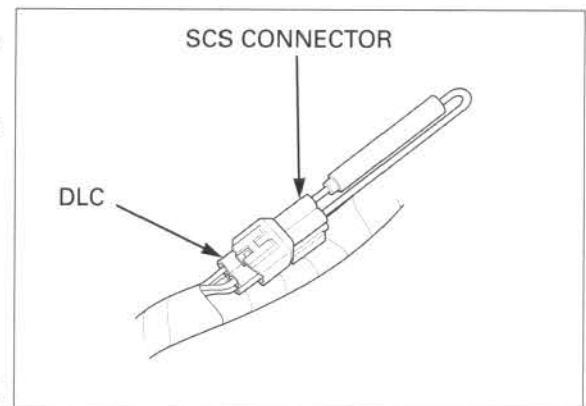
**SCS connector                      070PZ-ZY30100**

**CONNECTION: Brown/red - Green**

3. Turn the ignition switch ON.
4. Remove the special tool from the DLC.
5. The indicator will light for approximately 5 seconds. While the indicator lights, short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the gear position indicator goes off and starts blinking.

#### NOTE:

- The DLC must be jumped while the indicator lights. If not, the indicator will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the indicator starts blinking.





## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

### ESP DTC INDEX

#### NOTE:

- When the gear position indicator "–" is blinking constantly (and the MIL and coolant temperature indicator lights are dark), but no DTC is indicated or retrievable, refer to serial communication line (page 2-3).
- There are some DTCs (21-1 thru 23-1) related to the shift angle sensor circuit that have different conditions of malfunction detection. In case of the low voltage (about 0 V) or high voltage (about 5 V) in the shift angle sensor circuit, DTC 22-2 will be indicated when the control motor does not operate.

DTC (Refer to page)	Function Failure	Symptom/Fail-safe Function	PGM- FI DTC
8-1 (page 6-23)	TP sensor circuit Low voltage (less than 0.22 V) <ul style="list-style-type: none"><li>• TP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Poor engine acceleration</li><li>• Fail-safe value: 0°</li><li>• ESP does not work</li></ul>	8-1
8-2 (page 6-25)	TP sensor circuit High voltage (more than 4.93 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the TP sensor connector</li><li>• TP sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• Poor engine acceleration</li><li>• Fail-safe value: 0°</li><li>• ESP does not work</li></ul>	8-2
11-1 (page 23-15)	VS sensor no signal <ul style="list-style-type: none"><li>• Loose or poor contact of the Rear VS sensor connector</li><li>• Rear VS sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
21-1 (page 23-16)	Shift angle sensor circuit Low voltage (less than 0.37 V) <ul style="list-style-type: none"><li>• Shift angle sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
21-2 (page 23-18)	Shift angle sensor circuit High voltage (more than 4.62 V) <ul style="list-style-type: none"><li>• Loose or poor contact of the Sub-gearshift spindle angle sensor connector</li><li>• Shift angle sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
22-1 (page 23-19)	Shift angle sensor response (Control motor lock) <ul style="list-style-type: none"><li>• PCM activates the motor but the angle sensor voltage does not change in middle position</li><li>• Control motor or its circuit malfunction</li><li>• Shift angle sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
22-2 (page 23-19)	Shift angle sensor response (Control motor stuck) <ul style="list-style-type: none"><li>• PCM does not activate the motor but angle sensor voltage stays out of middle position (1.95 – 3.05 V)</li><li>• Control motor or its circuit malfunction</li><li>• Shift angle sensor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
23-1 (page 23-20)	Shift angle sensor response (Voltage variation) <ul style="list-style-type: none"><li>• PCM does not activate the motor but angle sensor voltage varies constantly</li><li>• Shift angle sensor installation problem</li><li>• Shift angle sensor or its circuit malfunction</li><li>• Control motor or its circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
24-1 (page 23-21)	Shift control motor drive circuit <ul style="list-style-type: none"><li>• Control motor or its circuit malfunction</li><li>• Control motor drive circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
32-1 (page 23-24)	Fail-safe relay circuit <ul style="list-style-type: none"><li>• Fail-safe relay circuit malfunction</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–
33-2 (page 6-18)	EEPROM malfunction	–	33-2
41-1 (page 23-24)	Gear position switch circuit <ul style="list-style-type: none"><li>• Gear position switch circuit malfunction (Short)</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li><li>• Gear position indicator blinks "–"</li></ul>	41-1
41-2 (page 23-25)	Gear position switch circuit <ul style="list-style-type: none"><li>• Gear position switch circuit malfunction (Open)</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li><li>• Gear position indicator blinks "–"</li></ul>	–
42-1 (page 23-27)	Gearshift (UP/DOWN) switch circuit <ul style="list-style-type: none"><li>• Gearshift (UP/DOWN) switch circuit malfunction (Short)</li></ul>	<ul style="list-style-type: none"><li>• ESP does not work</li></ul>	–



## DTC TROUBLESHOOTING

### NOTE:

- Refer to "ESP Connector Location" for the connector location and the necessary parts to disconnect the connector (page 23-9).
- Perform inspection with the ignition switch turned to OFF, unless otherwise specified.
- After troubleshooting, erase the DTC and test-ride the vehicle to be sure that the system is normal.

### VERIFY PROPER CONNECTOR CONTACT

Many ESP shifting problems and subsequent DTCs are caused by poor connector contacts. The first step in troubleshooting any DTC is to inspect the affected connectors.

### CONNECTOR INSPECTION

- Check for moisture in the affected connector
- Check for corrosion
- Check for folded pins on the male side of the connector
- Check for loose pins and/or pins pushed out of the connector

### DTC 11-1 (VS Sensor No Signal)

#### NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - VS sensor 3P
  - sub-wire harness 6P
  - PCM 33P (black and gray)

#### 1. VS Sensor System Inspection

Erase the DTC (page 23-13).

Test-ride the vehicle and check the VS sensor signal with the HDS pocket tester.

#### *Is the VS sensor signal indicated normally?*

- YES** –
- Intermittent failure.
  - Loose or poor contact of the connector

**NO** – GO TO STEP 2.

#### 2. VS Sensor Input Voltage Inspection

Turn the ignition switch to OFF.

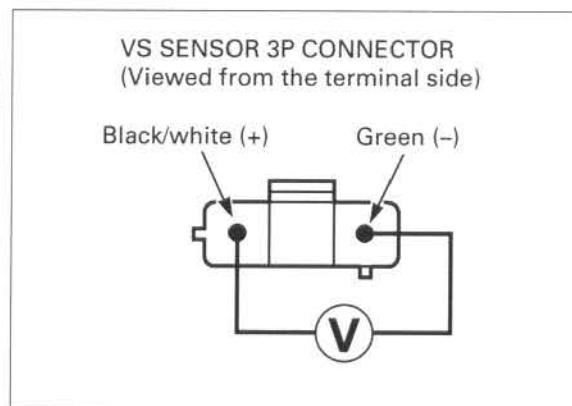
Disconnect the VS sensor 3P (black) connector. Measure the voltage between the wire harness side 3P connector terminals with the ignition switch turned to ON.

**Connection: Black/white (+) – Green (–)**

#### *Is there battery voltage?*

- NO** –
- Open or short circuit in the Black/white or Black/pink wire.
  - Open circuit in the Green wire.

**YES** – GO TO STEP 3.





## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

### 3. VS Sensor Output Line Inspection

Measure the voltage between the wire harness side 3P connector terminals.

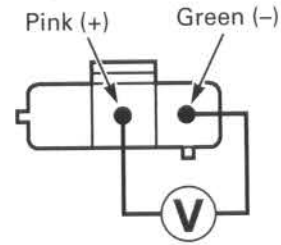
**Connection: Pink (+) – Green (–)**

**Is the voltage about 5 V?**

**NO** – Open or short circuit in the Pink or Pink/green wire.

**YES** – GO TO STEP 4.

VS SENSOR 3P CONNECTOR  
(Viewed from the terminal side)



### 4. VS Sensor Inspection

Turn the ignition switch OFF.  
Replace the VS sensor with a new one (page 6-54).  
Erase the DTC (page 23-13).  
Test-ride the vehicle and recheck the DTC.

**Is the DTC 11-1 indicated?**

**YES** – Replace the PCM with a new one, and recheck.

**NO** – Faulty original VS sensor.

## DTC 21-1 (Shift Angle Sensor Low Voltage)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - shift angle sensor 3P
  - sub-wire harness 6P
  - PCM 33P (black)

### 1. Angle Sensor System Inspection

Turn the ignition switch ON and the engine stop switch to "O".  
Check the shift angle sensor with the HDS pocket tester.

**Is about 0 V (low voltage) indicated?**

**NO** – • Intermittent failure.  
• Loose or poor contact of the connector.

**YES** – GO TO STEP 2.



**2. Angle Sensor Resistance Inspection**

Turn the ignition switch to OFF.  
Remove the shift angle sensor 3P (gray) connector.  
Check that the resistance at the angle sensor terminals.

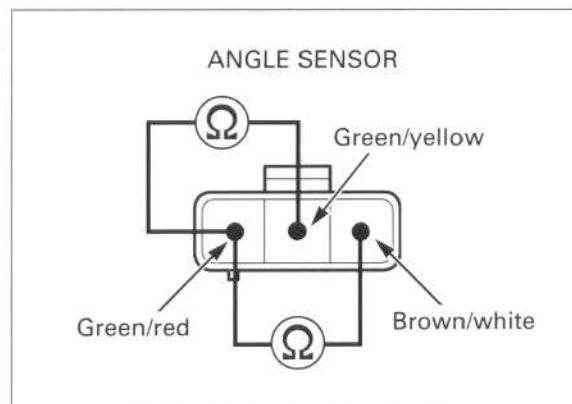
**Connection: Brown/white – Green/red**  
**4 – 6 k $\Omega$  (20°C/68°F)**

**Connection: Green/yellow – Green/red**  
**2 – 3 k $\Omega$  (20°C/68°F)**

*Is the resistance within specification?*

**NO** – Faulty shift angle sensor.

**YES** – GO TO STEP 3.

**3. Angle Sensor Input Voltage Inspection**

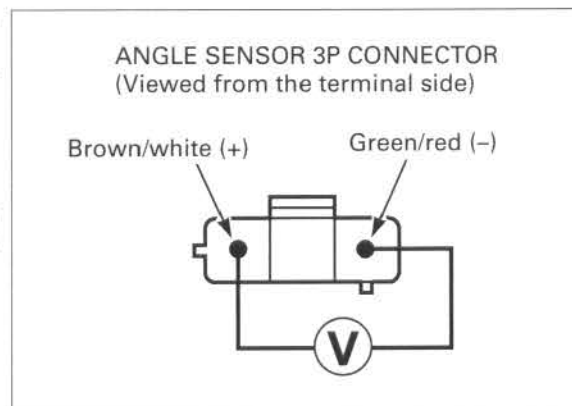
Turn the ignition switch ON and the engine stop switch to "O".  
Measure the voltage between the wire harness side 3P connector terminals.

**Connection: Brown/white (+) – Green/red (–)**

*Is the voltage about 5 V?*

**NO** – Open circuit in Brown/white or Brown/green wire. If the wire is normal, faulty PCM.

**YES** – GO TO STEP 4.

**4. Angle Sensor Output Line Open/short Circuit Inspection**

Turn the ignition switch OFF.  
Disconnect the PCM 33P (black) connector.  
Check the Green/blue and Green/yellow wires for continuity between the PCM 33P (black) connector and angle sensor 3P connector terminals.

**Connection: Green/blue (A14) – Green/yellow**

**TOOL:**

**Test probe 07ZAJ-RDJA110**

There should be continuity.

Check for continuity between the wire harness side 3P connector terminal and ground.

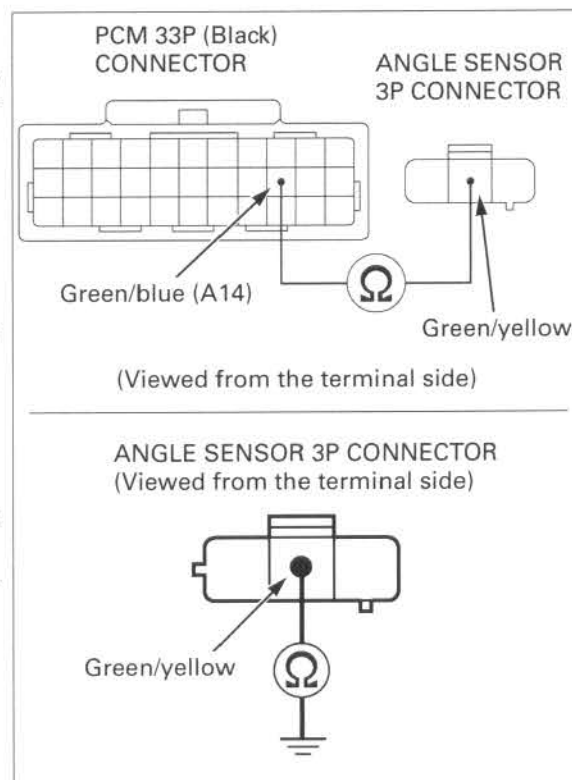
**Connection: Green/yellow – Ground**

There should be no continuity.

*Is there normal condition?*

**YES** – Replace the PCM with a known good one, and recheck.

**NO** – Open or short circuit in Green/yellow or Green/blue wire.





### DTC 21-2 (Shift Angle Sensor High Voltage)

#### 1. Angle Sensor System Inspection

Turn the ignition switch to ON and the engine stop switch to "O".

Check the shift angle sensor with the HDS pocket tester.

*Is about 5 V indicated?*

**NO** – • Intermittent failure.  
• Loose or poor contact of the connector

**YES** – GO TO STEP 2.

#### 2. Angle Sensor Resistance Inspection

Turn the ignition switch to OFF.

Remove the shift angle sensor 3P (gray) connector.

Check that the resistance at the angle sensor terminals.

**Connection: Brown/white – Green/red**

**4 – 6 k $\Omega$  (20°C/68°F)**

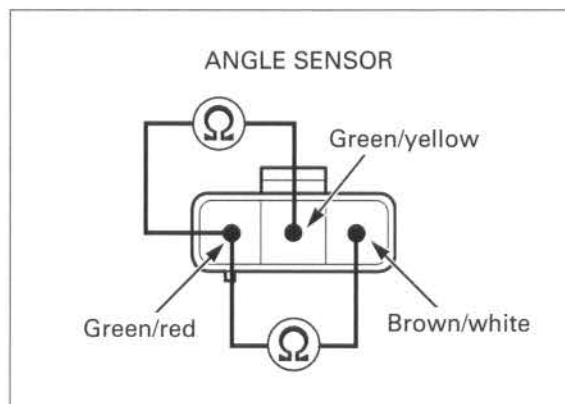
**Connection: Green/yellow – Green/red**

**2 – 3 k $\Omega$  (20°C/68°F)**

*Is the resistance within specification?*

**NO** – Faulty shift angle sensor.

**YES** – GO TO STEP 3.



#### 3. Angle Sensor Input Voltage Inspection

Turn the ignition switch to ON and the engine stop switch to "O".

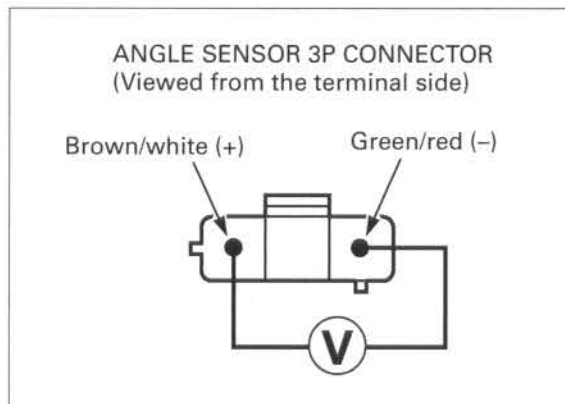
Measure the voltage between the wire harness side 3P connector terminals.

**Connection: Brown/white (+) – Green/red (–)**

*Is the voltage within 4.7 – 5.3 V?*

**YES** – Replace the PCM with a known good one, and recheck.

**NO** – Open circuit in Green red or Green/orange wire.





## DTC 22-1/22-2 (Shift Angle Sensor Response: Control Motor Lock/Stuck)

### NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - shift angle sensor 3P
  - sub-wire harness 6P
  - PCM 33P (black)

### 1. Angle Sensor System Inspection

Turn the ignition switch to ON and the engine stop switch to "O".

Check the shift angle sensor with the HDS pocket tester.

**Is about Low voltage (about 0 V) or High voltage (about 5 V) indicated?**

- YES** – • 0 V: Refer to DTC 21-1 (page 23-16).  
 • 5 V: Refer to DTC 21-2 (page 23-18)

**NO** – GO TO STEP 2.

### 2. Shifting Operation Check

Turn the ignition switch OFF.

Check the gear shifting operation manually by moving the gearshift spindle, using the gear change tool.

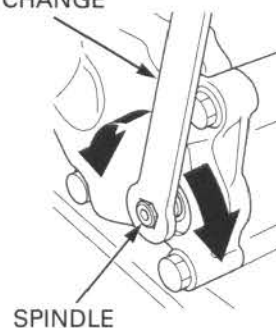
**Can the gears be changed manually?**

- NO** – Check the gearshift linkage (page 11-20) and transmission (page 13-8).

**YES** – GO TO STEP 3.

*DTC 23-1 will be indicated with the ignition switch turned to ON.*

GEAR CHANGE TOOL



SPINDLE

### 3. Angle Sensor Operation Resistance Inspection

Disconnect the shift angle sensor 3P (gray) connector.

Check that the resistance between the Green/yellow and Green/red terminals of the angle sensor varies while shifting the gear manually (page 23-29).

**When shifting up: Resistance increase**

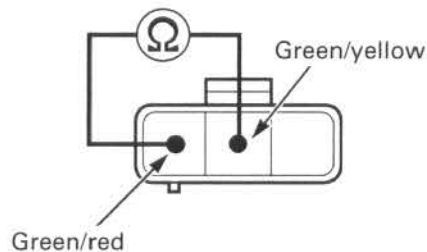
**When shifting down: Resistance decreases**

**Does the resistance vary properly?**

- NO** – Faulty shift angle sensor.

**YES** – GO TO STEP 4.

ANGLE SENSOR



### 4. Angle Sensor Condition Check

Check the shift angle sensor for installation condition or any damage (page 23-29).

**Is the angle sensor installed properly and in normal condition?**

- NO** – Install properly or replace the angle sensor.

**YES** – GO TO STEP 5.



### 5. Reduction Gear Condition Check

Check the reduction gears and control motor for installation condition or any damage (page 23-32).

**Are the reduction gears and control motor installed properly and in normal condition?**

**NO** – Install properly or replace faulty part.

**YES** – Replace the PCM with a new one, and recheck.

### DTC 23-1 (Shift Angle Sensor Response: Voltage Variation)

#### NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC.
  - shift angle sensor 3P
  - sub-wire harness 6P
  - PCM 33P (black)
- This code will be indicated when shifting the gear manually while the ignition switch is turned to ON.

#### 1. Angle Sensor System Inspection

Turn the ignition switch to ON and the engine stop switch to "O".

Check the shift angle sensor with the HDS pocket tester.

**Is about Low voltage (about 0 V) or High voltage (about 5 V) indicated?**

**YES** – • 0 V: Refer to DTC 21-1 (page 23-16).  
• 5 V: Refer to DTC 21-2 (page 23-18)

**NO** – GO TO STEP 2.

#### 2. Angle Sensor Condition Check

Check the shift angle sensor for looseness (page 23-29).

**Is the angle sensor installed properly?**

**NO** – Install properly or replace the angle sensor.

**YES** – GO TO STEP 3.

#### 3. Angle Sensor Operation Resistance Inspection

Disconnect the shift angle sensor 3P (gray) connector.

Check that the resistance between the Green/yellow and Green/red terminals of the angle sensor varies while shifting the gear manually (page 23-29).

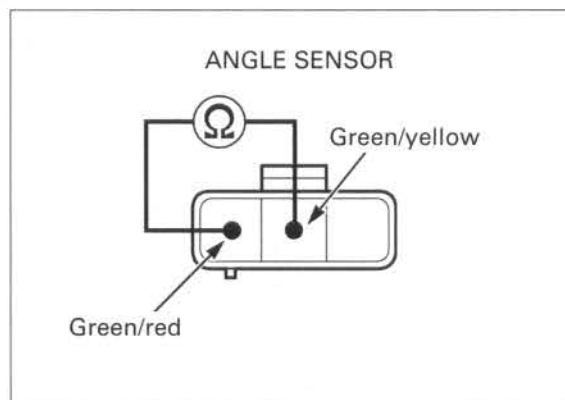
**When shifting up: Resistance increase**

**When shifting down: Resistance decreases**

**Does the resistance vary properly?**

**NO** – Faulty shift angle sensor.

**YES** – Replace the PCM with a new one, and recheck.





**DTC 24-1 (Shift Control Motor Drive Circuit)****NOTE:**

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - control motor 2P
  - PCM 5P

**1. PCM Motor Power Input Line Inspection**

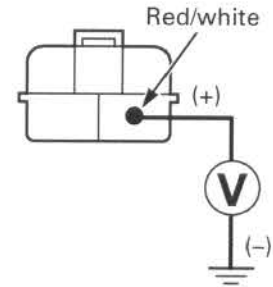
Disconnect the PCM 5P (black) connector. Measure the voltage between the Red/white wire terminal (+) of the wire harness side 5P connector and ground (-).

***Is there battery voltage?***

- NO** – • Blown MAIN 1 fuse (30 A).  
• Open circuit in the Red/white or Red wire.

**YES** – GO TO STEP 2.

PCM 5P CONNECTOR  
(Viewed from the terminal side)

**2. PCM Power Ground Line Inspection**

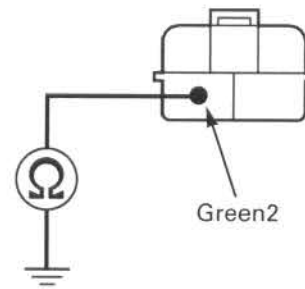
Check for continuity between the Green2 wire terminal of the wire harness side 5P connector and ground.

***Is there continuity?***

- NO** – Open circuit in the Green2 wire.

**YES** – GO TO STEP 3.

PCM 5P CONNECTOR  
(Viewed from the terminal side)





## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

### 3. Control Motor Line Open Circuit Inspection

Disconnect the control motor 2P (black) connector.

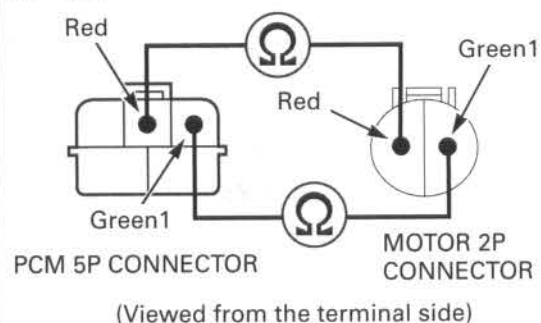
Check the Red and Green1 wires for continuity between the PCM 5P connector and motor 2P connector.

**Is there continuity?**

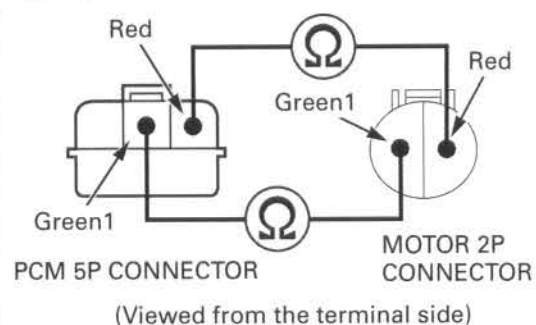
**NO** – Open circuit in the Red and/or Green1 wire

**YES** – GO TO STEP 4.

'07 – '08:



After '08:



### 4. Control Motor Line Short Circuit Inspection

Check for continuity between the Red wire terminal of the PCM 5P connector and ground, and between the Green1 wire terminal of the 5P connector and ground.

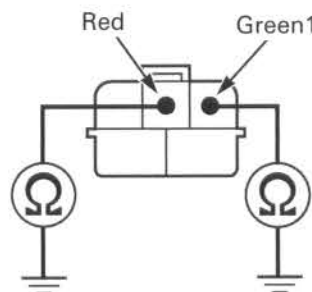
**Is there continuity?**

**NO** – GO TO STEP 5.

**YES** – Short circuit in the Red and/or Green1 wire

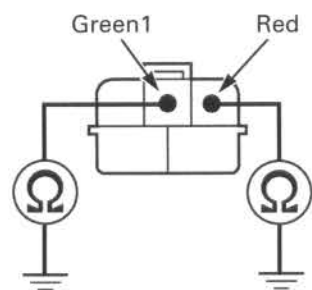
'07 – '08:

PCM 5P CONNECTOR  
(Viewed from the terminal side)



After '08:

PCM 5P CONNECTOR  
(Viewed from the terminal side)





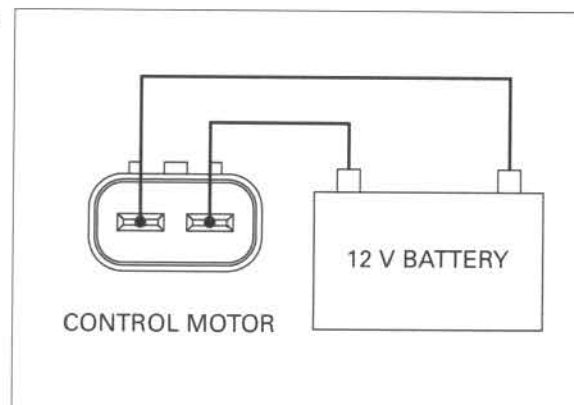
### 5. Control Motor Inspection

Connect a fully charged 12 V battery to the motor 2P connector terminals.

**Does the motor turn?**

**NO** – Faulty control motor.

**YES** – GO TO STEP 6.



### 6. Electric Shift Failure Checking

Connect the PCM and motor connectors.

Erase the DTC (page 23-13).

Turn the ignition switch to OFF and ON.

Recheck the gear shifting operation and DTC.

**Is the DTC 24-1 indicated?**

**NO** – Intermittent failure.

**YES** – Replace the PCM with a new one and troubleshoot again. If the DTC indicated again, replace the control motor.



### DTC 32-1 (Fail-safe Relay Circuit)

#### 1. Recheck DTC

Erase the DTC (page 23-13).  
Turn the ignition switch to OFF and ON, and check the DTC.

**Is the DTC 32-1 indicated?**

**NO** – Intermittent failure.

**YES** – Replace the PCM with a new one, and recheck.

### DTC 41-1 (Gear Position Switch Circuit: Short)

#### NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - gear position switch 8P
  - PCM 5P (black)

#### 1. Gear Position Switch Inspection with HDS

Check the gear position switch status with the HDS data list menu.

**Is the gear position status normal?**

**YES** – Intermittent failure.

**NO** – GO TO STEP 2.

#### 2. Gear Position Switch Inspection

Turn the ignition switch to OFF.  
Disconnect the gear position switch 8P (gray) connector.

Check for continuity at the sensor side 8P connector terminals.

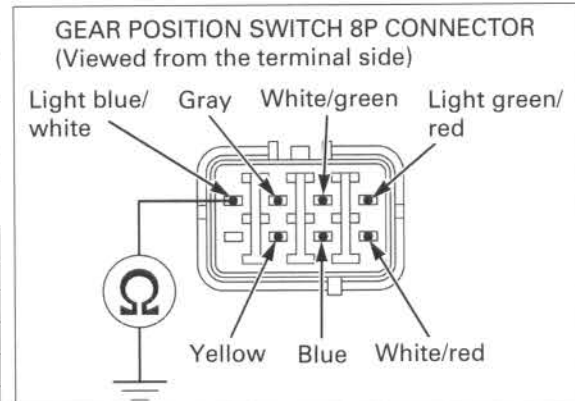
There should be continuity in each gear position, and should be NO continuity in the other position.

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	White/green – ground
2nd	White/red – ground
3rd	Blue – ground
4th	Yellow – ground
5th	Light blue/white – ground

**Is the gear position switch normal?**

**NO** – Faulty gear position switch.

**YES** – GO TO STEP 3.





**3. Gear Position Switch Inspection at PCM**

Connect the gear position switch 8P connector and disconnect the PCM 33P (black) connector. Check for continuity at the wire harness side 33P connector terminals, using the special tool. There should be continuity in each gear position, and should be NO continuity in the other position.

**TOOL:**

Pin probe (Male)

07ZAJ-RDJA110

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	Pink/blue – ground
2nd	Blue/white – ground
3rd	Light blue – ground
4th	Blue – ground
5th	Yellow/orange – ground

*Is the continuity normal condition?*

**NO** – Open or short circuit in the wire harness between the PCM and

**YES** – GO TO STEP 4.

**4. Recheck DTC**

Connect the PCM 33P connector.  
Erase the DTC (page 23-13).  
Turn the ignition switch to OFF and ON.  
Shift the transmission into each gear and check the DTC.

*Is the DTC 41-1 indicated?*

**NO** – Intermittent failure.

**YES** – Replace the PCM with a new one and troubleshoot again.

**DTC 41-2 (Gear Position Switch Circuit: Open)****NOTE:**

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - gear position switch 8P
  - PCM 5P (black)

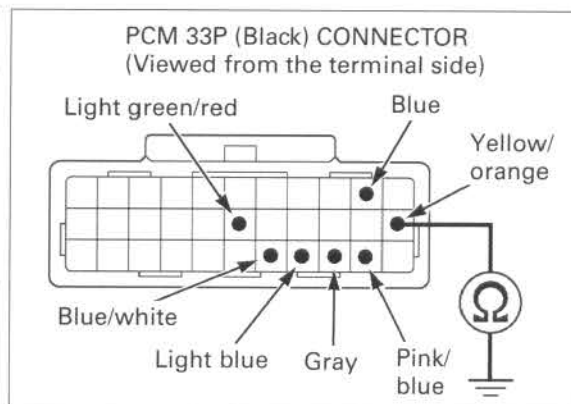
**1. Gear Position Switch Inspection with HDS**

Check the gear position switch status with the HDS data list menu.

*Is the gear position status normal?*

**YES** – Intermittent failure.

**NO** – GO TO STEP 2.



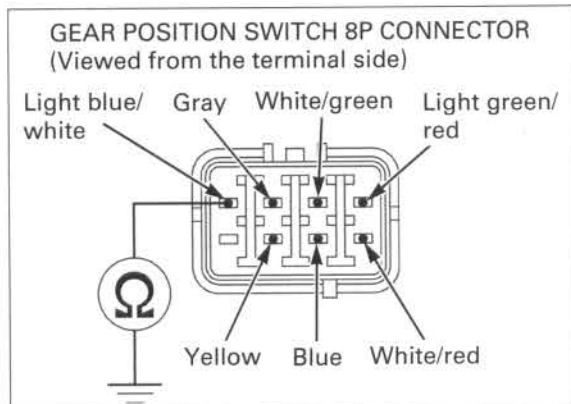


## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

### 2. Gear Position Switch Inspection

Turn the ignition switch to OFF.  
Disconnect the gear position switch 8P (gray) connector.  
Check for continuity at the sensor side 8P connector terminals.  
There should be continuity in each gear position.

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	White/green – ground
2nd	White/red – ground
3rd	Blue – ground
4th	Yellow – ground
5th	Light blue/white – ground



*Is there continuity?*

**NO** – Faulty gear position switch.

**YES** – GO TO STEP 3.

### 3. Gear Position Switch Inspection at PCM

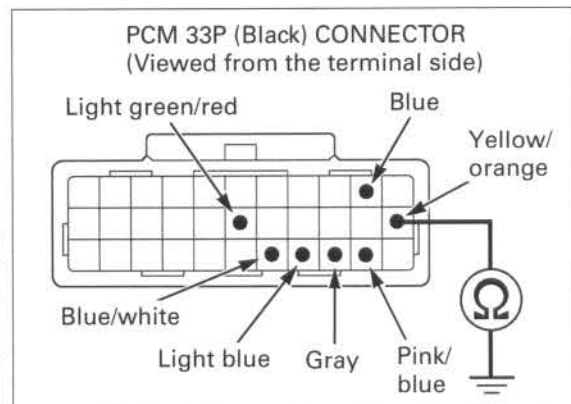
Connect the gear position switch 8P connector and disconnect the PCM 33P (black) connector.  
Check for continuity at the wire harness side 33P connector terminals, using the special tool.  
There should be continuity in each gear position.

**TOOL:**

Pin probe (Male)

07ZAJ-RDJA110

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	Pink/blue – ground
2nd	Blue/white – ground
3rd	Light blue – ground
4th	Blue – ground
5th	Yellow/orange – ground



*Is there continuity?*

**NO** – Open circuit in the wire harness between the PCM and gear position switch

**YES** – GO TO STEP 4.

### 4. Recheck DTC

Connect the PCM 33P connector.  
Erase the DTC (page 23-13).  
Test-ride the vehicle and check the DTC.

*Is the DTC 41-2 indicated?*

**NO** – Intermittent failure.

**YES** – Replace the PCM with a new one and troubleshoot again.



**DTC 42-1 (Gearshift Switch Circuit)****NOTE:**

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 23-15).
  - Gearshift switch 14P
  - PCM 33P (black)

**1. Gearshift Switch Inspection**

Check the gearshift switch status with the HDS data list menu.

	UP	DOWN
"Up" ON	3.64 – 4.08 V	1.76 – 2.09 V
"Down" ON	1.76 – 2.09 V	3.64 – 4.08 V
Both ON	4.0 – 4.99 V	4.0 – 4.99 V
Both OFF	0 – 0.99 V	0 – 0.99 V

*Is the gearshift switch status normal?*

**YES** – Intermittent failure

**NO** – GO TO STEP 2.

**2. Gearshift Switch Inspection at Handlebar Switch Connector**

Disconnect the handlebar switch 14P (green) connector.

Check for continuity between the following terminals of the switch side 14P connector while pushing the gearshift switch.

**With the upshift switch pushed:**

White/red – White/blue

**With the downshift switch pushed:**

White/red – White/yellow

*Is there continuity?*

**NO** – Faulty handlebar switch.

**YES** – GO TO STEP 3.

**3. Gearshift Switch Inspection at PCM Connector**

Connect the handlebar switch 14P connector and disconnect the PCM 33P (black) connector.

Check for continuity (use the special tool) between the following terminals of the wire harness side 33P connector while pushing the gearshift switch.

**TOOL:**

Pin probe (Male)

07ZAJ-RDJA110

**With the upshift switch pushed:**

White/red – White/blue

**With the downshift switch pushed:**

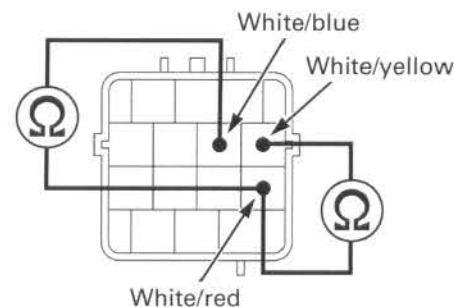
White/red – White/yellow

*Is there continuity?*

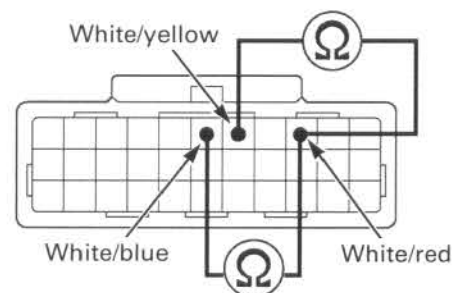
**NO** – Open circuit in the White/red, White/blue or White/yellow wire between the switch and PCM.

**YES** – GO TO STEP 4.

**HANDLEBAR SWITCH 14P CONNECTOR**  
(Viewed from the terminal side)



**PCM 33P (Black) CONNECTOR**  
(Viewed from the terminal side)





## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

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### 4. Recheck DTC

Connect the handlebar switch 14P and PCM 33P connectors.

Erase the DTC (page 23-13).

Turn the ignition switch to OFF and ON.

Check the shift operation and the DTC.

#### *Is the DTC 42-1 indicated?*

**NO** – Intermittent failure.

**YES** – Replace the PCM with a new one and troubleshoot again.



## SHIFT ANGLE SENSOR

### INSPECTION

Remove the left mudguard (page 3-6).

Disconnect the sensor 3P (gray) connector.

### SENSOR RESISTANCE

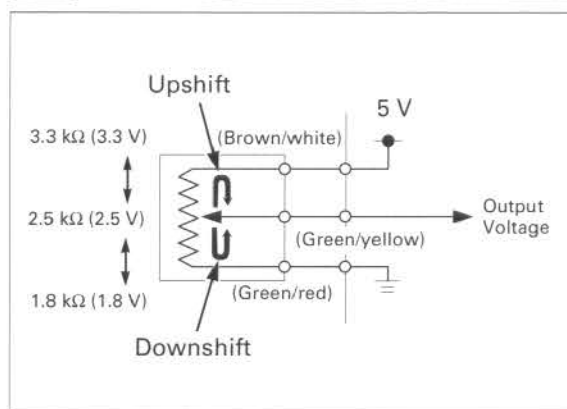
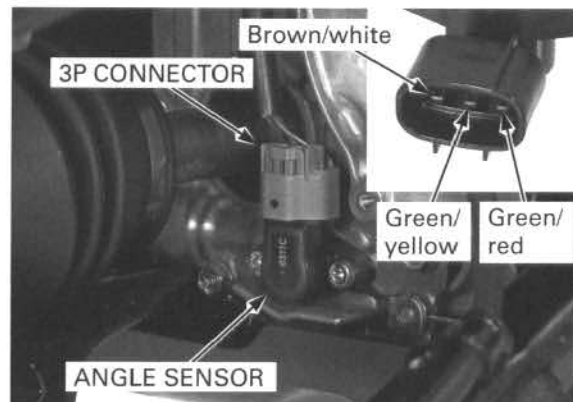
Measure the resistance between the Brown/white and Green/red terminal of the angle sensor.

**STANDARD: 4 – 6 k $\Omega$  (20°C/68°F)**

Check that the resistance between the Green/yellow and Green/red terminals varies while shifting the gear manually, using the gear change tool.

**When shifting up: Resistance increase**

**When shifting down: Resistance decreases**



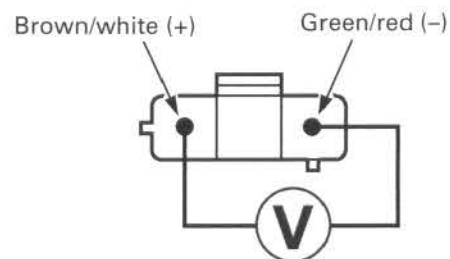
### INPUT VOLTAGE

Turn the ignition switch to ON and measure the input voltage between the Brown/white (+) and Green/red (-) terminal of the wire harness side connector.

**STANDARD: 4.7 – 5.3 V**

If the input voltage is out of specification, check for open or short circuit in the Brown/white, Brown/green, Green red and Green/orange wires between the angle sensor and PCM.

### ANGLE SENSOR CONNECTOR (Viewed from the terminal side)



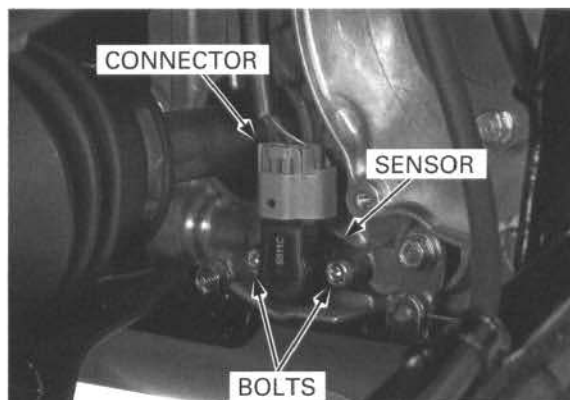
### REMOVAL

Remove the left mudguard (page 3-6).

Disconnect the sensor 3P connector.

Remove the two socket bolts and angle sensor.  
Remove the O-ring.

Check the sensor for wear or damage.





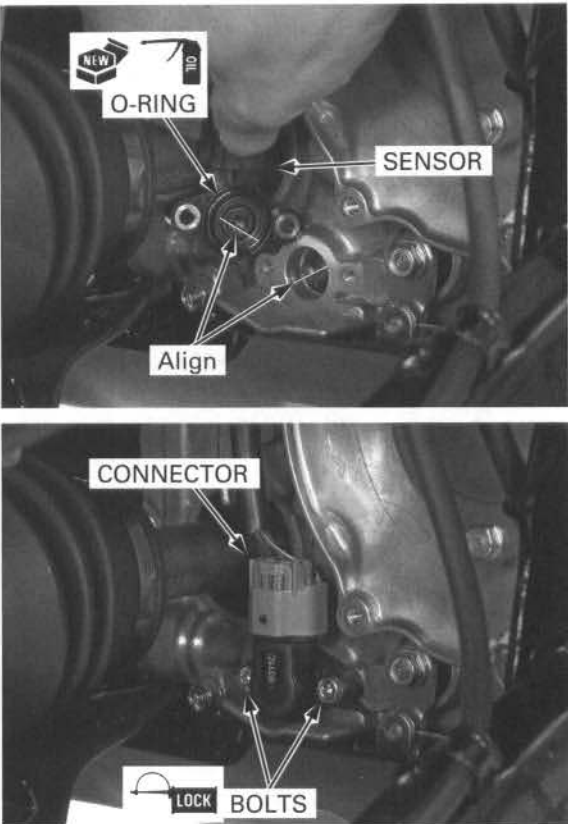
INSTALLATION

Coat a new O-ring with engine oil and install it into the sensor groove.  
Apply locking agent to the threads of the sensor socket bolts.

Carefully install the angle sensor by aligning the flat surfaces of the sensor shaft hole and gearshift spindle end.  
Install the two bolts and tighten them.

**TORQUE: 6 N·m (0.6 kgf·m, 4.4 lbf·ft)**

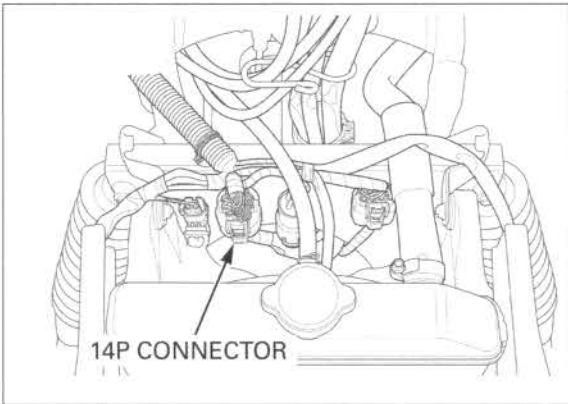
Connect the 3P connector.  
Install the mudguard (page 3-6).



GEARSHIFT SWITCH

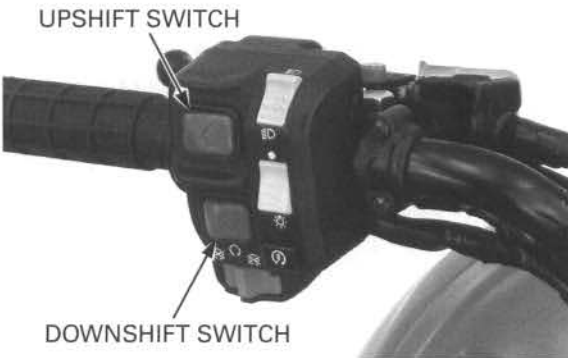
SYSTEM INSPECTION

Remove the front fender/carrier (page 3-7).  
Remove the handlebar switch 14P (green) connector from the frame and disconnect it.



Check for continuity between the switch side connector terminals with each switch pushed.  
Continuity should exist between the color coded wires as follows:

Color	White/red	White/blue	White/yellow
Position			
Upshift pushed	○	○	
Free			
Downshift pushed	○		○





### INPUT VOLTAGE

Remove the front fender/carrier (page 3-7).

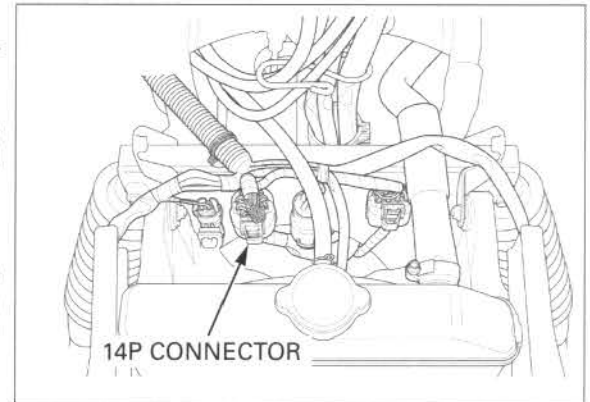
Remove the handlebar switch 14P (green) connector from the frame and disconnect it.

Turn the ignition switch to ON.

Measure the input voltage between the White/red wire terminal (+) of the harness side connector and ground (-).

**STANDARD: 4.7 – 5.3 V**

If the input voltage is abnormal, or if there is no input voltage, check for an open or short circuit in the wire harness, or loose or poor connections in the wire harness.





## SHIFT CONTROL MOTOR/REDUCTION GEARS

### REMOVAL

*Replace the control motor as an assembly.*

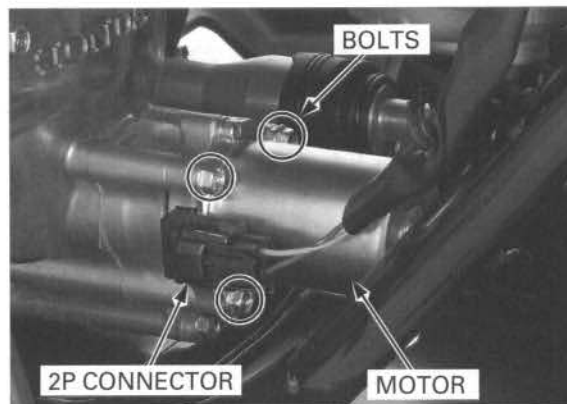
#### CONTROL MOTOR

Remove the following:

- left side cover (page 3-4)
- right mudguard (page 3-6)
- right front wheel (page 14-13)

Disconnect the motor 2P connector.

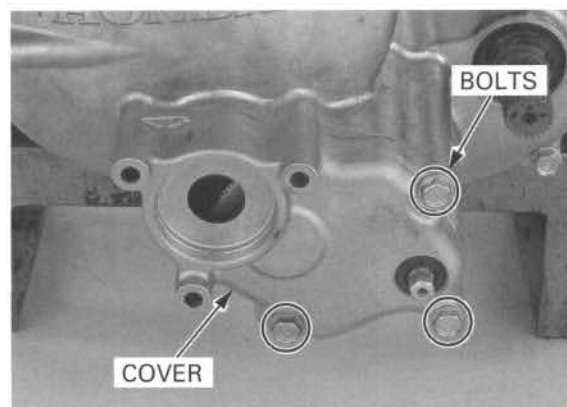
Remove the three bolts (flange) and the control motor.



#### REDUCTION GEARS

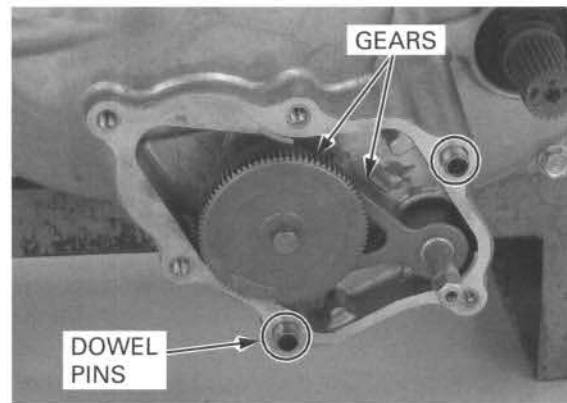
Remove the following:

- three bolts
- gear cover



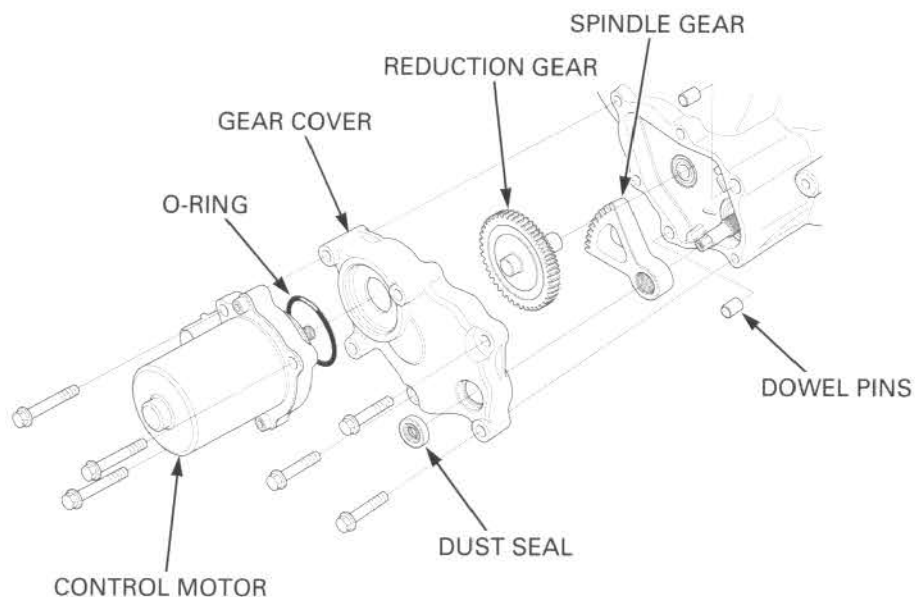
- reduction gear
- spindle gear
- two dowel pins

Check the gear teeth and splines for wear or damage.





## INSTALLATION



Remove any grease from the gears, gear cover and crankcase cover.

Clean the mating surfaces of the covers thoroughly, being careful not to damage them.

Install the spindle gear by aligning with the reference marks on the crankcase cover.

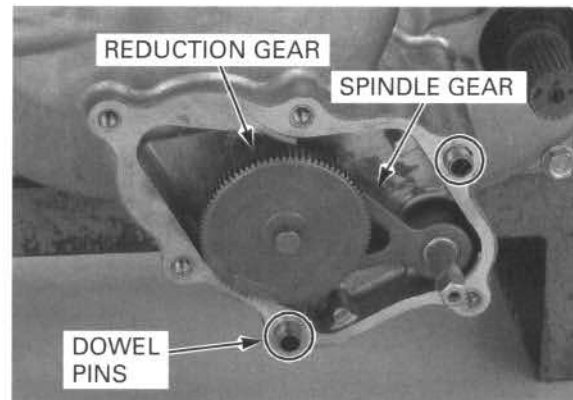
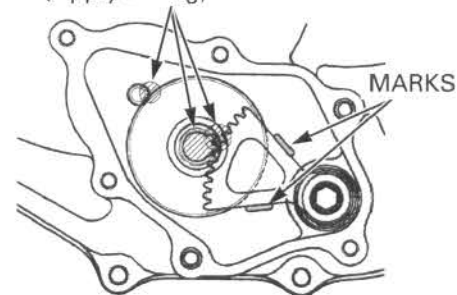
Apply 2 – 4 g of specified grease to the gear journals (both sides of the reduction gear) and gear teeth as shown.

Install the reduction gear.

**SPECIFIED GREASE: Templex N3 grease (ESSO)**

Install the dowel pins into the crankcase cover.

TEMPLEX N3 GREASE  
(Apply 2 – 4 g)





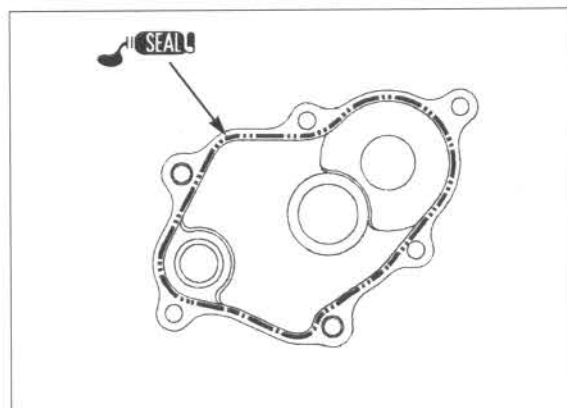
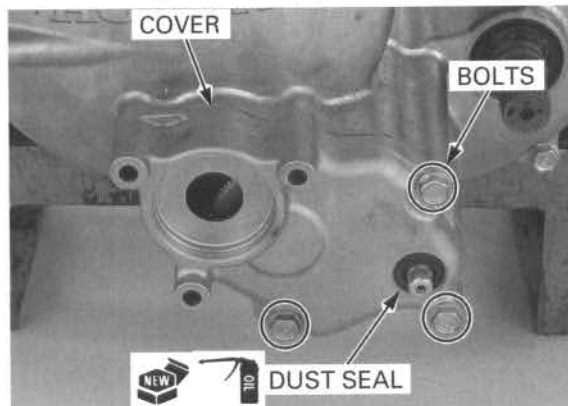
## ELECTRIC SHIFT PROGRAM (ESP: TE/FE/FPE models)

Apply engine oil to the seal lips of a new dust seal. Install the dust seal into the gear cover with the flat side facing out until it is fully seated.

Apply liquid sealant (TB1215 or equivalent) to the mating surface of the gear cover as shown.

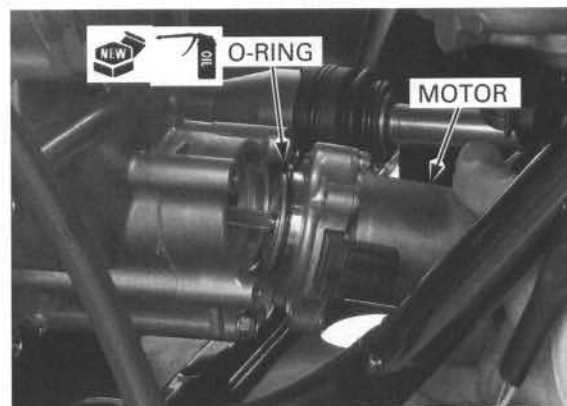
Install the gear cover with the three bolts.

*Tighten the bolts  
after installing the  
motor.*



Coat a new O-ring with engine oil and install it into the motor groove.

Install the control motor with the three bolts.

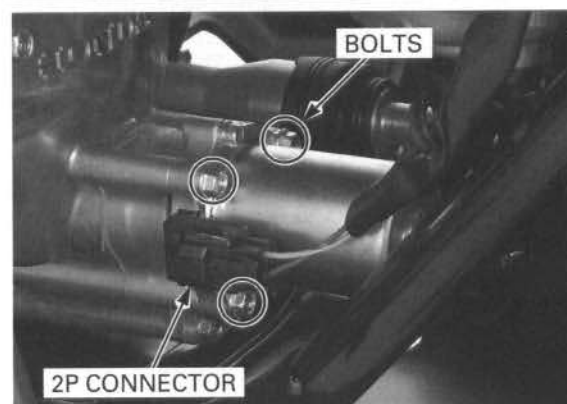


Tighten the six bolts in a crisscross pattern in several steps.

Connect the motor 2P connector.

Install the following:

- front wheel (page 14-13)
- mudguard (page 3-6)
- side cover (page 3-4)





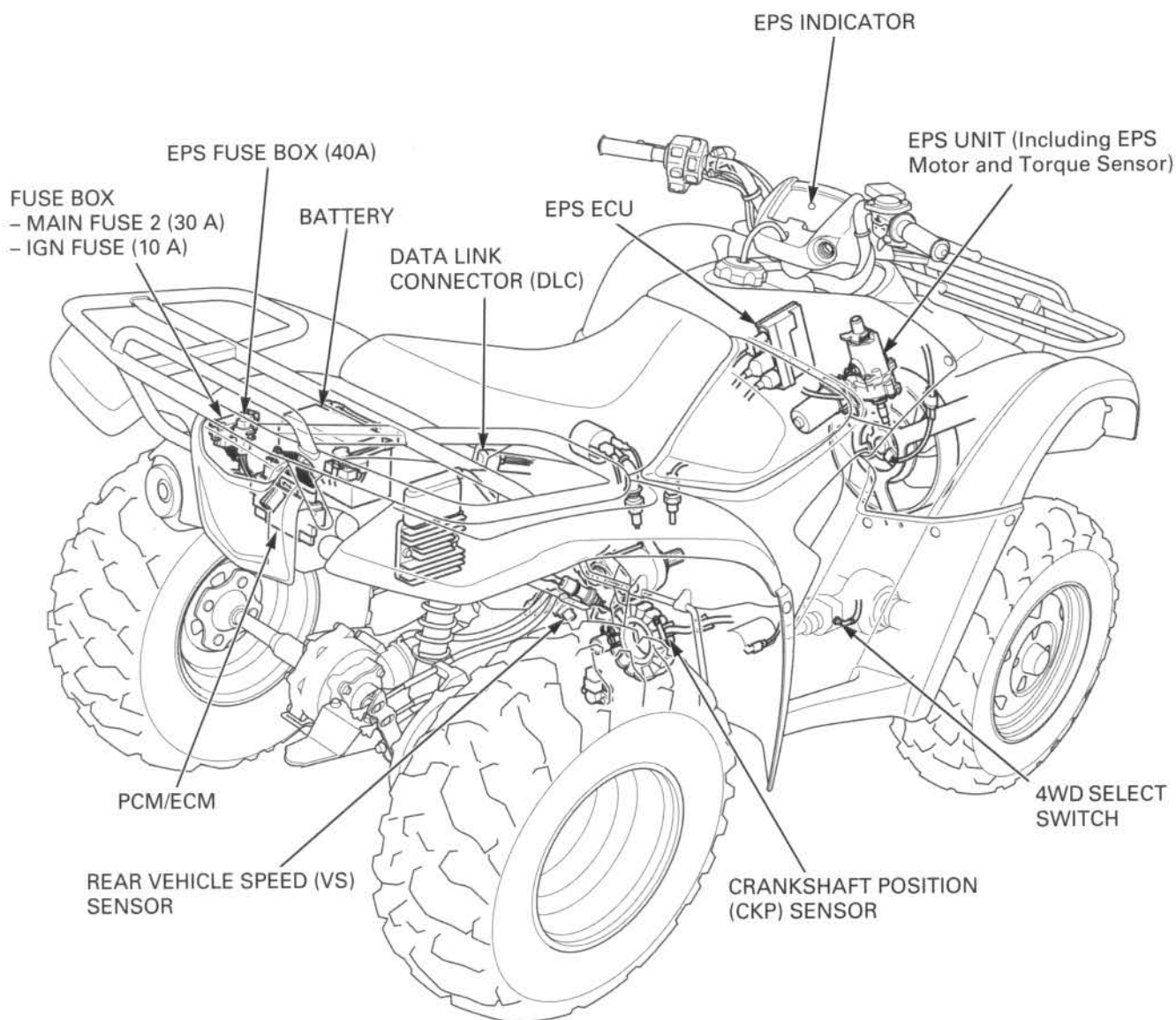
# 24. ELECTRIC POWER STEERING (EPS: FPM/FPE models)

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COMPONENT LOCATION .....	24-2	EPS DTC INDEX .....	24-14
SYSTEM DIAGRAM .....	24-3	SYMPTOM TROUBLESHOOTING INDEX .....	24-15
SERVICE INFORMATION .....	24-4	DTC TROUBLESHOOTING .....	24-16
EPS CONNECTOR LOCATION .....	24-5	SYMPTOM TROUBLESHOOTING .....	24-30
EPS TROUBLESHOOTING INFORMATION .....	24-7	EPS ECU .....	24-33

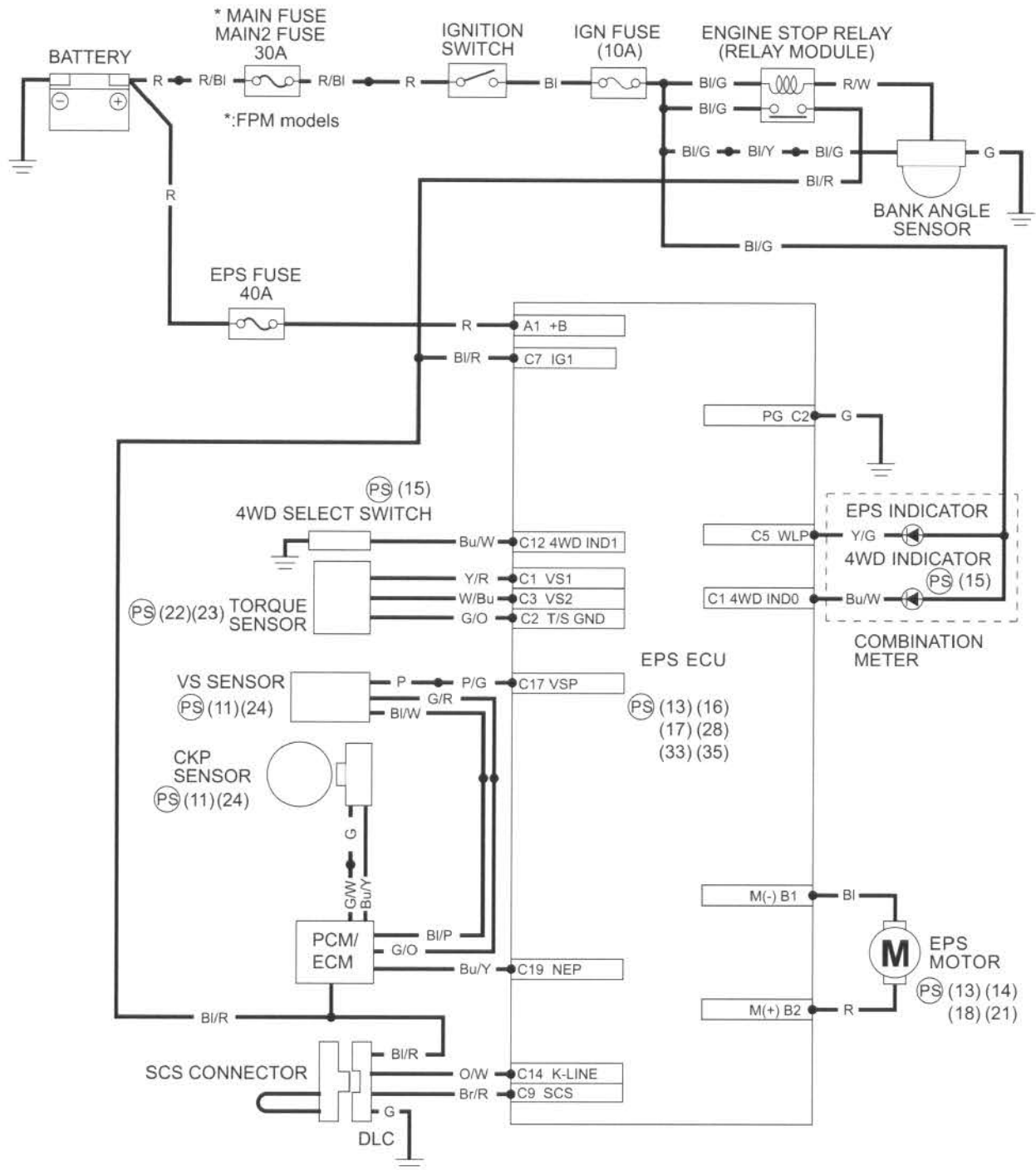


**COMPONENT LOCATION**





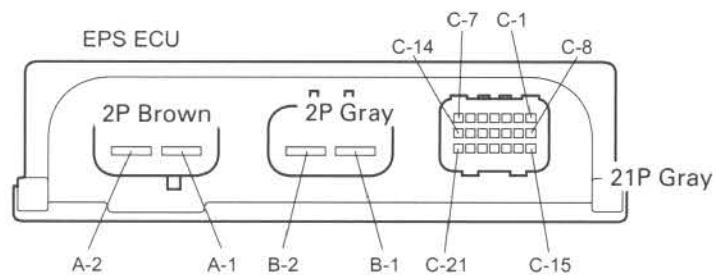
## SYSTEM DIAGRAM



Bl: Black  
Br: Brown  
Bu: Blue  
G: Green  
Gr: Gray  
Lg: Light green  
Lb: Light blue  
O: Orange  
P: Pink  
R: Red  
W: White  
Y: Yellow

(PS ( )): EPS indicator Blink

⏏ : Short terminals for reading DTC





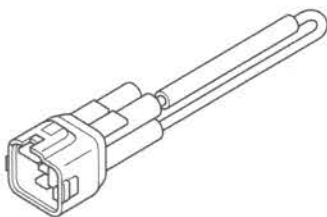
### SERVICE INFORMATION

#### GENERAL

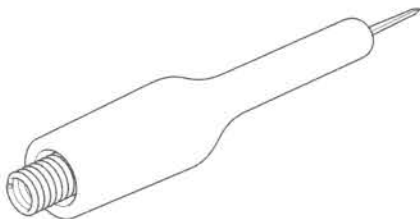
- This section covers electrical system service of the EPS (FPM/FPE models). For other service of the steering system, see Front Wheel/Suspension/Steering section (page 14-35).
- When performing the DTC troubleshooting, read "EPS Troubleshooting Information" carefully (page 24-7), and inspect and troubleshoot according to the DTC. Observe each step of the procedures one by one. Note the DTC and probable faulty part before starting diagnosis and troubleshooting.
- The EPS ECU may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the EPS ECU. Always turn off the ignition switch before disconnecting or connecting the connectors.

#### TOOLS

SCS connector  
070PZ-ZY30100



Pin probe (Male)  
07ZAJ-RDJA110

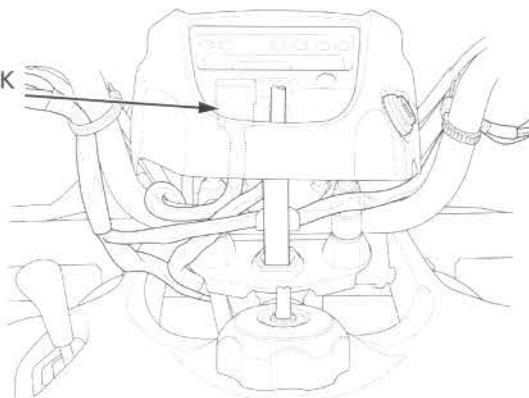




## EPS CONNECTOR LOCATION

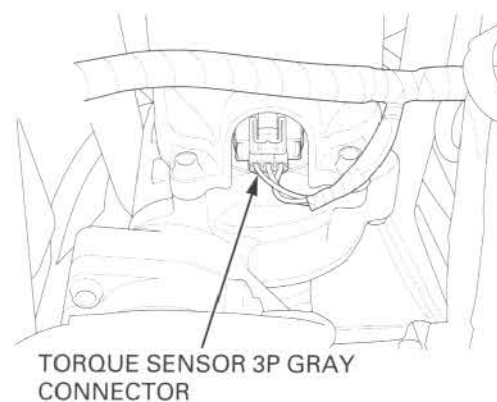
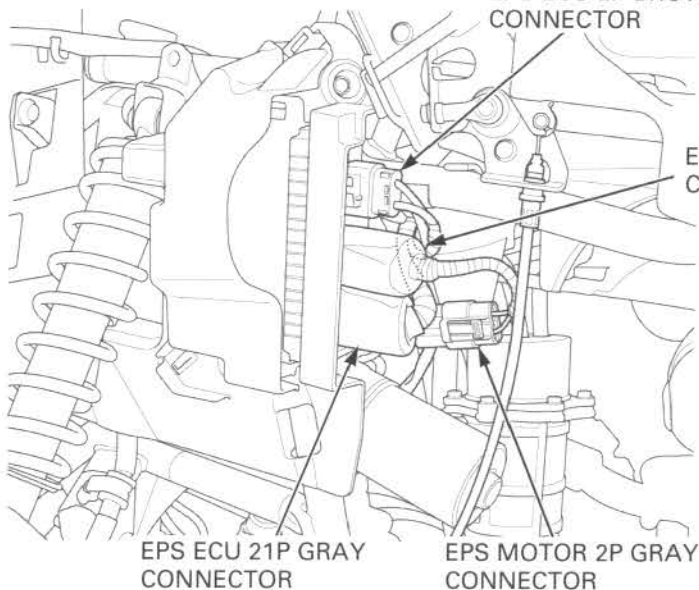
The parts listed below the connector must be removed to disconnect the connector.

METER 21P BLACK  
CONNECTOR



EPS ECU 2P BROWN  
CONNECTOR

EPS ECU 2P GRAY  
CONNECTOR

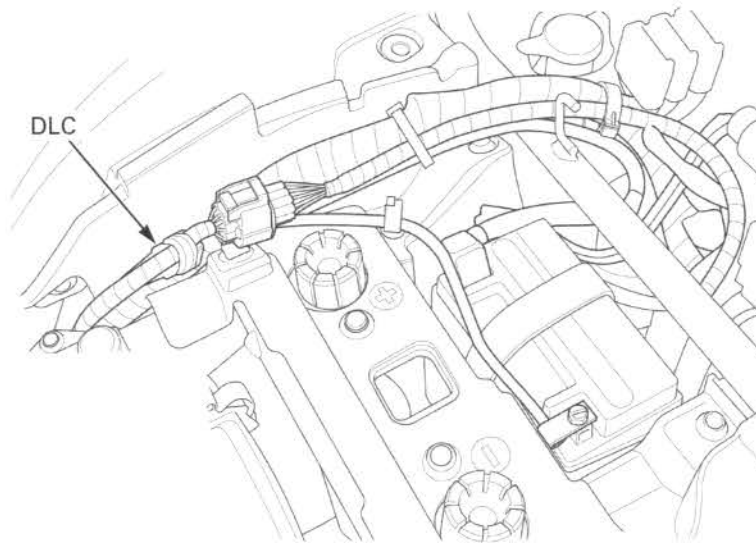
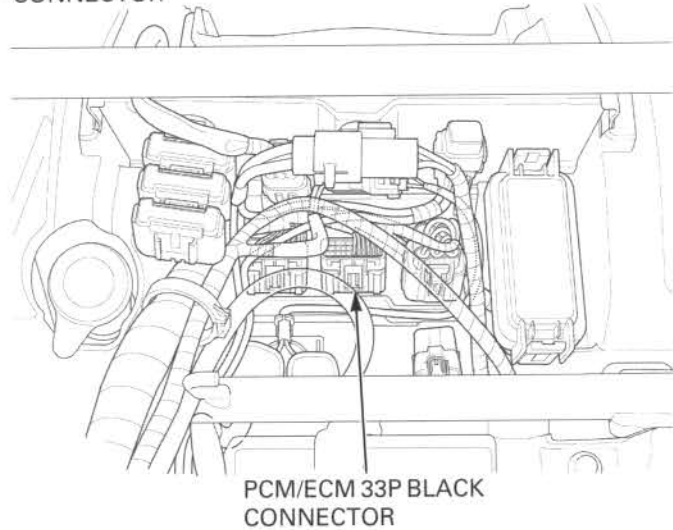
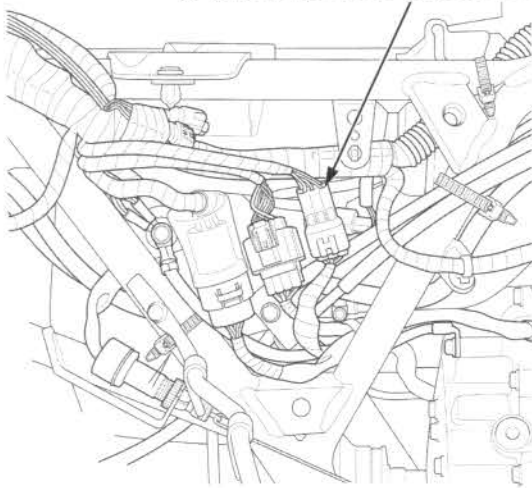


- Meter 21P black connector
  - meter/cover assembly (page 22-6)
- EPS ECU connectors
  - left side cover (page 3-4)
- EPS motor 2P gray connector
  - left side cover (page 3-4)
- Torque sensor 3P gray connector
  - left side cover (page 3-4)



## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

FPE: ENGINE SUB-WIRE HARNESS 6P CONNECTOR  
FPM: ENGINE SUB-WIRE HARNESS 3P CONNECTOR



- Engine sub-wire harness 6P or 3P connector
  - right side cover (page 3-4)
- PCM/ECM 33P black connector
  - rear fender cover (page 3-9)
- DLC
  - seat (page 3-4)



## EPS TROUBLESHOOTING INFORMATION

### SYSTEM DESCRIPTION

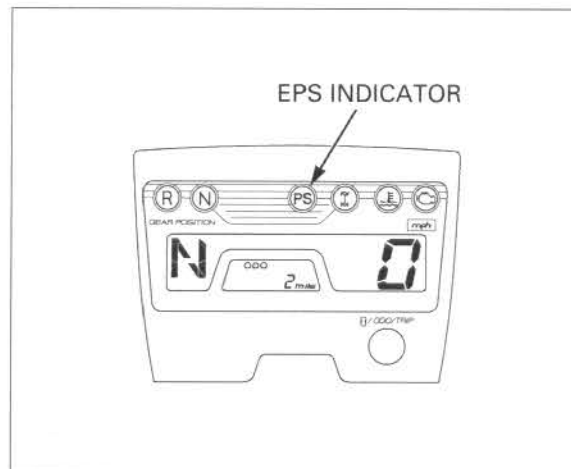
#### SELF-DIAGNOSIS SYSTEM

The EPS system is equipped with the self-diagnostic system. If the EPS ECU detects a system failure, it functions as follows:

1. turns on the EPS indicator to notify the rider of the problem.
2. stores a DTC (Diagnostic Trouble Code) in its erasable memory.
3. stops power assist (manual steering operation begins or reduces the assist power).

Self-diagnosis can be classified into three categories:

- Initial diagnosis: performed right after the engine starts and until the EPS indicator goes off.
- Regular diagnosis: performed right after the initial diagnosis until the ignition switch is turned to OFF.
- Revest: The EPS indicator turns on when the DTC is set. The EPS indicator will turn off after the vehicle has recovered from the fail-safe condition, but the DTC will be stored in the EPS ECU. There was a temporary problem, but the system is now fully operational.



#### DTC (Diagnostic Trouble Code)

The DTC(s) is memorized in the EEPROM (nonvolatile memory) therefore the memorized DTC(s) cannot be erased by disconnecting the battery. Perform the specified procedures to clear the DTC(s) (page 24-10).

#### EPS INDICATOR

Under normal conditions, the EPS indicator comes on when the ignition switch is turned to ON, then goes off after starting the engine. This indicates that the LED and its circuit are operating correctly.

If there is any trouble in the system after the engine is started, the EPS indicator will stay on and the EPS ECU memorizes the DTC.

(When the DTC 22 is stored; No initializing the torque sensor neutral position, the EPS indicator will blink.)

When a problem is detected and the EPS indicator comes on, there are cases that the indicator stays on until the ignition switch is turned to OFF, and the indicator goes off automatically when the system returns to normal.

If a problem is continuing after restarting the engine, the EPS indicator stays on and the EPS ECU stops the EPS function.

When the DTC 23 (torque sensor problem) is stored in the EPS ECU, the EPS indicator will stay on until the DTC is erased.



### RESTRICTION ON POWER ASSIST OPERATION

Repeated extreme steering force, such as turning the handlebar continuously back-and-forth with the vehicle stopped, causes an increase of power consumption in the EPS motor. The increase of electric current causes the motor to heat up. Because this heat adversely affects the system, the EPS ECU monitors the electric current of the motor. When the EPS ECU detects heat build-up in the motor, it reduces the electric current to the motor gradually to protect the system (motor and EPS ECU), this restricts the power assist operation. The EPS indicator does not come on during this function. When steering torque is not applied to the handlebar, or when the ignition is turned off, and the system cools, the EPS ECU will gradually restore the power assist.

### TORQUE SENSOR NEUTRAL POSITION (Torque Sensor Initialization)

The EPS ECU stores the torque sensor neutral position in the EEPROM. The torque sensor must be initialized whenever the EPS unit, the EPS ECU, etc is serviced (page 24-12).

Perform the Torque Sensor Initialization when you service the following components.

MAINTENANCE LOCATION	REPLACEMENT	REMOVAL/INSTALLATION
Cables and harness around handlebar	INITIALIZE	INITIALIZE
Handlebar	INITIALIZE	INITIALIZE
Steering shaft and steering shaft bushing	INITIALIZE	INITIALIZE
Steering arm and end nut	INITIALIZE	INITIALIZE
EPS unit	INITIALIZE	INITIALIZE
EPS ECU	INITIALIZE	NO NEED

#### NOTE:

- The torque sensor neutral position is not effected when erasing the DTC.

### HOW TO TROUBLESHOOT EPS DTC

1. Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the EPS indicator came on, such as during EPS control, after EPS control, when the vehicle was at a certain speed, etc.
2. When the EPS indicator does not come on during the test-ride, but troubleshooting is done based on the DTC, check for loose connectors, poor terminal contact, etc., in the affected circuit before you start troubleshooting.
3. After troubleshooting, erase the DTC(s) and test-ride the vehicle to be sure that the EPS indicator does not come on.

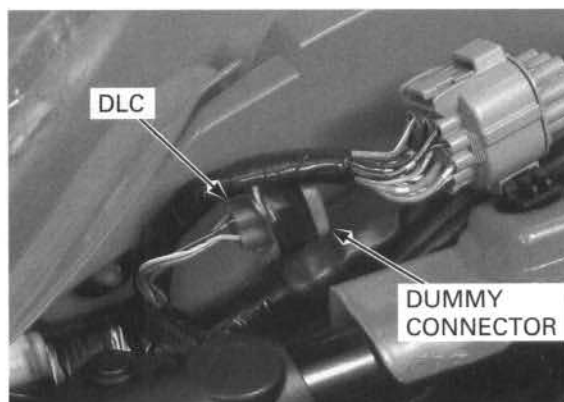
### HDS POCKET TESTER INFORMATION

- The HDS can readout and erase the DTC (without the torque sensor neutral position).

#### How to connect the HDS Pocket Tester

Turn the ignition switch to OFF.  
Remove the seat (page 3-4).

Remove the DLC from the dummy connector.  
Connect the HDS pocket tester to the DLC.  
Turn the engine stop switch to "O" and the ignition switch to ON, and check the DTC.





## DTC READOUT

### NOTE:

- If the HDS pocket tester is not available, DTC can be read from the EPS ECU memory by the EPS indicator blinking pattern (page 24-9).
- After performing diagnostic troubleshooting, erase the DTC(s) (page 24-10) and test-ride the vehicle to be sure that the problem(s) have been resolved.

Start the engine and check the EPS indicator.

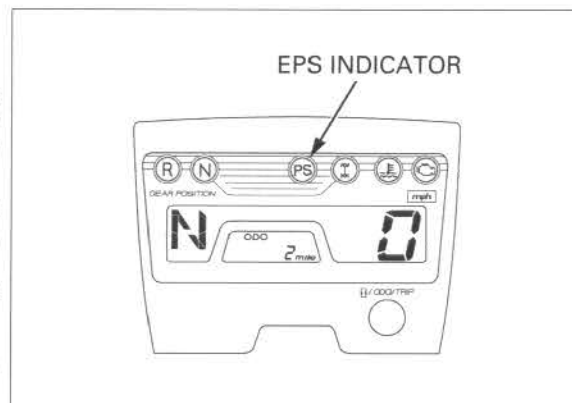
### NOTE:

- Under normal conditions, the EPS indicator stays on with the ignition switch is turned to ON until the engine starts, and it goes off after starting the engine.

If the EPS indicator stays on or blinks with the engine running, connect the HDS pocket tester to the DLC (page 24-8).

Read the DTC and follow the troubleshooting index (page 24-14).

To read the DTC without the HDS pocket tester, refer to the following procedure.



### Reading DTC with the EPS indicator

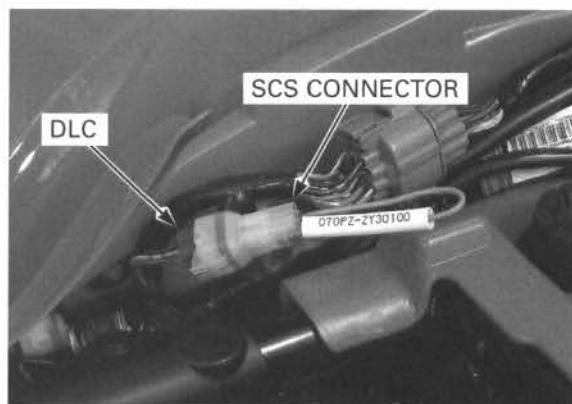
1. Remove the seat (page 3-4).
2. Remove the DLC from the dummy connector and short the DLC terminals using the special tool with the ignition switch is turned to OFF.

#### TOOL:

SCS connector 070PZ-ZY30100

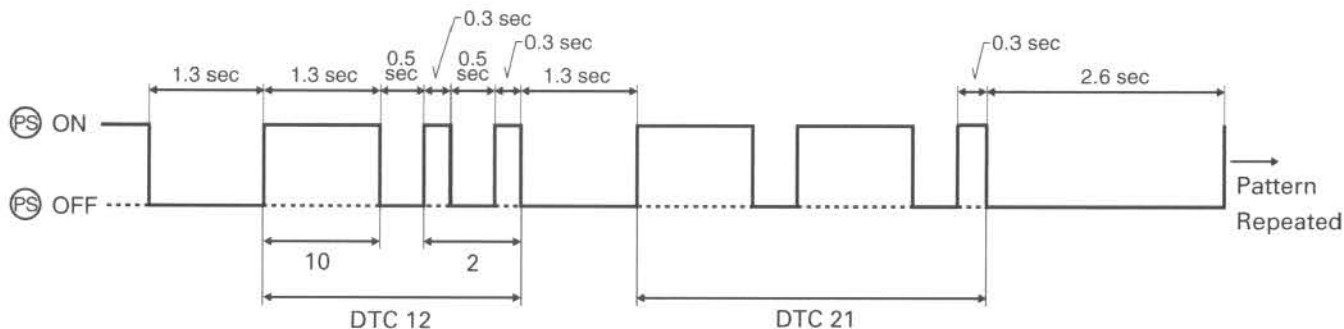
CONNECTION: Brown/red – Green

3. Make sure the engine stop switch is turned to "O". Turn the ignition switch to ON, and read the EPS indicator blinks. The number of blinks indicates the DTC (page 24-9). Refer to the troubleshooting index (page 24-14).



### EPS Indicator Blinking Pattern

- The number of EPS indicator blinks is the equivalent to the main code of the DTC (the sub-code cannot be displayed by the indicator blinking).
- The indicator has two types of blinks, a long blink and short blink. The long blink lasts for 1.3 seconds, the short blink lasts for 0.3 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by one short blink, the DTC is 21 (two long blink = 20 blinks, plus one short blink).
- When the EPS ECU stores more than one DTC, the indicator blinks in the order from the lowest number to highest number.





### ERASING DTC

#### NOTE:

- Perform this procedure using fully charged battery. The EPS indicator will stay lit and the EPS ECU will abort the process if you use a low or dead battery.

#### How to erase the DTC with HDS

Connect the HDS pocket tester to the DLC (page 24-8).

Erase the DTC with the HDS while the engine is stopped.

To erase the DTC without HDS, refer to the following procedure.

#### How to erase the DTC without HDS

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

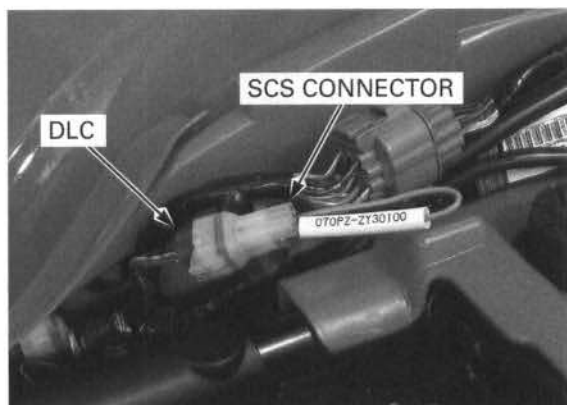
Remove the seat (page 3-4).

2. Remove the DLC from the dummy connector and short the DLC terminals using the special tool with the ignition switch turned to OFF.

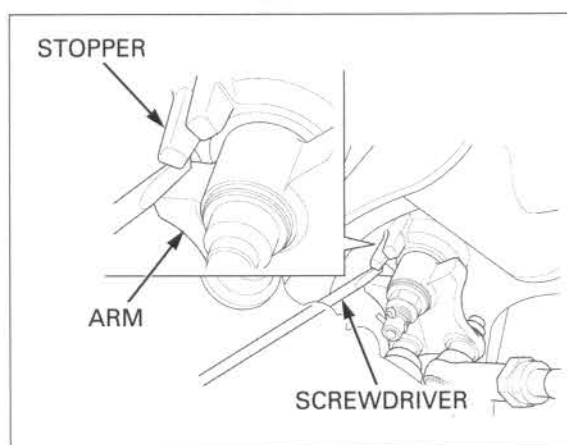
#### TOOL:

SCS connector                      070PZ-ZY30100

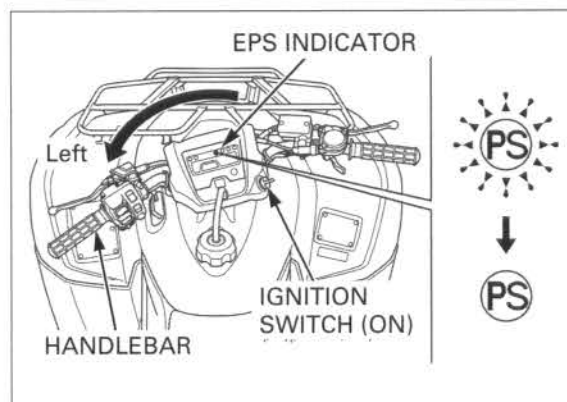
CONNECTION: Brown/red – Green



3. Place a 6 mm width screwdriver between the right side of the steering stopper and steering arm as shown.



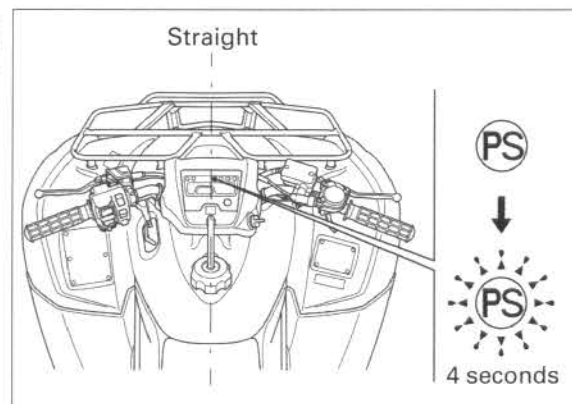
4. Make sure the engine stop switch is turned to "O". Fully turn the handlebar to the left and hold it.
5. Turn the ignition switch to ON. The EPS indicator comes on and it goes off after 4 seconds.



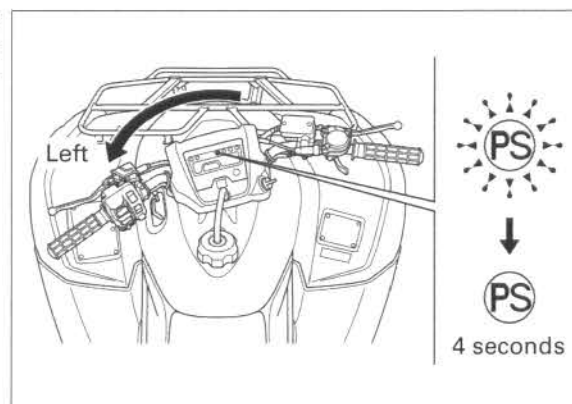


## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

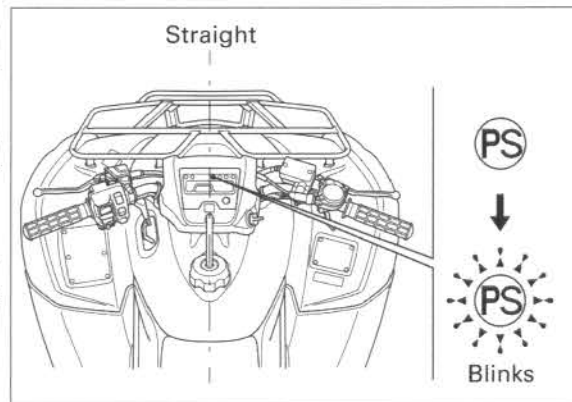
6. Within 4 seconds after the EPS indicator goes off, turn the handlebar in the straight ahead position and release it immediately. The EPS indicator comes on again 4 seconds.



7. Within 4 seconds after the EPS indicator comes on, fully turn the handlebar to the left and hold it immediately. The EPS indicator goes off 4 seconds.



8. Within 4 seconds after the EPS indicator goes off, turn the handlebar in the straight ahead position and release it immediately. The EPS indicator blinks twice.



*The ignition switch must be turned to OFF and this time.*

*If it is not, the system will be changed to the torque sensor initialization (page 24-13).*

Turn the ignition switch to OFF within 5 seconds after the EPS indicator blinks twice (DTC erasure is completed at this time).

### NOTE:

- If the EPS indicator does not blink twice, an error was made in the procedure and the DTC was not erased. Turn the ignition switch to OFF, and repeat the operation from step 3.

9. Remove the special tool from the DLC and install the DLC to the dummy connector. Remove the screwdriver inserted in Step 3.

10. Install the seat (page 3-4).



### TORQUE SENSOR INITIALIZATION

#### NOTE:

- Perform this procedure using a fully charged battery. The EPS indicator will stay lit and the EPS ECU will abort the process if you use a low or dead battery.
- The DTC will be erased when initializing the torque sensor.

#### How to Initialize the Torque Sensor with HDS

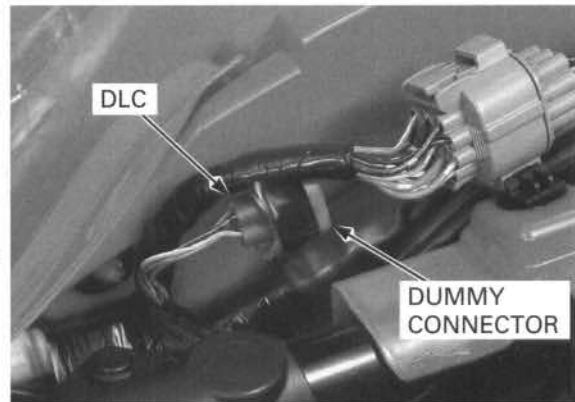
1. Raise the front wheels off the ground and support the vehicle securely.
2. Remove the DLC from the dummy connector and connect the HDS Pocket Tester to the DLC with the ignition switch turned to OFF.

Turn the ignition switch to ON.

Turn the handlebar straight ahead.

Initialize the Torque Sensor with the HDS while the engine is stopped.

Follow the instructions on the HDS display.



#### How to Initialize the Torque Sensor without HDS

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

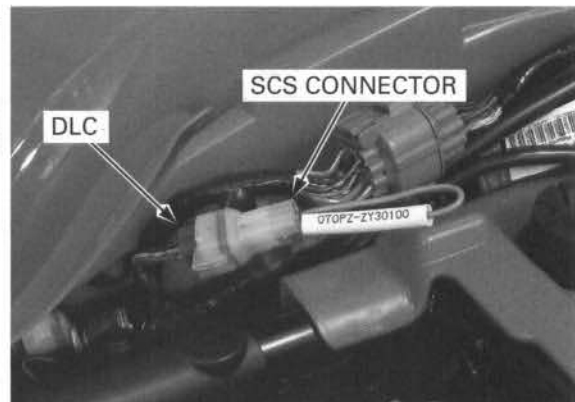
Remove the seat (page 3-4).

2. Remove the DLC from the dummy connector and short the DLC terminals using the special tool with the ignition switch turned to OFF.

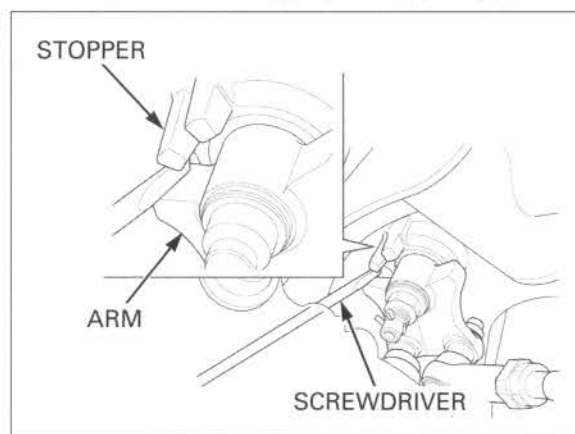
#### TOOL:

SCS connector 070PZ-ZY30100

CONNECTION: Brown/red – Green



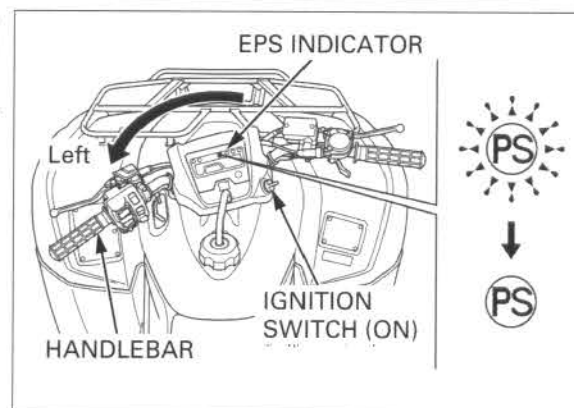
3. Place a 6 mm width screwdriver between the right side of the steering stopper and steering arm as shown.



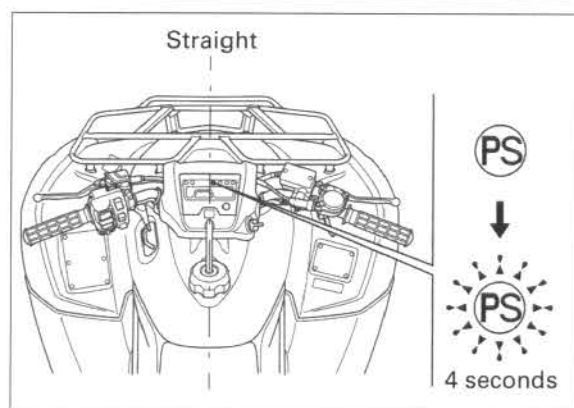


## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

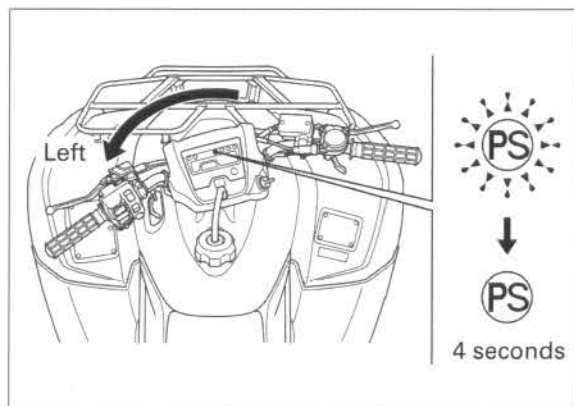
4. Make sure the engine stop switch is turned to "O". Fully turn the handlebar to the left and hold it.
5. Turn the ignition switch to ON. The EPS indicator comes on and it goes off after 4 seconds.



6. Within 4 seconds after the EPS indicator goes off, turn the handlebar in the straight ahead position and release it immediately. The EPS indicator comes on again 4 seconds.



7. Within 4 seconds after the EPS indicator comes on, fully turn the handlebar to the left and hold it immediately. The EPS indicator goes off 4 seconds.



*Do not touch the handlebar after releasing the handlebar.*

8. Turn the handlebar in the straight ahead position (fully turn-to-straight ahead time; within 1 second) and release it immediately after the EPS indicator goes off. The EPS indicator blinks twice. Wait for 5 seconds and the EPS indicator blinks 3 times.

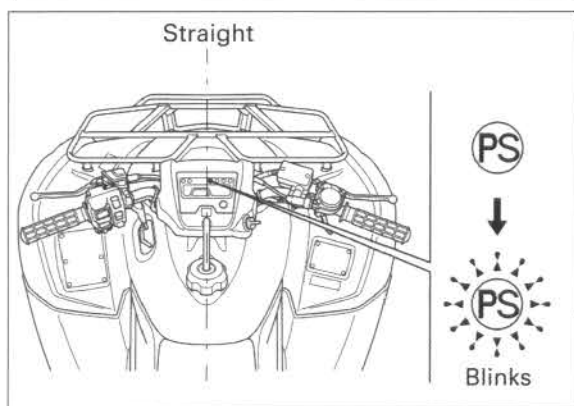
Turn the ignition switch to OFF after the EPS indicator blinks 3 times (torque sensor initialization is completed at this time).

### NOTE:

- If the EPS indicator does not blink 3 times, an error was made in the procedure and the torque sensor was not initialized. Turn the ignition switch to OFF, and repeat the operation from step 3.

9. Remove the special tool from the DLC and install the DLC to the dummy connector. Remove the screwdriver inserted in Step 3.

10. Install the seat (page 3-4).





## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

### EPS DTC INDEX

#### DEFINITIONS

**Latch:** The EPS indicator turns on and stays on whenever the ignition switch is in the ON position, or until the DTC is erased.

**Reset:** The EPS indicator turns on when the DTC is set. The EPS indicator will not turn on after the ignition switch is cycled from ON to OFF, but the DTC will be stored in the EPS ECU.

**Revest:** The EPS indicator turns on when the DTC is set. The EPS indicator will turn off after vehicle has recovered from the fail-safe condition, but the DTC will be stored in the EPS ECU. There was a temporary problem, but the system is now fully operational.

**Initial diagnosis:** Performed right after the engine starts and until the EPS indicator goes off.

**Regular diagnosis:** Performed right after the initial diagnosis until the ignition switch is turned to OFF.

DTC	Function Failure	Symptom/Fail-safe function	Type	Page
11-01	Excessive change of vehicle speed signal (Regular diagnosis)	Indicator ON/Substitution control of the engine rpm	Revest	24-16
11-02	Comparison between vehicle speed and engine speed signal (Regular diagnosis)	Indicator ON/Substitution control of the engine rpm	Revest	24-17
13-01	EPS ECU internal circuit (Lower FET stuck ON) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-17
13-02	EPS ECU internal circuit (Upper FET stuck ON) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-18
13-03	EPS ECU internal circuit (FET stuck ON <over current>) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-18
13-04	EPS ECU internal circuit (FET stuck ON (VM<Voltage Motor>)) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-18
13-05	EPS ECU internal circuit (FET stuck ON (over current<accumulated>)) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-18
14-01	EPS ECU internal circuit (Power relay stuck ON) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-18
14-02	EPS ECU internal circuit (Fail-safe relay 1 stuck ON) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-19
14-03	EPS ECU internal circuit (Fail-safe relay 2 stuck ON) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-19
14-04	EPS ECU internal circuit (Power relay stuck open) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-19
15-01	2WD/4WD select signal blinking (Regular diagnosis)	4WD indicator blink (EPS indicator will not come ON)/2WD assist power stabilized	Revest	24-19
15-02	2WD/4WD select signal input line (Regular diagnosis)	Indicator ON/2WD assist power stabilized or EPS operation is normally	Revest	24-20
16-01	EPS ECU internal circuit (Direction determine logic circuit) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
16-02	EPS ECU internal circuit (INH output circuit) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
17-01	EPS ECU internal circuit (Voltage raise transformation circuit) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
17-02	EPS ECU internal circuit (Voltage raise transformation circuit) (Regular diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-21
18-01	EPS ECU internal circuit (Current sensor) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
18-02	EPS ECU internal circuit (Current sensor off set) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
18-03	EPS ECU internal circuit (Current sensor stuck low) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-22



## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

DTC	Function Failure	Symptom/Fail-safe function	Type	Page
18-04	EPS ECU internal circuit (Current sensor stuck low) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-22
18-05	EPS ECU internal circuit (Motor current deflection) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
18-06	EPS ECU internal circuit (IM2) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
21-01	Abnormal motor terminal voltage (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-22
21-02	Abnormal motor terminal voltage (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-23
21-03	Open in the motor harness (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-23
22-01	Failure to initialize the torque sensor (Initial diagnosis)	Indicator blink/Disables steering assist until the torque sensor is initialized	Latch*	24-23
23-01	Low/high voltage for the torque sensor (VT1 and VT2) (Regular diagnosis)	Indicator ON/Disables steering assist until the DTC is erased	Latch	24-23
23-02	Torque sensor (VT3 Differential-amplification Function) (Regular diagnosis)	Indicator ON/Disables steering assist until the DTC is erased	Latch	24-26
23-03	Torque sensor (VT1, VT2 rapid change) (Regular diagnosis)	Indicator ON/Disables steering assist until the DTC is erased	Latch	24-26
23-04	Torque sensor (Temperature sensor) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-26
23-05	Torque sensor (Sensor Coil) (Regular diagnosis)	Indicator ON/Disables steering assist until the DTC is erased	Latch	24-26
24-01	Engine speed signal (Regular diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-27
31-01	Low/high IG1-terminal voltage (Initial diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-28
31-02	Low/high IG1-terminal voltage (Regular diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-28
32-01	Low/high VBU voltage (Regular diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-29
33-02	EPS ECU internal circuit (EEPROM) (Regular diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
35-01	EPS ECU internal circuit (CPU) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
35-03	EPS ECU internal circuit (CPU communication) (Initial diagnosis)	Indicator ON/Disables steering assist immediately	Reset	24-21
35-04	EPS ECU internal circuit (CPU communication) (Regular diagnosis)	Indicator ON/Disables steering assist under the Specified condition	Revest	24-21

\*The stored DTC is erased by performing the torque sensor initialization.

## SYMPTOM TROUBLESHOOTING INDEX

Symptom	Symptom/Fail-safe function	Refer to
EPS indicator does not come on	Symptom Troubleshooting	24-30
EPS indicator does not go off, and no DTCs are stored	Symptom Troubleshooting	24-31



### DTC TROUBLESHOOTING

- Refer to "EPS Connector Location" for the connector location and the necessary parts to disconnect the connector (page 24-5).
- Perform inspection with the ignition switch turned to OFF, unless otherwise specified.
- After troubleshooting, erase the DTC(s) and test-ride the vehicle to be sure that the EPS indicator does not come on.

#### VERIFY PROPER CONNECTOR CONTACT

Many EPS problems and subsequent DTCs are caused by poor connector contacts. The first step in troubleshooting any DTC is to inspect the affected connectors.

#### CONNECTOR INSPECTION

- Check for moisture in the affected connector
- Check for corrosion
- Check for folded pins on the male side of the connector
- Check for loose pins and/or pins pushed out of the connector

#### DTC 11-01: EXCESSIVE CHANGE OF VEHICLE SPEED SIGNAL (REGULAR DIAGNOSIS)

##### NOTE:

- Before starting the troubleshooting, check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).
- The system is reducing the assist power, the EPS indicator will come on when the ECU detects conditions of DTC 11-01 and DTC 11-02.

##### 1. VS Sensor Signal line Open Circuit Inspection

Disconnect the engine sub-wire harness connector (FPE: 6P, FPM: 3P) and the EPS ECU 21P gray connector.

Check the Pink/green wire for continuity between the wire harness side 6P or 3P connector and EPS ECU 21P gray connector terminals.

##### TOOL:

Pin probe (Male)                      07ZAJ-RDJA110

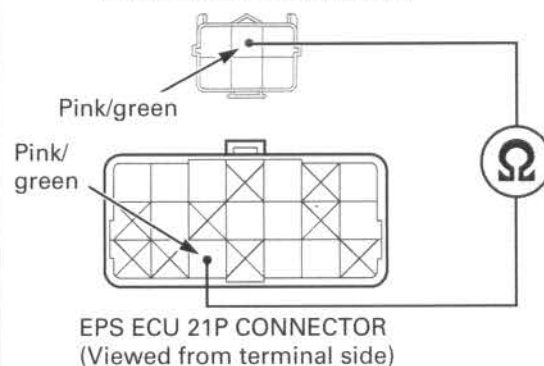
*Is there continuity?*

**NO**    - Open circuit in the Pink/green wire.

**YES**    - GO TO STEP 2.

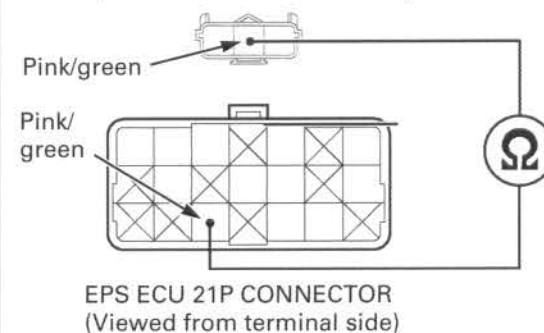
FPE model:

SUB-WIRE HARNESS 6P CONNECTOR  
(Viewed from terminal side)



FPM model:

SUB-WIRE HARNESS 3P CONNECTOR  
(Viewed from terminal side)





## 2. VS Sensor Signal line Short Circuit Inspection

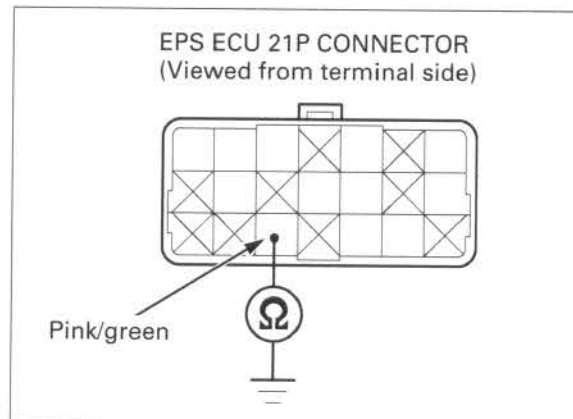
Check the Pink/green wire for continuity between the wire harness side EPS ECU 21P gray connector terminal and ground.

### TOOL:

Pin probe (Male) 07ZAJ-RDJA110

### Is there continuity?

- YES** – Short circuit in the Pink/green wire.  
**NO** – Replace the EPS ECU with a new one, and recheck (page 24-33).



## DTC 11-02: COMPARISON BETWEEN VEHICLE SPEED AND ENGINE SPEED SIGNAL (REGULAR DIAGNOSIS)

Refer to DTC 11-01: EXCESSIVE CHANGE OF VEHICLE SPEED SIGNAL TROUBLESHOOTING (page 24-16)

## DTC 13-01: EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) (INITIAL DIAGNOSIS)

### NOTE:

- Before starting the troubleshooting, check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).

### 1. EPS ECU System Inspection

- Erase the DTC (page 24-10).
- Start the engine.
- Fully turn the handlebar to the left or right and hold it 10 seconds.
- Check the EPS indicator.

### Does the EPS indicator come on?

- NO** – System is normal at this time.  
**YES** – GO TO STEP 2.

### 2. Motor Line Short Circuit Inspection

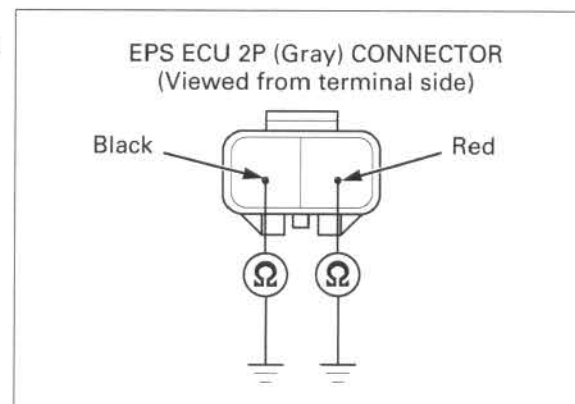
Disconnect the EPS ECU 2P gray connector. Check for continuity between each wire terminal of the EPS ECU 2P gray connector and ground.

### Connection:

**Black** – Body ground  
**Red** – Body ground

### Is there continuity?

- YES** – GO TO STEP 3.  
**NO** – GO TO STEP 4.





## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

### 3. Motor Short Circuit Inspection

Disconnect the EPS motor 2P gray connector.  
Check for continuity between each terminal of the motor side 2P connector and ground.

**Connection:**

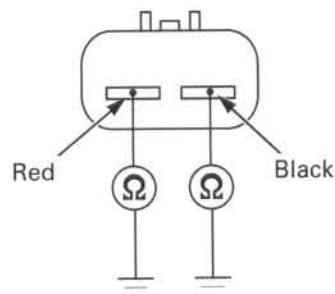
**Black – Body ground**

**Red – Body ground**

*Is there continuity?*

- NO** – Short circuit in the Red or Black wires .
- YES** – Replace the EPS unit with a new one, and recheck (page 14-35).

**MOTOR SIDE EPS MOTOR 2P CONNECTOR**  
(Viewed from terminal side)



### 4. Motor Line Short Circuit Inspection

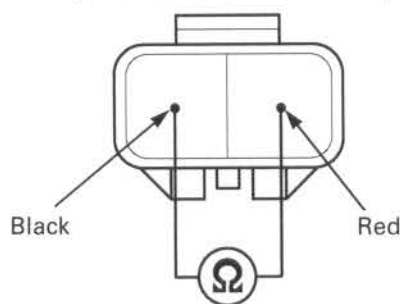
Disconnect the EPS motor 2P gray connector.  
Check for continuity between the terminals of the EPS ECU 2P gray connector.

**Connection: Red – Black**

*Is there continuity?*

- YES** – Short circuit in the motor sub-wire harness.
- NO** – Recheck for poor contact or loose connection in the wire harness. If they are OK, replace the EPS ECU with a new one (page 24-33).

**EPS ECU 2P (Gray) CONNECTOR**  
(Viewed from terminal side)



### DTC 13-02: EPS ECU INTERNAL CIRCUIT (UPPER FET STUCK ON) (INITIAL DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) troubleshooting (page 24-17)

### DTC 13-03: EPS ECU INTERNAL CIRCUIT (FET STUCK ON <OVER CURRENT>) (REGULAR DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) troubleshooting (page 24-17)

### DTC 13-04: EPS ECU INTERNAL CIRCUIT (FET STUCK ON (VM<VOLTAGE MOTOR>) (REGULAR DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)

### DTC 13-05: EPS ECU INTERNAL CIRCUIT (FET STUCK ON (OVER CURRENT<ACCUMULATED>) (REGULAR DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)

### DTC 14-01: EPS ECU INTERNAL CIRCUIT (POWER RELAY STUCK ON) (INITIAL DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)



**DTC 14-02: EPS ECU INTERNAL CIRCUIT (FAIL-SAFE RELAY 1 STUCK ON) (INITIAL DIAGNOSIS)**

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)

**DTC 14-03: EPS ECU INTERNAL CIRCUIT (FAIL-SAFE RELAY 2 STUCK ON) (INITIAL DIAGNOSIS)**

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)

**DTC 14-04: EPS ECU INTERNAL CIRCUIT (POWER RELAY STUCK OPEN) (REGULAR DIAGNOSIS)**

Refer to EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) TROUBLESHOOTING (page 24-17)

**DTC 15-01: 2WD/4WD SELECT SIGNAL BLINKING (REGULAR DIAGNOSIS)****NOTE:**

- Before starting the troubleshooting, check the following connectors for loose or poor contact (page 24-16).
  - 4WD select switch
  - EPS ECU 21P gray
  - meter 14P gray
- When this problem occurs, there are some of problem of 2WD/4WD select system.
- Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the 4WD indicator blinked, such as during 4WD-to-2WD selecting, 2WD-to-4WD selecting, at what speed, etc.

**1. EPS ECU System Inspection**

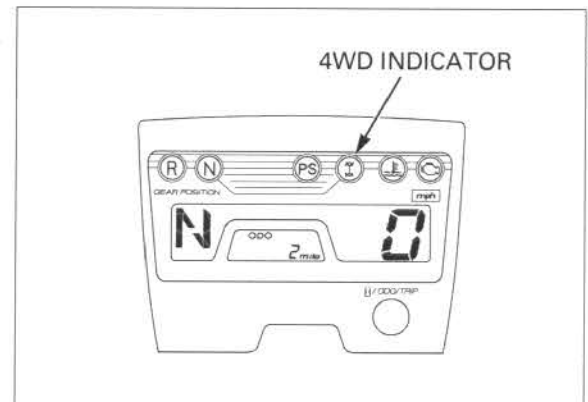
Erase the DTC (page 24-10).

Perform the test-ride and check the 4WD indicator.

***Does the 4WD indicator blinking?***

**NO** – Loose or poor contact of the connector.

**YES** – Check the 4WD select switch (page 22-18). If it is OK, inspect the 2WD/4WD select system (front final clutch; page 17-16).





### DTC 15-02: 2WD/4WD SELECT SIGNAL INPUT LINE (REGULAR DIAGNOSIS)

#### NOTE:

- Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the 4WD indicator blinked, such as during 4WD-to-2WD selecting, 2WD-to-4WD selecting, at what speed, etc.

#### 1. EPS ECU System Inspection

Erase the DTC (page 24-10).  
Start the engine and check the EPS indicator.

##### *Does the indicator come on?*

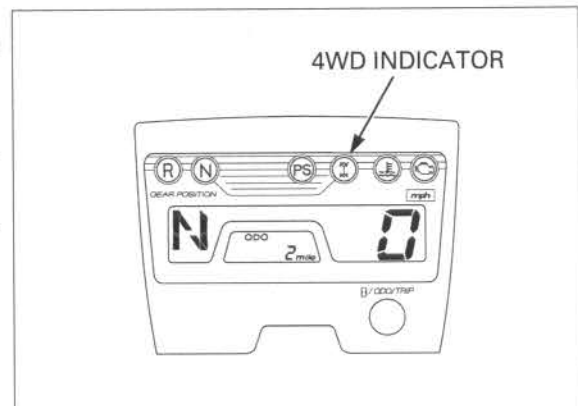
- NO** – System is normal at this time.  
**YES** – GO TO STEP 2.

#### 2. 4WD Indicator Inspection

Turn the ignition switch to ON.  
Operate the 2WD/4WD select lever several times and check the 4WD indicator.

##### *Is the 4WD indicator operated normally?*

- NO** – Check the 4WD select switch (page 22-18).  
**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).





## EPS ECU INTERNAL CIRCUIT

## NOTE:

- Before starting the troubleshooting, check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).

Perform the troubleshooting according to the DTC in the following table.

16-01	EPS ECU internal circuit (Direction determine logic circuit) (Regular diagnosis)
16-02	EPS ECU internal circuit (INH output circuit) (Initial diagnosis)
17-01	EPS ECU internal circuit (Voltage raise transformation circuit) (Initial diagnosis)
17-02	EPS ECU internal circuit (Voltage raise transformation circuit) (Regular diagnosis)
18-01	EPS ECU internal circuit (Current sensor) (Initial diagnosis)
18-02	EPS ECU internal circuit (Current sensor off set) (Regular diagnosis)
18-05	EPS ECU internal circuit (Motor current deflection) (Regular diagnosis)
18-06	EPS ECU internal circuit (IM2) (Regular diagnosis)
33-02	EPS ECU internal circuit (EEPROM) (Regular diagnosis)
35-01	EPS ECU internal circuit (CPU) (Initial diagnosis)
35-03	EPS ECU internal circuit (CPU communication) (Initial diagnosis)
35-04	EPS ECU internal circuit (CPU communication) (Regular diagnosis)

## 1. EPS ECU System Inspection

1. Erase the DTC (page 24-10).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it 10 seconds.
4. Check the EPS indicator.

*Does the EPS indicator come on?*

**NO** – System is normal at this time.

**YES** – GO TO STEP 2.

## 2. DTC Inspection

1. Check the DTC (page 24-9).

*Is DTC 16-01, 16-02, 17-01, 17-02, 18-01, 18-02, 18-05, 18-06, 33-01, 35-01, 35-03 or 35-04 indicated?*

**NO** – Perform the troubleshooting for the indicated DTC.

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).



### DTC 18-03: EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR STUCK LOW) (INITIAL DIAGNOSIS)

#### NOTE:

- Before starting the troubleshooting, check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).

#### 1. EPS ECU System Inspection

1. Erase the DTC (page 24-10).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it 10 seconds.
4. Check the EPS indicator.

#### *Does the EPS indicator come on?*

**NO** – System is normal at this time.

**YES** – GO TO STEP 2.

#### 2. Motor Line Open Circuit Inspection

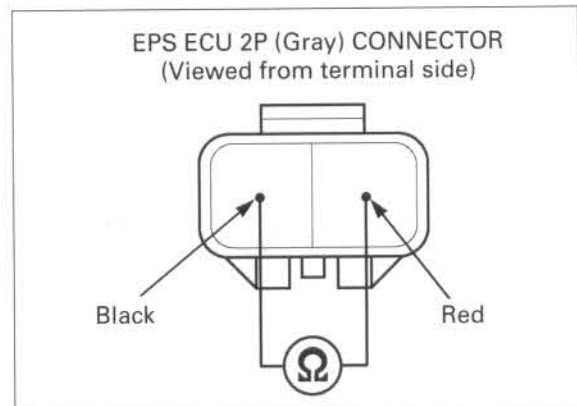
Disconnect the EPS ECU 2P gray connector. Check for continuity between the terminals of the EPS ECU 2P gray connector.

**Connection: Black – Red**

#### *Is there continuity?*

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).

**NO** – GO TO STEP 3.



#### 3. Motor Open Circuit Inspection

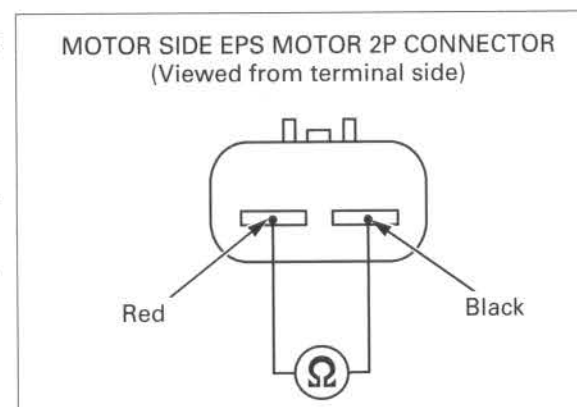
Disconnect the EPS motor 2P gray connector. Check for continuity between the terminals of the motor side 2P connector.

**Connection: Black – Red**

#### *Is there continuity?*

**YES** – Open circuit in the motor sub-wire harness.

**NO** – Replace the EPS unit with a new one, and recheck (page 14-35).



### DTC 18-04: EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR STUCK LOW) (REGULAR DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR STUCK LOW) (INITIAL DIAGNOSIS) troubleshooting (page 24-22)

### DTC 21-01: ABNORMAL MOTOR TERMINAL VOLTAGE (INITIAL DIAGNOSIS)

Refer to EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR LOW STUCK) (INITIAL DIAGNOSIS) troubleshooting (page 24-22)



**DTC 21-02: ABNORMAL MOTOR  
TERMINAL VOLTAGE (REGULAR  
DIAGNOSIS)**

Refer to EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR LOW STUCK) (INITIAL DIAGNOSIS) troubleshooting (page 24-22)

**DTC 21-03: OPEN IN THE MOTOR  
HARNESS (REGULAR DIAGNOSIS)**

Refer to EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR LOW STUCK) (INITIAL DIAGNOSIS) troubleshooting (page 24-22)

**DTC 22-01: FAILURE TO INITIALIZE  
THE TORQUE SENSOR (INITIAL  
DIAGNOSIS)****NOTE:**

- The EPS ECU stores the torque sensor neutral position. The torque sensor must be initialized whenever the EPS unit, the EPS ECU, etc is serviced (page 24-12).
- Refer to torque sensor neutral position information for detail of the initialization parts (page 24-8).
- The DTC will not store in the EPS ECU. (The stored DTC is erased by performing the torque sensor initialization) (page 24-12)
- The torque sensor neutral position is not effected when erasing the DTC. (page 24-10)

**1. Initializing Torque Sensor**

Perform the torque sensor initialization (page 24-12).

***Does the EPS indicator come on?***

**NO** – System is normal at this time.

**YES** – Check the DTC and perform the troubleshooting for the indicated DTC.

**DTC 23-01: LOW/HIGH VOLTAGE FOR  
THE TORQUE SENSOR (VT1 AND VT2)  
(REGULAR DIAGNOSIS)****NOTE:**

- Before starting the troubleshooting, check the related connectors for loose or poor contact.

**1. EPS ECU System Inspection**

1. Erase the DTC (page 24-10).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it 10 seconds.
4. Check the EPS indicator.

***Does the EPS indicator come on?***

**NO** – System is normal at this time.

**YES** – GO TO STEP 2.



## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

### 2. Torque Sensor Line Short Circuit Inspection

Disconnect the EPS ECU 21P gray connector.  
Check for resistance between the terminals of the EPS ECU 21P gray connector.

**Connection:**

Yellow/red – Green/orange

Yellow/red – White/blue

White/blue – Green/orange

**TOOL:**

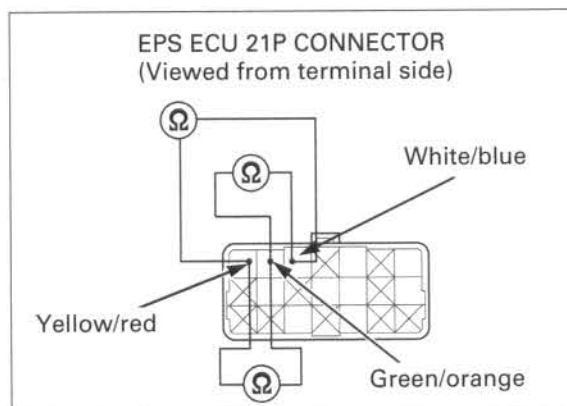
Pin probe (Male)

07ZAJ-RDJA110

*Is the resistance less than 10  $\Omega$  (at 20°C/68°F)?*

**YES** – GO TO STEP 3.

**NO** – GO TO STEP 4.



### 3. Torque Sensor Coil Short Circuit Inspection

Disconnect the torque sensor 3P connector.  
Check for resistance between the sensor terminals in the EPS unit.

**Connection:**

A terminal – B terminal

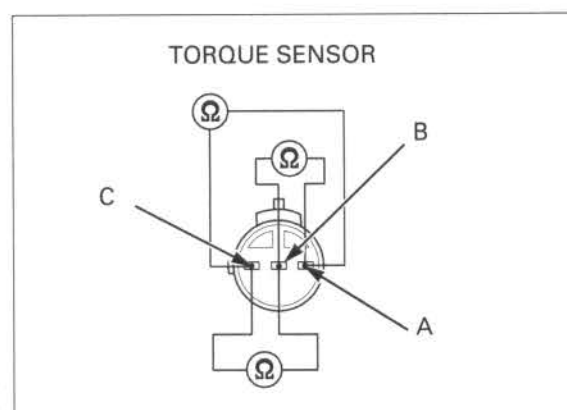
A terminal – C terminal

B terminal – C terminal

*Is the resistance less than 10  $\Omega$  (at 20°C/68°F)?*

**YES** – Replace the EPS unit with a new one, and recheck (short circuit in the torque sensor coil) (page 14-35).

**NO** – Short circuit in the wire harness between the EPS ECU and torque sensor.



### 4. Torque Sensor Line and Body Ground Short Circuit Inspection

Check for continuity between wire harness side of the EPS ECU 21P gray connector and body ground.

**Connection:**

Yellow/red – Body ground

White/blue – Body ground

**TOOL:**

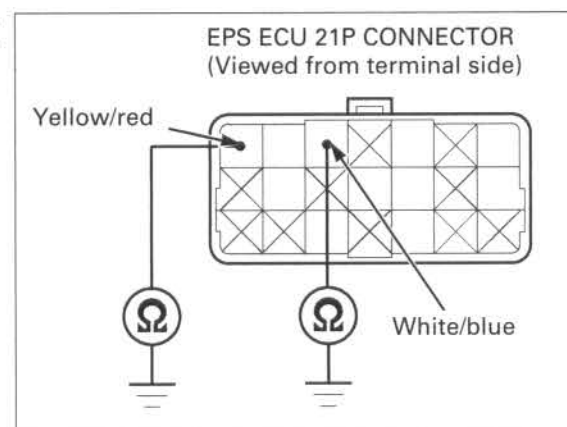
Pin probe (Male)

07ZAJ-RDJA110

*Is there continuity?*

**YES** – GO TO STEP 5.

**NO** – GO TO STEP 6.





## 5. Torque Sensor Coil Short Circuit Inspection

Disconnect the torque sensor 3P connector.  
Check for continuity between the sensor A and C terminals in the EPS unit and ground.

**Connection:**

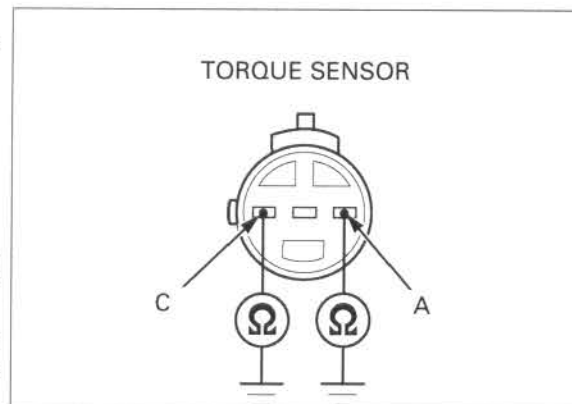
**A terminal – Body ground**

**C terminal – Body ground**

**Is there continuity?**

**YES** – Replace the EPS unit with a new one, and recheck (short circuit in the torque sensor coil) (page 14-35).

**NO** – Short circuit in the wire harness between the EPS ECU and torque sensor.



## 6. Torque Sensor Line Open Circuit Inspection

Disconnect the torque sensor 3P connector.  
Check for continuity between the EPS ECU 21P gray connector and torque sensor 3P connector terminals.

**Connection:**

**Yellow/red – Yellow/red**

**White/blue – White/blue**

**Green/orange – Green/orange**

**TOOL:**

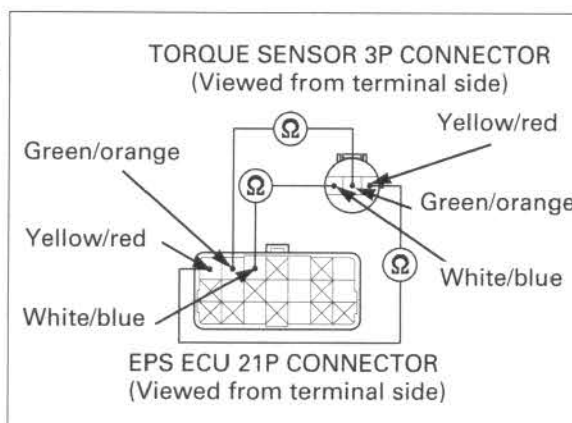
**Pin probe (Male)**

**07ZAJ-RDJA110**

**Is there continuity?**

**NO** – Open circuit in the wire harness between the EPS ECU and torque sensor.

**YES** – GO TO STEP 7.



## 7. Torque Sensor Open Circuit Inspection

Check that the resistance between the torque sensor terminals in the EPS unit.

**Connection:**

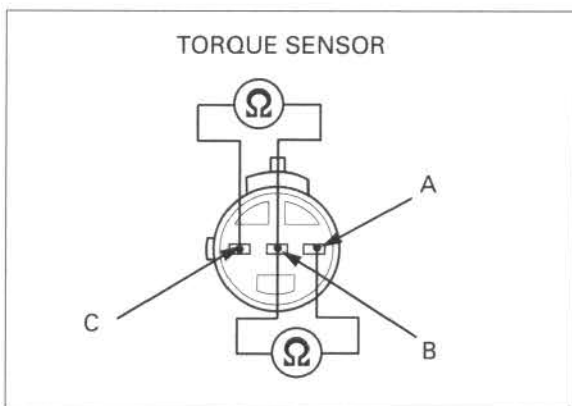
**A terminal – B terminal**

**B terminal – C terminal**

**Is the resistance within 10 – 40  $\Omega$  at 20°C/68°F?**

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).

**NO** – Replace the EPS unit with a new one, and recheck (short circuit in the torque sensor coil) (page 14-35).





### **DTC 23-02: TORQUE SENSOR (VT3 DIFFERENTIAL AMPLIFICATION FUNCTION) (REGULAR DIAGNOSIS)**

**NOTE:**

- Before starting the troubleshooting, check the related connectors for loose or poor contact.

#### **1. EPS ECU System Inspection**

1. Erase the DTC (page 24-10).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it 10 seconds.
4. Check the EPS indicator.

***Does the EPS indicator come on?***

**NO** – System is normally in this time.

**YES** – GO TO STEP 2.

#### **2. DTC Inspection**

1. Check the DTC (page 24-9).

***Is DTC 23-2 indicated?***

**NO** – Perform the troubleshooting for the indicated DTC.

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).

### **DTC 23-03: TORQUE SENSOR (VT1, VT2 RAPID CHANGE) (REGULAR DIAGNOSIS)**

Refer to LOW/HIGH VOLTAGE FOR THE TORQUE SENSOR (VT1 AND VT2) TROUBLESHOOTING (page 24-23).

### **DTC 23-04: TORQUE SENSOR (TEMPERATURE SENSOR) (REGULAR DIAGNOSIS)**

Refer to LOW/HIGH VOLTAGE FOR THE TORQUE SENSOR (VT1 AND VT2) TROUBLESHOOTING (page 24-23).

### **DTC 23-05: TORQUE SENSOR (SENSOR COIL) (REGULAR DIAGNOSIS)**

Refer to LOW/HIGH VOLTAGE FOR THE TORQUE SENSOR (VT1 AND VT2) TROUBLESHOOTING (page 24-23).



**DTC 24-01: ENGINE SPEED SIGNAL  
(REGULAR DIAGNOSIS)****NOTE:**

- Before starting the troubleshooting, check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).

**1. CKP Sensor Signal Line Open Circuit Inspection**

Disconnect the PCM/ECM 33P black and EPS ECU 21P gray connectors.

Check the Blue/yellow wire for continuity between the EPS ECU 21P gray connector and PCM/ECM 33P black connector terminals.

**TOOL:**

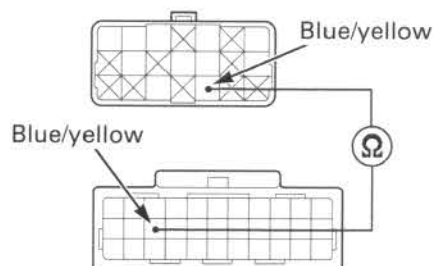
**Pin probe (Male)**                      **07ZAJ-RDJA110**

***Is there continuity?***

**NO**    – Open circuit in the Blue/yellow wire.

**YES**    – GO TO STEP 2.

**EPS ECU 21P CONNECTOR**  
(Viewed from terminal side)



**PCM/ECM 33P (Black) CONNECTOR**  
(Viewed from terminal side)

**2. CKP Sensor Signal Line Short Circuit Inspection**

Check the Blue/yellow wire for continuity between the wire harness side EPS ECU 21P gray connector terminal and ground.

**TOOL:**

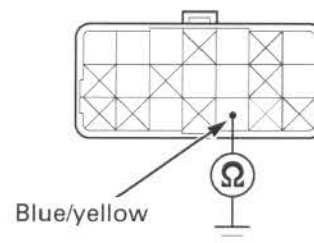
**Pin probe (Male)**                      **07ZAJ-RDJA110**

***Is there continuity?***

**YES**    – Short circuit in the Blue/yellow wire.

**NO**    – Replace the EPS ECU with a new one, and recheck (page 24-33).

**EPS ECU 21P CONNECTOR**  
(Viewed from terminal side)





### DTC 31-01: LOW/HIGH IG1-TERMINAL VOLTAGE (INITIAL DIAGNOSIS)

**NOTE:**

Before starting the troubleshooting check the following items:

- Check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).
- check for a blown 10A IGN fuse.
- battery condition (must use a fully charged battery)

#### 1. IG1 Line Open Circuit Inspection

Disconnect the EPS ECU 21P gray connector. With the ignition switch turned to ON, measure the voltage between the Black/red wire terminal of the EPS ECU 21P gray connector and ground.

**Connection: Black/red(+) – Body ground (-)**

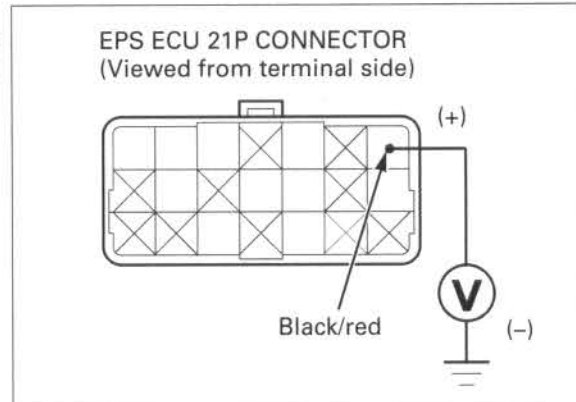
**TOOL:**

Pin probe (Male)                      07ZAJ-RDJA110

*Is there battery voltage?*

**NO** – Open circuit in the Black/red wire.

**YES** – GO TO STEP 2.



#### 2. Battery Inspection

Perform the Battery/Charging System troubleshooting (page 19-5).

*Is the battery and charging system in good condition?*

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).

**NO** – Repair the battery/charging system.

### DTC 31-02: LOW/HIGH IG1-TERMINAL VOLTAGE (REGULAR DIAGNOSIS)

Refer to DTC 31-01: LOW/HIGH IG1-TERMINAL VOLTAGE (INITIAL DIAGNOSIS) TROUBLESHOOTING (page 24-28)



**DTC 32-01: LOW/HIGH VBU VOLTAGE  
(REGULAR DIAGNOSIS)****NOTE:**

Before starting the troubleshooting check the following items

- Check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).
- check for a blown 40A and 10A IGN fuses.
- battery condition (must use a fully charged battery)

**1. EPS ECU +B Line Open Circuit Inspection**

Disconnect the EPS ECU 2P brown connector. With the ignition switch turned to ON, measure the voltage between the Red wire terminal of the EPS ECU 2P brown connector and ground.

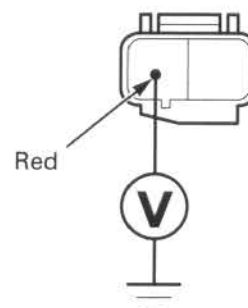
**Connection: Red (+) – Body ground (-)**

***Is there battery voltage?***

**NO** – Open circuit in the Red wire.

**YES** – GO TO STEP 2.

EPS ECU 2P (Brown) CONNECTOR  
(Viewed from terminal side)

**2. Battery Inspection**

Perform the Battery/Charging System troubleshooting (page 19-5).

***Is the battery and charging system in good condition?***

**YES** – Replace the EPS ECU with a new one, and recheck (page 24-33).

**NO** – Repair the battery and charging system.



### SYMPTOM TROUBLESHOOTING

- Refer to "EPS Connector Location" for the connector location and the necessary parts to disconnect the connector (page 24-5).
- Perform inspection with the ignition switch turned to OFF, unless otherwise specified.

#### EPS INDICATOR DOES NOT COME ON

##### NOTE:

- Under normal conditions, the EPS indicator comes on when the ignition switch is turned to ON, then goes off after starting the engine.
- Before starting the troubleshooting, check the connectors for loose contacts or corroded terminals.

##### 1. Combination Meter Inspection

Check that the combination meter functions properly.

###### *Does the combination function properly?*

**NO** – Perform the combination meter inspection (page 22-6).

**YES** – GO TO STEP 2.

##### 2. Indicator Operation Check (Short Circuit inspection)

Disconnect the EPS ECU 21P gray connector. Turn the ignition switch to ON and check the EPS indicator.

###### *Does the indicator come on?*

**YES** – Recheck for poor contact or loose connection in the wire harness. If they are OK, replace the EPS ECU with a new one (page 24-33).

**NO** – GO TO STEP 3.



##### 3. Indicator Line Short Circuit inspection

Turn the ignition switch to OFF.

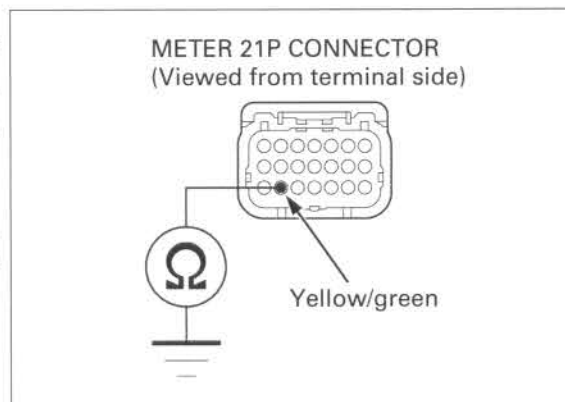
Disconnect the combination meter 21P black connector.

Check the for continuity between the Yellow/green wire terminal of the wire harness side meter 21P black connector and ground.

###### *Is there continuity?*

**NO** – Recheck for poor contact or loose connection in the wire harness. If they are OK, replace the combination meter with a new one (page 22-6).

**YES** – Short circuit in the Yellow/green wire.





## EPS INDICATOR DOES NOT GO OFF, AND NO DTCs ARE STORED

### NOTE:

- Under normal conditions, the EPS indicator comes on when the ignition switch is turned to ON, then goes off after starting the engine.
- Before starting the troubleshooting check the following items:
  - Check the related connectors for loose or poor contact, and recheck the EPS indicator (page 24-9).
  - check for a blown 40A and 10A IGN fuses.
  - battery condition (must use a fully charged battery)

### 1. Fuse Inspection

Check the 40A and 10A IGN fuses.

#### *Is the fuse OK?*

**NO** – Replace the fuse and recheck. If the fuse is blown, check for short to ground in this fuse circuit.

**YES** – GO TO STEP 2.

### 2. DTC Inspection

Check the DTC (page 24-9).

#### *Are there any DTCs?*

**YES** – Troubleshoot the indicated DTC.

**NO** – GO TO STEP 3.

### 3. Indicator Operation Check (Open Circuit Inspection)

Disconnect the EPS ECU 21P gray connector. Ground the Yellow/green wire terminal of the wire harness side EPS ECU 21P gray connector with a jumper wire.

#### TOOL:

**Pin probe (Male)**                      **07ZAJ-RDJA110**

Turn the ignition switch to ON and check the EPS indicator.

#### *Does the indicator go off?*

**YES** – Check for poor contact or loose connection in the wire harness. If they are OK, replace the EPS ECU with a new one (page 24-33).

**NO** – GO TO STEP 4.

### 4. Indicator Line Open Circuit Inspection

Turn the ignition switch to OFF.

Disconnect the combination meter 21P black connector.

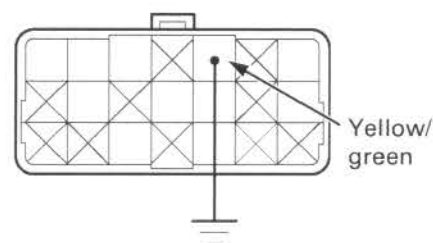
Check the Yellow/green wire for continuity between the combination meter 21P black connector and EPS ECU 21P gray connector terminals.

#### *Is there continuity?*

**NO** – Open circuit in the Yellow/green wire.

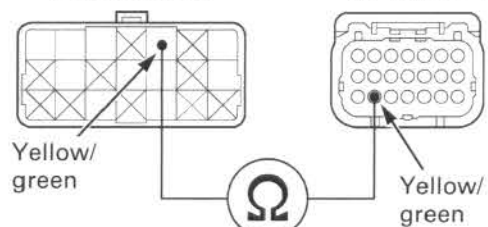
**YES** – GO TO STEP 5.

EPS ECU 21P CONNECTOR  
(Viewed from terminal side)



EPS ECU 21P  
CONNECTOR

METER 21P  
CONNECTOR



(Viewed from terminal side)



## ELECTRIC POWER STEERING (EPS: FPM/FPE models)

### 5. SCS Line Short Circuit Inspection

Check for continuity between the Brown/red wire terminal of the wire harness side EPS ECU 21P gray connector.

**Connection: Brown/red – Body ground**

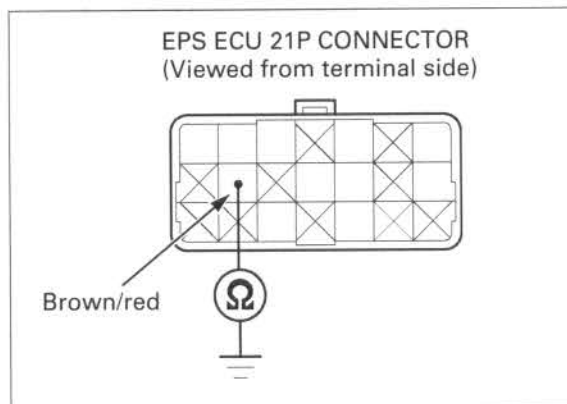
**TOOL:**

**Pin probe (Male) 07ZAJ-RDJA110**

**Is there continuity?**

**YES** – Short circuit in the Brown/red wire between the EPS ECU and DLC.

**NO** – GO TO STEP 6.



### 6. IG1 Line Open Circuit Inspection

With the ignition switch turned to ON, measure the voltage between the Black/red wire terminal (+) of the wire harness side EPS ECU 21P gray connector and ground (-).

**Connection: Black/red (+) – Body ground (-)**

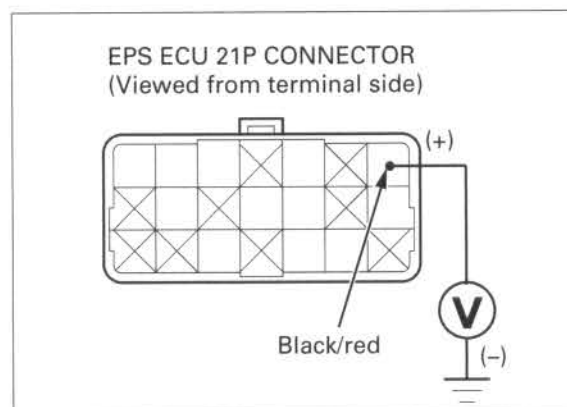
**TOOL:**

**Pin probe (Male) 07ZAJ-RDJA110**

**Is there battery voltage?**

**NO** – Open circuit in the Black/red wire.

**YES** – GO TO STEP 7.



### 7. EPS ECU +B Line Open Circuit Inspection

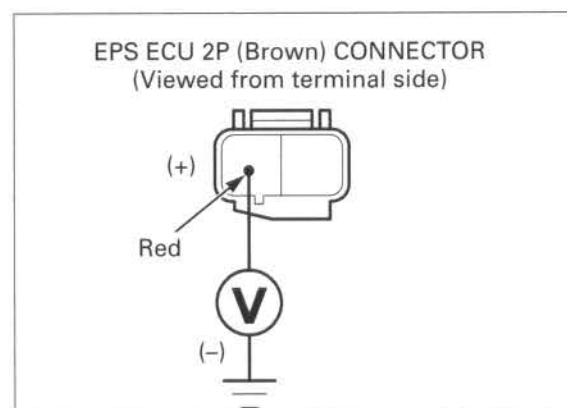
Disconnect the EPS ECU 2P brown connector. Measure the voltage between the Red wire terminal (+) of the wire harness side 2P brown connector and ground (-).

**Connection: Red (+) – Body ground (-)**

**Is there battery voltage?**

**NO** – Open circuit in the Red wire.

**YES** – GO TO STEP 8.



### 8. EPS ECU PG Line Open Circuit Inspection

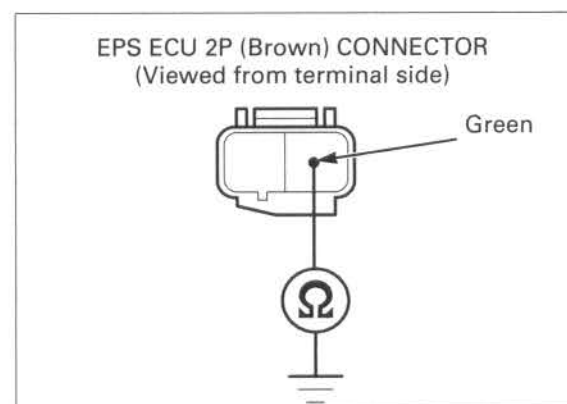
Check for continuity between the Green wire terminal of the wire harness side EPS ECU 2P brown connector and ground.

**Connection: Green(+) – Body ground (-)**

**Is there continuity?**

**NO** – Open circuit in the Green wire.

**YES** – GO TO STEP 9.





### 9. Battery Inspection

Perform the Battery/Charging System troubleshooting (page 19-5).

**Is the battery and charging system in good condition?**

- YES** – Recheck for poor contact or loose connection in the wire harness. If they are OK, replace the EPS ECU with a new one (page 24-33).
- NO** – Repair the battery and charging system.

## EPS ECU

### REMOVAL/INSTALLATION

Remove the left mudguard (page 3-6).

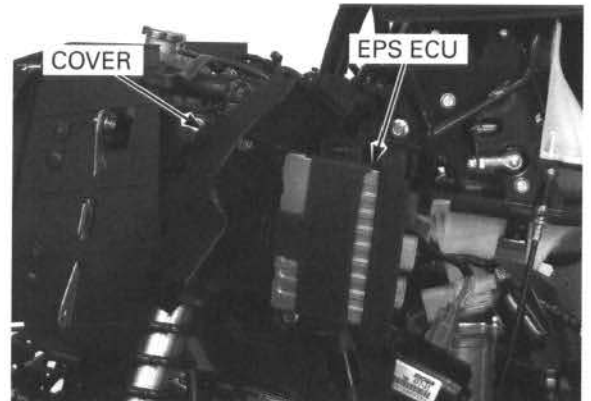
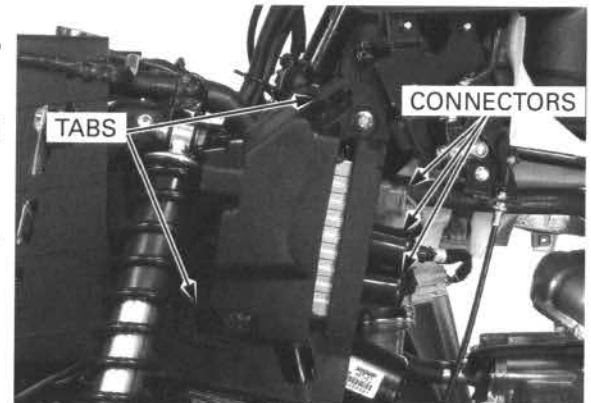
Disconnect the EPS ECU connectors (2P brown, 2P gray and 21P gray).

Release the two tabs to open the holder cover.

Remove the EPS ECU from the stays on the ECU holder.

Installation is in the reverse order of removal.

Perform the torque sensor initialization (page 24-12).





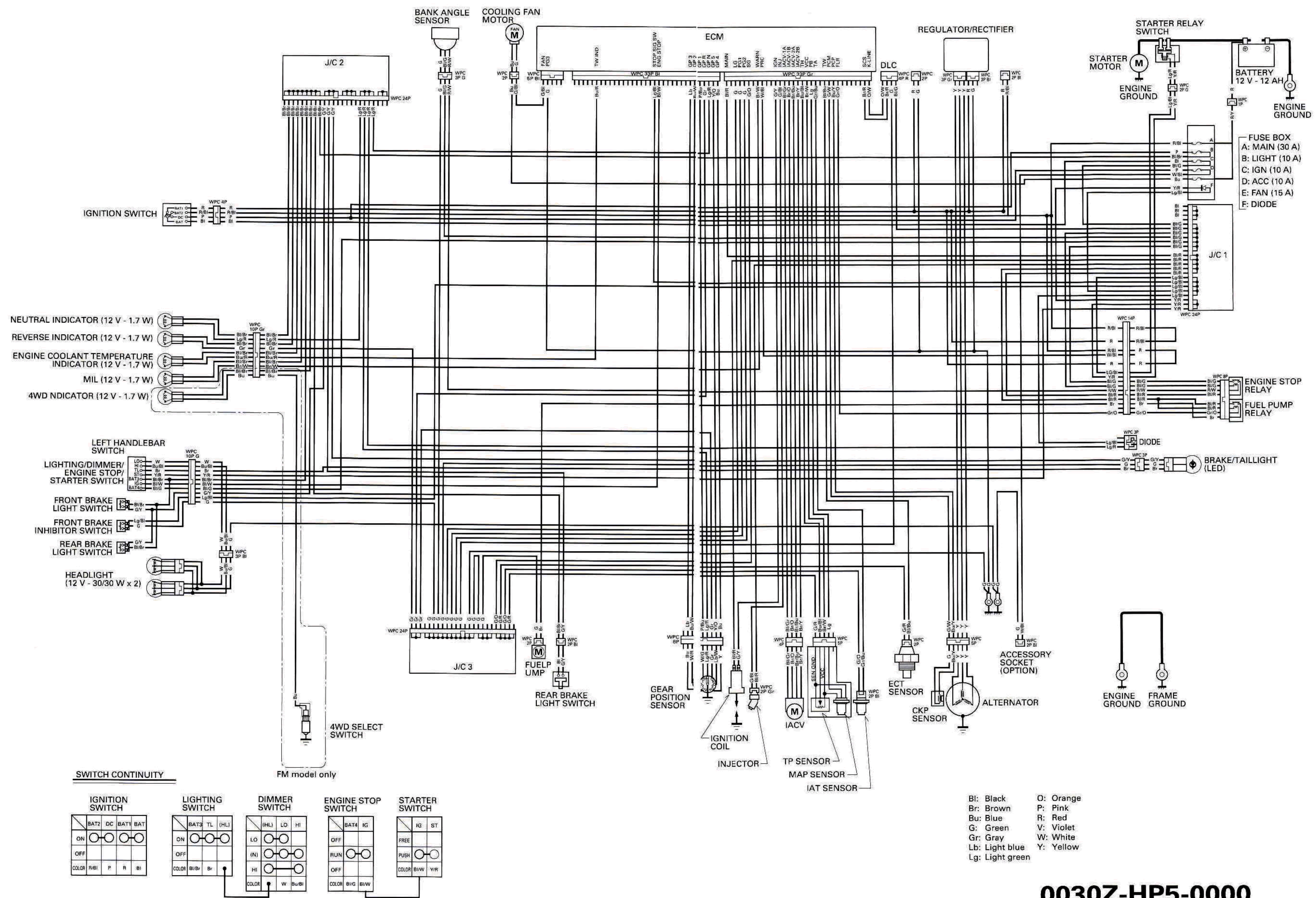
## 25. WIRING DIAGRAMS

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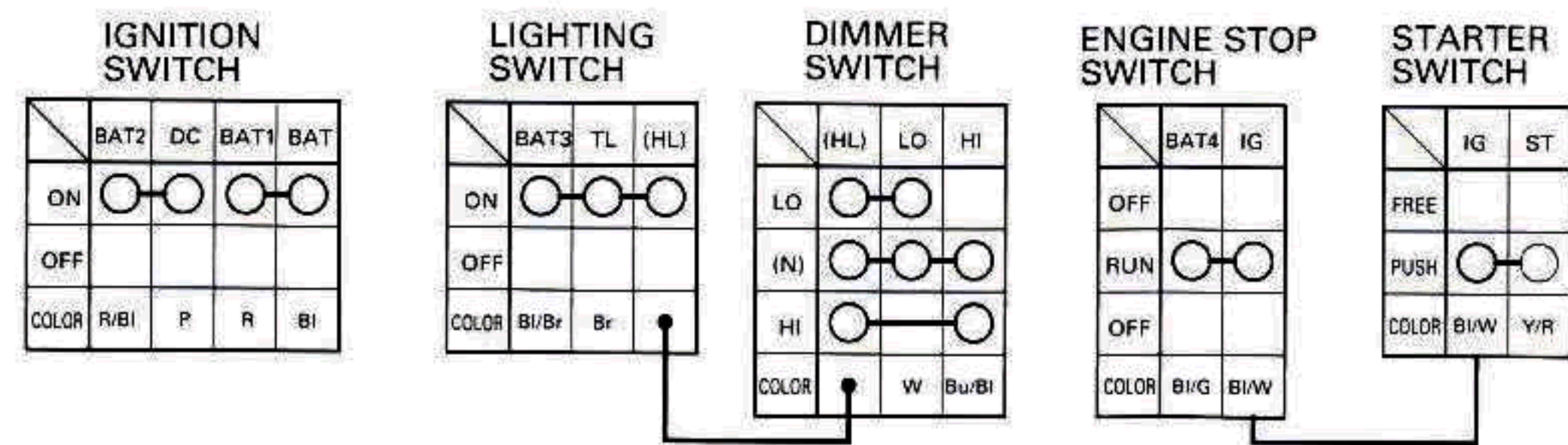
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'08 TE/FE models .....	25-7	FPE model .....	25-12



'07 TM/FM models



SWITCH CONTINUITY



- Bl: Black
- Br: Brown
- Bu: Blue
- G: Green
- Gr: Gray
- Lb: Light blue
- Lg: Light green
- O: Orange
- P: Pink
- R: Red
- V: Violet
- W: White
- Y: Yellow



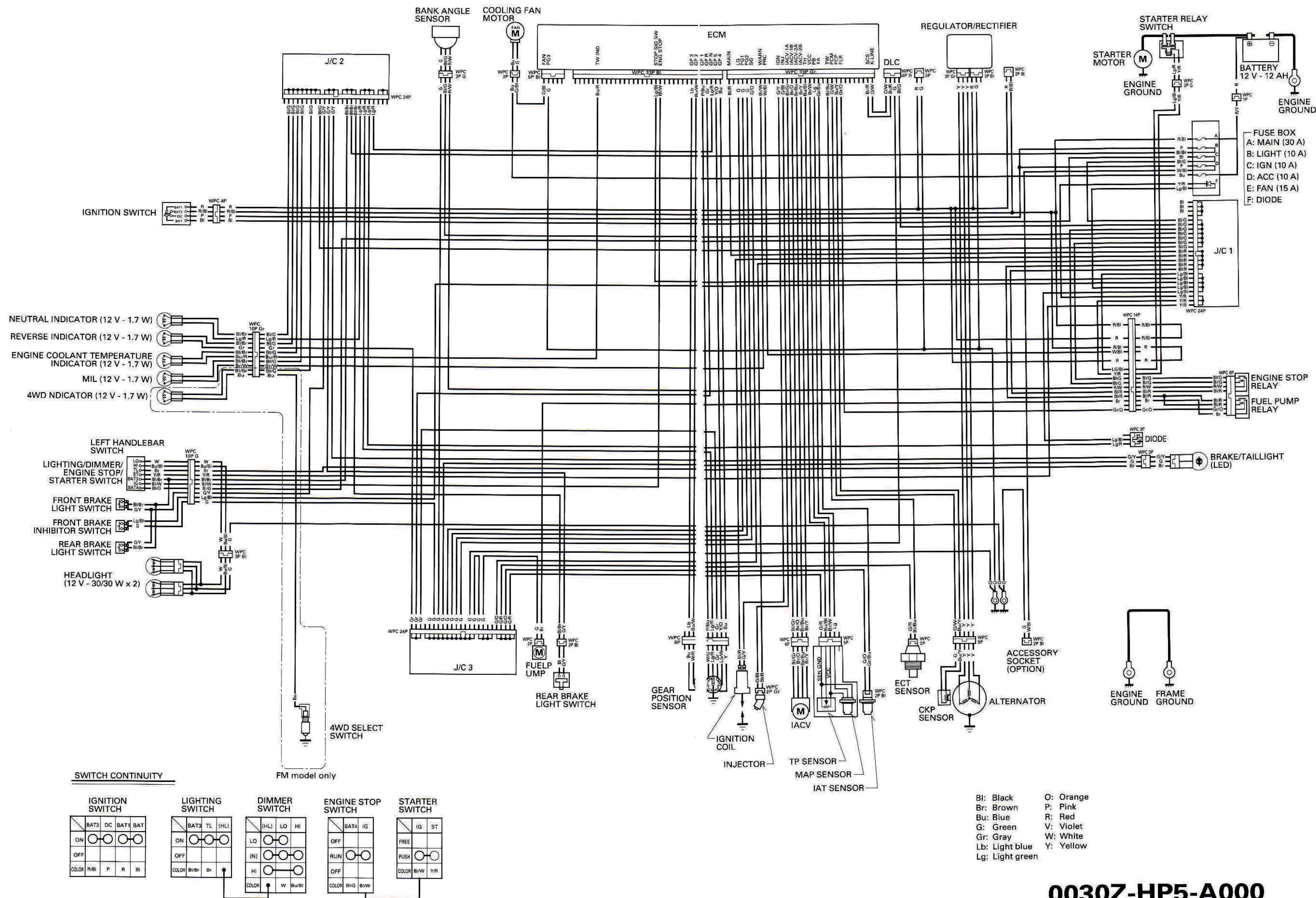
## '07 TE/FE models



**0030Z-HP5-6000**

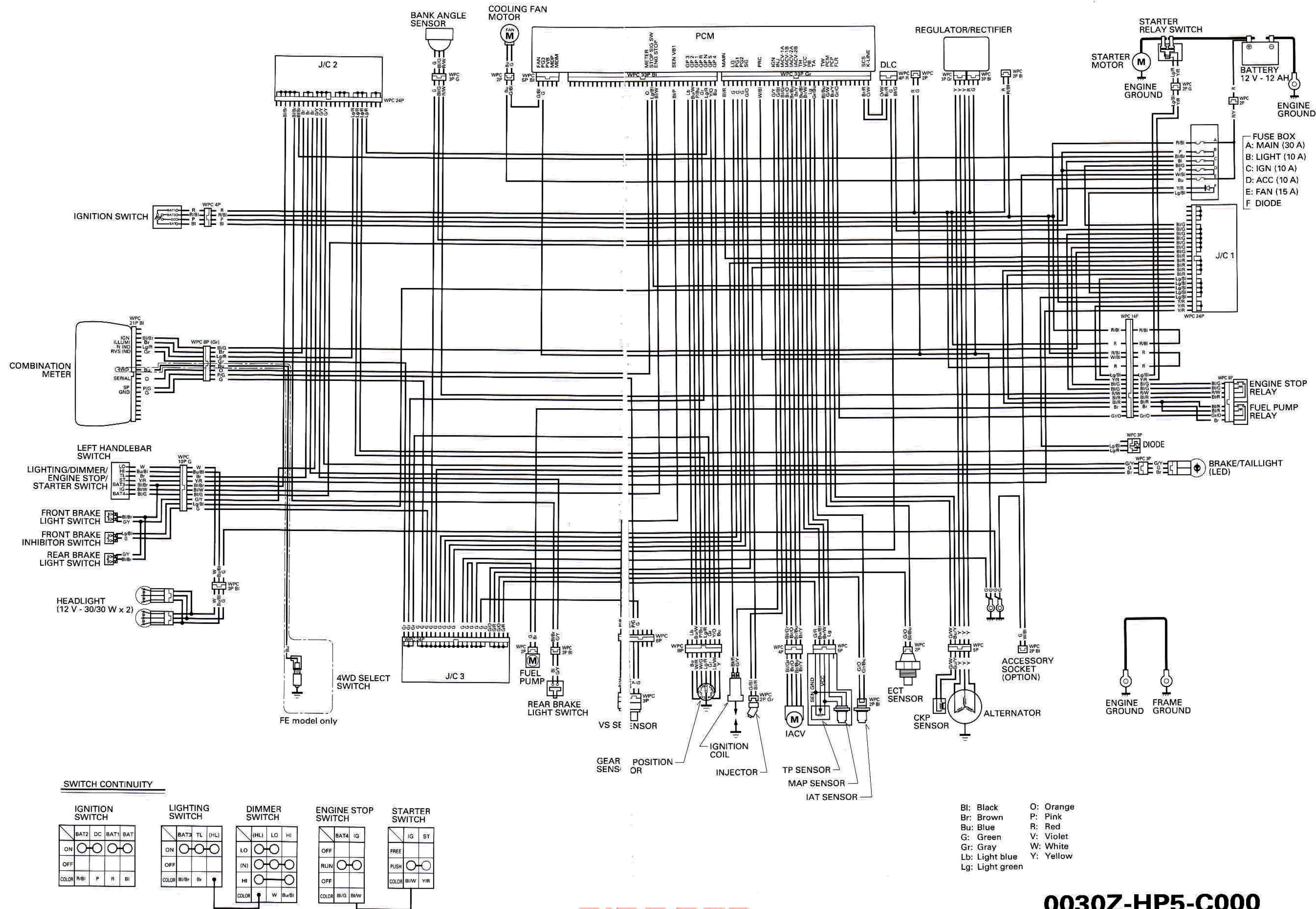


'08 U.S.A. TM/FM models



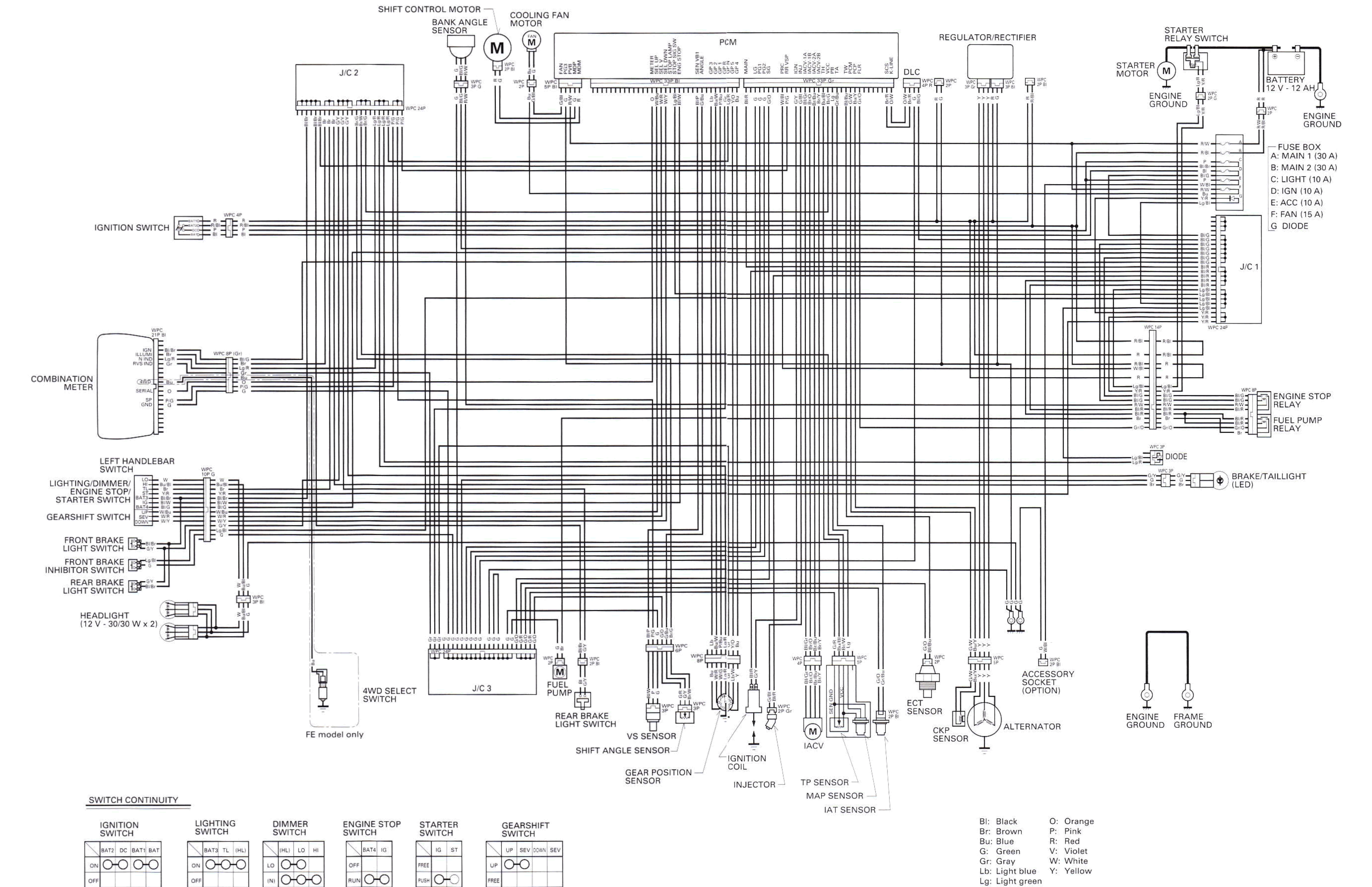
0030Z-HP5-A000







'08 TE/FE models

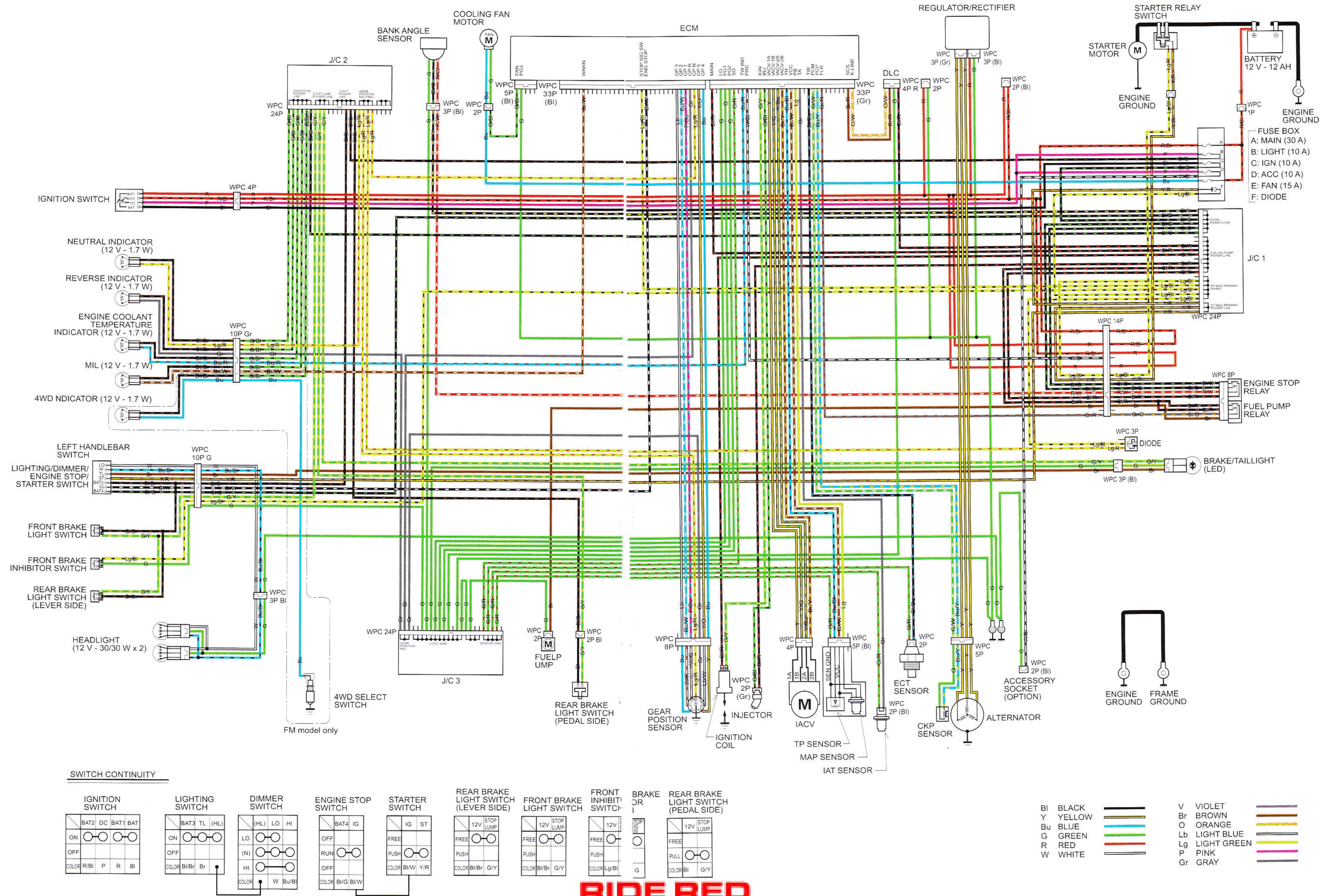


RIIDE RED

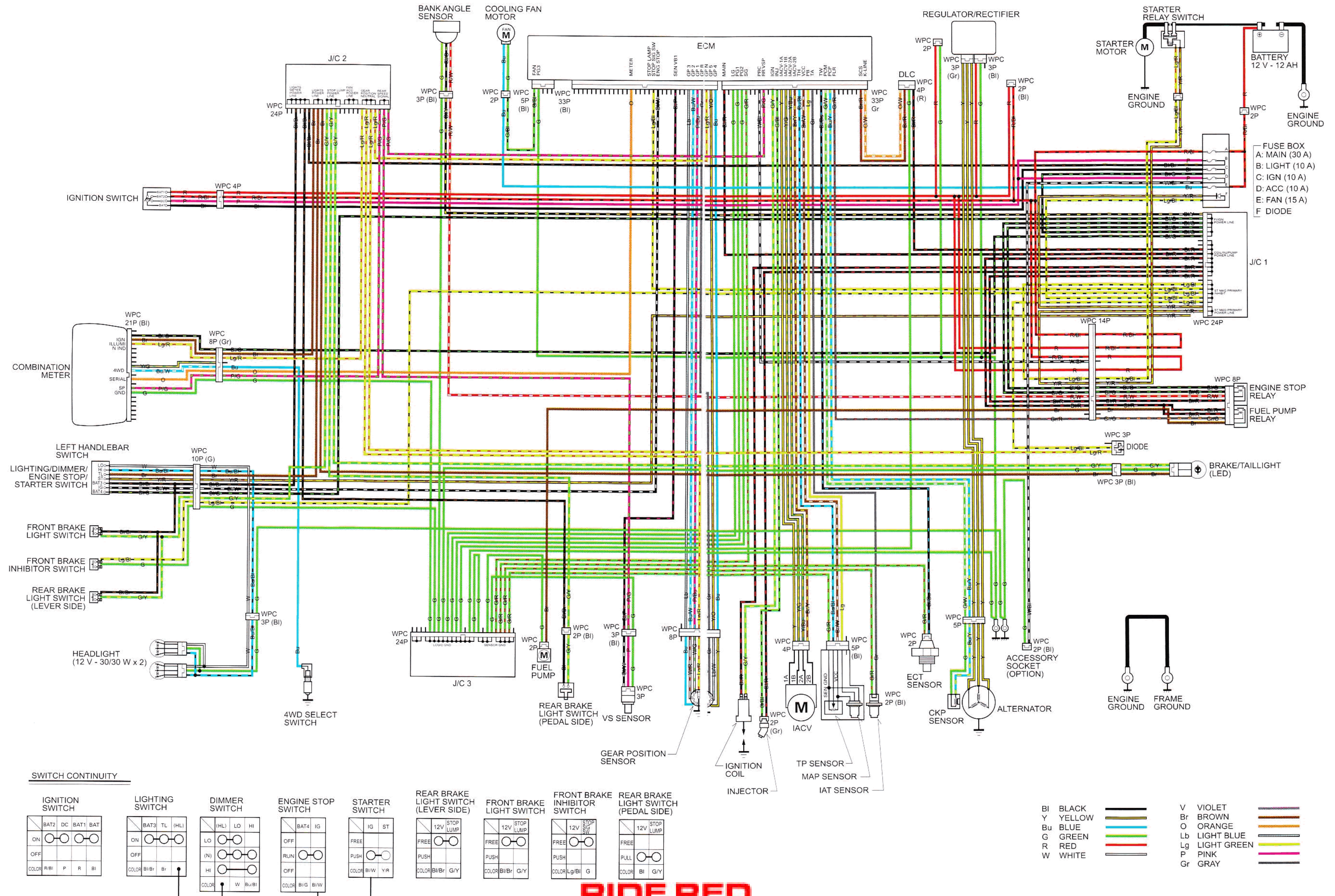
0030Z-HP5-A100



WIRING DIAGRAMS  
After '08 U.S.A. TM/FM models



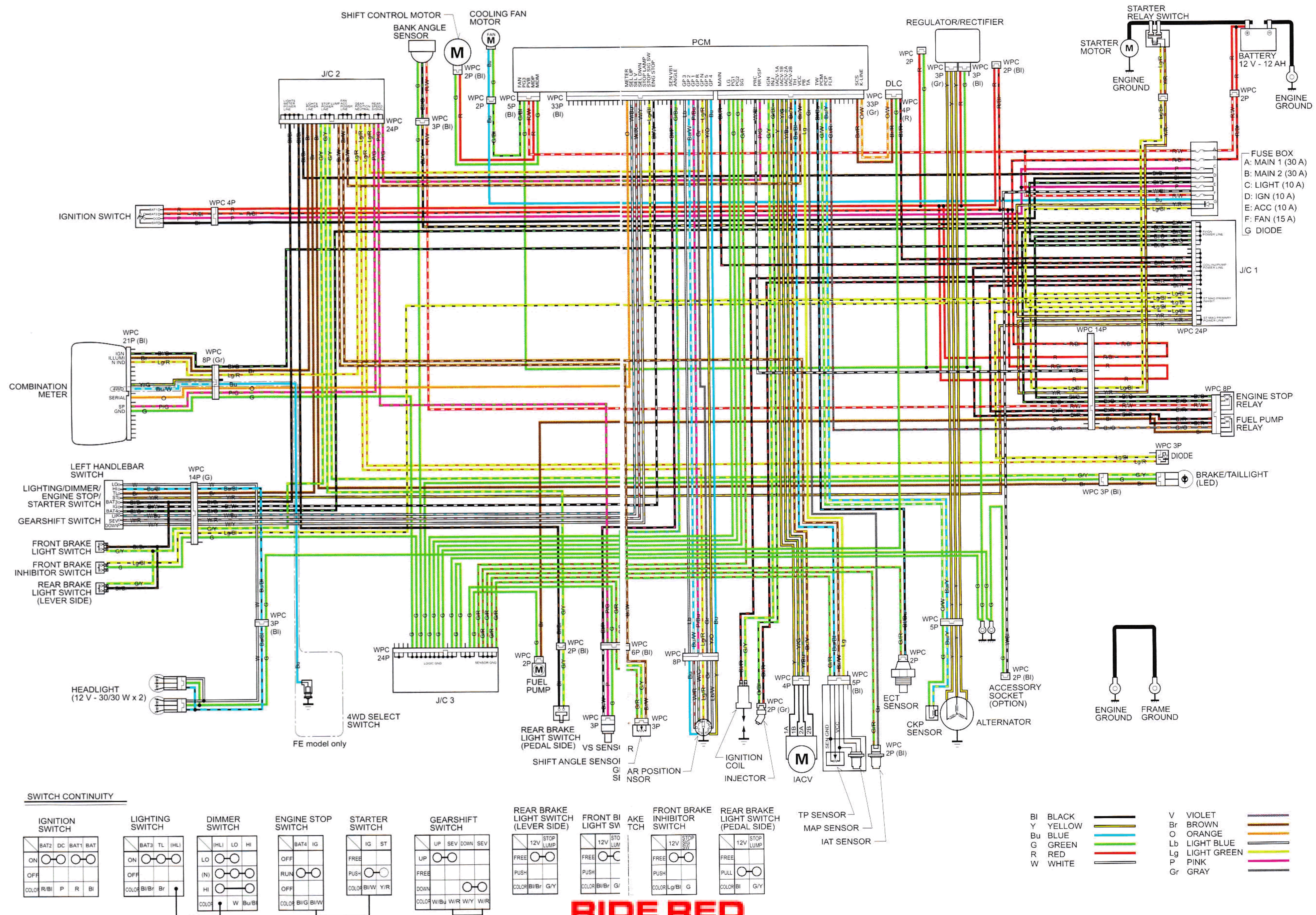






WIRING DIAGRAMS

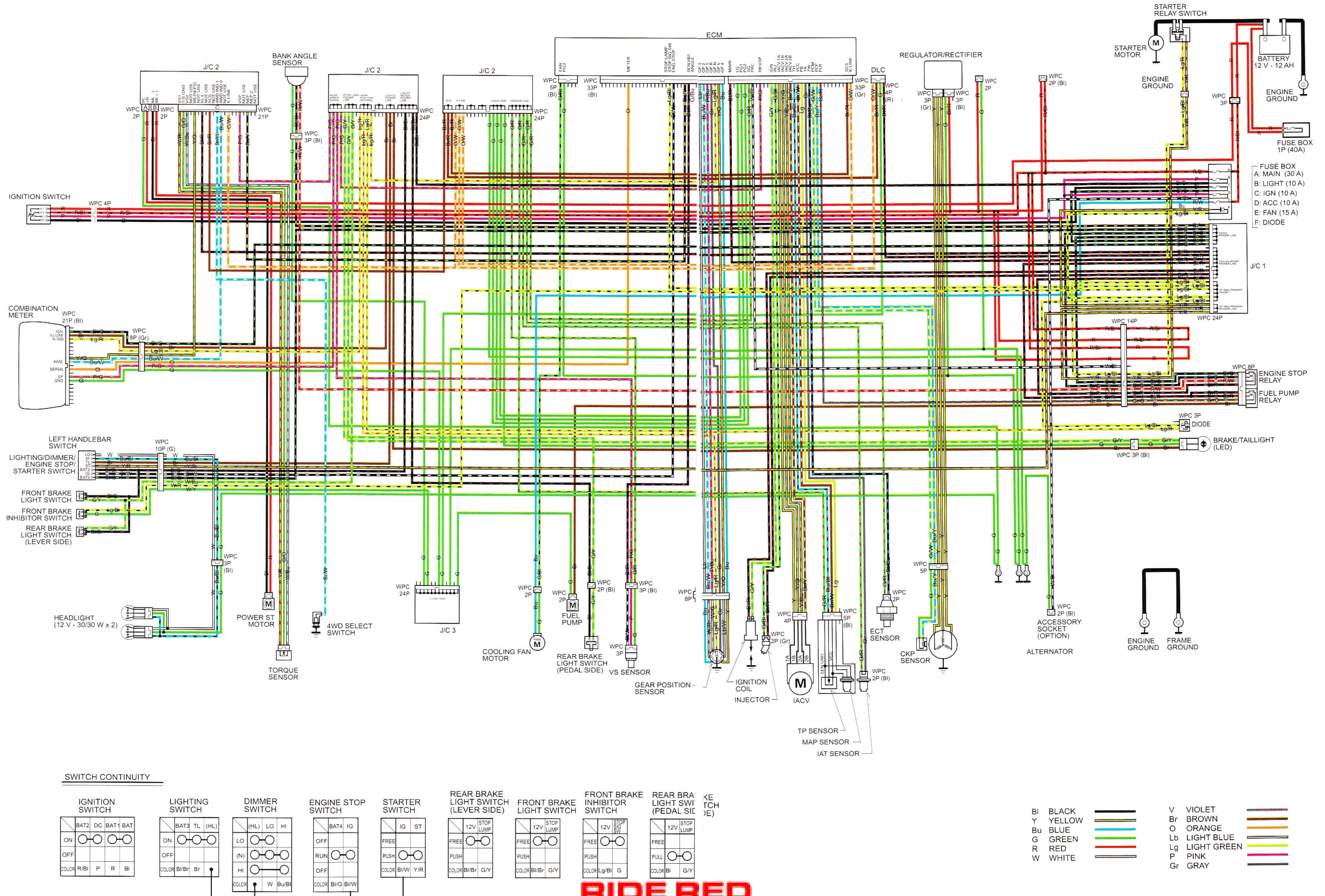
After '08 TE/FE models



RIIDE RED



FPM model





## FPE model





## 26. TROUBLESHOOTING

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ENGINE DOES NOT START OR  
IS HARD TO START ..... 26-2

ENGINE LACKS POWER ..... 26-3

POOR PERFORMANCE AT LOW AND  
IDLE SPEED ..... 26-5

POOR PERFORMANCE AT HIGH  
SPEED ..... 26-6

POOR HANDLING ..... 26-6



# ENGINE DOES NOT START OR IS HARD TO START

### 1. Spark Plug Inspection

Remove and inspect spark plug.

*Is the spark plug in good condition?*

- NO** – • Incorrect spark plug heat range  
• Incorrect spark plug gap  
• Dirty air cleaner

**YES** – GO TO STEP 2.

### 2. Spark Test

Perform spark test.

*Is there weak or no spark?*

- YES** – • Loose or disconnected ignition system wire  
• Broken or shorted spark plug wire  
• Loose or disconnected ignition system wires  
• Faulty ignition coil

**NO** – GO TO STEP 3.

### 3. Fuel Pump Inspection

Check for operation of the fuel pump and inspect the fuel flow.

*Is the fuel pump unit normal?*

- NO** – Faulty fuel pump

**YES** – GO TO STEP 4.

### 4. PGM-FI System Inspection

Check the PGM-FI system (page 6-6).

*Is the PGM-FI system normal?*

- NO** – Faulty PGM-FI system

**Yes** – GO TO STEP 5.

### 5. Cylinder Compression

Test cylinder compression.

*Is the compression low?*

- YES** – • Valve clearance too small  
• Valve stuck open  
• Worn cylinder and piston rings  
• Damaged cylinder head gasket  
• Seized valve  
• Improper valve timing

**NO** – GO TO STEP 5.

### 6. Engine Start Condition

Start by following normal procedure.

*Did the engine start but stops?*

- YES** – • Leaking throttle body insulator  
• Contaminated fuel  
• Improper ignition timing



## ENGINE LACKS POWER

### 1. Drivetrain Inspection

Raise wheel off the ground and spin by hand.

***Does the wheel spin freely?***

- NO** – • Brake dragging  
• Worn or damaged bearing  
• Damaged final drive gear

**YES** – GO TO STEP 2.

### 2. Tire Pressure Inspection

Check tire pressure.

***Are the tire pressures correct?***

- NO** – • Faulty tire valve  
• Punctured tire

**YES** – GO TO STEP 3.

### 3. Clutch Inspection

Accelerate rapidly low to second.

***Does the engine speed change?***

- NO** – • Clutch slipping  
• Worn clutch discs/plates  
• Warped clutch discs/plates  
• Weak clutch spring  
• Additive in engine oil

**YES** – GO TO STEP 4.

### 4. Engine Performance Inspection

Accelerate lightly.

***Does the engine speed increase?***

- NO** – • Clogged air cleaner  
• Restricted fuel flow  
• Clogged muffler  
• Restricted fuel fill cap breather

**YES** – GO TO STEP 5.

### 5. Engine Knocking Inspection

Accelerate or run at high speed.

***Is there knocking?***

- YES** – • Wrong type of fuel  
• Excessive carbon build-up in combustion chamber

**NO** – GO TO STEP 6.

### 6. Spark Plug Inspection

Remove and inspect spark plug.

***Is the spark plug in good condition?***

- YES** – • Plug not serviced frequently enough  
• Incorrect spark plug used

**NO** – GO TO STEP 7.

### 7. Engine Oil Inspection

Check oil level and condition.

***Is there correct level and good condition?***

- NO** – • Oil level too high  
• Oil level too low  
• Contaminated oil

**YES** – GO TO STEP 8.



## TROUBLESHOOTING

---

### 8. Ignition Timing Inspection

Check the ignition timing.

***Is the ignition timing correct?***

**NO** – • Faulty PCM/ECM  
• Faulty CKP sensor

**YES** – GO TO STEP 9.

### 9. Cylinder Compression Inspection

Test cylinder compression.

***Is the compression low?***

**YES** – • Valve clearance too small  
• Valve stuck open  
• Worn cylinder and piston rings  
• Damaged cylinder head gasket  
• Seized valve  
• Improper valve timing

**NO** – GO TO STEP 10.

### 10. Fuel pump Inspection

Inspect the fuel flow.

***Is the fuel pump unit normal?***

**NO** – Faulty fuel pump

**YES** – GO TO STEP 11.

### 11. PGM-FI System Inspection

Check the PGM-FI system (page 6-6).

***Is the PGM-FI System normal?***

**NO** – Faulty PGM-FI system

**YES** – GO TO STEP 12.

### 12. Valve Train Lubrication Inspection

Remove cylinder head cover and inspect lubrication.

***Is the valve train lubricated properly?***

**NO** – Clogged oil passage



## POOR PERFORMANCE AT LOW AND IDLE SPEED

### 1. Spark Test

Perform spark test.

*Is there weak or intermittent spark?*

- YES** – • Faulty spark plug  
• Fouled spark plug  
• Loose or disconnected ignition system wires  
• Broken or shorted spark plug wire  
• Faulty ignition coil

**NO** – GO TO STEP 2.

### 2. Fuel Pump Inspection

Inspect the fuel flow.

*Is the fuel pump unit normal?*

**NO** – Faulty fuel pump

**YES** – GO TO STEP 3.

### 3. PGM-FI System Inspection

Check the PGM-FI system (page 6-6).

*Is the PGM-FI system normal?*

**NO** – Faulty PGM-FI system

**YES** – GO TO STEP 4.

### 4. Intake Air Leak Inspection

Check for leaks at the intake manifold connections.

*Are there leaks?*

- YES** – • Loose insulator bands  
• Damaged insulator

**NO** – GO TO STEP 5.

### 5. Ignition Timing Inspection

Check the ignition timing.

*Is the ignition timing correct?*

- NO** – • Faulty PCM/ECM  
• Faulty CKP sensor



### POOR PERFORMANCE AT HIGH SPEED

#### 1. Fuel Pump Inspection

Inspect the fuel flow.

*Is the fuel pump unit operation normal?*

**NO** – Faulty fuel pump

**YES** – GO TO STEP 2.

#### 2. PGM-FI System Inspection

Check the PGM-FI system (page 6-6).

*Is the PGM-FI system normal?*

**NO** – Faulty PGM-FI system

**YES** – GO TO STEP 3.

#### 3. Ignition Timing Inspection

Check ignition timing.

*Is the ignition timing correct?*

**NO** – • Faulty PCM/ECM  
• Faulty CKP sensor

**YES** – GO TO STEP 4.

#### 4. Valve Timing Inspection

Check valve timing.

*Is the valve timing correct?*

**NO** – Camshaft not installed properly

**YES** – GO TO STEP 5.

#### 5. Valve Spring Inspection

Check valve springs.

*Are the valve springs weak?*

**YES** – Faulty valve spring

### POOR HANDLING

#### Steering is heavy

- Steering shaft nut or holder too tight
- Damaged steering shaft bushing
- Damaged steering shaft bearing

#### Any wheel is wobbling

- Excessive knuckle or hub bearing play
- Bent rim
- Improperly installed wheel hub
- Loose suspension arm
- Bent frame

#### Vehicle pulls to one side

- Tire air pressure incorrect
- Faulty shock absorber
- Bent tie-rod
- Incorrect tie-rod adjustment
- Improper wheel alignment
- Bent frame



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