HONDA

SHOP MANUAL
TURBO
CX650

PART NO.-HM 1055

1983

TURBO
CX650

IMPORTANT SAFETY NOTICE

WARNING *Indicates a strong possibility of severe personal injury or loss of life if instructions are not followed.*

CAUTION *Indicates a possibility of personal injury or equipment damage if instructions are not followed.*

NOTE: Gives helpful information.

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. It is important to note that this manual contains *some* warnings and cautions against some specific service methods which could cause **PERSONAL INJURY** to service personnel or could damage a vehicle or render it unsafe. Please understand that those warnings could not cover all conceivable ways in which service, whether or not recommended by Honda might be done or of the possible hazardous consequences of each conceivable way, nor could Honda investigate all such ways. Anyone using service procedures or tools, whether or not recommended by Honda *must satisfy himself thoroughly* that neither personal safety nor vehicle safety will be jeopardized by the service method or tools selected.

HOW TO USE THIS MANUAL

Follow the Maintenance Schedule recommendations to ensure that the vehicle is in peak operating condition and the emission levels are within the standards set by the U.S. Environmental Protection Agency. Performing the first scheduled maintenance is very important. It compensates for the initial wear that occurs during the break-in period.

Sections 1 through 3 apply to the whole motorcycle, while sections 4 through 22 describe parts of the motorcycle, grouped according to location.

Find the section you want on this page, then turn to the table of contents on page 1 of that 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 are not familiar with this motorcycle, read the Technical Features in section 23.

If you don't know what the source of the trouble, go to section 24, Troubleshooting.

HONDA MOTOR CO., LTD.
Service Publications Office

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MEMO

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1. GENERAL INFORMATION

GENERAL SAFETY

WARNING

If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in a closed area. The exhaust contains poisonous carbon monoxide gas.

WARNING

Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.

WARNING

The battery electrolyte contains sulfuric acid. Protect your eyes, skin and clothing. In case of contact flush thoroughly with water and call a doctor if electrolyte gets in your eyes.

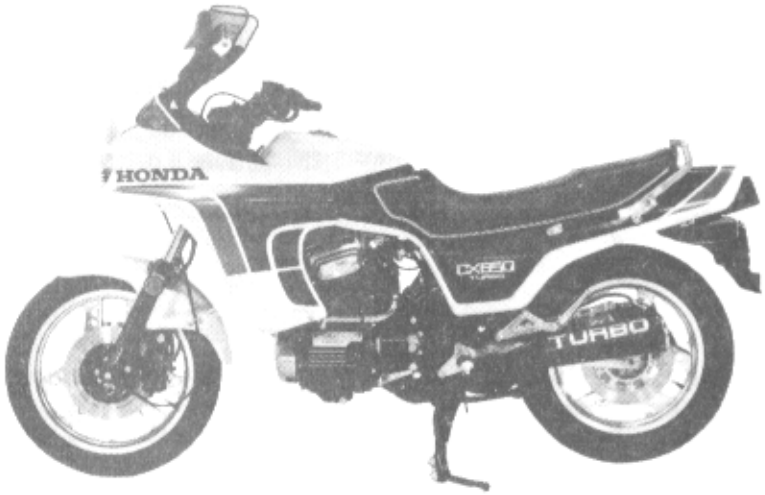
WARNING

The battery generates hydrogen gas which can be highly explosive. Do not smoke or allow flames or sparks near the battery, especially while charging it.

SERVICE RULES

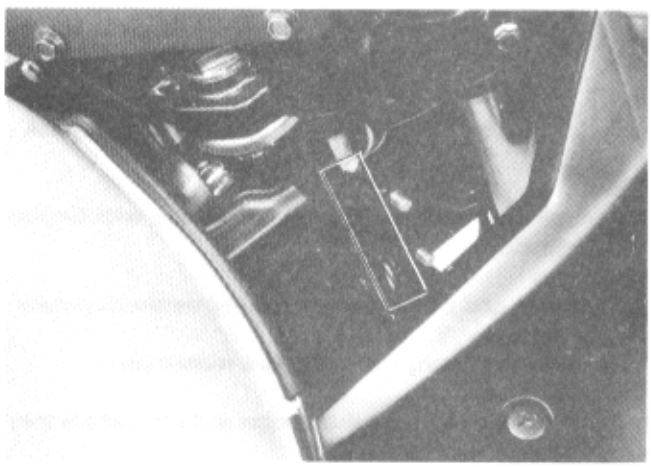
1. Use genuine HONDA or HONDA-recommended parts and lubricants or their equivalent. Parts that do not meet HONDA's design specifications may damage the motorcycle.
2. Use the special tools designed for this product.
3. Use only metric tools when servicing this motorcycle. Metric bolts, nuts, and screws are not interchangeable with English fasteners. The use of incorrect tools and fasteners may damage the motorcycle.
4. Install new gaskets, O-rings, cotter pins, lock plates, etc. when reassembling.
5. When tightening bolts or nuts, begin with larger-diameter or inner bolts first, and tighten to the specified torque diagonally, unless a particular sequence is specified.
6. Clean parts in high flash point 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 page 1-9 Cable & Harness Routing and away from sharp edges and areas where they can be easily pinched between moving parts.

MODEL IDENTIFICATION



BEGINNING FRAME NUMBER: JH2RC160*DM000001~

The frame serial number is stamped on the right side of the steering head.



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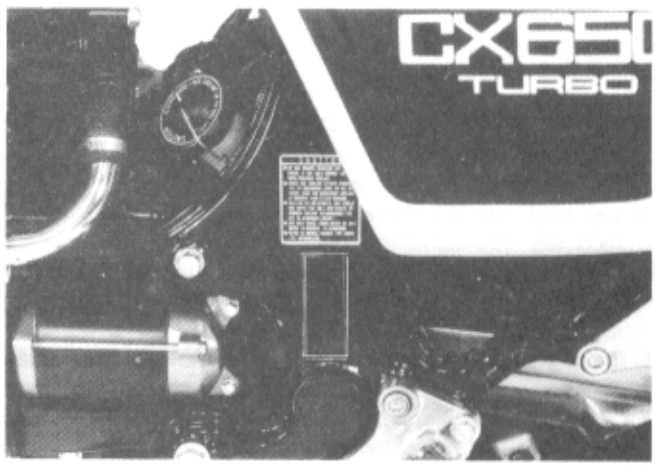

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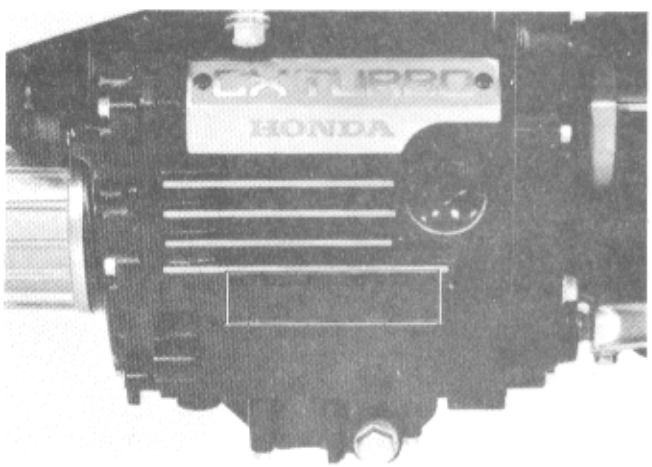
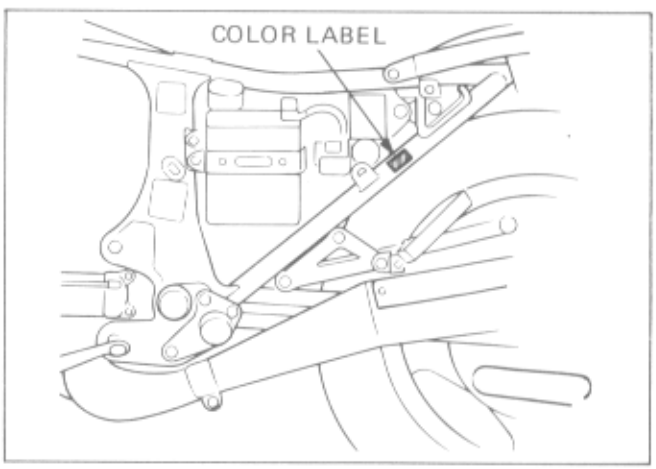


The color label is attached to the location shown. When ordering a color-coded part, always specify its designated color.



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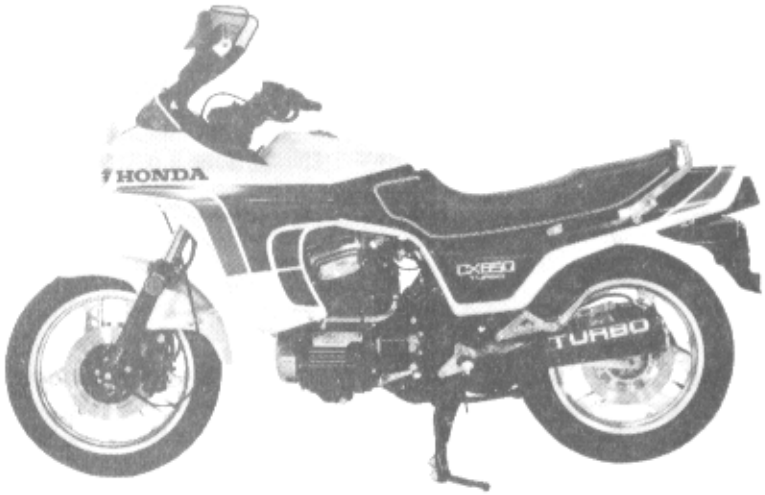

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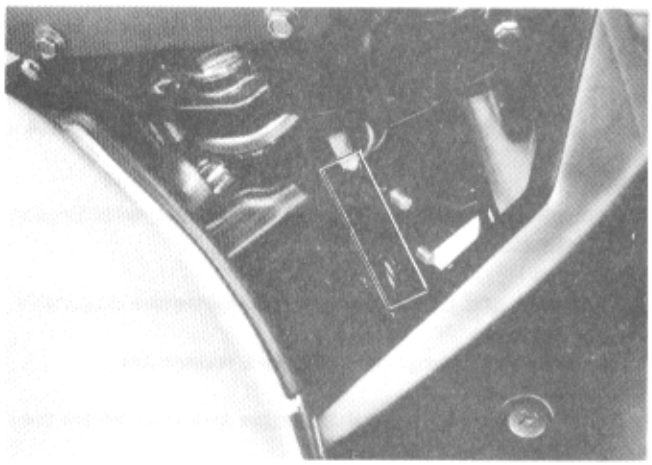

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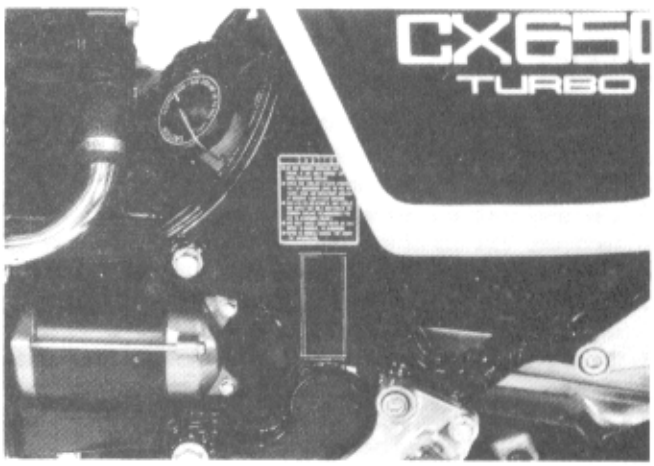

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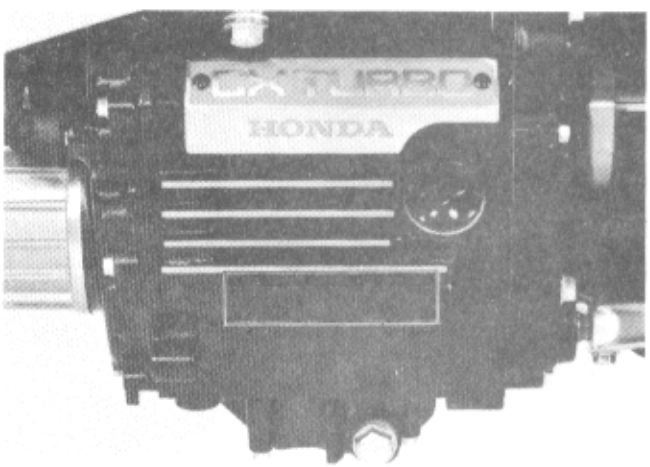

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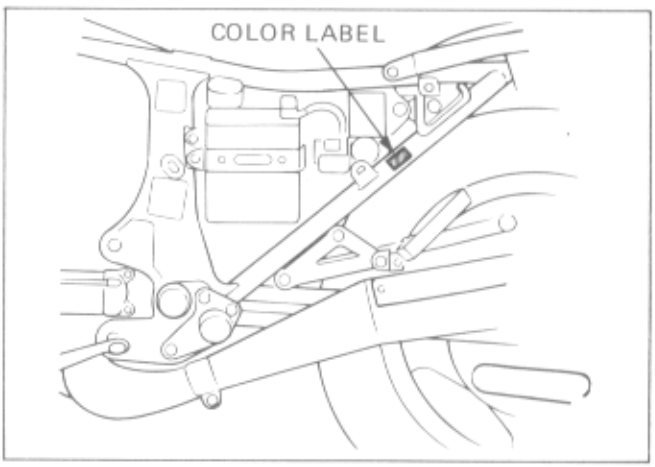

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SPECIFICATIONS

Item				
DIMENSIONS	Overall length			2,220 mm (87.4 in)
	Overall width			775 mm (30.5 in)
	Overall height			1,325 mm (52.2 in)
	Wheel base			1,495 mm (58.9 in)
	Seat height			790 mm (31.1 in)
	Ground clearance			145 mm (5.7 in)
	Dry weight			235 kg (518 lbs)
	Curb weight			256 kg (564 lbs)
FRAME	Type			Diamond
	Front suspension, travel			Telescopic with TRAC, 130 mm (5.1 in)
	Rear suspension, travel			Pro-link Swing arm, 105 mm (4.13 in)
	Front suspension air pressure			0–40 kPa (0–0.4 kg/cm^2, 0–6 psi)
	Rear suspension air pressure			200–600 kPa (2.0–6.0 kg/cm^2, 28–85 psi)
	Front tire size			100/90 V18
	Rear tire size			120/90 V17
	Cold tire pressures	Up to 90 kg (200 lbs) load	Front	250 kPa (2.5 kg/cm^2, 36 psi)
			Rear	250 kPa (2.5 kg/cm^2, 36 psi)
		Up to vehicle capacity load	Front	250 kPa (2.5 kg/cm^2, 36 psi)
			Rear	290 kPa (2.9 kg/cm^2, 41 psi)
	Front brake and lining swept area			Double disc, 238 cm^2 (36.9 sq in) x 4
	Rear brake and lining swept area			Single disc, 238 cm^2 (36.9 sq in) x 2
	Front disc effective diameter			490 mm (19.3 in)
	Rear disc effective diameter			490 mm (19.3 in)
	Caster angle			63°
	Trail length			110 mm (4.3 in)
	Front fork oil capacity			310 cm^3 (10.5 US oz, 8.7 Imp oz) after disassembly
	Rear shock air capacity			260 cm^3 (8.8 US oz, 7.3 Imp oz)
ENGINE	Type, cylinder arrangement			Liquid cooled, turbocharged 4 stroke OHV, 80° V twin engine
	Engine weight			78 kg (172 lbs)
	Bore and stroke			82.5 x 63 mm (3.25 x 2.48 in)
	Displacement			674 cm^3 (41.1 cu-in)
	Compression ratio			7.8 : 1
	Cylinder compression			700–1,000 kPa (7–10 kg/cm^2, 100–142 psi)
	Valve train			Chain driven camshaft and push rod
	Lubrication system			Forced pressure and wet sump
	Oil capacity			3.6 lit (3.8 US qt, 3.2 Imp qt) after disassembly
				3.1 lit (3.3 US qt, 2.7 Imp qt) at draining and oil filter change
				3.0 lit (3.2 US qt, 2.6 Imp qt) after draining
	Oil type			SAE 10W-40, Service classification SF
	Cooling system capacity			2.1 lit (2.2 US qt, 1.8 Imp qt) after disassembly
				1.5 lit (1.6 US qt, 1.3 Imp qt) after draining
	Camshaft			
	Intake valve	Opens		5° BTDC (At 1 mm lift) / 84° BTDC (At 0 mm lift)
		Closes		30° ABDC (At 1 mm lift) / 108° ABDC (At 0 mm lift)
	Exhaust valve	Opens		30° BBDC (At 1 mm lift) / 80° BBDC (At 0 mm lift)
		Closes		5° ATDC (At 1 mm lift) / 104° ATDC (At 0 mm lift)
	Valve clearance	IN		0.10 mm (0.004 in)
	(cold)	EX		0.12 mm (0.005 in)
	Idle speed			1,100 ± 100 rpm

Item		
FUEL SYSTEM	Type	Computerized fuel injection
	Fuel pressure	255 kPa (2.55 kg/cm^2, 36.3 psi)
	Fuel pump type	Electric
	Fuel capacity	20 lit (5.3 US gal, 4.4 Imp gal)
	Fuel reserve capacity	5 lit (1.3 US gal, 1.1 Imp gal)
	Fuel type	All gasoline, 89 or higher pump octane or 94 RON minimum
DRIVE TRAIN	Clutch type	Wet, multi plate
	Transmission	5 speed constant mesh
	Primary reduction ratio	1.725 (69/40)
	Gear ratio: 1st	2.500 : 1 (40/16)
	2nd	1.714 : 1 (36/21)
	3rd	1.280 : 1 (32/25)
	4th	1.036 : 1 (29/28)
	5th	0.839 : 1 (26/31)
	Final reduction ratio	3.400 : 1 (34/10)
	Gear shift pattern	Left foot operated, 1-N-2-3-4-5
	Final gear oil capacity	160–180 cm^3 (5.4–6.1 US oz, 4.5–5.1 Imp oz)
ELECTRICAL	Ignition	Transistorized
	Ignition timing "F" mark	10° BTDC at 1,100 rpm
	Starting system	Starter motor
	Alternator	Three phase 12 V–340 W/5,000 rpm
	Battery capacity	12 V – 14 AH
	Spark plug	
	Standard	DPR8EV-9 (NGK), X24EPR-GU9 (ND)
	For extended high speed riding	DPR9EV-9 (NGK), X27EPR-GU9 (ND)
	For cold climate (Below 5°C, 41°F)	DPR7EV-9 (NGK), X22EPR-GU9 (ND)
	Spark plug gap	0.8–0.9 mm (0.031–0.035 in)
	Fuse	30 A (main), 15 A (sub), 10 A (fan motor)
LIGHTS	Headlight (High/Low)	12V–60/55W H4 bulb (Phillips 12342/99, or equivalent)
	Tail/brake light	12V–8/27W (3/32cp, SAE No. 1157)
	Turn signal light	12V–23W (32cp, SAE No. 1073)
	Meter light	12V–3.4W (2cp, SAE No. 158)
	Neutral indicator	12V–3.4W (2cp, SAE No. 158)
	Turn signal indicator	12V–3.4W (2cp, SAE No. 158)
	High beam indicator	12V–3.4W (2cp, SAE No. 158)
	Oil pressure warning light	12V–3.4W (2cp, SAE No. 158)
	Fuel system warning light	12V–3.4W (2cp, SAE No. 158)
	Fuel reserve warning light	12V–3.4W (2cp, SAE No. 158)
	Running light	12V–4W

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TORQUE VALUES

ENGINE

Item	Q'ty	Thread dia. (mm)	Torque		
			N·m	kg-m	ft-lb
Crankshaft cap bolt	7	8	20– 24	2.0– 2.4	14–17
Connecting rod cap nut	4	9	41– 45	4.1– 4.5	30–33
Cylinder head bolt, 12 mm	8	12	50– 60	5.0– 6.0	36–43
8 mm	4	8	18– 25	1.8– 2.5	13–18
Exhaust manifold nut	4	8	20– 25	2.0– 2.5	14–18
Turbocharger bracket bolt	6	8	20– 25	2.0– 2.5	14–18
Turbocharger inlet flange nut	3	8	20– 25	2.0– 2.5	14–18
Flywheel rotor bolt	1	12	80–100	8.0–10.0	58–72
Cam sprocket bolt	2	7	16– 20	1.6– 2.0	12–14
Cam sprocket lock nut	1	20	80–100	8.0–10.0	58–72
Primary drive gear bolt	1	12	80– 95	8.0– 9.5	58–69
Clutch center lock nut	1	20	80–100	8.0–10.0	58–72
Transmission holder bolt, 6 x 20 mm	2	6	15– 20	1.5– 2.0	11–14
6 x 32 mm	2	6	10– 14	1.0– 1.4	7–10
7 x 32 mm	2	7	16– 20	1.6– 2.0	12–14
Starting clutch torx bolt	3	8	20– 25	2.0– 2.5	14–18
Neutral switch	1	8	10– 14	1.0– 1.4	7–10
Water temperature sending unit	1	8	21– 25	2.1– 2.5	15–18
Oil pressure switch	1	–	18– 23	1.8– 2.3	13–17
Water temperature sensor	1	–	21– 25	2.1– 2.5	15–18
Cam chain tensioner base bolt	1	8	18– 25	1.8– 2.5	13–18
Valve adjuster lock nut	8	6	15– 18	1.5– 1.8	11–13
Oil filter bolt	1	12	20– 25	2.0– 2.5	14–18
Engine oil drain bolt	1	14	15– 25	1.5– 2.5	11–18
Spark plug	2	12	12– 18	1.2– 1.8	9–13

FRAME

Item		Q'ty	Thread dia. (mm)	Torque		
				N·m	kg-m	ft-lb
Engine mount bolt (rear-lower)		1	12	60– 80	6.0– 8.0	43–58
Engine mount bolt (rear-upper)		2	10	50– 70	5.0– 7.0	36–51
Engine mount bolt (front)	NOTE	3	10	50– 70	5.0– 7.0	36–51
Front engine hanger nut		2	10	30– 40	3.0– 4.0	22–29
Front engine hanger bolt		2	10	35– 45	3.5– 4.5	25–33
Front axle nut		1	12	55– 70	5.5– 7.0	40–51
Front axle holder nut		4	10	18– 25	1.8– 2.5	13–18
Front fork pinch bolt		2	7	9– 15	0.9– 1.5	7–11
Front fork pinch bolt		2	10	45– 55	4.5– 5.5	33–40
Steering adjustment nut		1	26	14– 16	1.4– 1.6	10–12
Steering stem nut		1	24	80–120	8.0–12.0	58–87
Handlebar holder bolt		4	8	18– 30	1.8– 3.0	13–22
Rear axle nut		1	16	60– 80	6.0– 8.0	43–58
Rear axle pinch bolt		1	8	20– 30	2.0– 3.0	14–22

NOTE: Apply oil to the threads of the nuts before tightening them.

Item	Q'ty	Thread dia. (mm)	Torque		
			N-m	kg-m	ft-lb
Swing arm pivot bolt	1	30	16– 20	1.6– 2.0	12–14
Swing arm pivot lock nut	1	30	90–120	9.0–12.0	52–87
Rear shock absorber mount bolt	2	10	38– 48	3.8– 4.8	28–35
Pro-link linkage (shock link bolt)	1	10	50– 65	5.0– 6.5	36–47
(shock arm socket bolt)	2	10	40– 50	4.0– 5.0	29–36
(linkage connecting bolt)	1	10	50– 65	5.0– 6.5	36–47
Rear brake stopper arm bolt (front)	1	10	30– 40	3.0– 4.0	22–29
Rear brake stopper arm nut (front)	1	8	18– 28	1.8– 2.8	13–20
Rear brake stopper arm bolt (rear)	1	8	18– 28	1.8– 2.8	13–20
Final drive case nut	4	8	27– 34	2.7– 3.4	20–25
Brake hose bolt	7	10	25– 40	2.5– 4.0	18–29
Front caliper mount bolt (upper)	2	10	30– 40	3.0– 4.0	22–29
Front caliper mount bolt (lower)	2	8	20– 25	2.0– 2.5	14–18
Brake caliper pivot bolt	3	12	25– 30	2.5– 3.0	18–22
Brake caliper bolt	3	8	20– 25	2.0– 2.5	14–18
Brake caliper bleed valve	3	5	4– 7	0.4– 0.7	3– 5
Fuel hose joint bolt	1	17	35– 50	3.5– 5.0	25–36
Fuel hose joint nut	1	–	27– 29	2.7– 2.9	20–21
Fuel valve nut	1	22	20– 25	2.0– 2.5	14–18
Exhaust pipe joint nut	4	8	20– 28	2.0– 2.8	14–20
Muffler band bolt	2	8	18– 28	1.8– 2.8	13–20
Muffler mount bolt	3	10	30– 40	3.0– 4.0	22–29
Fairing bracket bolt	4	8	20– 30	2.0– 3.0	14–22
Rear brake pedal bolt	1	8	18– 28	1.8– 2.8	13–20
Foot peg holder bolt	4	8	20– 30	2.0– 3.0	14–22
Gearshift pedal	1	6	10– 15	1.0– 1.5	7–11
Radiator mount bolt	3	8	20– 30	2.0– 3.0	14–22

Torque specifications listed above are for the most important tightening points. If a torque specification is not listed, follow the standards given below.

STANDARD TORQUE VALUES

Type	Torque N·m (kg-m, ft-lb)	Type	Torque N·m (kg-m, ft-lb)
5 mm bolt, nut	4.5–6.0 (0.45–0.6, 3.3–4.3)	5 mm screw	3.5–5.0 (0.35–0.5, 2.5–3.6)
6 mm bolt, nut	8–12 (0.8–1.2, 6–9)	6 mm screw	7–11 (0.7–1.1, 5–8)
8 mm bolt, nut	18–25 (1.8–2.5, 13–18)	6 mm flange bolt, nut	10–14 (1.0–1.4, 7–10)
10 mm bolt, nut	30–40 (3.0–4.0, 22–29)	8 mm flange bolt, nut	24–30 (2.4–3.0, 17–22)
12 mm bolt, nut	50–60 (5.0–6.0, 36–43)	10 mm flange bolt, nut	30–40 (3.0–4.0, 22–29)

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TOOLS

SPECIAL

*: These tools are designed and have been used before.

DESCRIPTION	TOOL NUMBER	ALTERNATE TOOL	TOOL NUMBER	REF SECT.
Valve guide reamer, 6.6 mm	07984–6110000	Valve guide reamer	07984–6570100	7-8,7-9
*		*		
Valve guide driver attachment	07943–4150000	*		7-9
Clutch center holder	07923–4610000	Clutch center holder	07923–3710000	8-3,8-8
Gear holder	07924–MC70002	Gear holder modified	07924–4150000	9-5,11-3,11-8,12-5,12-16
		Gear holder modified	07924–MC70000	9-5,11-3,11-8,12-5,12-16
		Gear holder modified	07924–MC70001	9-5,11-3,11-8,12-5,12-16
Socket wrench, 17 x 27 mm	07907–MC70000	Equivalent tool commercially available in U.S.A.		10-7,11-3,11-8,11-10
Mechanical seal driver attachment	07945–4150400	Mechanical seal installer (U.S.A. only)	GN–AH–065–415	10-10
Crank cap driver	07945–4150100			12-3,13-15
Bearing remover, 20 mm	07936–3710600			
Bearing remover, Handle	07936–3710100	Bearing remover set	07936–371000	12-8
Bearing remover weight	07936–3710200			
Driver	07949–3710000			12-11
Piston remover	07941–MC70000	Equivalent tool commercially available in U.S.A.		13-3
Crank cap puller	07935–4150000	U.S.A.: Use press		13-7
Dis/Assembly tool	07973–MC70000			13-11,13-13
Hex wrench, 6 mm	07917–3230000	Equivalent tool commercially available in U.S.A.		15-16,15-21
Snap ring pliers	07914–3230001	Equivalent tool commercially available in U.S.A.		15-16,15-22,18-7,18-10
Fork seal driver	07947–3710101			15-21
Steering stem socket	07916–3710100			15-26,15-30
Steering stem driver	07946–MB00000	Steering stem driver	07946–3710601	15-28
Ball race remover	07953–4250002			15-28
Bearing race remover	07946–3710500			15-28
Attachment	07946–3710701	Attachment	07946–3710700	15-28,15-29
Bearing retainer wrench	07910–4300000			16-5,16-7
*Oil seal driver attachment (Ring)	07965–ME70100			16-3
Lock nut wrench	07908–4690001	Lock nut wrench	KS–HBA–469–08 (U.S.A. only)	16-16,16-21
Bearing remover, 30 mm	07936–8890300			16-18
Attachment	07947–6340201			17-5,17-11
Pinion holder	07924–ME40000			17-6,17-15
Pinion retainer lock nut wrench	07910–ME80000			17-7,17-10
Shaft puller	07931–ME40000			17-7
Attachment	07945–3330300			17-8
Driver	07945–3710200	Attachment	07746–0030100	17-10
Driver	07931–4630300	- Fork seal driver — Use together	07947–3710100	17-10
		- Attachment — Use together	07746–0010200	
Timing inspection plug	07999–4150000			20-3
Sensor inspection adaptor	07999–MC70000			24-19,24-20,24-22
*Inspection gauge, 2.9 mm	07998–ME70000	Inspection gauge 2.9 mm (Included in Turbo Kit U.S.A.)	GN–AHM–03–MC7	24-23
Oil seal driver attachment	07965–MA10200			16-11,16-13
Oil seal driver	07965–MC70100			16-11,16-13

COMMON

DESCRIPTION	TOOL NUMBER	ALTERNATE TOOL	TOOL NUMBER	REF SECT
Valve adjusting wrench, 10 x 12 mm	07708–0030200	Equivalent tool commercially available in U.S.A.		3-9
Valve adjuster	07708–0030400	Valve adjustment wrench	89201–200–000	3-9
Combination pressure/Vacuum tester	07406–0050000	Hand pressure pump with gauge (Included in Turbo Kit: U.S.A. only)	ST–AH–255–MC7	6-2,24-19,24-24
Valve spring compressor	07757–0010000	Valve spring compressor	07957–3290001	7-6,7-13
Valve guide driver, 6.6 mm	07742–0010200	Valve guide driver, 6.6 mm	07942–6570100	7-8,7-9
Rotor Puller	07733–0020001	Rotor puller	07933–3950000	9-5
Lock nut wrench 26 x 30 mm	07716–0020203	Lock nut wrench	07716–0020202	8-3,8-8
Extension	07716–0020500	Equivalent tool commercially available in U.S.A.		8-3,8-8,15-25
Torx driver bit T40	07703–0010100	Equivalent tool commercially available in U.S.A.		9-7
Piston slider	07755–0010000	Equivalent tool commercially available in U.S.A.		13-18
Bearing remover expander	07746–0050100	Equivalent tool commercially available in U.S.A.		15-8,16-6
Bearing remover collet, 15 mm	07746–0050400	Equivalent tool commercially available in U.S.A.		15-8
Socket wrench, 30 x 32 mm	07716–0020400	Equivalent tool commercially available in U.S.A.		15-25,15-31
Bearing remover, 17 mm	07746–0050500	Equivalent tool commercially available in U.S.A.		16-6
Socket bit, 17 mm	07703–0020500	Equivalent tool commercially available in U.S.A.		16-6,16-21
Attachment, 25 mm I.D.	07746–0030200	Equivalent tool commercially available in U.S.A.		17-10
Digital circuit tester (Kowa)	07411–0020000	Digital multimeter (Included in Turbo Kit–U.S.A. only)	KS–AHM–32–003	22-3,22-4,22-7,22-10, 22-11,24-19,24-20,24-22
Fuel pressure gauge	07406–0040000			24-17
Vacuum gauge	07404–0020000	Equivalent tool commercially available in U.S.A.		24-25
Attachment, 32 x 35 mm	07746–0010100			12-11,17-5,17-9
Attachment, 37 x 40 mm	07746–0010200			16-19
Attachment, 42 x 47 mm	07746–0010300			9-9,12-11,15-11 15-29,16-7,17-11
Attachment, 52 x 55 mm	07746–0010400			12-11,17-9
Attachment, 62 x 68 mm	07746–0010500			12-11
Pilot, 15 mm	07746–0040300			15-11
Pilot, 17 mm	07746–0040400			16-7
Pilot, 20 mm	07746–0040500			12-11
Pilot, 25 mm	07746–0040600			12-11
Pilot, 30 mm	07746–0040700			17-5
Pilot, 22 mm	07746–0041000			9-9
Driver	07749–0010000			9-9,10-10,12-11 15-11,15-28,15-29, 16-7,16-19,17-5 17-8,17-9,17-11

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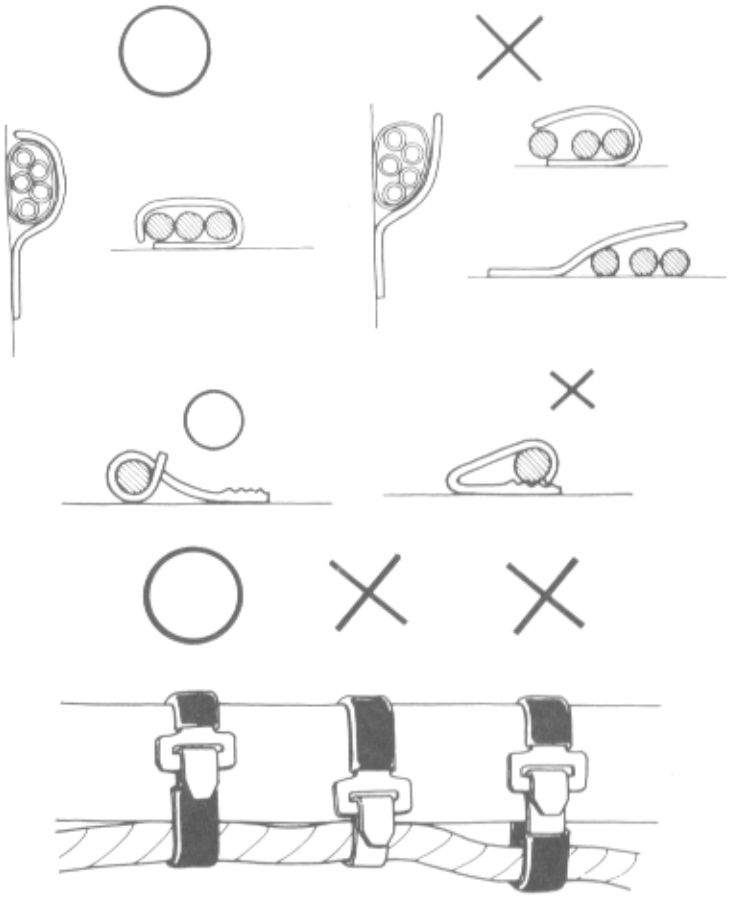
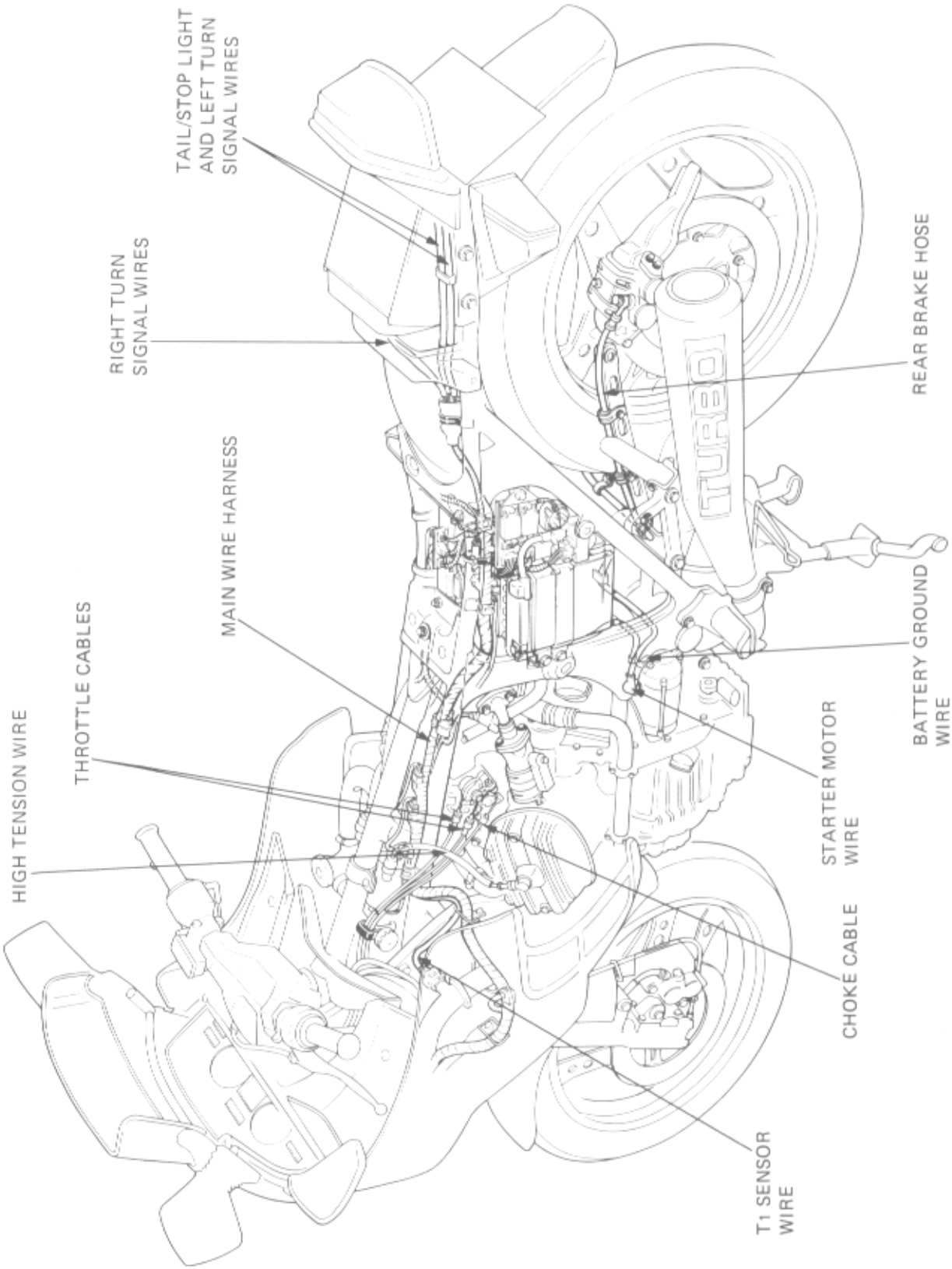
CABLE & HARNESS ROUTING

Note the following when routing cables and wire harnesses.

- A loose wire, harness or cable can be a safety hazard. After clamping, check each wire to be sure it is secure.
- Do not squeeze wires against the weld or end of its clamp when a weld-on clamp is used.
- Secure wires and wire harnesses to the frame with their respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.
- Route harnesses so they are not pulled taut or have excessive slack.
- Protect wires and harnesses with electrical tape or tubes if they are contact a sharp edge or corner. Clean the attaching surface thoroughly before applying tape.
- Do not use wires or harnesses with a broken insulator. Repair by wrapping them with a protective tape or replace them.
- Route wire harnesses avoid sharp edges or corners.
- Also avoid the projected ends of bolts and screws.
- Keep wire harnesses away from the exhaust pipes and other hot parts.
- Be sure grommets are seated in their grooves properly.
- After clamping, check each harness to be certain that it is not interferring with any moving or sliding parts.
- Wire harnesses routed along the handlebars should not be pulled taut, have excessive slack, be pinched, or interfer with adjacent or surrounding parts in all steering positions.
- After routing, check that the wire harnesses are not twisted or kinked.





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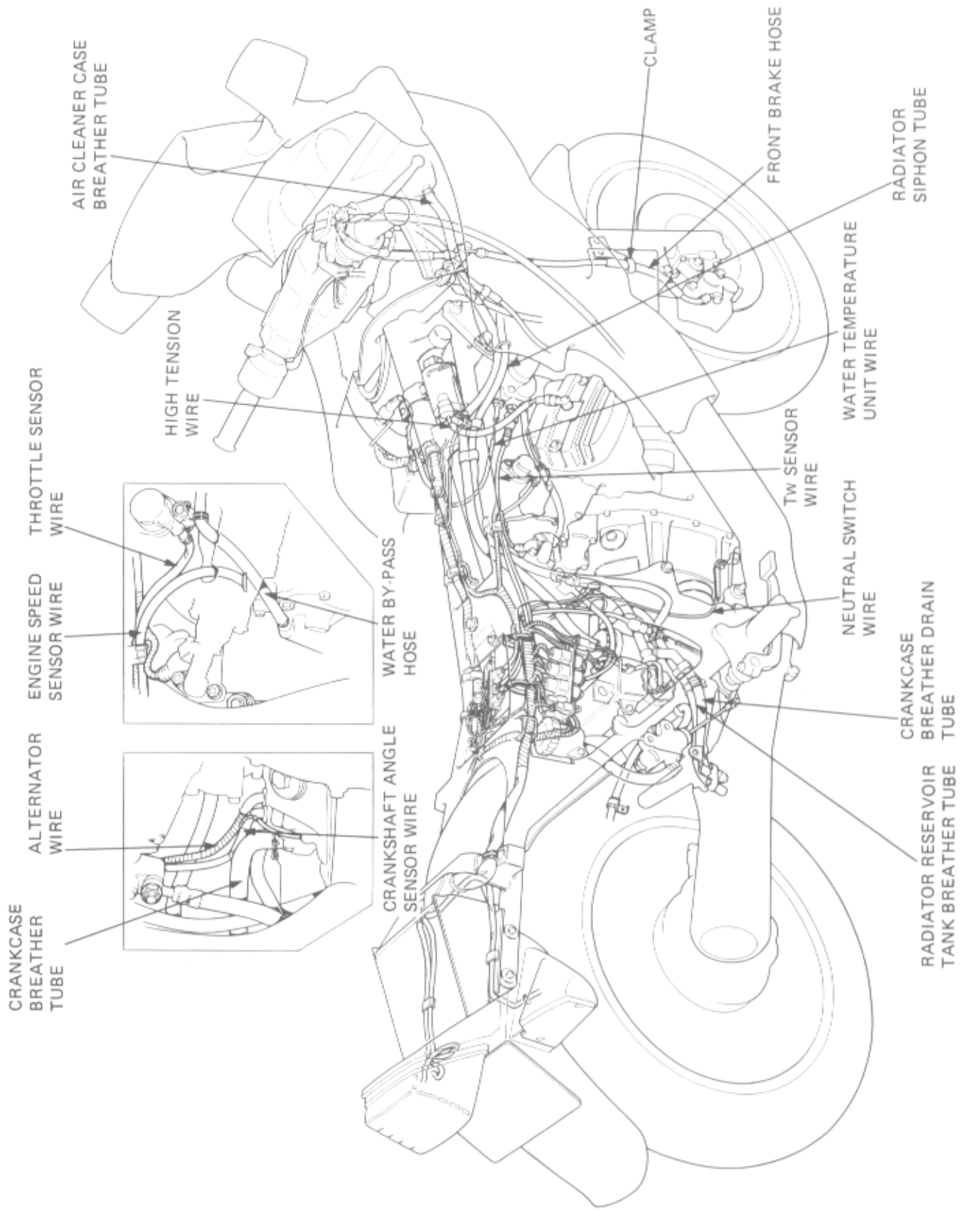

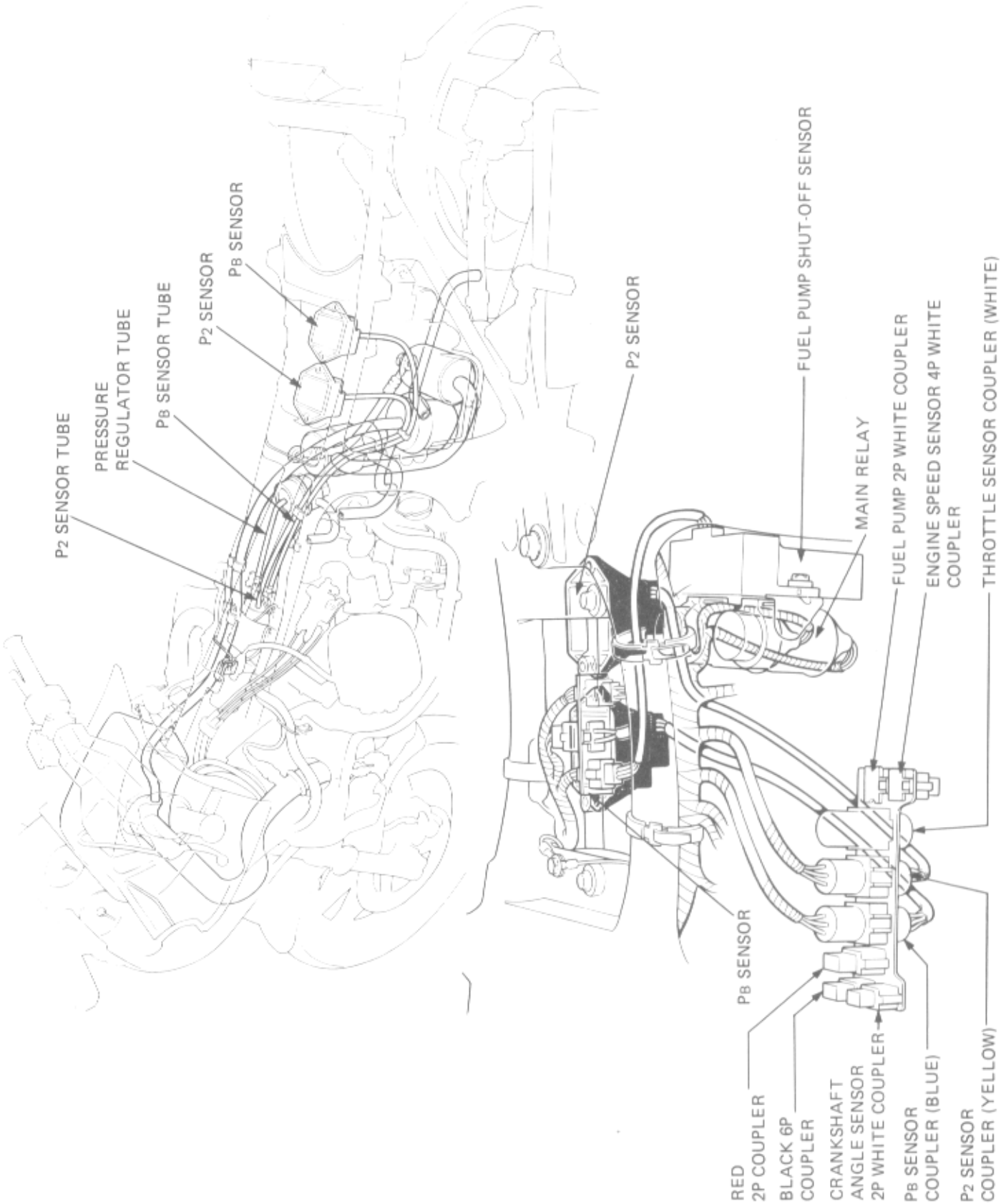

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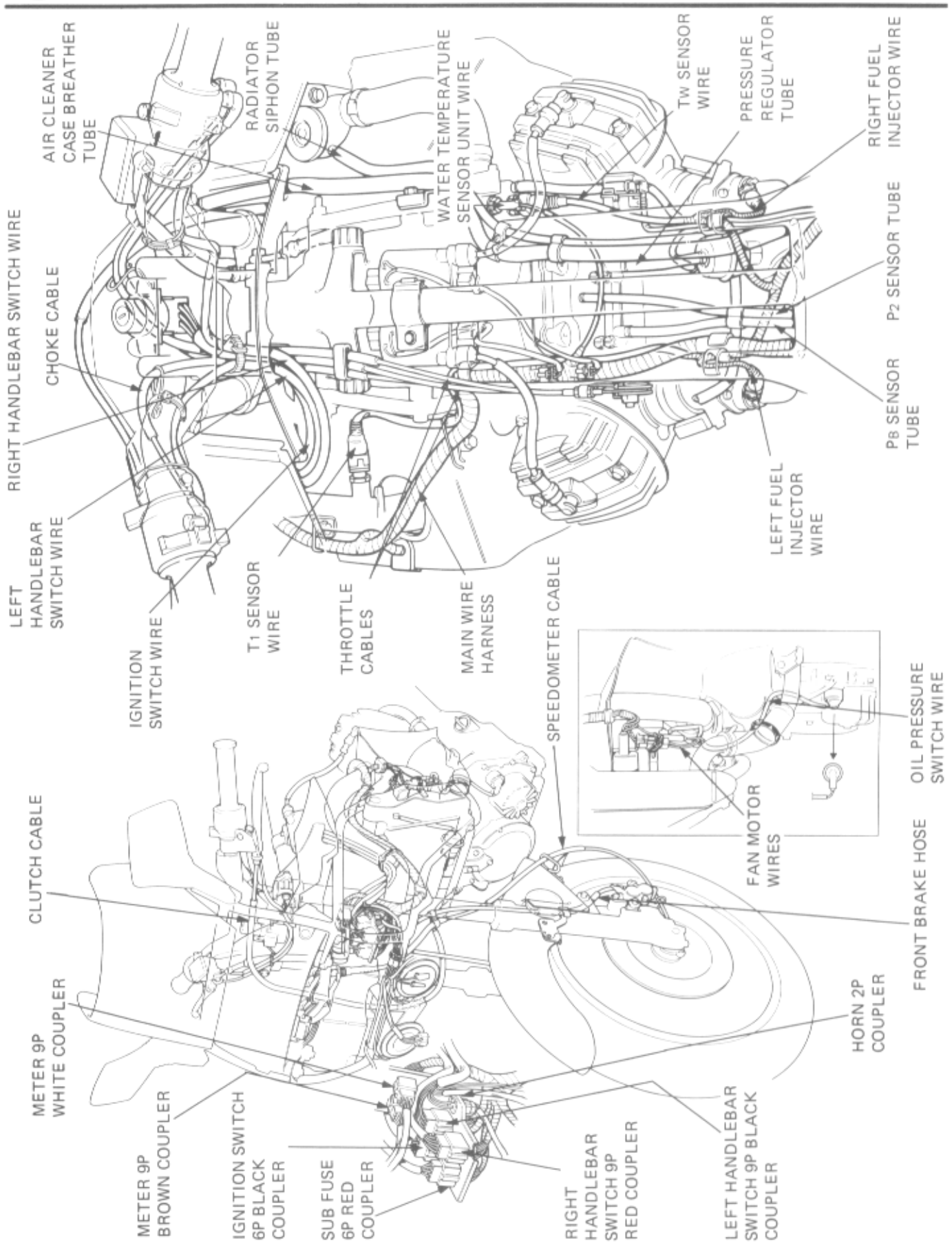

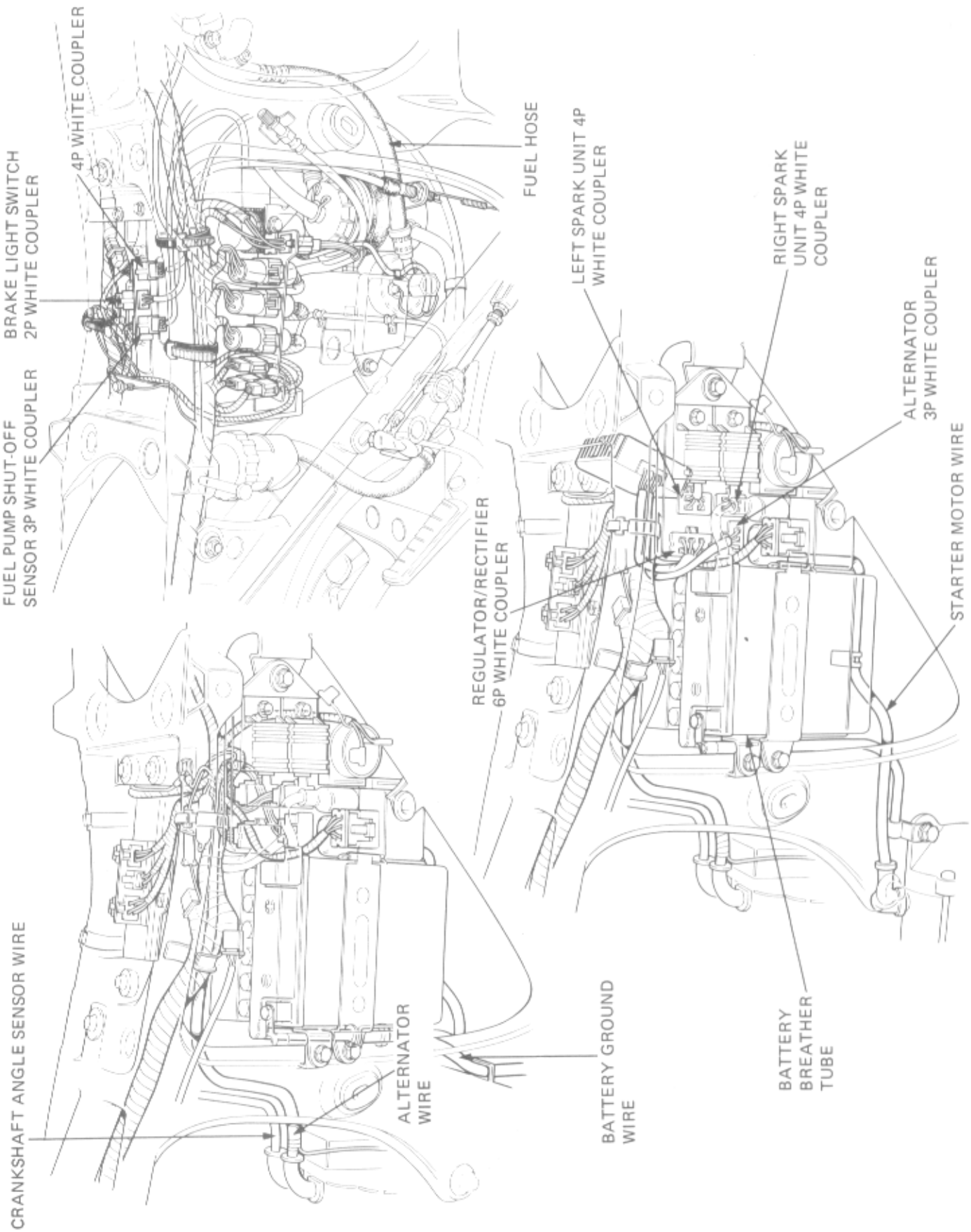

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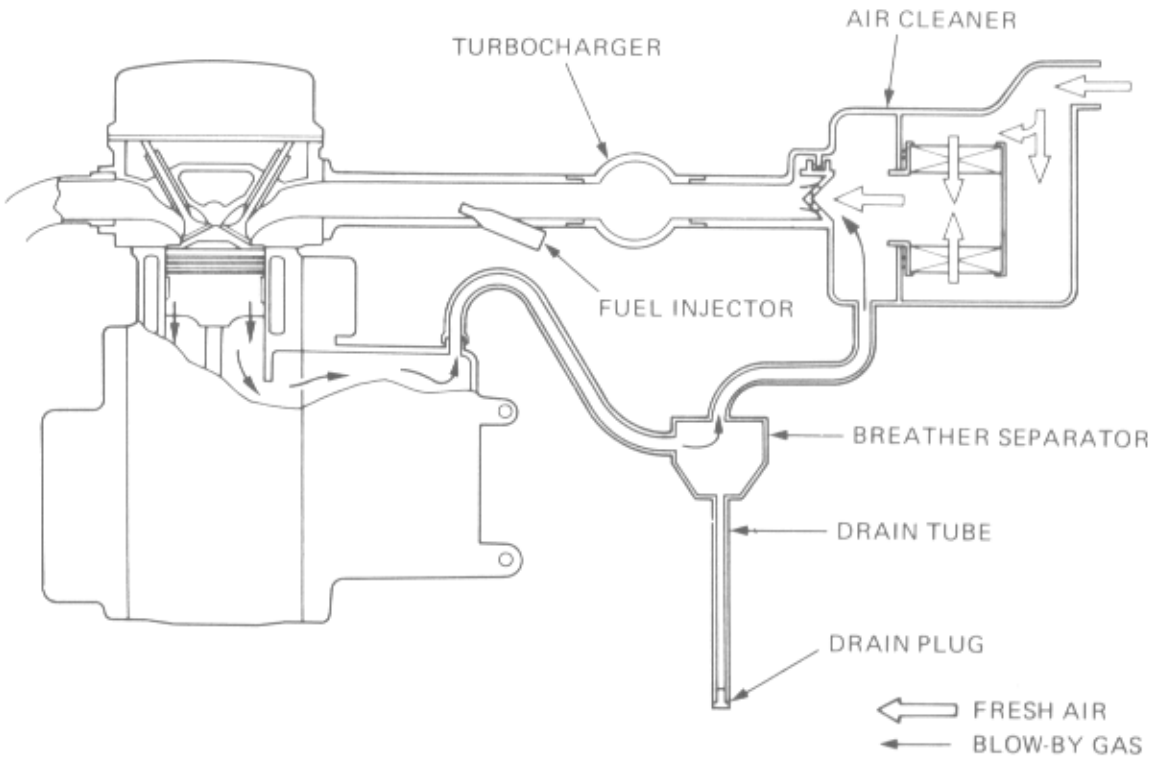
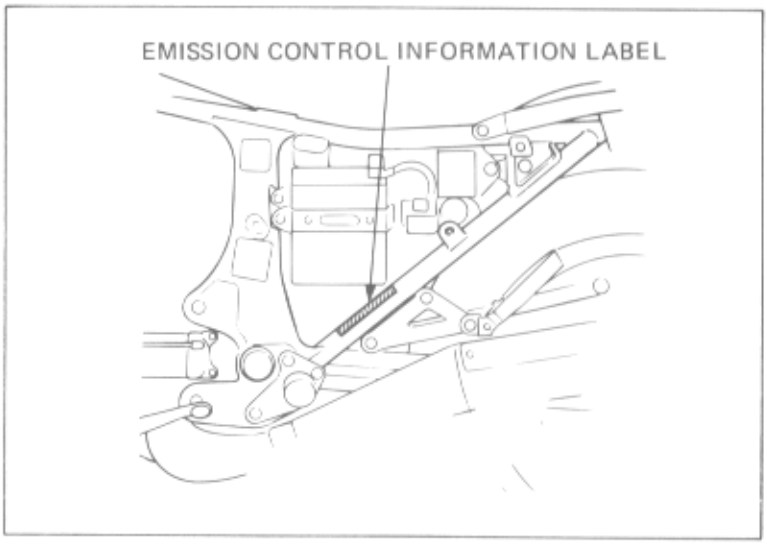
EMISSION CONTROL SYSTEM

The CX650 Turbo engine is equipped with a "closed crankcase system" to prevent discharging exhaust emissions into the atmosphere. Blow-by gas is returned to the combustion chamber through the breather separator, air cleaner and turbocharger.

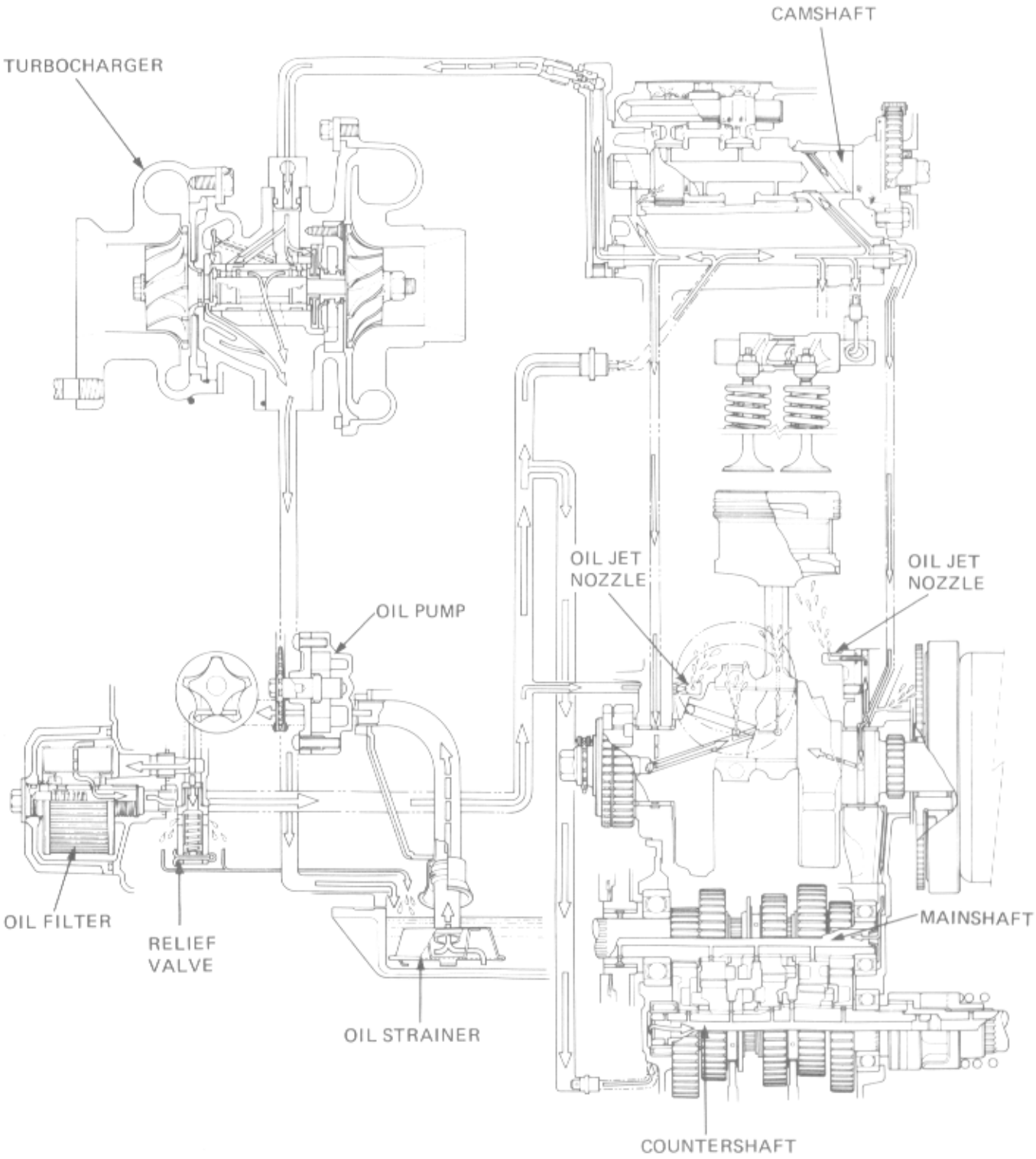


EMISSION CONTROL INFORMATION LABEL

An Emission Control Information Label is located on the frame as shown. It gives basic tune-up specifications.



LUBRICATION DIAGRAM



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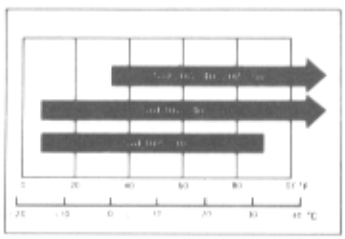
2. LUBRICATION

SERVICE INFORMATION

GENERAL

- Make sure that all oil passages are clean and not clogged before assembly. Do not use different brands of oil in the engine as they may not be compatible.
- Refer to section 8 for maintenance of the oil pump and pressure relief valve.

SPECIFICATIONS

Engine oil	Capacity	3.0 lit (3.2 US qt, 2.6 Imp qt) at draining 3.1 lit (3.3 US qt, 2.7 Imp qt) at draining and oil filter change 3.6 lit (3.8 US qt, 3.2 Imp qt) at disassembly
	Oil recommendation	API service classification: SF Viscosity: SAE 10W–40 (General, all temperature) Other viscosities shown in the chart may be used when the average temperature in your riding area is within the indicated range. 
	Oil pump delivery	35 lit (37.0 US qt, 30.8 Imp qt) at 3,300 rpm
	Oil pressure	500–600 kPa/4,000 rpm (5–6 kg/cm^2/4,000 rpm, 71.1–85.3 psi/4,000 rpm)
Final drive gear oil	Capacity	160–180 cm^3 (5.4–6.1 US oz, 4.5–5.1 Imp oz)
	Recommended oil	Hypoid gear oil Above 5°C/41°F SAE 90 Below 5°C/41°F SAE 80

TORQUE VALUES

Engine oil pressure switch	18–23 N·m (1.8–2.3 kg-m, 13–17 ft-lb)
Oil filter bolt	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Engine oil drain bolt	15–25 N·m (1.5–2.5 kg-m, 11–18 ft-lb)

TROUBLESHOOTING

Oil Level Too Low:
- Normal oil consumption.
- External oil leaks.
- Worn piston rings.

Oil Contamination:
- Oil or filter not changed often enough.
- Faulty head gasket.

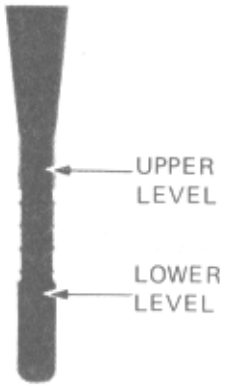
Low Oil Pressure:
- Faulty warning light switch.
- Pressure relief valve stuck open.
- Plugged oil pick-up screen.
- Oil pump worn.

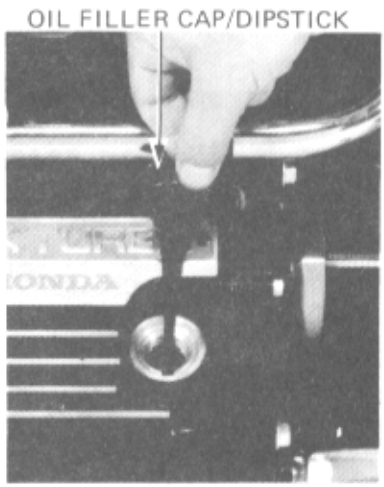
High Oil Pressure:
- Pressure relief valve stuck closed.
- Plugged oil filter, gallery, or metering orifice.
- Incorrect oil being used.

No Oil Pressure:
- Oil level too low.
- Oil pump drive chain broken.
- Faulty oil pump.

ENGINE OIL LEVEL CHECK

Place the motorcycle on its center stand. Check the oil level with the filler cap/dipstick. Do not screw in the cap when making this check. If the level is below the lower level mark on the dipstick, fill to the upper level mark with the recommended oil.





ENGING OIL & OIL FILTER CHANGE

NOTE

> Change engine oil with the engine at normal operating temperature and vehicle on its center stand to assure complete and rapid draining.

Remove the oil filler cap.
Remove the drain plug to drain oil from the engine.

NOTE

> The oil filter is regularly scheduled to be replaced every other time the oil is changed.

Screw out the oil filter bolt and remove the oil filter element from the oil filter case. Check operation of the bypass valve in the oil filter bolt. Make sure that the O-rings on the filter bolt and the oil filter cover are not damaged and are in good condition.

Install a new oil filter element and retighten the oil filter bolt.

Torque the oil filter bolt.

TORQUE: 20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)

Check that the sealing washer on the drain plug is in good condition and reinstall the drain plug.

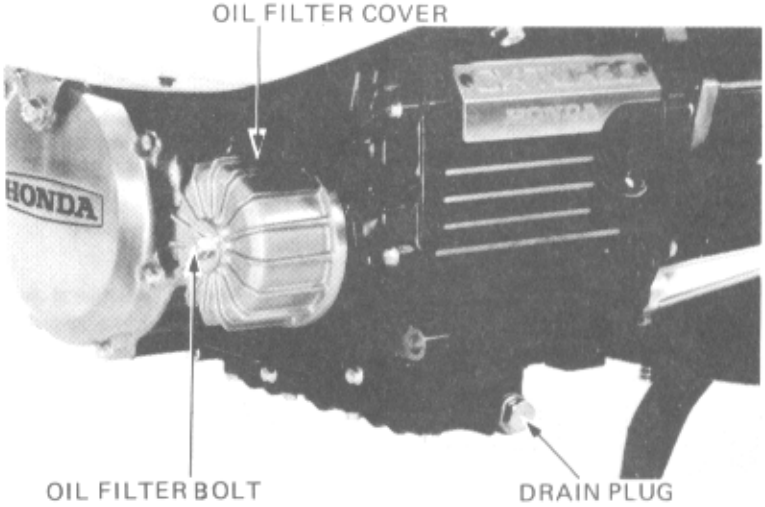
TORQUE: 15–25 N·m (1.5–2.5 kg-m, 11–18 ft-lb)

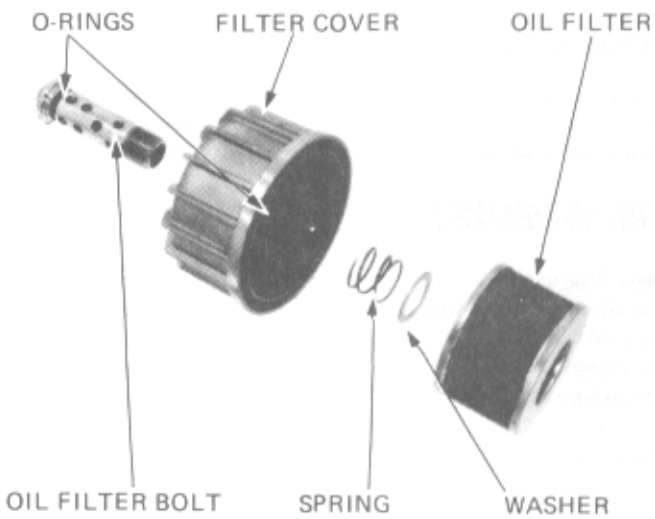
Fill the engine with **3.1 liters (3.3 US qt, 2.7 Imp qt)** of recommended oil.

RECOMMENDED OIL
API Service Classification: SF
General, all temperature: SAE 10W-40

Install the oil filler cap/dipstick.
Start the engine and let it idle for a few minutes.

Stop the engine, make sure that the oil level is at the upper level mark, and make sure there are no oil leaks.





OIL PRESSURE

Remove the wire from the oil pressure switch.
Remove the oil pressure switch and connect the oil pressure adapter.

NOTE

Apply vinyl tape to the oil pressure switch threads to keep them clean. So the case threads will not be damaged during reinstallation.

Warm the engine up to normal operating temperature and check the pressure at 1,100 rpm.

STANDARD: 155 kPa (1.55 kg/cm², 22 psi)

CAUTION

Check that the oil pressure warning light goes out when the engine is started. If the oil pressure warning light stays on, stop the engine immediately and determine the reason why.

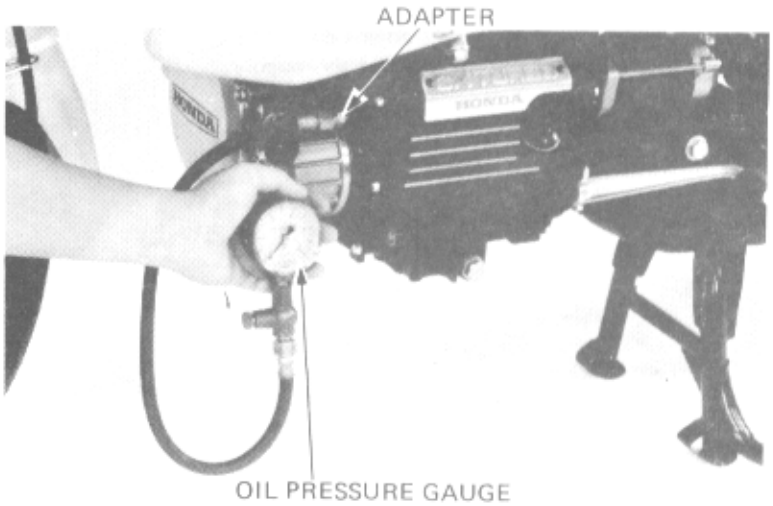
NOTE

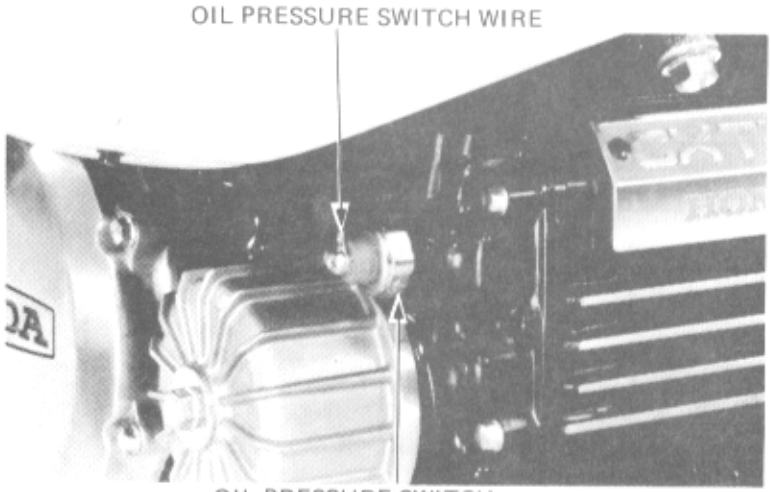
Before installing the pressure switch, apply a liquid sealant or seal tape to the threads.

Reinstall the oil pressure switch.

TORQUE: 18–23 N·m
(13–17 kg-m, 1.8–2.3 ft-lb)

Connect the oil pressure switch wire.
Place the dust cover over the switch.



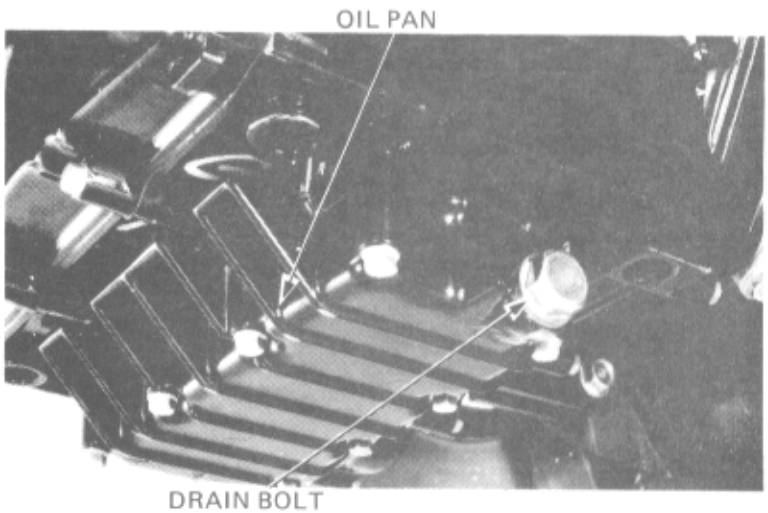


OIL STRAINER CLEANING

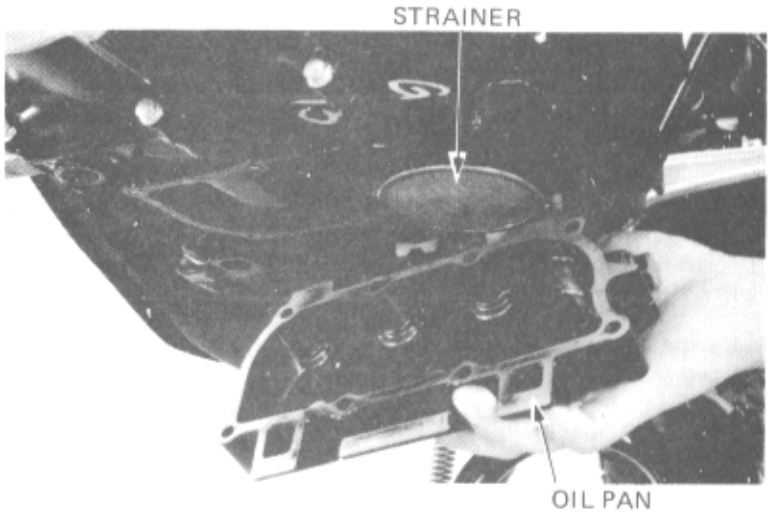
Drain the engine oil.
Remove the oil pan by removing the eight, 6 mm bolts.

NOTE

Loosen the bolts in an X pattern in two or more steps.



Remove the oil strainer from the engine case.
Clean the oil strainer screen and oil pan thoroughly.

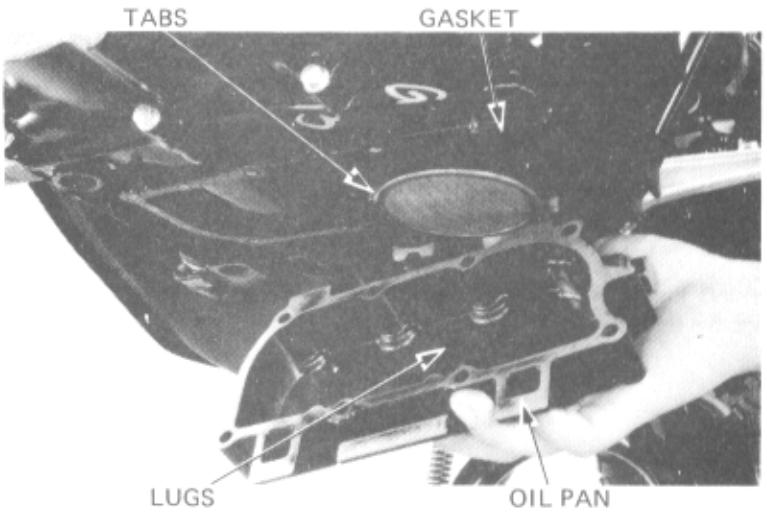


Install the new gasket on the oil pan.
Install the oil strainer into the oil pump inlet.

NOTE

Align the tabs of the strainer body with the lug in the oil pan.

Install the oil pan on the engine case.



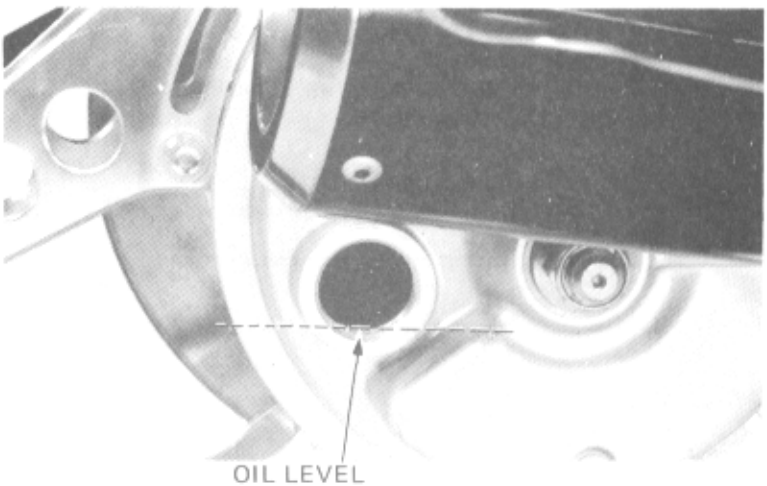
FINAL DRIVE LUBRICANT CHECK/ REPLACEMENT

OIL LEVEL CHECK

Place the motorcycle on its center stand on a level surface.
Remove the oil filler cap.
Check that the final gear case is filled up to the lower edge of the oil filler hole.

NOTE

If the level is low, check for leaks. Pour fresh oil through the oil filler opening until it reaches the lower edge of the opening.

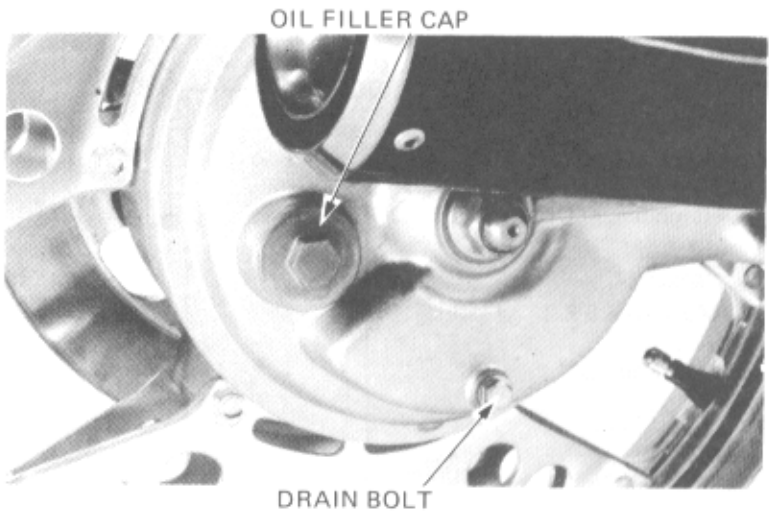


OIL REPLACEMENT

Remove the oil filler cap.
Remove the drain bolt to drain all oil from the final gear case.
Reinstall the drain bolt securely.
Fill the gear case with the recommended oil up to the correct level.

OIL CAPACITY:
160–180 cm^3
(5.4–6.1 US oz, 4.5–5.1 Imp oz)

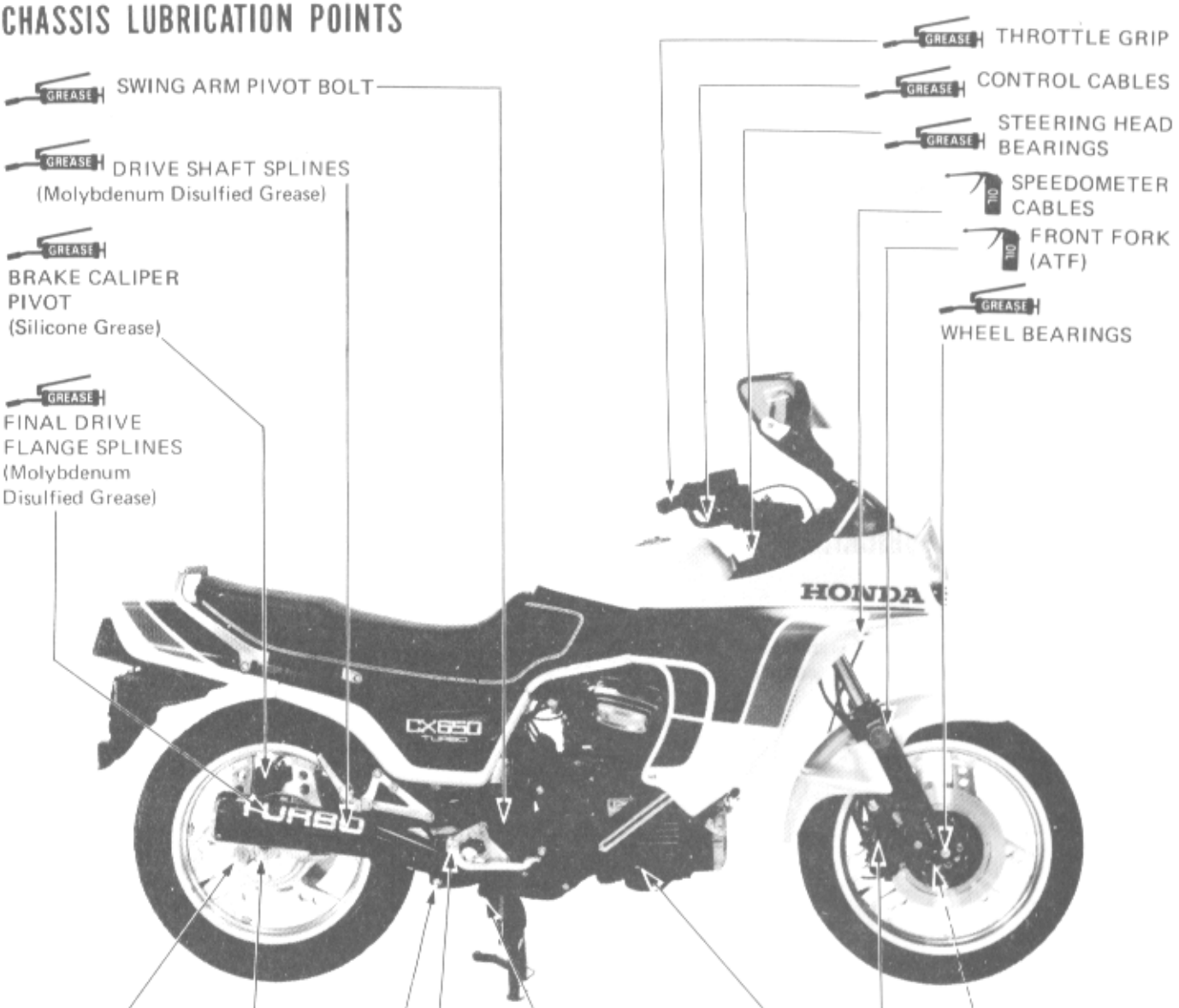
RECOMMENDED OIL: HYPOID GEAR OIL
- **SAE 90 (Above 5°C/41°F)**
- **SAE 80 (Below 5°C/41°F)**



CONTROL CABLE LUBRICATION

Periodically, disconnect the throttle, choke and clutch cables at their upper ends.
Thoroughly lubricate the cables and their pivot points with a commercially available cable lubricant.

CHASSIS LUBRICATION POINTS



SPECIAL LUBRICANT

- SHOCK ABSORBER UPPER MOUNT BUSHINGS
- SUSPENSION LINKAGE PIVOTS

CAUTION

Apply paste grease containing more than 45% of molybdenum as listed below:

- *Molykote® G-n Paste manufactured by Dow Corning U.S.A.*
- *Rocol Paste® manufactured by Sumico Lubricant Co., Ltd., Japan.*
- *Other lubricant of equivalent quality.*

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SERVICE INFORMATION

GENERAL

- Refer to section 2, Lubrication for details about the following items:
  - Engine oil
  - Engine oil filter
  - Final drive gear oil

SPECIFICATIONS

Engine

Spark plug:

	For cold climate (Below 5°C, 41°F)	Standard	For extended high speed riding
NGK	DPR7EV-9	DPR8EV-9	DPR9EV-9
ND	X22EPR-GU9	X24EPR-GU9	X27EPR-GU9

Spark plug gap:		0.8–0.9 mm (0.031–0.035 in)
Valve clearance	IN:	0.10 mm (0.004 in)
	EX:	0.12 mm (0.005 in)
Throttle grip free play:		2–4 mm (1/8–1/6 in)
Idle speed:		1,100 ± 100 rpm
Cylinder compression:		700–1,000 kPa (7.0–10.0 kg/cm^2, 100–142 psi)
Clutch free play:		10–20 mm (3/8–3/4 in)

Chassis

Tires

Tire size		Front	Rear
		100/90 V18	120/90 V17
Cold tire pressures kPa (kg/cm², psi)	Up to 90 kg (200 lbs) load	250 (2.5, 36)	250 (2.5, 36)
	90 kg (200 lbs) load to vehicle capacity load	250 (2.5, 36)	290 (2.9, 41)
Tire brand	BRIDGESTONE	L303	G508
	DUNLOP	F11	K627

Suspension air pressure: Front 0–40 kPa (0–0.4 kg/cm², 0–6 psi)
Rear 200–600 kPa (2.0–6.0 kg/cm², 28–85 psi)

TOOLS

Special
Inspection plug : 07999–4150000

Common
Valve adjusting wrench, 10 x 12 mm : 07708–0030200 – Commercially available in U.S.A.
Valve adjuster : 07708–0030400 or 89201-200-000 (U.S.A. only)

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MAINTENANCE SCHEDULE

Perform the PRE-RIDE INSPECTION in the Owner's Manual at each scheduled maintenance period.
I: INSPECT AND CLEAN, ADJUST, LUBRICATE, OR REPLACE IF NECESSARY.
C: CLEAN R: REPLACE A: ADJUST L: LUBRICATE

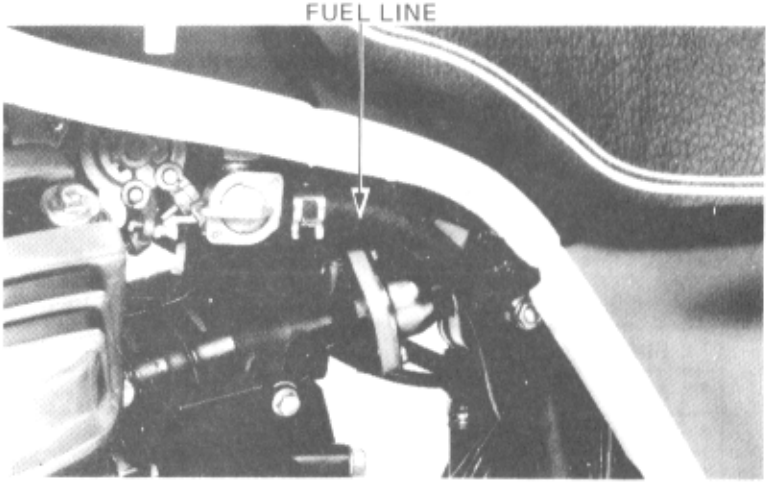
		ITEM \ FREQUENCY	WHICHEVER COMES FIRST ➡ / EVERY ⬇	ODOMETER READING (NOTE 3) 600 mi (1,000 km)	4,000 mi (6,400 km)	8,000 mi (12,800 km)	12,000 mi (19,200 km)	16,000 mi (25,600 km)	20,000 mi (32,000 km)	24,000 mi (38,400 km)	REFER TO PAGE
EMISSION RELATED ITEMS	*	FUEL LINES				I		I		I	3-4
	*	FUEL STRAINER								R	3-4
	*	THROTTLE OPERATION		I		I		I		I	3-5
	*	CHOKE				I		I		I	3-5
		AIR CLEANER	NOTE 1		C	C	C	C	C	C	3-6
		CRANKCASE BREATHER	NOTE 2		C	C	C	C	C	C	3-7
		SPARK PLUGS		REPLACE EVERY 2,000 mi (3,200 km)							3-7
	*	VALVE CLEARANCE		I	I	I		I		I	3-8
		ENGINE OIL	YEAR	R	REPLACE EVERY 2,000 mi (3,200 km)						2-2
		ENGINE OIL FILTER	YEAR	R	R	R	R	R	R	R	2-2
	*	ENGINE IDLE SPEED		I	I	I	I	I	I	I	3-10
		RADIATOR COOLANT				I		I		**R	3-10
	*	RADIATOR CORE				I		I		I	3-10
	*	COOLING SYSTEM HOSES & CONNECTIONS		I		I		I		I	3-11
NON-EMISSION RELATED ITEMS		FINAL DRIVE OIL				I		I		R	2-4
		BATTERY	MONTH	I	I	I	I	I	I	I	3-11
		BRAKE FLUID	MONTH: I 2 YEARS: *R	I	I	I	I	I	I	*R	3-11
		BRAKE PAD WEAR			I	I	I	I	I	I	3-12
		BRAKE SYSTEM		I		I		I		I	3-12
	*	BRAKE LIGHT SWITCH		I		I		I		I	3-13
	*	HEADLIGHT AIM		I		I		I		I	3-13
		CLUTCH		I	I	I	I	I	I	I	3-14
		SIDE STAND				I		I		I	3-15
	*	SUSPENSION		I		I		I		I	3-15
	*	NUTS, BOLTS, FASTENERS		I		I		I		I	3-17
	**	WHEELS		I		I		I		I	3-17
	**	STEERING HEAD BEARINGS		I		I		I		I	3-18

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

NOTES: 1. Service more frequently when riding in dusty areas.
2. Service more frequently when riding in rain or at full throttle.
3. For higher odometer readings, repeat at the frequency interval established here.

FUEL LINES

Make sure that the fuel lines and connections are not deteriorated, damaged or leaking. Replace any parts which have signs of deterioration, damage or leakage.



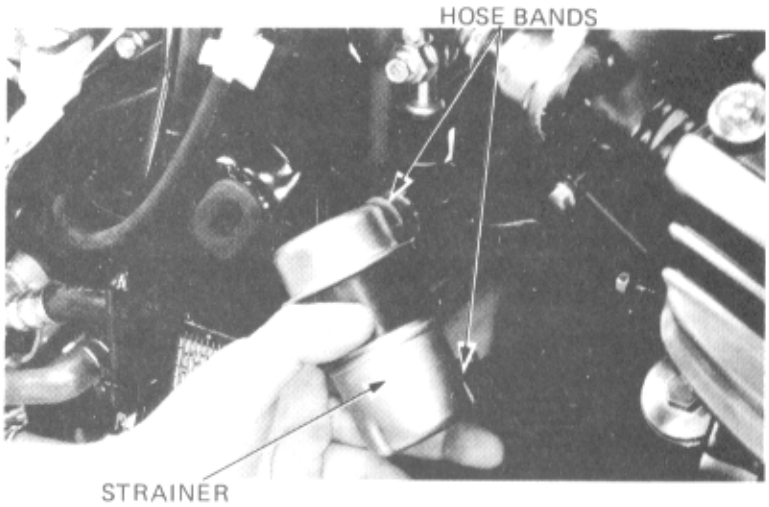
FUEL STRAINER

WARNING

Gasoline is flammable and explosive under certain conditions. Keep flames and sparks away from your work area.

Free the fuel strainer from the frame bracket and pull it out from the right side.

Remove the fuel hoses from the strainer by removing the hose bands.



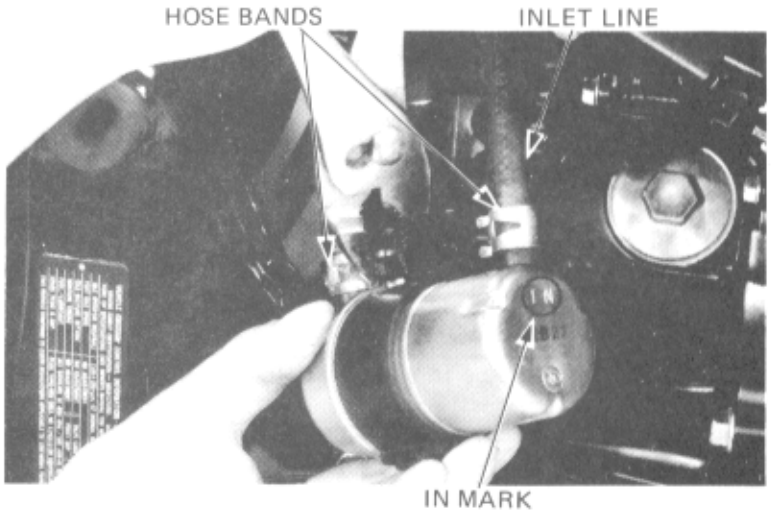
Install a new fuel strainer in the reverse order of removal.

NOTE

- Connect the fuel inlet tube to the IN end of the strainer.
- Install the strainer with the OUT end (outlet side) facing up.
- Install the hose bands with the ends pointing to the inside. Failure to point the ends to the inside may damage the adjacent wires and fuel lines.

Check the following items after installing the fuel strainer:

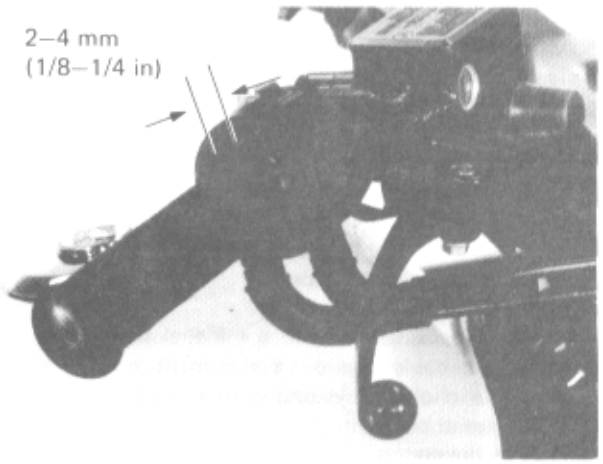
- Fuel leaks
- Collapsed, restricted or pinched fuel lines
- Routing of sensor wires and tubes



THROTTLE OPERATION

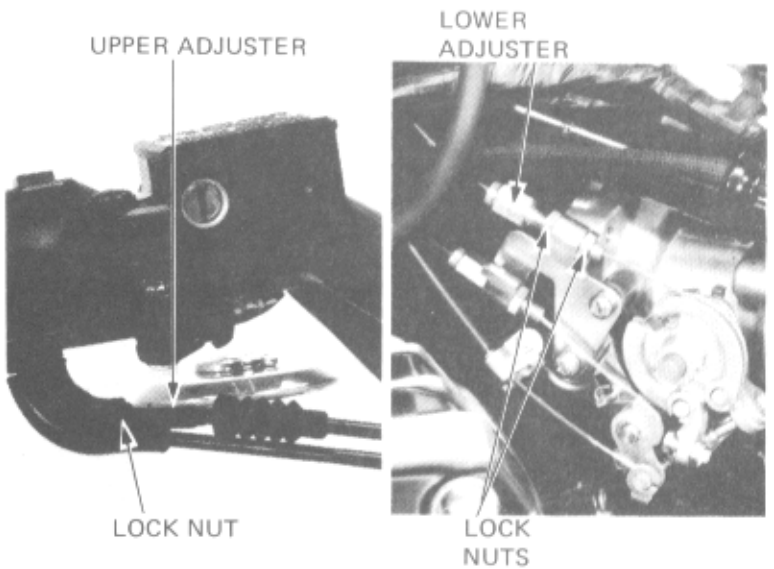
Check for smooth throttle grip full opening and automatic fully closing in all steering positions.
Make sure there is no deterioration, damage, or kinking in the throttle cables. Replace any damaged parts.
Lubricate the throttle cables, if throttle operation is not smooth.

Make sure throttle grip free play is 2–4 mm (1/8–1/4 in) at the throttle grip flange.



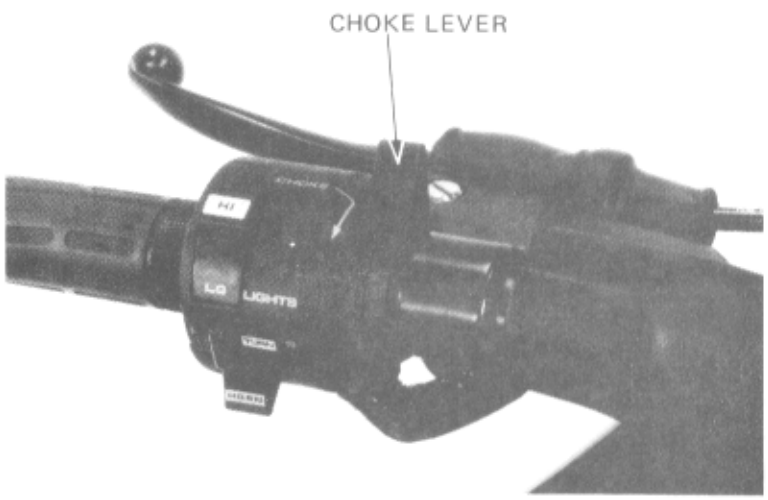
Throttle grip free play can be adjusted at either end of the throttle cable.
Minor adjustments are made with the upper adjuster. Major adjustments are made with the lower adjuster on the throttle body after removing the fuel tank. Adjust free play by loosening the lock nut and turning the adjuster, if necessary. Tighten the lock nut.

Install the fuel tank. Recheck throttle operation.



CHOKE

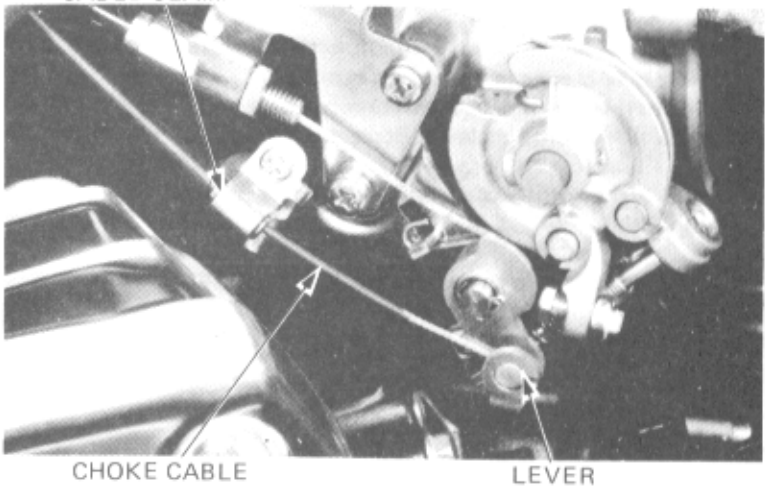
Check for smooth upper choke lever operation. Lubricate the choke cable if the operation is not smooth.



Pull the choke lever on the handlebar all the way down to the open position and make sure the throttle valve moves by moving the lifter lever on the throttle body.

Push the choke lever on the throttle body and cable housing all the way up to the closed position. Make sure the throttle valve is fully closed by checking for free play in the cable between the lifter lever on the throttle body and cable casing.

Adjust if necessary: Remove the fuel tank. Loosen the choke cable clamp on the throttle body and move the choke cable casing so the choke lever is in the closed position.
Tighten the clamp.
Install the removed parts in the reverse order of disassembly.

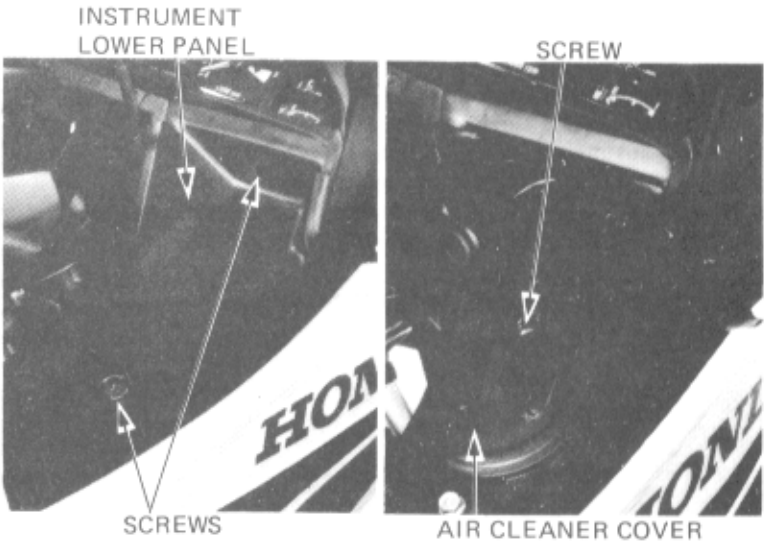


NOTE

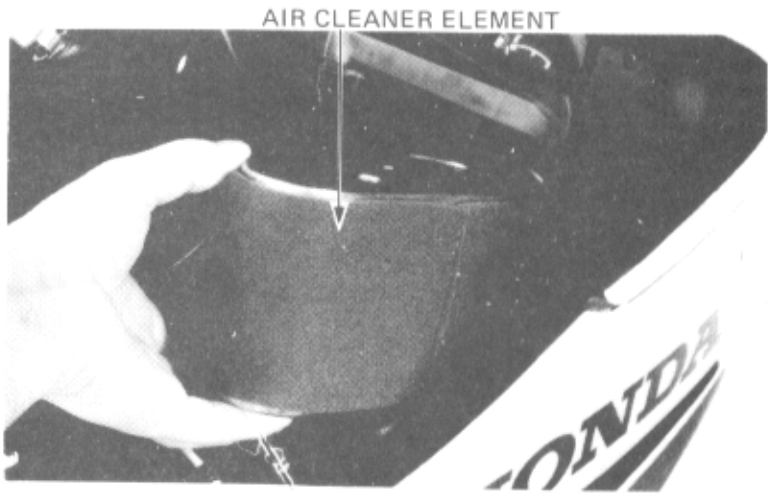
Refer to page 4-8 for fast idle speed adjustment.

AIR CLEANER

Turn the handlebar to the right and remove the lower right instrument panel screws and panel.
Remove the air cleaner cover screw and air cleaner cover.



Remove the air cleaner element.
Remove the air cleaner element from the element holder.



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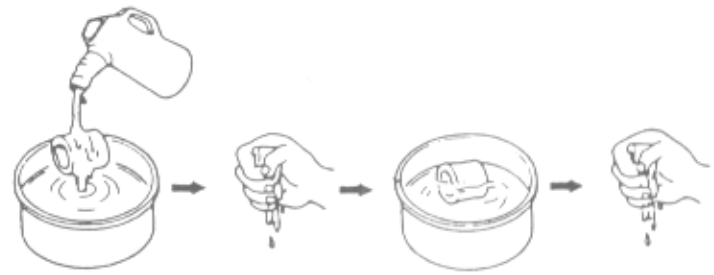
Wash the element in non-flammable or high flash point solvent, squeeze out the solvent thoroughly, and allow the element to dry.

Soak the element in gear oil (SAE 80–90) and squeeze out excess.

Reinstall the air cleaner element on its holder and apply a light coating of grease to the sealing edge of the element.
Reinstall the removed parts in the reverse order of disassembly.

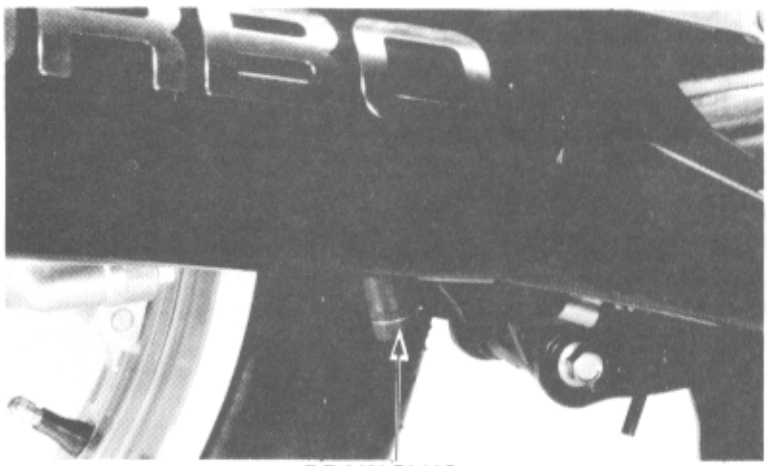


CRANKCASE BREATHER

Remove the plug from the drain tube to drain deposits.
Then reinstall the drain plug.

NOTE

Service more frequently when the motorcycle is ridden in the rain, or if the deposits can be seen in the transparent section of the drain tube.



SPARK PLUGS

WARNING

Do not operate the starter with the spark plugs removed, or fuel will be forced out causing a fire hazard.

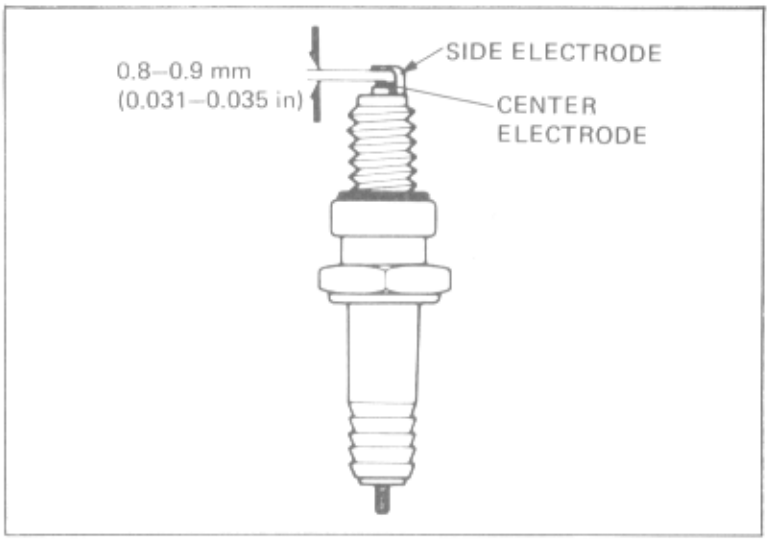
RECOMMENDED SPARK PLUGS:

	NGK	ND
Standard	DPR8EV-9	X24EPR-GU9
High speed riding	DPR9EV-9	X27EPR-GU9
Cold climate	DPR7EV-9	X22EPR-GU9

Disconnect the spark plug caps.
Clean any dirt from around the spark plug base.
Remove the spark plugs.
Measure the new spark plug gaps using a wire-type feeler gauge.

SPARK PLUG GAP:
0.8–0.9 mm (0.031–0.035 in)

Adjust by bending the side electrode carefully.
With the plug washer attached, thread the spark plugs in by hand to prevent crossthreading.
Tighten the spark plugs another 1/2 turn with a spark plug wrench to compress the plug washer.
Connect the spark plug caps.

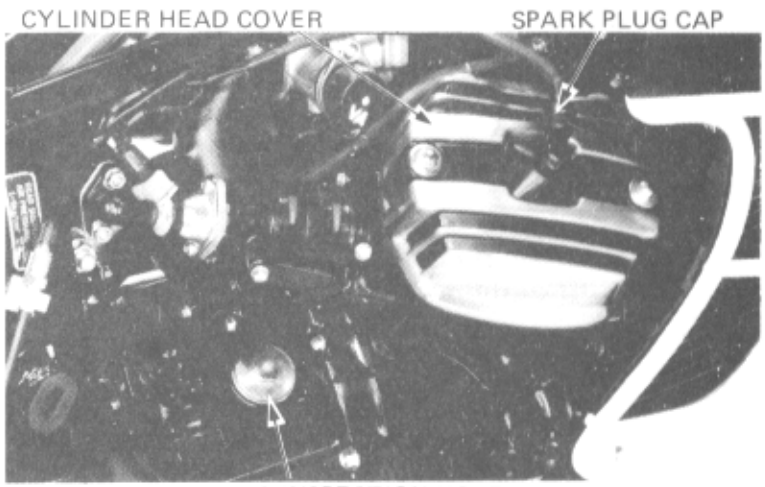


VALVE CLEARANCE

NOTE

This inspection and adjustment must be performed while the engine is cold (below 35°C, 95°F).

Remove the fuel tank (page 4-15) and timing inspection hole cap.
Disconnect the spark plug caps and remove the cylinder head covers.



Remove the radiator screen and the lower fairing.

Remove the crankshaft hole cap from the engine front cover.

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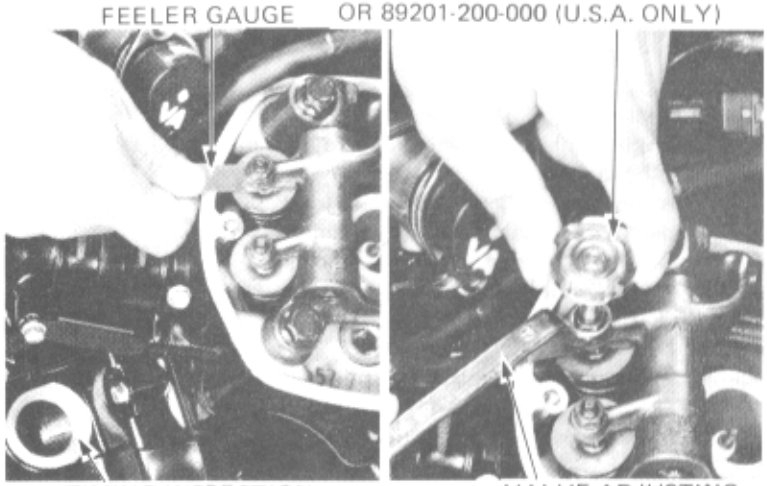
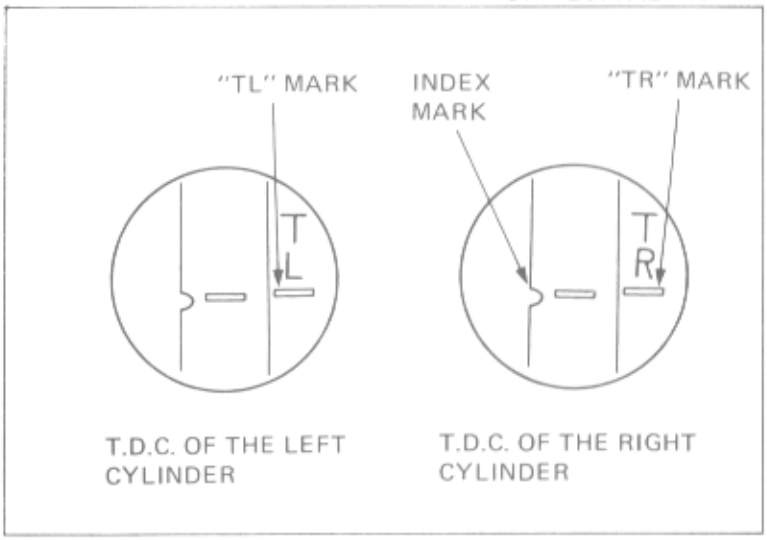
Turn the crankshaft clockwise and align the "TL" mark on the flywheel with the index mark. The left cylinder must be T.D.C. of the compression stroke; Both rocker arms will be loose.
Check the intake and exhaust valve clearance of the left cylinder by inserting a feeler gauge between the clearance adjusting screw and valve stem.

VALVE CLEARANCE
IN: 0.10 mm (0.004 in)
EX: 0.12 mm (0.005 in)



Adjust, by loosening the lock nut, and turning the screw until there is a slight drag on the feeler gauge. Hold the screw and tighten the lock nut.
Recheck the valve clearances.

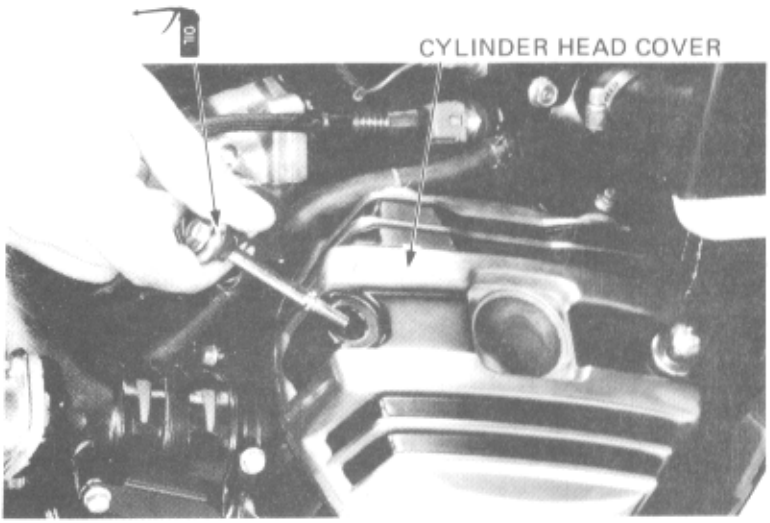
Turn the crankshaft clockwise and align the "TR" mark on the rotor with the index mark. The right cylinder must be at T.D.C. of the compression stroke.
Check the intake and exhaust valve clearance of the right cylinder as described for the left cylinder.



Install the removed parts in the reverse order of disassembly.

NOTE

Coat the cylinder head cover bolt rubbers with oil before tightening.



ENGINE IDLE SPEED

NOTE

- Inspect and adjust engine idle speed after all other engine adjustments are within specifications.
- The engine must be warm for accurate idle inspection and adjustment. Ten minutes of stop and go driving is sufficient, or when the temperature gauge needle is within the wide white line.

Warm up the engine, place the transmission in neutral and the motorcycle on its center stand.
Adjust idle speed with the throttle stop screw.

IDLE SPEED: 1,100 ± 100 rpm

CAUTION

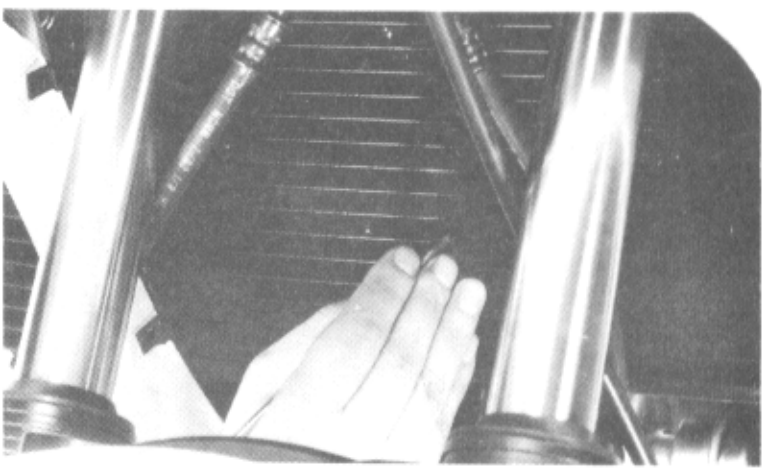
Use the throttle stop screw only for engine idle speed adjustment. Do not loosen the stop screw lock nut.

RADIATOR COOLANT

Check the coolant level of the reserve tank with the engine running at normal operating temperature. The level should be between the "FULL" and "LOW" level lines.
If necessary, remove the reserve tank cap and fill to the "FULL" level line and install the cap.

RADIATOR CORE

Check the air passages for clogging or damage.
Straighten bent fins or collapsed core tubes.
Remove insects, mud or any obstruction with compressed air or low water pressure.
Replace the radiator if the air flow is restricted over more than 20% of the radiator's core surface.



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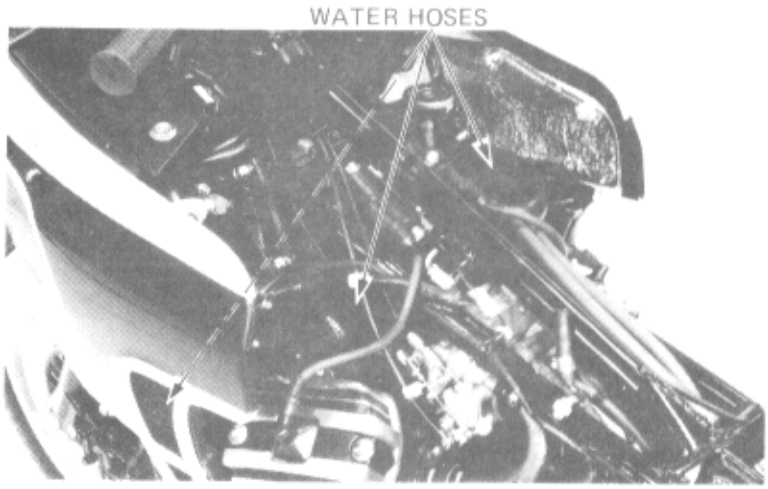
COOLING SYSTEM HOSES & CONNECTIONS

Remove the fuel tank (page 4-15).
Inspect the hoses for cracks or deterioration, and replace if necessary.
Check the tightness of the hose clamps, and tighten if necessary.



BATTERY

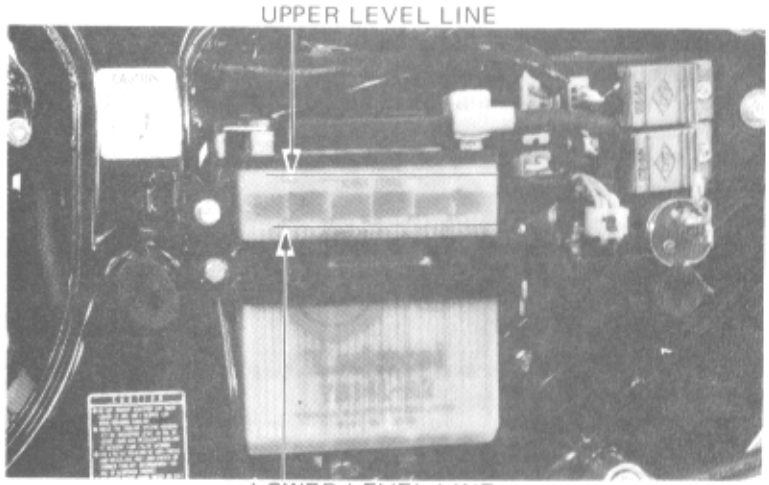
Remove the left side cover and inspect the battery electrolyte level.
When the electrolyte level nears the lower level mark, fill with distilled water to the upper level mark.
If sulfation forms on the battery walls or sediments (paste) accumulate on the bottom of the battery, replace the battery.

NOTE

Add only distilled water. Tap water will shorten the service life of the battery.

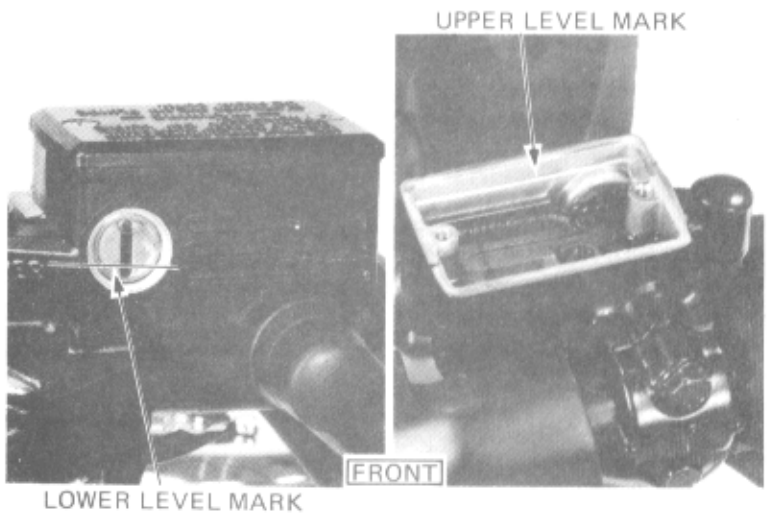
WARNING

The battery electrolyte contains sulfuric acid. Protect your eyes, skin and clothing. In case of contact, flush thoroughly with water and get immediate medical attention if electrolyte gets in your eyes.



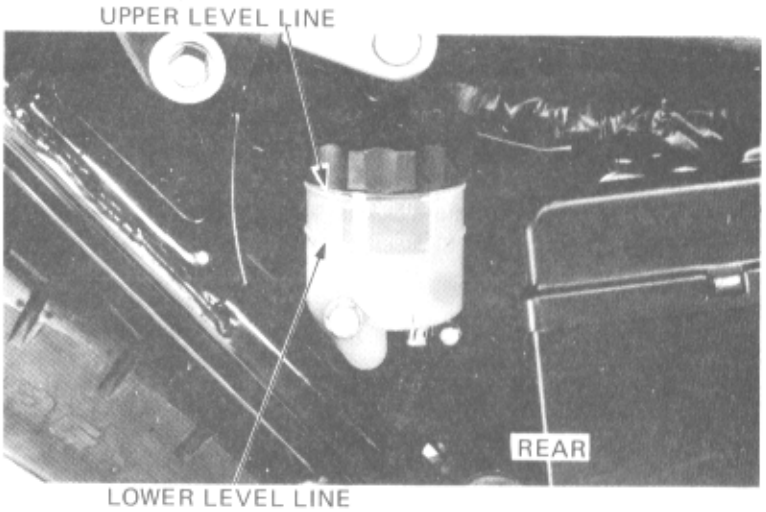
BRAKE FLUID

Check the front and rear brake fluid reservoir level.
If the level nears the lower level mark, fill the reservoir with DOT–3 Brake Fluid to the upper level mark.
Check the entire system for leaks, if the level is low.



CAUTION

- *Do not remove the cover until the handlebar has been turned so that the reservoir is level.*
- *Avoid operating the brake lever with the cap removed. Brake fluid will squirt out if the lever is pulled.*
- *Do not mix different types of fluid, as they may not be compatible.*



BRAKE PAD WEAR

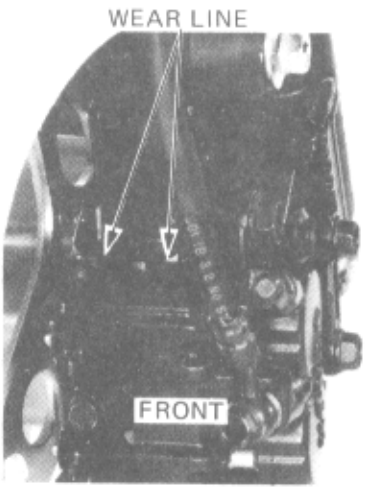
Check the front brake pads for excessive wear through the brake caliper inspection hole.

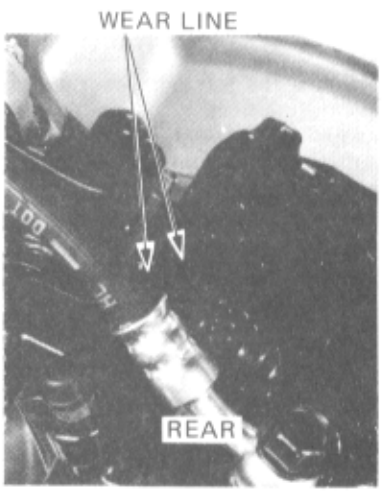
Check the rear brake pads after removing the dust cover.

Replace the brake pads if the wear line on the pads reaches the edge of the brake disc.

CAUTION

Always replace the brake pads in pairs to assure even disc pressure.





BRAKE SYSTEM

BRAKE SYSTEM HOSE

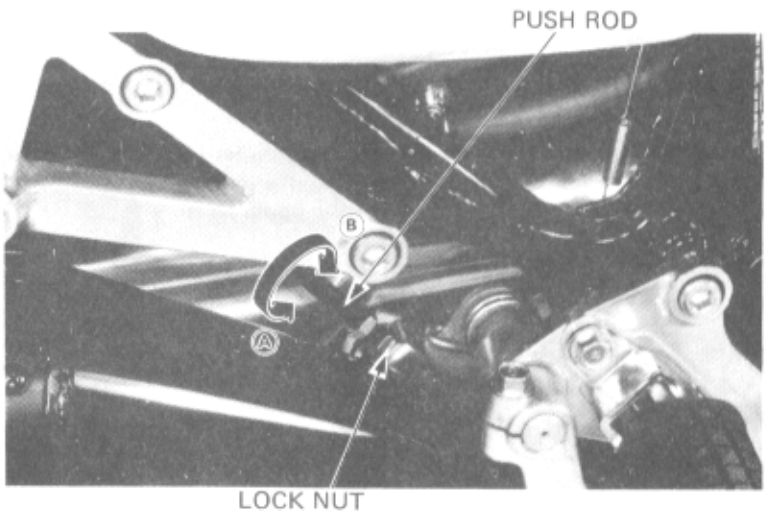
Make sure that the brake hose is not deteriorated and check the entire brake system for leaks.

BRAKE PEDAL HEIGHT

Loosen the lock nut and turn the push rod until the correct pedal height is obtained. Turning the push rod in direction (A) decreases the pedal's height. Turn the push rod in direction (B) to raise the pedal. Retighten the lock nut.

NOTE

After adjusting the brake pedal height, check the rear brake light switch and adjust if necessary.



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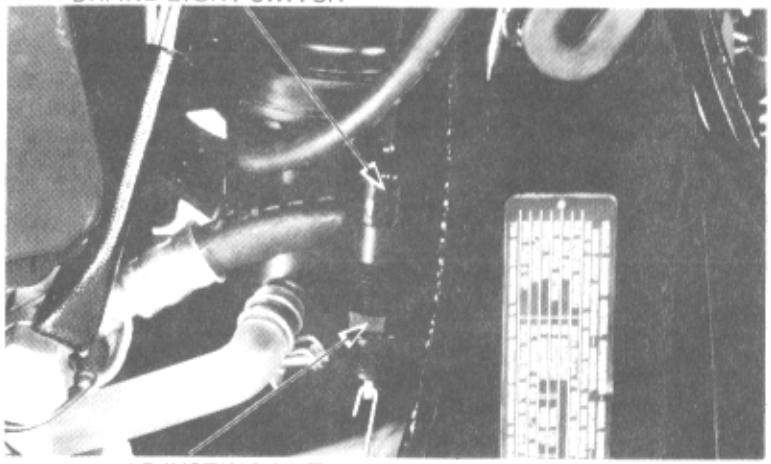
BRAKE LIGHT SWITCH

Adjust the brake light switch so that the brake light will come on when the brake pedal is depressed and brake engagement begins. Adjust by turning the switch adjusting nut. Do not turn the switch body.

Perform brake light switch adjustment after adjusting brake pedal play and pedal height.

BRAKE LIGHT SWITCH

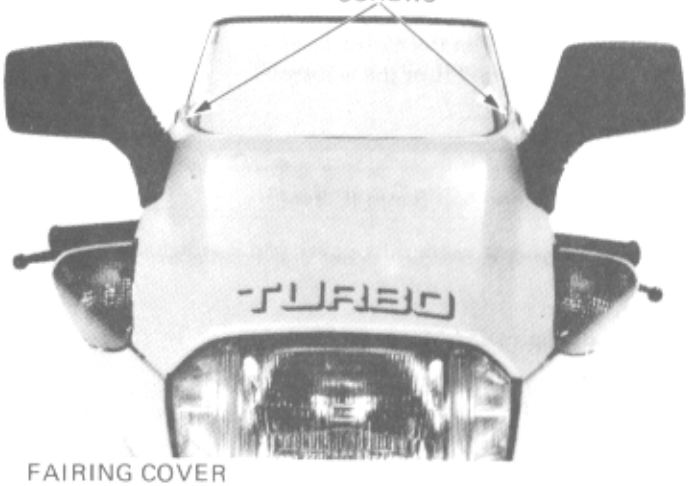


ADJUSTING NUT

HEADLIGHT AIM

Open the fairing cover by removing the two screws. Remove the two screws at the top of the fairing cover and tilt it forward.

SCREWS



FAIRING COVER

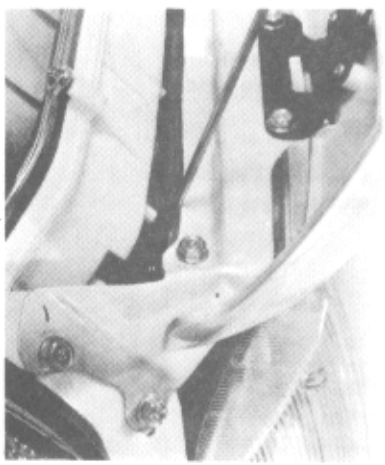
To adjust vertical aim, turn the right adjuster.
To adjust horizontal aim, turn the left adjuster.

NOTE

Adjust the headlight beam as specified by local laws and regulations.

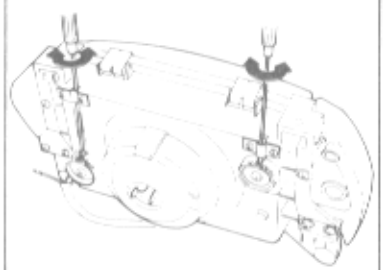
WARNING

An improperly adjusted headlight may blind oncoming drivers, or it may fail to light the road for a safe distance.



HORIZONTAL BEAM ADJUSTMENT (LEFT)

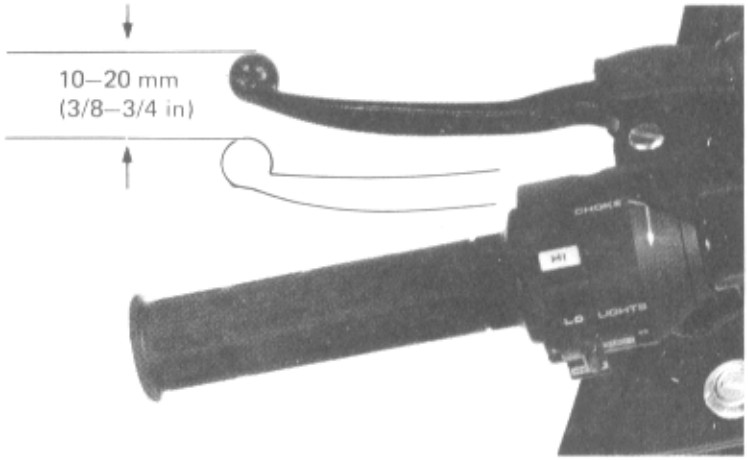
VERTICAL BEAM ADJUSTMENT (RIGHT)



CLUTCH

Inspect the clutch lever free play at the end of the lever.

FREE PLAY: 10–20 mm (3/8–3/4 in)



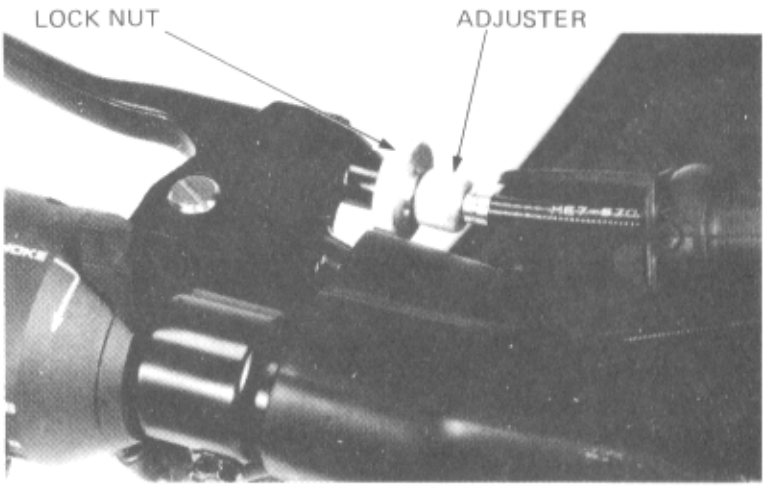
Minor adjustments can be made with the clutch cable adjuster located on the clutch lever.
Loosen the lock nut and turn the adjuster.

NOTE

Do not allow the threads at the adjuster to come out by more than 8 mm (0.3 in).

Reinstall the clutch cable dust cover and handlebar covers.

Recheck the operation of the clutch.



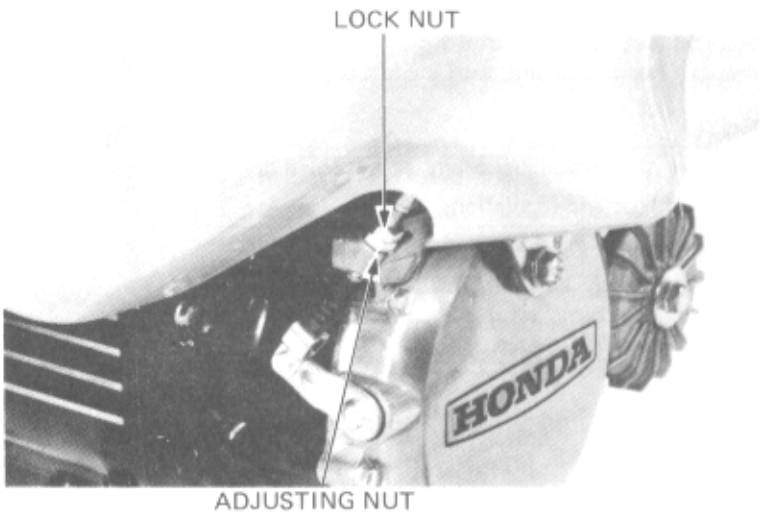
Major adjustments are made of the lower end of the cable at the clutch front engine cover.
Turn the adjuster on the clutch lever all the way in and back out one turn after removing the cable dust cover and loosening the lock nut.

Loosen the lower cable lock nut and turn the adjusting nut to obtain the correct clutch lever free play.

Tighten the lock nut.

CAUTION

The exhaust system can be very hot if the engine has been run. Use care not to touch the exhaust system to prevent burning yourself.



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SIDE STAND

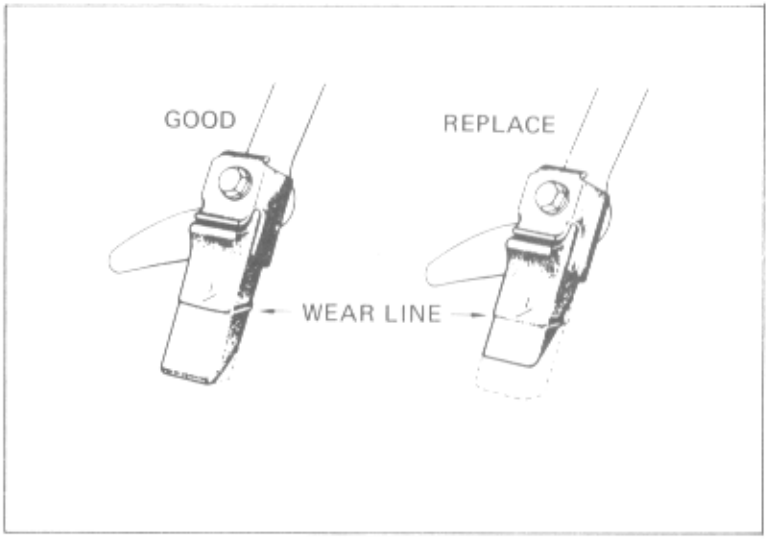
Check the rubber pad for deterioration or wear. Replace the pad if wear extends to the wear line as shown.

Check the side stand spring for damage and loss of tension, and the side stand assembly for freedom of movement and damage.

Spring tension is correct if the measurements fall within 2–3 kg (4.4–6.6 lb), when pulling the side stand lower and with a spring scale.

NOTE

When replacing, use a rubber pad with the mark over 260 lbs ONLY.



SUSPENSION

WARNING

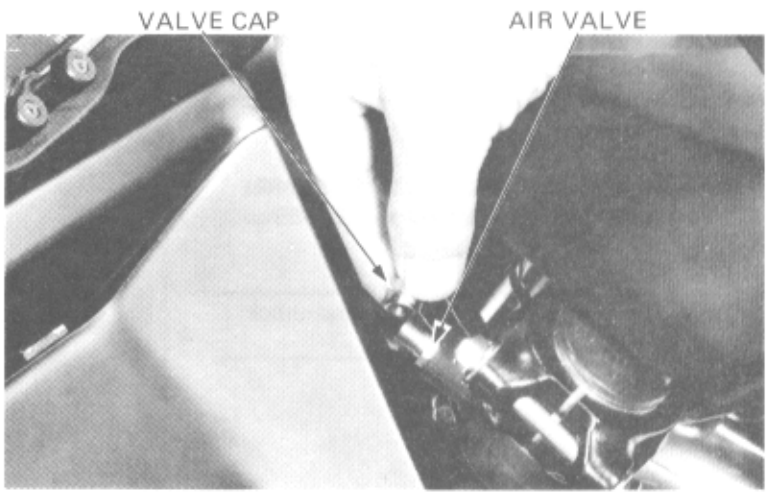
Do not ride a vehicle with faulty suspension. Loose, worn or damaged suspension parts impair vehicle stability and control.

FRONT

Check the action of the front forks by compressing them several times.
Check the entire fork assembly for leaks or damage. Replace damaged components which cannot be repaired.
Tighten all front suspension nuts and bolts.

Check the front fork air pressure when the front forks are cold.
Place the vehicle on its center stand.
Remove the valve cap and measure the front fork air pressure.

FRONT FORK AIR PRESSURE:
0–40 kPa (0–0.4 kg/cm², 0–6 psi)



ANTI DIVE SYSTEM (TRAC) INSPECTION

Check operation of the anti dive system at each adjuster position by riding the motorcycle and applying the brakes.

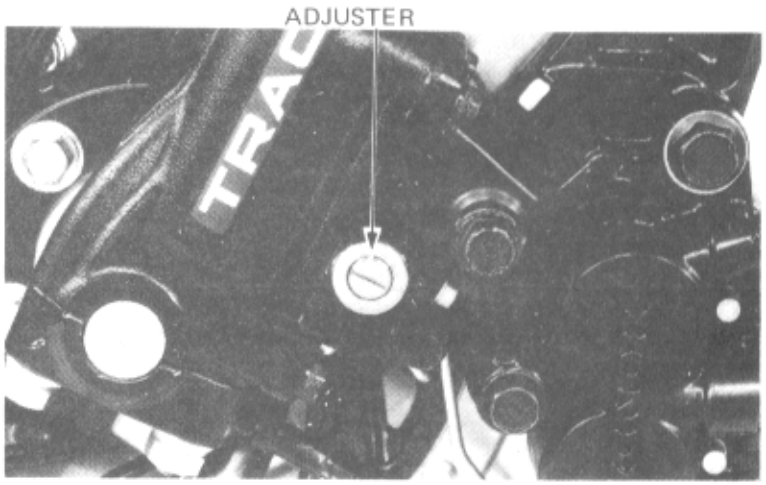
CAUTION

Make sure that the adjusters are at the same location on both sides.

WARNING

Select a safe place away from traffic to perform this test.

Inspect and if necessary, repair the system (Refer to Section 14).



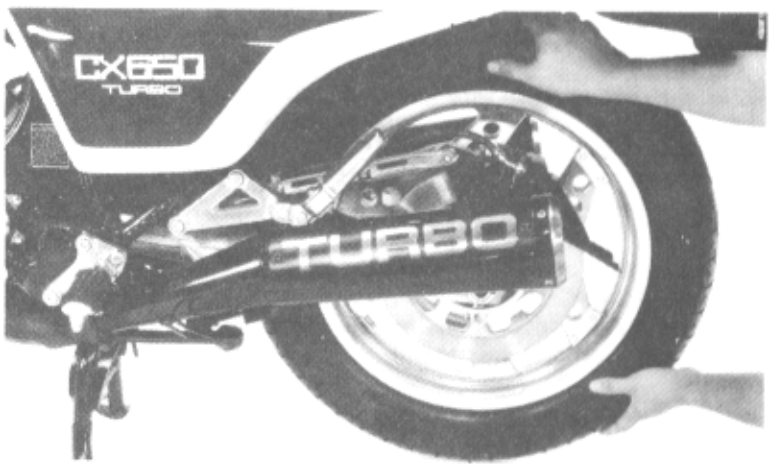
REAR

Place the motorcycle on its center stand.

Move the rear wheel sideways with force to see if the swing arm bearings are worn. Replace them if they are excessively worn.

Check the shock absorber for leaks or damage.

Tighten all rear suspension nuts and bolts.



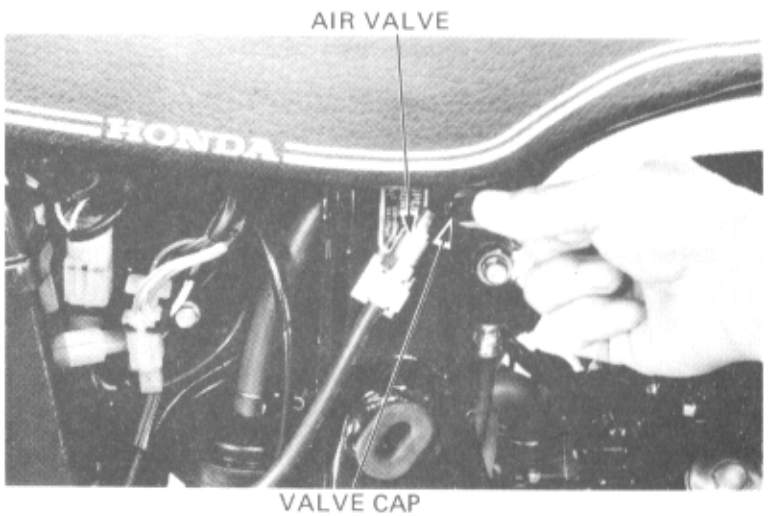
Remove the right side cover.

Remove the valve cap and measure the rear shock absorber air pressure.

REAR SHOCK ABSORBER AIR PRESSURE:
200–600 kPa (2.0–6.0 kg/cm^2, 28–85 psi)

NOTE

Check the air pressure when the rear shock absorber is cold.



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NUTS, BOLTS, FASTENERS

Check that all chassis nuts and bolts are tightened to correct torque values (page 1-5).

Check that all cotter pins and safety clips are in place and are secure.

WHEELS

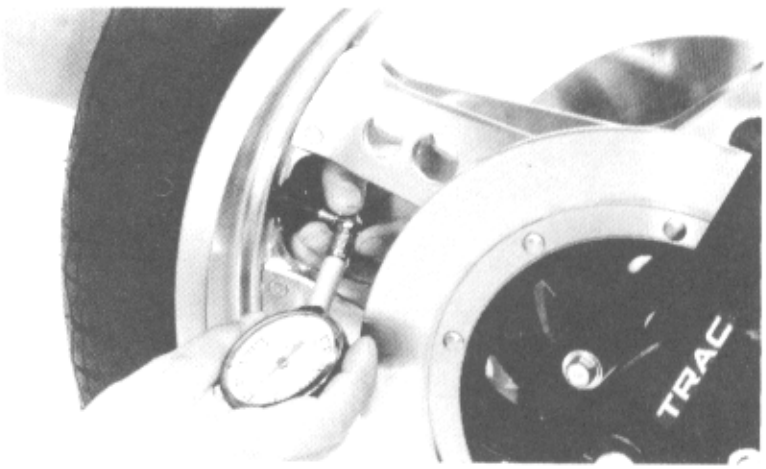
NOTE

Tire pressures should be checked when tires are COLD.

Check the tires for cuts, imbedded nails, or other sharp objects.

RECOMMENDED TIRE PRESSURES AND SIZES:

Tire size		Front	Rear
		100/90 V18	120/90 V17
Cold tire pressures kPa (kg/cm^2, psi)	Up to 90 kg (200 lbs) load	250 (2.5, 36)	250 (2.5, 36)
	90 kg (200 lbs) load to vehicle capacity load	250 (2.5, 36)	290 (2.9, 41)
Tire brand	BRIDGESTONE	L303	G508
	DUNLOP	F11	K627



Check the front and rear wheels for trueness.

Measure the tread depth at the center of the tires. Replace the tires if the tread depths reach the limits given below.

Minimum tread depth:
Front: 1.5 mm (1/16 in)
Rear: 2.0 mm (3/32 in)

STEERING HEAD BEARINGS

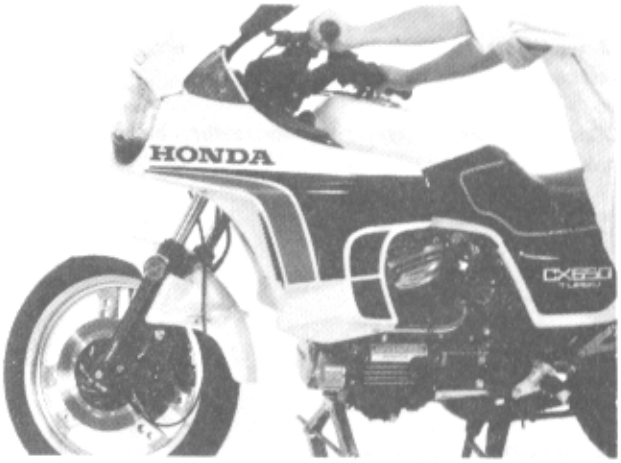
NOTE

Check that the control cables do not interfere with handlebar rotation.

Raise the front wheel off the ground.

Check that the handlebar rotates freely from side to side.

If the handlebar moves unevenly, binds, or has vertical movement, adjust the steering head bearing by turning the steering head adjusting nut (Section 15).



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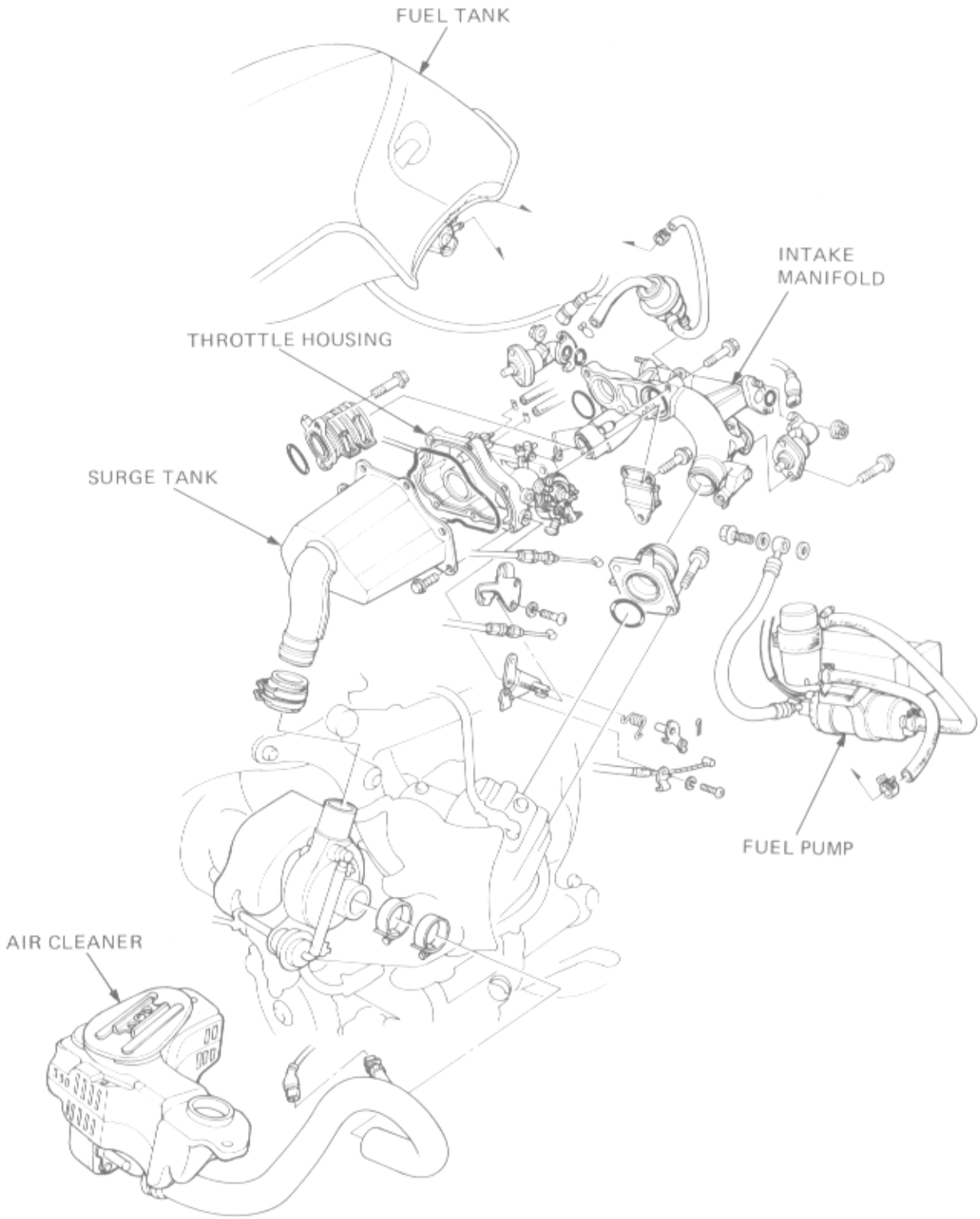
MEMO



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4. FUEL SYSTEM

SERVICE INFORMATION

GENERAL

WARNING

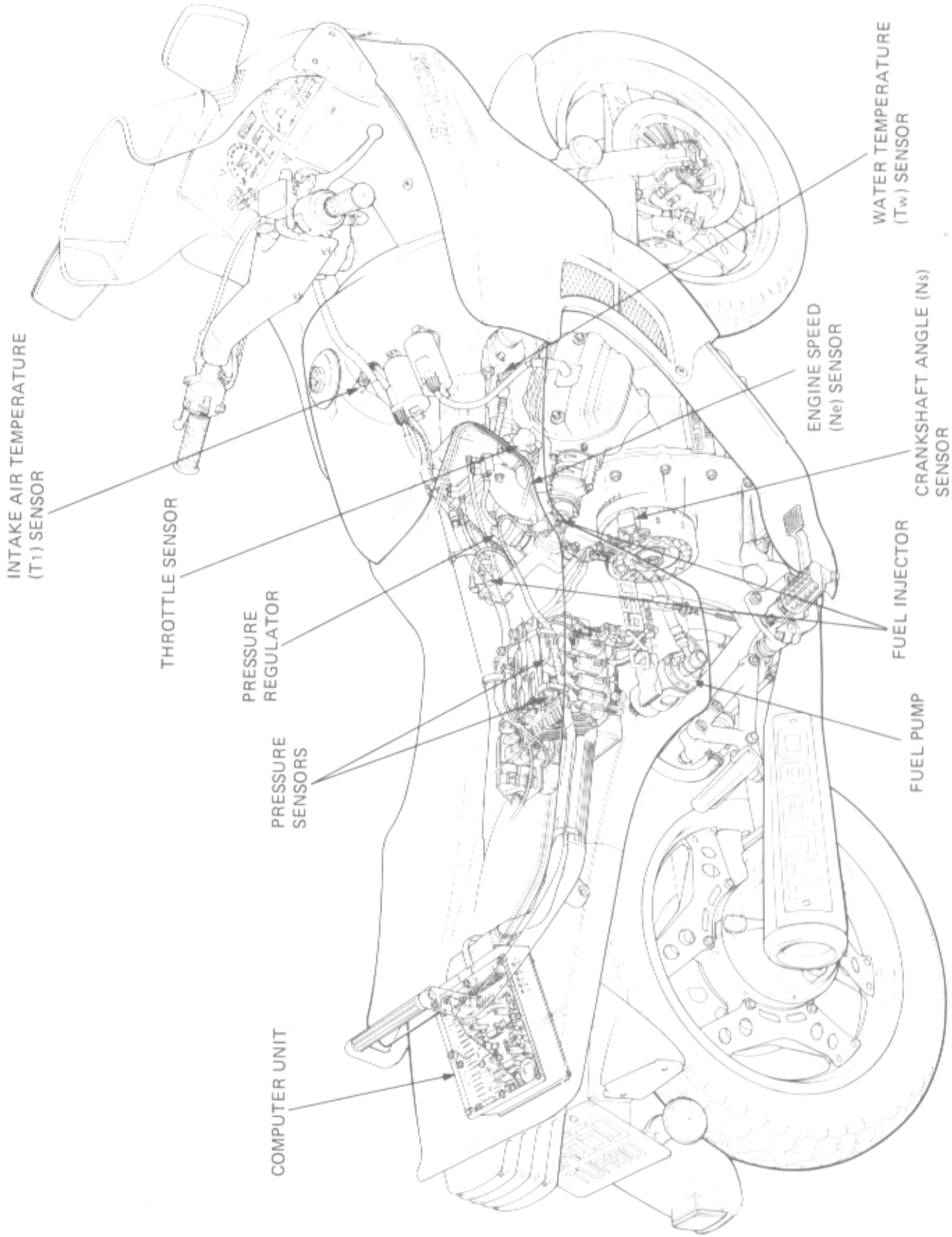
- *The fuel system must be serviced with the ignition switch OFF and battery ground cable disconnected from the battery.*
- *The fuel lines are pressurized. Shield your eyes and place a rag or shop towel around lines and fittings when disconnecting a line or disassembling a fuel part. Wipe up spilled gasoline at once.*
- *Use caution when working with gasoline. Always work in a well-ventilated area and away from sparks or open flames.*
- *If fuel gets in your eyes: Flush with water and get prompt medical attention.*

- When disassembling fuel system parts, note the locations of the O-rings. Replace them with new ones on reassembly.
- Do not let foreign particles enter the fuel lines as they will clog the fuel injectors. Wash all removed parts thoroughly before they can be reassembled.
- After reassembling, make sure that the tubes are not pinched or collapsed. Also check that there are no leaking parts.
- Use special care when connecting the battery cables not to reverse battery polarity. Remove the battery whenever charging is necessary. Turn the ignition switch OFF when disconnecting and connecting the battery cables.
- Keep water away from the CFI (Computerized Fuel Injection) computer and components, since water will adversely affect their performances.
- Keep connectors dry to prevent electrical shorts, especially the T_1, T_W and injector sensor wire couplers which have steel rings. When disconnecting the connector, care should be taken not do deform the steel rings. If a steel ring is deformed, replace it with a new one. Connect the electrical connectors and couplers securely, there should be an audible click when reconnected.
- See Section 24, Troubleshooting for inspection and adjustment of the fuel system.

TORQUE VALUES

Fuel hose joint bolt	35–50 N·m (3.5–5.0 kg-m, 25–36 ft-lb)
Fuel hose joint nut	27–29 N·m (2.7–2.9 kg-m, 20–21 ft-lb)
Pressure regulator	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Fuel injector holder	3.5–5.0 N·m (0.35–0.5 kg-m, 2.5–3.6 ft-lb)
Fuel valve nut	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)

PART LOCATIONS



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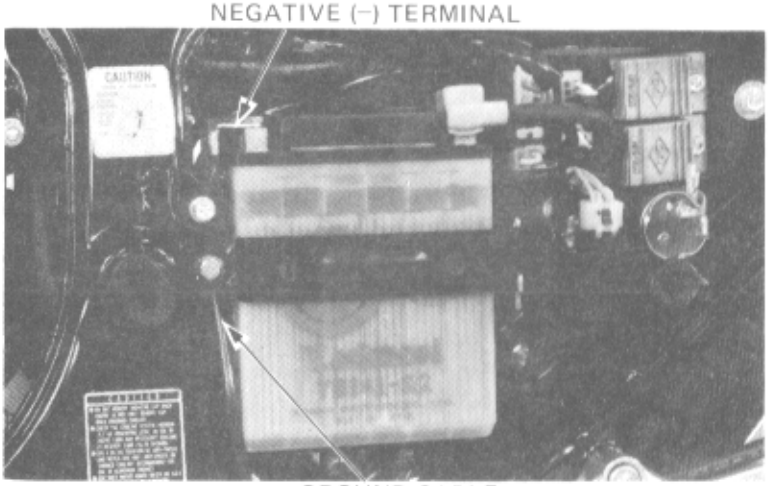
INTAKE MANIFOLD REMOVAL

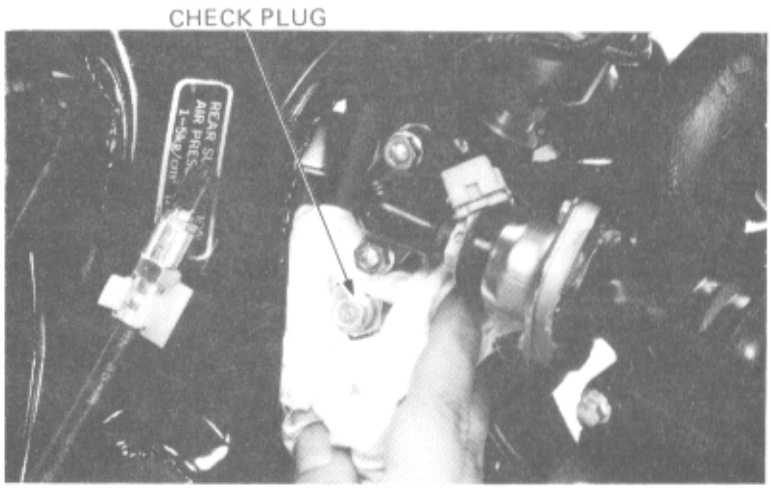
Remove the left frame side cover.
Turn the ignition switch OFF and disconnect the battery ground cable from the negative (−) terminal of the battery.
Remove the seat and fuel tank (page 4-15).



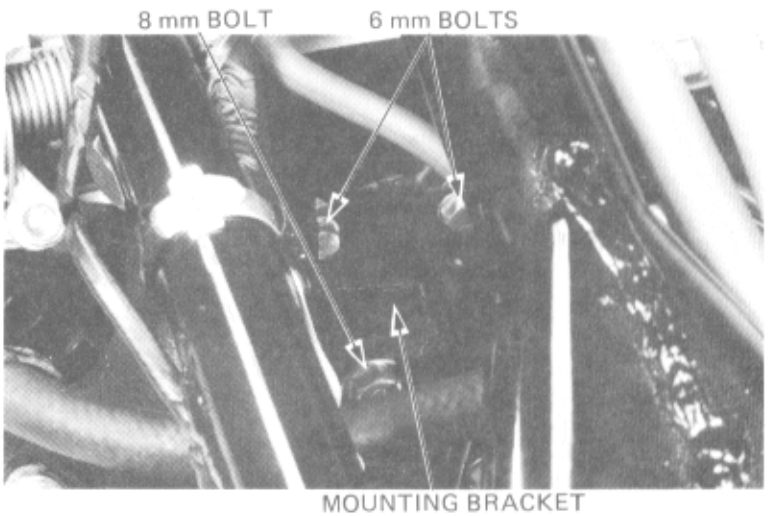
Wrap a shop towel around the fuel line and fitting. Loosen the fuel line check plug from the banjo bolt slowly to drain the line and prevent gasoline from squirting out.

WARNING

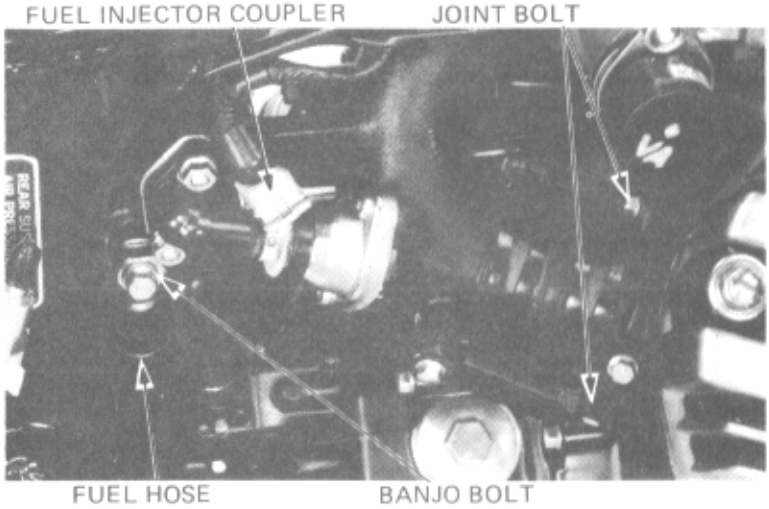
The fuel lines are pressurized. Wear eye protection when working on the fuel system. If gasoline gets in your eyes, wash with water and get prompt medical attention.



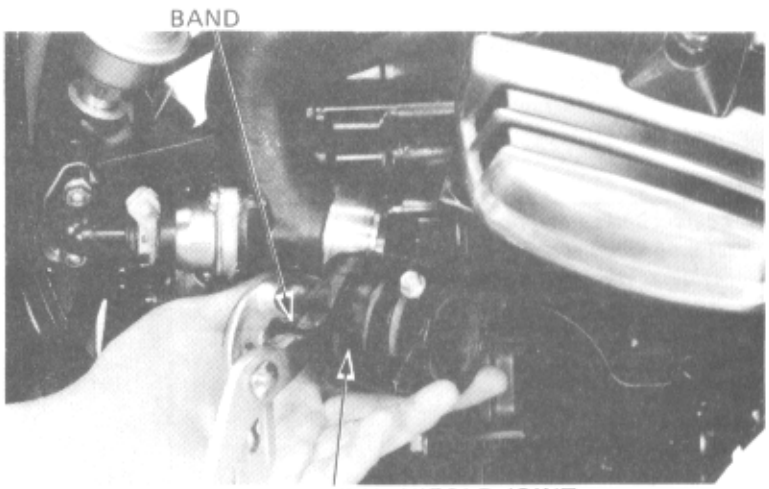
Remove the four, 6 mm manifold bolts.
Remove the throttle body mounting bracket by removing 8 mm bolt.



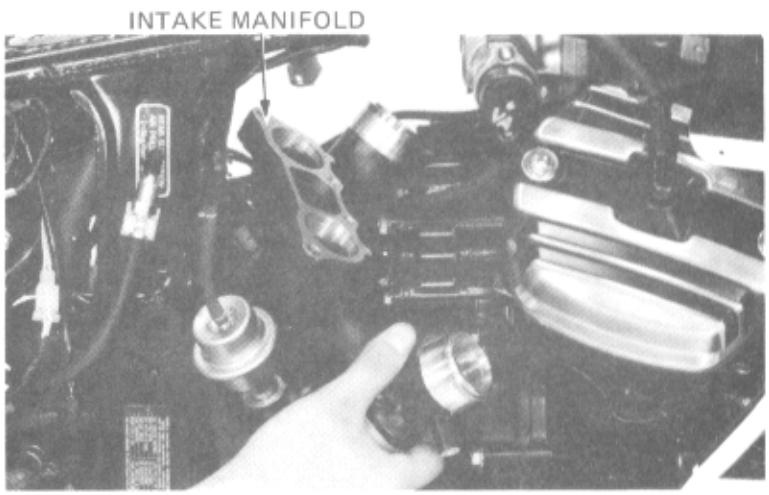
Unscrew the four bolts from the right and left intake manifold joints.
Disconnect the right and left fuel injector couplers from the fuel injectors.
Disconnect the fuel hose from the intake manifold by removing the banjo bolt.



Remove the right and left intake manifold joints by loosening the bands.



Remove the intake manifold from the right side.



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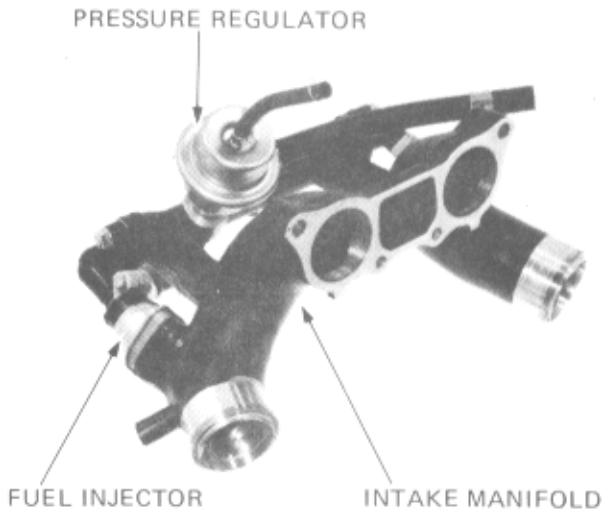
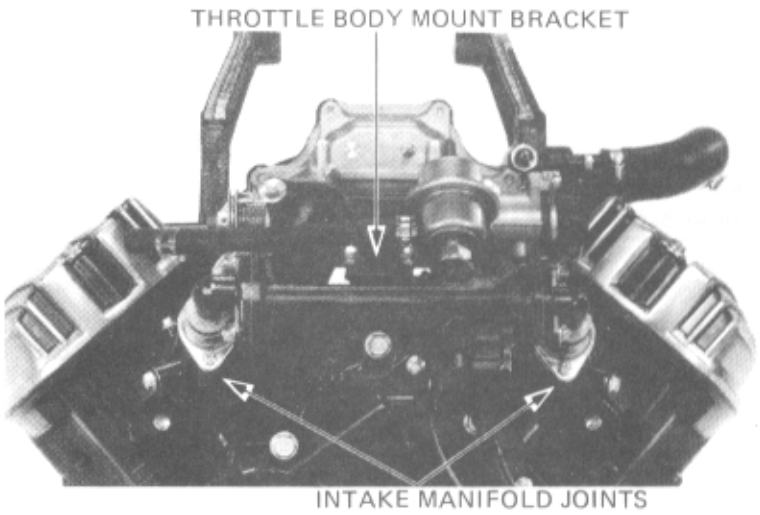
Remove the pressure regulator and fuel injectors from the intake manifold.
Inspect the intake manifold for cracks or damage.

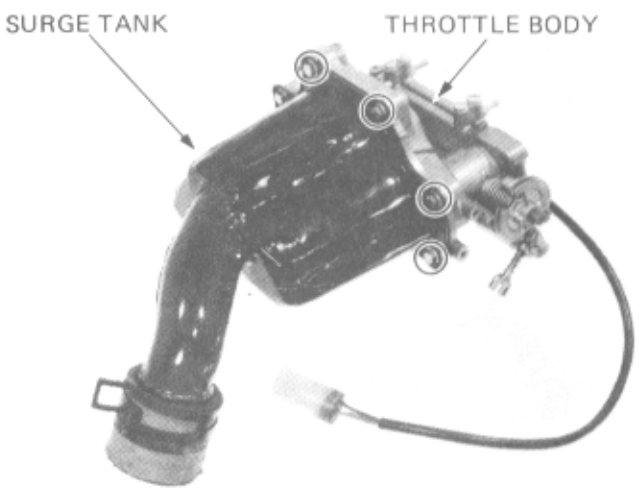


SURGE TANK/THROTTLE BODY

Remove the engine (Section 5).
Unscrew the four bolts from the right and left intake manifold joints.
Remove the throttle body mount bracket.
Remove the surge tank/throttle body assembly from the turbocharger connecting joint by loosening the band.
Separate the intake manifold from the throttle body.



Remove the bolts attaching the surge tank to the throttle body and separate them.

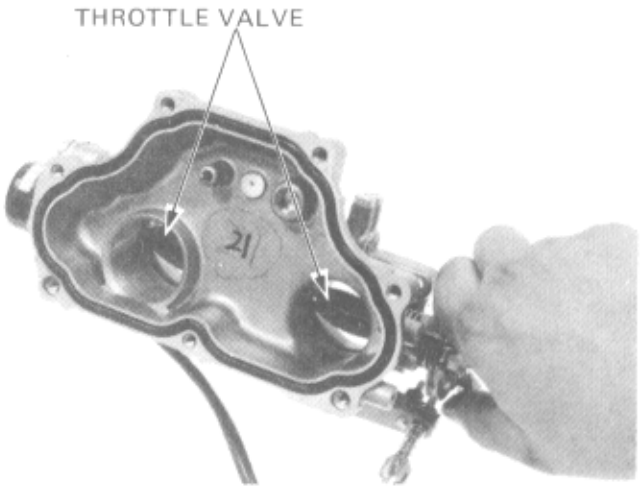


Clean the interior of the throttle body.

Check the operation of the throttle valves by rotating the throttle drum by hand.
See section 24 for throttle sensor inspection and adjustment.

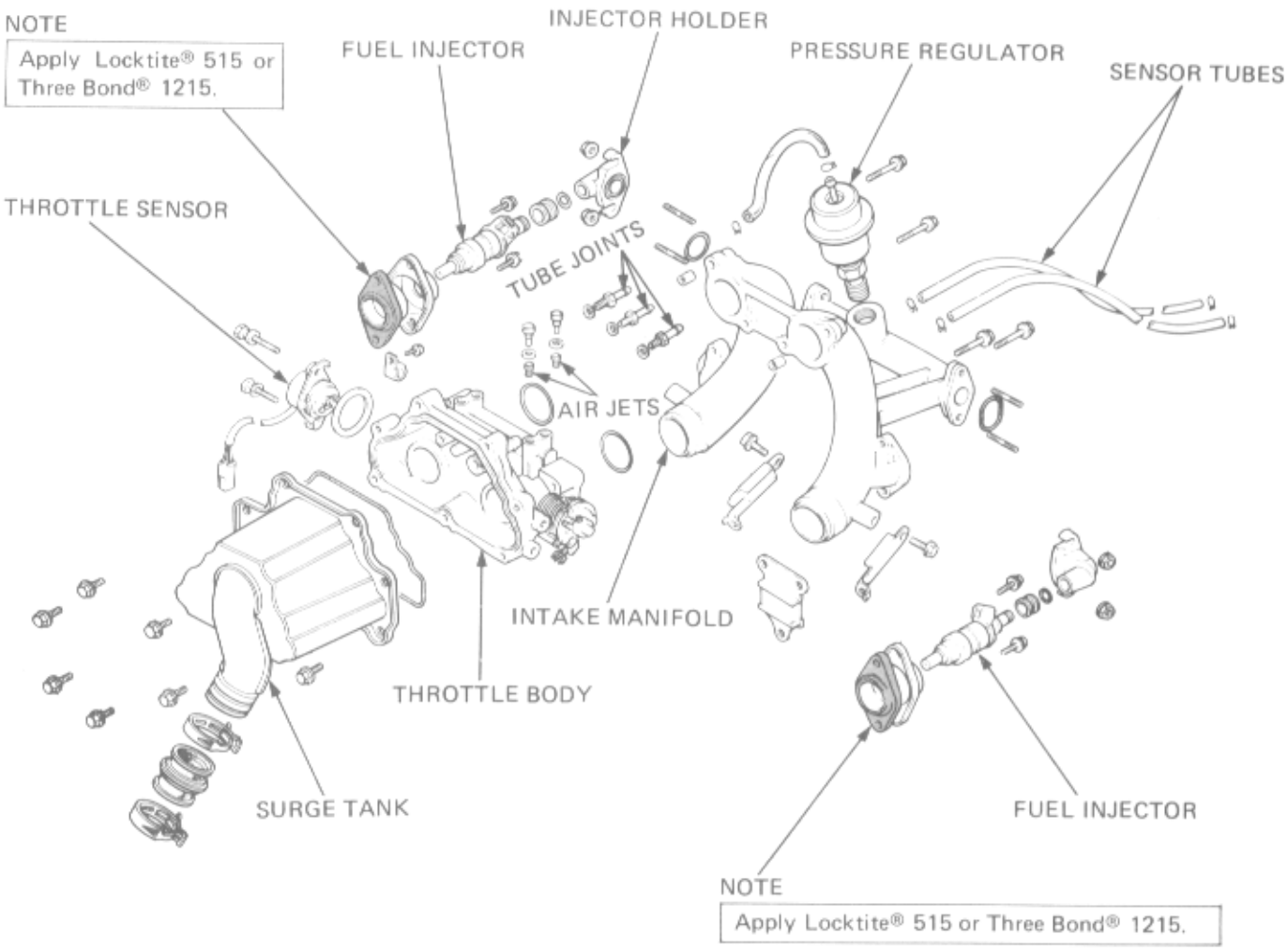
CAUTION

Do not disassemble the throttle sensor.



INSTALLATION

The installation sequence is essentially the reverse order of removal.



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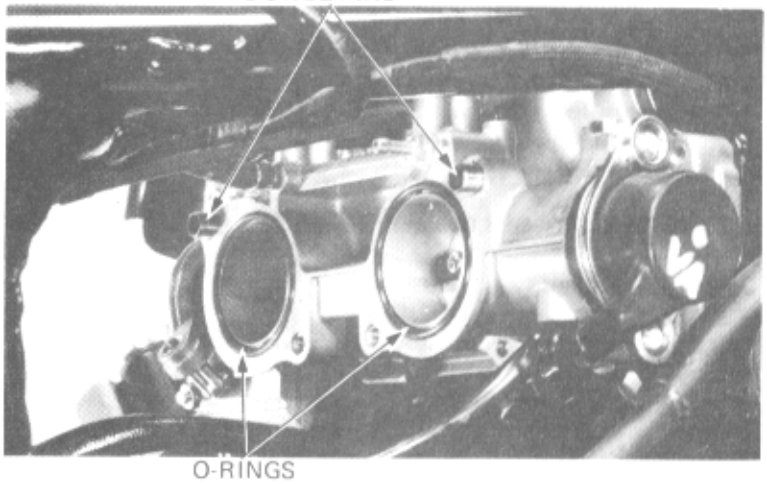
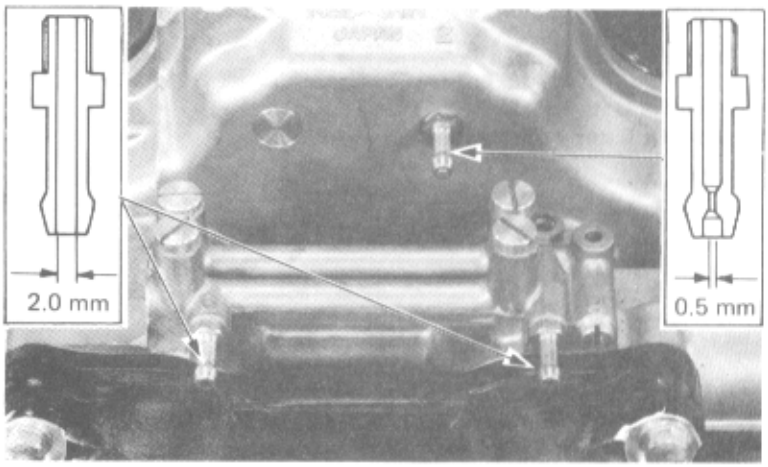
NOTE

- Be sure the dowel pins and new O-rings are in place before installation.
- Be sure the injector's manifold mating surface is clean and apply Locktite® 515 or Three Bond® 1215 between the injector assembly and intake manifold surfaces.
- Install new O-rings and sealing washers.



NOTE

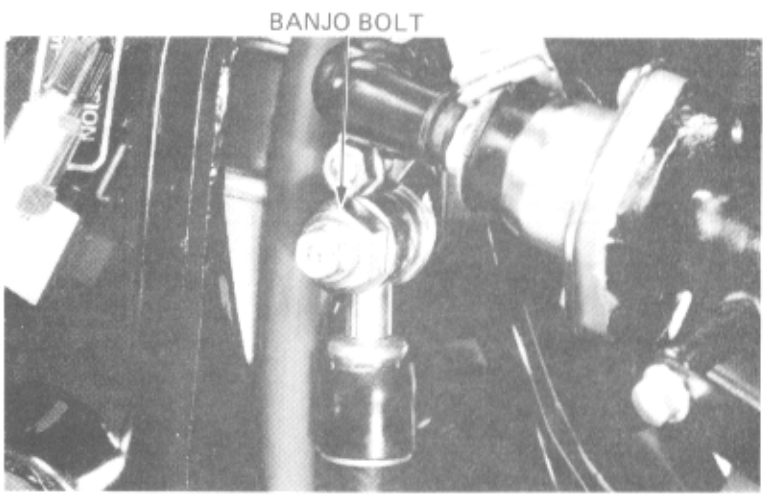
- There are three fuel tube joints; one, 0.5 mm (0.02 in), and two, 2.0 mm (0.08 in) diameter. Install them as shown.
- Blow open all tubes and passages in the throttle body with compressed air before assembly.



Install new sealing washers and tighten the fuel hose banjo bolt to the specified torque.

TORQUE: 35–50 N·m
(3.5–5.0 kg-m, 25–36 ft-lb)

After installation, make sure that the fuel hoses are not pinched or collapsed. Also check that there are no leaking parts.



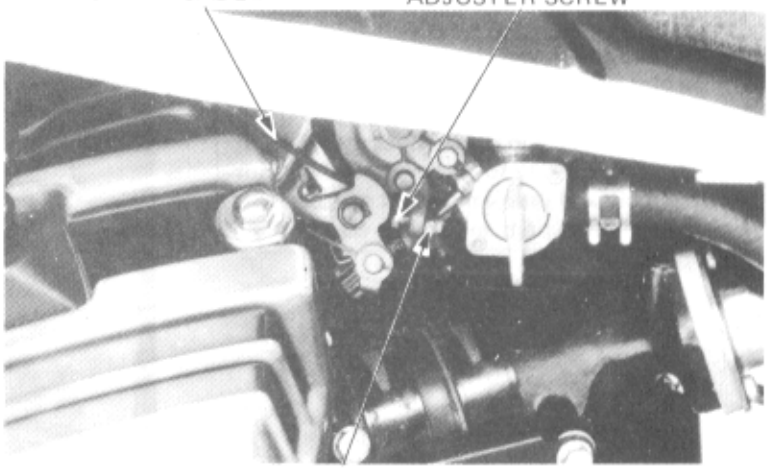
FAST IDLE SPEED ADJUSTMENT

Warm up the engine, place the transmission in neutral and the motorcycle on center stand.
Pull the choke lever on the handlebar all the way down to the full open position. Adjust the fast idle speed with the adjuster screw.

FAST IDLE SPEED: 3,000 rpm

Tighten the lock nut.

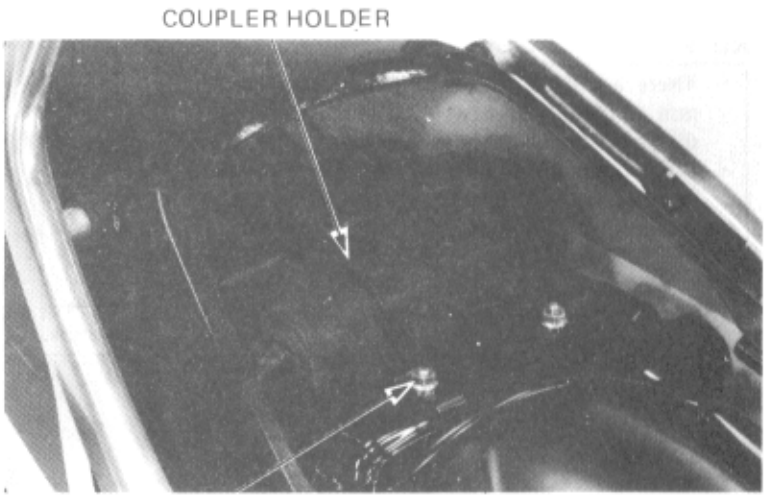
Push the choke lever on the throttle body and cable housing all the way up to the closed position. Make sure the throttle valve is fully closed by checking for free play in the cable between the lifter lever on the throttle body and cable casing.



COMPUTER UNIT

REMOVAL

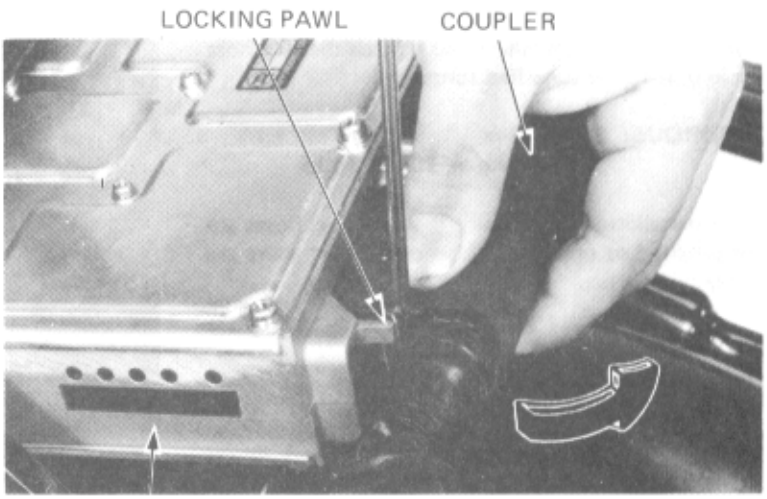
Remove the seat.
Remove the 6 mm nut and coupler holder.



Disconnect the CFI computer coupler from the unit by releasing the locking pawl.
Remove the computer unit.

NOTE

Do not disassemble the computer unit.



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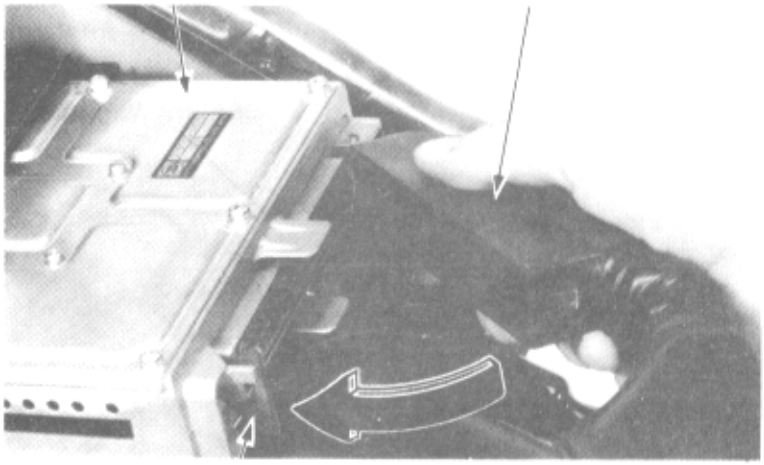
INSTALLATION

The installation sequence is the reverse order of removal.
Make sure that the coupler terminals are clean and in good condition.
After connecting the computer unit coupler to the computer unit, make sure that the locking pawls are engaged securely.



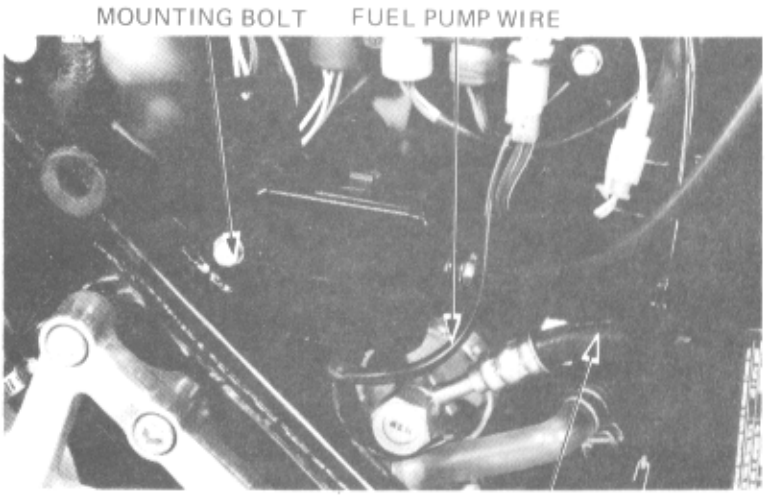
FUEL PUMP

REMOVAL

WARNING

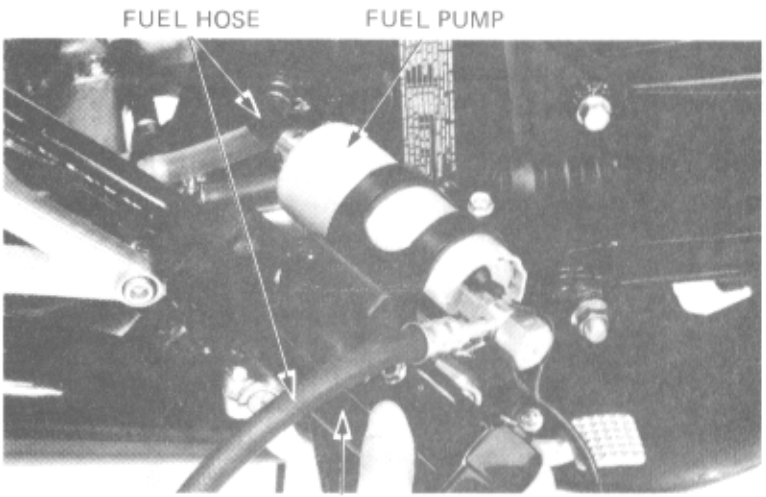
Gasoline is flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks near the work area.

Turn the ignition switch OFF.
Remove the right side cover.
Disconnect the fuel hose from the intake manifold by removing the fuel hose banjo bolt (page 4-4).
Disconnect the fuel pump wire coupler.
Remove the tool box mounting bolt.



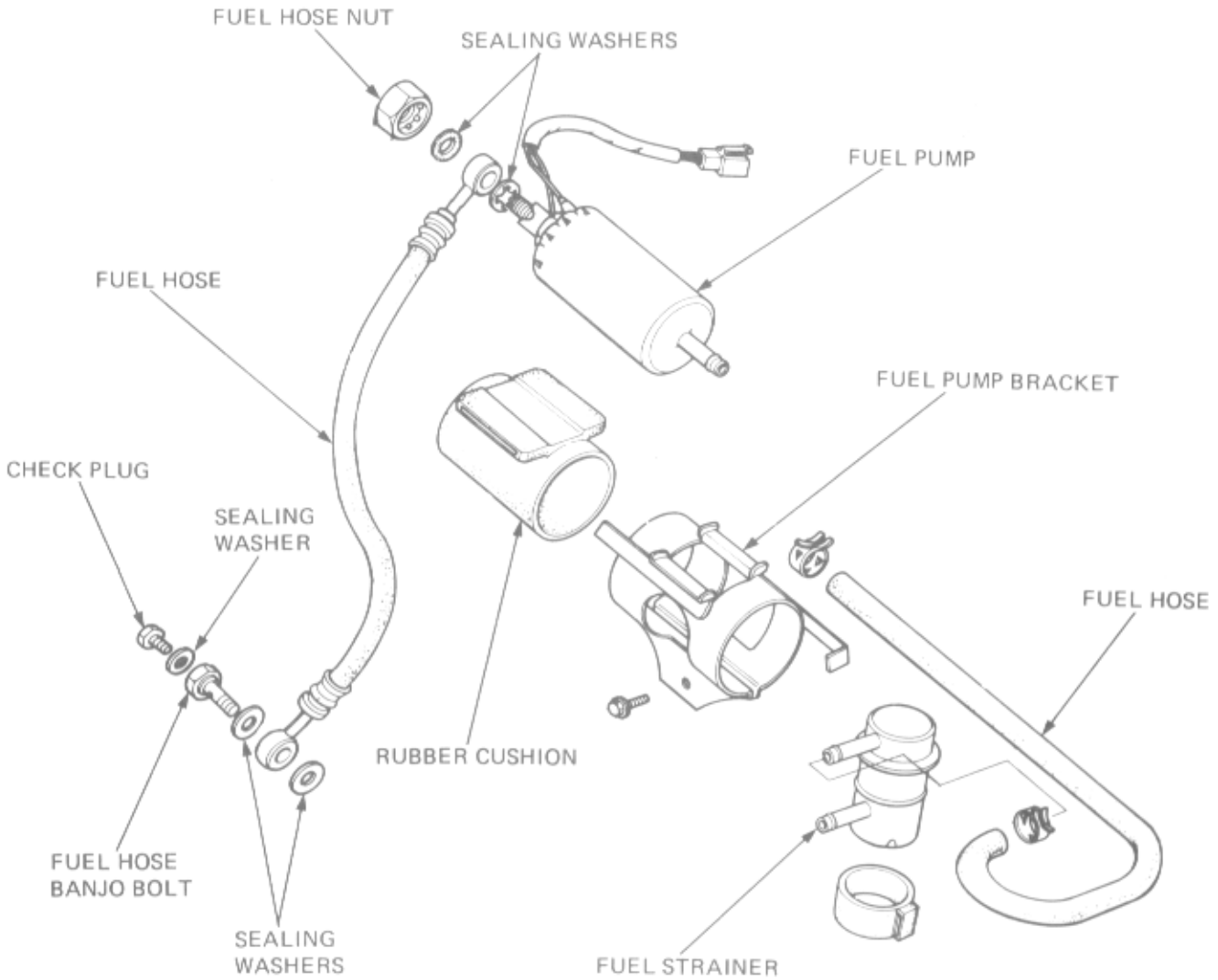
Remove the fuel pump from the tool box by removing the attaching nuts.

Disconnect the fuel lines from the fuel pump.



INSTALLATION

The remaining installation sequence is essentially the reverse order of removal.



Attach the fuel hose to the fuel pump at a 15–20° angle above the fuel pump fitting.
Tighten the fuel hose joint nut.

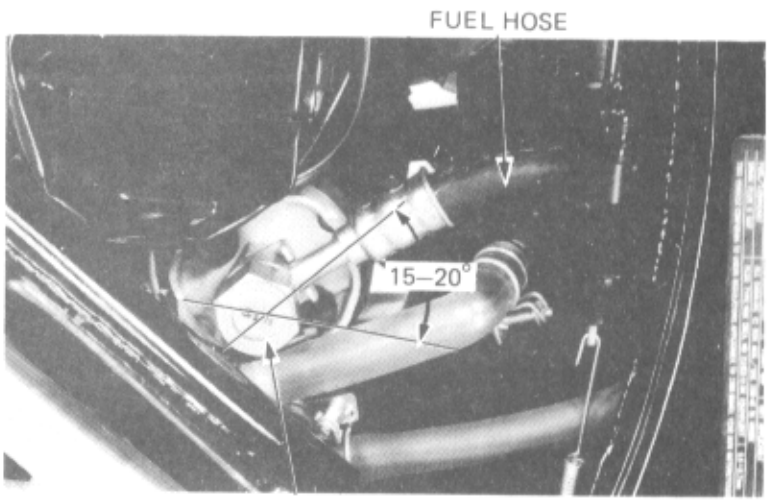
TORQUE: 27–29 N·m (2.7–2.9 kg-m, 20–21 ft-lb)

Connect the fuel hose to the intake manifold and tighten the fuel hose joint bolt.

TORQUE: 35–50 N·m (3.5–5.0 kg-m, 25–36 ft-lb)

NOTE

- Make sure there is sufficient clearance between the fuel line and rear brake light bracket.
- After installation, check that there are no leaking parts.
- Use new sealing washers.



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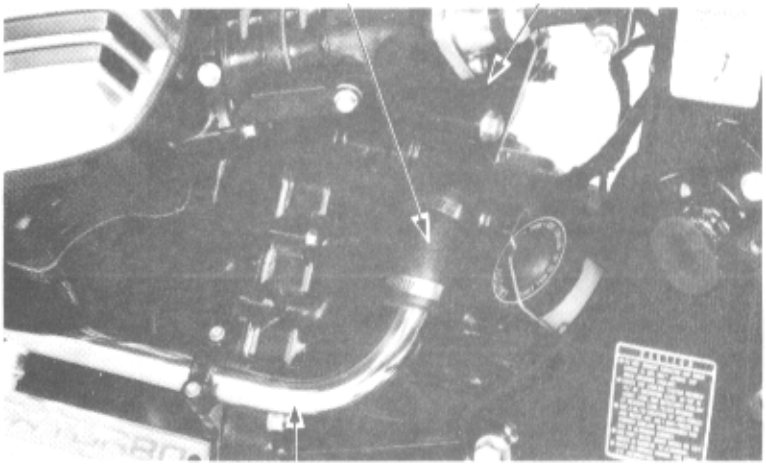
ENGINE SPEED SENSOR

REMOVAL

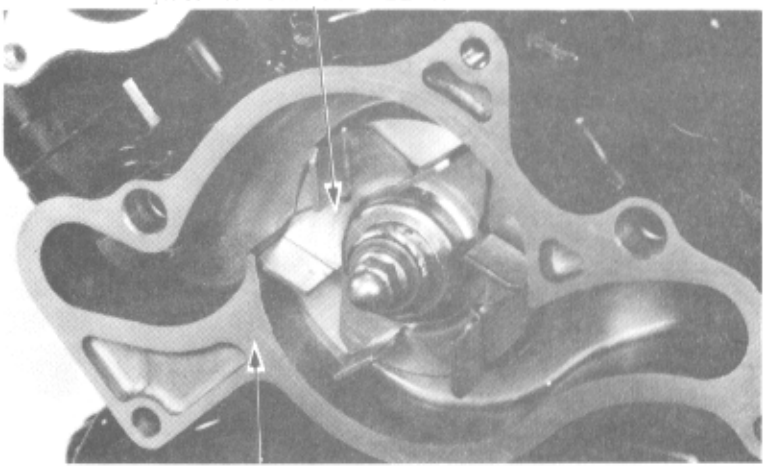
NOTE

Engine speed sensor service can be made with the engine in the frame.

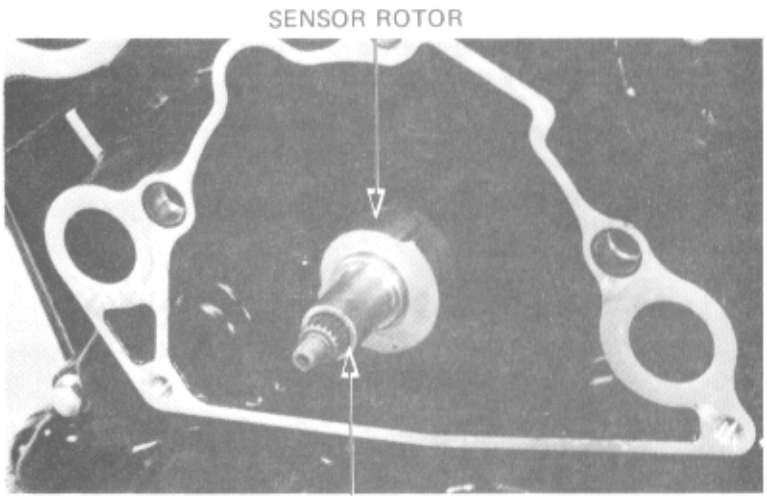
Drain the engine coolant (Section 10).
Remove the water pipe and joint hose.
Remove the water pump cover (Section 10).



Remove the water pump impeller and water pump body (Section 10).



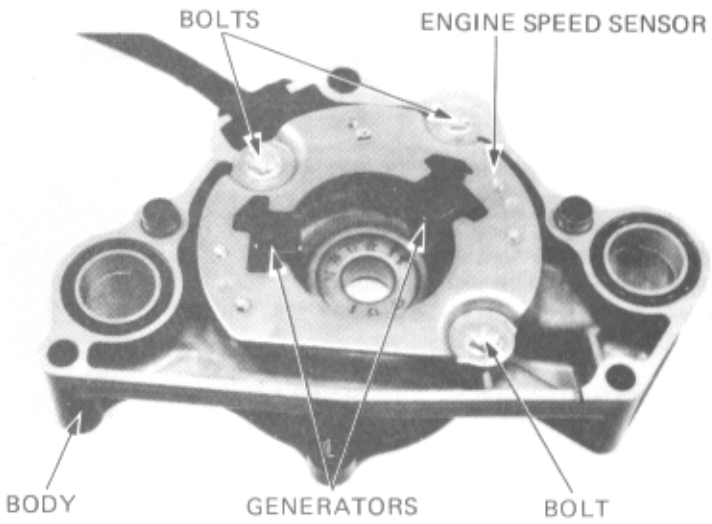
Remove the collar and sensor rotor from the camshaft.



Remove the engine speed sensor from the water pump body by removing three bolts.

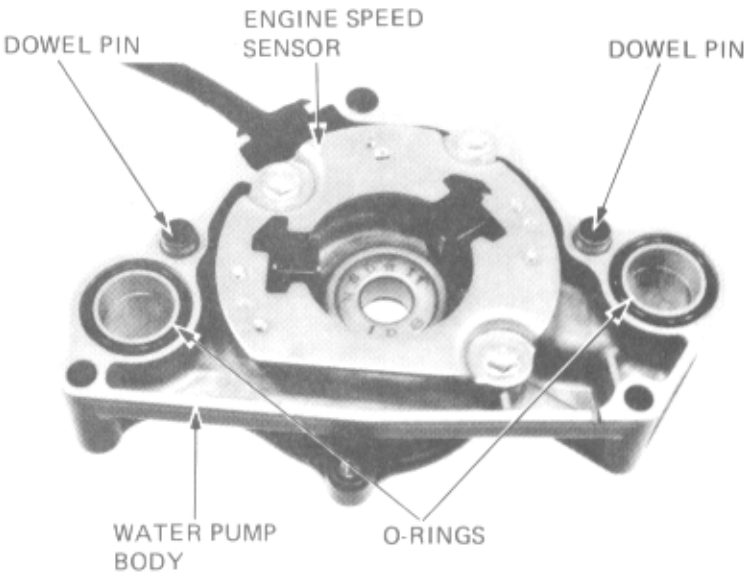
NOTE

Do not remove the sensor generators from its base.



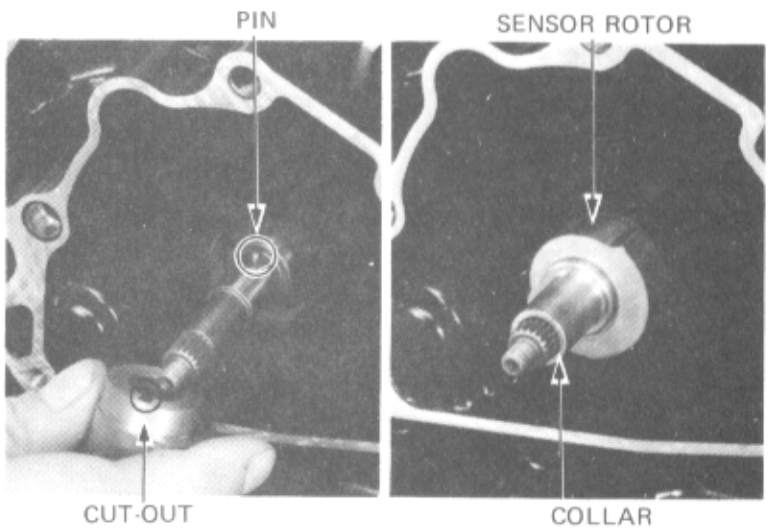
INSTALLATION

Install the dowel pins, new O-rings and engine speed sensor into the water pump body.



Align the cut-out in the engine speed rotor with the pin on the camshaft and install it.

Install the collar on the camshaft.
Install the water pump body and cover (Section 10).
Install the water pipe and joint hose.
Fill the radiator with coolant (Section 10).



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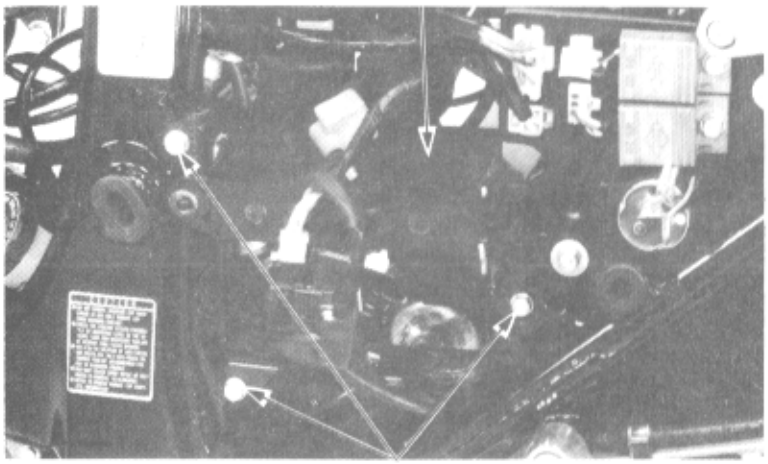
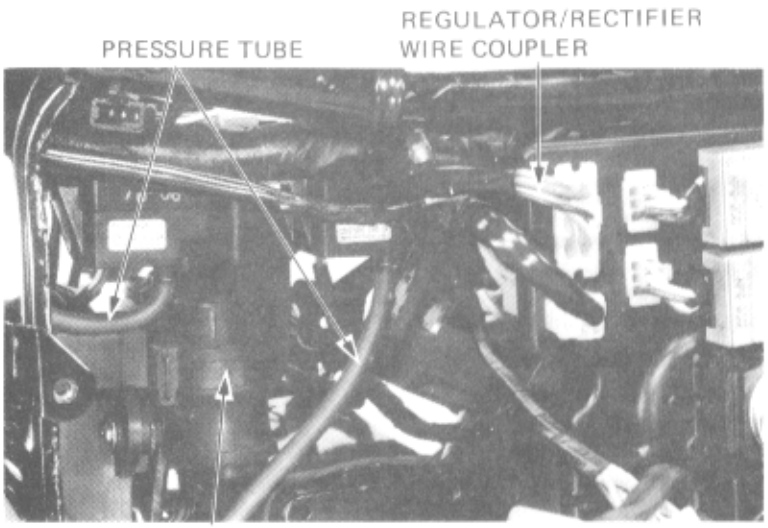
PRESSURE SENSORS

REMOVAL

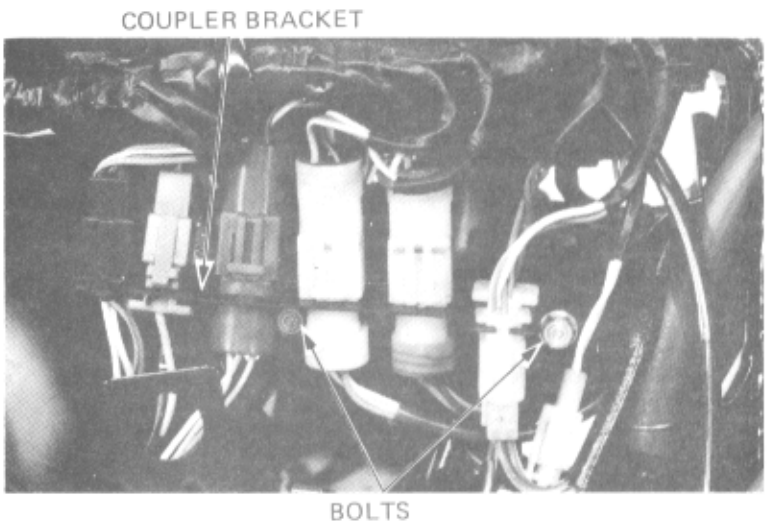
Remove the battery and battery case.



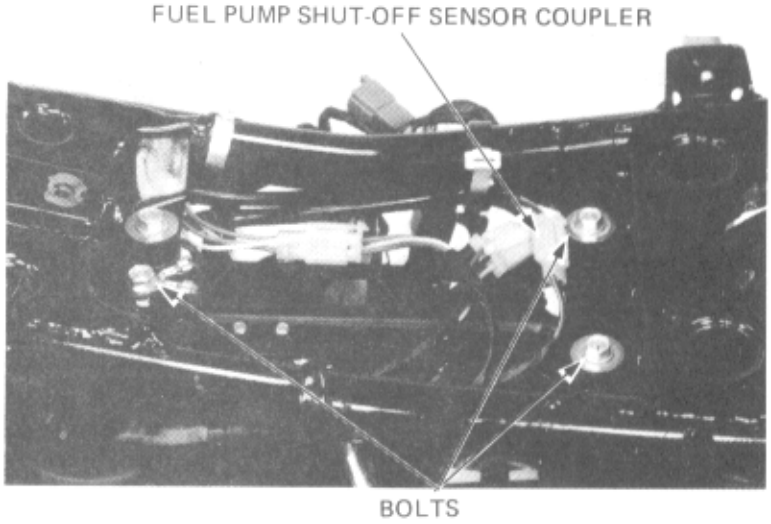
Disconnect the pressure tubes from the P_2 and P_B sensors.
Disconnect the regulator/rectifier coupler.
Remove the fuel pump relay from the bracket.



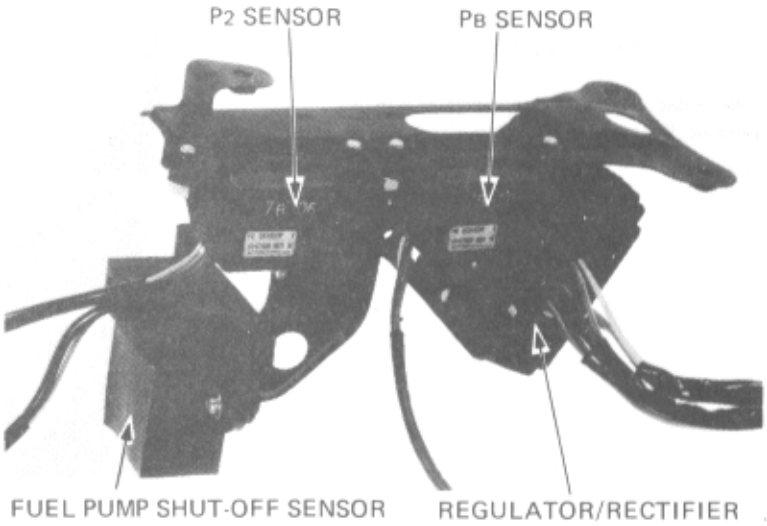
Disconnect the sensor couplers and remove the coupler bracket by removing two 6 mm bolts.
Remove the main relay from the bracket.



Disconnect the fuel pump shut-off sensor coupler. Remove the sensors by removing the three 6 mm bolts.



Remove each sensor and the regulator/rectifier from the sensor bracket.

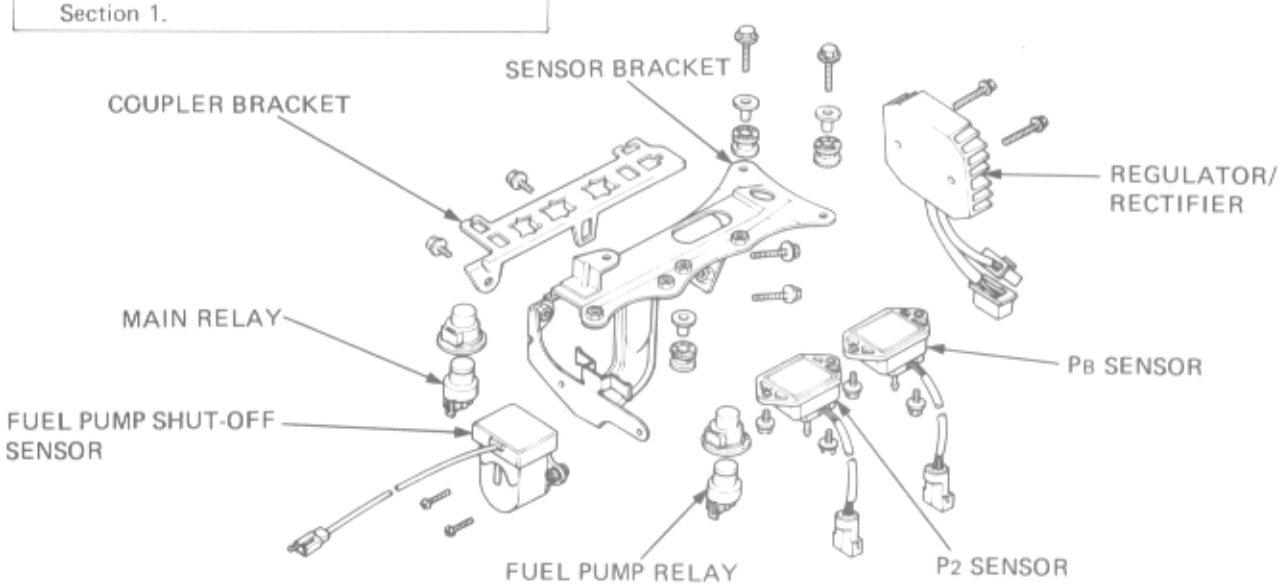


INSTALLATION

Installation is essentially the reverse order of removal. See the notes below.

NOTE

- Connect the vacuum tubes to the respective sensors as follows:
  Tube 2 : P2 sensor
  Tube 3 : PB sensor
- After connecting the tubes, make sure that they are not twisted or pinched.
- Route the wire harnesses, cables and tubes as described in Cable and Harness Routing, Section 1.



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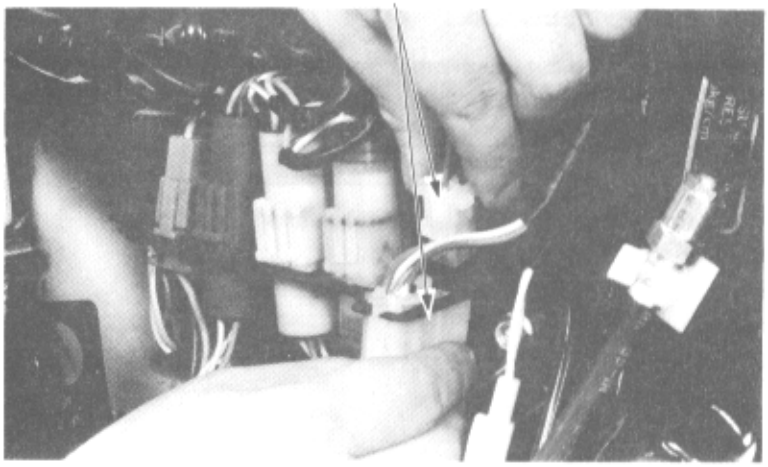
FUEL TANK

REMOVAL

Turn the ignition switch off.
Remove the side covers and seat.
Disconnect the fuel pump coupler, located under the right side cover.

CAUTION

Never turn the ignition switch on when the fuel tank is removed. Fuel could squirt out of the fuel return hose. Disconnect the fuel pump coupler whenever the fuel tank is removed.



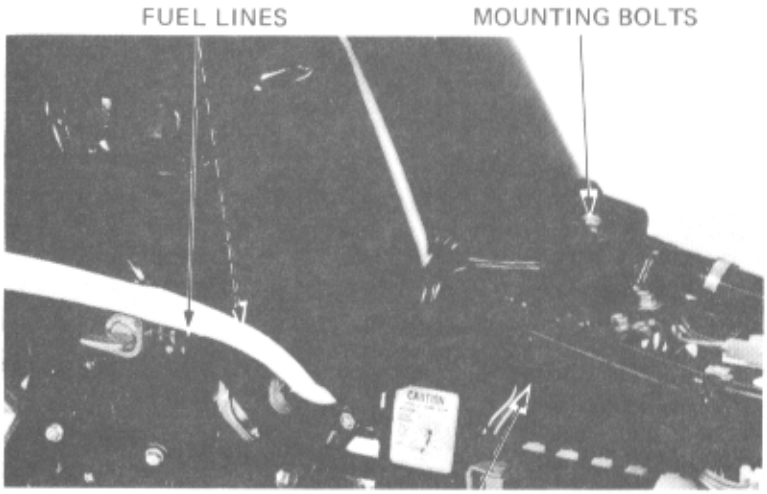
Disconnect the fuel lines from the fuel valve.

WARNING

The fuel pump coupler must be disconnected to prevent gasoline from being pumped out of the fuel hoses if the ignition switch is turned on and causing a fire hazard.

Disconnect the fuel gauge sensor coupler from the main wire harness.

Remove the fuel tank mounting bolt and remove the fuel tank being careful not to damage the fuel gauge wires and coupler.



WARNING

Gasoline is flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks near the work area while draining fuel.

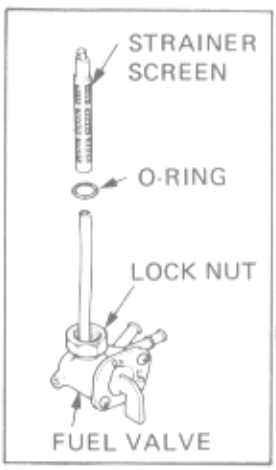
FUEL STRAINER

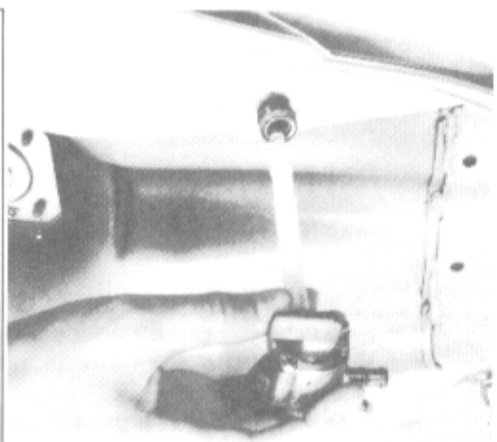
Drain the fuel tank.
Remove the fuel valve by loosening the lock nut.

NOTE

Hold the fuel valve body while turning the lock nut.

Remove the fuel strainer screen.
Blow dust and sediment off the screen with compressed air.
Check the O-ring for deterioration or damage and replace it with a new one if necessary.





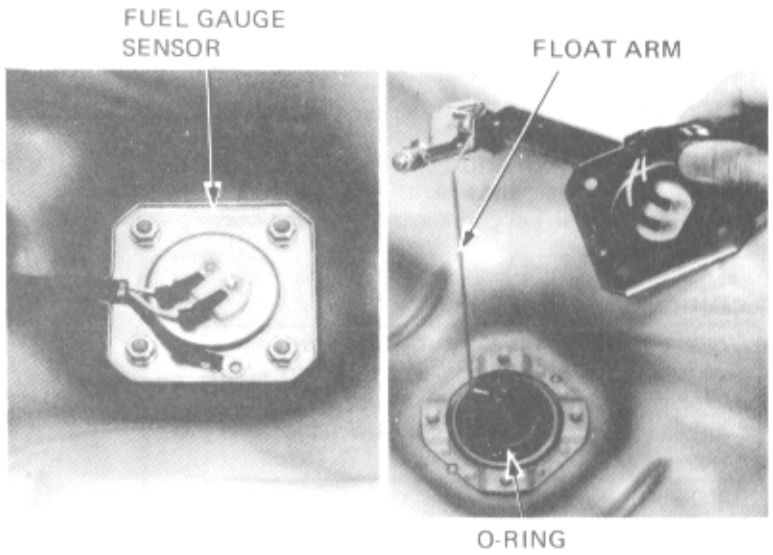
FUEL GAUGE SENSOR

Remove the four fuel gauge sensor nuts and sensor.

NOTE

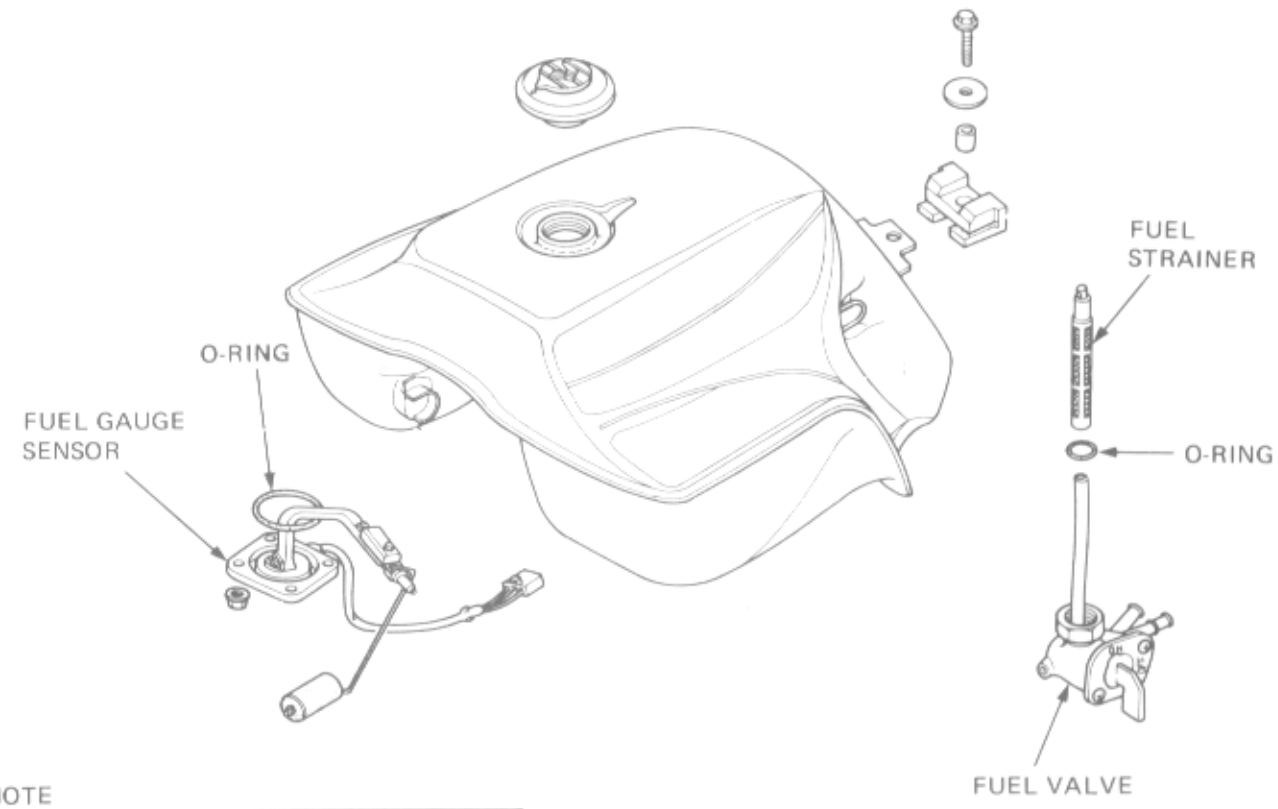
Do not bend the float arm.

Check the O-ring for deterioration or damage and replace it with a new one if necessary.



FUEL TANK ASSEMBLY

Assembly is the reverse order of disassembly.



NOTE

- After installation, check the operation of the fuel valve. Also make sure that there are no leaks.
- Hold the fuel valve while turning the fuel valve retaining nut.
- Do not bend the float arm.

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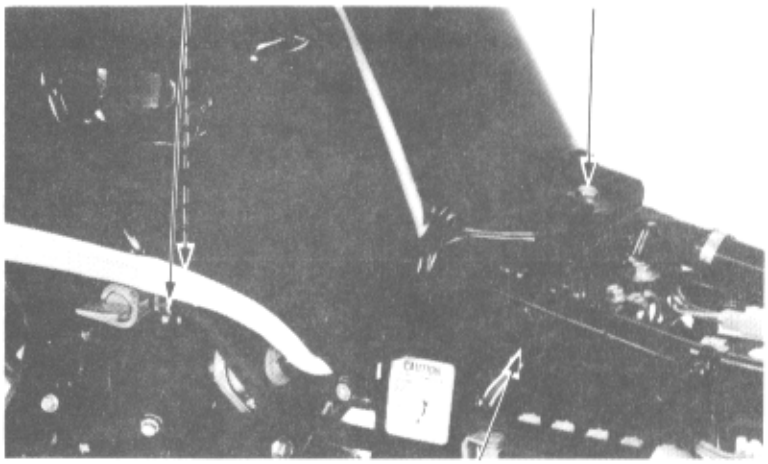
Connect the fuel lines to the fuel valve and attach the hose bands securely.
Connect the fuel gauge sensor coupler to the main wire harness.

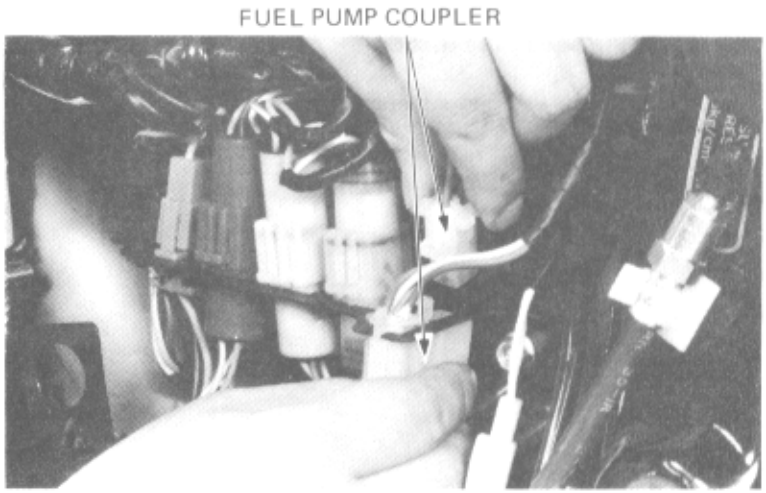
NOTE

Be sure the fuel gauge wires are routed and secured correctly.

Install the fuel tank mounting bolt.



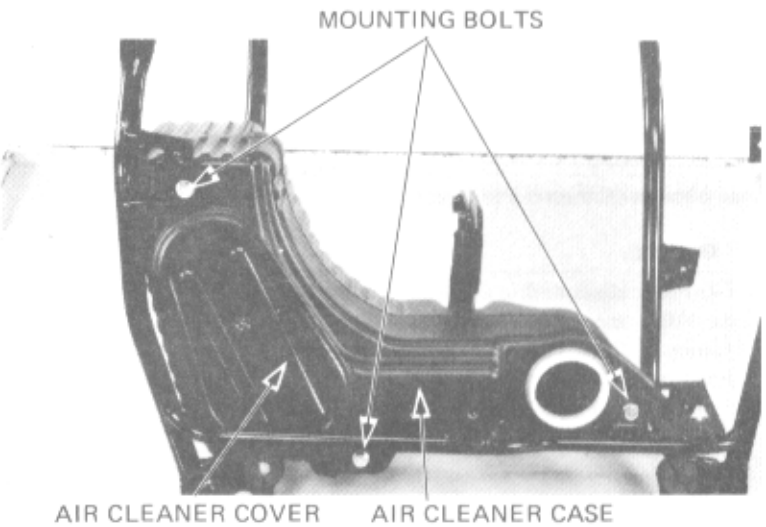
Reconnect the fuel pump coupler.
Install the seat and side covers.



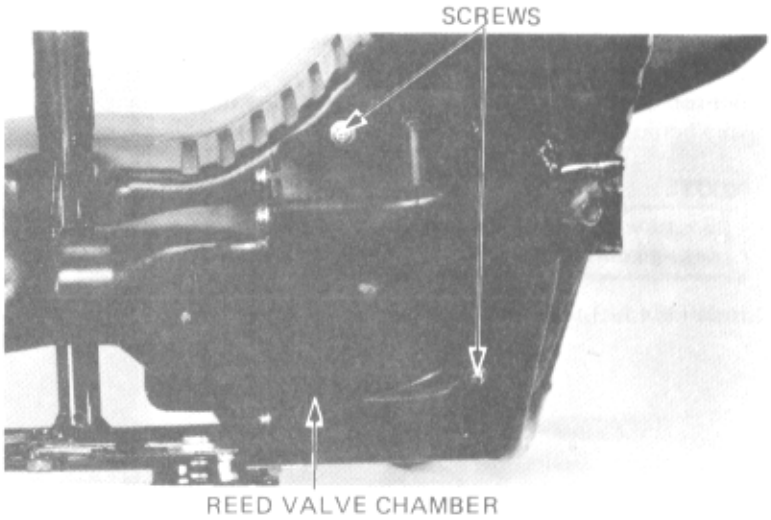
AIR CLEANER CASE/REED VALVE

DISASSEMBLY

Remove the fairing and fairing bracket (Section 14).
Remove the air cleaner cover and element from the air cleaner case.
Remove the three air cleaner case mounting bolts.

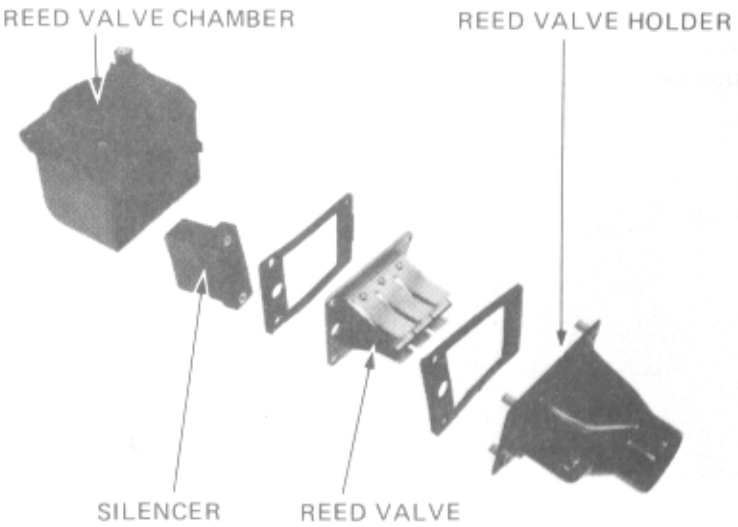


Remove the reed valve chamber from the air cleaner case by removing the two screws. Then remove the air cleaner case.



Disassemble the reed valve chamber.

Remove the reed valve and silencer from the reed valve chamber.

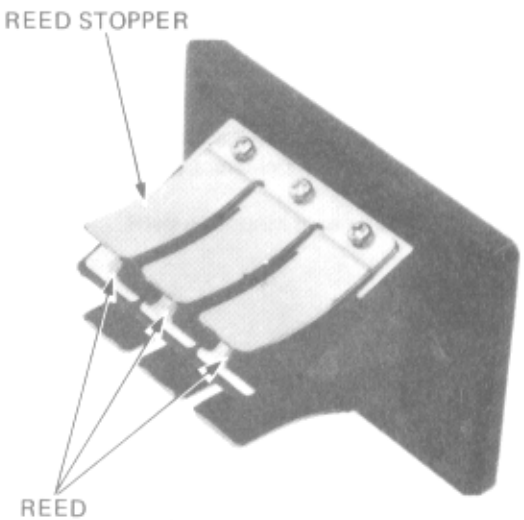


Check the reeds for damage or fatigue and replace if necessary.

Replace the reed valve with a new one if the seat rubber is cracked or damaged, or if there is clearance between the reed and seat.

CAUTION

Do not disassemble or bend the reed stopper as this may cause improper engine performance. The reed valve must not be disassembled. If the stopper, reed or seat is faulty, replace it as a unit.



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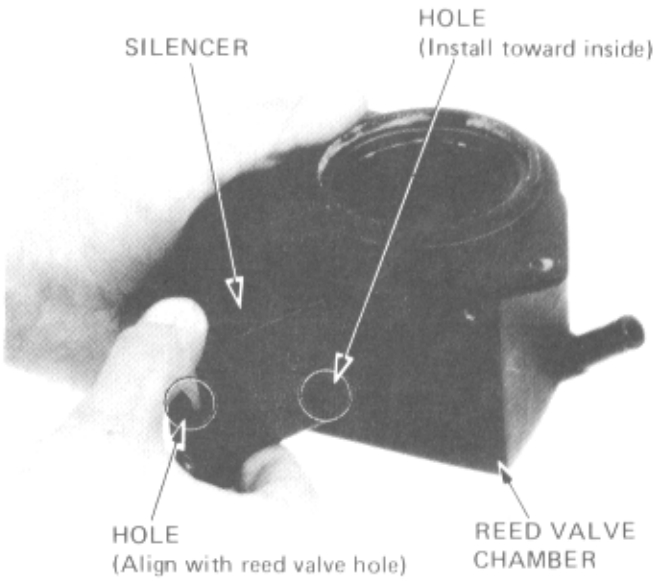
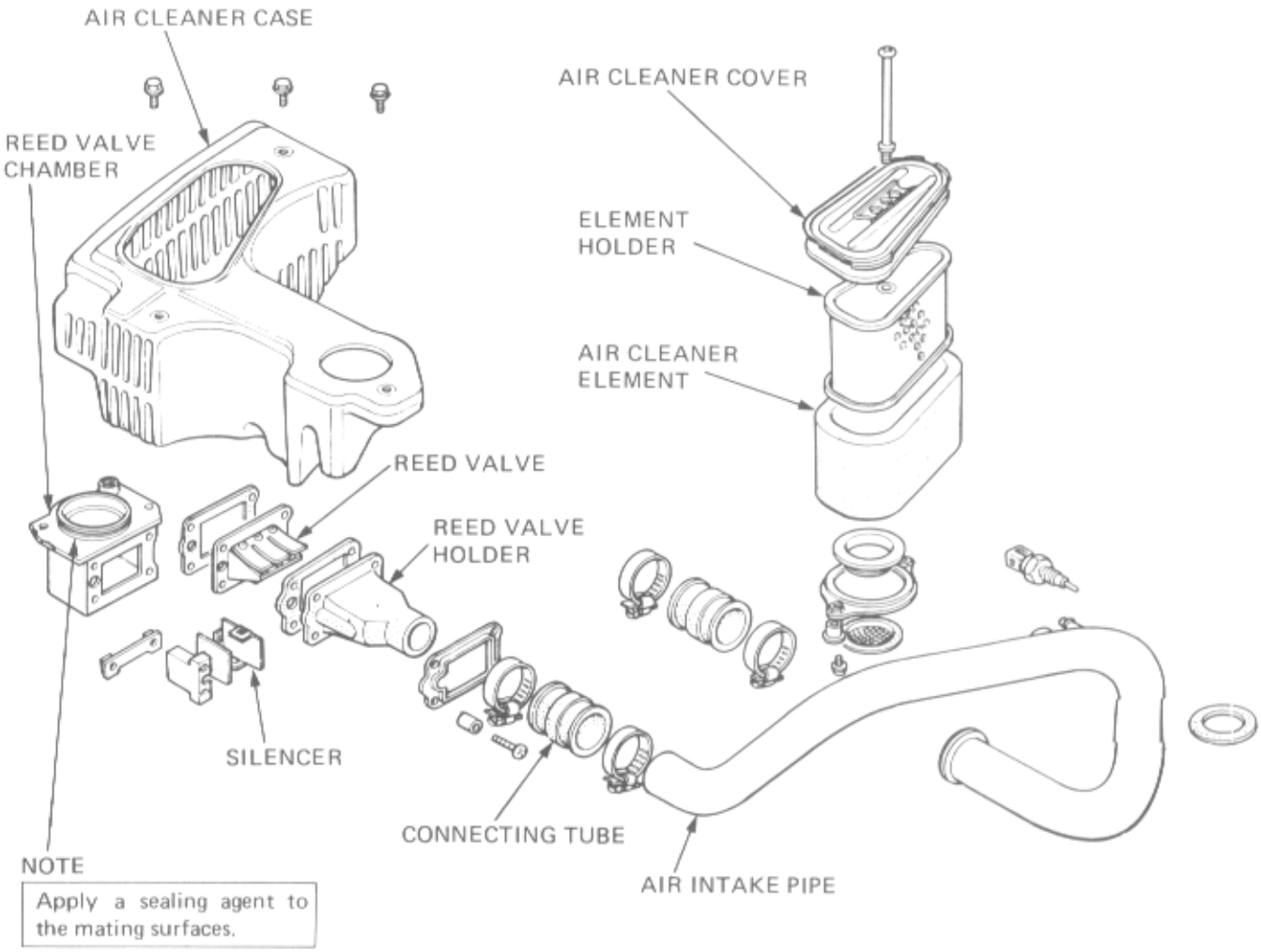
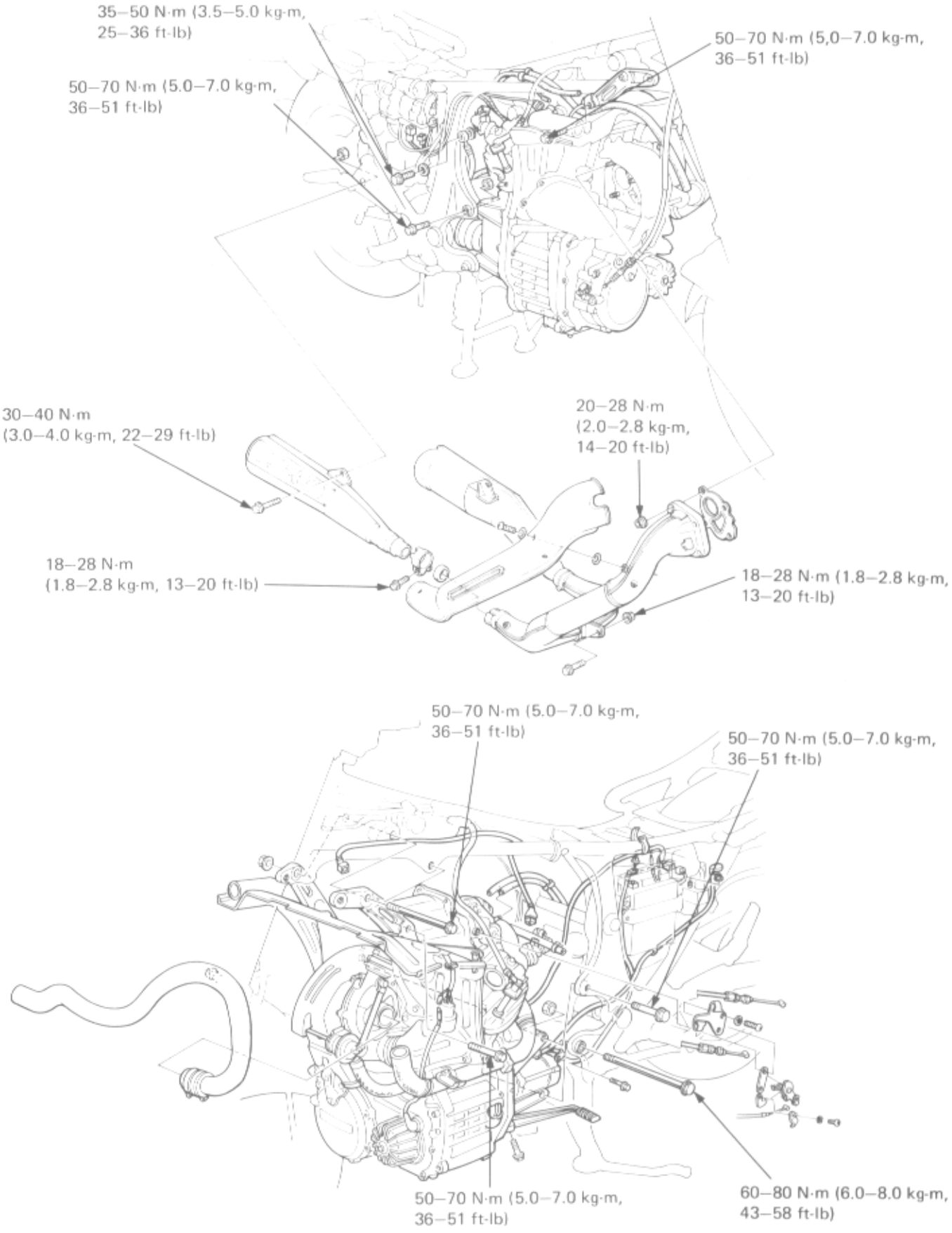
INSTALLATION

Assemble the reed valve chamber:
Install the reed valve with the hole at the side aligned with the hole in the chamber.
Install the silencer with the hole toward the inside.



Installation sequence is essentially the reverse order of removal.





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5. ENGINE REMOVAL/INSTALLATION

SERVICE INFORMATION

GENERAL

WARNING

Keep flames and sparks away from your work area.

- Parts requiring engine removal for servicing:
  - Crankshaft and pistons
  - Connecting rods
  - Camshaft
  - Flywheel and starting clutch
  - Gearshift spindle
  - Transmission

- Remove and install the engine with a hydraulic jack to support its weight.
- Drain the engine oil before removing the engine if the front or rear cover is to be removed.
- For cooling system removal and installation, see Section 10, Cooling System.

SPECIFICATIONS

Engine oil capacity	3.0 lit (3.2 US qt, 2.6 Imp qt) at draining 3.1 lit (3.3 US qt, 2.7 Imp qt) at draining and oil filter change 3.6 lit (3.8 US qt, 3.2 Imp qt) at disassembly
Engine oil recommendation	See page 2-1
Coolant capacity (Radiator and engine)	2.1 lit (2.2 US qt, 1.8 Imp qt) at draining

TORQUE VALUES

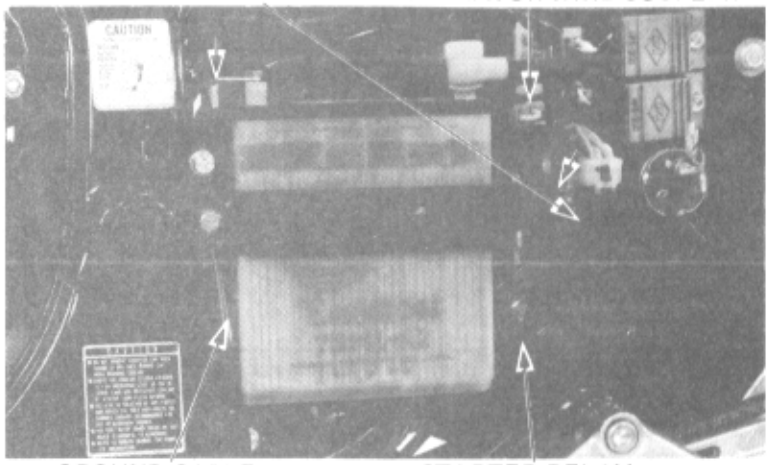
Front engine hanger bolt	35–45 N·m (3.5–4.5 kg-m, 25–33 ft-lb)
Front engine hanger nut	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Front engine mount bolt (10 mm)	50–70 N·m (5.0–7.0 kg-m, 36–51 ft-lb)
Rear engine mount bolt (10 mm)	50–70 N·m (5.0–7.0 kg-m, 36–51 ft-lb)
(12 mm)	60–80 N·m (6.0–8.0 kg-m, 43–58 ft-lb)
Muffler mount bolt	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Power chamber bolt	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
Muffler band bolt	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
Exhaust pipe joint nut	20–28 N·m (2.0–2.8 kg-m, 14–20 ft-lb)

ENGINE REMOVAL

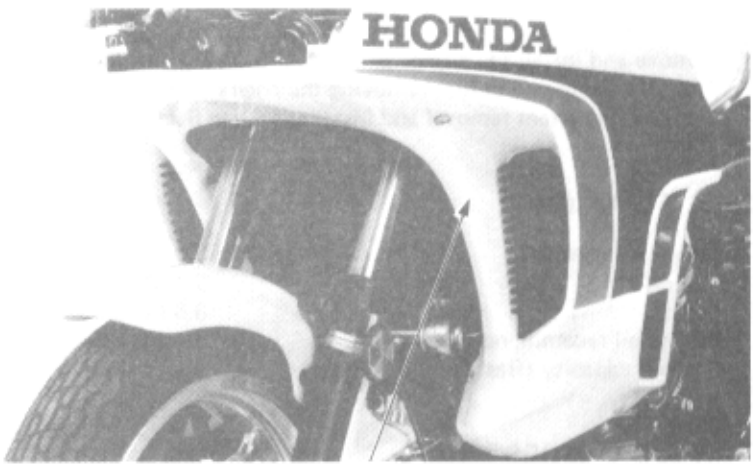
Disconnect the battery ground cable from the battery.

Remove the starter wires from the starter relay.

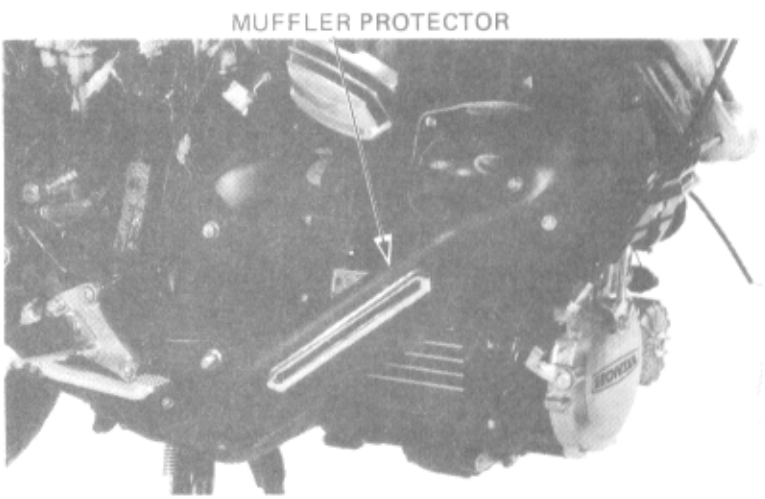
Remove the wire clamp and disconnect the alternator wire couplers.



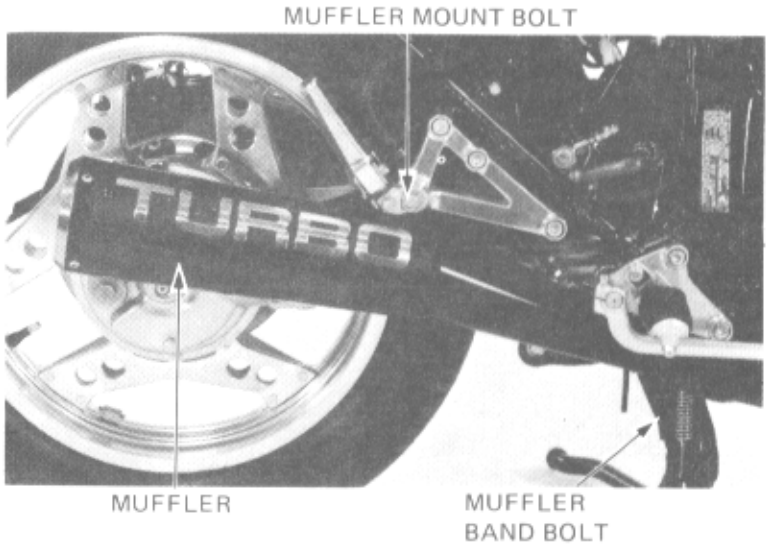
Remove the fuel tank (page 4-15).
Remove the fairing and fairing bracket as described in Section 14.
Drain the coolant from the radiator and remove the radiator (Section 10).



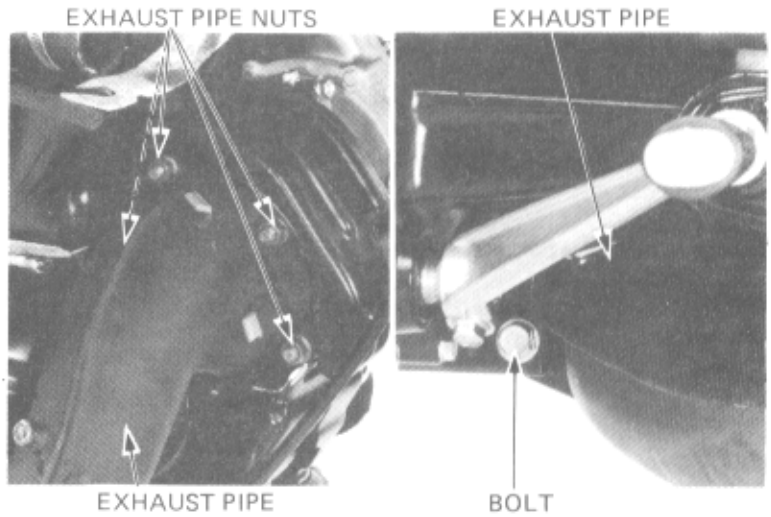
Remove the muffler protector.



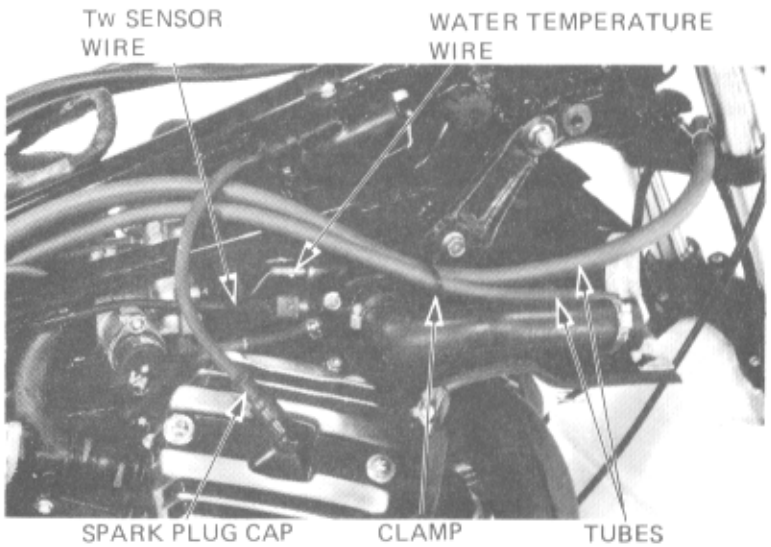
Remove the right and left exhaust mufflers.



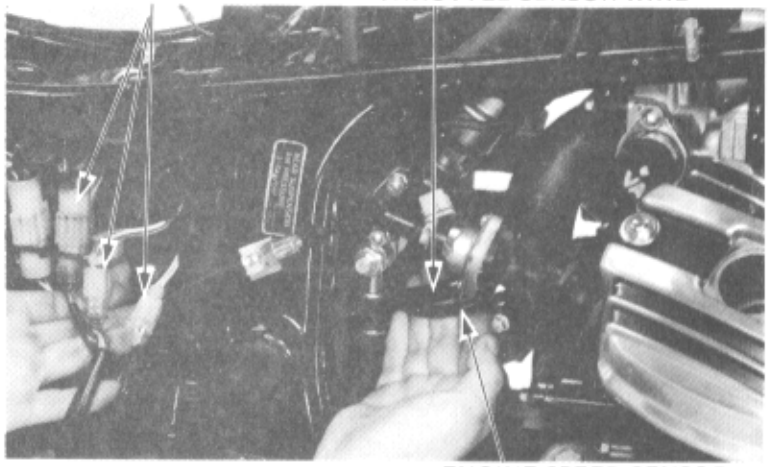
Remove the four exhaust pipe nuts and three exhaust pipe hanger bracket bolts. Remove the exhaust pipe.



Remove the spark plug caps from the spark plugs. Pull the crankcase breather and coolant siphon tubes back out of the tube clamp on the right front engine mount bracket.
Disconnect the Tw sensor and water temperature switch wire from the thermostat cover.



Disconnect the throttle sensor (white 3P water proof) coupler, crankshaft angle sensor (white 2P) and engine speed sensor (white 4P) couplers.

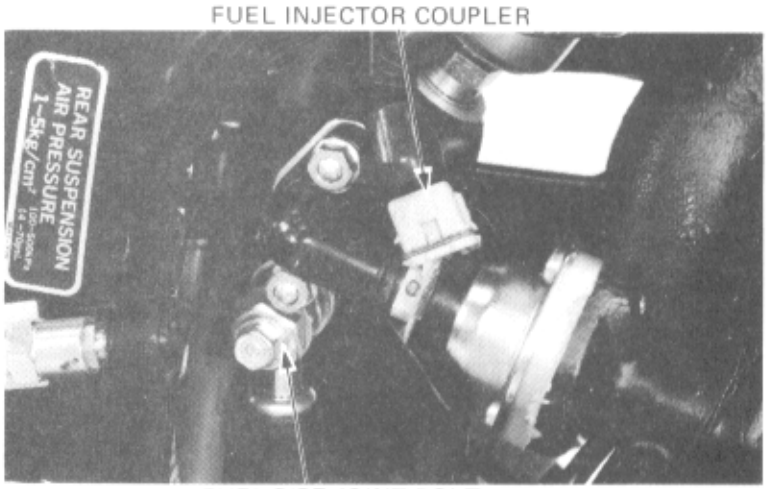


Disconnect the right and left fuel injector couplers.

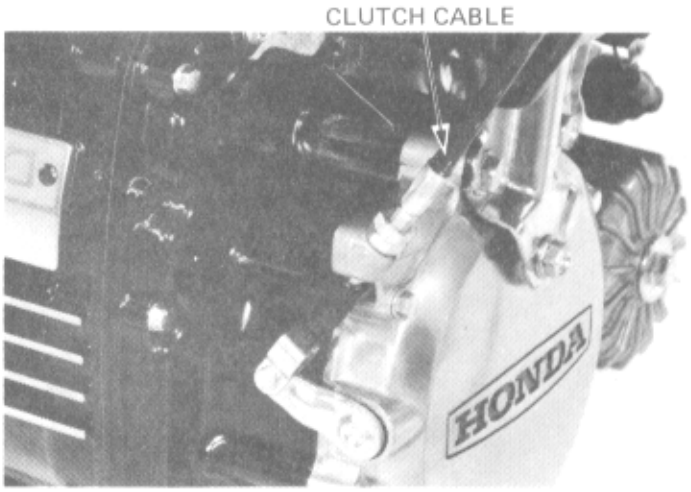
Wrap a shop towel around the fuel line and banjo bolt fitting.
Loosen the banjo bolt slowly to prevent fuel from squirting out.

Cover the fuel inlet port with tape.

Disconnect the crankcase breather tube from the engine case.



Disconnect the clutch cable from the clutch lifter lever.



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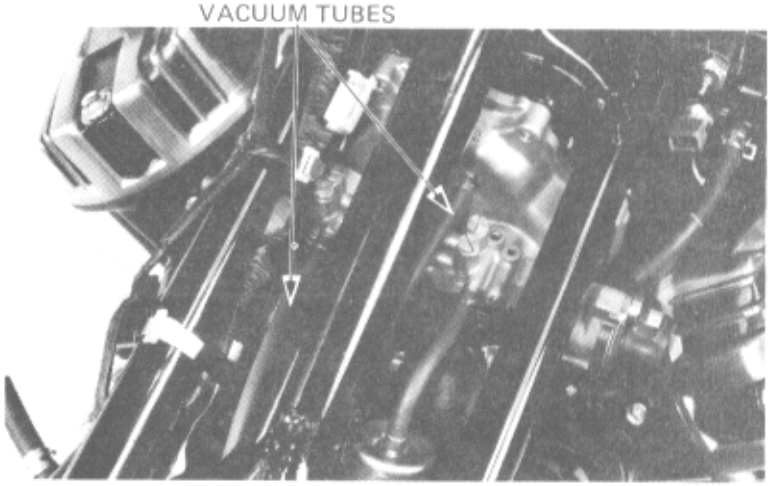
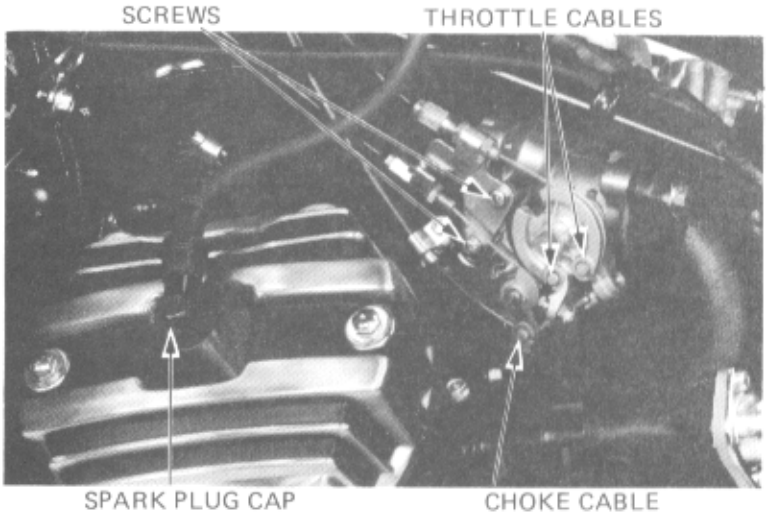
Remove the vacuum tubes from the throttle body.

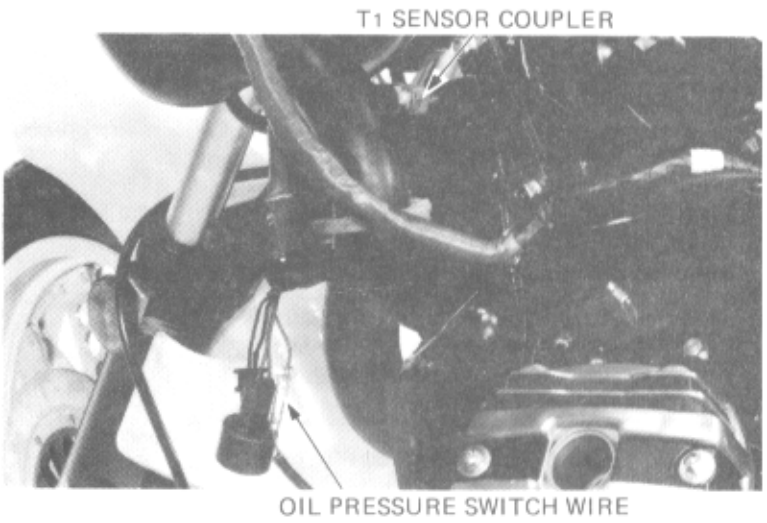


Remove the two screws attaching the throttle and choke cable bracket to the throttle body.
Disconnect the throttle and choke cable from the throttle body.
Remove the spark plug cap from the cylinder head.

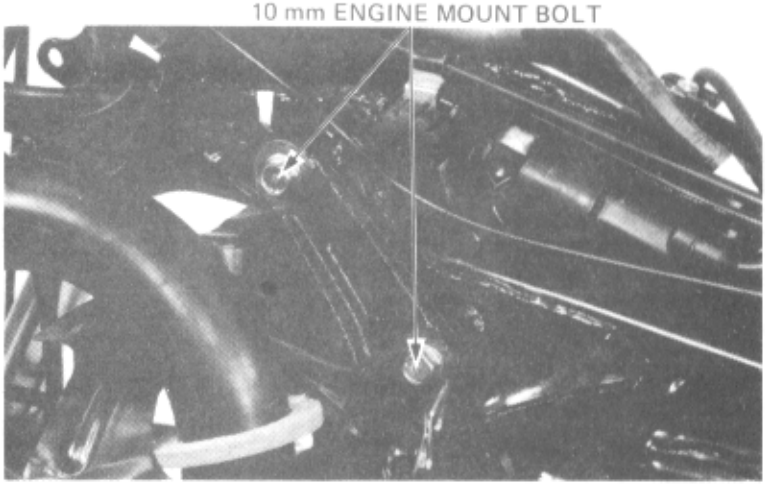


Remove the T1 sensor coupler at the air intake pipe.

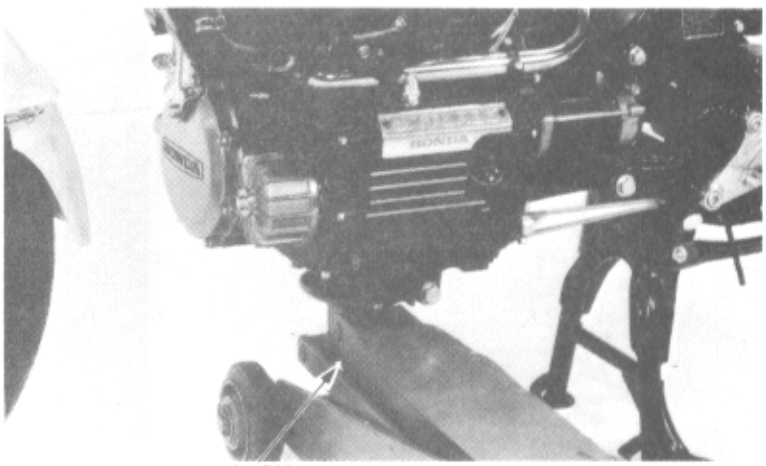
Disconnect the oil pressure switch wire connector.



Remove the three front 10 mm engine mount bolts and nuts.



Place a floor jack or other adjustable support under the engine.

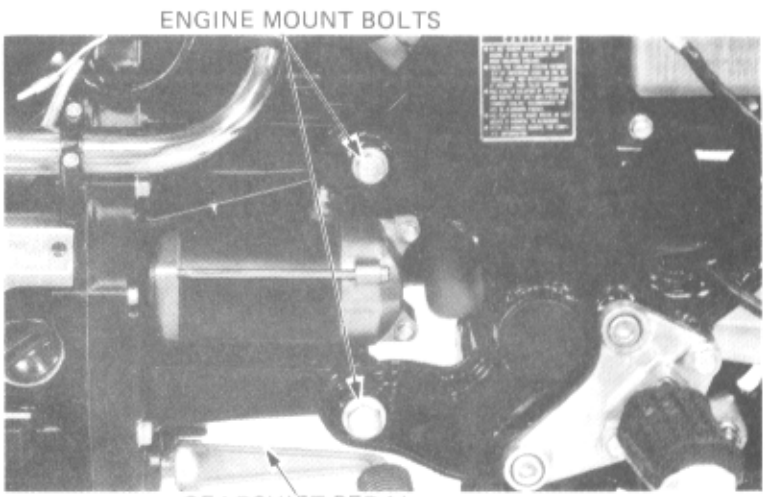


Remove the gearshift pedal.
Remove the three rear engine mount bolts and nuts.

Disengage the final shaft from the U-joint assembly by adjusting the jack height and moving the engine forward.
Remove the engine from the frame.

CAUTION

Jack height must be continuously adjusted during engine removal and installation to prevent damage to mounting bolt threads, wire harness and cables.



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ENGINE INSTALLATION

The installation sequence is essentially the reverse order of removal.
Place the transmission into gear.
Raise the engine with a jack and align the U-joint with the final shaft.
Slide the final shaft into the U-joint assembly by moving the engine backward.

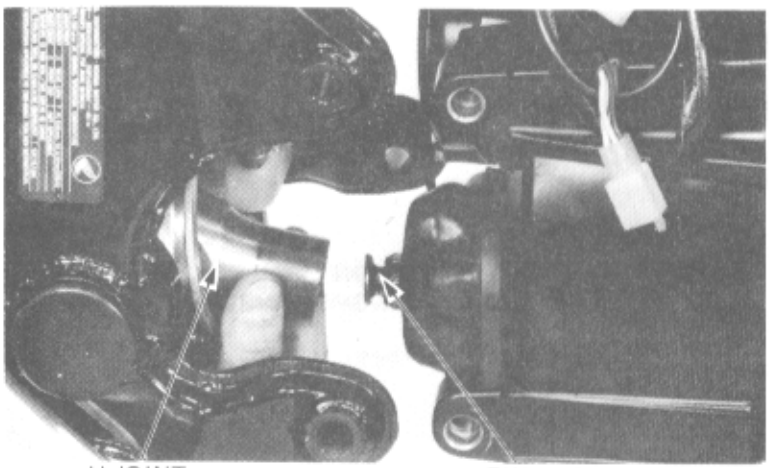
NOTE

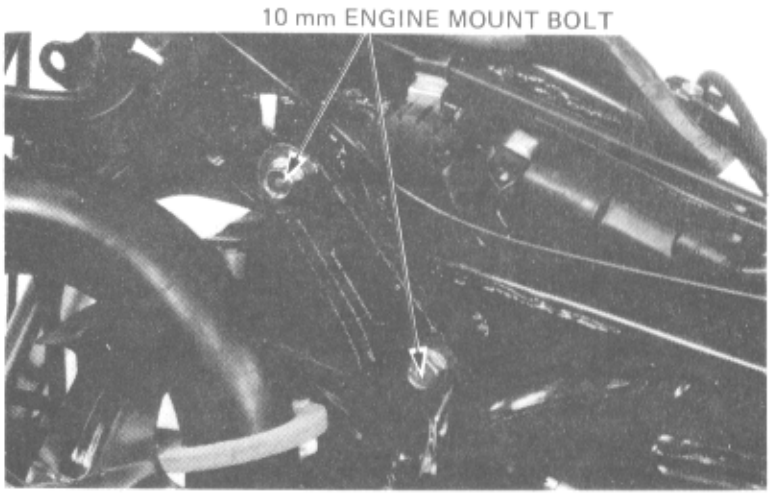
- Make sure that the final drive splines are exposed 5–6 mm from the end of the U-joint.
- Lubricate the final shaft splines with lithium-based multipurpose grease NLGI No. 2 (MoS_2 additive) before installation.
- Align the mounting surfaces carefully to prevent damage to the mounting bolt threads, wire harness and cables.
- Route the wires, tubes and cables properly (Section 1).
- The T_1, T_W and injector sensor wire harness couplers have stell rings. These couplers must be kept dry.
  If an audible click is not heard when connecting the couplers they must be repaired.
- Fill the engine with the recommended oil and coolant.
- Perform the following inspections and adjustments:
  Clutch free play (Section 3).
  Engine oil level (Section 2).
  Radiator coolant (Section 3).
  Tube routing (Section 1).

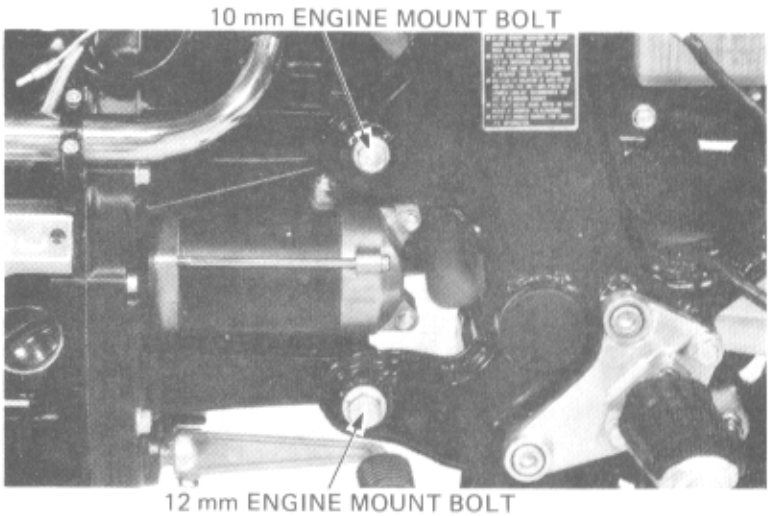
Tighten the engine mount bolts and drive shaft lock bolt.

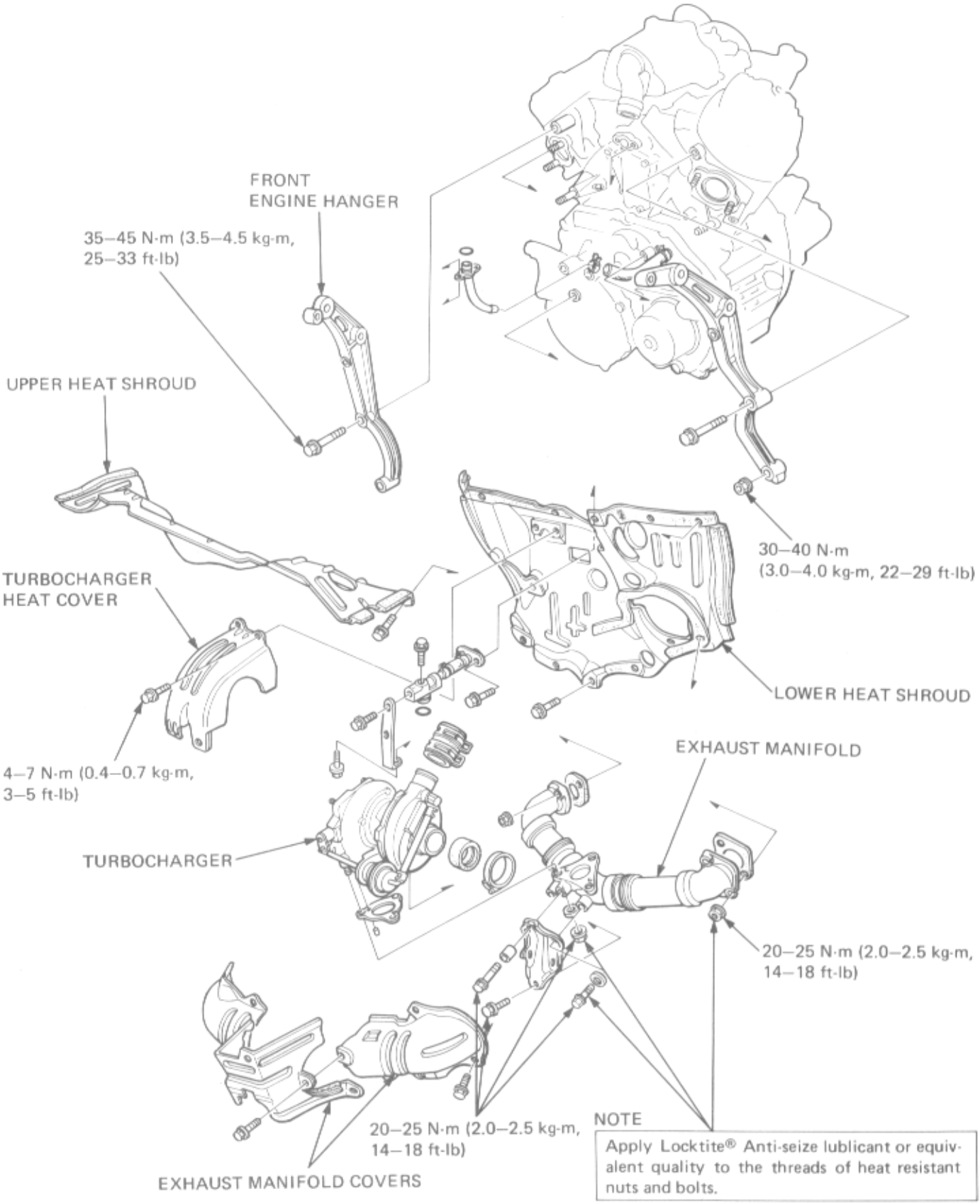
TORQUE VALUES:

10 mm bolt:	**50–70 N·m (5.0–7.0 kg-m, 36–51 ft-lb)**
12 mm bolt:	**60–80 N·m (6.0–8.0 kg-m, 43–58 ft-lb)**









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6. TURBOCHARGER

SERVICE INFORMATION

GENERAL

- The turbocharger must be serviced while it is COLD.
- To prevent loss of oil, cover the oil inlet and return line holes with tape after the lines have been disconnected. This is also important to prevent entry of dust and dirt into the turbocharger. Fill the lubricating system of a new turbocharger with clean engine oil, or refill the old turbocharger if there is any loss of oil during removal.
- Do not attempt to remove carbon from the turbine vanes or the balance of the rotor assembly may be impair.
- Do not hang the turbocharger by the wastegate actuator rod to prevent damage to the actuator body during removal and installation. If the rod is bent the turbocharger assembly must be replaced.
- Use the special heat resistant bolts and nuts whenever specified.
- Do not attempt to disassemble the turbocharger. Always replace it as a unit. Before installing a new turbocharger, make sure that there are no foreign particles in the intake and exhaust systems, particularly when replacement is required due to a broken turbine or compressor.
- The turbocharger can be serviced with the engine mounted in the frame.
- Do not lay the turbocharger on its side to prevent oil from accumulating in the compressor passage. Keep the turbocharger upright.

SPECIFICATIONS

Charging pressure control	Waste-gate valve
Rotor bearing	Full-floating
Charging pressure	113 kPa (1.16 kg/cm^2, 850 mmHg, 16.5 psi) at 8,000 rpm
Waste gate valve (Pressure/Lift)	124–131 kPa (1.26–1.34 kg/cm^2 925–985 mmHg, 17.9–19.1 psi) at 2.0 mm (0.08 in)
Compression ratio (cylinder)	7.8 : 1

TORQUE VALUES

Engine hanger bolt (10 mm)	35–45 N·m (3.5–4.5 kg-m, 25–33 ft-lb)
Engine hanger nut (10 mm)	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Exhaust manifold nut (8 mm)	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Turbocharger mounting bracket bolt (8 mm)	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Heat cover bolt (6 mm)	4– 7 N·m (0.4–0.7 kg-m, 3–5 ft-lb)

TOOL

Special

Combination Pressure/Vacuum tester	07406–0050000 or ST-AH-255-MC7 (U.S.A. only)

TROUBLESHOOTING

Engine lacks power/poor acceleration
- Turbine/compressor seized.
- Waste gate valve stuck open.
- Exhaust gas leak.

White smoke
- Faulty rotor oil seal.

Abnormal noise
- Damaged turbine shaft bearing.
- Turbine/compressor binding with housing.
- Foreign matter.

Knocking
- Waste gate stuck closed.

Turbine/compressor does not rotate
- Seized turbine shaft bearing.
  - Clogged oil control orifice.
  - Lack of oil in oil pan/deteriorated oil.
  - Rotor out of balance.

Waste gate not operated properly
- Faulty actuator.
- Bent actuator rod.
- Deformed waste gate or foreign matter stuck between gate and seat.
- Broken actuator control pipe.

TURBOCHARGER INSPECTION

TURBINE SPEED

Remove the fairing (Section 14).
Remove the exhaust pipe (Section 5).

Spin the turbine wheel by hand to make sure that it turns freely.

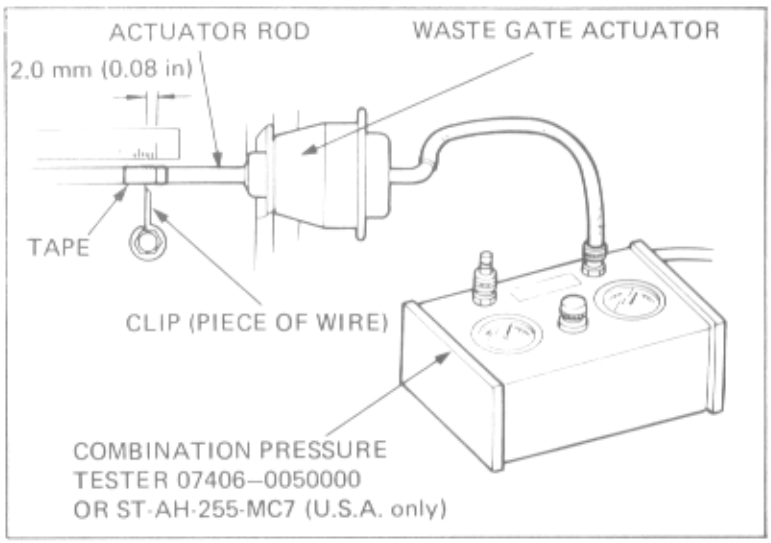
Replace the turbocharger as an assembly if the turbine does not rotate or rotates sluggishly.

CAUTION

If the turbine shaft seizes, check the engine oil level, oil type and oil passages for blockage. Be sure to determine and correct the cause of the seized shaft before installing a new turbocharger.

WASTE-GATE VALVE

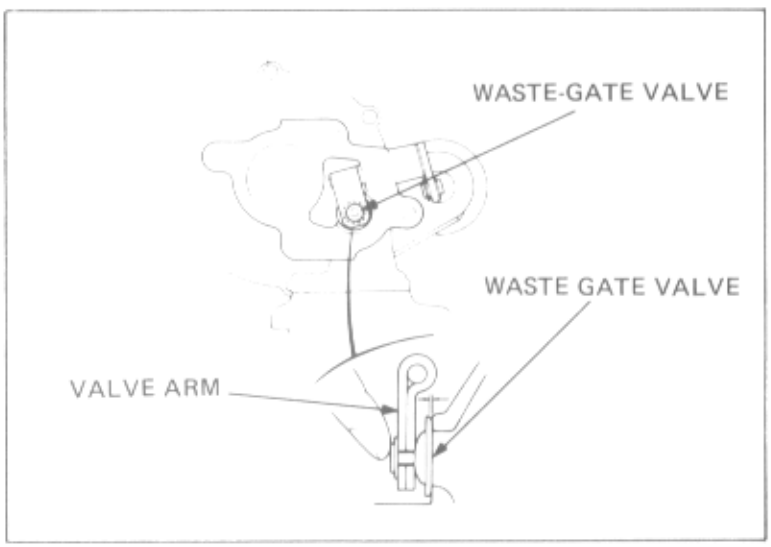
Remove the radiator screen and lower portion of the fairing (Section 14).
Loosen the turbocharger heat cover lower bolt 3-4 turns. Make a pointer; bend a small paper clip to point at the waste gate actuator rod. Clamp it in place with the bolt. Wrap a piece of tape around the rod and mark it where the clip points.
Disconnect the pressure hose from the actuator.
Apply pressure to the pressure pipe with a pressure tester.
The actuator is normal if the actuator rod is moved 2.0 mm (0.08 in) when a pressure of 124–131 kPa (1.26–1.34 kg/cm^2, 925–985 mmHg, 17.9–19.1 psi) is applied to the actuator.
Replace the turbocharger as an assembly if the actuator is faulty.



NOTE

Do not remove the actuator. It is not serviceable.

Check the waste-gate valve for proper seating.
Replace the turbocharger if the valve does not seat properly, or if there is play in the valve and valve arm.



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TURBOCHARGER REMOVAL

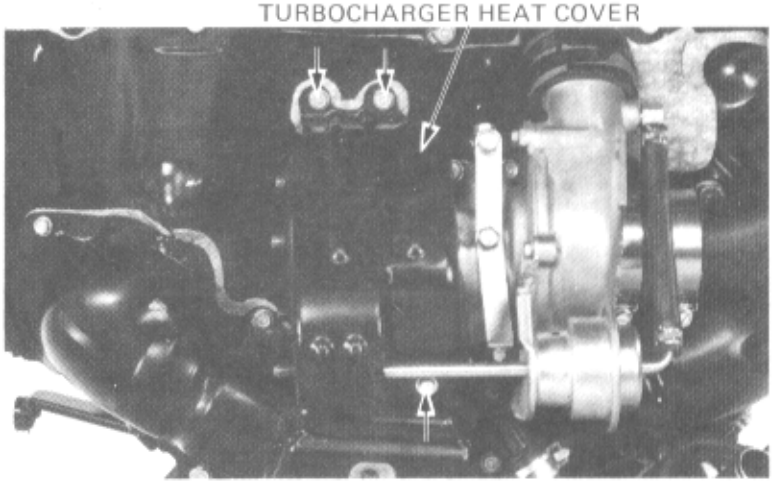
Remove the following parts before removing the turbocharger:

- Fairing assembly (Section 14).
- Fairing bracket (Section 14).
- Radiator (Section 10).
- Muffler/exhaust pipe (Section 5).

NOTE

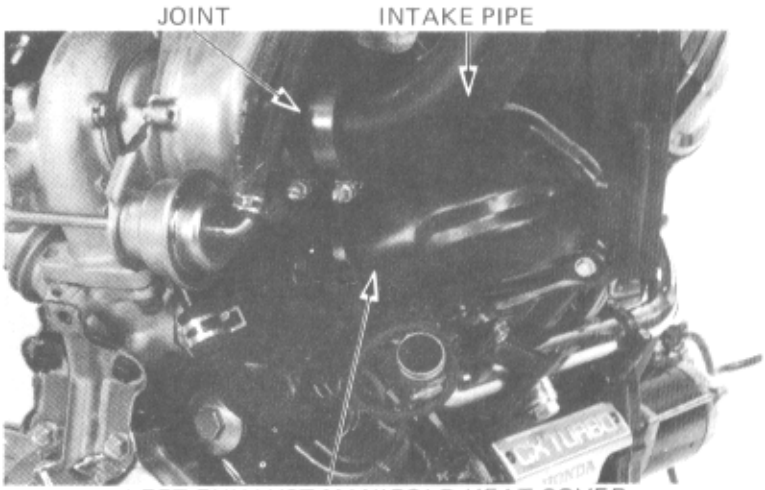
The turbocharger can be removed and installed with the engine mounted in the frame.

Remove the turbocharger heat cover bolts and cover.

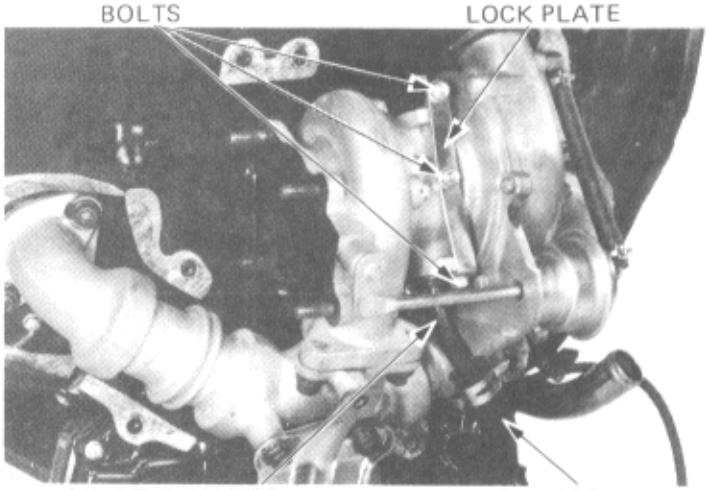


Remove the right exhaust manifold heat cover.

Remove the intake pipe and joint from the turbocharger.
Remove the left exhaust manifold heat cover.



Remove the rubber hose from the oil return pipe by loosening the spring clamp.
Pull the oil return pipe from the turbocharger center housing by removing the four bolts and a pipe joint lock plate.
Cover the end of the return pipe with tape.

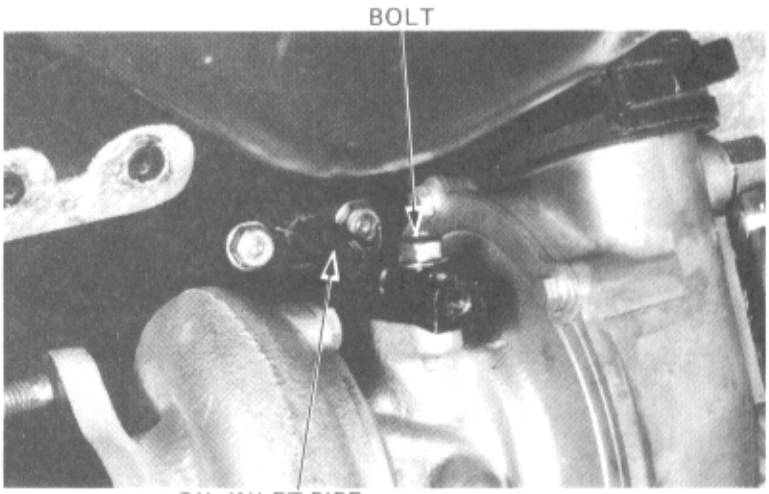


Remove the oil inlet pipe joint carefully from the center housing by removing the bolt.

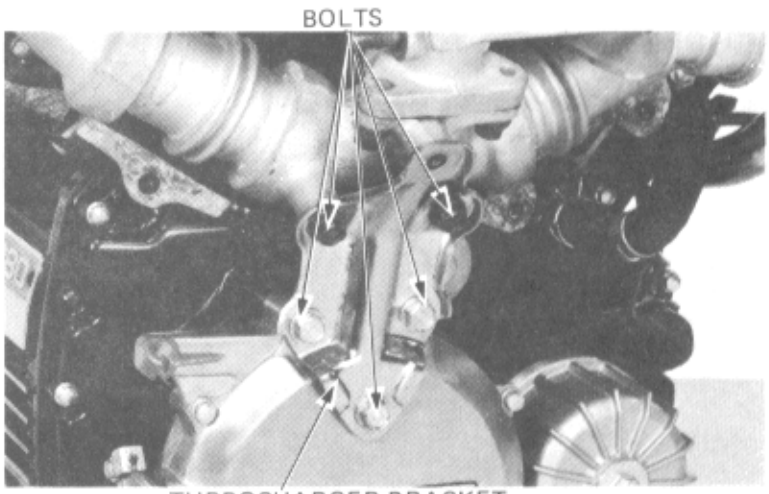
NOTE

- Pull the oil inlet pipe straight upward without bending it to prevent it from damage.
- To prevent loss of oil from the center housing, cover the hole with tape.

Cover the oil inlet and outlet holes with tape.



Remove the turbocharger bracket bolts and bracket.



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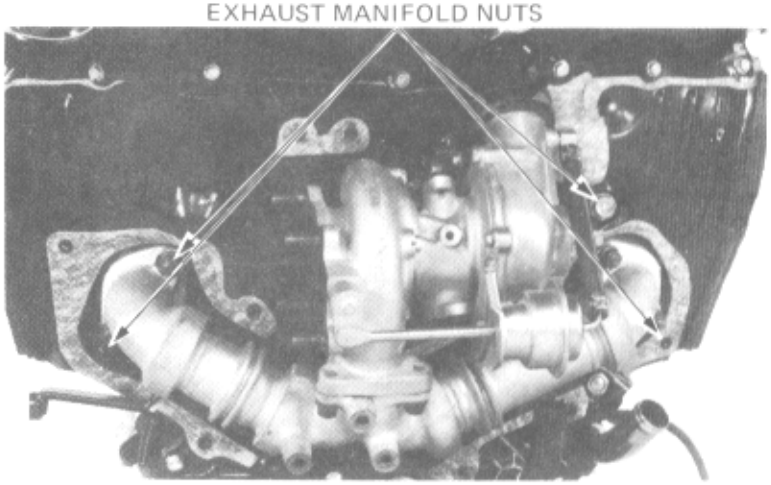
Remove the right and left exhaust manifold nuts.



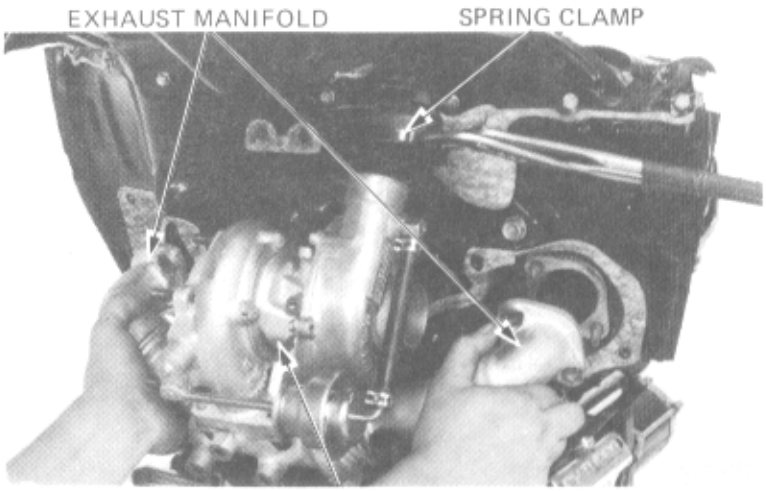
Remove the exhaust manifold from the cylinder head with the turbocharger while loosening the spring clamp on the air joint pipe as shown.

NOTE

- Do not pry between the manifold and exhaust port.
- Replace the gasket after removing.
- Avoid damaging the waste-gate control actuator.

CAUTION

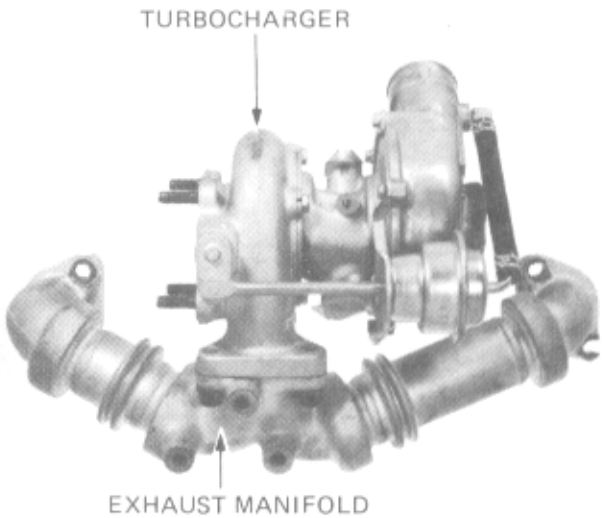
Do not bend the actuator rod. The turbocharger assembly must be replaced if it is bent.



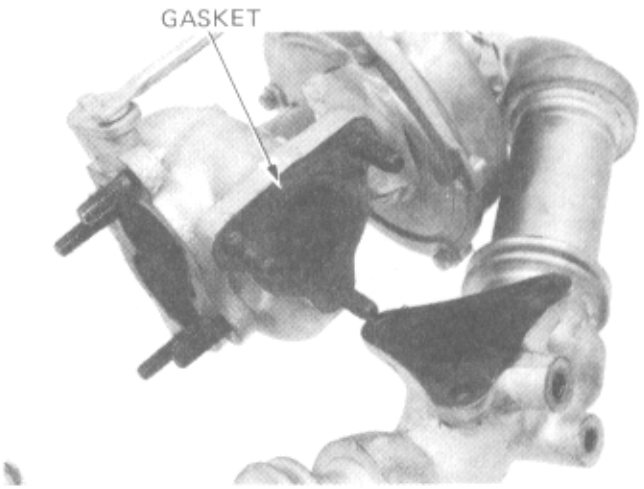
Remove the exhaust manifold from the turbocharger.

CAUTION

Do not disassemble the turbocharger. It is not serviceable.

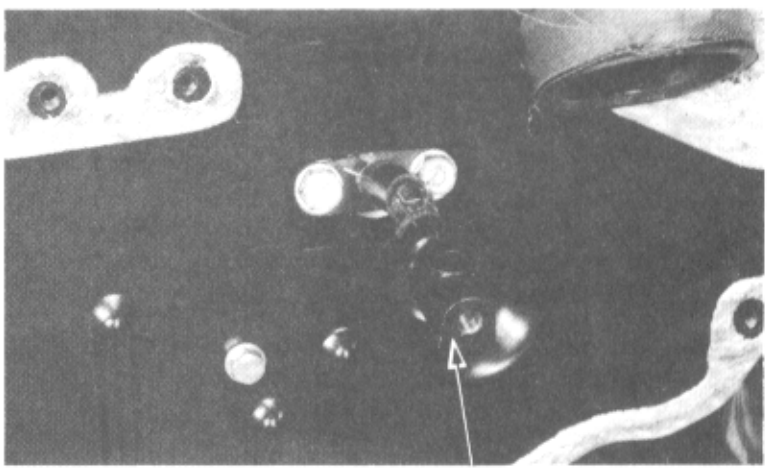


Check the exhaust manifold and turbocharger for distortion, cracks or damage.



OIL CONTROL ORIFICE

Disconnect the oil pipe from the camshaft holder.

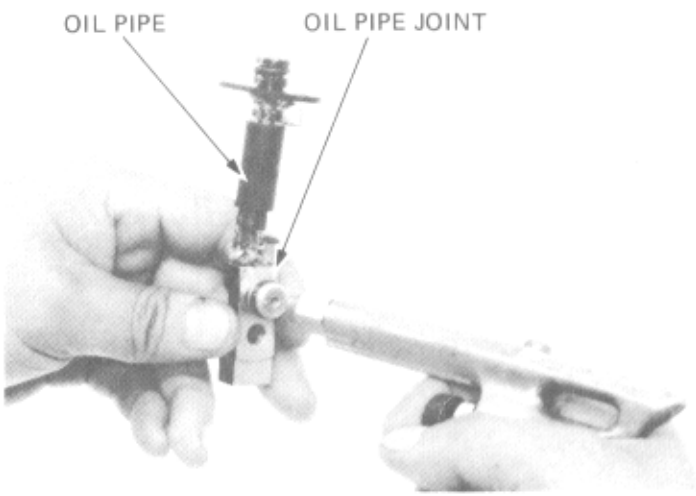


Blow the orifice open in the oil pipe joint and oil pipe with compressed air.

CAUTION

Do not use a piece of wire in an attempt to clean the orifice as this may enlarge the orifice.

Reconnect the oil pipe to the camshaft holder.



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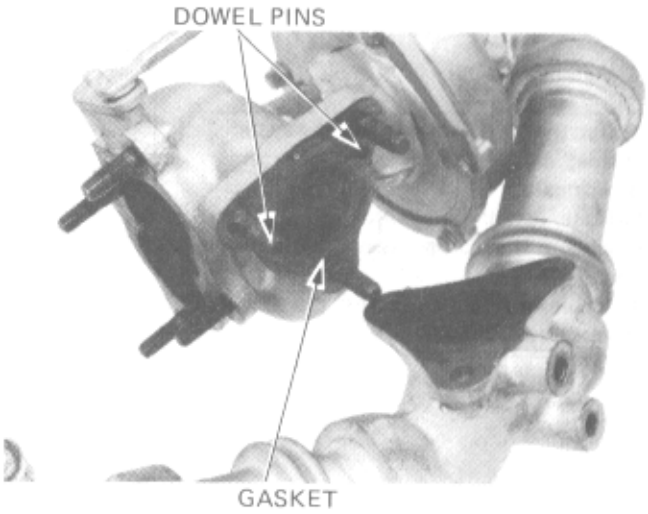
TURBOCHARGER INSTALLATION

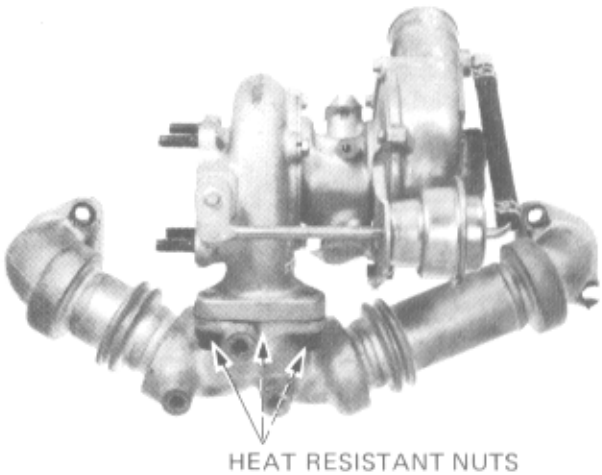
Install the dowel pins and a new gasket between the turbocharger and manifold.



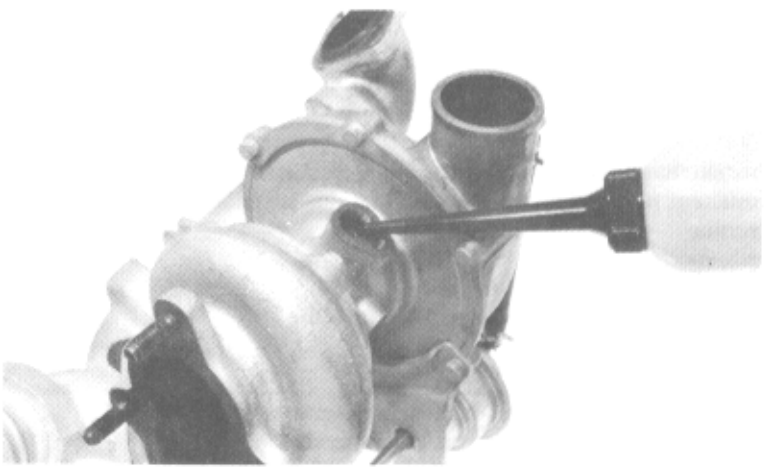
Apply Locktite® Anti-seize Lubricant or equivalent to the threads of the heat resistant nuts and bolts before installing.

Install the exhaust manifold on the turbocharger using the heat resistant nuts. Tighten the nuts to the specified torque.

TORQUE: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)



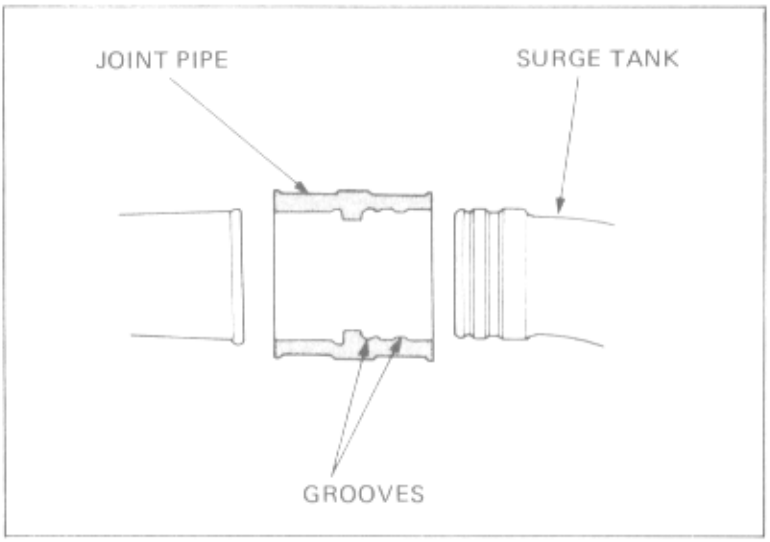
Fill the turbocharger with the recommended engine oil up to the oil inlet hole.
Cover the oil inlet hole with tape.



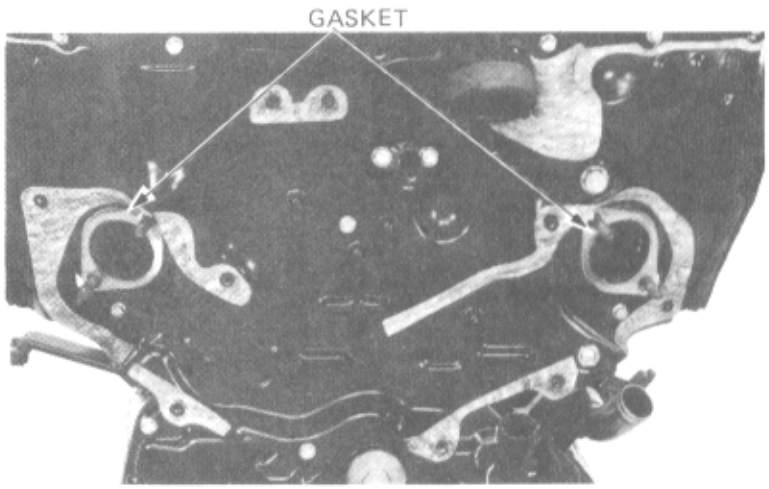
Install the joint pipe between the compressor and tank.

NOTE

- Check that the "UP" mark and corrugated end (inside) of the compressor connecting hose is facing up.
- To facilitate installation, slide the spring bands toward the center away from the hose end.
- Install the connecting hose with the inner grooves on the surge tank side.



Install new gaskets on the right and left exhaust ports.



Position the exhaust manifold on the cylinder head, aligning the compressor outlet with the connecting hose.

Apply Locktite® Anti-seize Lubricant or equivalent to the threads of the heat resistant nuts.

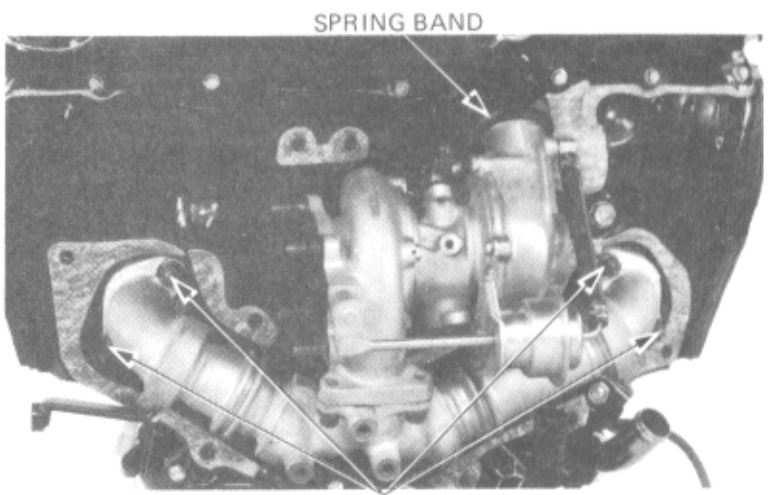
Install the exhaust manifold using the special heat resistant nuts. Tighten the nuts to the specified torque.

TORQUE: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)

NOTE

Do not hammer the corrugated sections of the manifold as they are easily damaged.

Slide the spring bands over the connection.



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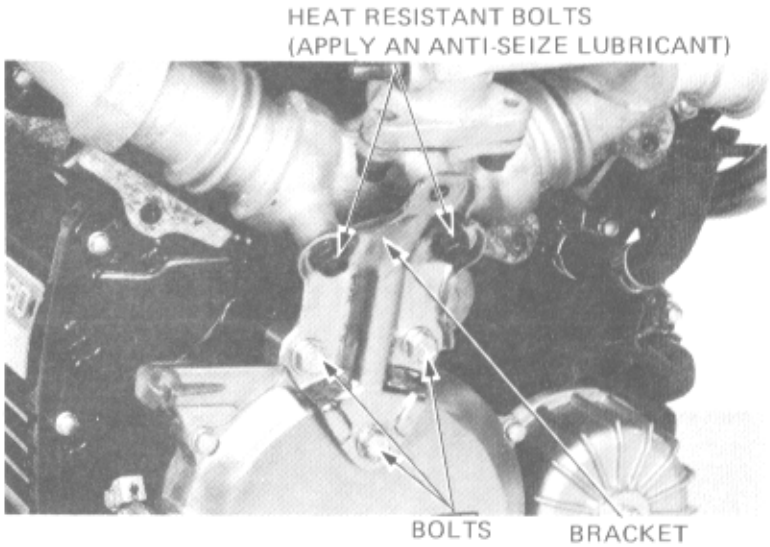
Apply Locktite® Anti-seize Lubricant or equivalent to the threads of the heat resistant bolts.
Install the turbocharger bracket on the exhaust manifold with the heat resistant bolts.

Install the turbocharger bracket on the clutch cover.

Tighten the bolts to the specified torque.

TORQUE: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)



Remove the tape from the oil inlet hole in the turbocharger.

Place a new O-ring in the oil pipe joint of the oil pipe and connect the oil pipe to the turbocharger.

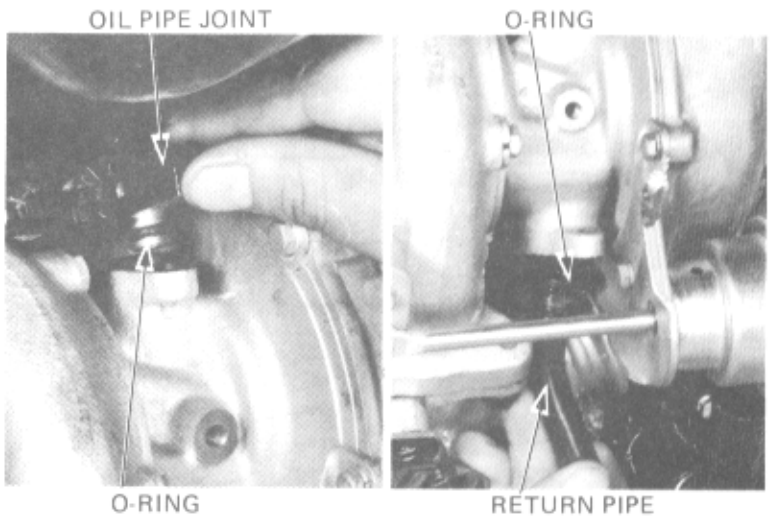
Remove the tape from the oil outlet hole.

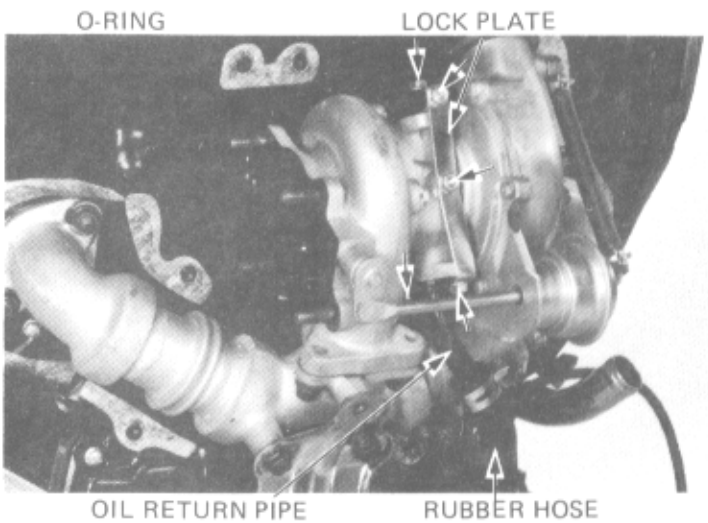
Place a new O-ring in the return pipe, and position the pipe on the turbocharger.
Connect the rubber hose to the return pipe.

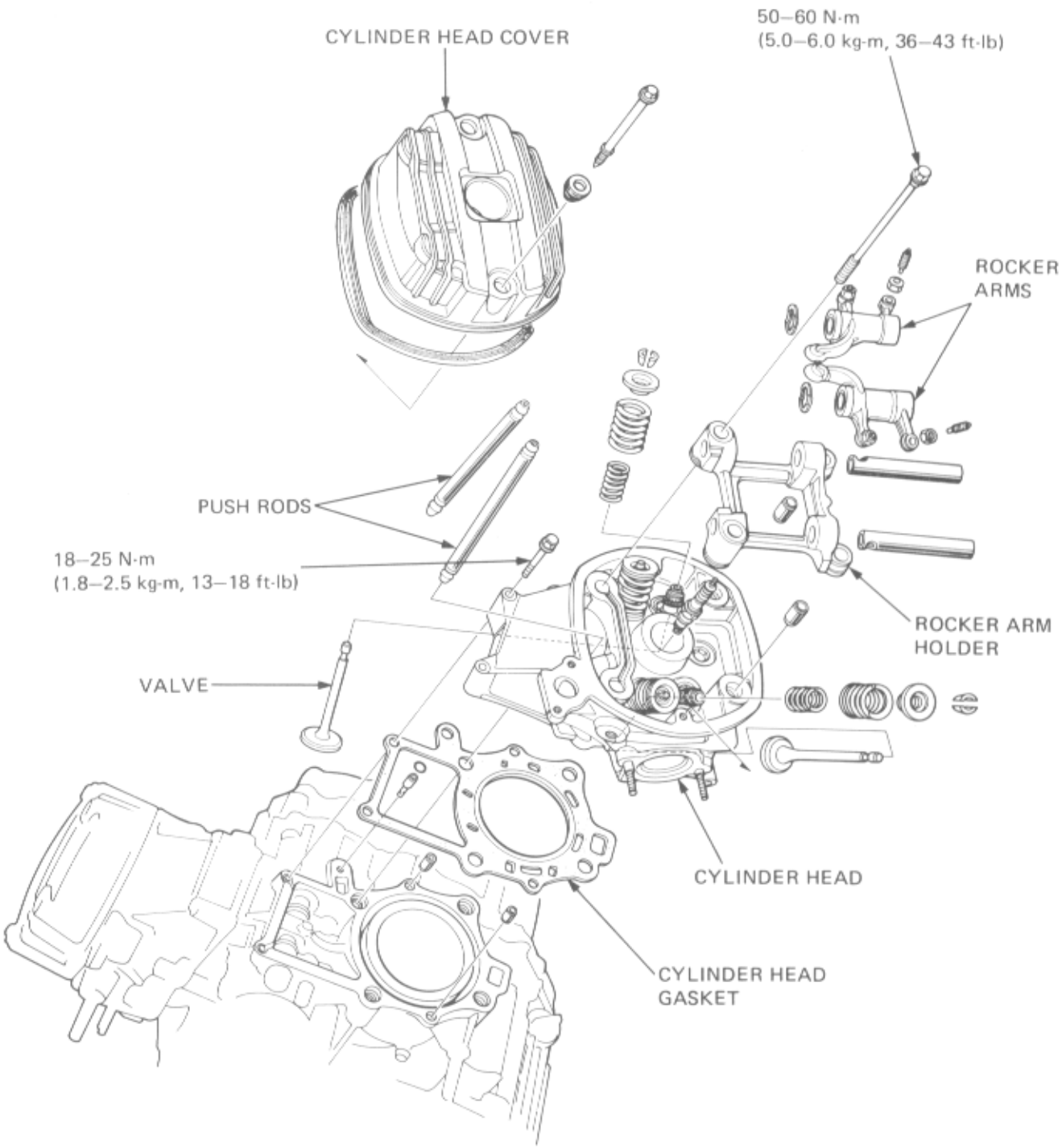
Attach the return pipe using the five bolts and lock plate. Tighten the bolts starting with the lower bolts first.

Install the right and left exhaust manifold heat covers.
Install the turbocharger heat cover making sure the waste-gate actuator rod will not contact anything when the rod moves.

Install the remaining removed parts in the reverse order of removal.







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7. CYLINDER HEAD/VALVES

SERVICE INFORMATION

GENERAL

- All cylinder head maintenance and inspection can be done with the engine in the frame. Before removing the cylinder heads, it is necessary to drain coolant from the cylinder water jackets by removing the drain bolts.
- The engine must be cool before removing the cylinder heads.
- Before assembly, blow open all oil and water passages with compressed air.
- Refer to Section 6 for removal of the turbocharger.

SPECIFICATIONS

Unit: mm (in)

Item			Standard	Service Limit
Cylinder compression (cold)			700–1,000 kPa/800 rpm (7–10 kg/cm², 100–142 psi)	———
Rocker arms	Shafts and holders	Rocker arm I.D.	15.000–15.018 (0.5906–0.5913)	15.04 (0.592)
		Rocker arm shaft O.D.	14.966–14.984 (0.5892–0.5899)	14.95 (0.589)
		Rocker arm holder I.D.	14.978–15.006 (0.5901–0.5908)	15.03 (0.592)
Valve springs	Free length	Outer (IN/EX)	50.40 (1.984)	48.5 (1.91)
		Inner (IN/EX)	50.20 (1.976)	48.3 (1.90)
	Preload/Length	Outer (IN/EX)	28.5 kg/39.9 mm (62.8 lbs/1.571 in)	26.5 kg/39.9 mm (58.4 lbs/1.571 in)
		Inner (IN/EX)	15.3 kg/37.9 mm (33.7 lbs/1.49 in)	14.2 kg/37.9 mm (31.3 lbs/1.49 in)
Valves and valve guides	Stem O.D.	IN	6.580–6.590 (0.2591–0.2594)	6.54 (0.258)
		EX	6.550–6.560 (0.2579–0.2583)	6.54 (0.258)
	Guide I.D.	IN, EX	6.600–6.620 (0.2598–0.2606)	6.70 (0.264)
	Stem-to-guide clearance	IN	0.010–0.040 (0.0004–0.0016)	0.10 (0.004)
		EX	0.040–0.070 (0.0016–0.0027)	0.10 (0.004)
Cylinder heads	Valve seat width		1.1–1.3 (0.04–0.05)	2.0 (0.08)
	Warpage		———	0.10 (0.004)

TORQUE VALUES

Cylinder head bolt (12 mm)	50–60 N·m (5.0–6.0 kg-m, 36–43 ft-lb)
Cylinder head bolt (8 mm)	18–25 N·m (1.8–2.5 kg-m, 13–18 ft-lb)
Front engine mount bolt (10 mm)	50–70 N·m (5.0–7.0 kg-m, 36–51 ft-lb)
Front engine hanger nut	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Front engine hanger bolt	35–45 N·m (3.5–4.5 kg-m, 25–33 ft-lb)

TOOLS

NOTE

In the lists below, "or equivalent" means there may be a commercially available tool in the U.S.A. that will work as well as the one listed.

Special

Valve guide driver attachment	07943–4150000
Valve guide reamer, 6.6 mm	07984–6110000 or 07984–6570100

Common

Valve spring compressor	07757–0010000 or 07957–3290001
Seat cutter, 29 mm	07780–0010300
Seat cutter, 35 mm	07780–0010400
Flat cutter, 30 mm	07780–0012300
Interior cutter, 30 mm	07780–0014000
Cutter holder, 6.6 mm	07781–0010200
Valve guide driver, 6.6 mm	07742–0010200 or 07942–6570100

(07780–0010300, 07780–0010400, 07780–0012300, 07780–0014000, 07781–0010200: or equivalents)

TROUBLESHOOTING

Engine top-end problems are usually performance related which can be diagnosed by a compression test, or are noises which can usually be traced to the top-end with a sounding rod or stethoscope.

Low or Uneven Compression

- Valve
  - Incorrect valve clearance
  - Burned or bent valves
  - Broken valve spring
  - Incorrect valve timing
  - Sticking valve
- Cylinder head
  - Leaking or damaged head gasket
  - Warped or cracked cylinder head
  - Cylinder and piston

High Compression

- Excessive carbon build-up on piston crown or in combustion chamber

Excessive Noise

- Incorrect valve adjustment
- Sticking valve or broken valve spring
- Damaged rocker arm or camshaft
- Bent push rod

Contaminated Engine Oil or Coolant

- Leaking head gasket

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ROCKER ARM/CYLINDER HEAD REMOVAL

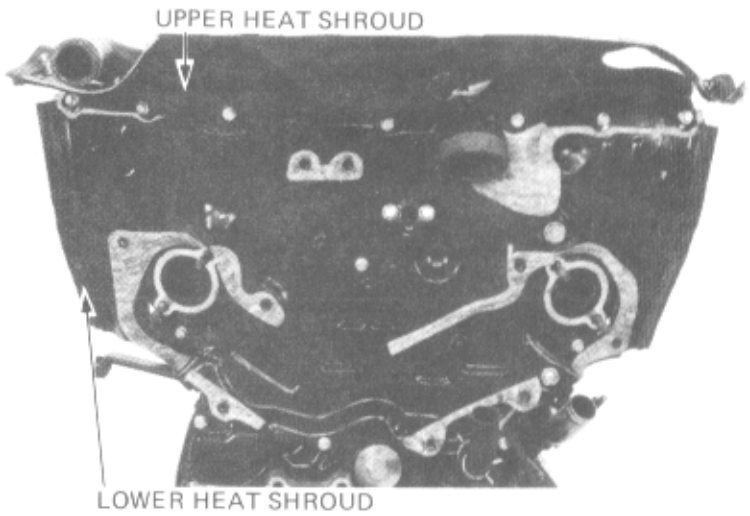
NOTE

The rocker arms can be removed without removing the fairing.

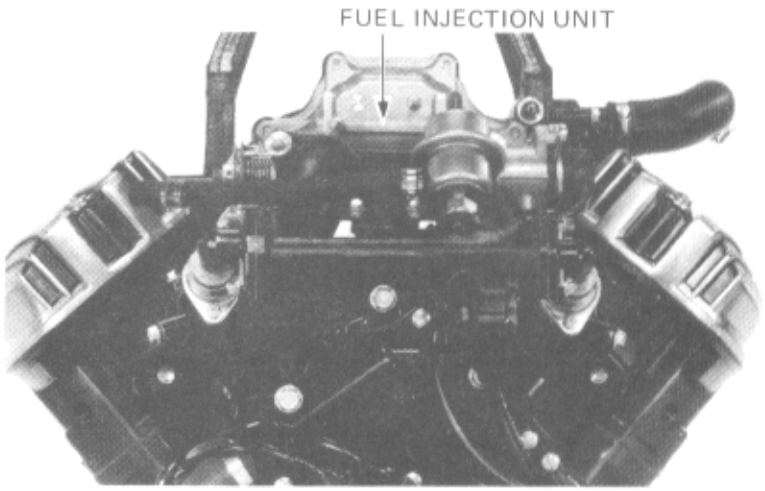
Remove the following parts before removing the cylinder head:

- Fairing/Fairing bracket (Section 14).
- Radiator (Section 10).
- Turbocharger (Section 6).

Remove the upper and lower heat shrouds.

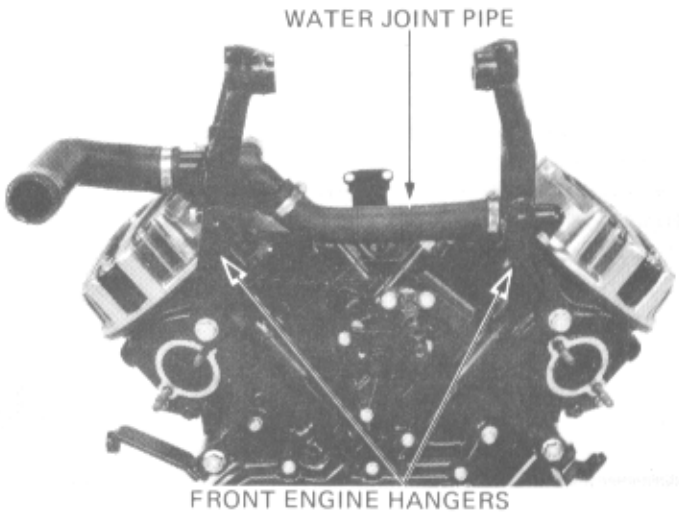


Remove the fuel injection unit from the cylinder head (Section 4).

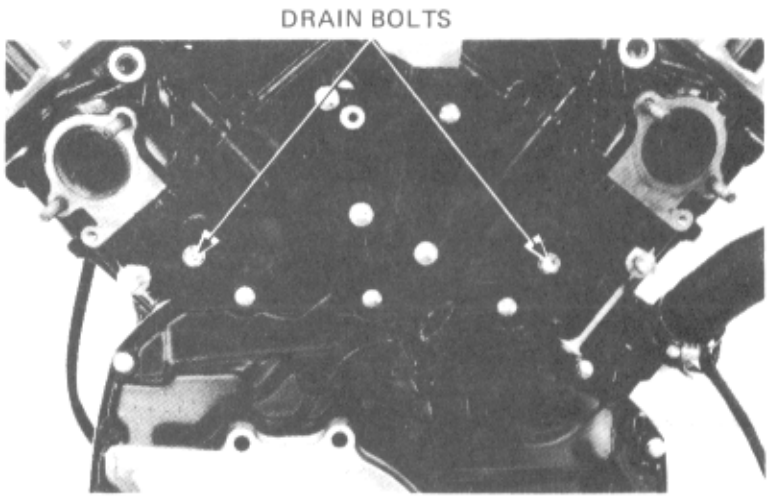


Remove the water joint pipe from the cylinder heads.

Remove the front engine hangers from the cylinder head.



Remove the cylinder drain bolts and drain the coolant.

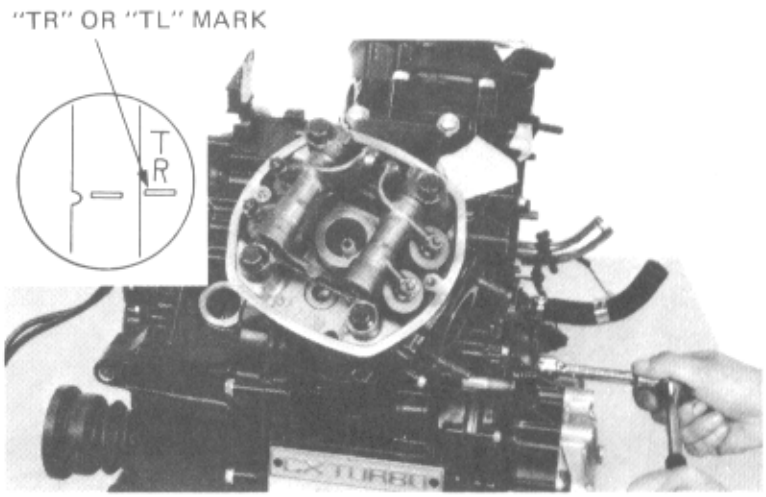


Remove the crankshaft hole cap and timing inspection cap.

Bring the piston to T.D.C. of the compression stroke by turning the crankshaft.

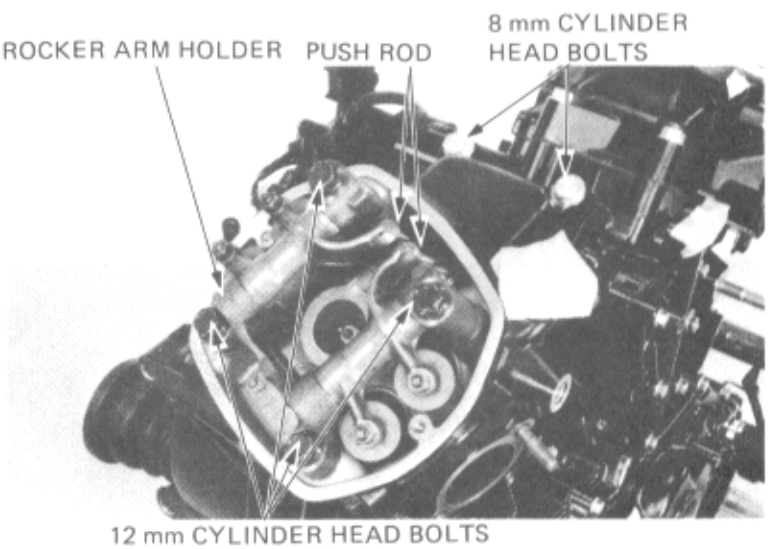
NOTE

- Align the index mark with the "TR" mark for the right cylinder.
- Align the index mark with the "TL" mark for the left cylinder.



Loosen the 12 mm cylinder head bolts in a criss-cross pattern in two or more steps.

Remove the rocker arm holder assembly, push rods and dowel pins.
Remove the 8 mm cylinder head bolts and the cylinder head.



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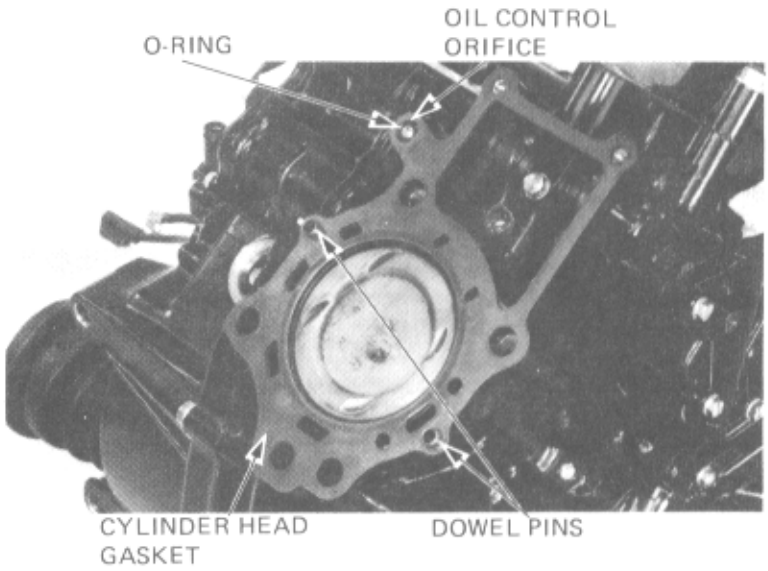
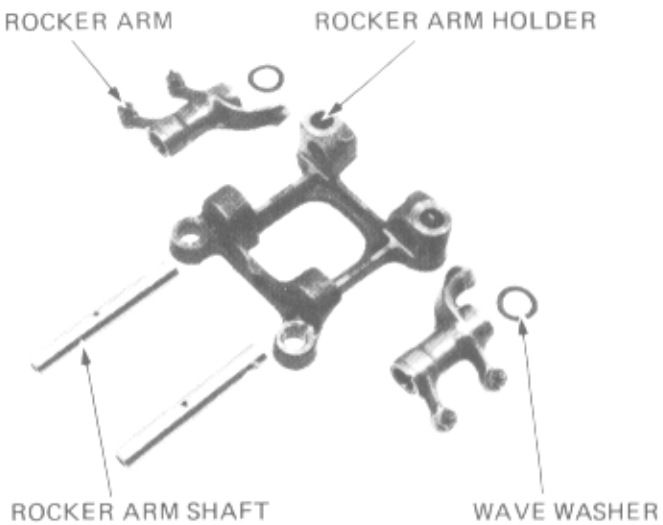
Remove the cylinder head gasket, O-ring and dowel pins.



ROCKER ARM DISASSEMBLY

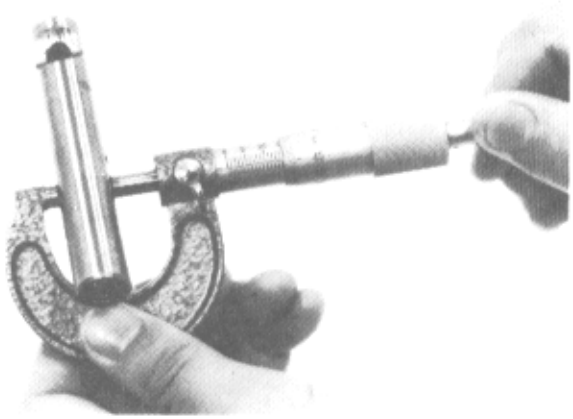
Withdraw the rocker arm shafts and remove the rocker arms and wave washers.



ROCKER ARM SHAFT INSPECTION

Measure the O.D. of each rocker arm shaft. Examine each shaft for damage; scoring, or nicks.

SERVICE LIMIT: 14.95 mm (0.589 in)



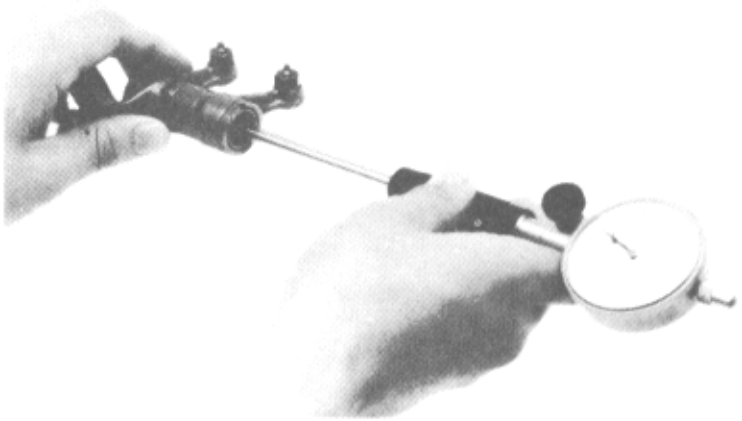
ROCKER ARM INSPECTION

Inspect each rocker arm for scoring, damage, or clogged oil holes. Measure the I.D. of each rocker arm.

If a rocker arm shows wear or damage to the adjusting screw or push rod contact face, inspect the push rods and stem contact faces for scoring, scratches, or evidence of insufficient lubrication.

Inspect the push rods for wear, damage and trueness.

SERVICE LIMIT: 15.04 mm (0.592 in)



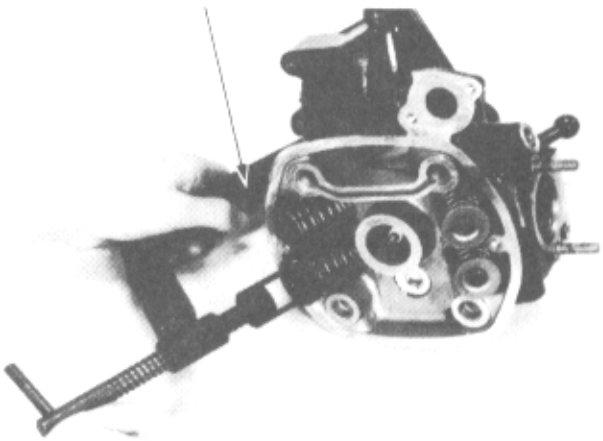
CYLINDER HEAD DISASSEMBLY

Remove the valve spring cotters, retainers, springs and valves.

NOTE

- Do not compress the valve springs more than necessary to remove the cotters.
- Mark all parts to ensure original assembly.

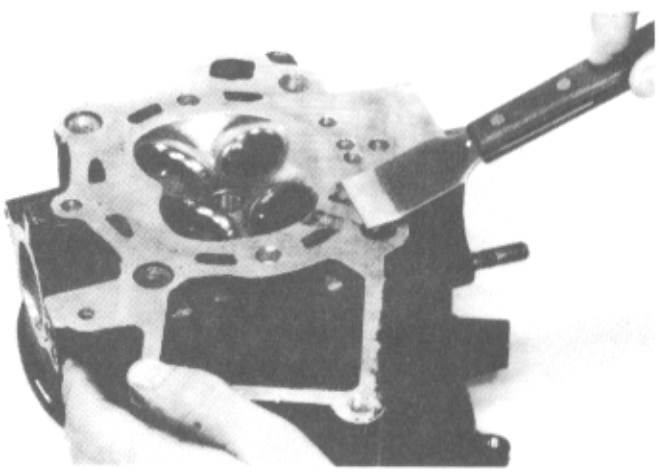
VALVE SPRING COMPRESSOR
07757–0010000 or 07957–3290001



Remove carbon deposits from the combustion chamber.
Remove any gasket material from the head surfaces.

NOTE

- Do not damage the gasket surfaces.
- Avoid dropping gasket material into the jackets or oil passages.
- Gaskets will come off easier if soaked in solvent.



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INSPECTION

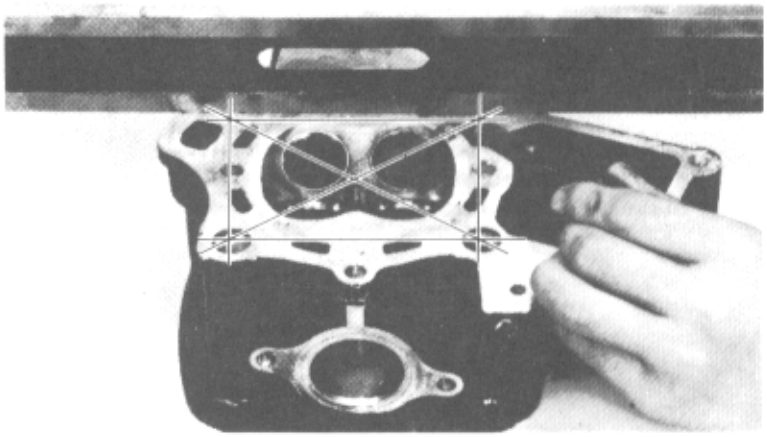
- CYLINDER HEAD

Check the spark plug hole and valve areas carefully for cracks.
Check the cylinder head for warpage with a straight edge and a feeler gauge.

SERVICE LIMIT: 0.10 mm (0.004 in)

NOTE

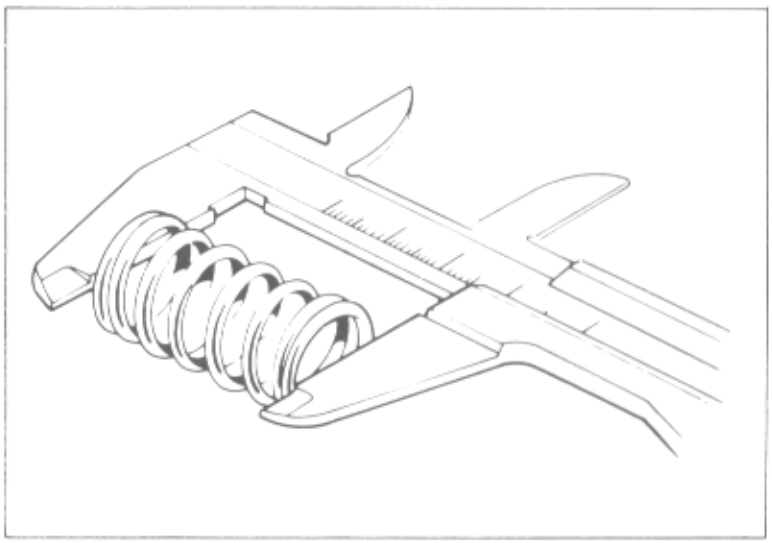
Check for warpage in an X pattern.



- VALVE SPRINGS

Measure the free length of the inner and outer valve springs.

SERVICE LIMITS:
INNER, IN/EX: 48.3 mm (1.90 in)
OUTER, IN/EX: 48.5 mm (1.91 in)



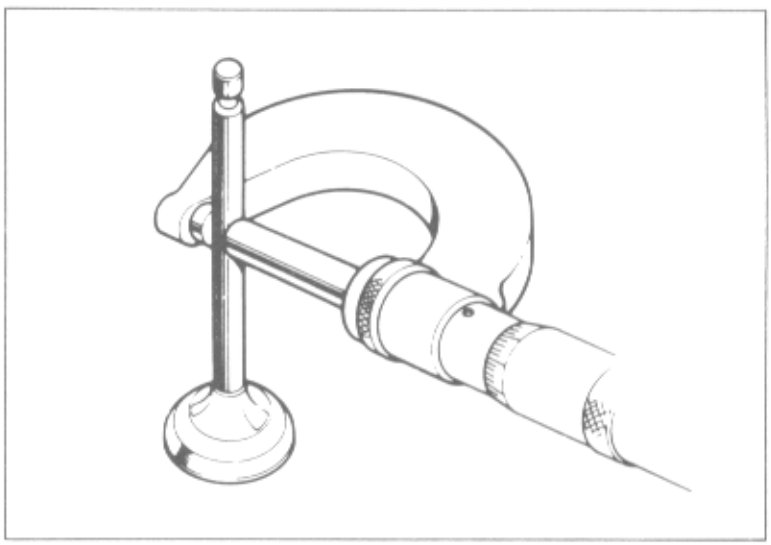
- VALVES

Clean the valves and inspect for trueness, burring, scoring, or abnormal stem end wear.

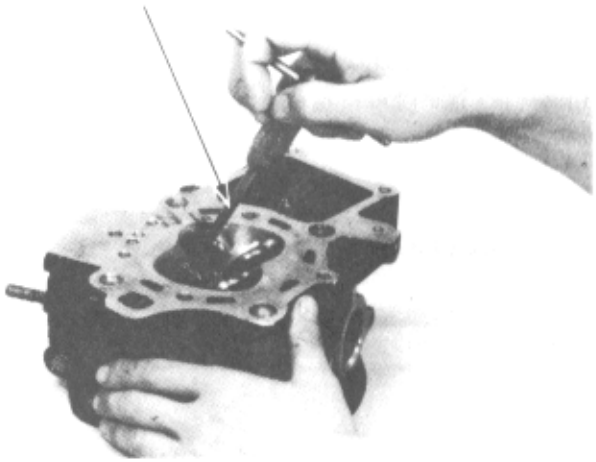
Check the valve movement in the guide.

Measure and record each valve stem O.D.

SERVICE LIMIT:
IN/EX: 6.54 mm (0.258 in)



VALVE GUIDE REAMER, 6.6 mm
07984–6110000 or 07984–6570100



• VALVE GUIDES

Ream the guides to remove any carbon build-up before checking valve stem-to-guide clearance.

NOTE

- Always turn the reamer in the cutting direction when inserting or removing it.
- Use cutting oil when reaming the guides.

• STEM-TO-GUIDE CLEARANCE

Measure and record each valve guide I.D. using a ball gauge or inside micrometer.

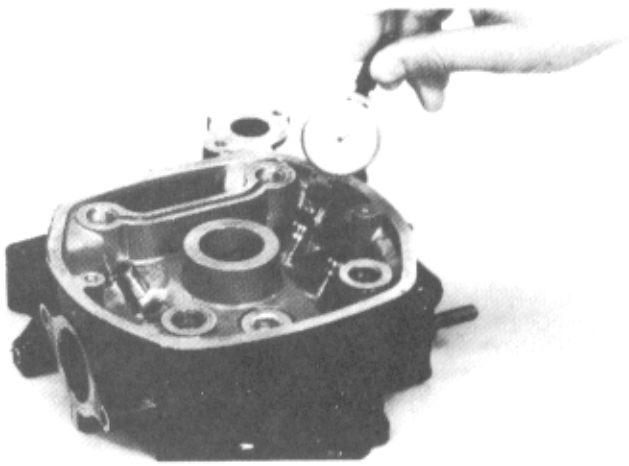
SERVICE LIMIT:
IN/EX: 6.70 mm (0.264 in)

Calculate the stem-to-guide clearance.

SERVICE LIMIT:
IN/EX: 0.10 mm (0.004 in)

NOTE

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 guides as necessary and ream to fit.

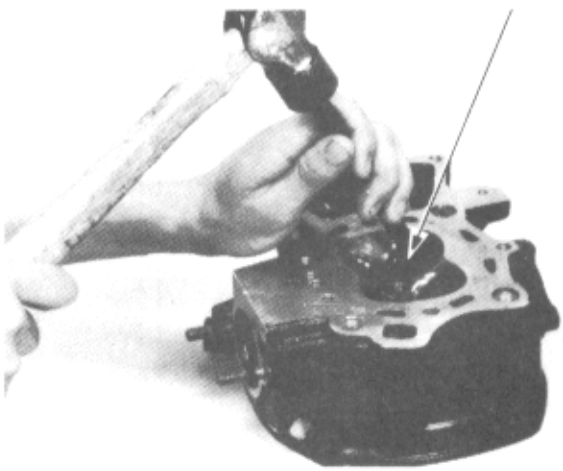


VALVE GUIDE REPLACEMENT

If the stem-to-guide clearance still exceeds the service limits with new guides, replace the valves and guides.

Support the cylinder head and drive out the guide from the valve port.

VALVE GUIDE DRIVER
07742–0010200 or 07942–6570100



Place the Attachment on the Valve Guide Remover. Drive the guides into place from the top of the head.

NOTE

The valve guide attachment must be used to position the valve guide correctly.

Ream the new valve guides after installation.

NOTE

- Use cutting oil on the reamer during this operation.
- It is important that the reamer always be rotated in the cutting direction when it is inserted or removed.
- Clean the head thoroughly.

VALVE SEAT INSPECTION AND GRINDING

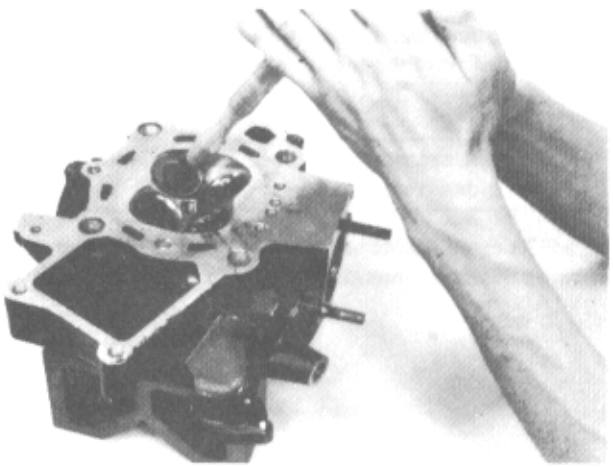
Clean all intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to each valve seat. Lap each valve and seat using a rubber hose or other hand-lapping tool.

Remove and inspect each valve.

CAUTION

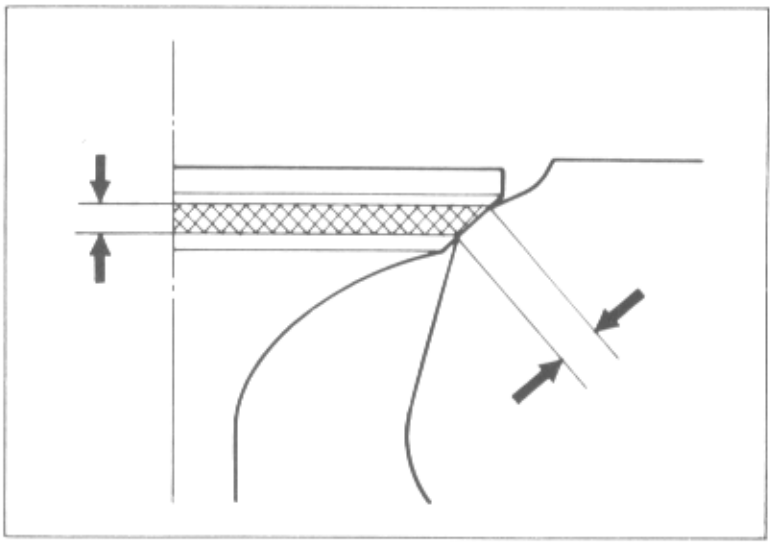
The valve cannot be ground. If the valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.



Inspect the width of each valve seat.

STANDARD: 1.1–1.3 mm (0.04–0.05 in)
SERVICE LIMIT: 2.0 mm (0.08 in)

If the seat is too wide, too narrow or has low spots, the seat must be ground.

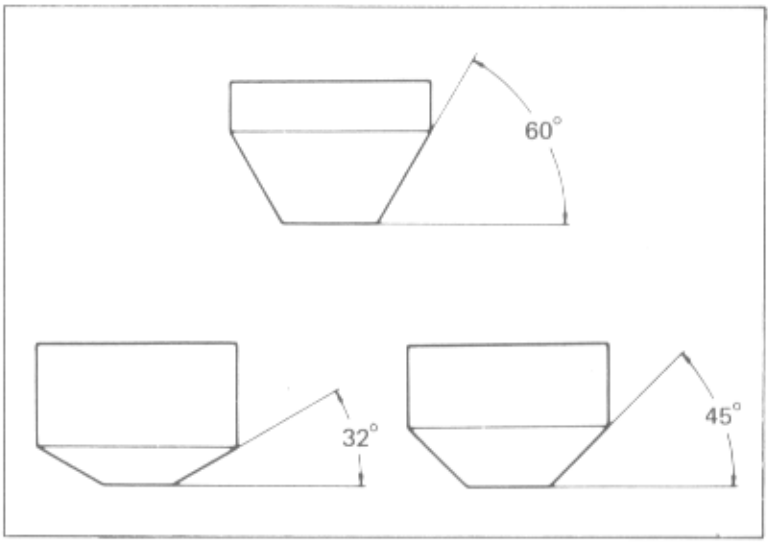


VALVE SEAT CUTTERS

Honda Valve Seat Cutters, grinder or equivalent valve seat refacing equipment is recommended to correct a worn valve seat.

NOTE

Follow the refacer manufacturer's operating instructions.



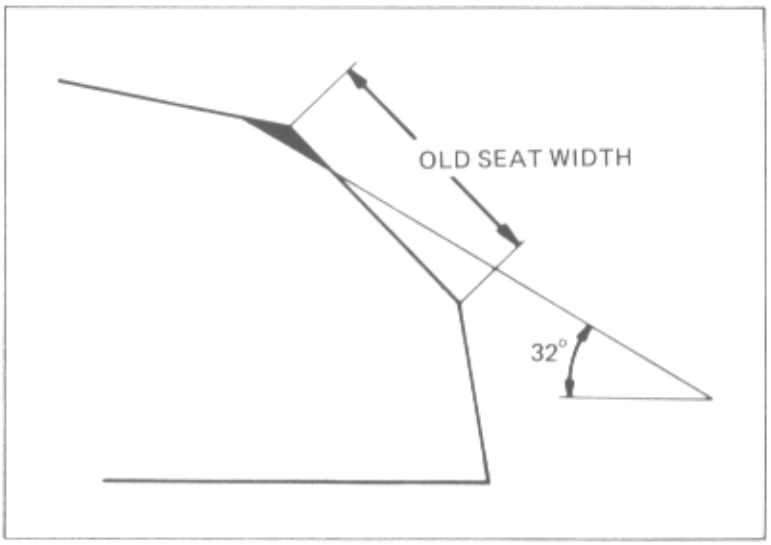
VALVE SEAT REFACING

Use a 45 degree cutter to remove any roughness or irregularities from the seat.

NOTE

Reface the seat with a 45 degree cutter when a valve guide is replaced.

Use a 32 degree cutter to remove the top 1/4 of the existing valve seat material.



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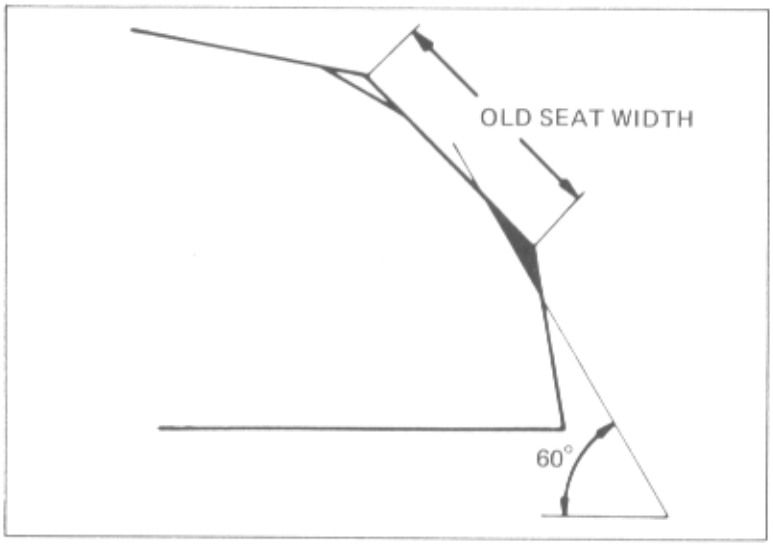
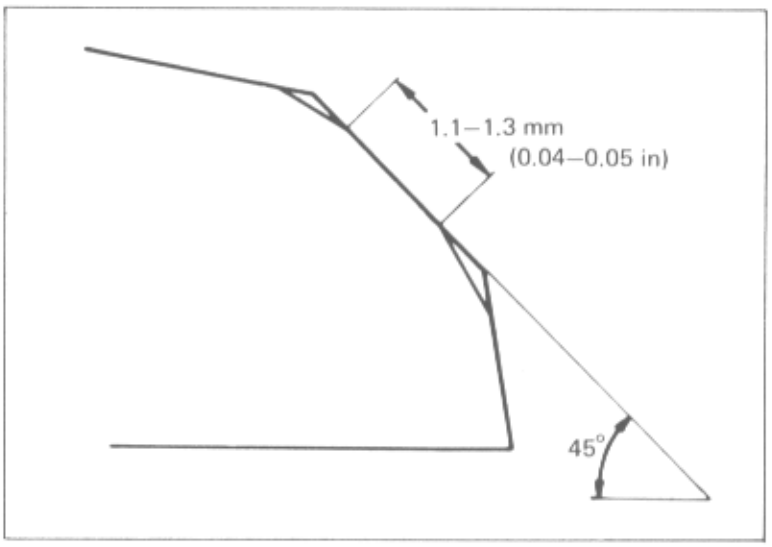
Use a 60 degree cutter to remove the bottom 1/4 of the old seat. Remove the cutter and inspect the area you have just removed.



Install a 45 degree finish cutter and cut the seat to the proper width.

NOTE

Make sure that all pitting and irregularities are removed. Refinish if necessary.



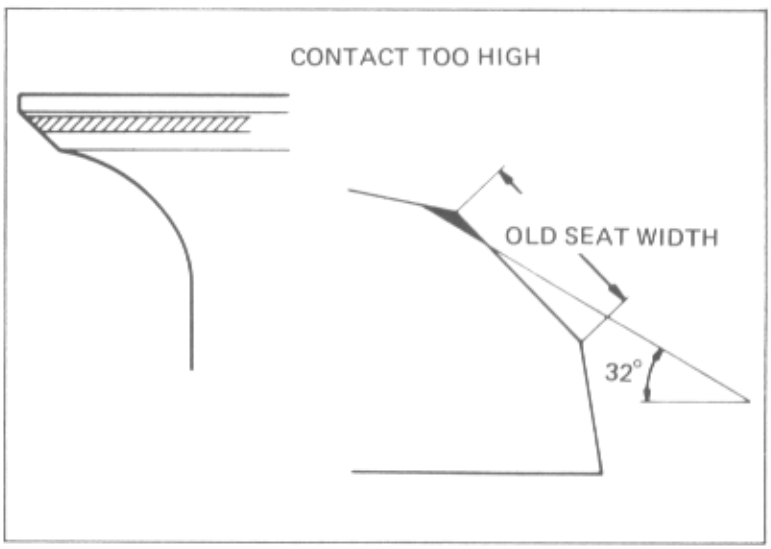
Apply a thin coating of Prussian Blue to the valve seat.

Press the valve through the valve guide and onto the seat to make a clear pattern.

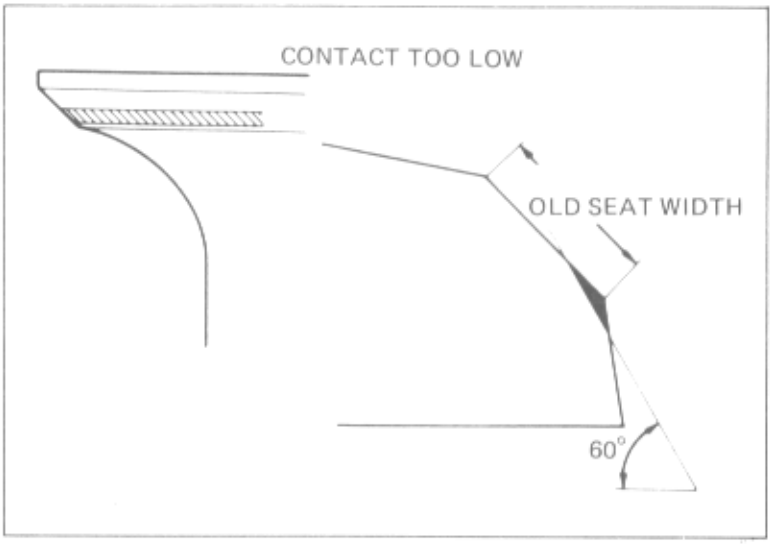
NOTE

The location of the valve seat in relation to the valve face is very important for good sealing.

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



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

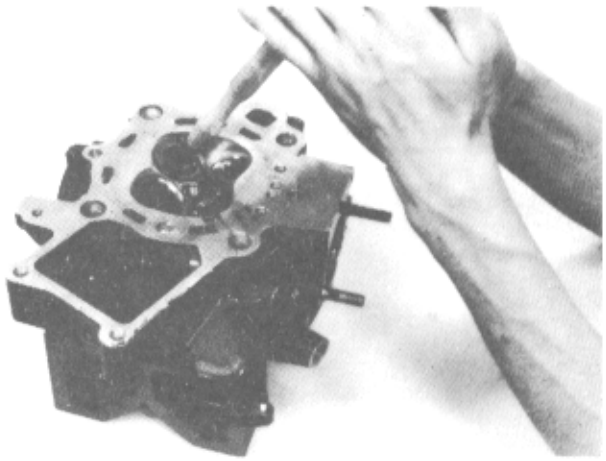


Refinish the seat to specifications, using a 45 degree finish cutter.

After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure. After lapping, wash all residual compound off the cylinder head and valve.

NOTE

Do not allow lapping compound to enter the guides.

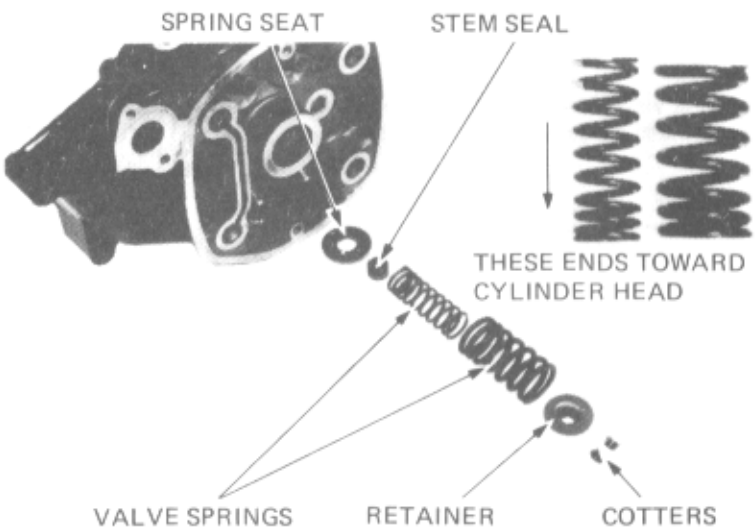


CYLINDER HEAD ASSEMBLY

Install the valve stem seals and spring seats.
Lubricate the valve stems with oil, and insert the valves into the guides.
Install the valve springs and retainers.

NOTE

- Install the valve springs with the tightly wound coils facing the head.
- Replace the stem seals with new ones whenever the valves are disassembled.



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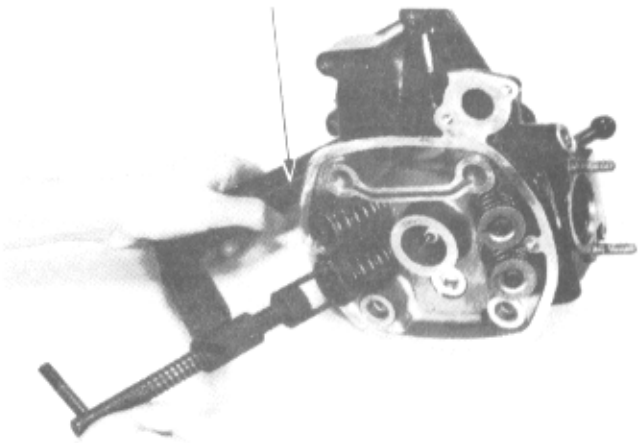
Install the valve cotters.

CAUTION

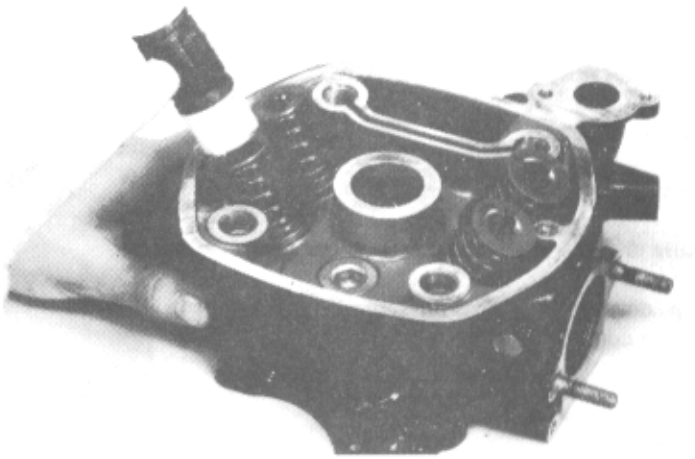
To prevent loss of valve spring tension, do not compress the valve springs more than necessary.



Tap the valve stems gently with a soft hammer to firmly seat the cotters.

NOTE

Support the cylinder head above the work bench surface to prevent damage.



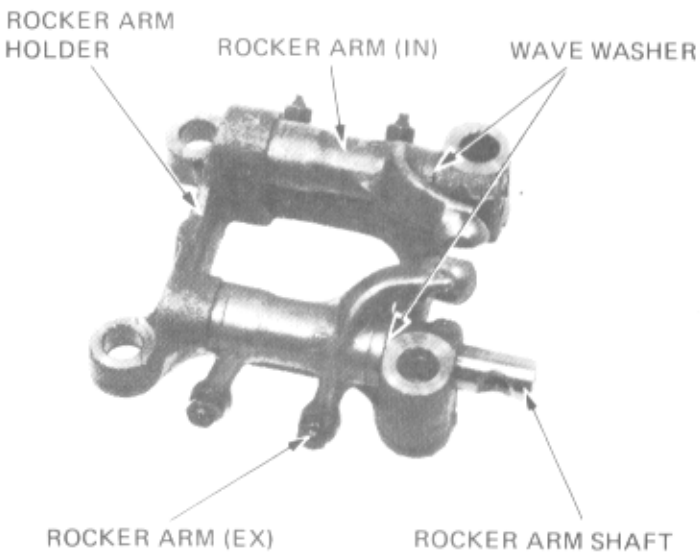
ROCKER ARM ASSEMBLY

Apply oil to the rocker arm shafts.
Assemble the rocker arms, shafts and wave washers.

NOTE

Do not interchange the IN and EX rocker arm shafts.

Make sure the rocker arm cut-outs align with the assembly bolt holes.

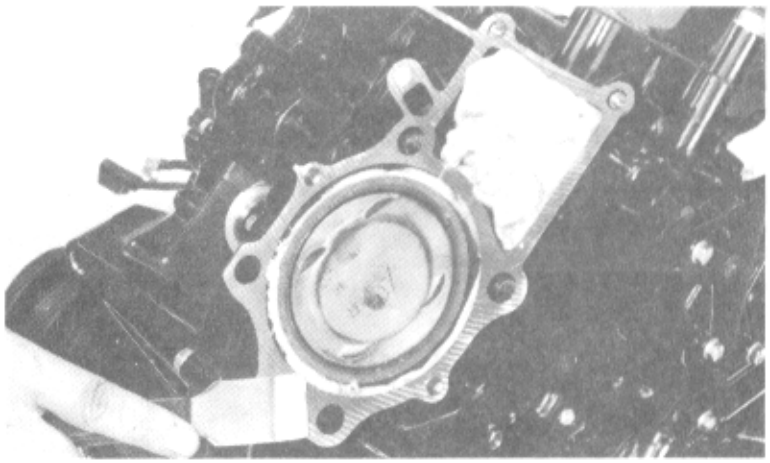


CYLINDER HEAD/ROCKER ARM INSTALLATION

Turn the crankshaft to put the piston at T.D.C.
Clean the cylinder surfaces of all gasket material.

NOTE

Do not damage the gasket surfaces.



Install the O-rings and cylinder head dowel pins.
Install a new head gasket and make sure that the oil orifices are not obstructed.

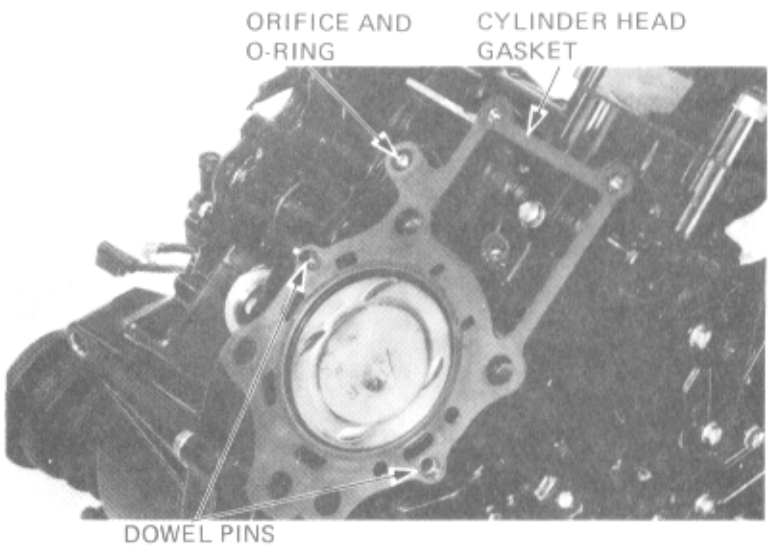
Install the cylinder drain bolts.

Remove the timing inspection cap.

Make sure the piston is at T.D.C. on the compression stroke; turn the crankshaft, when both push rods are down and the timing marks align, the piston is on compression.

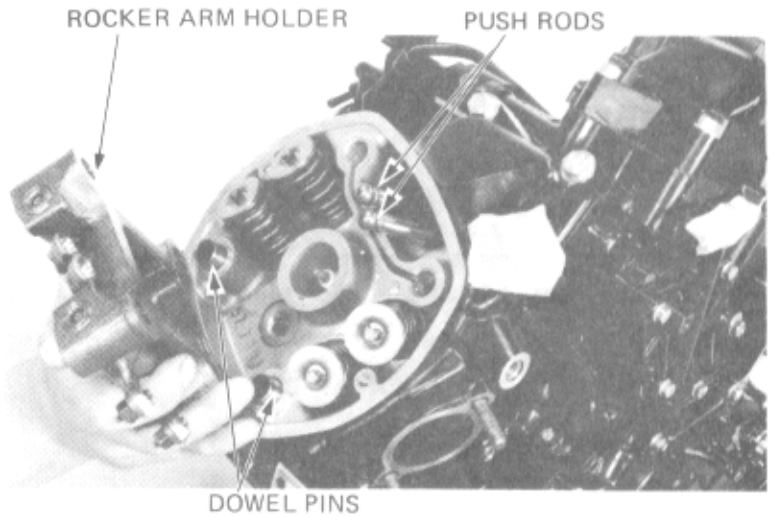
NOTE

- Align the index mark with the "TR" mark for the right cylinder.
- Align the index mark with the "TL" mark for the left cylinder.



Install the cylinder head.
Install the cylinder head dowel pins.
Apply Multipurpose NLGI No. 2 (MoS_2 additive) Grease to the end of each push rod and install the push rods into the rocker arm retainers.

Install the rocker arm holder assembly.
Align the rocker arms with the push rods.
Install the 8 mm cylinder head bolts.



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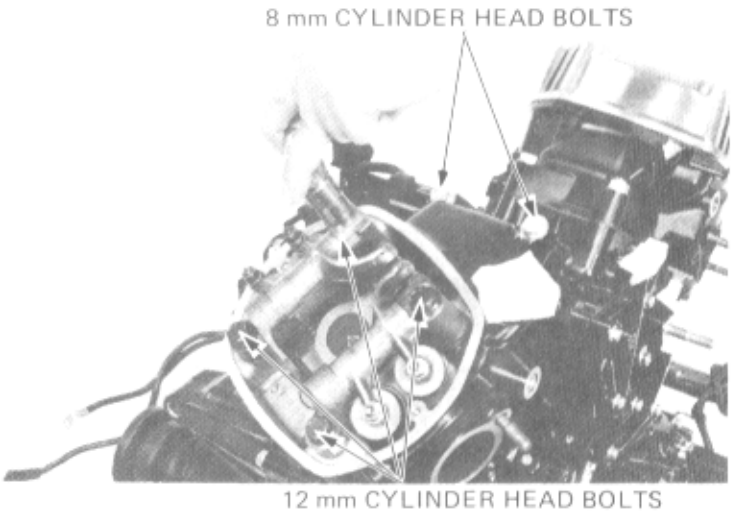
Tighten the cylinder head bolts in 2–3 steps in a crisscross pattern.

TORQUE VALUES:
12 mm bolt: 50–60 N·m
(5.0–6.0 kg-m, 36–43 ft-lb)
8 mm bolt: 18–25 N·m
(1.8–2.5 kg-m, 13–18 ft-lb)

Check the valve clearance (Section 3) and adjust, if necessary.



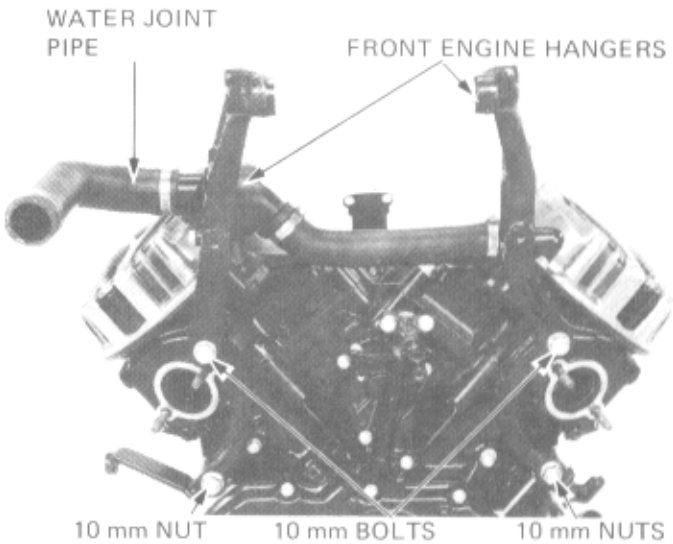
Install the cylinder head cover.
Place new O-rings on the water pipes and pipe joints.
Connect the water joint pipes from the thermostat housing to the cylinder heads.

NOTE

Make sure that the O-rings are not deteriorated or damaged.

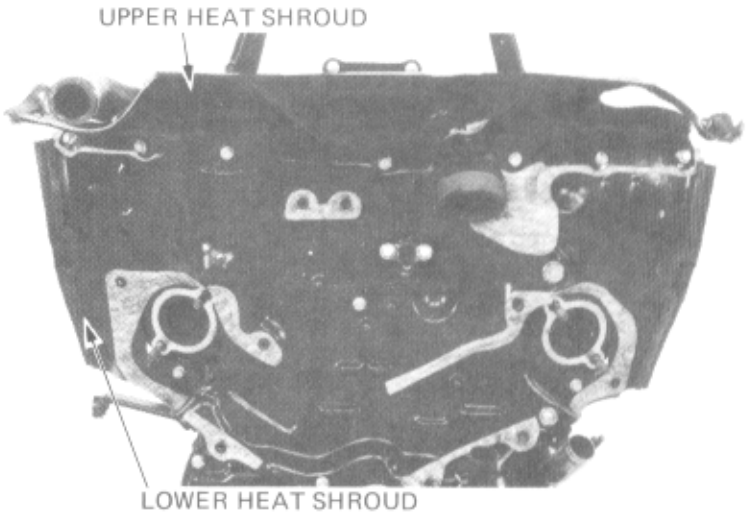
Install the front engine hangers.

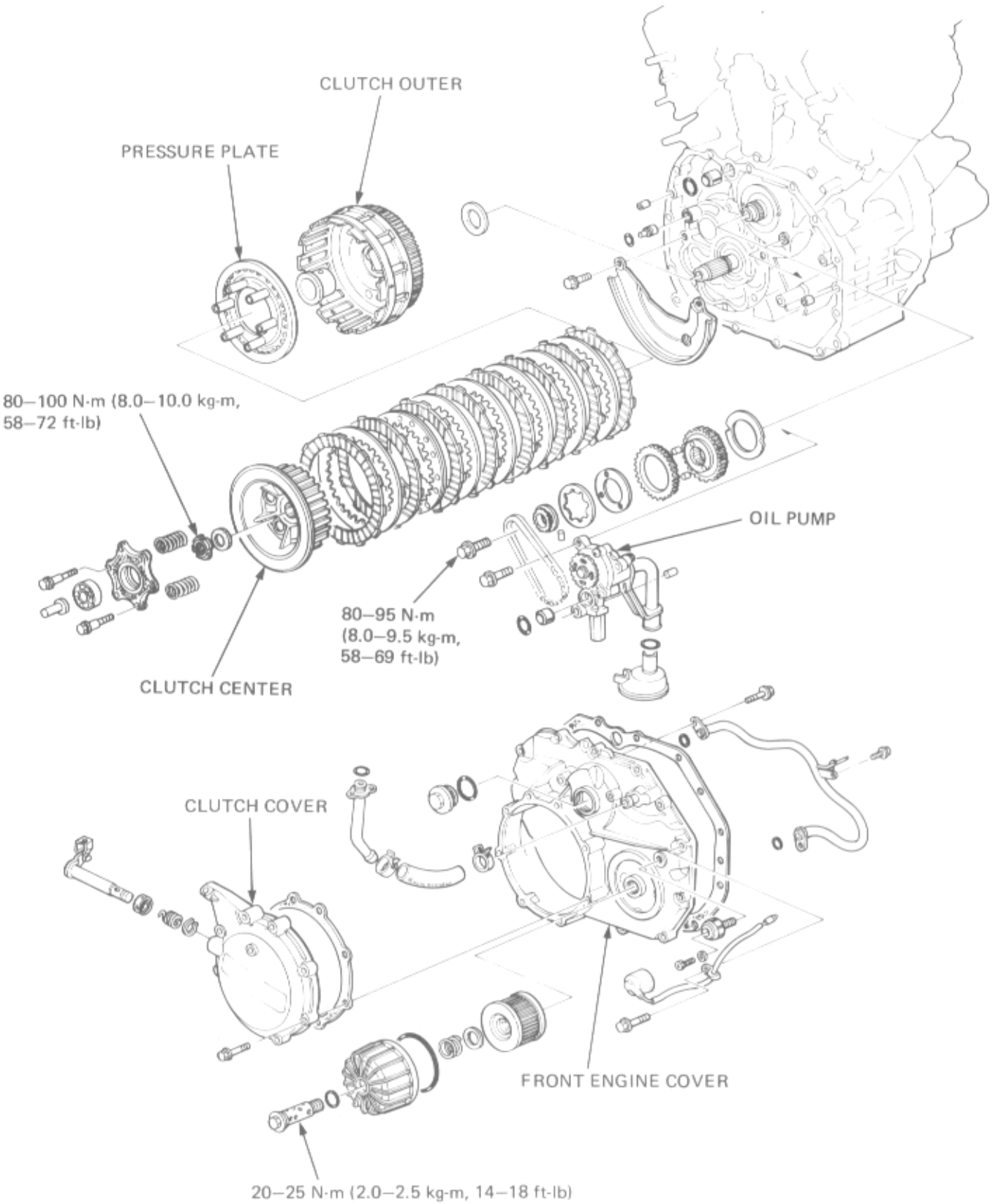
TORQUE VALUES:
10 mm bolt: 35–45 N·m
(3.5–4.5 kg-m, 25–33 ft-lb)
10 mm nut: 30–40 N·m
(3.0–4.0 kg-m, 22–29 ft-lb)



Install the fuel injection unit onto the cylinder head (Section 4).
Install the upper and lower heat shroud.

Install the remaining removed parts in the reverse order of removal.





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8. CLUTCH/OIL PUMP

SERVICE INFORMATION

GENERAL

- Clutch discs, plates "A" and "B", clutch center, and clutch plates can be serviced by removing the clutch cover.
- To service the oil pump, it is necessary to remove the fairing, fairing bracket, heat shroud, turbocharger, radiator and transmission cover.
- All these operations can be done with the engine in the frame.

SPECIFICATIONS

Unit: mm (in)

Item			Standard	Service Limit
Clutch	Lever free play (at lever end)		10–20 (3/8–3/4)	———
	Clutch spring	Free length	35.5 (1.40)	34.0 (1.34)
		Tension/length	19.0–21.0 kg/25 mm (41.9–46.3 lbs/0.98 in)	17.0 kg/25 mm (37.5 lbs/0.98 in)
	Disc thickness	A	3.42–3.58 (0.13–0.14)	3.10 (0.122)
		B		
	Plate warpage	A	0.10 (0.004)	0.20 (0.008)
		B	0.10 (0.004)	0.20 (0.008)
	Outer guide I.D.		32.025–32.053 (1.2608–1.2619)	32.12 (1.265)
Oil pump	Inner-to-outer rotor clearance		———	0.10 (0.004)
	Outer rotor-to-body clearance		0.10–0.20 (0.004–0.008)	0.35 (0.014)
	Rotor-to-body clearance		0.02–0.08 (0.001–0.003)	0.10 (0.004)
Oil pressure relief valve pressure			500–600 kPa (5.0–6.0 kg/cm^2, 71–85 psi)	———

TOOLS

Special

Clutch center holder	07923–4610000 or 07923–3710000

Common

Lock nut socket wrench, 26 x 30 mm	07716–0020203 or 07716–0020202
Extension	07716–0020500 or equivalent

TROUBLESHOOTING

Oil Pump
- Refer to page 2-1 for oil pump troubleshooting.

Clutch
- Faulty clutch operation can usually be corrected by adjusting the free play.

Clutch Slips when Accelerating
- No free play.
- Discs worn.
- Springs weak.

Clutch will not Disengage
- Too much free play.
- Plates warped.

Clutch Chatters or Rattles
- Worn clutch outer and disc splines.

Motorcycle Creeps with Clutch Disengaged
- Too much free play.
- Plates warped.

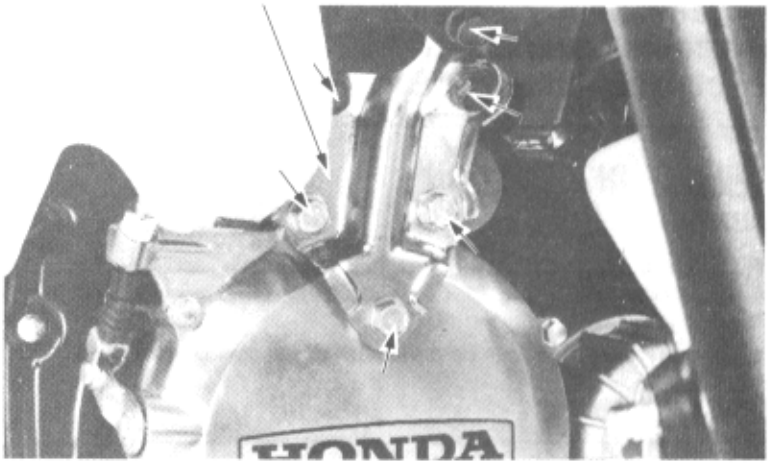
Excessive Lever Pressure
- Clutch cable kinked, damaged or dirty.
- Lifter mechanism damaged.

Clutch Operation Feels Rough
- Outer drum slots rough
- Disc plate wave spring weak or damaged.

CLUTCH DISASSEMBLY

Remove the following before removing the clutch cover.

- radiator screen.
- fairing lower cover (Section 14).
- turbocharger bracket six bolts and collar.

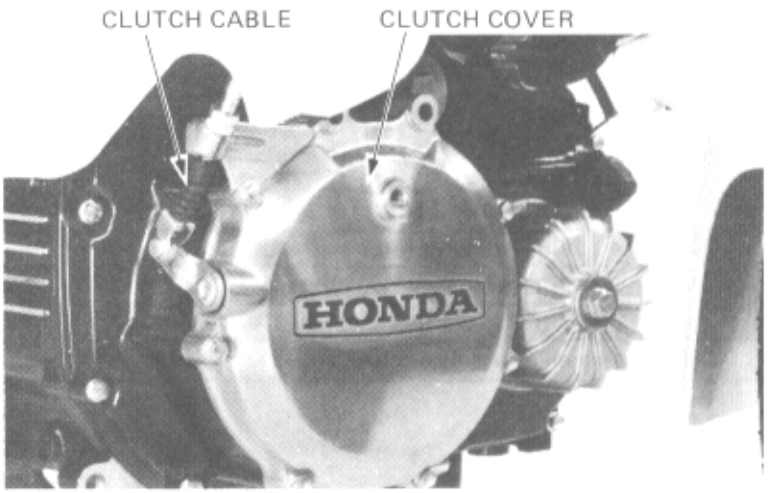


Remove the clutch cover and gasket.

NOTE

Move the clutch lever on the clutch cover to help remove it.

Disconnect the clutch cable from the clutch lifter lever.



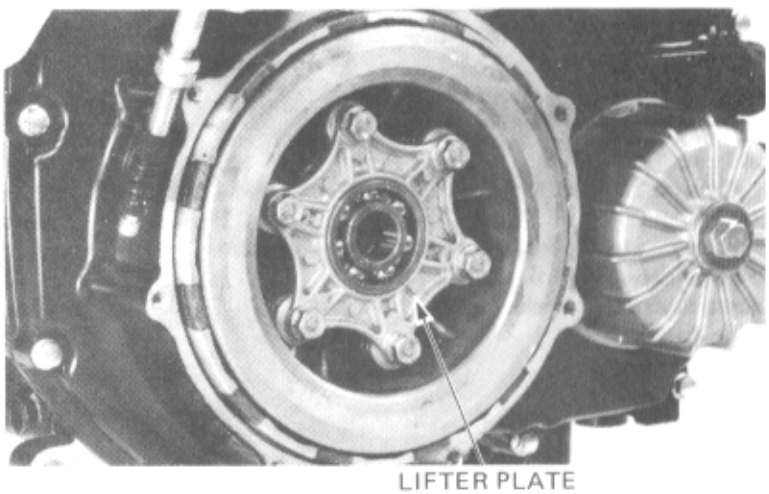
CLUTCH LIFTER PLATE REMOVAL

Remove the six bolts and clutch lifter plate.

NOTE

Loosen the bolts in an X pattern in two or more steps.

Remove the clutch springs.



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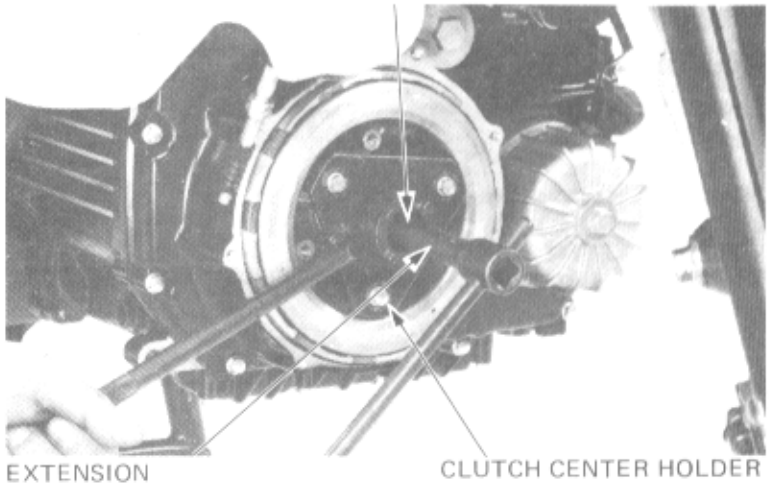
CLUTCH REMOVAL

Attach the Clutch Center Holder on to the pressure plate boss with three bolts. Finger tighten the bolts.

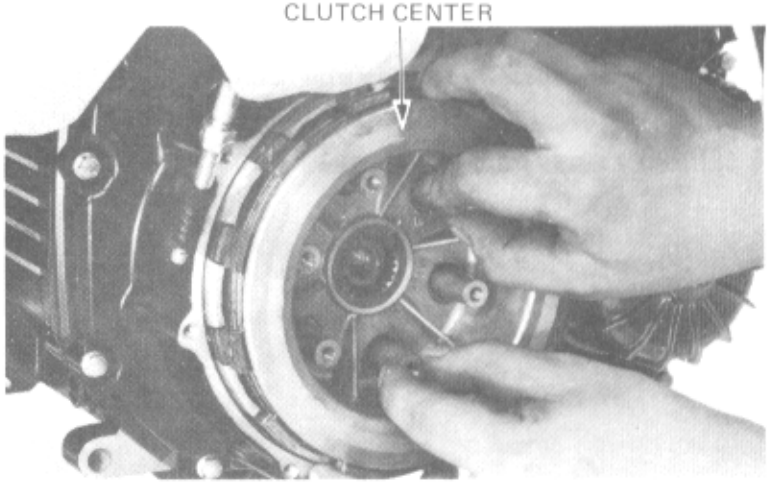
CAUTION

Damage to the pressure plate will occur, if the clutch center holder is not attached with 3 bolts.

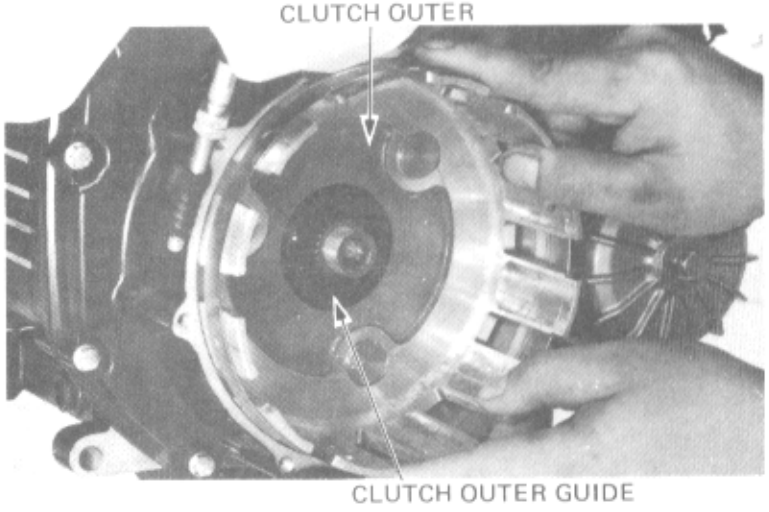
Remove the lock nut and lock washers using a 26 mm lock nut socket wrench.



Remove the pressure plate, discs A and B, plates A and B, and the clutch center as a unit.



Remove the clutch outer and clutch outer guide.



INSPECTION

- CLUTCH DISC

Replace the clutch discs if they show signs of scoring or discoloration.

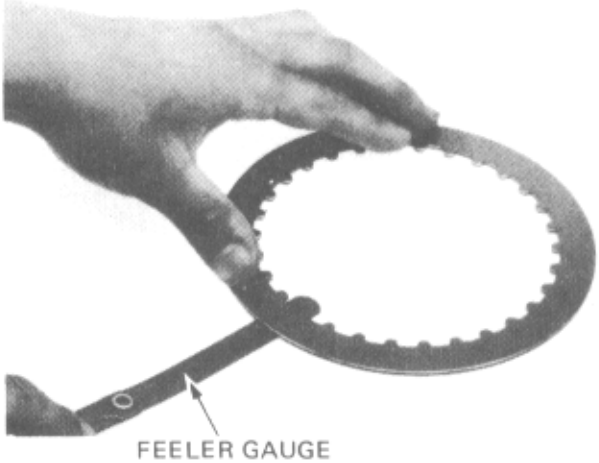
Measure the disc thickness.

SERVICE LIMIT:
Disc A and B: 3.10 mm (0.122 in)

- CLUTCH PLATE

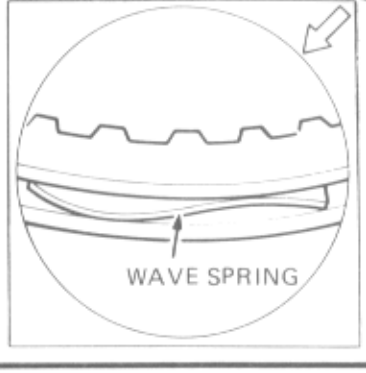
Check for plate warpage on a surface plate, using a feeler gauge.

SERVICE LIMIT: 0.20 mm (0.008 in)



- CLUTCH PLATE B

Check the wave spring for damage.



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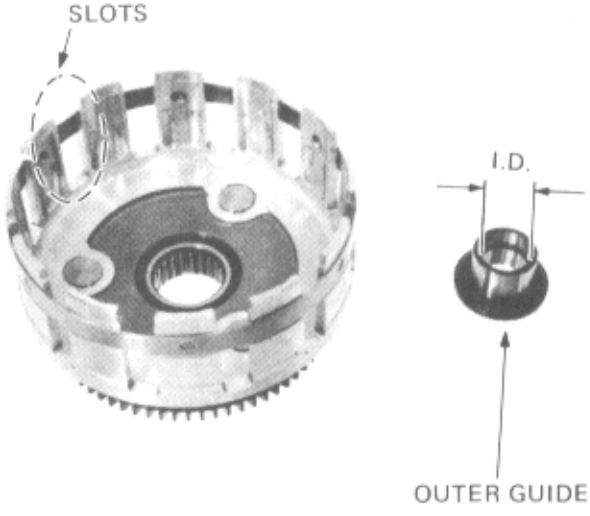
- CLUTCH OUTER AND OUTER GUIDE

Check the slots in the outer drum for nicks, cuts or indentations made by the friction discs.
Measure the I.D. of the outer guide.

SERVICE LIMIT:
Guide I.D.: 32.12 mm (1.265 in)

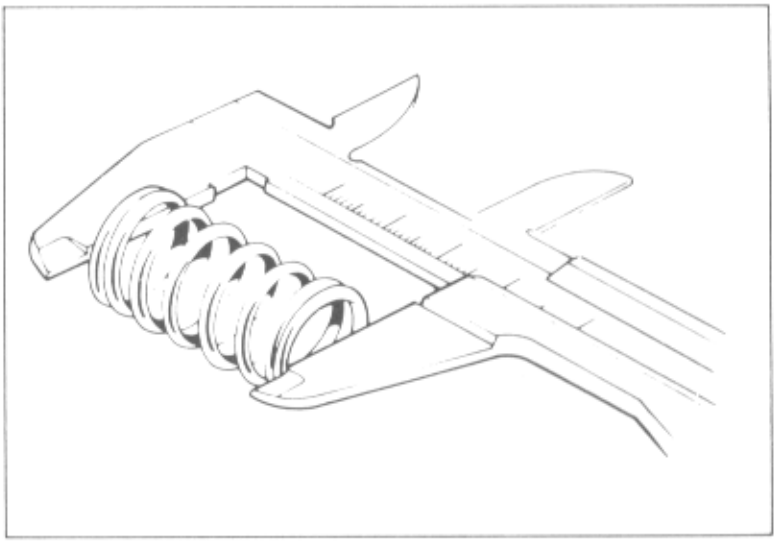


- CLUTCH SPRING

Measure the spring free length.

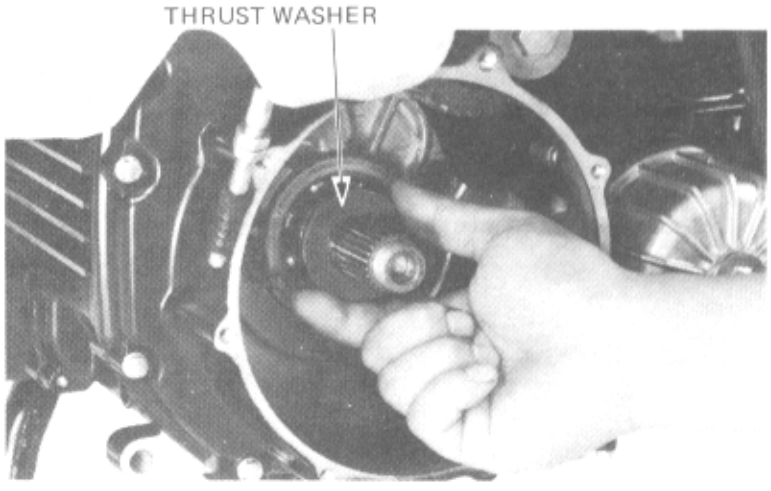
SERVICE LIMIT: 34.0 mm (1.34 in)

Replace all the springs if even one is shorter than the service limit.



CLUTCH INSTALLATION

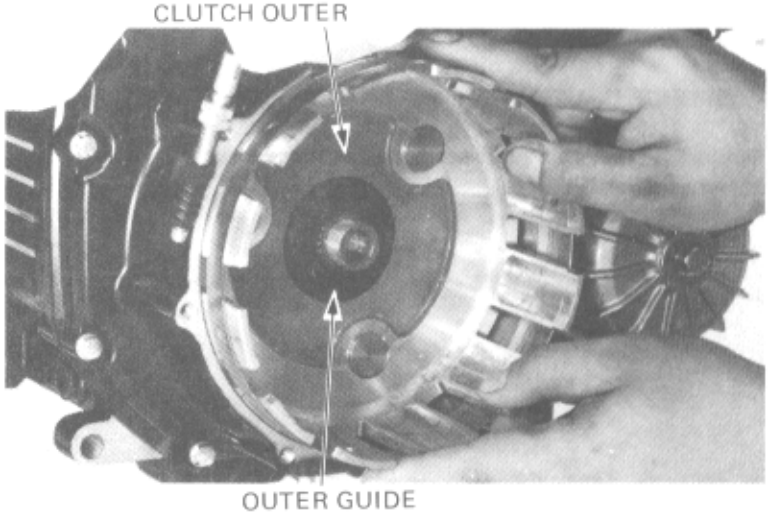
Slide the thrust washer onto the transmission mainshaft.



Install the clutch outer with the clutch outer guide.

NOTE

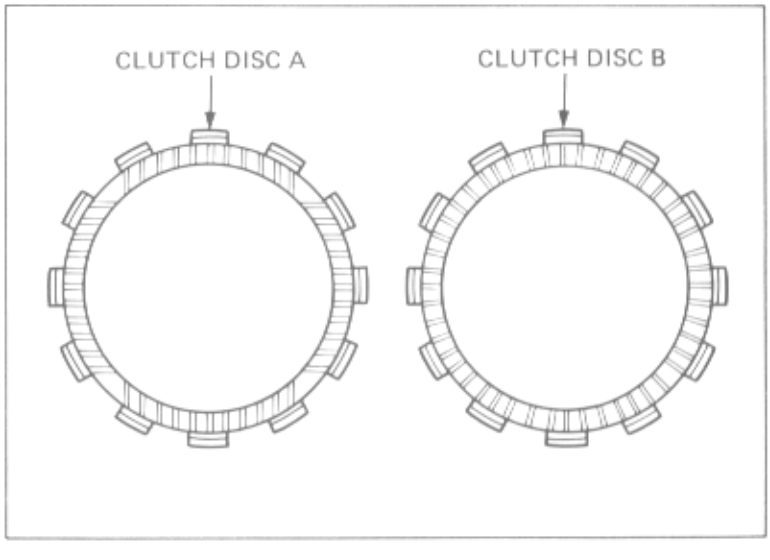
Before installing the clutch outer, align the primary gear teeth with the sub gear teeth for engagement with the clutch outer gear.



Position the pressure plate into the clutch outer.
Install the clutch plates and discs in the clutch outer as shown here and on page 8-7.
Clutch disc B's are the first and last disc's installed.

NOTE

The difference between clutch disc B and the other disc is the direction of the grooves.



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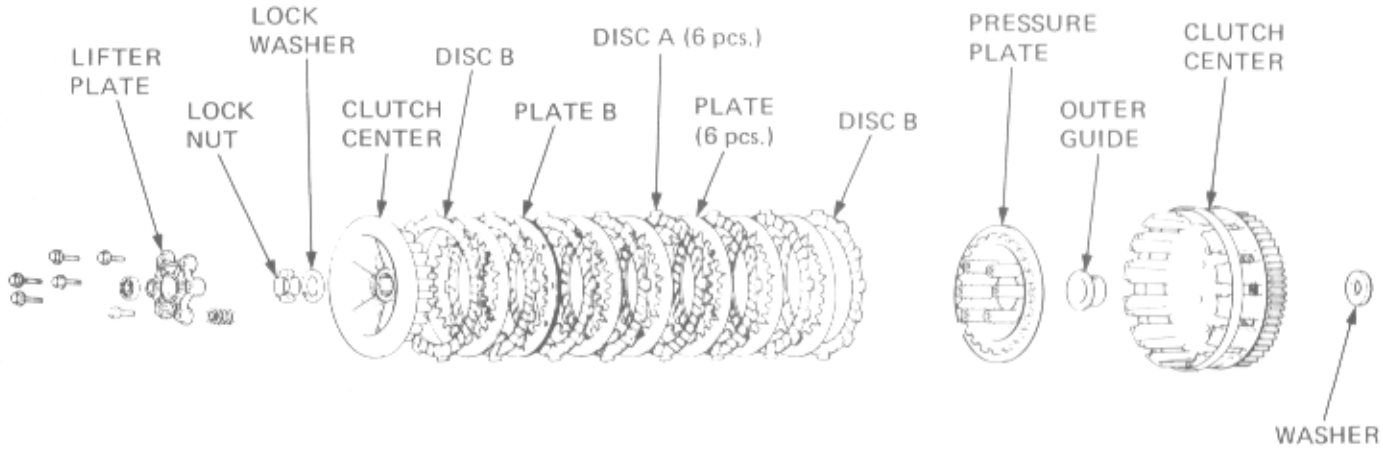
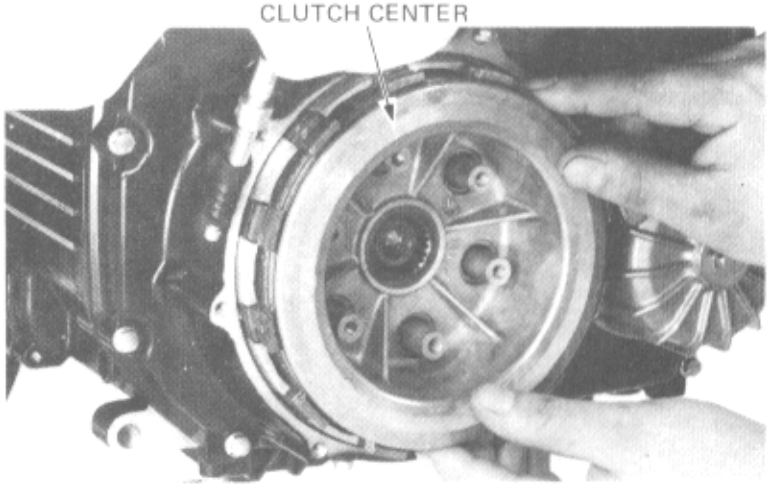


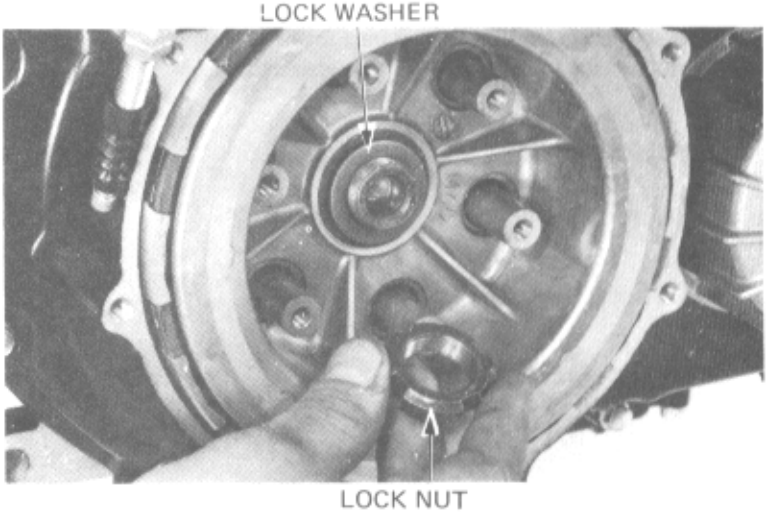
Install the clutch center, aligning the splines by rotating the clutch center.



Install the clutch on the mainshaft.
Install the lock washer and lock nut.

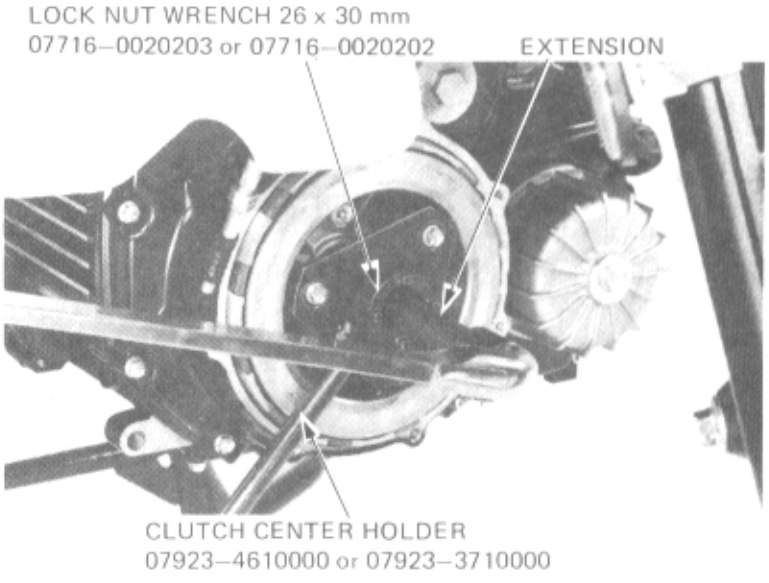
NOTE

- Install the lock washer with the mark "OUTSIDE" facing out.
- Install the lock nut with the flat end facing out.



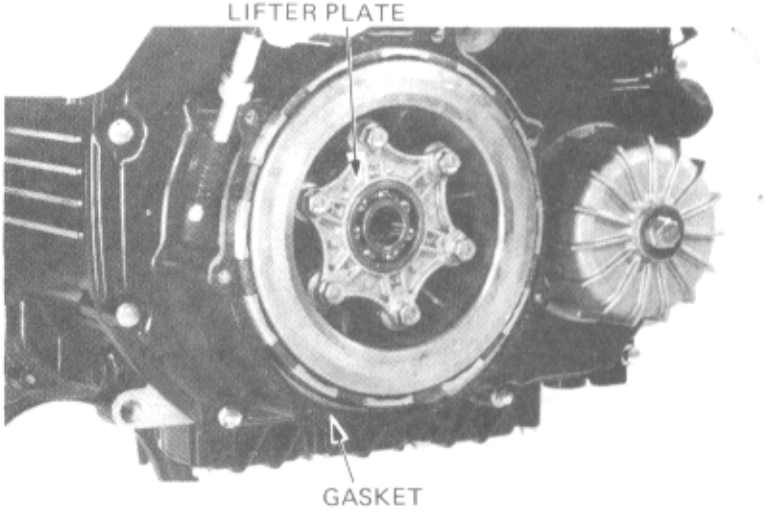
Attach the Clutch Center Holder with three bolts to the pressure plate boss to prevent it from turning. Tighten the lock nut.

TORQUE: 80–100 N·m
(8.0–10.0 kg·m, 58–72 ft·lb)

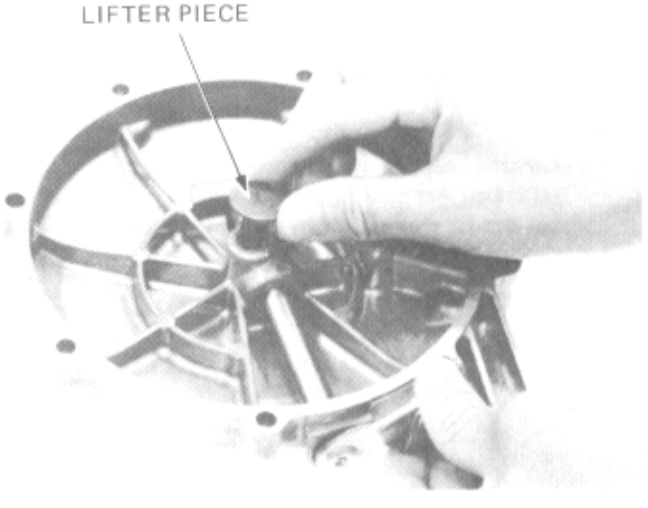


Install the clutch springs, lifter plate and lifter plate bolts. Tighten the bolts evenly in 2–3 steps using a crisscross pattern.

Install the clutch cover gasket.



Rotate the clutch lever to align the hole in the lever with the hole in the clutch cover and insert the lifter piece.



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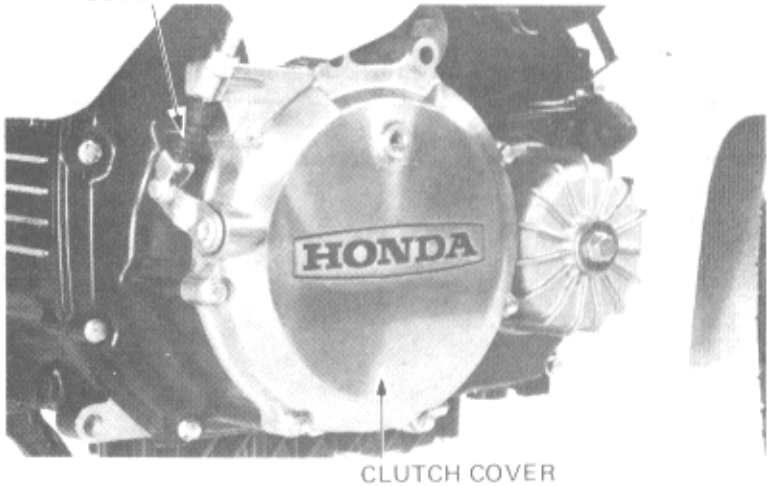
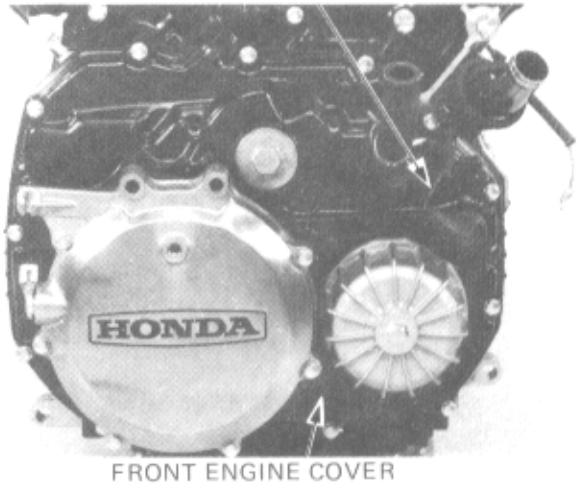
Install the clutch cover.
Connect the clutch cable.
Install the turbocharger bracket (Section 6).
Adjust the clutch cable free play (Section 3).



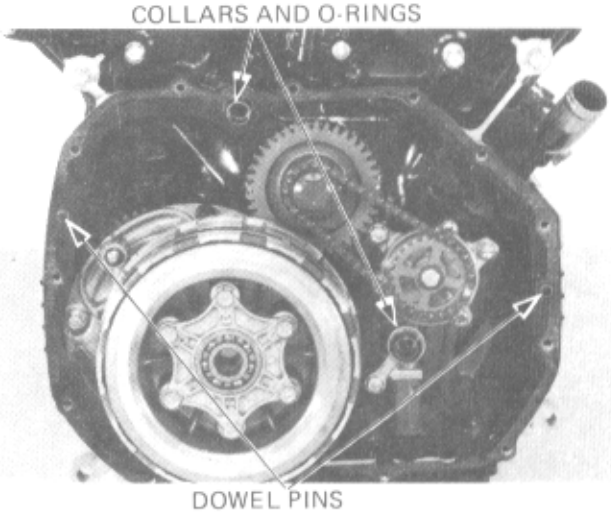
OIL PUMP REMOVAL

Remove the following parts before removing the front engine cover:
- Fairing assembly
- Fairing bracket
- Radiator
- Exhaust pipe/Muffler
- Heat insulators
- Turbocharger and bracket

Drain the oil from the engine.
Disconnect the oil pressure switch wire.
Remove the engine front cover attaching bolts and cover.



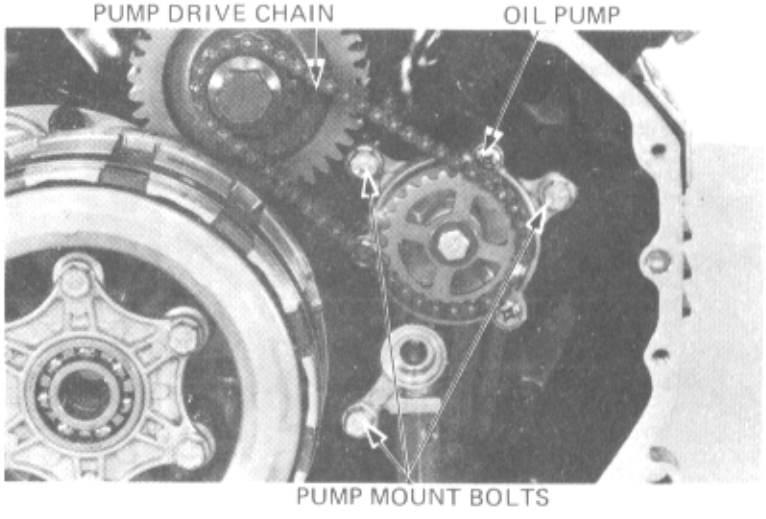
Remove the dowel pins, collars, O-rings and gasket.



Remove the oil pan and oil strainer (Section 2).

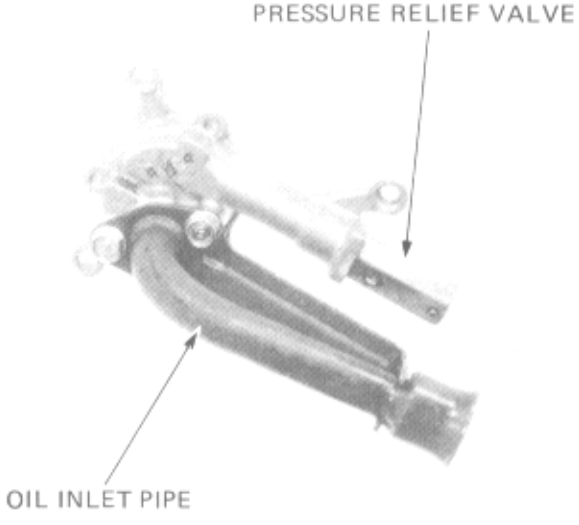
Remove the oil pump driven sprocket and pump drive chain.

Remove the three oil pump mount bolts and remove the oil pump.



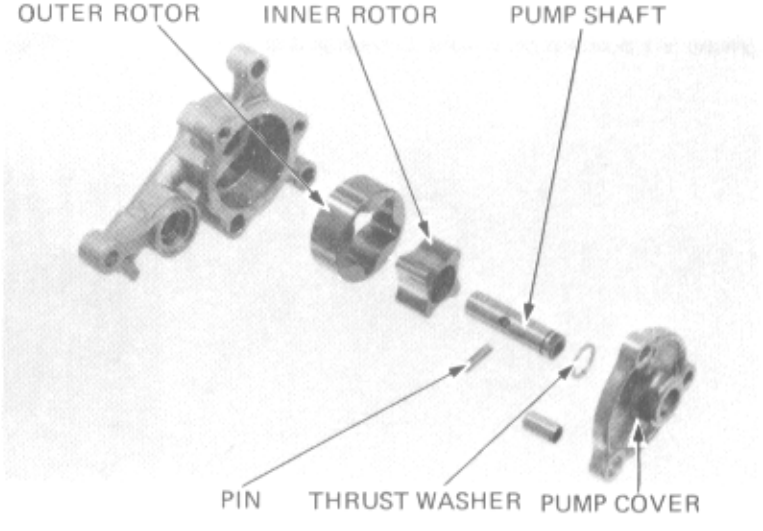
OIL PUMP DISASSEMBLY

Remove the oil pressure relief valve and oil inlet pipe.



Remove the pump cover, thrust washer, pump shaft, and driving pin.

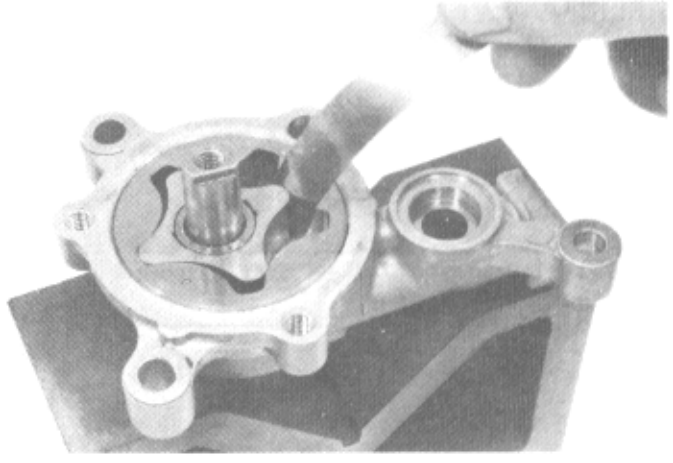
Remove the inner and outer rotors.



OIL PUMP INSPECTION

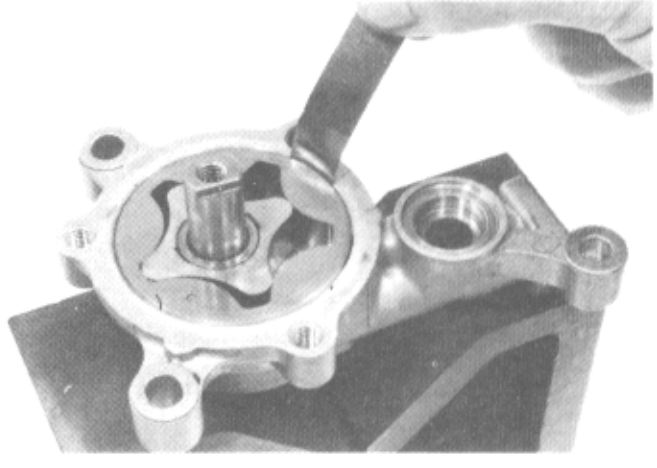
Measure the pump tip clearance.

SERVICE LIMIT: 0.10 mm (0.004 in)



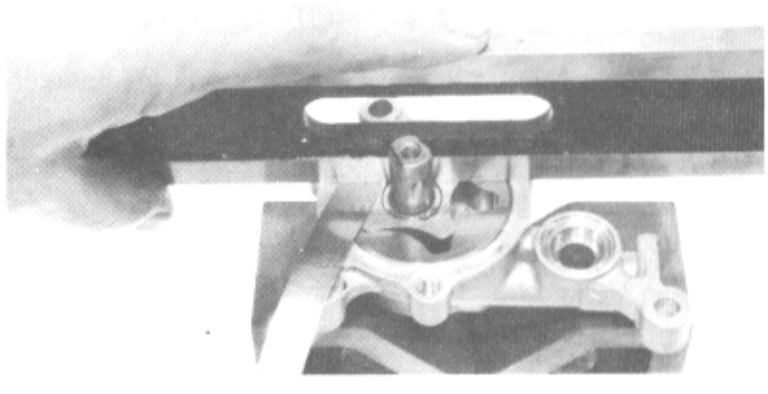
Measure the pump body clearance.

SERVICE LIMIT: 0.35 mm (0.014 in)



Measure the pump end clearance with a straight edge and feeler gauge.

SERVICE LIMIT: 0.10 mm (0.004 in)

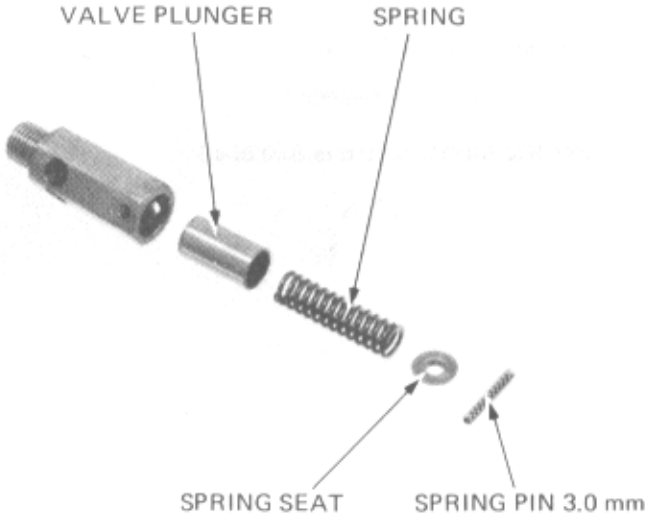


RELIEF VALVE INSPECTION

Remove the valve as an assembly and check its operation. If the valve does not operate properly, disassemble it and check for a stuck valve or weak spring. Replace the relief valve as a unit if the spring or plunger is damaged.

NOTE

Use a Pin driver 07744–0010200 to remove and install the spring pin.

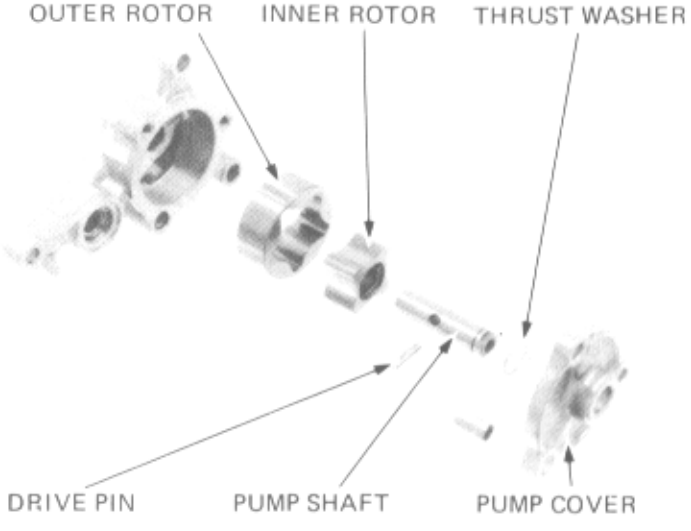


OIL PUMP ASSEMBLY

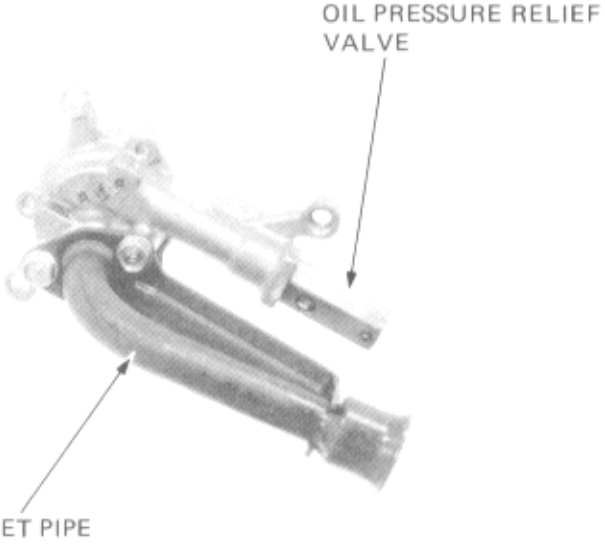
Insert the outer and inner rotors into the pump body. Slide the drive pin into the pump shaft, and install the shaft.

Install the thrust washer and drive pin.

Install the pump cover.

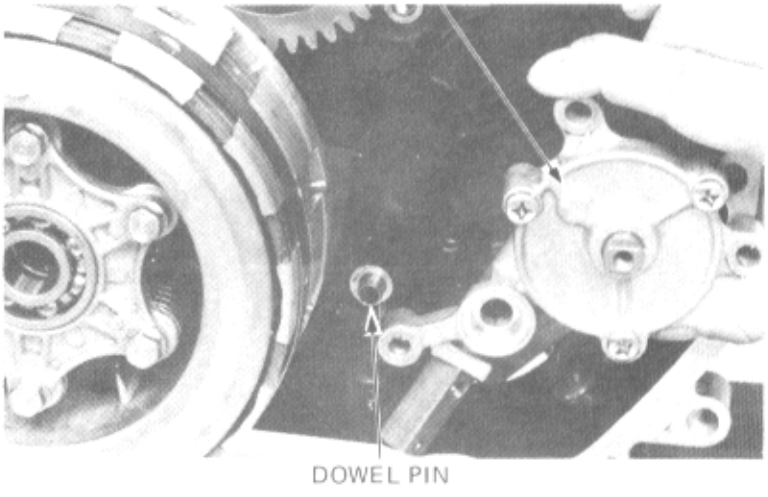


Install the inlet pipe.
Install the oil pressure relief valve.



OIL PUMP INSTALLATION

Install the dowel pin.
Install the oil pump. Do not tighten the mounting bolts at this time.



Place the drive chain over the pump driven and drive sprockets.

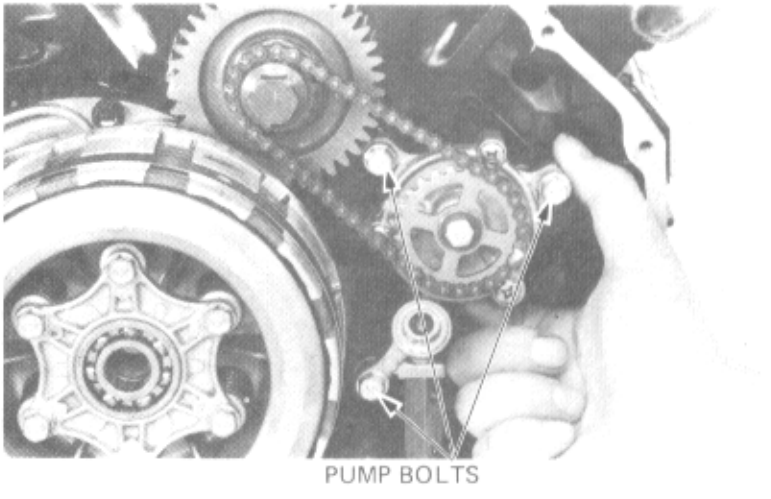
Adjust the chain free play by rotating the pump right or left, then torque the pump bolts.

FREE PLAY: 2.0–3.5 mm (0.08–0.14 in)

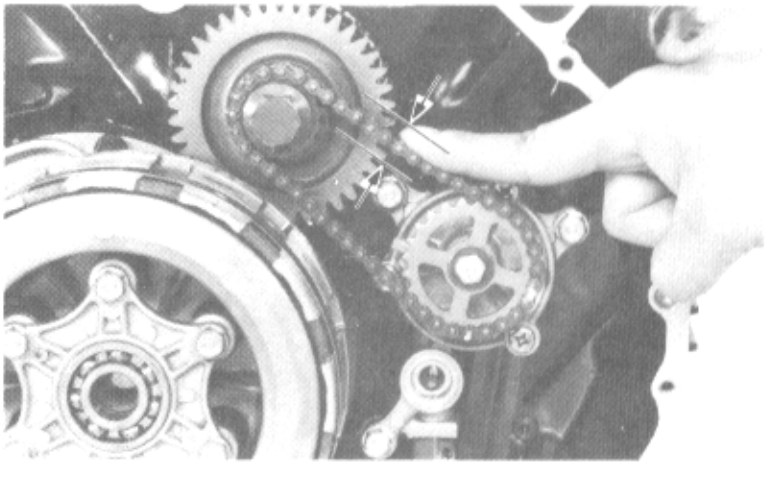
Tighten the three pump bolts.

TORQUE: 8–12 N·m
(0.8–1.2 kg-m, 6–9 ft-lb)

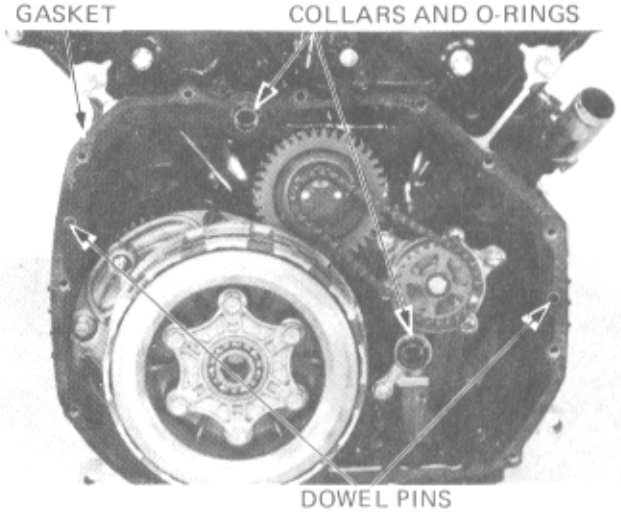
Tighten the pump sprocket bolt and relief valve.



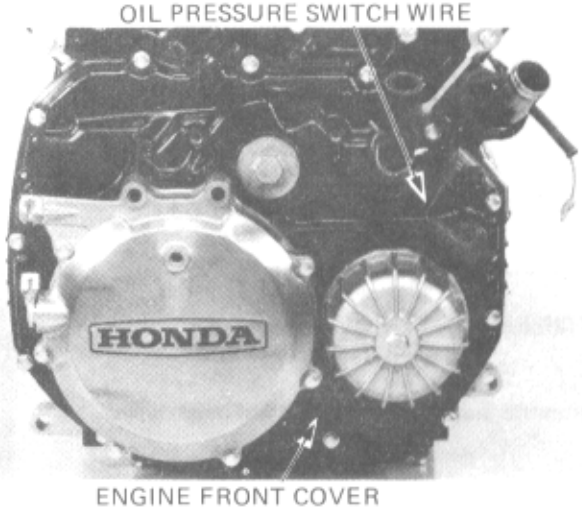
Recheck the oil pump drive chain free play.



Install the dowel pins, collars, O-rings and gasket.



Install the engine front cover and connect the oil pressure switch wire.
Install the removed parts in reverse order of removal.



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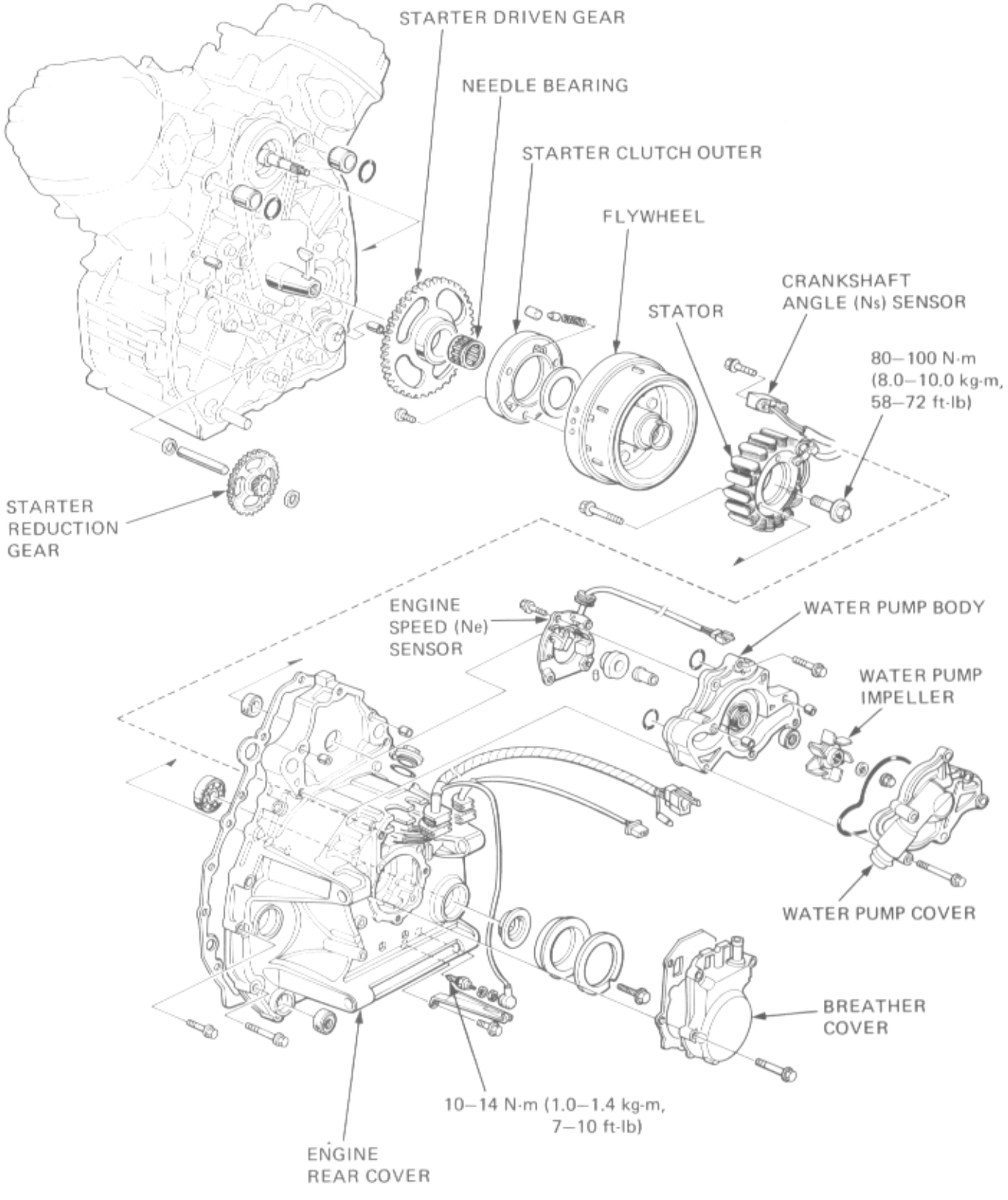

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9. ALTERNATOR/FLYWHEEL/ REAR COVER

SERVICE INFORMATION

GENERAL

- To inspect the ignition timing, see Section 20, Ignition System.
- The starter motor, water pump impeller and engine speed sensor can be serviced with the engine installed in the frame.
- Take care not to cut the alternator and stator wires and wire harnesses when removing or installing parts.
- For alternator inspection, see Section 19, Battery Charging System.

SPECIFICATIONS

Unit: mm (in)

Item	Standard	Service Limit
Starter reduction gear-to-shaft clearance	———	0.20 (0.008)
Starter drive gear O.D.	———	37.10 (1.461)

TORQUE VALUES

Alternator rotor bolt	80–100 N·m (8.0–10.0 kg-m, 58–72 ft-lb)
Starter clutch torx bolt	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)

TOOLS

Special

Gear holder	07924–MC70002 or modified 07924–MC70001 or 07924–MC70000 or 07924–4150000 (page 9-5)
Torx driver bit (T40)	07703–0010100 or commercial equivalent in U.S.A.
Flywheel puller	07733–0020001 or 07933–3950000

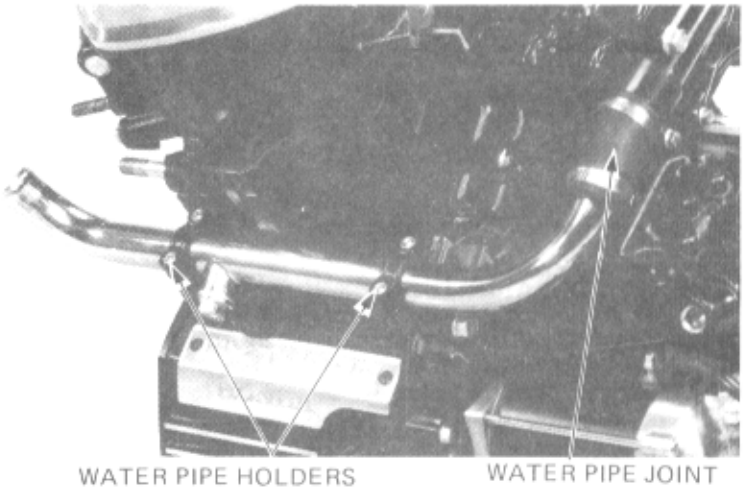
Common

Driver	07749–0010000
Pilot, 22 mm	07746–0041000
Attachment, 42 x 47 mm	07746–0010300

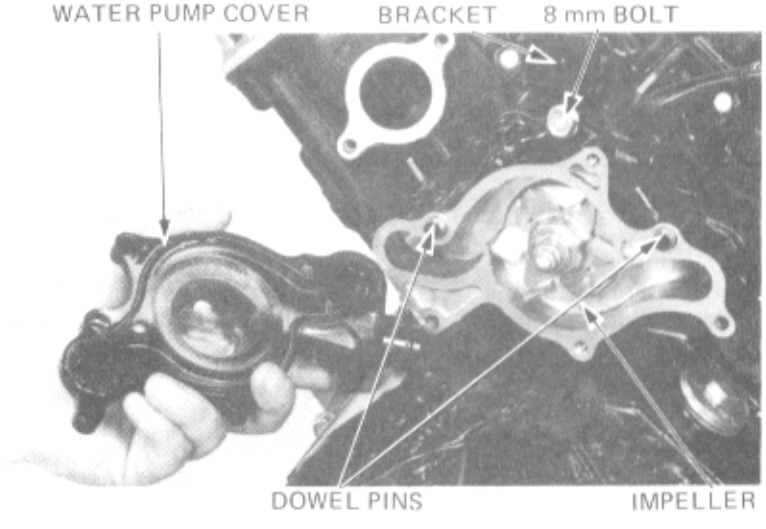
ENGINE REAR COVER REMOVAL

Drain the engine oil.
Remove the engine from the frame (Section 5).

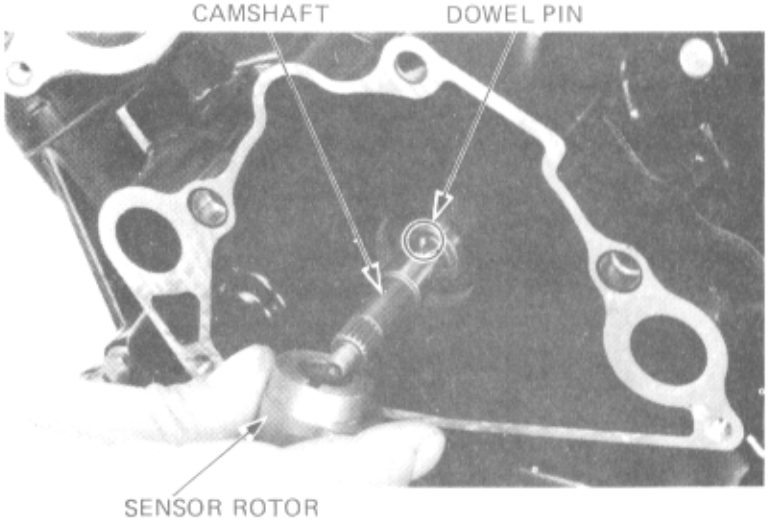
Remove the gearshift pedal.
Remove the water pipe holders, water pipe and water pipe joint.



Remove the water pump cover and dowel pins.
Remove the cap nut, copper washer and impeller.
Remove the water pump body and throttle housing bracket by removing the 8 mm bolt.



Remove the impeller collar, sensor rotor and dowel pin from the camshaft.



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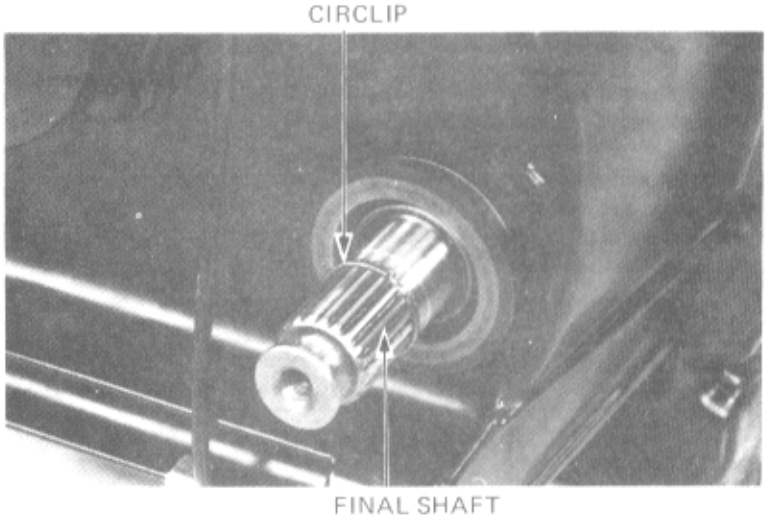
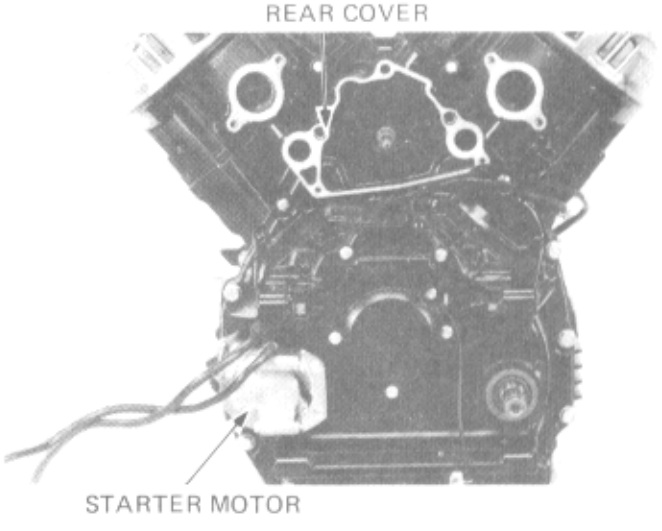
Remove the circlip from the final shaft.

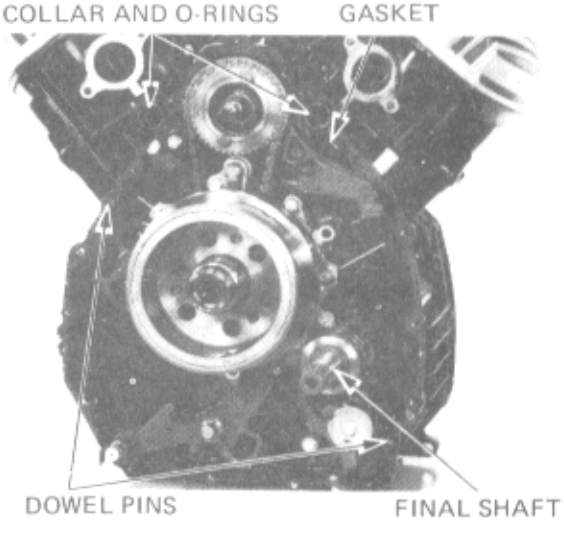


Remove the starter motor.

Remove the rear cover.



Remove the collars, O-rings, dowel pins, and gasket.
Remove the final shaft.



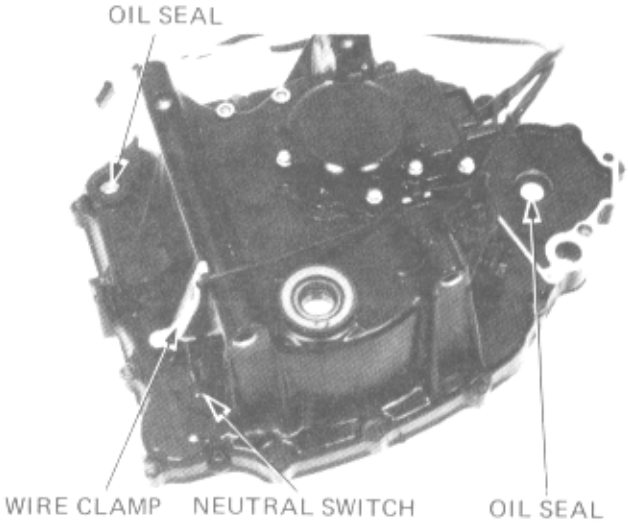
REAR COVER DISASSEMBLY

Inspect the condition of the oil seals and bearing. Replace them if necessary.

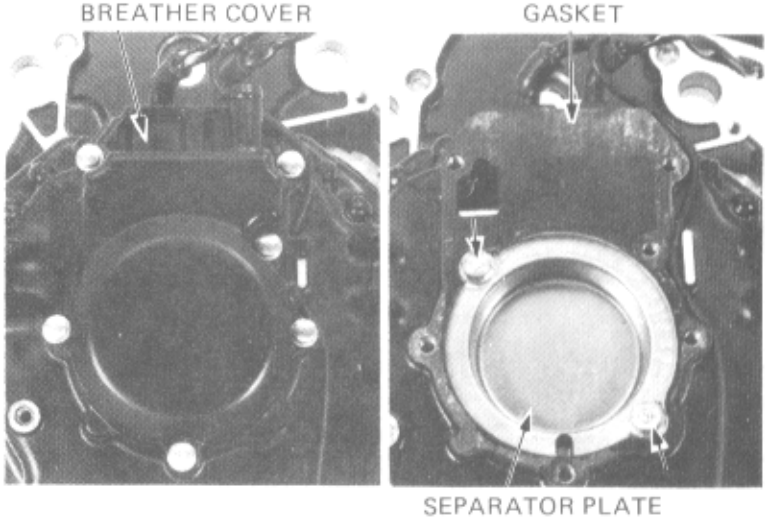
If neutral switch removal is necessary, remove the wire clamp and disconnect the neutral switch wire from the neutral switch. Then remove the neutral switch and sealing washer.

NOTE

Refer to Section 22 for neutral switch inspection.



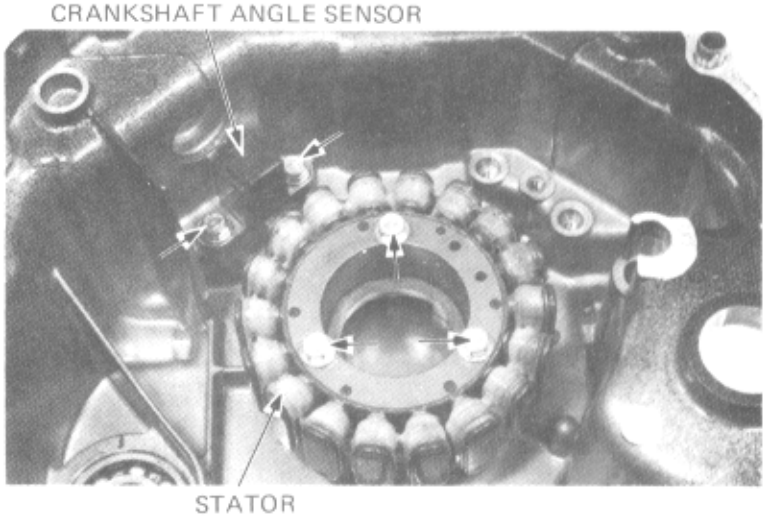
Remove the breather cover, separator plate and gasket.



Remove the stator and crankshaft angle (Ns) sensor from the rear cover.

CAUTION

Be careful not to damage the stator coil.



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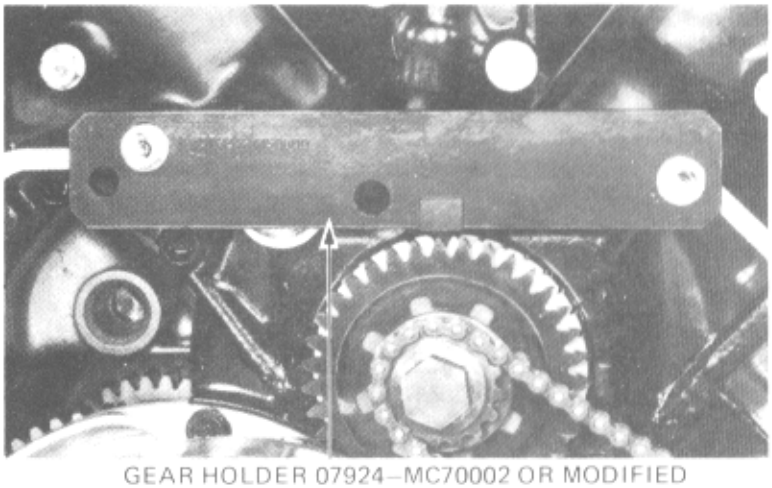
FLYWHEEL REMOVAL

Remove the front engine cover (Section 8).
Attach the Gear Holder to the primary drive gear.

NOTE

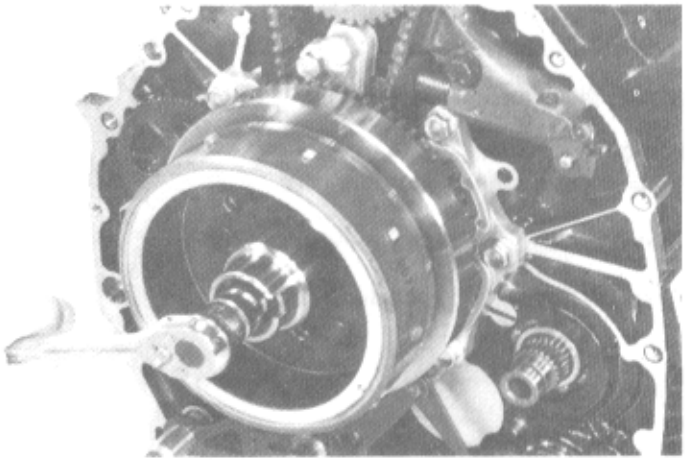
Modify the 07924–4150000 or 07924–MC70000 or 07924–MC70001 as shown, if 07924–MC70002 is unavailable.

Slot two holes as shown.

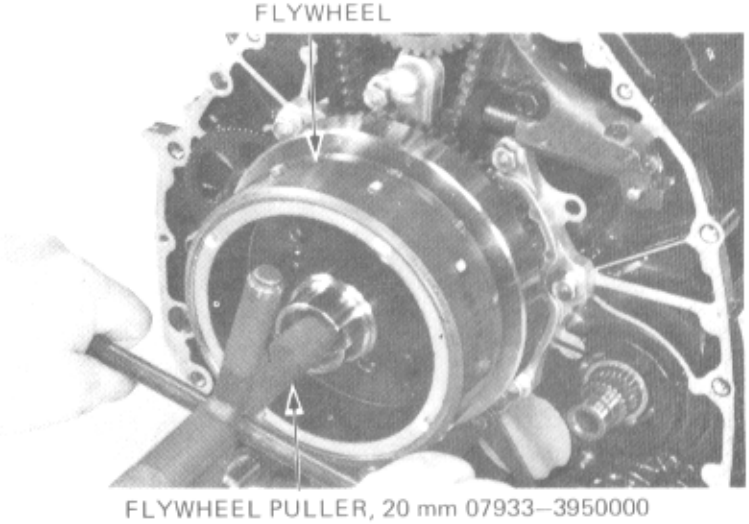


GEAR HOLDER 07924–MC70002 OR MODIFIED
07924–4150000, 07924–MC70000, 07924–MC70001

Remove the flywheel bolt.



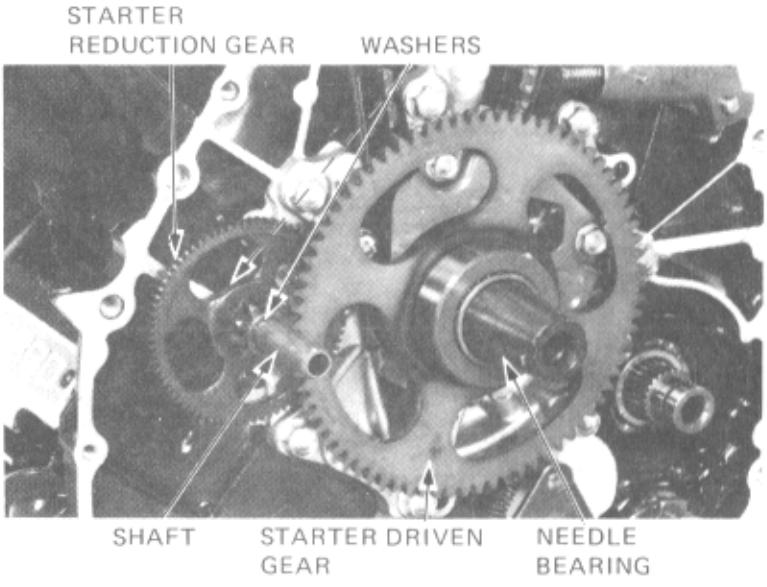
Remove the flywheel, using the Flywheel Puller.



FLYWHEEL PULLER, 20 mm 07933–3950000
OR 07733–0020001

Remove the starter reduction gear and washers by removing the gear shaft.

Remove the starter driven gear and needle bearing from the crankshaft.



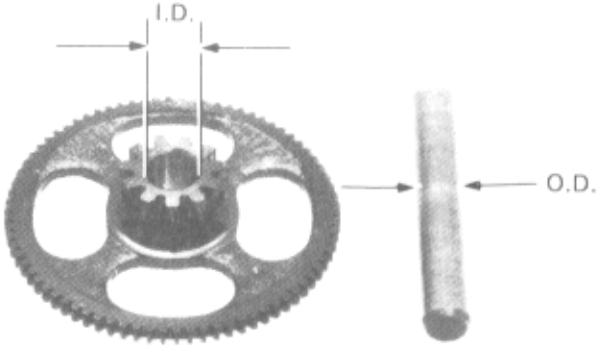
STARTER REDUCTION GEAR INSPECTION

Inspect the reduction gear teeth for damage.

Measure the reduction gear I.D.
Measure the reduction gear shaft O.D.

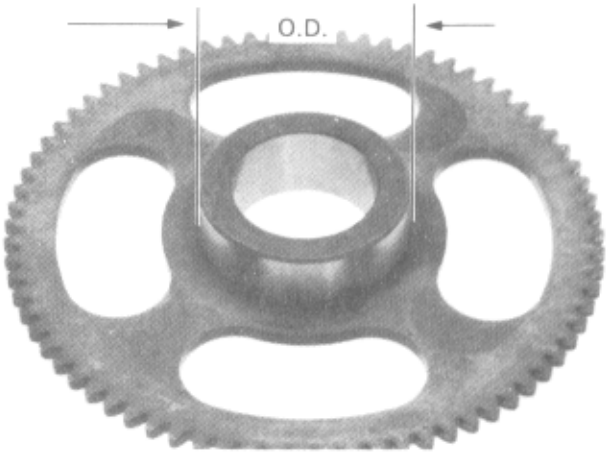
Calculate the gear to shaft clearance.

SERVICE LIMIT: 0.20 mm (0.008 in)



STARTER DRIVE GEAR INSPECTION

Check the drive gear for damage, excessive wear, indentations or other faults.



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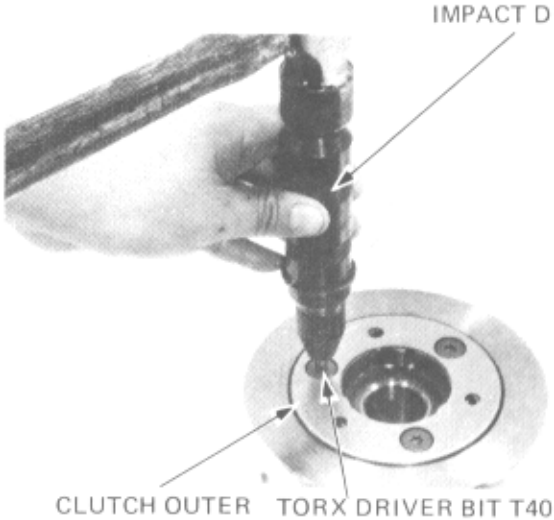
STARTER CLUTCH OUTER REMOVAL

Remove the starter clutch rollers, springs and plunger.

Remove the three torx bolts and starter clutch outer.

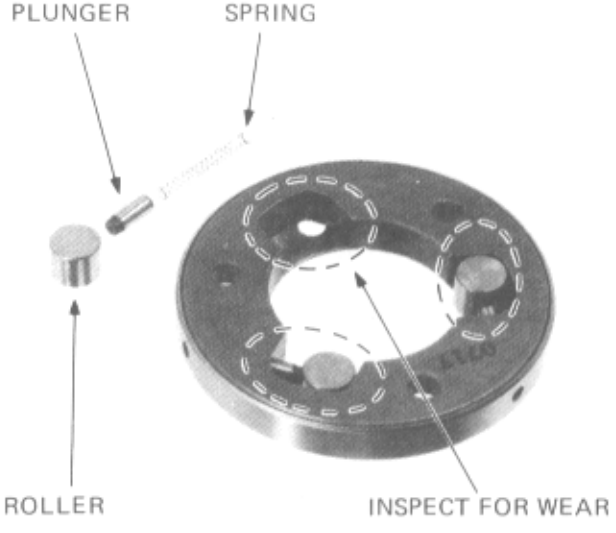


STARTER CLUTCH OUTER INSPECTION

Inspect the rollers for freedom of movement in their grooves. Inspect the each roller and replace it if it is worn or damaged.

Inspect the clutch outer for damaged or worn roller surfaces.

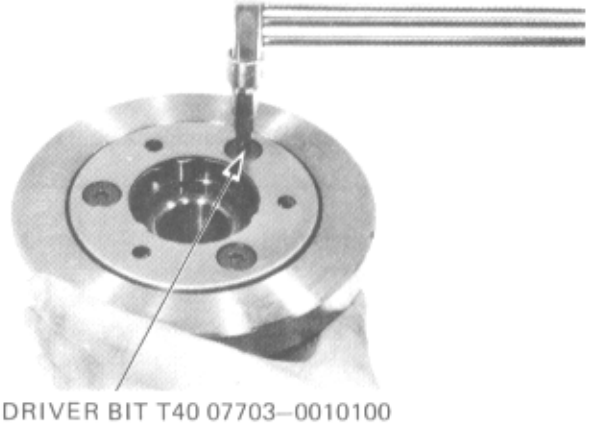
Examine the springs and plungers for distortion or excessive wear.



STARTER CLUTCH OUTER INSTALLATION

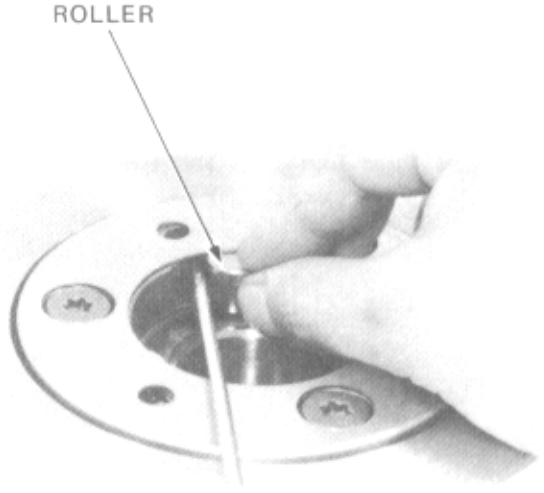
Slide the clutch outer into the flywheel, aligning the holes with the dowel pins in the flywheel.
Coat the threads and undersides of the TORX bolts with a locking agent prior to installation.
Install the torx bolts and tighten them to the specified torque.

TORQUE: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)



Slide the spring into the plunger and install it in the clutch outer.

Position the roller into place while holding the plunger with a screwdriver as shown.



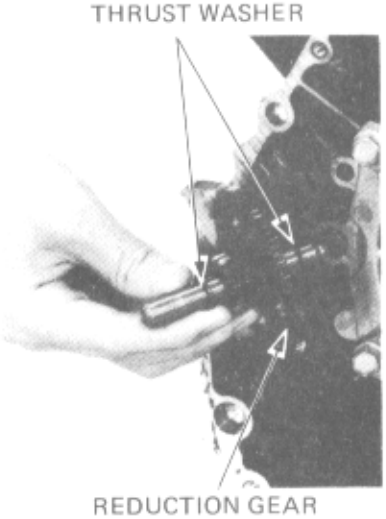
Install the reduction shaft, thrust washers and reduction gear.

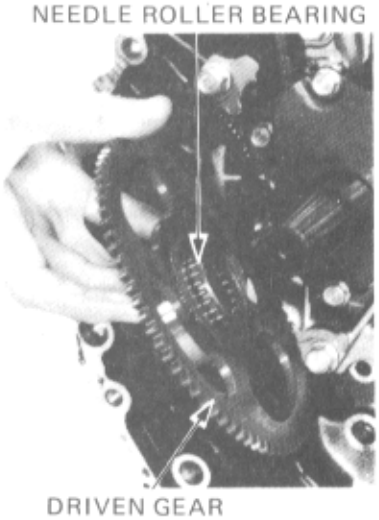
NOTE

Use two thrust washers, one on each side of the reduction gear.

Install the needle roller bearing in the driven gear.

Install the starter driven gear onto the crankshaft.



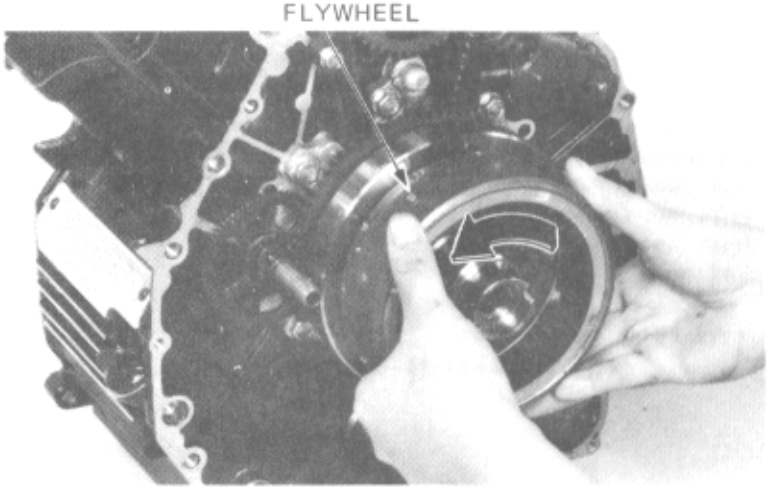


FLYWHEEL INSTALLATION

Install the flywheel onto the crankshaft.

NOTE

- Align the key in the crankshaft with the keyway in the flywheel.
- Rotate the flywheel counterclockwise to aid installation.



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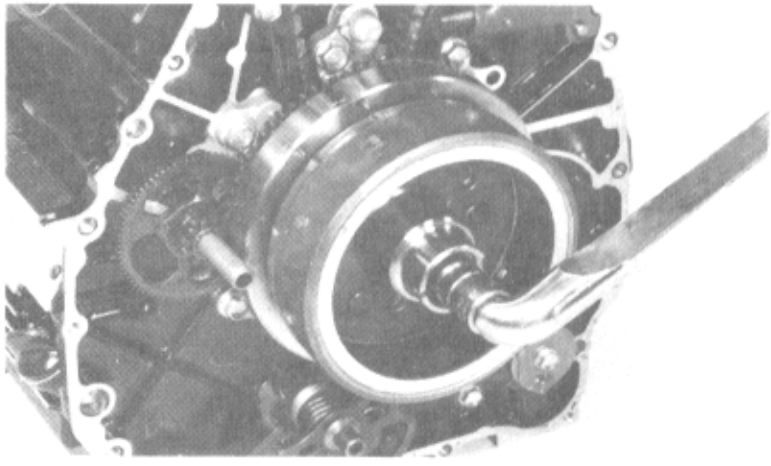
Install and tighten the flywheel bolt.

TORQUE: 90–105 N·m
(9.0–10.5 kg-m, 65–76 ft-lb)

Remove the Gear Holder from the primary drive gear.
Install the front engine cover.



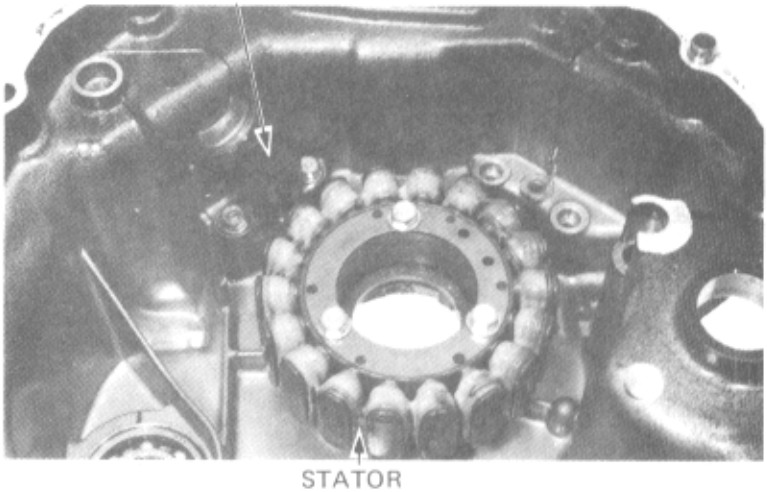
ENGINE REAR COVER INSTALLATION

Assemble the rear cover in the reverse order of disassembly.

NOTE

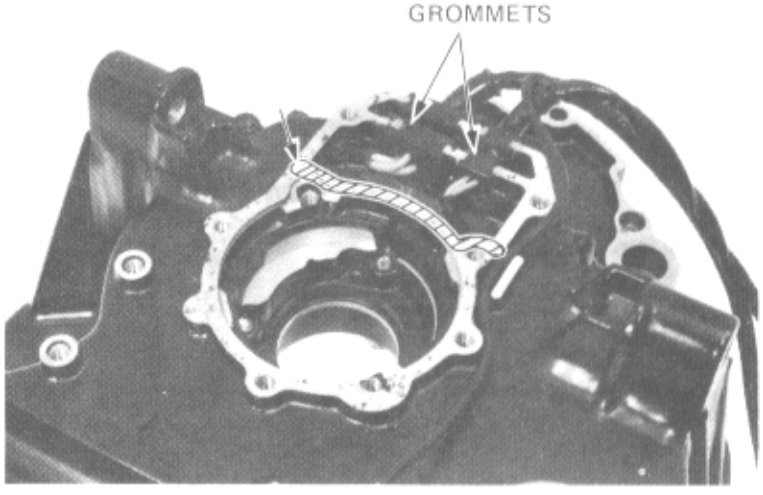
Drive the final shaft bearing in until it seats fully.

Install the stator and crankshaft angle (Ns) sensor into the rear cover.



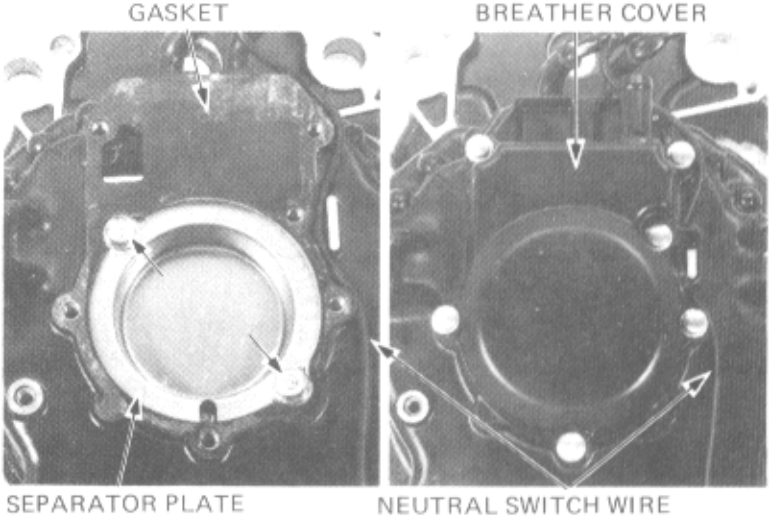
Insert the alternator and angle (Ns) sensor wire harness grommets into the rear cover securely.

Apply a liquid sealant to the surface indicated by the arrow and install the gasket.

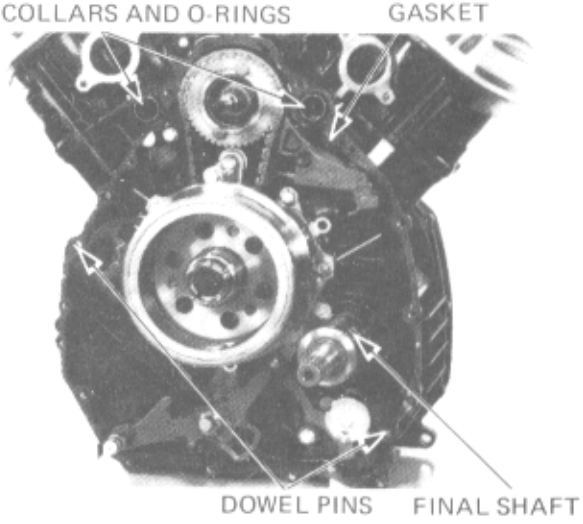


Install the separator plate.
Route the neutral switch wire as shown.

Install the breather cover, being careful not to pinch the neutral switch wire when tightening the breather cover bolts.



Install the final shaft.
Install the dowel pins, O-rings, collars and gasket.



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Install the engine rear cover and tighten the bolts in a crisscross pattern in 2–3 steps.
Begin with 8 mm bolts.

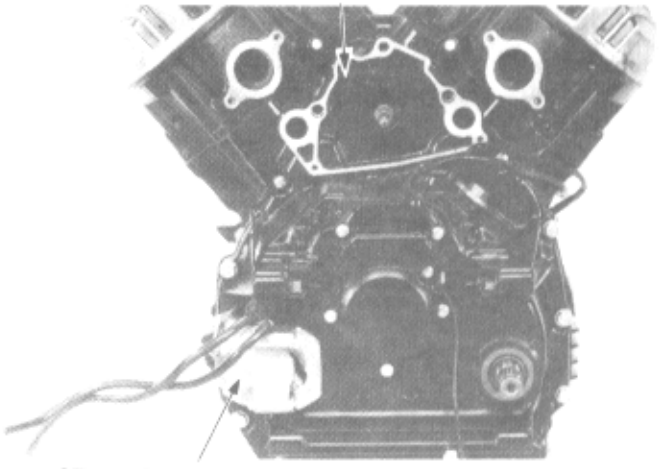
NOTE

- Be careful not to damage the gearshift spindle oil seal.
- Align the starter drive gear with the reduction gear before tightening the cover bolts.

TORQUE:

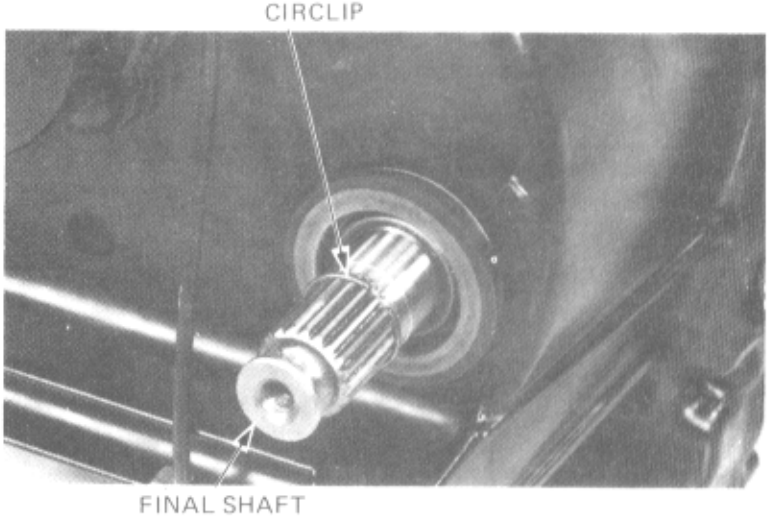
8 mm bolts: 18–25 N·m (1.8–2.5 kg-m, 13–18 ft-lb)
6 mm bolts: 8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)

Install the starter motor.

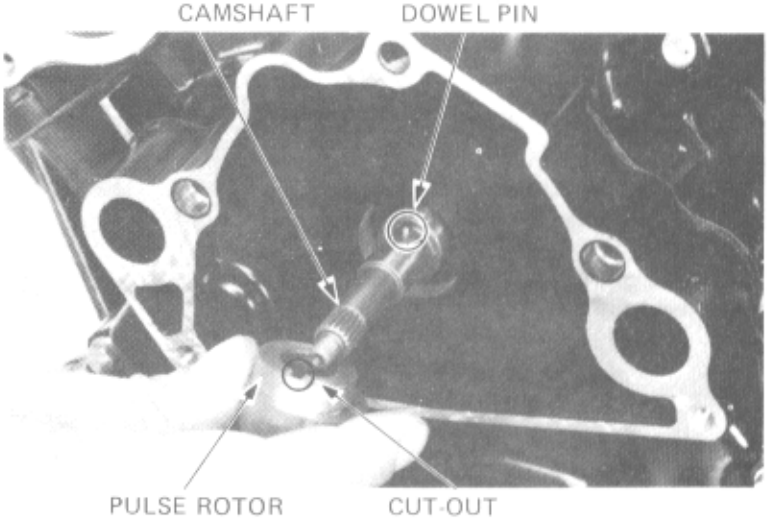


Install the circlip on the final shaft.
Install the joint boots.

Align the punch marks on the gearshift pedal and the spindle and install the pedal.



Install the dowel pin in the camshaft.
Install the pulse rotor, aligning the cut-out with the camshaft dowel pin.



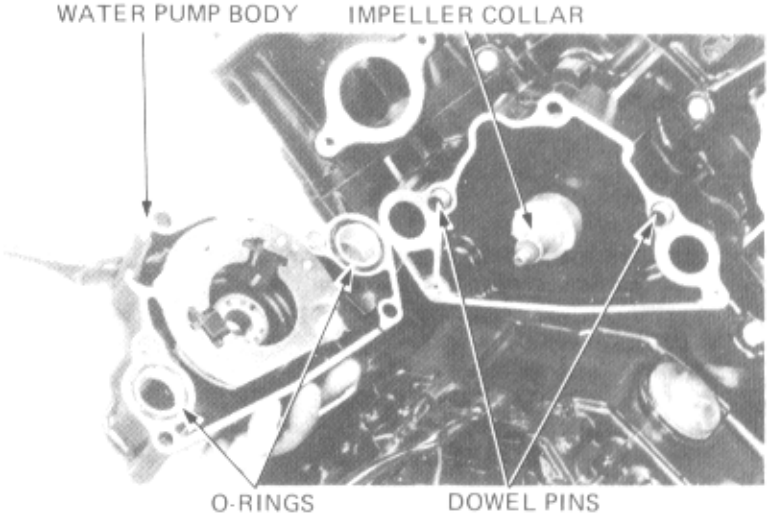
WATER PUMP INSTALLATION

Install the impeller collar onto the camshaft.
Install the dowel pins and O-rings on the water pump body.

Install the water pump body on the engine rear cover.

NOTE

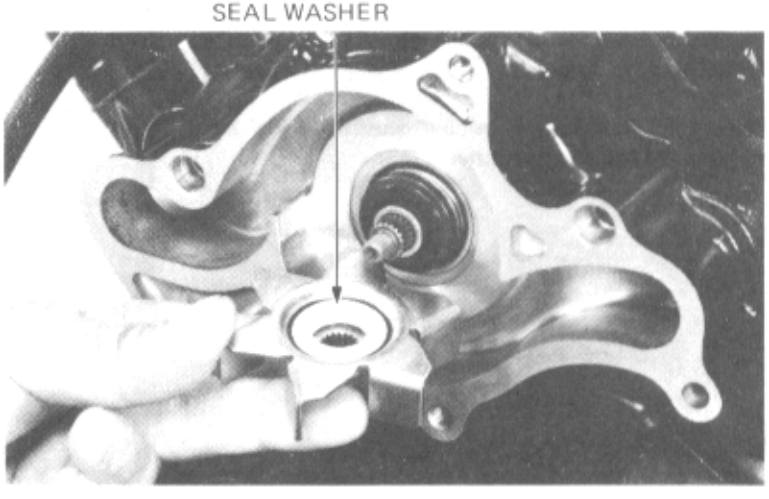
For water pump mechanical seal replacement, refer to page 10-9.



Apply soapy water to the sliding surfaces of the seal washer.

NOTE

Check that the rubber seal is positioned properly.

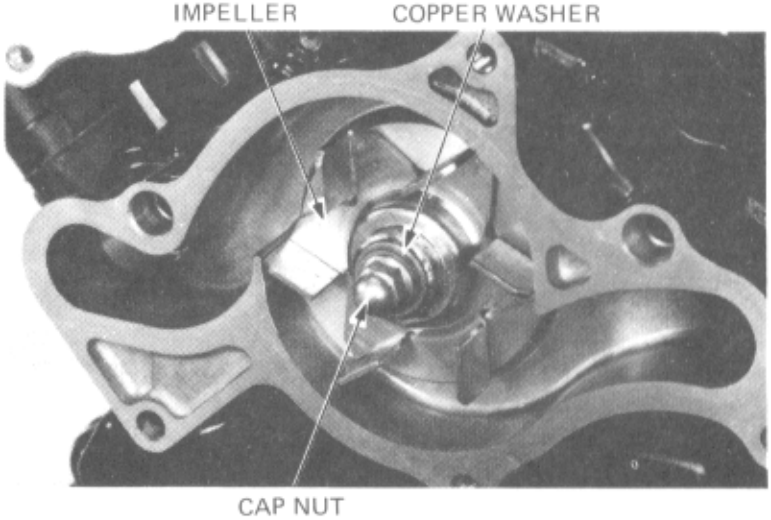


Install the impeller, copper washer and cap nut on the camshaft end.

Tighten the cap nut.

TORQUE: 8–12 N·m
(0.8–1.2 kg-m, 6–9 ft-lb)

Rotate the crankshaft to make sure that the pump turns freely without binding.



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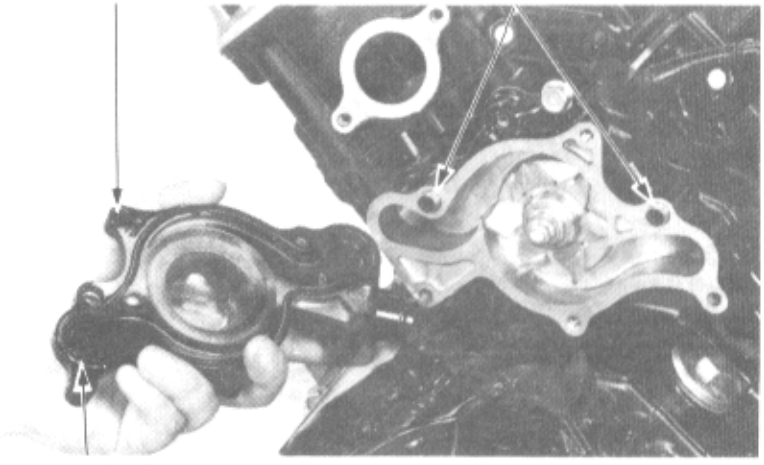
Check the pump cover rubber packing for deterioration or damage and replace if necessary.

Install the dowel pin in the cover and install the cover.

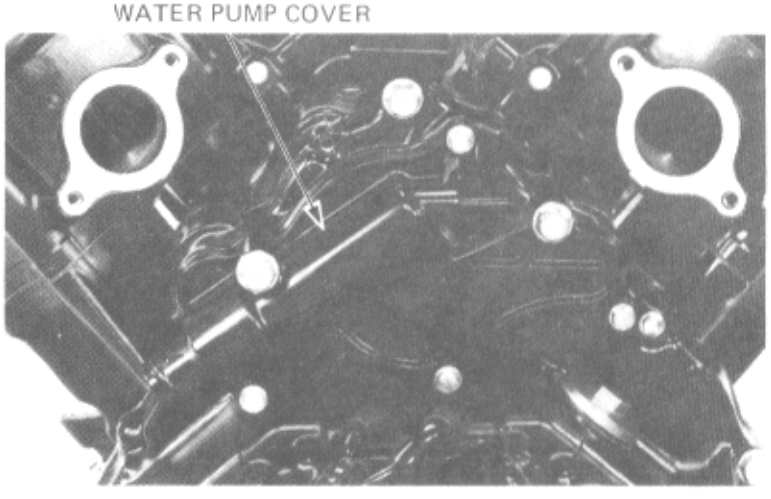
Install the intake manifold bracket.



Tighten the pump cover bolts.

TORQUE:

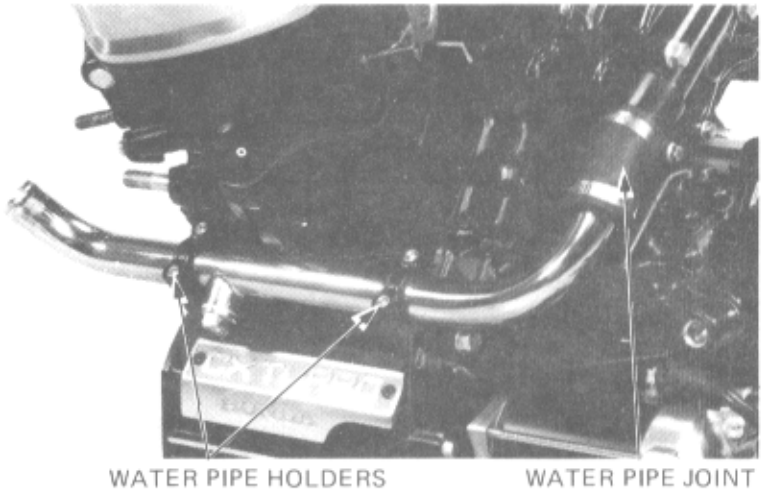
8 mm bolts:	**18–25 N·m (1.8–2.5 kg-m, 13–18 ft-lb)**
6 mm bolts:	**8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)**

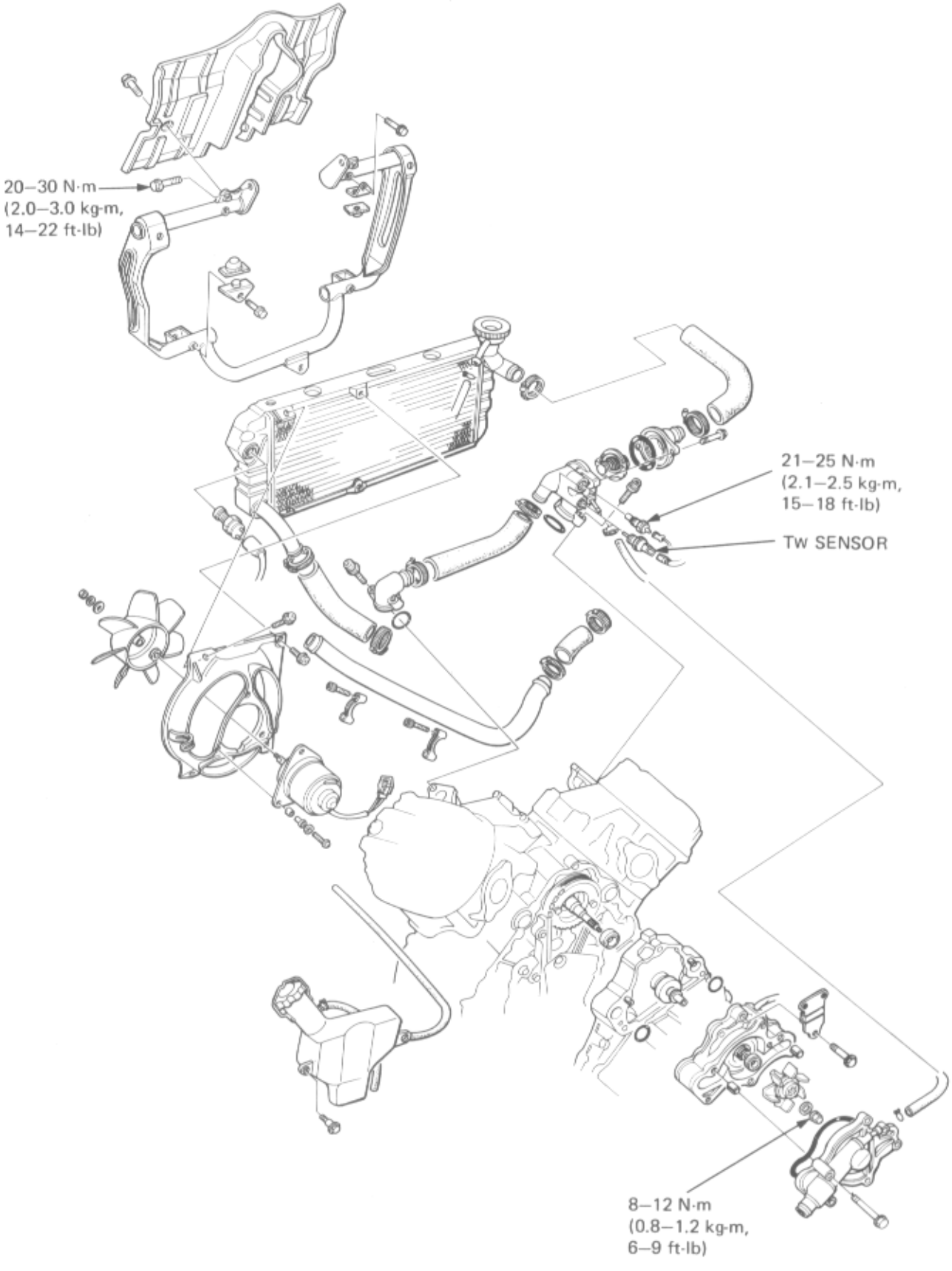


Apply soapy water to new water pipe O-rings and install them on the water pipe.

Connect the water pipe and joint pipe to the water pump cover. Be careful not to twist the O-ring.

Install the water pipe holders. Tighten the upper bolts first, then the lower bolts.





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10. COOLING SYSTEM

SERVICE INFORMATION

GENERAL

- To service the water pump seal, it is necessary to remove the engine and the rear engine cover. All other cooling system services can be made with the engine in the frame.
- Do not remove the radiator cap when the engine is hot. The coolant is under pressure and severe scalding could result. The engine must be cool before servicing the cooling system.
- Avoid spilling coolant on painted surfaces.
- After servicing the system, check for leaks with a cooling system tester.

SPECIFICATIONS

Radiator cap relief pressure	0.75–1.05 kg/cm^2 (10.7–14.9 psi)
Freezing point (Hydrometer test):	55% Distilled water + 45% ethylene glycol: −32°C (−26°F) 50% Distilled water + 50% ethylene glycol: −37°C (−35°F) 45% Distilled water + 55% ethylene glycol: −44.5°C (−48°F)
Coolant capacity: Radiator and engine Reserve tank Total system	 1.9 liters (2.0 US qt, 1.7 Imp qt) 0.2 liters (0.21 US qt, 0.18 Imp qt) 2.1 liters (2.2 US qt, 1.8 Imp qt)
Thermostat	Begins to open: 80° to 84°C (176° to 183°F) Fully open: 93° to 97°C (199° to 206°F) Valve lift: Minimum of 8 mm at 95°C (0.315 in at 203°F)
Boiling point (with 50–50 mixture):	Unpressurized: 107.7° C (226°F) Cap on, pressurized: 125.6°C (258°F)

TORQUE VALUE

Water pump impeller nut	8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)

TOOLS

Special

Mechanical seal driver attachment	07945–4150400 or GN-AH-065-415 (U.S.A. only)
Socket wrench, 17 x 27 mm	07907–MC70000 or 07907–4150000 or equivalent

Common

Driver	07749–0010000

TROUBLESHOOTING

Engine Temperature Too High
- Faulty temperature gauge or gauge sensor.
- Thermostat stuck closed.
- Faulty radiator cap.
- Insufficient coolant.
- Passages blocked in radiator, hoses, or water jacket.
- Fan blades bent.
- Faulty fan motor.

Engine Temperature Too Low
- Faulty temperature gauge or gauge sensor.
- Thermostat stuck open.

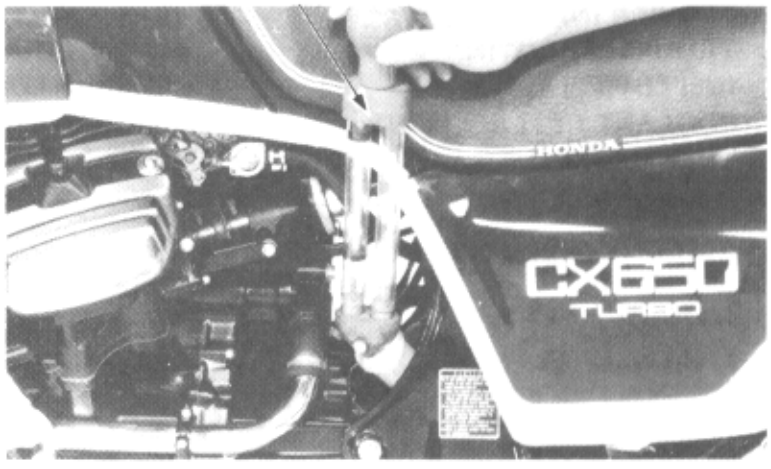
Coolant Leaks
- Faulty pump oil seal.
- Deteriorated O-rings.
- Radiator hose damaged.
- Loose or overtightened hose clamps.

INSPECTION

COOLANT

Test the coolant mixture with an anti-freeze tester. For minimum corrosion protection, a 50–50% solution of ethylene glycol and distilled water is recommended.

ANTI-FREEZE TESTER



RADIATOR CAP

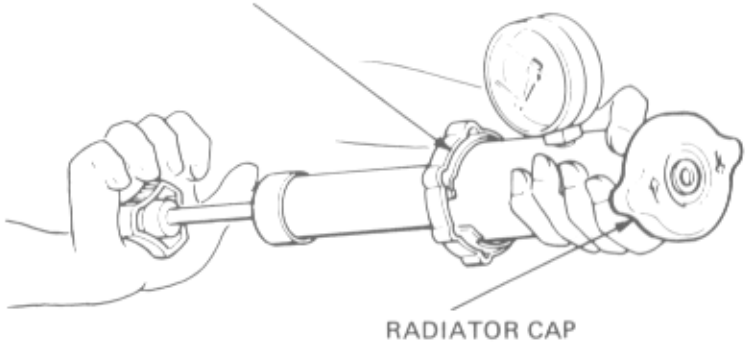
Pressure test the radiator cap. Replace the radiator cap if it does not hold pressure, or if relief pressure is too high or too low. It must hold specified pressure for at least six seconds.

NOTE

Before installing the cap on the tester, moisten the sealing surfaces.

RADIATOR CAP RELIEF PRESSURE:
75–105 kPa (0.75–1.05 kg/cm², 551–772 mmHg, 10.7–14.9 psi)

COOLING SYSTEM TESTER
(COMMERCIALLY AVAILABLE IN U.S.A.)



RADIATOR CAP

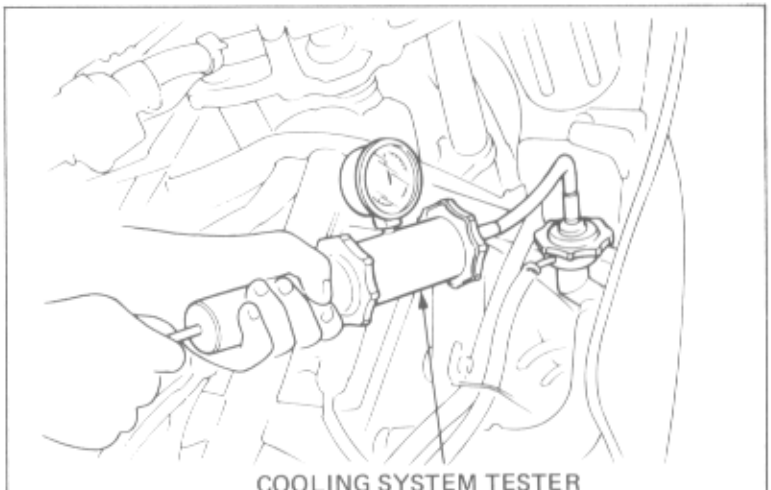
RADIATOR LEAKAGE TEST

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

CAUTION

Excessive pressure can damage the radiator. Do not exceed 105 kPa (1.05 kg/cm², 772 mmHg, 14.9 psi).

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



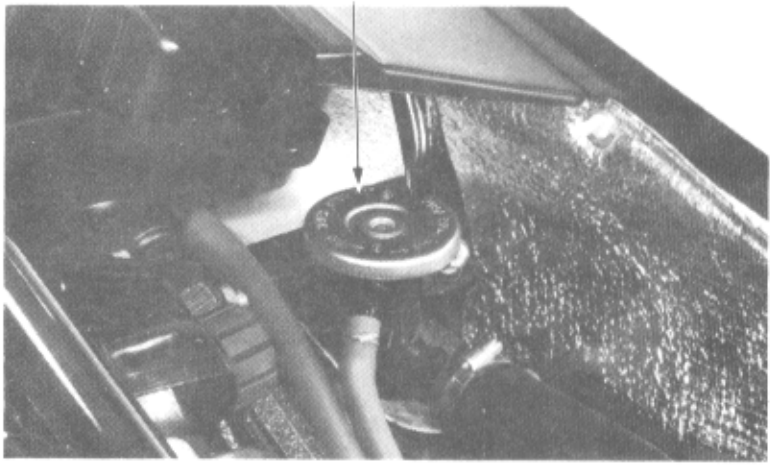
COOLING SYSTEM TESTER
(COMMERCIALLY AVAILABLE IN U.S.A.)

COOLANT REPLACEMENT

WARNING

The engine must be cool before servicing the cooling system, or severe scalding may result.

Remove the seat and fuel tank.
Remove the radiator cap.

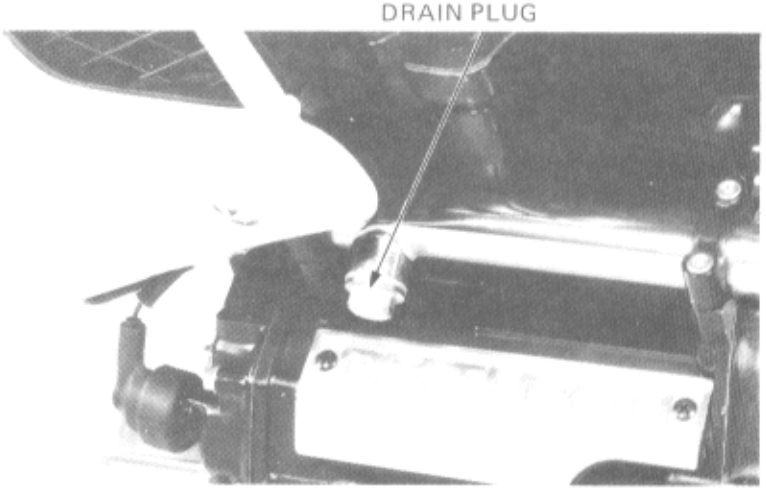


Remove the drain plug, and drain the coolant (about 1.5 liters, 1.6 US qt/1.3 Imp qt).

Replace the drain plug.

CAUTION

Do not overtighten the drain plug.



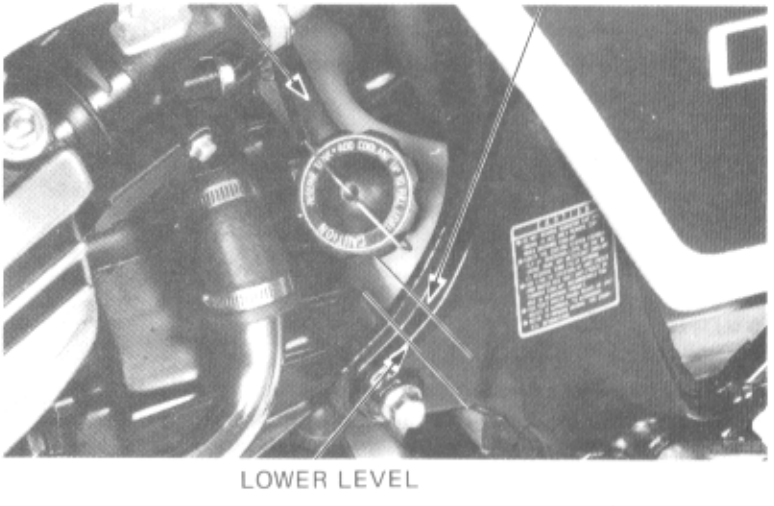
Fill the system with a 50–50 mixture of distilled water and ethylene glycol.

Start the engine with the radiator cap off and run until there are no air bubbles in the coolant and the coolant level stabilizes.

Stop the engine and add coolant up to the proper level, if necessary.

Reinstall the radiator cap.

Check the level of coolant in the reserve tank and fill to the correct level if the level is low, after the engine has cooled.



THERMOSTAT

REMOVAL

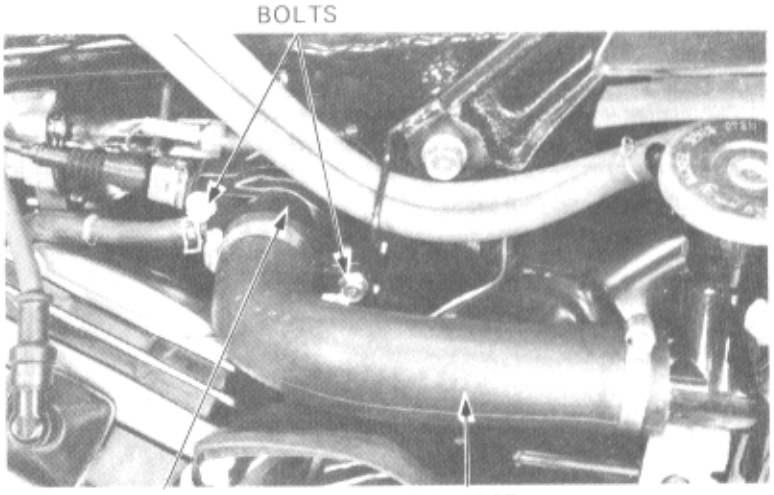
Remove the seat and fuel tank (Section 4).

Remove the fairing (Section 14).

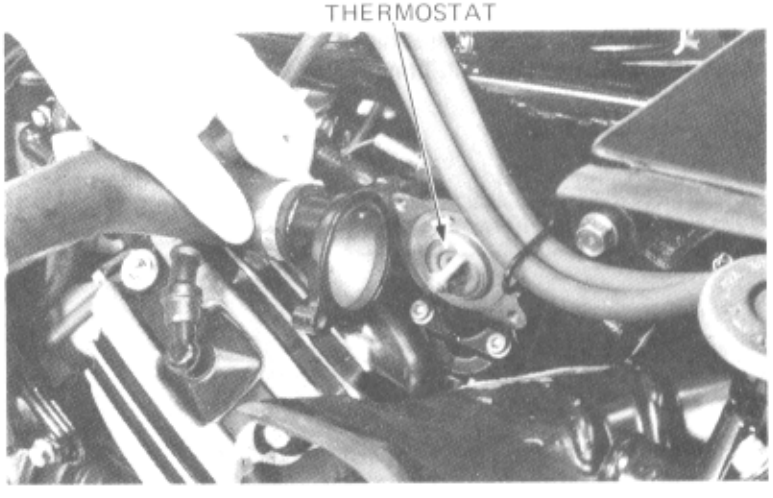
Drain the coolant (page 10-3).

Disconnect the water hose at the radiator.

Remove the two thermostat cover bolts and thermostat cover.



Remove the thermostat from the thermostat housing.



INSPECTION

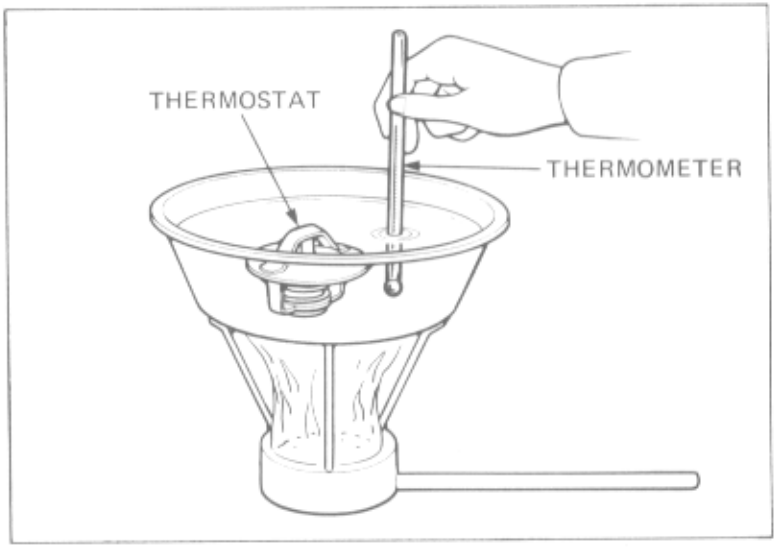
Visually inspect the thermostat for damage.
Suspend the thermostat in hot water to check its operation.
Do not let the thermostat or thermometer touch the pan or false readings will result.

Technical Data

Starts to open	80° to 84°C (176° – 183°F)
Full open	95°C (203°F)
Valve lift	8 mm (0.31 in) minimum

NOTE

- Replace the thermostat if the valve stays open at room temperature, or if it responds at temperatures other than those specified.
- Valve lift must be checked by applying heat for five minutes.



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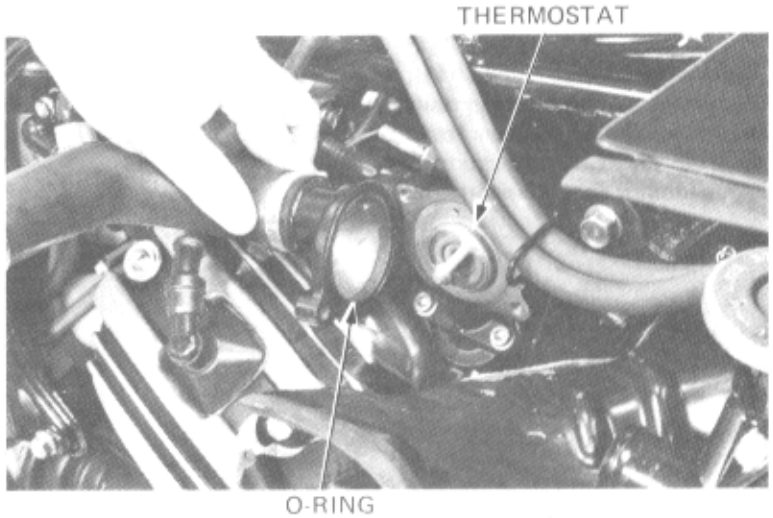
INSTALLATION

Insert the thermostat into the thermostat housing. Install a new O-ring on the thermostat housing and attach the thermostat cover.

NOTE

- Check that the O-rings are not dislodged.
- Make sure that the thermostat is installed in the correct direction.

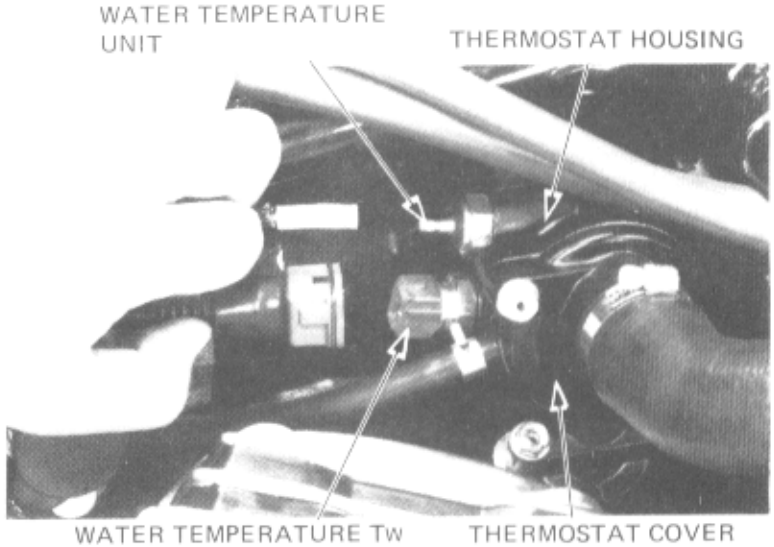
Fill the cooling system with coolant and bleed air from system (page 10-3).
Install the removed parts in reverse order of removal.



WATER TEMPERATURE UNIT

Disconnect the water temperature unit from the thermostat case. Plug the hole, after removing the water temperature unit.

Remove the water temperature sensor, if necessary. See Section 24 for inspection of the Tw sensor.



INSPECTION

Suspend the unit in oil and measure the resistance through the unit as the oil heats up.

Temperature	60°C	85°C	110°C	120°C
	140°F	185°F	230°F	248°F
Resistance	104.0Ω	43.9Ω	20.3Ω	16.1Ω

Do not let the unit or thermometer touch the pan or false readings will result.

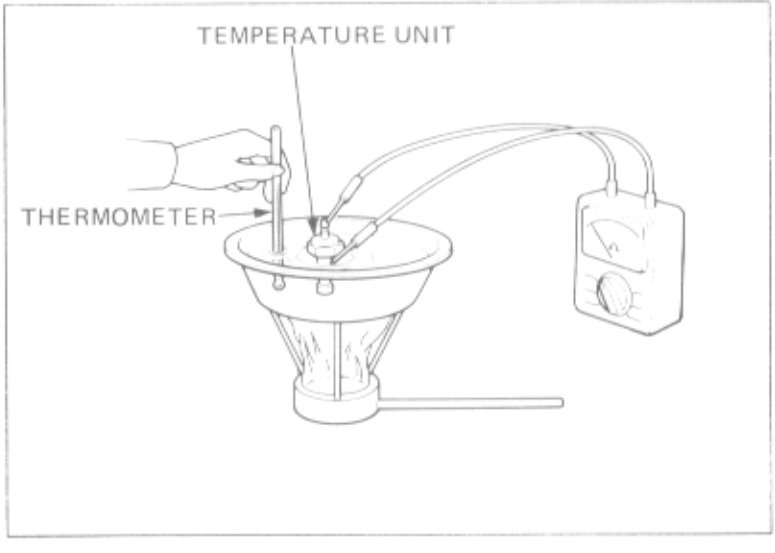
WARNING

Wear gloves and eye protection.

NOTE

Oil must be used as the heated liquid to check operation above 100°C (212°F).

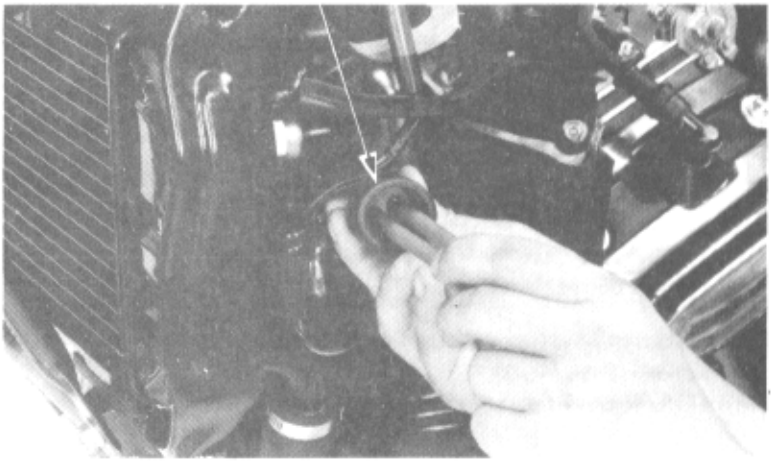
Temperature gauge inspection (Section 22).



COOLING FAN INSPECTION

Remove the fairing (Section 14).
Disconnect the thermostatic switch coupler.
Short the switch coupler terminals using a jump wire with the ignition switch turned ON.
The fan motor should operate smoothly.

THERMOSTATIC SWITCH COUPLER

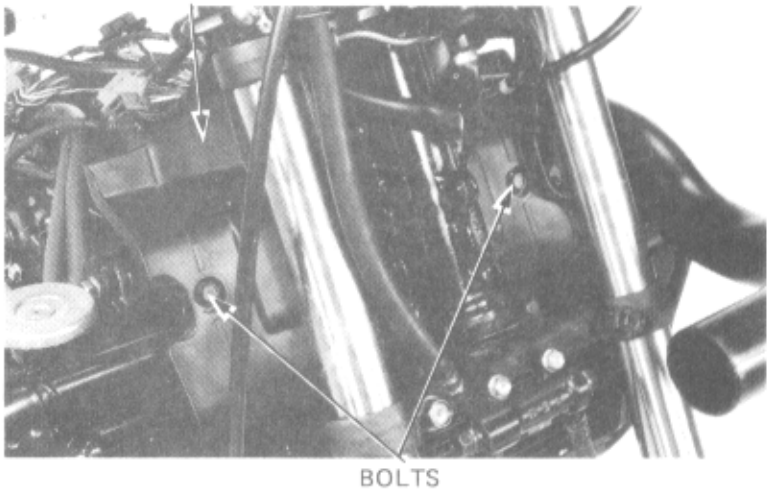


RADIATOR

REMOVAL

Remove the fairing bracket (Section 14).
Drain the coolant from the radiator.
Remove the radiator upper cover.

RADIATOR UPPER COVER



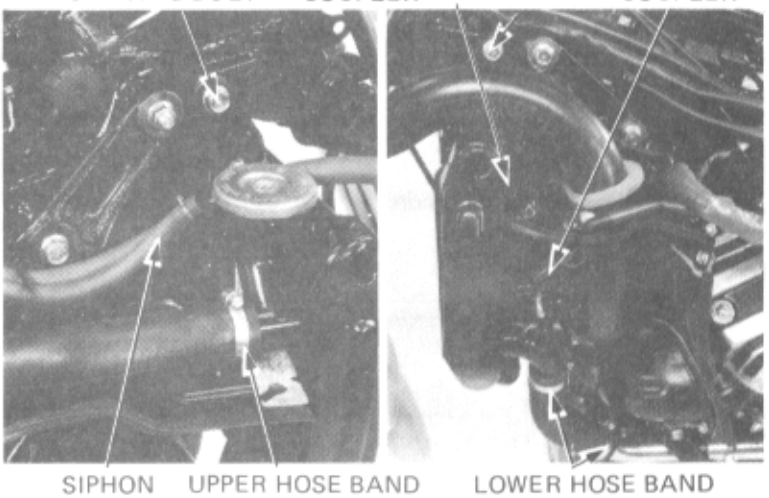
BOLTS

Loosen the upper and lower radiator hose bands.
Remove the right and left upper mounting bolts.
Disconnect the thermostatic switch and fan motor switch couplers.
Disconnect the siphon tube from the radiator.

MOUNTING BOLT

THERMOSTATIC SWITCH COUPLER

FAN MOTOR COUPLER



SIPHON TUBE

UPPER HOSE BAND

LOWER HOSE BAND

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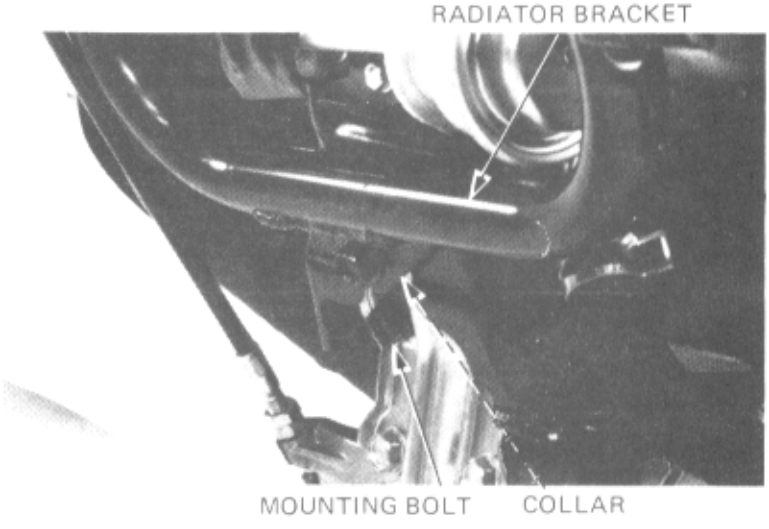
Remove the lower mounting bolt and collar and pull the radiator out. Disconnect the radiator hoses from the radiator.

CAUTION

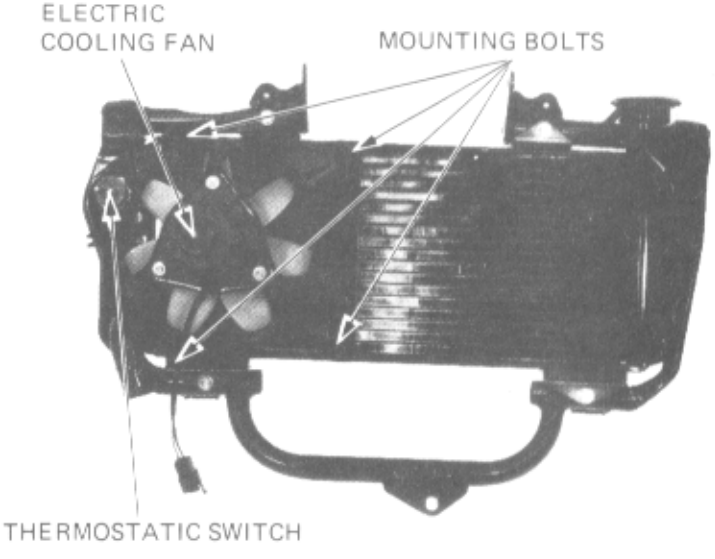
Do not damage the radiator fins.



DISASSEMBLY

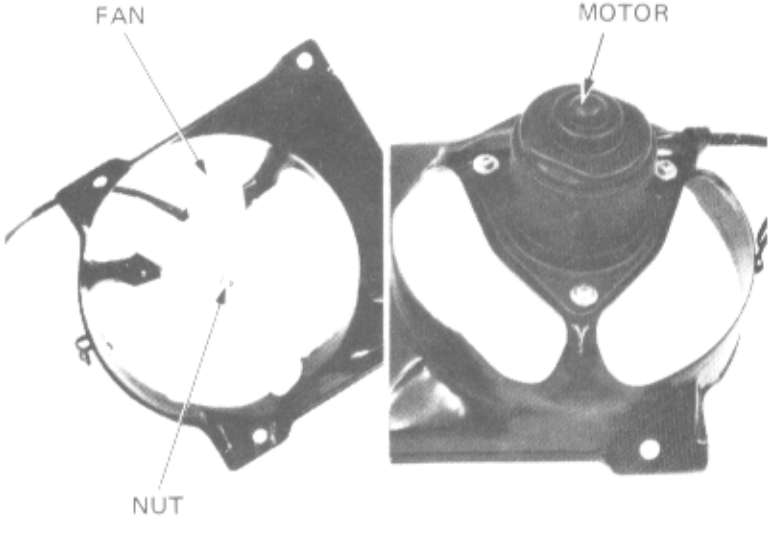
Remove the fan and motor mounting bolts and the fan and motor.

Remove the thermostatic switch using the special tool Socket Wrench 17 x 27 mm 07907–MC70000 or 07907–4150000 or commercial equipment in U.S.A.



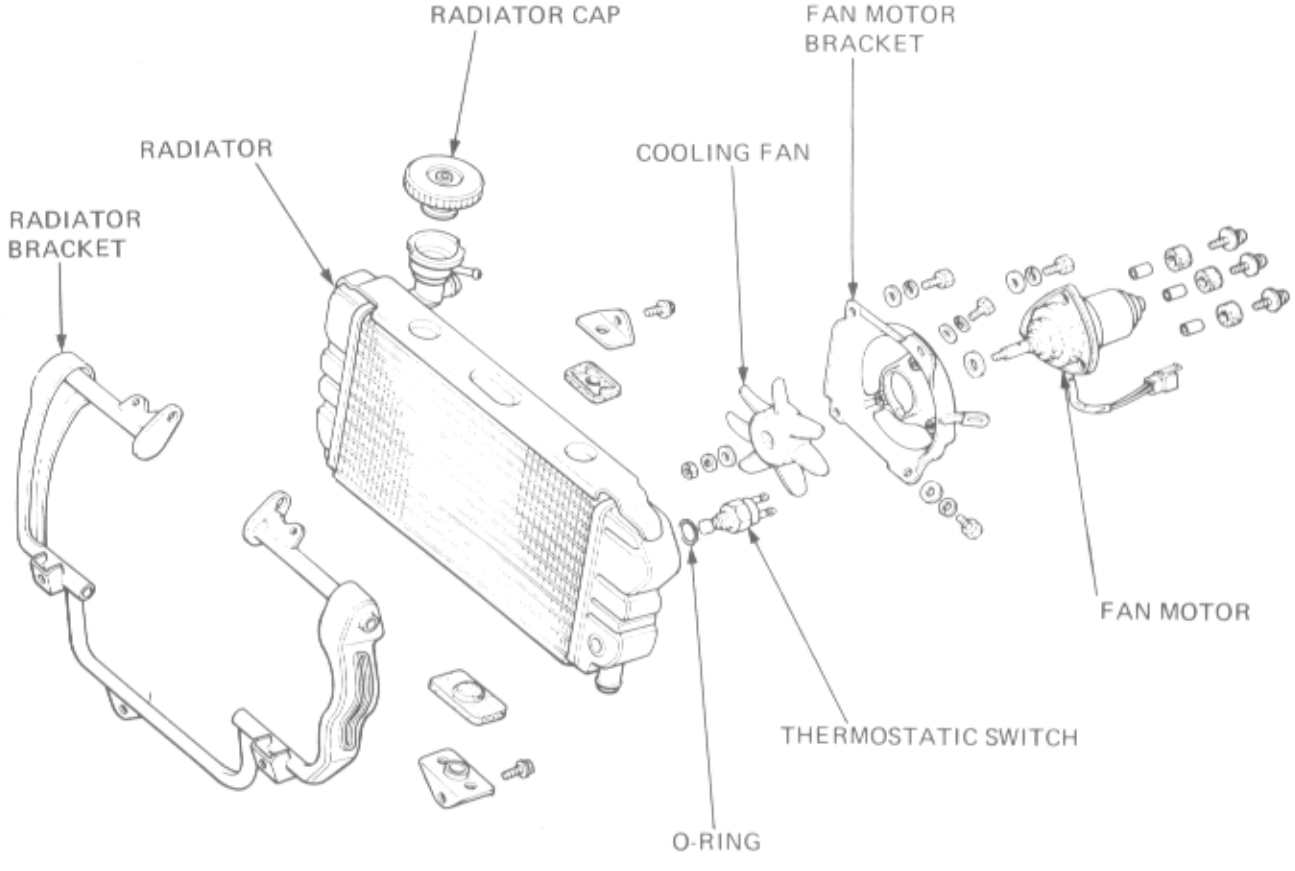
Remove the fan from the motor by removing the nut and the washers.

Remove the three mounting screws and remove the fan motor from the fan shroud.



ASSEMBLY

Assemble the radiator in the reverse order of disassembly.

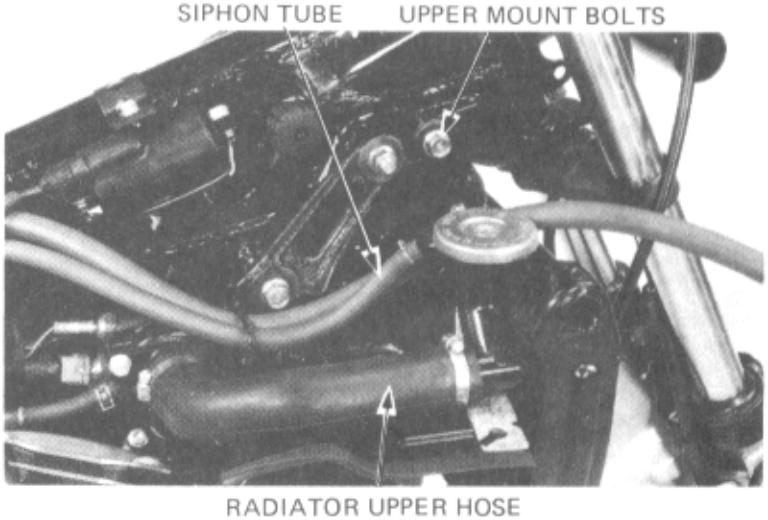


INSTALLATION

Connect the radiator upper hose to the radiator and connect the siphon tube.

Connect the radiator lower hose to the water pipe.

Install the radiator upper mount bolts.



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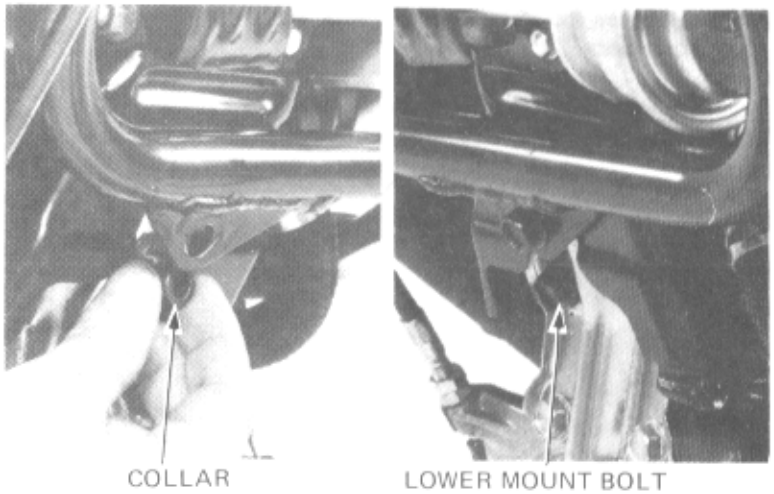
Install the radiator lower mount with the collar and 8 mm bolts.

Tighten the upper and lower mount bolts.

TORQUE: 20–30 N·m
(2.0–3.0 kg-m, 14–22 ft-lb)

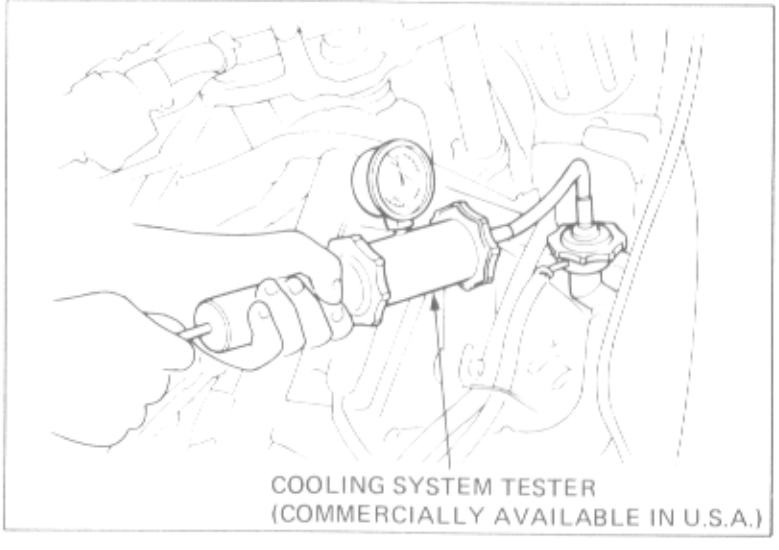
Connect the clutch cable and adjust clutch lever free play.



Tighten the hose bands securely.
Check the radiator for leakage (page 10-2).

Fill the system with coolant and bleed air from the radiator (page 10-3).

Install the removed parts.

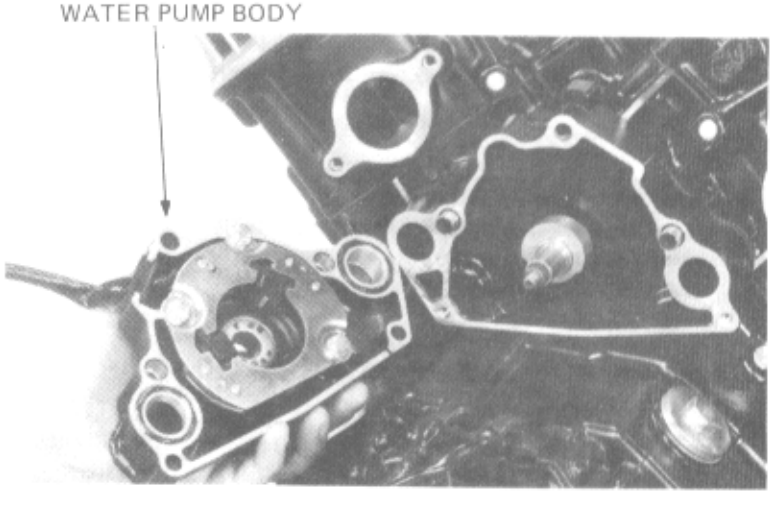


WATER PUMP

Refer to page 9-2 for water pump removal.
Refer to pages 9-12 and 9-13 for water pump installation.

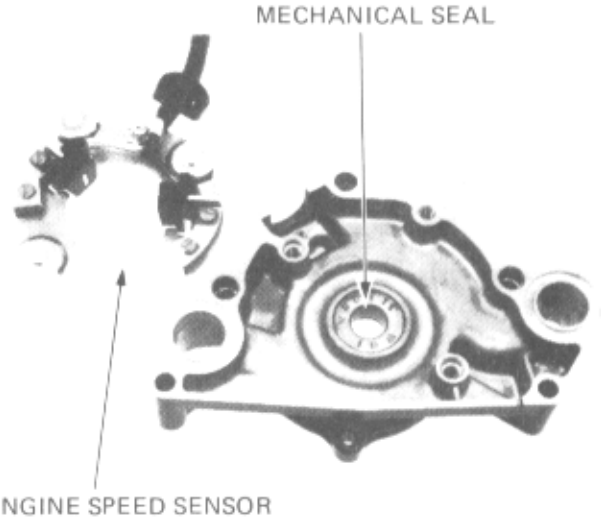
MECHANICAL SEAL REPLACEMENT

Remove the water pump body.



Remove the engine speed sensor's base from the water pump body.

Drive the mechanical seal out from the inside being careful not to damage the water pump body.

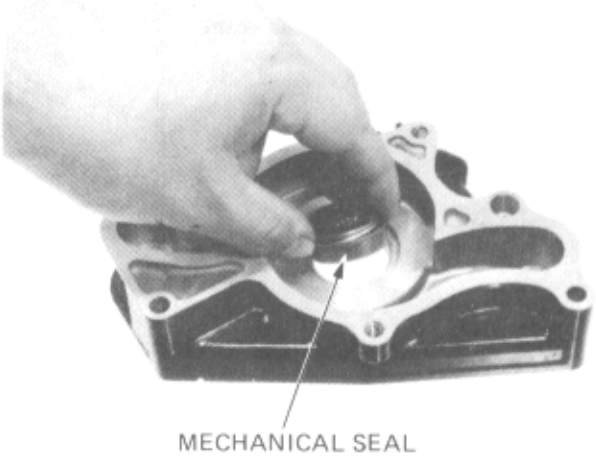


INSTALLATION

Apply a thin coat of liquid sealant to the outer-edge of the new mechanical seal.

NOTE

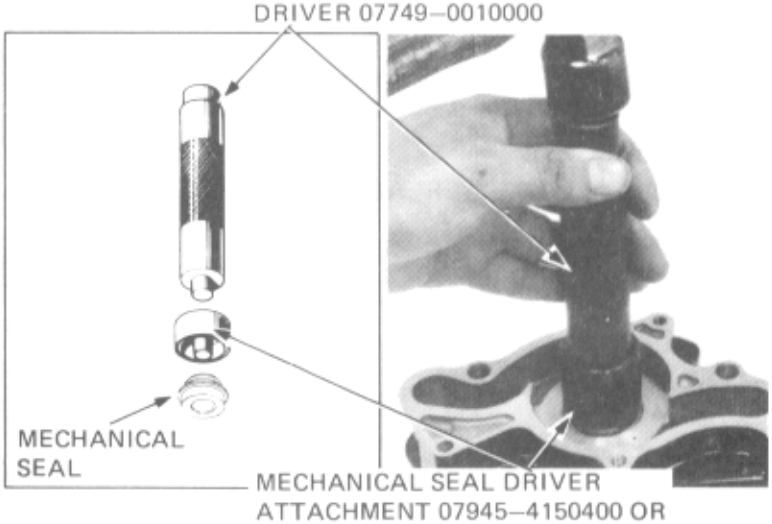
- Check that the water pump drain hole is clear.
- Refer to page 10-11 for installation instructions using the tool available only in the U.S.A.



Drive the mechanical seal into position in the water pump body with the mechanical seal driver attachment and driver.

NOTE

- Assemble the driver as follows:
  Install the seal driver attachment onto the driver. Place the mechanical seal into the attachment and hold it in place.
- Drive in the seal squarely.
- To install the mechanical seal using the special tool available in the U.S.A., refer to page 10-11.



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(U.S.A. ONLY)

To install the mechanical seal using tool GN-AH-065-415 (U.S.A. ONLY):
Remove the oil seal from the rear cover.

Slide the mechanical seal onto the bolt and into the installer cup of the special tool.

Apply a thin coat of sealant to the outer surface of the metal casing of the seal.

NOTE

Some mechanical seals may be precoated with sealant from the factory.

Position the seal and tool in the rear cover.

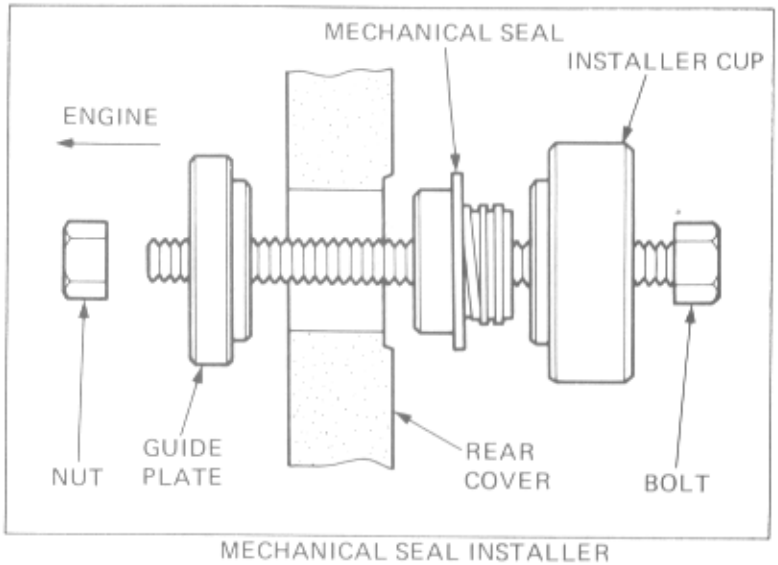
Install the guide plate and nut onto the bolt from the back side of the cover. Torque the nut to 42.6–44.8 N·m (370–389 lb-in) (30.8–32.4 lb-ft).

Remove the tool and inspect the installation.

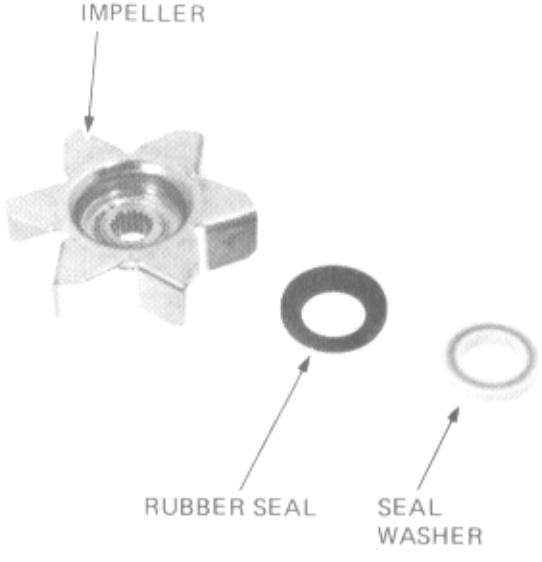
NOTE

Replace the rubber seal and seal washer with new ones whenever the mechanical seal is replaced.

Apply soapy water to the sliding surfaces of the seals before installation.



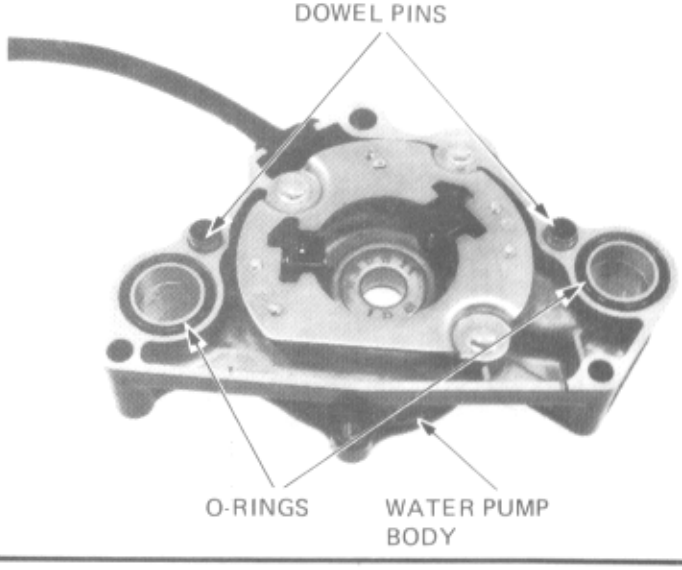
MECHANICAL SEAL INSTALLER
GN-AH-065-415

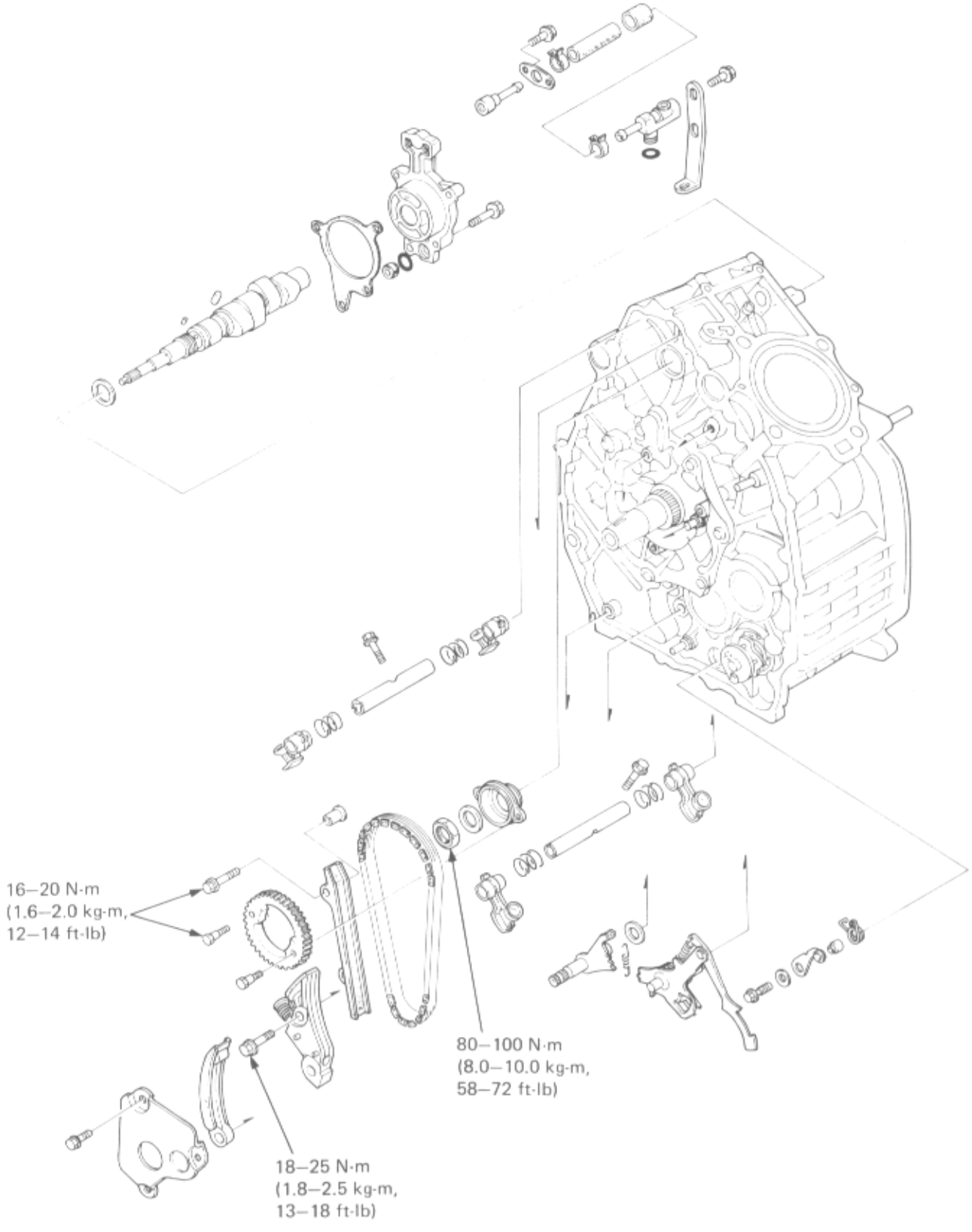


Install the engine speed sensor's base on the water pump body.

Install the dowel pins and O-rings on the water pump body.

Install the water pump onto the rear cover (page 9-12).





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11. CAMSHAFT/CAM CHAIN

SERVICE INFORMATION

GENERAL

- Camshaft lubricating oil is fed from the oil filter to the front bearing through an oil control orifice located in the engine case, and to the rear bearing through an oil control orifice in the camshaft rear holder.
- Be sure these orifices are not clogged and that the O-rings and dowel pins are in place before assembling the engine.
- Before assembling the camshaft, lubricate the bearings with engine oil and pour 100 cc of engine oil into the engine case oil pockets to provide initial lubrication.

SPECIFICATIONS

Unit: mm (in)

Item			Standard	Service Limit
Camshaft	Cam height	IN	37.284 (1.4679)	37.16 (1.463)
		EX	36.735 (1.4463)	36.63 (1.442)
	Journal O.D.	Front	21.959–21.980 (0.8645–0.8654)	21.91 (0.862)
		Rear	25.959–25.980 (1.0220–1.0228)	25.91 (1.020)
Camshaft holder I.D.			22.000–22.021 (0.8661–0.8670)	22.05 (0.868)
Camshaft bearing I.D.			26.000–26.021 (1.0236–1.0244)	26.17 (1.030)
Rocker arms and shafts	Arm I.D.		14.000–14.011 (0.5512–0.5516)	14.03 (0.552)
	Shaft O.D.		13.966–13.984 (0.5498–0.5506)	13.95 (0.549)

TORQUE VALUES

Camshaft lock nut	80–100 N·m (8.0–10.0 kg-m, 58–72 ft-lb)
Cam sprocket bolt	16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)
Cam chain tensioner set bolt	18–25 N·m (1.8–2.5 kg-m, 13–18 ft-lb)

TOOLS

Special

Gear holder	07924–MC70002 or modified	07924–MC70000 07924–MC70001 07924–4150000	See page 9-5
Lock nut socket wrench, 17 x 27 mm	07907–MC70000 or equivalent in U.S.A.		

TROUBLESHOOTING

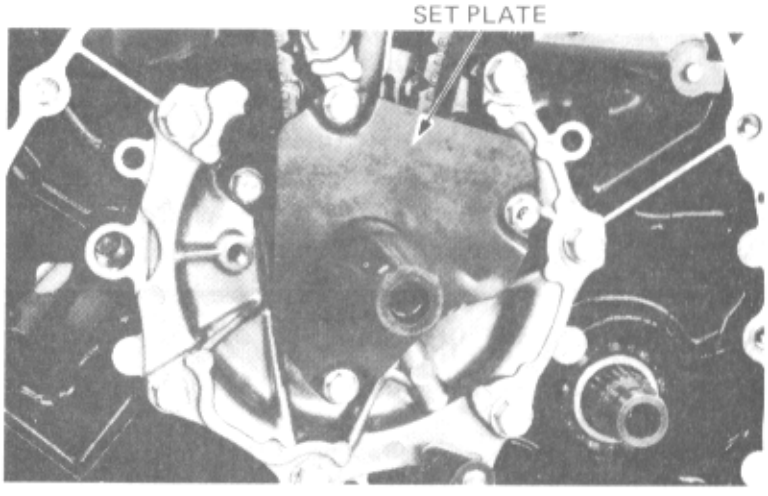
Excessive Noise

- Incorrect valve adjustment.
- Worn or damaged rocker arms or camshaft.
- Worn or damaged cam chain tensioner or cam chain guide.
- Worn cam sprocket teeth.
- Worn camshaft holder.

CAM CHAIN REMOVAL

Remove the following:
- fairing assembly (Section 14).
- engine (Section 5).
- engine rear cover (Section 9).
- starter reduction gear, flywheel and starter drive gear (Section 9).

Remove the chain guide set plate bolts.
Remove the chain guide set plate.



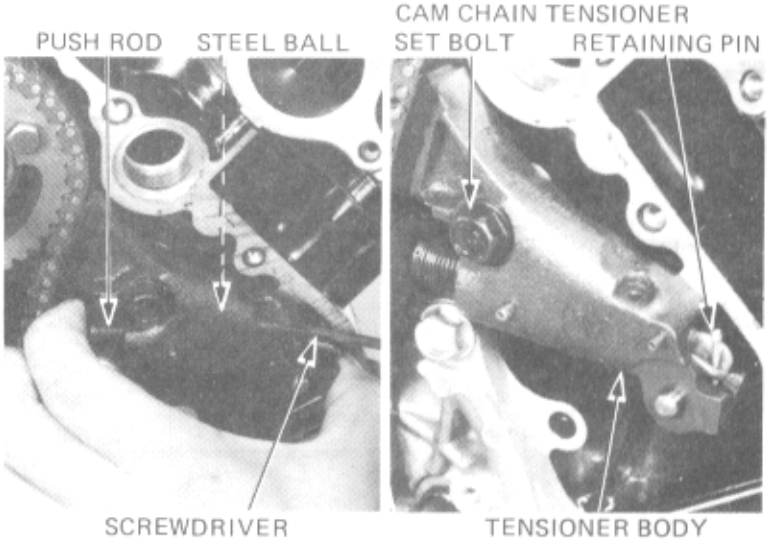
Remove the cam chain tensioner set bolt.
Remove the cam chain tensioner by compressing the push rod while pressing in the steel ball with a flat-end screwdriver as shown.

Hold the push rod by inserting the retaining pin through the push rod to the tensioner base.

Remove the cam chain tensioner set bolt and tensioner.

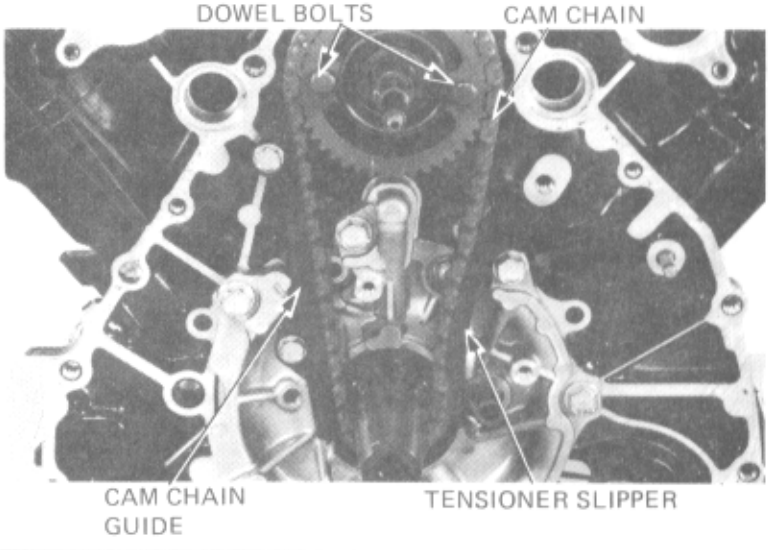
CAUTION

The set bolt has a special thread pitch. Do not use any other bolt in its place.



Remove the cam chain guide and tensioner slipper.

Remove the cam sprocket dowel bolts, cam sprocket and cam chain.



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CAMSHAFT REMOVAL

Remove the cylinder heads (Section 7).
Temporarily install the cam sprocket. Hold the cam sprocket with a Gear Holder 07924–MC70002 to prevent it from turning.

NOTE

See page 9-5 for gear holder modification details.

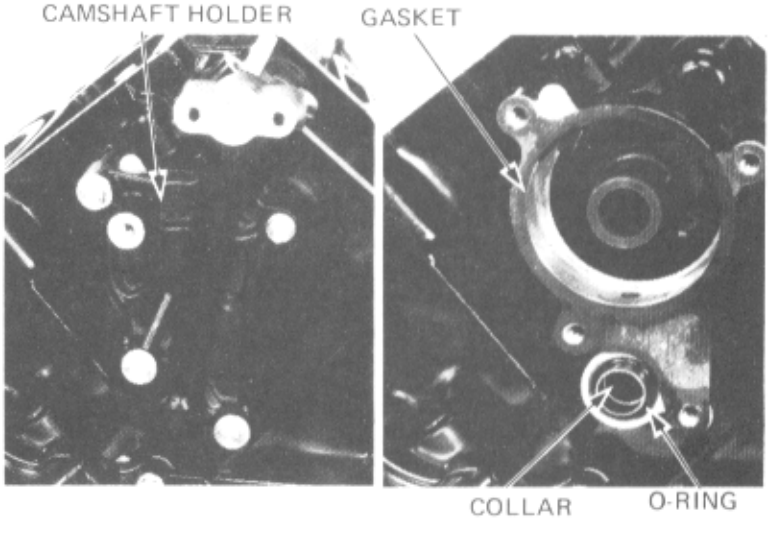
Loosen the lock nut and remove the cam sprocket and cam sprocket boss.

Remove the camshaft holder from the engine case.

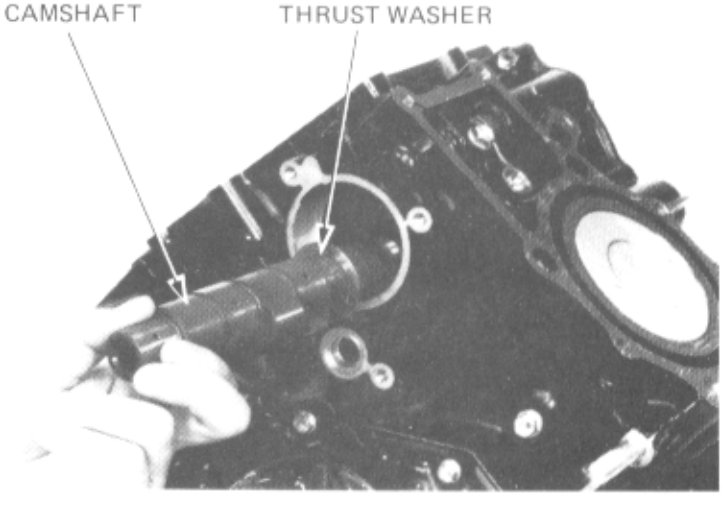
Remove the dowel pin, O-ring and gasket from the engine case.

NOTE

A 15 mm dowel pin and O-ring are used at the rear side of the camshaft holder.



Remove the camshaft with the thrust washer from the front.

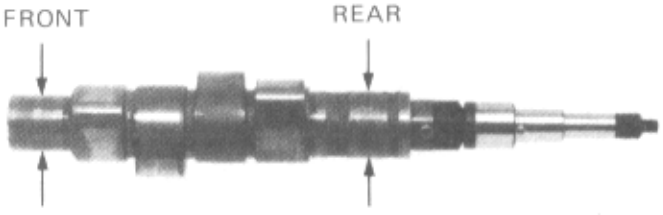


INSPECTION

- CAMSHAFT

Measure the O.D. of each camshaft bearing journal.

SERVICE LIMITS:
FRONT: 21.91 mm (0.862 in)
REAR: 25.91 mm (1.020 in)



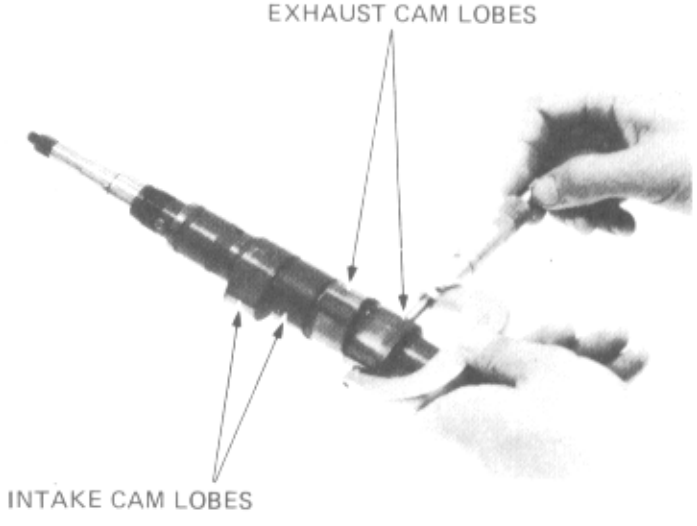
Calculate the journal and bearing clearance.

SERVICE LIMIT: 0.26 mm (0.010 in)

Inspect the worm gear for wear or damage.

Inspect the lobes for wear or damage.
Measure the height of each cam lobe.

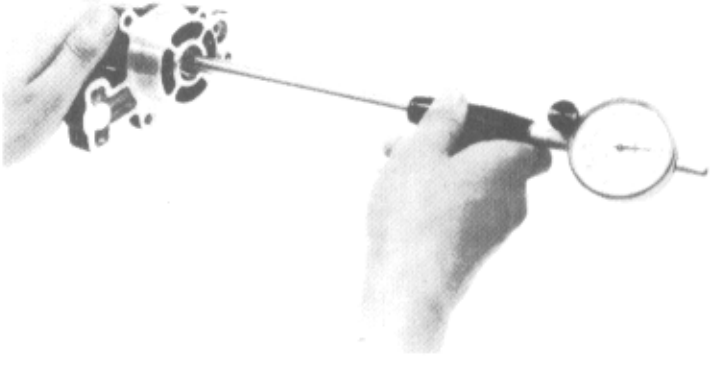
SERVICE LIMITS:
IN: 37.16 mm (1.463 in)
EX: 36.63 mm (1.442 in)



- CAMSHAFT HOLDER

Measure the camshaft holder I.D. as shown.

SERVICE LIMIT: 22.05 mm (0.868 in)



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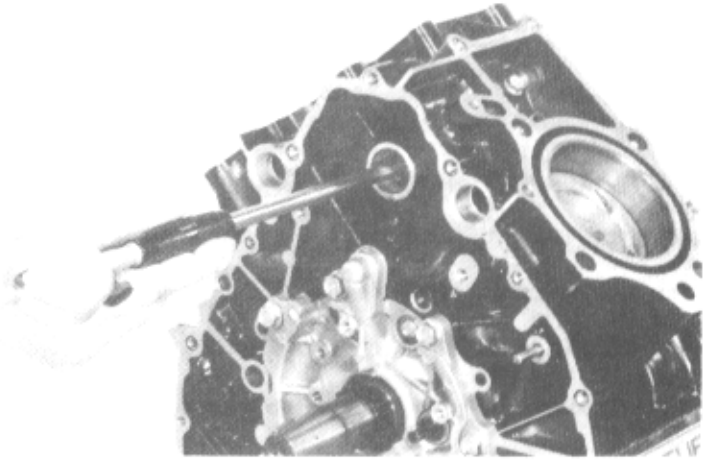
- CAMSHAFT BEARING

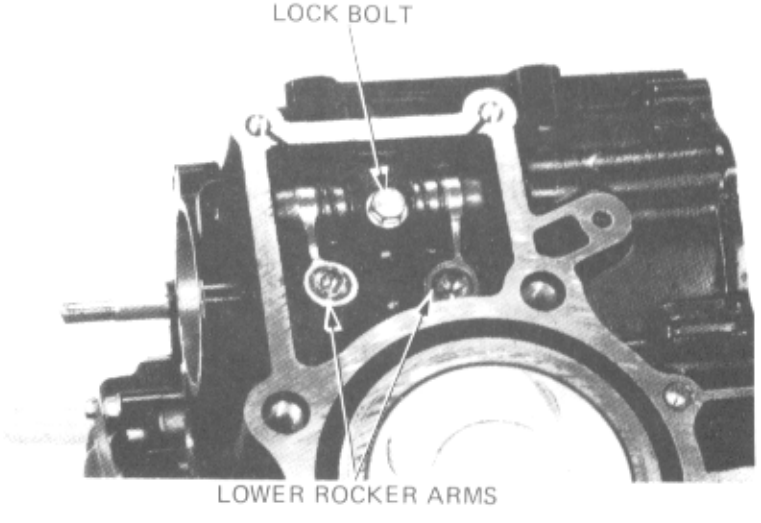
Measure the bearing I.D.

SERVICE LIMIT: 26.17 mm (1.030 in)

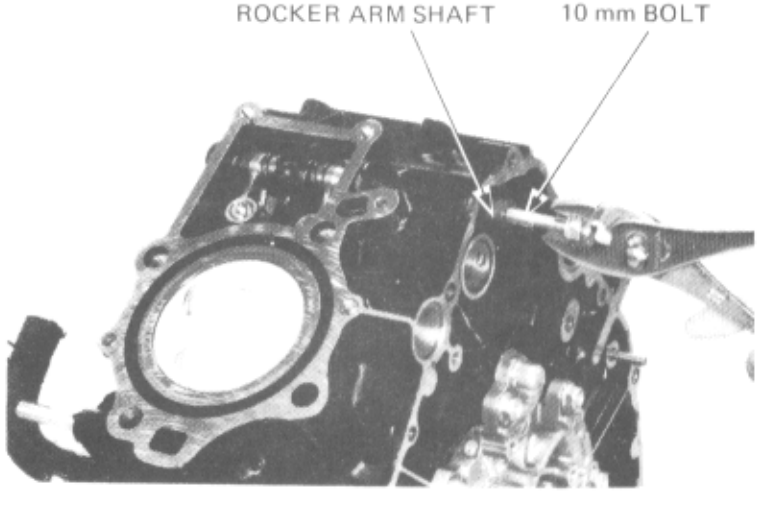


ROCKER ARM REMOVAL/INSTALLATION

Remove the rocker arm shaft lock bolts.



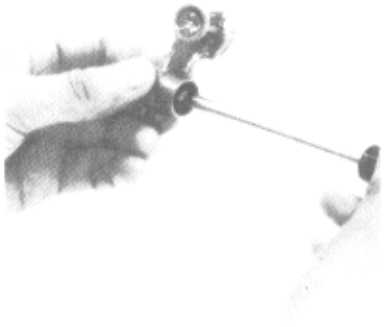
Screw a 10 mm bolt into each rocker arm shaft and remove the rocker arm shafts by pulling on the bolt. Remove the rocker arms and thrust springs.



ROCKER ARM INSPECTION

Inspect the rocker arms for wear or damage to the camshaft contact surfaces, or clogged oil holes. Measure the I.D. of each rocker arm.

SERVICE LIMIT: 14.03 mm (0.552 in)



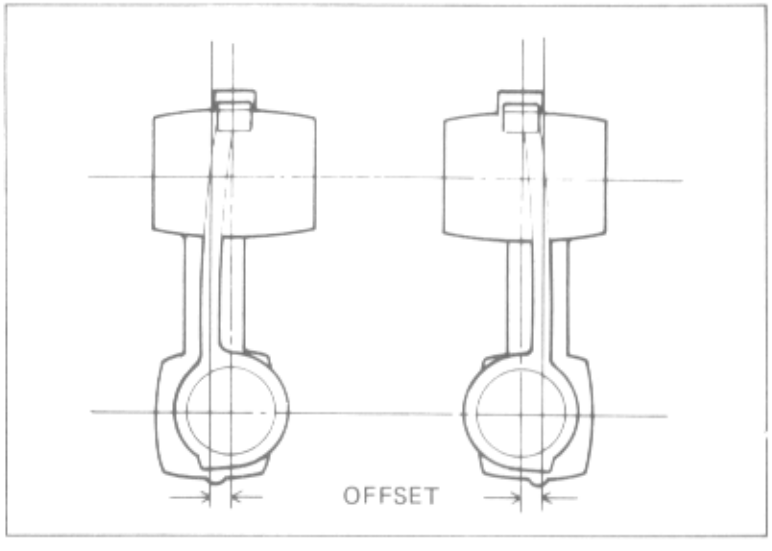
ROCKER ARM SHAFT INSPECTION

Measure each rocker arm shaft O.D.

SERVICE LIMIT: 13.95 mm (0.549 in)

Inspect each rocker arm shaft for wear or damage.

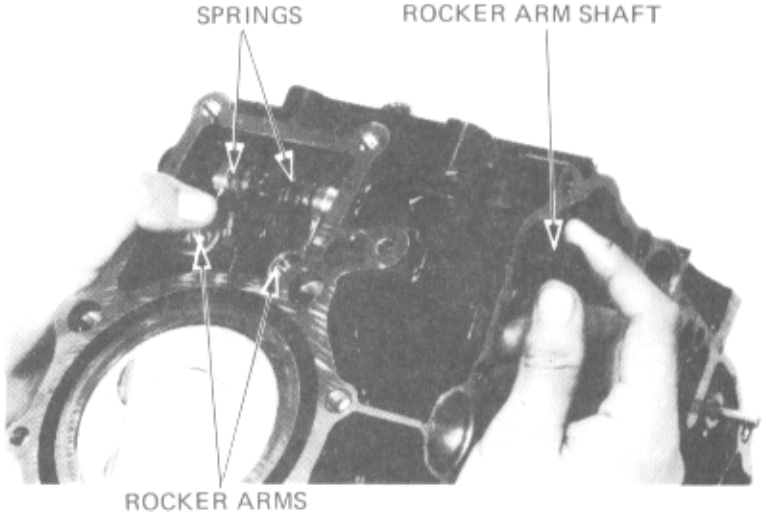
Install the rocker arms with the offset toward the inside and facing each other as shown.



Install the rocker arms and thrust springs in the engine case, and then insert the rocker arm shafts.

NOTE

- Lubricate the rocker arm shafts with engine oil before installation.
- Install each rocker arm shaft with the threaded end facing the rear (cam sprocket side).
- Install the thrust springs on the insides of the rocker arms.



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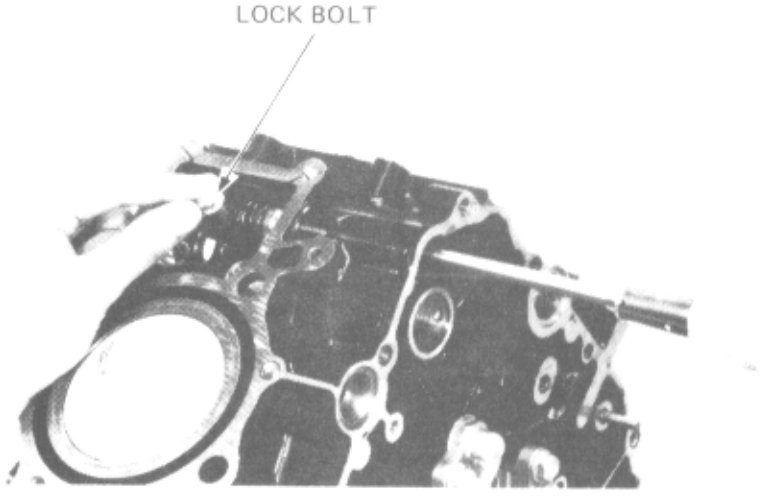
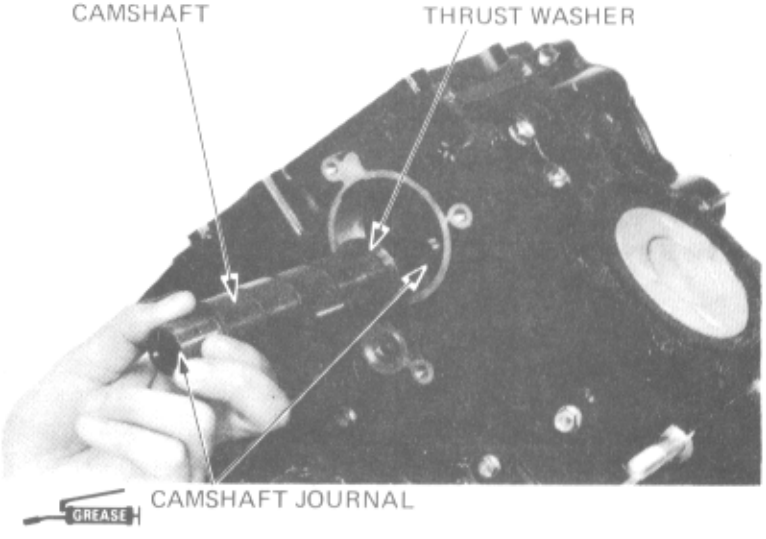
Rotate the rocker arm shaft with a screwdriver to align with the lock bolt hole. Install the lock bolt.



CAMSHAFT INSTALLATION

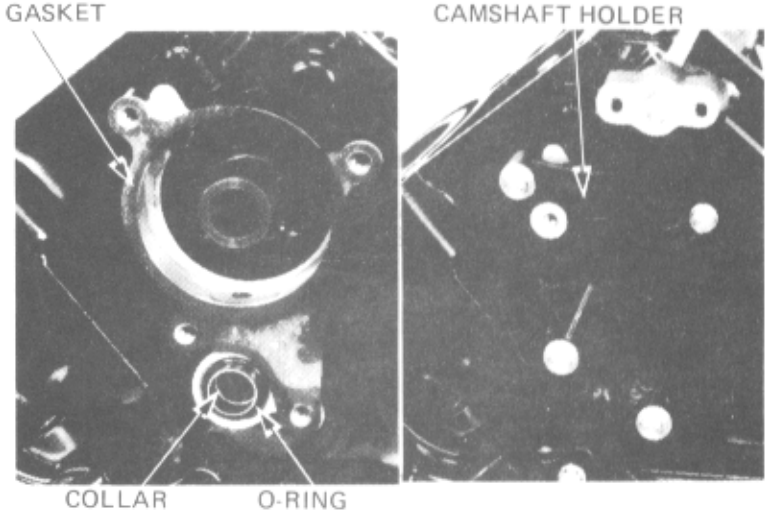
Lubricate the camshaft journals with Multipurpose NLGI No. 2 Grease (MoS2 additive).

Install the camshaft thrust washer on the camshaft and insert the camshaft from the front.



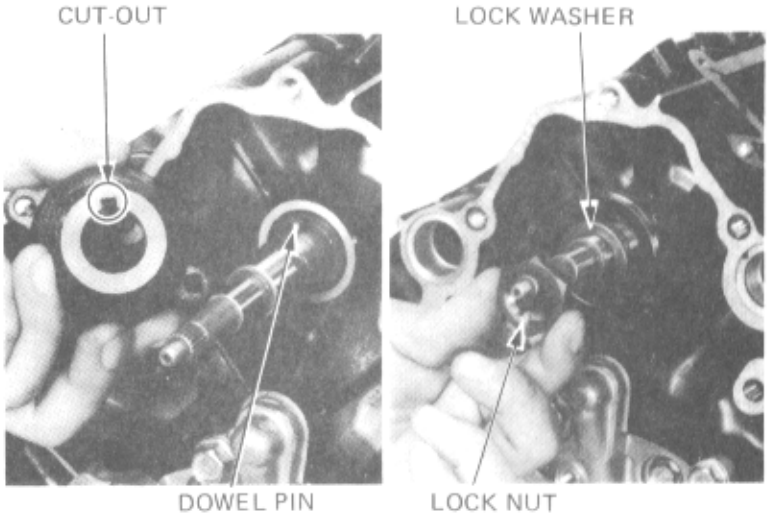
Install the camshaft holder gasket, O-ring, and collar.

Install the camshaft holder.



Install the cam sprocket boss, aligning the cut-out with the camshaft dowel pin.

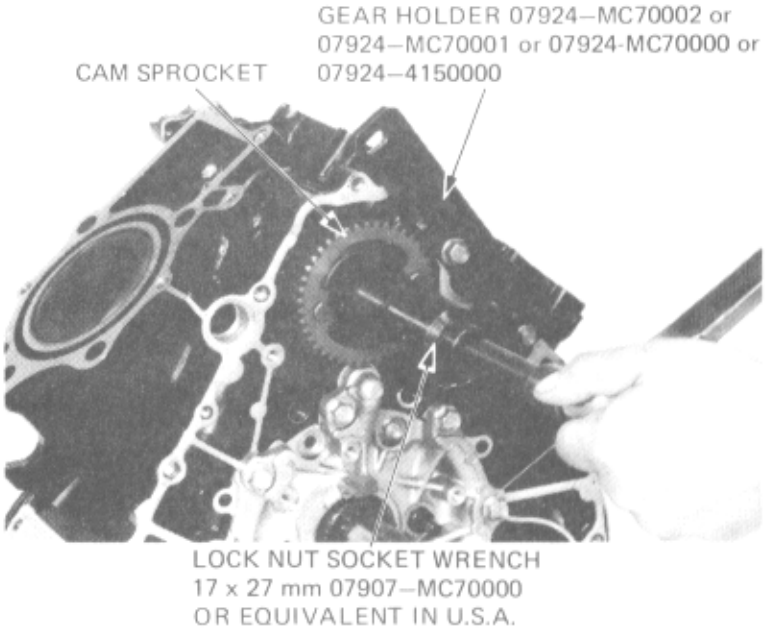
Install the lock nut and lock washer with the mark "OUTSIDE" facing out and tighten the lock nut temporarily.



Install the cam sprocket and hand tighten the bolts. Hold the cam sprocket with the Gear Holder and tighten the lock nut.

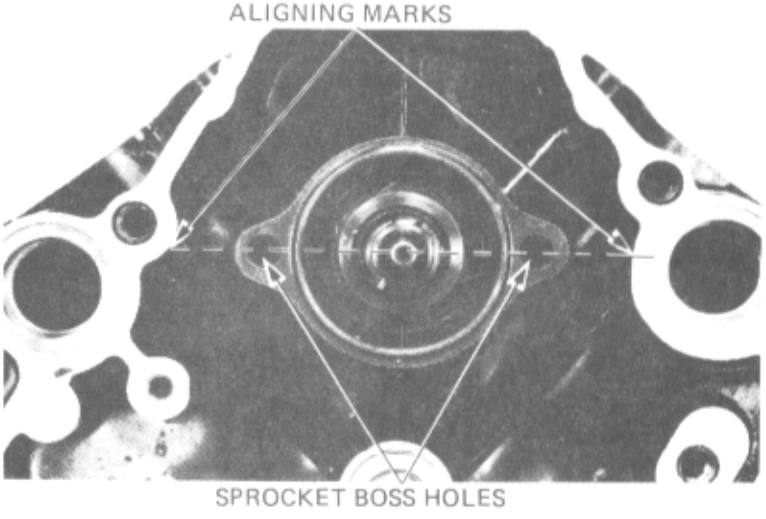
TORQUE: 80–100 N·m
(8.0–10.0 kg-m, 58–72 ft-lb)

Remove the cam sprocket.



VALVE TIMING ADJUSTMENT

Align the holes in the cam sprocket boss with the aligning marks on the engine case.



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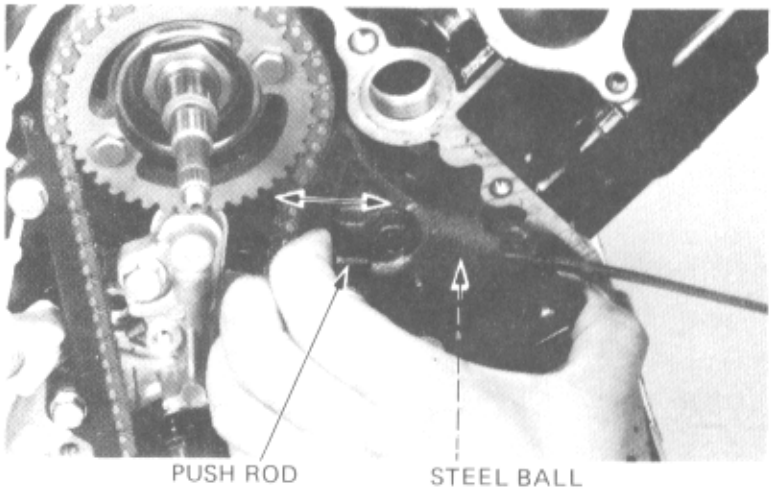
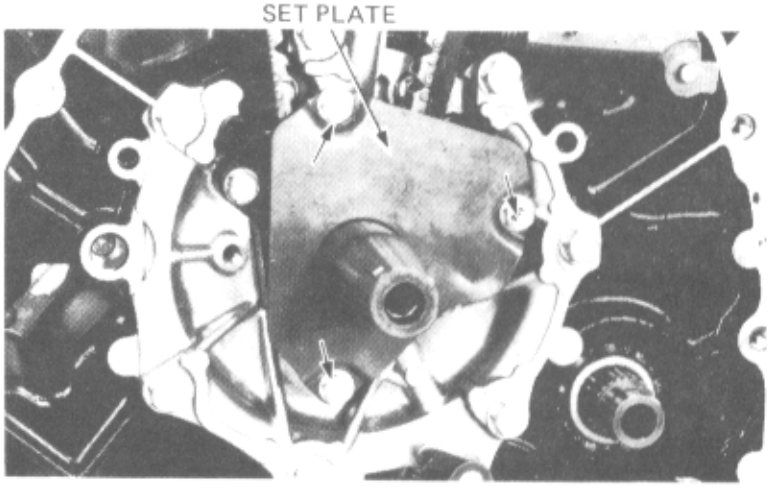
Make sure that the push rod moves smoothly by pressing the steel ball in.



Install the set plate
Torque the 6 mm bolts.

TORQUE: 8–12 N·m
(0.8–1.2 kg-m, 6–9 ft-lb)



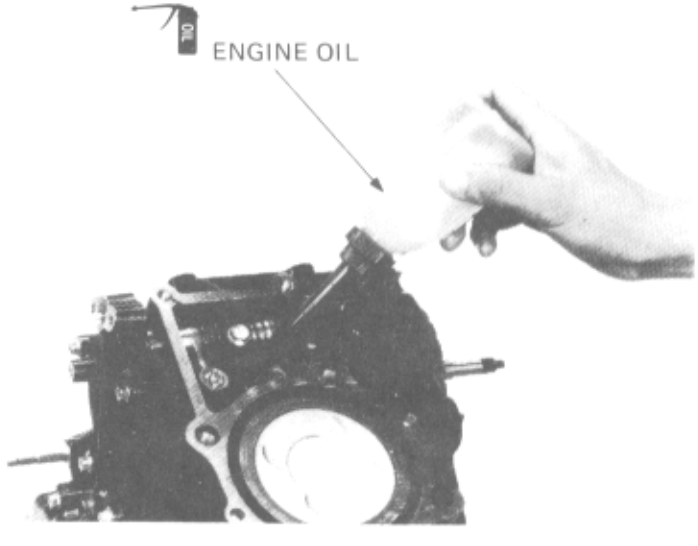
Pour about 100 cc of engine oil into the oil pockets of the engine block.

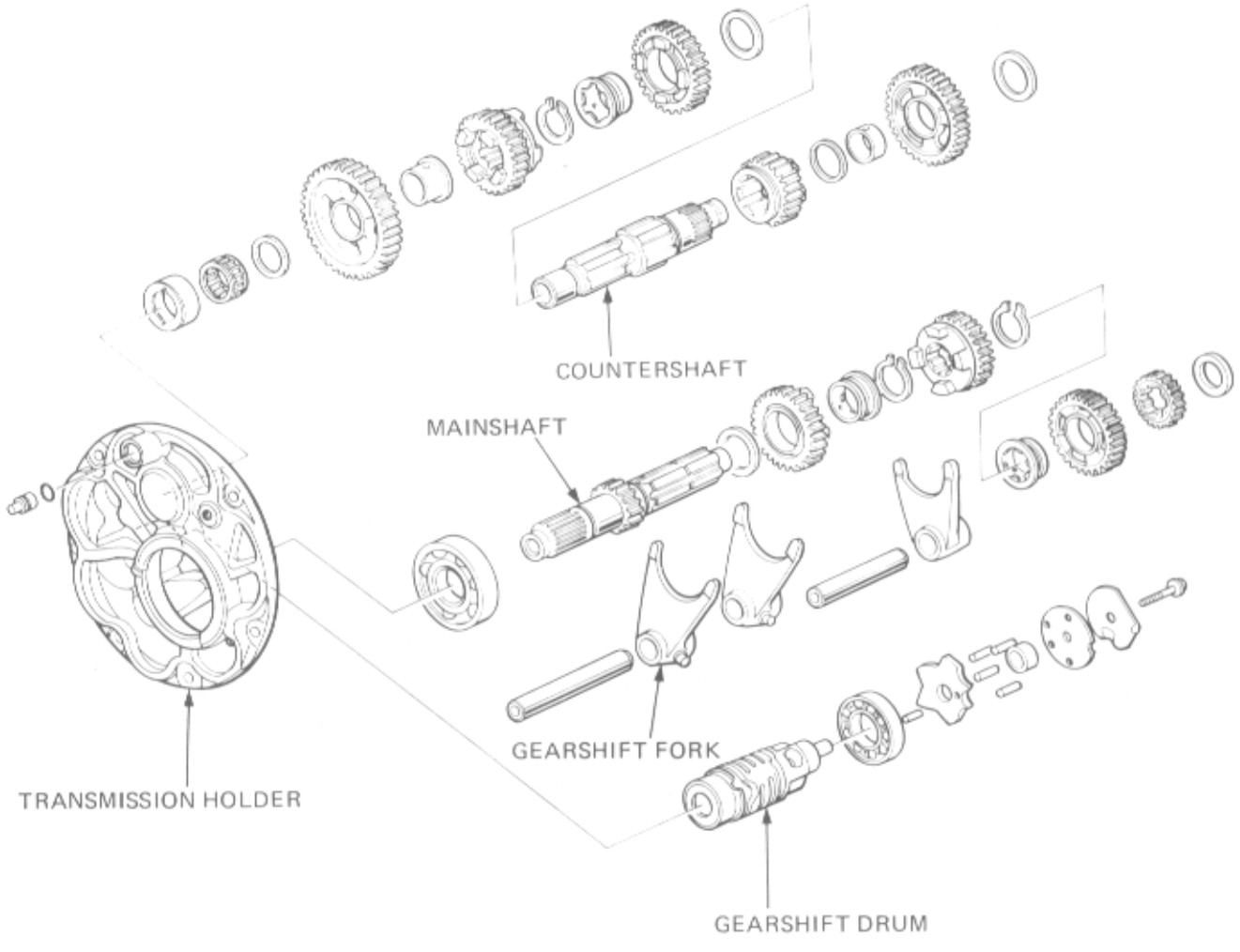
Install the flywheel (Section 9) and the cylinder heads (Section 7).

Adjust the valve clearance (Section 3).

Install the engine (Section 5).

Add the specified amount of engine oil (Section 2).





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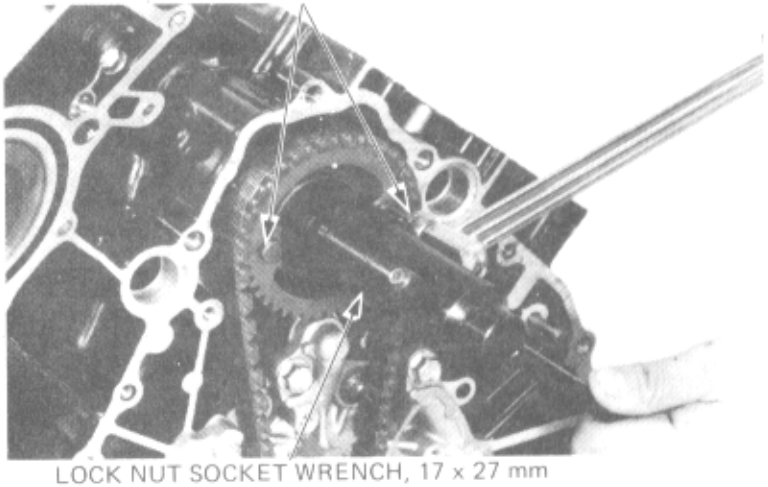
Hold the camshaft with the Lock Nut Socket Wrench and torque the cam sprocket bolts.

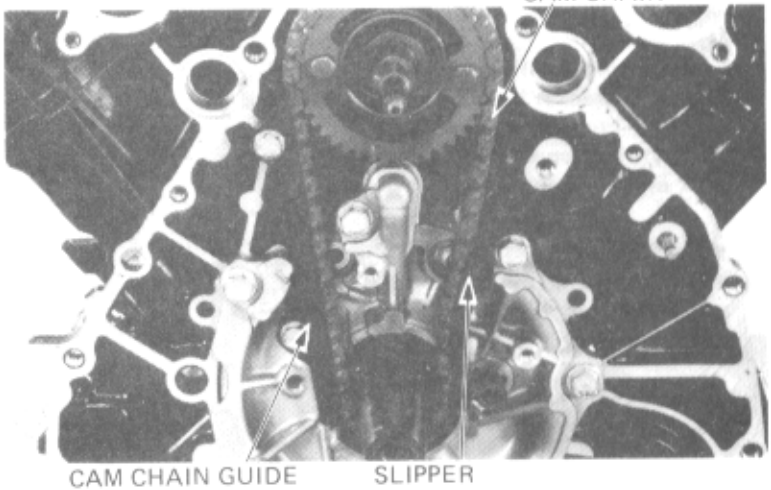
TORQUE: 16–20 N·m
(1.6–2.0 kg-m, 12–14 ft-lb)



LOCK NUT SOCKET WRENCH, 17 x 27 mm
07907–MC70000 OR EQUIVALENT

AUTOMATIC CAM CHAIN TENSIONER INSTALLATION

Install the cam chain guide and tensioner slipper.



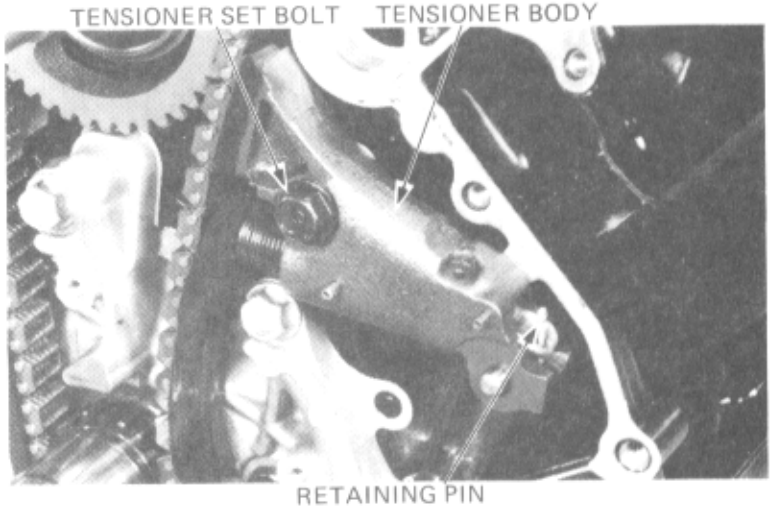
Install the cam chain tensioner.
Install and torque the tensioner set bolt.

TORQUE: 18–25 N·m
(1.8–2.5 kg-m, 13–18 ft-lb)

CAUTION

Be sure to use the correct set bolt. Failure to use the special bolt will ruin the thread hole in the engine case.

Remove the previously installed push rod retaining pin, the tensioner will give tension to the cam chain automatically.



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12. TRANSMISSION

SERVICE INFORMATION

GENERAL

- Place all removed parts in parts racks in order, so they can be reassembled in their original places.
- Before reassembling, lubricate the M4 and M5 gears with Multipurpose NLG1 No. 2 Grease (MoS_2 additive) or an equivalent.
- Apply engine oil to the other gears.
- To service the transmission, it is necessary to remove the engine from the frame.

SPECIFICATIONS

Unit: mm (in)

Item			Standard	Service Limit
Transmission	M4 and M5 gear	I.D.	29.020 – 29.041 (1.1425 – 1.1433)	29.10 (1.146)
		Bushing O.D.	28.979 – 29.000 (1.1409 – 1.1417)	28.95 (1.140)
	C1 gear	I.D.	24.020 – 24.041 (0.9457 – 0.9465)	24.10 (0.949)
	C1 gear bushing	O.D.	23.984 – 24.005 (0.9443 – 0.9451)	23.95 (0.943)
		I.D.	20.020 – 20.041 (0.7882 – 0.7890)	20.06 (0.790)
	C2 gear	I.D.	31.025 – 31.050 (1.2215 – 1.2224)	31.10 (1.224)
	C2 gear bushing	O.D.	30.985 – 31.010 (1.2199 – 1.2209)	30.95 (1.219)
		I.D.	27.500 – 27.521 (1.0827 – 1.0835)	27.54 (1.084)
	C3 gear	I.D.	29.020 – 29.041 (1.1425 – 1.1433)	29.10 (1.146)
		Bushing O.D.	28.979 – 29.000 (1.1409 – 1.1417)	28.95 (1.140)
	Countershaft O.D.	at C1	19.987 – 20.000 (0.7869 – 0.7874)	19.96 (0.786)
		at C2	27.459 – 27.480 (1.0811 – 1.0819)	27.44 (0.108)
	Mainshaft O.D. (at clutch outer guide)		31.987 – 32.000 (1.2593 – 1.2598)	31.93 (1.257)
	Gear-to-bushing clearance		–	0.15 (0.006)
	Bushing-to-shaft clearance		–	0.10 (0.004)
Shift fork	Claw thickness		5.93 – 6.00 (0.233 – 0.236)	5.50 (0.217)
	I.D.		13.000 – 13.018 (0.5118 – 0.5125)	13.05 (0.514)
Fork shaft	O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.95 (0.510)
Shift drum	Drum-to-holder clearance		0.025 – 0.075 (0.0010 – 0.0030)	0.15 (0.006)
Final shaft	Damper spring free length		68.9 (2.71)	64.2 (2.53)

TORQUE VALUES

Transmission holder bolt (6 x 20 mm) 15–20 N·m (1.5–2.0 kg-m, 11–14 ft-lb)
(6 x 32 mm) 10–14 N·m (1.0–1.4 kg-m, 7–10 ft-lb)
(7 x 32 mm) 16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)

TOOLS

Special

Gear holder	07924–MC70002 or modified	07924–MC70000 07924–MC70001 07924–4150000	see page 9-5
Bearing remover handle	07936–3710100		
Bearing remover weight	07936–3710200	Bearing remover set	07936–3710000
Bearing remover 20 mm	07936–3710600		
Crank cap driver	07945–4150100		

Common

Attachment, 32 x 35 mm	07746–0010100
Attachment, 42 x 47 mm	07746–0010300
Attachment, 52 x 55 mm	07746–0010400
Attachment, 62 x 68 mm	07746–0010500
Pilot, 20 mm	07746–0040500
Pilot, 25 mm	07746–0040600
Driver	07749–0010000

TROUBLESHOOTING

Hard to Shift
- Improper clutch adjustment: too much free play.
- Shift forks bent.
- Shift shaft bent.
- Shift fork claw bent.
- Shift drum cam grooves damaged.
- Shift guide pin damaged.

Transmission Jumps Out of Gear
- Gear dogs worn.
- Shift shaft bent.
- Shift drum stopper broken.
- Shift forks bent.

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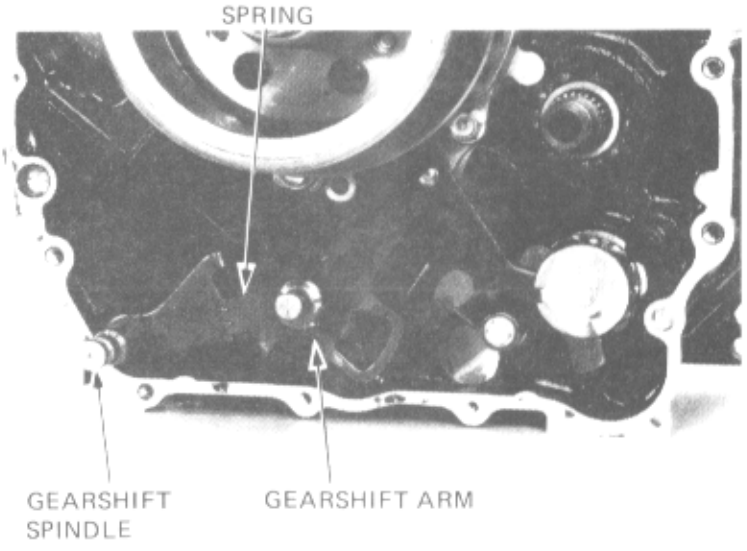
GEARSHIFT LINKAGE REMOVAL

Remove the following:
- engine (Section 5).
- engine rear cover (Section 9).
- final shaft.
- gearshift spindle and shift spring.
- gearshift arm.

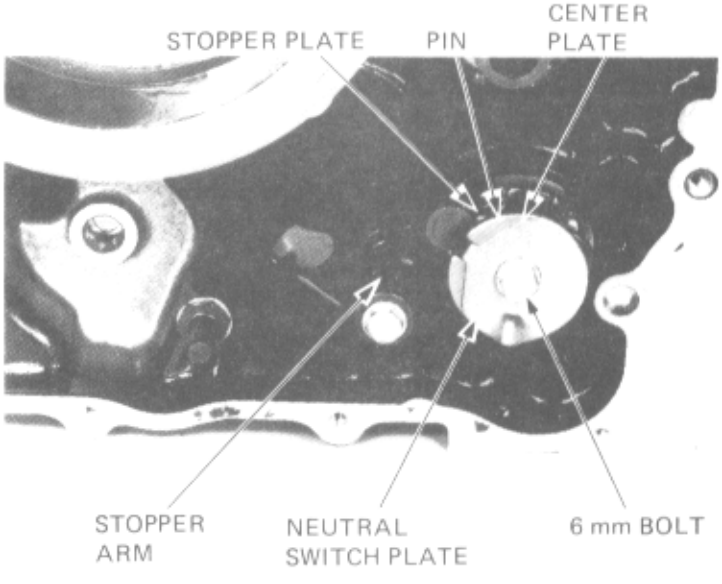


Then, remove the following:
- shift drum stopper bolt.
- shift drum stopper.
- neutral switch plate, shift drum stopper plate, gearshift drum pin, and collar.

NOTE

Do not disassemble the shift drum plates and pin except when replacement is necessary.

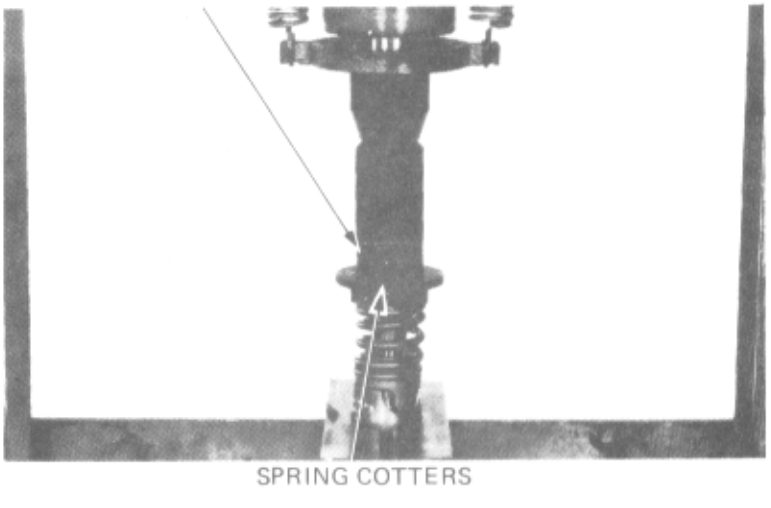
Check all removed parts for wear or damage.



FINAL SHAFT DISASSEMBLY

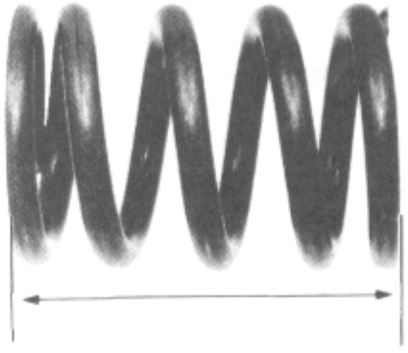
Compress the spring with a press and Crank Cap Driver and remove the spring cotters.

Remove the spring retainer, damper lifter and cam from the shaft.

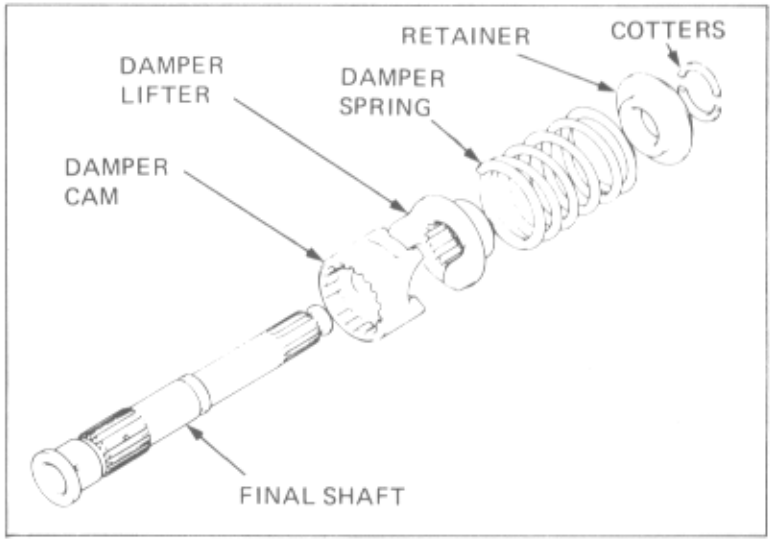


Measure the damper spring free length.

SERVICE LIMIT: 64.2 mm (2.53 in)



Inspect the damper lifter, shaft, and retainer for wear or damage.

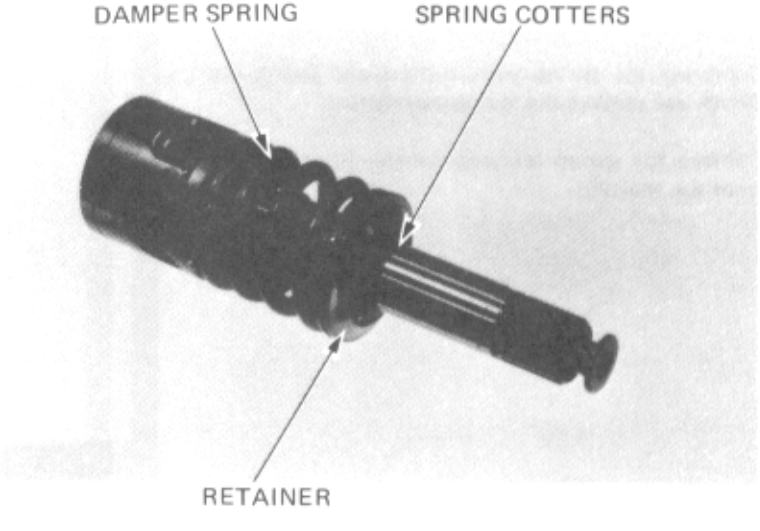


FINAL SHAFT ASSEMBLY

Slide the lifter, spring and retainer over the shaft. Compress the spring in the Crank Cap Driver and install the spring cotters.

NOTE

Make sure that the cotters are properly seated.



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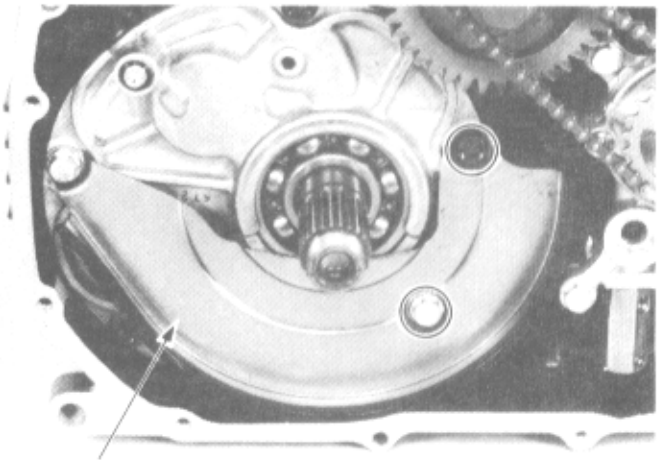
TRANSMISSION DISASSEMBLY

Remove the engine front cover and remove the clutch as an assembly (Section 8).

Remove the oil separator.



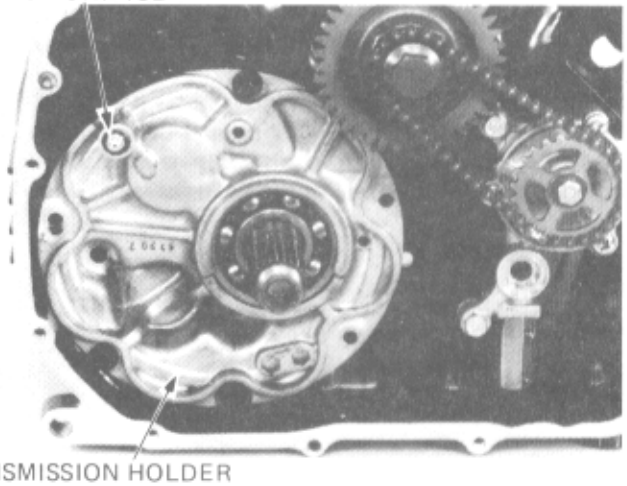
OIL SEPARATOR

Remove the oil control orifice and O-ring.

Remove the transmission holder bolts.

Remove the primary drive gear.

OIL CONTROL ORIFICE



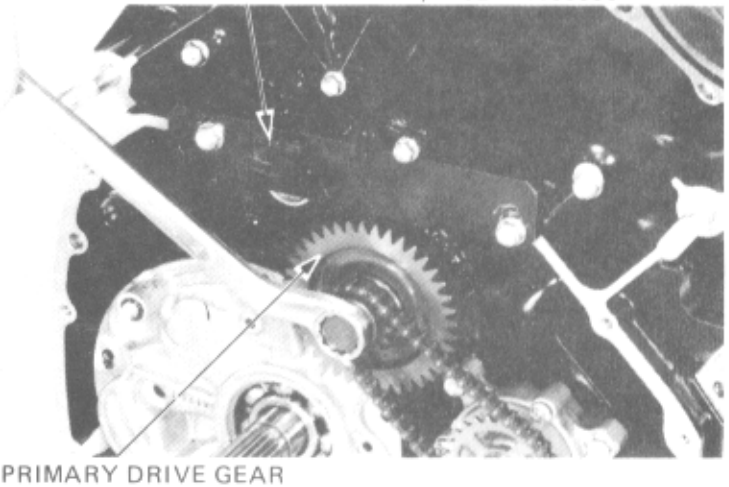
TRANSMISSION HOLDER

Hold the primary drive gear with a Gear Holder. Remove the primary drive gear bolt and the oil pump sprocket, disc spring, side plate, sub gear and primary gear.

NOTE

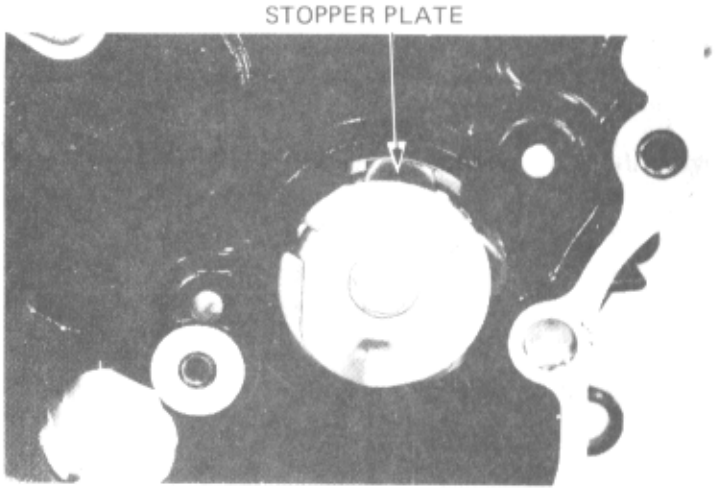
- Mark the sub gear and side plate so that they will face the correct direction during reassembly.
- See page 9-5 for Gear Holder modification.

GEAR HOLDER 07924–MC70001 OR
MODIFIED 07924–MC70000, 07924–4150000



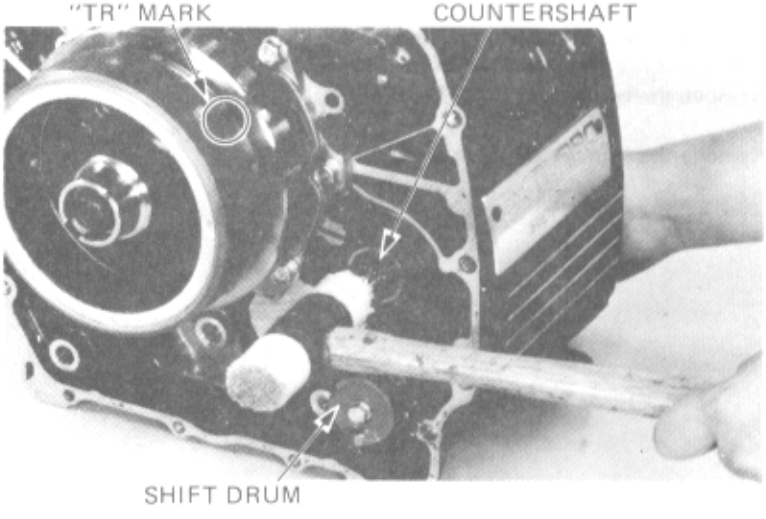
PRIMARY DRIVE GEAR

Align the projection on the shift drum stopper plate with the cut-out in the engine case by rotating the shift drum.

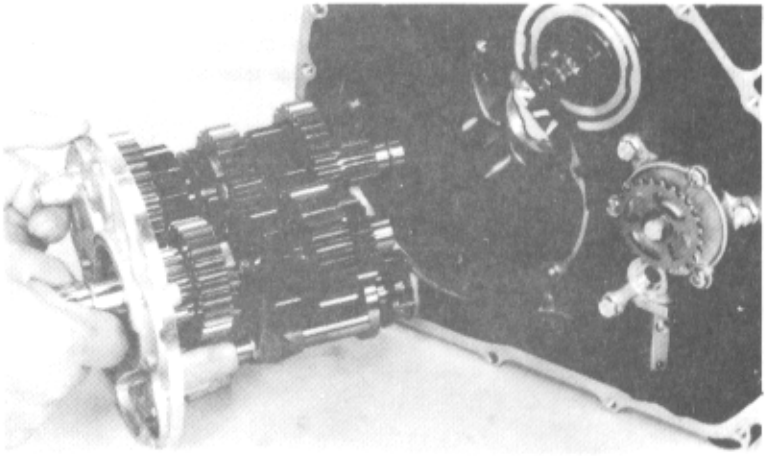


Put the right position at TDC by positioning the TR mark on the flywheel 45° towards the right side of the engine.

Drive the ends of the countershaft and shift drum carefully and evenly with a soft hammer until the transmission holder is clear of the engine case.



Remove the transmission assembly from the engine case.



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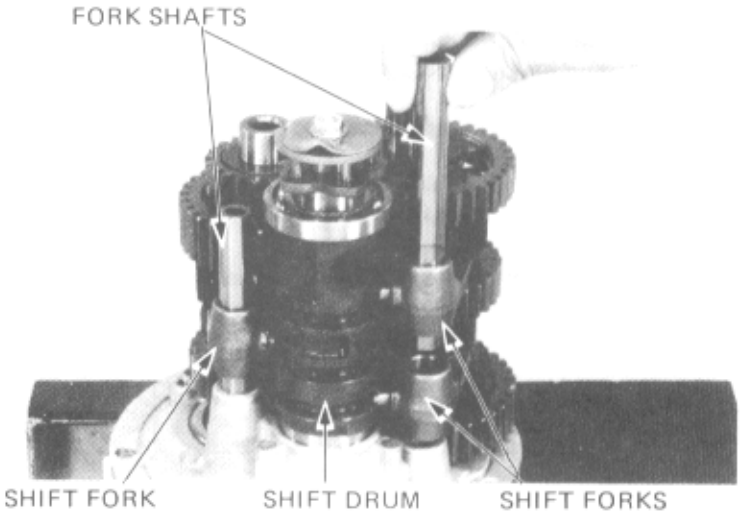
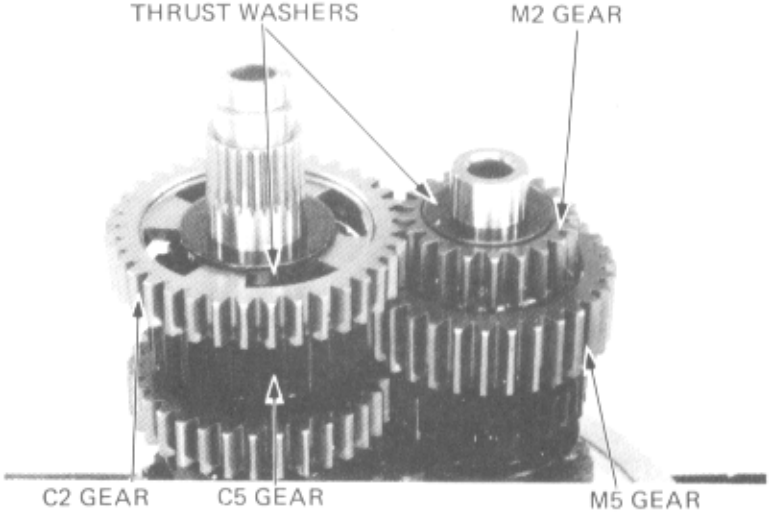
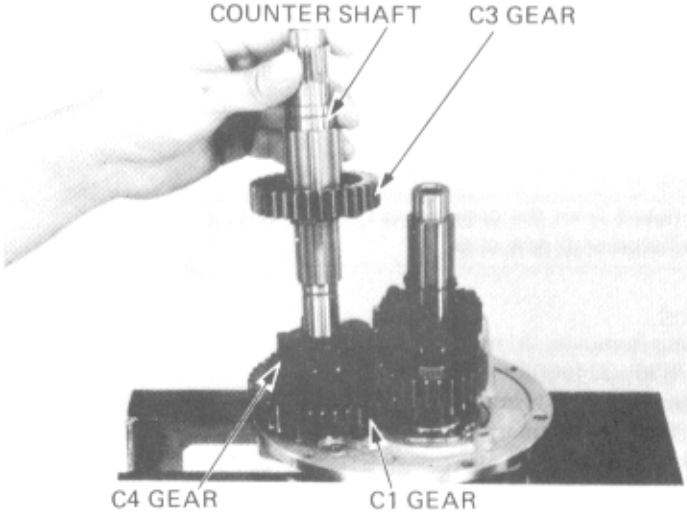
Remove the shift fork shafts, shift forks and shift drum.



Remove the thrust washers, 2nd and 5th gears from the countershaft and mainshaft.



Remove the countershaft 1st, 3rd and 4th gears and washers by removing the countershaft.



Thread the clutch lock nut onto the end of the mainshaft to prevent damage to the end.

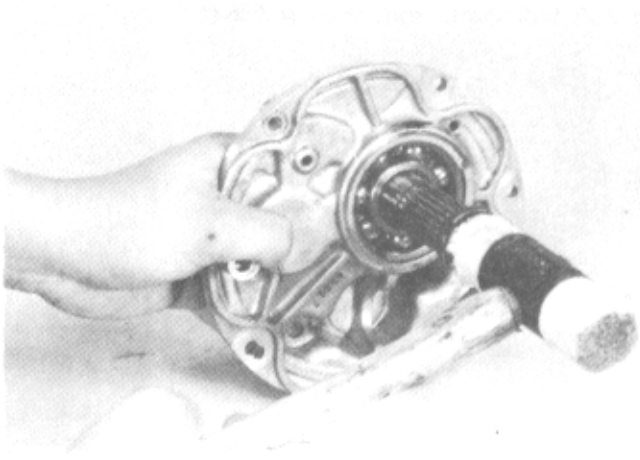
Remove the mainshaft by lightly tapping on the end with a soft hammer.

Remove the gears by prying off the snap ring.

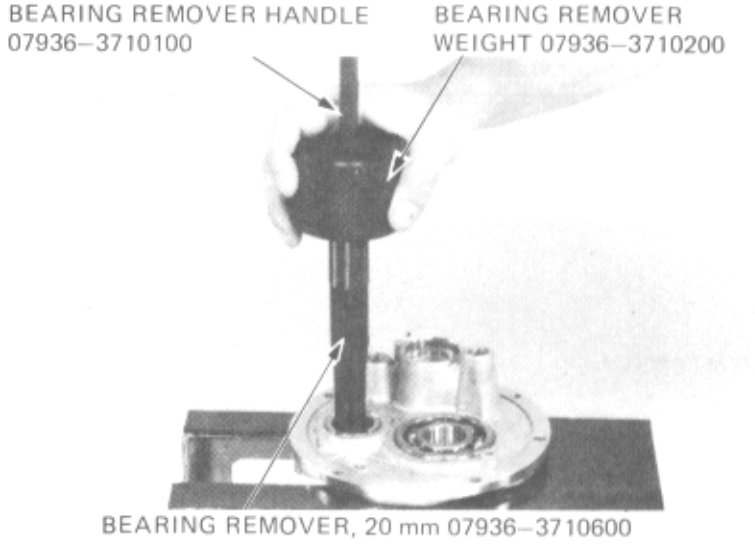
Remove the mainshaft bearing with a bearing puller if necessary.

NOTE

The bearing should be replaced with a new one if it is removed from the mainshaft.



Inspect each holder bearing for wear or damage. They should rotate smoothly and be free of play. Remove the bearing from the transmission holder.



Remove the countershaft bearing from the engine case.

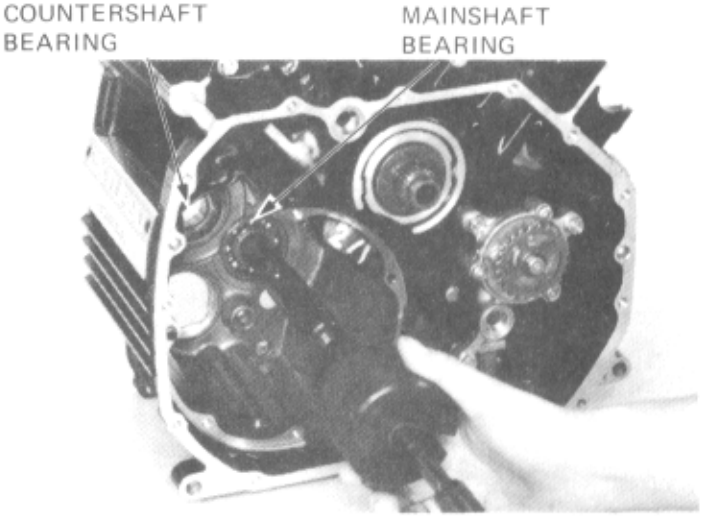
Remove the mainshaft bearing and oil guide plate from the engine case with the special tools.

NOTE

If removed from the case, the bearings should be replaced with new ones.

TOOLS

Bearing Remover, 20 mm
07936–3710600
Bearing Remover Handle
07936–3710100
Bearing Remover Weight
07936–3710200



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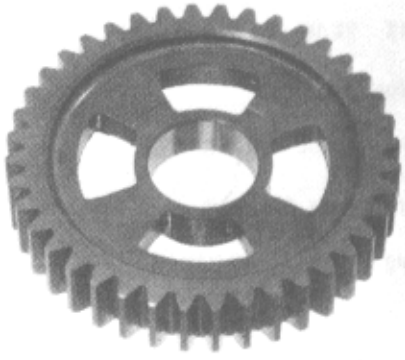
TRANSMISSION INSPECTION

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

Examine the gear dogs and slots for evidence of abnormal wear.

Measure the I.D. of each gear. If any gear exceeds the service limit, that gear must be replaced.



SERVICE LIMITS:

M4 and M5 gears	29.10 mm (1.146 in)
C1 gear	24.10 mm (0.949 in)
C2 gear	31.10 mm (1.224 in)
C3 gear	29.10 mm (1.146 in)

Measure the countershaft gear bushing I.D. and O.D.

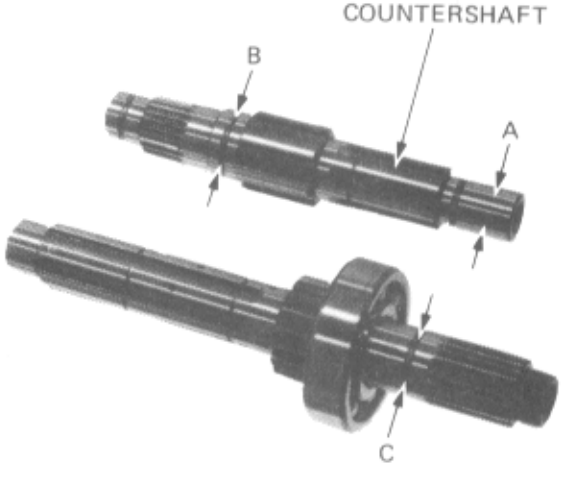
SERVICE LIMITS:

C1	O.D.:	23.95 mm (0.943 in)
	I.D.:	20.06 mm (0.790 in)
C2	O.D.:	30.95 mm (1.219 in)
	I.D.:	27.54 mm (1.084 in)

Measure the mainshaft gear bushing O.D.

SERVICE LIMIT:
M4 and M5 gears: 28.95 mm (1.140 in)

Measure and record the O.D. of the mainshaft and countershaft at the locations shown.



SERVICE LIMITS:

A (C1):	19.96 mm (0.786 in)
B (C2):	27.44 mm (1.080 in)
C (Clutch outer guide):	31.93 mm (1.257 in)

Calculate the clearance between the gear and gear shaft or bushing.

SERVICE LIMIT: 0.15 mm (0.006 in)

Measure the shift fork I.D.

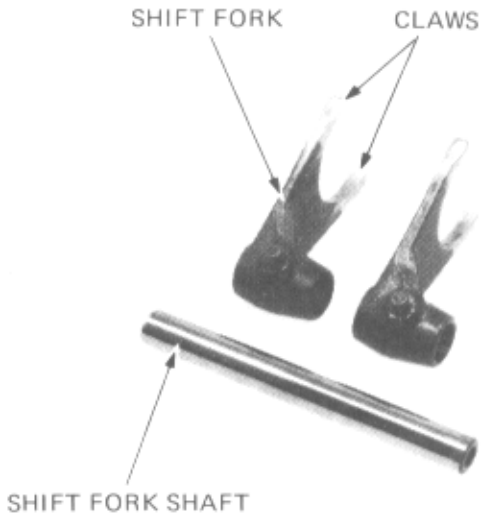
SERVICE LIMIT: 13.05 mm (0.514 in)

Measure the shift fork shaft O.D.

SERVICE LIMIT: 12.95 mm (0.510 in)

Measure the shift fork claw thickness.

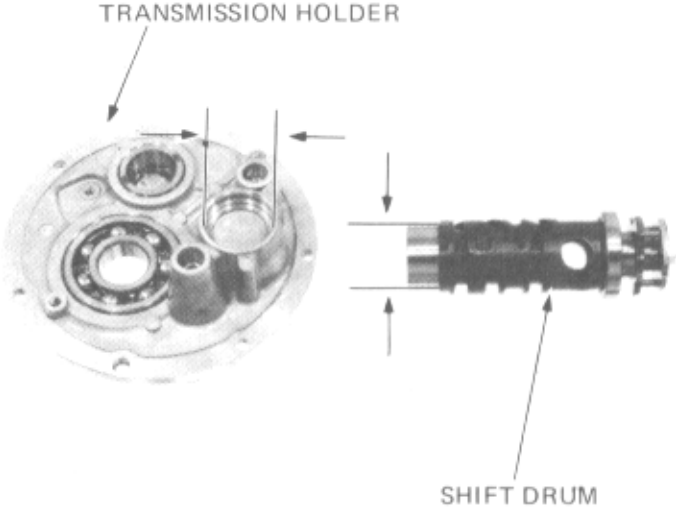
SERVICE LIMIT: 5.50 mm (0.217 in)



Measure and record the shift drum O.D. and transmission holder I.D.

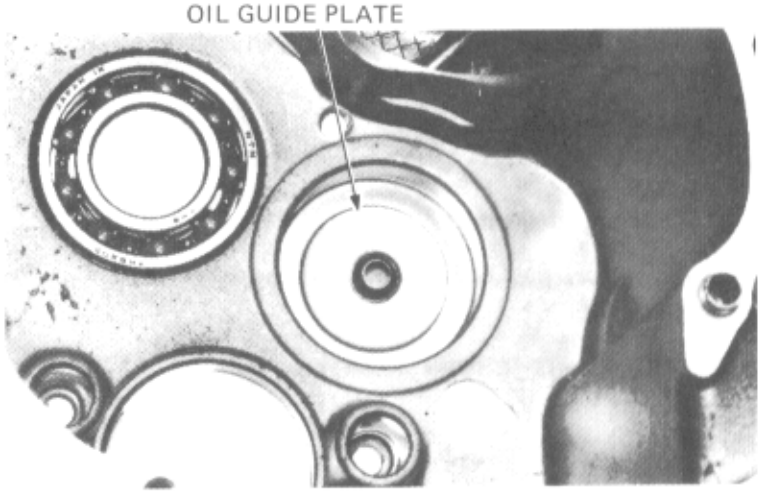
Calculate the clearance between the shift drum and the transmission holder.

SERVICE LIMIT: 0.15 mm (0.006 in)



TRANSMISSION ASSEMBLY

Install the oil guide plate in the mainshaft bearing hole.



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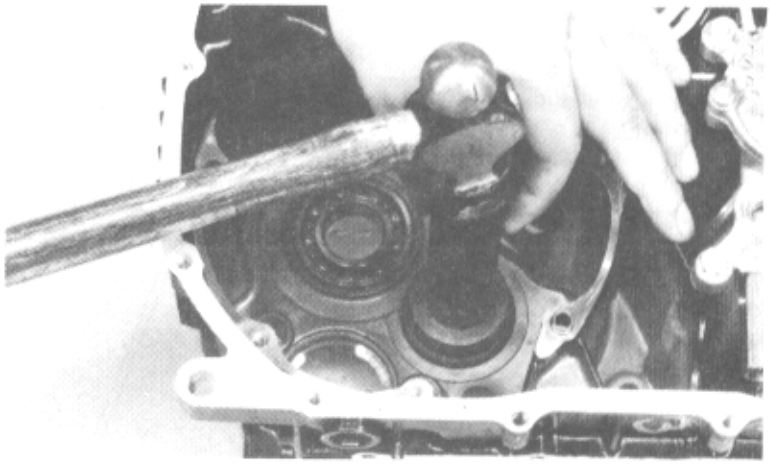
Install the mainshaft and countershaft bearings into the case.

TOOLS
Mainshaft Bearing
- Attachment, 42 x 47 mm 07746–0010300
- Driver 07749–0010000

Countershaft Bearing
- Attachment, 52 x 55 mm 07746–0010400
- Pilot, 25 mm 07746–0040600
- Driver 07749–0010000

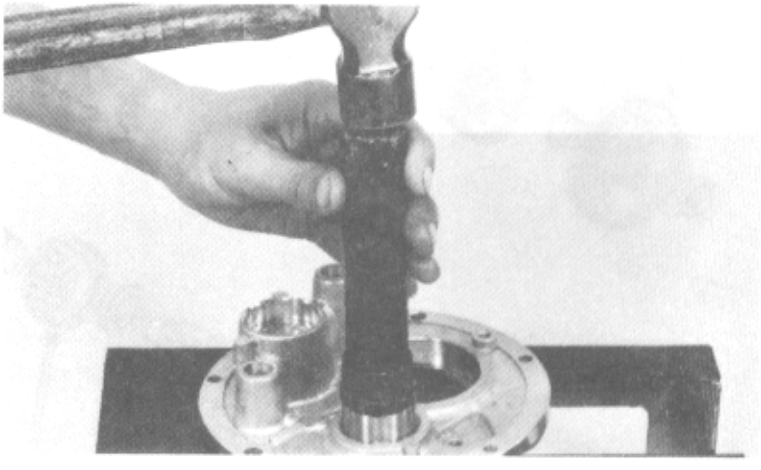


Drive the countershaft needle bearing outer race into the transmission holder. Insert the needle bearing into the outer race.

Drive the mainshaft bearing into the transmission holder if it was removed.

NOTE

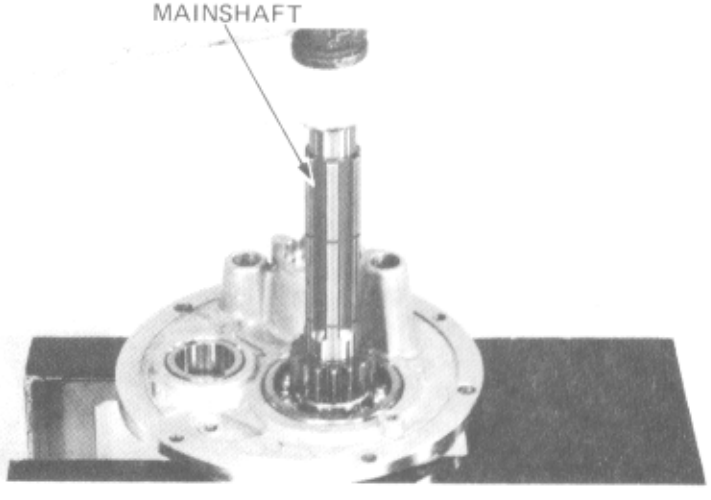
Support the transmission holder above the workbench to prevent damaging it.



TOOLS
Mainshaft Bearing
- Attachment, 62 x 68 mm 07746–0010500
- Pilot, 25 mm 07746–0040600
- Driver 07749–0010000

Countershaft Needle Bearing
- Attachment, 32 x 35 mm 07746–0010100
- Pilot, 20 mm 07746–0040500
- Driver 07749–0010000

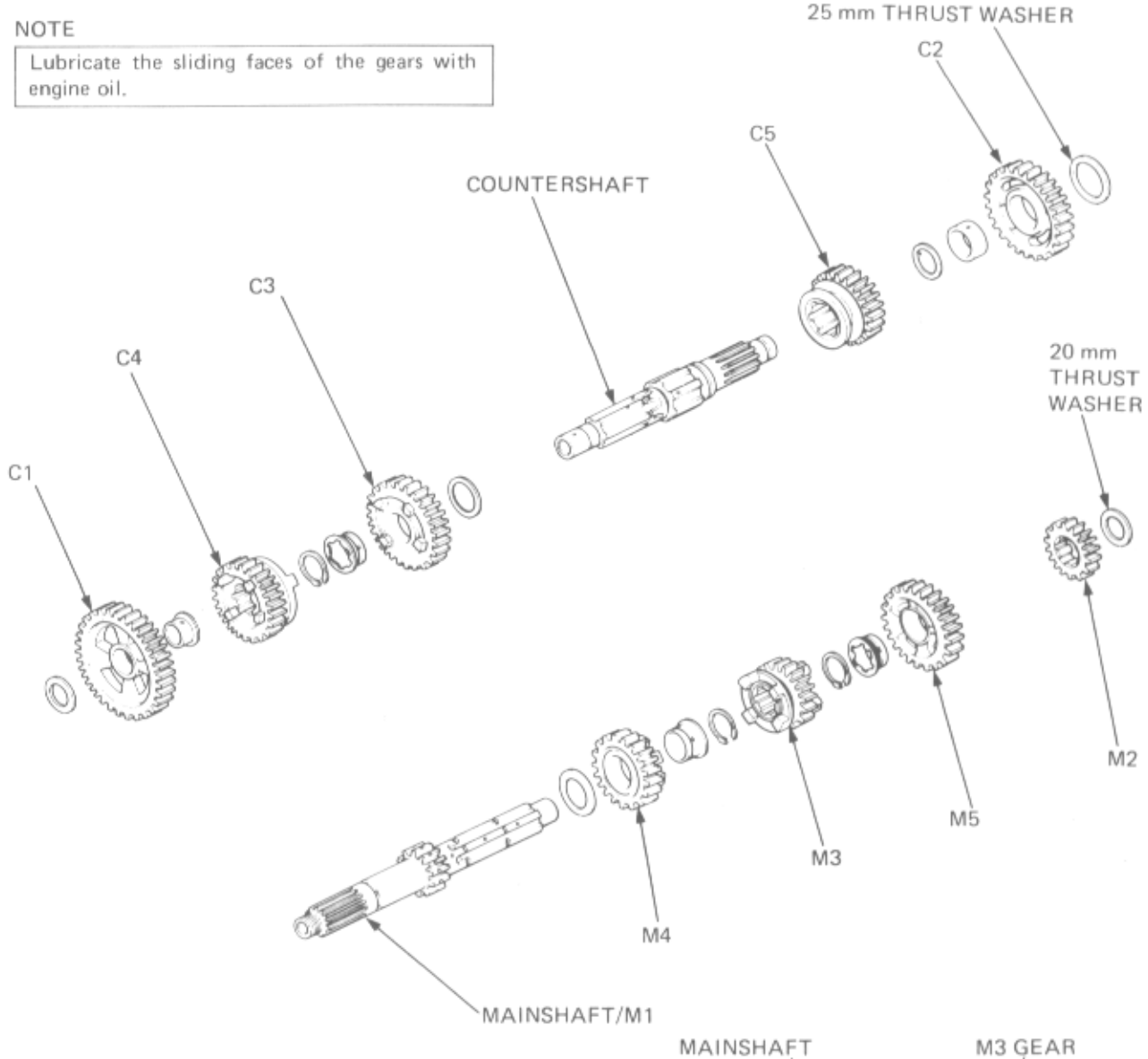
Drive the mainshaft into the mainshaft bearing.



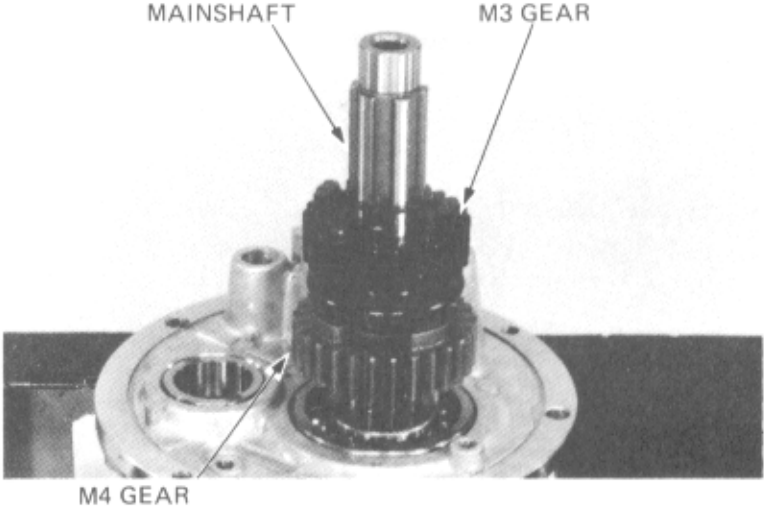
Assemble the mainshaft and countershaft as shown in the illustration.

NOTE

Lubricate the sliding faces of the gears with engine oil.



Install the mainshaft 3rd and 4th gears onto the mainshaft.



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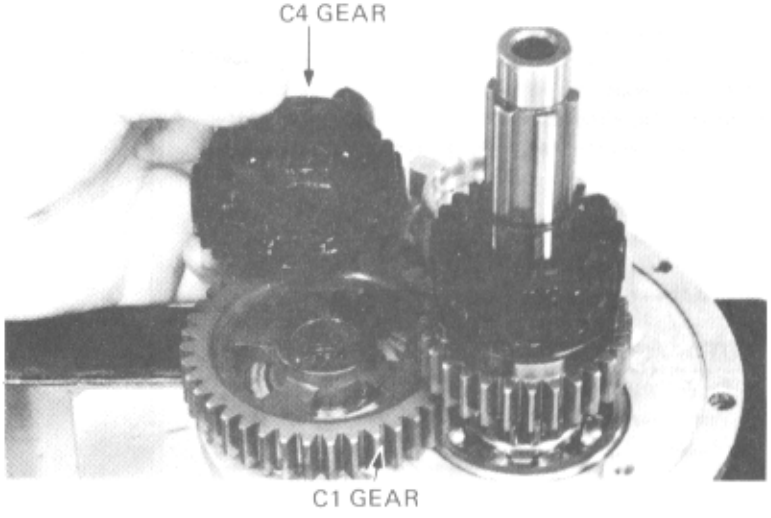
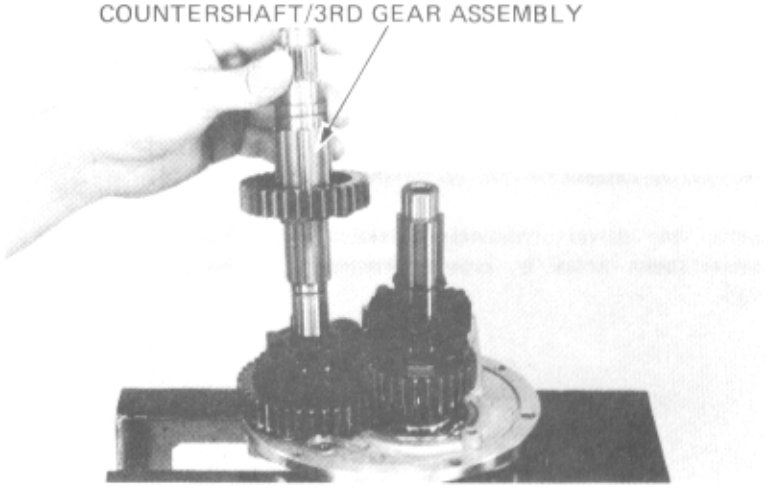
Place the countershaft low gear, washer and 4th gear over the needle bearing outer race.



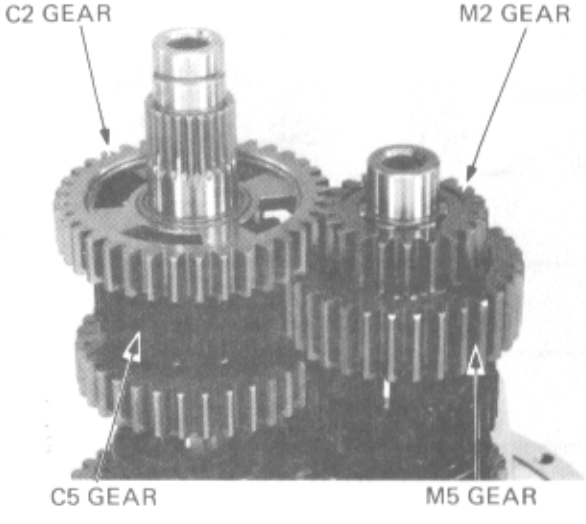
Install 3rd gear and the splined bushing onto the countershaft.

Install the countershaft with 3rd gear through 4th and 1st gears and into the needle bearing.



Slide 5th and 2nd gears onto the countershaft and mainshaft.

Check the engagement of the gears on the countershaft and mainshaft.



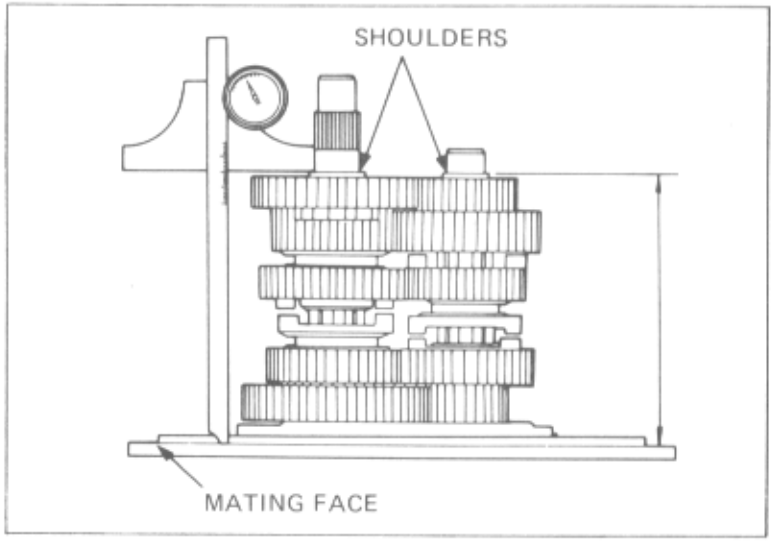
If the engine case, transmission holder, mainshaft, countershaft, or transmission bearing is to be replaced the correct transmission shaft thrust washer thickness must be selected. Measure the distance between the shoulder of the mainshaft (or countershaft) and engine case mating face of the transmission holder.

Record the distance on the mainshaft as X.

Record the distance on the countershaft as y.

NOTE

Place the removed thrust washers on both 2nd gears when no gears or bearings are replaced.

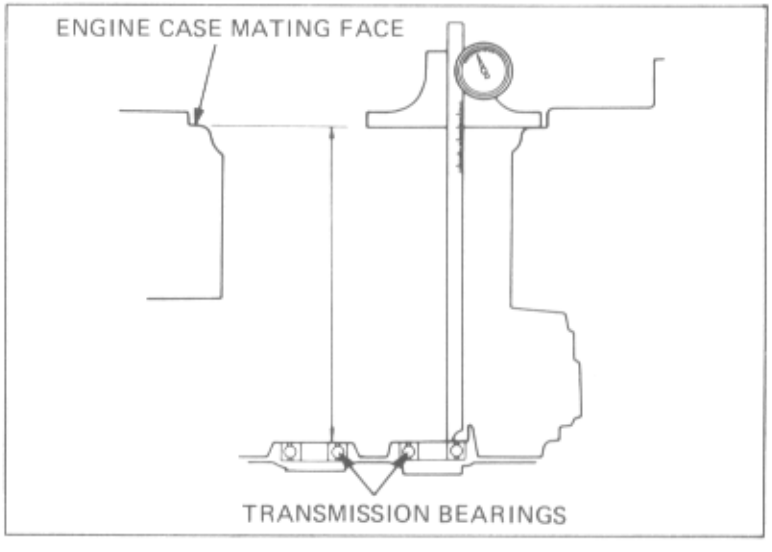


Then, measure the distance between the end of the engine case bearing inner race and holder mating face of the engine case.

Record the distance on the mainshaft as X'.

Record the distance on the countershaft as y'.

Select the correct thickness of washer from the tables shown below by cross-referencing x, x' and y, y'.



MAINSHAFT (20 mm thrust washer)

Unit: mm (in)

Distance x / Distance x'	119.70–119.77 (4.713–4.715)	119.78–119.87 (4.716–4.719)	119.88–120.00 (4.720–4.724)
118.30–118.37 (4.657–4.660)	B 1.10 (0.043)	C 1.20 (0.047)	D 1.40 (0.051)
118.38–118.47 (4.661–4.664)	A 1.00 (0.040)	B 1.10 (0.043)	C 1.20 (0.047)
118.48–118.60 (4.665–4.669)	A 1.00 (0.040)	A 1.00 (0.040)	B 1.10 (0.043)

COUNTERSHAFT (25 mm thrust washer)

Unit: mm (in)

Distance y / Distance y'	118.05–118.12 (4.648–4.650)	118.13–118.25 (4.651–4.656)
115.75–115.92 (4.557–4.564)	C 1.75 (0.069)	D 1.90 (0.075)
115.93–116.12 (4.564–4.572)	B 1.60 (0.063)	C 1.75 (0.069)
116.13–116.27 (4.572–4.578)	A 1.50 (0.059)	B 1.60 (0.063)
116.28–116.45 (4.578–4.585)	A 1.50 (0.059)	A 1.50 (0.059)

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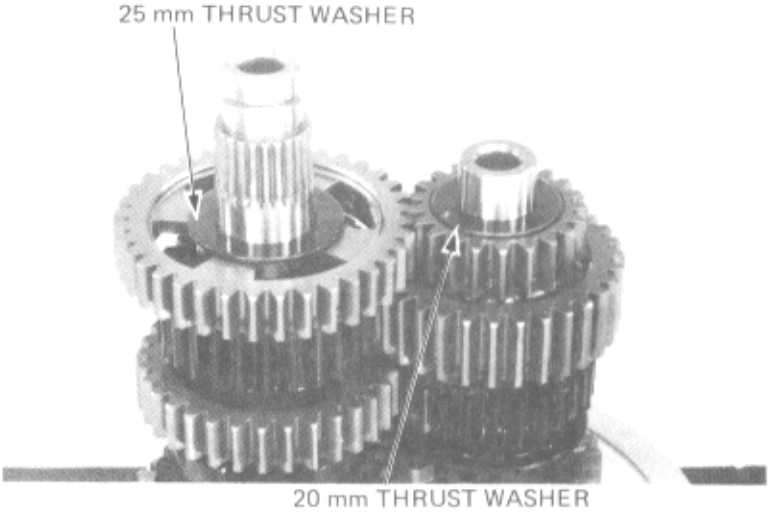
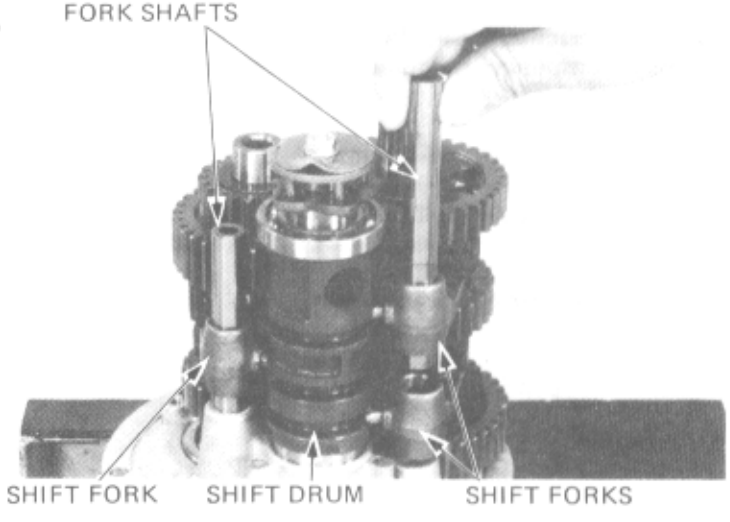
Place the washers selected on the mainshaft and countershaft 2nd gears.



Install the shift drum. Engage the shift forks with the gears and shift drum groove.

Install the shift fork shafts.

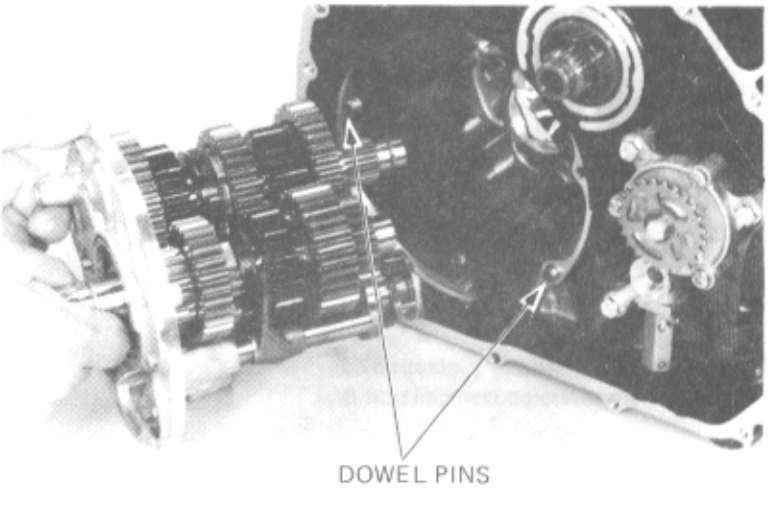


Install the dowel transmission holder pins into the case.

Place the transmission in neutral and insert the transmission assembly into the engine case.

NOTE

Align the projection on the shift drum with the cut-out in the engine case.



Install the primary gear, primary sub-gear, side plate, disc plate and oil pump drive sprocket onto the crankshaft (see page 13-15). Install the Drive Gear Holder to prevent the drive gear from turning.

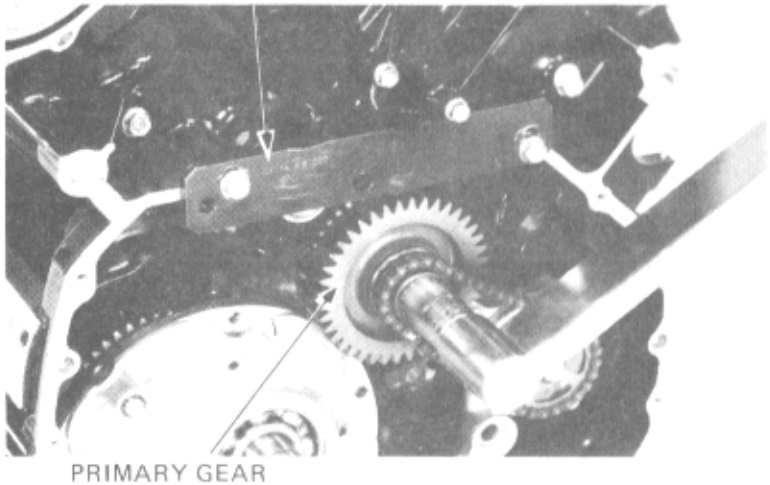
NOTE

Refer to page 9-5 for gear holder modification details.

Torque the primary drive gear bolt.

TORQUE: 80–95 N·m (8.0–9.5 kg-m, 58–69 ft-lb)

GEAR HOLDER 07924–MC70002 OR 07924–MC70001, MODIFIED 07924–MC70000, 07924–4150000



PRIMARY GEAR

Press the transmission holder into place while rotating the mainshaft and torque the holder bolts.

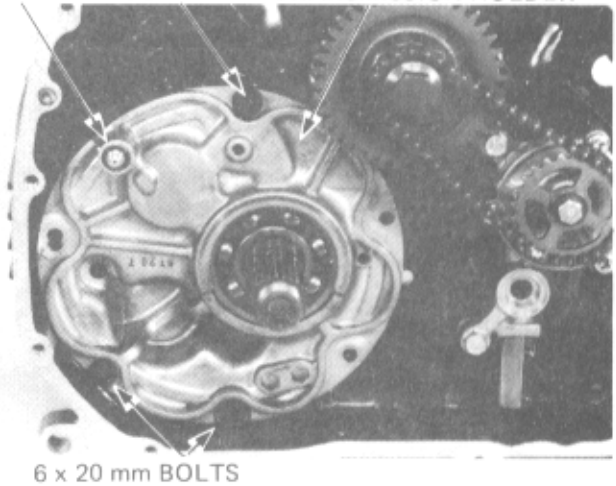
TORQUE:
- **6 x 20 mm bolt: 15–20 N·m (1.5–2.0 kg-m, 11-14 ft-lb)**
- **7 x 22 mm bolt: 16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)**

Install the oil control orifice and O-ring.

OIL CONTROL ORIFICE

7 x 22 mm BOLT

TRANSMISSION HOLDER



6 x 20 mm BOLTS

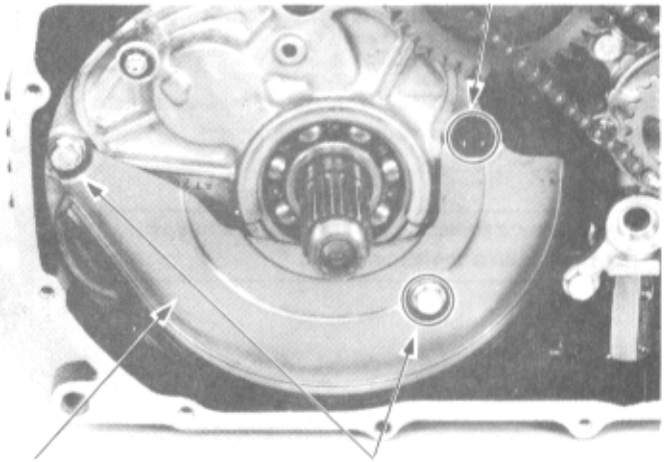
Install the oil control orifice and O-ring.
Install the oil separator.

TORQUE:
- **7 x 22 mm bolt: 16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)**
- **6 x 32 mm bolt: 10–14 N·m (1.0–1.4 kg-m, 7–10 ft-lb)**

After tightening the bolts, make sure that the shafts rotate freely.

Install the clutch assembly (Section 8).
Install the transmission cover (Section 8).

7 x 22 mm BOLT



OIL SEPARATOR

6 x 32 mm BOLTS

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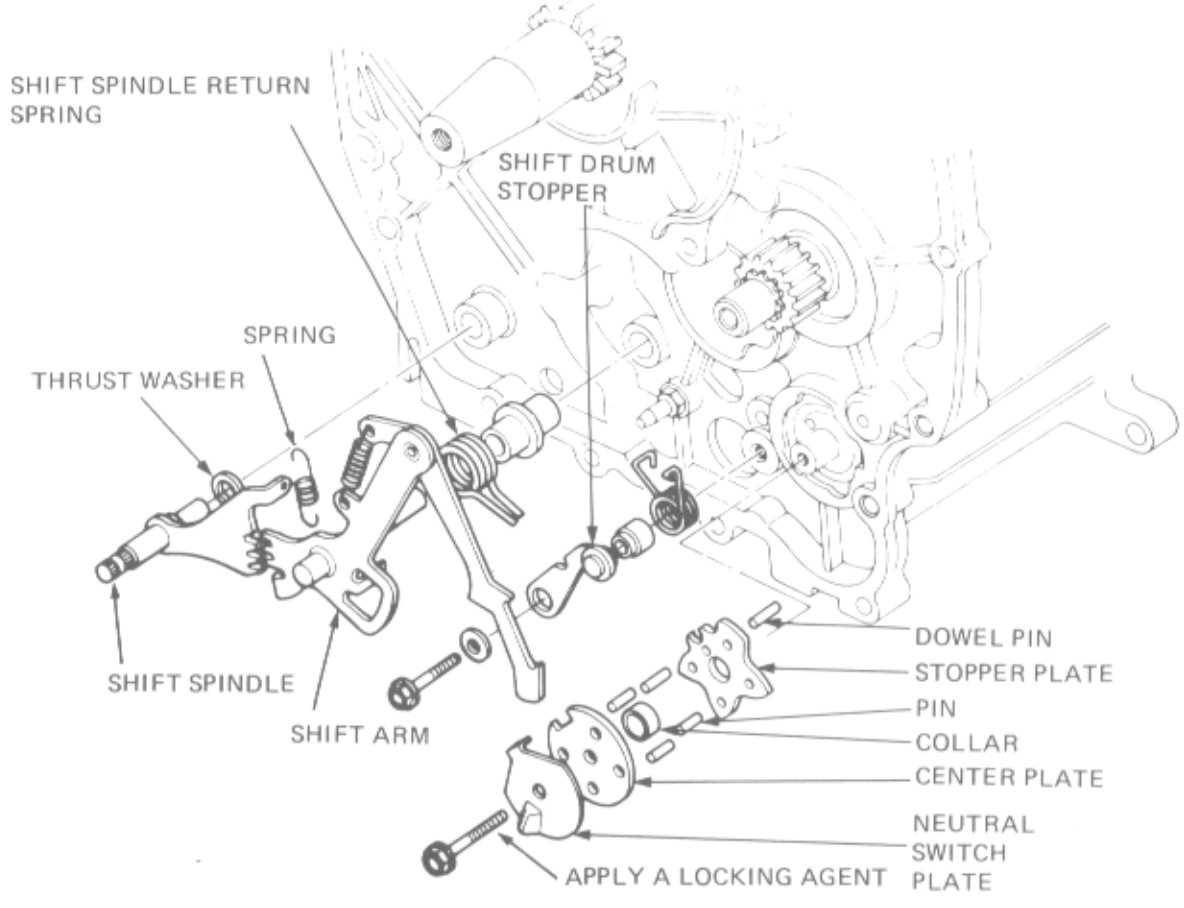
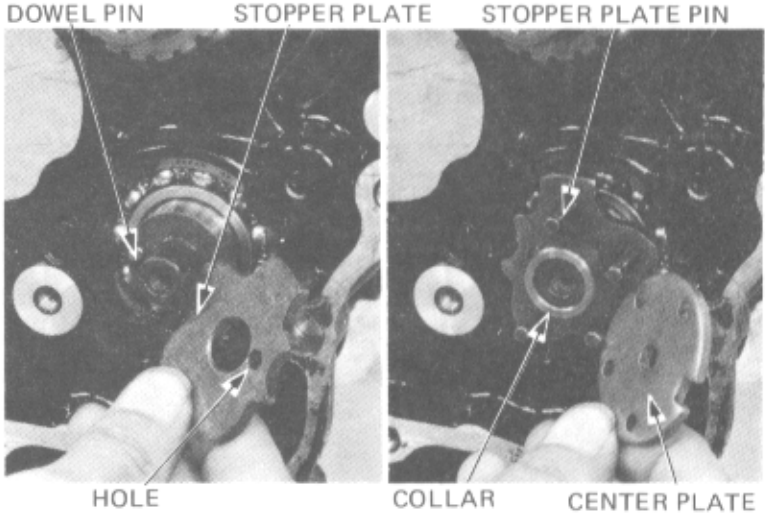
GEARSHIFT LINKAGE INSTALLATION



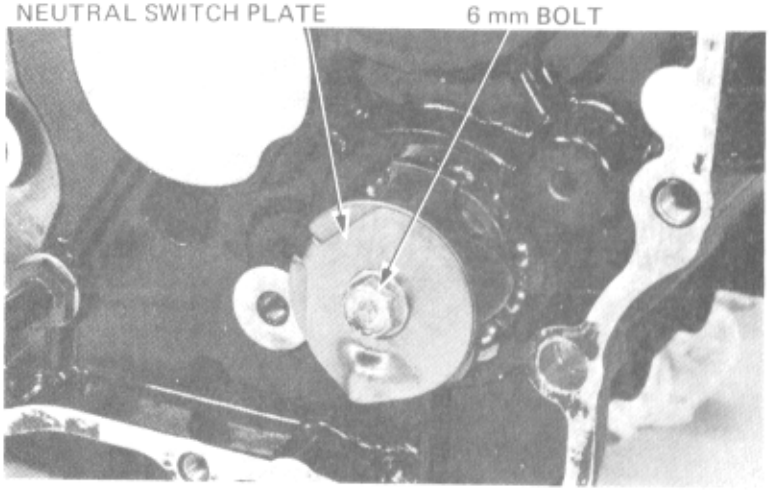
Install the dowel pin into the hole of the shift drum. Align the stopper plate hole with the dowel pin and install the stopper plate.
Install the four stopper plate pins, collar and center plate.

Install the shift drum stopper.
Install the shift arm and shift spindle.

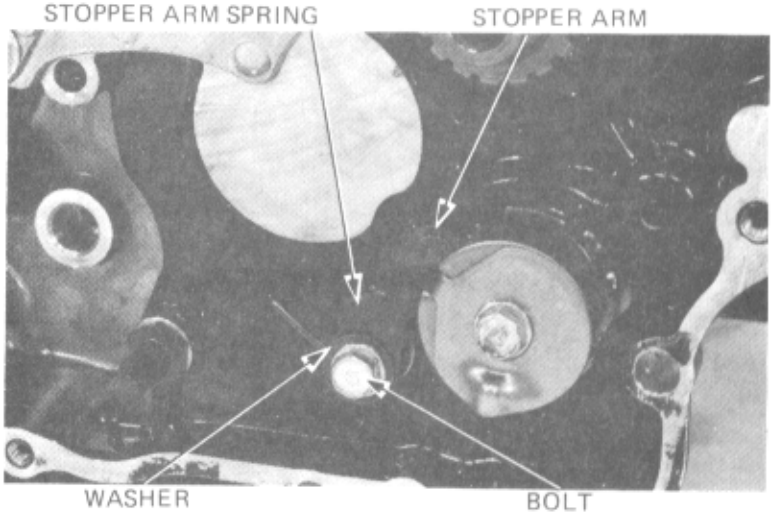


Install the neutral switch plate onto the center plate.

Apply a locking agent to the 6 mm bolt threads and tighten it.



Install the stopper arm spring, collar and arm and tighten with the plain washer and bolt.

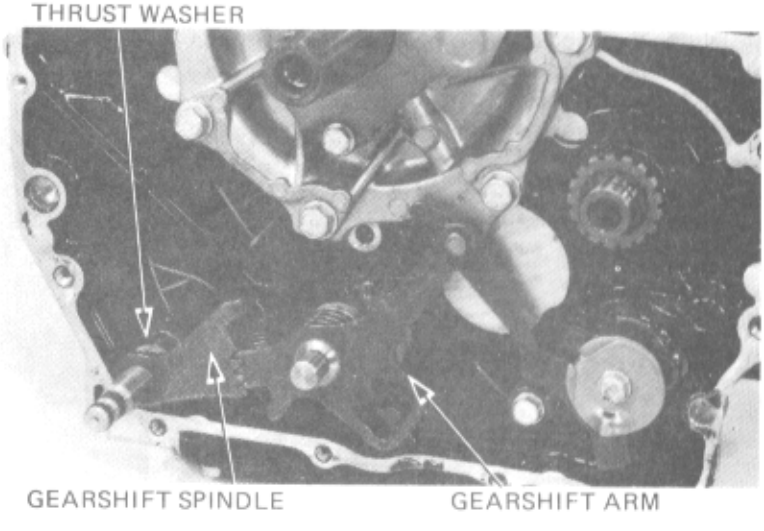


Install the gearshift arm and shift spindle.

Install the rear cover (Section 9).

NOTE

After installing the rear cover, install the gearshift pedal and check its operation.



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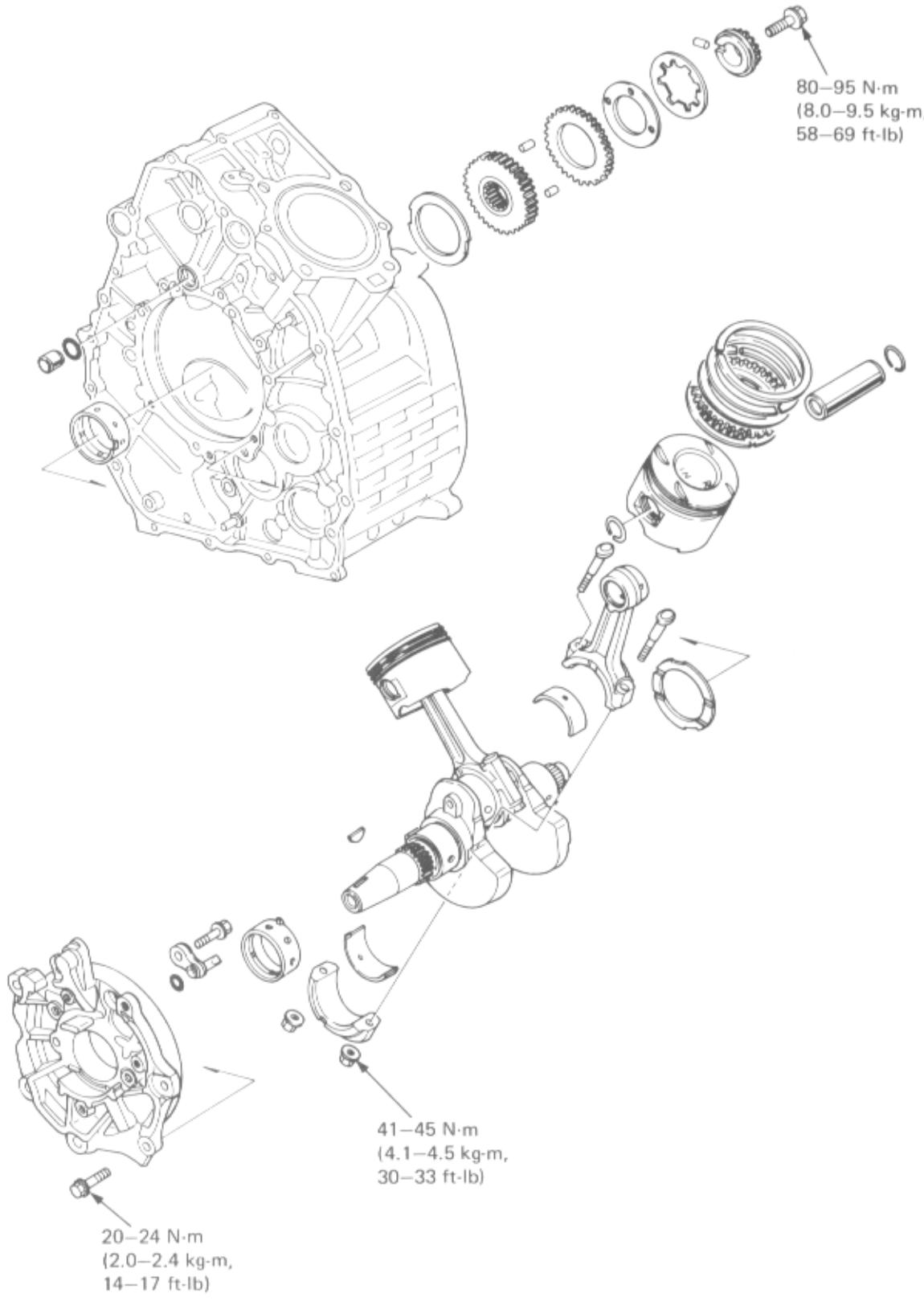
MEMO



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13. CRANKSHAFT/PISTON

SERVICE INFORMATION

GENERAL

- All bearing inserts are a select fit and are identified by color codes. Select replacement bearings from the color code tables.
- After installing new bearings, recheck them with plastigauge.
- Before removing the piston and connecting rod assemblies, clean the top of the cylinder.
- The right piston can be serviced by removing the oil pump and transmission cover. To service the left piston, it is necessary to remove the transmission.
- Apply molybdenum disulfide grease to the journals, crankpins and bearings during assembly.

SPECIFICATIONS

Unit: mm (in)

Item			Standard	Service Limit
Crankshaft	Main journal oil clearance		0.020–0.060 (0.0008–0.0023)	0.085 (0.0033)
	Crankpin oil clearance		0.024–0.056 (0.0009–0.0022)	0.085 (0.0033)
	Connecting rod side clearance		0.150–0.350 (0.0059–0.014)	0.50 (0.020)
Cylinder	I.D.		82.500–82.515 (3.2480–3.2486)	82.600 (3.2520)
	Warpage		–	0.10 (0.004)
Piston ring	Ring-to-groove clearance	Top	0.015–0.055 (0.0006–0.0022)	0.10 (0.004)
		Second	0.015–0.055 (0.0006–0.0022)	0.10 (0.004)
	Ring end gap	Top	0.20–0.35 (0.008–0.014)	0.60 (0.024)
		Second	0.20–0.35 (0.008–0.014)	0.60 (0.024)
		Oil (side rail)	0.30–0.90 (0.012–0.035)	1.10 (0.043)
Piston/ Piston pin	Piston O.D.		82.460–82.485 (3.2465–3.2474)	82.365 (3.2427)
	Piston pin bore		22.002–22.008 (0.8662–0.8665)	22.040 (0.8677)
	Piston pin O.D.		21.994–22.000 (0.8659–0.8661)	21.984 (0.8655)
	Small end I.D.		22.020–22.041 (0.8669–0.8678)	22.068 (0.8688)
	Piston-to-cylinder clearance		–	0.10 (0.004)

TORQUE VALUES

Crankshaft cap bolt	20–24 N·m (2.0–2.4 kg-m, 14–17 ft-lb)
Connecting rod cap nut	41–45 N·m (4.1–4.5 kg-m, 30–33 ft-lb)
Primary drive gear bolt	80–95 N·m (8.0–9.5 kg-m, 58–69 ft-lb)

TOOLS

NOTE

In the lists below, "or equivalent" means there may be a commercially available tool in the U.S.A. that will work as well as the one listed.

Special

Piston remover	07941–MC70000 (not available in U.S.A.) or equivalent
Crank cap puller	07935–4150000 (not available in U.S.A.)
Crank cap driver	07945–4150100
Main bearing dis/assembly tool	07973–MC70000

Common

Piston slider	07755–0010000 or equivalent

TROUBLESHOOTING

Excessive Noise
- Crankshaft
  - Worn main bearing.
  - Worn rod bearing.
- Piston and connecting rod
  - Worn piston or cylinder.
  - Worn piston pin or pin hole.
  - Worn rod small end.

Low Compression or Uneven Compression
- Worn cylinder or piston ring.

Excessive Smoke
- Worn cylinder, piston or piston rings.
- Improperly installed piston rings.
- Damaged piston or cylinder.

Overheating
- Excessive carbon build-up on piston head.
- Blocked or restricted flow of coolant.
- Sticking thermostat.

Knocking or Abnormal Noise
- Worn pistons and cylinders.
- Excessive carbon build-up on piston head.

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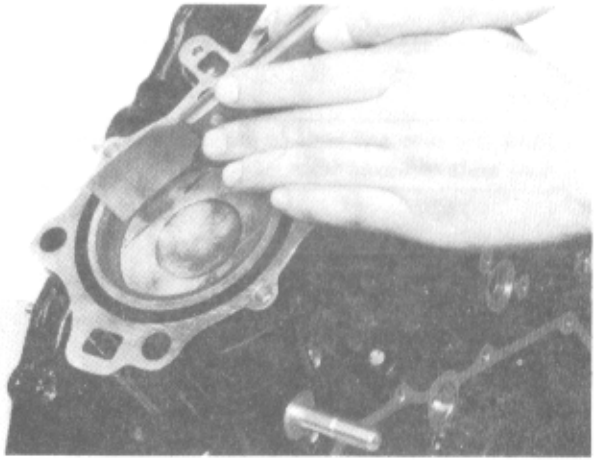
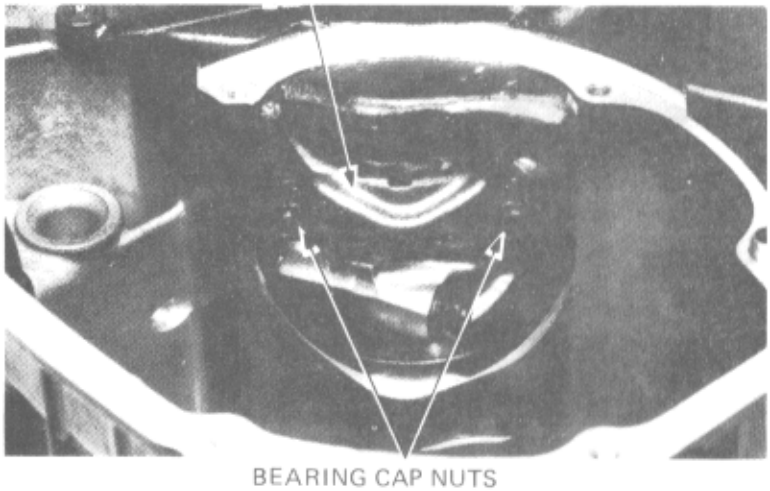
CONNECTING ROD REMOVAL

Remove the following:
- cylinder head (Section 7).
- oil pump (Section 8).
- transmission (Section 12).

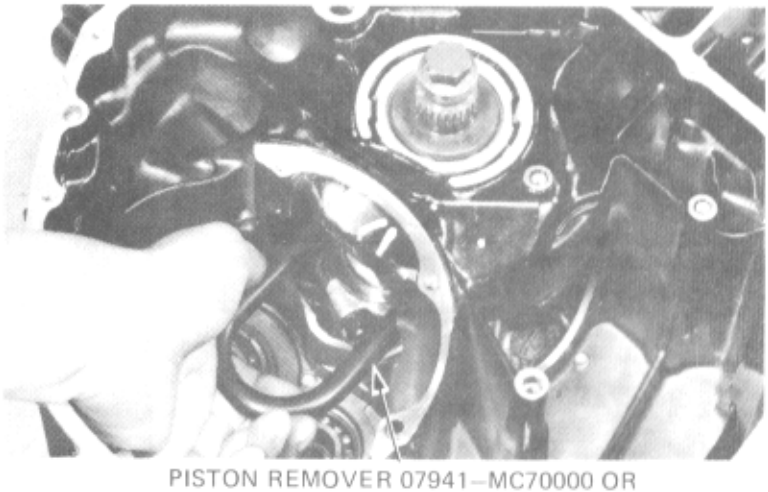
Scrape all deposits from the top of the cylinder.



Turn the crankshaft so that the piston to be removed is at BDC (Bottom Dead Center).
Remove the bearing cap and mark the bearing caps and rods to indicate cylinder position.
Remove the left side cap from the transmission. Work through the hole on the oil pump side to remove the right side cap.



Turn the crankshaft so that the piston is at TDC. Place the Piston Remover over the rod bolts, and push the piston and rod assembly out.

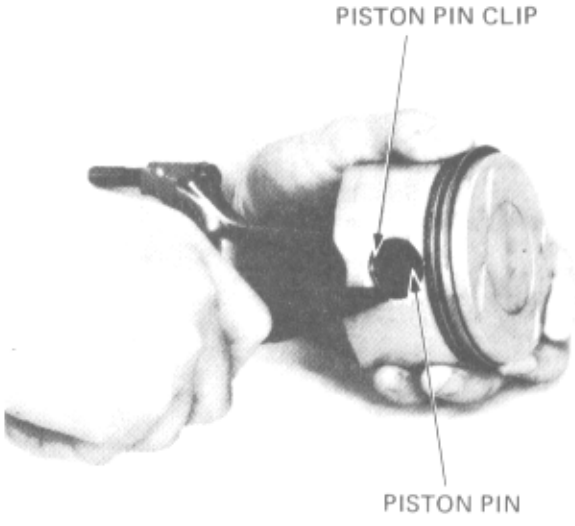


PISTON REMOVAL

Remove the piston pin clip and piston pin.

NOTE

Mark the pins and rods to indicate the piston they were removed from.



PISTON INSPECTION

Measure the ring-to-groove clearance.

SERVICE LIMIT:
TOP/SECOND: 0.10 mm (0.004 in)

Remove the piston rings.

NOTE

Mark the rings so they can be reinstalled on the piston they were removed from.

Clean and inspect the piston crown.

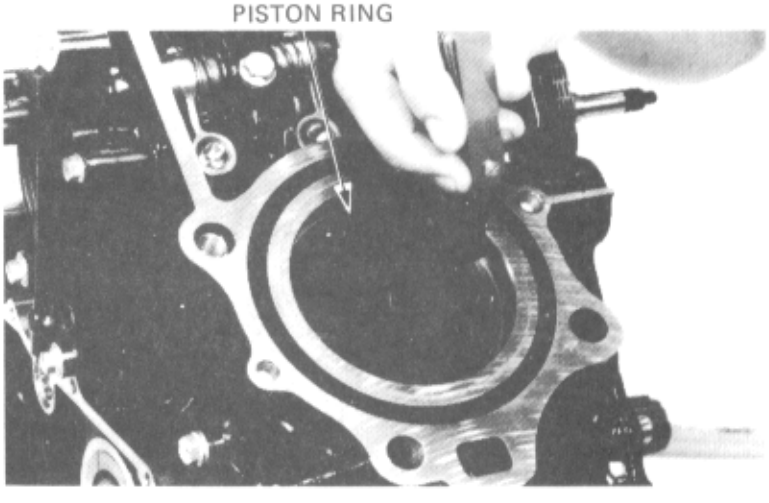
Inspect the piston for damage; check the ring grooves for excessive wear.

Insert each piston ring into the cylinder and measure the ring end gap.

SERVICE LIMITS:
TOP/SECOND: 0.60 mm (0.024 in)
OIL (SIDE RAIL): 1.10 mm (0.043 in)

NOTE

To measure the gap, use a piston to push the ring squarely into the cylinder.



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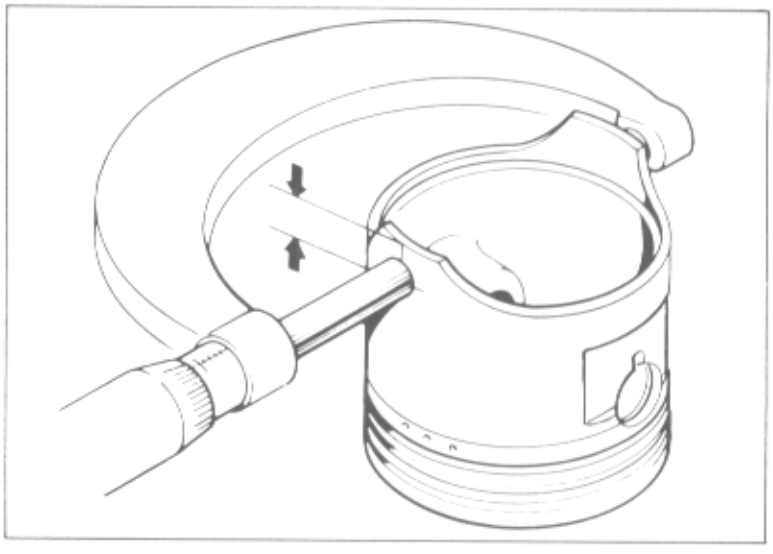
Measure the O.D. of each piston; 10 mm (0.40 in) from the bottom of the piston and 90° to the piston pin hole.

SERVICE LIMIT: 82.365 mm (3.2427 in)

If the pistons show wear beyond the limit, replacement is necessary.



CYLINDER INSPECTION

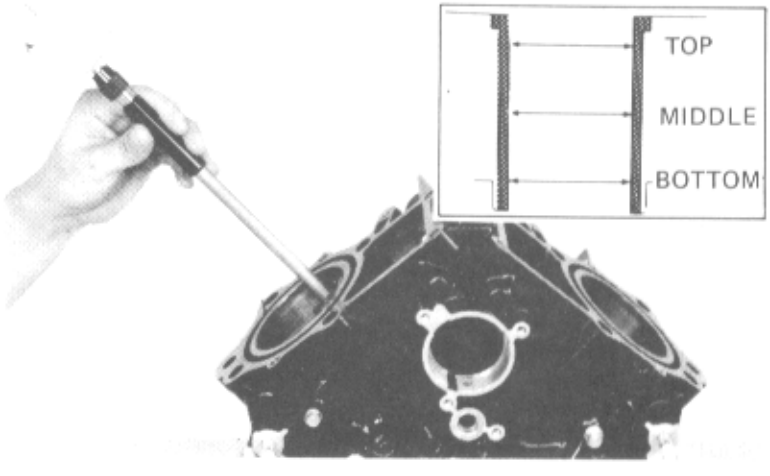
Measure the cylinder I.D.

SERVICE LIMIT: 82.600 mm (3.2520 in)

Calculate the piston-to-cylinder clearance.

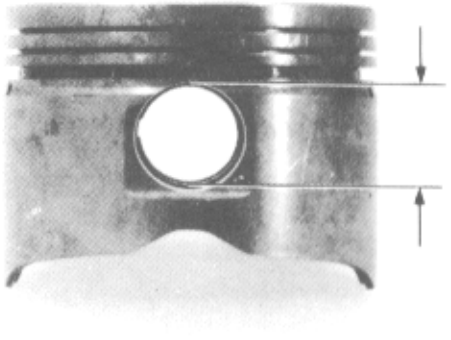
SERVICE LIMIT: 0.10 mm (0.004 in)

Oversize pistons are available in standard and 0.25 and 0.50 mm overbore sizes.



Measure the piston pin bore of each piston.

SERVICE LIMIT: 22.040 mm (0.8677 in)

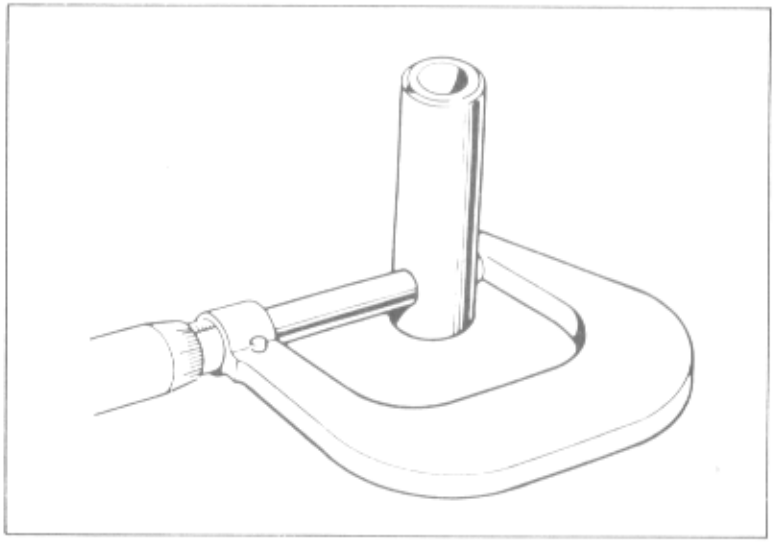


Measure the O.D. of each piston pin.

SERVICE LIMIT: 21.984 mm (0.8655 in)

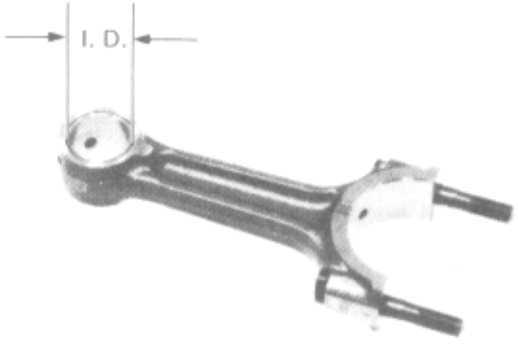
Calculate the piston pin to piston clearance.

SERVICE LIMIT: 0.05 mm (0.002 in)



Measure the rod end I.D. if the reading exceeds the service limit, replace the rod.

SERVICE LIMIT: 22.068 mm (0.8688 in)

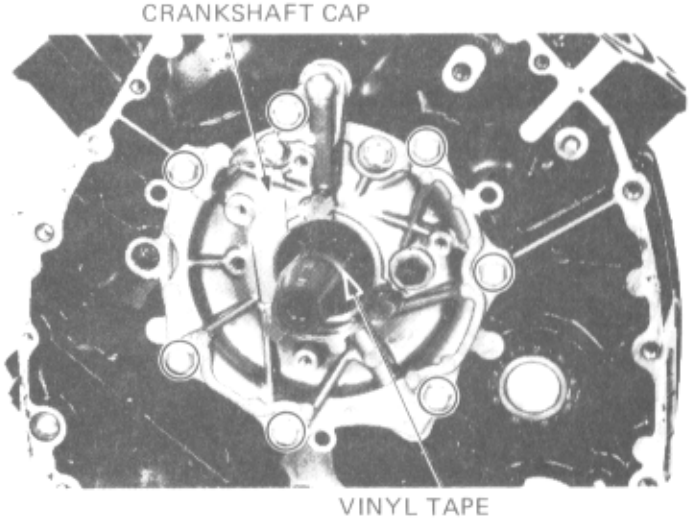


CRANKSHAFT REMOVAL

Remove the flywheel and cam chain (Section 11).
Remove the crankshaft holder cap bolts.

NOTE

Before removing the crankshaft, wrap the splines of the primary gear and timing sprocket with vinyl tape to prevent damage to the main bearing journals.



Attach the Crank Cap Puller to the front of the engine.

Press the crankshaft out by screwing in the Crank Cap Puller.

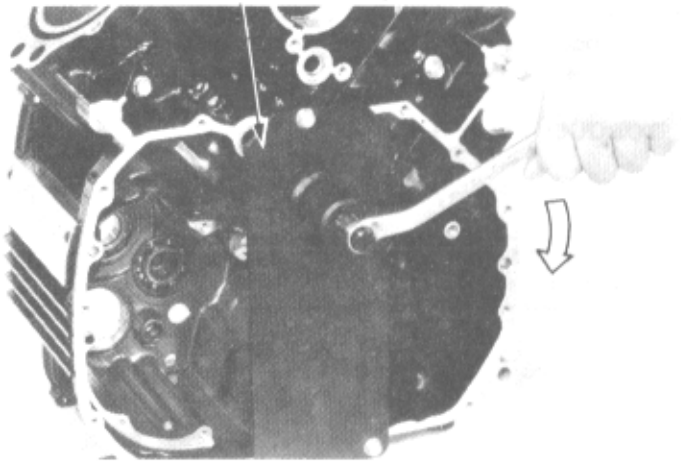
Hold the crankshaft to prevent it from falling.

CAUTION

Be careful not to damage the bearing when removing the crankshaft.

U.S.A.–
Place the engine case in a hydraulic press on supports so that it is at least 2 inches above the adjustable cross beam. Press the crankshaft and while holding the crankshaft cap.

CRANK CAP PULLER 07935–4150000
(NOT AVAILABLE IN U.S.A.)



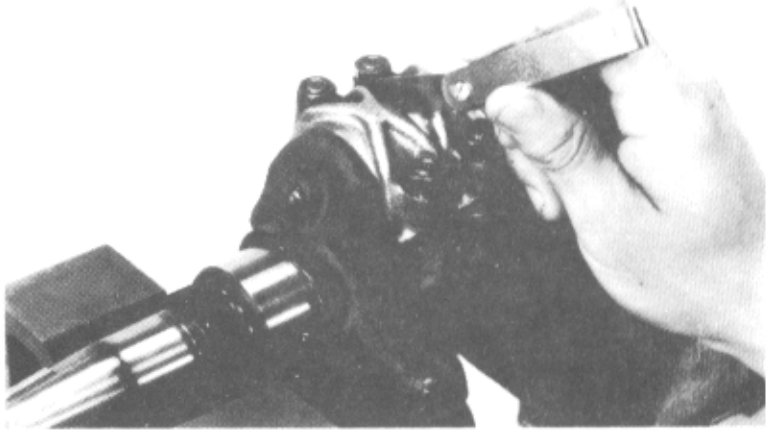
ROD SIDE CLEARANCE INSPECTION

Install each connecting rod and bearing cap in its original position and torque to specifications evenly in 2–3 steps.

TORQUE: 41–45 N·m
(4.1–4.5 kg-m, 30–33 ft-lb)

Measure the rod side clearance with a feeler gauge.

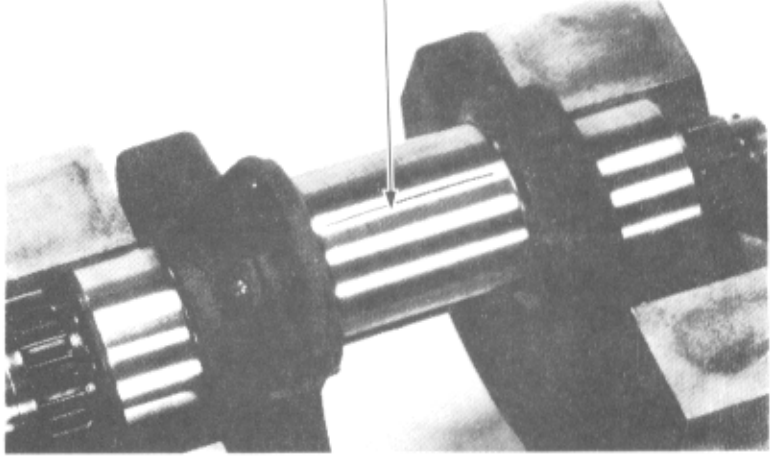
SERVICE LIMIT: 0.50 mm (0.020 in)



CRANK PIN BEARING INSPECTION/ SELECTION

Inspect each bearing insert for separation or other damage. Put the connecting rod inserts in each rod and rod cap.
Place a plastigauge strip across each rod crankpin avoiding the oil hole.

PLASTIGAUGE

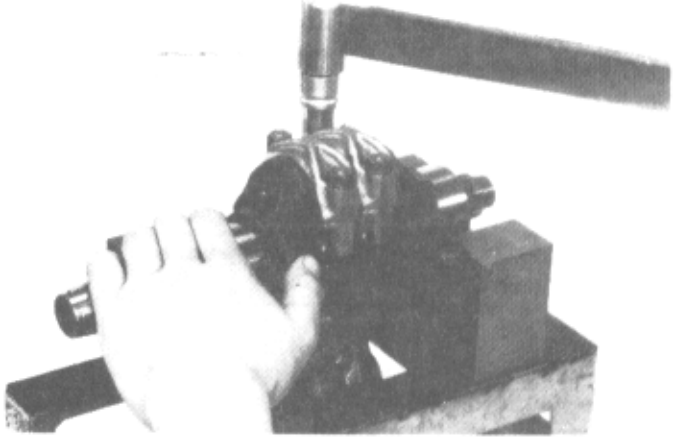


Install each connecting rod and bearing cap in their original positions and torque to specification evenly in 2-3 steps.

TORQUE: 41–45 N·m
(4.1–4.5 kg-m, 30–33 ft-lb)

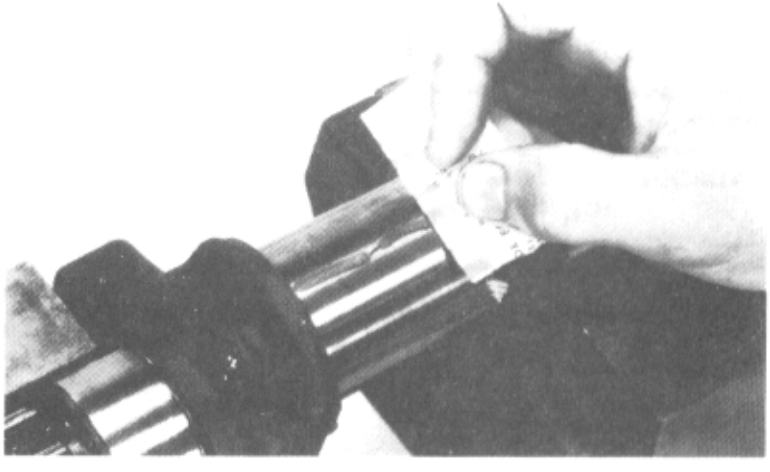
NOTE

Do not rotate the crankshaft during the inspection.



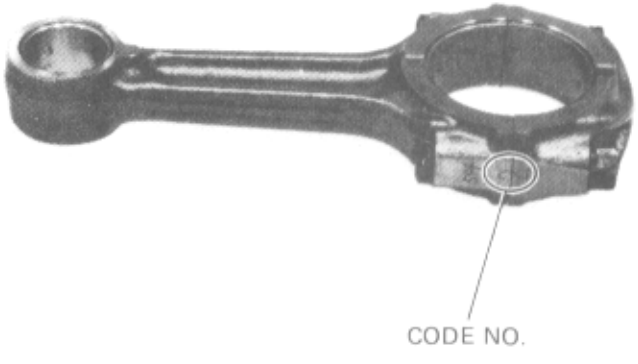
Remove the caps and measure the width of the compressed plastigauge. The widest thickness determines the oil clearance.

SERVICE LIMIT: 0.085 mm (0.0033 in)



ROD BEARING SELECTION

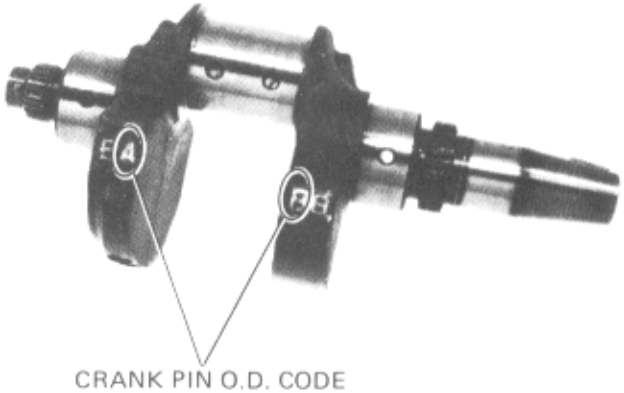
Determine and record each connecting rod I.D. code number.



Determine and record the crank pin O.D. code letters.

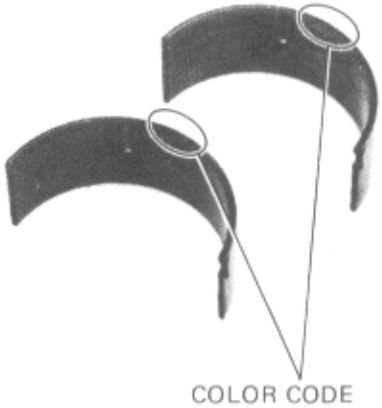
Cross reference the crank pin and rod codes to determine the replacement bearing color.

CONNECTING ROD I.D. CODE NUMBER		CRANK PIN SIZE CODE LETTER: A	CRANK PIN SIZE CODE LETTER: B
		42.994–43.004 mm (1.6927–1.6931 in)	42.984–42.994 mm (1.6923–1.6927 in)
		COLOR IDENTIFICATION	
1	46.000–46.010 mm (1.8110–1.8114 in)	YELLOW	GREEN
2	46.010–46.020 mm (1.8114–1.8118 in)	GREEN	BROWN



CRANK PIN O.D. CODE

COLOR	BEARING THICKNESS
BROWN	1.494–1.490 mm (0.0588–0.0587 in)
GREEN	1.490–1.486 mm (0.0587–0.0585 in)
YELLOW	1.486–1.482 mm (0.0585–0.0583 in)

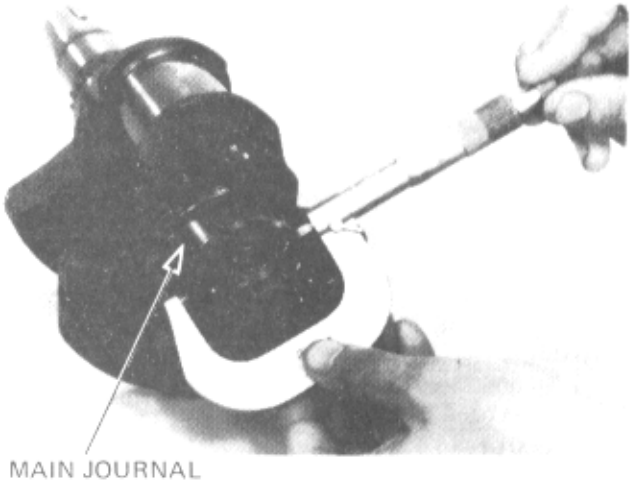

COLOR CODE

NOTE

After fitting new bearing inserts, they should be rechecked with plastigauge.

MAIN JOURNAL

Measure and record each journal's O.D.

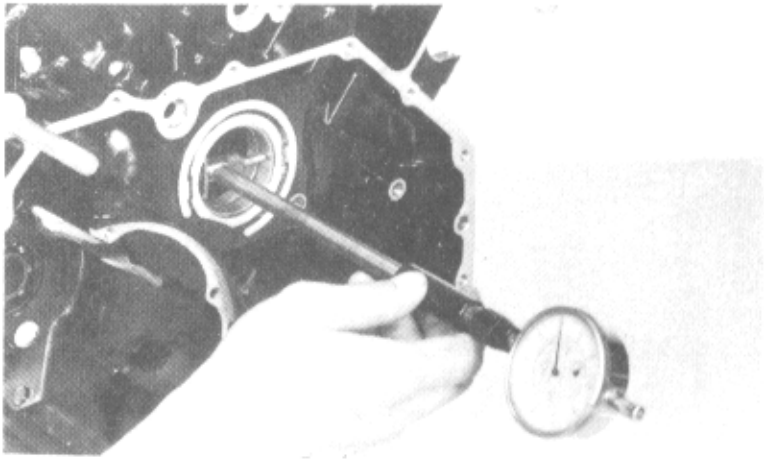


Measure and record the engine case and crankshaft bearing I.D.'s.
Calculate the journal-to-bearing clearance.

SERVICE LIMIT: 0.085 mm (0.0033 in)

CAUTION

Be careful not to damage the inside of the bearing.

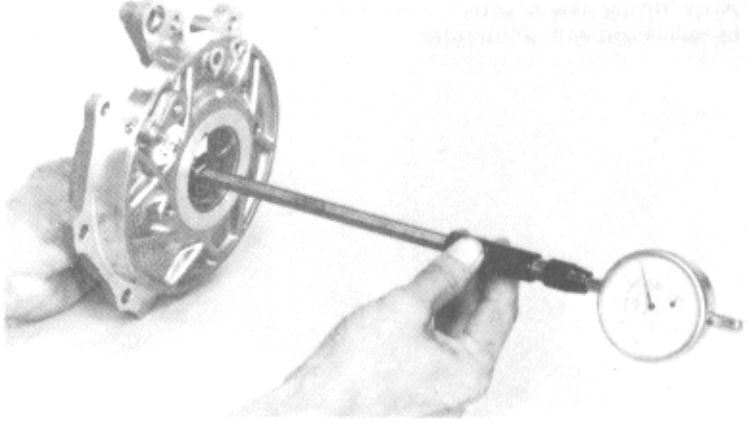


Measure the crankshaft cap bearing I.D. and calculate the journal-to-bearing clearance.

SERVICE LIMIT: 0.085 mm (0.0033 in)

CAUTION

Be careful not to damage the inside of the bearing.



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MAIN JOURNAL BEARING REPLACEMENT

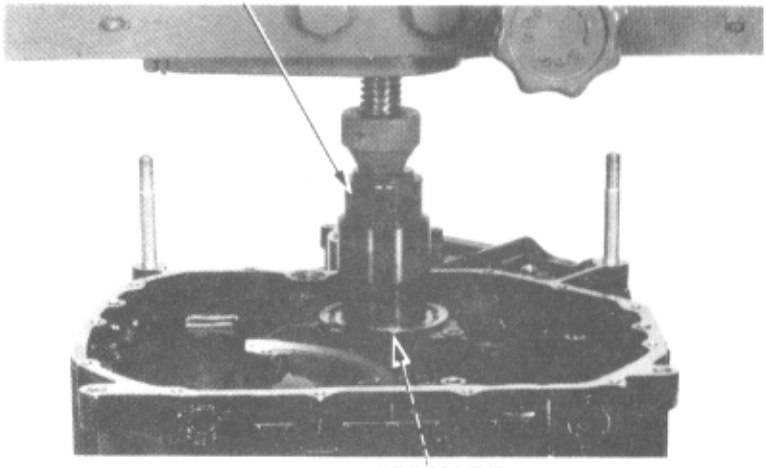
REMOVAL

Press the bearing out with a hydraulic press and Main Bearing Dis/assembly Tool; use the end with the "R" mark.

CAUTION

To prevent engine case damage, always use a hydraulic press and bearing removal tool to remove bearings.

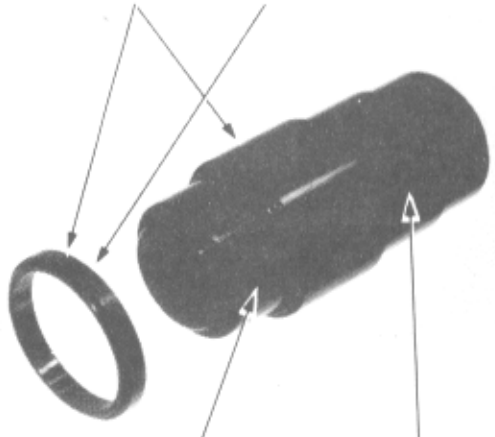
DIS/ASSEMBLY TOOL 07973–MC70000



"R" MARK

DIS/ASSEMBLY TOOL 07973–MC70000

ATTACHMENT (TO PRESS IN CRANK CAP BEARINGS)



(TO PRESS OUT CRANKCASE MAIN JOURNAL BEARINGS)

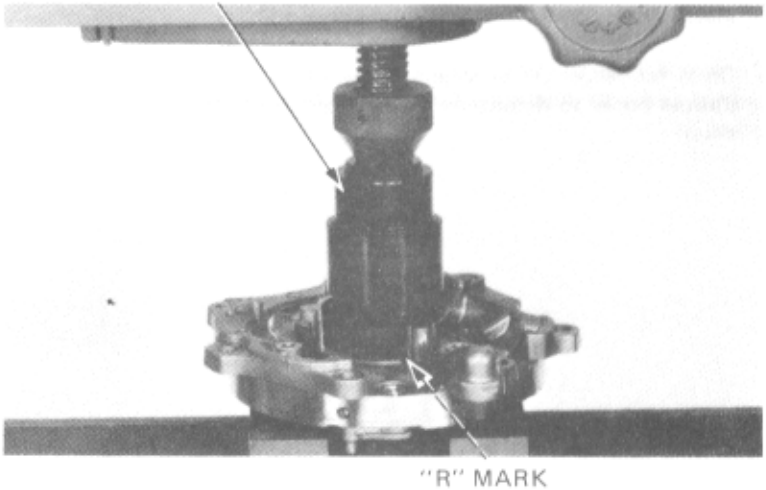
(TO PRESS IN MAIN JOURNAL BEARINGS)

Press the bearings out of the crankshaft cap bearing support with a hydraulic press and bearing removal tool. Use the tool end with the "R" mark.

CAUTION

To prevent crankshaft cap damage, always use a hydraulic press and bearing removal tool to remove bearings.

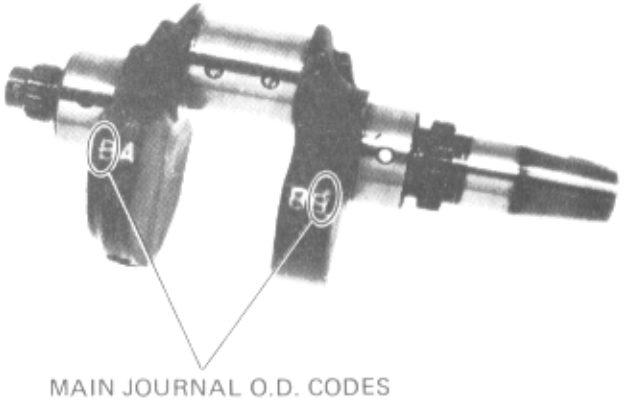
DIS/ASSEMBLY TOOL 07973–MC70000



"R" MARK

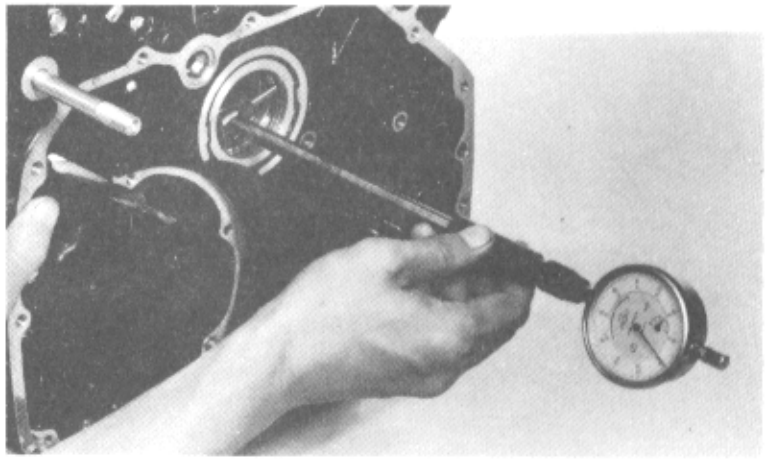
SELECTION

Determine and record the main journal O.D. codes.



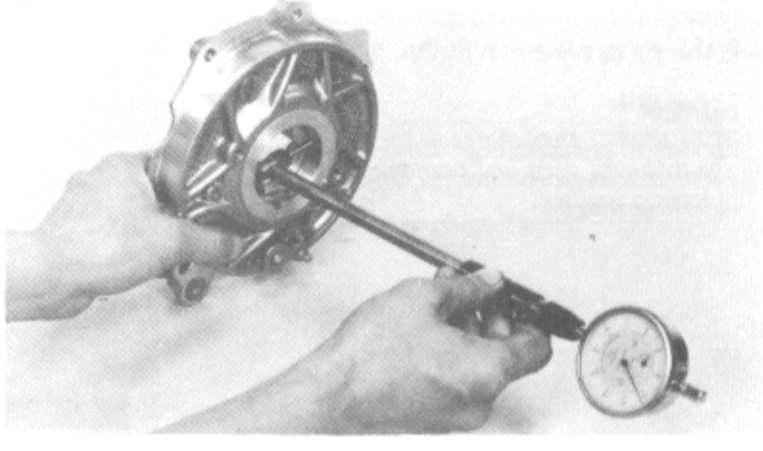
MAIN JOURNAL O.D. CODES

Measure and record the engine case bearing support I.D.



Measure the crankshaft cap bearing support I.D.

Cross reference the bearing support I.D. and crank journal codes to determine the replacement bearing color.



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MAIN BEARING SELECTION

CRANKCASE/CAP BEARING SUPPORT I.D.	MAIN JOURNAL SIZE CODES	
	A	B
	BEARING IDENTIFICATION COLOR	
46.030–46.040 mm (1.8122–1.8126 in)	BROWN	BLACK
46.020–46.030 mm (1.8118–1.8122 in)	BLACK	BLUE

JOURNAL BEARING SIZES

COLOR	THICKNESS
BROWN	1.989–1.999 mm (0.0783–0.0787 in)
BLACK	1.994–2.004 mm (0.0785–0.0789 in)
BLUE	1.999–2.009 mm (0.0787–0.0791 in)

COLOR CODE

INSTALLATION

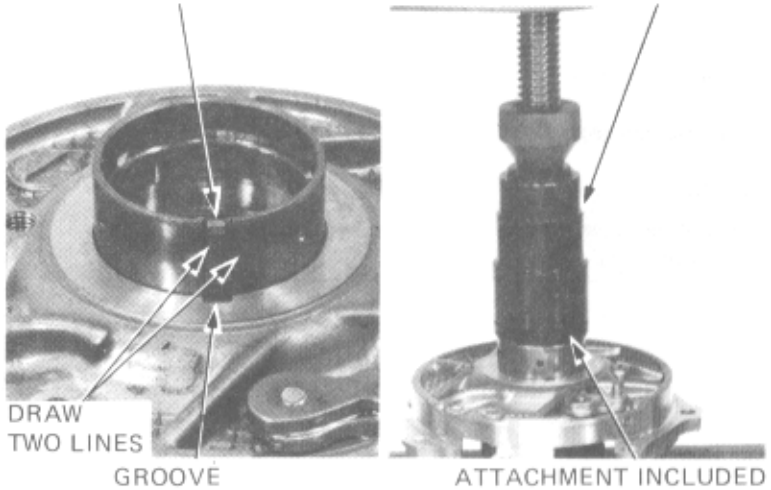
Apply engine oil or molybdenum disulfide grease to the bearing outer surface.
Align the tab of the bearing insert with the holder cap groove and press the bearings into place. Use the end of the tool with the "P" mark and the attachment.

NOTE

Draw two lines on the outside of the bearings to match the tab to aid in bearing alignment.

CAUTION

Be careful not to damage the bearings, when press fitting them.

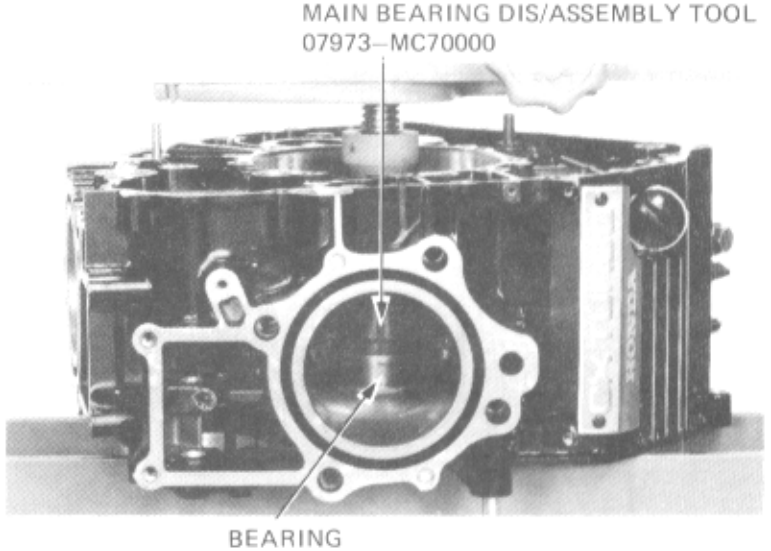


Lubricate the outer surface of the bearing with engine oil or molybdenum disulfide grease.

Align the tab of the bearing insert with the crankcase bearing support groove and press the bearings into place. Use the end of the tool with the "P" mark.

CAUTION

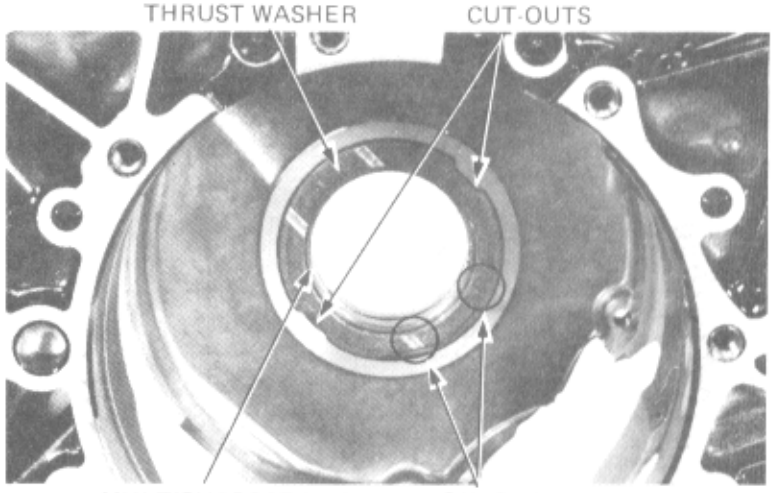
Be careful not to damage the bearings, when press fitting them.



CRANKSHAFT INSTALLATION

Lubricate the journal bearing of the engine case with Multipurpose NLGI No. 2 (MoS_2 additive) Grease.

Install the thrust washer on the engine case bearing with the oil grooves facing the rear and cut-outs aligned with the lugs on the engine case.

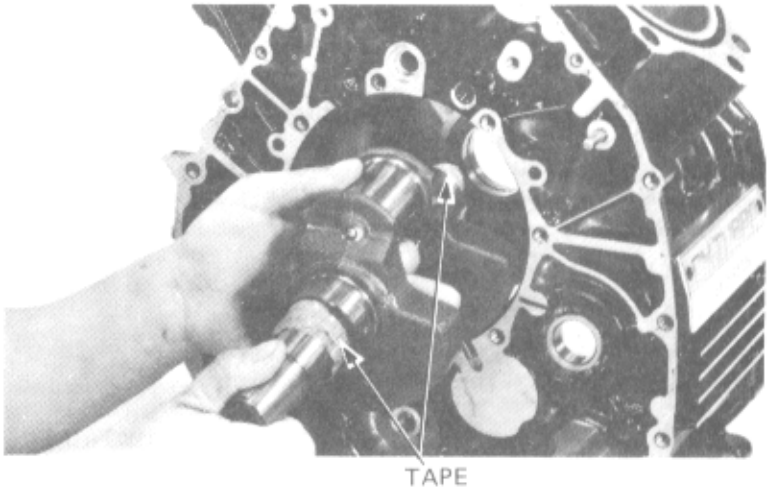


Wrap the splines of the crankshaft and timing gear area with vinyl tape to prevent damage to the main journal bearings.

Install the crankshaft.

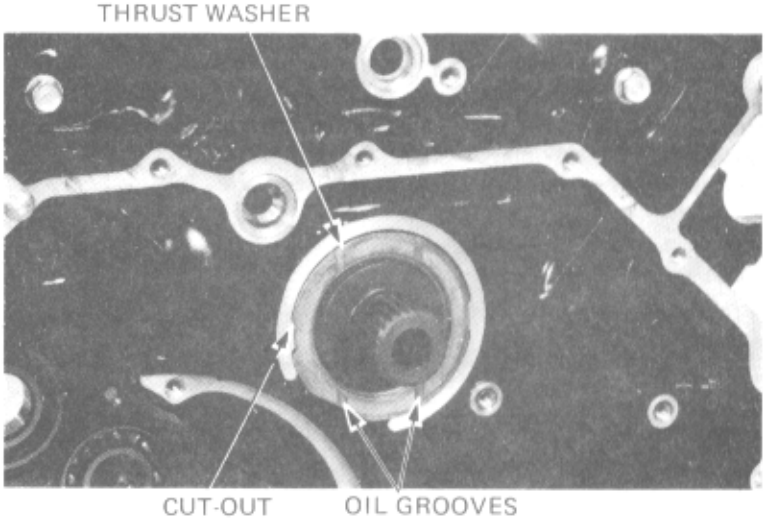
NOTE

Make sure that the thrust washer is not displaced.



Remove the vinyl tape from the splines.

Install the thrust washer on the engine case bearing with the oil grooves facing the front and cut-outs aligned with the lugs on the engine case.



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Install the primary gear and primary sub gear onto the crankshaft.

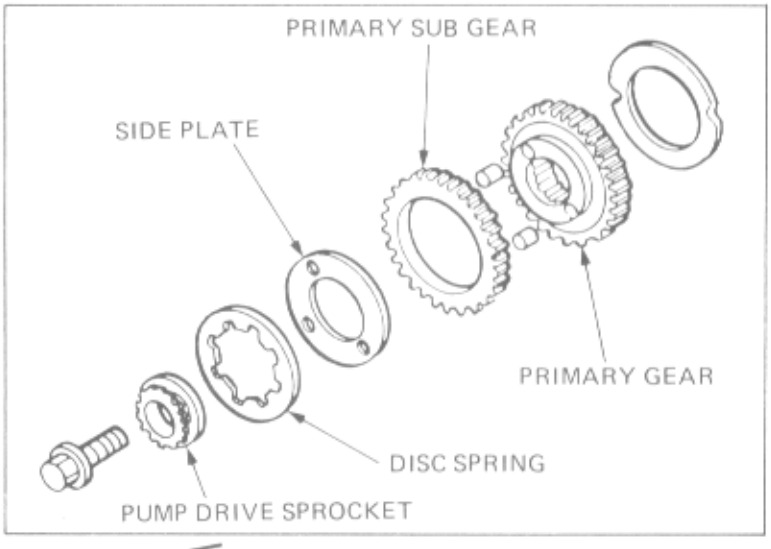
Install the side plate with the holes aligned with the dowel pins on the primary gear.

Install the oil pump drive sprocket and disc spring on the crankshaft aligning the cut-out in the pump drive gear with the dowel pin on the crankshaft.

Install the primary drive gear bolt and tighten it loosely to prevent damage to the crankshaft thrust washer when installing the crank cap.

NOTE

When installing the transmission assembly, the primary gears must be removed.



GREASE
MULTIPURPOSE NLGI
No. 2 (MoS_2 ADDITIVE)

Lubricate the main journal bearing of the crank cap with Multipurpose NLGI No. 2 (MoS_2 additive) Grease.

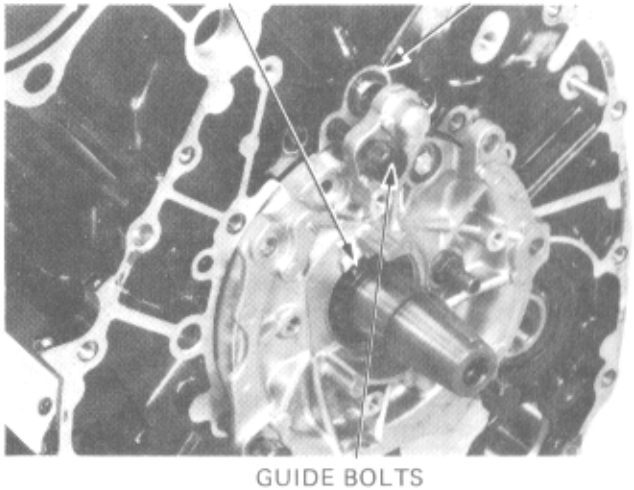
Install the O-ring and collar.

Install the crankshaft holer cap.

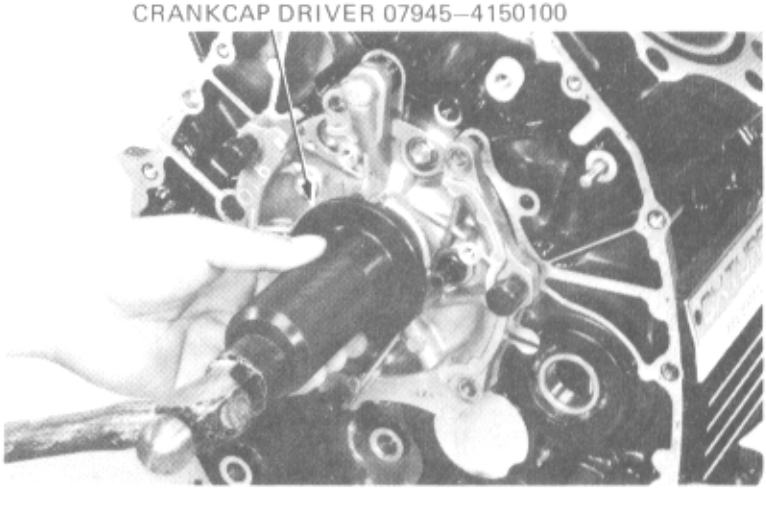
Install the guide bolts in the crankshaft holder cap as shown.

NOTE

Screw in the guide bolts evenly so that the cap is not tilted.



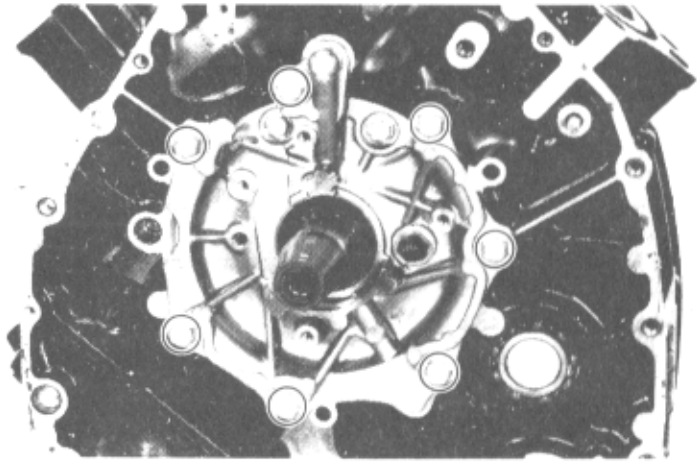
Press the crankshaft holder cap into place with the crank cap driver.



Tighten the crank cap bolts in a crisscross pattern.

TORQUE: 20–24 N·m
(2.0–2.4 kg-m, 14–17 ft-lb)

Turn the crankshaft to make sure it moves freely.



PISTON INSTALLATION

Clean the piston crown, ring lands, and side faces.

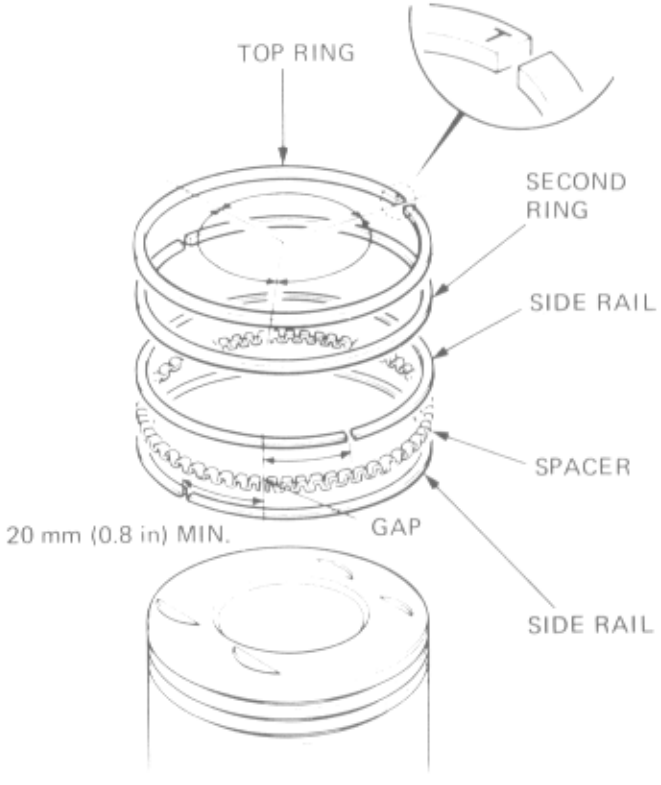
Carefully install the piston rings.

NOTE

- Be careful not to damage the pistons and piston rings during assembly.
- All rings should be installed with the markings facing up.
- Space the piston ring end gaps 120 degrees apart, avoiding the piston pin and thrust sides.
- Do not align the gaps in the oil rings.
- After installing the rings, they should be free to rotate in their grooves.

TOP RING

SECOND RING

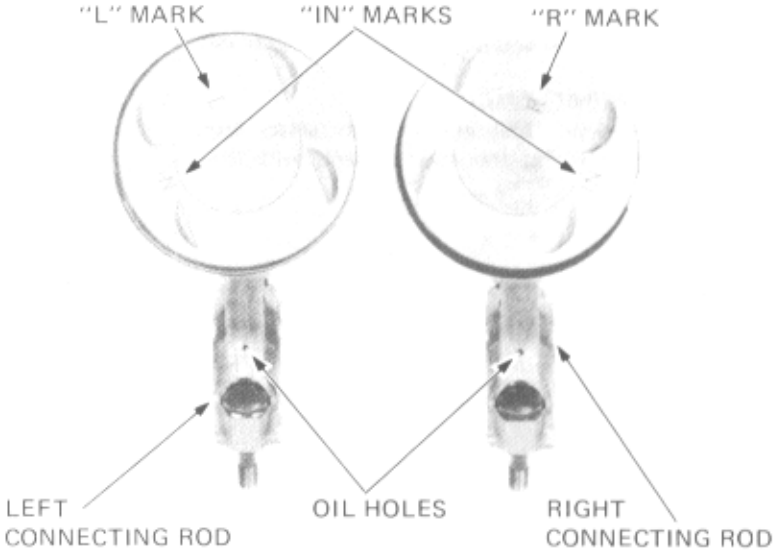


Coat the rod small end with molybdenum disulfide grease.

Assemble the pistons and connecting rods with the piston pins and new piston pin clips as shown.

NOTE

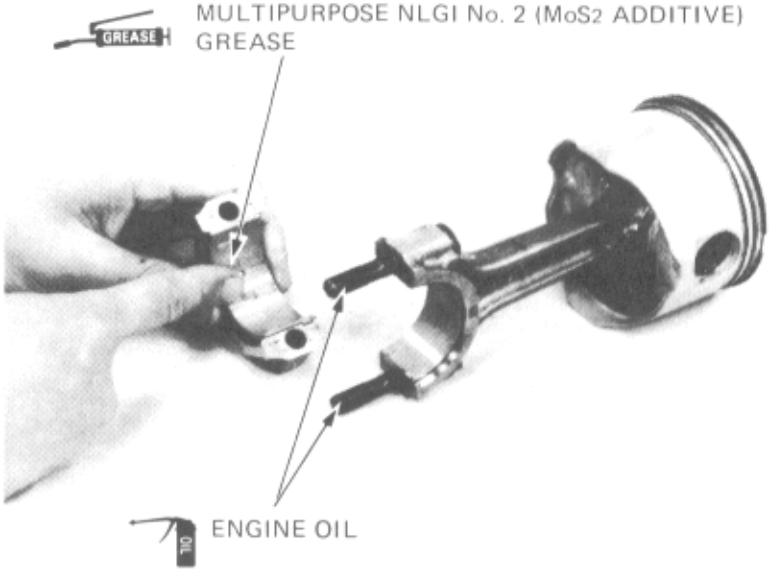
- Do not interchange the pistons, piston pins and connecting rods.
- Make sure that the piston pin clips are properly seated.
- Install the piston with the "L" mark on the left and the piston with the "R" mark on the right.



CONNECTING ROD INSTALLATION

Lubricate the rod bearings with Multipurpose NLGI No. 2 (MoS2 additive) Grease.

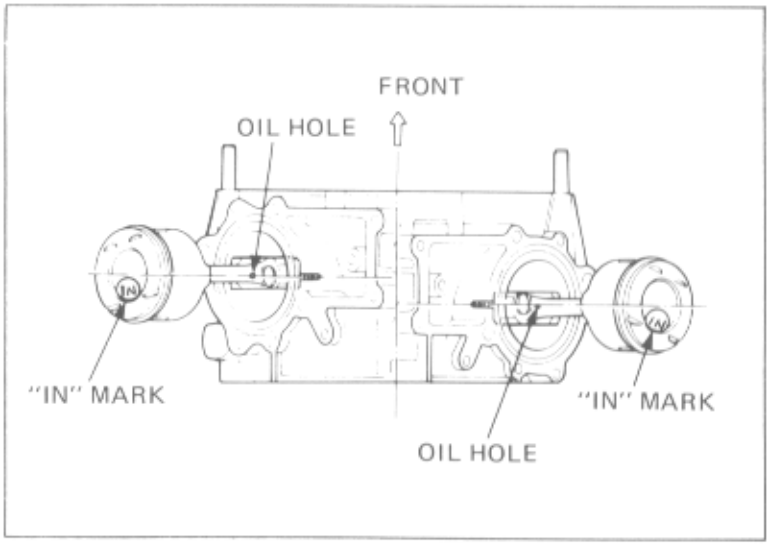
Clean the connecting rod cap bolts and apply engine oil to the bolt threads.



Install the rod assemblies into the cylinders from the top of the engine case.

NOTE

- The rod assemblies should be installed with the piston "IN" markings to the rear.
- Lubricate the piston ring grooves and cylinder walls with engine oil.



Lubricate the piston and piston ring with engine oil.

Bring the crankshaft to TDC.
Compress the piston rings and insert the piston into the cylinder aligning the rod big end with the crankpin.

NOTE

Be careful not to damage the pistons or rings during assembly.

Coat the connecting rod cap nuts with clean engine oil and install the connecting rod caps.

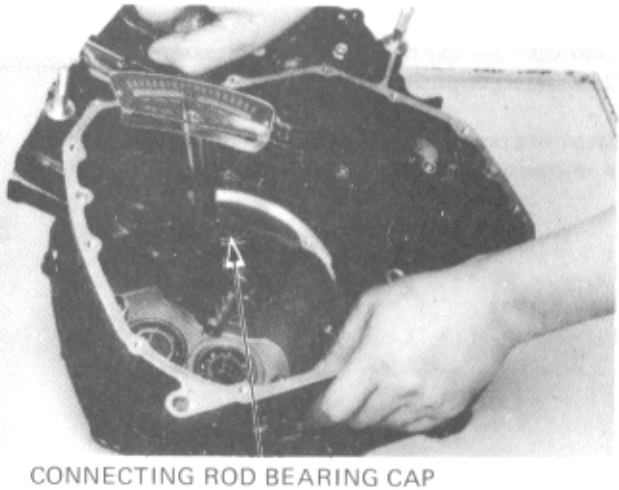
Torque the connecting rod cap nuts evenly in 2-3 steps.

TORQUE: 41–45 N·m
(4.1–4.5 kg-m, 30–33 ft-lb)

Turn the crankshaft to make sure the rods rotate freely without binding.

NOTE

Be sure the connecting rod bearing caps are installed in their original locations.


CONNECTING ROD BEARING CAP

CYLINDER COMPRESSION

Warm up the engine to operating temperature and stop the engine.
Turn the engine stop switch OFF.

Disconnect one spark plug cap and remove that spark plug.

WARNING

The fuel lines are pressurized. Remove only one spark plug at a time to prevent gasoline from being forced out the empty spark plug hole and creating a fire hazard. If gasoline gets in your eyes, wash out with water and get prompt medical attention.

Insert the compression gauge.

Open the throttle valves fully and crank the engine with the starter motor with the engine stop switch OFF until the gauge needle stops rising.

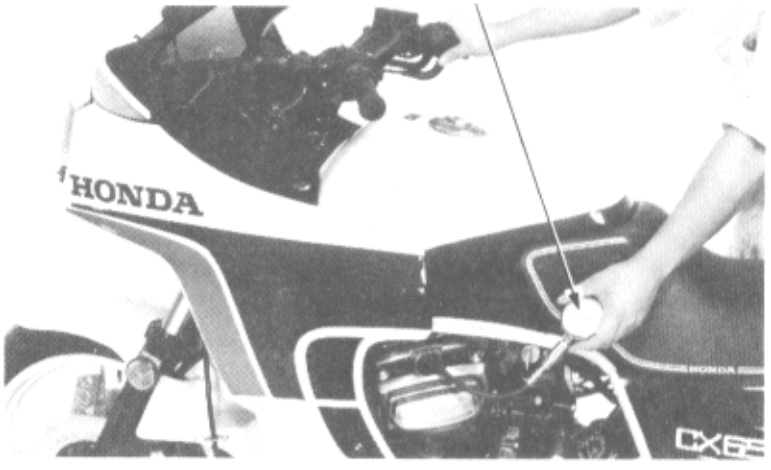
NOTE

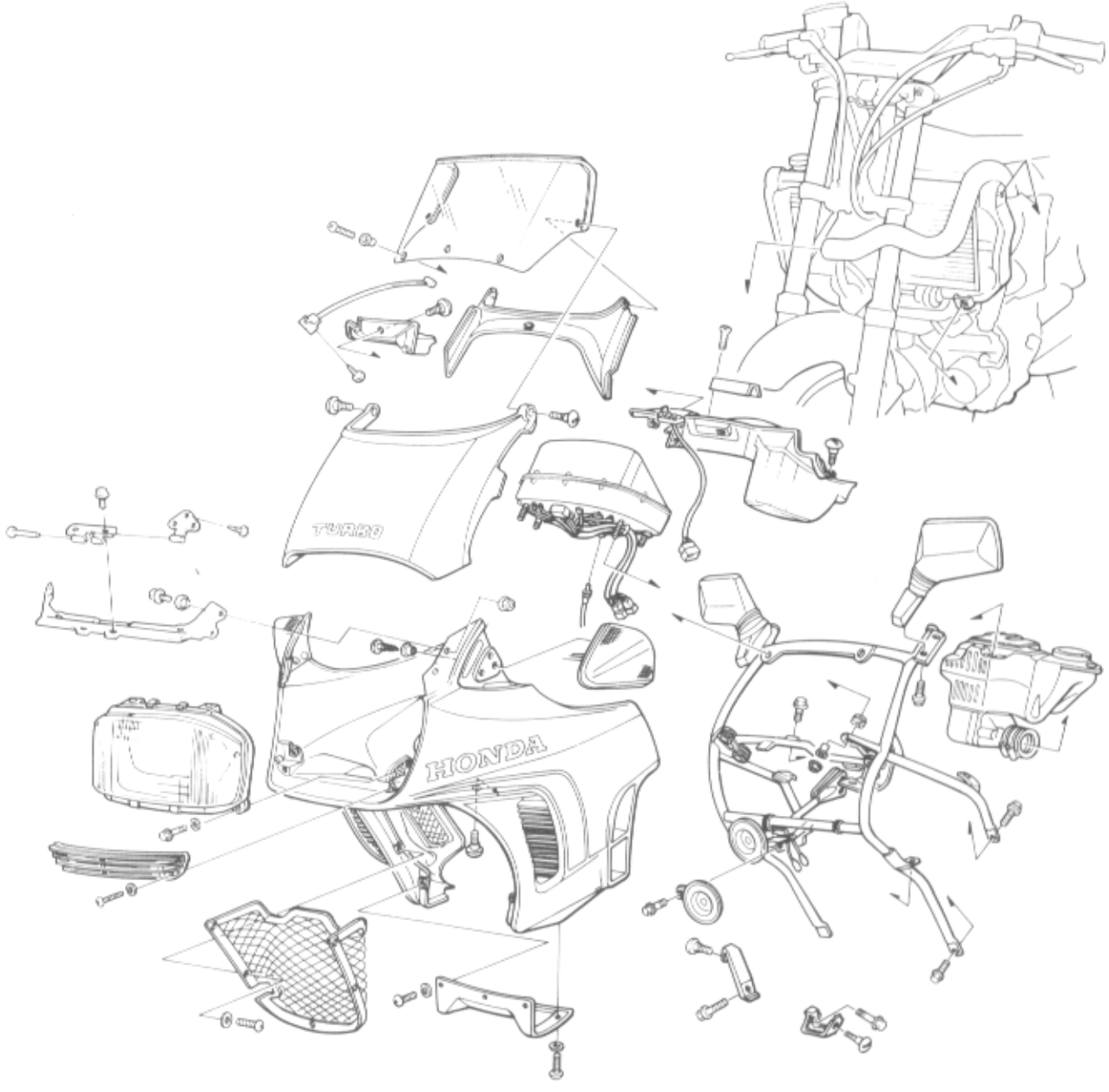
The maximum reading is usually reached within 4–7 seconds.

COMPRESSION PRESSURE:
700–1,000 kPa (7.0–10.0 kg/cm^2
99.5–142 psi)

Reinstall the spark plug and cap.
Repeat the test for the other cylinder.

COMPRESSION GAUGE





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14. FAIRING/INSTRUMENTS

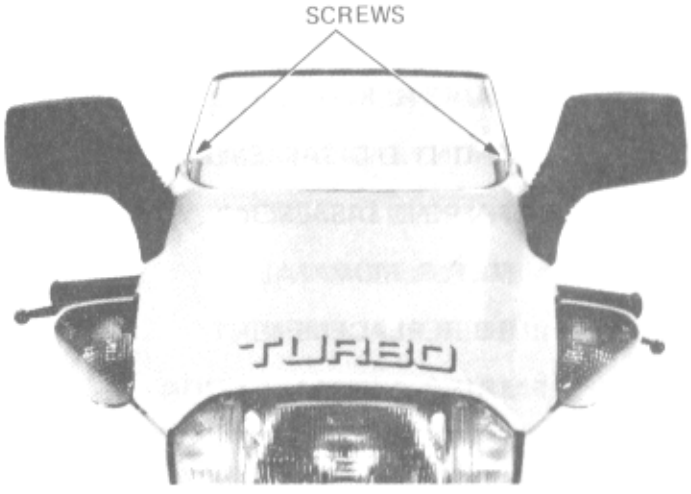
SERVICE INFORMATION

GENERAL

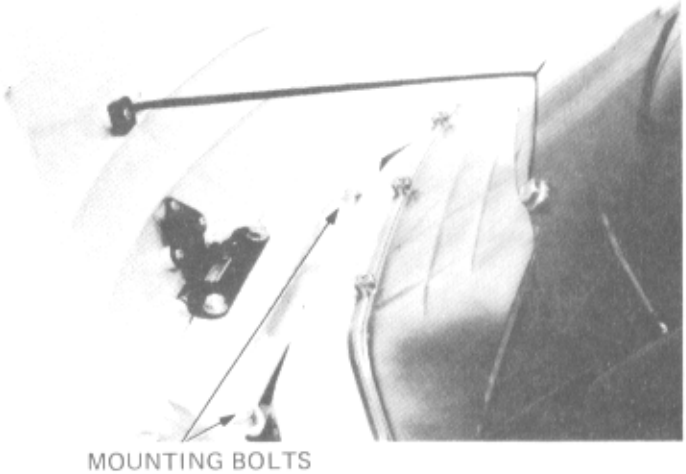
- For cable and harness routing refer to Section 1.
- Refer to section 20 for the Wiring Diagram.

FAIRING REMOVAL

Open the fairing cover by unscrewing the top two screws and pulling the cover forward.



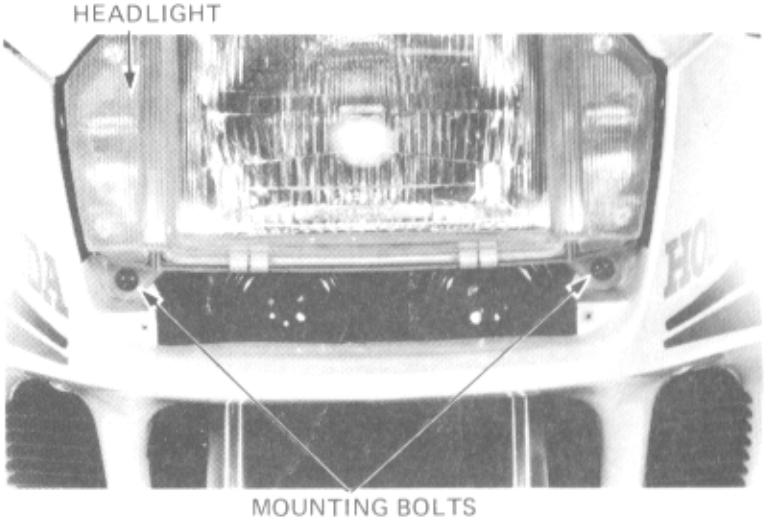
Remove the headlight mounting bolts and collars inside the fairing.



Remove the trim from under the headlight.

Remove the headlight mounting bolts and collars and pull the headlight out of the fairing.

Disconnect the headlight coupler and running light wires; remove the headlight.



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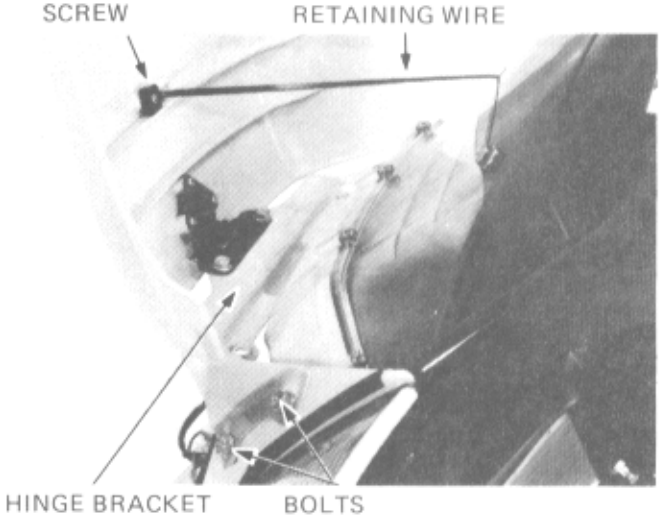
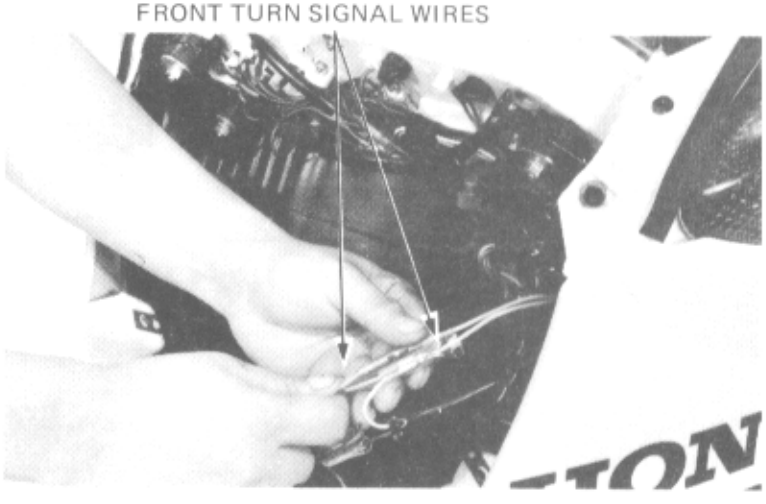
Remove the fairing cover retaining wire by loosening the screws at the cover.

Remove the four bolts attaching the fairing hinge bracket to the fairing.

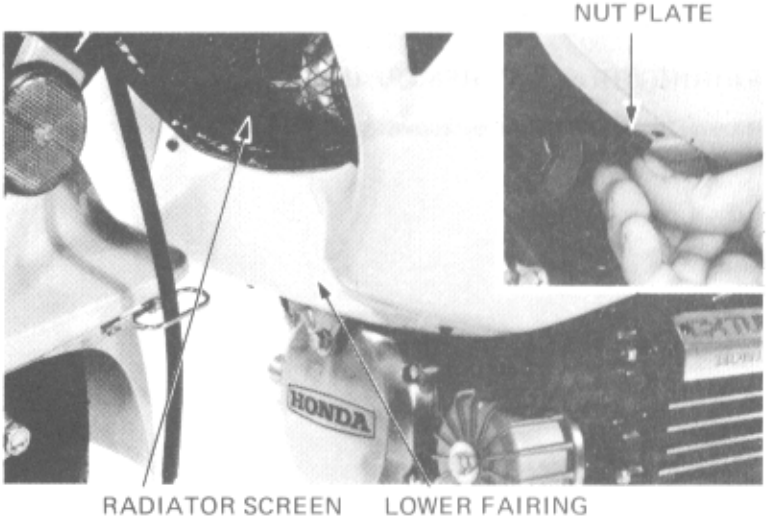
Remove the fairing cover with hinge bracket from the fairing.



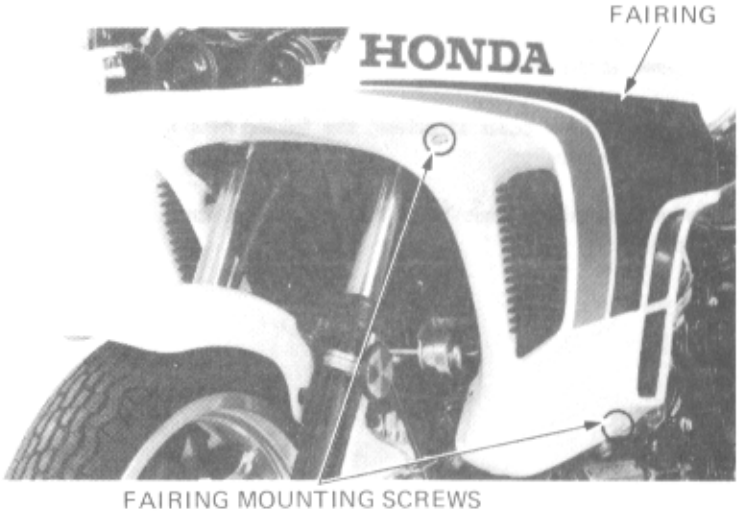
Disconnect the front turn signal wires inside the fairing.



Remove the radiator screen and lower fairing by removing the screws. Remove the nut plates from the edge of the fairing as they may gouge the front forks and front fender when removing the fairing.



Remove the four fairing mounting screws.

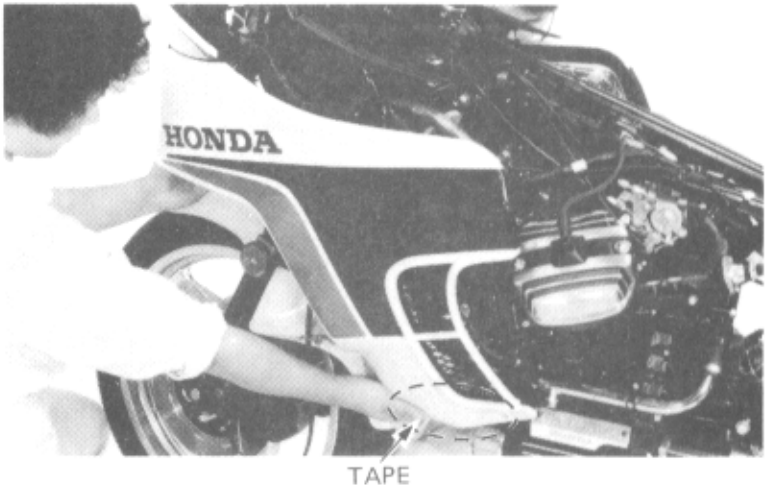


FAIRING MOUNTING SCREWS

Remove the fairing from the fairing bracket.

NOTE

Put tape on both bottom edges of the fairing or the front fork legs and the front fender, to prevent them from damage when the fairing is removed.

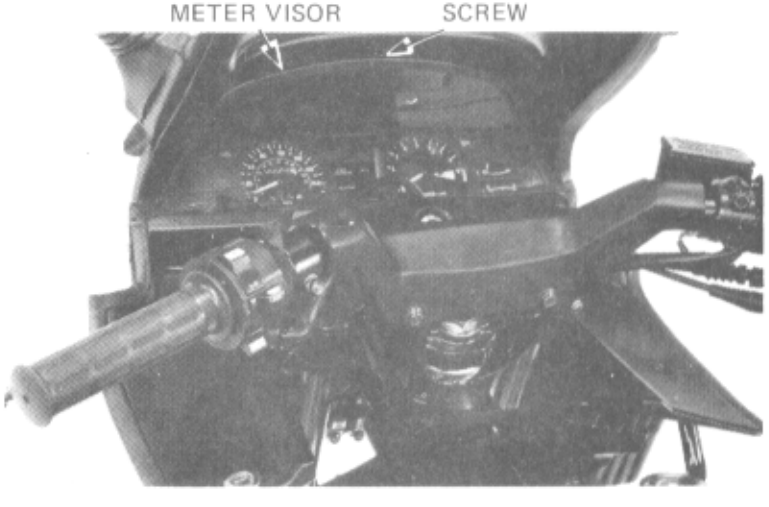


TAPE

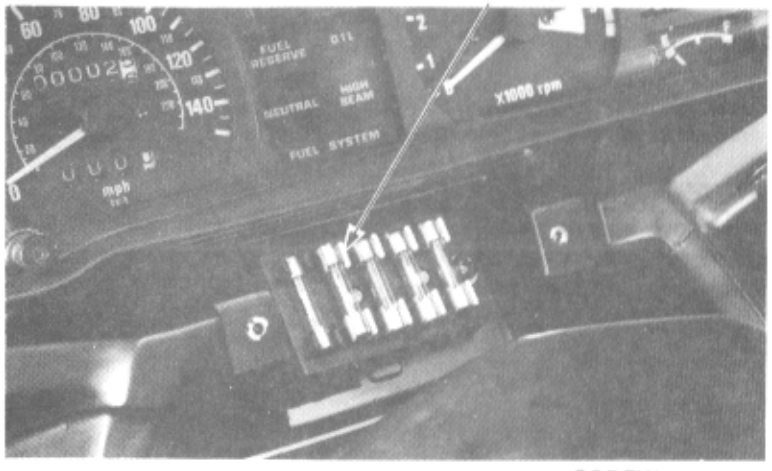
FRONT END DISASSEMBLY

FAIRING BRACKET REMOVAL

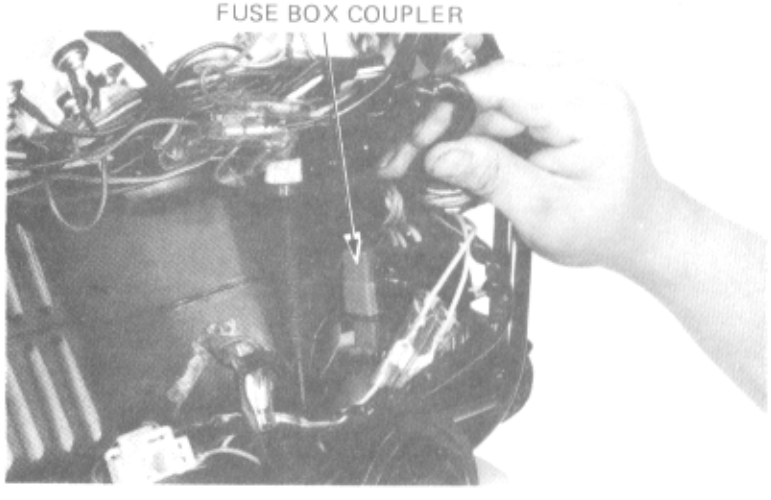
Remove the meter visor by removing the attaching screw.



Remove the two screws attaching the fuse box cover to the left/center dashboard.

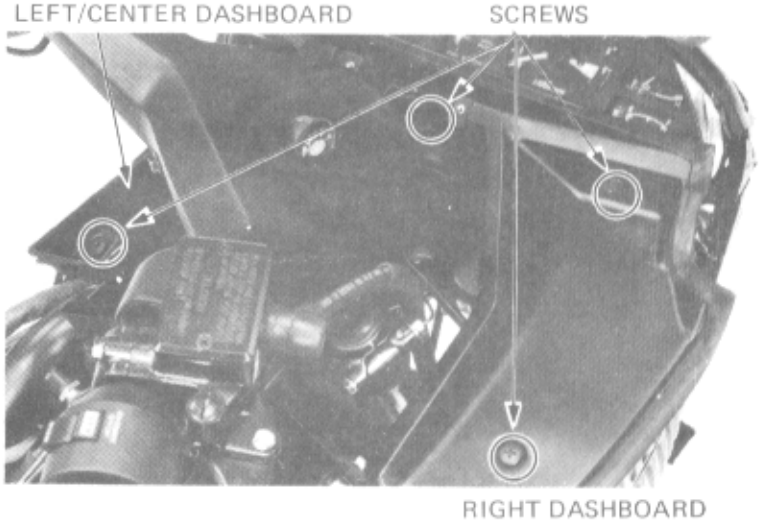


Disconnect the red fuse box coupler and remove the fuse box.



Remove the right dashboard by removing the two screws.

Remove the left/center dashboard with fuse box by moving the two screws.

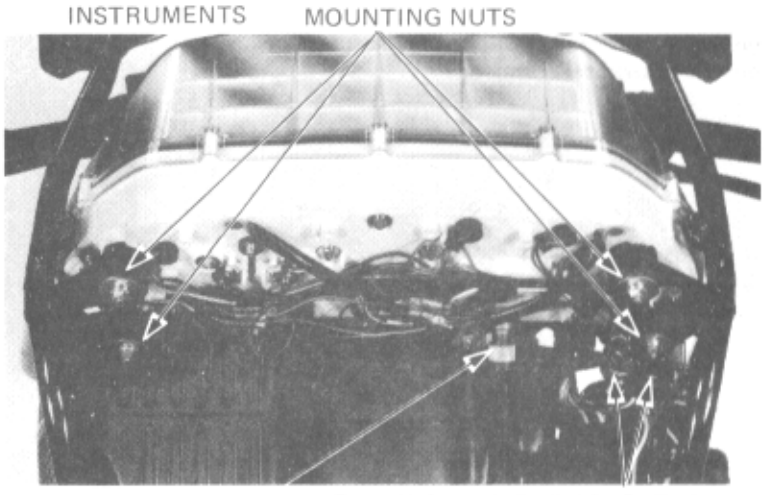


Disconnect the instrument couplers and speedometer cable.

Remove the four instrument mounting nuts to remove the instruments from the fairing bracket.

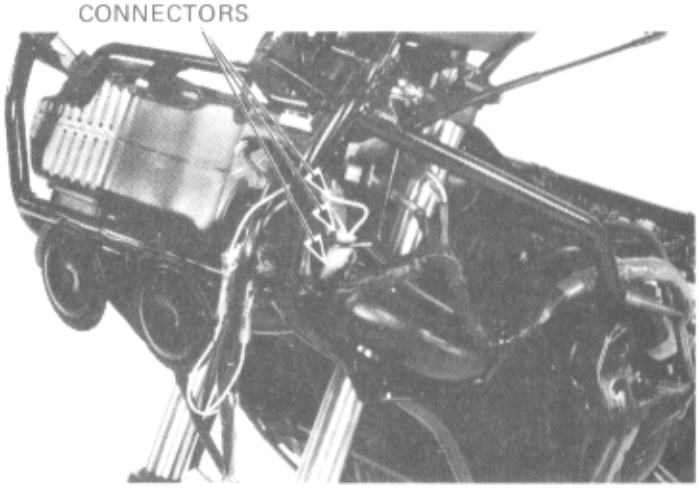
NOTE

The instruments should not be placed upside down because damper oil will leak out if the instruments are placed upside down.

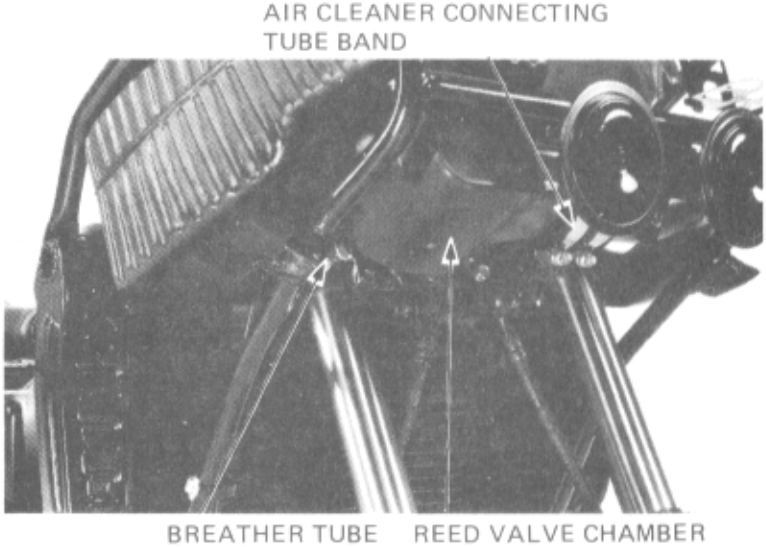


Remove the wire band.

Disconnect all connectors and couplers.



Loosen the air cleaner connecting tube bands and disconnect the connecting tube from the reed valve chamber.
Disconnect the breather tube from the reed valve chamber.



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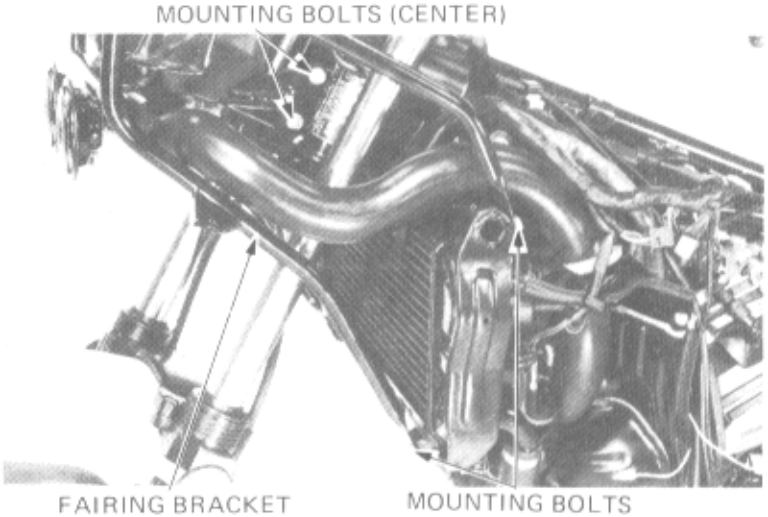
Remove the six bolts attaching the fairing bracket to the frame (two on the right, center and left sides) and remove the fairing bracket.

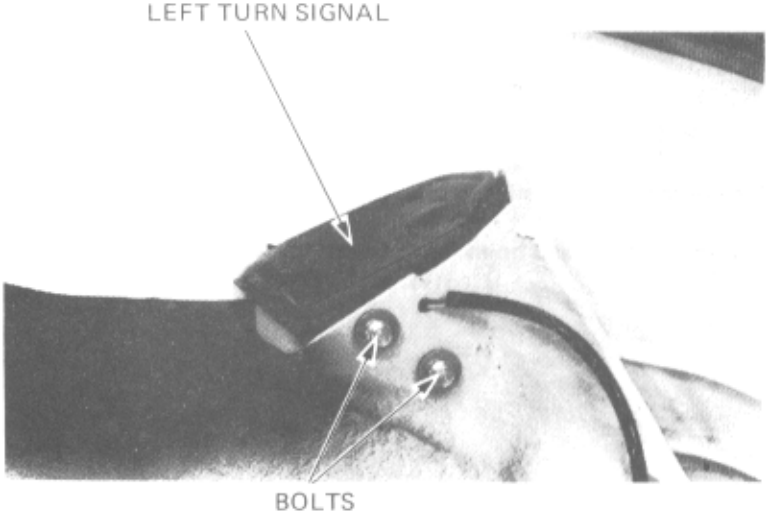
NOTE

Avoid damaging the windshield and the radiator fins.



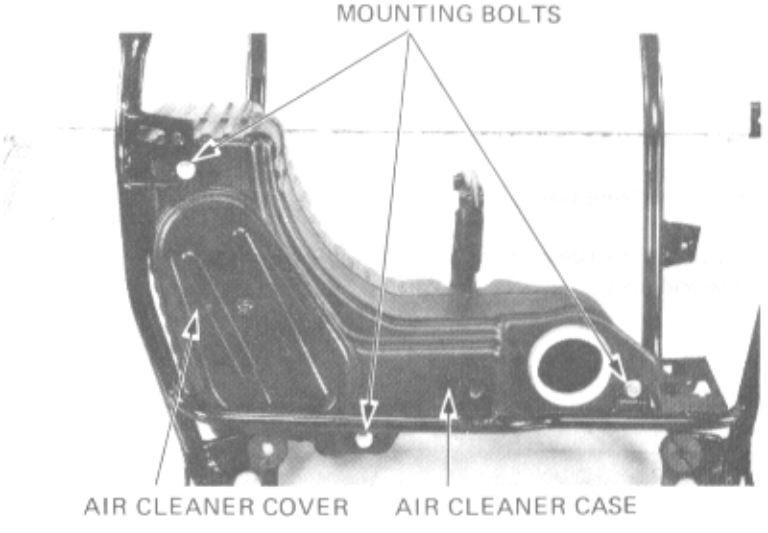
FAIRING DISASSEMBLY

Remove the bolts and right and left turn signals.

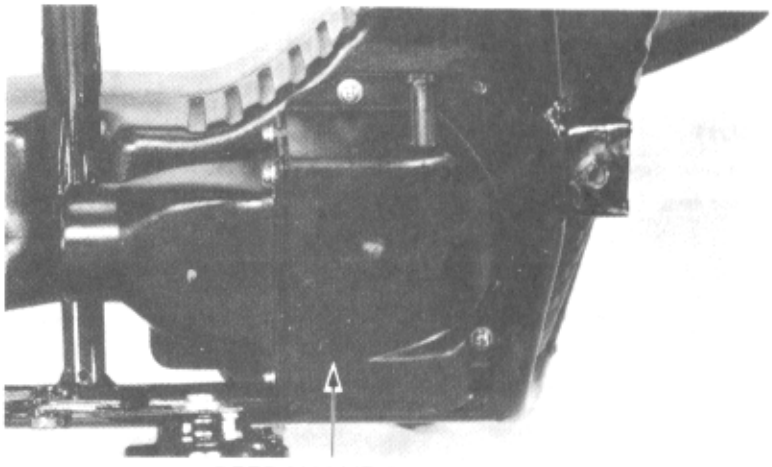


Remove the air cleaner cover and element from the air cleaner case.

Remove the three air cleaner case mounting bolts.



Remove the reed valve chamber by unscrewing two screws.



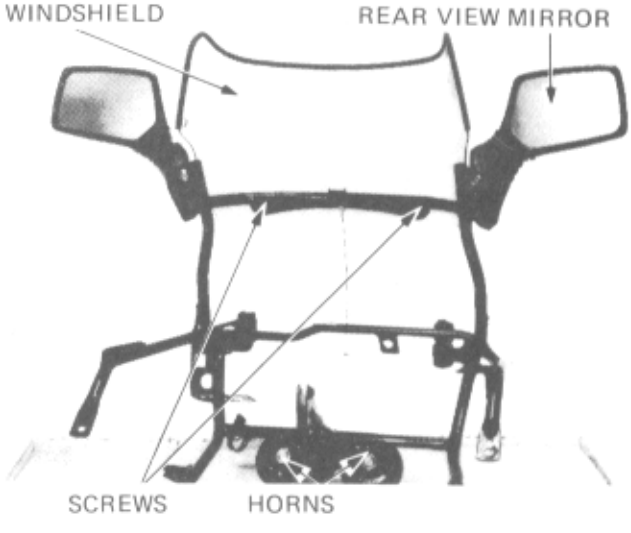
Remove the windshield by removing two screws.

NOTE

Avoid damaging the windshield.

Remove the rear view mirrors from the brackets.

Remove the bolts and horns from the horn bracket.



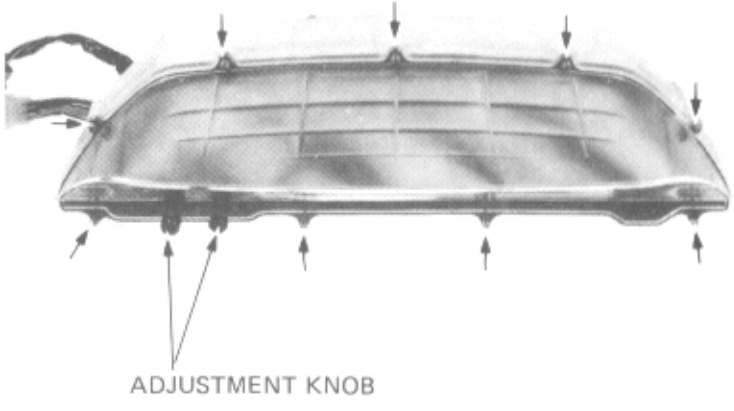
METER REMOVAL

Remove the meter visor by removing nine screws.

Unscrew the two clock adjustment knob set screws.

Remove the front cover.

Remove the instruments by removing the mounting screws and nuts.



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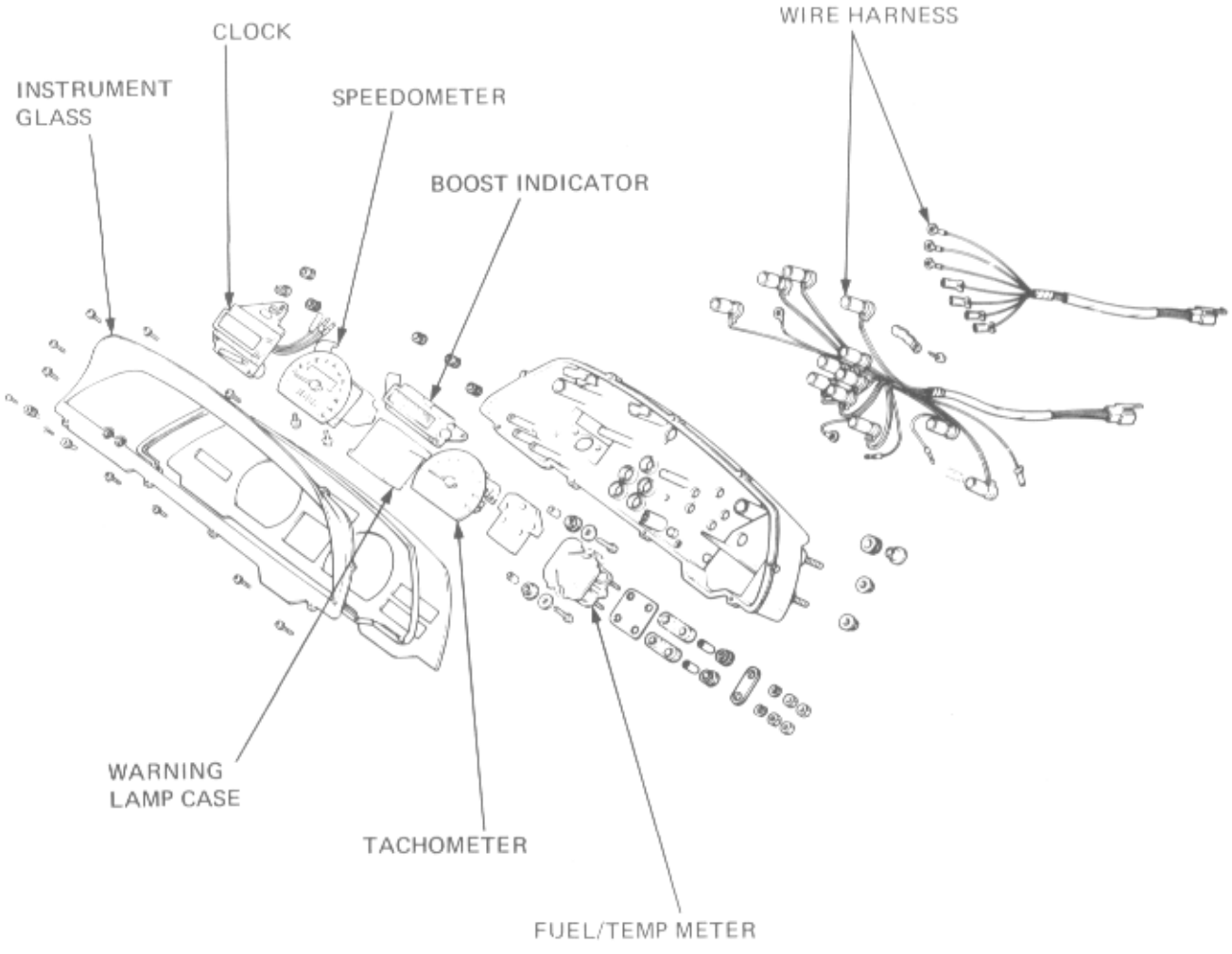
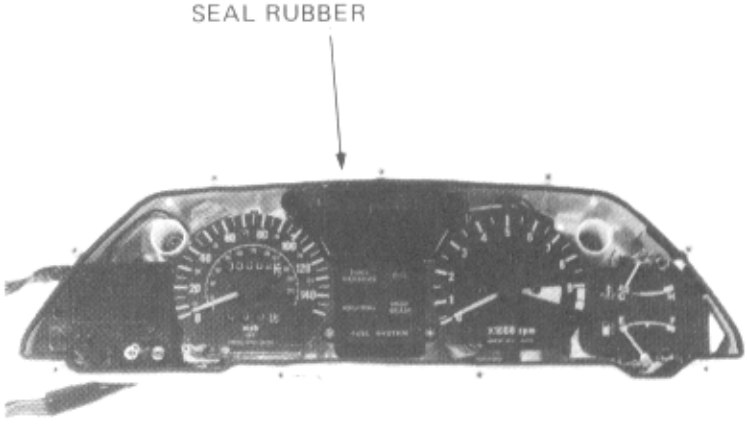
ASSEMBLY

Assemble the instrument panel in the reverse order of removal.



NOTE

Before installing the instrument glass, make sure the seal rubber is securely installed.



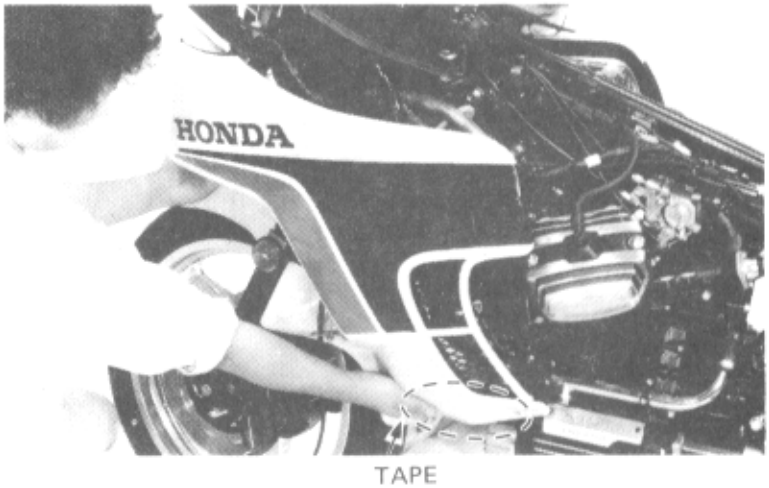
BULB REPLACEMENT

To replace a bulb, pull the rubber socket out of the panel. The bulb can be removed by pulling it straight out from the socket.

FAIRING INSTALLATION

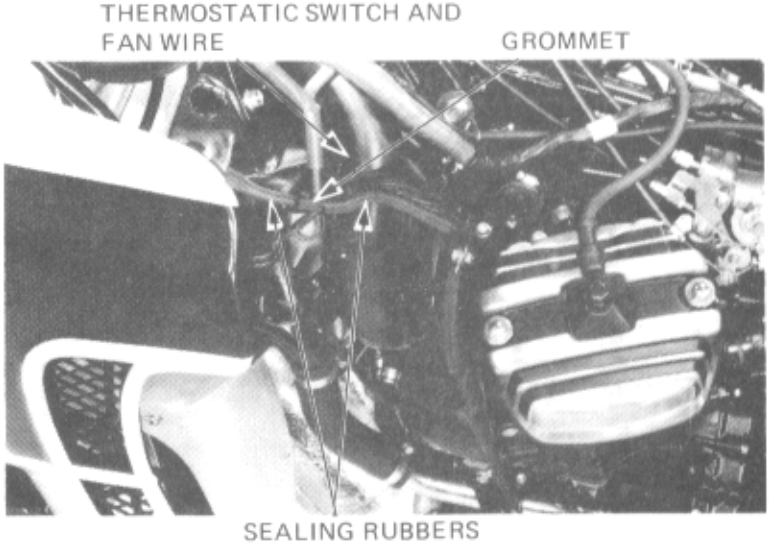
Install the fairing in the reverse order of removal after reading the notes below.

Be careful not to damage the fairing, the front fender and the front forkleg when installing it onto the bracket.



Check the thermostatic switch and fan wires to be sure they are securely connected before installing the fairing. They may have been unintentionally disconnected during removal of the fairing. Check them again after the fairing is installed.

Check each seal rubber to be sure it is securely in place after the fairing is installed.



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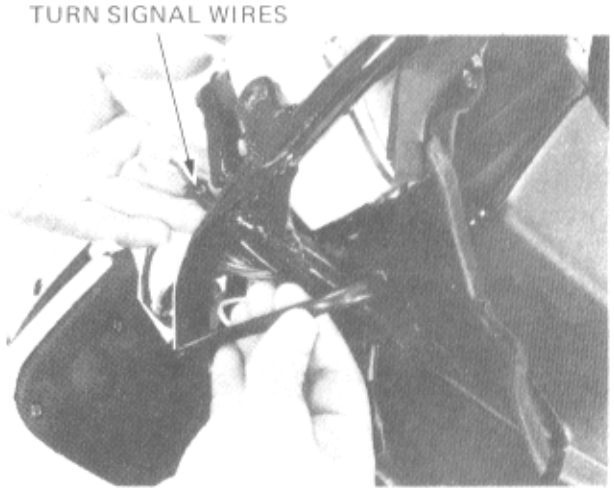
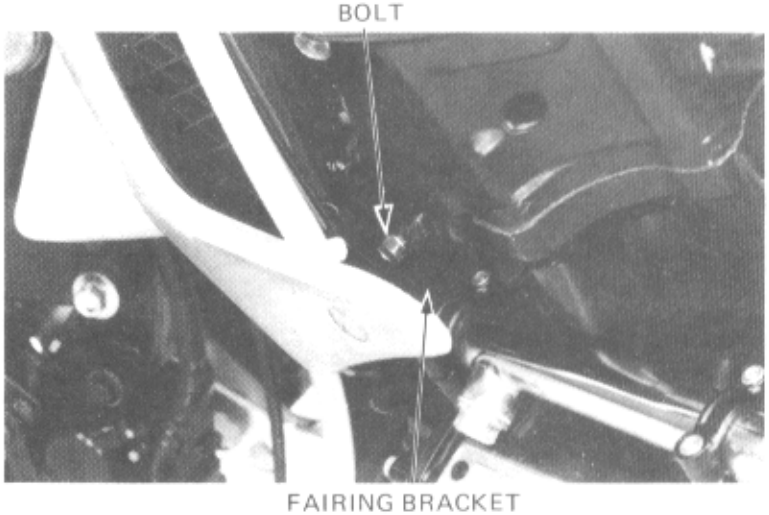
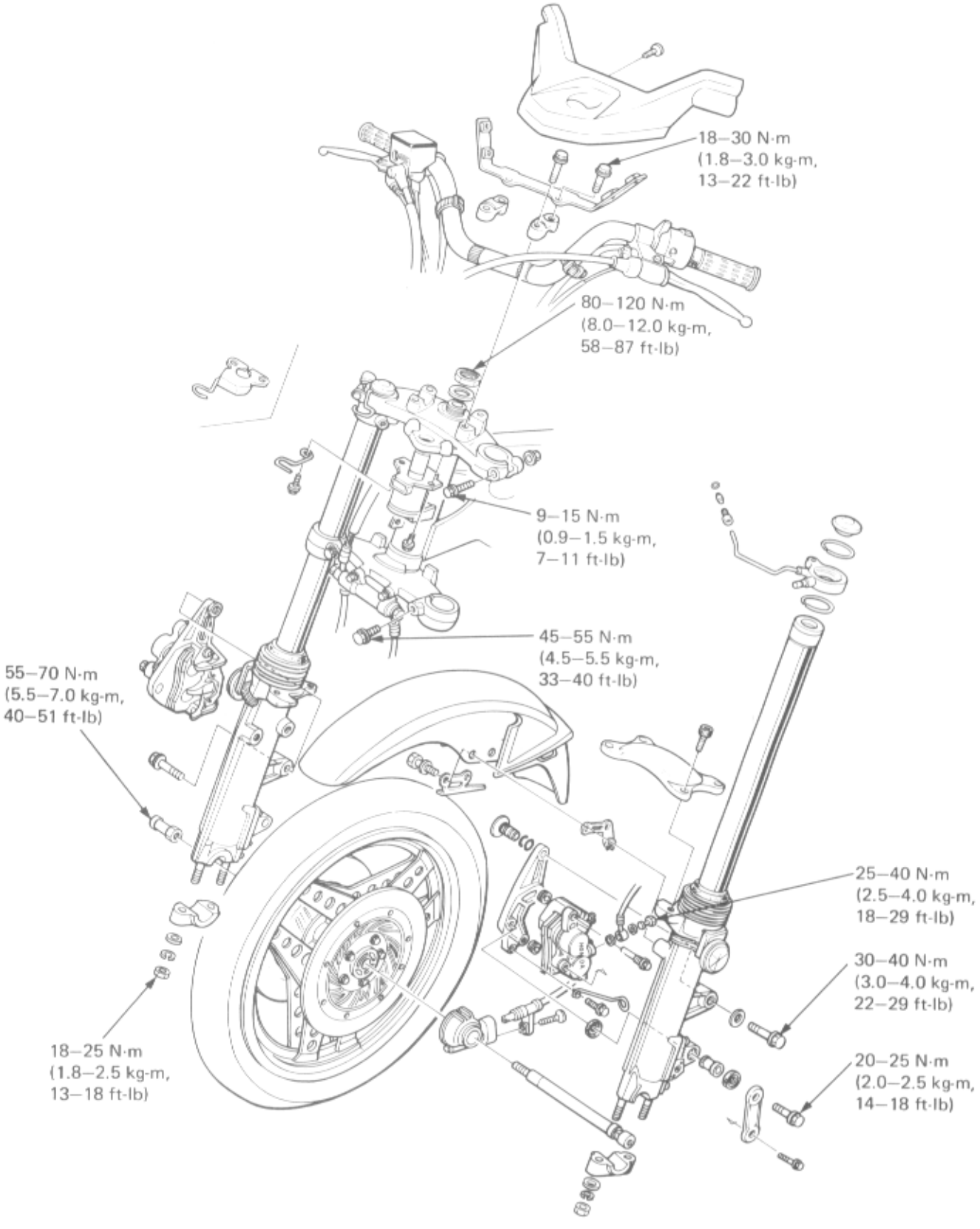
Route the right and left turn signal wires through the inside of the fairing bracket before installing the fairing as shown.



Loosen the right and left fairing side bracket bolts, if the fairing mount screws can not be aligned with the threads of the bracket. Tighten the bracket bolts securely after the fairing is installed.

Be sure all fairing couplers and wire connections are secure and that all wires are routed to prevent them from being pinched. Pay special attention to the turn signal wires, they are very susceptible to being pinched.





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15. FRONT WHEEL/SUSPENSION

SERVICE INFORMATION

GENERAL

- A jack or other support is required to support the motorcycle.
- COMSTAR® wheels are not serviceable. If either the spokes, rim or hub are damaged the entire wheel must be replaced.
- Tubeless tire removal, repair and remounting procedures are covered in the Tubeless Tire Manual.
- Check the fork tube bushing, slider bushing and back-up ring for damage after disassembling the front fork and replace if necessary.

SPECIFICATIONS

Unit: mm (in)

Item		Standard	Service Limit
Axle runout		—	0.2 (0.01)
Front wheel rim runout	Radial	—	2.0 (0.08)
	Axial	—	2.0 (0.08)
Front fork spring free length		571.4 (22.50)	560.0 (22.1)
Front fork tube runout		—	0.2 (0.01)
Front fork oil capacity		310 cc (10.5 US oz, 8.7 Imp oz)	—
Fork air pressure		0–40 kPa (0–0.4 kg/cm^2, 0–6 psi)	—

TORQUE VALUES

Handlebar holder bolt	18–30 N·m (1.8–3.0 kg-m, 13–22 ft-lb)
Fork pinch bolt (upper)	9–15 N·m (0.9–1.5 kg-m, 7–11 ft-lb)
(lower)	45–55 N·m (4.5–5.5 kg-m, 33–40 ft-lb)
Front axle nut	55–70 N·m (5.5–7.0 kg-m, 40–51 ft-lb)
Steering stem nut	80–120 N·m (8.0–12.0 kg-m, 58–87 ft-lb)
Steering adjustment nut	14–16 N·m (1.4–1.6 kg-m, 10–12 ft-lb)
Front axle holder nut	18–25 N·m (1.8–2.5 kg-m, 13–18 ft-lb)
Caliper mount bolt (upper)	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Caliper mount bolt (lower)	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Caliper bolt	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Caliper pivot bolt	35–40 N·m (3.5–4.0 kg-m, 25–29 ft-lb)
Brake hose union bolt	25–40 N·m (2.5–4.0 kg-m, 18–29 ft-lb)

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TOOLS

NOTE

In the lists below, "or equivalent" means there may be a commercially available tool in the U.S.A. that will work as well as the one listed.

SPECIAL

Snap ring	07914–3230001 or equivalent
Steering stem socket	07916–3710100
Hex wrench, 6 mm	07917–3230000 or equivalent
Race remover	07946–3710500
Steering stem driver	07946–MB00000 or 07946–3710601
Attachment	07946–3710701 or 07946–3710700
Fork oil seal driver	07947–3710101
Race remover	07953–4250002

Common

Socket wrench, 30 x 32 mm	07716–0020400 or equivalent
Extension	07716–0020500 or equivalent
Attachment, 42 x 47 mm	07746–0010300
Pilot, 15 mm	07746–0040300
Driver	07749–0010000
Bearing remover expander	07746–0050100
Bearing remover collet, 15 mm	07746–0050400 or equivalent

TROUBLESHOOTING

Hard Steering
- Steering stem nut too tight.
- Faulty steering stem bearings.
- Damaged steering stem ball race and/or cone race.
- Insufficient tire pressure.

Steers to One Side or does not Track Straight
- Bent forks.
- Bent frame.
- Forks installed incorrectly.
- Axle installed incorrectly.
- Bent swingarm.
- Wheel installed incorrectly.

Front Wheel Wobbling or Vibration
- Loose axle (front or rear).
- Loose wheel bearings.
- Loose steering stem nut or bearings.
- Loose lock nut(s) on swingarm pivot bolt.
- Unbalanced tire and wheel.
- Bent wheel.
- Excessive lateral wheel runout.
- Bent forks.
- Bent swingarm.
- Bent or cracked frame.
- Loose engine mounts.

Soft Suspension
- Weak fork springs.
- Insufficient fluid in front forks.
- Insufficient fork air pressure.

Hard Suspension
- Incorrect fluid weight in front forks.
- Clogged fork hydraulic passage.
- Bent fork tubes.
- Slider binding.
- Too much air pressure.
- Clogged anti-dive orifice.

Front Suspension Noise
- Slider binding.
- Insufficient fluid in forks.
- Loose front fork fasteners.
- Steering stem nut loose.
- Broken parts in forks.

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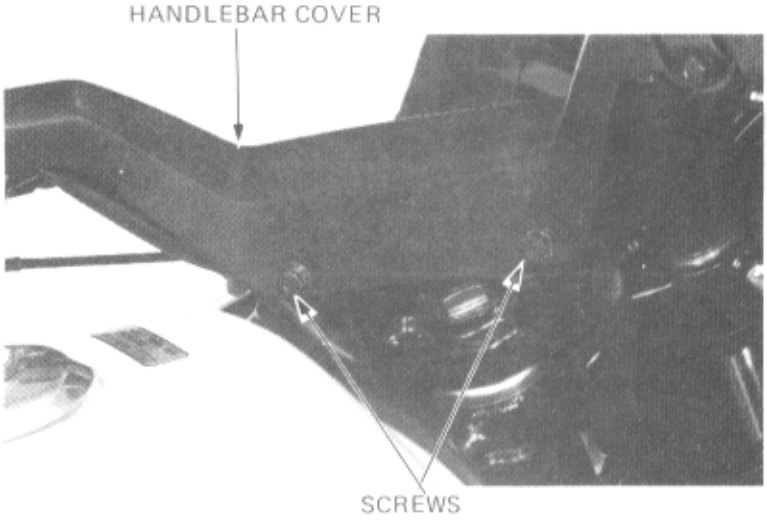
HANDLEBARS

REMOVAL

Remove handlebar cover bolts and cover.



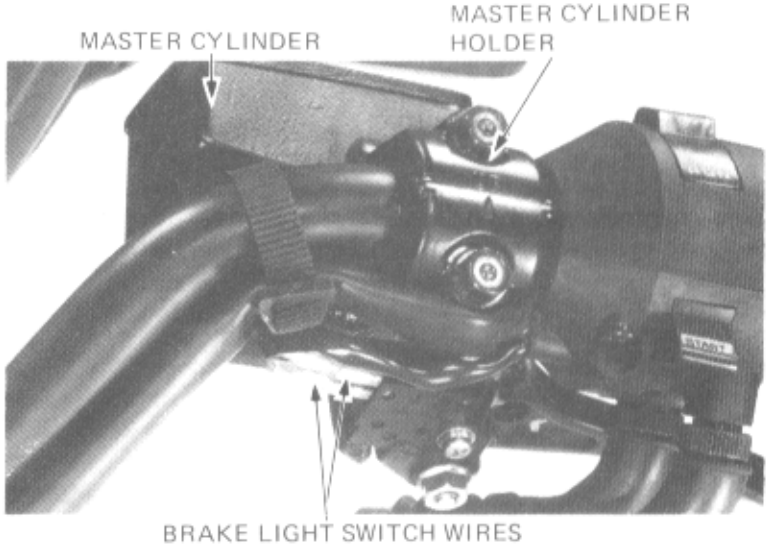
Disconnect the front brake light switch wires and remove the master cylinder.

NOTE

Do not loosen the brake hose unless necessary

WARNING

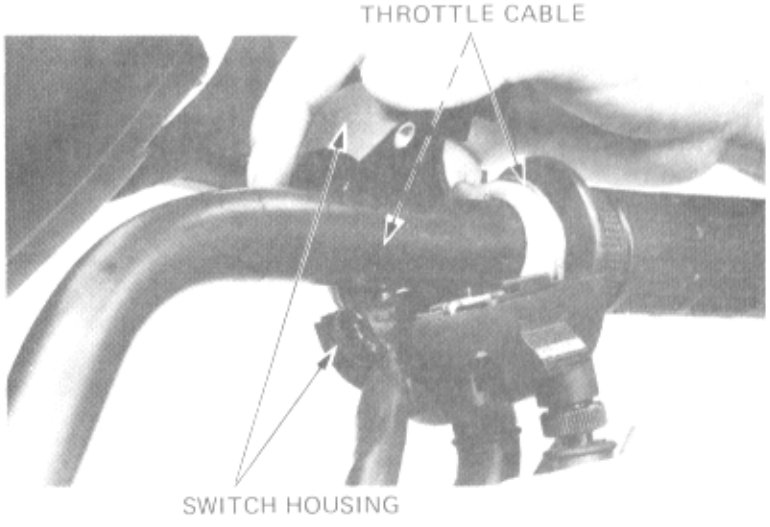
- *After removing the master cylinder, keep it level. Do not tilt the master cylinder, or turn it upside down to prevent air from entering the brake hose.*
- *Do not hang the master cylinder by the brake hose.*



Remove the four wire harness bands.

Remove the two screws attaching the right handlebar switch housing.

Disconnect the throttle cable ends from the throttle grip.

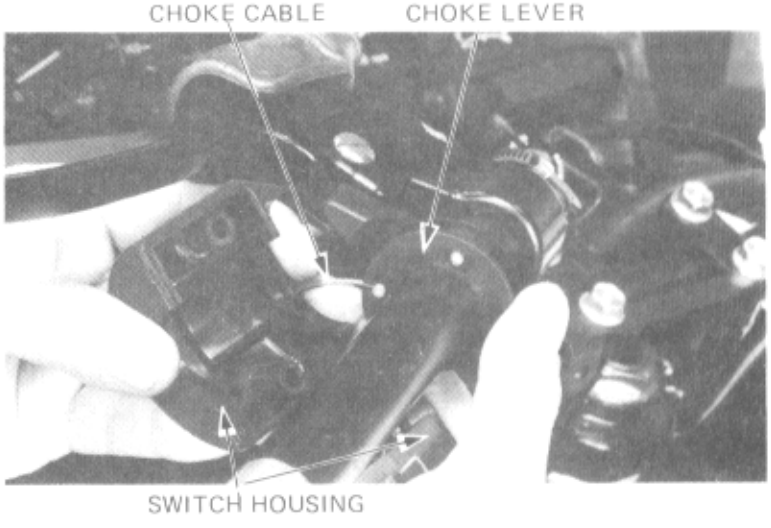


Remove the left handlebar grip.

Remove the two screws attaching the left handlebar switch housing.

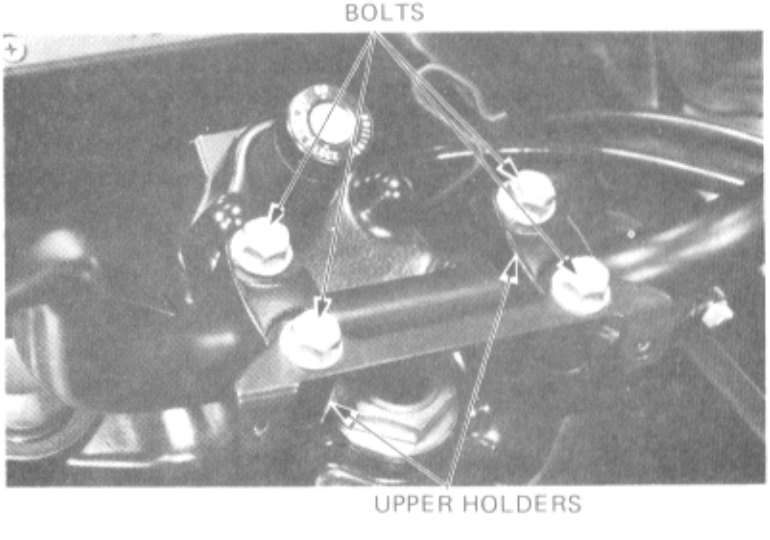
Disconnect the choke cable from the choke lever. Remove the left handlebar switch.

Disconnect the clutch cable and remove the clutch lever bracket.



Remove the four upper holder bolts, upper holders and cover bracket.

Remove the handlebars.



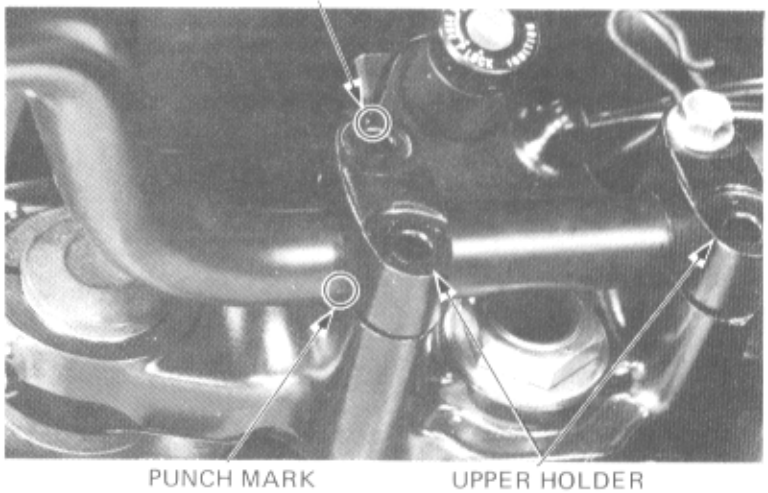
INSTALLATION

Installation of the handlebars is essentially the reverse order of removal.

NOTE

Coat the throttle grip area of the handlebar with grease.

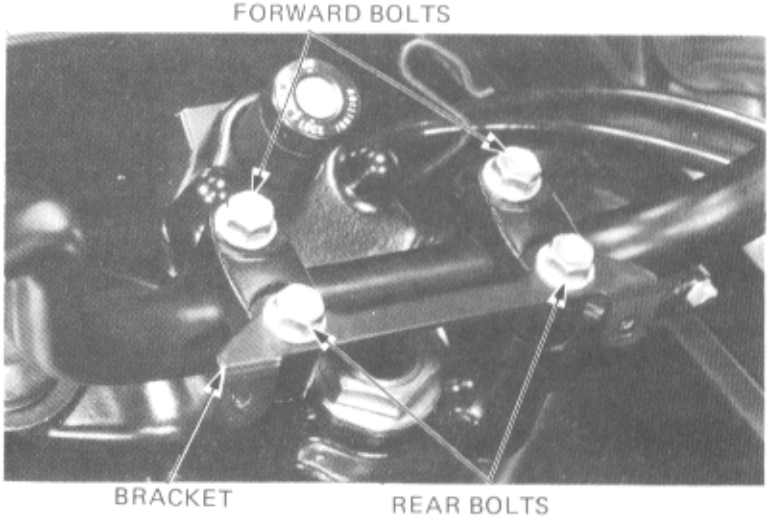
Align the punch mark on the handlebar with the split of the upper holder and fork bridge.
Position the handlebar upper holders on the handlebar with the punch marks facing forward.



Install the handlebar cover bracket.

Tighten the forward bolts first, then tighten the rear bolts.

TORQUE: 18–30 N·m (1.8–3.0 kg-m, 13–22 ft-lb)



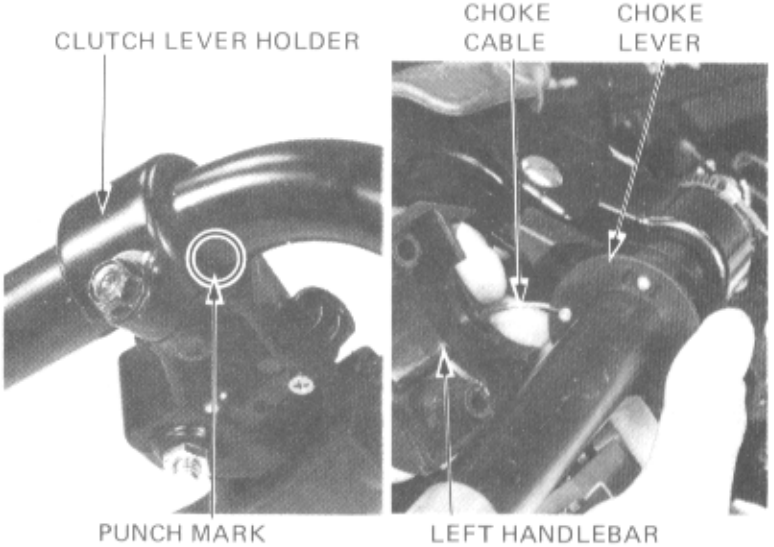
Position the clutch lever holder so the gap aligns with the punch mark on the handlebar and tighten the bolt securely. Connect the clutch cable.

Connect the choke cable to the choke lever.
Install the left handlebar switch on the handlebar.

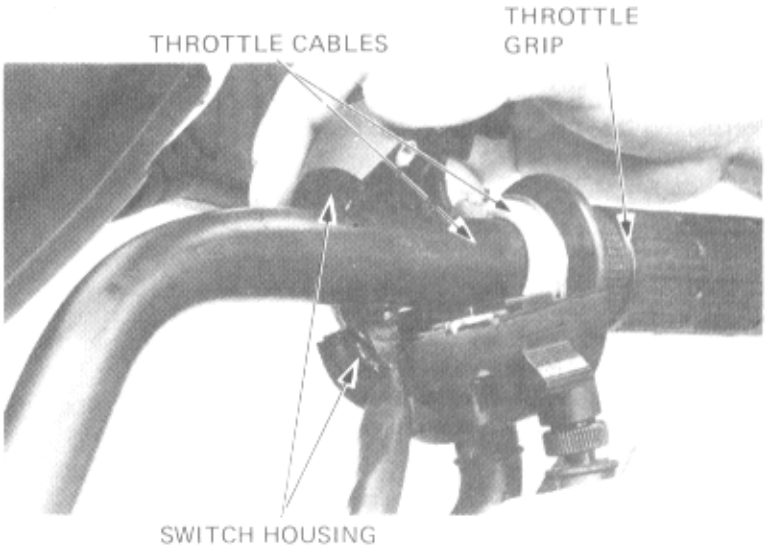
Tighten the upper screws first, then tighten the lower screws to the same torque.

CAUTION

Make sure the wire harness is not pinched between the switch assembly and the handlebar.



Connect the throttle cables to the throttle grip. Insert the pin on the bottom half of each switch assembly into the hole in the handlebar. Tighten the forward screws first, then tighten the rear screws to the same torque.

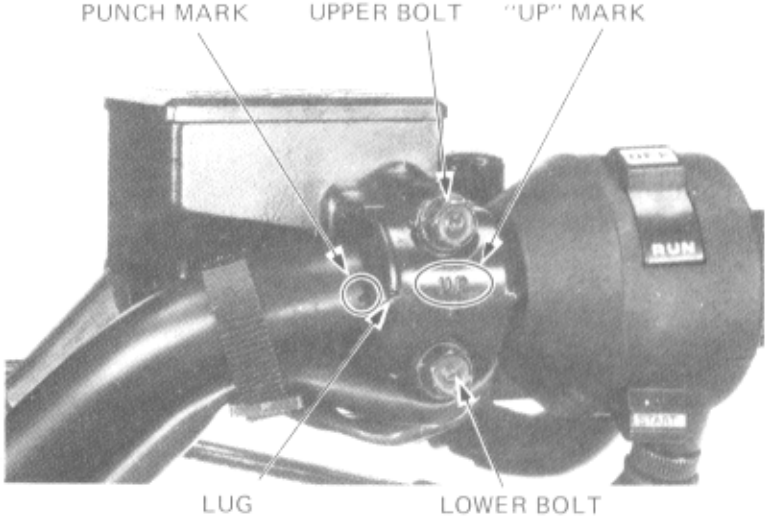


Position the master cylinder on the handlebar. Loosely install the holder with the "UP" mark facing upward using the two bolts.

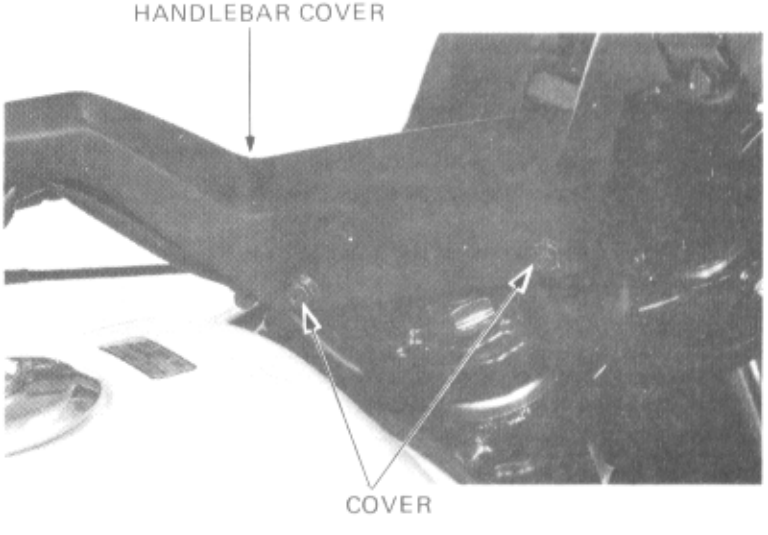
Align the lug on the holder with the punch mark on the handlebar.

Tighten the upper bolt first, then tighten the lower bolt.

Apply contact cement to the left handlebar grip and push it into place.



Install the handlebar cover with the two bolts.



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FRONT WHEEL

REMOVAL

Put the motorcycle on its center stand.

Raise the front wheel off the ground by placing a block or safety stand under the engine.

NOTE

Avoid damaging the finned surfaces of the oil pan.

Disconnect the speedometer cable from the speedometer gearbox.

Remove the right and left calipers by removing the caliper bolts.

CAUTION

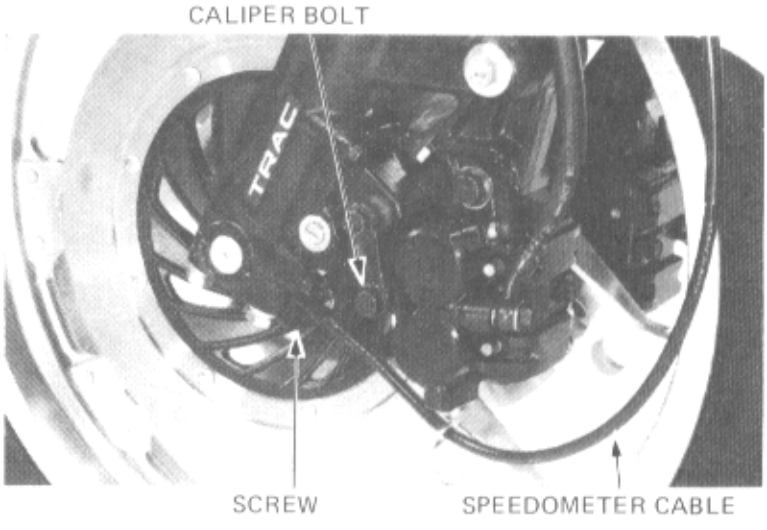
Support the caliper assembly so that it does not hang from the brake hose. Do not twist the brake hose.

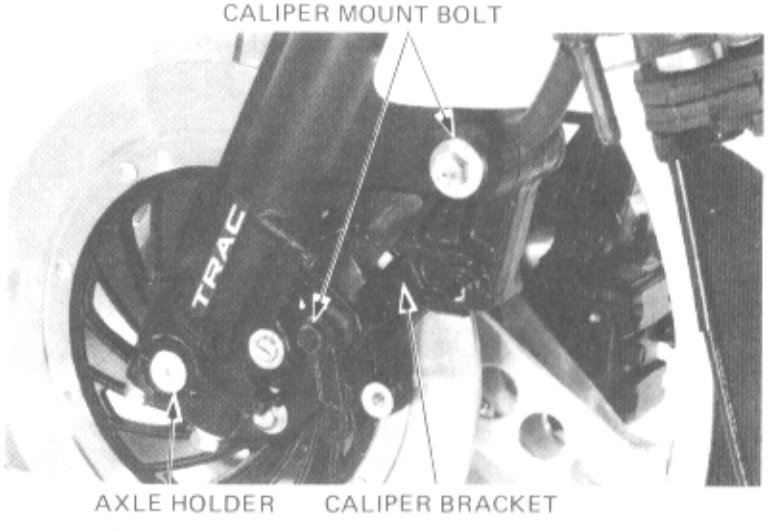
Remove the left caliper bracket by removing the caliper mount bolts. Support the caliper so that it does not hang by the brake hose.

Remove the axle holders and the front wheel.

NOTE

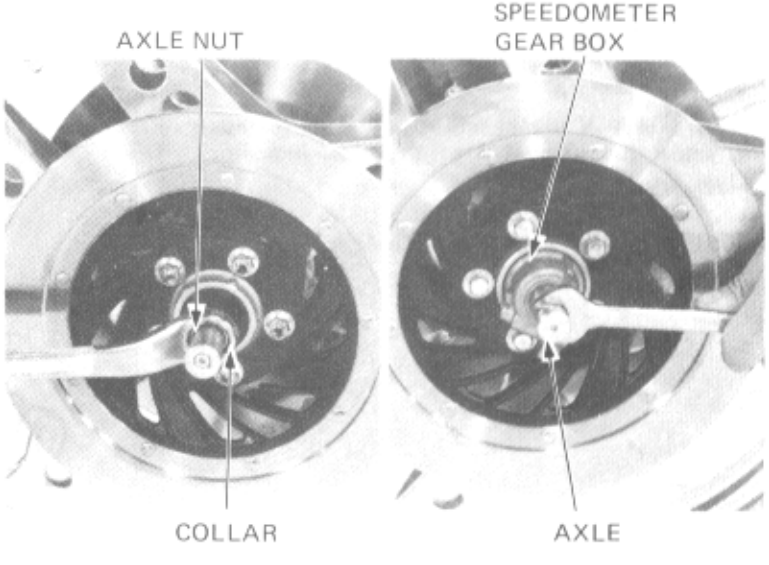
Do not depress the brake lever when the wheel is off the motorcycle or it will be difficult to refit the disc between the brake pads.



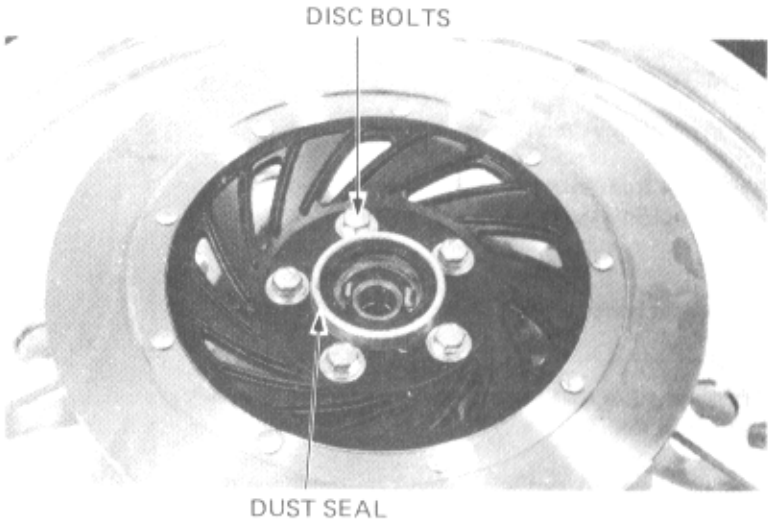


DISASSEMBLY

Remove the axle nut, speedometer gear box, axle and collar.



Remove the disc bolts, discs and dust seals.



Remove the bearings and the distance collar from the hub.

NOTE

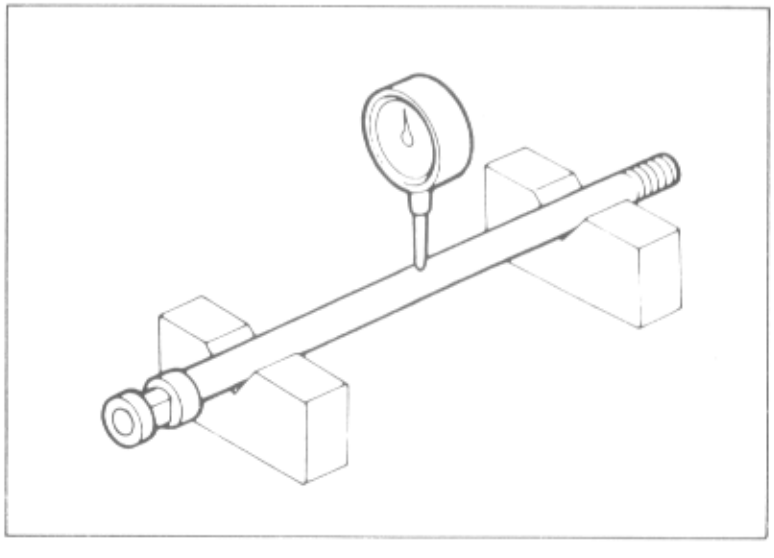
If the bearings are removed, replace them with new bearings during assembly.

INSPECTION

- AXLE

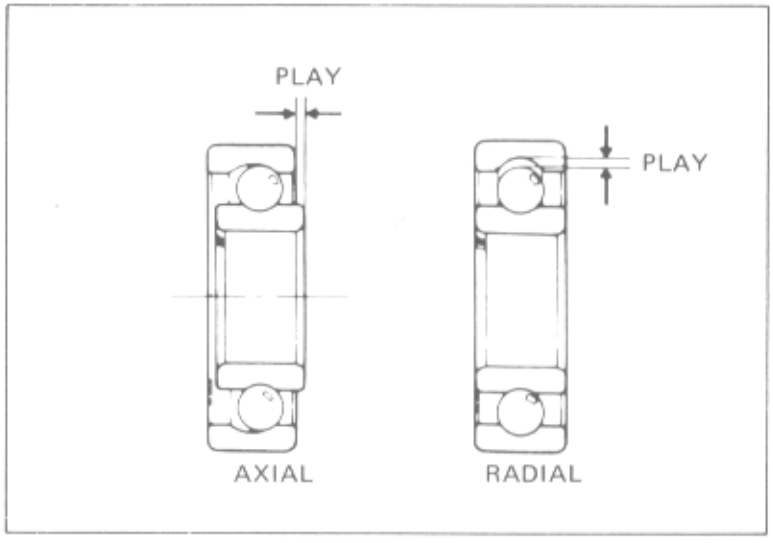
Set the axle in V blocks and measure the runout. The actual runout is 1/2 of the total indicator reading.

SERVICE LIMIT: 0.2 mm (0.01 in)



• WHEEL BEARING

Check the wheel bearing play by placing the wheel in a truing stand and spinning the wheel by hand. Replace the bearings with new ones if they are noisy or have excessive play.



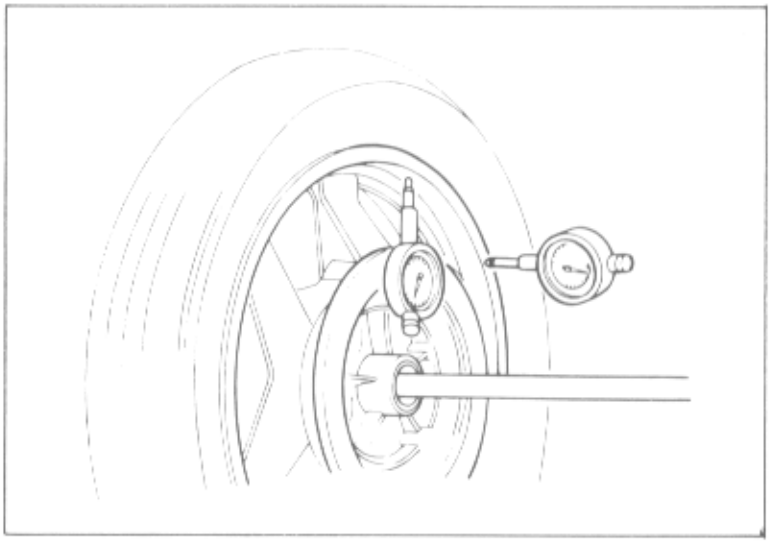
• WHEEL

Place the wheel in a truing stand. Spin the wheel slowly and measure the runout with a dial indicator gauge.

SERVICE LIMITS:
RADIAL RUNOUT: 2.0 mm (0.08 in)
AXIAL RUNOUT: 2.0 mm (0.08 in)

NOTE

The COMSTAR WHEEL cannot be repaired and must be replaced if the service limits are exceeded.



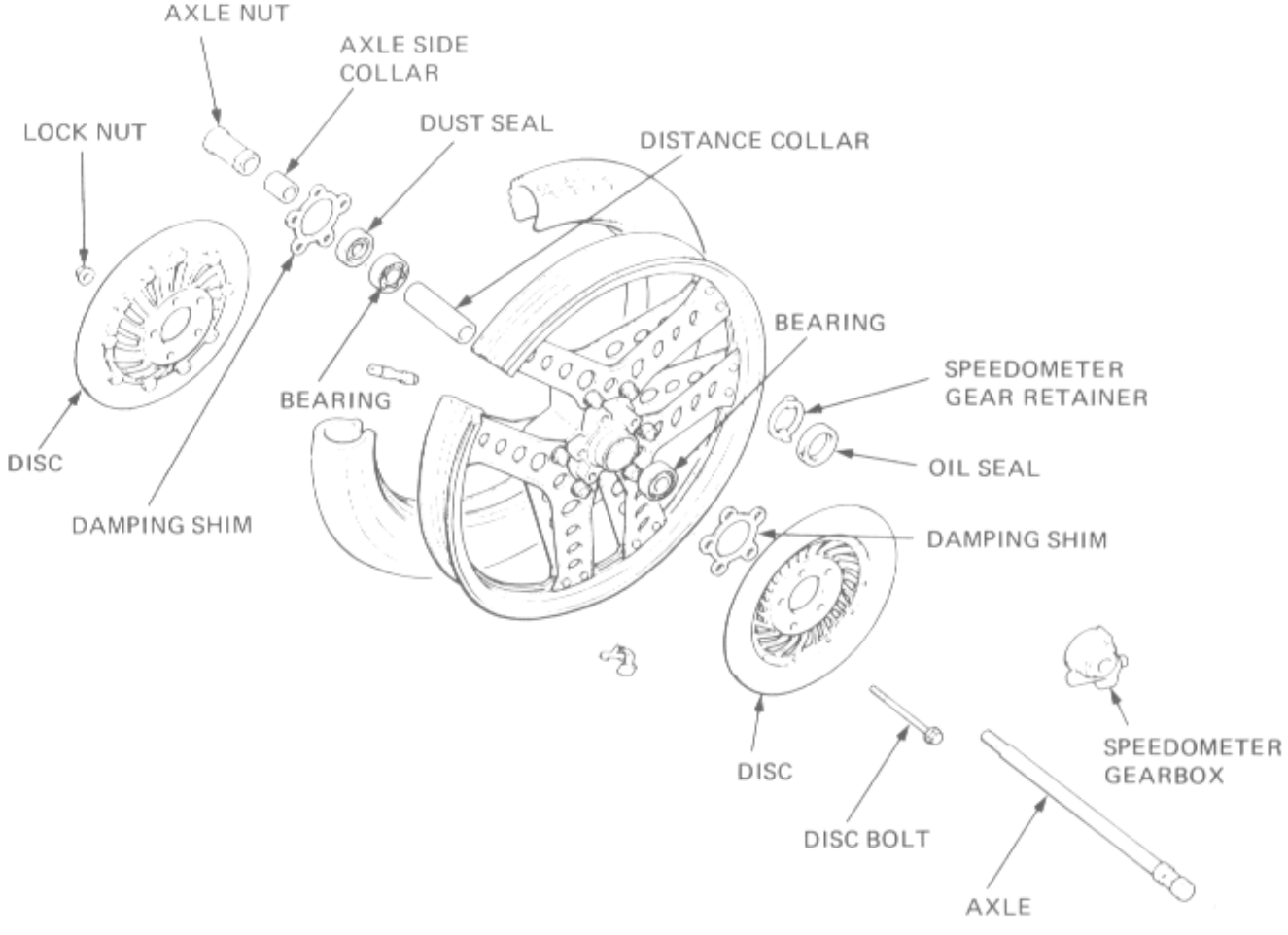
ASSEMBLY

WARNING

Do not get grease on the brake disc or braking power will be eliminated.

NOTE

- The COMSTAR WHEEL does not have a rim band.
- Install the bearings with the closed ends facing out.



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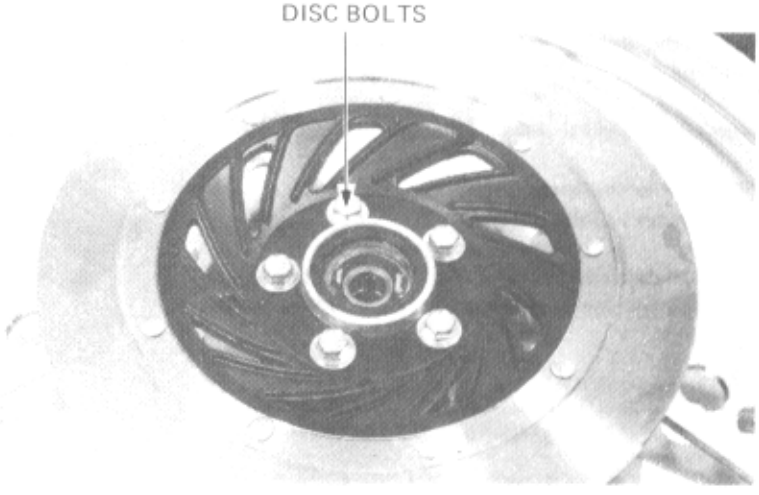
Install the discs, disc bolts and lock nuts.

TORQUE: 27–33 N·m
(2.7–3.3 kg-m, 20–24 ft-lb)



Pack the bearing cavities with grease if new ones are being installed.
Drive in the right bearing first and press the distance collar into place.

NOTE

Be certain the distance collar is in position before installing the left bearing.

Drive in the left bearing.

NOTE

Drive the bearings in squarely. Make sure that they are fully seated and that the sealed sides are facing out.

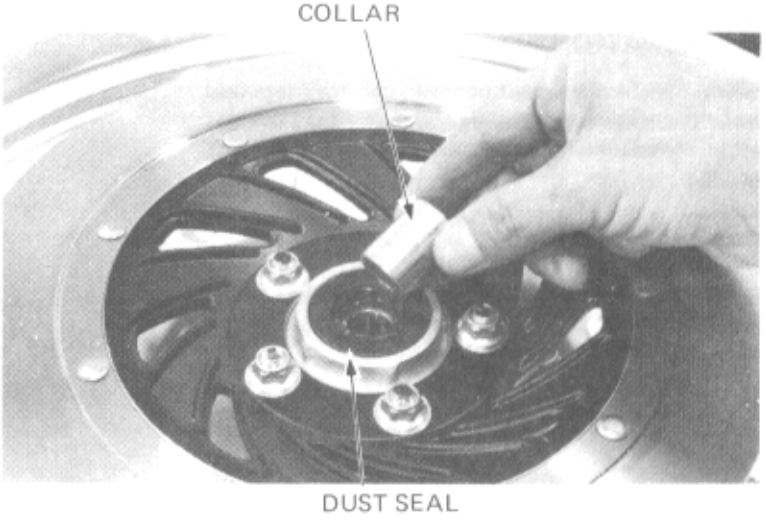
Lubricate the dust seal lip with grease.
Install the dust seal and collar into the hub.

NOTE

The spoke plate bolts and nuts require no retightening since they are secured with lock pins. Do not remove the pins.

CAUTION

Remove all the grease from around the outside of the dust seal.



Install the speedometer gear retainer in the hub from the left side.

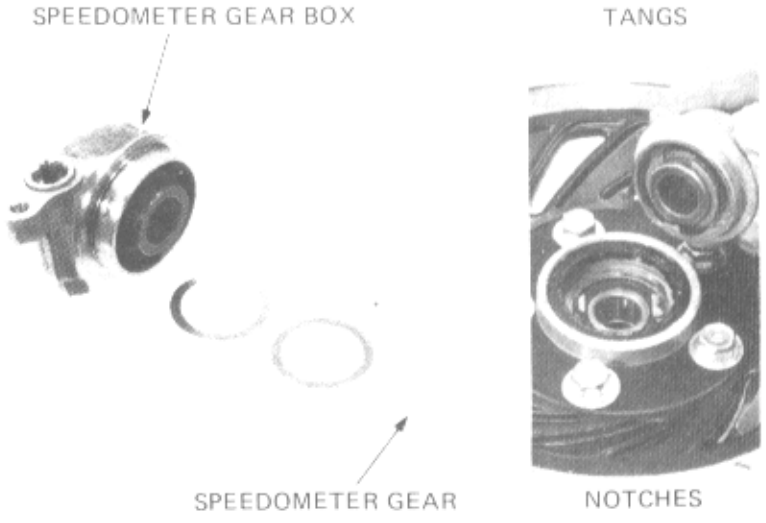
Lubricate the oil seal lip and install it.

Disassemble the speedometer gear box and lubricate the gears and sliding surfaces.

Install the speedometer gear in the wheel hub, aligning the gear box notches with the tangs in the retainer.

CAUTION

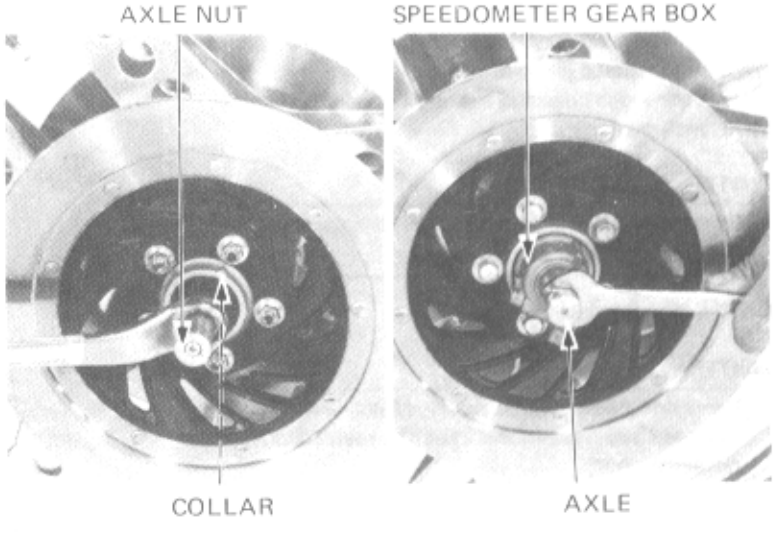
Remove all the grease around the outside of the oil seal.



Install the axle and axle nut, then tighten the axle nut.

TORQUE: 55–70 N·m
(5.5–7.0 kg-m, 40–51 ft-lb)

Clean the brake discs with a high quality degreasing agent.

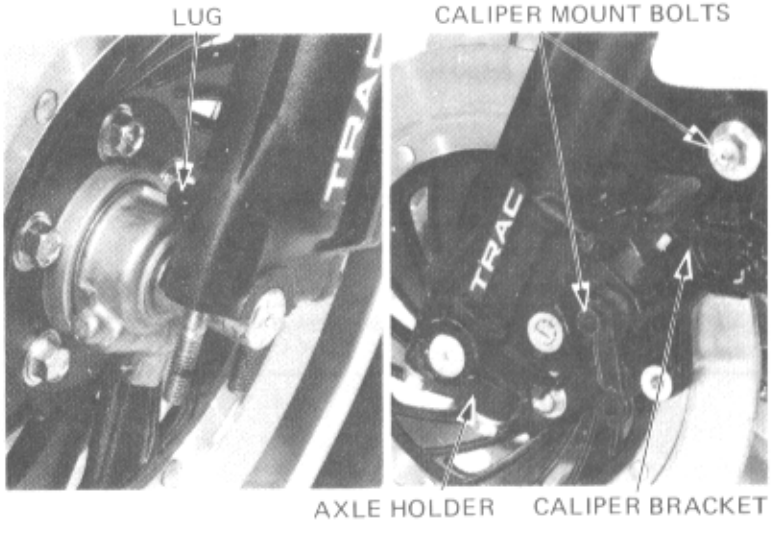


INSTALLATION

Position the front wheel between the fork legs and lower the forks onto the axle. Be sure that the slot on the speedometer gear is in the lug on the left fork leg.

Install the axle holders.

Tighten the axle holders nuts loosely and install the left caliper bracket.



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Fit the calipers over the discs, taking care not to damage the brake pads.

Install the caliper bolts.

TORQUE: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)

Tighten the caliper mount bolts.

TORQUE VALUES:
Upper bolt: 30–40 N·m
(3.0–4.0 kg-m, 22–29 ft-lb)
Lower bolt: 20–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)

Measure the clearance between each surface of the left brake disc and the left brake caliper with a 0.70 mm (0.028 in) feeler gauge.
If the feeler gauge cannot be inserted easily, move the left fork out until the gauge can be inserted.

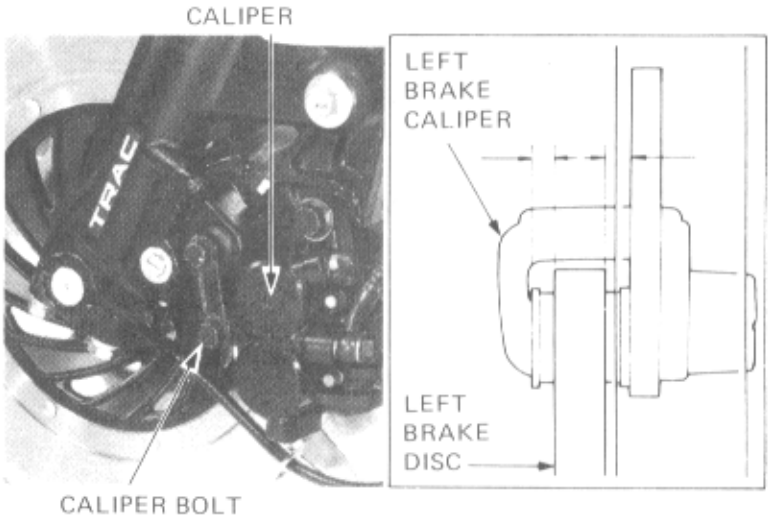
Tighten the axle holder forward nuts to the specified torque first, then tighten the rear nuts to the same torque.

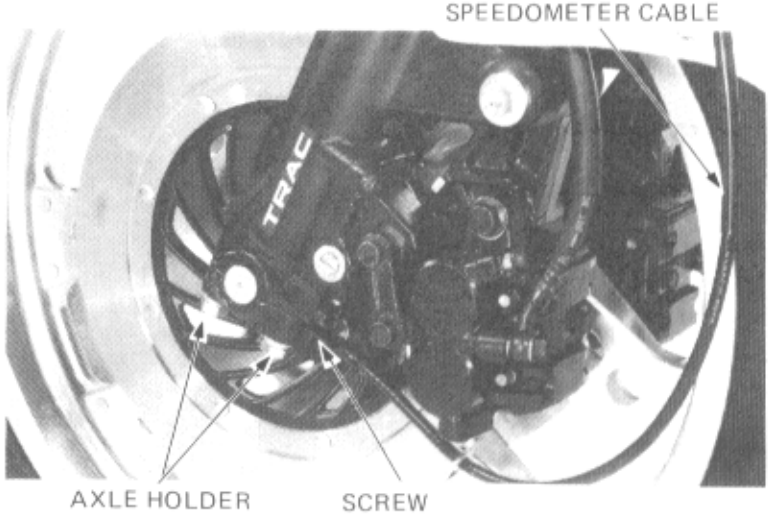
TORQUE: 18–25 N·m
(1.8–2.5 kg-m, 13–18 ft-lb)

CAUTION

After installing the wheel, apply the brakes several times and recheck the caliper clearance on both sides. Failure to provide clearance will damage the brake discs and affect braking efficiency.

Connect the speedometer cable to the speedometer gearbox.





FRONT FORK

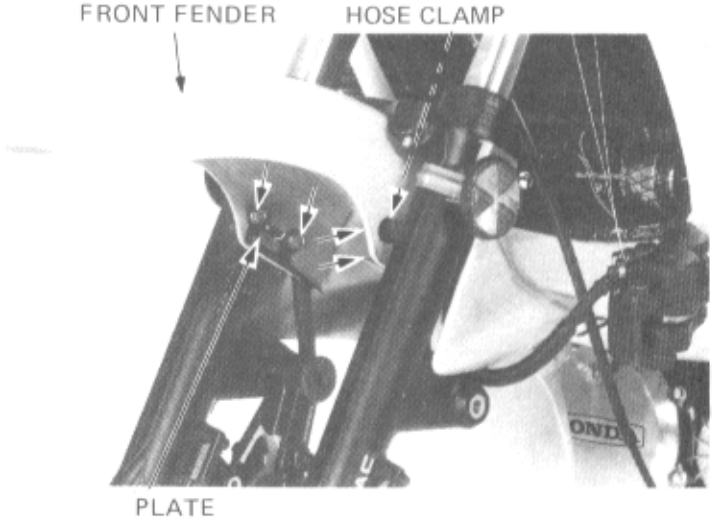
REMOVAL

Remove the following:

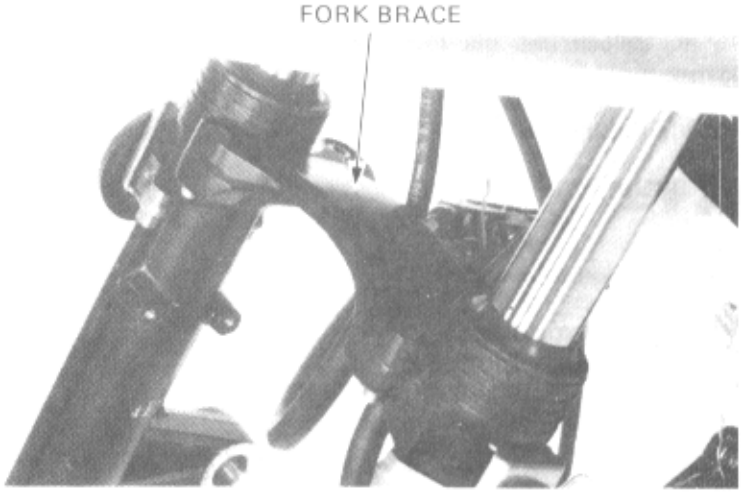
- front wheel (page 15-7).
- front fender.
- brake caliper brackets by unscrewing the caliper mount bolts.

NOTE

Do not loosen the brake hose unless necessary.



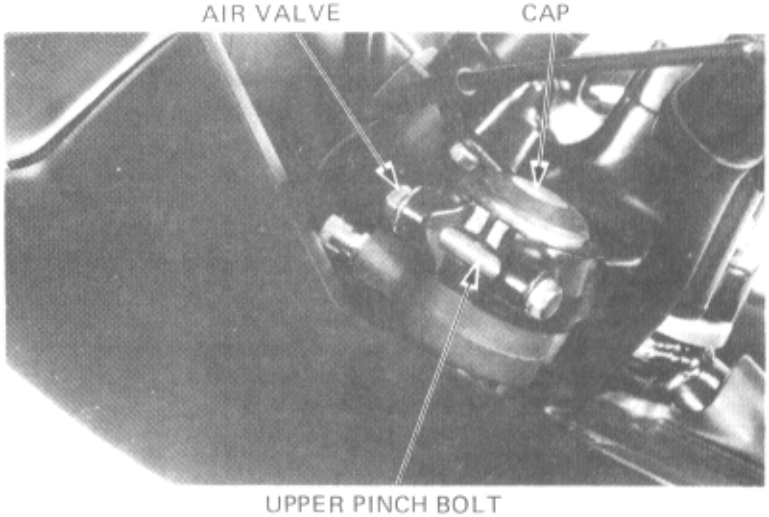
Remove the front fork brace.



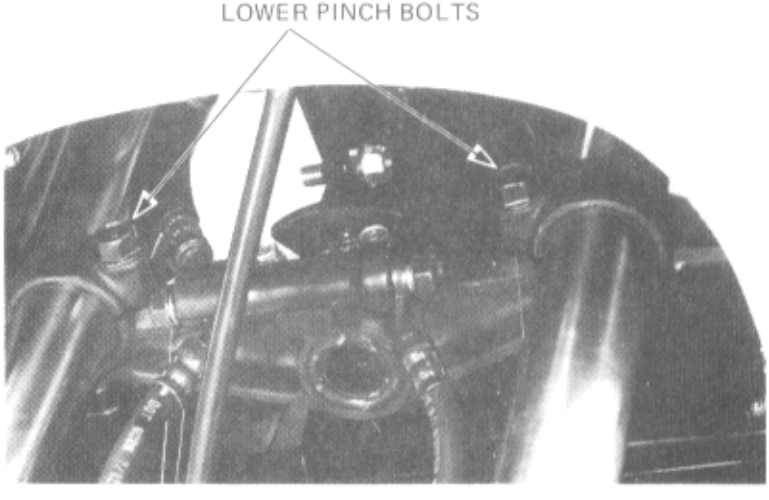
Release the air from the front forks by pressing the air valve core.

Remove the fork tube cap.

Loosen the fork upper pinch bolts.



Loosen the fork lower pinch bolts.



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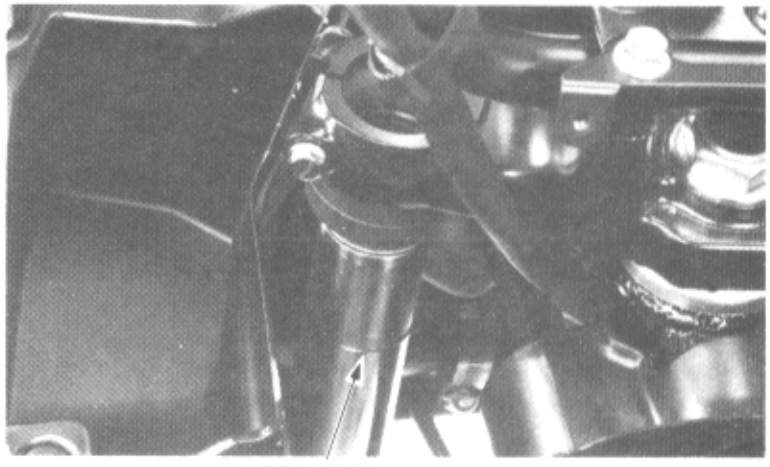
Remove the stop ring from the front fork tube and remove the front forks.



STOP RING

DISASSEMBLY

Hold the fork tube in a vise with soft jaws.

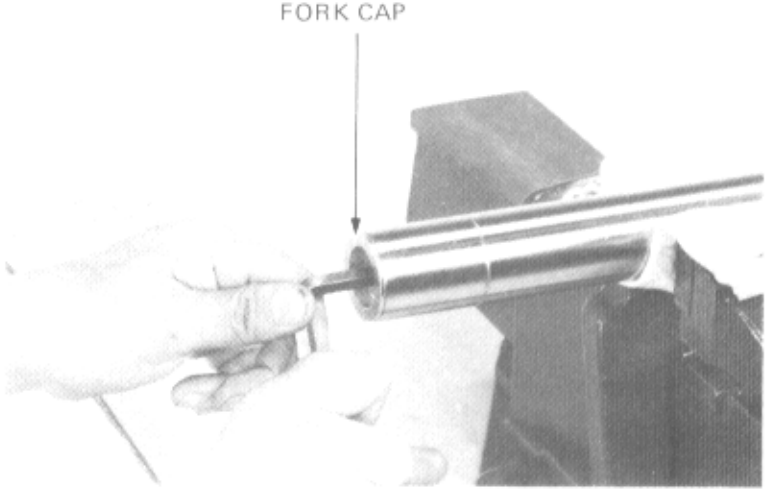
Remove the fork cap bolt.

CAUTION

Do not damage or bend the sliding surface.

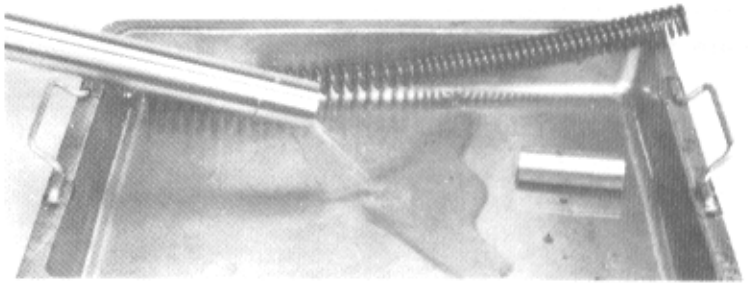
WARNING

Use care when loosening the bolt or the spring will pop out.



Remove the fork spacer and spring.

Pour out any remaining fork fluid by pumping the fork up and down several times.



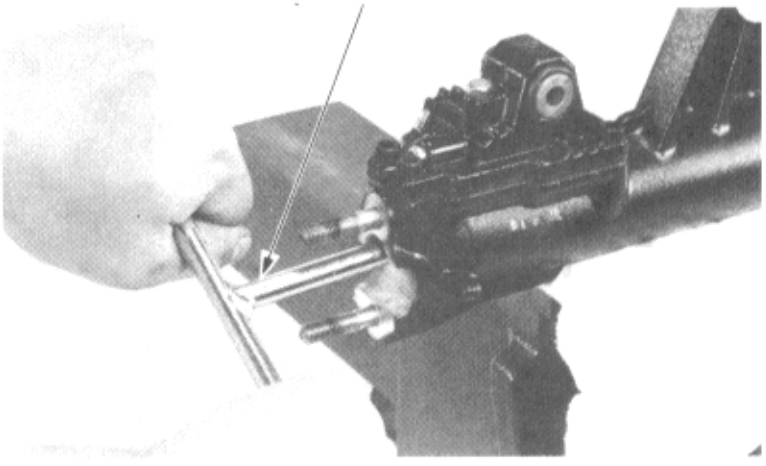
Hold the fork slider in a vise with soft jaws and remove the hex bolt.

CAUTION

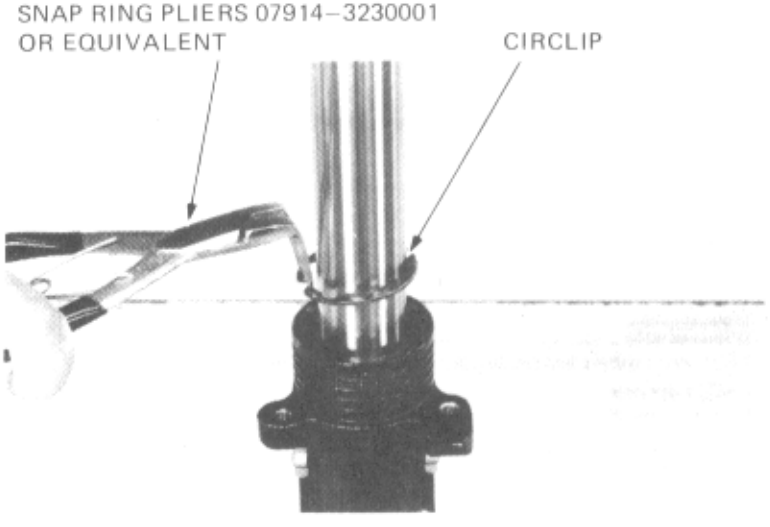
Excessive vise pressure can damage the fork slider.

NOTE

Temporarily install the spring and fork bolt if difficulty is encountered in removing the hex bolt.



Remove the dust seal, foam seal, plastic washer and circlip.

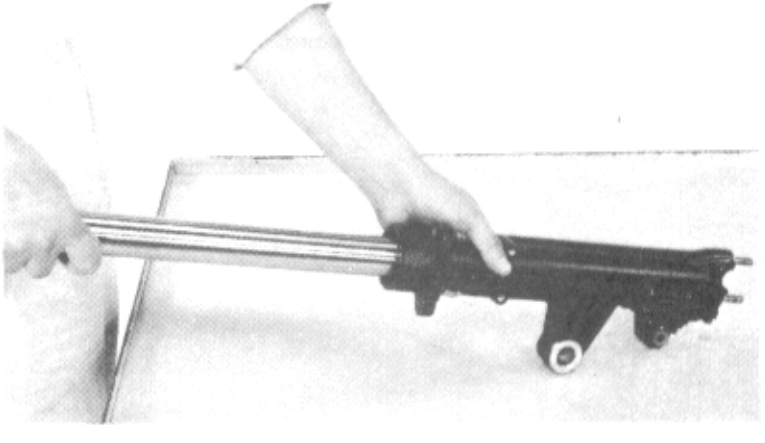


Remove the fork tube from the slider by pumping it in and out several times.

NOTE

The slider bushing causes resistance and the fork tube bushing must force it out.

Remove the oil lock piece from the bottom case.



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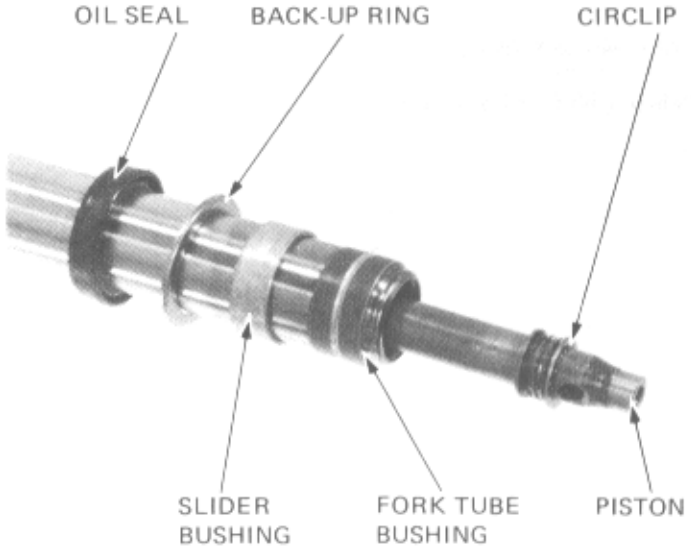
Remove the oil seal, back-up ring and slider bushing from the fork tube.

NOTE

Do not remove the fork tube bushing unless it is necessary to replace it with a new one.

Remove the circlip, spring and washers from the piston. Remove the piston from the fork tube and the oil lock piece from the slider.



INSPECTION

- FRONT FORK SPRING FREE LENGTH

Measure the fork spring free length.

SERVICE LIMIT: 560 mm (22.1 in)

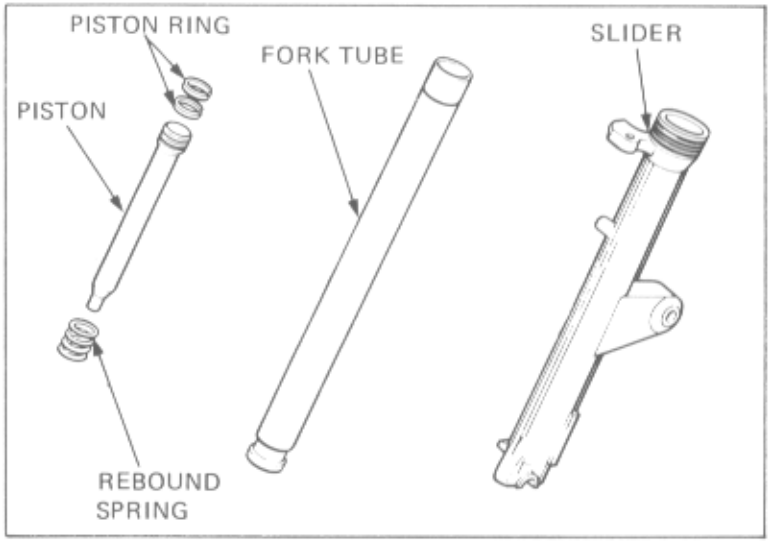
- FORK TUBE/FORK SLIDER/PISTON

Check the fork tubes, fork sliders and pistons for score marks, scratches, or excessive or abnormal wear.

Check the fork piston ring for wear or damage.

Check the rebound spring for fatigue or damage.

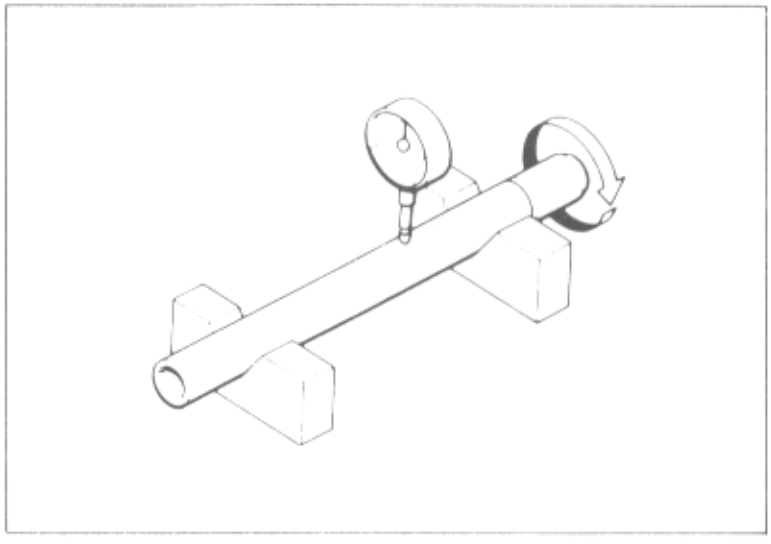
Replace any components which are worn or damaged.



• FORK TUBE

Set the fork tube in V blocks and read the runout.

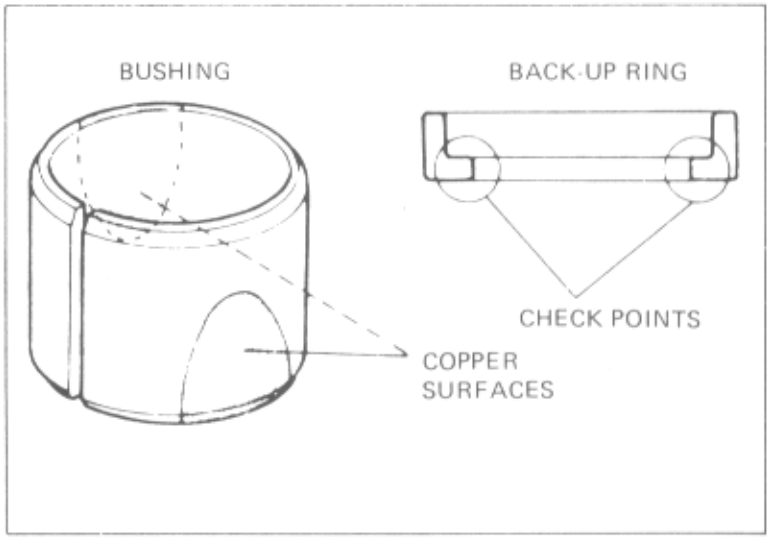
SERVICE LIMIT: 0.2 mm (0.01 in)



• BUSHING/BACK-UP RING

Visually inspect the slider and fork tube bushings. Replace the bushings if there is excessive scoring or scratching, or if the teflon is worn so that the copper surface appears on more than 3/4 of the entire surface.

Check the back-up ring; replace it if there is any distortion at the check points shown.



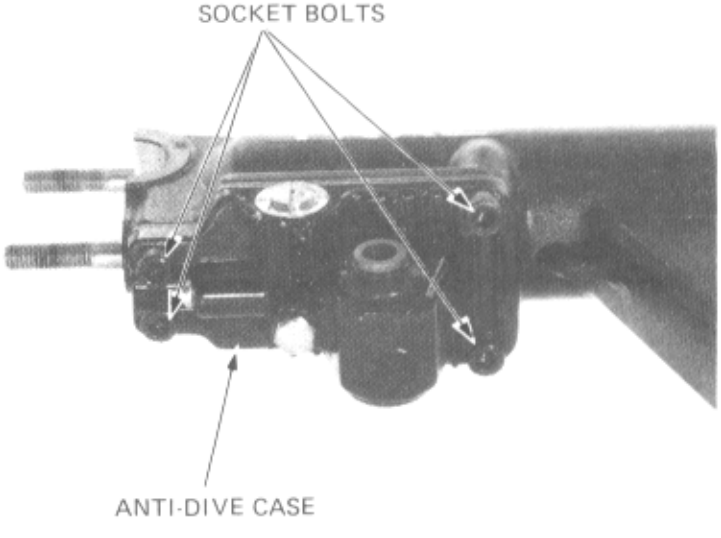
ANTI-DIVE CASE

• REMOVAL

Remove the four socket bolts and remove the anti-dive case.

NOTE

- Drain the oil before servicing the anti-dive system.
- Place the steel ball and spring in a parts rack so they are not lost.



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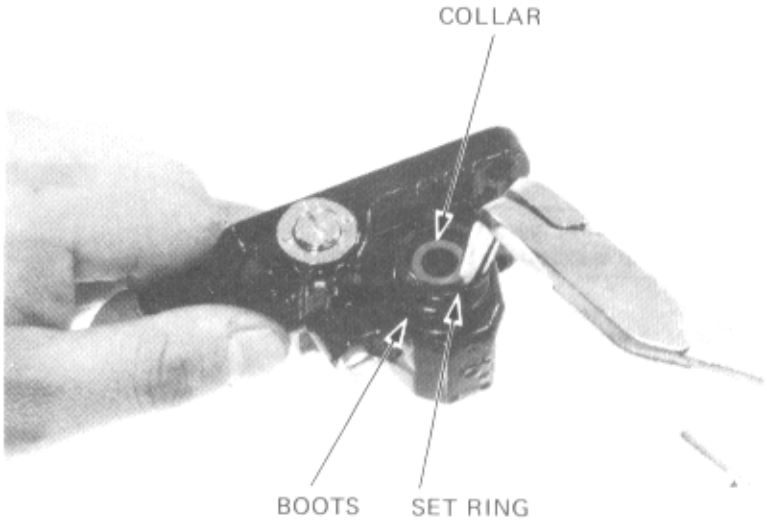
Remove the boot set ring and remove the boots and pivot collar.

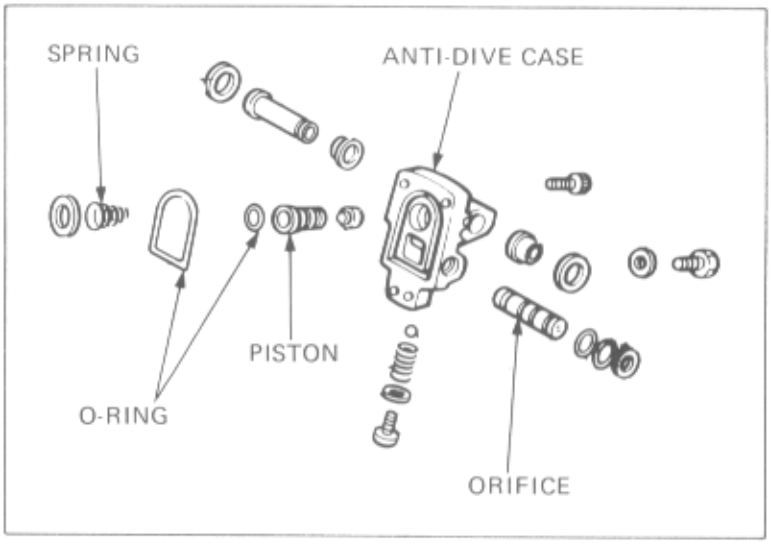


- INSPECTION

Check the spring and piston for wear or damage.

Check the orifice for clogging by applying compressed air.

Check the operation of the adjuster.

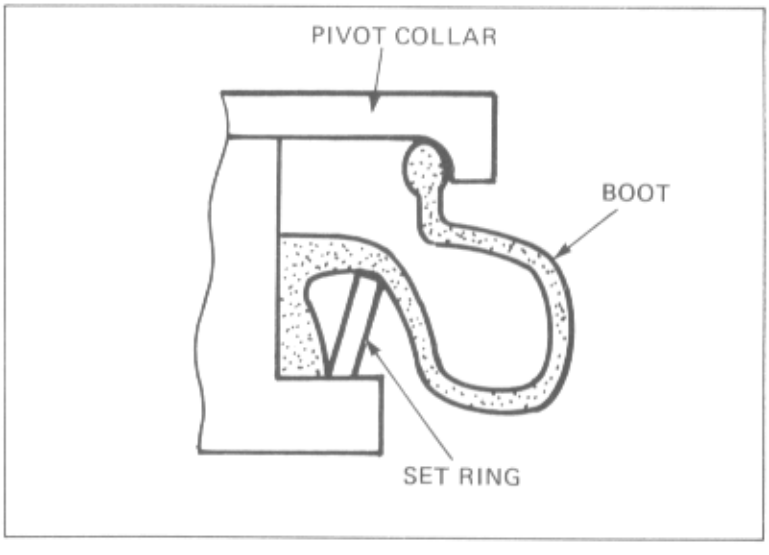


- ASSEMBLY

Assemble removed parts and install the assembly in the bottom of the case.

NOTE

- Apply a locking agent to the threads of the screws and socket bolts before assembly.
- Apply ATF to the piston and piston O-ring.
- Apply silicone grease to the pivot bolt collar.
- Install the pivot bolt collar boot set ring as shown.

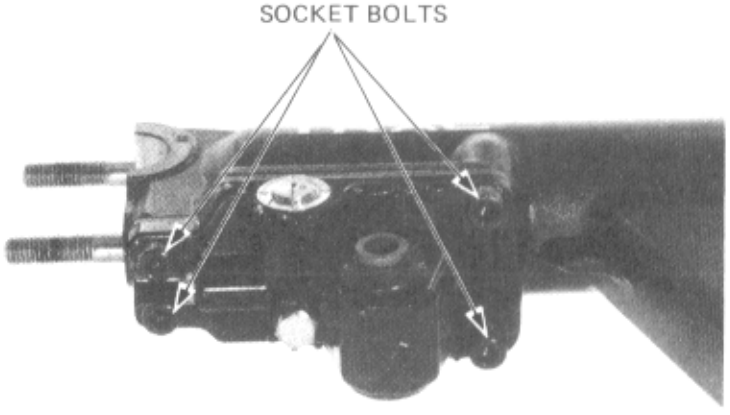


Tighten the socket bolts to the specified torque.

TORQUE: 6–9 N·m
(0.6–0.9 kg-m, 4.3–6.5 ft-lb)

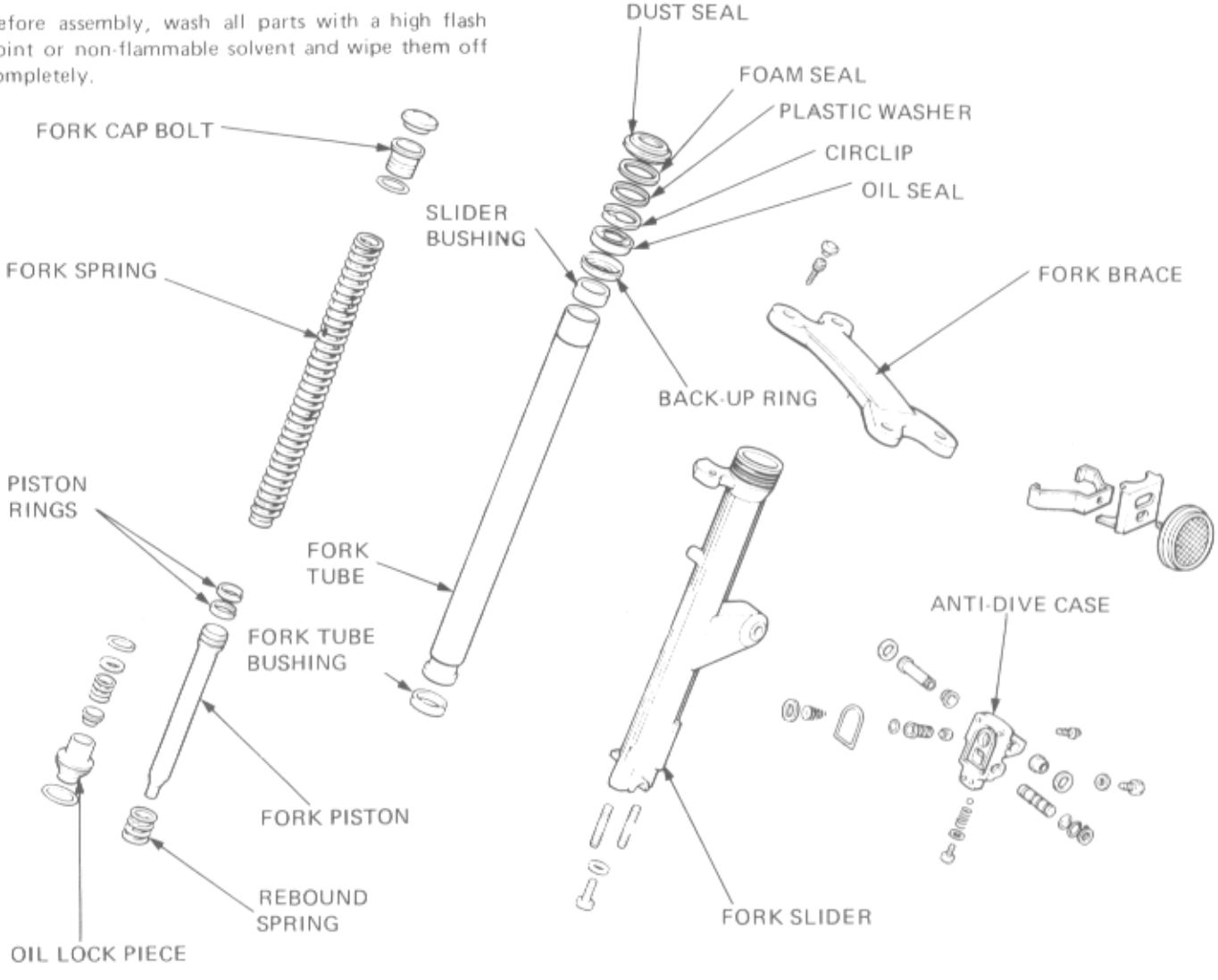
NOTE

Apply a locking agent to the threads of the screws and socket bolts before assembly.



ASSEMBLY

Before assembly, wash all parts with a high flash point or non-flammable solvent and wipe them off completely.



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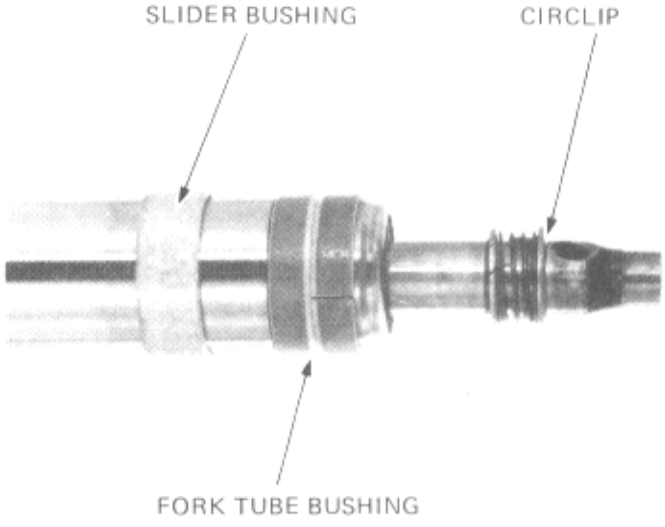
Install a new bushing on the fork tube if necessary. Place the rebound spring and piston into the fork tube. Place the oil lock piece on the end of the piston and insert the fork tube into the slider.



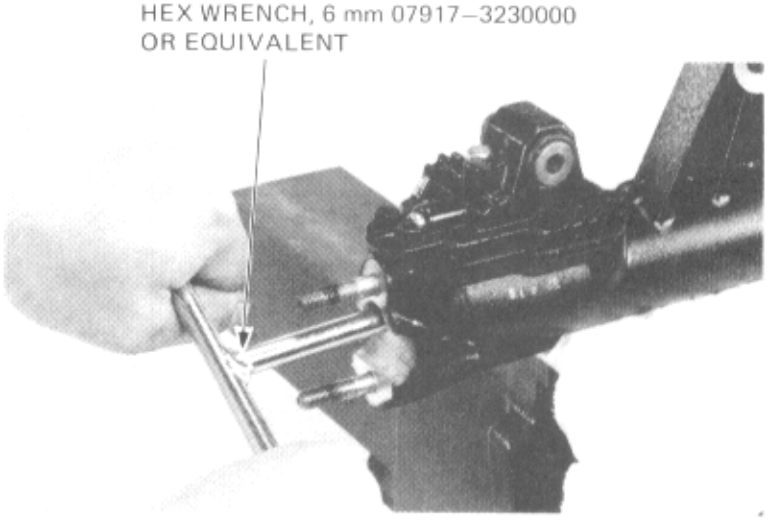
Place the fork slider in a vise with soft jaws.

Apply a locking agent to the socket bolt and thread it into the piston. Tighten with a 6 mm hex wrench.

NOTE

Temporarily install the fork spring and fork cap bolt to tighten the socket bolt.

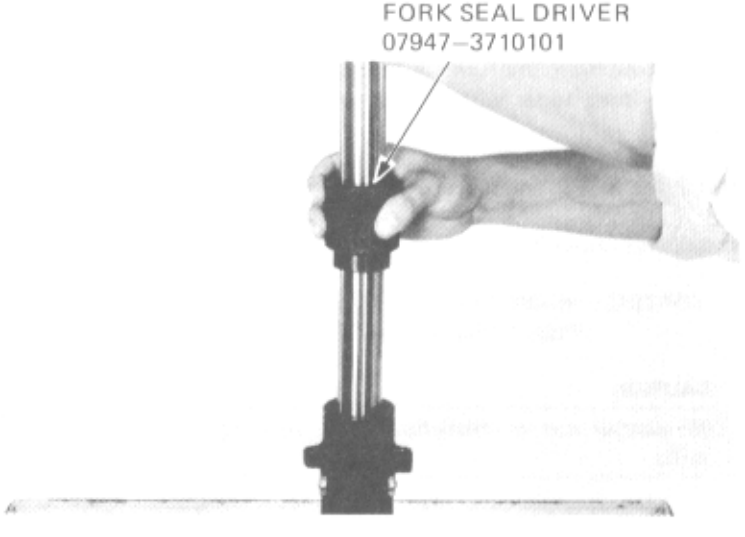
TORQUE: 15–25 N·m (1.5–2.5 kg-m, 11–18 ft-lb)



Place the slider bushing over the fork tube and rest it on the slider. Put the back-up ring and an old bushing or equivalent tool on top.

Drive the bushing into place with the seal driver.

Remove the old bushing.



Check the groove and top edge of the fork tube for burrs or scratches.

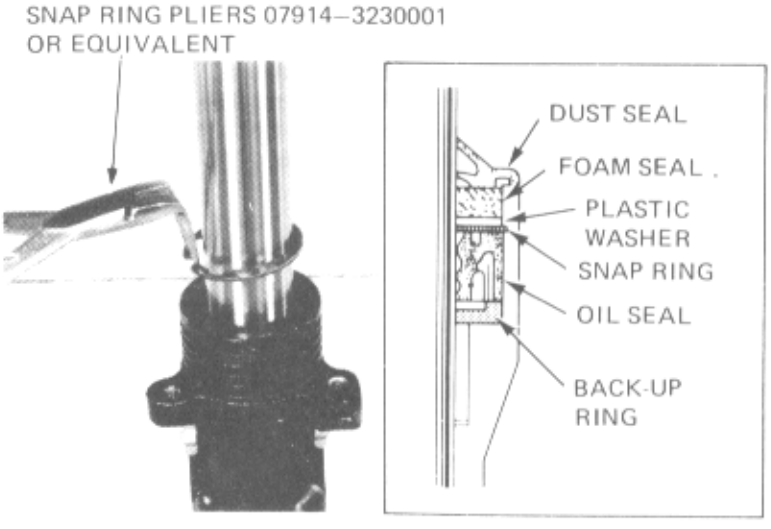
Wrap the fork tube groove or top edge with vinyl tape to prevent damage to the oil seal lip, during installation.

Install the back-up ring.

Coat a new oil seal with ATF and install it with the seal mark facing up.

Drive the oil seal in with the seal driver with the fork seal driver.

Install the back-up plate, circlip and dust cover.

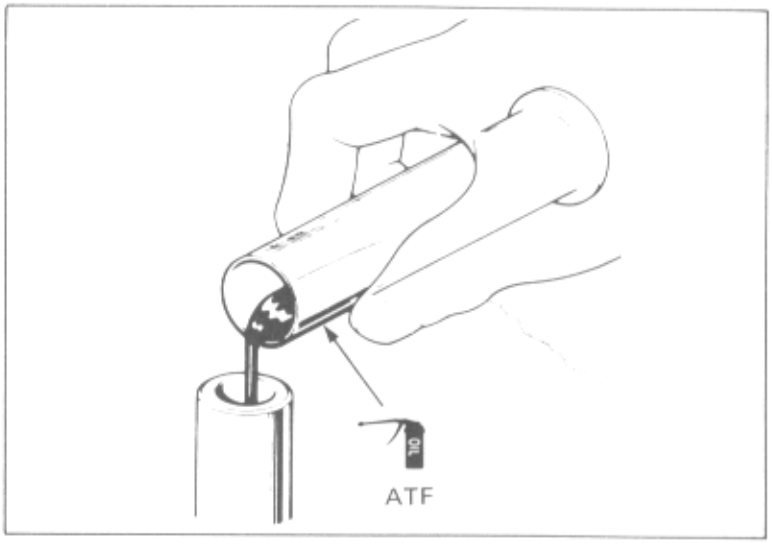


Pour the specified amount of ATF into the fork tube.

CAPACITY: 310 cc (10.5 US oz, 8.7 Imp oz)

NOTE

Be sure the oil level is the same in both fork tubes.



Wipe all oil from the fork springs and install them into the fork tubes with the narrow coils toward the top.

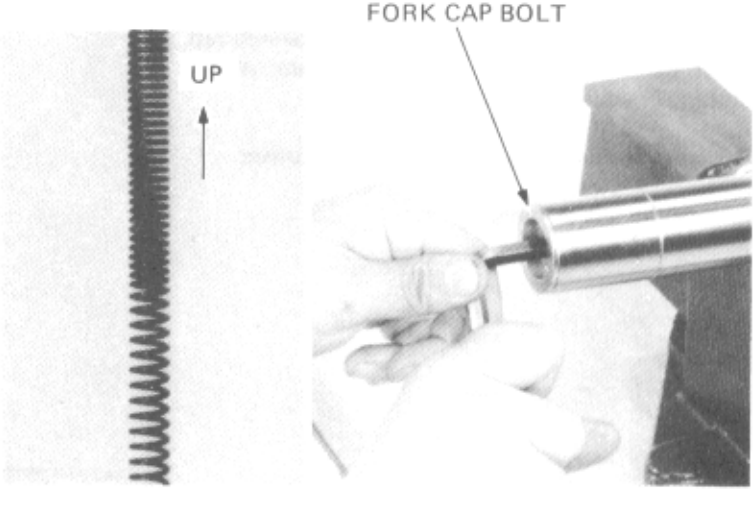
Install the fork spring spacers.

Install and torque the fork caps.

TORQUE: 15–30 N·m
(1.5–3.0 kg-m, 11–22 ft-lb)

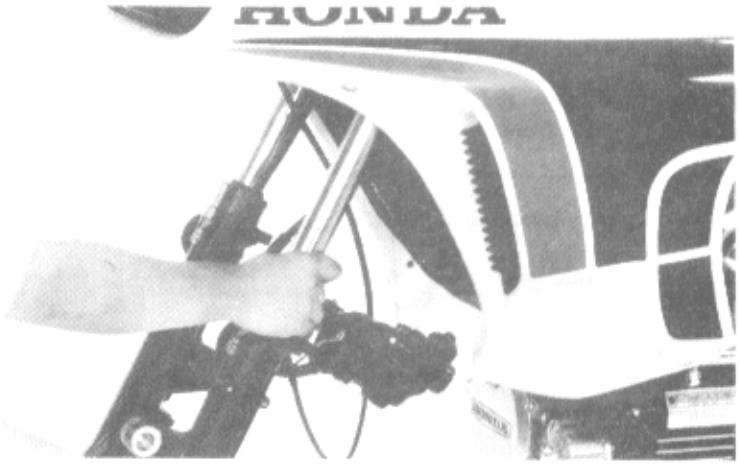
CAUTION

Be careful not to cross-thread the fork cap bolts.

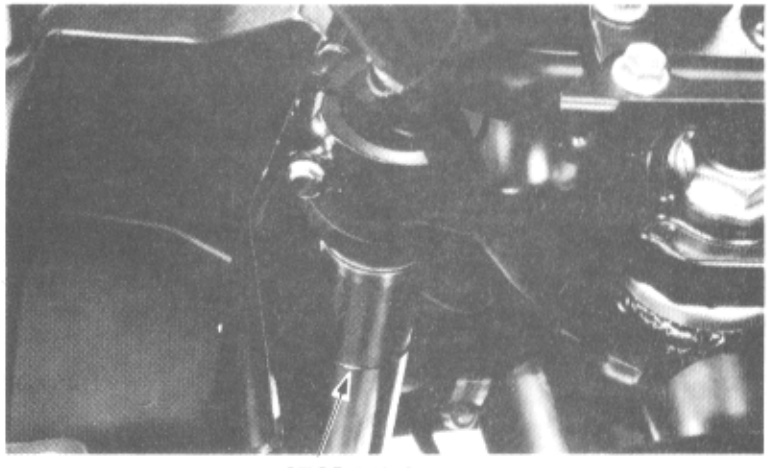


INSTALLATION

Place the fork tubes into the steering stem.
Tighten the lower pinch bolt loosely.



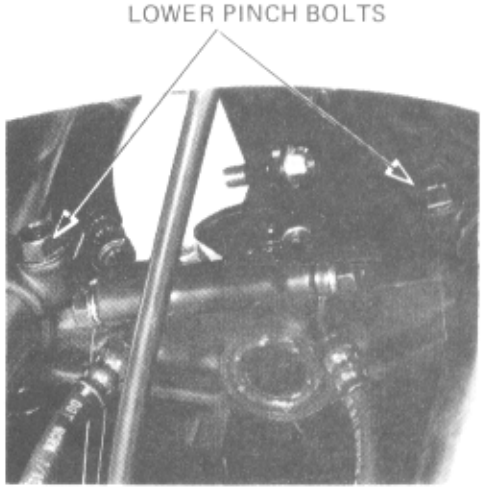
Install the stop ring on the fork tube groove securely. Then, loosen the lower fork pinch bolts and place the fork tube up into the fork bridge until the stop ring seats.



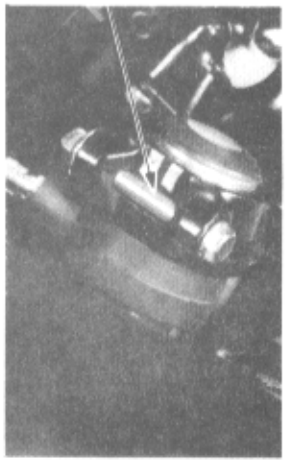
STOP RING

Tighten the fork tube pinch bolts.

TORQUE VALUES:
UPPER: 9–15 N·m
(0.9–1.5 kg-m, 7–11 ft-lb)
LOWER: 45–55 N·m
(4.5–5.5 kg-m, 33–40 ft-lb)



LOWER PINCH BOLTS



UPPER PINCH BOLT

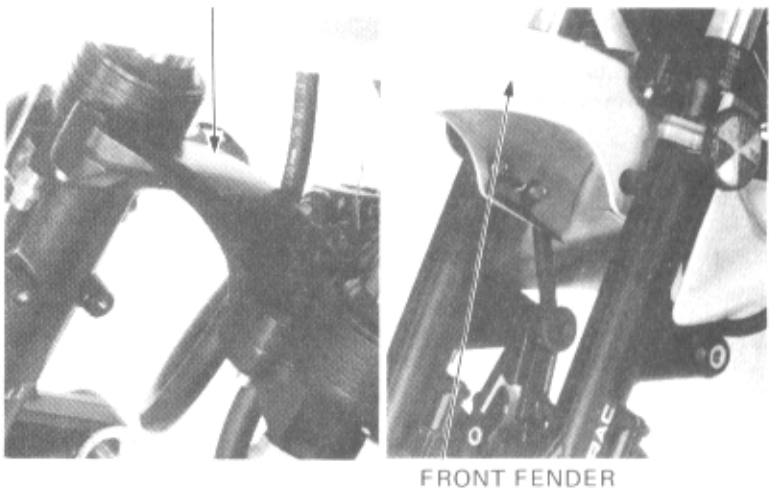
Install the fork brace and front fender.

NOTE:

Do not torque the fork brace bolts before torquing the front fork pinch bolts and front axle.

Install the front wheel (page 15-12).

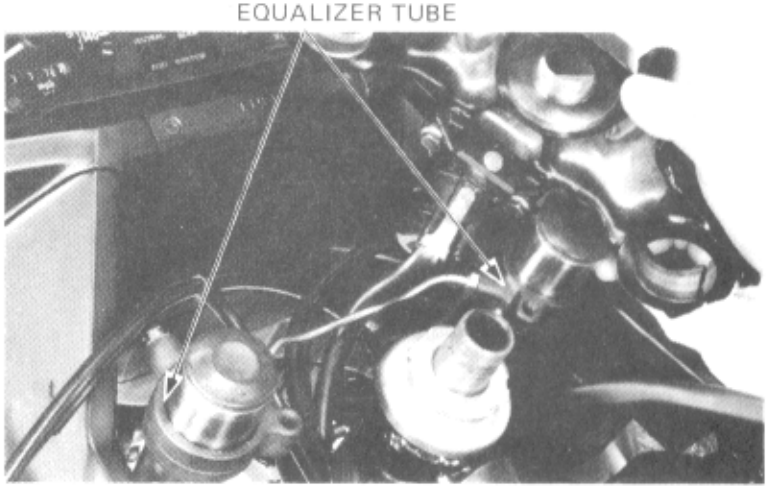
Fill the fork tubes with air (Section 3).



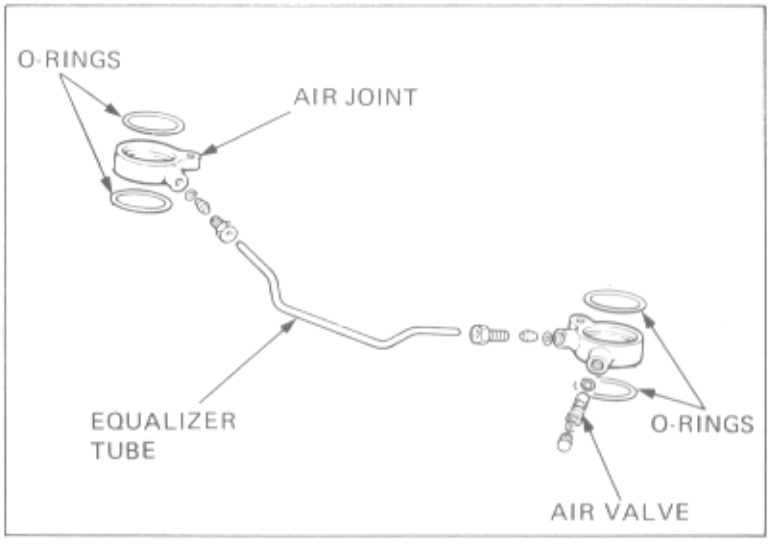
AIR EQUALIZER TUBE

Remove the fork top bridge (page 15-25).

Remove the air equalizer from the fork tubes.



Inspect the O-rings for damage or deterioration. Replace the O-rings if necessary.



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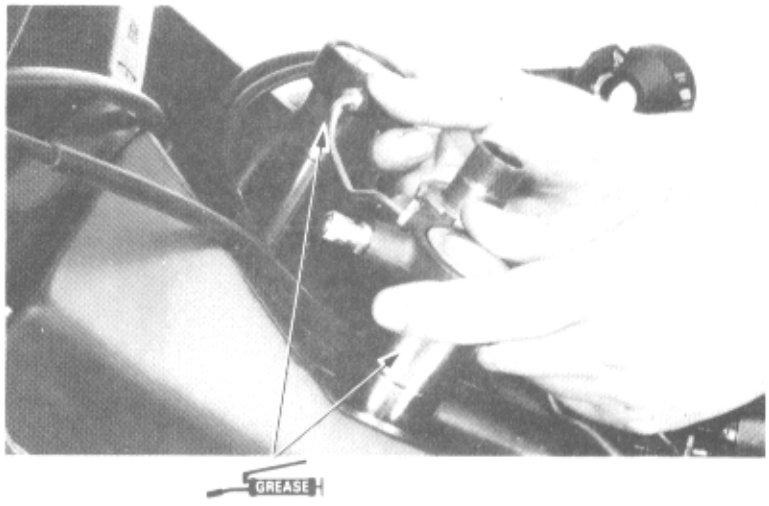
Apply grease to the fork tubes and install the equalizer onto the fork tubes.

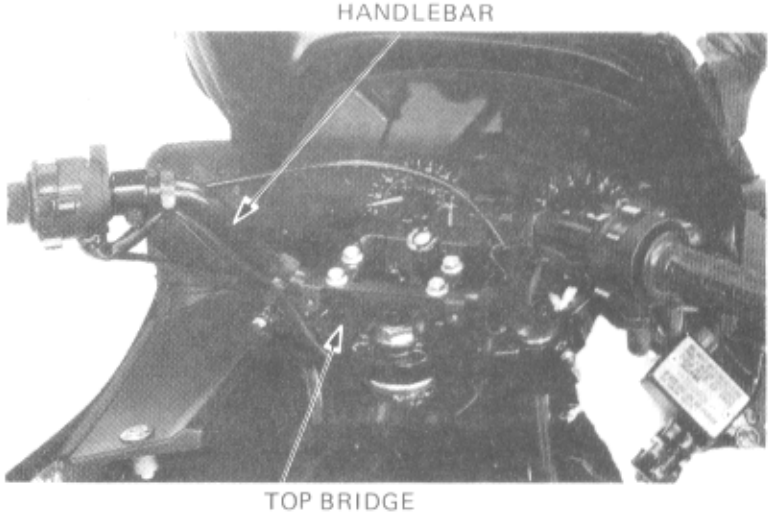
Install the fork bridge onto the forks (page 15-31). Check for air leakage after assembly.



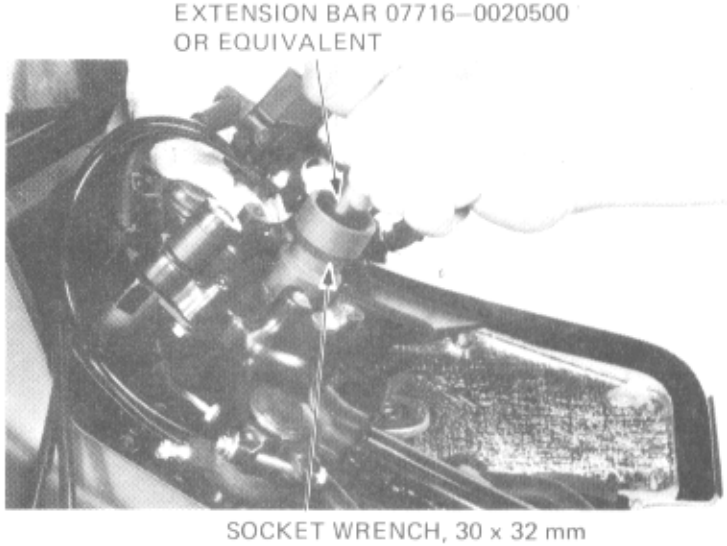
STEERING STEM

REMOVAL

Remove the handlebar (page 15-3).



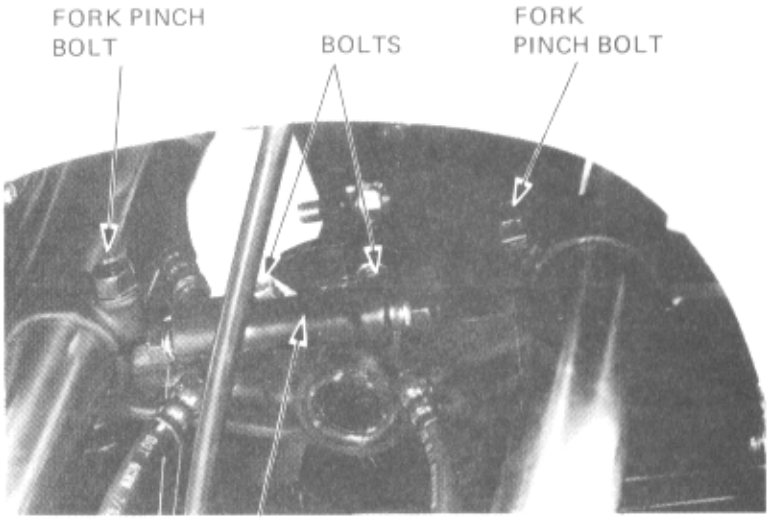
Remove the steering stem nut.
Loosen the upper fork pinch bolts and remove the top bridge.



Remove the front brake three-way joint mounting bolts.

Remove the front wheel (page 15-7).

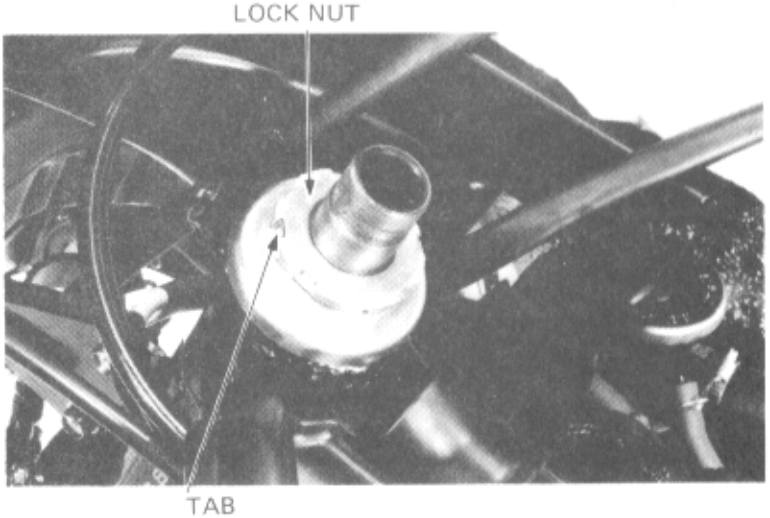
Loosen the lower fork pinch bolts and remove the front forks.



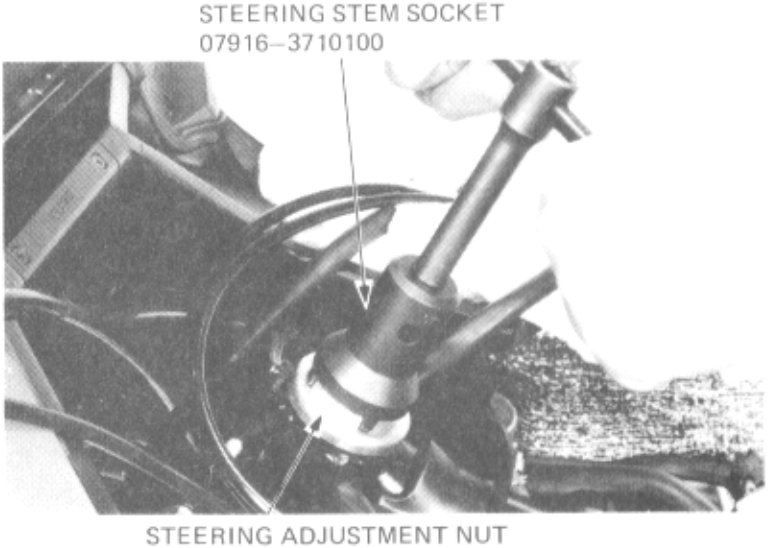
THREE-WAY JOINT

Straighten the tab of the lock washer and remove the top thread nut.

Remove the lock nut.



Hold the steering stem to prevent it from falling.
Remove the steering adjustment nut.



STEERING ADJUSTMENT NUT

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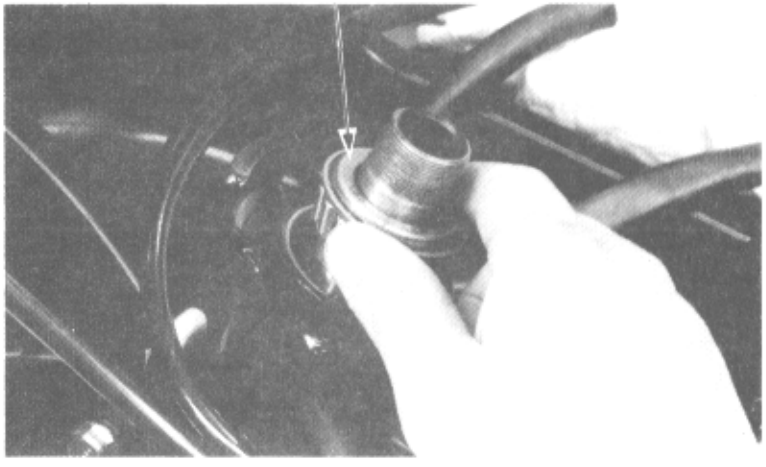
Remove the upper roller bearing.
Remove the steering stem and lower bearing.

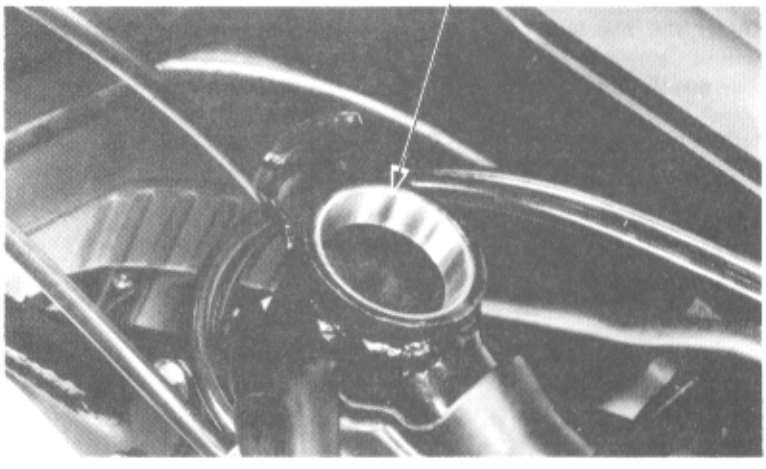
ROLLER BEARING



BEARING INSPECTION

Check the upper and lower bearing race surfaces for wear or damage and replace if necessary.

BEARING RACE



BOTTOM BEARING REPLACEMENT

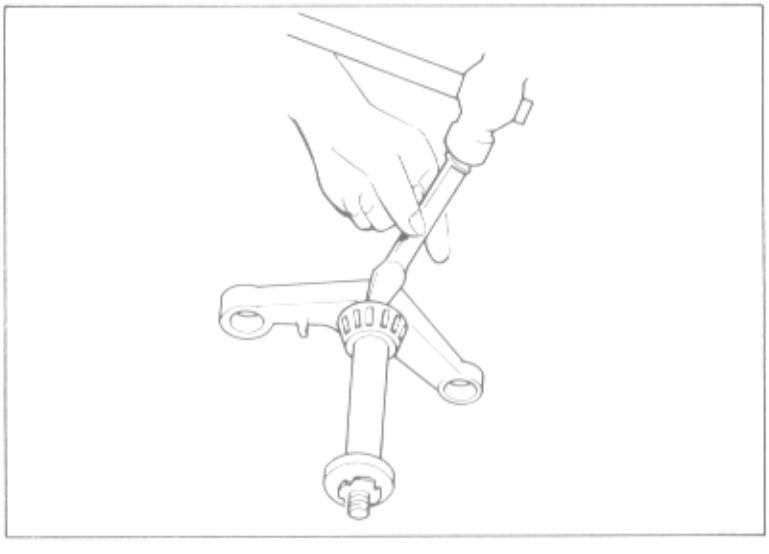
NOTE

Always replace the bearing and race as a set.

Remove the bottom bearing with a hammer and a drift.

NOTE

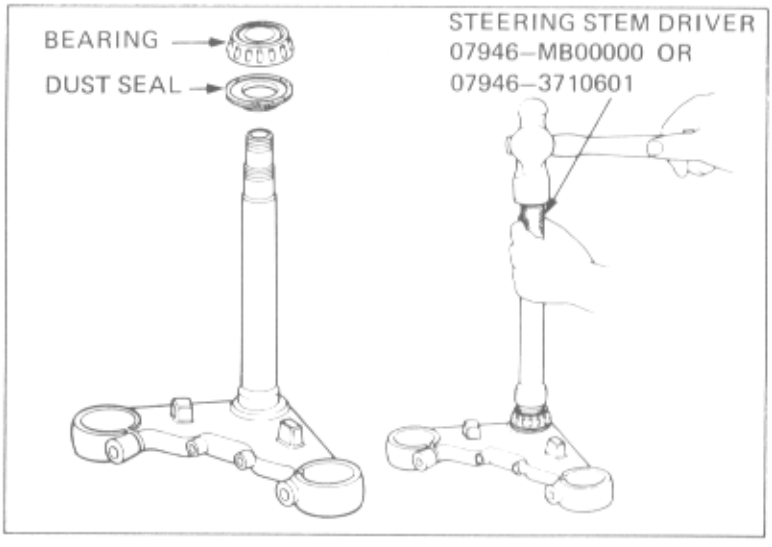
- Install the bearing holder, outer race and adjustment nut on the top end of the steering stem to prevent damage to the threads.
- The bearing will be damaged during removal and will require replacement.



Install a new dust seal and drive a new bearing into place.

NOTE

Replace the dust seal and bearing whenever they are removed from the steering stem.

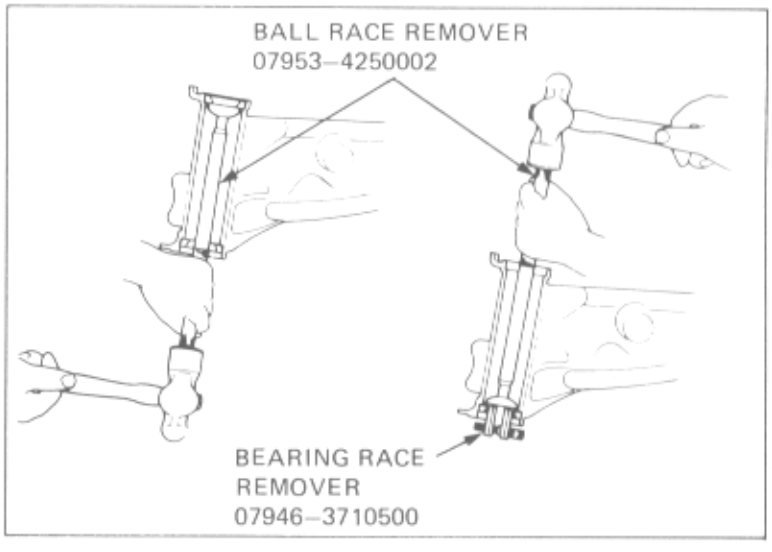


BEARING RACE REPLACEMENT

Inspect the top and bottom races and replace if worn or damaged.
Drive out the top race and then the bottom race.

NOTE

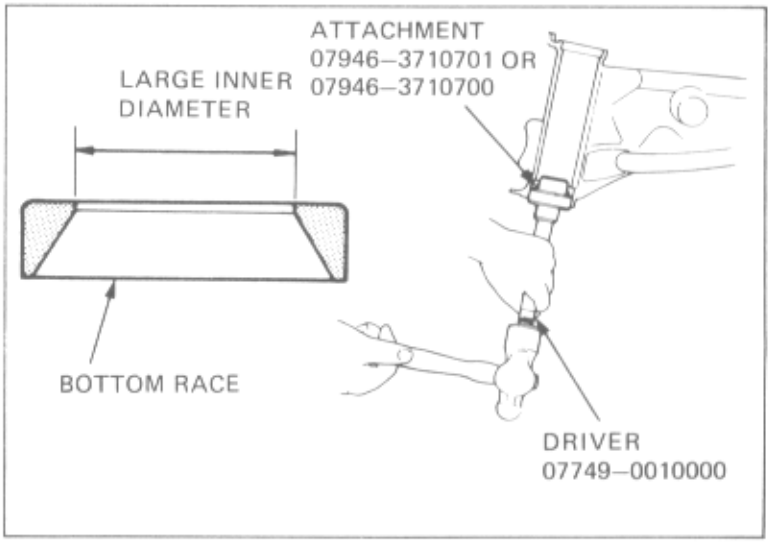
Always remove the top race before driving out the bottom race.



Install a new bottom race.

NOTE

- The bottom race has a larger I.D. than the top race. Be sure to install the races in their proper places.
- Drive the races in squarely until they seat fully.



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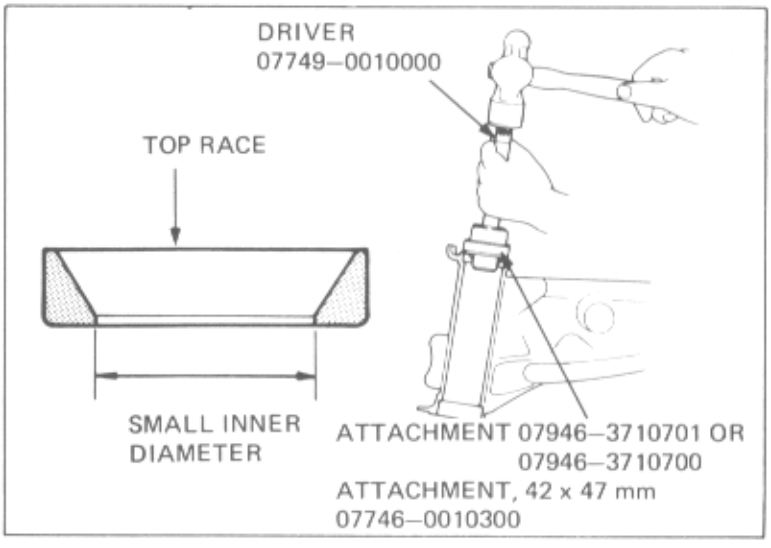
Install a new top race first with attachment 07946–3710701 or 07946–3710700.
Then use attachment 07746–0010300 or old race to install a new bottom race until it seats.

NOTE

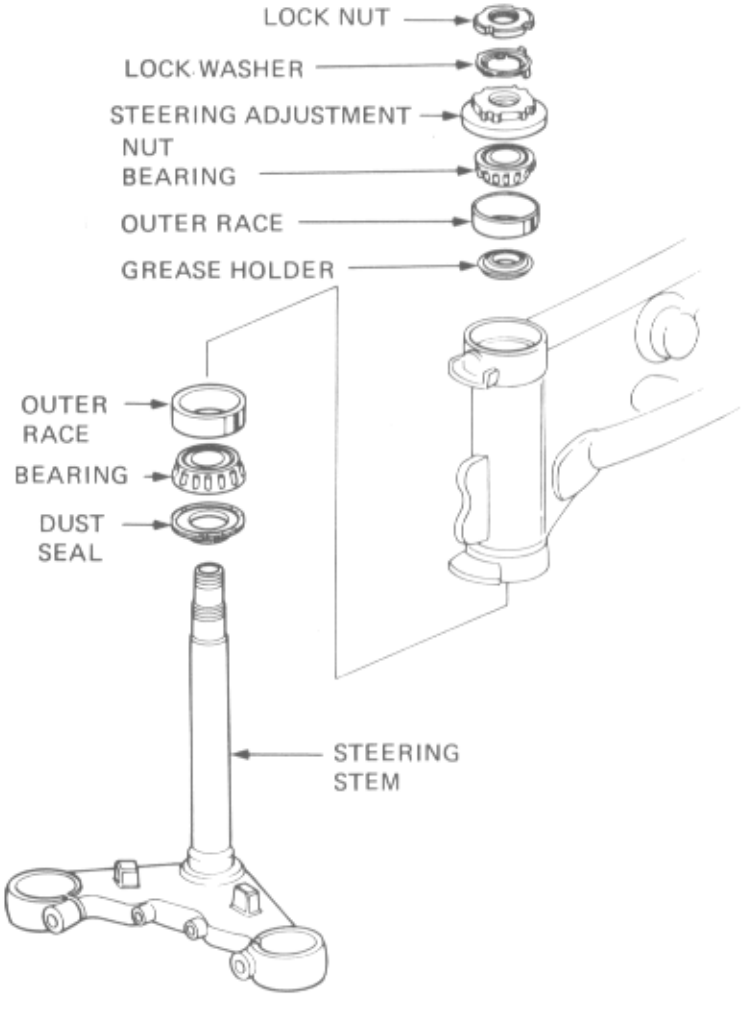
Drive the races in squarely until they are fully seated.



INSTALLATION

Grease the outer races and install the bearings and races.

Grease the lower bearing and install it.

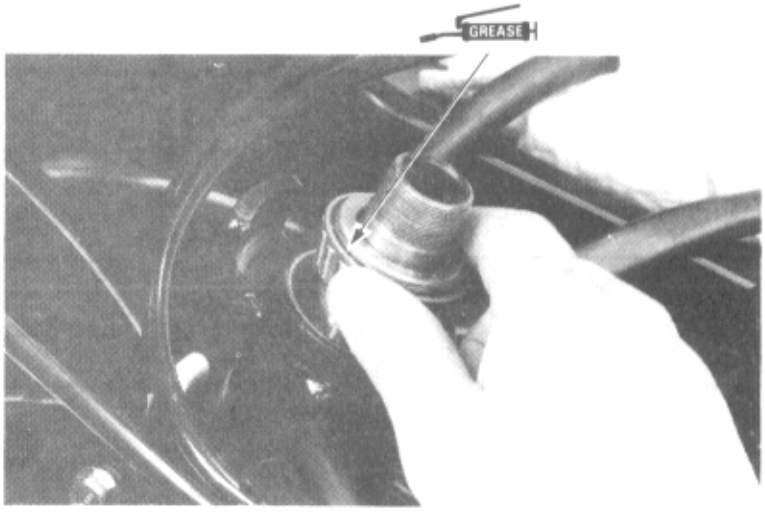


Clean the upper and lower bearings thoroughly.

Thread the steering adjustment nut and lock nut onto the steering stem to make sure that they turn smoothly and will not bind.
Remove the top thread "B" nut and adjustment nut.

Clean the steering stem and adjustment nut threads. Remove all dirt and burrs and pack all bearing cavities with bearing grease.

Insert the steering stem into the steering head pipe and install the upper bearing holder and bearing.



Install and tighten the adjustment nut.

TORQUE: **14–16 N·m**
(1.4–1.6 kg-m, 10–12 ft-lb)

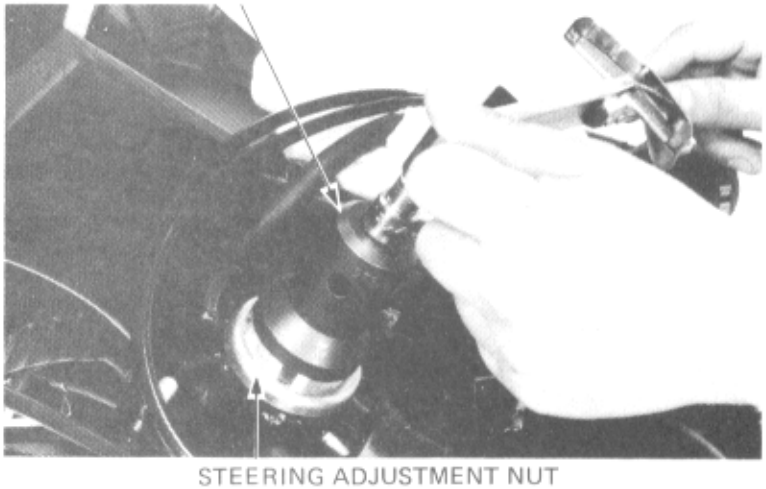
Turn the steering stem lock-to-lock 5 times to seat the bearings. Repeat the bearing tightening and steering stem turning sequence twice.

If the nut does not tighten after turning the steering stem the first or second time, remove the nut and inspect it and the steering stem threads for dirt or burrs.

WARNING

If the top thread nut is too loose, handlebar oscillation may be experienced. If too tight, cornering instability and excessive noise during braking will be experienced.

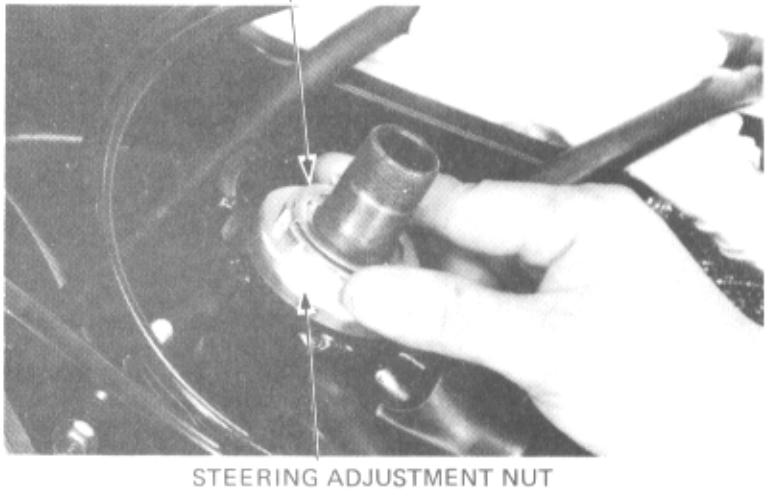
STEERING STEM SOCKET
07916–3710100



STEERING ADJUSTMENT NUT

Install a new lock washer on the steering adjustment nut.

LOCK WASHER



STEERING ADJUSTMENT NUT

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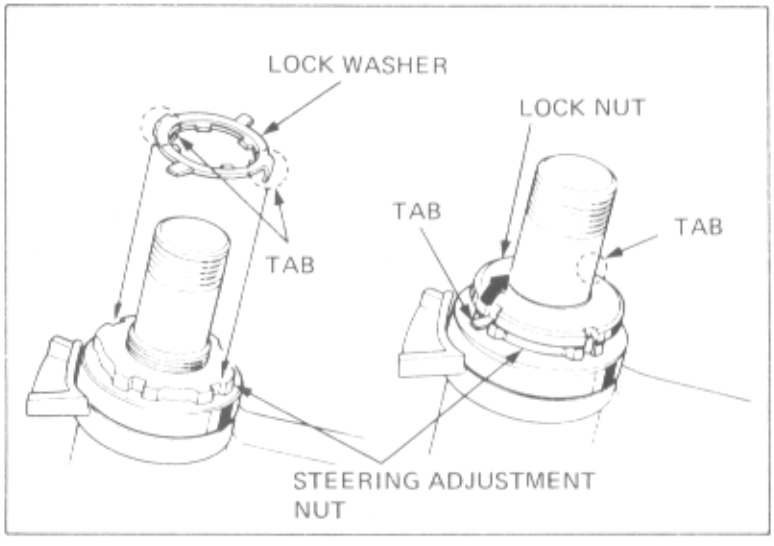
Hand tighten the lock nut. Hold the adjustment nut and hand tighten the lock nut only to align its grooves with the lock washer tabs.

NOTE

If the lock nut grooves cannot be easily aligned with the lock washer tabs, remove the nut, turn it over and reinstall it.

Bend the other two lock washer tabs up into the lock nut grooves.



FORK BRIDGE INSTALLATION

Install the front fork legs.

Temporarily hold the front fork legs by tightening the lower fork pinch bolts.
Install the fork equalizer tube onto the fork tubes (15-25).

Install the fork top bridge.

Tighten the steering stem nut.

TORQUE: 80–120 N·m (8.0–12.0 kg-m, 58–87 ft-lb)

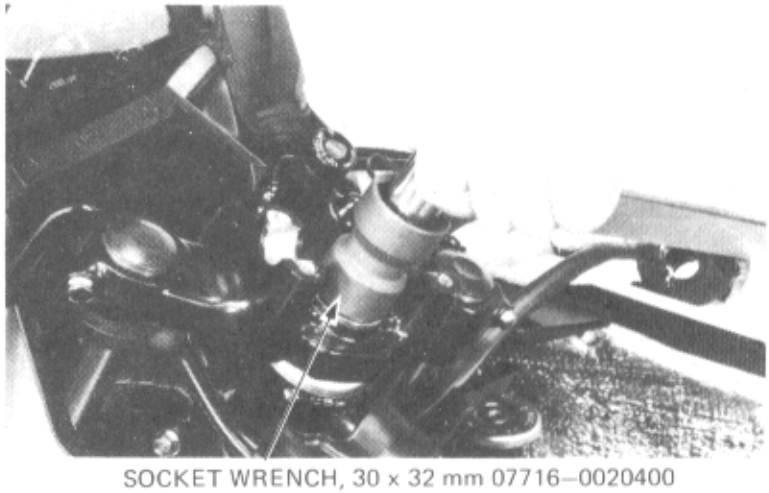
Tighten the lower fork pinch bolts.

TORQUE: 45–55 N·m (4.5–5.5 kg-m, 33–40 ft-lb)

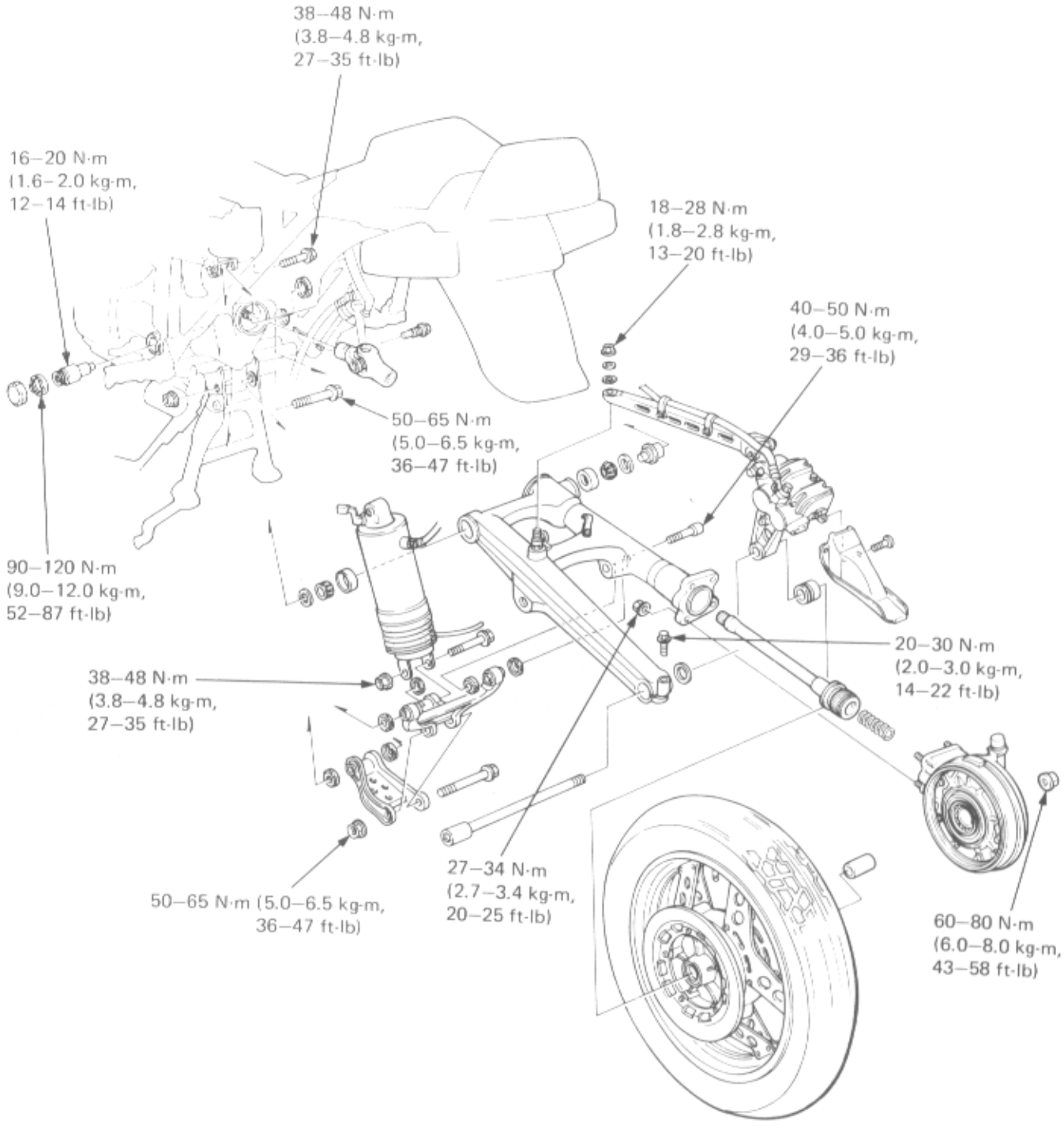
Tighten the upper fork pinch bolts.

TORQUE: 9–15 N·m (0.9–1.5 kg-m, 7–11 ft-lb)

Check that the steering stem turns freely and that there is no steering stem vertical movement.



SOCKET WRENCH, 30 x 32 mm 07716–0020400
OR EQUIVALENT



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16. REAR WHEEL/SUSPENSION

SERVICE INFORMATION

GENERAL

- COMSTAR wheels are not serviceable. If either the spokes, rim or hub are damaged the entire wheel must be replaced.
- Tubeless tire removal, repair and remounting procedures are covered in the Tubeless Tire Manual.
- Before installing the rear wheel, apply Multipurpose NLGI No. 2 Grease (MoS2 Molybdenum disulfide additive) to the final driven flange and the final driveshaft splines.
- Take care not to damage the body when removing and installing the shock absorber.

WARNING

Use only genuine Honda replacement rear suspension linkage and shock absorber pivot/mount bolts. Others may not have adequate strength. Note the installation direction of the bolts.

SPECIFICATIONS

Item		Standard	Service Limit
Axle runout		—	0.2 mm (0.01 in)
Rear wheel runout	Radial	—	2.0 mm (0.08 in)
	Axial	—	2.0 mm (0.08 in)
Rear shock absorber oil capacity		120 cc (3.38 Imp oz, 4.06 US oz)	—
Rear shock absorber air pressure		200–600 kPa (2.0–6.0 kg/cm^2, 28–84 psi)	—

16

TORQUE VALUES

Shock absorber mount bolts	38–48 N·m (3.8–4.8 kg-m, 27–35 ft-lb)
Suspension linkage pivot bolt	50–65 N·m (5.0–6.5 kg-m, 36–47 ft-lb)
Shock arm socket bolt	40–50 N·m (4.0–5.0 kg-m, 29–36 ft-lb)
Rear axle nut	60–80 N·m (6.0–8.0 kg-m, 43–58 ft-lb)
Rear axle pinch bolt	20–30 N·m (2.0–3.0 kg-m, 14–22 ft-lb)
Swing arm pivot bolt	16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)
Swing arm pivot lock nut	90–120 N·m (9.0–12.0 kg-m, 52–87 ft-lb)
Final gear case nut	27–34 N·m (2.7–3.4 kg-m, 20–25 ft-lb)
Brake stopper arm bolt/nut	15–25 N·m (1.5–2.5 kg-m, 11–18 ft-lb)
Rear brake pedal bolt	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
Rear brake stopper arm bolt (front)	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Rear brake stopper arm nut (front)	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
Rear brake stopper arm bolt (rear)	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)

TOOLS

NOTE

In the lists below, "or equivalent" means there may be a commercially available tool in the U.S.A. that will work as well as the one listed.

Special

Swing arm lock nut wrench	07908–4690001 or KS–HBA–469–08 (U.S.A. only)
Bearing retainer wrench	07910–4300000
Bearing remover handle	07936–3710100
Bearing remover weight	07936–3710200
Bearing remover, 30 mm	07936–8890300
Driver attachment	07965–MA10200
Oil seal driver	07965–MC70100
Attachment	07965–ME70100

Common

Socket bit, 17 mm	07703–0020500 or equivalent
Attachment, 37 x 40 mm	07746–0010200
Pilot, 17 mm	07746–0040400
Attachment, 42 x 47 mm	07746–0010300
Driver	07749–0010000
Bearing remover expander	07746–0050100
Bearing remover collet, 17 mm	07746–0050100

TROUBLESHOOTING

Wobble or Vibration
- Distorted rim.
- Loose wheel bearing.
- Loose or distorted spokes.
- Faulty tire.
- Loose axle.
- Loose swing arm pivot bolt.

Soft Suspension
- Weak spring.
- Shock absorber improperly adjusted.
- Insufficient air pressure.
- Weak rear damper.
- Insufficient fluid in rear shock absorber.

Hard Suspension
- Shock absorber improperly adjusted.
- Incorrect fluid weight in rear shock absorber.
- Too much air pressure.

Suspension Noise
- Shock case binding.
- Loose fasteners.

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REAR WHEEL/REAR BRAKE

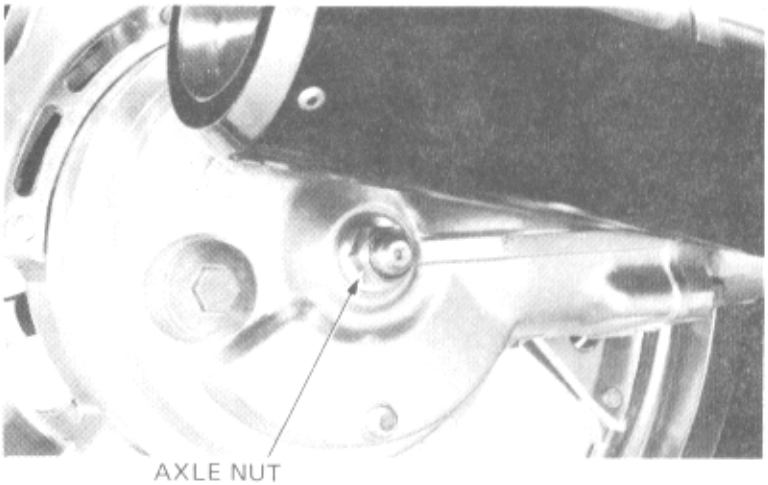
REAR WHEEL REMOVAL

Place the motorcycle on its center stand.

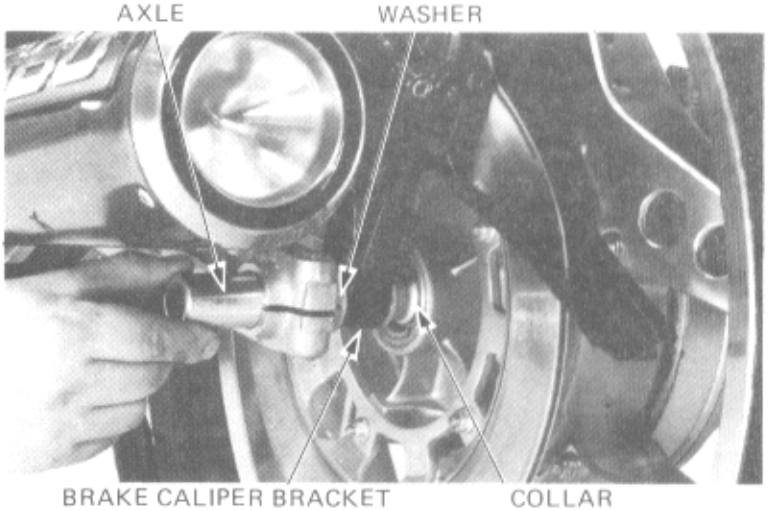
Place a wood block under the rear tire to support the wheel.

Loosen the axle nut.

Remove the three nuts attaching the swingarm to the final gear case.



Remove the three nuts attaching the swing arm to axle.

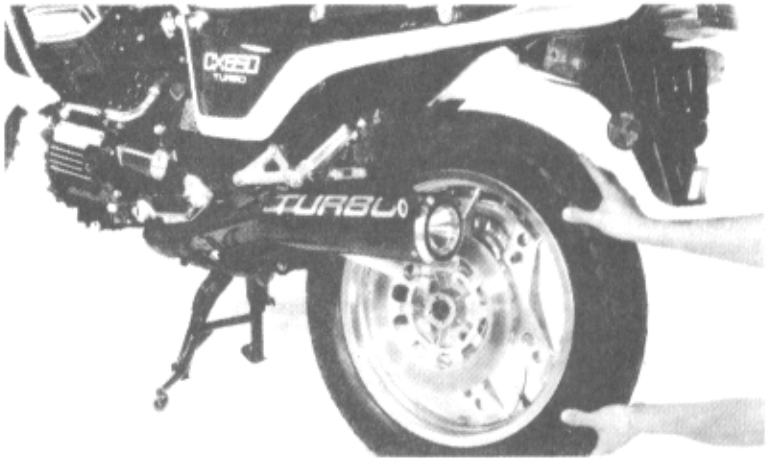


Pull the rear brake caliper up and pull the brake torque link outward to allow removal of the rear wheel.

While someone tilt the motorcycle, remove the rear wheel.

NOTE

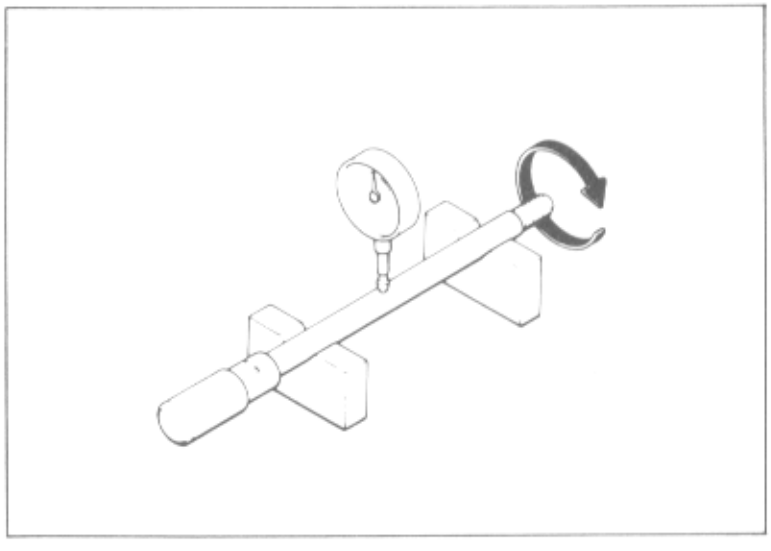
Do not depress the brake pedal while the wheel is off the motorcycle or it will be difficult to refit the brake caliper.



AXLE INSPECTION

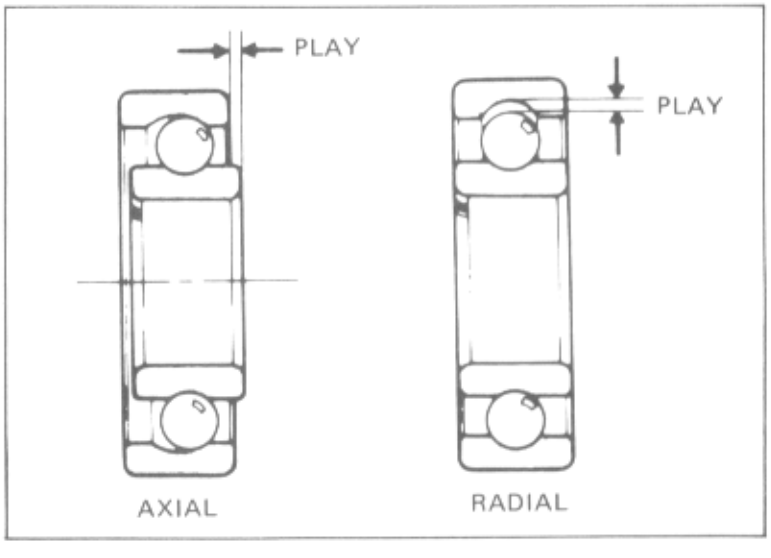
Set the axle shaft in V-blocks and measure the runout. The actual runout is 1/2 of the total indicator reading.

SERVICE LIMIT: 0.2 mm (0.01 in)



REAR WHEEL BEARING INSPECTION

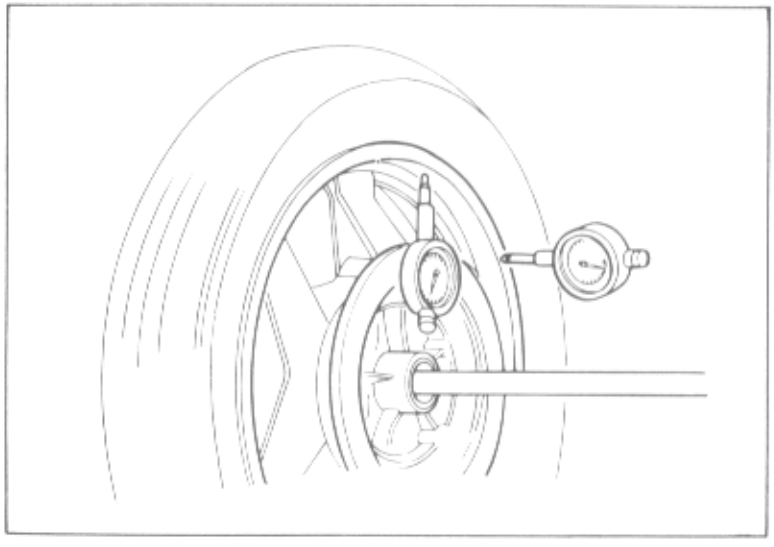
Rotate the rear wheel bearings by hand. Replace the wheel bearings with new ones if they are noisy or have excessive play.



REAR WHEEL RIM RUNOUT INSPECTION

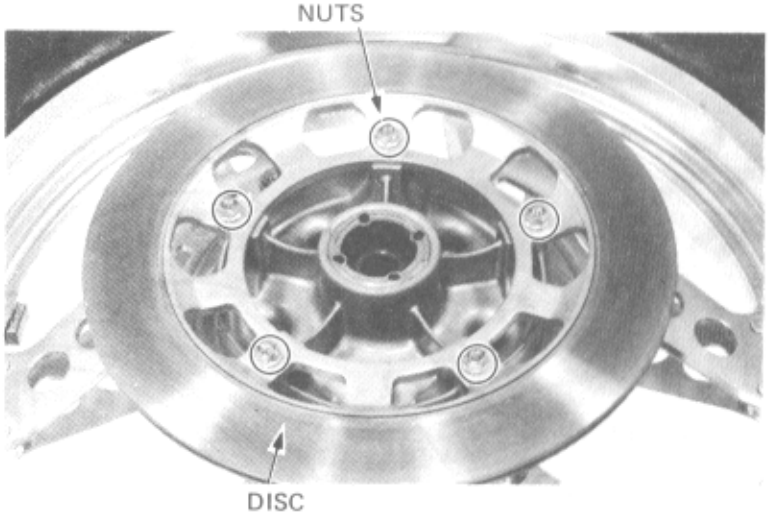
Place the wheel in a truing stand. Spin the wheel slowly and measure the runout with a dial indicator.

SERVICE LIMITS:
RADIAL RUNOUT: 2.0 mm (0.08 in)
AXIAL RUNOUT: 2.0 mm (0.08 in)

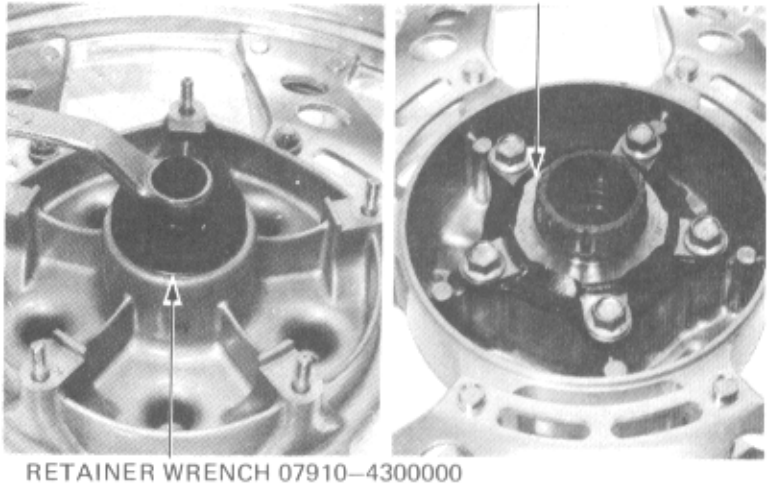


REAR WHEEL DISASSEMBLY

Remove the rear brake disc.



Remove the bearing retainer with the Retainer Wrench and remove the final driven flange.



Remove the bearings and distance collar from the rear wheel hub.

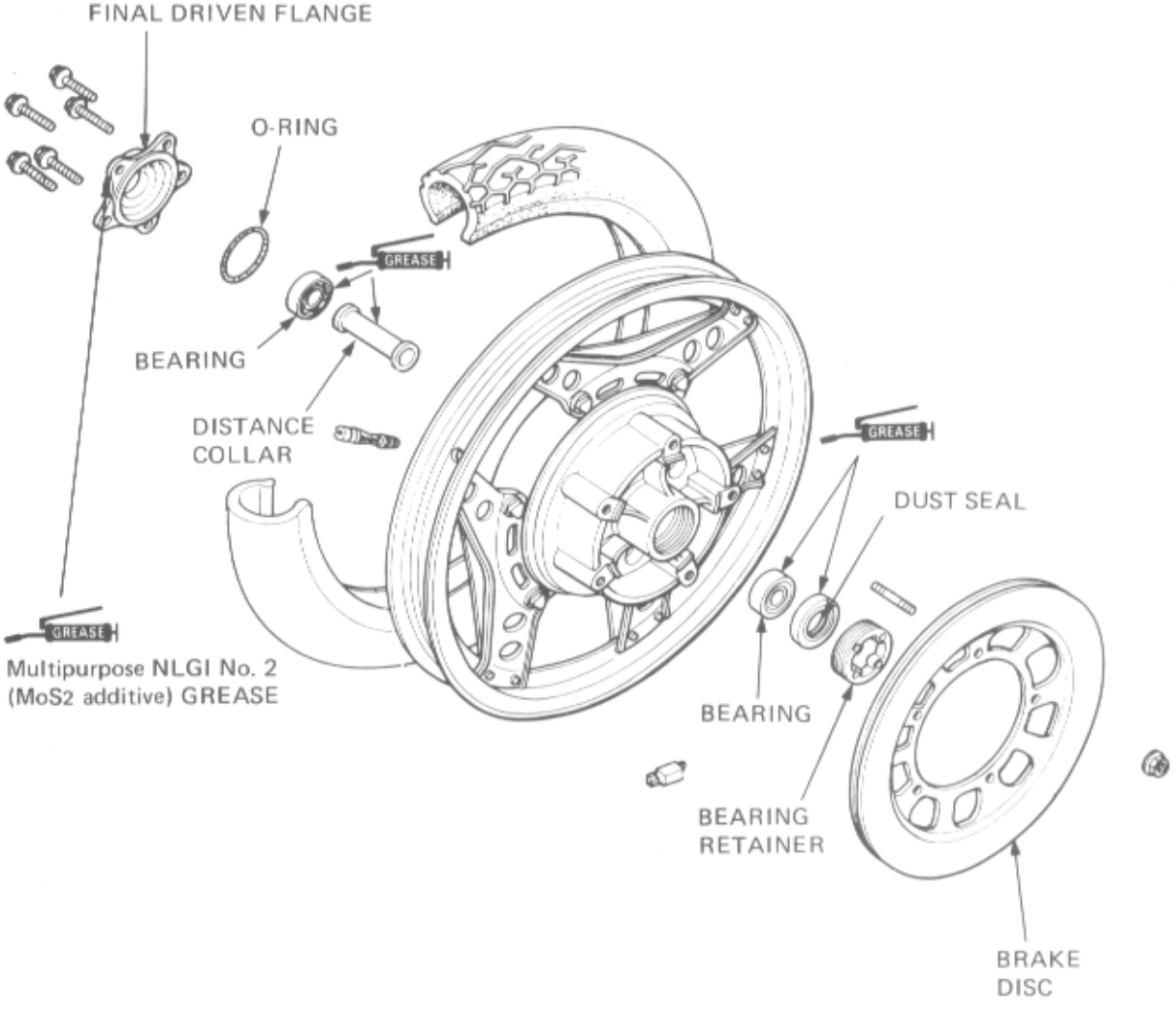
NOTE

If the bearings are removed, replace them with new bearings during assembly.

BEARING REMOVER EXPANDER
07746–0050100 OR EQUIVALENT

BEARING REMOVER COLLET, 17 mm
07746–0050500 OR EQUIVALENT

REAR WHEEL ASSEMBLY



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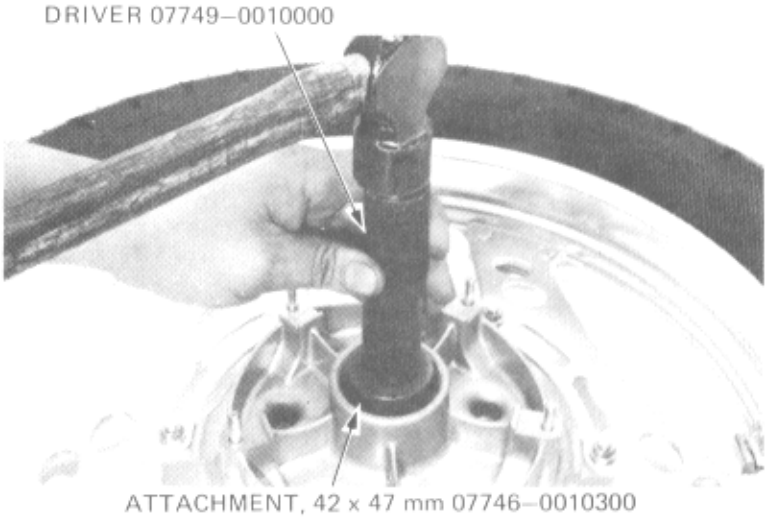
Pack new bearing cavities with grease and drive in the left bearing with a bearing driver.

CAUTION

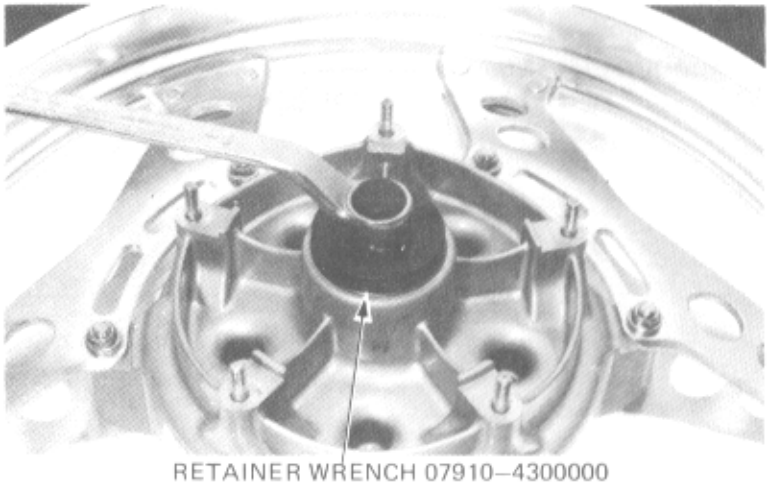
Drive the bearings in squarely with the sealed ends facing out. Make sure they are fully seated.

Install the distance collar and then drive in the right bearing.



Install the dust seal.

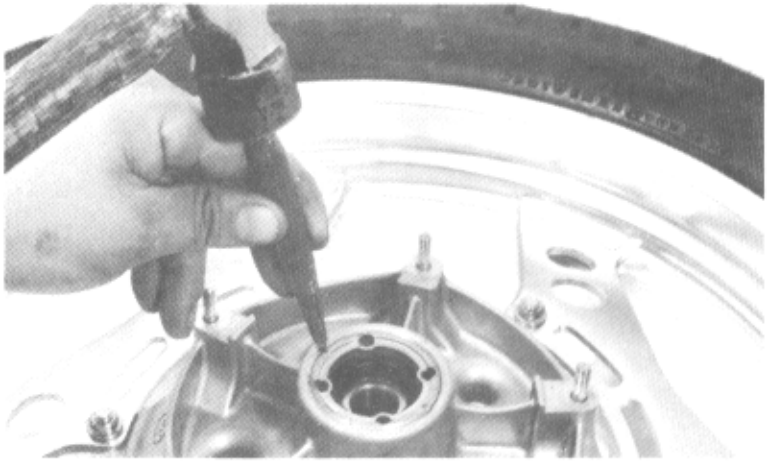
Then, install the bearing retainer with the Retainer Wrench as shown.



Peen the retainer to the hub.

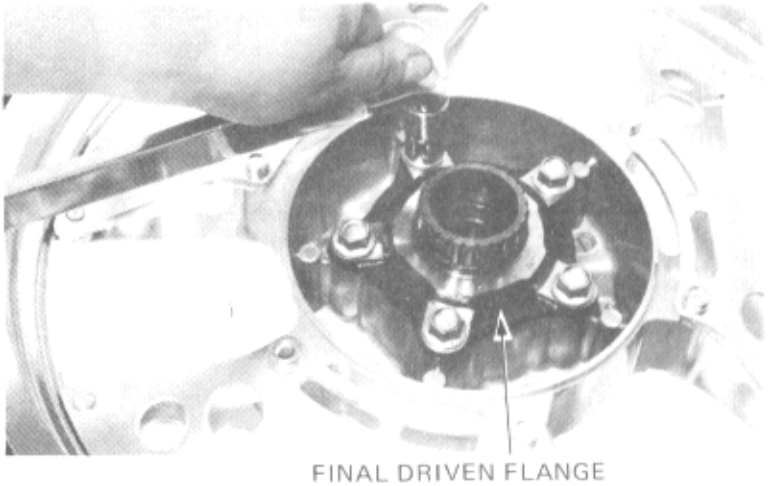
NOTE

Check the condition of the bearing retainer. Replace the retainer if the threads are damaged.



Install the final driven flange and torque the bolts.

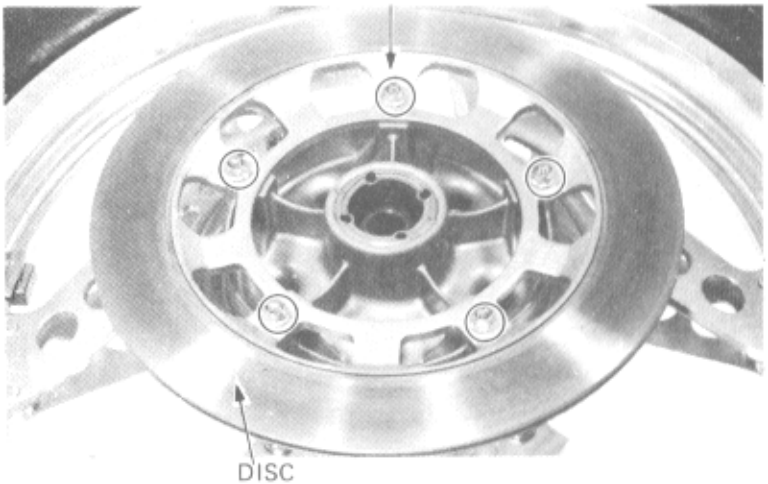
TORQUE: 40–50 N·m
(4.0–5.0 kg-m, 29–36 ft-lb)



FINAL DRIVEN FLANGE

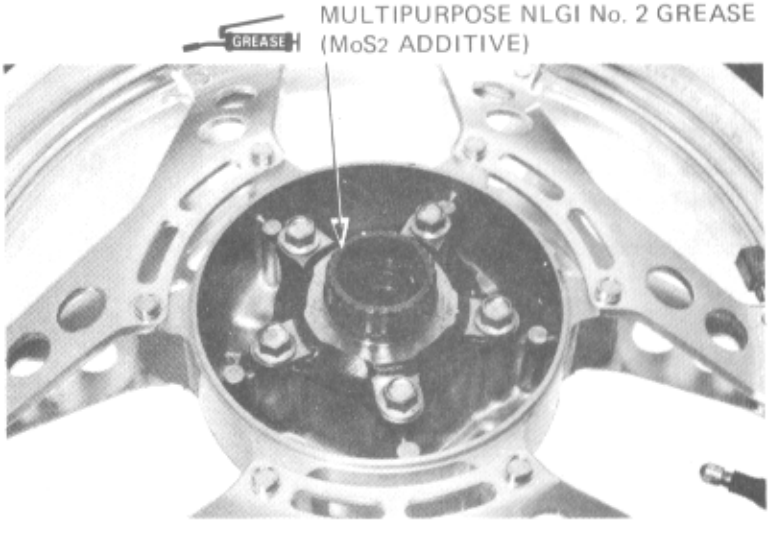
Install the rear brake disc.

TORQUE: 10–12 N·m
(1.0–1.2 kg-m, 7–9 ft-lb)



REAR WHEEL INSTALLATION

Apply Multipurpose NLGI No. 2 Grease (MoS_2 additive) to the final driven flange splines.



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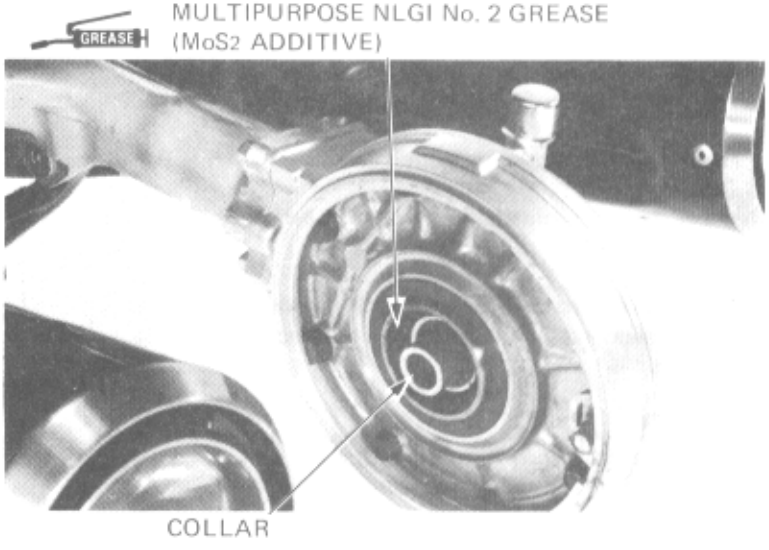
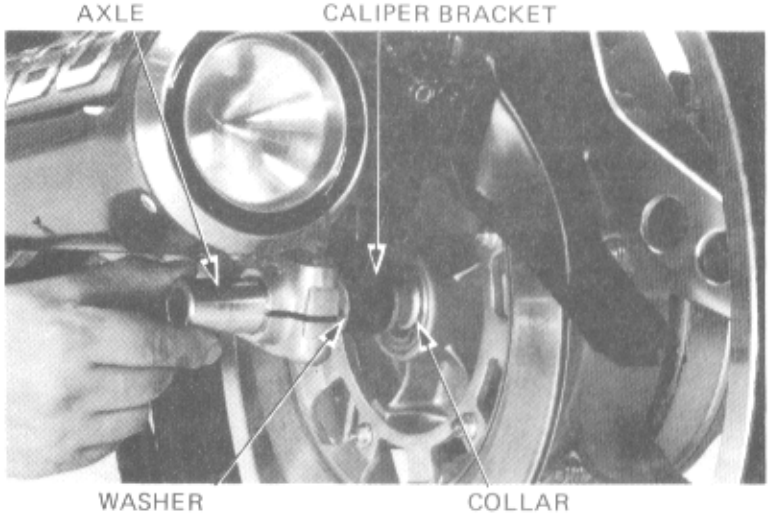
Apply Multipurpose NLGI No. 2 Grease (MoS_2 additive) to the splines of the ring gear shaft.

Make sure the distance collar is in place in the final gear case.



Install the rear wheel onto the final gear case, aligning their splines.

Insert the rear axle through the swing arm, washer, caliper bracket, collar and rear wheel.

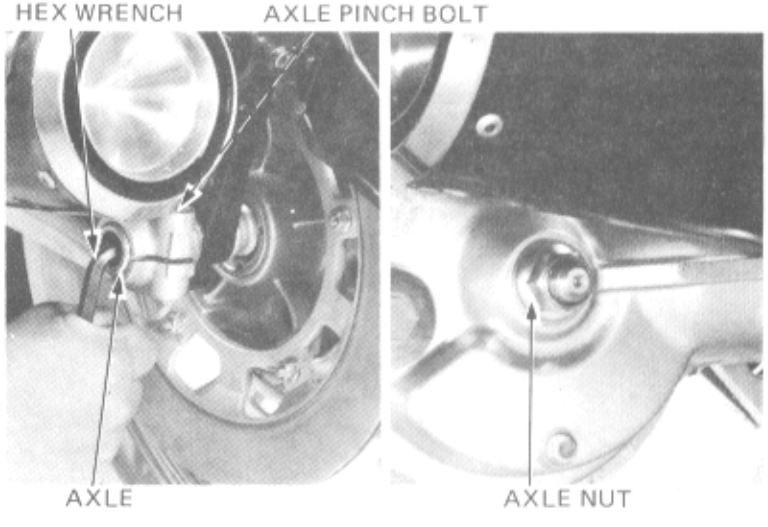


Install and tighten the axle nut while holding the left axle end with a hex wrench.

TORQUE: 60–80 N·m
(6.0–8.0 kg-m, 43–58 ft-lb)

Tighten the axle pinch bolt.

TORQUE: 20–30 N·m
(2.0–3.0 kg-m, 14–22 ft-lb)



SHOCK ABSORBER

REMOVAL

Place the motorcycle on the center stand.

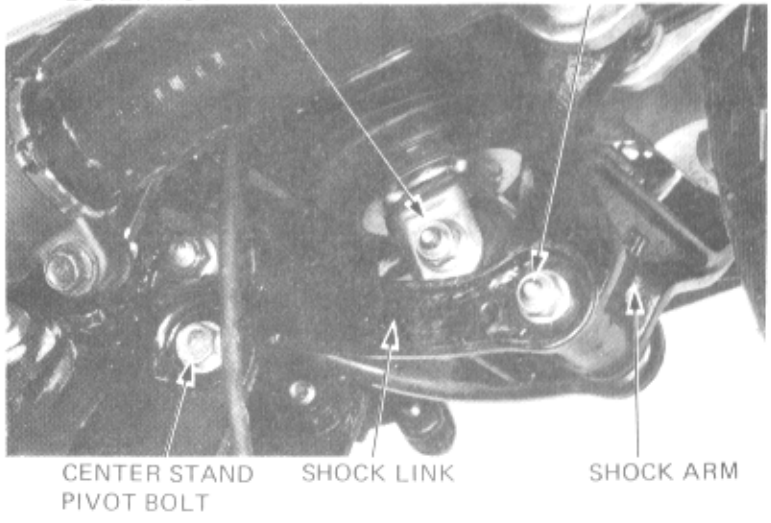
Remove the bolt connecting the shock arm to the shock link.

Loosen the center stand pivot bolts (left and right). Unscrew them just enough to allow the shock link to fall free.

CAUTION

If you unscrew the pivot bolts all the way, the mainstand will come off causing the motorcycle to fall.

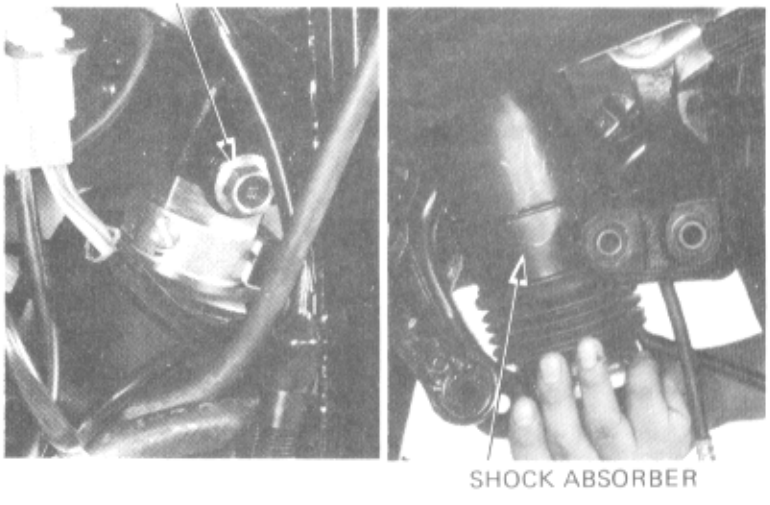
Push down on the shock link.



Remove the crankcase breather separator.

Disconnect the air hose from the hose clamp and remove the shock absorber upper mount bolt. Hold the shock absorber to prevent it from falling out.

Remove the shock absorber.

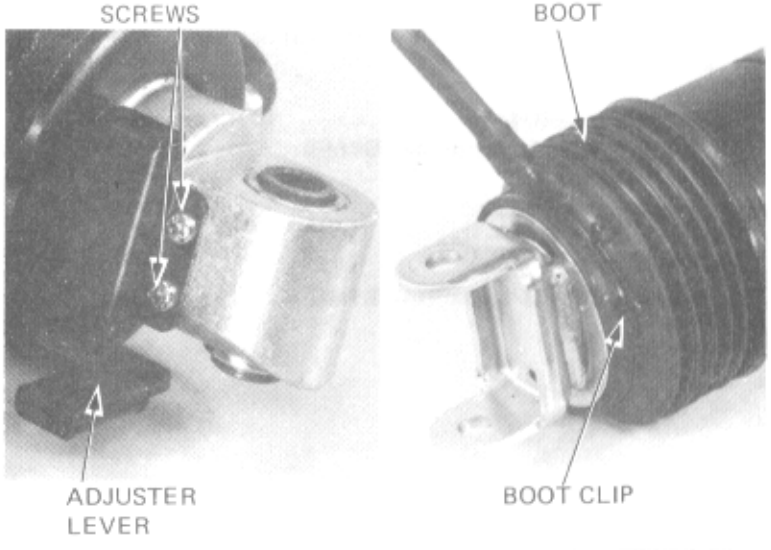


OIL SEAL REPLACEMENT

Release air from the shock absorber by pressing the valve core in.

With the damper adjusting lever pushed in fully, remove the lever by removing the screws.

Remove the boot clip and boot.



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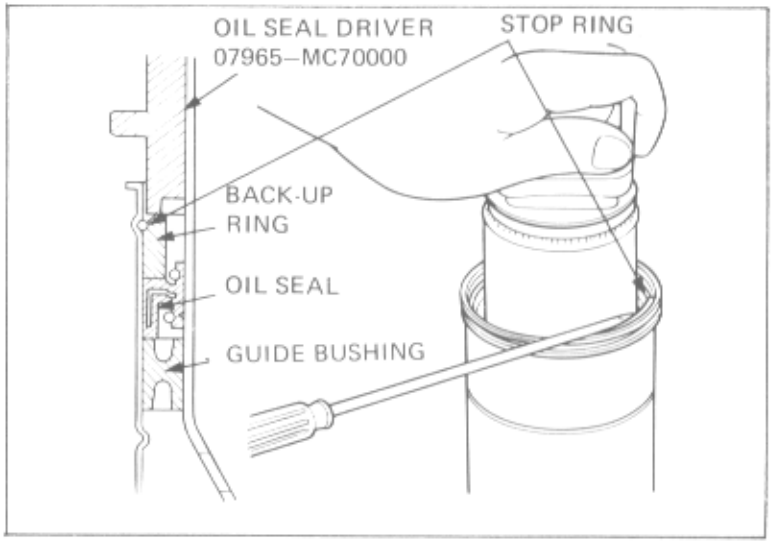
Press the back-up ring 1.0–2.0 mm (0.04–0.08 in) in with the Oil Seal Driver.

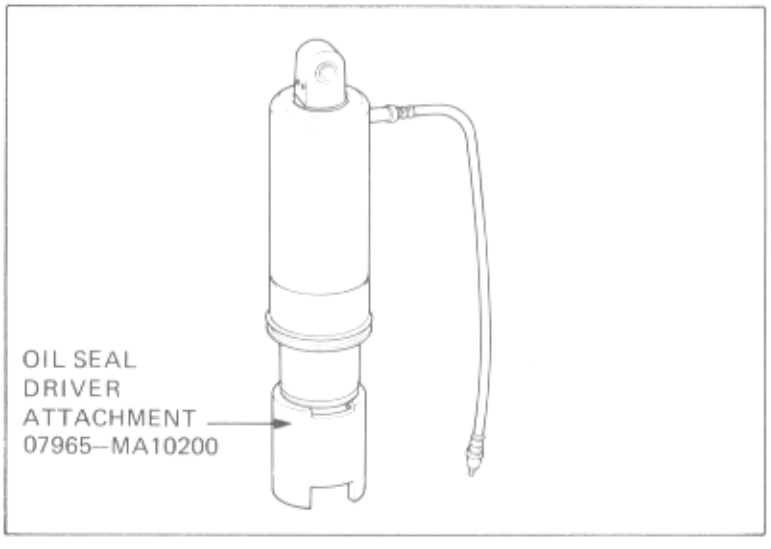
NOTE

Do not press the back-up ring in excessively as such practice causes the guide bushing to strike the shock case. Resulting in either of malfunction or in difficulty in removing the guide bushing.

Remove the stop ring.

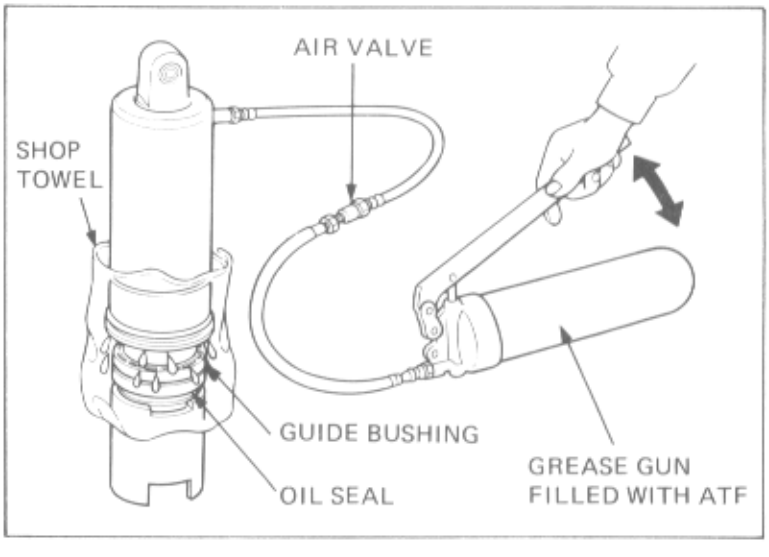


Place the shock absorber upright in an oil drain pan. Let the shock stand for 5 minutes to allow air to escape.



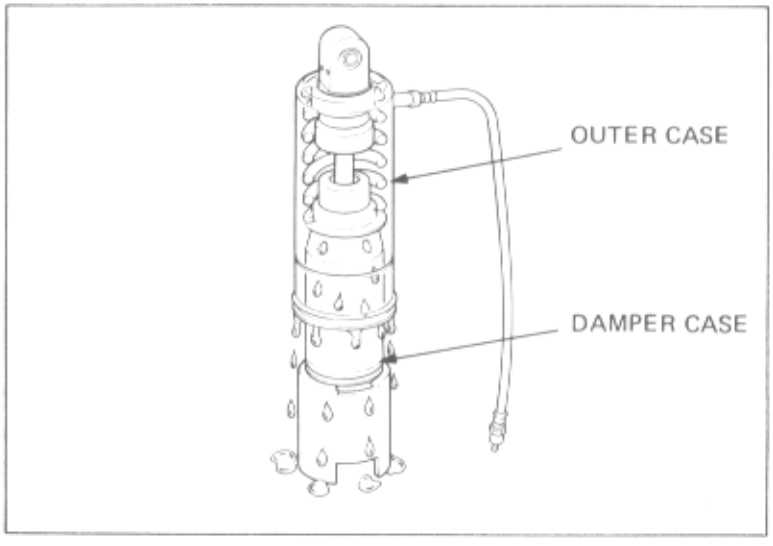
Fill a high pressure grease gun with ATF (Automatic Transmission Fluid) and connect the attachment hose to the shock absorber air valve. Keep the shock upright.

Wrap a shop towel around the oil seal.
Pump ATF into the shock absorber through the attachment hose to force the oil seal and guide bushing out. The ATF will also come out.



Leave the shock absorber for another 10 minutes to let any remaining ATF drain out.

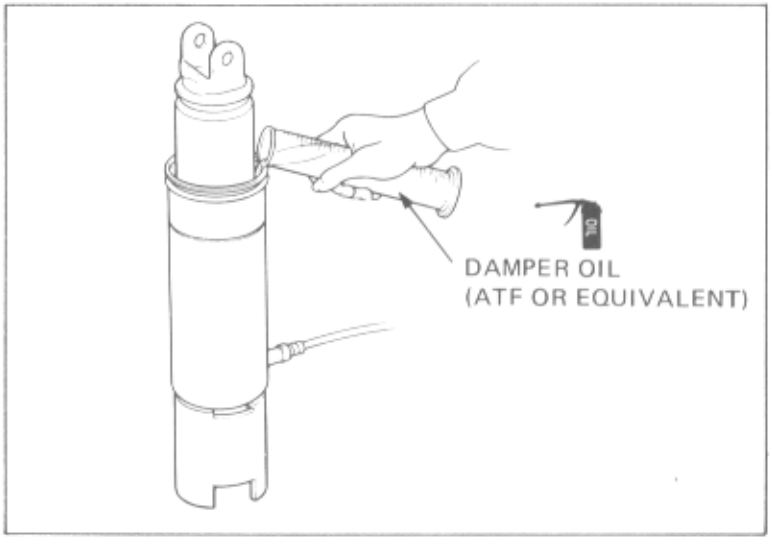
Do not tilt the shock absorber or ATF will flow out of the damper case.



Turn the shock absorber upside down as soon as all the ATF has drained from the outer case.

Fill the damper case with the specified amount of ATF.

SPECIFIED AMOUNT:
120 cc (4.06 US oz, 3.38 Imp oz)



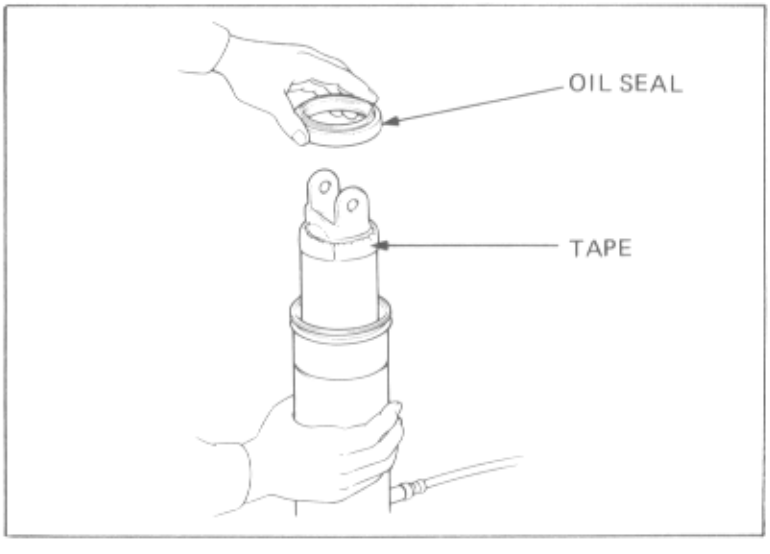
Install the guide bushing into the damper case.

Wrap a piece of tape around the groove at the end of the shock absorber.

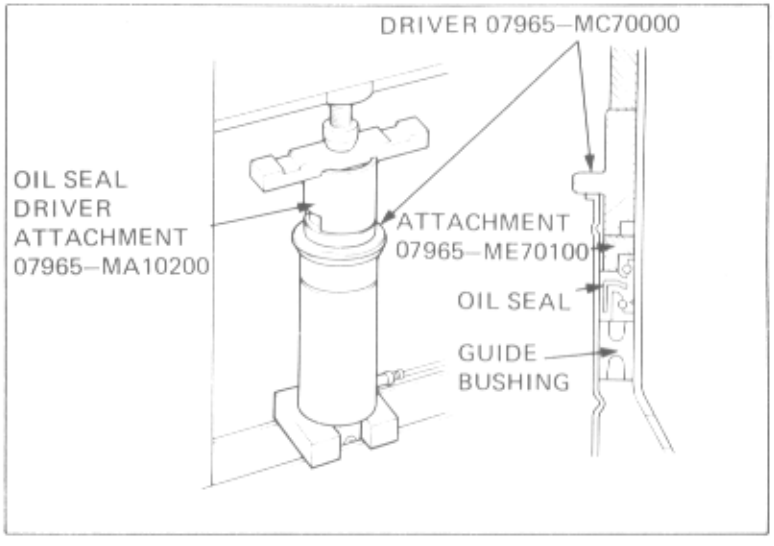
Dip the oil seal in ATF and install it onto the damper.

CAUTION

Be careful not to damage the oil seal during installation.



Press the oil seal into the shock absorber with a hydraulic press until the oil seal driver stops at the edge of the outer case.



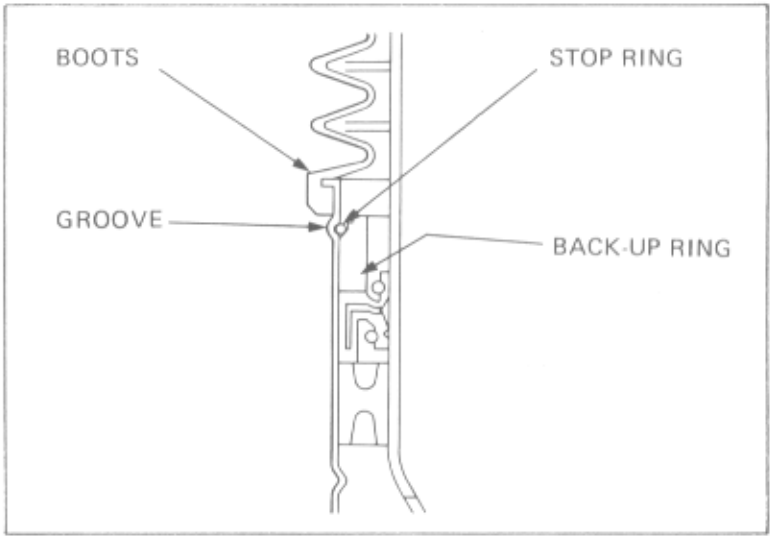
Install the back-up ring.

Install the stop ring, being certain that it is seated in the ring groove in the outer case.

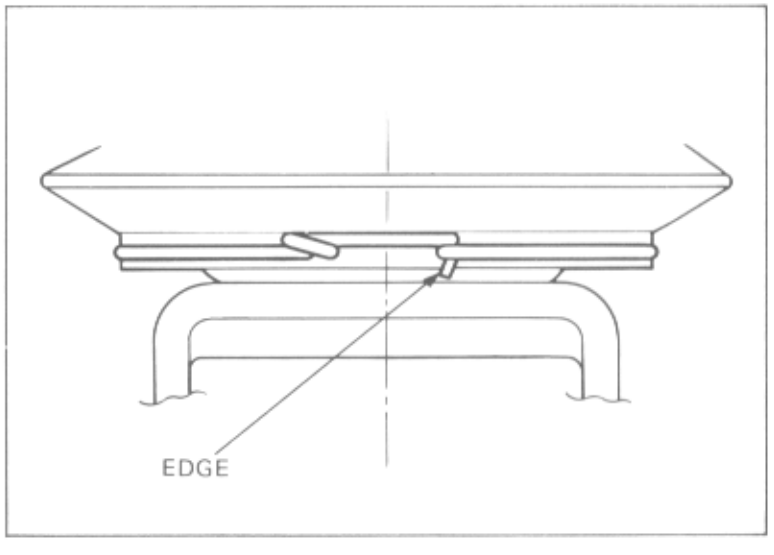
WARNING

Be sure the stop ring is seated in the ring groove all the way around.

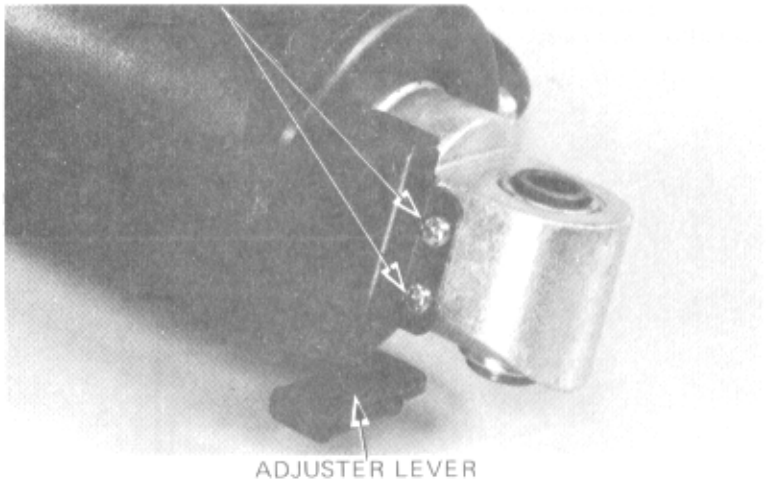
Install the boot.



Install the boot clip with the edge facing down.



Install the damper adjuster lever with the lever pushed in all the way.

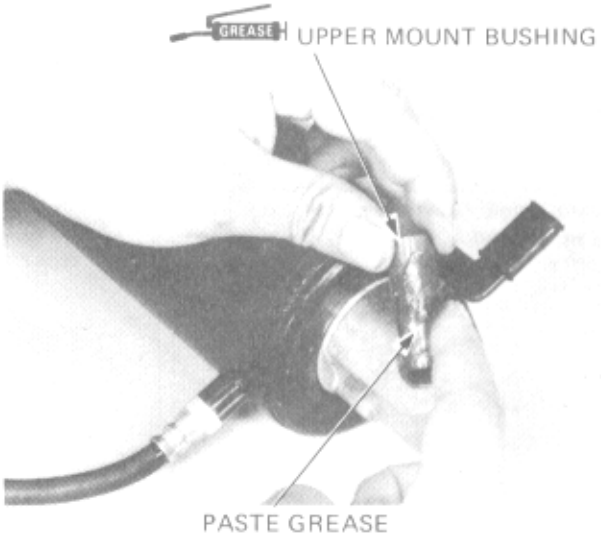


SHOCK ABSORBER INSTALLATION

Apply paste grease (containing more than 45% molybdenum) to the upper mount bushings.

NOTE

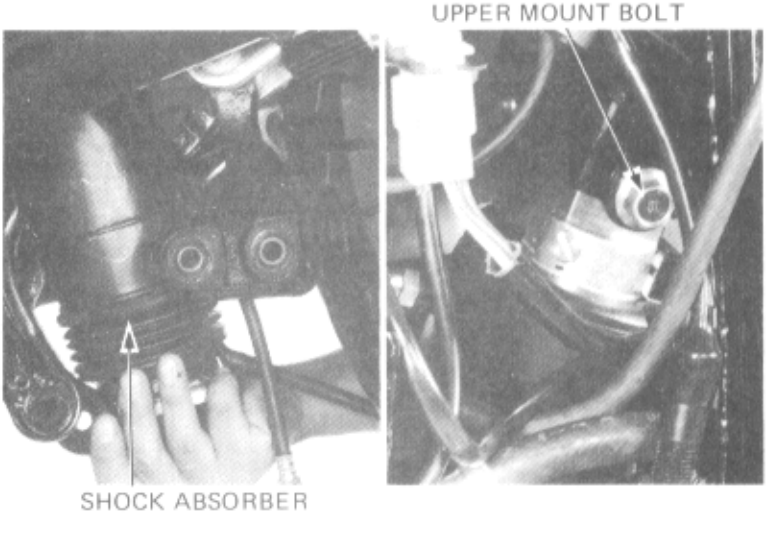
Use paste grease (containing more than 45% of molybdenum) as follows:
- *Molykote® G-n Paste manufactured by Dow Corning U.S.A.
- *Rocol paste manufactured by Sumico Lubricant Co. Ltd., Japan.
- *Other lubricants of equivalent quality.



Install the shock absorber and tighten the upper mount bolt.

TORQUE: 38–48 N·m
(3.8–4.8 kg-m, 28–35 ft-lb)

Install the crankcase breather separator.



Lubricate the linkage pivots with paste grease (containing more than 45% of molybdenum).

Install the shock arm and shock link.

Tighten the lower shock mount bolt.

TORQUE: 38–48 N·m (3.8–4.8 kg-m, 27–35 ft-lb)

Install the shock arm-to-shock link connecting bolt.

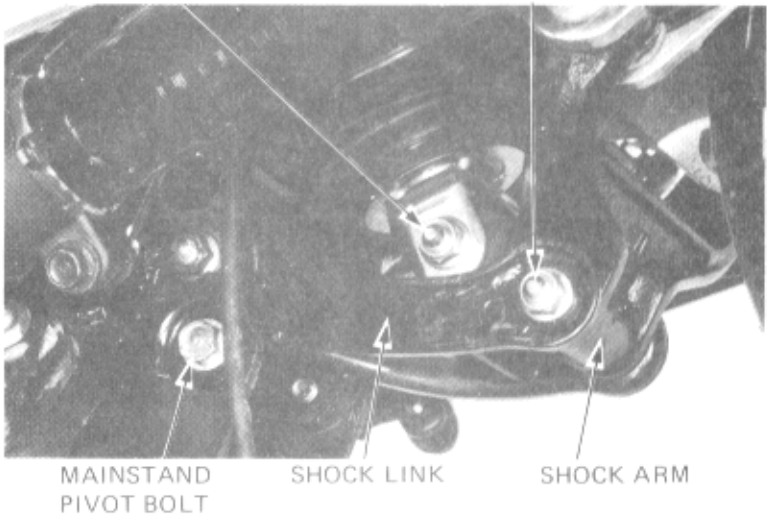
TORQUE: 50–65 N·m (5.0–6.5 kg-m, 36–47 ft-lb)

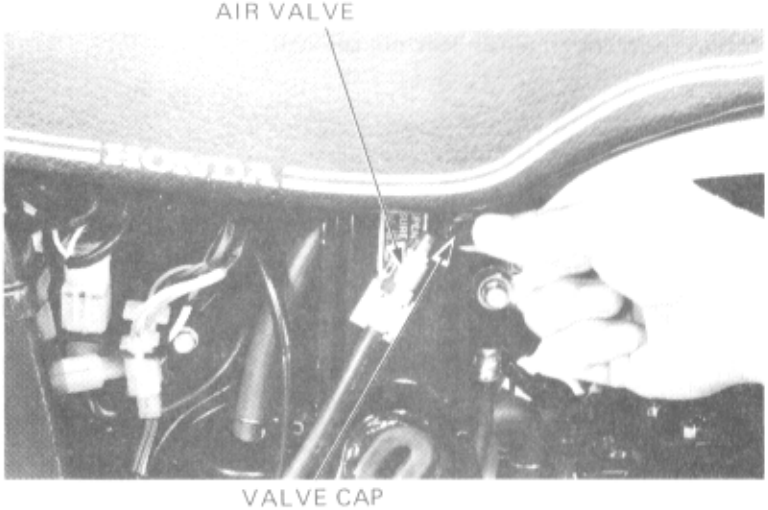
Tighten the mainstand pivot bolts.

TORQUE: 30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)

Make sure all weight is off the rear wheel, and add air to the shock absorber.

RECOMMENDED AIR PRESSURE:
200–600 kPa (2.0–6.0 kg/cm^2, 28–85 psi)



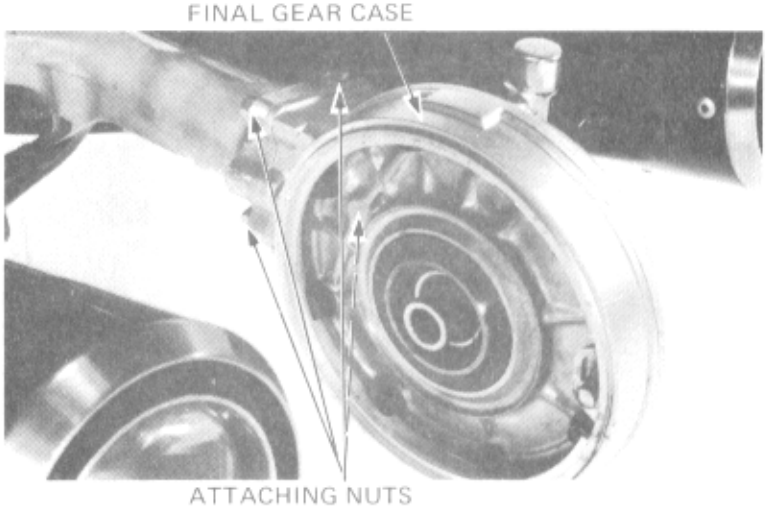


SWING ARM/DRIVESHAFT

REMOVAL

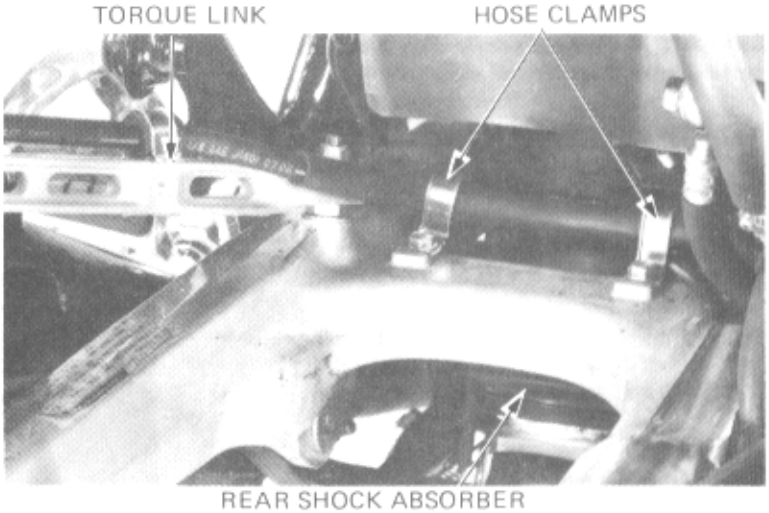
Remove the rear wheel.

Remove the final gear case (Section 17).

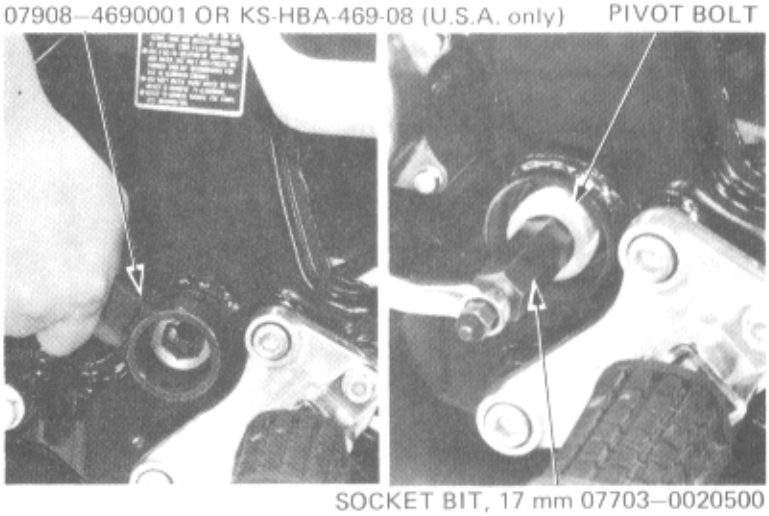


Remove the two hose clamp bolts and torque link nut.

Remove the rear shock absorber (page 16-10).

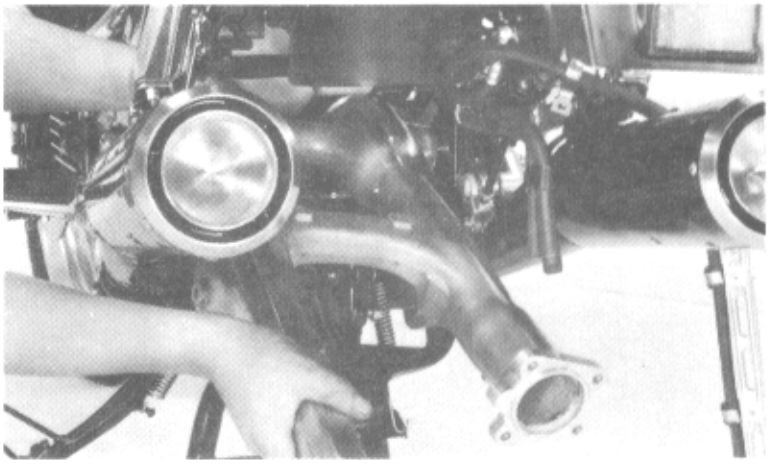


Loosen the swing arm pivot lock nut and bolt.



Remove the swing arm pivot lock nut and bolt.

Remove the swing arm.

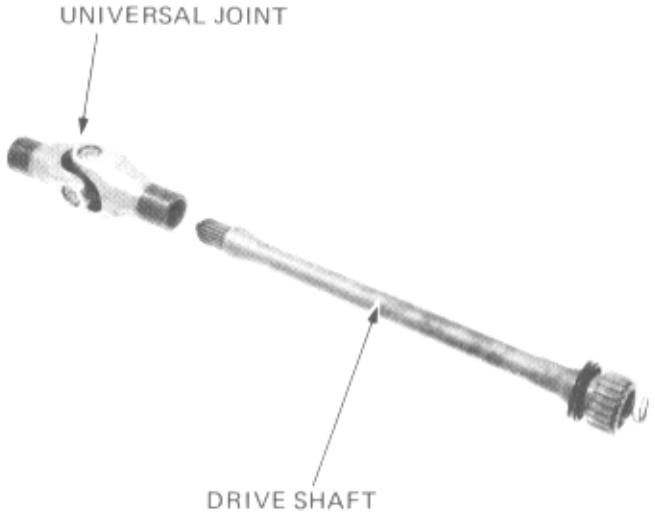


DRIVE SHAFT INSPECTION

Remove the universal joint from the swing arm.

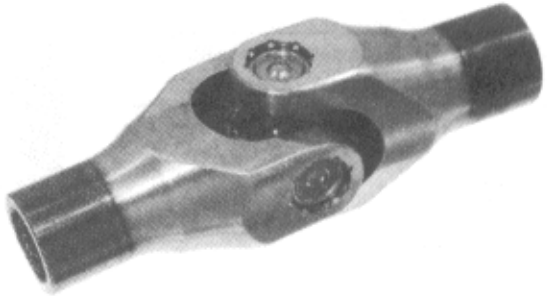
Remove the drive shaft from the final drive (page 17-3).

Inspect the drive shaft and universal joint splines for wear or damage. Replace it if necessary.



Inspect the universal joint. There should be no play in the bearings. Rotate the shaft and joint in opposite directions. If there is any evidence of side play, the universal joint must be replaced.

Lubricate the splines with Multipurpose NLGI No. 2 Grease (MoS_2 additive).

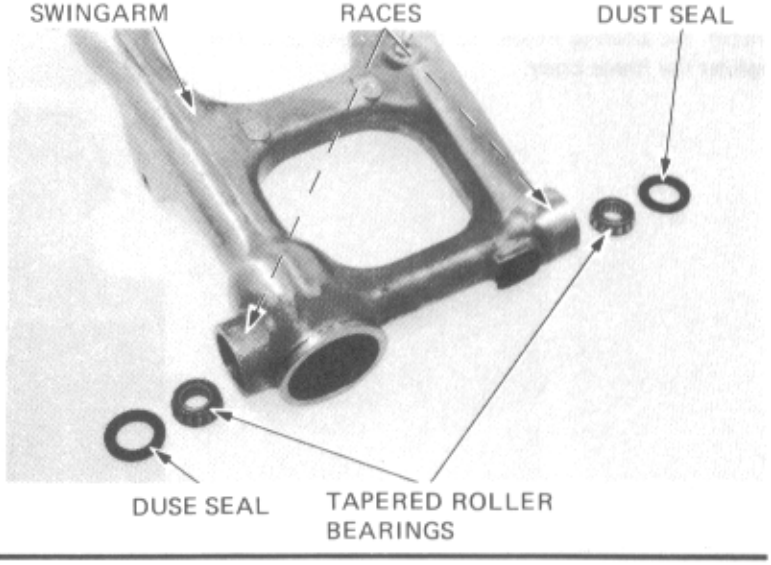


PIVOT BEARING REPLACEMENT

Inspect the tapered roller bearings and races for damage or wear.

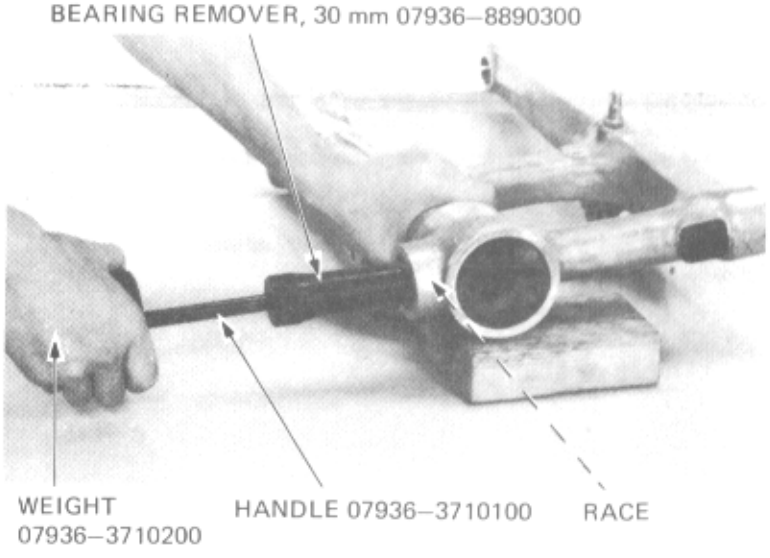
NOTE

Always replace pivot bearings in pairs.



Remove the outer races with the baring remover.

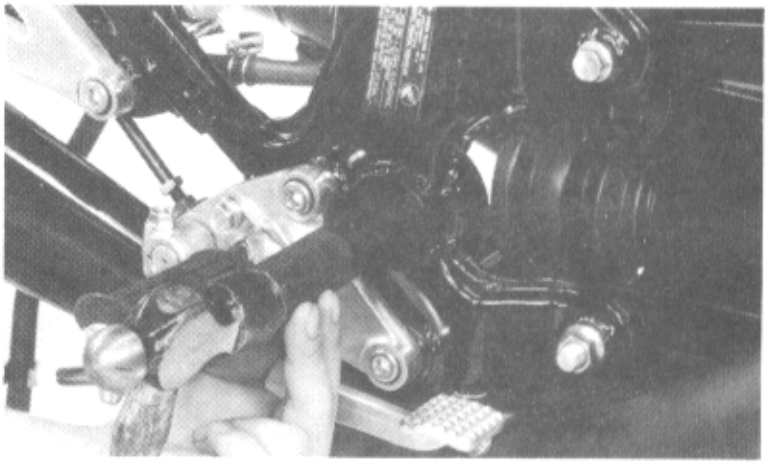
Remove the grease holder.



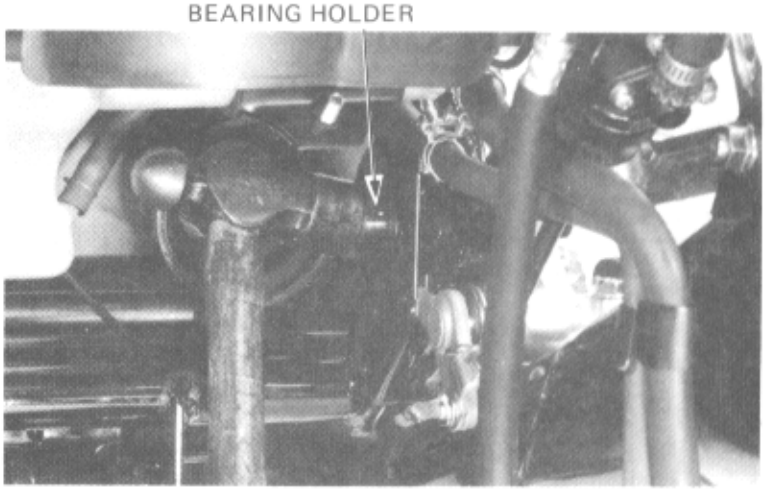
Remove the cap and lightly tap the pivot bearing holder to drive it out.

CAUTION

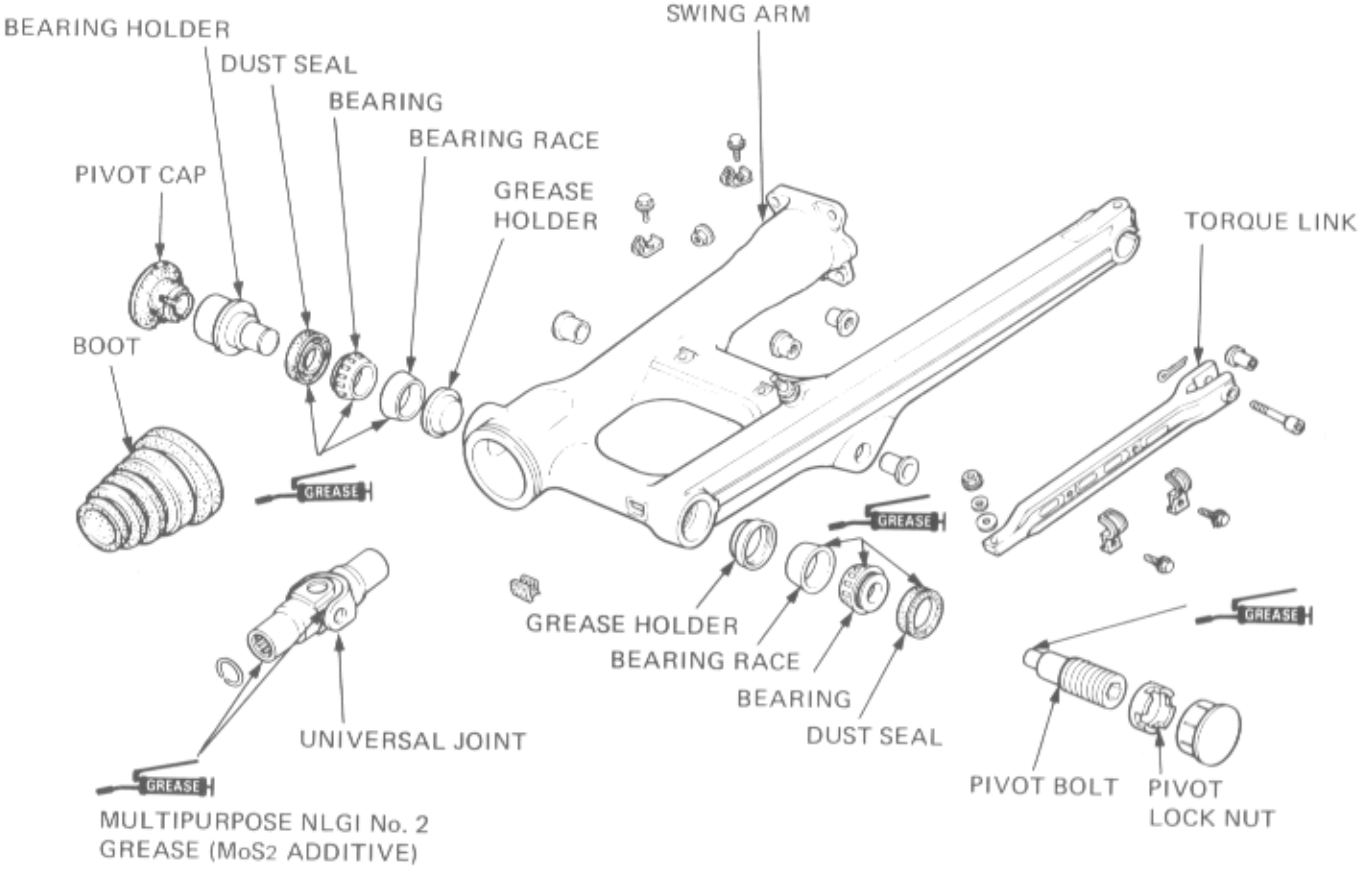
The pivot bearing holder is easily damaged, so use care when removing it.



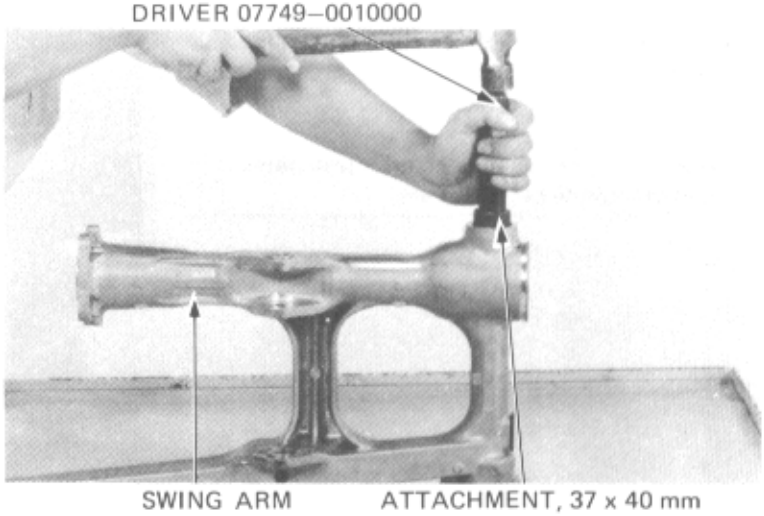
Install the bearing holder so that the end is seated against the frame body.



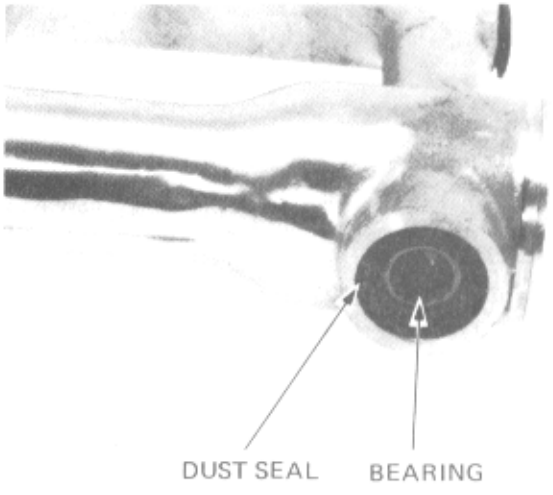
SWING ARM ASSEMBLY



Install the grease holder.
Drive the new bearing races squarely into the swing arm.

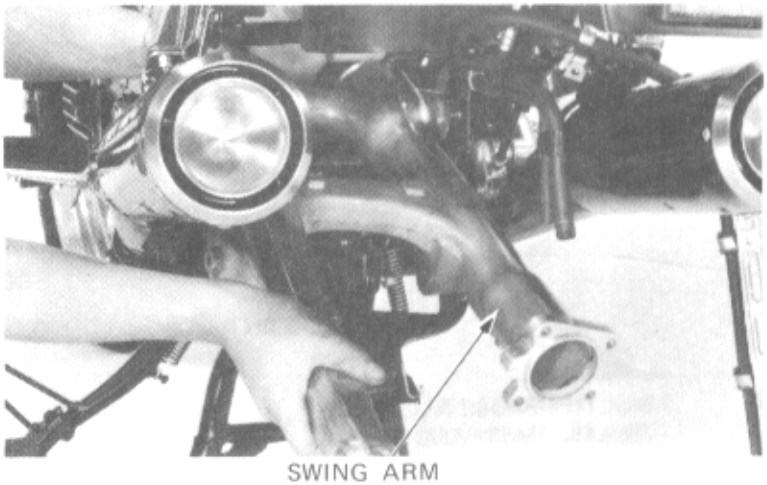


Install the bearings and dust seal into the swing arm.



SWING ARM INSTALLATION

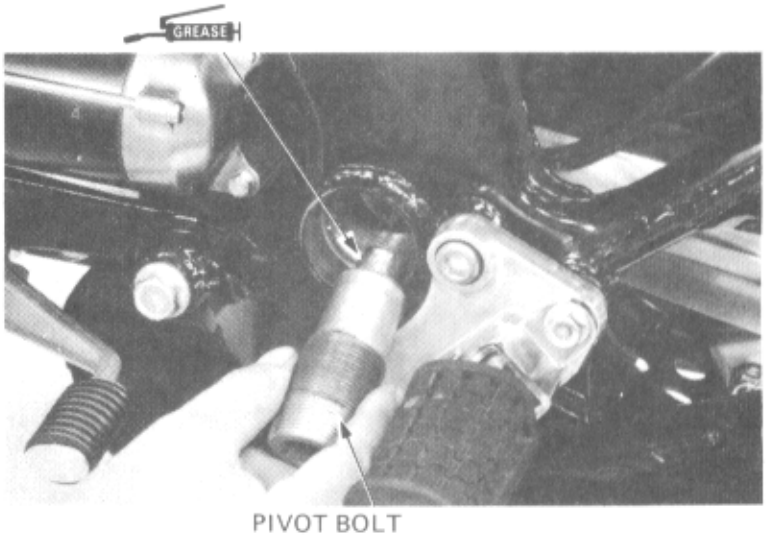
Install the universal joint into the swing arm.
Install the swing arm onto the right pivot bearing holder from the left side.



Apply grease to the tip of the pivot bolt and loosely install it.

NOTE

Make sure that the end of the pivot bolt is inserted into the bearing inner.



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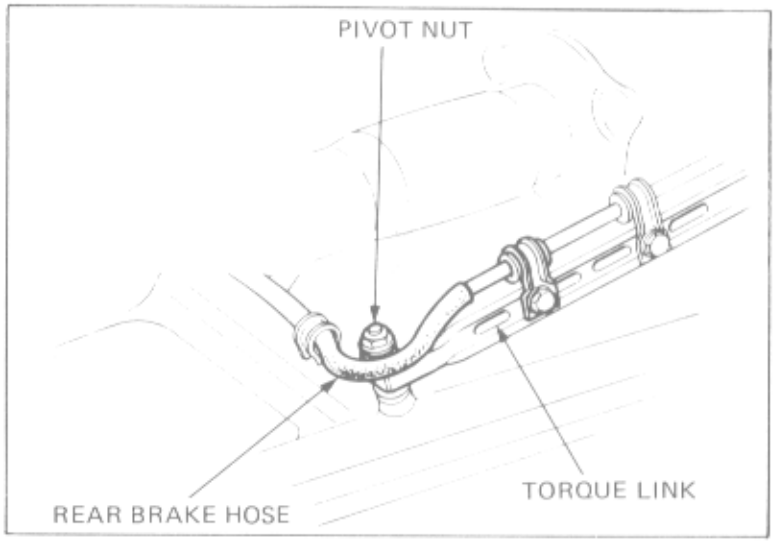
Route the rear brake hose on top of the torque link and clamp it in place.

WARNING

Be sure the rear brake hose does not contact the torque link pivot and nut.

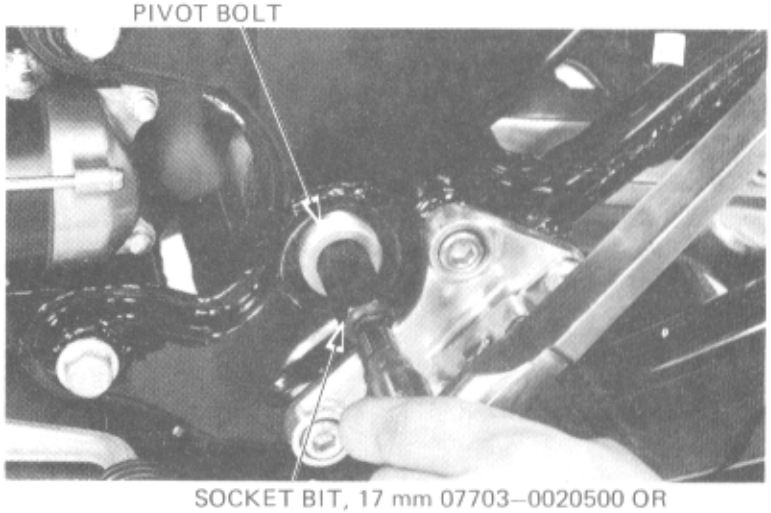
Install the brake hose clamps.



Tighten the pivot bolt to the specified torque.

TORQUE: 16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)

Move the swing arm up and down several times to seat the bearings with the pivot bolt then retighten the pivot bolt to the specified torque.

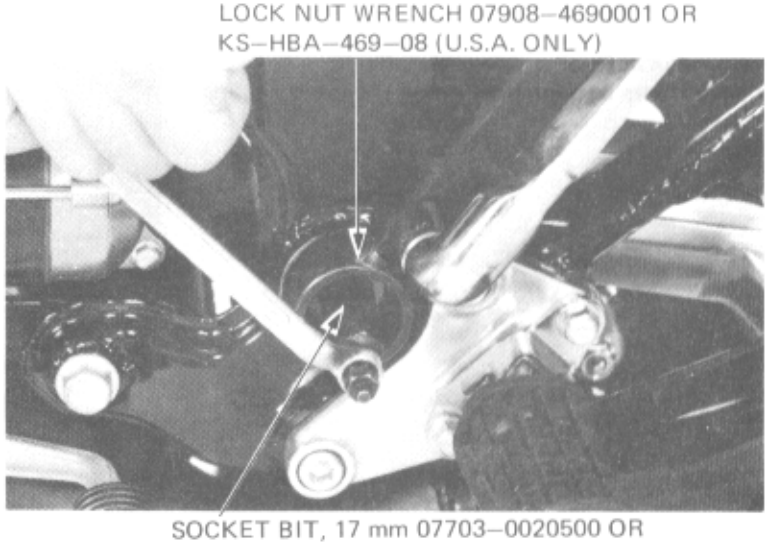


Install the pivot lock nut on the pivot bolt.
Hold the pivot bolt and tighten the pivot lock nut to a torque wrench reading of 80–105 N·m (8.0–10.5 kg-m, 58–76 ft-lb).

NOTE

Because the lock nut wrench increases the torque wrench's leverage, the torque actually applied to the lock nut is the specified torque value – 90–120 N·m (9.0–12.0 kg-m, 52–87 ft-lb).

Install the pivot caps.
Install the shock absorber (page 16-14).

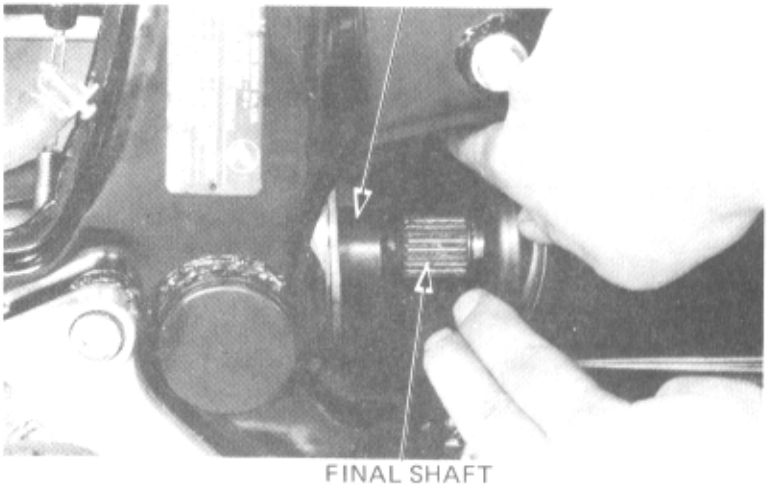


Lubricate the universal joint and final shaft splines with Multipurpose NLGI No. 2 Grease (MoS2 additive).

Insert the universal joint into the final shaft.

Install the drive shaft and final gear case (Section 17).

Install the rear wheel (page 16-8).

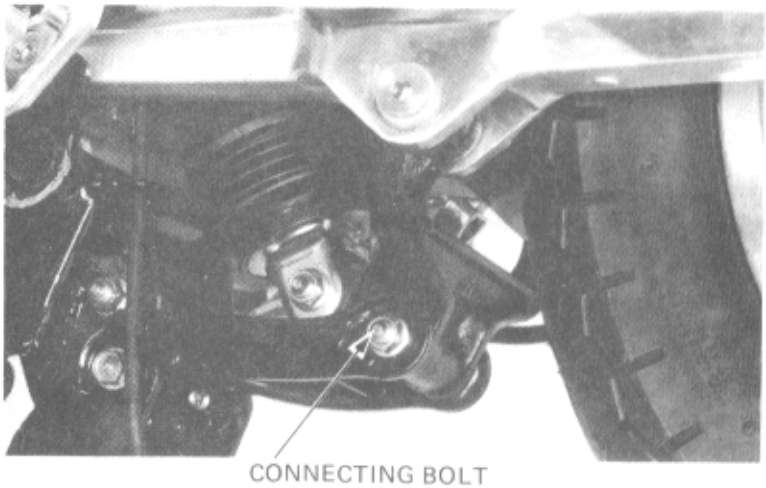


SUSPENSION LINKAGE

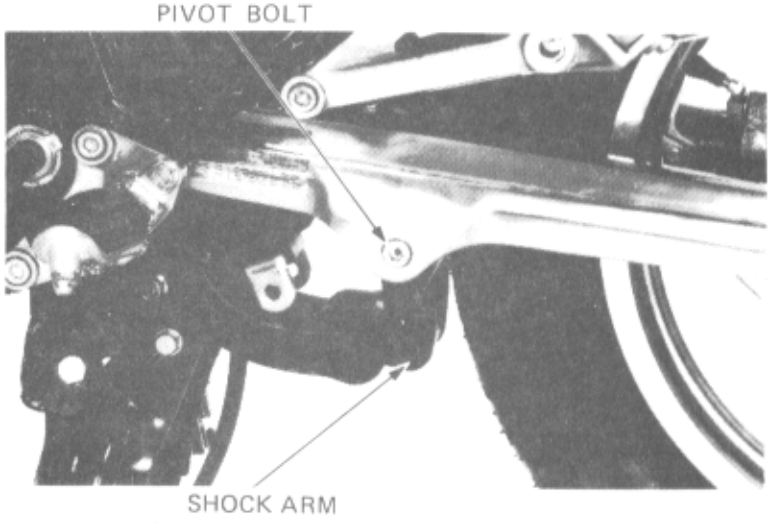
REMOVAL

Remove the folliwing:

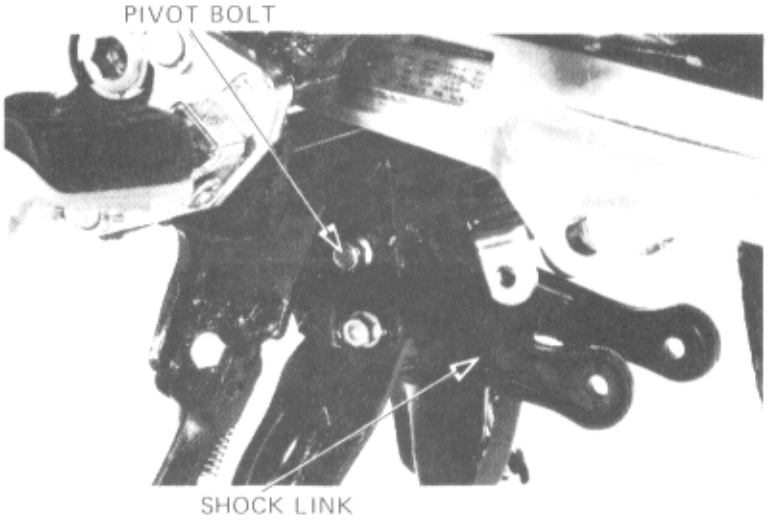
- muffler (Section 5).
- bolt connecting the shock arm to the shock link.



- rear shock absorber lower mount bolt.
- pivot bolts attaching the shock arm to the swing arm.



Remove the shock link by removing the pivot bolt.

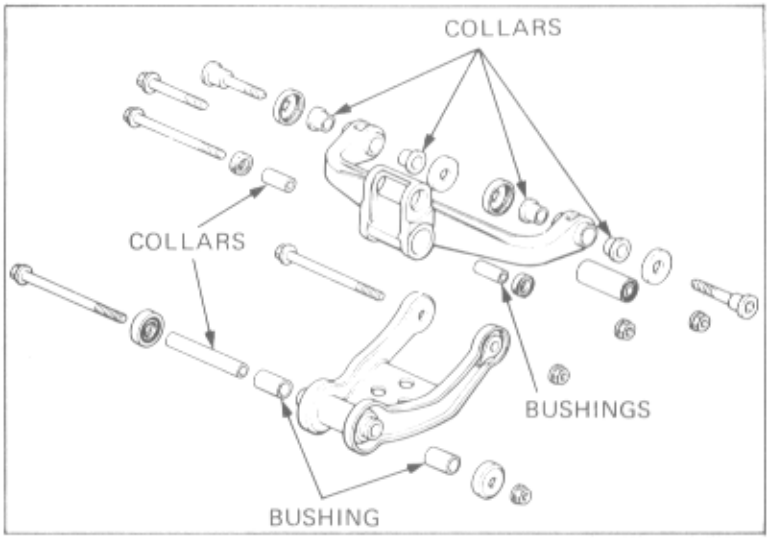


INSPECTION

Inspect the outside surface of the collars and the inside of the bushings. Replace them if they have score marks, scratches, or excessive or abnormal wear.

NOTE

The bushings and shock arm nuts are press-fitted. Do not remove the bushings and shock arm nuts unless they have to be replaced.



INSTALLATION

Apply paste grease (containing more than 45% of molybdenum) to the insides of the bushings and dust seal lips.

NOTE

Use paste grease (containing more than 45% of molybdenum) as follows:
- *Molykote® G-n Paste manufactured by Dow Corning U.S.A.
- *Rocol paste manufactured by Sumico Lubricant Co. Ltd., Japan.
- *Other lubricants of equivalent quality.

Install the collars and dust seals making sure that the sealing lips seat properly.

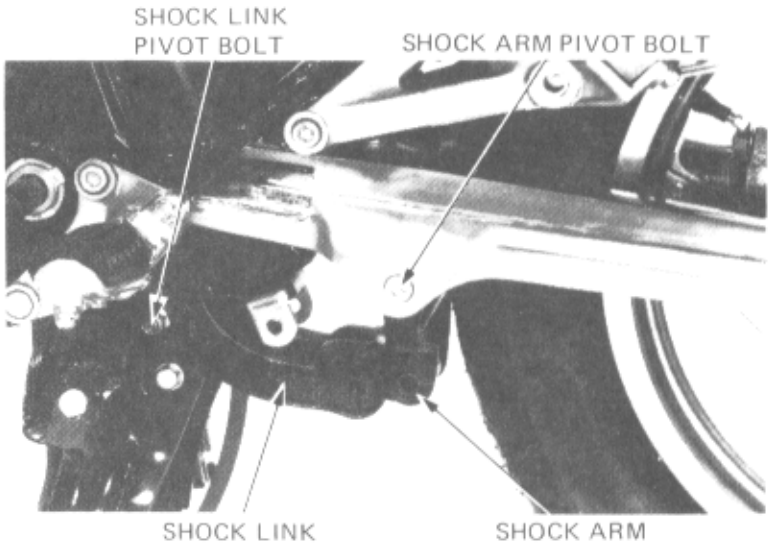
Attach the shock link onto the frame and torque the pivot bolt.

TORQUE: 50–65 N·m (5.0–6.5 kg-m, 36–47 ft-lb)

Install the shock arm to the swing arm and torque the pivot bolts.

TORQUE: 40–50 N·m (4.0–5.0 kg-m, 29–36 ft-lb)

Check the shock link and arm operation by moving them.



Install the shock absorber lower mount to the shock arm and torque the mount bolt.

TORQUE: 38–48 N·m (3.8–4.8 kg-m, 27–35 ft-lb)

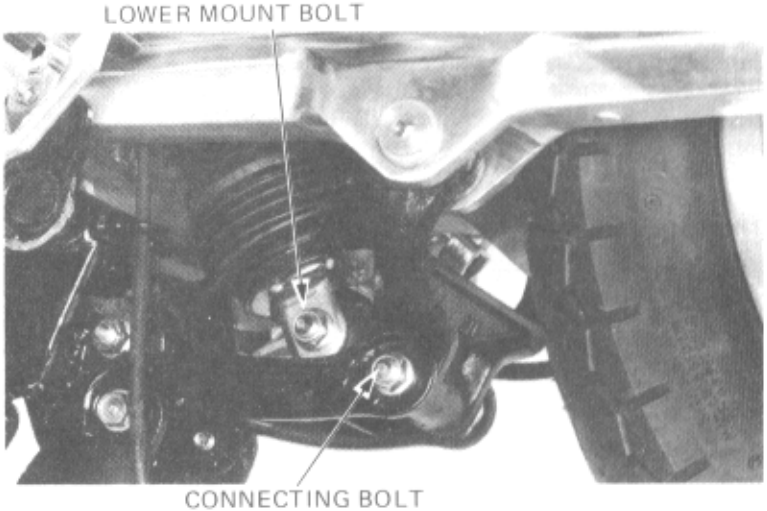
Connecting the shock arm to the shock link and torque the connecting bolt.

TORQUE: 50–65 N·m (5.0–6.5 kg-m, 36–47 ft-lb)

Install the mufflers.

NOTE

Check that the rear shock absorber upper mount rubber bushing and shock arm lower mount bushing are not twisted.



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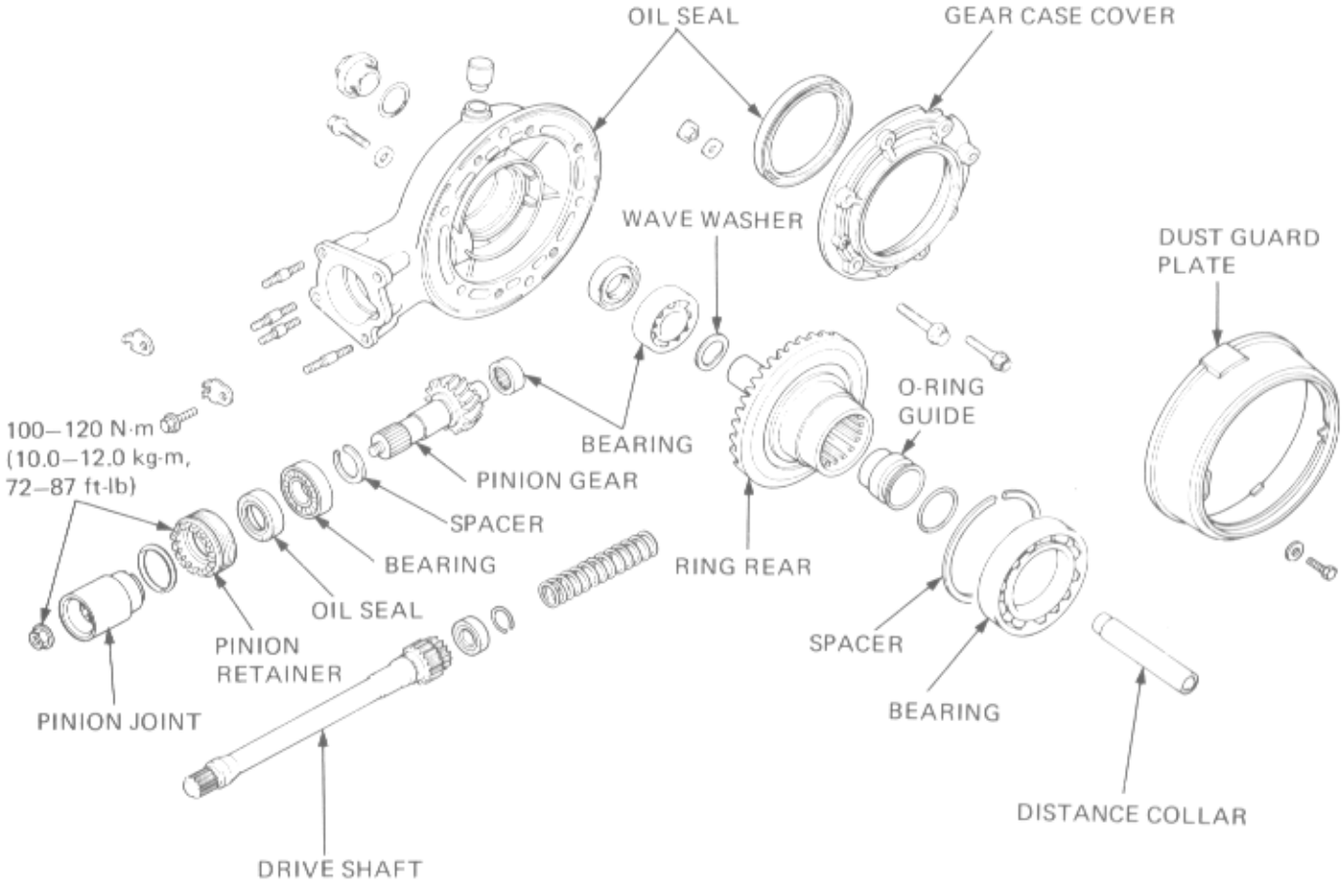
MEMO



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17. FINAL DRIVE

SERVICE INFORMATION

GENERAL

- The final drive gear assembly must be removed together with the drive shaft.
- Replace all oil seals and O-rings whenever the final drive gear assembly is disassembled.
- Check tooth contact pattern and gear backlash when the bearing, gear set and/or gear case has been replaced.

SPECIFICATIONS

		STANDARD	SERVICE LIMIT
Final gear oil	Capacity	160–180 cc (5.4–6.1 ozs)	———
	Recommended oil	Hypoid-gear oil API, GL–5 Above 5°C/41°F SAE #90 Below 5°C/41°F SAE #80	———
Gear backlash		0.08–0.18 mm (0.003–0.007 in)	0.30 mm (0.012 in)
Gear assembly preload		0.2–0.4 N·m (2.–4 kg-cm, 1.7–3.5 in-lb)	———

TORQUE VALUES

Pinion bearing retainer	100–120 N·m (10–12 kg-m, 72–87 ft-lb)
Pinion nut	100–120 N·m (10–12 kg-m, 72–87 ft-lb)
Gear case cover bolt 10 mm	45–50 N·m (4.5–5.0 kg-m, 33–36 ft-lb)
8 mm	23–28 N·m (2.3–2.8 kg-m, 17–20 ft-lb)
Final gear case attaching nut	27–34 N·m (2.7–3.4 kg-m, 20–25 ft-lb)

17

TOOLS

Special

Attachment	07945–3330300
Attachment	07947–6340201
Pinion retainer wrench	07910–ME80000
Pinion holder	07924–ME40000
Shaft puller	07931–ME40000
Driver	07931–4630300 or 07947–3710101 and 07746–0010200

Common

Driver	07749–0010000
Attachment, 42 x 47 mm	07746–0010300
Attachment, 52 x 55 mm	07746–0010400
Attachment, 32 x 35 mm	07746–0010100
Pilot, 30 mm	07746–0040700
Driver	07746–0030100
Attachment, 25 mm I.D.	07746–0030200 or Driver 07945–3710200

TROUBLESHOOTING

Excessive noise

- Worn or scored ring gear shaft and driven flange.
- Scored driven flange and wheel hub.
- Worn or scored drive pinion and splines.
- Worn pinion and ring gears.
- Excessive backlash between pinion and ring gear.
- Oil level too low.

Oil leak

- Clogged breather.
- Oil level too high.
- Seals damaged.

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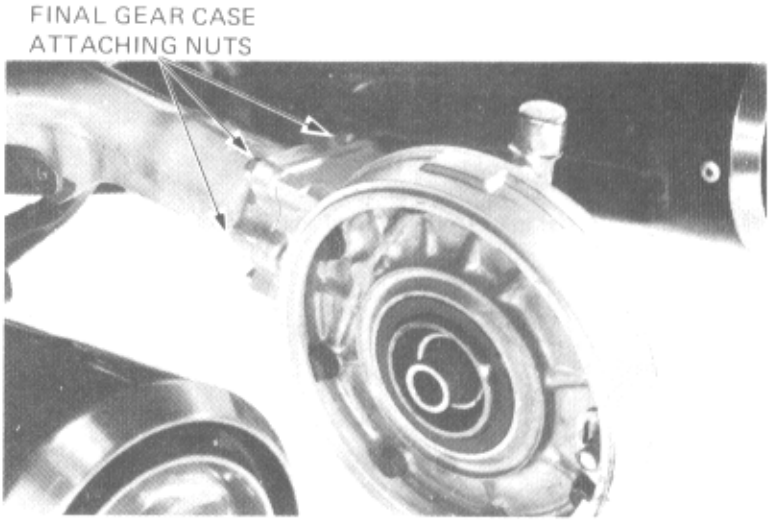
FINAL DRIVE REMOVAL

Place the motorcycle on its center stand. Drain the final gear oil (page 2-5) and remove the rear wheel (page 16-3).

Remove the final gear case attaching nuts and remove the gear case from the swingarm.

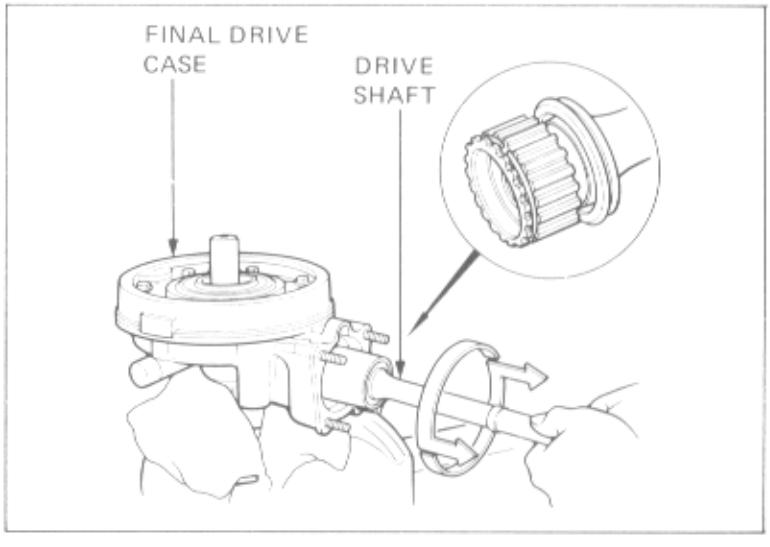


DRIVE SHAFT

REMOVAL

Insert the axle through the gear case and secure the case in a vise with soft jaws or shop rags by clamping the axle. Place the shock mount between the jaws for stability.

Separate the drive shaft from the gear case by gently revolving the shaft in a circular motion while tugging slightly.



DISASSEMBLY

Remove the spring, oil seal and stop ring from the drive shaft.

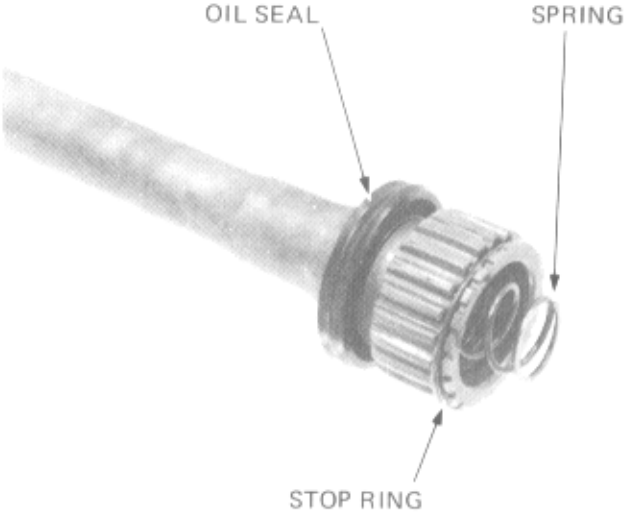
NOTE

Replace the oil seal with a new one if it is removed.

ASSEMBLY

Place a new oil seal over the drive shaft.

Install the damper spring and new stop ring.

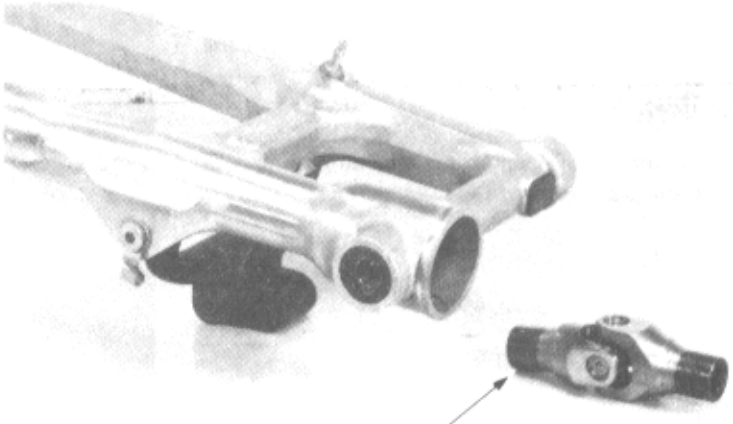


UNIVERSAL JOINT

REMOVAL/INSTALLATION

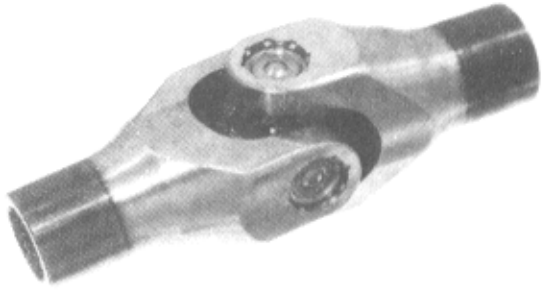
Remove the swing arm (page 16-15).

Remove the universal joint from the final shaft.



Inspect the universal joint bearings for excessive play or damage. Replace the universal joint if necessary.

Apply multipurpose NLGI No. 2 (MoS_2 additive) grease to the splines and install the universal joint.

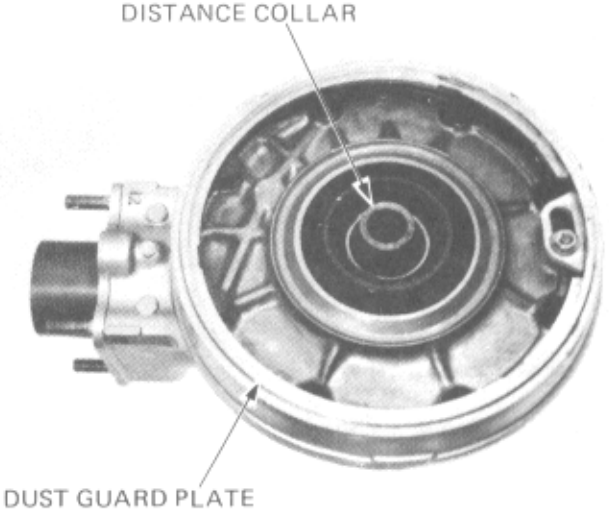


FINAL DRIVE GEAR

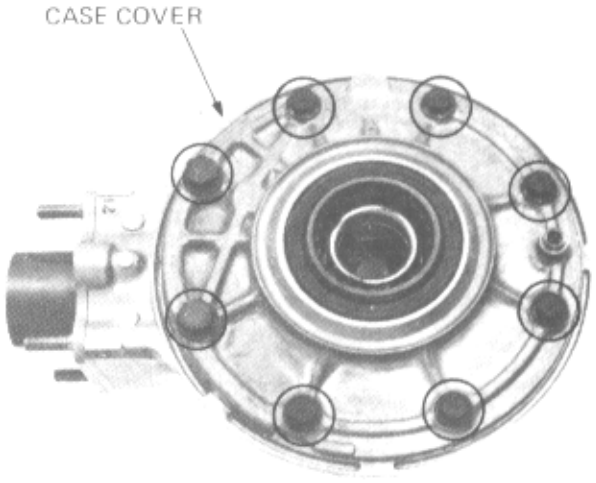
RING GEAR REMOVAL

Remove the distance collar.

Remove the dust guard plate bolts and the dust guard plate by turning it clockwise.

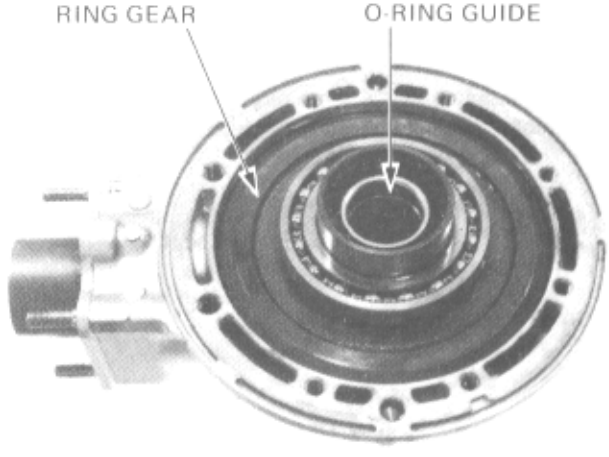


Remove the eight case cover bolts and cover. If the ring gear stays in the cover, do the following:
Place the cover in a press with the ring gear down. Make sure the cover is secrely supported. Press the ring gear out of the cover with driver 07749–0010000 and attachment, 32 x 35 mm 07746–0010100.



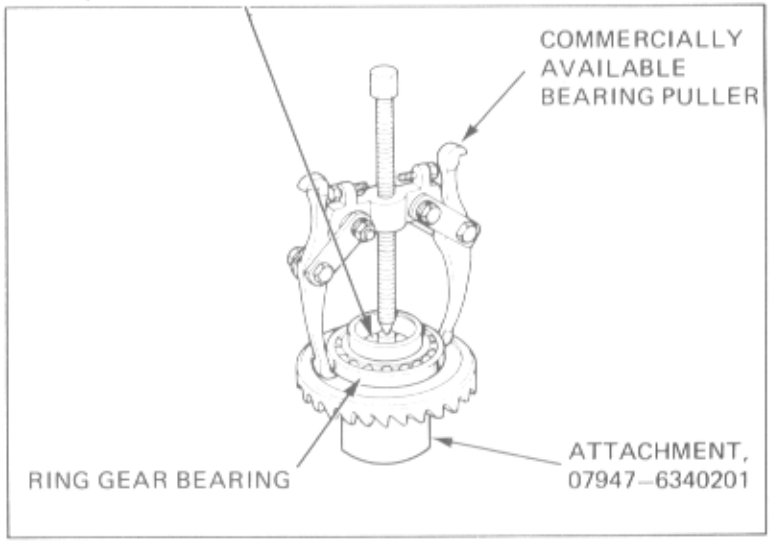
Remove the ring gear from the final drive case.

Remove the O-ring guide by tapping it from the opposite side.



RING GEAR BEARING REMOVAL

Remove the ring gear bearing and gear adjusting spacer.



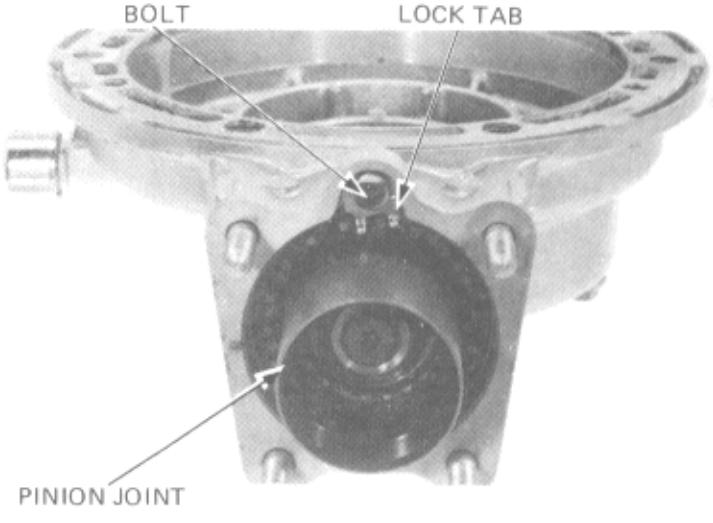
CASE COVER OIL SEAL REPLACEMENT

Remove the oil seal from the case cover and press in a new oil seal.

PINION GEAR REMOVAL

Install the pinion joint holder onto the pinion joint and remove the pinion shaft nut. Remove the tool.

Remove the pinion joint.
Remove the retainer lock tab.



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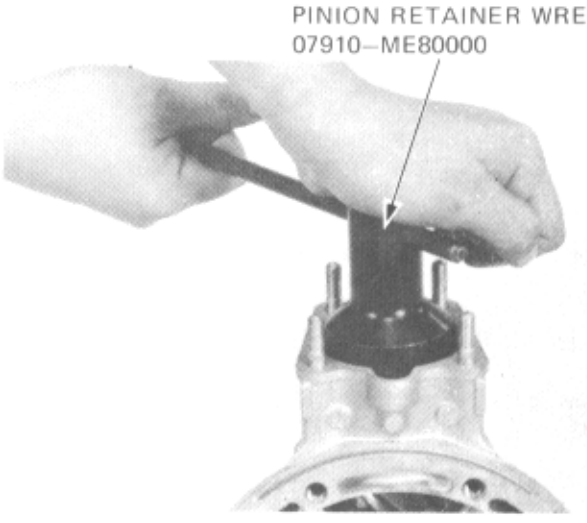
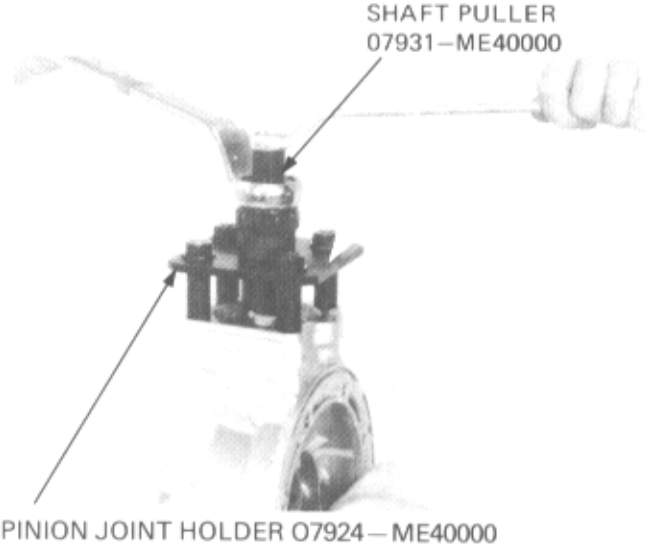
Remove the pinion retainer with the pinion retainer wrench.



Pull the pinion assembly off with the pinion puller.

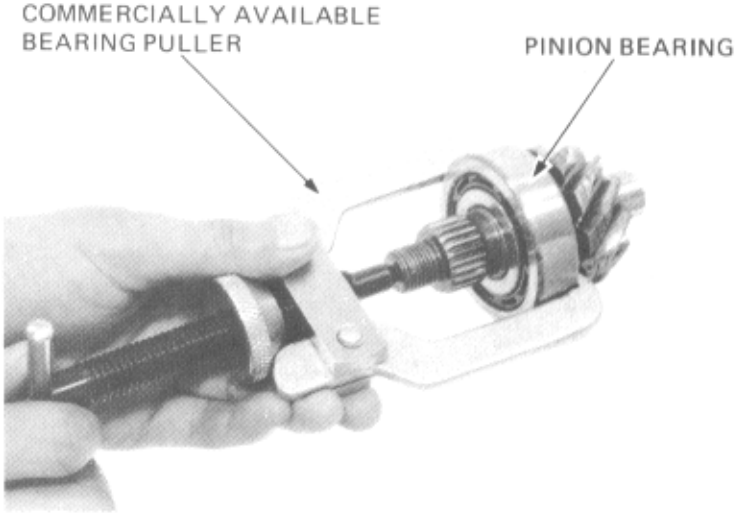


PINION BEARING REMOVAL

Pull the bearing outer and inner races off the shaft with the bearing puller.

Pull the other inner race off with the same tool.

Remove the pinion adjustment spacer.



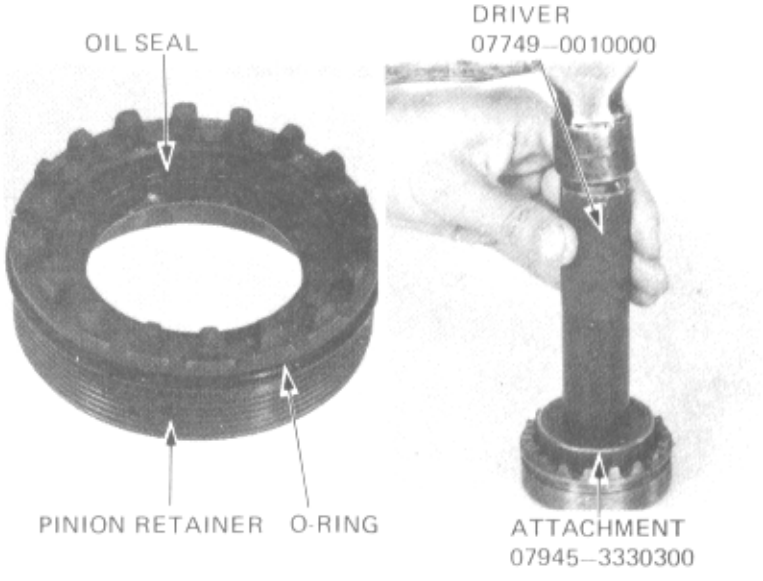
PINION RETAINER OIL SEAL REPLACEMENT

Remove the O-ring and oil seal from the pinion retainer.

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

Drive a new oil seal into the retainer.

To install a new oil seal, use driver attachment 07945–3330300.



CASE BEARING AND OIL SEAL REPLACEMENT

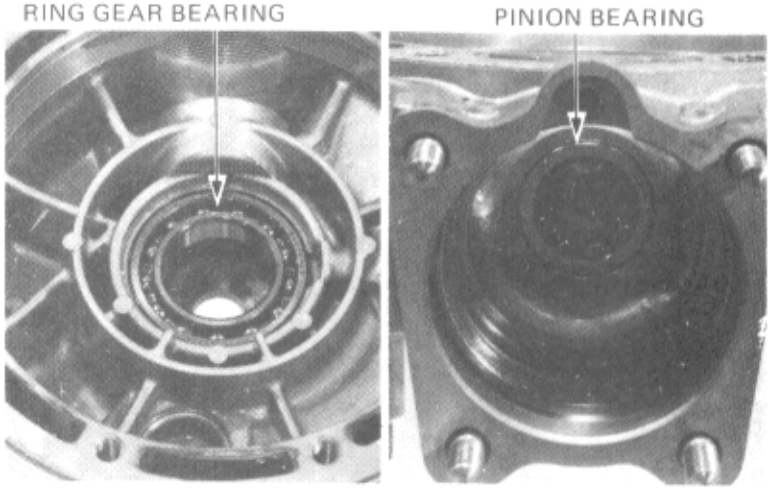
Heat the gear case to 80°C (176°F). Tap the gear case with a plastic hammer and remove the ring gear and pinion bearings.

CAUTION

Always wear gloves when handling the gear case after it has been heated.

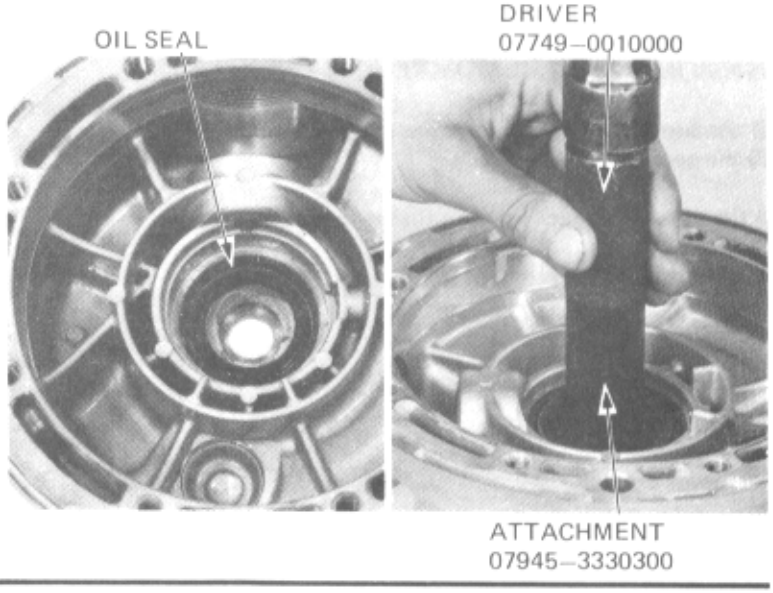
NOTE

Use bearing remover (35 mm) 07936–3710400 to remove the ring gear case bearing.



Remove the ring gear shaft oil seal.

Drive a new oil seal into the case, using the special tools.



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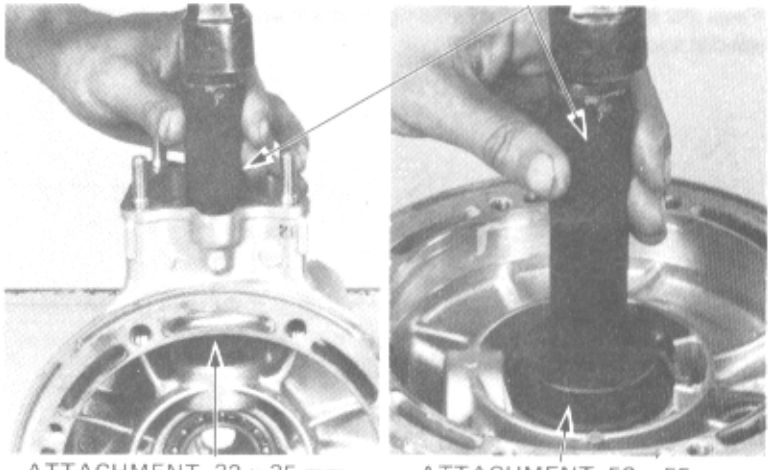
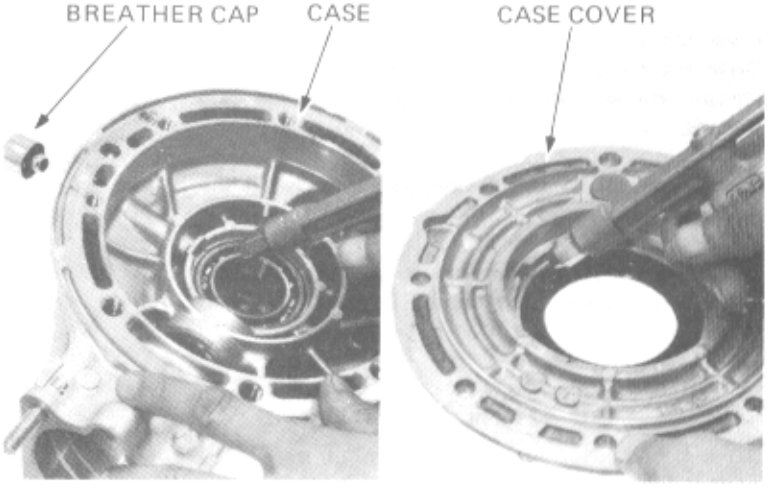
Drive new pinion and ring gear bearings into the case.



BREATHER HOLE CLEANING

Remove the breather hole cap and blow through the breather hole with compressed air.

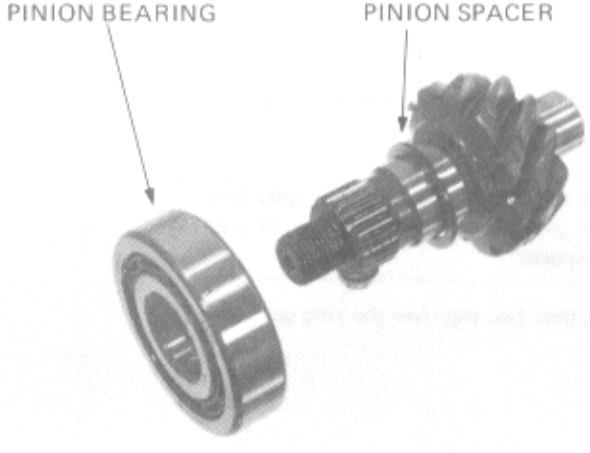


PINION GEAR ASSEMBLY

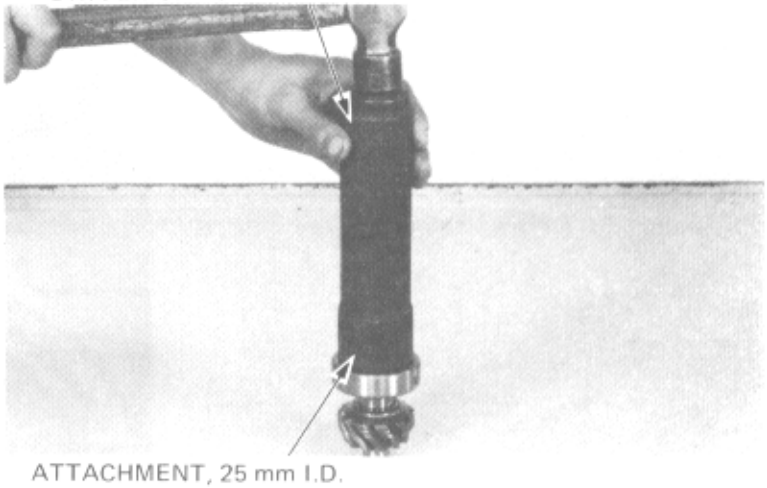
Install the original pinion gear spacer.

NOTE

When the gear set, pinion bearing and/or gear case has been replaced, use a 2.0 mm thick spacer.



Press the bearing onto the pinion gear shaft with the special tools shown.

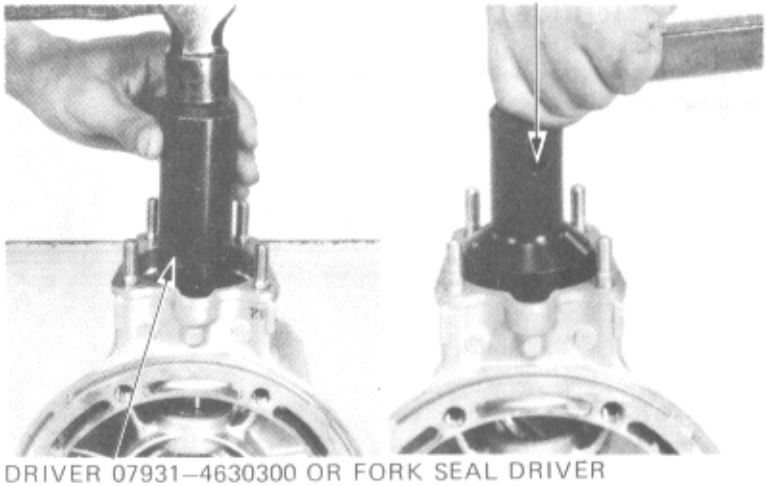


Place the pinion assembly into the gear housing. Drive the pinion assembly into the gear case until pinion retainer threads can engage with the case threads.

Apply gear oil to the O-ring and threads on the pinion retainer.

Screw in the pinion retainer to press the pinion bearing into place, then tighten it to the specified torque.

TORQUE: 100–120 N·m
(10–12 kg-m, 72–87 ft-lb)



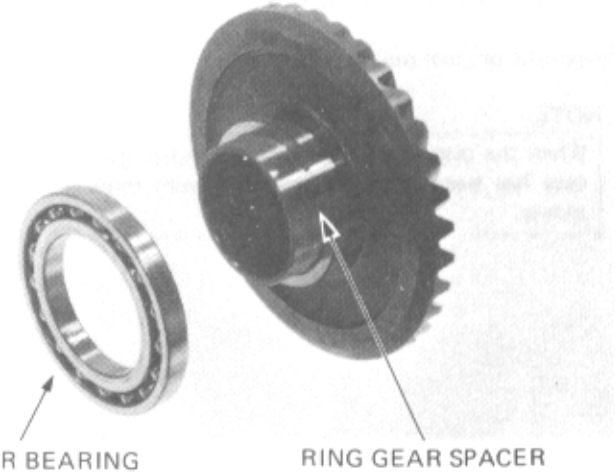
RING GEAR ASSEMBLY

Install the original spacer onto the ring gear.

NOTE

If the gear set, pinion bearing, ring gear bearing and/or gear case is replaced, install a 2.0 mm thick spacer.

Place the ring gear bearing over the ring gear shaft.



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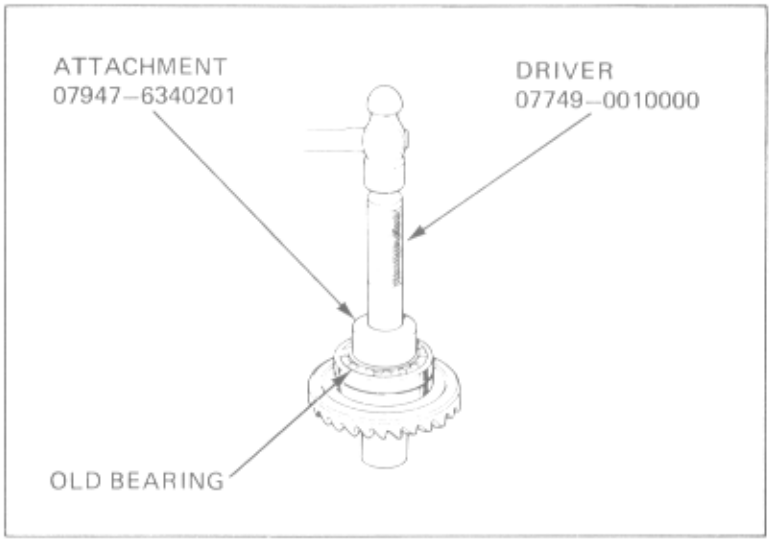
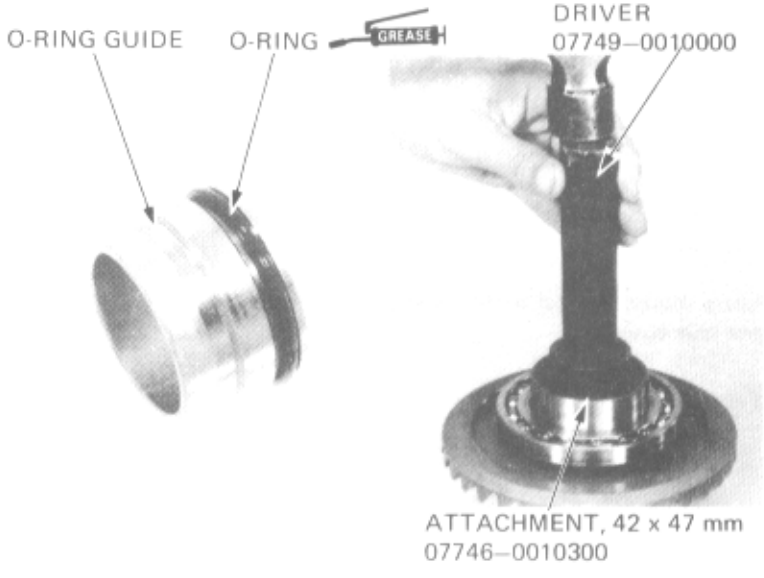
Place a new ring gear bearing on the ring gear shaft. Place the old bearing on top of it. Then, drive the new bearing onto the shaft with the old bearing and attachment. Then remove the old bearing.



Install a new O-ring onto the O-ring guide.

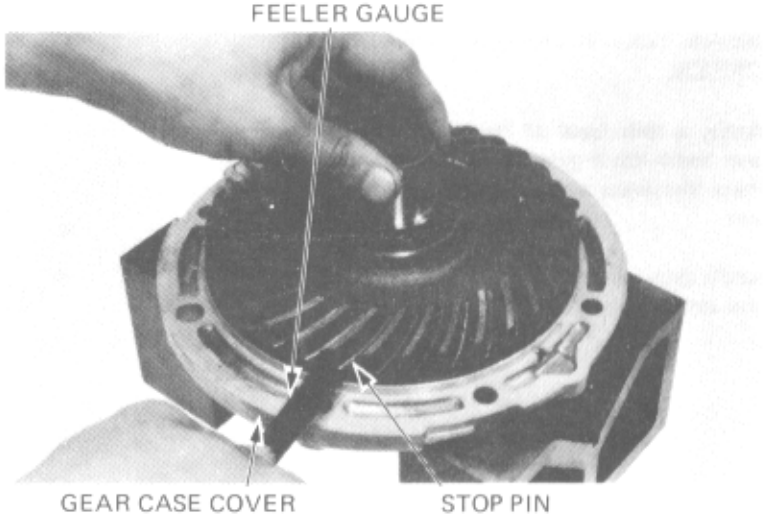
Apply grease to the O-ring and drive the O-ring guide onto the ring gear shaft.



Install the ring gear into the gear case cover.

Measure the clearance between the ring gear and the ring gear stop pin with a feeler gauge.

CLEARANCE: 0.30–0.60 mm (0.012–0.024 in)



Remove the ring gear. If the clearance exceeds the service limit, heat the gear case cover to approximately 80°C (176°F) and remove the stop pin by tapping the cover.

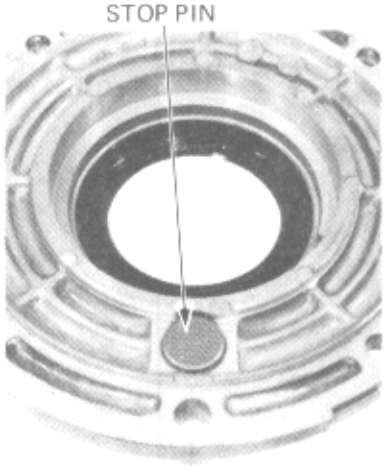
CAUTION

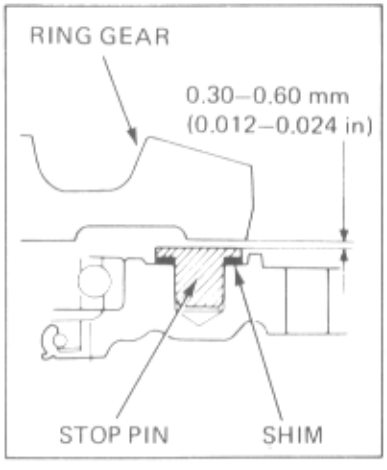
Always wear gloves when handling the gear case after it has been heated.

Install a stop pin shim to obtain the correct clearance.

SHIM THICKNESS: 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.



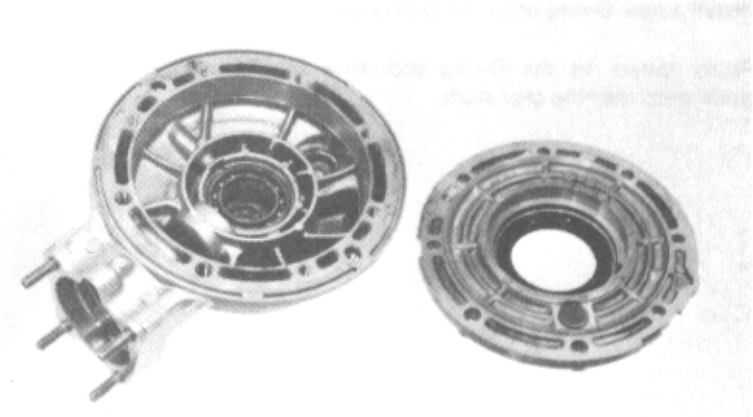


Clean all sealing material off the mating surfaces of the gear case and cover.

NOTE

- Keep dust and dirt out of the gear case.
- Be careful not to damage the mating surfaces.

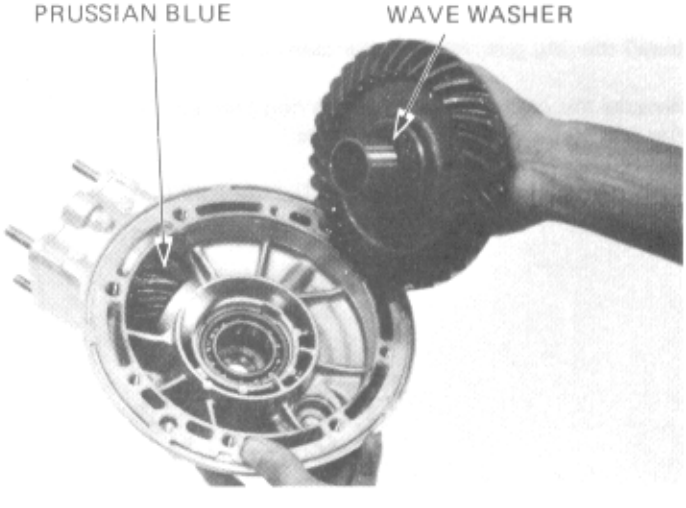
Apply liquid sealant to the mating surface of the gear case cover.



GEAR TOOTH CONTACT PATTERN CHECK

Apply a thin coat of Prussian Blue to the pinion gear teeth for a gear tooth contact pattern check. Place the wave washer and ring gear into the gear case.

Apply gear oil to the lip of the oil seal on the gear case cover and install the gear case cover.



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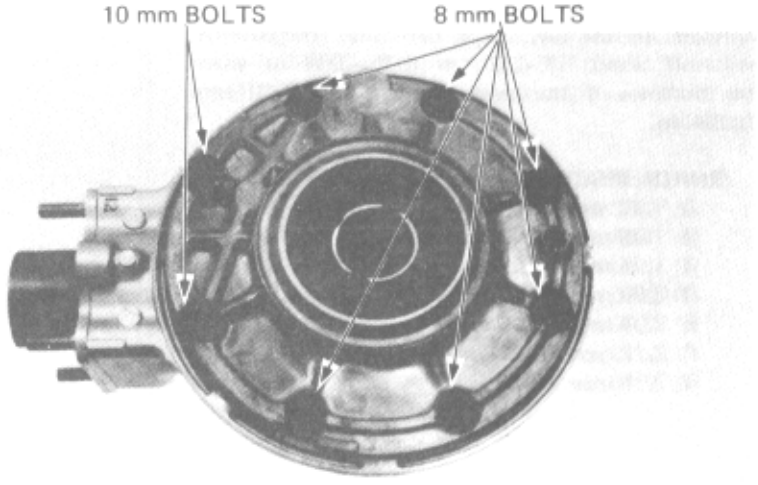
Tighten all the cover bolts in 2–3 steps until the cover evenly touches the gear case, then tighten the 8 mm bolts to the specified torque in a crisscross pattern in two or more steps.

TORQUE: 23–28 N·m
(2.3–2.8 kg-m, 17–20 ft-lb)

Then tighten the 10 mm bolts.

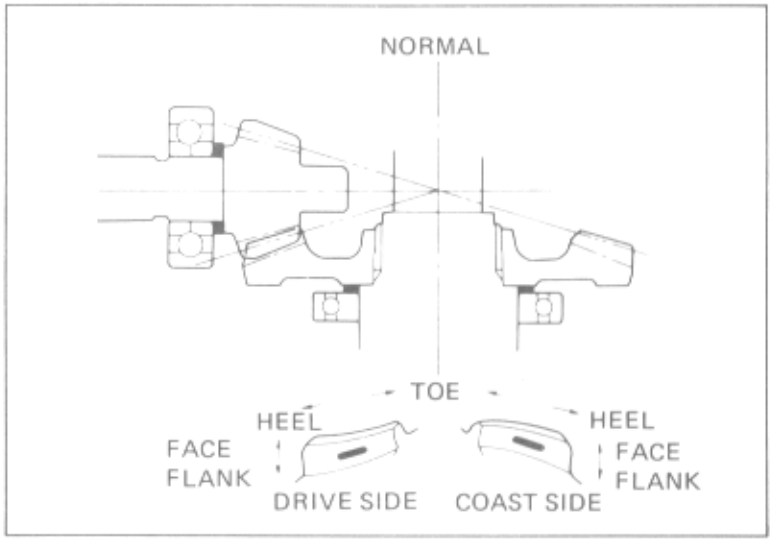
TORQUE: **45–50 N·m**
(4.5–5.0 kg-m, 33–36 ft-lb)



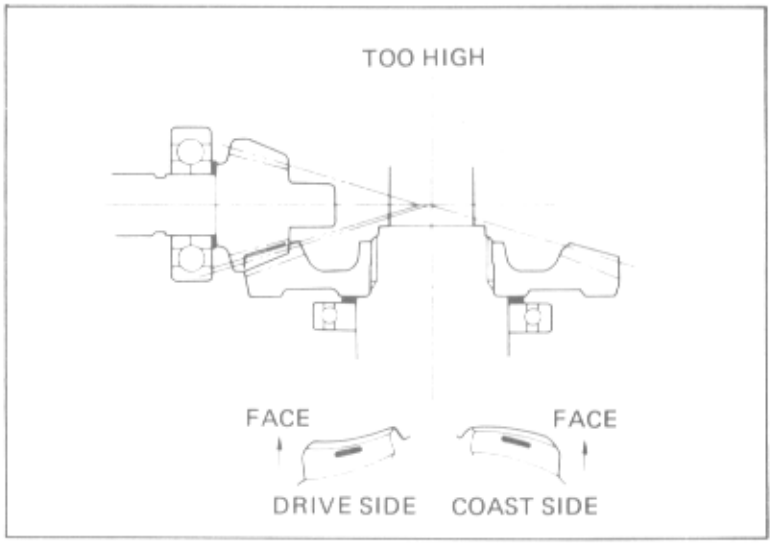
Remove the oil filler cap from the final gear case.

Rotate the ring gear several times in the normal direction 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 before assembly.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth and slightly to the flank side.

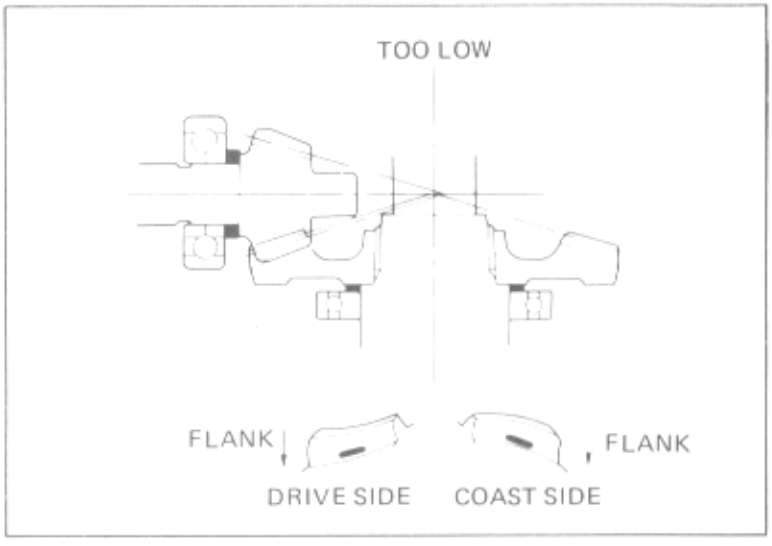


If the patterns are not correct, remove and replace the pinion spacer. Replace the pinion spacer with a thicker one if the contacts are too high, toward the face.



Replace the pinion spacer with a thinner one if the contacts are too low, to the flank side. The patterns will shift about 1.5–2.0 mm (0.06–0.08 in) when the thickness of the spacer is changed by 0.10 mm (0.004 in).

PINION SPACER:
- **A 1.82 mm (0.072 in)**
- **B 1.88 mm (0.074 in)**
- **C 1.94 mm (0.076 in)**
- **D 2.00 mm (0.079 in) Standard**
- **E 2.06 mm (0.081 in)**
- **F 2.12 mm (0.084 in)**
- **G 2.18 mm (0.086 in)**

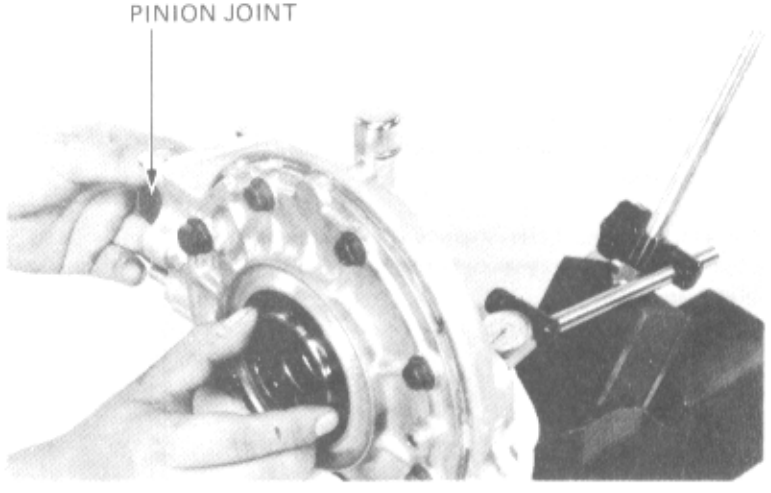


BACKLASH INSPECTION

Remove the oil filler cap.

Set the final gear assembly into a jig or stand to hold it steady. Set a horizontal type dial indicator on the ring gear, through the oil filler hole. Temporarily install the pinion joint onto the pinion gear and hold the pinion joint by hand. Rotate the ring gear by hand until gear slack is taken up. Turn the ring gear back and forth to read backlash.

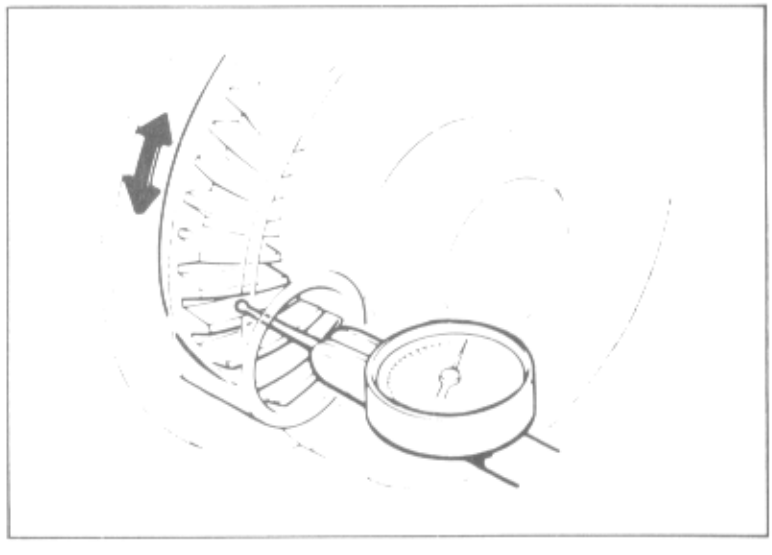
STANDARD: 0.08–0.18 mm (0.03–0.007 in)
SERVICE LIMIT: 0.30 mm (0.02 in)



Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.

Compare the difference of the three measurements.

DIFFERENCE OF MEASUREMENT
SERVICE LIMIT: 0.10 mm (0.004 in)



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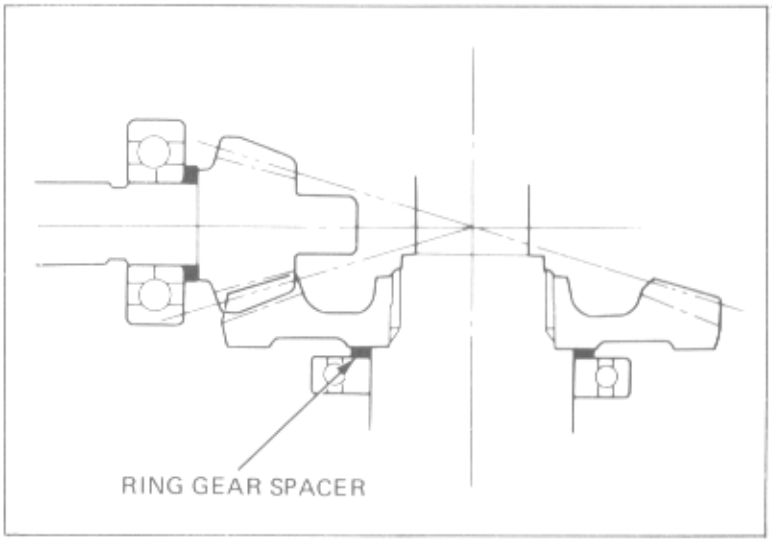
If the difference in measurements exceeds the limit, it indicates that the bearing is not installed squarely. Inspect the bearings and reinstall if necessary.

If backlash is too small, replace the ring gear spacer with a thinner one.

Backlash is changed by about 0.06–0.07 mm (0.002–0.003 in) when thickness of the spacer is changed by 0.10 mm (0.004 in).

RING GEAR SPACER:
- A 1.82 mm (0.072 in)
- B 1.88 mm (0.074 in)
- C 1.94 mm (0.076 in)
- D 2.00 mm (0.079 in) Standard
- E 2.06 mm (0.081 in)
- F 2.12 mm (0.084 in)
- G 2.18 mm (0.086 in)
- H 2.24 mm (0.088 in)
- I 2.30 mm (0.091 in)



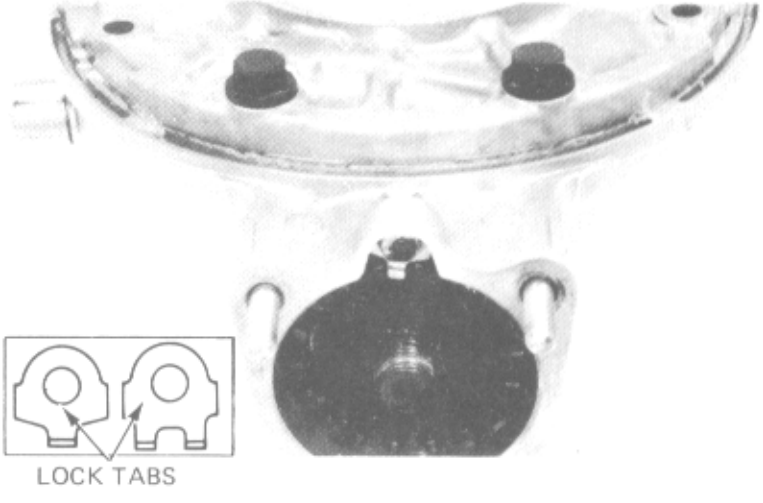
Remove the pinion joint from the pinion gear.

PINION JOINT INSTALLATION

Install the appropriate pinion retainer bolt lock tab.

NOTE

There are two types of lock tabs as shown.

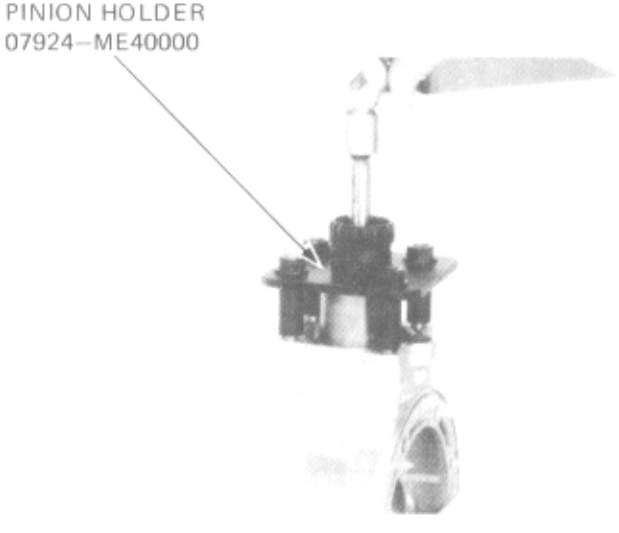


Apply gear oil to the oil seal lip contact surface of the pinion joint and install the pinion joint.

Install the pinion joint holder tool and tighten the pinion nut.

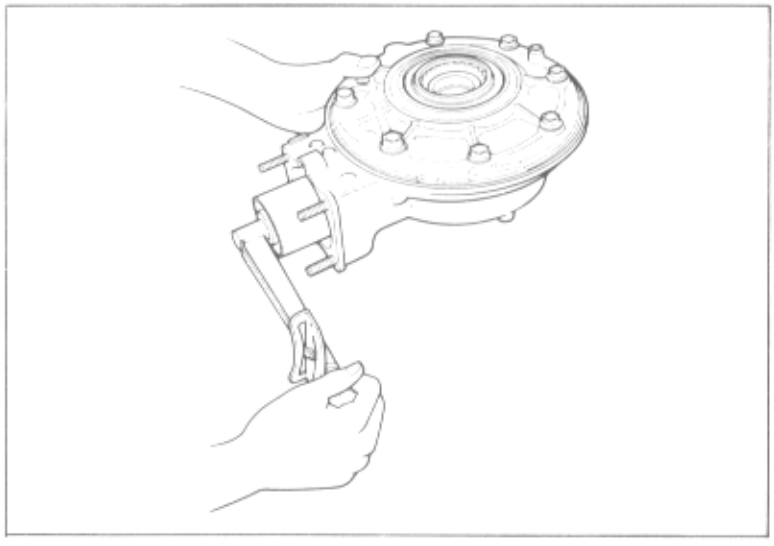
TORQUE: 100–120 N·m (10.0–12.0 kg-m, 72–87 ft-lb)

Remove the pinion joint holder tool.



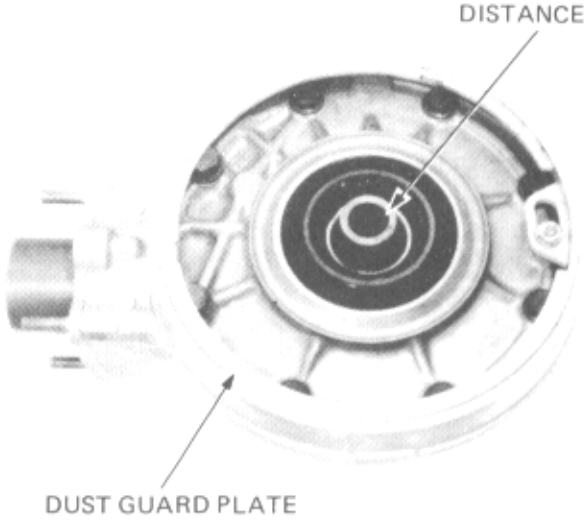
Make sure that the gear assembly rotates smoothly without binding by turning the pinion joint.

GEAR ASSEMBLY PRELOAD:
0.2–0.4 N·m (2–4 kg-cm, 1.7–3.5 in-lb)



Install the dust guard plate and torque the bolt.

Install the distance collar.



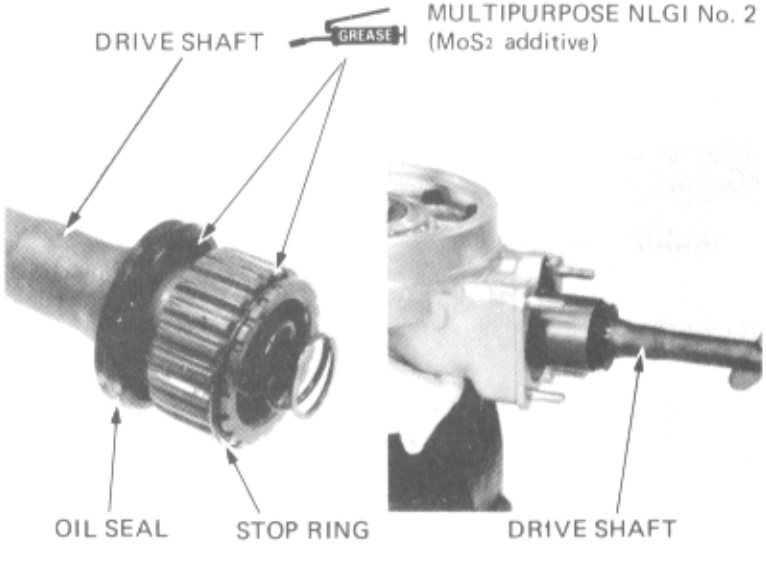
FINAL DRIVE INSTALLATION

Lubricate the splines of the drive shaft with Multi-purpose NLGI No. 2 (MoS_2 additive) Grease.

Insert the drive shaft into the pinion joint until the stop ring seats in the pinion joint spline grooves.

NOTE

- Make sure that the stop ring is seated properly by pulling on the drive shaft lightly.
- Be careful not to damage the drive shaft oil seal.



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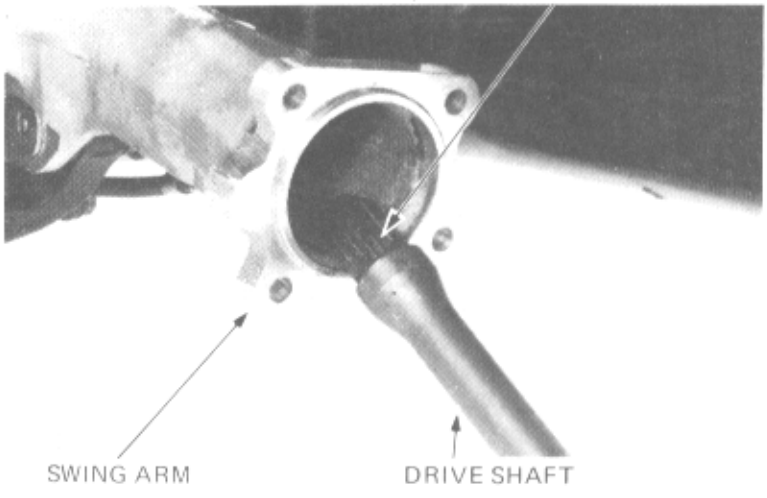
GREASE MULTIPURPOSE NLGI No. 2 (MoS_2 additive)

Lubricate the splines of the drive shaft with Multipurpose NLGI No. 2 (MoS_2 additive) Grease.

Insert the drive shaft assembly into the swing arm and align its splines with the universal joint.

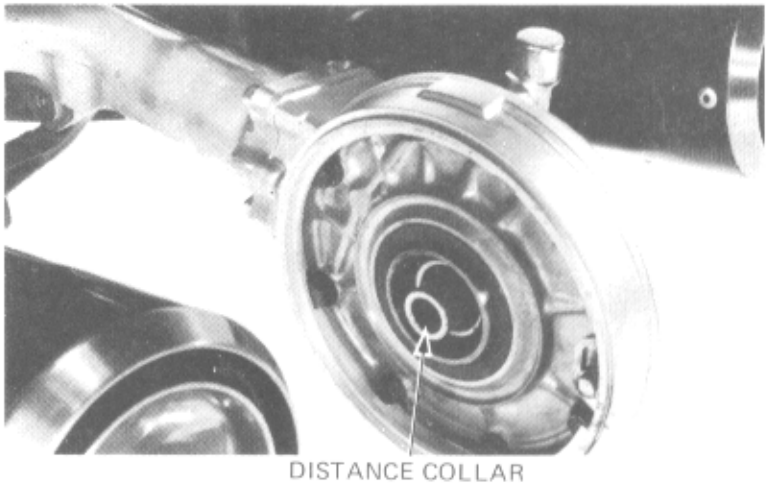


Attach the gear case onto the swing arm loosely.

NOTE

To ease axle installation, do not tighten the gear case nuts until after the axle is installed.

Install the distance collar into the final gear case.



Install the rear wheel (page 16-9).

Tighten the axle nut.

TORQUE: 60–80 N·m (6.0–8.0 kg-m, 43–58 ft-lb)

Tighten the three final gear case attaching nuts.

TORQUE: 27–34 N·m (2.7–3.4 kg-m, 20–25 ft-lb)

Tighten the axle pinch bolt.

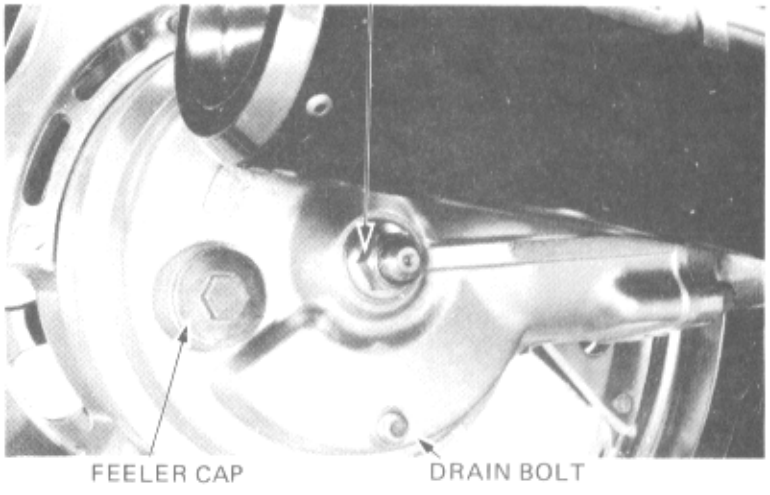
TORQUE: 20–30 N·m (2.0–3.0 kg-m, 14–22 ft-lb)

Make sure that the case drain bolt is tightened.

Remove the oil filler cap and pour the specified amount of recommended oil up to the filler neck.

RECOMMENDED OIL: HYPOID GEAR OIL
Over 5°C: SAE 90
Below 5°C: SAE 80

OIL CAPACITY: 160–180 cc (5.4–6.1 oz
4.5–5.1 Imp oz)



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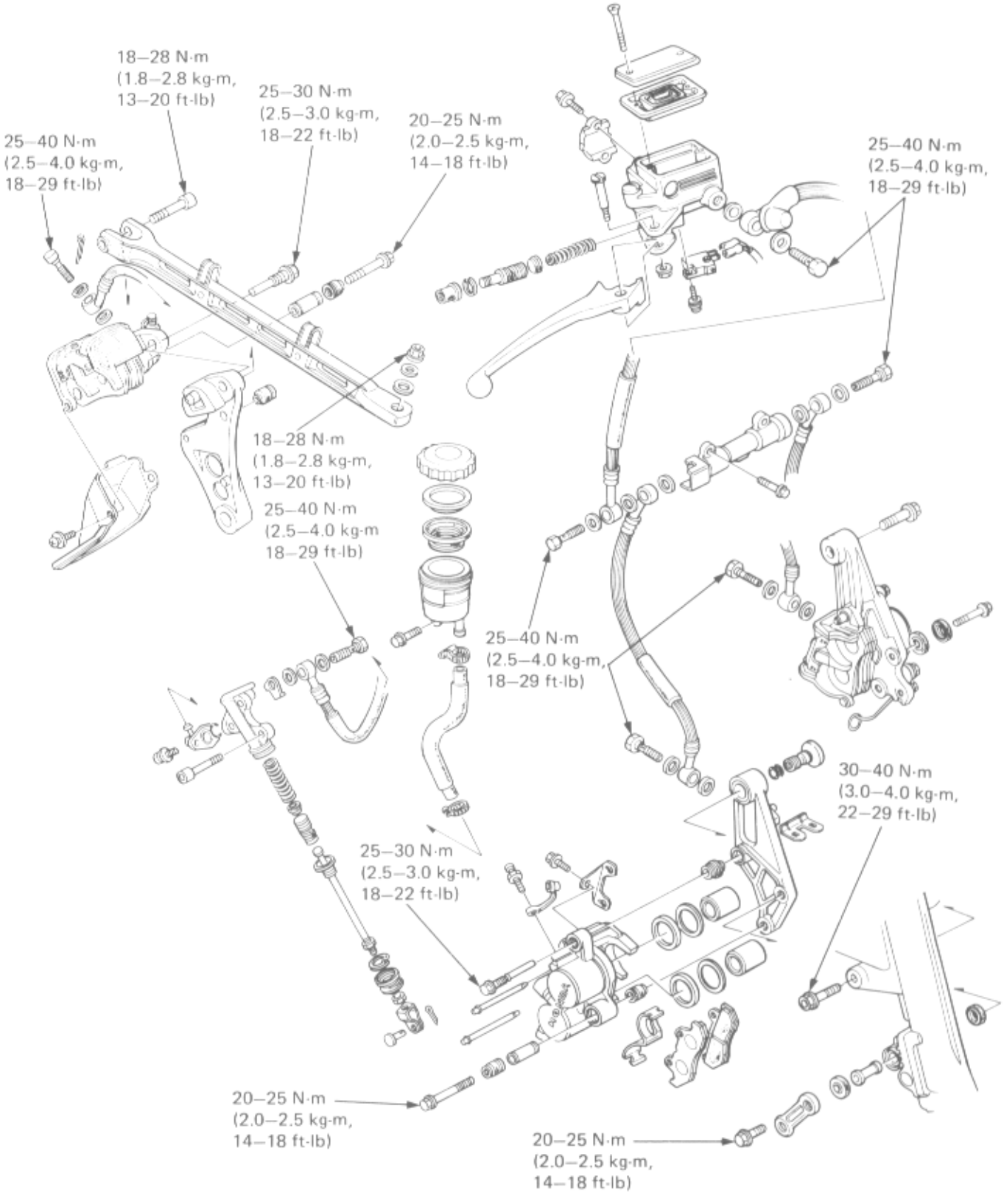

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18. HYDRAULIC BRAKES

SERVICE INFORMATION

GENERAL

- The front brake can be removed without disconnecting the hydraulic system. Once the hydraulic systems has been opened, or if the brakes feel spongy, the system must be bled.
- Do not allow foreign material to enter the system when filling the reservoir.
- Avoid spilling brake fluid on painted surfaces or instrument lenses, as severe damage will result.
- Always check brake-operation before riding the motorcycle.
- Replace the sealing washers whenever the brake hose bolt is removed.

SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Disc thickness	FRONT	4.9–5.1 (0.19–0.20)	4.0 (0.16)
	REAR	6.9–7.1 (0.27–0.28)	6.0 (0.24)
Disc runout		———	0.3 (0.01)
Master cylinder I.D.	FRONT	15.870–15.913 (0.6248–0.6265)	15.925 (0.6270)
	REAR	14.000–14.043 (0.5512–0.5529)	14.055 (0.5533)
Master piston O.D.	FRONT	15.827–15.854 (0.6231–0.6242)	15.815 (0.6226)
	REAR	13.957–13.984 (0.5495–0.5506)	13.945 (0.5490)
Caliper piston O.D.	FRONT	32.148–32.198 (1.2657–1.2676)	32.140 (1.2654)
	REAR	30.148–30.198 (1.1869–1.1889)	30.140 (1.1866)
Caliper cylinder I.D.	FRONT	32.230–32.280 (1.2689–1.2709)	32.290 (1.2713)
	REAR	30.230–30.280 (1.1901–1.1921)	30.290 (1.1925)

TORQUE VALUES

Brake hose bolt	25–40 N·m (2.5–4.0 kg-m, 18–29 ft-lb)
Front brake caliper mount bolt (Upper)	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
(Lower)	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Front brake caliper pivot bolt	25–30 N·m (2.5–3.0 kg-m, 18–22 ft-lb)
Front brake caliper bolt	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Rear brake caliper mount bolt	20–25 N·m (2.0–2.5 kg-m, 14–18 ft-lb)
Rear brake caliper pivot bolt	25–30 N·m (2.5–3.0 kg-m, 18–22 ft-lb)
Rear brake stopper arm bolt (front)	30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
nut (front)	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
bolt (rear)	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)
Rear brake pedal bolt	18–28 N·m (1.8–2.8 kg-m, 13–20 ft-lb)

TOOL

Special

Snap Ring Pliers	07914–3230001

TROUBLESHOOTING

Brake lever soft or spongy
- Air bubbles in hydraulic system.
- Low fluid level.
- Hydraulic system leaking.

Brake lever too hard
- Sticking piston(s)
- Clogged hydraulic system.
- Pads glazed or worn excessively.

Brakes drag
- Hydraulic system sticking.
- Sticking piston(s)
- Incorrect rear brake pedal adjustment.

Brakes grab or pull to one side
- Pads contaminated.
- One side of front brake faulty.
- Disc or wheel misaligned.

Brake chatter or squeal
- Pads contaminated.
- Excessive disc runout.
- Caliper installed incorrectly.
- Disc or wheel misaligned.

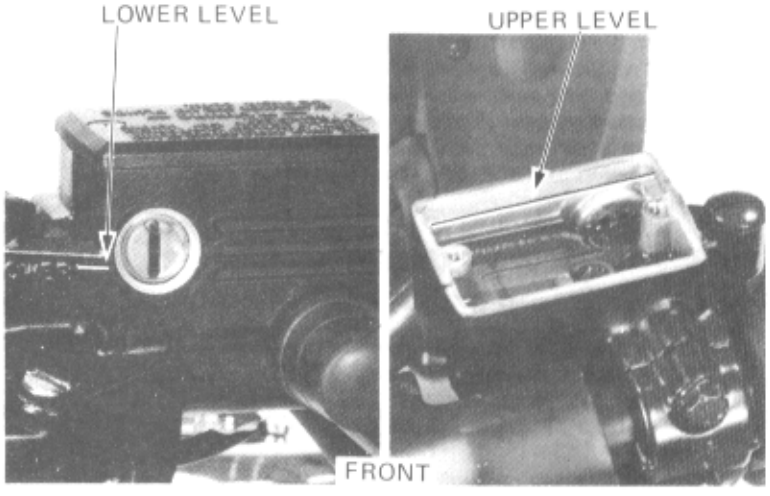
Date of Issue: December, 1982

BRAKE FLUID REPLACEMENT/ AIR BLEEDING

Check the fluid level with the fluid reservoir parallel to the ground.

CAUTION

- *Install the diaphragm on the reservoir when operating the brake lever. Failure to do so will allow brake fluid to squirt out of the reservoir during brake operation.*
- *Avoid spilling fluid on painted surfaces. Place a rag over the fuel tank whenever the system is serviced.*



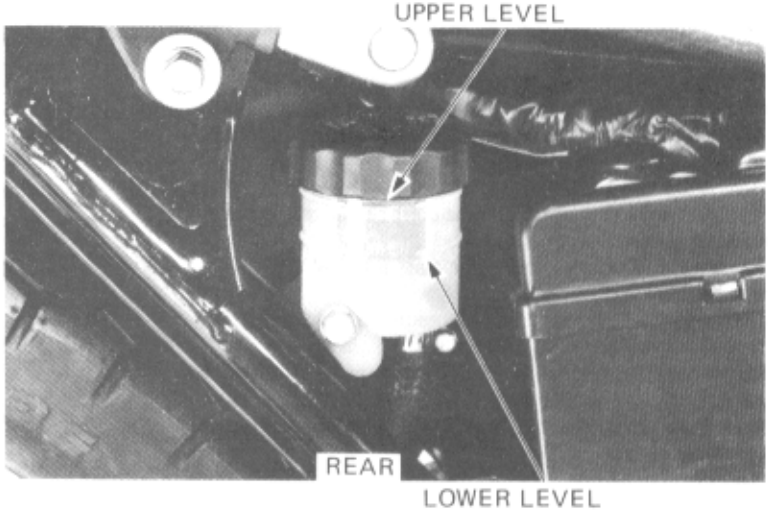
BRAKE FLUID DRAINING

Connect a bleed hose to the bleed valve.

Loosen the caliper bleed valve and pump the brake lever (or pedal). Stop pumping the lever (or pedal) when no more fluid flows out of the bleed valve.

WARNING

A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean a contaminated disc with a high quality brake degreasing agent.

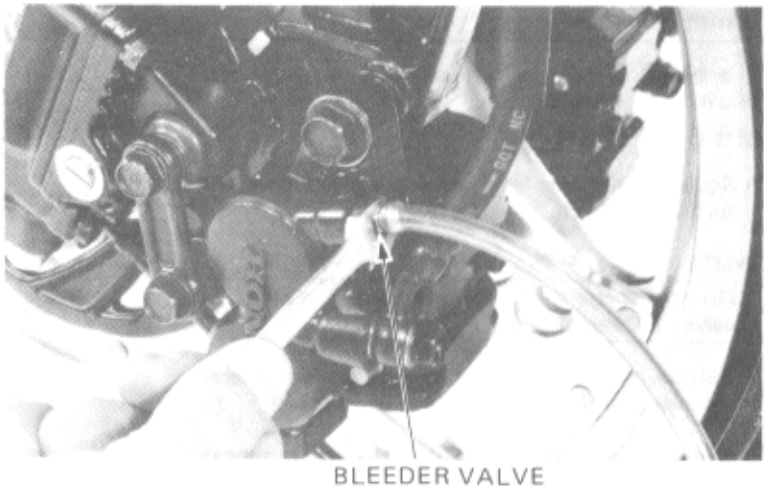


BRAKE FLUID FILLING

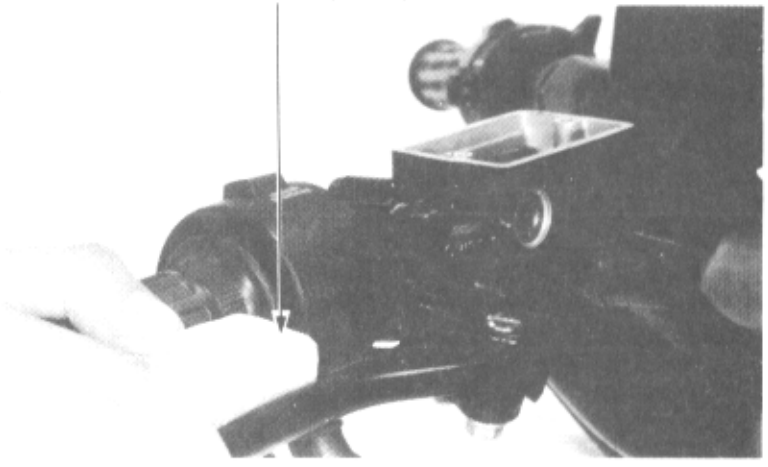
NOTE

Use only DOT–3 brake fluid from a sealed container. Do not mix different types of fluid. They are not compatible.

Close the bleed valve, fill the reservoir, and install the diaphragm.



To prevent piston overtravel and brake fluid seepage, keep a 20 mm (3/4 in) spacer between the handlebar grip and lever when filling and bleeding the front brake system. Pump up the system pressure with the lever until there are no air bubbles in the fluid flowing out of the reservoir small hole and lever resistance is felt.



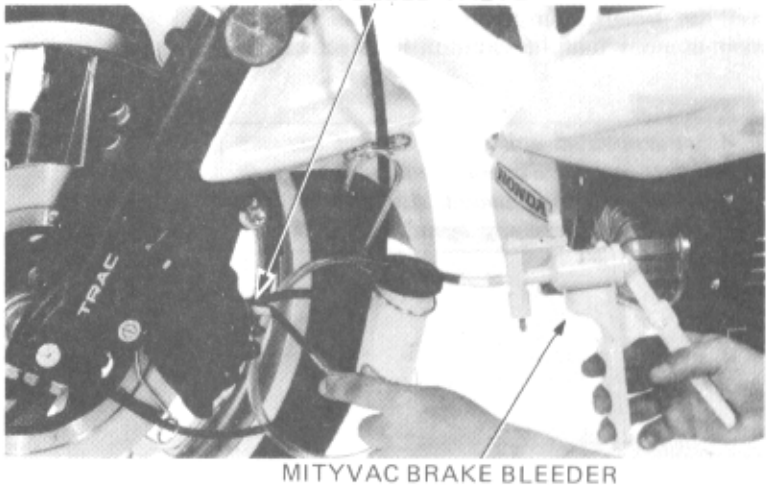
AIR BLEEDING (U.S.A. ONLY)

NOTE

- Check the fluid level often while bleeding the brakes to prevent air from being pumped into the system.
- Use only DOT 3 brake fluid from a sealed container.
- Do not mix brake fluid types and never reuse the contaminated fluid which has been pumped out during brake bleeding, because that would will impair the efficiency of the brake system.
- When using a brake bleeding tool, follow the manufacturer's operating instructions.

Connect a Mityvac Brake Bleeder No. 6860 or equivalent to the bleed valve. Loosen the bleed valve 1/2 turn and bleed air until bubbles do not appear in the fluid.

Pump the brake lever or pedal to bring the caliper pads in contact with the disc.
Remove the master cylinder cap and fill the reservoir to near full.
Connect the Mityvac Brake Bleeder or equivalent to the bleed valve.
Pump the brake bleeder and loosen the bleeder valve.
Add fluid when the fluid level in the master cylinder reservoir is low.
Repeat the above procedures until air bubbles do not appear in the plastic hose.



NOTE

If air is entering the bleeder from around the bleeder valve the threads. Seal the threads with teflon tape.

If a brake bleeder is not available, perform the following procedure.

AIR BLEEDING

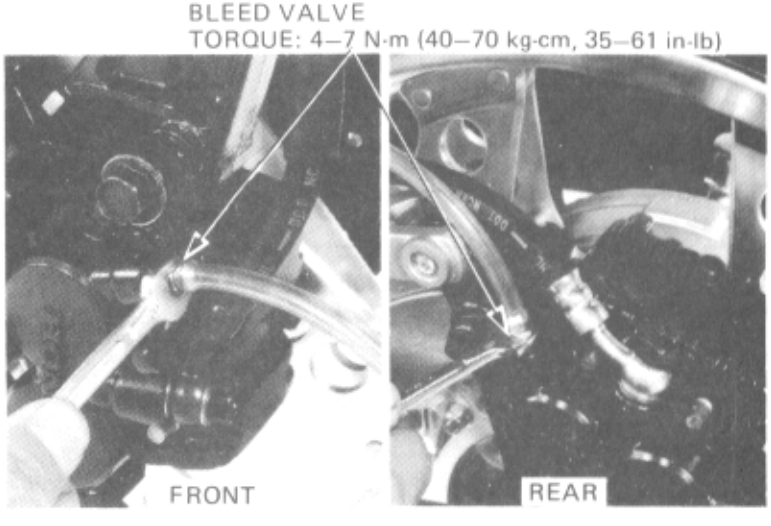
1) Squeeze the brake lever, open the bleed valve 1/2 turn and then close the valve.

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.

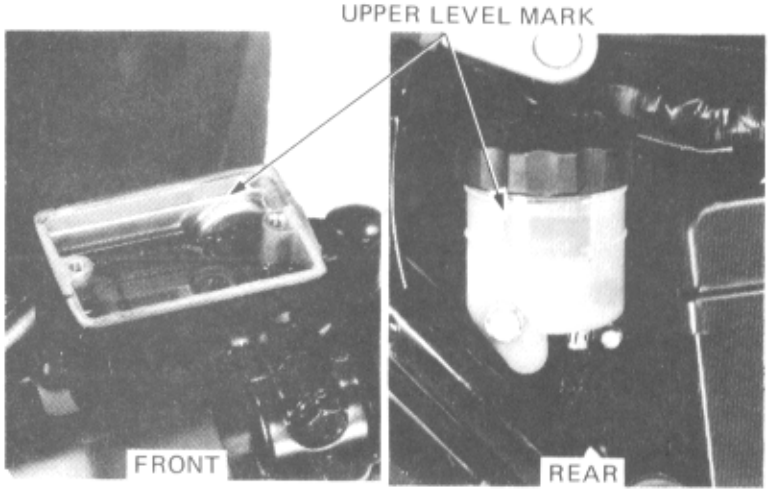
Repeat steps 1 and 2 until bubbles cease to appear in the fluid at the end of the hose.



Fill the fluid reservoir to the upper level mark.

WARNING

A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean a contaminated disc with a high quality brake degreasing agent.



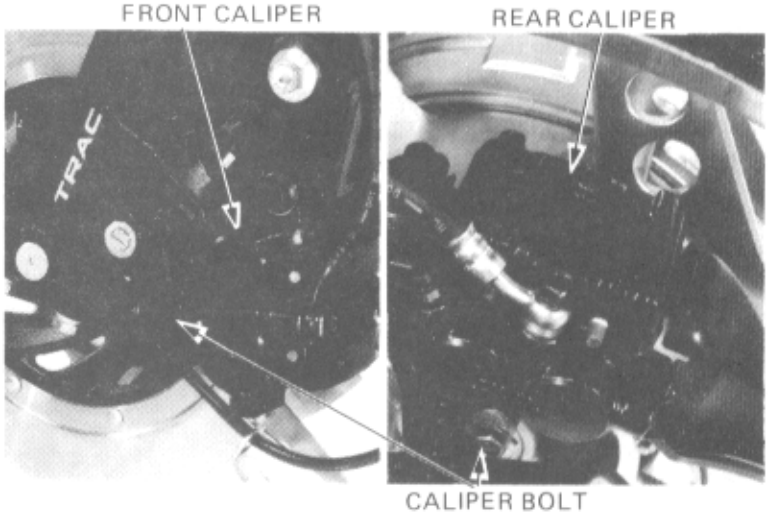
BRAKE PADS/DISC

PAD REPLACEMENT

NOTE

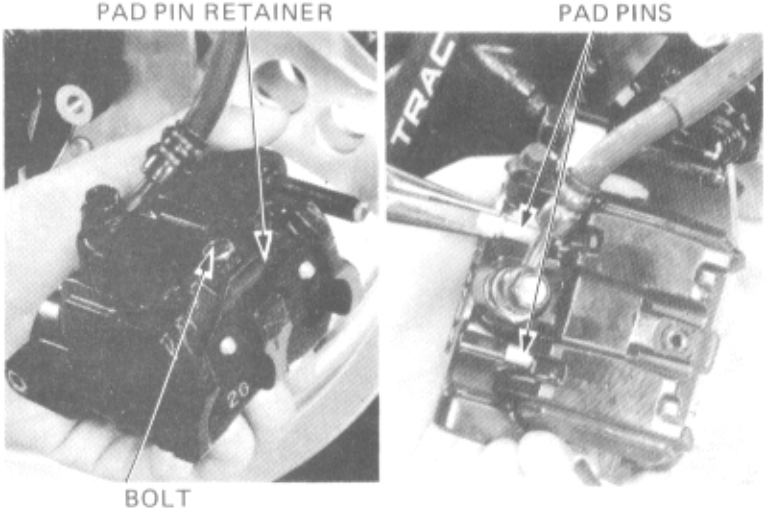
Always replace the brake pads in pairs to assure even disc pressure.

Remove the caliper bolt.
Pivot the caliper up out of the way and remove the caliper from the bracket.



Remove the pad pin retainer and pull the pad pins out of the caliper.

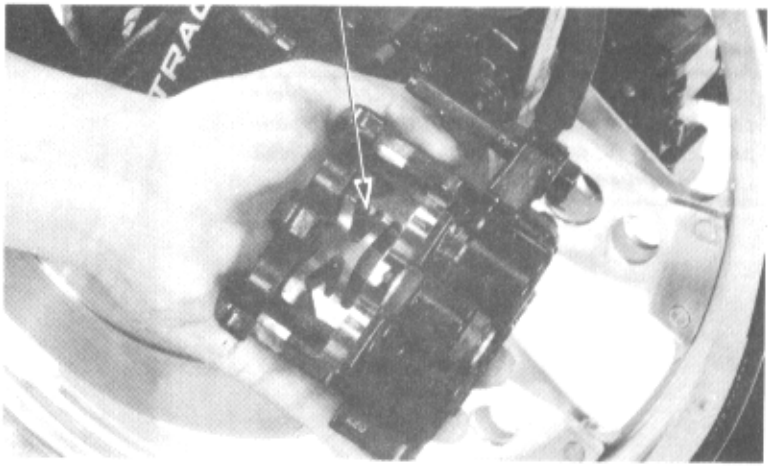
Remove the brake pads.



Position the pad spring in the caliper as shown.

Push the caliper pistons in all the way.

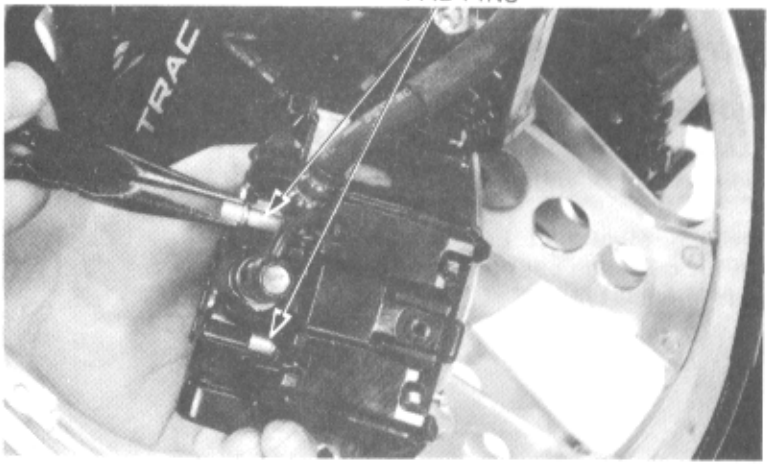
PAD SPRING



Install the new pads in the caliper.

Install the pad pins, one pad pin first, then install the other pin by pushing the pads against the caliper to depress the pad spring.

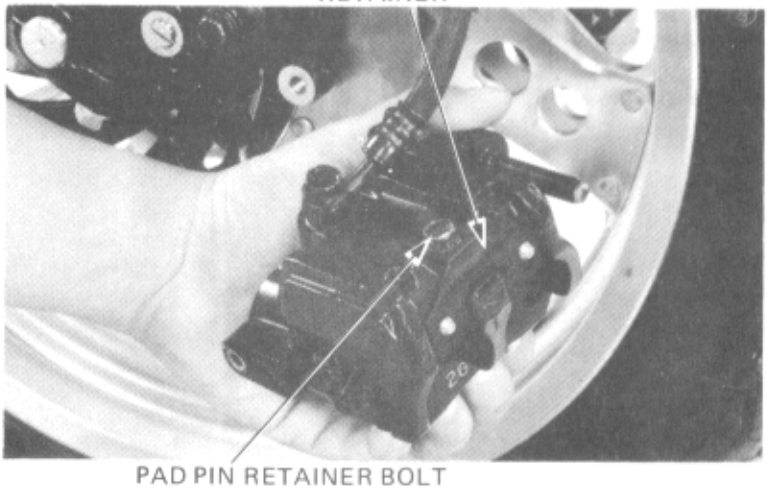
PAD PINS



Place the pad pin retainer over the pad pins. Push the retainer down to secure the pins.

Install the pad pin retainer bolt.

RETAINER

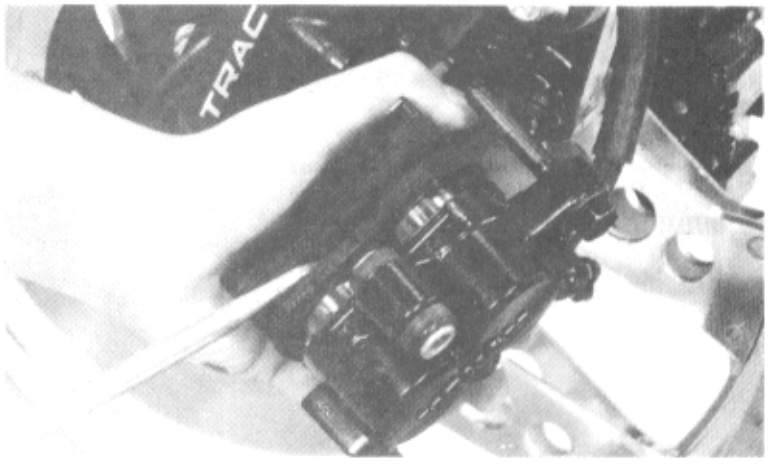


PAD PIN RETAINER BOLT

Puch the piston all the way in to allow installation of new brake pads.

NOTE

Check the brake fluid level in the brake master cylinder reservoir as this operation causes the level to rise.

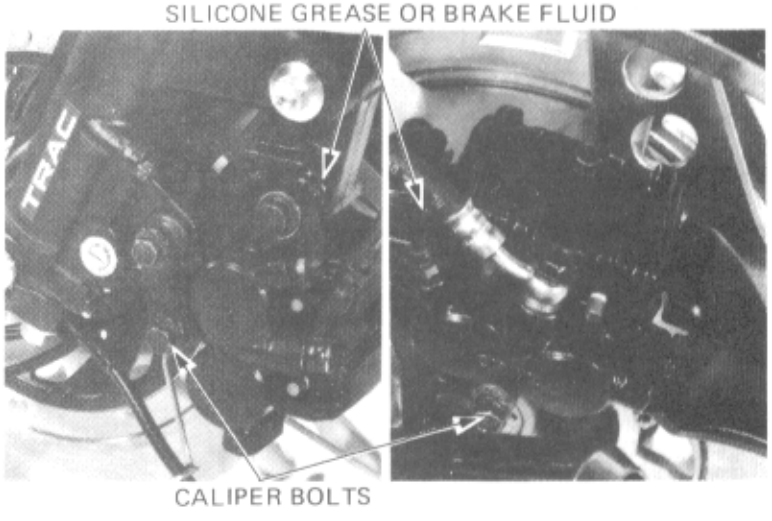


Apply silicone grease or brake fluid to the caliper pivot bolt and insert the pivot bolt into the pivot bolt hole.

Pivot the caliper down so the brake disc is positioned between the pads, making sure not to damage the pads.

Install the caliper bolt and tighten it.

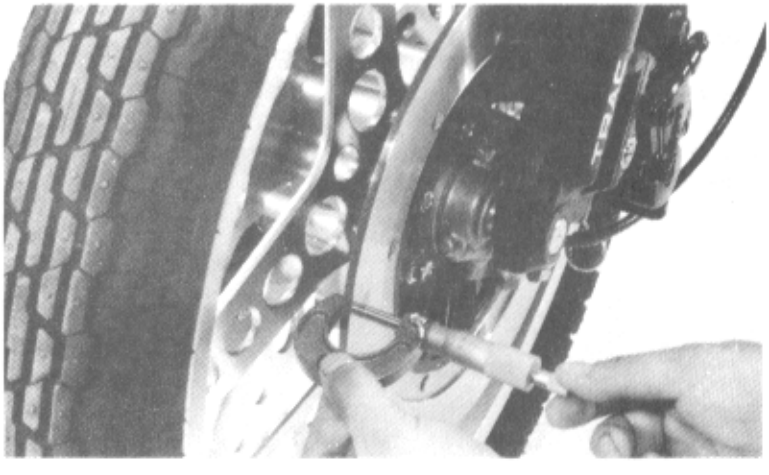
TORQUE: 18–25 N·m
(1.8–2.5 kg-m, 13–18 ft-lb)



BRAKE DISC THICKNESS

Measure the thickness of each brake disc.

SERVICE LIMITS:
FRONT: 4.0 mm (0.16 in)
REAR: 6.0 mm (0.24 in)

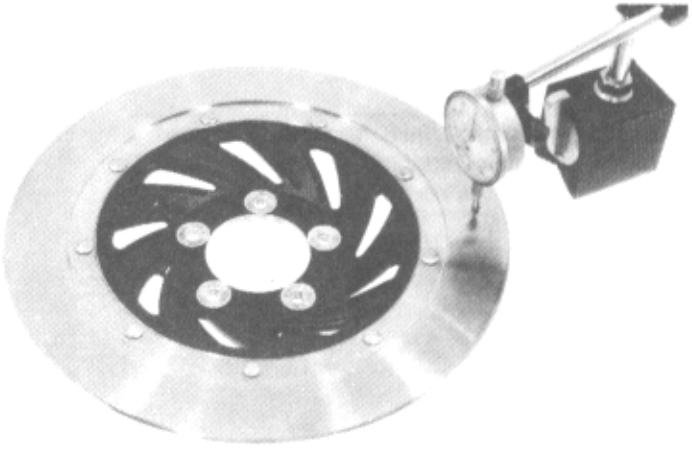


BRAKE DISC WARPAGE

Remove the wheel (front, page 15-7), (rear wheel, 16-3).
Remove the disc from the wheel.
Measure the brake disc warpage on a surface plate.

SERVICE LIMIT: 0.30 mm (0.012 in)

Reinstall the disc and wheel.



BRAKE MASTER CYLINDERS

FRONT MASTER CYLINDER DISASSEMBLY

Drain brake fluid from the hydraulic system.

Disconnect the brake light switch wires.

Remove the brake lever and rear view mirror from the master cylinder. Disconnect the brake hose.

CAUTION

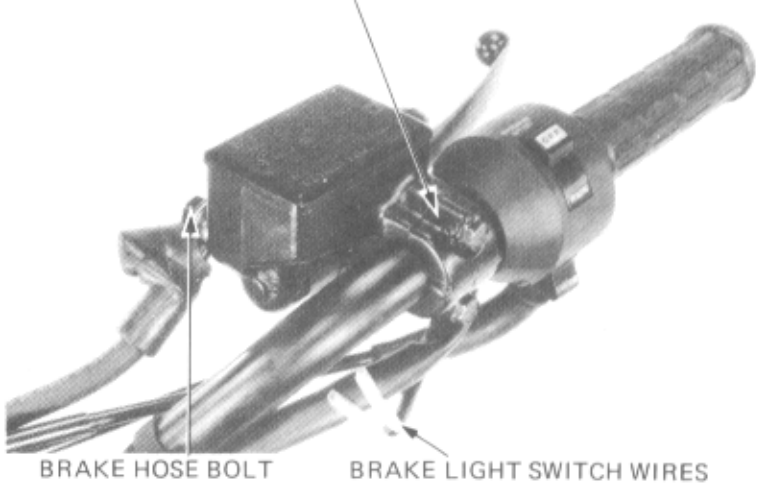
Avoid spilling brake fluid on painted surfaces. Place a rag over the fuel tank whenever the brake system is serviced.

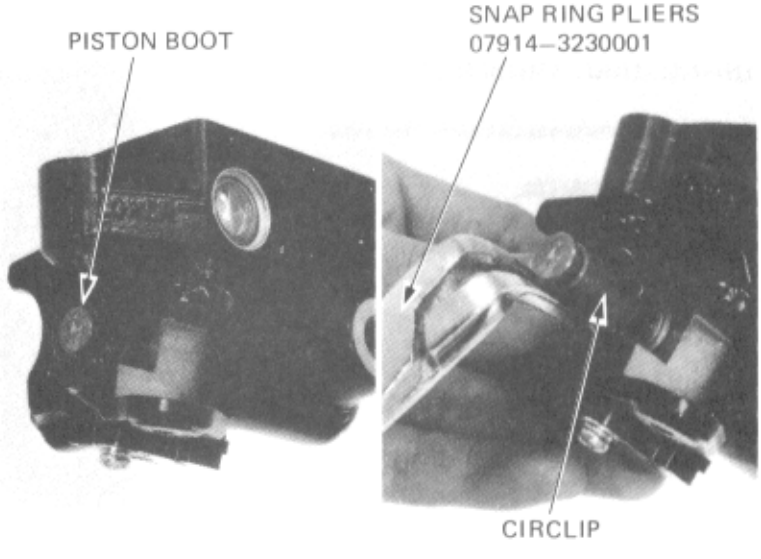
NOTE

When removing the oil hose bolt, cover the end of the hose to prevent contamination. Secure the hose to prevent fluid from leaking out.

Remove the master cylinder.

Remove the piston boot and the circlip from the master cylinder body.





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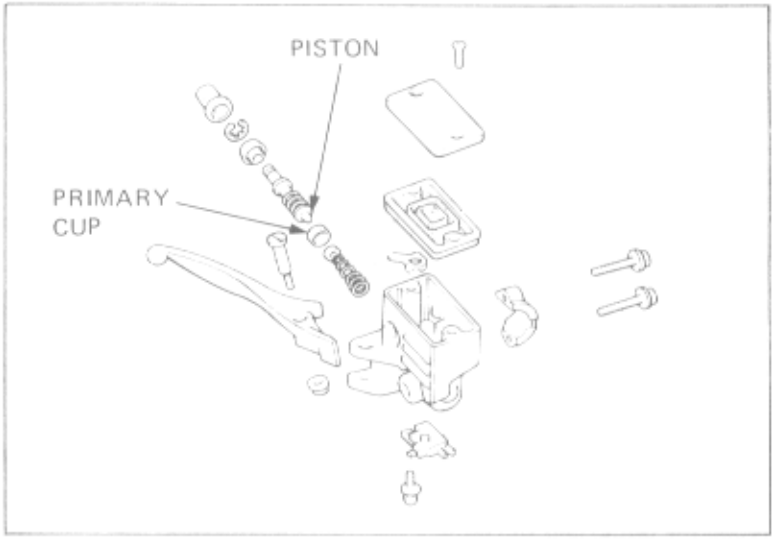
Remove the master cylinder piston. Then remove the primary cup and spring.

Remove the brake light switch from the master cylinder body, if necessary.

Clean the inside of the master cylinder and reservoir with brake fluid.



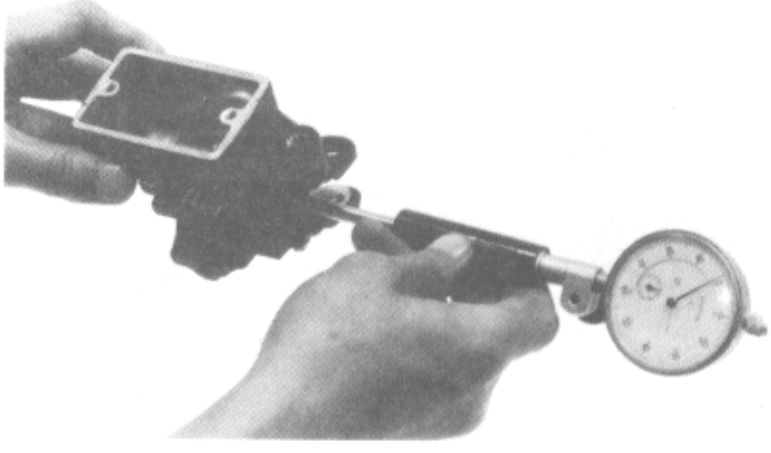
INSPECTION

- FRONT MASTER CYLINDER I.D.

Measure the master piston bore I.D.

SERVICE LIMIT: 15.925 mm (0.6270 in)

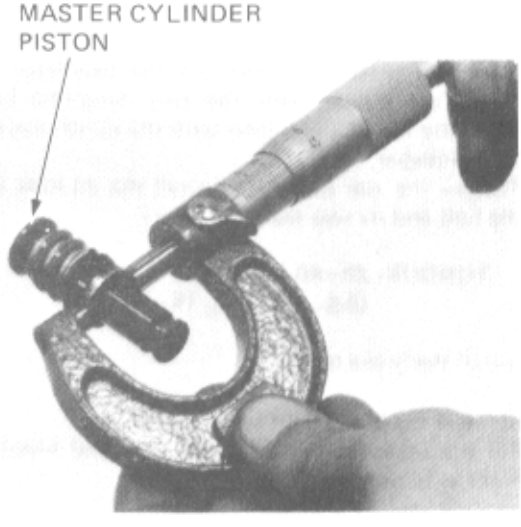
Check for scores, scratches, nicks or other damage.



- FRONT MASTER CYLINDER PISTON O.D.

Measure the master cylinder piston O.D. as shown.

SERVICE LIMIT: 15.815 mm (0.6226 in)



FRONT MASTER CYLINDER ASSEMBLY

CAUTION

Handle the master cylinder piston, cylinder and spring as a set.

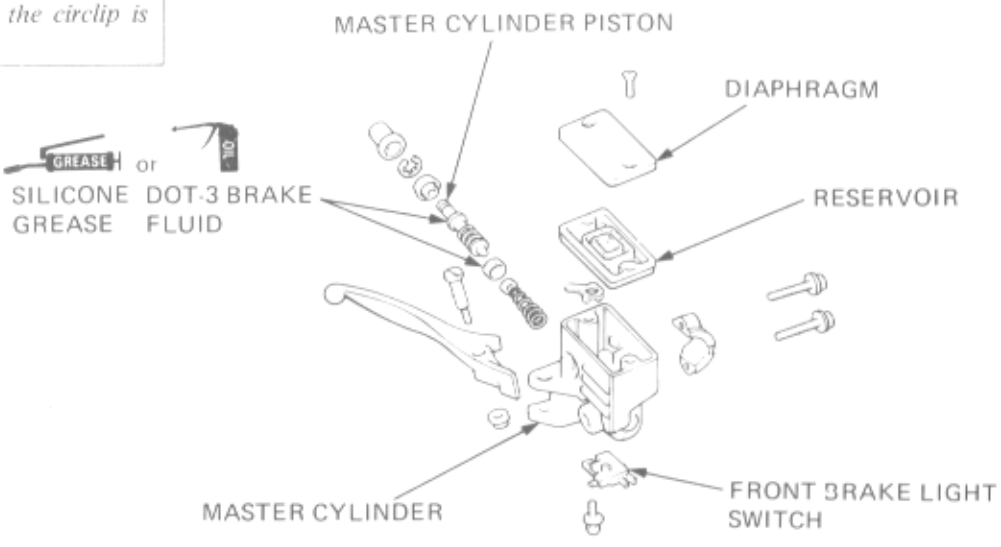
Assemble the master cylinder. Coat all parts with clean brake fluid before assembly. Install the spring and primary cup together.

Dip the piston cup in brake fluid before assembly.

CAUTION

When installing the cups, do not allow the lips to turn inside out. Be certain the circlip is seated firmly in the groove.

Install the piston clip and boot.

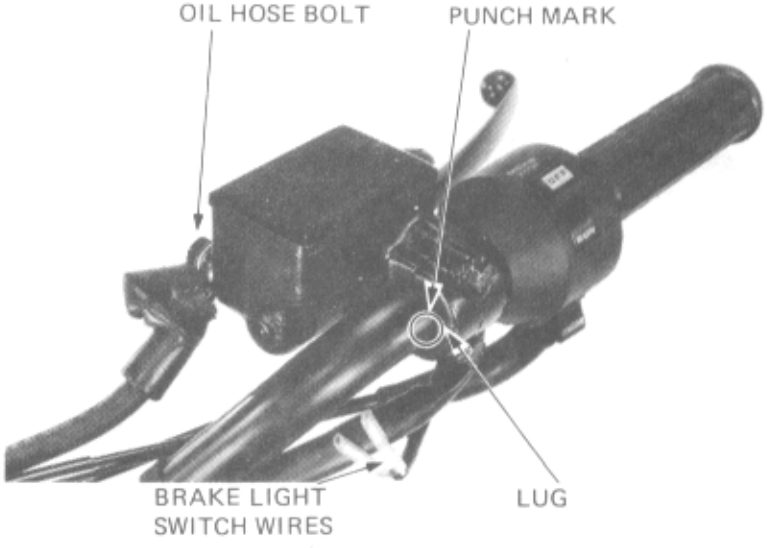


Place the master cylinder on the handlebar and install the holder with the two mounting bolts. Align the lug of the holder with the punch mark on the handlebar.
Tighten the top bolt first. Install the oil hose with the bolt and its two sealing washers.

TORQUE: 25–40 N·m
(2.5–4.0 kg-m, 18–29 ft-lb)

Install the brake lever.

Connect the brake light switch wires.
Fill the reservoir to the upper level and bleed the brake system (page 18-3).

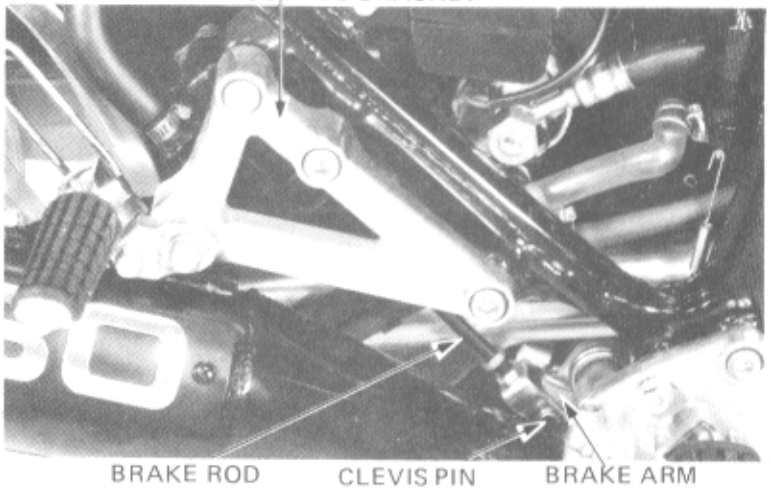


REAR MASTER CYLINDER DISASSEMBLY

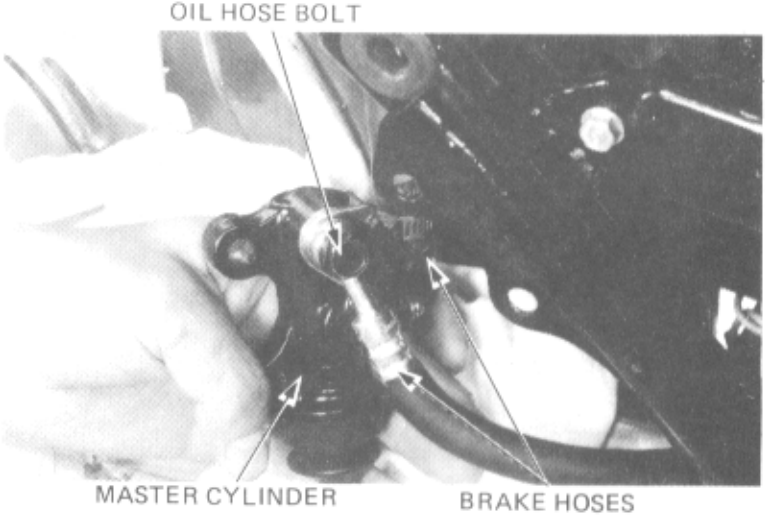
Remove the right side cover.

Remove the right passenger foot peg bracket.

Remove the cotter pin and clevis and disconnect the brake rod from the brake arm.



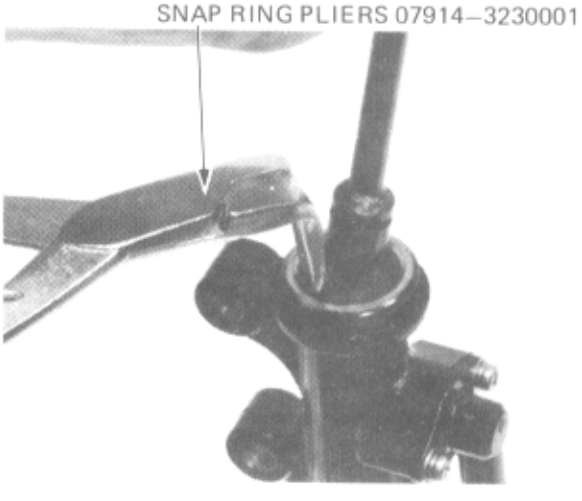
Place a drip pan under the breake line. Disconnect the brake hoses from the master cylinder.



Remove the rubber cover.
Remove the snap ring and pull the rod out of the master cylinder body.

CAUTION

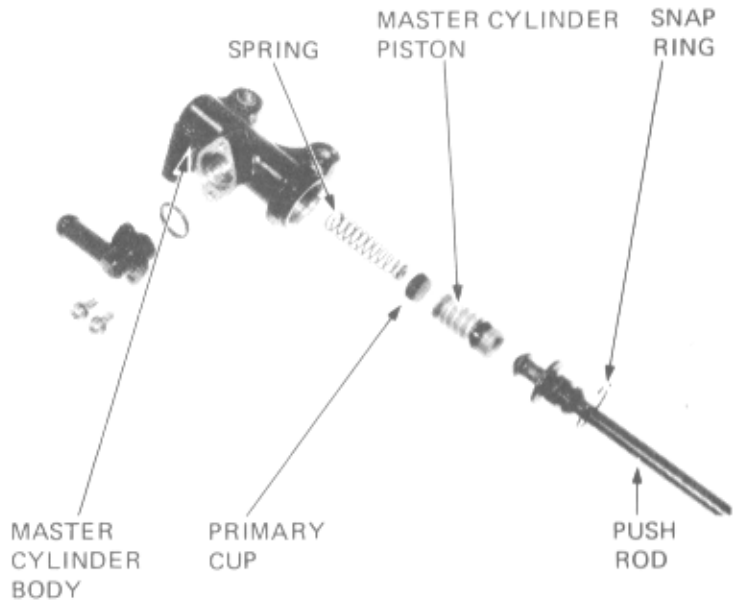
Beware that the piston rod will pop out when removing the circlip.



Remove the master cylinder piston, primary cup and spring.

It may be necessary to apply a small amount of air pressure to the fluid outlet to remove the master piston and primary cup.

Clean all parts with brake fluid.



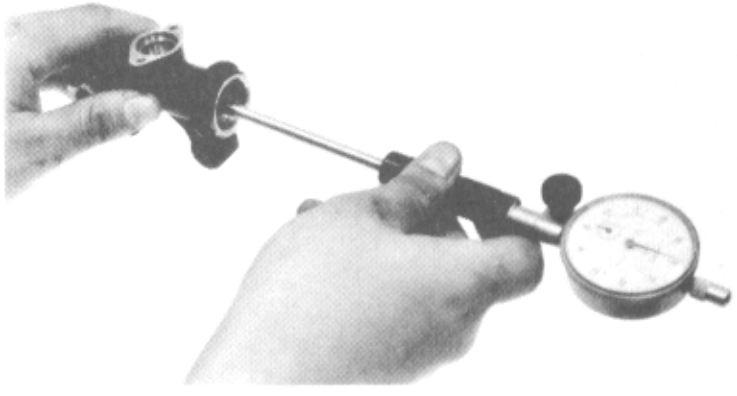
INSPECTION

- REAR MASTER CYLINDER I.D.

Measure the inside diameter of the master cylinder bore.

SERVICE LIMIT: 14.055 mm (0.5533 in)

Check for scores, scratches or nicks.

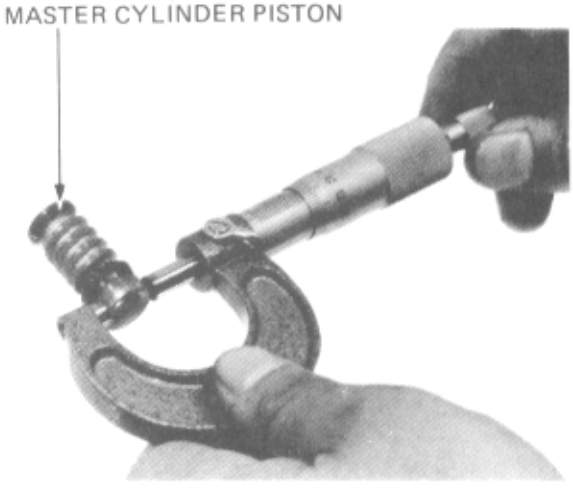


- REAR MASTER CYLINDER PISTON O.D.

Measure the master piston O.D. as shown.

SERVICE LIMIT: 13.945 mm (0.5490 in)

Check the primary cup and secondary cup for damage before reassembly.



REAR MASTER CYLINDER ASSEMBLY

NOTE

Handle the master cylinder piston, cylinder and spring as a set.

Coat all parts with clean brake fluid.

Dip the piston cup in brake fluid before assembly.
Assemble the master cylinder.

CAUTION

When installing the cups, do not allow the lips to turn inside out. Be certain the snap ring is seated firmly in the groove.

Install the primary cup and piston.

Install the push rod and circlip.

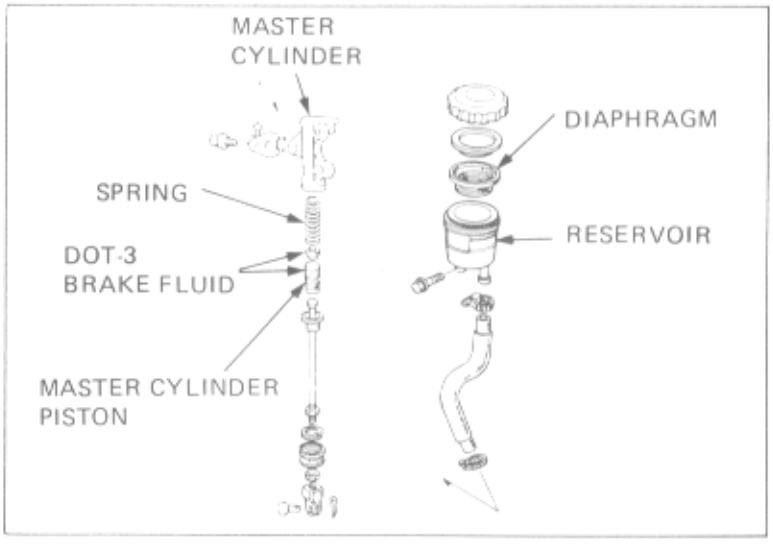
Install the boot, nut and rod eye.

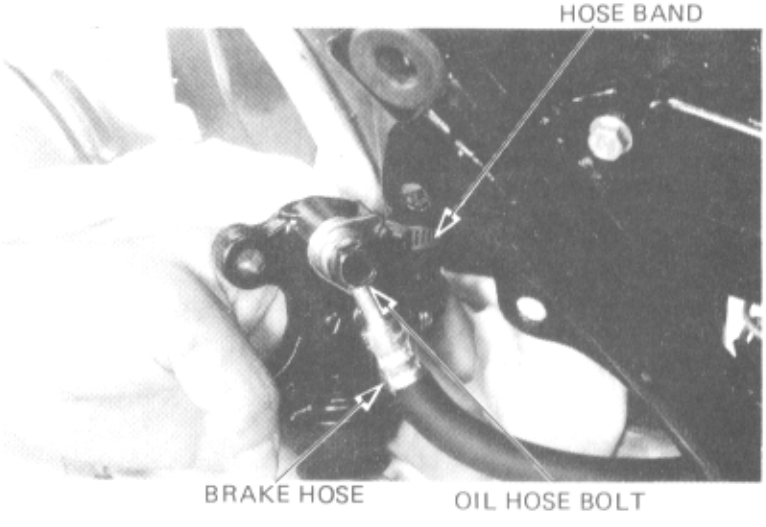
NOTE

Be sure that the boot is installed in the groove.

Connect the brake hose from the reservoir to the master cylinder and tighten the hose band.
Install the brake hose with the bolt and its two sealing washers.

TORQUE: 25–40 N·m
(2.5–4.0 kg-m, 18–29 ft-lb)

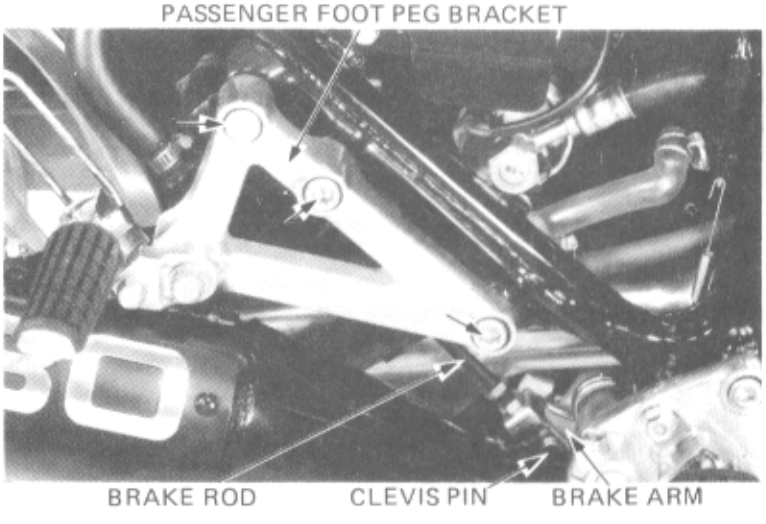




Connect the brake rod to the brake arm with the clevis pin and a new cotter pin.
Install the passenger foot peg bracket.

TORQUE: 30–40 N·m
(3.0–4.0 kg-m, 22–29 ft-lb)

Bleed the brake hydraulic system after assembly (page 18-3).



BRAKE CALIPERS

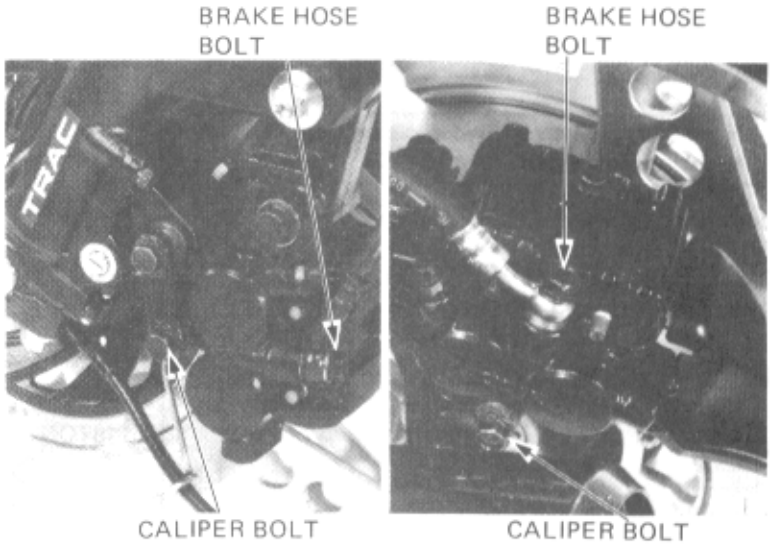
REMOVAL

Place a clean container under the caliper and disconnect the brake hose from the caliper.

CAUTION

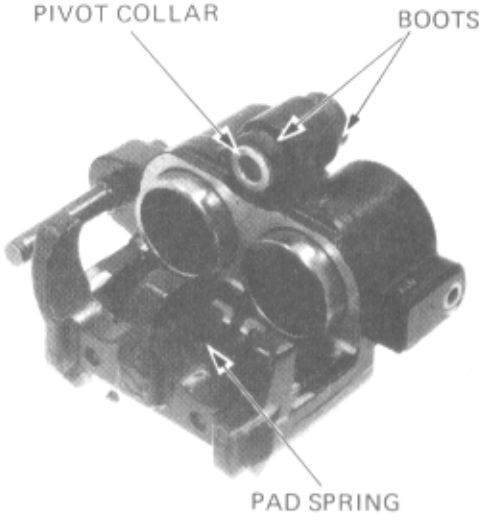
Avoid spilling brake fluid on painted surfaces.

Remove the caliper bolt and caliper.



DISASSEMBLY

Remove the following:
- pads and pad spring.
- caliper pivot collar and boots.
- pistons from the caliper.



If necessary, apply compressed air to the caliper fluid inlet to get the piston out. Place a shop rag under the caliper to cushion the piston when it is expelled. Use the air in short spurts.

CAUTION

Do not bring the nozzle too close to the inlet.

Examine the pistons and cylinders for scoring, scratches or other damage and replace if necessary.

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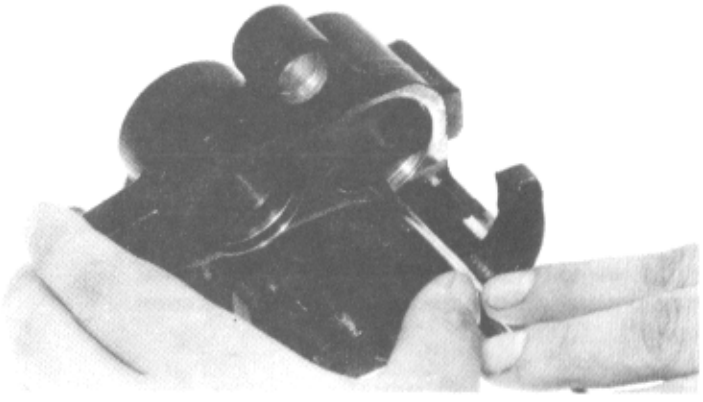
Push the piston seals in, lift them out and discard them.

Clean the oil seal grooves with brake fluid.

CAUTION

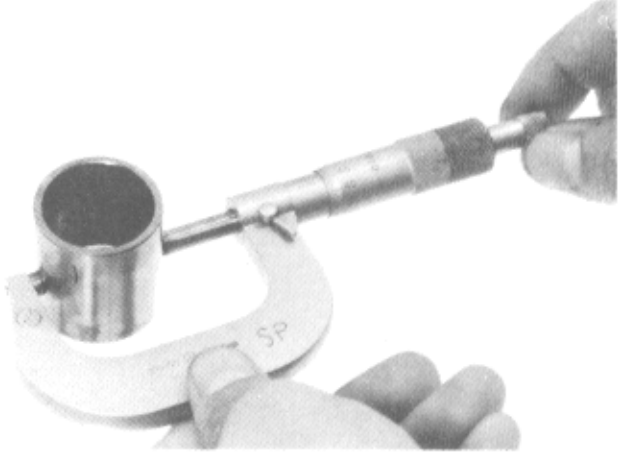
Be careful not to damage the piston sliding surfaces when removing the seals.



PISTON INSPECTION

Check the pistons for scoring, scratches or other faults. Measure the piston diameter with a micrometer.

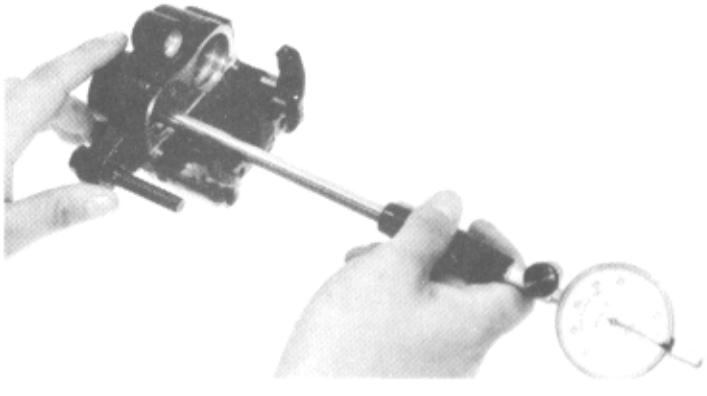
SERVICE LIMITS:
FRONT: 32.140 mm (1.2654 in)
REAR: 30.140 mm (1.1866 in)



CYLINDER INSPECTION

Check the caliper cylinder bore for scoring, scratches or other faults. Measure the caliper cylinder bore.

SERVICE LIMITS:
FRONT: 32.290 mm (1.2713 in)
REAR: 30.290 mm (1.1925 in)



ASSEMBLY

If the piston boots are hardened or deteriorated, replace them with new ones. The piston seals must be replaced with new ones whenever they are removed. Coat the seals with silicone grease or brake fluid before assembly.

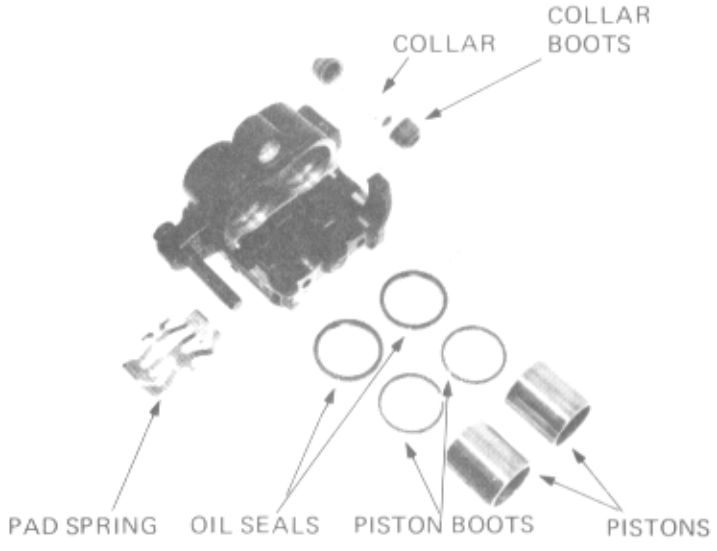
Install the pistons with the dished ends toward the pads. Then install the piston boots.

Install the collar boots and collar making sure that the boots are seated in the collar and caliper grooves properly.

Install the pad spring and pads.

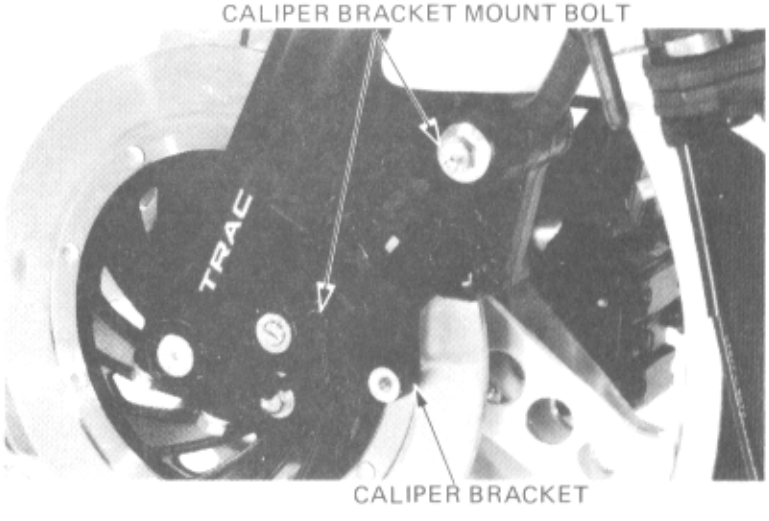
Install the caliper pivot bolt, if it was removed.

TORQUE: 25–30 N·m
(2.5–3.0 kg-m, 18–22 ft-lb)



FRONT CALIPER BRACKET REMOVAL

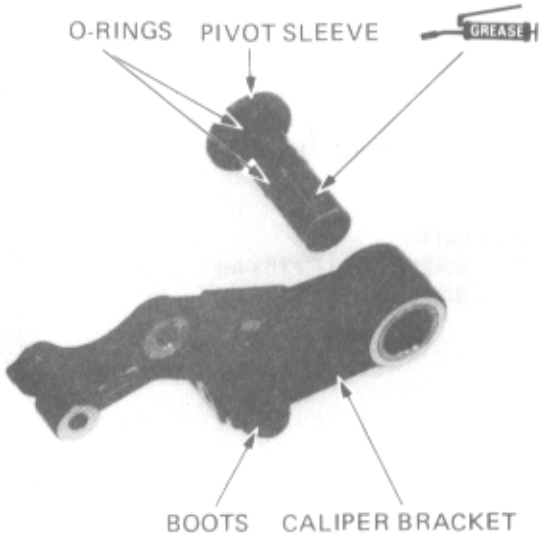
Remove the caliper bracket mount bolts and remove the caliper bracket from the fork leg.



INSTALLATION

Inspect the condition of the caliper pivot bolt boots. Check the O-rings for damage.

Coat the outer side of the caliper bracket pivot sleeve with Multipurpose NLGI No. 2 Grease (MoS_2 additive).



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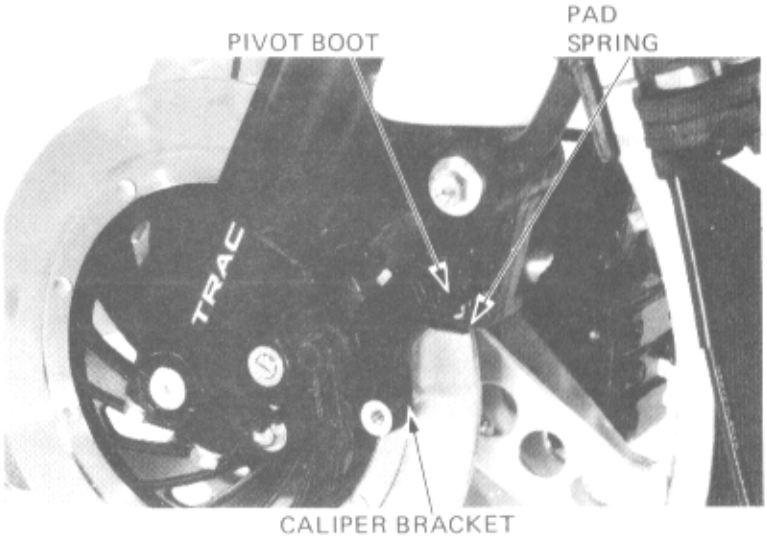
Install the caliper bracket onto the fork leg.

Install the pivot boot and pad spring as shown.



Apply silicone grease to the caliper bolt, pivot bolt and collar.

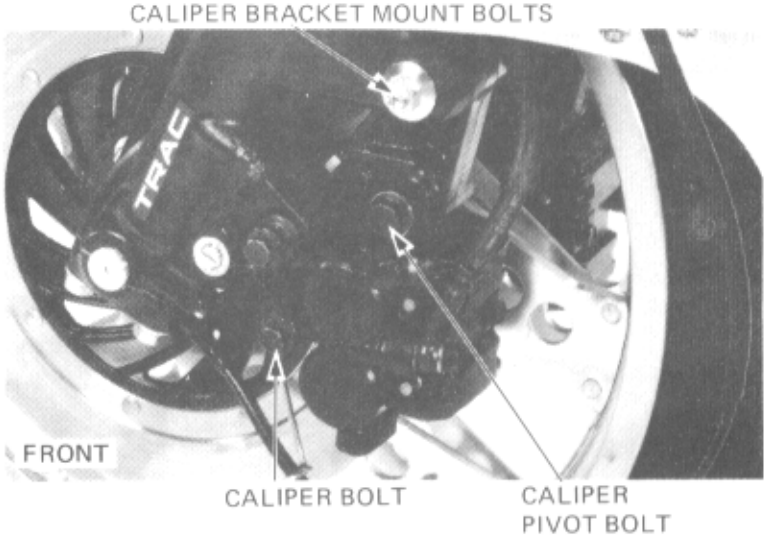
Install the caliper assembly over the brake disc so that the disc is positioned between the pads.

CAUTION

Be careful not to damage the pads.

Tighten the caliper mount bolts.

TORQUE:
Upper: 30–40 N·m
(3.0–4.0 kg-m, 22–29 ft-lb)
Lower: 29–25 N·m
(2.0–2.5 kg-m, 14–18 ft-lb)



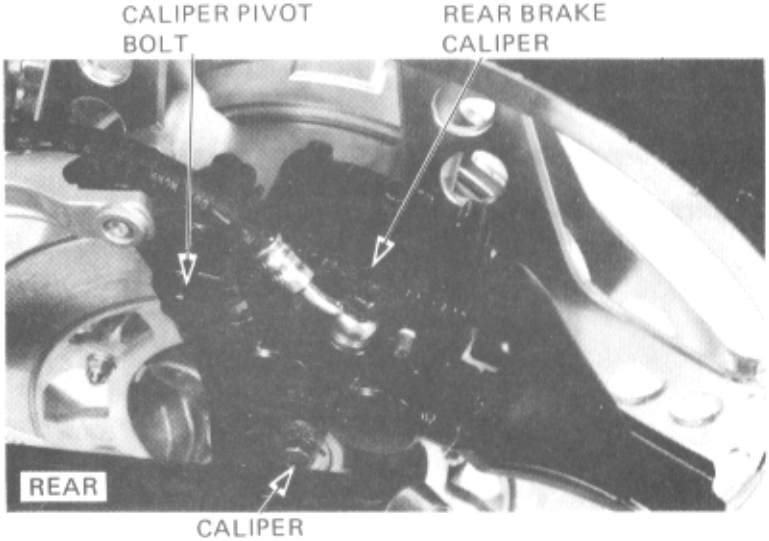
Tighten the caliper bolts.

TORQUE:
Pivot bolt: 25–30 N·m
(2.5–3.0 kg-m, 18–22 ft-lb)

Connect the brake hose and tighten the brake hose bolt.

TORQUE: 25–40 N·m
(2.5–4.0 kg-m, 18–29 ft-lb)

Fill the brake fluid reservoir and bleed the brake system (page 18-3).

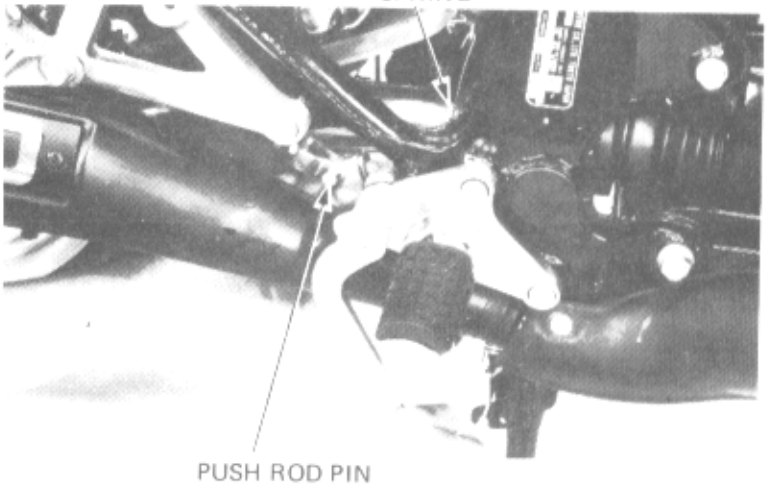


BRAKE PEDAL SNAFT

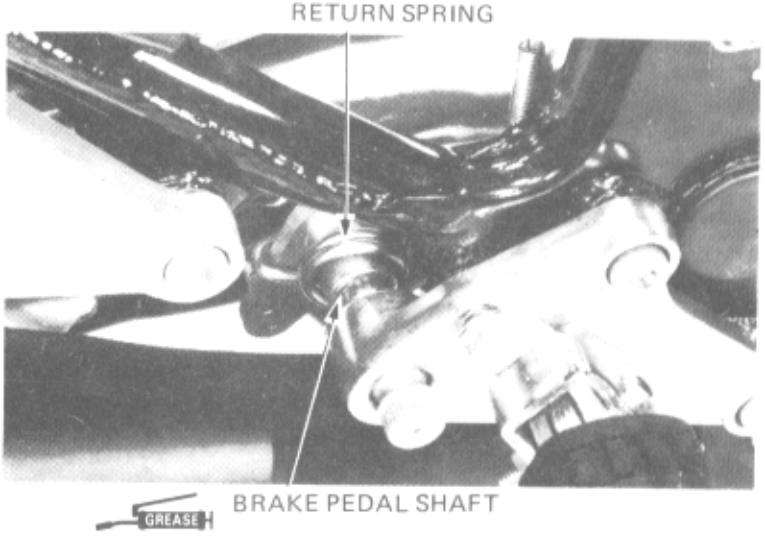
Remove the master cylinder mount bolts and remove the push rod pin.

Remove the rear brake light switch spring.

Remove the rear brake pedal and shaft.



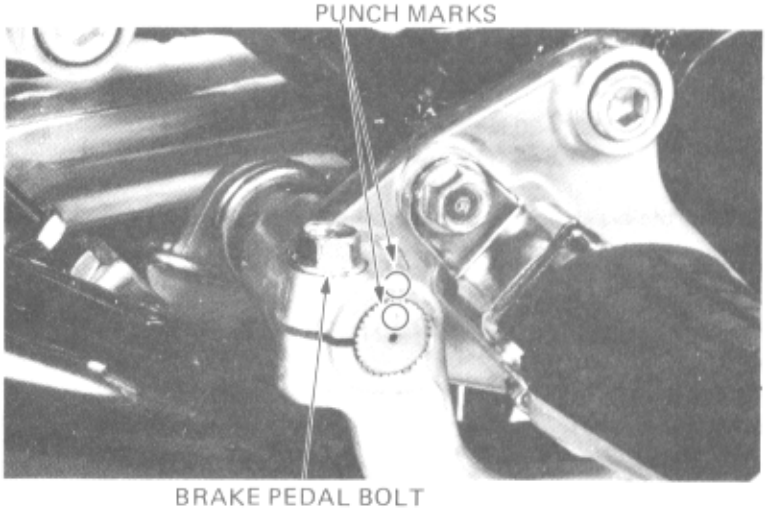
Install the brake return spring as shown.



Install the brake pedal aligning the punch marks as shown.

Tighten the brake pedal bolt.

TORQUE: 18–28 N·m
(1.8–2.8 kg-m, 13–20 ft-lb)



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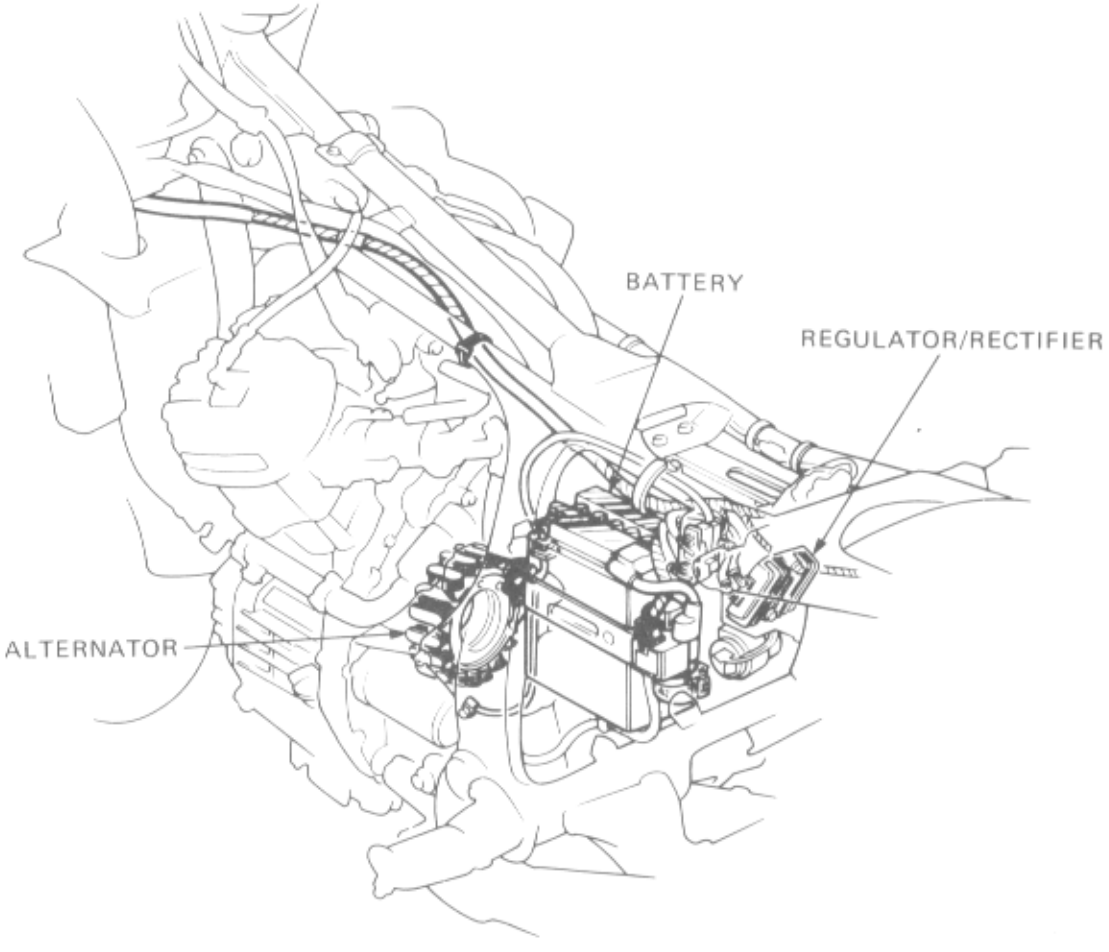
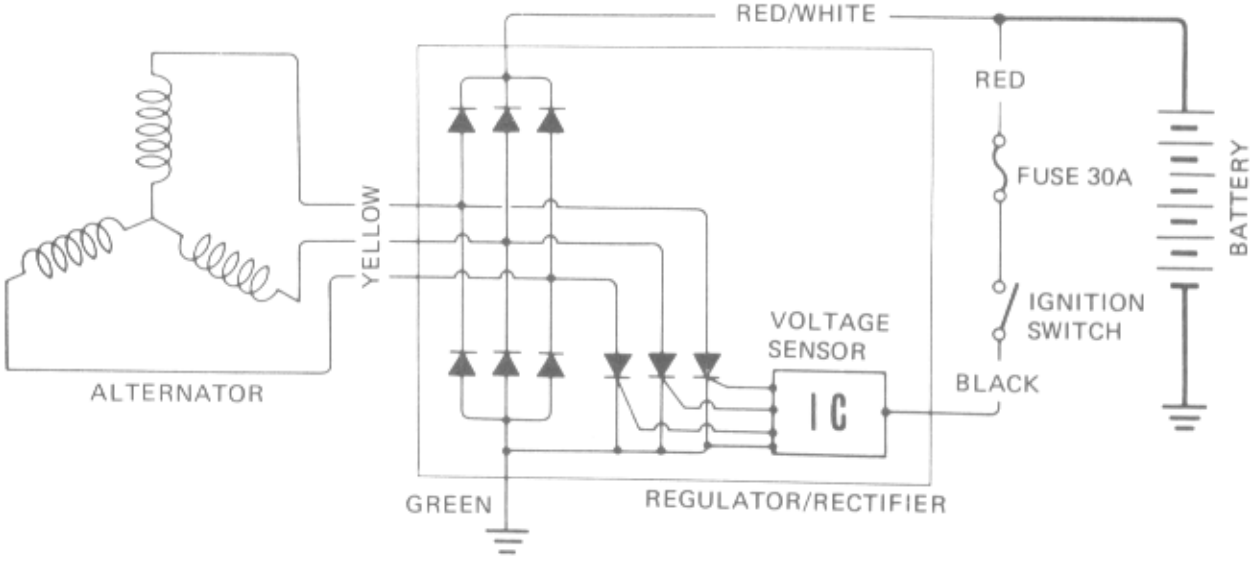
MEMO



BATTERY CHARGING DIAGRAM



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19. BATTERY/CHARGING SYSTEM

SERVICE INFORMATION

GENERAL

- The battery fluid level should be checked regularly. Fill with distilled water as necessary.
- Quick charge the battery only in an emergency. Slow-charging is preferred.
- Remove the battery from the motorcycle for charging. If the battery must be charged on the motorcycle, disconnect the battery cables.

WARNING

Do not smoke or have flames near a charging battery. The hydrogen gas produced by a battery is highly flammable and can explode.

- For Alternator removal and installation, refer to Section 9.
- All charging system components can be tested on the motorcycle.

SPECIFICATIONS

Battery	Capacity	12 V, 14 ampere-hours
	Specific gravity	1.28/20°C (68°F)
	Charging rate	1.4 amperes maximum (20°C, 68°F)
Alternator	Capacity	24 amperes minimum/5,000 rpm (14 volts)
Voltage regulator	Type	Transistorized, non-adjustable

TROUBLESHOOTING

No power – key turned on:
- Dead battery.
  - Low fluid level.
  - Low specific gravity.
  - Charging system failure.
- Disconnected battery cable.
- Main fuse burned out.
- Faulty ignition switch.

Low power – key turned On:
- Weak battery.
  - Low fluid level.
  - Low specific gravity.
  - Charging system failure.
- Loose battery connection.

Low power – engine running:
- Battery undercharged.
  - Low fluid level.
  - One or more dead cells.
- Charging system failure.

Intermittent power:
- Loose battery connection.
- Loose charging system connection.
- Loose starting system connection.
- Loose connection or short circuit in ignition system.
- Loose connection or short circuit in lighting system.

Charging system failure:
- Loose, broken, or shorted wire or connection.
- Faulty voltage regulator/rectifier.
- Faulty alternator.

19

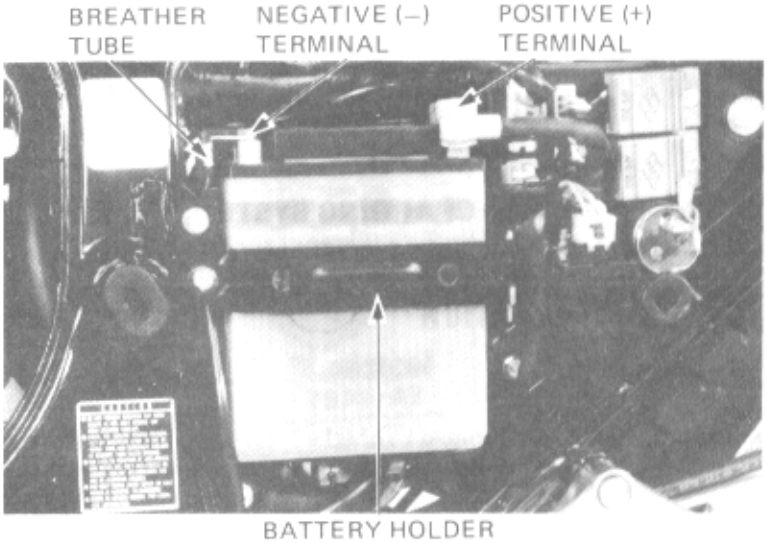
BATTERY

REMOVAL

Disconnect the ground cable and remove the battery holder.

Disconnect the positive (+) cable at the battery.

Disconnect the battery breather tube, and remove the battery.



TESTING SPECIFIC GRAVITY

Test each cell with a hydrometer.

SPECIFIC GRAVITY: (20°C, 68°F)

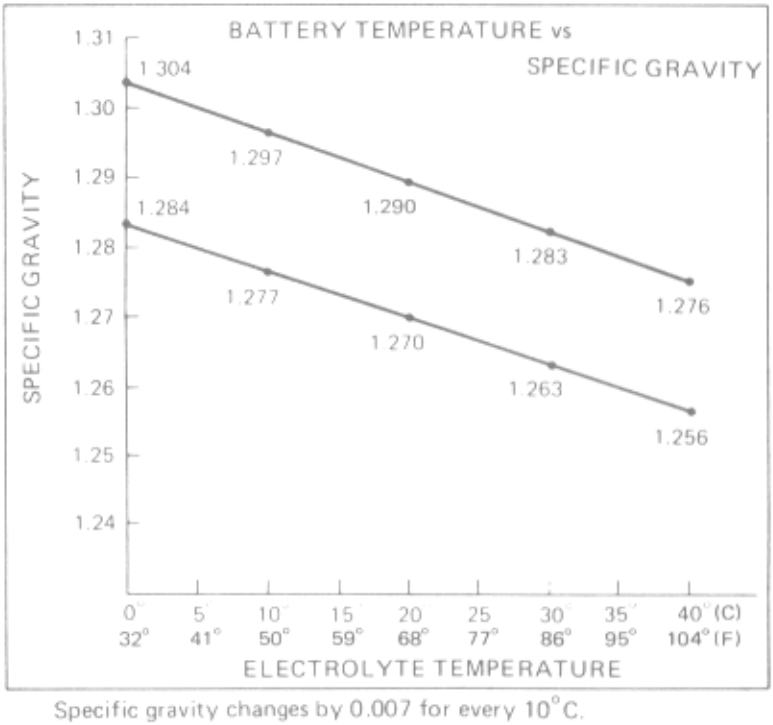
1.27–1.29	Fully charged
Below 1.26	Under charged

NOTE

- The battery must be recharged if the specific gravity is below 1.23.
- The specific gravity varies with the temperature as shown in the table.
- Replace the battery if sulfation is evident or if the space below the cell plates is filled with sediment.

WARNING

The battery electrolyte contains sulfuric acid. Avoid contact with skin, eyes, or clothing. Antidote: Flush with water and call a doctor if electrolyte gets in your eyes.



Specific gravity changes by 0.007 for every 10°C.

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BATTERY CHARGING

Remove the battery cell caps.

Connect the charger positive (+) cable to the battery positive (+) terminal.

Connect the charger negative (–) cable to the battery negative (–) terminal.

Charging current:
1.4 amperes max.

Charging:
Charge the battery until specific gravity is 1.27–1.29 at 20°C (68°F).

WARNING

- *Before charging a battery, remove each cell cap.*
- *Keep flames and sparks away from a charging battery.*
- *Turn power ON/OFF at the charger, not at the battery terminals.*
- *Discontinue charging if the electrolyte temperature exceeds 45°C (113°F).*

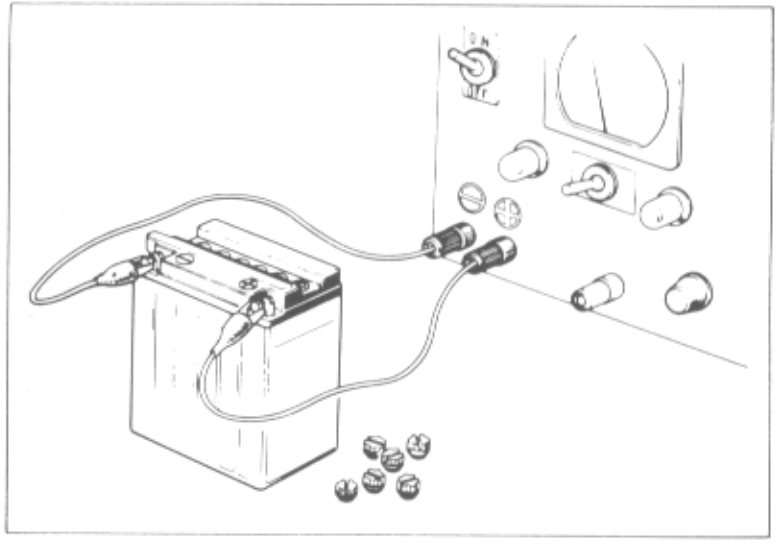
CAUTION

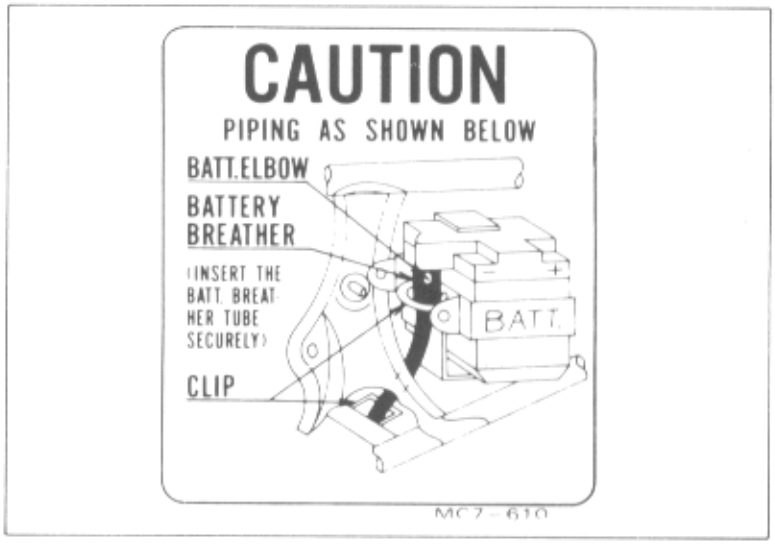
Quick-charging should only be done in an emergency; slow-charging is preferred.

After installing the battery, coat the terminals with clean grease before reconnecting the battery cables.

CAUTION

Route the breather tube as shown on the battery caution label.





CHARGING SYSTEM

CHARGING OUTPUT TEST

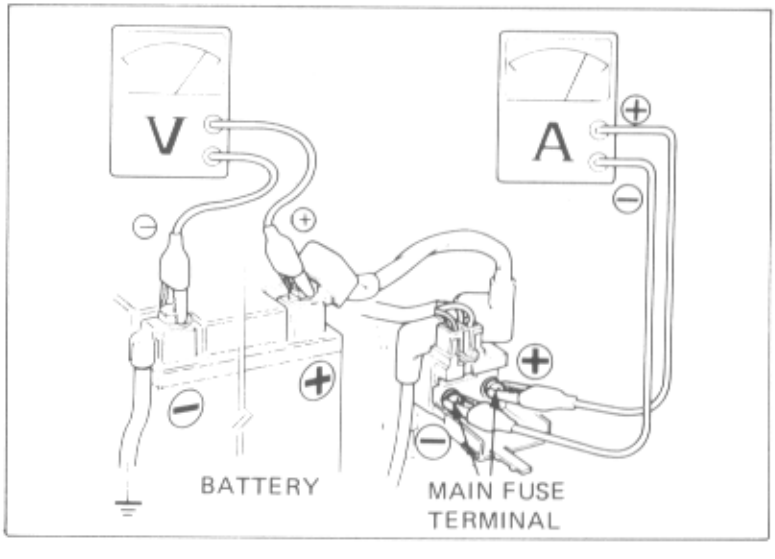
Warm the engine up to operating temperature before taking readings.
Disconnect the main fuse coupler. Open the main fuse cover and remove the main fuse, then reconnect the coupler.
Connect a voltmeter and ammeter as shown.

NOTE

Use a fully charged battery to check the charging system output.

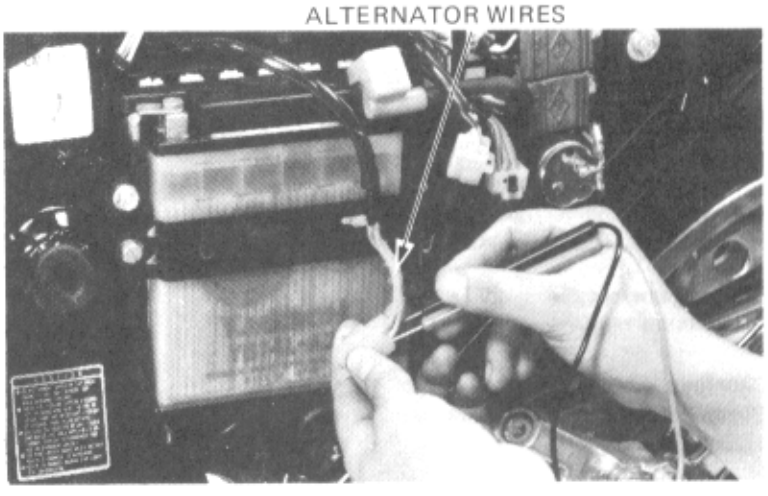
TECHNICAL DATA:

MAIN SWITCH	LIGHTING SWITCH	INITIAL CHARGING RPM	CHARGING AT 5,000 rpm
ON	ON (High beam)	1,200 rpm	(5 amperes minimum/ 14.0 volts)



STATOR COIL CONTINUITY TEST

Check the yellow leads to the alternator stator for continuity with eachother. Replace the stator if any yellow lead is not continuous with the others, or if any lead has continuity to ground.
Alternator removal is covered in section 9.



VOLTAGE REGULATOR/ RECTIFIER TEST

Check the resistances between the leads with an ohmmeter.

NOTE

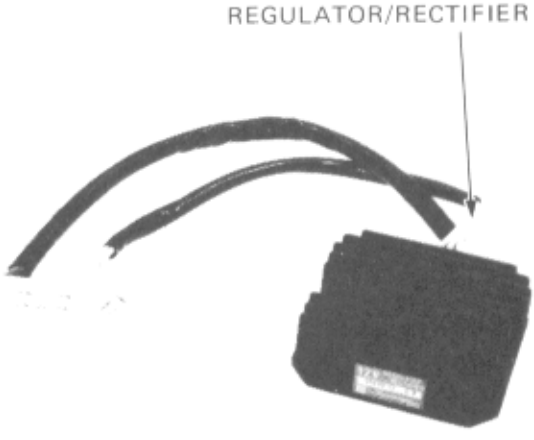
The test results shown are for a positive ground ohmmeter and the opposite results will be obtained when a negative ground ohmmeter is used.

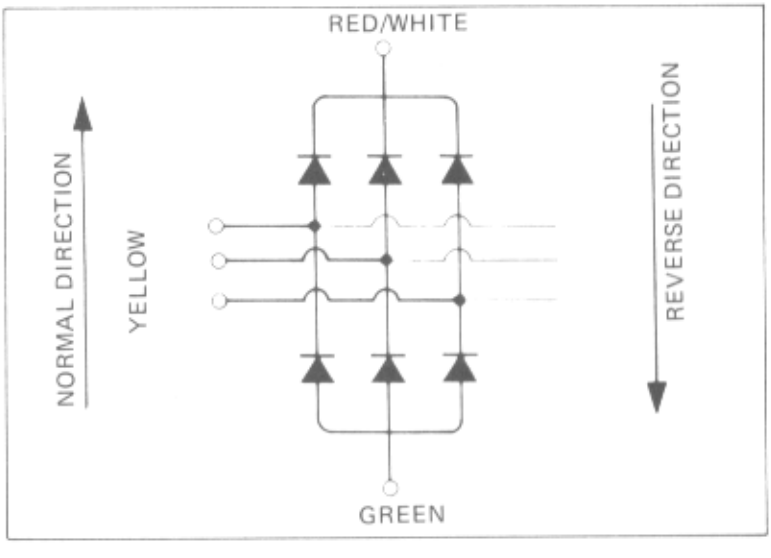
NORMAL DIRECTION: CONTINUITY

	+ probe	– probe
I	YELLOW	GREEN
II	RED/WHITE	YELLOW

REVERSE DIRECTION: NO CONTINUITY

	+ probe	– probe
I	GREEN	YELLOW
II	YELLOW	RED/WHITE





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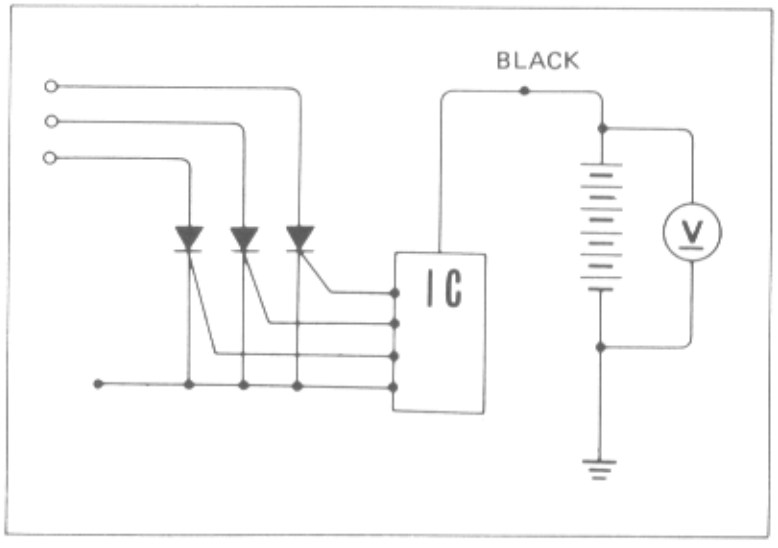
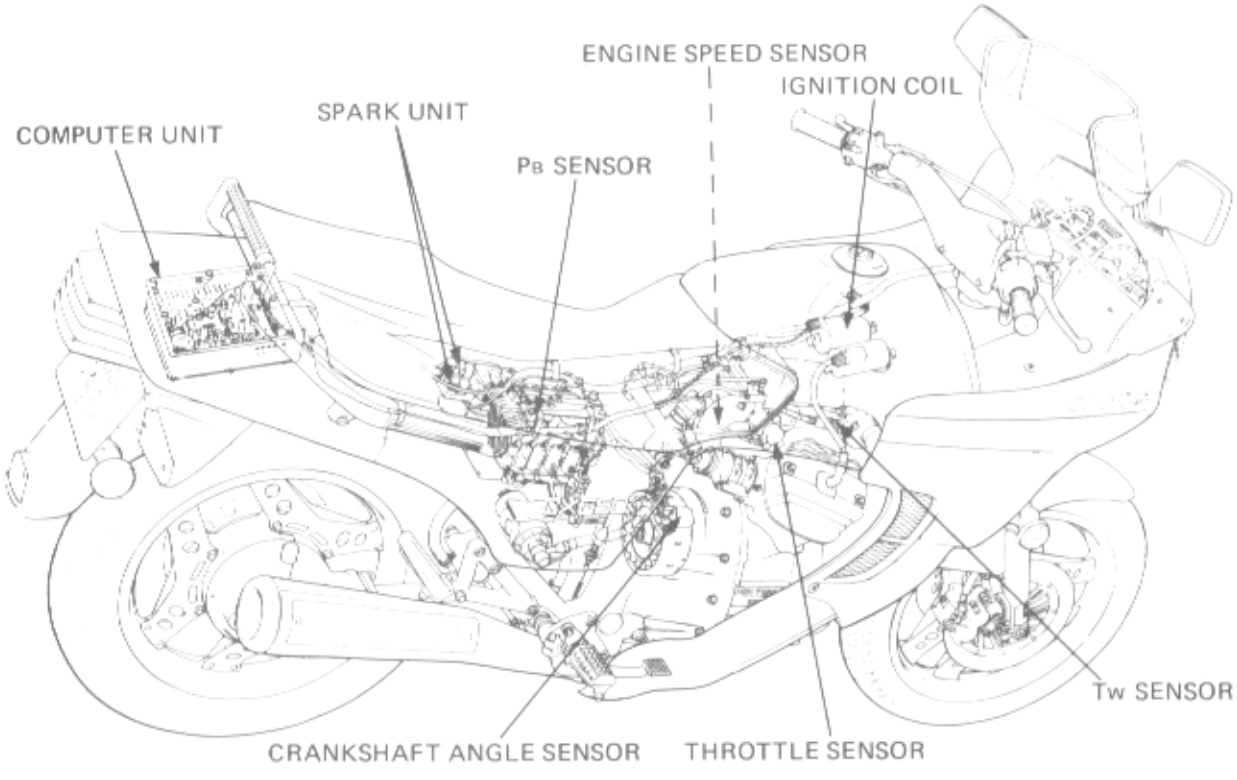
VOLTAGE REGULATOR PERFORMANCE TEST

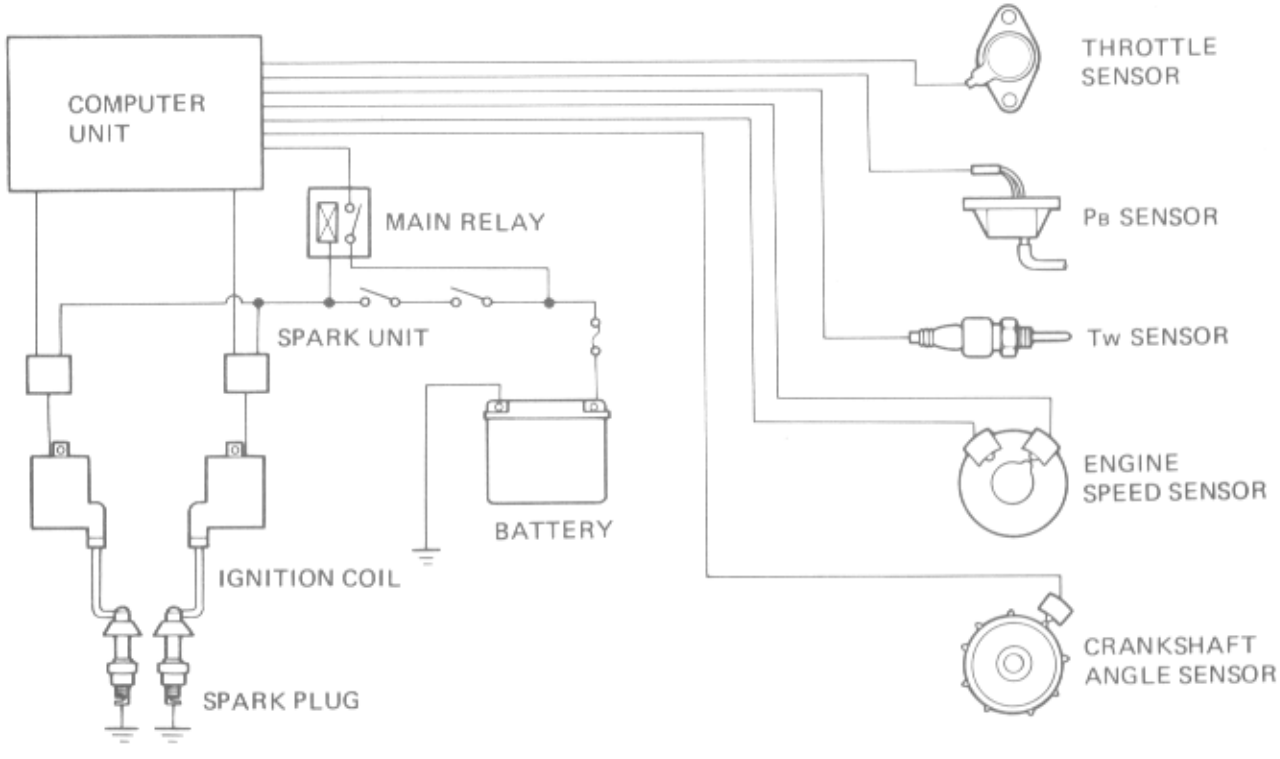
Test with a voltmeter.

Connect a voltmeter across the battery.

Check regulator performance with the engine running. The regulator must divert current to ground when battery voltage reaches 14.0–15.0 V.







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20. IGNITION SYSTEM

SERVICE INFORMATION

GENERAL

- The COMPUTERRIZED IGNITION SYSTEM requires no adjustments.
- Do not bend or collapse the pressure sensor vacuum tube.
- Refer to Section 24 for ignition system inspection.

SPECIFICATIONS

RECOMMENDED SPARK PLUGS

	For cold climate (Below 5°F, 41°F)	Standard	For extended high speed riding
NGK	DPR7EV-9	DPR8EV-9	DPR9EV-9
ND	X22EPR-GU9	X24EPR-GU9	X27EPR-GU9

Spark plug gap: 0.8–0.9 mm (0.031–0.035 in)
Ignition FI mark: 10° BTDC
Ignition full advance marks: 60° BTDC

TOOL

Special

Inspection plug	07999–4150000

Common

Kowa Tester	TH–5H
Sanwa Tester	07308–0020000

TROUBLESHOOTING

Engine cranks but will not start
- Engine stop switch OFF.
- No spark at plugs.
- Faulty computer unit.
- Faulty engine speed sensor and crankshaft angle sensor (See page 24-4).

No spark at plug
- Engine stop switch OFF
- Poorly connected, broken or shorted wires.
  - Between ignition switch and engine stop switch.
  - Between ignition control unit and engine stop switch.
  - Between ignition control unit and ignition coil.
  - Between ignition coil and plug.
  - Between ignition control unit and pulse generator.
- Faulty ignition coil.
- Faulty ignition switch.
- Faulty computer unit.
- Faulty engine speed sensor and crankshaft angle sensor (See page 24-4).
- Faulty spark unit.

Engine starts but runs poorly
- Faulty related sensors.
- Faulty computer unit.
- Ignition primary circuit.
  - Faulty ignition coil.
  - Loose or bare wire.
  - Intermittent short circuit.
- Secondary circuit.
  - Faulty plug.
  - Faulty high tension wire.

Timing advance incorrect
- Faulty related sensor.
- Broken or restricted pressure sensor vacuum tube.
- Pressure sensor vacuum tube.
- Faulty computer unit.

IGNITION COIL

REMOVAL

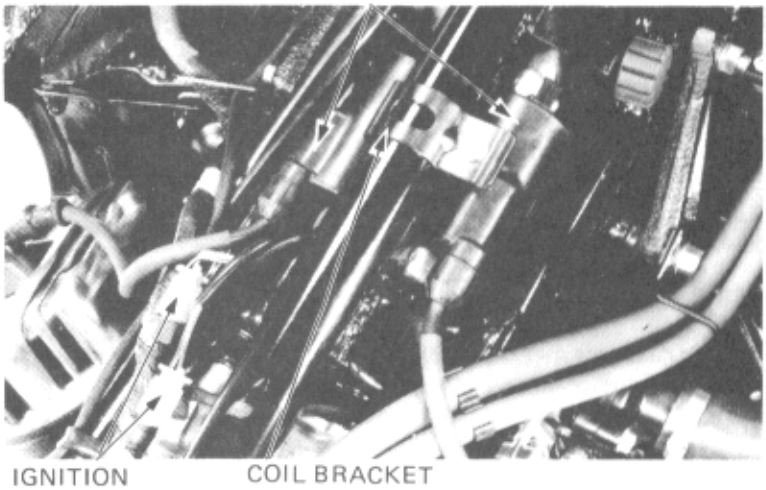
Remove the fuel tank.

Disconnect the ignition coil couplers and spark plug caps.

Remove the coil bracket by removing the attaching bolts.

Remove the ignition coil.

IGNITION COILS



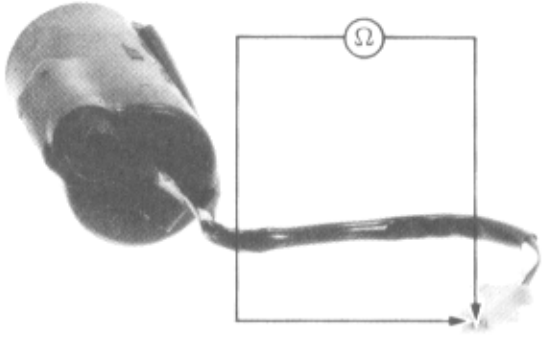
IGNITION COIL COUPLERS

COIL BRACKET

PRIMARY COIL INSPECTION

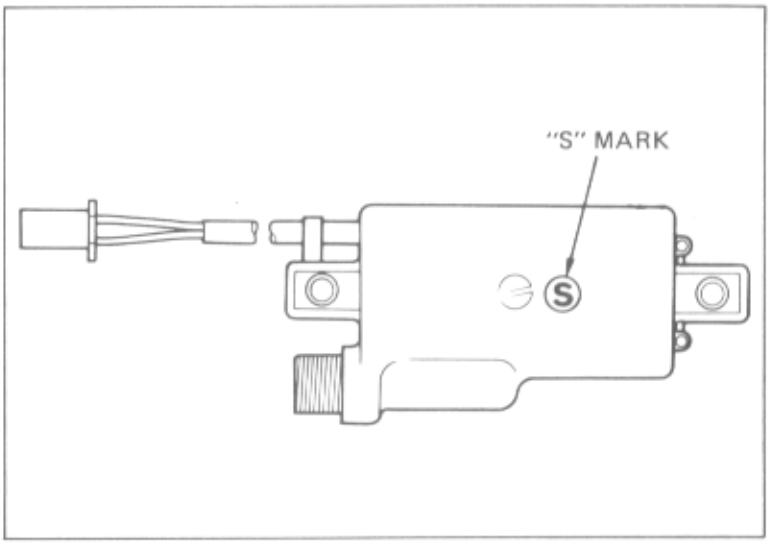
Check the resistance between the leads with an ohmmeter as shown.

RESISTANCE: 2–3 Ω



SECONDARY COIL INSPECTION

The secondary coil inspection method differs depending on whether or not there is a mark on the ignition coil body. Look for an "S" mark before testing.



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WITH "S" MARK

Measure the resistance between the black/white coupler terminal and the high tension terminal.

NOTE

- Use SANWA TESTER (07308–0020000) or KOWA TESTER (TH–5H).
- Use new test batteries for this test.

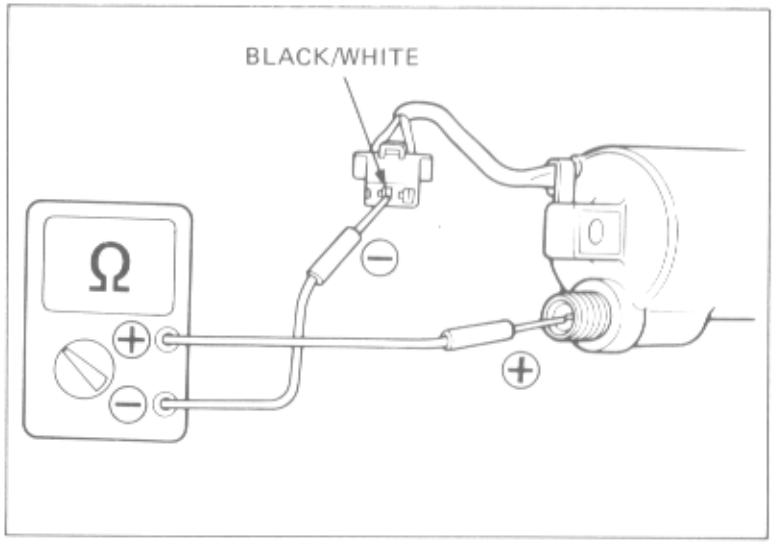
Connect the negative probe of the tester to the coupler terminal and positive probe to the high tension terminal and measure the resistance.

RESISTANCE:
SANWA TESTER: 200–350 KΩ
KOWA TESTER: 50–200 KΩ

Change the tester polarities and measure the resistance.

RESISTANCE: ∞ ohms

Replace the ignition coil if the resistance limits are not met.



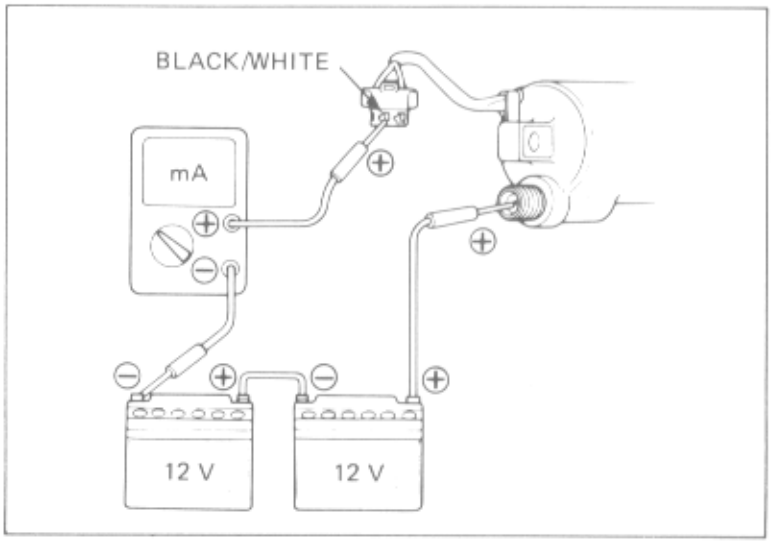
WITHOUT "S" MARK

Connect the ignition coil, tester and two 12 V batteries as shown in the figure.

NOTE

Make sure the battery voltage is 23–25 V before measuring.

Replace the ignition coil if the reading does not meet the specification.



Tester	Measuring range	Specification
SANWA	25 mA	Approximately 3 mA
KOWA	100 mA	Needle should swing slightly.

Change the tester polarities. Replace the ignition coil if there is continuity.

IGNITION TIMING INSPECTION

Start the engine and warm it up to operating temperature.

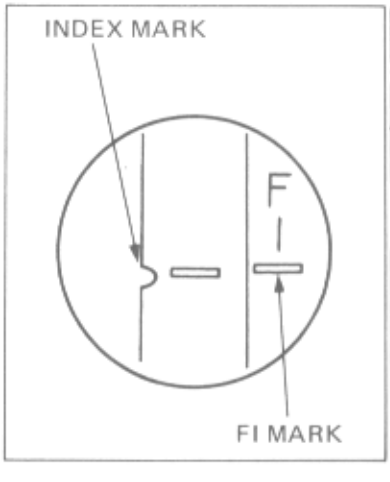
Remove the timing hole cap and attach a timing inspection plug.

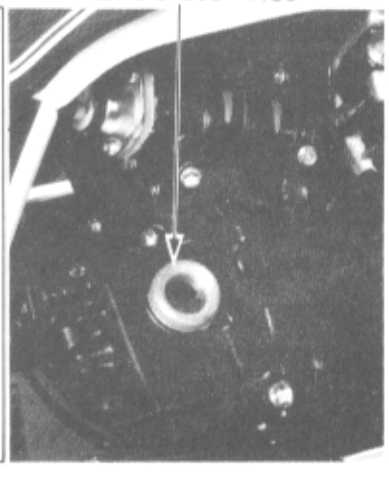
Connect a stroboscopic timing light to the right cylinder.

Start the engine and let it idle.

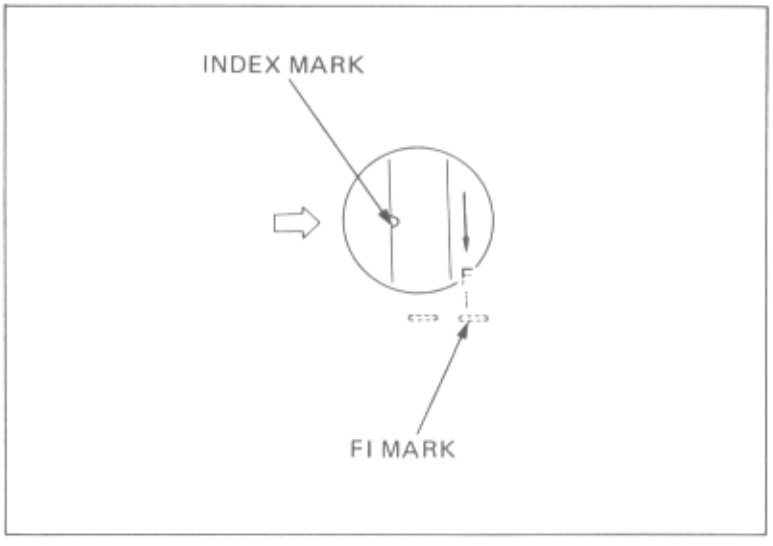
IDLE SPEED: 1,100 ± 100 rpm

Aim the timing light at the timing mark, the "FI" mark should align with the index mark.





Start the engine and let it run at 2,000–2,500 rpm, the FI mark should move down.
Check the ignition system using the troubleshooting chart in Section 24, if the timing is incorrect.



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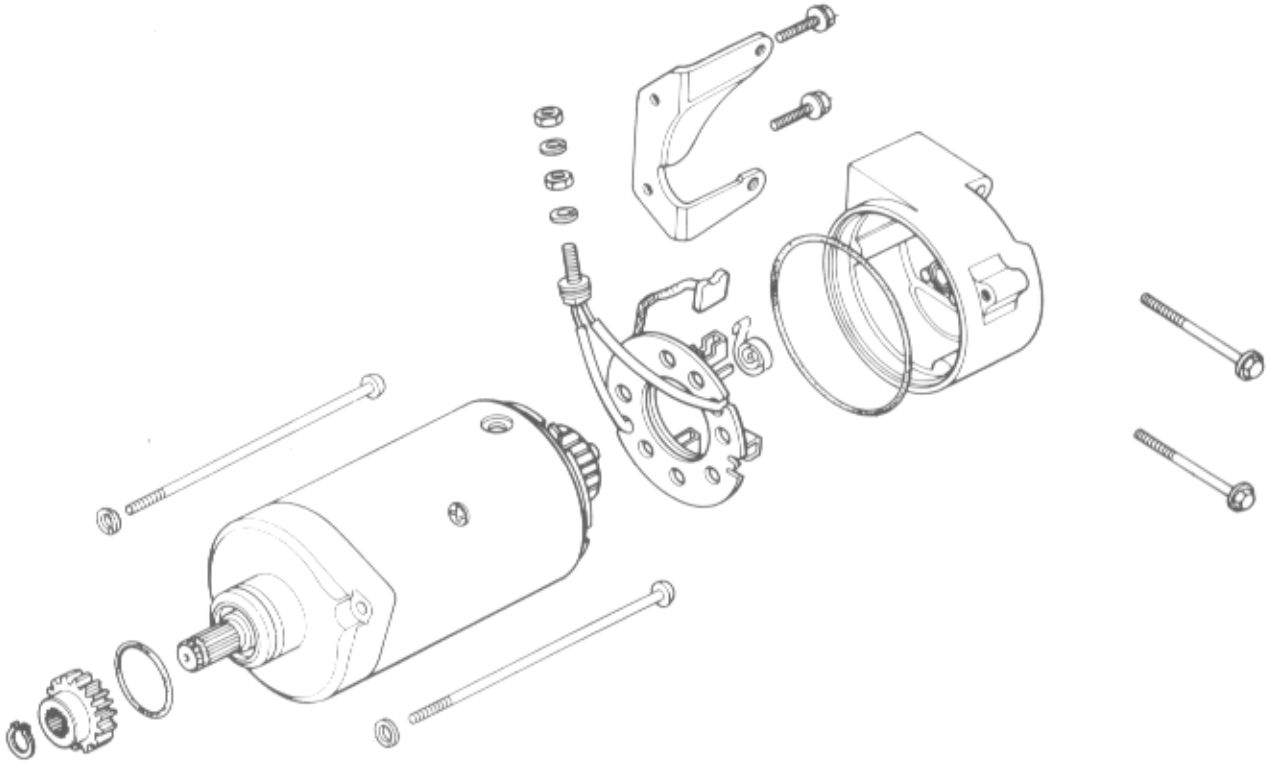

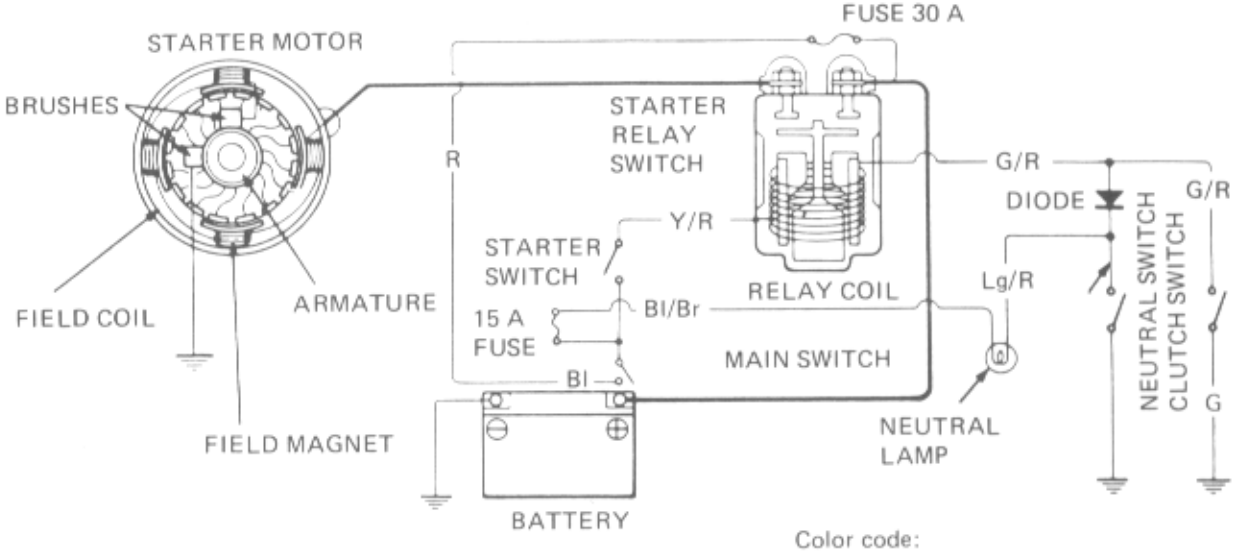

Color code:
R = Red
Y/R = Yellow/Red
G/R = Green/Red
Br = Brown
Lg/R = Light green/Red
G = Green
Bl = Black

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21. STARTER SYSTEM

SERVICE INFORMATION

GENERAL

The starter motor can be removed with the engine in the frame. See Section 9 for starter clutch repairs.

SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Starter motor	Brush spring tension	680–920 g	520 g
	Brush length	12–12.5 mm (0.47–0.49 in)	6.5 mm (0.26 in)

TROUBLESHOOTING

Starter motor will not turn:
- Dead battery.
- Faulty ignition switch.
- Faulty starter switch.
- Faulty neutral switch.
- Faulty starter relay switch.
- Loose or disconnected wire or cable.
- Clutch switch diode open.
- Faulty clutch switch.

Starter motor turns engine slowly:
- Low battery.
- Excessive resistance in circuit.
- Binding in starter motor.

Starter motor turns, but engine does not turn:
- Faulty starter clutch.
- Faulty starter motor gears.
- Faulty starter motor or idle gear.

Starter motor and engine turn, but engine does not start:
- Faulty ignition system.
- Engine problems, see engine related sections.
- Faulty engine stop switch.

21

STARTER MOTOR

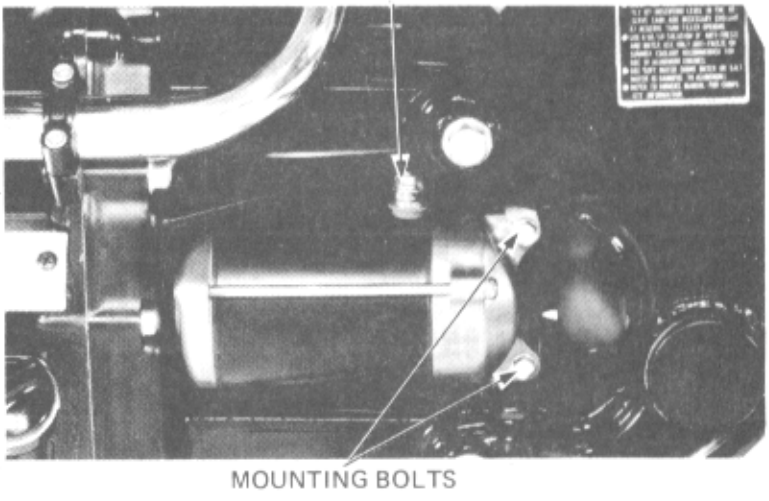
REMOVAL

WARNING

With the ignition switch OFF, remove the negative cable at the battery before servicing the starter motor.

Remove the starter mounting bolts and pull the motor out of the engine case.

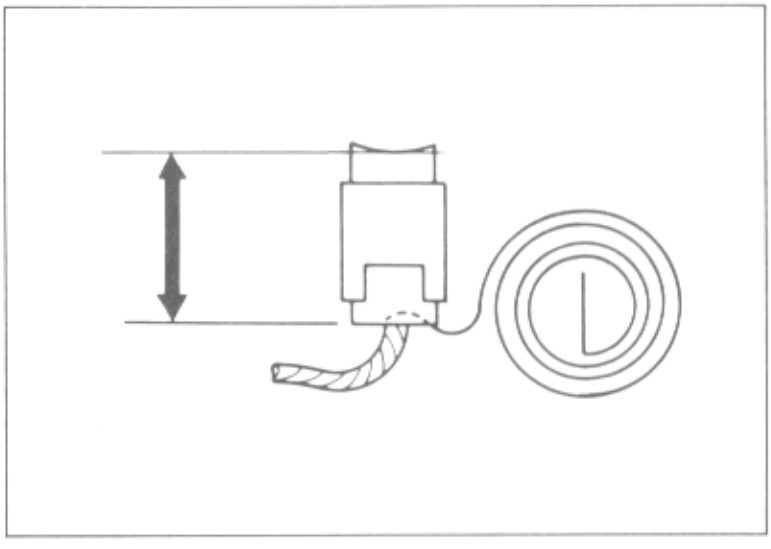
Disconnect the starter cable.



BRUSH INSPECTION

Remove the starter motor case screws. Inspect the brushes and measure brush length. Measure brush spring tension with a spring scale.

SERVICE LIMTS:
Brush length: 6.5 mm (0.26 in)
Brush spring tension: 520 g



COMMUTATOR INSPECTION

Remove the starter motor case.

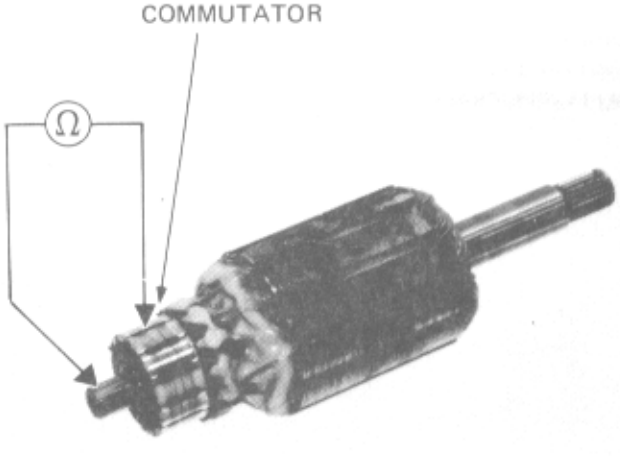
NOTE

Record the location and number of the thrust washers.

Inspect the commutator bars for discoloration. Bars discolored in pairs indicate grounded armature coils.

NOTE

Do not use emery or sand paper on the commutator.



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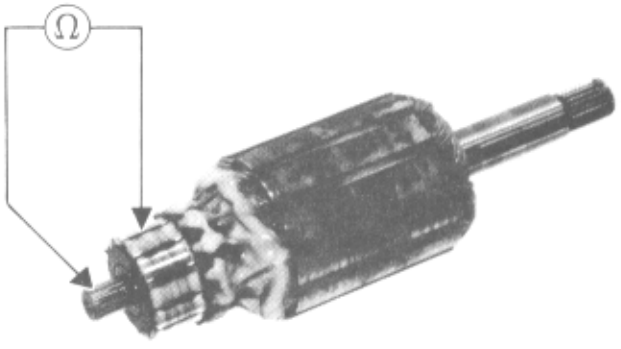
Check for continuity between pairs of commutator bars, and no continuity between commutator bars and the armature shaft.

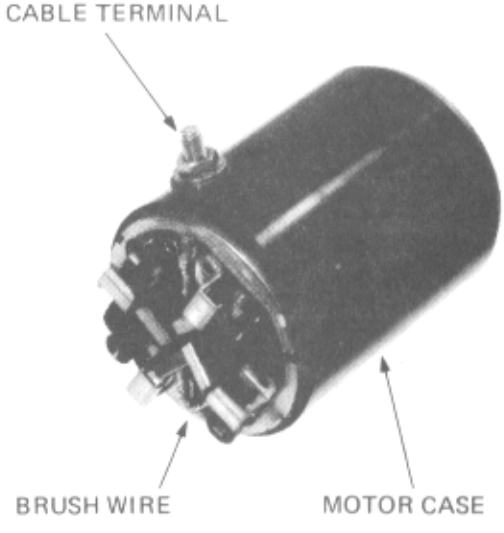
Replace the starter motor if armature coils are open, or shorted to armature shaft.



FIELD COIL INSPECTION

Check for continuity from the cable terminal to the motor case and from the cable terminal to the brush wire.

Replace the starter motor if the field coil is not continuous or if it is shorted to the motor case.



ASSEMBLY/INSTALLATION

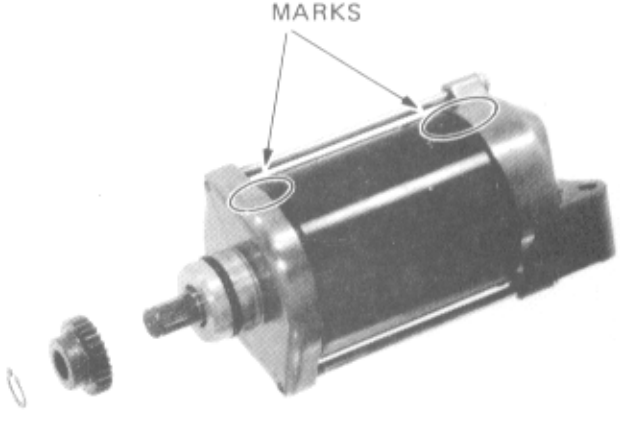
Install the starter motor case· align the punch mark on the case with the punch mark on the cover.

Assemble the starter motor.

Connect the starter motor cable.

Install the starter motor on the engine.

Reconnect the battery negative cable.



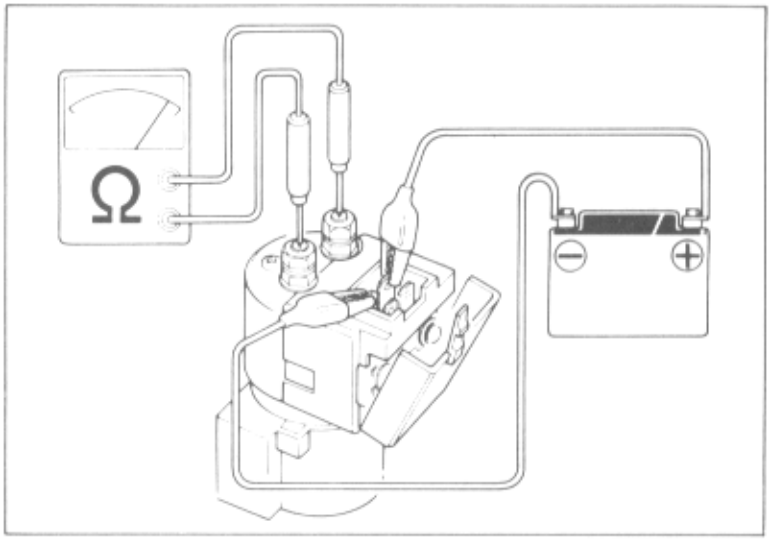
STARTER RELAY SWITCH

INSPECTION

To test if the switch primary coil is normal, depress the switch button. The coil is normal if you hear the switch click into position.

Remove the starter relay switch.

Connect an ohmmeter and 12 V battery to the starter relay switch as shown. The switch is normal if there is continuity.



CLUTCH SWITCH DIODE

INSPECTION

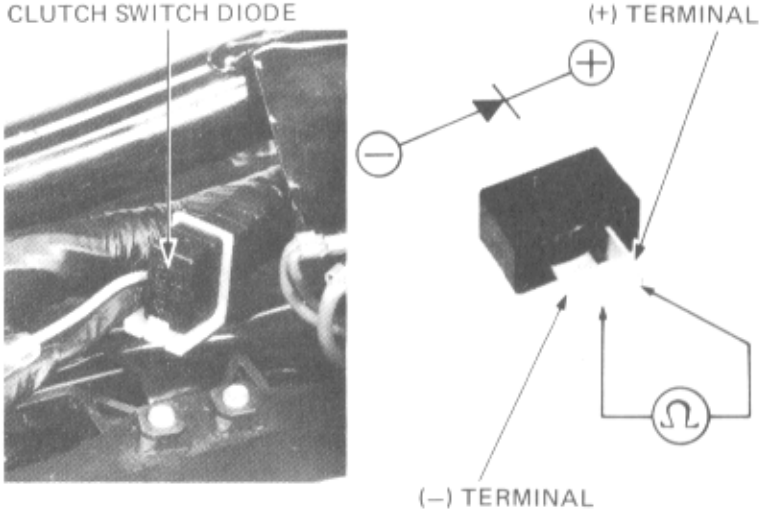
Remove the clutch switch diode from the wire harness. Check for continuity with an ohmmeter.

NOTE

The test chart is for a positive ground ohmmeter. The test results will be reversed if a negative ground ohmmeter is used.

NORMAL DIRECTION: CONTINUITY
- ⊕ probe: Light green/Red (+)
- ⊖ probe: Green/Red (–)

REVERSE DIRECTION: NO CONTINUITY
- ⊕ probe: Green/Red (–)
- ⊖ probe: Light green/Red (+)



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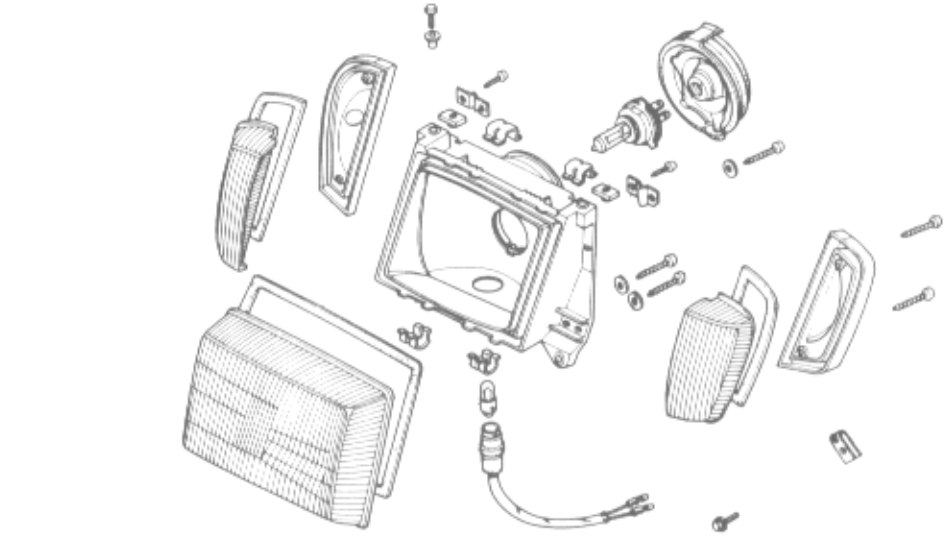

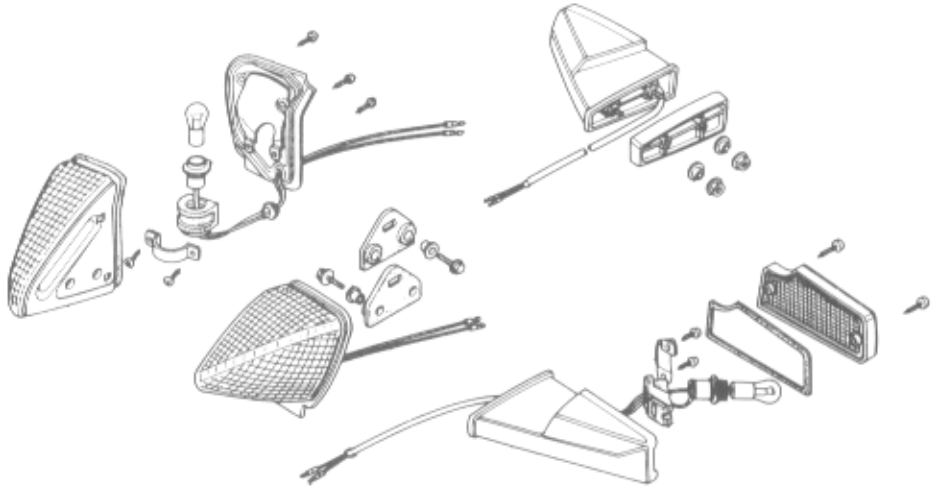

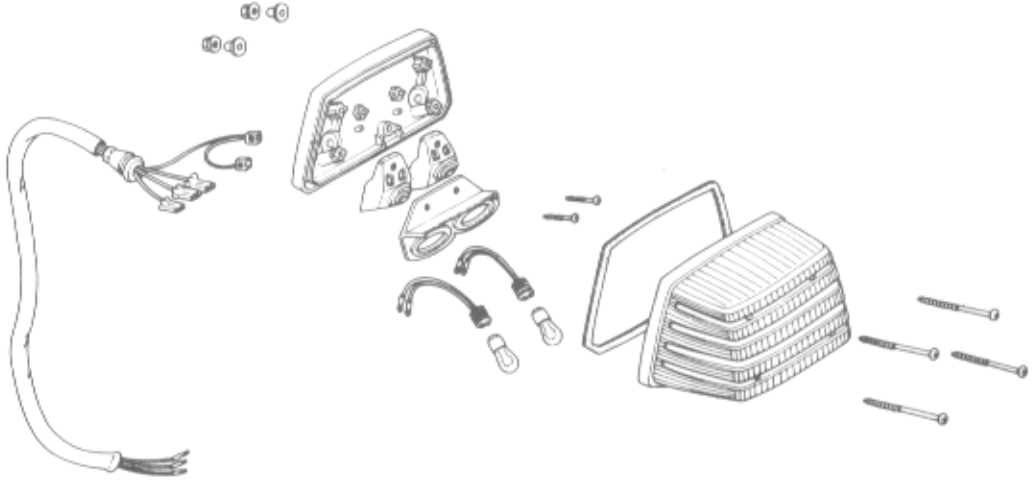

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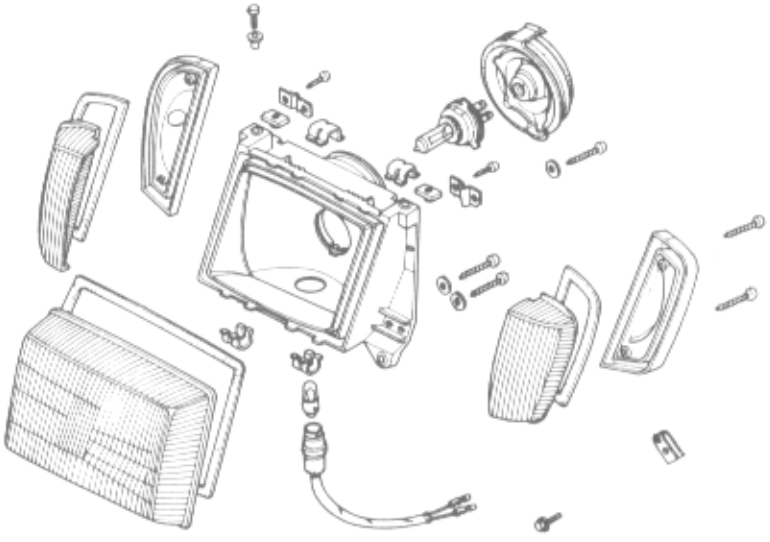

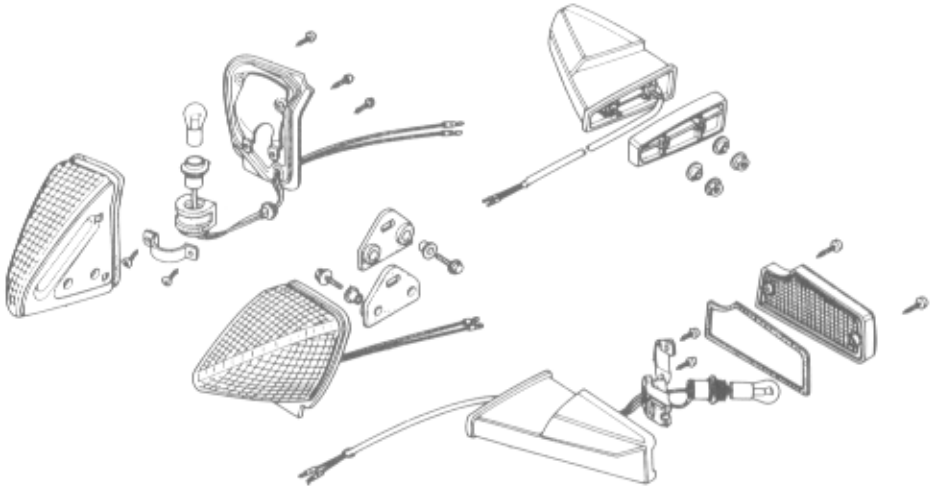

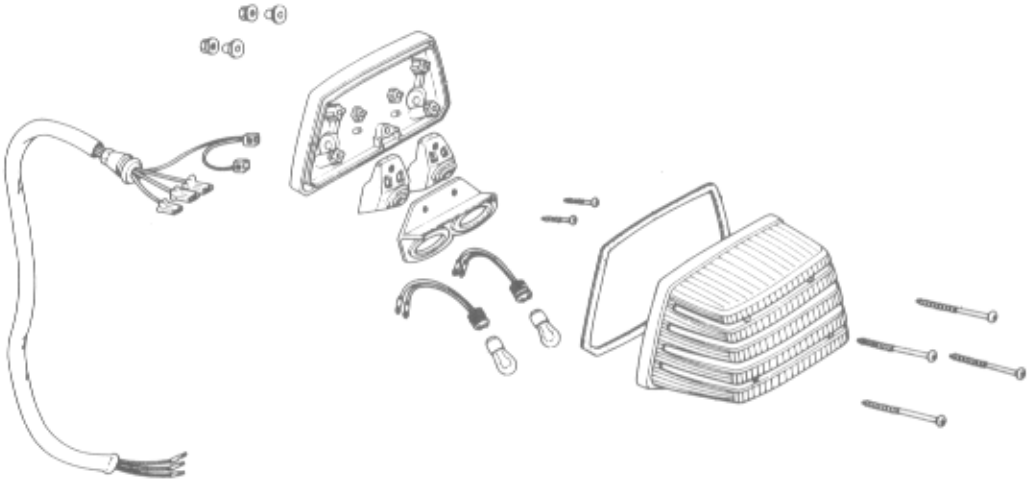

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22. LIGHT/SWITCHES/METERS

SERVICE INFORMATION

GENERAL

- Some wires have different colored bands around them near the connector. These are connected to other wires which correspond with the band color.
- All plastic plugs have locking tabs that must be released before disconnecting, and must be aligned when reconnecting.
- The following color codes are indicated throughout this section and on the wiring diagram.

Bu = Blue	G = Green	Lg = Light Green	R = Red
Bl = Black	Gr = Grey	O = Orange	W = White
Br = Brown	Lb = Light Blue	P = Pink	Y = Yellow

- To isolate an electrical failure, check the continuity of the electrical path through the part. A continuity check can usually be made without removing the part from the motorcycle. Simply disconnect the wires and connect a continuity tester or volt-ohmmeter to the terminals or connections.
- A continuity tester is useful when checking to find out whether or not there is an electrical connection between the two points. An ohmmeter is needed to measure the resistance of a circuit, as when there is a specific coil resistance involved, or when checking for high resistance by corroded connections.
- Do not turn the ignition switch ON once the fuel tank is removed to prevent fuel from squirting out of the fuel line.
- For inspection of the low fuel warning lamp, refer to page 22-11.

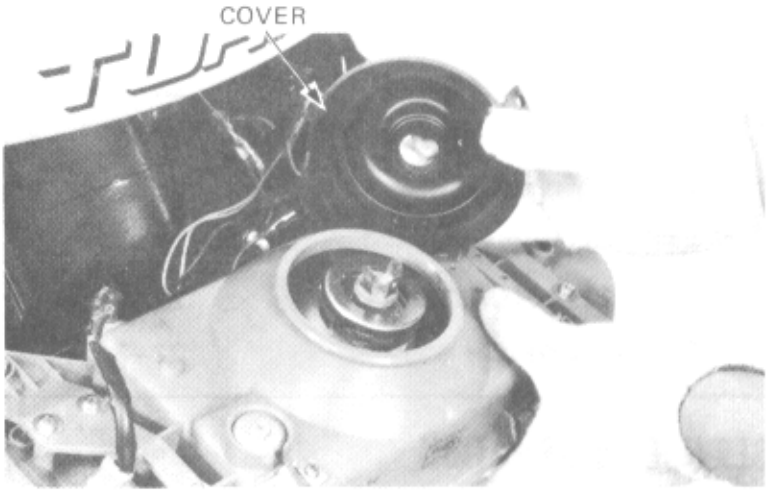
TOOLS

22

BULB REPLACEMENT

HEADLIGHT

Remove the headlight (Section 14) and bulb cover.

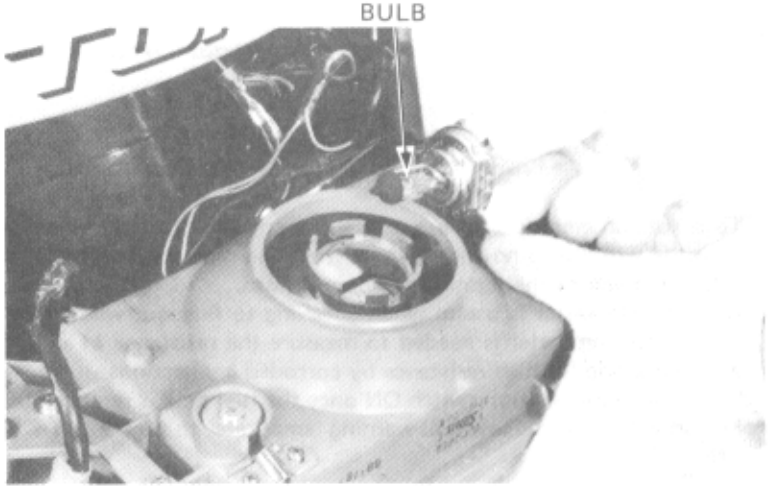


Remove the headlight bulb.
Install a new headlight bulb.

CAUTION

Wear clean gloves when installing the halogen bulb. If you touch the bulb with your bare hands, clean it with a cloth moistened with alcohol to prevent its early failure.

Install the headlight in the reverse order of removal.



FRONT TURN SIGNALS

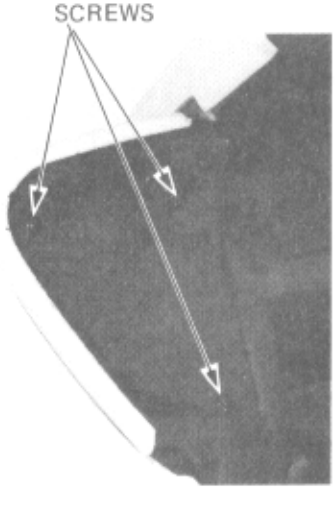
Remove the front turn signals from the base plates by removing the three screws for each lens.

Remove the bulbs from the base plates.

The installation sequence is the reverse order of removal.

CAUTION

Be careful not to overtighten the lens mounting screws to prevent cracking the lens.



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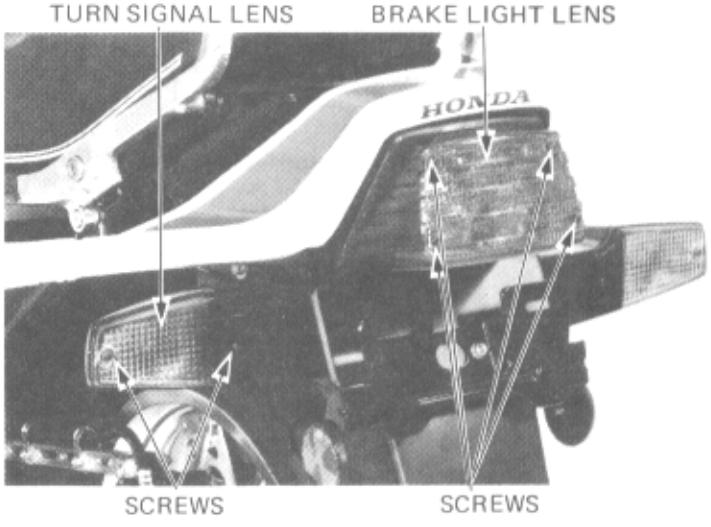
REAR TURN SIGNAL AND BRAKE LIGHT

Remove the mounting screws and lens to remove the bulb.

CAUTION

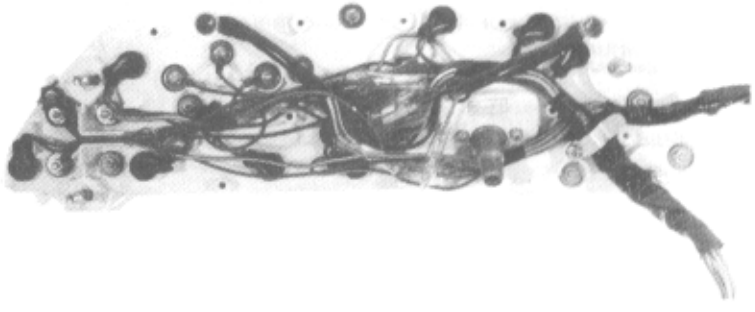
Be careful not to overtighten the lens mounting screws to prevent cracking the lens.



INSTRUMENT BULBS

Open the fairing cover and remove the headlight. Reaching from behind the instrument panel, remove the socket with the faulty bulb.

Pull the faulty bulb out of the socket and install a new bulb.
Plug the socket back into the instrument panel.



OIL PRESSURE WARNING SWITCH

Check for continuity while applying pressure to the switch.

Continuity:	**Below 20 kPa (0.2 kg/cm², 2.8 psi)**
No continuity:	**Above 20–40 kPa (0.2–0.4 kg/cm², 2.8–5.6 psi)**

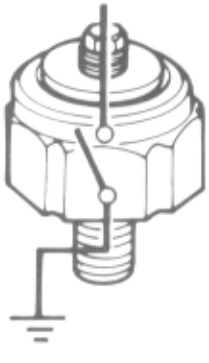
Replace the switch if necessary.

Apply a liquid sealant to the switch threads.
Install and tighten the switch.

TORQUE: 18–23 N·m (1.8–2.3 kg-m, 13–17 ft-lb)

CAUTION

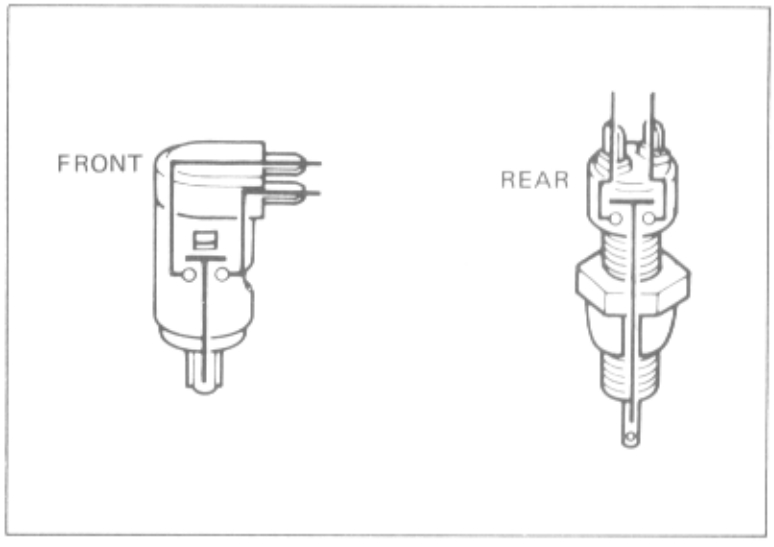
Be careful not to overtighten the switch to prevent damaging the threads of the engine cover.



BRAKE SWITCHES

Check the rear brake light switch for continuity with the rear brake applied.

Check the front brake light switch for continuity with the front brake applied.



NEUTRAL SWITCHES

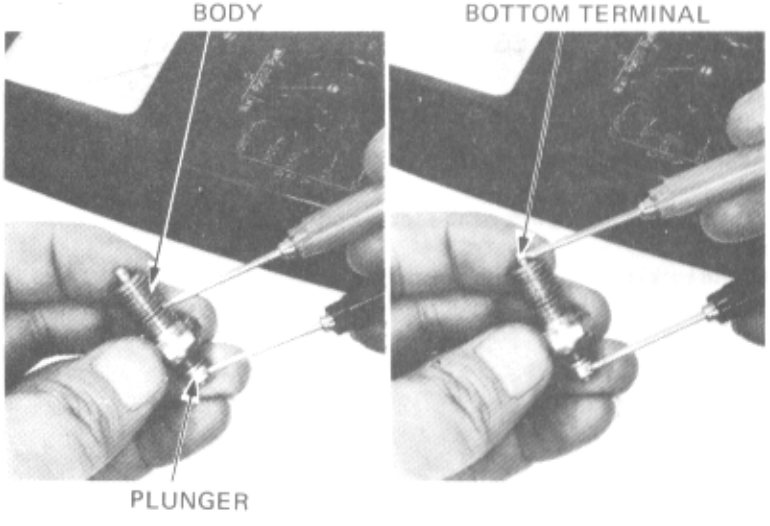
NOTE

Refer to page 9-3 for neutral switch removal.

Check the neutral switch for continuity between the top and bottom terminals. The switch is normal if there is continuity.

Check for shorts between the top terminal and body ground. Replace the switch if there is continuity.

Inspect the neutral switch wire.

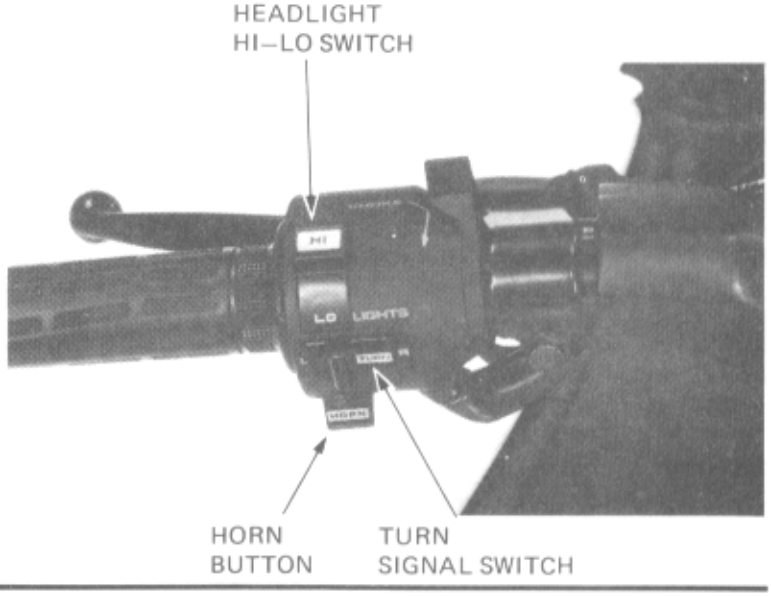


HANDLEBAR SWITCHES

The handlebar cluster switches (lights, turn signals, horn) must be replaced as assemblies.

Continuity tests for the components of the handlebar cluster switches follow:

Continuity should exist between the color coded wires on each chart.



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HEADLIGHT HI–LOW SWITCH

HI: Bu/W to Bu
MIDDLE(N): Bu/W to W to Bu
LO: Bu/W to W

Headlight Hi – Low Switch

	HL	Hi	Lo
Hi	○	○	
(N)	○	○	○
Lo	○		○
Color code	Bu/W	Bu	W

TURN SIGNAL SWITCH

LEFT: Gr to O
OFF: No continuity
RIGHT: Gr to Lb

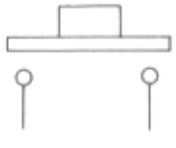
Turn Signal Switch

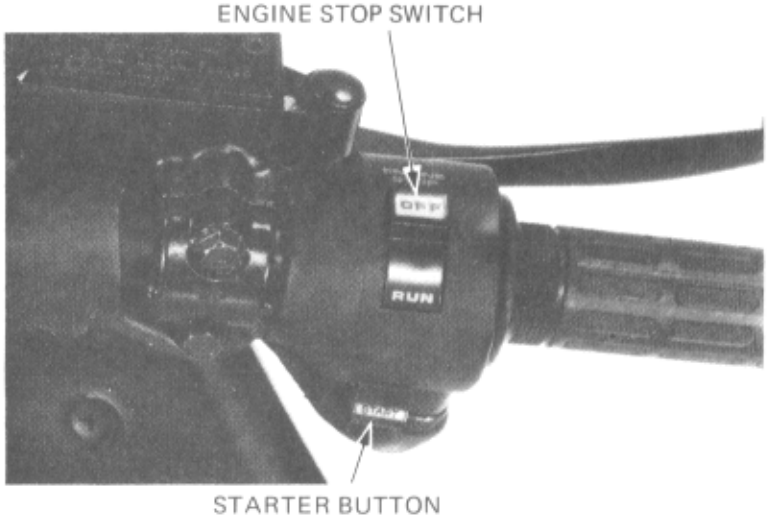
	W	L	R
LEFT	○	○	
OFF			
RIGHT	○		○
Color code	Gr	O	Lb

HORN BUTTON

W/G to Lg with button depressed.
No continuity with button released.

Horn Button

	Ho1	Ho2
		
Color code	W/G	Lg



STARTER BUTTON

Bl to Y/R with button depressed

Bl/R to Bu/W with button out.

Starter Button

	BAT2	ST	HL1	HL2
FREE			○	○
START	○	○		
Color code	Bl	Y/R	Bl/R	Bu/W

ENGINE STOP SWITCH

RUN: Bl to Bl/W
OFF: No continuity

Engine Stop Switch

	BAT2	IG
OFF		
RUN	○	○
Color code	Bl	Bl/W

CLUTCH SWITCH

Check continuity of the clutch lever (safety) switch with the clutch released and applied and replace if necessary.

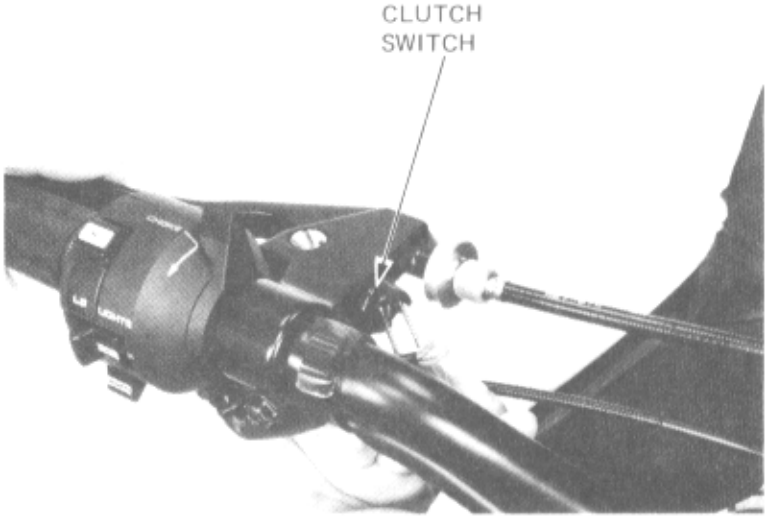
CLUTCH APPLIED: CONTINUITY
CLUTCH RELEASED: NO CONTINUITY

REMOVAL

Unplug the wires and remove the clutch lever and cable.
Remove the switch.

NOTE

The switch case has a small protrusion that must point toward the handlebar when installed.



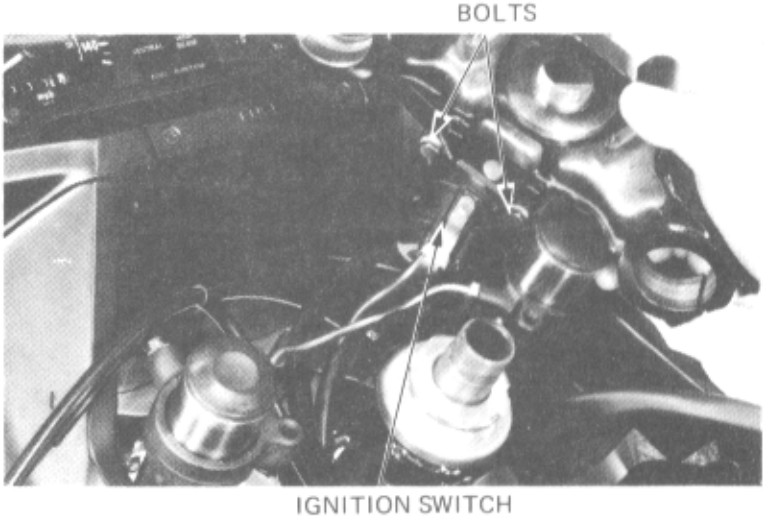
IGNITION SWITCH

Remove the handlebar cover.

Disconnect the ignition switch coupler and remove the ignition switch.

NOTE

Identify the wire colors at the connector. There are no colors on the switch.

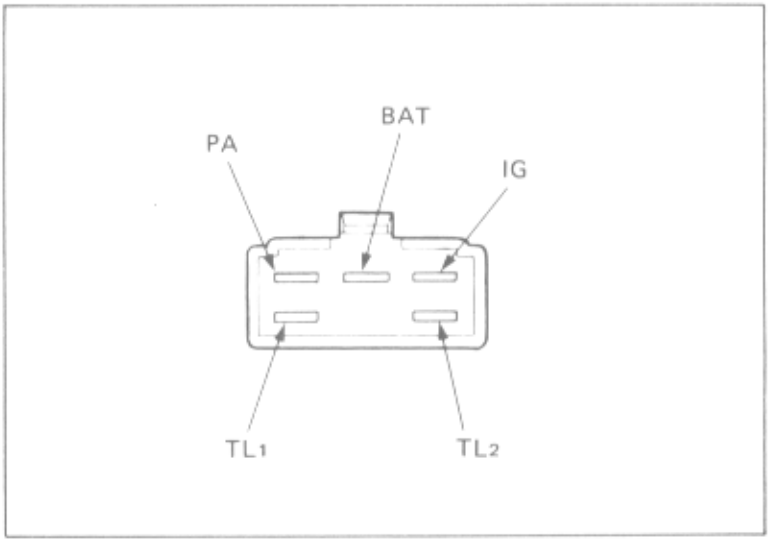


Check continuity of the terminals on the ignition switch in each position.

SWITCH POSITION

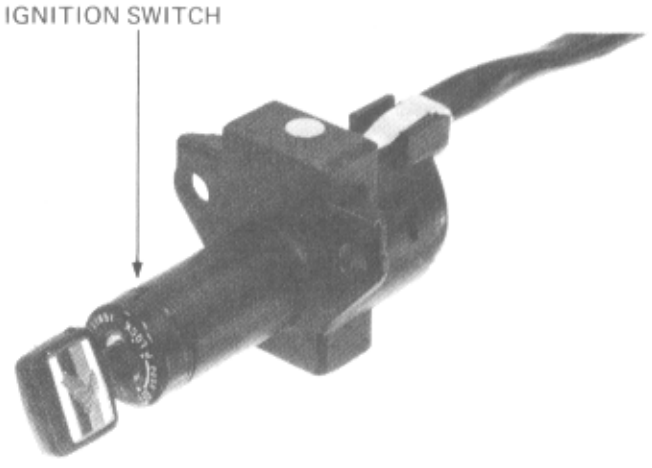
ON: **BAT to IG, TL1 to TL2**
OFF: **No continuity**
P.LOCK: **BAT to PA**
LOCK: **No continuity**

CODE	PA	BAT	IG	TL1	TL2
ON		○—○		○—○	
OFF					
P. LOCK	○—○				
LOCK					
Color code	Br	R	Bl	Br/W	Br



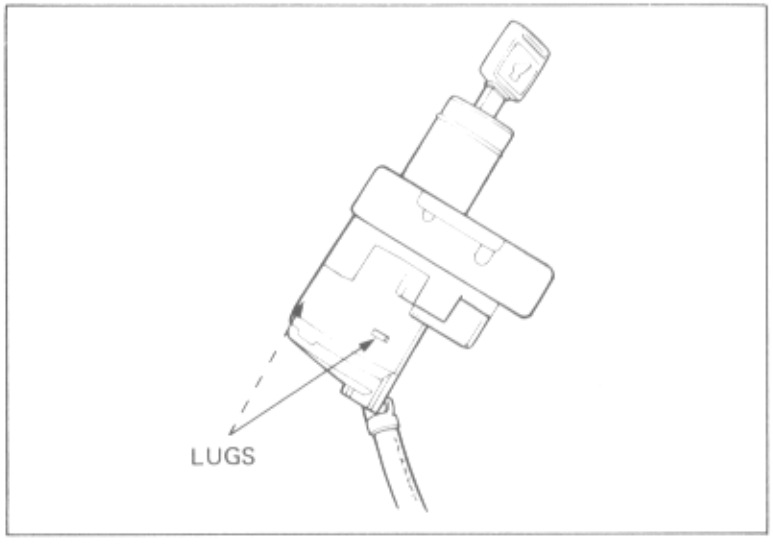
IGNITION SWITCH DISASSEMBLY

Insert the key and position it in the middle of the "ON" and "OFF" positions.



Push the lugs from the slots and remove the contact base.

Assemble in the reverse order of removal.



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TEMPERATURE GAUGE

INSPECTION

Connect a tested sensor and instrument as shown to the gauge to be tested.

CAUTION

The temperature gauge operates on 7 volts. Do not apply 12 volts directly to the gauge.

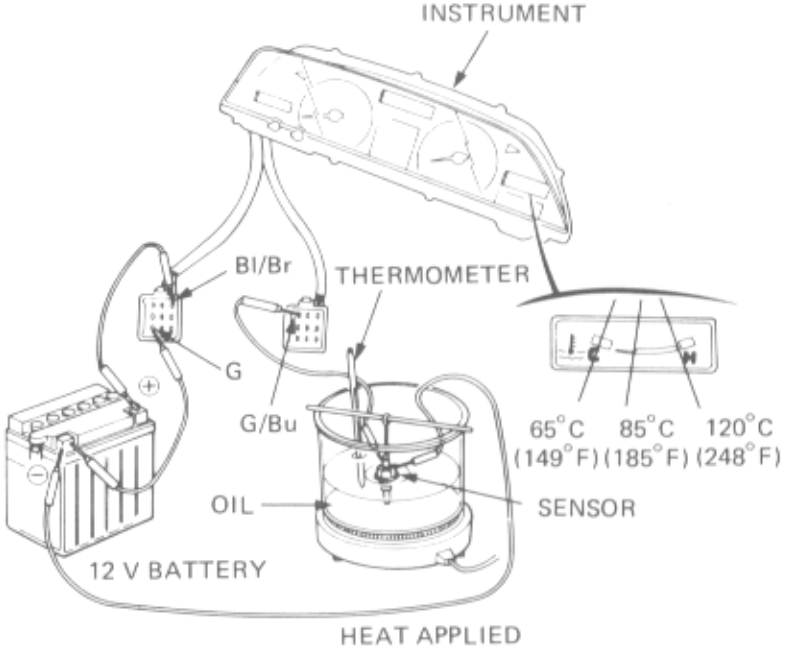
Suspend the sensor in a pan of oil.

Do not let the sensor or thermometer touch the pan or false readings will result.

Compare the gauge readings to the thermometer readings as the oil heats.

NOTE

Refer to page 10-5 for temperature unit inspection.



FUEL GAUGE

FUNCTION TEST

Place the motorcycle on its center stand.

Remove the seat and fuel tank (page 4-15).

Remove the fuel valve. Turn the fuel tank upside down to drain all the remaining fuel.

Refer to Page 4-15, for removal of the fuel valve.

WARNING

Keep gasoline away from open flames or sparks. Wipe up spilled gasoline at once.

Reinstall the fuel valve and fill the fuel tank with the specified amount of fuel, making sure that the gauge pointer registers properly.

Remove the headlight and disconnect the fuel gauge instrument couplers.

CAUTION

The fuel gauge operates on 7 volts. Do not apply 12 volts directly to the gauge.

Measure the resistances between the Bu/W and G terminals using a tester as shown in the bottom illustration.

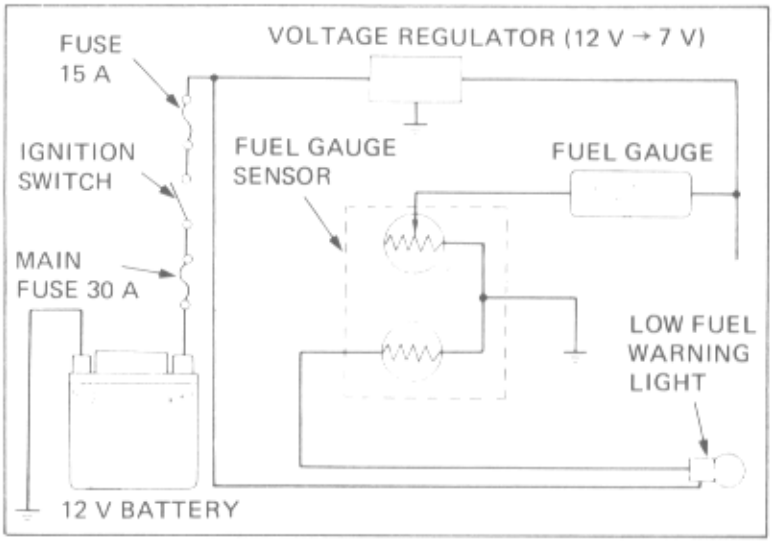
Position	E	1/2	F
Amount	5 lit 1.3 US gal 1.1 Imp gal	13 lit 3.4 US gal 2.8 Imp gal	17 lit 4.4 US gal 3.7 Imp gal
Resistance	71–75 Ω	34–39 Ω	10–15 Ω

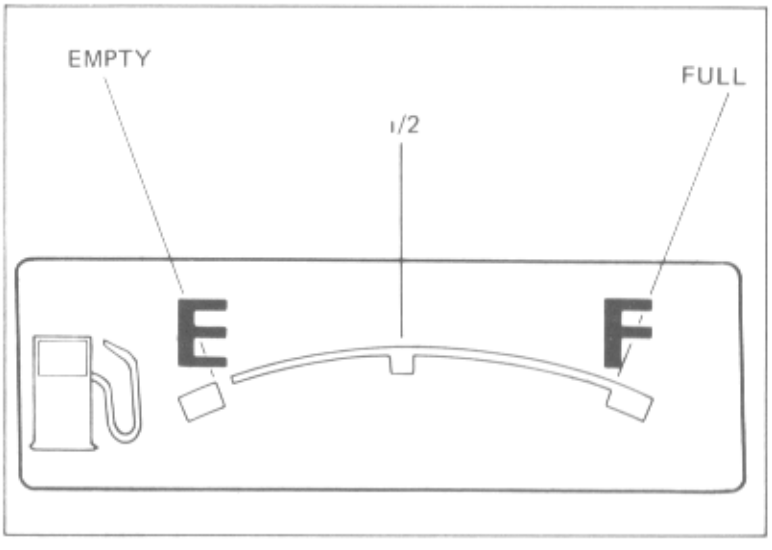
NOTE

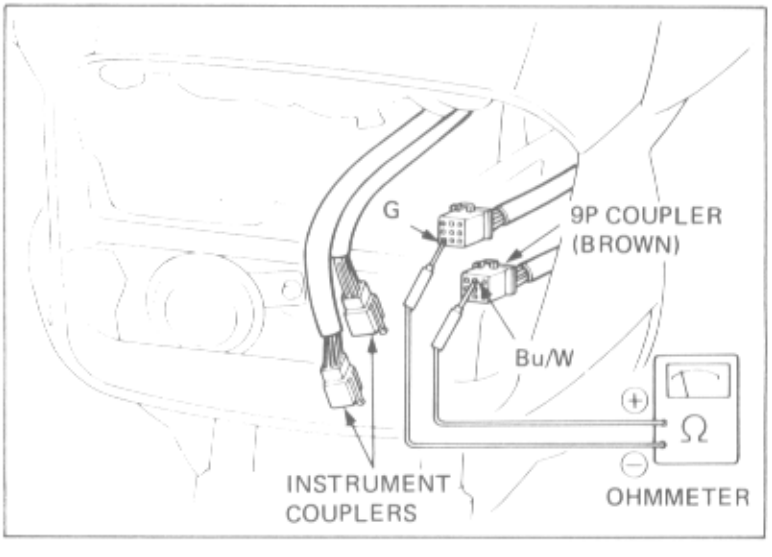
- Connect the instrument couplers and turn the ignition switch ON before checking the pointer indications.
- Turn the ignition switch OFF and disconnect the coupler before measuring the resistances.

Replace the fuel gauge as an assembly when the pointer indications are abnormal, even if the resistances are correct.

Remove the sensor and replace with a new one if the resistances are not correct. Refer to Page 4-16 for removal of the fuel gauge sensor.







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LOW FUEL WARNING LIGHT

Place the motorcycle on its center stand.

Check that the low fuel warning light comes on within 30 seconds after the ignition switch has been turned ON with the amount of fuel in the fuel tank below 4.0 liters (1.06 US gal, 0.88 Imp gal).

NOTE

The light will not go on immediately after the ignition switch is turned ON.

If the light does not go on within 30 seconds, check for a blown fuse or bulb, loose connector or open circuit in the wire harness.

Replace the sensor if the above procedure does not indicate that anything is wrong.

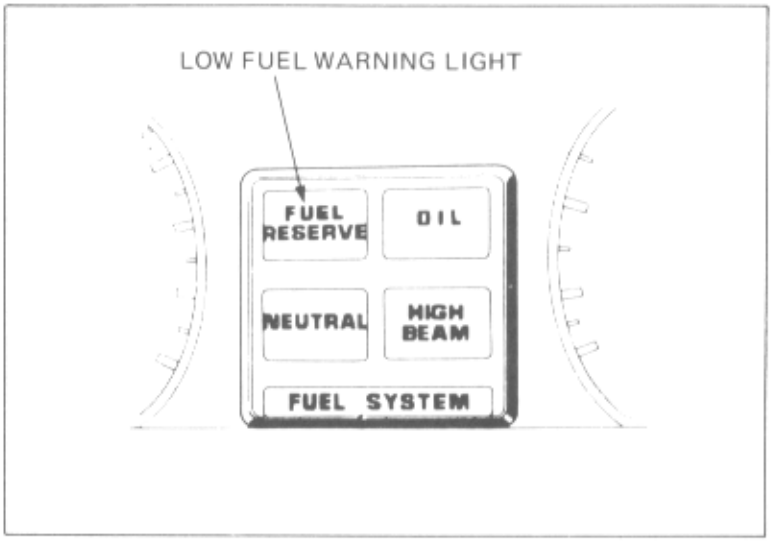
Check that the low fuel warning light will not light when the ignition switch is turned ON with the amount of fuel in the fuel tank above 6.5 liters (1.72 US gal, 1.43 Imp gal).

If the warning light goes on, check for a short circuit in the wire harness or coupler.

Replace the sensor if nothing wrong is indicated.

NOTE

Refer to Page 4-16 for removal of the fuel gauge sensor.



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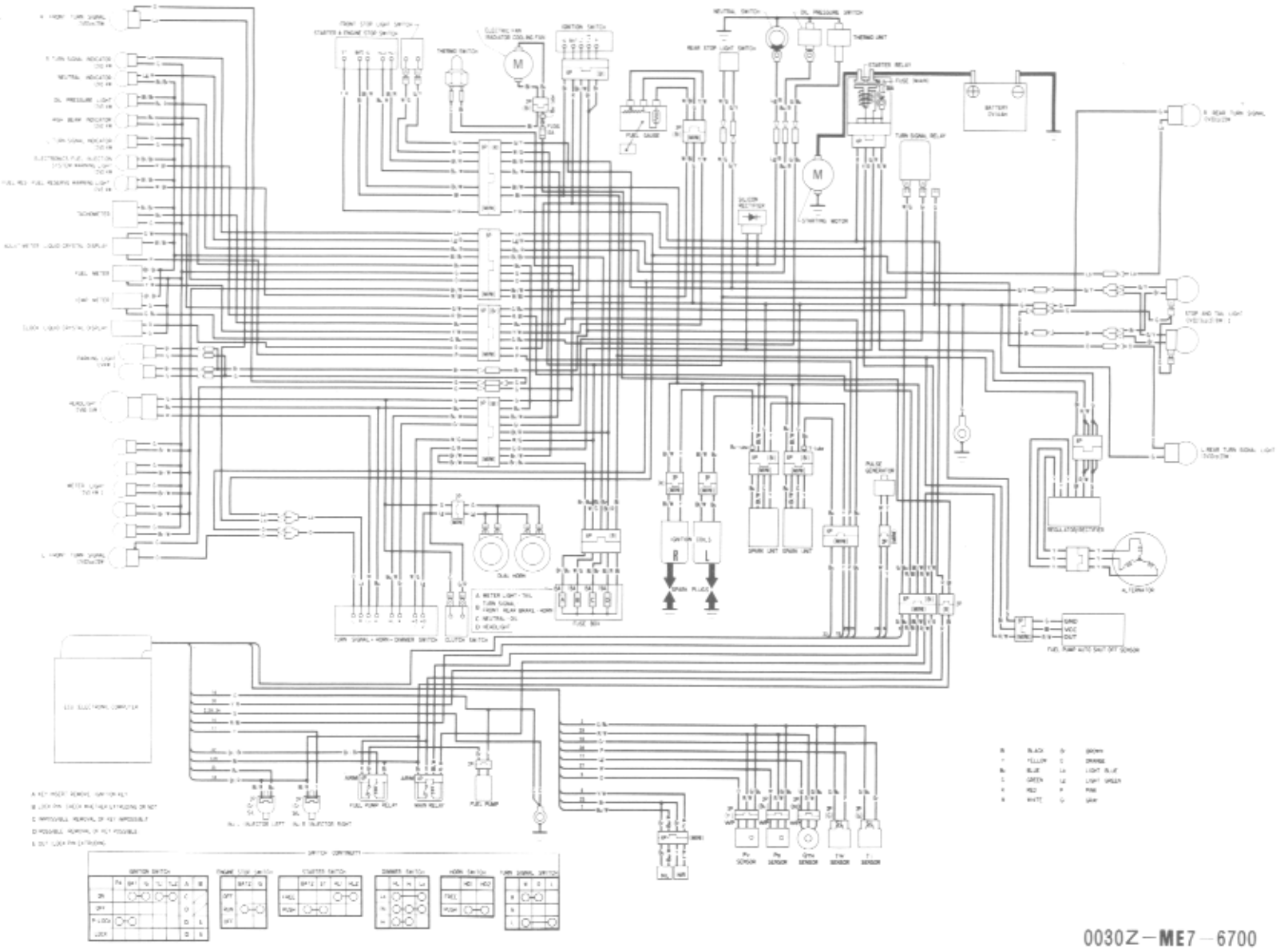
WIRING DIAGRAM



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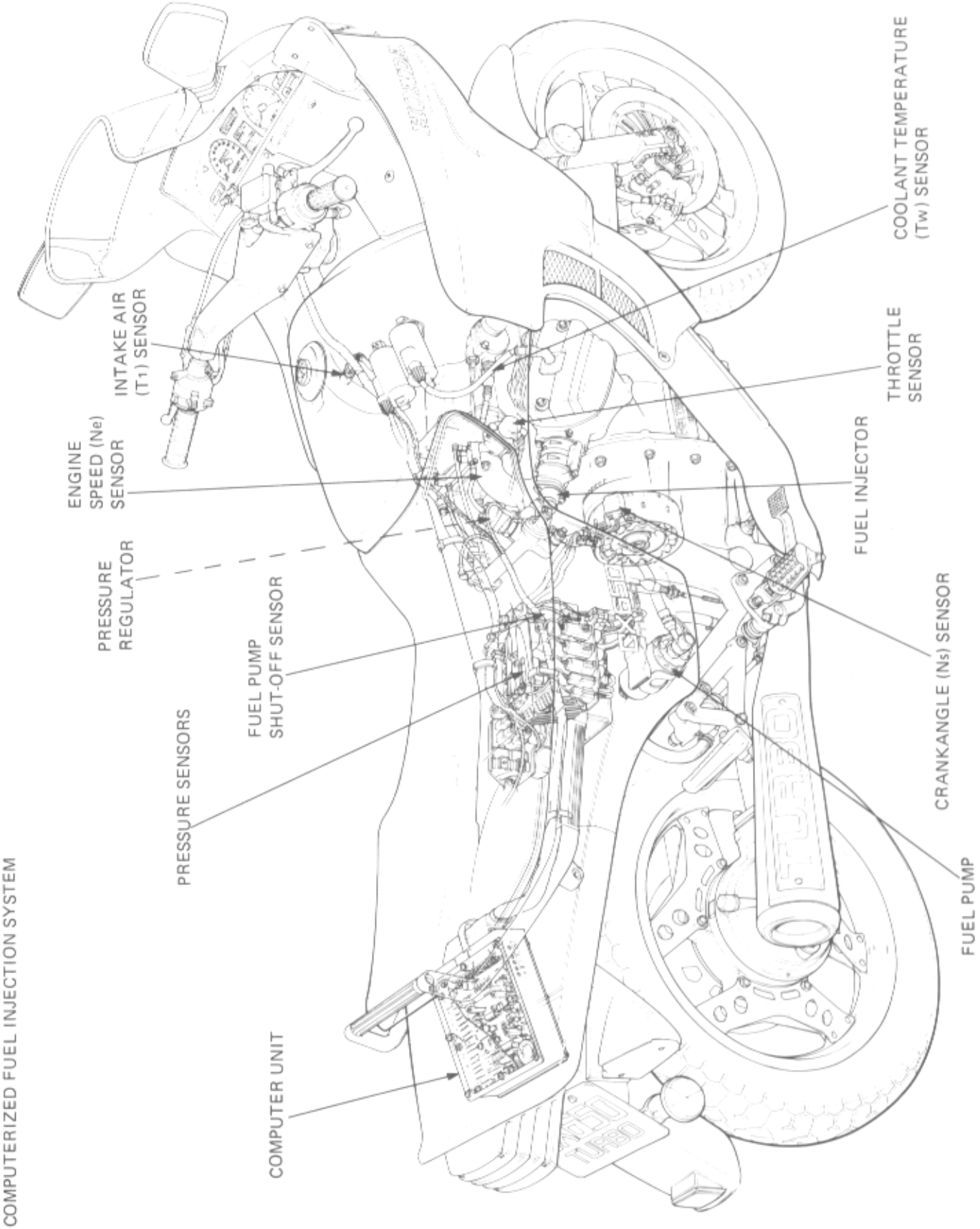
MEMO



COMPUTERIZED FUEL INJECTION SYSTEM

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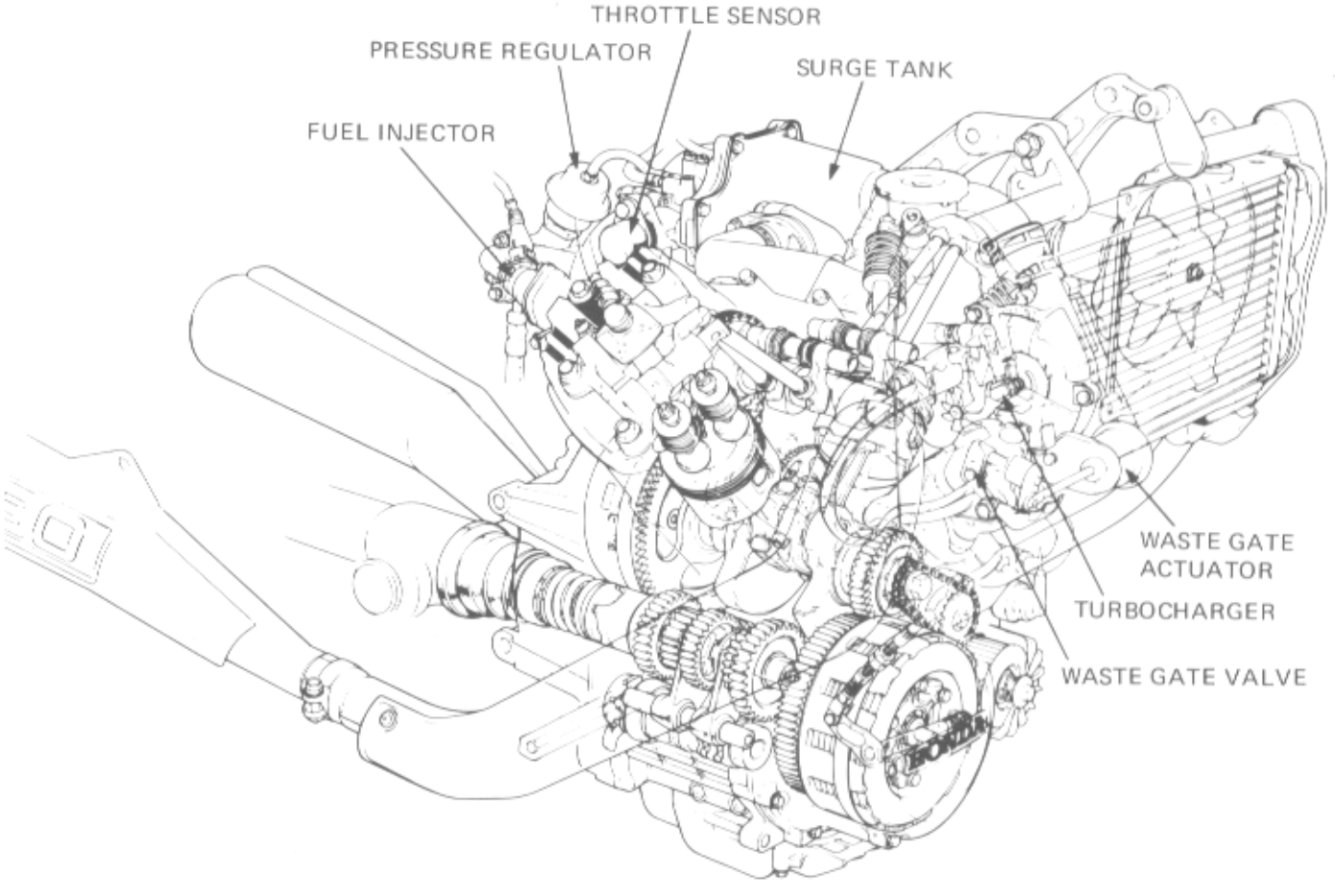
23. TECHNICAL FEATURES

ENGINE CUT-AWAY

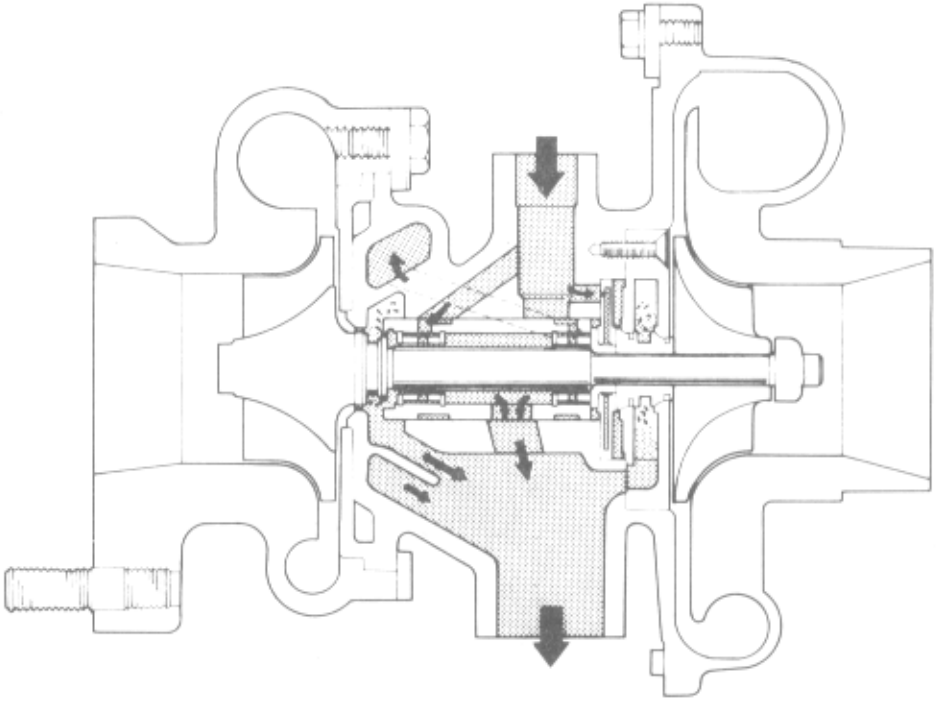


23

TURBOCHARGER

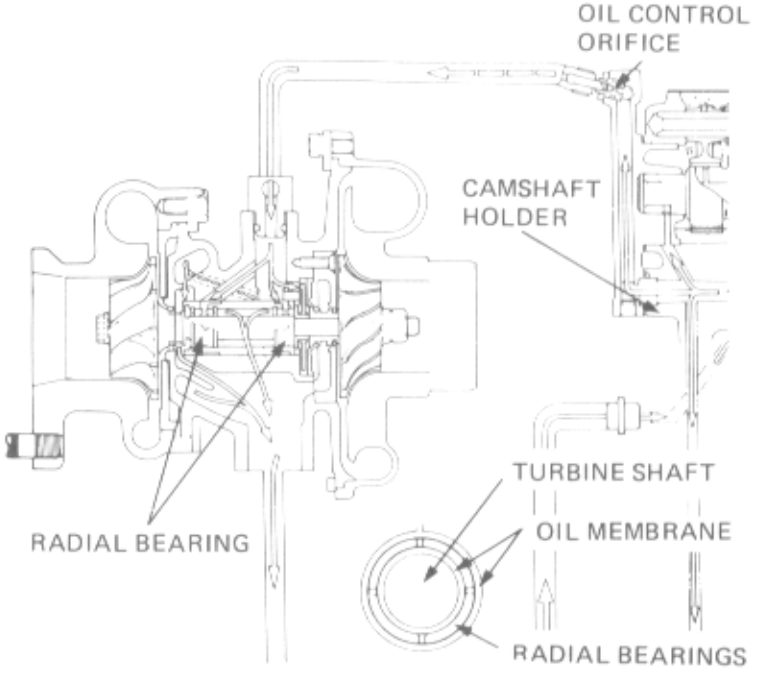
WORKING PRINCIPLE OF TURBOCHARGER

In the naturally aspirated engine, about 40% of the energy generated from fuel combustion is discharged into the atmosphere as heat in the exhaust gas. A turbocharger utilizes a part of this energy to drive the turbine and the compressor which are attached to the same shaft. The compressor increases the pressure of the engine intake air which enables the engine to effectively use a greater mixture of air and fuel. This produces an increase in power output over the naturally–aspirated engine.



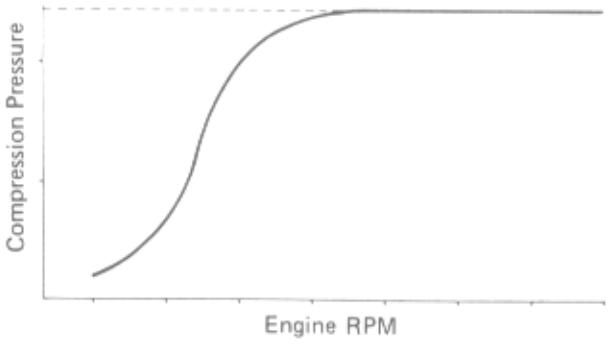
LUBRICATION SYSTEM

The turbocharger uses floating radial bearings to support its rotor which must rotate at 180,000 rpm under the most extreme conditions. Since the bearings are not held rigidly but are free to rotate on layers of oil in the housings, the relative movement between the bearing and turbine shaft is reduced to also reduce friction. Less vibration is also transmitted from the turbine shaft to the housing, contributing to quiet operation of the unit. The bearings get lubricated by oil which is under pressure from the engine's lubrication system.

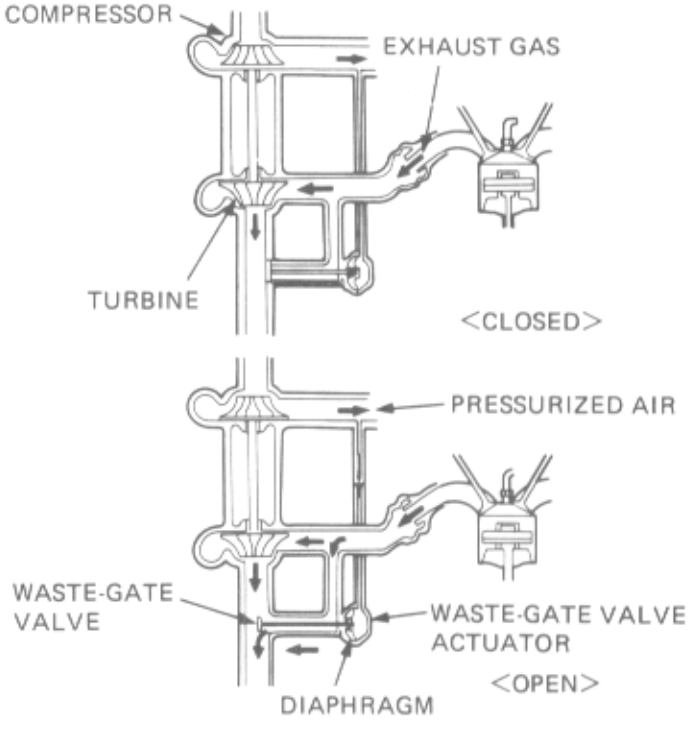


BOOST PRESSURE CONTROL

Boost pressure is increased as engine rpm increases, which could cause knocking if boost becomes excessive. The turbocharger uses a waste-gate control which, when engine speed increases, acts to maintain desired turbocharger speed by routing excess exhaust gas through a bypass into the exhaust pipe. As engine speed decreases so that the boost is low, the waste-gate remains closed, allowing all of the exhaust passes to go through the turbine.

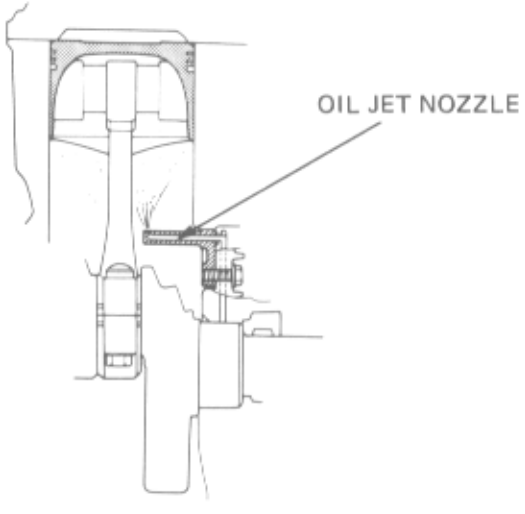


Increased rate of air flow to an engine means higher heat stress and greater loads on engine parts. On the CX650 TURBO, an oil jet nozzle supplies additional oil to the pistons. Heat is isolated not only at the turbine and "hot-ends" of the turbocharger components but also at the turbocharger itself by use of heat covers and a heat shroud for protection and maximum heat convection. The parts are also designed to withstand the greater stresses encountered by this engine.



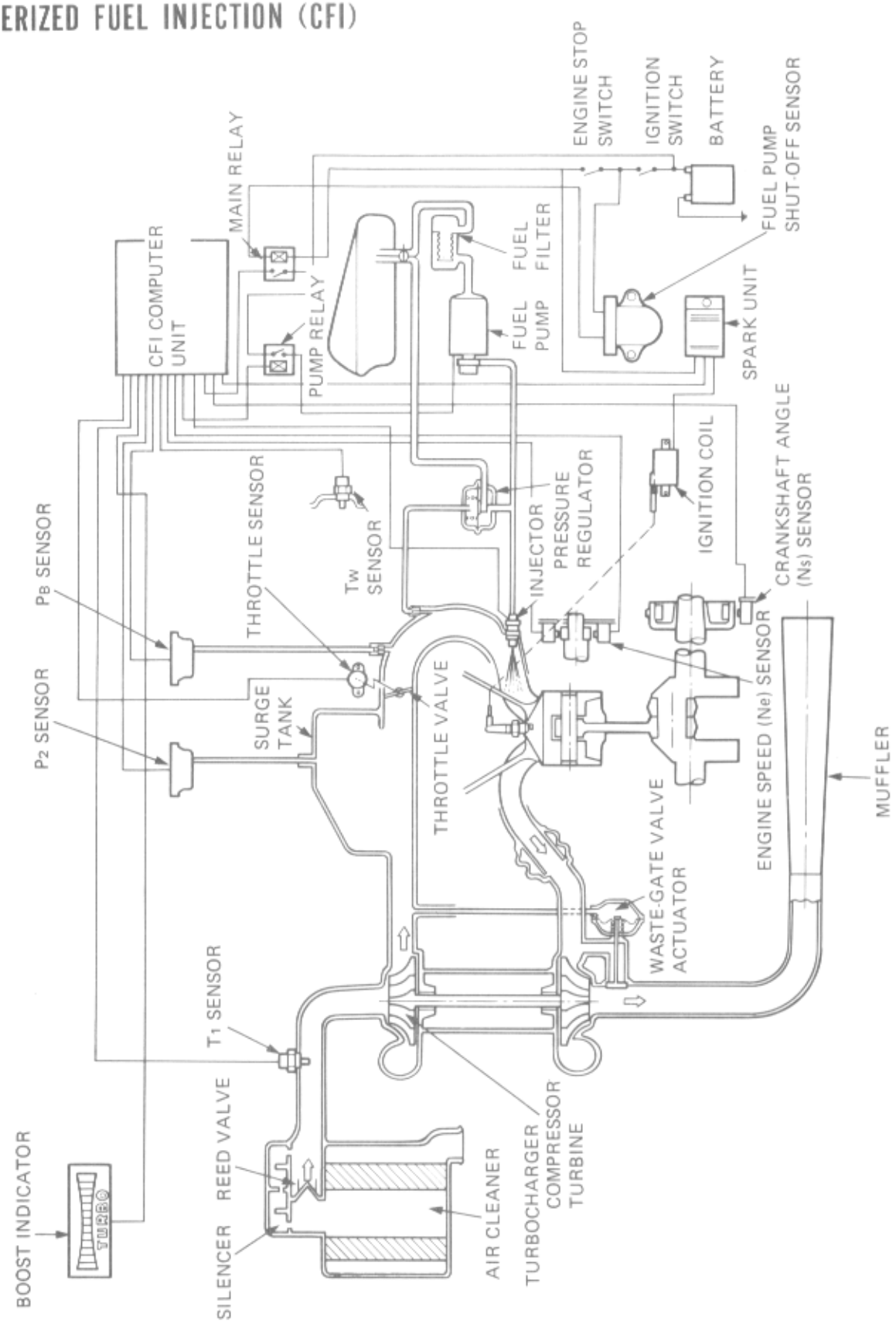
ADVANTAGES OF THE TURBOCHARGED ENGINE

- Engine power output can be increased without increasing the engine speed or displacement.
- Engine weight and volume per horsepower can be reduced.
- Fuel efficiency is increased by utilizing exhaust energy to improve performance.
- Fuel economy can be increased through use of smaller engines for the same applications as larger normally aspirated engines.
- Engine exhaust noise is lower.



COMPUTERIZED FUEL INJECTION (CFI) SYSTEM

CFI SYSTEM DIAGRAM



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INTRODUCTION

In the naturally aspirated engine, the operation of the carburetor is dependent upon the vacuum at the venturi in the carburetor air horn. The turbocharger assists the vacuum by raising the pressure of the incoming air by having the carburetor mounted ahead of its compressor. However, such an installation would not be acceptable where precision control of fuel supply in response to manifold pressure is required. For example, over-fueling or fuel collected in the manifold or compressor due to coasting of the turbine when the throttle is closed is a frequent cause of malfunctions associated with such a design. The CX650 TURBO uses a new computerized fuel injection (CFI) system which is based on the system which has already been proven on the CX500 TURBO.

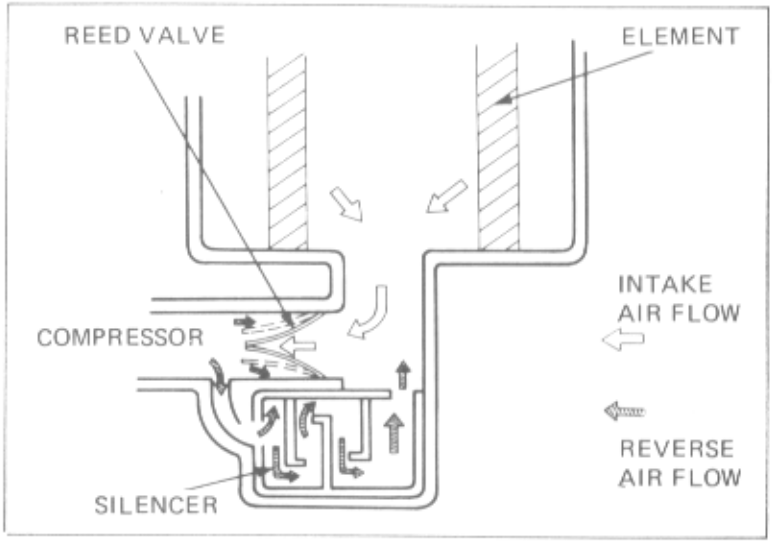
FUNCTIONS AND RELATED PARTS

System	Function	Related Parts
Intake system	Supplies air required for combustion	Air cleaner, silencer, reed valve, surge tank throttle valve, intake manifold
Fuel supply system	Supplies fuel in the correct amount and at the right time	Fuel filter, fuel pump, injectors, pressure regulator, fuel pump stop sensor
Fuel control system	Controls amount of fuel to be injected by the injectors	Pressure sensors (P_2 and P_B), throttle sensor, coolant temperature sensor (T_W), intake air temperature sensor (T_1), engine speed sensor (Ne), crankshaft angle sensor (Ns), micro computer
Ignition timing system	Controls ignition timing	Pressure sensor (P_B), throttle sensor, engine speed sensor (Ne), crankshaft angle sensor (Ns), micro computer

AIR INTAKE SYSTEM

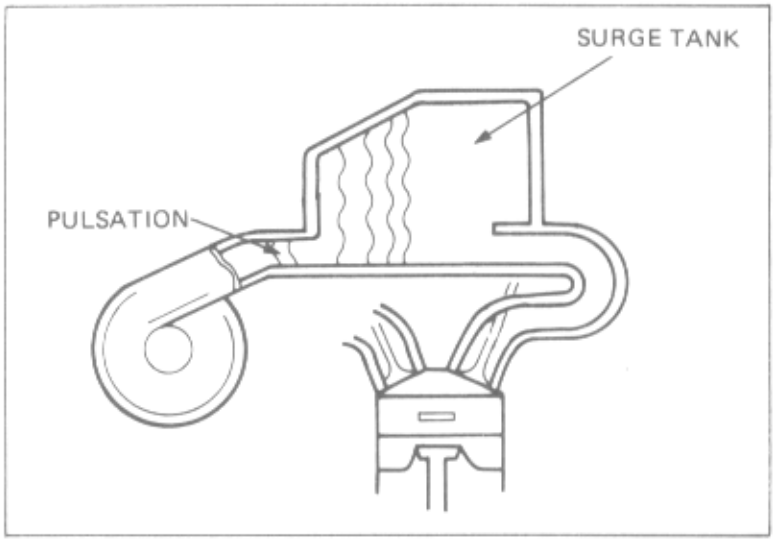
Air cleaner

The air cleaner case contains a reed valve and a silencer. When engine compression is used as a braking device at high rpm, the incoming air flow is reversed. The reed valve prevents the sudden reversed air flow from making excessive noise by blocking the air flow, causing it to go into a silencer. The reed valve, under such a condition, forces the air to flow through the silencer, quieting noises caused by the air flow.



Surge tank
Since the intake air flow is intermittent, there will be some degree of pulsation in the air flowing into the compressor. If it were not for the surge tank, compressor surging or imblance in the intake efficiency between the cylinders would result. The surge tank acts as a damper to smooth out pulsating columns of air ensuring optimum breathing under all speeds and loads of the engine.

Throttle valve
The throttle valves are conventional butterfly valves controlling the amount of air reaching the cylinders.



FUEL SUPPLY SYSTEM

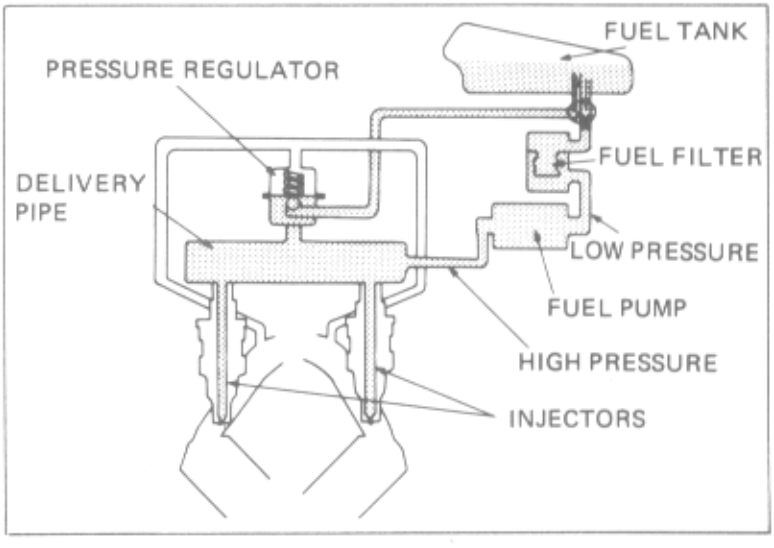
The fuel system delivers the proper amount of fuel into the intake manifold in response to the manifold pressure. A micro computer provides extremely accurate control of the air-fuel mixture in the manifold under all operating conditions.

Fuel filter
The fuel injector is a very precision component and its performance can be impaired easily when dirt is stuck between the nozzle and seat. The filter traps even the finest dust particles which are present in the fuel.

Fuel pump
The pump delivers fuel to the injector after the fuel has passed through the fuel filter. A pressure relief valve prevents abnormal pressure from being attained within the system due to clogged or restricted fuel flow.

Pressure regulator
The principle function of the pressure regulator is to maintain higher pressure in relation to manifold pressure. This ensures optimum fuel injection regardless of changes in manifold pressure. Excess fuel is returned into the fuel tank through a return pipe.

Injector
The injector contains a solenoid which is actuated from a micro computer. Since the lift of the plunger, hence, the needle valve,xis constant, the amount of fuel injected is regulated by the duration of time during which the solenoid is energized.



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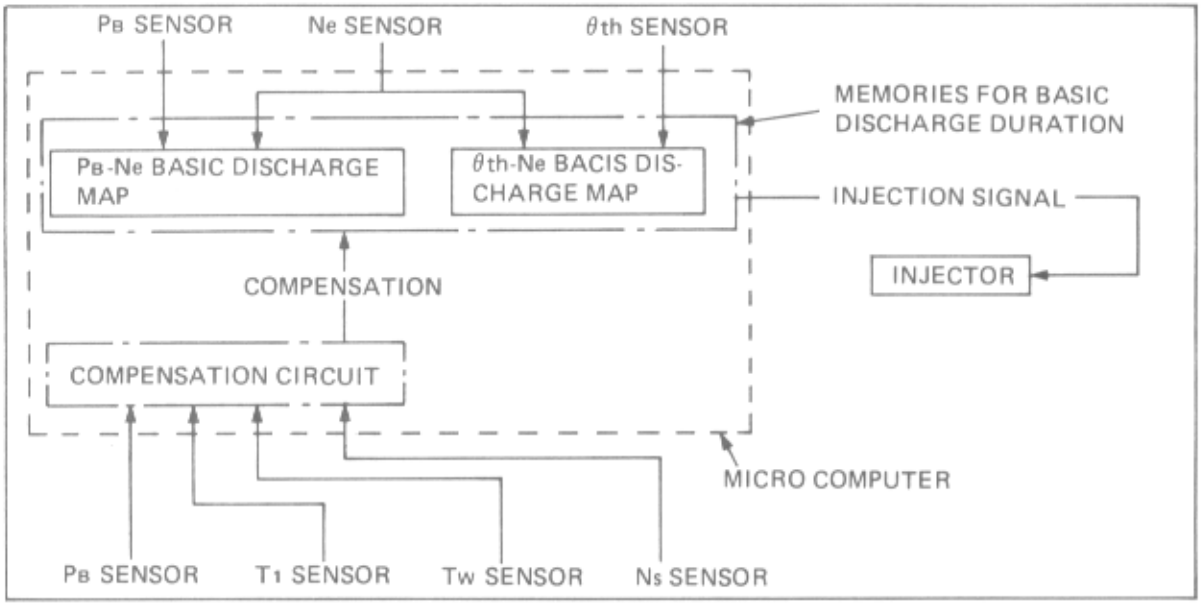
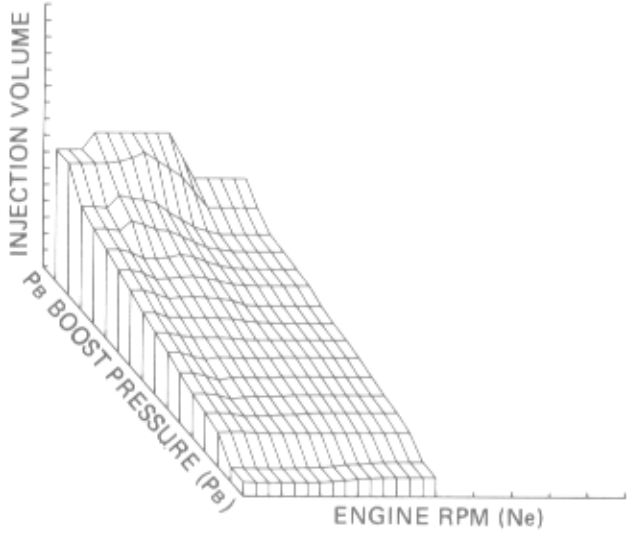
FUEL CONTROL SYSTEM

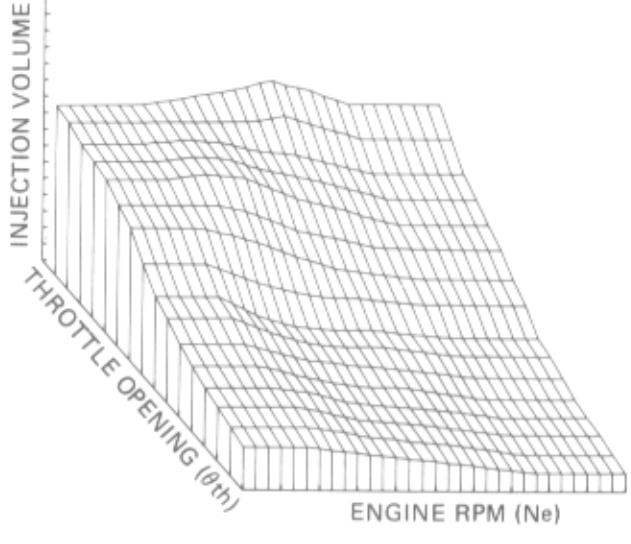
The fuel control system consists of sensors, injectors, fuel pump and a micro computer and delivers the proper amount of fuel into the intake manifold in response to manifold pressure. The micro computer serves as a master electronic control unit that determines the duration the injectors must injet fuel. The BASIC DISCHARGE DURATION and INJECTION TIMING are determined by the 3-dimensional maps fed into the computer storage by engine speed (Ne sensor), throttle opening (θth sensor) and boost pressure (P_B sensor) as parameters. The Basic Discharge Duration and Injection Timing read out are further acted upon by information sent from the intake air temperature sensor (T_1), coolant temperature sensor (Tw) and crankshaft angle sensor (Ns).



P_B-Ne BASIC FUEL INJECTION VOLUME MAP

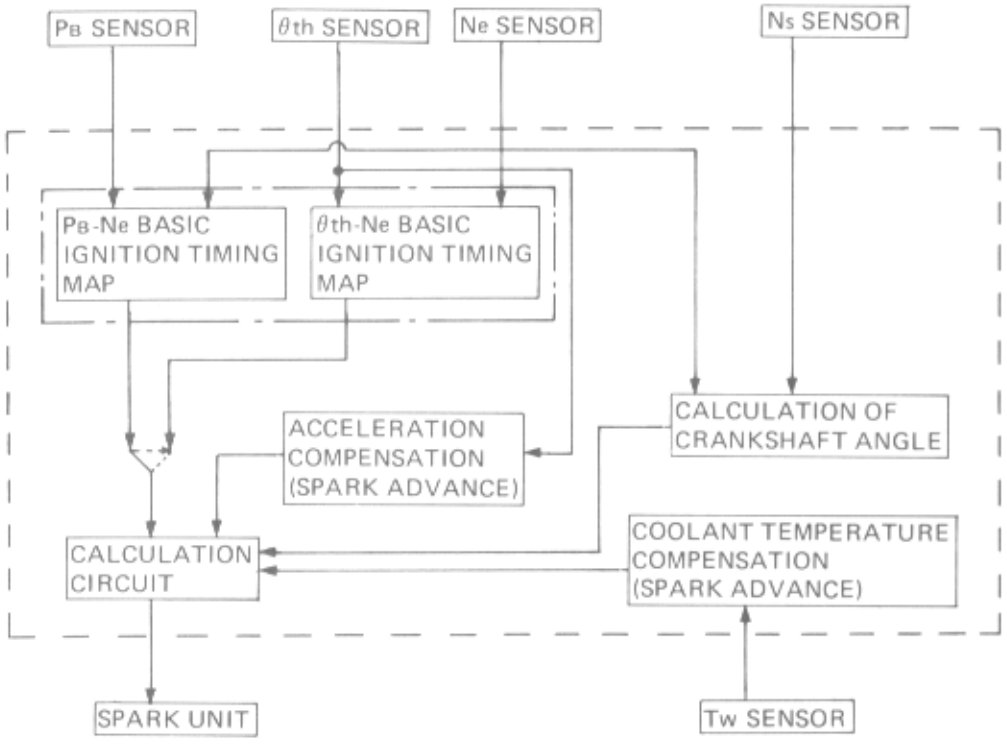


θth-Ne BASIC FUEL INJECTION VOLUME MAP

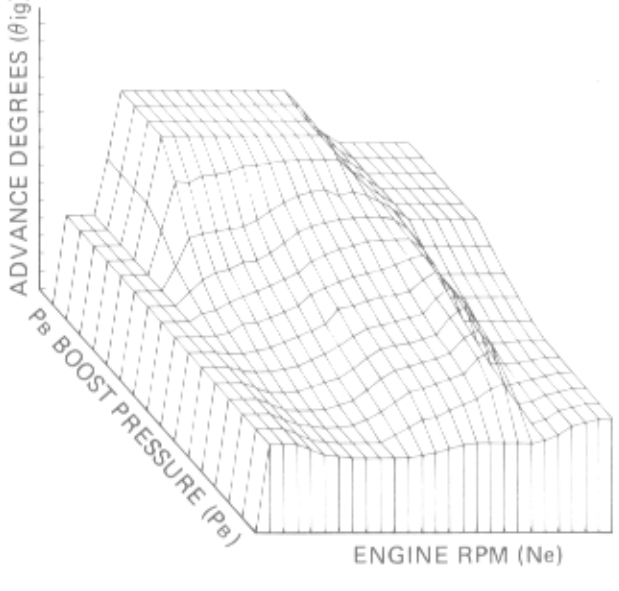


IGNITION CONTROL SYSTEM

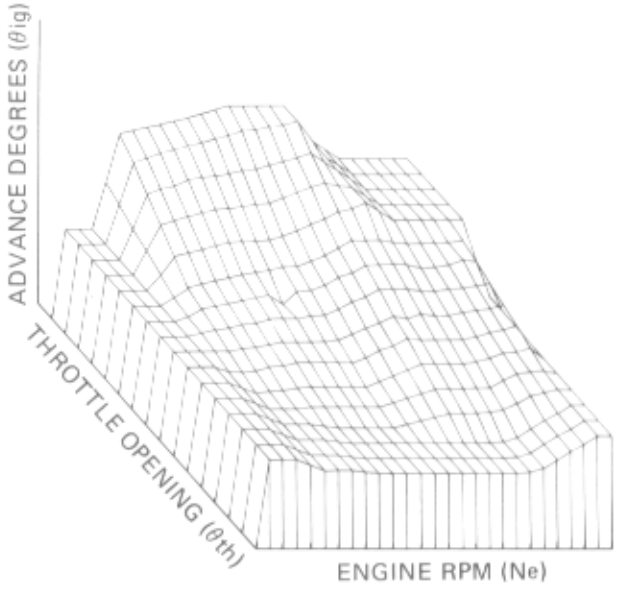
The micro computer serves also to inject fuel into each cylinder at the correct moment and in the correct amount. The Basic Ignition Timing is determined by signals sent from the engine speed sensor (Ne), throttle opening sensor (θth) and boost pressure sensor (PB). It is further acted upon by signals sent from the coolant temperature sensor (Tw) and crankshaft angle sensor (Ns) to let the spark unit appropriately adjust ignition timing.



PB-Ne BASIC IGNITION TIMING ADVANCE MAP



θth-Ne BASIC IGNITION TIMING ADVANCE MAP



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FUNCTIONS OF SYSTEM PARTS

Part Name	Function
Charging pressure sensor (P_2)	To detect charging pressure and send signals to micro computer.
Boost pressure sensor (P_B)	To detect manifold pressure and send signals to micro computer.
Throttle sensor (θ)	To detect opening angle of throttle and send signals to micro computer.
Coolant temperature sensor (T_W)	To detect coolant temperature and send signals to micro computer.
Engine speed sensor (Ne)	To detect specific angular position of crankshaft and send signals to micro computer. Micro computer then determines fuel injection and ignition timing for both cylinders.
Crankshaft angle sensor (Ns)	To detect variations of crankshaft speed and to send signals to the micro computer. Micro computer controls ignition and accurate fuel injection timings accurately.
Boost indicator	To indicate boost pressure. Also computer controlled.
Fuel pump relay	To control fuel pump power supply according to voltage from the micro computer.
Main relay	To turn computer power supply on and off depending on how ignition switch or engine stop switch is operated. Entire function of CFI system is stopped when supply of power to micro computer is shut down.
Fuel pump shut-off sensor	To turn main relay off when motorcycle is leaned over 60° on either side, stopping the function of the CFI system.
Computer unit	• Receives signals from various sensors to get fuel into cylinders in correct amount and at the right time through the injectors. • Determines optimum ignition timing based on signals sent from various sensors. Also controls ON/OFF of ignition current. • Drives and controls boost indicator and fuel pump. • Indicates faulty system or components through self-diagnosis system and offers fail-safe functions.

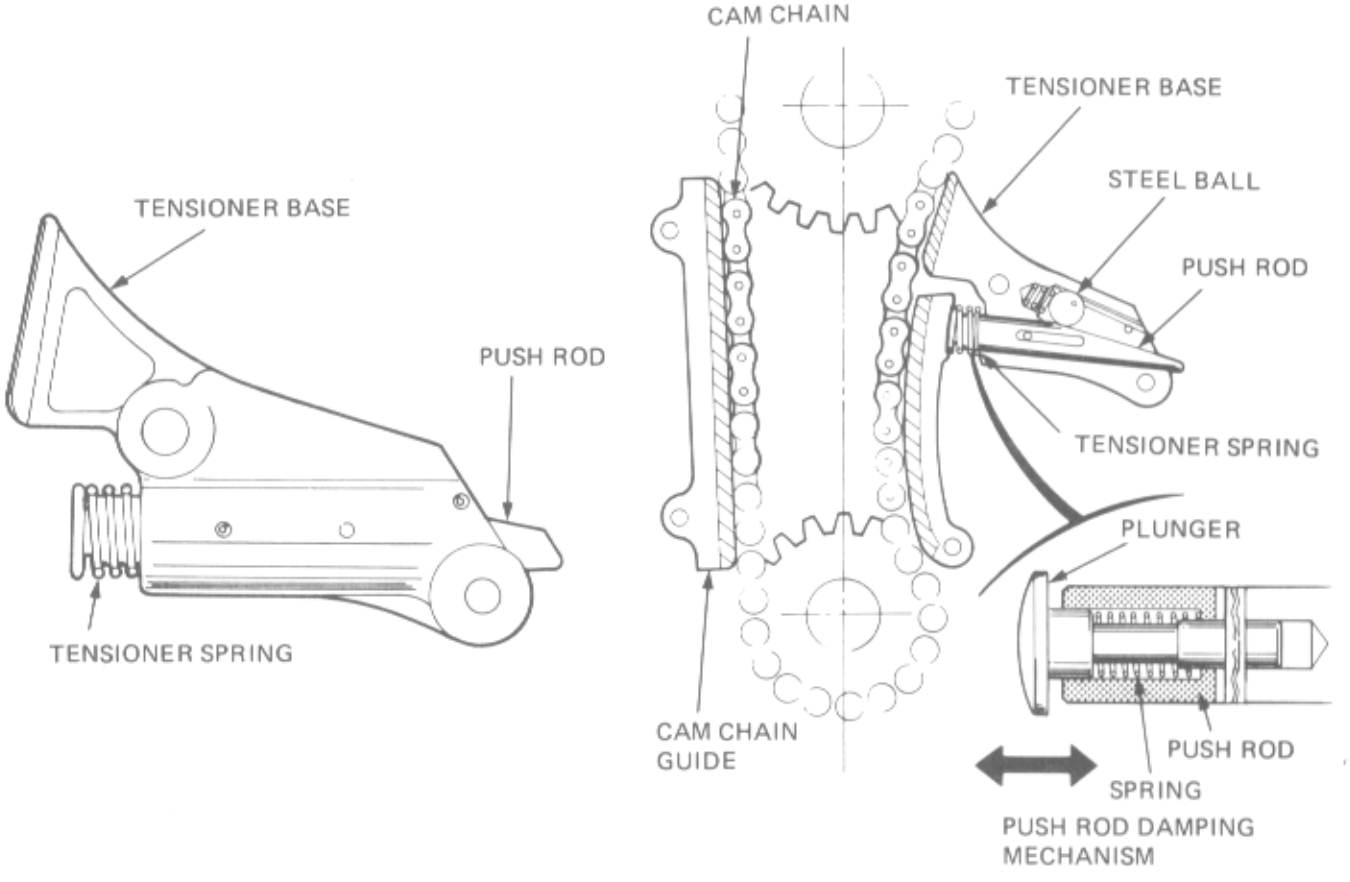
AUTOMATIC CAM CHAIN TENSIONER

GENERAL

The motorcycle is equipped with an automatic cam chain tensioner to compensate for chain wear, eliminating periodic adjustment and maintenance service.

Construction

The unit consists of a spring-loaded steel ball and push rod having a damper at its end. The damper is comprised of a plunger that is also spring loaded within the push rod as shown.



OPERATION

1. A push rod is placed between the chain guide and a steel ball. The steel ball is held against the wedge end of the push rod, keeping the push rod from being pushed back by the chain guide. The damper absorbs minor chain lash when the cam chain is driven by the sprockets.

2. As the chain slackens, the steel ball forces the push rod towards the chain guide until an equilibrium is reached between it and the chain guide, causing the tensioner to adjust itself to take up any cam chain slack.

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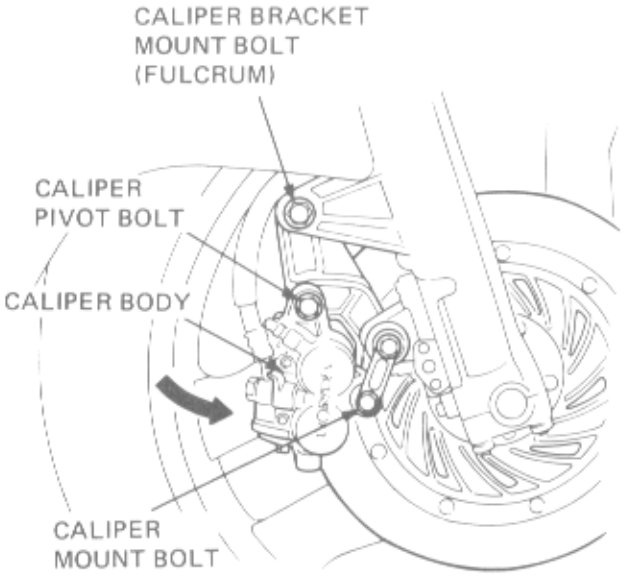
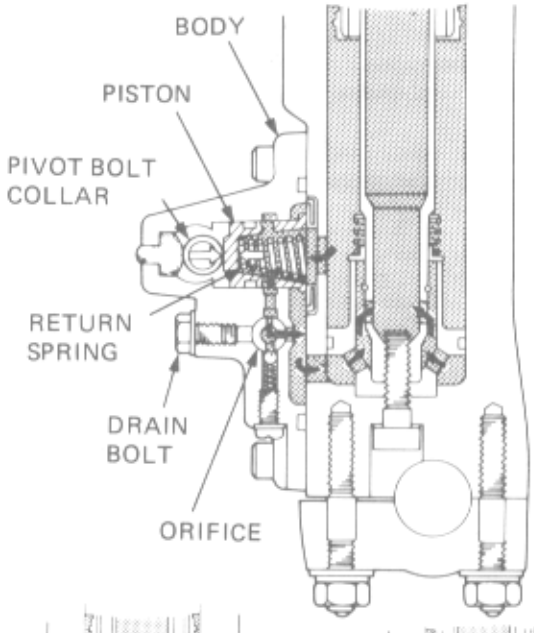
FRONT SUSPENSION TRAC (Torque Reactive Anti-dive Control)

GENERAL

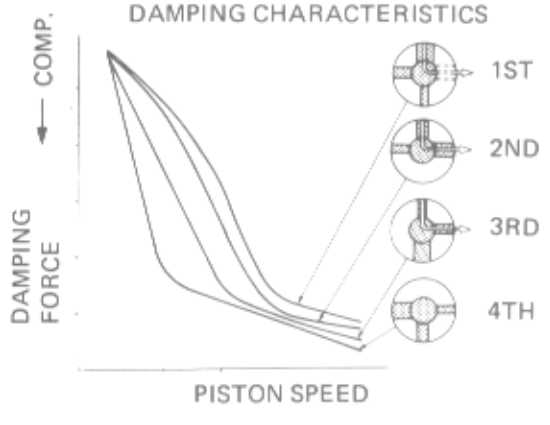
This motorcycle has an anti-dive front suspension system with four-way adjustability to provide the desired ride under various braking conditions. The system consists of a piston, return spring, oil control orifice and body.

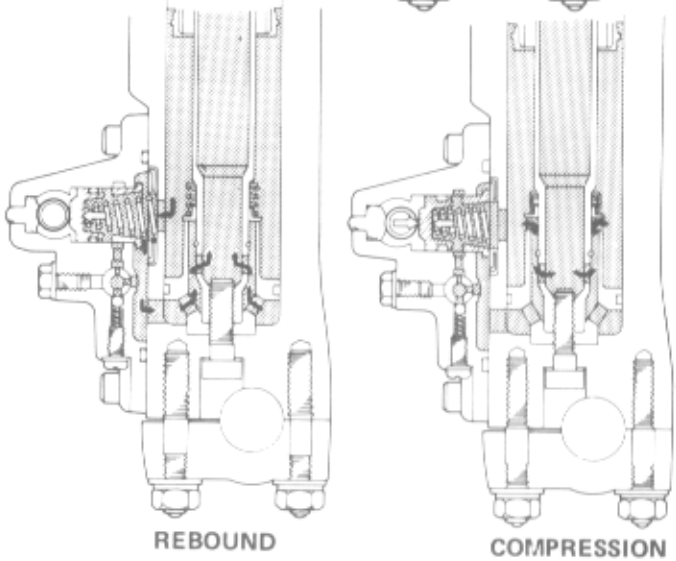




OPERATION

When the motorcycle is slowed or stopped, the brake disc is squeezed by the brake pads, causing the brake caliper to pivot on its bracket mounting bolt.
This movement causes the pivot bolt to push the piston in, uncovering the oil control orifice.
Since the orifice has four oil passages of different diameters, the desired damping can be selected by turning it. Always adjust the right and left to the same position.





Front Suspension Adjustment Chart

POSITION	DAMPING EFFECT
1	SOFT
2	STANDARD
3	FIRM
4	EXTRA FIRM

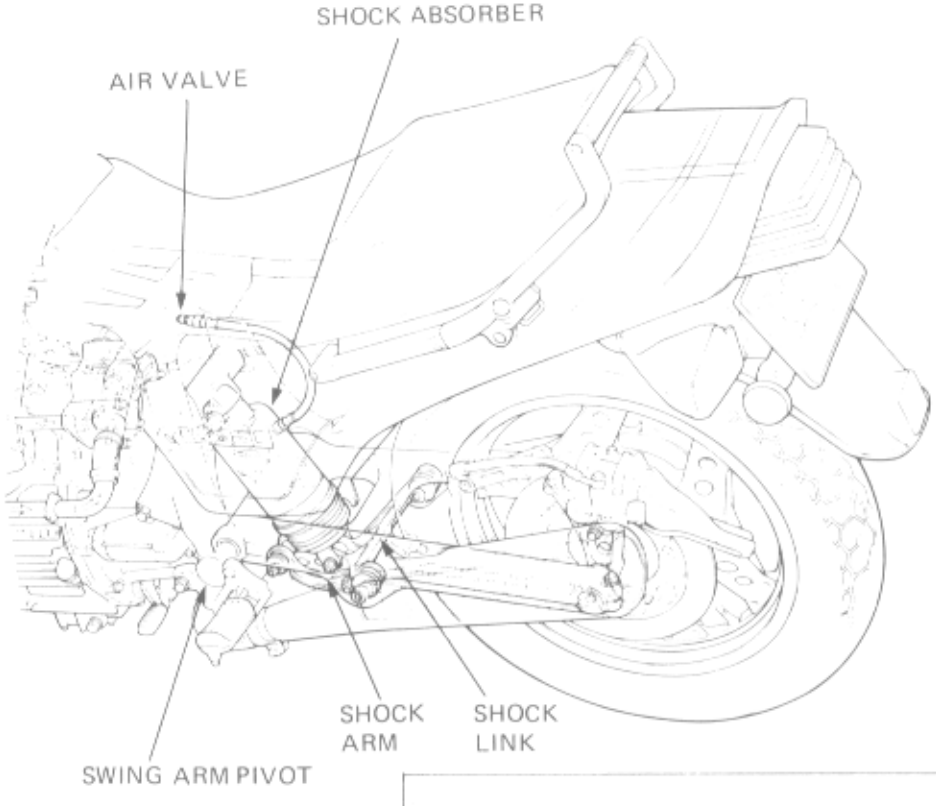
PRO-LINK REAR SUSPENSION

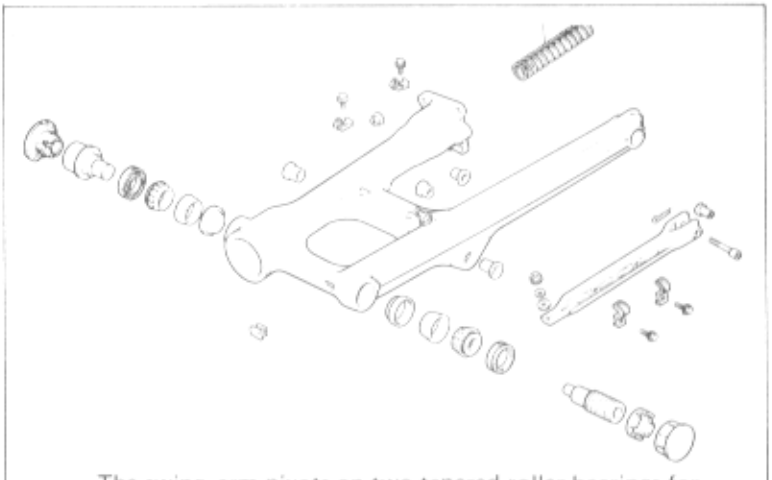
GENERAL

The Pro-Link suspension system is a single shock absorber connected to the swing arm and the lower frame with a shock arm and shock link. The shock absorber and linkage are located in front of the rear tire.

The carefully designed pivoting shock arm and shock link, combined with the shock's matched spring and damping rates, provide what is known as a "progressively rising rate" suspension. This provides relatively soft springing and damping during initial wheel travel and increasing spring and damping rates to meet increasing wheel travel with greater resistance.

This "progressively rising rate" enables the rear wheel to transfer more power to the ground, giving the rider greater comfort as whell as the best possible control over rough roads.





The swing arm pivots on two tapered roller bearings for smooth up and down movement of the wheel.

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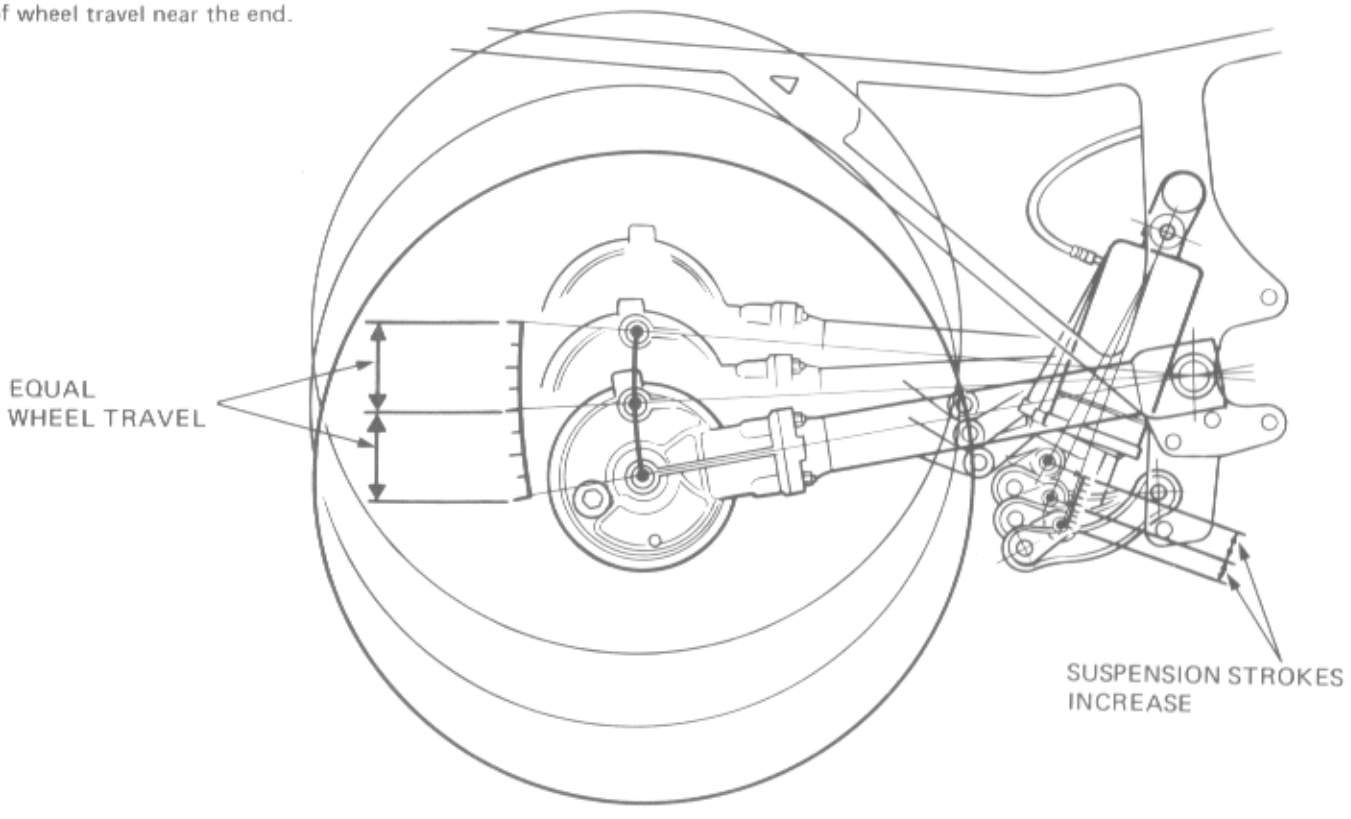
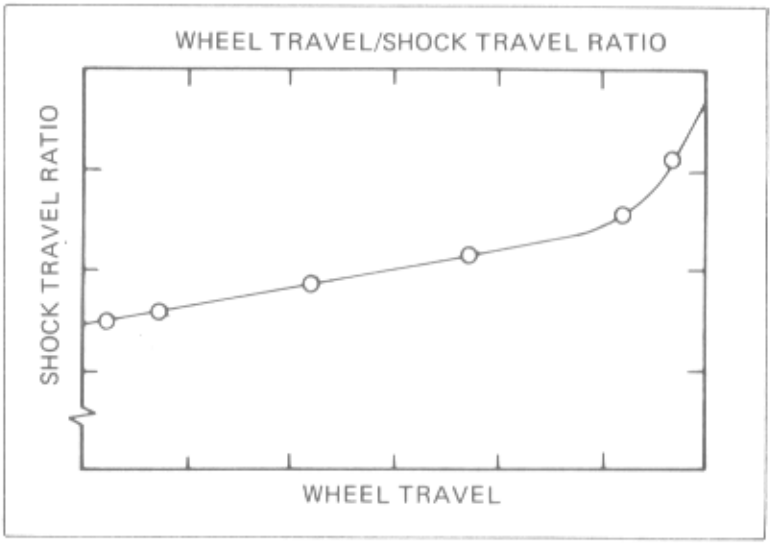
OPERATION

As the wheel and swing arm are driven up by bumps, the shock absorber is compressed by the shock arm which is held in a precise arc by the shock link. As wheel travel increases the shock arm rises above the swing arm proportionately increasing absorber compression (more shock rod travel per unit of rear wheel travel).

This provides the progressive rise rate; the shock absorber moves only about one-fourth of wheel travel at the beginning and moves about one-third of wheel travel near the end.

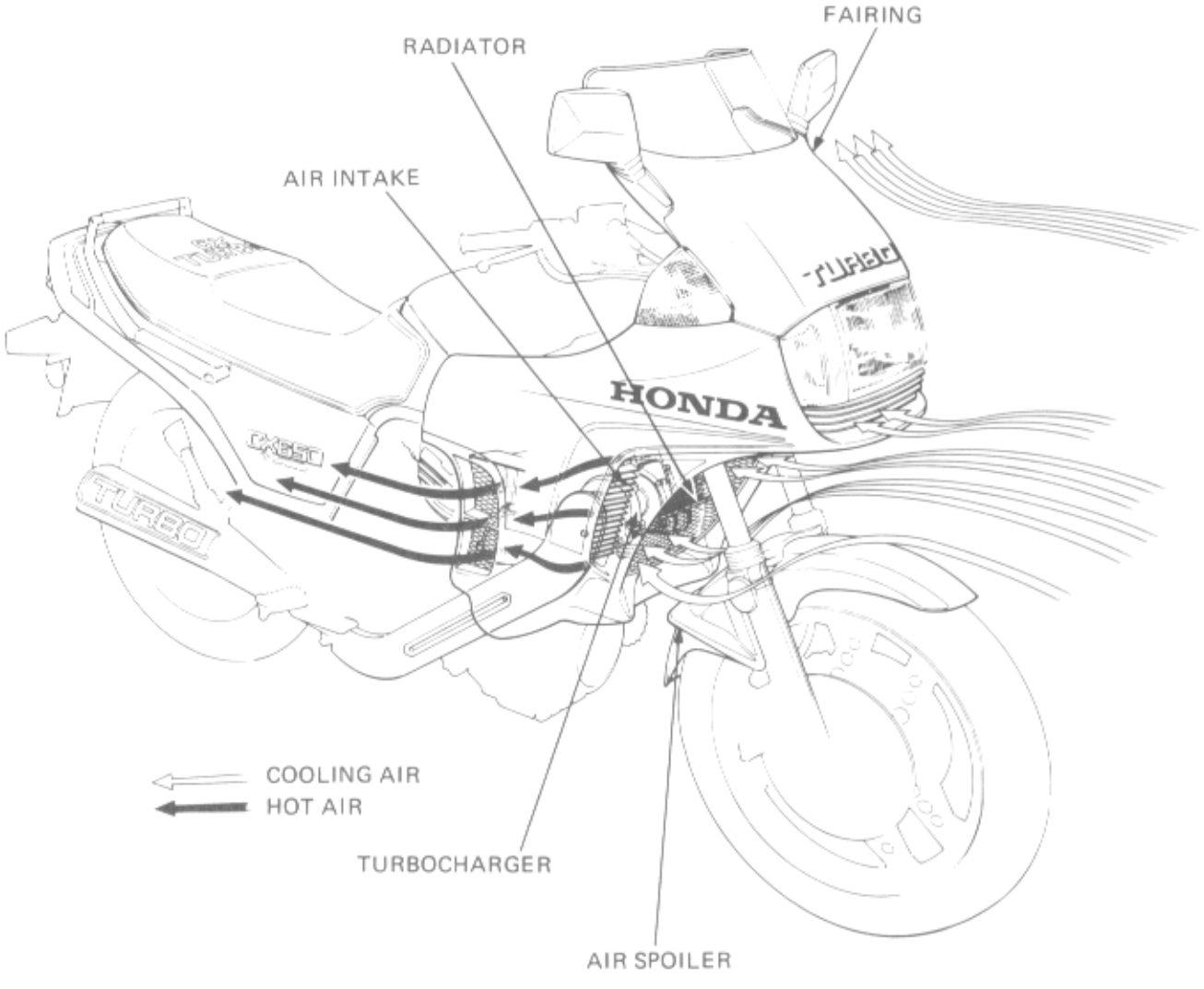


This graph shows the wheel travel/shock travel ratio through the entire stroke of a CX650 TURBO Pro-Link system.



FAIRING

In addition to being used as an ordinary windshield screen, the fairing serves to direct a positive flow of air through the radiator for optimum engine cooling. The rider is also protected from the heat of the turbocharger by the fairing.



24. TROUBLESHOOTING

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SERVICE INFORMATION

SPECIFICATIONS

ITEM			STANDARD
Fuel pressure	Ignition switch ON with engine stopped		240–270 kPa (2.4–2.7 kg/cm², 34–38 psi)
	Idle speed (1,100±100 rpm)		200–240 kPa (2.0–2.4 kg/cm², 28–34 psi)
Fuel injector solenoid resistance			1.0–3.0 Ω
Pressure sensor input voltage		P_2	4.75–5.25 V
		P_B	4.75–5.25 V
Pressure sensor output voltage (at engine stopped)		P_2	1.09–1.29 V
		P_B	3.13–3.73 V
Pressure sensor output voltage (at idle speed)		P_2	———
		P_B	2.0–3.0 V
Pressure sensor output voltage (dynamic test)	P_2	(–) 34 kPa (250 mmHg, 0.34 kg/cm², 4.83 psi)	0.4–0.6 V
		(+) 100 kPa (735 mmHg, 1.00 kg/cm², 14.22 psi)	2.9–3.5 V
	P_B	(–) 47 kPa (345 mmHg, 0.47 kg/cm², 6.68 psi)	1.7–2.1 V
		(–) 8 kPa (59 mmHg, 0.08 kg/cm², 1.14 psi)	2.9–3.4 V
T_1, Tw sensor resistance		At 20°C (68°F)	2–3 kΩ
		At 80°C (176°F)	0.2–0.4 kΩ
Engine speed sensor coil resistance		Between coupler terminal (Y–G)	100–250 Ω
		Between coupler terminal and ground	∞
Crankshaft angle sensor coil resistance		At 20°C (68°F)	85–115 Ω
Throttle sensor output voltage (with 2.9 mm gauge)			0.665–0.685 Ω
Throttle sensor resistance (Between coupler terminal P–G)			4–6 kΩ
Fuel pump shut-off sensor voltage		(Between coupler terminal R/W–G)	0–1 V
		(Between coupler terminal Bl–G)	12V (Battery boltage)
Fuel pump shut-off sensor operating angle			50–70°
Turbocharger waste-gate valve operating pressure [At 2.0 mm (0.08 in) lift]			124–131 kPa (925–985 mmHg, 1.26–1.34 kg/cm², 17.9–19. 1 psi)
Fuel pump delivery volume			1.5 lit (0.4 US gal, 0.33 Imp gal)/minute minimum

TOOLS

Special

Inspection adapter	07999–MC70000
Throttle sensor gauge, 2.9 mm	07998–ME70000 or GN–AHM–03–MC7 (U.S.A only)

Common

Fuel pressure gauge	07406–0040000 or equivalent in U.S.A.
Combination pressure/vacuum tester	07406–0050000 or ST–AH–255–MC7 and ST–AH–260–MC7 (U.S.A. only)
Digital circuit tester	07411–0020000 or KS–AHM–32–003 (U.S.A. only)

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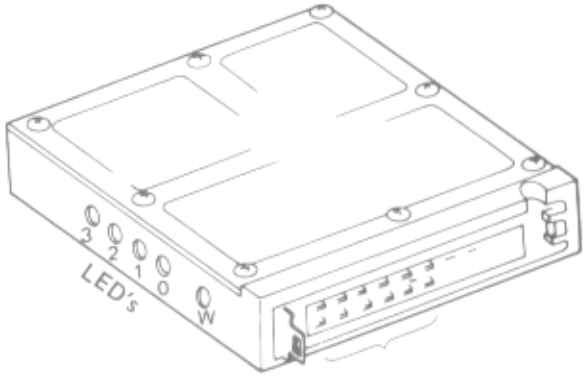
QUICK REFERENCE CHART

● . . . . . Most probable cause
○ . . . . . Other possible cause

System	Faulty part \ Symptom	Hard starting (cold)	Hard starting (hot)	Erratic or poor idling	Engine stalling	Poor acceleration/leak of power	Poor performance driveability	Excessive fuel consumption	Afterfire	Misfire	Knocking	Overheating	Poor engine braking	Abnormal noise	Excessive white smoke	Excessive black smoke	Boost indicator	Excessive charging pressure	Ref. page
FUEL SYSTEM	1. Fuel pressure	●	●	●	●	●	○	●	●	●						●			24-17
	2. Fuel leak	○	○	○	○	○	○	○	○	○									3-4
	3. Gasoline (octane rating)										●								
	4. Fuel valve	○	○	○	○	○	○	○	○	○									4-15
	5. Fuel filter	○	○	○	○	○	○	○	○	○									3-4
	6. Fuel pressure regulator	●	●	○	○	○	○	○	○	○									4-5
CFI SYSTEM	1. Fuel pump (confirm by operating noise)	●	●		○														24-6
	2. Injector (confirm by "click")	●	●	○	○	○			○							○			24-17
	3. Throttle sensor					○	●	●								○			24-22
	4. PB sensor	○	○	●	●	○	●	●	●	○						○			24-18
	5. P2 sensor					○	○	○											
	6. T1 sensor			○					○	○									24-21
	7. TW sensor	○		○												●			
	8. Engine speed sensors	○	○	○	○		○	○	○										24-22
	9. Wire connectors	●	●	●	●	●	●	○	○	○						○			
	10. Tubing	○	●	●	●	●	●	○	○	○						○			
	11. ECU unit	●	●	○	○	●	○	○	○	●	●					○	○		
	12. Throttle valves (PB synch)			●	○			○	○	●									24-25
IGNITION CONTROL SYSTEM	1. Spark plugs	●	●	●	●	●	●	●	●	●	●					●			3-7
	2. Spark plug wire	○	○	○	○	●	○												
	3. Ignition coil	○	○	○	○	○	○												20-2
	4. Spark unit	○	○		○				○	○									
	5. Wire connectors	●	●	○	○	●	●	●	○	●	●	○					○	○	
	6. Battery	○	○	○															
	7. Ns sensor				○	●	●	○	○	○									24-22
	8. Plug gap	○	○	●	○	○	○	○	○	○									3-7
ENGINE	1. Secondary air leak			●	●	●	●			●				●				○	
	2. Deformed air intake components					○	○												
	3. Leaky exhaust parts					○								●					
	4. Distorted exhaust components					○													
	5. Cylinder compression	○	○	○	○	○						○							13-19
	6. Foreign matter in turbo unit					○								●					6-2
	7. Waste-gate					●	○											●	6-2
	8. Valve clearance	○	○	○	○	○	○	●	○	○									3-8
	9. Insulator (fuel settled)				○					●						○			
	10. Rotor bearing leak														●				
	11. Worn piston/rings/cylinder														●				
	12. Worn valve stems/guides/seals					○		○				●							
FRAME	1. Brake dragging					○		●											
	2. Coolant level											●							3-10
	3. Air cleaner reed valve/silencer						○						○	●					4-18
	4. Boost indicator																●		24-25
	5. Clogged crankcase breather														●				3-7
	Ref. page	24-6		24-9		24-8	24-10		24-11	24-12	24-13		24-14		24-15		24-16		

SELF-DIAGNOSIS SYSTEM

The memory loaded into the computer storage includes some fail-safe functions and a self-diagnosis program with a series of LED's on the side of the computer housing.
When a problem occurs in a system or component, the LED(s) for that system or component lights up allowing the mechanic to trace the problem to its source.



Electronic Control Unit

◉ :On ● : Blinking ○ : Off

No.	LEDS (abnormality)					Troubleshooting		Fail-safe Functions
	3	2	1	0	W			
1	○	○	○	●	◉	P_B sensor	· Open circuit · Shorted signal wire	BASIC DISCHARGE DURATION and IGNITION TIMING are determined by ENGINE SPEED and THROTTLE OPENING without regard to P_B pressure. (Note 2)
2	○	○	●	○	◉	P_2 sensor	· Open circuit · Shorted signal wire · Faulty waste gate	P_2 is fixed to 760 mmHg
3	○	○	●	●	◉	Throttle sensor (θ TH)	· Open circuit · Shorted signal wire	BASIC DISCHARGE DURATION and IGNITION TIMING are determined by ENGINE SPEED and P_B pressure without regard to throttle opening. (Note 2)
4	○	●	○	●	◉	Intake air temp (T_1) sensor	· Open circuit · Shorted signal wire	T_1 is fixed at 25°C (77°F)
5	○	●	●	○	◉	Water temp (T_W) sensor	· Open circuit · Shorted signal wire	T_W is fixed at 80°C (176°F)
6	○	●	●	●	◉	Injector (left)	· Open or short circuit	Fuel pump is stopped.
7	●	○	○	○	◉	Injector (right)		
8	●	○	●	○	◉	P_2 sensor	· Disconnected piping	
9	○	○	○	○	◉	Computer	· Internal fault	
10	●	○	○	●	◉	Crankshaft angle (Ns) sensor	· Open circuit · Shorted signal wire	See the table below
11	●	○	●	●	◉	Engine speed (Ne) sensor (left)	· Open circuit · Shorted signal wire	
12	●	●	○	○	◉	Engine speed (Ne) sensor (right)	· Open circuit · Shorted signal wire	

Ns and Ne Sensor Fail-safe Function

○: Normal X: Fail

SENSOR			FUNCTION	
L-Ne	R-Ne	Ns	INJECTION	IGNITION TIMING
○ ○ X	○ X ○	○ ○ ○	Normal	Normal
○	○	X	Injection started by right Ne sensor generator on right cylinder. Injection started by left Ne sensor generator on left cylinder.	Ignited by right Ne sensor generator on right cylinder. Ignited by left Ne sensor generator on left cylinder.
X X ○	X ○ X	○ X X	Not covered (Engine dose not start)	

NOTE: 1) The system also includes a LED self-checking function. The five LED's and fuel system warning light should remain ON for about 2 seconds immediately after the ignition switch is turned on.

2) Fixed injection volume takes place when P_B and THROTTLE sensors are both faulty at the same time.

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TROUBLESHOOTING CHARTS

A. PRELIMINARY INSPECTIONS

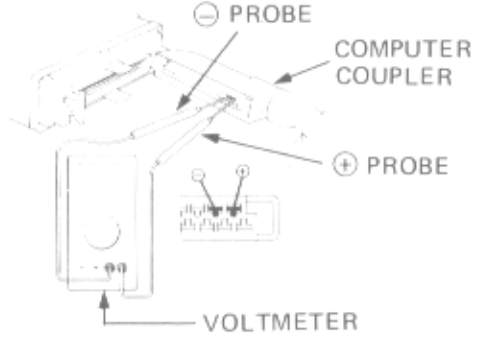
1. FUEL SYSTEM WARNING LIGHT

Only the FUEL SYSTEM WARNING LIGHT does not light when IGNITION SWITCH is turned ON.

Check if LED'S go OFF about 1.5 seconds after IGNITION SWITCH has been turned ON.

- WENT OFF → Check for blown BULB or loose contact in SOCKET.
  - → Repair or replace BULB.
- DO NOT GO OFF ↓

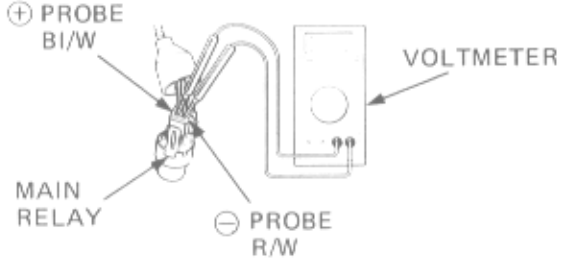
With IGNITION SWITCH ON, measure INPUT VOLTAGE to MICRO COMPUTER.



NOTE: Do not bend or widen coupler terminals.

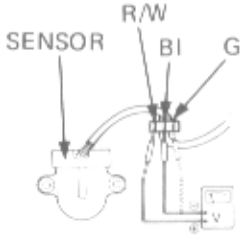
- NORMAL (BATTERY VOLTAGE) → Check COUPLER TERMINALS for loose contact.
  - NORMAL → Replace MICRO COMPUTER UNIT.
  - POOR CONTACT → Repair.
- NO VOLTAGE ↓

With IGNITION SWITCH ON, measure VOLTAGE between RED/WHITE and BLACK/WHITE terminals of MAIN RELAY COUPLER. 12 V should appear.



- NO VOLTAGE → Check MAIN RELAY and WIRE HARNESS for a broken wire or poorly contacted terminals.
  - → Replace MAIN RELAY; repair any faulty parts.
- NORMAL ↓

Measure VOLTAGES between TERMINALS of FUEL PUMP SHUT-OFF SENSOR COUPLER.



	STANDARD
R/W–G	0–1 V
BI–G	BATTERY VOLTAGE

- ABNORMAL → Check COUPLERS and WIRE HARNESSES for a broken wire or poorly contacted terminals.
  - NORMAL → Replace FUEL PUMP STOP SENSOR.
  - POOR CONTACTS OR WIRES BROKEN → Repair.
- NORMAL → Try with a new or good MICRO COMPUTER.

2. ENGINE DOES NOT START OR IS HARD TO START

Check the following items before using this charts.
1) Fuel level
2) Fuel valve on
3) Ignition switch on
4) Engine auto stop switch on
5) Starting motor is in good condition
6) That crankshaft is turned by starting motor
7) Spark plug condition

WARNING

Observe the following when performing the spark test:
- *Fuel is sprayed from the injector as sufficient speed to squirt into your eyes. Keep your face well away from the spark plug hole when the existing plug is used to perform this test. If possible, do not remove the spark plug but use a spare spark plug instead when troubleshooting.*
- *Keep away from open flames or sparks away from the work area.*
- *Purge the cylinder of the residual gasoline by cranking 2 to 3 seconds with the engine stop switch and fuel valve OFF.*

Check that the FUEL SYSTEM WARNING LIGHT goes OFF about 1.5 seconds after the Ignition Switch has been turned ON.
— REMAINS ON → Check LED'S on Micro Computer.
NORMAL → Listen for Injector "CLICK" (Page 24-17).

WENT OFF

Check that FUEL PUMP 'chatters' for about 3 seconds after Ignition Switch is turned ON.
— PUMP 'CHATTERS' → FUEL PRESSURE INSPECTION CHART (Page 24-7).

OPERATING NOISE NOT HEARD

Disconnect Fuel Pump Coupler and apply battery voltage between the Brown and Green Terminals of the COUPLER.
— PUMP WON'T OPERATE → Replace FUEL PUMP.

PUMP ROTATED

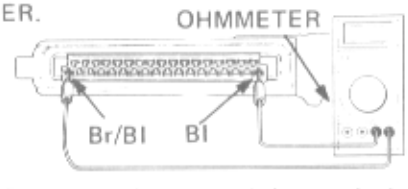
Check that VOLTAGE is applied to PUMP HARNESS COUPLER for about 3 seconds after Ignition Switch is turned ON.
— VOLTAGE APPEARS → Check Wiring and COUPLER for loose connection, poor contact or a broken wire.
NORMAL → Repair or replace FUEL PUMP.
ABNORMAL → Repair or replace HARNESS or COUPLER.

VOLTAGE DOES NOT APPEAR

Measure VOLTAGE between Brown/Black terminal of FUEL PUMP RELAY COUPLER and BODY GROUND. There should be 0–1 V for about 3 seconds after the Ignition Switch is turned ON, and thereafter BATTERY VOLTAGE should appear.
NOTE: Engine stop switch should be ON.
— NORMAL → Check for short or open circuit in HARNESS between RELAY and FUEL PUMP. → Inspect FUEL PUMP RELAY (Page 24-26).
Replace or repair wire harness.

ABNORMAL

Disconnect MICRO COMPUTER COUPLER and check for continuity between BROWN/BLACK and BLACK TERMINALS of WIRE HARNESS SIDE COUPLER.
— NO CONTINUITY → Open circuit in WIRE HARNESS.



NOTE: Do not bend or expand the terminals.

CONTINUITY EXISTS

Check that Battery Voltage appears at MICRO COMPUTER with ignition switch ON (Page 24-5).
— NO VOLTAGE → Repair or replace WIRE HARNESS.

VOLTAGE APPEARS → Try with a new or good MICRO COMPUTER.

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2-1 INJECTOR OPERATING NOISE

With IGNITION SWITCH ON, listen for INJECTOR 'CLICK' by opening and closing THROTTLE GRIP rapidly. INJECTORS should remain silent when THROTTLE GRIP is opened slowly (Page 24-17).

→ "CLICK" HEARD → Proceed to 2-2 FUEL PRESSURE.

NO "CLICK" HEARD

Check that Battery Voltage appears at MICRO COMPUTER with ignition switch ON (Page 24-5).

→ NO VOLTAGE → Repair or replace WIRE HARNESS.

VOLTAGE APPEARS

→ Try with a new or good MICRO COMPUTER.

2-2 FUEL PRESSURE

WARNING

Attach a pressure gauge with the ignition switch OFF. The fuel lines still hold pressure even if the ignition switch is turned OFF. Be sure to release the pressure before attaching the fuel gauge. For installation of the fuel pressure gauge, see page 24-27.

Attach a fuel pressure gauge and measure FUEL PRESSURE (Page 24-17).

→ NORMAL → Proceed to 1-3 IGNITION TIMING.

ABNORMAL

Check FUEL STRAINER and FUEL FILTER for clogging.

→ CLOGGED → Clean STRAINER or replace FILTER.

NOT CLOGGED

With the FUEL PUMP removed from frame, measure the amount of FUEL DELIVERY (Page 24-28).
NOTE: Battery voltage should be enough to turn starter motor.

→ INCORRECT → Replace FUEL PUMP.

NORMAL

Check FUEL PIPE between FUEL TANK and PUMP for bending, clogging or leakage.

→ BENT, CLOGGED OR LEAKING → Repair or replace FUEL SUPPLY LINE.

NORMAL

→ Replace PRESSURE REGULATOR and recheck fuel pressure.

2-3 IGNITION TIMING

Using a stroboscopic timing light, check that "FI" MARK on FLYWHEEL aligns with index mark on crankcase (Page 20-3).

→ NOT ALIGNED → Check ignition timing related sensors.
- Ne, Ns, θth, P_B, Tw sensors

NORMAL

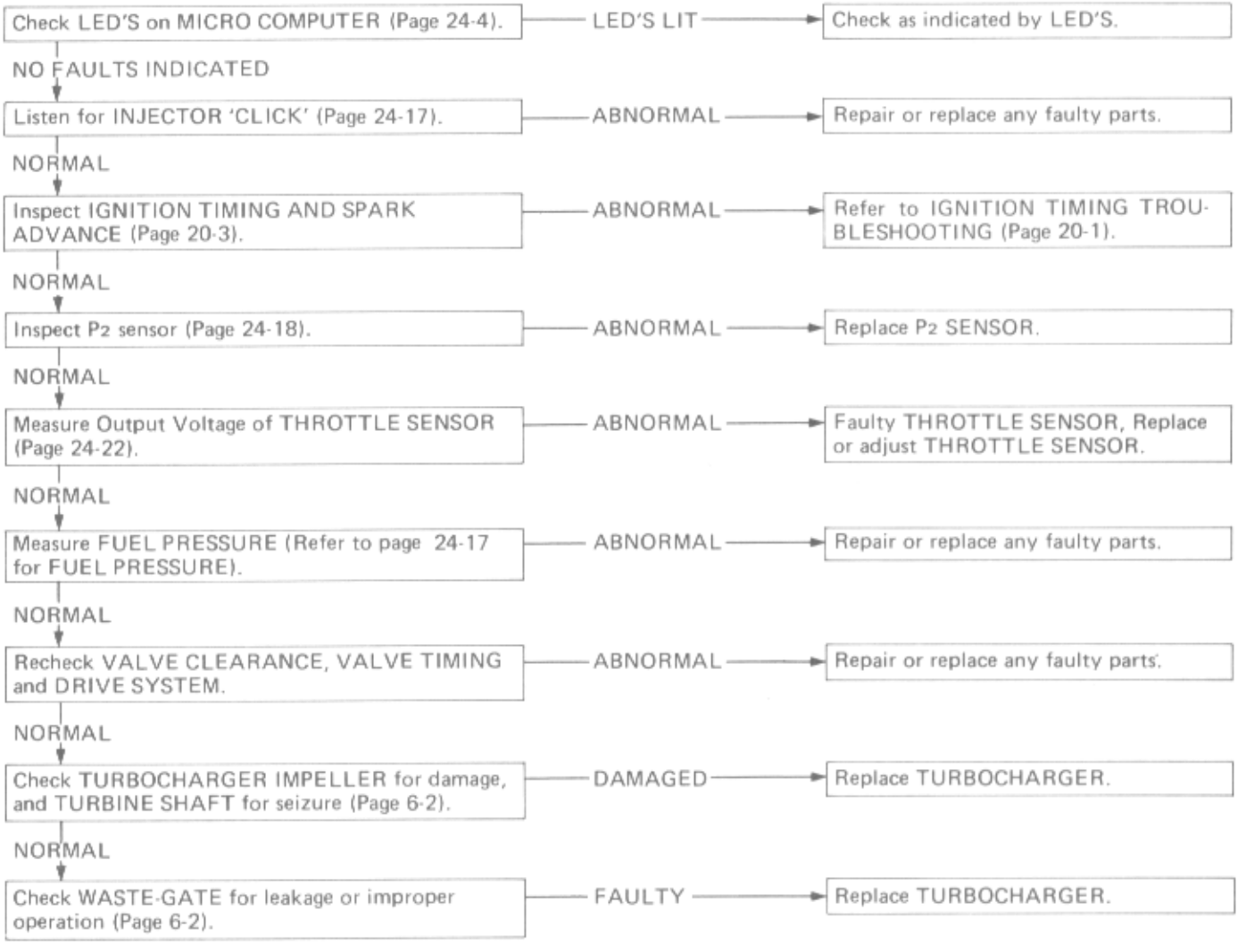
→ Recheck with a new or known good MICRO COMPUTER or SPARK UNIT.

ALIGNED

Test CYLINDER COMPRESSION (Page 13-19).

3. LOSS OF POWER/POOR ACCELERATION

Check the following items before using this chart.
1) Fouled or clogged air cleaner
2) Tire pressure
3) Brake dragging
4) Spark plugs
5) Cylinder compression



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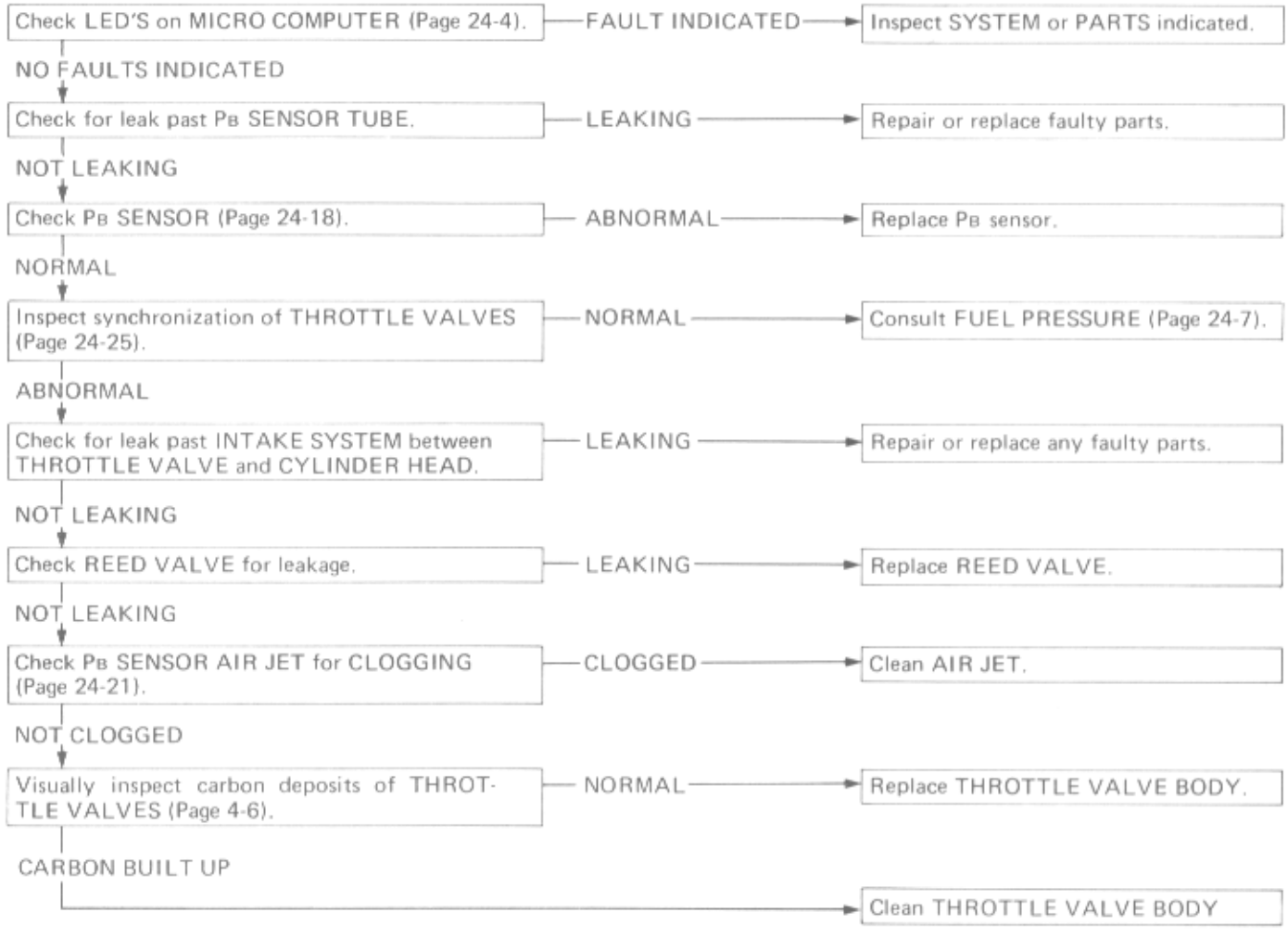
4. POOR PERFORMANCE AT LOW AND IDLE SPEEDS

Check the following items before using this chart. Check air valve if fast idel is erratic.

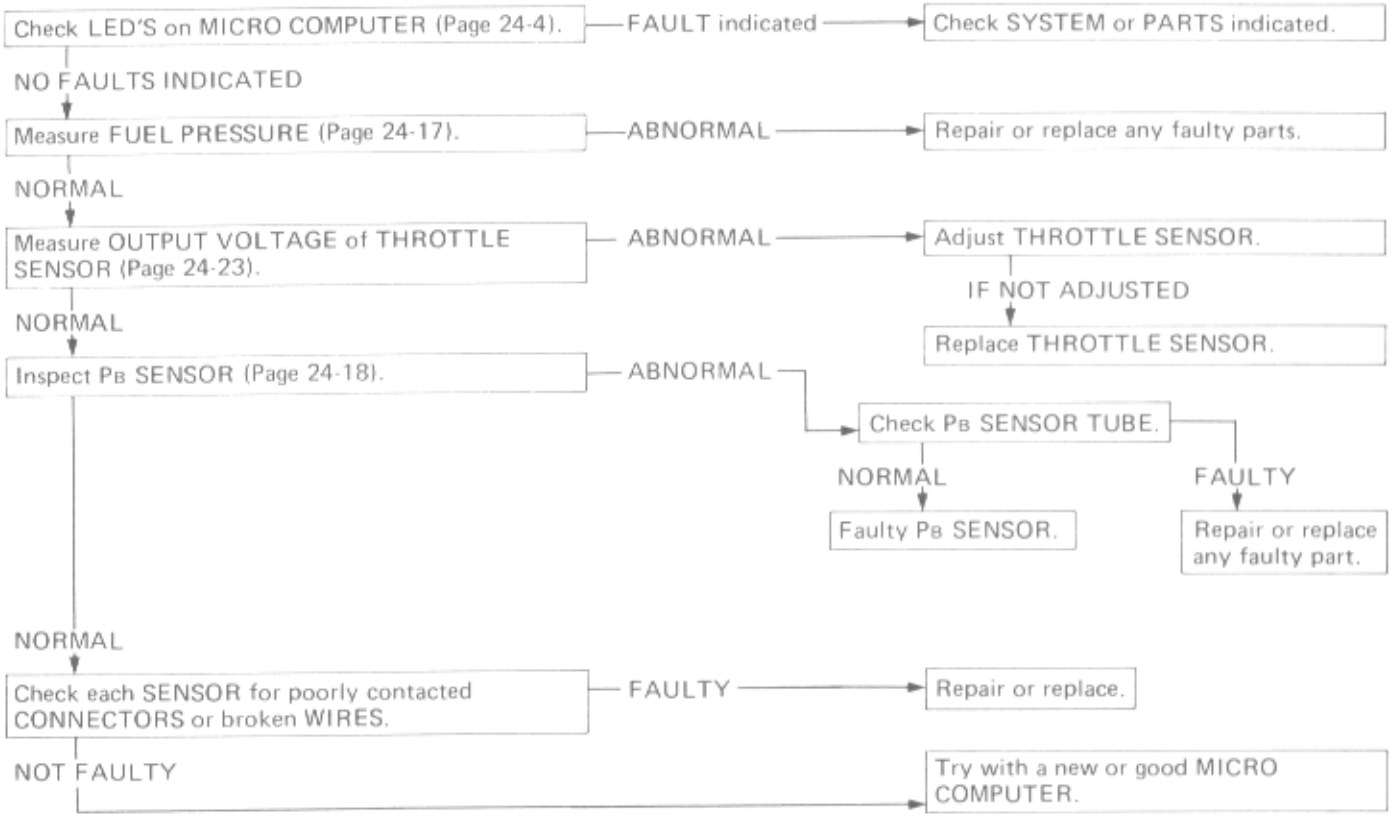
1) Spark plugs
2) Idle speed
3) Compression (valve clearance)
4) Fouled or clogged air cleaner
5) Loose battery terminals
6) Poorly connected ground (engine side)



5. POOR PERFORMANCE AT MEDIUM AND HIGH SPEEDS

Check the following items before using this chart.

1) Clogged air cleaner
2) Spark plugs
3) Routing of sensor tubes
4) Loose battery terminals
5) Poorly connected ground



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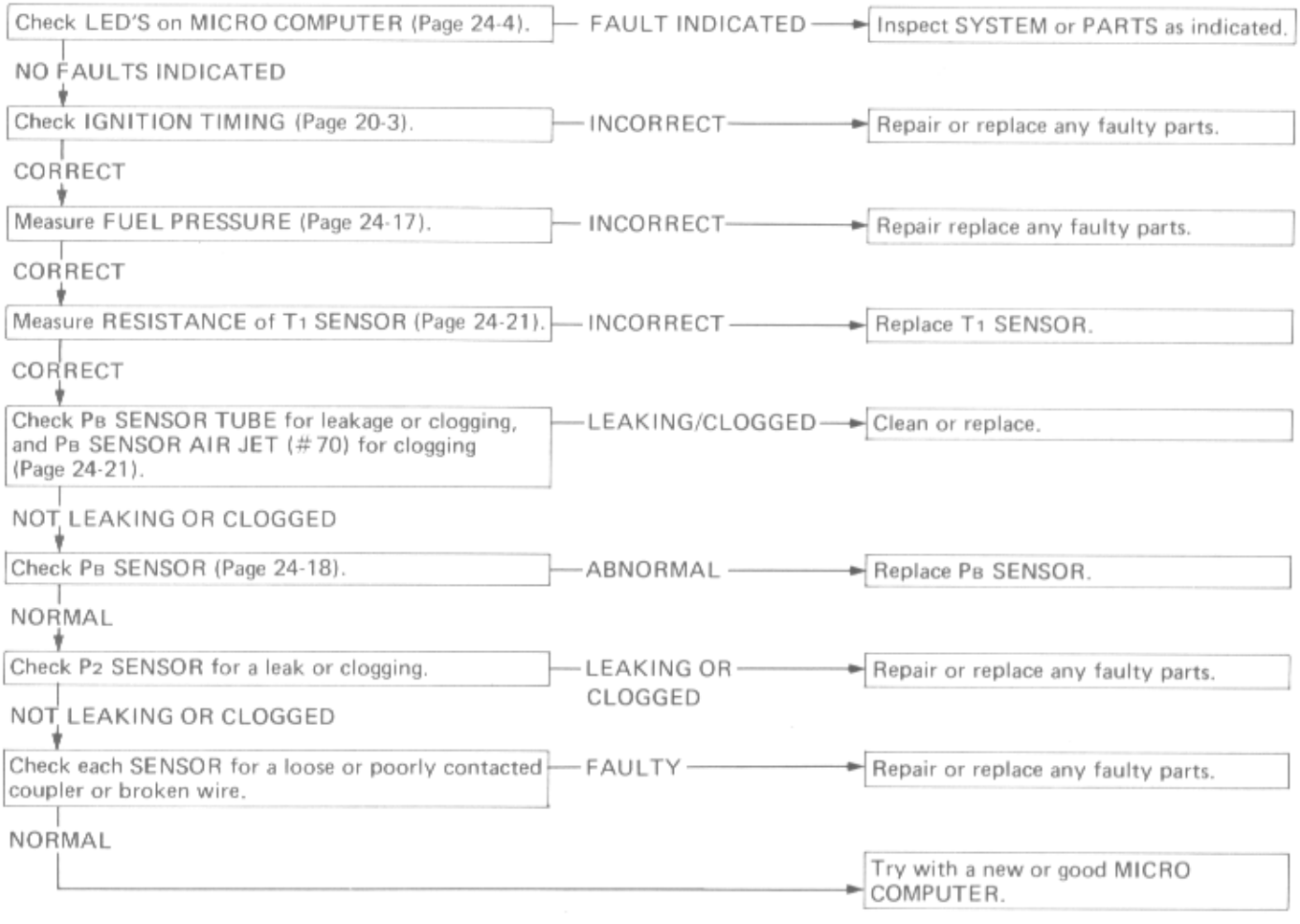
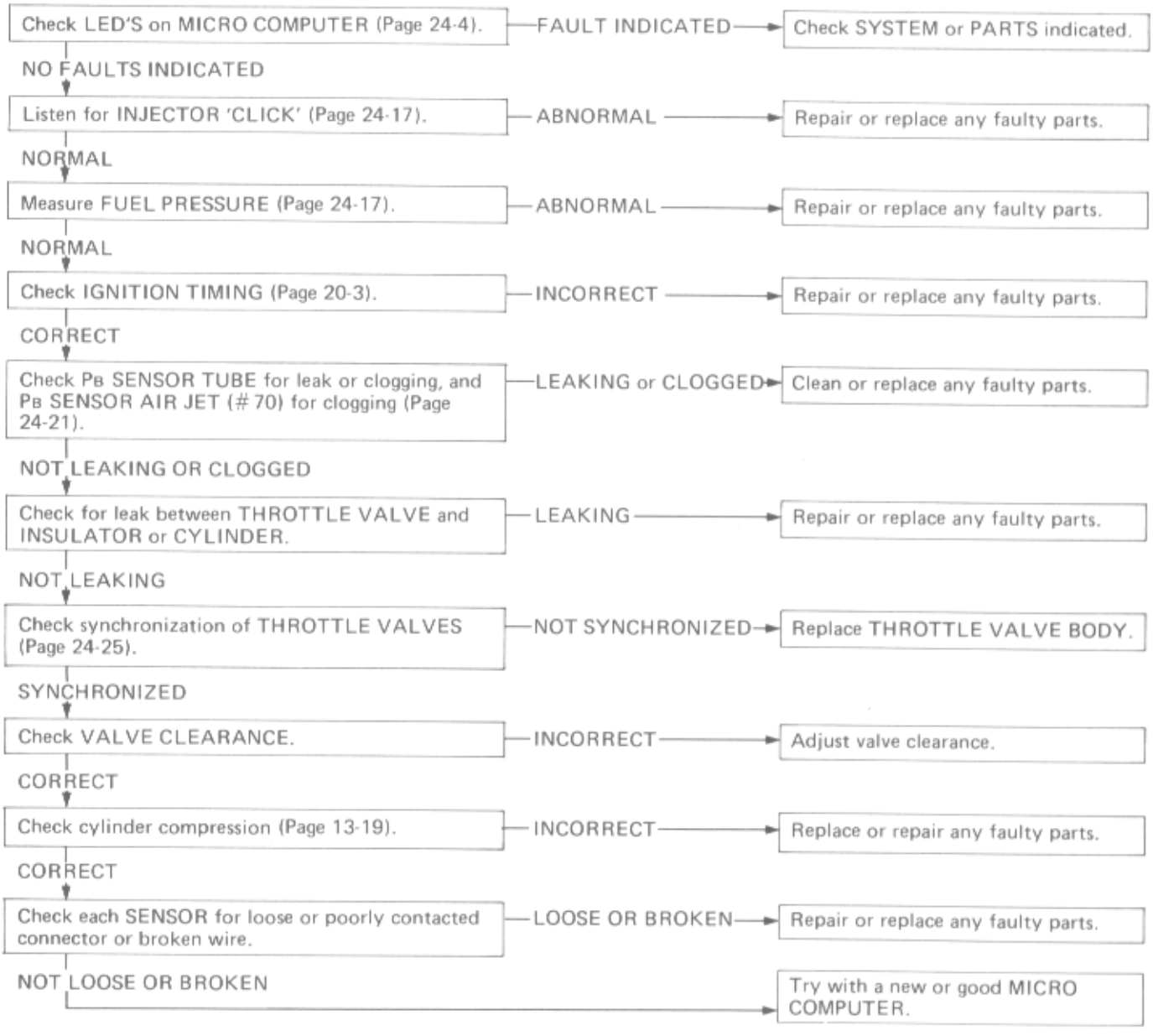
6. AFTERFIRE

Check the following items before using this chart.
1) Spark plugs
2) Valve clearance



7. BACKFIRE

Check the following item before using this chart.
1) Spark plugs
SPECIFIED SPARK PLUGS: DPR8EV-9 (NGK)
X24EPR-GU9 (ND)



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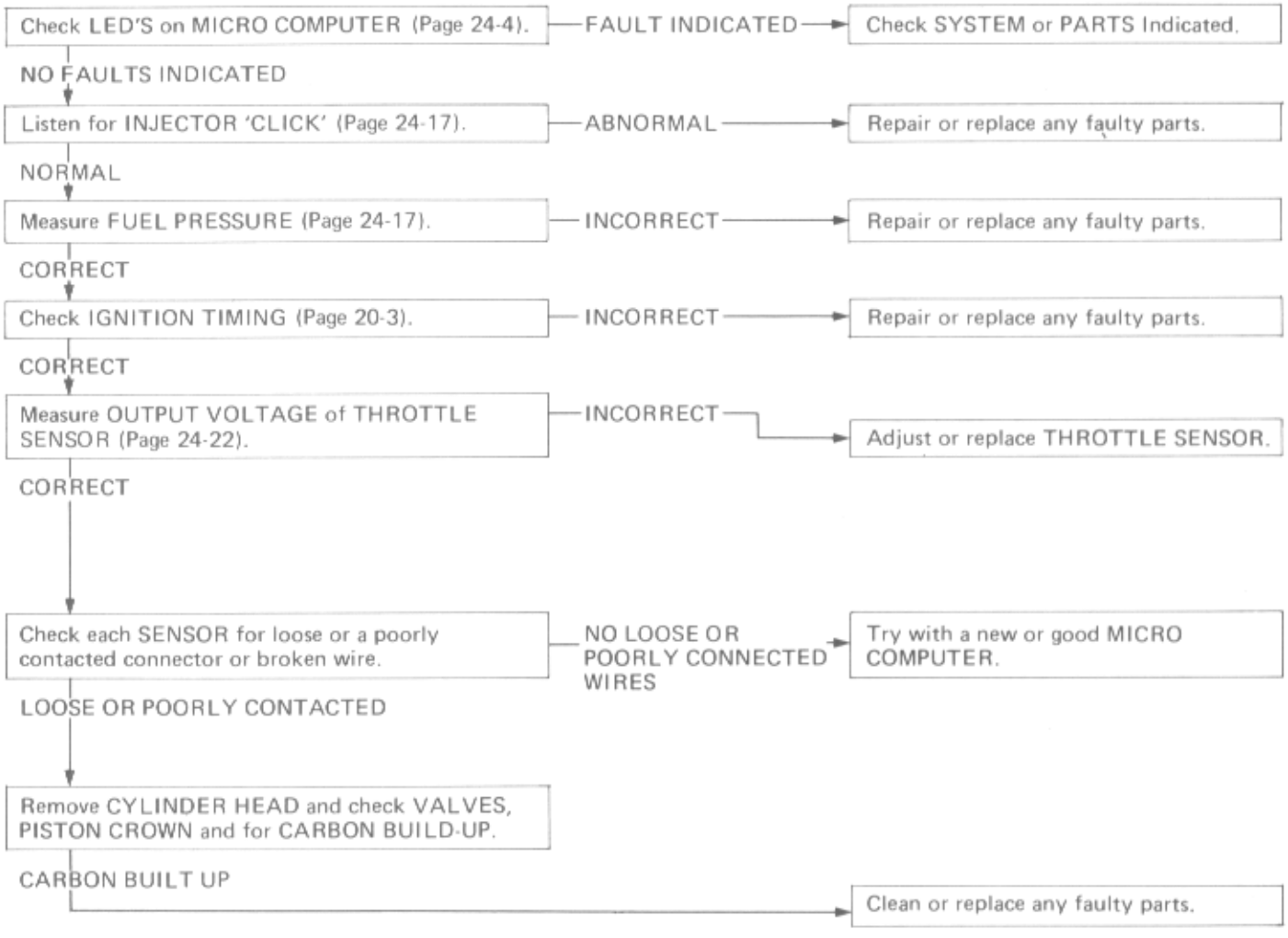
8. KNOCKING

Check the following items before using this chart.
1) Octane rating of fuel (89 or higher pump octane or 94 RON).
2) Spark plugs



9. POOR ENGINE BRAKING

Check ENGINE IDLE SPEED: 1,100 ± 100 rpm. — INCORRECT → Adjust IDLE SPEED.

CORRECT ↓

Check if REED VALVE BYPASS HOLE in AIR CLEANER CASE for clogging. — CLOGGED → Clean bypass hole.

10. ABNORMAL NOISES (AROUND TURBOCHARGER)

Check the following items before troubleshooting:
- Leakage past intake pipe joints

Remove TURBOCHARGER and inspect for:
- Binding between IMPELLER and CASING
- Excessive play of IMPELLER SHAFT

— ABNORMAL → Replace TURBOCHARGER.

NOTE

* Abnormal noise when downshifting:
  – Pressure leakage between turbocharger and air cleaner.
  – Faulty reed valve.
* Abnormal noises other than when downshifting:
  – Impeller binding against casing.

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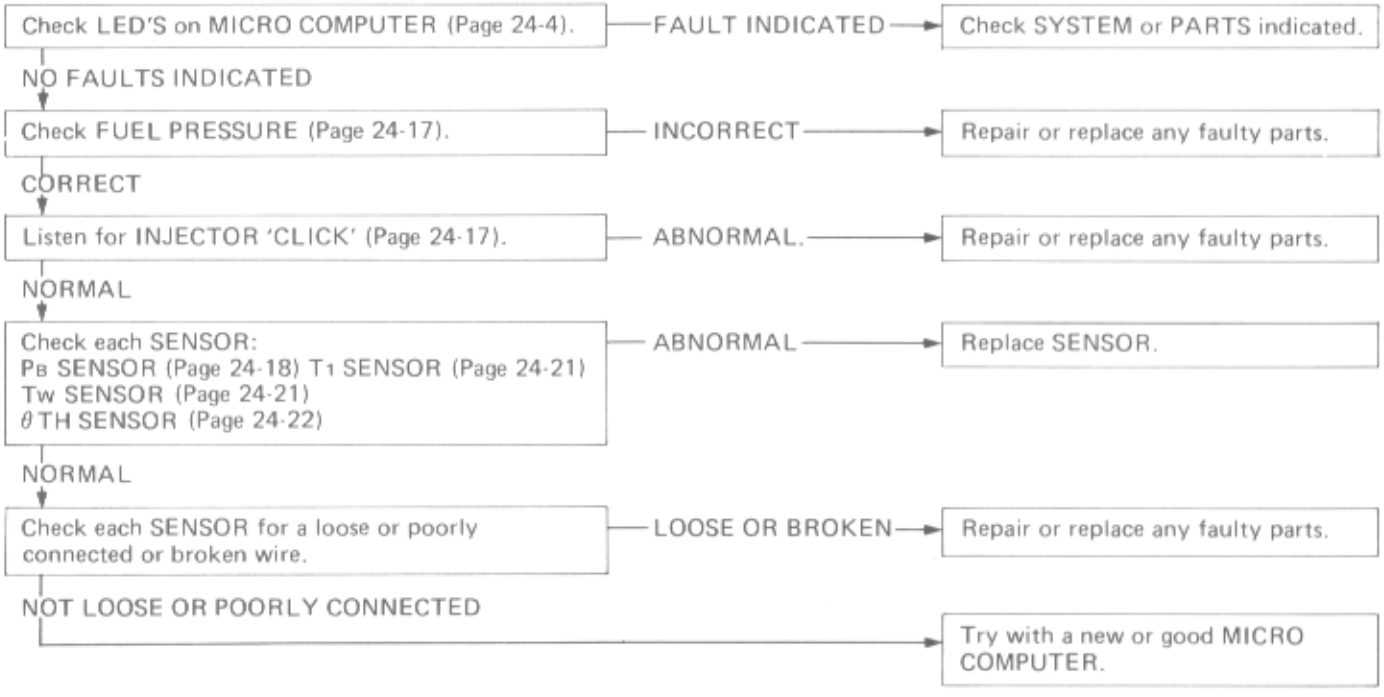
11. EXCESSIVE BLACK SMOKE

Check the following items before using this chart.
1) Engine is at operating temperature.
2) Spark plug condition.

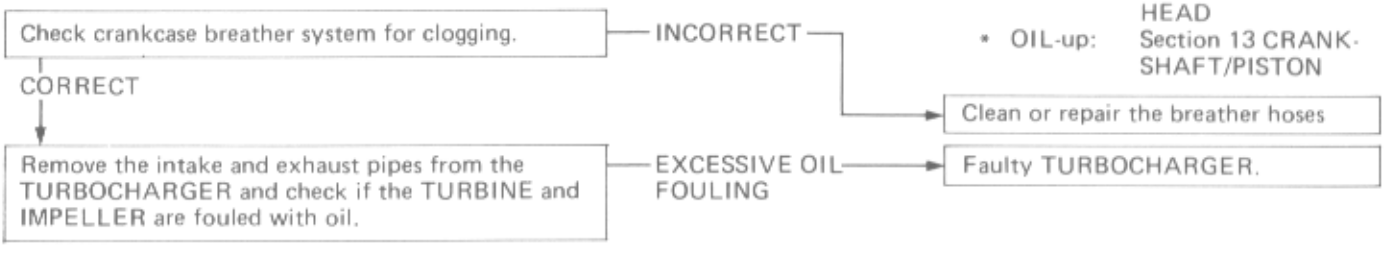


12. WHITE SMOKE

Check the following items before troubleshooting:
- Engine oil level.
- Spark plug condition.

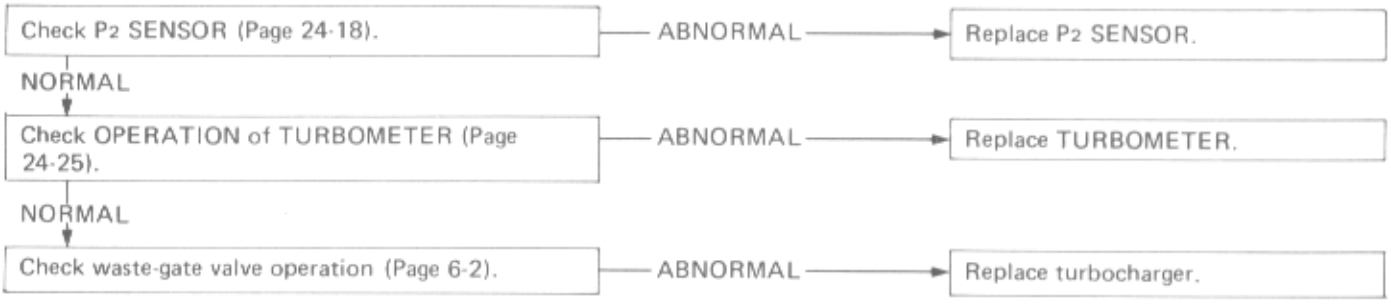
NOTE

Refer to ENGINE TROUBLESHOOTING CHART for the engine:
- Oil-down: Section 7 CYLINDER HEAD
- OIL-up: Section 13 CRANKSHAFT/PISTON



13. TURBOCHARGER WARNING LAMP GOES ON WHILE RUNNING

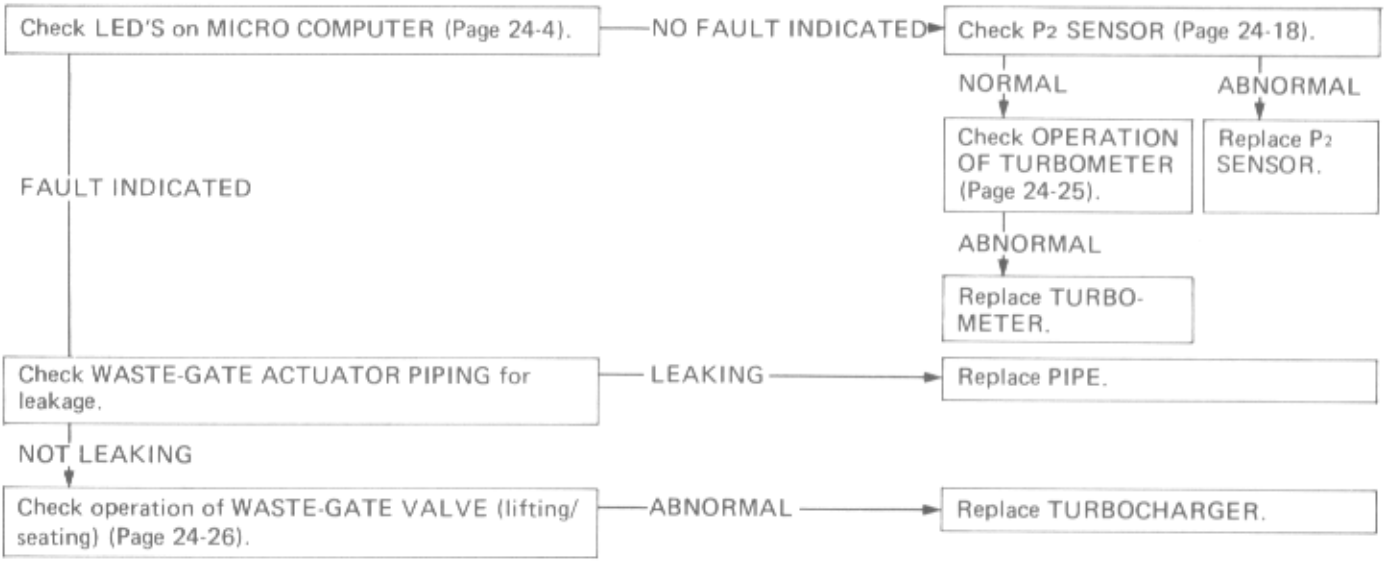
If it remains lit:



If it goes OFF after being lit:

NOTE

It is normal for the warning lamp to light for a moment when accelerating or decelerarating.



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B. SYSTEM INSPECTIONS/ SPECIFICATIONS

1. FUEL PRESSURE

With the engine stopped, turn the ignition switch ON. The fuel pump is normal if it operates for about 3 seconds as indicated by operating noise. To recheck the fuel pressure, turn the ignition switch OFF.

NOTE

Fuel pressure can be felt by pinching the fuel return hose between your fingers.

Place a shop towel around the fuel line and remove the check plug from the banjo bolt slowly.

WARNING

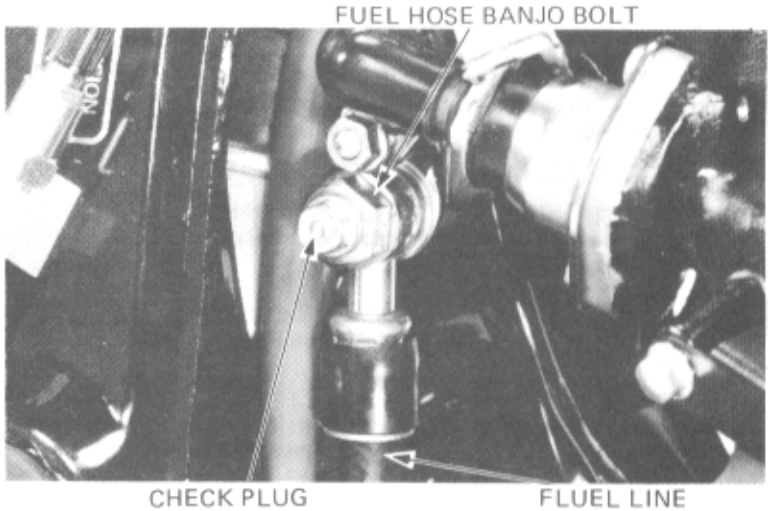
The fuel line is pressurized. Be sure to place a shop towel around the fuel line, and remove the check plug from the banjo bolt slowly.

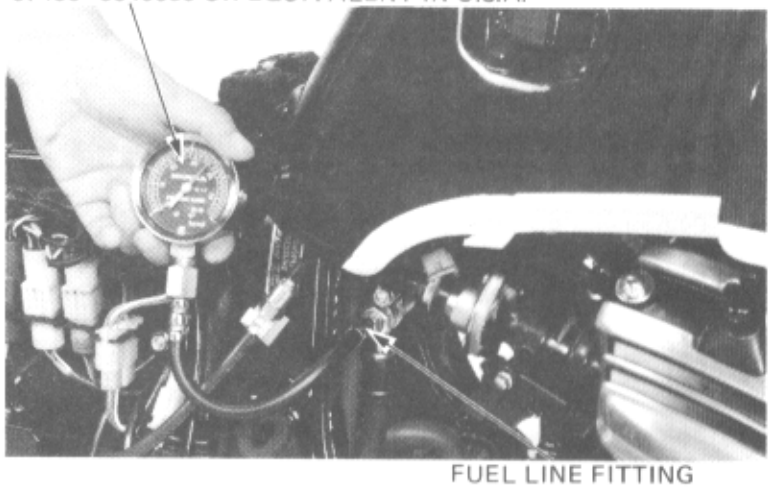
Attach the pressure gauge (No. 07406–0040000) to the banjo bolt fitting. Measure the fuel pressure by turning the ignition switch ON.

STANDARD:
Ignition switch ON with engine stopped:
240–270 kPa (2.4–2.7 kg/cm^2, 34–38 psi)
Idle:
200–240 kPa (2.0–2.4 kg/cm^2, 28–34 psi)

CAUTION

Replace the aluminum washer with a new one whenever it is removed.

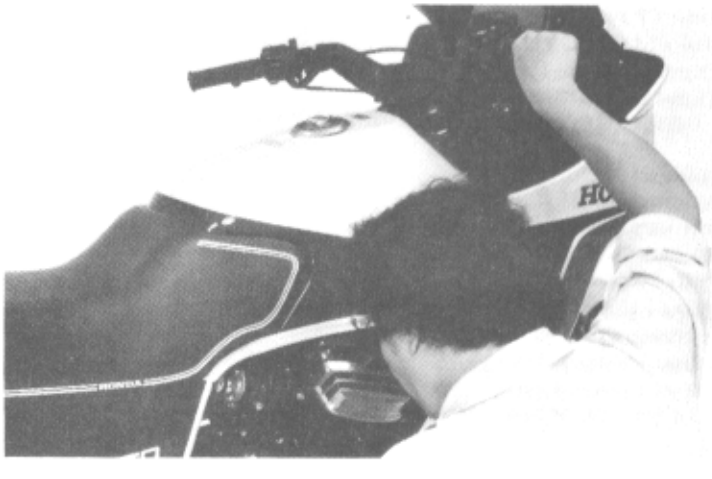




2. FUEL INJECTOR

FUEL INJECTOR NOISE

With the engine stopped, turn the ignition switch ON. The injector is normal if it 'clicks' when the throttle is opened. It should remain silent when the throttle is opened slowly.



NOTE

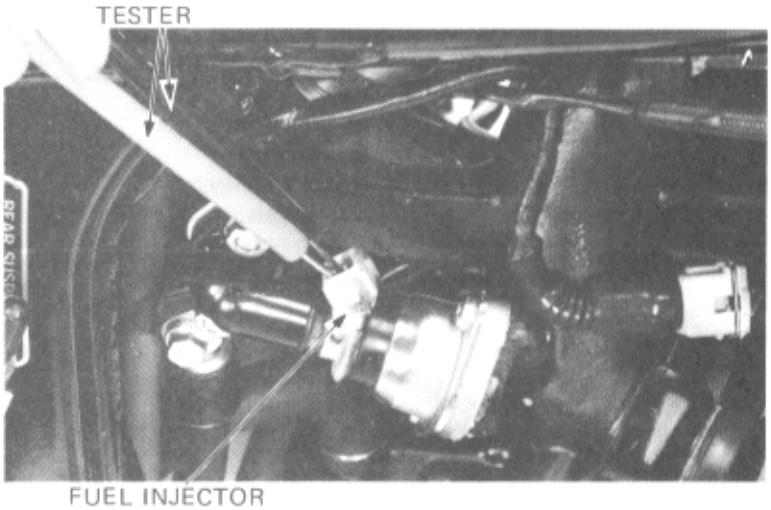
Should the LED's indicate that the injectors are faulty, first check that the couplers are connected securely and that the injector wires are not damaged.

With the engine stopped and ignition switch turned ON, check the coupler for continuity by observing the ECU LED's.

With the engine stopped and ignition switch turned ON, listen for plunger noise by opening the throttle quickly.

Turn ignition switch off. Disconnect the injector coupler and measure the resistance between the terminals as shown.

STANDARD: 1.0–3.0 Ω



FUEL INJECTOR

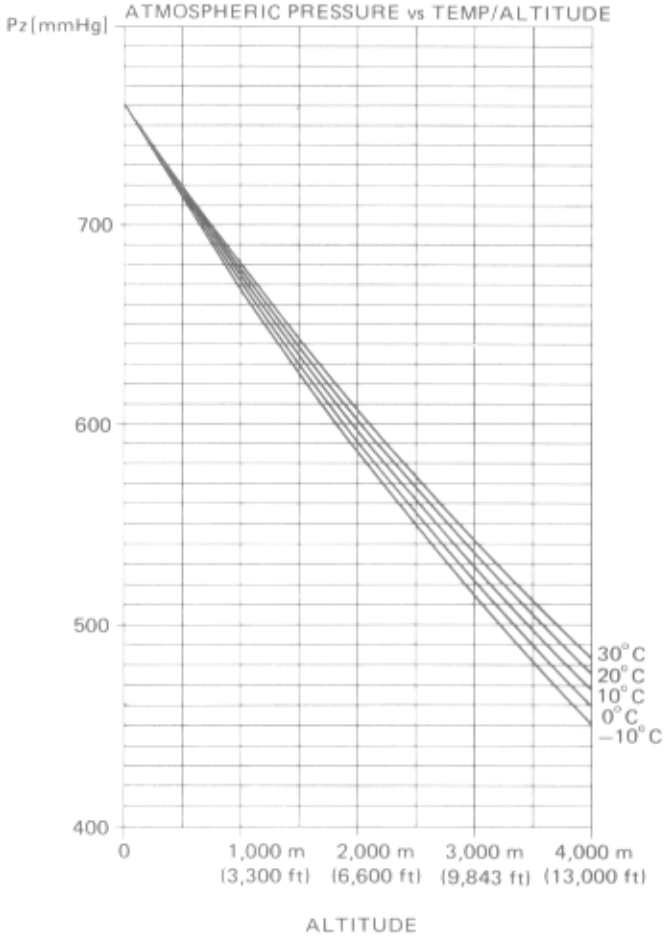
3. PRESSURE SENSORS

After taking measurements, they must be compensated for atmospheric pressure and temperature as follows.

(1) Obtain the atmospheric pressure Pz at the altitude Zm from the chart on the right. If available, use a barometer.
(2) Compensate the reading for atmospheric pressure using the formula below:
   P_B sensor: Voltage reading + [correction factor of 0.004444 multiplied by (760–Pz)]
   P_2 sensor: Voltage reading + [correction factor of 0.002667 multiplied by (760–Pz)]
(3) The sensor is normal if the result falls within the specified value.

(Example 1)
Conditions:
Altitude: 1,500 m (5,000 ft)
Temperature: 20°C (68°F)
Unit: P_2 sensor
Type of test: DYNAMIC
Output voltage: 0.85 V
Output compensation:
0.85 + [0.002667 (760–640)] = 1.17 V

(Example 2)
Conditions:
Altitude: 900 m (3,000 ft)
Temperature: 30°C (86°F)
Unit: P_B sensor
Type of test: STATIC TEST with negative pressure of 345 mmHg applied
Output voltage: 1.69 V
Output compensation:
1.69 + [0.004444 (760–690)] = 2.00 V



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Static Test:

NOTE

Be sure the battery is fully charged before starting the static test.

Remove the fuel tank, (section 4).
Disconnect the fuel pump wire couplers located under the right side cover.

WARNING

The fuel pump coupler must be disconnected to prevent gasoline from being pumped out of the fuel hoses if the ignition switch is turned on. Which would cause a fire hazard.

Disconnect the P_2 or P_B sensor pressure tube from the throttle valve body. Plug the tube. Install the plugged tube to the hose joint of the throttle valve body.

Connect the combination pressure tester (No. 07406–0050000) or a hand vacuum pump (or a pressure pump) to the sensor as shown. Connect the inspection adapter (No. 079999–MC70000) to a digital circuit tester. (No. 07411–0020000).
Connect the **PINK** lead of the inspection adapter to the positive (+) probe of a digital circuit tester, and **GREEN** lead to the negative (–) tester probe. With the ignition switch ON, measure the input voltages for each sensor.

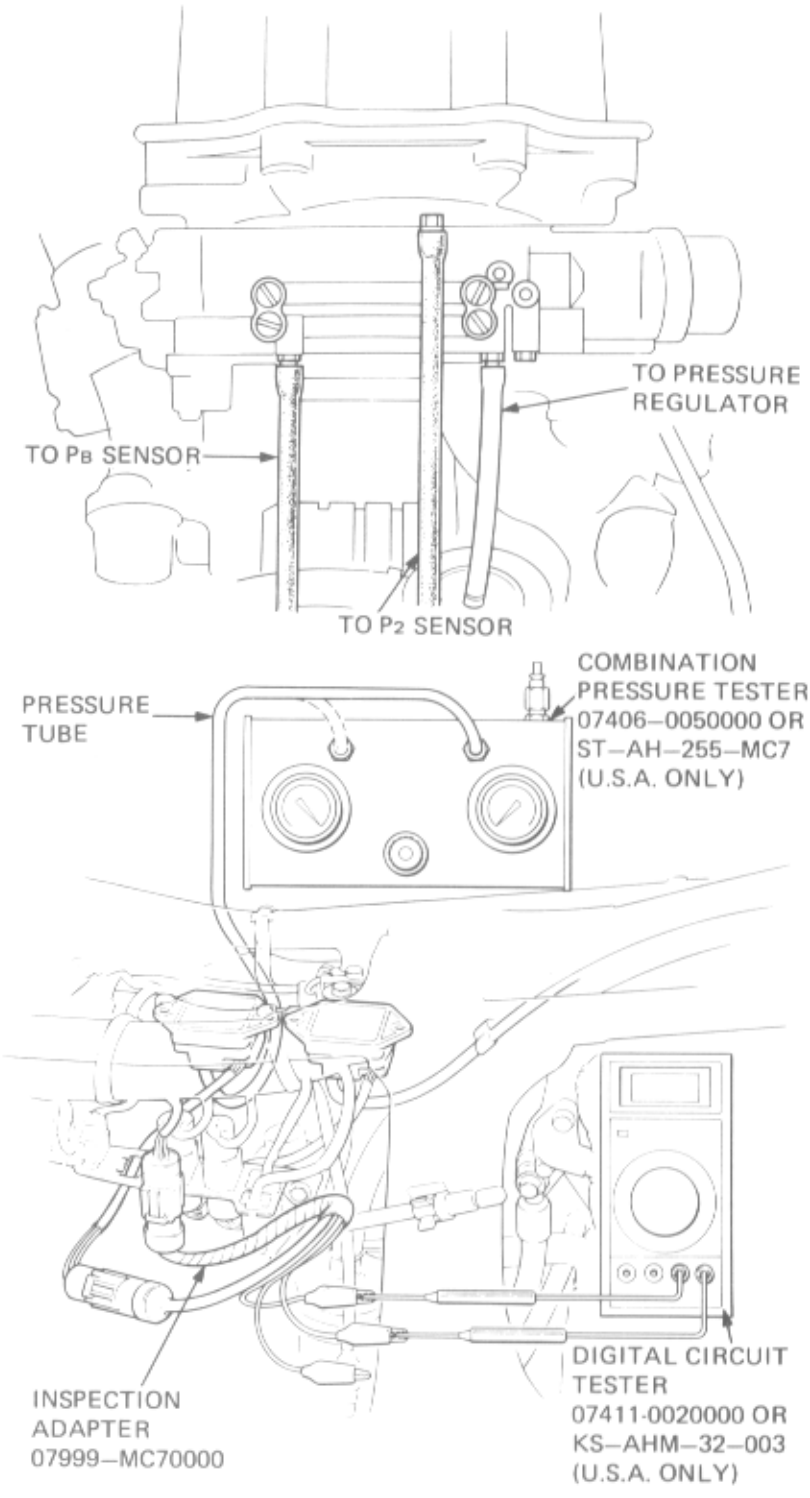
INPUT VOLTAGE (P_2 and P_B sensors): 4.75–5.25 V

Connect the **WHITE** lead of the inspection adapter to the positive (+) tester probe, and **GREEN** lead to the negative (–) tester probe.

With the engine stopped and ignition switch ON, measure the output voltages for each sensor as shown in the test chart.

CAUTION

Be sure to turn the ignition switch OFF after the measurements have been done. Failure to turn the ignition switch OFF can cause damage to the micro computer when the adapter terminal contacts the frame or other terminals.



SENSOR	TEST PROBE		PRESSURE	TEST PRESSURE				OUT PUT VOLTAGE
	+	–		mmHg	kPa	kg/cm²	psi	
P_2 (YELLOW COUPLER)	White	Green	NEGATIVE	250	33	0.34	4.84	0.4–0.6 V
			POSITIVE	735	98	1.00	14.1	2.9–3.5 V
P_B (BLUE COUPLER)	White	Green	NEGATIVE	345	46	0.47	6.67	1.7–2.1 V
			POSITIVE	59	8	0.08	1.14	2.9–3.4 V

NOTE

- Should the LED's indicate that the P_2 or P_B sensor is faulty, first make sure that the sensor couplers are engaged securely and are in good order.
- Check that the sensor tubes are not bent, clogged or damaged.
- To measure voltages, use a KOWA DIGITAL CIRCUIT TESTER (No. 07411–0020000) or another tester with 1% accuracy.

Dynamic Test:

With the ignition switch OFF, disconnect the sensor coupler from the wire harness coupler (yellow for the P_2 sensor and blue for the P_B sensor).

Connect the inspection adapter (No. 07999–MC70000) between the couplers.

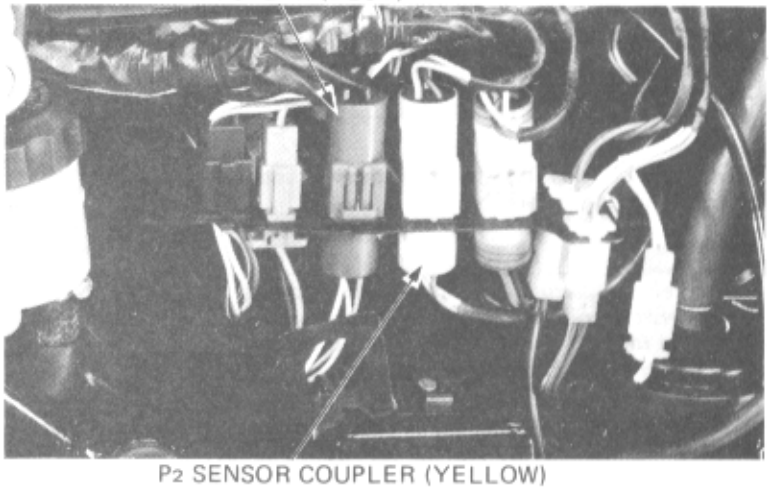
Connect the tester probes to the adapter wires according to the instructions described in the test chart below.

CAUTION

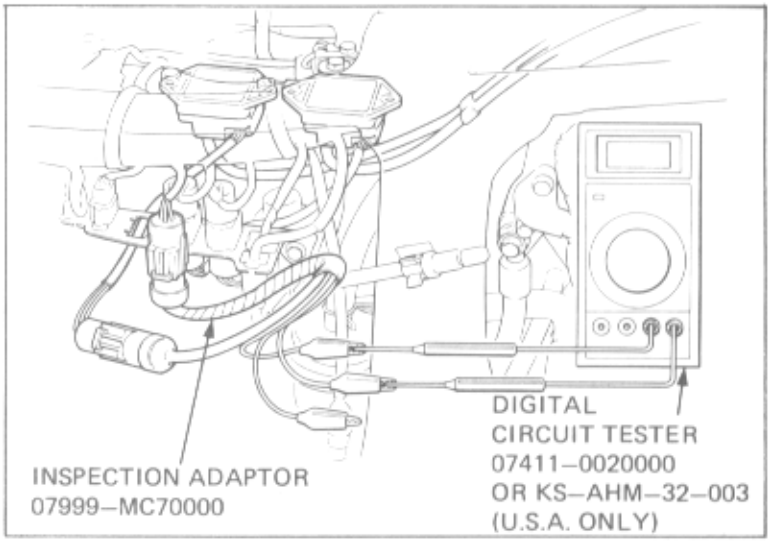
Be sure to turn the ignition switch OFF after taking measurements. Failure to turn the ignition switch OFF can cause damage to the micro computer when the adapter terminal touchs the frame or other terminals.

Turn the ignition switch ON and measure the output voltages.

P_B SENSOR COUPLER (BLUE)



P_2 SENSOR COUPLER (YELLOW)



SENSOR	INPUT VOLTAGE (Between **Pink** wire with (+) probe and **Green** wire with (–) probe)	OUTPUT VOLTAGE (Between **White** with (+) probe and **Green** with (–) probe)	
		At Engine OFF, Ignition ON	At Idle speed (1,100 rpm)
P_2	4.75–5.25 V	1.09–1.29 V	———
P_B		3.13–3.73 V	2.0–3.0 V

Measure the output voltage of the P_B sensor with the engine at idle speed.

After taking measurements, compensate for the atmospheric pressure and temperature (Page 24-18).

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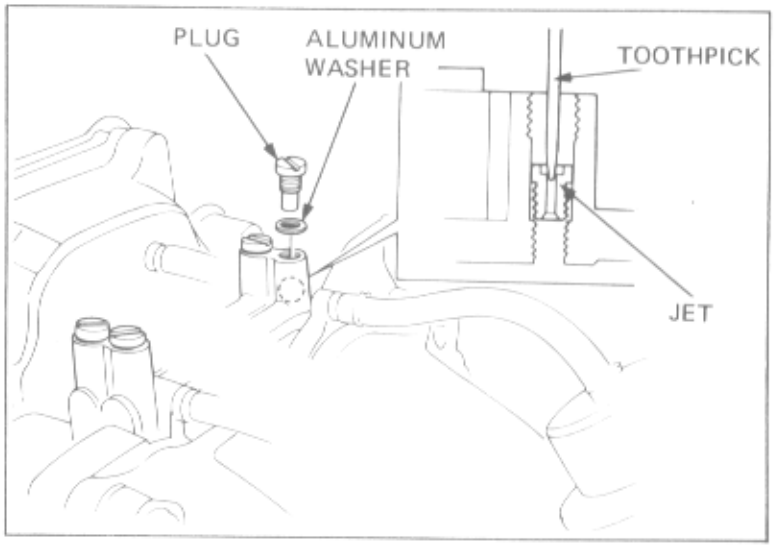
Pressure Sensor Orifices and Jets:

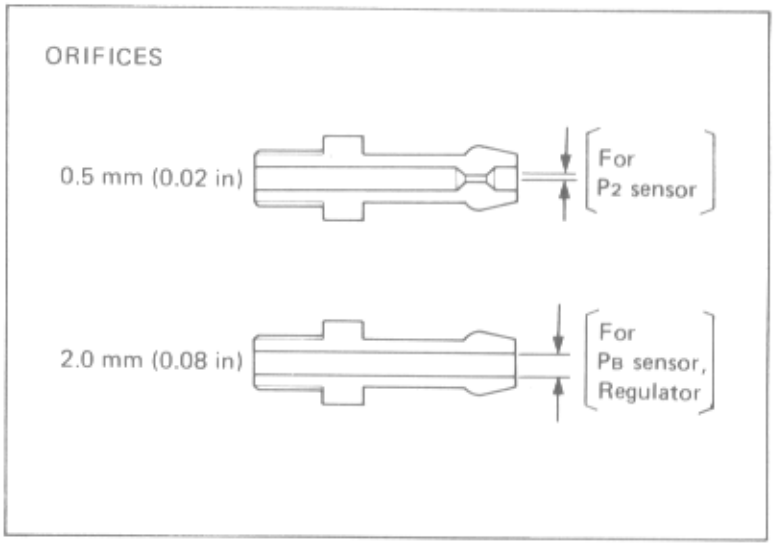
Remove the orifices and jets from the throttle valve body. Check for clogging and blow open all passages with compressed air.

NOTE

Mark the orifices and jets during disassembly so that they can be reinstalled in the same place they were removed from.

P_2 sensor tube: 0.5 mm orifice
P_B sensor tube: 2.0 mm orifice



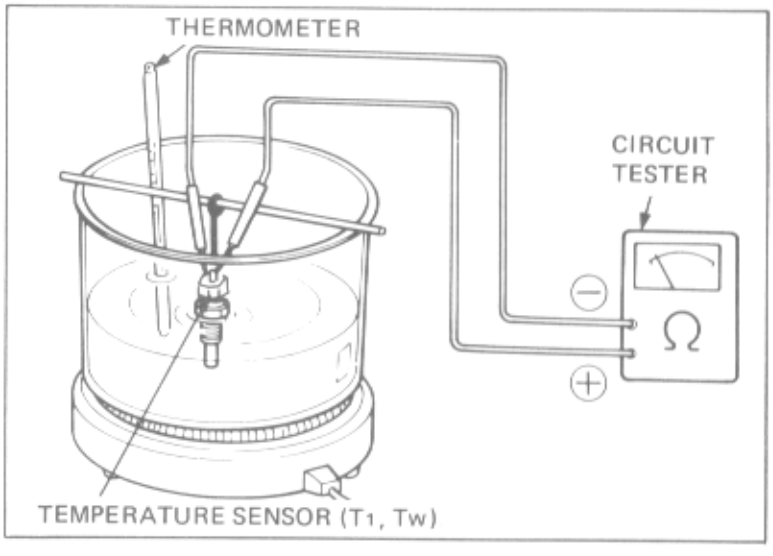


4. TEMPERATURE SENSORS (T_1, T_W)

With the engine stopped and ignition switch ON, check for loose, open or shorted wires or connectors by observing the ECU LED's.

Measure resistances between the terminals:

Water Temperature	Resistance (KΩ)
20°C (68°F)	2–3
80°C (176°F)	0.2–0.4



5. ENGINE SPEED (Ne) SENSOR

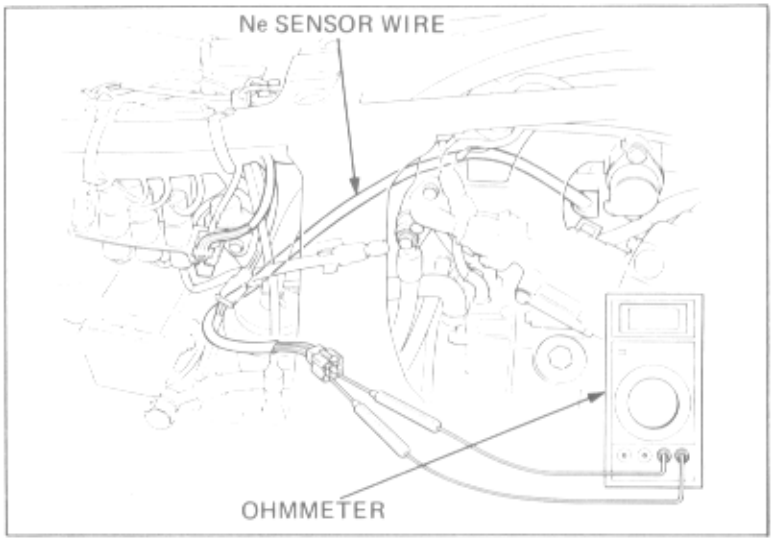
With the engine stopped and ignition switch ON, check for loose, open or shorted wires or connectors by observing the ECU LED's.

Disconnect the coupler and measure the resistance between the terminals.

STANDARD: 100–250 Ω

Measure the resistance between either terminal and ground.

STANDARD: ∞ Ω

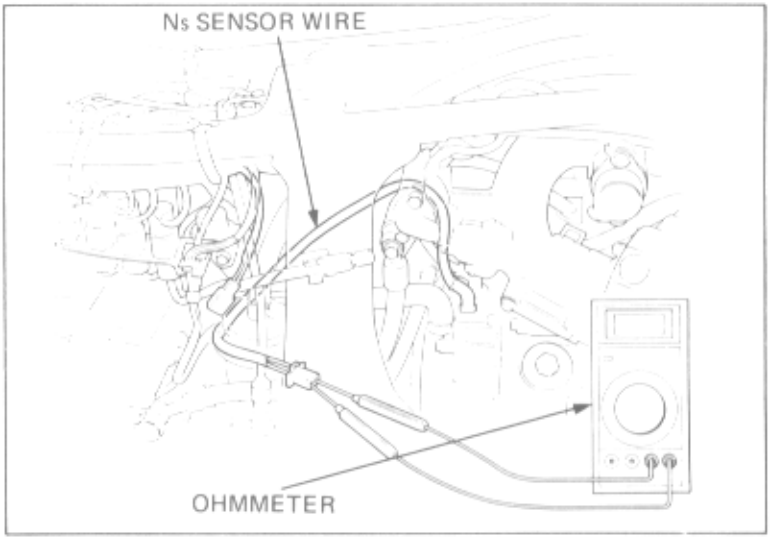


6. CRANKSHAFT ANGLE (Ns) SENSOR

Disconnect the 3-P coupler of the Ns sensor wire. Measure the resistances between the **YELLOW** and **WHITE** terminals.

STANDARD: 85–115 Ω AT 20°C (68°F)

Check the pulse generator if the readings are out of specification.



7. THROTTLE (θth) SENSOR

With the engine stopped and ignition switch ON, check for loose, open or shorted wires or connectors by observing the ECU LED's.

Remove the fuel tank.

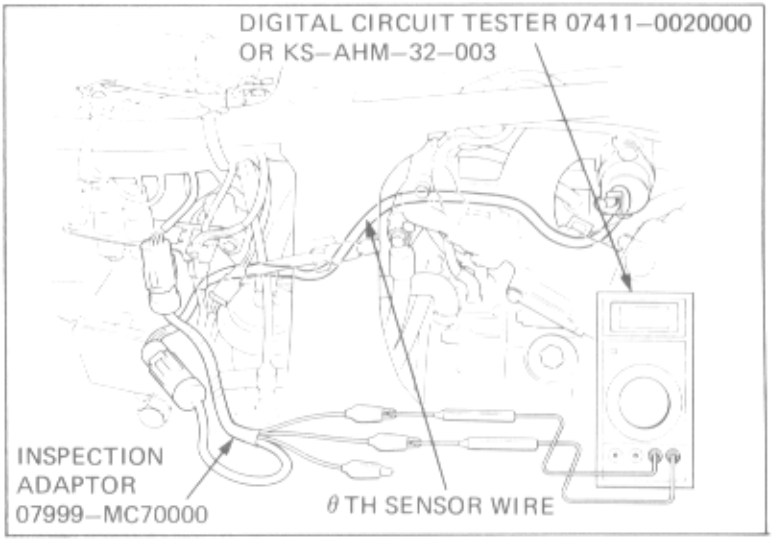
Remove the throttle sensor coupler and attach an inspection adapter (No. 07999–MC70000) to the sensor and connect the tester probes to the adapter leads as follows:

Input side: Negative probe to **GREEN**, and positive probe to **PINK**

Output side: Negative probe to **GREEN**, and positive probe to **WHITE**

Measure the input voltage:

STANDARD: 4.75–5.25 V



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Loosen the idle adjustment screw until it lightly contacts the throttle lever and install a 2.9 mm (0.114 in) feeler gauge between the throttle lever and stop screw.

NOTE

Be careful not to put the feeler gauge between the throttle lever protrusion and stop screw.

CAUTION

- *Do not loosen the idle stopper screw lock nut.*
- *It is important to use a 2.9 mm (0.114 in) inspection gauge only.*

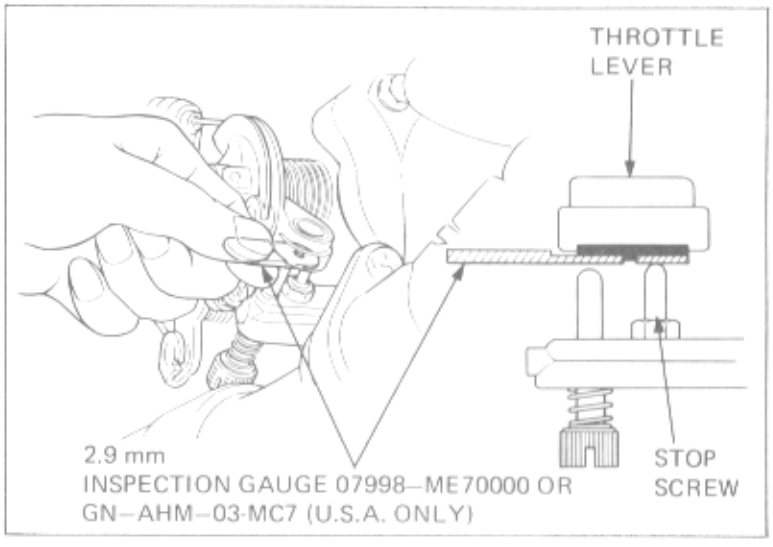
Measure the output voltage with the 2 V scale:

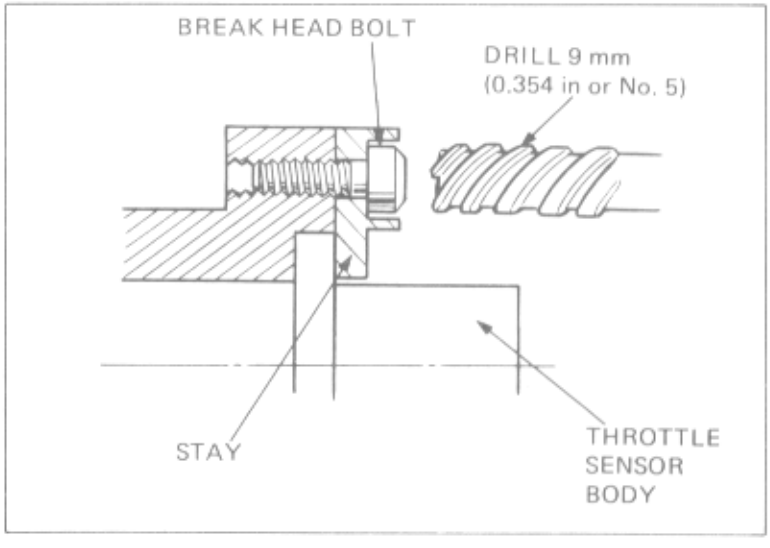
STANDARD:
0.665–0.685 V (with a 2.9 mm (0.114 in) feeler gauge inserted between the throttle lever and stop screw)

Turn the ignition switch off, disconnect the coupler on the wire harness side and measure the resistance between the terminals on the input side.

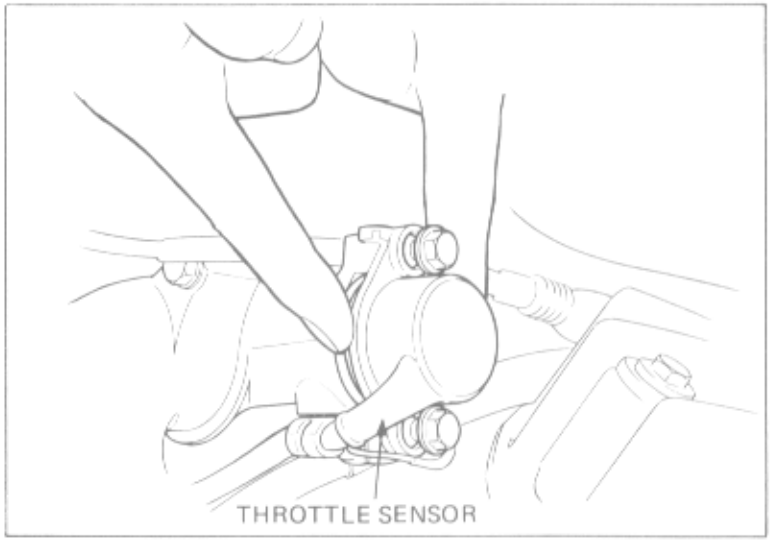
Between PINK and GREEN: 4–6 KΩ

To adjust, drill out the mounting bolts with a 9 mm (0.354 in or No. 5) drill bit to loosen the bracket; then, remove the bolt. Install a new break-head bolt but do not break the head off at this time.



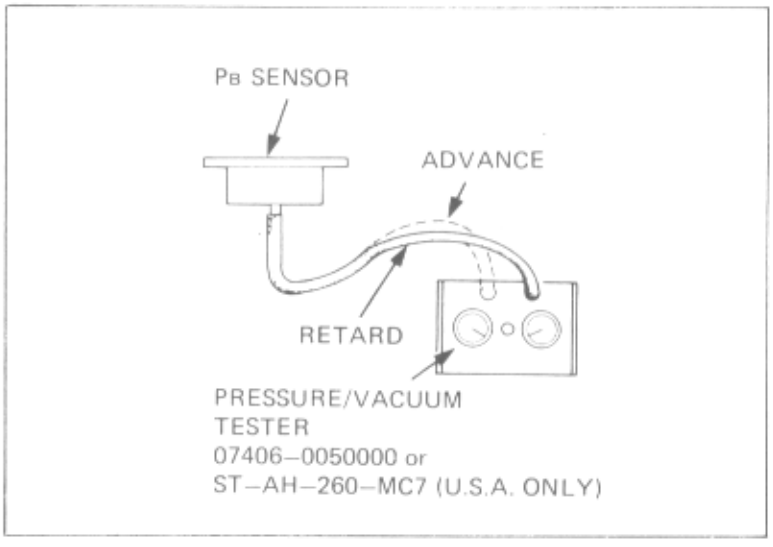


Rotate the throttle sensor right or left so that the output voltage is 0.665–0.685 V as done previously. Rev the engine up lightly and recheck the voltage. Break the head off the bolt when voltage is correct.



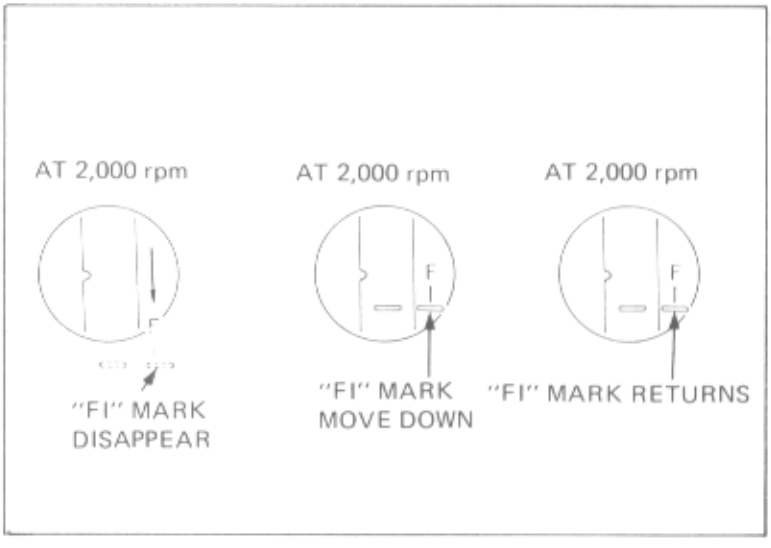
8. SPARK ADVANCE INSPECTION

Start the engine and warm it up to operating temperature.
Start the engine and run it at 2,000 rpm.
Disconnect the throttle sensor coupler and PB sensor tube.
Connect a stroboscopic timinglight to the right cylinder. Connect the Pressure/Vacuum Tester to the PB sensor tube.



Apply pressure to the PB sensor and check the FI mark movement.

"FI" mark: "FI" mark should be near the lower edge of the inspection window when pressure is not applied.
Advance: "FI" mark should recede into the engine case when vacuum is applied.
Retard: "FI" mark should be returned near the center when pressure is applied.

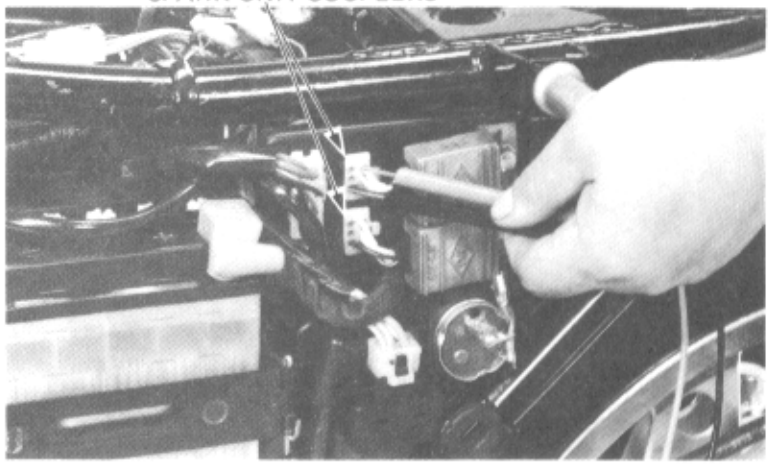


Spark Unit Input Voltage Inspection:

With the engine stopped and ignition switch ON, measure the voltages between the **YELLOW** and **GREEN, BLACK/WHITE** and **GREEN** wires of the spark unit couplers.

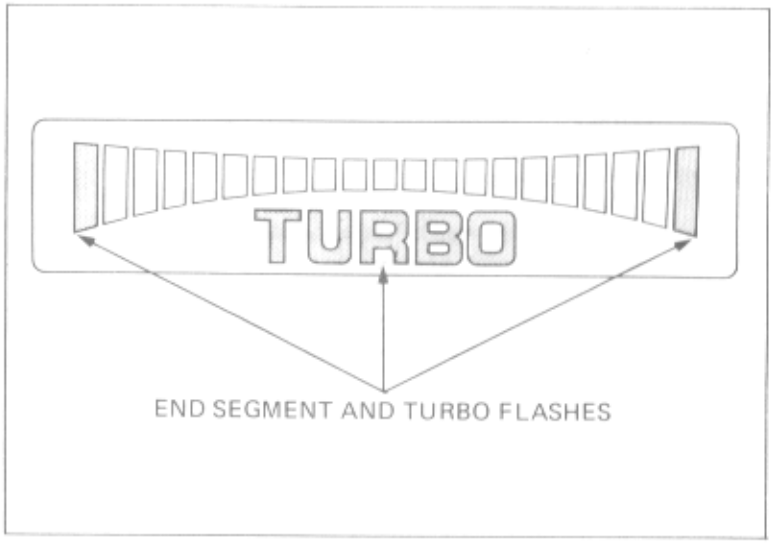
STANDARD:
YELLOW – GREEN: 4.75– 5.25 V
BLACK/WHITE – GREEN: 12 V (Battery voltage)

SPARK UNIT COUPLERS



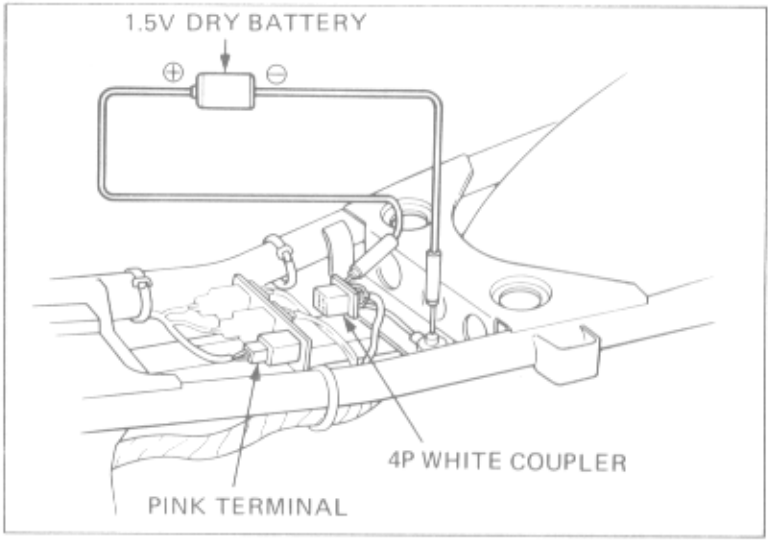
9. BOOST INDICATOR

Make sure that the boost indicator segments are operating when the engine is running.



Remove the seat.
Apply voltage to the **PINK** terminal of the 4P white coupler and ground as shown.

STANDARD:
Segment 0–5 should be lit when 1.5 V is applied.
Segment 0–8 should be lit when 3.0 V is applied.



10. BOOST PRESSURE INSPECTION (THROTTLE VALVE SYNCHRONIZATION)

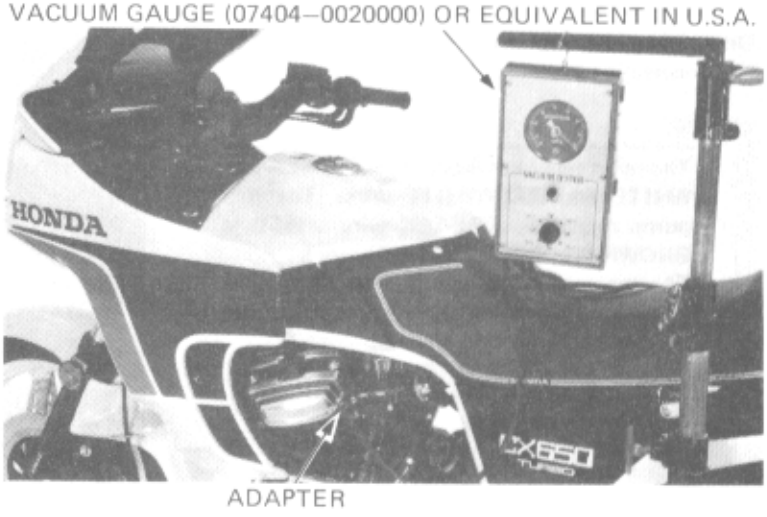
NOTE

This inspection is performed with engine at normal operating temperature, transmission in neutral, and vehicle on center stand.

Remove the plugs from the inlet pipe joints and install the adapters.

Connect the vacuum gauge.
Start the engine and adjust the idle speed to 1,100 ± 100 rpm. Check the vacuum and difference between the right and left cylinder.

STANDARD:
VACUUM: –200 mHg (560 mmHg abs)
DIFFERENCE: BELOW 30 mmHg



11. WASTE-GATE VALVE

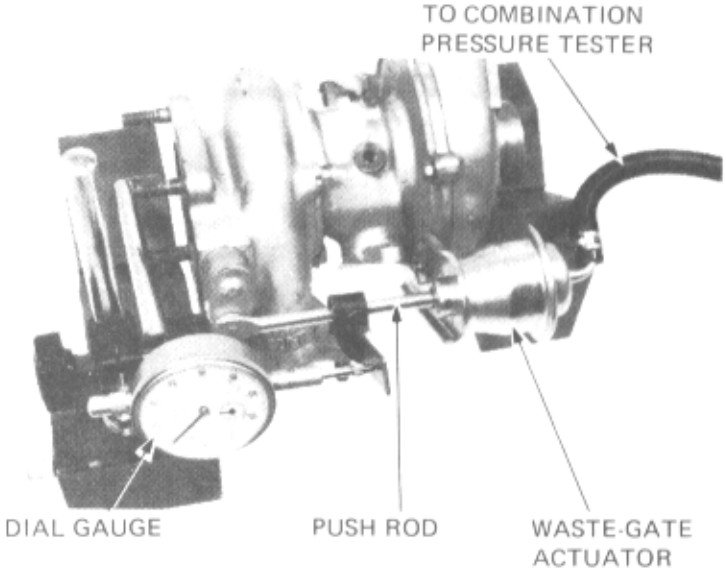
< OFF-frame >

Remove the turbocharger.

Set a dial gauge with its needle resting against the end of the waste gate push rod as shown.

Measure the movement of the push rod by applying pressure to the waste-gate actuator with a pressure tester.

STANDARD: 2.0 mm (0.08 in)
at pressure: 124–131 kPa (925–985 mmHg, 1.26–1.34 kg/cm², 17.9–19.1 psi)



12. FUEL PUMP AND MAIN RELAY

FUEL PUMP RELAY REMOVAL

Remove the battery and battery bracket.

Remove the fuel pump relay from the bracket.

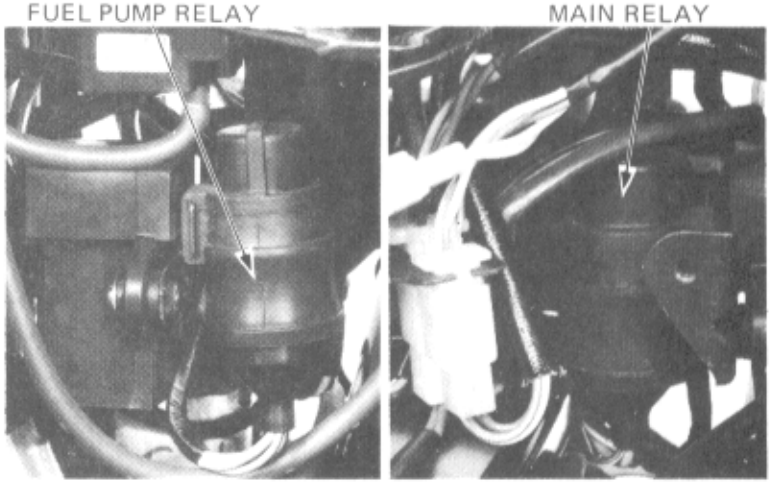
MAIN REMOVAL

Remove the coupler holder by removing two bolts.

Remove the main relay from the bracket.

NOTE

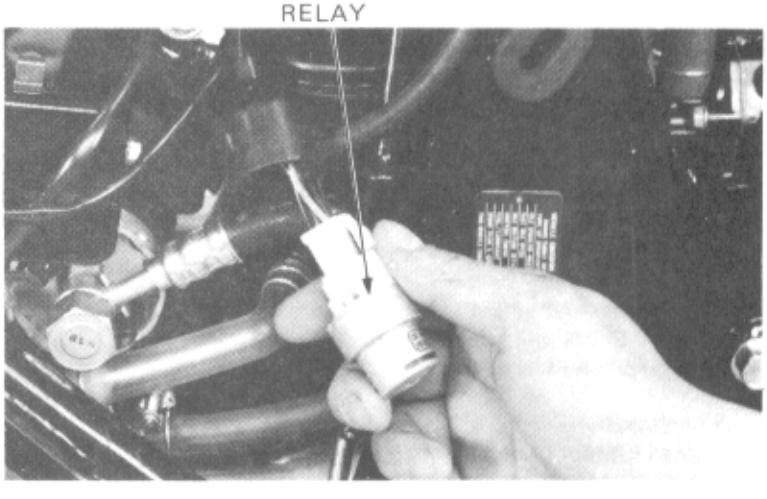
- The main relay is located on the left side.
- The fuel pump relay is located on the right side.



Disconnect the main and fuel pump relays from their respective couplers.

NOTE

- The main relay has **BLACK, RED, BLACK/WHITE** and **RED/WHITE** wires. The fuel pump relay has a **BLACK** wire, a **RED**, a **BROWN** and **BROWN/BLACK** wire.
- The main and fuel pump wires are similar in construction except for the wire colors. Be careful not to mix them up.



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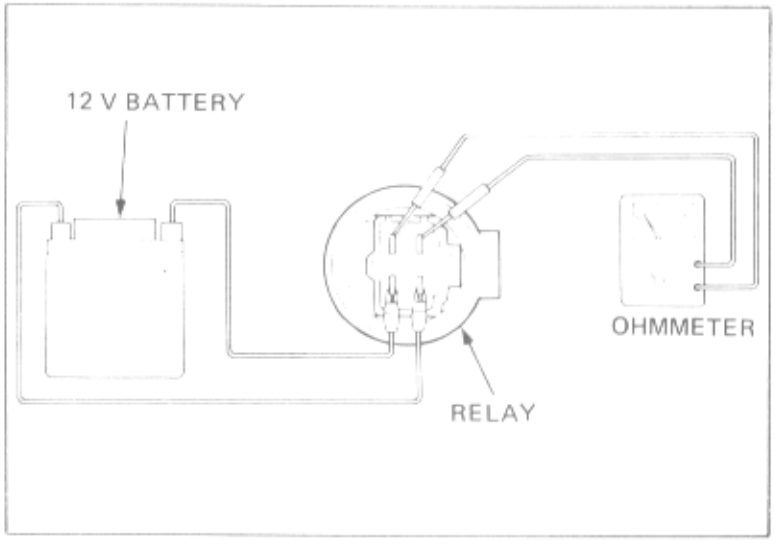
Connect a fully charged 12 V battery and an ohmmeter to the relay terminals as shown.

The relay is normal if there is continuity when voltage is applied.

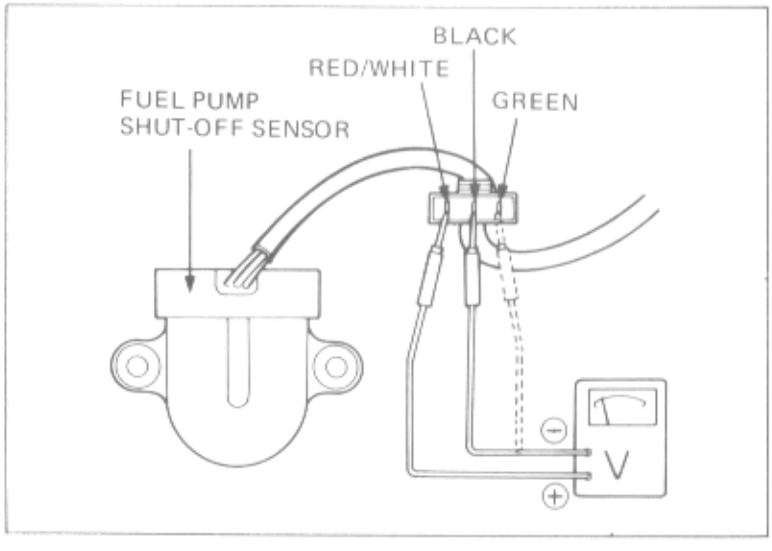


13. FUEL PUMP SHUT-OFF SENSOR

< On-frame >

With the ignition switch ON, measure the voltages between the terminals:

Wire ⊕ – ⊖	STANDARD
RED/WHITE–GREEN **BLACK–GREEN**	0– 1 V 12V (BATTERY VOLTAGE)



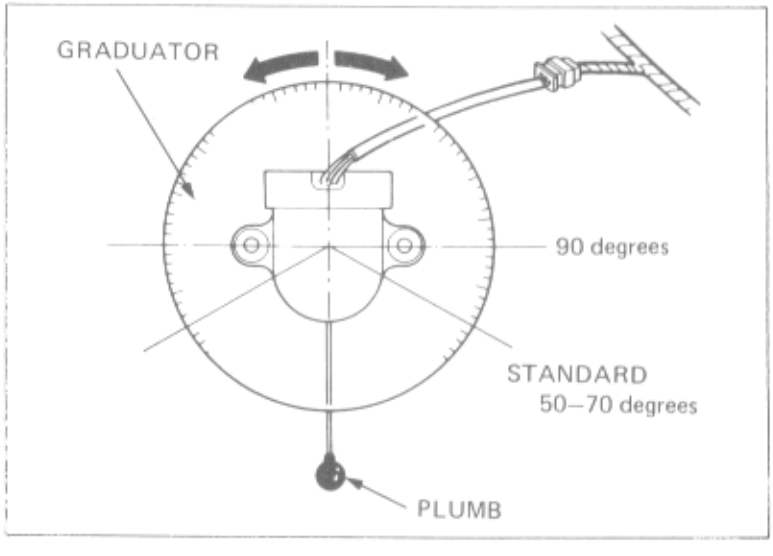
< Off-frame >

Disconnect the PB sensor coupler.

Turn the ignition switch ON. Check that the FUEL SYSTEM WARNING LAMP stays on.

Attach a graduator and plumb to the unit as shown. Find the angle at which the FUEL SYSTEM WARNING LAMP goes off by rotating the unit clockwise. Do the same in the opposite direction.

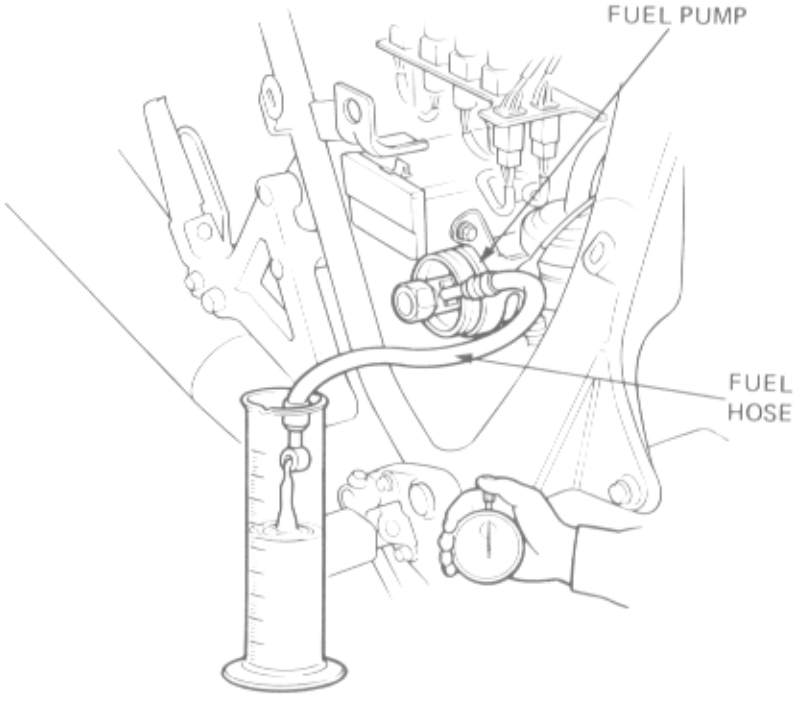
STANDARD: 50°–70°



13. FUEL PUMP

Disconnect the fuel hose banjo bolt.
Engage the transmission with the clutch lever out, and push the starter button so the starter motor will not work but the fuel pump will operate.
Measure the amount of fuel flow from the fuel pump.

STANDARD: 1.5 lit.
(0.4 US gal, 0.33 imp gal)/minutes minimum



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