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HONDA

SERVICE MANUAL

TRX350TM/TE
RANCHER

TRX350FM/FE
RANCHER 4x4

HOW TO USE THIS MANUAL

This service manual describes the service procedures for the TRX350 TM/TE and TRX350 FM/FE.

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

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

Sections 1 and 3 apply to the whole motorcycle. Section 2 illustrates procedures for removal/installation of components that may be required to perform service described in the following sections. Sections 4 through 21 describe parts of the vehicle, grouped according to location.


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

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

If you don't know the source of the trouble, go to Section 24, 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.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. Honda Motor Co., Ltd. RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION WHATSOEVER. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION. THIS MANUAL IS WRITTEN FOR PERSONS WHO HAVE ACQUIRED BASIC KNOWLEDGE OF MAINTENANCE ON Honda MOTORCYCLES, MOTOR SCOOTERS OR ATVS.

Honda Motor Co., Ltd.
SERVICE PUBLICATION OFFICE

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1. GENERAL INFORMATION

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SERVICE RULES

1. Use genuine HONDA or HONDA-recommended parts and lubricants or their equivalents. Parts that don't meet HONDA's design specifications may cause damage to the motorcycle.
2. Use the special tools designed for this product to avoid damage and incorrect assembly.
3. Use only metric tools when servicing the motorcycle. Metric bolts, nuts and screws are not interchangeable with English fasteners.
4. Install new gaskets, O-rings, cotter pins, and lock plates when reassembling.
5. When tightening bolts or nuts, begin with the larger diameter or inner bolt first. Then tighten to the specified torque diagonally in incremental steps unless a particular sequence is specified.
6. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
7. After reassembly, check all parts for proper installation and operation.
8. Route all electrical wires as shown on pages 1-22 through 1-32, Cable & Harness routing.

MODEL IDENTIFICATION

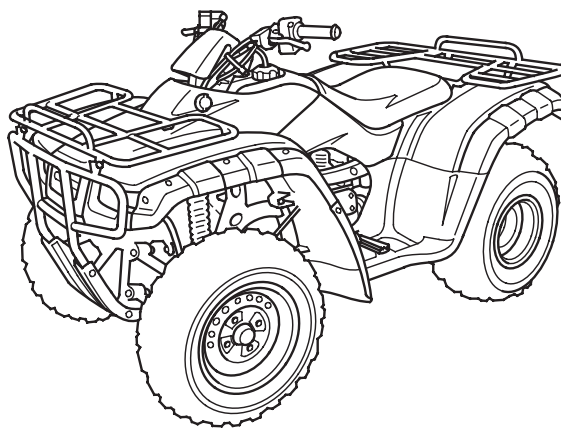
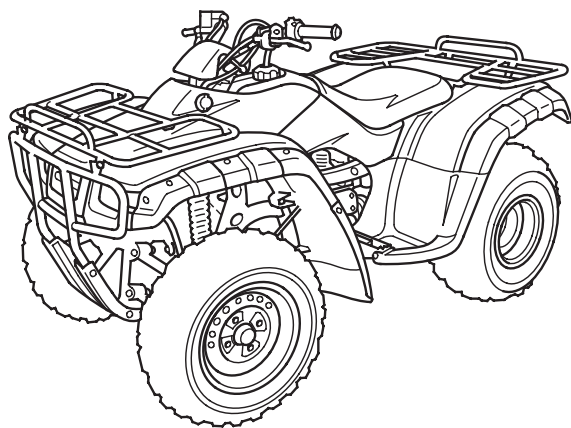
This manual covers 4 types of TRX350 models:

- TM—2WD/Left foot operated gearshift
- TE—2WD/Electric shift program (ESP)
- FM—4WD/Left foot operated gearshift
- FE—4WD/Electric shift program (ESP)

Be sure to refer to the procedure that pertains to the appropriate version of the TRX350.

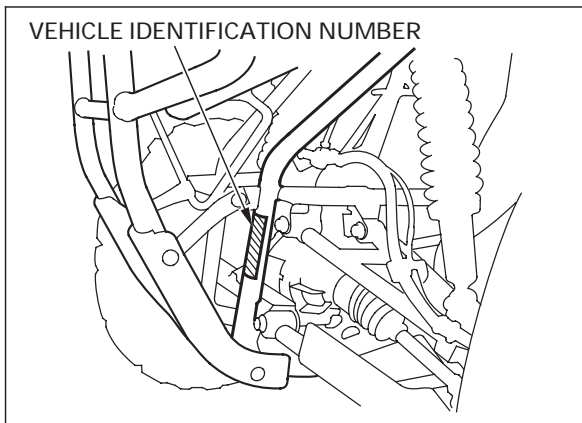
TRX350 TM/FM:
(U.S.A. type shown)

TRX350 TE/FE:



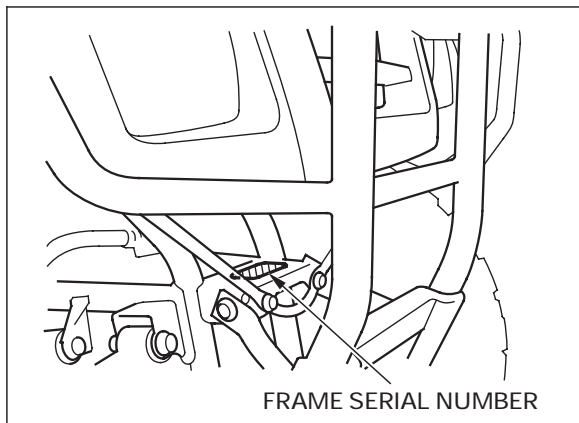
GENERAL INFORMATION

VEHICLE IDENTIFICATION NUMBER



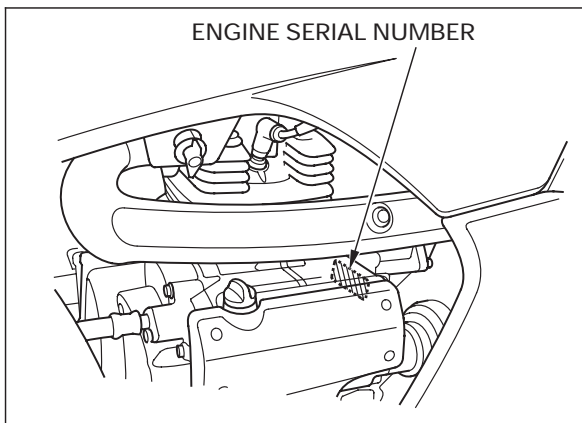
The Vehicle Identification Number (VIN) is located on the left side frame down tube.

FRAME SERIAL NUMBER



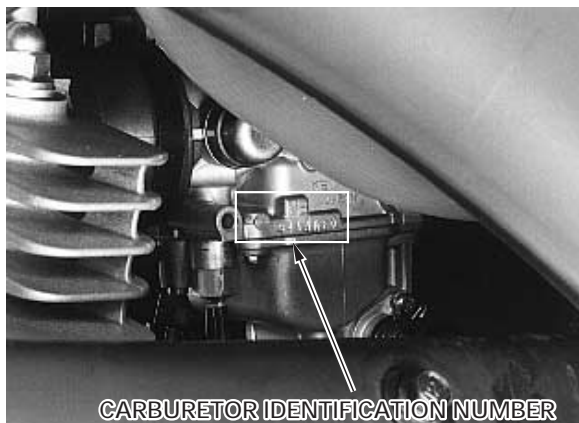
The frame serial number is stamped on the front side of the frame.

ENGINE SERIAL NUMBER



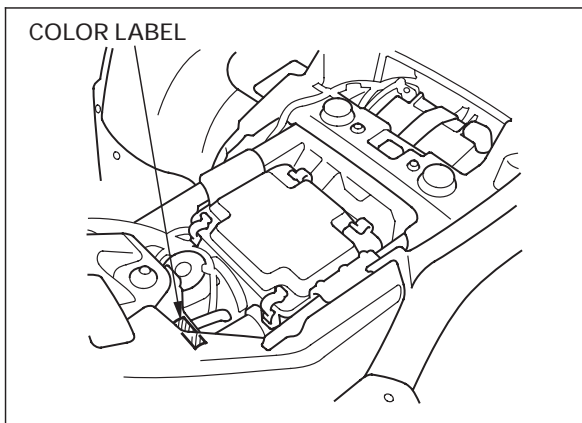
The engine serial number is stamped on the left side of the rear crankcase.

CARBURETOR IDENTIFICATION NUMBER



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

COLOR LABEL



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

SPECIFICATIONS

GENERAL: TRX3501M/TE			ITEM		SPECIFICATIONS	
DIMENSIONS	Overall length		1,983 mm (78.1 in)			
	Overall width		1,143 mm (45.0 in)			
	Overall height		1,119 mm (44.1 in)			
	Wheelbase		1,253 mm (49.3 in)			
	Front tread		851 mm (33.5 in)			
	Rear tread		840 mm (33.1 in)			
	Seat height		812 mm (32.0 in)			
	Footpeg height		TM: 323 mm (12.7 in)/TE: 318 mm (12.5 in)			
	Ground clearance		186 mm (7.3 in)			
	Dry weight		2000—2001:	TM: 226 kg (498 lbs)	/TE: 232 kg (511 lbs)	
FRAME	Curb weight		After 2001:	TM: 226.5 kg (499.3 lbs)	/TE: 232.5 kg (512.6 lbs)	
			2000—2001:	TM: 237 kg (522 lbs)	/TE: 243 kg (536 lbs)	
			After 2001:	TM: 237.5 kg (523.6 lbs)	/TE: 243.5 kg (536.8 lbs)	
	Maximum weight capacity		210 kg (463 lbs)			
	Frame type		Double cradle			
	Front suspension		Double wish-bone			
	Front wheel travel		150 mm (5.9 in)			
	Front damper		Double tube			
	Rear suspension		Swingarm			
	Rear wheel travel		150 mm (5.9 in)			
Rear damper		Double tube				
Front tire size		AT24 × 8-12 ★★				
Rear tire size		AT25 × 11-10 ★★				
Front rim size		12 × 6.0 AT				
Rear rim size		10 × 8.5 AT				
Front tire brand		TRACKER CL (Goodyear)				
Rear tire brand		TRACKER CL (Goodyear)				
Front brake		Hydraulic drum brake (Dual leading)				
Rear brake		Mechanical drum brake (Leading-trailing)				
Caster angle		7°				
Trail length		31 mm (1.2 in)				
Camber angle		0°				
Fuel tank capacity		13.0 ℓ (3.43 US gal , 2.86 Imp gal)				
Fuel tank reserve capacity		3.2 ℓ (0.85 US gal , 0.70 Imp gal)				
ENGINE	Cylinder arrangement		Single cylinder, longitudinally installed			
	Bore and stroke		78.5 × 68.0 mm (3.09 × 2.68 in)			
	Displacement		329.1 cm³ (20.08 cu-in)			
	Compression ratio		8.8 : 1			
	Valve train		OHV			
	Intake valve		opens	8°BTDC (at 1 mm lift)		
			closes	38°ABDC (at 1 mm lift)		
	Exhaust valve		opens	40°BBDC (at 1 mm lift)		
			closes	7°ATDC (at 1 mm lift)		
	Lubrication system		Forced pressure (dry sump)			
Oil pump type		Trochoid				
Cooling system		Air cooled (with cooling fan [TE only] and oil cooler)				
Air filtration		Oiled urethane foam				
Engine dry weight		TM: 43.4 kg (95.7 lbs)/TE: 44.9 kg (99.0 lbs)				

GENERAL INFORMATION

GENERAL: TRX350TM/TE (Cont'd)		
ITEM		SPECIFICATIONS
CARBURETOR	Carburetor type Throttle bore	Constant Vacuum (VE type) 32 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 2.188 (70/32) 1.933 (29/15) 3.692 (48/13) 3.455 (38/11) 1.933 (29/15) 1.333 (28/21) 0.966 (28/29) 0.720 (18/25) 4.600 (39/13 × 23/15) R-N-1-2-3-4-5 Left foot operated return system (TM) Electric shift (left hand operated) return system (TE)
ELECTRICAL	Ignition system Starting system Charging system Regulator/rectifier Lighting system	DC-CDI Electric starter motor and emergency recoil starter Triple phase output alternator SCR shorted, triple phase full wave rectification Battery

GENERAL: TRX350FM/FE		
	ITEM	SPECIFICATIONS
DIMENSIONS	Overall length	1,983 mm (78.1 in)
	Overall width	1,143 mm (45.0 in)
	Overall height	1,130 mm (44.5 in)
	Wheelbase	1,246 mm (49.1 in)
	Front tread	844 mm (33.2 in)
	Rear tread	860 mm (33.9 in)
	Seat height	824 mm (32.4 in)
	Footpeg height	FM: 334 mm (13.1 in)/FE: 330 mm (13.0 in)
	Ground clearance	184 mm (7.2 in)
	Dry weight	2000—2001: FM: 237.5 kg (523.6 lbs)/FE: 242.5 kg (534.6 lbs) After 2001: FM: 238 kg (525 lbs) /FE: 243 kg (536 lbs)
FRAME	Curb weight	2000—2001: FM: 248.5 kg (547.8 lbs)/FE: 253.5 kg (558.9 lbs) After 2001: FM: 249 kg (549 lbs) /FE: 254 kg (560 lbs)
	Maximum weight capacity	220 kg (485 lbs)
ENGINE	Frame type	Double cradle
	Front suspension	Double wish-bone
	Front wheel travel	150 mm (5.9 in)
	Front damper	Double tube
	Rear suspension	Swingarm
	Rear wheel travel	150 mm (5.9 in)
	Rear damper	Double tube
	Front tire size	AT24 × 8-12 ★★
	Rear tire size	AT24 × 9-11 ★★
	Front rim size	12 × 6.0 AT
	Rear rim size	11 × 7.0 AT
	Front tire brand	DIRT HOOKS 15 (Bridgestone)
	Rear tire brand	DIRT HOOKS 14 (Bridgestone)
	Front brake	Hydraulic drum brake (Dual leading)
	Rear brake	Mechanical drum brake (Leading-trailing)
	Caster angle	4°
	Trail length	17 mm (0.7 in)
	Camber angle	0° 06'
	Fuel tank capacity	13.0 ℓ (3.43 US gal , 2.86 Imp gal)
	Fuel tank reserve capacity	3.2 ℓ (0.85 US gal , 0.70 Imp gal)
ENGINE	Cylinder arrangement	Single cylinder, longitudinally installed
	Bore and stroke	78.5 × 68.0 mm (3.09 × 2.68 in)
	Displacement	329.1 cm ³ (20.08 cu-in)
	Compression ratio	8.8 : 1
	Valve train	OHV
	Intake valve	opens closes
	Exhaust valve	opens closes
	Lubrication system	Forced pressure (dry sump)
	Oil pump type	Trochoid
	Cooling system	Air cooled (with cooling fan and oil cooler)
	Air filtration	Oiled urethane foam
	Engine dry weight	FM: 43.8 kg (96.6 lbs) /FE: 45.3 kg (99.9 lbs)

GENERAL INFORMATION

GENERAL: TRX350FM/FE (Cont'd)		SPECIFICATIONS
ITEM		
CARBURETOR	Carburetor type Throttle bore	Constant Vacuum (VE type) 32 mm (1.3 in)
DRIVE TRAIN	Clutch system Clutch operation system Transmission Primary reduction Secondary reduction Final reduction Front Rear Gear ratio 1st 2nd 3rd 4th 5th Reverse Gearshift pattern	Centrifugal and Multi-plate, wet Automatic Constant mesh, 5-speeds with reverse 2.188 (70/32) 1.933 (29/15) 3.769 (49/13) 3.692 (48/13) 3.455 (38/11) 1.933 (29/15) 1.333 (28/21) 0.966 (28/29) 0.720 (18/25) 4.600 (39/13 × 23/15) R—N—1—2—3—4—5 Left foot operated return system (FM) Electric shift (left hand operated) return system (FE)
ELECTRICAL	Ignition system Starting system Charging system Regulator/rectifier Lighting system	DC-CDI Electric starter motor and emergency recoil starter Triple phase output alternator SCR shorted, triple phase full wave rectification Battery

Unit: mm (in)

LUBRICATION

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	1.95 ℓ (2.06 US qt , 1.72 Imp qt)	_____
	After draining/filter change	2.0 ℓ (2.1 US qt , 1.8 Imp qt)	_____
	After disassembly	2.5 ℓ (2.6 US qt , 2.2 Imp qt)	_____
Recommended engine oil		Pro Honda GN4 or HP4 (without molybdenum additives) 4-stroke oil or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-40	_____
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.22 (0.006 – 0.009)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.12 (0.005)

FUEL SYSTEM

ITEM	SPECIFICATIONS
Carburetor identification number	VE94A
Main jet	# 130
Slow jet	# 42
Jet needle clip position	3rd groove from top
Pilot screw opening	See page 5-15
Float level	18.5 mm (0.73 in)
Idle speed	1,400 ± 100 rpm
Throttle lever free play	3 – 8 mm (1/8 – 5/16 in)

CYLINDER HEAD/VALVE/CAMSHAFT

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder compression at 450 rpm			667 kPa (6.8 kgf/cm ² , 97 psi)	_____
Valve clearance			IN/EX	0.15 (0.006)
Valve, valve guide	Valve stem O.D.	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.45 (0.215)
		EX	5.455 – 5.470 (0.2148 – 0.2154)	5.43 (0.214)
	Valve guide I.D.	IN/EX	5.500 – 5.512 (0.2165 – 0.2170)	5.52 (0.217)
		IN	0.010 – 0.037 (0.0004 – 0.0015)	0.12 (0.005)
	Stem-to-guide clearance	EX	0.030 – 0.057 (0.0012 – 0.0022)	0.14 (0.006)
Valve spring	Free length	IN/EX	1.2 (0.05)	1.5 (0.06)
		Inner	36.95 (1.455)	36.94 (1.454)
	Free length	Outer	41.67 (1.641)	40.42 (1.591)
Rocker arm	Arm I.D.	IN/EX	12.000 – 12.018 (0.4724 – 0.4731)	12.05 (0.474)
	Shaft O.D.	IN/EX	11.966 – 11.984 (0.4711 – 0.4718)	11.92 (0.469)
	Arm-to-shaft clearance	IN/EX	0.016 – 0.052 (0.0006 – 0.0020)	0.08 (0.003)
Camshaft and cam follower	Cam lobe height	IN/EX	35.2995 – 35.4595 (1.38974 – 1.39604)	35.13 (1.383)
	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)

GENERAL INFORMATION

Unit: mm (in)

Unit: mm (in)

CYLINDER/PISTON ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		78.500—78.510 (3.0905—3.0909)	78.60 (3.094)
	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		78.465—78.485 (3.0892—3.0900)	78.43 (3.088)
	Piston pin hole I.D.		17.002—17.008 (0.6694—0.6696)	17.04 (0.671)
	Piston pin O.D.		16.994—17.000 (0.6691—0.6693)	16.96 (0.668)
	Piston-to-piston pin clearance		0.002—0.014 (0.0001—0.0006)	0.02 (0.001)
	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	0.015—0.045 (0.0006—0.0018)	0.09 (0.004)
Cylinder-to-piston clearance			0.015—0.045 (0.0006—0.0018)	0.10 (0.004)
Connecting rod small end I.D.			17.016—17.034 (0.6699—0.6706)	17.10 (0.673)
Connecting rod-to-piston pin clearance			0.016—0.040 (0.0006—0.0016)	0.06 (0.002)

Unit: mm (in)

CLUTCH/GEARSHIFT LINKAGE ITEM				STANDARD	SERVICE LIMIT
Change clutch	Spring free length	TM/FM		28.0 (1.10)	27.0 (1.06)
		TE/FE		31.3 (1.23)	30.2 (1.19)
	Disc thickness			2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage			—	0.20 (0.008)
	Outer I.D.			28.000 – 28.021 (1.1024 – 1.1032)	28.04 (1.104)
	Outer guide	I.D.		22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
		O.D.		27.959 – 27.980 (1.1007 – 1.1016)	27.92 (1.099)
Centrifugal clutch	Mainshaft O.D. at clutch outer guide			21.967 – 21.980 (0.8648 – 0.8654)	21.93 (0.863)
	Drum I.D.			126.0 – 126.2 (4.96 – 4.97)	126.4 (4.98)
	Weight lining thickness			2.0 (0.08)	1.3 (0.05)
	Clutch spring height			2.87 (0.113)	2.73 (0.107)
	Clutch weight spring free length			25.8 (1.02)	26.9 (1.06)
Primary drive gear	Gear I.D.			27.000 – 27.021 (1.0630 – 1.0638)	27.05 (1.065)
	Crankshaft O.D. at drive gear			26.959 – 26.980 (1.0614 – 1.0622)	26.93 (1.060)

Unit: mm (in)

ALTERNATOR/STARTER CLUTCH ITEM			STANDARD	SERVICE LIMIT
Starter driven gear boss O.D.			45.660 – 45.673 (1.7976 – 1.7981)	45.65 (1.797)

Unit: mm (in)

CRANKCASE/TRANSMISSION/CRANKSHAFT			STANDARD	SERVICE LIMIT
ITEM				
Shift fork	I.D.		13.000—13.018 (0.5118—0.5125)	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.	M4	23.000—23.021 (0.9055—0.9063)	23.04 (0.907)
		M5	18.000—18.021 (0.7087—0.7095)	18.05 (0.711)
		C1, C2, C3, CR	25.000—25.021 (0.9843—0.9851)	25.05 (0.986)
		Reverse idle	13.000—13.018 (0.5118—0.5125)	13.04 (0.513)
	Gear bushing O.D.	M4	22.959—22.979 (0.9039—0.9047)	22.94 (0.903)
		M5	17.959—17.980 (0.7070—0.7079)	17.94 (0.706)
		C1, C2, C3, CR	24.959—24.980 (0.9826—0.9835)	24.93 (0.981)
	Gear-to-bushing clearance	M4	0.021—0.062 (0.0008—0.0024)	0.10 (0.004)
		M5, C1, C2, C3, CR	0.020—0.062 (0.0008—0.0024)	0.10 (0.004)
	Gear bushing I.D.	M4	20.000—20.021 (0.7874—0.7882)	20.04 (0.789)
		M5	15.000—15.018 (0.5906—0.5913)	15.04 (0.592)
		C3	22.000—22.021 (0.8661—0.8670)	22.04 (0.868)
	Mainshaft O.D.	at M4	19.959—19.980 (0.7858—0.7866)	19.93 (0.785)
		at M5	14.966—14.984 (0.5892—0.5899)	14.94 (0.588)
	Countershaft O.D.	at C3	21.959—21.980 (0.8645—0.8654)	21.93 (0.863)
	Reverse idle shaft O.D.		12.966—12.984 (0.5105—0.5112)	12.94 (0.509)
	Bushing-to-shaft clearance	M4, C3	0.020—0.062 (0.0008—0.0024)	0.10 (0.004)
		M5	0.016—0.052 (0.0006—0.0020)	0.10 (0.004)
	Reverse idle gear-to-shaft clearance		0.016—0.052 (0.0006—0.0020)	0.10 (0.004)
Crankshaft	Runout		—	0.05 (0.002)
	Big end side clearance		0.05—0.65 (0.002—0.026)	0.8 (0.03)
	Big end radial clearance		0.006—0.018 (0.0002—0.0007)	0.05 (0.002)

GENERAL INFORMATION

Unit: mm (in)

FRONT WHEEL/SUSPENSION/STEERING (TM/TE model)		ITEM	STANDARD	SERVICE LIMIT
Minimum tire tread depth			_____	4.0 (0.16)
Cold tire pressure	Standard		20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____
	Minimum		17 kPa (0.17 kgf/cm ² , 2.5 psi)	_____
	Maximum		23 kPa (0.23 kgf/cm ² , 3.3 psi)	_____
	With cargo		20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____
Tie-rod distance between the ball joints			355 ± 1 (14.0 ± 0.04)	_____
Toe			Toe-in: 3 ± 15 (1/8 ± 9/16)	_____

Unit: mm (in)

FRONT WHEEL/SUSPENSION/STEERING (FM/FE model)		ITEM	STANDARD	SERVICE LIMIT
Minimum tire tread depth			_____	4.0 (0.16)
Cold tire pressure	Standard		25 kPa (0.25 kgf/cm ² , 3.6 psi)	_____
	Minimum		22 kPa (0.22 kgf/cm ² , 3.2 psi)	_____
	Maximum		28 kPa (0.28 kgf/cm ² , 4.0 psi)	_____
	With cargo		25 kPa (0.25 kgf/cm ² , 3.6 psi)	_____
Tie-rod distance between the ball joints			346 ± 1 (13.6 ± 0.04)	_____
Toe			Toe-out: 18 ± 15 (3/4 ± 9/16)	_____

REAR WHEEL/SUSPENSION (TM/TE model)		ITEM	STANDARD	SERVICE LIMIT
Minimum tire tread depth			_____	4.0 mm (0.16 in)
Cold tire pressure	Standard		20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____
	Minimum		17 kPa (0.17 kgf/cm ² , 2.5 psi)	_____
	Maximum		23 kPa (0.23 kgf/cm ² , 3.3 psi)	_____
	With cargo		20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____

REAR WHEEL/SUSPENSION (FM/FE model)		ITEM	STANDARD	SERVICE LIMIT
Minimum tire tread depth			_____	4.0 mm (0.16 in)
Cold tire pressure	Standard		25 kPa (0.25 kgf/cm ² , 3.6 psi)	_____
	Minimum		22 kPa (0.22 kgf/cm ² , 3.2 psi)	_____
	Maximum		28 kPa (0.28 kgf/cm ² , 4.0 psi)	_____
	With cargo		25 kPa (0.25 kgf/cm ² , 3.6 psi)	_____

Unit: mm (in)

BRAKE SYSTEM

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	Honda DOT 4 brake fluid	—————
	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Shoe lining thickness	4.0 (0.16)	1.0 (0.04)
	Brake panel warpage	—————	0.4 (0.02)
	Waterproof seal lip length	22 (0.9)	20 (0.8)
	Master cylinder I.D.	12.700 – 12.743 (0.5000 – 0.5017)	12.755 (0.5022)
	Master piston O.D.	12.657 – 12.684 (0.4983 – 0.4994)	12.645 (0.4978)
	Wheel cylinder I.D.	17.460 – 17.503 (0.6874 – 0.6891)	17.515 (0.6896)
	Wheel cylinder piston O.D.	17.417 – 17.444 (0.6857 – 0.6868)	17.405 (0.6852)
Rear brake	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Lining thickness	5.0 (0.20)	To index mark

Unit: mm (in)

FRONT DRIVING MECHANISM (FM/FE model)

FRONT DRIVING MECHANISM (FM/FE model)			STANDARD	SERVICE LIMIT
ITEM				
Front differential	Oil capacity	After draining	241 cm ³ (8.2 US oz , 8.5 Imp oz)	————
		After disassembly	275 cm ³ (9.3 US oz , 9.7 Imp oz)	————
	Recommended oil		Hypoid gear oil SAE # 80	————
	Gear backlash		0.05—0.25 (0.002—0.010)	0.4 (0.02)
	Backlash difference		————	0.2 (0.01)
	Slip torque		14—17 N·m (1.45—1.75 kgf·m , 10—13 lbf·ft)	12 N·m (1.2 kgf·m , 9 lbf·ft)
	Face cam-to-housing distance		6.3—6.7 (0.25—0.26)	6.3 (0.25)
	Differential housing cap depth		9.55—9.65 (0.376—0.380)	9.55 (0.376)
	Cone spring free height		2.8 (0.11)	2.6 (0.10)

Unit: mm (in)

REAR DRIVING MECHANISM

REAR DRIVING MECHANISM			Unit: mm (in)	
ITEM			STANDARD	SERVICE LIMIT
Axle runout			_____	3.0 (0.12)
Rear final drive	Oil capacity	After draining	85 cm ³ (2.9 US oz , 3.0 Imp oz)	_____
		After disassembly	100 cm ³ (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)	_____

GENERAL INFORMATION

BATTERY/CHARGING SYSTEM

ITEM			SPECIFICATIONS
Battery	Capacity		12 V – 12 Ah
	Current leakage		1 mA max. (Equipped with digital meter)
			0.1 mA max. (No digital meter)
	Voltage (20°C/68°F)	Fully charged	13.0 – 13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.4 A × 5 – 10 h
		Quick	6.0 A × 1.0 h
Alternator	Capacity		0.245 kW/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω

IGNITION SYSTEM

ITEM		SPECIFICATIONS
Spark plug	Standard	DPR7EA-9 (NGK) , X22EPR-U9 (DENSO)
	For cold climate (below 5°C/41°F)	DPR6EA-9 (NGK) , X20EPR-U9 (DENSO)
Spark plug gap		0.8 – 0.9 mm (0.03 – 0.04 in)
Ignition coil primary peak voltage		100 V minimum
Ignition pulse generator peak voltage		0.7 V minimum
Ignition timing ("F" mark)		11° BTDC at idle

ELECTRIC STARTER

Unit: mm (in)

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

LIGHTS/METER/SWITCHES

ITEM			SPECIFICATIONS
Bulbs	Headlight (high/low beam)		12 V-30/30 W × 2
	Taillight		12 V-5 W
	Neutral indicator		12 V-1.7 W (No meter)
			LED (Equipped with digital meter)
	Reverse indicator		12 V-1.7 W (No meter)
			LED (Equipped with digital meter)
	Oil temperature indicator		12 V-1.7 W (No meter)
			LED (Equipped with digital meter)
Fuse	Meter light		LED × 12 (Equipped with digital meter)
	Main fuse	TM/FM	30 A
		TE/FE	30 A × 2
	Sub-fuse		15 A × 2, 10 A × 2

TORQUE VALUES

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

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

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

ENGINE ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
MAINTENANCE:				
Spark plug	1	—	18 (1.8, 13)	
Valve adjusting lock nut	2	6	17 (1.7, 12)	
Timing hole cap	1	14	10 (1.0, 7)	
Engine oil drain bolt	1	12	25 (2.5, 18)	
Engine oil filter cover	3	6	10 (1.0, 7)	
Clutch adjusting screw lock nut	1	8	22 (2.2, 16)	
FUEL SYSTEM:				
Carburetor insulator band screw	1	5	4 (0.4, 2.9)	
CYLINDER HEAD/VALVE:				
Rocker arm shaft retaining bolt	1	6	7 (0.7, 5.1)	
Cylinder head cap nut	4	10	39 (4.0, 29)	NOTE 2
Rocker arm holder bolt	1	8	30 (3.1, 22)	NOTE 2
Cam chain tensioner slider pivot bolt	1	6	12 (1.2, 9)	NOTE 1
CYLINDER/PISTON:				
Cylinder stud bolt	4	8	12 (1.2, 9)	Page 8-5
CLUTCH/GEARSHIFT LINKAGE:				
Change clutch center lock nut	1	18	108 (11.0, 80)	NOTE 2, 8
Centrifugal clutch lock nut	1	20	118 (12.0, 87)	NOTE 2, 8
Gearshift cam bolt	1	8	23 (2.3, 17)	NOTE 1
Gearshift drum stopper arm pivot bolt	1	6	12 (1.2, 9)	NOTE 1
Gearshift spindle return spring pin	1	8	22 (2.2, 16)	NOTE 1
ALTERNATOR/STARTER CLUTCH:				
Starter clutch bolt	6	6	23 (2.3, 17)	NOTE 1
Recoil starter driven pulley bolt	1	12	108 (11.0, 80)	NOTE 2
Alternator stator bolt	3	6	10 (1.0, 7)	
Ignition pulse generator bolt	2	5	6 (0.6, 4.3)	NOTE 1

GENERAL INFORMATION

ENGINE (Cont'd)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
LIGHTS/METER/SWITCHES:				
Gear position switch bolt	1	6	12 (1.2)	NOTE 1
Oil thermosensor	1	—	18 (1.8)	
ELECTRIC SHIFT PROGRAM (ESP: TE/FE model):				
Angle sensor bolt	2	5	6 (0.6)	NOTE 1
Reverse shift switch	1	—	13 (1.3)	

FRAME

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
FRAME/BODY PANELS/EXHAUST SYSTEM:				
Muffler band bolt	2	8	23 (2.3 , 17)	
Muffler cover bolt	6	6	22 (2.2 , 16)	
Exhaust pipe cover bolt	6	6	22 (2.2 , 16)	
Footpeg bolt (TM/FM)	4	8	32 (3.3 , 24)	
Footpeg bracket bolt (TE/FE)	8	8	32 (3.3 , 24)	
MAINTENANCE:				
Front differential oil filler cap	1	30	12 (1.2 , 9)	
drain bolt	1	8	12 (1.2 , 9)	
Rear final gear case oil check bolt	1	8	12 (1.2 , 9)	
filler cap	1	30	12 (1.2 , 9)	
drain bolt	1	8	12 (1.2 , 9)	
Tie-rod lock nut	4	12	54 (5.5 , 40)	
LUBRICATION SYSTEM:				
Cooling fan assembly mounting bolt (equipped model)	4	6	18 (1.8 , 13)	
FUEL SYSTEM:				
Starting enrichment (SE) valve nut	1	14	2 (0.2 , 1.4)	
ENGINE REMOVAL/INSTALLATION:				
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)	
bolt (engine side)	2	8	32 (3.3 , 24)	
CLUTCH/GEARSHIFT LINKAGE:				
Gearshift pedal pinch bolt (TM/FM only)	1	6	20 (2.0 , 14)	
FRONT WHEEL/SUSPENSION/STEERING:				
Handlebar lower holder nut	2	10	39 (4.0 , 29)	NOTE 5
Throttle housing cover screw	3	4	2 (0.2 , 1.4)	
Front wheel nut	8	10	64 (6.5 , 47)	
Front wheel hub nut	2	18	78 (8.0 , 58)	NOTE 3, 6
Shock absorber mounting nut	4	10	30 (3.1 , 22)	NOTE 5
Upper and lower arm pivot nut	8	10	44 (4.5 , 33)	NOTE 5
Upper and lower arm ball joint nut	4	12	29 (3.0 , 22)	NOTE 6
Brake hose clamp bolt	4	6	12 (1.2 , 9)	
Tie-rod stud joint nut	4	10	54 (5.5 , 40)	NOTE 5
Steering shaft end nut	1	14	108 (11.0 , 80)	NOTE 3
Steering shaft holder bolt	2	8	32 (3.3 , 24)	
REAR WHEEL/SUSPENSION:				
Rear wheel nut	8	10	64 (6.5 , 47)	
Shock absorber mounting nut (upper)	1	10	44 (4.5 , 33)	NOTE 5
bolt (lower)	1	10	44 (4.5 , 33)	
Swingarm pivot bolt (left)	1	30	118 (12.0 , 87)	
(right)	1	30	4 (0.4 , 2.9)	
Swingarm right pivot lock nut	1	30	118 (12.0 , 87)	
Trailer hitch nut	2	10	44 (4.5 , 33)	NOTE 5

FRAME (Cont'd)				
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
BRAKE SYSTEM:				
Brake hose oil bolt	3	10	34 (3.5 , 25)	
Wheel cylinder bleed valve	2	8	6 (0.6 , 4.3)	
Front master cylinder reservoir cap screw	2	4	2 (0.2 , 1.4)	
Front brake lever pivot bolt	1	6	6 (0.6 , 4.3)	
nut	1	6	6 (0.6 , 4.3)	
Front master cylinder holder bolt	2	6	12 (1.2 , 9)	
Wheel cylinder bolt	4	6	8 (0.8 , 5.8)	
nut	4	8	17 (1.7 , 12)	
Wheel cylinder oil pipe joint nut	4	10	16 (1.6 , 12)	
Front brake panel bolt	8	8	29 (3.0 , 22)	NOTE 7
Brake oil pipe joint nut	2	10	17 (1.7 , 12)	
Rear brake arm pinch bolt	1	8	20 (2.0 , 14)	
Rear wheel hub nut	2	20	137 (14.0 , 101)	NOTE 6
Rear brake panel nut	4	10	44 (4.5 , 33)	NOTE 5
Rear brake panel drain bolt	1	8	12 (1.2 , 9)	
FRONT DRIVING MECHANISM (FM/FE):				
Differential ring gear bolt	6	8	49 (5.0 , 36)	NOTE 7
Differential pinion bearing lock nut	1	60	98 (10.0 , 72)	NOTE 5, 8
Differential case cover bolt	2	10	49 (5.0 , 36)	NOTE 1
	6	8	25 (2.6 , 19)	
Differential mounting bolt	1	10	44 (4.5 , 33)	
	2	8	22 (2.2 , 16)	
nut	1	10	44 (4.5 , 33)	NOTE 5
	1	8	22 (2.2 , 16)	
REAR DRIVING MECHANISM:				
Final gear case pinion bearing lock nut	1	64	98 (10.0 , 72)	NOTE 5, 8
Final gear case cover bolt	2	10	49 (5.0 , 36)	NOTE 1
	6	8	25 (2.6 , 19)	
Final gear case mounting bolt	8	10	54 (5.5 , 40)	
Left axle housing nut	4	10	44 (4.5 , 33)	NOTE 5
Skid plate bolt	3	8	32 (3.3 , 24)	

GENERAL INFORMATION

TOOLS

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

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SECTION
Carburetor float level gauge	07401-0010000		5
Universal bearing puller	07631-0010000	NOTE 2	11
Flywheel holder	07725-0040000	NOTE 2	10
Adjustable bearing puller, 24—40 mm	07736-A01000B (U.S.A. only)	NOTE 4: 07736-A01000A (U.S.A. only) use with commercially available 3/8" × 16 slide hammer	13
Remover weight	07741-0010201		15, 16
Valve guide driver, 5.5 mm	07742-0010100		7
Attachment, 32 × 35 mm	07746-0010100		11, 12
Attachment, 37 × 40 mm	07746-0010200		11, 13
Attachment, 42 × 47 mm	07746-0010300		11, 12
Attachment, 52 × 55 mm	07746-0010400		11, 15, 16
Attachment, 62 × 68 mm	07746-0010500		16
Attachment, 72 × 75 mm	07746-0010600		11
Attachment, 24 × 26 mm	07746-0010700		11
Attachment, 22 × 24 mm	07746-0010800	NOTE 1	11, 13, 15, 16
Driver, 22 mm I.D.	07746-0020100		9, 15
Attachment, 15 mm I.D.	07746-0020200		12, 15
Attachment, 20 mm I.D.	07746-0020400		9, 12, 15
Driver, 40 mm I.D.	07746-0030100		15, 16
Attachment, 30 mm I.D.	07746-0030300		16
Pilot, 10 mm	07746-0040100		11
Pilot, 12 mm	07746-0040200		11
Pilot, 15 mm	07746-0040300		11
Pilot, 17 mm	07746-0040400		11, 13
Pilot, 20 mm	07746-0040500		11, 12, 13
Pilot, 25 mm	07746-0040600		11
Pilot, 30 mm	07746-0040700		12
Pilot, 35 mm	07746-0040800		11, 16
Pilot, 40 mm	07746-0040900		11, 16
Pilot, 22 mm	07746-0041000		11
Pilot, 28 mm	07746-0041100		11, 15, 16
Pilot, 14 mm	07746-0041200	NOTE 1	15, 16
Driver	07749-0010000		11, 12, 15, 16
Valve spring compressor	07757-0010000		7
Valve seat cutter, 29 mm (EX 45°)	07780-0010300	NOTE 2	7
Valve seat cutter, 35 mm (IN 45°)	07780-0010400	NOTE 2	7
Flat cutter, 38.5 mm (IN 32°)	07780-0012400	NOTE 2	7
Flat cutter, 33 mm (EX 32°)	07780-0012900	NOTE 2	7
Interior cutter, 30 mm (EX 60°)	07780-0014000	NOTE 2	7
Interior cutter 37.5 mm (IN 60°)	07780-0014100	NOTE 2	7
Cutter holder, 5.5 mm	07781-0010101	NOTE 2	7
Lock nut wrench	07908-4690003		13
Pilot screw wrench	07908-4730002		5
Snap ring pliers	07914-SA50001		14
Lock nut wrench, 30 × 64 mm	07916-MB00002		16
Lock nut wrench, 34 × 44 mm	07916-ME50001		15
Puller shaft	07931-ME40000	NOTE 4: 07931-ME4010B and 07931-HB3020A (U.S.A. only)	16
Clutch puller	07933-HB3000A		9

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SECTION
Bearing remover set, 20 mm	07936-3710001	NOTE 3	12
Remover handle	07936-3710100		11, 12, 13, 15, 16
Remover weight	07936-3710200	NOTE 4: 07936-371020A (U.S.A. only)	11, 12, 13, 15, 16
Bearing remover, 17 mm	07936-3710300		11, 13
Bearing remover, 20 mm	07936-3710600		12
Bearing remover set, 15 mm	07936-KC10000	NOTE 3	11
Remover shaft, 15 mm	07936-KC10100	NOTE 3	11, 15, 16
Remover head, 15 mm	07936-KC10200		11, 15, 16
Bearing remover, 15 mm	07936-KC10500		11
Attachment	07945-3330300		12
Attachment, 28 × 30 mm	07946-1870100		12, 13
Driver	07949-3710001		12, 13
Oil seal driver	07965-KE80200	NOTE 4: 07947-KA50100	16
Oil seal driver	07965-MC70100		14
Crankcase assembly tool	07965-VM00000	NOTE 3	11
Assembly collar	07965-VM00100		11
Assembly shaft	07965-VM00200	NOTE 3/NOTE 4: 07931-ME4010B and 07YMF-HN4010A (NOTE 1: U.S.A. only) and 07931-HB3020A (U.S.A. only)	11, 15
Threaded adapter	07965-VM00300	NOTE 3/NOTE 4: 07931-KF00200	11
Valve guide reamer, 5.5 mm	07984-2000001	NOTE 4: 07984-200000D (U.S.A. only)	7
Clutch holder	07GMB-HA7010B	NOTE 1	9
Pinion puller set	07HMC-MM80101	NOTE 3	16
Pinion puller base	07HMC-MM80110	NOTE 4: 07HMC-MM8011A (U.S.A. only)	15, 16
Oil seal driver	07JAD-PH80101		12
Clutch center holder	07JMB-MN50301	NOTE 4: 07HGB-001010B (U.S.A. only) or 07HGB-001010A (U.S.A. only) with 07HGB-001020B (U.S.A. only) or 07HGB-001020A (U.S.A. only)	9
Ball joint remover/installer	07JMF-HC50110		12
Differential inspection tool	07KMK-HC50101	NOTE 4: 07KMK-HC5010A (U.S.A. only)	15
Driver attachment	07LAD-PW50500	NOTE 1	16
Ball joint remover, 28 mm	07MAC-SL00200		12, 15
Pilot, 32 × 35 mm	07MAD-PR90200		16
Bearing remover, 14 mm	07WMC-KFG0100		15, 16
Ball joint remover/installer	07WMF-HN00100		12
Rotor puller	07YMC-HN40100	NOTE 1	10
Remover shaft, 14mm	07YMC-001010A (U.S.A. only)	can use collet of 07936-KC10500	15, 16
Differential bearing ring compressor	07YME-HN4010A (U.S.A. only)		15, 16
Threaded adapter, 16 × 1.5 — 12 × 1.25 mm	07YMF-HN4010A (U.S.A. only)		15

LUBRICATION & SEAL POINTS

ENGINE	LOCATION	MATERIAL	REMARKS
	Camshaft cam lobes Rocker arm shaft sliding surface Valve stem (valve guide sliding surface) Change clutch outer guide inner and outer surfaces Piston pin outer surface Starter driven gear bearing Starter reduction gear shaft journals Starter reduction gear teeth	Molybdenum oil solution (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	
	Rocker arm followers and adjusting screw tips Cam chain Cam follower whole surfaces Cylinder head cap nut threads Rocker arm holder bolt threads Cam chain tensioner slider pivot Connecting rod small end inner surface Piston outer surface and piston pin hole Piston rings Cylinder bore Clutch adjusting plate boss outer surface Change clutch disc lining Change clutch center lock nut threads Centrifugal sprag clutch whole surface Centrifugal clutch drum sprag clutch contacting surface Centrifugal clutch drive plate sprag clutch contacting surface Centrifugal clutch lock nut threads Reverse stopper shaft journal Recoil starter driven pulley bolt threads Recoil starter drive pulley bolt threads Starter one-way clutch whole surface Transmission gear teeth and rotating surfaces Mainshaft and countershaft journals Shift fork shaft Shift drum grooves Each bearing rotating area Each O-ring whole surface Each oil seal lip	Engine oil	
	Recoil starter driven pulley oil seal lips Recoil starter drive pulley pivot pin and ratchet sliding surfaces	Multi-purpose grease	
	Electric shift reduction gear teeth and journals (front crankcase cover)	Unirex N2 grease (ESSO) or Unirex N3 grease (ESSO)	TE/FE only: Apply 3–5 g; Coating area (page 21-23)

ENGINE (Cont'd)

LOCATION	MATERIAL	REMARKS
Oil pipe retaining bolt threads Gear position switch special bolt threads Cam chain tensioner slider pivot bolt threads Cam chain tensioner lifter bolt threads Camshaft bearing retainer bolt threads Gearshift drum stopper arm pivot bolt threads Gearshift cam plate bolt threads Gearshift spindle return spring pin threads Gearshift spindle retaining bolt threads Starter clutch bolt threads Recoil starter mounting bolt threads Ignition pulse generator bolt threads Mainshaft bearing setting plate bolt threads Shift drum bearing setting plate bolt threads Angle sensor bolt threads	Locking agent	TE/FE only
Alternator/ignition pulse generator wire grommet seating groove Gear position switch wire grommet seating groove Front crankcase cover mating surface Rear crankcase cover mating surface Crankcase mating surface	Liquid sealant	Coating area (page 9-19) Coating area (page 10-10) Coating area (page 8-6 and 11-16)

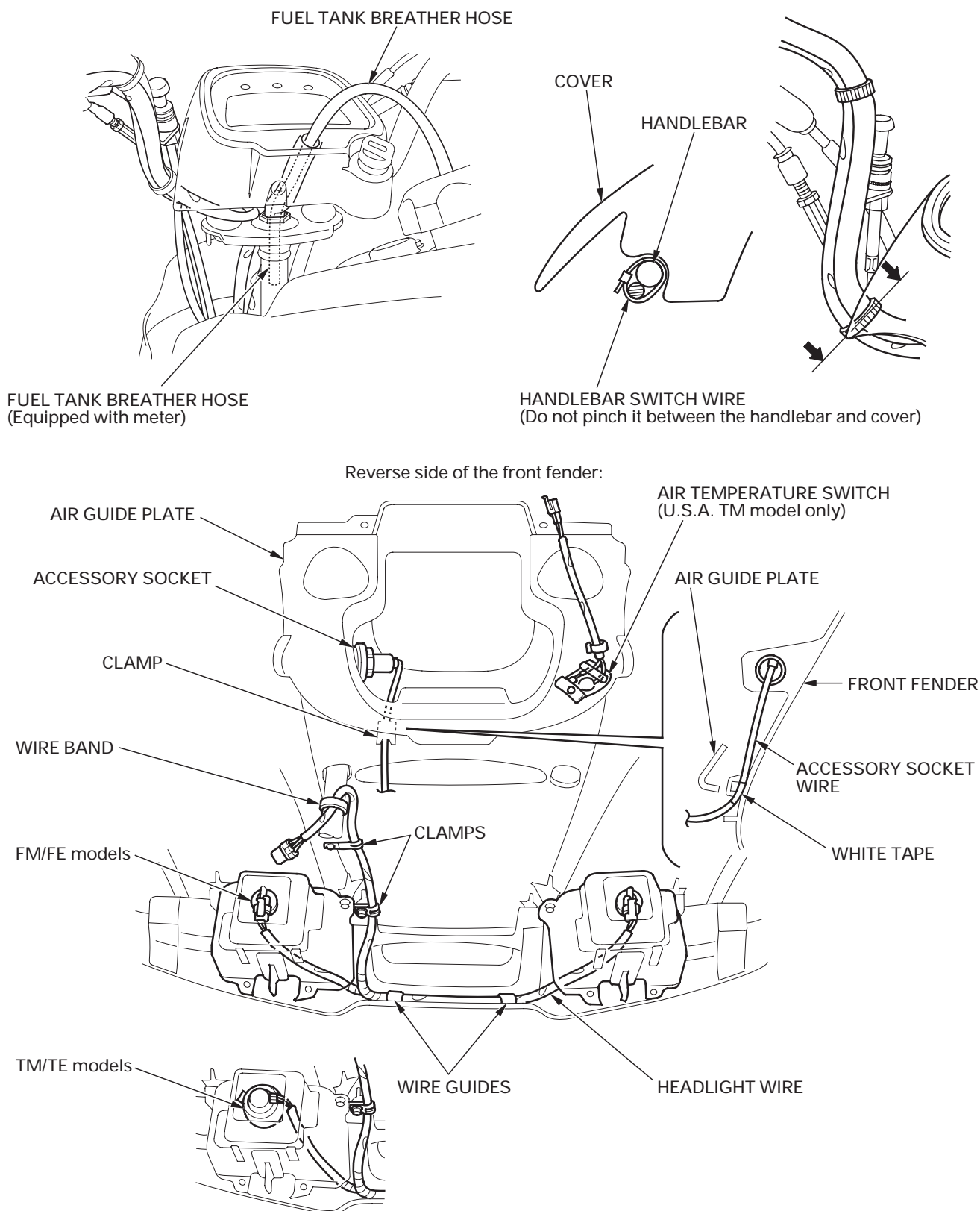
GENERAL INFORMATION

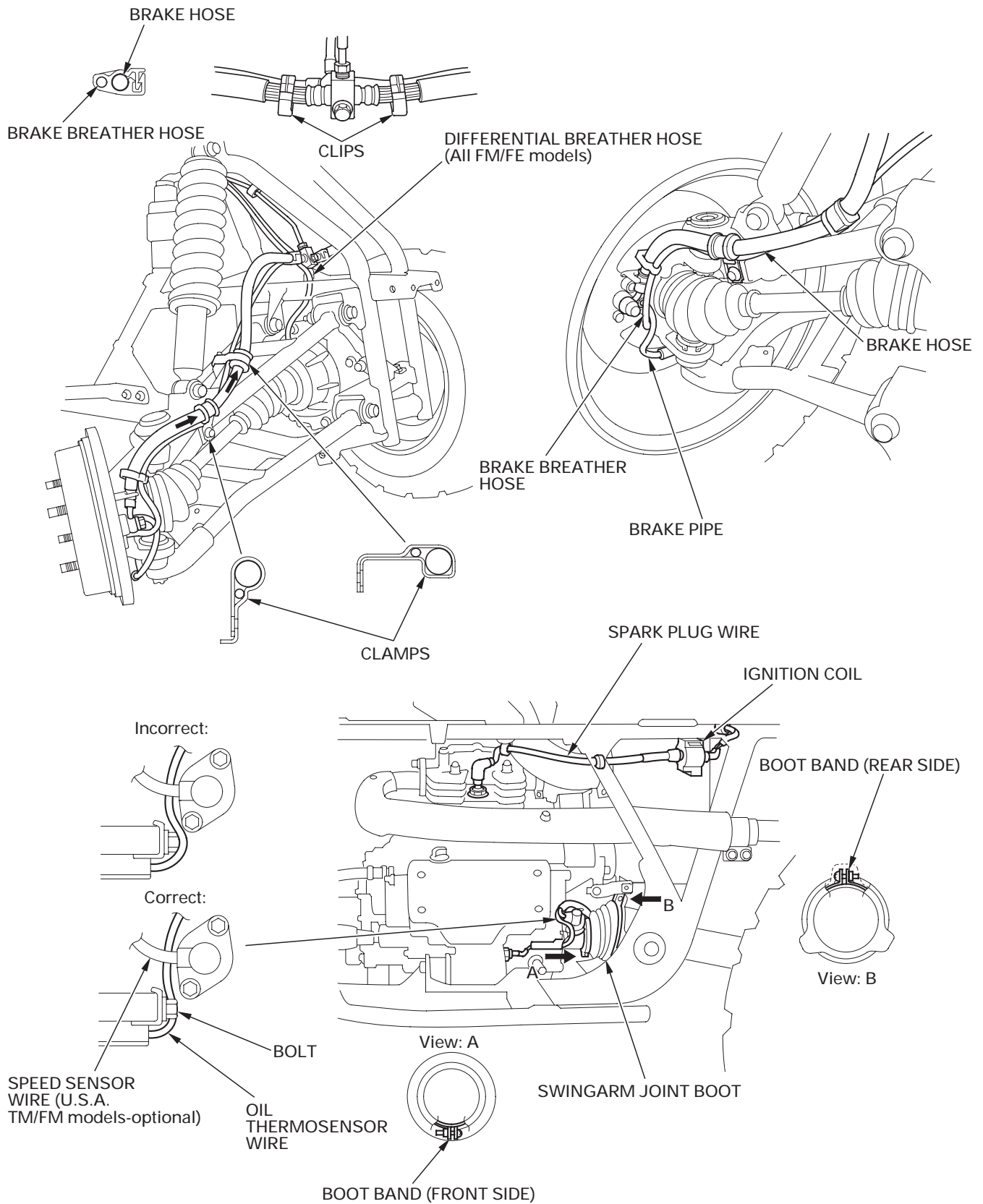
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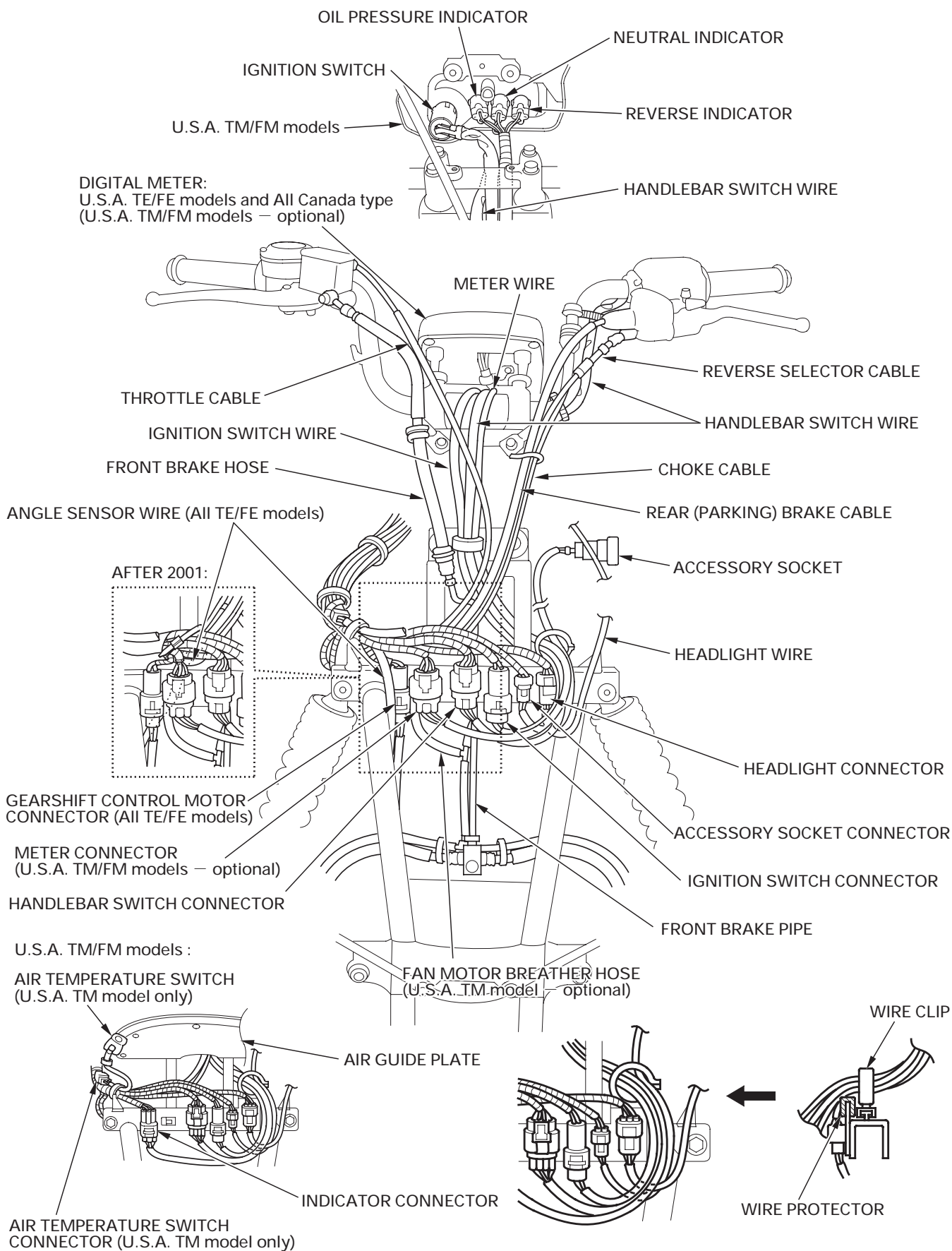
LOCATION	MATERIAL	REMARKS
Handlebar grip rubber inside Air cleaner case-to-connecting tube (carburetor and air intake duct) mating groove Air cleaner case-to-crankcase breather tube grommet mating groove	Honda Bond A or Honda Hand Grip Cement (U.S.A. only) or equivalent	
Front brake lever-to-master piston contacting area Front brake lever pivot Wheel cylinder adjuster screw threads and adjuster nut spindle outer surface Wheel cylinder body boot groove and piston boot groove Brake panel shoe metal contacting areas Wheel cylinder adjuster groove and piston groove (shoe contacting grooves)	Silicone grease	
Master cylinder piston and cups Wheel cylinder piston and cup	DOT 4 brake fluid	
Wheel cylinder-to-brake panel mating surface Front differential case cover mating surface Rear final gear case cover mating surface	Liquid sealant	FM/FE only
Cooling fan motor shaft nut threads	Locking agent	Except U.S.A. TM

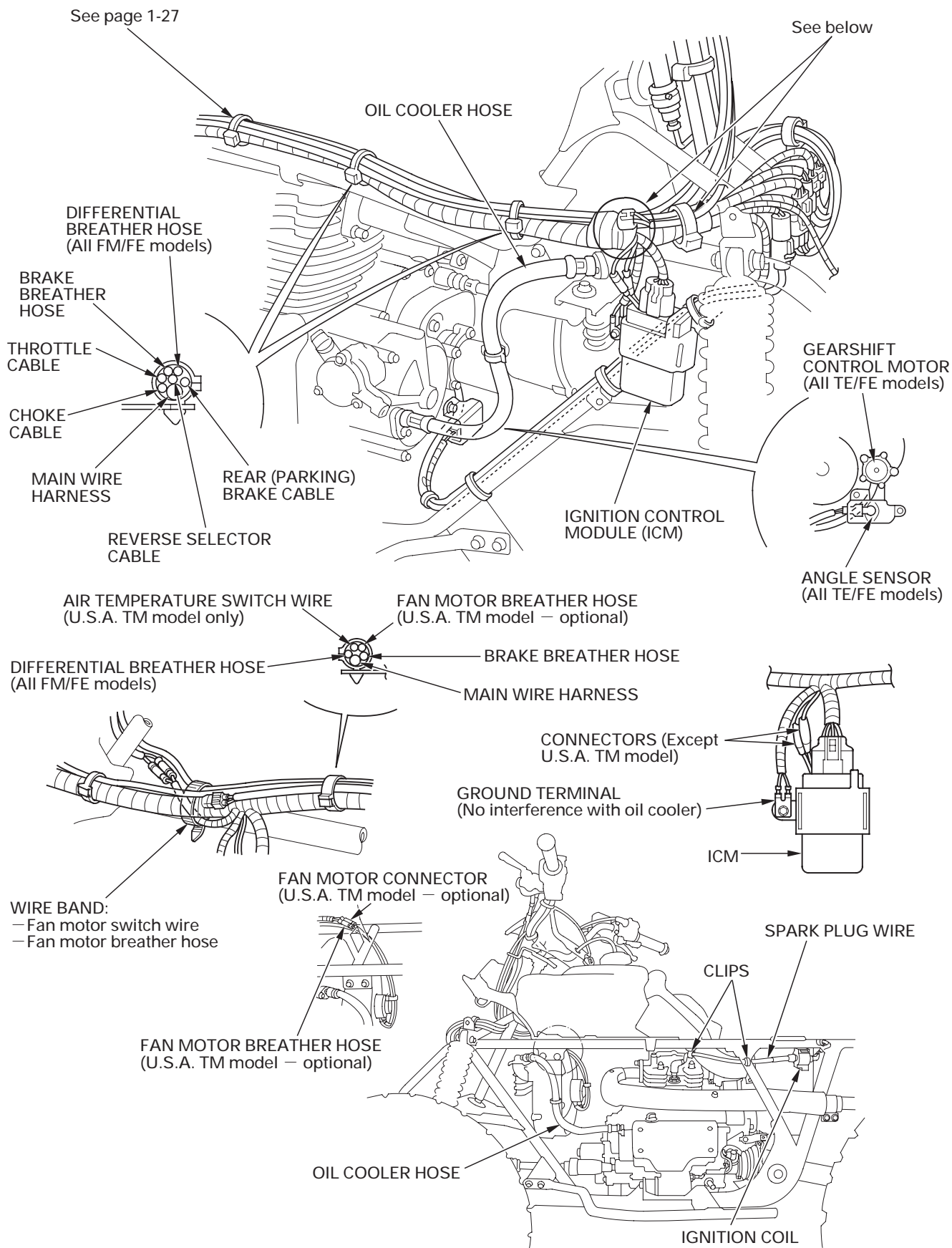
CABLE & HARNESS ROUTING



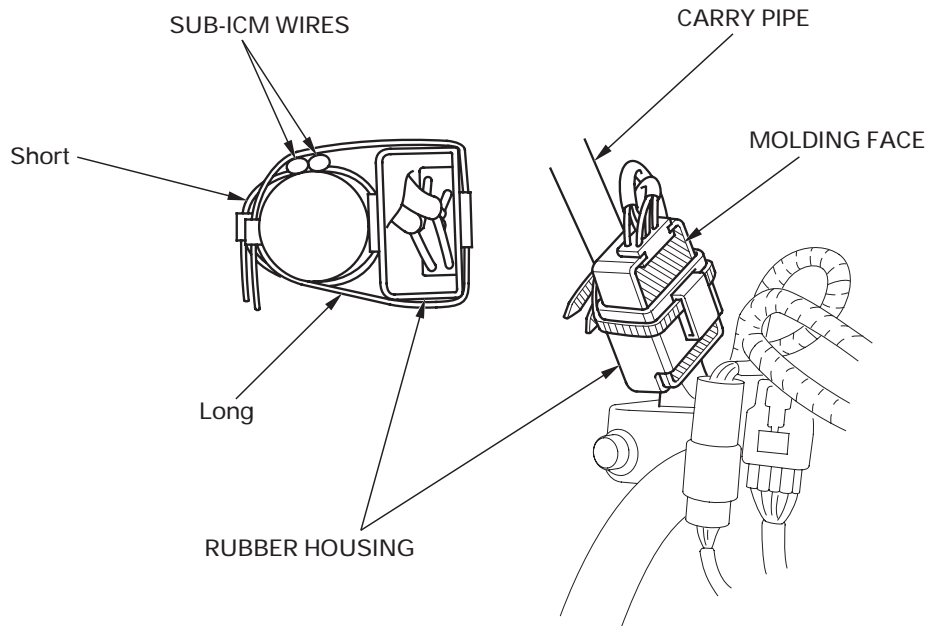
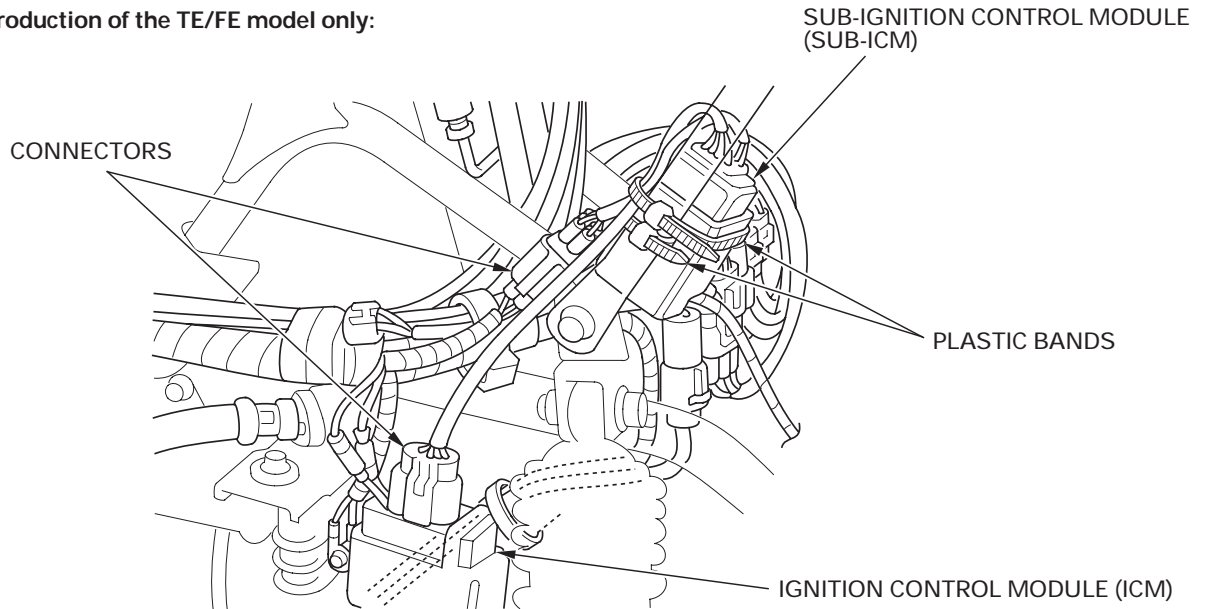


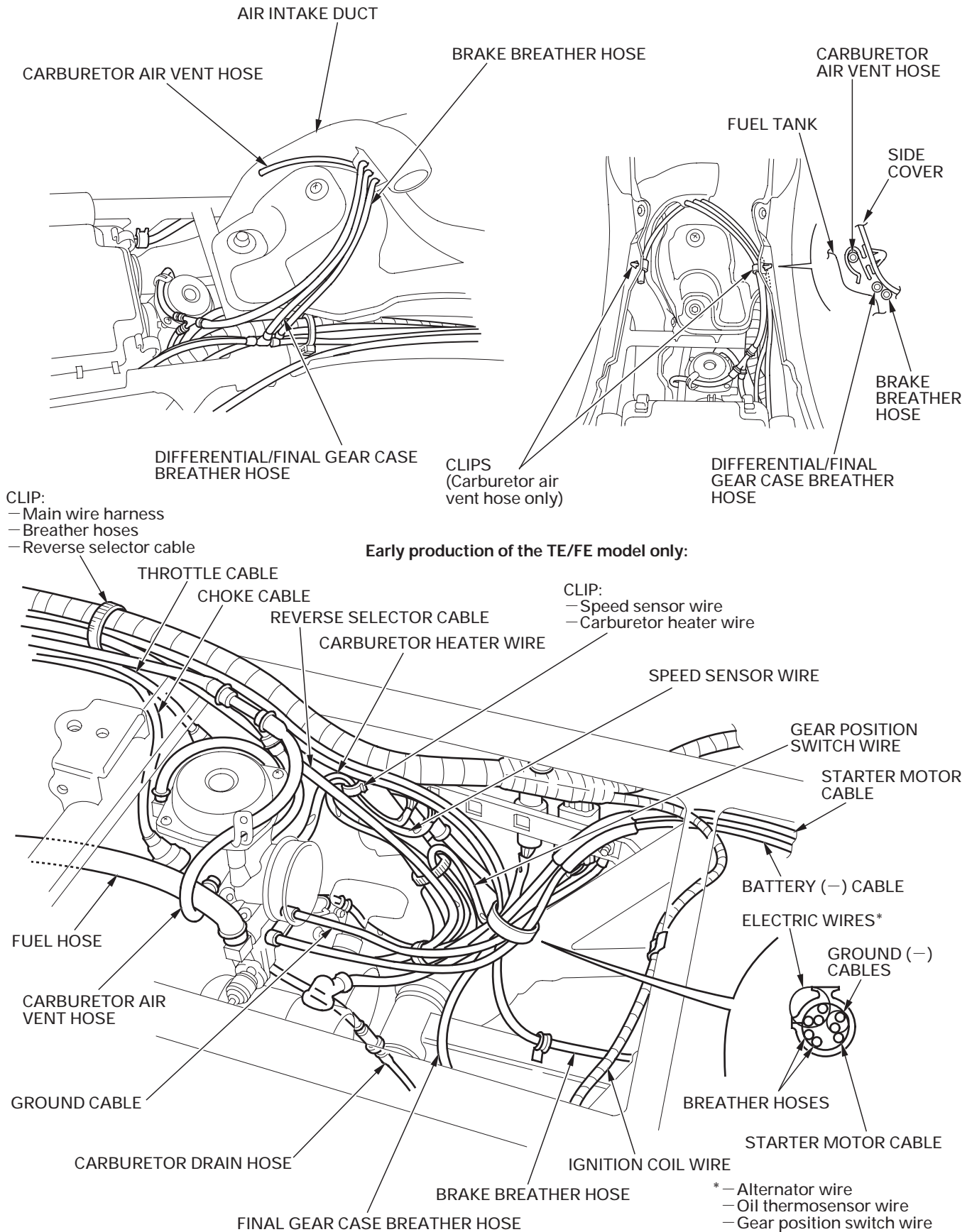
GENERAL INFORMATION





Early production of the TE/FE model only:



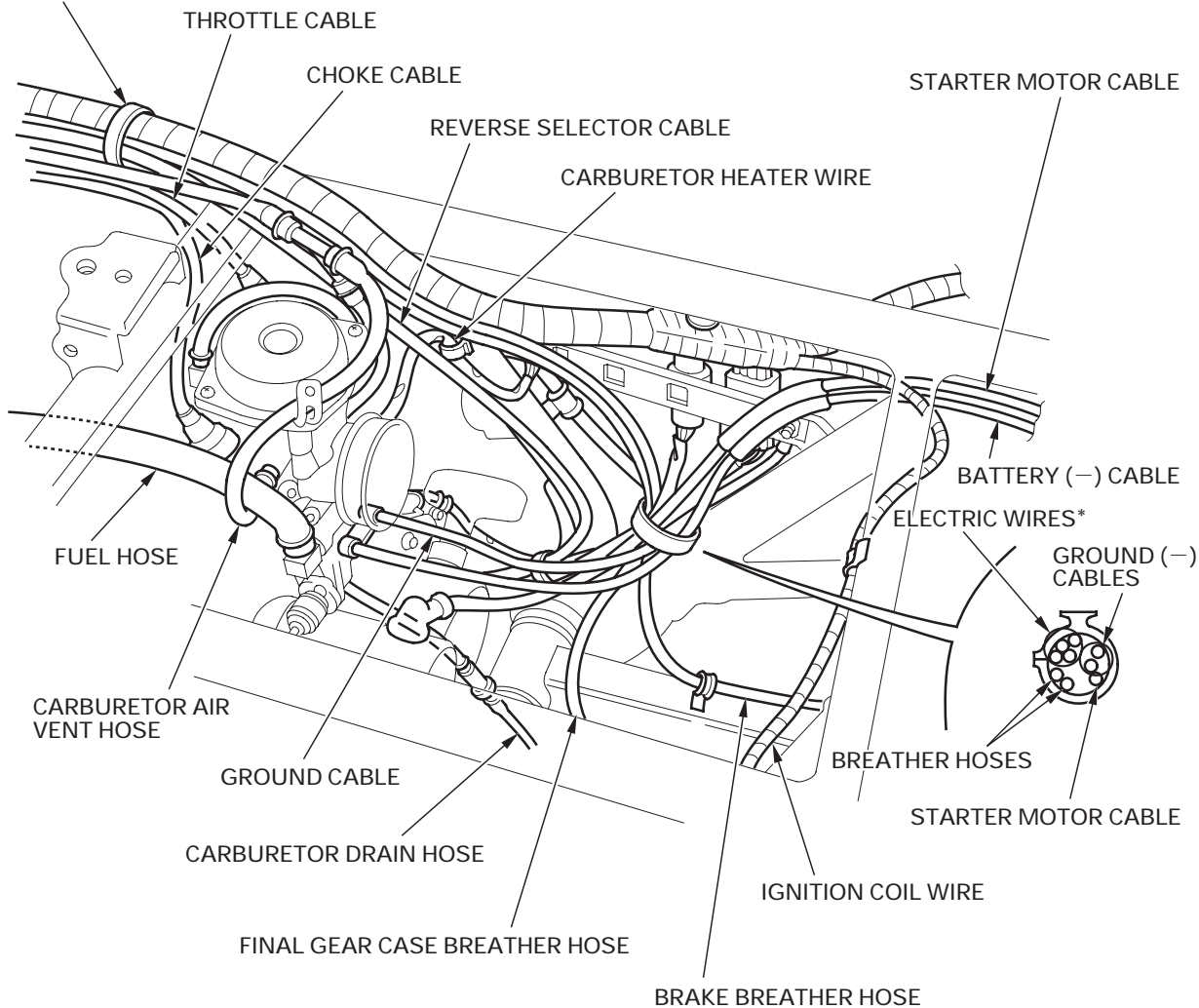


GENERAL INFORMATION

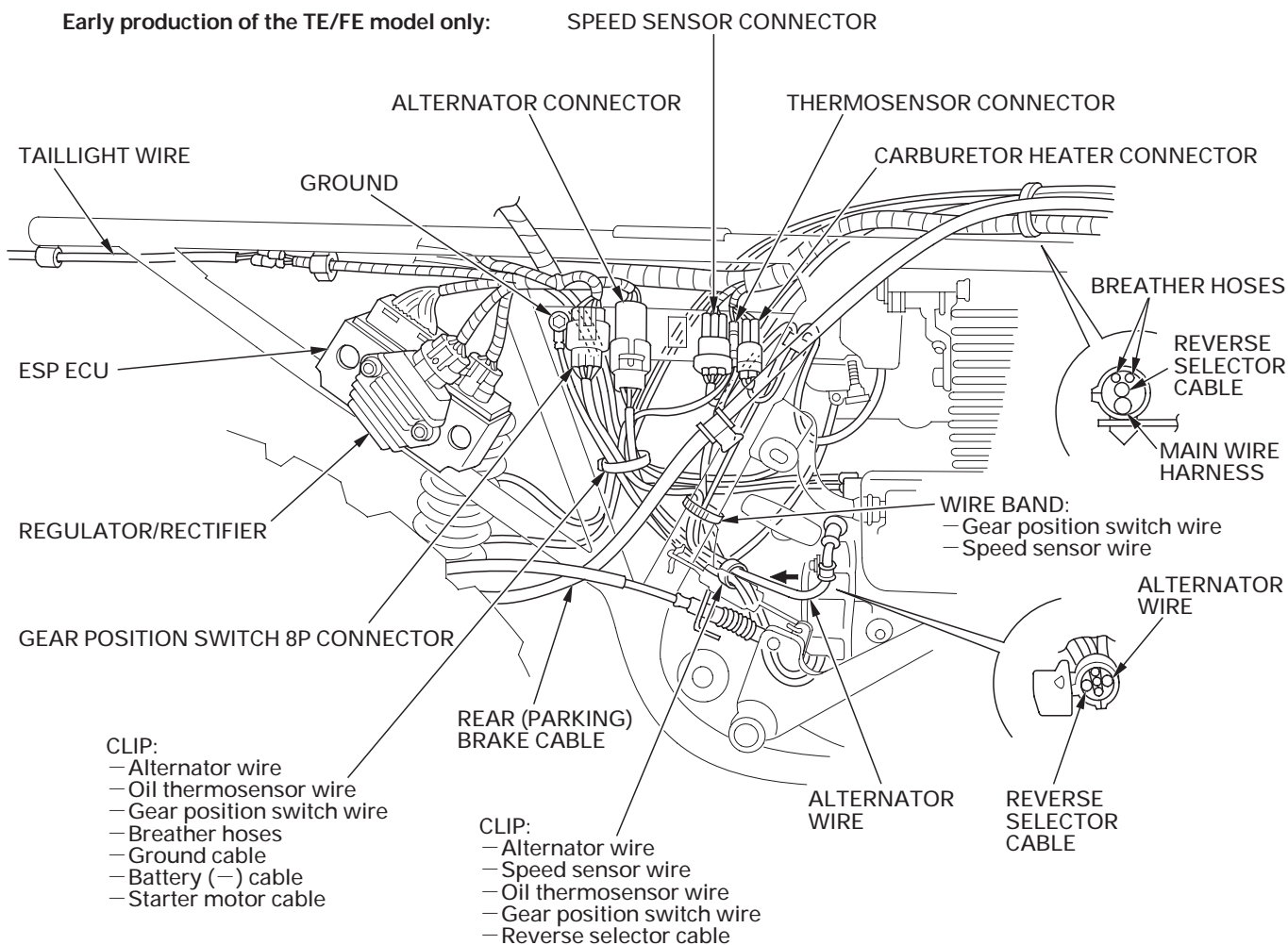
Except early TE/FE model production:

CLIP:

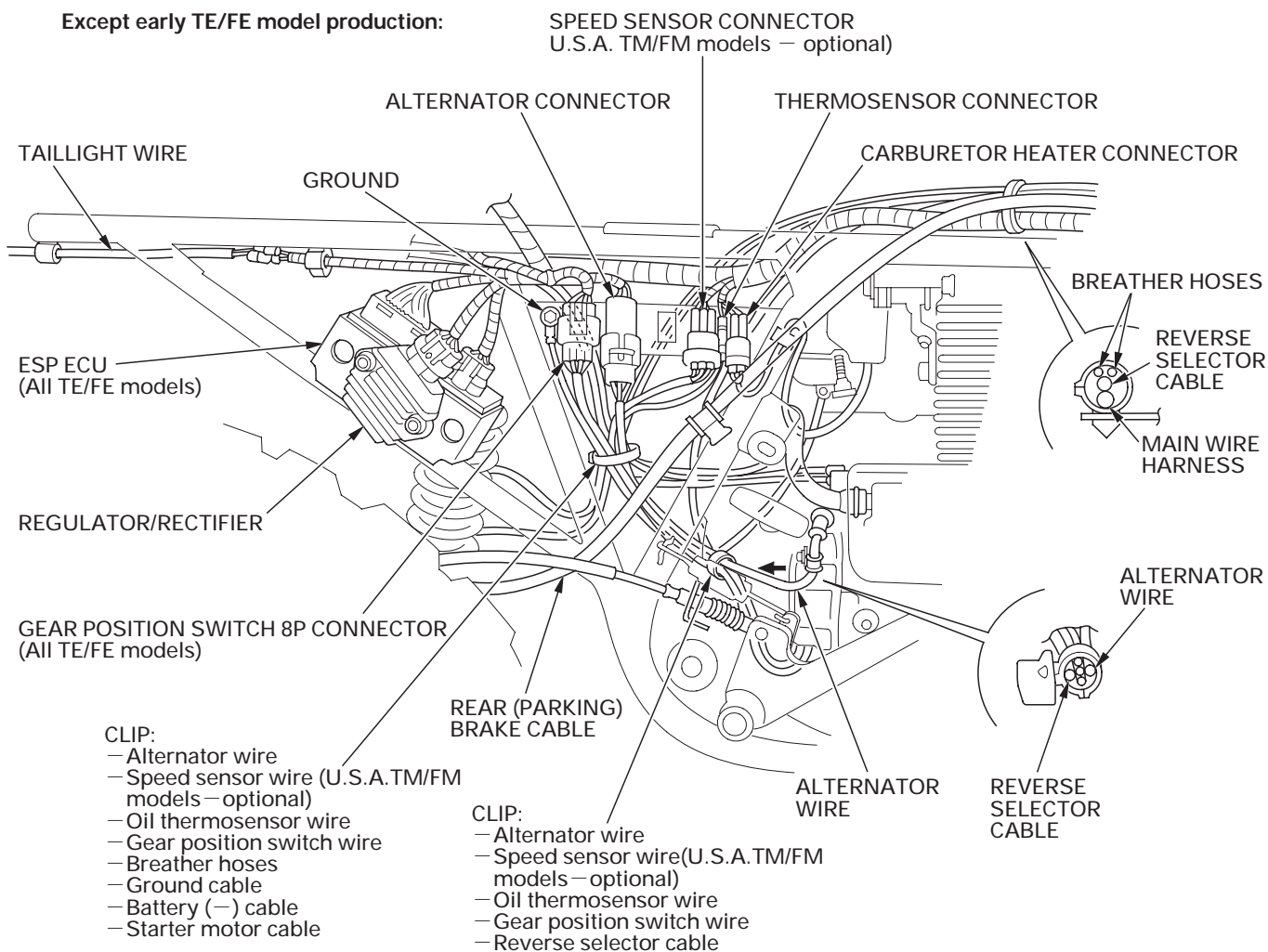
- Main wire harness
- Breather hoses
- Reverse selector cable



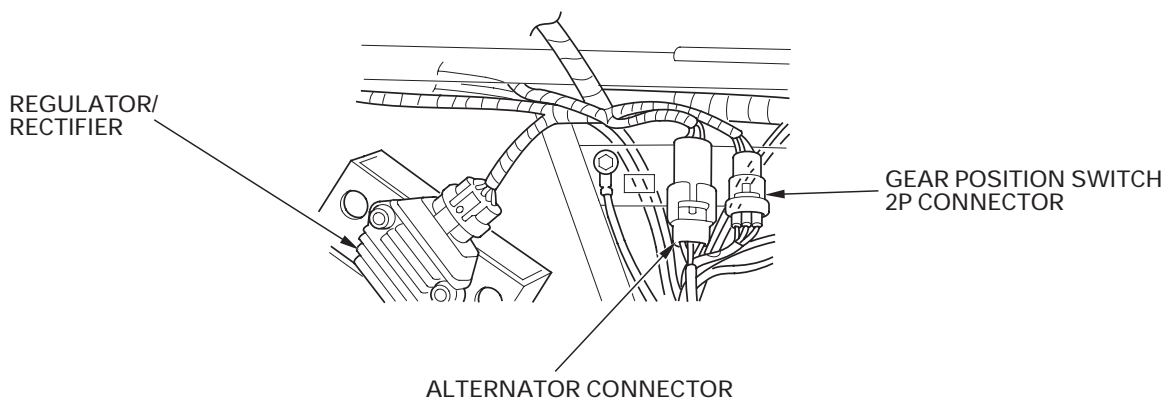
- * — Alternator wire
- Oil thermosensor wire
- Gear position switch wire
- Speed sensor wire (U.S.A. TM/FM models — optional)

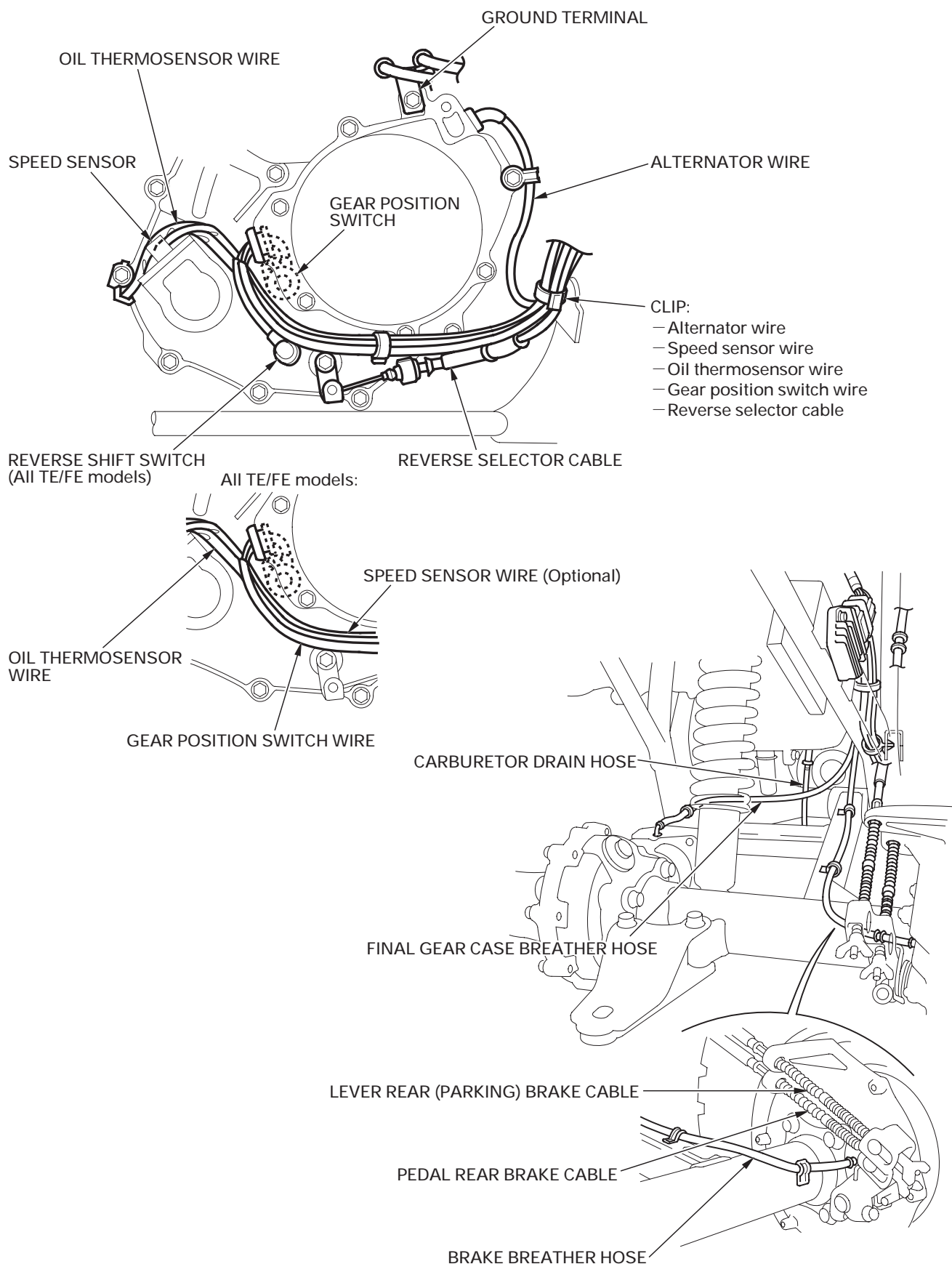


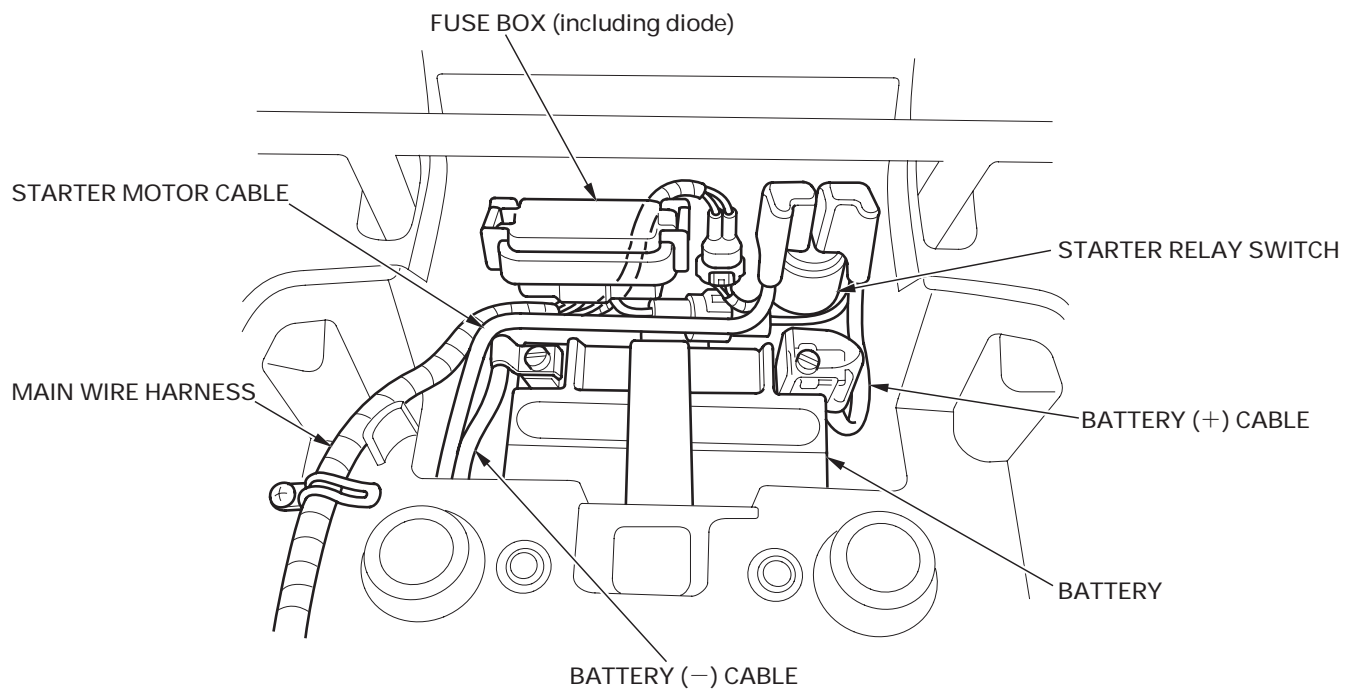
Except early TE/FE model production:



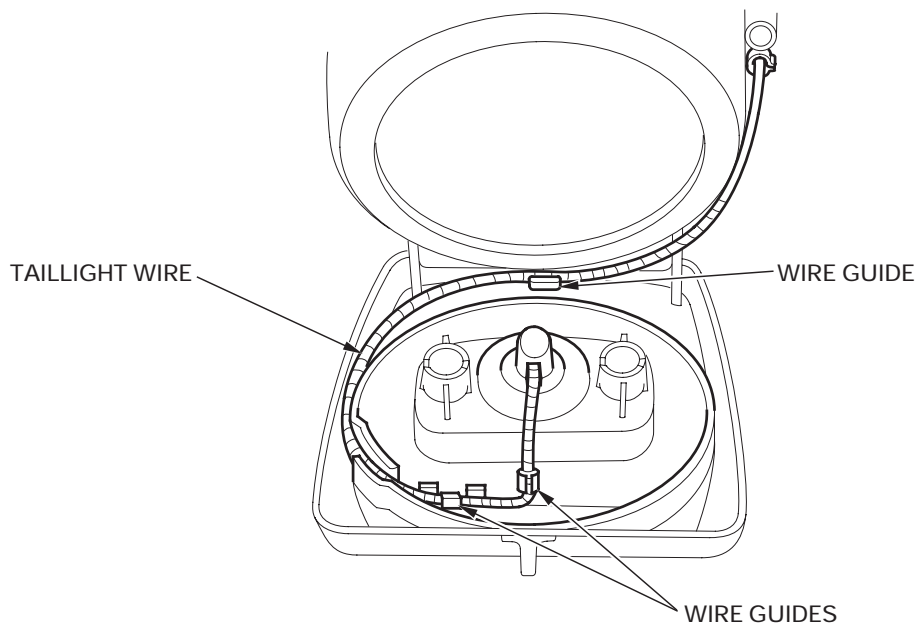
All TM/FM models:







Reverse side of the tool box cover:



EMISSION CONTROL SYSTEMS

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

SOURCE OF EMISSIONS

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

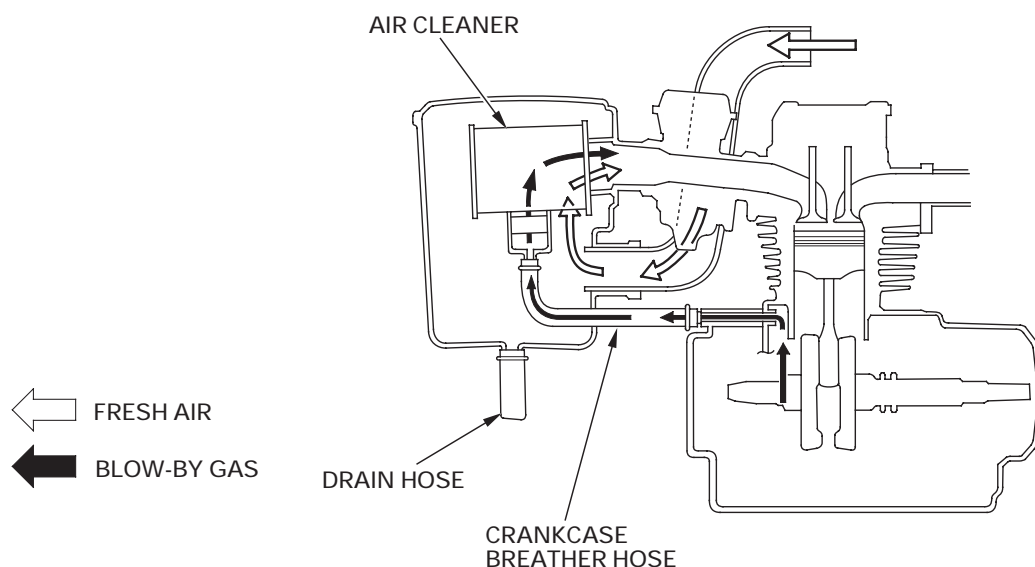
Honda Motor Co., Ltd. utilizes lean carburetor settings as well as other systems, to reduce carbon monoxide and hydrocarbons.

EXHAUST EMISSION CONTROL SYSTEM

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

CRANKCASE EMISSION CONTROL SYSTEM

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



NOISE EMISSION CONTROL SYSTEM

TAMPERING WITH THE NOISE CONTROL SYSTEM IS PROHIBITED: U.S. federal law prohibits or Canadian provincial laws may prohibits the following acts or the causing thereof: (1) The removal or rendering inoperative by any person, other than for purpose of maintenance, repair or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use; (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

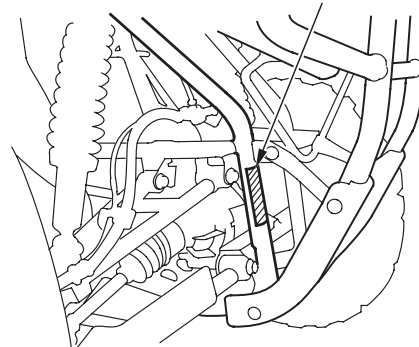
AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE ACTS LISTED BELOW:

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

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

The Vehicle Emission Control Information Label is attached on the right side frame down tube.

EMISSION CONTROL INFORMATION LABEL



2. FRAME/BODY PANELS/EXHAUST SYSTEM

SERVICE INFORMATION	2-1	FRONT CARRIER/CARRY PIPE	2-7
TROUBLESHOOTING	2-1	FRONT FENDER	2-7
BODY PANEL LOCATIONS	2-2	REAR CARRIER	2-8
SEAT	2-4	REAR FENDER	2-8
SIDE COVER	2-4	TOOL BOX	2-9
FUEL TANK COVER	2-5	INNER FENDER	2-9
REAR MUD GUARD (TM/FM models)	2-5	OUTER FENDER	2-9
CENTER MUD GUARD (TE/FE models)	2-6	HEADLIGHT GRILL	2-10
FRONT MUD GUARD	2-6	EXHAUST SYSTEM	2-10

SERVICE INFORMATION

GENERAL

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

TORQUE VALUES

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 bolt	22 N·m (2.2 kgf·m , 16 lbf·ft)
Footpeg bolt (TM/FM model)	32 N·m (3.3 kgf·m , 24 lbf·ft)
Footpeg bracket bolt (TE/FE model)	32 N·m (3.3 kgf·m , 24 lbf·ft)

TROUBLESHOOTING

Excessive exhaust noise

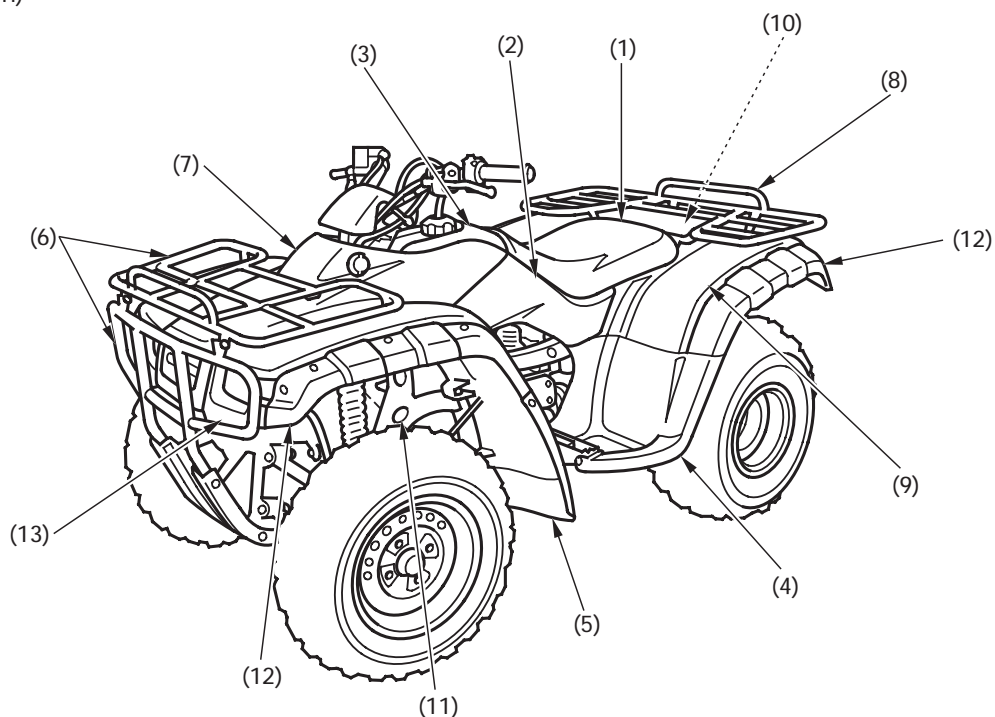
- Broken exhaust system
- Exhaust gas leaks

Poor performance

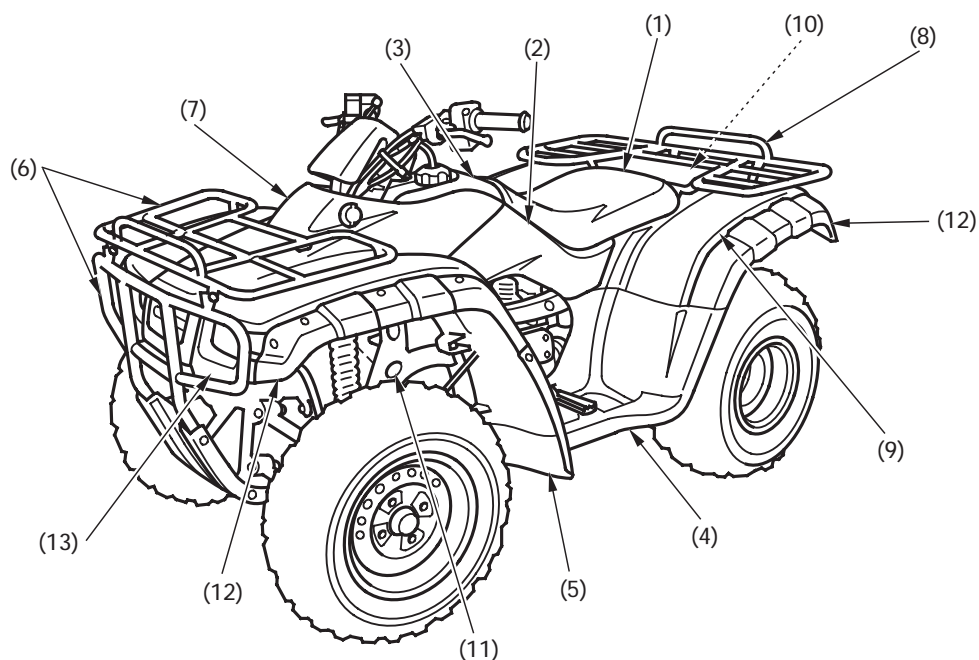
- Deformed exhaust system
- Exhaust gas leaks
- Clogged muffler

BODY PANEL LOCATIONS

TRX350 TM/FM:
(U.S.A. type shown)



TRX350 TE/FE:



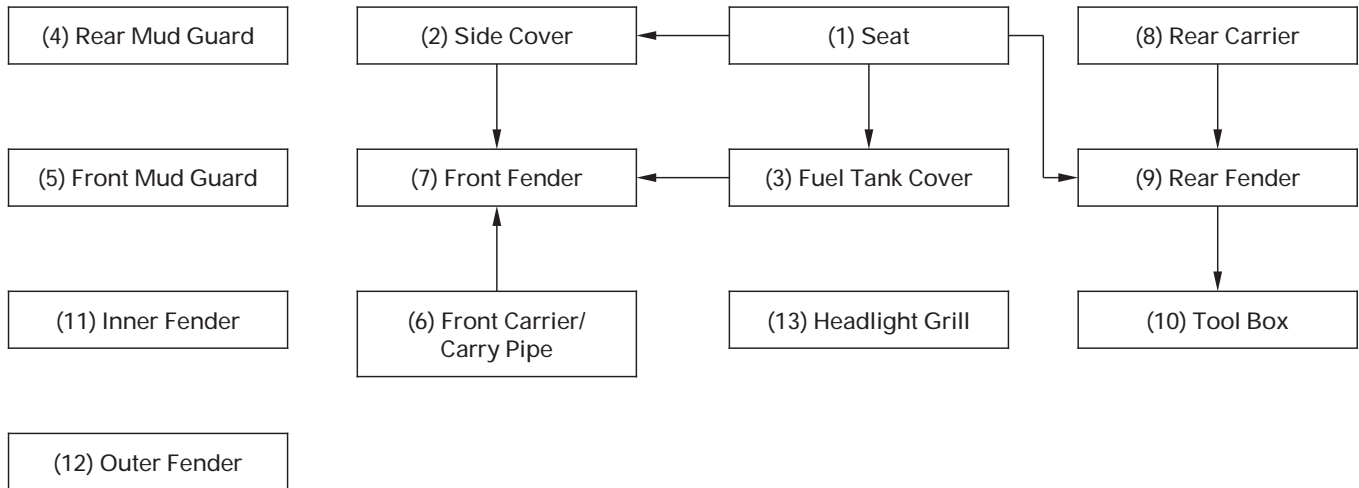
- (1) Seat (page 2-4)
- (2) Side Cover (page 2-4)
- (3) Fuel Tank Cover (page 2-5)
- (4) Rear Mud Guard (TM/FM: page 2-5)
- (4) Center Mud Guard (TE/FE: page 2-6)
- (5) Front Mud Guard (page 2-6)
- (6) Front Carrier/Carry Pipe (page 2-7)

- (7) Front Fender (page 2-7)
- (8) Rear Carrier (page 2-8)
- (9) Rear Fender (page 2-8)
- (10) Tool Box (page 2-9)
- (11) Inner Fender (page 2-9)
- (12) Outer Fender (page 2-9)
- (13) Headlight Grill (page 2-10)

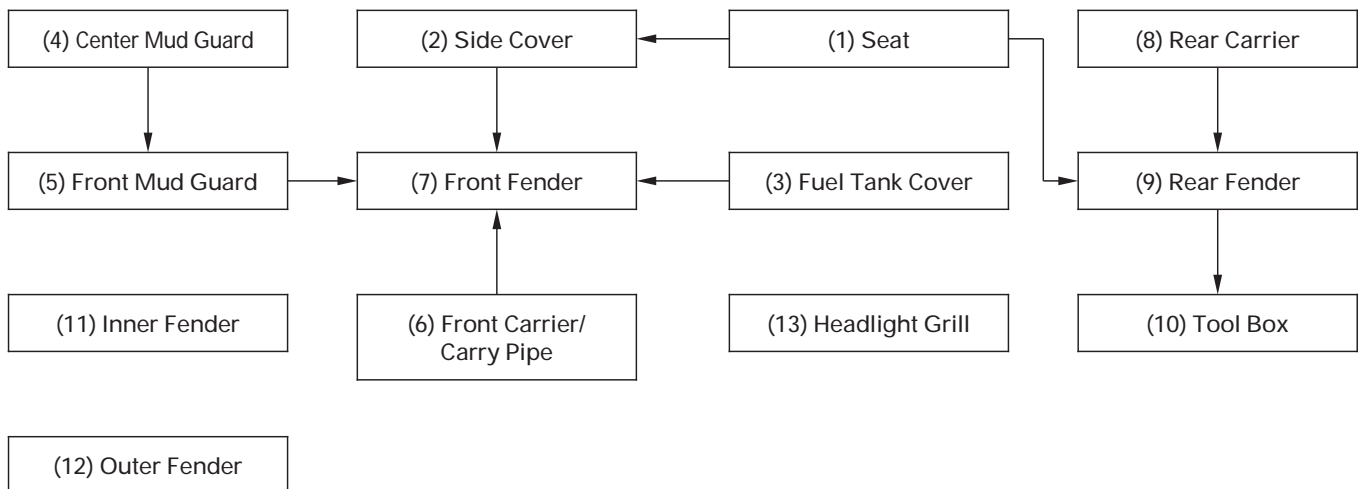
BODY PANEL REMOVAL CHART

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

TRX350 TM/FM:



TRX350 TE/FE:



SEAT

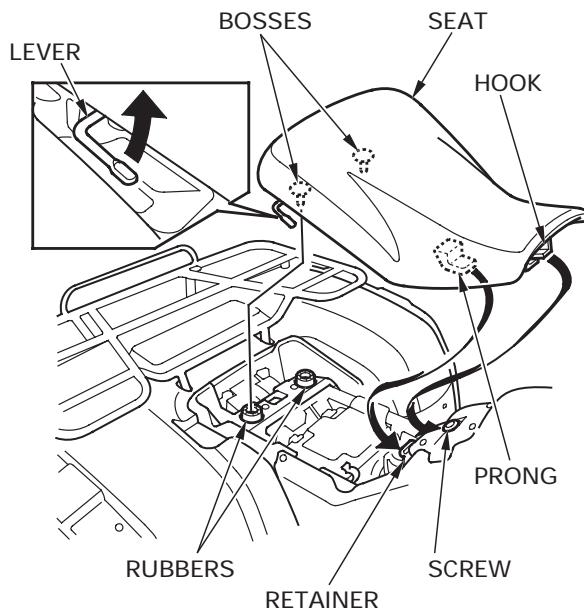
REMOVAL

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

INSTALLATION

Install the seat by inserting the hook between the screw and fuel tank and the prong into the seat retainer of the frame.

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



SIDE COVER

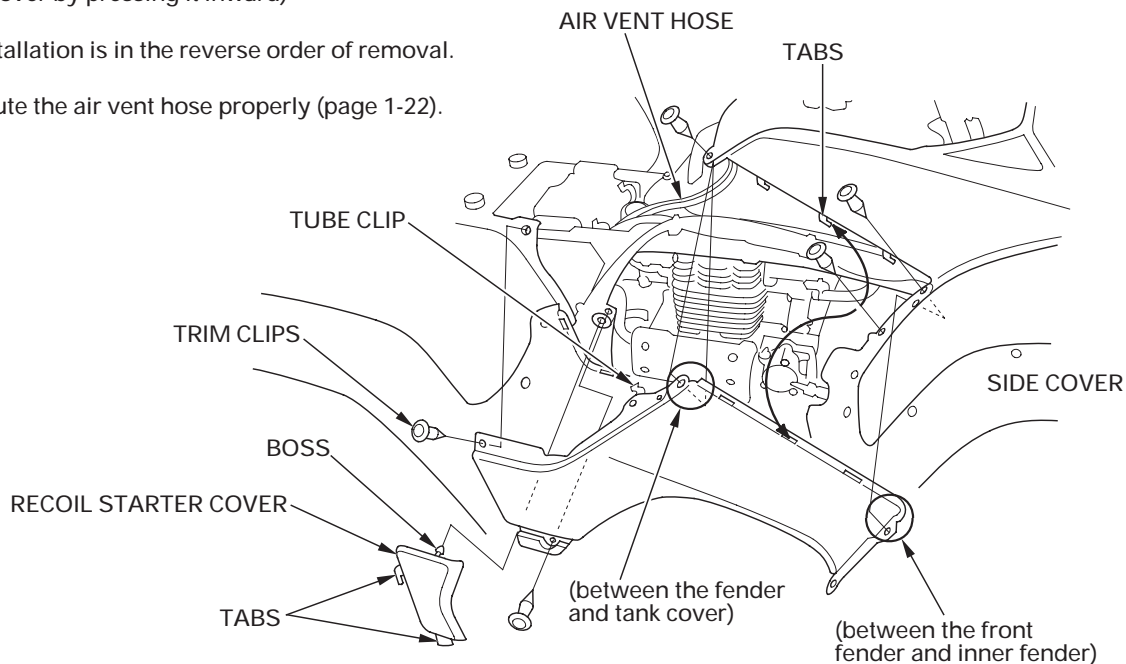
Remove the seat.

Remove the following:

- carburetor air vent hose (from clips on side covers)
- recoil starter cover (release boss and tabs)
- five trim clips
- side cover (release three tabs of fender by sliding cover forward and front mounting portion of cover by pressing it inward)

Installation is in the reverse order of removal.

Route the air vent hose properly (page 1-22).

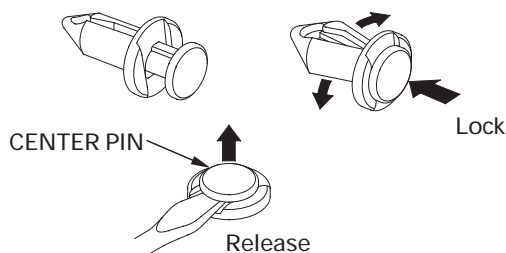


When installing the trim clip, carefully align the clip hole to avoid damaging the clip.

Trim clip removal and retaining procedure:

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

Remove and install



FUEL TANK COVER

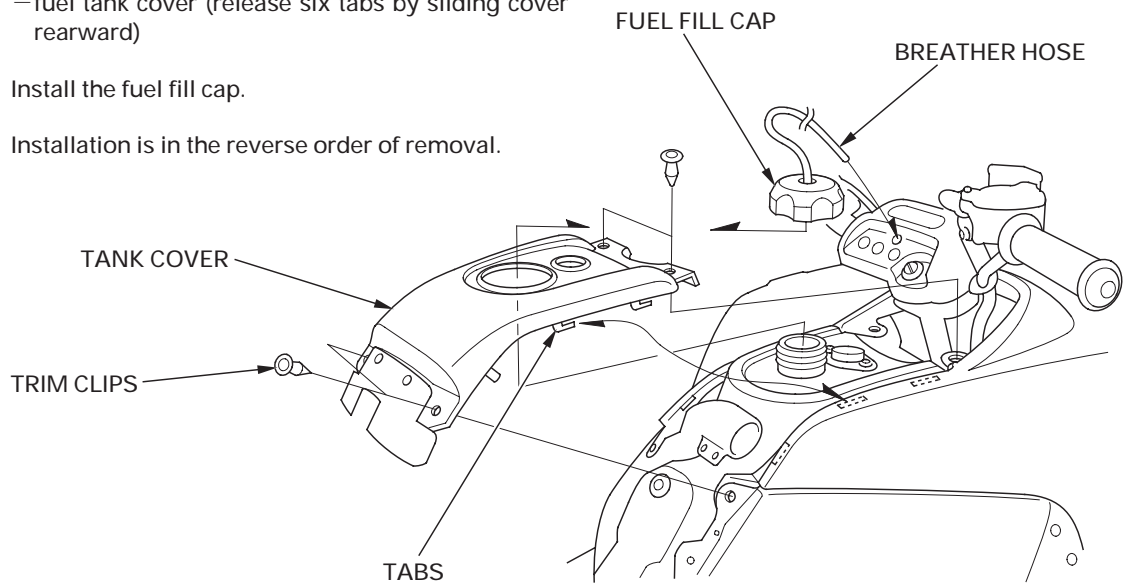
Remove the seat (page 2-4).

Remove the following:

- four trim clips
- fuel tank breather hose and fuel fill cap
- fuel tank cover (release six tabs by sliding cover rearward)

Install the fuel fill cap.

Installation is in the reverse order of removal.



REAR MUD GUARD (TM/FM models)

RIGHT SIDE:

Remove the following:

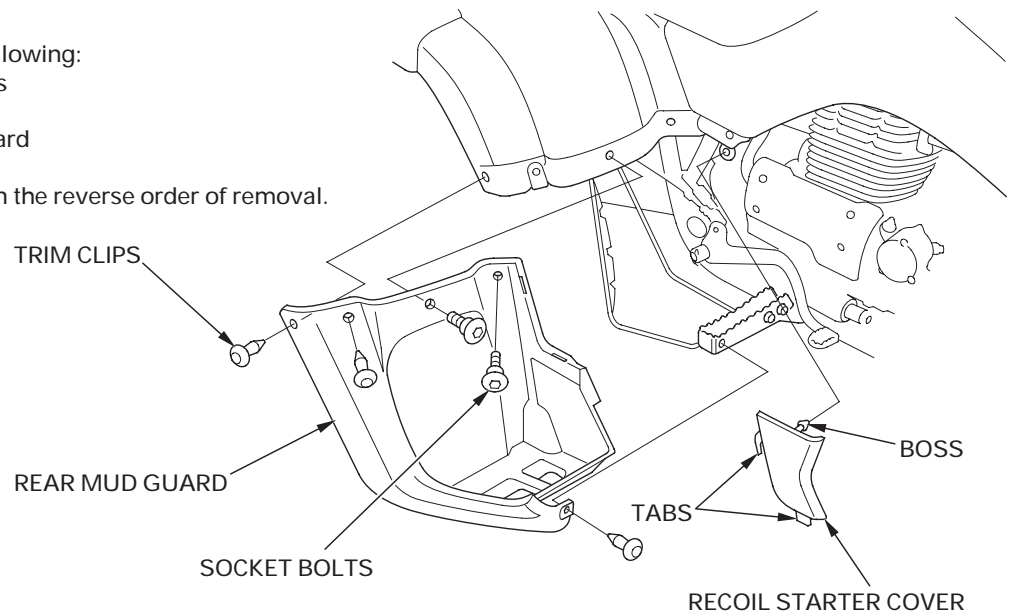
- recoil starter cover (release boss and tabs)
- three trim clips
- two socket bolts
- rear mud guard

LEFT SIDE:

Remove the following:

- five trim clips
- socket bolt
- rear mud guard

Installation is in the reverse order of removal.



CENTER MUD GUARD (TE/FE models)

RIGHT SIDE:

Remove the following:

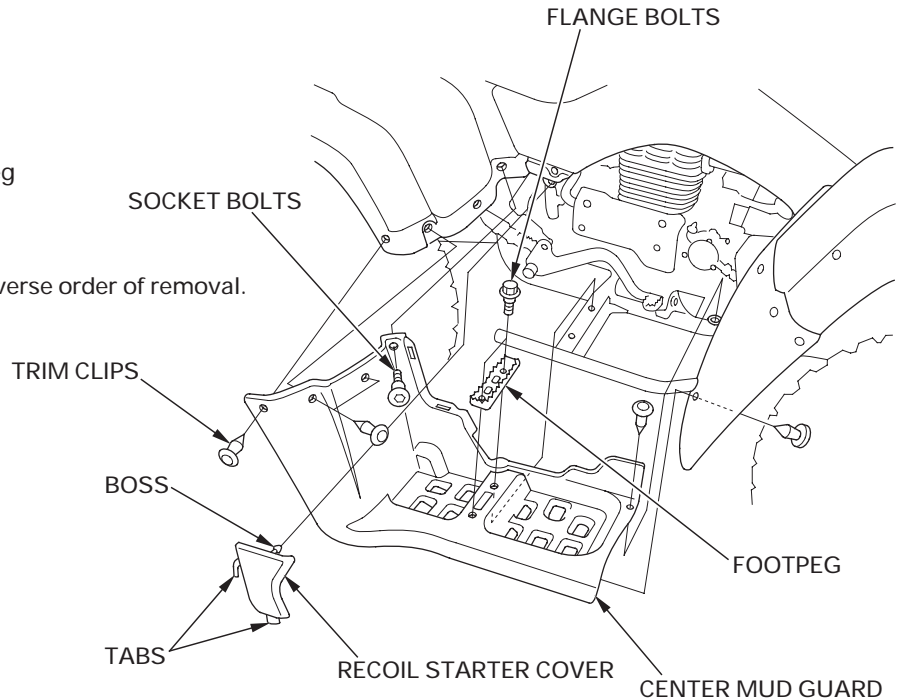
- recoil starter cover (release boss and tabs)
- two bolts and footpeg
- five trim clips
- socket bolt
- center mud guard

LEFT SIDE:

Remove the following:

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

Installation is in the reverse order of removal.



FRONT MUD GUARD

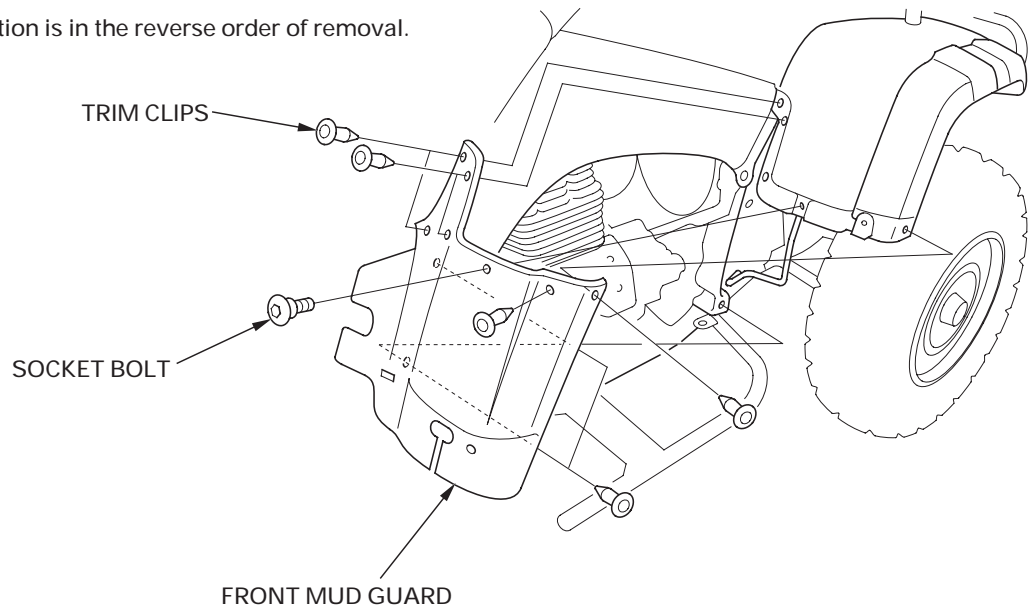
Remove the center mud guard (TE/FE only).

Remove the following:

- eight trim clips
- socket bolt
- front mud guard (TE/FE: from footpeg bracket)

TE/FE model shown:

Installation is in the reverse order of removal.



FRONT CARRIER/CARRY PIPE

Early TE/FE model production only: Remove the two plastic bands to remove the sub-ignition control module (ICM) from the carry pipe.

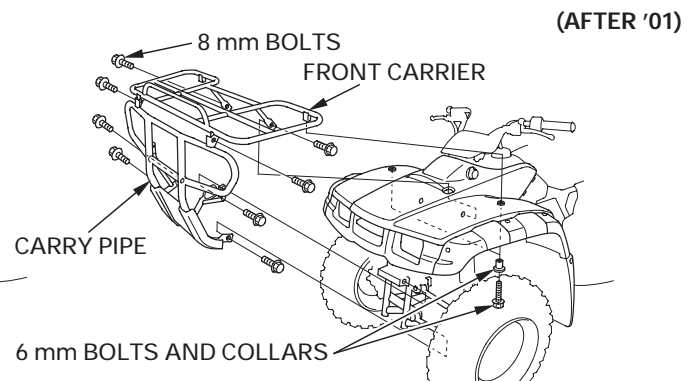
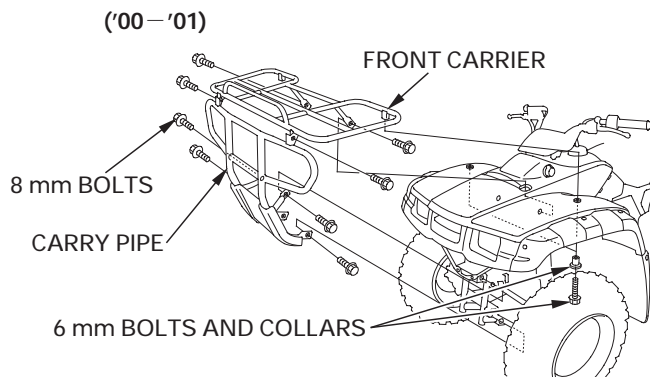
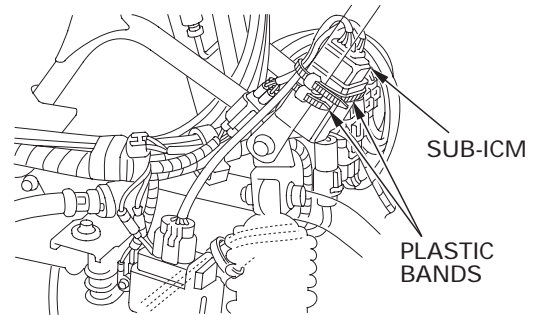
Be careful not to scratch the front fender.

Remove the following:

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

Installation is in the reverse order of removal.

Install the sub-ICM and wires properly if removed (page 1-22).



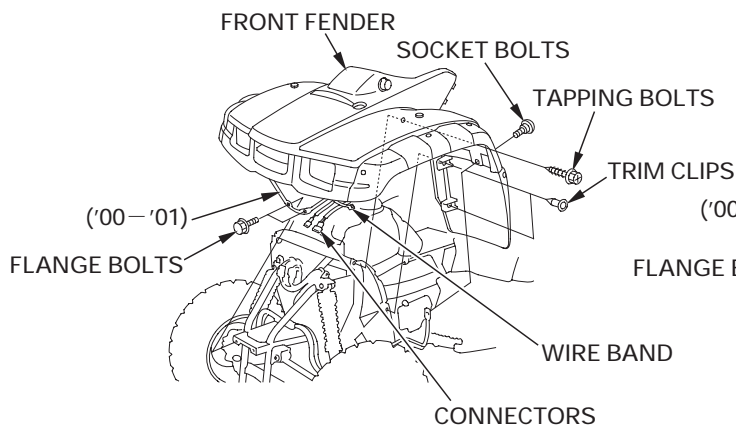
FRONT FENDER

Remove the following:

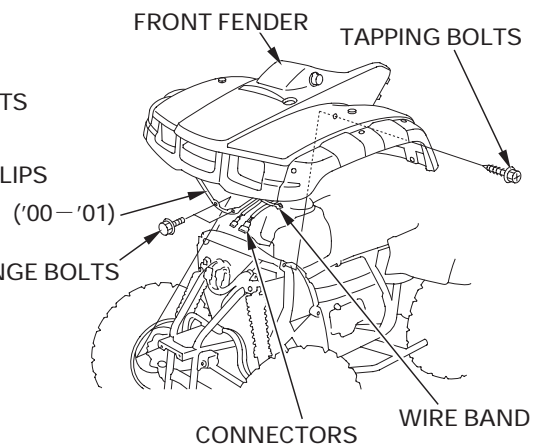
- side covers (page 2-4)
- fuel tank cover (page 2-5)
- front mud guards (TE/FE only: page 2-6)
- front carrier
- headlight wire band
- headlight and accessory socket connectors
- four trim clips (TM/FM only)
- six bolts (TM/FM)/
- four bolts (TE/FE)
- front fender (while spreading upper rear portion)

Installation is in the reverse order of removal.

TM/FM models:



TE/FE models:

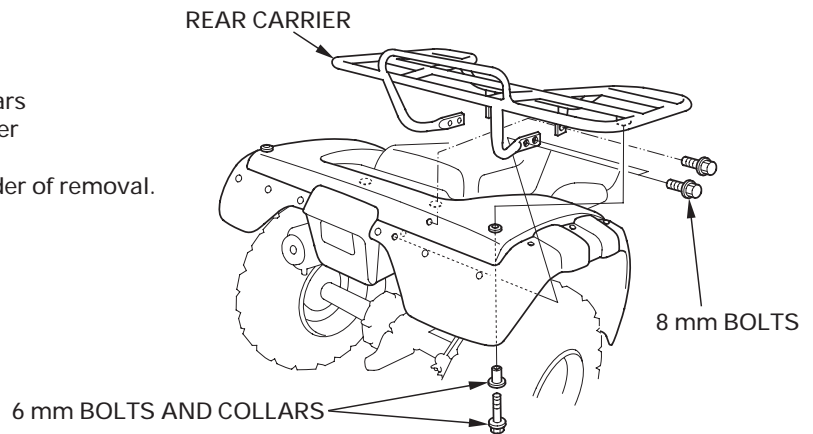


REAR CARRIER

Remove the following:

- two 6 mm bolts and two collars
- six 8 mm bolts and rear carrier

Installation is in the reverse order of removal.



REAR FENDER

Remove the rear carrier.

Remove the battery (page 17-4).

Release the main wire harness from the clamp.
Disconnect the starter motor cable from the starter relay by removing the terminal nut and washer.

Remove the following from the battery box:

- fuse box
- starter relay
- connectors

Remove the following from the rear fender:

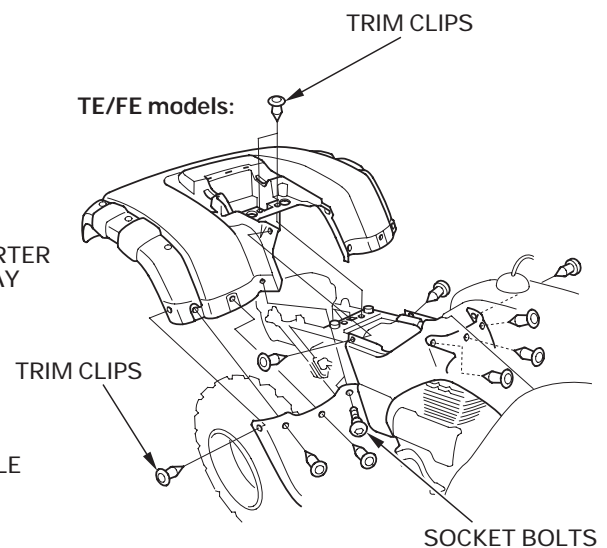
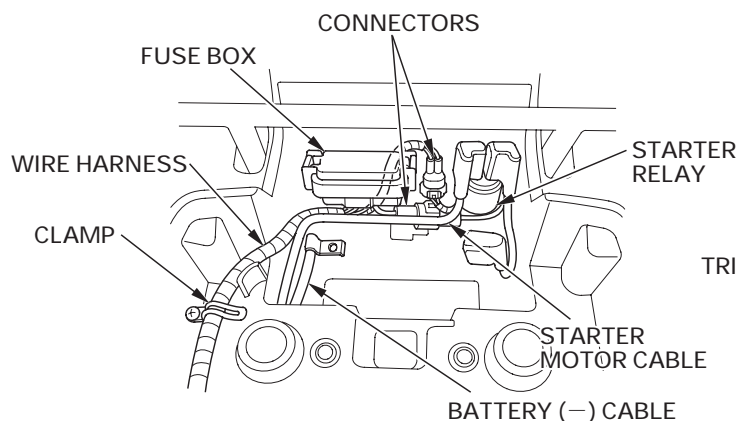
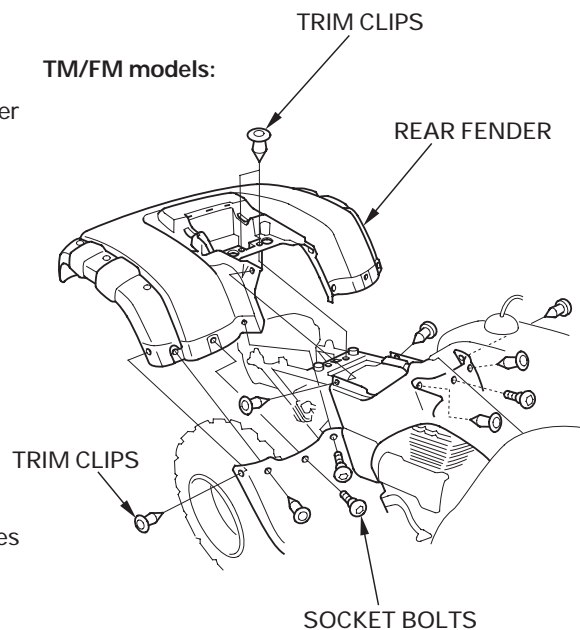
- nine trim clips (TM/FM)/
eleven trim clips (TE/FE)
- two flange bolts (upper side of fender)
- three socket bolts (TM/FM)/
one socket bolt (TE/FE)

Do not allow the rear fender to contact the muffler when the exhaust system is hot.

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

Installation is in the reverse order of removal.

Route the wires and cables properly (page 1-22).



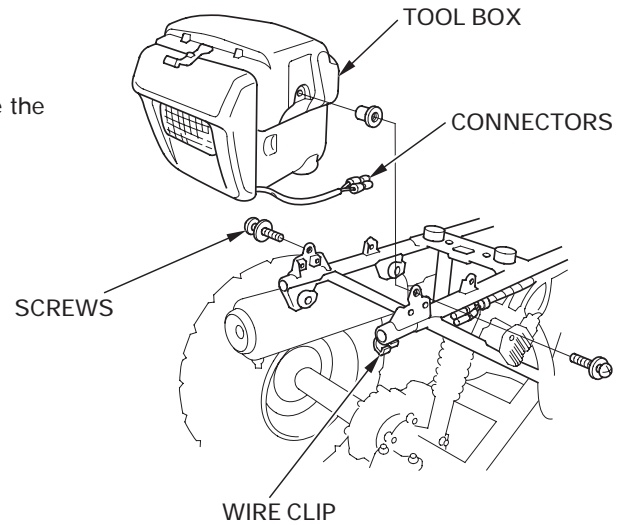
TOOL BOX

Remove the rear fender (page 2-8).

Disconnect the taillight connectors and release the wire from the wire clip on the frame pipe.

Remove the two screws and the tool box.

Installation is in the reverse order of removal.

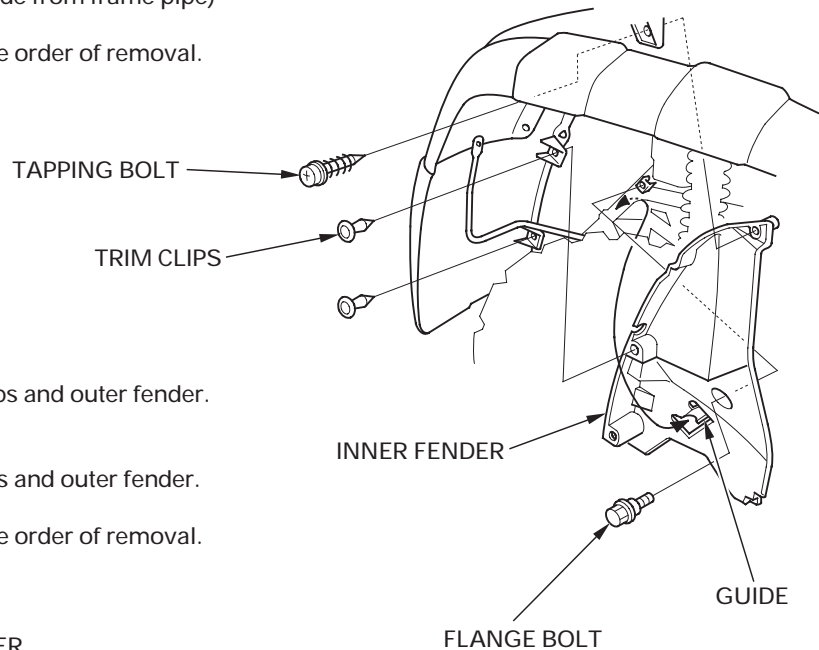


INNER FENDER

Remove the following:

- two trim clips
- two bolts
- inner fender (release guide from frame pipe)

Installation is in the reverse order of removal.



OUTER FENDER

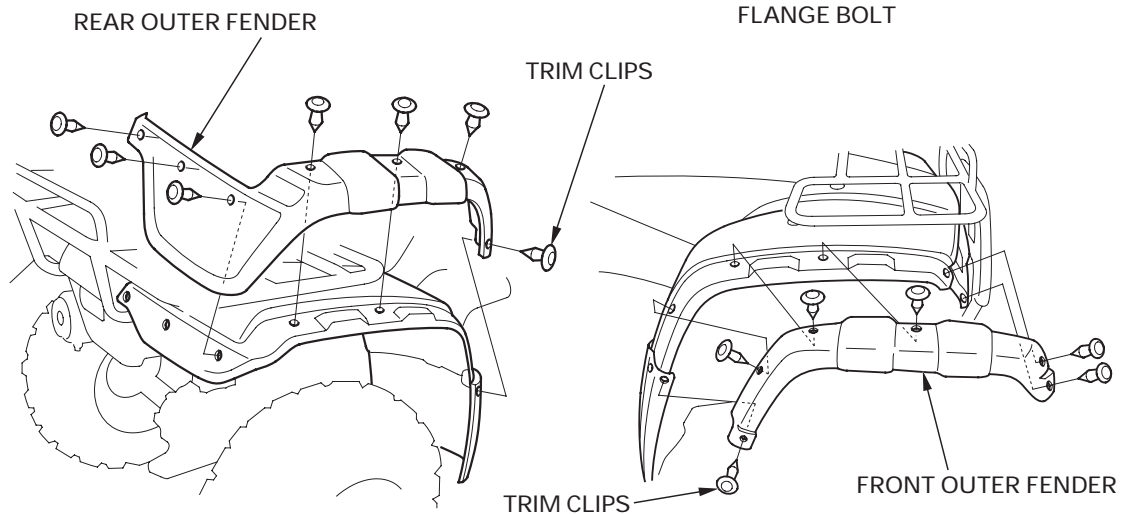
FRONT:

Remove the seven trim clips and outer fender.

REAR:

Remove the eight trim clips and outer fender.

Installation is in the reverse order of removal.



HEADLIGHT GRILL

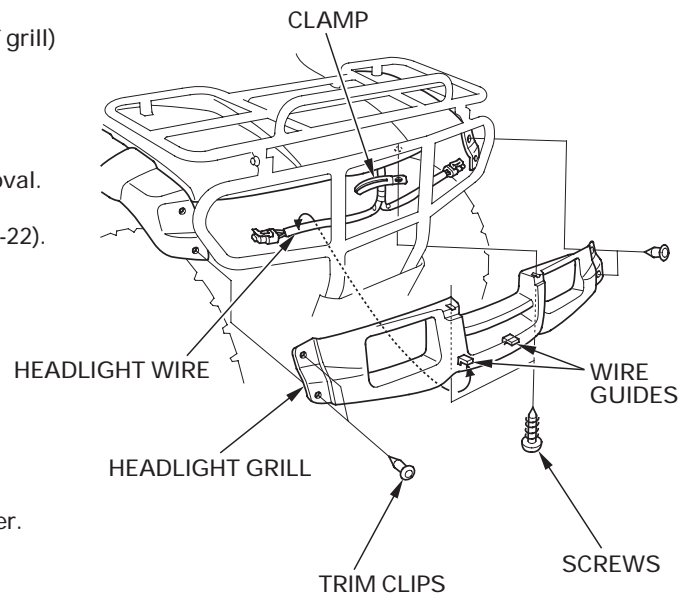
Remove the headlights (page 20-3).

Remove the following:

- headlight wire (from two wire guides of grill)
- two screws and wire clamp
- four trim clips
- headlight grill

Installation is in the reverse order of removal.

Route the headlight wire properly (page 1-22).



EXHAUST SYSTEM REMOVAL

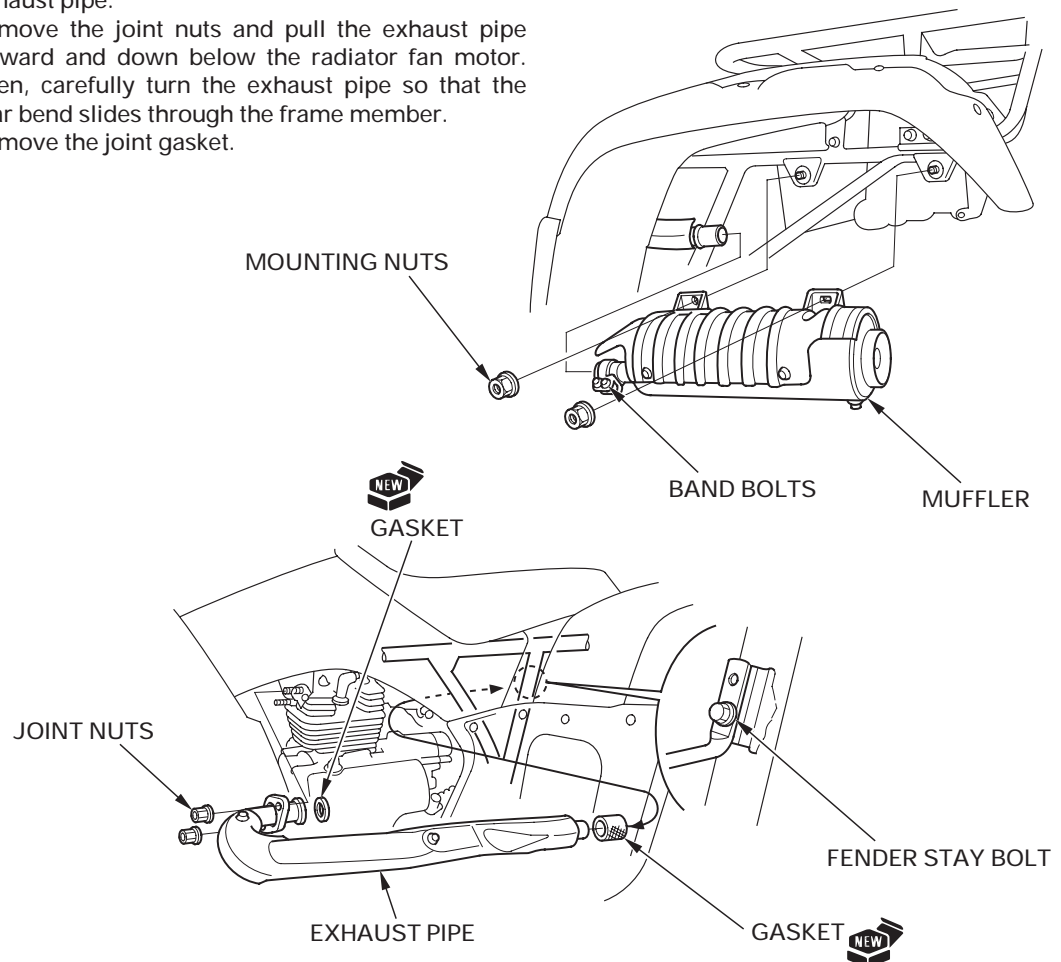
MUFFLER

Loosen the muffler band bolts.
Remove the mounting nuts and the muffler.
Remove the muffler gasket.

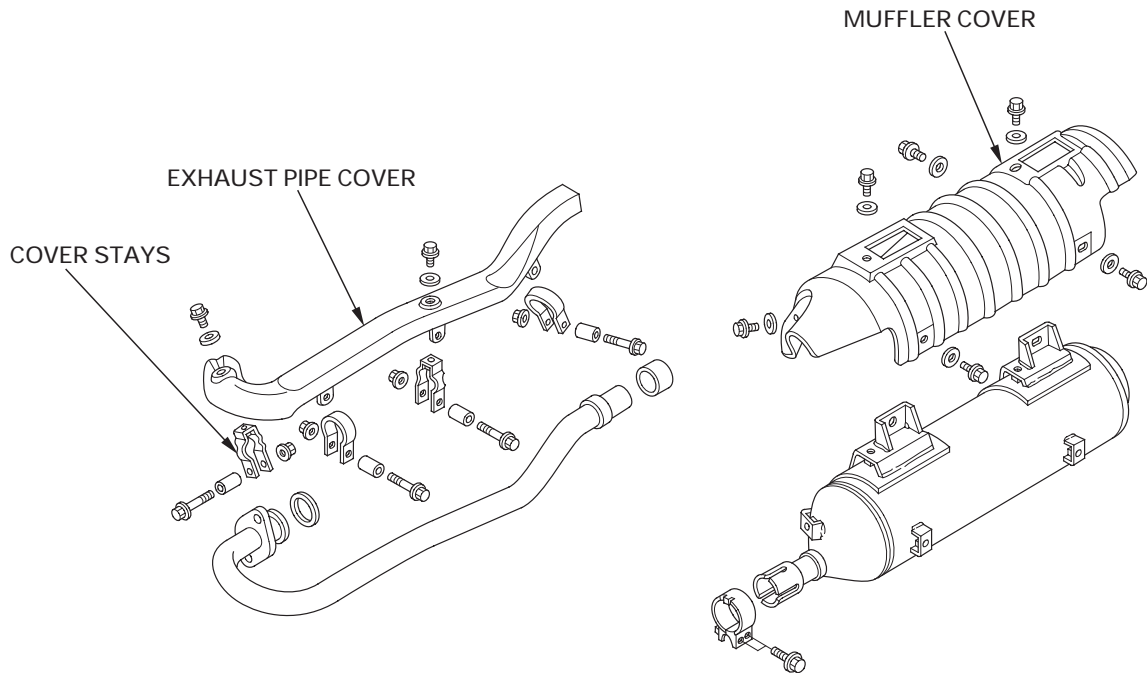
EXHAUST PIPE

TM/FM model only: Remove the fender stay bolt and move the stay aside so that the stay does not interfere with the exhaust pipe.

Remove the joint nuts and pull the exhaust pipe forward and down below the radiator fan motor. Then, carefully turn the exhaust pipe so that the rear bend slides through the frame member. Remove the joint gasket.



DISASSEMBLY/ASSEMBLY



INSTALLATION

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

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

TORQUE:

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

bolt: 22 N·m (2.2 kgf·m , 16 lbf·ft)

After installation, inspect the exhaust system for leaks.

MEMO

3. MAINTENANCE

SERVICE INFORMATION	3-1	REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL	3-12
MAINTENANCE SCHEDULE	3-3	BRAKE FLUID	3-14
FUEL HOSE	3-5	BRAKE SHOE WEAR	3-14
THROTTLE OPERATION	3-5	BRAKE SYSTEM	3-15
CARBURETOR CHOKE	3-6	REVERSE LOCK SYSTEM	3-16
AIR CLEANER	3-6	SKID PLATES	3-17
AIR CLEANER HOUSING DRAIN HOSE	3-7	CLUTCH SYSTEM	3-17
SPARK PLUG	3-8	SUSPENSION	3-17
VALVE CLEARANCE	3-8	SPARK ARRESTER	3-18
ENGINE OIL	3-10	NUTS, BOLTS, FASTENERS	3-18
ENGINE OIL FILTER	3-11	WHEELS/TIRES	3-18
ENGINE IDLE SPEED	3-12	STEERING SHAFT HOLDER BEARING	3-19
DRIVE SHAFT BOOTS (FM/FE models)	3-12	STEERING SYSTEM	3-19

SERVICE INFORMATION

GENERAL

- Place the vehicle on level ground before starting any work

SPECIFICATIONS

ITEM		SPECIFICATIONS
Throttle lever free play		3 – 8 mm (1/8 – 5/16 in)
Spark plug	Standard	DPR7EA-9 (NGK), X22EPR-U9 (DENSO)
	For extended high speed riding	DPR6EA-9 (NGK), X20EPR-U9 (DENSO)
Spark plug gap		0.8 – 0.9 mm (0.03 – 0.04 in)
Valve clearance	IN/EX	0.15 mm (0.006 in)
Engine oil capacity	After draining	1.95 l (2.06 US qt, 1.72 Imp qt)
	After draining/filter change	2.0 l (2.1 US qt, 1.8 Imp qt)
	After disassembly	2.5 l (2.6 US qt, 2.2 Imp qt)
Recommended engine oil		Pro Honda GN4 or HP4 (without molybdenum additives) 4-stroke oil or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-40
Engine idle speed		1,400 ± 100 rpm
Front differential oil capacity	After draining	241 cm ³ (8.2 US oz, 8.5 Imp oz)
	After disassembly	275 cm ³ (9.3 US oz, 9.7 Imp oz)
Recommended differential oil		Hypoid gear oil SAE # 80
Rear final drive oil capacity	After draining	85 cm ³ (2.9 US oz, 3.0 Imp oz)
	After disassembly	100 cm ³ (3.4 US oz, 3.5 Imp oz)
Recommended final drive oil		Hypoid gear oil SAE # 80

MAINTENANCE

ITEM			SPECIFICATIONS
Recommended brake fluid			Honda DOT 4 brake fluid
Front brake shoe lining thickness			Standard: 4.0 mm (0.16 in)/Service limit: 1.0 mm (0.04 in)
Front brake lever free play			25 – 30 mm (1 – 1-3/16 in)
Rear (parking) brake lever free play			15 – 20 mm (9/16 – 13/16 in)
Rear brake pedal free play			15 – 20 mm (9/16 – 13/16 in)
Reverse selector lever free play			2 – 4 mm (1/16 – 3/16 in)
Cold tire pressure (Front/Rear)	TM/TE	Standard	20 kPa (0.20 kgf/cm ² , 2.9 psi)
		Minimum	17 kPa (0.17 kgf/cm ² , 2.5 psi)
		Maximum	23 kPa (0.23 kgf/cm ² , 3.3 psi)
		With cargo	20 kPa (0.20 kgf/cm ² , 2.9 psi)
	FM/FE	Standard	25 kPa (0.25 kgf/cm ² , 3.6 psi)
		Minimum	22 kPa (0.22 kgf/cm ² , 3.2 psi)
		Maximum	28 kPa (0.28 kgf/cm ² , 4.0 psi)
		With cargo	25 kPa (0.25 kgf/cm ² , 3.6 psi)
Tire size	TM/TE	Front	AT24 × 8-12 ★★
		Rear	AT25 × 11-10 ★★
	FM/FE	Front	AT24 × 8-12 ★★
		Rear	AT24 × 9-11 ★★
Tire brand	TM/TE	Front	TRACKER CL (Goodyear)
		Rear	TRACKER CL (Goodyear)
	FM/FE	Front	DIRT HOOKS 15 (Bridgestone)
		Rear	DIRT HOOKS 14 (Bridgestone)
Minimum tread depth (Front/Rear)			4.0 mm (0.16 in)
Toe	TM/TE	Toe-in: 3 ± 15 mm (1/8 ± 9/16 in)	
	FM/FE	Toe-out: 18 ± 15 mm (3/4 ± 9/16 in)	

TORQUE VALUES

Spark plug	18 N·m (1.8 kgf·m , 13 lbf·ft)
Valve adjusting lock nut	17 N·m (1.7 kgf·m , 12 lbf·ft)
Timing hole cap	10 N·m (1.0 kgf·m , 7 lbf·ft)
Engine oil drain bolt	25 N·m (2.5 kgf·m , 18 lbf·ft)
Engine oil filter cover	10 N·m (1.0 kgf·m , 7 lbf·ft)
Front differential oil filler cap	12 N·m (1.2 kgf·m , 9 lbf·ft)
drain bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)
Rear final gear case oil check bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)
filler cap	12 N·m (1.2 kgf·m , 9 lbf·ft)
drain bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m , 1.4 lbf·ft)
Clutch adjusting screw lock nut	22 N·m (2.2 kgf·m , 16 lbf·ft)
Tie-rod lock nut	54 N·m (5.5 kgf·m , 40 lbf·ft)

MAINTENANCE SCHEDULE

TRX350 TM/TE:

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 →	mi	km	HOURS	INITIAL MAINTENANCE	REGULAR MAINTENANCE INTERVAL			Refer to page
EMISSION RELATED ITEMS	*	FUEL HOSE									I	3-5
	*	THROTTLE OPERATION									I	3-5
	*	CARBURETOR CHOKE									I	3-6
		AIR CLEANER	NOTE 1						C		C	3-6
		AIR CLEANER HOUSING DRAIN HOSE	NOTE 2						I		I	3-7
		SPARK PLUG							I		I	3-8
	*	VALVE CLEARANCE						I	I		I	3-8
		ENGINE OIL						R	R		R	3-10
		ENGINE OIL FILTER						R	R		R	3-11
	*	ENGINE IDLE SPEED						I	I		I	3-12
NON-EMISSION RELATED ITEMS		REAR FINAL GEAR CASE OIL							(R: Every 2 years)		I	3-12
	*	BRAKE FLUID	NOTE 3						I		I	3-14
	*	BRAKE SHOE WEAR	NOTE 1								I	3-14
		BRAKE SYSTEM						I	I		I	3-15
	*	REVERSE LOCK SYSTEM						I	I		I	3-15
		SKID PLATES							I		I	3-17
	*	CLUTCH SYSTEM						I	I		I	3-17
	*	SUSPENSION							I		I	3-17
	*	SPARK ARRESTER							C		C	3-18
	*	NUTS, BOLTS, FASTENERS						I			I	3-18
	**	WHEELS/TIRES						I	I		I	3-19
	**	STEERING SHAFT HOLDER BEARING									I	3-19
	**	STEERING SYSTEM									I	3-19

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

** In the interest of safety, we recommend these items be serviced only by your Honda dealer.

NOTES: 1. Service more frequently if the ATV is ridden in dusty areas, sand or snow.
2. Service more frequently if the ATV is ridden in very wet or muddy conditions.
3. Replace every 2 years. Replacement requires mechanical skill.

MAINTENANCE

TRX350 FM/FE:

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	
			NOTE	HOURS	20	100	200	
EMISSION RELATED ITEMS	*	FUEL HOSE					I	3-5
	*	THROTTLE OPERATION					I	3-5
	*	CARBURETOR CHOKE					I	3-6
		AIR CLEANER	NOTE 1			C	C	3-6
		AIR CLEANER HOUSING DRAIN HOSE	NOTE 2			I	I	3-7
		SPARK PLUG				I	I	3-8
	*	VALVE CLEARANCE			I	I	I	3-8
		ENGINE OIL			R	R	R	3-10
		ENGINE OIL FILTER			R	R	R	3-11
	*	ENGINE IDLE SPEED			I	I	I	3-12
NON-EMISSION RELATED ITEMS		DRIVE SHAFT BOOTS				I	I	3-12
		REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL				(R: Every 2 years)	I	3-12
	*	BRAKE FLUID	NOTE 3			I	I	3-14
	*	BRAKE SHOE WEAR	NOTE 1				I	3-14
		BRAKE SYSTEM			I	I	I	3-15
	*	REVERSE LOCK SYSTEM			I	I	I	3-16
		SKID PLATES				I	I	3-17
	*	CLUTCH SYSTEM			I	I	I	3-17
	*	SUSPENSION				I	I	3-17
	*	SPARK ARRESTER				C	C	3-18
	*	NUTS, BOLTS, FASTENERS			I		I	3-18
	**	WHEELS/TIRES			I	I	I	3-19
	**	STEERING SHAFT HOLDER BEARING					I	3-19
	**	STEERING SYSTEM					I	3-19

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

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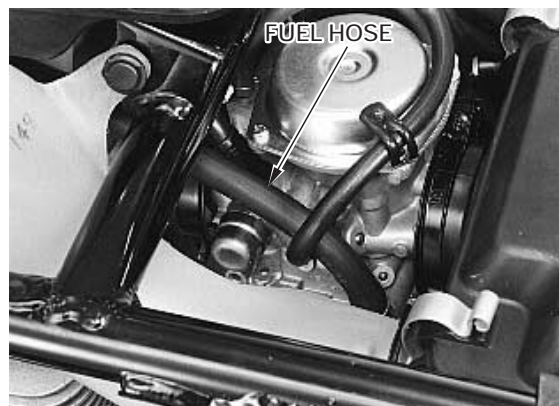
NOTES: 1. Service more frequently if the ATV is ridden in dusty areas, sand or snow.
2. Service more frequently if the ATV is ridden in very wet or muddy conditions.
3. Replace every 2 years. Replacement requires mechanical skill.

FUEL HOSE

Remove the seat (page 2-4).

Check the fuel hose for deterioration, damage or leakage.

Replace the fuel hose if necessary.

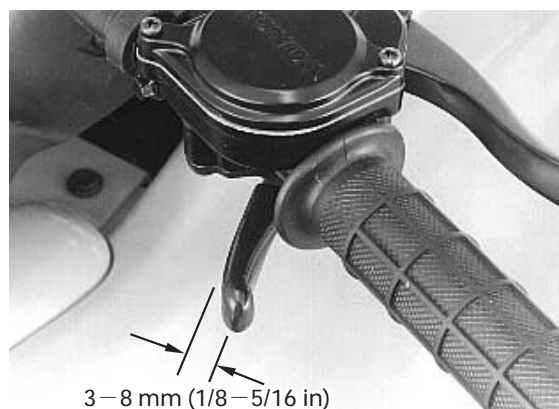


THROTTLE OPERATION

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.

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



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

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

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

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

THROTTLE LEVER FREE PLAY: 3–8 mm (1/8–5/16 in)

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

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

Install the rubber boot securely.

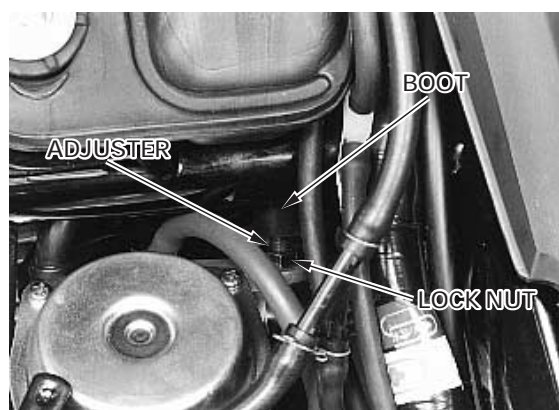
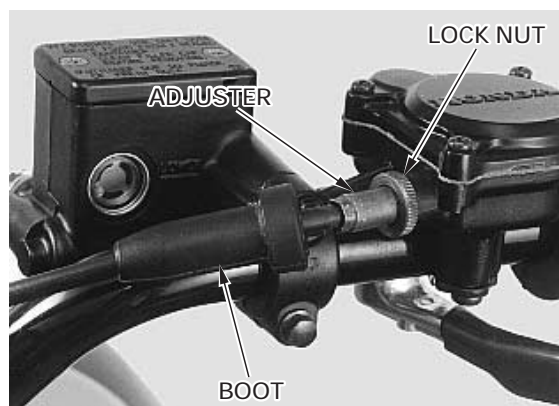
Major adjustments are made with the lower adjuster.

Remove the seat (page 2-4).

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

Install the rubber boot securely.

Recheck the throttle operation and install the seat (page 2-4).



CARBURETOR CHOKE

This model's choke system uses a fuel enriching circuit controlled by a starting enrichment (SE) valve.

The SE valve opens the enriching circuit via a cable when the choke knob on the handlebar is pulled up.

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

Check the choke cable for frays, kinks or other damage.



AIR CLEANER

Remove the seat (page 2-4).

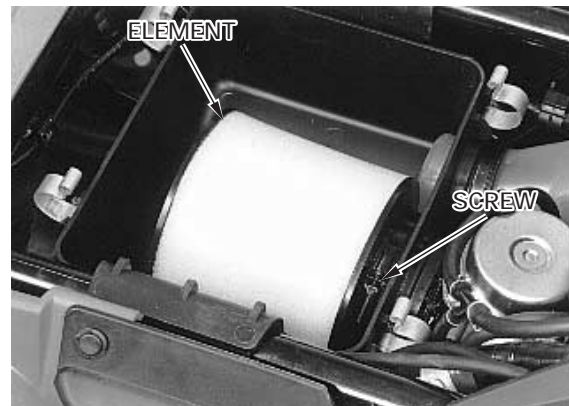
Release the retaining clips from the air cleaner housing cover and remove the cover.

NOTE:

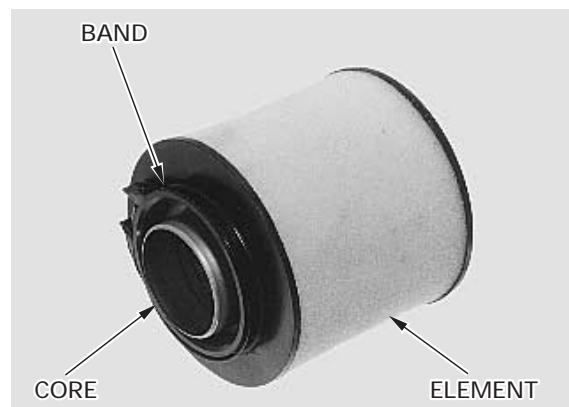
- If the vehicle is used in dusty areas, sand or snow, more frequent inspections are required.



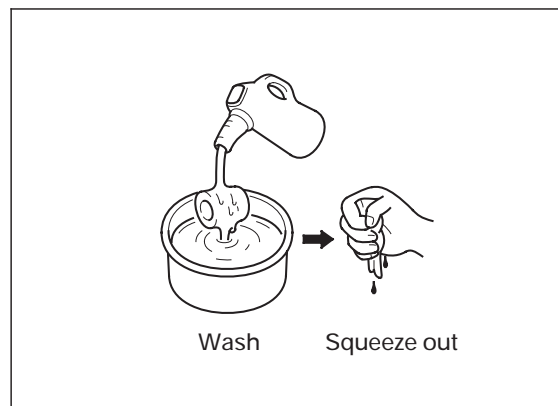
Loosen the air cleaner element band screw. Remove the air cleaner element assembly from the housing.



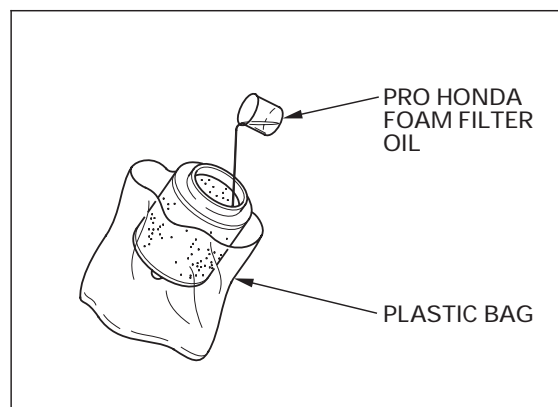
Remove the element band and the element core from the air cleaner element.



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

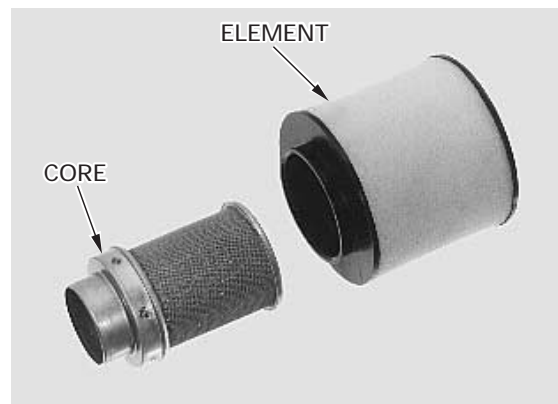
Install the element band onto the air cleaner element and the element assembly over the connecting tube flange of the housing securely.
Tighten the band screw.

NOTE:

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

Install the air cleaner housing cover and secure it with the retaining clips.

Install the seat (page 2-4).



AIR CLEANER HOUSING DRAIN TUBE

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

Install the drain tube securely.

NOTE:

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



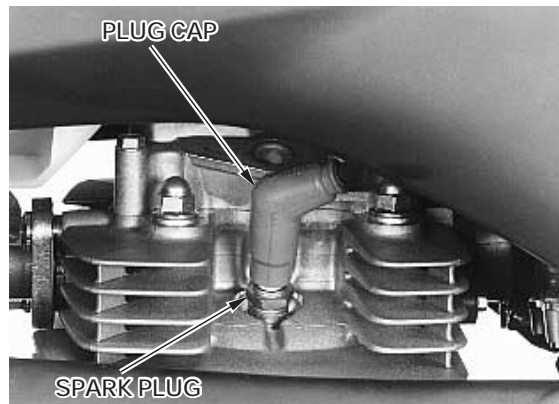
SPARK PLUG

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

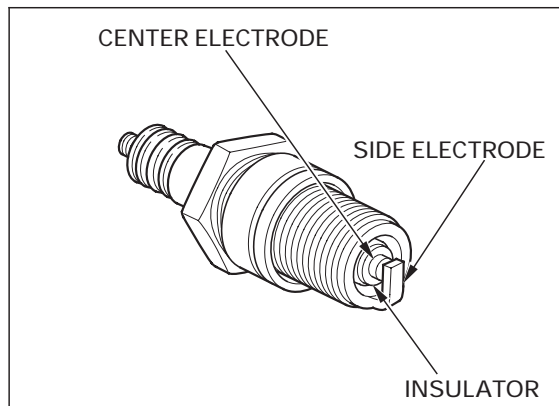
NOTE:

- Clean around the spark plug base with compressed air before removing the plug, and be sure that no debris is allowed to enter the combustion chamber.

Remove the spark plug.



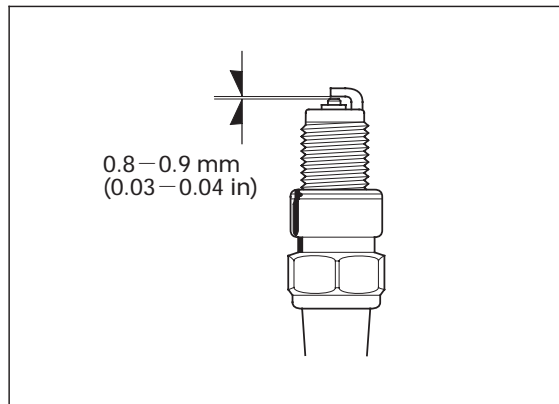
Check the insulator for cracks or damage, and the electrodes for wear, fouling or discoloration. Replace the plug if necessary (recommended spark plug: page 3-1).



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

SPARK PLUG GAP: 0.8–0.9 mm (0.03–0.04 in)



To prevent damage to the cylinder head, hand-tighten the spark plug before using a wrench to tighten to the specified torque.

Reinstall the spark plug in the cylinder head and hand-tighten, then torque to specification.

TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)

Connect the spark plug cap.

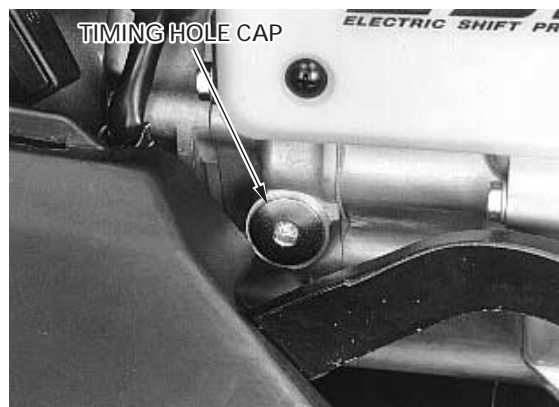
VALVE CLEARANCE

NOTE:

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

Remove the following:

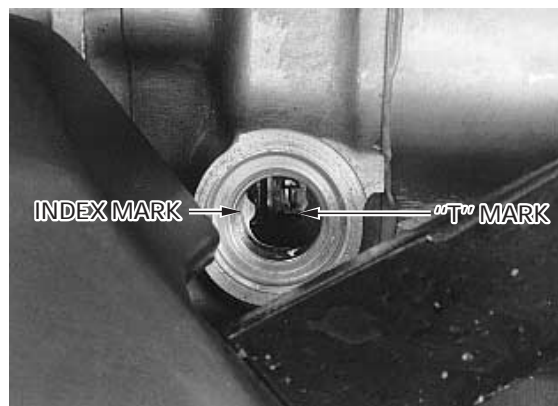
- cylinder head cover (page 7-3)
- recoil starter cover (page 2-5)
- timing hole cap



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

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

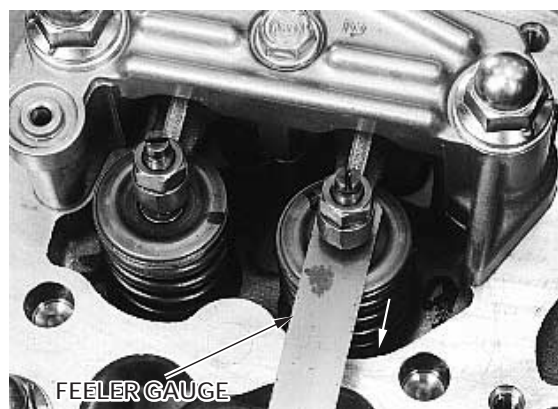
This position can be obtained by confirming that there is slack in the rocker arm. If there is no slack, rotate the crankshaft one full turn and match up the "T" mark again.



When checking the clearance, slide the feeler gauge from the inside out in the direction of the arrow.

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

VALVE CLEARANCE: IN/EX: 0.15 mm (0.006 in)

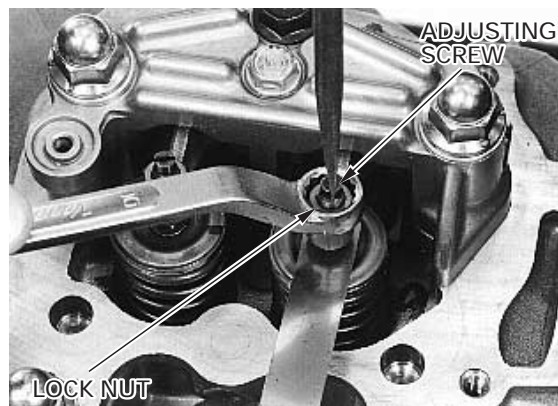


Adjust by loosening the lock nut and turning the adjusting screw until there is a slight drag on the feeler gauge.

Hold the adjusting screw and tighten the lock nut.

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

After tightening the lock nut, recheck the valve clearance.

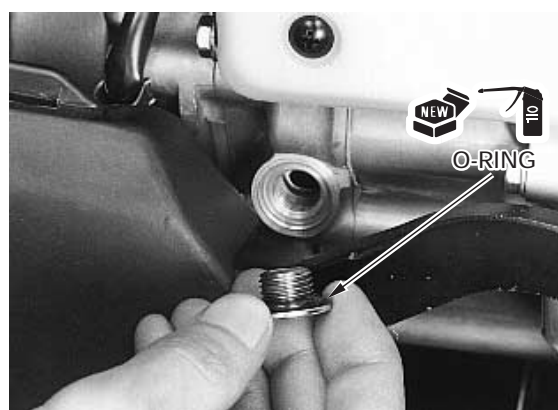


Coat a new O-ring with engine oil and install it onto the timing hole cap. Install the timing hole cap and tighten it.

TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)

Install the recoil starter cover.

Install the cylinder head cover (page 7-15).



ENGINE OIL

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.

LEVEL CHECK

NOTE:

- Check the oil level after starting the engine and allowing the oil to circulate through the engine thoroughly. This 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.

Place the vehicle on level ground.

Start the engine and let it idle for a 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.

After a few minutes, remove the dipstick and wipe it clean.

Check the oil level by inserting the 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, remove the oil filler cap and add the recommended engine oil to the upper level mark.

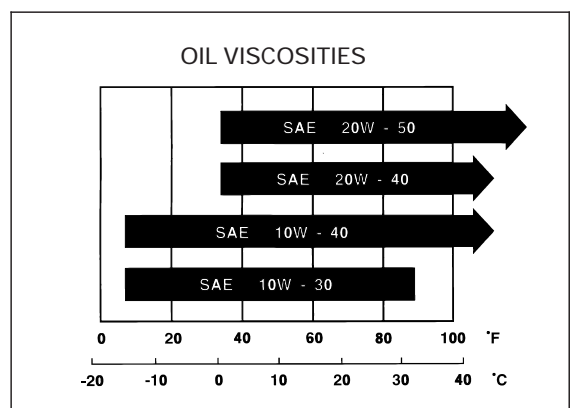
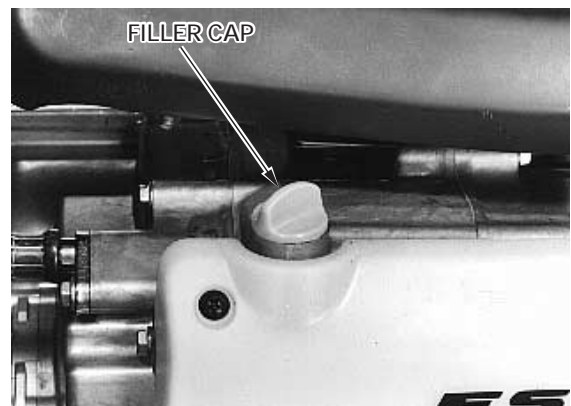
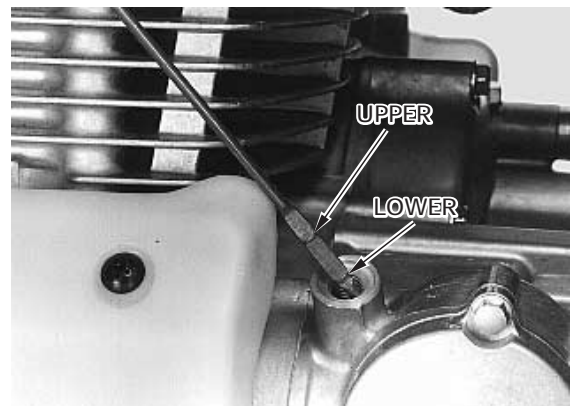
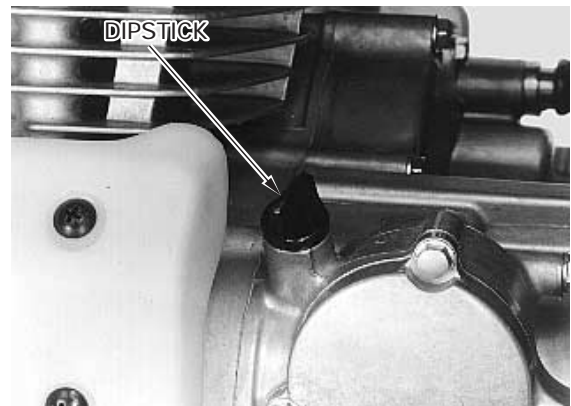
RECOMMENDED ENGINE OIL:

Pro Honda GN4 or HP4 (without molybdenum additives) 4-stroke oil or equivalent motor oil
API service classification: SG or higher
JASO T 903 standard: MA
Viscosity: SAE 10W-40

NOTE:

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

Reinstall the oil filler cap and dipstick.



OIL CHANGE

NOTE:

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

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

Remove the drain bolt and 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 3-10) into the engine to the upper level mark on the dipstick.

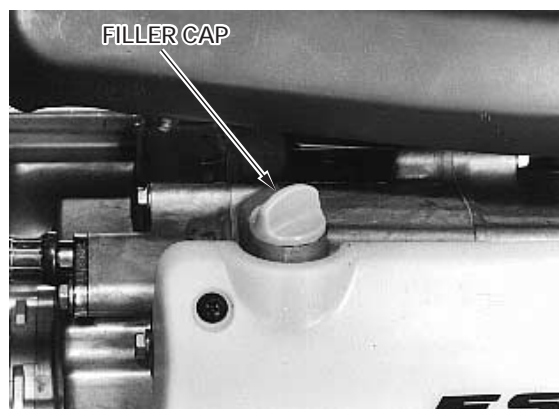
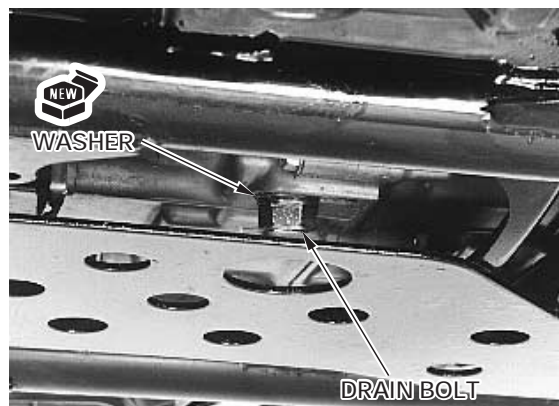
OIL CAPACITY:

- 2.0 ℓ (2.1 US qt , 1.8 Imp qt) at draining/filter change
- 2.5 ℓ (2.6 US qt , 2.2 Imp qt) at disassembly

Install the oil filler cap.

Check the oil level (page 3-10).

After replacing, make sure there are no oil leaks.



ENGINE OIL FILTER

Drain the engine oil.

Remove the following:

- cover bolts
- filter cover and O-rings
- oil filter
- spring

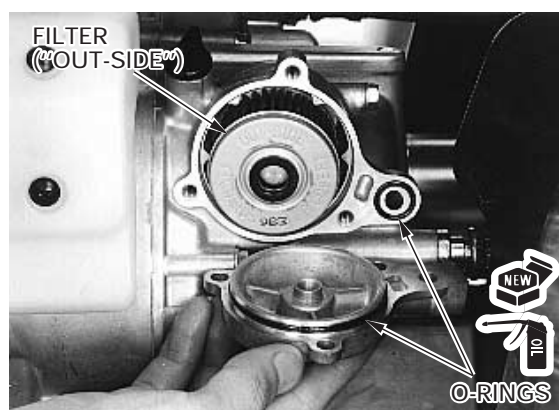
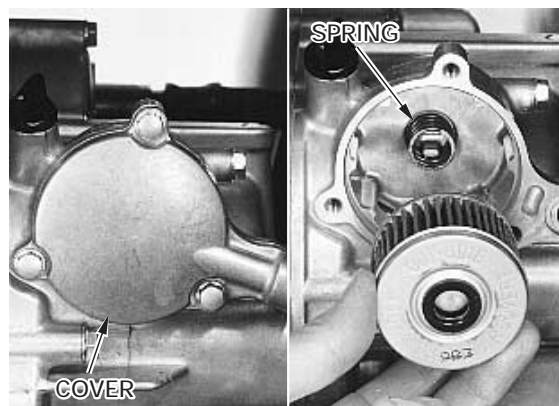
Coat new O-rings with engine oil and install them into the grooves in the filter cover and crankcase cover.

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

Install the spring between 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.

TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)

Fill the engine with the engine oil.



ENGINE IDLE SPEED

NOTE:

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

Warm up the engine, shift the transmission into neutral and place the vehicle on a level surface. Check the idle speed and adjust by turning the throttle stop screw as required.

IDLE SPEED: 1,400 \pm 100 rpm



DRIVE SHAFT BOOTS (FM/FE models)

Check the drive shaft boots for cuts or other damage.

If a boot is damaged, replace it (page 15-3).



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

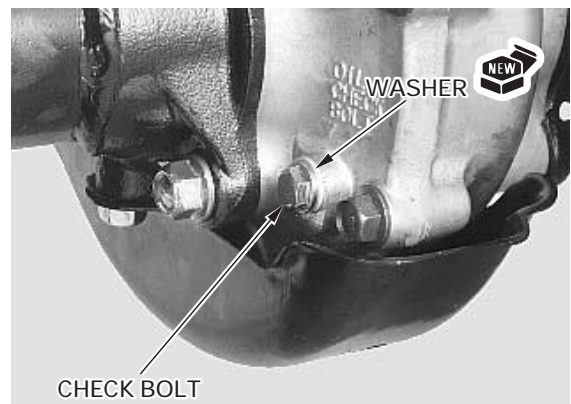
Install the check bolt with a new sealing washer and tighten it.

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)

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

Install the filler cap and tighten it.

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)



OIL CHANGE

Place the vehicle on a level surface.

Remove the oil filler cap and drain bolt to drain the oil.

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

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)

Fill the final gear case with the recommended oil (page 3-12).

OIL CAPACITY:

85 cm³ (2.9 US oz , 3.0 Imp oz) at draining

100 cm³ (3.4 US oz , 3.5 Imp oz) at disassembly

DIFFERENTIAL OIL (FM/FE only)

LEVEL CHECK

Place the vehicle on a level surface.

Remove the oil filler cap and check that the oil level is to 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 filler cap groove.

Install the filler cap and tighten it.

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)

OIL CHANGE

Place the vehicle on a level surface.

Remove the oil filler cap and drain bolt to drain the oil.

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

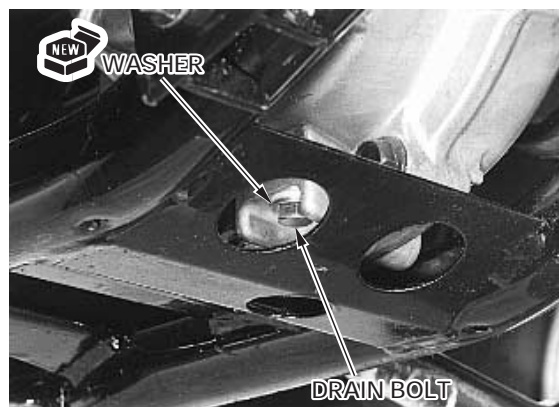
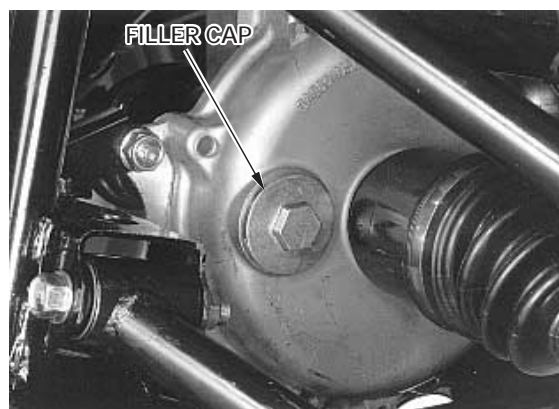
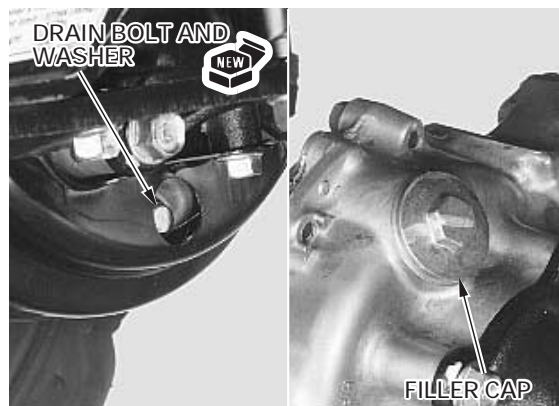
TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)

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

OIL CAPACITY:

241 cm³ (8.2 US oz , 8.5 Imp oz) at draining

275 cm³ (9.3 US oz , 9.7 Imp oz) at disassembly



BRAKE FLUID

FRONT BRAKE

NOTICE

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

NOTE:

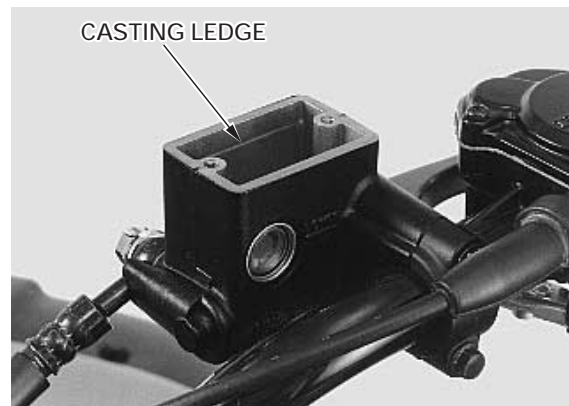
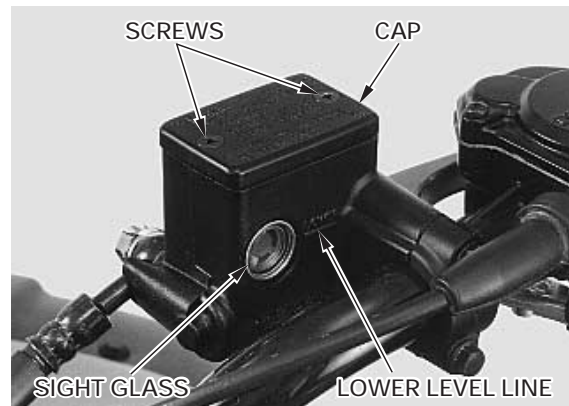
- When the fluid level is low, check the entire system for leaks.

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

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

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

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



BRAKE SHOE WEAR

FRONT BRAKE

Remove the inspection hole cap and inspect the lining thickness.

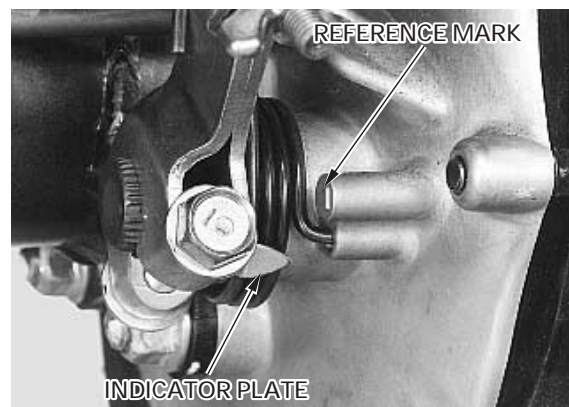
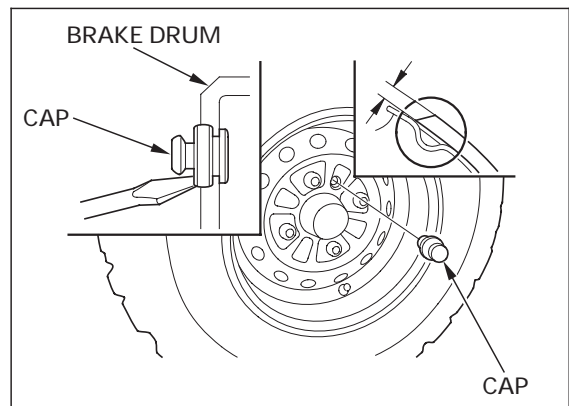
SERVICE LIMIT: 1.0 mm (0.04 in)

NOTE:

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

REAR BRAKE

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



BRAKE SYSTEM

FRONT BRAKE

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

FREE PLAY: 25–30 mm (1–1-3/16 in)

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

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

Remove the inspection hole cap and align the cap hole with one of the brake shoe adjusters and turn the adjuster up with a screwdriver until the shoes lock, then back off three steps.

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

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

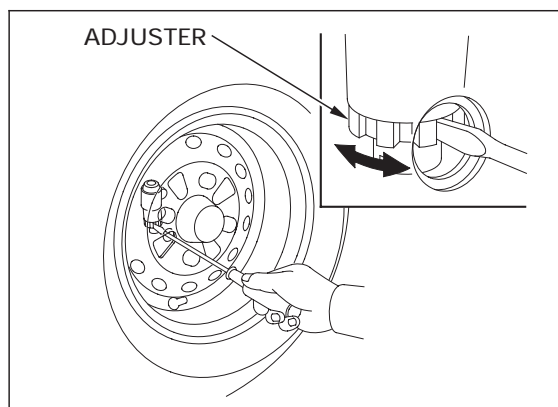
Adjust both wheels.

NOTE:

- There are two adjusters on each front wheel. Adjust all four adjusters (both wheels).

Recheck the brake lever free play. If the free play is still excessive after adjusting the brake shoe lining clearance, there is probably air in the brake system and it must be bled (section 14).

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



REAR BRAKE

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

Replace or repair if necessary.

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

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

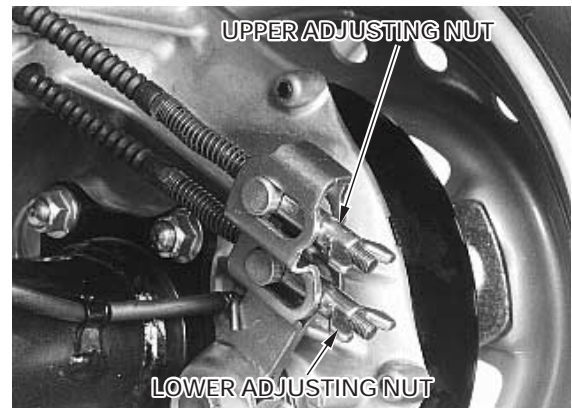
FREE PLAY: 15–20 mm (9/16–13/16 in)



MAINTENANCE

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

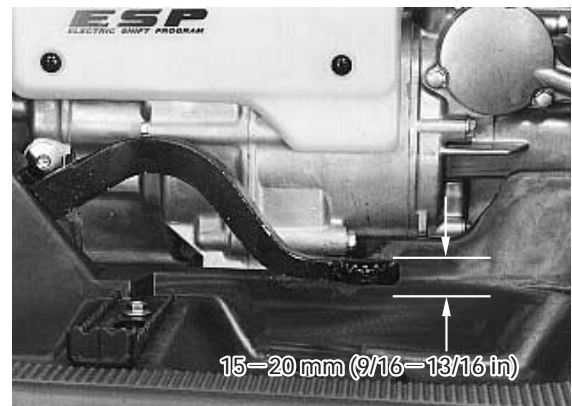
Adjust the brake lever free play by turning the upper adjusting nut at the brake arm.



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

FREE PLAY: 15–20 mm (9/16–13/16 in)

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



REVERSE LOCK SYSTEM

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

Measure the lever free play at the lever end near the cable.

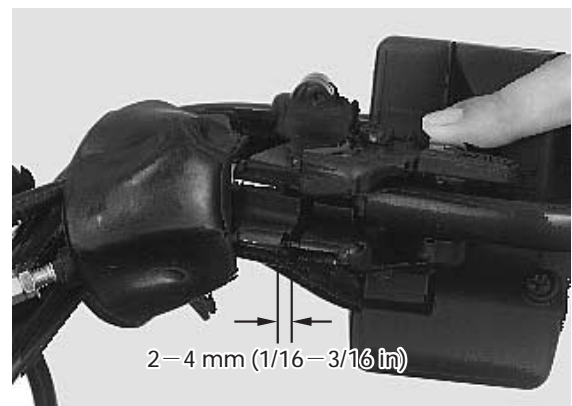
FREE PLAY: 2–4 mm (1/16–3/16 in)

NOTE:

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

Adjust by loosening the lock nut and turning the adjuster. Tighten the lock nut.

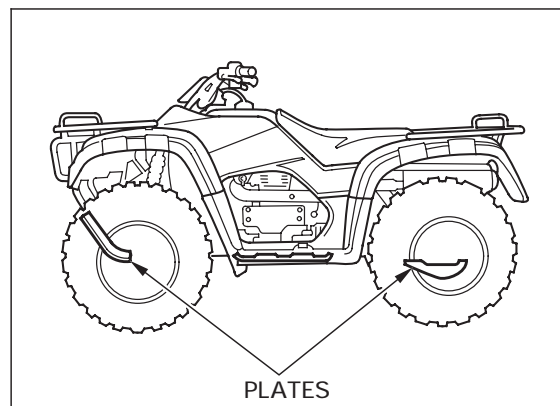
Install the dust cover securely.



SKID PLATES

Check the skid plates for cracks, damage or looseness.

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



CLUTCH SYSTEM

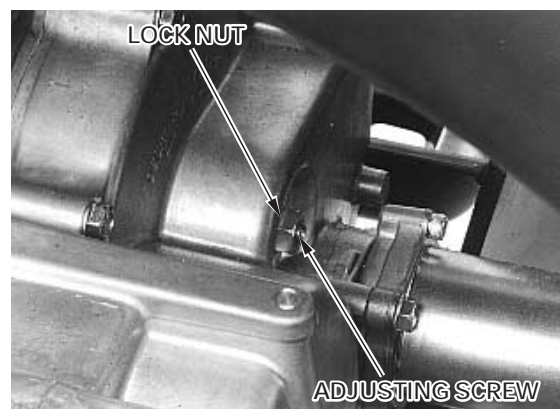
Loosen the lock nut and turn the adjusting screw one full turn clockwise.

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.

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

After adjustment, start the engine and check for proper clutch operation.



SUSPENSION

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

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

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

Replace damaged components which cannot be repaired.

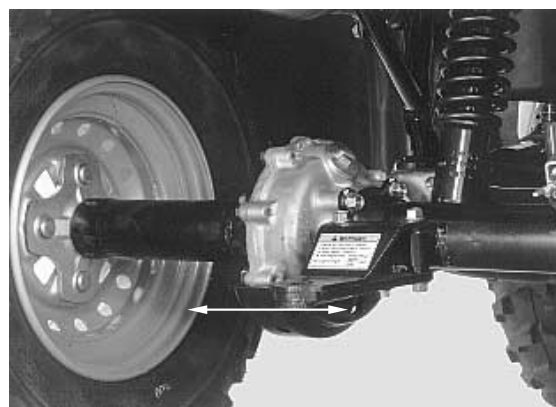
Tighten all nuts and bolts.



Raise the rear wheel off the ground by supporting the frame securely.

Check for worn swingarm bearings by grabbing the rear axle and attempting to move the wheels side to side.

Replace the bearings if any looseness is noted (section 13).



SPARK ARRESTER

Remove the 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 with the washer and tighten it securely.



NUTS, BOLTS, FASTENERS

Check that all chassis nuts and bolts are tightened to their correct torque values (page 1-22).

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 (Front & Rear):
Unit: kPa (kgf/cm², psi)

	TM/TE	FM/FE
Standard	20 (0.20, 2.9)	25 (0.25, 3.6)
Minimum	17 (0.17, 2.5)	22 (0.22, 3.2)
Maximum	23 (0.23, 3.3)	28 (0.28, 4.0)
With cargo	20 (0.20, 2.9)	25 (0.25, 3.6)



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

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

MINIMUM TREAD DEPTH (Front/Rear):
4.0 mm (0.16 in)

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

STEERING SHAFT HOLDER BEARING

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 movement, inspect the steering shaft holder bushing and bearing (section 12).



STEERING SYSTEM

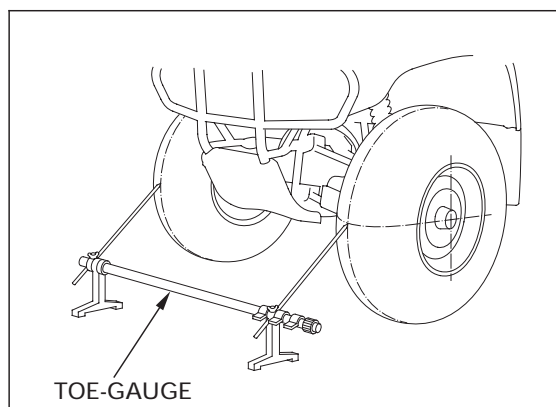
Place the vehicle on level ground with the front wheels facing straight ahead.

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: 3 ± 15 mm ($1/8 \pm 9/16$ in)

FM/FE: Toe-out: 18 ± 15 mm ($3/4 \pm 9/16$ in)

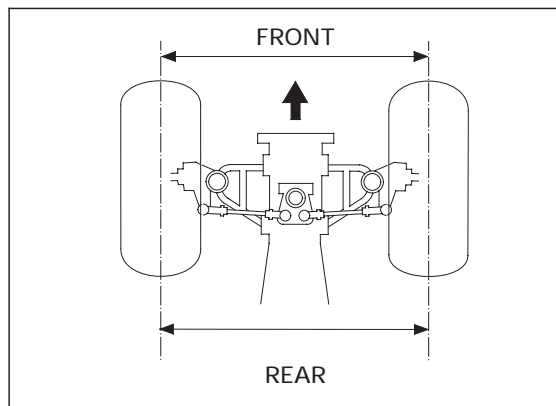
TOOL:

Toe gauge

Equivalent commercially available in U.S.A

NOTE:

- Toe-in means the rear measurement is greater than the front measurement (TM/TE models).
- Toe-out means the front measurement is greater than the rear measurement (FM/FE models).

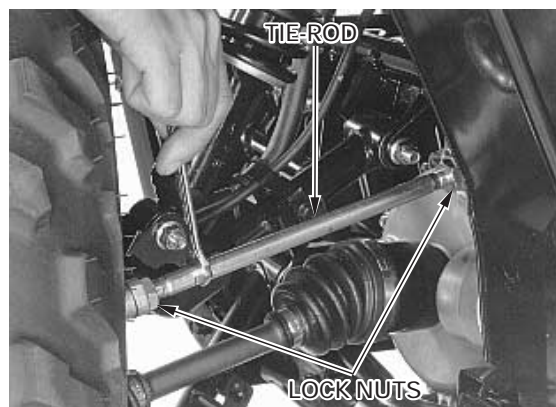


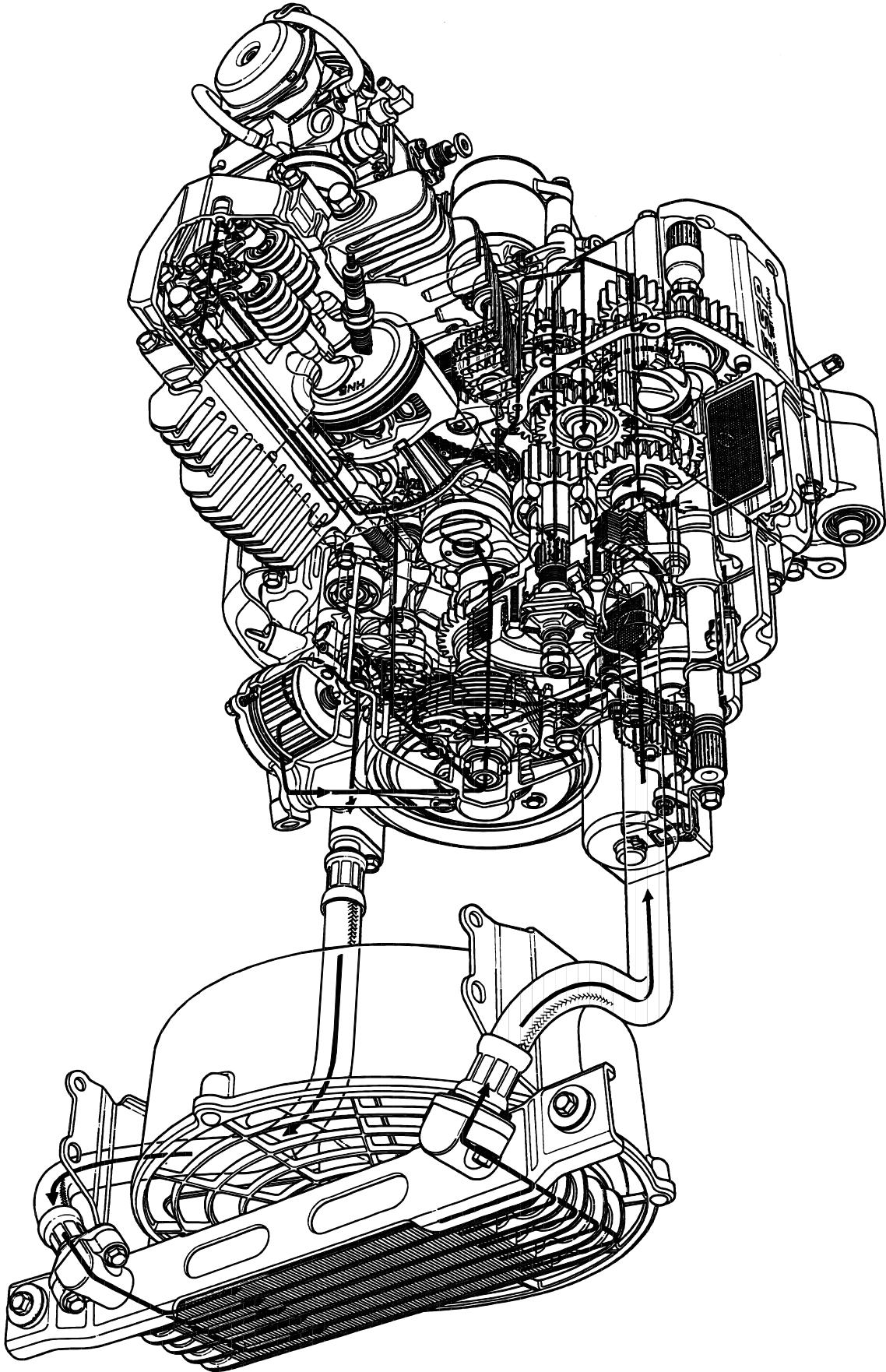
When the toe is out of specification, adjust it by changing the length of the tie-rods equally by loosening the lock nuts and turning the tie-rods while holding the ball joints.

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

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

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





4. LUBRICATION SYSTEM

SERVICE INFORMATION	4-1	COOLING FAN (Except U.S.A. TM model)	4-2
TROUBLESHOOTING	4-1	OIL PUMP	4-4
OIL COOLER	4-2		

SERVICE INFORMATION

GENERAL

4

⚠ CAUTION

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

- This section covers service of the oil pump, oil cooler and cooling fan.
For oil level check, oil change and oil filter replacement, refer to section 3.
The service procedures in this section can be performed with the engine installed in the frame.
- This engine uses a dry sump system, however, in addition to the oil tank, the lubrication system uses part of the crankcase as an oil tank.
Refer to section 23 "Technical Features" for system descriptions.
- 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.
- After the oil pump and oil cooler have been installed, check that there are no oil leaks.
- The oil thermosensor signals the ignition control module (ICM) to start the cooling fan motor according to the engine oil temperature. For oil cooling system inspection, see section 20.

SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	1.95 ℓ (2.06 US qt , 1.72 Imp qt)	_____
	After draining / filter change	2.0 ℓ (2.1 US qt , 1.8 Imp qt)	_____
	After disassembly	2.5 ℓ (2.6 US qt , 2.2 Imp qt)	_____
Recommended engine oil		Pro Honda GN4 or HP4 (without molybdenum additives) 4-stroke oil or equivalent motor oil API service classification: SG or higher JASO T 903 standard: MA Viscosity: SAE 10W-40	_____
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.22 (0.006 – 0.009)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.12 (0.005)

TORQUE VALUES

Cooling fan assembly mounting bolt 18 N·m (1.8 kgf·m , 13 lbf·ft)

TROUBLESHOOTING

Oil level too low — high oil consumption

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

Oil contamination

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

OIL COOLER

INSPECTION

Check the oil cooler air passage for clogging or damage.

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

Check for any oil leakage from the oil cooler and hose joints.



REMOVAL/INSTALLATION

Drain the engine oil (page 3-11).

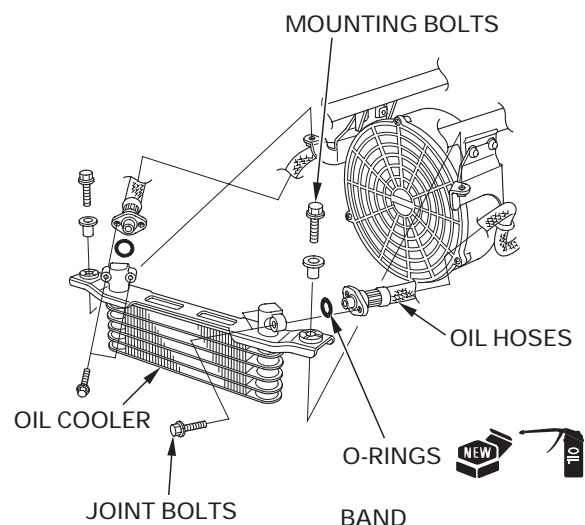
Remove the inner fenders (page 2-9).

Disconnect the oil hoses from the oil cooler by removing the joint bolts and remove the O-rings.

Remove the mounting bolts and the oil cooler out of the frame to the left, being careful not to damage the cooler fins.

Replace the O-rings with new ones and coat them with engine oil.

Installation is in the reverse order of removal.



COOLING FAN (Except U.S.A. TM model)

REMOVAL/INSTALLATION

Remove the following:

- right side cover (page 2-4)
- right inner fender (page 2-9)

Remove the wire band that secured the fan motor wire and breather tube, and disconnect the motor connectors and breather tube from the 3-way joint.

Loosen the four mounting bolts and remove the two stay bolts of right side to get the clearance.

Remove the four mounting bolts and the cooling fan assembly, being careful not to damage the oil cooler fins.

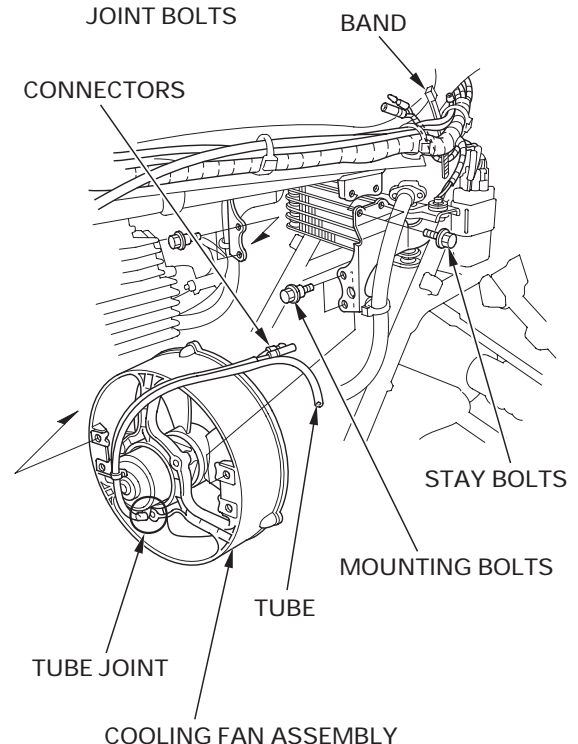
Install with the breather tube joint side of the motor facing down.

Installation is in the reverse order of removal.

TORQUE: Assembly mounting bolt:

18 N·m (1.8 kgf·m , 13 lbf·ft)

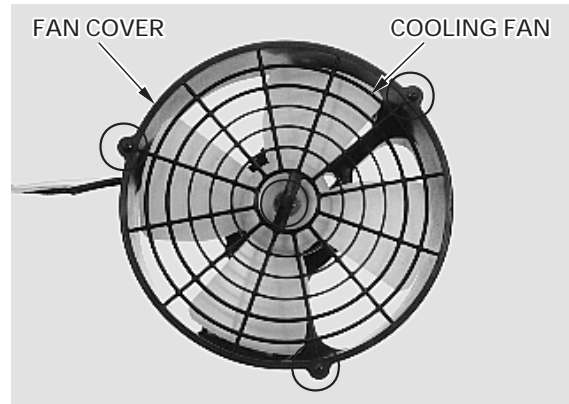
Route the wire and tube properly (page 1-22).



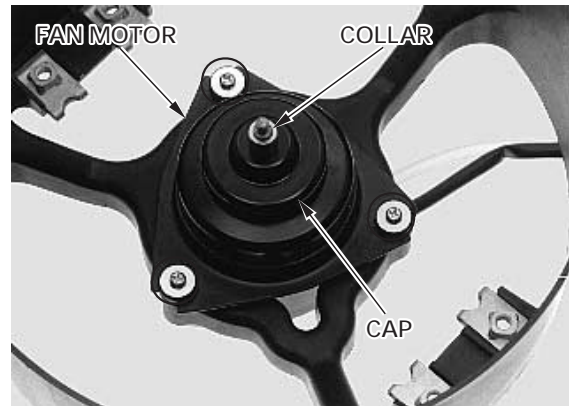
DISASSEMBLY

Remove the following:

- three screws and fan cover
- nut and cooling fan

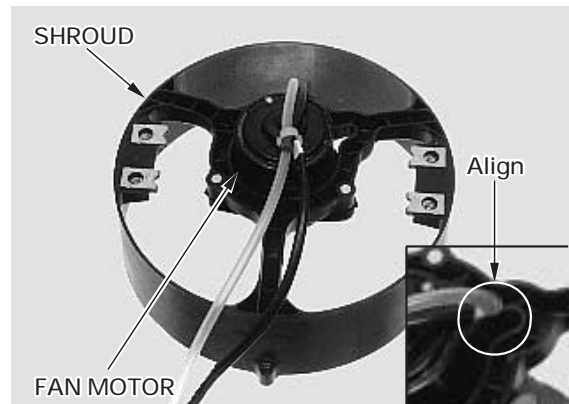


- collar
- cap
- three screws and fan motor



ASSEMBLY

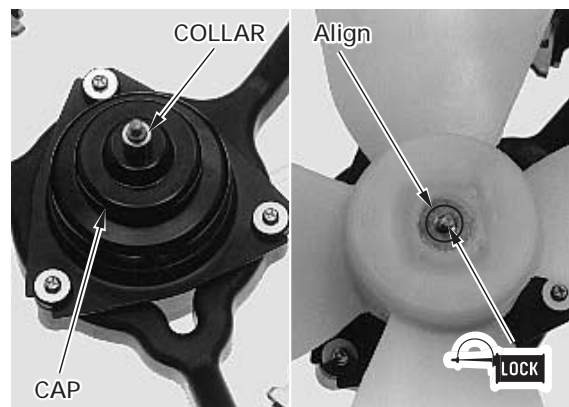
Set the fan motor into the shroud by aligning the tube joint with the groove and install it with the three screws as shown.



Install the cap and collar.

Install the cooling fan by aligning the flat surfaces of the motor shaft and fan. Apply locking agent to the motor shaft nut threads and tighten it.

Install the fan cover with the three screws.



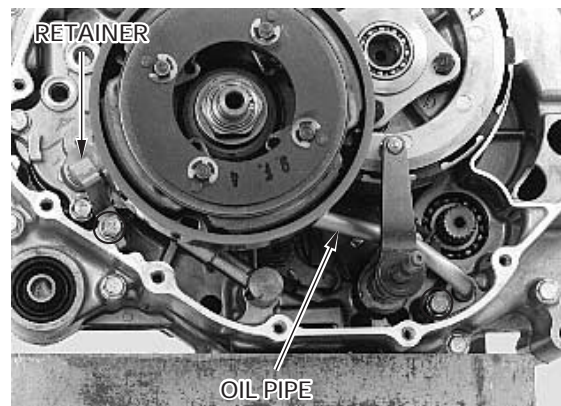
OIL PUMP

REMOVAL

Remove the front crankcase cover (page 9-3).

Remove the following:

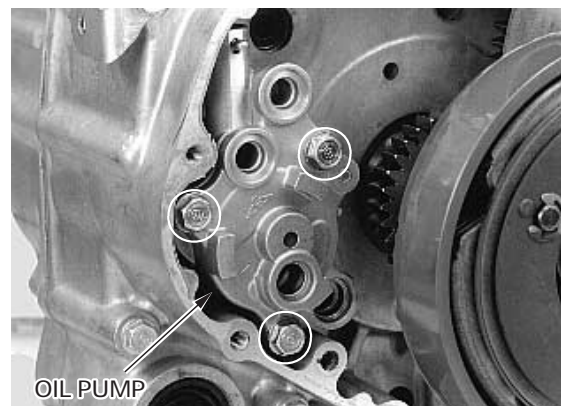
- two bolts and retainer
- feed oil pipe (long)
- O-rings



- bolt
- scavenge oil pipe (short)
- O-rings



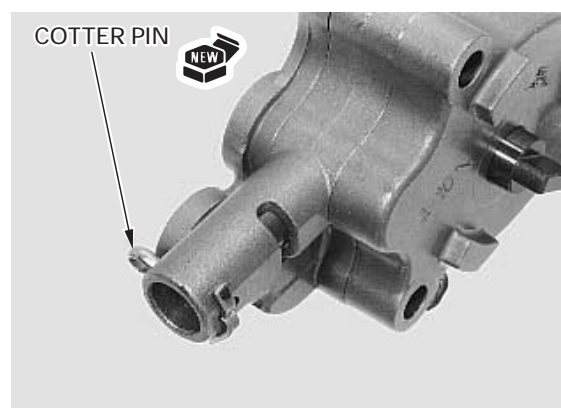
- three bolts
- oil pump



RELIEF VALVE CHECK

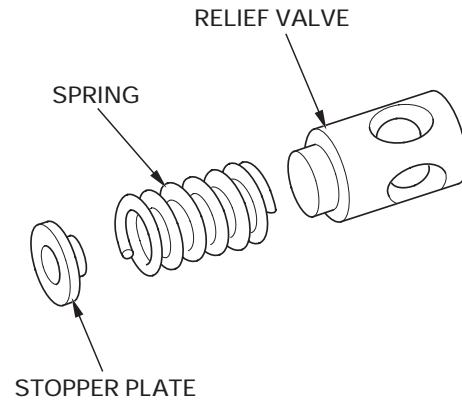
Remove the following:

- cotter pin
- stopper plate
- spring
- valve



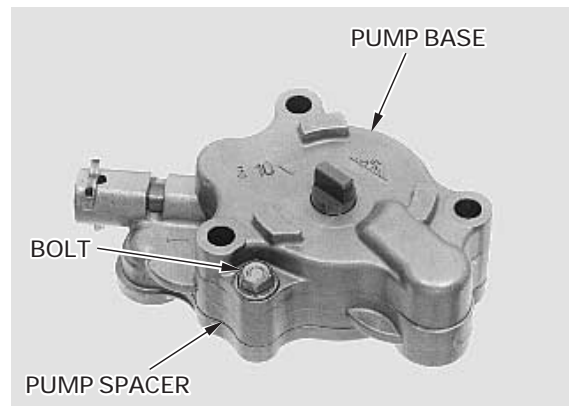
Check the spring and valve for wear or damage.

Install the valve, spring and stopper plate into the oil pump, then insert a new cotter pin from the pump body side (outside) and secure it.



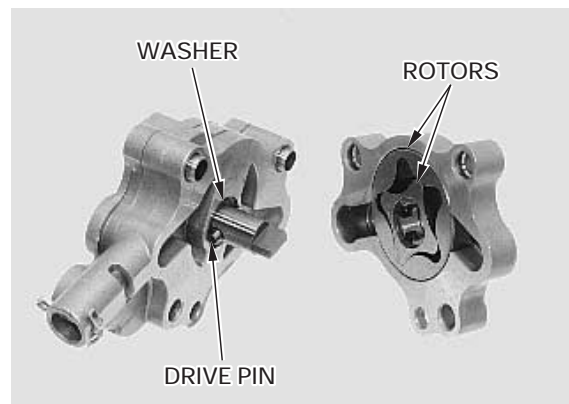
DISASSEMBLY

Remove the bolt and separate the pump base from the pump spacer.



Remove the following:

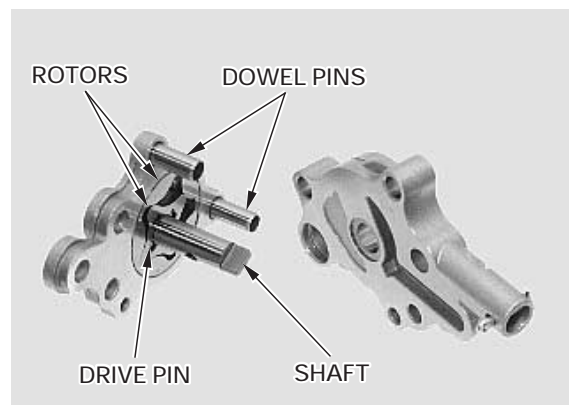
- inner rotor
- outer rotor
- drive pin
- thrust washer



Separate the pump body from the pump spacer.

Remove the following:

- pump shaft
- drive pin
- dowel pins
- inner rotor
- outer rotor



INSPECTION

NOTE:

- Measure at several places and use the largest reading to compare the service limit. If any portion of the oil pump is worn beyond the specified service limits, replace the oil pump as an assembly.

Install the inner and outer rotors into the pump base and pump body.

Install the pump shaft with the drive pin into the inner rotor and measure rotor tip clearance.

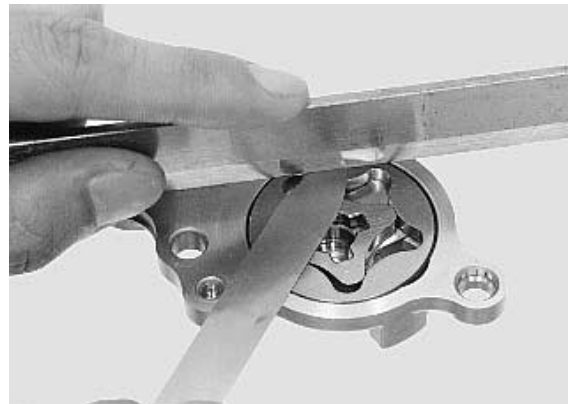
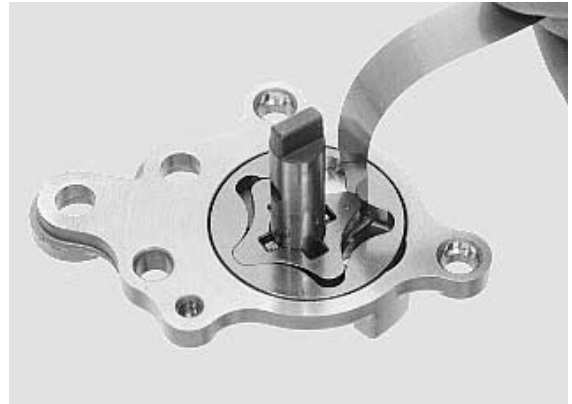
SERVICE LIMIT: 0.20 mm (0.008 in)

Measure the pump body clearance.

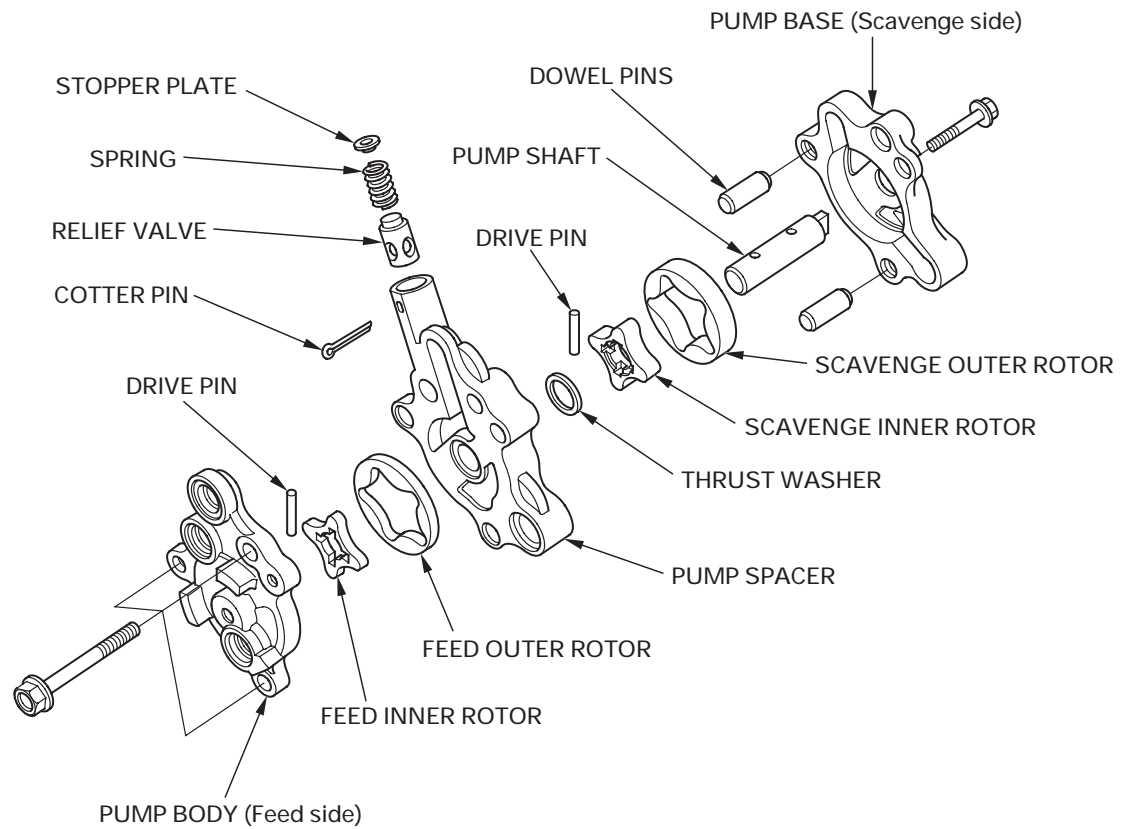
SERVICE LIMIT: 0.25 mm (0.010 in)

Measure the pump side clearance.

SERVICE LIMIT: 0.12 mm (0.005 in)



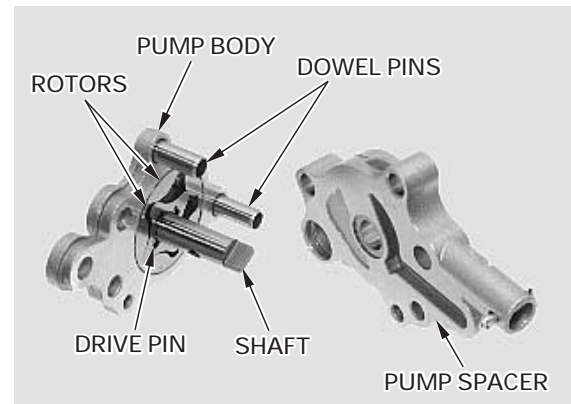
ASSEMBLY



Install the following into the pump body:

- outer rotor
- inner rotor
- drive pin and shaft with the stepped end facing pump base (inside)
- dowel pins

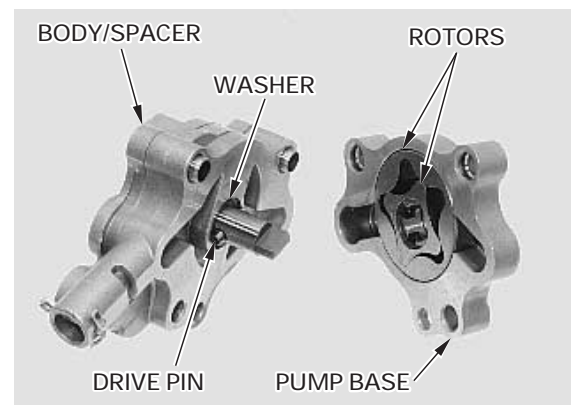
Assemble the pump body and spacer.



Install the following onto the pump shaft and into the pump base:

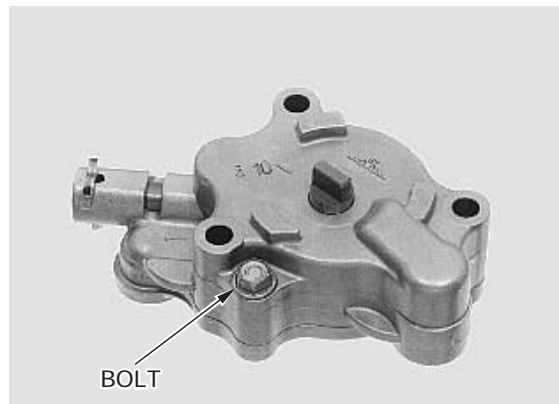
- thrust washer
- drive pin
- outer rotor
- inner rotor

Assemble the pump body/spacer assembly and pump base by aligning the drive pin with the grooves in the inner rotor.



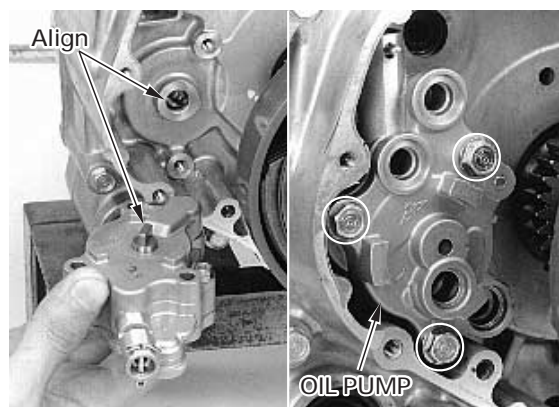
LUBRICATION SYSTEM

Be sure that there are no gap between the mating surfaces and tighten the bolt.

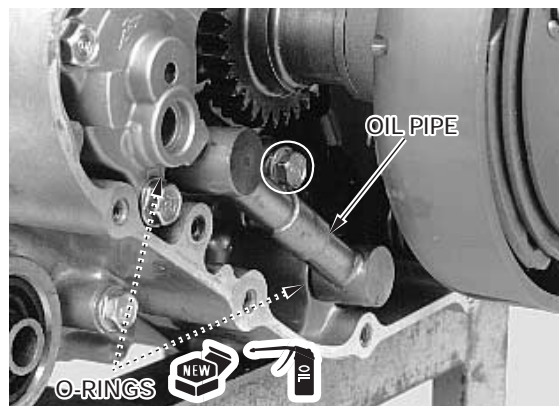


INSTALLATION

Set the pump assembly onto the crankcase by aligning the pump shaft end with the balancer groove and tighten the three bolts securely.

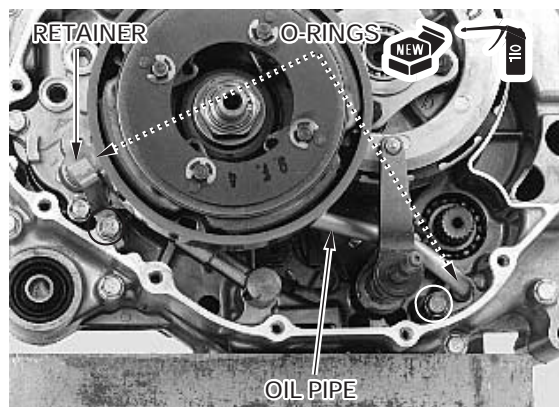


Coat new O-rings with engine oil and install them onto the scavenge oil pipe. Install the oil pipe into the crankcase and tighten the bolt.

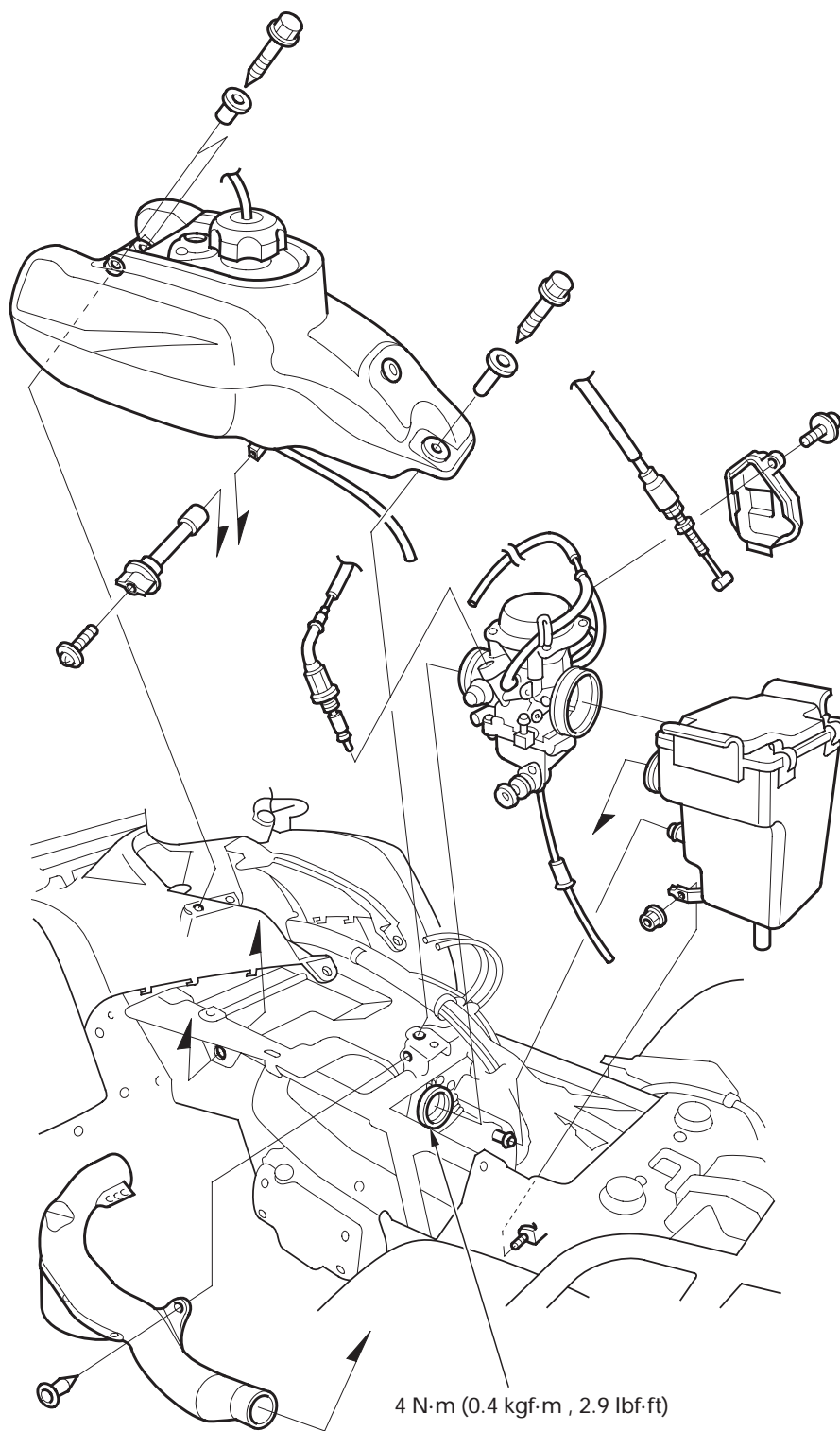


Coat new O-rings with engine oil and install them onto the feed oil pipe. Install the oil pipe into the crankcase with the two bolts and retainer.

Install the front crankcase cover (page 9-18).



MEMO



5. FUEL SYSTEM

SERVICE INFORMATION	5-1	CARBURETOR ASSEMBLY	5-9
TROUBLESHOOTING	5-2	CARBURETOR INSTALLATION	5-14
AIR CLEANER HOUSING	5-3	PILOT SCREW ADJUSTMENT	5-15
CARBURETOR REMOVAL	5-4	HIGH ALTITUDE ADJUSTMENT	5-16
CARBURETOR DISASSEMBLY/ INSPECTION	5-5	FUEL TANK	5-17

SERVICE INFORMATION

GENERAL

- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.
- Bending or twisting the control cable will impair smooth operation and could cause the cable to stick or bind, resulting in loss of vehicle control.
- Before removing the carburetor, place an approved fuel container under the drain tube, loosen the drain screw and drain the carburetor.
- After removing the carburetor, cover the intake port of the cylinder head with shop towel to prevent any foreign material from dropping into the engine.
- When disassembling the fuel system parts, note the locations of the O-rings. Replace them with new ones on reassembly.
- If the vehicle is to be stored for more than one month, drain the float chamber. Fuel left in the float chamber may cause clogged jets, resulting in hard starting or poor driveability.
- Refer to section 20 for carburetor heater inspection.

SPECIFICATIONS

ITEM	SPECIFICATIONS
Carburetor identification number	VE94A
Main jet	# 130
Slow jet	# 42
Jet needle clip position	3rd groove from top
Pilot screw opening	See page 5-15
Float level	18.5 mm (0.73 in)
Idle speed	1,400 \pm 100 rpm
Throttle lever free play	3 – 8 mm (1/8 – 5/16 in)

TORQUE VALUES

Carburetor insulator band screw 4 N·m (0.4 kgf·m , 2.9 lbf·ft)

TOOLS

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

TROUBLESHOOTING

Engine cranks but won't start

- No fuel in tank
- No fuel to carburetor
 - Clogged fuel strainer
 - Clogged fuel line
 - Clogged fuel tank breather tube
 - Misadjusted fuel level
- Too much fuel getting to the engine
 - Clogged air cleaner
 - Flooded carburetor
- Intake air leak
- Contaminated/deteriorated fuel
 - Clogged jets
- Clogged starting enrichment valve circuit
- Improper starting enrichment valve operation
- Improper throttle operation
- No spark at plug (faulty ignition system — section 18)

Lean mixture

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

Rich mixture

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

Engine stalls, hard to start, rough idling

- Restricted fuel line
- Fuel mixture too lean/rich
- Contaminated/deteriorated fuel
 - Clogged jets
- Intake air leak
- Misadjusted idle speed
- Misadjusted pilot screw
- Misadjusted float level
- Restricted fuel tank breather tube
- Clogged air cleaner
- Clogged slow circuit
- Clogged starting enrichment valve circuit
- Faulty ignition system (section 18)

Afterburn when engine braking is used

- Lean mixture in slow circuit
- Faulty air cut-off valve
- Faulty ignition system (section 18)

Backfiring or misfiring during acceleration

- Lean mixture
- Faulty ignition system (section 18)

Poor performance (driveability) and poor fuel economy

- Clogged fuel system
- Faulty ignition system (section 18)

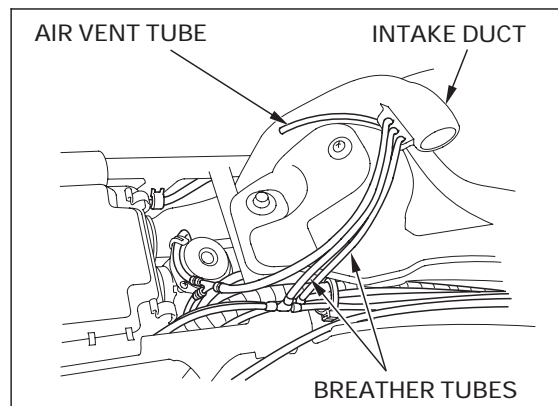
AIR CLEANER HOUSING

REMOVAL/INSTALLATION

Remove the following:

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

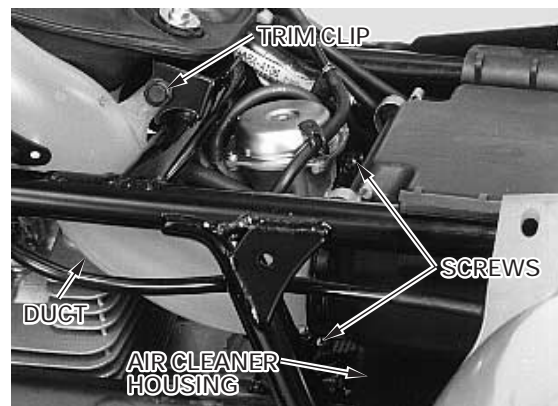
Remove the air vent and breather tubes from the air intake duct.



Disconnect the crankcase breather hose.



Loosen the connecting tube band and intake duct band screws.
Remove the trim clip from the intake duct.

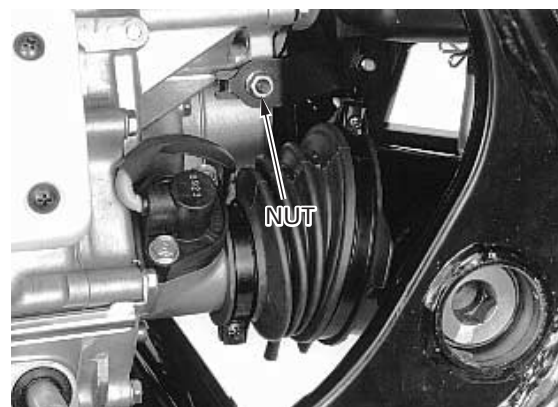


Remove the mounting nut.

Remove the air cleaner housing off the carburetor and the intake duct from the air cleaner housing.
Remove the air cleaner housing out of the frame.

Installation is in the reverse order of removal.

Route the tubes properly (page 1-22).



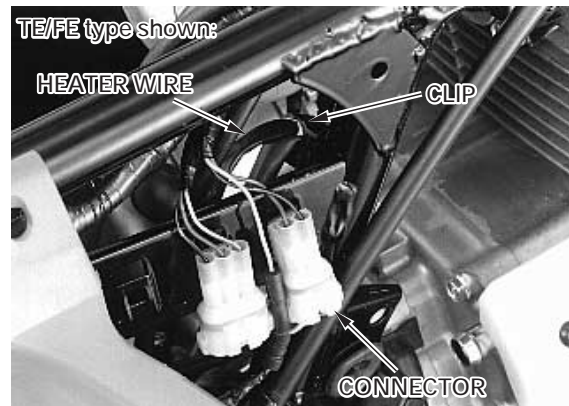
CARBURETOR REMOVAL

Remove the following:

- side covers (page 2-4)
- air cleaner housing (page 5-3)

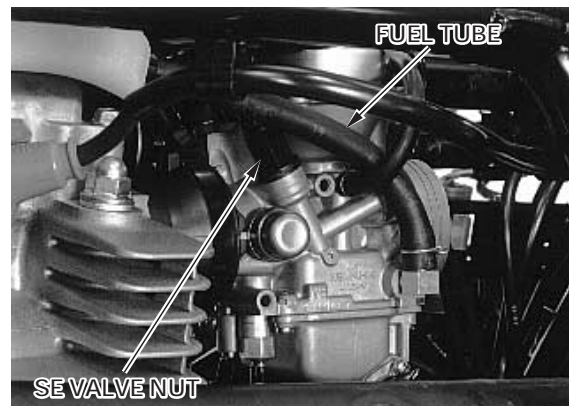
Place an approved fuel container under the drain tube. Loosen the drain screw and drain the carburetor.

Release the carburetor heater wire from the clip and disconnect its connector.



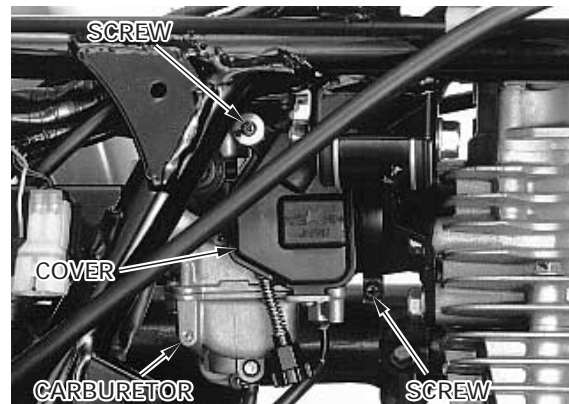
Disconnect the fuel tube.

Loosen the starting enrichment (SE) valve nut.



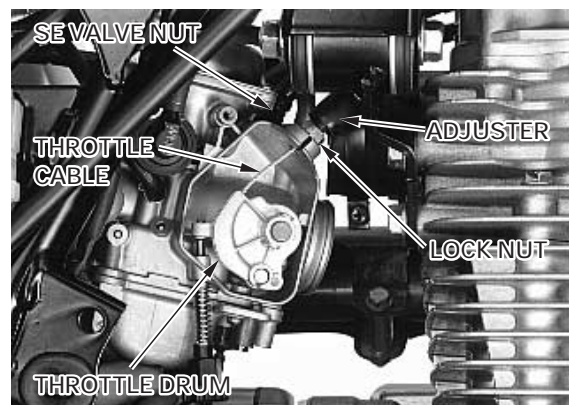
Remove the screw and the throttle drum cover.

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



Disconnect the choke cable by turning the SE valve nut, being careful not to damage the SE valve.

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

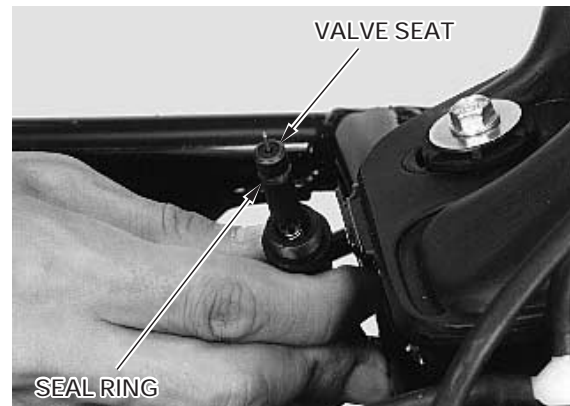


CARBURETOR DISASSEMBLY/ INSPECTION

Check the SE valve face for scores, scratches or wear.

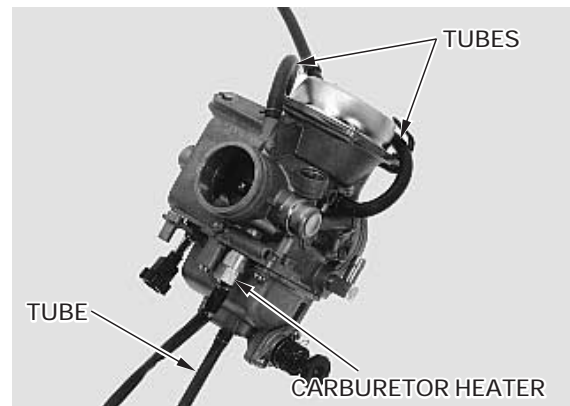
Check the SE valve seat at the tip of the valve for stepped wear.

Check the seal ring for wear or damage.



Remove the following from the carburetor body:

- air vent tubes
- drain tubes
- carburetor heater

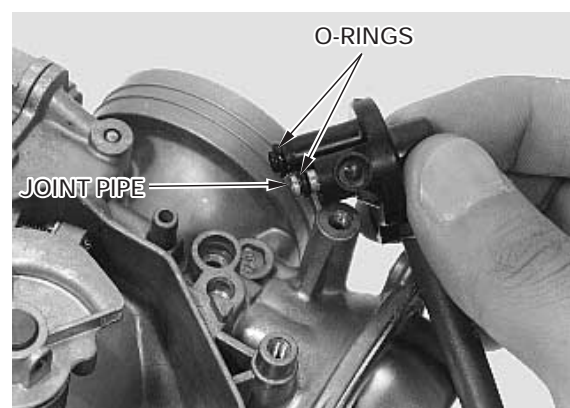


AIR CUT-OFF VALVE

Remove the attaching screw and the air cut-off valve.



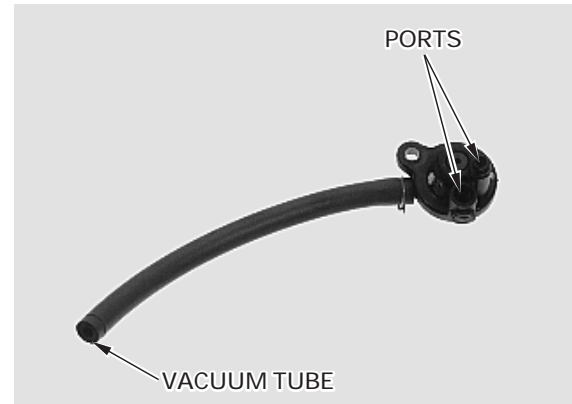
Remove the O-rings and joint pipe.



FUEL SYSTEM

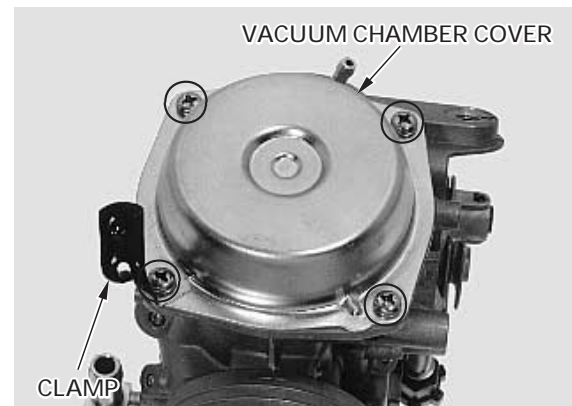
Apply vacuum to the vacuum tube.

The vacuum should be maintained.
Air should not flow through the valve ports when the vacuum is applied, and should flow when the vacuum is not applied.

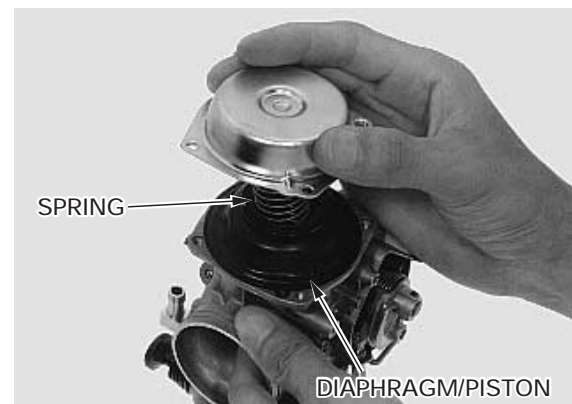


VACUUM CHAMBER

Remove the four screws with the tube clamp and the vacuum chamber cover while holding it.



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

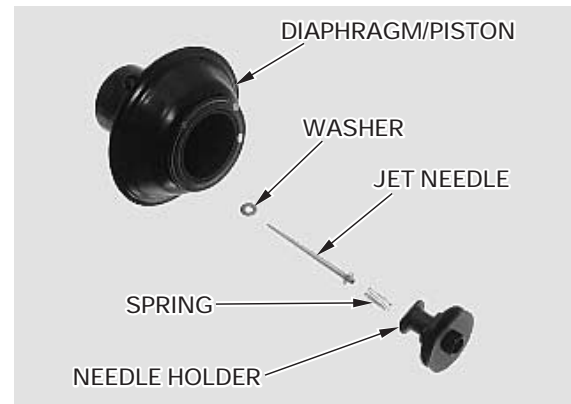


Be careful not to damage the diaphragm. Turn the needle holder counterclockwise by using a screwdriver while pressing it in and release the holder flange from the vacuum piston. Remove the needle holder, spring, jet needle and washer.



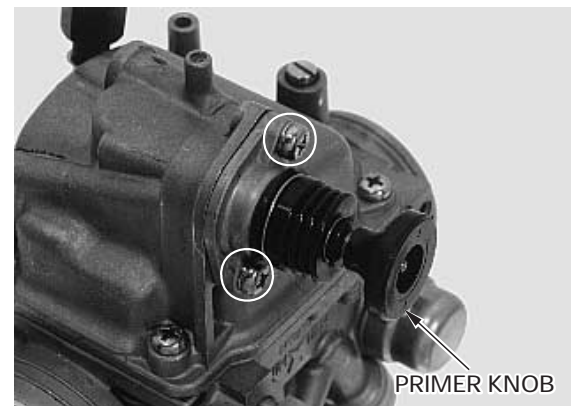
Check the jet needle for stepped wear.
 Check the vacuum piston for wear or damage.
 Check the diaphragm for pin hole, deterioration or damage.
 Check the vacuum piston for smooth operation up and down in the carburetor body.

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

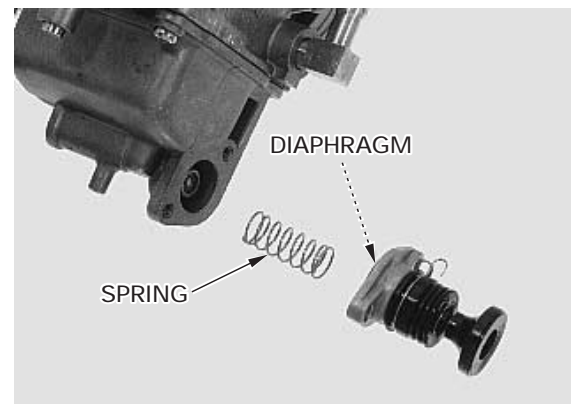


PRIMER KNOB

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

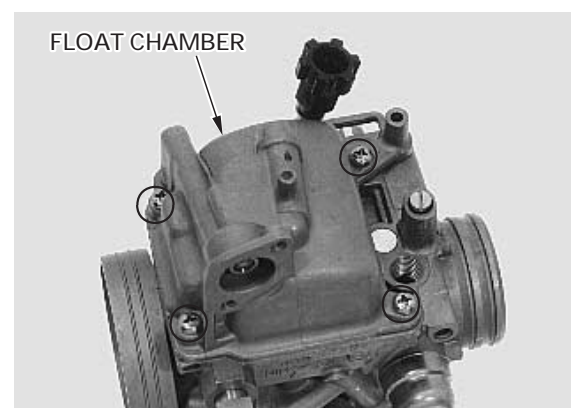


Check the diaphragm for pin holes, deterioration or damage.



FLOAT CHAMBER

Remove the four screws and the float chamber.



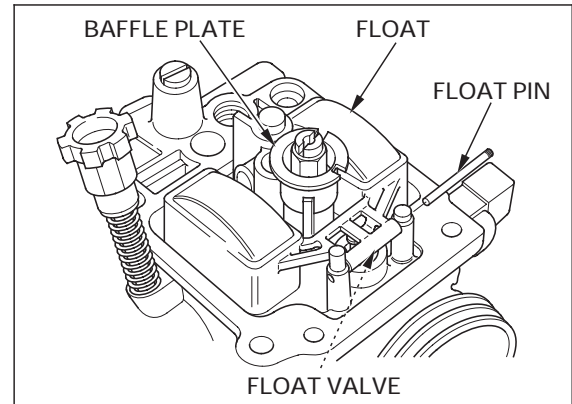
FUEL SYSTEM

Tap the float pin gently with suitable pin (O.D. 2 mm)

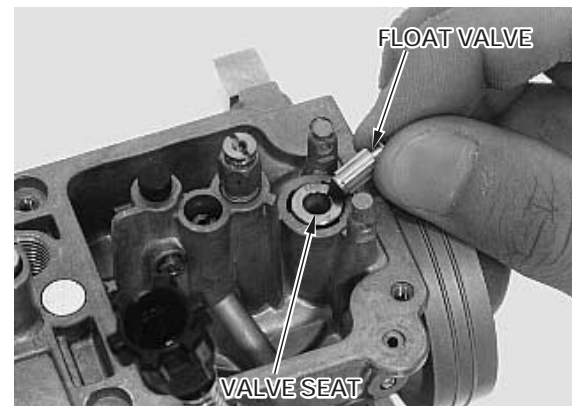
Remove the following:

- baffle plate
- float pin
- float
- float valve

Check the float for damage or fuel in the float.



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



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

Remove the following:

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

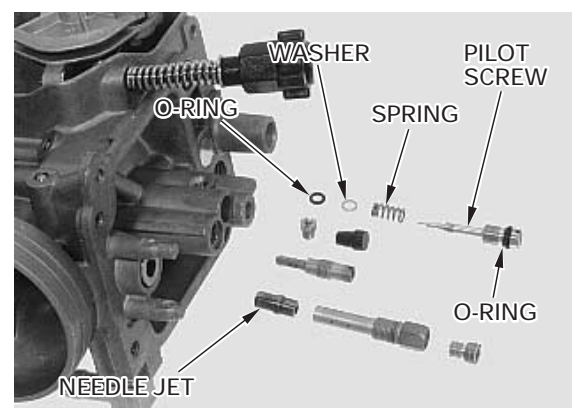
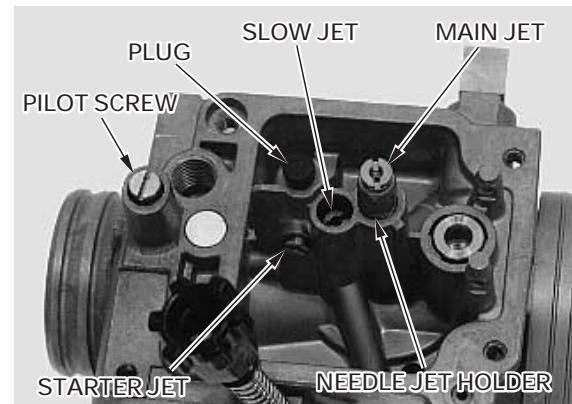
Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.

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

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

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

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



CARBURETOR CLEANING

Remove the following:

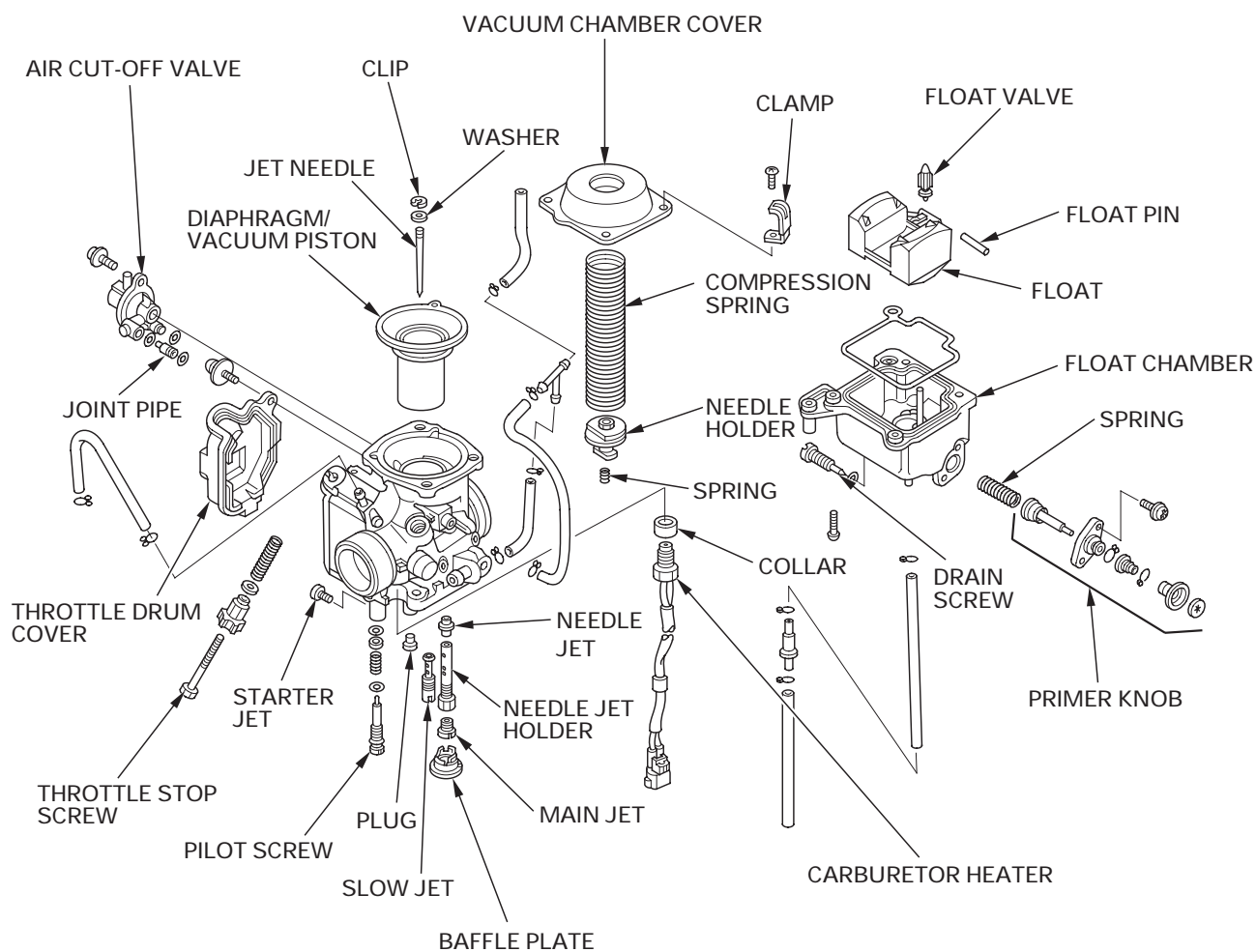
- air cut-off valve
- diaphragm/vacuum piston.
- main jet, needle jet holder and needle jet
- slow jet
- starter jet
- pilot screw

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

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



CARBURETOR ASSEMBLY



FLOAT AND JETS

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

Install the pilot screw with the spring, washer and a new O-ring and return it to its original position as noted during removal.

Perform the pilot screw adjustment if a new pilot screw is installed.

Install the following:

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

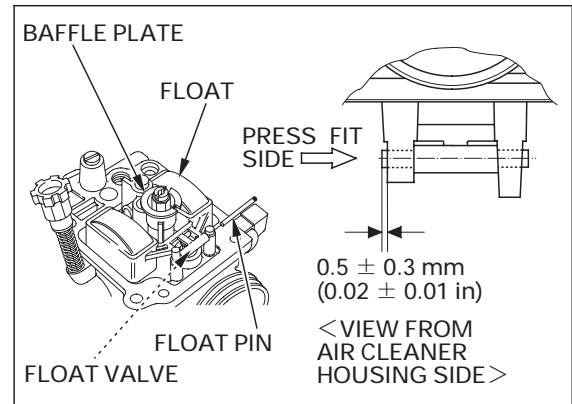
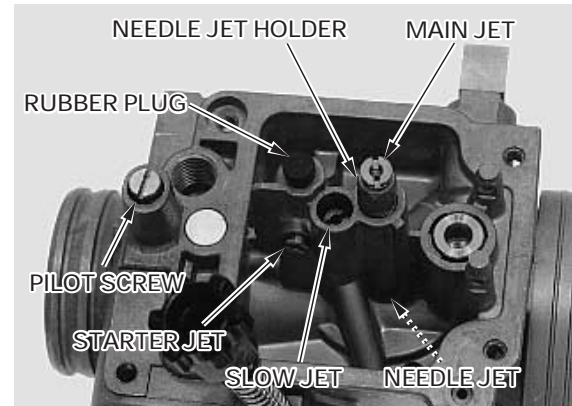
Tap the float pin gently with suitable pin (O.D. 2 mm)

Hang the float valve onto the float arm lip.

Install the float valve and float.

Install the float pin as shown.

Install the baffle plate.



FLOAT LEVEL INSPECTION

NOTE:

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

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

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

TOOL:

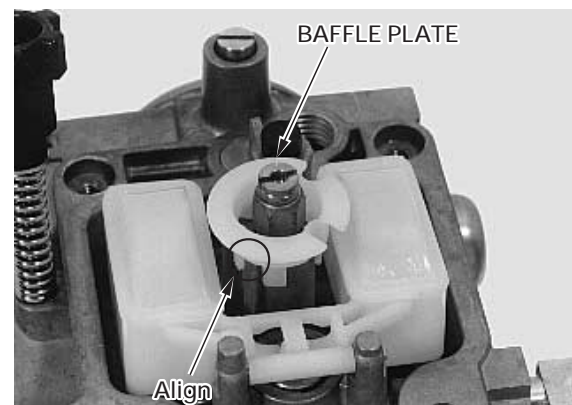
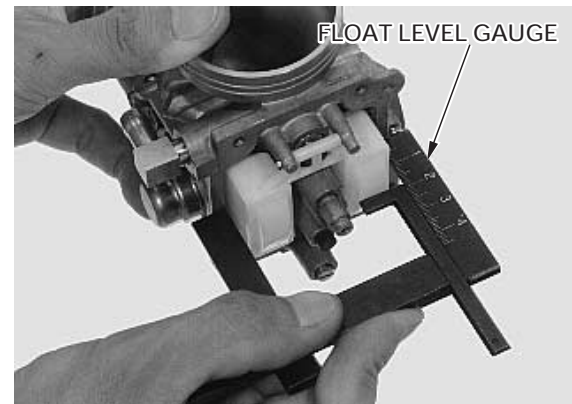
Carburetor float level gauge 07401-0010000

FLOAT LEVEL: 18.5 mm (0.73 in)

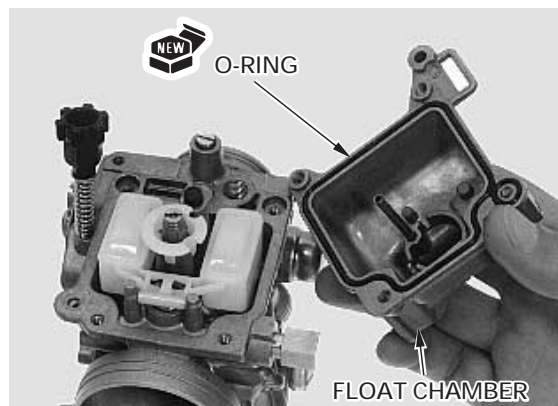
The float cannot be adjusted.

Replace the float assembly if the float level is out of specification.

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

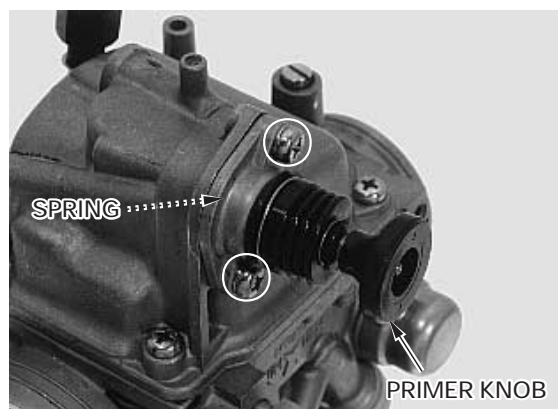


Install a new O-ring into the float chamber groove securely.
Install the float chamber and tighten the four screws.



PRIMER KNOB

Install the primer knob with the spring and tighten the two screws, being careful not to pinch the diaphragm.



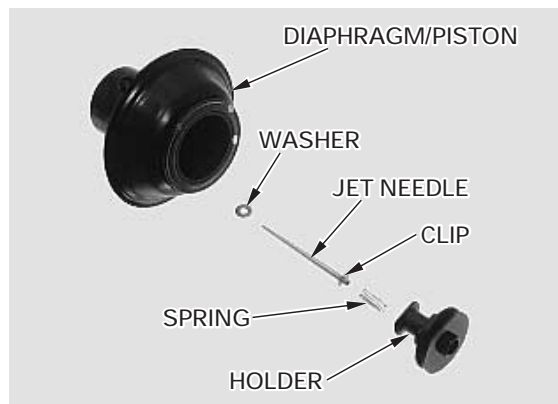
VACUUM CHAMBER

Install the needle clip onto the jet needle.

STANDARD CLIP POSITION: 3rd groove from top

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

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



Turn the needle holder clockwise while pressing it until it locks. Holder flange should be fitted the vacuum piston after turning.



FUEL SYSTEM

Be careful not to damage the jet needle.

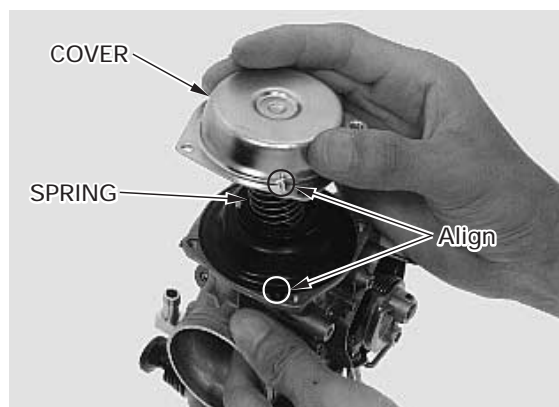
Install the diaphragm/vacuum piston into the carburetor body by aligning the tab of the diaphragm with the air passage, then insert the jet needle into the needle jet.

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



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

Install the spring and vacuum chamber cover while the piston remains held in place. Align the concave of the cover with the air passage in the carburetor and secure the cover with at least two screws before releasing the vacuum piston.



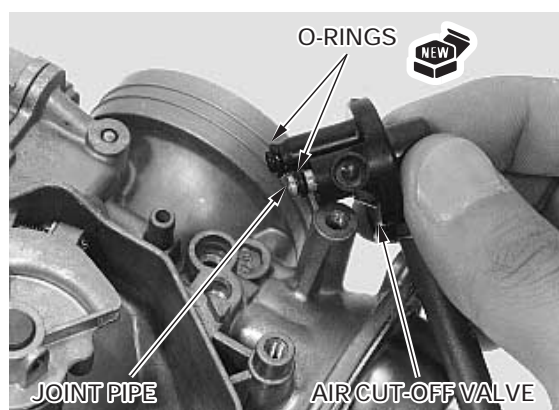
Install the screws with the tube clamp and tighten them.



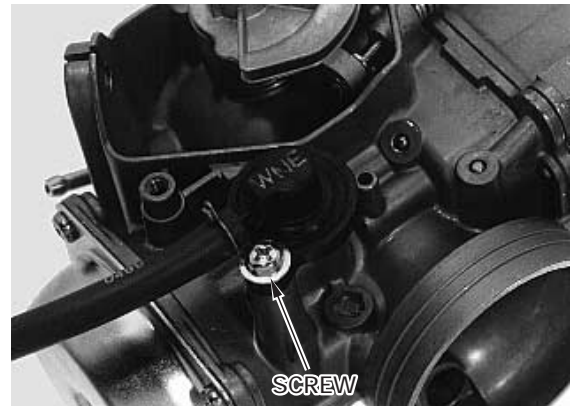
AIR CUT-OFF VALVE

Install new O-rings onto the air cut-off valve and joint pipe.

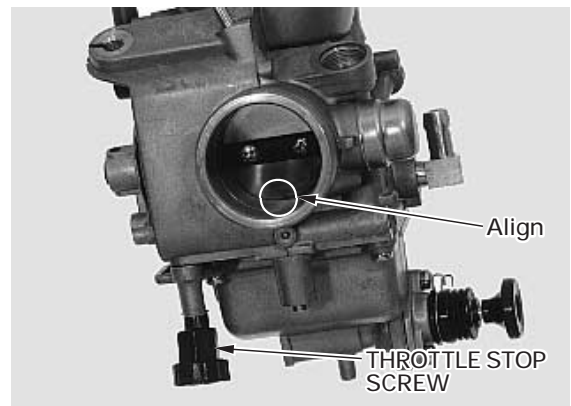
Install the joint pipe into the air cut-off valve with the stepped side facing the air cut-off valve.



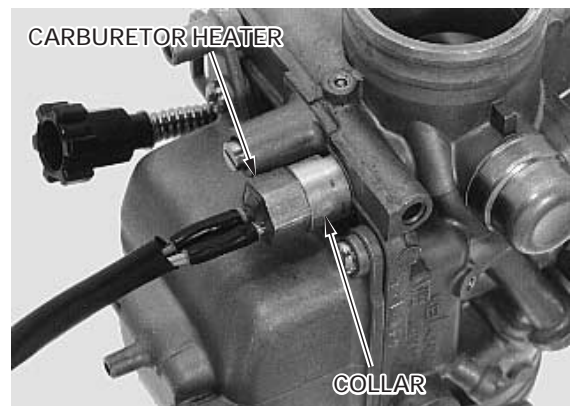
Install the air cut-off valve and secure it with the screw.



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

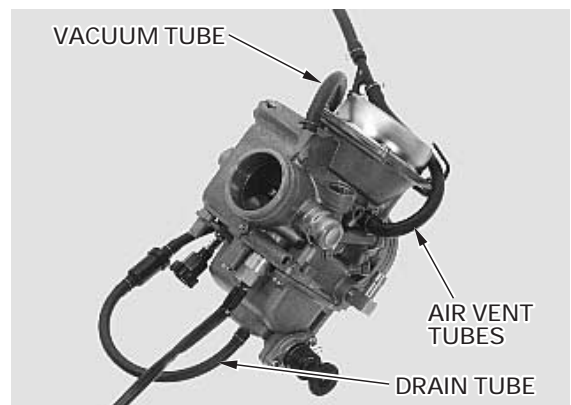


Install the collar and carburetor heater with the stepped side of the collar facing the carburetor and tighten it.



Install the following tubes to the carburetor and secure the air vent tube with the clamp as shown:

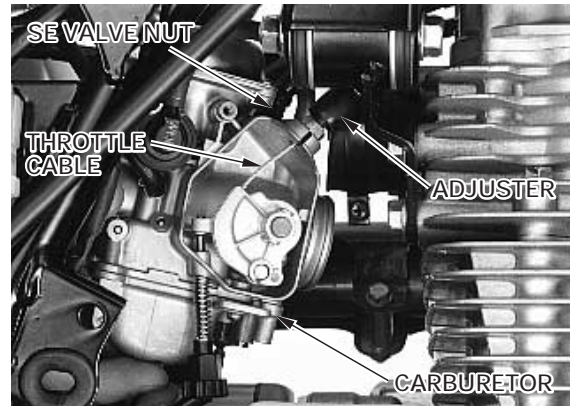
- air cut-off valve vacuum tube
- air vent tubes
- drain tube



CARBURETOR INSTALLATION

Connect the throttle cable to the throttle drum and install the cable adjuster into the carburetor body.

Connect the choke cable by screwing the SE valve nut, being careful not to damage the SE valve.

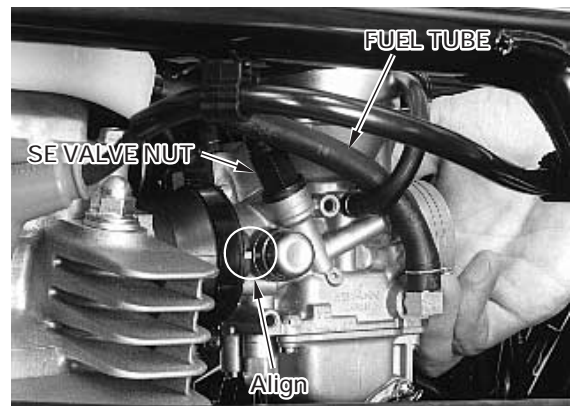


Install the carburetor into the insulator by aligning the lug with the groove, and tighten the band screw.

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

Tighten the SE valve nut.

Connect the fuel tube.



Install the throttle drum cover by aligning its tab with the slit in the carburetor and secure it with the screw.

Route the tubes and wire properly and connect the carburetor heater connector (page 1-22).

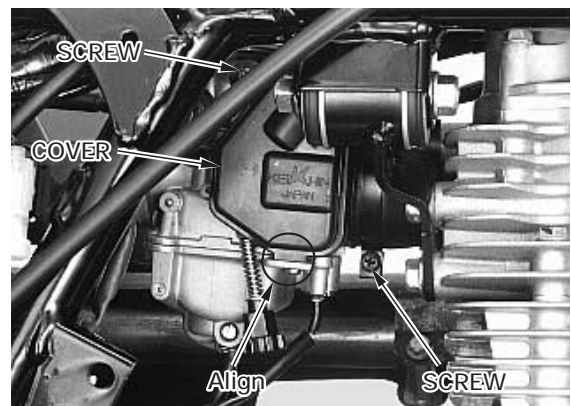
Remove the following:

- air cleaner housing (page 5-3)
- side covers (page 2-4)

Perform the following inspections and adjustments.

- engine idle speed (page 3-12)
- throttle operation (page 3-5)

Adjust the pilot screw if it was replaced (page 5-15)



PILOT SCREW ADJUSTMENT

IDLE DROP PROCEDURE

NOTE:

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

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

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

TOOL:

Pilot screw wrench 07908-4730002

INITIAL OPENING: 1-3/4 turns out

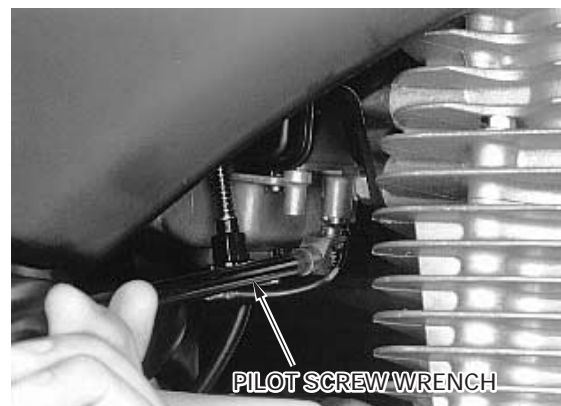
2. Warm up the engine to operating temperature. Stop and go riding for 10 minutes is sufficient.
3. Stop the engine and connect a tachometer according to the tachometer manufacturer's instructions.
4. Start the engine and adjust the idle speed with the throttle stop screw.

IDLE SPEED: 1,400 \pm 100 rpm

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

FINAL OPENING: 1-3/4 turns out

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



HIGH ALTITUDE ADJUSTMENT

	Below 5,000 ft (1,500 m)	Between 3,000—8,000 ft (1,000—2,500 m)
Main jet	# 130	# 125
Pilot screw opening	Factory preset	3/4 turns in from factory preset

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

STANDARD SETTING: Below 5,000 ft (1,500 m)

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

The high altitude carburetor adjustment is performed as follows:

Remove the carburetor (page 5-4) and the float chamber.

Replace the standard main jet with the high altitude type.

HIGH ALTITUDE MAIN JET: # 125

Check that the O-ring on the float chamber is in good condition and replace it with a new one if necessary.

Install the float chamber and the carburetor.

Turn-in the pilot screw the specified number of turns from the initial setting.

HIGH ALTITUDE PILOT SCREW OPENING:

3/4 turn in from initial opening

Start the engine and adjust the idle speed at high altitude to ensure proper high altitude operation.

Sustained operation below 5,000 ft (1,500 m) with the high altitude settings may cause engine overheating and engine damage. Install the standard main jet and screw out the pilot screw the specified number of turns, when riding below 5,000 ft (1,500 m).

STANDARD MAIN JET: # 130

Pilot screw change for low altitude: 3/4 turn out



FUEL TANK

REMOVAL/INSTALLATION

Remove the following:

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

FUEL TANK

Remove the air vent and breather tubes from the air intake duct.

Loosen the intake duct band screw.

Remove the trim clip and the intake duct from the air cleaner housing.

Disconnect the fuel tube.

Remove the following:

- screw and fuel valve lever
- three mounting bolts
- fuel tank

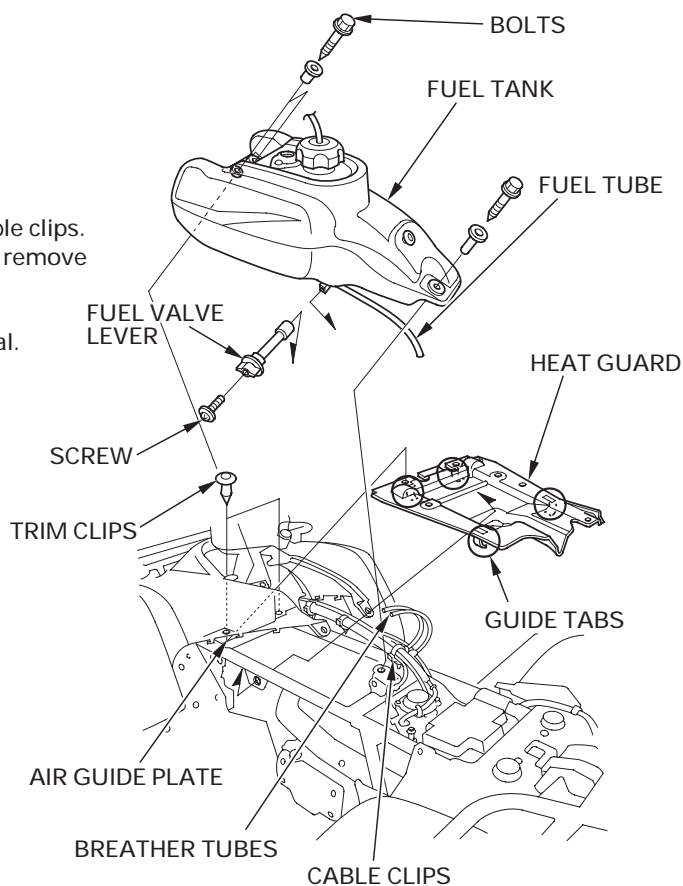
HEAT GUARD

Remove the two trim clips and the three cable clips. Release the four guide tabs off the frame to remove the fuel tank heat guard.

Install the heat guard under the air guide plate.

Installation is in the reverse order of removal.

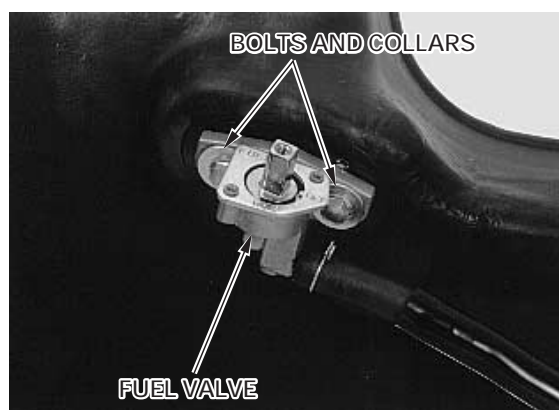
Route the tubes properly (page 1-22).



FUEL STRAINER SCREEN CLEANING

Remove the fuel tank.

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

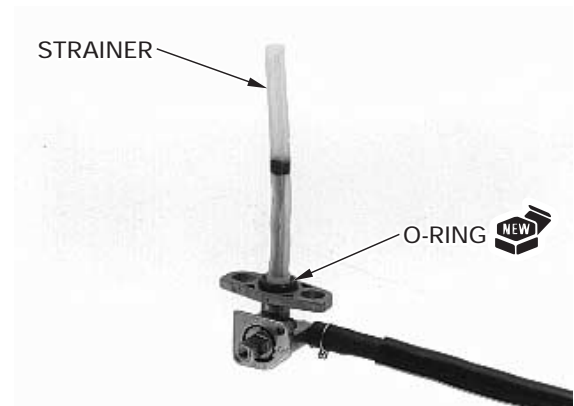


FUEL SYSTEM

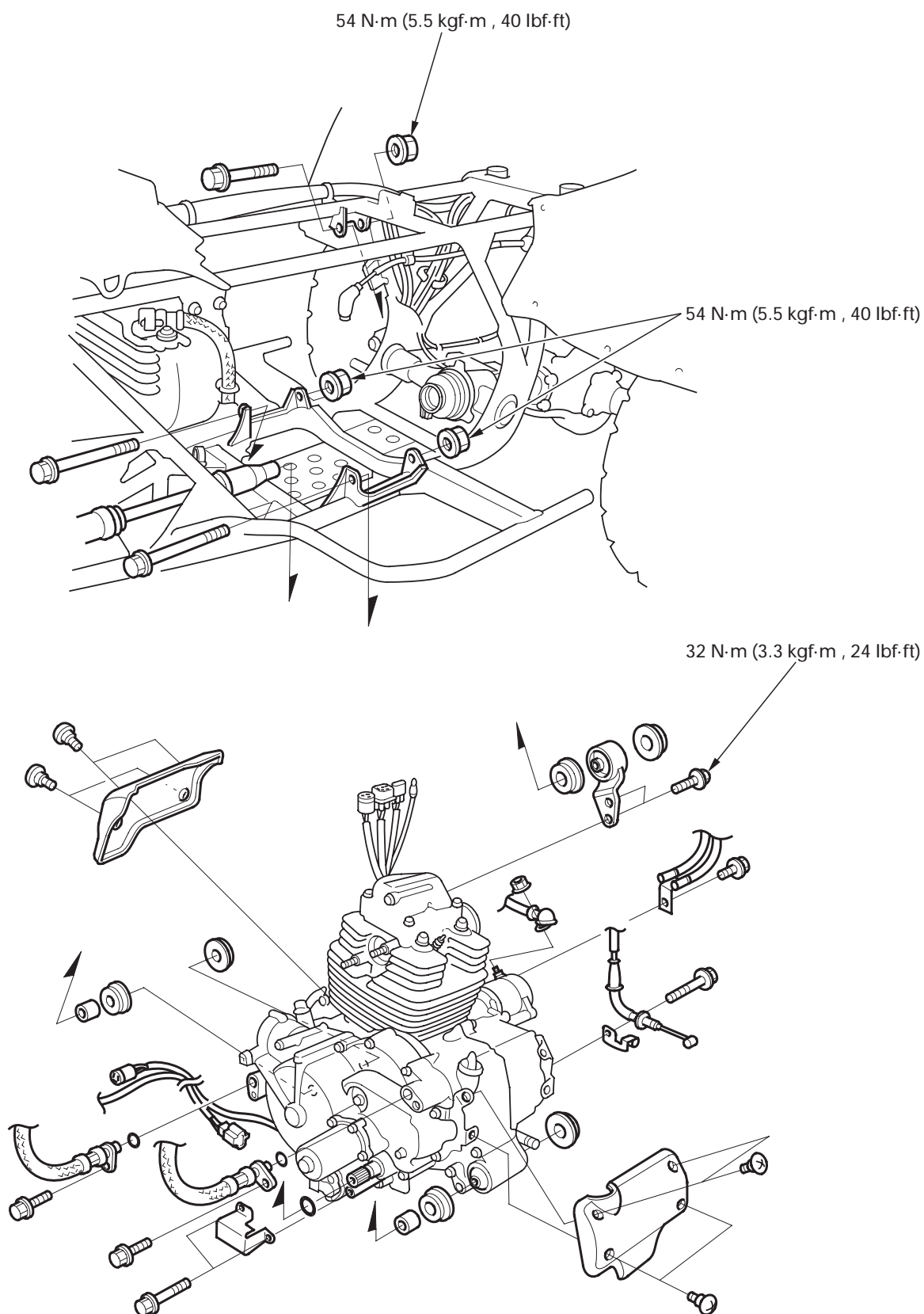
Remove the O-ring.
Clean the strainer screen with non-flammable or high flash point solvent.

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

Install the fuel tank.



MEMO



6. ENGINE REMOVAL/INSTALLATION

SERVICE INFORMATION	6-1	ENGINE INSTALLATION	6-5
ENGINE REMOVAL	6-2		

SERVICE INFORMATION

GENERAL

- When removing and installing the engine, tape the frame around the engine beforehand for frame protection.
 - The following components require engine removal for service:
 - alternator and starter clutch (section 10)
 - transmission (including shift fork and shift drum) (section 11)
 - crankshaft and balancer (section 11)
- Other components without above can be serviced with the engine installed in the frame.

SPECIFICATIONS

ITEM		SPECIFICATIONS
Engine dry weight	TM model	43.4 kg (95.7 lbs)
	TE model	44.9 kg (99.0 lbs)
	FM model	43.8 kg (96.6 lbs)
	FE model	45.3 kg (99.9 lbs)
Engine oil capacity	After draining	1.95 ℓ (2.06 US qt , 1.72 Imp qt)
	After draining/filter change	2.0 ℓ (2.1 US qt , 1.8 Imp qt)
	After disassembly	2.5 ℓ (2.6 US qt , 2.2 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)
bolt (engine side)	32 N·m (3.3 kgf·m , 24 lbf·ft)

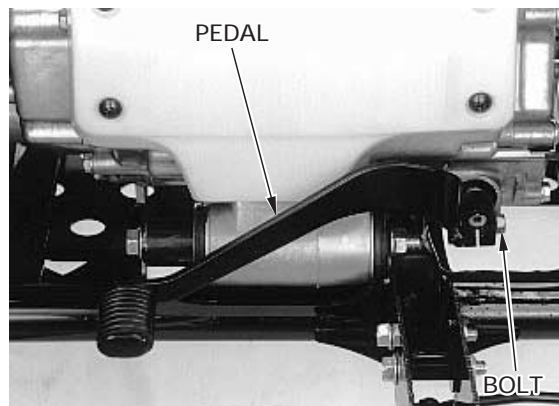
ENGINE REMOVAL

Drain the engine oil (page 3-11).

Remove the following:

- front fender (page 2-7)
- fuel tank and heat guard (page 5-17)
- exhaust system (page 2-10)
- carburetor assembly (page 5-4)
- brake pedal (page 14-19)

TM/FM model only: Remove the pinch bolt and the gearshift pedal.



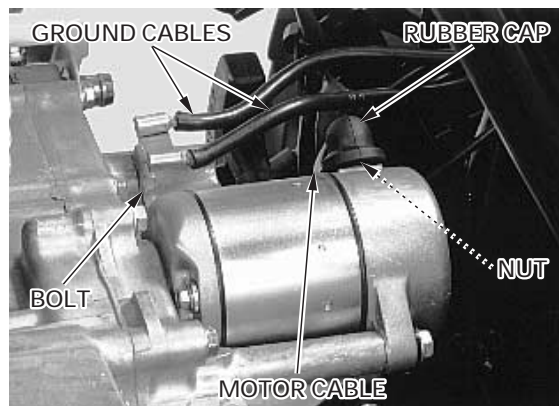
Disconnect the spark plug cap.

Remove the four screws and each engine side cover.



Slide the rubber cap and remove the terminal nut to disconnect the starter motor cable.

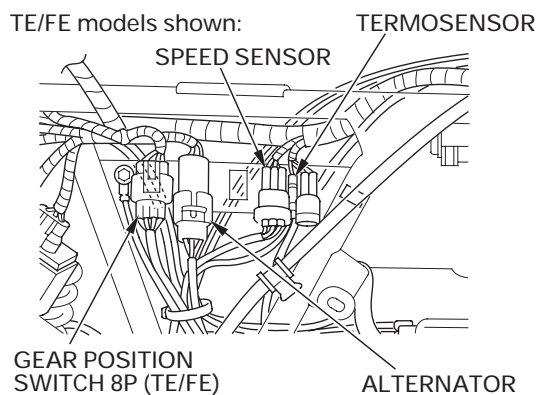
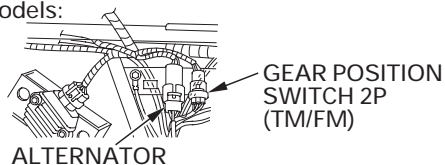
Remove the terminal bolt to disconnect the ground cable(s).



Disconnect the following connectors:

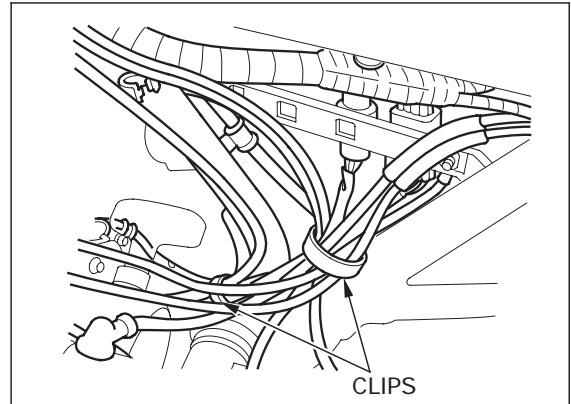
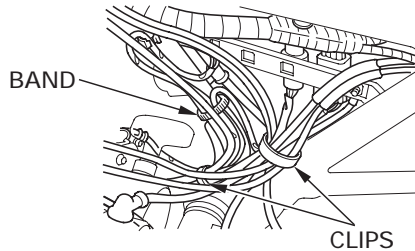
- thermosensor
- speed sensor 3P (U.S.A. TM/FM models — optional)
- gear position switch 2P (All TM/FM models)
- alternator 5P
- gear position switch 8P (All TE/FE models)

TM/FM models:

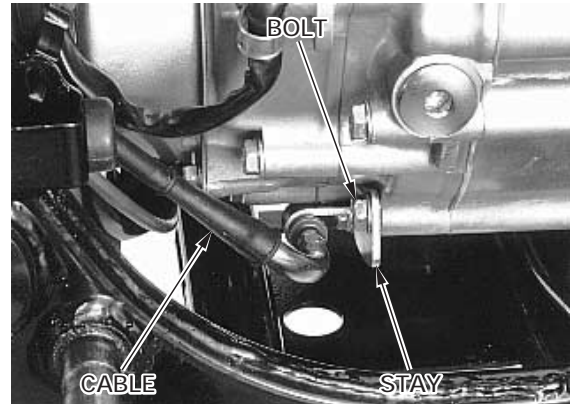


Remove the wire band (early TE/FE model production only) and release the two wire clips.

Early production of the TE/FE models:



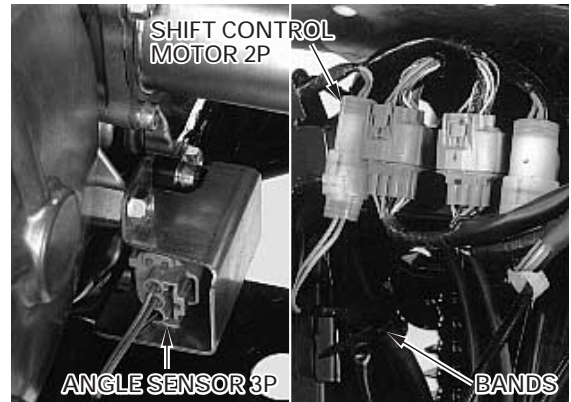
Remove the bolt and stay and disconnect the reverse selector cable from the selector arm.



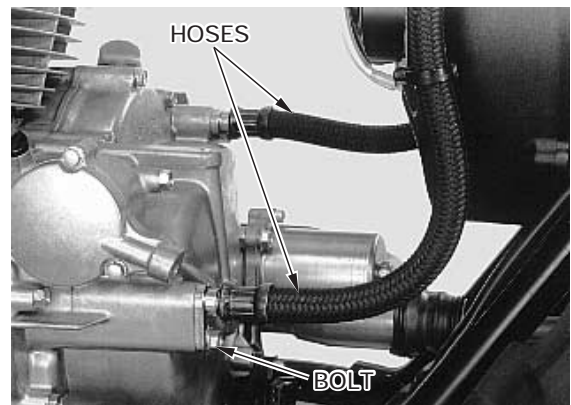
TE/FE model only: Remove the three wire bands from the frame down tube and release the wire clip on the frame cross member that secured the angle sensor and shift control motor wires.

Disconnect the following connectors:

- angle sensor 3P
- shift control motor 2P



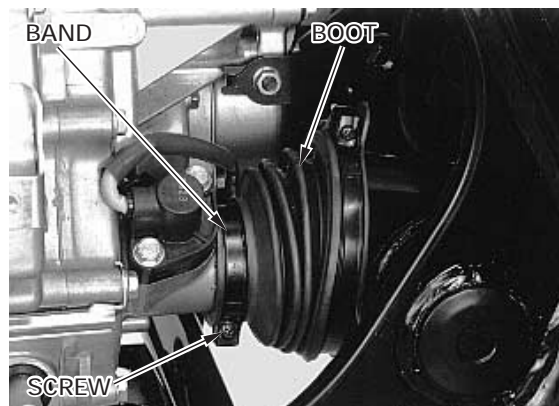
Disconnect each oil cooler hose by removing the bolt.
Remove the O-rings.



ENGINE REMOVAL/INSTALLATION

Remove the propeller shaft from the engine (FM/FE only; page 15-8).

Loosen the band screw and remove the boot band. Remove the joint boot from the engine.



Remove the following:

- upper hanger bolts and nut
- hanger bracket and mounting rubbers



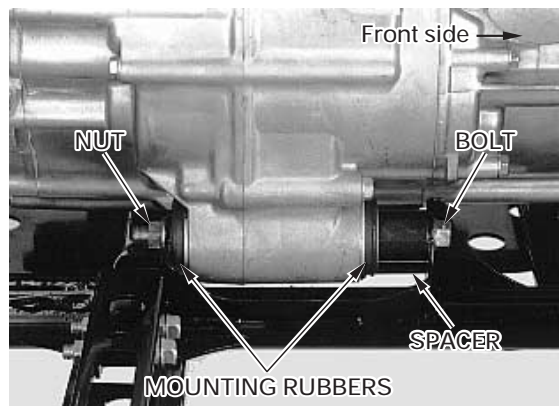
- left and right lower hanger nuts

Support the bottom of the engine securely.

Remove the following:

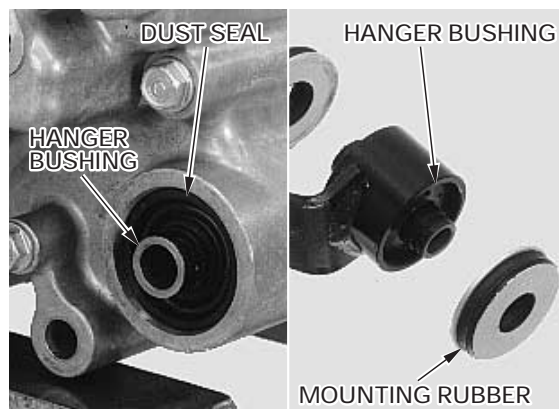
- left and right lower hanger bolts
- spacers
- mounting rubbers

Move the engine forward and disconnect the output shaft from the universal joint. Remove the engine out of the frame.



Remove the engine hanger bushings and dust seals.

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

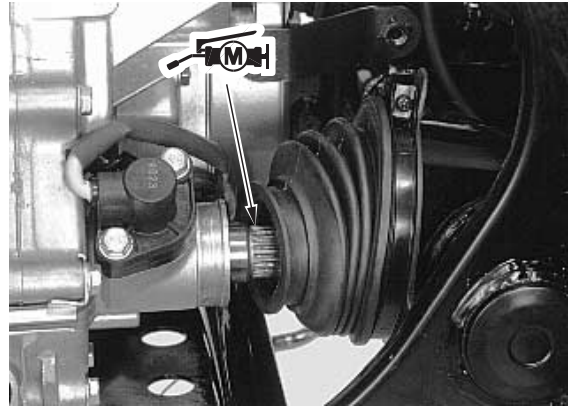


ENGINE INSTALLATION

Install the engine into the frame in the reverse order of removal.

NOTE:

- Apply molybdenum disulfide grease to the output shaft spline.
- Note the installation direction of the hanger bolts, mounting rubbers (large I.D. side facing in) and dust seals (lips side facing out) and position of the spacers and mounting rubbers.



Install the lower hanger bolts and nuts with the spacers and mounting rubbers while supporting the engine.

Install the upper hanger bolts, nuts and upper hanger bracket with the mounting bolt.

Tighten the bolts and nuts to the specified torque.

TORQUE:

Lower hanger nut:

54 N·m (5.5 kgf·m, 40 lbf·ft)

Upper hanger nut (frame side):

54 N·m (5.5 kgf·m, 40 lbf·ft)

Upper hanger bolt (engine side):

32 N·m (3.3 kgf·m, 24 lbf·ft)

Install the removed parts from engine removal procedure (page 6-2 to 6-4).

NOTE:

- Route the wires, cables and tubes properly (page 1-22).
- Replace the oil cooler hose O-rings with new ones and coat them with engine oil.
- When installing the gearshift pedal, set the lower side of the pedal joint horizontally.

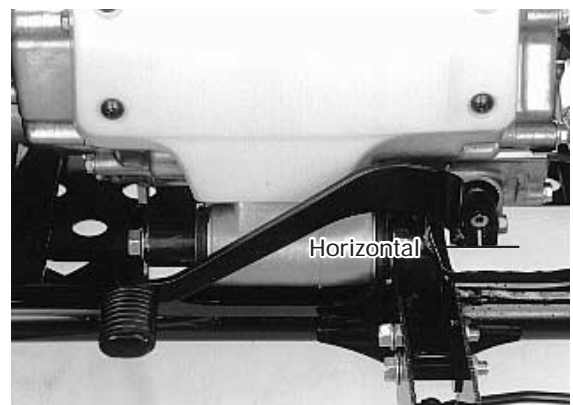
TM/FM model only:

Install the following:

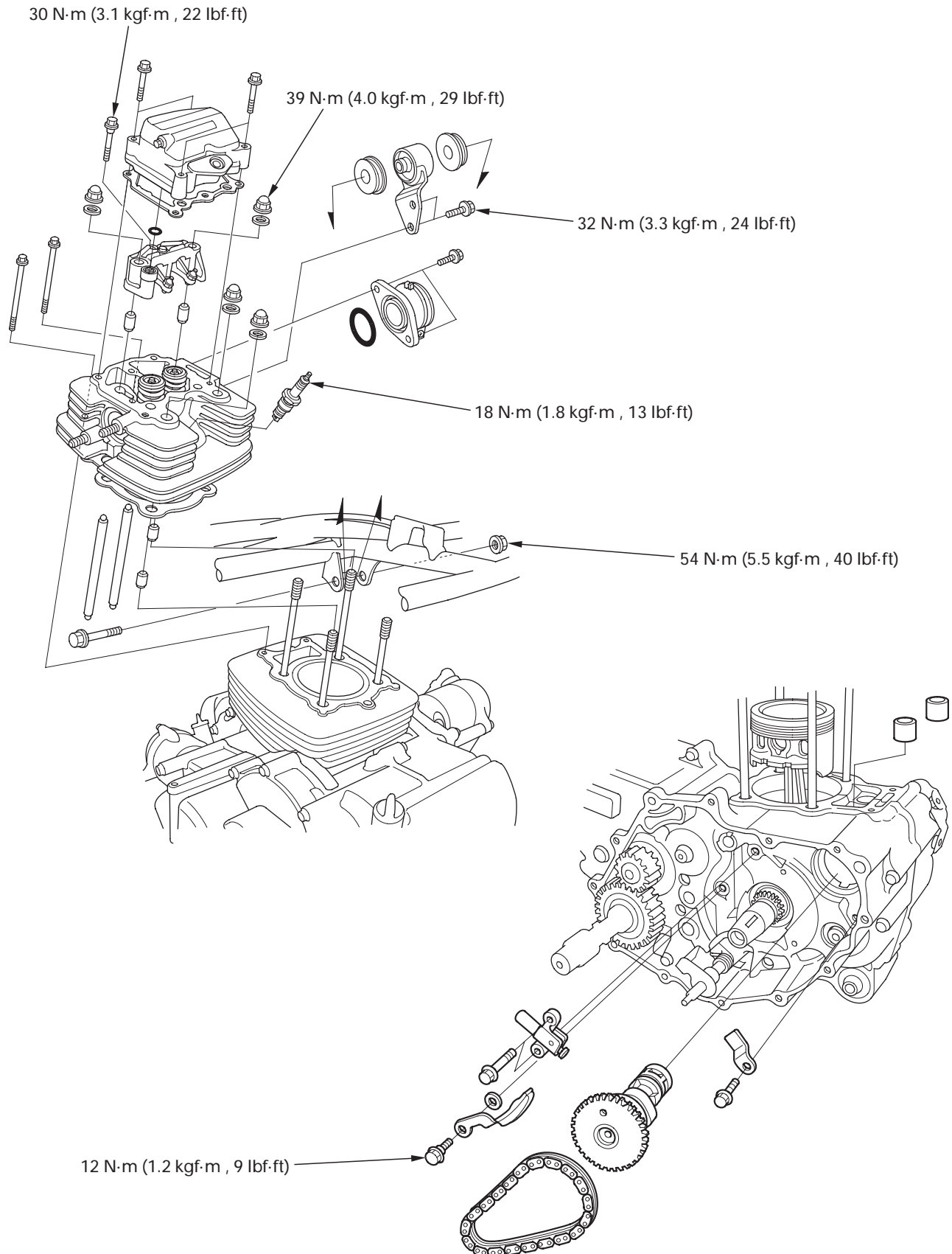
- propeller shaft (page 15-23)
- exhaust system (page 2-11)
- carburetor assembly (page 5-14)
- brake pedal (page 14-19)
- fuel tank and heat guard (page 5-17)
- front fender (page 2-7)

Perform the following inspections and adjustments.

- throttle operation (page 3-5)
- brake pedal free play (page 3-16)
- reverse selector lever free play (page 3-16)



CYLINDER HEAD/VALVE



7. CYLINDER HEAD/VALVE

SERVICE INFORMATION	7-1	VALVE SEAT INSPECTION/REFACING	7-8
TROUBLESHOOTING	7-2	CYLINDER HEAD ASSEMBLY	7-11
CYLINDER COMPRESSION	7-3	CYLINDER HEAD INSTALLATION	7-13
CYLINDER HEAD REMOVAL	7-3	CAMSHAFT REMOVAL	7-15
CYLINDER HEAD DISASSEMBLY	7-5	CAMSHAFT INSTALLATION	7-17
VALVE GUIDE REPLACEMENT	7-8		

SERVICE INFORMATION

GENERAL

- This section covers service of the cylinder head, rocker arms, valves and camshaft. To service the camshaft, the engine must be removed from 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 450 rpm			667 kPa (6.8 kgf/cm ² , 97 psi)	————
Valve clearance		IN/EX	0.15 (0.006)	————
Valve, valve guide	Valve stem O.D.	IN	5.475–5.490 (0.2156–0.2161)	5.45 (0.215)
		EX	5.455–5.470 (0.2148–0.2154)	5.43 (0.214)
	Valve guide I.D.	IN/EX	5.500–5.512 (0.2165–0.2170)	5.52 (0.217)
		IN	0.010–0.037 (0.0004–0.0015)	0.12 (0.005)
	Stem-to-guide clearance	EX	0.030–0.057 (0.0012–0.0022)	0.14 (0.006)
Valve seat width		IN/EX	1.2 (0.05)	1.5 (0.06)
Valve spring	Free length	Inner	36.95 (1.455)	36.94 (1.454)
		Outer	41.67 (1.641)	40.42 (1.591)
Rocker arm	Arm I.D.	IN/EX	12.000–12.018 (0.4724–0.4731)	12.05 (0.474)
	Shaft O.D.	IN/EX	11.966–11.984 (0.4711–0.4718)	11.92 (0.469)
	Arm-to-shaft clearance	IN/EX	0.016–0.052 (0.0006–0.0020)	0.08 (0.003)
Camshaft and cam follower	Cam lobe height	IN/EX	35.2995–35.4595 (1.38974–1.39604)	35.13 (1.383)
	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)

TORQUE VALUES

Rocker arm shaft retaining bolt	7 N·m (0.7 kgf·m , 5.1 lbf·ft)	
Cylinder head cap nut	39 N·m (4.0 kgf·m , 29 lbf·ft)	Apply oil to the threads and seating surface
Rocker arm holder bolt	30 N·m (3.1 kgf·m , 22 lbf·ft)	Apply oil to the threads and seating surface
Cam chain tensioner slider pivot bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)	Apply locking agent to the threads
Spark plug	18 N·m (1.8 kgf·m , 13 lbf·ft)	
Upper engine hanger nut (frame side)	54 N·m (5.5 kgf·m , 40 lbf·ft)	
bolt (engine side)	32 N·m (3.3 kgf·m , 24 lbf·ft)	

Valve spring compressor	07757-0010000	
Valve guide driver, 5.5 mm	07742-0010100	
Valve guide reamer, 5.5 mm	07984-2000001	or 07984-200000D (U.S.A. only)
Valve seat cutter, 35 mm (IN 45°)	07780-0010400	— or equivalent commercially available in U.S.A.
Valve seat cutter, 29 mm (EX 45°)	07780-0010300	—
Flat cutter, 38.5 mm (IN 32°)	07780-0012400	—
Flat cutter, 33 mm (EX 32°)	07780-0012900	—
Interior cutter, 37.5 mm (IN 60°)	07780-0014100	—
Interior cutter, 30 mm (EX 60°)	07780-0014000	—
Cutter holder, 5.5 mm	07781-0010101	—

- Engine top-end problems usually affect engine performance. These can be diagnosed by a compression test, or by tracing top-end noise with a sounding rod or stethoscope.
- If the performance is poor at low speeds, check for a white smoke in the crankcase breather tube. If the tube is smoky, check for seized piston ring (section 8).

- Valves
 - Incorrect valve adjustment
 - Burned or bent valves
 - Incorrect valve timing
 - Broken valve spring
 - Uneven valve seating
 - Valve stuck open
- Cylinder head
 - Leaking or damaged cylinder head gasket
 - Warped or cracked cylinder head
 - Loose spark plug
- Cylinder/piston problem (section 8)

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

- Worn valve stem or valve guide
- Damaged stem seal
- Cylinder/piston problem (section 8)

- Incorrect valve clearance
- Sticking valve or broken valve spring
- Excessive worn valve seat
- Worn or damaged camshaft
- Worn rocker arm and/or shaft
- Worn rocker arm follower or valve stem end
- Worn or damaged push rod and/or cam follower
- Worn cam chain
- Worn or damaged cam chain tensioner
- Worn cam sprocket teeth
- Cylinder/piston problem (section 8)

- Low cylinder compression

CYLINDER COMPRESSION

Warm up the engine to normal operating temperature.

Stop the engine, disconnect the spark plug cap and remove the spark plug.

Install the compression gauge into the spark plug hole.

Shift the transmission in neutral and close the choke knob (OFF).

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

COMPRESSION PRESSURE:

667 kPa (6.8 kgf/cm² , 97 psi) at 450 rpm

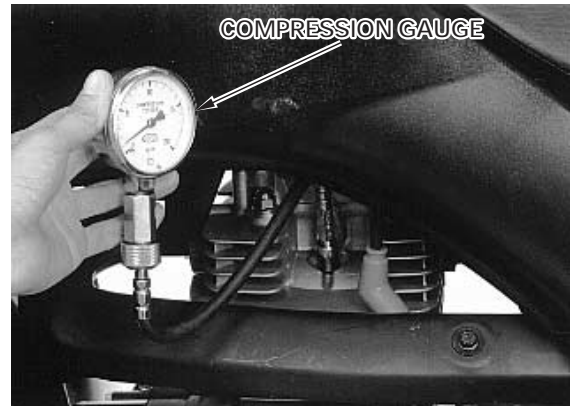
Check that there is no leakage at the gauge connection.

Low compression can be caused by:

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

High compression can be caused by:

- carbon deposits in combustion chamber or on piston head



CYLINDER HEAD REMOVAL

HEAD COVER

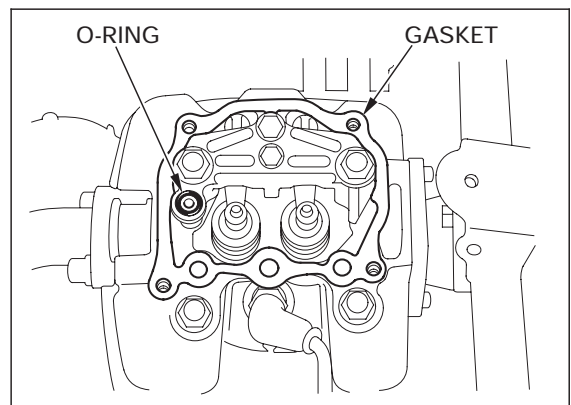
Remove the fuel tank and heat guard (page 5-17).

Remove the following:

- four bolts
- head cover



- O-ring
- gasket



CYLINDER HEAD AND ROCKER ARM HOLDER

Remove the following:

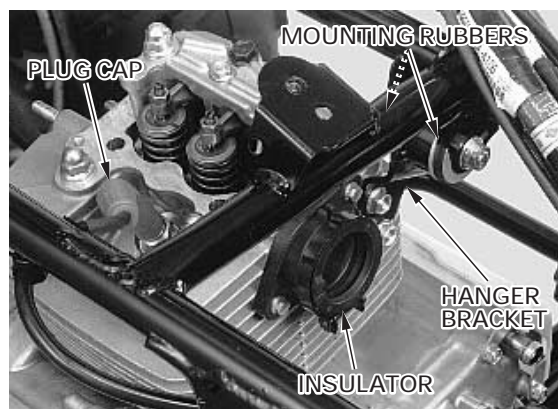
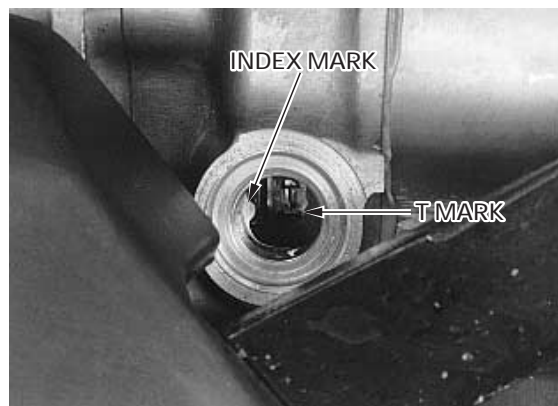
- exhaust system (page 2-10)
- carburetor assembly (page 5-4)
- timing hole cap

Rotate the crankshaft clockwise using the recoil starter knob to align the T mark on the flywheel with the index mark on the rear crankcase cover. Make sure the piston is TDC (Top Dead Center) on the compression stroke.

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

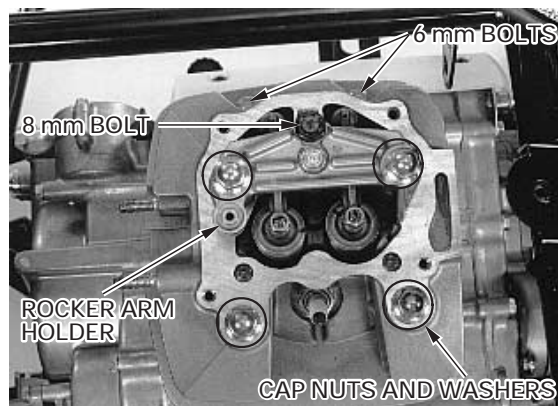
Remove the following:

- spark plug cap
- two bolts and insulator
- upper engine hanger bolts and nut
- hanger bracket and mounting rubbers



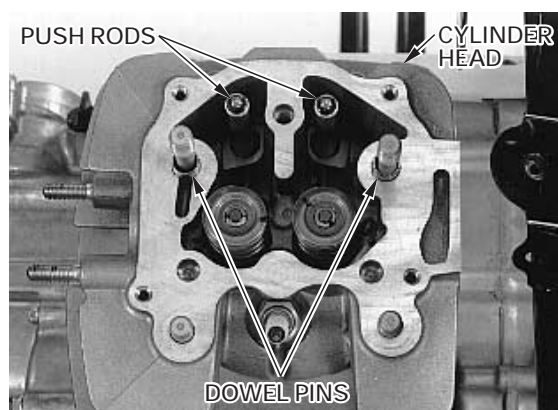
Loosen in a crisscross pattern in 2 or 3 steps.

- rocker arm holder bolt (8 mm)
- two bolts (6 mm)
- four cap nuts and washers
- rocker arm holder

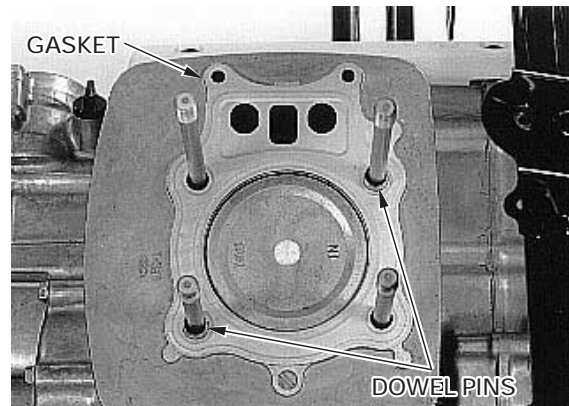


Mark the push rods so they can be placed back in their original locations. Do not strike the cylinder head too hard.

- two dowel pins
- push rods
- cylinder head



- two dowel pins
- gasket



CYLINDER HEAD DISASSEMBLY

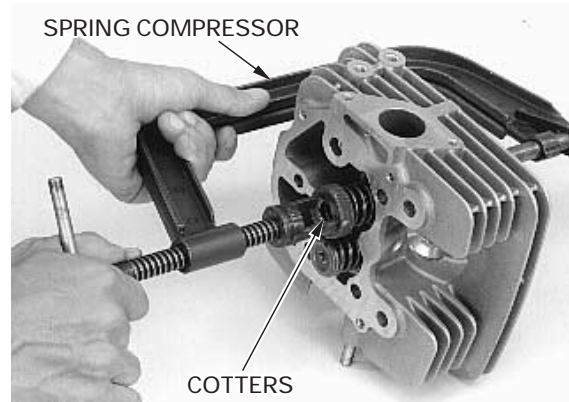
CYLINDER HEAD

Remove the spark plug.

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

Remove the valve spring cotters using the valve spring compressor.

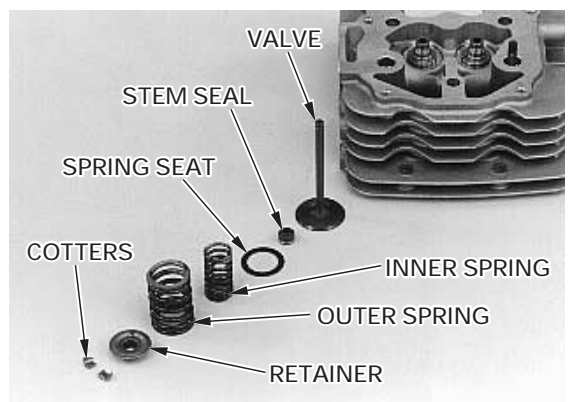
TOOL:
Valve spring compressor 07757-0010000



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

Remove the following:

- spring retainer
- inner and outer valve springs
- valve
- stem seal
- valve spring seat

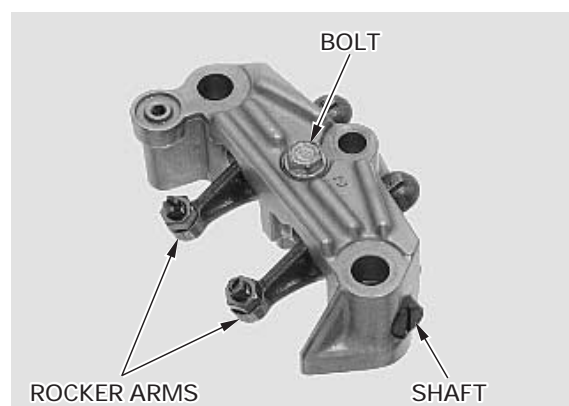


ROCKER ARM HOLDER

Mark rocker arms so they can be placed back in their original locations.

Remove the following:

- shaft retaining bolt
- rocker arm shaft
- rocker arms



INSPECTION

ROCKER ARM/SHAFT

Check the rocker arms and shafts for wear or damage.

If the rocker arm follower is worn or damaged, check the push rod and oil passages.

Measure each rocker arm shaft O.D.

SERVICE LIMIT: 11.92 mm (0.469 in)

Measure each rocker arm I.D.

SERVICE LIMIT: 12.05 mm (0.474 in)

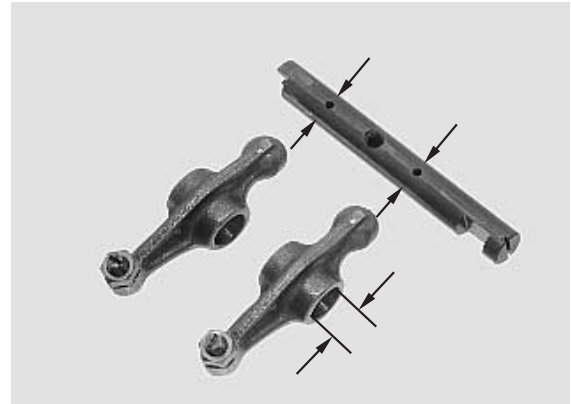
Subtract each rocker arm shaft O.D. from the corresponding rocker arm I.D. to obtain the rocker arm-to-shaft clearance.

SERVICE LIMIT: 0.08 mm (0.003 in)

PUSH ROD

Check the push rods for wear or damage.

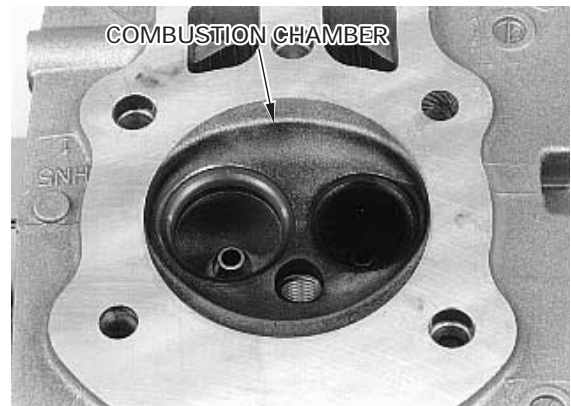
If the push rod is worn or damaged, check the cam follower and camshaft.



CYLINDER HEAD

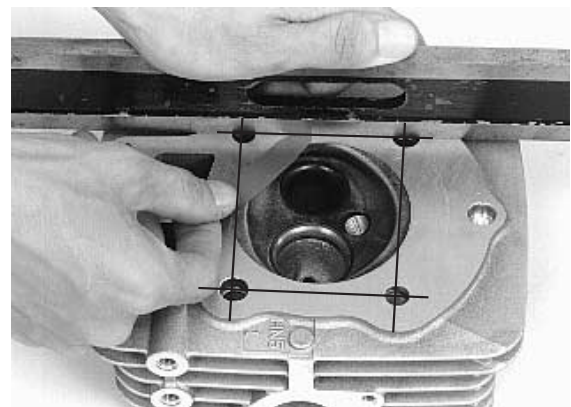
Remove the carbon deposits from the combustion chamber, being careful not to damage the gasket surface.

Check the spark plug hole and valve areas for cracks.



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

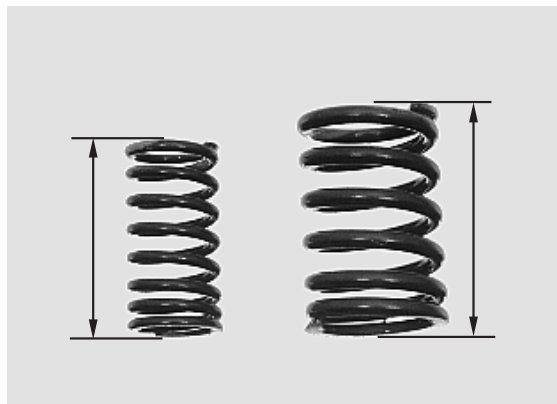
SERVICE LIMIT: 0.10 mm (0.004 in)



VALVE SPRING

Measure the valve spring free length.

SERVICE LIMITS: Inner: 36.94 mm (1.454 in)
Outer: 40.42 mm (1.591 in)

**VALVE/VALVE GUIDE**

Check that the valve moves smoothly in the guide.
Check the valve for bending, burning or abnormal wear.
Measure each valve stem O.D. and record it.

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



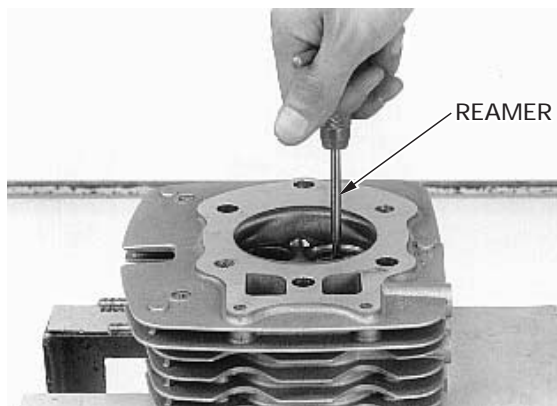
Ream the valve guide to remove any carbon build-up before measuring the guide.
Insert the reamer from the combustion chamber side of the head and always rotate the reamer clockwise.

TOOL:

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

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

SERVICE LIMITS: IN/EX: 5.52 mm (0.217 in)



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

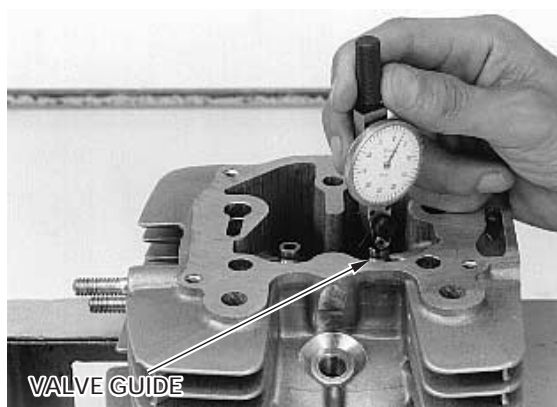
SERVICE LIMITS: IN: 0.12 mm (0.005 in)
EX: 0.14 mm (0.006 in)

Inspect and reface the valve seats whenever the valve guides are replaced (page 7-8).

If the stem-to-guide clearance exceeds the service limit, determine if a new guide with standard dimensions would bring the clearance within tolerance.

If so, replace any guides as necessary and ream to fit.

If the stem-to-guide clearance exceeds the service limit with a new guide, also replace the valve.



VALVE GUIDE REPLACEMENT

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

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

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

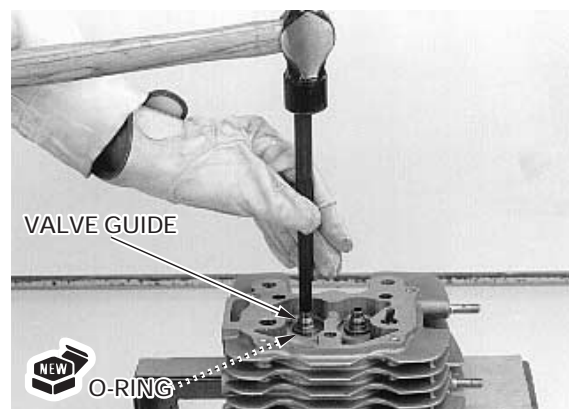
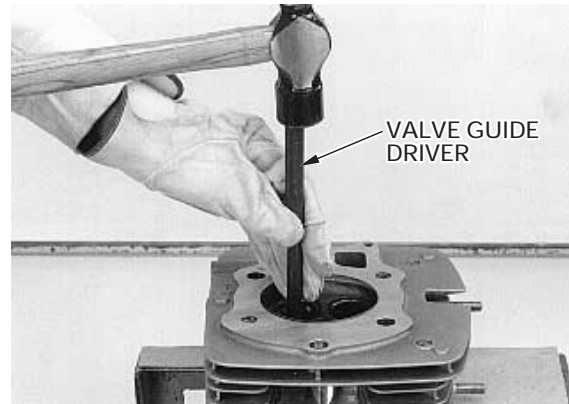
Support the cylinder head and drive the valve guides out of the cylinder head from the combustion chamber side.

TOOL:

Valve guide driver, 5.5 mm 07742-0010100

Install new O-rings onto the new valve guides. Drive the new valve guides in the cylinder head from the rocker arm side using the same tool while the cylinder head is still heated.

Let the cylinder head cool to room temperature.



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

Ream the new valve guides.

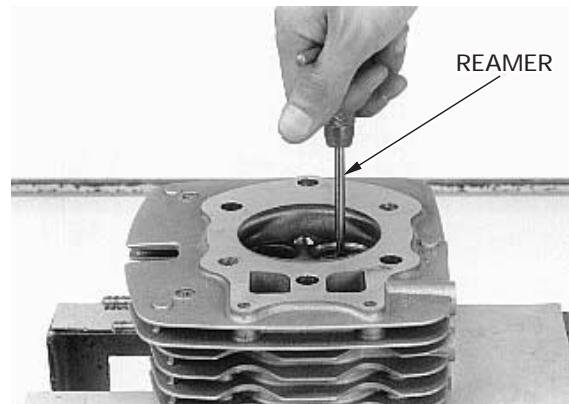
Insert the reamer from the combustion chamber side of the head and always rotate the reamer clockwise.

TOOL:

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

Use cutting oil on the reamer during this operation.

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



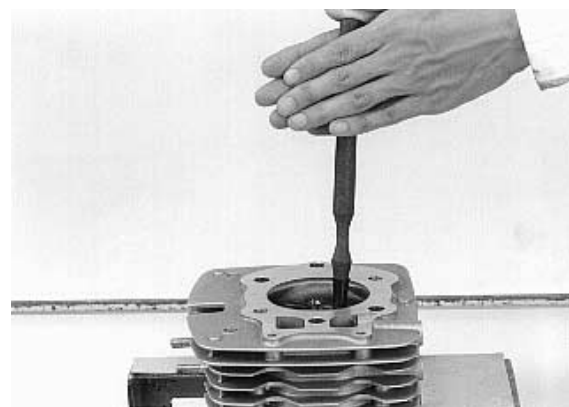
VALVE SEAT INSPECTION/REFACING

INSPECTION

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

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

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



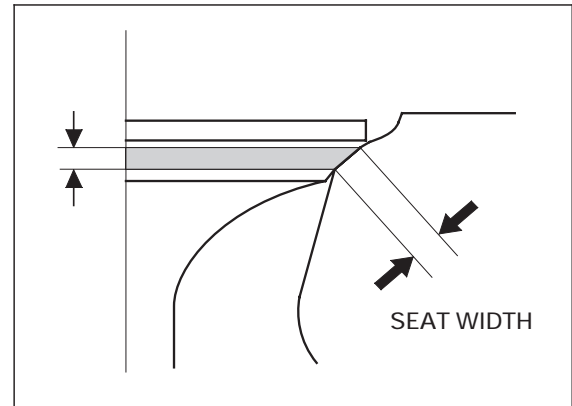
The valve cannot be ground. If the valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.

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)

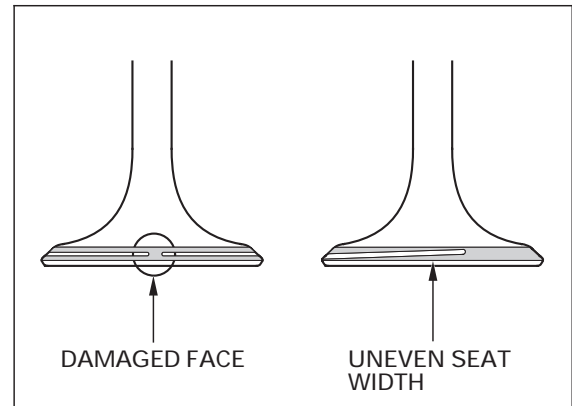
SERVICE LIMIT: 1.5 mm (0.06 in)

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

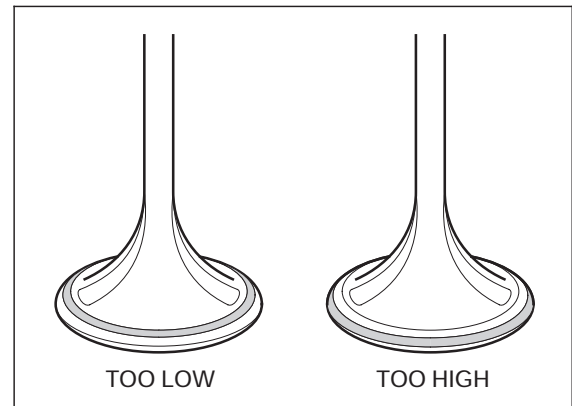


Inspect the valve seat face for:

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



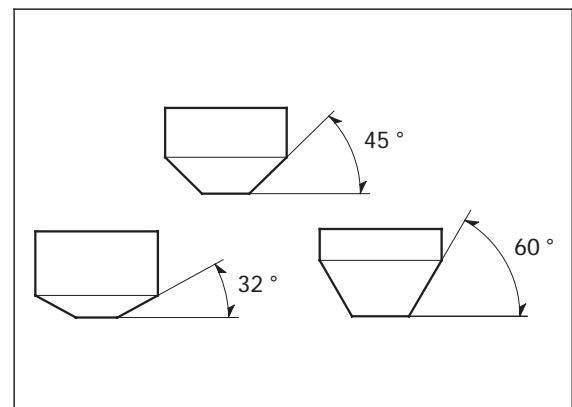
- Contact area (too high or too low)
 - Reface the valve seat.



REFACING

NOTE:

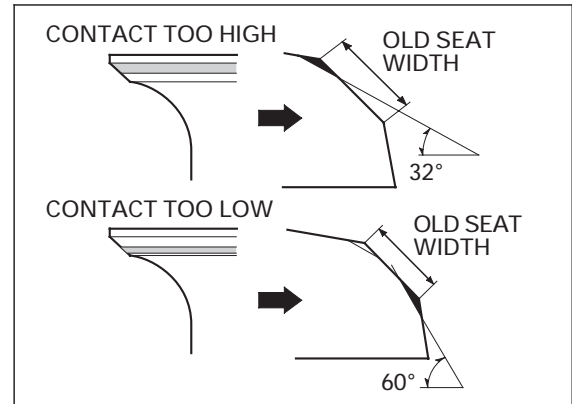
- Follow the refacing manufacturer's operating instructions.
- Be careful not to grind the seat more than necessary.



CYLINDER HEAD/VALVE

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

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



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

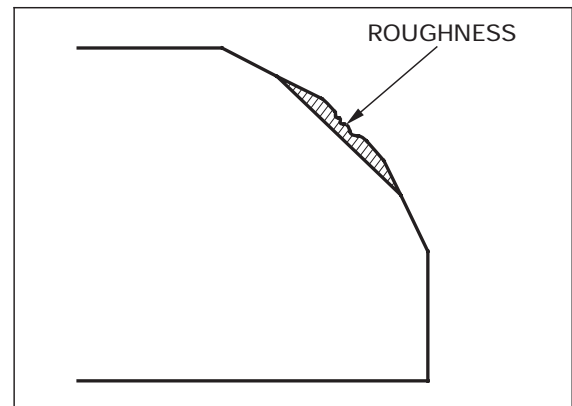
TOOLS:

Valve seat cutter, 35 mm (IN) 07780-0010400

Valve seat cutter, 29 mm (EX) 07780-0010300

Cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.



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

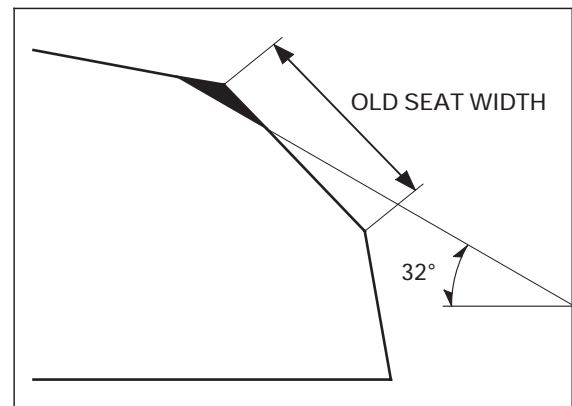
TOOLS:

Flat cutter, 38.5 mm (IN) 07780-0012400

Flat cutter, 33 mm (EX) 07780-0012900

Cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.



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

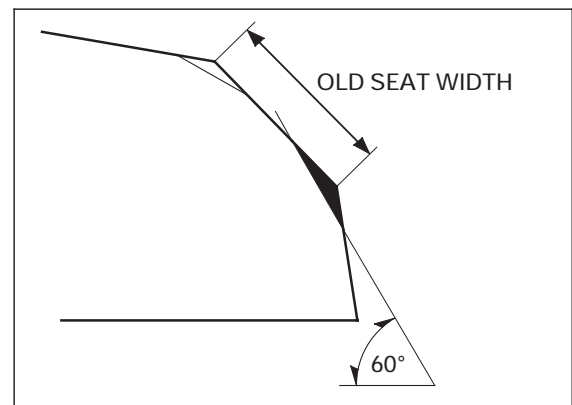
TOOLS:

Interior cutter, 37.5 mm (IN) 07780-0014100

Interior cutter, 30 mm (EX) 07780-0014000

Cutter holder, 5.5 mm 07781-0010101

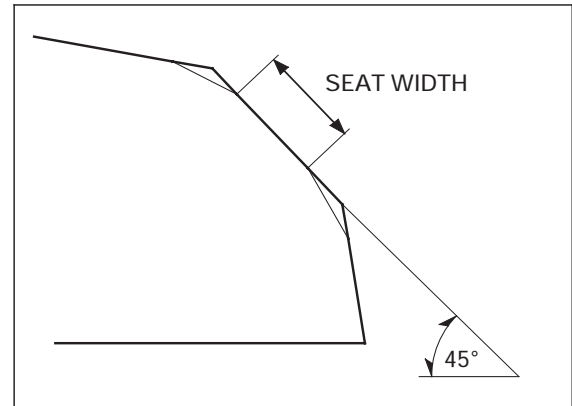
or equivalent commercially available in U.S.A.



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

VALVE SEAT WIDTH: 1.2 mm (0.05 in)

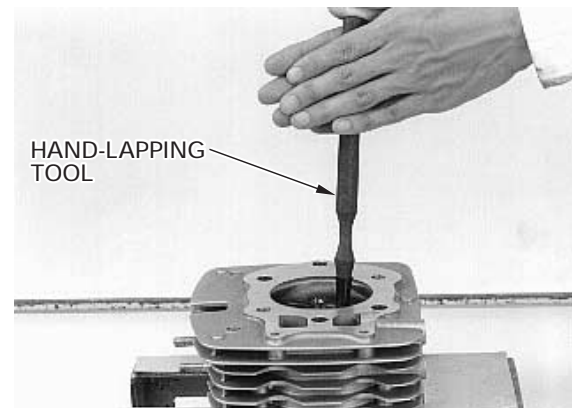
Make sure that all pitting and irregularities are removed.



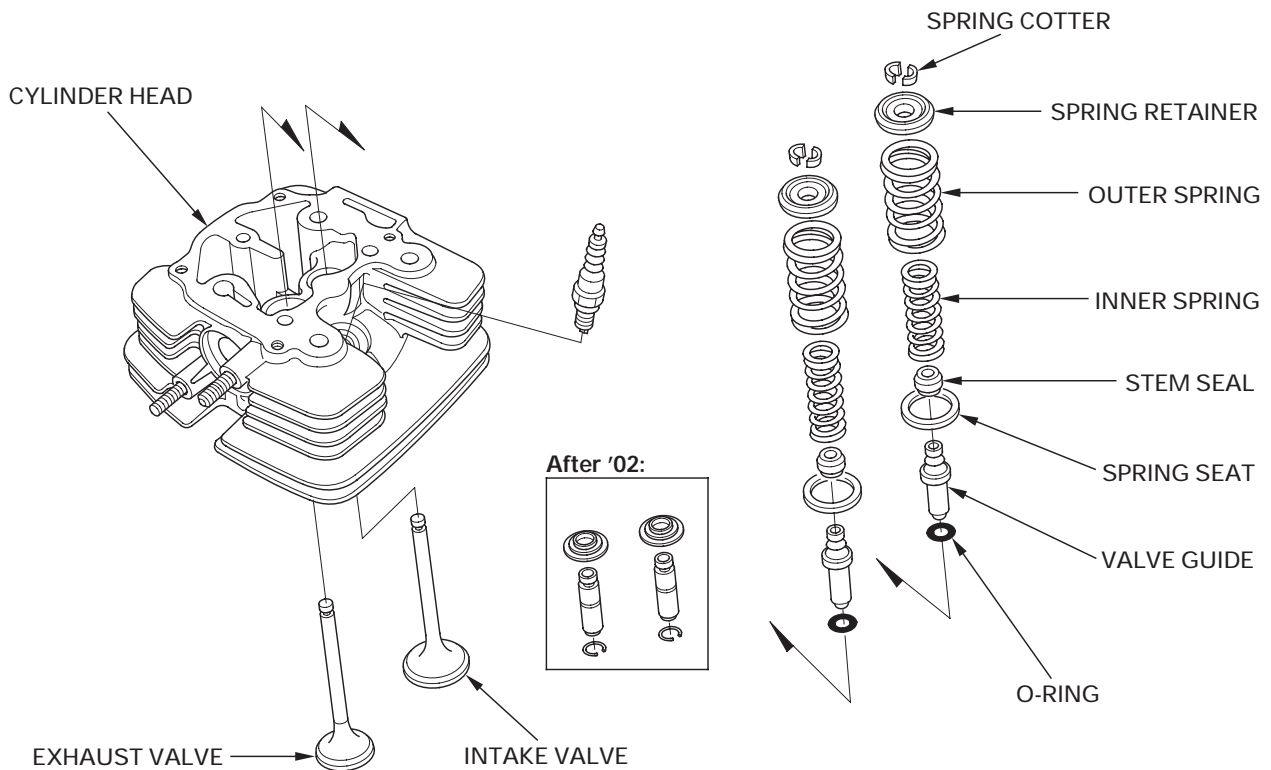
Excessive lapping pressure may deform or damage the seat. Do not allow lapping compound to enter the guides.

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

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

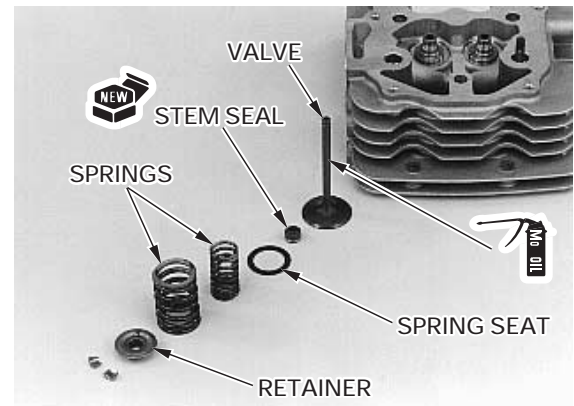


CYLINDER HEAD ASSEMBLY



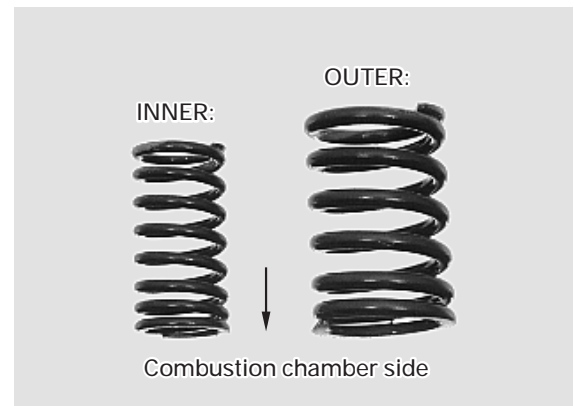
CYLINDER HEAD

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



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

Install the spring retainer.

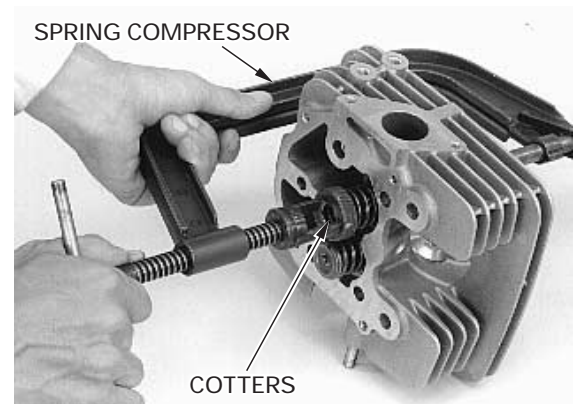


*Grease the cotters to ease installation.
To prevent loss of tension, do not compress the valve springs more than necessary to install the cotters.*

Install the valve spring cotters using the valve spring compressor.

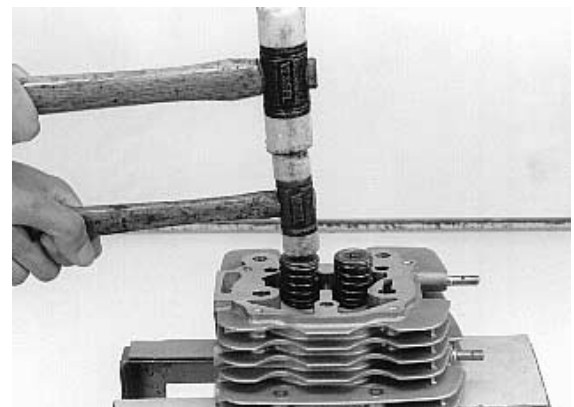
TOOL:

Valve spring compressor 07757-0010000



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

Install the spark plug.

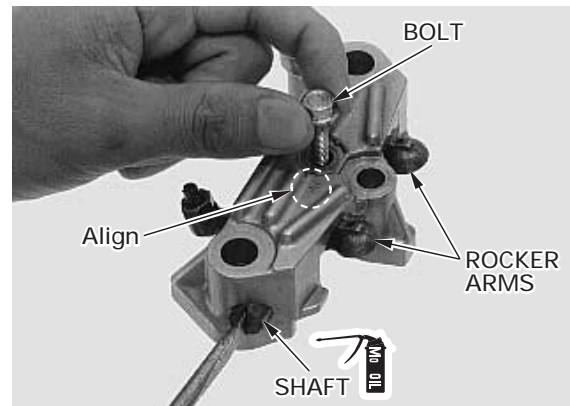


ROCKER ARM HOLDER

Apply molybdenum oil solution to the rocker arm and shaft sliding surfaces.

Set the rocker arms into the rocker arm holder and install the rocker arm shaft through the holder and arms.

Turn the rocker arm shaft and align the bolt holes in the shaft and holder, and install the retaining bolt.



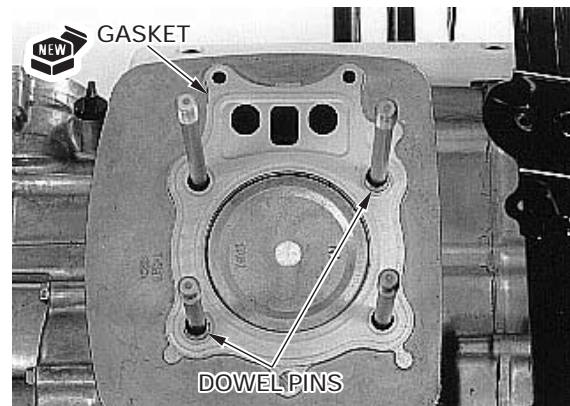
CYLINDER HEAD INSTALLATION

CYLINDER HEAD AND ROCKER ARM HOLDER

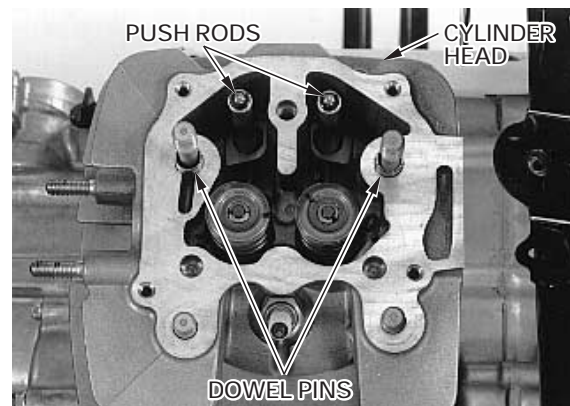
Clean the mating surface of the cylinder and head.

Install the following:

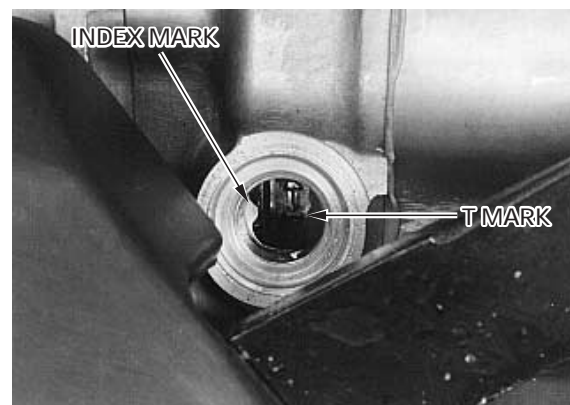
- two dowel pins
- new gasket



- cylinder head
- push rods
- two dowel pins



Rotate the crankshaft clockwise using the recoil starter knob to align the T mark on the flywheel with the index mark on the rear crankcase cover. Make sure the piston is TDC (Top Dead Center) on the compression stroke. If not, rotate the crankshaft one full turn and match up the T mark again.



CYLINDER HEAD/VALVE

Apply engine oil to rocker arm followers and adjusting screw tips.
Install the rocker arm holder onto the cylinder head.

Install the following and tighten them in a crisscross pattern in 2 or 3 steps:

- four cap nuts with new sealing washers (apply engine oil)
- rocker arm holder bolt (apply engine oil)
- two cylinder head bolts

TORQUE: Cap nuts: 39 N·m (4.0 kgf·m , 29 lbf·ft)
Holder bolt: 30 N·m (3.1 kgf·m , 22 lbf·ft)

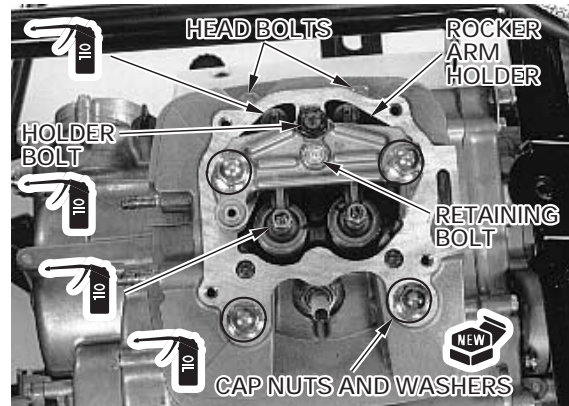
Tighten the rocker arm shaft retaining bolt.

TORQUE: 7 N·m (0.7 kgf·m , 5.1 lbf·ft)

Tighten the spark plug.

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

Install the spark plug cap.



Install the following and tighten the bolts and nut:

- engine hanger bracket
- mounting rubbers (large I.D. side toward inside)
- 10 mm bolt (from front side) and nut
- 8 mm bolts

TORQUE:

Upper engine hanger nut (frame side):
54 N·m (5.5 kgf·m , 40 lbf·ft)

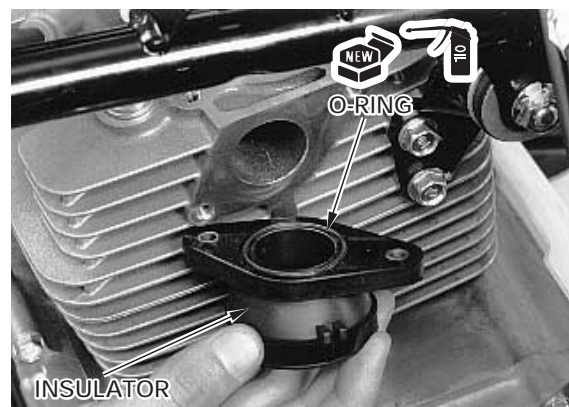
Upper engine hanger bolt (engine side):
32 N·m (3.3 kgf·m , 24 lbf·ft)



Coat a new O-ring with engine oil and install it into the groove in the carburetor insulator.
Install the insulator onto the cylinder head and tighten the two bolts.

Install the following:

- timing hole cap (page 3-9)
- exhaust system (page 2-11)
- carburetor assembly (page 5-14)

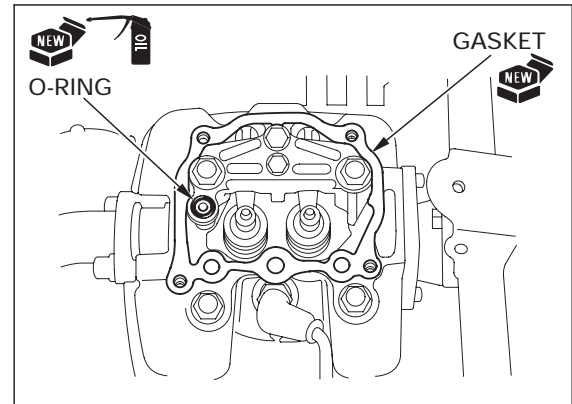


HEAD COVER

Clean the mating surfaces of the head cover and cylinder head.
Blow through the oil passage in the head cover with compressed air.

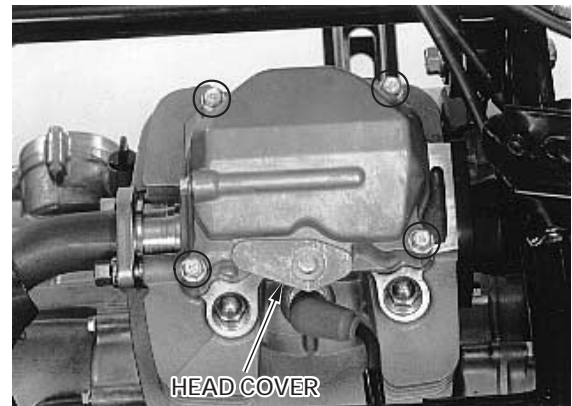
Install the following:

- new gasket
- new O-ring (coat with engine oil)



Install the cylinder head cover and tighten the four bolts.

Install the heat guard and fuel tank (page 5-17).



CAMSHAFT REMOVAL

Remove the following:

- cylinder (section 8)
- flywheel and starter driven gear (section 10)

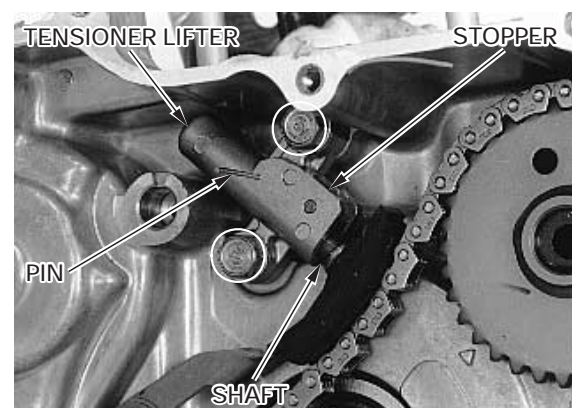
Mark the followers so they can be placed back in their original locations.

Remove the cam followers.



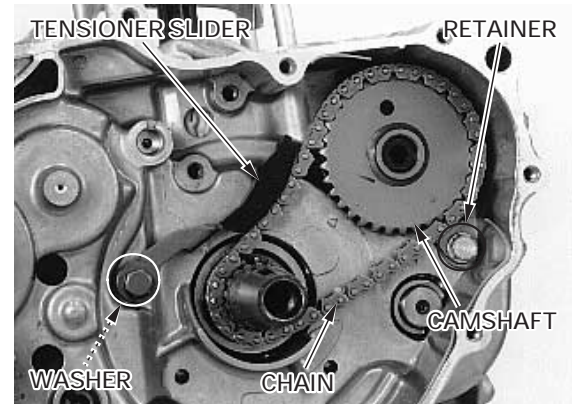
Remove the two bolts and cam chain tensioner lifter.

After removal, push in the tensioner shaft while pressing the stopper block to retract the tensioner and secure it with a pin.



Remove the following:

- tensioner pivot bolt
- tensioner slider
- washer
- retainer bolt
- bearing retainer
- camshaft
- cam chain

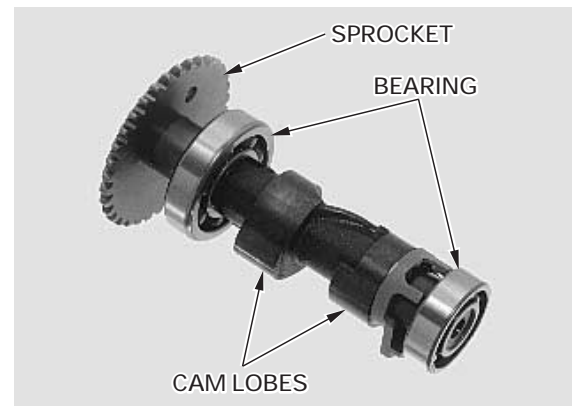


INSPECTION

CAMSHAFT

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

Turn the outer race of each bearing with your finger.
The bearings should turn smoothly and quietly.
Replace the bearing if the outer race does not turn smoothly and quietly.



Measure each cam lobe height.

SERVICE LIMITS: IN/EX: 35.13 mm (1.383 in)



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



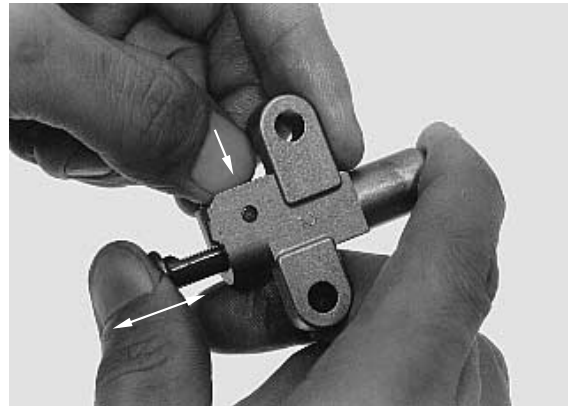
CAM CHAIN TENSIONER

Check the slipper surface of the tensioner slider for wear or damage.



Check the tensioner lifter operation:

- the tensioner shaft should not go into the body when it is pushed.
- When stopper block is pressed in, the tensioner shaft should be pushed into the body. The shaft springs out of the body when the stopper block is released.

**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.

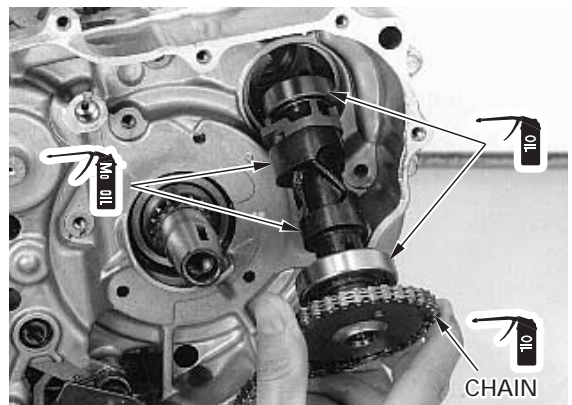
SERVICE LIMIT: 22.54 mm (0.887 in)

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

SERVICE LIMIT: 0.07 mm (0.003 in)

**CAMSHAFT INSTALLATION**

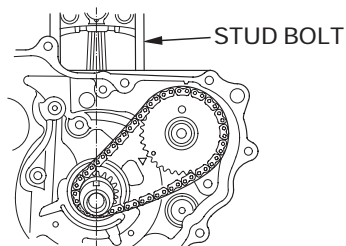
Lubricate the camshaft bearing and cam chain with oil.
Apply molybdenum oil solution to the cam lobes.



CYLINDER HEAD/VALVE

Turn the crankshaft so that the key groove is facing up and parallel with the cylinder stud bolt (This position is TDC).

Do not turn the crankshaft while installing. Install the cam chain over the cam sprocket and insert the camshaft into the crankcase. Align the punch mark (After 2001: "350" mark) on the cam sprocket with the index mark ▷ on the crankcase, then install the cam chain onto the crankshaft.



Parallel with stud bolt

Apply locking agent to the retainer bolt threads. Install the bearing retainer and tighten the retainer bolt.

Apply locking agent to the tensioner slider pivot bolt threads.

Install the tensioner slider with the washer (between the arm and crankcase) and tighten the pivot bolt.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Push the tensioner shaft while pressing the stopper block to retract the tensioner and secure it with a pin.

Apply locking agent to the lifter bolt threads. Install the tensioner lifter and tighten the bolts.

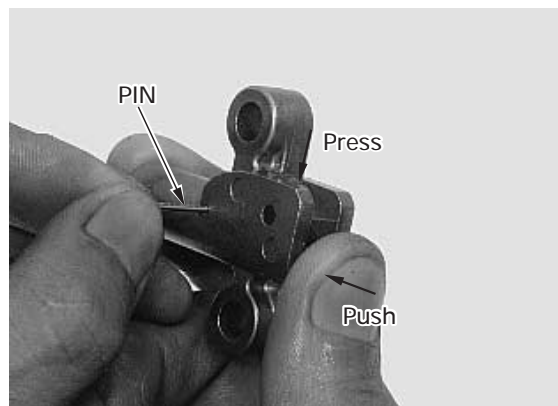
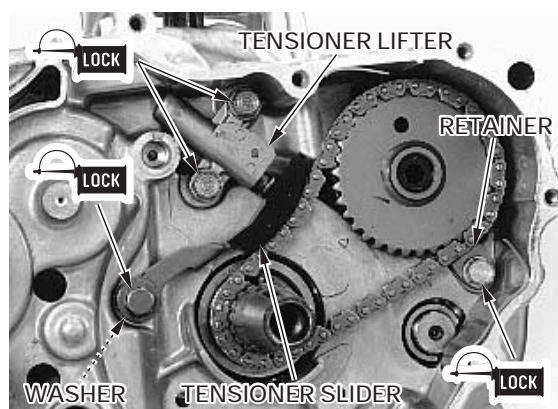
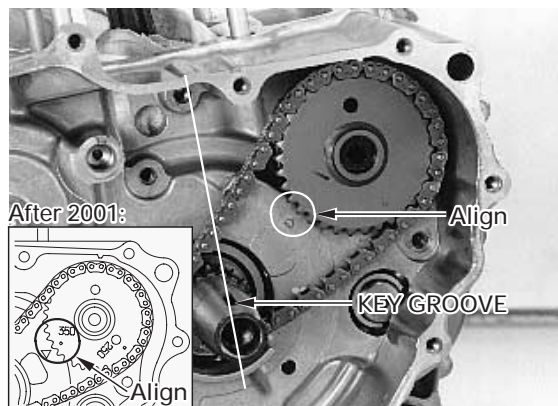
Remove a pin from the tensioner lifter.

Make sure that the punch mark on the cam sprocket is aligned with the index mark on the crankcase when the key groove in the crankshaft is facing up and parallel with the cylinder stud bolt.

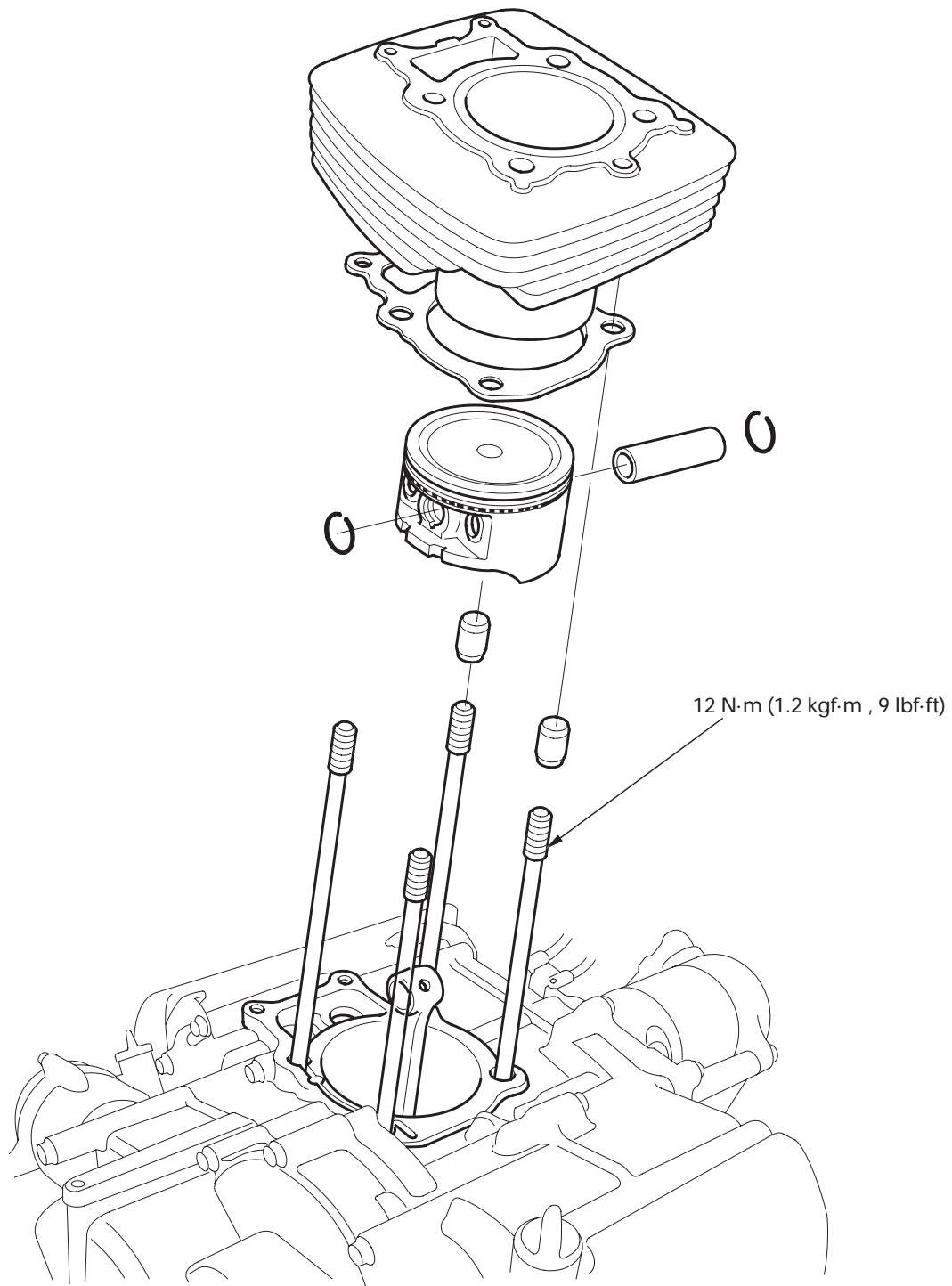
Apply engine oil to the whole surfaces of the cam followers and install them into the crankcase, being careful not to damage the sliding surface of the followers and bores.

Install the following:

- starter driven gear and flywheel (section 10)
- cylinder (section 8)



MEMO



8. CYLINDER/PISTON

SERVICE INFORMATION	8-1	CYLINDER/PISTON REMOVAL	8-2
TROUBLESHOOTING	8-1	CYLINDER/PISTON INSTALLATION	8-5

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. Do not strike the cylinder too hard during removal.
- Rocker arm and valve lubricating oil is fed through the oil passage in the cylinder. Clean the oil passage before installing the cylinder.

SPECIFICATIONS

				Unit: mm (in)
ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		78.500 – 78.510 (3.0905 – 3.0909)	78.60 (3.094)
	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		78.465 – 78.485 (3.0892 – 3.0900)	78.43 (3.088)
	Piston pin hole I.D.		17.002 – 17.008 (0.6694 – 0.6696)	17.04 (0.671)
	Piston pin O.D.		16.994 – 17.000 (0.6691 – 0.6693)	16.96 (0.668)
	Piston-to-piston pin clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.02 (0.001)
	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		0.015 – 0.045 (0.0006 – 0.0018)	0.09 (0.004)	
Cylinder-to-piston clearance			0.015 – 0.045 (0.0006 – 0.0018)	0.10 (0.004)
Connecting rod small end I.D.			17.016 – 17.034 (0.6699 – 0.6706)	17.10 (0.673)
Connecting rod-to-piston pin clearance			0.016 – 0.040 (0.0006 – 0.0016)	0.06 (0.002)

TORQUE VALUE

Cylinder stud bolt 12 N·m (1.2 kgf·m , 9 lbf·ft) see page 8-5

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
- Bent connecting rod

Compression too high, overheating or knocking

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

Excessive smoke

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

Abnormal noise

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

CYLINDER/PISTON REMOVAL

CYLINDER REMOVAL

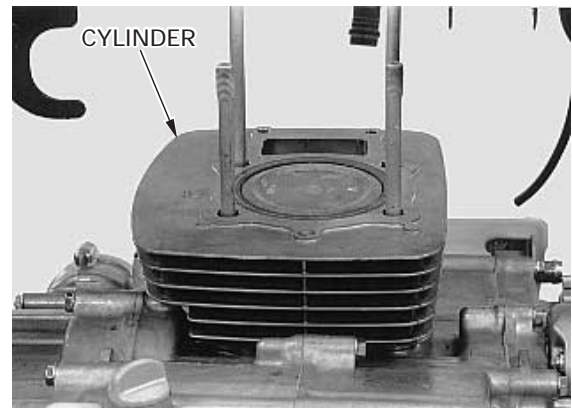
Remove the cylinder head (section 7).

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

Remove the following:

- cylinder

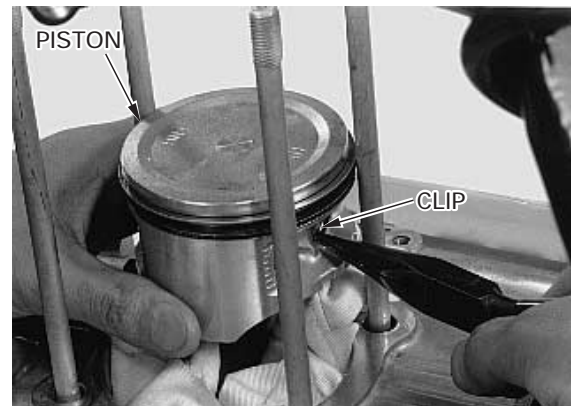
- gasket
- dowel pins



PISTON REMOVAL

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

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



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

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



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



INSPECTION

CYLINDER

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

SERVICE LIMIT: 78.60 mm (3.094 in)

Calculate the cylinder-to-piston clearance. Refer to page 8-4 for measurement of the piston O. D.

SERVICE LIMIT: 0.10 mm (0.004 in)

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

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

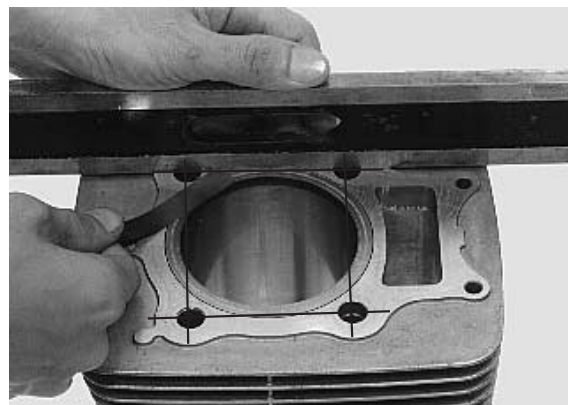
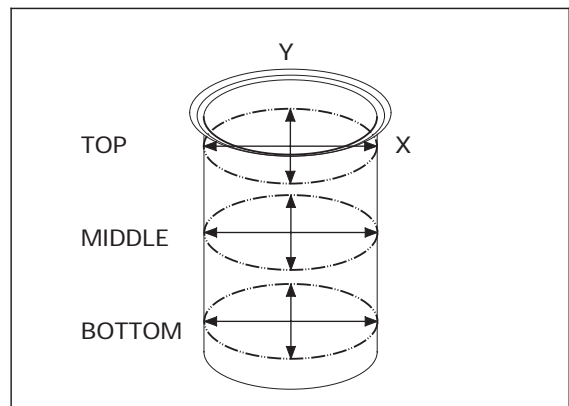
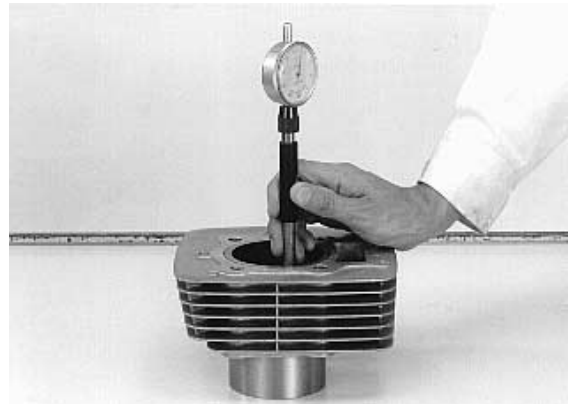
The cylinder must be rebored and an oversize piston fitted if the service limits are exceeded.

The four oversize pistons are available from 0.25 mm piston to 1.0 mm piston in intervals of 0.25 mm (0.010 in).

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

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

SERVICE LIMIT: 0.10 mm (0.004 in)



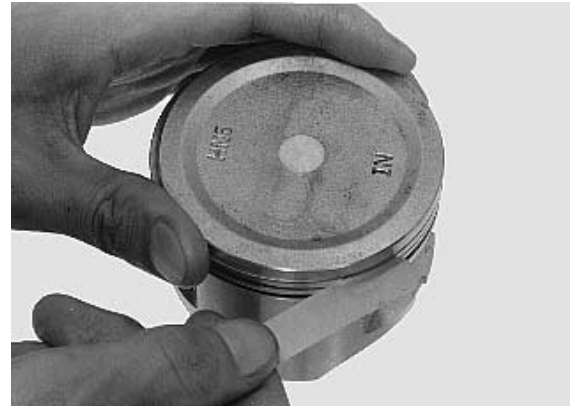
CYLINDER/PISTON

PISTON/PISTON RING

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

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

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



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

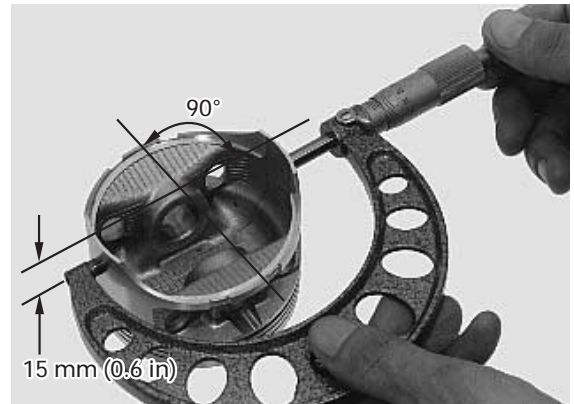
SERVICE LIMITS: Top: 0.5 mm (0.02 in)
Second: 0.6 mm (0.02 in)
Oil (side rail): 0.9 mm (0.04 in)



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

SERVICE LIMIT: 78.43 mm (3.088 in)

Compare this measurement against the maximum cylinder I.D. measurement and calculate the piston-to-cylinder clearance (page 8-3).



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

SERVICE LIMIT: 17.04 mm (0.671 in)

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

SERVICE LIMIT: 16.96 mm (0.668 in)

Calculate the piston-to-piston pin clearance.

SERVICE LIMIT: 0.02 mm (0.001 in)

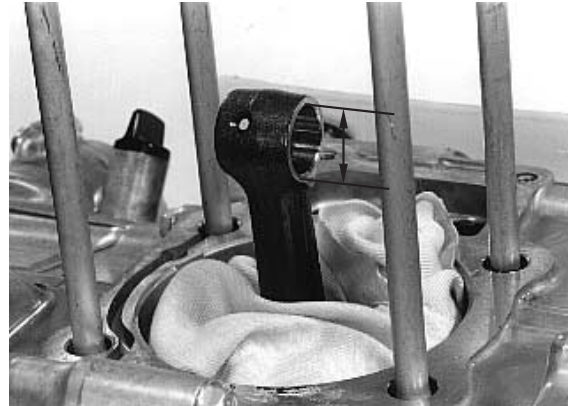


Measure the connecting rod small end I.D.

SERVICE LIMIT: 17.10 mm (0.673 in)

Calculate the connecting rod-to-piston pin clearance.

SERVICE LIMIT: 0.06 mm (0.002 in)



CYLINDER STUD BOLT REPLACEMENT

Remove the stud bolts from the cylinder.

Install new stud bolts in their proper positions and tighten them.

A: 10 × 166 mm stud bolt

B: 10 × 206 mm stud bolt

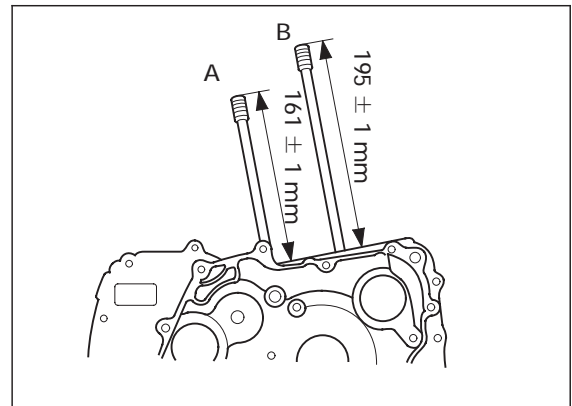
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

After installation, measure the stud height from the cylinder surface.

SPECIFIED HEIGHT: A: 161 ± 1 mm (6.3 ± 0.04 in)

B: 195 ± 1 mm (7.7 ± 0.04 in)

Adjust the stud height if necessary.



CYLINDER/PISTON INSTALLATION

PISTON RING INSTALLATION

Be careful not to damage the piston and rings.

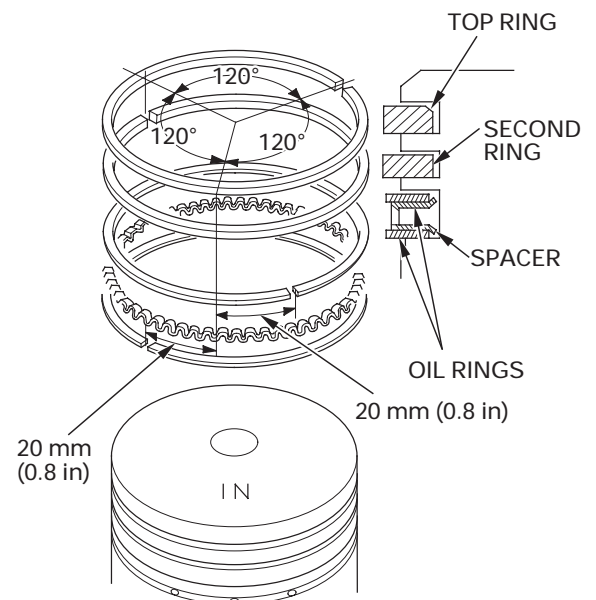
Carefully install the piston rings into the piston ring grooves with the markings facing up.

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 clip from falling into the crankcase.

Apply molybdenum oil solution to the piston pin outer surface.

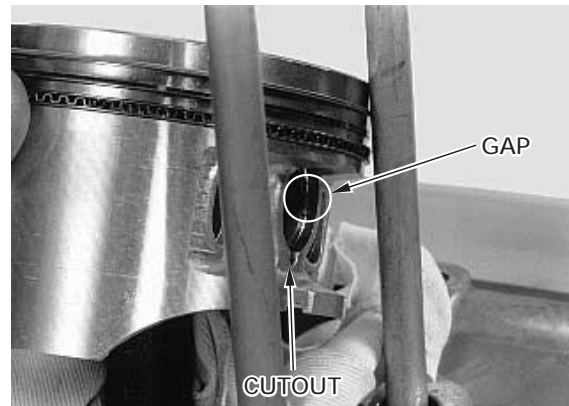
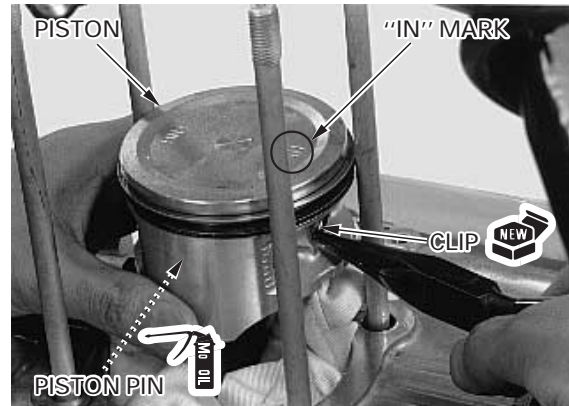
Apply engine oil to the piston pin hole and connecting rod inner surface.

Install the piston with the "IN" mark toward the intake side and insert the piston pin through the piston and connecting rod.

Install new piston pin clips into the grooves in the piston pin hole.

NOTE:

- Make sure that the piston pin clips are seated securely.
- Do not align the piston pin clip end gap with the piston cutout.

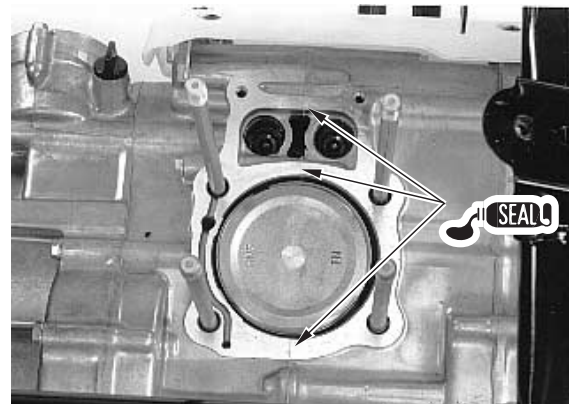


CYLINDER INSTALLATION

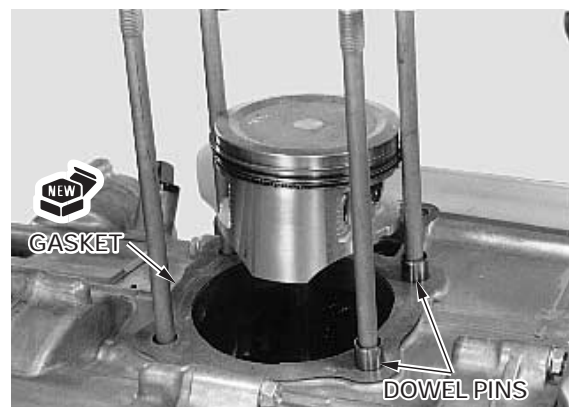
Clean the gasket surfaces of the cylinder and crankcase thoroughly, being careful not to damage it, and being careful not to allow gasket material into the crankcase.

Blow through the oil passage (stud bolt hole) in the cylinder with compressed air.

Apply liquid sealant to the crankcase mating areas as shown.



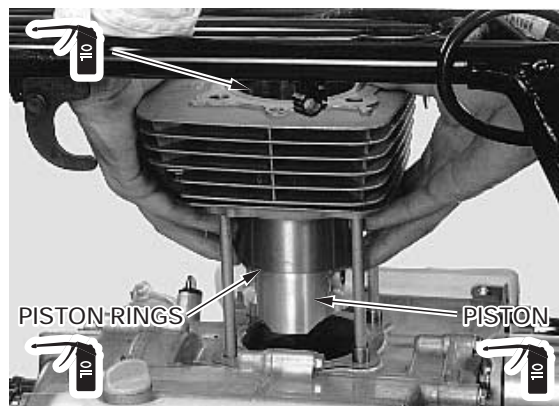
Install the dowel pins and a new gasket.



Apply engine oil to the cylinder wall, piston and piston ring outer surfaces.

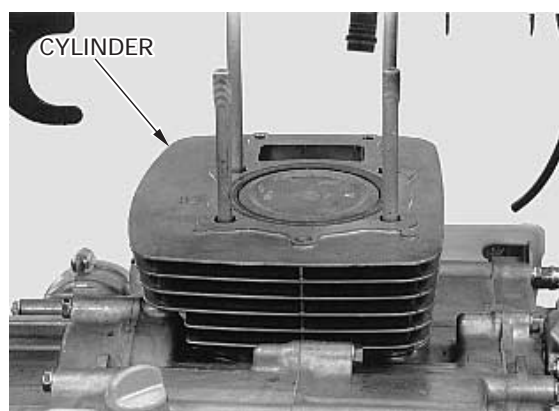
Be careful not to damage the piston rings and cylinder wall.

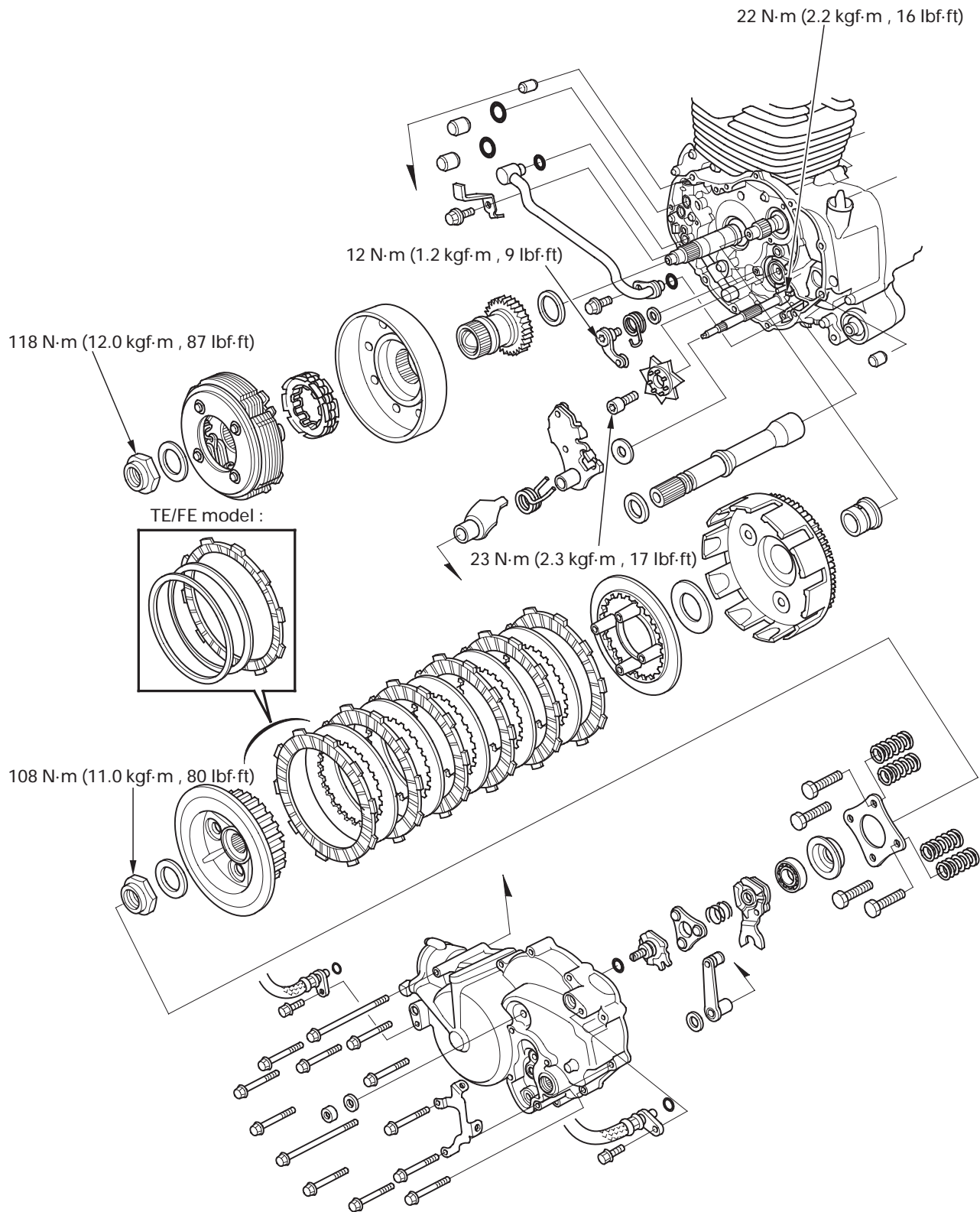
Install the cylinder over the piston while compressing the piston rings with your fingers.



Make sure that the cylinder touches the crankcase evenly.

Install the cylinder head (section 7).





9. CLUTCH/GEARSHIFT LINKAGE

SERVICE INFORMATION	9-1	GEARSHIFT LINKAGE	9-15
TROUBLESHOOTING	9-2	GEARSHIFT SPINDLE AND REVERSE STOPPER ARM	9-17
FRONT CRANKCASE COVER REMOVAL	9-3	FRONT CRANKCASE COVER INSTALLATION	9-18
CENTRIFUGAL CLUTCH	9-4		
CHANGE CLUTCH	9-9		

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 spindle, 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 (section 11).
- 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 from the oil filter is fed through the oil passages in the front crankcase cover. Clean the oil passages before installing the crankcase cover.
- The TE/FE type is equipped with the electric shift program (ESP), refer to section 21 for this service.

9

SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Change clutch	Spring free length	TM/FM	28.0 (1.10)	27.0 (1.06)
		TE/FE	31.3 (1.23)	30.2 (1.19)
	Disc thickness		2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage		—	0.20 (0.008)
	Outer I.D.		28.000 – 28.021 (1.1024 – 1.1032)	28.04 (1.104)
	Outer guide	I.D.	22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
		O.D.	27.959 – 27.980 (1.1007 – 1.1016)	27.92 (1.099)
Centrifugal clutch	Mainshaft O.D. at clutch outer guide		21.967 – 21.980 (0.8648 – 0.8654)	21.93 (0.863)
	Drum I.D.		126.0 – 126.2 (4.96 – 4.97)	126.4 (4.98)
	Weight lining thickness		2.0 (0.08)	1.3 (0.05)
	Clutch spring height		2.87 (0.113)	2.73 (0.107)
	Clutch weight spring free length		25.8 (1.02)	26.9 (1.06)
Primary drive gear	Gear I.D.		27.000 – 27.021 (1.0630 – 1.0638)	27.05 (1.065)
	Crankshaft O.D. at drive gear		26.959 – 26.980 (1.0614 – 1.0622)	26.93 (1.060)

TORQUE VALUES

Change clutch center lock nut	108 N·m (11.0 kgf·m , 80 lbf·ft)	Apply oil to the threads and seating surface/ Stake
Centrifugal clutch lock nut	118 N·m (12.0 kgf·m , 87 lbf·ft)	Apply oil to the threads and seating surface/ Stake
Gearshift cam bolt	23 N·m (2.3 kgf·m , 17 lbf·ft)	Apply locking agent to the threads
Gearshift drum stopper arm pivot bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)	Apply locking agent to the threads
Gearshift spindle return spring pin	22 N·m (2.2 kgf·m , 16 lbf·ft)	Apply locking agent to the threads

TOOLS

Clutch holder	07GMB-HA7010B
Clutch puller	07933-HB3000A
Driver, 22 mm I.D.	07746-0020100
Attachment, 20 mm I.D.	07746-0020400
Clutch center holder	07JMB-MN50301 or
Holder plate	07HGB-001010B (U.S.A. only) or
	07HGB-001010A (U.S.A. only) with
Holder collar A	07HGB-001020B (U.S.A. only) or
	07HGB-001020A (U.S.A. only)

TROUBLESHOOTING

Clutch slips when accelerating

- Incorrect clutch adjustment (section 3)
- 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 (section 3)
- Worn or damaged gearshift cam and stopper arm
- Faulty clutch lifter
- Improper engine oil viscosity
- Bent fork shaft and gearshift spindle or damaged shift forks and shift drum (section 11)

Transmission jumps out of gear

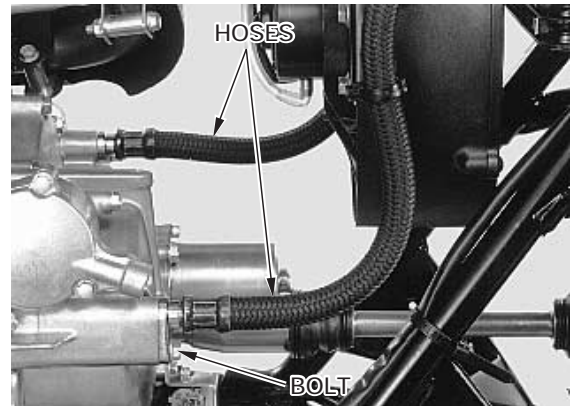
- Broken shift drum stopper arm
- Weak or broken shift linkage return springs
- Worn or damaged gearshift cam
- Bent fork shaft or worn shift forks and shift drum (section 11)
- Worn gear dogs or slots (section 11)

FRONT CRANKCASE COVER REMOVAL

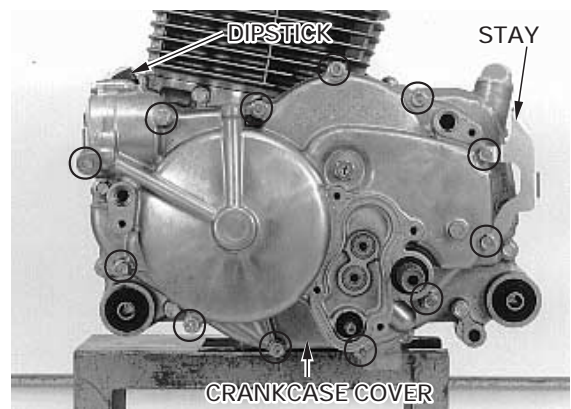
Drain the engine oil (page 3-11).

- FM/FE model only:*
- Remove the following:
 - shift control motor reduction gears (page 21-23)
 - propeller shaft from the engine (page 15-8)

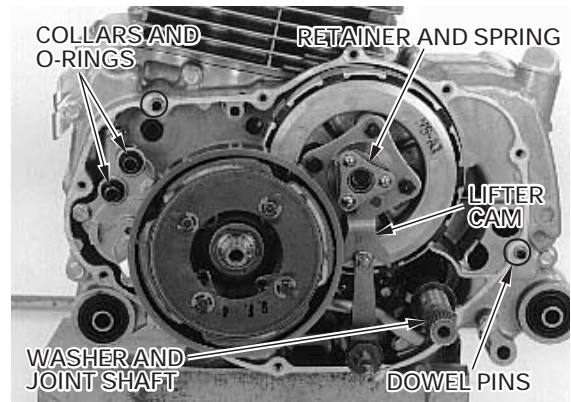
- Remove the following:
- four screws and left engine side cover
 - two joint bolts and oil cooler hoses
 - O-rings



- oil level dipstick
- twelve bolts and side cover stay
- front crankcase cover

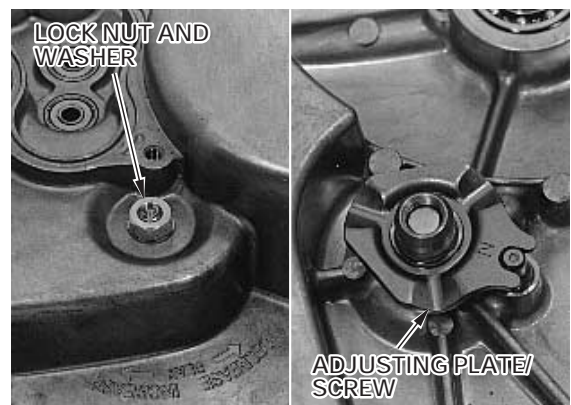


- FM/FE model only:*
- ball retainer and spring
 - lifter cam
 - two joint collars and O-rings
 - washer and output joint shaft
 - two dowel pins



- lock nut and washer
- adjusting plate/screw
- O-ring

For bearing replacement of crankcase cover, see page 11-12.



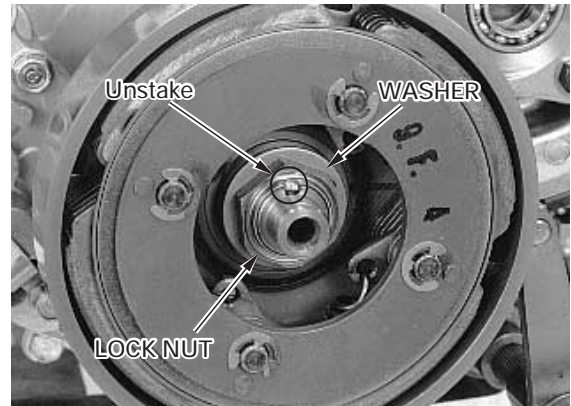
CENTRIFUGAL CLUTCH

REMOVAL

Remove the front crankcase cover (page 9-3).

Be careful not to damage the crankshaft threads.

Unstake the clutch lock nut.

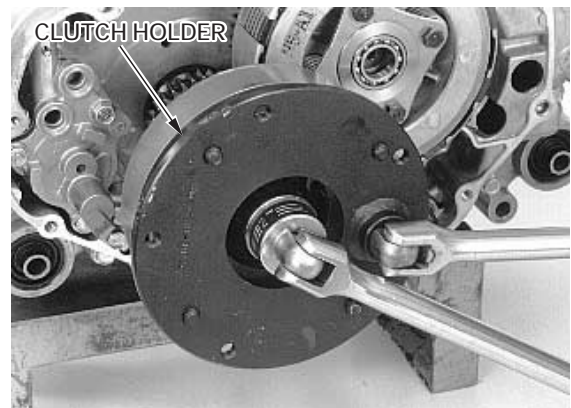


Set the special tool into the grooves in the drive plate and hold it, and loosen the lock nut.

TOOLS:

Clutch holder 07GMB-HA7010B

Remove the lock nut and washer.

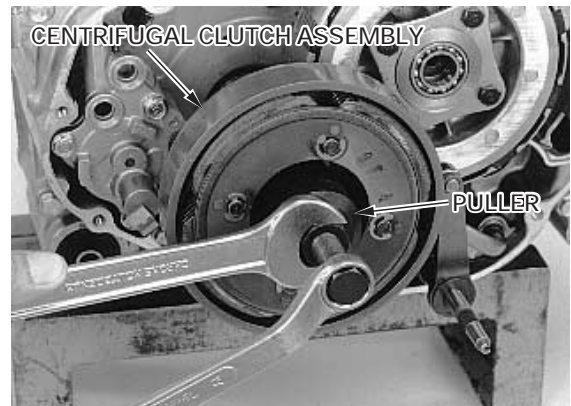


Remove the centrifugal clutch assembly using the special tool.

TOOL:

Clutch puller 07933-HB3000A

For primary drive gear removal, see page 9-9 "Change Clutch".



Check the one-way clutch operation. 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.



INSPECTION

ONE-WAY CLUTCH

Check the one-way clutch sprag for abnormal wear, damage or irregular movement.



Check the drive plate boss and clutch drum inner contact surfaces for abnormal wear or damage.



CLUTCH DRUM AND LINING

Check the weight contact surface for scratches or abnormal wear.

Measure the drum I.D.

SERVICE LIMIT: 126.4 mm (4.98 in)



Replace the clutch weights as a set.

Measure the lining thickness.

SERVICE LIMIT: 1.3 mm (0.05 in)



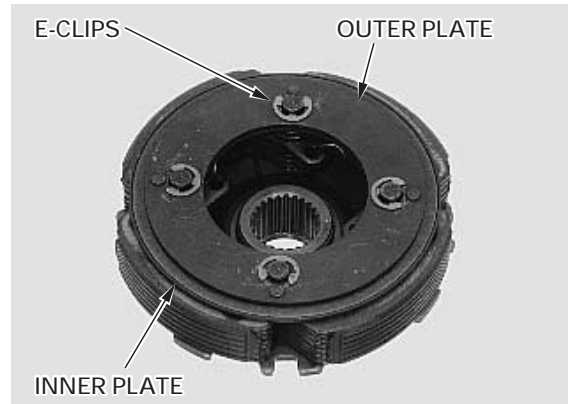
CLUTCH/GEARSHIFT LINKAGE

CLUTCH SPRING

Be careful not to damage the clutch weights while compressing. Remove the E-clips using a screwdriver while compressing the outer plate.

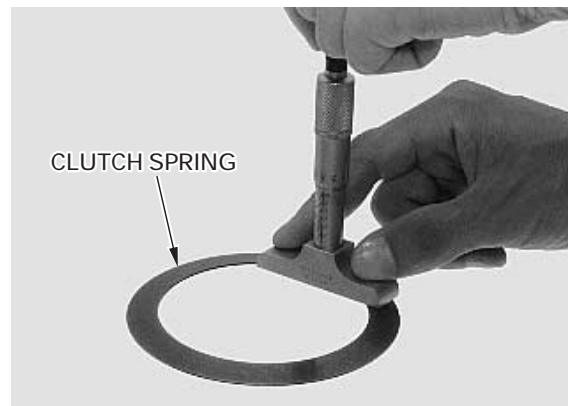
Remove the following:

- outer plate
- clutch spring
- inner plate



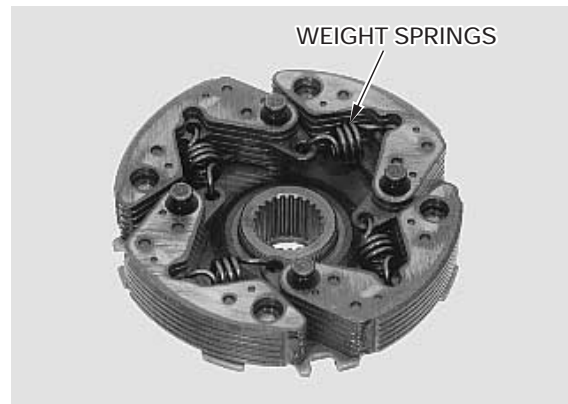
Measure the height of the clutch spring.

SERVICE LIMIT: 2.73 mm (0.107 in)



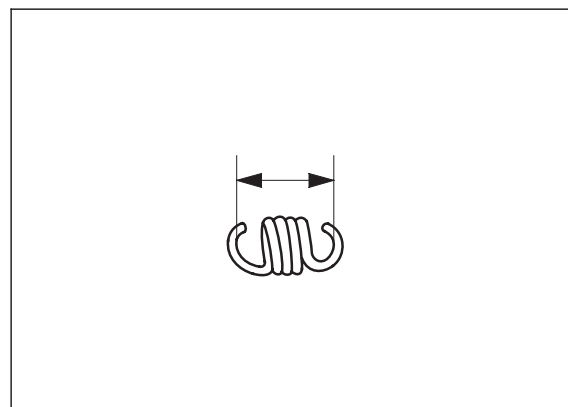
WEIGHT SPRING

Replace the springs as a set. Check the weight springs for wear or damage.

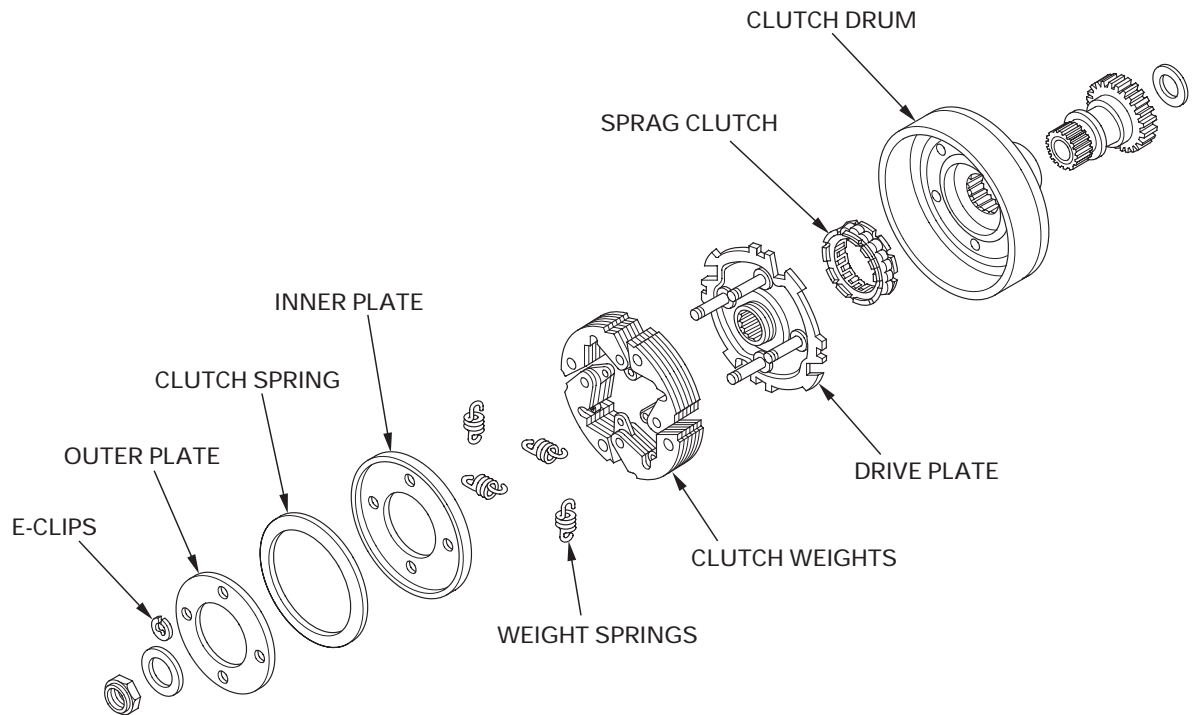


Remove the clutch weights and springs from the drive plate.
Measure the spring length.

SERVICE LIMIT: 26.9 mm (1.06 in)

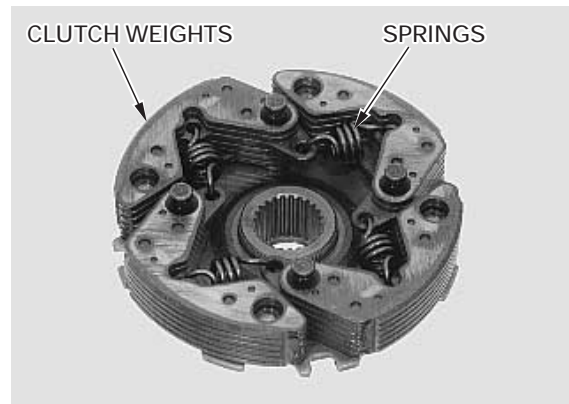


ASSEMBLY



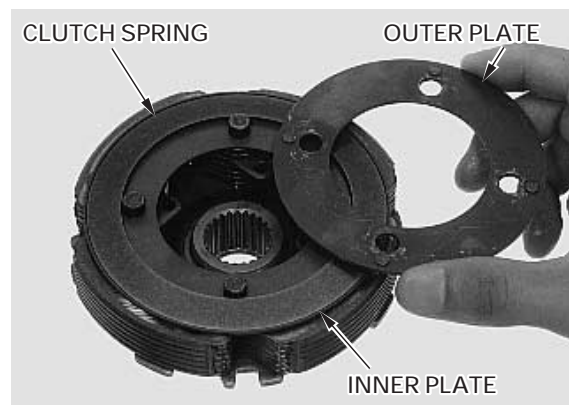
Install with the spring's open ends facing in.

Install the clutch weights and springs onto the drive plate as shown.



Install the following:

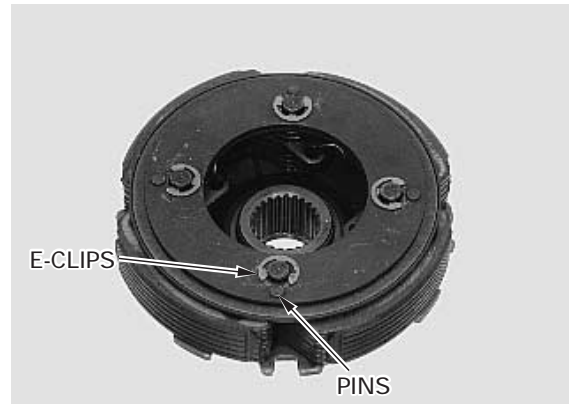
- inner plate with flange side facing up
- clutch spring with concavity side facing down
- outer plate with locating pins facing up



CLUTCH/GEARSHIFT LINKAGE

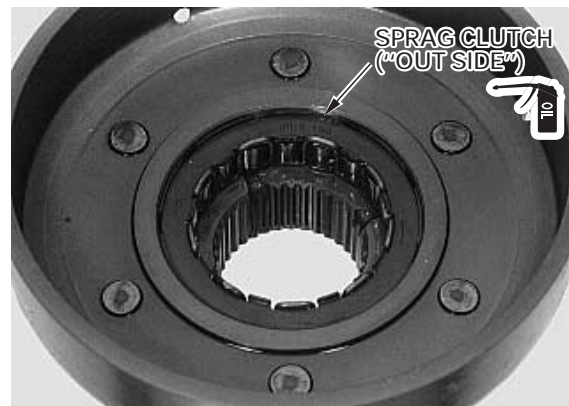
Be careful not to damage the clutch weights while compressing.

Install the E-clips into the spindle grooves with its gap facing towards the locating pin by using the pliers while compressing the outer plate.



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, then align the splines of the clutch drum and primary drive gear by turning the clutch drum.

Tap the drive plate to install it.

Be careful not to damage the crankshaft threads.

TOOLS:

Driver, 22 mm I.D. 07746-0020100

Attachment, 20 mm I.D. 07746-0020400

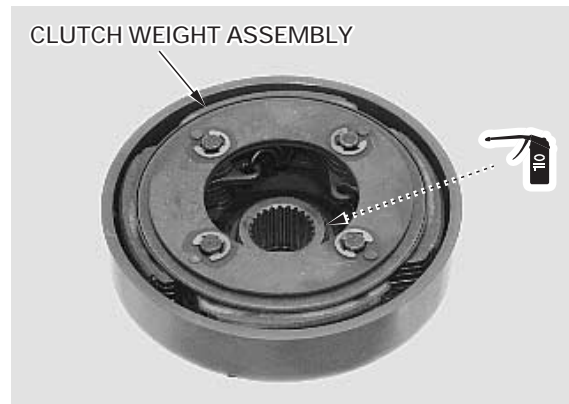
Apply engine oil to threads of a new lock nut and install it with the washer.

Hold the drive plate of the centrifugal clutch assembly with the special tool and tighten the lock nut.

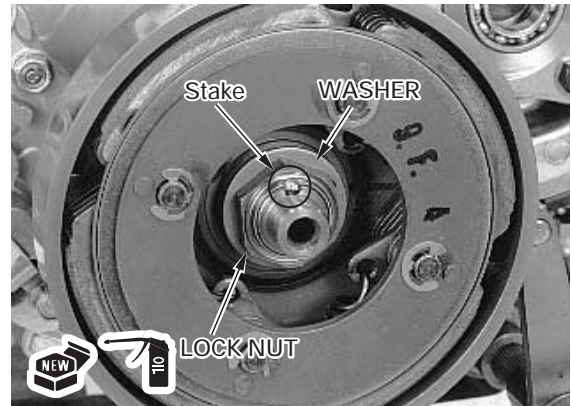
TOOLS:

Clutch holder 07GMB-HA7010B

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 9-18).

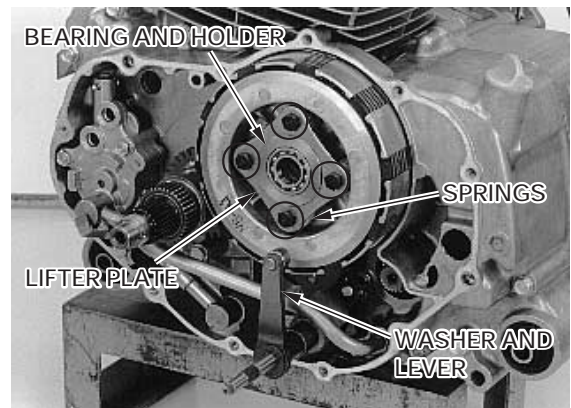


CHANGE CLUTCH REMOVAL

Remove the centrifugal clutch assembly (page 9-4).

Remove the following:
 — washer and lifter lever
 — lifter bearing and bearing holder
 — clutch bolts
 — lifter plate
 — springs

Loosen in a crisscross pattern in several steps.



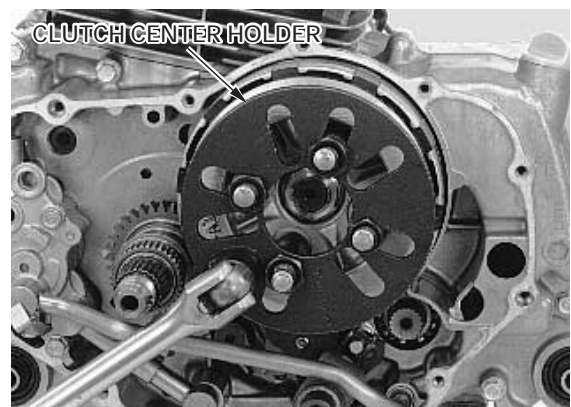
Be careful not to damage the mainshaft threads. Unstake the clutch center lock nut.



Hold the pressure plate bosses with the special tool and loosen the clutch center lock nut.

TOOLS:
Clutch center holder 07JMB-MN50301 or 07HGB-001010B or 07HGB-001010A (U.S.A. only) with 07HGB-001020B or 07HGB-001020A (U.S.A. only)
Holder plate
Holder collar A

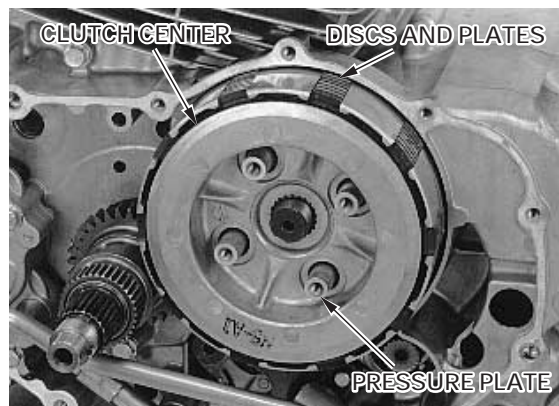
Remove the lock nut and washer.



CLUTCH/GEARSHIFT LINKAGE

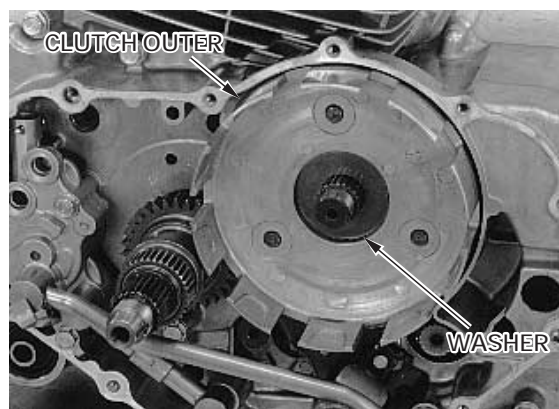
Remove the following as an assembly:

- clutch center
- spring seat
- judder spring
- clutch discs
- clutch plates
- pressure plate



Remove the following from the mainshaft:

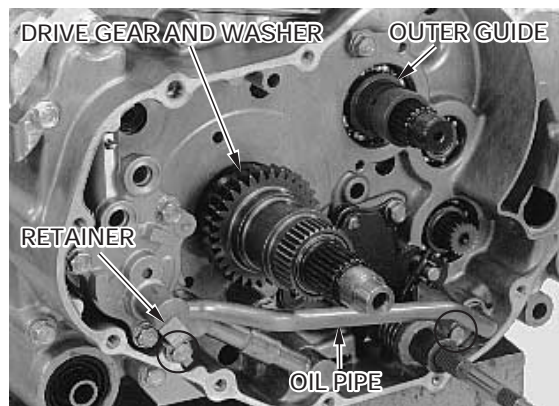
- thrust washer
- clutch outer



- outer guide

Remove the following:

- two bolts and retainer
- feed oil pipe
- O-rings
- primary drive gear
- washer



INSPECTION

LIFTER BEARING

Turn the inner race of the lifter bearing with your finger.

The bearing should turn smoothly and quietly.

Replace if necessary.

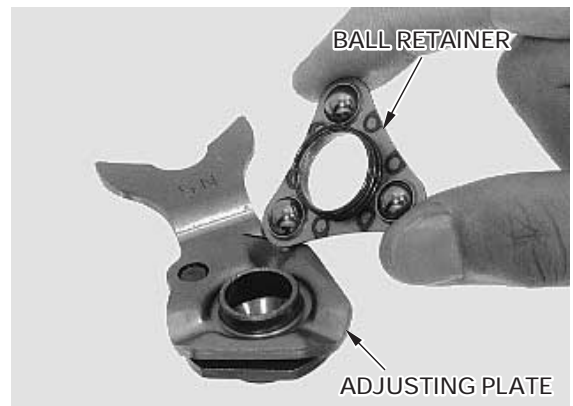


LIFTER CAM

Check the lifter lever for wear or damage.



Check the cam plate, ball retainer and adjusting plate for abnormal wear or damage.

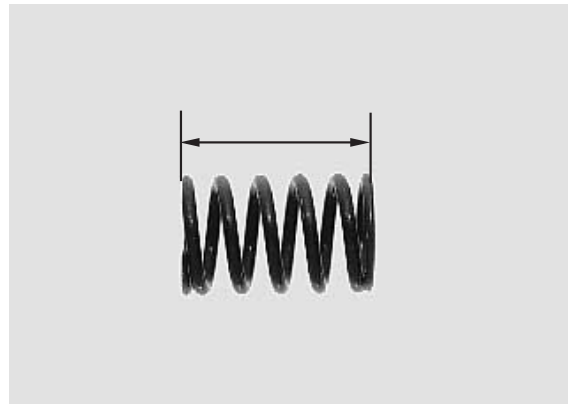


CLUTCH SPRING

Replace the clutch springs as a set

Measure the clutch spring free length.

SERVICE LIMIT: TM/FM: 27.0 mm (1.06 in)
TE/FE: 30.2 mm (1.19 in)



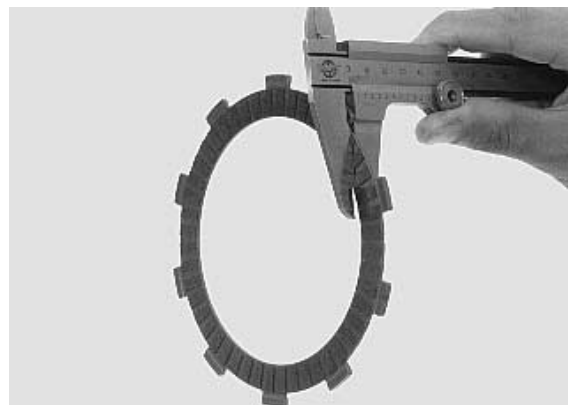
CLUTCH DISC

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)

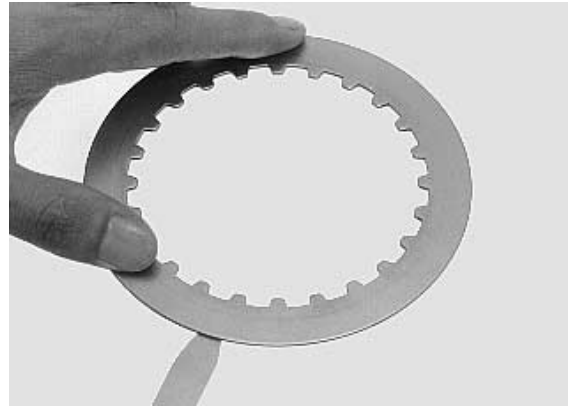


CLUTCH/GEARSHIFT LINKAGE

CLUTCH PLATE

Replace the clutch discs and plates as a set. Check the plates for discoloration. Check the spring seat and judder spring for distortion, wear or damage. 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.



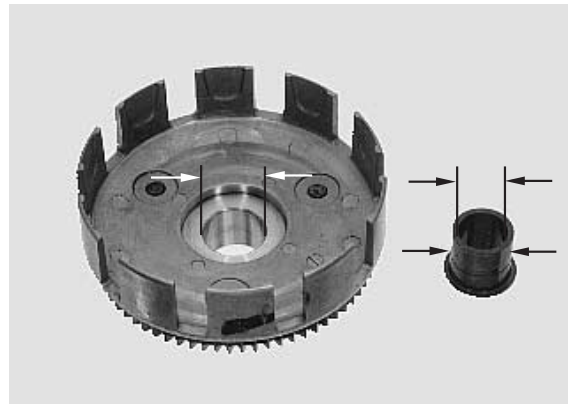
CLUTCH OUTER AND OUTER GUIDE

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: 28.04 mm (1.104 in)

Measure the clutch outer guide I.D. and O.D.

SERVICE LIMITS: I.D.: 22.05 mm (0.868 in)
O.D.: 27.92 mm (1.099 in)



PRIMARY DRIVE GEAR

Check the gear teeth for wear or damage. Measure the drive gear I.D.

SERVICE LIMIT: 27.05 mm (1.065 in)



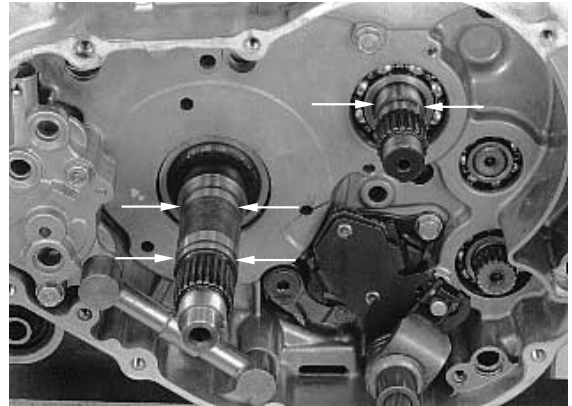
MAINSHAFT AND CRANKSHAFT

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: 26.93 mm (1.060 in)

**ASSEMBLY**

Apply engine oil to the primary drive gear inner surface.

Install the thrust washer and the drive gear onto the crankshaft.

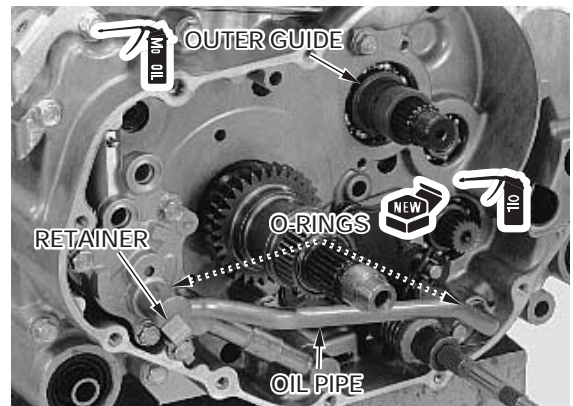


Coat new O-rings with engine oil and install them onto the feed oil pipe.

Install the oil pipe into the crankcase with the two bolts and retainer.

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.



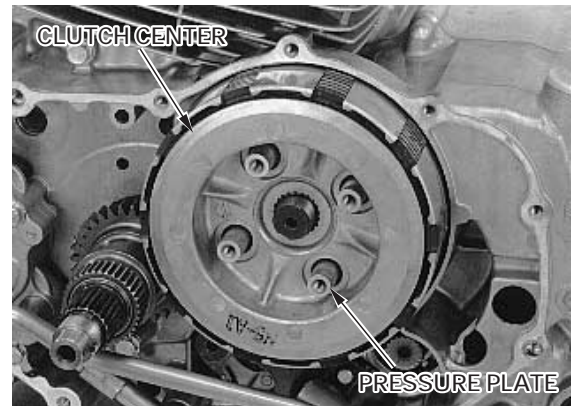
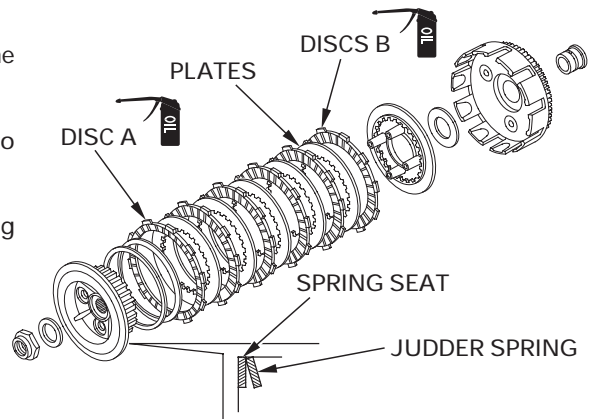
CLUTCH/GEARSHIFT LINKAGE

Coat the clutch discs with clean engine oil.

Assemble the following and install them onto the mainshaft:

- pressure plate
- six discs (large I.D. disc A is installed onto outside end only on TE/FE models)
- five plates
- judder spring (with the concave side facing toward disc only on TE/FE models)
- spring seat (only on TE/FE models)
- clutch center

Install the discs and plate alternately, starting with the disc. Disc A, the judder spring, and spring seat are only on TE/FE models.

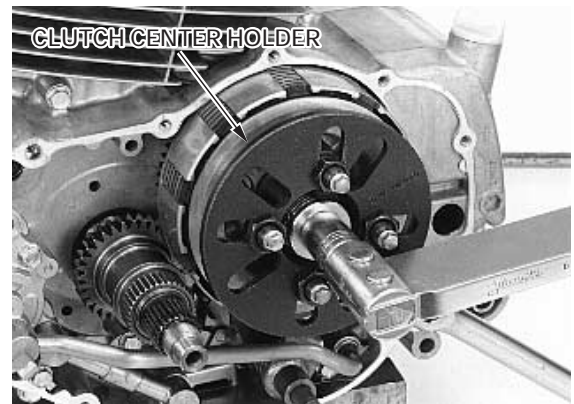


Apply engine oil to the threads of a new lock nut and install the washer and lock nut.

Hold the pressure plate bosses with the special tool and tighten the lock nut.

TOOLS:

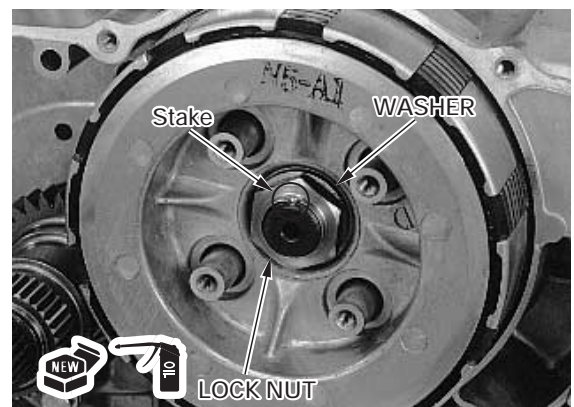
Clutch center holder	07JMB-MN50301 or 07HGB-001010B or 07HGB-001010A (U.S.A. only) with
Holder plate	07HGB-001020B or 07HGB-001020A (U.S.A. only)
Holder collar A	



TORQUE: 108 N·m (11.0 kgf·m , 80 lbf·ft)

Be careful not to damage the mainshaft threads.

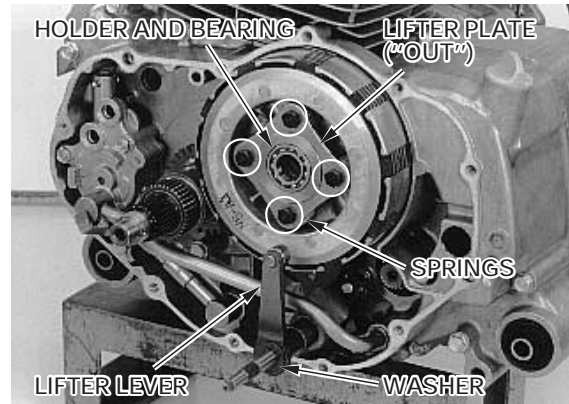
Stake the lock nut into the mainshaft groove.



Install the clutch springs and lifter plate with the "OUT" mark facing out and tighten the clutch bolts in a crisscross pattern in several steps.

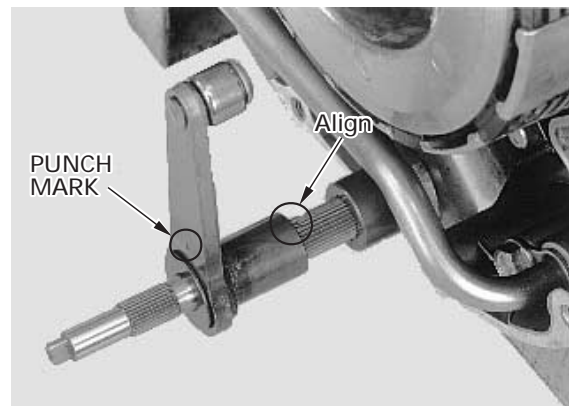
Install the following:

- bearing holder and lifter bearing



- lifter lever by aligning wide groove (indicated by punch mark) with wide tooth of spindle
- washer

Install the centrifugal clutch assembly (page 9-8).



GEARSHIFT LINKAGE

NOTE:

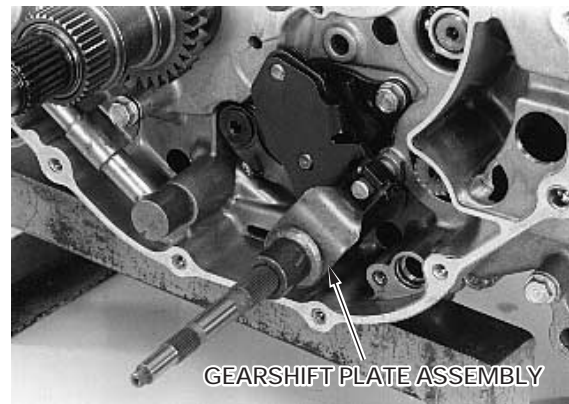
- For sub-gearshift spindle service, refer to section 11.

REMOVAL

Remove the change clutch and the oil pipe (page 9-9).

Remove the following:

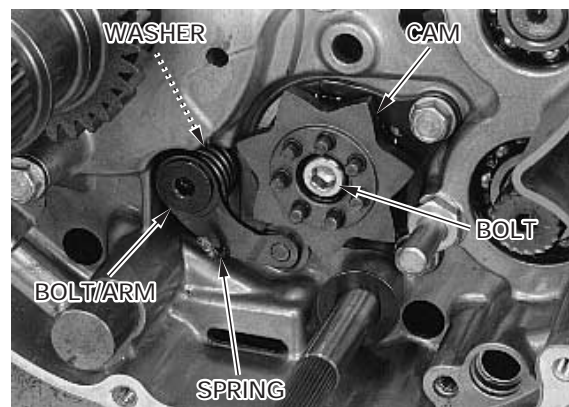
- gearshift plate assembly from sub-gearshift spindle
- bolt and gearshift cam while holding stopper arm with a screwdriver
- bolt/stopper arm
- return spring
- washer
- dowel pin



INSPECTION

STOPPER ARM AND CAM

Check the stopper arm and gearshift cam for abnormal wear or damage.
Check the stopper arm return spring for fatigue or damage.



CLUTCH/GEARSHIFT LINKAGE

GEARSHIFT PLATE

Check the gearshift plate for wear or damage.
Check the return spring and reset spring for fatigue or damage.

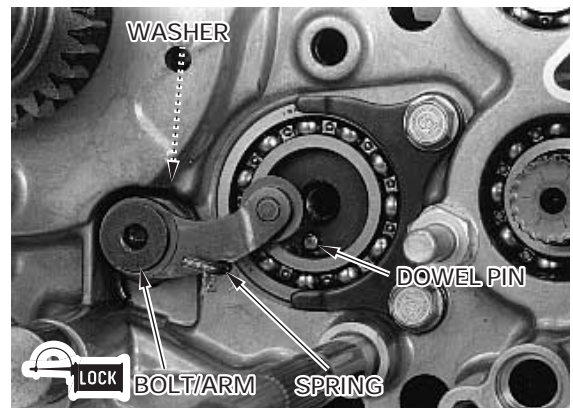


INSTALLATION

Install the following:

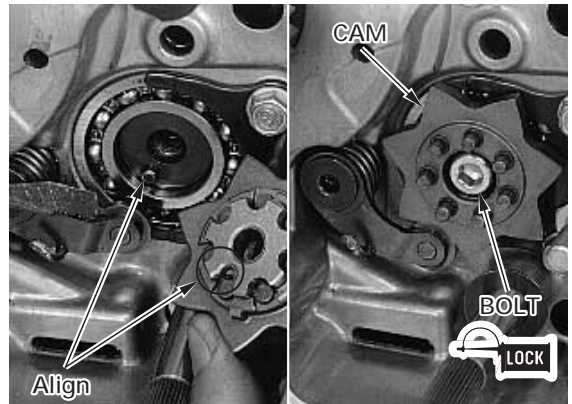
- dowel pin (into shift drum)
- washer (between spring and crankcase)
- return spring
- bolt/stopper arm (apply locking agent to threads)

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)



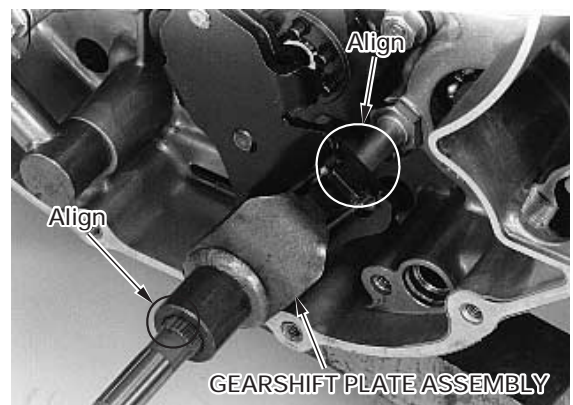
- Lower the stopper arm with a screwdriver.*
- gearshift cam (aligning pin groove with dowel pin)
 - bolt (apply locking agent to threads)

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



- gearshift plate assembly (aligning wide groove with wide tooth and spring ends with spring pin)

Assemble the change clutch (page 9-13).



GEARSHIFT SPINDLE AND REVERSE STOPPER ARM

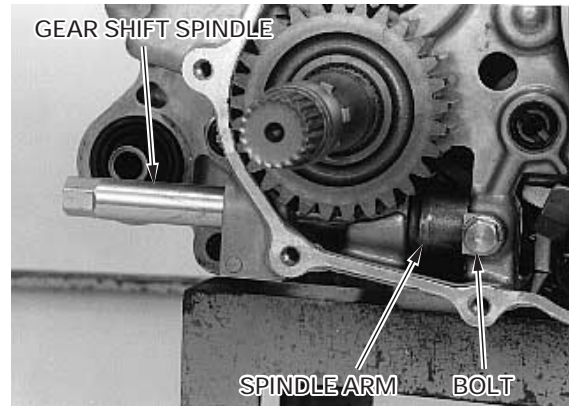
Remove the rear crankcase cover (page 10-7).

REMOVAL

GEARSHIFT SPINDLE

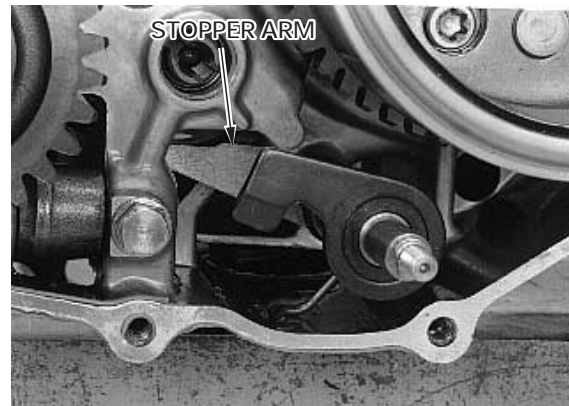
Remove the following:

- retaining bolt
- gearshift spindle
- spindle arm



REVERSE STOPPER ARM

Pull the stopper arm shaft out of the crankcase while holding the arm to release it from the shift drum.



INSPECTION

Check the gearshift spindle and arm for wear or damage.



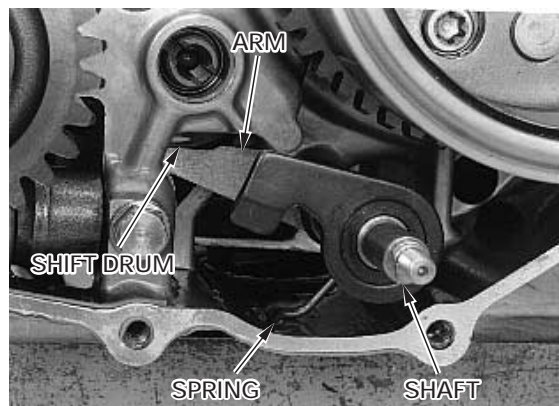
Check the stopper arm for wear or damage.
Check the return spring for fatigue or damage.



INSTALLATION

REVERSE STOPPER ARM

Apply engine oil to the shaft journal.
Set the spring end onto the arm groove.
Install the shaft of the stopper arm into the hole in the crankcase securely while pressing the spring against the crankcase bottom and set the arm to the shift drum.



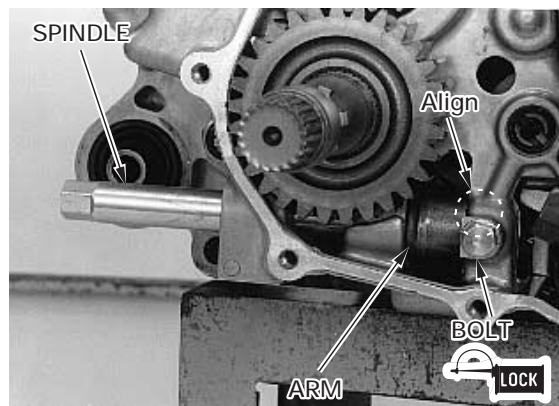
GEARSHIFT SPINDLE

Apply engine oil to a new oil seal lips and install it into the crankcase with the flat side facing out.



Set the spindle arm into the crankcase and install the gearshift spindle through the crankcase and spindle arm by aligning the wide tooth (indicated by punch mark) with the wide groove.
Apply locking agent to the spindle retaining bolt threads.
Install the retaining bolt by aligning it with the spindle groove and tighten it.

Install the rear crankcase cover (page 10-10).

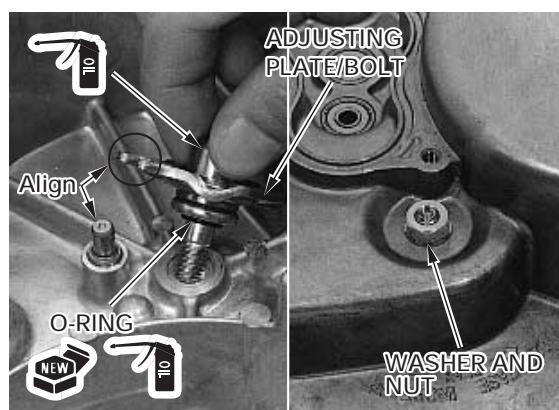


FRONT CRANKCASE COVER INSTALLATION

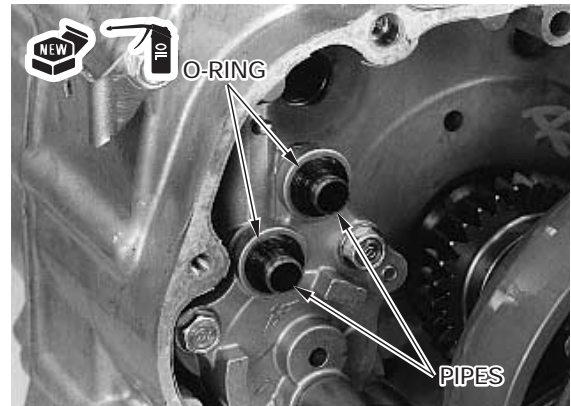
Coat a new O-ring with engine oil and install it onto the clutch adjusting screw.
Install the adjusting plate/screw by aligning the groove with the stopper pin.

Install the washer and lock nut.

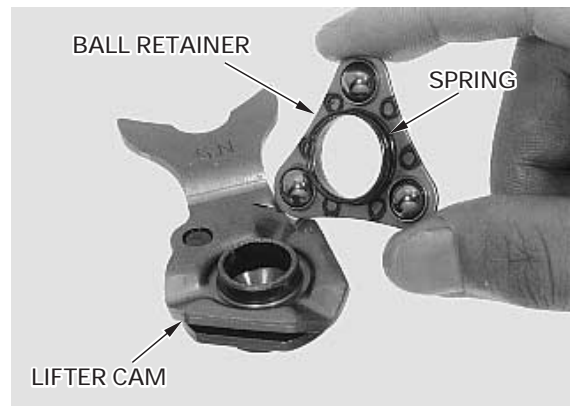
Apply engine oil to the boss of the adjusting plate.



Install the joint pipes into the oil pump.
Coat new O-rings with engine oil and install them onto the joint pipe.

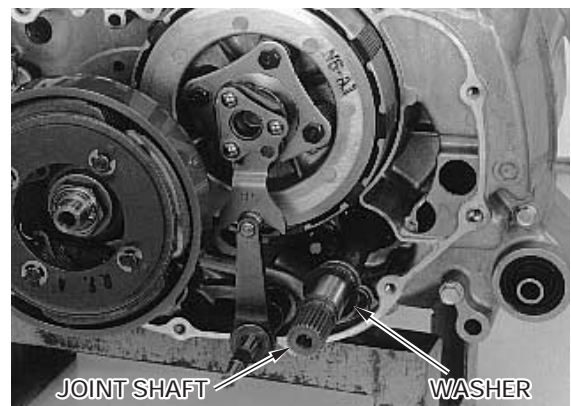


Install the spring onto the ball retainer and install them onto the lifter cam.



Install the ball retainer/lifter cam into the lifter bearing and onto the lifter lever.

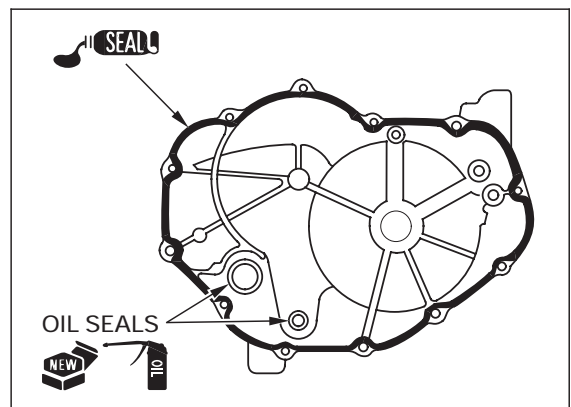
FM/FE model only: Install the output joint shaft onto the output shaft and the washer onto the joint shaft.



Apply engine oil to new gearshift spindle oil seal and joint shaft oil seal lips and install them with the flat side facing out.

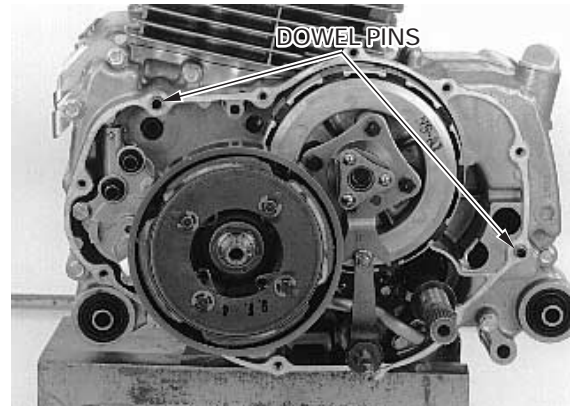
Clean the crankcase and cover mating surfaces.
Blow through the oil passages in the front crankcase cover with compressed air.

Apply liquid sealant to the mating surface (shadowed area) of the front crankcase cover as shown.



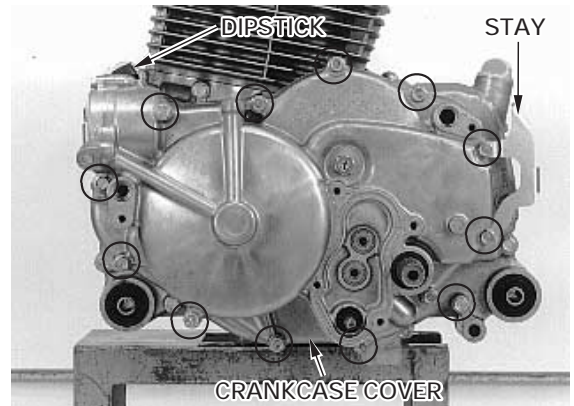
CLUTCH/GEARSHIFT LINKAGE

Install the two dowel pins and the front crankcase cover, being careful not to damage the oil seal lips.



Install the twelve bolts with the engine side cover stay and tighten them in a crisscross pattern in several steps.

Install the oil level dipstick.



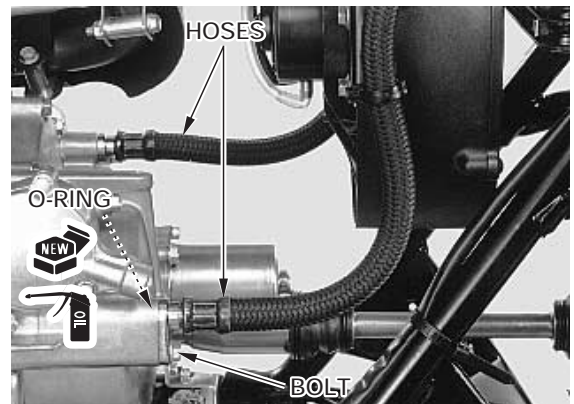
Coat new O-rings with engine oil and install them onto the oil cooler hose joints. Connect the oil cooler hoses into the crankcase cover and tighten the joint bolts.

Install the left engine side cover with four screws.

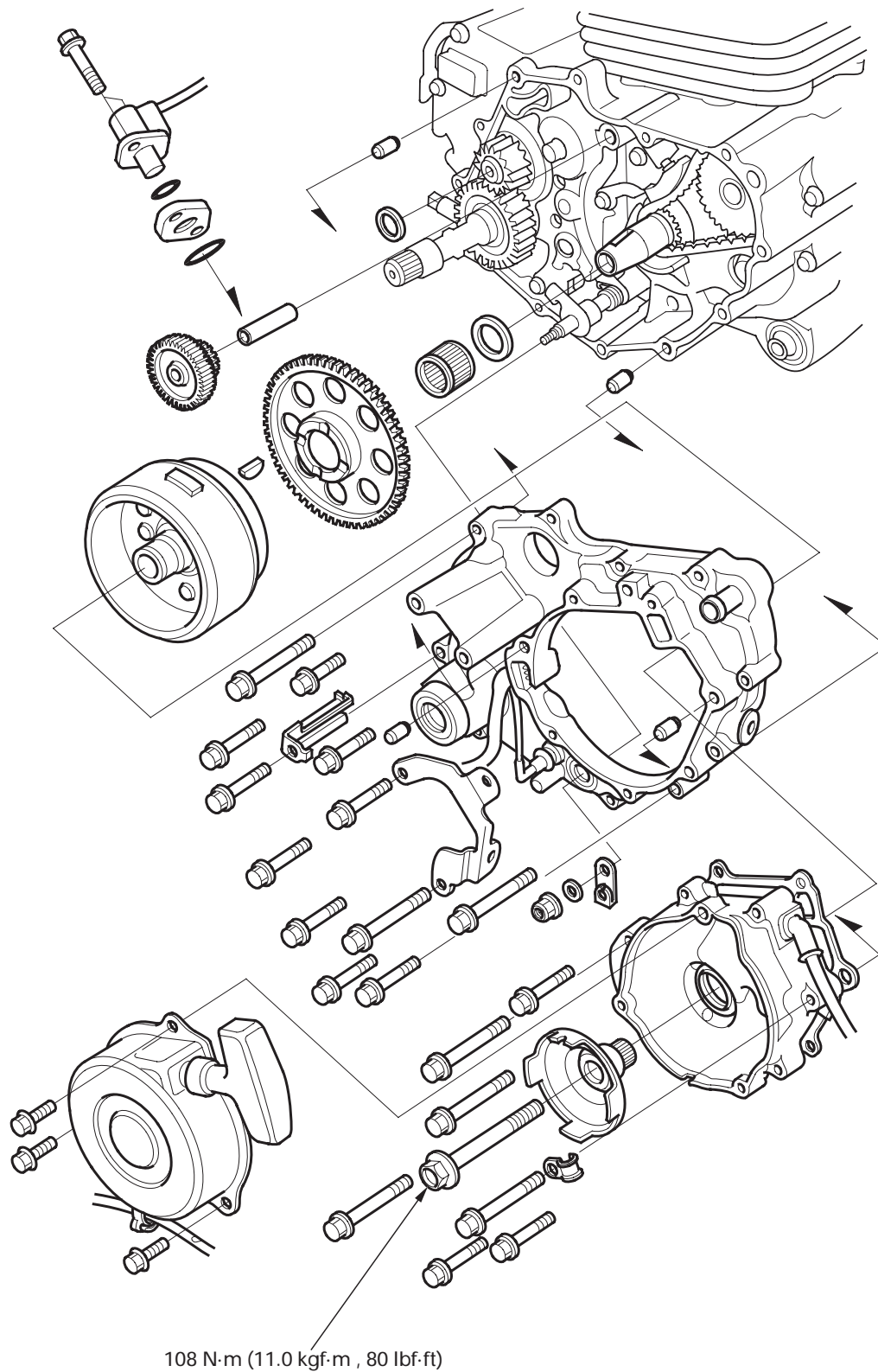
FM/FE model only: Install the following:
— shift control motor reduction gears (page 21-23)
— propeller shaft (page 15-23)

Adjust the clutch system (page 3-17).

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



MEMO



10. ALTERNATOR/STARTER CLUTCH

SERVICE INFORMATION	10-1	ALTERNATOR STATOR	10-5
TROUBLESHOOTING	10-1	FLYWHEEL/STARTER CLUTCH	10-7
RECOIL STARTER	10-2		

SERVICE INFORMATION

GENERAL

- The recoil starter can be removed with the engine installed in the frame. To service the alternator stator, flywheel and starter clutch, the engine must be removed from the frame (these items can be serviced by removing the swingarm if no additional engine work is needed).
- Transmission lubricating oil is fed through the oil passages in the rear crankcase cover. Clean the oil passages before installing the crankcase cover.
- Refer to section 17 for alternator stator inspection.
- Refer to section 19 for starter motor servicing.

SPECIFICATION

Unit: mm (in)

ITEM	STANDARD	SERVICE LIMIT
Starter driven gear boss O.D.	45.660–45.673 (1.7976–1.7981)	45.65 (1.797)

10

TORQUE VALUES

Starter clutch bolt	23 N·m (2.3 kgf·m , 17 lbf·ft)	Apply locking agent to the threads
Recoil starter driven pulley bolt	108 N·m (11.0 kgf·m , 80 lbf·ft)	Apply oil to the threads and seating surface
Alternator stator bolt	10 N·m (1.0 kgf·m , 7 lbf·ft)	
Ignition pulse generator bolt	6 N·m (0.6 kgf·m , 4.3 lbf·ft)	Apply locking agent to the threads

TOOLS

Flywheel holder	07725-0040000 or equivalent commercially available in U.S.A.
Rotor puller	07YMC-HN40100

TROUBLESHOOTING

Starter motor turns, but engine does not turn

- Faulty starter clutch
- Damaged starter reduction gear

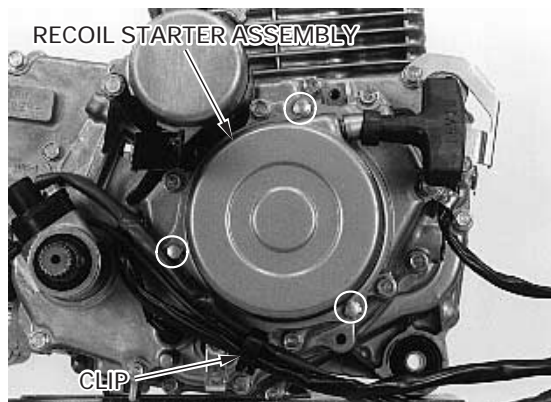
RECOIL STARTER

REMOVAL

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

Remove the wire clip from the recoil starter housing.

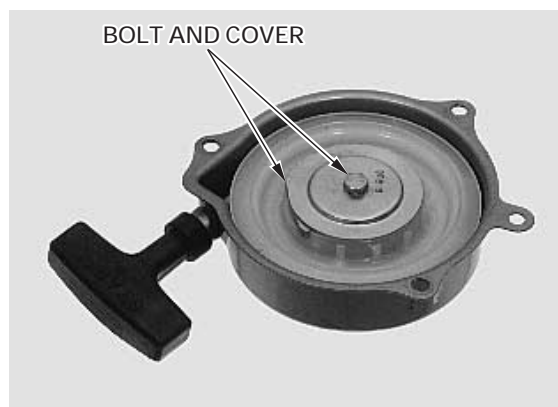
Remove the three mounting bolts and the recoil starter assembly.



DISASSEMBLY

Remove the following:

- bolt
- ratchet cover



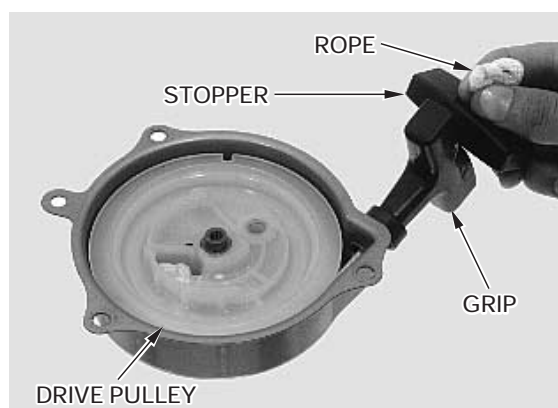
- ratchet guide and spring seat
- spring
- ratchet and pin

Check each part for wear or damage.



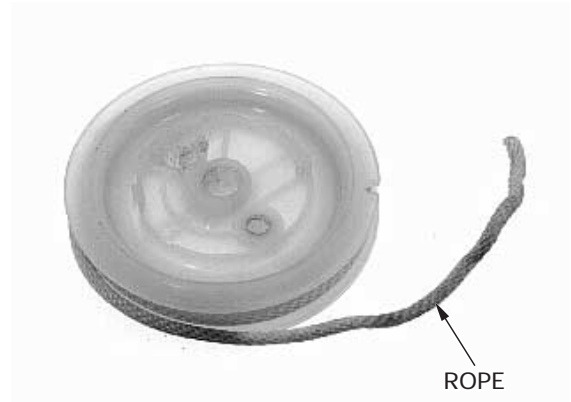
Separate the stopper from the starter grip and untie the starter rope, then remove the stopper and grip while holding the drive pulley. Release the starter rope slowly.

Carefully remove the drive pulley from the starter spring and pulley shaft of the housing.



Remove the starter rope from the drive pulley.

Check the starter rope for wear or damage.



Check the starter spring for damage or break.

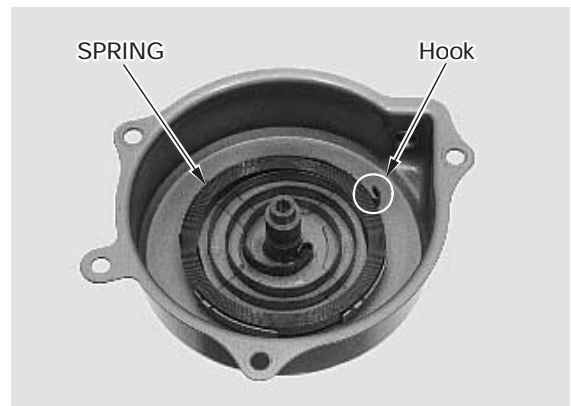
Remove the spring and replace it if it is broken.

Wear eye protection and use care when removing. The spring may pop out of the housing if care is not used.

ASSEMBLY

Install the starter rope and tie a square knot as shown.

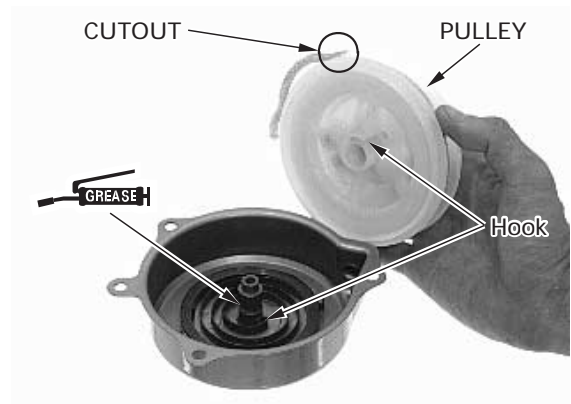
Wrap the rope around the drive pulley in a counter-clockwise direction as viewed from the ratchet side as shown.



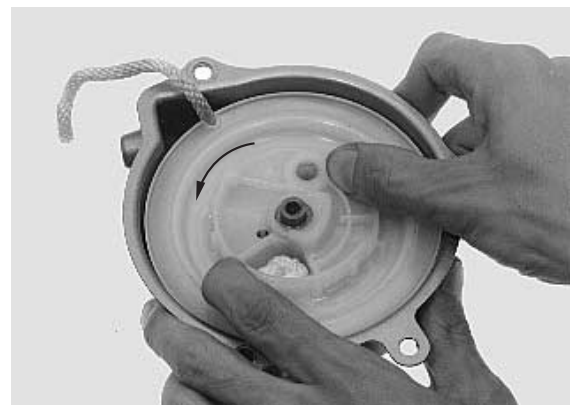
Ensure that the spring does not pop-out of the housing during installation.

Install the starter spring by hooking the spring end on the housing hook.

Apply grease to the pulley shaft groove. Set the starter rope into the pulley cutout and install the pulley by hooking the spring end on the pulley hook.



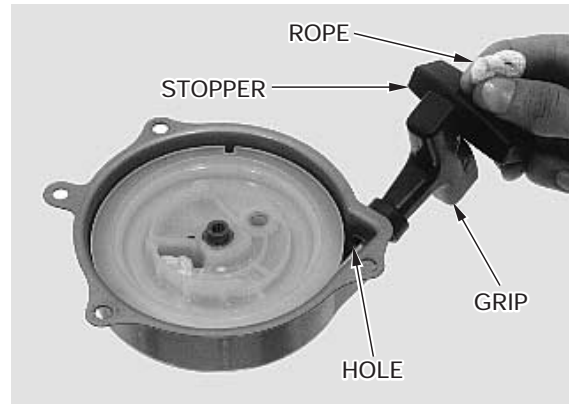
Preload the starter spring by turning the pulley 4 turns counterclockwise and hold it.



ALTERNATOR/STARTER CLUTCH

Route the rope end through the housing hole while the pulley remains held in place.
Route the rope end through the starter grip and stopper, then tie it in a square knot.

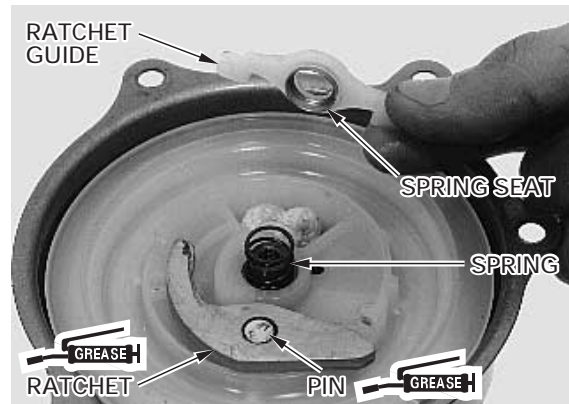
Press the knot in the stopper and install the stopper into the starter grip securely.



Apply grease to the ratchet and pivot pin sliding surfaces.

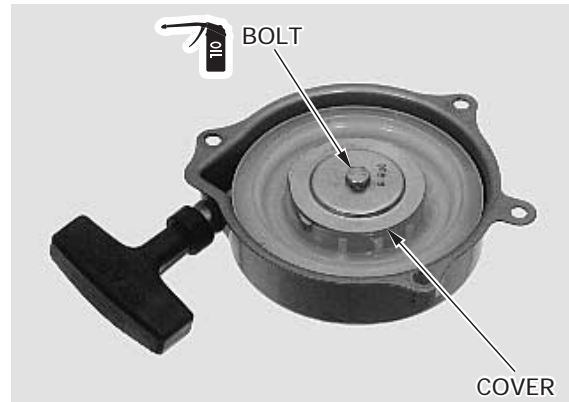
Install the following:

- pin
- ratchet
- spring
- spring seat
- ratchet guide



- ratchet cover
- bolt (apply engine oil to threads)

Check that the recoil starter for smooth operation by pulling the grip.

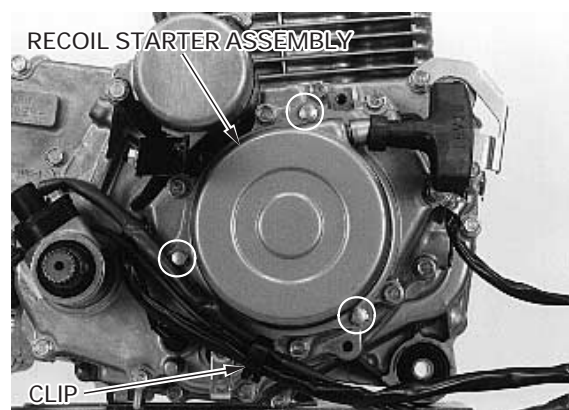


INSTALLATION

Install the recoil starter assembly and tighten the three mounting bolts.

Install the wire clip into the starter housing.

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



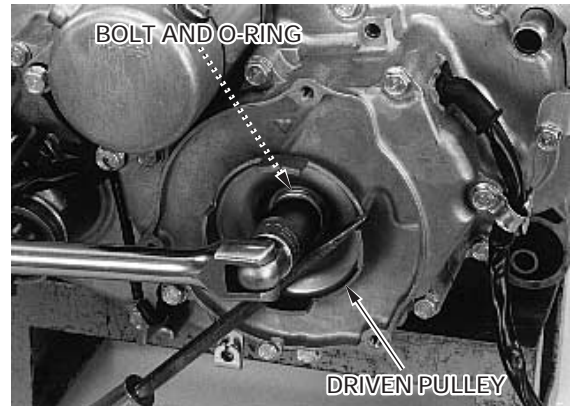
ALTERNATOR STATOR

ALTERNATOR COVER REMOVAL

Remove the engine from the frame (section 6).
Remove the recoil starter (page 10-3).

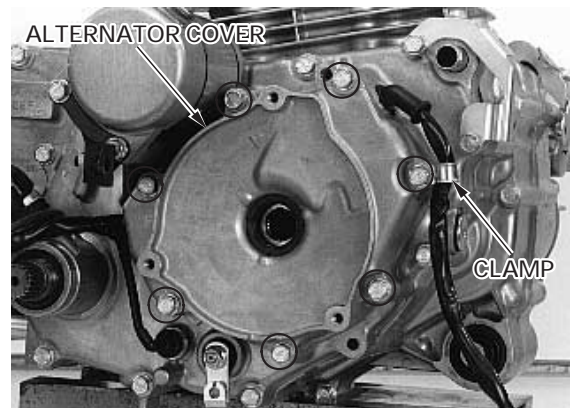
Hold the recoil starter driven pulley using a screwdriver and loosen the bolt.

Remove the bolt, O-ring and the driven pulley.



The cover (stator) is magnetically attached to the flywheel, be careful during removal.

Remove the seven bolts, clamp and the alternator cover.



Remove the dowel pins and gasket.

Remove the oil seal, being careful not to damage the stator and ignition pulse generator.

STATOR REMOVAL/INSTALLATION

Remove the following:

- two ignition pulse generator bolts and clamp
- three stator bolts
- grommet
- stator/ignition pulse generator assembly

Set the assembly onto the alternator cover.
Apply sealant to the wire grommet grooves and install the grommet into the cover groove securely.

Install the stator bolts and tighten them.

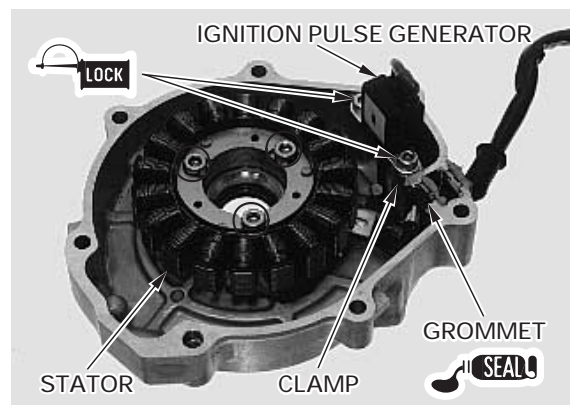
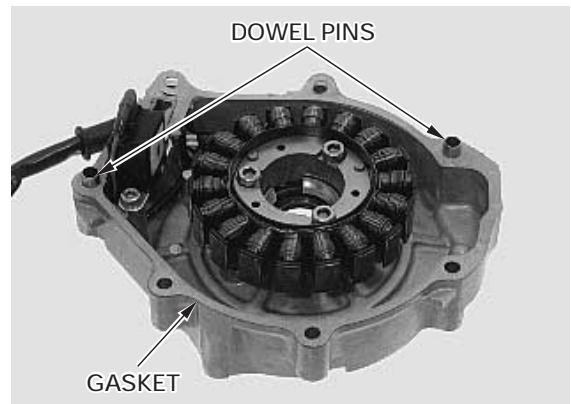
TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)

Apply locking agent to the ignition pulse generator bolt threads.

Install the bolts with the clamp and tighten them.

TORQUE: 6 N·m (0.6 kgf·m , 4.3 lbf·ft)

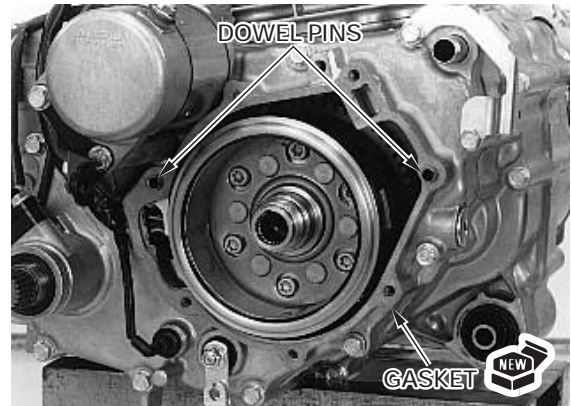
Secure the ignition pulse generator with the clamp.



ALTERNATOR/STARTER CLUTCH

ALTERNATOR COVER INSTALLATION

Install the dowel pins and a new gasket.



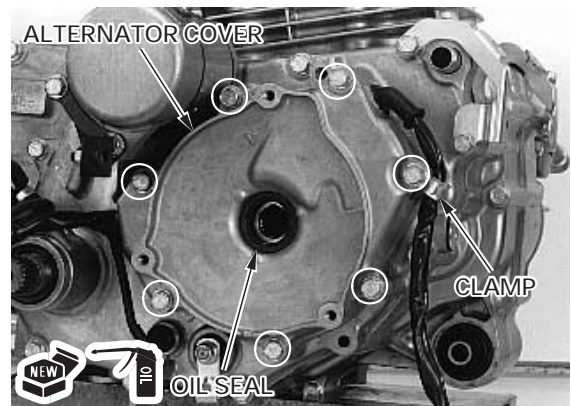
The cover (stator) is magnetically attached to the flywheel, be careful not to get anything caught between these parts when installing.

Install the alternator cover.

Install the seven bolts with the clamp and tighten them.

Secure the alternator wire with the clamp.

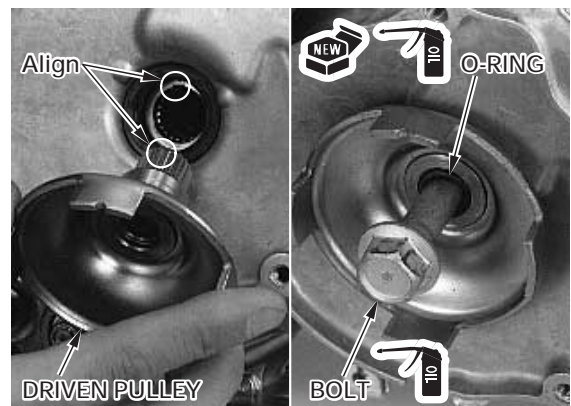
Apply engine oil to a new oil seal and install it into the alternator cover.



Install the recoil starter driven pulley into the flywheel by aligning the wide tooth with the key way.

Coat a new O-ring with engine oil and install it onto the driven pulley bolt.

Apply engine oil to the pulley bolt threads and seating surface and install it.

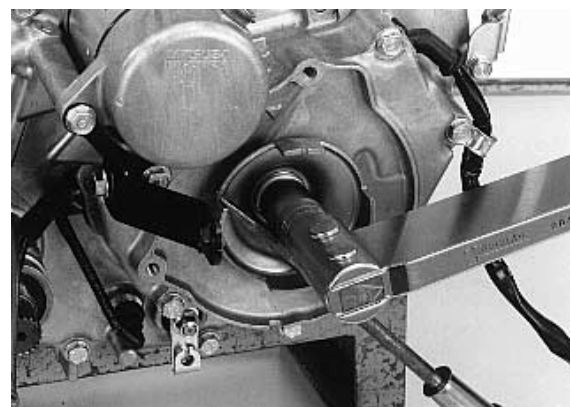


Tighten the pulley bolt by holding the driven pulley using a screwdriver.

TORQUE: 108 N·m (11.0 kgf·m , 80 lbf·ft)

Install the recoil starter (page 10-5).

Install the engine (section 6).



FLYWHEEL/STARTER CLUTCH

REAR CRANKCASE COVER REMOVAL

Remove the following:

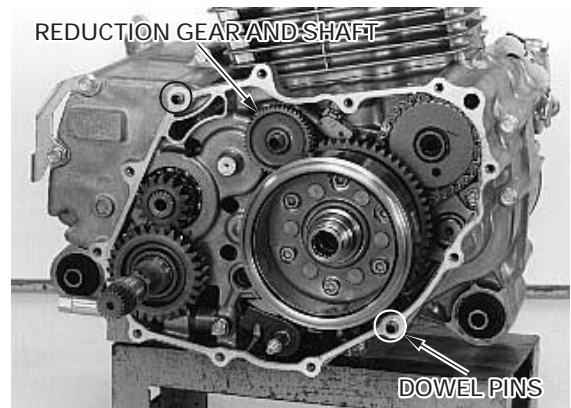
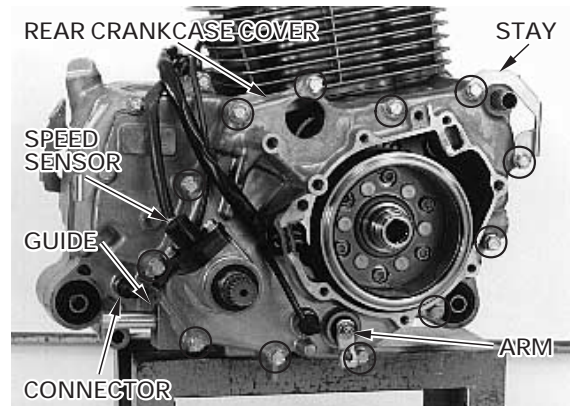
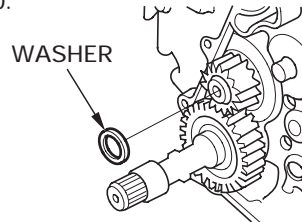
- alternator cover (page 10-5)
- starter motor (page 19-4)
- speed sensor bolts
- speed sensor, sensor base and O-rings
- nut, washer and reverse selector arm
- twelve cover bolts, wire guide and side cover stay
- thermosensor connector

Remove the rear crankcase cover.

Remove the following:

- thrust washer
- two dowel pins
- reduction gear and shaft

For gear position switch removal/installation, see section 20.

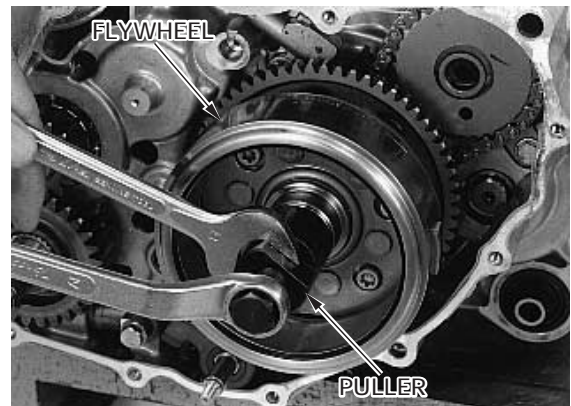


FLYWHEEL REMOVAL

Remove the flywheel using the special tool.

TOOL:

Rotor puller 07YMC-HN40100



Remove the following:

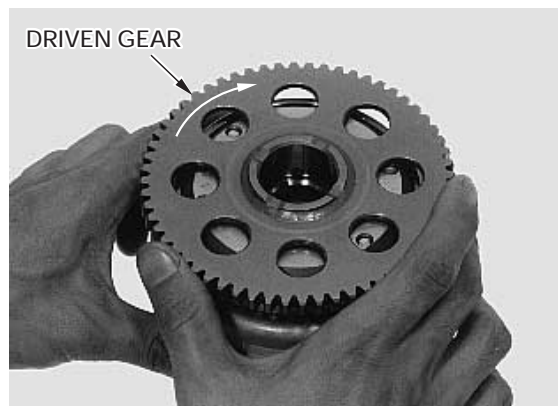
- starter drive gear
- woodruff key
- needle bearing
- washer



STARTER CLUTCH REMOVAL/ INSPECTION

Make sure that the starter driven gear turns clockwise smoothly and does not turn counterclockwise.

Remove the driven gear while turning it clockwise.



Hold the flywheel with the special tool and remove the starter clutch bolts.

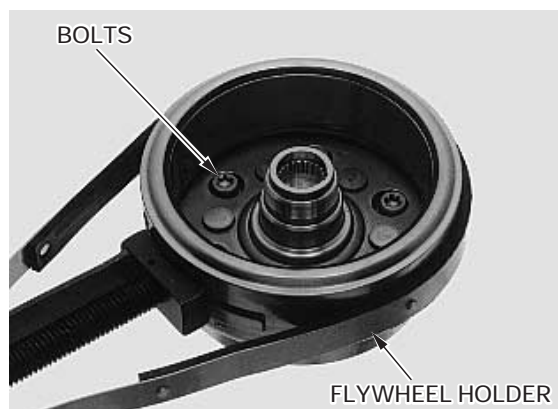
TOOL:

Flywheel holder

07725-0040000 or
equivalent commercially
available in U.S.A.

Remove the starter clutch assembly from the flywheel.

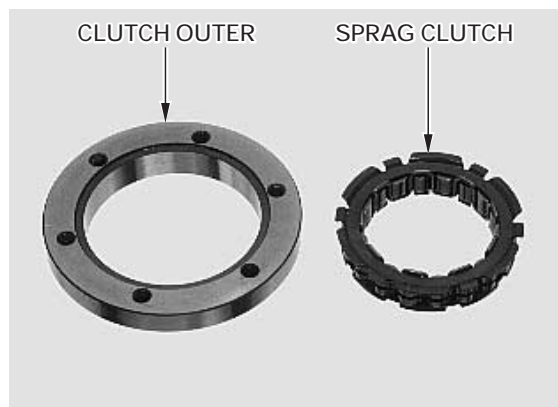
Remove the sprag clutch from the starter clutch outer.



Check the starter reduction gear and shaft for wear or damage.



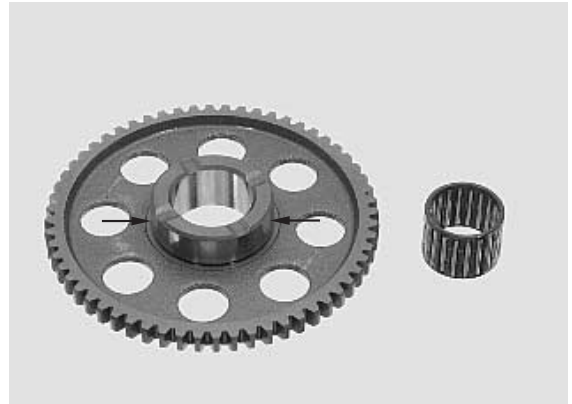
Check the starter clutch outer and sprag clutch for abnormal wear or damage.



Check the starter driven gear teeth and needle bearing for wear or damage.

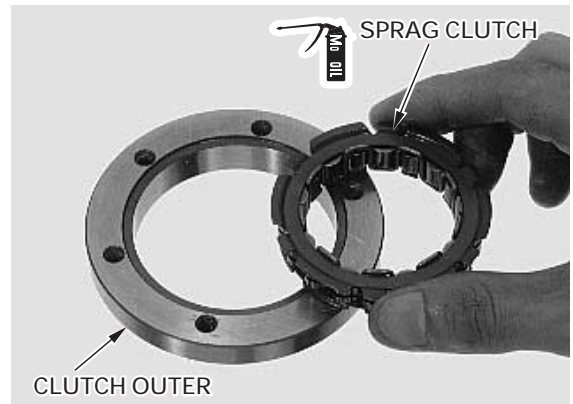
Measure the starter driven gear boss O.D.

SERVICE LIMIT: 45.65 mm (1.797 in)



STARTER CLUTCH INSTALLATION

Lubricate the sprag clutch with engine oil and install it into the starter clutch outer with the flange side facing the flywheel side.



Apply locking agent to the starter clutch bolt threads.

Install the starter clutch assembly onto the flywheel and install the bolts.

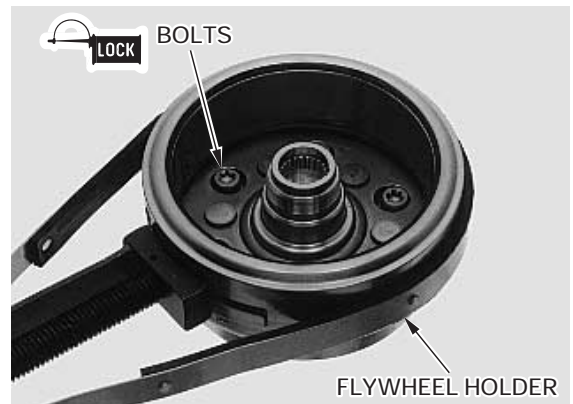
Hold the flywheel with the special tool and tighten the bolts.

TOOL:

Flywheel holder

07725-0040000 or
equivalent commercially
available in U.S.A.

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



FLYWHEEL INSTALLATION

Install the starter driven gear while turning it clockwise.

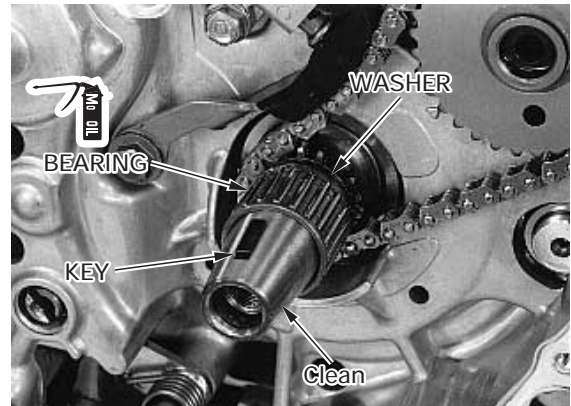


ALTERNATOR/STARTER CLUTCH

Lubricate the needle bearing with molybdenum oil solution.
Install the washer and needle bearing onto the crankshaft.

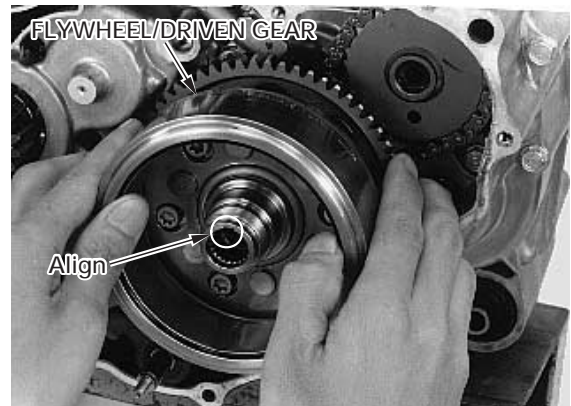
Clean any oil from the tapered portions of the crankshaft and flywheel.

Install the woodruff key into the crankshaft key groove.

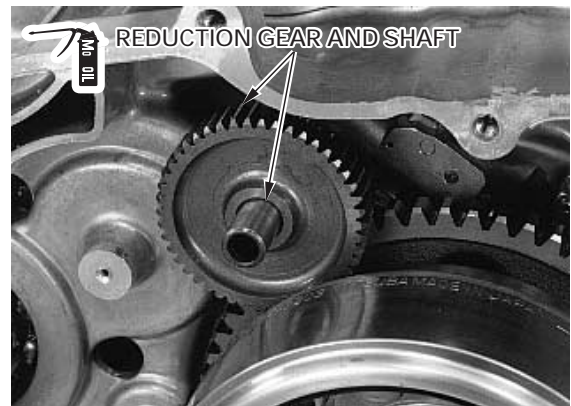


Install the flywheel on the crankshaft, aligning the key with the woodruff key.

Temporarily install the recoil starter driven pulley and bolt and tighten it to seat the flywheel (page 10-7).
Remove the driven pulley.



Apply molybdenum oil solution to the reduction gear teeth and shaft.
Install the gear shaft with the reduction gear.

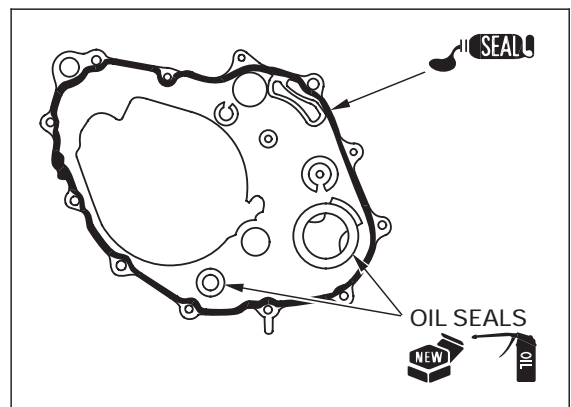


REAR CRANKCASE COVER INSTALLATION

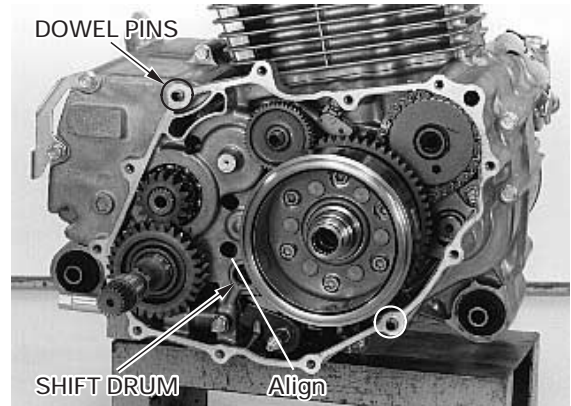
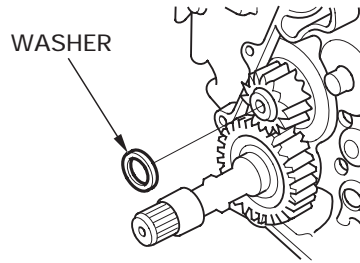
Apply engine oil to new reverse stopper shaft oil seal and output shaft oil seal lips and install them with the flat side facing out.

Clean the mating surfaces of the crankcase and cover.
Blow through the oil passages in the rear crankcase cover with compressed air.

Apply liquid sealant to the mating surface (shadowed area) of the rear crankcase cover as shown.



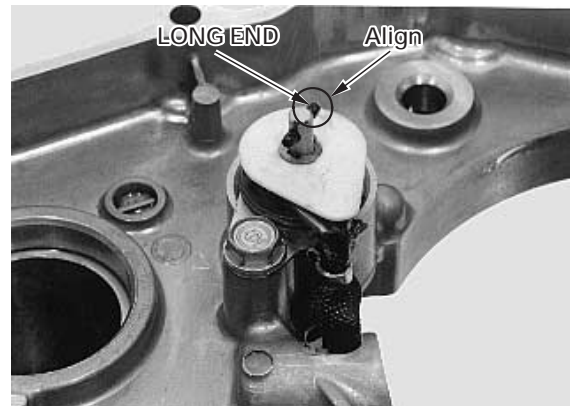
Install the two dowel pins and thrust washer. Shift the transmission into neutral to align the groove in the shift drum with the lug on the crankcase.



Align the long end of the gear position switch pin with the "N" mark on the switch plate. Install the crankcase cover while aligning the switch pin with the shift drum groove properly.

Be careful not to damage the switch pin and the oil seal lips.

If the cover doesn't install easily, remove it and check the alignment of the switch pin and the shift drum or the switch for damage.



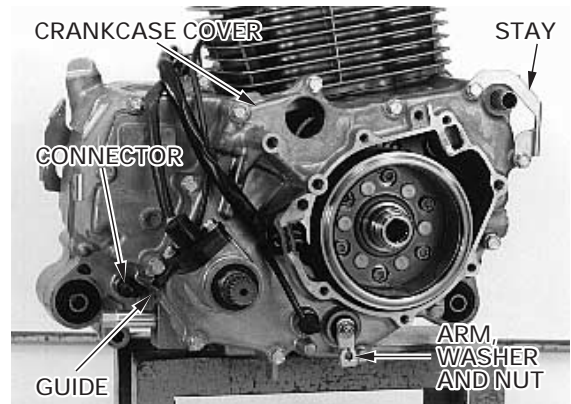
Route the thermosensor wire through the wire guide properly.

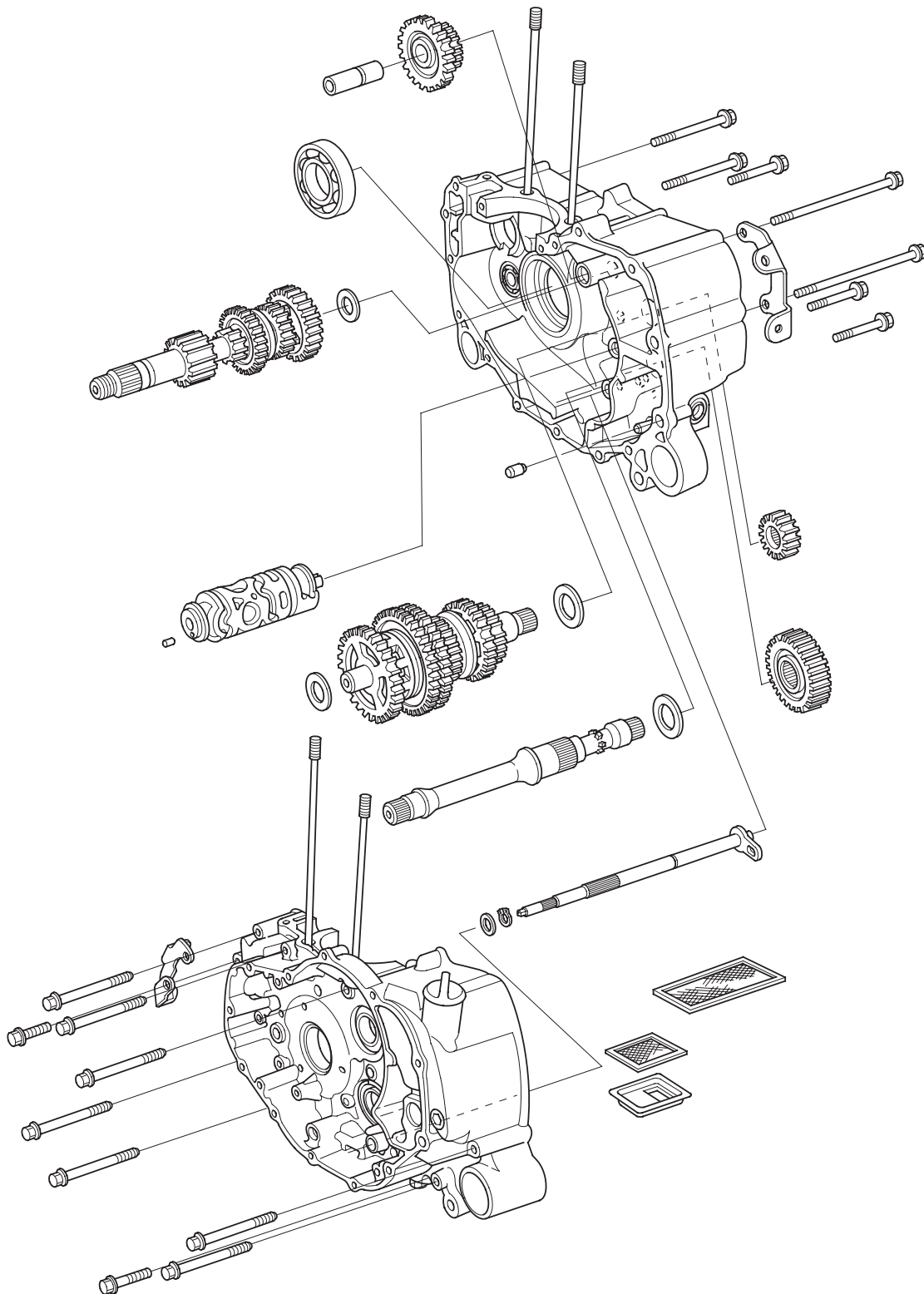
Connect the thermosensor connector. Install the twelve bolts with the wire guide and side cover stay and tighten them in a crisscross pattern in several steps.

Install the reverse selector arm with the slit facing out by aligning the flat surfaces. Install the arm nut with the washer and tighten it.

Install the following:

- speed sensor (page 20-11)
- starter motor (page 19-4)
- alternator cover (page 10-5)





11. CRANKCASE/TRANSMISSION/CRANKSHAFT

SERVICE INFORMATION	11-1	CRANKSHAFT/BALANCER	11-10
TROUBLESHOOTING	11-2	CRANKCASE BEARING REPLACEMENT	11-12
CRANKCASE SEPARATION	11-3	CRANKCASE ASSEMBLY	11-16
TRANSMISSION	11-4		

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 (section 6).
- Be careful not to damage the crankcase mating surfaces when servicing.
- Transmission 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—13.018 (0.5118—0.5125)	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.	M4	23.000—23.021 (0.9055—0.9063)	23.04 (0.907)
		M5	18.000—18.021 (0.7087—0.7095)	18.05 (0.711)
		C1, C2, C3, CR	25.000—25.021 (0.9843—0.9851)	25.05 (0.986)
		Reverse idle	13.000—13.018 (0.5118—0.5125)	13.04 (0.513)
	Gear bushing O.D.	M4	22.959—22.979 (0.9039—0.9047)	22.94 (0.903)
		M5	17.959—17.980 (0.7070—0.7079)	17.94 (0.706)
		C1, C2, C3, CR	24.959—24.980 (0.9826—0.9835)	24.93 (0.981)
	Gear-to-bushing clearance	M4	0.021—0.062 (0.0008—0.0024)	0.10 (0.004)
		M5, C1, C2, C3, CR	0.020—0.062 (0.0008—0.0024)	0.10 (0.004)
	Gear bushing I.D.	M4	20.000—20.021 (0.7874—0.7882)	20.04 (0.789)
		M5	15.000—15.018 (0.5906—0.5913)	15.04 (0.592)
		C3	22.000—22.021 (0.8661—0.8670)	22.04 (0.868)
	Mainshaft O.D.	at M4	19.959—19.980 (0.7858—0.7866)	19.93 (0.785)
		at M5	14.966—14.984 (0.5892—0.5899)	14.94 (0.588)
	Countershaft O.D.	at C3	21.959—21.980 (0.8645—0.8654)	21.93 (0.863)
	Reverse idle shaft O.D.		12.966—12.984 (0.5105—0.5112)	12.94 (0.509)
	Bushing-to-shaft clearance	M4, C3	0.020—0.062 (0.0008—0.0024)	0.10 (0.004)
M5		0.016—0.052 (0.0006—0.0020)	0.10 (0.004)	
Reverse idle gear-to-shaft clearance		0.016—0.052 (0.0006—0.0020)	0.10 (0.004)	
Crankshaft	Runout		—	0.05 (0.002)
	Big end side clearance		0.05—0.65 (0.002—0.026)	0.8 (0.03)
	Big end radial clearance		0.006—0.018 (0.0002—0.0007)	0.05 (0.002)

TOOLS

Universal bearing puller	07631-0010000 or equivalent commercially available in U.S.A.
Bearing remover set, 15 mm	07936-KC10000 not available in U.S.A.
– bearing remover, 15 mm	07936-KC10500
– remover head	07936-KC10200
– remover shaft	07936-KC10100 not available in U.S.A.
– remover weight	07936-371020A or 07936-3710200
Bearing remover, 17 mm	07936-3710300
Remover handle	07936-3710100
Sliding weight	07936-371020A or 07936-3710200
Driver	07749-0010000
Attachment, 22 × 24 mm	07746-0010800
Attachment, 24 × 26 mm	07746-0010700
Attachment, 32 × 35 mm	07746-0010100
Attachment, 37 × 40 mm	07746-0010200
Attachment, 42 × 47 mm	07746-0010300
Attachment, 52 × 55 mm	07746-0010400
Attachment, 72 × 75 mm	07746-0010600
Pilot, 10 mm	07746-0040100
Pilot, 12 mm	07746-0040200
Pilot, 15 mm	07746-0040300
Pilot, 17 mm	07746-0040400
Pilot, 20 mm	07746-0040500
Pilot, 22 mm	07746-0041000
Pilot, 25 mm	07746-0040600
Pilot, 28 mm	07746-0041100
Pilot, 35 mm	07746-0040800
Pilot, 40 mm	07746-0040900
Crankcase assembly tool	07965-VM00000 not available in U.S.A.
– assembly collar	07965-VM00100
– assembly shaft	07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A
– threaded adapter	07965-VM00300 not available in U.S.A. or 07931-KF00200

TROUBLESHOOTING

Excessive engine noise

- Worn, seized or chipped transmission gears
- Worn transmission bearings
- Worn or damaged connecting rod bearing
- Worn crankshaft main journal bearing
- Worn connecting rod small end
- 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

Hard to shift

- Damaged shift fork
- Bent shift fork shaft
- Damaged shift fork guide pin
- Damaged shift drum guide groove

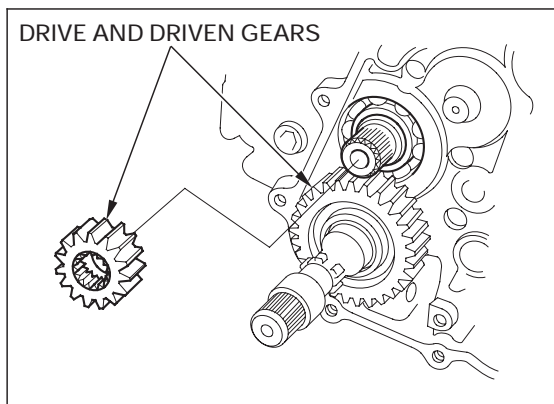
Abnormal vibration

- Improper balancer timing

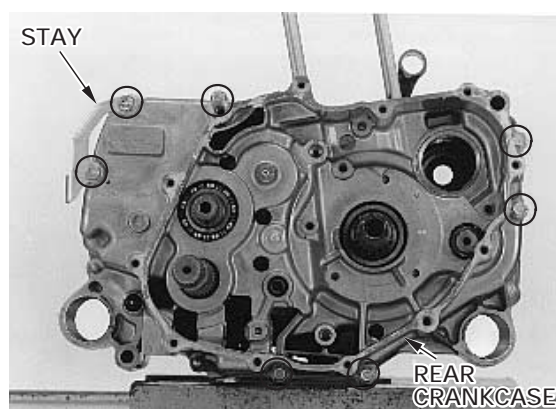
CRANKCASE SEPARATION

Remove the following:

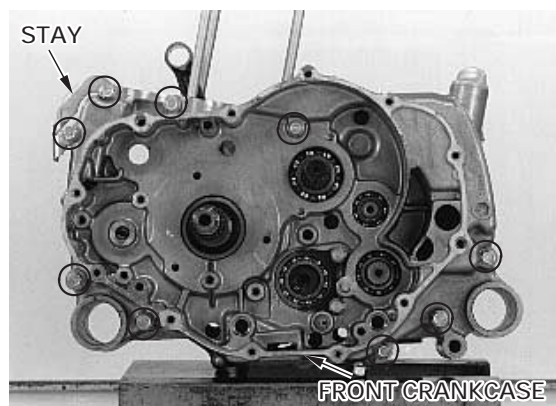
- engine (section 6)
- cylinder head (section 7)
- cylinder and piston (section 8)
- clutch and gearshift linkage (section 9)
- oil pump (section 4)
- flywheel and starter clutch (section 10)
- camshaft (section 7)
- output shaft drive and driven gears



Loosen the seven rear crankcase bolts in a crisscross pattern in several steps and remove them with the side cover stay.



Loosen the nine front crankcase bolts in a crisscross pattern in several steps and remove them with the side cover stay.



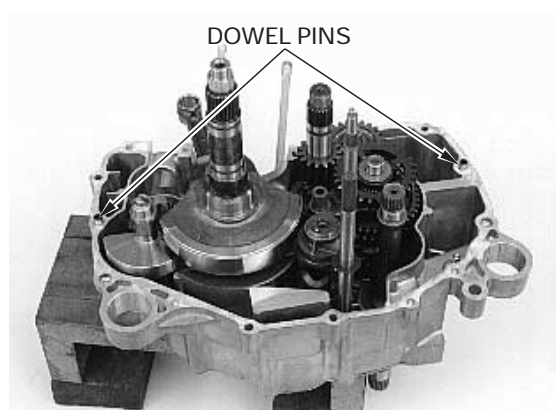
Place the crankcase assembly with the rear crankcase down.

Do not pry the crankcase apart with a screwdriver.

Remove the front crankcase from the rear crankcase while tapping them at several locations with a soft hammer.

Remove the two dowel pins.

Remove the oil strainers and strainer plate from the front crankcase.



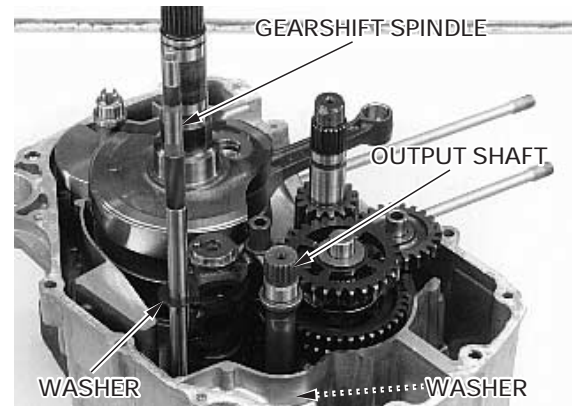
TRANSMISSION

DISASSEMBLY

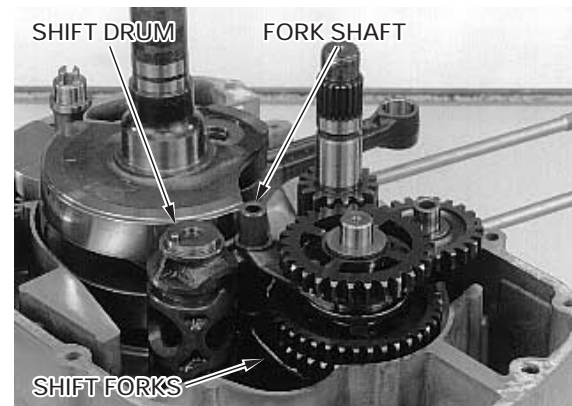
Separate the crankcase (page 11-3).

Remove the following:

- washer and sub-gearshift spindle
- output shaft and washer

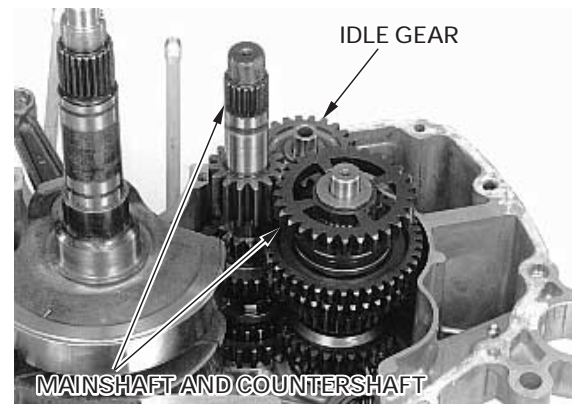


- shift fork shaft
- shift drum
- shift forks



- shaft and reverse idle gear
- mainshaft and countershaft as an assembly

For crankcase bearing replacement, see page 11-12.

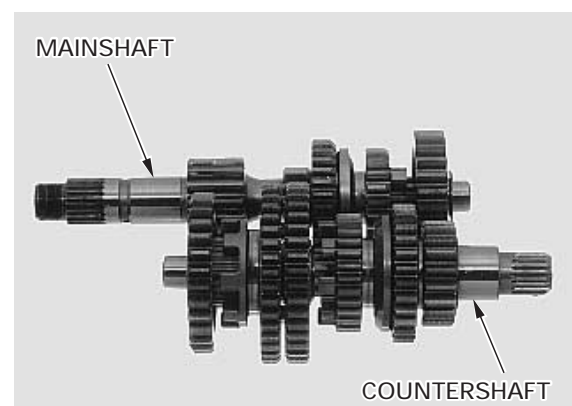


Disassemble the mainshaft and countershaft.

Clean all disassembled part in solvent thoroughly.

NOTE:

- Keep track of the disassembled parts by stacking them on a tool or slipping them onto a piece of wire.
- Do not expand the snap ring more than necessary for removal. To remove the snap ring, expand the snap ring and pull it off using the gear behind it.



INSPECTION

GEAR/BUSHING/SHAFT

Check the gear shifter groove for abnormal wear or damage.

Check the gear dogs and teeth for abnormal wear or damage.

Measure the gear I.D.

SERVICE LIMITS: M4: 23.04 mm (0.907 in)
 M5: 18.05 mm (0.711 in)
 C1, C2, C3, CR:
 25.05 mm (0.986 in)
 Reverse idle: 13.04 mm (0.513 in)

Measure the gear bushing O.D.

SERVICE LIMITS: M4: 22.94 mm (0.903 in)
 M5: 17.94 mm (0.706 in)
 C1, C2, C3, CR:
 24.93 mm (0.981 in)

Calculate the gear-to-bushing clearance.

SERVICE LIMIT: 0.10 mm (0.004 in)

Measure the gear bushing I.D.

SERVICE LIMITS: M4: 20.04 mm (0.789 in)
 M5: 15.04 mm (0.592 in)
 C3: 22.04 mm (0.868 in)

Check the mainshaft and countershaft for abnormal wear or damage.

Measure the mainshaft O.D. at the M4 and M5 gears.

SERVICE LIMITS: At M4: 19.93 mm (0.785 in)
 At M5: 14.94 mm (0.588 in)

Measure the countershaft O.D. at the C3 gear.

SERVICE LIMIT: At C3: 21.93 mm (0.863 in)

Calculate the gear bushing-to-shaft clearance.

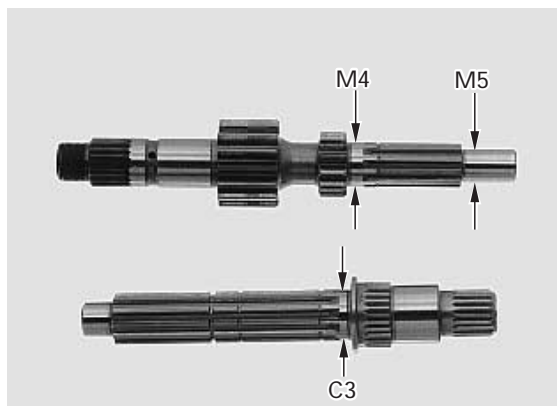
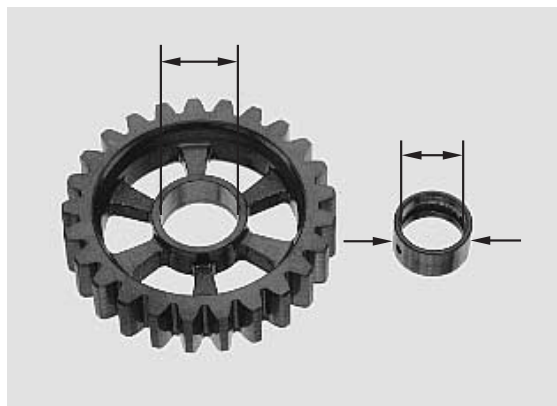
SERVICE LIMIT: 0.10 mm (0.004 in)

Measure the idle gear shaft O.D.

SERVICE LIMIT: 12.94 mm (0.509 in)

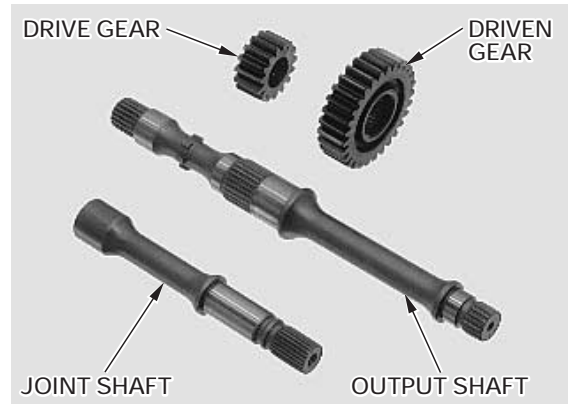
Calculate the idle gear-to-shaft clearance.

SERVICE LIMIT: 0.10 mm (0.004 in)



OUTPUT SHAFT/JOINT SHAFT/GEAR

Check the teeth and splines for abnormal wear or damage.



SHIFT DRUM

Check the shift drum guide grooves for abnormal wear or damage.

Check the shift drum journals for scoring, scratches or evidence of insufficient lubrication.



SHIFT FORK

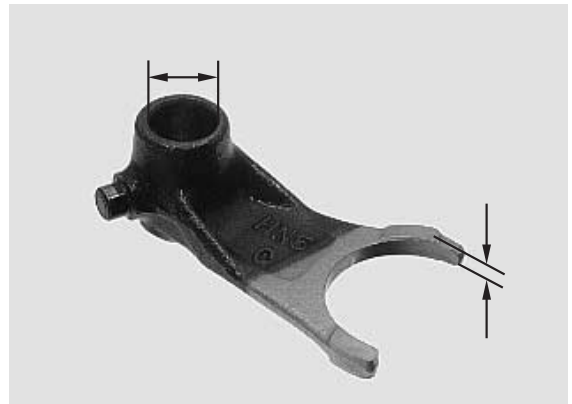
Check the shift fork guide pins for abnormal wear or damage.

Measure the shift fork I.D.

SERVICE LIMIT: 13.04 mm (0.513 in)

Measure the shift fork claw thickness.

SERVICE LIMIT: 4.5 mm (0.18 in)

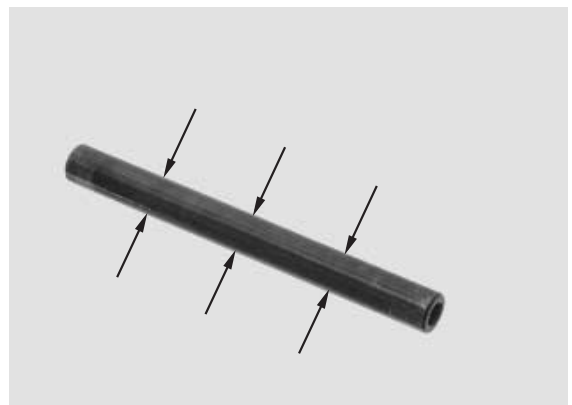


SHIFT FORK SHAFT

Check the shift fork shaft for damage or bending.

Measure the shift fork shaft O.D.

SERVICE LIMIT: 12.96 mm (0.510 in)



SUB-GEARSHIFT SPINDLE

Check the spindle for damage or bending.
Check the spindle arm for wear or damage.



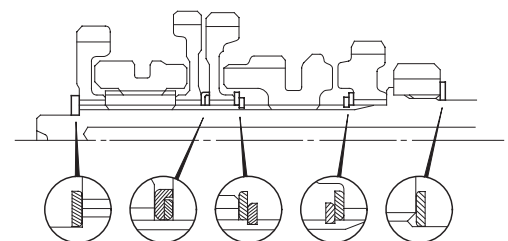
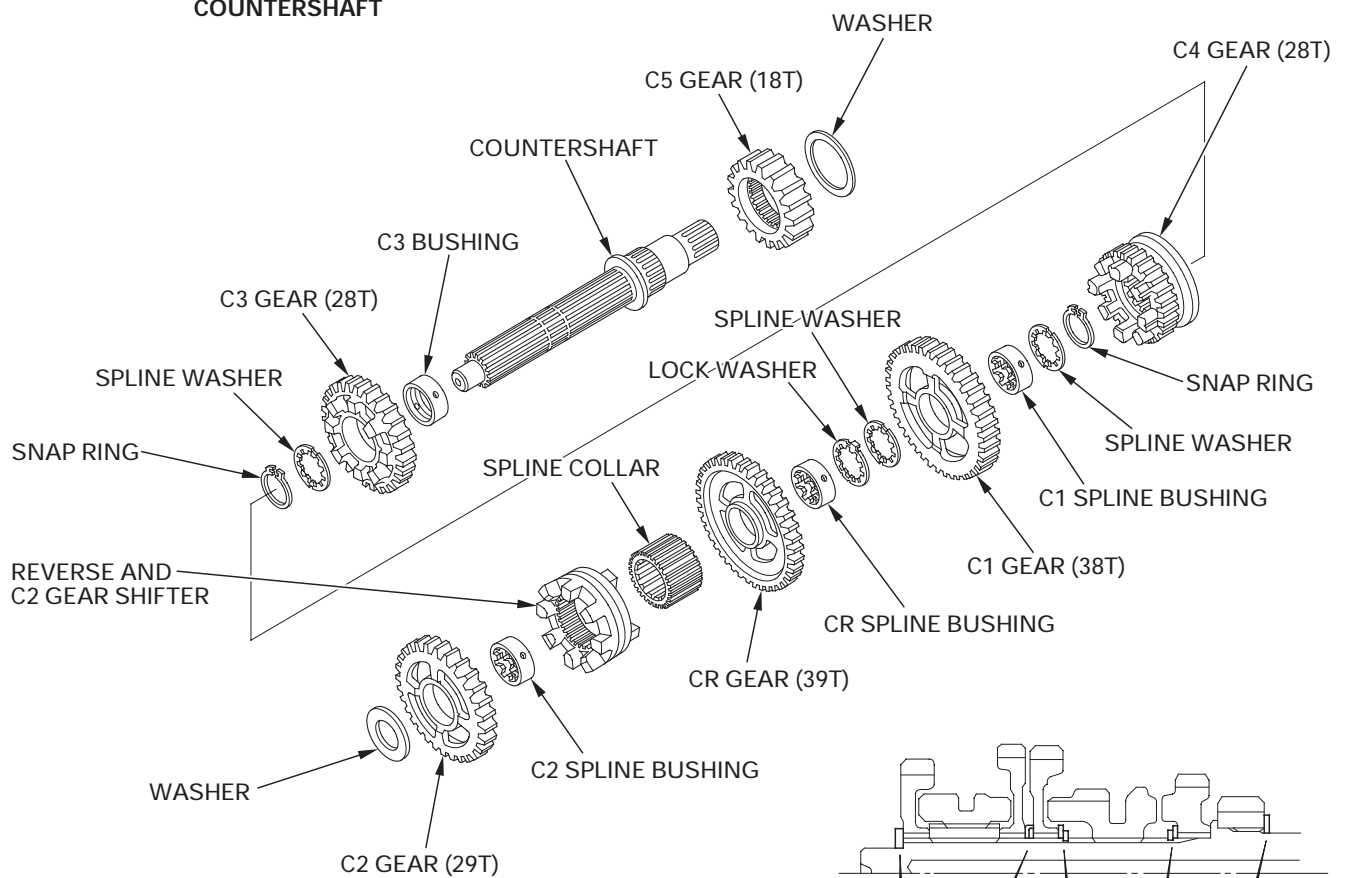
ASSEMBLY

Clean all parts in solvent and dry them thoroughly.

Apply engine oil to the gear teeth, sliding surface, shifter grooves and bushings.

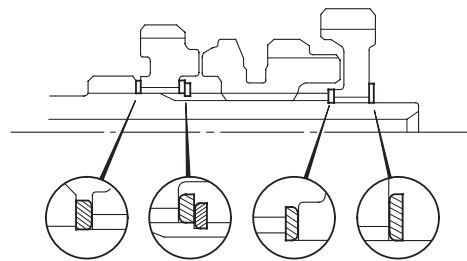
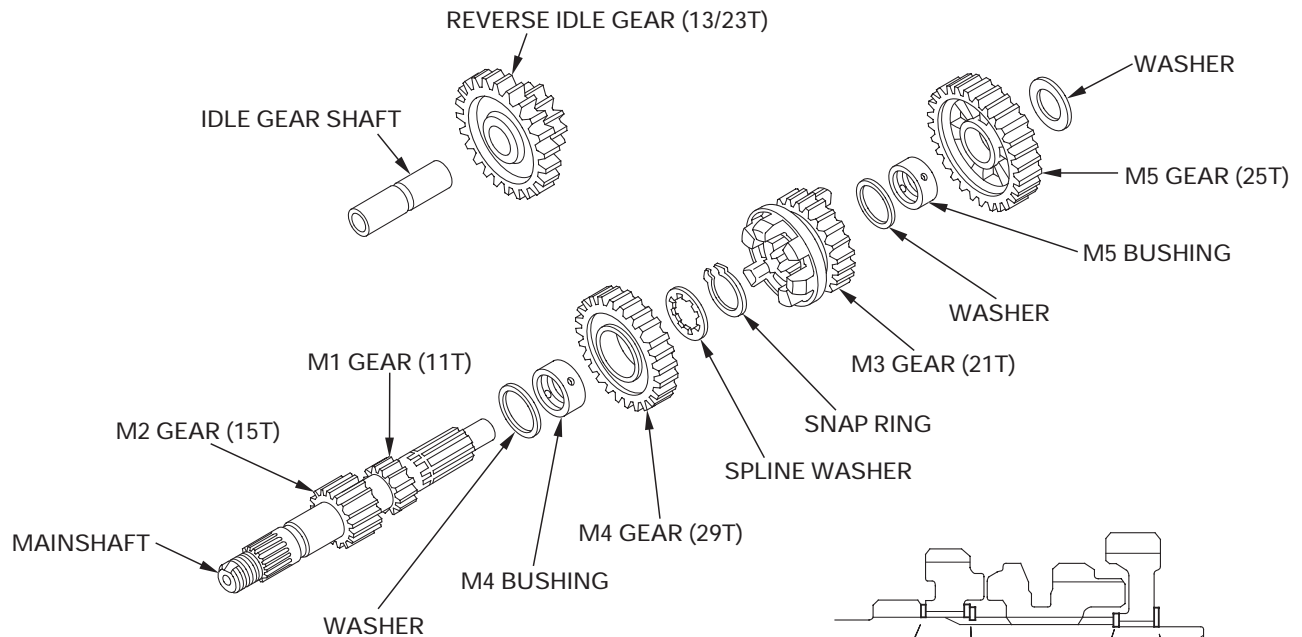
Assemble the mainshaft and countershaft.

COUNTERSHAFT



Washer and snap ring direction:

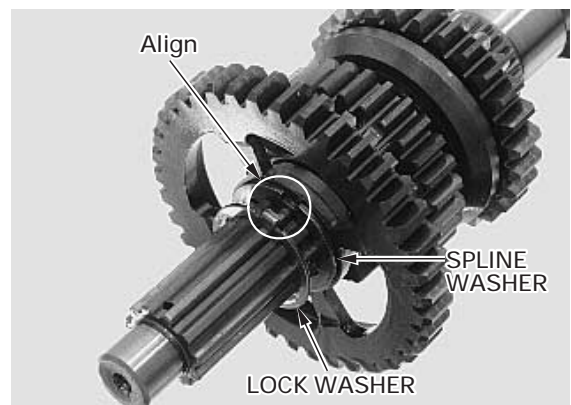
MAINSHAFT



Washer and snap ring direction:

NOTE:

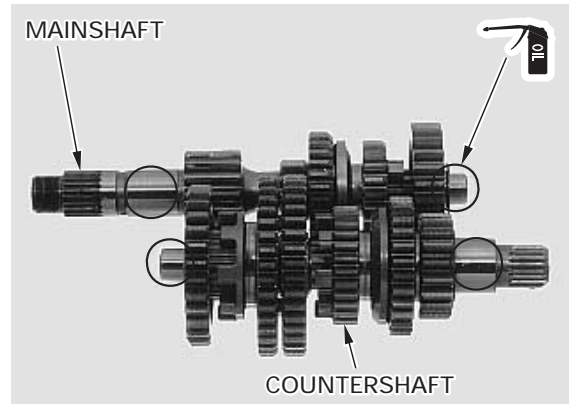
- Always install the thrust washer and snap ring with the chamfered (rolled) edge facing away from the thrust load.
- Install the snap ring so that its end gap aligns with the groove in the splines.
- Make sure that the snap ring is fully seated in the shaft groove after installing it.
- Align the lock washer tabs with the spline washer grooves.



Check the gears for freedom of movement or rotation on the shaft.

Apply engine oil to the mainshaft and countershaft journals.

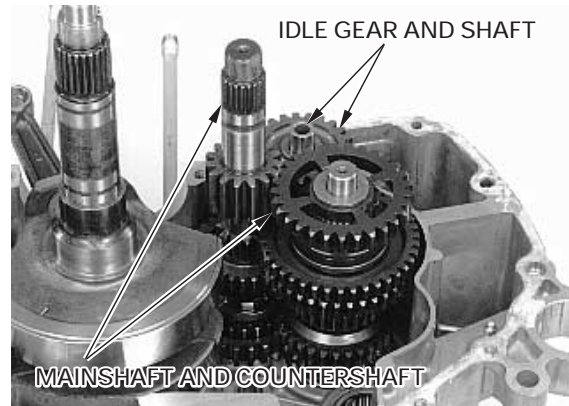
Engage the mainshaft and countershaft gears.



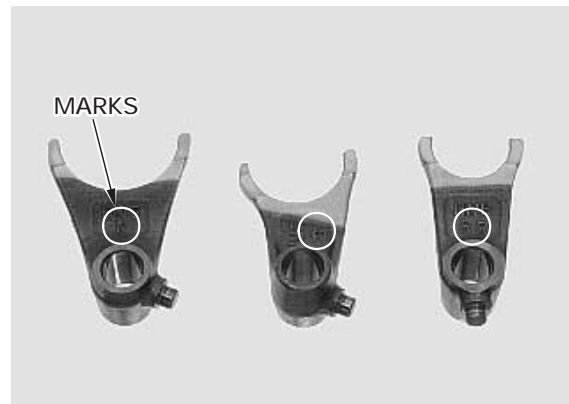
If removed, install the crankshaft and balancer (page 11-11).

Be sure to install the thrust washers. Install the mainshaft and countershaft assemblies as a set into the rear crankcase.

Install the idle gear and shaft.



Each shift fork has an identification mark; "RR" for the rear fork, "C" for the center fork and "F" for the front fork.



Coat the shift forks with engine oil.

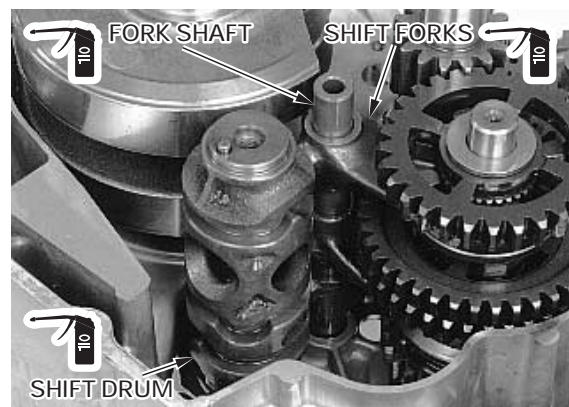
Install the shift forks into the gear shifter grooves (R fork into M3 gear, C fork into C4 gear and F fork into gear shifter) with their identification marks facing up (front crankcase side).

Apply engine oil to the shift drum guide pin grooves and journals.

Install the shift drum while inserting the shift fork guide pins into the guide pin grooves properly.

Coat the shift fork shaft with engine oil.

Install the fork shaft through the shift forks and into the crankcase.

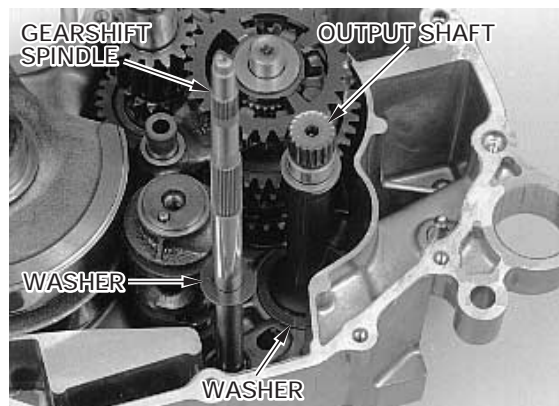


CRANKCASE/TRANSMISSION/CRANKSHAFT

Install the output shaft into the crankcase with the washer.

Install the sub-gearshift spindle and the washer.

Assemble the crankcase halves (page 11-16).



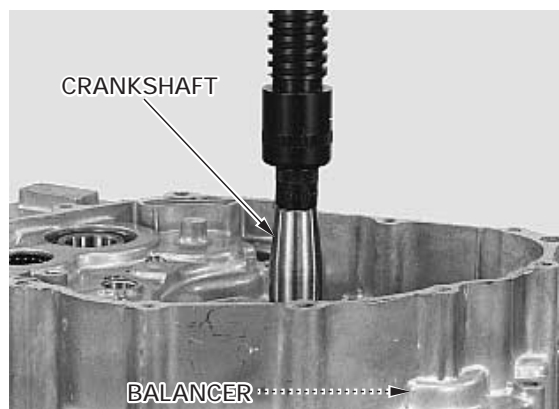
CRANKSHAFT/BALANCER

REMOVAL

Separate the crankcase (page 11-3).
Remove the transmission (page 11-4).

Be careful not to damage the crankcase mating surface and crankshaft assembly.

Remove the crankshaft and balancer from the rear crankcase using a hydraulic press. Be sure to hold the crankshaft and balancer while pressing them out of the crankcase.



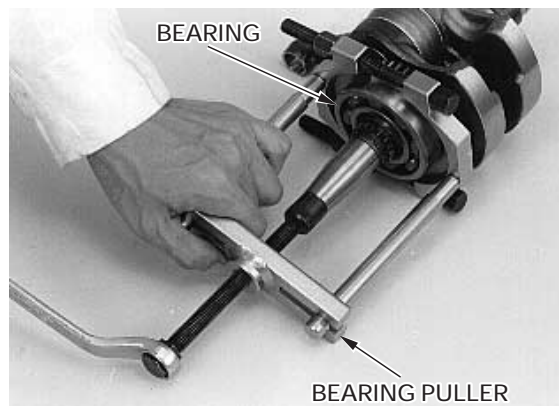
If the rear crankshaft bearing is left on the crankshaft, remove it using the bearing puller with a suitable protector.

TOOL:

Universal bearing puller 07631-0010000 or equivalent commercially available in U.S.A.

NOTE:

- Always replace the rear crankshaft bearing with a new one when the crankshaft is removed.

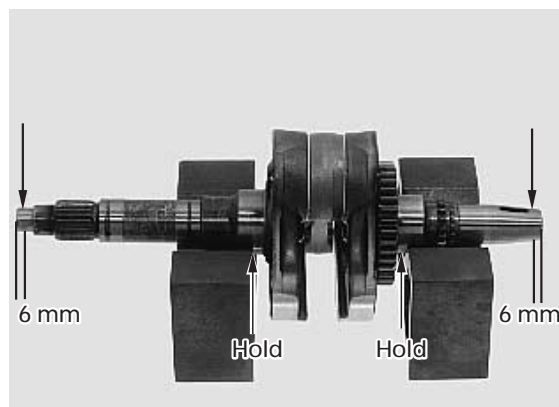


INSPECTION

CRANKSHAFT

Set the crankshaft as shown and measure the runout using a dial indicator.

SERVICE LIMIT: 0.05 mm (0.002 in)



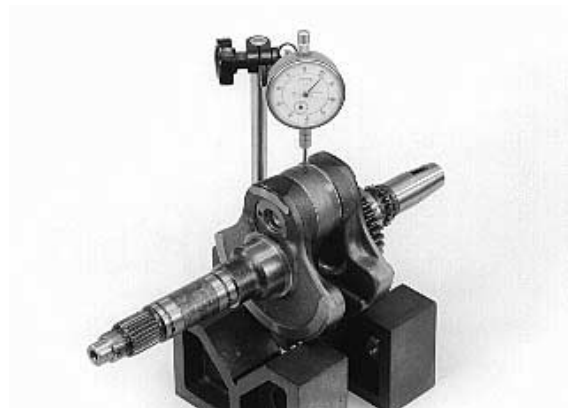
Measure the side clearance between the connecting rod big end and crank weight with a feeler gauge.

SERVICE LIMIT: 0.8 mm (0.03 in)



Measure the radial clearance at the connecting rod big end.

SERVICE LIMIT: 0.05 mm (0.002 in)



BALANCER

Check the balancer gear for wear or damage.



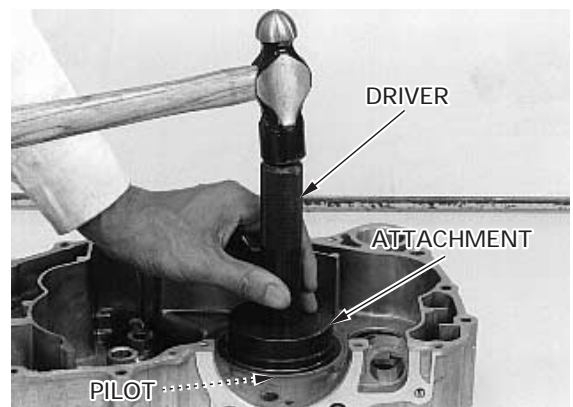
INSTALLATION

Apply engine oil to a new rear crankshaft bearing. Drive the crankshaft bearing into the rear crankcase with the marking side facing up.

TOOLS:

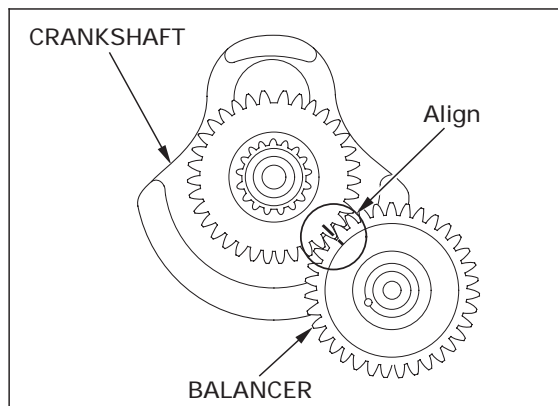
Driver	07749-0010000
Attachment, 72 × 75 mm	07746-0010600
Pilot, 35 mm	07746-0040800

For front crankshaft bearing replacement, see page 11-12.



CRANKCASE/TRANSMISSION/CRANKSHAFT

Engage the balancer and crankshaft by aligning the index lines on the side surfaces of the balancer drive and driven gears and install the crankshaft and balancer together into the rear crankcase.



Be careful not to let the connecting rod press against the crankcase mating surface while drawing.

Assemble the special tools onto the crankshaft. Draw the crankshaft into the bearing inner race.

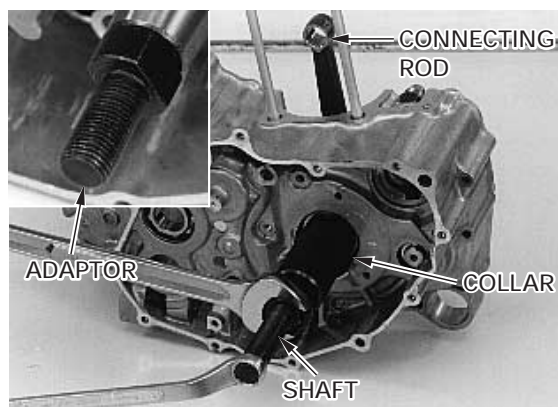
TOOLS:

Crankcase assembly tool

—assembly collar
—assembly shaft

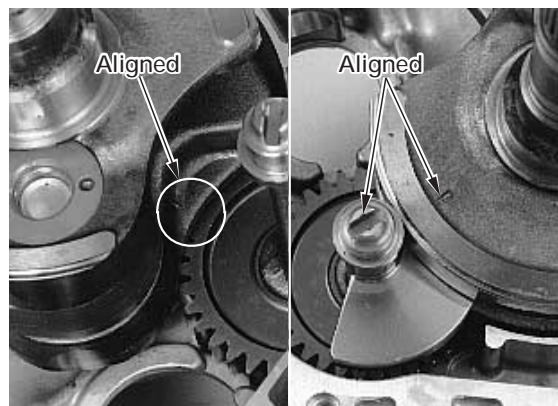
—threaded adapter

07965-VM00000
not available in U.S.A.
07965-VM00100
07965-VM00200
not available in U.S.A. or
07931-ME4010B and
07931-HB3020A
07965-VM00300
not available in U.S.A. or
07931-KF00200



After installing the crankshaft in, make sure that the index lines on the crank weight and balancer driven gear are aligned, and the index line on the crank weight is aligned with the groove in the balancer shaft.

Install the transmission (page 11-7).
Assemble the crankcase halves (page 11-16).

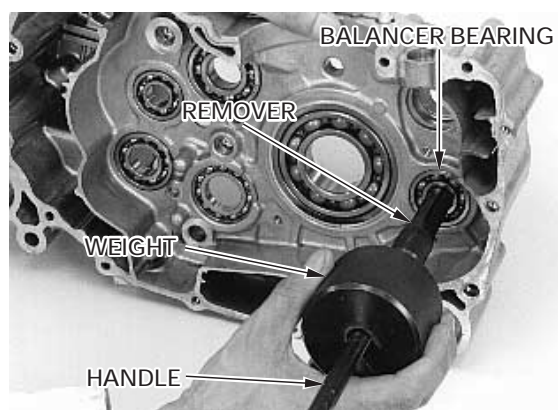


CRANKCASE BEARING REPLACEMENT FRONT CRANKCASE

Remove the balancer bearing with the special tools.

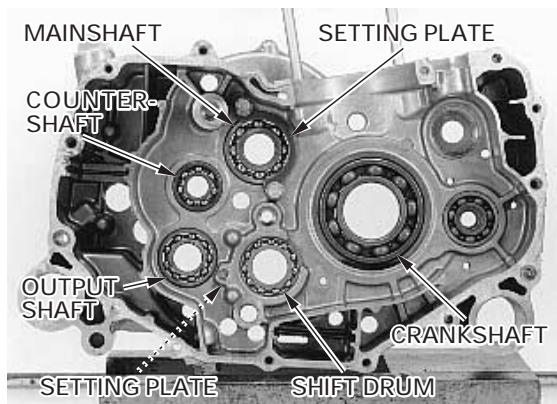
TOOLS:

Bearing remover, 17 mm 07936-3710300
Remover handle 07936-3710100
Remover weight 07936-371020A or
07936-3710200



Remove the bolts and shift drum bearing and mainshaft bearing setting plates.

Drive the crankshaft, output shaft, shift drum, mainshaft and countershaft bearings out of the front crankcase.



Apply engine oil to new bearings.
Drive the bearings in with the marking side facing out using the special tools.

TOOLS:

Mainshaft bearing:

Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 22 mm	07746-0041000

Countershaft bearing:

Driver	07749-0010000
Attachment, 37 × 40 mm	07746-0010200
Pilot, 15 mm	07746-0040300

Output shaft bearing:

Driver	07749-0010000
Attachment, 42 × 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500

Shift drum bearing:

Driver	07749-0010000
Attachment, 42 × 47 mm	07746-0010300
Pilot, 25 mm	07746-0040600

Crankshaft bearing:

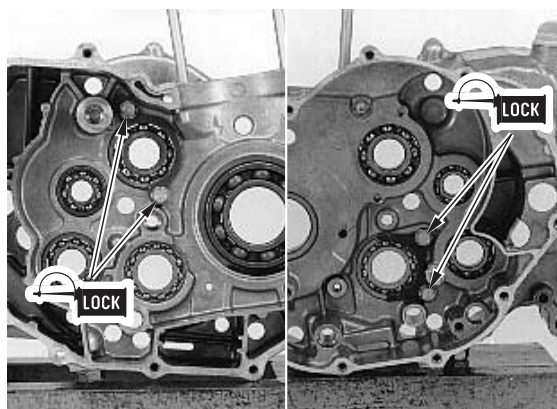
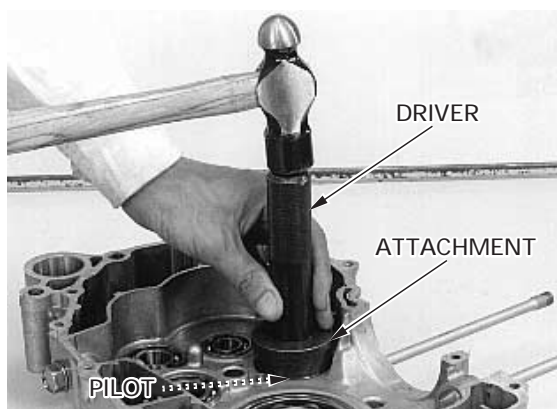
Driver	07749-0010000
Attachment, 72 × 75 mm	07746-0010600
Pilot, 40 mm	07746-0040900

Balancer bearing:

Driver	07749-0010000
Attachment, 37 × 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400

Apply locking agent to the bearing setting plate bolt threads.

Install the mainshaft bearing and shift drum bearing setting plates and tighten the bolts.

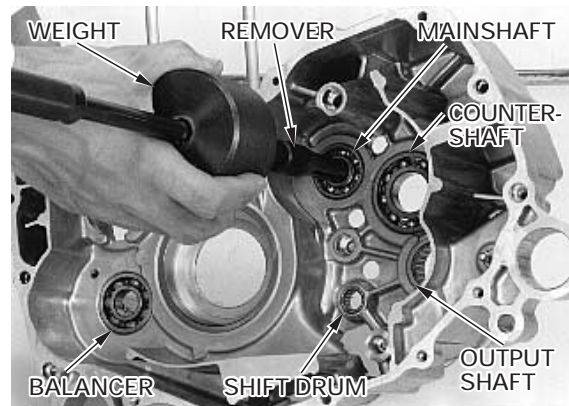


REAR CRANKCASE

Remove the mainshaft bearing with the special tools.

TOOLS:

Bearing remover set, 15 mm	07936-KC10000 not available in U.S.A.
—Bearing remover, 15 mm	07936-KC10500
—remover head	07936-KC10200
—remover shaft	07936-KC10100 not available in U.S.A.
—Remover weight	07936-371020A or 07936-3710200



Drive the countershaft and balancer bearings out of the rear crankcase.

Wear heavy gloves to avoid burns when handling the heated crankcase. Using a torch to heat the crankcase may cause warpage.

Heat the crankcase 80°C (176°F) evenly using a heat gun and remove the shift drum and output shaft bearings.

Apply engine oil to new bearings.

Drive the following bearings in with the marking side facing up using the special tools.

TOOLS:

Mainshaft bearing:

Driver	07749-0010000
Attachment, 32 × 35 mm	07746-0010100
Pilot, 15 mm	07746-0040300

Countershaft bearing:

Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 25 mm	07746-0040600

Balancer bearing:

Driver	07749-0010000
Attachment, 37 × 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400

Press the output shaft bearings in until they are fully seated.

TOOLS:

Driver	07749-0010000
Attachment, 37 × 40 mm	07746-0010200
Pilot, 28 mm	07746-0041100

Press the shift drum bearing in until it is fully seated.

TOOLS:

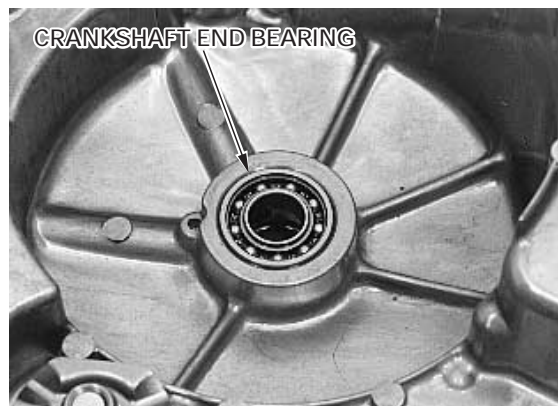
Driver	07749-0010000
Pilot, 15 mm	07746-0040300

FRONT CRANKCASE COVER

Remove the crankshaft end bearing with the special tools.

TOOLS:

Bearing remover set, 15 mm	07936-KC10000 not available in U.S.A.
— Bearing remover, 15 mm	07936-KC10500
— remover head	07936-KC10200
— remover shaft	07936-KC10100 not available in U.S.A.
— Remover weight	07936-371020A or 07936-3710200



Remove the output joint shaft (FM/FE) and sub-gearshift spindle (TE/FE) oil seals.

Heat the crankcase cover 80°C (176°F) evenly using a heat gun and remove the needle bearings.

Apply engine oil to new bearings.

Drive the crankshaft end bearing in with the sealed side facing down using the special tools.

TOOLS:

Driver	07749-0010000
Attachment, 32 × 35 mm	07746-0010100
Pilot, 15 mm	07746-0040300

Wear heavy gloves to avoid burns when handling the heated crankcase cover. Using a torch to heat the crankcase cover may cause warpage.

FM/FE model only: Press the output joint shaft bearing in with the marking side facing up until they are fully seated.

TOOLS:

Driver	07749-0010000
Attachment, 24 × 26 mm	07746-0010700
Pilot, 20 mm	07746-0040500

TE/FE model only: Press the gearshift spindle bearing in with the marking side facing up until it is flush with the crankcase cover.

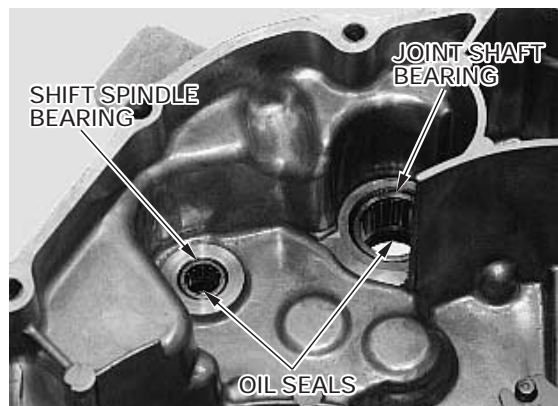
TOOLS:

Driver	07749-0010000
Pilot, 17 mm	07746-0040400

Install the crankshaft (page 11-11).

Install the transmission (page 11-7).

Assemble the crankcase halves (page 11-16).

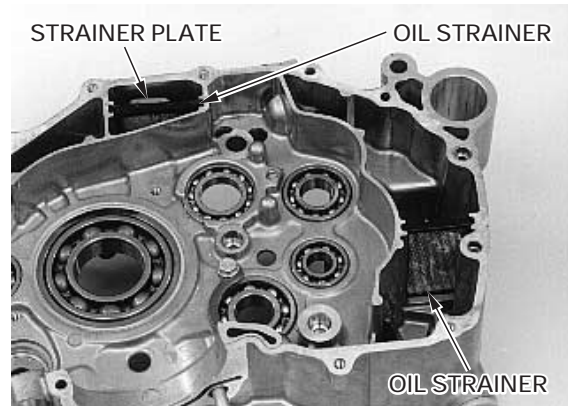


CRANKCASE ASSEMBLY

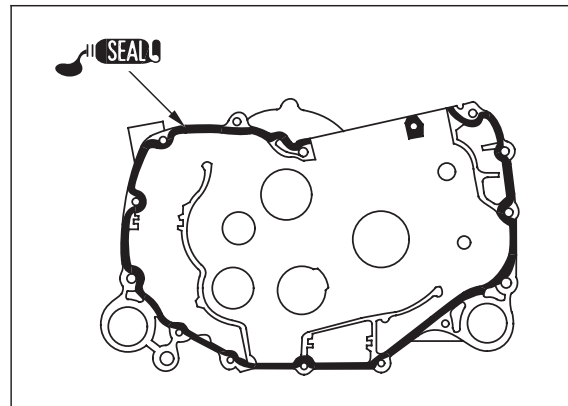
Clean the front and rear crankcase mating surfaces thoroughly, being careful not to damage them. Blow through the oil passages in the crankcases with compressed air.

Wash the strainer screen thoroughly in high flash point solvent until all accumulated dirt has been removed. Blow the screen dry with compressed air.

Install the strainer plate and oil strainers with the thin side of the strainer facing toward the crankcase.



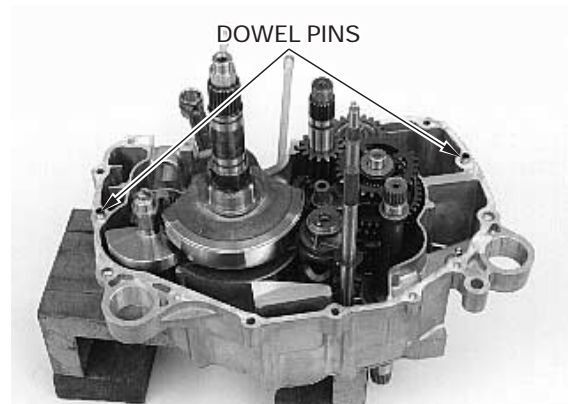
Apply liquid sealant to the mating surface (shadowed area) of the front crankcase as shown.



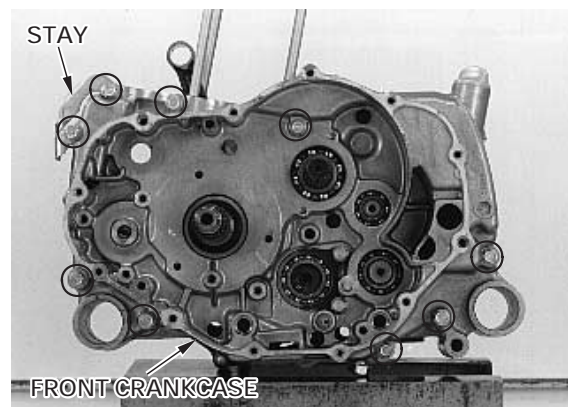
Install the dowel pins.

Make sure all the parts are installed in the rear crankcase.

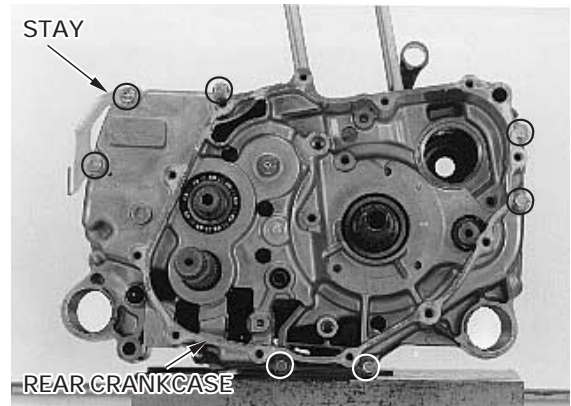
Install the front crankcase over the rear crankcase.



Install the nine front crankcase bolts with the stay and tighten them in a crisscross pattern in 2 or 3 steps.



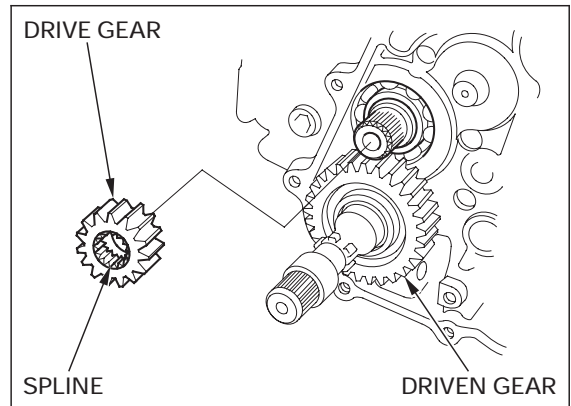
Install the seven rear crankcase bolts with the stay and tighten them in a crisscross pattern in 2 or 3 steps.



Install the output shaft driven gear and the drive gear with the spline side facing out.

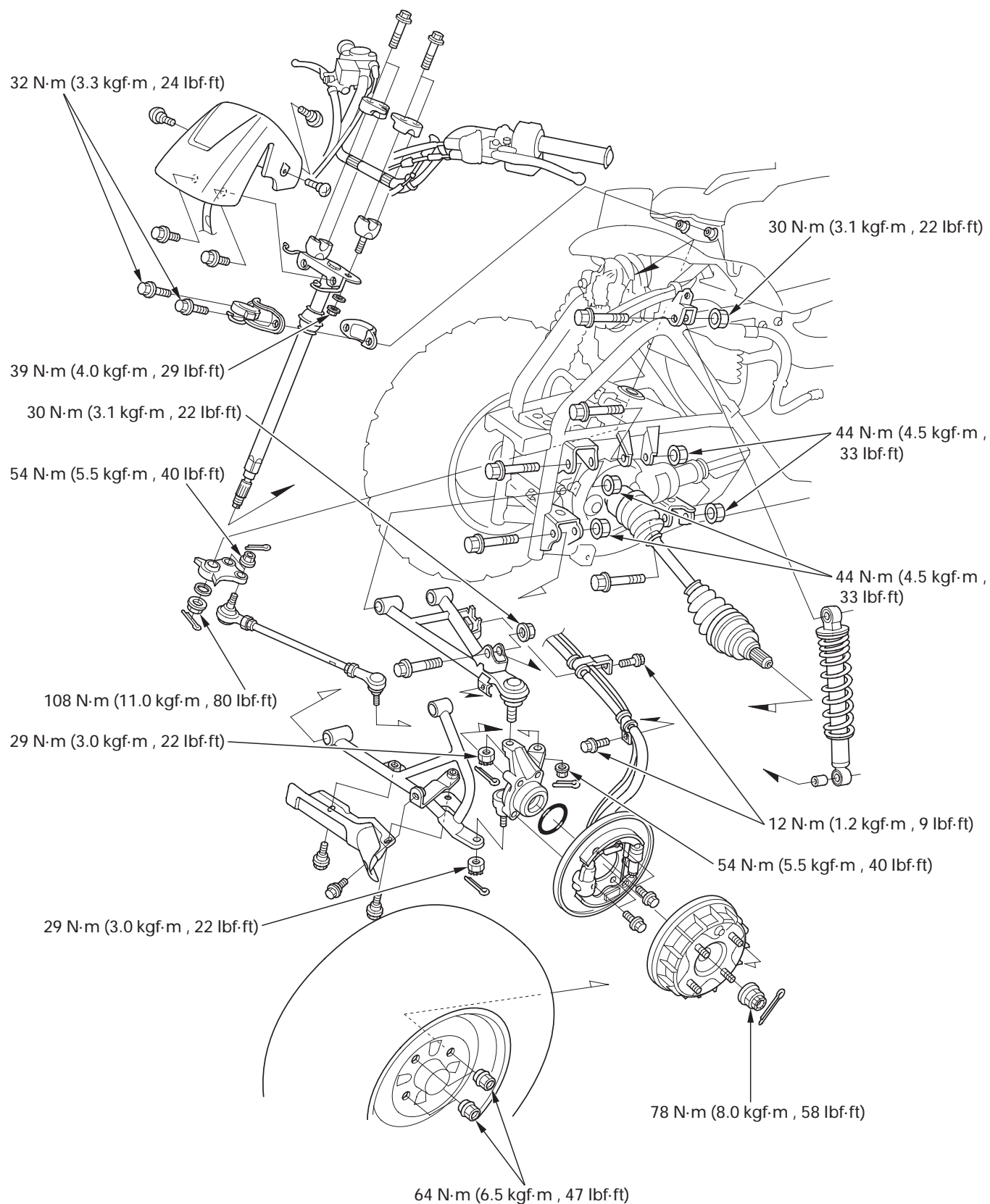
Install the following:

- camshaft (section 7)
- flywheel and starter clutch (section 10)
- oil pump (section 4)
- gearshift linkage and clutch (section 9)
- cylinder and piston (section 8)
- cylinder head (section 7)
- engine (section 6)



FRONT WHEEL/SUSPENSION/STEERING

FE model shown:



FRONT WHEEL/SUSPENSION/STEERING

TORQUE VALUES

Handlebar lower holder nut	39 N·m (4.0 kgf·m , 29 lbf·ft)	Lock nut
Front master cylinder holder bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)	
Throttle housing cover screw	2 N·m (0.2 kgf·m , 1.4 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)	Apply grease to the threads and seating surface/
		Castle nut
Shock absorber mounting nut	30 N·m (3.1 kgf·m , 22 lbf·ft)	Lock nut
Upper and lower arm pivot nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut
Upper and lower arm ball joint nut	29 N·m (3.0 kgf·m , 22 lbf·ft)	Castle nut
Brake hose clamp bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)	
Tie-rod stud joint nut	54 N·m (5.5 kgf·m , 40 lbf·ft)	Lock nut
Tie-rod lock 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)	Apply grease to the threads and seating surface
Steering shaft holder bolt	32 N·m (3.3 kgf·m , 24 lbf·ft)	

TOOLS

Bearing remover set, 20 mm	07936-3710001 not available in U.S.A.
— Bearing remover, 20 mm	07936-3710600
— Remover handle	07936-3710100
— Remover weight	07936-371020A or 07936-3710200
Driver	07749-0010000
Driver	07949-3710001
Attachment, 28 × 30 mm	07946-1870100
Attachment, 32 × 35 mm	07746-0010100
Attachment, 42 × 47 mm	07746-0010300
Attachment, 15 mm I.D.	07746-0020200
Attachment, 20 mm I.D.	07746-0020400
Pilot, 20 mm	07746-0040500
Pilot, 30 mm	07746-0040700
Attachment	07945-3330300
Ball joint remover, 28 mm	07MAC-SL00200
Oil seal driver	07JAD-PH80101
Ball joint remover/installer	07WMF-HN00100
Ball joint remover/installer	07JMF-HC50110

TROUBLESHOOTING

Hard steering

- Steering shaft holder too tight
- Damaged steering shaft bearing/bushing
- Insufficient tire pressure

Steers one side or does not track straight

- Incorrect wheel alignment
- Unequal tire pressure
- Bent tie-rod, suspension arm or frame
- Worn or damaged knuckle bearing or brake drum bearing
- Weak shock absorber

Front wheel wobbling

- Bent rim
- Worn or damaged knuckle bearing or brake drum bearing
- Faulty tire
- Axle nut not tightened properly

Soft suspension

- Weak shock absorber spring
- Faulty shock absorber damper

Hard suspension

- Bent shock absorber damper rod
- Improperly installed suspension arms
- Faulty suspension arm bushings

Front suspension noise

- Loose front suspension fasteners
- Damaged suspension components

HANDLEBAR

REMOVAL

U.S.A. TM/FM models: Disconnect the ignition switch 4P and indicator 6P connectors, and open the two wire clips on the frame and steering shaft holder.

Remove the following:

- fuel tank breather tube
- cover cap
- two screws
- handlebar cover



Except U.S.A. TM/FM models,: Disconnect the ignition switch 4P and meter 14P connectors, and open the two wire clips on the frame and steering shaft holder.

Remove the following:

- fuel tank breather tube
- three screws
- breather hose (from steering shaft hole)
- meter cover



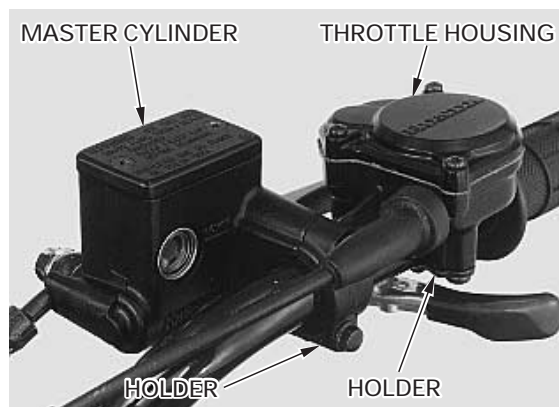
- two bolts
- meter mounting bracket/meter



Remove the following:

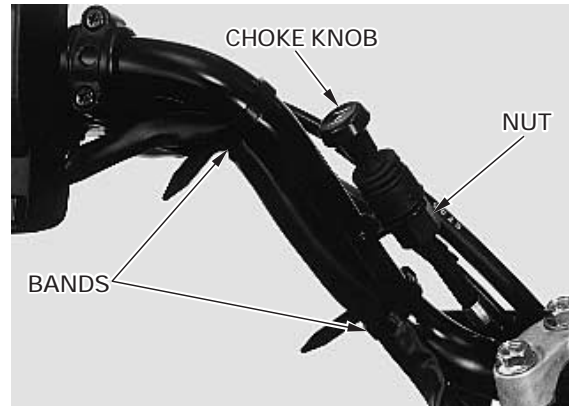
- two screws
- holder
- throttle housing
- two bolts
- holder
- master cylinder

Keep the brake master cylinder upright to prevent air from entering the hydraulic system.

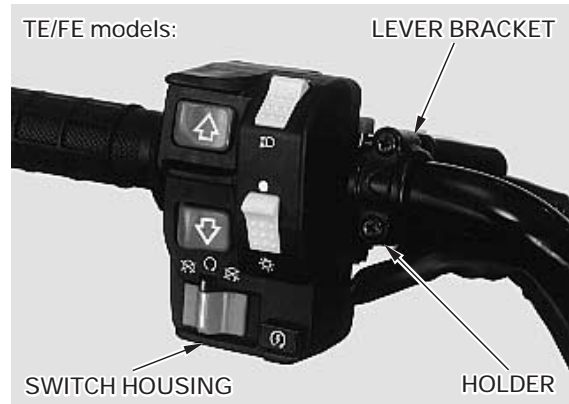
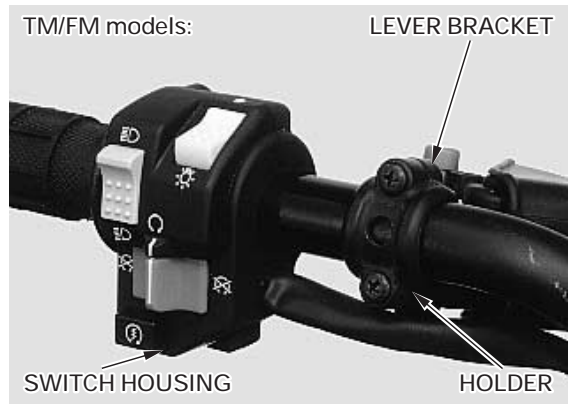


FRONT WHEEL/SUSPENSION/STEERING

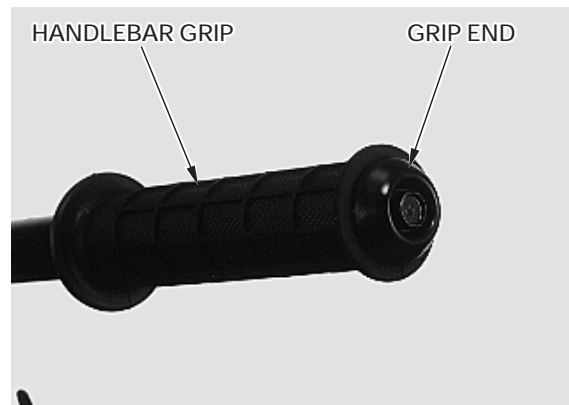
- choke knob (loosening the lock nut)
- two wire bands



- two screws
- holder
- rear (parking) brake lever bracket
- two screws (TM/FM models)
- three screws (TE/FE models)
- handlebar switch



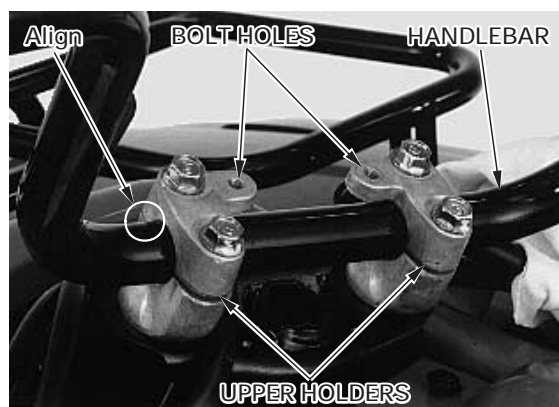
- bolts
- grip ends
- handlebar grips



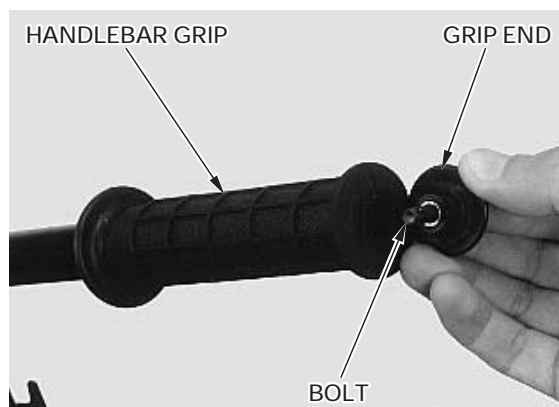
- four bolts
- upper holders
- handlebar

INSTALLATION

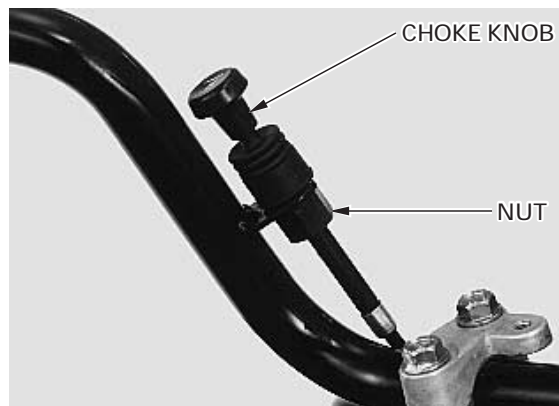
Route the wires and cables properly (page 1-22). Place the handlebar onto the lower holders and align the punch mark on the handlebar with the top of the lower holder. Install the upper holders with the bolt holes facing forward. Install the four bolts and tighten the forward bolts first, then tighten the rear bolts.



Apply Honda Bond A or Honda Hand Grip Cement (U.S.A. only) to the inside surface of the handlebar grip and to the clean surface of the handlebar. Wait 3—5 minutes and install the grip. Rotate the grip for even application of the adhesive. Install the grip end with the screw securely.



Install the choke knob into the stay and tighten the lock nut.



TM/FM models: Install the handlebar switch housing by aligning its locating pin with the hole in the handlebar. Tighten the upper screw first, then tighten the lower screw.

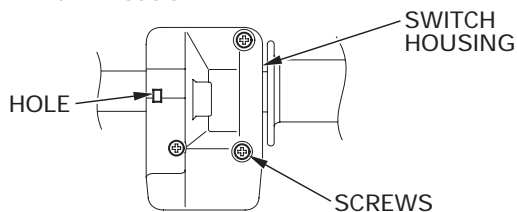


FRONT WHEEL/SUSPENSION/STEERING

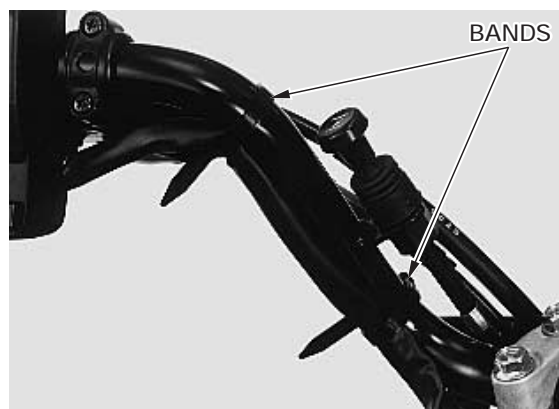
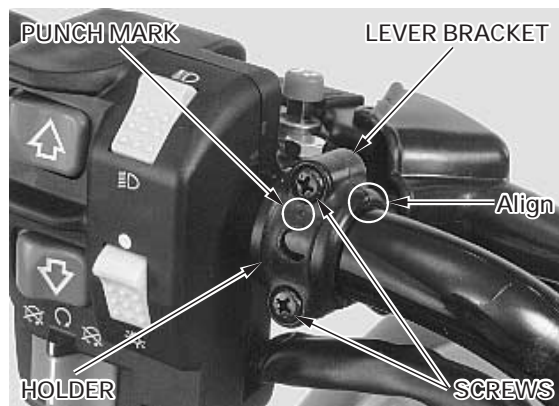
TM/FM models: Install the brake lever bracket and holder with the punch mark facing up. Align the right edge of the bracket with the outside punch mark on the handlebar, and tighten the upper screw first, then the lower screw.

TE/FE models: Loosely install the handlebar switch housing with the three screws. Install the brake lever bracket and holder with the punch mark facing up by aligning the locating pin on the lever bracket with the hole in the switch housing. Align the right edge of the bracket with the inside punch mark on the handlebar, and tighten the bracket upper screw first, then the lower screw. Tighten the housing upper screw first, then the lower screws.

TE/FE models:

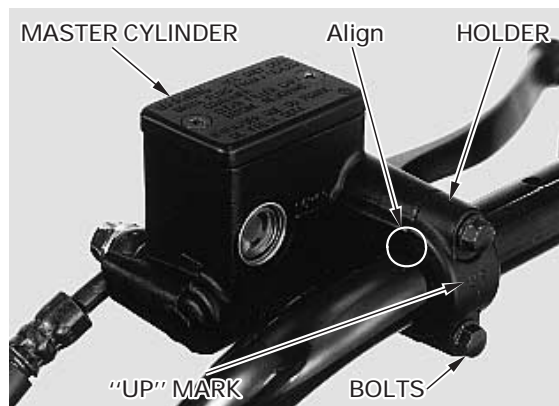


Secure the switch wire with the wire bands.



Install the master cylinder and holder with the "UP" mark facing up. Align the edge of the master cylinder with the punch mark on the handlebar, and tighten the upper bolt first, then the lower bolt.

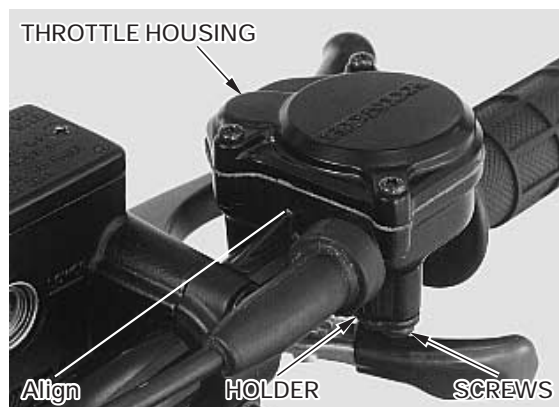
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



Install the throttle housing and holder against the master cylinder. Align the lug on the throttle housing with the slit of the master cylinder, and tighten the forward screw first, then the rear screw.

Install the following in the reverse order of removal:

- handlebar cover (U.S.A. TM/FM models)
- combination meter and meter cover (Except U.S. A. TM/FM)
- breather tube



THROTTLE HOUSING

DISASSEMBLY

Remove the following:

- three screws
- throttle housing cover
- gasket



Slide the boot off the throttle cable adjuster.
Loosen the cable adjuster.

Bend down the lock washer tab and remove the pivot nut, lock washer, throttle arm and return spring, then the throttle lever with the plastic washer.

Disconnect the throttle cable from the throttle arm.
Remove the dust seal from the housing bottom.



ASSEMBLY

Apply grease to the throttle lever pivot in the housing.

Coat a new dust seal lip with grease and install it into the housing until it is fully seated.

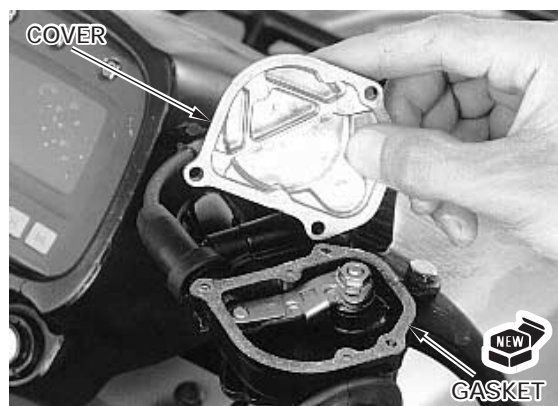
Apply grease to the throttle cable end and connect the cable to the throttle arm.

Insert the throttle lever with the washer into the housing and install the throttle arm with the spring over the throttle lever pivot by aligning the flat surfaces.

Install a new lock washer and the pivot nut.

Tighten the pivot nut and bend up the washer tab against the nut.

Install the housing cover with a new gasket and tighten the three screws.



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

Adjust the throttle lever free play (page 3-5).

FRONT WHEEL

REMOVAL

Loosen the wheel nuts.

Place the support block under the frame to raise the front wheel off the ground.

Remove the nuts and wheel.



INSTALLATION

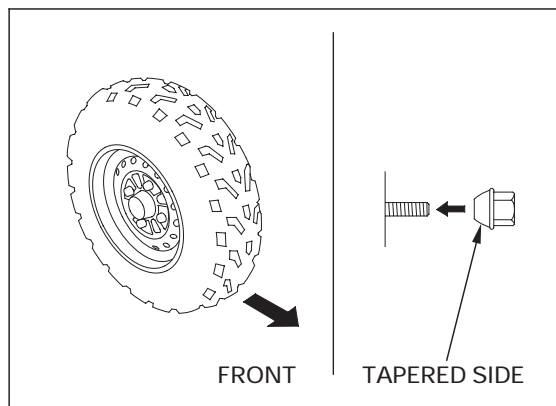
Install the wheel with the arrow mark facing in the normal rotating direction.

NOTE:

- Do not interchange the left and right tires.

Install the wheel nuts 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 Universal Bead Breaker (GN-AH-958-BB1).
- Remove and install the tire from the rim side opposite the valve stem.

Remove the core from the valve stem.

Do not damage the bead seating area of the rim. Use of an improper size blade may result in damage to the rim, tire or blade.

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.

Install the blade for 9/11" (rear) rims onto the breaker arm assembly. Use only one of the two white buttons.

Place the proper size adaptor onto the threaded shaft and then put the wheel over the threaded shaft and adaptor.

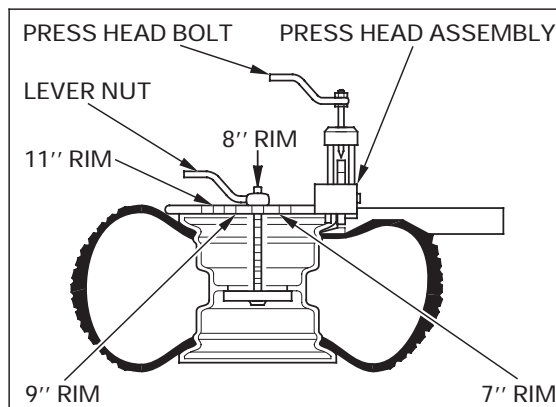
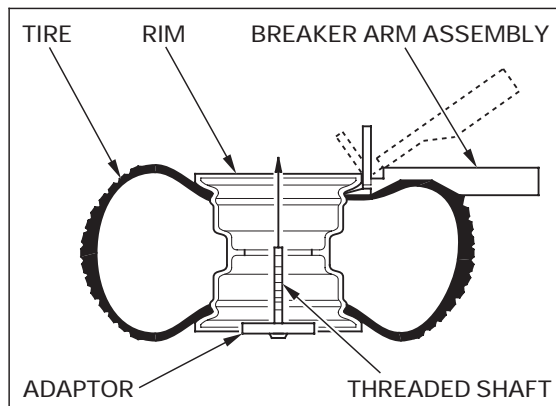
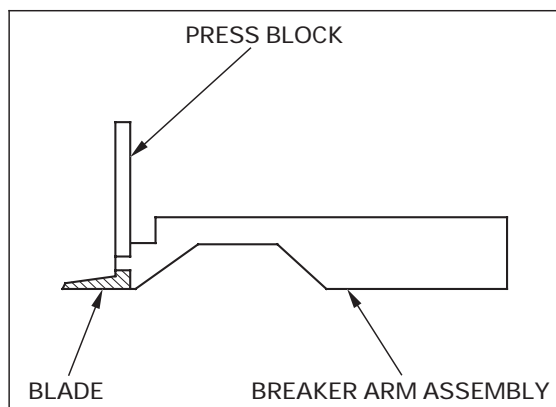
Use only water as a lubricant when removing or mounting tires. Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.

Lube the bead area with water, pressing down on the tire sidewall/bead area in several places to allow the water to run into and around the bead. Also lube the area where the breaker arm will contact the sidewall of the tire.

While holding the breaker arm assembly at an approximate 45° position, insert the blade of the breaker arm between the tire and rim. Push the breaker arm inward and downward until it is in the horizontal position with its press block in contact with the rim.

With the breaker arm in the horizontal position, place the breaker press head assembly over the breaker arm press block. Make sure the press head bolt is backed out all the way and then position the nylon button on the press head against the inside edge of the rim.

Insert the threaded shaft through the appropriate hole in the breaker press head assembly and then tighten the lever nut until both ends of the breaker press head assembly are in firm contact with the rim.



Tighten the press head bolt until the reference mark on the press block is aligned with the top edge of the press head.

If the rest of the bead cannot be pushed down into the center of the rim by hand, loosen the press head bolt and the lever nut.

Rotate the breaker arm assembly and breaker press head assembly 1/8 to 1/4 the circumference of the rim.

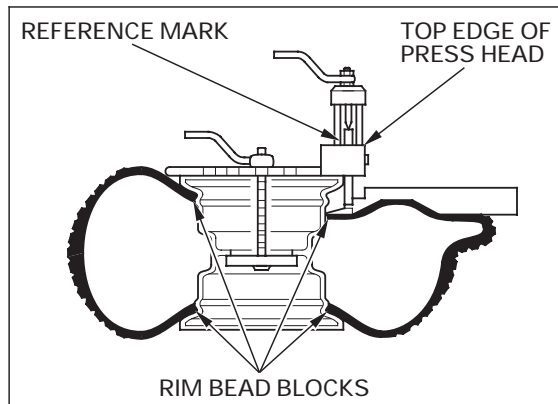
Tighten the lever nut and then tighten the press head bolt as described.

Repeat this procedure as necessary until the remainder of the bead can be pushed down into the center of the rim.

Assemble the Universal Bead Breaker on the other side of the wheel and break the bead following the same procedures.

Remove the tire from the rim using a tire changer machine or tire irons and rim protectors.

Remove the tire from the side of the rim that has the smallest shoulder area to simplify removal.



TIRE REPAIR

NOTE:

- Use the manufacturer's instructions for the tire repair kit you are using. If your kit does not have instructions, use the procedures provided here.

Check the tire for puncturing objects.

Chalk mark the punctured area and remove the puncturing object.

Inspect and measure the injury.

Tire repairs for injuries larger than 15 mm (5/8 in) should be a section repair.

Section repairs should be done by a professional tire repair shop.

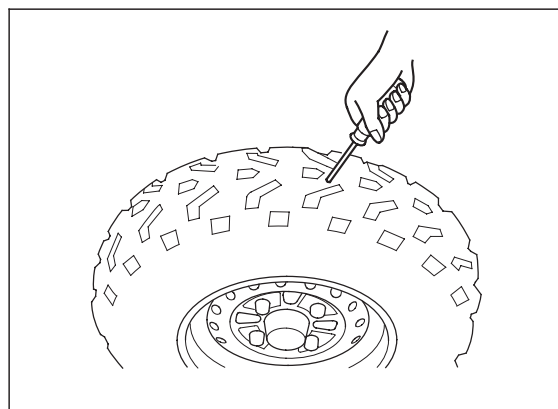
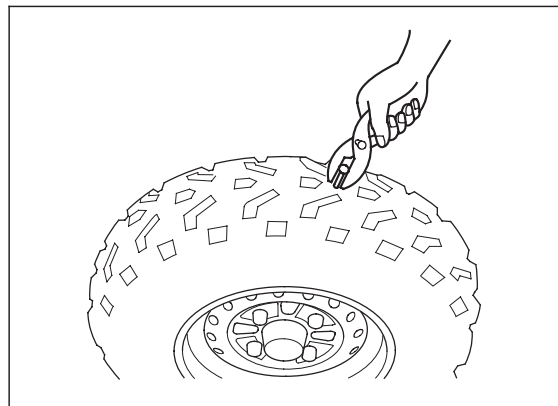
If the injury is smaller than 15 mm (5/8 in), proceed with the repair as described here.

Install a rubber plug into the injury as follows:

Apply a cement to a plug inserting needle and work the needle into the injury to clean and lubricate it.

Do this three times.

Do not let the cement dry.



FRONT WHEEL/SUSPENSION/STEERING

Insert and center a rubber plug through the eye of the inserting needle.

Apply cement to the rubber plug.

Push the inserting needle with plug into the injury until the plug is slightly above the tire.

Twist the needle and remove it from the tire; the plug will stay in the tire.

Trim the plug 6 mm (1/4 in) above the tire surface.

Repeat the above procedure if the puncture is large. Do not use more than two plugs per injury.

Allow the repair to dry. Drying time will vary with air temperature. Refer to the tire repair kit manufacturer's recommendations.

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 12-7) and apply a cold patch to the inside of the tire as described.

If a plug has been inserted, trim it even with the inner tire surface.

Temporarily place a rubber patch that is at least twice the size of the puncture over the injury. Make a mark around the patch, slightly larger than the patch itself.

Rough the area marked inside the tire with a tire buffer or a wire brush. Clean the rubber dust from the buffed area.

Apply cement over the area marked and allow it to dry until tacky.

Do not touch the cement with dirty or greasy hands. Remove the lining from the patch and center it over the injury.

Press the patch against the injury using a special roller.

ASSEMBLY

Install the tire onto the rim, where the rim shoulder width is the narrowest, to simplify installation.

Clean the rim bead seat and flanges.

Apply clean water to the rim flanges, bead seat and base.

Install the valve core in the valve stem.

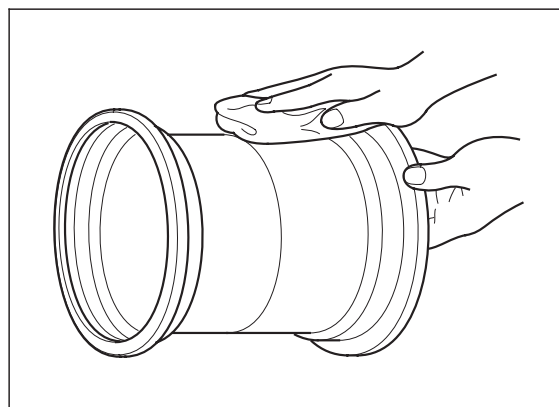
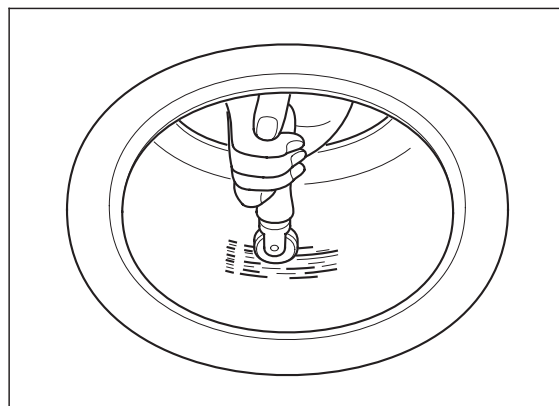
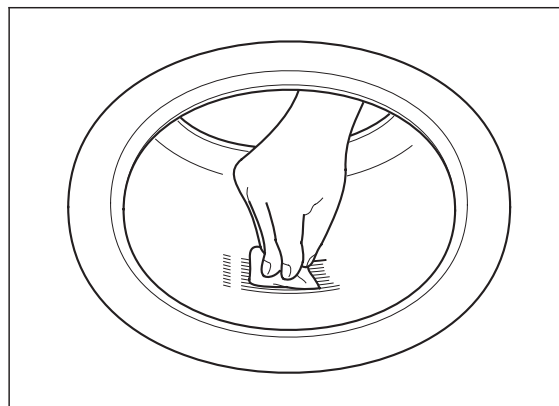
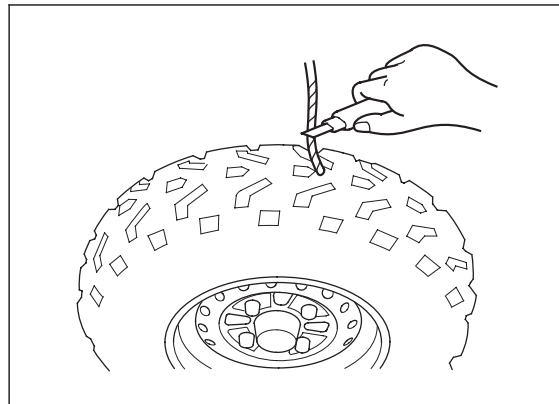
Install the tire with the arrow mark facing in the normal rotating direction.

Inflate the tire to seat the tire bead.

Deflate the tire. Wait 1 hour and inflate the tire to the specified pressure (page 3-18).

Check for air leaks and install the valve cap.

Be careful not to push the plug all the way into the tire to prevent it from falling inside.



Use only water as a lubricant 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 wheel (page 12-7).

Remove the following:

- cotter pin
- hub nut
- brake drum/hub

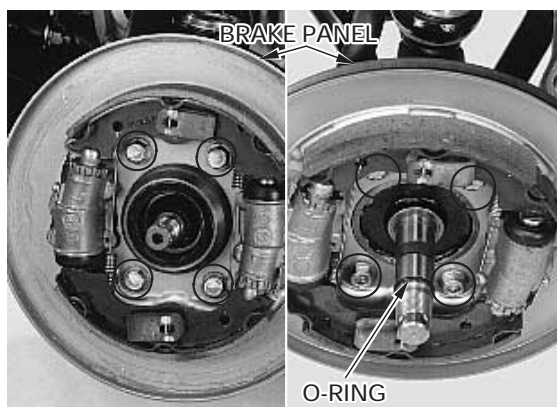
Do not get grease on the brake shoes or stopping power will be reduced.

For waterproof seal inspection, see section 14.

Do not twist the brake hose.

- O-ring (TM/TE model only)
- brake panel bolts

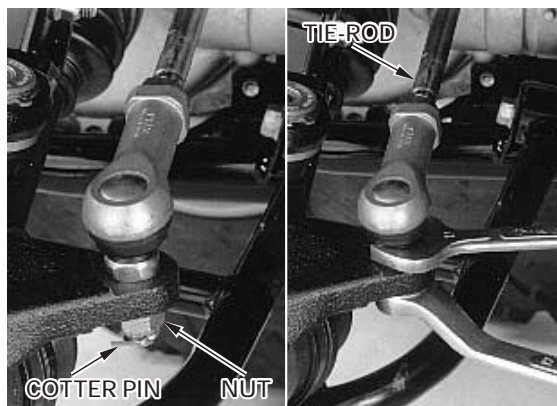
Support the brake panel so that it does not hang from the brake hose.



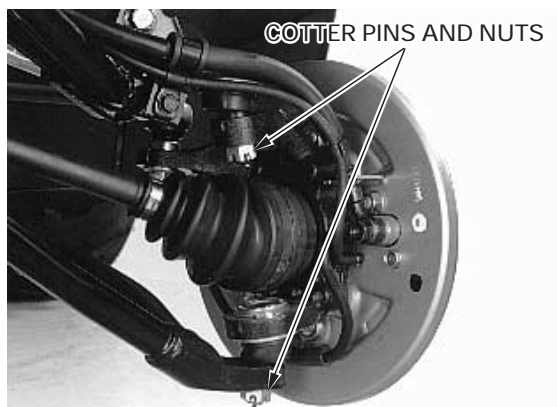
Remove the cotter pin from the tie-rod ball joint stud.

Remove the joint nut by holding the joint stud flat surfaces.

For tie-rod service, see page 12-19.



Remove the cotter pins from the ball joint studs. Loosen the joint nuts, but do not remove them yet.



FRONT WHEEL/SUSPENSION/STEERING

Release the ball joints, using the special tool according to the following instructions.

TOOL:

Ball joint remover, 28 mm 07MAC-SL00200

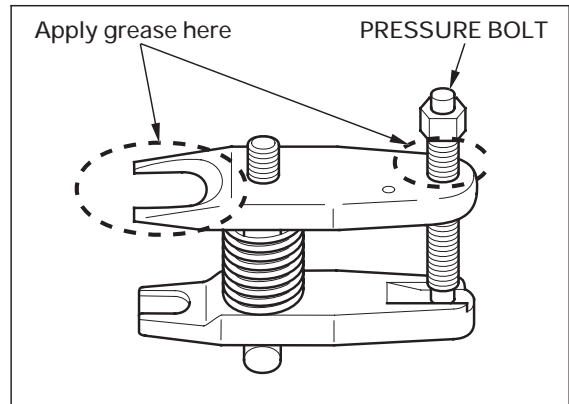


Apply grease to the ball joint remover at the point shown.
This will ease installation of the tool and prevent damage to the pressure bolt threads.

Insert the jaws carefully, making sure that you do not damage the ball joint boot.

Adjust the jaw spacing by turning the pressure bolt.

If necessary, apply penetrating type lubricant to loosen the ball joint.

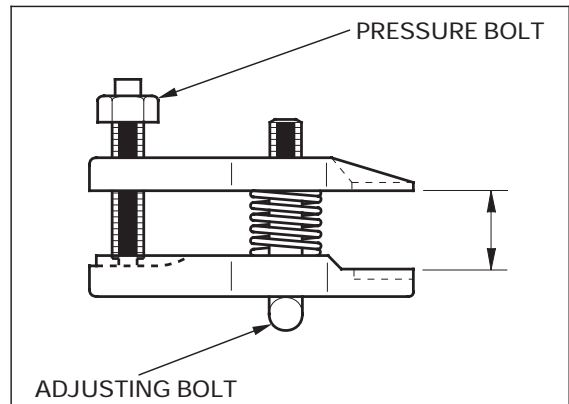


Once the tool is in place, turn the adjusting bolt as necessary to make the jaws parallel.

Then hand-tighten the pressure bolt and recheck the jaws to make sure they are still parallel.

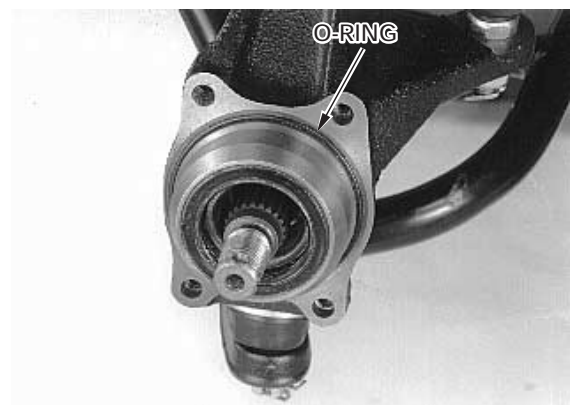
Tighten the pressure bolt with a wrench until the ball joint stud pops loose.

Remove the knuckle from the upper and lower arms by loosening the joint nuts.



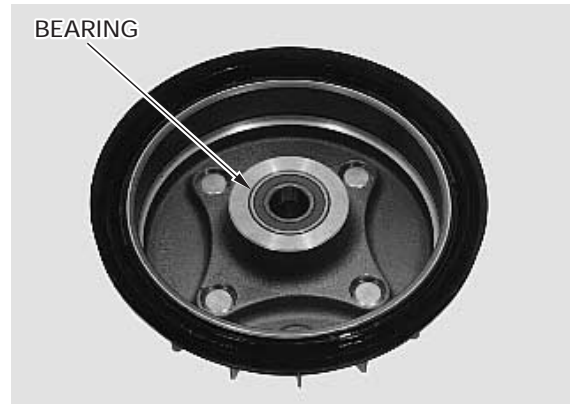
Remove the O-ring from the knuckle.

For suspension arm service, see page 12-16.



INSPECTION

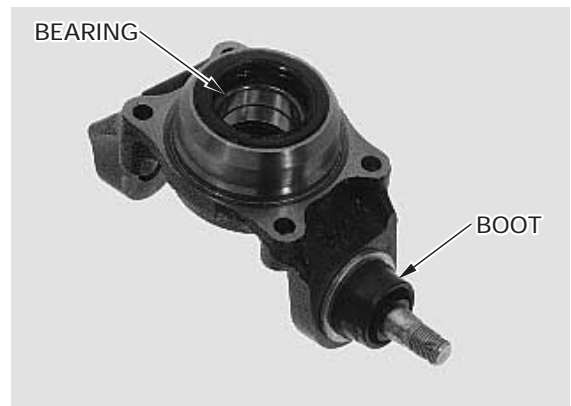
Turn the inner race of each bearing in the brake drum/hub (TM/TE models) and knuckle (FM/FE models) with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the hub or knuckle.



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.

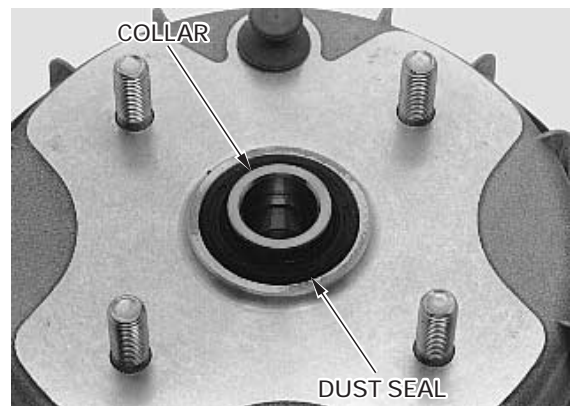
For ball joint replacement, see page 12-17.



BEARING REPLACEMENT

TM/TE model only: **HUB**

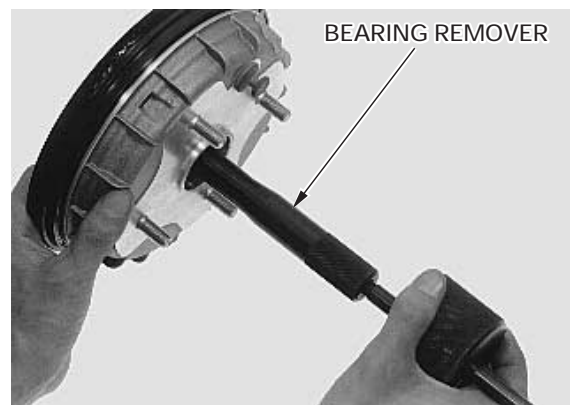
Remove the side collar and dust seal.



Replace the bearings in pairs. Remove the hub bearing with the special tools. Remove the distance collar and drive out the other bearing.

TOOLS:

Bearing remover set, 20 mm 07936-3710001
not available in U.S.A.
07936-3710600
—Bearing remover, 20 mm 07936-3710100
—Remover handle 07741-0010201 or
—Sliding weight 07936-371020A or
07936-3710200



FRONT WHEEL/SUSPENSION/STEERING

Drive in a new inner bearing (brake drum side) squarely with the marking side facing up until it is fully seated.

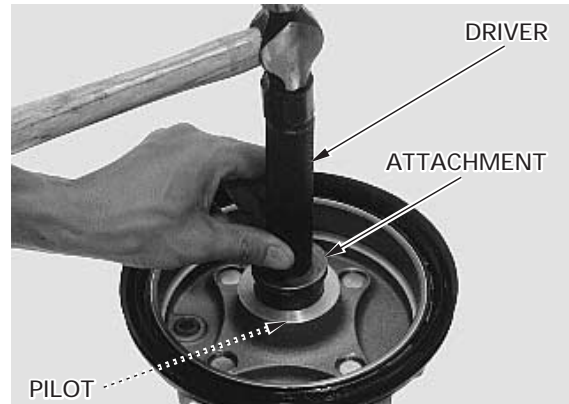
Install the distance collar.

Support the center boss of the hub to avoid damaging the waterproof seal.

Drive in a new outer bearing squarely with the marking side facing up until it is fully seated.

TOOLS:

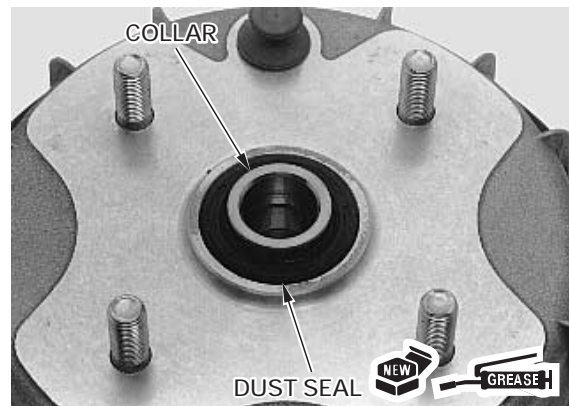
Driver	07749-0010000
Attachment, 42 × 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500



Apply grease to a new dust seal lips.

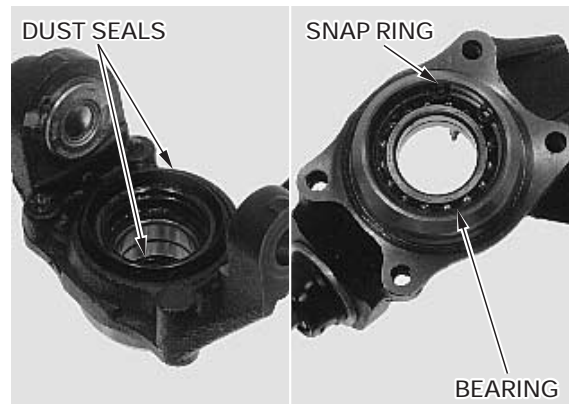
Install the dust seal until they are flush with the hub surface.

Install the side collar.



FM/FE model only: **KNUCKLE**

Remove the dust seals and the snap ring.
Drive the bearing out of the knuckle.

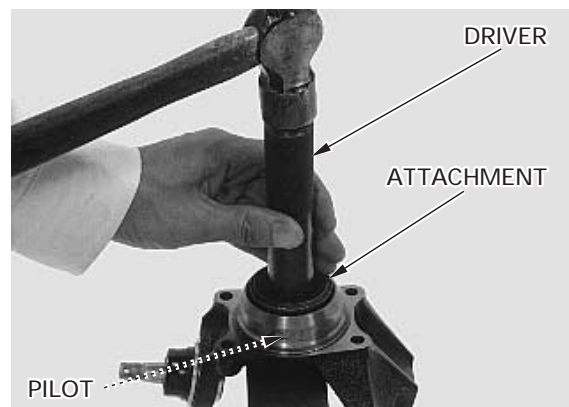


Pack the cavities of a new bearing with grease.
Drive in the bearing squarely with the marking side facing up until it is fully seated.

TOOLS:

Driver	07749-0010000
Attachment	07945-3330300
Pilot, 30 mm	07746-0040700

Install the snap ring into the knuckle groove with the chamfered edge facing in.



Apply grease to a new outer dust seal lips and install it using the same tools until it is flush with the knuckle end.



Apply grease to a new inner dust seal lips and install it until it is fully seated being careful not to damage the lips.

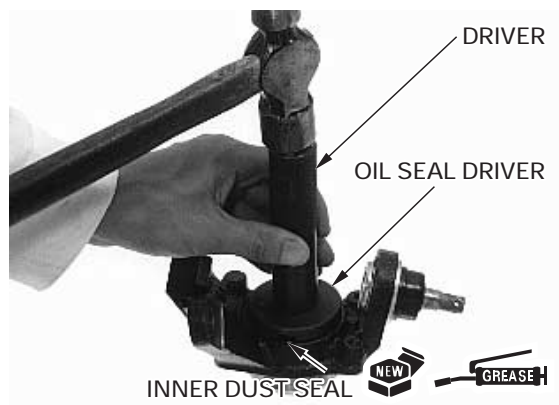
TOOLS:

Driver

07749-0010000

Oil seal driver

07JAD-PH80101



INSTALLATION

Install the knuckle onto the drive shaft (FM/FE only) and the lower and upper arms with the joint nuts. Connect the tie-rod into the knuckle with a new joint nut.

Tighten each arm joint nut to the specified torque and further tighten until their grooves align with the cotter pin hole.

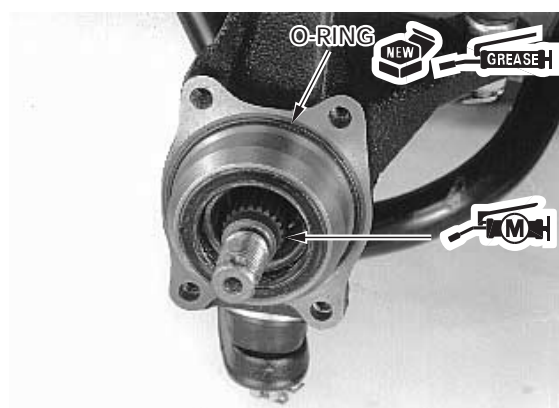
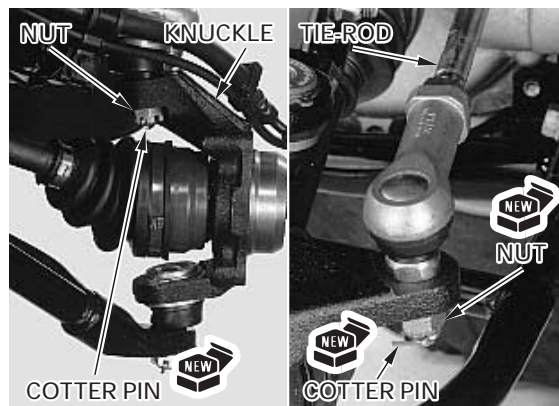
TORQUE: 29 N·m (3.0 kgf·m , 22 lbf·ft)

Tighten the tie-rod joint nut.

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

Install new cotter pins.

Coat a new O-ring with grease and install it onto the knuckle.



FRONT WHEEL/SUSPENSION/STEERING

Install the brake panel onto the knuckle and tighten the four bolts.

TM/TE model only: Coat a new O-ring with grease and install it into the axle groove.

NOTICE

Make sure that the waterproof seal on the brake drum is packed with the multi-purpose grease (NLGI # 3) (page 14-9).

FM/FE model only: Apply molybdenum disulfide grease to the drive shaft spline.

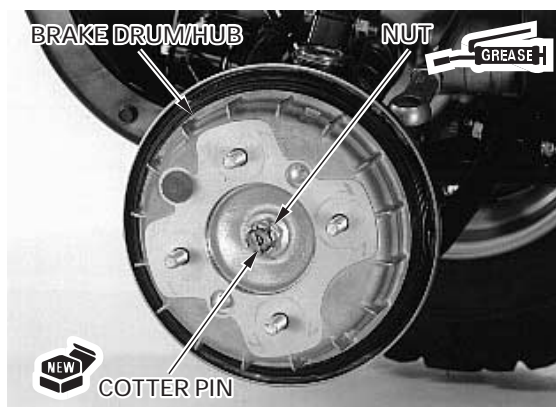
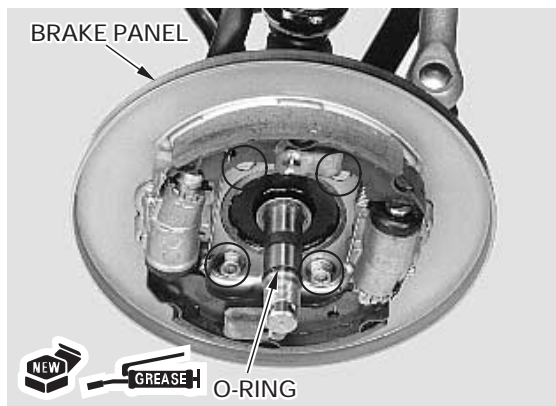
Apply grease to the hub nut threads and seating surface.

Do not get grease onto the brake drum and shoes. Install the brake drum/hub with the 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 wheel (page 12-8).

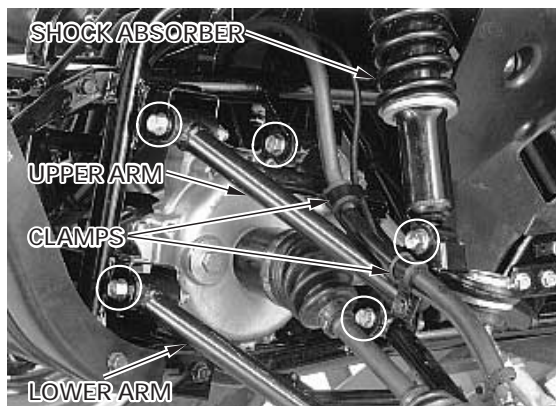
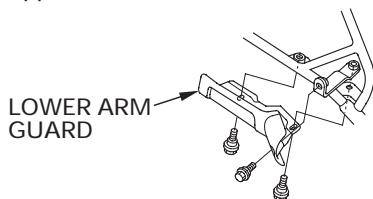


SUSPENSION ARM REMOVAL

Remove the knuckle (page 12-11).

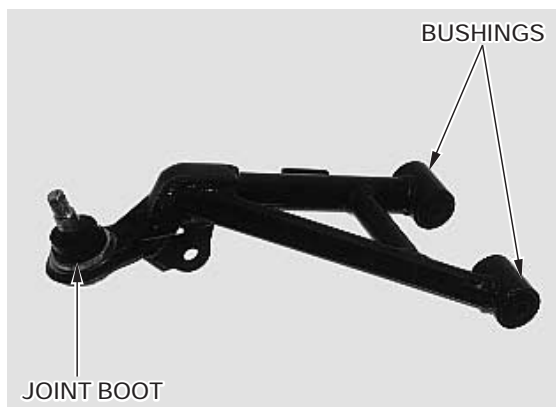
Remove the following:

- lower arm guard if necessary (FM/FE models)
- pivot nuts, bolts and lower arm
- two clamp bolts from upper arm
- shock absorber lower mounting nut and bolt
- pivot nuts, bolts (remove front side first) and upper arm



INSPECTION

Check the pivot bushings for wear or damage. Inspect the ball joint boot for tears or other damage by moving the ball joint studs. It should move freely and smoothly.



BALL JOINT REPLACEMENT**UPPER ARM**

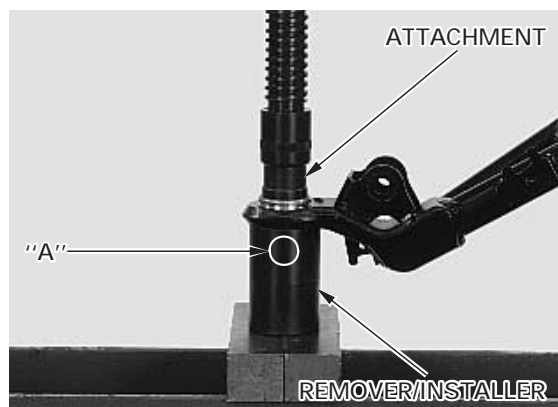
Remove the snap ring from the ball joint.



Set the upper arm and special tools with "A" mark side of the remover/installer facing to the ball joint as shown.
Press the ball joint out of the upper arm.

TOOLS:

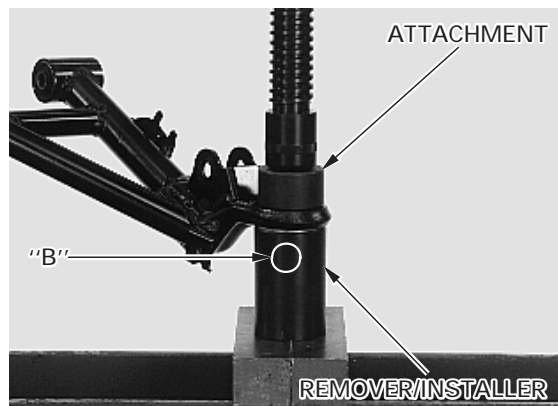
Ball joint remover/installer 07WMF-HN00100
Attachment, 28 × 30 mm 07946-1870100



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

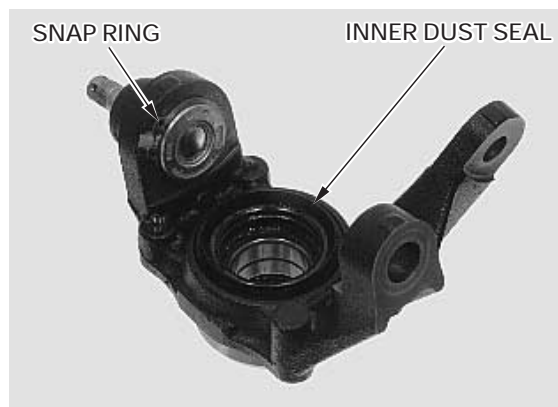
**NOTICE**

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.

KNUCKLE

Remove the snap ring and the inner dust seal (FM/FE model only).



FRONT WHEEL/SUSPENSION/STEERING

Set the knuckle and special tools with "A" mark side of the remover/installer facing to the ball joint, in a vise as shown.
Press the ball joint out of the knuckle.

TOOLS:

Ball joint remover/installer 07JMF-HC50110
Attachment, 28 × 30 mm 07946-1870100

Set the knuckle and special tools with "B" mark side of the remover/installer facing to the ball joint in a vise as shown.
Press the ball joint into the knuckle until it is fully seated.

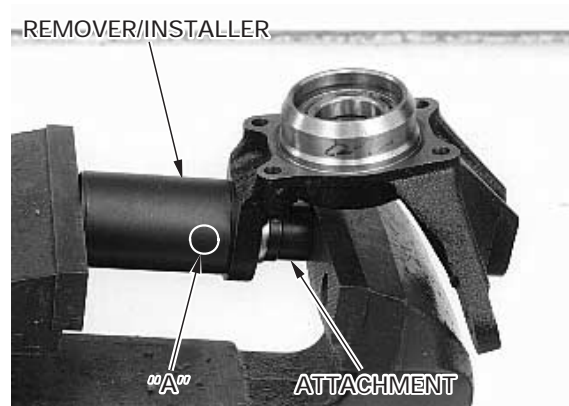
TOOLS:

Ball joint remover/installer 07JMF-HC50110
Attachment, 15 mm I.D. 07746-0020200

NOTICE

If you feel strong resistance when lowering the press, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.

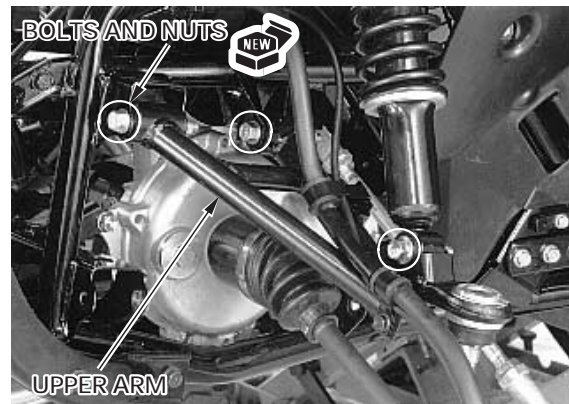
Install the snap ring with the chamfered edge facing in.
Install the dust seal (page 12-15).



INSTALLATION

Install the following:

- upper arm onto frame and shock absorber with pivot bolts (from front side)
- new pivot nuts



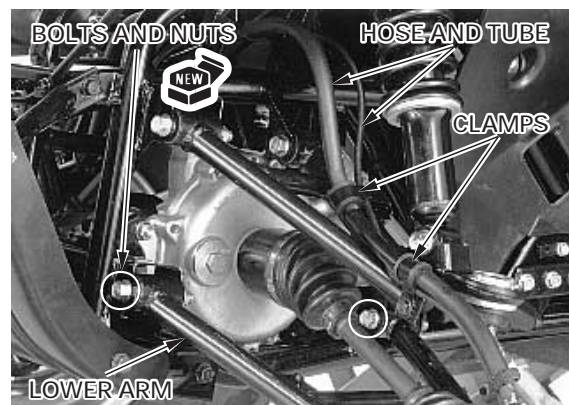
- lower arm with pivot bolts (from front side)
- new pivot nuts

TORQUE:

Upper/Lower arm: 44 N·m (4.5 kgf·m , 33 lbf·ft)
Shock absorber: 30 N·m (3.1 kgf·m , 22 lbf·ft)

Install the brake hose and breather tube onto the upper arm and tighten the two clamp bolts.

Install the knuckle (page 12-15).



STEERING SHAFT AND TIE-ROD

REMOVAL

When removing the tie-rod only, it can be removed without removing the front fender.

Remove the following:

- front fender (page 2-7)
- inner fenders (page 2-9)
- handlebar cover (U.S.A. TM/FM models)/meter cover and combination meter (Except U.S.A. TM/FM) (page 12-3)

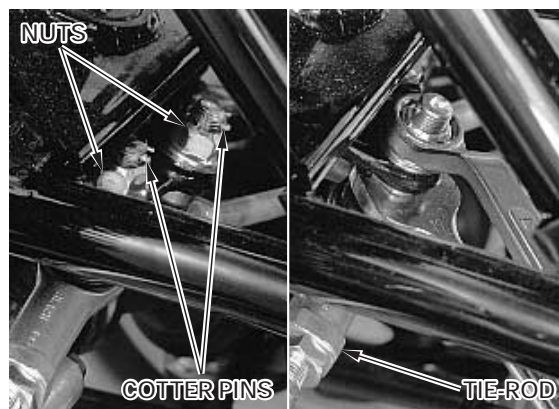
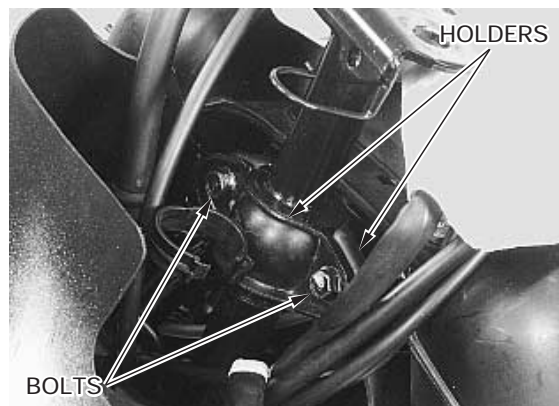
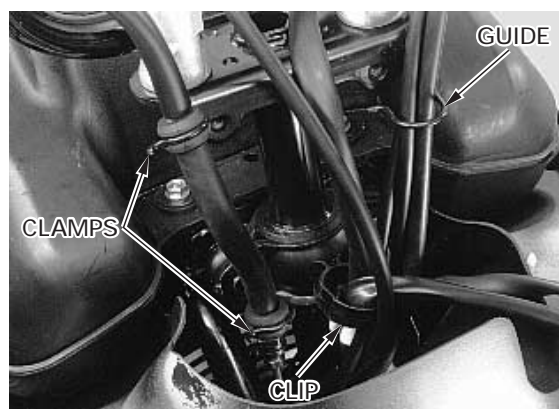
Remove the following:

- wire harness from harness clip (by releasing clip)
- cables from guide
- brake hose from clamps
- lower holder nuts and washers
- handlebar assembly from steering shaft

Do not twist or bend the brake hose and pipe.

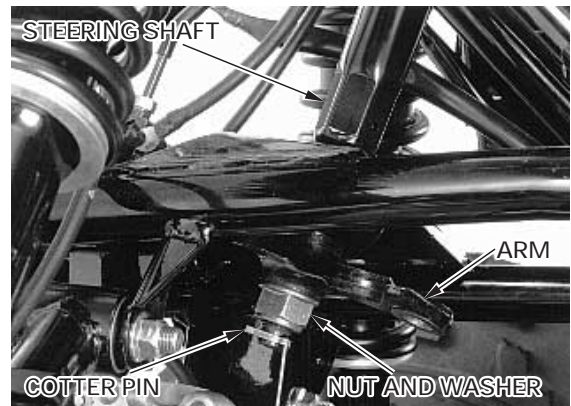
- holder bolts
- steering shaft holders

- cotter pins (from knuckle and steering shaft ball joint studs)
- joint nuts (by holding joint stud flat surfaces)
- tie-rods (from steering shaft and knuckles)



FRONT WHEEL/SUSPENSION/STEERING

- cotter pin (from steering shaft end)
- shaft end nut and washer
- shaft arm
- steering shaft



INSPECTION

Inspect the tie-rod for distortion or damage.
Inspect the ball joint boots for tears or other damage by moving the ball joint studs.
They should move freely and smoothly.



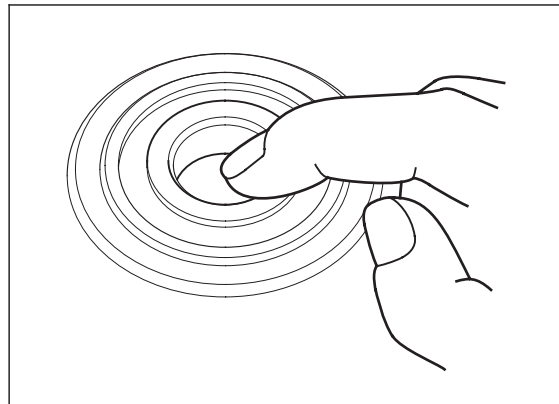
Check the steering shaft bushing for wear or damage.



Check the steering shaft for distortion or damage.



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 frame.



BEARING REPLACEMENT

Remove the upper and lower dust seals. Remove the snap ring.

Drive the steering shaft bearing out of the frame from below.

TOOLS:

Driver 07749-0010000
Attachment, 32 × 35 mm 07746-0010100

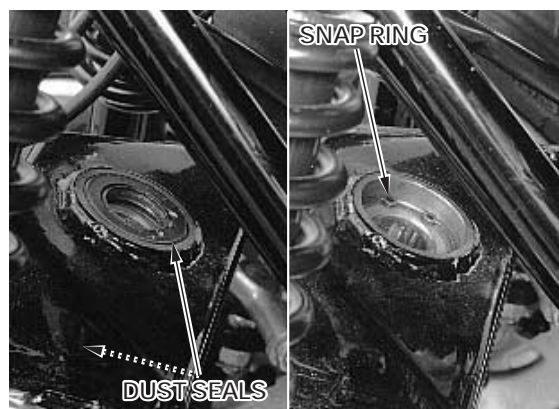
Drive in a new bearing squarely with the marked side facing up until it is fully seated.

TOOLS:

Driver 07949-3710001
Attachment, 42 × 47 mm 07746-0010300
Pilot, 20 mm 07746-0040500

Install the snap ring into the groove properly with the chamfered edge facing up.

Coat new dust seals with grease and install them (the upper seal is flush with the frame edge and the lower seal is fully seated onto the bearing).



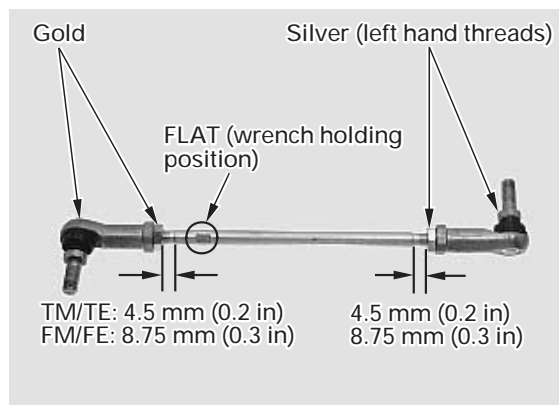
TIE-ROD ASSEMBLY

When the tie-rod ball joints will be replaced, install the ball joints and lock nuts as shown.

Adjust the tie-rod length so that the distance between each lock nut and thread end is 4.5 mm (TM/TE models)/8.75 mm (FM/FE models). (A difference between both ends distances is 3 mm max.)

Tighten these nuts after installing the tie-rod into the knuckle and steering shaft.

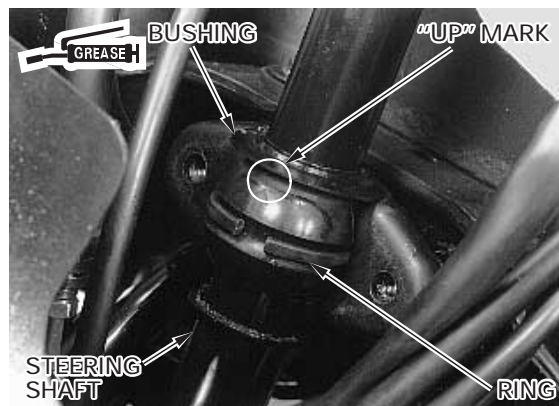
Temporarily tighten the lock nuts while the ball joint positions are 180° from each other.



INSTALLATION

Install the bushing ring onto the shaft bushing.
Apply grease to the shaft bushing inner surface.

Install the shaft bushing onto the steering shaft with the "UP" mark facing up.
Install the steering shaft into the shaft bearing.



Install the shaft holders and bolts with the hose clamp on the front holder facing the right side.
Tighten the holder bolts.

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

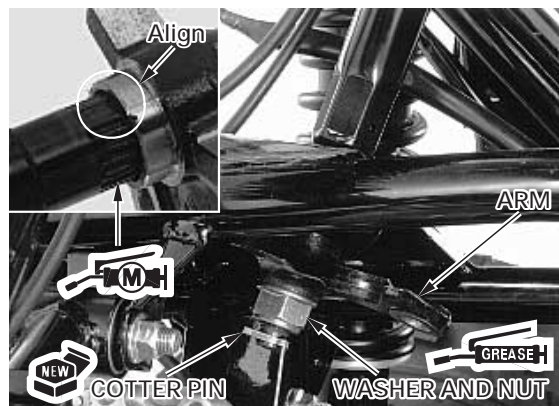


Apply grease to the end nut threads and seating surface.
Apply molybdenum disulfide grease to the steering shaft spline.

Install the shaft arm over the steering shaft by aligning the wide tooth with the wide groove.
Install the washer and end nut, and tighten the nut to the specified torque.

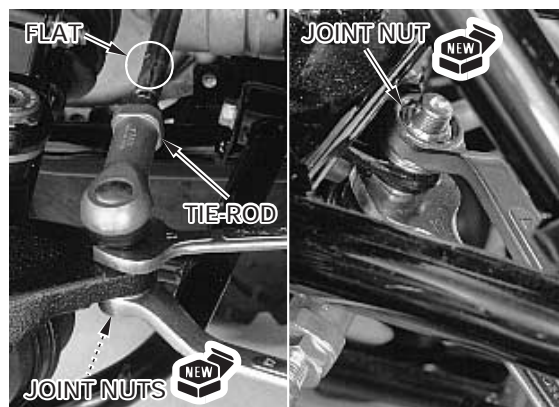
TORQUE: 108 N·m (11.0 kgf·m , 80 lbf·ft)

Install a new cotter pin.



Install the tie-rod into the steering shaft and knuckle with the flat area (wrench holding point) toward the knuckle.
Install new joint nuts and tighten them by holding the joint stud flat surfaces.

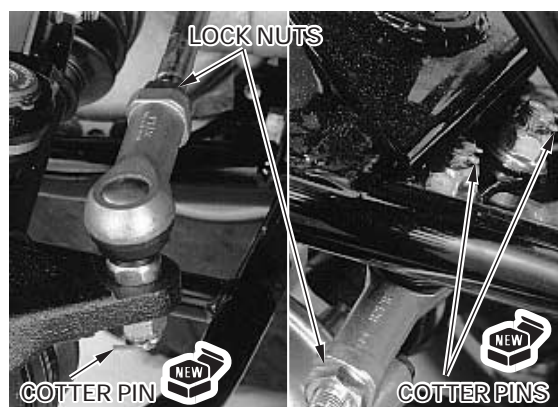
TORQUE: 54 N·m (5.5 kgf·m , 40 lbf·ft)



If the tie-rod ball joints were replaced, tighten the lock nuts as follows:
Rotate both ball joints with the tie-rod axis until they stop against the ball joint studs. Hold them in that position and tighten the ball joint lock nuts.

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

Install new cotter pins into the ball joint studs.



Do not twist or bend the brake hose and pipe. Route the wire and cable properly (page 1-22).

Install the handlebar assembly onto the steering shaft with new lower holder nuts and washers. Tighten the nuts.

TORQUE: 39 N·m (4.0 kgf·m , 29 lbf·ft)

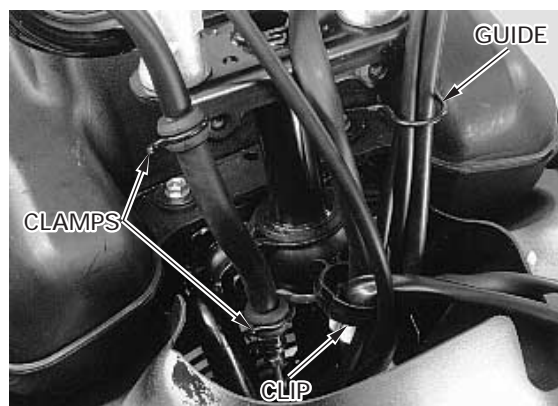


Install the brake hose into the clamps to secure it. Install the cables into the cable guide. Secure the wires with the clip.

Adjust the toe (page 3-19).

Install the following:

- inner fenders (page 2-9)
- front fender (page 2-7)
- handlebar cover (U.S.A. TM/FM models)/meter cover and combination meter (Except U.S.A. TM/FM) (page 12-3)



FRONT SHOCK ABSORBER

REMOVAL

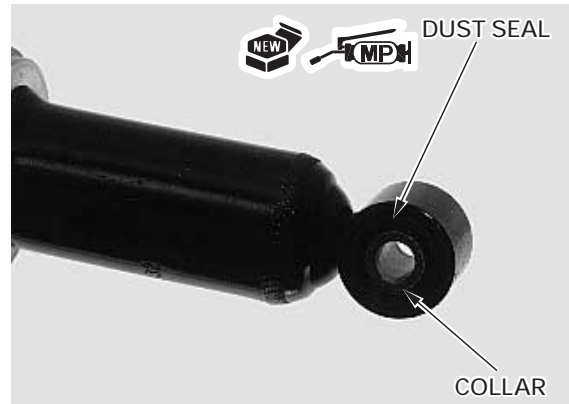
Support the vehicle with a support block to raise the front wheels off the ground.

Support the suspension arm or front wheel, and remove the mounting nuts, bolts and shock absorber.



INSPECTION

Remove the lower pivot collar and dust seals.
Check the pivot collar for wear or damage.



Check the bushings for wear or damage.
Check the damper unit for leakage or other damage.
Replace the shock absorber assembly if necessary.

INSTALLATION

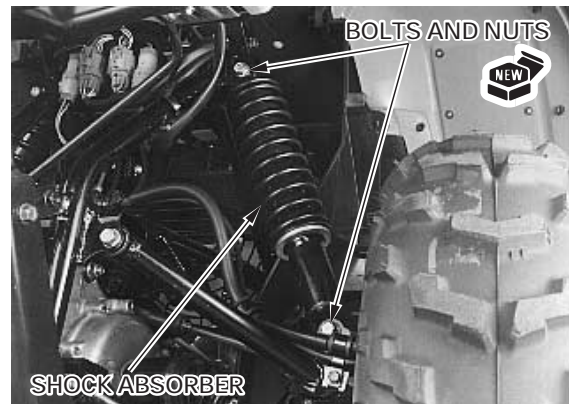
Apply molybdenum disulfide paste to the lower bushing of the shock absorber.
Coat new dust seal lips with molybdenum disulfide paste and install them into the lower pivot until they are fully seated.
Install the lower pivot collar.



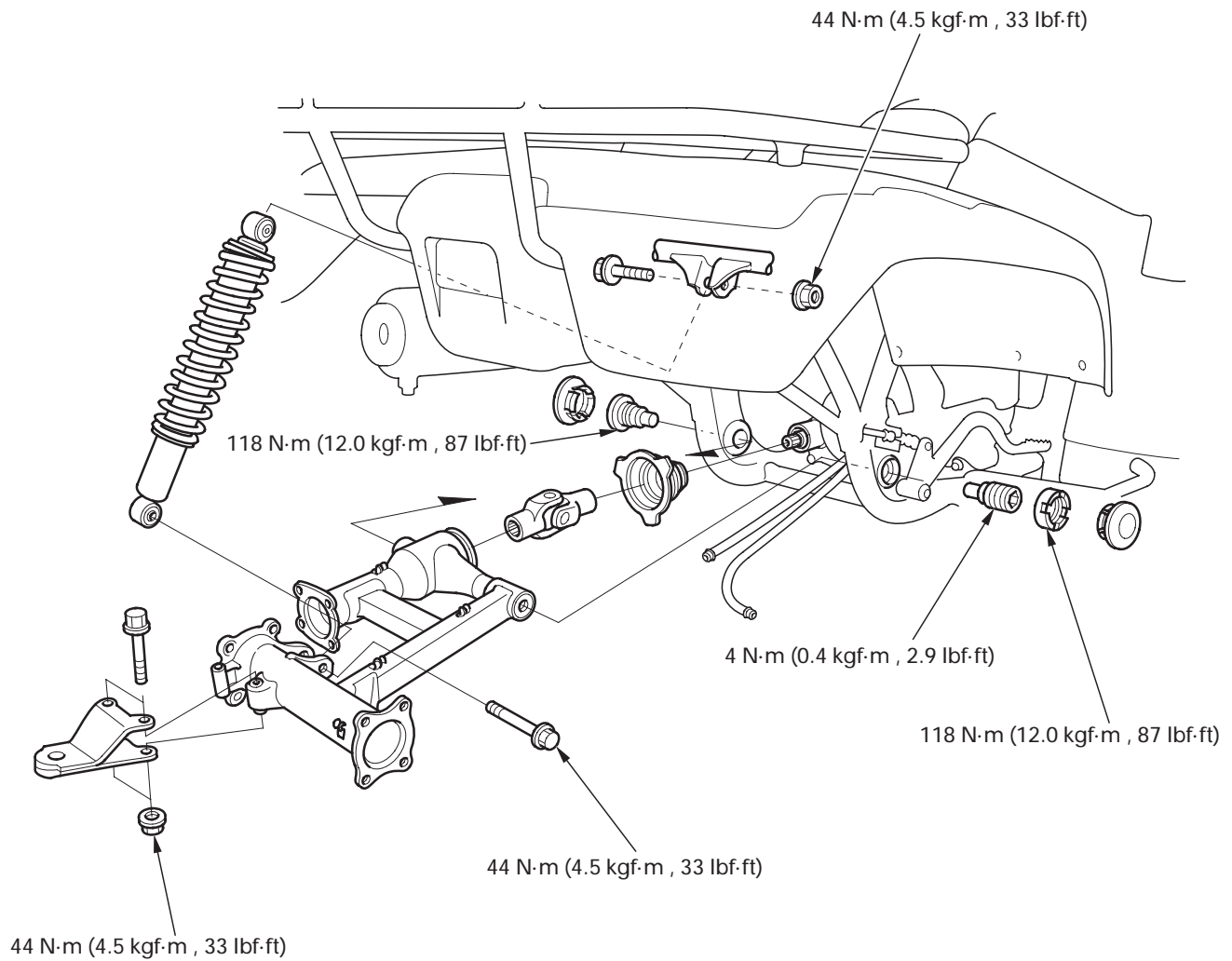
Install the shock absorber with the mounting bolts from front side.
Install new mounting nuts and tighten them.

TORQUE: Upper/Lower:

30 N·m (3.1 kgf·m , 22 lbf·ft)



MEMO



13. REAR WHEEL/SUSPENSION

SERVICE INFORMATION	13-1	REAR SHOCK ABSORBER	13-3
TROUBLESHOOTING	13-2	SWINGARM	13-4
REAR WHEEL	13-3		

SERVICE INFORMATION

GENERAL

- This section covers service of the rear wheel, rear shock absorber and swingarm.
 - For tire information, refer to section 12.
 - For brake system service, refer to section 14.
- For rear driving mechanism service, refer to section 16.
- A jack or other support is required to support the vehicle.
 - Use genuine Honda replacement bolts and nuts for all suspension pivots and mounting points.
 - When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not overtighten the lock nut. The specification later in the text gives both actual and indicated.

SPECIFICATIONS

-TM/TE model

ITEM		STANDARD	SERVICE LIMIT
Minimum tire tread depth		_____	4.0 mm (0.16 in)
Cold tire pressure	Standard	20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____
	Minimum	17 kPa (0.17 kgf/cm ² , 2.5 psi)	_____
	Maximum	23 kPa (0.23 kgf/cm ² , 3.3 psi)	_____
	With cargo	20 kPa (0.20 kgf/cm ² , 2.9 psi)	_____

–FM/FE model

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

TORQUE VALUES

Rear wheel nut	64 N·m (6.5 kgf·m , 47 lbf·ft)	
Shock absorber mounting nut (upper)	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut
bolt (lower)	44 N·m (4.5 kgf·m , 33 lbf·ft)	
Swingarm pivot bolt (left)	118 N·m (12.0 kgf·m , 87 lbf·ft)	
(right)	4 N·m (0.4 kgf·m , 2.9 lbf·ft)	
Swingarm right pivot lock nut	118 N·m (12.0 kgf·m , 87 lbf·ft)	
Trailer hitch nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut

REAR WHEEL/SUSPENSION

TOOLS

Bearing remover, 17 mm	07936-3710300
Remover handle	07936-3710100
Remover weight	07936-371020A or 07936-3710200
Driver	07949-3710001
Attachment, 22 × 24 mm	07746-0010800
Attachment, 28 × 30 mm	07946-1870100
Attachment, 37 × 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400
Pilot, 20 mm	07746-0040500
Lock nut wrench	07908-4690003
Adjustable bearing puller, 24 — 40 mm	07736-A01000B or 07736-A01000A (U.S.A. only) use with commercially available 3/8" × 16 slide hammer

TROUBLESHOOTING

Rear wheel wobbling

- Bent rim
- Worn or damaged rear axle bearings
- Faulty rear tire
- Axle fastener not tightened properly
- Faulty swingarm pivot bearings

Rear wheel turns hard

- Faulty rear axle bearings
- Bent rear axle
- Rear brake drag

Soft suspension

- Weak shock absorber spring
- Oil leakage from damper unit

Hard suspension

- Damaged rear suspension pivot bearing or bushing
- Damaged swingarm pivot bearing
- Improperly tightened swingarm pivot

Rear suspension noise

- Faulty rear shock absorber
- Loose rear suspension fasteners
- Worn rear suspension pivot bearing or bushing

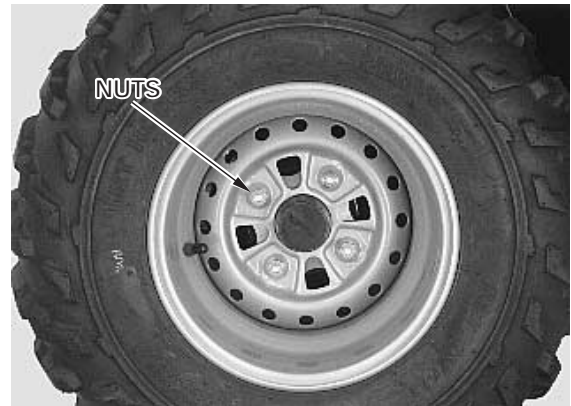
REAR WHEEL

REMOVAL

Loosen the wheel nuts.

Support the vehicle with a support block to raise the rear wheels off the ground.
Remove the nuts and wheel.

For tire removal/installation and repair, refer to section 12.



INSTALLATION

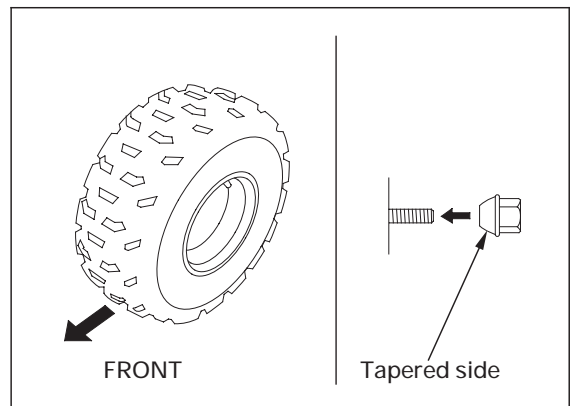
Install the wheel with the arrow mark facing in the normal rotating direction.

NOTE:

- Do not interchange the left and right tires.

Install the wheel nuts with the tapered side facing inward and tighten them.

TORQUE: 64 N·m (6.5 kgf·m , 47 lbf·ft)

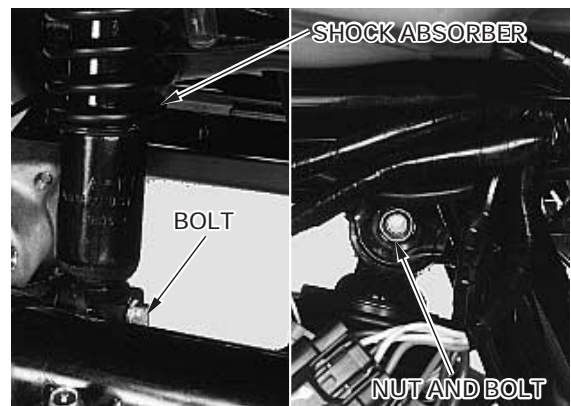


REAR SHOCK ABSORBER

REMOVAL

Support the vehicle with a support block to raise the rear wheels off the ground.

Support the swingarm and remove mounting nut, bolts and the shock absorber.



INSPECTION

Be careful not to lose the needle rollers of the bearing.

Remove the lower pivot collar and check the needle bearing, pivot collar, dust seals and upper pivot bushing for wear or damage.
Check the damper unit for leakage or other damage.
Replace the shock absorber assembly if necessary.

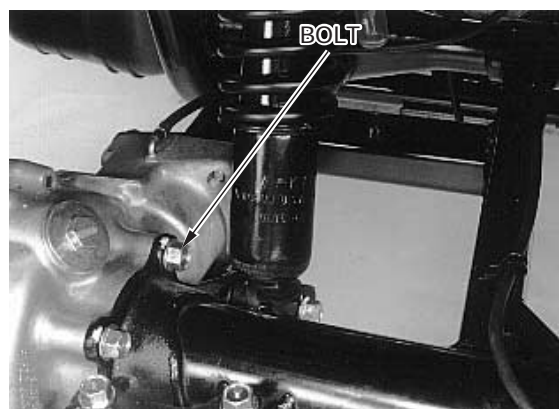
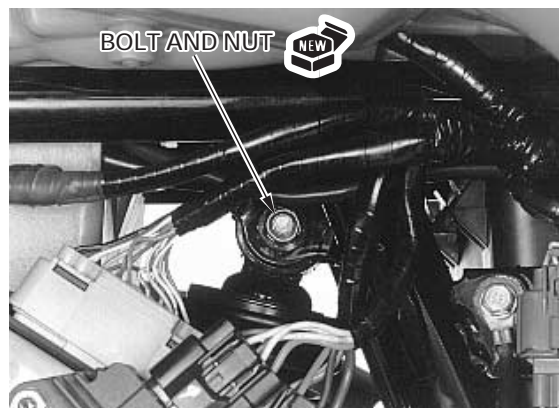


INSTALLATION

Set the shock absorber into the frame and swing-arm, then install the upper bolts from the left side and the lower bolt from the right side.

Install a new upper mounting nuts and tighten the nut and bolt.

TORQUE: Upper/Lower: 44 N·m (4.5 kgf·m , 33 lbf·ft)



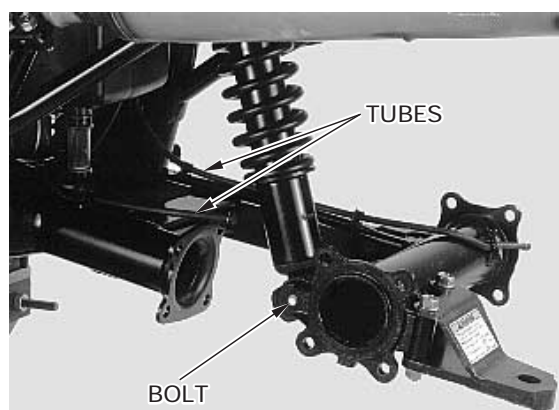
SWINGARM

REMOVAL

Remove the final gear case (section 16).

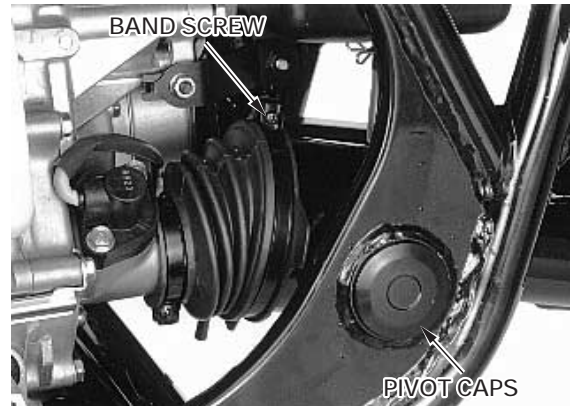
Support the swingarm and remove the following:

- breather tubes from the clamps
- shock absorber lower mounting bolt



Remove left and right pivot caps.

Loosen the joint boot band screw.

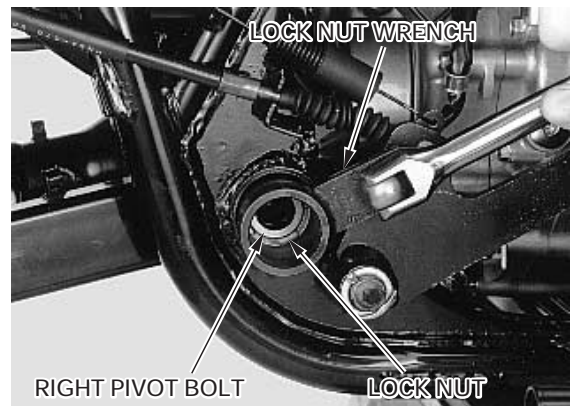


Loosen the right pivot lock nut and remove it.

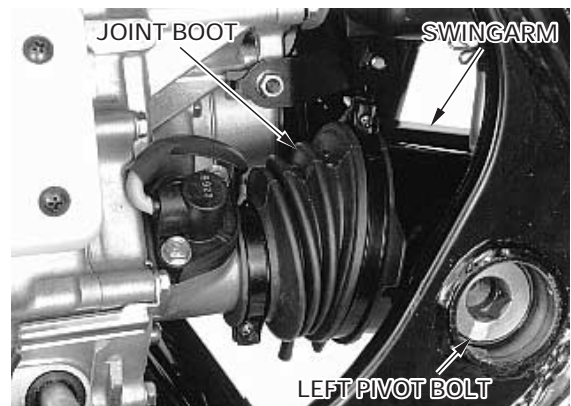
TOOL:

Lock nut wrench

07908-4690003



Remove the right and left pivot bolts and release the joint boot off the swingarm, then remove the swingarm.



Remove the universal joint.

Check the joint boots for tears or other damage.



REAR WHEEL/SUSPENSION

INSPECTION

Both bearings, outer races and grease holders must be replaced as a set if any part is damaged or worn.

Remove the dust seals.
Check the dust seals for wear or damage.
Turn the inner race of each bearing with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the pivot.



BEARING REPLACEMENT

Remove the pivot bearing using the special tools.

TOOLS:

Bearing remover, 17 mm	07936-3710300
Remover handle	07936-3710100
Remover weight	07936-371020A or 07936-3710200



Drive the grease holder into the swingarm to remove it.

TOOLS:

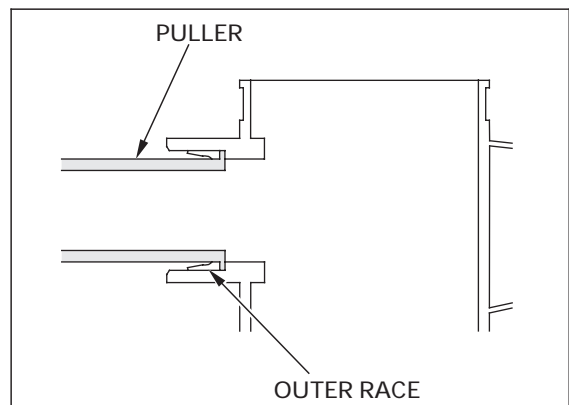
Driver	07749-0010000
Attachment, 28 × 30 mm	07946-1870100



Pull the outer race out of the swingarm using a commercially available 3/8 in × 16 sliding hammer and the special tool.

TOOL:

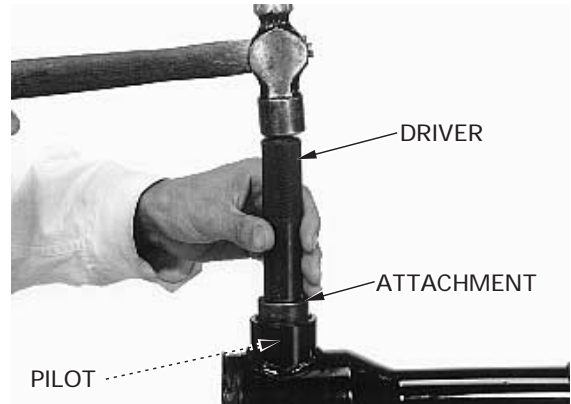
Adjustable bearing puller, 24—40 mm	07736-A01000B or 07736-A01000A (U.S.A. only)
-------------------------------------	--



Install the grease holder into the swingarm pivot.
Drive in a new bearing squarely until it is fully seated.

TOOLS:

Driver	07749-0010000
Attachment, 37 × 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400



Pack 3 g (0.1 oz) of grease into each bearing cavity and grease holder.

Apply grease to new dust seal lips and install them into the swingarm pivot until they are flush with the pivot end, using the same tools.



INSTALLATION

Apply molybdenum disulfide grease to the output shaft spline and install the universal joint onto the output shaft.



Set the swingarm into the frame and install the left and right pivot bolts.

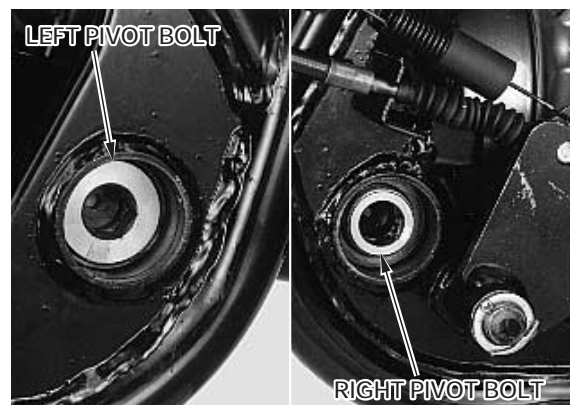
Tighten the left pivot bolt.

TORQUE: 118 N·m (12.0 kgf·m , 87 lbf·ft)

Tighten the right pivot bolt.

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

Move the swingarm up and down several times to seat the pivot bearings.
Retighten the pivot bolts to the same torque.



REAR WHEEL/SUSPENSION

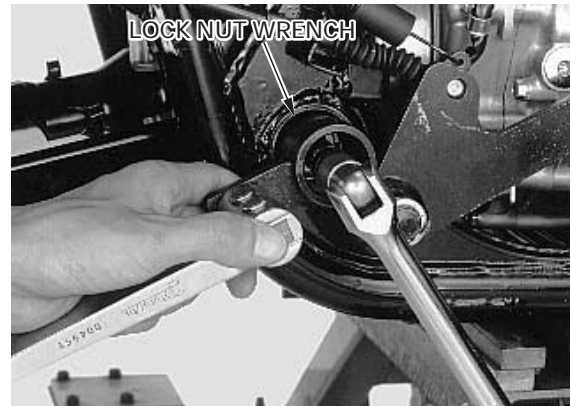
Tighten the right pivot lock nut while holding the pivot bolt.

TOOL:

Lock nut wrench 07908-4690003

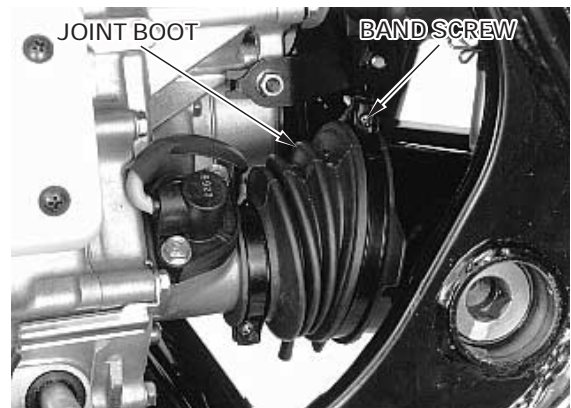
Refer to torque wrench reading information on page 13-1 "Service Information".

TORQUE: **Actual:** 118 N·m (12.0 kgf·m , 87 lbf·ft)
Indicated: 107 N·m (10.9 kgf·m , 79 lbf·ft)

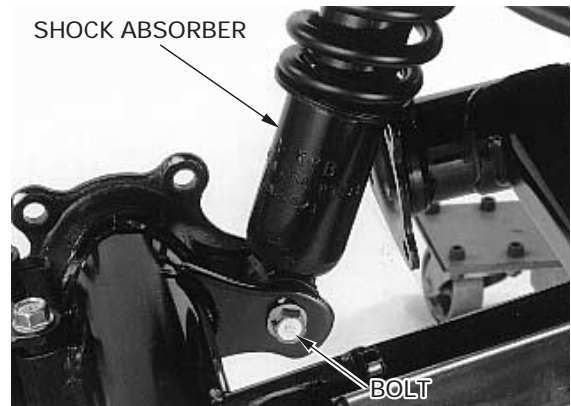


Install the joint boot over the swingarm securely.

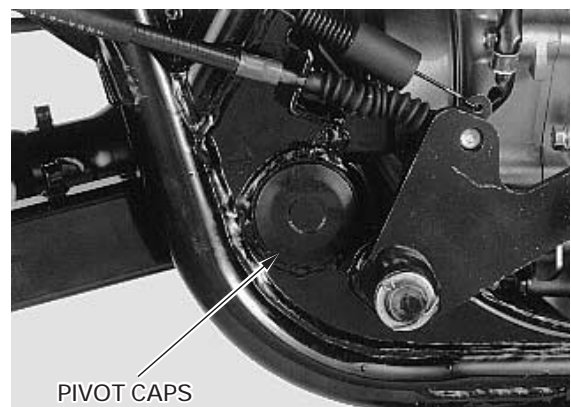
Position the screw of the boot band facing up as shown and tighten it.



Connect the swingarm onto the shock absorber and tighten the mounting bolt.

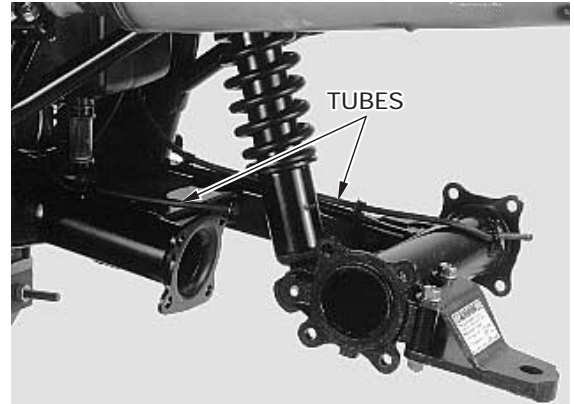


Install the left and right pivot caps securely.



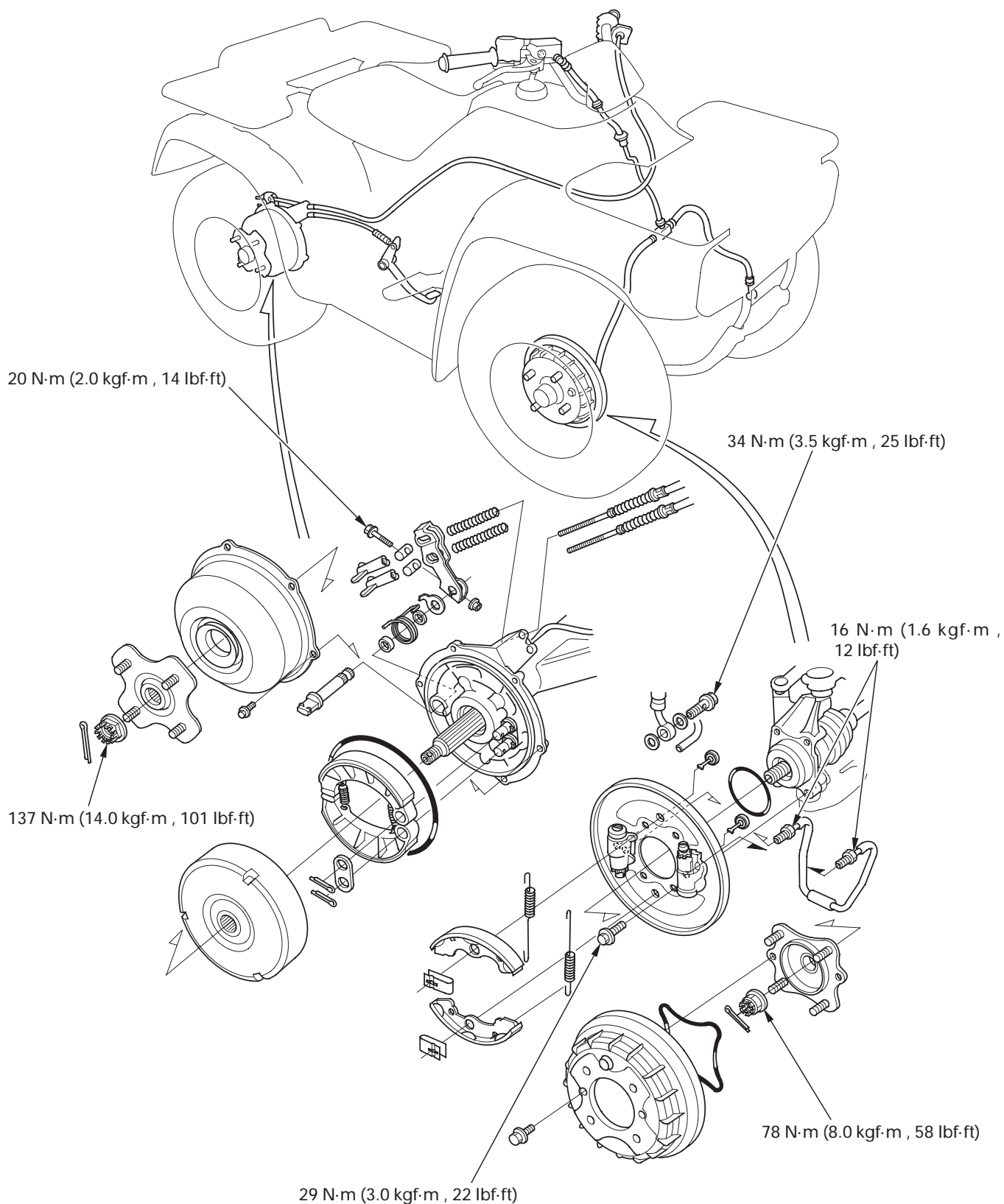
Route the breather tubes properly (page 1-22) and secure them with the clamps.

Install the final drive and rear axle (page 16-16).



BRAKE SYSTEM

FM/FE model shown:



14. BRAKE SYSTEM

SERVICE INFORMATION	14-1	FRONT BRAKE SHOES AND DRUM	14-6
TROUBLESHOOTING	14-2	FRONT WHEEL CYLINDER AND PANEL	14-10
BRAKE FLUID REPLACEMENT/ AIR BLEEDING	14-3	REAR BRAKE SHOES AND DRUM	14-14
FRONT MASTER CYLINDER	14-4	REAR BRAKE PEDAL	14-19

SERVICE INFORMATION

GENERAL

⚠ CAUTION

Frequent inhalation of brake lining dust, regardless of material composition could be hazardous to your health.

- Avoid breathing dust particles.
- Never use an air hose or brush to clean brake assemblies. Use an OSHA-approved vacuum cleaner.

- A contaminated brake drum or shoe reduces stopping power. Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.
- Spilled brake fluid will severely damage the plastic parts and painted surfaces. It is also harmful to some rubber parts. Be careful whenever you remove the reservoir cap; make sure the reservoir is horizontal first.
- Never allow contaminants (dirt, water, etc.) to get into an open reservoir.
- Once the hydraulic system has been opened, or if the brake feels spongy, the system must be bled.
- Always use fresh DOT 4 brake fluid from a sealed container when servicing the system. Do not mix different types of fluid as they may not be compatible.
- Always check brake operation before riding the vehicle.

SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	Honda DOT 4 brake fluid	_____
	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Shoe lining thickness	4.0 (0.16)	1.0 (0.04)
	Brake panel warpage	_____	0.4 (0.02)
	Waterproof seal lip length	22 (0.9)	20 (0.8)
	Master cylinder I.D.	12.700–12.743 (0.5000–0.5017)	12.755 (0.5022)
	Master piston O.D.	12.657–12.684 (0.4983–0.4994)	12.645 (0.4978)
	Wheel cylinder I.D.	17.460–17.503 (0.6874–0.6891)	17.515 (0.6896)
Rear brake	Wheel cylinder piston O.D.	17.417–17.444 (0.6857–0.6868)	17.405 (0.6852)
	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Lining thickness	5.0 (0.20)	To index mark

14

BRAKE SYSTEM

TORQUE VALUES

Brake hose oil bolt	34 N·m (3.5 kgf·m , 25 lbf·ft)
Wheel cylinder bleed valve	6 N·m (0.6 kgf·m , 4.3 lbf·ft)
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m , 1.4 lbf·ft)
Front brake lever pivot bolt	6 N·m (0.6 kgf·m , 4.3 lbf·ft)
nut	6 N·m (0.6 kgf·m , 4.3 lbf·ft)
Front master cylinder holder bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)
Wheel cylinder bolt	8 N·m (0.8 kgf·m , 5.8 lbf·ft)
nut	17 N·m (1.7 kgf·m , 12 lbf·ft)
Wheel cylinder oil pipe joint nut	16 N·m (1.6 kgf·m , 12 lbf·ft)
Front brake panel bolt	29 N·m (3.0 kgf·m , 22 lbf·ft) Special bolt
Front wheel hub nut	78 N·m (8.0 kgf·m , 58 lbf·ft)
	Apply grease to the threads and seating surface/Castle nut
Rear brake arm pinch bolt	20 N·m (2.0 kgf·m , 14 lbf·ft)
Rear wheel hub nut	137 N·m (14.0 kgf·m , 101 lbf·ft)
Brake oil pipe joint nut	17 N·m (1.7 kgf·m , 12 lbf·ft)
Rear brake panel drain bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)

TOOLS

Snap ring pliers	07914-SA50001
Oil seal driver	07965-MC70100

TROUBLESHOOTING

Front wheel wobbling and noise

- Worn brake shoes

Poor brake performance

- Brake not adjusted properly
- Worn brake shoes and drum
- Water in brake drum
- Contaminated brake shoes and drum
- Air in hydraulic system
- Leaking hydraulic system
- Clogged/restricted fluid passage
- Incorrectly installed rear brake arm
- Worn rear brake cam

BRAKE FLUID REPLACEMENT/AIR BLEEDING

NOTICE

- Do not allow foreign material to enter the system when filling the reservoir.
- Avoid spilling fluid on painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.
- Use only DOT 4 brake fluid from a sealed container.
- Do not mix different types of fluid. They are not compatible.

BRAKE FLUID DRAINING

Remove the reservoir cap, set plate and diaphragm.

Connect the bleed hose to the bleed valve. Loosen the bleed valve and pump the brake lever until no more fluid flows out of the bleed valve.

Perform above procedure for other side bleed valve.

BRAKE FLUID FILLING/BLEEDING

Close the bleed valves. Fill the reservoir with DOT 4 brake fluid from a sealed container.

Connect a commercially available brake bleeder to the bleed valve. Operate the brake bleeder and loosen the bleed valve. If not using an automatic refill system, add brake fluid when the fluid level in the reservoir is low.

NOTE:

- Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.
- When using a brake bleeding tool, follow the manufacturer's operating instructions.

Perform the bleeding procedure until the system is completely flushed/bled.

NOTE:

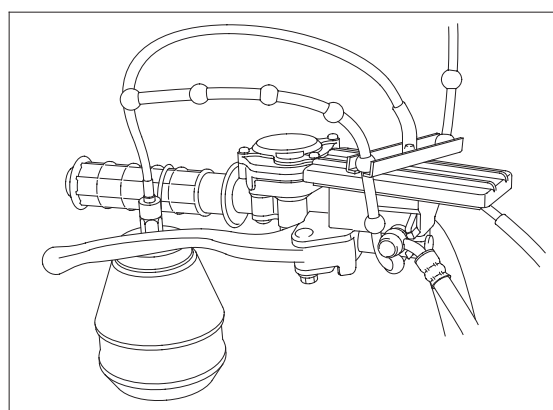
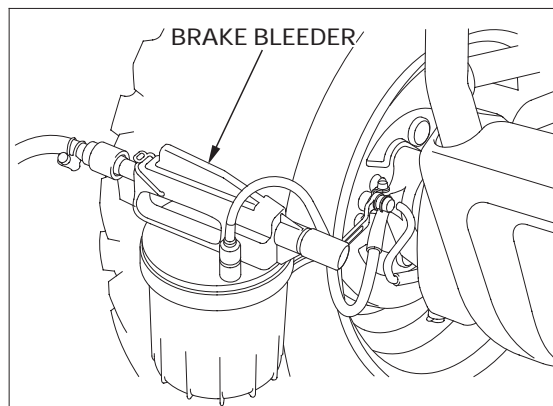
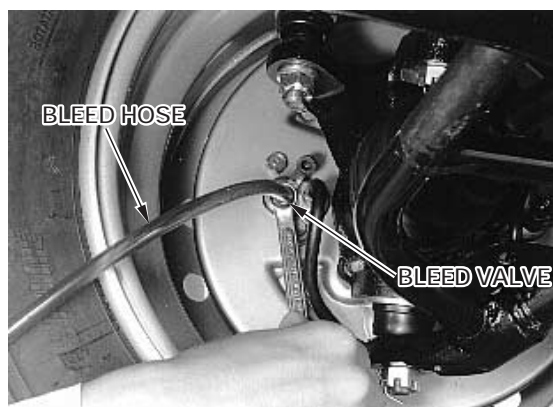
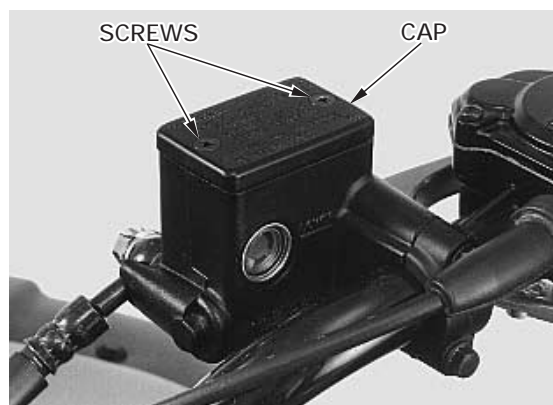
- If air is entering the bleeder from around the bleed valve threads, seal the threads with teflon tape.

Close the bleed valve and perform air bleeding for the other side bleed valve.

Close the bleed valve and operate the brake lever. If it still feels spongy, bleed the system again.

If a brake bleeder is not available, use the following procedure:

Pump up the system pressure with the brake lever until lever resistance is felt.



BRAKE SYSTEM

Connect a bleed hose to the bleed valve and bleed the system as follows:

1. Squeeze the brake lever, open the bleed valve 1/4 turn and then close it.

NOTE:

- Do not release the brake lever until the bleed valve has been closed.

2. Release the brake lever slowly and wait several seconds after it reaches the end of its travel.

Repeat the steps 1 and 2 until air bubbles do not appear in the bleed hose.

Perform air bleeding for the other side bleed valve.

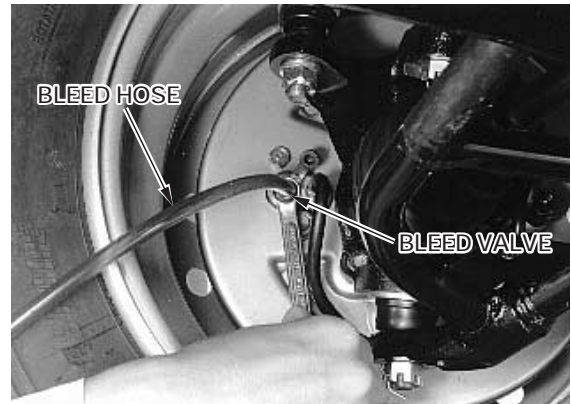
Tighten the bleed valve.

TORQUE: 6 N·m (0.6 kgf·m , 4.3 lbf·ft)

Fill the reservoir to the upper level line 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 , 1.4 lbf·ft)



FRONT MASTER CYLINDER

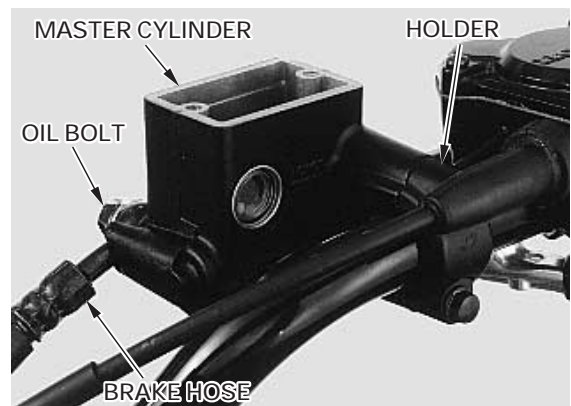
DISASSEMBLY

Drain the brake fluid from the front brake hydraulic system (page 14-3).

When removing the oil bolt, cover the end of the hose to prevent contamination.

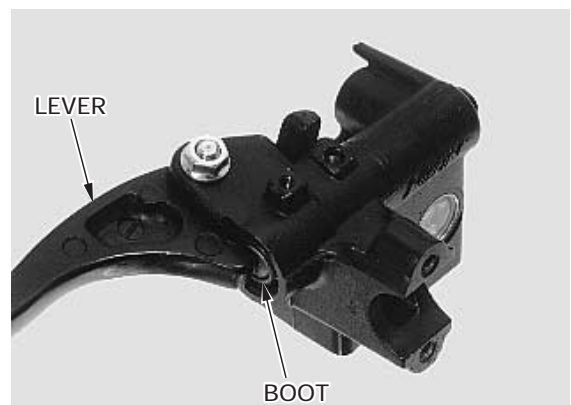
Disconnect the brake hose from the master cylinder by removing the oil bolt and sealing washers.

Remove the master cylinder holder bolts, holder and the master cylinder.



Remove the following:

- pivot nut, bolt and brake lever
- piston boot



— snap ring

TOOL:

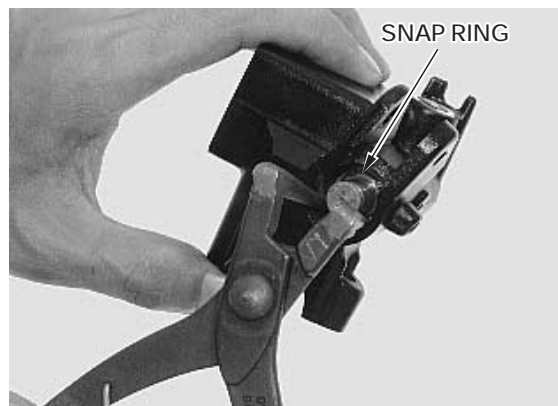
Snap ring pliers

07914-SA50001

— master piston

— spring

Clean the master cylinder, reservoir and master piston in clean brake fluid.



INSPECTION

Check the piston cups for wear, deterioration or damage.

Check the spring for damage.

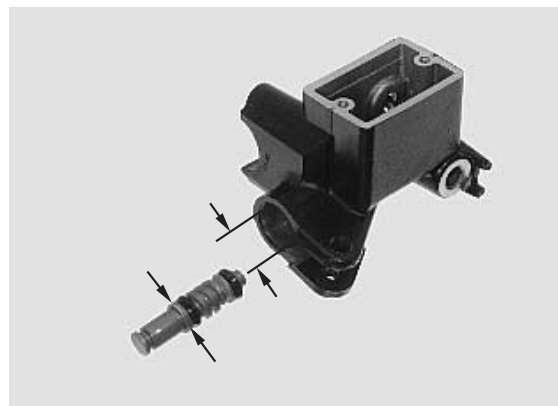
Check the master cylinder and piston for scoring, scratches or damage.

Measure the master cylinder I.D.

SERVICE LIMIT: 12.755 mm (0.5022 in)

Measure the master piston O.D.

SERVICE LIMIT: 12.645 mm (0.4978 in)

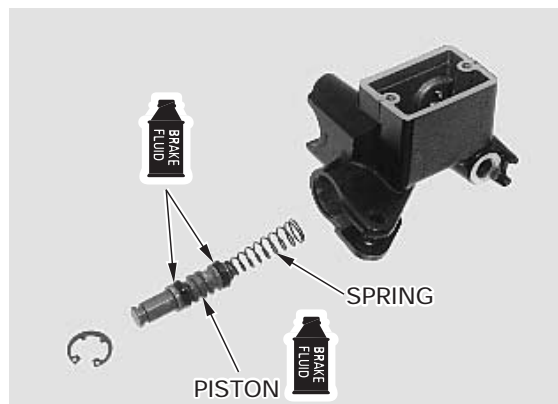


ASSEMBLY

Coat the master piston and piston cups with clean brake fluid.

Install the spring onto the master piston.

Do not allow the piston cup lips to turn inside out. Install the spring and master piston into the master cylinder.

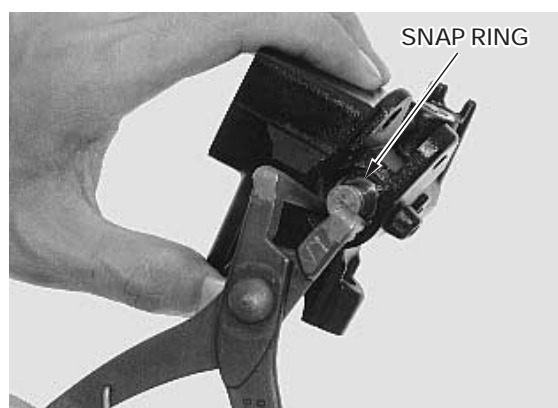


Be certain the snap ring is firmly seated in the groove. Install the snap ring into the groove in the master cylinder, using the special tool.

TOOL:

Snap ring pliers

07914-SA50001



BRAKE SYSTEM

Install the boot into the master cylinder and the groove in the piston.

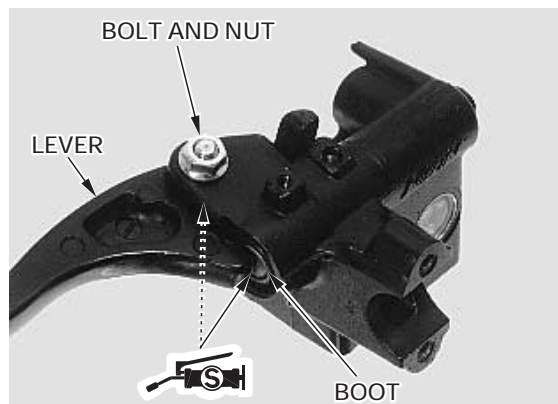
Apply silicone grease to the brake lever contacting surface of the piston.

Apply silicone grease to the brake lever pivot. Install the brake lever and pivot bolt, and tighten it.

TORQUE: 6 N·m (0.6 kgf·m , 4.3 lbf·ft)

Install the pivot nut and tighten it.

TORQUE: 6 N·m (0.6 kgf·m , 4.3 lbf·ft)



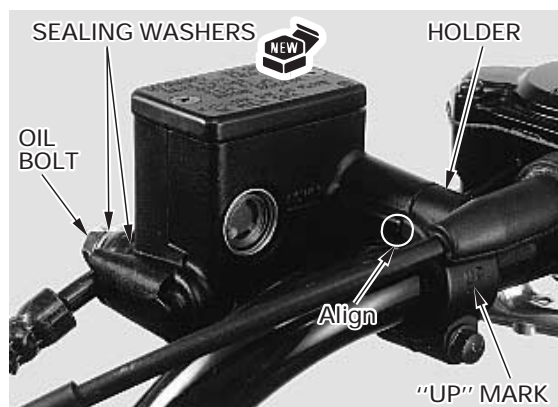
Install the master cylinder and holder with the "UP" mark facing up.

Align the end of the master cylinder with the punch mark on the handlebar, and tighten the upper bolt first, then tighten the lower bolt.

TORQUE: 12 N·m (1.2 kgf·m , 9 lbf·ft)

Connect the brake hose to the master cylinder with the oil bolt and new sealing washers by aligning the hose joint with the stopper groove. Tighten the oil bolt.

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



Fill and bleed the front brake hydraulic system (page 14-3).

FRONT BRAKE SHOES AND DRUM

BRAKE DRUM REMOVAL

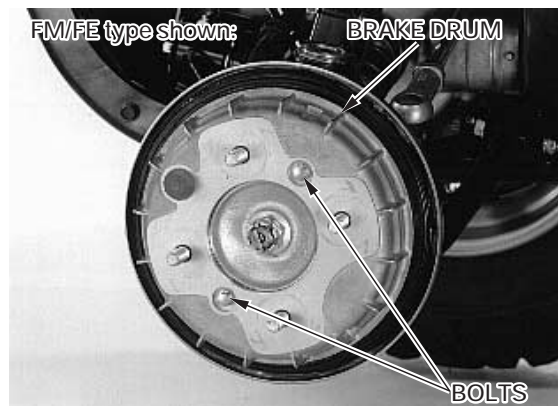
Remove the front wheel (page 12-7).

TM/TE models: Remove the following:

- cotter pin
- hub nut
- brake drum/hub.

FM/FE models: Remove the following:

- two drum bolts
- brake drum

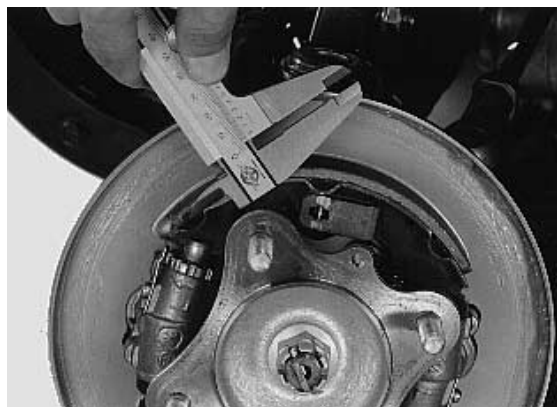


SHOES AND DRUM INSPECTION

BRAKE SHOE

Measure the lining thickness.

SERVICE LIMIT: 1.0 mm (0.04 in)



BRAKE DRUM

Measure the drum I.D.

SERVICE LIMIT: 161.0 mm (6.34 in)

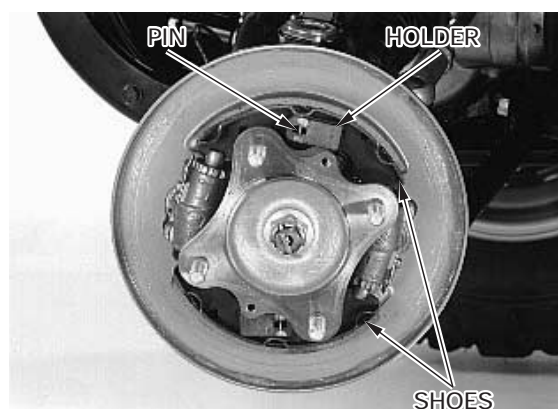
For waterproof seal and brake panel inspection, see page 14-8.



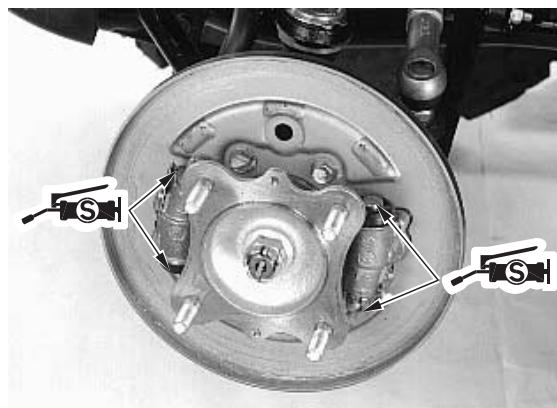
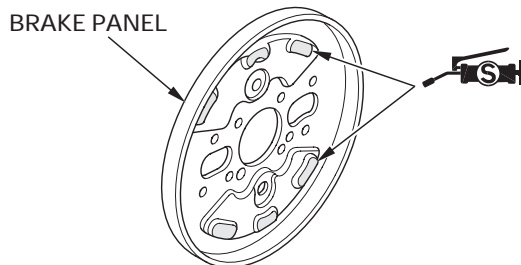
Always replace the brake shoes in pairs.

BRAKE SHOE REPLACEMENT

Turn each retaining pin 90° while pressing the pin holder to remove them. Expand the shoes and remove the shoes and shoe springs from the wheel cylinders.



Coat the shoe metal contact areas of brake panel with silicone grease (6 places). Apply silicone grease into the shoe contact grooves of the wheel cylinders (4 places).

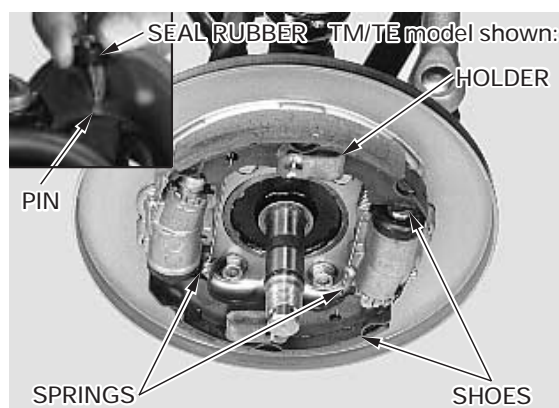


Note the installation direction of the shoe spring and pin holder. Do not get grease to the shoe linings.

Hook the springs into the shoes as shown and install the shoes onto the end grooves of the wheel cylinders properly.

Check that the seal rubbers are in good condition. Install the each retaining pin and pin holder as shown, then set the pin end lengthwise against the holder grooves while pressing the holder to secure the shoes.

Install the brake drum (page 14-9).



BRAKE SYSTEM

*Do not get
grease on the
shoe linings.*

BRAKE PANEL AND WATERPROOF SEAL INSPECTION

BRAKE PANEL

Clean any grease from the brake panel thoroughly. Check the brake panel at the waterproof seal lip contact area for abnormal scratches or wear.

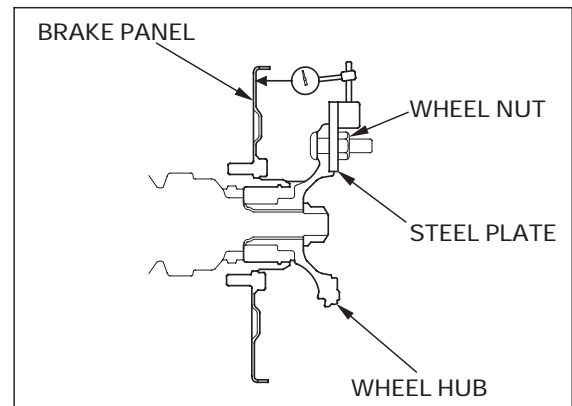
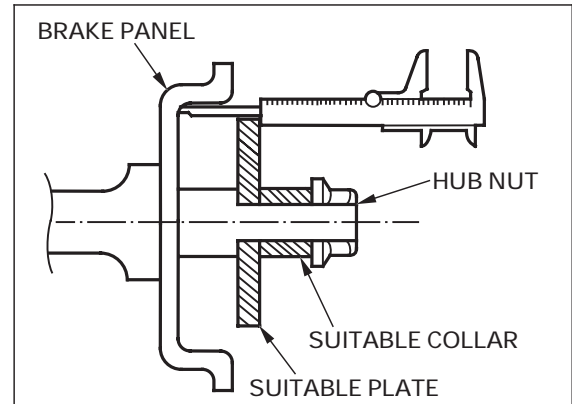
TM/TE models: Install a suitable steel plate and collar onto the axle and tighten the hub nut securely. Using a vernier caliper as shown, measure the depth of the brake panel at several points on the seal lip contact area. Calculate the warpage.

SERVICE LIMIT: 0.4 mm (0.02 in)

FM/FE models: Install a suitable steel plate onto the wheel hub and secure it with the wheel nut securely as shown. Measure the brake panel on the points attached to the seal lip for warpage using a dial indicator.

SERVICE LIMIT: 0.4 mm (0.02 in)

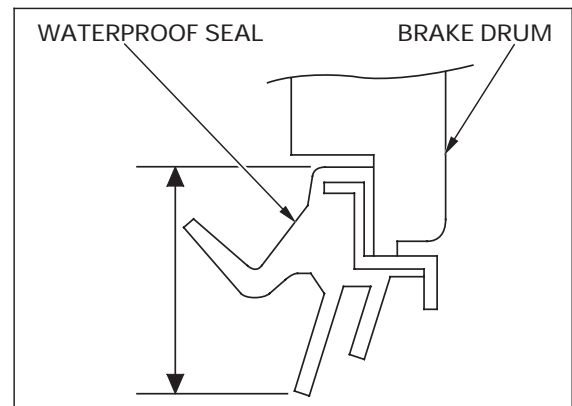
For brake panel replacement, see page 14-10.



WATERPROOF SEAL

Check the waterproof seal for damage, fatigue or faulty installation. Measure the seal lip length.

SERVICE LIMIT: 20 mm (0.8 in)



WATERPROOF SEAL REPLACEMENT

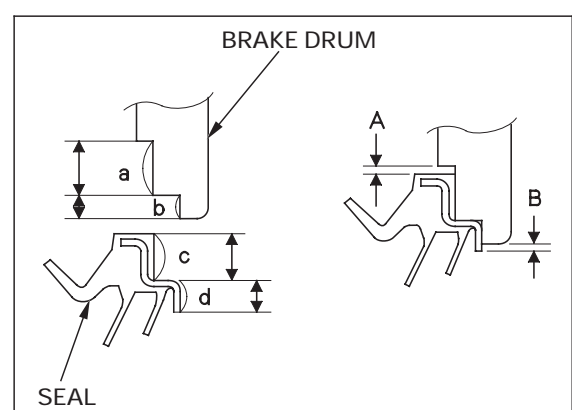
Remove the waterproof seal from the brake drum by prying open the seal edge.

Measure the drum and seal at points a, b, c and d as shown.

Calculate clearances A and B between the drum and seal.

$$A = a - c$$

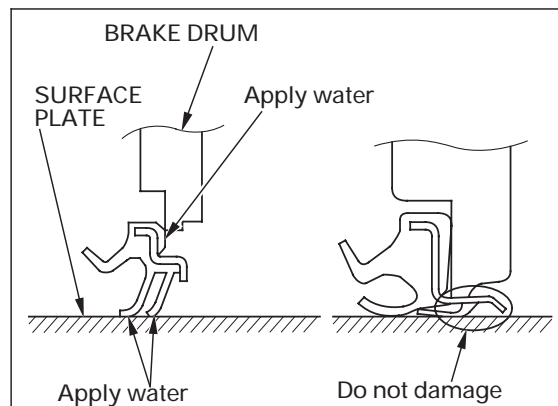
$$B = d - b$$



Press the drum onto the seal evenly, so the lips will not be damaged. If the seal is damaged or mis-installed, remove it and try again with a new seal.

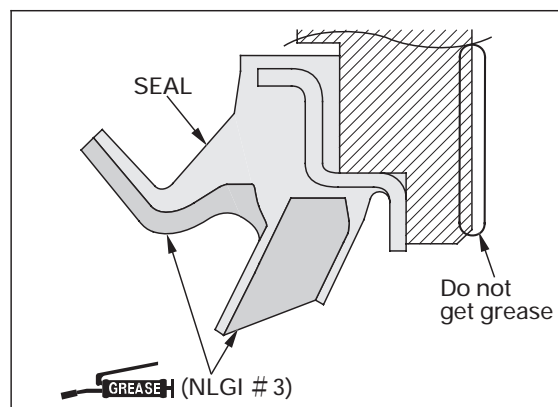
Apply water to a new waterproof seal entire. Place the waterproof seal on a clean surface plate, and press the brake drum into the waterproof seal, making sure that the clearances between the drum and seal will reach the calculated clearance (see previous step).

Place a steel plate [about 140 mm (5.5 in) in diameter and more than 10 mm (0.4 in) in thickness] on the brake drum, or the brake drum will be warped or damaged (FM/FE only).



Do not get grease to the inner surface of the brake drum. Keep grease off the drum.

Dry the seal thoroughly and pack the lips cavities with 14–16 g (0.5–0.6 oz) of multi-purpose grease (NLGI # 3) as shown.

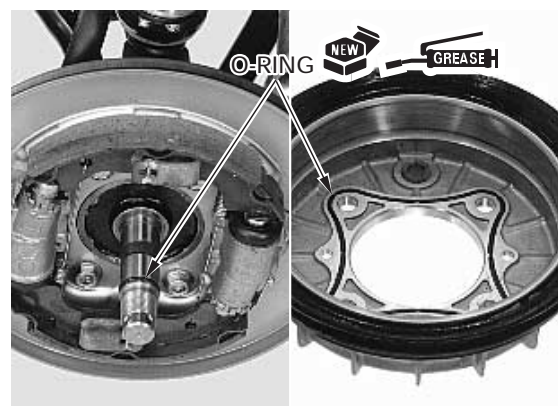


BRAKE DRUM INSTALLATION

TM/TE models: Coat a new O-ring with grease and install it into the axle groove.

FM/FE models: Coat a new O-ring with grease and install it into the brake drum groove.

Make sure that the waterproof seal is packed with the multi-purpose grease (NLGI # 3) (see above).



TM/TE models: Install the brake drum/hub onto the axle.

Do not get grease to the brake drum and shoes.



BRAKE SYSTEM

FM/FE models: Apply molybdenum disulfide grease to the drive shaft spline.
Install the wheel hub onto the drive shaft, if it was removed.

Apply grease to the hub nut threads and seating surface.

Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

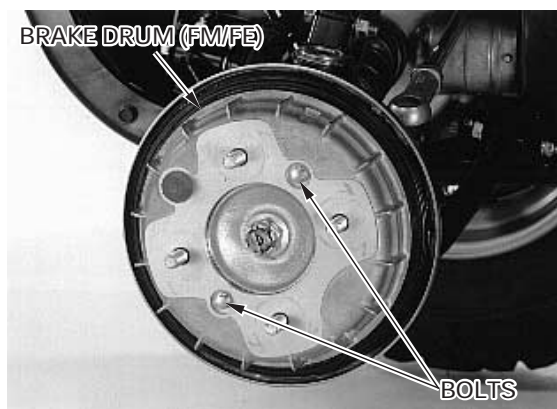
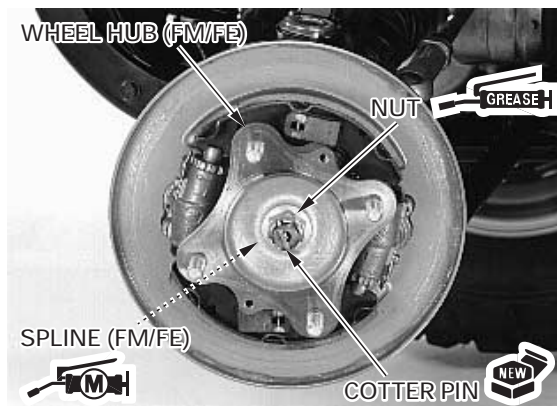
TORQUE: 78 N·m (8.0 kgf·m , 58 lbf·ft)

Install a new cotter pin.

FM/FE models: Install the brake drum onto the hub.
Install the drum bolts and tighten them.

Do not get grease to the brake drum and shoes.

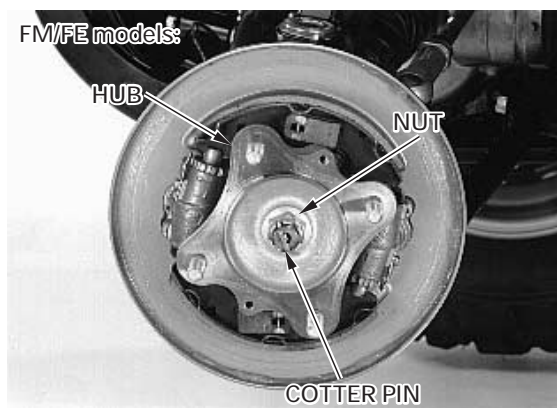
Install the front wheel (page 12-8).



FRONT WHEEL CYLINDER AND PANEL DISASSEMBLY

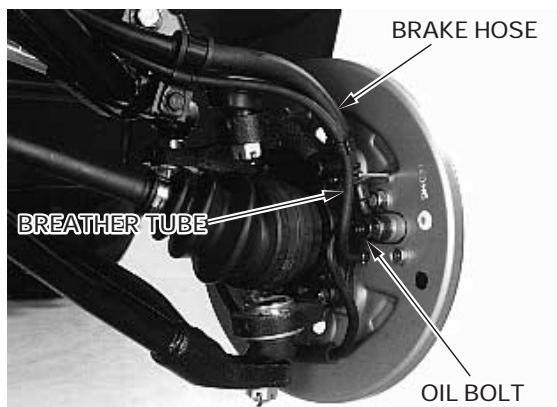
Drain the brake fluid from the front brake hydraulic system (page 14-3).
Remove the brake drum (page 12-6).

FM/FE model only: Remove the following:
— cotter pin
— hub nut
— wheel hub



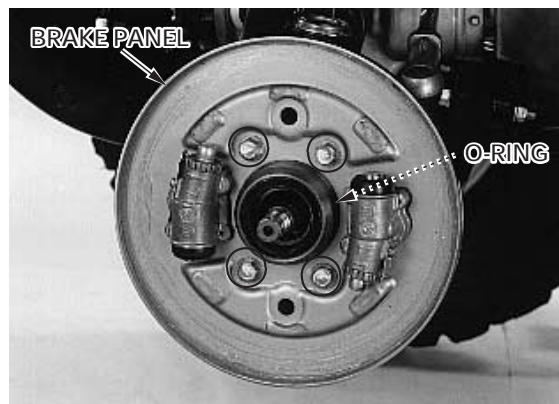
Remove the brake shoes (page 12-7).

When removing the oil bolt, cover the end of the hose to prevent contamination.
Remove the following:
— oil bolt
— sealing washers
— brake hose
— breather tube

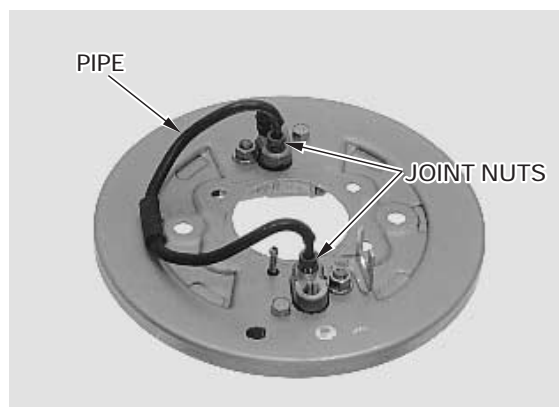


- four bolts (discard them)
- brake panel
- O-ring

Do not reuse the panel bolts because their threads are specially dry-coated for waterproofing.

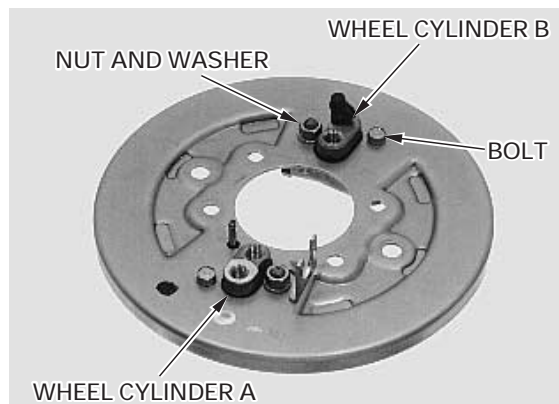


Loosen the pipe joint nuts and remove the brake pipe.

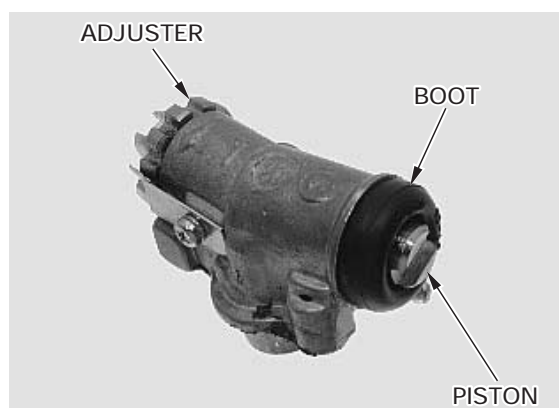


Remove the nuts, washers and bolts and the wheel cylinder A and B.

Clean any sealant material from the wheel cylinders, bolts and brake panel.

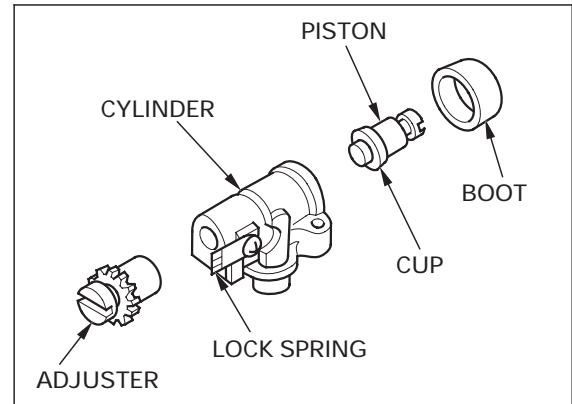


Disassemble the wheel cylinder.



INSPECTION

Check the piston cup and boot for wear, deterioration or damage.
Check the cylinder bore and piston for scoring, scratches or damage.
Check the adjuster for wear or damage.
Check the lock spring for fatigue or damage.



Measure the wheel cylinder I.D.

SERVICE LIMIT: 17.515 mm (0.6896 in)

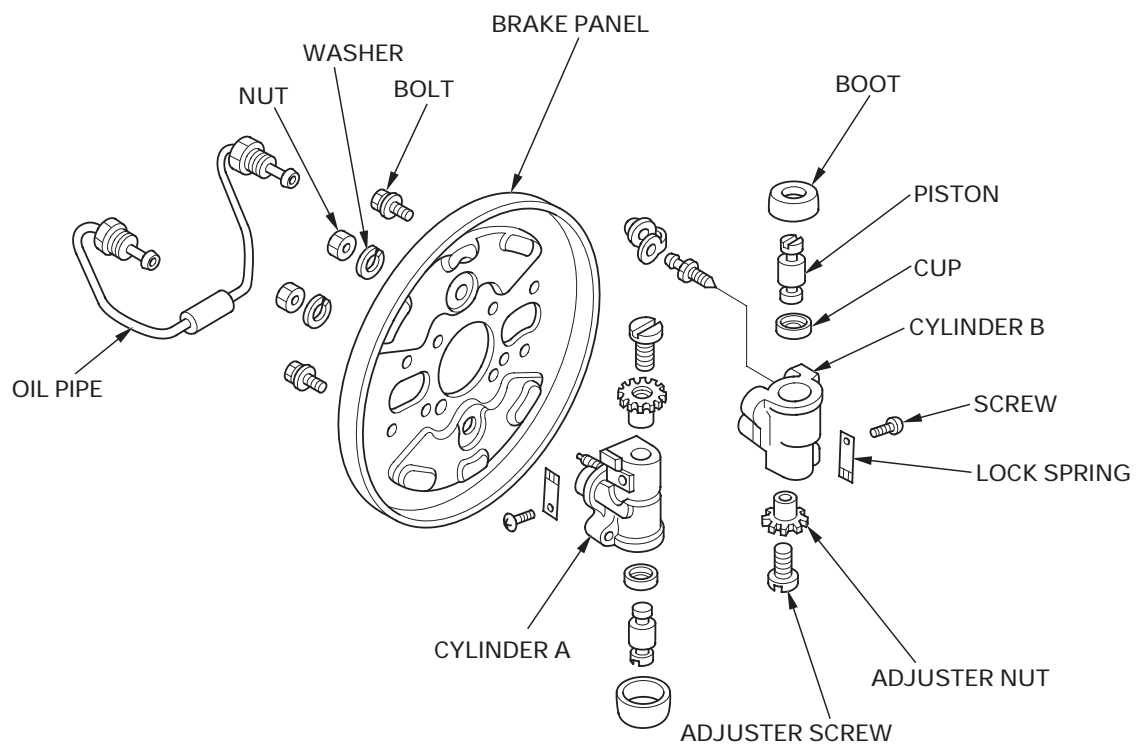
Measure the piston O.D.

SERVICE LIMIT: 17.405 mm (0.6852 in)



ASSEMBLY

Clean all parts with brake fluid excluding the boots.
Blow out passages with compressed air.

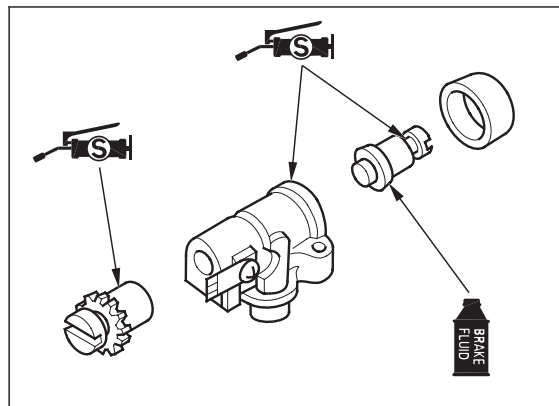


Coat the piston and cups with clean brake fluid.
Install the piston into the wheel cylinder.

Do not allow the piston cup lips to turn inside out.

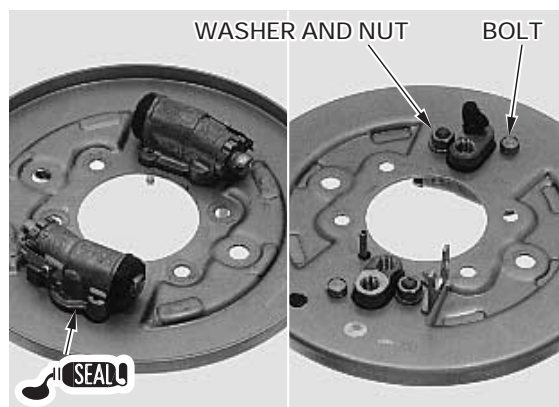
Apply silicone grease to the boot grooves in the piston and cylinder body.
Install the piston boot onto the cylinder and piston grooves securely.

Apply silicone grease to the adjuster screw threads and adjuster nut spindle outer surface.
Install the adjuster into the master cylinder.



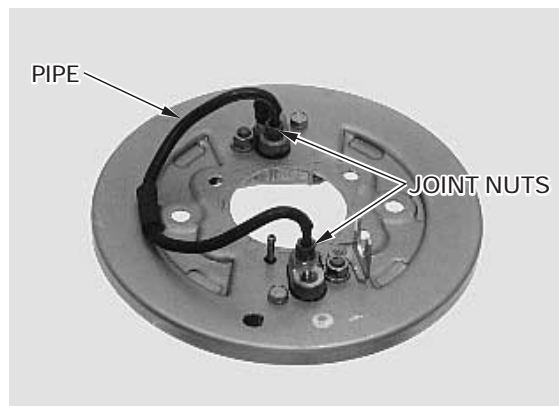
Apply sealant to the mating surface of the cylinder body.
Install the wheel cylinder A and B with the bolts, washers and nuts.

TORQUE: Bolt: 8 N·m (0.8 kgf·m , 5.8 lbf·ft)
Nut: 17 N·m (1.7 kgf·m , 12 lbf·ft)



Install the brake pipe as shown and tighten the joint nuts.

TORQUE: 16 N·m (1.6 kgf·m , 12 lbf·ft)



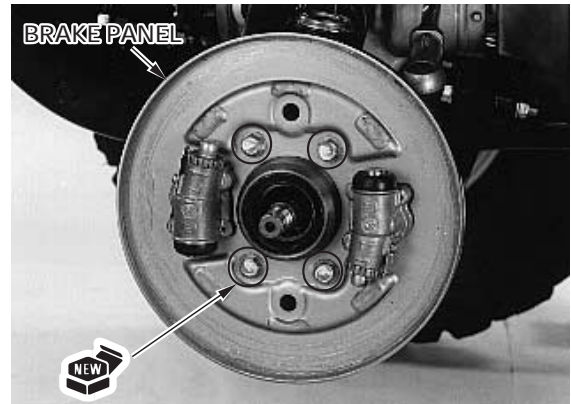
Coat a new O-ring with grease and install it onto the knuckle.



BRAKE SYSTEM

Install the brake panel onto the knuckle with new panel bolts.

TORQUE: 29 N·m (3.0 kgf·m , 22 lbf·ft)



Connect the brake hose to the wheel cylinder with the oil bolt and new sealing washers by aligning the hose joint with the stopper groove. Tighten the oil bolt.

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

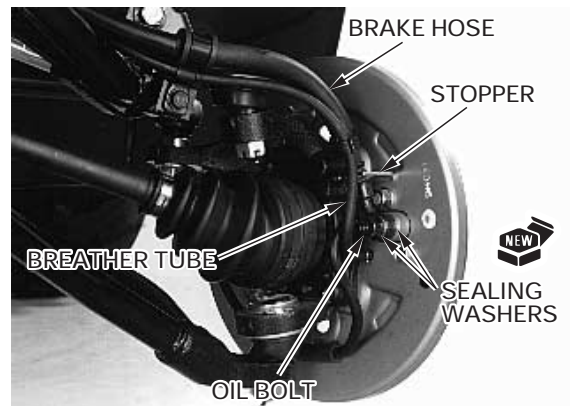
Connect the breather tube to the brake panel joint.

Install the following:

- brake shoes (page 14-7)
- wheel hub and brake drum (FM/FE models) or brake drum/hub (TM/TE models) (page 14-9)

Fill and bleed the front brake hydraulic system (page 14-3).

Adjust the front brake system (page 3-15).



REAR BRAKE SHOES AND DRUM

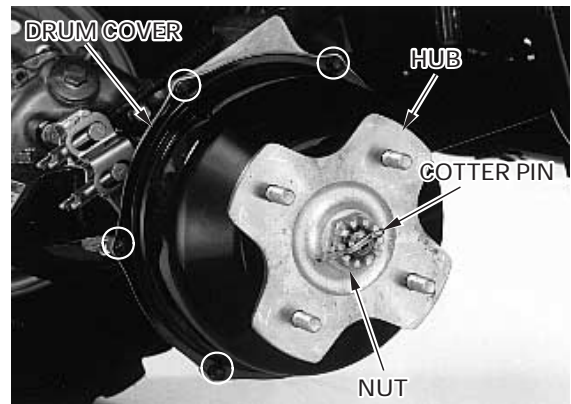
BRAKE DRUM REMOVAL

Remove the right rear wheel (page 13-3).

Remove the following:

- cotter pin
- hub nut
- wheel hub
- cover bolts
- brake drum cover

- O-ring
- brake drum



INSPECTION

Measure the brake drum I.D.

SERVICE LIMIT: 161.0 mm (6.34 in)



Check the dust seals in the wheel hub and drum cover for wear or damage.

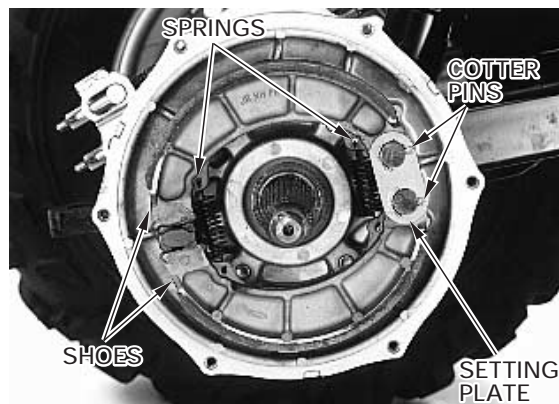


DISASSEMBLY

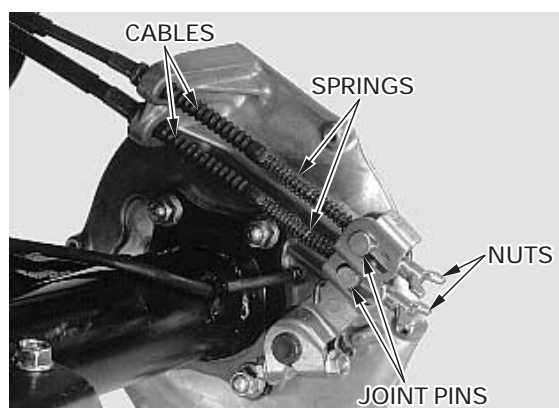
Always replace the brake shoes in pairs.

Remove the following:

- cotter pins
- setting plate
- brake shoes
- springs

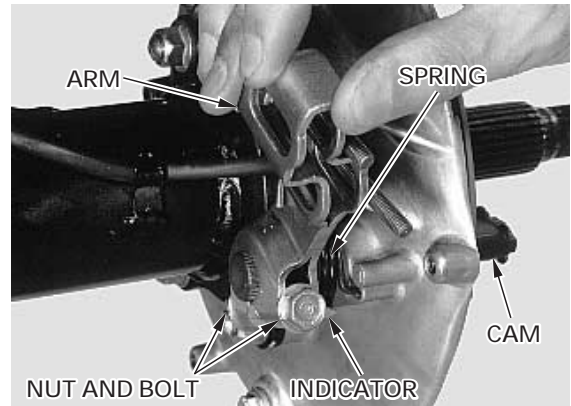


- adjusting nuts
- joint pins
- springs
- brake cables



BRAKE SYSTEM

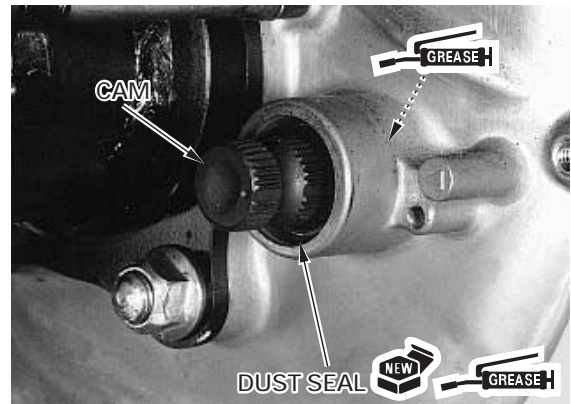
- nut and bolt
- brake arm
- wear indicator
- spring
- brake cam
- felt seal
- dust seal



ASSEMBLY

Apply grease to the lips of a new brake cam dust seal and install it with the flat side facing toward the brake arm until it is fully seated.

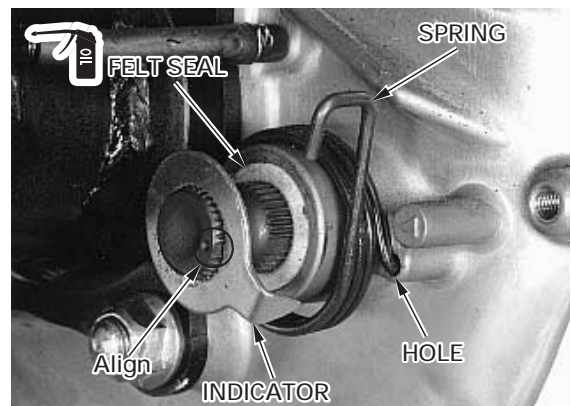
Apply grease to the brake cam spindle and install it.



Apply engine oil to the felt seal and install it over the brake cam.

Install the return spring by aligning its end with the hole.

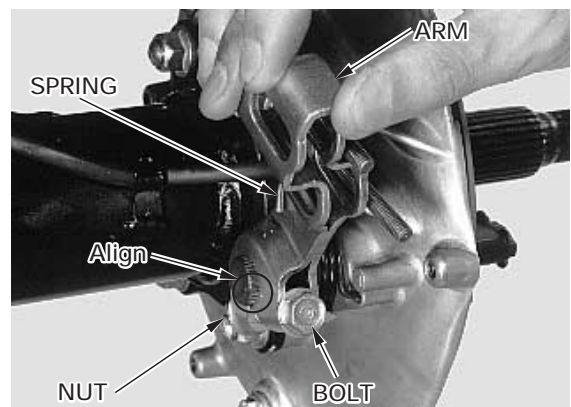
Install the wear indicator by aligning its wide teeth with the wide groove.



Install the brake arm by aligning the punch marks.

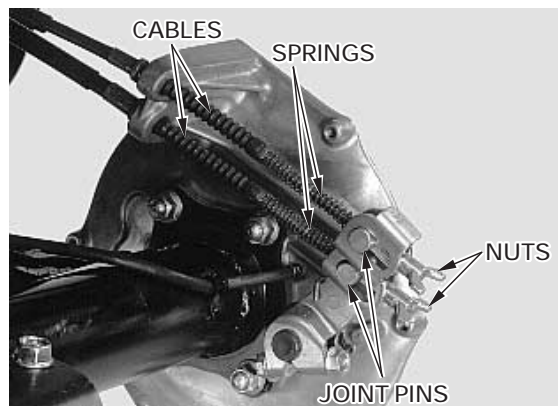
Install the pinch bolt from the punch mark side and the nut, and tighten it.

TORQUE: 20 N·m (2.0 kgf·m , 14 lbf·ft)



Install the brake cables into the cable holders on the brake panel (upper holder for parking brake cable and lower holder for pedal brake cable).

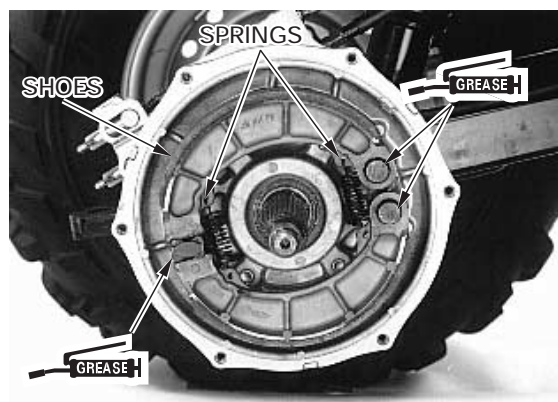
Install the cable springs onto the cables and the joint pins into the brake arm. Connect the brake cables to the brake arm with the adjusting nuts.



Apply grease to the anchor pins and brake cam sliding surfaces.

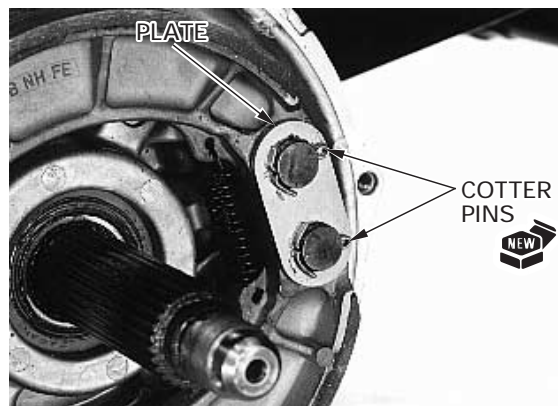
Do not get grease into the shoe linings.

Assemble the brake shoes and springs so that the spring ends are facing outside as shown and install the assembly onto the brake panel.



Install the setting plate with the chamfered side facing toward the brake shoe and secure it with new cotter pins.

The cotter pins are installed from front side.



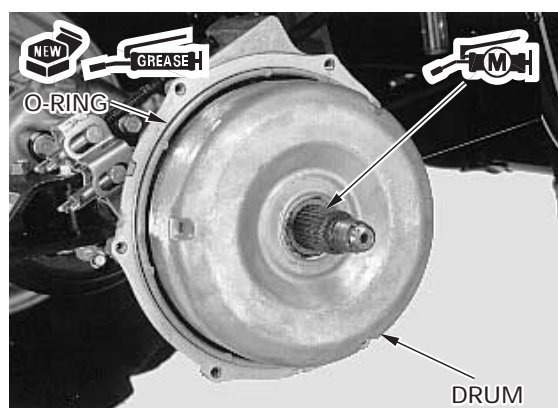
BRAKE DRUM INSTALLATION

Apply molybdenum disulfide grease to the axle spline.

Install the brake drum onto the axle.

Do not get grease to the brake drum and shoes.

Coat a new O-ring with grease and install it into the groove in the brake panel.



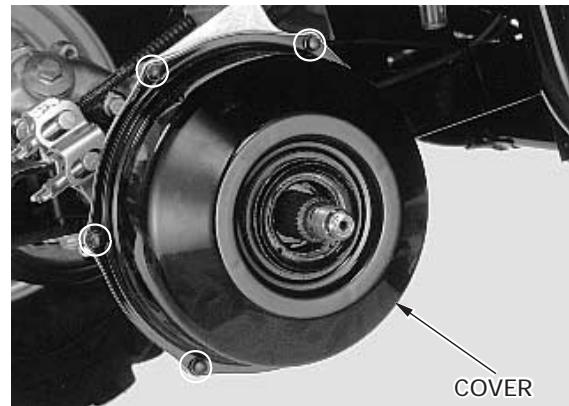
BRAKE SYSTEM

Apply grease to the seal lips of a new drum cover dust seal and install it using the special tool.

TOOL:
Oil seal driver 07965-MC70100

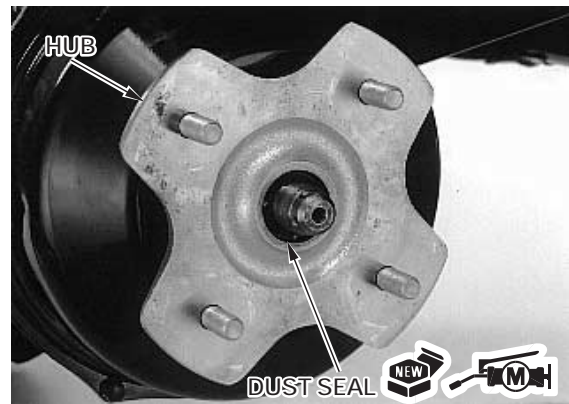


Install the drum cover and tighten the six bolts.



Apply molybdenum disulfide grease to the seal lips of a new hub dust seal and install it with the flat side facing in until it is fully seated.

Install the wheel hub onto the axle.

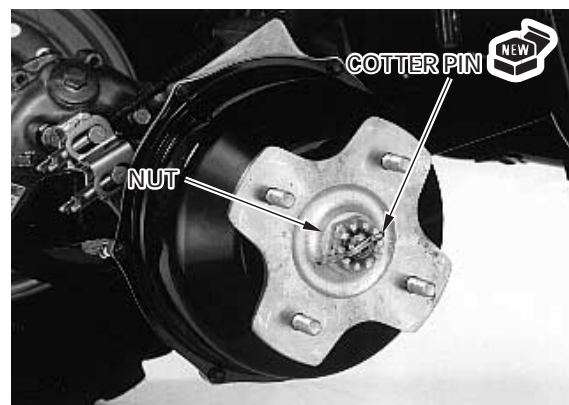


Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m , 101 lbf·ft)

Install a new cotter pin.

Install the rear wheel (page 13-3).
Adjust the rear brake (page 3-15).



REAR BRAKE PEDAL

REMOVAL

Remove the right rear mud guard (page 2-5).
Disconnect the pedal brake cable from the brake arm (page 14-15).

Remove the following:

- spring
- brake cable
- cotter pin
- washer
- brake pedal
- dust seals

INSTALLATION

Apply grease to the lips of the new dust seals and install them with the flat side facing to the pedal.

Apply grease to the groove in the pivot shaft and install the brake pedal.

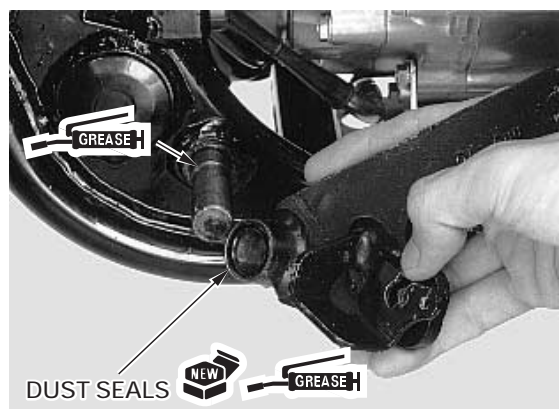
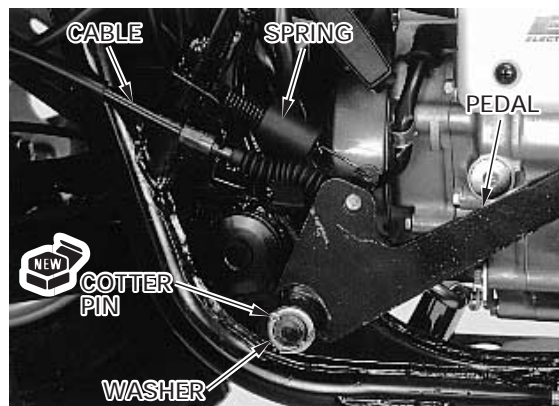
Install the washer and a new cotter pin.

Connect the brake cable to the pedal and install it into the stay on the frame.

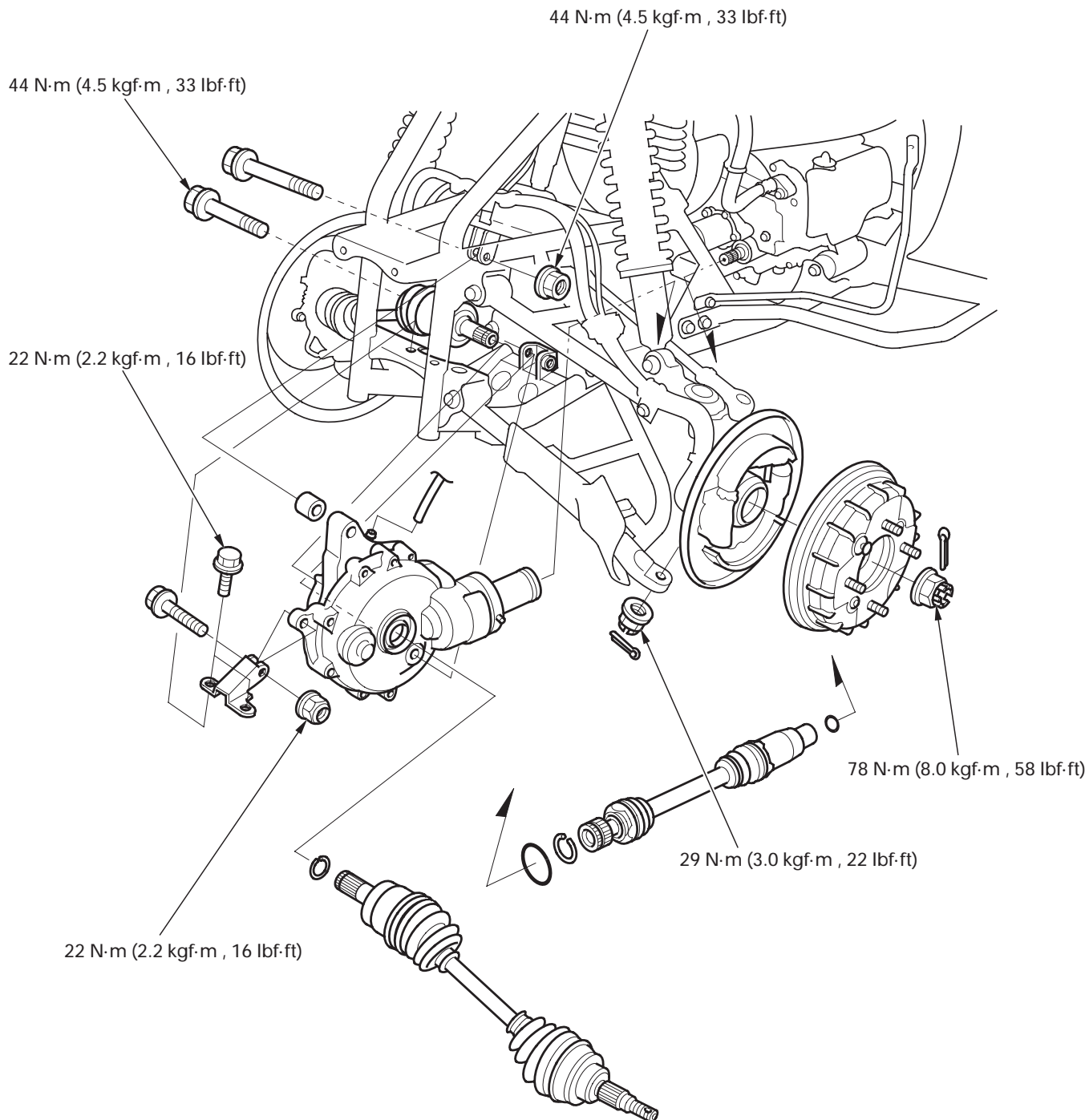
Install the return spring as shown.

Connect the brake cable to the brake arm (page 14-17).

Install the rear mud guard (page 2-5).



FRONT DRIVING MECHANISM (FM/FE model)



15. FRONT DRIVING MECHANISM (FM/FE models)

SERVICE INFORMATION	15-1	CASE BEARING REPLACEMENT	15-17
TROUBLESHOOTING	15-2	DIFFERENTIAL ASSEMBLY	15-19
FRONT DRIVE SHAFT	15-3	DIFFERENTIAL INSTALLATION	15-23
DIFFERENTIAL REMOVAL	15-8		
DIFFERENTIAL DISASSEMBLY/ INSPECTION	15-9		

SERVICE INFORMATION

GENERAL

- The differential assembly and propeller shaft must be removed together.
- 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 halves as an assembly if the face cam, differential housing or cap is faulty.

SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Front differential	Oil capacity	After draining	241 cm ³ (8.2 US oz , 8.5 Imp oz)	————
		After disassembly	275 cm ³ (9.3 US oz , 9.7 Imp oz)	————
	Recommended oil		Hypoid gear oil SAE # 80	————
	Gear backlash		0.05 — 0.25 (0.002 — 0.010)	0.4 (0.02)
	Backlash difference		————	0.2 (0.01)
	Slip torque		14 — 17 N·m (1.45 — 1.75 kgf·m , 10 — 13 lbf·ft)	12 N·m (1.2 kgf·m , 9 lbf·ft)
	Face cam-to-housing distance		6.3 — 6.7 (0.25 — 0.26)	6.3 (0.25)
	Differential housing cap depth		9.55 — 9.65 (0.376 — 0.380)	9.55 (0.376)
	Cone spring free height		2.8 (0.11)	2.6 (0.10)

15

TORQUE VALUES

Upper and lower arm ball joint nut	29 N·m (3.0 kgf·m , 22 lbf·ft)	Castle nut
Front wheel hub nut	78 N·m (8.0 kgf·m , 58 lbf·ft)	
	Apply grease to the threads and seating surface/Castle nut	
Differential ring gear bolt	49 N·m (5.0 kgf·m , 36 lbf·ft)	Special bolt
Differential pinion bearing lock nut	98 N·m (10.0 kgf·m , 72 lbf·ft)	Stake/Lock nut
Differential case cover bolt	49 N·m (5.0 kgf·m , 36 lbf·ft)	Apply locking agent to the threads
	25 N·m (2.6 kgf·m , 19 lbf·ft)	
Differential mounting bolt (10 mm)	44 N·m (4.5 kgf·m , 33 lbf·ft)	
nut (10 mm)	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut
bolt and nut (8 mm)	22 N·m (2.2 kgf·m , 16 lbf·ft)	

TOOLS

Driver	07749-0010000
Attachment, 22 × 24 mm	07746-0010800
Attachment, 52 × 55 mm	07746-0010400
Pilot, 14 mm	07746-0041200
Pilot, 28 mm	07746-0041100
Driver, 22 mm I.D.	07746-0020100
Driver, 40 mm I.D.	07746-0030100
Attachment, 15 mm I.D.	07746-0020200
Attachment, 20 mm I.D.	07746-0020400
Ball joint remover, 28 mm	07MAC-SL00200
Differential inspection tool	07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)
Lock nut wrench, 34 × 44 mm	07916-ME50001
Pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Assembly shaft	07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A (U.S.A. only) and 07YMF-HN4010A (U.S.A. only)
Remover shaft, 14 mm	07YMC-001010A (U.S.A. only) can use collet of 07936-KC10500
Remover shaft, 15 mm	07936-KC10100
Bearing remover, 14 mm	07WMC-KFG0100
Bearing remover, 15 mm	07936-KC10200
Remover weight	07741-0010201
Remover weight	07936-3710200 or 07936-371020A (U.S.A. only)
Remover handle	07936-3710100
Differential bearing ring compressor	07YME-HN4010A (U.S.A. only)
Threaded adapter, 16×1.5–12×1.25 mm	07YMF-HN4010A (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 differential case
- Improper tooth contact between ring gear and pinion gear

Gear noises while running

- Oil level too low
- Foreign matter contaminating gear oil
- Chipped or damaged gears
- Improper tooth contact between ring gear and pinion gear

Gear noises while coasting

- Damage or chipped gears

Abnormal noises when turning

- Worn or damaged ring gear bearing
- Worn or damaged face cam and cam follower
- Worn or damaged differential housing groove
- Worn cone spring or shim

Abnormal noises at start or during acceleration

- Excessive backlash between ring gear and pinion gear
- Worn differential splines
- Loose fasteners
- Worn cone spring or shim

Oil leak

- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

Over heating

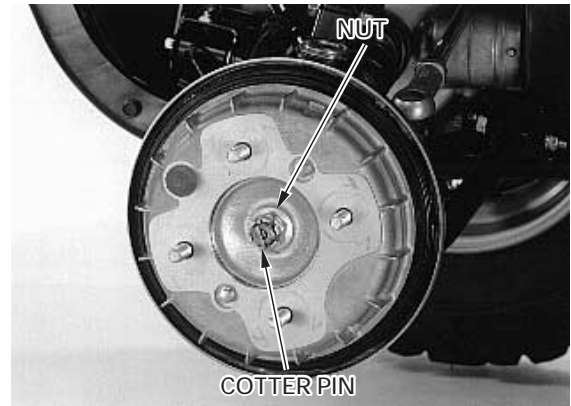
- Oil level too low
- Insufficient backlash between ring gear and pinion gear

FRONT DRIVE SHAFT

REMOVAL

Remove the front wheel (page 12-7).

Remove the cotter pin and loosen the hub nut.

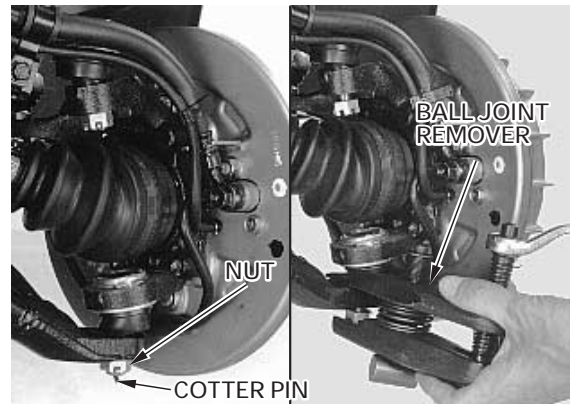


Remove the cotter pins and loosen the ball joint nuts.

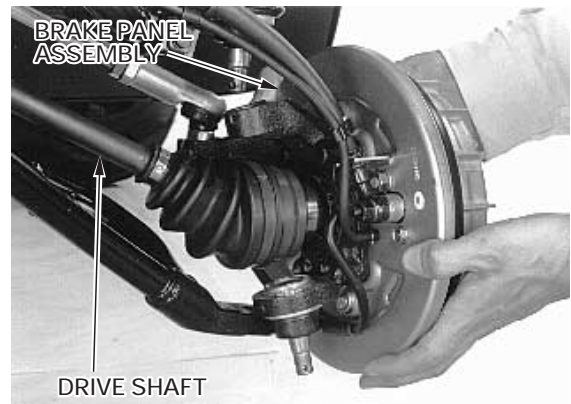
Release the ball joints, using the special tool according to the instructions on page 12-12.

TOOL:

Ball joint remover, 28 mm 07MAC-SL00200



Remove the hub nut and joint nuts and separate the brake panel assembly from the drive shaft.
Do not twist the brake hose. Support the brake panel assembly so that it does not hang from the brake hose.



To prevent damage to the differential oil seal, hold the inboard joint horizontal until the drive shaft is clear of the differential. Hold the inboard joint of the drive shaft and tug firmly to force the stopper ring at the drive shaft end past the groove while prying with a screwdriver.



DISASSEMBLY/INSPECTION

Check the boots for cuts or other damage.
Check the drive shaft joints for excessive play or noise by moving the joints in a circular direction.
If the outboard joint seems to be worn or damaged, the drive shaft must be replaced.

NOTE:

- To replace the outboard boot, first remove the inboard boots as described in following steps.
Then remove bands and the outboard boot off the inboard end of the shaft.
- The outboard joint can not be disassembled.

Replace the bands with new ones whenever removing them.

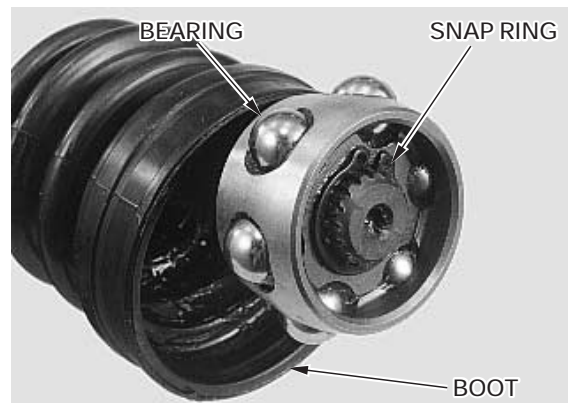
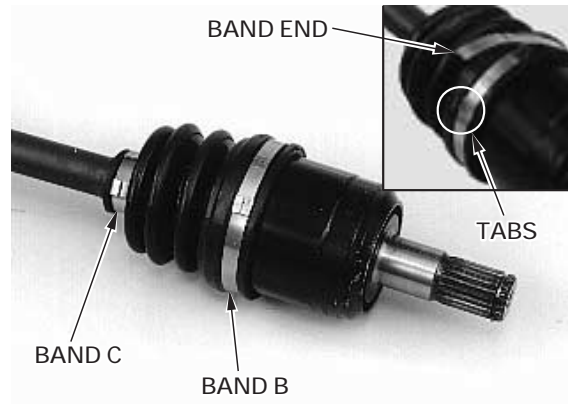
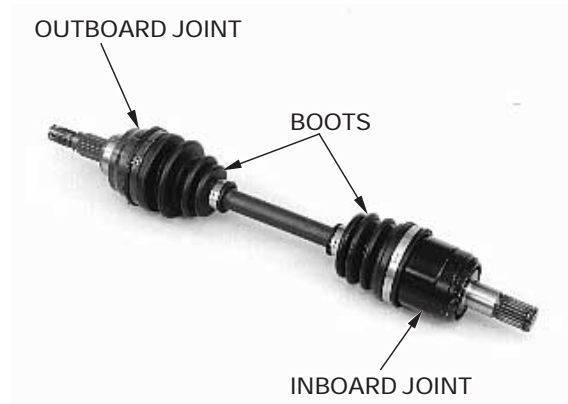
Bend up the lock tabs and raise the band end to loosen the boot bands on the inboard side.
Remove the boot band B.

Release the boot off the inboard joint.

Remove the following:

- stopper ring
- inboard joint

- snap ring
- bearing
- inboard boots
- boot band C



FRONT DRIVING MECHANISM (FM/FE models)

Replace their
components as an
assembly.

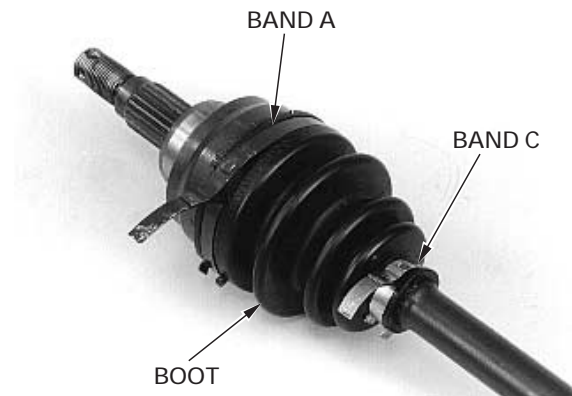
Check the following for wear or damage.

- bearing cage
- race
- steel balls
- inboard joint

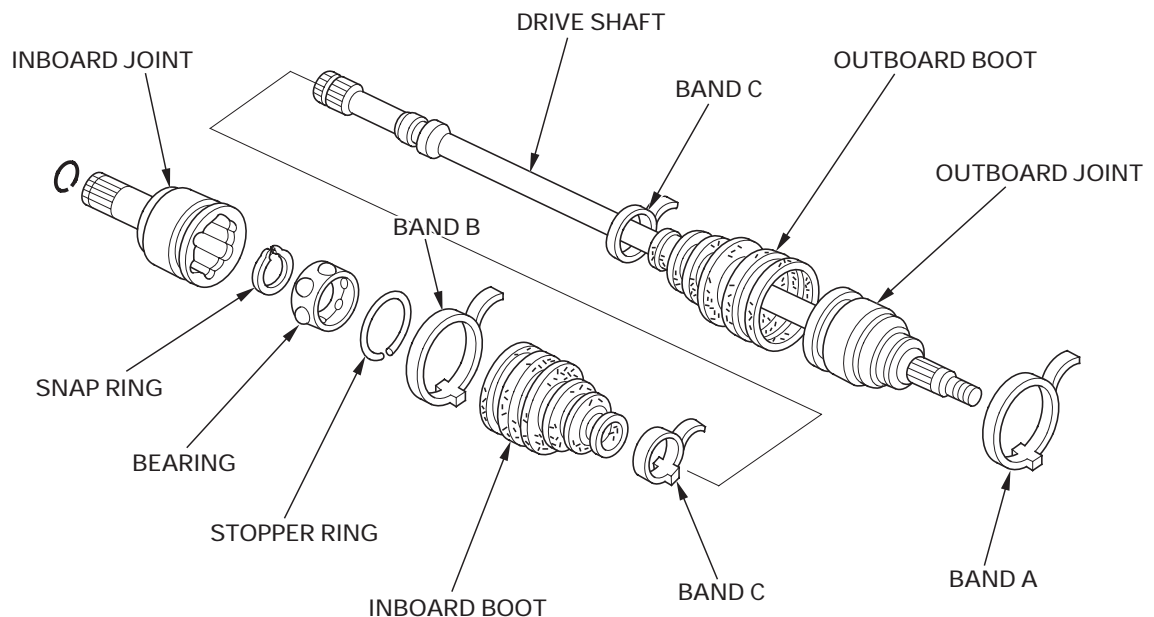


Remove the following:

- boot band C and A
- outboard boot



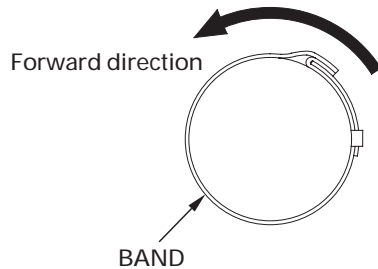
ASSEMBLY



FRONT DRIVING MECHANISM (FM/FE models)

Each boot has an identification mark; "BJ68L" for the outboard and "BJ68" for the inboard.

Note the installation direction of the boot bands.

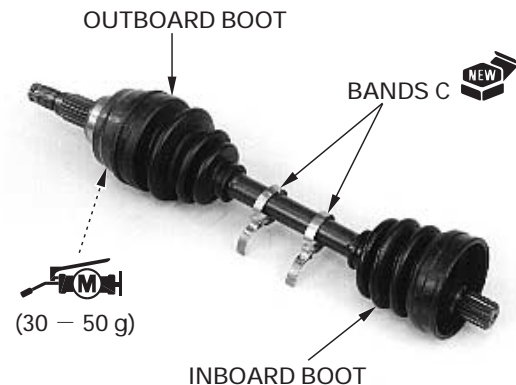
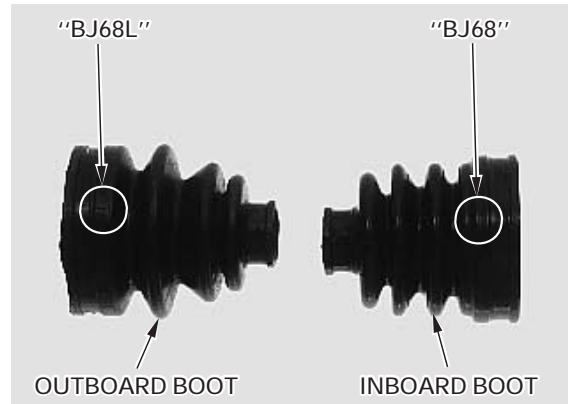


Pack the outboard joint with 30–50 g of molybdenum disulfide grease.

Install the following:

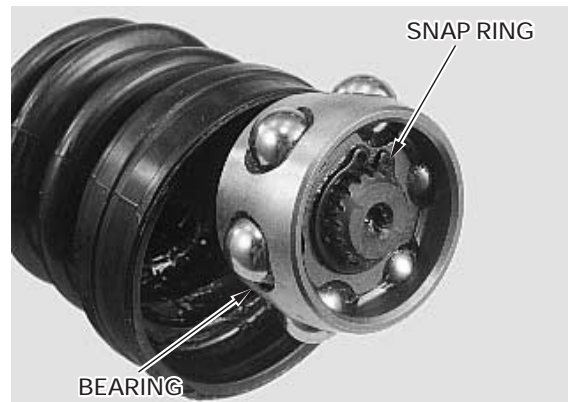
- outboard boot
- new boot bands C
- inboard boot

Do not tighten the bands at this time.



Install the bearing with the small O.D. facing to the drive shaft.

Install the snap ring with the chamfered side facing to the bearing.



Pack the inboard joint with 40–60 g of molybdenum disulfide grease.

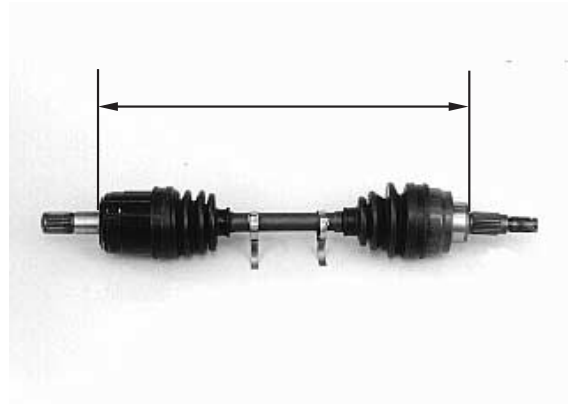
Install the inboard joint over the bearing.

Install the stopper ring into the groove the in the inboard joint properly.



Adjust the length of the drive shaft to the figure given below.

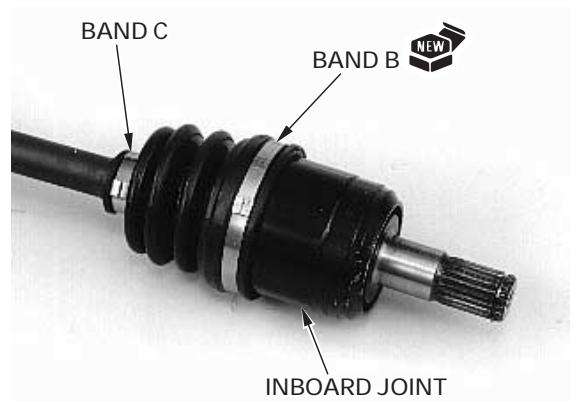
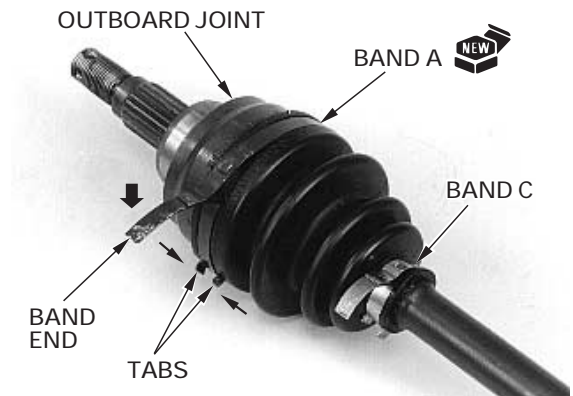
DRIVE SHAFT LENGTH: Left/Right:
344.8–354.8 mm (13.57–13.97 in)



See page 15-6 for
band installation
direction.

Install the boot bands C onto the boots.
Install new boot band A onto the outboard boot and
the 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
differential gear
case.*

Install the drive shaft by holding the inboard joint
until the stopper ring seats in the groove of the
differential.

Make sure that the stopper ring is seated properly
by pulling on the inboard joint lightly.



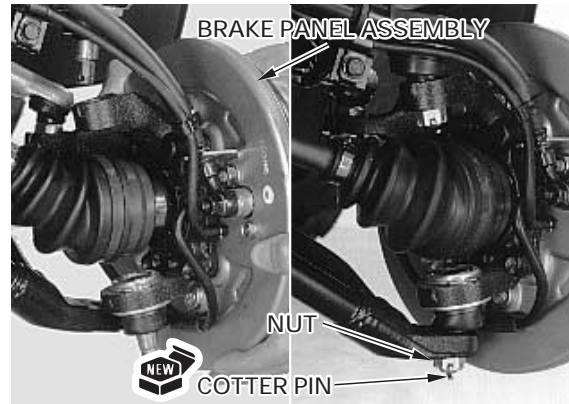
FRONT DRIVING MECHANISM (FM/FE models)

Install the brake panel assembly over the drive shaft and onto the suspension arms.

Install and tighten each joint nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 29 N·m (3.0 kgf·m , 22 lbf·ft)

Install new cotter pins.



Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 78 N·m (8.0 kgf·m , 58 lbf·ft)

Install a new cotter pin.

Install the front wheel (page 12-8).



DIFFERENTIAL REMOVAL

Drain the differential oil (page 3-13).

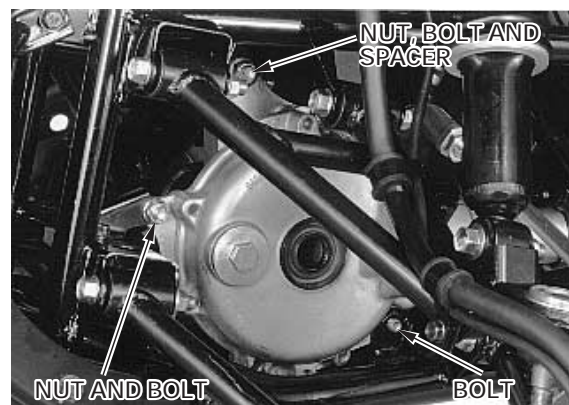
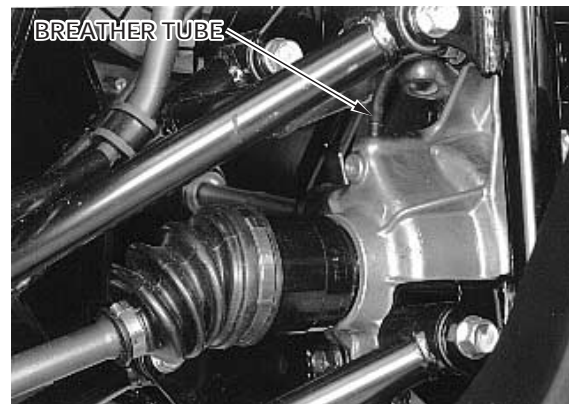
Remove the following:

- left front mud guard (page 2-6)
- one drive shaft (page 15-3)

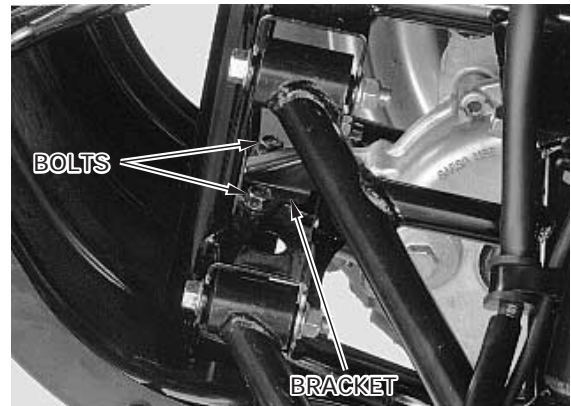
Disconnect the breather tube.

Remove the following mounting fasteners:

- 8 mm nut and bolt
- 10 mm nut, spacer, and two bolts



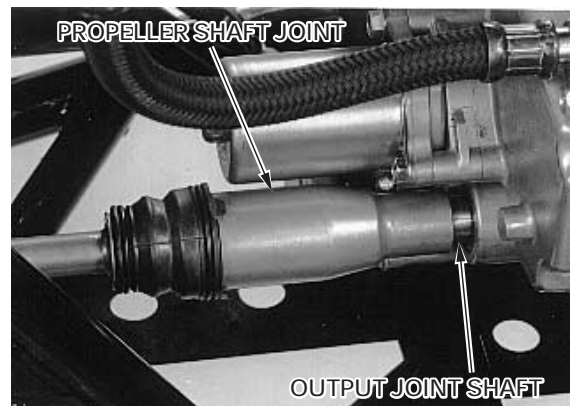
- two 8 mm bolts
- mounting bracket



Move the differential forward for maximum clearance between the propeller shaft joint and engine.

Pull the propeller shaft joint forward, then separate it from the engine (output shaft joint).

Separate the other drive shaft from the differential as you remove it.
Remove the differential assembly out of the frame.

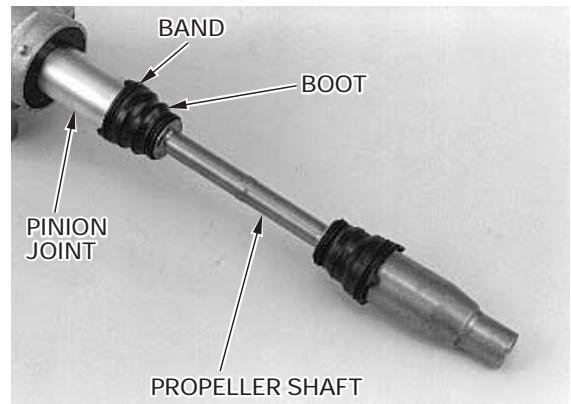


DIFFERENTIAL DISASSEMBLY/INSPECTION

PROPELLER SHAFT REMOVAL

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

Separate the propeller shaft from the differential by pulling it to force the stopper ring at the propeller shaft end past the groove in the pinion joint.



Remove the boot band from the dust boot of the propeller shaft joint side and release the dust boot off the joint to remove the propeller shaft joint and spring.

ASSEMBLY INSPECTION

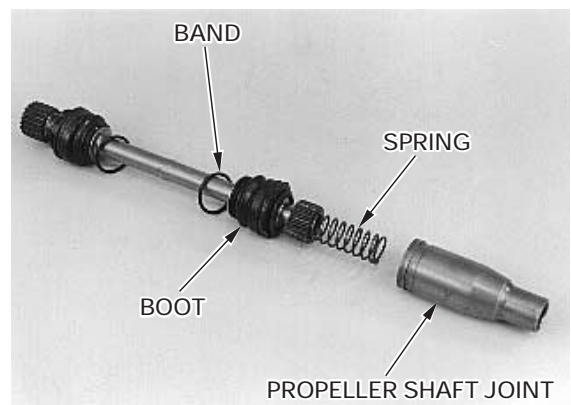
PROPELLER SHAFT

Check the splines of the propeller shaft for wear or damage.

If damaged, check the pinion joint and drive shaft joint also.

Check the dust seals for fatigue or damage.

Check the boots for cuts or damage.



FRONT DRIVING MECHANISM (FM/FE models)

DIFFERENTIAL

Turn the pinion joint and check that the gear turns smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty. They must be checked after disassembly; replace them if necessary.

BACKLASH INSPECTION

Hold the pinion gear with the special tools.

TOOLS:

Pinion puller base

07HMC-MM80110 or
07HMC-MM8011A
(U.S.A. only)

Assembly shaft

07965-VM00200
not available in U.S.A. or
07931-ME4010B and

Puller shaft

Threaded adapter,
16 × 1.5 — 12 × 1.25 mm

Special nut

07YMF-HN4010A
(U.S.A. only) and
07931-HB3020A
(U.S.A. only)

Set the differential case into a jig or vise with soft jaws.

Install the differential inspection tool into the right side of the differential.

TOOL:

Differential inspection tool

07KMK-HC50101 or
07KMK-HC5010A
(U.S.A. only)

Remove the oil filler cap and set a horizontal type dial indicator on the ring gear through the filler hole.

Turn the ring gear back and forth to read backlash.

STANDARD: 0.05 — 0.25 mm (0.002 — 0.010 in)

SERVICE LIMIT: 0.4 mm (0.02 in)

Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.

Compare the difference of the three measurements.

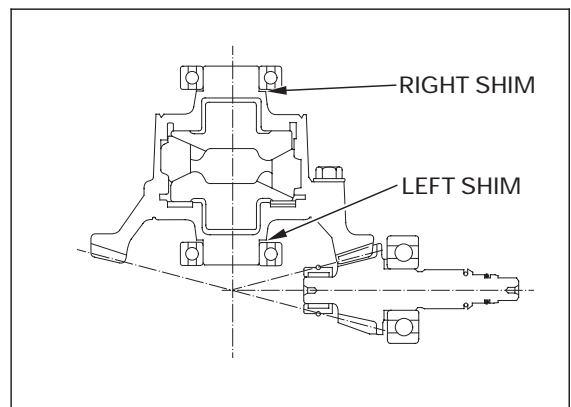
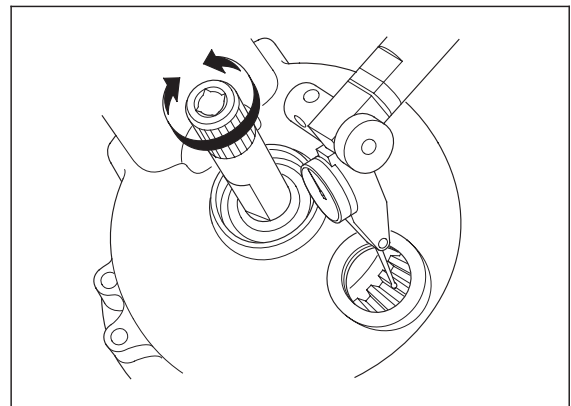
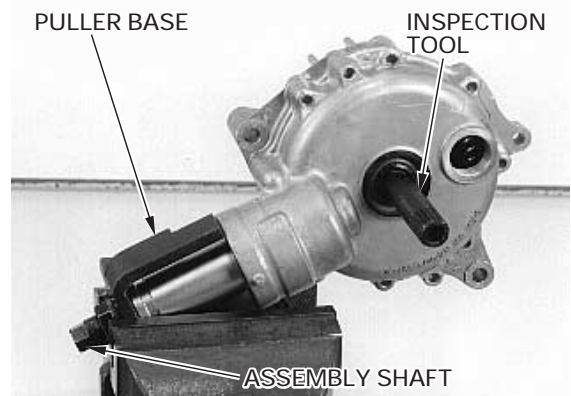
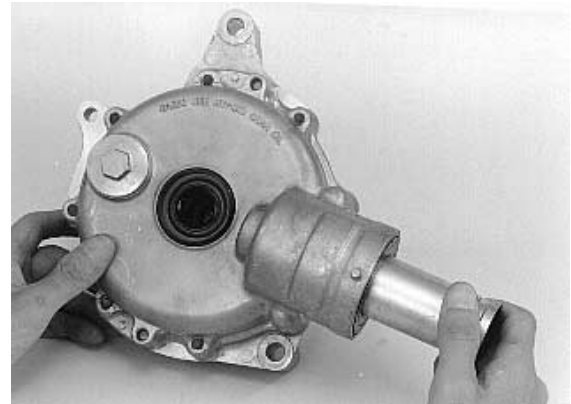
SERVICE LIMIT: 0.2 mm (0.01 in)

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.

If the backlash is excessive, replace the ring gear left side shim with a thinner one.

If the backlash is too small, replace the ring gear left side shim with a thicker one.

Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.10 mm (0.004 in).



NOTE:

- Twenty-three different thickness shims are available from the thinnest (0.50 mm thickness: A) shim to the thickest (1.60 mm thickness: W) in intervals of 0.05 mm.

Ring gear shims:

A: (thinnest): 0.50 mm (0.020 in) —

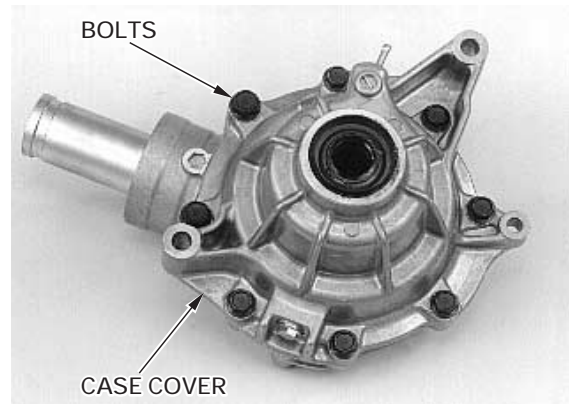
K: (standard): 1.00 mm (0.039 in) —

W: (thickest): 1.60 mm (0.063 in)

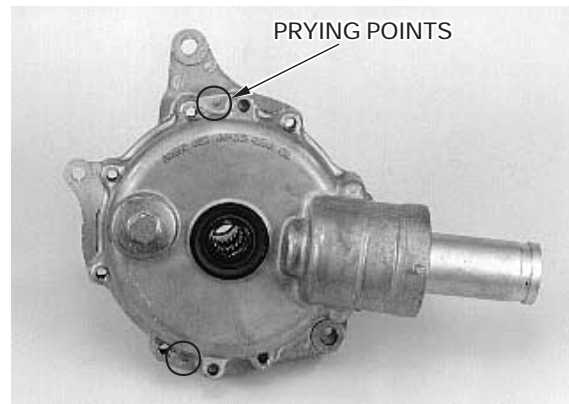
Change the right side shim and equal thickness and opposite amount of what the left side shim was changed; if the left shim was replaced with a 0.10 mm (0.004 in) thicker shim, replace the right shim with one that is 0.10 mm (0.004 in) thinner.

DIFFERENTIAL CASE DISASSEMBLY

Remove the cover bolts in a crisscross pattern in several steps.



Pry the cover at the prying points using a screwdriver and remove the case cover.

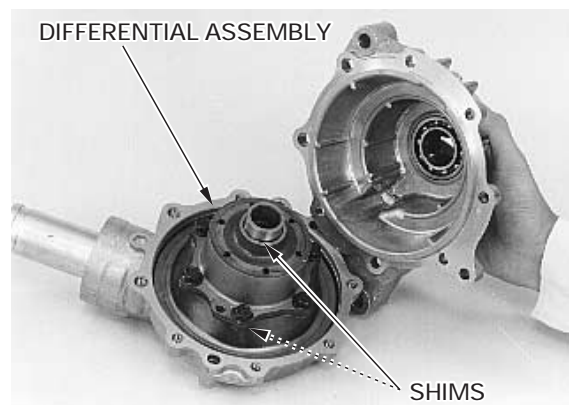


Remove the differential assembly and shims.

BEARING INSPECTION

Turn the inner race of each bearing in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

For ring gear bearing replacement, see page 15-17.
For pinion gear removal and bearing replacement, see page 15-16 and 15-18.



FRONT DRIVING MECHANISM (FM/FE models)

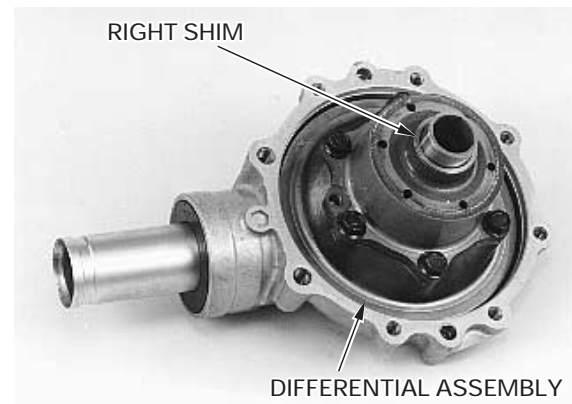
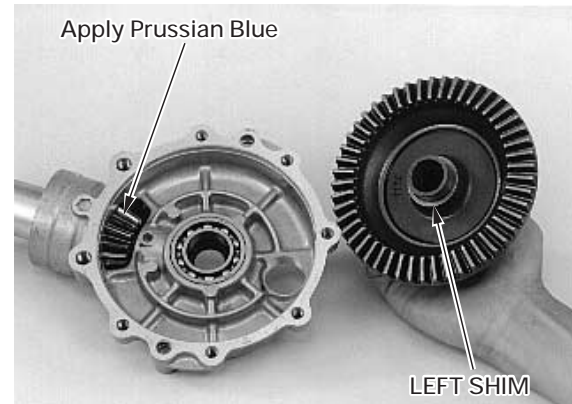
GEAR TOOTH CONTACT PATTERN CHECK

Keep dust and dirt out of the case and cover. Clean sealing material off the mating surfaces of the differential case and cover, being careful not to damage them.

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

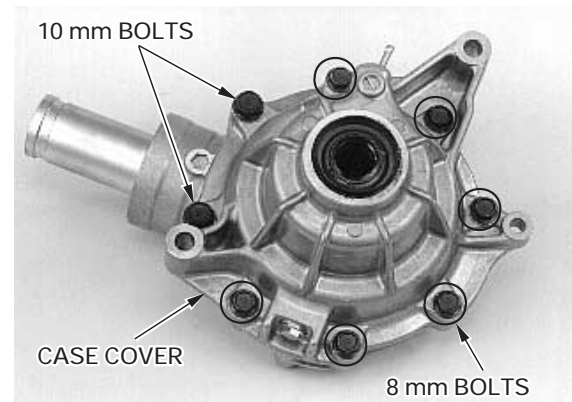
Install the ring gear shims onto the differential assembly.

Install the differential assembly into the gear case.



It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening. Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)



Remove the oil filler cap.

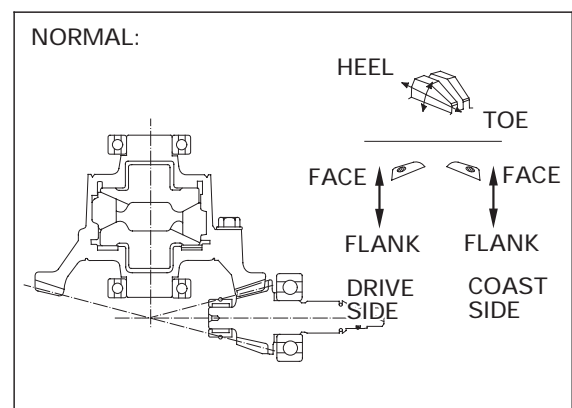
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

The pattern is indicated by the Prussian Blue applied to the pinion.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.



Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

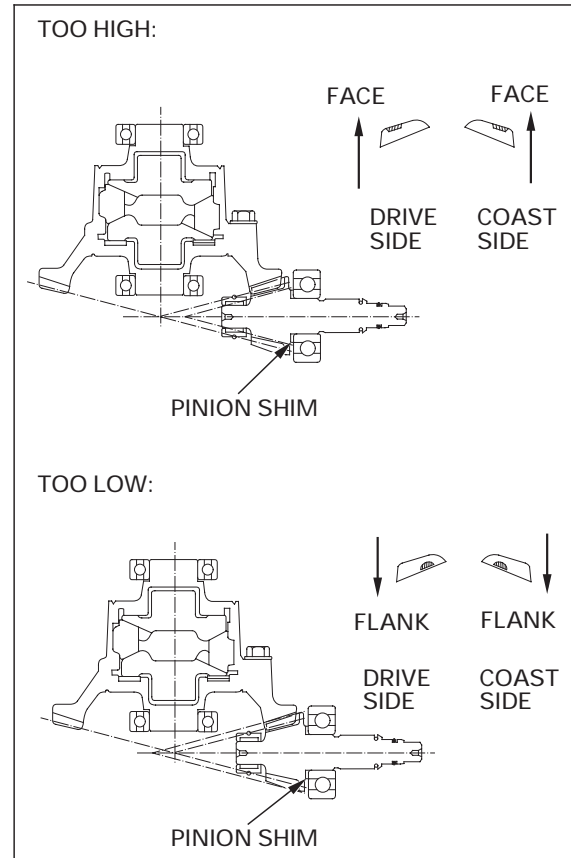
Replace the pinion shim with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

Pinion shims:

L: 1.64 mm (0.064 in)	C: 1.94 mm (0.076 in)
M: 1.70 mm (0.067 in)	D: 2.00 mm (0.079 in)
N: 1.76 mm (0.069 in)	E: 2.06 mm (0.081 in)
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)

For pinion shim replacement, see page 15-16.



DIFFERENTIAL INSPECTION

Install the inspection tools into both sides of the differential.

TOOL:

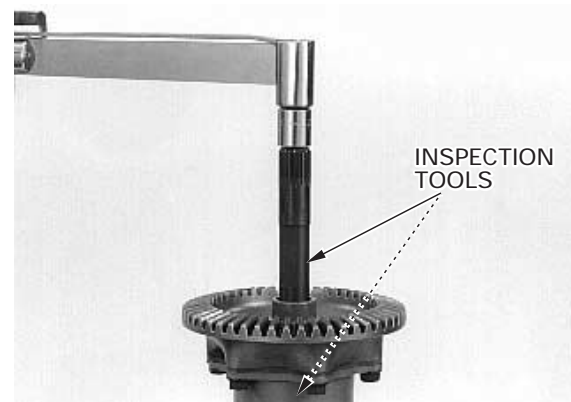
Differential inspection tool 07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)

Hold the flat surface of the tool with a bench vise. Attach a torque wrench to the other tool and measure the limited slip torque.

STANDARD: 14 – 17 N·m (1.45 – 1.75 kgf·m , 10 – 13 lbf·ft)

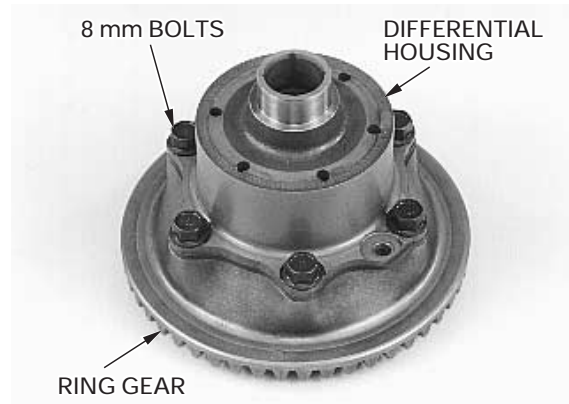
SERVICE LIMIT: 12 N·m (1.2 kgf·m , 9 lbf·ft)

If the slip torque is out of specification, disassemble the differential and perform the components inspection (page 15-14) since the differential may be faulty.



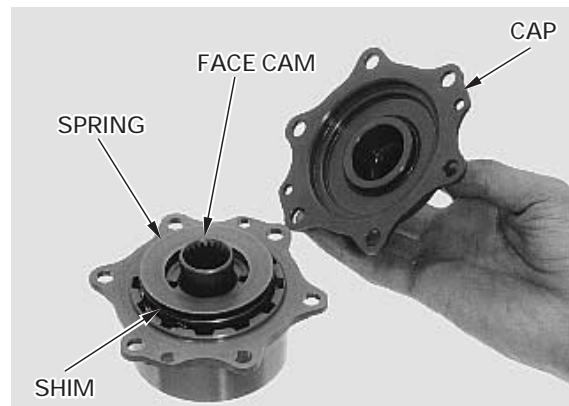
DIFFERENTIAL DISASSEMBLY

Remove the six bolts, then place the differential assembly with the housing side down, and remove the ring gear.



Remove the following:

- differential cap
- cone spring
- shim



- left face cam
- six cam followers A and six cam followers B
- right face cam



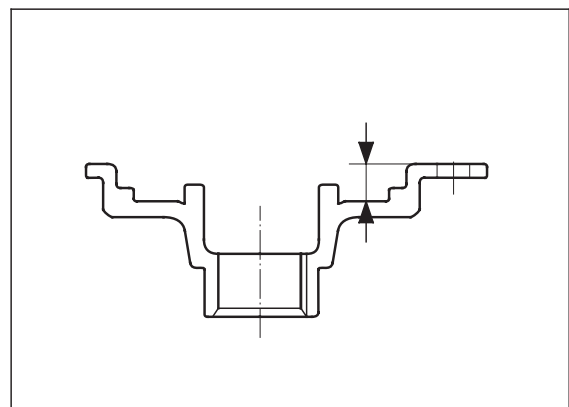
If the differential housing, cap and face cam are faulty, replace the differential as an assembly.

DIFFERENTIAL COMPONENTS INSPECTION

DIFFERENTIAL CAP

Check the sliding surface of the cap for damage or discoloration. Measure the depth of the cap from the mating surface as shown.

SERVICE LIMIT: 9.55 mm (0.376 in)



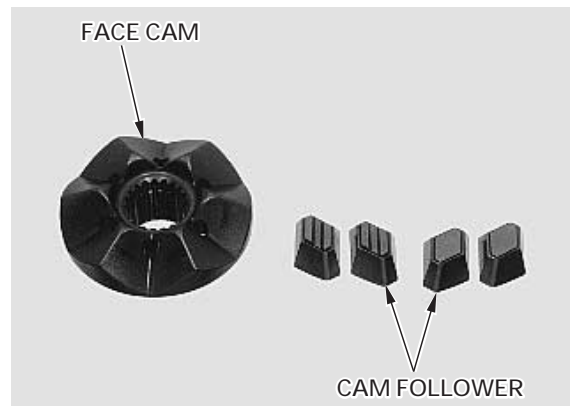
DIFFERENTIAL HOUSING/FACE CAM/ CAM FOLLOWER

Check the sliding surface and grooves of the housing for damage or discoloration.



Replace the cam followers as a set (12 pieces).

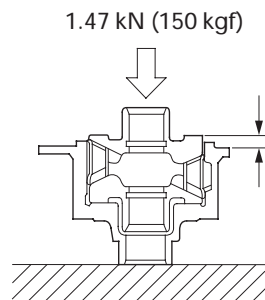
Check the shim, face cams and followers for damage.



Temporarily assemble the differential housing, face cams and cam followers (page 15-21). Measure the height of the face cam from the housing mating surface as shown while applying a load of 1.47 kN (150 kgf) to the face cam boss using a hydraulic press.

SERVICE LIMIT: 6.3 mm (0.25 in)

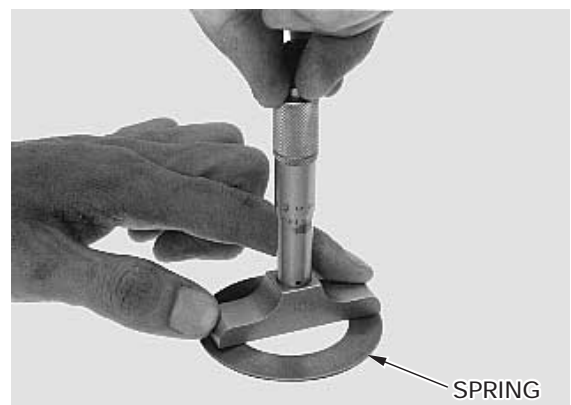
If the height exceeds the limit, replace the differential as an assembly.



SIDE CONE SPRING

Check the spring for damage. Measure the height of the cone spring.

SERVICE LIMIT: 2.6 mm (0.10 in)

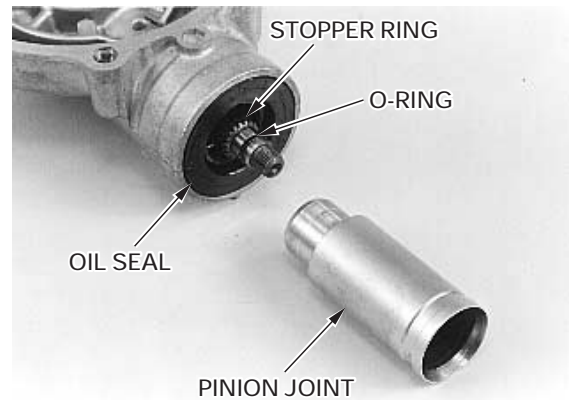


FRONT DRIVING MECHANISM (FM/FE models)

PINION GEAR REMOVAL

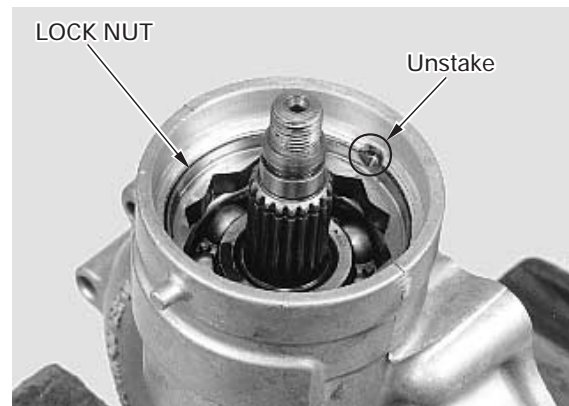
Remove the pinion joint from the differential by pulling it to force the stopper ring at the pinion gear shaft past the groove in the pinion joint.

Remove the oil seal, O-ring and stopper ring.



Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

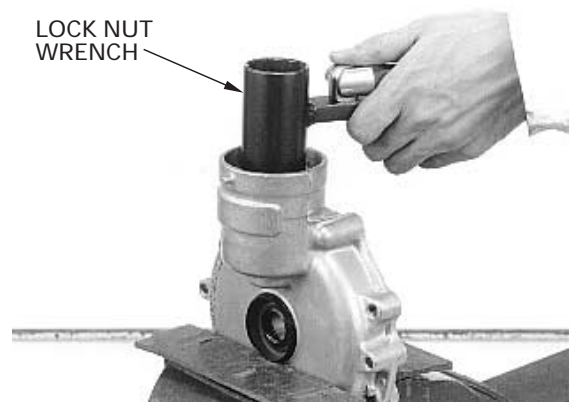
Unstake the pinion bearing lock nut with a drill or grinder.



Remove the lock nut and discard it.

TOOL:

Lock nut wrench, 34 × 44 mm 07916-ME50001



Install the special tools onto the pinion gear shaft and gear case.

Pull the pinion assembly out from the case.

TOOLS:

Pinion puller base

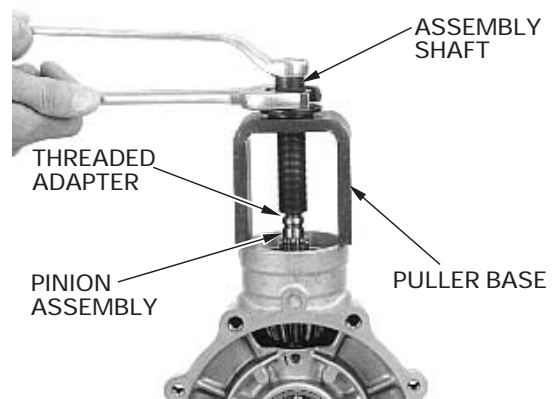
Assembly shaft

Puller shaft

Threaded adapter,
16 × 1.5 – 12 × 1.25 mm

Special nut

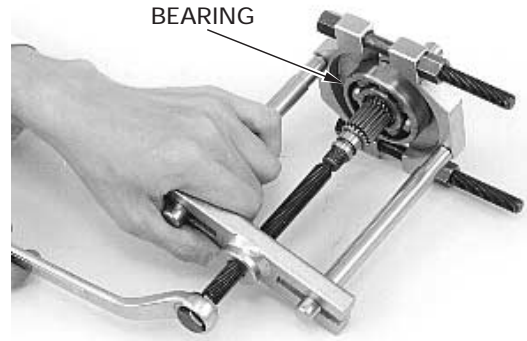
07HMC-MM80110 or
07HMC-MM8011A
(U.S.A. only)
07965-VM00200
not available in U.S.A. or
07931-ME4010B and
07YMF-HN4010A
(U.S.A. only) and
07931-HB3020A
(U.S.A. only)



PINION GEAR BEARING AND SHIM REPLACEMENT

Pull the pinion bearing from the shaft with a commercially available bearing puller.

Remove the pinion shim.



Install the shim and bearing onto the pinion gear.

NOTE:

- When the gear set, ring gear bearing, differential housing and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.



Drive the bearing with the marking side facing up.

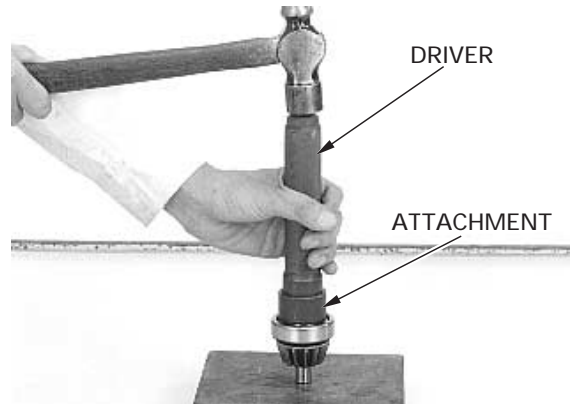
TOOLS:

Driver, 22 mm I.D.

07746-0020100

Attachment, 20 mm I.D.

07746-0020400

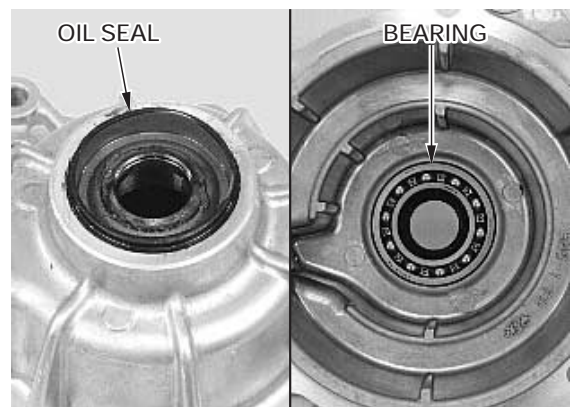


CASE BEARING REPLACEMENT

RING GEAR BEARING

Remove the oil seal.

Drive the bearings out of the case and cover.

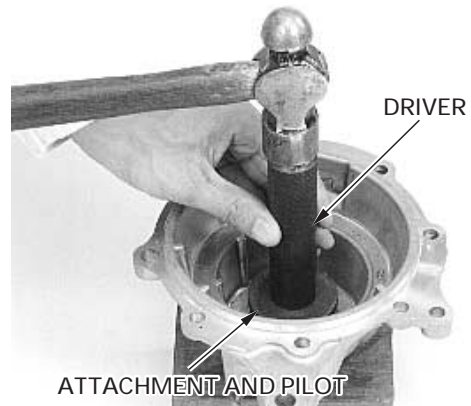


FRONT DRIVING MECHANISM (FM/FE models)

Drive the bearings into the case and cover.

TOOLS:

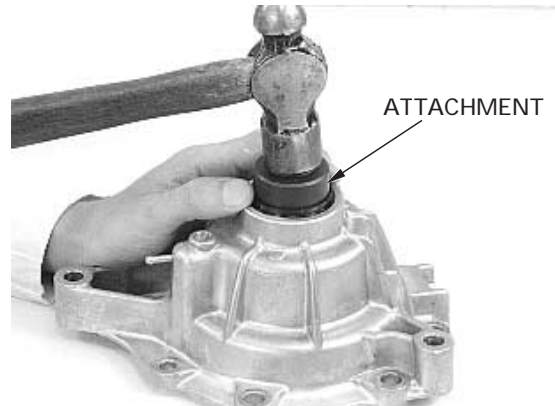
Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 28 mm	07746-0041100



Apply grease to new dust seal lips and install them into the case and cover.

TOOL:

Attachment, 20 mm I.D.	07746-0020400
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PINION NEEDLE BEARING

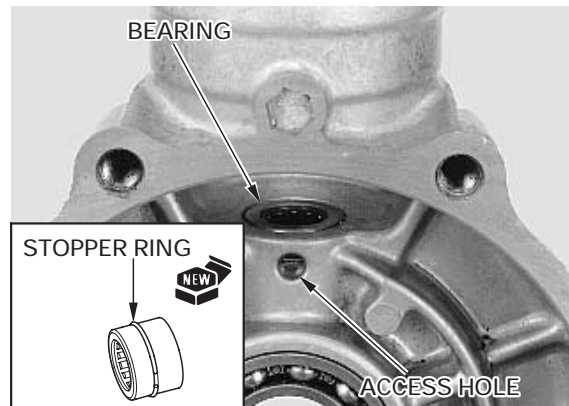
Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole. Bend up the end of the ring with a screwdriver. Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole. Remove the filler cap.

Heat the gear case to 80 °C (176 °F) and remove the needle bearing by using the special tools.

TOOL:

Bearing remover, 14 mm	07WMC-KFG0100
Remover shaft, 15 mm	07936-KC10100
Remover weight	07741-0010201
U.S.A. only:	
Bearing remover, 15 mm	07936-KC10200
Remover shaft, 14 mm	07YMC-001010A
Remover weight	07936-371020A or 07936-3710200
Remover handle	07936-3710100

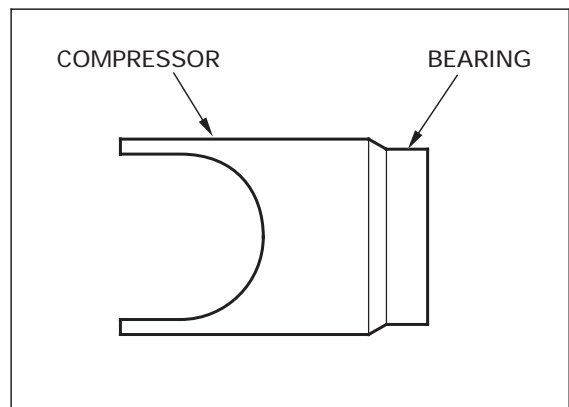
Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.



Install the stopper ring into the groove in the bearing. Install the bearing into the compressor until the bearing is flush with the end of the tool. Place the driver on top of the bearing and tape the driver to the compressor. Place the assembly into a freezer for at least 30 minutes.

TOOLS:

Driver	07749-0010000
Differential bearing ring compressor	07YME-HN4010A
Attachment, 22 × 24 mm	07746-0010800
Pilot, 14 mm	07746-0041200

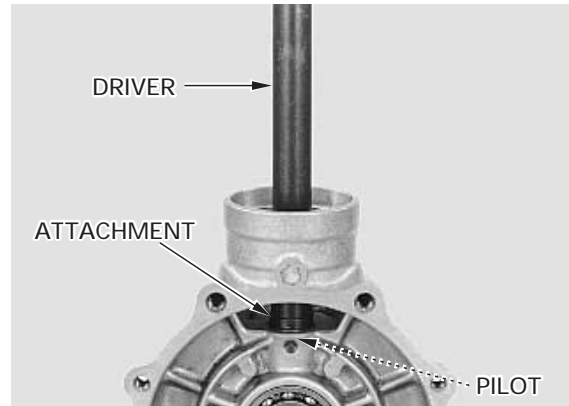


Heat the gear case to 80 °C (176 °F).

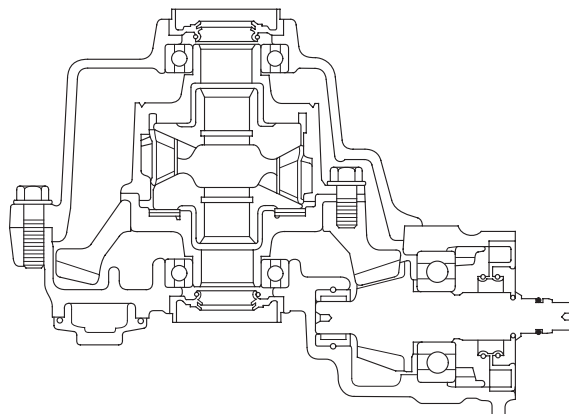
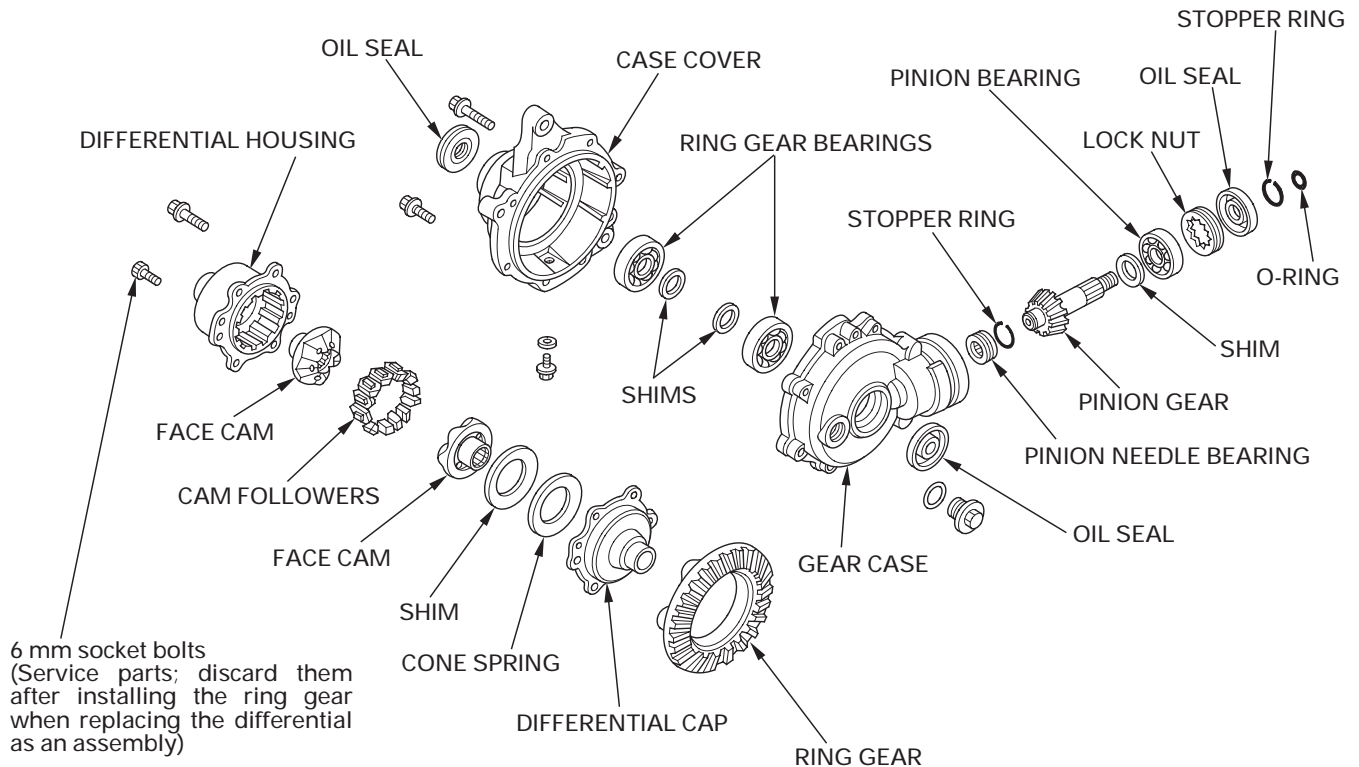
Remove the needle bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

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 one.

Make sure the stopper ring is securely set in the groove of the gear case.



DIFFERENTIAL ASSEMBLY



PINION GEAR INSTALLATION

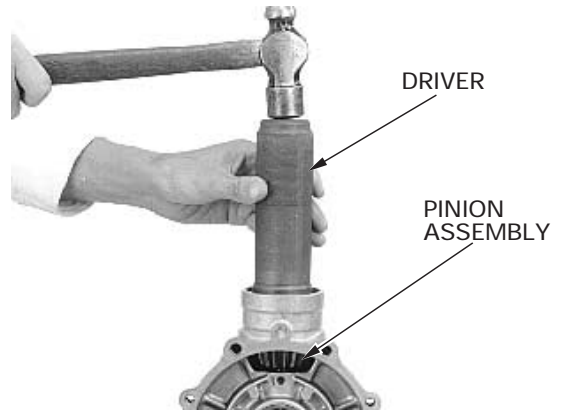
Drive the pinion assembly into the gear case.

TOOL:

Driver, 40 mm I.D. 07746-0030100

NOTE:

- Keep the driver centered with the bearing outer race during installation.



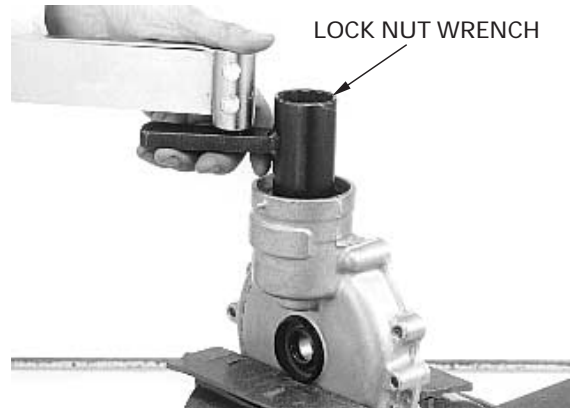
Install a new lock nut and tighten it.

TOOL:

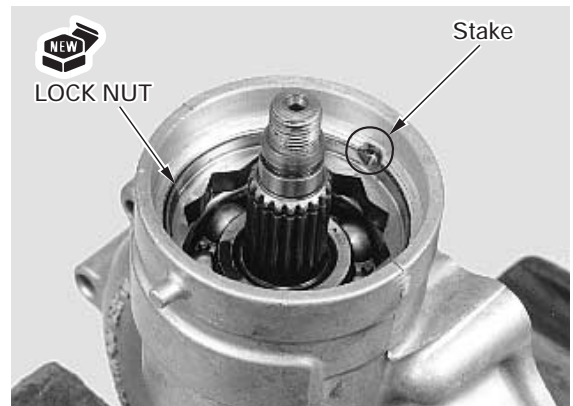
Lock nut wrench, 34 × 44 mm 07916-ME50001

Refer to torque wrench reading information on page 15-1 "Service Information".

TORQUE: Actual: 98 N·m (10.0 kgf·m , 72 lbf·ft)
Indicated: 89 N·m (9.1 kgf·m , 66 lbf·ft)



Stake the lock nut into the case groove.



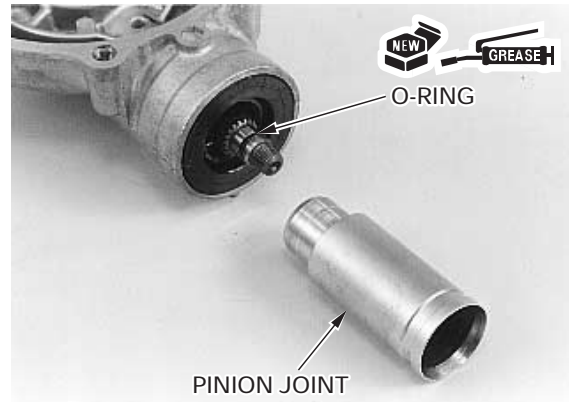
Install a new stopper ring into the groove in the pinion gear shaft spline.

Apply grease to a new oil seal lips.
Install the oil seal into the gear case until it is fully seated.



Coat a new O-ring with grease and install it into the groove in the pinion gear shaft.

Apply molybdenum disulfide grease to the pinion gear shaft spline and install the pinion joint until the stopper ring seats in the groove. Make sure that the stopper ring is seated properly by pulling on the pinion joint lightly.

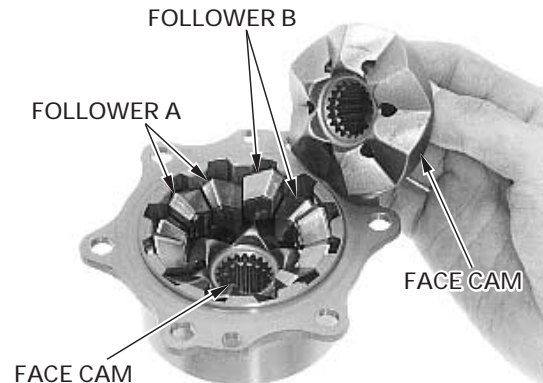
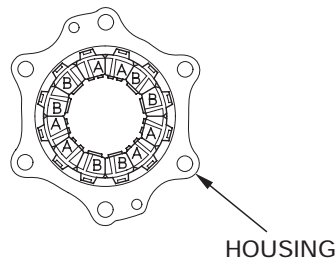


Keep dust and dirt out of the differential housing.

DIFFERENTIAL ASSEMBLY

Install the face cam into the differential housing.

Install the six cam followers A (rib) and six followers B (flat) into the specified grooves in the housing by two and two as shown.



Install the face cam onto the cam followers.

Measure the depth of the differential cap and the height of the housing-to-cam, and record them (page 15-14 and 15-15).

Calculate the shim thickness using the equation below. The correct shim is nearly this dimension.

$$A = B - C - 1.7 \text{ mm}$$

A: New shim thickness
B: Recorded cap depth
C: Recorded cam height

Select the shim and install it onto the face cam.

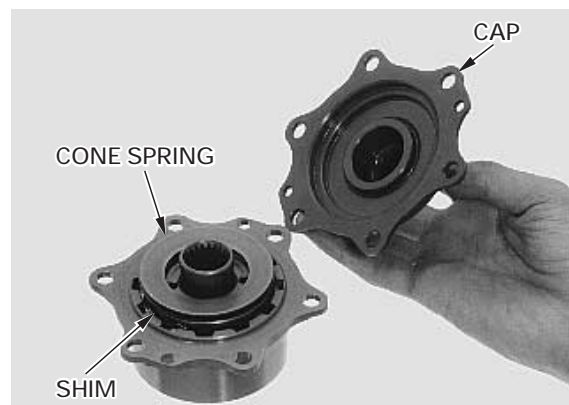
Differential shims:

L: 1.3 mm (0.05 in) C: 1.7 mm (0.07 in)
M: 1.4 mm (0.06 in) D: 1.8 mm (0.07 in)
N: 1.5 mm (0.06 in) E: 1.9 mm (0.07 in)
A: 1.6 mm (0.06 in)

Install the cone spring with the concave side facing up (differential cap side).
Install the differential cap.

NOTE:

- Inspect the slip torque (page 15-13) after installing the ring gear with the original bolts. If the slip torque is out of specification, perform the shim adjustment. Replace the differential assembly when the replacement shim is changed by 0.3 mm or more from the selected shim (see above).



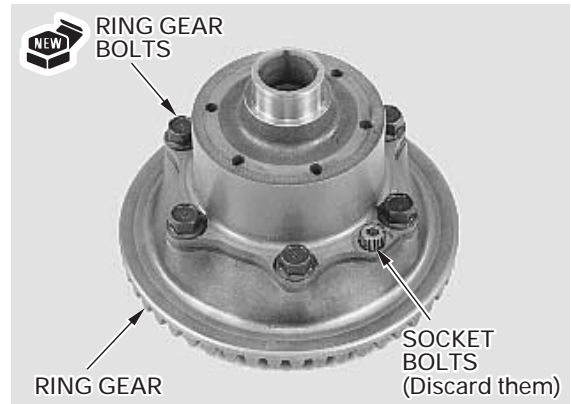
FRONT DRIVING MECHANISM (FM/FE model)

Install the ring gear onto the differential assembly with new ring gear bolts. Tighten the six bolts in a crisscross pattern in several steps.

TORQUE: 49 N·m (5.0 kgf·m , 36 lbf·ft)

NOTICE

If the differential assembly is replaced, remove the two socket bolts and discard them after installing the ring gear.



DIFFERENTIAL CASE ASSEMBLY

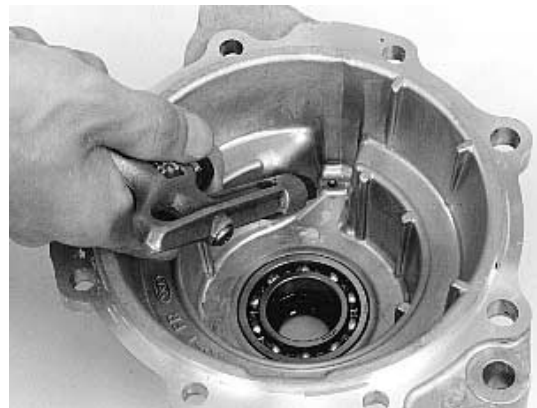
NOTE:

- When the gear set, bearing, differential housing and/or gear case has been replaced, check the tooth contact pattern check (page 15-12) and gear backlash (page 15-10).

Keep dust and dirt out of the case and cover.

Clean the mating surface of the gear case and cover, being careful not to damage them.

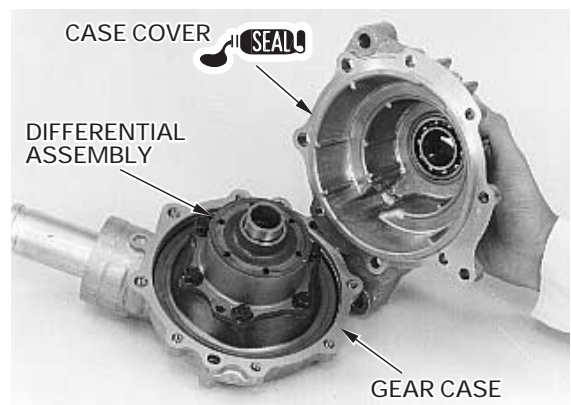
Blow compressed air through the breather hole in the case cover.



Install the proper ring gear shims onto the differential assembly and install the assembly into the gear case.



Apply liquid sealant to the mating surface of the case cover. Install the cover over the gear case.



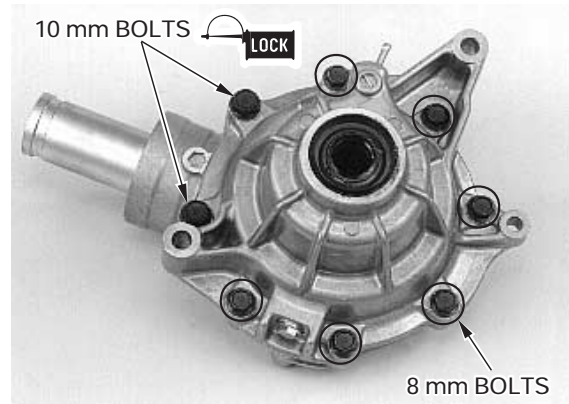
It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Apply locking agent to the threads of the two 10 mm bolts.

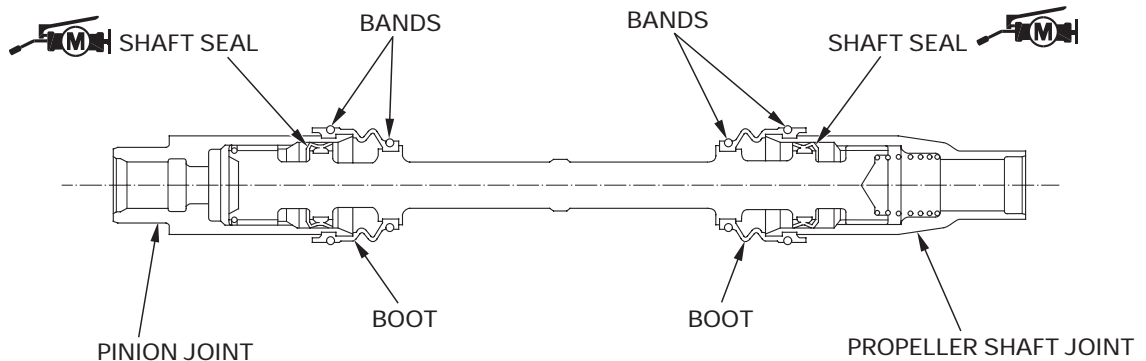
Install the bolts and tighten them several steps until the cover evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m , 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m , 19 lbf·ft)

Make sure that the gear assembly rotates smoothly without binding.



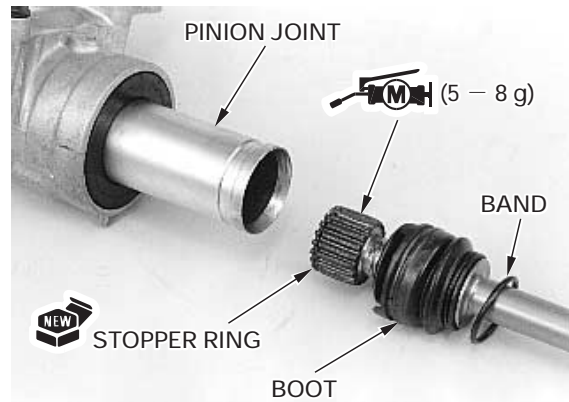
PROPELLER SHAFT ASSEMBLY/ INSTALLATION



Place the boot bands over the propeller shaft. Install a new stopper ring into the groove in the propeller shaft.

Apply 5–8 g of molybdenum disulfide grease to the propeller shaft spline. Install the propeller shaft into the pinion joint until the stopper ring seats in the groove. Make sure that the stopper ring is seated properly by pulling on the pinion joint lightly.

Install the boot over the pinion joint securely and secure it with the boot band.

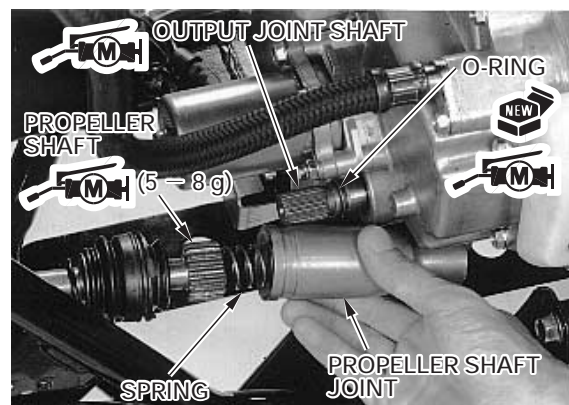


DIFFERENTIAL INSTALLATION

Place the differential into the frame.

Coat a new O-ring with molybdenum disulfide grease and install it into the groove in the output joint shaft and apply molybdenum disulfide grease to the output joint shaft spline.

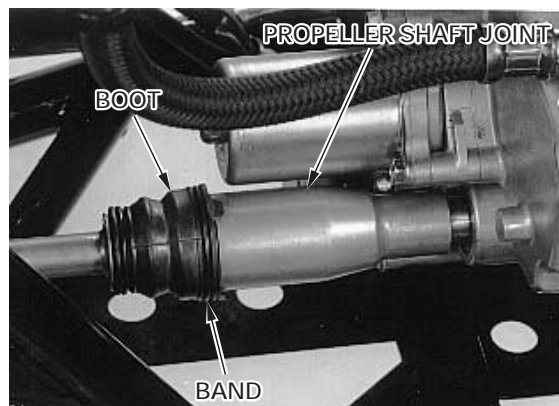
Apply 5–8 g of molybdenum disulfide grease to the propeller shaft spline. Set the spring and propeller shaft joint and compress it, then install the shaft joint over the output joint shaft.



FRONT DRIVING MECHANISM (FM/FE models)

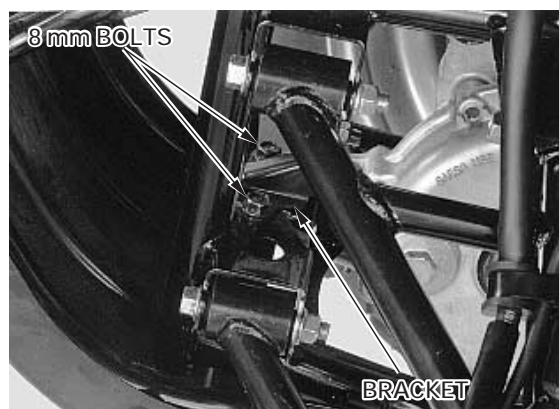
Install the boot over the propeller shaft joint securely and secure it with the boot band.

Install the drive shaft into the differential (page 15-7).



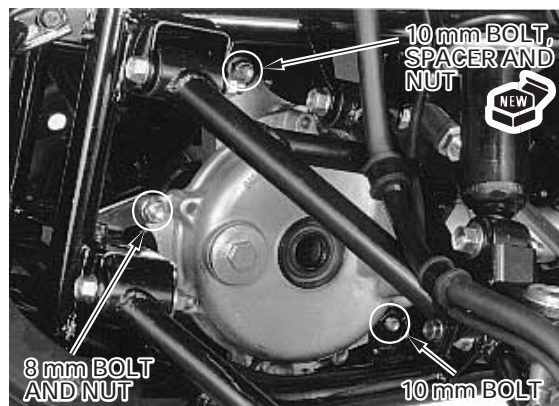
Set the mounting bracket over the front mounting boss of the differential and onto the frame, then install the two mounting bolts and tighten them.

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



Install the mounting bolts from right side with the spacer (upper side only: between the right side of the differential and frame) and the nuts (the upper mounting nut is used with a new one), and tighten them.

TORQUE: 8 mm: 22 N·m (2.2 kgf·m , 16 lbf·ft)
10 mm: 44 N·m (4.5 kgf·m , 33 lbf·ft)

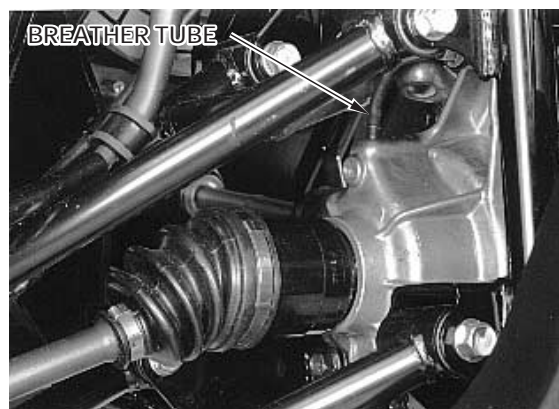


Connect the breather tube.

Install the following:

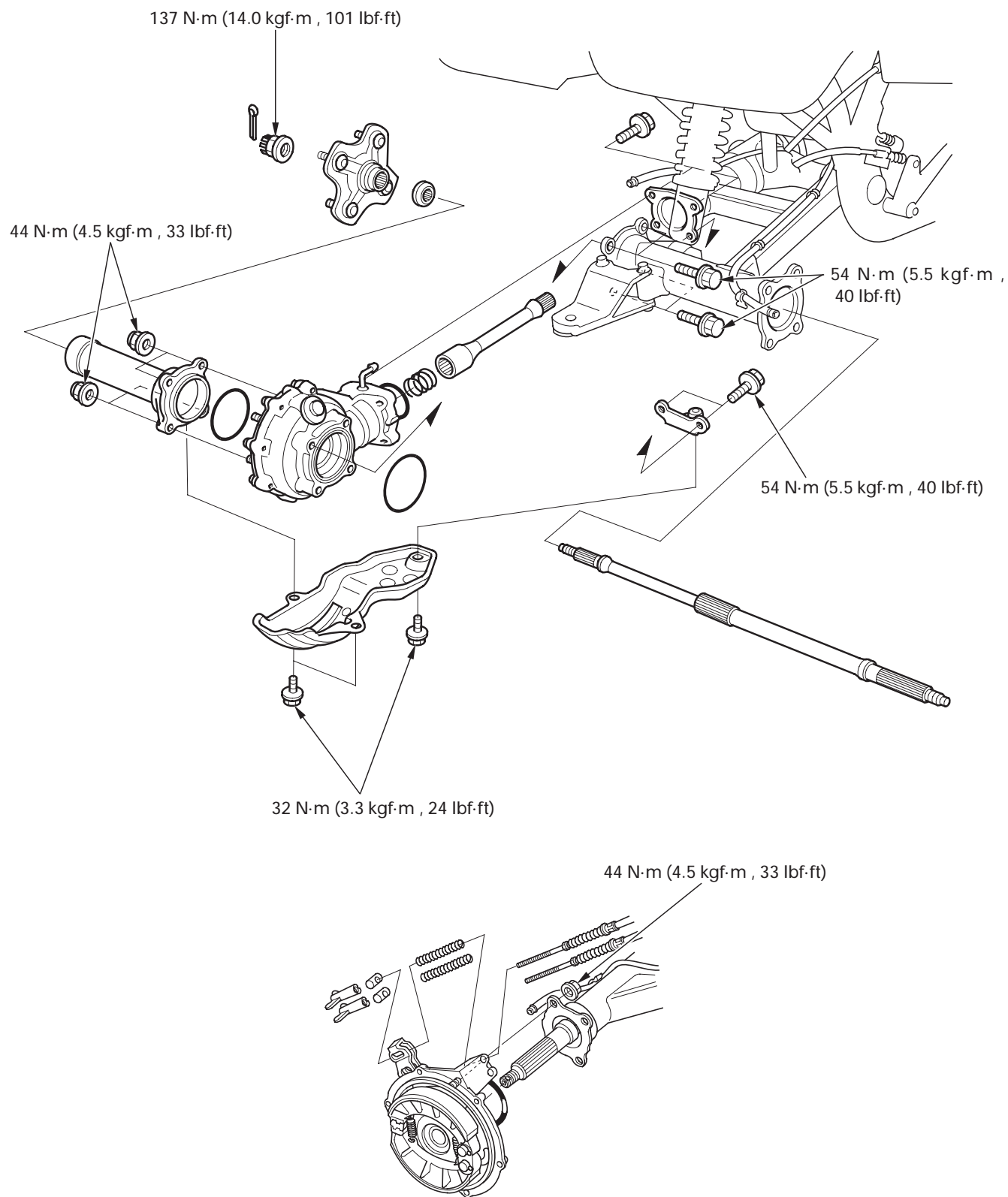
- drive shaft (page 15-7)
- front mud guard (page 2-6)

Fill the differential with the recommended oil (page 3-13).



MEMO

REAR DRIVING MECHANISM



16. REAR DRIVING MECHANISM

SERVICE INFORMATION	16-1	CASE BEARING REPLACEMENT	16-11
TROUBLESHOOTING	16-2	FINAL DRIVE ASSEMBLY	16-13
REAR AXLE REMOVAL	16-3	FINAL DRIVE INSTALLATION	16-16
FINAL DRIVE REMOVAL	16-5	REAR AXLE INSTALLATION	16-17
FINAL DRIVE DISASSEMBLY/ INSPECTION	16-6		

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.

SPECIFICATIONS

				Unit: mm (in)
ITEM			STANDARD	SERVICE LIMIT
Axle runout			_____	3.0 (0.12)
Rear final drive	Oil capacity	After draining	85 cm ³ (2.9 US oz , 3.0 Imp oz)	_____
		After disassembly	100 cm ³ (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)	_____

16

TORQUE VALUES

Final gear case pinion bearing lock nut	98 N·m (10.0 kgf·m , 72 lbf·ft)	Stake/Lock nut
Final gear case cover bolt (10 mm)	49 N·m (5.0 kgf·m , 36 lbf·ft)	Apply locking agent to the threads
(8 mm)	25 N·m (2.6 kgf·m , 19 lbf·ft)	
Final gear case mounting bolt	54 N·m (5.5 kgf·m , 40 lbf·ft)	
Left axle housing nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut
Skid plate bolt	32 N·m (3.3 kgf·m , 24 lbf·ft)	
Rear wheel hub nut	137 N·m (14.0 kgf·m , 101 lbf·ft)	
Rear brake panel nut	44 N·m (4.5 kgf·m , 33 lbf·ft)	Lock nut

REAR DRIVING MECHANISM

TOOLS

Driver	07749-0010000
Attachment, 22 × 24 mm	07746-0010800
Attachment, 52 × 55 mm	07746-0010400
Attachment, 62 × 68 mm	07746-0010500
Pilot, 14 mm	07746-0041200
Pilot, 28 mm	07746-0041100
Pilot, 35 mm	07746-0040800
Pilot, 40 mm	07746-0040900
Pilot, 32 × 35 mm	07MAD-PR90200
Driver, 40 mm I.D.	07746-0030100
Attachment, 30 mm I.D.	07746-0030300
Lock nut wrench, 30 × 64 mm	07916-MB00002
Pinion puller set	07HMC-MM80101 not available in U.S.A.
— puller shaft	07931-ME40000 or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
— pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Remover shaft, 14 mm	07YMC-001010A (U.S.A. only)
	can use collet of 07936-KC10500
Remover shaft, 15 mm	07936-KC10100
Bearing remover, 14 mm	07WMC-KFG0100
Bearing remover, 15 mm	07936-KC10200
Remover weight	07741-0010201
Remover weight	07936-3710200 or 07936-371020A (U.S.A. only)
Remover handle	07936-3710100
Oil seal driver	07965-KE80200 or 07947-KA50100
Driver attachment	07LAD-PW50500
Differential bearing ring compressor	07YME-HN4010A (U.S.A. only)

TROUBLESHOOTING

Excessive noise

- Worn or scored ring gear shaft and axle
- Worn or scored pinion and splines
- Worn pinion and ring gears
- Excessive backlash between pinion and ring gears
- Oil level too low

Wobble or vibration in vehicle

- Axle not tightened properly
- Bent axle

Oil leak

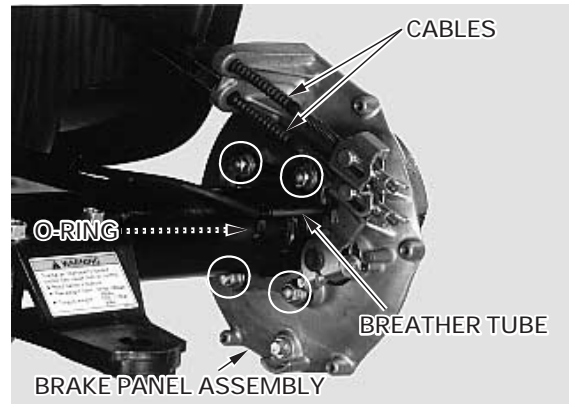
- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

REAR AXLE REMOVAL

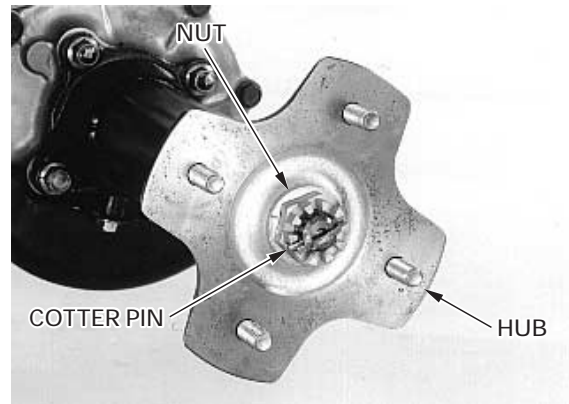
Remove the following:

- rear wheels (page 13-3)
- rear brake drum (page 14-14)
- breather tube
- adjusting nuts
- joint pins
- springs
- brake cables
- four nuts (discard them)
- brake panel assembly
- O-ring

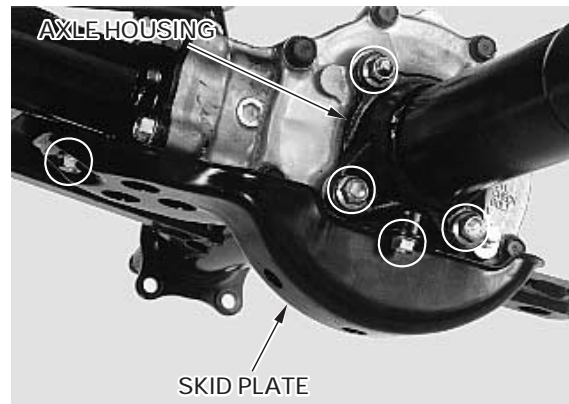
*Do not get grease
onto the shoe
linings.*



- cotter pin
- hub nut
- left wheel hub

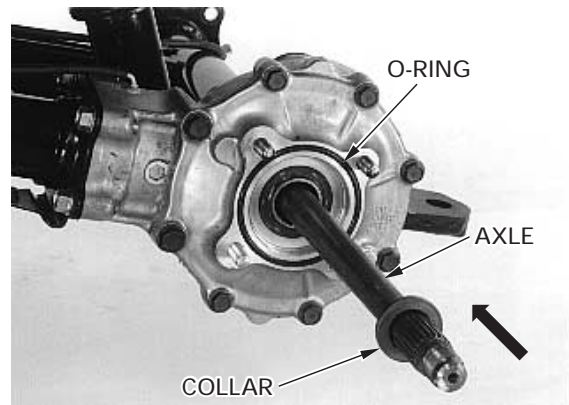


- three bolts
- skid plate
- four left axle housing bolts (discard them)
- left axle housing



- O-ring
- left side collar

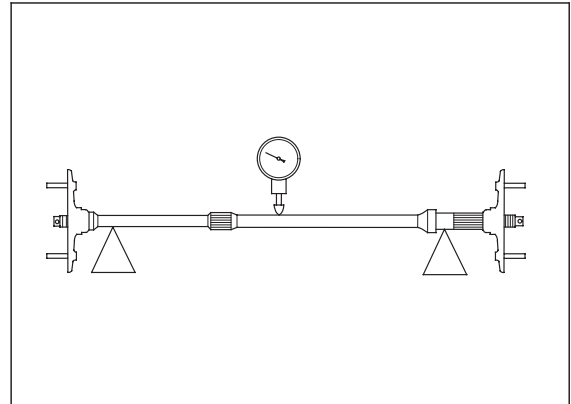
Remove the axle by driving the axle from left side using a rubber mallet.



INSPECTION

Set the axle in V-blocks and measure the axle runout with a dial indicator.
Axle runout is 1/2 the total indicator reading.

SERVICE LIMIT: 3.0 mm (0.12 in)



AXLE BEARING

Remove the dust seals from the axle housing and brake panel.
Turn the inner race of each bearing with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the housing or panel.



BEARING REPLACEMENT

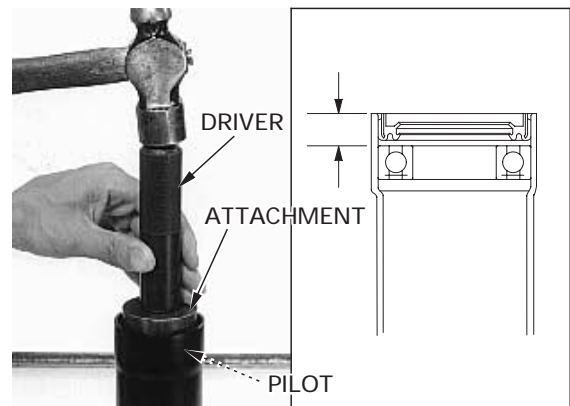
AXLE HOUSING

Drive the axle bearing out of the axle housing.

Press the bearing into the axle housing with the sealed side facing down until the depth from the housing edge is 11.0 mm (0.43 in).

TOOLS:

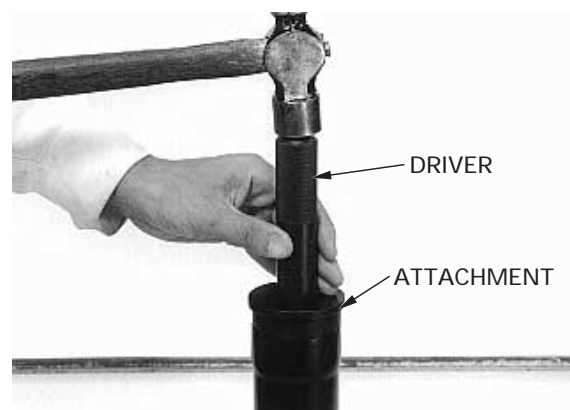
Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 32 × 35 mm	07MAD-PR90200



Apply grease to a new dust seal lips.
Install the dust seal with the metal plate side facing up until it is flush with the housing end.

TOOLS:

Driver	07749-0010000
Attachment, 62 × 68 mm	07746-0010500



BRAKE PANEL

Remove the snap ring.
Drive the axle bearings out of the brake panel.

Support the bearing housing section of the brake panel when installing.

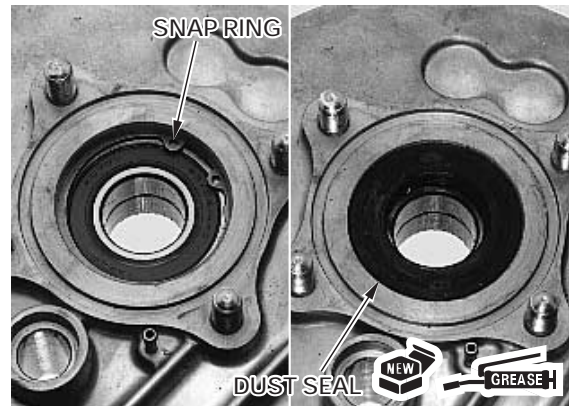
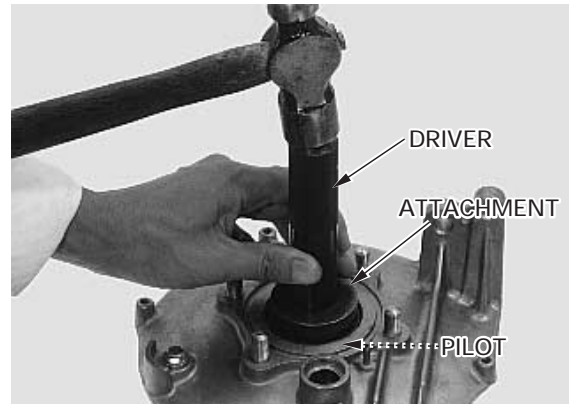
Drive the outer bearing (brake drum side) squarely with the sealed side facing down until it is fully seated, then the inner bearing with the sealed side facing up.

TOOLS:

Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Pilot, 28 mm	07746-0041100

Install the snap ring with the chamfered side facing to the bearing securely.

Apply grease to a new dust seal lips.
Install the dust seal with the flat side facing up until it is flush with the brake panel.



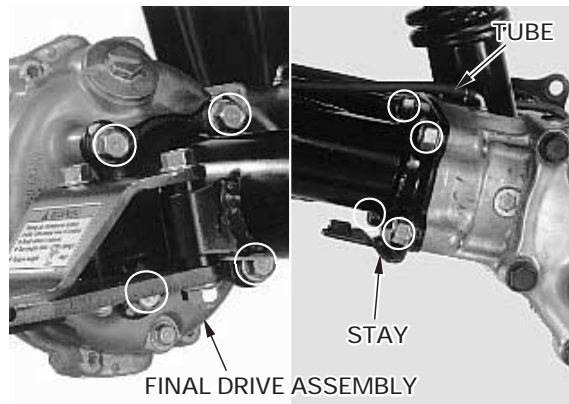
FINAL DRIVE REMOVAL

Drain the final gear case oil (page 3-12).

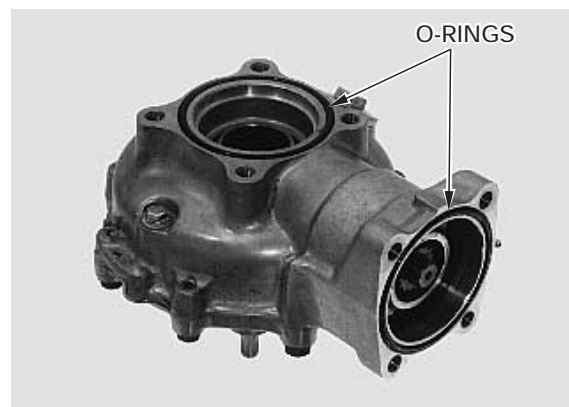
Remove the rear axle (page 16-3)

Disconnect the breather tube.

Remove the eight gear case mounting bolts with the skid plate stay, then remove the final drive assembly.



Remove the O-rings.



Remove the spring and drive shaft from the swingarm.

INSPECTION

DRIVE SHAFT

Check the splines of the drive shaft for wear or damage.

If the splines are damaged, check the pinion and universal joint splines also.

For universal joint removal, see page 13-4 "Swingarm"

FINAL DRIVE

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.

FINAL DRIVE DISASSEMBLY/ INSPECTION

BACKLASH INSPECTION

Hold the pinion gear with the special tools.

TOOLS:

Pinion puller set	07HMC-MM80101
— puller shaft	07931-ME40000
— pinion puller base	07HMC-MM80110
or U.S.A. only:	
Puller shaft	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base	07HMC-MM8011A

Set the differential case into a jig or vise with soft jaws.

Remove the oil filler cap and set a horizontal type dial indicator on the ring gear through the filler hole.

Turn the ring gear back and forth to read backlash.

STANDARD: 0.05—0.25 mm (0.002—0.010 in)

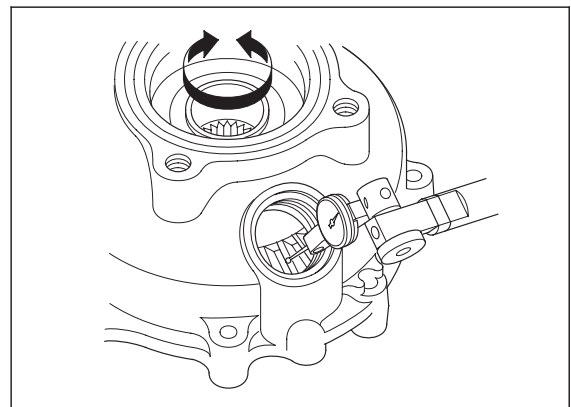
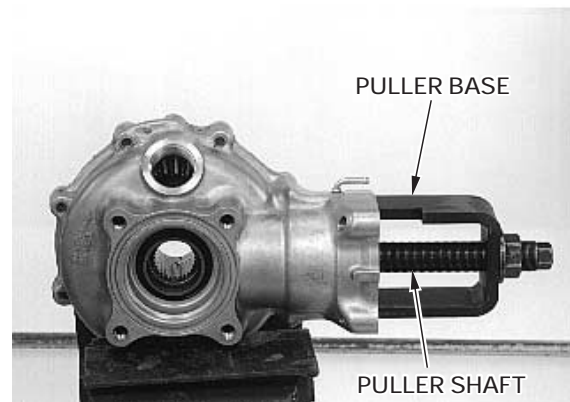
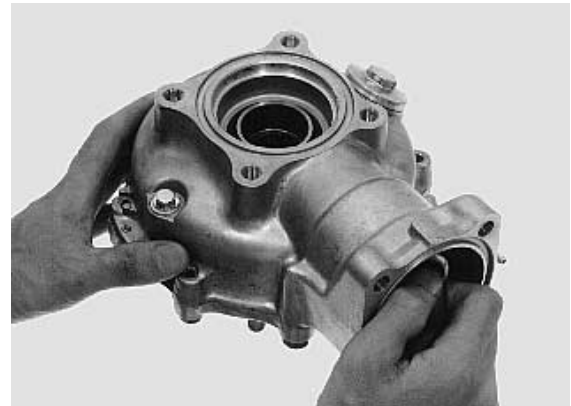
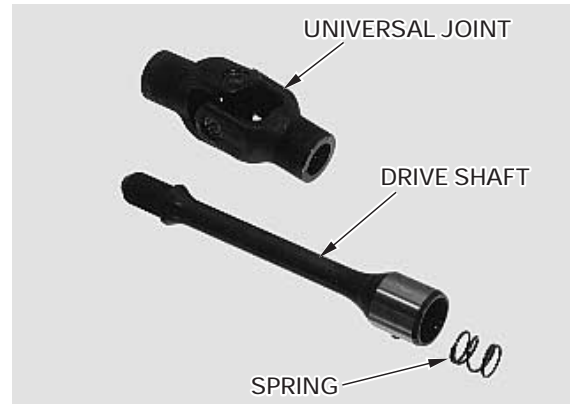
SERVICE LIMIT: 0.4 mm (0.02 in)

Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.

Compare the difference of the three measurements.

SERVICE LIMIT: 0.2 mm (0.01 in)

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.



If the backlash is excessive, replace the ring gear 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).

NOTE:

- Eleven different thickness right shims are available from the thinnest (1.26 mm thickness: A) shim to the thickest (1.86 mm thickness: K) in intervals of 0.06 mm.
- Nine different thickness left shims are available from the thinnest (1.82 mm thickness: A) shim to the thickest (2.30 mm thickness: I) in intervals of 0.06 mm.

Right ring gear shims:

A: (thinnest) : 1.26 mm (0.050 in) —
E: (standard) : 1.50 mm (0.059 in) —
K: (thickest) : 1.86 mm (0.073 in)

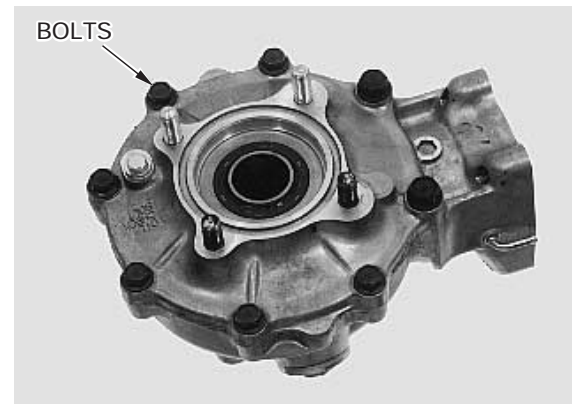
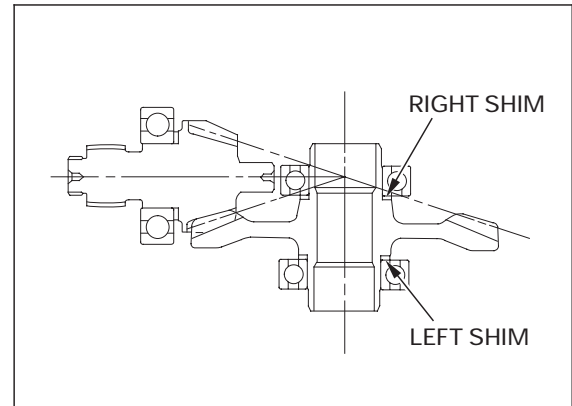
Left ring gear shims:

A: (thinnest) : 1.82 mm (0.072 in) —
D: (standard) : 2.00 mm (0.079 in) —
I: (thickest) : 2.30 mm (0.091 in)

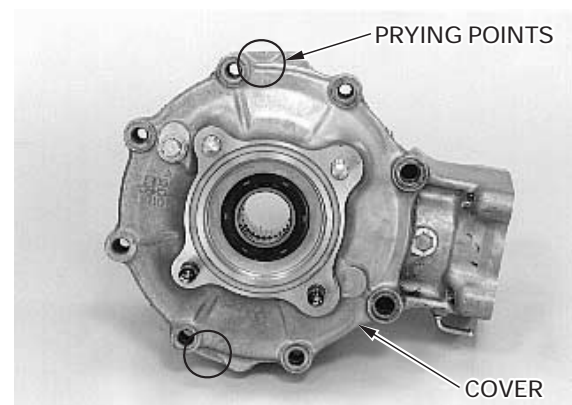
Change the left side shim and equal thickness and opposite amount of what the right side shim was changed; If the right shim was replaced with a 0.12 mm (0.005 in) thicker shim, replace the left shim with one that is 0.12 mm (0.005 in) thinner.

FINAL GEAR CASE DISASSEMBLY

Remove the cover bolts in a crisscross pattern in several steps.

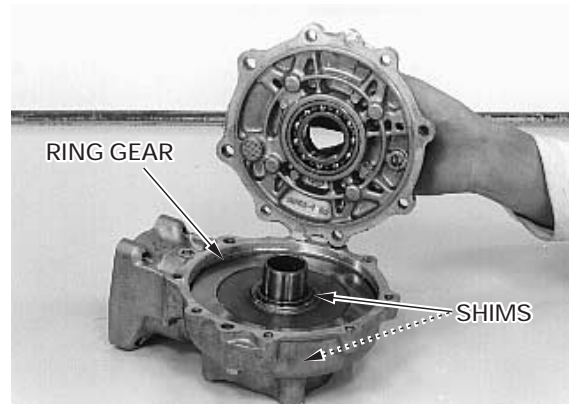


Pry the cover at the prying points using a screwdriver and remove the case cover.



REAR DRIVING MECHANISM

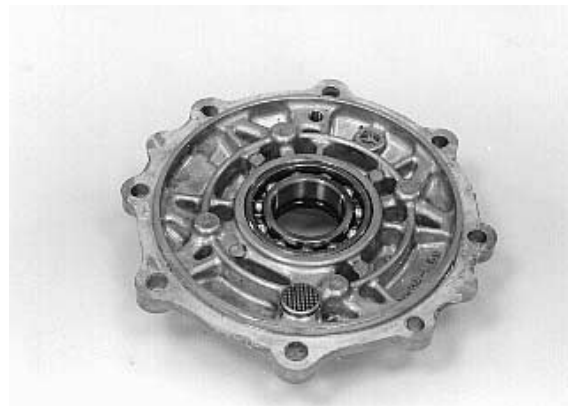
Remove the ring gear and shims.



BEARING INSPECTION

Turn the inner race of each bearing in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

For ring gear bearing replacement, see page 16-11.
For pinion gear removal and bearing replacement, see page 16-10 and 16-12.

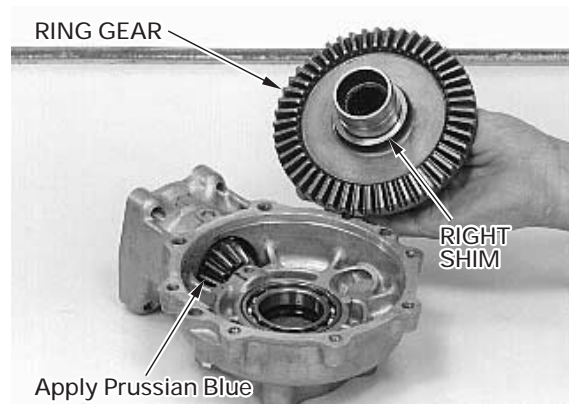


GEAR TOOTH CONTACT PATTERN CHECK

Keep dust and dirt out of the case and cover. Clean sealing material off the mating surfaces of the gear case and cover, being careful not to damage them.

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims onto the ring gear.



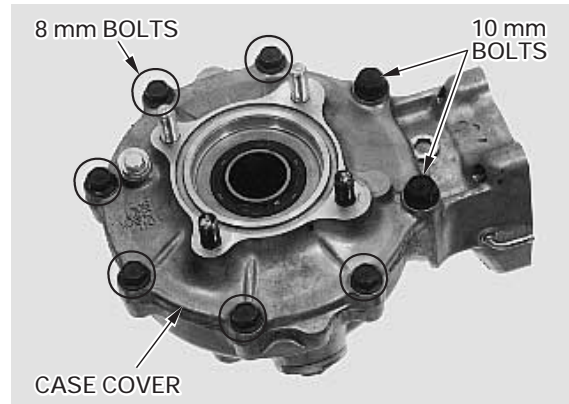
Install the ring gear with the shims into the gear case.



It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m , 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m , 19 lbf·ft)



Remove the oil filler cap.

Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

The pattern is indicated by the Prussian Blue applied to the pinion.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion 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.

Replace the pinion shim with a thinner one if the contact pattern is too low, toward the flank.

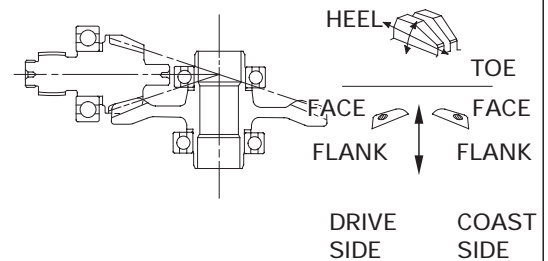
The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

Pinion shims:

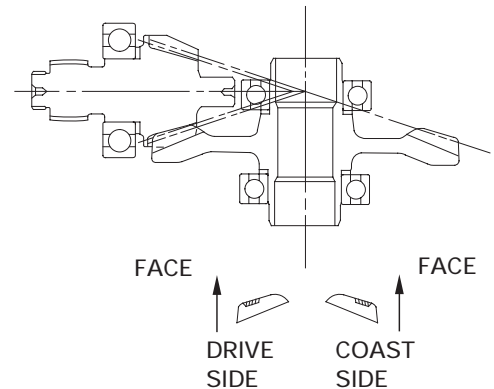
A: 1.64 mm(0.064 in)	F: 1.94 mm(0.076 in)
B: 1.70 mm(0.067 in)	G: 2.00 mm(0.079 in)
C: 1.76 mm(0.069 in)	H: 2.06 mm(0.081 in)
D: 1.82 mm(0.072 in)	I: 2.12 mm(0.083 in)
E: 1.88 mm(0.074 in)	J: 2.18 mm(0.086 in)

For pinion shim replacement, see page 16-10.

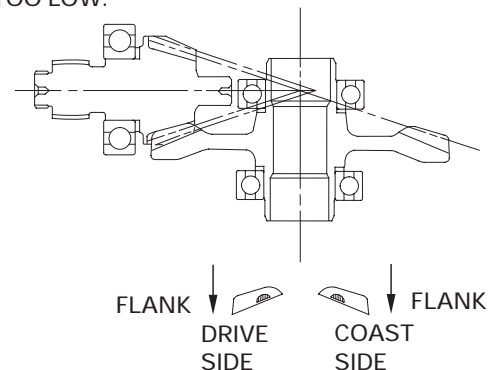
NORMAL:



TOO HIGH:



TOO LOW:

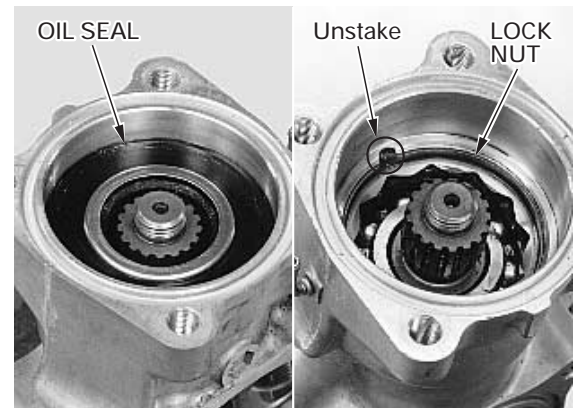


PINION GEAR REMOVAL

Remove the oil seal from the gear case.

Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

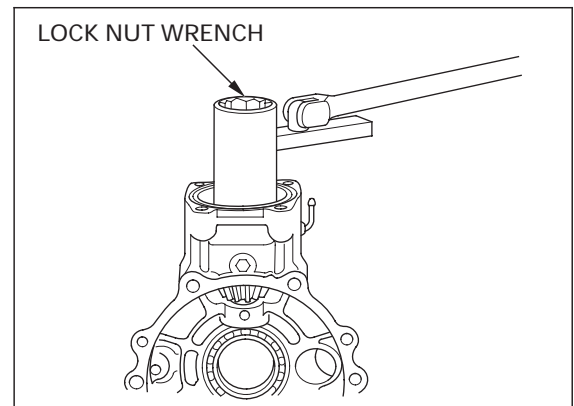
Unstake the pinion bearing lock nut with a drill or grinder.



Remove the lock nut and discard it.

TOOL:

Lock nut wrench, 30 × 64 mm 07916-MB00002

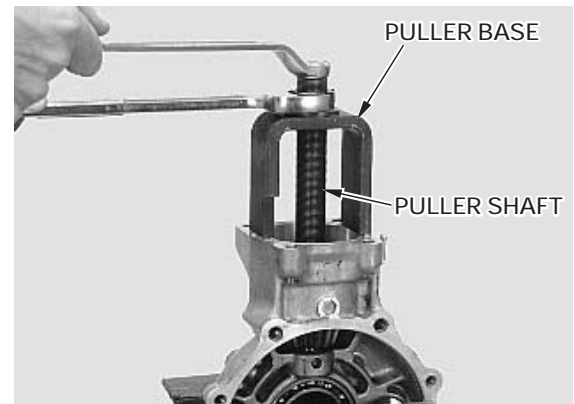


Install the special tools onto the pinion gear shaft and gear case.

TOOLS:

Pinion puller set	07HMC-MM80101
—puller shaft	07931-ME40000
—pinion puller base	07HMC-MM80110
or U.S.A. only:	
Puller shaft	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base	07HMC-MM8011A

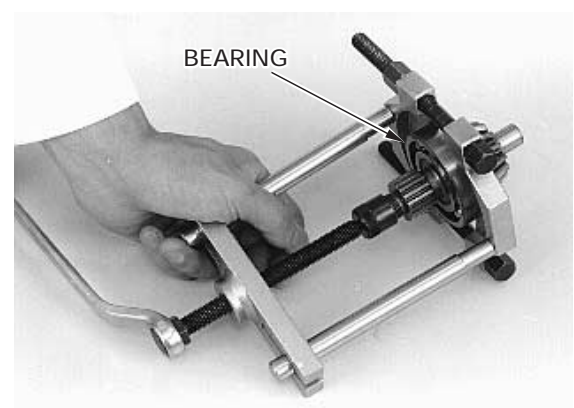
Pull the pinion assembly out from the case.



PINION GEAR BEARING AND SHIM REPLACEMENT

Pull the pinion bearing from the shaft with a commercially available bearing puller.

Remove the pinion shim.



Install the shim and bearing onto the pinion gear.

NOTE:

- When the gear set, ring gear bearing, and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.



Drive the bearing with the marking side facing up.

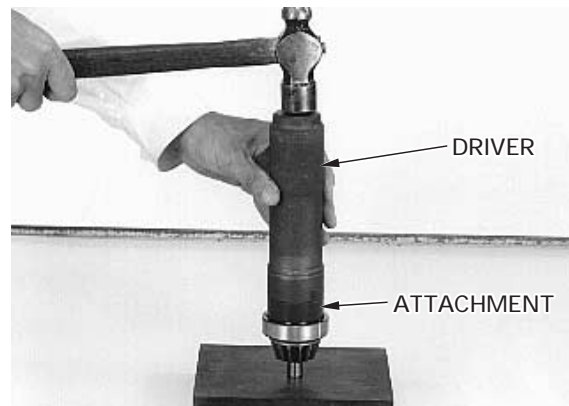
TOOLS:

Driver, 40 mm I.D.

07746-0030100

Attachment, 30 mm I.D.

07746-0030300



CASE BEARING REPLACEMENT

RING GEAR BEARING

Remove the oil seal.

Drive the bearings out of the case and cover.



Drive each bearing into the case and cover.

TOOLS:

Gear Case:

Driver

07749-0010000

Attachment, 62 × 68 mm

07746-0010500

Pilot, 40 mm

07746-0040900

Case Cover:

Driver

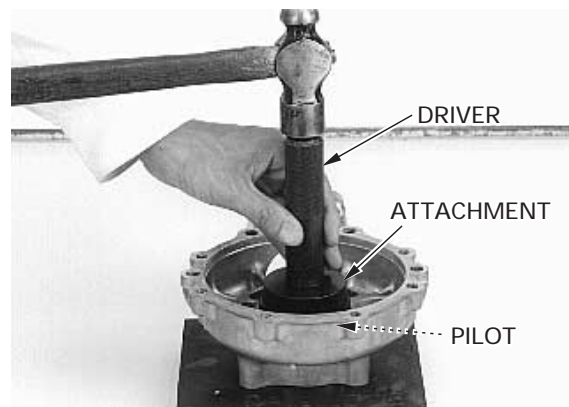
07749-0010000

Attachment, 62 × 68 mm

07746-0010500

Pilot, 35 mm

07746-0040800

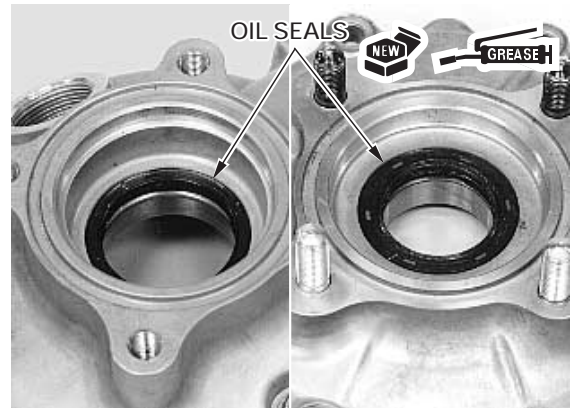


REAR DRIVING MECHANISM

Apply grease to new oil seal lips.
Install each oil seal with the flat side facing out until it is flush with the case or cover.

TOOL:

Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400



PINION NEEDLE BEARING

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole.
Bend up the end of the ring with a screwdriver.
Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.
Remove the filler cap.

Heat the gear case to 80 °C (176 °F) and remove the needle bearing by using the special tools.

TOOL:

Bearing remover, 14 mm	07WMC-KFG0100
Remover shaft, 15 mm	07936-KC10100
Remover weight	07741-0010201
U.S.A. only:	
Bearing remover, 15 mm	07936-KC10200
Remover shaft, 14 mm	07YMC-001010A
Remover weight	07936-371020A or 07936-3710200

Remover handle

07936-3710100



Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

Install the stopper ring into the groove in the bearing.
Install the bearing into the compressor until the bearing is flush with the end of the tool.
Place the driver on top of the bearing and tape the driver to the compressor. Place the assembly into a freezer for at least 30 minutes.

TOOLS:

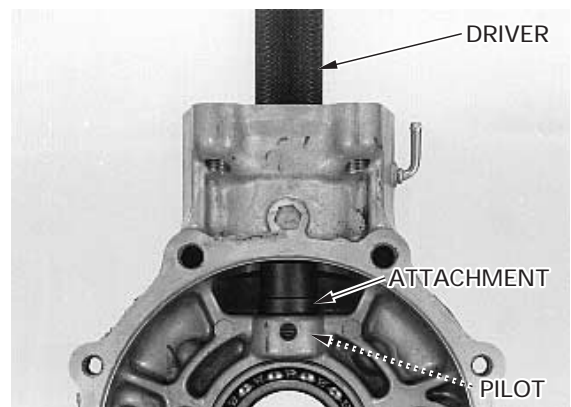
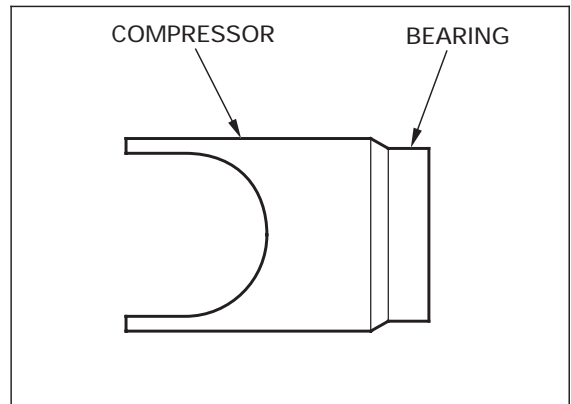
Driver	07749-0010000
Differential bearing ring compressor	07YME-HN4010A
Attachment, 22 × 24 mm	07746-0010800
Pilot, 14 mm	07746-0041200

Heat the gear case to 80 °C (176 °F).

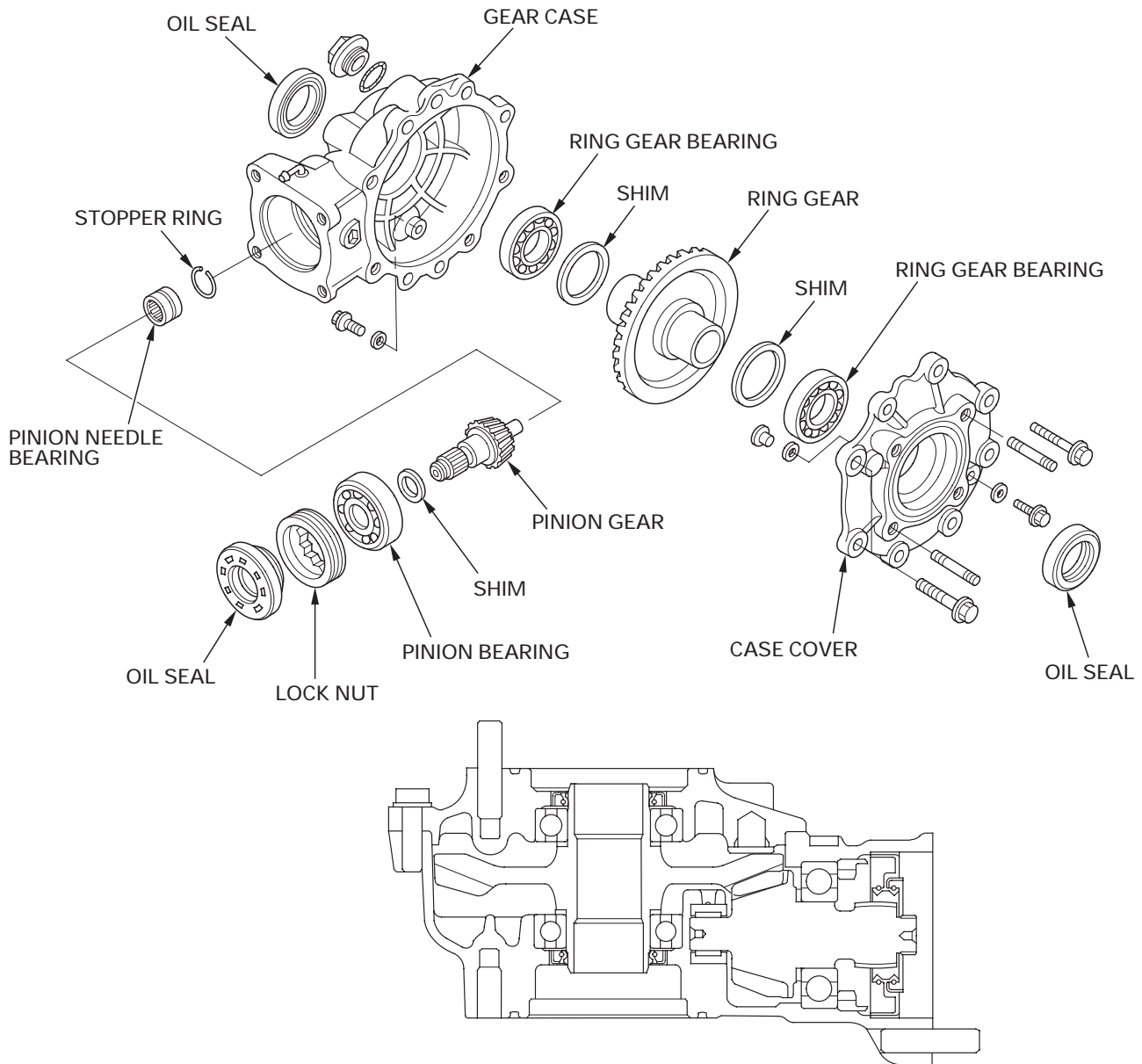
Remove the needle bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

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 one.

Make sure the stopper ring is securely set in the groove of the gear case.



FINAL DRIVE ASSEMBLY



PINION GEAR INSTALLATION

Drive the pinion assembly into the gear case.

TOOL:

Oil seal driver

07965-KE80200 or
07947-KA50100

NOTE:

- Keep the driver centered with the bearing outer race during installation.



REAR DRIVING MECHANISM

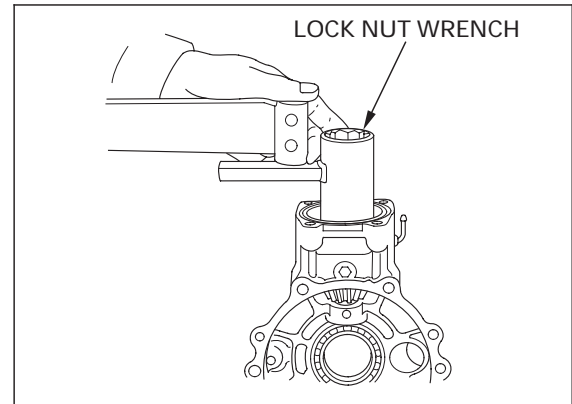
Install a new lock nut and tighten it.

TOOL:

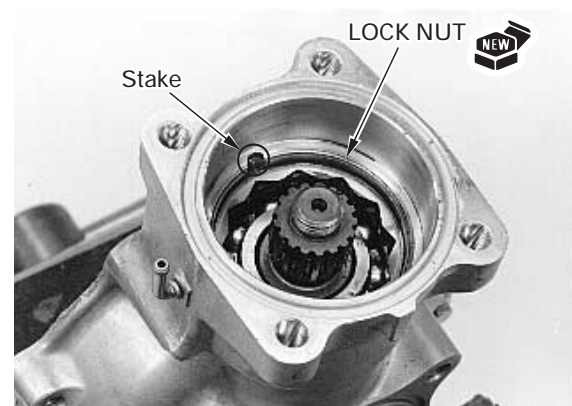
Lock nut wrench, 30 × 64 mm 07916-MB00002

*Refer to torque
wrench reading
information on
page 16-1
"Service
information".*

TORQUE: Actual: 98 N·m (10.0 kgf·m , 72 lbf·ft)
Indicated: 89 N·m (9.1 kgf·m , 66 lbf·ft)



Stake the lock nut into the case groove.



Apply grease to a new oil seal lips and install it into the gear case until it is fully seated.

TOOL:

Driver attachment 07LAD-PW50500

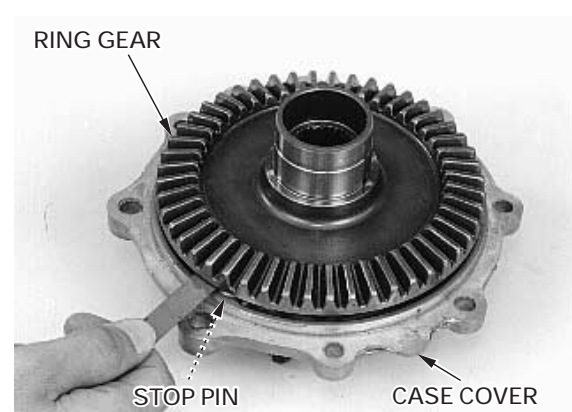


RING GEAR CLEARANCE INSPECTION

Install the ring gear with the shim into the case cover.

Measure the clearance between the ring gear and stop pin with a feeler gauge.

CLEARANCE: 0.3—0.6 mm (0.01—0.02 in)



Remove the ring gear.

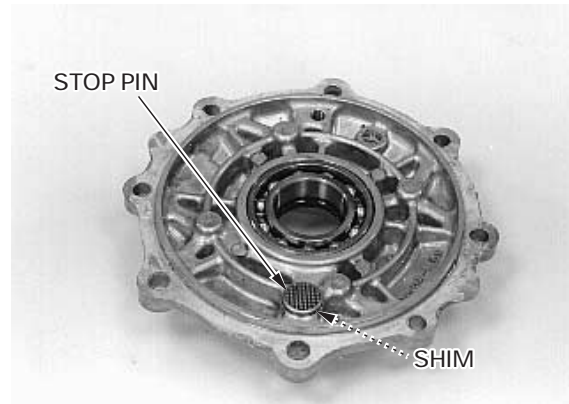
Be sure to wear heavy gloves to avoid burns when handling the heated case cover. Using a torch to heat the case cover may cause warpage.

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.



FINAL GEAR CASE ASSEMBLY

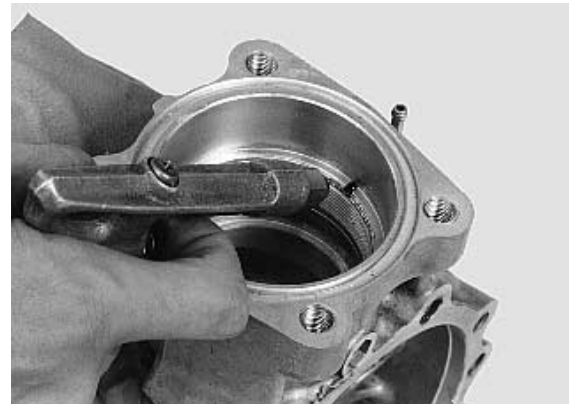
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the tooth contact pattern check (page 16-8) and gear backlash (page 16-6).

Keep dust and dirt out of the case and cover.

Clean the mating surface of the gear case and cover, being careful not to damage them.

Blow compressed air through the breather hole in the gear case.

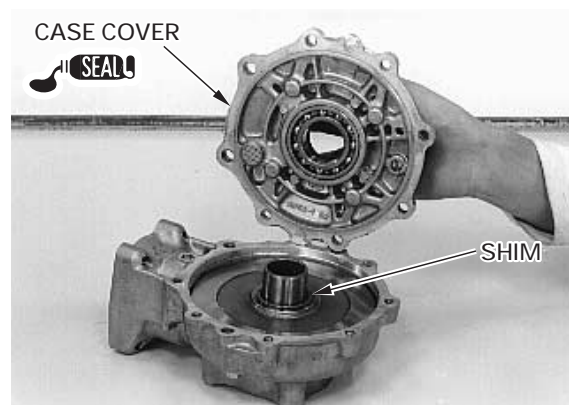


Install the proper ring gear shims onto the ring gear and install them into the gear case.



Apply liquid sealant to the mating surface of the case cover.

Install the cover over the gear case.



REAR DRIVING MECHANISM

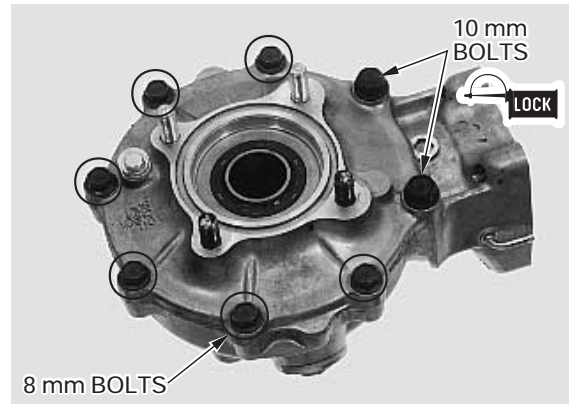
It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Apply locking agent to the threads of the two 10 mm bolts.

Install the bolts and tighten them several steps until the cover evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m , 36 lbf·ft)
8 mm bolt: 25 N·m (2.6 kgf·m , 19 lbf·ft)

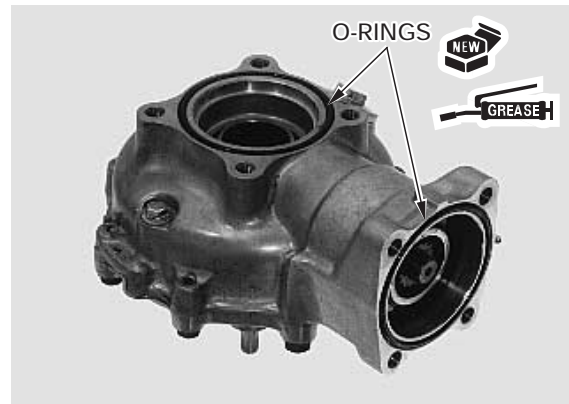
Make sure that the gear assembly rotates smoothly without binding.



FINAL DRIVE INSTALLATION

Clean the mating surfaces of the gear case and swingarm.

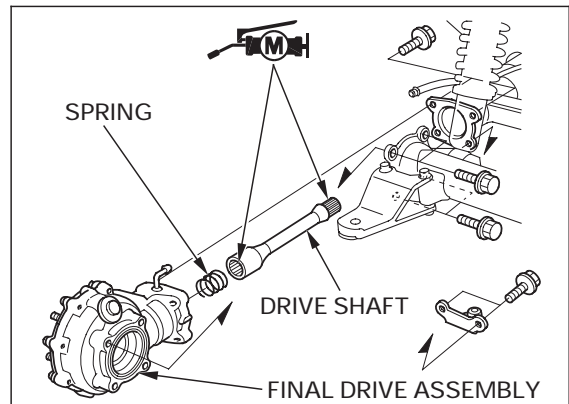
Coat new O-rings with grease and install them into the grooves in the gear case.



Apply molybdenum disulfide grease to the drive shaft splines.

Insert the drive shaft into the swingarm and carefully align the splines with the universal joint to install it.

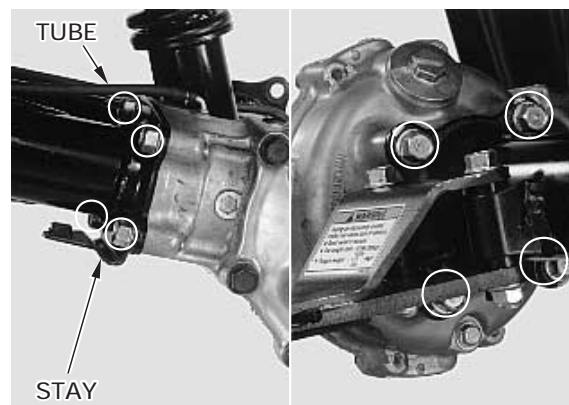
Install the spring into the drive shaft and set the final drive assembly onto the swingarm, then secure it with at least two mounting bolts.



Install the mounting bolts with the skid plate stay and tighten them in several steps.

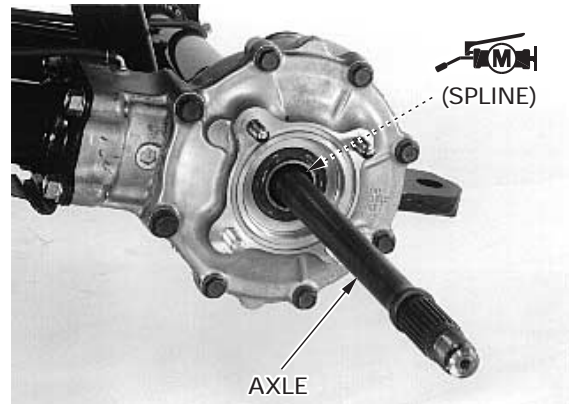
TORQUE: 54 N·m (5.5 kgf·m , 40 lbf·ft)

Connect the breather tube to the tube joint.



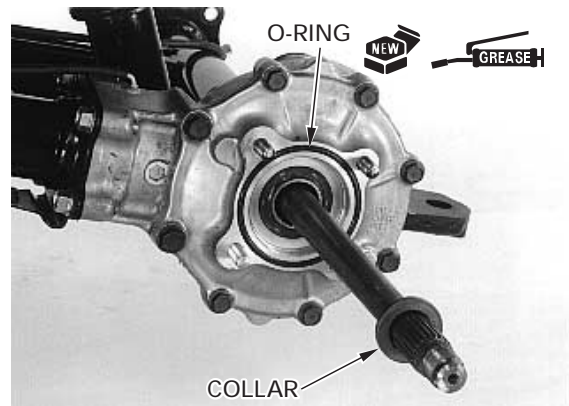
REAR AXLE INSTALLATION

Apply molybdenum disulfide grease to the center spline of the axle.
Install the axle into the final gear case from right side until it is fully seated.



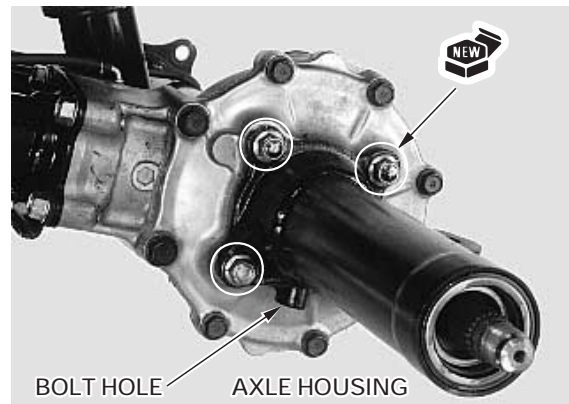
Coat a new O-ring with grease and install it into the gear case groove.

Install the side collar onto the axle with the tapered side facing inward.



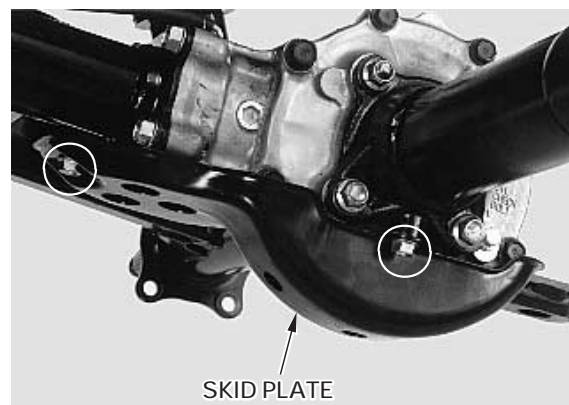
Install the left axle housing with the skid plate bolt hole facing down.
Install four new housing nuts and tighten them.

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



Install the skid plate and tighten the three bolts.

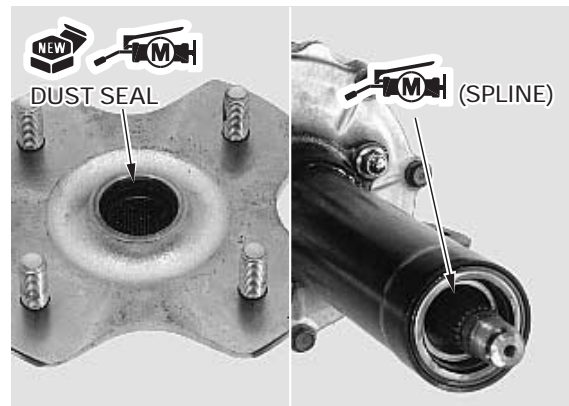
TORQUE: 32 N·m (3.3 kgf·m , 24 lbf·ft)



REAR DRIVING MECHANISM

Apply molybdenum disulfide grease to the seal lips of a new hub dust seal and install it with the flat side facing in until it is fully seated.

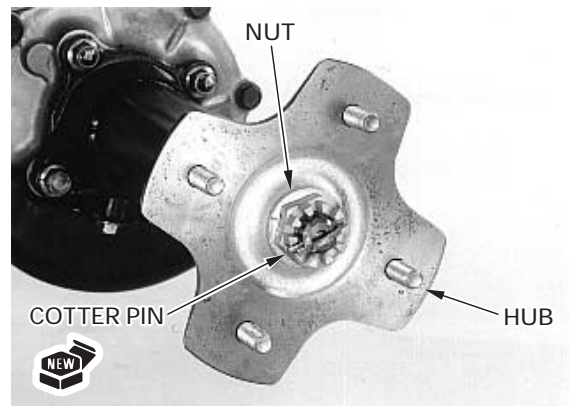
Apply molybdenum disulfide grease to the left spline of the axle and install the wheel hub.



Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m , 101 lbf·ft)

Install a new cotter pin.



Coat a new O-ring with grease and install it into the brake panel groove.

Do not get grease to the shoe linings.

Install the brake panel assembly onto the axle.



Install new brake panel nuts and tighten them.

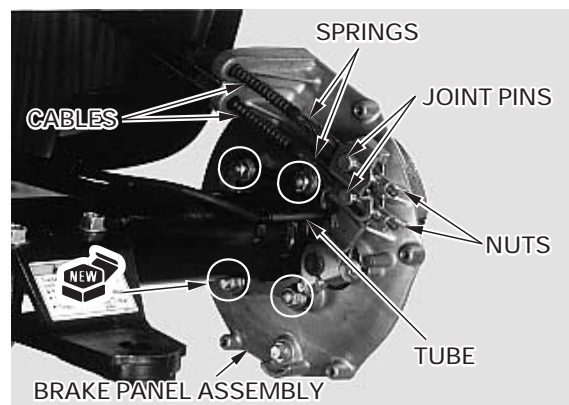
TORQUE: 44 N·m (4.5 kgf·m , 33 lbf·ft)

Install the brake cables into the cable holders on the brake panel (upper holder for parking 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.

Install the rear brake drum (page 14-17).

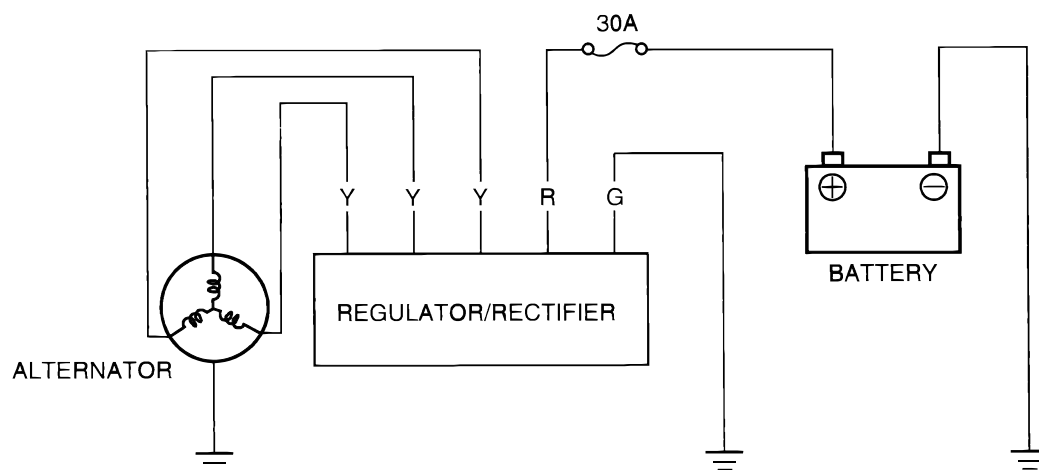
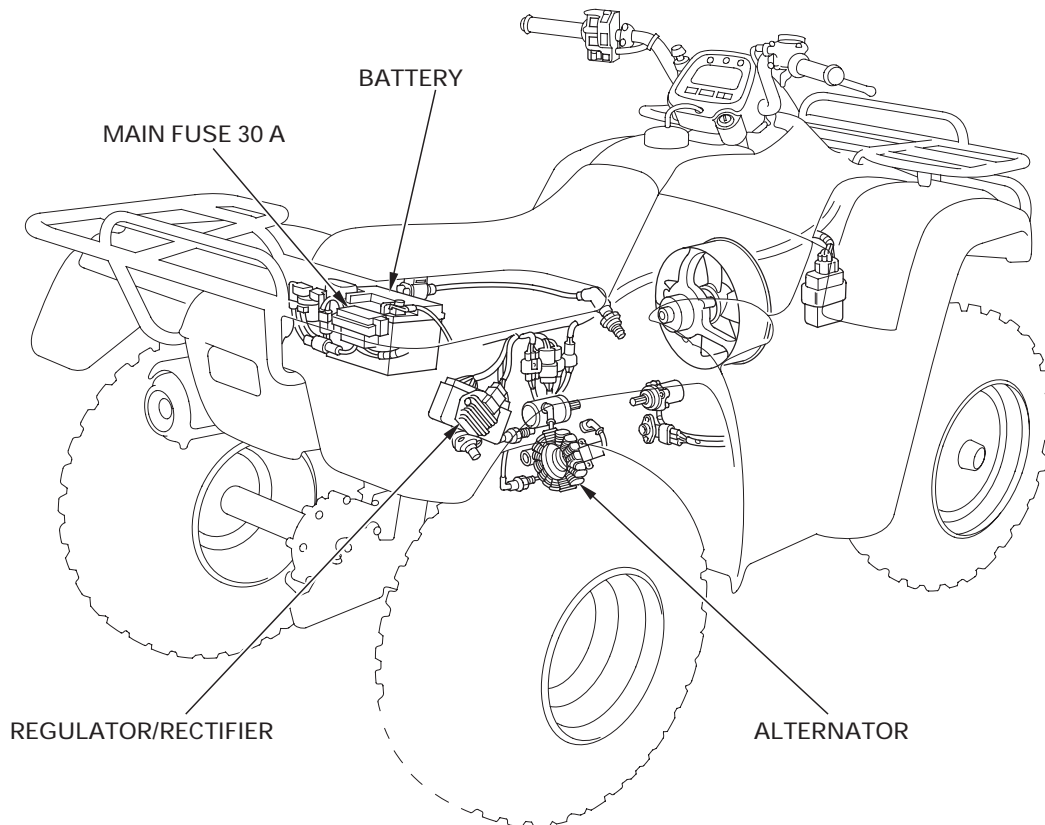
Fill the gear case with the recommended oil (page 3-12).



MEMO

BATTERY/CHARGING SYSTEM

TE/FE model shown:



Y : Yellow
G : Green
R : Red

17. BATTERY/CHARGING SYSTEM

SERVICE INFORMATION	17-1	CHARGING SYSTEM INSPECTION	17-5
TROUBLESHOOTING	17-3	REGULATOR/RECTIFIER	17-6
BATTERY	17-4	ALTERNATOR CHARGING COIL	17-6

SERVICE INFORMATION

GENERAL

WARNING

- The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging.
- The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.
 - If electrolyte gets on your skin, flush with water.
 - If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.
- Electrolyte is poisonous.
 - If swallowed, drink large quantities of water or milk and call your local Poison Control Center or a physician immediately. KEEP OUT OF REACH OF CHILDREN.

- Always turn off the ignition switch before disconnecting any electrical component.
- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.
- For extended storage, remove the battery, give it a full charge, and store it in a cool, dry place.
- For a battery remaining in a stored vehicle, disconnect the negative battery cable from the battery.
- The battery caps should not be removed. Attempting to remove the sealing caps from the cells may damage the battery.
- The maintenance free battery must be replaced when it reaches the end of its service life.
- The battery can be damaged if overcharged or undercharged, or if left to discharge for long period. These same conditions contribute to shortening the "life span" of the battery. Even under normal use, the performance of the battery deteriorates after 2–3 years.
- Battery voltage may recover after battery charging, but under heavy load, the battery voltage will drop quickly and eventually die out. For this reason, the charging system is often suspected as the problem. Battery overcharge often results from problems in the battery itself, which may appear to be an overcharging symptom. If one of the battery cells is shorted and battery voltage does not increase, the regulator/rectifier supplies excess voltage to the battery. Under these conditions, the electrolyte level goes down quickly.
- Before troubleshooting the charging system, check for proper use and maintenance of the battery. Check if the battery is frequently under heavy load, such as having the headlight and taillight ON for long periods of time without riding the vehicle.
- The battery will self-discharge when the vehicle is not in use. For this reason, charge the battery every two weeks to prevent sulfation from occurring.
- Filling a new battery with electrolyte will produce some voltage, but in order to achieve its maximum performance, always charge the battery. Also, the battery life is lengthened when it is initially charged.
- When checking the charging system, always follow the steps in the troubleshooting flow chart (page 17-3).
- For alternator service, refer to section 10.

BATTERY/CHARGING SYSTEM

BATTERY CHARGING

- This model comes with a maintenance free (MF) battery. Remember the following about MF batteries.
 - Use only the electrolyte that comes with the battery
 - Use all of the electrolyte
 - Seal the battery properly
 - Never open the seals again
- For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.

BATTERY TESTING

Refer to the instruction of the Operation Manual for the recommended battery tester for detail the battery testing step. The recommended battery tester puts a "load" on the battery so that the actual battery condition of the load can be measured.

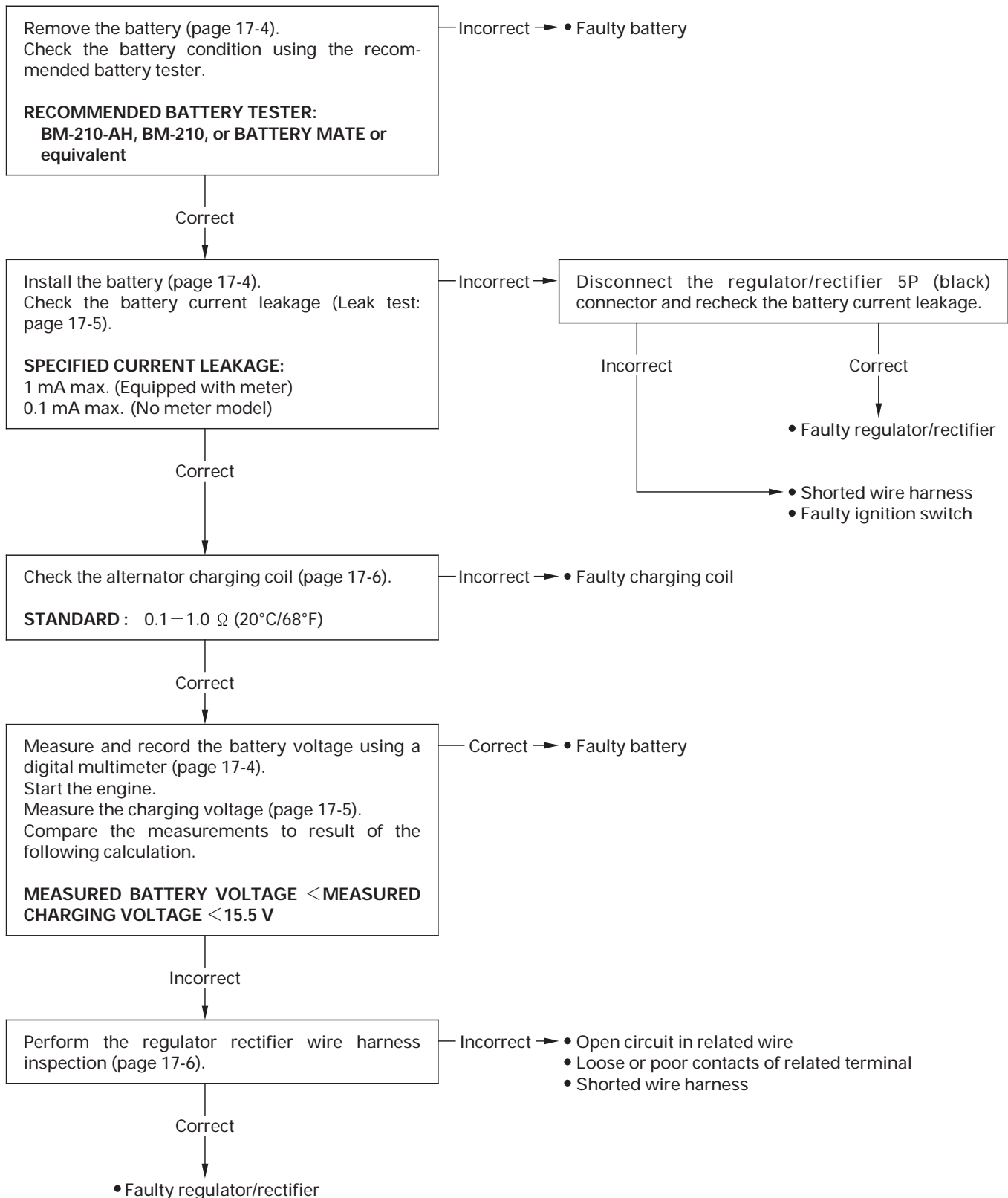
Recommended battery tester **BM-210-AH, BM-210, or BATTERY MATE or equivalent**

SPECIFICATIONS

ITEM			SPECIFICATIONS
Battery	Capacity		12 V – 12 Ah
	Current leakage		1 mA max.(Equipped with digital meter)
			0.1 mA max. (No digital meter)
	Voltage (20°C/68°F)	Fully charged	13.0 – 13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.4 A × 5 – 10 h
Quick		6.0 A × 1.0 h	
Alternator	Capacity		0.245 kW/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω

TROUBLESHOOTING

Battery is damaged or weak



BATTERY

REMOVAL/INSTALLATION

Remove the seat (page 2-4).

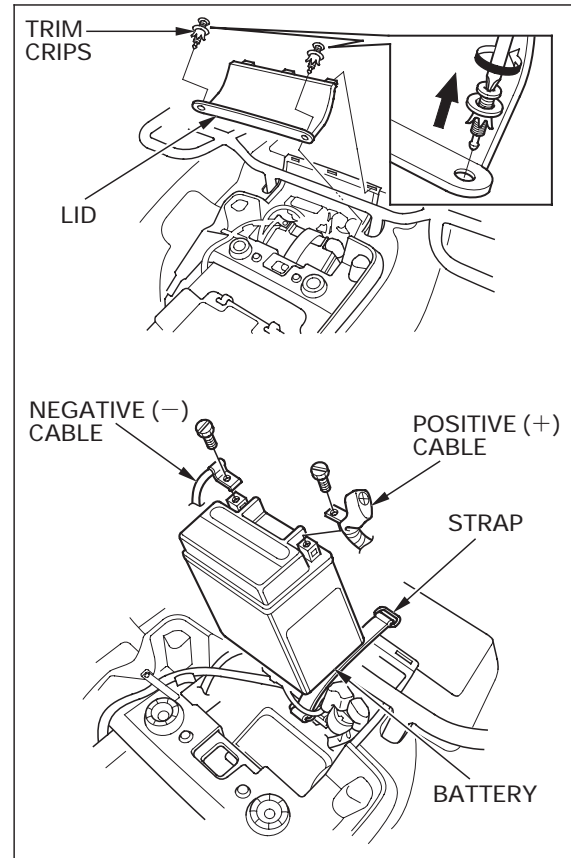
Remove the two trim clips.
Pull the maintenance lid and release the tabs from the slits to remove it.

With the ignition switch OFF, disconnect the negative (–) cable first, then disconnect the positive (+) cable.
Remove the strap from the front side retainer.
Remove the battery.

Install the battery in the reverse order of removal.

NOTE:

- Connect the positive (+) cable first, then connect the negative (–) cable.
- After connecting the battery cables, coat the terminals with grease.



VOLTAGE INSPECTION

Remove the seat (page 2-4).
Measure the battery voltage using a commercially available digital multimeter.

VOLTAGE(20°C/68°F):

Fully charged: 13.0–13.2 V

Under charged: Below 12.3 V



BATTERY CHARGING

Remove the battery.

Turn the power ON/OFF at the charger, not at the battery terminals.

Connect the charger positive (+) cable to the battery positive (+) terminal.
Connect the charger negative (–) cable to the battery negative (–) terminal.

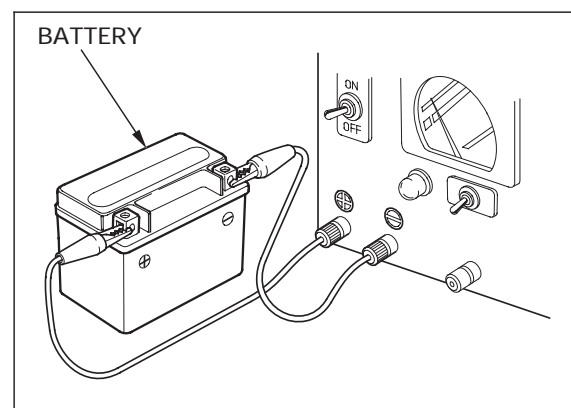
CHARGING CURRENT/TIME:

Standard: 1.4 A × 5–10 h

Quick: 6.0 A × 1.0 h

NOTE:

- Quick charging should only be done in an emergency; slow charging is preferred.
- For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.



CHARGING SYSTEM INSPECTION

Remove the seat (page 2-4).

CURRENT LEAKAGE TEST

Turn the ignition switch OFF, and disconnect the negative (–) cable from the battery.

Connect the ammeter (+) probe to the negative (–) cable and the ammeter (–) probe to the battery (–) terminal.

With the ignition switch OFF, check for current leakage.

NOTE:

- When measuring current using a tester, set it to a high range, and then bring the range down to an appropriate level. Current flow higher than the range selected may blow out the fuse in the tester.
- While measuring current, do not turn the ignition switch ON. A sudden surge of current may blow out the fuse in the tester.

SPECIFIED CURRENT LEAKAGE:

- 1 mA max. (Equipped with meter)
- 0.1 mA max. (No meter model)

If current leakage exceeds the specified value, a shorted circuit is likely.

Locate the short by disconnecting connections one by one and measuring the current.

CHARGING VOLTAGE INSPECTION

NOTE:

- Be sure that the battery is in good condition before performing this test.

Do not disconnect the battery or any cable in the charging system without first switching off the ignition switch. Failure to follow this precaution can damage the tester or electrical components.

Start the engine and warm it up to the operating temperature; stop the engine.

Connect the multimeter between the positive and negative terminals of the battery.

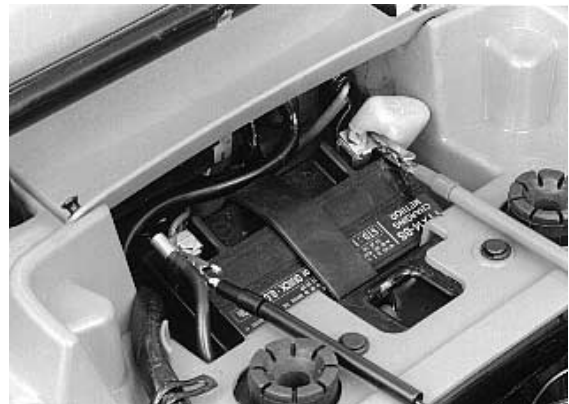
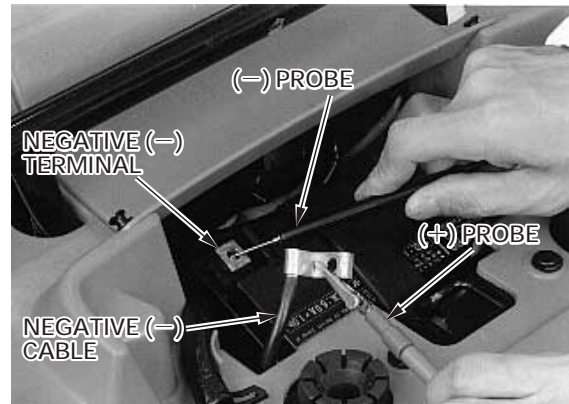
NOTE:

- To prevent short, make absolutely certain which are the positive and negative terminals or cable.

With the headlight on Hi beam, restart the engine. Measure the voltage on the multimeter when the engine runs at 5,000 rpm.

STANDARD:

Measured battery voltage (page 17-4) < Measured charging voltage (see above) < 15.5 V



ALTERNATOR CHARGING COIL

INSPECTION

Disconnect the alternator 5P (white) connector.

Measure the resistance between the Yellow wire terminals of the alternator side connector.

STANDARD: 0.1 – 1.0 Ω (20°C/68°F)

Check for continuity between each Yellow wire terminal of the alternator side connector and ground.

There should be no continuity.

Replace the alternator stator if resistance is out of specification, or if any wire has continuity to ground.

Refer to section 10 for alternator stator replacement.



REGULATOR/RECTIFIER

WIRE HARNESS INSPECTION

Disconnect the regulator/rectifier 5P (black) connector.

Check the connector for loose contacts or corroded terminals.

BATTERY LINE

Measure the voltage between the Red wire terminal and ground.

There should be battery voltage at all times.

GROUND LINE

Check the continuity between the Green wire terminal and ground.

There should be continuity at all times.

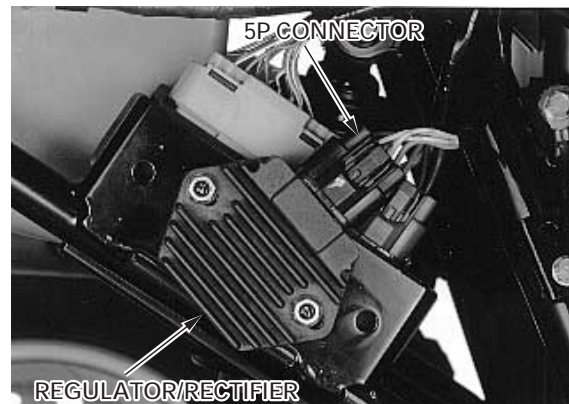
CHARGING COIL LINE

Measure the resistance between the Yellow wire terminals.

STANDARD: 0.1 – 1.0 Ω (20°C/68°F)

Check for continuity between each Yellow wire terminal and ground.

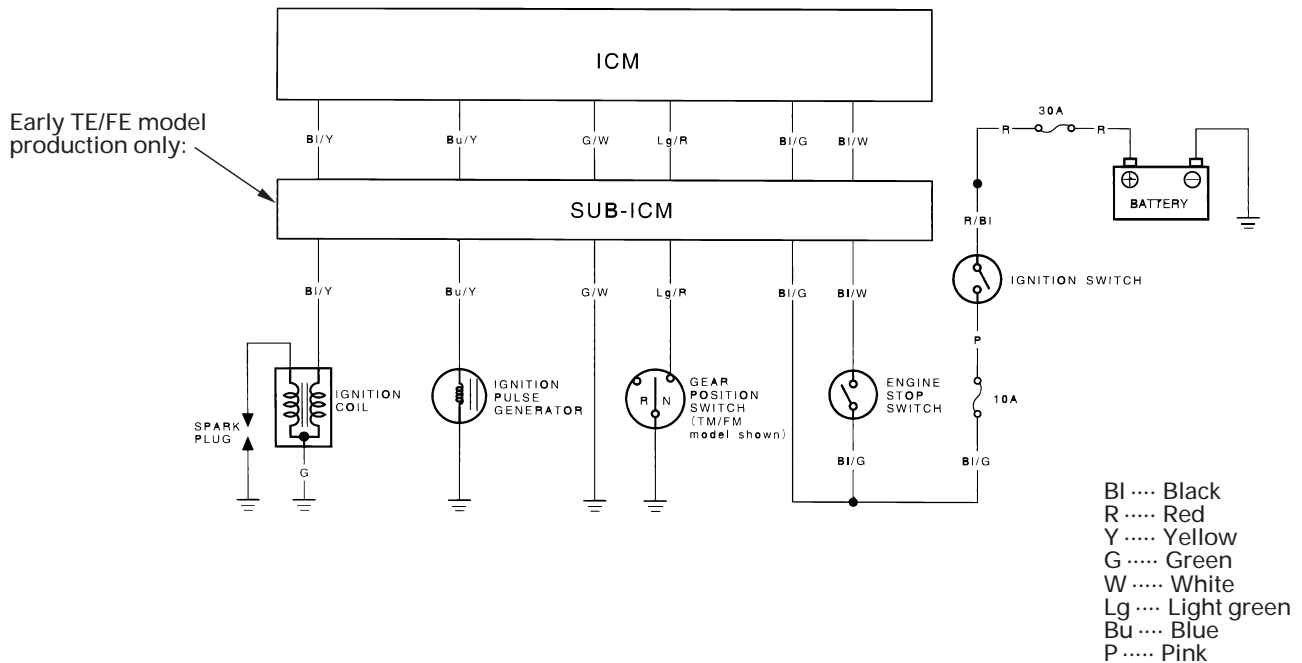
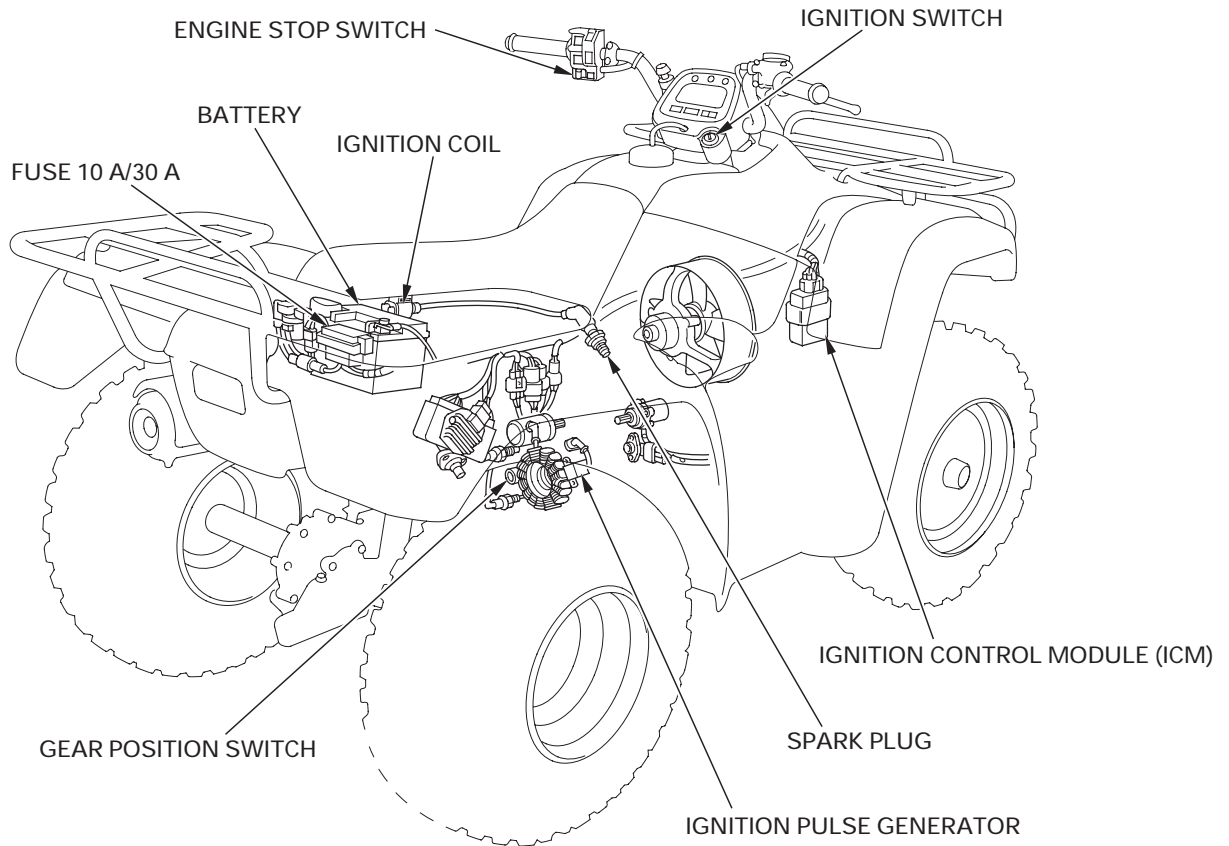
There should be no continuity.



MEMO

IGNITION SYSTEM

TE/FE model shown:



18. IGNITION SYSTEM

SERVICE INFORMATION	18-1	IGNITION COIL	18-4
TROUBLESHOOTING	18-2	IGNITION TIMING	18-5
IGNITION SYSTEM INSPECTION	18-3		

SERVICE INFORMATION

GENERAL

- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.
- When servicing the ignition system, always follow the steps in the troubleshooting on page 18-2.
- The ignition timing cannot be adjusted since the ignition control module (ICM) is factory preset.
- The ICM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the ICM. Always turn off the ignition switch before servicing.
- A faulty ignition system is often related to poor connections. Check those connections before proceeding.
- Use a spark plug of the correct heat range. Using spark plug with an incorrect heat range can damage the engine.
- For ignition switch and engine stop switch inspection, see section 20.
- For ignition pulse generator (alternator stator) removal/installation, see section 10.

SPECIFICATIONS

ITEM		SPECIFICATIONS
Spark plug	Standard	DPR7EA-9 (NGK) , X22EPR-U9 (DENSO)
	For cold climate (below 5°C/41°F)	DPR6EA-9 (NGK) , X20EPR-U9 (DENSO)
Spark plug gap		0.8—0.9 mm (0.03—0.04 in)
Ignition coil primary peak voltage		100 V minimum
Ignition pulse generator peak voltage		0.7 V minimum
Ignition timing ("F" mark)		11° BTDC at idle

TORQUE

Timing hole cap 10 N·m (1.0 kgf·m , 7 lbf·ft)

TOOL

Peak voltage tester (U.S.A. only) or
Peak voltage adaptor

07HGJ-0020100 (not available in U.S.A.) with commercially available digital
multitester (impedance 10 M Ω /DCV minimum)

TROUBLESHOOTING

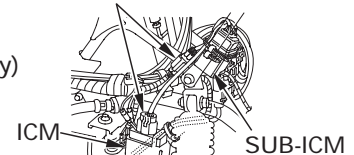
- Inspect the following before diagnosing the system.
 - Faulty spark plug
 - Loose spark plug cap or spark plug wire connections
 - Water got into the spark plug cap (Leaking the ignition coil secondary voltage)

No spark at spark plug

	UNUSUAL CONDITION	PROBABLE CAUSE (Check in numerical order)
Ignition coil primary voltage	Low peak voltage	1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections.) 2. The multimeter impedance is too low; below 10M Ω /DCV. 3. Cranking speed is too low. (Battery is undercharged.) 4. The sampling timing of the tester and measured pulse were not synchronized. (System is normal if measured voltage is over the standard voltage at least once.) 5. Poorly connected connectors or an open circuit in ignition system. 6. Faulty gear position switch. 7. An open circuit or loose connection in No. 6 related circuit (light green/red wire). 8. Faulty ignition coil. 9. Faulty ignition control module (ICM). (when above No. 1 through 8 are normal.)
	No peak voltage	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. Faulty ignition switch or engine stop switch. 4. Loose or poorly connected ICM connector. 5. No voltage at the black/white wire of the ICM. 6. Open circuit or poor connection in ground (green) wire of the ICM. 7. Faulty gear position switch. 8. An open circuit or loose connection in No. 7 related circuit (light green/red wire). 9. Faulty peak voltage adaptor. 10. Faulty ignition pulse generator. (Measure peak voltage.) 11. Faulty ICM. (when above No. 1 through 10 are normal.)
	Peak voltage is normal, but no spark jumps at plug	1. Faulty spark plug or leaking ignition coil secondary current ampere. 2. Faulty ignition coil.
Ignition pulse generator	Low peak voltage	1. The multimeter impedance is too low; 10M Ω /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 ignition pulse generator. (when above No. 1 through 3 are normal).
	No peak voltage	1. Faulty peak voltage adaptor. 2. Faulty ignition pulse generator.

- Early products of the TE/FE model only (equipped with sub-ICM):
 If the result of the troubleshooting was likely to malfunction the "ICM", check as follows.
 Disconnect the sub-ICM connectors and connect the main harness side 8P (gray) connector to the ICM and perform the spark test.
 - If the plug is no spark, faulty ICM.
 - If the plug is sparks, faulty sub-ICM.

CONNECTORS



IGNITION SYSTEM INSPECTION

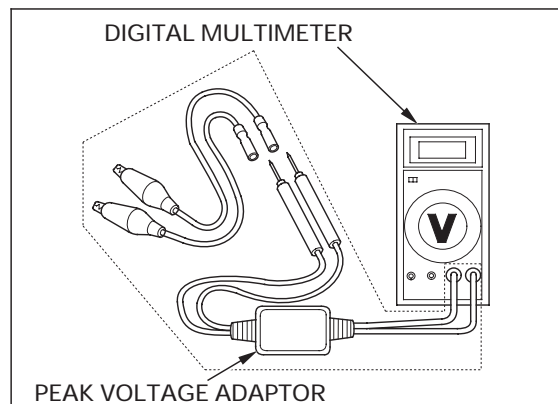
NOTE:

- If not spark jumps at the plug, check all connections for loose or poor contact before measuring each peak voltage.
- Use recommended digital multimeter or a commercially available digital multimeter (impedance 10 M Ω /DCV minimum).
- The display value differs depending upon the internal impedance of the multimeter.

Connect the peak voltage adaptor to the digital multimeter, or use the peak voltage tester.

TOOLS:

Peak voltage tester (U.S.A. only) or
Peak voltage adaptor 07HGJ-0020100
 (not available in U.S.A.)
 with commercially available digital multimeter
 (impedance 10M Ω /DCV minimum)



IGNITION PRIMARY PEAK VOLTAGE

NOTE:

- Check all system connections before this inspection. Poor connected connectors can cause incorrect readings.
- Check the cylinder compression and check that the spark plug is installed correctly in the cylinder.

Disconnect the spark plug cap from the spark plug. Connect known good spark plug to the spark plug cap and ground the spark plug to the cylinder head as done in a spark test.

With the connector connected, connect the peak voltage tester or adaptor probes to the ignition coil primary terminal and body ground.

CONNECTION:

Black/yellow (–) – Body ground (+)

Turn the ignition switch ON.

Crank the engine with the starter motor and read the ignition coil primary voltage.

PEAK VOLTAGE: 100 V minimum

If the peak voltage is lower than the standard value, follow the checks described in the troubleshooting on page 18-2.

To avoid electric shock, do not touch the spark plug or tester probes during this procedure.



IGNITION PULSE GENERATOR PEAK VOLTAGE

NOTE:

- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

Disconnect the ignition control module (ICM) 8P (gray) connector.

Connect the peak voltage tester or adaptor probes to the connector terminals of the wire harness side.

CONNECTION:

Blue/yellow (+) – Green/white (–)

Turn the ignition switch ON.

Crank the engine with the starter motor and read the peak voltage.

PEAK VOLTAGE: 0.7 V minimum

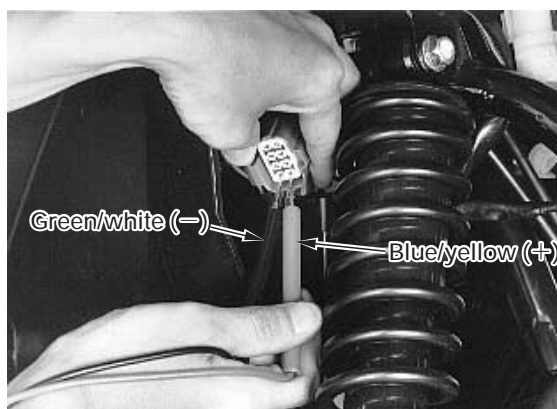
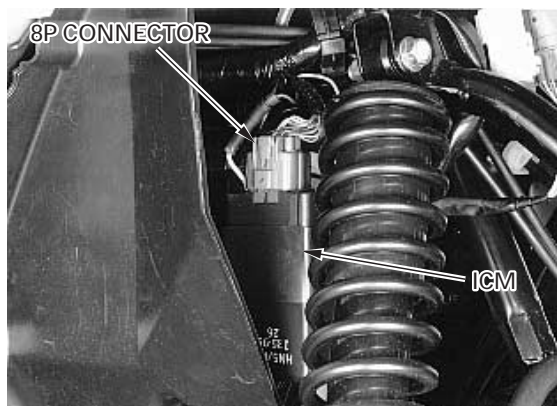
If the voltage measured at ICM connector is abnormal, measure the peak voltage at the alternator connector.

Disconnect the alternator 5P (white) connector and connect the peak voltage tester or adaptor probes to the Blue/yellow wire terminal of the alternator side connector and ground.

In the same manner as at the ICM connector, measure the peak voltage and compare it to the voltage measured at the ICM connector.

- If the peak voltage measured at the ICM connector is abnormal and the one measured at the alternator connector is normal, the Blue/yellow wire has an open or short circuit, or loose connections.
- If both peak voltages are abnormal, follow the checks described in the troubleshooting on page 18-2.

See section 10 for stator/ignition pulse generator assembly replacement.

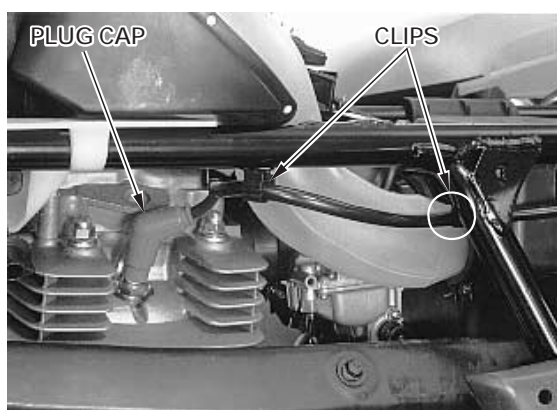


IGNITION COIL

REPLACEMENT

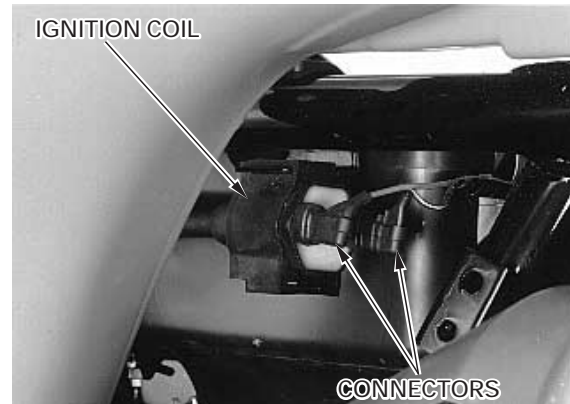
Remove the left side cover (page 2-4).

Release the spark plug wire from the clip.
Remove the spark plug cap from the plug.



Disconnect the connectors.
Remove the ignition coil from the stay of the frame.

Install a new ignition coil in the reverse order of removal.



IGNITION TIMING

Remove the recoil starter cover (page 2-5).

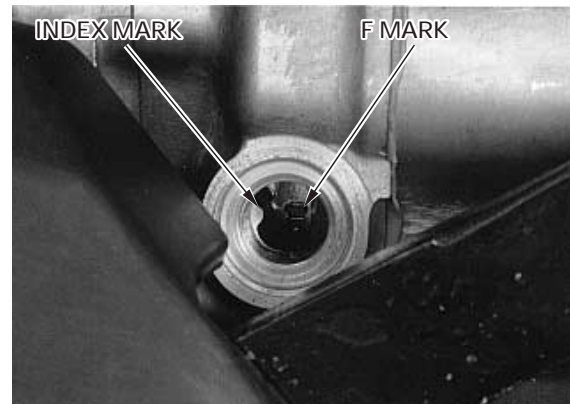
Start the engine and warm it up operating temperature.
Stop the engine and remove the timing hole cap.

Read the instructions for timing light and tachometer operation.

Connect the timing light and tachometer.

Start the engine, let it idle (1,400 rpm) and check the ignition timing.

The ignition timing is correct if the F mark on the flywheel aligns with the index mark on the rear crankcase cover at idle.



Increase the engine speed and make sure the F mark begins to move.

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

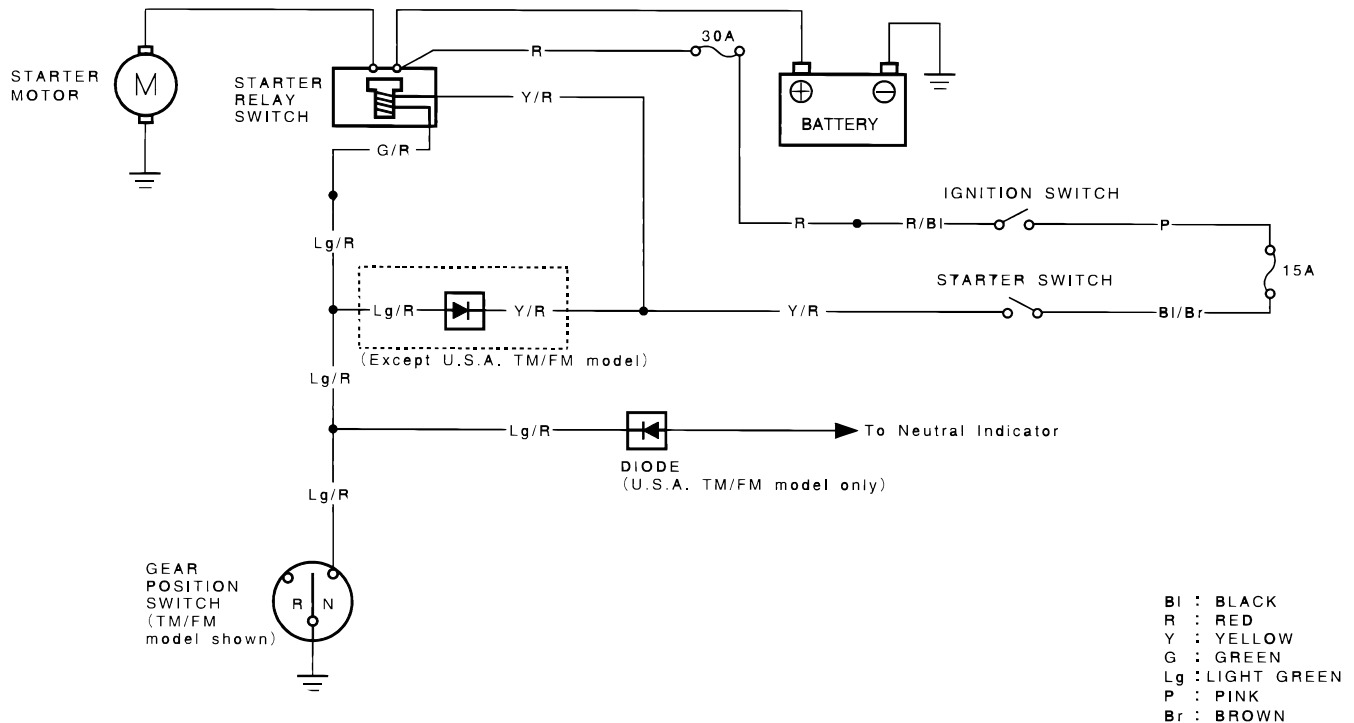
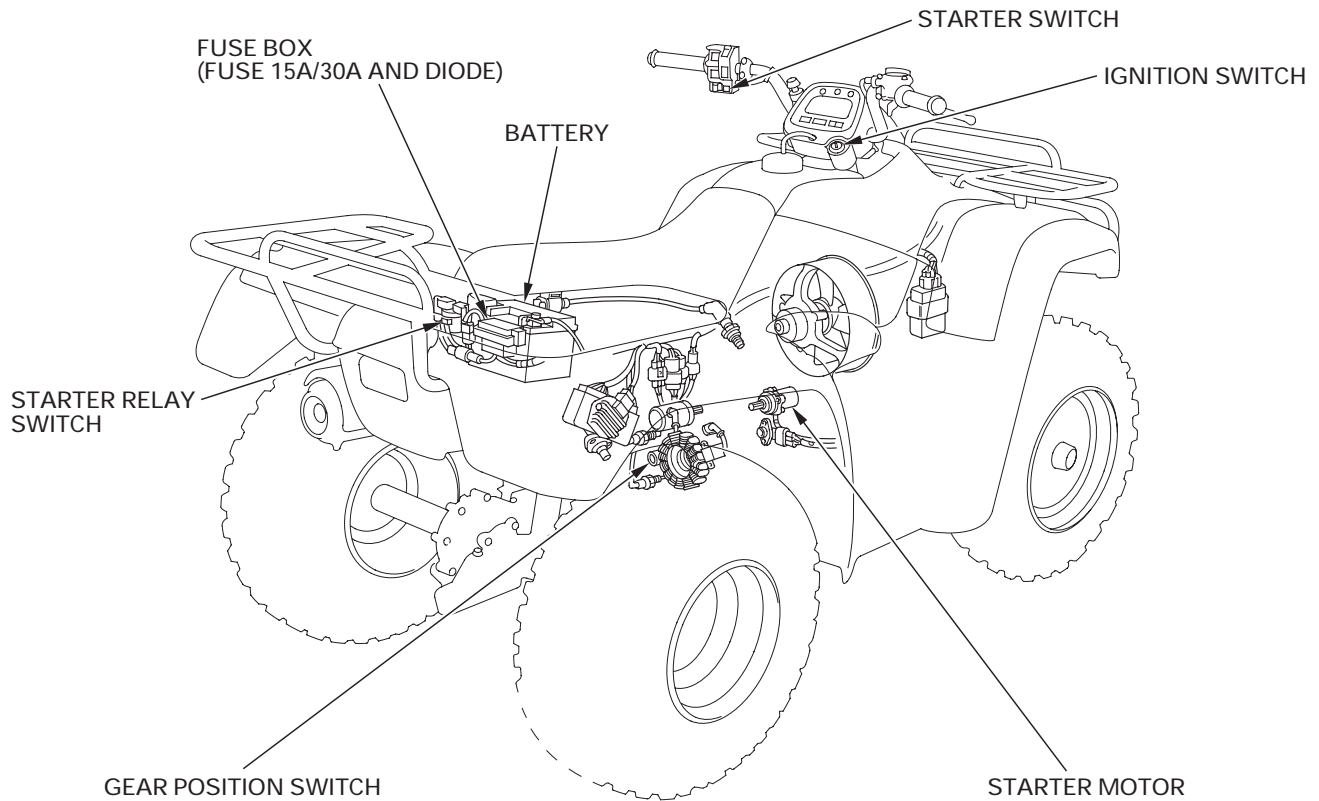
TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)

Install the recoil starter cover (page 2-5).



ELECTRIC STARTER

TE/FE model shown:



19. ELECTRIC STARTER

SERVICE INFORMATION	19-1	STARTER RELAY SWITCH	19-9
TROUBLESHOOTING	19-2	DIODE	19-10
STARTER MOTOR	19-4		

SERVICE INFORMATION

GENERAL

- Always turn the ignition switch OFF before servicing the starter motor. The motor could suddenly start, causing serious injury.
- The starter motor can be serviced with the engine in the frame.
- When checking the starter system, always follow the steps in the troubleshooting flow chart (page 19-2).
- A weak battery may be unable to turn the starter motor quickly enough, or supply adequate ignition current.
- If the current is kept flowing through the starter motor to turn it while the engine is not cranking over, the starter motor may be damaged.
- See section 10 for starter clutch servicing.
- See section 20 for following components:
 - Ignition switch
 - Starter switch
 - Gear position switch

SPECIFICATIONS

Unit: mm (in)		
ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.5 (0.49)	9.0 (0.35)

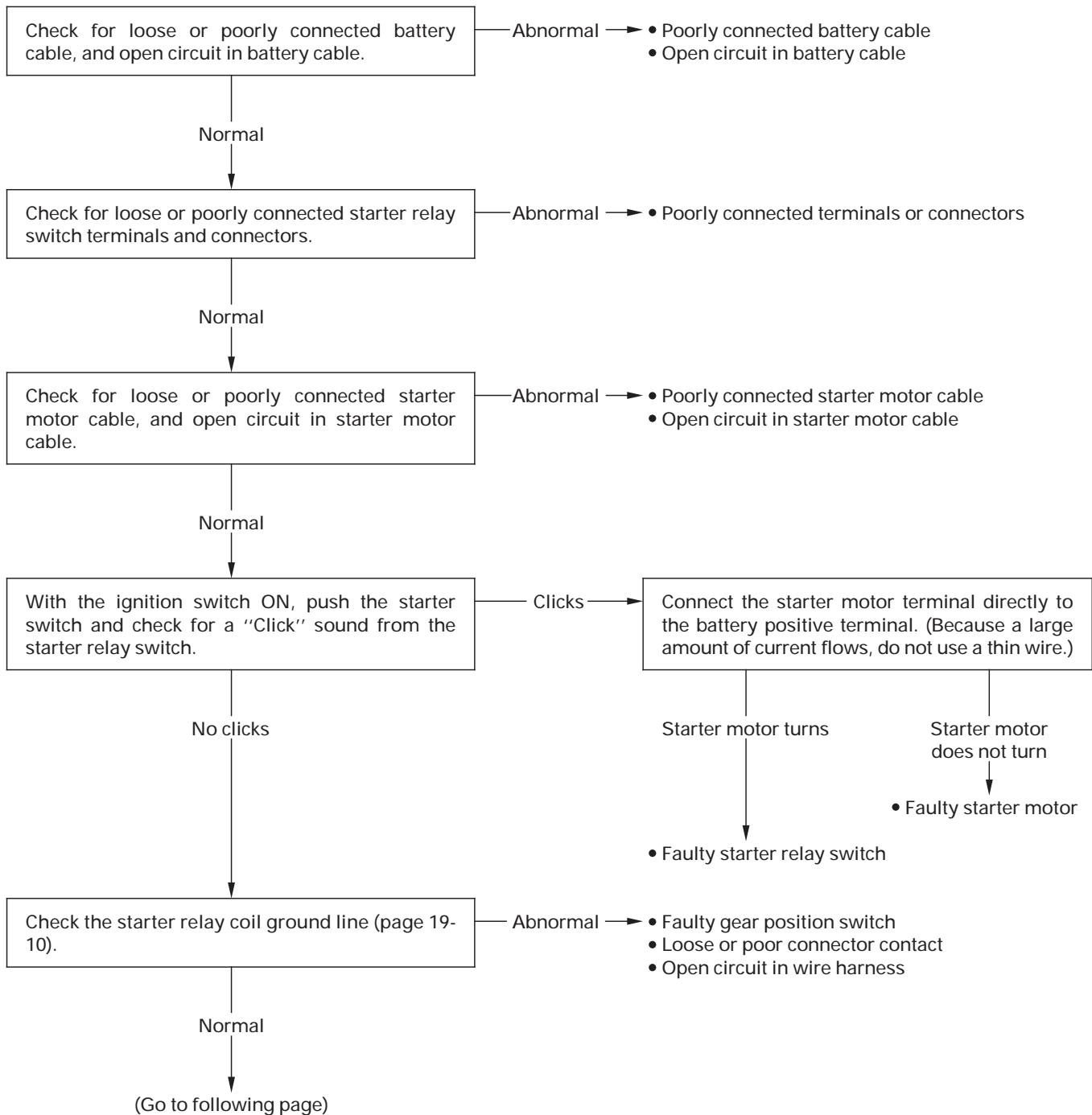
TROUBLESHOOTING

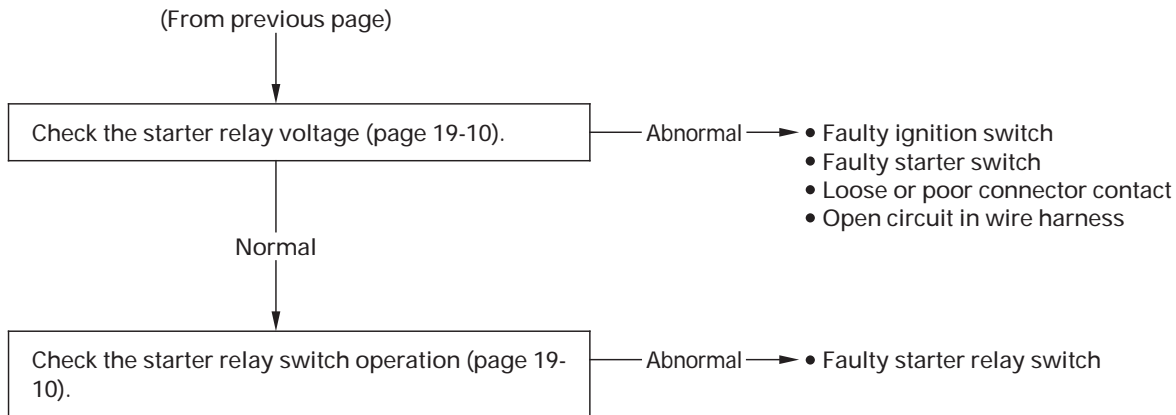
NOTE:

- The starter motor should operate only when the transmission is in neutral with the ignition switch ON.

Starter motor will not turn

- Check for a blown fuse (15 A).
- Check that the battery is fully charged and in good condition.



**Starter motor turns slowly**

- Weak battery
- Poorly connected battery cable
- Poorly connected starter motor cable
- Faulty starter motor

Starter motor turns, but engine does not turn

- Faulty starter clutch (section 10)

Starter relay switch "clicks", but engine does not turn over

- Crankshaft does not turn due to engine problem
- Faulty starter reduction gear (section 10)

STARTER MOTOR

REMOVAL

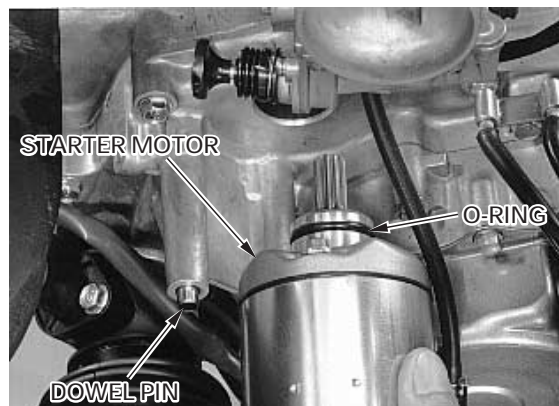
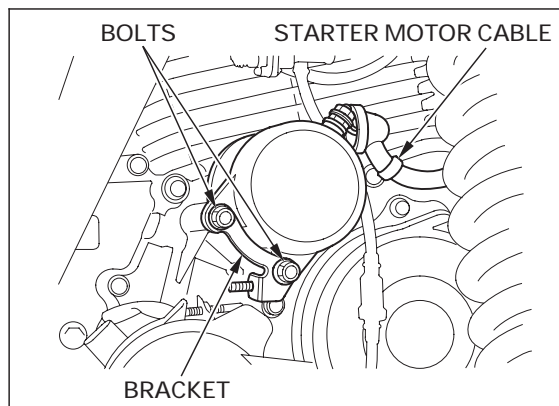
Remove the air cleaner housing (page 5-3).

When the ignition switch OFF, remove the negative cable at the battery before servicing the starter motor.

Release the rubber cap and remove the terminal nut to disconnect the starter motor cable.

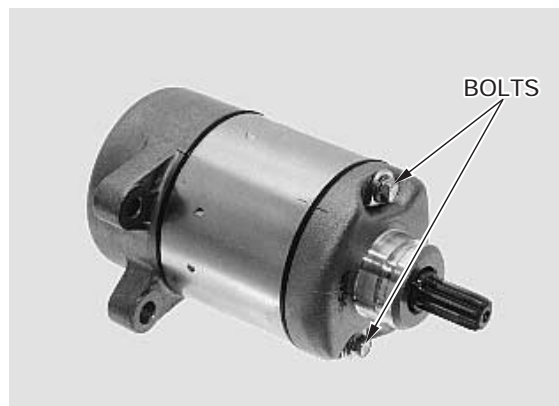
Remove the two mounting bolts with the air cleaner housing bracket and the starter motor from the crankcase cover.

Remove the dowel pin from the crankcase cover.
Remove the O-ring from the starter motor.



DISASSEMBLY/INSPECTION

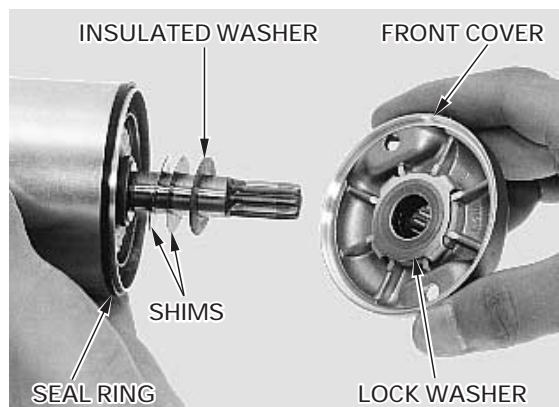
Remove the starter motor case bolts.



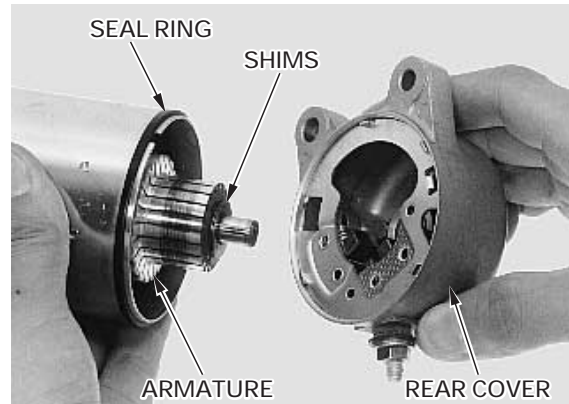
Record the location and number of shims.

Remove the following:

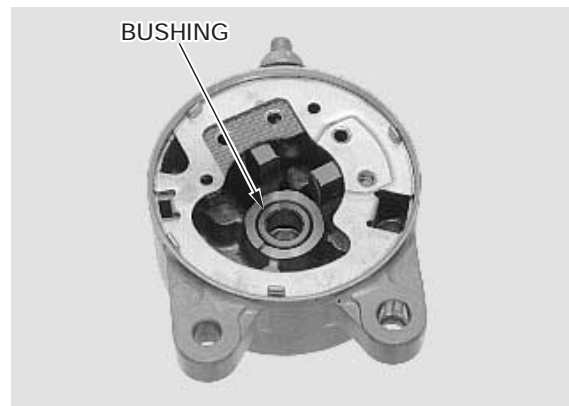
- front cover
- lock washer
- insulated washer
- shims
- seal ring



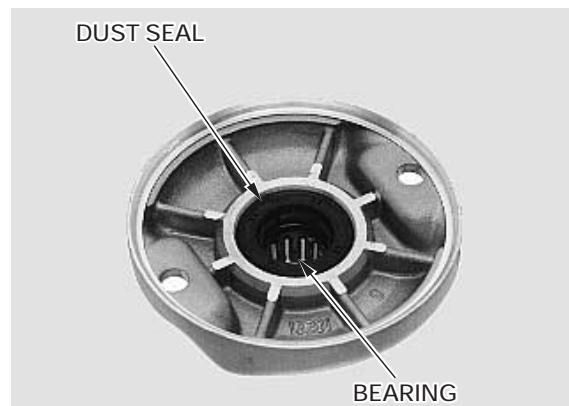
- rear cover
- shims
- seal ring
- armature



Check the bushing in the rear cover for wear or damage.



Check the dust seal and needle bearing in the front cover for deterioration, wear or damage.



Check the commutator bars of the armature for discoloration.

NOTE:

- Do not use emery or sand paper on the commutator.



ELECTRIC STARTER

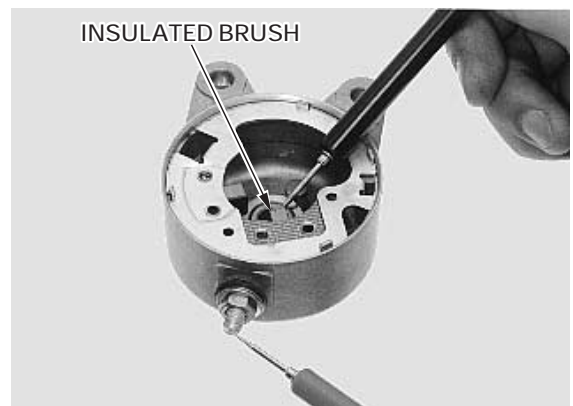
Check for continuity between pairs of commutator bars.
There should be continuity.



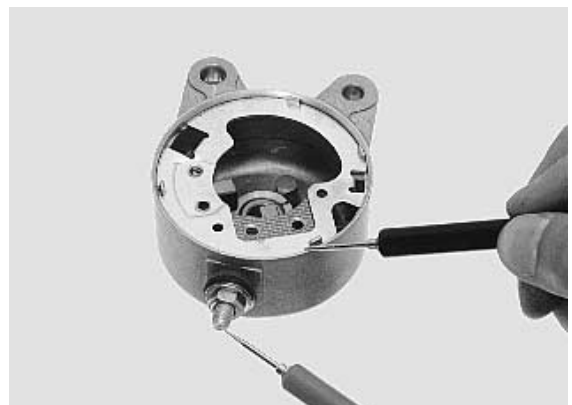
Check for continuity between each commutator bar and the armature shaft.
There should be no continuity.



Check for continuity between the insulated brush and cable terminal.
There should be continuity.

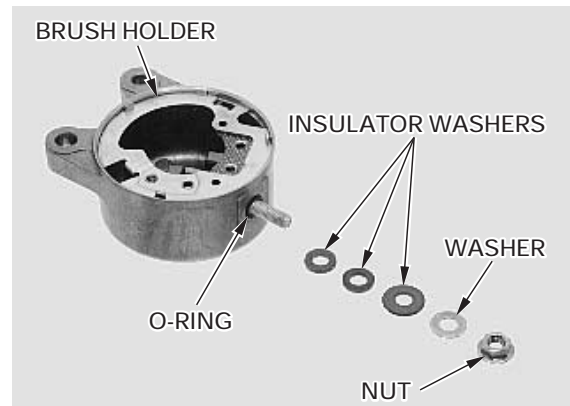


Check for continuity between the cable terminal and motor case.
There should be no continuity.



Remove the following:

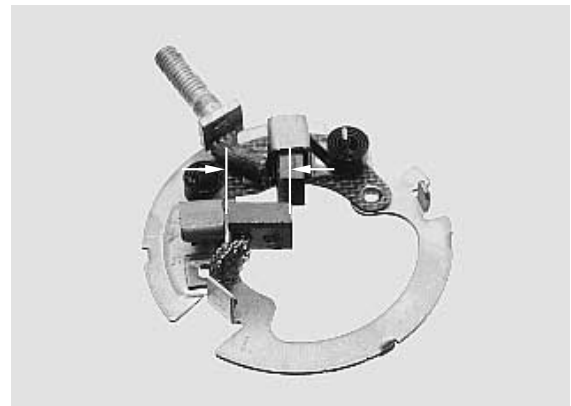
- nut
- washer
- insulator washers
- brush holder assembly
- O-ring



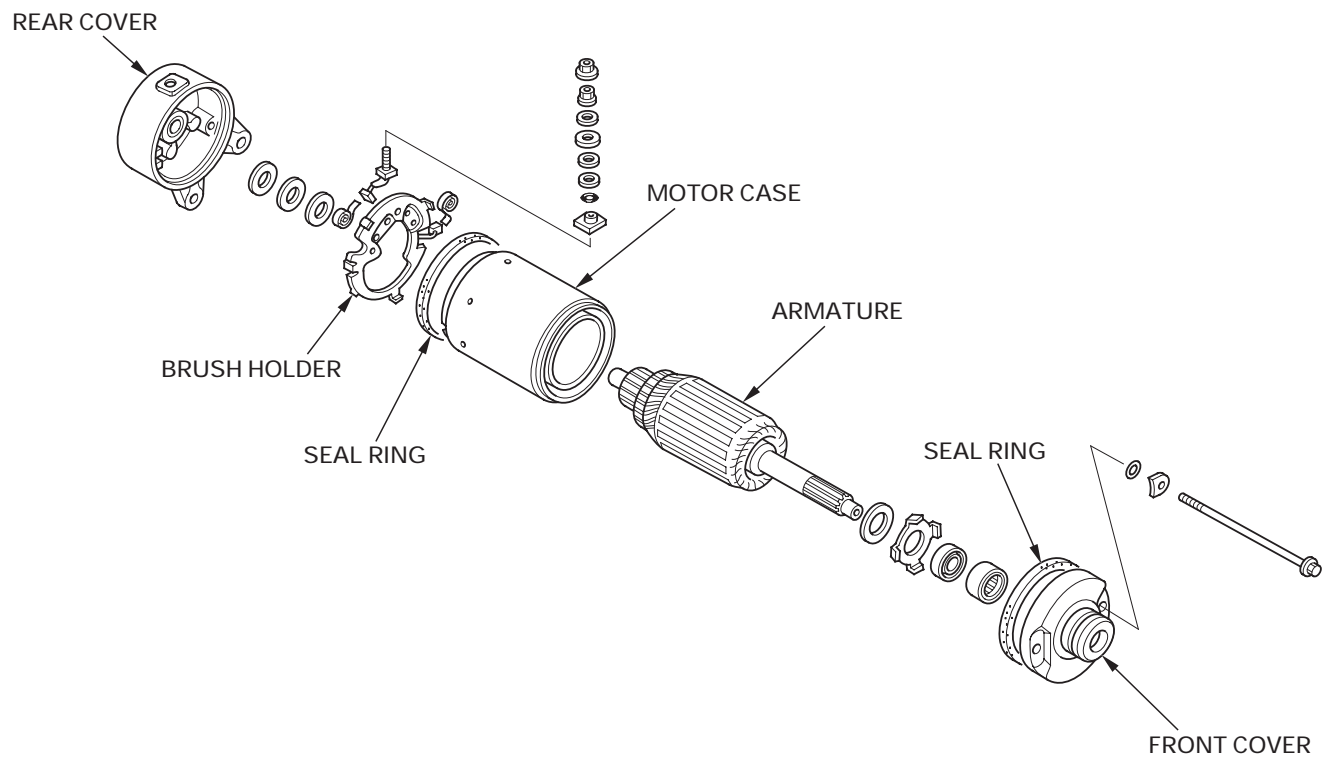
Remove the brushes from the brush holder.

Measure the brush length.

SERVICE LIMIT: 9.0 mm (0.35 in)

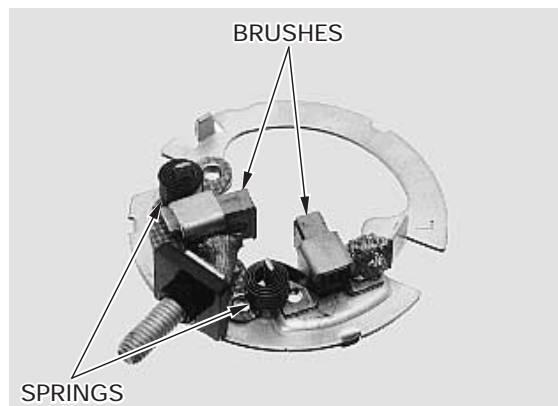


ASSEMBLY



ELECTRIC STARTER

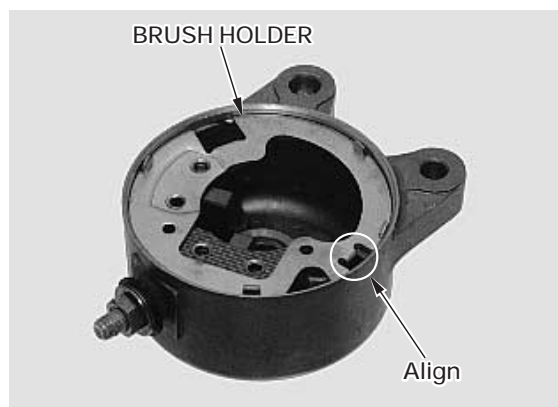
Install the brushes into the brush holder.



Install the brush holder assembly into the rear cover by aligning the tab of the holder with the groove in the rear cover.

Install the following:

- new O-ring
- insulator washers
- washer
- nut

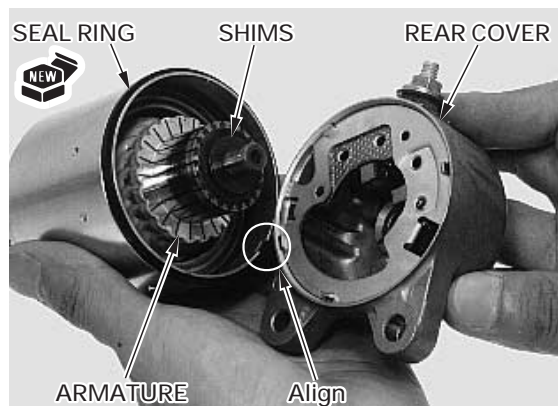


The coil may be damaged if the magnet pulls the armature against the case.

Install the armature into the motor case while holding the armature tightly to keep the magnet of the case from pulling the armature against it.

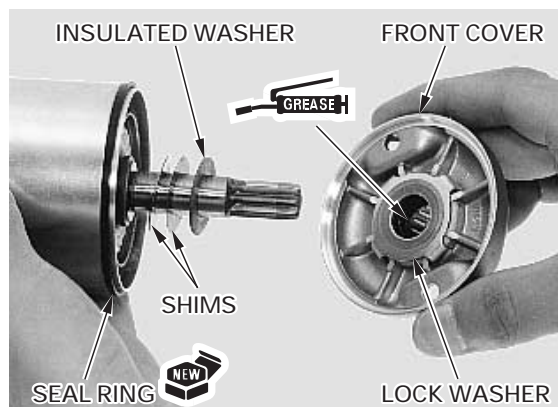
Install a new seal ring onto the motor case. Install the same number of shims in the same locations as noted during disassembly.

Install the rear cover while pushing in the brushes into the brush holder by aligning the brush holder tab with the motor case groove.

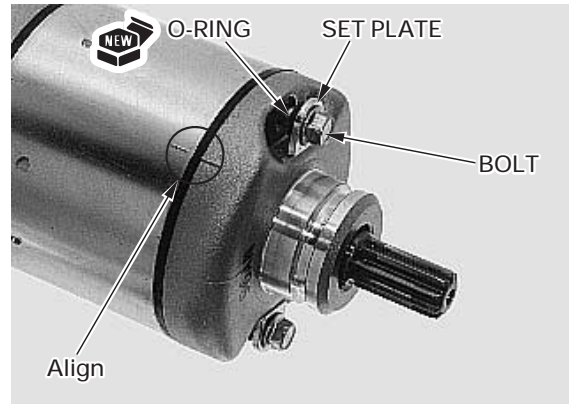


Install a new seal ring onto the motor case. Install the shims and insulated washer onto the armature shaft.

Apply grease to the dust seal lip and needle bearing in the front cover. Install the lock washer onto the front cover and the front cover over the motor case.



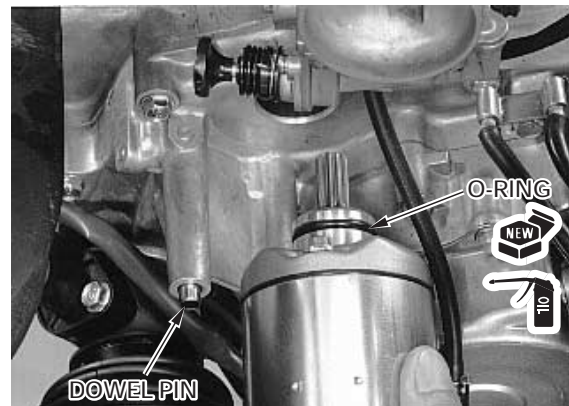
Align the index lines on the front cover and motor case.
 Install the set plates and new O-rings onto the motor case bolts.
 Install the motor case bolts and tighten them.



INSTALLATION

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

Install the dowel pin into the crankcase cover.

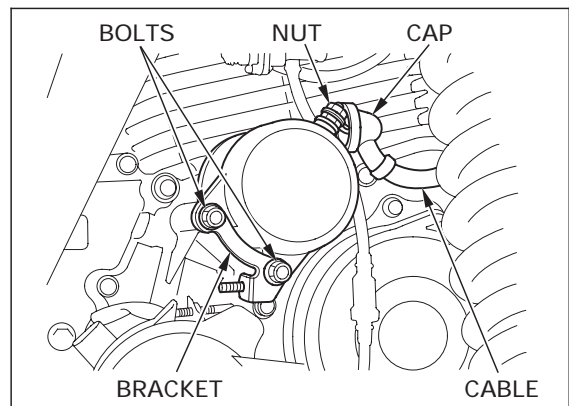


Install the starter motor.

Install the mounting bolts with the bracket as shown and tighten them.

Connect the starter motor cable to the motor terminal with the terminal nut and tighten it.
 Install the rubber cap over the motor terminal securely.

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



STARTER RELAY SWITCH

INSPECTION

Remove the maintenance lid (page 17-4).

Shift the transmission into neutral.
 Turn the ignition switch ON and push the starter switch.
 The coil is normal if the starter relay switch clicks.

If you don't hear the switch "CLICK", inspect the relay switch using the procedure below.

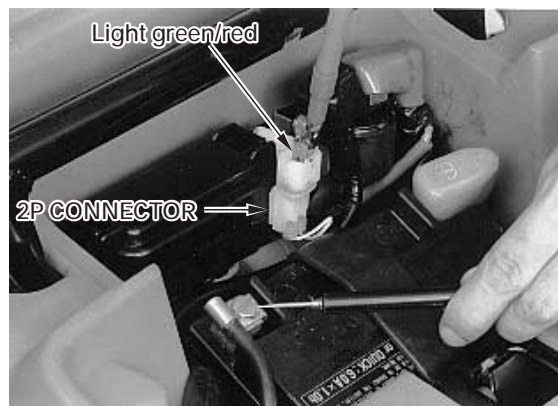


ELECTRIC STARTER

GROUND LINE

Disconnect the starter relay 2P (white) connector. Check for continuity between the Light green/red wire terminal of the harness side connector and ground.

If there is continuity when the transmission is in neutral, the ground circuit is normal.



STARTER RELAY VOLTAGE

Measure the voltage between the Yellow/red wire terminal (+) of the harness side 2P connector and ground (-).

If the battery voltage appears only when the starter switch is pushed with the ignition switch ON, the circuit is normal.



OPERATION CHECK

Disconnect battery (+) cable and starter motor cable from the starter relay switch.

Connect the fully charged 12 V battery positive terminal to the Yellow/red wire terminal and negative terminal to the Green/red wire terminal of the relay switch side 2P connector.

There should be continuity between the cable terminals while the battery is connected, and no continuity when the battery is disconnected.

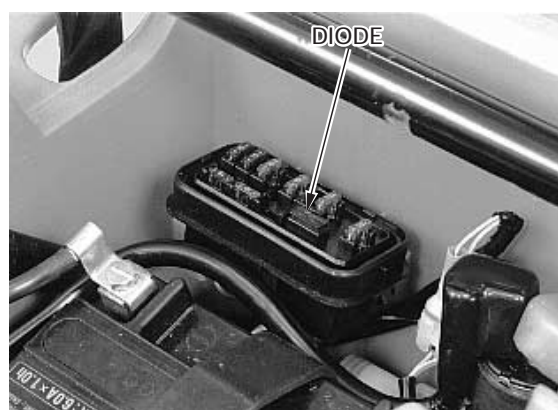


DIODE

INSPECTION

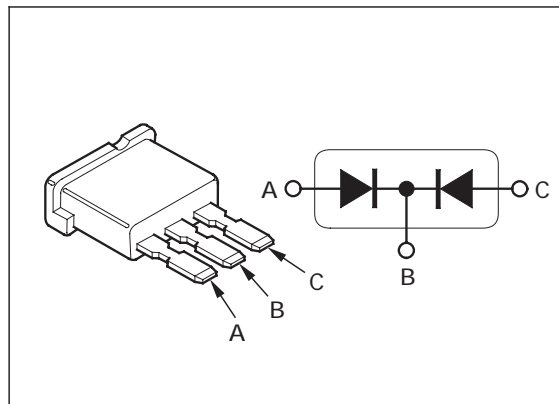
Remove the maintenance lid (page 17-4).

Remove fuse box cover and the diode.



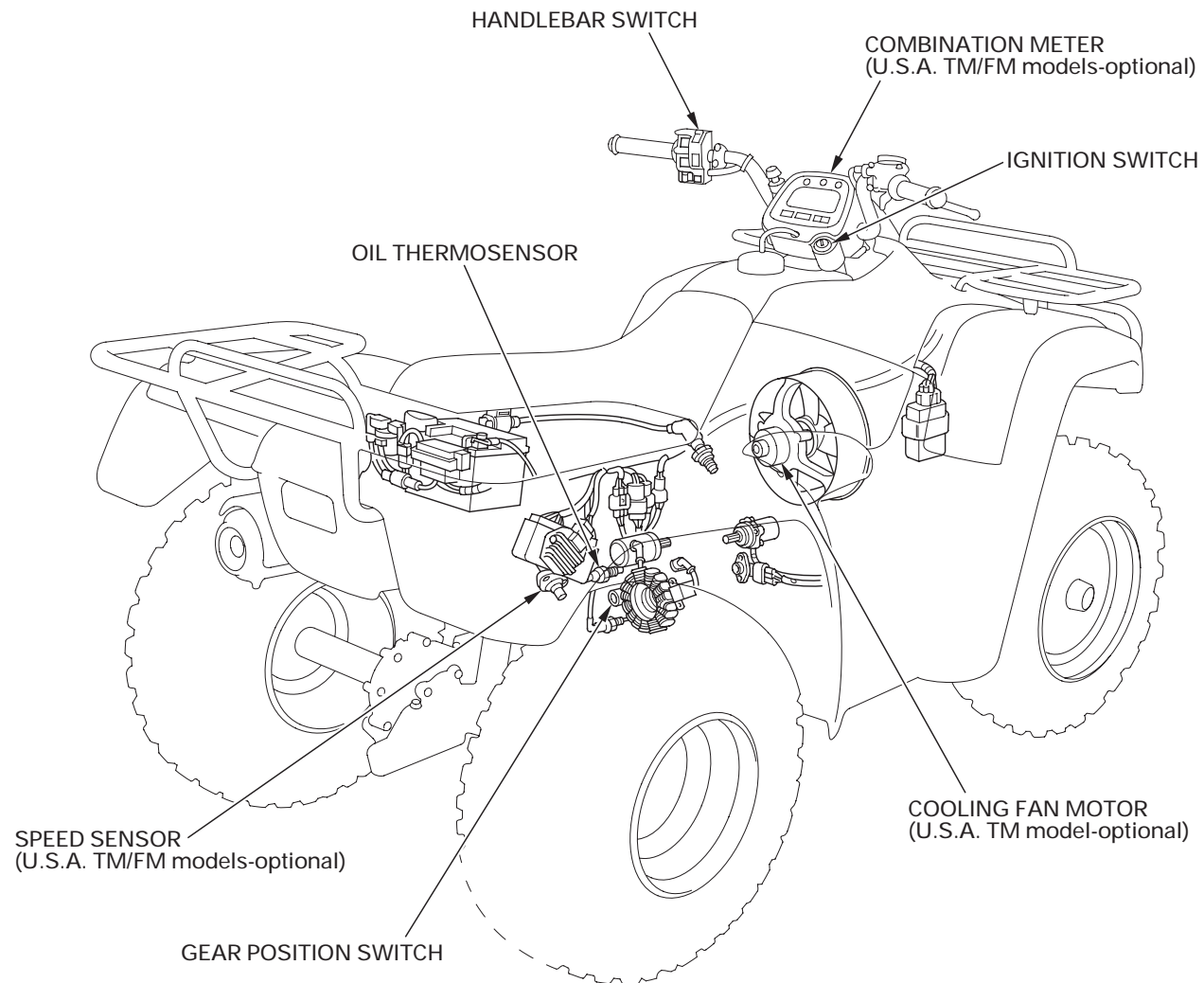
Check for continuity between the diode terminals.
When there is continuity, a small resistance value will register.

If there is continuity in one direction, the diode is normal.



LIGHTS/METERS/SWITCHES

TE/FE model shown:



20. LIGHTS/METERS/SWITCHES

SERVICE INFORMATION	20-1	GEAR POSITION SWITCH	20-7
BULB REPLACEMENT	20-2	CARBURETOR HEATER	20-8
HEADLIGHT	20-3	COMBINATION METER/SPEED SENSOR (Except U.S.A. TM/FM models)	20-9
ACCESSORY SOCKET	20-4	OIL COOLING SYSTEM/ TEMPERATURE INDICATOR	20-11
IGNITION SWITCH	20-5		
HANDLEBAR SWITCH	20-5		

SERVICE INFORMATION

GENERAL

- All plastic connectors have locking tabs that must be released before disconnecting, and must be aligned when reconnecting.
- A continuity check can usually be made without removing the part from the vehicle. Simply disconnect the connectors and connect a continuity tester to the terminals or connections.
- Check the battery condition before performing any inspection that requires proper battery voltage.
- The following color codes used are indicated throughout this section.

Bu: Blue	G: Green	Lg: Light Green	R: Red
Bl: Black	Gr: Gray	O: Orange	W: White
Br: Brown	Lb: Light Blue	P: Pink	Y: Yellow

SPECIFICATIONS

ITEM			SPECIFICATIONS
Bulbs	Headlight (high/low beam)		12 V-30/30 W × 2
	Taillight		12 V-5 W
	Neutral indicator		12 V-1.7 W (No meter)
			LED (Equipped with digital meter)
	Reverse indicator		12 V-1.7 W (No meter)
			LED (Equipped with digital meter)
	Oil temperature indicator		12 V-1.7 W (No meter)
Fuse			LED (Equipped with digital meter)
	Meter light		LED × 12 (Equipped with digital meter)
	Main fuse	TM/FM	30 A
		TE/FE	30 A × 2
	Sub-fuse		15 A × 2, 10 A × 2

TORQUE VALUES

Gear position switch bolt	12 N·m (1.2 kgf·m , 9 lbf·ft)	Apply locking agent to the threads
Oil thermosensor	18 N·m (1.8 kgf·m , 13 lbf·ft)	

BULB REPLACEMENT

HEADLIGHT

TM/TE models: Remove the screw and the cover cap by releasing the tabs from the slits in the headlight cover.

Remove the dust cover from the headlight.

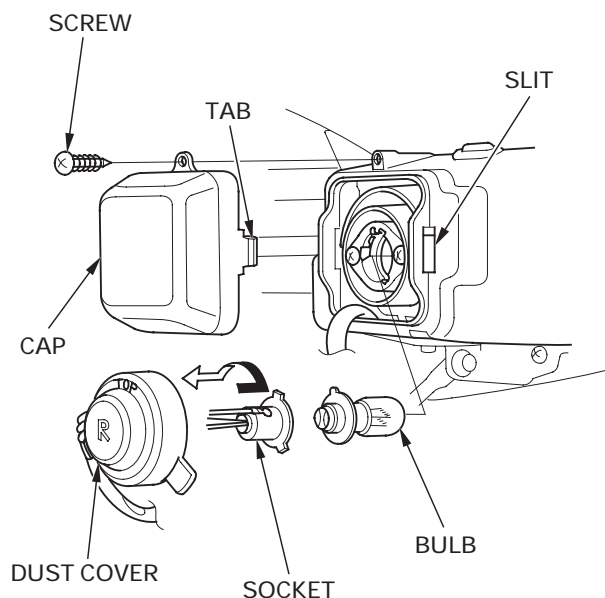
While pushing the bulb socket in, turn it counter-clockwise to remove it.

Remove the bulb from the headlight and replace it with a new one.

Align the bulb tab with the headlight groove.

Install the dust cover tightly against the headlight with the "TOP" mark facing up.

Install the removed parts in the reverse order of removal.



FM/FE models: Remove the screw and the cover cap by releasing the tabs from the slits in the headlight cover.

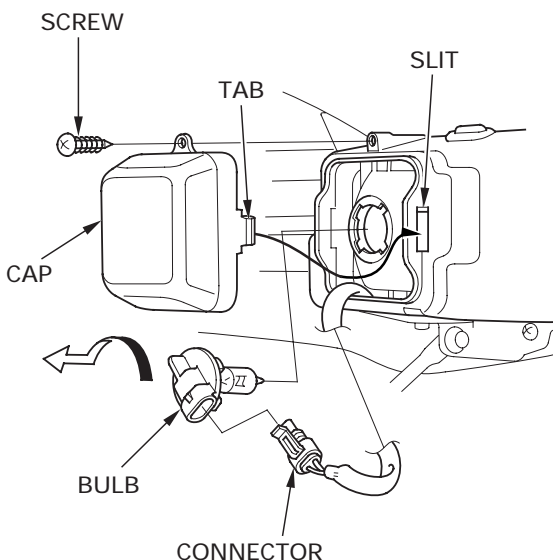
Remove the bulb socket by turning it counterclockwise.

Disconnect the bulb connector and replace the bulb with a new one.

Make sure that the seal rubber on the connector is installed in position and is in good condition.

Align the socket tabs with the headlight grooves properly.

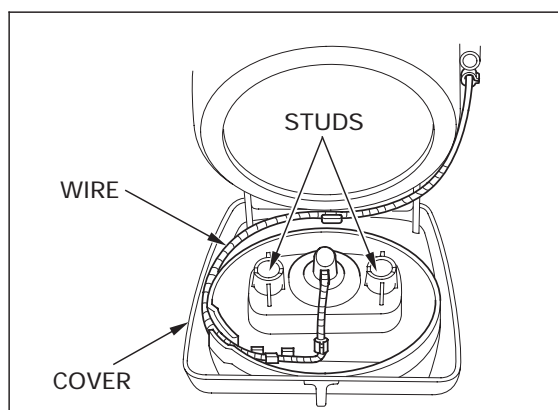
Install the bulb in the reverse order of removal.



TAILLIGHT

Open the tool box cover.
Release the taillight wire from the wire guides.

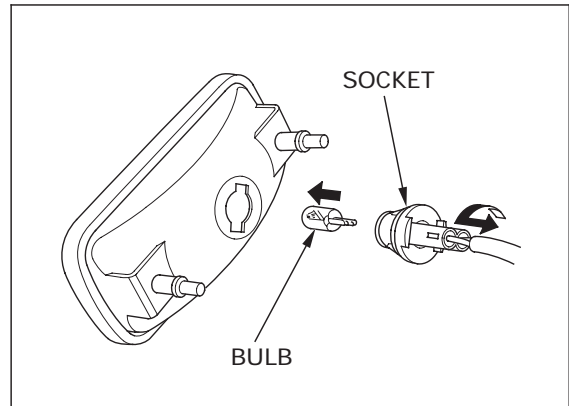
Remove the taillight unit from the box cover by pushing the mounting studs off the grommets.



Turn the bulb socket counterclockwise and remove it.
Pull the bulb out of the socket and replace it with a new one.

Make sure that the seal rubber is installed in position and is in good condition.

Route the taillight wire properly. Install the removed parts in the reverse order of removal.



INDICATOR (U.S.A. TM/FM model only)

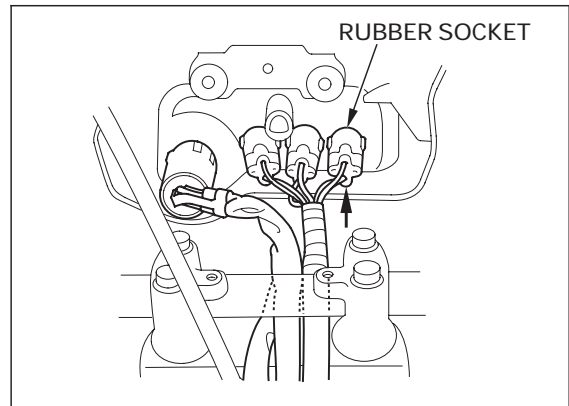
Remove the handlebar cover (page 12-3).

Raise the rubber socket toward upper side to remove it off the cover.

Remove the indicator lens and turn the socket inside out.

Pull the bulb out of the socket and replace it with a new one.

Align the socket lugs with the cover grooves. Installation is in the reverse order of removal.



HEADLIGHT

REMOVAL/INSTALLATION

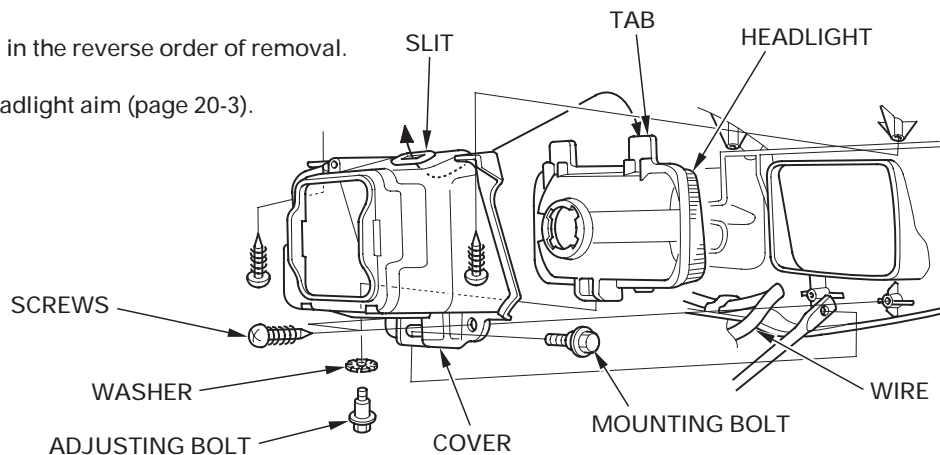
Remove the headlight bulb (page 20-2).

Remove the following fasteners:
— aim adjusting bolt and lock washer
— mounting bolt
— four mounting screws

Remove the headlight assembly from the headlight grill and the headlight from the cover by releasing the tabs from the slits.

Route the headlight wire between the cover and headlight properly (page 1-22). Installation is in the reverse order of removal.

Adjust the headlight aim (page 20-3).



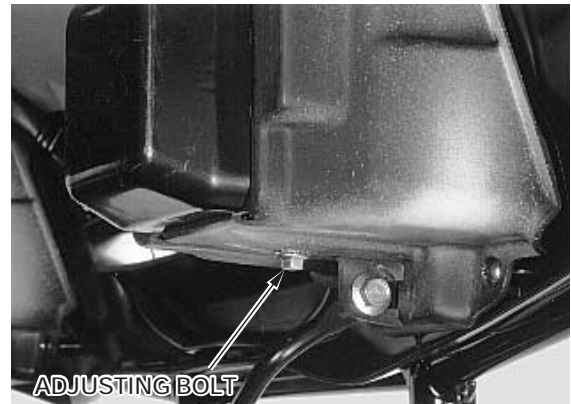
HEADLIGHT AIM

Adjust the headlight beam vertically by loosening the adjusting bolt and moving the headlight back and forth.

Tighten the mounting bolts.

NOTE:

- An improperly adjusted headlight may blind oncoming drivers, or it may fail to light the road for a safe distance.



ACCESSORY SOCKET

INSPECTION

Disconnect the accessory socket 2P (white) connector.

Measure the voltage between the White/black (+) and Green (–) wire terminals of the wire harness side connector.

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in related wires.



Remove the accessory socket cap.

Check for continuity between the White/black wire terminal of the socket side 2P connector and bottom center terminal of the socket and between the Green wire terminal and side wall terminal.

There should be continuity.

If there is no continuity, replace the accessory socket.



REPLACEMENT

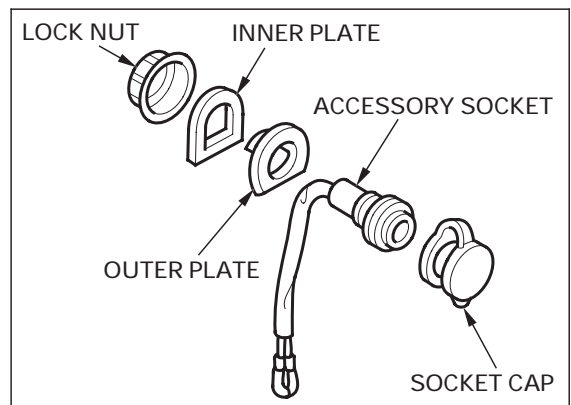
Remove the front fender (page 2-7).

Remove the following:

- lock nut
- inner plate
- accessory socket
- outer plate

Align the socket lug with the groove in the front fender.

Install a new accessory socket in the reverse order of removal.



IGNITION SWITCH

INSPECTION

Disconnect the ignition switch 4P (white) connector.

Check for continuity between the switch side connector terminals in each switch position. Continuity should exist between the color coded wires as follows:

Color	Red/black	Pink	Red	Black
Position				
ON				
OFF				

REPLACEMENT

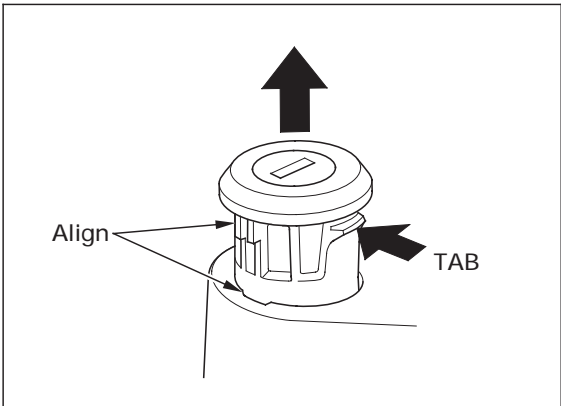
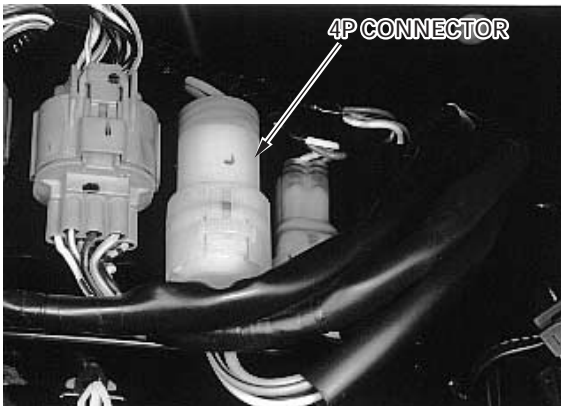
Disconnect the ignition switch connector. Release the switch wire from the wire clips on the frame and steering shaft holder.

Remove the handlebar cover or meter cover (page 12-3). Remove the ignition switch from the cover while pushing in the two stopper tabs.

Install a new ignition switch by aligning the locating tab with the groove in the cover. Connect the ignition switch connector.

Route the wire properly (page 1-22).

Install the handlebar cover or meter cover in the reverse order of removal.



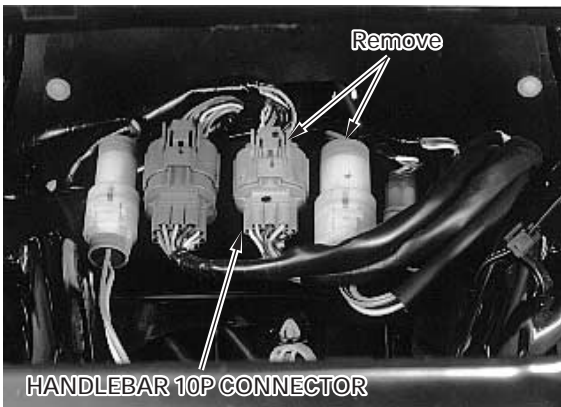
HANDLEBAR SWITCH

INSPECTION

Remove the connectors from the frame in order as follows:

- ignition switch (4P white)
- handlebar switch (10P green)

Disconnect the handlebar switch connector (green).

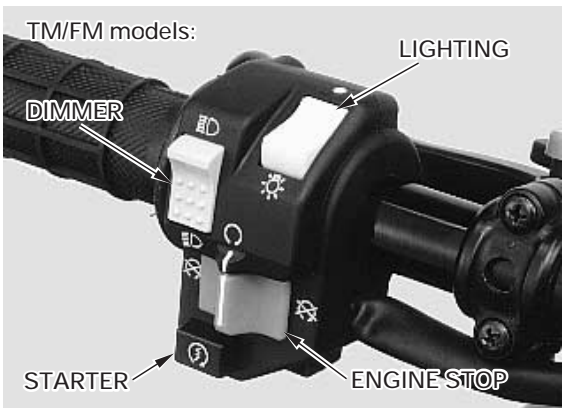


LIGHTS/METERS/SWITCHES

Check for continuity between the switch side connector terminals in each switch position. Continuity should exist between the color coded wires as follows:

ENGINE STOP SWITCH

Color Position	Bl/G	Bl/W
OFF		
RUN	○	○
OFF		



LIGHTING SWITCH

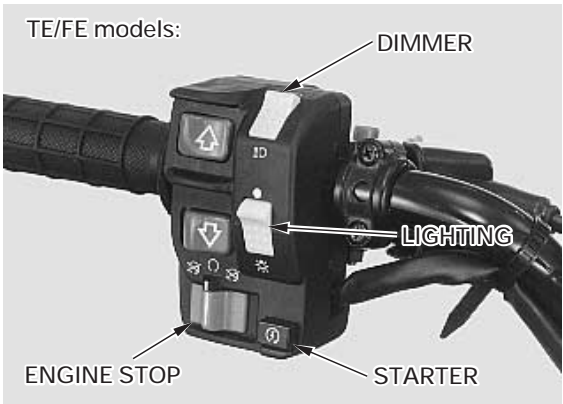
Color Position	Bl/Br	Br	
ON	○	○	○
OFF			

DIMMER SWITCH

Color Position		W	Bu/Bl
Low	○	○	
(N)	○	○	○
High	○		○

STARTER SWITCH

Color Position	Bl/Br	Y/R
FREE		
PUSH	○	○



GEAR POSITION SWITCH

INSPECTION

TM/FM model only: Remove the right side cover (page 2-4).

TE/FE model only: Remove the alternator connector, then the gear position switch connector from the frame.

Disconnect the gear position switch connector.
Check for continuity between each terminal of the switch side connector and ground.
There should be continuity in each gear position as follows.

TM/FM model

Neutral: Light green/red

Reverse: Gray

TE/FE model

Neutral: Light green/red

Reverse: Gray

1st: White/green

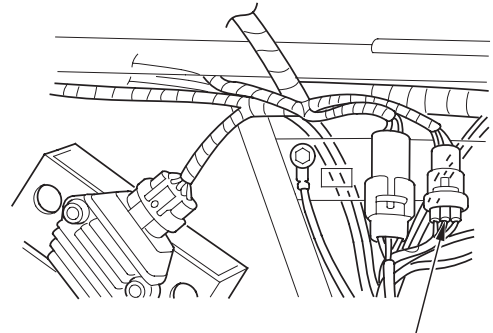
2nd: White/red

3rd: Blue

4th: Yellow

5th: Light blue/white

TM/FM models:



GEAR POSITION SWITCH 2P CONNECTOR

TE/FE models:



ALTERNATOR CONNECTOR

GEAR POSITION SWITCH 8P CONNECTOR

REPLACEMENT

Remove the rear crankcase cover (page 10-7).

TE/FE model only: Disconnect the reverse shift switch connector.

Remove the wire grommet from the crankcase.
Remove the retaining bolt and the gear position switch.

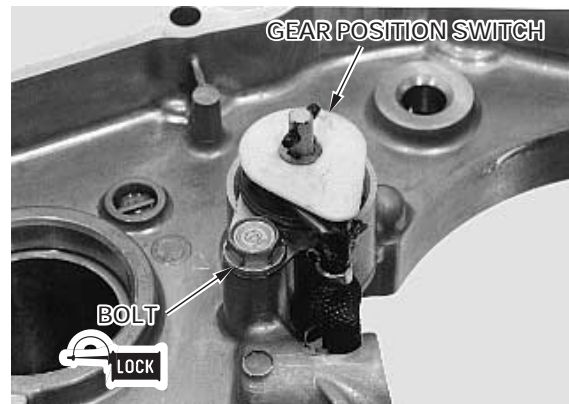
Be careful not to damage the switch pin and shaft while installing. Apply locking agent to the retaining bolt threads.
Install a new gear position switch into the crankcase and tighten the bolt.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Apply liquid sealant to the grommet outer surface and install the grommet into the crankcase groove securely.

Connect the reverse shift switch connector.

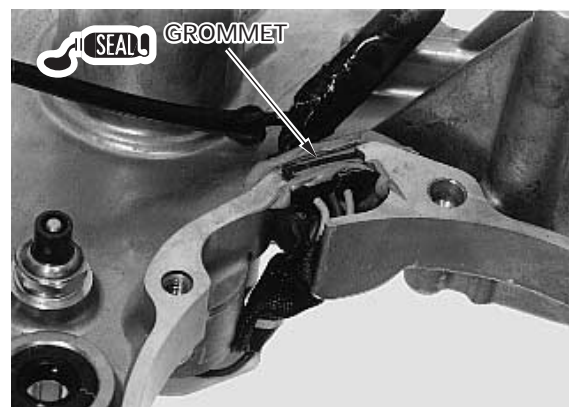
Install the rear crankcase cover (page 10-10).



GEAR POSITION SWITCH

BOLT

LOCK



SEAL

GROMMET

CARBURETOR HEATER

INSPECTION (Except U.S.A. TM model)

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

Disconnect the carburetor heater 2P (white) connector.

Measure the voltage between the Brown/black (+) and Yellow (−) wire terminals at the harness side connectors.

There should be battery voltage with the ignition switch ON.

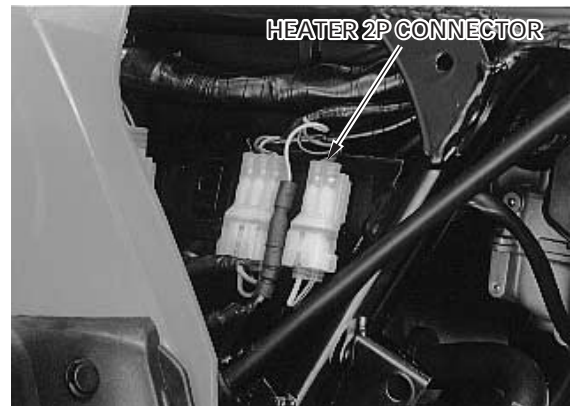
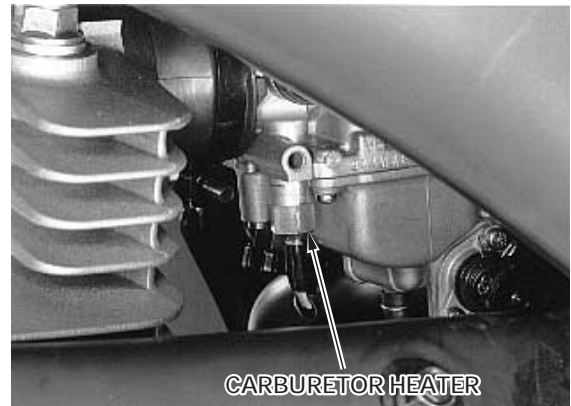
If there is no voltage, check for open circuit in related wires.

If the wires are OK, check as follows:

Measure the resistance between the heater side connector terminals.

STANDARD: 13—15 Ω (20°C/68°F)

If the resistance is out of above ranges, replace the carburetor heater.



INSPECTION (U.S.A. TM model)

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

Disconnect the carburetor heater 2P (white) connector and the air temperature switch 2P (white) connector.

Check for continuity between the Brown/black terminals at the harness side connectors.

There should be continuity.

If there is no continuity, check for open circuit in Brown/black wire.

Measure the voltage between the Black/green (+) and Yellow (−) wire terminals at the harness side connectors.

There should be battery voltage with the ignition switch ON.

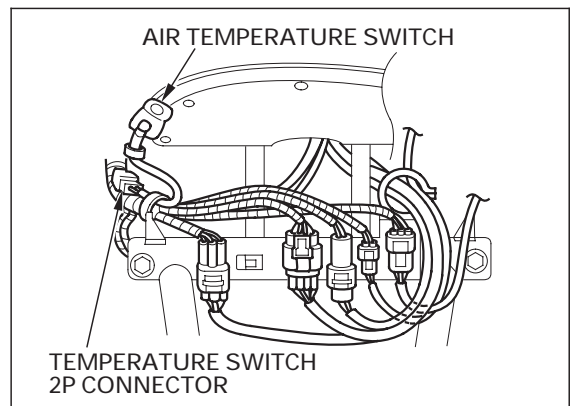
If there is no voltage, check for open circuit in related wires.

If the wires are OK, check as follows:

Measure the resistance between the heater side terminals of the heater 2P connector.

STANDARD: 13—15 Ω (20°C/68°F)

If the resistance is out of above ranges, replace the carburetor heater.

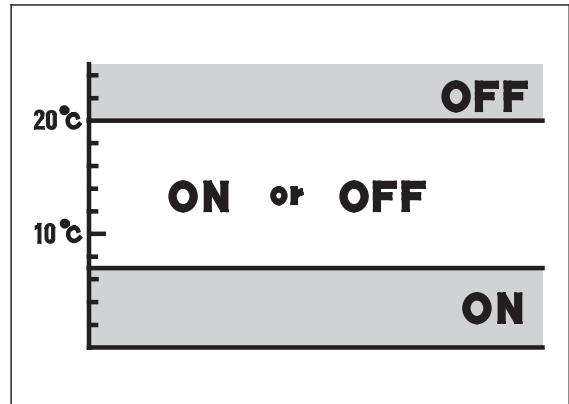


If the carburetor heater resistance is normal, check for continuity between the switch side connector terminals of the temperature switch 2P connector.

Above: 20°C (68°F) : No Continuity

Below: 7°C (45°F) : Continuity

If there is abnormal, replace the air temperature switch.



COMBINATION METER/SPEED SENSOR (Except U.S.A. TM/FM models)

POWER/GROUND LINE INSPECTION

Remove the connectors from the frame in order as follows:

- ignition switch (4P white)
- handlebar switch (10P green)
- meter (14P gray)

Disconnect the meter 14P connector and check the following at the wire harness side connector.

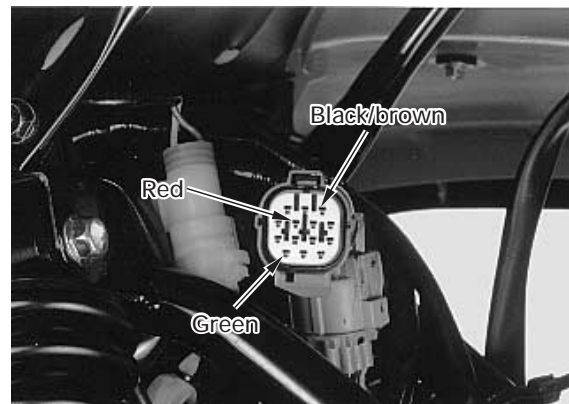


POWER INPUT LINE

Measure the voltage between the Black/brown wire terminal (+) and ground (–).

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in Black/brown wire.



BACK-UP VOLTAGE LINE

Measure the voltage between the Red wire terminal (+) and ground (–).

There should be battery voltage at all times.

If there is no voltage, check for open circuit in Red wire.

GROUND LINE

Check for continuity between the Green wire terminal and ground.

There should be continuity at all times.

If there is no continuity, check for open circuit in Green wire.

SPEEDOMETER/SPEED SENSOR SYSTEM INSPECTION

Check that the hour meter or odometer/trip meter function properly.

- If they do not function, perform the power/ground line inspection (page 20-9).
- If they function, check the following.

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

Disconnect the speed sensor 3P (white) connector.

Measure the voltage between the Black/blue (+) and Green (–) wire terminals at the harness side 3P connector.

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in related wires.

If there is voltage, check the sensor as follows.

Connect the inspection adaptor to the sensor 3P connectors.

TOOL:

Inspection adaptor 07GMJ-ML80100

Shift the transmission into neutral.

Raise the wheels off the ground and support the vehicle securely with a hoist or equivalent.

Measure the voltage between the Red clip (+) and White clip (–).

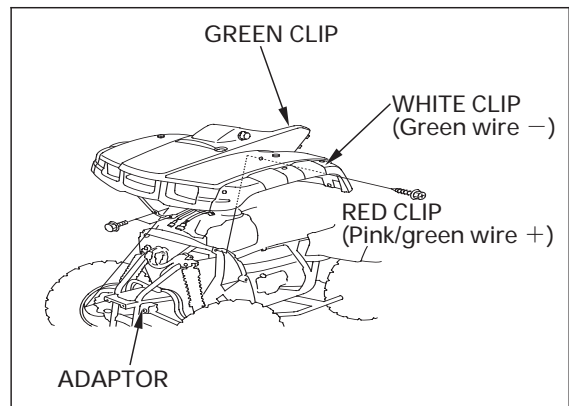
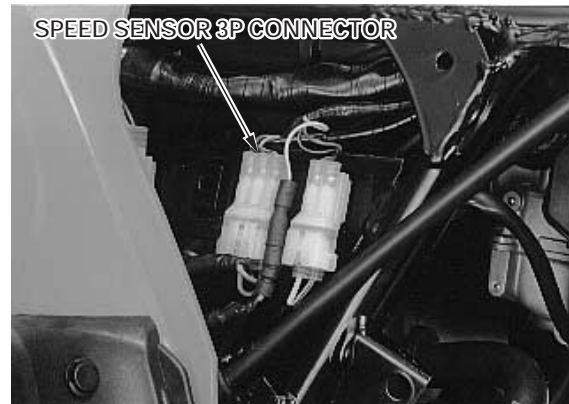
With the ignition switch ON, slowly turn the rear wheels by hand.

There should be 0 to 5 V pulse voltage.

—If the pulse voltage does not appear, replace the speed sensor.

—If the pulse voltage appear, disconnect the meter 14P connector (page 20-9) and check for open or short circuit Pink/green wire between the 14P connector and sensor 3P connector.

If the wires are OK, replace the combination meter.



SPEED SENSOR REPLACEMENT

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

Disconnect the speed sensor 3P (white) connector and release the sensor wire from the clips.

Remove the following:

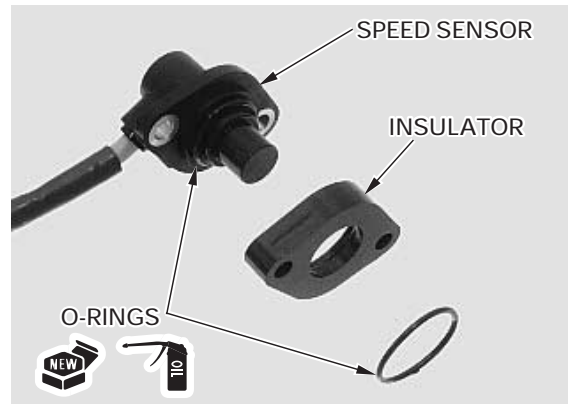
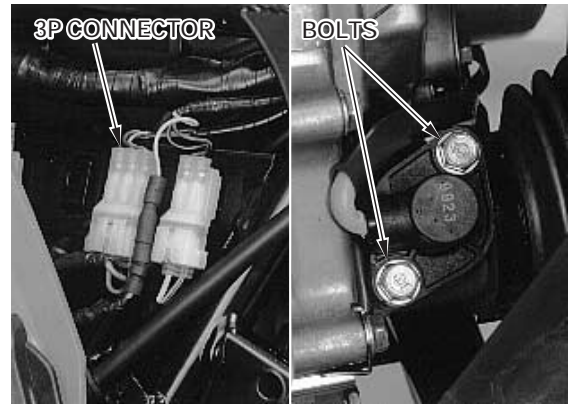
- two bolts
- speed sensor
- sensor insulator
- O-rings

Coat new O-rings with engine oil and install them onto the crankcase cover and a new speed sensor.

Install the speed sensor and insulator and tighten the two bolts.

Route the sensor wire properly and connect the 3P connector (page 1-22).

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



OIL COOLING SYSTEM/ TEMPERATURE INDICATOR

INSPECTION

Check that the neutral indicator or reverse indicator function properly.

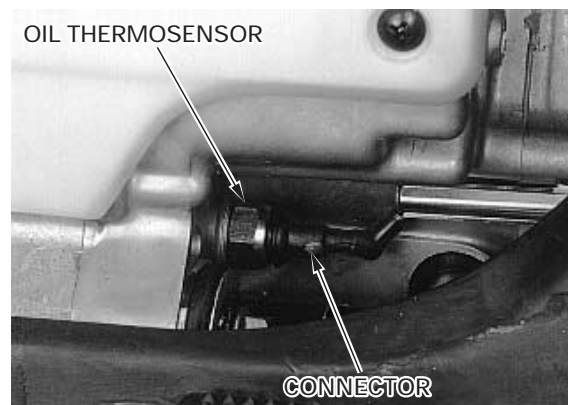
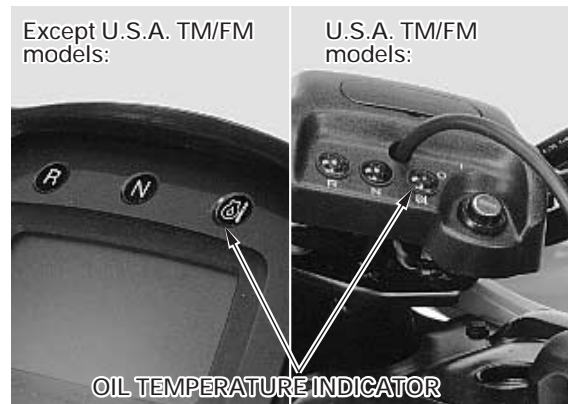
- If they do not function, perform the power/ground line inspection (page 20-9).
- If they function, check the following.

Disconnect the connector from the oil thermosensor and ground it with a jumper wire.

Turn the ignition switch ON and check the cooling fan motor (U.S.A. TM model – optional) and oil temperature indicator.

The motor should start and indicator should come on when the jumper wire is connected, and the motor should not start and indicator should not come on when the jumper wire is disconnected.

- If the system is normal, check the oil thermosensor (page 20-14).
- If there is abnormal, check as follows (next page).



Fan motor does not start, then oil temperature indicator does not come on

Disconnect the ignition control module (ICM) 8P connector. Check for continuity between the 8P connector Light blue terminal and oil thermosensor connector terminal (Blue). There should be continuity.

If there is no continuity, check for open circuit in Light blue and Blue wires between the ICM and thermosensor.

If there is continuity, replace the ICM.

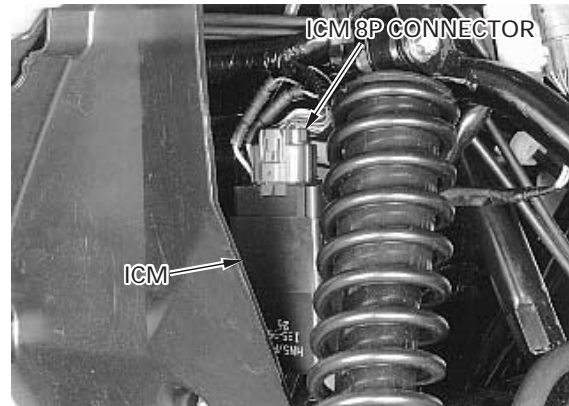
Fan motor does not stop, then oil temperature indicator does not go off

Disconnect the ignition control module (ICM) 8P connector. Check for continuity between the oil thermosensor connector terminal (Blue) and ground.

There should be no continuity.

If there is continuity, check for short circuit in Light blue and Blue wires between the ICM and thermosensor.

If there is no continuity, replace the ICM.



Fan motor does not start

Disconnect the White wire connector (single lead) of the ignition control module (ICM) and ground the harness side White wire terminal with a jumper wire.

Turn the ignition switch ON and check the fan motor.

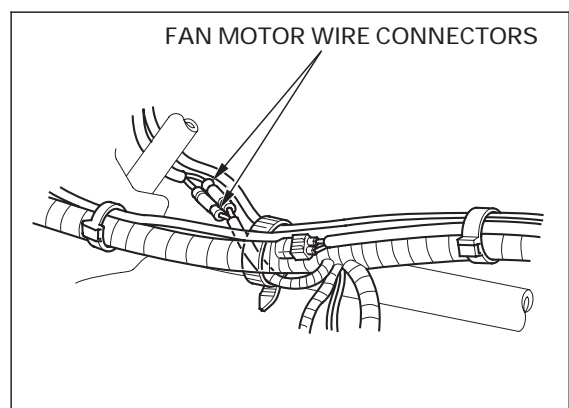
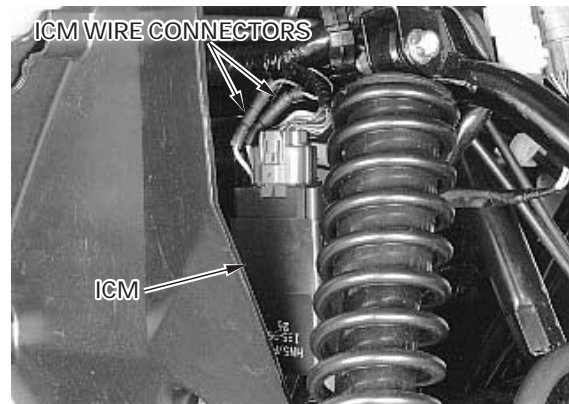
If the motor starts, disconnect the Green wire connector of the ICM and check for open circuit in ICM green wire (ground line). If the wire is OK, replace the ICM.

If the motor does not start, remove the right inner fender (page 2-9) and disconnect the fan motor Blue wire connector. Measure the voltage between the harness side Blue wire terminal (+) and ground (-).

There should be battery voltage with the ignition switch ON.

—If there is no voltage, check for open circuit in Blue wire.

—If there is voltage, disconnect the fan motor Green-White wire connector and check for open circuit in White wire between the fan motor and ICM. If it is OK, replace the fan motor.



Fan motor does not stop

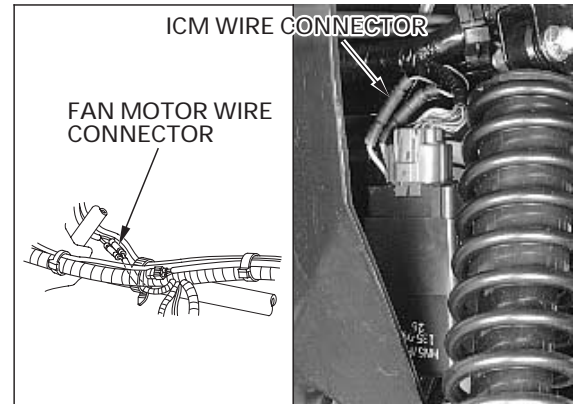
Remove the right inner fender (page 2-9).
Disconnect the fan motor Green-White connector and ignition control module (ICM) White wire connector.

Check for continuity between the White wire terminal and ground.

There should be no continuity.

If there is continuity, check for short circuit in White wire.

If there is no continuity, replace the ICM.



Oil temperature indicator does not come on

Disconnect the ignition control module (ICM) 8P connector and ground the Blue/red wire terminal with a jumper wire.

Turn the ignition switch ON and check the indicator.

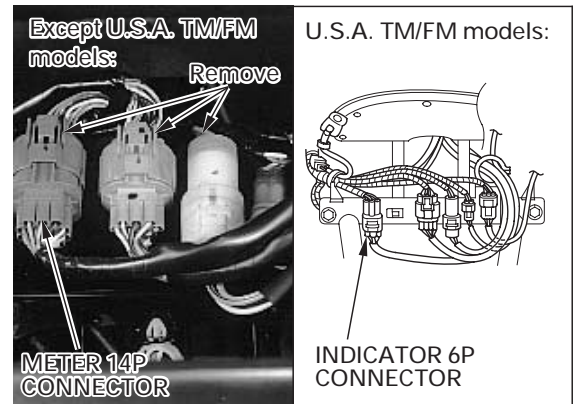
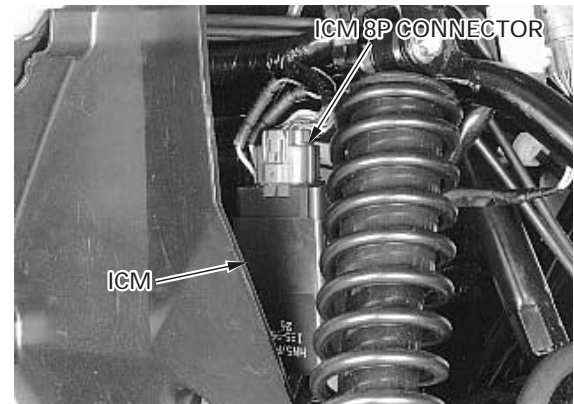
If the indicator comes on, replace the ICM.

Except U.S.A. TM/FM models: If the indicator does not come on, remove the connectors from the frame in order as follows and disconnect the meter 14P connector.

- ignition switch (4P white)
- handlebar switch (10P green)
- meter (14P gray)

Check for open circuit in Blue/red wire between the meter and ICM. If it is OK, replace the combination meter.

U.S.A. TM/FM models: If the indicator does not come on, disconnect the indicator 6P connector and check for open circuit in Blue/red wire between the indicator and ICM.



Oil temperature indicator does not go off

Disconnect the meter 14P connector or indicator 6P connector (see above).

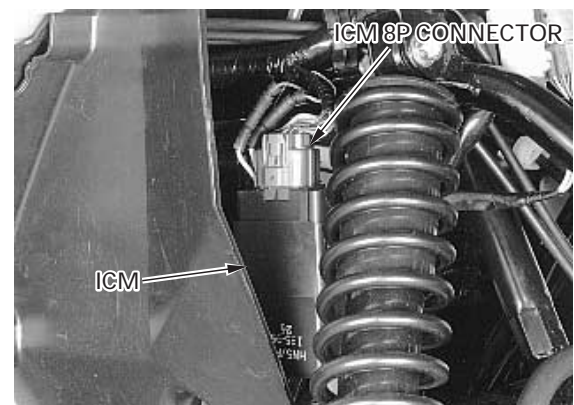
Disconnect the ignition control module (ICM) 8P connector.

Check for continuity between the Blue/red wire terminal and ground.

There should be no continuity.

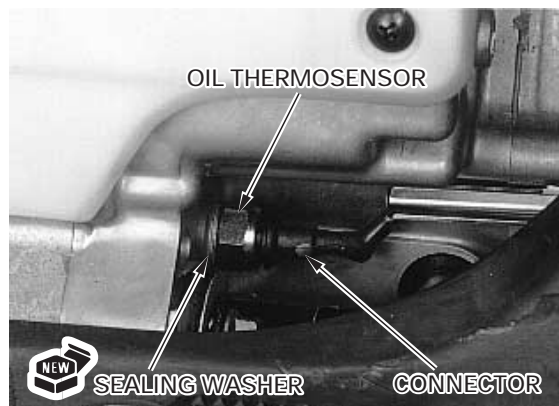
If there is continuity, check for short circuit in Blue/red wire.

If there is no continuity, replace the ICM.



OIL THERMOSENSOR INSPECTION

Disconnect the connector and remove the thermosensor.

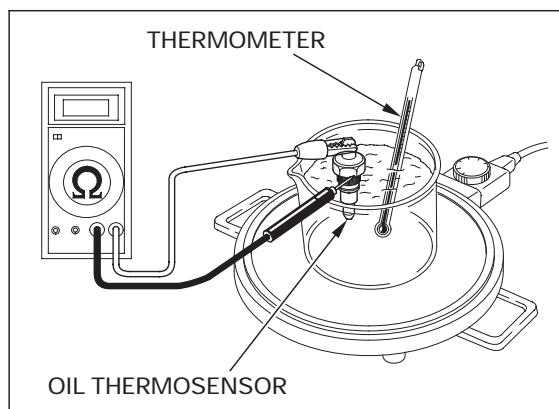


Suspend the thermosensor in a pan of engine oil on an electric heating element and measure the resistance through the sensor as the oil heats up.

NOTE:

- Soak the thermosensor in oil up to its threads with at least 40 mm (1.57 in) from the bottom of the pan to the bottom of the sensor.
- Keep the temperature constant for 3 minutes before testing. A sudden change of temperature will result in incorrect readings. Do not let the thermometer and thermosensor touch the pan.

Temperature	150°C (302°F)	170°C (338°F)
Resistance	306—340 Ω	209—231 Ω



Replace the oil thermosensor if it is out of specifications by more than 10% at any temperature listed.

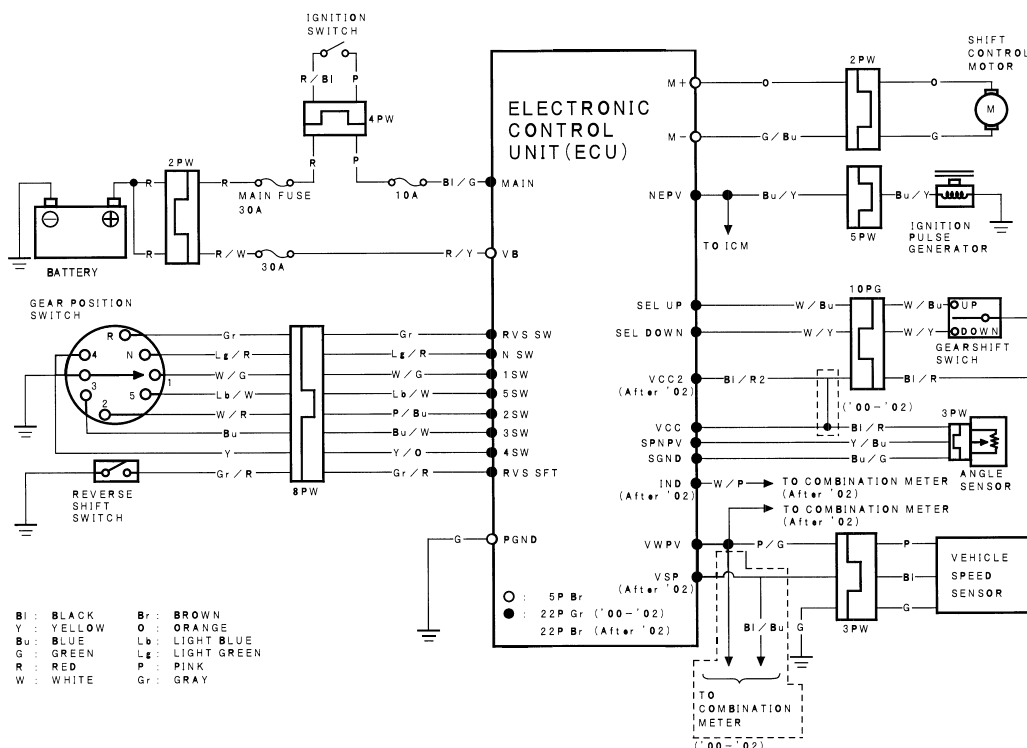
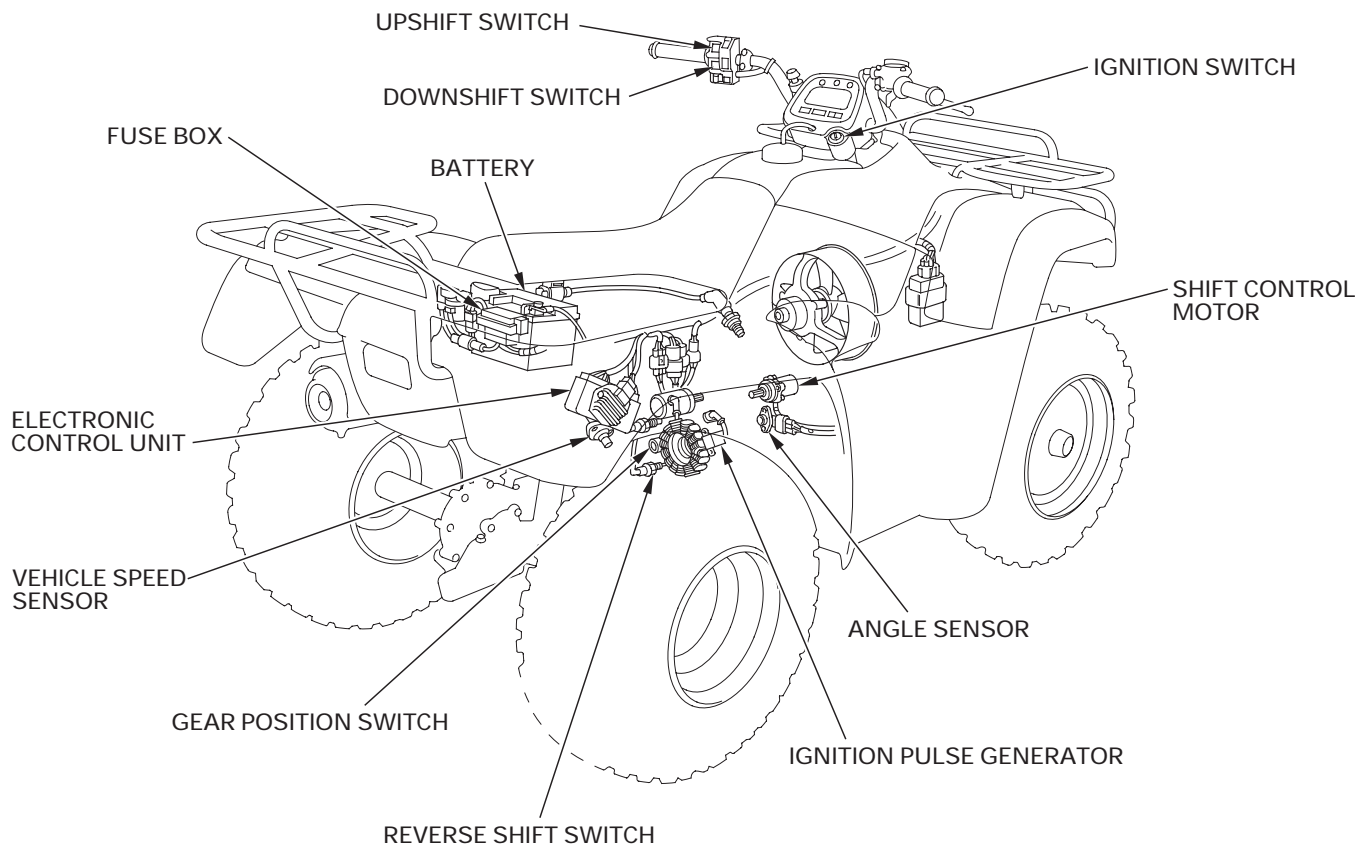
Install the oil thermosensor with a new sealing washer and tighten it.

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

Connect the thermosensor connector.

MEMO

ELECTRIC SHIFT PROGRAM (ESP: TE/FE model)



21. ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

SERVICE INFORMATION	21-1	CONTROL MOTOR AND REDUCTION GEARS	21-22
TROUBLESHOOTING ('00 – '02)	21-2	GEARSHIFT SWITCH	21-24
(After '02)	21-8	REVERSE SHIFT SWITCH	21-25
ANGLE SENSOR	21-20		

SERVICE INFORMATION

GENERAL

- When checking the Electric Shift Program (ESP) system, always follow the steps in the troubleshooting flow chart (page 21-3).
- The ESP parts can be serviced with the engine installed in the frame.
- The ECU may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the ECU. Always turn off the ignition switch before disconnecting or connecting the connectors.
- Use a digital tester for ESP system inspection.
- For vehicle speed sensor and gear position switch inspection, see section 20.

TORQUE VALUES

Angle sensor bolt	6 N·m (0.6 kgf·m , 4.3 lbf·ft)	Apply locking agent to the threads
Reverse shift switch	13 N·m (1.3 kgf·m , 9 lbf·ft)	

TROUBLESHOOTING ('00 — '02)

TROUBLESHOOTING FEATURE

When the ECU detects a system abnormality, it has a built-in self-diagnostic function that stops the Electronic Shift (ES) activity or resets the system entirely (just as when the ignition switch is turned from "OFF" to "ON"). The ECU does not have the capability to inform the operator of the cause of the abnormality, except that the ES function stops immediately when the ECU detects a failure condition.

When the ECU is in "failure" mode, the shift function is immediately deactivated and will remain so until the ignition switch is turned to "OFF". When the ignition switch is turned back to "ON", the ECU will be reactivated unless it immediately detects another fail condition. If the ECU does not immediately detect a fail condition, the operator can then document the conditions that lead to another "failure" mode.

BEFORE TROUBLESHOOTING

When the operator detects the abnormality, check the following before proceeding with the diagnosis:

- Make sure the battery is fully charged and in good condition.
- Make sure the clutch is adjusted properly.
- Ask the operator about the following.
 1. How often did the abnormality occur.
 2. Vehicle speed, road situation (level, climbing and etc.), engine revolution
 3. Mileage
 4. Clutch maintenance history

NOTE:

- The gear position indicator can indicate "—" when the engine is stopped.
When the engine is running, the indicator may indicate "—" under very limited conditions. This is just a temporary symptom and occurs when shifting the transmission while the engine speed is high. When this occurs, throttle-back to decrease engine speed and then shift the transmission. The proper gear position will then appear on the display (it will replace the "—"). Be aware that this is not a problem, and in fact seldom occurs.

Procedure for "Fail" recurrence

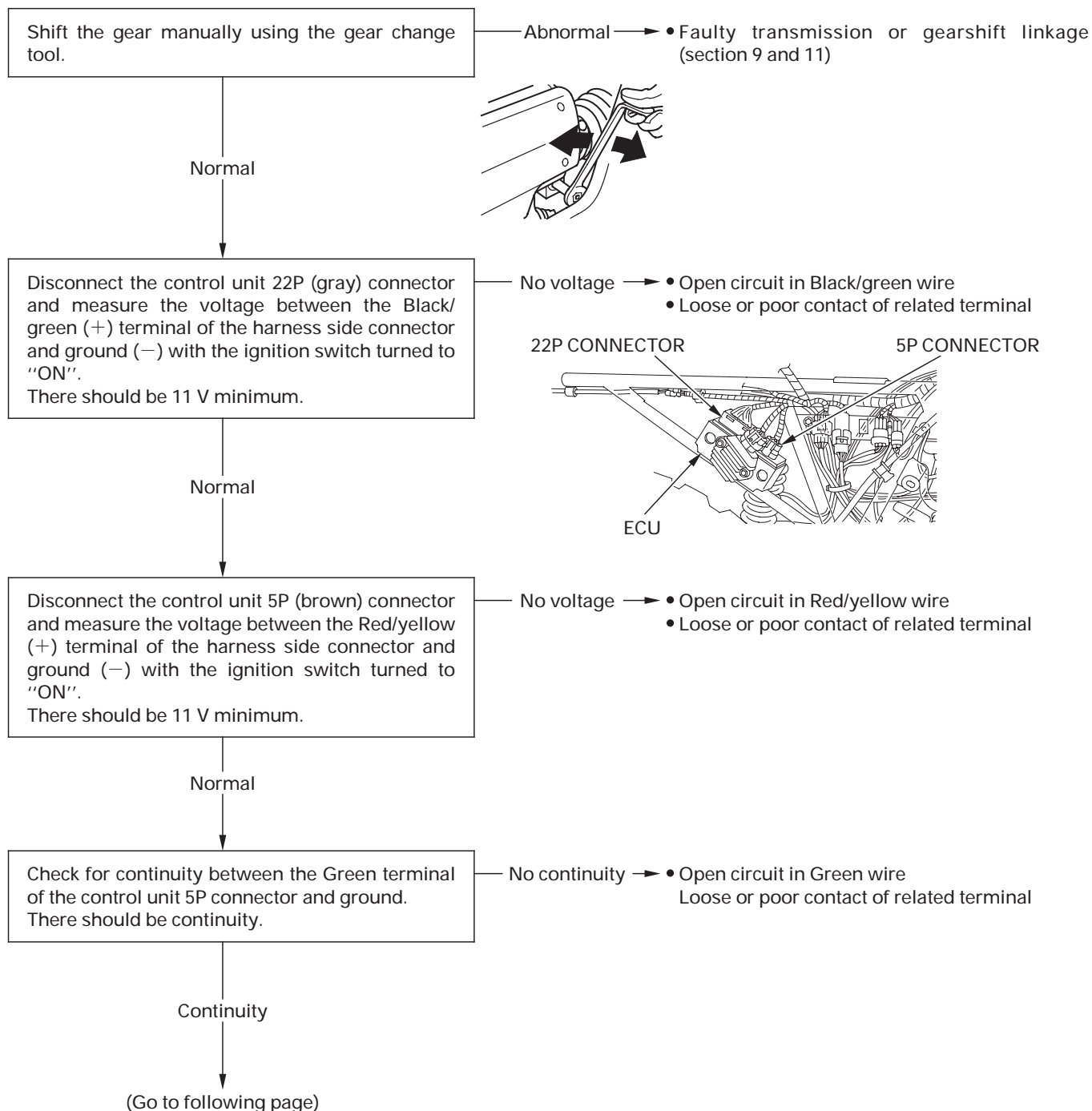
Attempt to recreate the "Fail" situation from information from the operator and record the vehicle speed, engine revolution and shift position. Proceed with the diagnosis from this information.

FLOWCHARTS

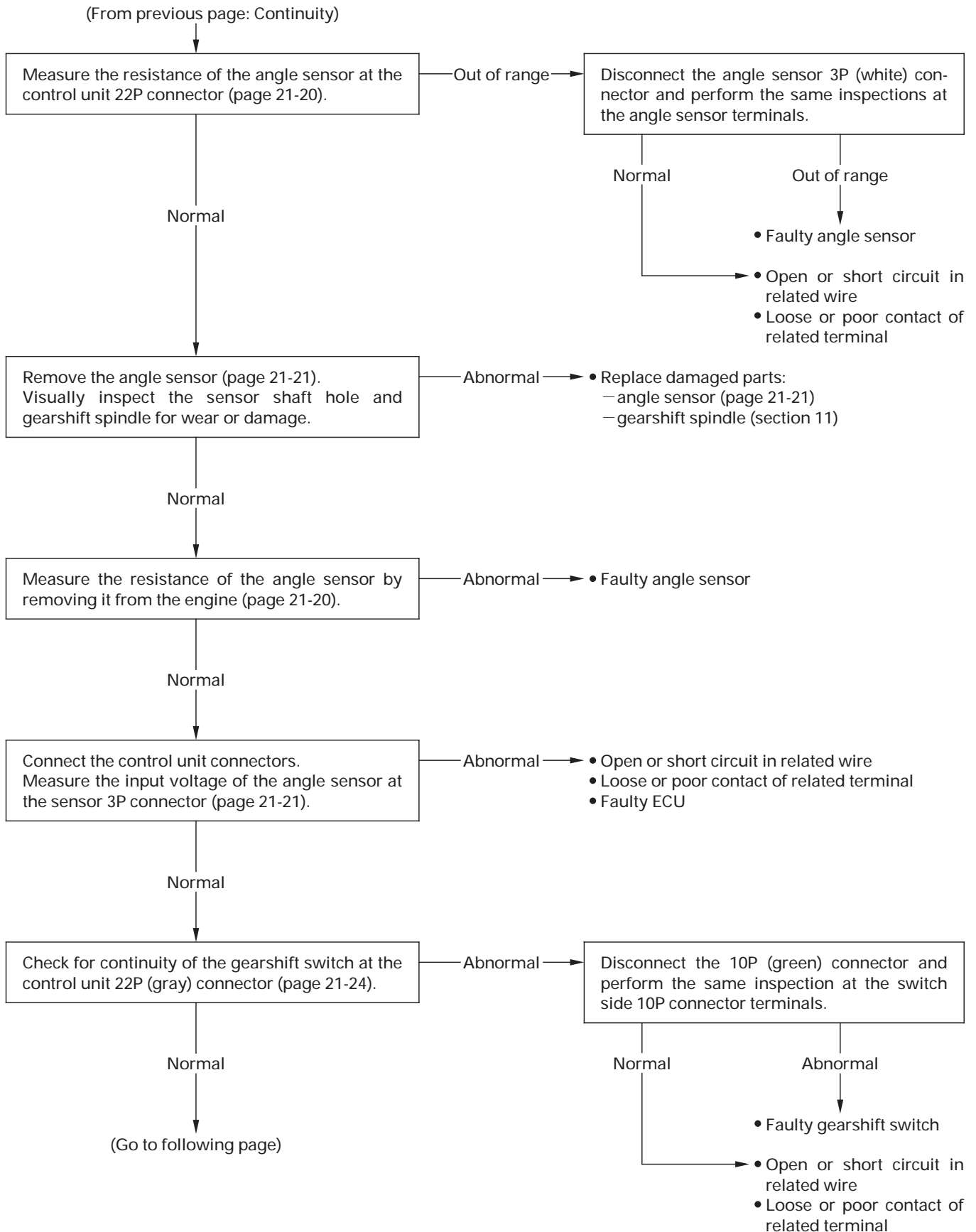
NOTE:

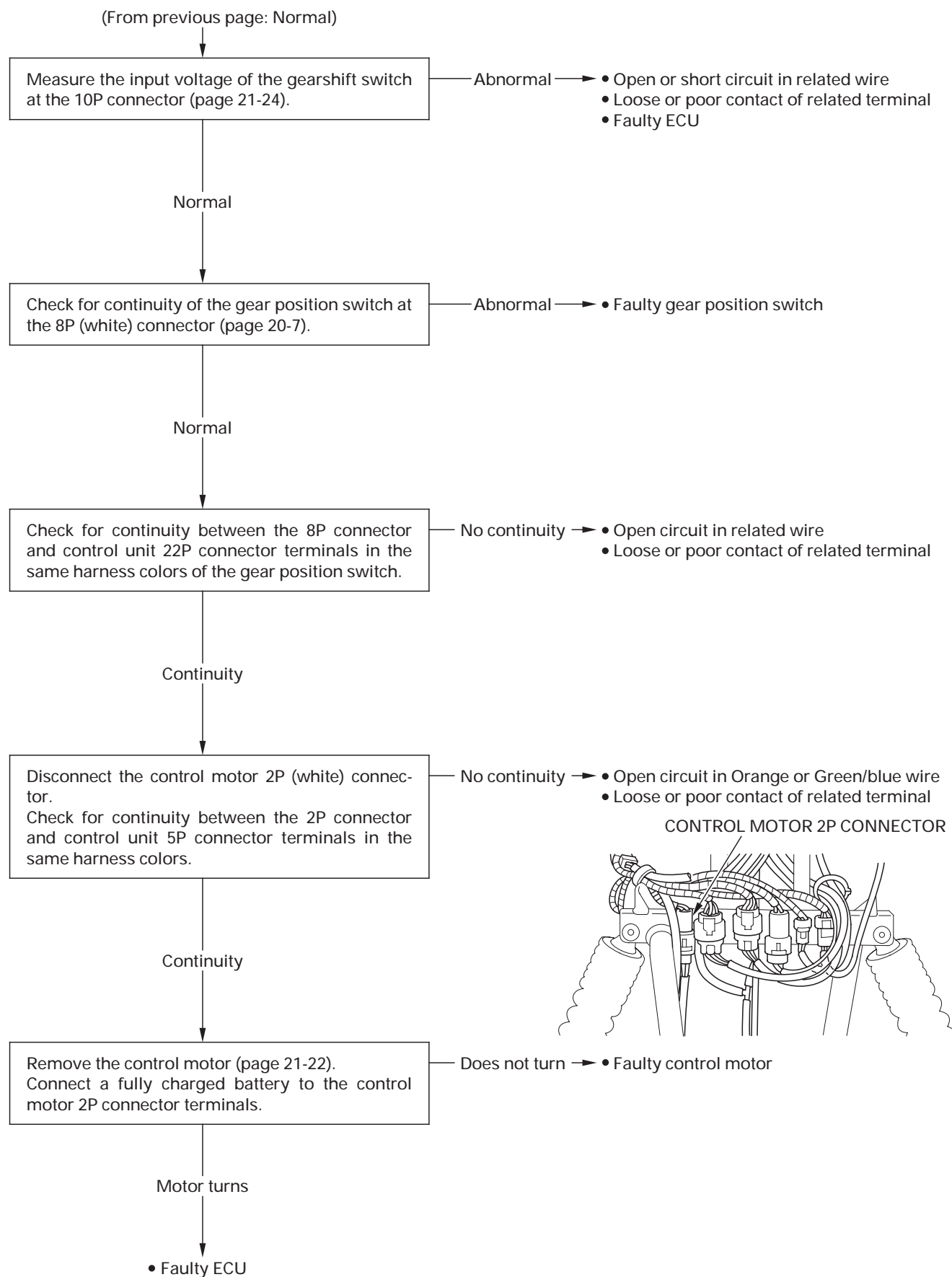
- Turn the ignition switch to "OFF" unless otherwise specified.
- Inspect the following before diagnosing the system
 - Make sure the battery is fully charged and in good condition
 - Make sure the clutch is adjusted properly.
 - Check for a blown fuse
- When the ECU is found to be faulty, recheck the connectors before replacing it.

Electric shift does not operate



ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

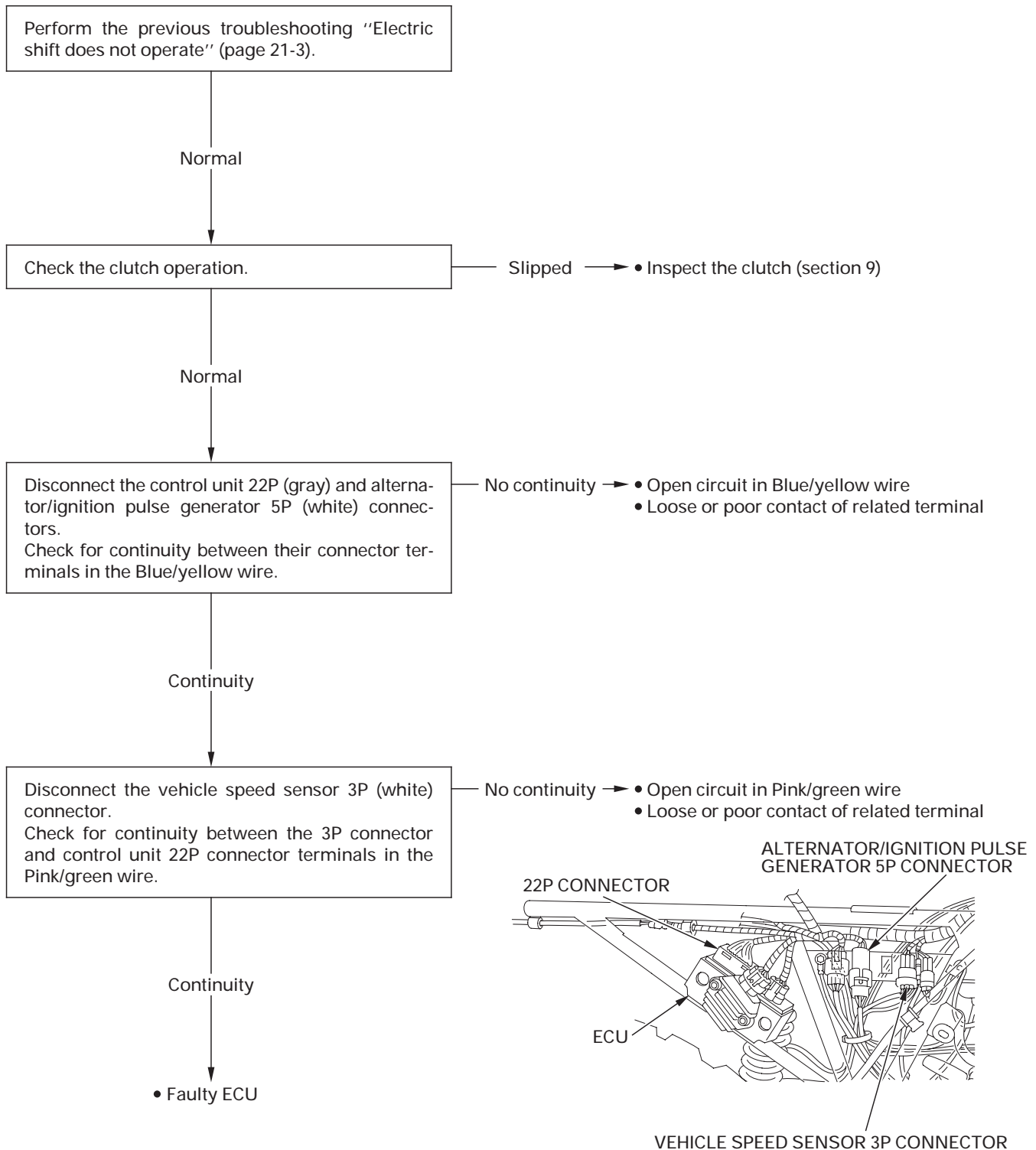




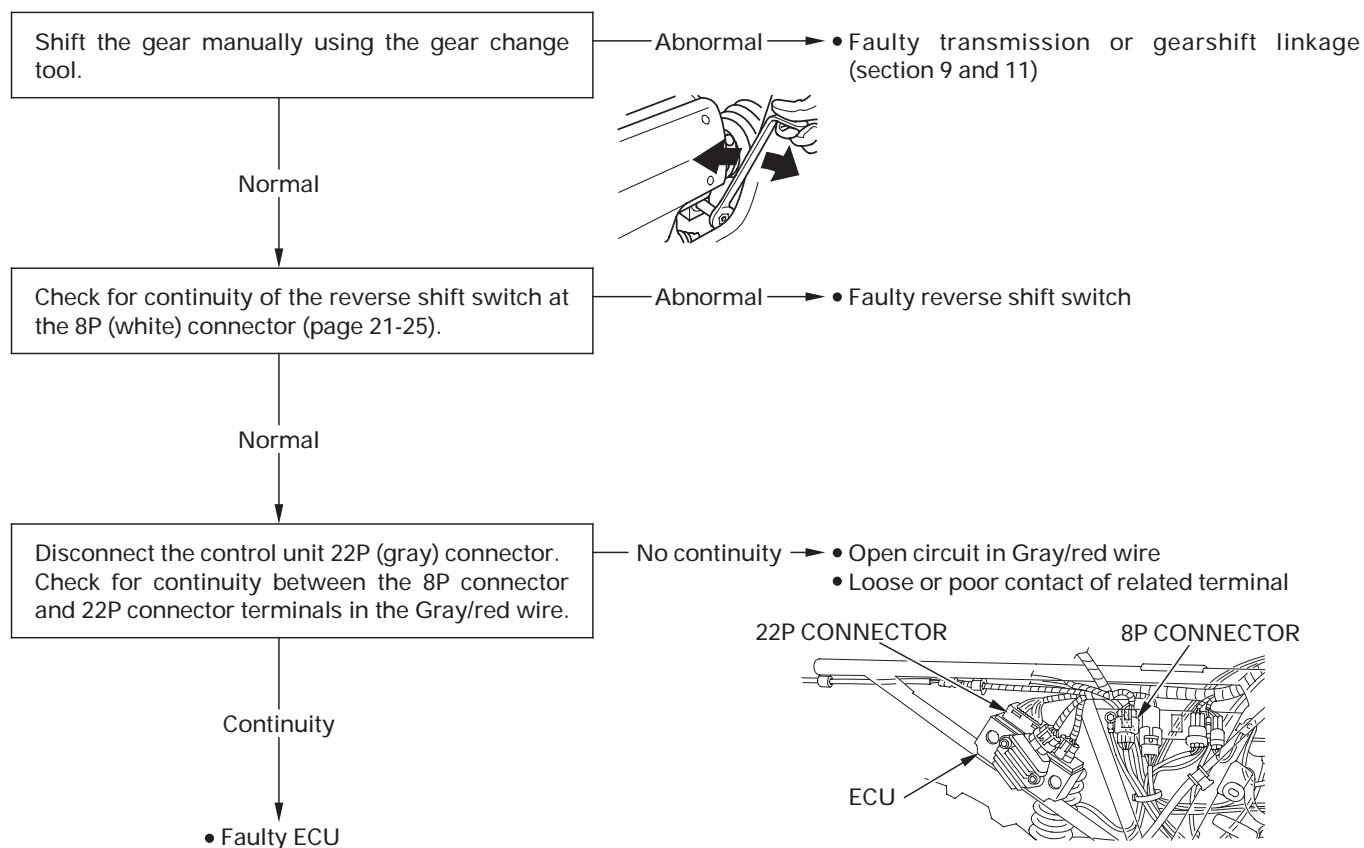
ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

Electric shift malfunction during vehicle operation

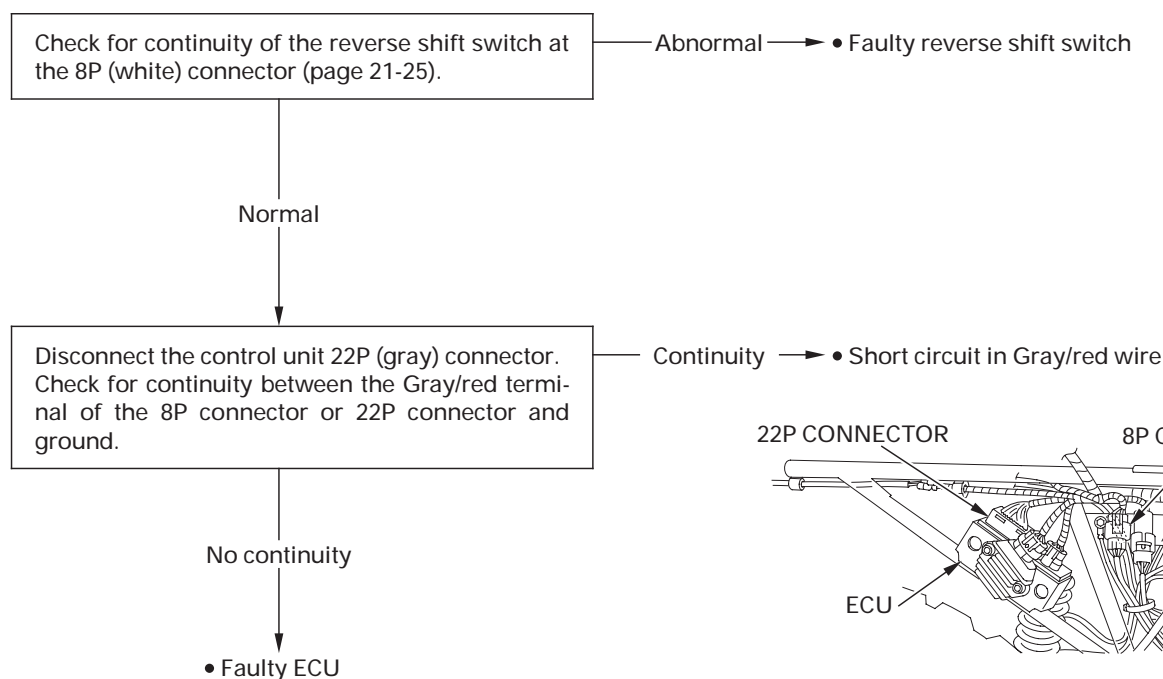
- Check that the speedometer functions properly and the engine operates normally before troubleshooting.
If the speedometer does not function properly, perform the meter and vehicle speed sensor inspection (see section 20).



Electric shift does not operate when engaging the reverse gear



Control motor turns when the shift switch is pushed down from the neutral position with the reverse selector not engaged



TROUBLESHOOTING (After '02)

BEFORE TROUBLESHOOTING

When the Electric Control Unit (ECU) detects a system abnormality, it has a built-in self-diagnostic function that stops the Electric Shift (ES) system or resets the systems entirely (just as when the ignition switch is turned from "OFF" to "ON"). If the ECU detects an ES system failure, the ECU stops the ES system function and records a problem code. The ES system will not operate, even after the ignition switch is turned to "OFF".

To reset the ES system, turn the ignition switch from "ON" to "OFF" and back to "ON" again. However, if the ECU still detects a problem, it will continue to deactivate the ES system function. When this occurs, the gear position indicator will blink a certain number of times to indicate the appropriate problem code.

The ECU is able to record system failures and outputs these as problem codes that are shown on the indicator (i. e., the "N" blinks a designated number of times).

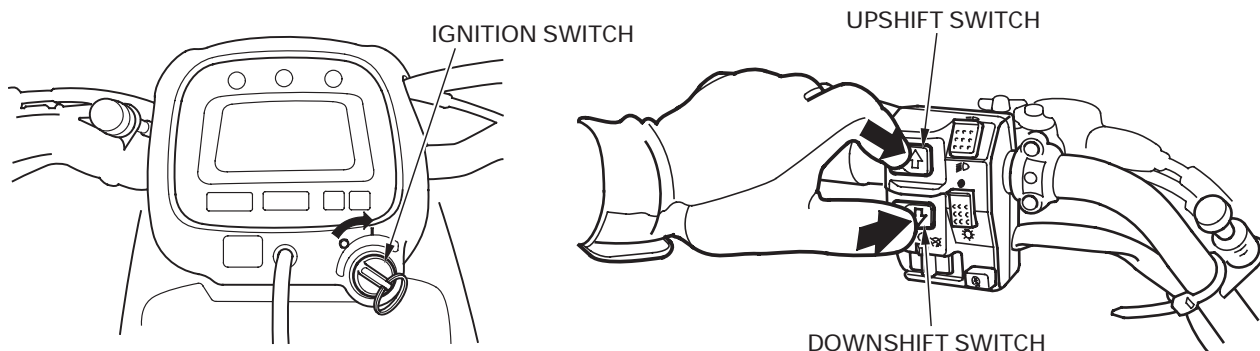
TROUBLESHOOTING PROCEDURE

When the operator detects an abnormality, check the following before proceeding with the diagnosis:

1. Check the battery voltage (minimum spec. 12.4 V) and any blown fuses.
2. Turn the ignition switch to "ON". If the gear indicator blinks, record the number of blinks, since this indicates the type of failure. Then troubleshoot the indicated failure. Refer to the appropriate problem code within this chapter.

If no ES system failure occurs (the indicator does not blink), perform the following:

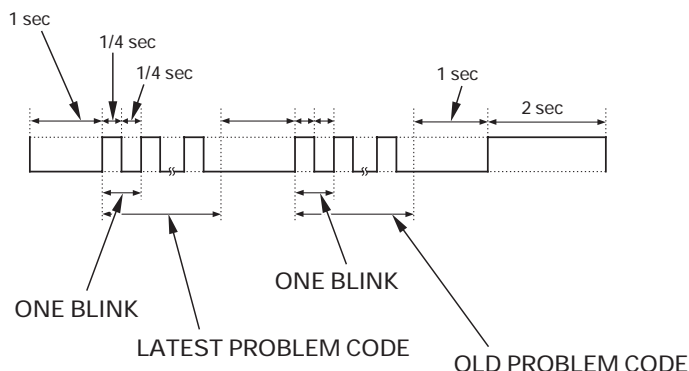
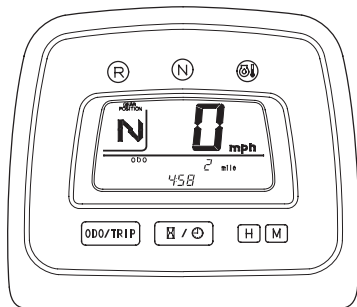
1. Make sure the gear position indicator blinked codes to the user. Check the problem code as described below.
 - a) Turn the ignition switch to "OFF"
 - b) Place the transmission in neutral.
 - c) Apply the parking brake so the vehicle does not move.
 - d) Push both Upshift switch and Downshift switch to "ON".



- e) While pushing both switches, turn the ignition switch to "ON".

Before the letter "N" appears on the gear position indicator (in about 2 seconds), release both the shift switches, then push them again for more than 3 seconds.

If the switches are not released and pushed within 2 seconds, the code number will not appear.



2. If the code number could not be checked (the indicator did not blink), repeat steps 2 and 4.
3. If a failure is still not indicated (i. e., the "N" does not blink), the problem is as follows:
 - a) Electric shift does not operate (page 21-10) and/or
 - b) Faulty gear indicator (e. g., does not indicate the problem, keeps indicating the same gear position, indicates a different gear position than what the transmission is in)
4. After performing the above troubleshooting steps and repairing the problem, delete the codes as follows:
 - a) Turn the ignition switch to "OFF".
 - b) Place the transmission in neutral.
 - c) Apply the parking brake so the vehicle does not move.
 - d) Push both the Upshift and Downshift switches to "ON".
 - e) While pushing them, turn the ignition switch to "ON".
 Before the letter "N" appears on the shift position indicator (in about 2 seconds), release both the shift switches, then push them again more than 3 seconds.
 If the switches are not released and pushed within 2 seconds, the code number will not appear.
 - f) While the indicator is showing the problem code (i. e., blinking with the transmission in neutral), push both electric shift switches to delete the problem code number.
 - g) Turn the ignition switch to "OFF".

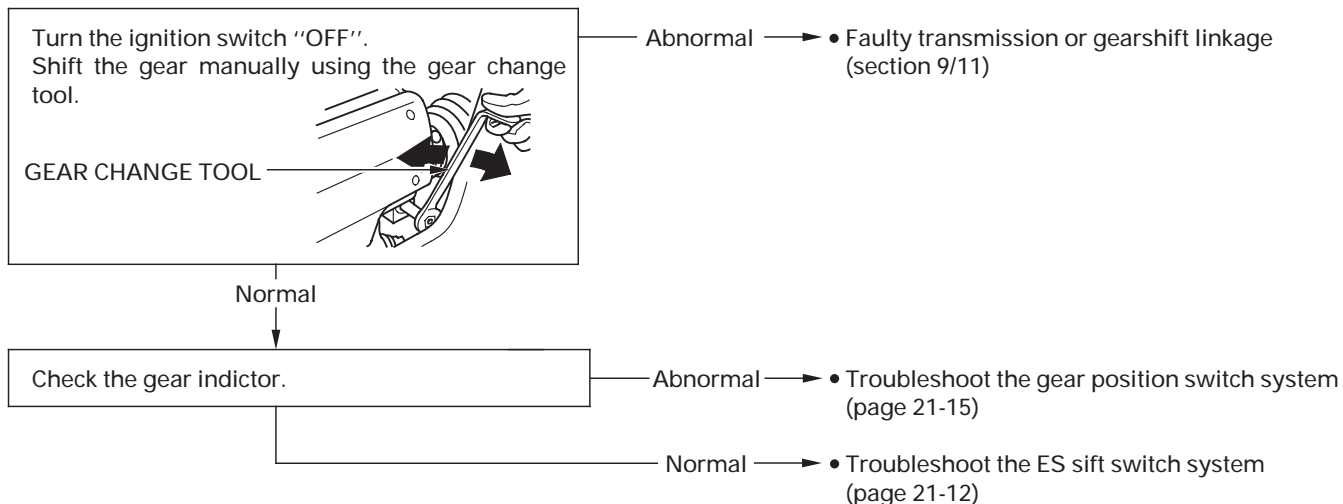
Diagnosis table

Gear indicator blinks	Check part and system	Probable faulty part	Refer to page
0	No problem	No problem	—
1	ECU (writing and recording circuit)	ECU	21-12
2	ES shift switch system (up and down)	Shift switch or related wire harness or ECU	21-12
3	Angle sensor system	Angle sensor (abnormally installed) or related wire harness or ECU	21-13
4	Gear position switch system	Gear position switch or related wire harness or ECU	21-15
5	ECU motor driver circuit	ECU	21-16
6	ECU fail-safe relay circuit	ECU	21-17
7	ECU voltage convert circuit	ECU	21-17
8	Angle sensor system	Angle sensor or control motor or related wire harness or ECU	21-13
9	Angle sensor system	Angle sensor (short or open) or related wire harness or ECU	21-13
10	Ignition pulse generator system	Ignition pulse generator or related wire harness	21-18
11	Vehicle speed sensor system (vehicle speed)	Vehicle speed sensor or related wire harness or ECU	21-19
12	Gear position switch system	Gear position switch or related wire harness or ECU	21-15

ELECTRIC SHIFT PROGRAM (ESP)

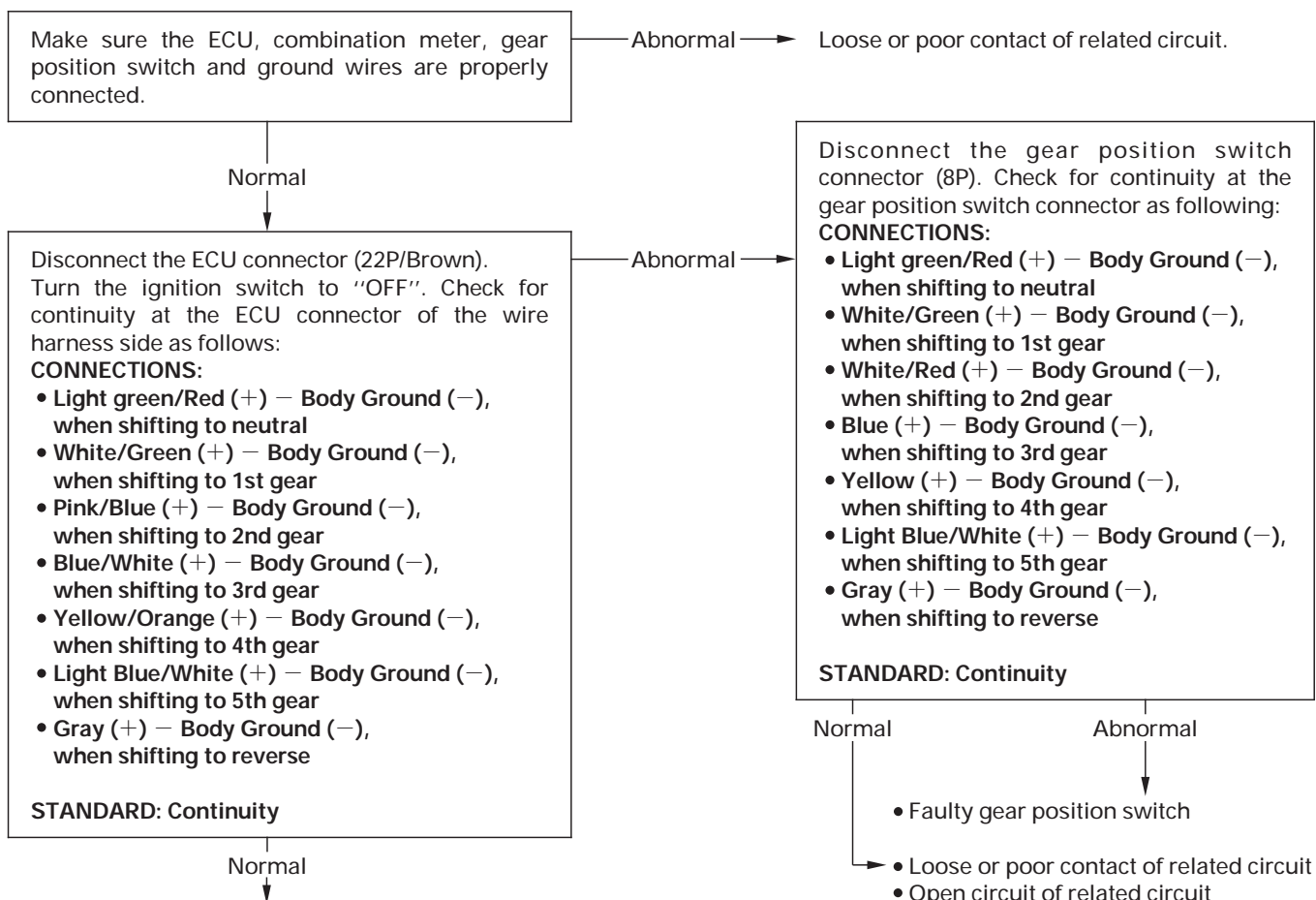
ELECTRIC SHIFT DOES NOT OPERATE

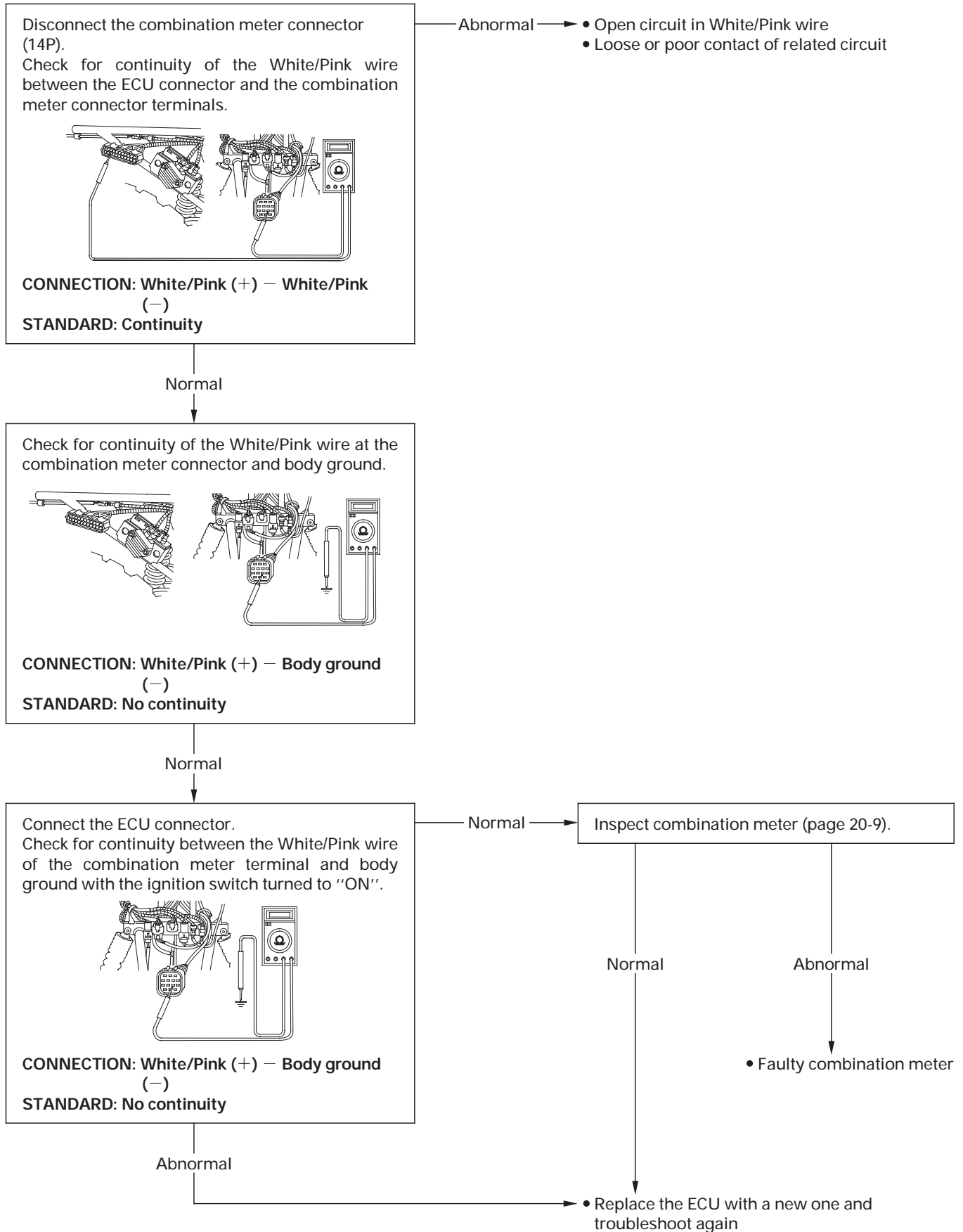
- Inspect the following before diagnosing the system.
 - Make sure the battery is fully charged and in good condition.
 - Make sure the clutch is adjusted properly.
 - Blown main (30 A), motor (30 A) or sub fuse, ignition (10 A)



GEAR INDICATOR PROBLEM

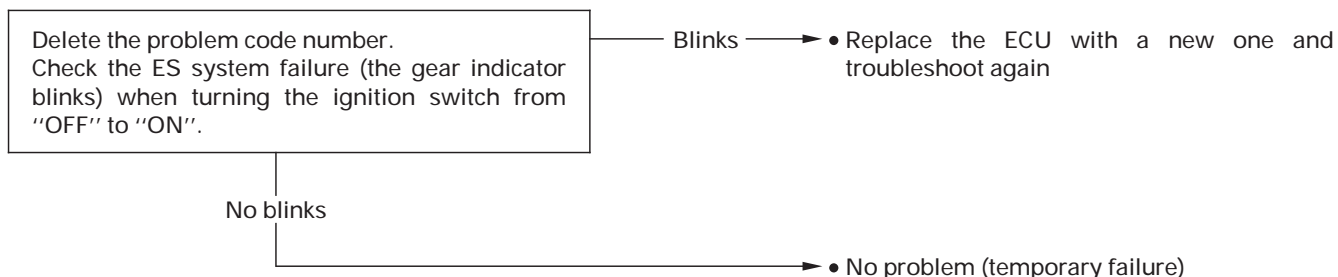
- No indication of gear position
- Keeps indicating same gear position
- Different gear is indicated



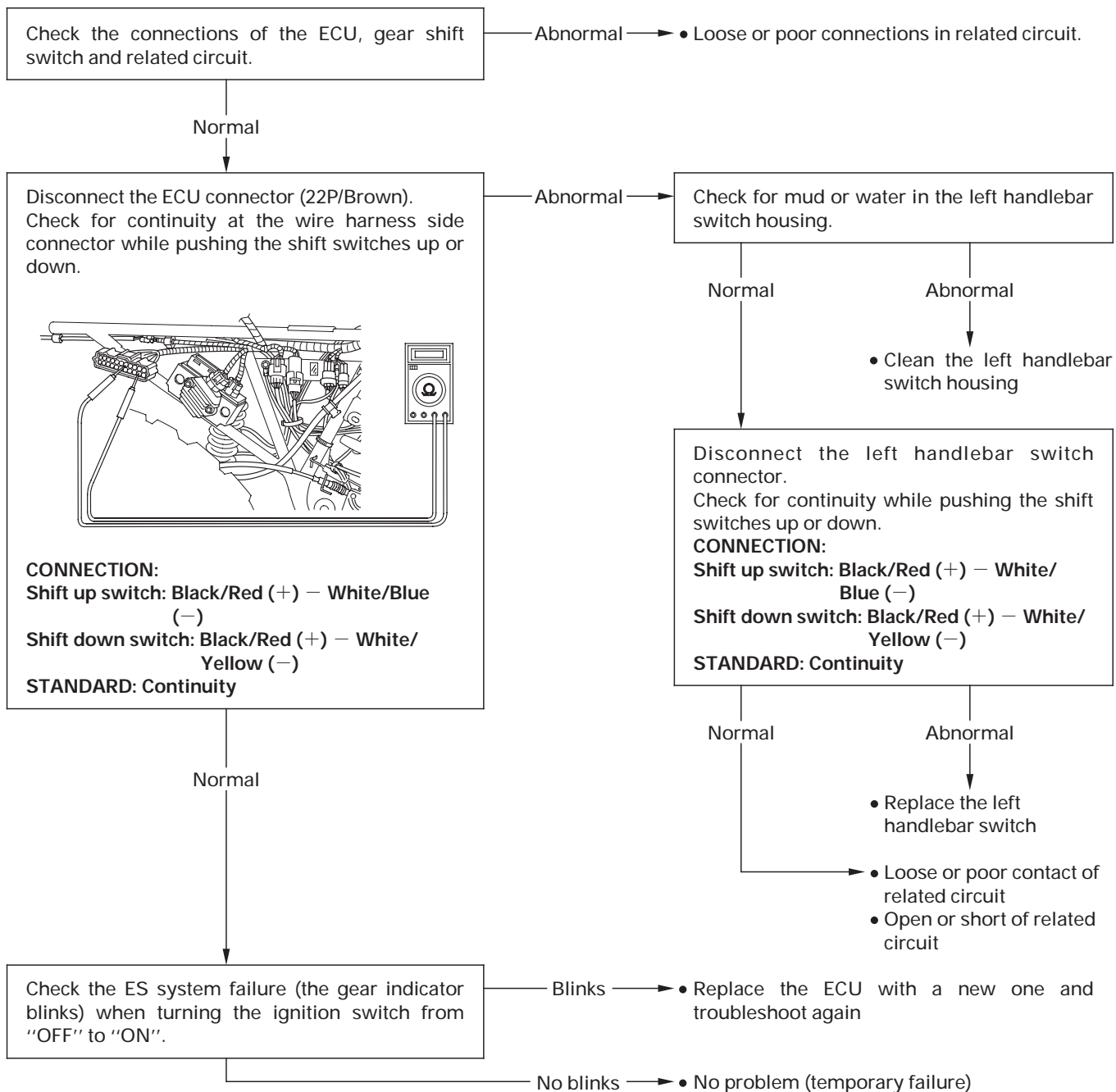


ELECTRIC SHIFT PROGRAM (ESP)

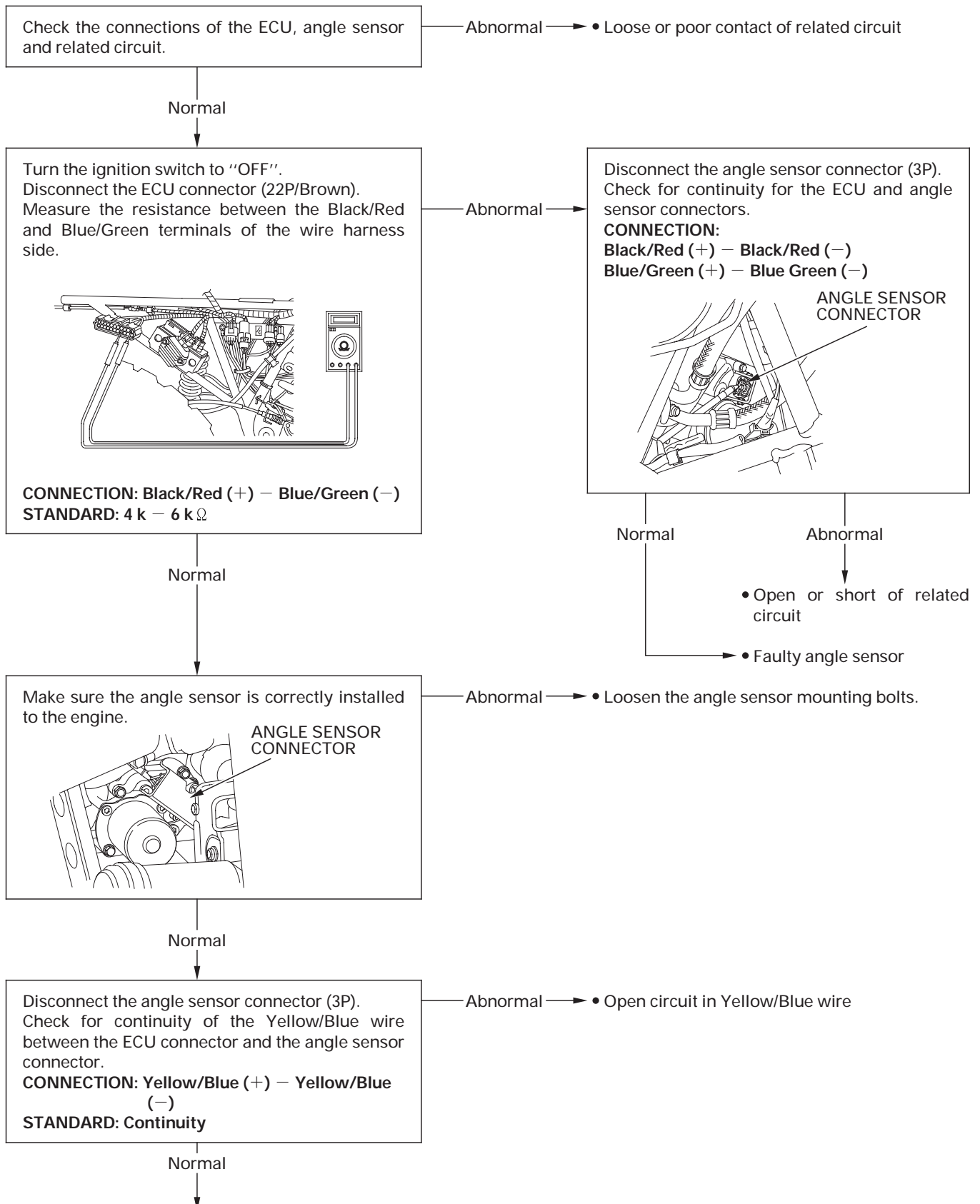
Problem Code 1: ECU (writing and recording circuit)



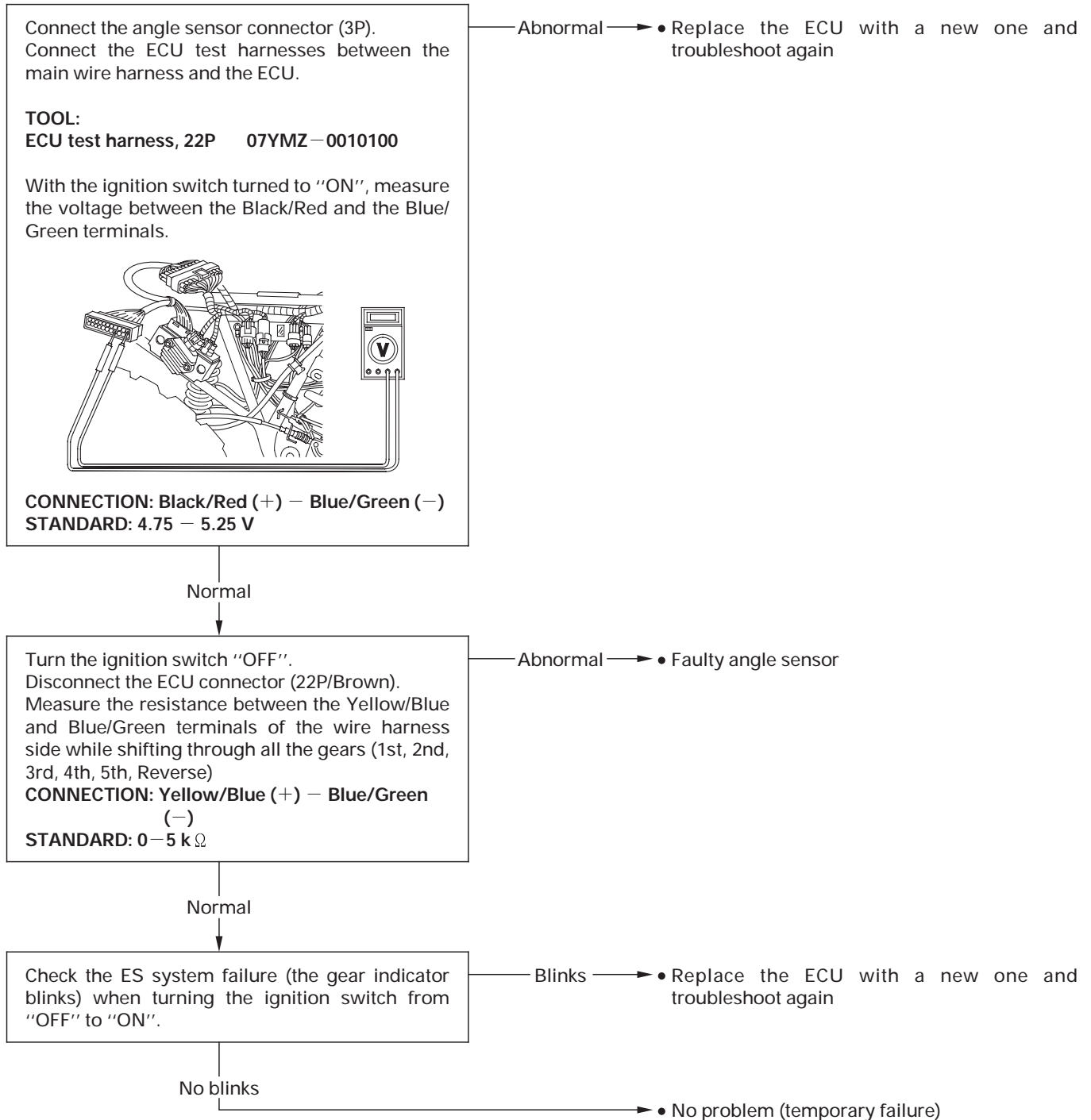
Problem Code 2: ES Shift Switch System (Up And Down)



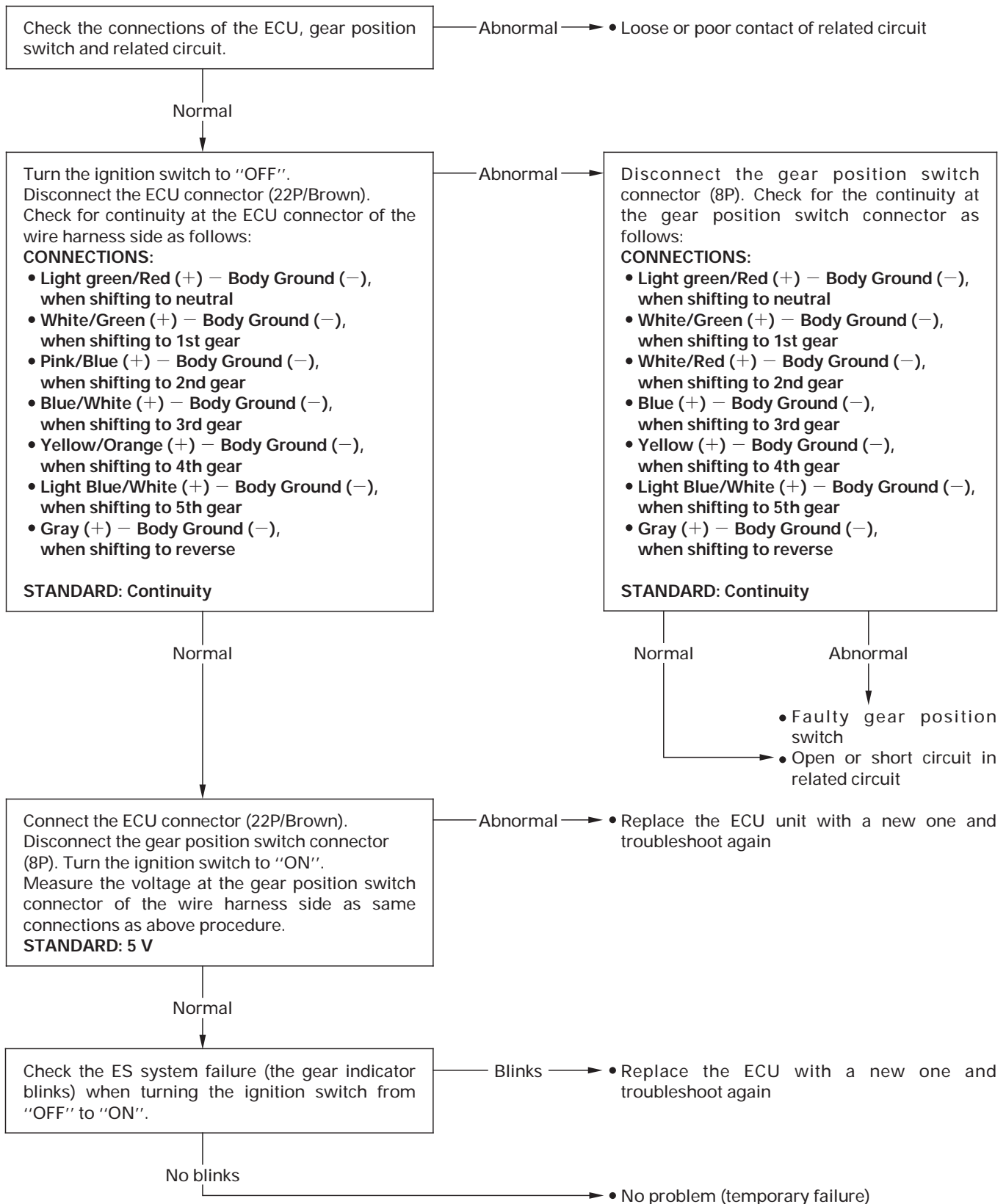
Problem Code 3, 8, 9: Angle Sensor System



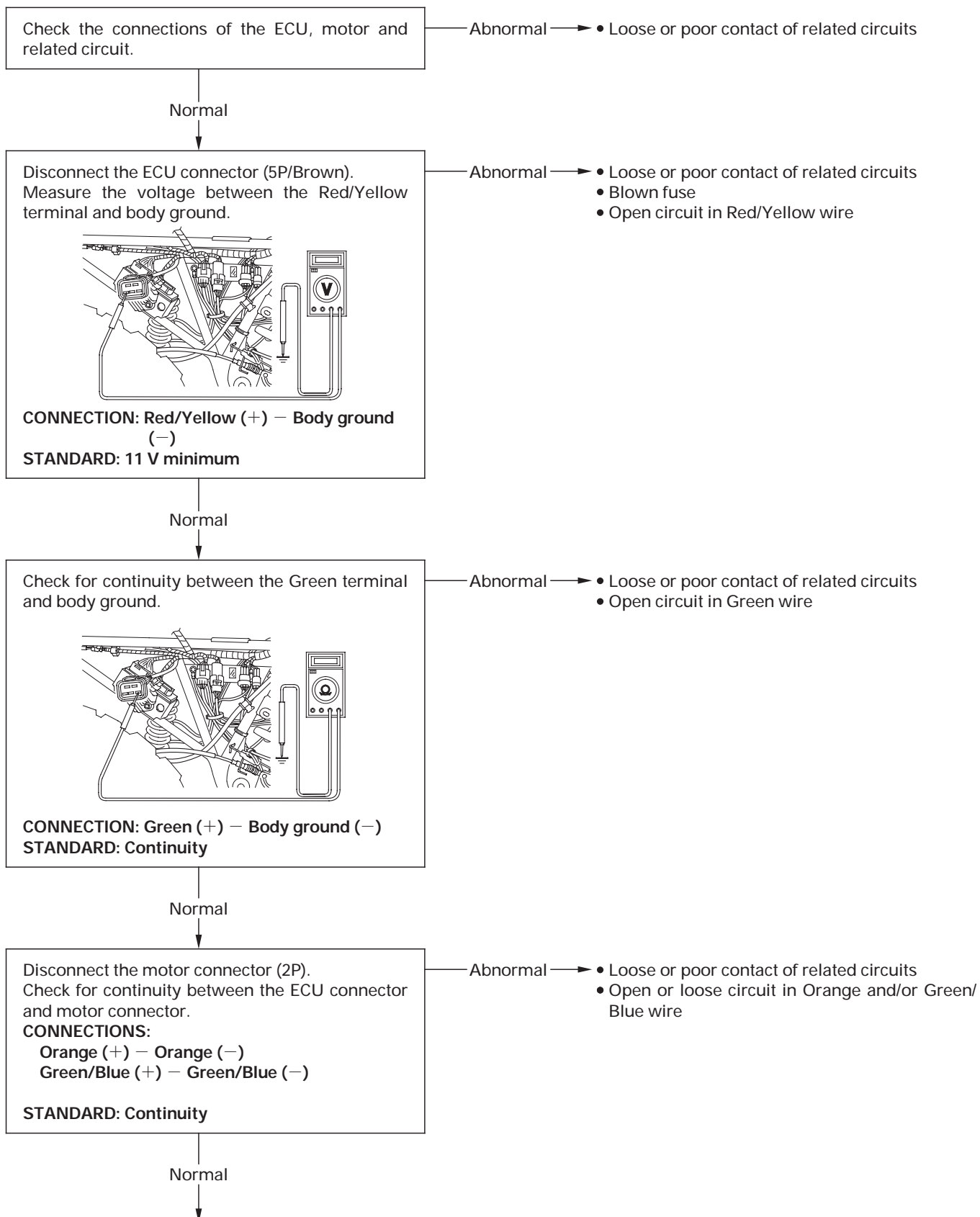
ELECTRIC SHIFT PROGRAM (ESP)

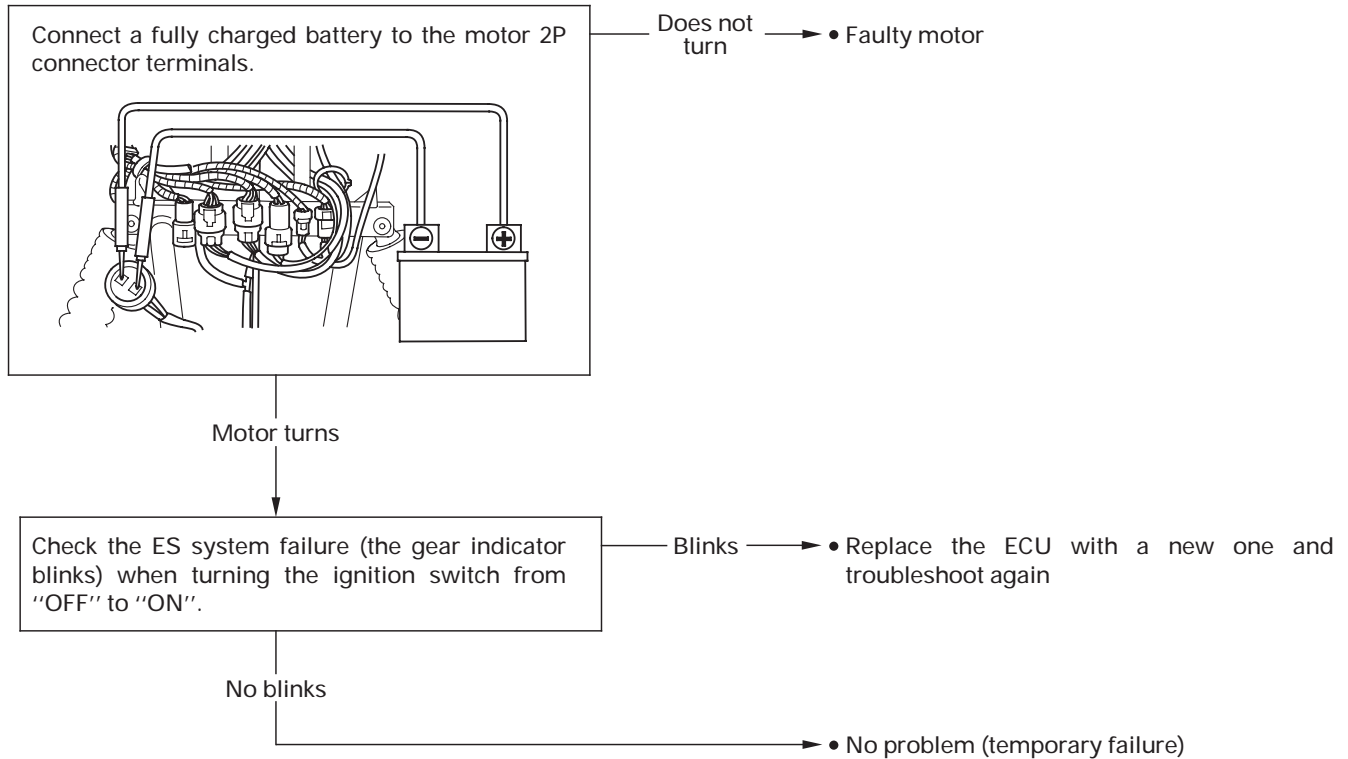


Problem Codes 4 or 12: Gear Position Switch System

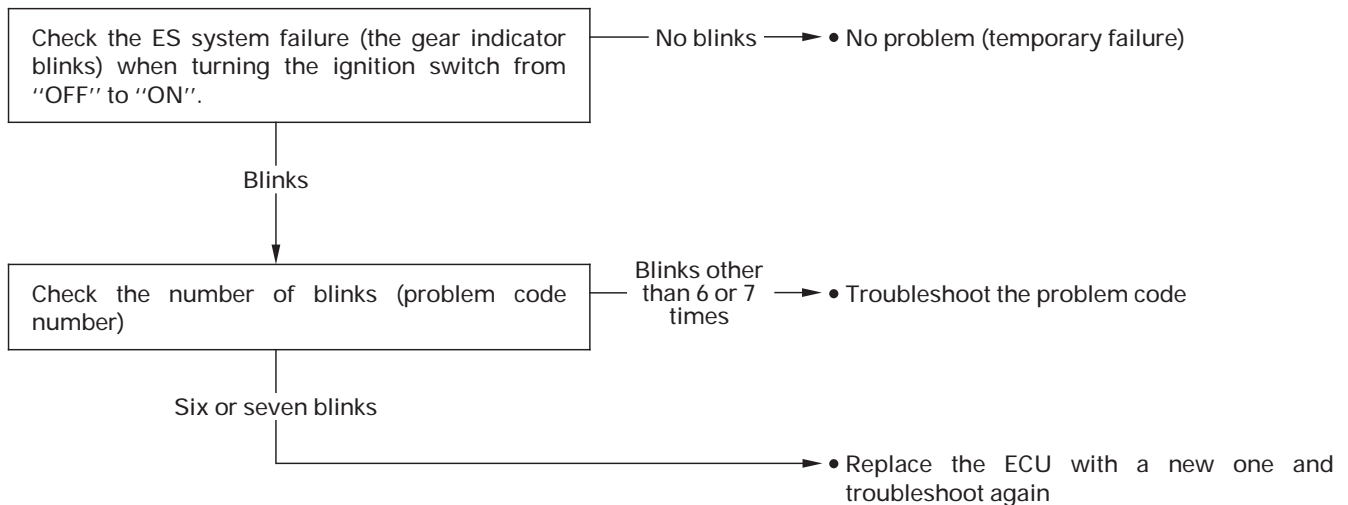


Problem Code 5: ECU Motor Driver Circuit

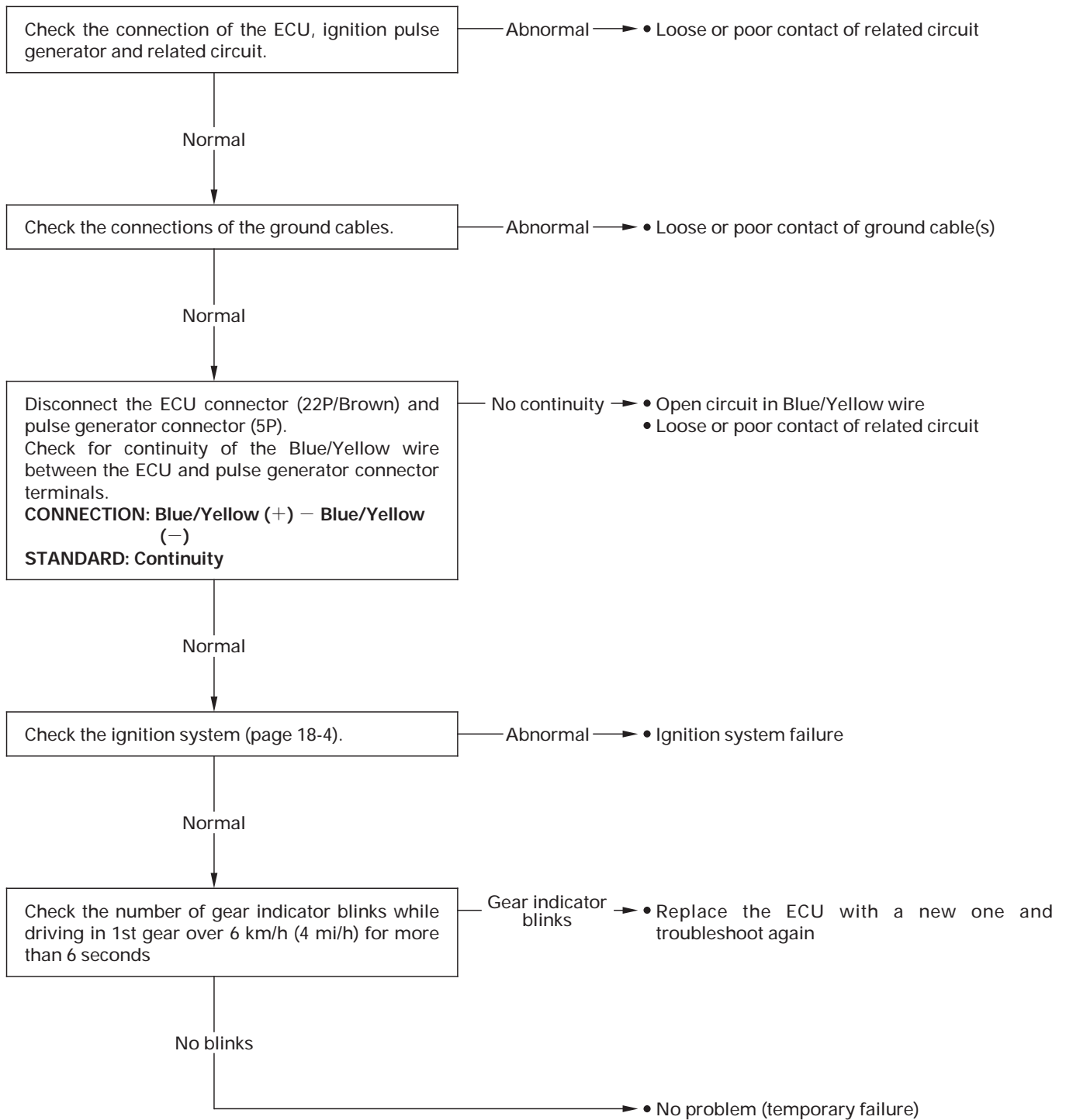




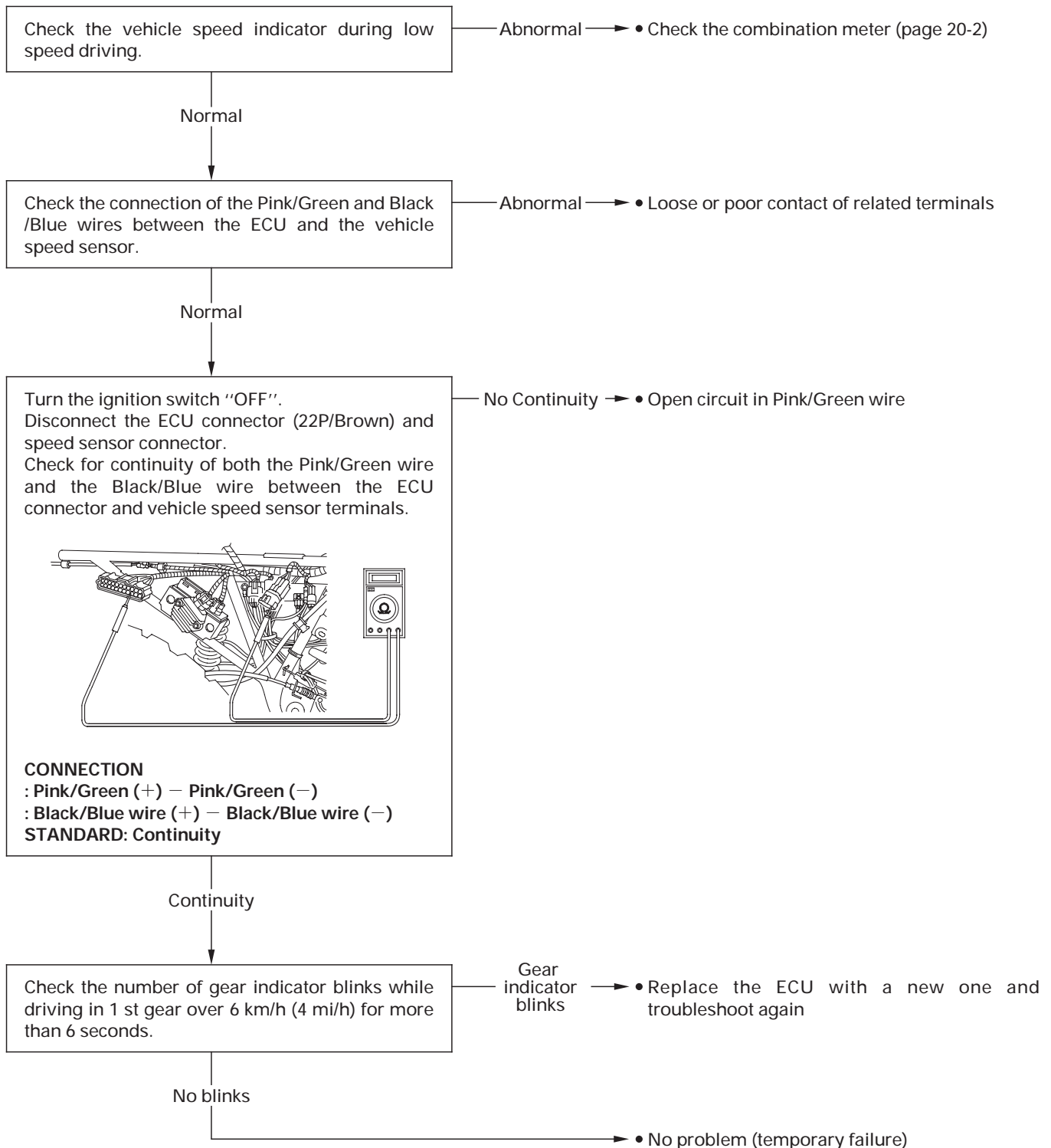
Problem Code 6: ECU Fail-Safe Circuit or Problem Code 7: ECU Voltage Convert Circuit



Problem Code 10: Ignition Pulse Generator System



Problem Code 11: Vehicle Speed Sensor System



ANGLE SENSOR

SYSTEM INSPECTION

1. Total resistance:

Turn the ignition switch to "OFF".

Disconnect the ECU 22P (gray: '00-'02, brown: After '02) connector.

Measure and record the resistance between the Black/red and Blue/green terminals of the harness side control unit connector.

STANDARD: 4—6 k Ω (20 °C/68 °F)

2. Shift-up resistance:

Measure and record the resistance between the Yellow/blue and Blue/green terminals while upshifting the gear manually by using the gear change tool.

3. Shift-down resistance:

Measure and record the resistance between the Yellow/blue and Blue/green terminals while downshifting the gear in the same manner as at upshift.

- Compare the measurements to result of the following calculations.

STANDARD:

Shift-up resistance (step 2)/Total resistance (step 1) <0.4

Shift-down resistance (step 3)/Total resistance (step 1) >0.6

The angle sensor is normal if the result of the calculations is less than 0.4 at upshift and more than 0.6 at downshift.

If the measurement is abnormal, remove the angle sensor cover (page 21-21) and disconnect the sensor 3P connector and perform the same inspection at the angle sensor terminals.

- If the measurement at the control unit is abnormal and the one at the angle sensor is normal, check for an open or short circuit, or loose or poor sensor connector contact.
- If the both measurements are abnormal, replace the angle sensor.

Remove the angle sensor (page 21-21).

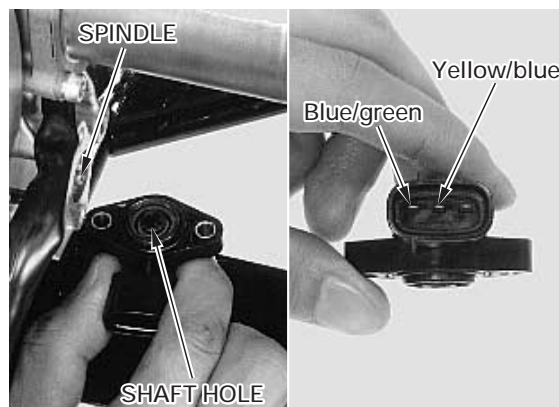
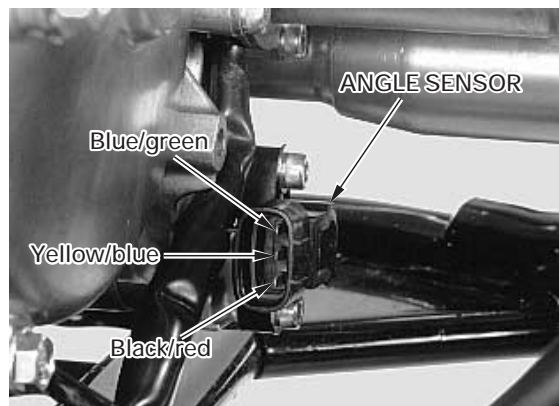
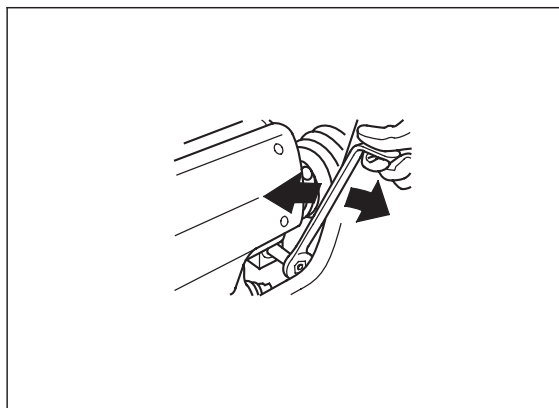
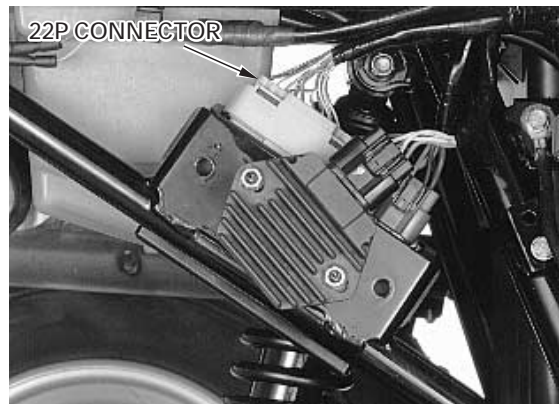
Check the sensor shaft hole and gearshift spindle for wear or damage.

Check that the resistance between the Yellow/blue and Blue/green wire terminals of the angle sensor while turning the sensor shaft slowly.

Clockwise turn: Resistance decreases smoothly

Counterclockwise turn: Resistance increases smoothly

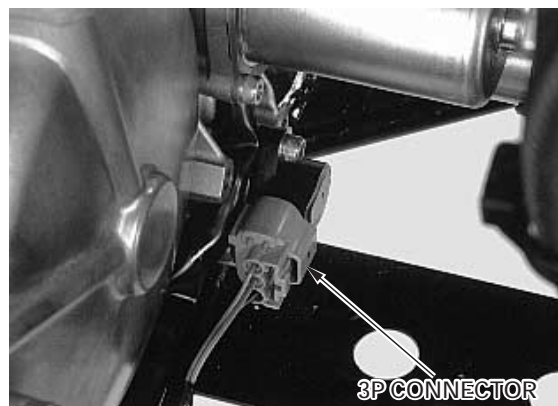
Be careful not to damage the sensor shaft hole.



Connect the control unit 22P (gray: '00–'02, brown: After '02) connector. Measure the input voltage between the Black/red (+) and Blue/green (–) terminals of the angle sensor 3P connector with the ignition switch turned to "ON".

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.



REMOVAL

Remove the two bolts and sensor cover.

Disconnect the 3P connector. Remove the two socket bolts, washers and angle sensor.

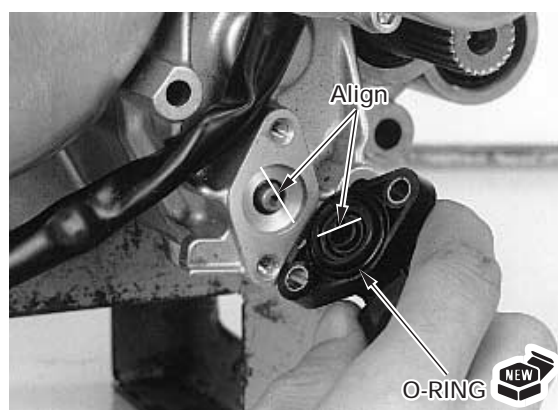
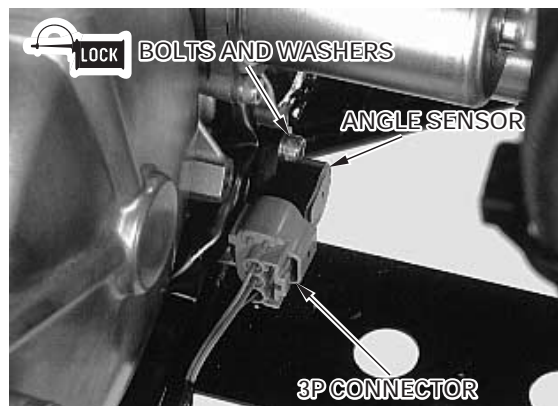
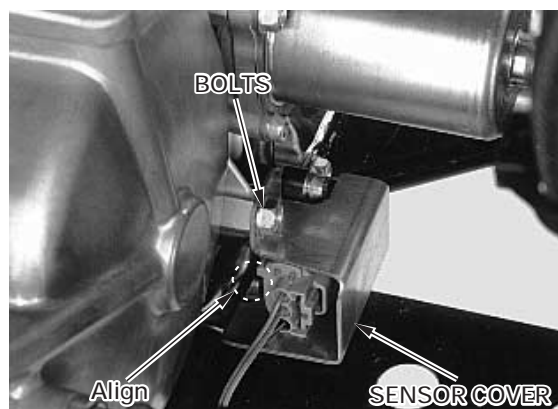
INSTALLATION

Install a new O-ring into the sensor groove. Carefully install the angle sensor by aligning the flat surfaces of the sensor shaft hole and gearshift spindle end.

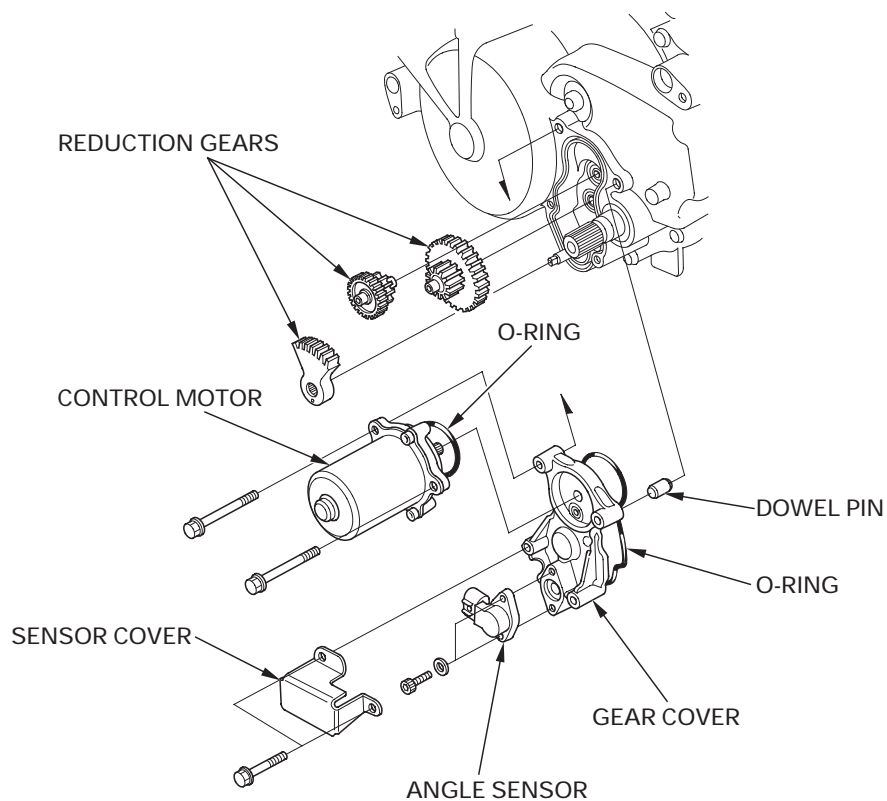
Apply locking agent to the socket bolt threads and install the socket bolts with the washers and tighten them.

TORQUE: 6 N·m (0.6 kgf·m , 4.3 lbf·ft)

Route the control motor wire properly (page 1-22). Install the sensor cover by aligning its groove with the lug on the crankcase cover and tighten the two bolts.



CONTROL MOTOR AND REDUCTION GEARS



Replace the control motor as an assembly.

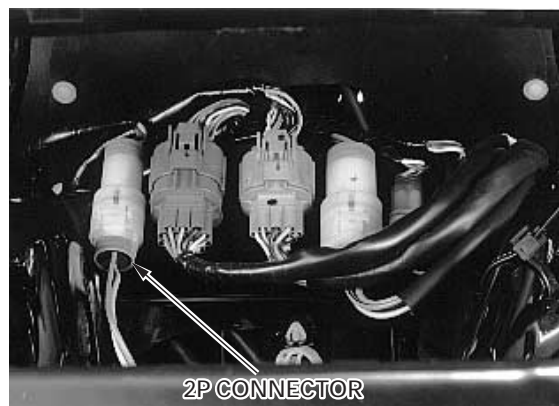
MOTOR

REMOVAL

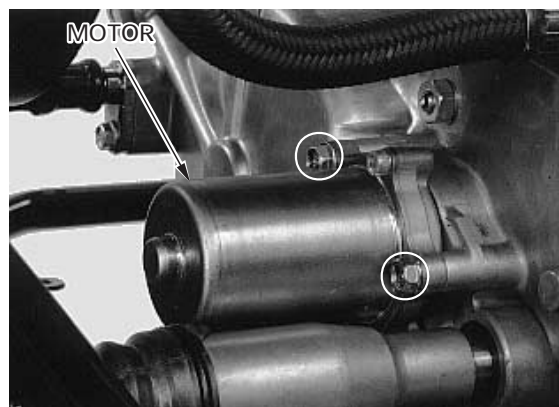
Remove the sensor cover (page 21-21).

Remove the three wire bands from the frame down tube and release the motor wire from the wire clip on the frame cross member.

Disconnect the motor 2P (white) connector.



Remove the two mounting bolts and control motor.

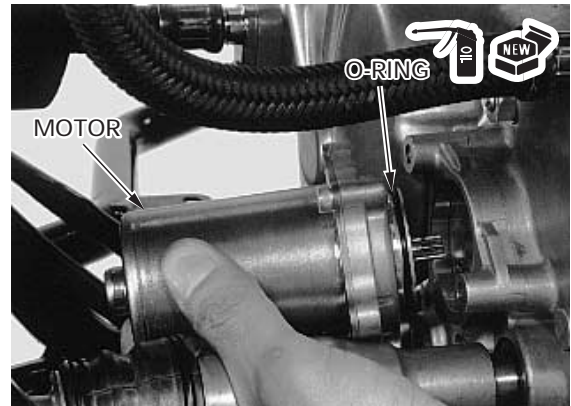


INSTALLATION

Coat a new O-ring with engine oil and install it into the groove in the motor.
Install the control motor and tighten the mounting bolts.

Route the wires properly (page 1-22). Connect the motor 2P connector and secure the motor and angle sensor wires with the wire clip and wire bands.

Install the sensor cover (page 21-21).

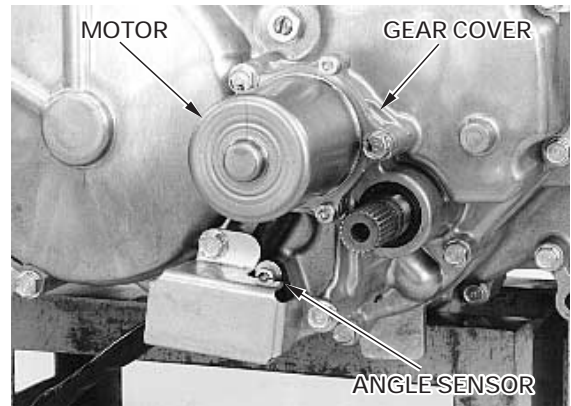


REDUCTION GEARS

The reduction gears can be serviced with the engine installed in the frame.

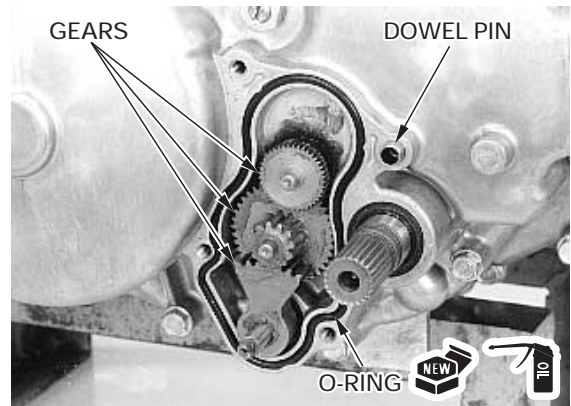
REMOVAL

- Remove the following:
- angle sensor (page 21-21)
 - control motor (page 21-22)
 - gear cover



- dowel pin
- O-ring
- reduction gears

Check the gear teeth for abnormal wear or damage.

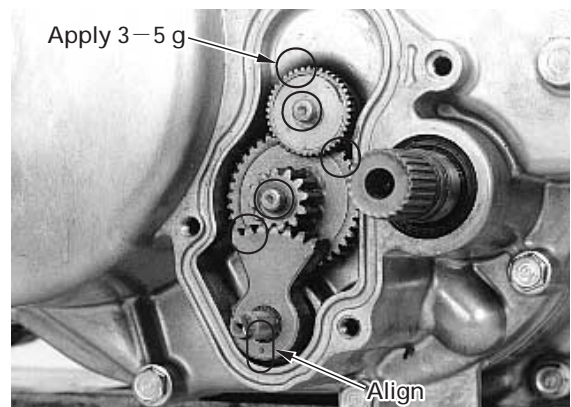


INSTALLATION

Thoroughly clean the gears and journals.
Install the middle and upper gears into the crankcase cover, and the lower gear by aligning its wide groove (indicated by punch mark) with the wide tooth on the shift spindle.
At this time, apply 3—5 g of specified grease to the gear journals (both sides of the upper and middle gears) and gear teeth as shown (encircled areas) and install the gears.

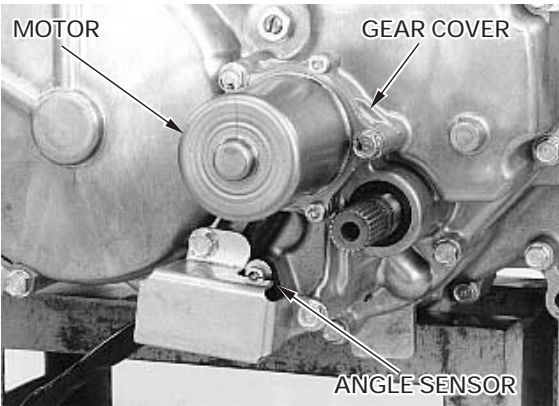
SPECIFIED GREASE: Unirex N2 grease (ESSO) or Unirex N3 grease (ESSO)

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



ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

- Install the following:
- gear cover
 - control motor (page 21-23)
 - angle sensor (page 21-21)



GEARSHIFT SWITCH

SYSTEM INSPECTION

Disconnect the ECU 22P (gray) connector.
Check for continuity between the terminals of the connector in each switch position.
Continuity should exist between the color coded wires as follows:

Color Position	White/ blue	Black/ red	White/ Yellow	Black/ red
Up	○	○		
Free				
Down			○	○



If the continuity is abnormal, perform the same inspection at the handlebar switch 10P (green) connector.

Remove the following connectors from the frame and disconnect the 10P connector:

- ignition switch (4P white)
 - handlebar switch (10P green)
- If the continuity at the control unit is abnormal and the one at the 10P connector is normal, check for an open or short circuit, or loose or poor connector contact.
 - If both continuities are abnormal, replace the gearshift switch.



Connect the control unit 22P connector.
Measure the input voltage between the Black/red (+) terminal of the harness side 10P (green) connector and ground (–) with the ignition switch turned to "ON".

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.

REVERSE SHIFT SWITCH

INSPECTION

Remove the seat (page 2-4).

Remove the alternator 5P and gear position/reverse shift switch 8P connectors from the frame.

Disconnect the gear position/reverse shift switch 8P (white) connector and check for continuity between the Gray/red terminal of the switch side connector and ground.

There should be continuity with the reverse selector operated and no continuity with it released.

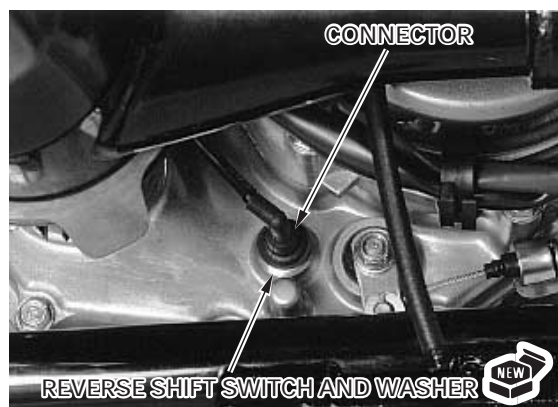
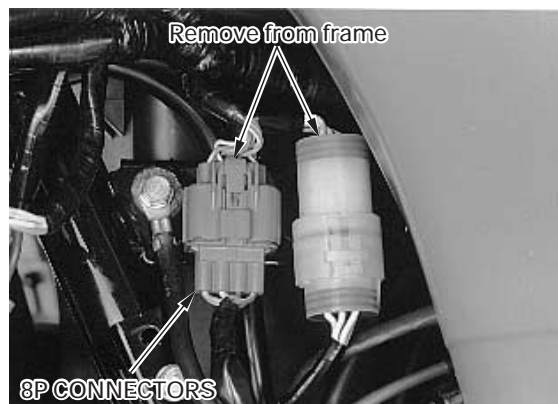
REMOVAL/INSTALLATION

Disconnect the switch connector and remove the reverse shift switch.

Install the switch with a new sealing washer and tighten it.

TORQUE: 13 N·m (1.3 kgf·m , 9 lbf·ft)

Connect the switch connector securely.



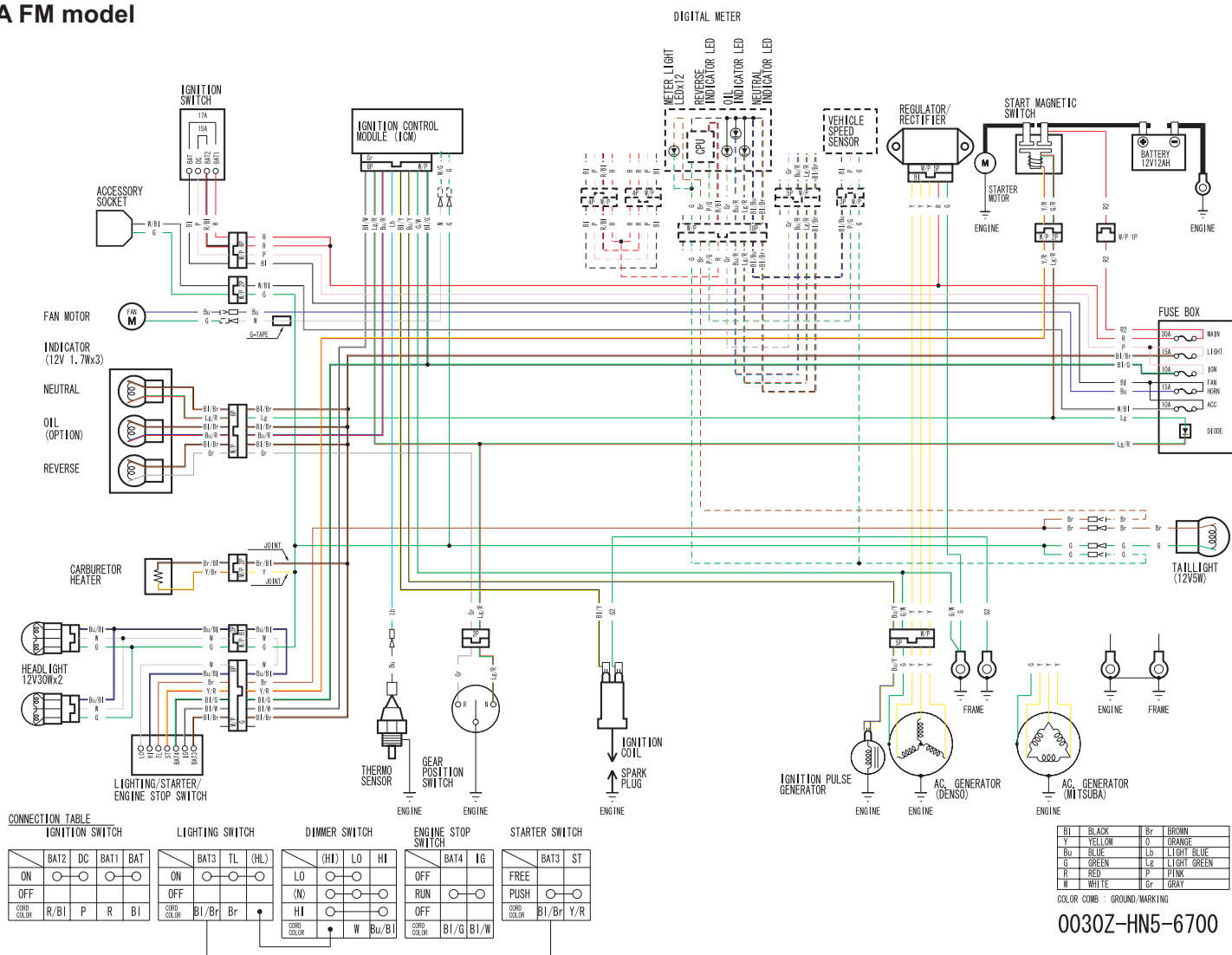
MEMO

22. WIRING DIAGRAMS

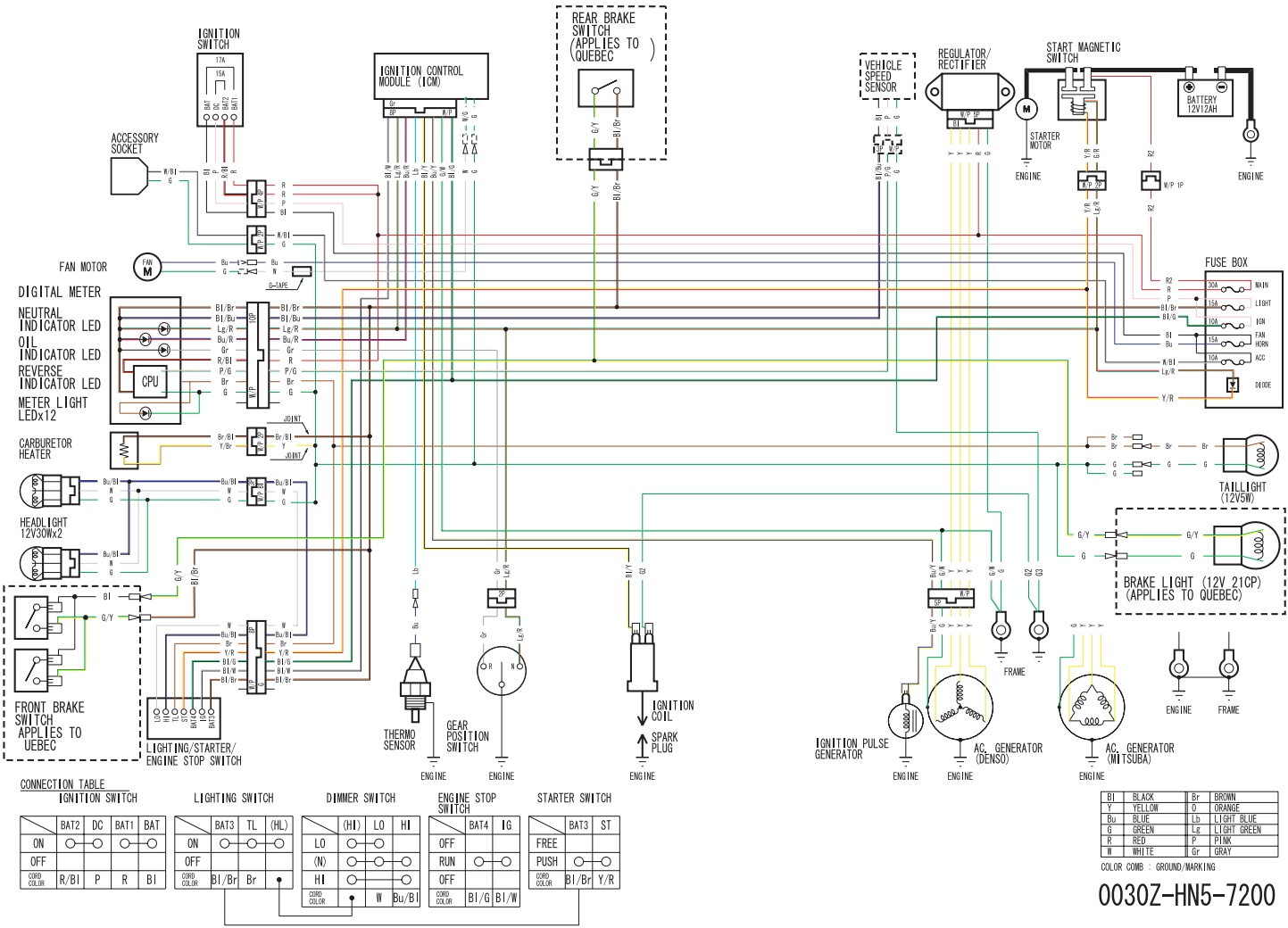
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USA FM MODEL	22-2	CANDADA TE/FE 00-02 MODELS	22-6
CANADA TM/FM MODEL	22-3	CANDADA TE/FE After 02 MODELS	22-7
USA TE/FE 00-02 MODELS	22-4		



WIRING DIAGRAMS USA FM model



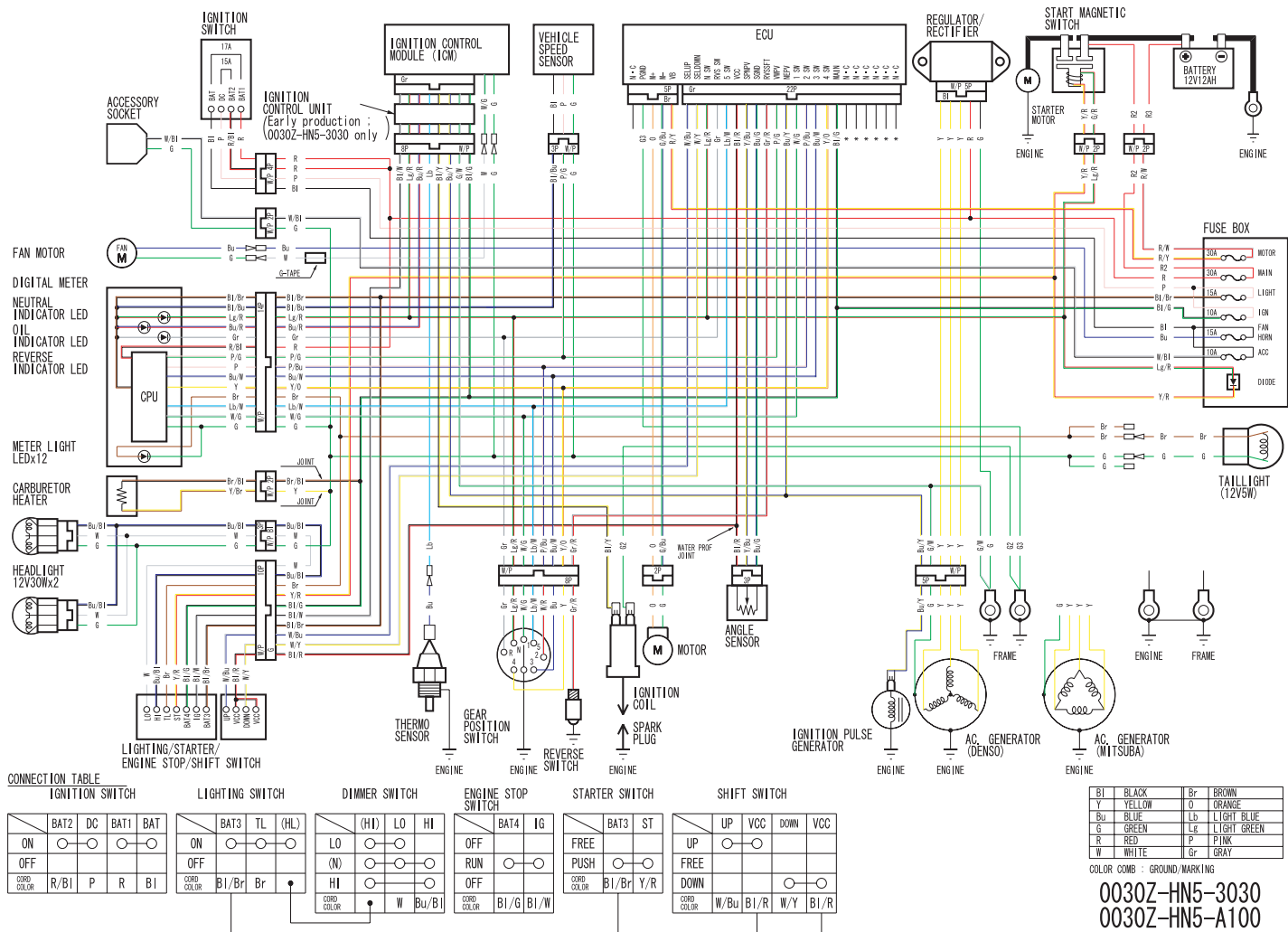
Canada TM/FM models



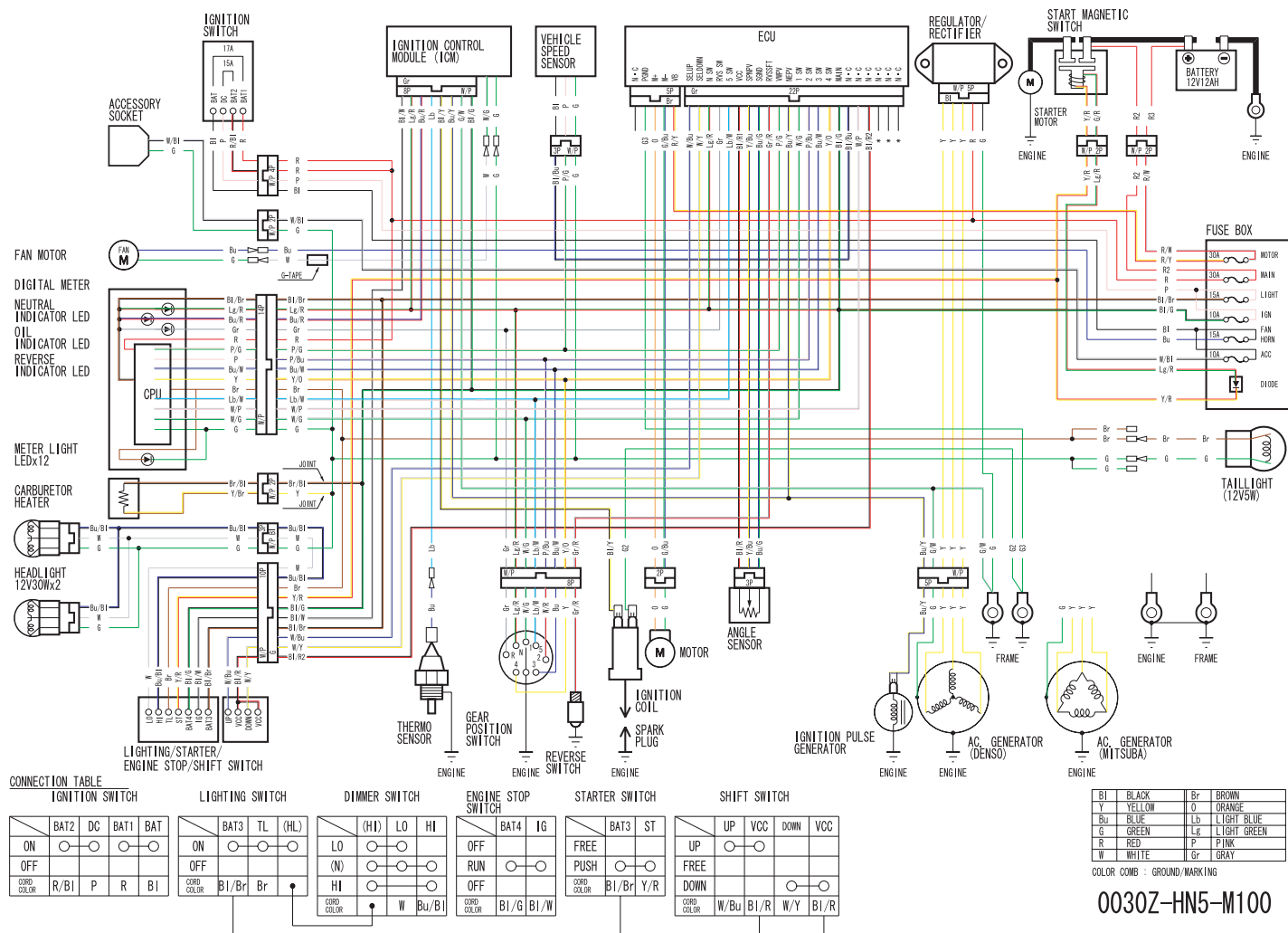
0030Z-HN5-7200

WIRING DIAGRAMS

USA TE/FE 00-02 models

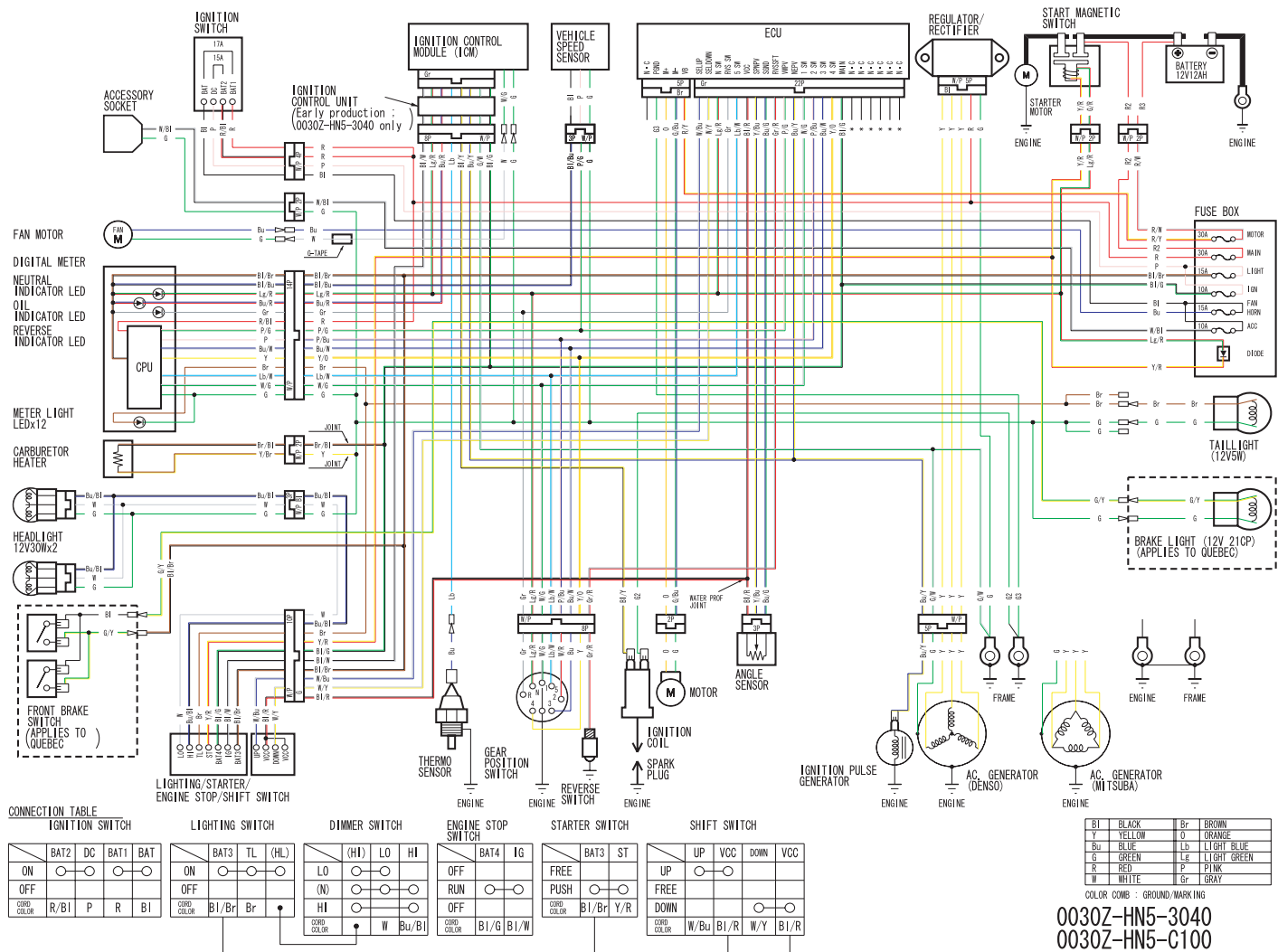


USA TE/FE After 02 models

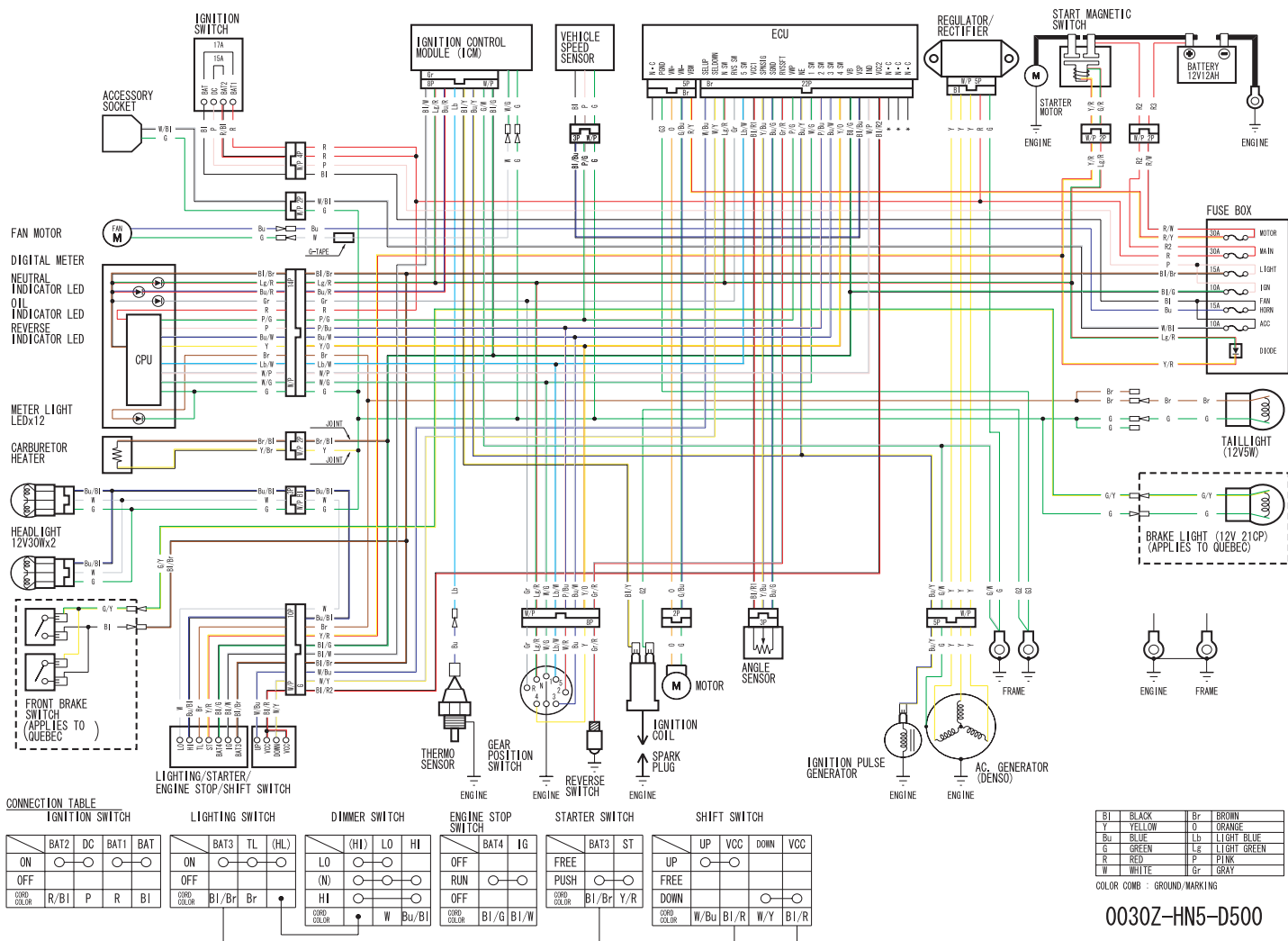


WIRING DIAGRAMS

Canada TE/FE 00-02 models



Canada TE/FE After 02 models



23. TECHNICAL FEATURES

DRY SUMP MECHANISM OF INTEGRAL OIL TANK IN CRANKCASE

23-1

ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

23-6

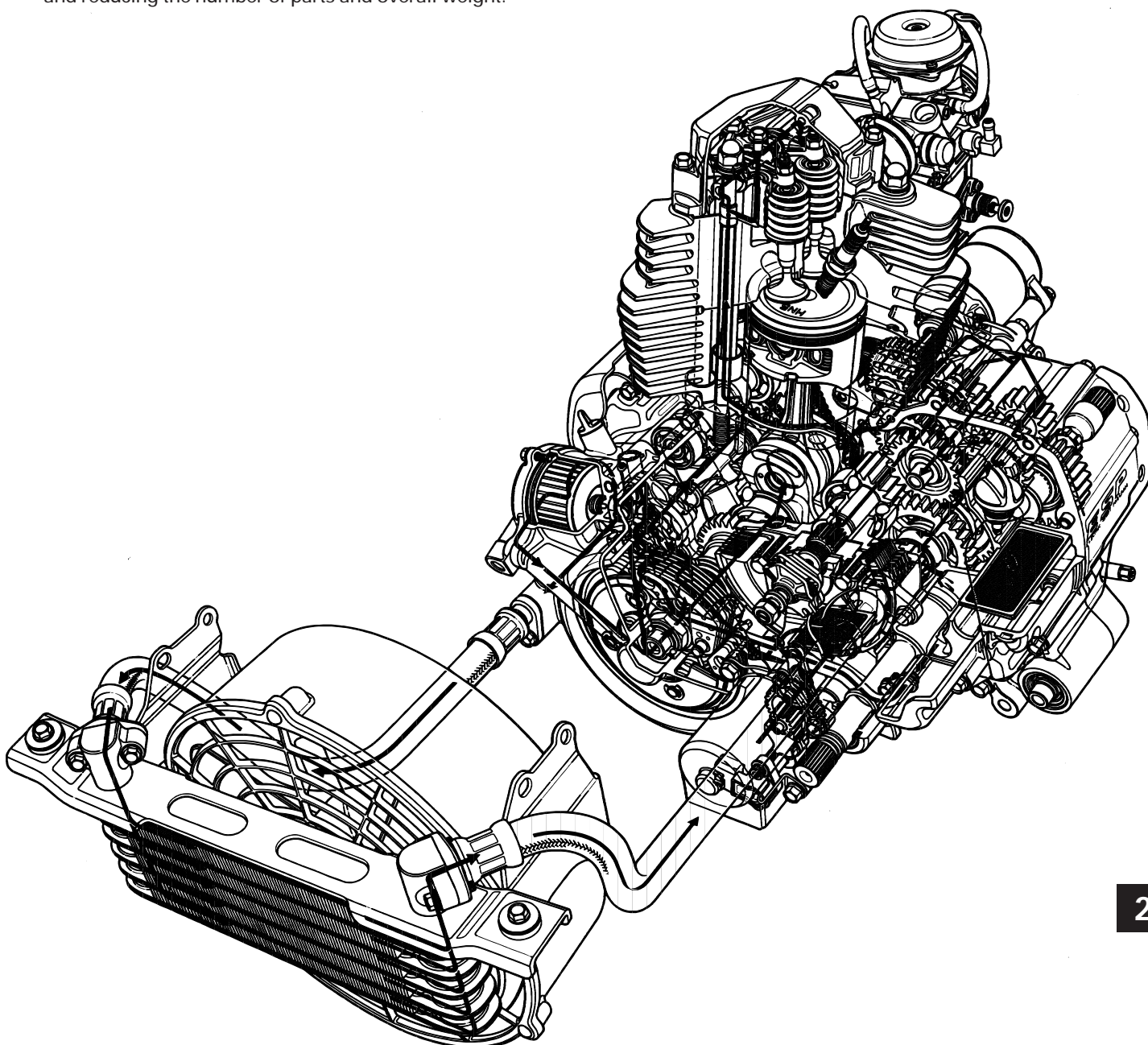
A.P.SURETRAC TORQUE BIASING LIMITED SLIP DIFFERENTIAL

23-3

DRY SUMP MECHANISM OF INTEGRAL OIL TANK IN CRANKCASE

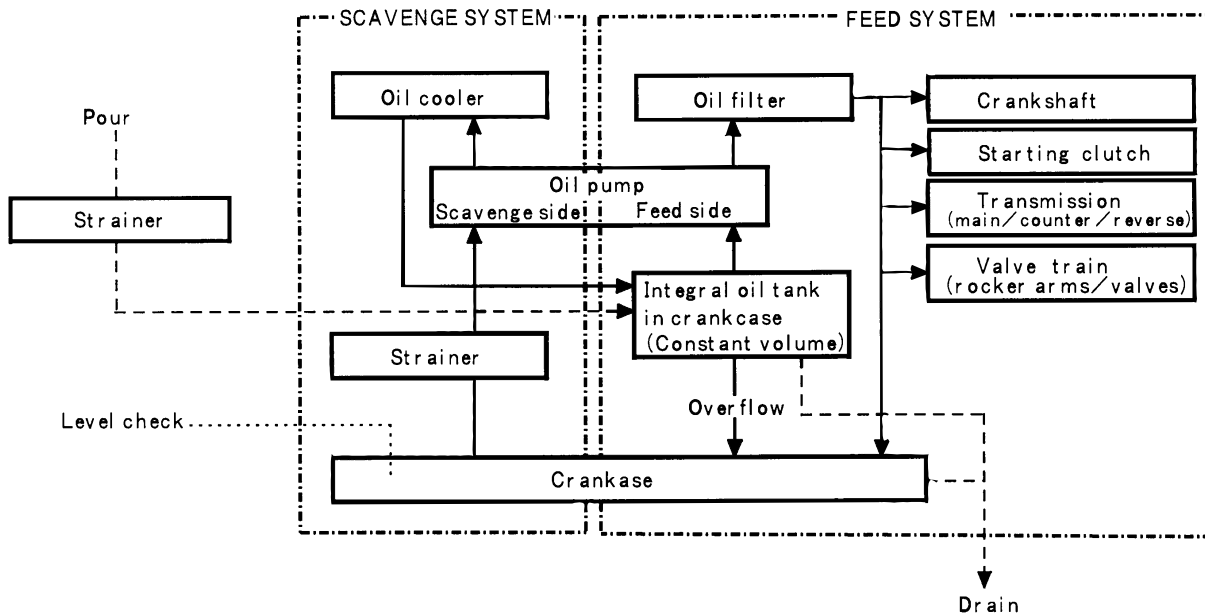
This engine was designed and manufactured to reduce the overall height of the engine body and to reduce the size of the entire lubrication system.

In a normal dry sump mechanism, the oil tank is separated from the engine and laid out as an independent unit. However, this TRX350 does not have an independent oil tank and uses a part of the crankcase as an oil tank, centralizing of mass, and reducing the number of parts and overall weight.

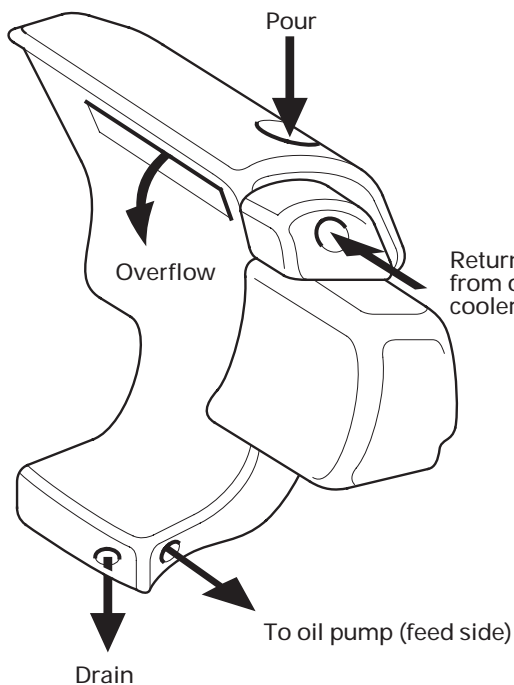


TECHNICAL FEATURES

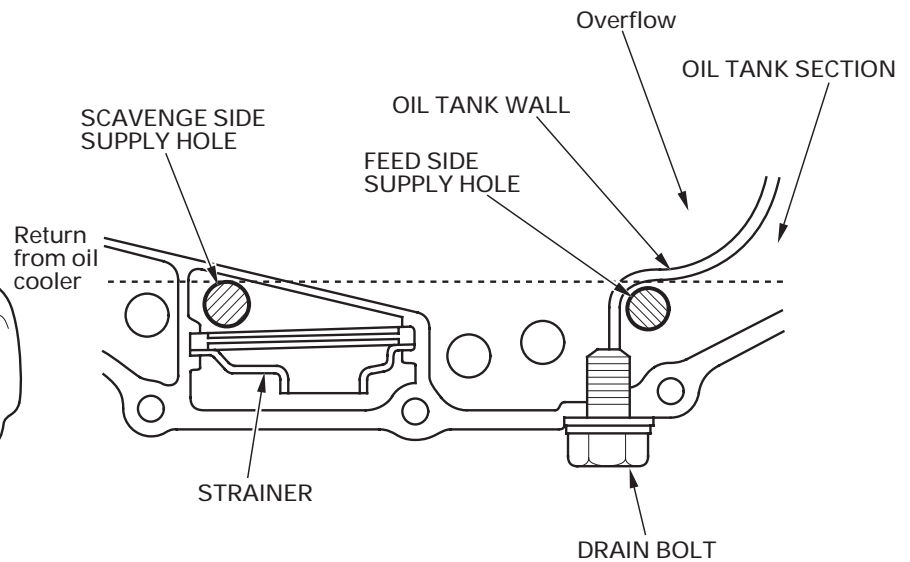
OIL MANAGEMENT SYSTEM DRAWING:



OIL TANK:



OIL SUPPLY AND DRAIN PART DETAIL (FRONT CRANKCASE):



If the engine is not operated for a long time, the engine oil will drain to the bottom of the crankcase from the oil tank section through the crankcase mating surface. Always check the engine oil level after starting the engine and allowing the oil to circulate through the engine (page 3-10).

A.P. SURETRAC TORQUE BIASING FRONT DIFFERENTIAL CONSTRUCTION

In this mechanism, torque is transmitted through the differential using a cam and follower principle.

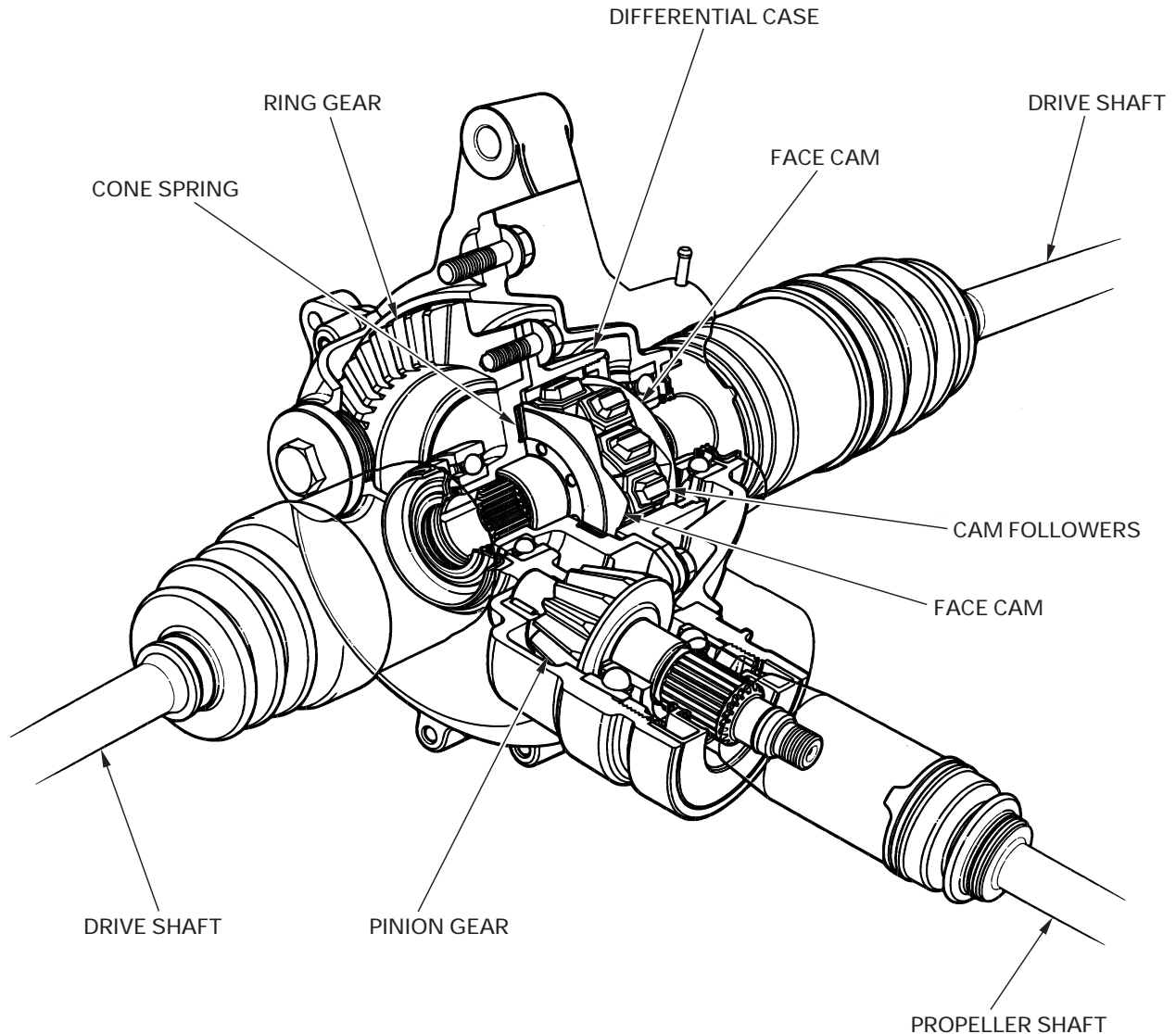
The differential is groove-fitted in the differential case (which receives torque from a ring gear) so that the cam followers can move to the left and right. Torque is transmitted by contact of the cam faces at the left and right ends of the cam followers with the cam faces of the both face cams (equivalent to the side gears in a conventional configuration).

When the differential operates, the cam followers move to the left and right back and forth, transmitting torque to the face cams.

The performance of this type of differential differs from conventional types because the torque difference is established before any relative motion takes place. The tire dynamics dictate the torque generated so that the differential always provides the optimum torque balance. This maintains tire adhesion and enhances directional stability and safety.

This construction differs from a conventional differential in the following ways:

- Fewer number of structural parts
- Reduced steering load
- Greater durability



TECHNICAL FEATURES

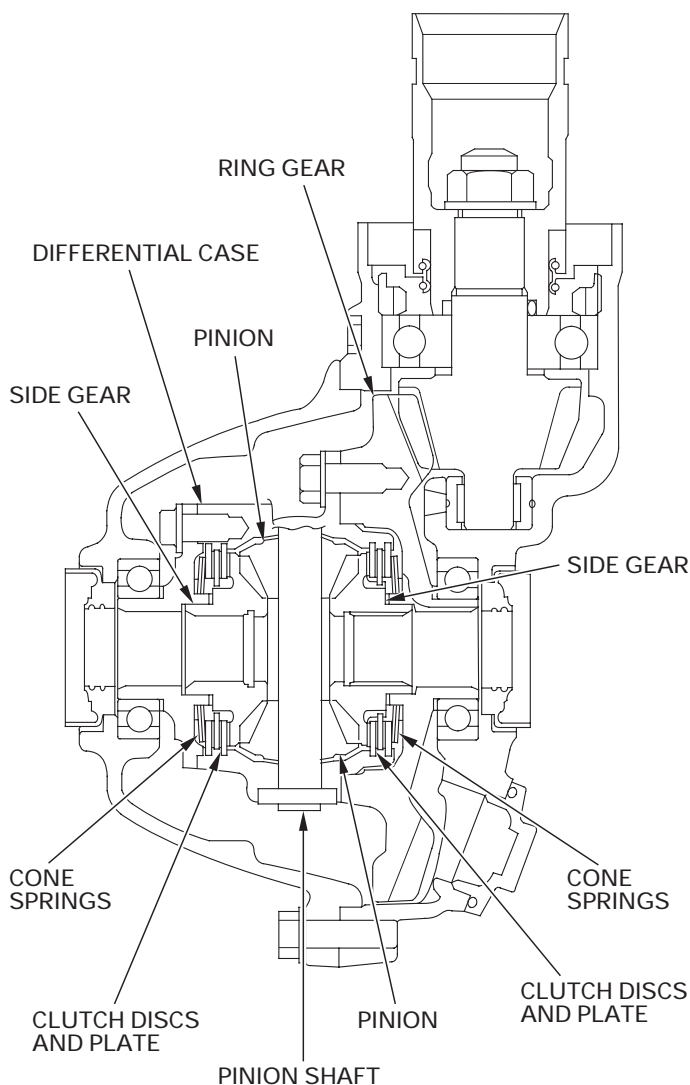
CONVENTIONAL TYPE

1. Torque transmission:
Ring Gear \Rightarrow Differential Case \Rightarrow Pinion Shaft \Rightarrow Pinions \Rightarrow Side Gears \Rightarrow Drive Shafts \Rightarrow Tires
2. Absorption of differential rotation:
Self-turning pinion absorb difference in rotation of the side gears (left and right tires).
3. Differential limit:
Initial torque — The cone springs in a multi-disc clutch imparts axial load in the thrust direction, producing initial torque.
Torque bias ratio — Distribution of torque (except initial torque) to the left and right tires when differential action occurs is 1 : 1.

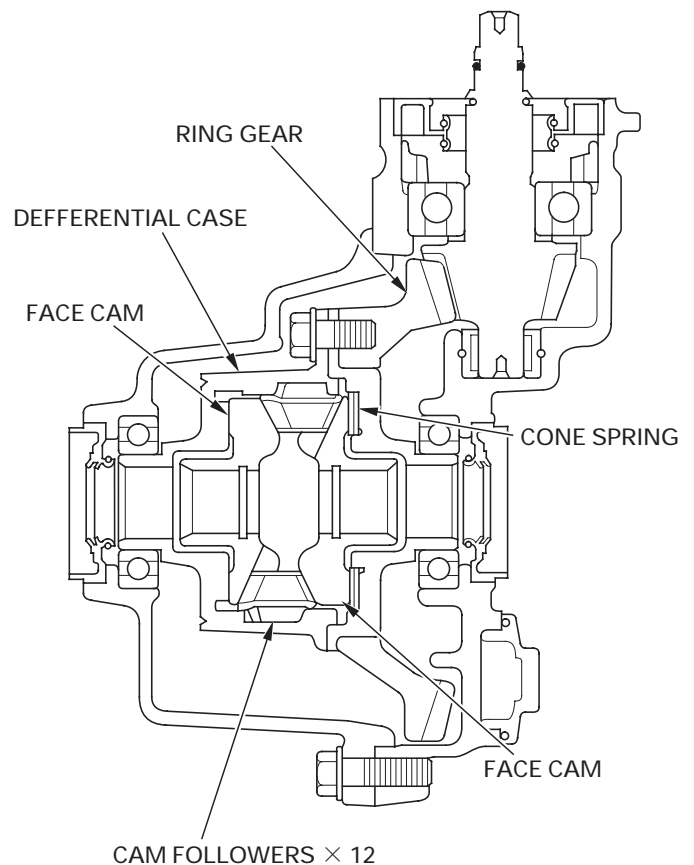
NEW TYPE (Suretrac differential)

1. Torque transmission:
Ring Gear \Rightarrow Differential Case \Rightarrow Cam Followers \Rightarrow Face cams \Rightarrow Drive Shafts \Rightarrow Tires
2. Absorption of differential rotation:
Cam followers back-and-forth motion absorbs difference in rotation of the face cams (left and right tires).
3. Differential limit:
Initial torque — Pre-load is imparted to the sliding cam faces by action of the cone spring pressing the face cam against the cam followers, producing initial torque.
Torque bias ratio — Torque is distributed according to preset optimum bias ratio by frictional braking action created by the cam follower and face cam sliding faces when differential action occurs.

CONVENTIONAL DIFFERENTIAL



NEW DIFFERENTIAL

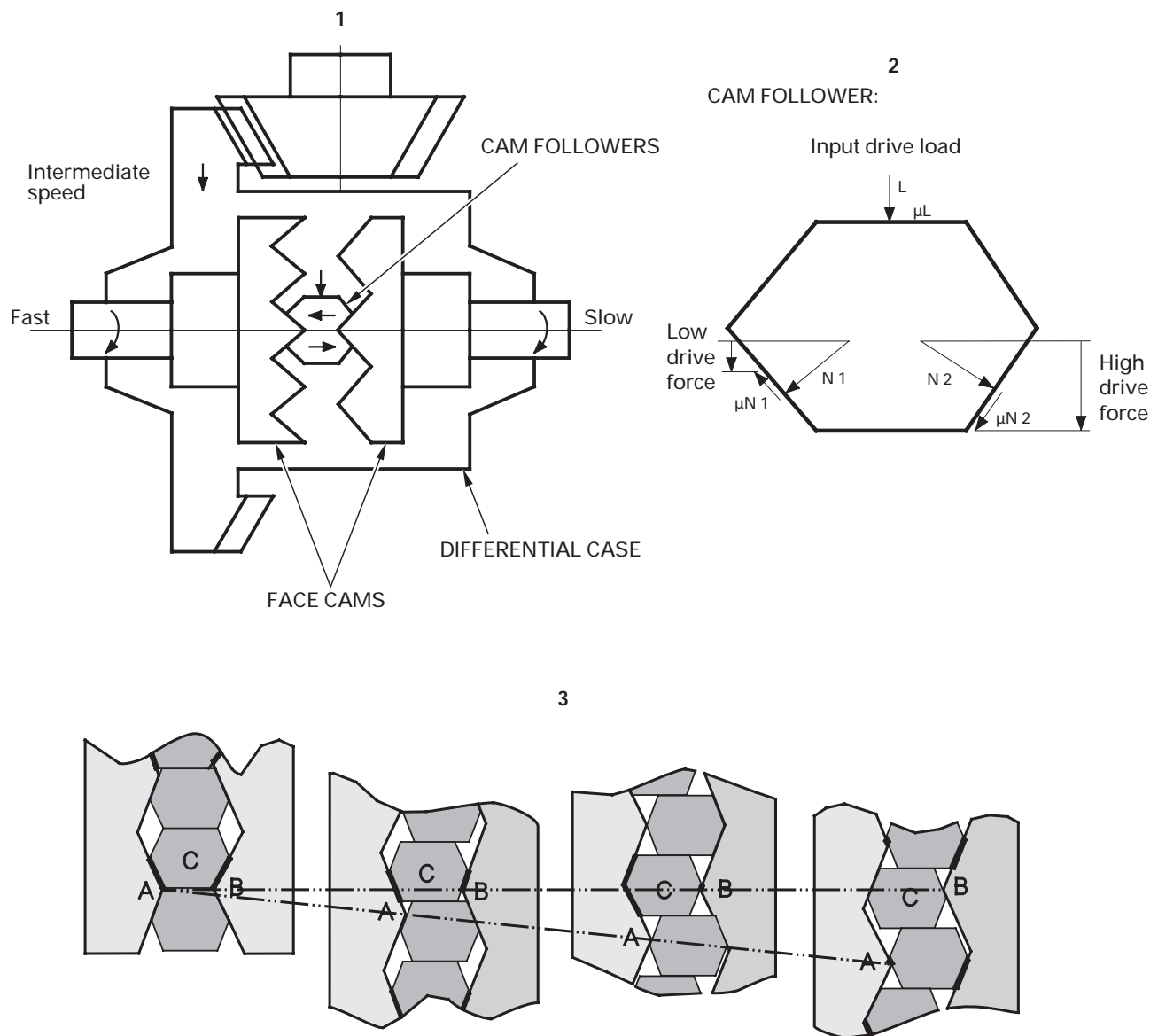


DIFFERENTIAL OPERATION

Figure 1 shows the conditions when one wheel wants to spin, that is, tries to rotate faster than the differential case. The torque generates a force applied to the flank of the follower dog from the differential case spline, which is then shared between the two face cams by forces on the inclined faces.

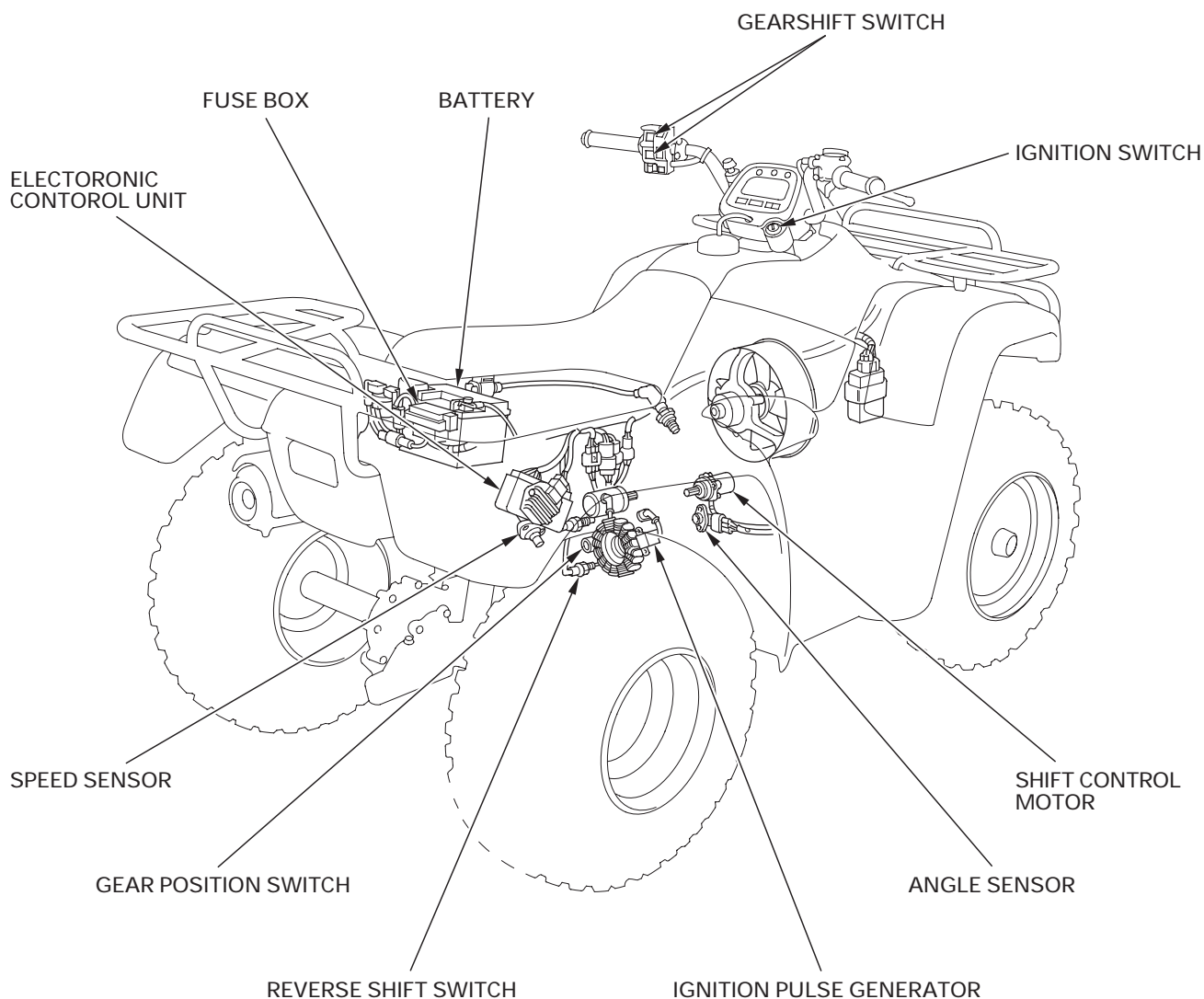
Figure 2 shows the friction forces on the ends of the cam follower. Since the differential speed is intermediate between the two face cam speeds, the cam follower will move faster than the face cam at one end, and slower than the face cam at the other end. This generates friction forces that are in opposite directions, leading to total resultant forces that are large on the slow face cam and small on the fast face cam. If there is a relative speed, then the friction must be at its limiting value, but it can build up to this progressively before rotation occurs.

Figure 3 shows how the load is shared between the followers. Only those followers bearing on the forward faces of the face cam form transmit torque. The bold lines show the load bearing areas at any one time, and there is always just less than half the cam followers driving. The figure shows the situation at a number of discrete time steps, showing how the load carrying role is passed from follower to follower. The right hand face cam is drawn in the same position as a point of reference where the left hand face cam moves down with the cam followers (which are carried by the differential case moving down at about half speed).

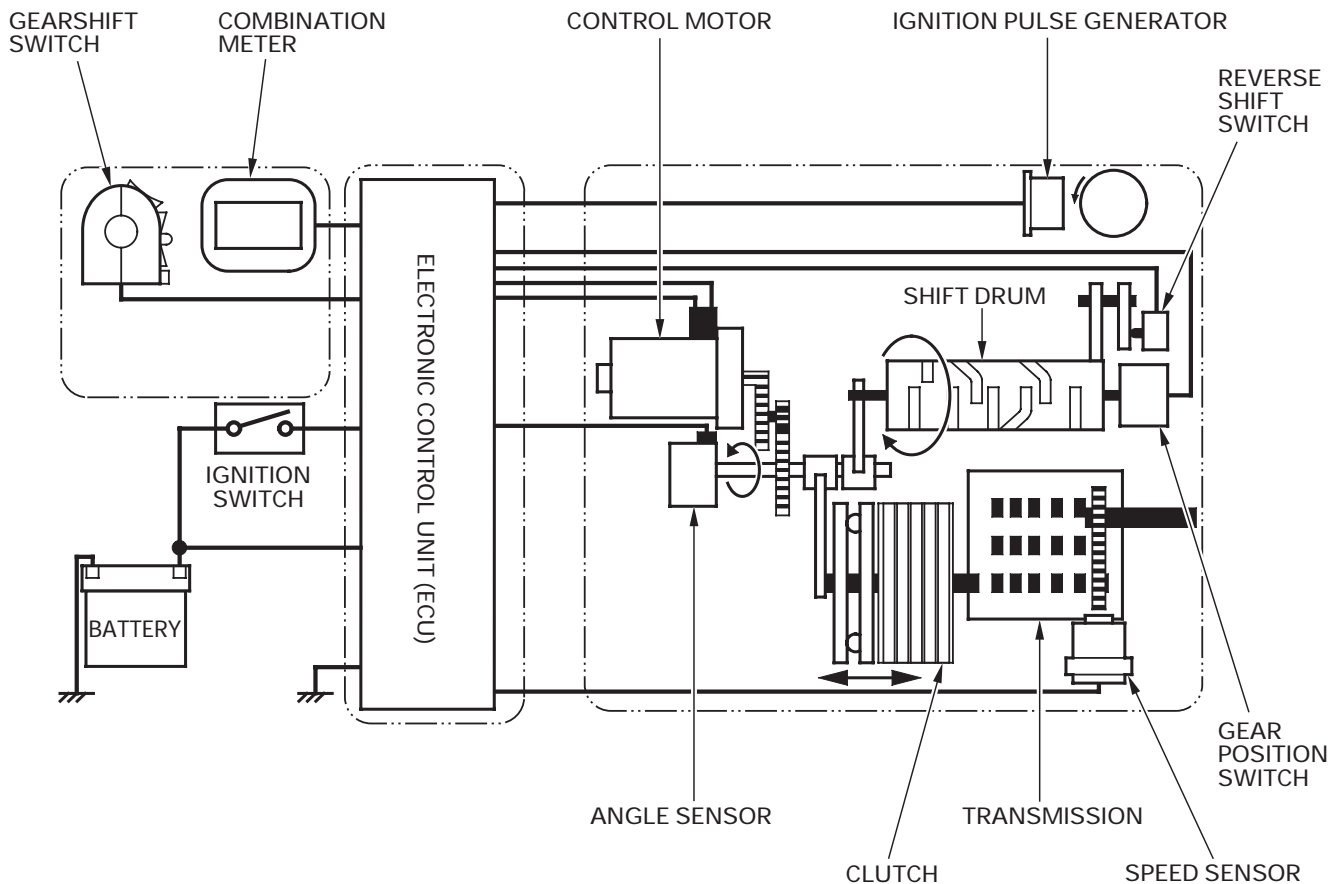


ELECTRIC SHIFT PROGRAM (ESP: TE/FE models)

Electric Shift Program (ESP) is designed to make gear shift operation easier by replacing conventional foot-operated shift change with a switch located near the operators hand.



COMPONENT DIAGRAM



Shift Position Indicator

The shift position indicator incorporated in the combination meter indicates the current shift position, as it receives the signal from the gear position switch.

Gearshift Switch

When the operator presses the gearshift switch installed on the left handlebar, it sends the shift-up or shift-down signal to Electronic Control Unit.

Reverse Shift Switch

The reverse shift switch, located on the rear crankcase cover, turns ON when the reverse selector is operated.

The Electronic Control Unit will shift to Reverse and the control motor starts to run.

While the reverse selector is being operated.

Electronic Control Unit

The Electronic Control Unit, installed inside the right rear fender, controls the system by processing the signals coming from each switch and sensor.

Ignition Pulse Generator

The pulse generator, installed inside the rear crankcase cover, controls the ignition system and also sends an engine revolution signal to the Electronic Control Unit.

Control Motor

The control motor, installed on the front crankcase cover, rotates the sub-gearshift spindle depending on the current from the Electronic Control Unit.

TECHNICAL FEATURES

Angle Sensor

The angle sensor, installed on the front crankcase cover, converts the direction of rotation, rotating angle and rotating speed of the sub-gearshifts spindle into a voltage change and speed change and outputs them to the Electronic Control Unit.

Gear Position Switch

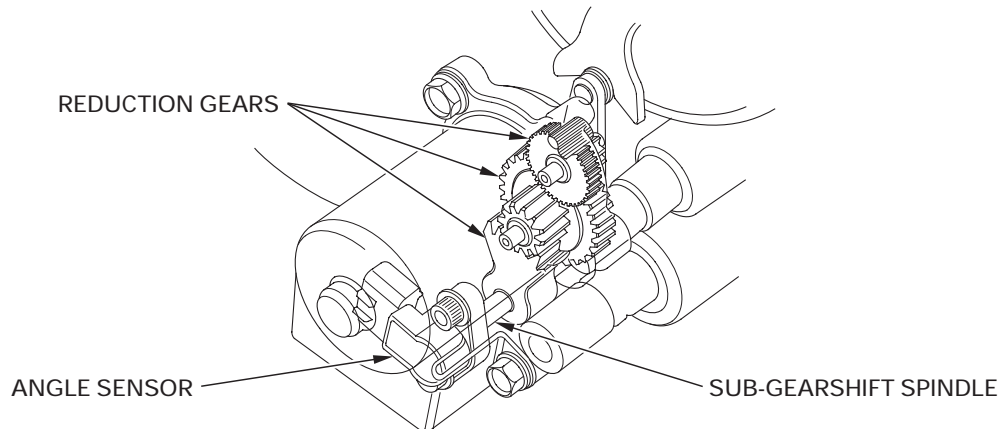
The gear position switch, installed inside the rear crankcase cover, sends gear position signals to the Electronic Control Unit.

Speed Sensor

The speed sensor, installed on the rear crankcase cover, sends a vehicle speed signal both to the combination meter and the Electronic Control Unit.

DESCRIPTION OF MAJOR COMPONENTS

Angle Sensor



The angle sensor shaft is connected to the end of the sub-gearshift spindle. It converts the direction of rotation, rotating angle and rotating speed of the sub-gearshift spindle into a voltage change and speed change and then outputs these signals to the Electronic Control Unit.

The rotation of the angle sensor shaft changes a variable resistance value, thereby changing the output voltage to the Electronic Control Unit from the angle sensor.

The Electronic Control Unit detects whether the gear is shifted down or up during the voltage change.

Electronic Control Unit

Consisting of the CPU and a motor drive circuit, the Electronic Control Unit calculates the signals from each switch and sensor and controls the ESP system.

The Electronic Control Unit has a self-diagnostic function (though it does not have the capability to display the results) which checks the system.

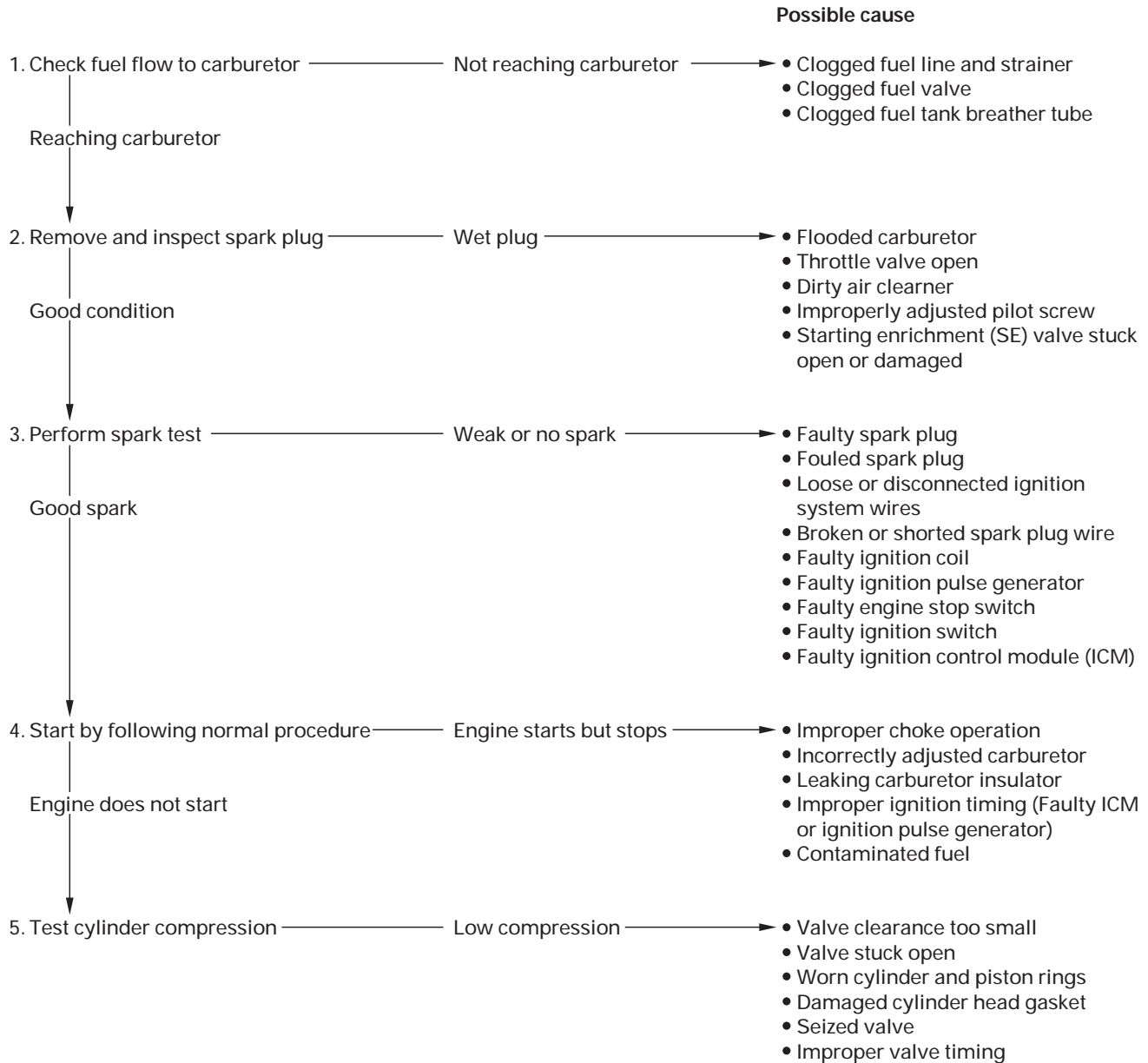
If any error is found as the result of self-diagnosis, it shuts off the electric current for operation, bringing ESP to a stop.

If the error is temporary, turn OFF the ignition switch to erase the self-diagnostic results. Then, re-start the engine to reactivate the system.

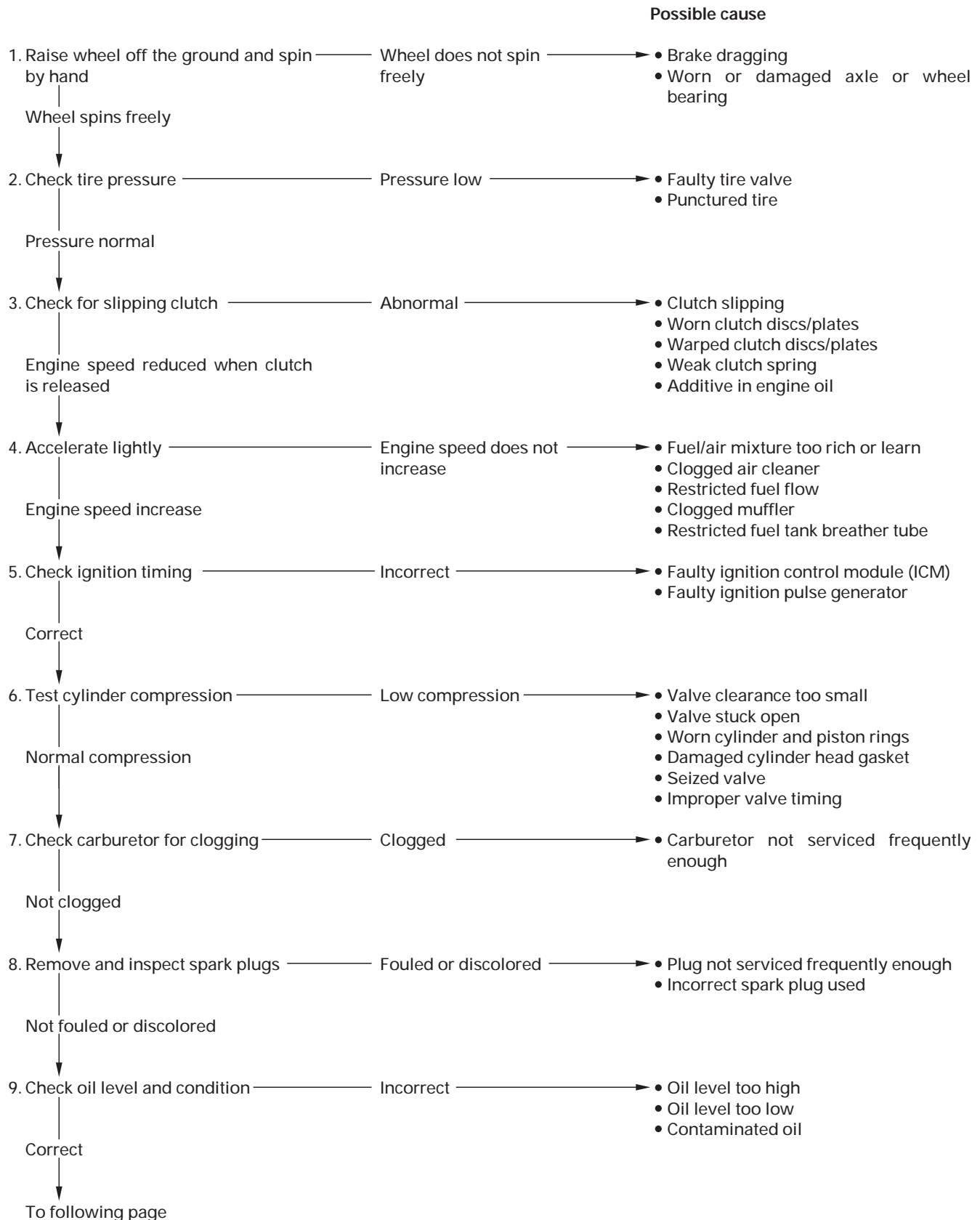
24. TROUBLESHOOTING

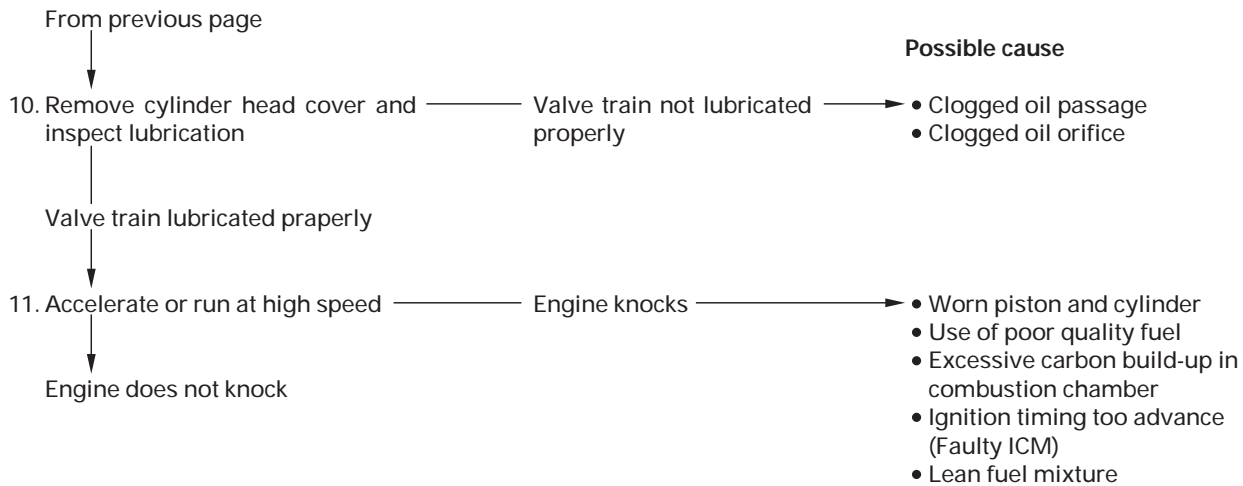
ENGINE DOES NOT START OR IS HARD TO START	24-1	POOR PERFORMANCE AT HIGH SPEED	24-4
ENGINE LACKS POWER	24-2	POOR HANDLING	24-4
POOR PERFORMANCE AT LOW AND IDLE SPEED	24-3		

ENGINE DOES NOT START OR IS HARD TO START

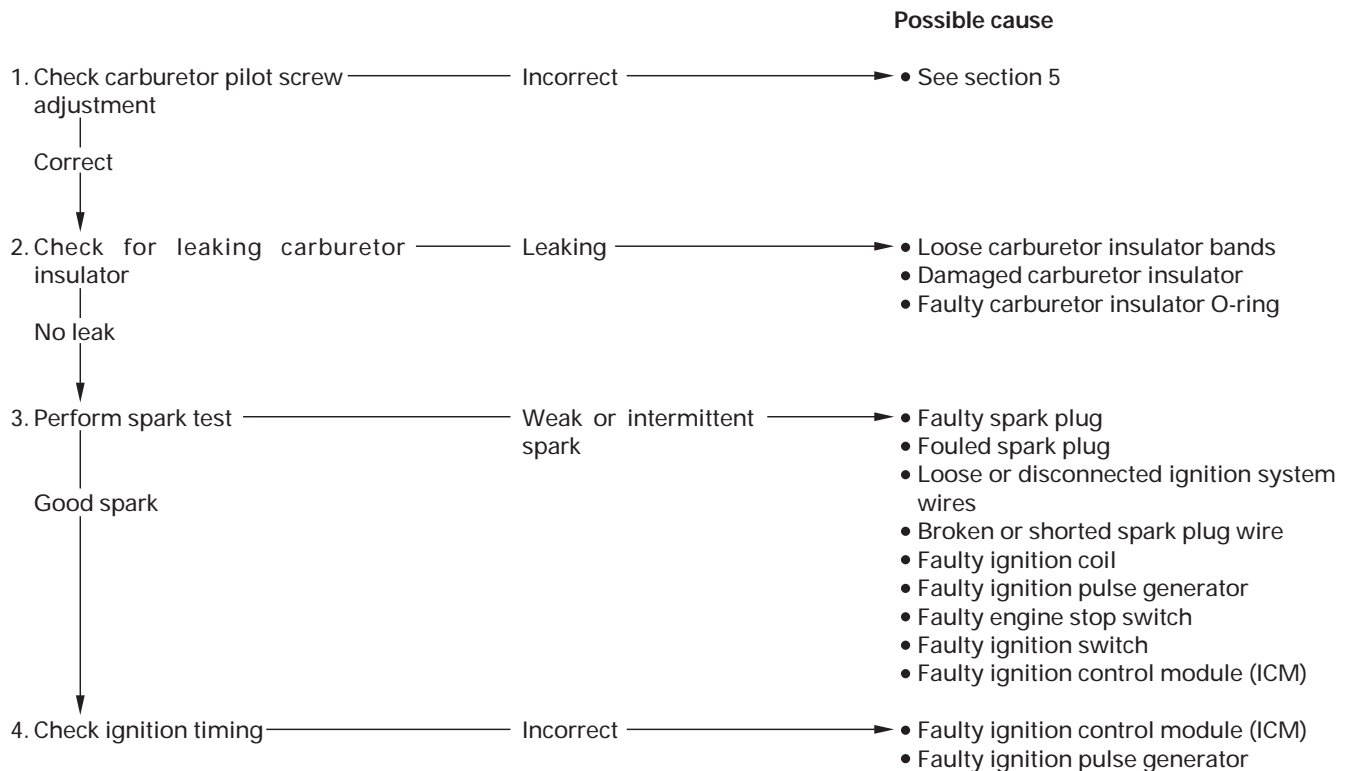


ENGINE LACKS POWER

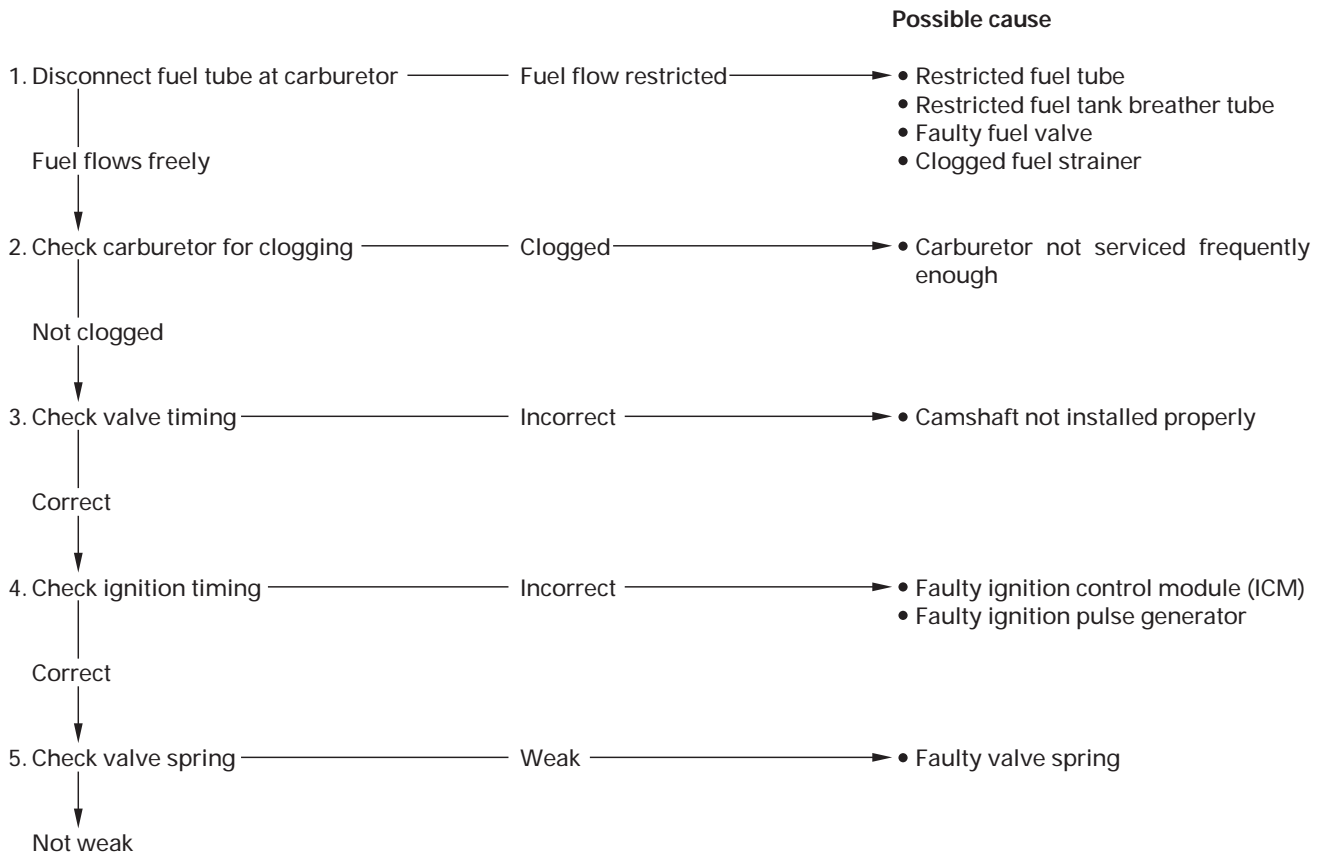




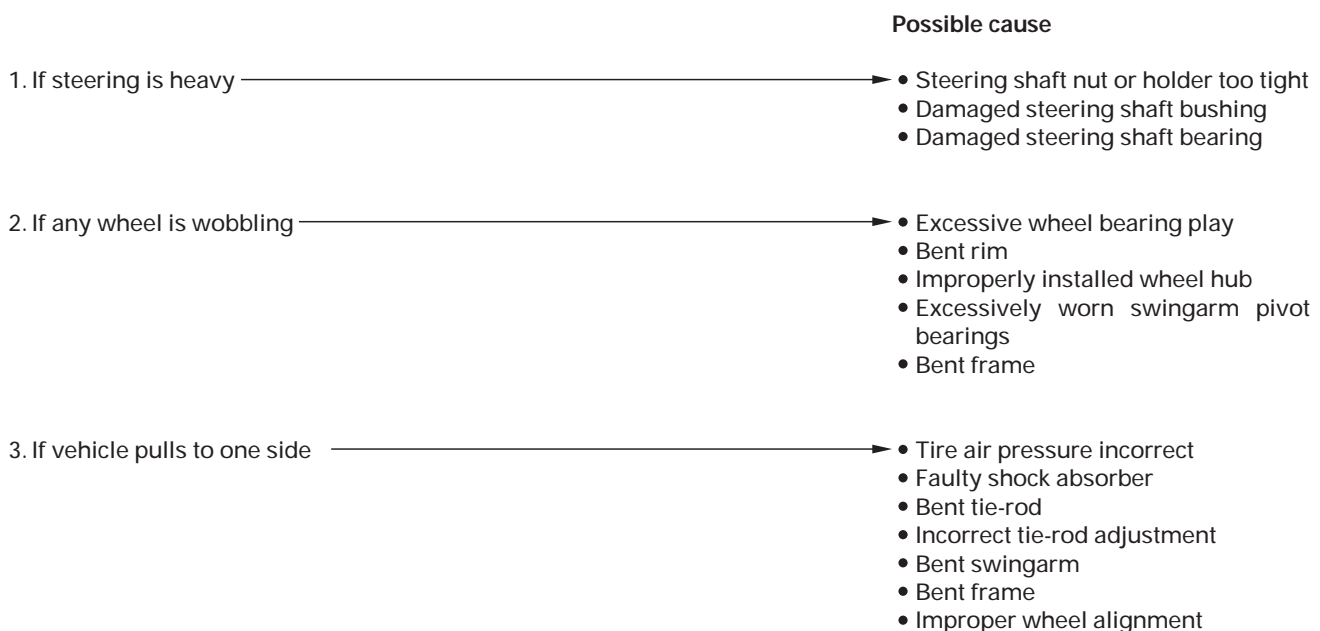
POOR PERFORMANCE AT LOW AND IDLE SPEED



POOR PERFORMANCE AT HIGH SPEED



POOR HANDLING



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