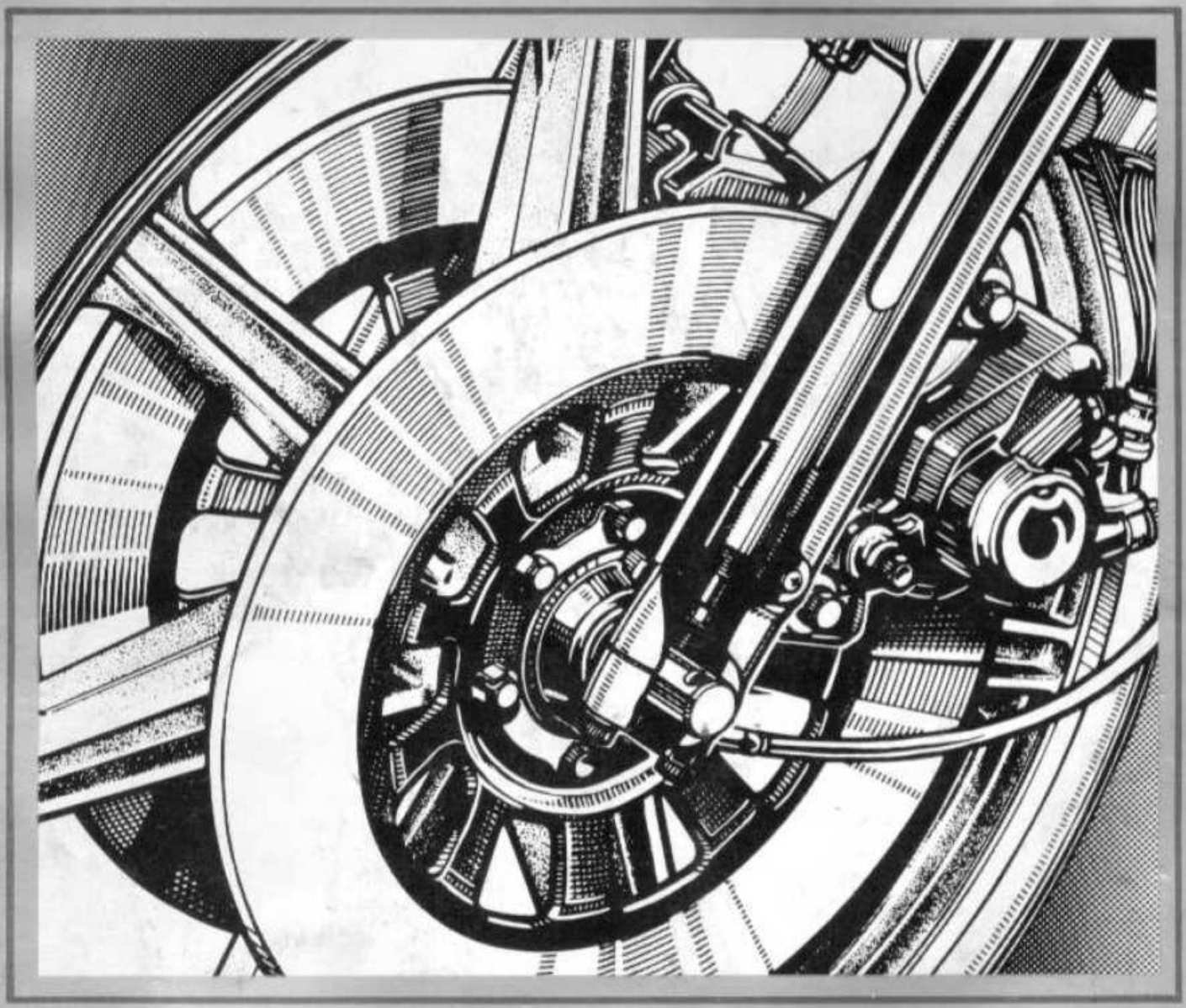
GENUINE

YAMAHA

XJ 650 LJ
Service Manual



- SPECIFICATIONS
- EXPLODED VIEWS
- RECOMMENDED MAINTENANCE
- TUNE-UP AND OVERHAUL PROCEDURES

LIT 11616-XJ-61

Being a Yamaha owner, you obviously prefer a quality product.

gĕn·ū·ĭne

adj. 1. Real 2. Authentic, not artificial 3. Yamaha.

GENUINE **YAMAHA** PARTS & ACCESSORIES

Don't compromise the quality and performance of your Yamaha with off-brand alternatives. You'll be getting exactly what you're paying for.

NOTICE

This manual has been written by Yamaha Motor Company for use by Authorized Yamaha Dealers and their qualified mechanics. In light of this purpose it has been assumed that certain basic mechanical precepts and procedures inherent to our products are already known and understood by the reader.

Without such basic knowledge, repairs or service to this model may render the motorcycle unsafe, and for this reason we must advise that all repairs and/or service be performed by an Authorized Yamaha Dealer who is in possession of the requisite basic product knowledge.

This Research, Engineering and Overseas Service Department of Yamaha are continually striving to further improve all models manufactured by the company. Modifications are therefore inevitable and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha Dealers and will, where applicable, appear in future editions of this manual.

Particularly important information is distinguished in this manual by the following notations:

NOTE: A NOTE provides key information to make procedures easier or clearer.

CAUTION: A CAUTION indicates special procedures that must be followed to avoid damage to the machine.

WARNING: A WARNING indicates special procedures that must be followed to avoid injury to a machine operator or person inspecting or repairing the machine.

XJ650 LJ
SERVICE MANUAL

1st Edition - June 1982
3rd Printing - September 1984 JEM D-150, D-176

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CYPRESS, CALIFORNIA 90630

LIT-11616-XJ-61

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This manual has been combined with previous service manuals to provide complete service information for: **XJ650LJ.**

Please read and give special consideration to the "NOTICE" on the preceding page for your safety.

XJ650LJ SUPPLEMENT	**LJ**
XJ650G SERVICE MANUAL	**G**

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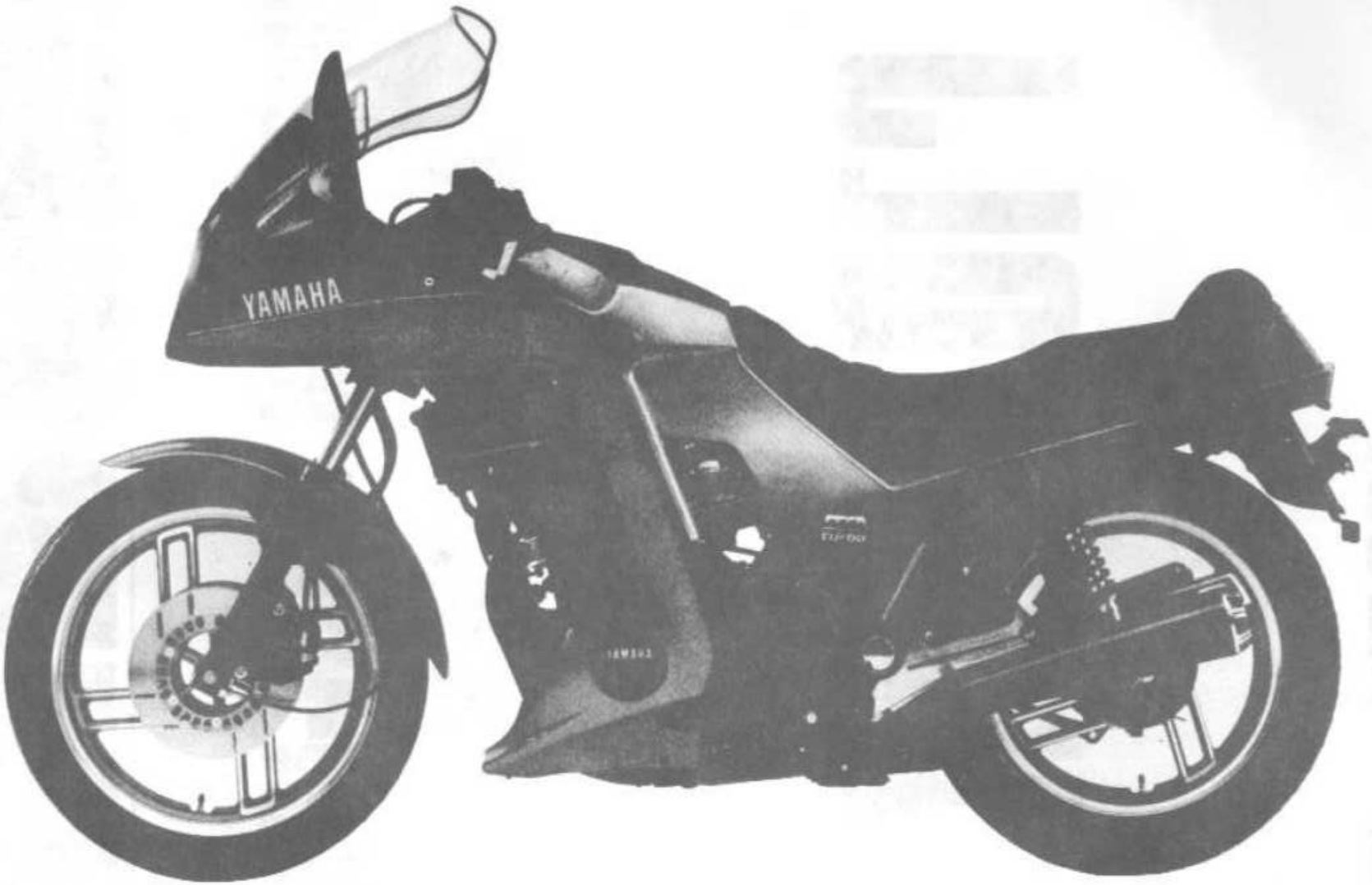
YAMAHA

XJ650LJ

Supplementary Service Manual

LJ

LIT-11616-02-85



NOTE:
Designs and specifications are subject to change without notice.

FOREWORD

This Supplementary Service Manual has been prepared to introduce new service and new data for the XJ650LJ. For complete information on service procedures, it is necessary to use this Supplementary Service Manual together with following manual:

XJ650G Service Manual (LIT-11616-01-94)

SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.

NOTE:
This Supplementary Service Manual contains information regarding periodic maintenance to the emission control system for the XJ650LJ. Please read this material carefully.

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent to motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit for use and/or unsafe.

This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. Proper service with the correct tools is necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure, it is imperative that you contact a Yamaha dealer for any service information changes that apply to this model. This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

Particularly important information is distinguished in this manual by the following notations:

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Starting Serial Number

XJ650LJ	16G-000101



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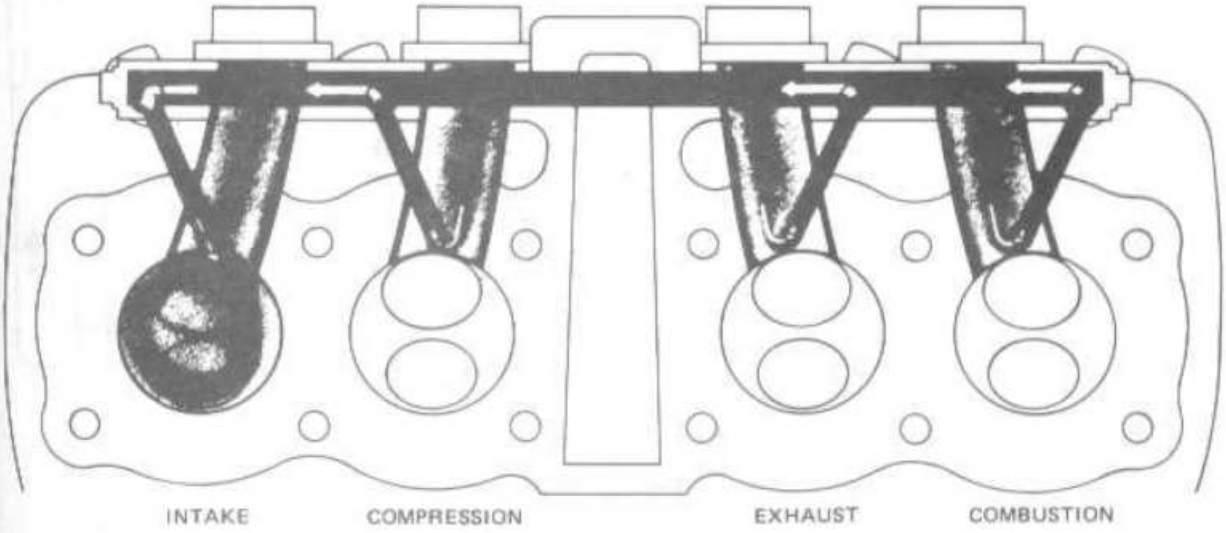
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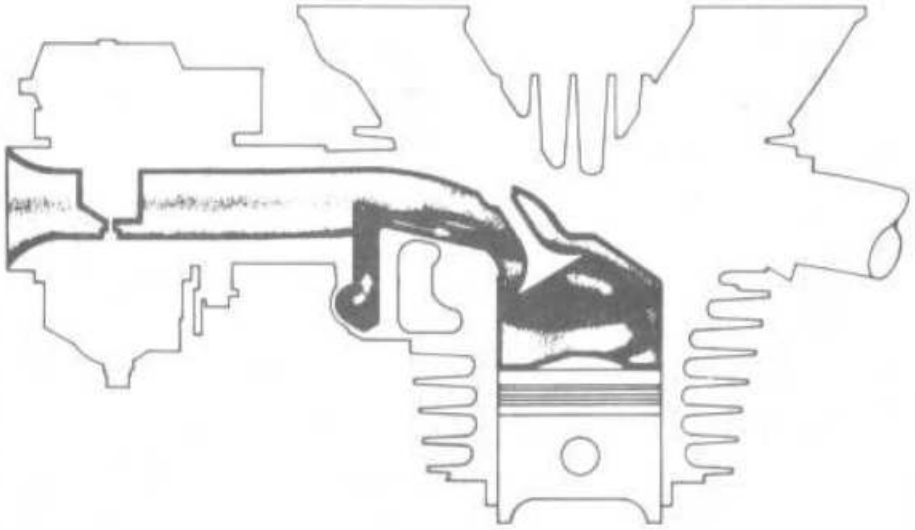
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MAJOR FEATURES

YAMAHA INDUCTION CONTROL SYSTEM

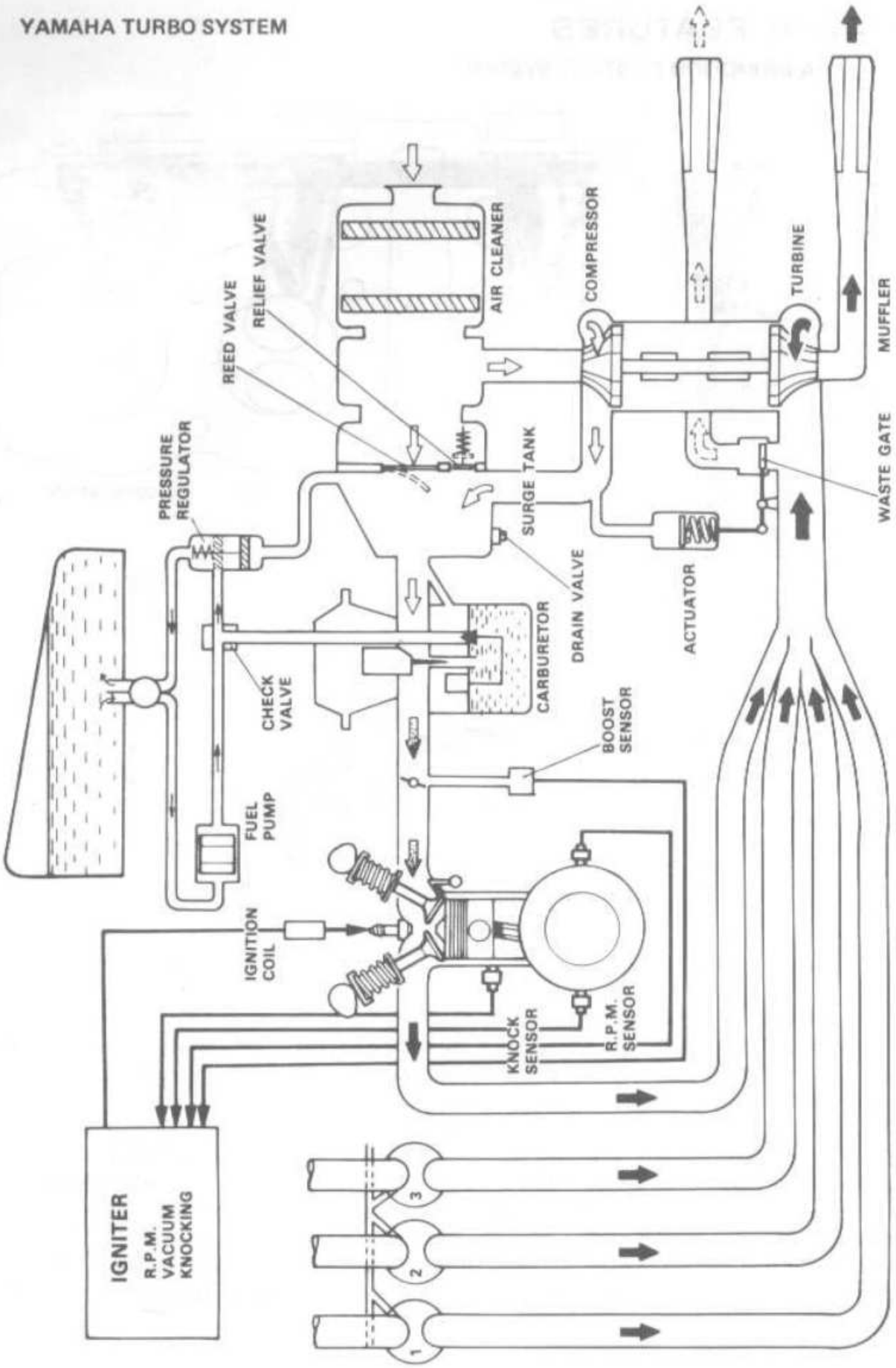




This system has subintake ports. The cross-sectional area of these subintake port is smaller than that of main intake ports. The smaller ports enter the main ports just above the intake valve seat and at such an angle that their charge is directed around the walls of the cylinder; this results in a swirling effect as the mixture is compressed into the combustion chamber.

The subintake ports for all four cylinders are interconnected. Since only one cylinder is on the intake stroke at a time, the subintake port for that cylinder draws mixture from the other three carburetors and subintake ports. When the piston is moving down and the intake valve opens, a vacuum is created in the main and subintake ports. But since the area of the subintake port is so much smaller, the mixture moves faster through it than through the main intake port. The charge from the subintake port, therefore, blasts around the wall of the cylinder, swirling the entire intake charge. This results in more complete burning of the air-fuel mixture.

YAMAHA TURBO SYSTEM

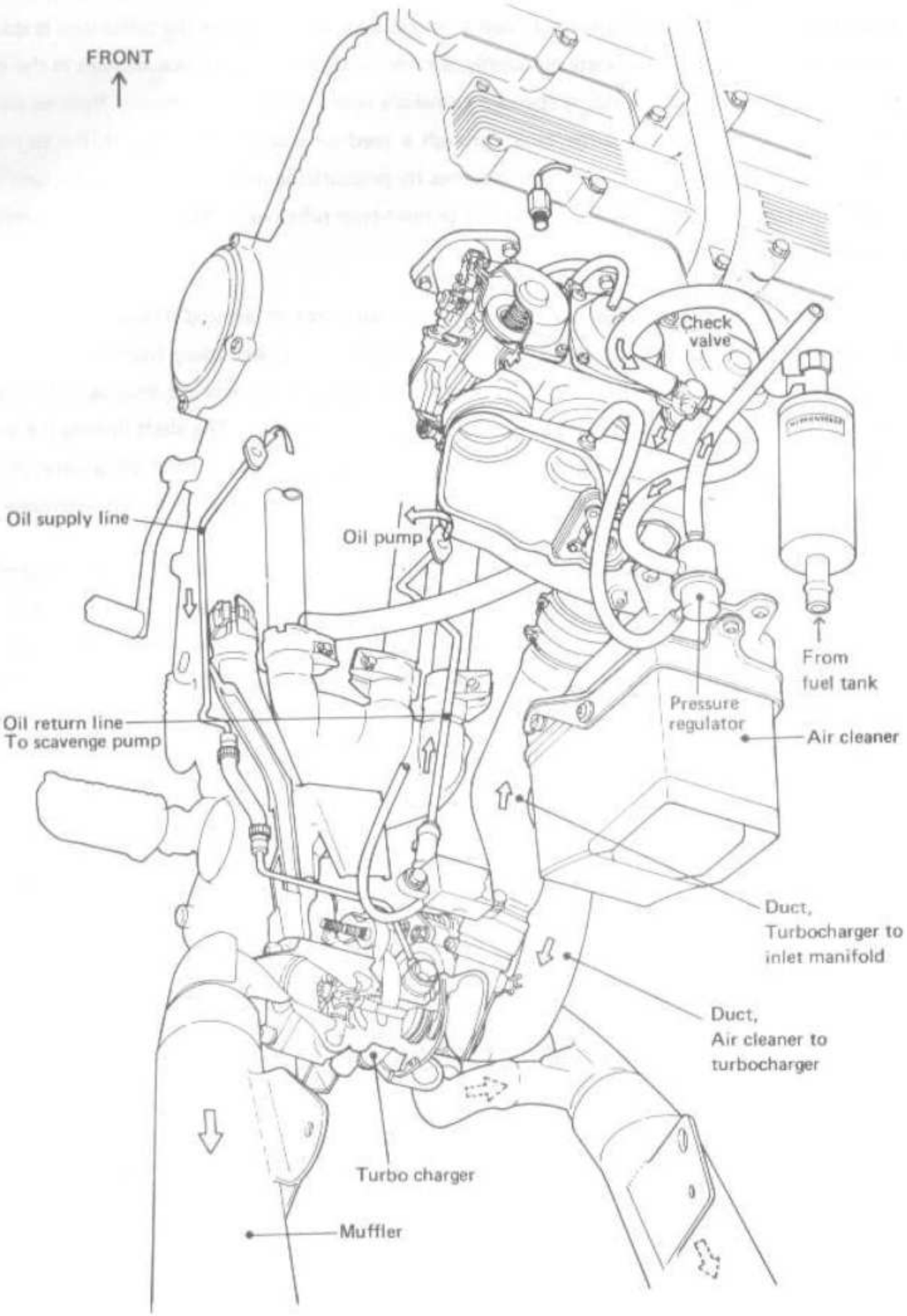


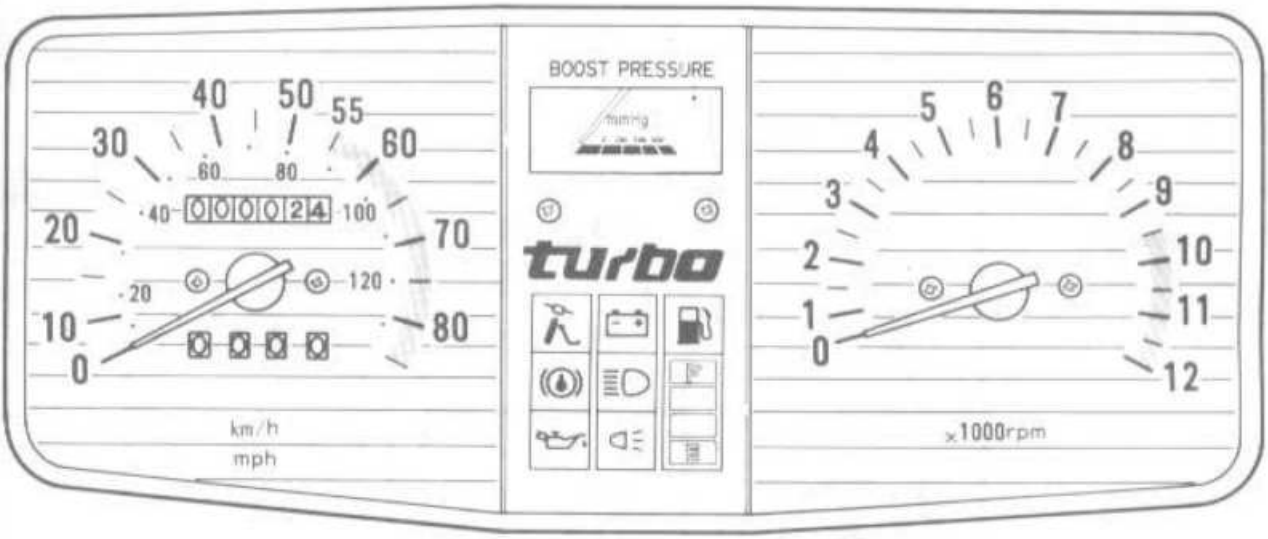
GENERAL DESCRIPTION OF THE TURBOCHARGER

Yamaha has largely eliminated "turbo lag", a phenomenon which afflicts conventional turbo systems when the throttle is snapped open at low engine speeds. Since the turbo unit is spinning too slowly to provide an adequate air supply, a conventional turbo suffers a vacuum in the intake tract and hesitates before building speed. Yamaha's system, however, provides fresh air directly from the air cleaner to the surge tank through a reed-valve-controlled passage; the engine can build speed frelly until the turbo unit resumes its pressurizing effect and closes the reed valve. Another notable feature in the surge tank is a poppet-type relief valve that backs up the wastegate in preventing excess boost in the intake side.

The turbocharger unit is subjected to exhaust temperatures of around 1500°F; it is therefore positioned behind the crankcase and below the swingarm pivot, well away from the rider and the fuel system. The turbo unit itself, a Mitsubishi TC03-06A, is the world's smallest: the turbine diameter is only 39 mm, and it can spin safely up to 210,000 rpm. The shaft linking the turbine to the intake compressor is pressure-lubricated from the crankshaft's main oil gallery; an additional scavenging pump retrieves the oil from the turbo unit, ensuring a constant, adequate flow.

The exhaust system has an inner wall of stainless steel from the header pipes to the turbocharger. A patented exhaust manifold links the #1 and #4 exhaust pipes together and the #2 and #3 pipes together before they enter the turbocharger; this design provides even exhaust pulsing to drive the turbine and results in greater midrange torque. A wastegate in the manifold bleeds off excess exhaust pressure to prevent too much boost in the intake. The left-side muffler receives the exhaust gas from the turbo unit, and the right-side muffler handles excess from the wastegate.

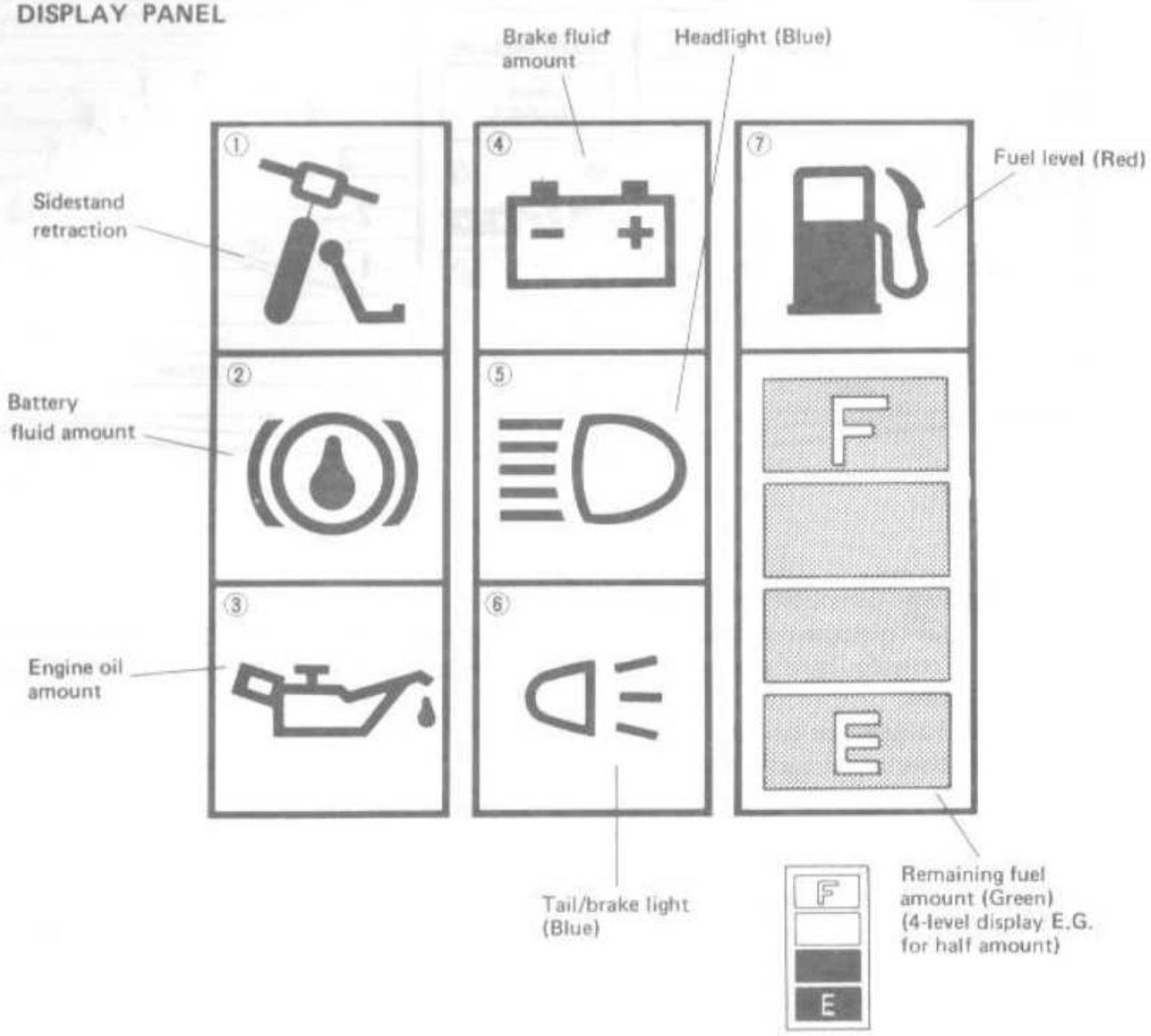

FRONT
Check valve
Oil supply line
Oil pump
From fuel tank
Pressure regulator
Air cleaner
Oil return line
To scavenge pump
Duct, Turbocharger to inlet manifold
Duct, Air cleaner to turbocharger
Turbo charger
Muffler



The XJ650 turbo computer monitor system features:

1. Easy-to-see pictographic displays; a further improvement upon the XJ750 computer monitor.
2. Highly reliable liquid crystal displays in three colors, specifically designed for motorcycle application.
   1) Red display for safety
      - Sidestand retraction
      - Disc brake fluid amount
      - Engine oil amount
      - Fuel amount
   2) Blue display for electrics
      - Battery liquid amount
      - Headlight
      - Tail/brake light
   3) Green display for remaining fuel amount
      - Four-stage display for remaining fuel amount

DISPLAY PANEL



① This indicator is displayed when the sidestand is not retracted.

② This indicator is displayed when the brake fluid level is below specification in the front brake master cylinder.

③ This indicator is displayed when the engine oil level is low.

④ This indicator is displayed when the battery fluid level is low.

⑤ This indicator is displayed when the headlight bulb is burned out.

⑥ This indicator is displayed when the taillight and/or brake light bulbs are burned out.

⑦ This indicator is displayed when the fuel level is low.

TURBO 650 FAIRING

The fairings on Yamaha's innovative new models represent more than just handsome cosmetics. Indeed, from their inception to their final rendering, form was designated secondary to function. In designing a fairing; two of the most important aerodynamic factors are wind resistance and front wheel lift force. Through extensive wind-tunnel testing, Yamaha engineers crafted a fairing for the Seca Turbo which significantly reduces these effects. Every component down to the rear-view mirrors was designed with aerodynamic efficiency in mind. The coefficient of drag, a measurement of wind resistance, is among the lowest in the world for a road machine. A reduction of about 10% was achieved in front wheel lift force over a similar machine not equipped with a fairing.

Yamaha maintains its lead in advanced high-performance technology with the introduction of the XJ650LJ, featuring the Yamaha Turbo System. This system uses the power of the exhaust gases, normally wasted, to spin a turbine which supercharges the intake of the air fuel mixture. The system goes far beyond the unrefined, bolt-on turbochargers offered by accessory companies. The Yamaha Turbo System is a fully integrated combination of sophisticated engineering features which virtually eliminates the problems of conventional turbocharging while enhancing its advantages. The result is a lightweight, nimble-handling machine which performs like a superbike with an engine twice as large. Yamaha is poroud to rewrite the books on high-performance motorcycling!



MAINTENANCE AND LUBRICATION CHARTS

PERIODIC MAINTENANCE EMISSION CONTROL SYSTEM

NO.	ITEM	REMARKS	INITIAL BREAK-IN		THEREAFTER EVERY	
			1,000 km (600 mi) or 1month	5,000 km (3,000 mi) 7 months	4,000 km (2,500 mi) 6 months	8,000 km (5,000 mi) 12 months
1	Valve Clearance	Check and adjust valve clearance when engine is cold.		○		○
2	Spark plug	Check condition. Adjust gap. Clean. Replace after initial 13,000 km (8,000 mi) or 18 months and thereafter every 12,000 km (7,500 mi) or 18 months.		○	○	Replace every 12,000 km (7,500 mi) or 18 months
3	Crankcase Ventilation	Check ventilation hose for cracks or damage. Replace if necessary.		○		○
4	Fuel Line	Check fuel hose and vacuum pipe for cracks or damage. Replace if necessary.		○		○
5	Intake/Exhaust System	Check for leakage. Retighten as necessary. Replace gasket(s) if necessary.		○	○	
6	Idle Speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		○	○	
7	Carburetor Synchronization	Adjust synchronization of carburetors.		○	○	

GENERAL MAINTENANCE/LUBRICATION

NO.	ITEM	REMARKS	TYPE	INITIAL BREAK-IN		THEREAFTER EVERY		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000mi) or 24 months
1	Engine Oil	Warm up engine before draining	Yamalube 4 cycle oil or SAE 20W40 type SE motor oil	○	○	○		
2	Oil Filter	Replace	–	○	○		○	
3	Air Filter	Clean with compressed air.	–		○		○	
4	Brake System	Adjust free play. Replace pads if necessary. (Front) Replace shoes if necessary. (Rear)	–	○ ○	○ ○	○ ○		
5	Clutch	Adjust free play.	–	○	○	○		
6	Final Gear Oil	Replace	SAE 80 API "GL-4" Hypoid gear oil	○			○	
7	Control and Meter Cable	Apply chain lube thoroughly.	Yamaha chain and cable lube or SAE 10W 30 motor oil	○	○	○		

NOTE. 1. The air filter should be cleaned more often than at specified intervals if machine is operated in extremely dusty areas.

2. The lubrication chart must be adhered to strictly. Observe the following service hints to ensure that the oil will meet the demands placed on it by the engine.

Observe all periodic inspections as outlined.

Use only the oil grades specified.

Keep the oil level at the specified level.

NO.	ITEM	REMARKS	TYPE	INITIAL BREAK-IN		THEREAFTER EVERY		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000 mi) or 24 months
8.	Rear Arm Pivot Bearing	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi)	Medium weight bearing grease.					Repack
9.	Center and Side-Stand Pivots	Apply lightly	Yamaha chain and cable lube or SAE 10W30 motor oil		○	○		
10.	Front Fork Oil	Drain completely. Refill to specification.	Yamaha fork oil 10 wt or equivalent					○
11.	Steering Ball Bearing and Races	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi)	Medium weight wheel bearing grease		○	○		Repack
12.	Wheel Bearings	Check bearings for smooth rotation. Replace if necessary.	–		○	○		
13.	Battery	Check specific gravity. Check breather pipe for proper operation.	–		○	○		
14.	Change/ Brake Pedal shaft Pivot	Apply lightly	Yamaha chain and cable lube or SAE 10W30 motor oil		○	○		
15.	A.C. Generator	Replace generator brushes. Replace at initial 13,000 km *(8,000 mi) and thereafter every 16,000 km (10,000 mi)	–					Replace
16.	Brake/ Clutch Lever Pivot Shaft	Apply lightly	Yamaha chain and cable lube or SAE 10W30 motor oil		○	○		

PERIODIC MAINTENANCE AND ADJUSTMENT

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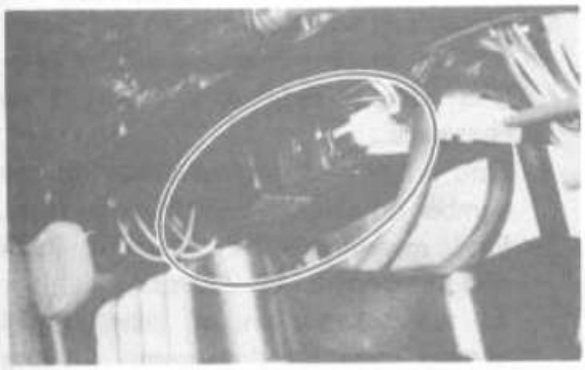
ENGINE

A. Valve clearance adjustment

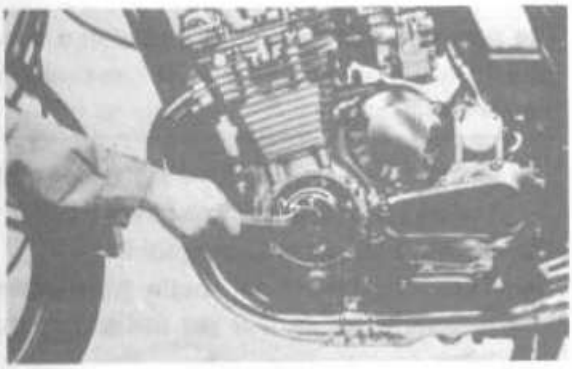
NOTE:

Valve clearance must be measured with the engine and at room temperature.

1. Remove the seat, fairing components, and fuel tank. See page 35.
2. Remove the horn, flasher relay, emergency engine stop relay and spark plug lead wires.



3. Remove the cylinder head cover and left crankcase cover (pick-up base cover). Care should be taken to not scratch or damage the gasket sealing surfaces.
4. Turn the crankshaft with the nut on the left end of the crankshaft to turn the cams. The proper position of the cam when measuring the valve clearance is with the cam lobe directly opposite the valve lifter.



5. Insert a feeler gauge between the valve lifter and the camshaft base circle.



Intake valve clearance (cold):
0.11 ~ 0.15 mm (0.004 ~ 0.006 in)
Exhaust valve clearance (cold):
0.16 ~ 0.20 mm (0.006 ~ 0.008 in)

Adjustment

Valve clearance is adjusted by replacing the adjusting pad on the top of the valve lifter. Adjusting pads are available in 25 thicknesses ranging from No. 200 (2.000 mm) to No. 320 (3.20 mm) in steps of 0.05 mm. The thickness of each pad is marked on the pad face that contacts of the valve lifter (not the cam). Adjustment of the valve clearance is accomplished as follows:

1. Determine valve clearance (feeler gauge measurement.)
2. Remove adjusting pad and note number.
3. Select proper pad from appropriate chart (intake or exhaust chart).
4. Install new pad and check installed clearance.

Procedure

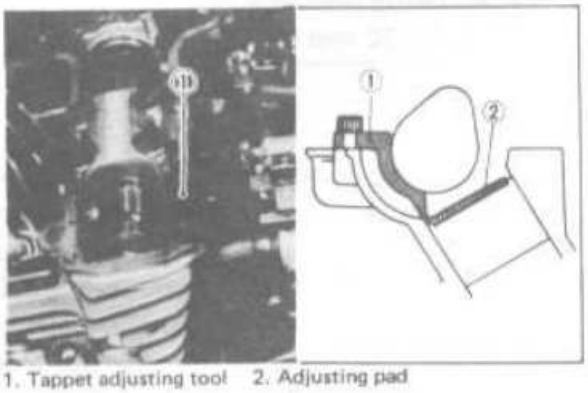
1. Measure valve clearance. If clearance is incorrect, record the measured amount of clearance. This must be measured carefully.
2. There is a slot in the valve lifter. This slot must be positioned opposite the blades of the tappet adjusting tool before the tools is installed.
3. Turn the cam until the lobe fully depresses the valve lifter and opens the valve. Install the tappet adjusting tool as shown to hold the lifter in this depressed position.

NOTE:

The tappet adjusting tool is fastened to the cylinder head securely using one allen screw such as one used to install the cylinder head cover. Make sure that the tool contacts the lifter only, and not the pad.

CAUTION:

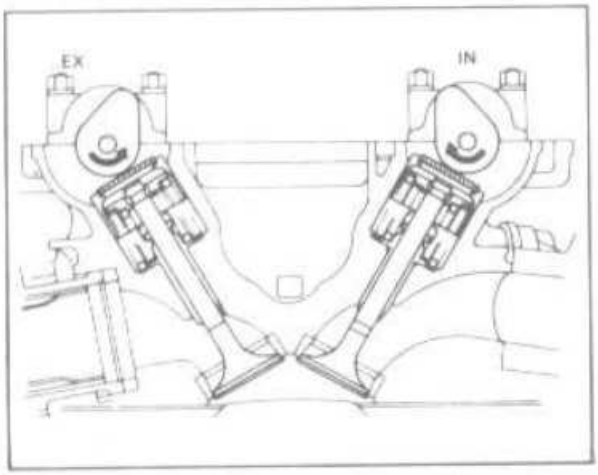
If the cam lobe touches the tappet adjusting tool, the stress may fracture the cylinder head. DO NOT ALLOW THE CAM TO CONTACT THE TAPPET ADJUSTING TOOL.



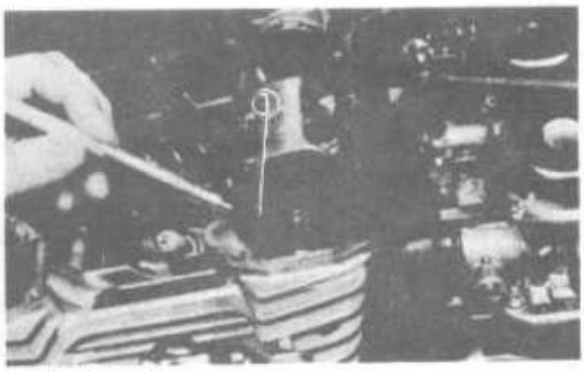
1. Tappet adjusting tool 2. Adjusting pad

4. Carefully rotate the cam so that the pad can be removed. To avoid cam touching the adjusting tool, turn cams as follows: (view from left side of the motorcycle)

   Intake: Carefully rotate CLOCKWISE.
   Exhaust: Carefully rotate COUNTER-CLOCKWISE.



5. Remove the pad from the lifter. There is a slot in the lifter. Use a smaller screwdriver or other blade and a magnetic rod to remove the pad. Note the number on the pad.



1. Adjusting pad

6. Proper pad selection is made as follows: (Use appropriate chart for exhaust or intake valves.) Refer to the table in the next page.
   a. Find number of original (installed) pad number on chart. Read down on chart.
   b. Find measured valve clearance (from step 1) on chart. Read across.
   c. At the intersection of installed pad number (down) and measured clearance (across) is a new pad number.

EXAMPLE:
Intake valve, installed pad:
No. 250 (read down)
Measured clearance:
0.32 mm (read across)
New pad number: No. 270
(intersection of down & across)

NOTE:

The new pad number is to be used as a guide only. Verify the correctness of this choice in the following step(s).

7. Install the new pad in the lifter. Install the pad with the number down.
8. Remove tappet adjusting tool.
9. Turn crankshaft to rotate cam several rotations. This will set the pad in the lifter.
10. Check valve clearance (step 3). If clearance is incorrect, repeat preceding steps until proper clearance is obtained.
11. Inspect head cover gasket. If bent or torn, replace gasket.
12. Reinstall removed parts in reverse order.

PAD SELECTION CHART

Intake

Measured clearance	INSTALLED PAD NUMBER																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 - 0.05			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.06 - 0.10		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.11 - 0.15																									
1.16 -0.20	206	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.21 - 0.25	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.26 - 0.30	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.31 - 0.35	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.36 - 0.40	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.41 - 0.45	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.46 - 0.50	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.51 - 0.55	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.56 - 0.60	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.61 - 0.65	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.66 - 0.70	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.71 - 0.75	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.76 - 0.80	265	270	275	280	285	290	295	300	305	310	315	320													
0.81 - 0.85	270	275	280	285	290	295	300	305	310	315	320														
0.86 - 0.90	275	280	285	290	295	300	305	310	315	320															
0.91 - 0.95	280	285	290	295	300	305	310	315	320																
0.96 - 1.00	285	290	295	300	305	310	315	320																	
1.01 - 1.05	290	295	300	305	310	315	320																		
1.06 - 1.10	295	300	305	310	315	320																			
1.11 - 1.15	300	305	310	315	320																				
1.16 - 1.20	305	310	315	320																					
1.21 - 1.30	310	315	320																						
1.26 - 1.30	315	320																							
1.31 - 1.35	320																								

VALVE CLEARANCE (engine cold) 0.11~0.15 mm
Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 270
Pad Number: (example) Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm
Always install pad with number down.

Exhaust

Measured clearance	INSTALLED PAD NUMBER																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 - 0.05				200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305
0.06 - 0.10			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.11 - 0.15		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.16 - 0.20																									
0.21 - 0.25	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.26 - 0.30	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.31 - 0.35	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.36 - 0.40	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.41 - 0.45	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.46 - 0.50	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.51 - 0.55	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.56 - 0.60	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.61 - 0.65	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.66 - 0.70	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.71 - 0.75	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.76 - 0.80	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.81 - 0.85	265	270	275	280	285	290	295	300	305	310	315	320													
0.86 - 0.90	270	275	280	285	290	295	300	305	310	315	320														
0.91 - 0.95	275	280	285	290	295	300	305	310	315	320															
0.96 - 1.00	280	285	290	295	300	305	310	315	320																
1.01 - 1.05	285	290	295	300	305	310	315	320																	
1.06 - 1.10	290	295	300	305	310	315	320																		
1.11 - 1.15	295	300	305	310	315	320																			
1.16 - 1.20	300	305	310	315	320																				
1.21 - 1.25	305	310	315	320																					
1.26 - 1.30	310	315	320																						
1.31 - 1.35	315	320																							
1.36 - 1.40	320																								

VALVE CLEARANCE (engine cold) 0.16~0.20 mm
Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 265
Pad Number: (example) Pad No. 250 = 250 mm
Pad No. 255 = 255 mm
Always install pad with number down.

B. Spark plug

1. Check the electrode condition and wear, insulator color, and electrode gap.
2. Use a wire gauge for measuring the plug gap.
3. If the electrodes become too worn, replace the spark plug.
4. When installing the plug, always clean the gasket surface. Wipe off any grime that might be present on the surface of the spark plug, and torque the spark plug properly.

Standard spark plug:
BP8ES (NGK) or W24EP-U (ND)
Spark plug gap:
0.7 ~ 0.8 mm (0.028~0.032 in)
Spark plug tightening torque:
2.0 m-kg, (14.5 ft-lb)

C. Cam chain tensioner

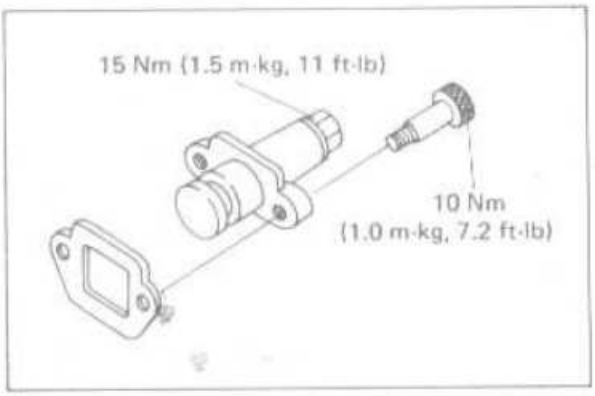
This model has been equipped the automatic cam chain tensioner. No adjustment is necessary.
When installing this tensioner onto the cylinder, proceed as follows:

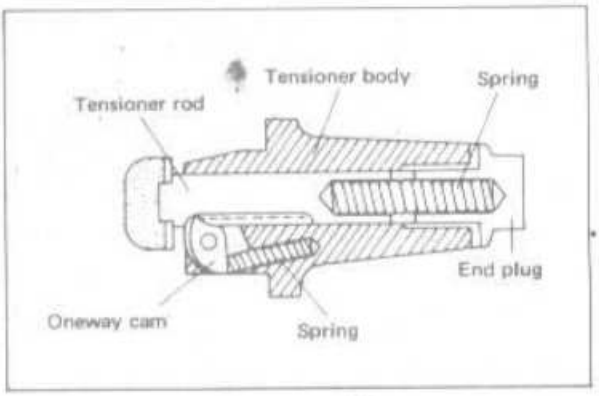
1. Remove the end plug and spring from the tensioner assembly.
2. Unlock the oneway cam by pushing it with your finger and push the tensioner rod into the tensioner body until it stops.
3. Install the tensioner to the cylinder and torque the bolts to the specification.

Tightening torque:
10 Nm (1.0 m-kg, 7.2 ft-lb)

4. Reinstall the spring and end plug with the gasket. Torque the end plug to the specification.

Tightening torque:
15 Nm (1.5 m-kg, 11 ft-lb)





D. Ignition timing

1. Ignition timing is checked with a timing light by observing the position of the stationary pointer and the marks stamped on the timing plate.

The timing plate is marked as follows:
"⊔"..... Firing range for No. 1(L.H.) cylinder
"T"..... Top Dead Center for No. 1 (L.H.) and No. 4 (R.H.) cylinders

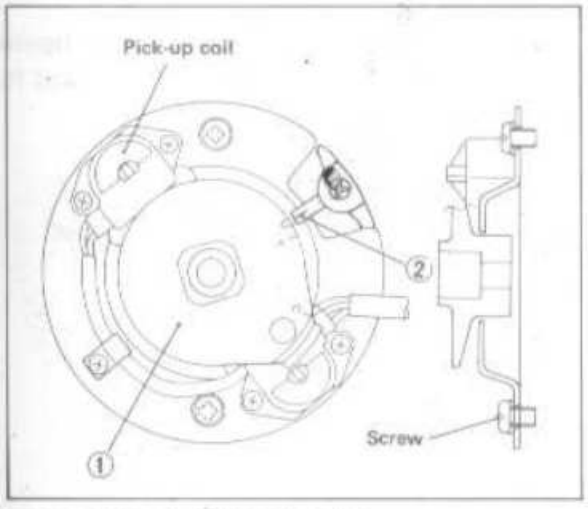
2. Connect the timing light to No. 1 (L.H.) spark plug lead wire.
3. Start the engine and keep the engine speed as specified. Use a tachometer to check the engine speed.

Specified engine speed: 1,050 r/min

4. The stationary pointer should be within the limits of "⊔" on the timing plate. If it exceeds the limits or does not steady, check the timing plate for tightness and/or ignition system for damage. (See "ELECTRICAL")

CAUTION:

Never bend the stationary pointer.



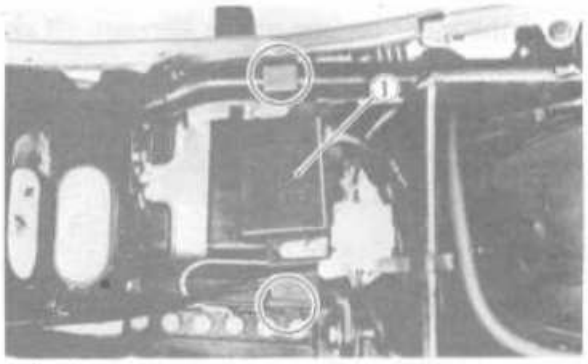
1. Timing plate 2. Stationary pointer

E. Air filter

1. Removal

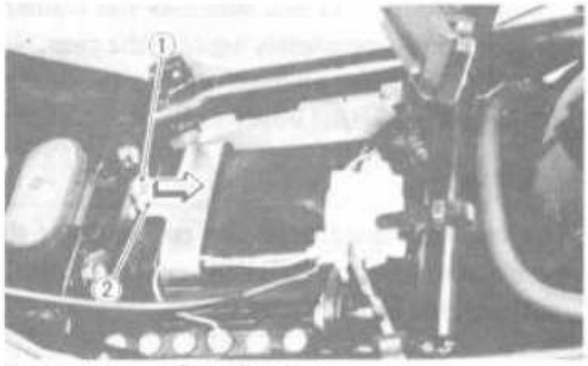
a. Remove the seat.

b. Remove the fuse box.



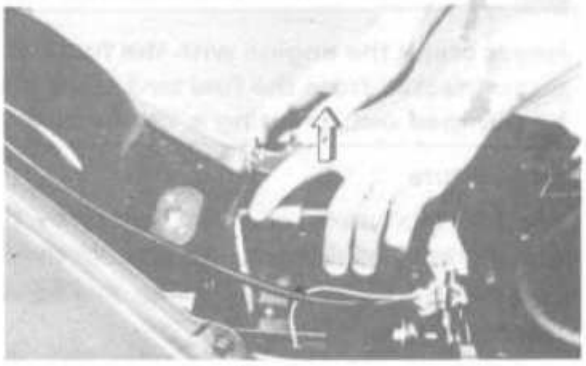
1. Fuse box

c. Remove the air filter case securint screw. Then, pull the air filter case holding plate backward.



1. Securing screw 2. Holding plate

d. Pull out the air filter case.



e. Pull out the element.



1. Air filter element

2. Cleaning method
   Tap the element lightly to remove most of the dust and dirt; then blow out the remaining dirt with compressed air from the inner surface of the element. If element is damaged, replace it.



3. Reassemble by reversing the removal procedure. Check whether the element is seated completely against the case.
4. The air filter element should be cleaned at the specified intervals.

CAUTION:

The engine should never be run without the air cleaner element installed; excessive piston and/or cylinder wear may result.

F. Carburetor

WARNING:

Never crank the engine with the fuel lines disconnected from the fuel tank. Fuel will be pumped out, creating a fire hazard.

Idle mixture

The idle mixture is set at the factory by the use of special equipment. No attempt should be made by the dealer to change this adjustment.

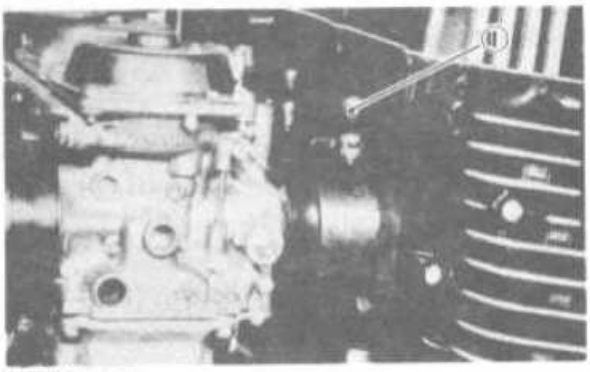
Synchronization

The seat must be removed and the rear of the tank elevated to gain access to the vacuum connections and synchronizing screw.

NOTE:

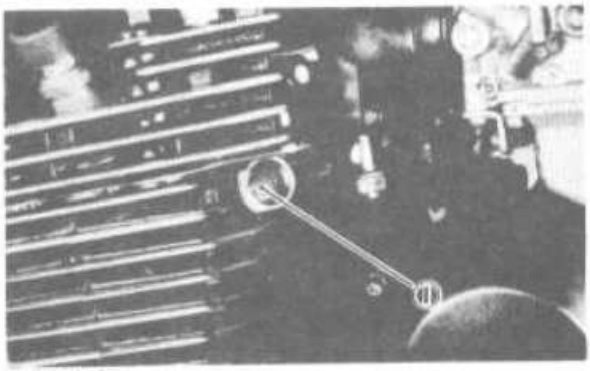
The valve clearances must be set properly before synchronizing the carburetors.

1. Remove the vacuum pipe from the carburetor manifold (No. 3 cylinder) and turn the fuel cock to "PRI."
2. Remove the rubber caps from the No. 1, 2, and 4 carburetor manifolds.



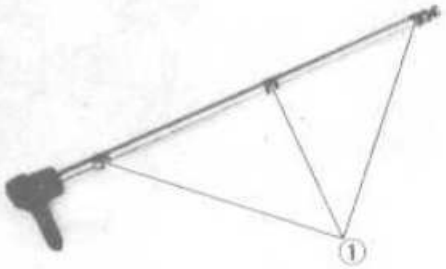
1. Rubber cap

3. Remove either the left or right (but not both) blind plug at the end of the YICS (Yamaha Induction Control System) passage in the cylinder.



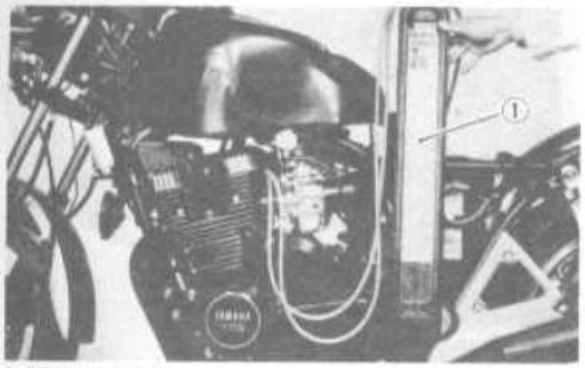
1. Blind plug

4. Insert the YICS shut-off tool (special tool P/No. 90890-04068) fully and flip the locking lever.



1. Shut-off tool rubber (P/No. 90890-04073)

5. Connect each vacuum gauge hose to its proper carburetor.



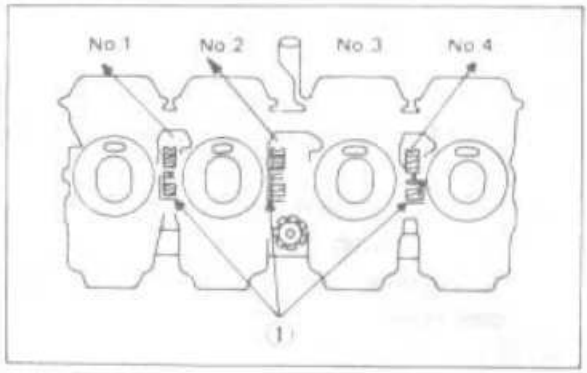
1. Vacuum gauge

6. Start the engine and allow it to warm up for a few minutes. The warm-up is complete when the engine responds normally to the throttle opening.
7. Make sure the engine idle speed is 950 ~ 1,000 r/min. If it is not, adjust the idle speed with the throttle stop screw.

NOTE:

With the YICS shut off tool fitted, the engine speed generally drops a little. Thus, continue with the following steps at an idle speed of 950 ~ 1,000 r/min.

8. Each gauge reading will indicate the same if the carburetors are synchronized. The No. 3 carburetor has no synchronizing screw, and the other carburetors are to be synchronized to it in order, one at a time.
   First, synchronize carburetor No. 1 to carburetor No. 2 by turning the No. 1 synchronizing screw until both gauges read the same.
   Second, in the same way synchronize carburetor No. 4 to carburetor No. 3.
   Third, by adjusting No. 2 screw, watch No. 3 carburetor reading. No. 1 and No. 2 carburetors will both change to match No. 3 carburetor.



1. Synchronizing screws

9. Remove the YICS shut-off tool and reinstall the blind plug.

Tightening torque:
22 Nm (2.2 m-kg, 16 ft-lb)

10. Check the idle speed.
    Adjust if necessary.

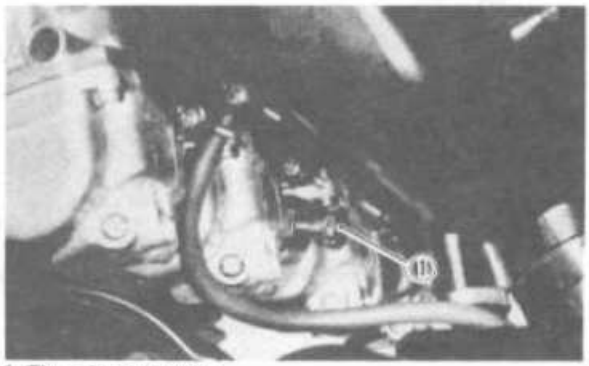
Idle speed adjustment

NOTE:

Carburetors must be synchronized before setting the final idle speed. The idle speed adjustment is made by turning only one throttle stop screw.

1. The engine must be warmed up before setting the idle speed.
2. Set the engine idle speed by turning the throttle stop screw in (to increase engine speed) or out (to decrease engine speed).

Standard idle speed: 1,050 ± 50 r/min



1. Throttle stop screw

G. Engine oil

1. Oil level measurement

a. Place the motorcycle on its centerstand. Warm up the engine for several minutes.

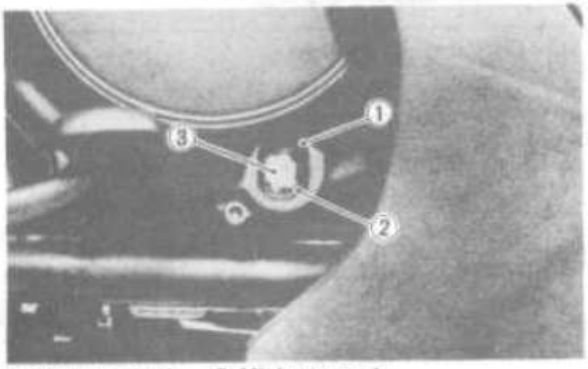
NOTE:

Be sure the motorcycle is positioned straight up when checking the oil level; a slight tilt toward the side can produce false readings.

b. With the engine stopped, check the oil level through the level window locatec at the lower part of the light side crank case cover.

NOTE:

Wait a few minutes until the oil level settle: before checking.



1. Maximum mark 2. Minimum mark
3. Level window

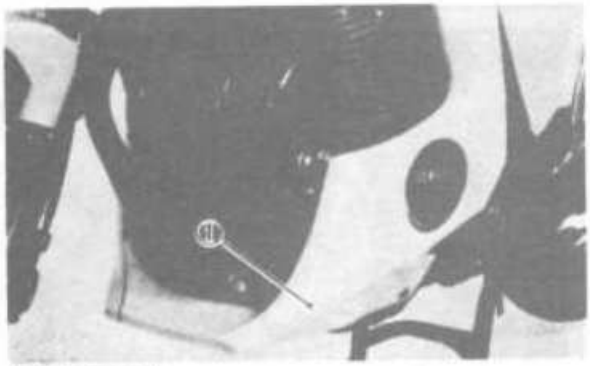
c. The oil level should be at the maximum level. If the level is lower, add sufficient oil to raise it to the maximum level.

2. Engine oil and oil filter replacement

a. Start the engine and run it a few minutes to warm it up.

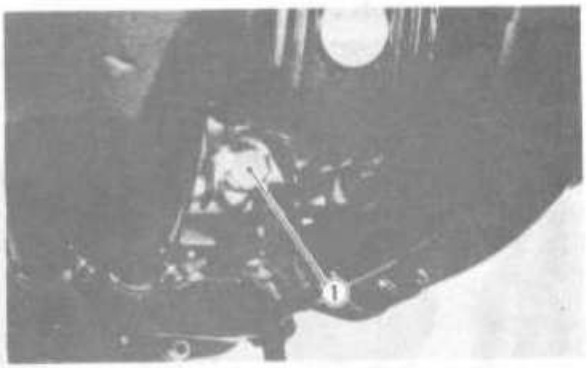
b. Place an oil pan under the engine and remove the oil filler cap.

c. Remove the lower pannel.



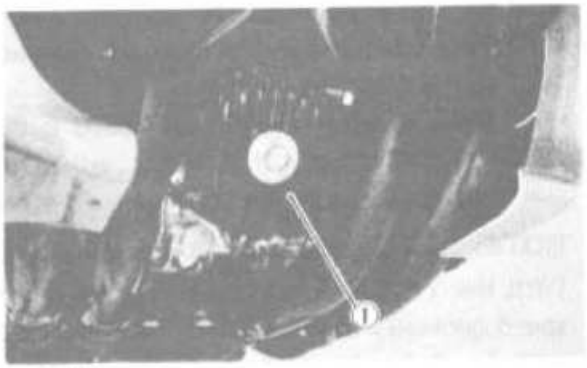
1. Lower pannel

d. Remove the drain plug and drain the oil.



1. Drain plug

e. Remove the oil filter bolt and filter element.



1. Oil filter cover

f. Reinstall the drain plug (make sure it is tight).

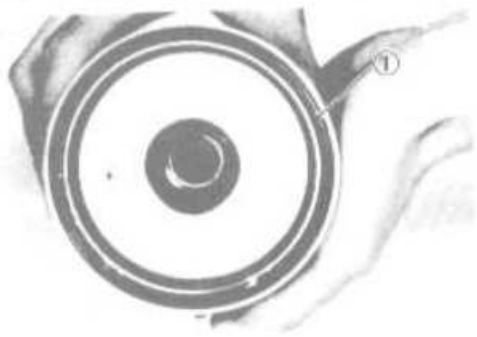
Drain plug torque:
43 Nm (4.2 m-kg, 31.0 ft-lb)

g. Install the new oil filter element, new O-ring and filter cover; tighten the oil filter bolt.

Oil filter bolt torque:
15 Nm (1.5 m-kg, 11.0 ft-lb)

NOTE:

Make sure the O-ring is positioned properly.



1. Proper O-ring position

h. Add oil through the oil filler hole.

Periodic oi change:
2.5 L (2.2 Imp qt, 2.6 US qt)
With oil filter replacement:
2.9 L (2.6 Imp qt, 3.1 US qt)
Recommended oil:
YAMALUBE 4-cycle oil or SAE 20W40 type SE motor oil

CAUTION:

Take care not to allow foreign material to enter the crankcase.



i. After replacing engine oil, and/or the oil filter, be sure to check for oil leakage. The oil indicator light should go off after oil is filled.

CAUTION:

If the indicator light flickers or remains on, the oil level switch may be damaged. Refer to ELECTRICAL for corrective action.

j. Reinstall the lower panel.

H. Final gear oil

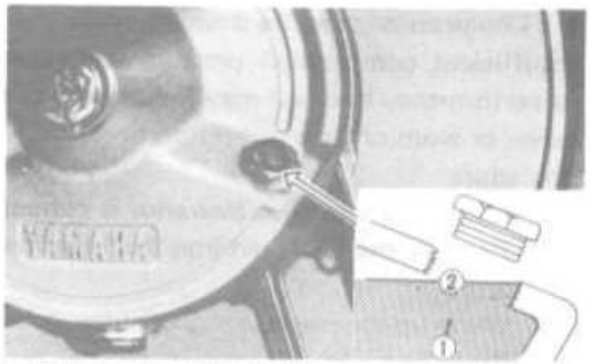
1. Oil level measurement

a. Place the motorcycle on a level place and place it on the centerstand. The engine should be cool (at atmospheric temperature).

b. Remove the oil filler cap and check the oil level whether it is to the hole brim. If it is not up to this level, replenish oil.

CAUTION:

Take care not to allow foreign material to enter the final gear case.

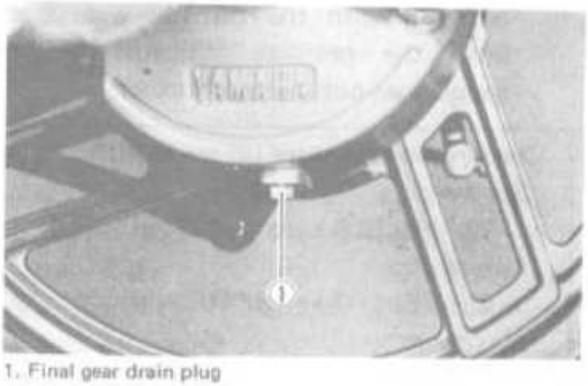


1. Final gear oil 2. Correct oil level

2. Gear oil replacement

a. Place an oil pan under the final gear case.

b. Remove the final gear oil filler cap and the drain plug, and drain the oil.



1. Final gear drain plug

WARNING:

When draining or filling, take care not to allow foreign material to enter the final gear case. Do not allow the gear oil to contact the tire and wheel.

c. Reinstall and tighten the final drain plug.

Tightening torque:
23 Nm (2.3 m·kg, 17 ft·lb)

d. Fill the gear case to the specified level.

Oil capacity:
Final gear case:
0.2 L (0.18 Imp qt, 0.21 US qt)
Recommended oil:
SAE 80 API "GL-4" Hypoid gear oil.
If desired, an SAE 80W90 hypoid gear oil may be used for all conditions.

e. Reinstall the filler cap securely.

I. Compression pressure measurement

Insufficient compression pressure will result in performance loss and may indicate leaking valves or worn or damaged piston rings.

Procedure:

1. Make sure the valve clearance is correct.
2. Remove the headlight fuse from the fuse box.
3. Warm up the engine 2 ~ 3 minutes. Stop the engine.
4. Remove the all spark plugs.
5. Install a compression-check gauge.
6. Turn over the engine with the electric starter (make sure the battery is fully charged) with the battery is fully charged) with the throttle wide open until the pressure indicated on the gauge does not increase further.

Compression pressure (at sea level):
Standard
834 kPa (8.5 kg/cm², 121 psi)
Minimum
686 kPa (7 kg/cm², 100 psi)
Maximum
981 kPa (10 kg/cm², 142 psi)

WARNING:

When cranking the engine, ground the removal spark plug wires to prevent sparking.



1. Compression gauge

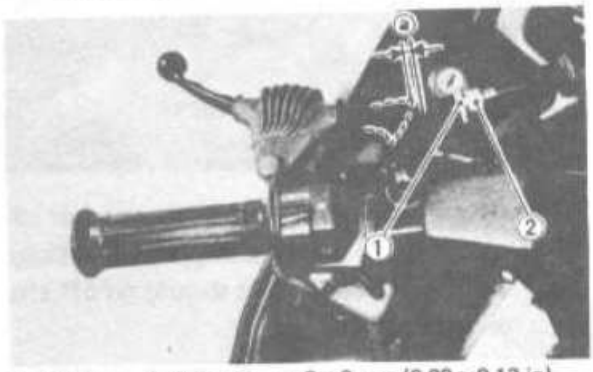
7. If the pressure is too low, squirt a few drops of oil into the cylinder being measured. Measure compression again. If there is a higher reading than before (without oil), the piston rings may be worn or damaged. If the pressure remains the same after measuring with the oil, either or both the rings and valves may be the cause.
8. Check each cylinder. Compression pressure should not vary more than the specified value from one cylinder another.

Difference in gauge reading:
Less than 98.1 kPa (1.0 kg/cm², 14 psi)

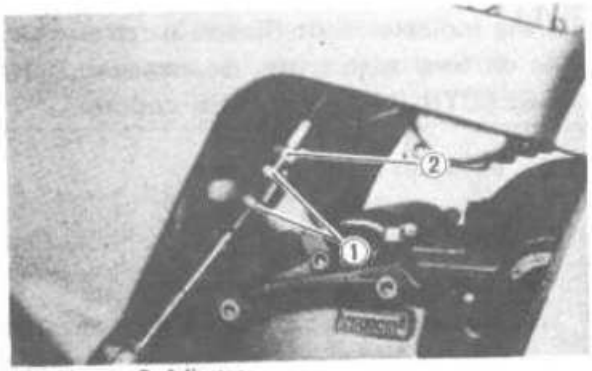
J. Clutch adjustment

Free play adjustment

a. Loosen either the handle lever adjuster locknut or the cable length-adjuster locknut.
b. Turn the cable length-adjuster either in or out until the proper lever free play is achieved.

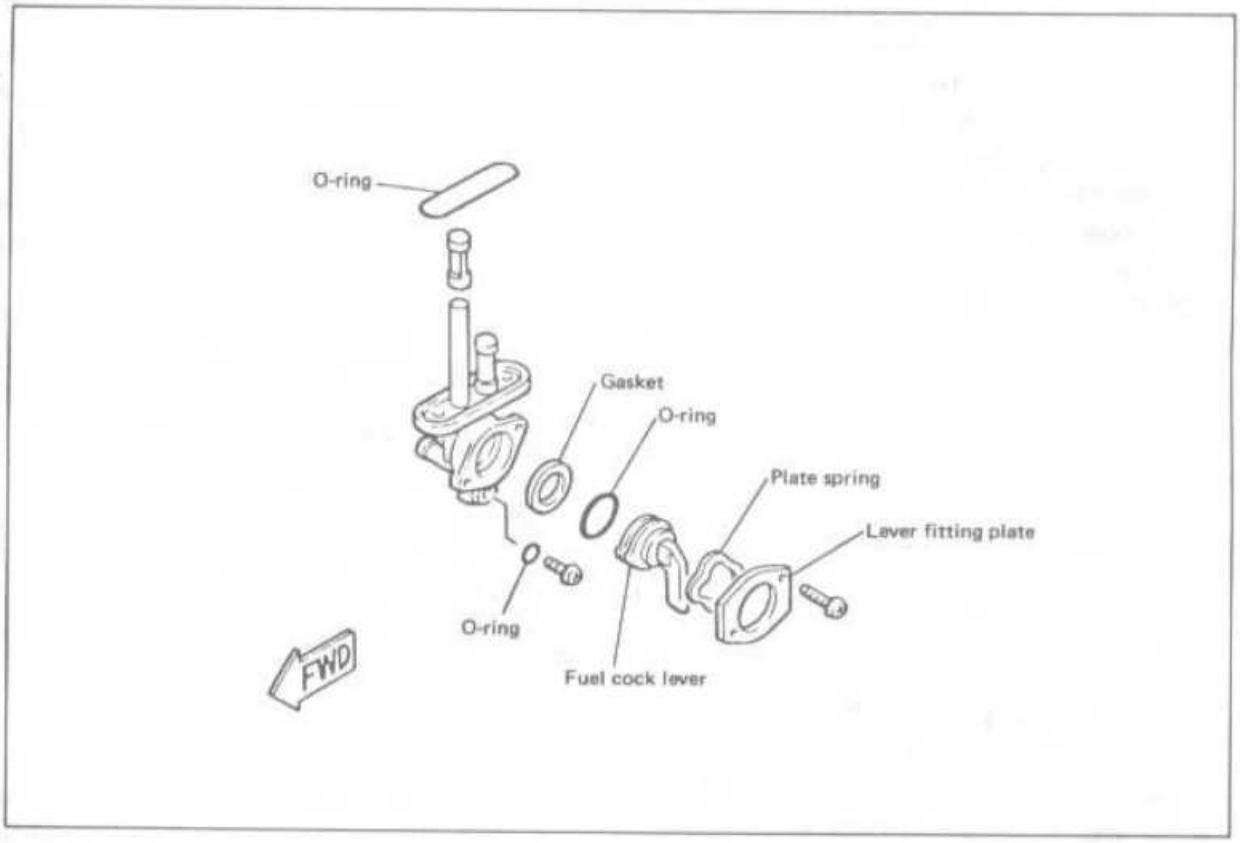


1. Locknut 2. Adjuster a. 2~3 mm (0.08~0.12 in)



1. Locknut 2. Adjuster

A. Fuel petcock



If the fuel petcock is leaking or excessively contaminated, it should be removed from the fuel tank and inspected.

1. Remove the fuel tank, and position it so that fuel will not spill when the petcock is removed.
2. Remove the petcock and inspect the filter screen. Replace the filter if sriously contaminated.
3. Remove the screws on the front and rear of the petcock and remove the plate, gaskets, lever, and diaphragm.
4. Inspect all components and replace any that are damaged. If the diaphragm is in any way damaged, or the petcock body gasket surfaces scratched or corroded, the petcock assembly must be replaced. If there is abrasive damage to any component, the fuel tank must be drained and flushed.
5. Reassemble the petcock and install it on the fuel tank.

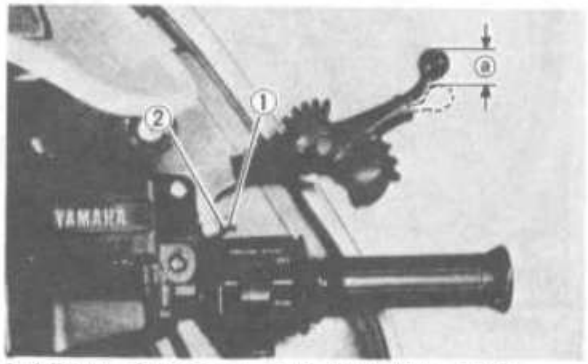
B. Front and rear brake

1. Brake adjustment

a. Front brake lever free play adjustment. The brake can be adjusted by simply adjusting the free play of the brake lever. The piston in the caliper moves forward as the brake pad wears out, automatically adjusting the clearance between the brake pads and brake disc.

CAUTION:

Proper lever free play is essential to avoid excessive brake drag.



1. Adjuster 2. Lock nut a. 5 8 mm (0.2 0.3 in)

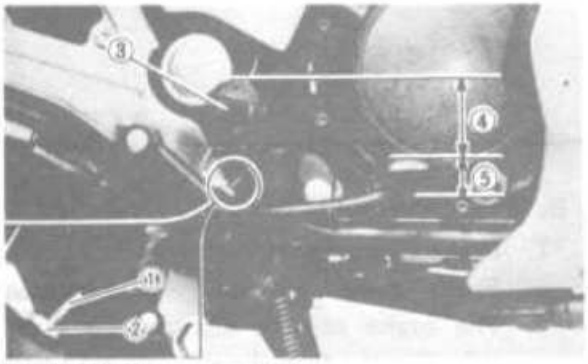
1) Loosen the adjuster locknut on the brake lever.
2) Turn the adjuster so that the brake lever movement at the lever end is 5 ~ 8 mm (0.2 ~ 0.3 in) before the adjuster contacts the master cylinder piston.
3) After adjusting, tighten the locknut.

b. Rear brake pedal height adjustment

1) Loosen the adjuster locknut (for pedal height).
2) By turning the adjuster bolt clockwise or counterclockwise, adjust the brake pedal position so that its top end is approximately 20 mm (0.78 in) below the footrest top end.
3) Secure the adjuster locknut.

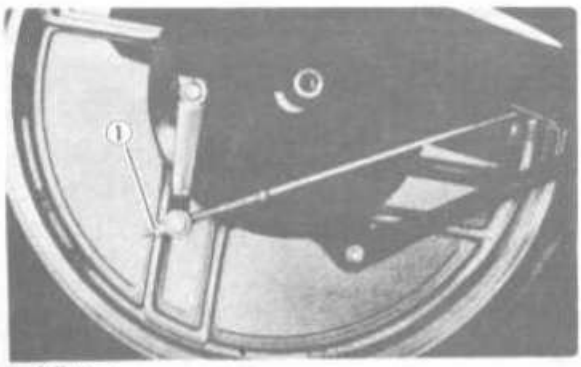
WARNING:

After adjusting the pedal height, the brake pedal free play should be adjusted.



1. Adjuster bolt (for pedal height)
2. Locknut
3. Footrest
4. Pedal height 40 mm (1.6 in)
5. Free play 20 30 mm (0.8 1.2 in)

c. Rear brake pedal free play adjustment
Turn the adjuster on the brake rod clockwise or counterclockwise to provide the brake pedal with a free play of 20 ~ 30 mm (0.8 ~ 1.2 in).



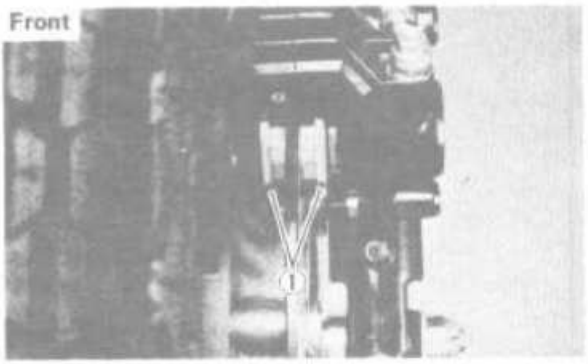
1. Adjuster

WARNING:

Check the operation of the brake light after adjusting the rear brake.

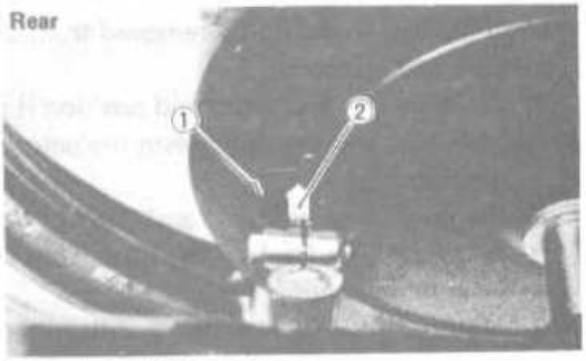
2. Front brake pad and rear brake shoe check

a. Front brake pad
To check, look at the pad in front. If any pad is worn to the wear limit, replace both pads in the caliper.



1. Wear indicator

b. Rear brake shoe
To check, see the wear indicator position while depressing the brake pedal. If the indicator reaches to the wear limit line, replace the shoes.



1. Wear limit 2. Wear indicator

3. Brake fluid
Insufficient brake fluid may allow air to enter the brake system, possibly causing the brake to become ineffective. Check the brake fluid level and replenish when necessary, observing these precautions:



1. Lower level

a. Use only the designated quality brake fluid; otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.

Recommended brake fluid: DOT # 3

b. Refill with the same type and brand of brake fluid; mixing fluids may result in a harmful chemical reaction and lead to poor performance.
c. Be careful that water or other contamination does not enter the master cylinder when refilling. Water will significantly lower the boiling point and may result in vapor lock.
d. Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.
e. Check the cause if the brake fluid level goes down.

Brake fluid replacement

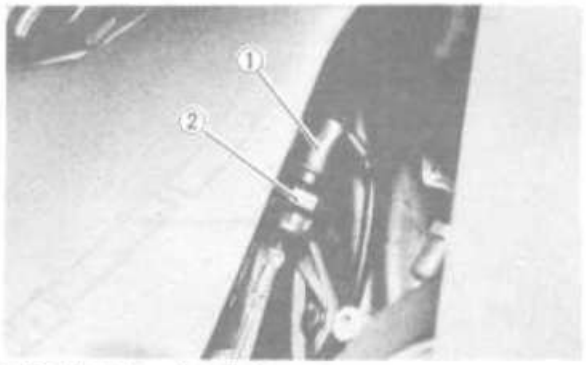
1. Complete fluid replacement should be done only by trained Yamaha service personnel or other qualified mechanic.
2. Complete fluid replacement should be done whenever the caliper cylinder or master cylinder is disassembled, or the fluid becomes seriously contaminated.
3. Replace the following components whenever damaged or leaking, also:

a. Replace all brake seals every two years.
b. Replace all brake hoses every four years.

Brake light switch adjustment

The brake light switch is operated by the movement of the brake pedal.

To adjust, hold the switch body with the hand so it does not rotate and turn the adjusting nut. Proper adjustment is achieved when the brake light comes on slightly before the brake begins to take effect.



1. Switch body 2. Adjusting nut

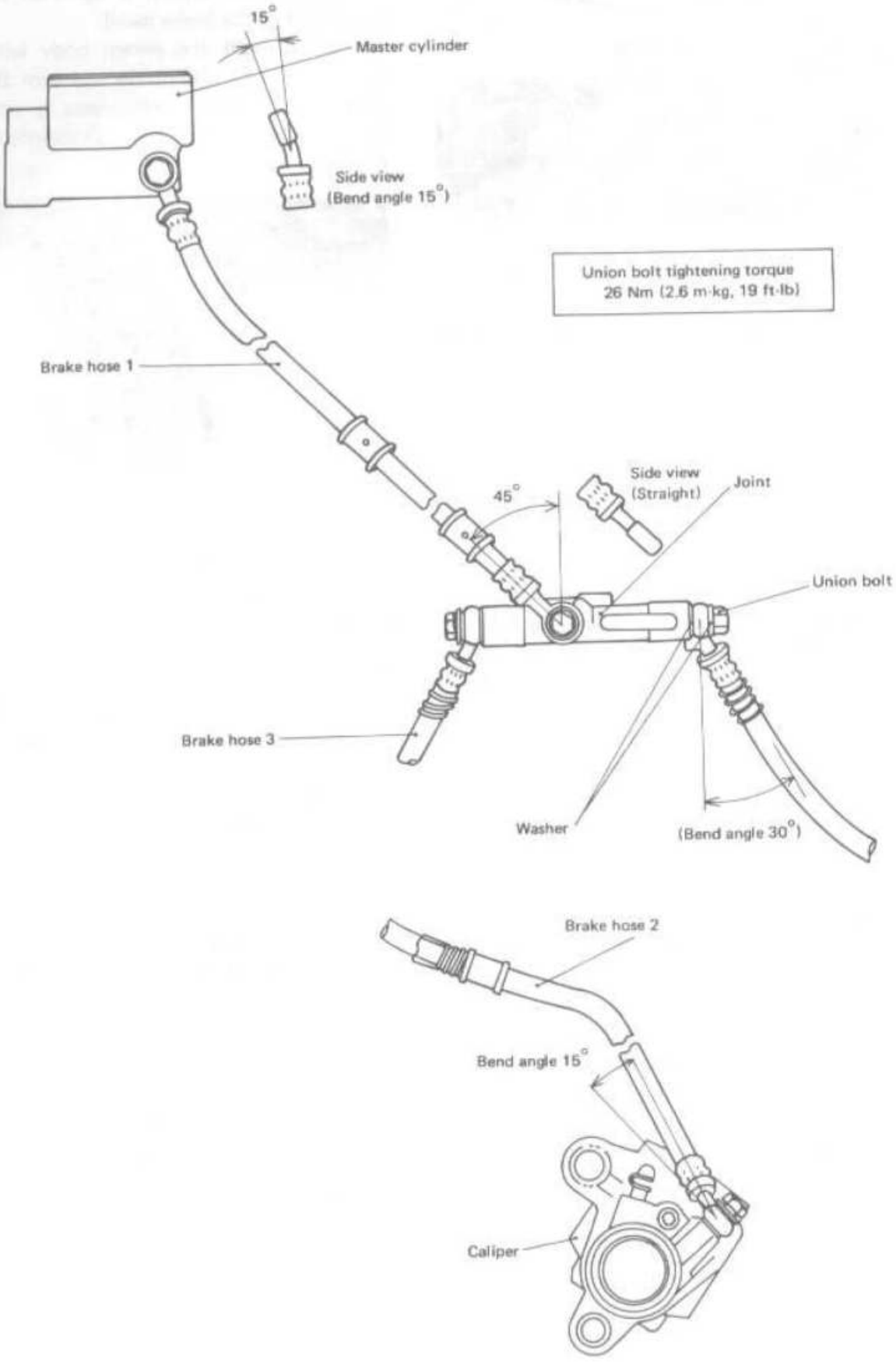
Front brake hose installation

The front brake hoses should be installed as shown in the illustration.

NOTE:

1. When installing the brake hose to the master cylinder, the joint, or the caliper, pay attention to the banjo fitting angle; see the illustration.
2. When installing the banjo fitting to the caliper or the joint, use the stopper.
3. When installing the banjo fitting to the master cylinder, brake hose 1 should not have any excessive twists or bends in it, nor should it be tightly stretched.

FRONT BRAKE HOSE INSTALLATION



C. Tubeless tires and aluminum wheels

This motorcycle is equipped with aluminum wheels designed to be compatible with either tube or tubeless tires. Tubeless tires are installed as standard equipment.

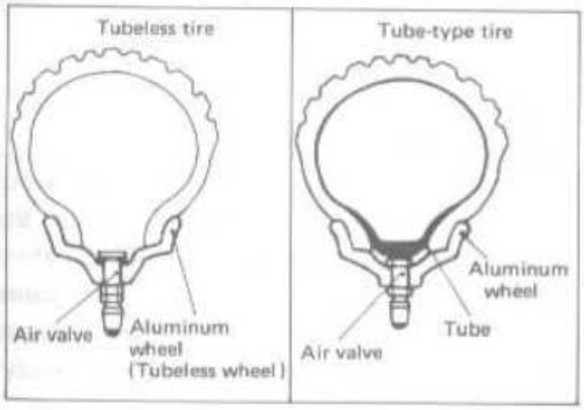
WARNING:

Do not attempt to use tubeless tires on a wheel designed for use only with tube-type tires. Tire failure and personal injury may result from sudden deflation.

Tube-type Wheel – Tube-type tires only

Tubeless-type Wheel – Tube-type or Tubeless tires

When using tube-type tires, be sure to install the proper tube also.



To insure maximum performance, long service, and safe operation, note the following precautions:

1. Check tire pressure before riding; adjust as necessary.
2. Before operation, always check the tire surfaces for wear and/or damage; look for cracks, glass, nails, metal fragments, stones, etc. Correct any such hazard before riding.
3. Always inspect the aluminum wheels before a ride. Place the motorcycle on its centerstand and check for cracks, bends, or warpage of the wheels. Do not attempt even small repairs to the wheel. If a wheel is deformed or cracked, it must be replaced.
4. Tires and wheels should be balanced whenever either one is changed or replaced. Failure to have a wheel assembly balanced can result in poor performance, adverse handling characteristics, and shortened tire life.
5. After installing a tire, ride conservatively to allow the tire to seat itself on the rim properly. Failure to allow proper seating may cause tire failure, resulting in damage to the motorcycle and injury to the rider.
6. After repairing or replacing a tire, check to be sure the valve stem locknut is securely fastened. If not, torque it as specified.

Tightening torque:
0.15 m·kg (1.1 ft·lb)

D. Front fork oil change

NOTE:

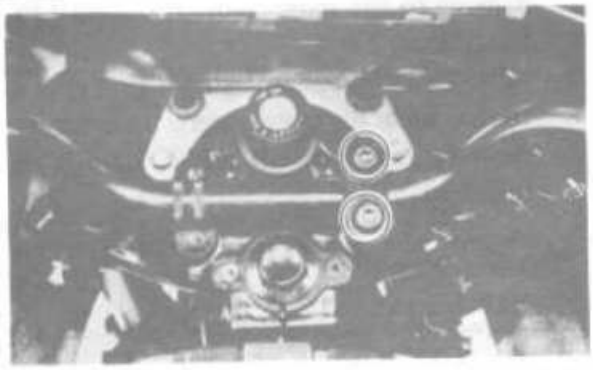
It is recommended that you proceed to the front fork oil change after clearing the front fork area of the fairing. This makes the work easier without the fairing being damaged.

WARNING:

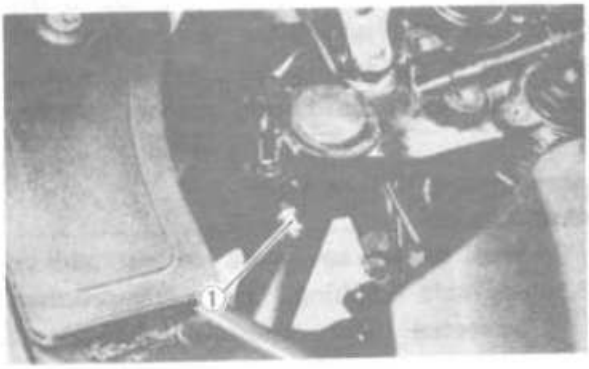
1. **Fork oil leakage cause loss of stability and safe handling. Have any problem corrected before operating the motorcycle.**
2. **Securely support the motorcycle so there is no danger of it falling over.**

1. Raise the motorcycle or remove the front wheel so that there is no weight on the front end of the motorcycle.
2. Remove the handlebar cover and handlebars.





3. Remove the air valve cap from the left fork.



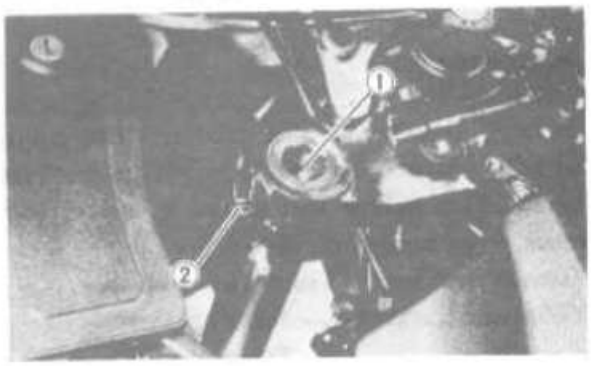
1. Air valve cap

4. Keep the valve open while pressing it for several seconds so that the air can be let out of the inner tube.



1. Push

5. Remove the rubber cap from the top of each fork.
6. Loosen the pinch bolts and remove the cap bolt from each inner tube.

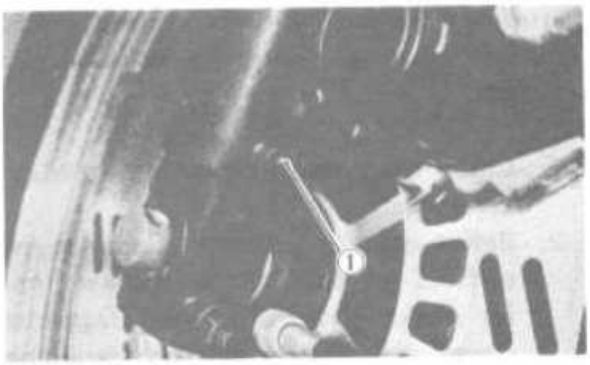


1. Cap bolt 2 Pinch bolt

7. Place an open container under each drain hole. Remove the drain screw from each outer tube.

WARNING:

Do not allow oil to contact the disc brake components. If any oil should contact the brake components, it must be removed before the motorcycle is operated. Oil will cause diminished braking capacity and will damage the rubber components of the brake assembly.



1. Drain screw

8. When most of the oil has drained, slowly raise and lower the outer tubes to pump out the remaining oil.
9. Inspect the drain screw gasket. Replace if damaged. Reinstall the drain screw.
10. Pour the specified amount of oil into the fork inner tube.

Front fork oil (each fork):
238 cm³ (8.4 Imp oz, 8.0 US oz)
Yamaha Fork Oil 10wt or equivalent

11. After filling, slowly pump the outer tubes up and down to distribute the oil.
12. Inspect the O-ring on the cap bolt.
13. Reinstall the cap bolt and the rubber cap. Then, tighten the pinch bolts.

Tightening torque:
Cap bolt:
20 Nm (2.0 m·kg, 14.0 ft·lb)
Pinch bolt:
17 Nm (1.7 m·kg, 12.0 ft·lb)

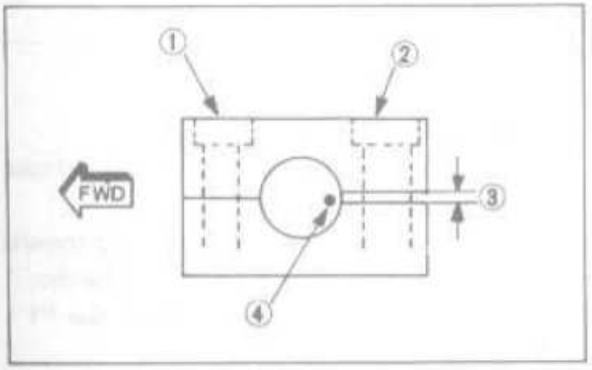
14. Fill the fork with air using a manual air pump or other pressurized air supply. Refer to "Front fork and rear shock absorber adjustment" for proper air pressure adjusting.

Maximum air pressure:
118 kPa (1.2 kg/cm², 17 psi)
Do not exceed this amount.

15. Reinstall the air valve cap to the left fork.
16. Reinstall the handlebars and handlebar cover.

NOTE:
First tighten the bolts on the front side of the handlebar holder, and then tighten the bolts on the rear side.

Handlebar upper holder
tightening torque:
19 Nm (1.9 m·kg, 13.0 ft·lb)



1. 1st 2. 2nd 3. Gap 4. Punch mark

Front fork and rear shock adjustment

CAUTION:
Don't dent the air chamber nor damage the air hose. It will result in an air leakage.

Front fork:

NOTE:
Since the right and left front forks are connected by air hose, there is only one valve where the air pressure is measured and adjusted.

1. Air pressure
a. Elevate the front wheel by placing the motorcycle on the centerstand.

NOTE:
When checking and adjusting the air pressure, there should be no weight on the front end of the motorcycle.

b. Remove the air valve cap.
c. Using the air check gauge, check and adjusted the air pressure. If the air pressure is increased, the suspension becomes stiffer and if decreased, it becomes softer.

To increase:
Use a manual air pump or other pressurized air supply.
To decrease:
Release the air by pushing the valve pin.



1. Air check gauge

NOTE:

An optional air check gauge is available.
P/No. 2X4-2811A-00

Standard air pressure:
39.2 kPa (0.4 kg/cm², 5.7 psi)
Maximum air pressure:
118 kPa (1.2 kg/cm², 17 psi)
Minimum air pressure:
39.2 kPa (0.4 kg/cm², 5.7 psi)

CAUTION:

Never exceed the maximum pressure or oil seal damage may occur.

WARNING:

Never pressurize the front fork above the maximum or below the minimum air pressure. It will cause damage to front fork and/or loss of motorcycle control.

d. Reinstall the air valve cap.

E. Rear shock absorber

NOTE:

Since the right and left shock absorbers are connected by air hose, there is only one valve where the air pressure is measured and adjusted.

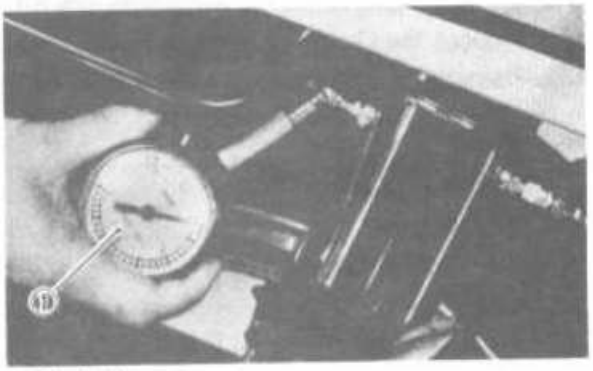
1. Air pressure
a. Elevated the rear wheel by placing the motorcycle on the centerstand.

NOTE:

When checking and adjusting the air pressure, there should be no weight on the rear end of the motorcycle.

b. Remove the air valve cap.
c. Using the air check gauge, check and adjust the air pressure. If the air pressure is increased, the suspension becomes stiffer, and if decreased, it becomes softer.

To increase:
Use a manual air pump or other pressurized air supply.
To decrease.
Release the air by pushing the valve pin.



1. Air check gauge

NOTE:

An optional air check gauge is available.
P/No. 2X4-2811A-00

Standard air pressure:
98.1 kPa (1.0 kg/cm², 14 psi)
Maximum air pressure:
392 kPa (4.0 kg/cm², 57 psi)
Minimum air pressure:
98.1 kPa (1.0 kg/cm², 14 psi)

CAUTION:

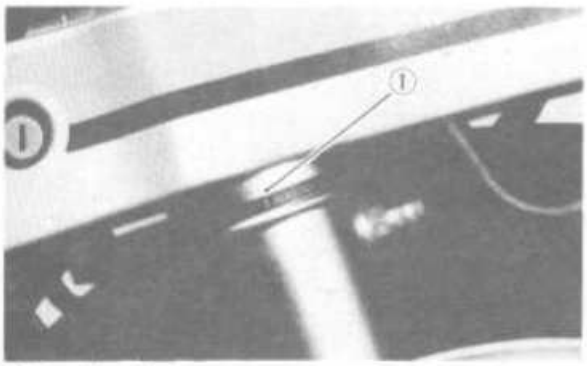
Never exceed the maximum pressure or oil seal damage may occur.

WARNING:

Never pressurize the shock abosrber above the maximum or below the minimum air pressure. It will cause damage to rear shock absorber and/or loss of motorcycle control.

d. Reinstall the air valve cap.
2. Damping
a. Turning the damping adjuster to increase or decrease the damping.
b. If the damping adjuster is turned toward the "4", the damping becomes harder; if the adjuster is turned toward the "1", damping becomes softer.

Standard position – No. 1
No. 1 – Minimum damping
No. 4 – Maximum damping



1. Damping adjuster

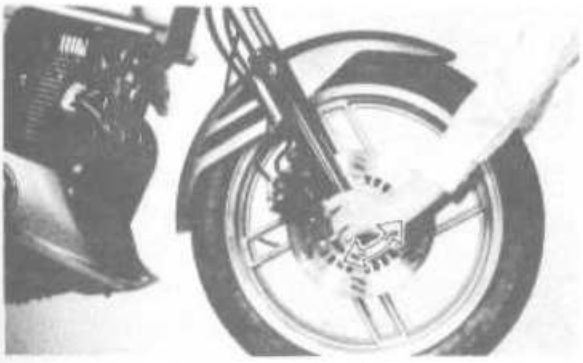
WARNING:

Always the shock absorbers on each side to the same position. Uneven adjustment will cause an improper riding position.

F. Steering head adjustment

The steering assembly should be checked periodically for looseness.

1. Raise the front end of the motorcycle so that there is no weight on the front wheel.
2. Grasp the bottom of the forks and gently rock the fork assembly backward and forward, checking for looseness in the steering assembly bearings.



3. If there is looseness in the steering head, loosen the steering stem and front fork pinch bolts and steering fitting bolt.
4. Use a steering nut wrench to loosen top steering fitting nut. The top nut serves as a locknut.
5. Tighten the lower steering fitting nut until the steering head is tight, but does not bind when forks are turned.
6. Retighten the top steering fitting nut, steering fitting bolt and steering stem and front fork pinch bolts, in that order.
7. Recheck steering adjustment to make sure there is no binding when the forks are moved from lock to lock. If necessary, repeat adjustment procedure.

G. Cable inspection and lubrication

WARNING:

Damage to the outer housing of the various cables may cause corrosion; free movement could be obstructed. An unsafe condition may result, so replace such cables as soon as possible.

1. If the inner cables do not operate smoothly, lubricate or replace them.

Recommended lubricant:
Yamaha Chain and Cable Lube or
SAE 10W30 motor oil

H. Throttle cable and grip lubrication

The throttle twist grip assembly should be greased when the cable is lubricated, since the grip must be removed to get at the end of the throttle cable. Two screws clamp the throttle housing to the handlebar. Once these two are removed, the end of the cable can be held high to pour in several drops of lubricant. With the throttle grip disassembled, coat the metal surface of the grip assembly with a suitable all-purpose grease to cut down friction.

I. Rear arm pivot bearings

The swingarm must pivot freely on its bearings but not have any excess play. Check and adjust pivot bearings if necessary.

J. Brake and change pedals/brake and clutch levers

Lubricate the pivoting parts of each lever and pedal.

Recommended lubricant: Yamaha Chain and Cable Lube or SAE 10W30 motor oil

K. Centerstand and sidestand pivots

Lubricate the centerstand and sidestand at their pivot points.

Recommended lubricants: Yamaha Chain and Cable Lube or SAE 10W30 motor oil

ELECTRICAL

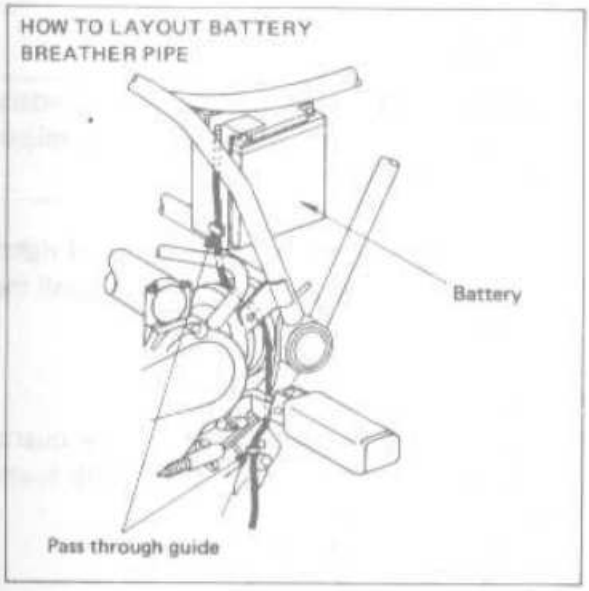
A. Battery

1. The fluid level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.

CAUTION:

Normal tap water contains minerals which are harmful to a battery; therefore, refill only with distilled water.

2. Always make sure the connections are correct when installing the battery. Make sure the breather pipe is properly connected, properly routed, and is not damaged or obstructed.



CAUTION:

The battery must be charged before using to insure maximum performance. Failure to properly charge the battery before first use or a low electrolyte level will cause premature failure of the battery.

Charging current: 1.2 amps/10 hrs or until the specific gravity reaches 1.280 at 20°C (68°F)

WARNING:

Battery electrolyte is poisonous and dangerous, causing severe burns, etc. It contains sulfuric acid. Avoid contact with skin, eyes, or clothing.

Antidote: EXTERNAL-Flush with water. INTERNAL--Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes. Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in closed space. Always shield eyes when working near batteries.

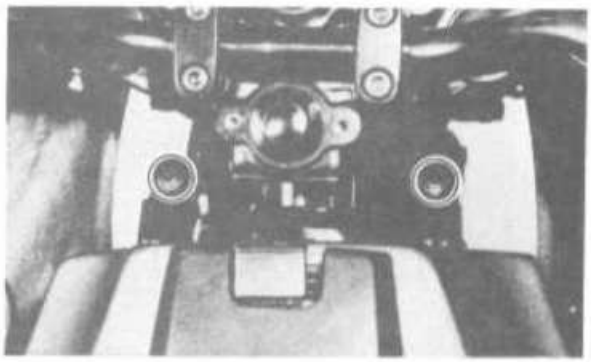
KEEP OUT OF REACH OF CHILDREN.

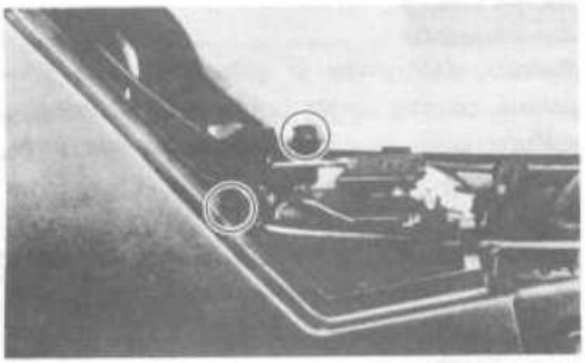
Replenishing the battery bluid

A poorly maintained battery will deteriorate quickly. The battery fluid should be checked at least once a month.

1. Remove the seat.
2. Remove the handlebar cover and side panels (left and right).







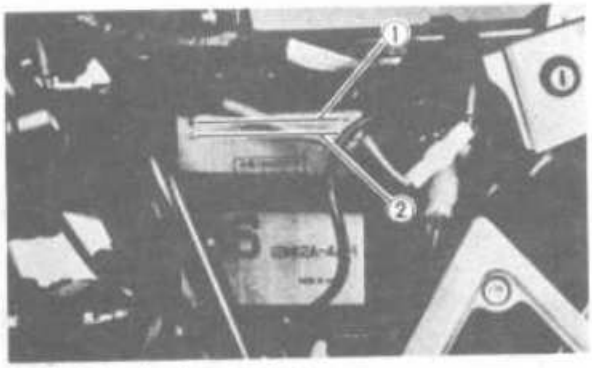
3. The level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.

CAUTION:

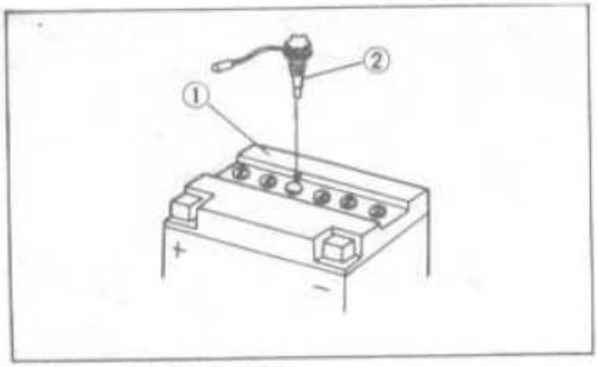
Normal tap water contains minerals which are harmful to a battery; therefore, refill only with distilled water.

CAUTION:

Install the battery sensor into 3RD hole from positive terminal.



1. Upper level 2. Lower level



1. Battery 2. Battery sensor

4. When the motorcycle is not to be used for a month or longer, remove the battery and store it in a cool, dark place. Completely recharge the battery before reusing.
5. If the battery is to be stored for a longer period than the above, check the specific gravity of the fluid at least once a month and recharge the battery when it is too low.
6. Always make sure the connections are correct when putting the battery back in the motorcycle.
   Make sure the breather pipe is properly connected and is not damaged or obstructed.

CAUTION:

Make sure that the connection to the battery is correct; otherwise, damage to the microcomputer may occur.

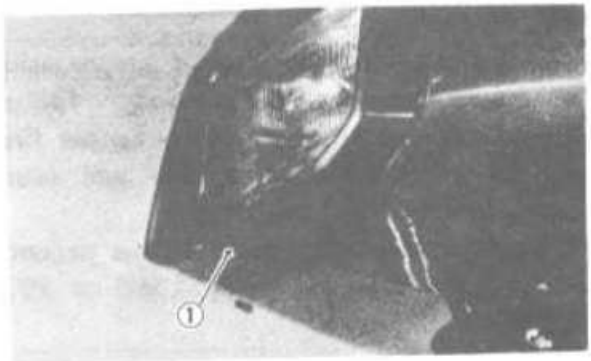
7. Reinstall the side panels (left and right) and handlebar cover. Then, reinstall the seat.

B. Headlight

This motorcycle is equipped with a quartz bulb headlight. If the headlight bulb burns out, replace the bulb as follows:

1. Headlight bulb replacement

a. Remove the headlight nacelle.



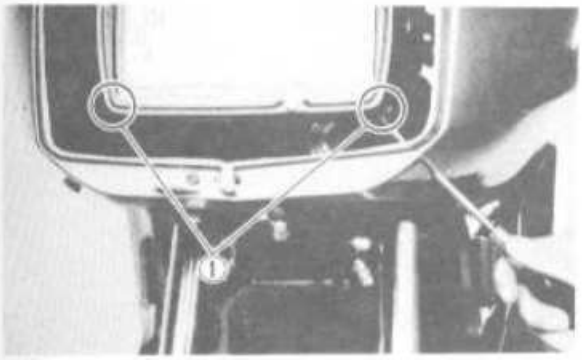
1. Nacelle holding screw

b. Remove the two blind plugs from the upper panels (left and right).



1. Blind plug

c. Remove the 2 screws holding the light unit assembly to the headlight body.

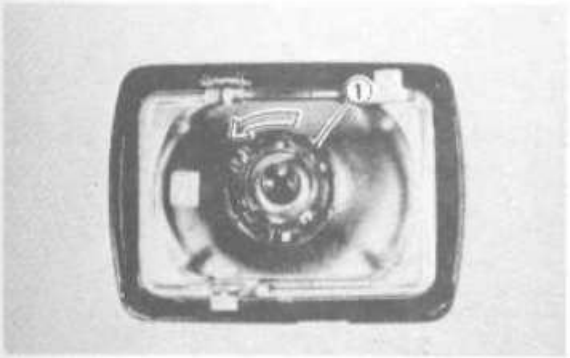


1. Holding screw

d. Disconnect the leads and remove the light unit assembly.



e. Turn the bulb holder counterclockwise and remove the defective bulb.



1. Bulb holder

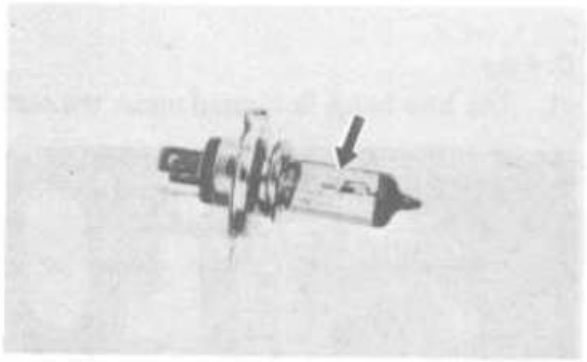
f. Slip a new bulb into position and secure it with the bulb holder.

CAUTION:

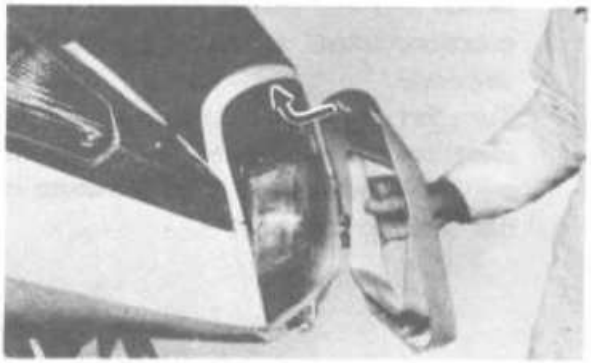
Avoid touching the glass part of the bulb. Also keep it free from oil stains; otherwise, the transparency of the glass, life of the bulb, and luminous flux will be adversely affected. If the glass is oil stained, thoroughly clean it with a cloth moistened with alcohol or lacquer thinner.

WARNING:

Keep flammable products or your hands away from the bulb while it is on, because it heats up. Do not touch the bulb until it cools down.



g. For reassembly, follow procedure below with care.
   1) Install the two blind plugs.
   2) Make sure the projecting portions of the headlight nacelle are positioned correctly.

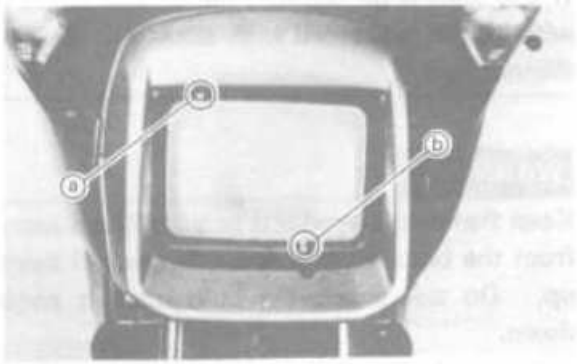


3) Adjust the headlight beam if necessary.

2. Headlight beam adjustment:

a. Horizontal adjustment:
To adjust the beam to the left, turn the adjusting screw clockwise.
To adjust the beam to the right, turn the screw counterclockwise.

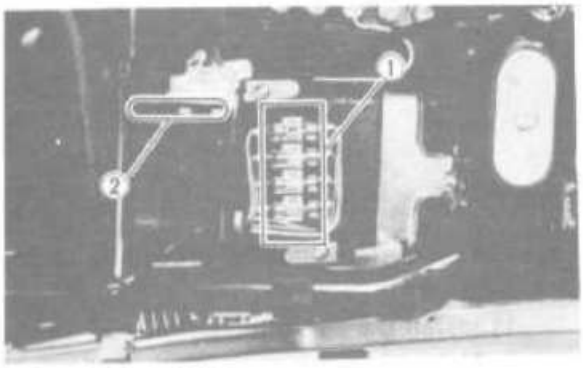
b. Vertical adjustment:
To adjust the beam to the upper, turn the adjusting screw clockwise.



a. Horizontal adjusting screw b. Vertical adjusting screw

C. Fuse

1. The fuse block is located under the seat.



1. Fuse 2. Spare fuse

2. If any fuse is blown, turn off the ignition switch and the switch in the circuit in question, install a new fuse of proper amperage.
Turn on the switches, and see if the electrical device operates. If the fuse immediately blows again, find the cause in the circuit in question.

WARNING:

Do not use fuses of a higher amperage rating than those recommended. Substitution of a fuse of improper rating can cause extensive electrical system damage and possible fire.

NEW SERVICE

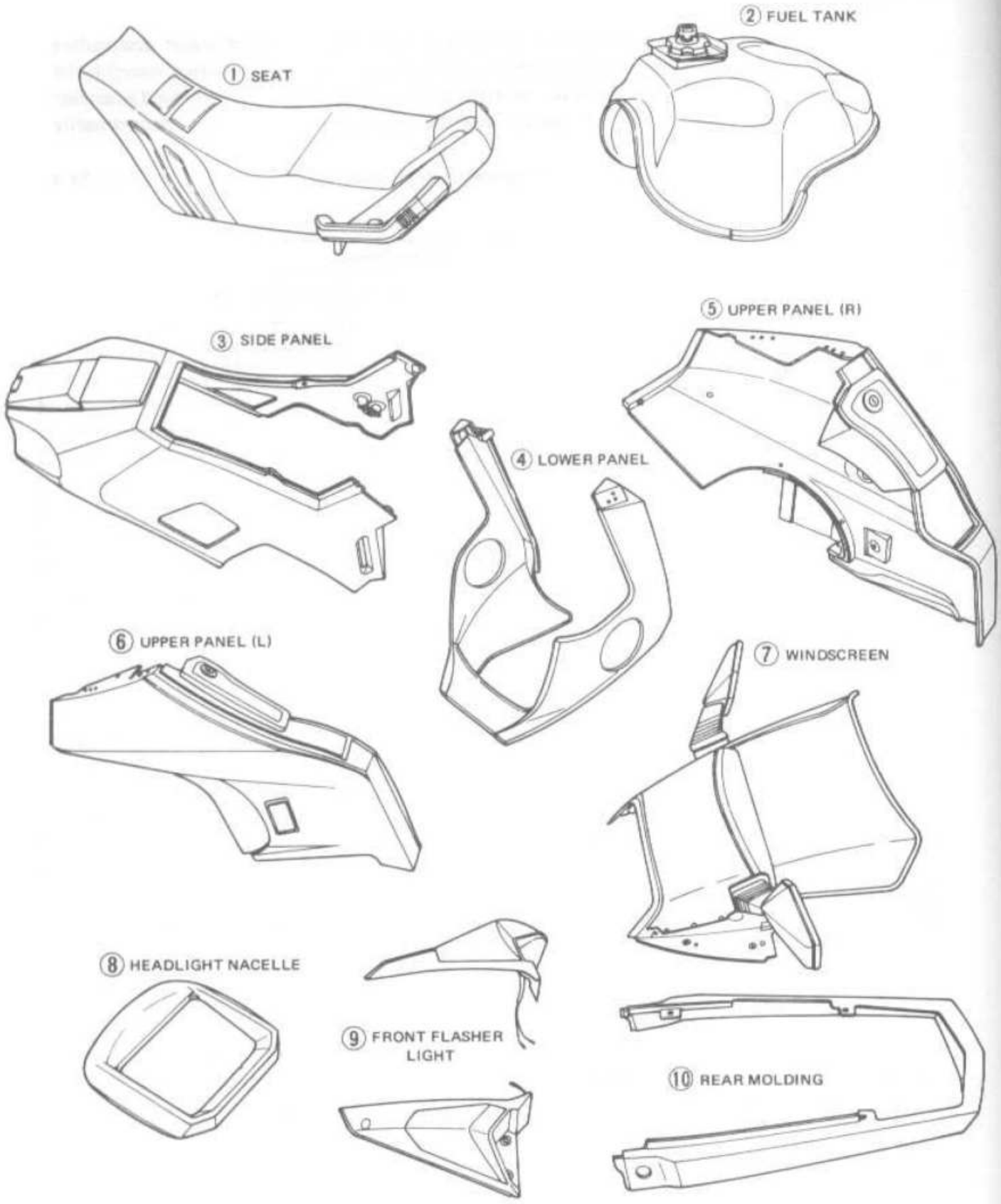
FAIRING REMOVAL

The fairing assembly must be removed to perform maintenance as well as major overhauling procedures. Some maintenance procedures require that only part of the fairing assembly be removed. Yamaha recommends, however, that the entire fairing assembly be removed whenever the motorcycle is serviced. This will ensure that the fairing is not damaged or unnecessarily marred.

The following table lists those fairing components that must be removed to gain acess to a particular area or component:

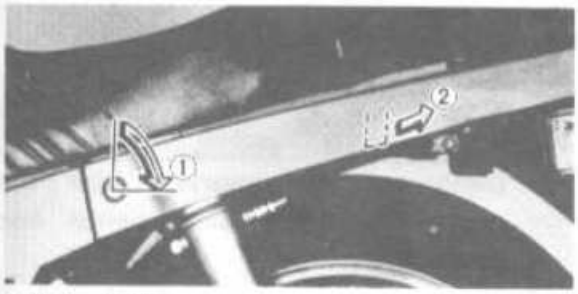
		Sections to be removed										
		1	2	3	4	5	6	7	8	9	10	NOTE
ENGINE	A. Turbo Charger Unit				○							
	B. Valve Clearance Adjustment	○	○	○		○	○	○	○	○		
	C. Ignition Timing				○							
	D. Air Cleaner	○										
	E. Carburetor	○	○	○	○							
	F. Engine Oil	○										
	G. Final Gear Oil											
	H. Compression Pressure Measurement											
	I. Clutch Adjustment											
CHASSIS	A. Fuel Cock	○	○	○	○							*Loosen the securing bolts.
	B. Front and Rear Brake											
	C. Tubeless Tires and Aluminium Wheels											
	D. Front Fork Oil Change											
	E. Rear Shock Absorber										○	
	F. Steering Head Adjustment										○	
	G. Cable Inspection and Lubrication	○		○								*Clutch cable inspection
	H. Throttle Cable and Grip Lubrication	○		○								
	I. Rear Arm Pivot Bearings											
	J. Brake and Change Pedals/Brake and Clutch Levers											
	K. Center and Side Stand Pivots											
ELECTRICAL	A. Battery	○		○								
	B. Spark Plug											
	C. Headlight									○		
	D. Fuse	○										

A fairing component marked with a solid circle must be removed; a fairing component marked with a broken circle need not be removed, but servicing procedures will be much easier if it is.


① SEAT
② FUEL TANK
③ SIDE PANEL
④ LOWER PANEL
⑤ UPPER PANEL (R)
⑥ UPPER PANEL (L)
⑦ WINDSCREEN
⑧ HEADLIGHT NACELLE
⑨ FRONT FLASHER LIGHT
⑩ REAR MOLDING

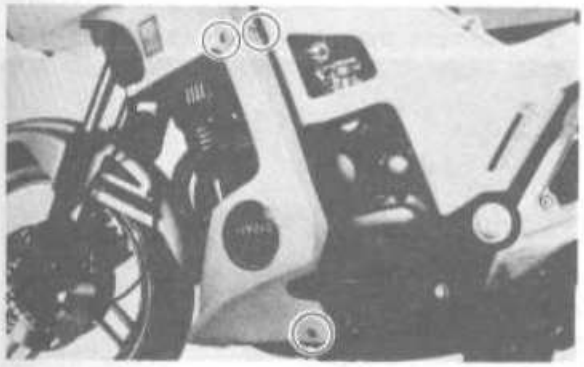
Fairing Removal

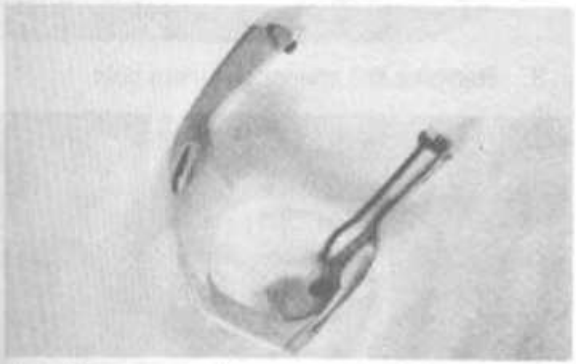
1. Remove the seat.
   To open the seat lock, insert the key in the lock. Then, turn it clockwise and pull the lever backward.



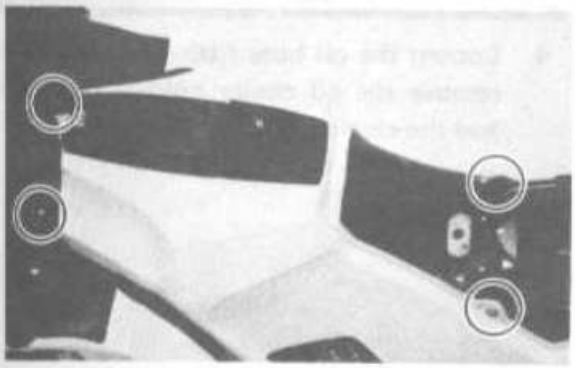
1. Open 2. Pull

2. Remove the lower panel securing bolts (3X2) and remove the lower panel as one piece.

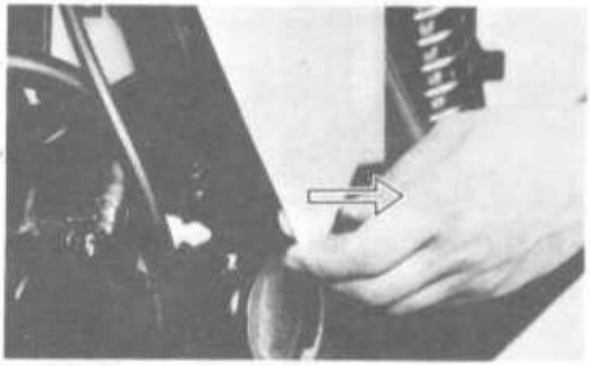




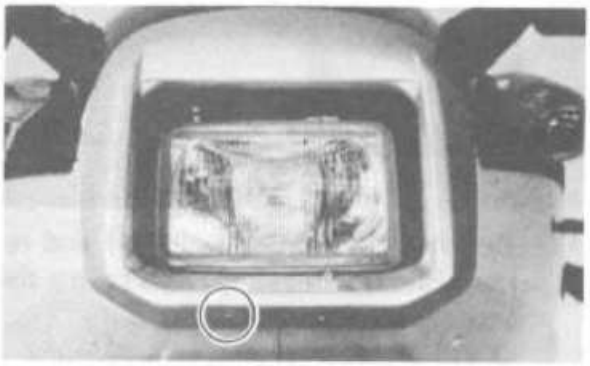
3. Remove the front securing bolts (2) and the side securing bolts (2).



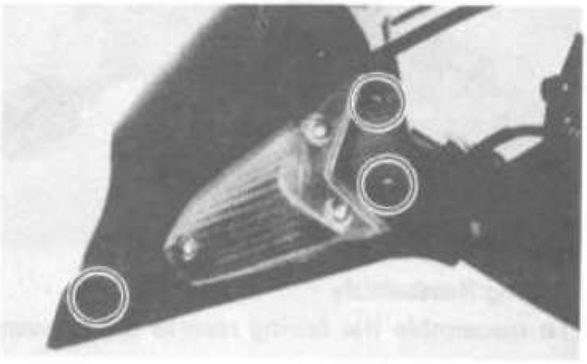
4. Remove the side panels as one piece. Grasp the panels on either side where the panels are joined to the frame. Pull the male connectors out; then pull the rear of the panels up.



5. Remove the headlight nacelle.



6. Remove the left and right front flashers (3X2); disconnect the lead couplers.



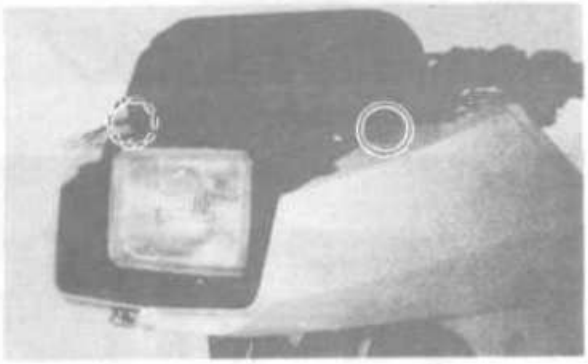
7. Remove the windscreen with the rear view mirrors (2X2).



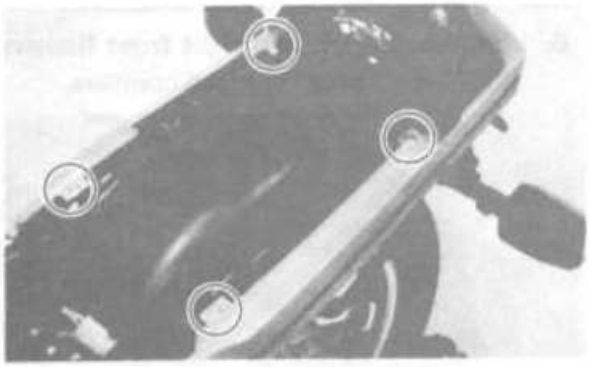
8. Remove the two clips.



9. Remove the left and right upper panels.



10. Remove the securing bolts (4) and remove the rear molding while prying the ends apart.



Fairing Reassembly

To reassemble the fairing reverse the removal procedure.

Fuel Tank Removal

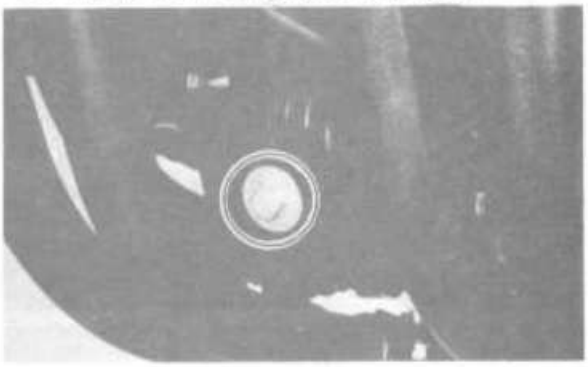
1. Remove the fuel tank securing bolt.



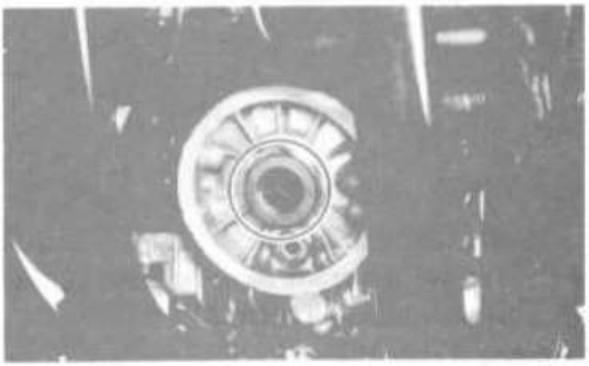
2. Disconnect the overlow pipe and emergency engine stop switch lead connecter.
3. Disconnect the fuel lines.
4. Remove the fuel tank.

Oil Cooler Removal

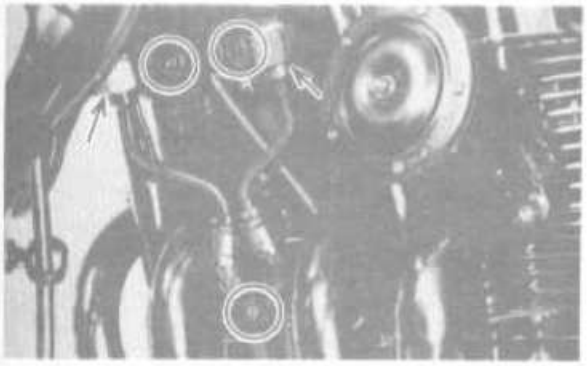
1. Place an open container under the engine.
2. Remove the oil cleaner cap bolt.



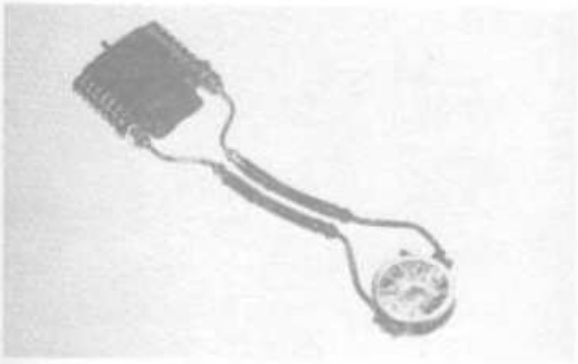
3. Remove the spacer securing bolt.



4. Loosen the oil hose fitting nuts(2); then remove the oil cooler holding bolts (2) and the clamp bolt.

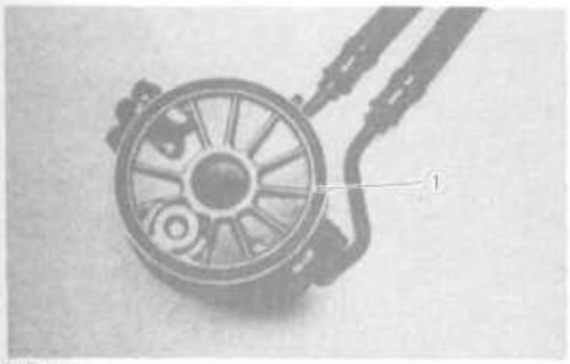


5. Remove the oil cooler assembly, pulling down and then away from the motorcycle.



Oil Cooler Installation

1. Install a new "O-ring" and install the oil cooler spacer to the crankcase. Make sure the "O-ring" is positioned properly.

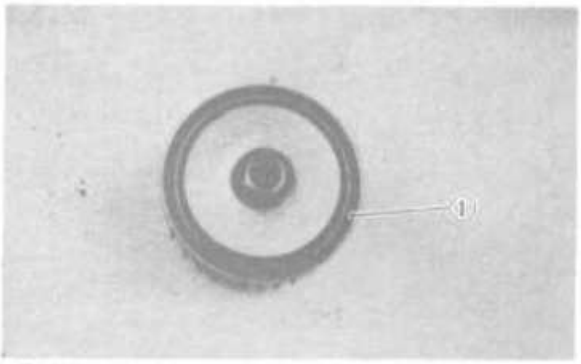


1. O-ring

2. Tighten the spacer securing bolt.

Tightening torque:
50 Nm (5.0 m-kg, 36 ft-lb)

3. Install the oil filter element into the filter cover and install a new "O-ring". Make sure the "O-ring" is positioned properly.



1. O-ring

4. Tighten the oil cleaner cap bolt.

Tightening torque:
15 Nm (1.5 m-kg, 11 ft-lb)

5. Tighten the oil cooler holding bolts (2).

Tightening torque:
10 Nm (1.0 m-kg, 7.2 ft-lb)

6. Tighten the clamp bolt.

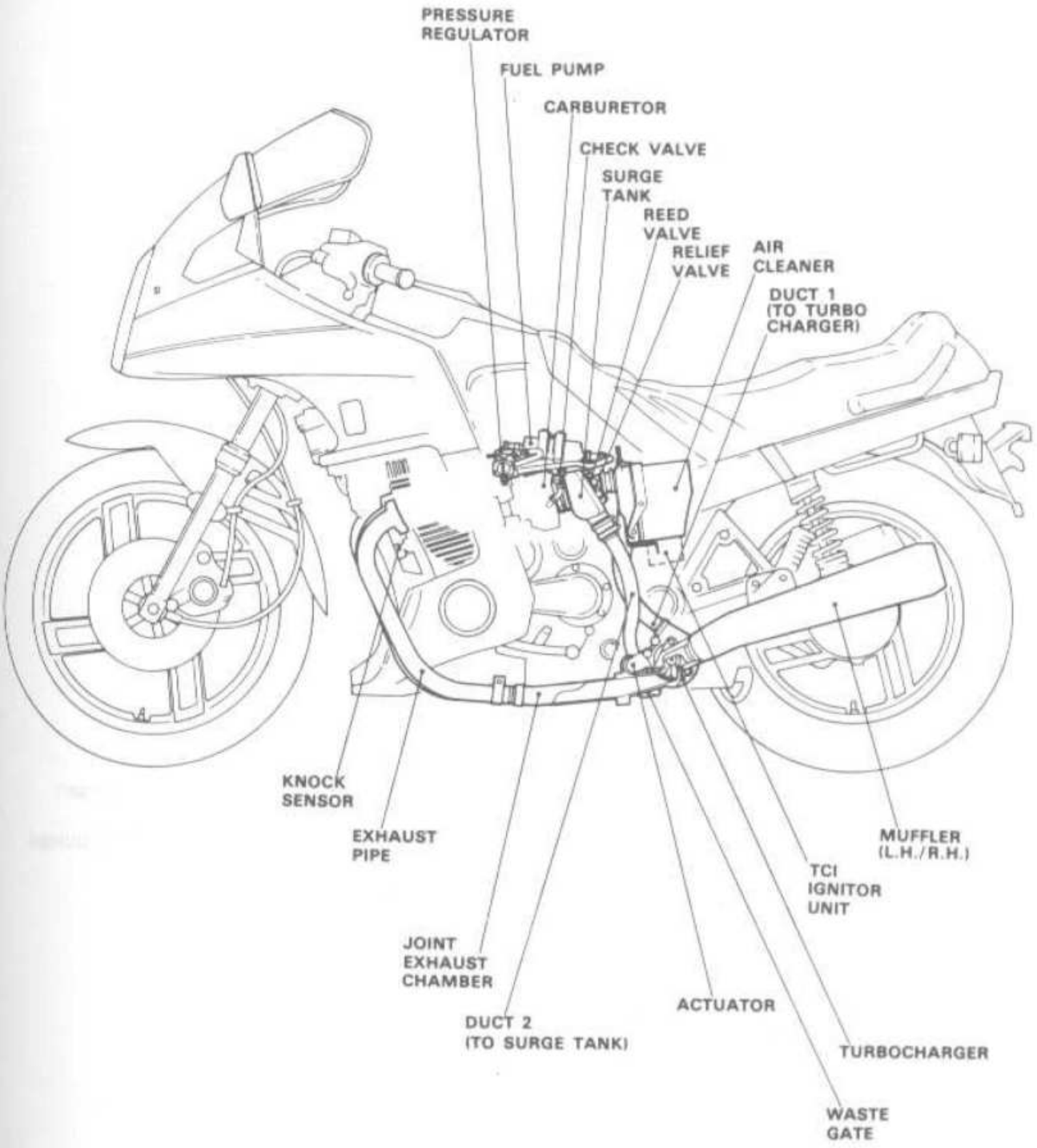
Tightening torque:
10 Nm (1.0 m-kg, 7.2 ft-lb)

7. Tighten the oil hose fitting nuts (2).

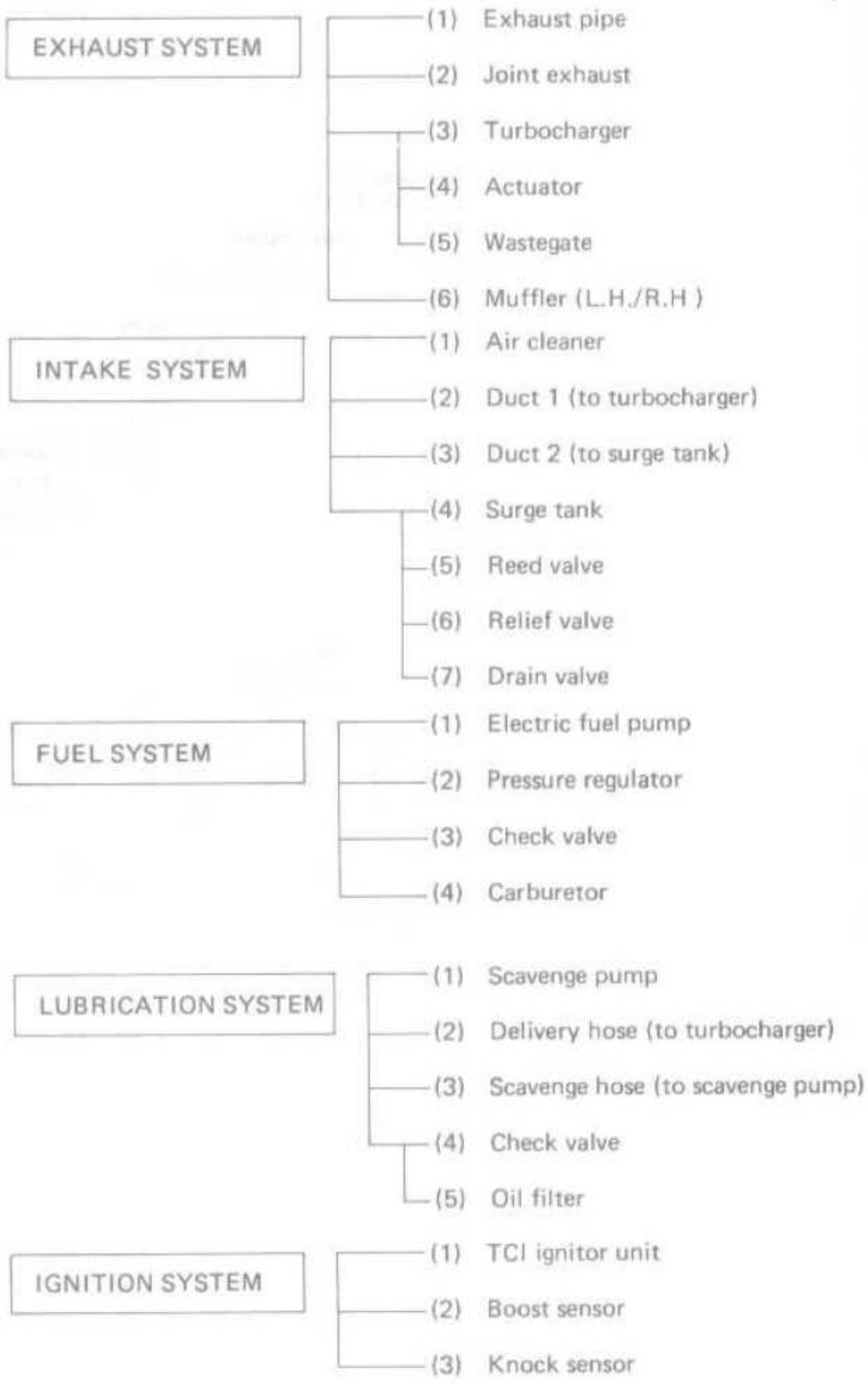
Tightening torque:

—MEMO—

LOCATION AND OUTLINE OF TURBO SYSTEM COMPONENTS

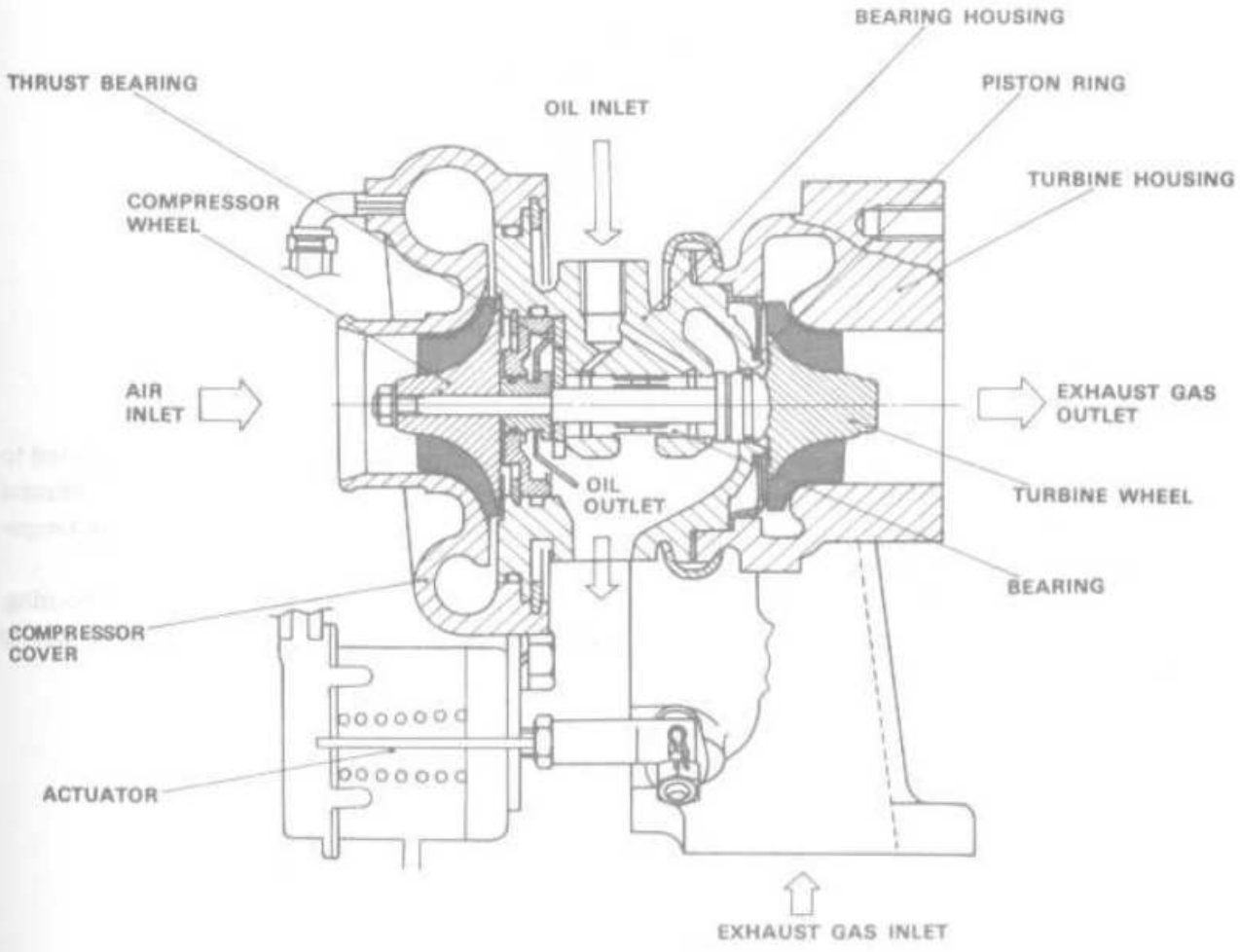


MAJOR COMPONENTS OF THE YAMAHA TURBO SYSTEM



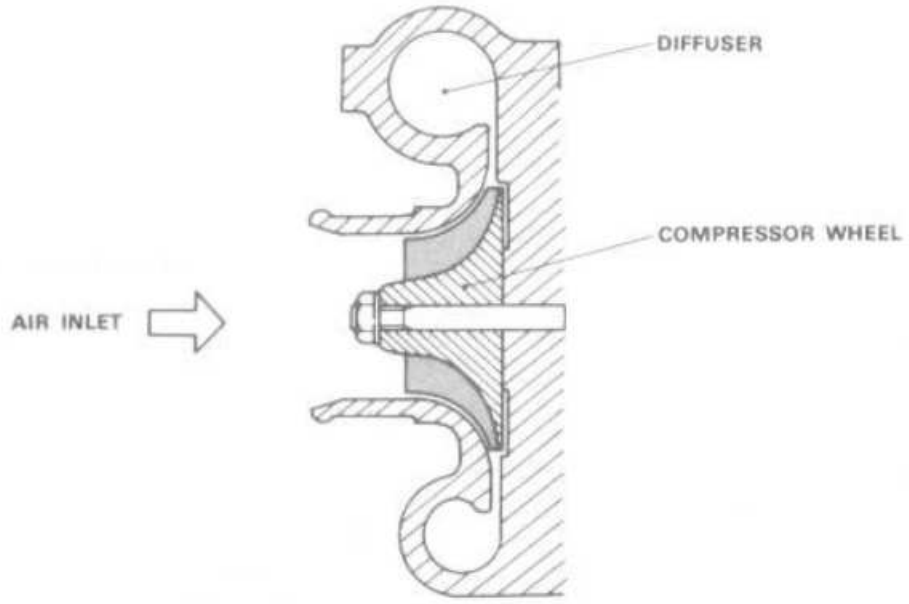
CONSTRUCTION OF THE TURBOCHARGER UNIT

The turbocharger unit is made up of the following components: the compressor, which produces the boost pressure by compressing air; the turbine, which converts the exhaust gas into energy to drive the compressor; the bearings, which support the rotor shaft as it rotates at high speed; and the boost pressure control unit, which is composed of the wastegate and its actuator valve.



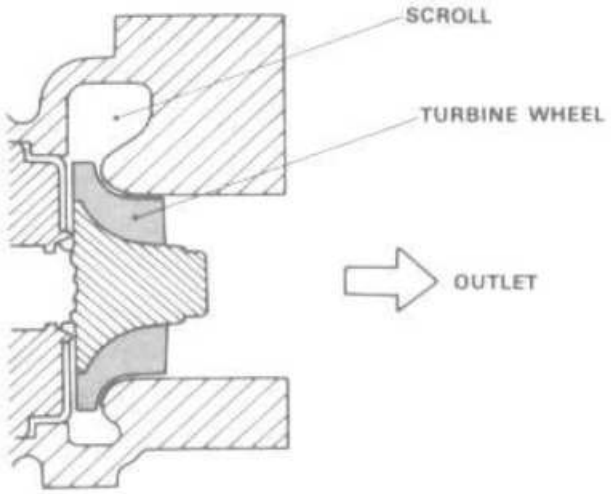
Compressor

The compressor is a rotor located within a housing of decreasing volume. As the compressor rotor turns, in excess of 100,000 rpm, it moves air by centrifugal force. Because of the design, the air being sent to the carburetors slows from its initial velocity, but because of the decreasing volume of the housing, the air pressure increase.



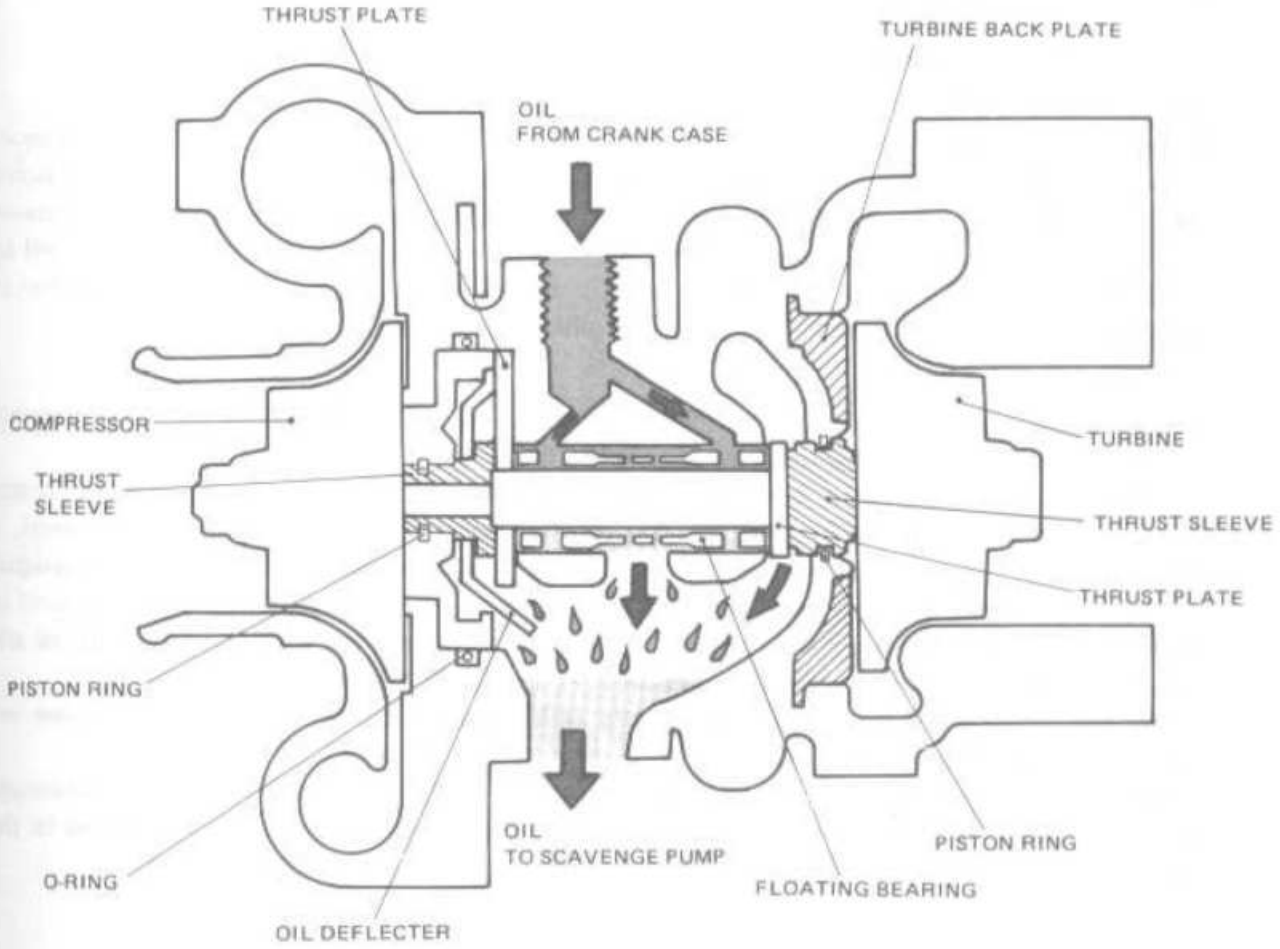
Turbine

The turbine is driven by the engine's exhaust gases. The rotating turbine, which is connected to the compressor, turns the compressor. The turbine rotor is constructed of a ultra heat-resistant alloy, which is a precision casting that can withstand high-speed operation at extreme temperatures. The turbine housing is shaped like a snail and is called a scroll casing.
This design directs the exhaust gases into the turbine rotor blades. Because the turbine housing, like the turbine rotor, is subjected to high temperatures, resisting distortion and oxidation due to extremely high temperatures.



Floating bearing

Floating bearings support the turbine shaft as it turns at speeds of 100,000 to 210,000 rpm. It is the fact that these bearings "float" in a constant flow of lubricating oil that permits the turbine/compressor shaft to spin at such high rpms. These bearings are designed to turn freely between the shaft and the bearing housing. Lubricating oil surrounds the bearings, flowing freely yet absorbing the vibrations created by the turbine/compressor shaft. To ensure that the oil is not stressed any more than necessary, the bearing housing has special seals that separate the exhaust gas driving the turbine from the lubricating oil.



Cooling of the bearing section

During full-throttle, high-speed operation the temperature of the inlet at the turbine is more than 850°C, and even the serface temperature of the turbine housing is as high as 550 to 750°C. If such heat is transferred to the center bearing housing, the bearing temperature will rise accordingly. This reduces the oil's viscosity, making it ineffective in absorbing the vibrations from the floating bearing. To guard against these high temperatures, the rear of the turbine is covered with a backing plate so that an air chamber is formed between the backing plate and the housing, thus serving as a heat insulator.

Gas seal on the turbine side

The shaft on the turbine side is provided with a ring groove into which a small-diameter ring is fitted to seal out the exhaust gas from the turbine. The ring is forced against the center bearing housing by its own tension so that it does not turn with the shaft; the shaft rotates while keeping full contact with the ring.

Oil seal on the compressor side

A ring is fitted in the groove around the thrust collar to provide a good seal.

Boost pressure control

When the engine speed is low, that is, when the exhaust gas flow is not much, the boost pressure is also low. But when the engine speed increases, the turbine wheel spins faster, thus increasing the boost pressure. As engine rpms increase, so does boost pressure, further increasing power. If the boost pressure is not controlled, it will increase to the point where the engine will be damaged. To control boost pressure, a valve is used through which exhaust gas is routed to bypass the turbine. Boost pressure is thus controlled.

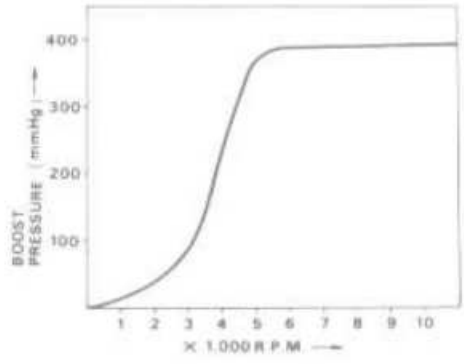
Wastegate valve

The wastegate is opened and closed by the actuator valve which is operated by the boost pressure. The wastegate limits the boost pressure supplied to the engine.

The boost pressure is carried from the compressor, through the rubber hose, to the actuator chamber. When the boost pressure exerted on the chamber goes beyond the preset level, it overcomes the spring force and pushes the diaphragm and linkage. This opens the wastegate valve to permit the exhaust gas to flow to the right-hand muffler. As a result, the amount of exhaust gas exerted on the turbine wheel is reduced, and thus the speed of both turbine and compressor wheels is slowed down. The result is a decrease in the boost.

When the boost pressure is below 53.2 kPa (400 mmHg, 15.7 inHg), all exhaust gases are channeled through the turbine vanes.

When the boost reaches 53.2 kPa (400 mmHg, 15.7 inHg), the diaphragm of the wastegate actuator causes the gate to open, and the excess exhaust gas flows through the bypass to the exhaust pipe.



Wastegate valve

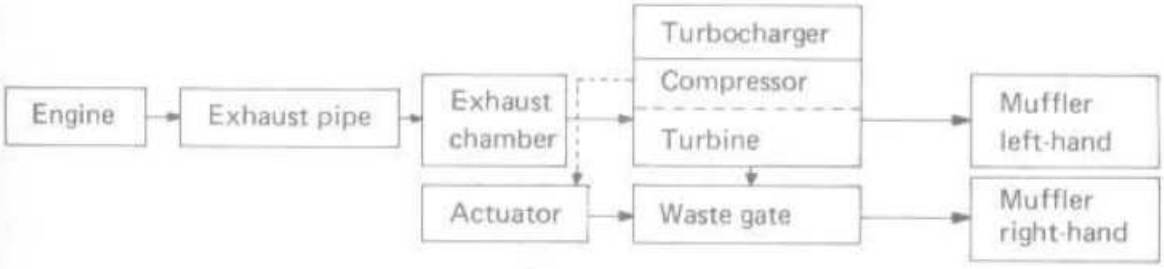
Stroke: 5 mm

Pressure: 83.4 ± 6.9 kPa
(0.85 ± 0.07 kg/cm²)
(12.1 ± 1.0 psi)

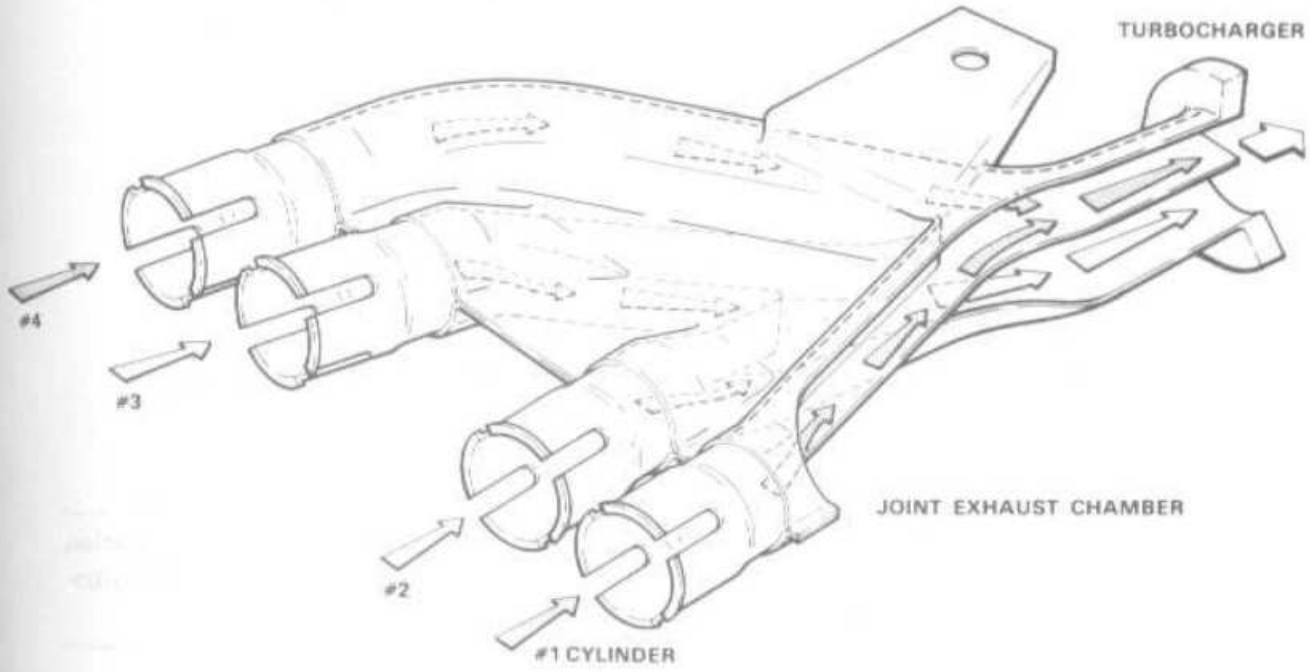
OPERATION OF YAMAHA TURBO SYSTEM

EXHAUST SYSTEM

The exhaust system is composed of exhaust pipes, an exhaust chamber/turbocharger assembly, and mufflers. The turbocharger is operated by the engine's expelled gases and this in turn operates the compressor rotor, which creates the boost pressure for the combustion chambers. The boost pressure is controlled by a wastegate that channels unneeded exhaust out the right-hand muffler. See the block diagram below.



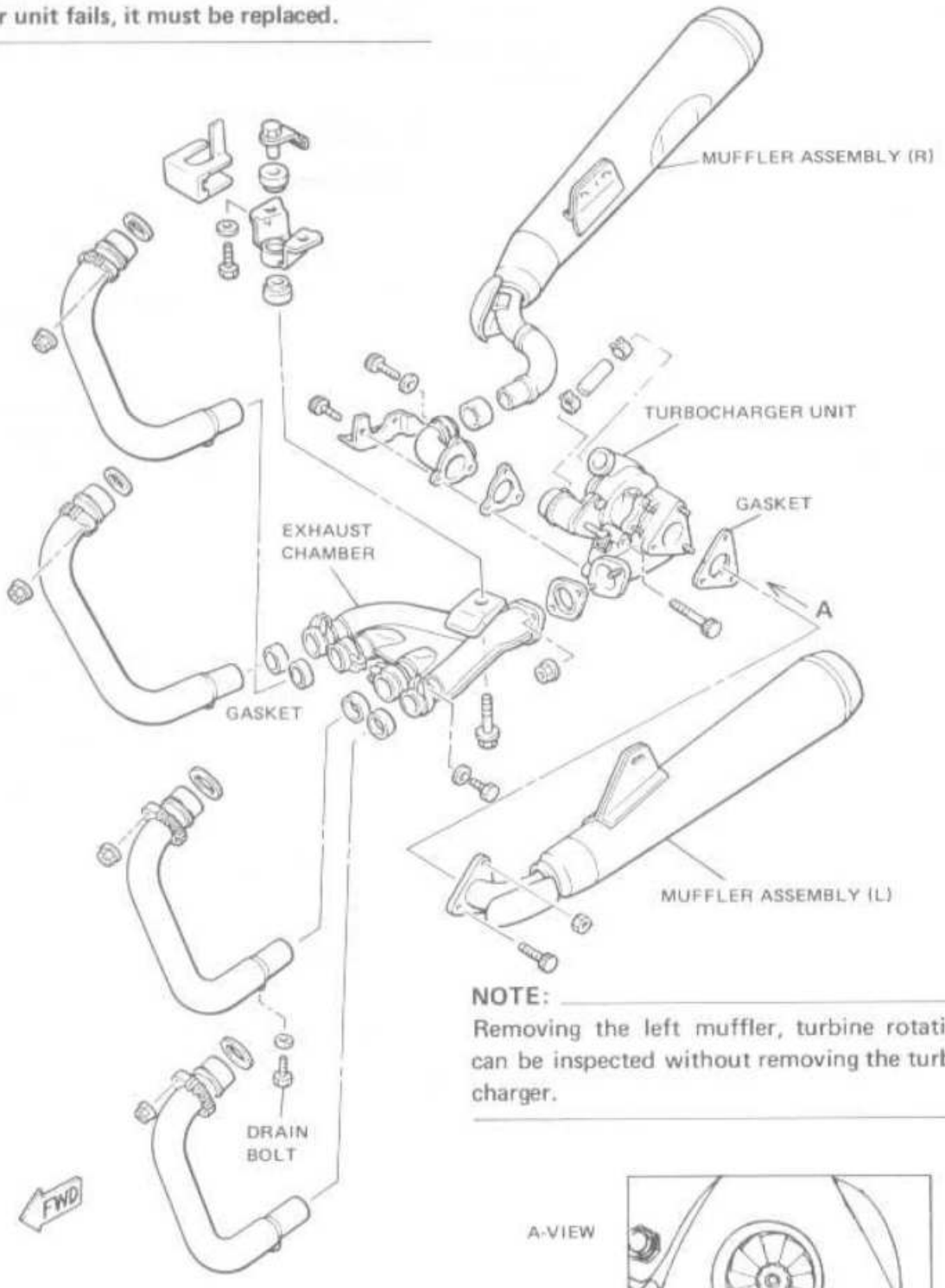
The turbocharging system features a patented Yamaha exhaust joint chamber. The exhaust pipes are grouped together to supply an even exhaust flow -- a 360° interval with less interference from exhaust pulses. As a result, the engine gives a smooth, ever-increasing curve of performance.



EXHAUST SYSTEM REMOVAL

CAUTION:

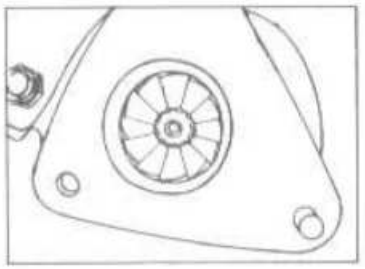
Do not, under any circumstances, disassemble the turbocharger unit itself. If the turbocharger unit fails, it must be replaced.



NOTE:

Removing the left muffler, turbine rotation can be inspected without removing the turbocharger.

A-VIEW



DISASSEMBLY

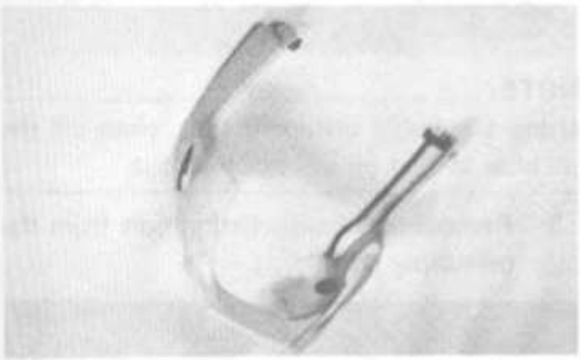
Exhaust Pipe and Exhaust Chamber

1. Remove the lower, fairing panel that shields the turbocharger/exhaust chamber assembly.

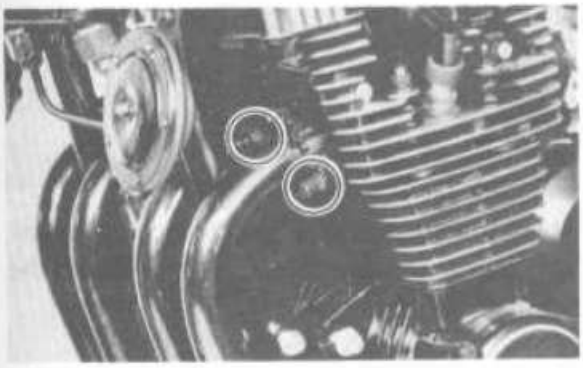
NOTE:

The lower fairing panel need not be removed; however disassembling the exhaust pipes and exhaust chamber will be easier.

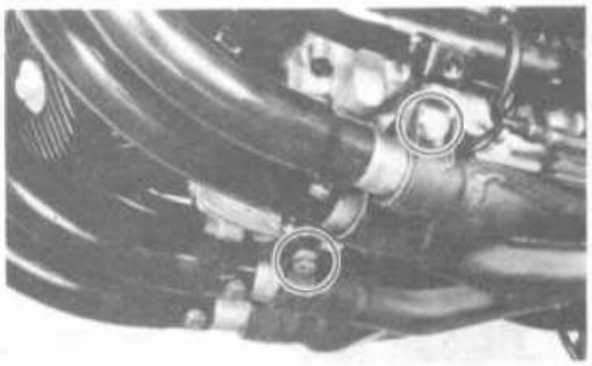




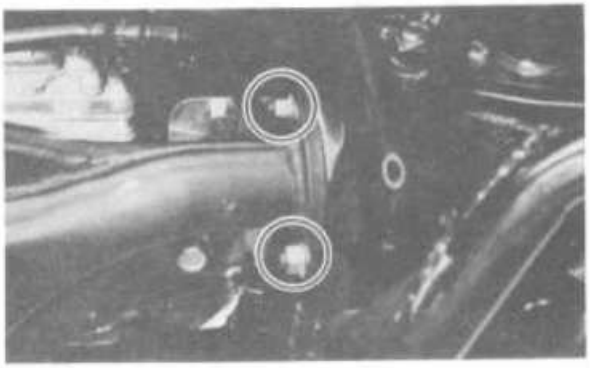
2. Remove the exhaust pipe mounting flange nuts.



3. Loosen the clamps that mount the exhaust chamber to the exhaust pipes.

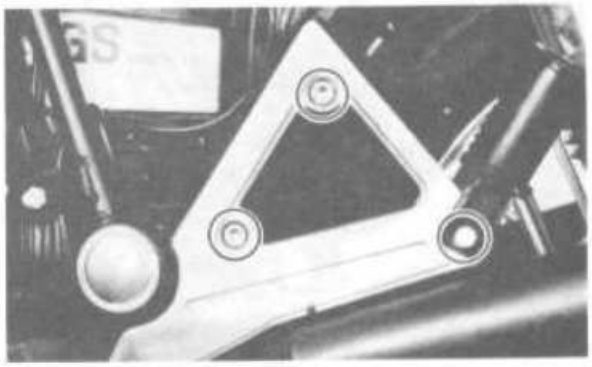


4. Remove the exhaust pipes.
5. Remove the nuts at the exhaust chamber /turbocharger mounting flange, and remove the exhaust chamber.

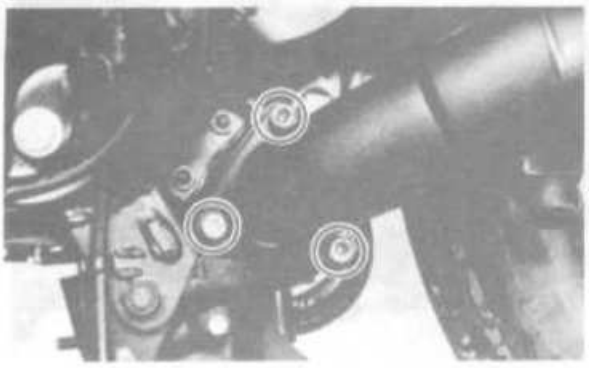


Mufflers

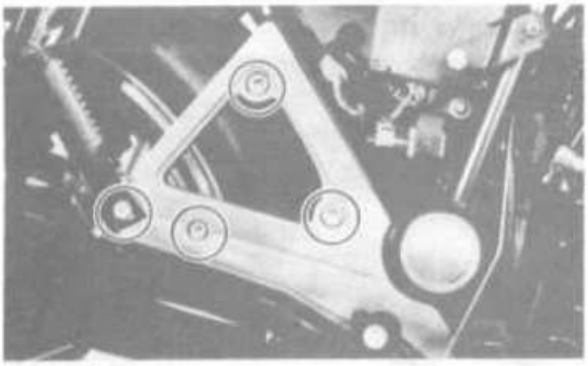
1. Remove the left muffler mounting bracket bolts.



2. While supporting the left muffler, loosen the coupling bolt and nuts at the turbocharger, and remove the left muffler.



3. Remove the right muffler mounting flange bolt.

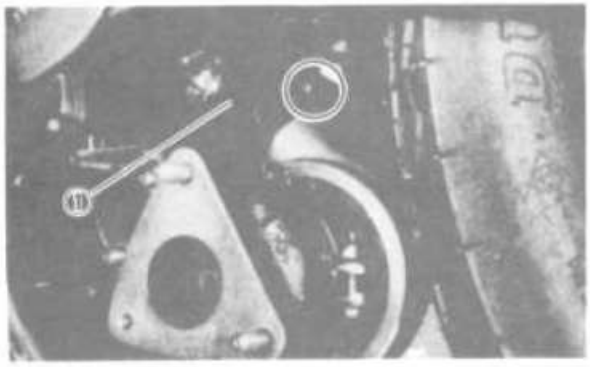


4. While supporting the muffler, remove the mounting flange bolts that connect the muffler to the turbocharger, and remove the muffler.



Turbocharger

1. Loosen the clamp screws.



1. Duct to surge tank



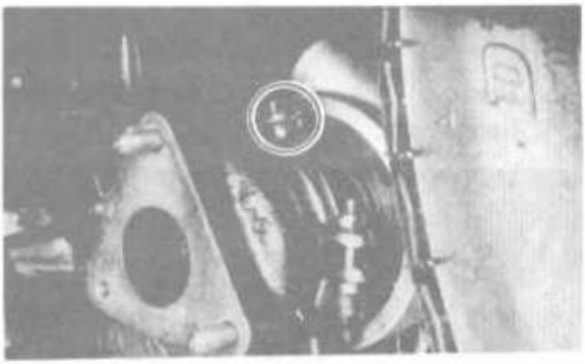
1. Duct from air cleaner

2. Remove the scavenging oil hose.

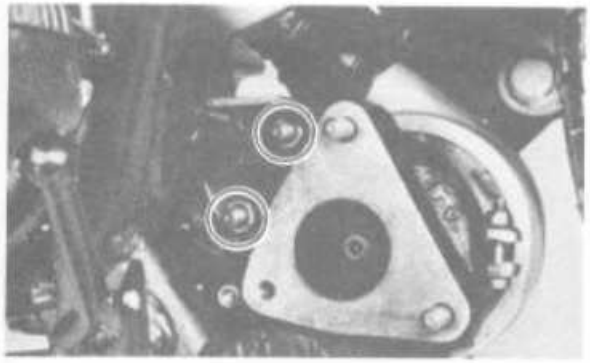


NOTE:
Using a suitable clamp or bolt, close off the oil hose so that oil will not leak out.

3. Remove the banjo fitting bolt from the oil supply hose.



4. While supporting the turbocharger, remove the mounting nuts, and remove the turbocharger.



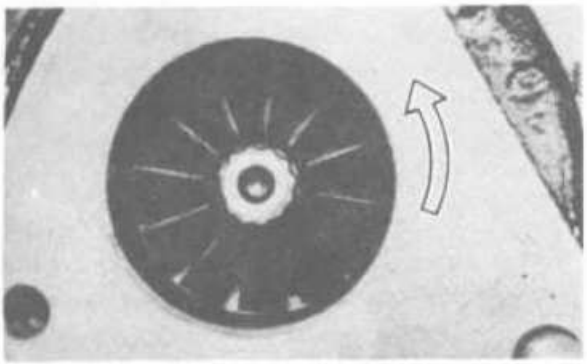
CAUTION:

Don't allow foreign particles to enter the turbocharger, when removing the turbocharger.

INSPECTION

Turbocharger

1. Ensure that the turbine and compressor rotors turn smoothly.



2. Ensure that the actuator valve and wastegate assembly operate correctly.
3. As the turbine is turned it should not bind at any point, there should be no side play, and there should be no axial play in the turbine/compressor shaft.

WARNING:

IF THE TURBOCHARGER UNIT DOES NOT OPERATE PROPERLY, THE ENTIRE UNIT, INCLUDING THE ACTUATOR VALVE/WASTEGATE ASSEMBLY, MUST BE REPLACED.

Exhaust Pipes and Mufflers

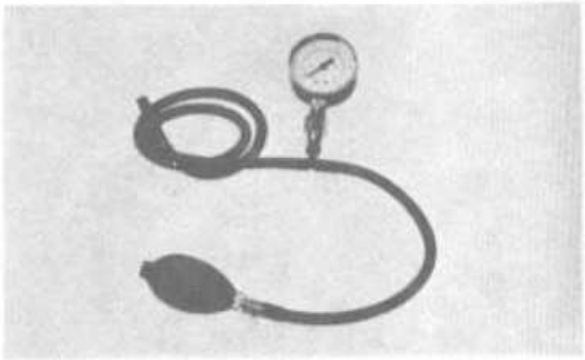
CAUTION:

Check the exhaust pipes, exhaust chamber, and left and right mufflers for any leaks or material that could make its way into the turbocharger unit. Also check the oil scavenge and oil supply lines for any leaks. Replace as necessary.

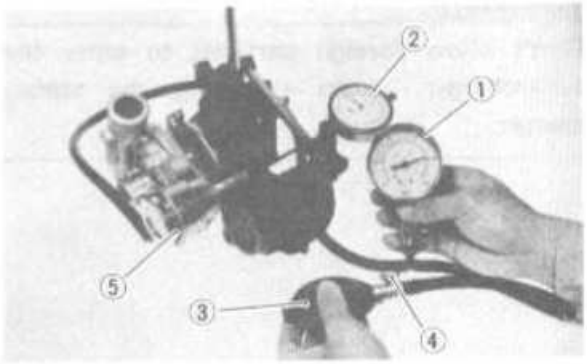
Actuator Valve/Wastegate Assembly

Using the following procedure, check the pressure on the actuator valve.

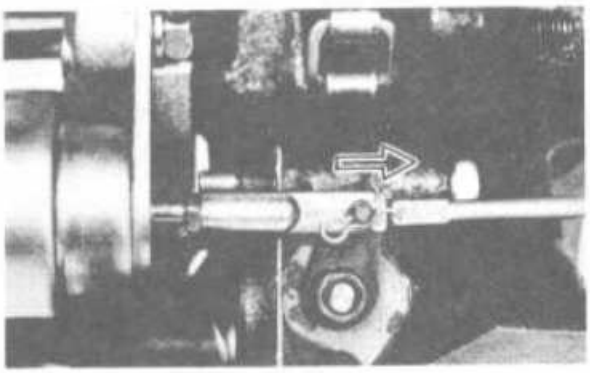
1. Install the turbocharger pressure gauge (P/N YM-33076) and the dial gauge as shown below.



1. Turbocharger pressure gauge



1. Turbocharger pressure gauge
2. Dial gauge
3. Bellows
4. Relief valve
5. Actuator

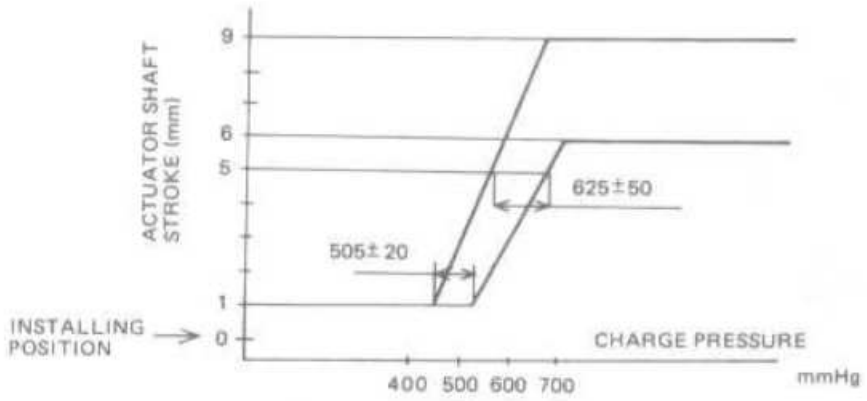


Dial gauge read	Pressure gauge read		
1.0 mm (0.04 in)	67.7 ± 2.9 kPa	0.69 ± 0.03 kg/cm²	9.81 ± 0.43 psi
5.0 mm (0.20 in)	83.4 ± 6.9 kPa	0.85 ± 0.07 kg/cm²	12.1 ± 1.00 psi

CAUTION:

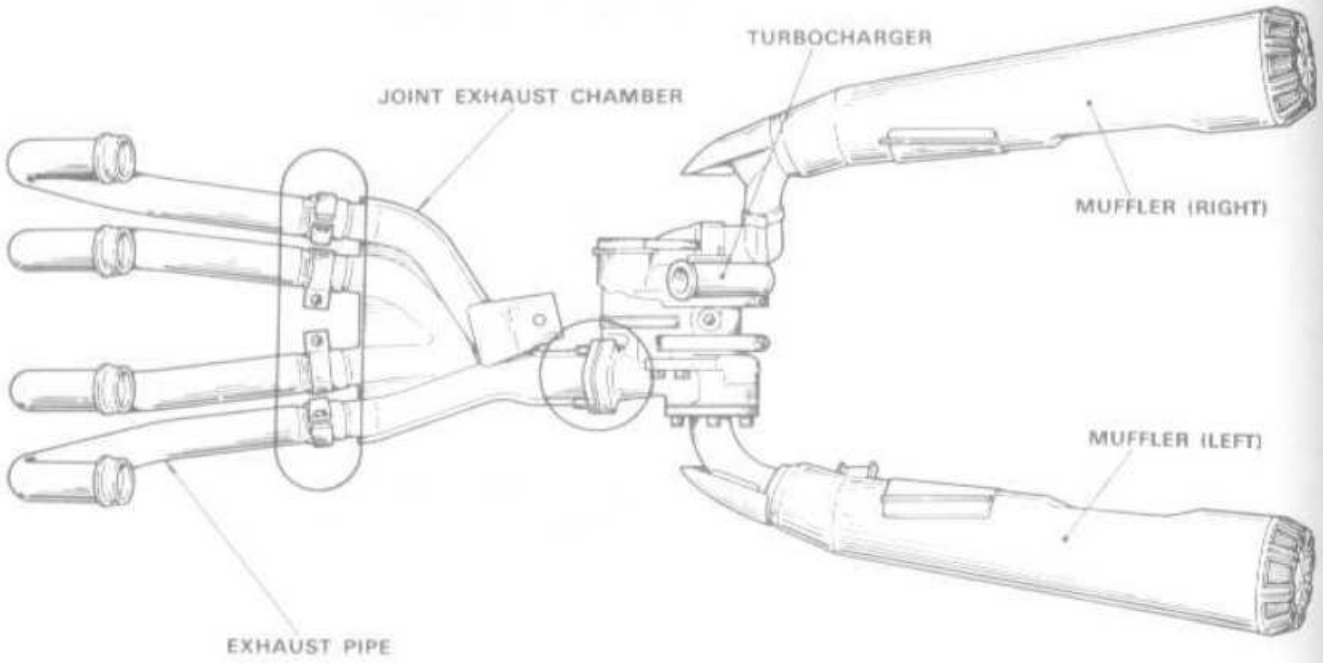
Do not loosen the actuator shaft locknut. The shaft and locknut held fast by an adhesive. An attempt to force them apart will cause damage to the actuator diaphragm.

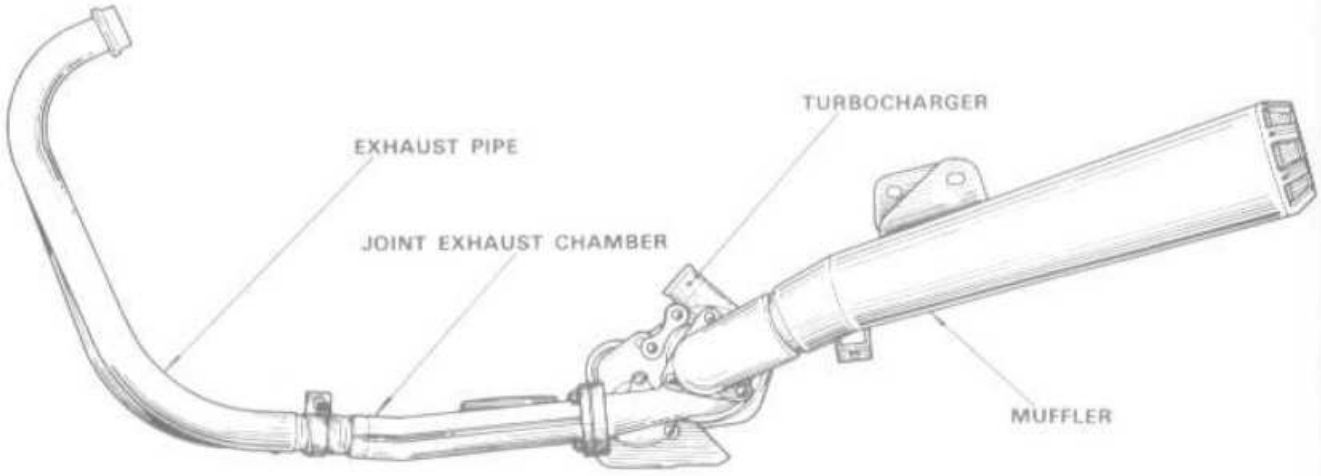
ACTUATOR CURVE



REASSEMBLY

CAUTION: The exhaust system operates under very high pressure from the turbocharger. Every connection and joint in the system must be tight, and new gaskets must be used. There must be no exhaust leaks or a drop in performance will result.

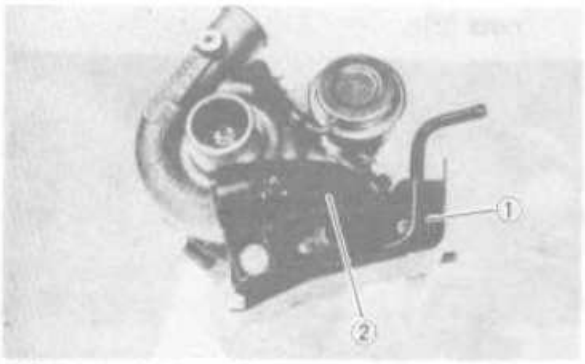




CAUTION:

Observe the following assembly instructions carefully.
The exhaust system must be assembled in the order listed below.

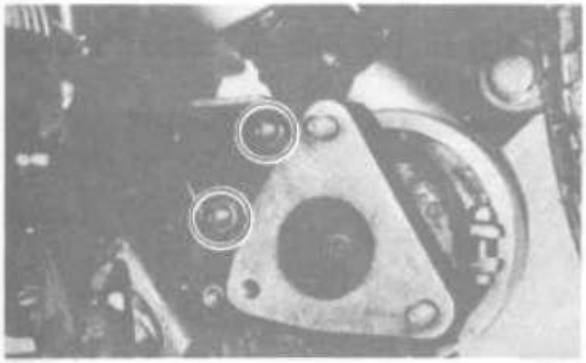
1. Mount the sub-muffler and the protecter to the turbocharger.



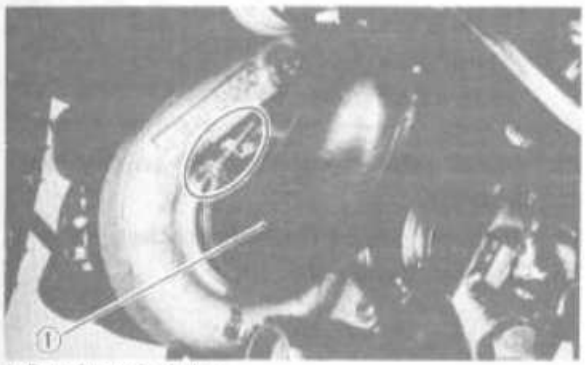
1. Protecter 2. Sub-muffler

Tightening torque:
12 Nm (1.2m-kg, 8.7 ft-lb)

2. Mount the turbocharger to the frame, and finger-tighten the mounting nut.



3. Connect the ducts 1 and 2 to the turbocharger, and tighten the clamp screws.



1. Duct from air cleaner



1. Duct to surge tank

Tightening torque:
2 Nm (0.2 m-kg, 1.4 ft-lb)

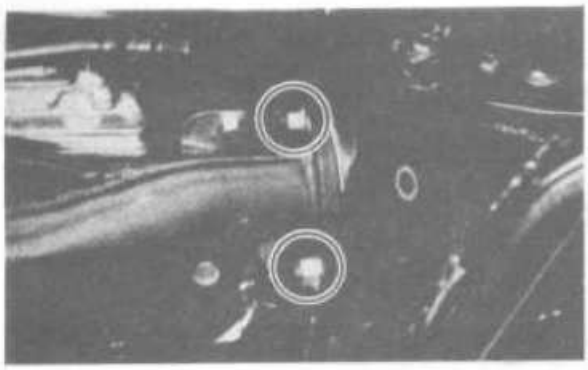
4. Connect the oil lines, and tighten the banjo fitting bolt.





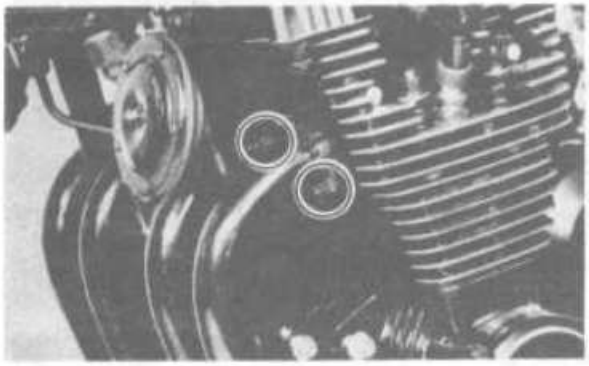
Tightening torque.
21 Nm (2.1 m-kg, 15 ft-lb)

5. Install the exhaust chamber to the turbocharger, and finger-tighten the mounting bolt to the frame.
6. Tighten the flange nuts (2).



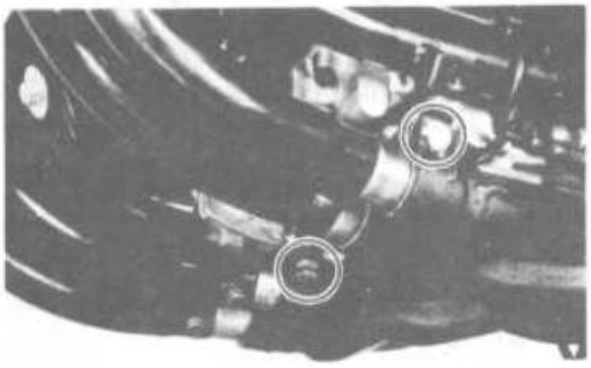
Tightening torque:
20 Nm (2.0 m·kg, 14 ft·lb)

7. Install the exhaust pipes to the exhaust chamber, and install the ringnuts to the cylinder head.
8. Tighten the ringnut securing nuts (8).



Tightening torque:
10 Nm (1.0 m·kg, 7.2 ft·lb)

9. Tighten the clamp bolts (4).



Tightening torque:
20 Nm (2.0 m·kg, 14 ft·lb)

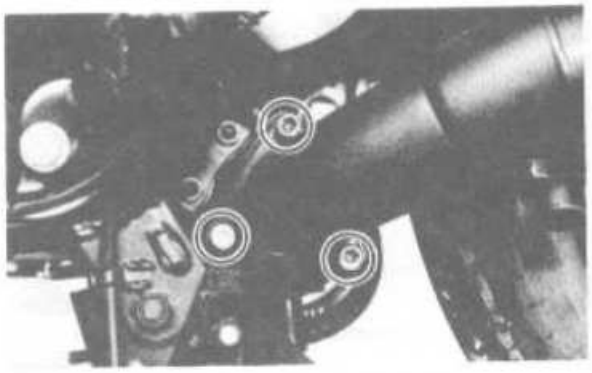
10. Tighten the exhaust chamber mounting bolt.

Tightening torque:
25 Nm (2.5 m·kg, 18 ft·lb)

11. Tighten the turbocharger mounting nuts (2).

Tightening torque:
20 Nm (2.0 m·kg, 14 ft·lb)

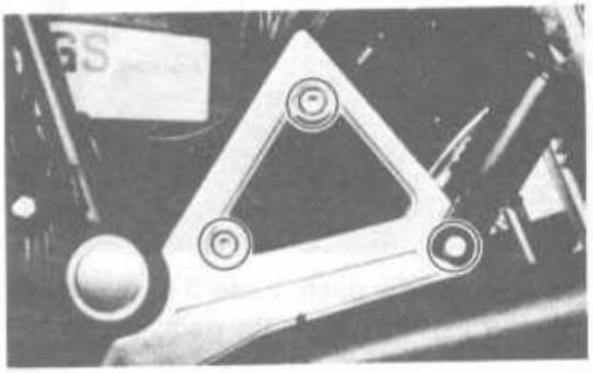
12. Install the left muffler to the turbocharger, and finger-tighten the bolt and nuts (2).



13. Install the left footrest bracket.
14. Tighten the coupling bolt and nuts (2).

Tightening torque:
20 Nm (2.0 m·kg, 14 ft·lb)

15. Tighten the footrest bracket securing bolts (3).



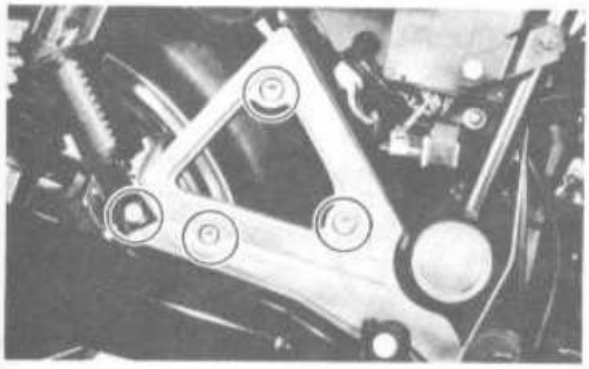
Tightening torque:
25 Nm (2.5 m·kg, 18 ft·lb)

16. Install the right muffler to the sub-muffler.
17. Install the right footrest bracket.
18. Tighten the clamp bolt.



Tightening torque:
20 Nm (2.0 m·kg, 14 ft·lb)

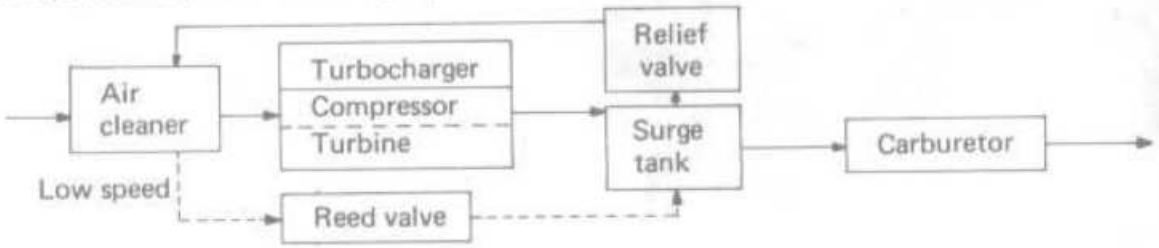
19. Tighten the footrest bracket securing bolts.



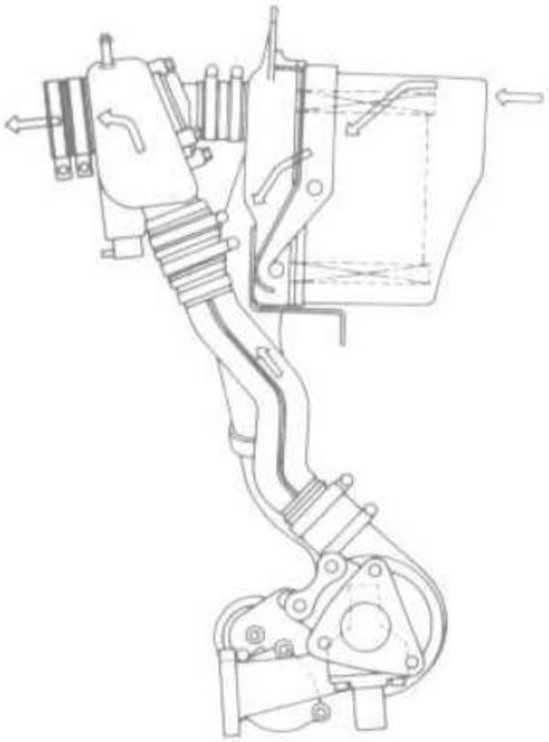
Tightening torque:			
	Nm	m·kg	ft·lb
M8	20	2.0	14
M10	25	2.5	18

INTAKE SYSTEM

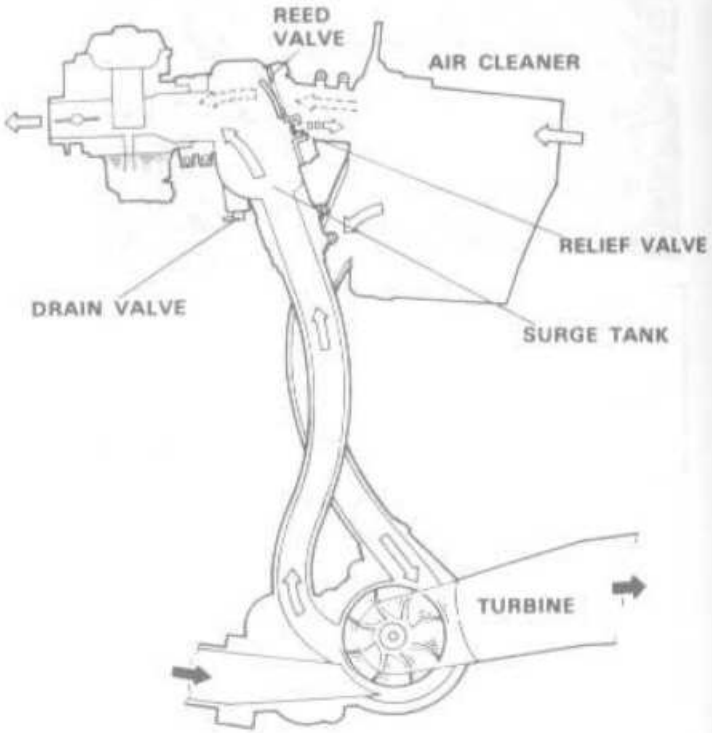
The intake system consists of an air cleaner, a surge tank, a reed valve, and a relief valve. All work together to provide the correct amount of air over the entire range of the engine's performance requirements, from low to high speeds.



SIDE VIEW

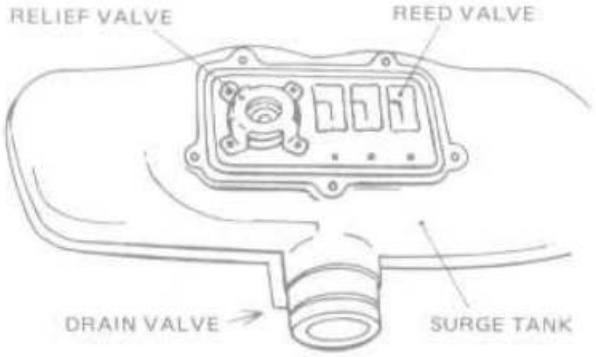


SECTIONAL SIDE VIEW



Surge Tank

The surge tank is an alloy air chamber that can hold large amounts of compressed air under constant pressure. The relief valve and the reed valve are located in the surge tank.



Relief valve

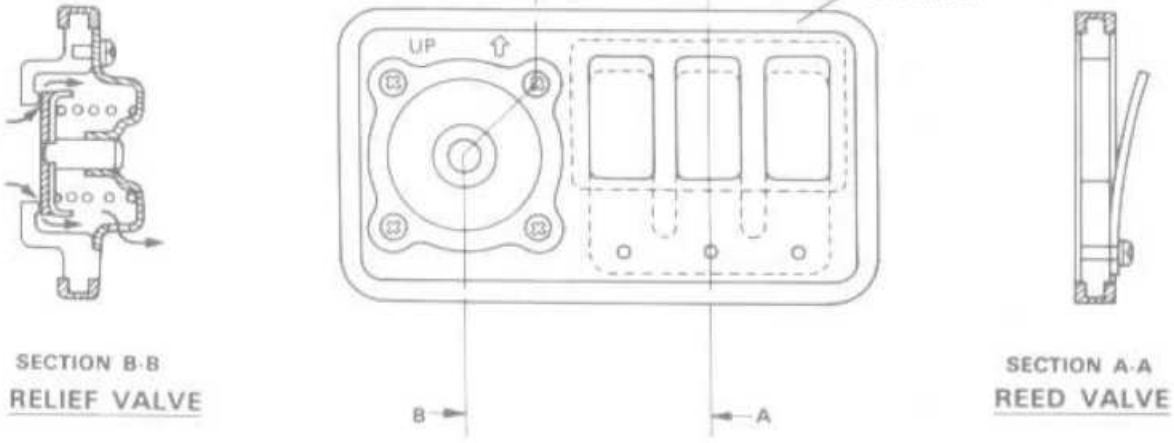
The relief valve releases excessive boost pressure in the surge tank if boost pressure becomes to high. This is a back up system to the waste gate.

If the wastegate actuator valve should fail, the relief valve will open the surge tank, reducing the excess boost pressure and thus protect the engine.

Relief valve setting pressure:
98.1 kPa (1.0 kg/cm², 14.2 psi)

Reed valve

The reed valve opens at low engine RPM when the turbocharger does not provide sufficient boost pressure. In this way, turbo lag is largely eliminated and better throttle response can be obtained.



SECTION B-B
RELIEF VALVE

SECTION A-A
REED VALVE

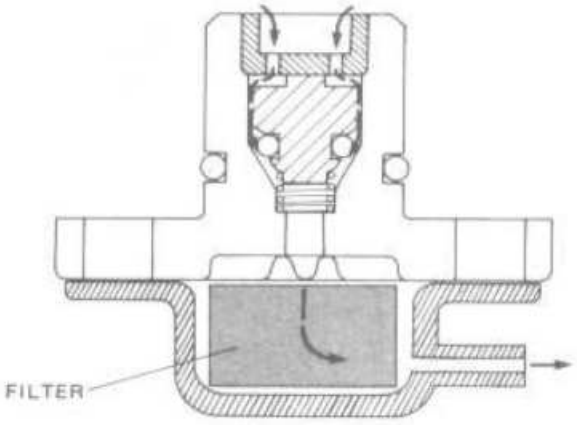
NOTE:

The relief valve assembly must be installed into the surge tank with the arrow pointing upward; see the illustration.

Drain valve;

This valve is provided to drain the surge tank of trapped fuel. It remains open when the engine is at a stop but starts to close as the surge tank is charged.

Drain valve closing pressure: 4.9 kPa (0.05 kg/cm², 0.7 psi)

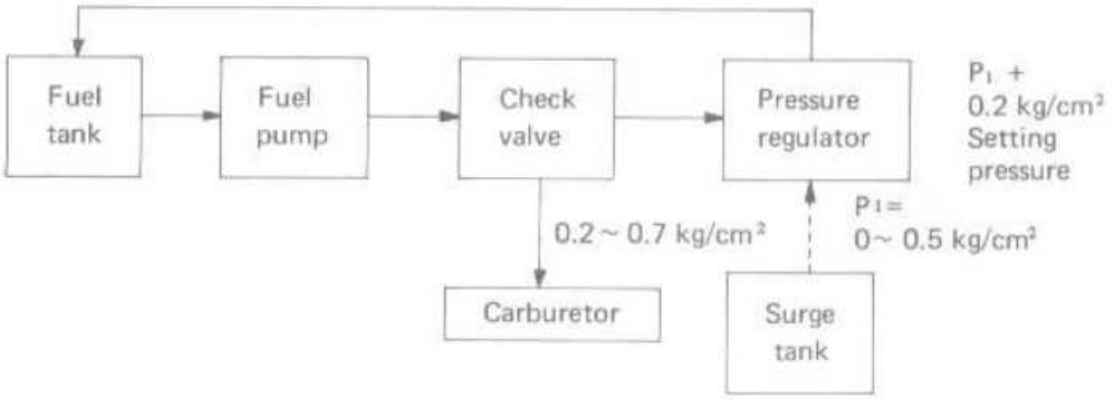


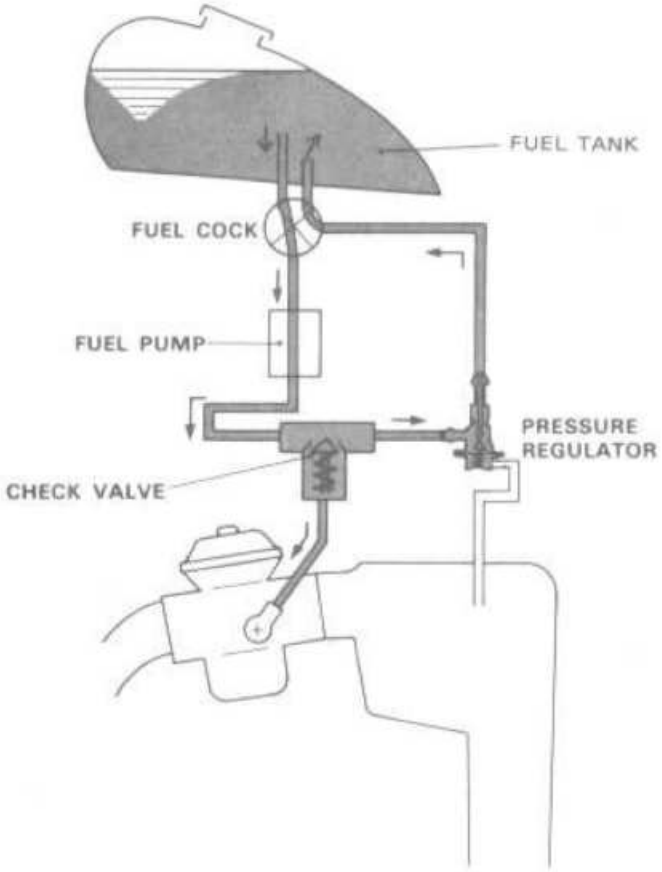
DRAIN VALVE

FUEL SYSTEM

The fuel system is made up of a fuel tank, fuel cock, an electrical fuel pump, a check valve, a pressure regulator, and the carburetors.

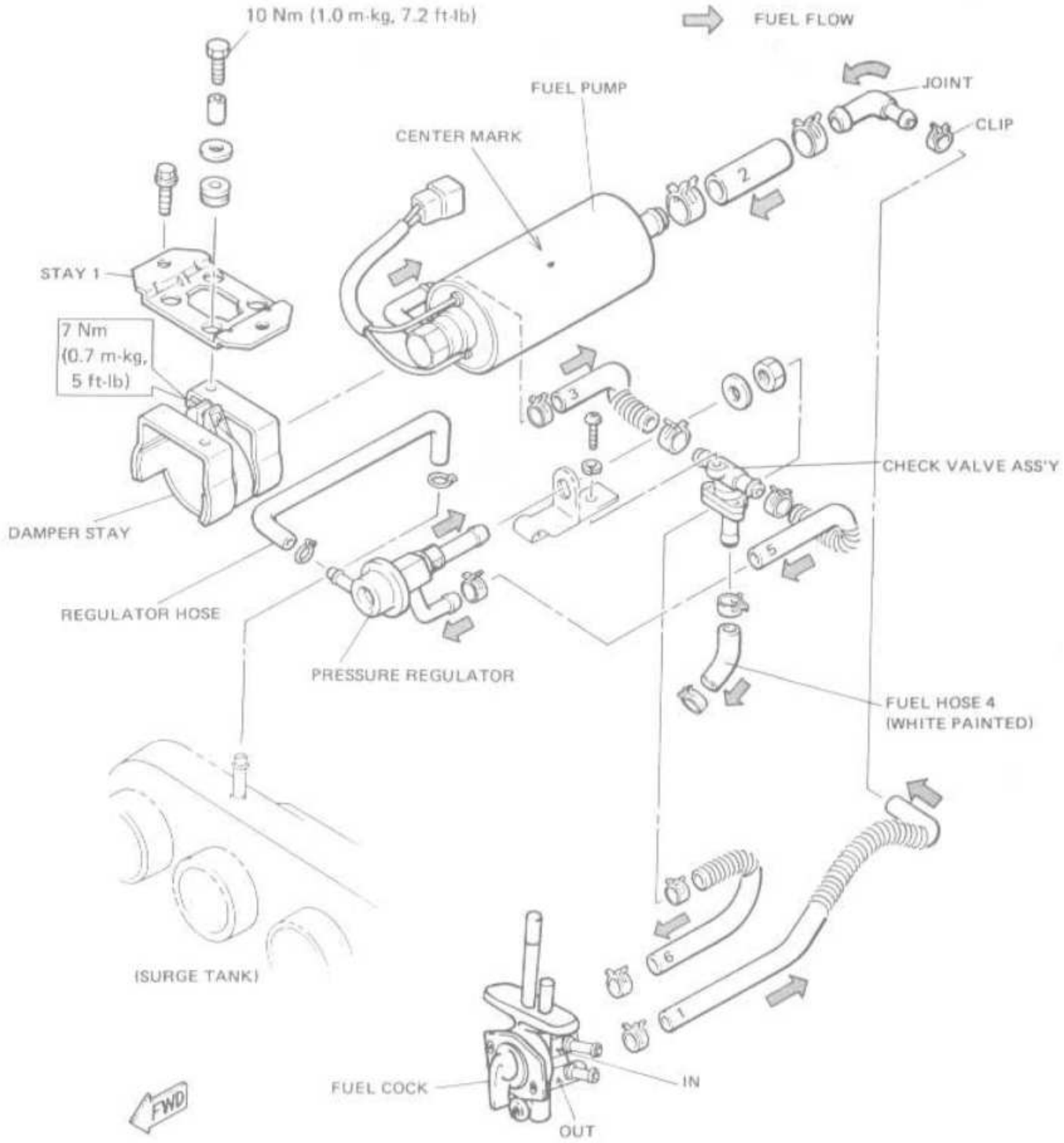
Fuel is fed to the carburetor float chambers by the boost pressure picked up from the surge tank. The excess pressure (which determines the rate of flow of the fuel) is channeled through the pressure regulator back into the fuel tank. The pressurized fuel goes through the check valve to the carburetor float chambers. Unlike conventional carburetors, the fuel in the float chamber must be pressurized so that it can be metered into the venturiis. If it were not pressurized, the higher pressure with which the air enters the carburetors as the result of turbocharging would prevent any fuel from leaving the carburetors.





—MEMO—

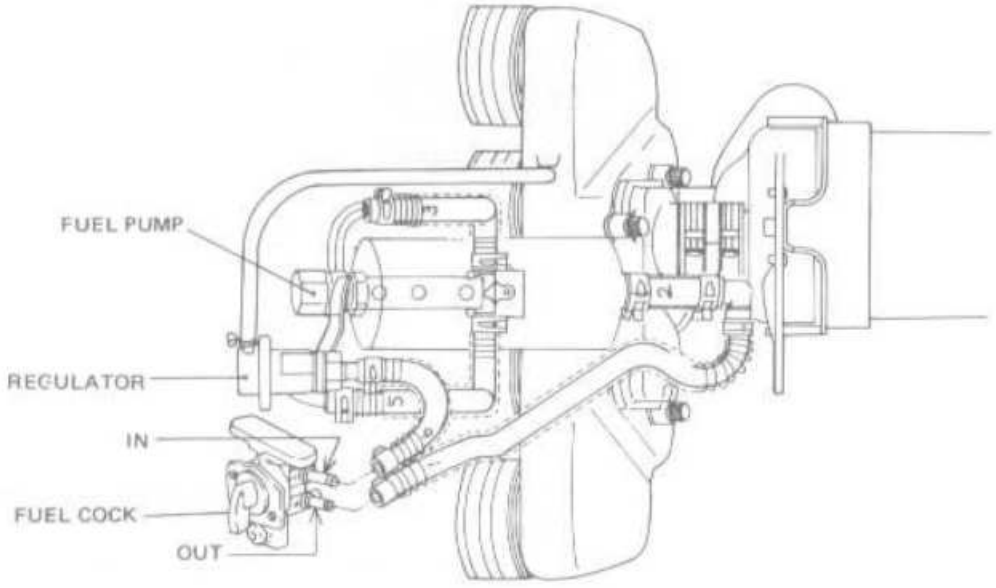
FUEL SYSTEM COMPONENTS



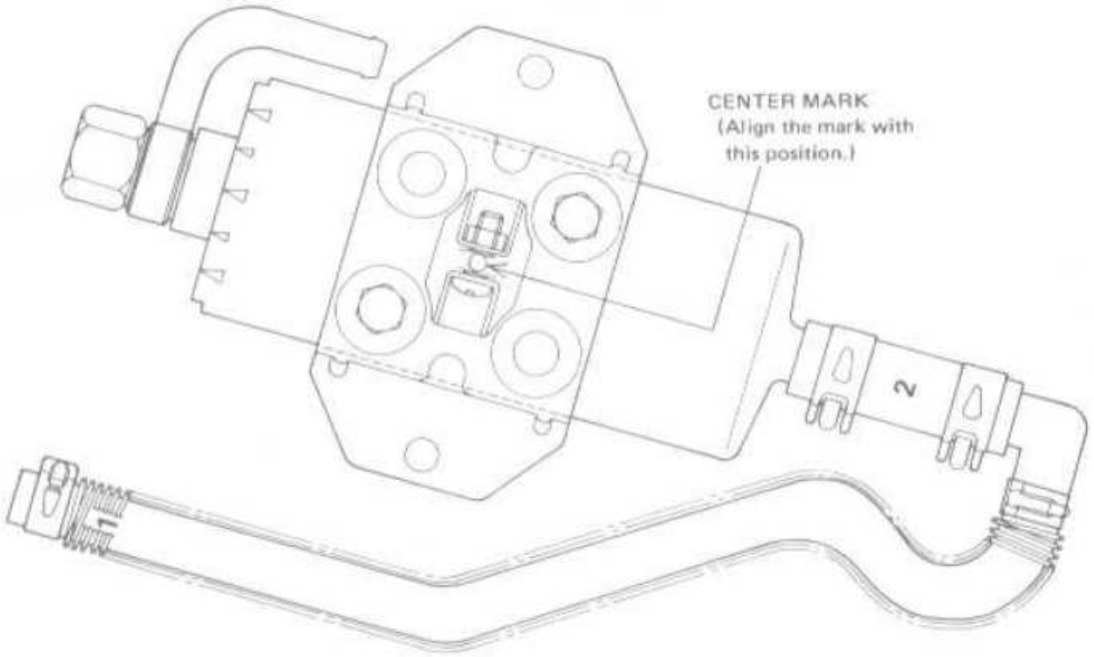
NOTE:

1. Connect fuel hose 1 to the fuel cock "OUT".
2. Connect fuel hose 6 to the fuel cock "IN".
3. The center mark on the fuel pump should be located in the upper center of the damper stay as shown in the illustration.

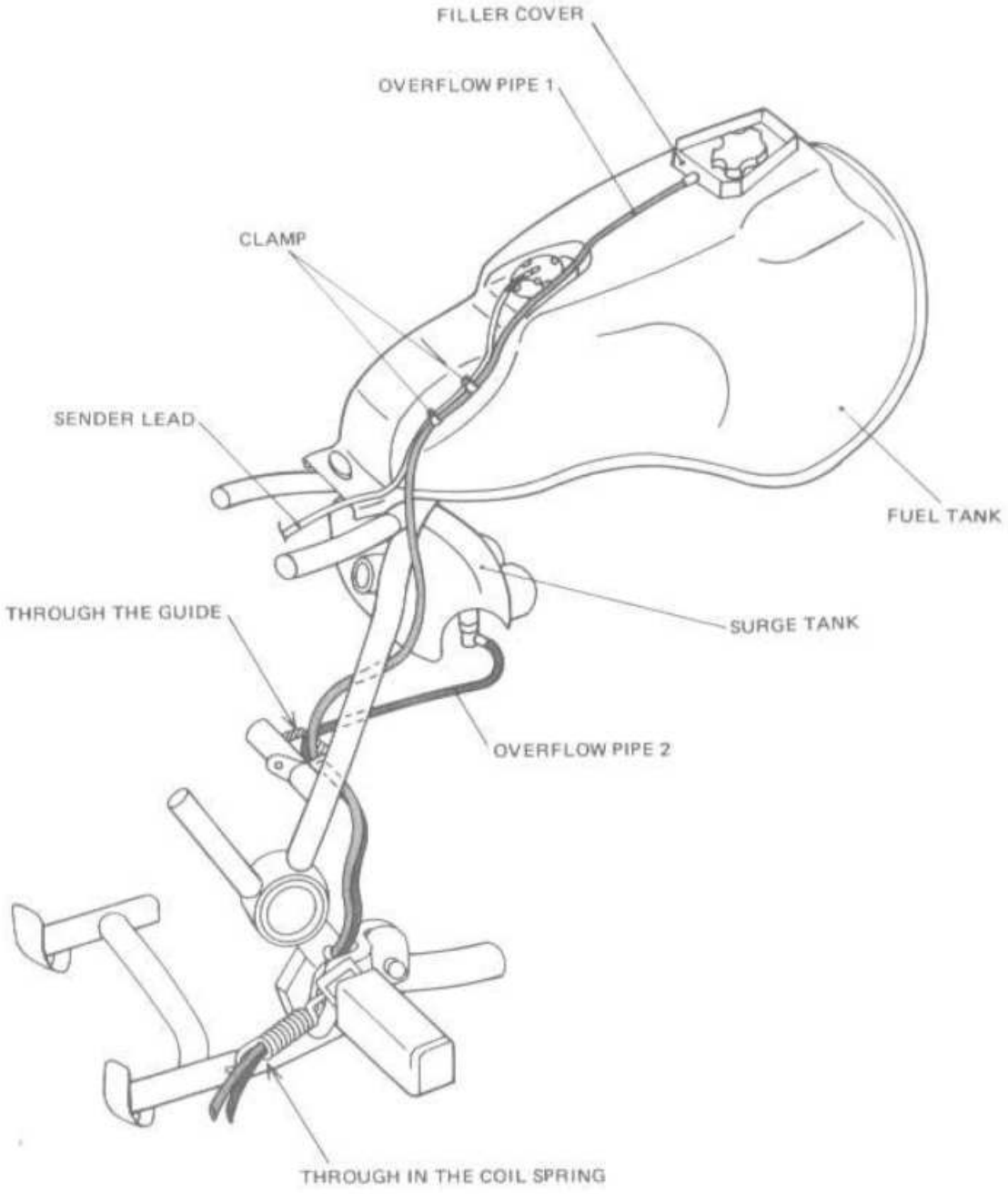
HOW TO LAYOUT FUEL HOSES



FUEL PUMP LOCATION



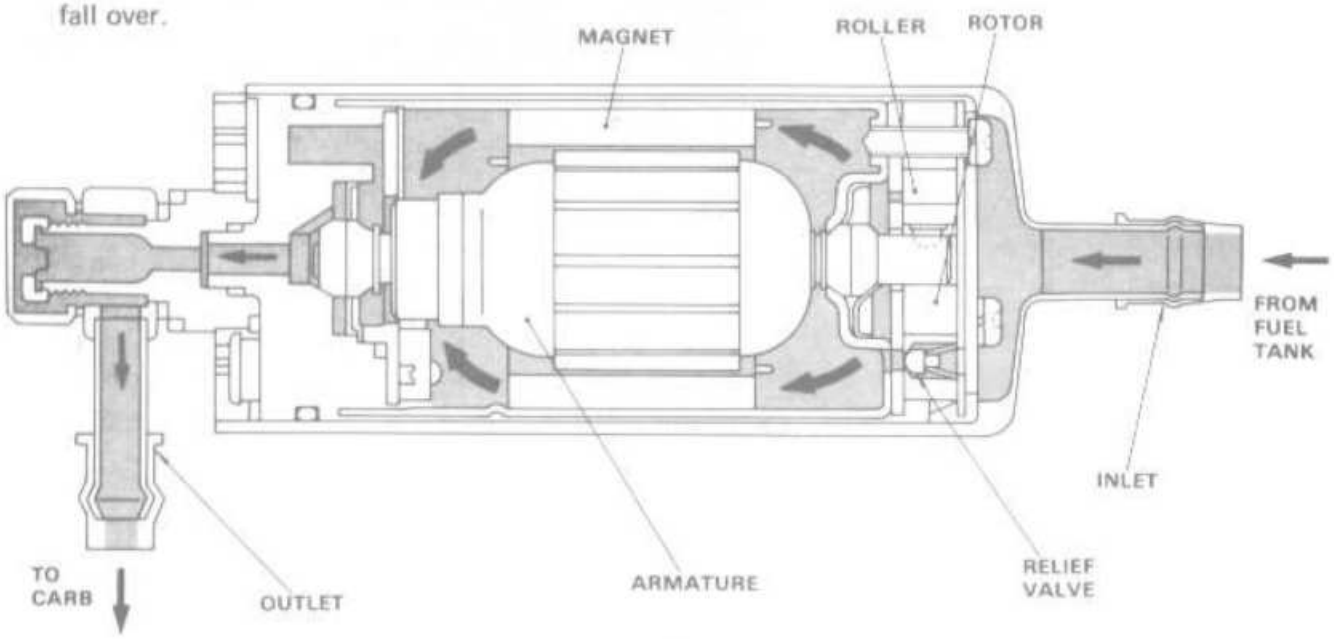
OVERFLOW PIPE ROUTING



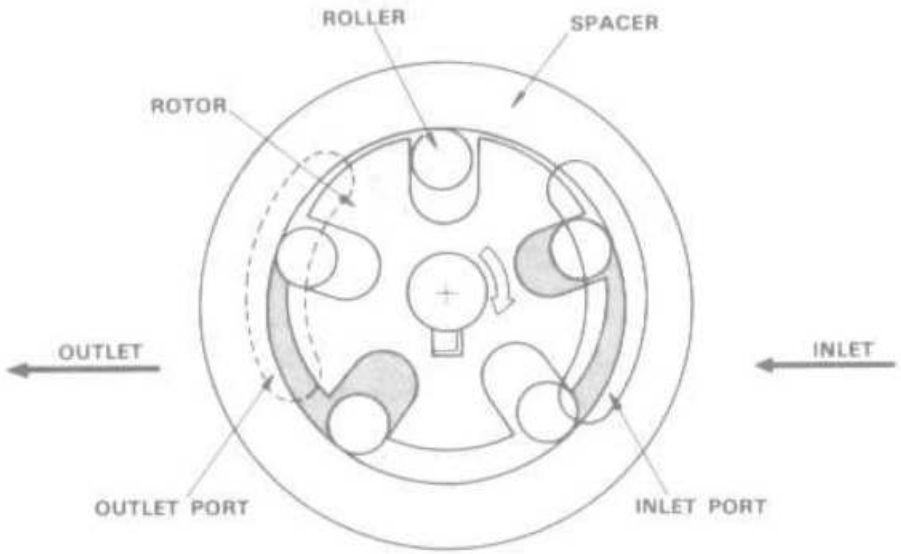
FUEL PUMP

The fuel pump is operated by a DC motor that is directly coupled to the pump. Fuel from the fuel cock is drawn into the pump, flows around the motor to the outlet at the opposite end of the housing, and then is fed through the check valve.

The fuel pump is connected to the electric starter circuit and begins pumping fuel when the starter is made to perate. The pump is protected by the circuits that sense AC generator output should the engine stall and a ballast switch, which shuts the fuel pump off should the motorcycle fall over.

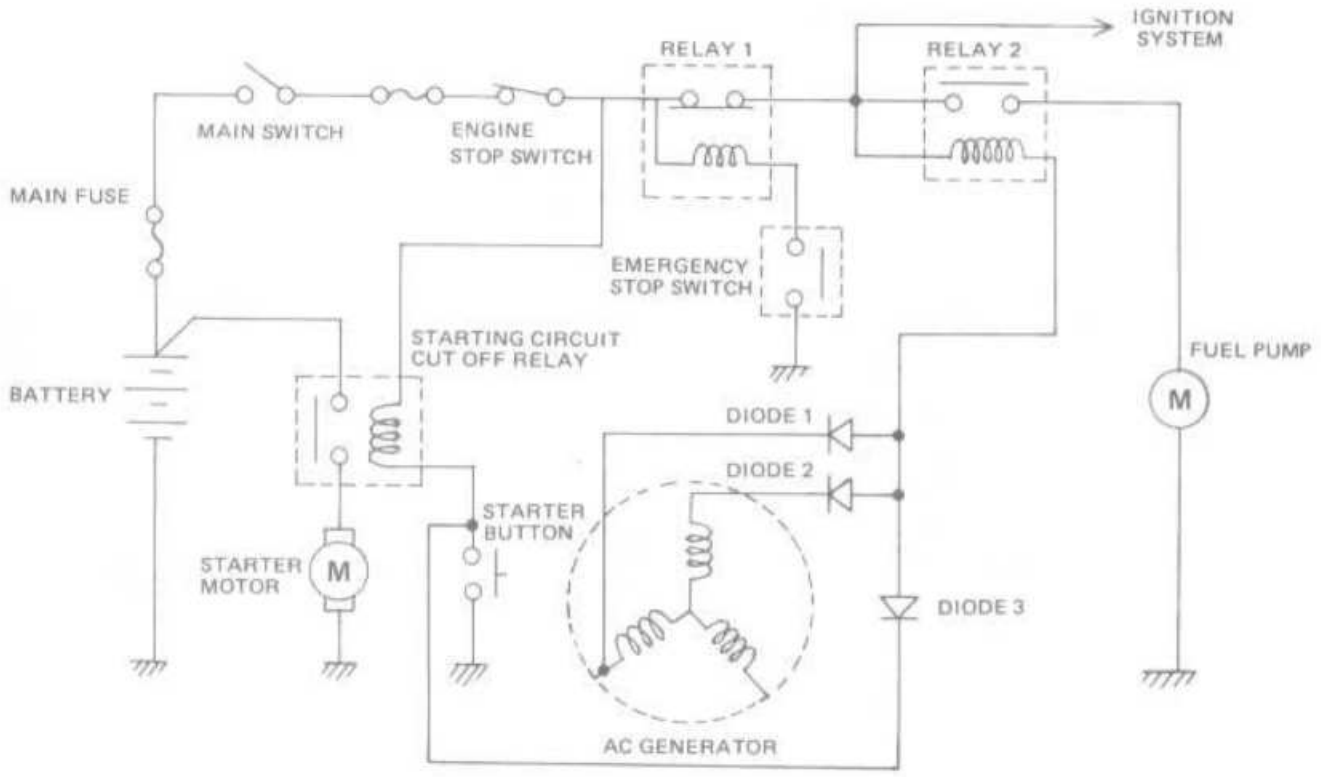


The pump is made up of a housing, a rotor, and a series of rollers. While the rotor is turning, the rollers, which are pushed against the housing by centrifugal force, trap fuel. The fuel thus trapped is squeezed out as the rotor further turns. In the event of restricted fuel flow in the system, a spring-loaded relief valve is used to work at 2.5 kg/cm^2. This valve relieves excess pressure that could build up in the fuel system.



FUEL PUMP CIRCUIT

This fuel pump can run when the starter motor is running or when the engine is running.



FUEL PUMP OPERATION

1. Main Switch On:
   The ignition system circuit is closed, but the fuel pump will not run.
2. Electric Starter Button On:
   The electric starter begins to operate. Relay 2, in parallel with the electric starter, closes, thereby making the fuel pump operate.
3. Engine On:
   When the engine is turned over, the AC generator creates voltage which keeps relay 2 on and the pump running.
4. Engine Stalls:
   If the engine stalls, the AC generator does not produce voltage. Relay 2 is turned off, stopping the fuel pump. No other switches need be turned off.
5. Motorcycle Falls:
   Should the motorcycle go down, the ballast switch turns on and relay 1 is turned off. This opens the ignition circuit which kills the engine. At the same time, the pump is also cutoff from its power supply and stops running.

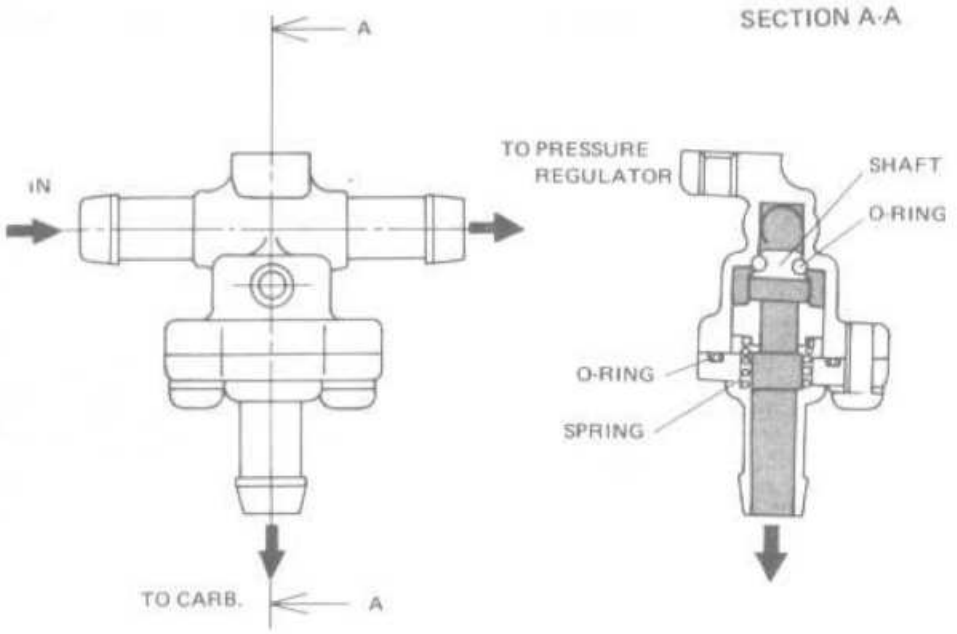
Fuel pump specifications:

Consumption amperage: 2A or less

Output pressure: 98.1 kPa (1.0 kg/cm^2, 14.2 psi)

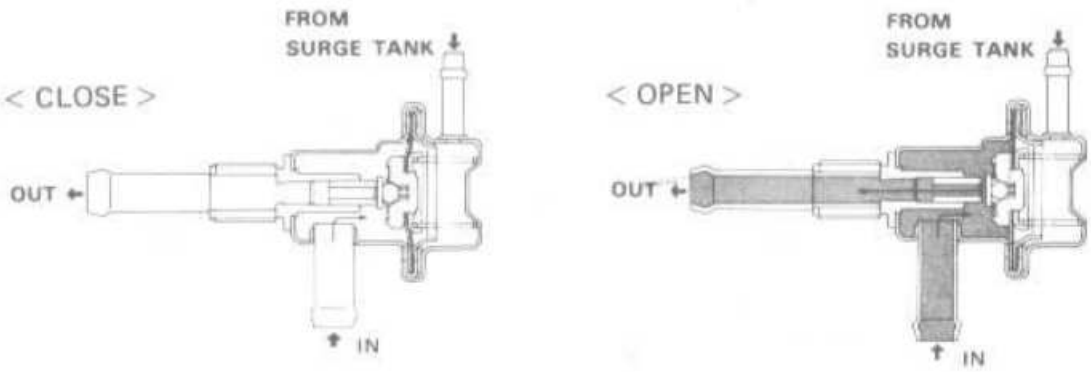
CHECK VALVE

This valve replaces the traditional vacuum fuel cock. It is fitted to the system to prevent fuel flow to the carburetors when the engine is not running. If a pressure of 19.6 kPa (0.2 kg/cm^2, 2.8 psi) is created on the intake side of the valve, fuel flow will be 3.5L/hour to the carburetors.



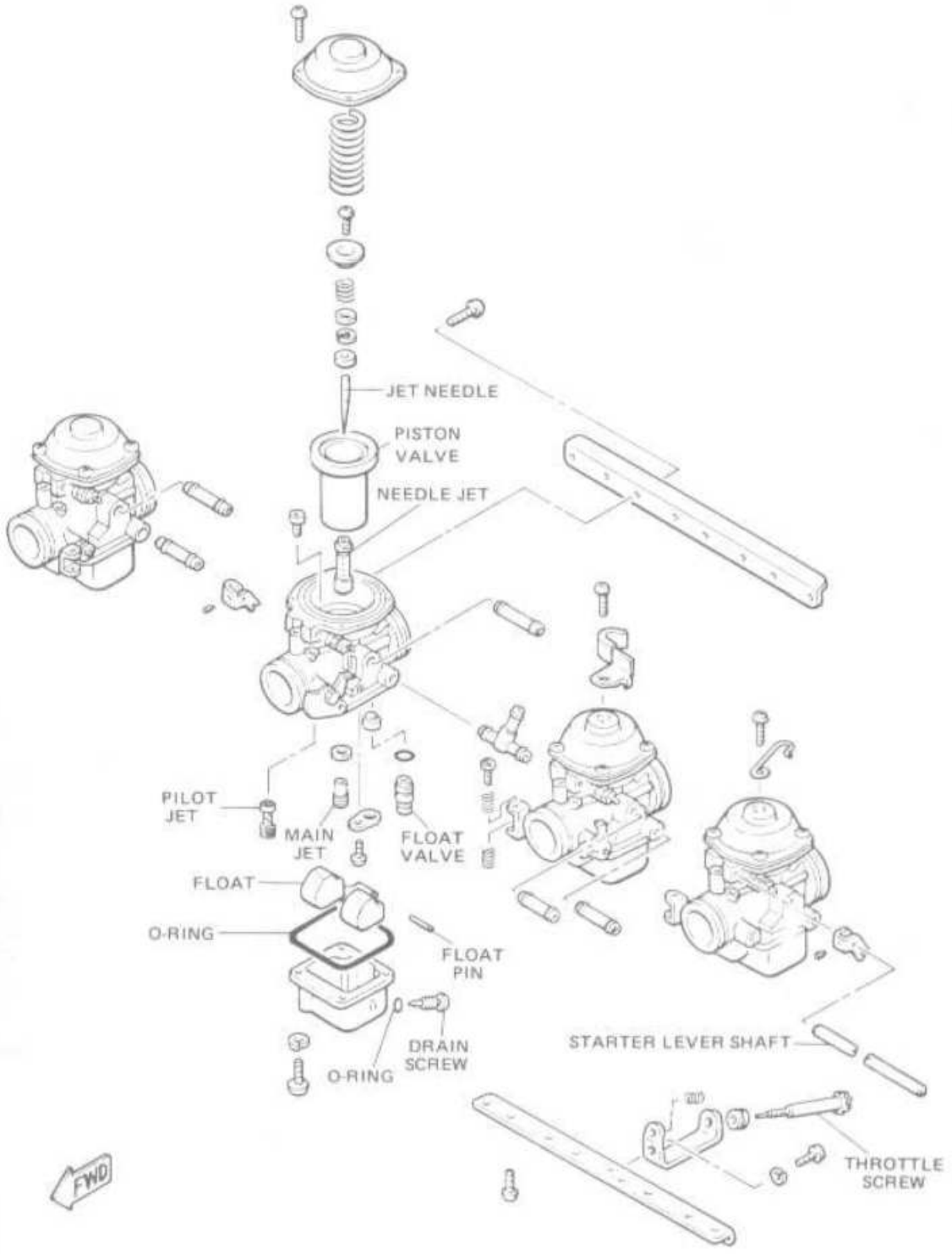
PRESSURE REGULATOR

This regulator is closed when the engine is at a stop and open when the engine is running, thereby controlling the feed pressure (i.e., fuel flow) in the range of the charging pressure plus an additional 0.2 kg/cm^2. Spring-and-diaphragm control of pressure is used to ensure the proper manifold-/fuel pressure difference. The spring end of the regulator is thus open to the engine manifold. As the pressure exceeds 0.2 kg/cm^2, the diaphragm opens the regulator, causing excess fuel to return into the fuel tank.

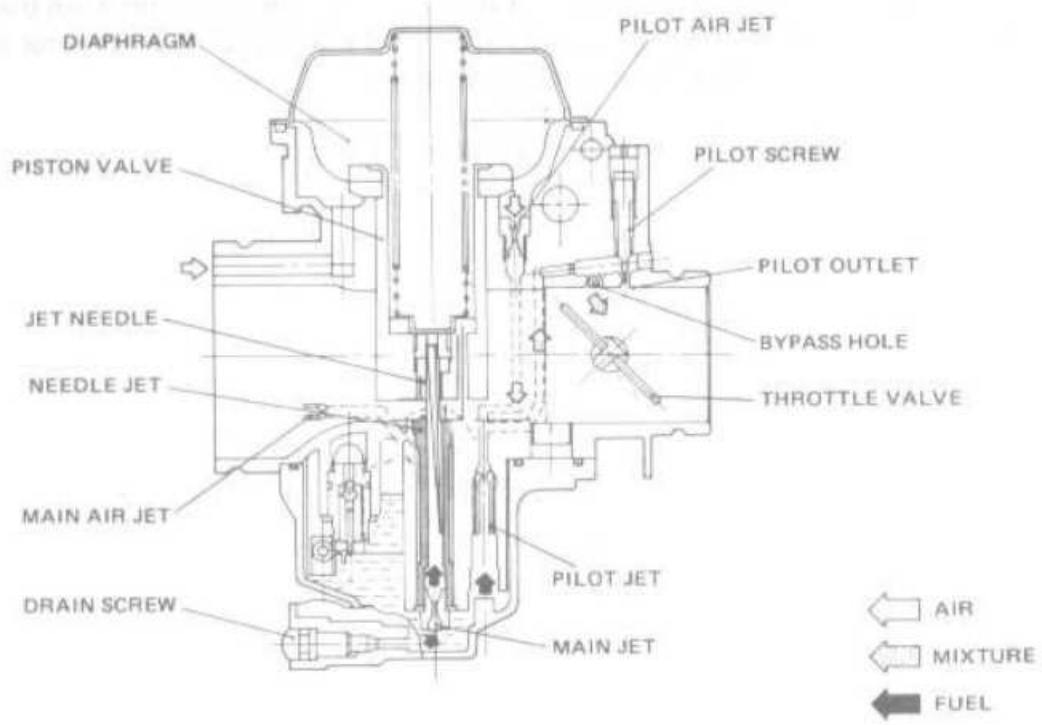


CARBURETOR

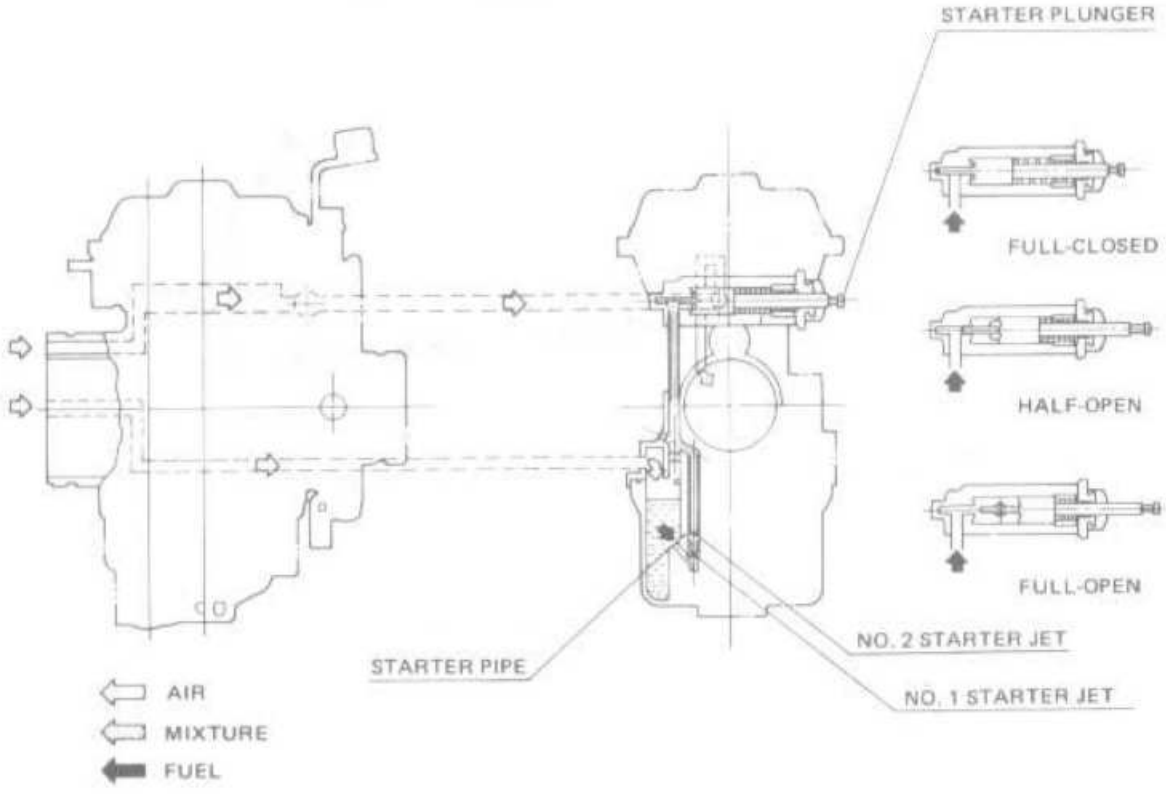
The carburetor is a fully-enclosed type BS30; float chamber ventilation is opened to the surge tank, because the float chamber must always be under boost pressure in order to supply sufficient fuel to the venturi.



CARBURETOR SECTION VIEW

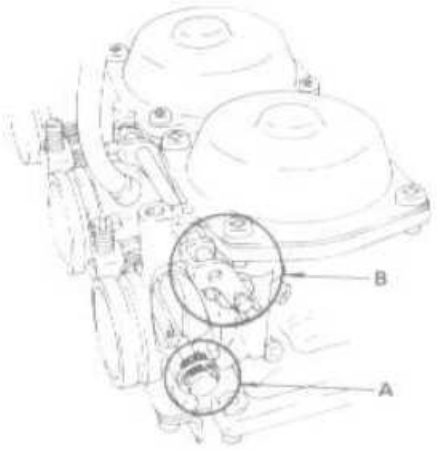


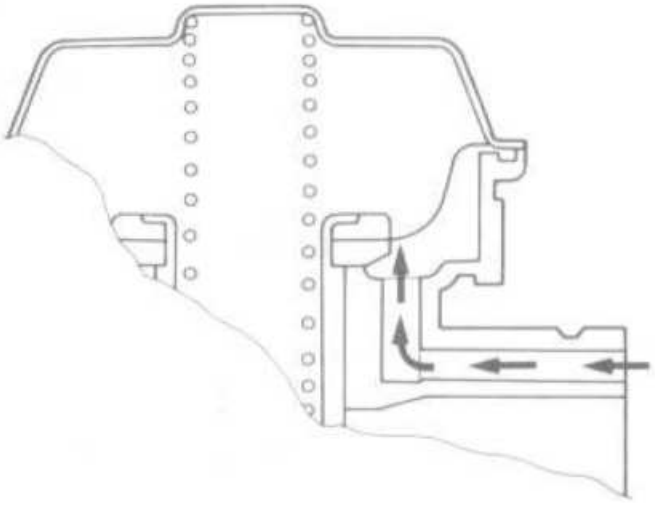
STARTER SYSTEM

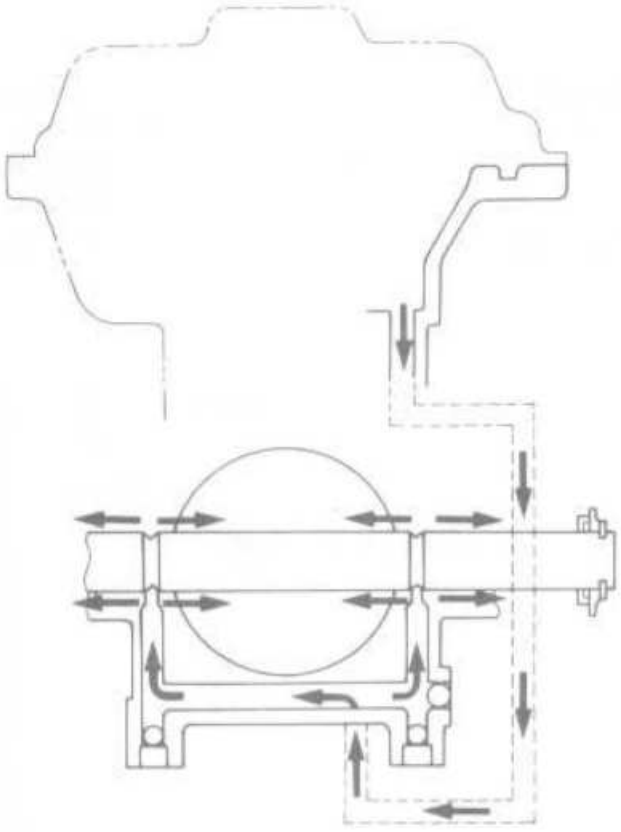


PRESSURE-SEALED CARBURETORS

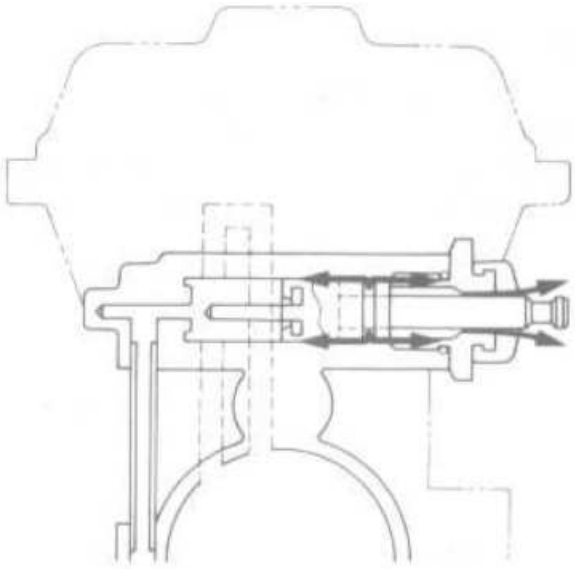
These carburetors have been specifically developed for use with a turbocharger. Because they are subjected to high intake pressures created by the turbocharger, they too must be pressurized to work effectively. To achieve this, the throttle valve shaft and starter plunger have O-rings to prevent pressure leaks, and to ensure that they do not leak, special passages deliver pressurized air to complete the seal. Air will leak from the throttle shaft and starter plunger O-rings, but this is normal. Should, however, fuel begin to leak from these passages, the carburetor must be serviced immediately.





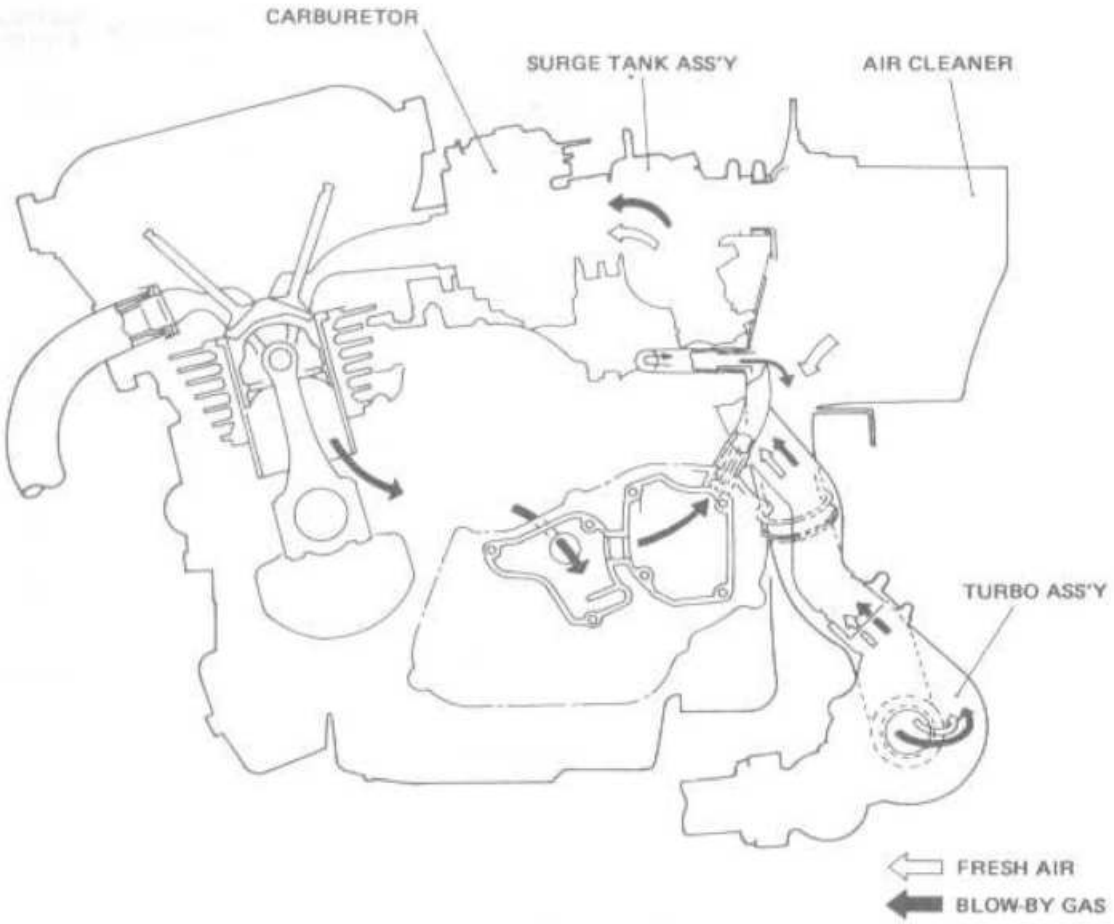


THROTTLE VALVE SHAFT (A)



STARTER PLUNGER (B)

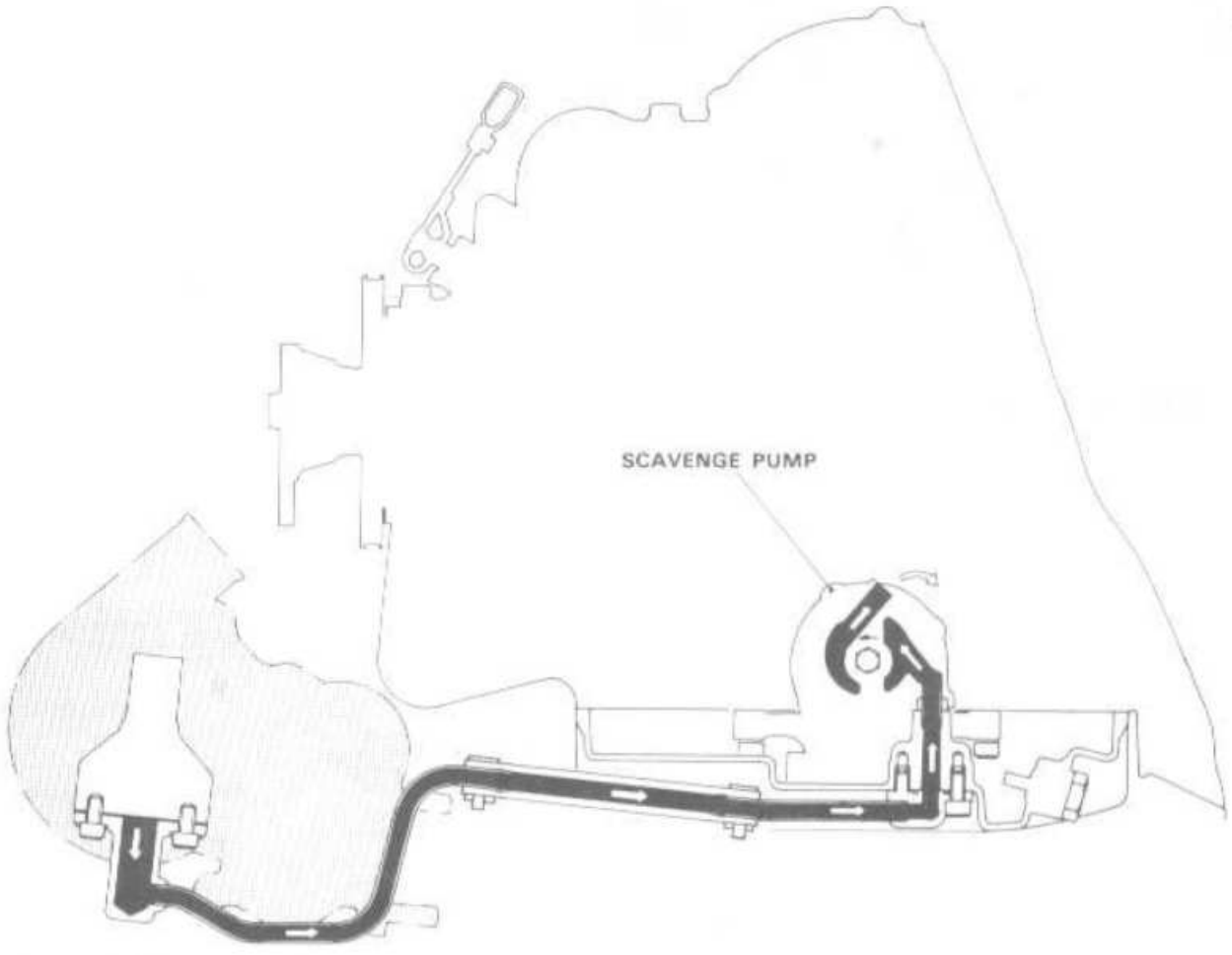
AIR CLEANER AND CRANKCASE VENTILATION SYSTEM



LUBRICATION SYSTEM

The turbo unit is pressure-lubricated from the main engine oil gallery. A check valve is installed on the outlet of the engine main oil gallery to stop oil flow to the turbo unit when the engine is not running. A scavenging pump rotor is equipped behind the original oil pump rotor to retrieve the oil from the turbo unit, ensuring a constant flow of oil.

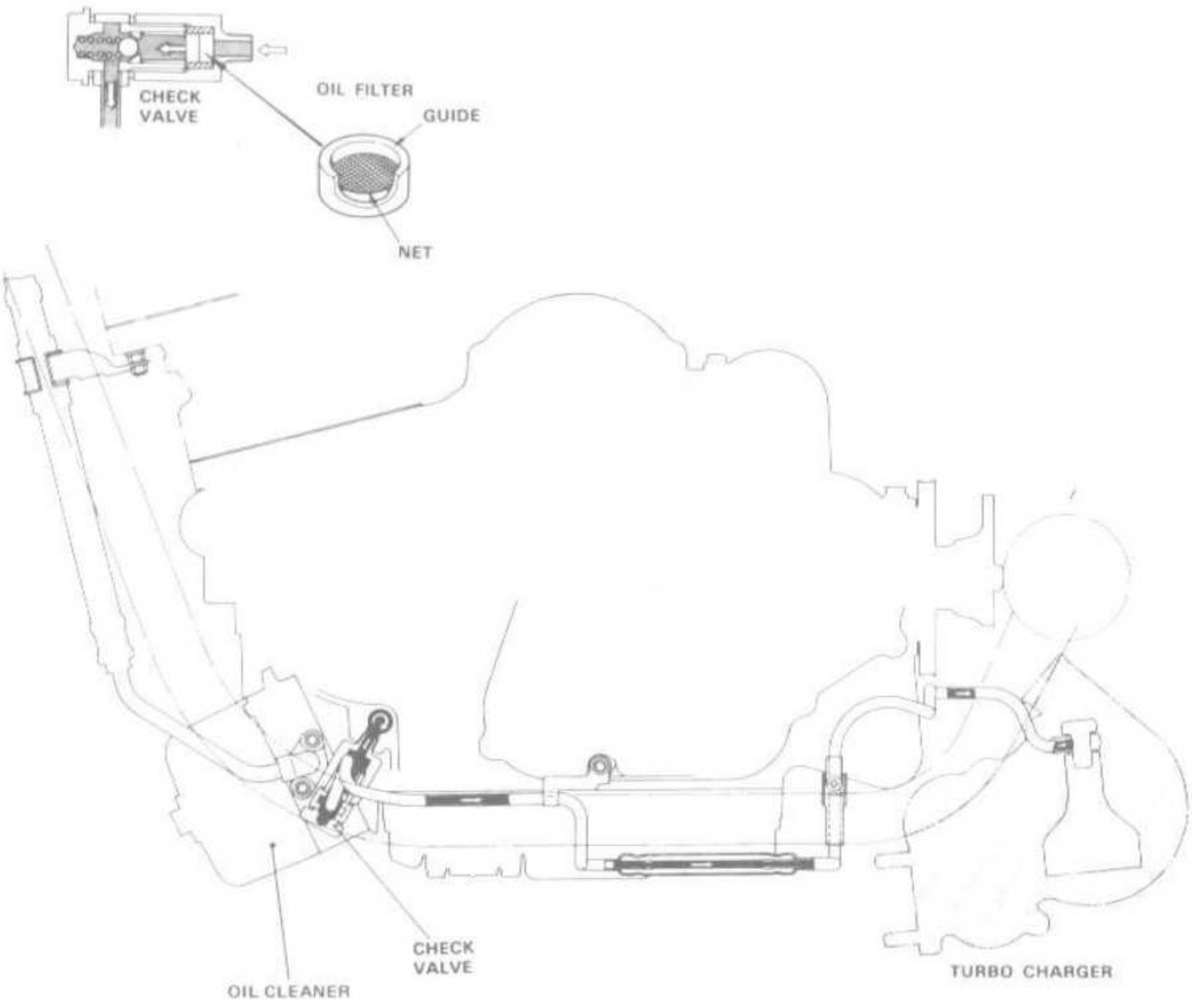
Check valve opening pressure: 24.5 kPa (0.25 kg/cm , 3.56 psi)



RIGHT SIDE VIEW

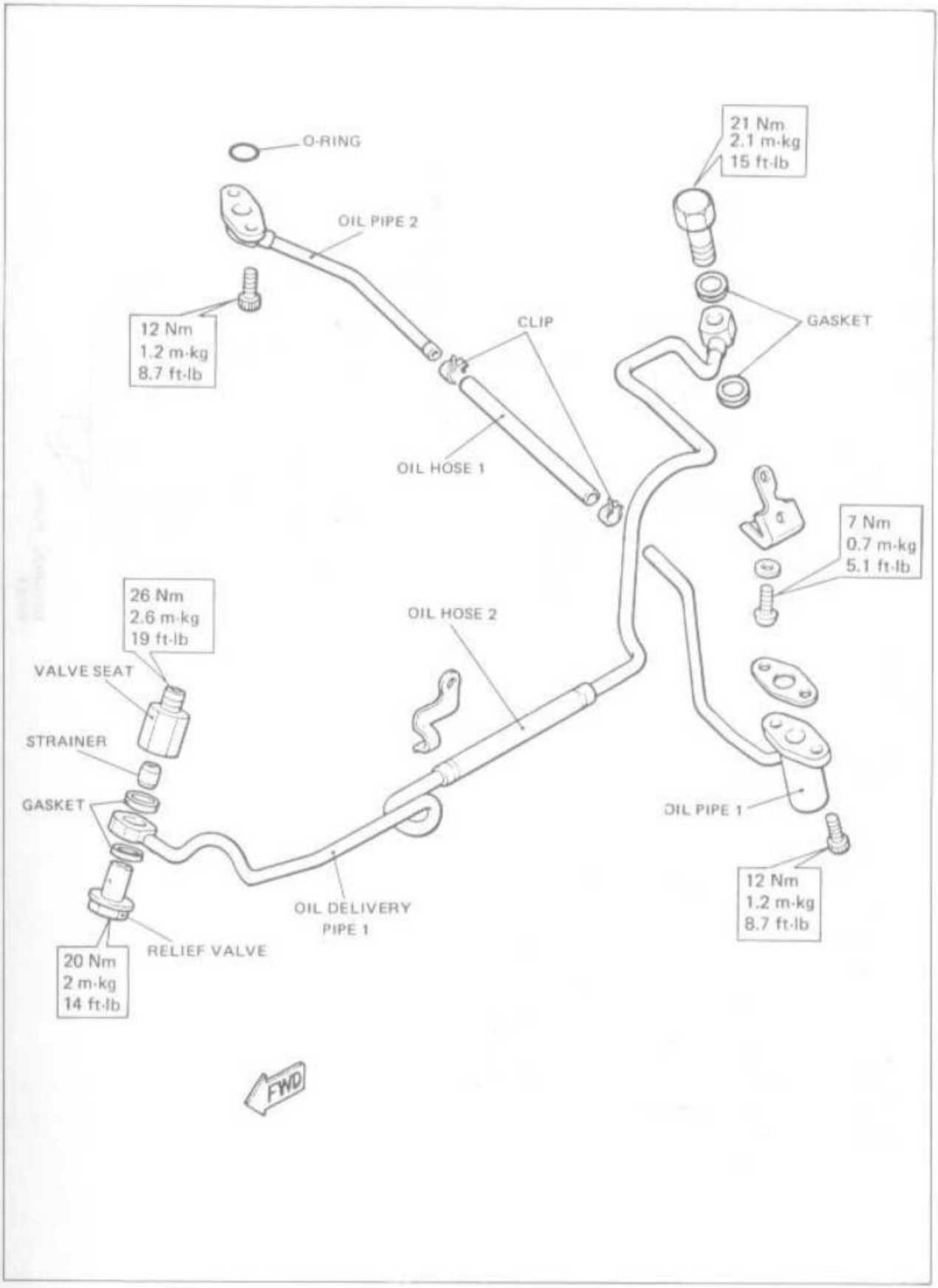
NOTE:

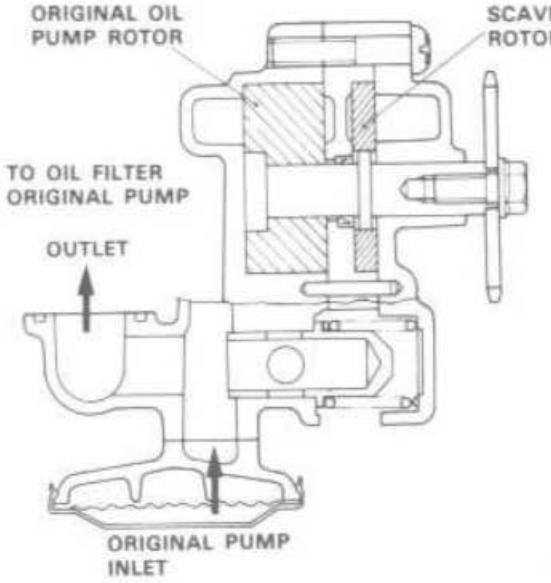
This filter traps material missed by the engine filter. It is made of a coarser mesh than the engine filter and must be cleaned after the first engine oil filter inspection (500 km) and thereafter every

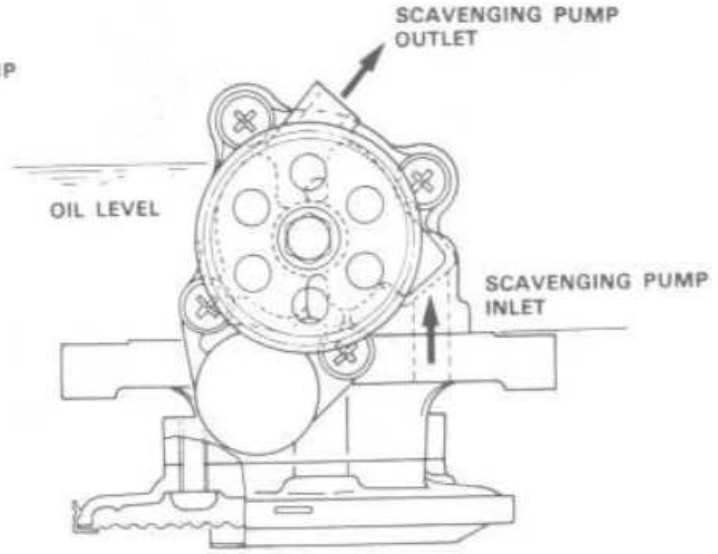


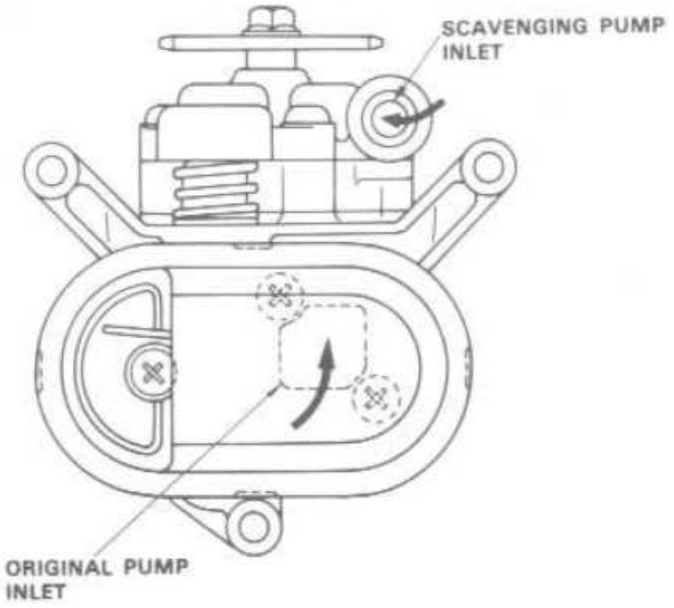
LEFT SIDE VIEW

OIL PIPE FOR TURBO UNIT

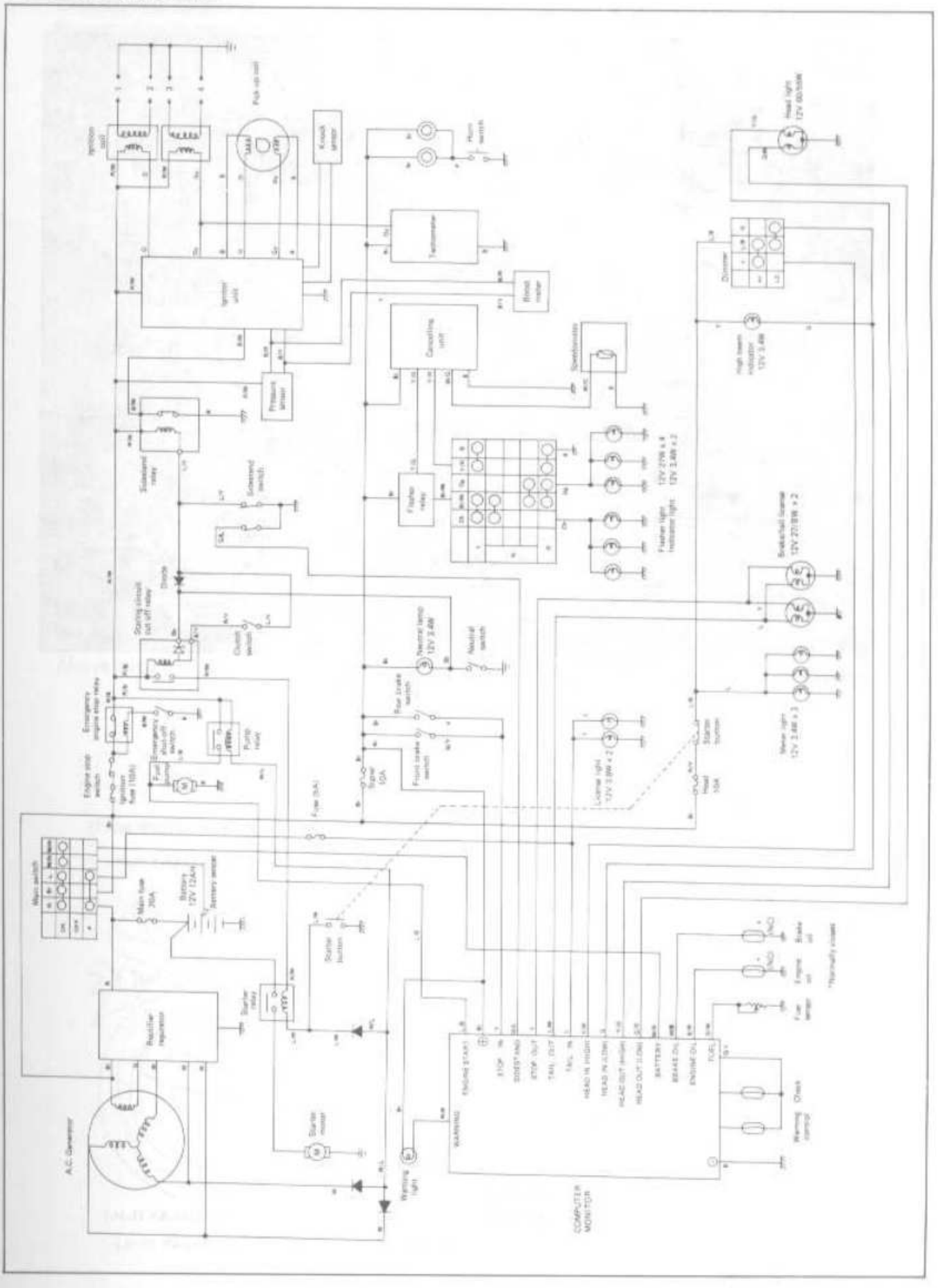



ORIGINAL OIL
PUMP ROTOR
SCAVENGING PUMP
ROTOR
TO OIL FILTER
ORIGINAL PUMP
OUTLET
ORIGINAL PUMP
INLET

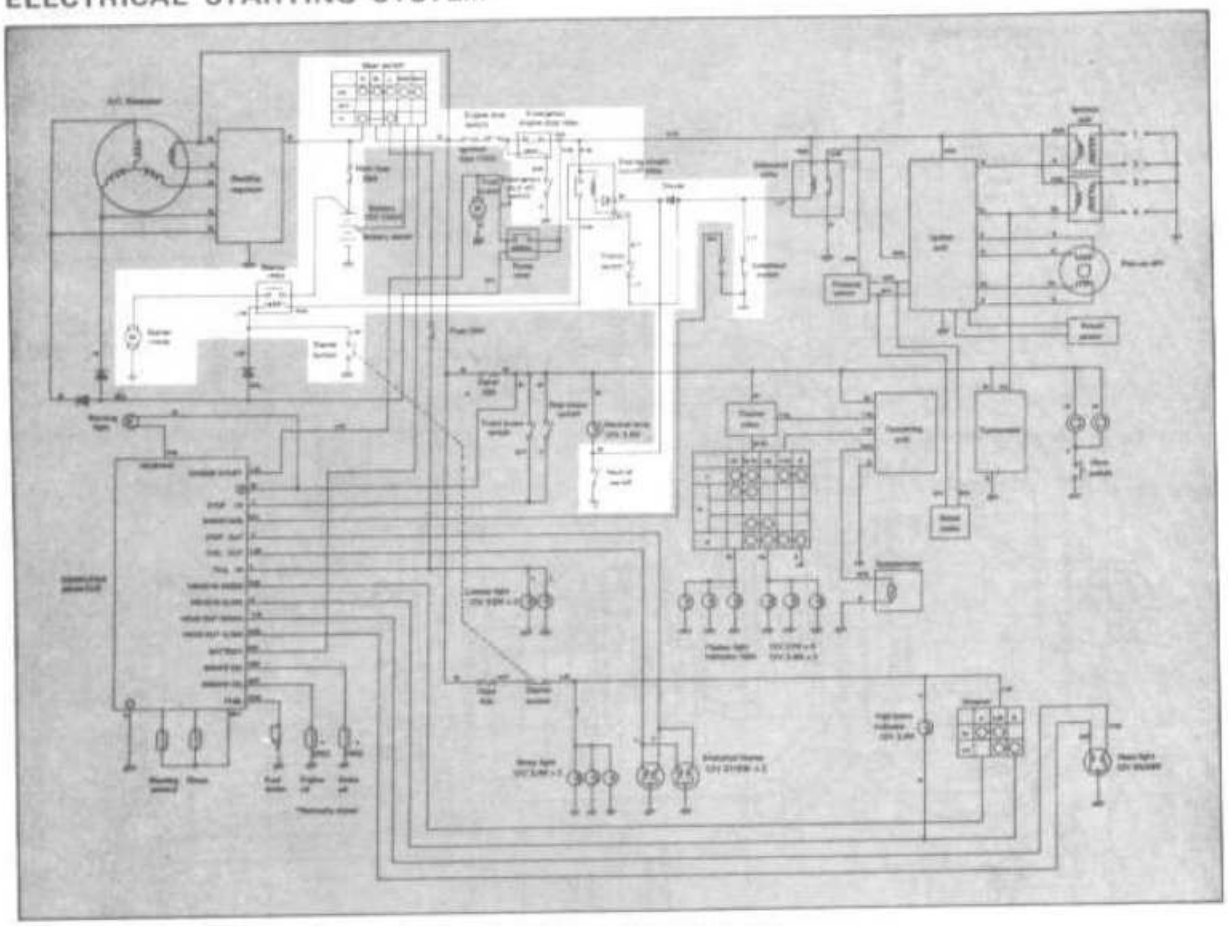

SCAVENGING PUMP
OUTLET
OIL LEVEL
SCAVENGING PUMP
INLET


SCAVENGING PUMP
INLET
ORIGINAL PUMP
INLET

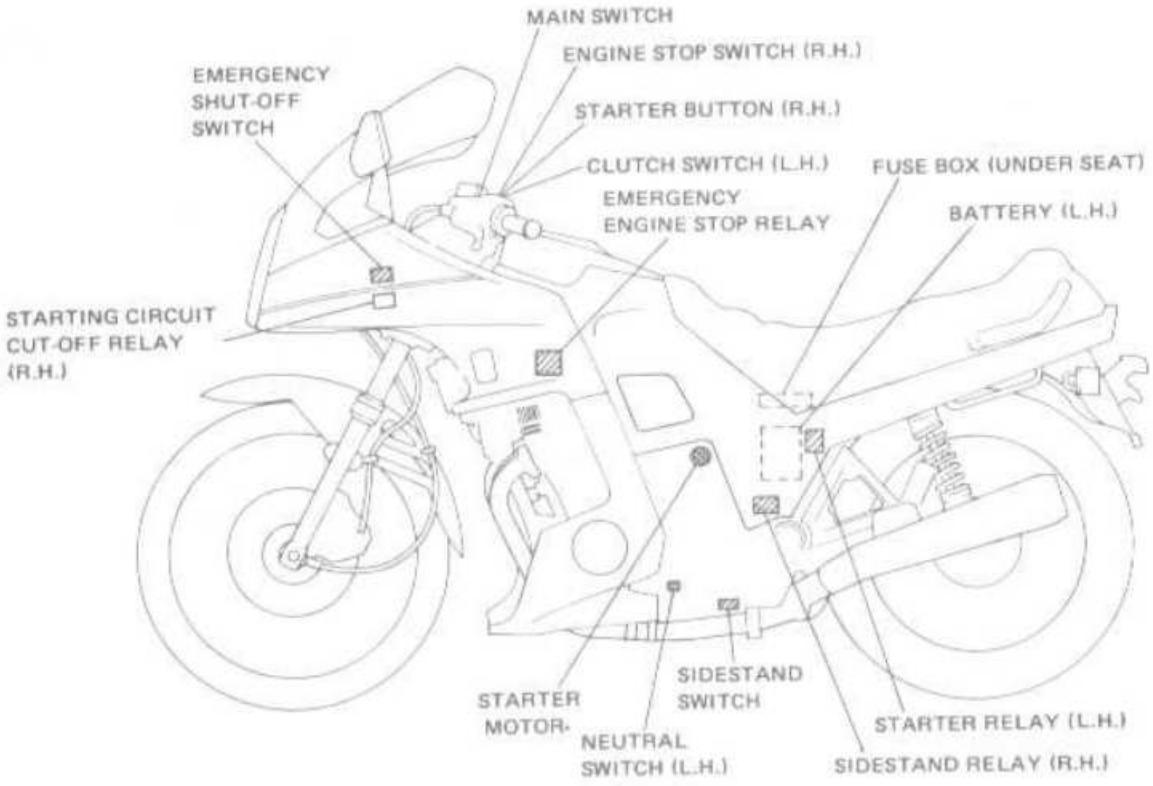
XJ650LJ WIRING DIAGRAM



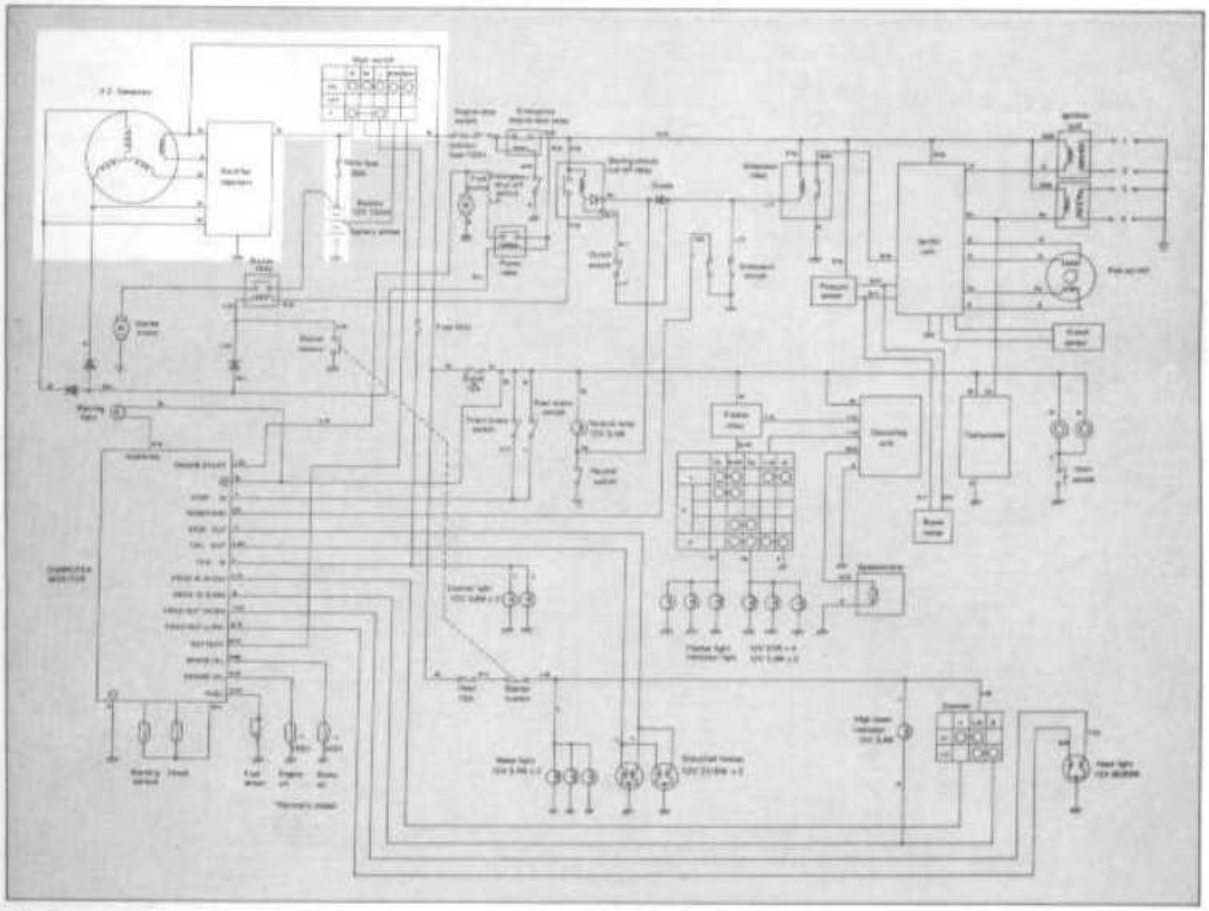
ELECTRICAL STARTING SYSTEM



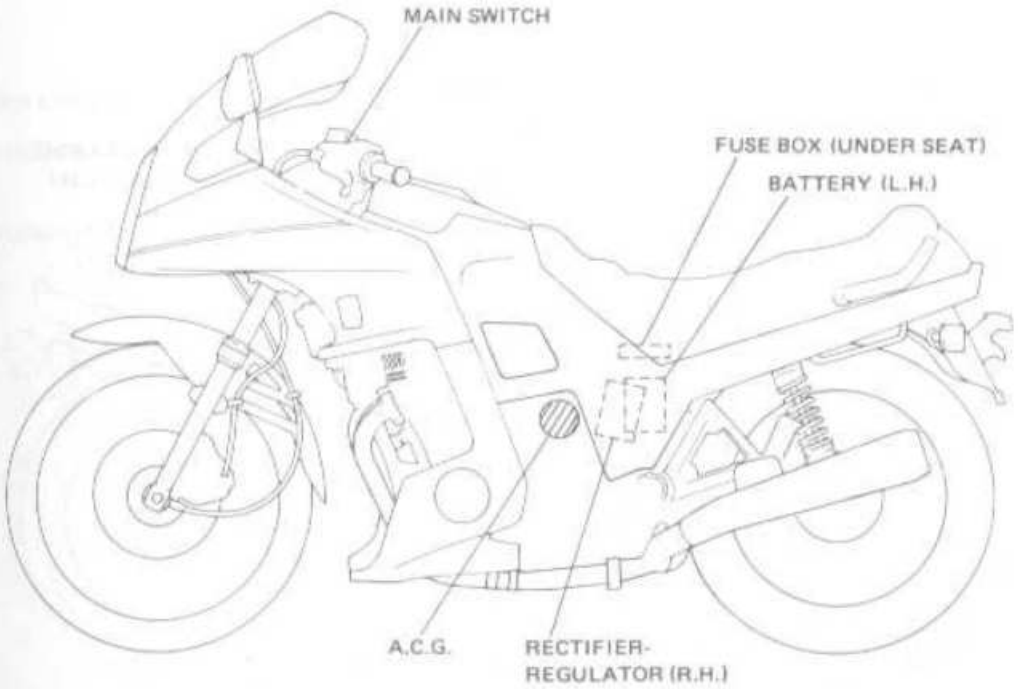
Above circuit diagram shows starter circuit in wiring diagram.



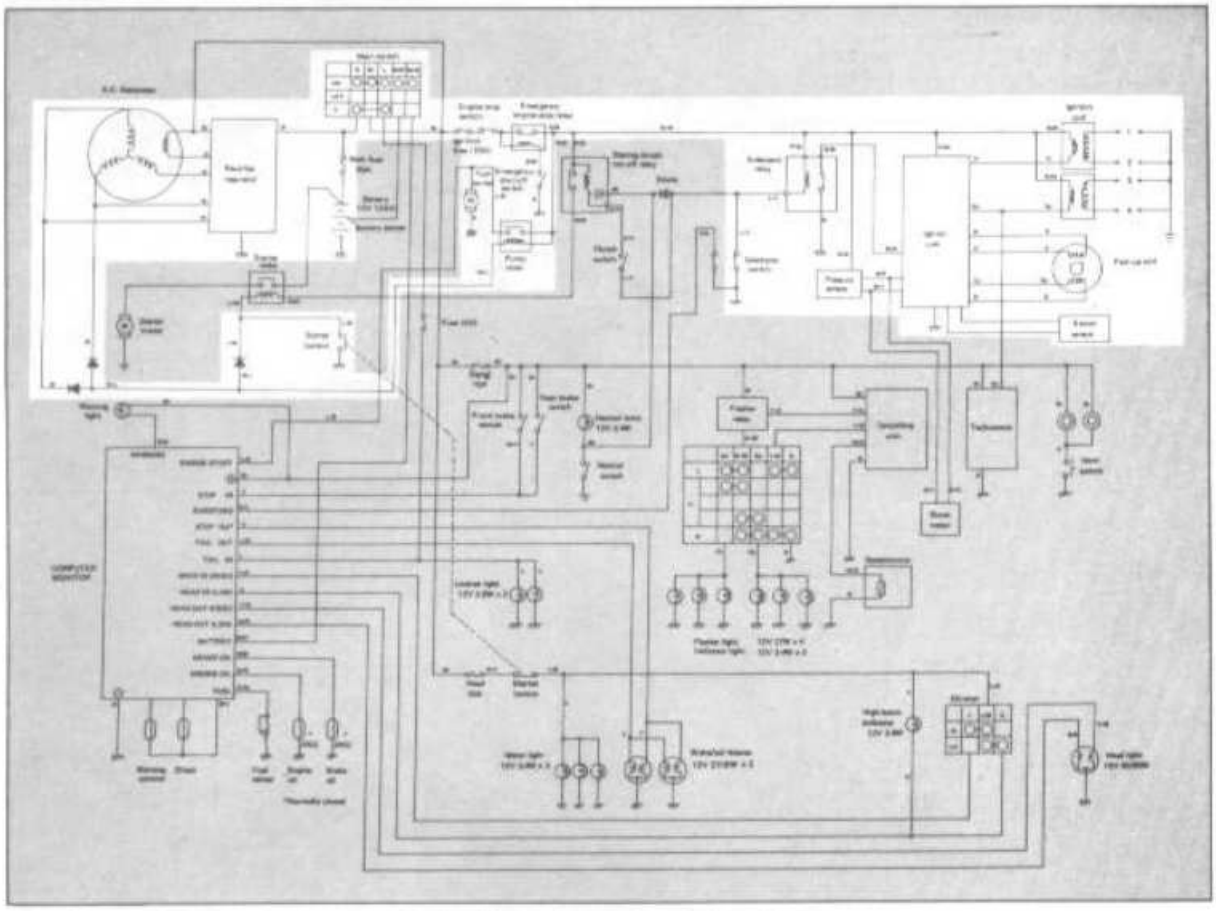
CHARGING SYSTEM



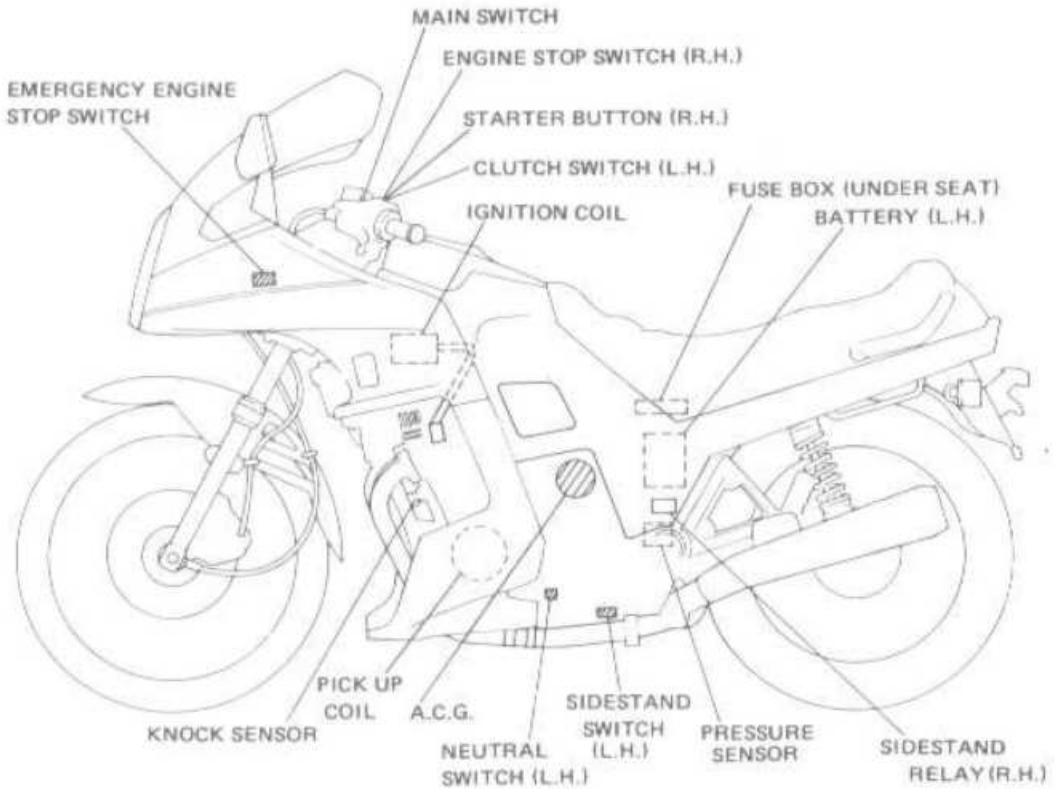
Above circuit diagram shows charging circuit in wiring diagram.



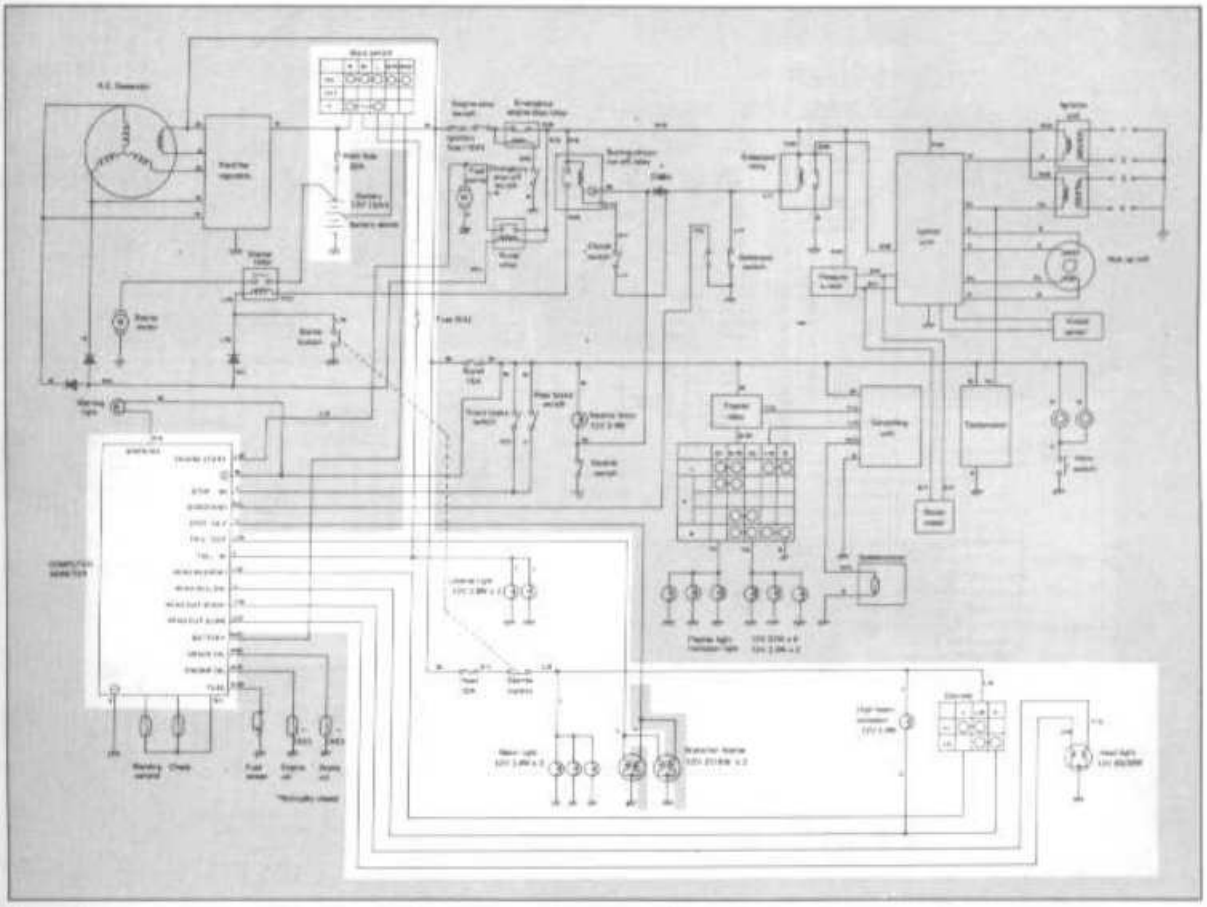
IGNITION SYSTEM



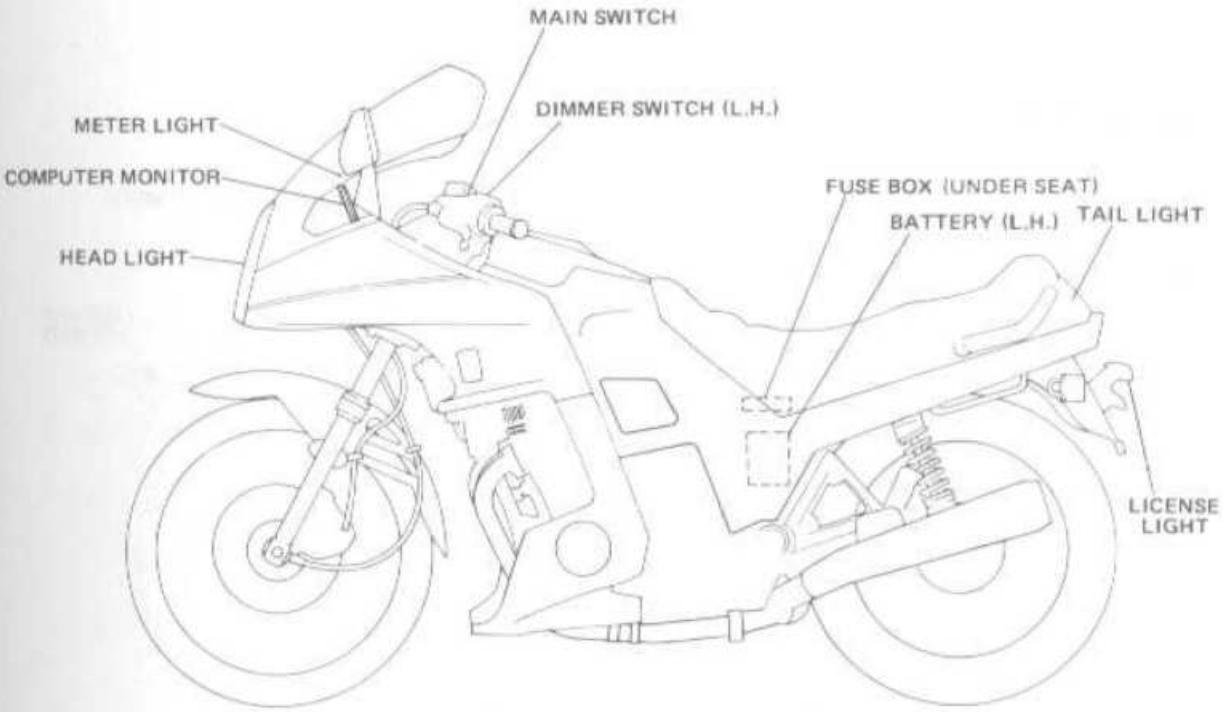
Above circuit diagram shows only ignition circuit in wiring diagram.



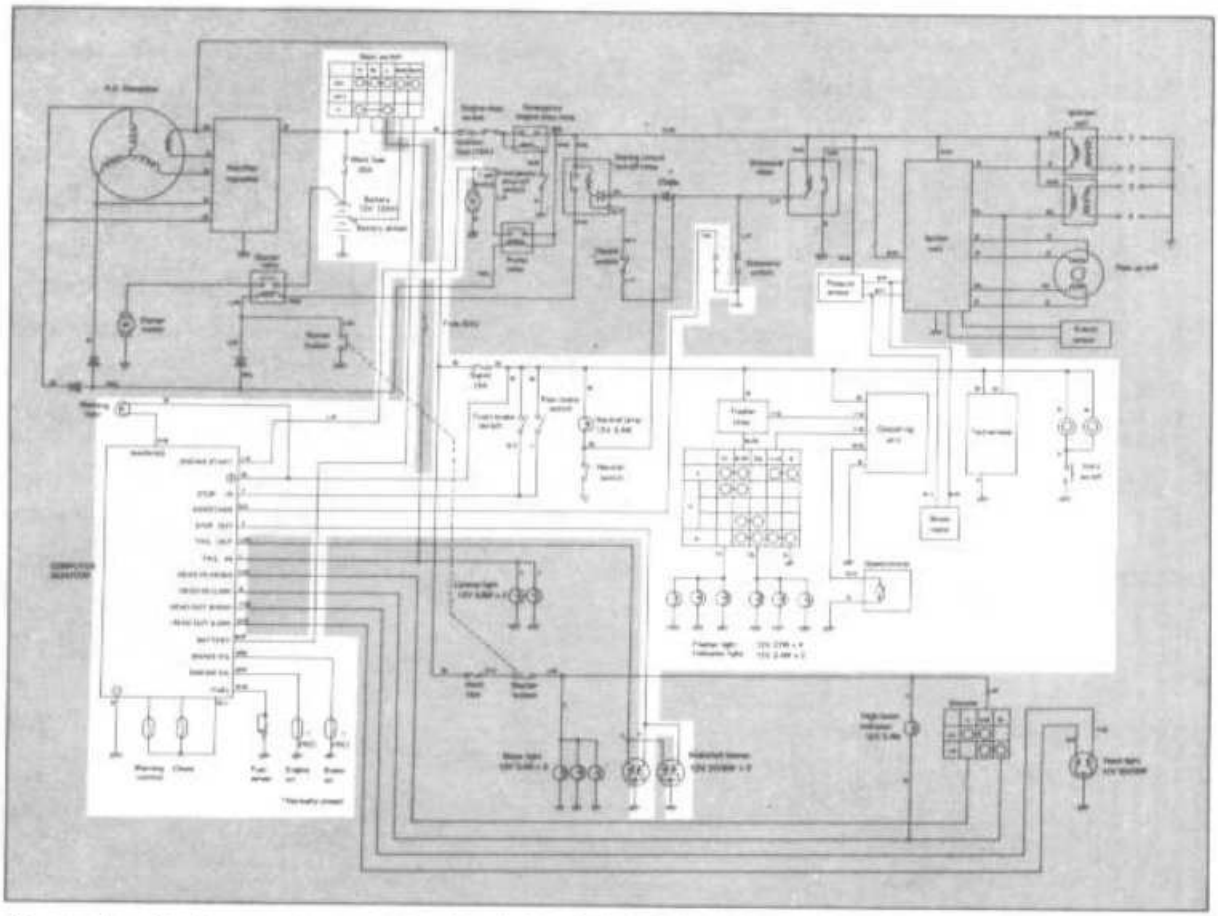
LIGHTING SWITCH



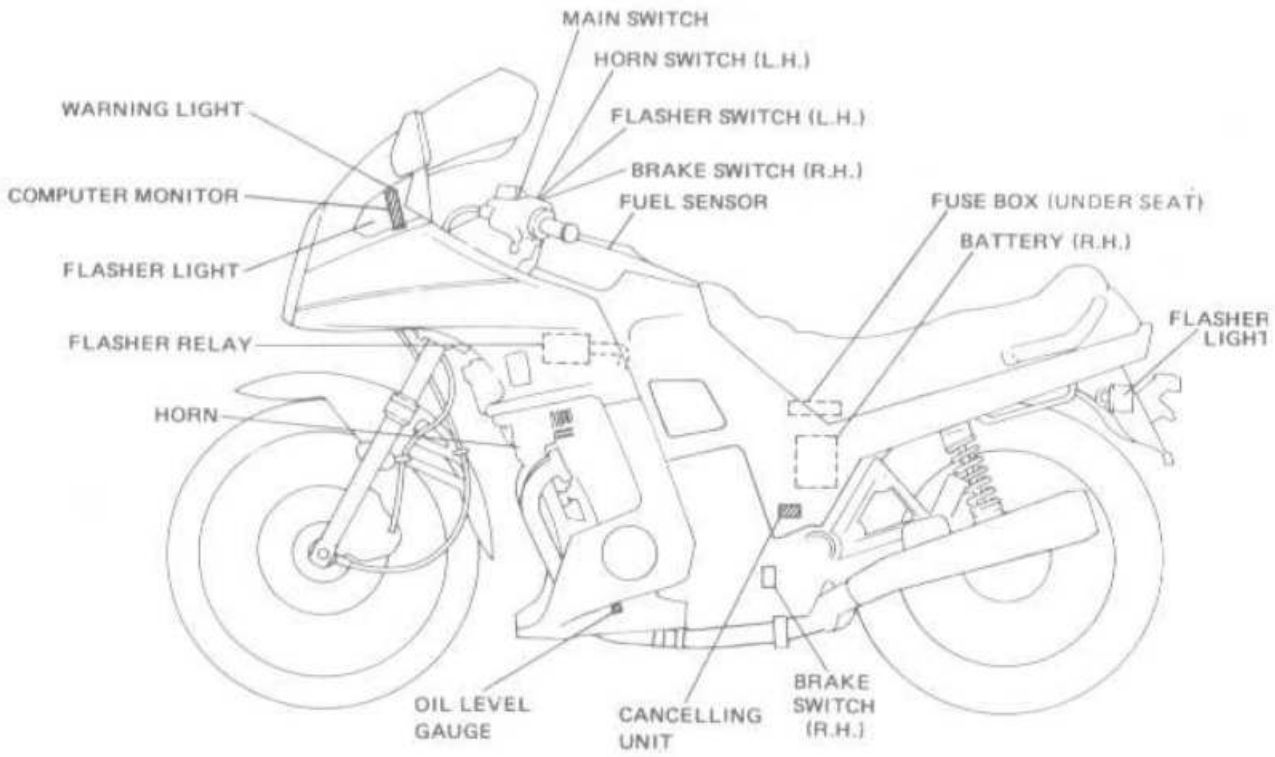
Above circuit diagram shows only lighting circuit in wiring diagram.



SIGNAL SYSTEM



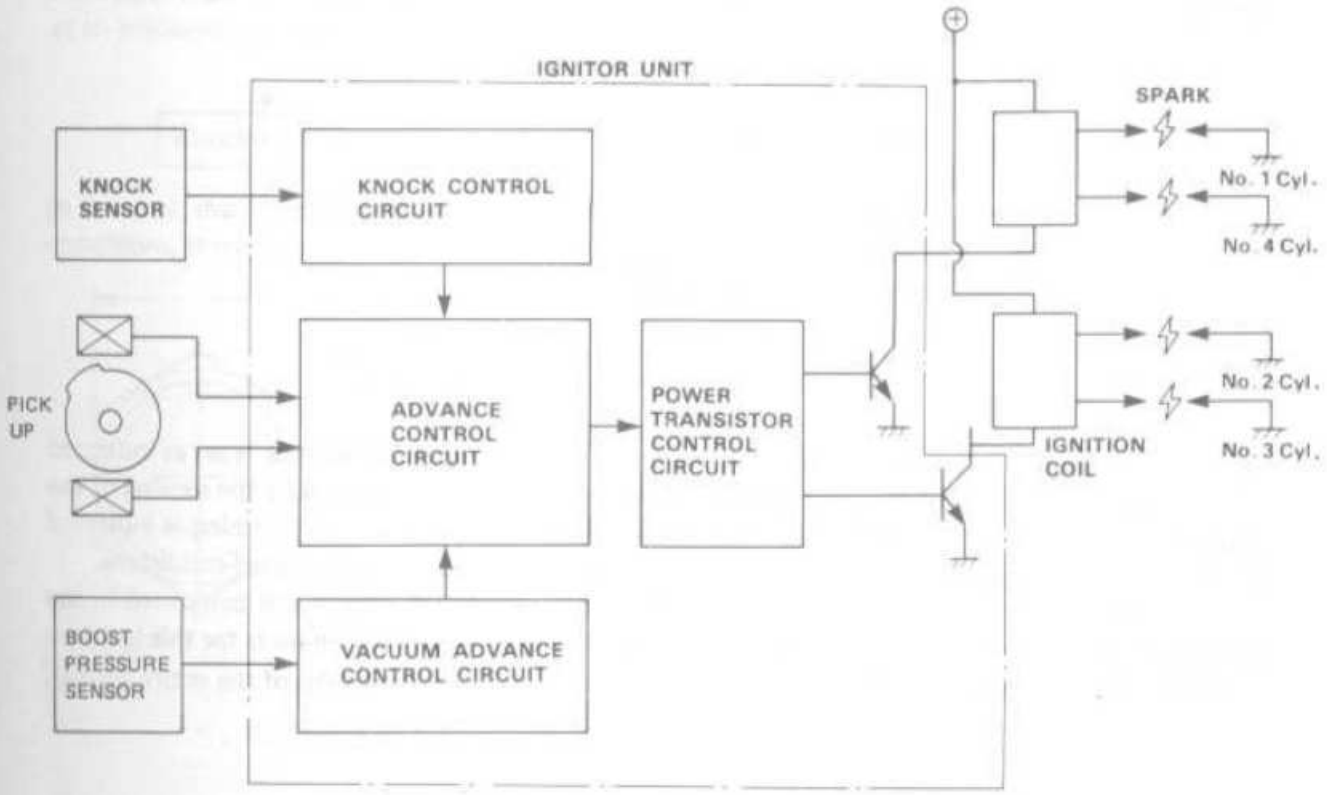
Above circuit diagram shows only signal circuit in wiring diagram.



IGNITION CONTROL SYSTEM

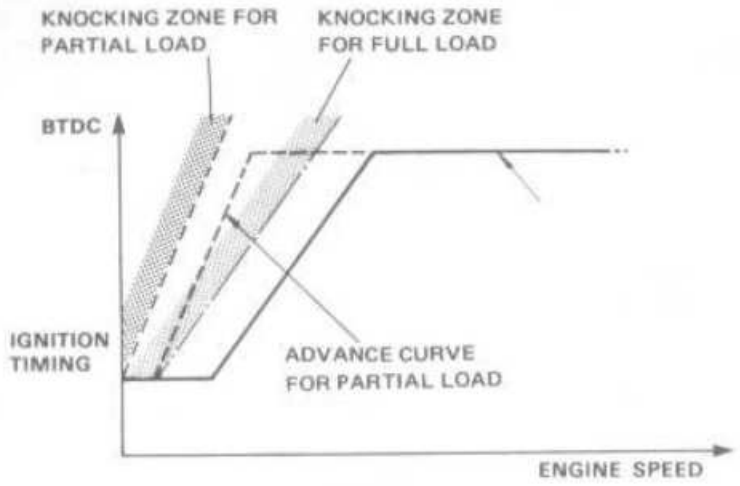
This motorcycle is equipped with the conventional transistor-advance system as well as a semiconductor-controlled boost sensor and a knock sensor. These combine to produce the optimum ignition timing according to engine conditions (i.e., engine speed, load, knocking, etc.).

Ignition system block diagram



VACUUM ADVANCE CONTROL SYSTEM

Generally speaking, in a 4-stroke motorcycle, the knocking zone varies with engine load.

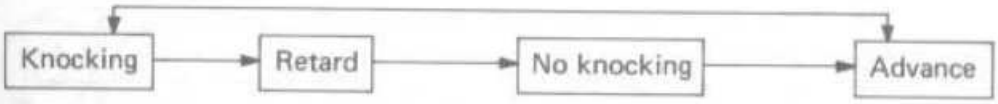


In an advance system concerned only with engine speed, the ignition advance is set as indicated by the heavy broken line (– – – –), whereas in the advance system assisted by the sensing of the engine load conditions, the optimum ignition can be obtained by setting the timing as indicated by the lighter broken line (----------). This is the case especially under partial-load conditions.
Engine load conditions are monitored by a semiconductor boost sensor and computed in the electronic circuit for the control of ignition timing. The absence of moving parts for this ignition-timing system contributes to the longer life, smaller size, and lighter weight of the entire system.

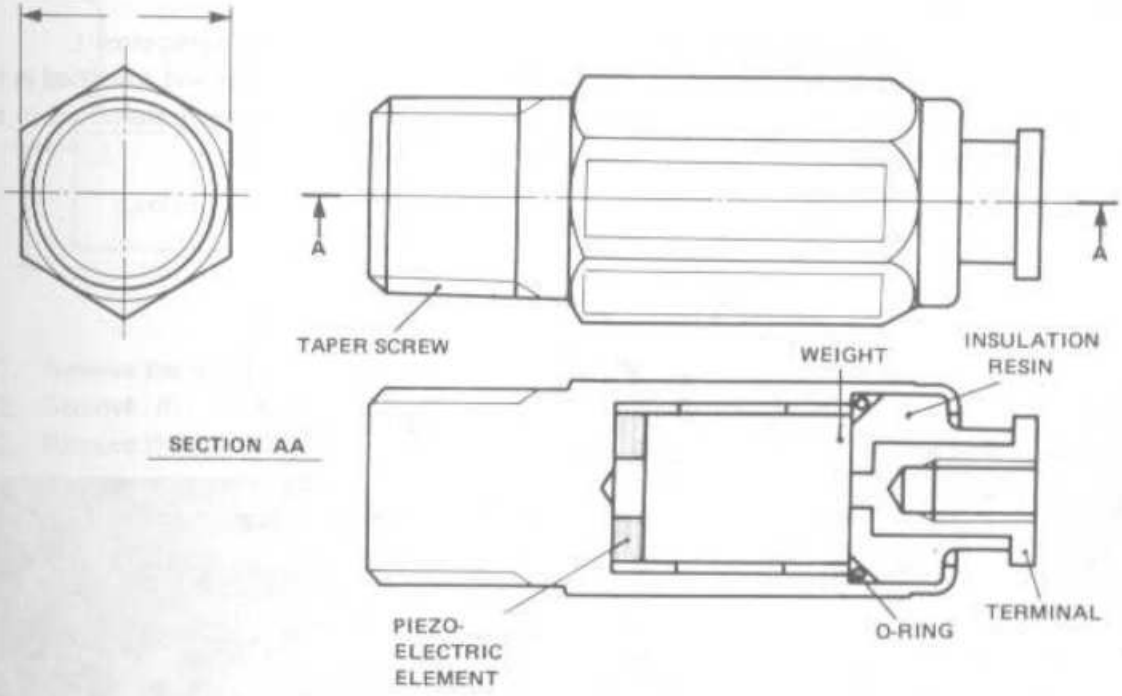
KNOCK SENSOR

The knock sensor senses the high-frequency vibrations developed by the engine and, as soon as this takes place, this knock-sensing system retards the ignition timing gradually so that knocking can be suppressed.

When there is no knocking for a certain period of time, this system functions to advance the ignition timing very gradually, until knocking is about to occur. This sensor feeds back the vibrations from the knocking engine and thereby controls the ignition timing so it is always set at an advanced position, but just before knocking would occur.



In this way, this knock-control system makes it possible to deal with constantly varying operating conditions, thereby supplying the constant and optimum ignition timing and spark.



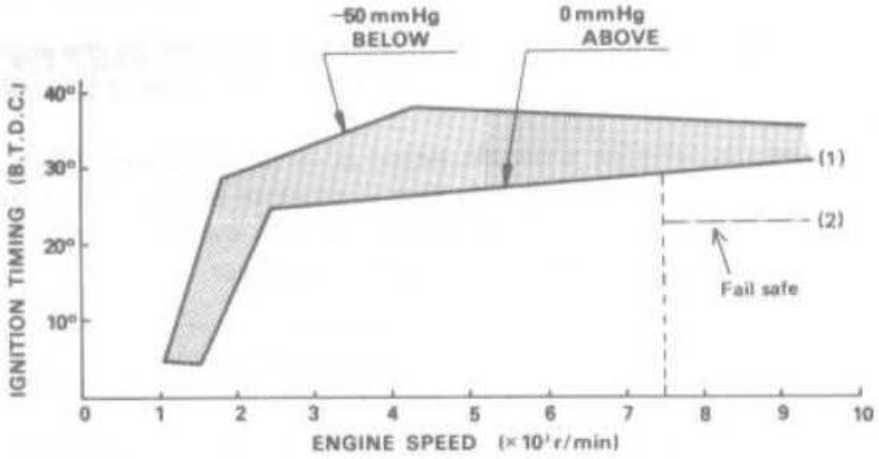
This sensor which is mounted between # 2 and #3 cylinders on the exhaust side, employs a combined piezo-electric element and terminal place. This unit senses high-frequency oscillations caused by engine knocking. The oscillations are a form of pressure, and this pressure generates electrical voltage in the piezo element. The generated voltage is carried to the ignitor unit, and this signal retards the timing, preventing the engine from knocking.

Fail-safe functions

If the knock sensor fails because of a lead failure, short-circuit, couple disconnection, or sensor damage, the ignitor unit automatically retards ignition timing from the advanced setting.

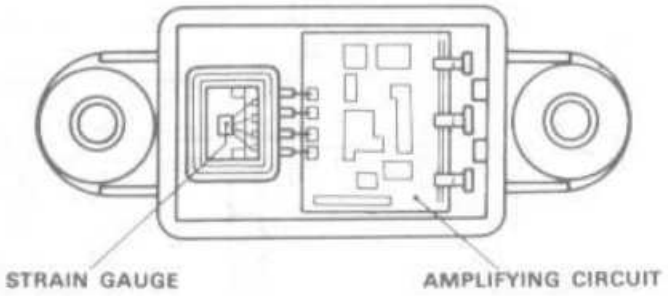
(1) If the pressure sensor is disconnected, the ignition unit automatically retards the ignition timing to the curve (1) shown in the illustration.

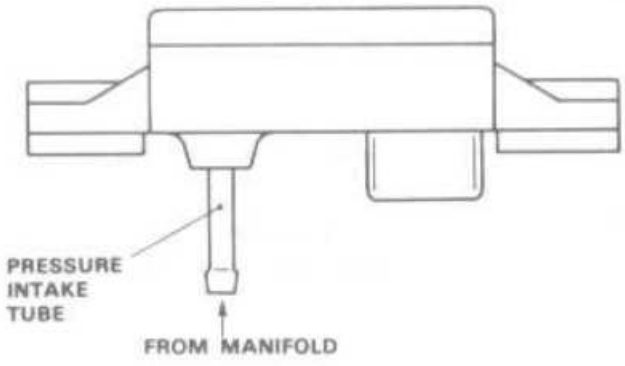
(2) If the knock sensor output is zero, the ignitor unit automatically retards 5 ± 1.5° from the advanced setting, the safest setting over 7,500 rpm.



PRESSURE SENSOR

This boost sensor unit consists of a semiconductor strain gauge and an amplifying circuit. Pressure to the carb manifold (venturi portion) is sensed by the strain gauge and amplified in the circuit connected with this gauge. The amplified pressure signals are than transmitted to the ignition system for the control of ignition timing advance.

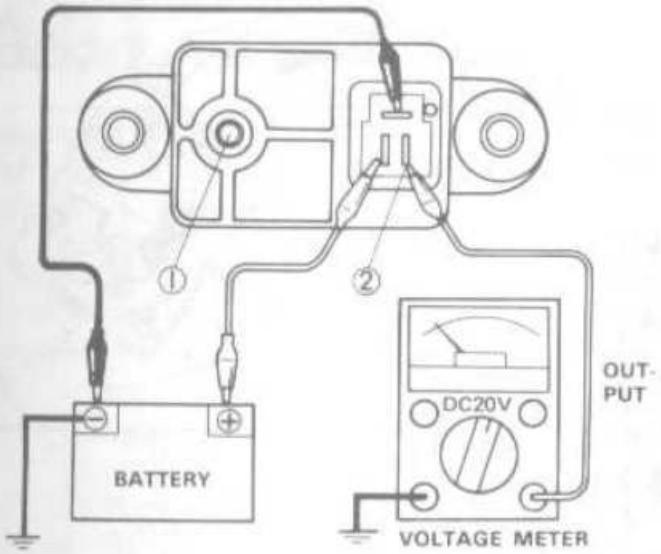


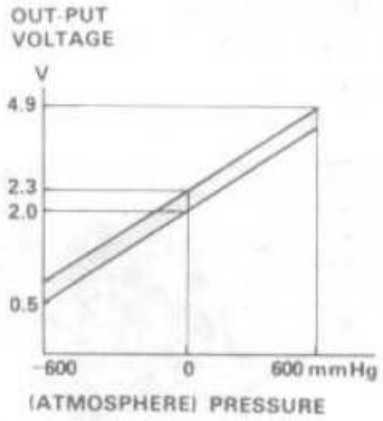


PRESSURE SENSOR INSPECTION (OFF-FRAME)

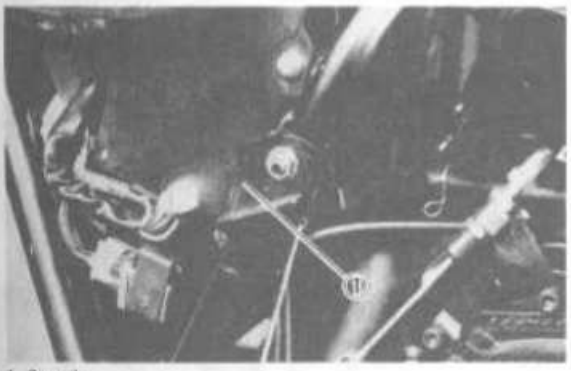
Open the pressure intake tube (1) to the atmosphere, and check the voltage between the output terminal (2) and the ground. See the following picture.

Output voltage: About 2.0 DC. volt





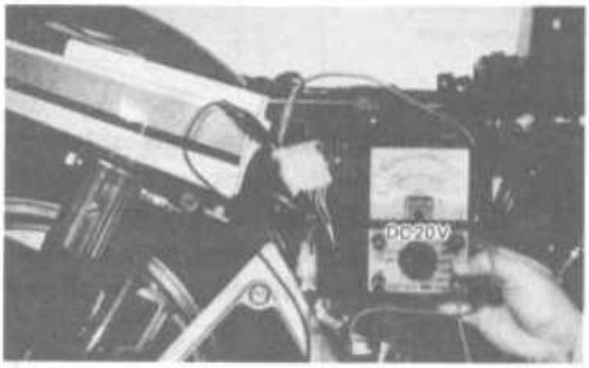
1. Remove the seat.
2. Remove the side panels as one piece.
3. Remove the stay 1.



1. Stay 1.

4. Pull out the TCI unit connecter and connect a Yamaha Pocket Tester.

   ⊕ lead – Black/Red
   ⊖ lead – Black/Yellow



5. Turn the main switch key to ON; or connect the battery ⊕ lead to R/W and ⊖ lead to ground.
6. Read the tester. If the tester reading is not in the vicinity of the specified range, replace the pressure switch.

Specified range: About 2.0 DC. volt

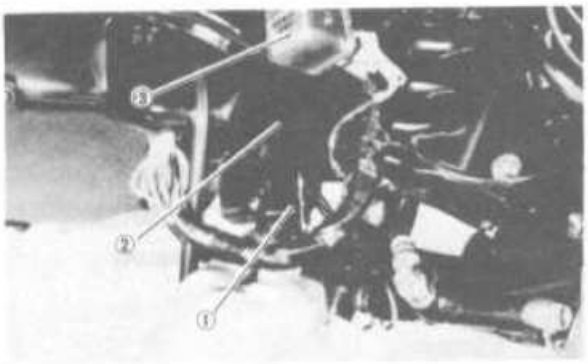
SWITCH AND RELAYS

EMERGENCY SHUT-OFF SWITCH

The emergency shutoff switch is a mechanical switch and mounted behind the headlight. This switch will shut off the ignition system if for any reason the motorcycle reaches a lean angle of 60 degrees or more from vertical.

Removal

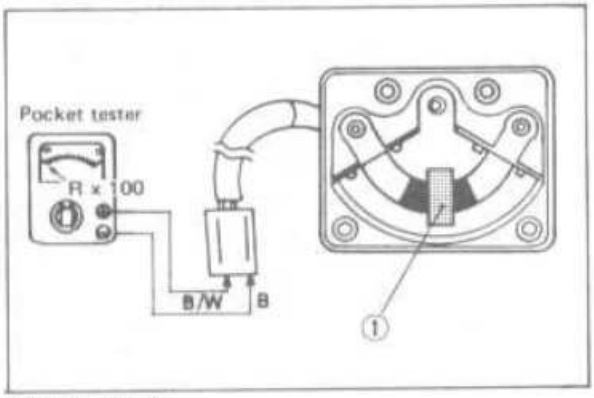
1. Remove the required fairing.
2. Disconnect the lead wires from the wire harness and pull out the switch assembly from its rubber mounting harness.



1. Emergency shut-off switch
2. Rubber mounting
3. Fuel pump relay

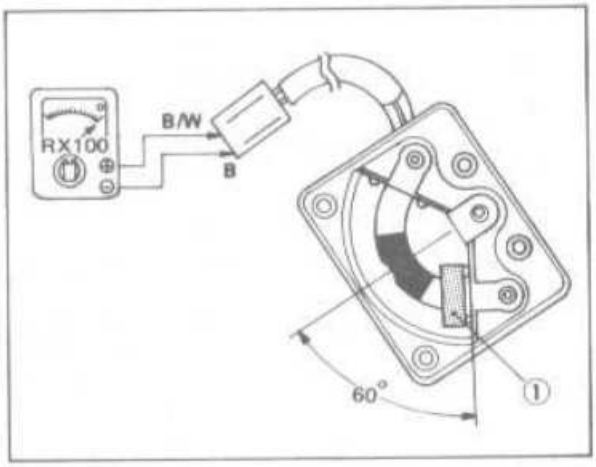
Inspection

1. Connect the pocket tester leads as shown.
2. The tester (with ohms x 100 scale) needle should show infinity (∞) when the switch is positioned vertically as shown. Replace the switch if it shows 0Ω.



1. Weight contact

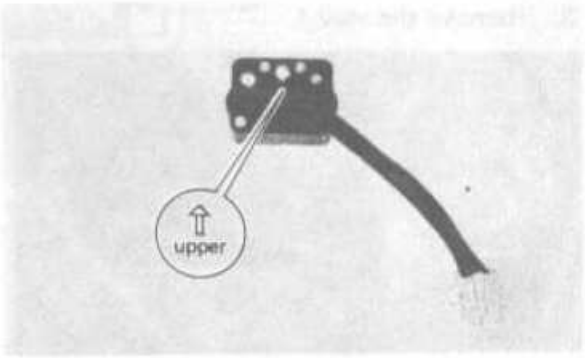
3. The tester (with ohms x 100 scale) needle should swing to 0Ω when the switch is leaned about 60 degrees or more to either left or right from the vertical position.
   Replace the switch if it shows infinite resistance (∞).



Installation

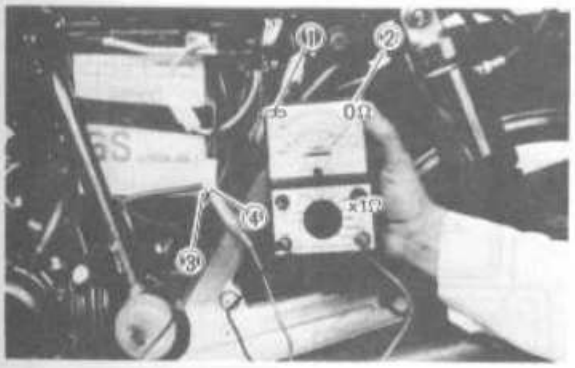
CAUTION:

Install the switch with the arrow pointing up, or the switch will not operate correctly.



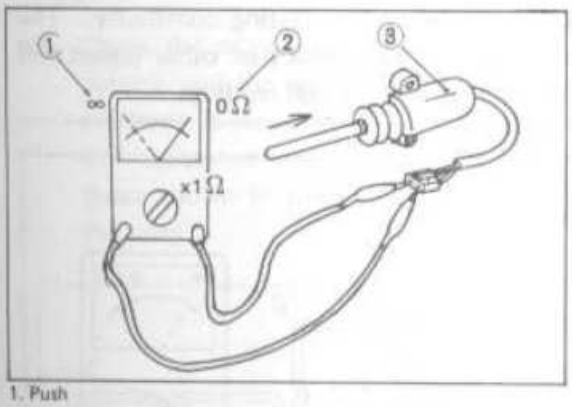
SIDESTAND SWITCH

1. Remove the seat.
2. Remove the side panels as one piece.
3. Disconnect the connector from the wiring harness.
4. Connect the pocket tester leads as shown, and set the tester selector to ohm x 1. When the sidestand is up, the tester should read zero ohms. When the sidestand is down, the tester should read infinity.



SIDESTAND	SWITCH	L/Y	B	G/L
UP	FREE	○	○	○
DOWN	PUSH			

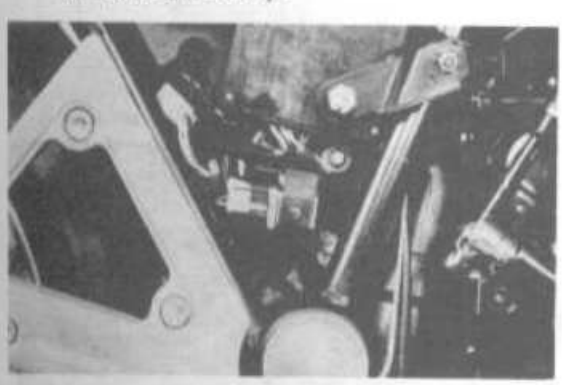
Also you can remove the switch and check it as a unit.



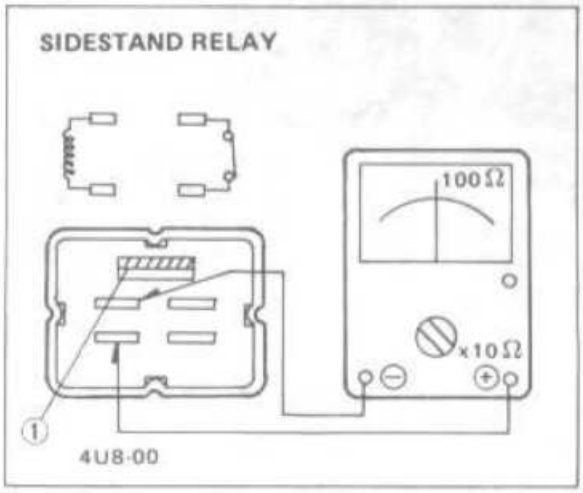
1. Push
2. Free
3. Sidestand switch

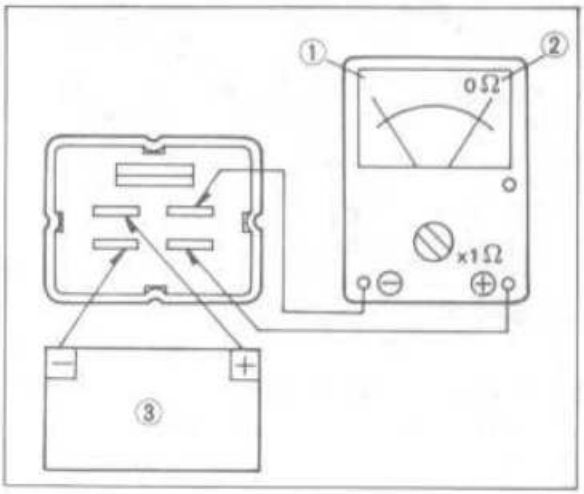
SIDESTAND RELAY

1. Remove the seat and the side panels.
2. Disconnect the connector and remove the sidestand relay.



3. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.
4. Check the relay contact breaker points with the pocket tester and a 12 volt battery. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.

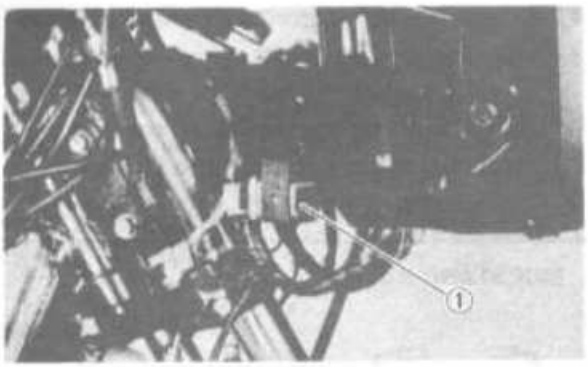




1. When the battery is connected.
2. When the battery is disconnected.
3. 12 volt battery

STARTING CIRCUIT CUT-OFF RELAY

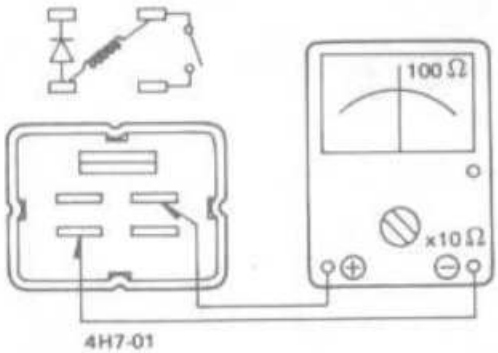
1. Remove the required fairing.
2. Disconnect the connector.
3. Remove the starting circuit cut-off relay.



1. Starter circuit cut-off relay

4. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.

STARTING CIRCUIT CUT-OFF RELAY



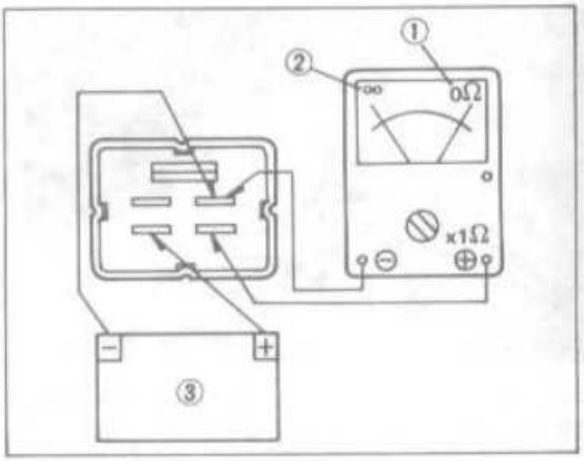
4H7-01
No color

5. Check the relay function with a 12 volt battery and the pocket tester. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.

CAUTION:

Wrong connection of the battery leads may cause damage to the relay diode.

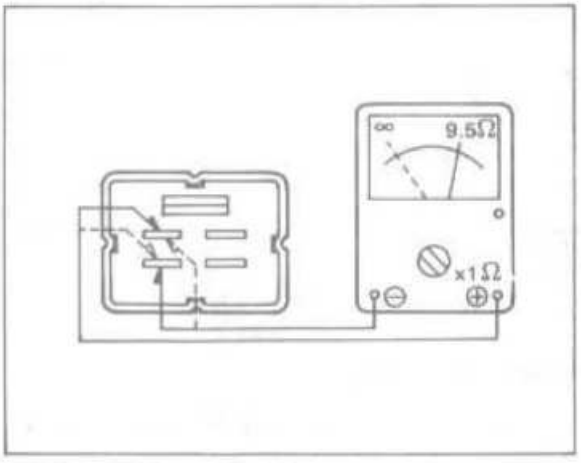
6. Check the diode in the starting-circuit cut-off relay with the pocket tester as shown in the illustration. Replace the relay if the diode is damaged.



1. When the battery is connected.
2. When the battery is disconnected.
3. 12 volt battery

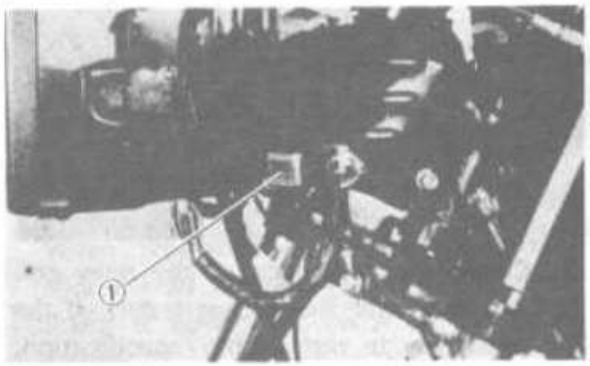
NOTE:

Only the Yamaha Pocket Tester will give a 9.5Ω reading when testing continuity. The particular characteristics of other testers will vary the continuity test readings.



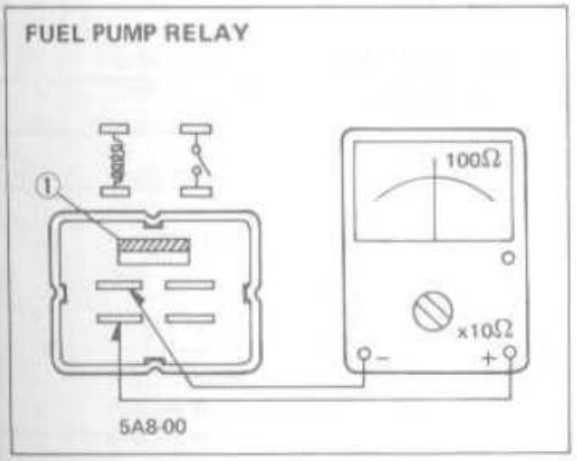
FUEL PUMP RELAY

1. Remove the required fairing.
2. Disconnect the connector.
3. Remove the fuel pump relay.



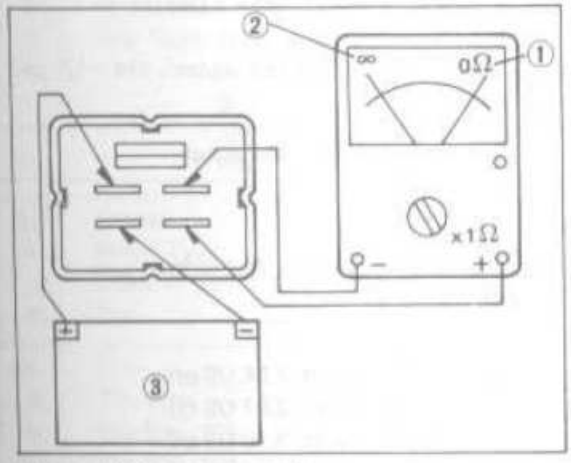
1. Fuel pump relay

4. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.



1. Red

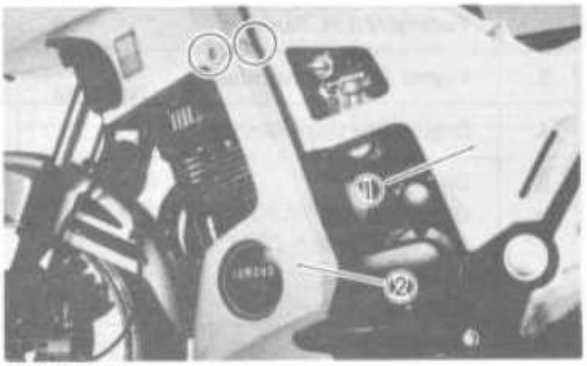
5. Check the relay function with a 12 volt battery and the pocket tester. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.



1. When the battery is connected.
2. When the battery is disconnected.
3. 12 volt battery

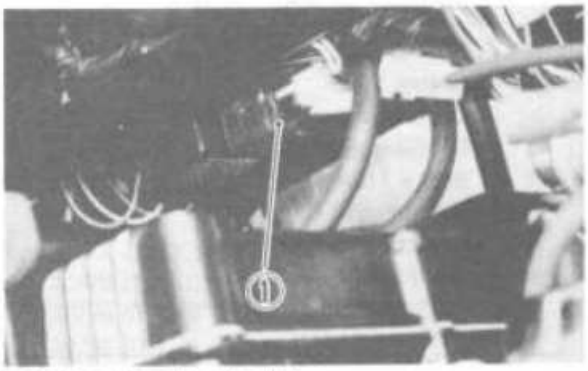
Emergency engine stop relay inspection

1. Remove the seat.
2. Remove the side panels as one piece.
3. Remove the lower panel securing bolts (2X2).



1. Side panel
2. Lower panel

4. Remove the fuel tank.
5. Disconnect the connecter and remove the emergency engine stop relay.



1. Emergency engine stop relay

6. Check the relay as shown in "Sidestand relay inspection."

SPECIFICATIONS

I. GENERAL SPECIFICATIONS

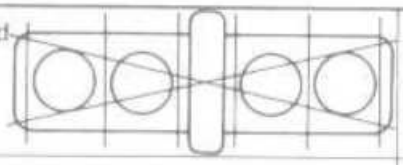
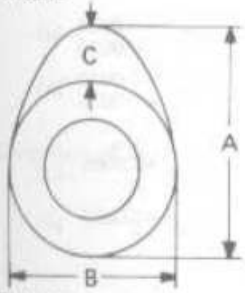
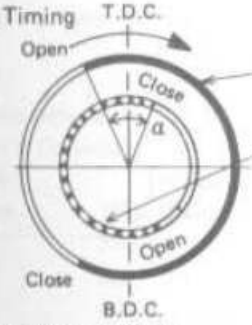
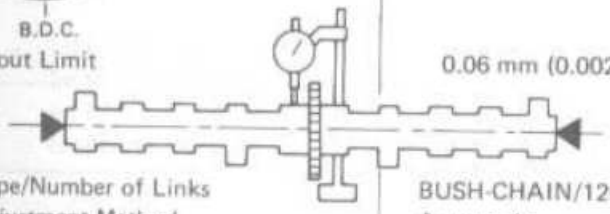
1.	Model Code Number	16G
2.	Federal V.I.N. Number	JYA16G00 *CA000101
3.	Frame Starting Number	16G-000101
4.	Engine Starting Number	16G-000101
5.	Dimensions:	
a.	Overall length	2,170 mm (85.4 in)
b.	Overall Width	730 mm (28.7 in)
c.	Overall Height	1,355 mm (53.3 in)
d.	Seat Height	780 mm (30.7 in)
e.	Wheelbase	1,440 mm (56.7 in)
f.	Minimum Ground Clearance	140 mm (5.5 in)
6.	Weight:	
a.	With Oil and Full Fuel Tank	249 kg (549 lb)
b.	Engine Dry Weight	———
7.	Minimum Turning Radius	2,600 mm (102.4 in)
8.	Engine:	
a.	Engine Type	D.O.H.C., air-cooled, gasoline
b.	Cylinder Arrangement	Forward-incline, parallel 4-cylinder
c.	Displacement	653 cc (39.8 cu.in)
d.	Bore x Stroke	63,0 x 52.4 mm (2.480 x 2.063 in)
e.	Compression Ratio	8.2 : 1
f.	Compression Pressure	785 ~ 834 kPa (8.0~8.5 kg/cm^2, 114 ~ 121 psi)
g.	Starting System	Electric
9.	Lubrication System	Pressure lubricated, Wet sump
10.	Engine Oil Type or Grade	Yamalube 4-cycle oil, SAE 20W40 type SE motor oil
11.	Engine Oil Capacity	
a.	Periodic Oil Change	2.5 L (2.20 Imp qt, 2.64 US qt)
b.	Oil Filter Replacement	2.9 L (2.55 Imp qt, 3.07 US qt)
c.	Total Amount	3.5 L (3.08 Imp qt, 3.70 US qt)
12.	Middle/Final Gear Oil	
a.	Grade or Type	SAE 80 API "GL-4" Hypoid gear oil
b.	Final Gear Case Oil Amount	0.2 L (0.18 Imp qt, 0.21 US qt)
13.	Air Filter	Dry type element

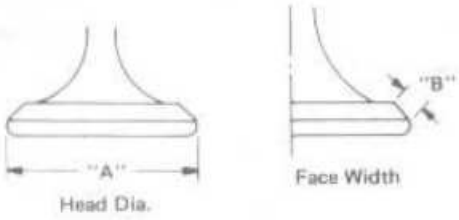
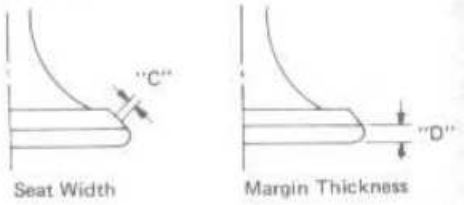
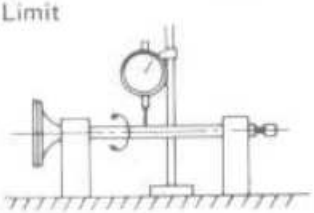
14.	Fuel	
a.	Type	Premium gasoline (Research octan of 95 or more)
b.	Tank Capacity	15.5 L (3.41 Imp gal, 4.10 US gal)
c.	Reserve Amount	2.2 L (0.484 Imp gal, 0.581 US gal)
15.	Carburetor	
a.	Type	BS30
b.	Manufacturer	MIKUNI
16.	Spark Plug	
a.	Type	BP8ES, W24EP-U
b.	Manufacturer	(NGK) (NIPPON DENSO)
c.	Gap	0.7 ~ 0.8 mm (0.023 ~ 0.032 in)
17.	Clutch Type	Wet, multiple disc
18.	Transmission:	
a.	Primary Reduction System	Gear
b.	Primary Reduction Ratio	97/58 (1.672)
c.	Secondary Reduction System	Shaft drive
d.	Secondary Reduction	
	Transmission output	
	Type/teeth/ratio	Spur gear, 49/36 (1.361)
	Middle gear case	
	Type/Teeth/ratio	Bevel gear, 19/18 (1.055)
	Final gear case	
	Type/Teeth/ratio	Bevel gear, 32/11 (2.909)
e.	Transmission Type	Constant mesh, 5-speed, drum shifter
f.	Operation	Left foot operation
g.	Gear Ratio 1st	35/16 (2.187)
	2nd	30/20 (1.500)
	3rd	30/26 (1.153)
	4th	28/30 (0.933)
	5th	26/32 (0.812)
19.	Chassis:	
a.	Frame Type	Tubular steel double cradle
b.	Caster Angle	27°45'
c.	Trail	115 mm (4.53 in)
20.	Tire	
a.	Tire Type	Tubeless
b.	Tire Size (F)	3.25V19-4PR
c.	Tire Size (R)	120/90 V18
d.	Manufacturer	BRIDGESTONE, DUNLOP
21.	Tire Pressure	(Cold pressure)
a.	Up to 90 kg (198 lb) load* (F)	177 kPa (1.8 kg/cm^2, 26 psi)
	(R)	196 kPa (2.0 kg/cm^2, 28 psi)
b.	90 kg (198 lb) ~166 kg (366 lb) load* (F)	226 kPa (2.3 kg/cm^2, 33 psi)
	(R)	245 kPa (2.5 kg/cm^2, 36 psi)

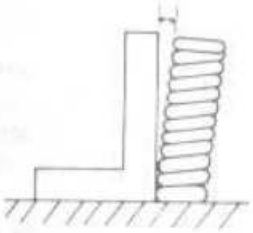
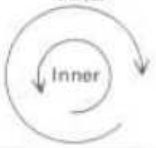
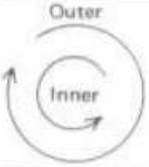
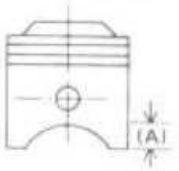
c.	High-speed Riging (F) (R)	196 kPa (2.0 kg/cm², 28 psi) 226 kPa (2.3 kg/cm², 33 psi)
	*Total weight of accessories, etc. excepting motorcycle.	
22.	Brake	
a.	Front Brake Type	Dual hydraulic disc
b.	Operation	Right hand
c.	Rear Brake Type	Drum brake
d.	Operation	Right foot
23.	Suspension	
a.	Front Suspension	Telescopic fork
b.	Rear Suspension	Swingarm
24.	Shock Absorber	
a.	Front Shock Absorber	Oil damper, air and coil spring
b.	Rear Shock Absorber	Oil damper, air and coil spring
25.	Wheel Travel	
a.	Front Wheel Travel	140 mm (5.6 in)
b.	Rear Wheel Travel	96 mm (3.8 in)
26.	Electrical	
a.	Ignition System	Battery ignition (Full transistor ignition)
b.	Generator System	A.C. generator
c.	Battery Type or Model	12N12A-4A
d.	Battery Capacity	12V 12Ah (10)
27.	Headlight Type	HALOGEN (Antivibratory bulb)
28.	Bulb Wattage x Pcs	
a.	Headlight	60W/55W 1 pcs.
b.	Turn light	27W x 4 pcs.
c.	Tail/Brake light	8W/27W x 2 pcs.
d.	Meter light	3.4W x 2 pcs.
e.	License light	3.8W x 2 pcs.
29.	Indicator light Wattage x Pcs.	
a.	" Neutral "	3.4W x 1 pcs.
b.	" High Beam "	3.4W x 1 pcs.
c.	" Warning "	3.4W x 1 pcs.
d.	" Turn "	3.4W x 2 pcs.

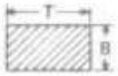
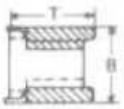
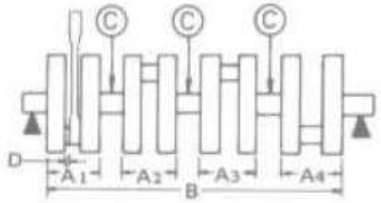
II. MAINTENANCE SPECIFICATIONS

A. Engine

1.	Cylinder Head	
a.	Volume	22.7 cc
b.	Warp Limit	< 0.03 mm (0.0012 in) > *Lines indicate straightedge measurement
2.	Cylinder	
a.	Material	Aluminum alloy with cast iron sleeve
b.	Bore Size	63.0 mm (2.480 in)
c.	Taper Limit	<0.05 mm (0.0020 in)>
d.	Out-of-round Limit	<0.01 mm (0.0004 in)>
3.	Camshaft	
a.	Drive Method	Chain drive Center
b.	Cam Cap Inside Diameter	$25^{+0.021}_{-0}$ mm ($0.98^{+0.008}_{-0}$ in)
c.	Camshaft Outside Diameter	$25^{-0.020}_{-0.033}$ mm ($0.98^{-0.0008}_{-0.0013}$ in)
d.	Shaft-to-cap Clearance	0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in)
e.	Cam Dimensions	
	Intake "A"	35.50 mm (1.398 in)
	 "B"	28.00 mm (1.102 in)
	"C"	7.50 mm (0.295 in)
	"A"	35.50 mm (1.398 in)
	Exhaust "B"	28.00 mm (1.102 in)
	"C"	7.50 mm (0.295 in)
f.	Valve Timing 	
	IN. Open	B.T.D.C. 28°
	Close	A.B.D.C. 48°
	EX. Open	B.B.D.C. 53°
	Close	A.T.D.C. 23°
	Over Lap	α = 51°
g.	Camshaft Runout Limit 	0.06 mm (0.0024 in)
h.	Cam Chain Type/Number of Links	BUSH-CHAIN/120
i.	Cam Chain Adjustment Method	Automatic

4.	Valve, Valve Seat, Valve Guide	
a.	Valve Clearance (Cold)	
	IN.	0.11 ~ 0.15 mm (0.0043 ~ 0.0059 in)
	EX.	0.16 ~ 0.20 mm (0.0063 ~0.0079 in)
b.	Valve Dimensions	
		
	"A" Head Dia. IN.	33 ± 0.1 mm (1.30 ± 0.0039 in)
	EX.	28 ± 0.1 mm (1.10 ± 0.0039 in)
	"B" Face Width IN.	2.3 mm (0.091 in)
	EX.	2.3 mm (0.091 in)
	"C" Seat Limit Width IN.	1 ± 0.1 mm (0.0394 ± 0.039 in)
	EX.	1 ± 0.1 mm (0.0394 ± 0.039 in)
	"D' Margin Thickness Limit IN.	0.7 mm (0.028 in)
	EX.	0.7 mm (0.028 in)
c.	Stem Outside Diameter	
	IN.	$7^{-0.010}_{-0.025}$ mm (0.2756 $^{-0.0004}_{-0.0010}$ in)
	EX.	$7^{-0.025}_{-0.040}$ mm (0.2756 $^{-0.0010}_{-0.0016}$ in)
d	Guide Inside Diameter	
	IN.	$7^{+0.012}_{0}$ mm (0.2756 $^{+0.0005}_{0}$ in)
	EX.	$7^{+0.012}_{0}$ mm (0.2756 $^{+0.0005}_{0}$ in)
e.	Stem-to-guide Clearance	
	IN.	0.010~ 0.037 mm (0.004 ~ 0.0015 in)
	EX.	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in)
f.	Stem Runout Limit	<0.03 mm (0.0012 in) >
		
g.	Valve Seat Width Standard <Limit >	1.0 mm (0.039 in) <2.0 mm (0.080 in)>
6.	Valve Spring	
a.	Free Length	
	Inner Spring IN.	35.9 mm (1.413 in)
	EX.	35.9 mm (1.413 in)
	Outer Spring IN.	39.5 mm (1.555 in)
	EX.	39.5 mm (1.555 in)

b.	Spring rate		
	Inner Spring	IN.	2.36 kg/mm (132 lb/in)
		EX.	2.36 kg/mm (132 lb/in)
	Outer Spring	IN.	4.58 kg/mm (256 lb/in)
		EX.	4.58 kg/mm (256 lb/in)
c.	Compression Length (Valve Closed)		
	Inner Spring	IN.	31.0 mm (1.220 in)
		EX.	31.0 mm (1.220 in)
	Outer Spring	IN.	34.0 mm (1.339 in)
		EX.	34.0 mm (1.339 in)
d.	Compression Force (Valve Closed)		
	Inner Spring	IN.	9.0 kg (20 lb)
		EX.	9.0 kg (20 lb)
	Outer Spring	IN.	19.1 kg (42.1 lb)
		EX.	19.1 kg (42.1 lb)
e.	Tilt Limit		
	Inner Spring	IN. & EX.	2.5°
	Outer Spring	IN. & EX.	2.5°
			
f.	Direction of Winding (Top View)		Intake: Outer / Inner  Exhaust: Outer / Inner 
7.	Piston		
a.	Piston Size/ Measuring Point (A)		63.0 mm (2.48 in)/ 7.5 mm (0.295 in) (From bottom line of piston skirt)
b.	Clearance between Piston & Cylinder <Limit>		0.03 ~ 0.05 mm (0.0012 ~ 0.0020 in) <0.1 mm (0.0049 in)>
c.	Oversize 1st		—
	2nd		63.50 mm (2.50 in)
	3rd		—
	4th		64.00 mm (2.52 in)
d.	Piston Pin Hole Off-Set		0.5 mm (0.02 in)/In-side

8.	Piston Ring		
a.	Sectional Sketch		
		Top Ring	$B = 1.2^{-0.01}_{-0.03}$ mm ($0.47^{-0.0004}_{-0.0012}$ in) T = 2.6 ± 0.1 mm (0.102± 0.0014 in)
		2nd Ring	$B = 1.5^{-0.01}_{-0.03}$ mm ($0.059^{-0.0004}_{-0.0012}$ in) T = 2.8 ± 0.1 mm (0.110± 0.0004 in)
		Oil Ring	B = 2.5 mm (0.098 in) T = 2.8 ± 0.15 mm (0.110 ± 0.0059 in)
b.	End Gap (Installed)		
	Limit	Top Ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in) <1.0 mm (0.039 in)>
		2nd Ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in) <1.0 mm (0.039 in)>
		Oil Ring	0.3 ~ 0.9 mm (0.012 ~ 0.035 in) <1.5 mm (0.059 in)>
c.	Side Clearance		
	Limit	Top Ring	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in) <0.15 mm (0.0059 in)>
		2nd Ring	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in) <0.15 mm (0.0059 in)>
d.	Plating or Coating		
		Top Ring	Chrome plated, Ferox coating
		2nd Ring	—
		Oil Ring	Chrome plated, Ferox coating
9.	Connecting Rod		
a.	Oil Clearance		0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)
b.	Color Code		1. Blue, 2. Black, 3. Brown, 4. Green
10.	Crankshaft		
			
a.	Crank Width "A"		A_1 = 56.15 mm (2.21 in) A_2 = 59.2 mm (2.33 in) A_3 = 60.45 mm (2.38 in) A_4 = 56.45 mm (2.22 in)
b.	Assembly Width "B"		341.4 ± 0.6 mm (13.44± 0.024 in)
c.	Deflection Limit "C"		<0.04 mm (0.0016 in)>
d.	Big End Side Clearance "D"		0.16 ~ 0.27 mm (0.006 ~ 0.011 in)
e.	Journal Oil Clearance		0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in)
f.	Color Code – Corresponding Size	Blue	$1.5^{+0.006}_{+0.002}$ mm ($0.0591^{+0.00024}_{+0.00008}$ in)
		Black	$1.5^{+0.002}_{-0.002}$ mm ($0.0591^{+0.00008}_{-0.00008}$ in)
		Brown	$1.5^{-0.002}_{-0.006}$ mm ($0.0591^{-0.00008}_{-0.00024}$ in)
		Green	$1.5^{-0.006}_{-0.010}$ mm ($0.0591^{-0.00024}_{-0.00039}$ in)
		Yellow	$1.5^{-0.010}_{-0.014}$ mm ($0.0591^{-0.00039}_{-0.00055}$ in)

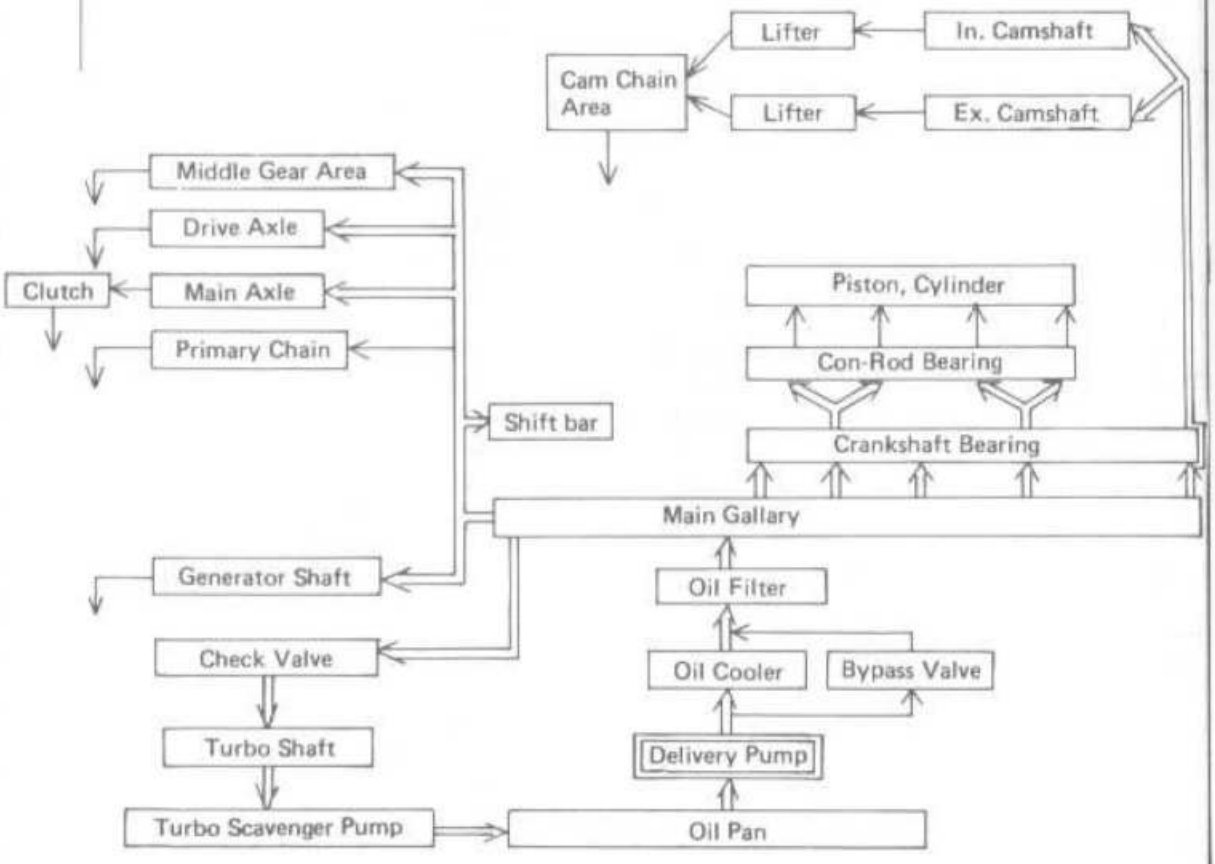
11.	Clutch		
a.	Friction Plate Thickness/Quantity		3.0 ± 0.1 mm (0.12 ± 0.004 in)/8 pcs.
b.	Wear Limit		<2.8 mm (0.11 in)>
c.	Clutch Plate Thickness/Quantity		1.6 mm (0.06 in)/7 pcs.
d.	Warp Limit		<0.05 mm (0.002 in)>
e.	Clutch Spring Free Length		42.8 mm (1.69 in)
f.	Minimum Length		41.8 mm (1.65 in)
g.	Primary Reduction Gear Backlash Tolerance		118
h.	Primary Drive Gear Backlash Number		87 ~ 91
i.	Primary Driven Gear Backlash Number		27 ~ 32
j.	Clutch Release Method		Rack & Pinion pull, Outer pull
12.	Transmission		
a.	Main Axle Run-out Limit		<0.08 mm (0.0031 in)>
13.	Shifter		
a.	Shifter Type		Cam drum
14.	Carburetor		
a.	Type/Manufacturer/Quantity		BS30/MIKUNI/4 pcs.
b.	I.D. Mark		16G 00
c.	Throttle Valve Size		ϕ 30 mm (ϕ1.18 in)
d.	Venturi Size		ϕ 26.4 mm (ϕ 1.04 in)
e.	Main Jet	(M.J.)	#127.5 (For #1, #4 cyl.), #132.5 (For #2, #3 cyl.)
f.	Main Air Jet	(M.A.J.)	#70
g.	Jet Needle	(J.N.)	4DPS39
h.	Needle Jet	(N.J.)	O-6 (#318)
i.	Throttle Valve	(Th.V.)	14°
j.	Pilot Jet	(P.J.)	#35
k.	Pilot Air Jet	(P.A.J.)	#170
l.	Pilot Screw (turns out)	(P.S.)	Pre-set
m.	Pilot Outlet Size	(P.O.)	ϕ0.8
n.	Starter Jet	(G.S.)	#30
o.	Valve Seat Size	(V.S.)	ϕ1.2
p.	Fuel Level	(F.L.)	2 ± 1 mm (0.08 ± 0.04 in)
q.	Float Height	(F.H.)	17.5 ± 0.5 mm (0.7 ± 0.02 in)
r.	Engine Idling Speed		1,050 ± 50 r/min
s.	Vacuum Pressure at Idling Speed		Above 185 mmHg (7.28 inHg)
15.	Turbocharger		
a.	Model/Manufacturer		TC03-06A/MITSUBISHI
b.	Turbine Diameter		ϕ40 mm (ϕ 1.58 in)
c.	Compressor Diameter		ϕ 40 mm (ϕ 1.58 in)
d.	Maximum RPM.		210,000 r/min
e.	Wastegate Valve		Yes

16.	Lubrication System:	
a.	Oil Filter Type	Paper filter
b.	Oil Pump Type	Trochoid pump
c.	Rotor Thickness	
	Delivery pump	$18\ ^{0}_{-0.02}$ mm ($0.709\ ^{0}_{-0.0008}$ in)
	Turbo scavenger pump	$5\ ^{0}_{-0.02}$ mm ($0.197\ ^{0}_{-0.0008}$ in)
d.	Tip Clearance	0.03 ~ 0.09 mm (0.001~ 0.004 in)
e.	Side Clearance	0.03 ~ 0.08 mm (0.01 ~ 0.003 in)
f.	Bypath Valve Setting Pressure	1.0± 0.2 kg/cm (14.2 ± 2.8 lb/in)
g.	Relief Valve Operating Pressure	5.0 ± 0.6 kg/cm (7.2 ± 8.5 lb/in)
h.	Lubrication Diagram	

⇨ Pressure oil feed

→ Splash oil feed

⇨ Oil suction

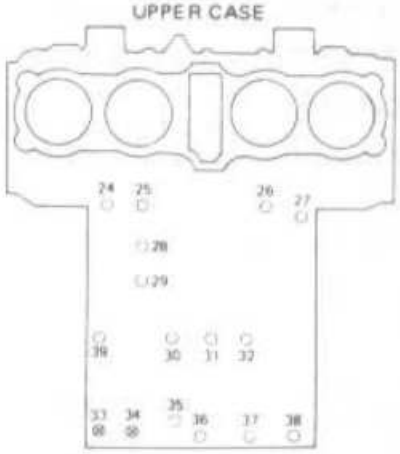


17.	Middle Gear Backlash	0.1 ~ 0.2 mm (0.0039 ~ 0.0079 in)
18.	Final Gear Backlash	0.1 ~ 0.2 mm (0.0039 ~ 0.0079 in)
19.	Crankcase Tightening Sequence	

LOWER CASE



UPPER CASE



Tightening torque:

⊗ ..... 8 mm bolt: 24 Nm (2.4 m·kg, 17.5 ft·lb)

○ ..... 6 mm bolt: 12 Nm (1.2 m·kg, 8.7 ft·lb)

20. Tightening Torque							
Part to be tightened	Part name	Thread size	Q'ty	Tightening torque			Remarks
				Nm	m·kg	ft·lb	
ENGINE							
Cylinder head	Nut	M10 P1.25	12	36	3.6	25	Apply oil.
Cylinder head cover	Bolt	M6 P1.0	20	1.0	1.0	7.2	
Spark plug	–		4	20	2.0	14	
Cylinder	Nut	M8 P1.25	2	20	2.0	14	Cam chain case Front & Rear
Cylinder holding bolt	Stud bolt Bolt	M10 P1.25 M10 P1.25	7 5	20 20	2.0 2.0	14 14	Apply oil
Cam shaft cap	Bolt	M6 P1.0	20	10	1.0	7.2	Tighten in 3-stages.
Cam sprocket	Bolt	M7 P1.0	4	20	2.0	14	
Cam chain tensioner end plug		M11 P1.0	1	15	1.5	11	
Cam chain tensioner securing bolt	Bolt	M6 P1.0	2	10	1.0	7.2	
Connecting rod	Nut	M7 P0.75	8	25	2.5	18	
Generator (rotor)	Bolt	M10 P1.25	1	55	5.5	40	
Drain plug	Bolt	M14 P1.5 M8 P1.25	1 1	43 24	4.3 2.4	31 17	Crankcase drain
Oil filter	Bolt	M20 P1.5	1	15	1.5	11	
Pump cover	Screw	M6 P1.0		7	0.7	5.1	
Strainer cover	Bolt	M6 P1.0	13	10	1.0	7.2	
Crankcase	Flange Bolt	M8 P1.25 M6 P1.0	12 27	24 12	2.4 1.2	17 8.7	
Clutch boss	Nut	M20 P1.0	1	72	7.2	52	
Clutch spring screw	Bolt	M6 P1.0	5	10	1.0	7.2	
Change Pedal	Bolt	M6 P1.0	1	10	1.0	7.2	
Neutral Switch	–	M10 P1.25	1	20	2.0	14	
Exhaust Pipe	Nut	M6 P1.0	8	10	1.0	7.2	
Oil cooler	Joint Nut	M22 P1.5	2	45	4.5	32	
SHAFT DRIVE:							
– Middle Gear –							
Drive Shaft	Nut	M34 P1.5	1	110	11	80	Stake.
Mount cover	Screw	M8 P1.25	4	25	2.5	18	Stake.
Driven shaft	Nut	M14 P1.5	1	120	12	85	Use LOCTITE: Stake.
Bearing cap	Flange Bolt	M8 P1.25	4	25	2.5	18	
– Final Gear –							
Drive Shaft	Nut	M14 P1.5	1	110	11	80	
Bearing housing	Flange Bolt	M10 P1.25	2	23	2.3	17	
Bearing housing	Nut	M8 P1.25	6	23	2.3	17	
Oil mount screw	Plug	M14 P1.5	1	23	2.3	17	
Oil drain screw	Plug	M14 P1.5	1	23	2.3	17	
Bearing retainer		M65 P1.5	1	110	11	80	Left hand screw

B. Chassis

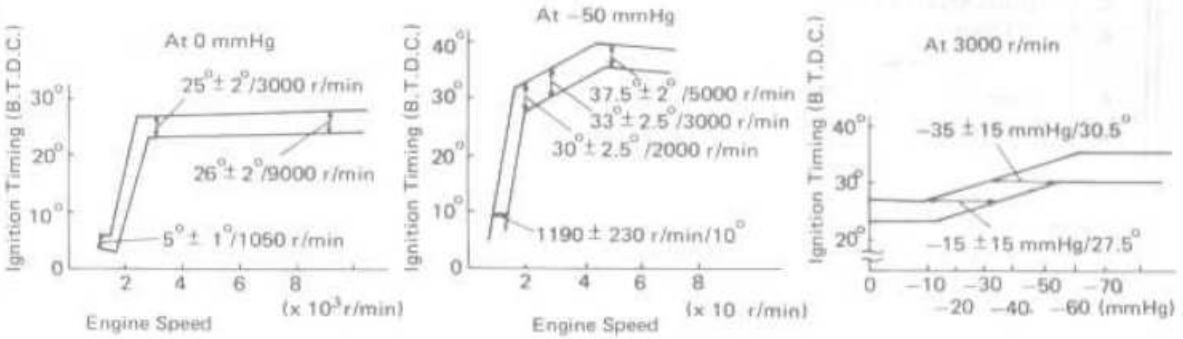
1.	Steering System	
a.	Steering Bearing Type	Ball Bearing
b.	No./Size of Steel Balls	
	Upper	19 pcs/1/4 in
	Lower	19 pcs/1/4 in
c.	Lock-to-lock Angle	38.5°
2.	Front Suspension	
a.	Front Fork Travel	140 mm (5.51 in)
b.	Fork Spring Free Length	449 mm (17.7 in)
c.	Spring Rate/Stroke K_1	4.13 N/mm (0.421 kg/mm, 23.6 lb/in)/ 0 ~100 mm (0 ~3.94 in)
	K_2	7.36 N/mm (0.75 kg/mm, 42.0 lb/in)/ 100 ~ 140 mm (3.94~ 5.51 in)
d.	Optional Spring	No.
e.	Oil Capacity	238± 4 cc (8.04 ± 0.14 US oz)
	or	
	Oil Level	180 mm (7.09 in) (From top of inner tube fully compressed without spring.)
f.	Oil Grade	Yamaha fork oil (10) wt or equivalent SAE 10W30 motor oil
g.	Enclosed Air Pressure	39 kPa (0.4 kg/cm², 5.7 psi)
3.	Rear Suspension	
a.	Shock Absorber Travel	80 mm (3.15 in)
b.	Spring Free Length	251.5 mm (9.90 in)
c.	Spring Rate/Stroke	13.7 N/mm (1.4 kg/mm, 78.4 lb/in)/ 0 ~80 mm (0 ~ 3.15 in)
d.	Optional Spring	No.
4.	Rear Arm	
a.	Swing Arm Free Play Limit	
	– End	0 mm (0 in)
	– Side	0 mm (0 in)
5.	Wheel	
a.	Front Wheel Type	Cast Wheel
	Rear Wheel Type	Cast Wheel
b.	Front Rim Size/Material	MT1.85 x 19/Steel, Aluminum
	Rear Rim Size/Material	MT2.15 x 18/Steel, Aluminum
c.	Rim Runout Limit – Vertical	<0.5 mm (0.02 in)>
	– Lateral	<1.0 mm (0.04 in)>
6-1.	Disc Brake	
a.	Type Front	Dual disc
b.	Outside Dia. x Thickness	
	Front	267 x 5 mm (10.5 x 0.2 in)

c.	Pad Thickness <Limit> 	6.8 mm (0.27 in) <0.8 mm (0.032 in)>
d.	Master Cylinder Inside Dia. Front	15.87 mm (0.62 in)
e.	Caliper Cylinder Inside Dia. Front	38.18 mm (1.50 in)
f.	Brake Fluid Type	DOT # 3
6-2.	Drum Brake	
a.	Type Rear	Leading trailing
b.	Drum Inside Dia. Rear	200 mm (7.87 in)
c.	Lining Thickness <Limit >	4 mm (0.16 in) <2 mm (0.08 in)>
d.	Shoe Spring Free Length Rear	68 mm (2.68 in)
7.	Brake Lever & Brake Pedal	
a.	Brake Lever Free Play	5.0~8.0 mm (0.2~0.3 in)
b.	Brake Pedal Free Play	20~30 mm (0.8~1.2 in)
c.	Brake Pedal Position	40 mm (1.6 in) (Vertical height below footrest top.)
8.	Clutch Lever Free Play	2~3 mm (0.08~0.12 in)

9. Tightening Torque							
Part to be tightened	Part name	Thread size	Q'ty	Tightening torque			Remarks
				Nm	m-kg	ft-lb	
CHASSIS:							
Engine Front, upper Mounting Front, under Bolt Rear	Nut Bolt Nut	M10 P1.25 M10 P1.25 M12 P1.25	1 2 1	42 42 70	4.2 4.2 7.0	30 30 50	
Engine Mounting Stay Front	Bolt	M8 P1.25	4	20	2.0	14	
Handle crown & Steering shaft	Bolt Bolt	M14 P1.25 M8 P1.25	1 1	54 20	5.4 2.0	39 14	
Handle crown & Inner tube	Nut cap	M8 P1.25	1	20	2.0	14	
Handle crown & Handle holder	Bolt	M8 P1.25	2	20	2.0	14	
Front fork							
Under bracket & Inner tube	Bolt	M8 P1.25	4	20	2.0	14	
Front wheel shaft	Nut castle	M14 P1.5	1	107	10.7	77	
Front wheel Axle pinch bolt	Nut salf	M8 P1.25	2	20	2.0	14	
Pivot shaft	Bolt	M22 P1.5	1	5.5	0.55	4.0	Taper roller bearing
Rear wheel shaft	Nut castl	M14 P1.5	1	107	10.7	77	
Rear shock absorber (Upper)	Nut cap	M10 P1.25	2	30	3.0	22	
Rear shock absorber (Lower)	L Nut cap R Bolt	M10 P1.25	2	30	3.0	22	
Footrest	Nut	M10 P1.25	2	42	4.2	30	
Tension bar & Brake plate	Bolt	M8 P1.25	1	20	2.0	14	
Tension bar & Rear arm	Bolt	M8 P1.25	1	20	2.0	14	
Camshaft lever & Camshaft	Bolt	M6 P1.0	1	9	0.9	6.5	
Disc sbrake section							
Brake disc & Hub (Front)	Bolt	M8 P1.25	12	20	2.0	14	Lock washer
Master cylinder & Brake hose (Front)	Bolt union	M10 P1.25	1	26	2.6	19	
Brake hose & Joint	Bolt union	M10 P1.25	1	26	2.6	19	
Caliper & Brake hose	Bolt union	M10 P1.25	1	26	2.6	19	
Caliper & Front fork (Front)		M8 P1.25	1	26	2.6	19	
Caliper bleed screw (Front)		M8 P1.25	1	6	0.6	4.3	
Front fender	Bolt	M8 P1.25	4	10	1.0	7.2	
Master cylinder cap	Screw	M5 P0.8	2	1.8	0.18	1.3	
Pivot shaft	Bolt	M22 P1.5	1	100	10.0	72	Lock washer
Final gear & Rear arm	Nut	M10 P1.25	4	42	4.2	30	
Cross Joint	Hexagon bolt with washer	M8 P1.25	4	44	4.4	32	
Muffler bracket & Frame	Bolt	M10 P1.25	3	43	4.3	31	
Rear fender	Bolt	M10 P1.25	2	32	3.2	23	
Muffler bracket & Muffler	Bolt	M10 P1.25	2	25	2.5	18	
Master cylinder & Master cylinder bracket	Bolt	M6 P1.0	2	9	0.9	6.5	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque			Remarks
				Nm	m-kg	ft-lb	
Valve seat & Crankcase	—	PT 1/8	1	26	2.6	19	Apply Loctite
Relief valve & Valve seat	Union bolt	M16 P1.5	1	20	2.0	14	
Union bolt & Turbocharger	Union bolt	M10 P1.25	1	21	2.1	15	
Oil pipe & Turbocharger	Bolt	M6 P1.0	2	12	1.2	8.7	
Oil pipe & Crankcase	Bolt	M6 P1.0	2	12	1.2	8.7	
Oil pipe clamp crankcase	Screw	M6 P1.0	1	7	0.7	5.1	
Regulator stay 1 & Frame	Hex. bolt	M6 P1.0	2	12	1.2	8.7	
Regulator & Regulator stay	Hex. nut	M12 P1.25	1	18	1.8	13	
Check valve & Regulator stay	Screw	M5 P0.8	1	4	0.4	2.9	
Carburetor & Regulator stay	Screw	M6 P1.0	2	7	0.7	5.1	
Clamp:							
Air filter case & Surge tank	Screw	M4 P0.7	2	2	0.2	1.4	
Turbo duct 2 & Surge tank	Screw	M4 P0.7	2	2	0.2	1.4	
Carburetor & Surge tank	Screw	M4 P0.7	8	2	0.2	1.4	
Drain valve & Surge tank	Screw	M5 P0.8	2	4	0.4	2.9	
Reed valve cover & Surge tank	Bolt	M6 P1.0	5	12	1.2	8.7	
Air filter stay & Frame	Bolt	M6 P1.0	1	7	0.7	5.1	
Air filter case & Stay	Screw	M6 P1.0	1	5	0.5	3.6	
Air filter case & Stay	Screw	Tapping	2	4	0.4	2.9	
Air cleaner stay & Frame	Bolt	M6 P1.0	2	12	1.2	8.7	
Clamp:							
Turbo duct 1 & Turbocharger	Screw	M4 P0.7	1	2	0.2	1.4	
Turbo duct 1 & Air cleaner	Screw	M4 P0.7	1	2	0.2	1.4	
Turbo duct 2 & Turbocharger	Screw	M4 P0.7	2	2	0.2	1.4	
Carb. joint & Carburetor	Screw	M4 P0.7	4	2	0.2	1.4	
Fuel pump & Stay	Screw	M5 P0.8	1	4	0.4	2.9	
Muffler & Foot rest bracket	Flange bolt	M10 P1.25	3	25	2.5	18	
Frame & Foot rest bracket	Bolt	M8 P1.25	1	20	2.0	14	
Frame & Exhaust chamber	Flange bolt	M10 P1.25	1	25	2.5	18	
Turbocharger & Exhaust chamber	Nut	M8 P1.25	2	20	2.0	14	
Turbocharger & Muffler	Bolt	M8 P1.25	1	20	2.0	14	
Turbocharger & Muffler	Nut	M8 P1.25	2	20	2.0	14	
Sub-muffler & Protecter	Bolt	M6 P1.0	3	12	1.2	8.7	
Silencer cap & Muffler	Bolt	M6 P1.0	4	12	1.2	8.7	

C. Electrical

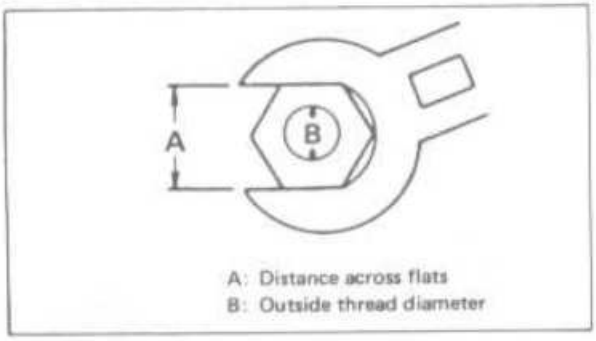
1.	Voltage	12V
2.	Ignition System	
a.	Ignition Timing (B.T.D.C.) Advanced Timing (B.T.D.C.)	5°/1,050 r/min 25°/2,500 r/min (Boost pressure 0 mm or more)
		
b.	Advancer Type	Electrical and vacuum controlled
3.	T.C.I.	
a.	Pick up Coil Resistance (Color)	120Ω ± 20% at 20°C (68°F) (O − B, Gy − B)
b.	T.C.I. Unit - Model/Manufacturer	TID14-13/HITACHI
4.		
a.	Ignition Coil - Model/Manufacturer	CM-12-09/HITACHI
b.	Minimum Spark Gap	6 mm (0.24 in) or more at 500 r/min (19 KV/100 r/min at 6V, 16KV/9,500 r/min at 14V)
c.	Primary Winding Resistance	2.5Ω ± 10% at 20°C (68°F)
d.	Secondary Winding Resistance	11KΩ ± 20% at 20°C (68°F)
5.	Charging System	
a.	Type	A.C. Generator
b.	Model/Manufacturer	LD119-08/HITACHI
c.	Output	14V 19A at 5,000 r/min
d.	Field (Inner) Coil Resistance (Color)	4.0Ω ± 10% at 20°C (68°F) (G − Br)
e.	Armature (Outer) Coil Resistance (Color)	0.46Ω ± 10% at 20°C (68°F) (W − W)
f.	Brush-Overall Length	17 mm (0.67 in)
g	− Wear Limit	10 mm (0.39 in)
h.	− Spring Pressure	360 g (12.7 oz)
6.	Voltage Regulator	
a.	Type	I.C. type
b.	Model/Manufacturer	S8534/TOSHIBA
c.	No Load Regulated Voltage	14.5V
7.	Rectifier	
a.	Model/Manufacturer	S8534/TOSHIBA
b.	Capacity	15A
c.	Withstand Voltage	300V

8.	Battery	
a.	Capacity	12V 14AH
b.	Specific Gravity	1.280
9.	Electric Starter System	Constant mesh type
a.	Starter Motor – Model/Manufacturer	ADB4D2/NIPPONDENSO
b.	– Output	0.6 kw
c.	Armature Coil Resistance	0.014Ω ± 6% at 20°C (68°F)
d.	Brush-Overall Length	12 mm (0.47 in)
e.	Limit	<8.5 mm (0.33 in)>
	Spring Pressure	800 ± 150 g (28.22 ± 5.29 oz)
f.	Commutator Dia.	28 mm (1.1 in)
g.	Wear Limit	<27 mm (1.06 in)>
	Mica Undercut	0.6 ± 0.2 mm (0.024 ± 0.008 in)
h.	Starter Switch Manufacturer	HONDA LOCK
i.	Amperage Rating	150A
10.	Horn	
a.	Type	Eddy type
	Quantity	2 pcs.
b.	Model/Manufacturer	SF-12/Nikko
c.	Maximum Amperage	2.5A
11.	Flasher Relay	
a.	Type	Condenser type
b.	Model/Manufacturer	FU257CD/NIPPONDENSO
c.	Self Cancelling Device	Yes
d.	Flasher Frequency	85 ± 10 cycle/min
e.	Wattage	27W x 2 + 3.4W
12.	Self Cancelling Unit	
a.	Model/Manufacturer	1A0/MATSUSHITA
13.	Oil Level Switch	
a.	Manufacturer	NIPPONDENSO
14.	Fuel Gauge	
a.	Manufacturer	NIPPON SEIKI
b.	Sender Unit Resistance – Full	24Ω ± 10 %
	– Empty	315Ω ± 15 %
15.	Starting Circuit Cut Off Relay	
a.	Model/Manufacturer	4H7-01/OMRON
b.	Coil Winding Resistance	100Ω ± 10% at 20°C (68°F)
c.	Color Code	No. color
16.	Emergency Engine Stop Relay	
a.	Model/Manufacturer	4U8-00/OMRON
b.	Coil Winding Resistance	100Ω ± 10% at 20°C (68°F)
c.	Color Code	Blue
17.	Sidestand Relay	
a.	Model/Manufacturer	4U8-00/OMRON
b.	Coil Winding Resistance	100Ω ± 10% at 20°C (68°F)
c.	Color Code	Blue

18.	Fuel Pump Relay	
a.	Model/Manufacturer	5A8-00/OMRON
b.	Coil Winding Resistance	100Ω ± 10% at 20°C (68°F)
c.	Color Code	Red
19.	Fuel Pump	
a.	Manufacturer	NIPPONDENSO
b.	Consumption Amperage	2A or less
c.	Output Pressure	60 L (13.2 Imp gal, 15.9 US gal)
20.	Circuit Breaker	
a.	Type	Fuse
b.	Amperage for Individual Circuit	
	Main	20A/1 pc.
	Headlight	10A/1 pc.
	Signal	10A/1 pc.
	Ignition	10A/1 pc.
	Tail (In Headlight body)	5A/1 pc.

General Torque Specifications

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a criss-cross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads Components should be at room temperature.



A: Distance across flats
B: Outside thread diameter

A (Nut)	B (Bolt)	General torque specifications		
		Nm	m-kg	ft-lb
10 mm	6 mm	6	0.6	4.5
12 mm	8 mm	15	1.5	11
14 mm	10 mm	30	3.0	22
17 mm	12 mm	55	5.5	40
19 mm	14 mm	85	8.5	51
22 mm	16 mm	130	13.0	94

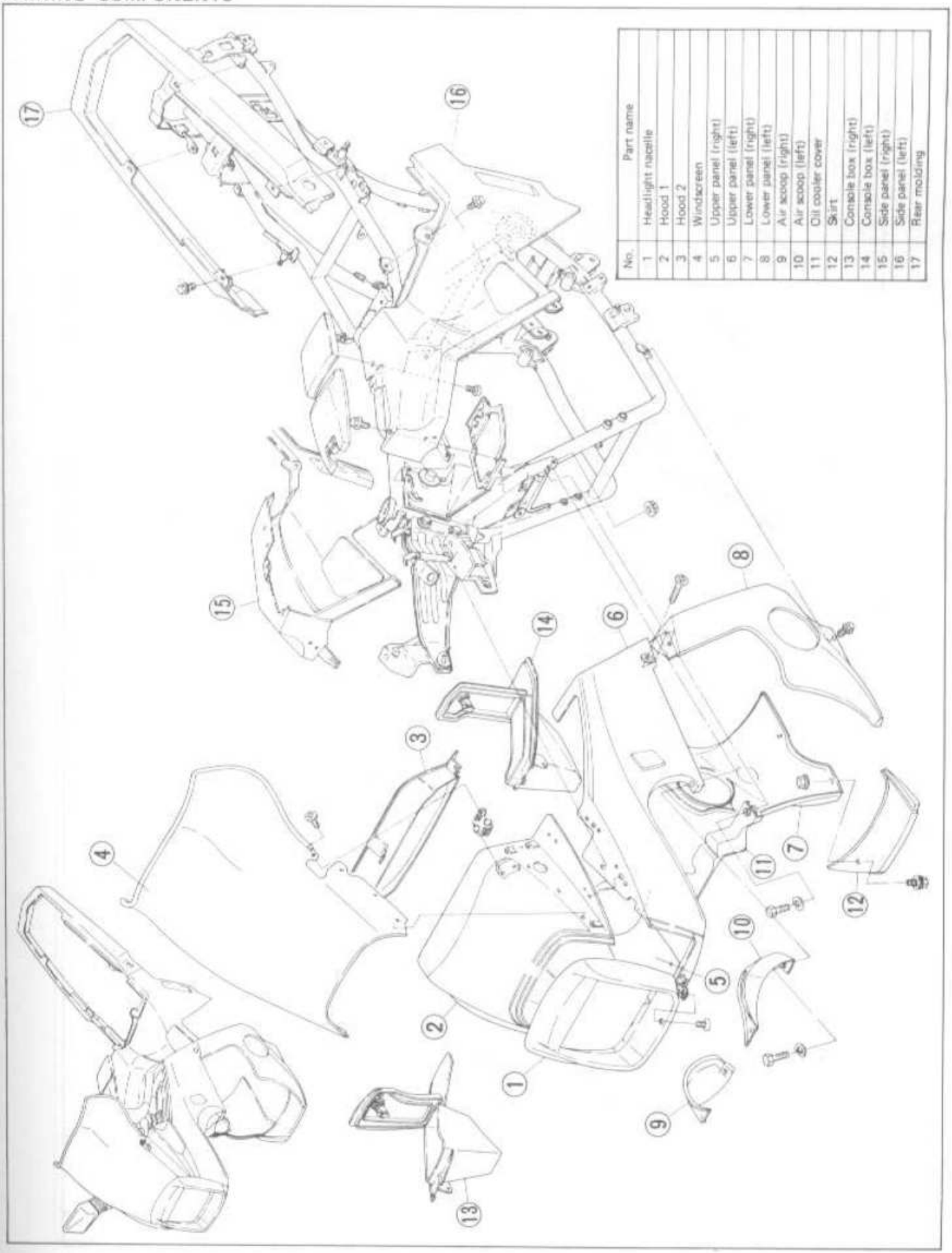
CONVERSION TABLES

METRIC TO INCH SYSTEM			
	KNOWN	MULTIPLIER	RESULT
TORQUE	m-kg	7.233	ft-lb
	m-kg	86.80	in-lb
	cm-kg	0.0723	ft-lb
	cm-kg	0.8680	in-lb
WT.	kg	2.205	lb
	g	0.03527	oz
FLOW/DISTANCE	km/lit	2.352	mpg
	km/hr	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.03937	in
VOL./ CAPACITY	cc (cm^3)	0.03382	oz (US liq)
	cc (cm^3)	0.06102	cu.in
	lit (liter)	2.1134	pt (US liq)
	lit (liter)	1.057	qt (US liq)
	lit (liter)	0.2642	gal (US liq)
MISC.	kg/mm	56.007	lb/in
	kg/cm^2	14.2234	psi (lb/in^2)
	Centigrade (°C)	9/5(°C) + 32	Fahrenheit (°F)

INCH TO METRIC SYSTEM			
	KNOWN	MULTIPLIER	RESULT
TORQUE	ft-lb	0.13826	m-kg
	in-lb	0.01152	m-kg
	ft-lb	13.831	cm-kg
	in-lb	1.1521	cm-kg
WT.	lb	0.4535	kg
	oz	28.352	g
FLOW/DISTANCE	mpg	0.4252	km/lit
	mph	1.609	km/hr
	mi	1.609	km
	ft	0.3048	m
	yd	0.9141	m
	in	2.54	cm
	in	25.4	mm
VOL./ CAPACITY	oz (US liq)	29.57	cc (cm^3)
	cu.in	16.387	cc (cm^3)
	pt (US liq)	0.4732	lit (liter)
	qt (US liq)	0.9461	lit (liter)
	gal (US liq)	3.785	lit (liter)
MISC.	lb/in	0.017855	kg/mm
	psi (lb/in^2)	0.07031	kg/cm^2
	Fahrenheit (°C)	5/9(°F−32)	Centigrade (°F)

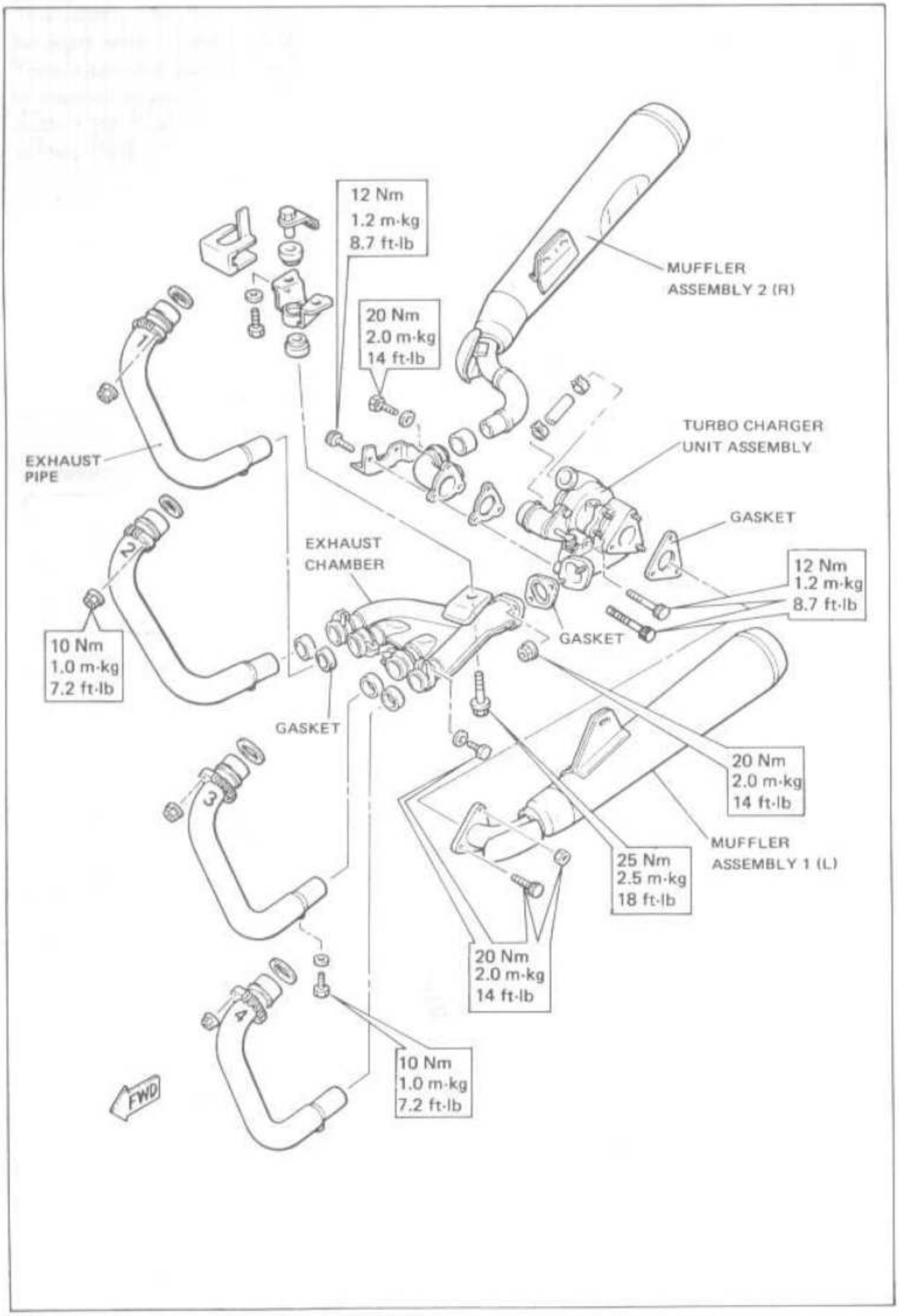
NEW COMPONENT ILLUSTRATIONS

FAIRING COMPONENTS

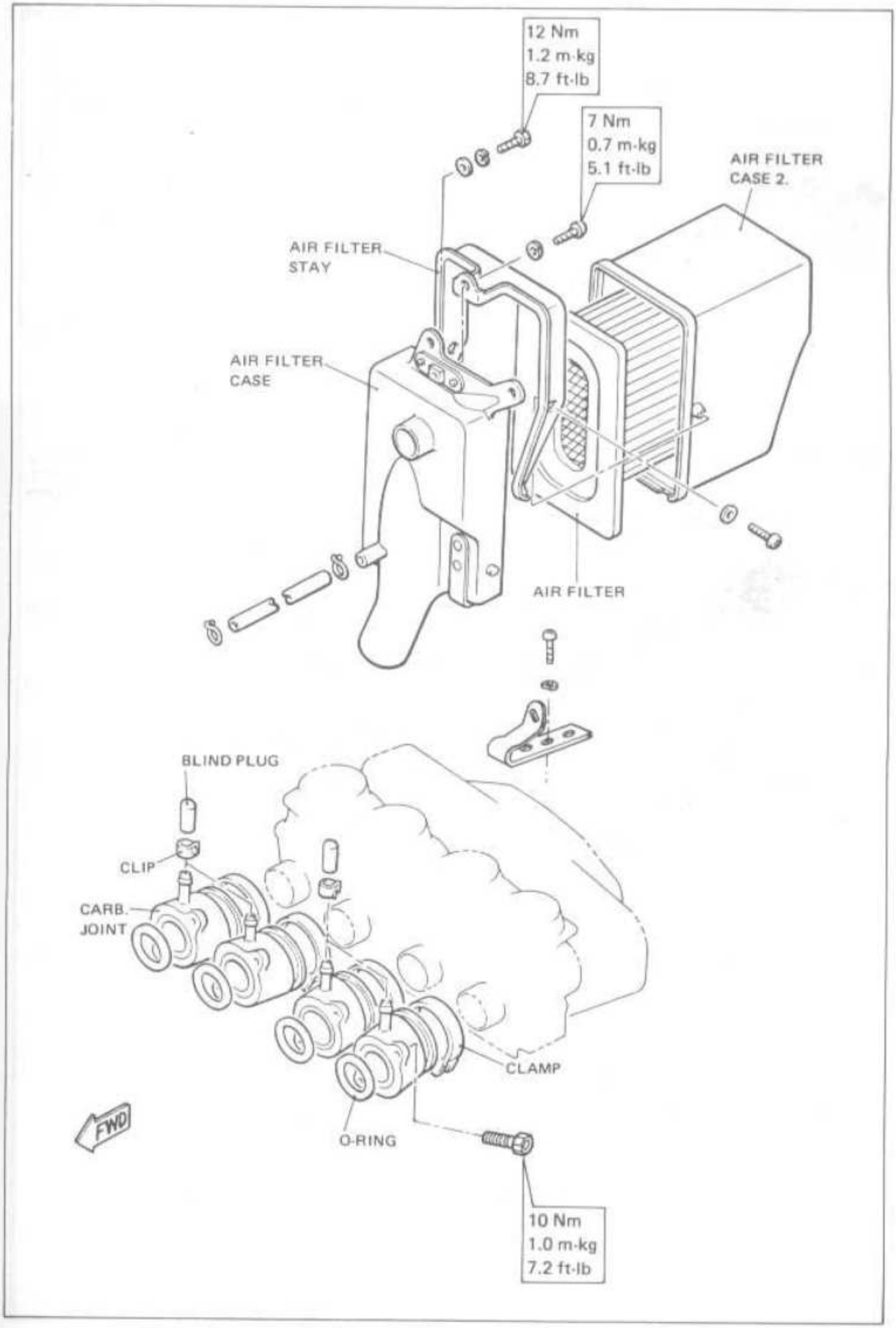


No.	Part name
1	Headlight nacelle
2	Hood 1
3	Hood 2
4	Windscreen
5	Upper panel (right)
6	Upper panel (left)
7	Lower panel (right)
8	Lower panel (left)
9	Air scoop (right)
10	Air scoop (left)
11	Oil cooler cover
12	Skirt
13	Console box (right)
14	Console box (left)
15	Side panel (right)
16	Side panel (left)
17	Rear molding

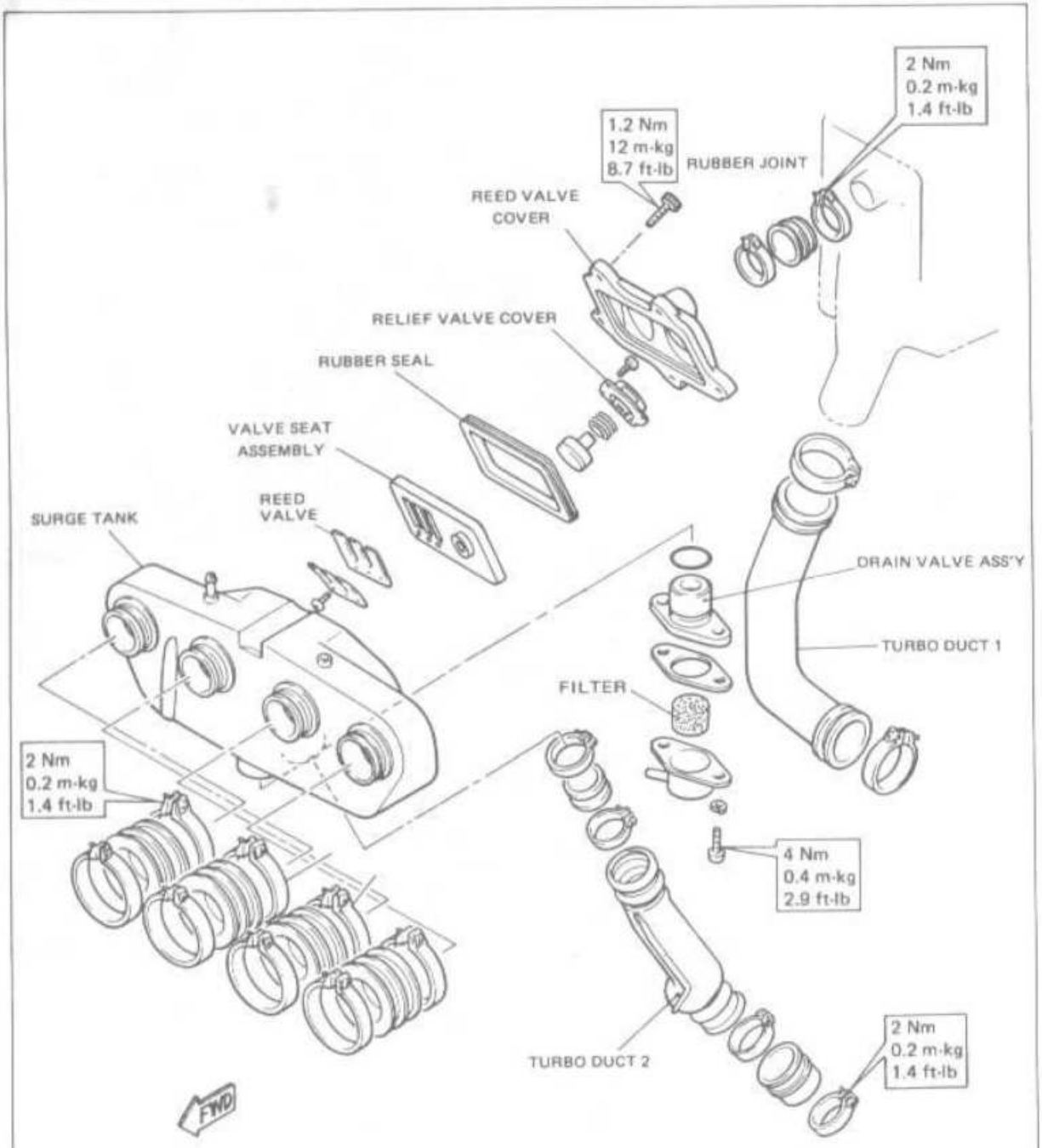
EXHAUST


12 Nm
1.2 m·kg
8.7 ft·lb
MUFFLER
ASSEMBLY 2 (R)
20 Nm
2.0 m·kg
14 ft·lb
TURBO CHARGER
UNIT ASSEMBLY
EXHAUST
PIPE
GASKET
EXHAUST
CHAMBER
12 Nm
1.2 m·kg
8.7 ft·lb
GASKET
10 Nm
1.0 m·kg
7.2 ft·lb
GASKET
20 Nm
2.0 m·kg
14 ft·lb
MUFFLER
ASSEMBLY 1 (L)
25 Nm
2.5 m·kg
18 ft·lb
20 Nm
2.0 m·kg
14 ft·lb
10 Nm
1.0 m·kg
7.2 ft·lb
FWD

INTAKE

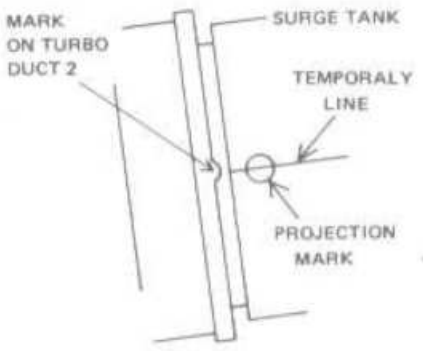

12 Nm
1.2 m·kg
8.7 ft·lb
7 Nm
0.7 m·kg
5.1 ft·lb
AIR FILTER
CASE 2.
AIR FILTER
STAY
AIR FILTER
CASE
AIR FILTER
BLIND PLUG
CLIP
CARB.
JOINT
CLAMP
FWD
O-RING
10 Nm
1.0 m·kg
7.2 ft·lb

SURGE TANK

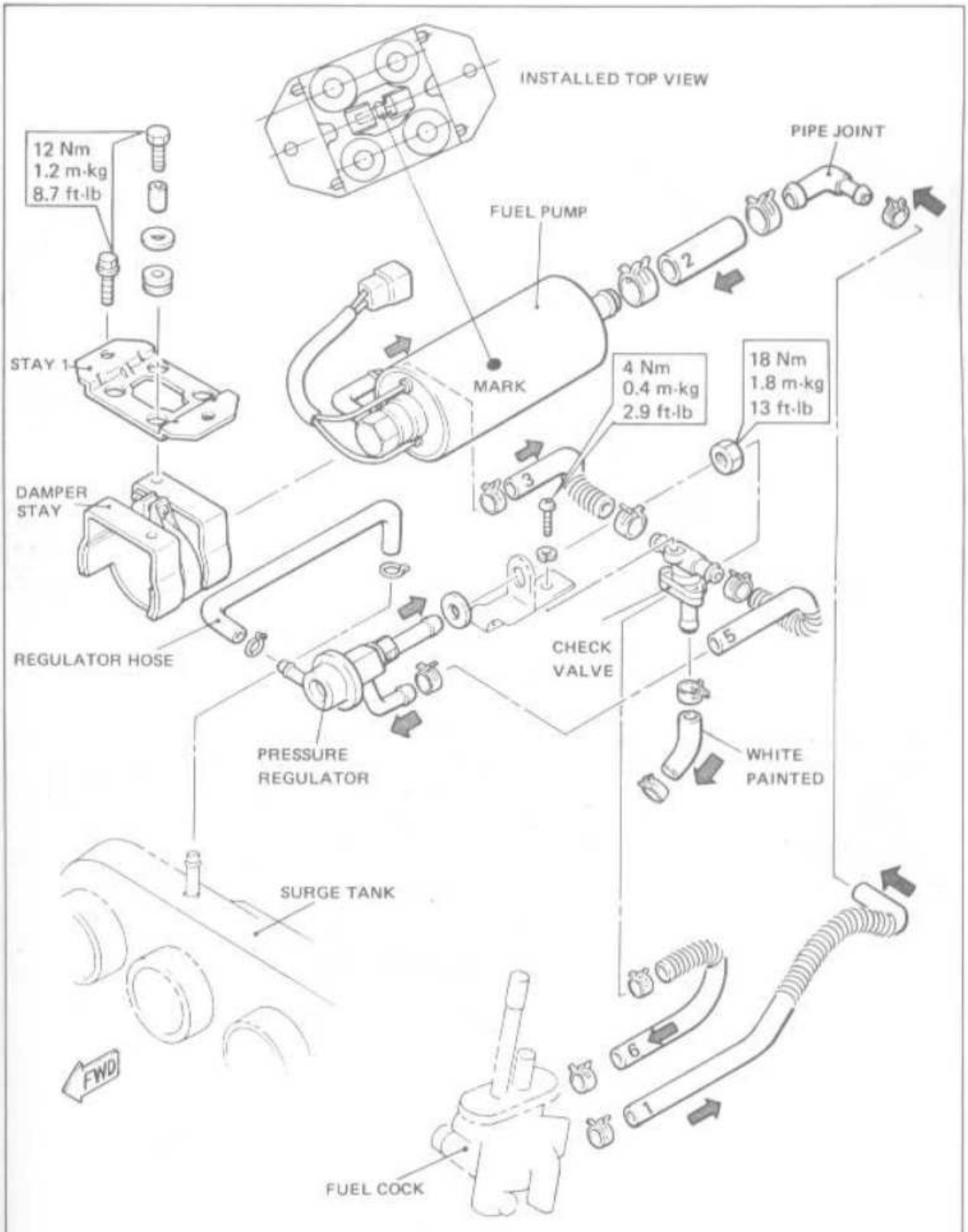


NOTE:

The mark on the turbo duct 2 should be aligned to the surge tank mark.



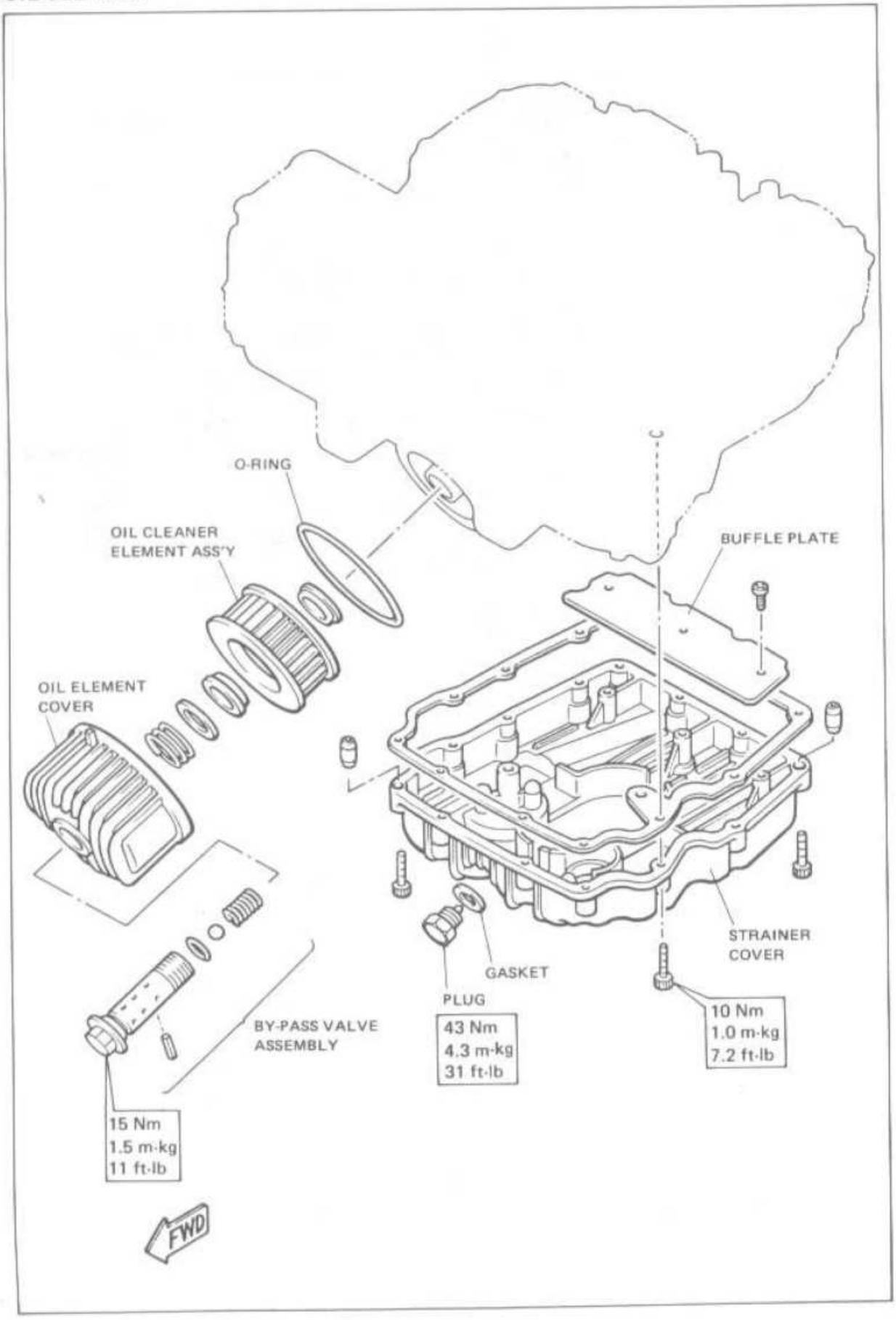
FUEL PUMP



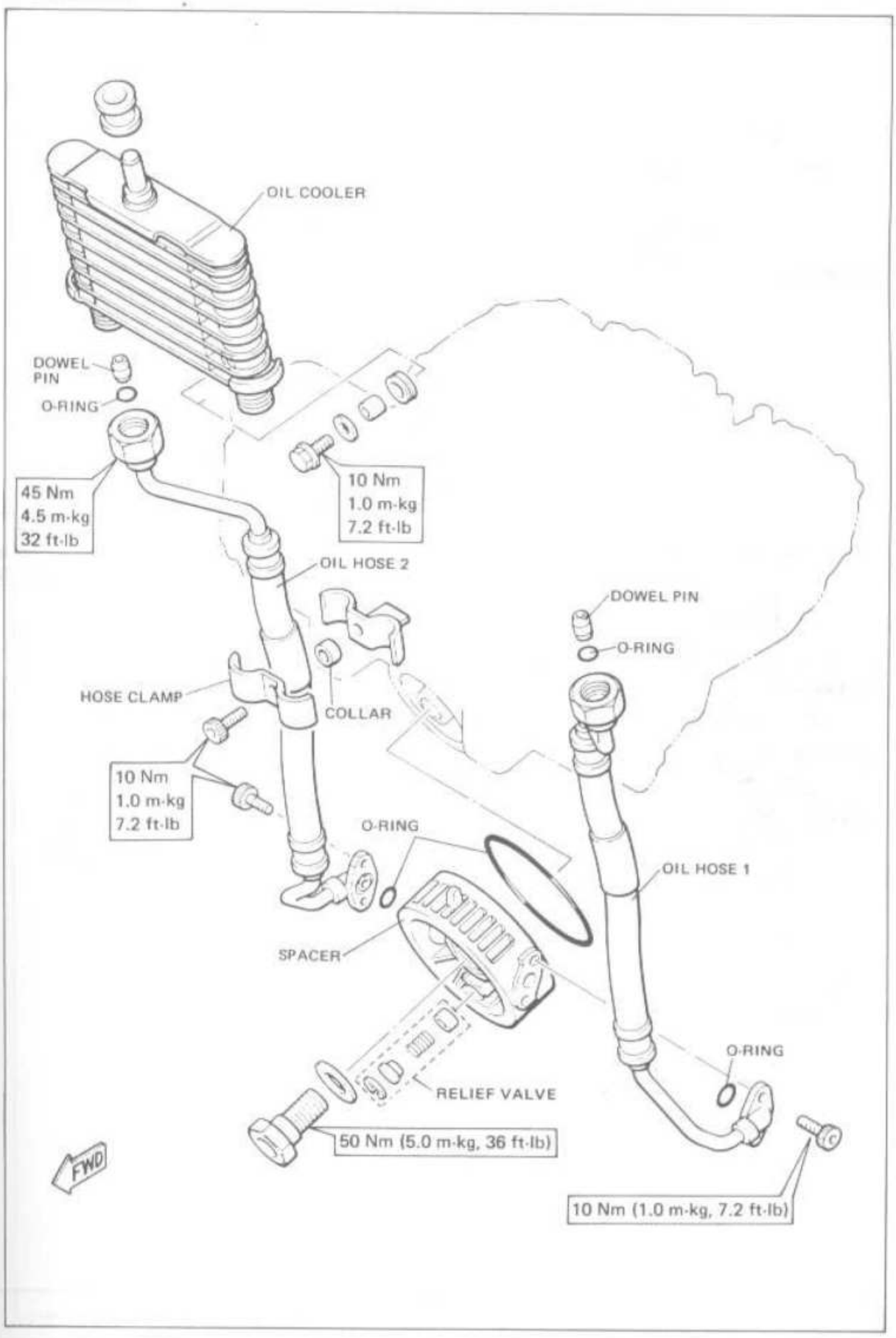
NOTE:

1. The arrow marks (➡) show the fuel flow direction.
2. The fuel hoses and hose clamps should be securely fitted.

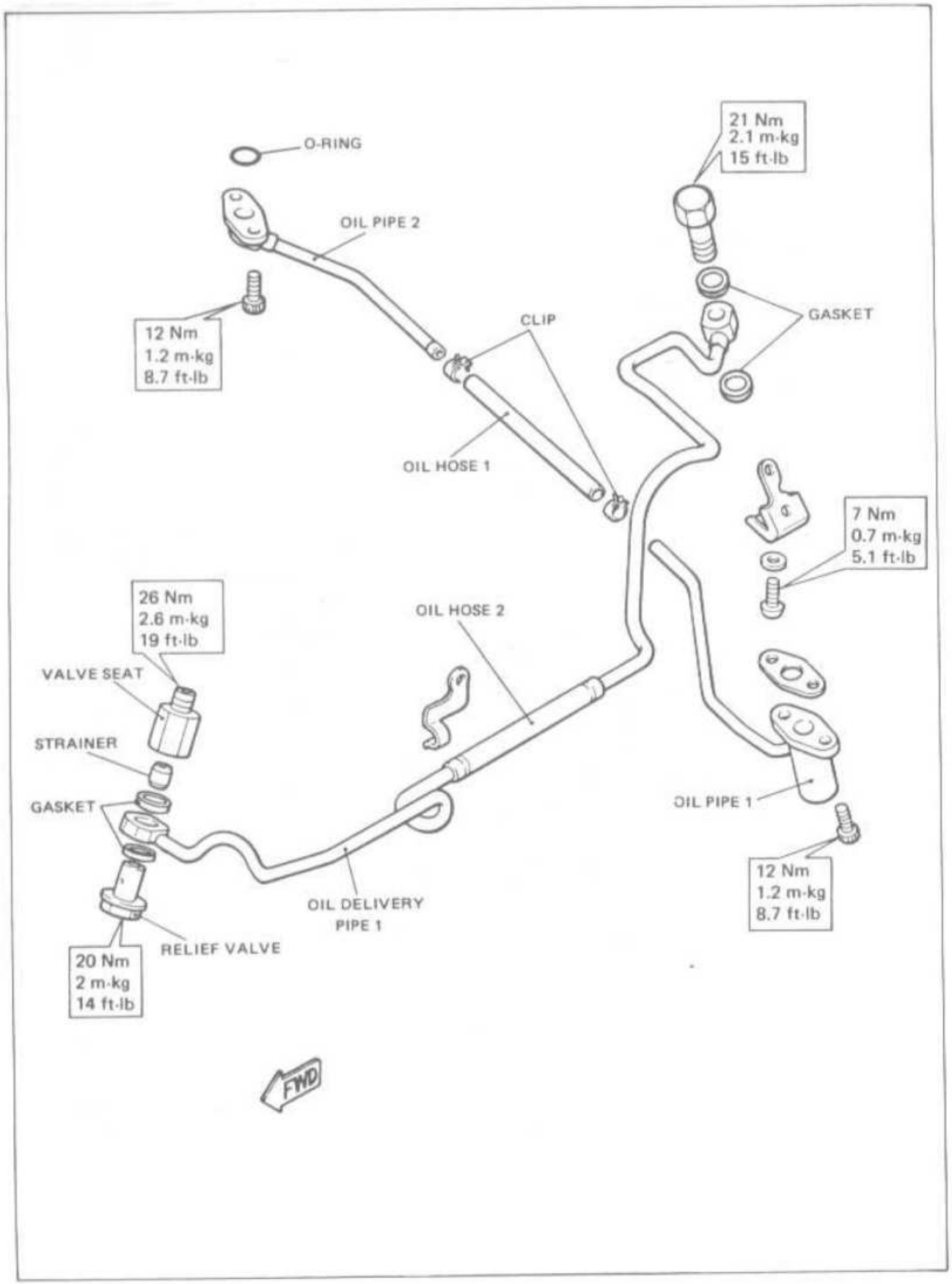
OIL CLEANER


O-RING
OIL CLEANER
ELEMENT ASS'Y
OIL ELEMENT
COVER
BUFFLE PLATE
STRAINER
COVER
GASKET
PLUG
43 Nm
4.3 m·kg
31 ft·lb
10 Nm
1.0 m·kg
7.2 ft·lb
BY-PASS VALVE
ASSEMBLY
15 Nm
1.5 m·kg
11 ft·lb
FWD

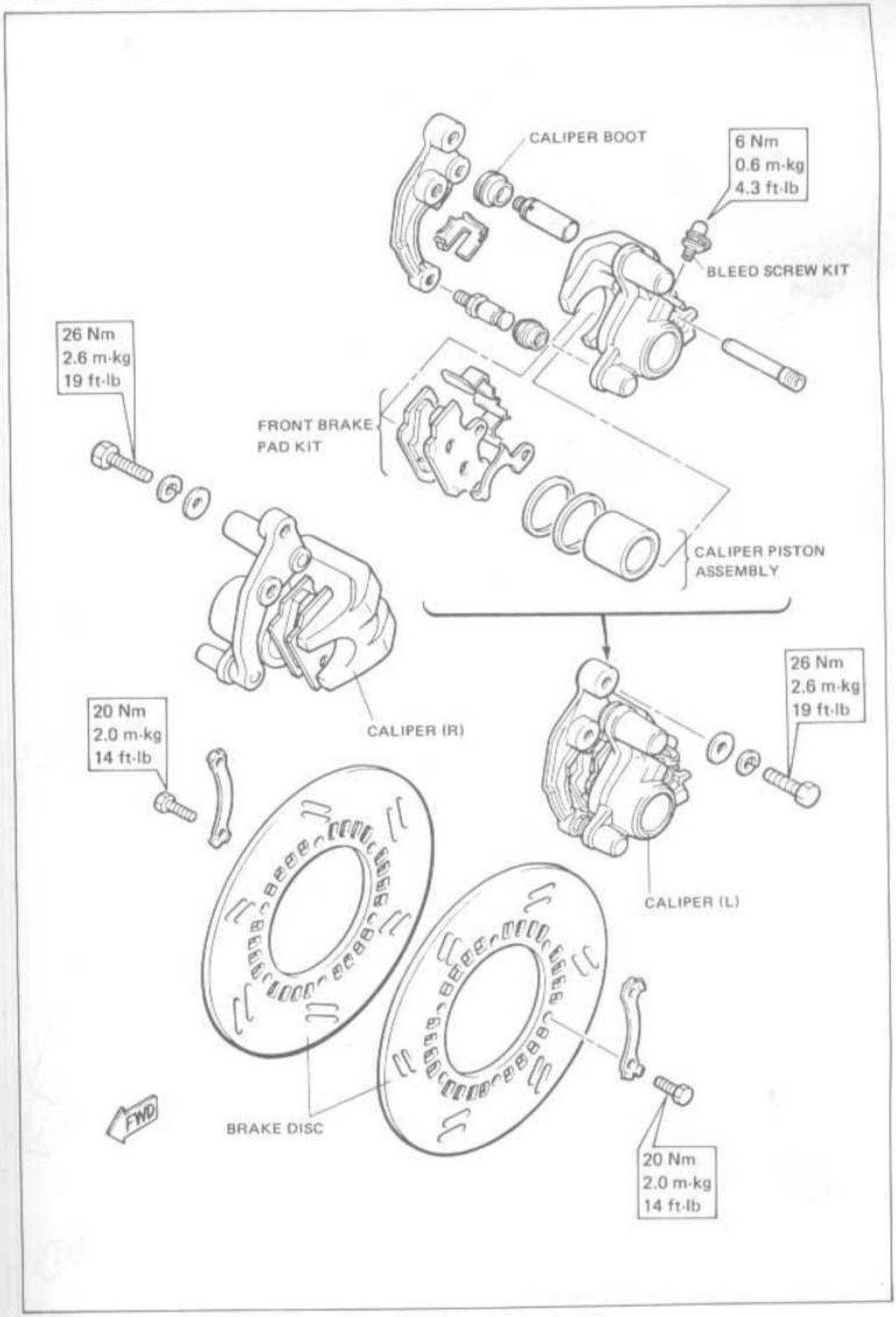
OIL COOLER


OIL COOLER
DOWEL PIN
O-RING
45 Nm
4.5 m-kg
32 ft-lb
10 Nm
1.0 m-kg
7.2 ft-lb
OIL HOSE 2
DOWEL PIN
O-RING
HOSE CLAMP
COLLAR
10 Nm
1.0 m-kg
7.2 ft-lb
O-RING
OIL HOSE 1
SPACER
O-RING
RELIEF VALVE
50 Nm (5.0 m-kg, 36 ft-lb)
FWD
10 Nm (1.0 m-kg, 7.2 ft-lb)

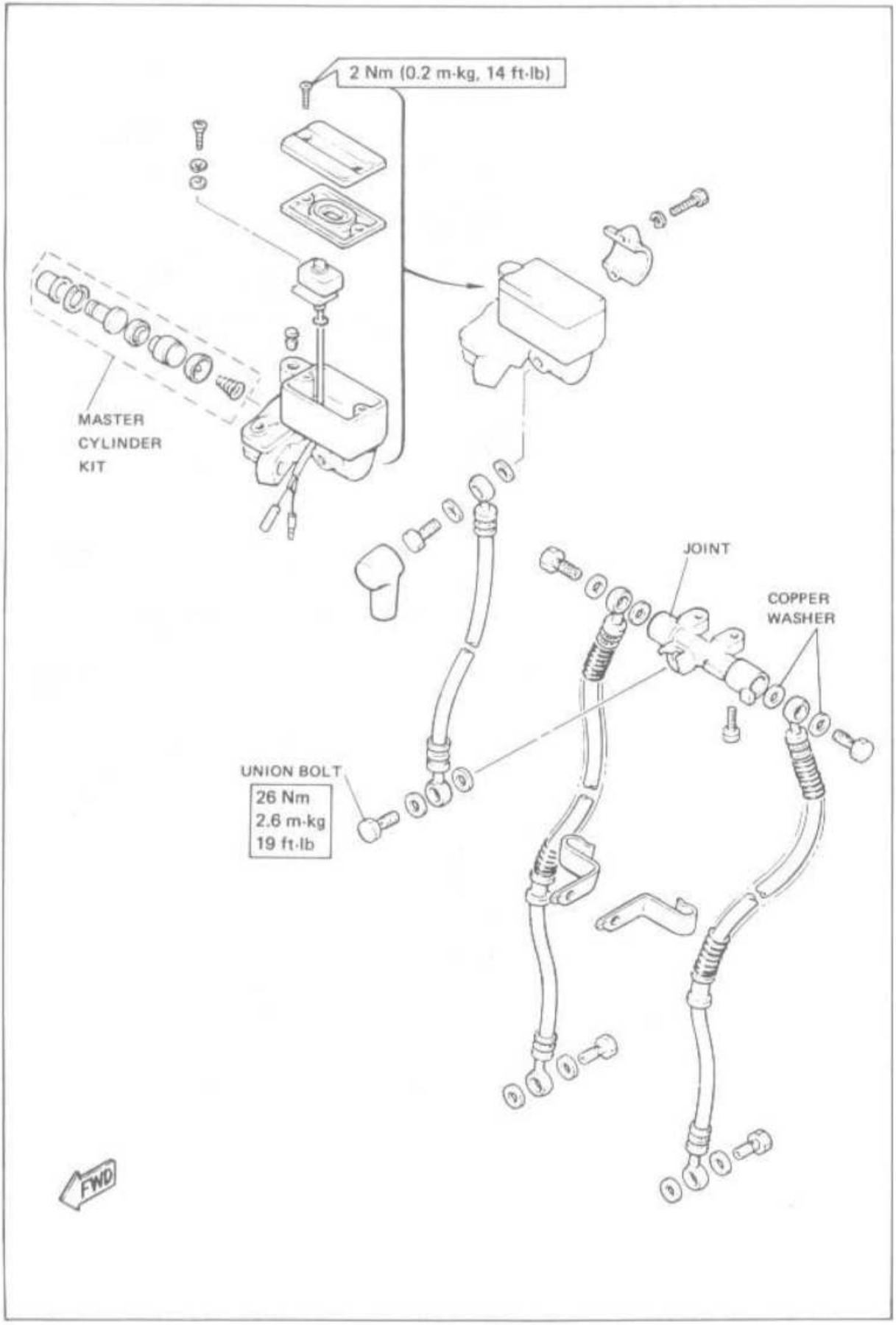
OIL PIPE FOR TURBO UNIT



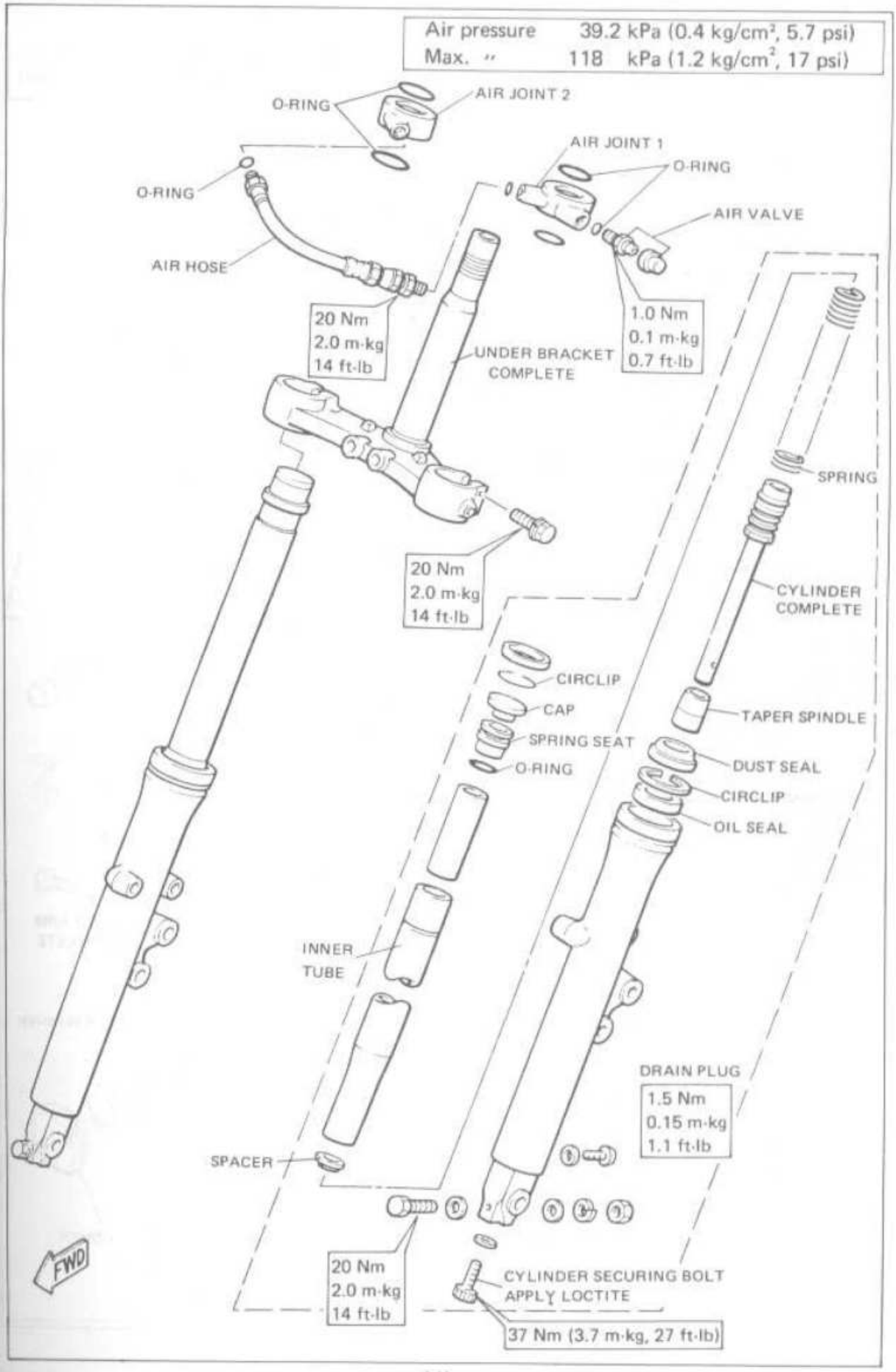
FRONT BRAKE CALIPER



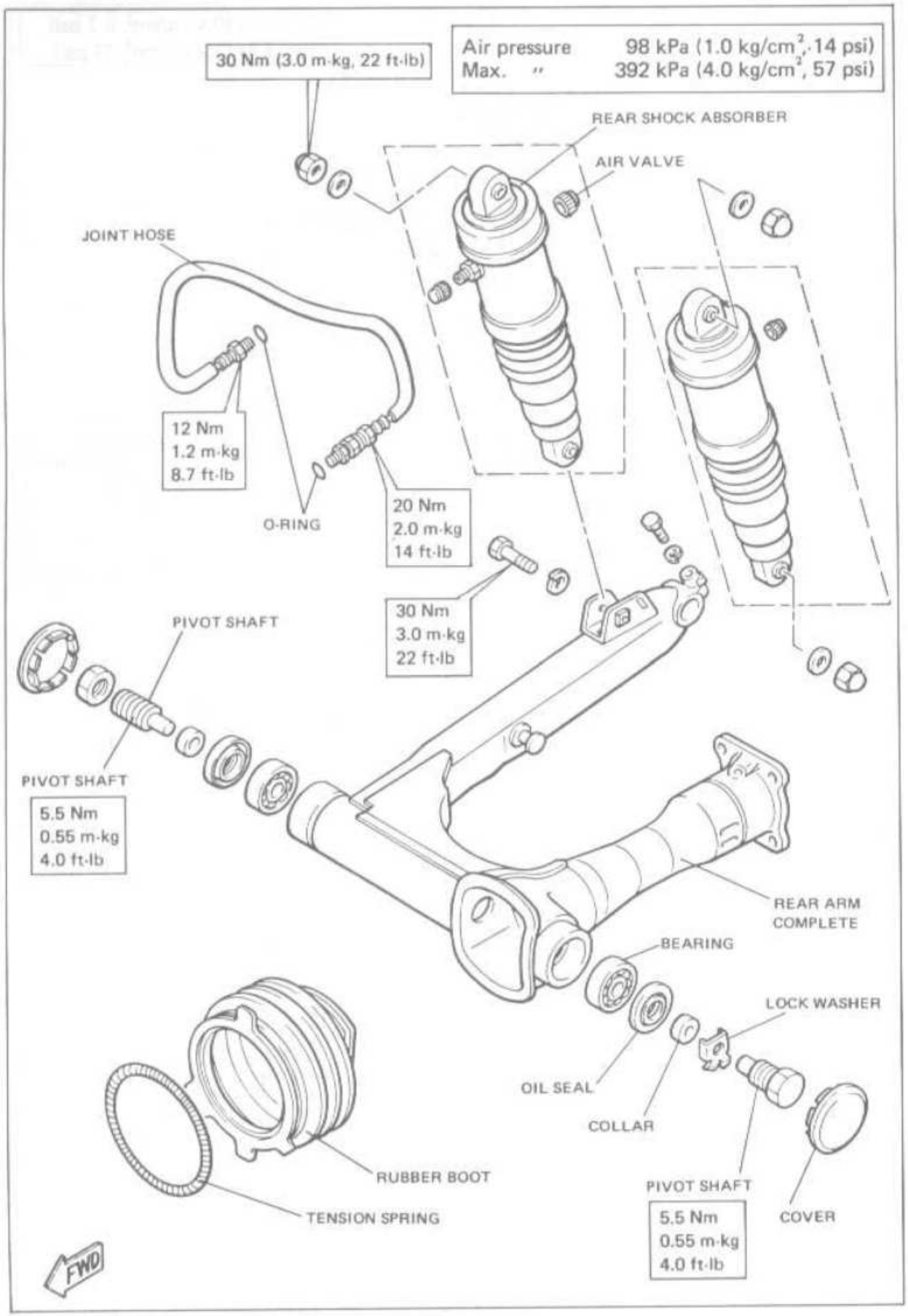
FRONT MASTER CYLINDER



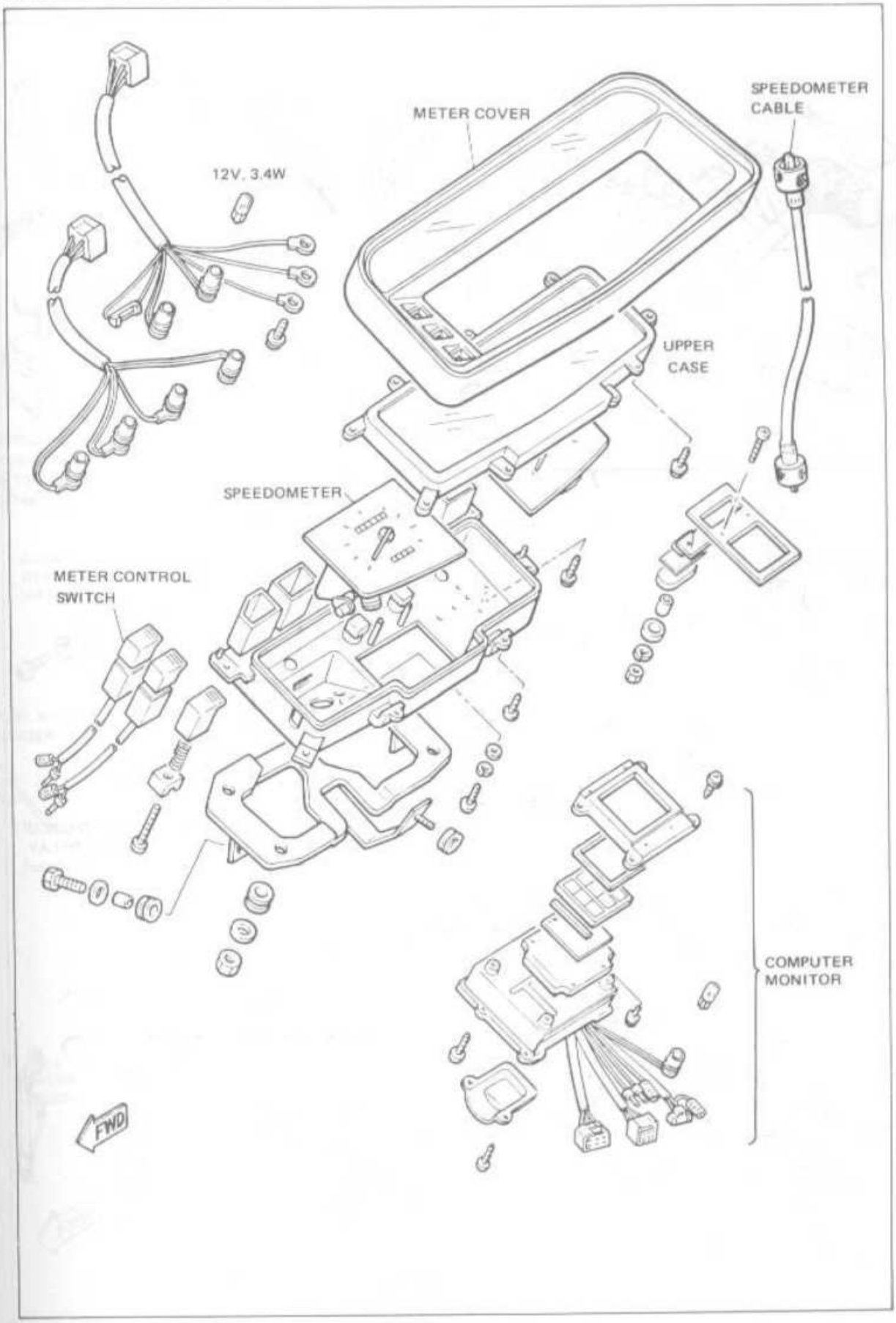
FRONT FORK

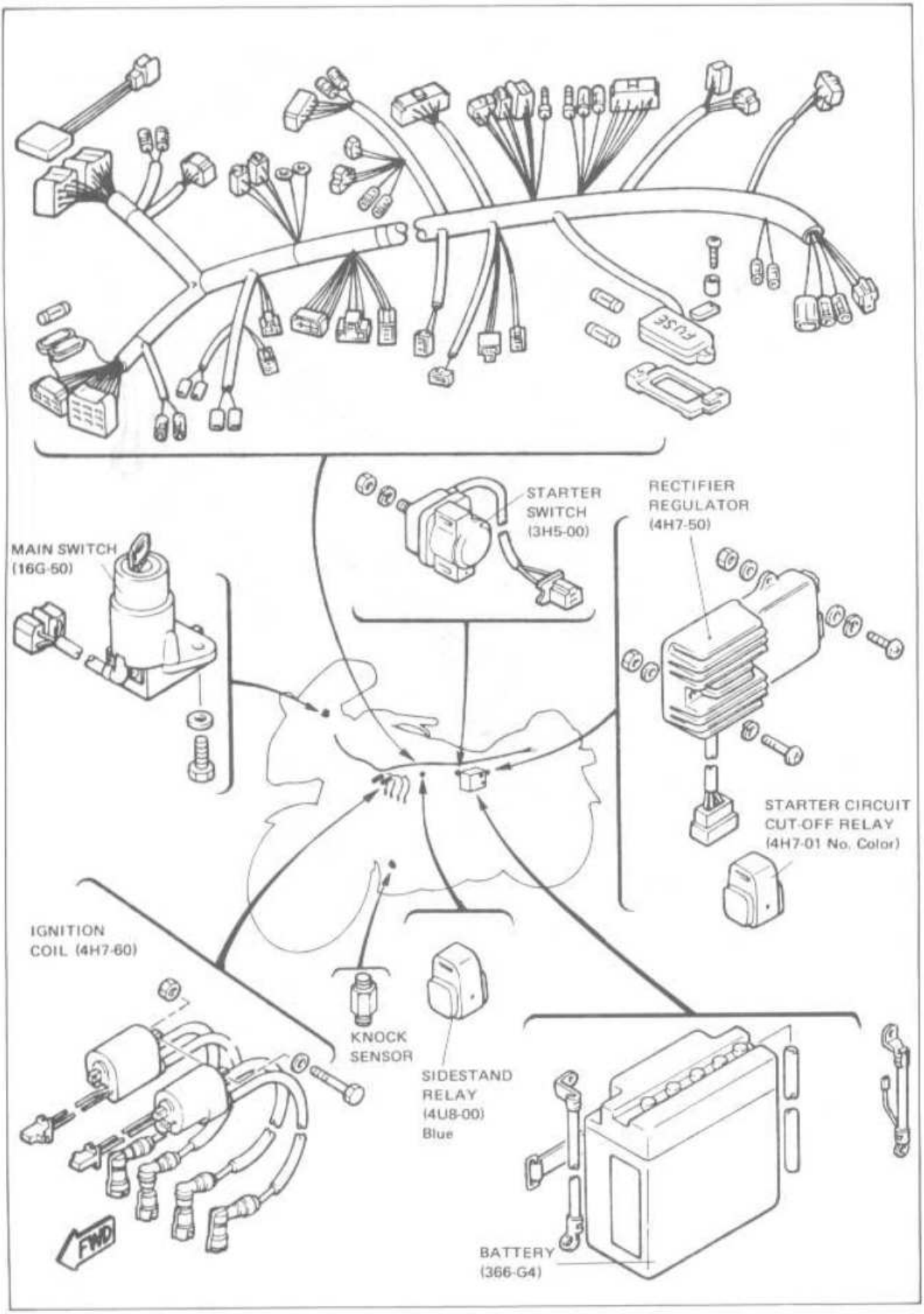

Air pressure 39.2 kPa (0.4 kg/cm², 5.7 psi)
Max. " 118 kPa (1.2 kg/cm², 17 psi)
O-RING
AIR JOINT 2
AIR JOINT 1
O-RING
O-RING
AIR VALVE
AIR HOSE
20 Nm
2.0 m·kg
14 ft·lb
1.0 Nm
0.1 m·kg
0.7 ft·lb
UNDER BRACKET COMPLETE
SPRING
20 Nm
2.0 m·kg
14 ft·lb
CYLINDER COMPLETE
CIRCLIP
CAP
TAPER SPINDLE
SPRING SEAT
DUST SEAL
O-RING
CIRCLIP
OIL SEAL
INNER TUBE
DRAIN PLUG
1.5 Nm
0.15 m·kg
1.1 ft·lb
SPACER
FWD
20 Nm
2.0 m·kg
14 ft·lb
CYLINDER SECURING BOLT
APPLY LOCTITE
37 Nm (3.7 m·kg, 27 ft·lb)

REAR ARM/SUSPENSION

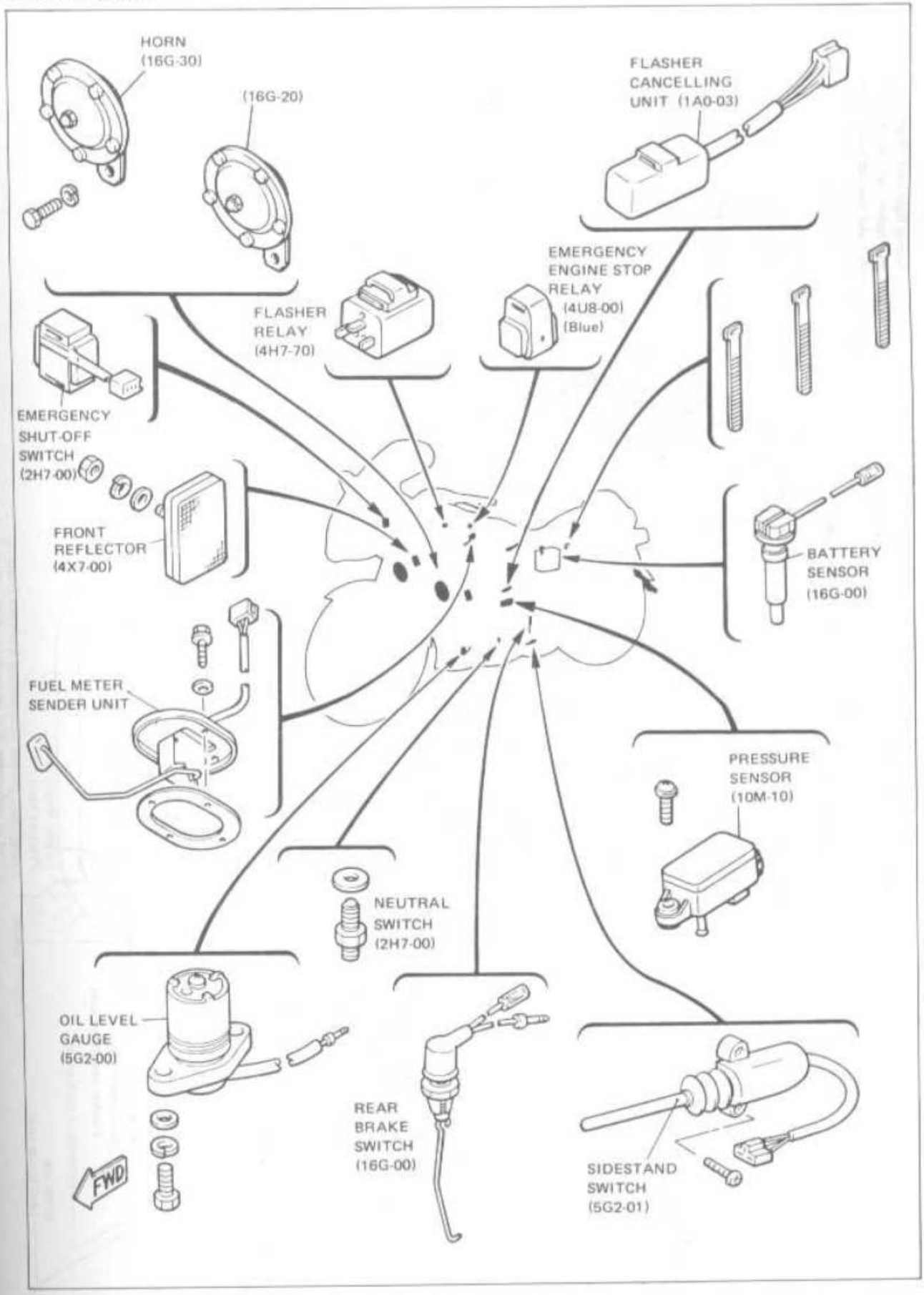


SPEEDOMETER/TACHOMETER

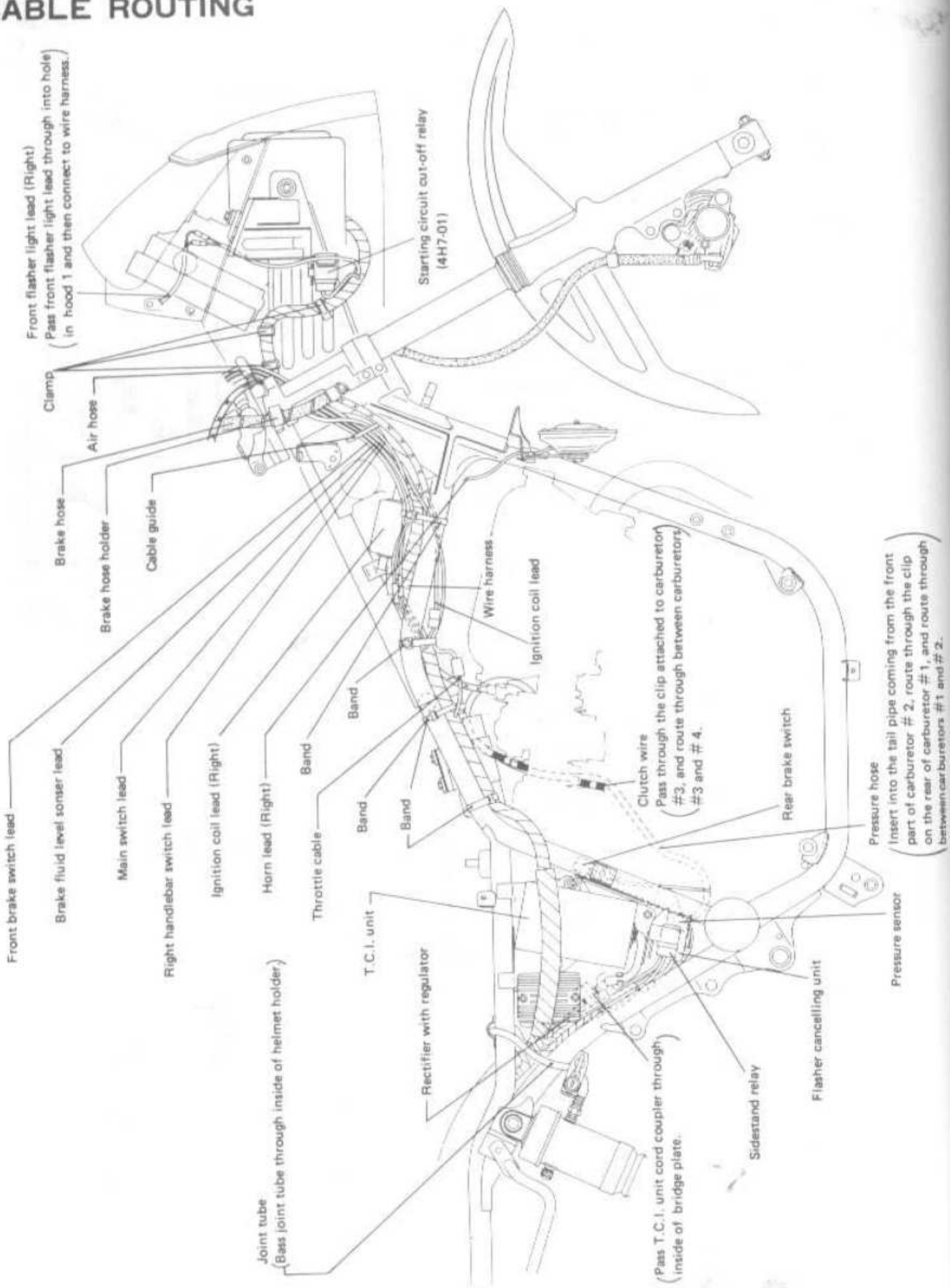


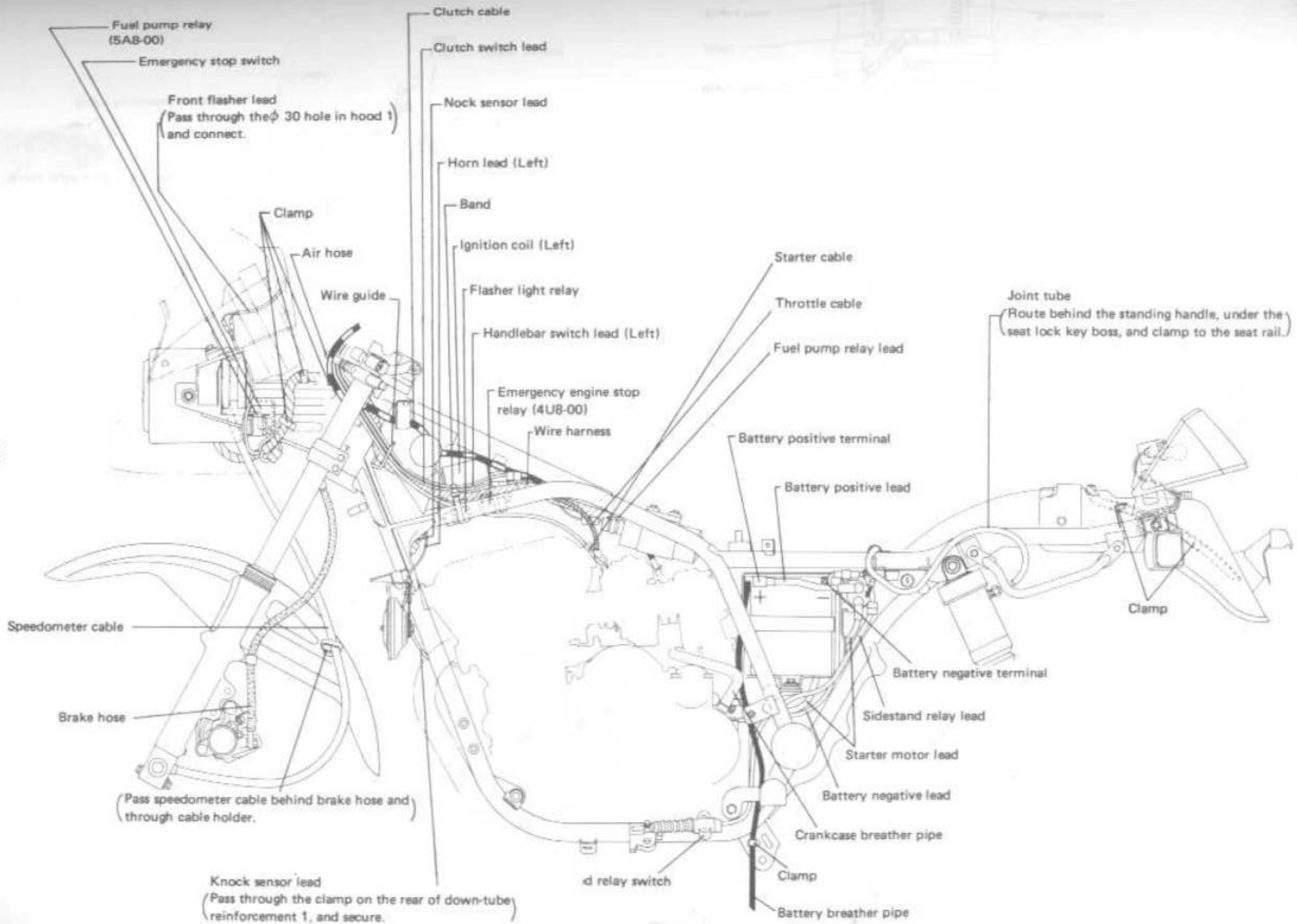

FUSE
STARTER SWITCH (3H5-00)
RECTIFIER REGULATOR (4H7-50)
MAIN SWITCH (16G-50)
STARTER CIRCUIT CUT-OFF RELAY (4H7-01 No. Color)
IGNITION COIL (4H7-60)
KNOCK SENSOR
SIDESTAND RELAY (4U8-00) Blue
FWD
BATTERY (366-G4)

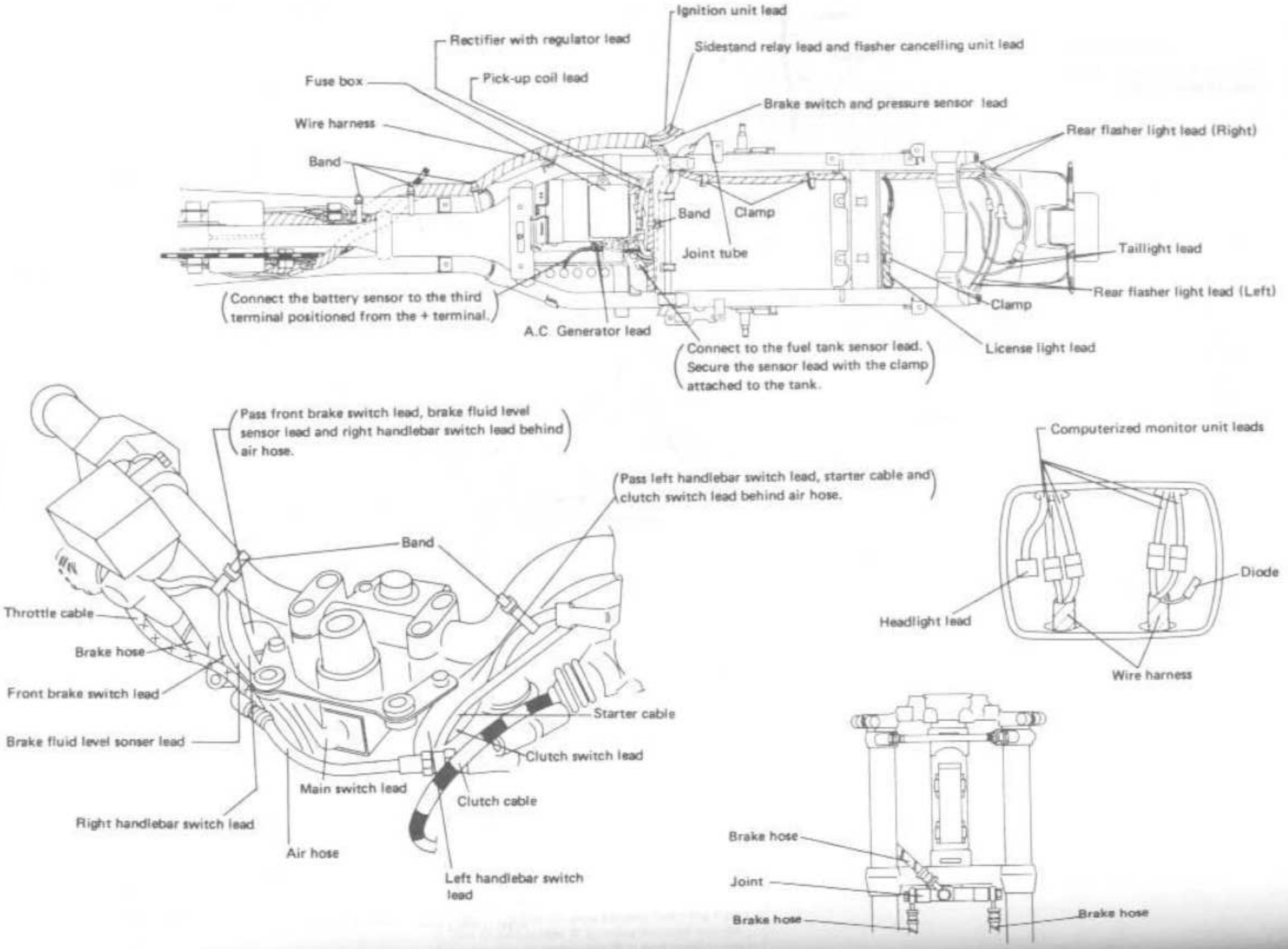
ELECTRICAL 2



CABLE ROUTING




Fuel pump relay (5A8-00)
Emergency stop switch
Front flasher lead
(Pass through the ϕ 30 hole in hood 1 and connect.)
Clamp
Air hose
Wire guide
Clutch cable
Clutch switch lead
Nock sensor lead
Horn lead (Left)
Band
Ignition coil (Left)
Flasher light relay
Handlebar switch lead (Left)
Emergency engine stop relay (4U8-00)
Wire harness
Starter cable
Throttle cable
Fuel pump relay lead
Joint tube
(Route behind the standing handle, under the seat lock key boss, and clamp to the seat rail.)
Battery positive terminal
Battery positive lead
Clamp
Speedometer cable
Brake hose
(Pass speedometer cable behind brake hose and through cable holder.)
Battery negative terminal
Sidestand relay lead
Starter motor lead
Battery negative lead
Crankcase breather pipe
Clamp
Battery breather pipe
Knock sensor lead
(Pass through the clamp on the rear of down-tube reinforcement 1, and secure.)
d relay switch


Ignition unit lead
Rectifier with regulator lead
Sidestand relay lead and flasher cancelling unit lead
Fuse box
Pick-up coil lead
Brake switch and pressure sensor lead
Wire harness
Rear flasher light lead (Right)
Band
Band
Clamp
Joint tube
Taillight lead
Rear flasher light lead (Left)
Connect the battery sensor to the third terminal positioned from the + terminal.
Clamp
A.C. Generator lead
License light lead
Connect to the fuel tank sensor lead. Secure the sensor lead with the clamp attached to the tank.
Pass front brake switch lead, brake fluid level sensor lead and right handlebar switch lead behind air hose.
Pass left handlebar switch lead, starter cable and clutch switch lead behind air hose.
Computerized monitor unit leads
Band
Diode
Throttle cable
Headlight lead
Brake hose
Front brake switch lead
Wire harness
Starter cable
Brake fluid level sonser lead
Clutch switch lead
Main switch lead
Clutch cable
Right handlebar switch lead
Air hose
Brake hose
Joint
Left handlebar switch lead
Brake hose
Brake hose

—MEMO—

YAMAHA MOTOR CO.,LTD.
IWATA, JAPAN

PRINTED IN U.S.A.

YAMAHA

XJ650G

Service Manual

G

LIT-11616-01-94

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent to motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit to use and/or unsafe.

This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. Proper service with the correct tools is necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure, it is imperative that you contact a Yamaha dealer for any service information changes that apply to this model. This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

NOTE:

This Service Manual contains information regarding periodic maintenance to the emission control system for the XJ650G. Please read this material carefully.

Particularly important information is distinguished in this manual by the following notations.

NOTE: A NOTE provides key information to make procedures easier or clearer.

CAUTION: A CAUTION indicates special procedures that must be followed to avoid damage to the motorcycle.

WARNING: A WARNING indicates special procedures that must be followed to avoid injury to a motorcycle operator or person inspecting or repairing the motorcycle.

SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.

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CARBURETION 4

CHASSIS 5

ELECTRICAL 6

APPENDICES 7

CHAPTER 1. GENERAL INFORMATION

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B. Engine Serial Number 1
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B. For Engine Service 2
C. For Shaft Drive Service 4
D. For Electrical Components 6

CHAPTER 1. GENERAL INFORMATION

MOTORCYCLE IDENTIFICATION

A. Frame Serial Number

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

B. Engine Serial Number

The engine serial number is stamped into the elevated part of the right rear section of the engine.

NOTE:

The first three digits of these numbers are for model identifications; the remaining digits are the unit production number.

Starting Serial Number:

XJ650G 4H7-000101

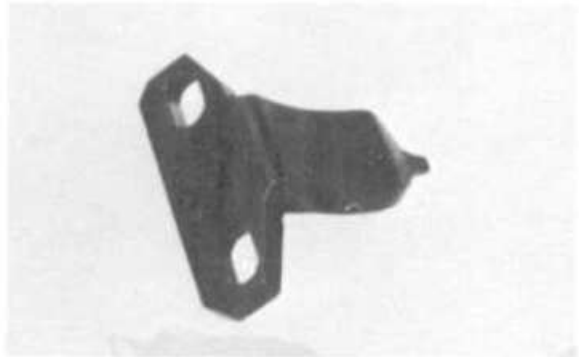


SPECIAL TOOLS

The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help to prevent damage from improper tools or improvised techniques.

A. For Tune-up

1. Compression gauge
2. Timing light
3. Tachometer
4. Tappet adjusting tool
   P/N. 90890-01245-00



This tool is necessary to replace valve adjusting pads. This can also be used for the XS750, XS850 and XS1100.

5. Vacuum gauge
   P/N. TLU-11080-30-02



This gauge is needed for carburetor synchronization.

B. For Engine Service

1. Clutch hub holder
   P/N. TLM-90910-42-00



This tool is used to hold the clutch when removing or installing the clutch boss lock nut.

2. Valve guide reamer
   P/N. 90890-01227-00



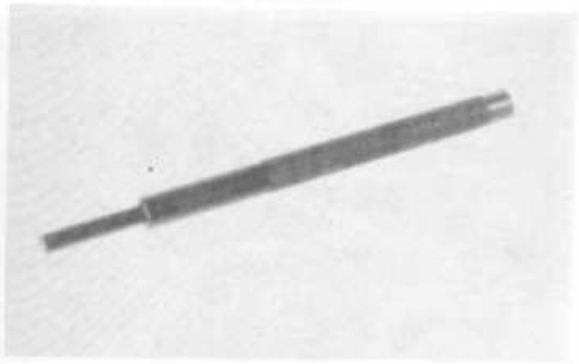
This must be used when replacing the valve guide.

3. Valve seat cutter
   P/N. TLM-90910-43-20



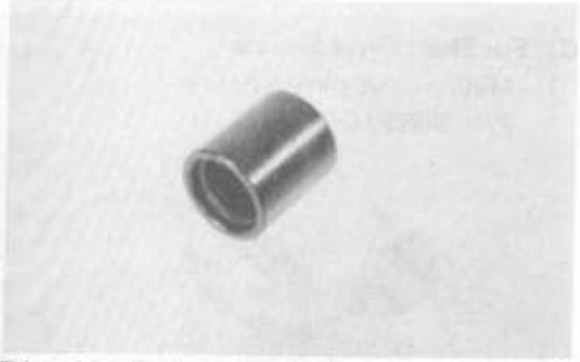
This tool is needed to re-surface the valve seat.

4. Valve guide remover
P/N. 90890-01225-00



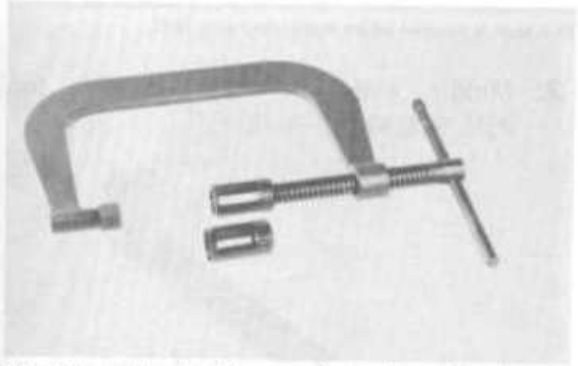
This must be used to remove the valve guides.

5. Valve guide installer
P/N. 90890-04017-00



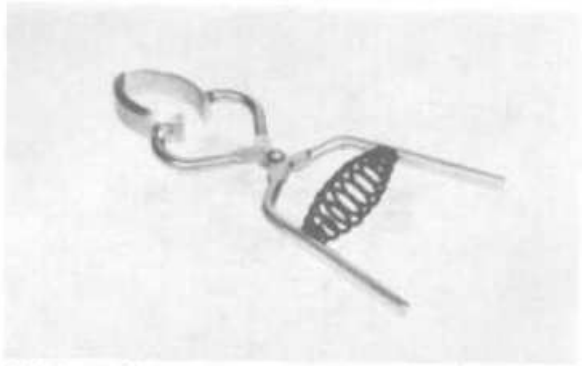
This tool is needed for proper installation of the valve guides.

6. Valve spring compressor
P/N. 90890-01253-00



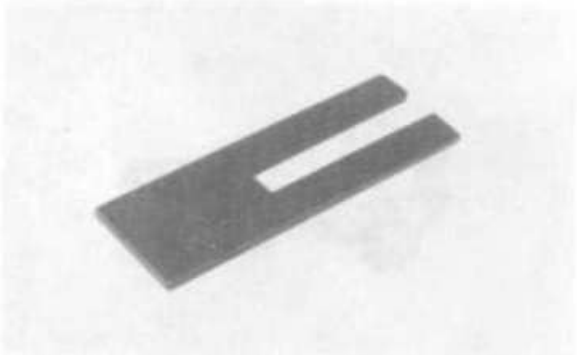
This tool must be used for removing and installing the valve assemblies.

7. Piston ring compressor
P/N. 90890-04044-00



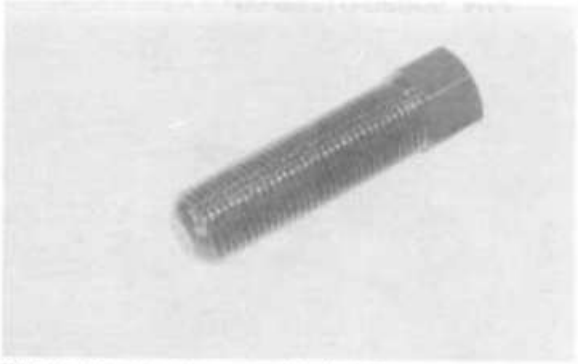
This is used to compress piston rings when installing the cylinder.

8. Piston base
P/N. 90890-01067-00



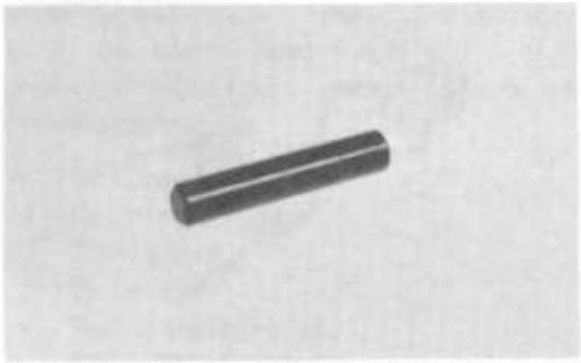
Use 4 of these to hold the pistons during cylinder installation.

9. Rotor puller
P/N. 90890-01080-00



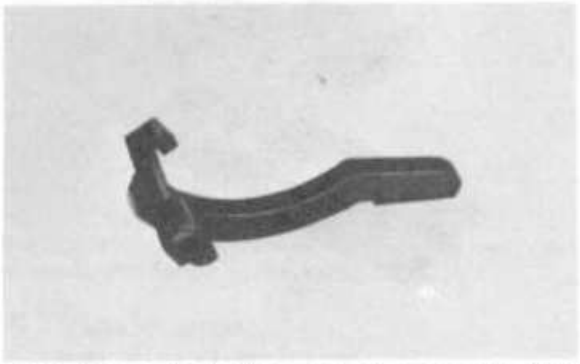
This tool is needed to remove the A.C. Generator rotor.

10. Rotor puller attachment
P/N. 90890-04052-00



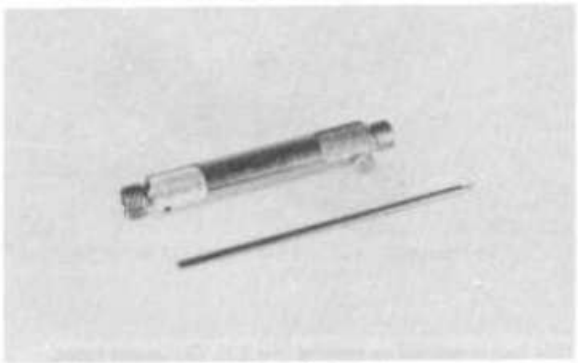
This tool is needed when removing the A.C. Generator rotor together with the rotor puller.

11. Rotor holding tool
P/N. 90890-04043-00



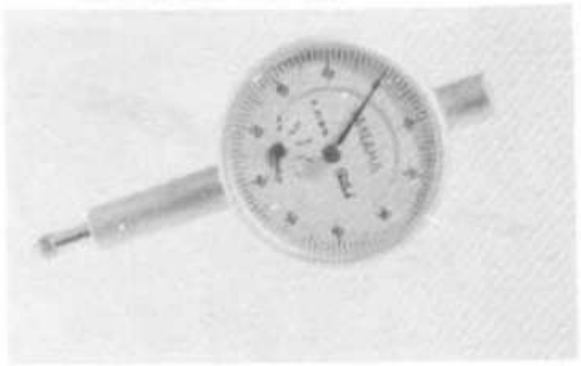
This tool is used to hold the A.C. Generator rotor during removal and installation.

12. Dial gauge stand
P/N. 90890-01258-00



This tool is needed to hold the dial gauge.

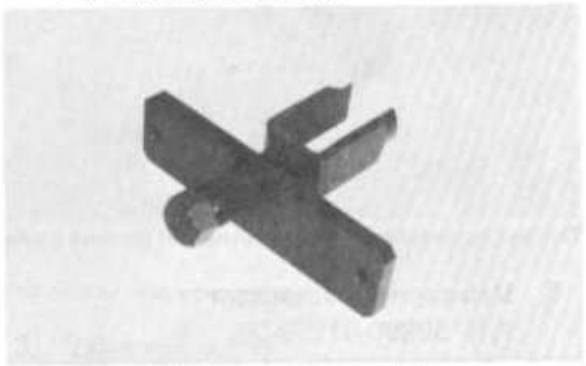
13. Dial gauge
P/N. 90890-03097-00



This dial gauge is used to determine piston position for correct timing.

C. For Shaft Drive Service

1. Middle drive pinion holder
P/N. 90890-04051-00



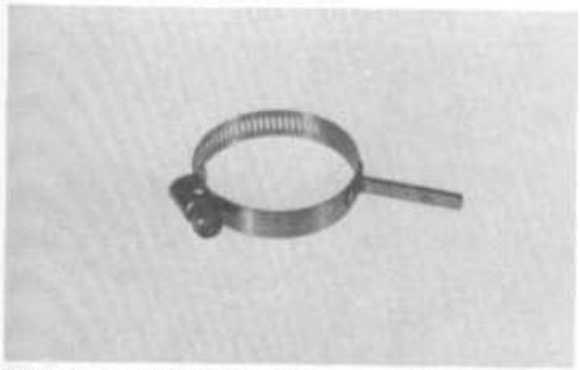
This tool is needed when measuring gear lash.

2. Middle and final gear holding tool
P/N. 90890-01229-00



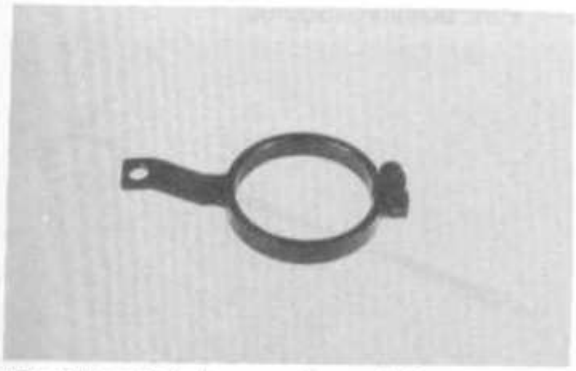
This tool is needed when measuring gear lash.

3. Gear lash measurement tool (Final gear)
P/N. 90890-01230-00



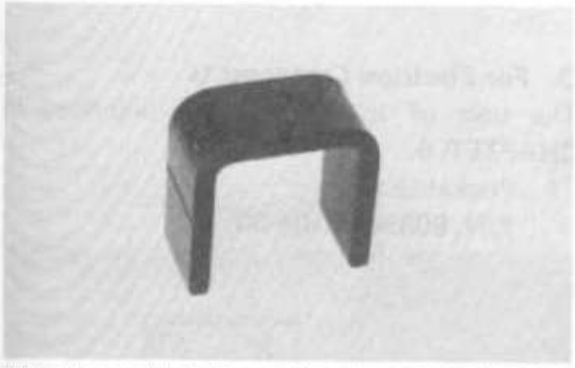
This tool is needed when measuring gear lash for final gear.

4. Final gear holding tool
P/N. 90890-01254-00



This tool is needed when measuring gear lash.

5. Damper compressor
P/N. 90890-04011-00



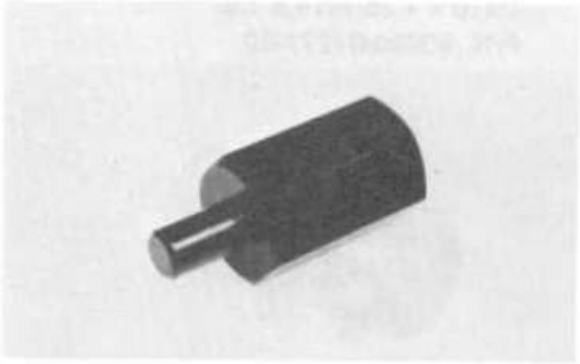
This tool is needed to disassemble and reassemble the middle gear damper.

6. Middle drive shaft nut wrench
P/N. 90890-04045-00



This tool is used to loosen and tighten the drive shaft nut.

7. Middle drive shaft holder
P/N. 90890-04046-00



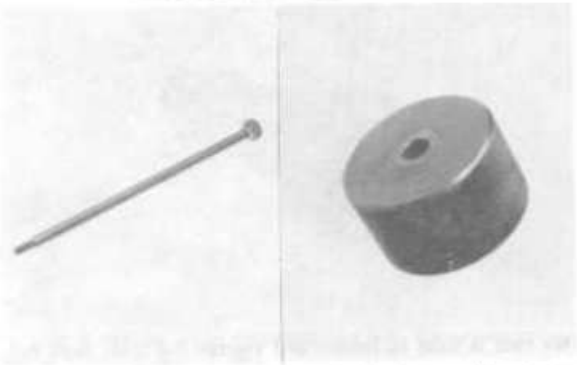
This tool is needed when loosening and tightening the drive shaft nut.

8. Drive pinion bearing retainer remover
P/N. 90890-04050-00



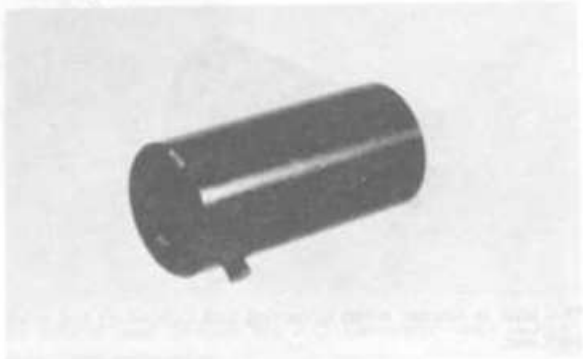
This tool is used to loosen and tighten the final gear drive pinion bearing retainer.

9. Armature shock puller (M10 x 1.25)
P/N. 90890-01290-00,
90890-01291-00



These tools are used to remove the final gear drive pinion.

10. Crank installer adapter
(M10 x 1.25/M14 x 1.5)
P/N. 90890-01277-00



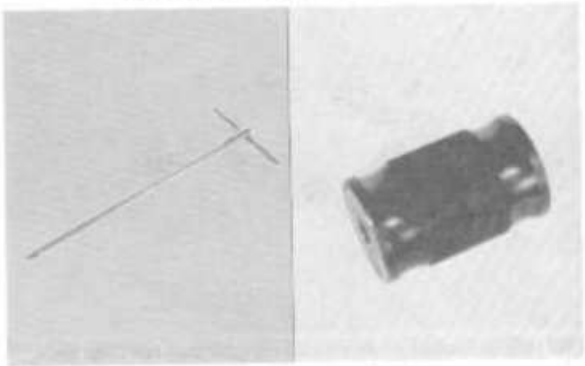
This adapter is needed when using the armature shock puller.

11. Drive shaft puller
P/N. 90890-04012-00



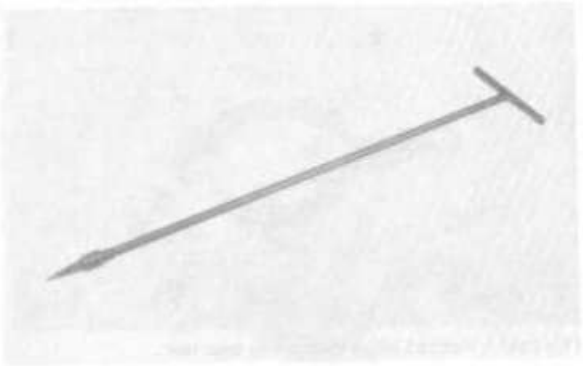
This tool is used to remove the drive shaft.

12. Slide hammer
P/N. 90890-01083-00,
90890-01084-00



These tools are used to remove the drive shaft.

13. Front fork cylinder comp. holder
P/N. 90890-01300-00



This tool is used to loosen and tighten the front fork cylinder comp. holding bolt.

D. For Electrical Components

The uses of these tools are described in CHAPTER 6.

1. Pocket tester
P/N. 90890-03104-00



2. Electro tester
   P/N. 90890-03021-00



CHAPTER 2.
PERIODIC INSPECTIONS AND ADJUSTMENTS

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2

CHAPTER 2.
PERIODIC INSPECTIONS AND ADJUSTMENTS

INTRODUCTION

This chapter includes all information necessary to perform recommend inspection and adjustments. These preventative maintenance procedures, if followed, will insure more reliable vehicle operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies not only to vehicles already in service, but also to new vehicles that are being prepared for sale. Any service technician performing preparation work should be familiar with this entire chapter.

MAINTENANCE INTERVALS CHARTS

Proper periodic maintenance is important. Especially important are the maintenance services related to emissions control. These controls not only function to ensure cleaner air but are also vital to proper engine operation and maximum performance. In the following tables of periodic maintenance, the services related to emissions control are grouped separately.

PERIODIC MAINTENANCE EMISSION CONTROL SYSTEM

No.	Item	Remarks	Initial break-in		Thereafter every	
			1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months
1*	Cam chain	Adjust chain tension.	○	○		○
2*	Valve clearance	Check and adjust valve clearance when engine is cold.		○		○
3	Spark plugs	Check condition. Adjust gap/Clean. Replace after initial 13,000 km (8,000 mi) or 18 months and thereafter every 12,000 km (7,500 mi) or 18 months.		○	○	Replace every 12,000 km (7,500 mi) or 18 months
4*	Crankcase ventilation system	Check ventilation hose for cracks or damage. Replace if necessary.		○		○
5*	Fuel line	Check fuel hose for cracks or damage. Replace if necessary.		○		○
6*	Exhaust system	Check for leakage. Retighten as necessary. Replace gasket(s) if necessary.		○	○	
7*	Carburetor synchronization	Adjust synchronization of carburetors.		○	○	
8*	Idle speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		○	○	

*It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

GENERAL MAINTENANCE/LUBRICATION

No.	Item	Remarks	Type	Initial break-in		Thereafter every		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000 mi) or 24 months
1	Engine oil	Warm-up engine before draining.	Refer to page 17.	○	○	○		
2	Oil filter	Replace.	—	○	○		○	
3	Final gear oil	Replace.	Refer to page 18.	○			○	
4	Air filter	Clean with compressed air.	—		○		○	
5*	Brake system	Adjust free play. Front: Replace pads if necessary. Rear: Replace shoes if necessary.	—	○	○	○		
6*	Clutch	Adjust free play	—	○	○	○		
7*	Control and meter cable	Apply chain lube thoroughly.	Yamaha chain and cable lube or SAE 10W/30 motor oil	○	○	○		
8*	Rear arm pivot bearings	Check bearing assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease					Repack
9*	A.C. generator	Replace generator brushes. Replace at initial 13,000 km (8,000 mi) and thereafter every 16,000 km (10,000 mi)	—					Replace
10	Brake/clutch lever pivot shaft	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
11	Change/Brake pedal shaft pivot	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
12	Center and side stand pivots	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
13*	Front fork oil	Drain completely. Refill to specification.	Yamaha fork oil 10wt or equivalent					○
14*	Steering Ball Bearing and races	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease		○	○		Repack
15*	Wheel bearings	Check bearings for smooth rotation, Replace if necessary.	—		○	○		
16	Battery	Check specific gravity. Check breather pipe for proper operation.	—		○	○		

*It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

ENGINE

A. Valve Clearance Adjustment

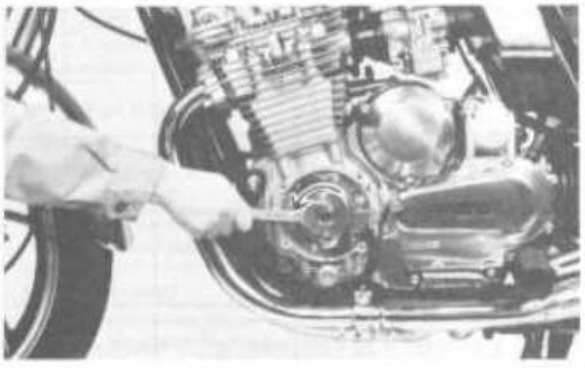
NOTE:

Valve clearance must be measured with the engine and at room temperature.

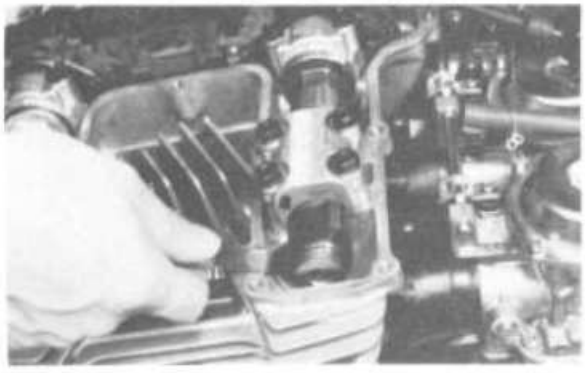
1. Remove the seat and fuel tank.
2. Remove the horn, flasher relay, and spark plug lead wires.



3. Remove the cylinder head cover and left crankcase cover (pick-up base cover). Care should be taken to not scratch or damage the gasket sealing surfaces.
4. Turn the crankshaft with the nut on the left end of the crankshaft to turn the cams. The proper position of the cam when measuring the valve clearance is with the cam lobe directly opposite the valve lifter.



5. Insert a feeler gauge between the valve lifter and the camshaft base circle.



Intake valve clearance (cold):
0.11 ~ 0.15 mm (0.004 ~ 0.006 in)
Exhaust valve clearance (cold):
0.16 ~ 0.20 mm (0.006 ~ 0.008 in)

Adjustment

Valve clearance is adjusted by replacing the adjusting pad on the top of the vale lifter. Adjusting pads are available in 25 thicknesses ranging from No. 200 (2.00 mm) to No. 320 (3.20 mm) in steps of 0.05 mm. The thickness of each pad is marked on the pad face that contacts the valve lifter (not the cam). Adjustment of the valve clearance is accomplished as follows:

1. Determine valve clearance (feeler gauge measurement.)
2. Remove adjusting pad and note number.
3. Select proper pad from appropriate chart (intake or exhaust chart).
4. Install new pad and check installed clearance.

Procedure

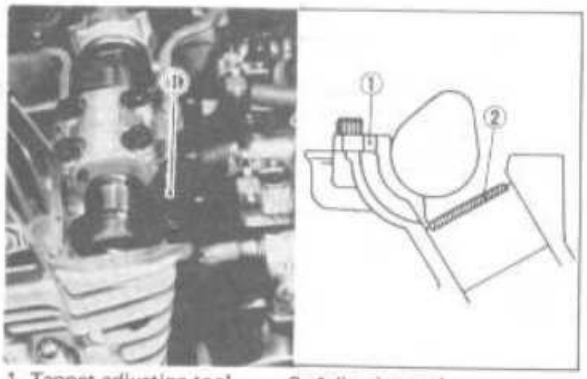
1. Measure valve clearance. If clearance is incorrect, record the measured amount of clearance. This must be measured carefully.
2. There is a slot in the valve lifter. This slot must be positioned opposite the blade of the tappet adjusting tool before the tools is installed.
3. Turn the cam until the lobe fully depresses the valve lifter and opens the valve. Install the tappet adjusting tool as shown to hold the lifter in this depressed position.

NOTE:

The tappet adjusting tool is fastened to the cylinder head securely using an allen screw. Make sure that the tool contacts the lifter only, and not the pad.

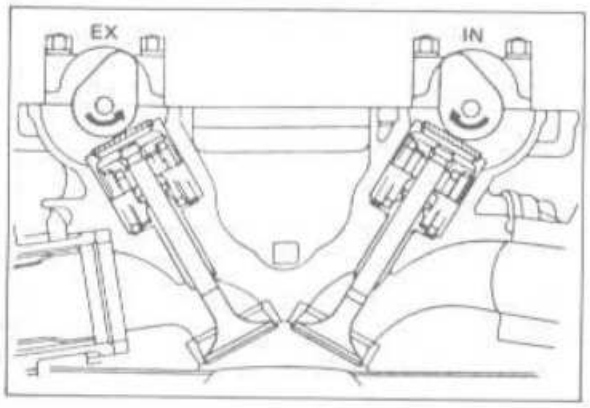
CAUTION:

If the cam lobe touches the tappet adjusting tool, the stress may fracture the cylinder head. DO NOT ALLOW THE CAM LOBE TO CONTACT THE TAPPET ADJUSTING TOOL.



1. Tappet adjusting tool 2. Adjusting pad

4. Carefully rotate the cam so that the pad can be removed. To avoid cam touching the adjusting tool, turn cams as follows: (view from left side of the motorcycle)
   Intake: Carefully rotate CLOCKWISE.
   Exhaust: Carefully rotate COUNTER-CLOCKWISE.



5. Remove the pad from the lifter. There is a slot in the lifter. Use a small screwdriver or other blade and tweezers or a magnetic rod to remove the pad. Note the number on the pad.


1. Adjusting pad

6. Proper pad selection is made as follows: (Use appropriate chart for exhaust or intake valves.)
   a. Find number of original (installed) pad number on chart. Read down on chart.
   b. Find measured valve clearance (from step 1) on chart. Read across.
   c. At the intersection of installed pad number (down) and measured clearance (across) is a new pad number.

EXAMPLE:
Intake valve, installed pad:
No. 250 (read down)
Measured clearance:
0.32 mm (read across)
New pad number: No. 270
(intersection of down & across)

NOTE:
The new pad number is to be used as a guide only. Verify the correctness of this choice in the following step(s).

7. Install the new pad in the lifter. Install the pad with the number down.
8. Remove tappet adjusting tool.
9. Turn crankshaft to rotate cam several rotations. This will set the pad in the lifter.
10. Check valve clearance (step 3). If clearance is incorrect, repeat preceding steps until proper clearance is obtained.
11. Inspect head cover gasket. If bent or torn, replace gasket.
12. Reinstall removed parts in reverse order.

Intake

MEASURED CLEARANCE	INSTALLED PAD NUMBER*																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 ~ 0.05			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.06 ~ 0.10		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.11 ~ 0.15																									
0.16 ~ 0.20	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.21 ~ 0.25	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.26 ~ 0.30	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.31 ~ 0.35	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.36 ~ 0.40	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.41 ~ 0.45	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.46 ~ 0.50	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.51 ~ 0.55	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.56 ~ 0.60	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.61 ~ 0.65	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.66 ~ 0.70	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.71 ~ 0.75	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.76 ~ 0.80	265	270	275	280	285	290	295	300	305	310	315	320													
0.81 ~ 0.85	270	275	280	285	290	295	300	305	310	315	320														
0.86 ~ 0.90	275	280	285	290	295	300	305	310	315	320															
0.91 ~ 0.95	280	285	290	295	300	305	310	315	320																
0.96 ~ 1.00	285	290	295	300	305	310	315	320																	
1.01 ~ 1.05	290	295	300	305	310	315	320																		
1.06 ~ 1.10	295	300	305	310	315	320																			
1.11 ~ 1.15	300	305	310	315	320																				
1.16 ~ 1.20	305	310	315	320																					
1.21 ~ 1.25	310	315	320																						
1.26 ~ 1.30	315	320																							
1.31 ~ 1.35	320																								

VALVE CLEARANCE (engine cold) 0.11~ 0.15mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 270

*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm

Always install pad with number down.

Exhaust

MEASURED CLEARANCE	INSTALLED PAD NUMBER*																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 ~ 0.05				200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305
0.06 ~ 0.10			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.11 ~ 0.15		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.16 ~ 0.20																									
0.21 ~ 0.25	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.26 ~ 0.30	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.31 ~ 0.35	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.36 ~ 0.40	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.41 ~ 0.45	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.46 ~ 0.50	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.51 ~ 0.55	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.56 ~ 0.60	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.61 ~ 0.65	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.66 ~ 0.70	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.71 ~ 0.75	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.76 ~ 0.80	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.81 ~ 0.85	265	270	275	280	285	290	295	300	305	310	315	320													
0.86 ~ 0.90	270	275	280	285	290	295	300	305	310	315	320														
0.91 ~ 0.95	275	280	285	290	295	300	305	310	315	320															
0.96 ~ 1.00	280	285	290	295	300	305	310	315	320																
1.01 ~ 1.05	285	290	295	300	305	310	315	320																	
1.06 ~ 1.10	290	295	300	305	310	315	320																		
1.11 ~ 1.15	295	300	305	310	315	320																			
1.16 ~ 1.20	300	305	310	315	320																				
1.21 ~ 1.25	305	310	315	320																					
1.26 ~ 1.30	310	315	320																						
1.31 ~ 1.35	315	320																							
1.36 ~ 1.40	320																								

VALVE CLEARANCE (engine cold) 10.16 ~0.20 mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 265

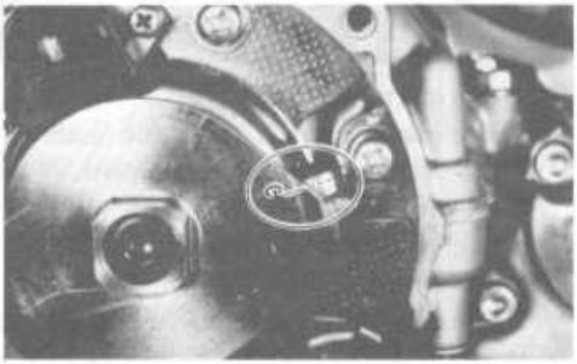
*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm

Always install pad with number down.

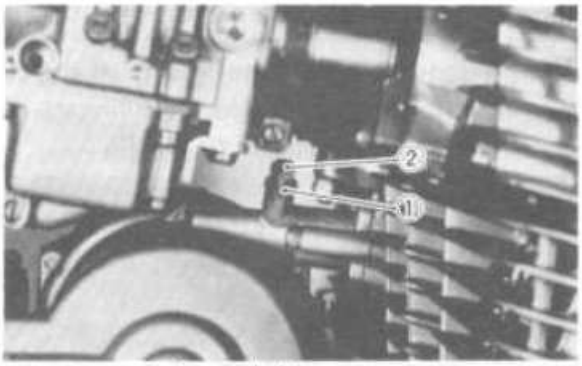
B. Cam Chain Adjustment

The cam chain becomes stretched with use, resulting in improper valve timing and engine noise. To prevent this, the cam chain tensioner must be adjusted regularly.

1. Remove the timing plate cover.
2. Slowly rotate the crankshaft counterclockwise until the "C" mark on the timing plate aligns with the stationary pointer.



3. Loosen the tensioner lock nut and then loosen the stopper bolt. This releases the cam chain tensioner with the proper tension.



1. Lock nut 2. Stopper bolt

4. Tighten the stopper bolt and lock nut.

Stopper bolt torque: 0.6 m-kg (4.3 ft-lb) Lock nut torque: 0.9 m-kg (6.5 ft-lb)

5. Reinstall the timing plate cover.

C. Ignition Timing

1. Ignition timing is checked with a timing light by observing the position of the stationary pointer and the marks stamped on the timing plate.

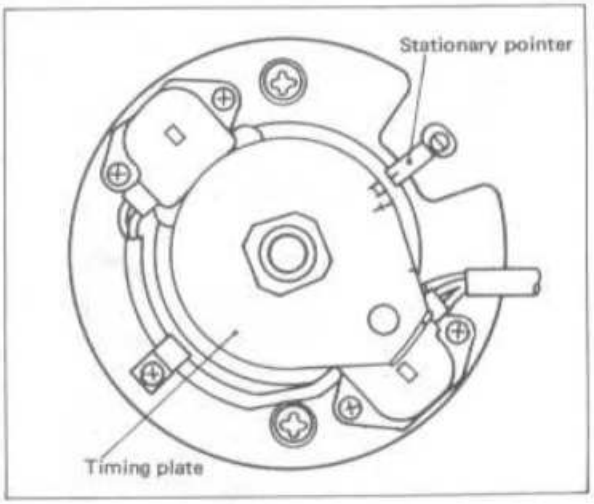
The timing plate is marked as follows: "⊓" ... Firing range for No.1 (L.H.) cylinder "T" ..... Top Dead Center for No. 1 (L.H.) and No. 4 (R.H.) cylinders

2. Connect the timing light to No. 1 (L.H.) spark plug lead wire.
3. Start the engine and keep the engine speed as specified. Use a tachometer to check the engine speed.

Specified engine speed: 1,050 r/min

4. The stationary pointer should be within the limits of "⊓" on the timing plate. If it exceeds the limits or does not steady, check the timing plate for tightness and/or ignition system for damage. (See "CHAPTER 6. ELECTRICAL)

CAUTION: **Never bend the stationary pointer.**



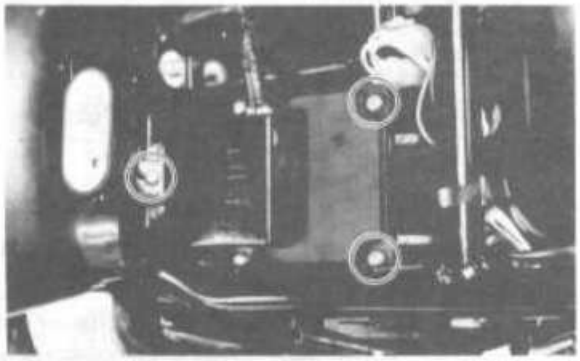
D. Air Cleaner

1. Removal

a. Remove the seat.

b. Remove the tool tray.

c. Remove the air filter case cover by removing the three screws.



d. Pull out the element.



1. Air filter element

2. Cleaning method

Tap the element lightly to remove most of the dust and dirt; then blow out the remaining dirt with compressed air from the inner surface of the element. If element is damaged, replace it.



3. Reassemble by reversing the removal procedure. Check whether the element is seated completely against the case.

4. The air filter element should be cleaned at the specified intervals.

CAUTION:

The engine should never be run without the air cleaner element installed; excessive piston and/or cylinder wear may result.

E. Carburetor

NOTE:

The carburetors are numbered 1, 2, 3, and 4 from the left when viewed from astride the motorcycle.

1. Idle mixture

The idle mixture is set at the factory by the use of special equipment. Not attempt should be made by the dealer to change this adjustment.

2. Synchronization

The seat must be removed and the rear of the tank elevated to gain access to the vacuum connections and throttle adjustment screws.

NOTE:

The valve clearances must be set properly before synchronizing the carburetors.

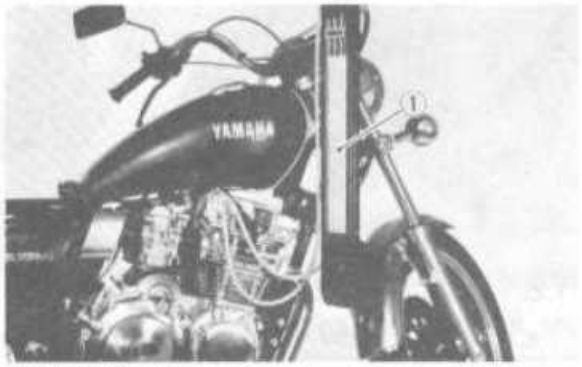
a. Remove the vacuum pipe from the carburetor manifold (No. 3 cylinder) and turn the fuel petcock to "PRI".



b. Remove the rubber caps from the No. 1, 2, and 4 carburetor manifolds.

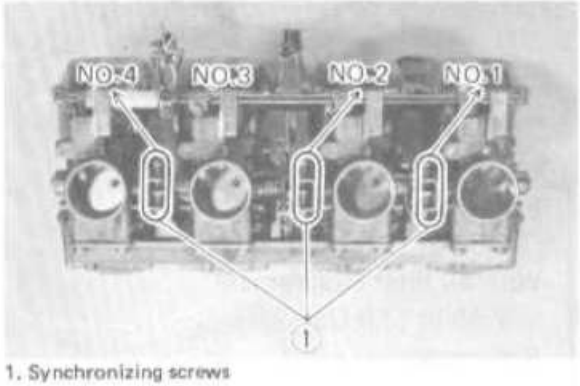


c. Connect the each vacuum gauge hose to its proper carburetor.



1. Vacuum gauge

d. Start the engine and allow it to warm-up for a few minutes. The warm-up is complete when engine responds normally to the throttle opening.
e. Set the engine idle at approximately 1,050 r/min.
f. Each gauge reading will indicate the same if the carburetors are synchronized. The No. 3 carburetor has no synchronizing screw and the other carburetors are to be synchronized to it in order, one at a time.
First, synchronize carburetor No. 1 to carburetor No. 2 by turning the No. 1 synchronizing screw until both gauges read the same.
Second, in the same way synchronize carburetor No. 4 to carburetor No. 3.
Third, by adjusting No. 2 screw to watch No. 3 carburetor reading, No.1 and No.2 carburetors will both change to match No. 3 carburetor.



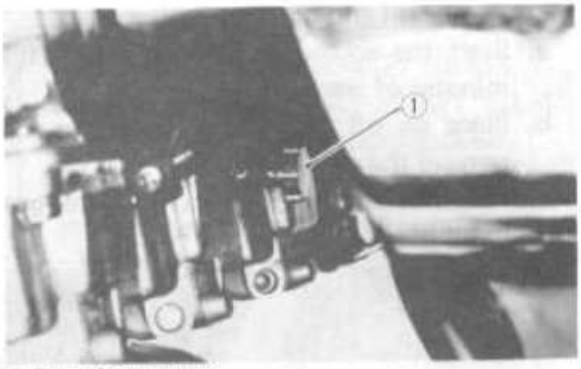
1. Synchronizing screws

3. Idle speed adjustment

NOTE:
Carburetors must be synchronized before setting final idle speed. The idle speed adjustment is made by turning only one throttle stop screw.

a. The engine must be warmed up before setting idle speed.
b. Set the engine idle speed by turning the throttle stop screw in (to increase engine speed) or out (to decrease engine speed).

Standard idle speed: 1,050 ± 50 r/min



1. Throttle stop screw

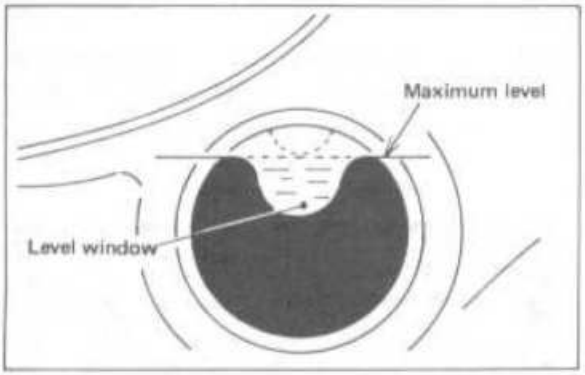
F. Engine Oil

1. Oil level measurement
a. Place the motorcycle on the center stand. Warm up the engine for several minutes.

NOTE:
Be sure the motorcycle is positioned straight up when checking the oil level; a slight tilt toward the side can produce false readings.

b. With the engine stopped, check the oil level through the level window located at the lower part of the right side crankcase cover.

NOTE:
Wait a few minutes until the oil level settles before checking.



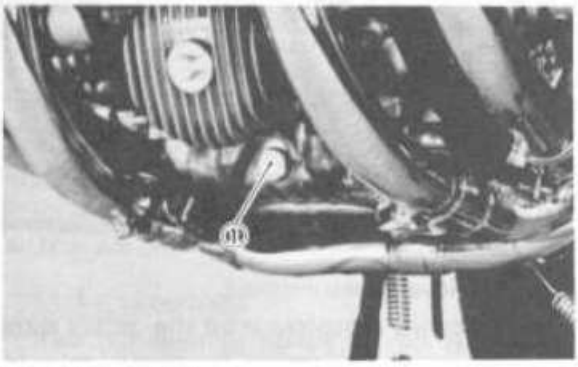
c. The oil level should be maximum level. If the level is lower, add sufficient oil to raise it to the maximum level.

2. Engine oil and oil filter replacement

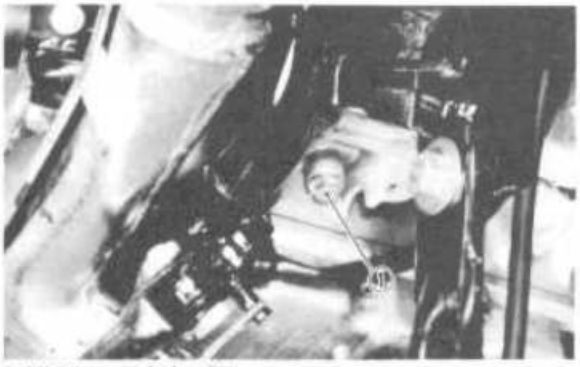
a. Start the engine and stop it after a few minutes of warm-up.

b. Place an oil pan under the engine and remove the oil filler cap.

c. Remove the engine and middle gear drain plugs and drain the oil.

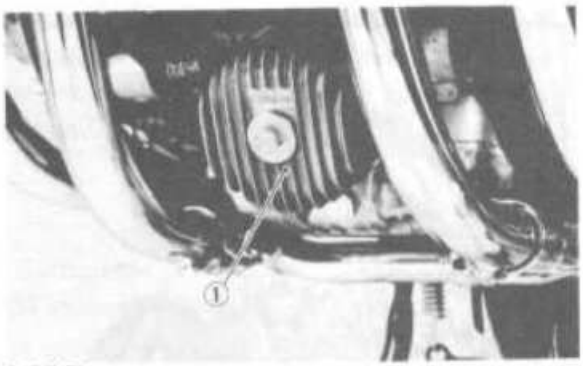


1. Engine drain plug



1. Middle gear drain plug

d. Remove the oil filter bolt and filter element.



1. Oil filter cover

e. Re-install the drain plugs (make sure they are tight).

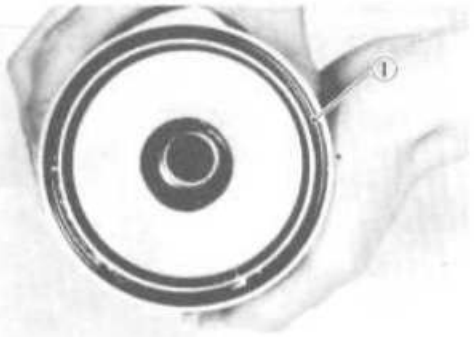
Drain plug torque:	
Middle gear:	1.6 m-kg (11.6 ft-lb)
Engine:	4.3 m-kg (31.0 ft-lb)

f. Install the new oil filter element, new "O-ring" and filter cover, tighten the oil filter bolt.

Oil filter bolt torque:
1.5 m-kg (11.0 ft-lb)

NOTE:

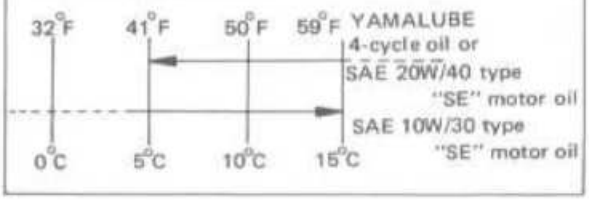
When installing the filter cover, make sure the "O-ring" is positioned properly and insert the locating projection on it into the corresponding guides on the crankcase.



1. Proper O-ring position

g. Add oil through the oil filler hole.

Periodic oil change:
2.35 lit (2.5 US qt.)
With oil filler replacement:
2.65 lit (2.8 US qt.)
Recommended oil:





h. After replacement of the engine oil, and/or oil filter, be sure to check for oil leakage. The oil level indicator light should go off after the oil is filled.

CAUTION:

If the indicator light flickers or remains on, the oil level switch may be damaged. Refer to "CHAPTER 6" for corrective action.

G. Final Gear Oil

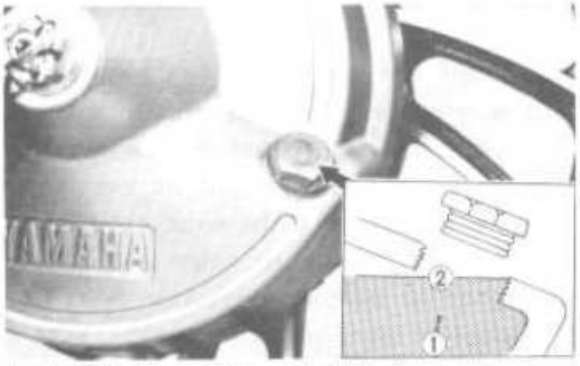
1. Oil level measurement

a. Place the motorcycle on a level place and place it on the center stand. The engine should be cool (at atmospheric temperature).

b. Remove the oil filler cap and check the oil level whether it is to the hole brim. If it is not up to this level, replenish oil.

CAUTION:

Take care not to allow foreign material to enter the final gear case.



1. Final gear oil 2. Correct oil level

2. Gear oil replacement

a. Place an oil pan under the final gear case.

b. Remove the final gear oil filler cap and the drain plug, and drain the oil.



1. Final gear drain plug

c. Reinstall and tighten the final gear drain plug.

d. Fill the gear case to the specified level.

Oil capacity: 0.20 lit (0.21 US qt.)
Recommended oil: SAE 80 API "GL-4" Hypoid gear oil

If desired, an SAE 80W/90 hypoid gear oil may be used for all conditions.

e. Reinstall the filler cap securely.

H. Compression Pressure Measurement

Insufficient compression pressure will result in performance loss and may indicate leaking valves or worn or damaged piston rings.

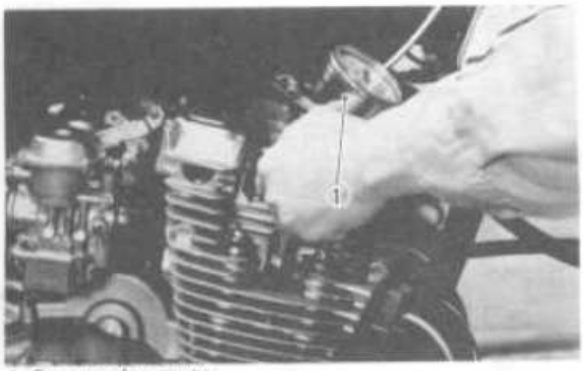
Procedure:

1. Make sure the valve clearance is correct.
2. Remove the headlight fuse from the fuse box.
3. Warm up the engine 2 ~ 3 minutes. Stop the engine.
4. Remove the all spark plugs.
5. Install a compression check gauge.
6. Turn over the engine with the electric starter (make sure the battery is fully charged) with the throttle wide open until the pressure indicated on the gauge does not increase further.

Compression pressure (at sea level):
Standard . . . . . 11 kg/cm² (156 psi)
Minimum . . . . . 9 kg/cm² (128 psi)
Maximum . . . . . 12 kg/cm² (171 psi)

WARNING:

When cranking the engine, ground the removal spark plug wires to prevent sparking.



1. Compression gauge



1. Lock nut 2. Adjuster

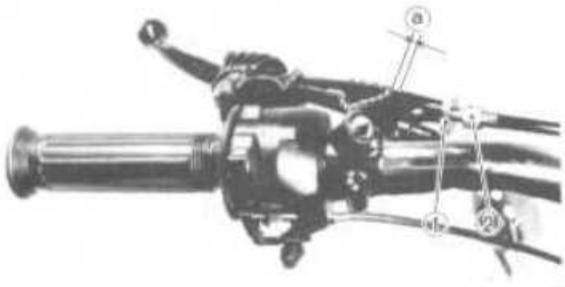
7. If the pressure is too low, squirt a few drops of oil into the cylinder being measures. Measure compression again. If there is a higher reading than before (without oil), the piston rings may be worn or damaged. If the pressure remains the same after measuring with the oil, either or both the rings and valves may be the cause.
8. Check each cylinder. Compression pressure should not vary more than specified value from one cylinder to any other cylinder.

Difference in gauge reading:
Less than 1 kg/cm² (14 psi)

I. Clutch Adjustment

Free play adjustment

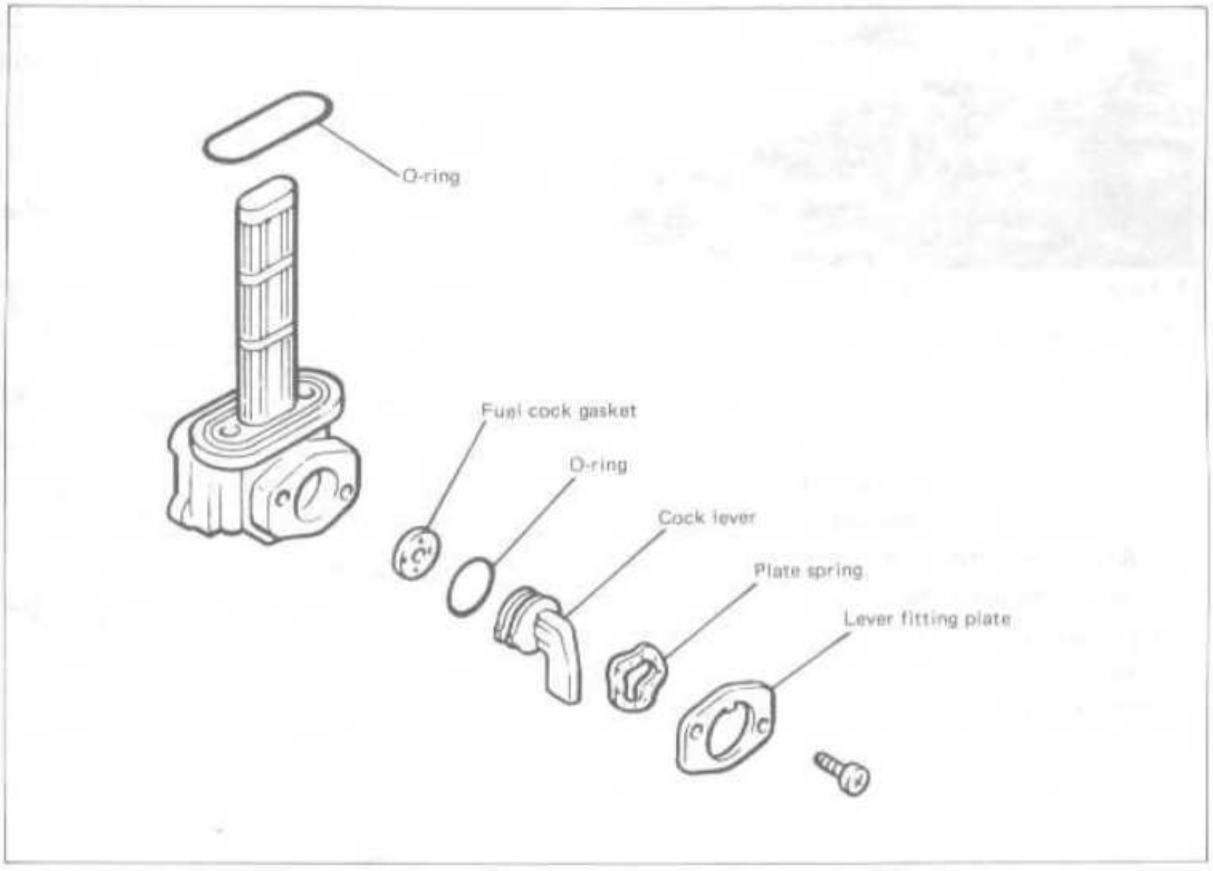
a. Loosen either the handle lever adjuster lock nut or the cable length adjuster lock nut.
b. Turn the cable length adjuster either in or out until proper lever free play is achieved.



1. Lock nut 2. Adjuster a. 2~3 mm (0.08~0.12 in)

CHASSIS

A. Fuel Petcock



If the fuel petcock is leaking or excessively contaminated, it should be removed from the fuel tank and inspected.

1. Remove the fuel tank and position it so that fuel will not spill when the petcock is removed.
2. Remove the petcock and inspect the filter screen. Replace the filter if seriously contaminated.
3. Remove the screws on the front and rear of the petcock and remove the plate, gaskets, lever, and diaphragm.
4. Inspect all components and replace any that are damaged. If the diaphragm is in any way damaged, or the petcock body gasket surfaces scratched or corroded, the petcock assembly must be replaced. If there is abrasive damage to any component, the fuel tank must be drained and flushed.
5. Reassemble the petcock and install it on the fuel tank.

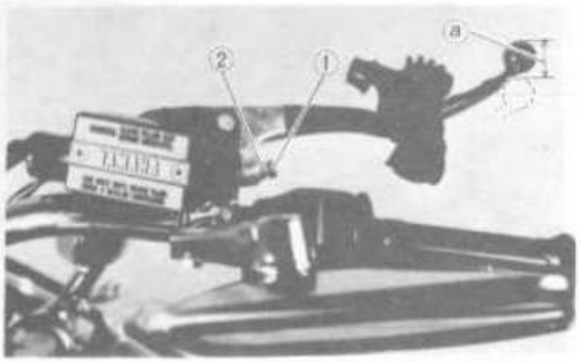
B. Front and Rear Brake

1. Brake adjustment

a. Front brake lever free play adjustment.
The brake can be adjusted by simply adjusting the free play of the brake lever. The piston in the caliper moves forward as the brake pad wears out, automatically adjusting the clearance between the brake pads and brake disc.

CAUTION:

Proper lever free play is essential to avoid excessive brake drag.



1. Adjuster 2. Lock nut a. 5~8 mm (0.2~0.3 in)

1) Loosen the adjuster lock nut on the brake lever.
2) Turn the adjuster so that the brake lever movement at the lever end is 5~ 8 mm (0.2 ~ 0.3 in) before the adjuster contacts the master cylinder piston.
3) After adjusting, tighten the lock nut.

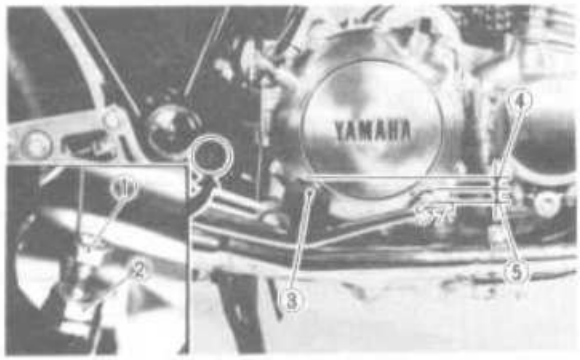
b. Rear brake pedal height adjustment

1) Loosen the adjuster lock nut (for pedal height).
2) By turning the adjuster bolt clockwise or counterclockwise, adjust the brake pedal position so that its top end is approximately 20 mm (0.78 in) below the footrest top end.
3) Secure the adjuster lock nut.

WARNING:

After adjusting the pedal height, the brake pedal free play should be adjusted.

c. Rear brake pedal free play adjustment



1. Adjuster bolt (for pedal height) 2. Lock nut 3. Footrest 4. Pedal height 20 mm (0.8 in) 5. Free play 20~30 mm (0.8~1.2 in)

Turn the adjuster on the brake rod clockwise or counterclockwise to provide the brake pedal end with a free play of 20 ~ 30 mm (0.8 ~ 1.2 in).

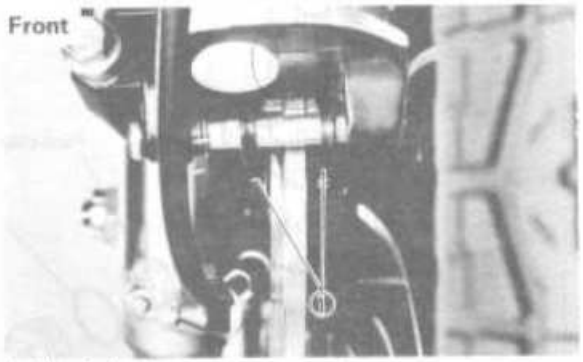
NOTE:

Check to see whether or not the brake light operates correctly after adjusting.

2. Front brake pad and rear brake shoe check

a. Front brake pad

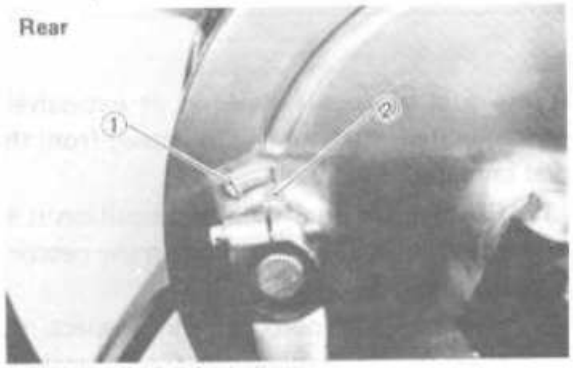
To check, look at the pad in front. If any pad is worn to the wear limit, replace the both pads in the caliper.



1. Wear indicator

b. Rear brake shoe

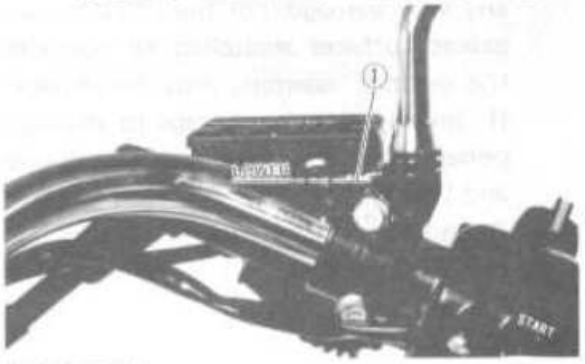
To check, see the wear indicator position while depressing the brake pedal. If the indicator reaches to the wear limit line, replace the shoes.



1. Wear limit 2. Wear indicator

3. Brake fluid

Insufficient brake fluid may allow air to enter the brake system, possibly causing the brake to become ineffective. Check the brake fluid level and replenish when necessary observing these precautions:



1. Lower level

a. Use only the designated quality brake fluid; otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.

Recommended brake fluid: DOT # 3

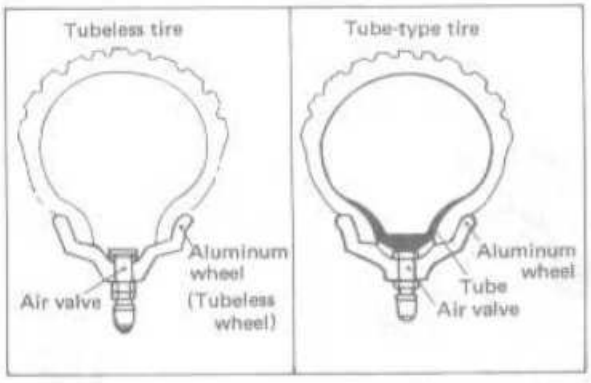
b. Refil with the same type and brand of brake fluid; mixing fluids may result in a harmful chemical reaction and lead to poor performance.
c. Be careful that water or other contamination does not enter the master cylinder when refilling. Water will significantly lower the boiling point and may result in vapor lock.
d. Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

C. Tubeless Tires and Aluminum Wheels

This motorcycle is equipped with aluminum wheels designed to be compatible with either tube or tubeless tires. Tubeless tires are installed as standard equipment.

WARNING:

Do not attempt to use tubeless tires on a wheel designed for use only with tube-type tires. Tire failure and personal injury may results from sudden deflation.
Tube-type Wheel — Tube-type tires only
Tubeless-type Wheel — Tube-type or Tubeless tires
When using tube-type tires, be sure to install the proper tube also.



To insure maximum performance, long service, and safe operation, note the following precautions:

1. Check tire pressure, before riding, adjust as necessary.
2. Before operation, always check the tire surfaces for wear and/or damage; look for cracks, glass, nails, metal fragments, stones, etc. Correct any such hazard before riding.
3. Always inspect the aluminum wheels before a ride. Place the motorcycle on the center stand and check for cracks, bends or warpage of the wheels. Do not attempt even small repairs to the wheel. If a wheel is deformed or cracked, it must be replaced.
4. Tires and wheels should be balanced whenever either one is changed or replaced. Failure to have a wheel assembly balanced can result in poor performance, adverse handling characteristics, and shortened tire life.
5. After installing a tire, ride conservatively to allow the tire to seat itself on the rim properly. Failure to allow proper seating may cause tire failure resulting in damage to the motorcycle and injury to the rider.
6. After repairing or replacing a tire, check to be sure the valve stem lock nut is securely fastened. If not, torque it as specified.

Tightening torque: 0.15 m-kg (1.1 ft-lb)

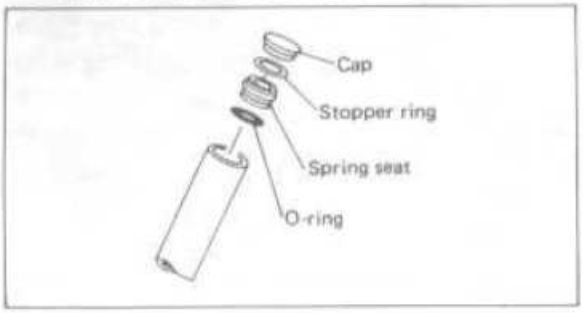
D. Front Fork Oil Change

WARNING:

Securely support the motorcycle so there is no danger of it falling over.

1. Raise the motorcycle or remove the front wheel so that there is no weight on the front end of the motorcycle. Remove the handlebar if necessary.
2. Remove the rubber cap from the top of each fork.
3. The spring seat and fork spring are retained by a stopper ring (spring wire circlip). It is necessary to depress the

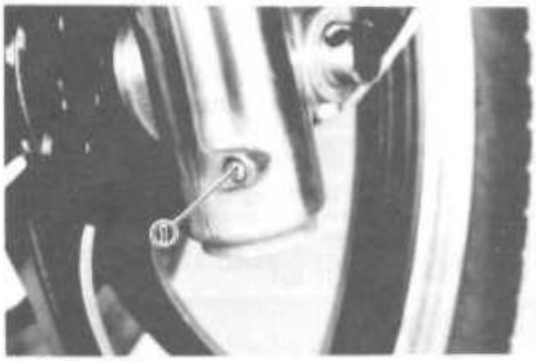
spring seat and fork spring to remove the stopper ring. Remove the stopper ring by carefully prying out one end with a small screwdriver.



4. Place an open container under each drain hole. Remove the drain screw from each outer tube.

WARNING:

Do not allow oil to contact the disc brake components. If any oil should contact the brake components it must be removed before the motorcycle is operated. Oil will cause diminished braking capacity and will damage the rubber components of the brake assembly.



1. Drain screw

5. When most of the oil has drained, slowly raise and lower the outer tubes to pump out the remaining oil.
6. Inspect the drain screw gasket. Replace if damaged. Reinstall the drain screw.
7. Pour the specified amount of oil into the fork inner tube.

Front fork oil (each fork):
262 cc (9.24 oz)
Recommended oil:
Yamaha Fork Oil 10wt or equivalent

9. After filling, slowly pump the forks up and down to distribute the oil.
10. Inspect the "O-ring" on the spring seat. Replace "O-ring" if damaged.
11. Reinstall the spring seat, stopper ring and rubber cap.

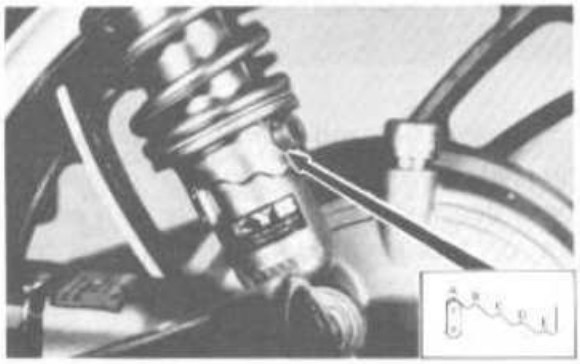
CAUTION:

Always use a new stopper ring (spring wire circlip).

E. Rear Shock Absorber

If the spring seat is raised, the spring becomes stiffer and if lowered, it becomes softer.

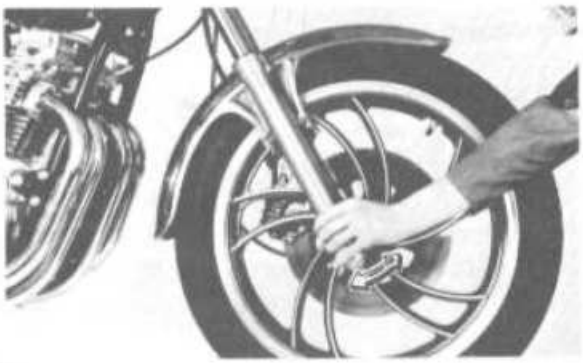
Standard position	A
A. position	Softest
E. position	Stiffest



F. Steering Head Adjustment

The steering assembly should be checked periodically for looseness.

1. Raise the front end of the motorcycle so that there is no weight on the front wheel.
2. Grasp the bottom of the forks and gently rock the fork assembly backward and forward, checking for looseness in the steering assembly bearings.



3. If there is looseness in the steering head, loosen the steering stem and front fork pinch bolts and steering fitting bolt.
4. Use a steering nut wrench to loosen top steering fitting nut. The top nut serves as a lock nut.
5. Tighten the lower steering fitting nut until the steering head is tight, but does not bind when forks are turned.
6. Retighten the top steering fitting nut, steering fitting bolt and steering stem and front fork pinch bolts, in that order.
7. Recheck steering adjustment to make sure there is no binding when the forks are moved from lock to lock. If necessary, repeat adjustment procedure.

G. Cable Inspection and Lubrication

WARNING:

Damage to the outer housing of the various cables, may cause corrosion and often free movement will be obstructed. An unsafe condition may result so replace such cables as soon as possible.

1. If the inner cables do not operate smoothly, lubricate or replace them.

Recommended lubricant:
Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

H. Throttle Cable and Grip Lubrication

The throttle twist grip assembly should be greased when the cable is lubricated, since the grip must be removed to get at the end of the throttle cable. Two screws clamp the throttle housing to the handlebar. Once these two are removed, the end of the cable can be held high to pour in several drops of lubricant. With the throttle grip disassembled, coat the metal surface of the grip assembly with a suitable all-purpose grease to cut down friction.

I. Rear Arm Pivot Bearings

The swing arm must pivot freely on its bearings but not have any excess play. Check and adjust pivot bearings if necessary. (Refer to CHAPTER 5. SWING ARM).

J. Brake and Change Pedals/Brake and Clutch Levers

Lubricate the pivoting parts of each lever and pedal.

Recommended lubricant:
Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

K. Center and Side Stand Pivots

Lubricate the center and side stands at their pivot points.

Recommended lubricants:
Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

ELECTRICAL

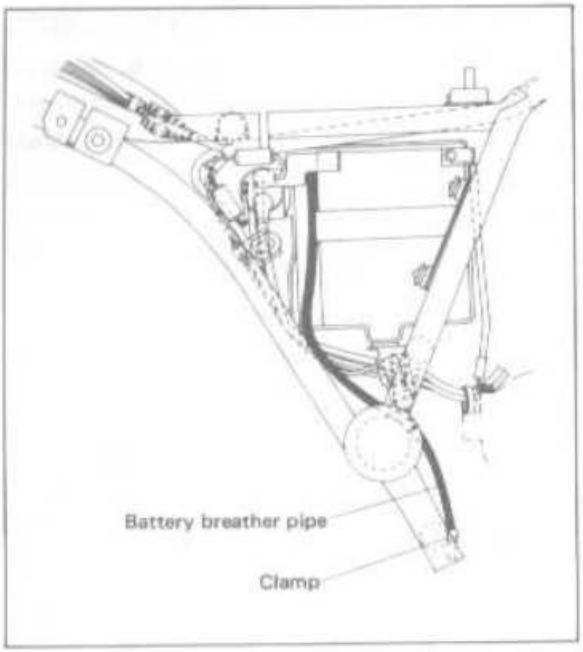
A. Battery

1. The fluid level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.

CAUTION:

Normal tap water contains minerals which are harmful to a battery; therefore, refill only with distilled water.

2. Always make sure the connections are correct when installing the battery. Make sure the breather pipe is properly connected, properly routed, and is not damaged or obstructed.



CAUTION:

The battery must be charged before using to insure maximum performance. Failure to properly charge the battery before first use, or low electrolyte level will cause premature failure of the battery.
Charging current: 1.2 amps/10 hrs or until the specific gravity reaches 1.280 at 20°C (68°F)

WARNING:

Battery electrolyte is poisonous and dangerous, causing severe burns, etc. Contains sulfuric acid. Avoid contact with skin, eyes or clothing.
Antidote: EXTERNAL-Flush with water. INTERNAL—Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately.
Eyes: Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gasive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in closed space. Always shield eyes when working near batteries.
KEEP OUT OF REACH OF CHILDREN.

B. Spark Plug

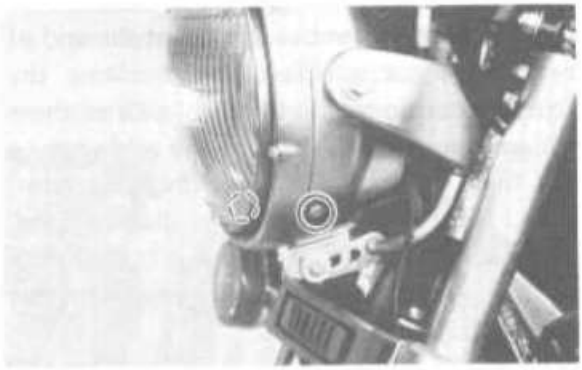
1. Check the electrode condition and wear, insulator color and electrode gap.
2. Use a wire gauge for measuring the plug gap.
3. If the electrodes become too worn, replace the spark plug.
4. When installing the plug, always clean the gasket surface. Wipe off any grime that might be present on the surface of the spark plug, and torque the spark plug properly.

Standard spark plug:
BP7ES (NGK) or W22EP (ND)
Spark plug gap:
0.7 ~ 0.8 mm (0.028 ~ 0.032 in)
Spark plug tightening torque:
2.0 m-kg (14.5 ft-lb)

C. Headlight

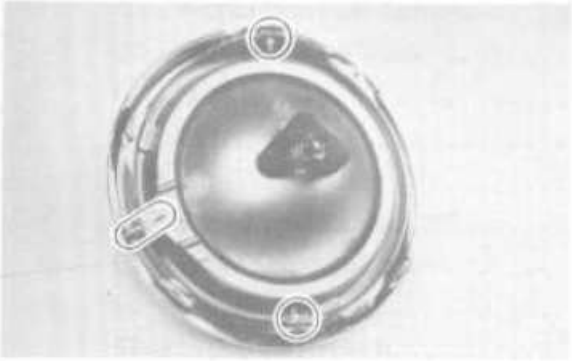
1. Headlight bulb replacement

a. Remove the 2 screws holding the light unit assembly to the headlight body.

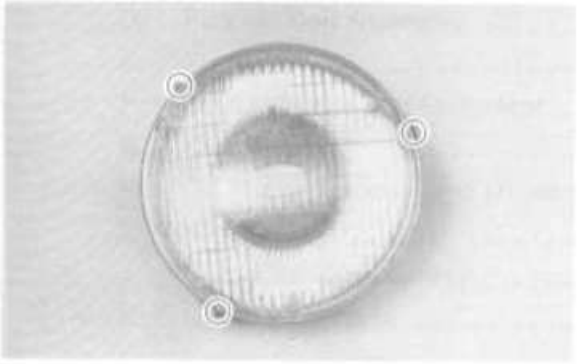


b. Disconnect the lead wires and remove the light unit assembly.

c. Remove the top and bottom fitting screws and the horizontal adjusting screw. Remove the light unit assembly from the headlight rim.



d. Remove the sealed beam unit holding screws. Remove the unit retaining ring and the defective unit.



e. Slip a new sealed beam unit into position and secure it with the retaining ring and install it into the headlight rim.

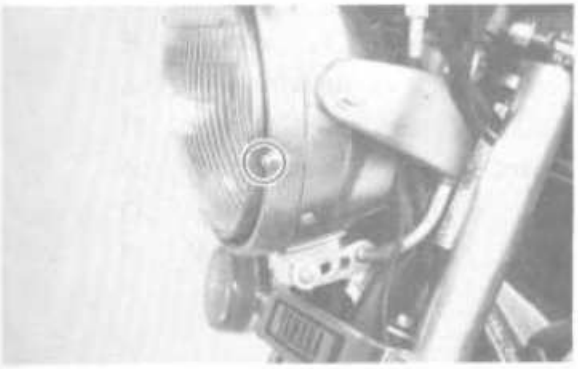
f. Reinstall the light unit assembly to the headlight body. Adjust the headlight beam.

2. Headlight beam adjustment

a. Horizontal adjustment

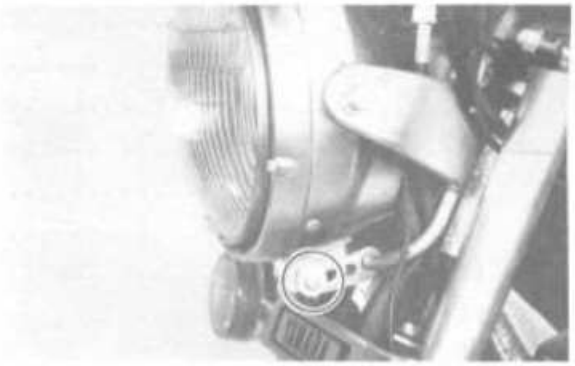
To adjust the beam to the right, turn the adjusting screw clockwise.

To adjust the beam to the left, turn the screw counterclockwise.



b. Vertical adjustment:

Loosen the adjusting screw under the headlight body. Adjust vertically by moving the headlight body. When proper adjustment is determined, retighten the adjusting screw.



D. Fuse

The fuse block is located under the seat. If any fuse is blown, turn off the ignition switch and the switch in the circuit in question and install a new fuse of proper amperage. Then turn on the switches, and see if the electrical device operates. If the fuse immediately blows again, check the circuit in question (refer to "CHAPTER 6. ELECTRICAL").

WARNING:

Do not use fuses of a higher amperage rating than those recommended. Substitution of a fuse of improper rating can cause extensive electrical system damage and possible fire.

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CHAPTER 3. ENGINE OVERHAULING

ENGINE REMOVAL

NOTE:

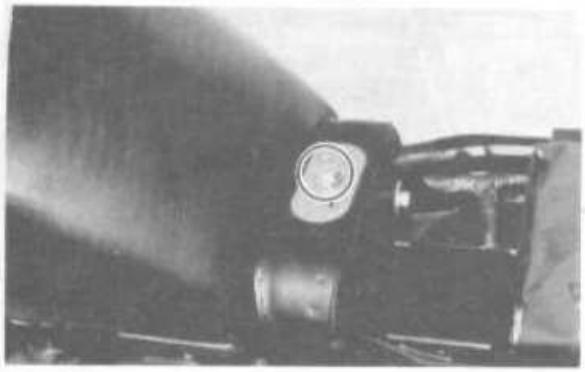
It is not necessary to remove the engine in order to remove the cylinder head, cylinder, or pistons.

A. Preparation for Removal

1. All dirt, mud, dust and foreign material should be thoroughly removed from the exterior of the engine before removal and disassembly. This will help prevent any harmful foreign material from engine oil.
2. Before the engine removal and disassembly, be sure that you have the proper tools and cleaning equipment so that you can perform a clean and efficient job.
3. During disassembly of the engine, clean and place all of the parts in trays in order of disassembly. This will speed up assembly time and help insure correct reinstall-action of all the engine parts.
4. Place the motorcycle on its center stand. Start the engine and allow it to warm up. Stop the engine and drain the engine and middle gear oil.
5. Remove the oil filter element from the crankcase.
6. Remove the left and right side covers.

B. Seat and Fuel Tank

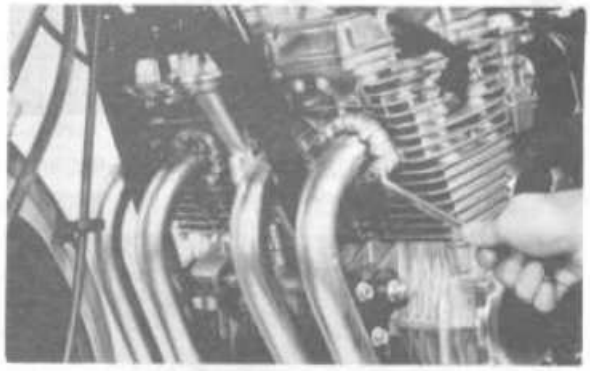
1. Turn the fuel petcock to "ON".
2. Remove the seat and the fuel tank holding bolt. Lift the rear end of the fuel tank and disconnect the fuel pipes and vacuum pipe from the petcock.



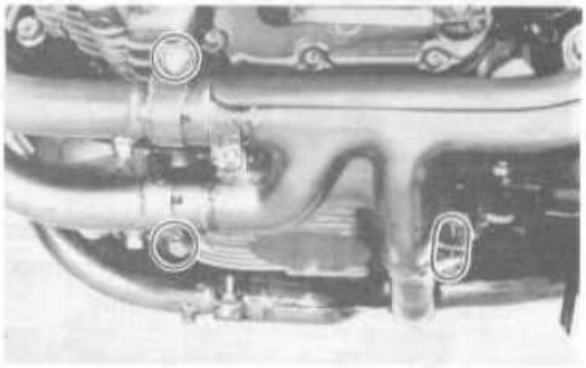
3. Remove the tool tray.

C. Mufflers

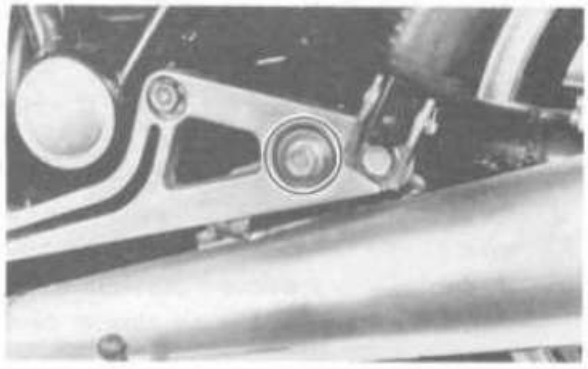
1. Remove the rear brake pedal.
2. Remove the exhaust pipe holding nuts from the cylinder head.



3. Loosen the calmp bolts securing the muffler joints.



4. Remove the bolts holding the right and left mufflers to the muffler bracket and remove the left and right mufflers.



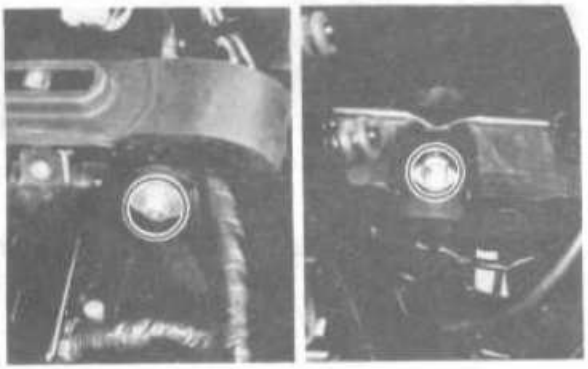
D. Battery Case

1. Remove the negative battery cable from the battery terminal then remove the positive battery plate. Remove the battery.



1. Positive battery plate

2. Remove the battery case holding bolts and remove the battery case.

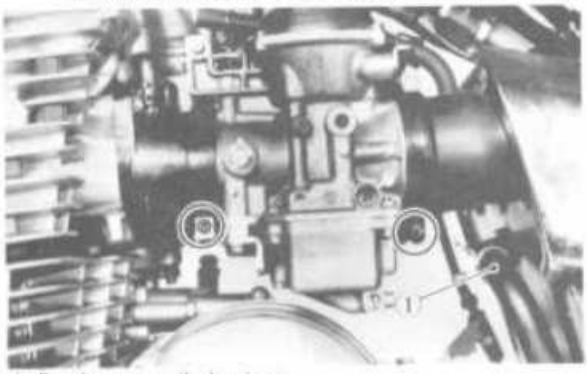


E. Air Cleaner Case

1. Remove the ignitor unit mounting board securing screw and disconnect all connectors. Remove the board assembly.

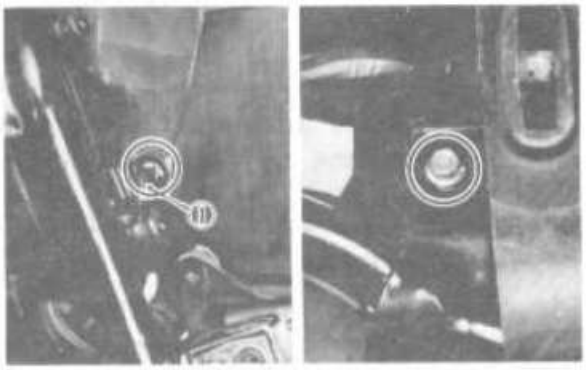


2. Remove the clamps holding the carburetors to the air cleaner case and intake manifolds. Remove the crankcase ventilation hose at the air cleaner case.



1. Crankcase ventilation hose

3. Remove the bolts holding the air cleaner case to the frame (left and upper)

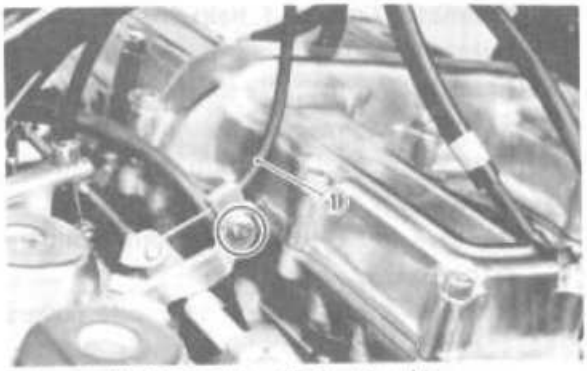


1. Engine ground wire

NOTE:

The engine ground wire is secured together with left side holding bolt.

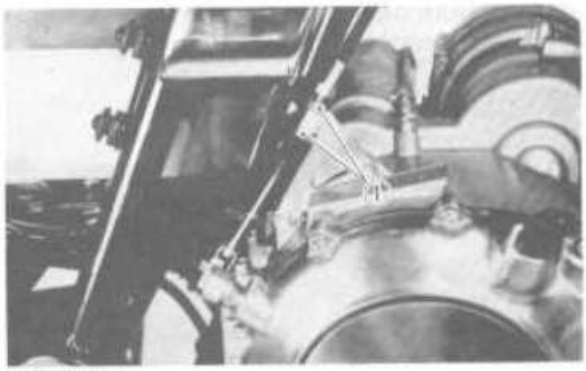
4. Remove the starter (CHOKE) cable from the carburetor.
5. Remove the air cleaner joint rubbers and pull the carburetor assembly to the rear.
6. Disconnect the throttle cable from the carburetor throttle lever and remove the carburetor assembly to the right.



1. Starter (CHOKE) cable 2. Throttle cable

F. Wiring and Cables

1. Disconnect the clutch cable at the crankcase side.

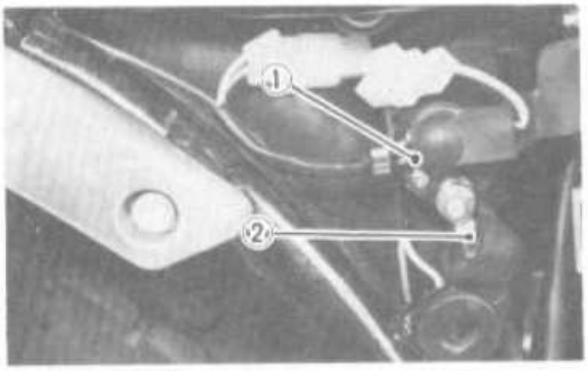


1. Lock nut

2. Remove the spark plug lead wires and the tachometer cable.

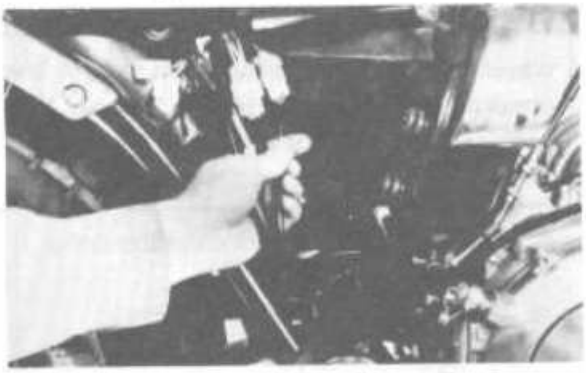


3. Disconnect the electric starter cable at the starter relay switch.



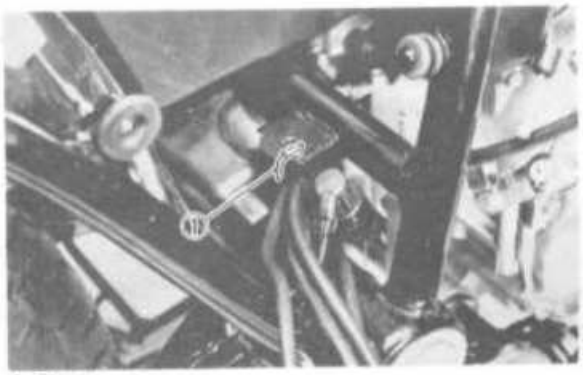
1. Starter relay switch
2. Electric starter cable

4. Disconnect the pick-up coil and A.C.G. lead wire couplers.
   Position the disconnect lead wires so that they can be safely removed.



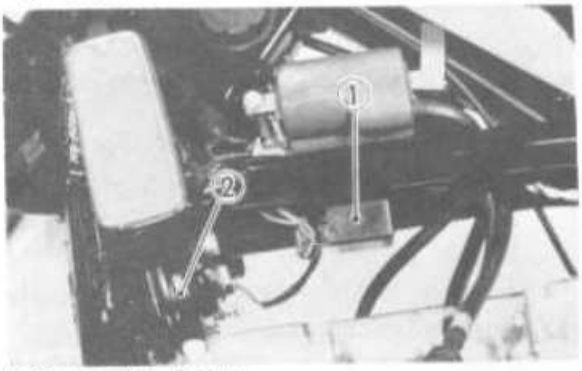
CAUTION:

The A.C.G. lead, starter cable, and pick-up lead are clamped at the upper cross tube of the frame. Do not forget to remove this clamp before removing the engine.



1. Clamp

5. Remove the horn and flasher relay.



1. Flasher relay 2. Horn

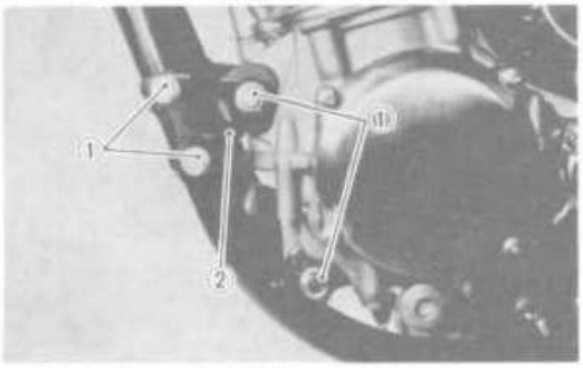
G. Drive Shaft Joint

1. Remove the coil spring holding the rubber boot.
2. Pull the rubber boot from the drive shaft coupling to expose the joint bolts.
3. Remove the joint bolts on the drive shaft coupling.



H. Engine Removal

1. Remove the front engine mounting bolts and nuts. Remove the brackets.

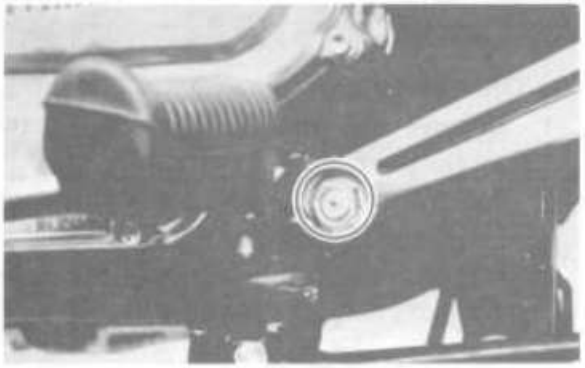


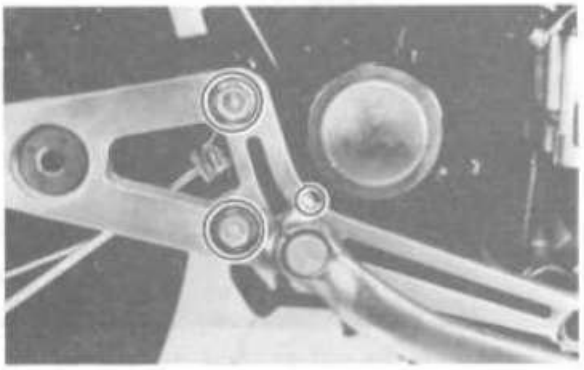
1. Front engine mounting bolts 2. Engine stay

NOTE:

It is advisable to hold the engine with a suitable garage jack before removing the engine mounting bolts and nuts.

2. Remove the rear engine mounting bolt and right and left footrests. Remove the brake pedal and right side muffler bracket holding bolt and remove the muffler bracket assembly.





3. Slide the engine forward slightly and remove the engine to the right.

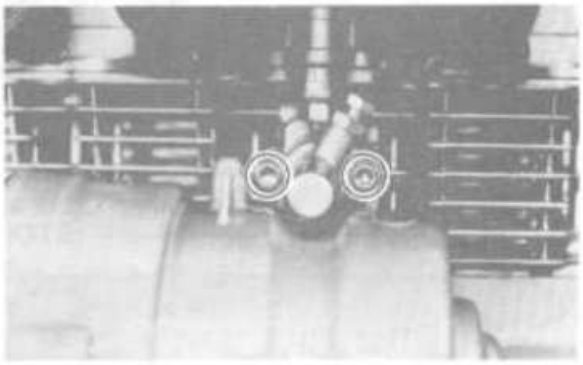
NOTE:

Position a box or other support to the right side of the motorcycle for the assistance when removing the engine.

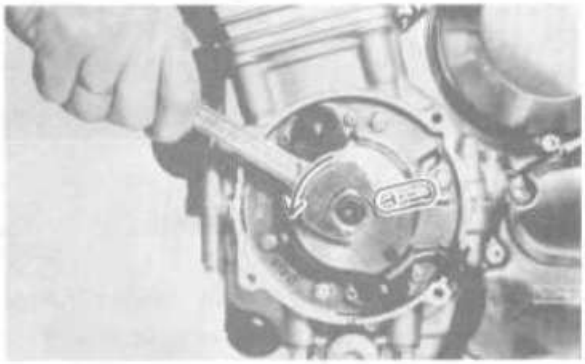
ENGINE OVERHAUL

A. Cylinder Head and Cylinder

1. Remove the cylinder head cover.
2. Remove the left crankcase cover (pick-up coil cover).
3. Remove the cam chain tensioner.



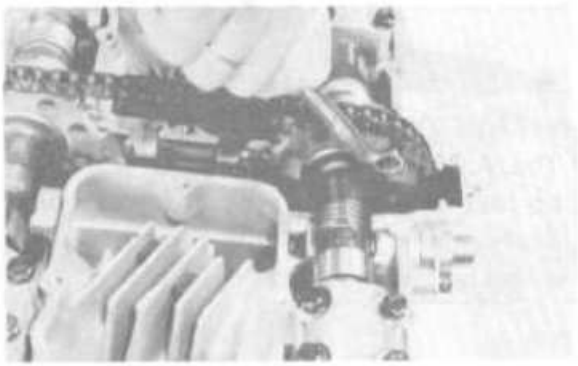
4. Use a 19 mm wrench on the timing plate flats to rotate the crankshaft counter-clockwise until the engine is at T.D.C.



CAUTION:

Never use an allen wrench to rotate the crankshaft. Always use the 19 mm flats provided on the timing plate to rotate this engine.

5. Remove the four cam sprocket bolts.

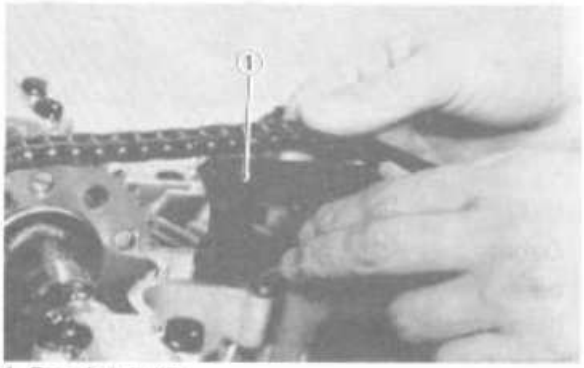


6. Slip each sprocket off its mounting boss on the cam.

—CAUTION:—

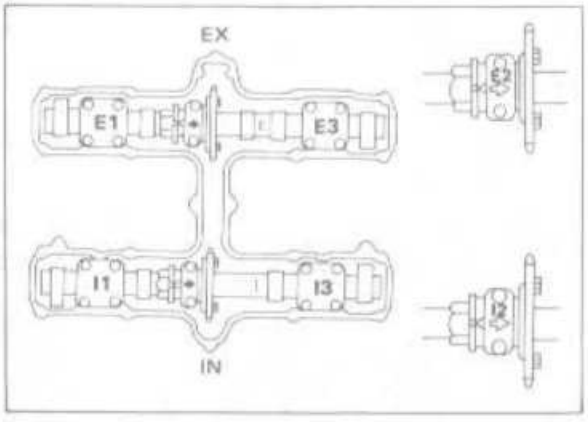
From this point on, do not rotate the cam shaft or valve damage may occur. On this, it is not necessary to break the cam chain. However, it can be broken if so desired. It is easier to disassemble the engine without separating the chain.

7. Remove the cam chain guide.

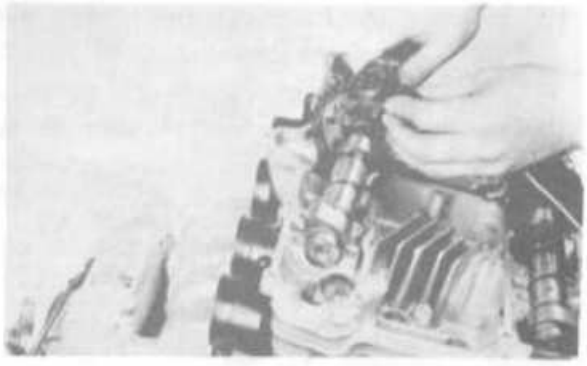


1. Cam chain guide

8. Remove the cam caps. Note the location of the cam caps. The caps for the intake cam shaft are identified I-1 through I-3. The exhaust cam caps are identified E-1 through E-3. Directional arrows are cast on each cap and point toward the clutch side.



9. Fasten safety wire to the cam chain to prevent its falling into the crankcase cavity.
   Slide the cams and sprockets from under the chain and remove the cams and sprockets.

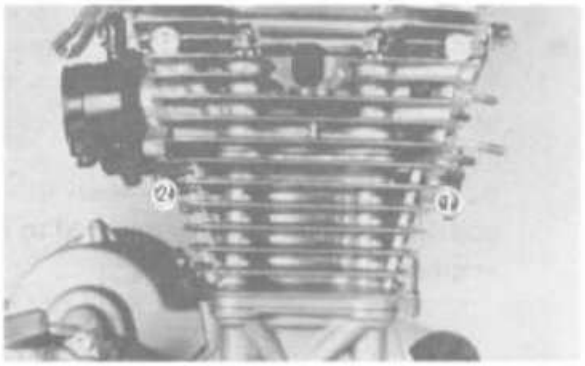


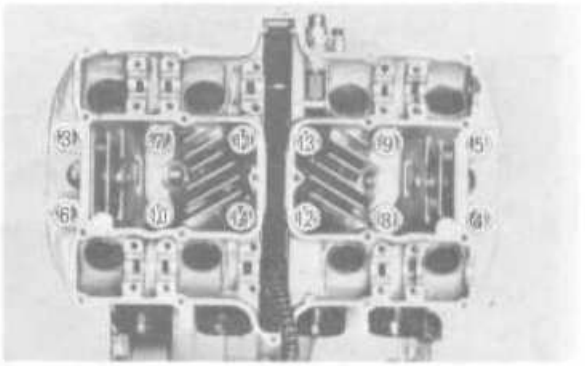
10. Remove the front cam chain guide.



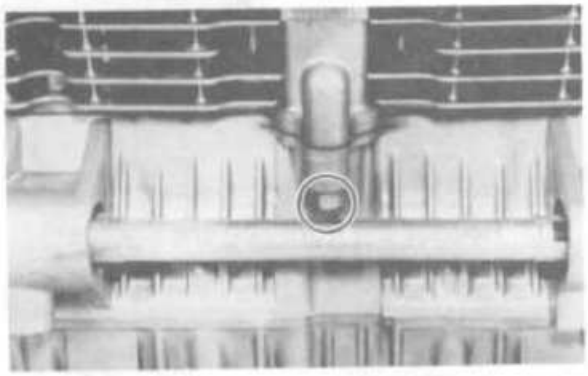
1. Front cam chain guide

11. Remove the spark plugs.
12. Remove the cylinder head bolts and nuts in the numerical order as shown. Start by loosening each nut 1/2 turn until all of the nuts are loose. Remove the cylinder head.

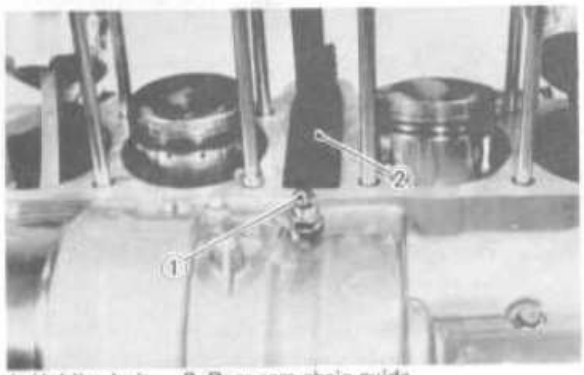




13. Remove the front cylinder holding nut and remove the cylinder assembly. It may be necessary to tap the cylinder lightly to loosen it from the base gasket.



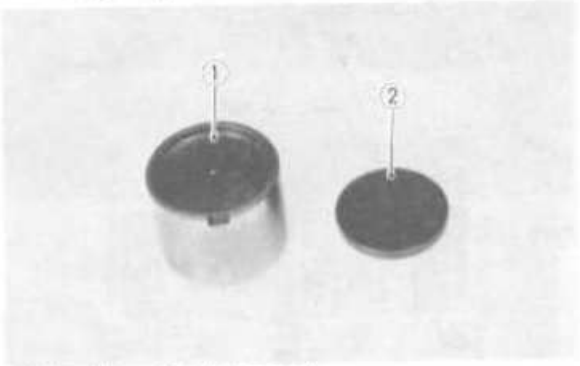
14. Remove the rear cam chain guide by loosening the holding bolt.



1. Holding bolt 2. Rear cam chain guide

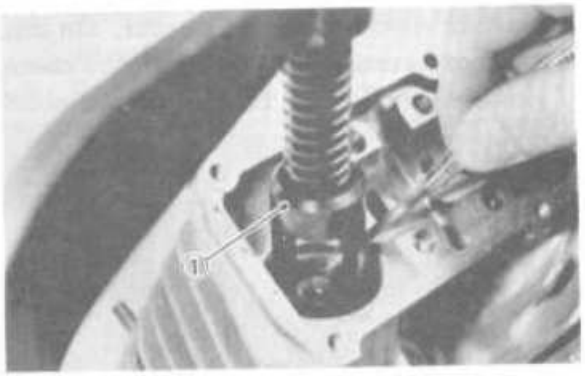
B. Cylinder Head Disassembly

1. Remove the valve lifters and pads. Be careful not to scratch the lifter bodies or lifter bores in the cylinder head.
   Be very careful to identify each lifters position so that it may be returned to its original place.



1. Valve filter 2. Adjusting pad

2. Mount the valve spring compressor on the head and depress each valve spring. Take out the retainer and valve spring with tweezers.

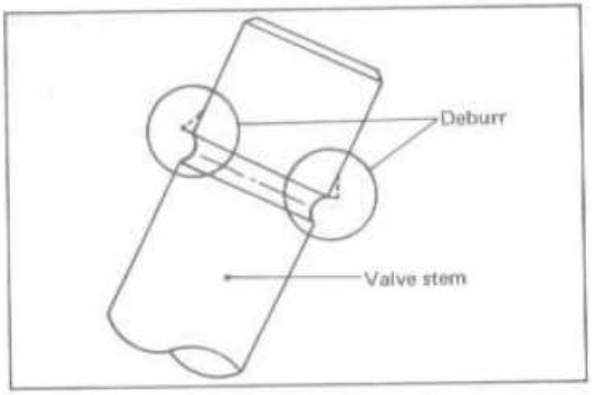


1. Valve spring compressor

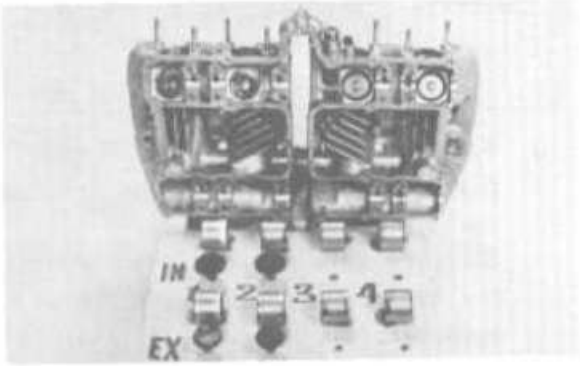
3. Remove valves.

NOTE:

Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.

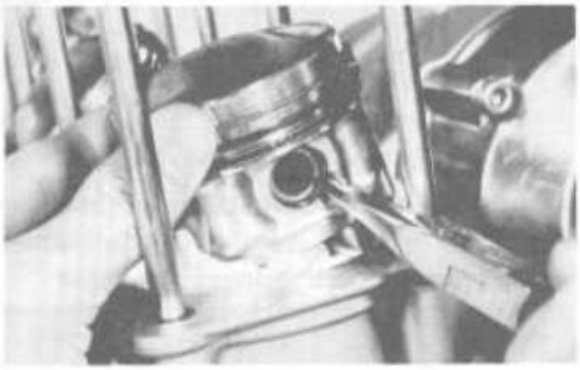


4. Use a small box to hold the parts and identify the original position of each lifter and valve. Be very careful not to mix the location of these components.



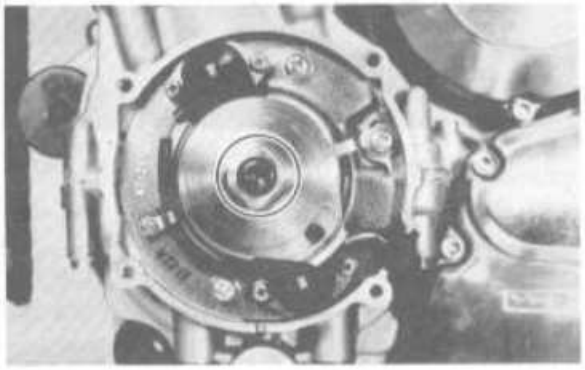
C. Piston

1. Make each piston to aid in reassembly.
2. Place a clean towel or rag into the crankcase to keep circlips and material from falling into the engine.
3. Remove piston pin clips, piston pins, and pistons.

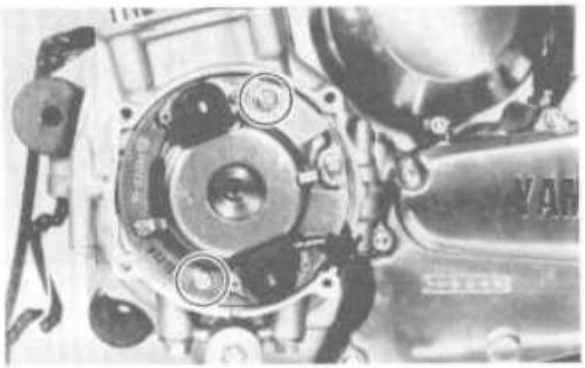


D. Pick-up Coil Assembly

1. Remove the allen bolt that holds the timing plate.



2. Remove the pick-up coil securing screws and remove the pick-up coil assembly.

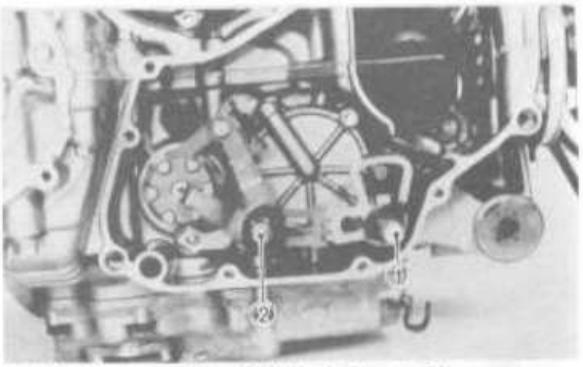


E. Shifter

1. Remove the change pedal.
2. Remove the left crankcase cover.

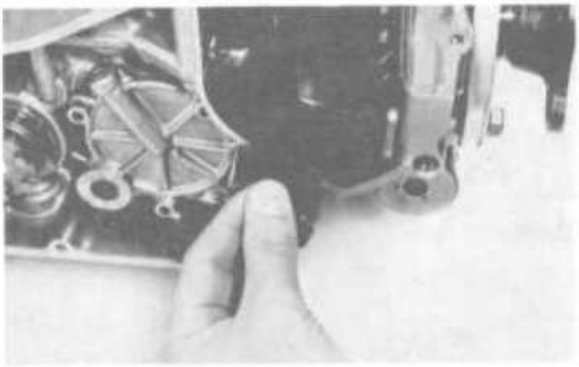


3. Remove the shift lever assembly and shift shaft assembly.



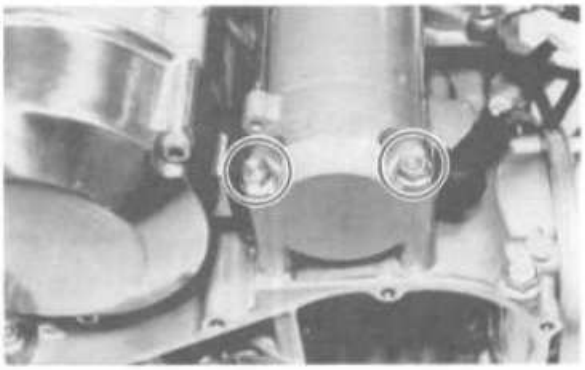
1. Shift lever assembly 2. Shift shaft assembly

4. Remove the middle gear case oil level maintaining plug.

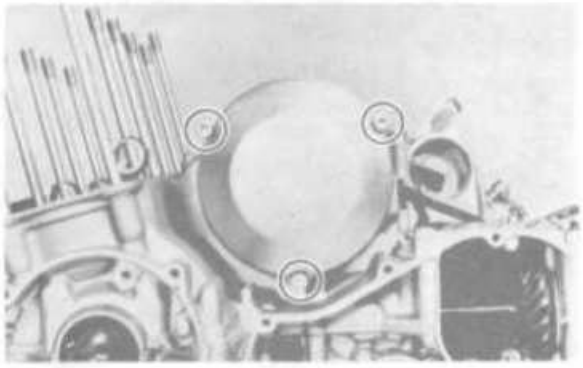


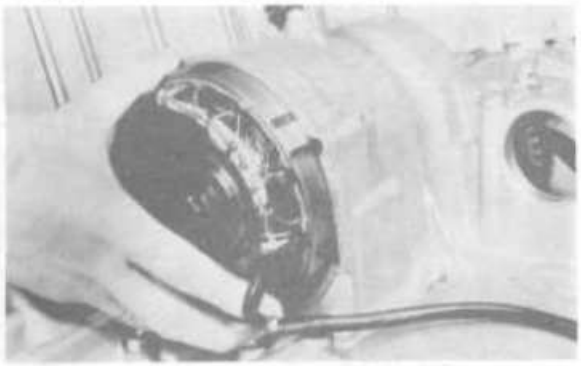
F. Starter Motor and Generator

1. Remove the starter motor securing bolts and remove the motor assembly.

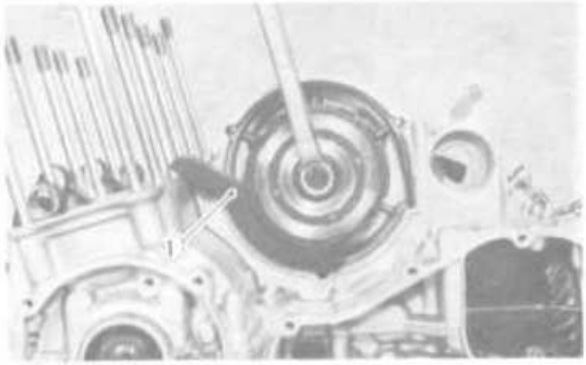


2. Remove the generator cover and stator coil assembly.



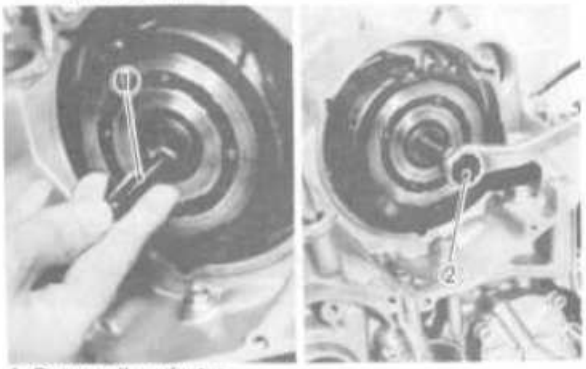


3. Install the rotor holding tool (special tool) on the rotor as shown and remove the rotor holding bolt.



1. Rotor holding tool

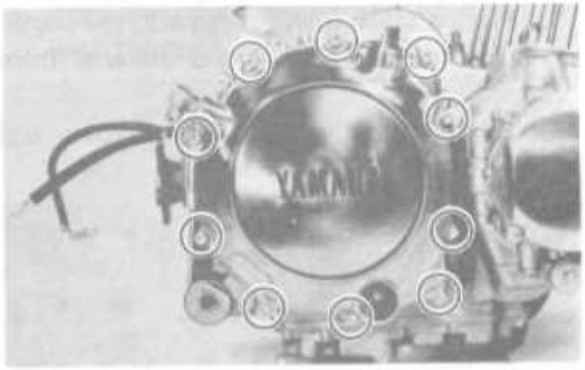
4. Invert the holding tool as shown and insert the rotor puller adapter (special tool) into the rotor shaft and screw in the rotor puller (special tool). Remove the rotor.



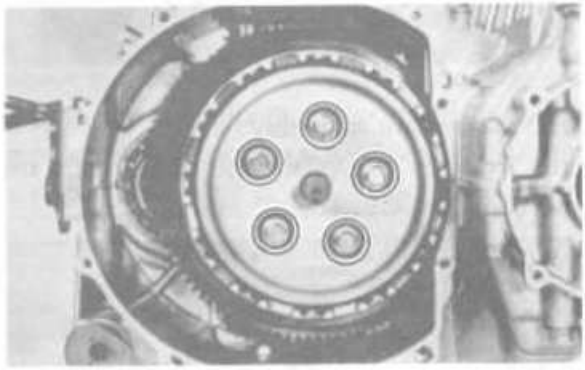
1. Rotor puller adapter
2. Rotor puller

G. Clutch

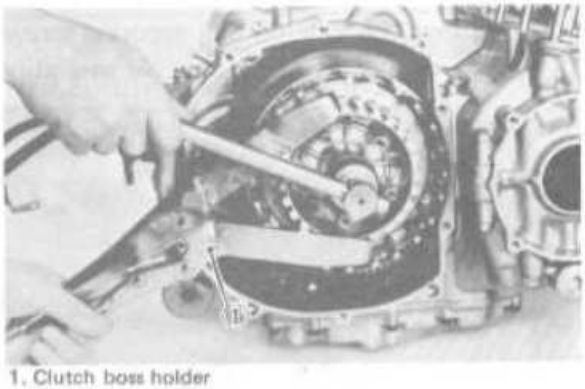
1. Remove right crankcase cover.



2. Release the tension evenly on the 6 mm bolts and remove the clutch pressure plate and clutch springs.

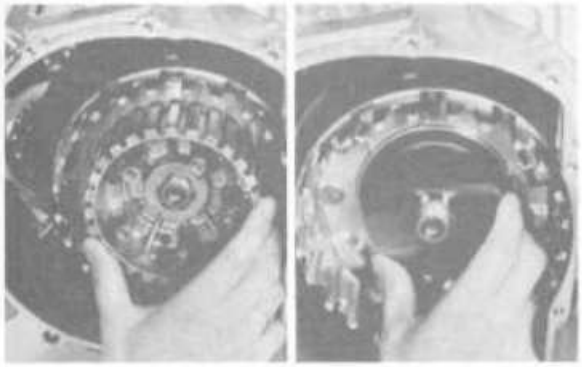


3. Remove the friction plates and clutch plates.
4. Straighten the lock washer tab. Use the clutch boss holder (special tool) to hold the clutch boss and remove the lock nut and lock washer.

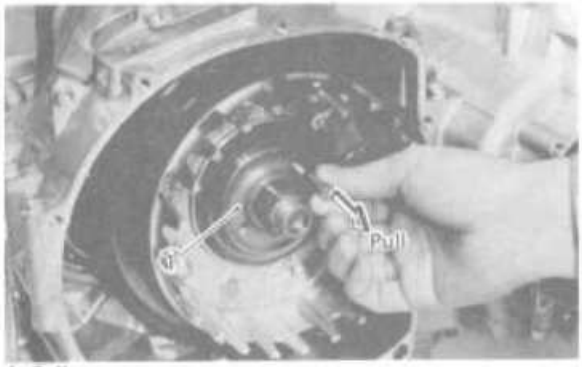


1. Clutch boss holder

5. Remove the clutch boss and spacer.

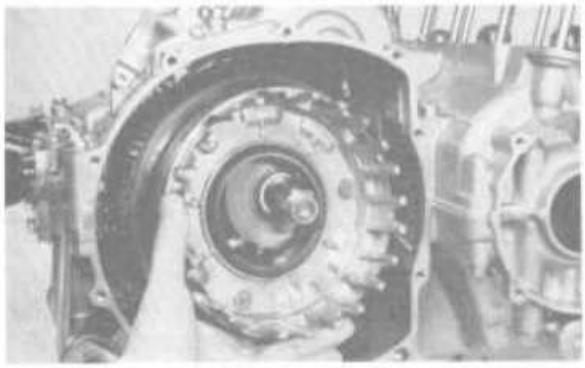


6. Screw in a suitable length of 6 mm bolt into the one of the threaded holes on the collar and pull out the collar and needle bearing from the primary driven gear.



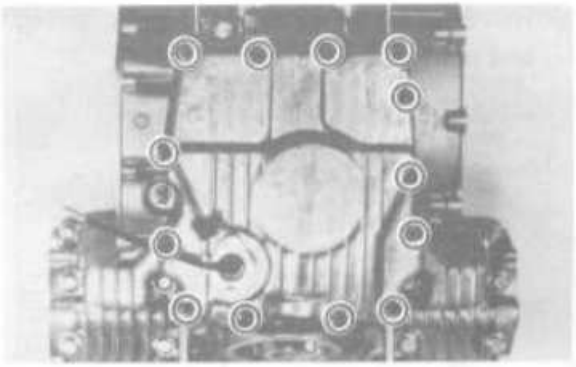
1. Collar

7. Remove the primary driven gear assembly and oil pump drive sprocket.

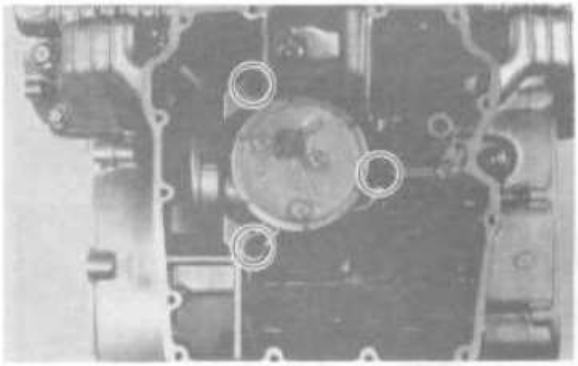


H. Oil Pump Removal and Disassembly

1. Remove the strainer cover. Note the wire harness clip position.



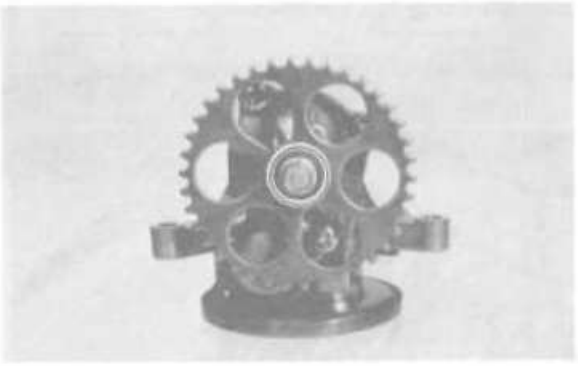
2. Remove the oil pump securing bolts and remove the sprocket cover and oil pump assembly.



CAUTION:

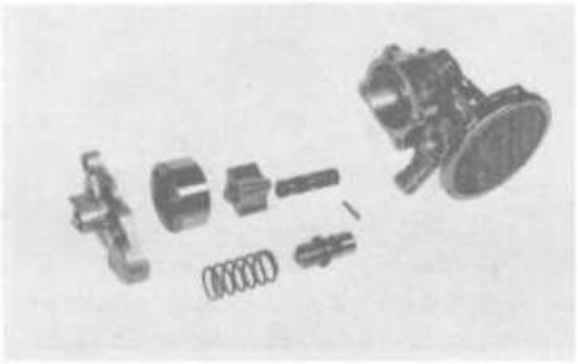
Do not attempt to remove the strainer screen as it is permanently fitted onto the pump housing. If the pump housing and/or any parts of the pump are damaged, the pump assembly must be replaced with a new one.

3. Remove the oil pump driven sprocket.



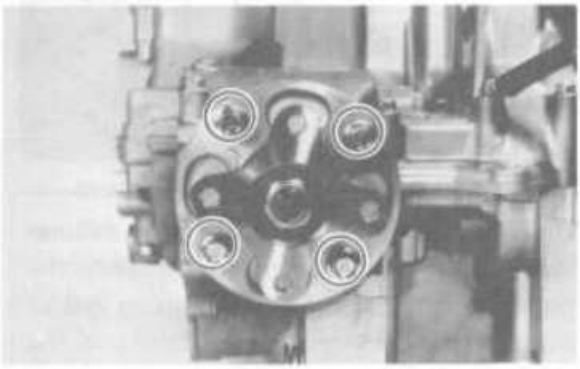
4. Remove the oil pump cover and rotor assembly.

5. Remove the pressure relief valve spring and plunger.



I. Middle Gear

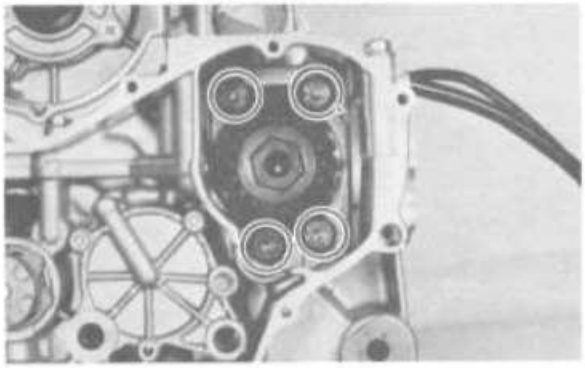
1. Remove the middle driven gear housing holding bolts.
2. Remove the middle driven gear housing assembly and shims.



NOTE:

If it is difficult to remove housing assembly, loosen the two crankcase bolts located near the middle driven gear housing.

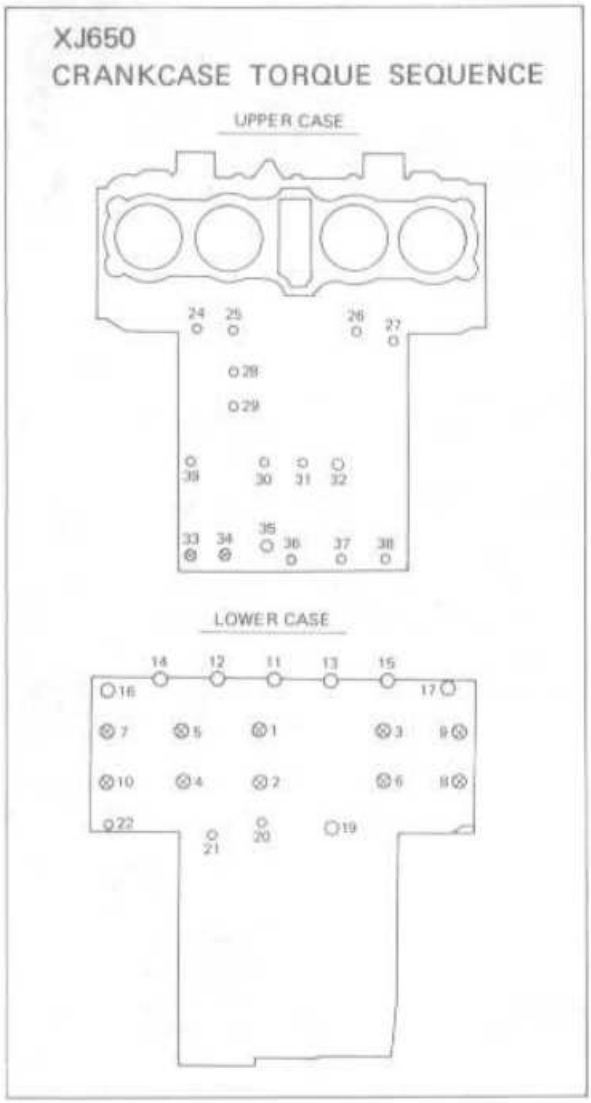
3. Remove "TORX" screws holding the middle drive gear assembly.



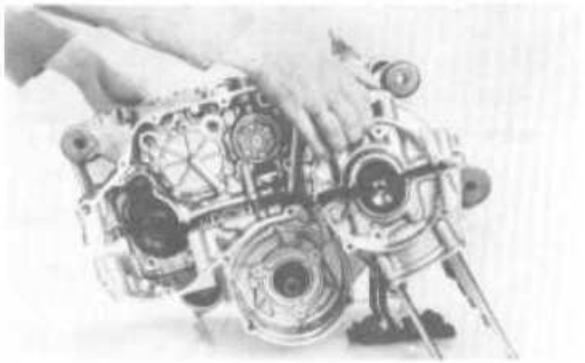
4. Remove the bearing retainers.

J. Crankcase Disassembly

1. Remove the upper crankcase bolts, starting the highest numbered bolt.
   Turn over the engine and remove the lower crankcase bolts.

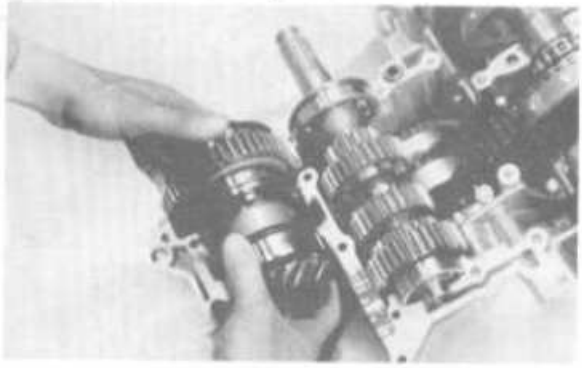


2. Separate the lower case from the engine. Use a soft rubber hammer to carefully separate the crankcase.

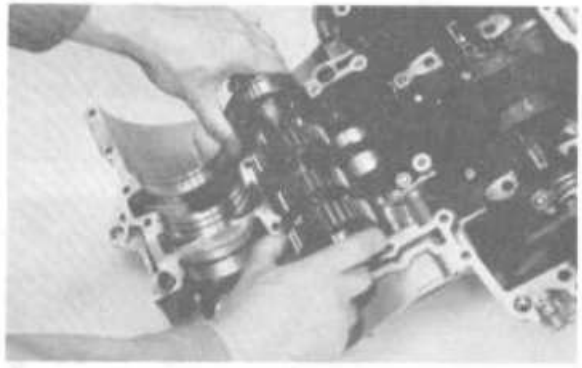


K. Upper Crankcase

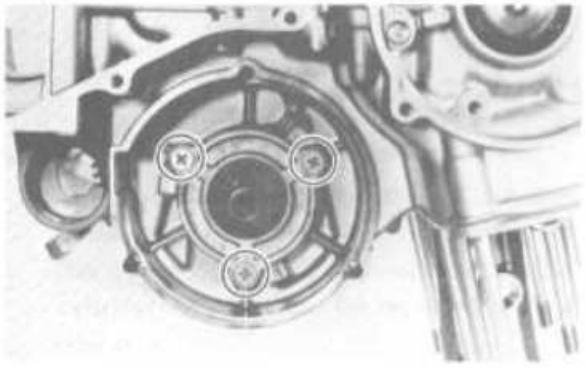
1. Remove the middle drive gear and damper assembly.



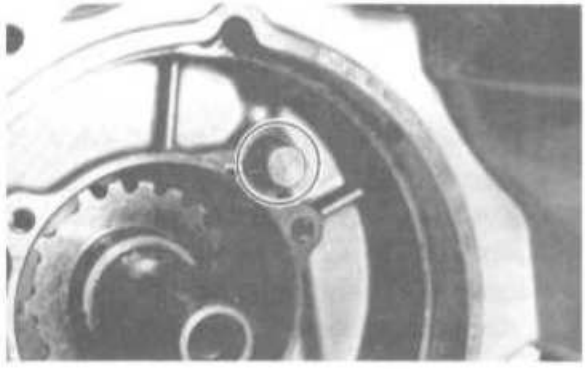
2. Remove the transmission main shaft assembly.



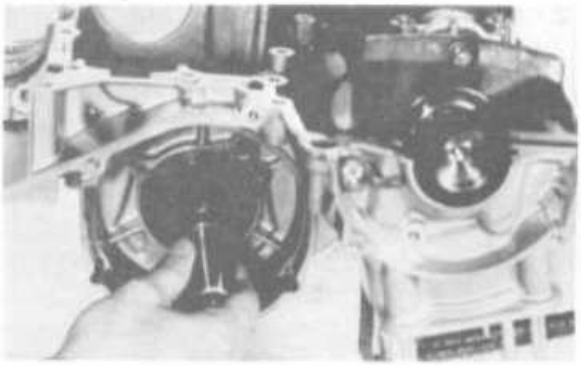
3. Remove the A.C.G. shaft cover.



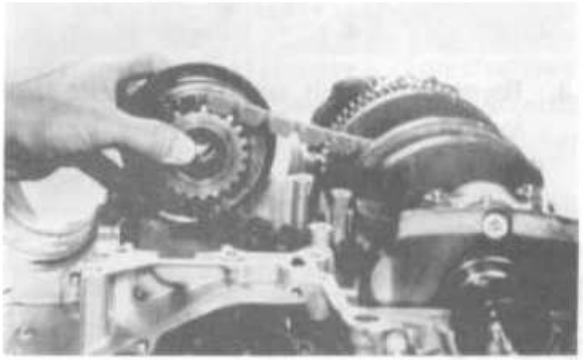
4. Remove the oil spray nozzle.



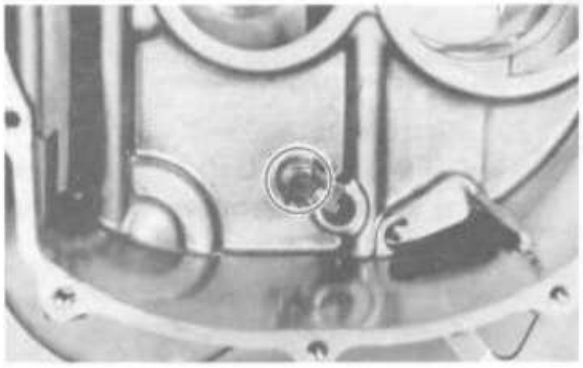
5. Carefully remove the A.C.G. shaft from the gear.



6. Remove the gear from the chain.

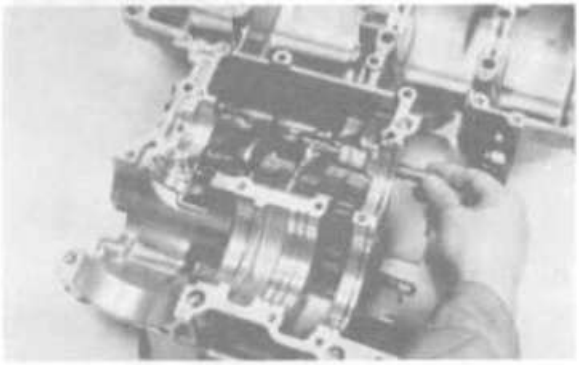


7. Straighten the lock washer tube and remove the bolt securing the starter idle gear shaft. Remove the shaft and starter idle gear.

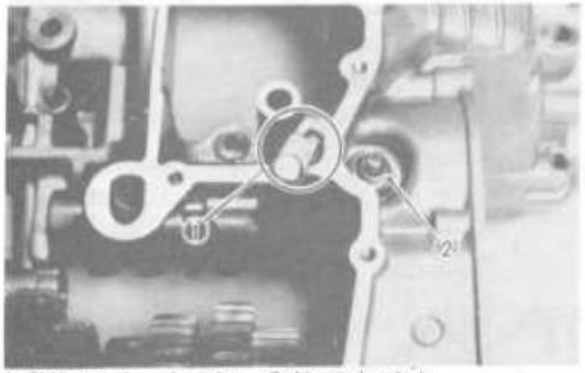


L. Lower Crankcase

1. Remove the dowel pin and "O-ring".
2. Remove the shift fork guide bar and shift forks. The shift forks are identified by numbers cast on their sides.

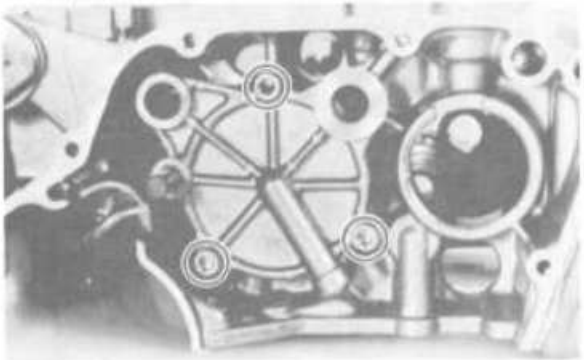


3. Remove the bolt securing the shift cam locating pin and remove the stopper plate and locating pin.
4. Remove the neutral switch.

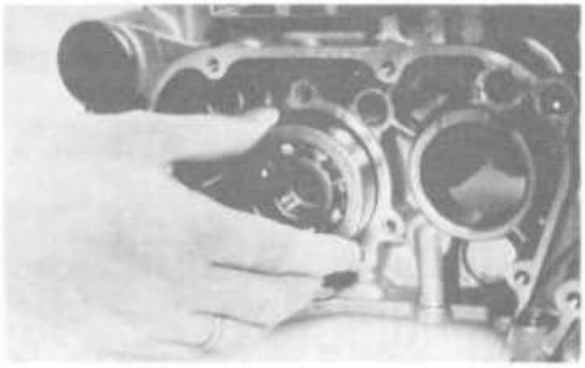


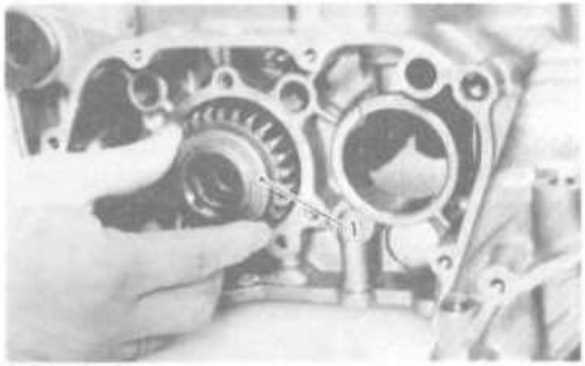
1. Shift cam locating pin 2. Neutral switch

5. Pull out the shift cam.
6. Remove the driven shaft bearing cover holding screws and remove the bearing cover.

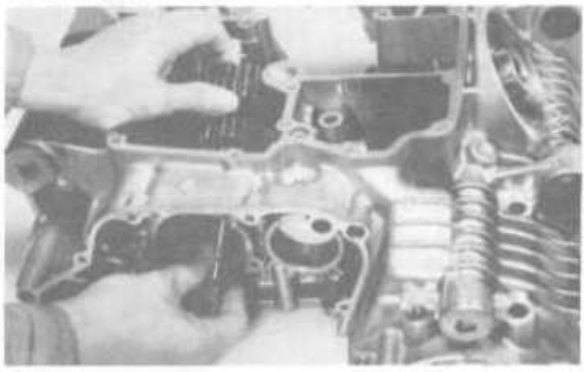


7. Remove the bearing and 5th wheel gear from the driven shaft and pull out the driven shaft assembly.





1. 5th wheel gear



INSPECTION AND REPAIR

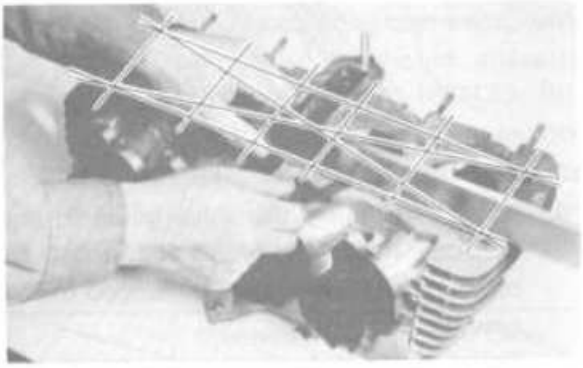
A. Cylinder Head Cover

Place head cover on a surface plate. There should be no warpage. Correct by re-surfacing as follows:

Place # 400 or #600 grit wet sandpaper on surface plate and re-surface head cover using a figure-eight sanding pattern. Rotate head cover several times to avoid removing too much material from one side.

B. Cylinder Head

1. Using a rounded scraper, remove carbon deposits from combustion chamber. Take care to avoid damaging spark plug threads and valve seats. Do not use a sharp instrument. Avoid scratching the aluminum.
2. Check the cylinder head warpage with a straight edge as shown.

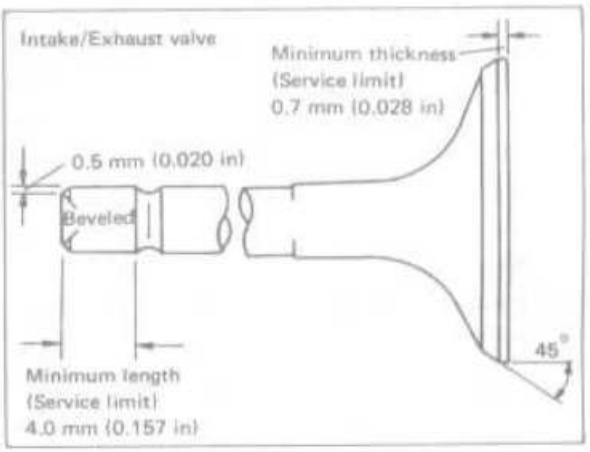


The warpage should not exceed the specified limit, if necessary resurface. If the warpage exceeds allowable limit, the cylinder head should be replaced with a new one.

Cylinder head warpage: less than 0.05 mm (0.002 in) Allowable limit: 0.25 mm (0.010 in)

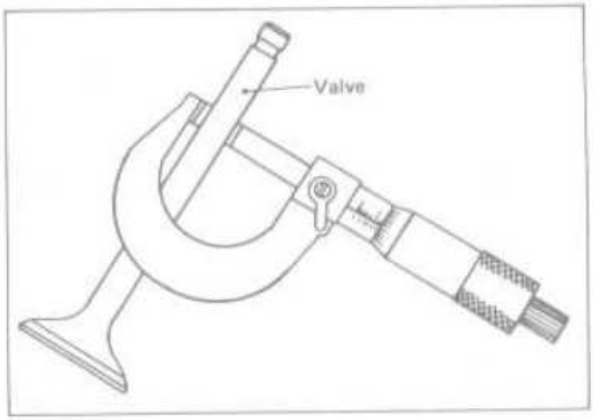
C. Valve, Valve Guide, and Valve Seat

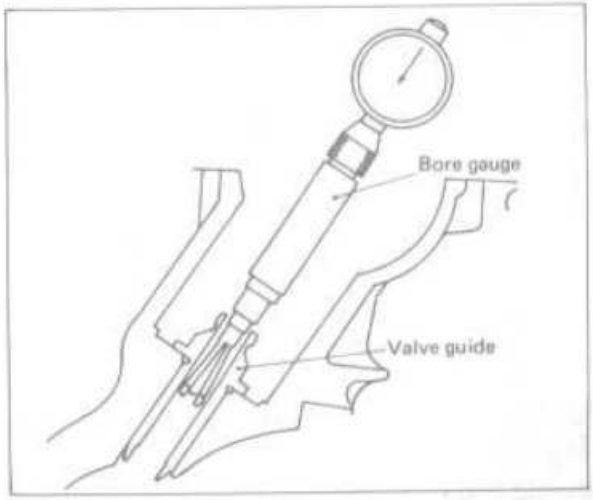
1. Check the valve face and the stem end for wear. If the valve face and/or the stem end are pitted or worn, regrind the valve with a valve refacer. Replace the valve if any dimension exceeds the specifications in the illustration.



2. Valve stem wear must be measured and then combined with valve guide measurements to guide clearance. This clearance must be within tolerances. If it exceeds the maximum limit, then replace either or both valve and guide, as necessary.

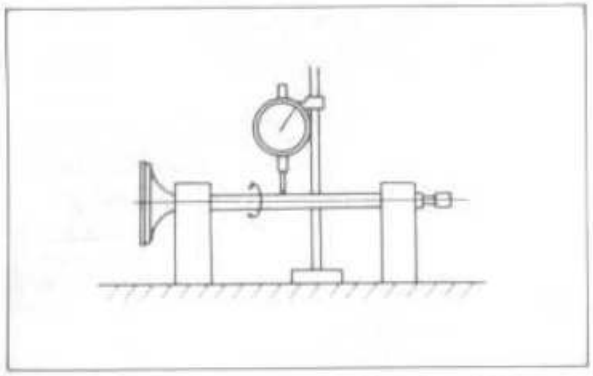
	Valve Stem Clearance	Maximum
Intake	0.010~0.037 mm (0.0004~0.0015 in)	0.10 mm (0.004 in)
Exhaust	0.025~0.052 mm (0.0010~0.0020 in)	0.12 mm (0.005 in)





3. Valve stem end
   Inspect the end of the valve stem. If the end appears to be "mushroomed" or has a larger diameter than the rest of the stem, the valve, valve guide, and oil seal should be replaced.
4. Turn valve on "V" blocks and measure the amount of stem runout with a dial gauge. If it exceeds the maximum limit, replace the valve.

Maximum valve stem runout:
0.03 mm (0.0012 in)



5. Valve guide and valve oil seal replacement
   If oil leaks into the cylinder through a valve due to a worn valve guide, or if a valve is replaced, the valve guide should also be replaced.

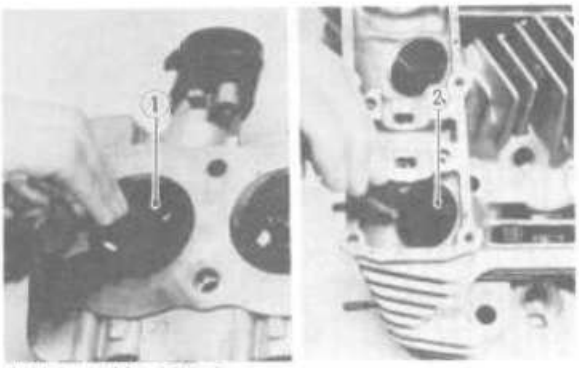
NOTE:
The valve oil seal should be replaced whenever a valve is removed or replaced.

a. Measure valve guide inside diameter with a small bore gauge. If it exceeds the limit, replace with an oversize valve guide.

Guide diameter (I.D.):
Limit: 7.10 mm (0.280 in)

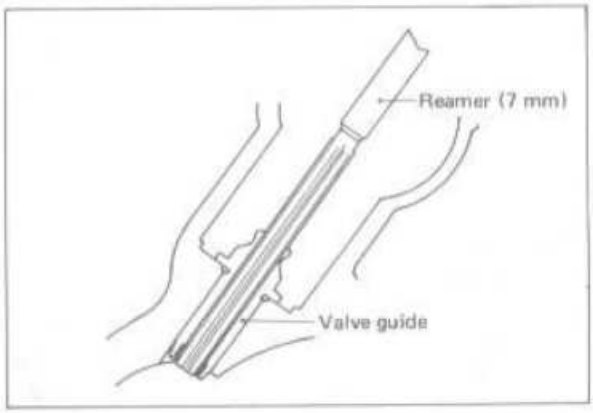
b. To ease guide removal and reinstallation, and to maintain the correct interference fit, heat the head to 100℃ (212°F). Use an oven to avoid any possibility of head warpage due to uneven heating.
c. Use the appropriate shouldered punch (special tool) to drive the old guide out and drive the new guide in.

NOTE:
When a valve guide is replaced, the O-ring should also be replaced.

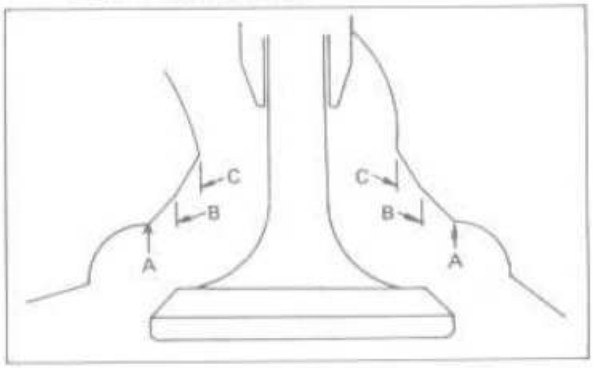


1. Valve guide remover
2. Valve guide installer

d. After installing the valve guide, use the 7 mm reamer (special tool) to obtain the proper valve guide to valve stem clearance.



e. After installing the valve guide in the cylinder head, the valve seat must be recut. The valve should be lapped to the new seat.
6. Grinding the Valve Seat
a. The valve seat is subject to severe wear. Whenever the valve is replaced or the valve face is re-surfaced (see caution) the valve seat should be re-surfaced at a 45° angle. If a new valve guide has been installed the valve seat must be recut to guarantee complete sealing between the valve face and seat.



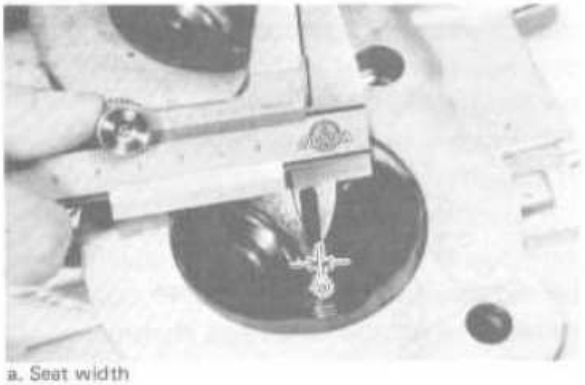
CAUTION:

If the valve seat is obviously pitted or worn, it should be cleaned with a valve seat cutter. Use the 45° cutter, and when twisting the cutter, keep an even downward pressure to prevent chatter marks.

If cutting section "A" of the valve seat, use 30° cutter. If cutting section "B", use the 45° cutter. If cutting section "C" use 60° cutter.

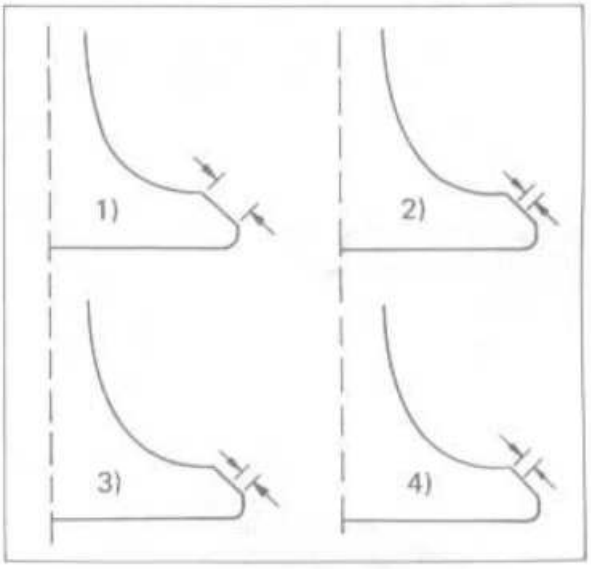
b. Measure valve seat width. Apply mechanic's bluing dye (such as Dykem) to the valve face and valve seat, apply a very small amount of fine grinding compound around the surface of the valve face insert the valve into position, and spin the valve quickly back and forth. Lift the valve, clean off all grinding compound, and check valve seat width. The valve seat and valve face will have removed bluing wherever they contacted each other. Measure the seat width with vernier calipers. It should measure approximately 1.1 mm (0.0433 in). Also, the seat should be uniform in contact area. If valve seat width varies, or if pits still exist, further cutting will be necessary. Remove just enough material to achieve a satisfactory seat.

	Standard Width	Wear Limit
Seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039in)	2.0 mm (0.080 in)

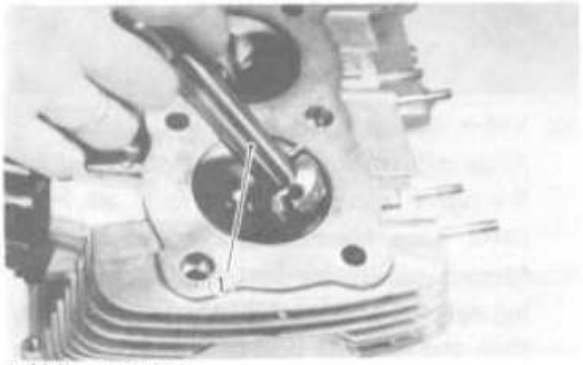


a. Seat width

c. If the valve seat is uniform around the perimeter of the valve face, but is too wide or not centered on the valve face, it must be altered. Use either the 30°, 45° or 60° cutters to correct the improper seat location in the manner described below:



1) If the valve face shows that the valve seat is centered on the valve face, but too wide, then lightly use both the 30° and the 60° cutters to reduce the seat width to 1.1 mm (0.0433 in).



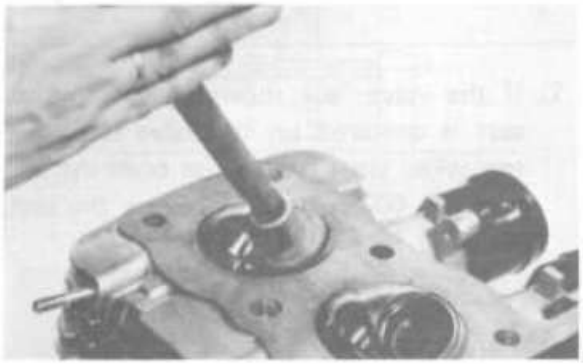
1. Valve seat cutter

2) If the seat shows to be in the middle of the valve face, but too narrow, use the 45° cutter until the width equals 1.1 mm (0.0433 in).
3) If the seat is too narrow and right up near the valve margin, then first use the 30° cutter and then the 45° cutter to get the correct seat width.
4) If the seat is too narrow and down near the bottom edge of the valve face, then first use the 60° cutter and then the 45° cutter.

7. Lapping the valve/valve seat assembly

a. The valve/valve seat assembly should be lapped if neither the seat nor the valve face are severely worn.

b. Apply a small amount of coarse lapping compound to valve face. Insert the valve into the head. Rotate the valve until the valve and valve seat are evenly polished. Clean off the coarse compound, then follow the same procedure with fine compound.
Continue lapping until the valve face shows a complete and smooth surface all the way around. Clean off the compound material. Apply bluing dye to the valve face and seat and rotate the valve face for full seat contact which is indicated by a grey surface all around the valve face where the bluing has been rubbed away.



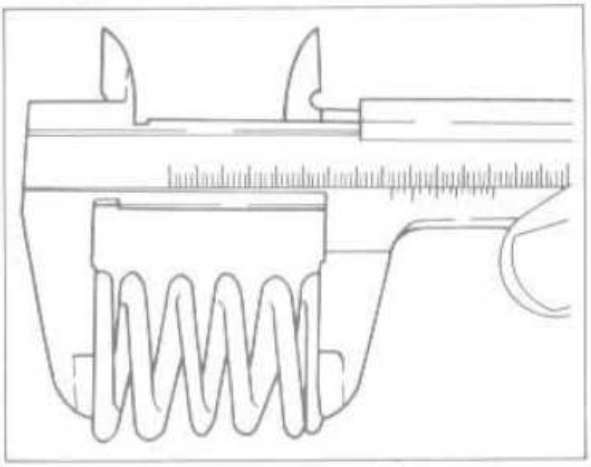
c. Valve leakage check
After all work has been performed on the valve and valve seat, and all head parts have been assembled, check for proper valve/valve seat sealing by pouring solvent into each of the intake ports, then the exhaust ports. There should be no leakage past the seat. If fluid leaks, disassemble and continue to lap with fine lapping compound. Clean all parts thoroughly, reassemble and check again with solvent. Repeat this procedure as often as necessary to obtain a satisfactory seal.

D. Valve Spring and Lifters

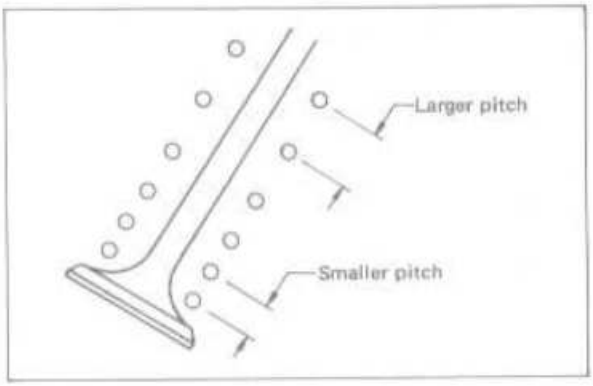
1. Checking the valve springs

a. This engine uses two springs of different sizes to prevent valve float or surging. The valve spring specifications show the basic value characteristics.

b. Even though the spring is constructed of durable spring steel, it gradually loses some of it's tension. This is evidenced by a gradual shortening of free length. Use a vernier caliper to measure spring free length. If the free length of any spring has decreased more than 2 mm (0.080 in) from its specification replace it.



c. Another symptom of a fatigued spring is insufficient spring pressure when compressed. This can be checked using a valve spring compression rate gauge. Test each spring individually. Place it in the gauge and compress the spring first to the specified compressed length with the valve closed (all spring specifications can be found in the previous section, Valve Spring), then to the length with the valve open. Note the poundage indicated on the scale at each setting. Use this procedure with the outer springs, then the inner springs.



NOTE:

All valve springs must be installed with larger pitch upward as shown.

Valve Spring Specifications		
	OUTER	INNER
Free length	39.5 mm (1.55 in)	35.9 mm (1.413 in)
Installed length (valve closed)	34.0 mm (1.339 in)	31.0 mm (1.220 in)
Installed pressure	19.1 kg (42.1 lb)	9.0 kg (19.8 lb)
Allowable tilt from vertical	1.6°	←

2. Valve lifter

a. Check each valve lifter for scratches or other damage. If the lifter is damaged in any way, the cylinder head surface in which it rides is probably also damaged. If the damage is severe, it may be necessary to replace both the lifter and the cylinder head.

NOTE:
For proper valve lifter-to-head clearance, always install lifters on their original valves.

E. Camshafts, Cam chain and Cam Sprockets

1. Camshaft

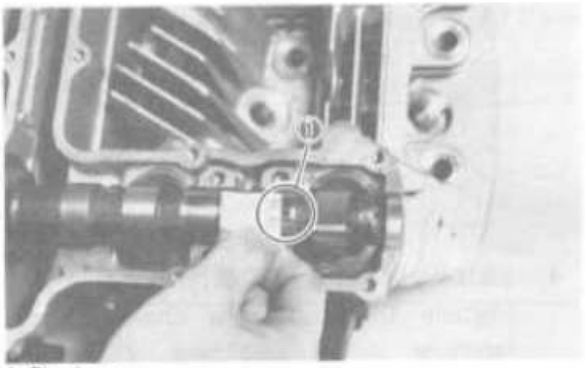
a. The cam lobe metal surface may have a blue discoloration due to excessive friction. The metal surface could also start to flake off or become pitted.

b. If any of the above wear conditions are readily visible, the camshaft should be replaced.

c. Even though the cam lobe surface appears to be in satisfactory condition, the lobes should be measured with a micrometer. Cam lobe wear can occur without scarring the surface. If this wear exceeds a pre-determined amount, valve timing and lift are affected. Replace the camshaft if wear exceeds the limits.

d. Install the camshaft on the cylinder head. Place a strip of Plastigage between camshaft and camshaft cap as illustrated (lengthwise along camshaft). Tighten the nuts with specified torque. Remove the camshaft cap and determine the clearance by measuring the width of the flattened Plastigage.

Cap nut tightening torque:
1.0 m-kg (7.2 ft-lb)



1. Plastigage

NOTE:
Do not turn camshaft when measuring clearance with Plastigage.

Camshaft-to-cap clearance:
Standard: 0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in)
Maximum: 0.160 mm (0.006 in)

If the camshaft-to-cap clearance exceeds specification, measure camshaft bearing surface diameter.

Bearing surface diameter:
Standard: 24.967 ~ 24.980 mm (0.9830 ~ 0.9835 in)

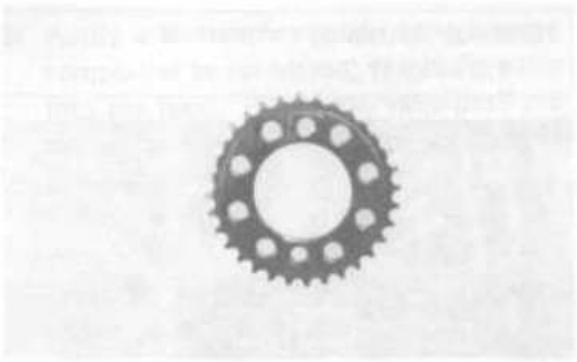
1) If camshaft diameter is less than specification, causing excessive clearance, replace camshaft.
2) If camshaft is within specification and camshaft-to-cap clearance is excessive, replace cylinder head.

2. Cam chain

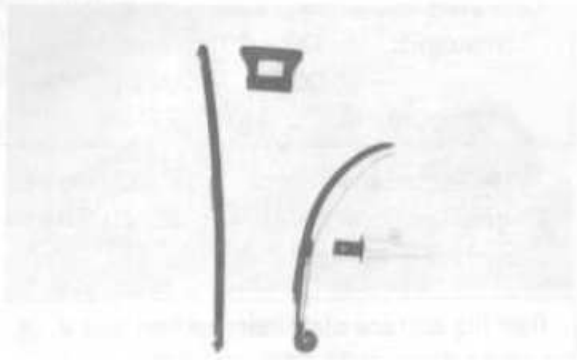
Except in cases of oil starvation, the cam chain wears very little. If the cam chain has stretched excessively and it is difficult to keep the proper cam chain tension, the chain should be replaced.

3. Cam sprockets

Check cam sprockets for obvious wear.



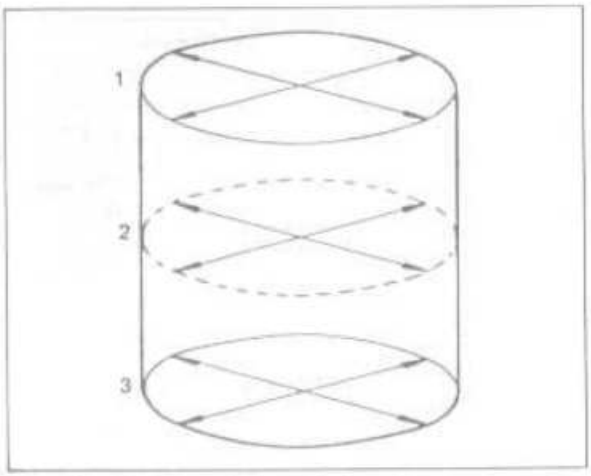
4. Cam chain dampers and tensioner
   Inspect the top cam chain damper (stopper guide) and two (2) vertical (slipper-type) dampers for excessive wear. Any that shows excessive wear should be replaced. Worn dampers may indicate an improperly adjusted or worn-out cam chain.



F. Cylinder

1. Inspect the cylinder walls for scratches. If vertical scratches are evident, the cylinder wall should be rebored or the cylinder should be replaced.
2. Measure cylinder wall wear as shown. If wear is excessive, compression pressure will decrease. Rebore the cylinder wall and replace the piston and piston rings. Cylinder wear should be measured at three depths with a cylinder bore gauge. (See illustration.)

	Standard	Wear Limit
Cylinder bore	63.00 mm (2.480 in)	63.10 mm (2.484 in)
Cylinder taper	—	0.05 mm (0.002 in)
Cylinder out-of-round	—	0.01 mm (0.0004 in)



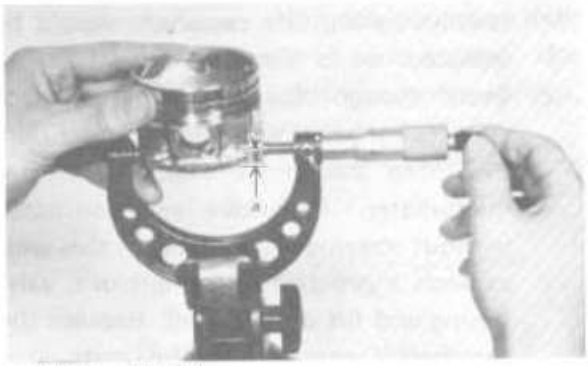
If the cylinder wall is worn more than the wear limit, it should be rebored.

G. Piston and Piston Rings

1. Piston

a. Measure the outside diameter of the piston at the piston skirt.
Measurement should be made at a point 7.5 mm (0.3 in) above the bottom edge of the piston. Place the micrometer at right angles to the piston pin.

Standard	63.00 mm (2.480 in)
Oversize 1	63.25 mm (2.490 in)
Oversize 2	63.50 mm (2.500 in)
Oversize 3	63.75 mm (2.510 in)
Oversize 4	64.00 mm (2.520 in)



a. 7.5 mm (0.3 in)

b. Determine piston clearance as follows:

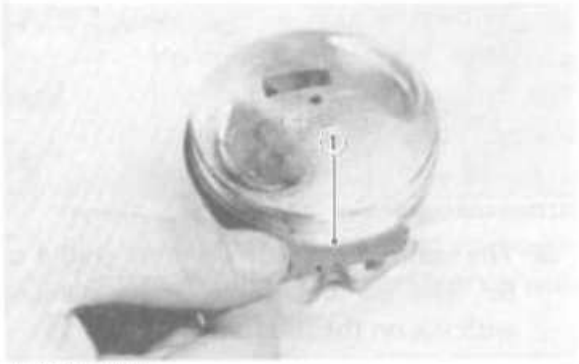
Minimum bore measurement
— Maximum piston measurement
= Piston clearance

EXAMPLE:
63.0 mm (2.4803 in)
— 62.96 mm (2.4787 in)
= 0.04 mm (0.0016 in)
Piston clearance

Piston clearance:
Standard: 0.030 ~ 0.050 mm (0.0012 ~ 0.0020 in)
Service limit: 0.1 mm (0.0039 in)

c. Piston ring/ring groove fit must have correct clearance. If the piston and ring have already been used, the ring must be removed and the ring groove cleaned of carbon. The ring should then be re-installed. Use a feeler gauge to measure the gap between the ring and the land.

Side clearance	Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)
	2nd	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in)



1. Feeler gauge

2. Piston ring

a. The oversize top and middle ring sizes are stamped on top of the ring.

Oversize 1	0.25 mm (0.0098 in)
Oversize 2	0.50 mm (0.0197 in)
Oversize 3	0.75 mm (0.0295 in)
Oversize 4	1.00 mm (0.0394 in)

b. The expander spacer of the bottom ring (oil control ring) is color-coded to identify sizes.
The color mark is painted on the expander spacer.

Size	Color
Oversize 1	Brown
Oversize 2	Blue
Oversize 3	Black
Oversize 4	Yellow

c. Push the ring into the bore and check end gap clearance with a feeler gauge.

NOTE:
The end gap on the expander spacer of the oil control ring is unmeasurable. If the oil control ring rails show excessive gap, all three components should be replaced.

	Standard	Limit
Top/2nd ring	0.15 ~ 0.35 mm (0.006 ~ 0.014 in)	1.0 mm (0.039 in)
Oil control (Rails)	0.3 ~ 0.9 mm (0.012 ~ 0.035 in)	1.5 mm (0.059 in)

H. Piston Pin

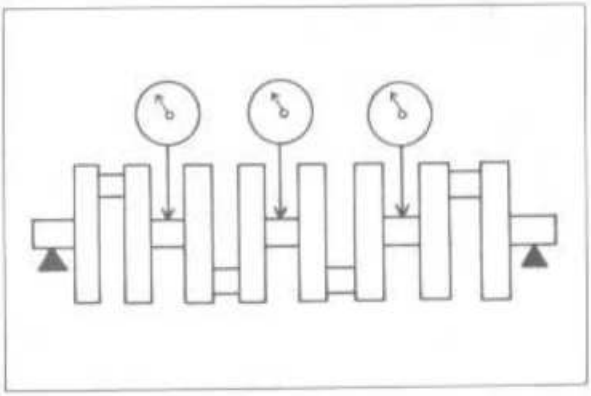
1. Apply a light film of oil to pin. Install in connecting rod small end. Check for play. There should be no noticeable vertical play. If play exists, check connecting rod small end for wear. Replace pin and connecting rod as required.
2. The piston pin should have no noticeable free play in piston. If the piston pin is loose, replace the pin and/or the piston.

I. Crankshaft

1. Crankshaft run-out
Support the crankshaft at both ends on V-blocks. Measure the amount of crankshaft run-out on the main bearing journals with a dial gauge while rotating crankshaft.

Run-out limit: 0.040 mm (0.0016 in)

If run-out exceeds limit, replace crankshaft.



2. Inspection of bearings
Check the bearings. If the inner or outer surface is burned, flaked, rough, scratched or worn, the bearings should be replaced.

replaced.

3. Measuring main bearing oil clearance

a. Clean all crankshaft and crankcase journal surfaces.

b. Place upper crankcase half upside-down on a bench. Install bearing inserts into top crankcase.

c. Install crankshaft into upper crankcase.

d. Place Plastigage on crankshaft journal surface to be inspected.

NOTE:
Do not move crankshaft until clearance check has been completed.

e. Install bearings into bottom crankcase. Carefully, place lower crankcase onto upper crankcase.

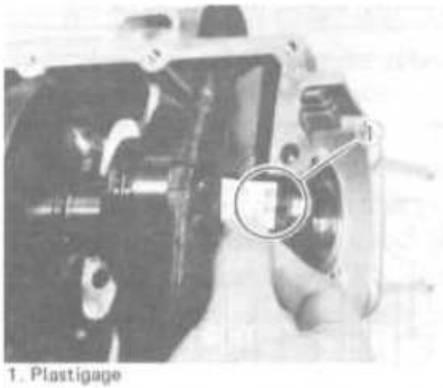
f. Install crankcase holding bolts 1 through 10. Tighten to full torque in torque sequence cast on crankcase.

Crankcase torque (8 mm bolt): 2.4 m-kg (17.5 ft-lb)

g. Remove bolts in reverse assembly order (10, 9, 8 ... etc.)

h. Carefully remove lower crankcase. Measure width of Plastigage on crankshaft journals to determine clearance.

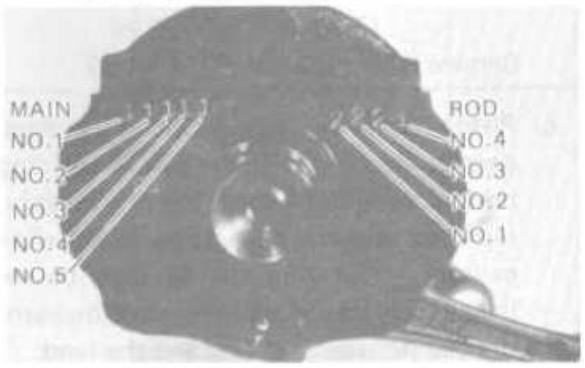
Main bearing oil clearance: 0.040 ~ 0.064 mm (0.0016 ~ 0.0025 in)

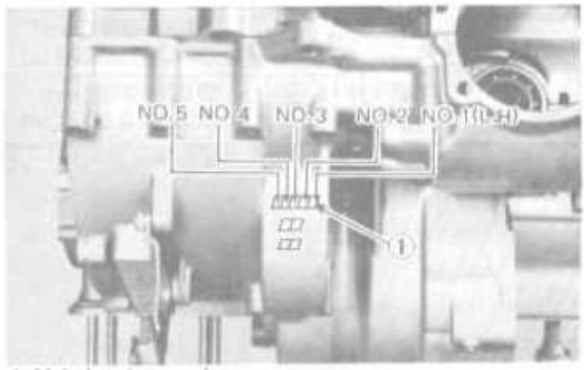


1. Plastigage

4. Crankshaft main bearing selection

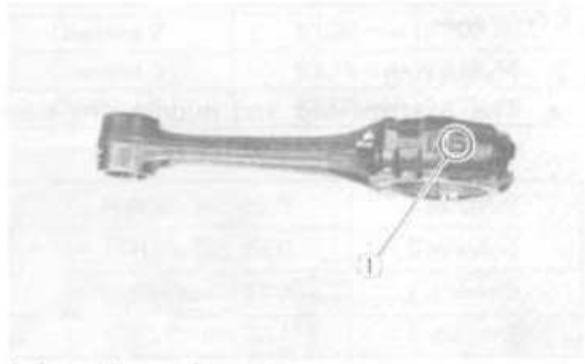
a. Numbers used to indicate crankshaft journal sizes are stamped on the L.H. crank web. The first five (5) are main bearing journal numbers, starting with the left journal. The four (4) rod bearing journal numbers follow in the same sequence. The upper crankcase half is numbered 4, 5, or 6 as shown.





1. Main bearing numbers

b. The connecting rods are numbered 4 or 5. The numbers for rods are stamped with ink on the rod itself.



1. Connecting rod size number

c. The proper bearing selection is made by subtracting the crankshaft journal number from the crankcase or rod size number. Use the color code to choose the proper bearing.

EXAMPLE:
Rod No. (Minus) Journal No.
= Bearing No.
5 – 2 = 3
No. 3 bearing is Brown. Use Brown bearing inserts.

BEARING COLOR CODE	
No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green
*No. 5	Yellow

*For crankshaft main bearing only.

d. When assembling, apply a liberal coat of motor oil to all bearing surfaces.

NOTE:
When applying final torque to the rod caps, observe the following procedures:

e. Apply molybdenum disulfide grease to connecting rod bolt threads. Apply torque evenly to both ends of the cap. While tightening, if a torque of 2.0 m-kg (14.5 ft-lb) or more is reached, DO NOT STOP tightening until final torque is reached. If tightening is interrupted between 2.0 m-kg and 2.5 m-kg, loosen the nut to less than 2.0 m-kg and start again. Tighten to full torque specification without pausing.

J. Oil Pump

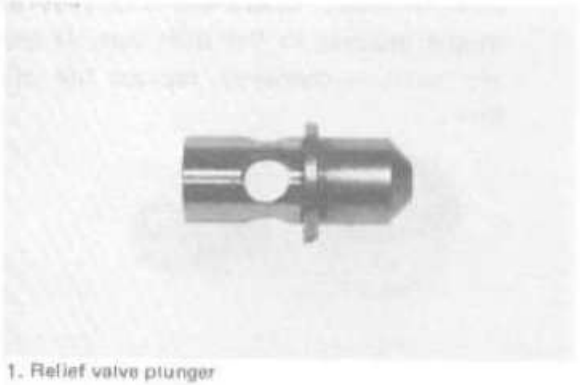
1. Check the clearance between housing and outer rotor.

Standard clearance:
0.09 ~ 0.15 mm
(0.0035 ~ 0.0059 in)

2. Check the clearance between outer rotor and inner rotor.

Standard clearance
0.12 mm (0.005 in) or less

3. Check the plunger for scratches and wear.



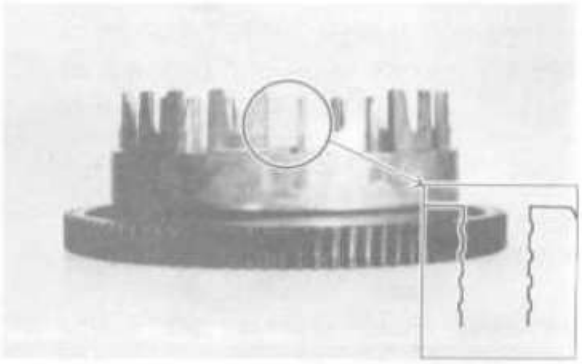
1. Relief valve plunger

K. Clutch

1. Clutch housing

a. Check the dogs on the clutch housing. Look for cracks and signs of galling on edges. If damage is moderate, deburr. If severe, replace the clutch housing.

NOTE:
Galling on the friction plate dogs of the clutch housing will cause erratic clutch operation.



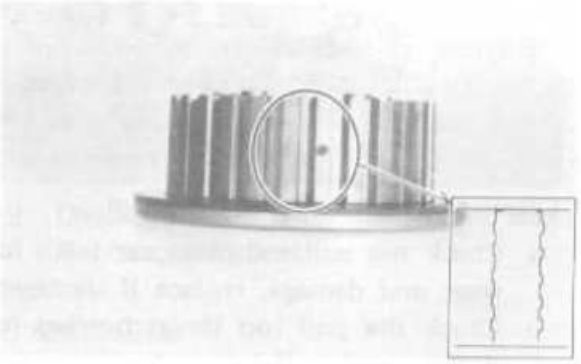
b. Check the clutch housing bearing for damage. If damaged replace bearing.

2. Clutch boss

a. The clutch boss contains a built-in damper beneath the first clutch plate (clutch plate 2). It is not normally necessary to remove the circlip and disassemble the built-in damper unless there is serious clutch chattering.

b. Check splines on clutch boss for galling. If damage is slight to moderate, deburr; if it is severe, replace clutch boss.

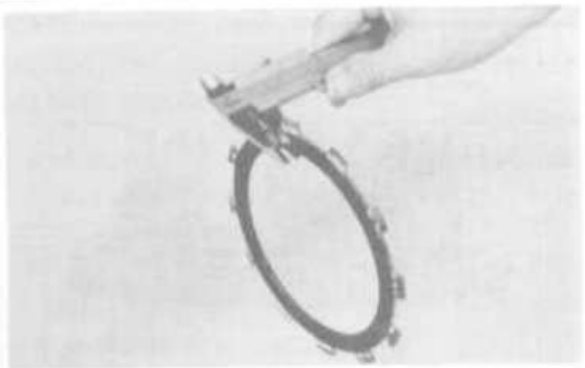
NOTE:
Galling on clutch plate splines will cause erratic operation.

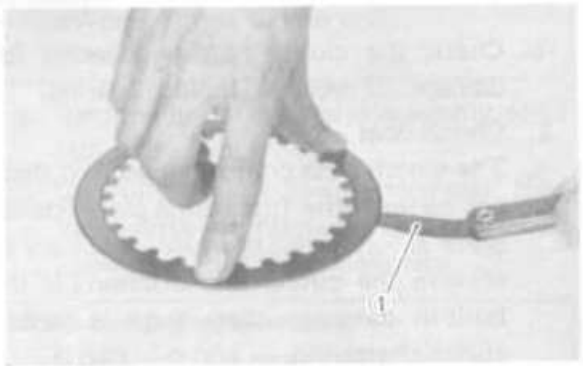


3. Friction and clutch plates
Check clutch steel plates and friction plates for heat damage. Measure friction plate thickness at 3 or 4 points. Measure

clutch plates for warpage with a dial gauge and stand. Replace clutch plate or friction plates as a set if any is faulty or beyond wear limits.

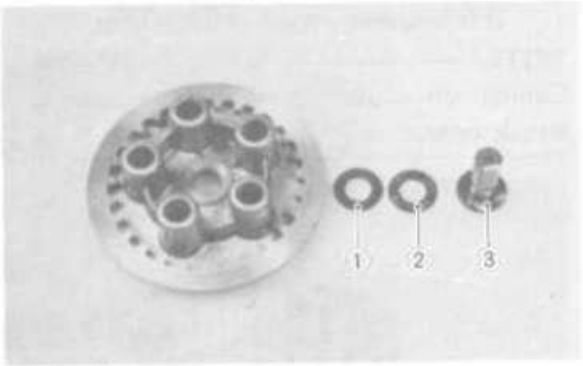
	Standard	Wear limit
Friction plate thickness	3.0 mm (0.12 in)	2.8 mm (0.11 in)
Clutch plate warp limit	—	0.05 mm (0.0020 in)





1. Feeler gauge

4. Clutch actuating mechanism



1. Plate washer 2. Thrust bearing 3. Pull rod

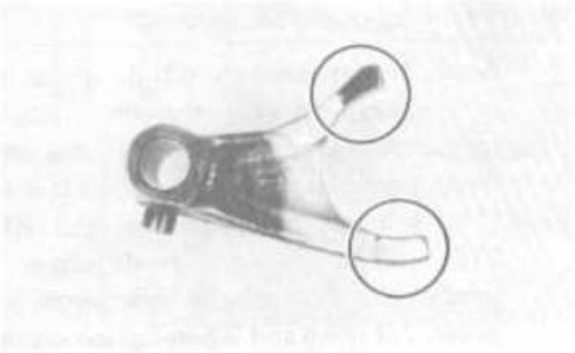
a. Check the pull rod rack gear teeth for wear and damage, replace if damaged.
b. Check the pull rod thrust bearing for damage, replace if damaged.
c. Check the clutch lever shaft pinion gear teeth for damage, replace if damaged.

5. Clutch springs
Measure the clutch spring free length. Replace the springs as a set if any is less than minimum free length.

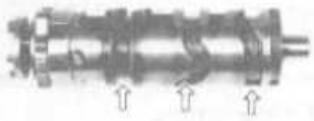
Clutch spring minimum length: 39.1 mm (1.539 in)

L. Transmission

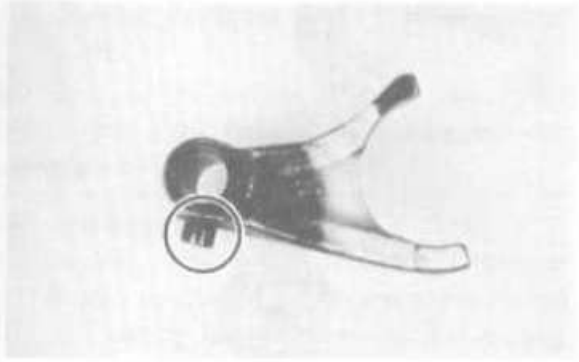
1. Inspect each shift fork for signs of galling on gear contact surfaces. Check for bending. Make sure each fork slides freely on its guide bar.



2. Roll the guide bar across a surface place. If the bar is bent, replace.
3. Check the shift cam grooves for signs of wear or damage. If any profile has excessive wear and/or damage, replace cam.



4. Check the cam followers on each shift fork for wear. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace the shift forks.



5. Check shift cam dowel pins and side plate for looseness, damage or wear. Replace as required.
6. Check the shift cam stopper plate and circlip and stopper for wear. Replace as required.
7. Check the transmission shafts using a centering device and dial gauge. If any shaft is bent beyond specified limit, replace shaft.

Maximum run-out: 0.08 mm (0.0031 in)

8. Carefully inspect each gear. Look for signs of obvious heat damage (blue discoloration). Check the gear teeth for signs of pitting, galling or other extreme wear. Replace as required.
9. Check to see that each gear moves freely on its shaft.
10. Check to see that all washers and clips are properly installed and undamaged. Replace bent or loose clips and bent washers.
11. Check to see that each gear properly engages its counterpart on the shaft. Check the mating dogs for rounded edges, cracks, or missing portions. Replace as required.

M. Starter Drivers



1. Electric starter clutch and gears

a. Check the surface of the idle gear for pitting or other damage. If severe, replace the gear.

b. Check the spring caps and the springs for deformation or damage. If severe, replace as necessary.

c. Check the starter clutch bolts (allen screw) for looseness. If loose, remove the bolts and replace with new bolts. Apply a thread locking compound such as "LOCTITE" to threads and tighten to specified torque. Stake over the end of the bolts.

Starter clutch bolt torque: 3.0 m-kg (21.7 ft-lb)

d. Check the "HY-VO" chain for damage and wear, replace if damaged.

e. Check the "HY-VO" chain guide for damage, replace if damaged.

N. Crankcases and Strainer Cover

1. Check crankcase for cracks or other damage.
2. Clean all oil passages and blow out with compressed air.
3. Strainer cover: Apply a thread locking compound such as "LOCTITE" to strainer cover bolts during reassembly.

O. Bearing and Oil Seals

1. After cleaning and lubricating bearings, rotate inner race with a finger. If rough spots are felt, replace the bearing.

NOTE:
Bearings are most easily removed or installed if the housings are first heated to approximately 95°~125°C (200°~250°F). Bring the case up to proper temperature slowly. Use an oven to avoid distortion.

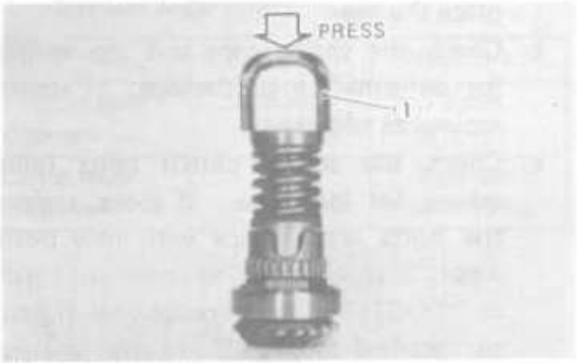
2. Check oil seal lips for damage and wear. Replace as required.

P. Middle Gear

1. Damper disassembly

NOTE:
Disassembly of the middle gear damper requires the damper compressor (special tool) and a hydraulic press.

a. Place the middle drive shaft in a press with the damper compressor (special tool) in place as shown.



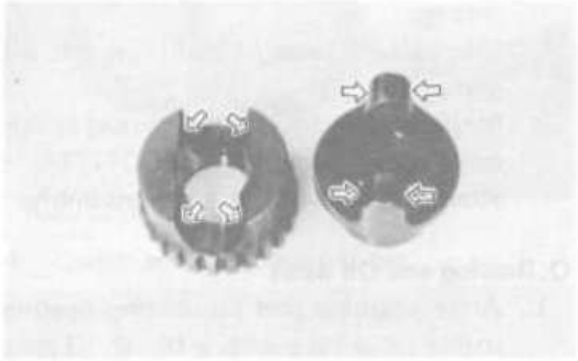
1. Damper compressor

b. Press the damper spring and remove the spring retainers.

c. Remove the spring seat, spring, and damper cams from the drive shaft.

2. Inspection

a. Inspect the damper cam surfaces. Check for smooth cam action and excessive wear on the cam surface. If cam surface is severely worn, replace damper assembly.



b. Inspect the damper spring for fatigue, wear and damage. Replace as necessary.

c. Check bearing movement for damage to balls, rouge spots, bearing looseness. Inspect gear teeth. If any gear tooth and/or bearing are damaged, the gear set and/or bearing must be replaced.

3. Middle drive/driven shaft bearing removal

CAUTION:

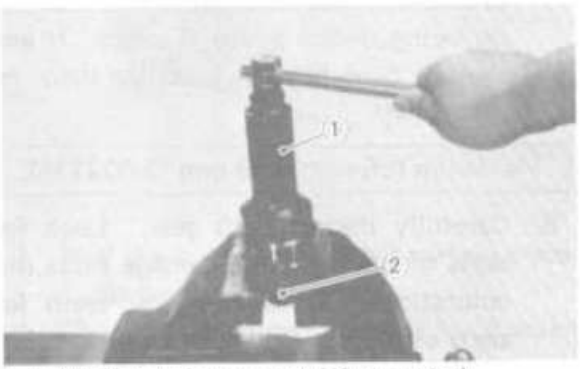
The following procedures should be performed only if the bearing or gear is to be replaced.

a. Middle drive gear

1) Bend down the locking collar of the nut with a suitable center punch.



2) Support the middle drive shaft holder (special tool) in a vise securely and put the drive pinion on it as shown. Remove the bearing holding nut with the 46 mm socket (special socket) and remove the bearing.



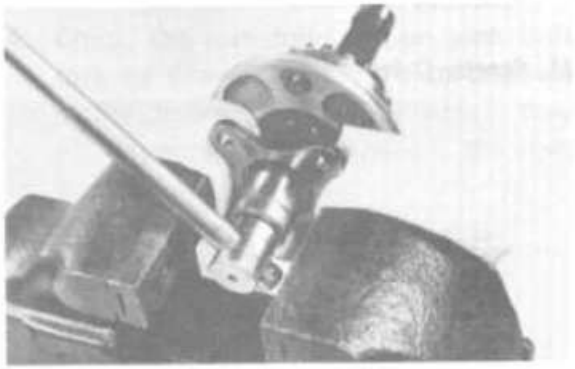
1. Middle drive shaft nut wrench (46 mm socket)
2. Middle drive shaft holder

b. Middle driven gear

1) Support the drive flange in a vise securely. Remove the flange holding nut.

CAUTION:

This holding nut has been locked with a thread locking compound, when reinstalling do not forget to apply a thread locking compound such as "LOCTITE" and punch.



2) Remove the drive flange from the driven shaft.

NOTE:
Driven gear shaft bearing should be replaced together with a bearing housing.

4. Middle gear reassembly

a. Middle drive gear bearing and damper

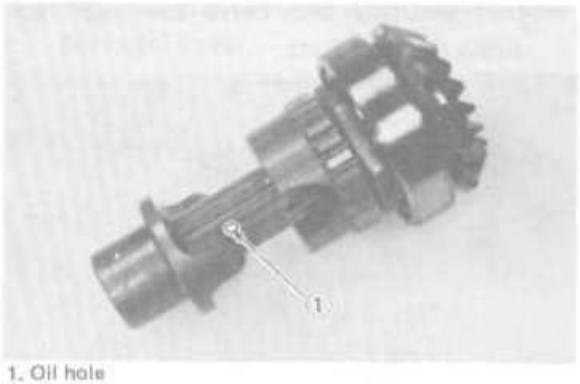
1) Install the bearing onto the drive pinion and secure it with a new lock nut using the middle drive shaft holder and special socket.

Tightening torque:
11 m-kg (80 ft-lb)

2) Stake the locking collar of the nut to the slot on the drive pinion shaft.



3) Install the driven damper cam onto the drive pinion shaft with the cam lobes positioned 90° from the row of shaft oil holes. Positioning tolerance is ± 1 spline (15°) from the 90° position.



1. Oil hole

4) Install the drive damper cams, spring, spring seat, and retainers using a press and the damper compressor.

b. Middle driven gear

1) Install the new bearing housing assembly onto the driven pinion shaft.

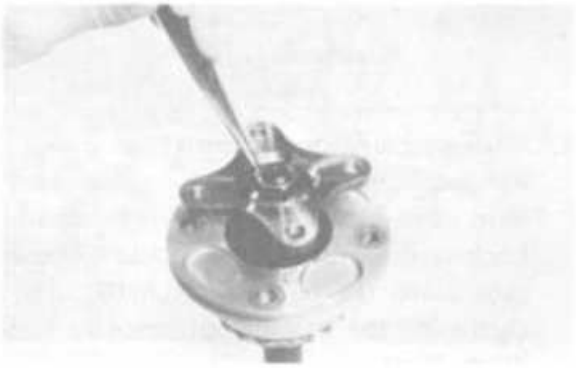
CAUTION:
Do not press the bearing outer race. Always press the inner race with care when installing.

2) Install the drive flange and new "O-ring" onto the driven gear shaft. Apply a thread locking compound such as "LOCTITE" to the shaft threads and tighten the nut to the specified torque.

Tightening torque:
12 m-kg (87 ft-lb)



3) Stake the nut with a center punch to lock as shown.

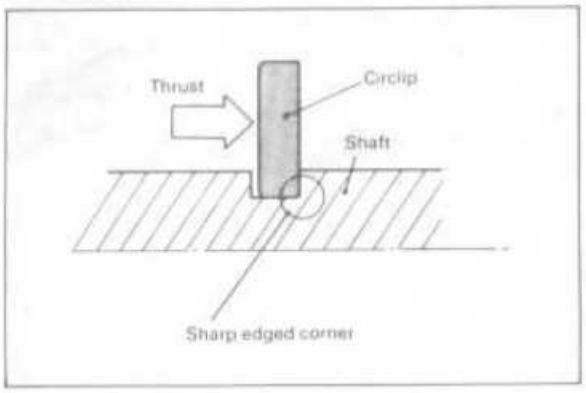


4) Install the new "O-ring" onto the bearing housing.

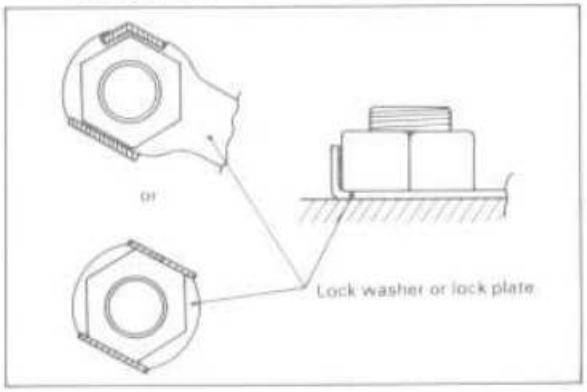
ENGINE ASSEMBLY AND ADJUSTMENT

A. Important Informations

1. Gasket and seal
   All gaskets and seals should be replaced when an engine is overhauled. All gasket surfaces and oil seal lips must be cleaned.
2. Properly oil all mating engine and transmission parts and bearings during reassembly.
3. Circlip
   All circlips should be inspected carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips.
   When installing a circlip, make sure that the sharp edged corner is positioned opposit to the thrust it receives. See the sectional view below.



4. Lock washer/plate and cotter pin
   All lock washers/plates and cotter pins must be replaced when they are removed. Lock washer/plate tab(s) should be bent over along the bolt or nut flat(s) after tightening the bolt or nut properly (see illustration).



   Cotter pins should be replaced after one use.

B. Engine Assembly

1. Upper crankcase
   a. Install the connecting rods onto the crankshaft with the proper connecting rod bearings and apply molybedenum disulfide grease to the bolt threads. Apply torque evenly to both ends of the cap.

CAUTION:

While tightening, if a torque of 2.0 m-kg (14.5 ft-lb) or more is reached, DO NOT STOP tightening until final torque is reached.
If tightening is interrupted between 2.0 m-kg and 2.5 m-kg, loosen the nut to less than 2.0 m-kg and start again. Tighten to full torque specification without pausing.

Rod cap torque: 2.5 m-kg (18.1 ft-lb)

   b. Install the proper cankshaft main bearings into the crankcase and place the crankshaft. Oil the bearings liberaly.

NOTE:

Do not forget to install the crankshaft oil seal (L.H.), blind plug (R.H.), "HY-VO" chain and cam chain on the crankshaft before installing. Also, install the chain guide into upper crankcase if removed.

   c. Install the starter idle gear, shaft, stopper plate, and new lock plate. Tighten the bolt securely and bend the lock tabs along the bolt flats.

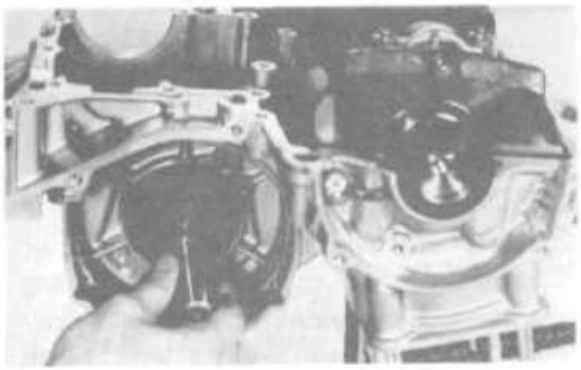


1. Lock washer

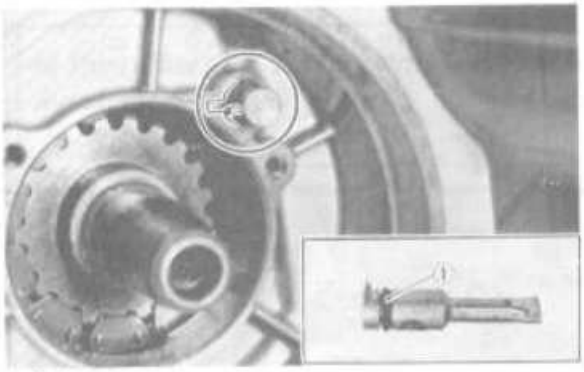
Tightening torque: 1.0 m-kg (7.2 ft-lb)

d. Put the starter clutch and sprocket assembly in the "HY-VO" chain and lay it into the crankcase.

e. Install the A.C.G. Generator shaft into the starter clutch assembly.

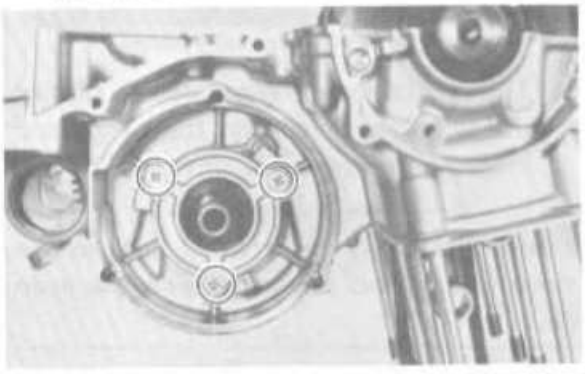


f. Install the "HY-VO" chain oil spray nozzle. The locating pin on the nozzle should be placed into the crankcase locating slot. Do not forget to install the new "O-ring" onto the nozzle.

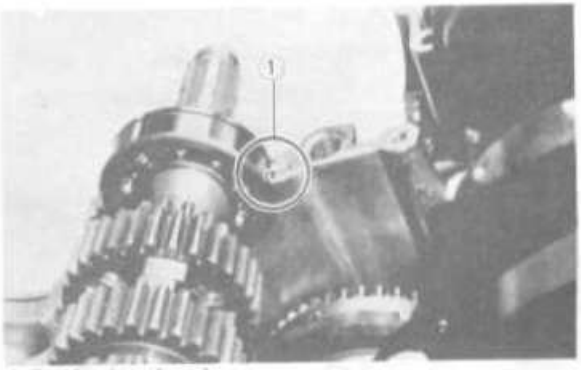


1. O-ring

g. Install the new "O-ring" onto the bearing housing and install it with the panhead screw.

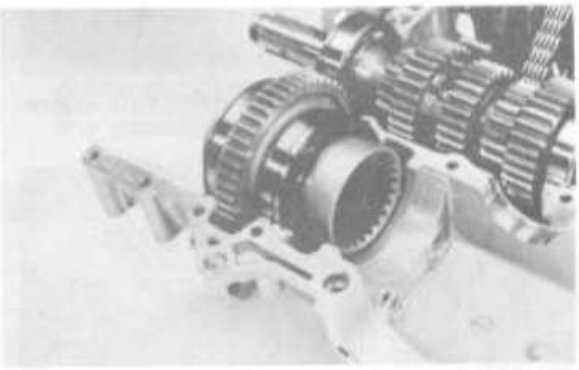


h. Install the transmission main axle assembly on the upper crankcase.
Point the bearing locating pin toward the crankshaft and lay it on the case.

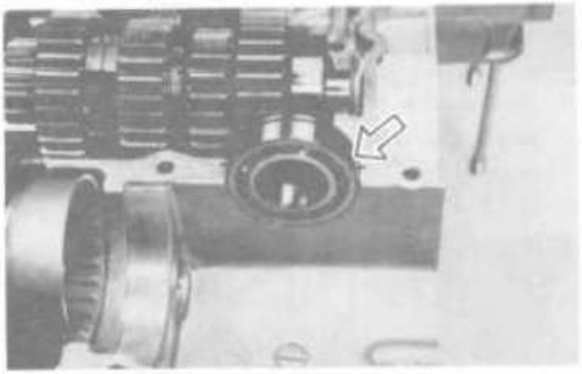


1. Bearing locating pin

i. Install the middle driven gear (without the middle drive pinion gear).



j. Install the middle driven gear shaft end bearing.



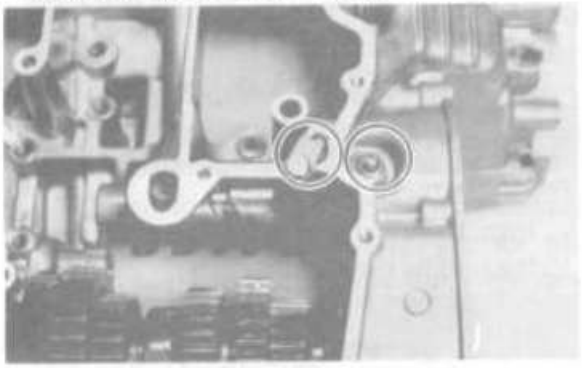
k. Install the dowel pin with "O-ring" into the crankcase.



2. Lower crankcase

a. Install the shift cam and secure it with the guide pin. Install the stopper plate and bolt and tighten securely.

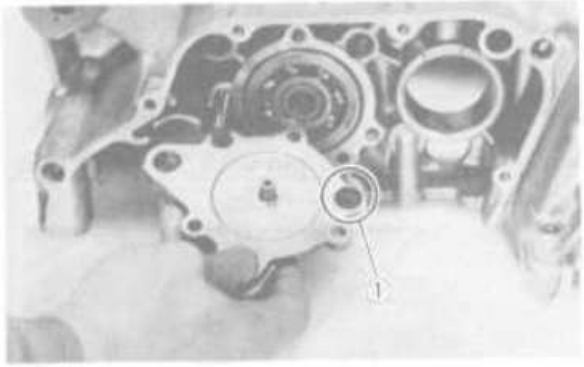
b. Install the neutral switch.



c. Install the transmission drive axle assembly into the crankcase.

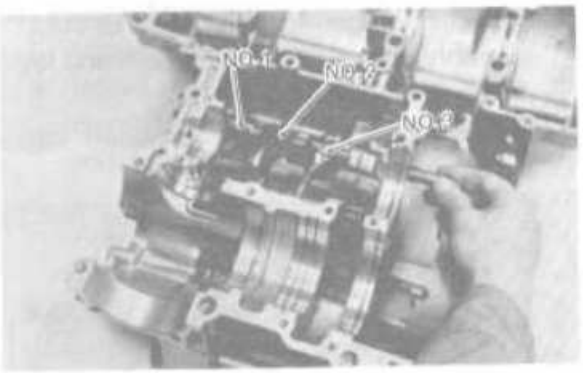


d. Install the 5th wheel gear and bearing onto the drive axle. Install the bearing cover. Be sure the "O-ring" is on the cover.



1. O-ring

e. Install the shift forks and guide bar. Each shift fork is identified by a number cast on its side. All the numbers should face the left side and numbered 1, 2, and 3 from left.

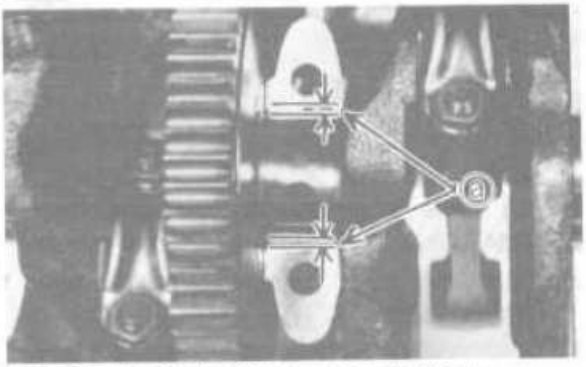


3. Crankcase assembly

a. Apply Yamaha bond # 4 sealant or equivalent to the crankcase mating surface. Be very careful not to allow any sealant to come in contact with the oil gallery "O-ring" and crankshaft bearings. It is extremely important, however, that sealant be applied around the case stud holes. Apply sealant to within 2 ~ 3 mm (0.08 ~0.12 in) of the bearings.

CAUTION:

Failure to apply sealant here will result in reduced oil pressure and possible crank seizure.



a. 2~3 mm (0.08~ 0.12 in) Do not apply sealant.

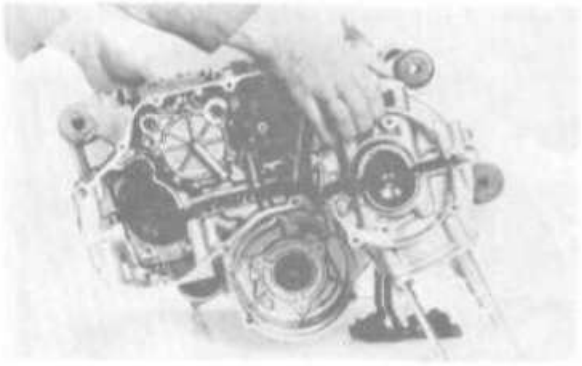
b. The crankcases are assembled by placing the upper case half on the bench and lowering the lower case onto it.

NOTE:

Be sure that shift fork No. 2 engages the groove in the 2nd pinion gear on the main axle.

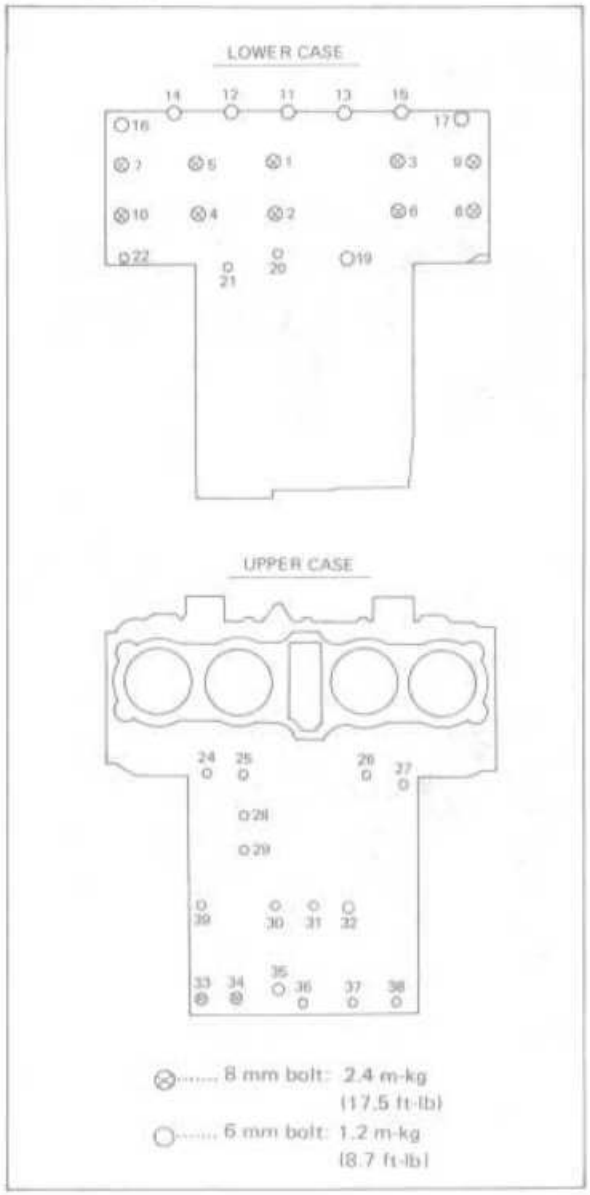
CAUTION:

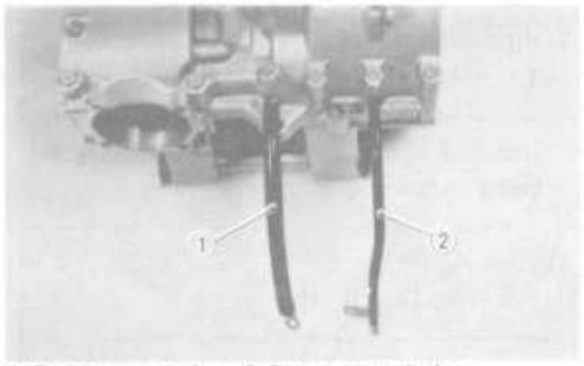
Before installing and torquing the crankcase bolts, check to make sure the transmission is functioning properly by shifting it by hand with the shift cam.



c. Start installation of the crankcase bolts with the center crankshaft area bolts. Place the two bolts without washers in the oil filter area.

d. The crankcase bolts should be torqued in proper sequence. Refer to the tightening sequence in the illustration.



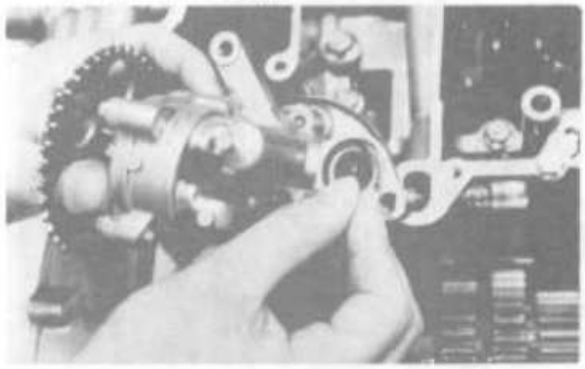


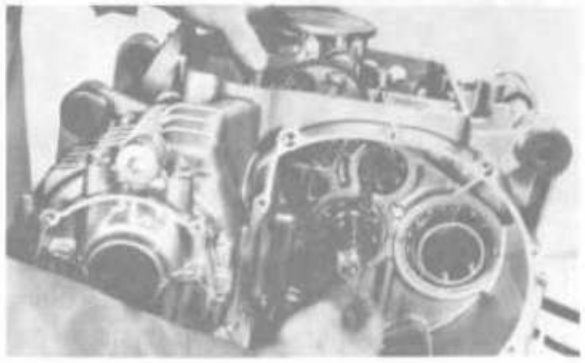
1. Engine ground wire 2. Battery ground wire

4. Oil pump and strainer cover

a. Place the oil pump drive chain on the transmission main axle.

b. Place the drive chain on the oil pump driven sprocket and install the pump on the crankcase. The "O-ring" should be installed properly.





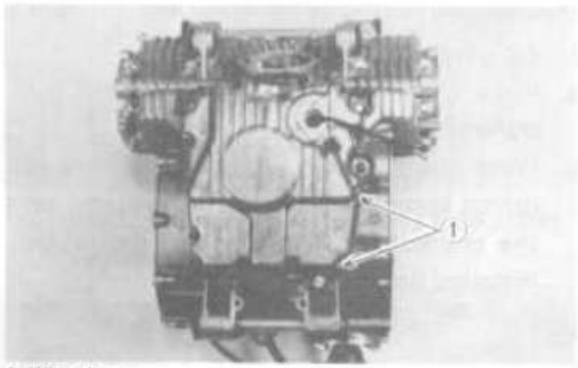
c. Install the drive chain cover on the oil pump and secure with the 2 shouldered bolts and one normal 6 mm bolt.



Tightening torque:
1.0 m-kg (7.2 ft-lb)

d. Install the strainer cover and torque the bolts to the specification.

Tightening torque:
1.0 m-kg (7.2 ft-lb)



1. Wire clamps

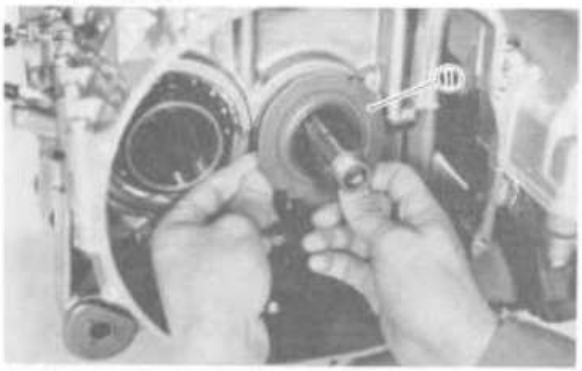
5. Clutch assembly

a. Install the thrust plate onto the transmission main axle.



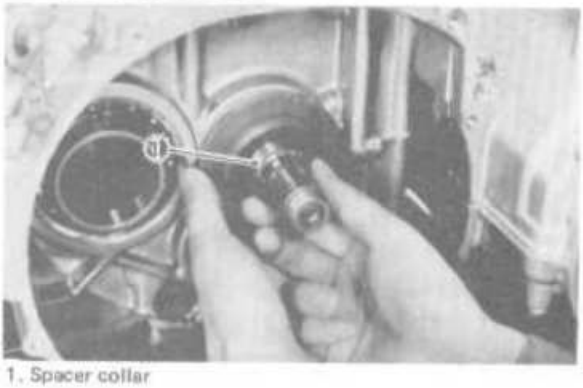
1. Thrust plate

b. Install the oil pump drive sprocket onto the main axle without the spacer collar and place the oil pump drive chain on its sprocket.



1. Oil pump drive sprocket

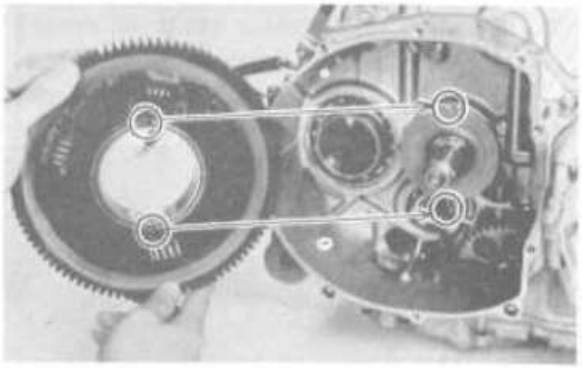
c. Insert the spacer collar into the oil pump drive sprocket.



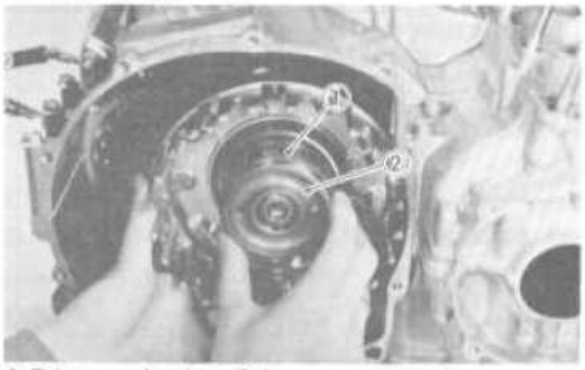
1. Spacer collar

d. Install the primary driven gear (clutch housing) without the bearing and inner spacer.

CAUTION:
Be sure that the oil pump drive gear tabs engage the clutch housing grooves on it's back or the tabs will be damaged when tightening the clutch boss securing nut.

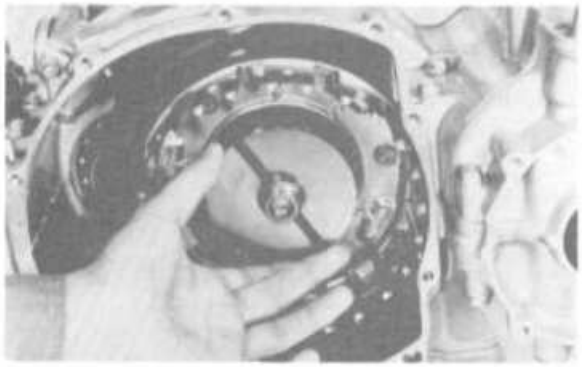


e. Installing the primary driven gear bearing and inner spacer into the clutch housing.

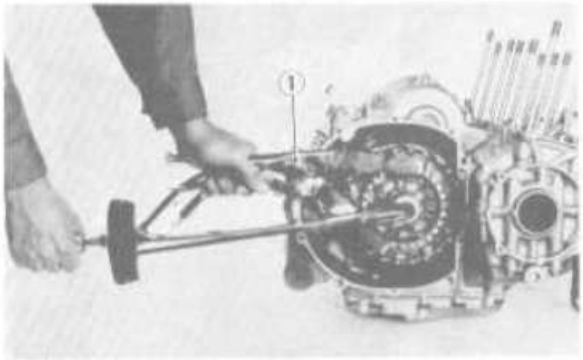


1. Driven gear bearing 2. Inner spacer

f. Install the large thrust plate and clutch boss onto the main axle.



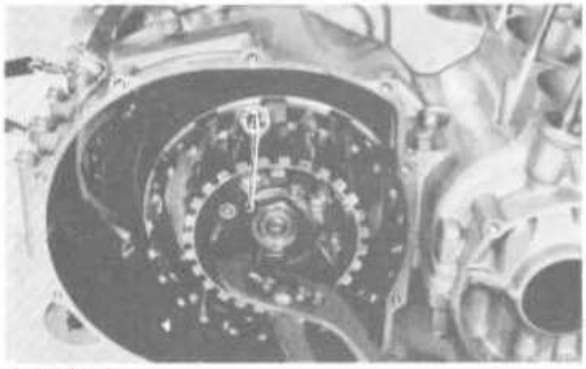
g. Install a new lock washer and nut and tighten the nut to the specified torque. Use the clutch boss holder (special tool).



1. Clutch boss holder

Tightening torque: 7.2 m-kg (52 ft-lb)

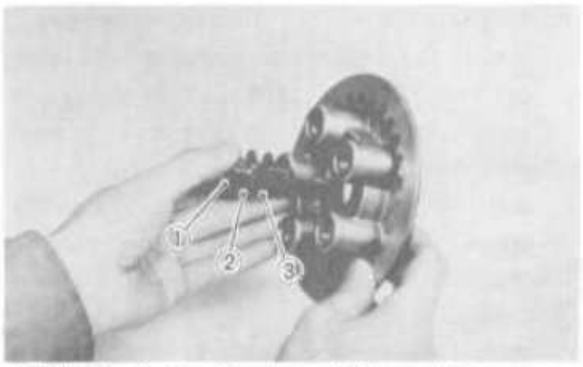
h. Bend the lock washer tabs along the nut flats.



1. Lock tab

i. Install the clutch plates and friction plates alternately on the clutch boss, starting with a friction plate and ending with a friction plate.

j. Install the plate washer, thrust bearing, and clutch pull rod into the clutch pressure plate from inside.

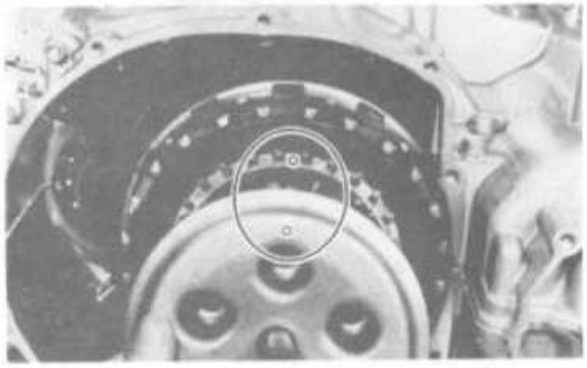


1. Pull rod 2. Thrust bearing 3. Plate washer

k. Install the pressure plate assembly onto the clutch boss.

NOTE:

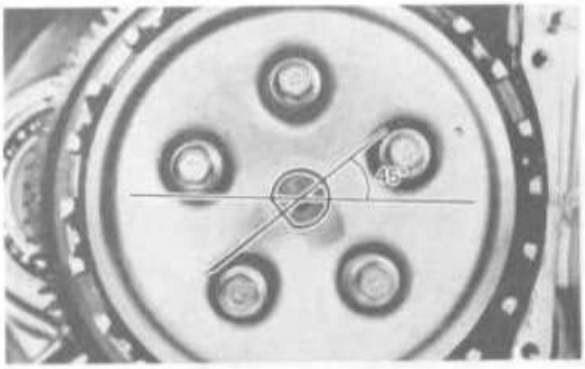
Pressure plate has a dot on it which must line up with the dot on clutch boss.



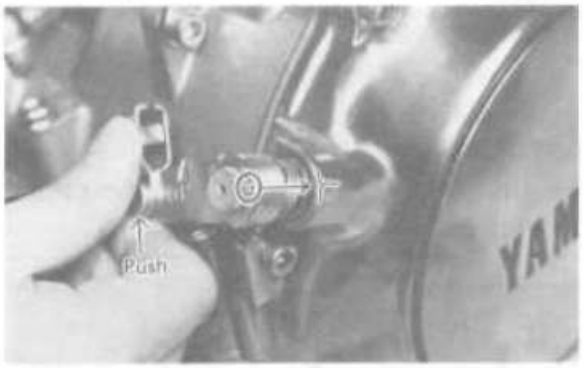
l. Install the clutch springs and screws. Tighten the screws.

Clutch screw torque: 1.0 m-kg (7.2 ft-lb)

m. Set the gear of the clutch pull rod on the pressure plate facing approximately 45° from horizontal toward the rear; set the clutch lever (if installed) on the right crankcase cover parallel to the gasket surface and install the cover to the crankcase. Do not forget to install two dowel pins.



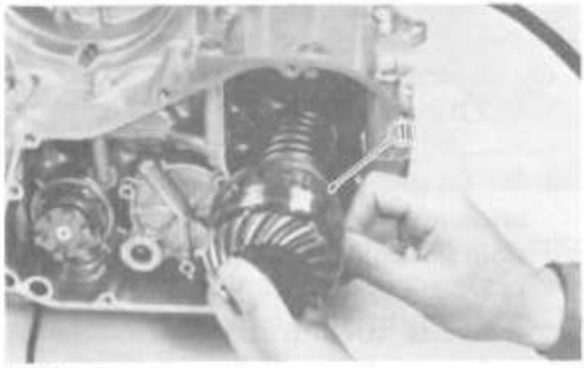
n. If the clutch lever has been removed, install the lever return spring and lever on the shaft after installing the right crankcase cover. In this case make sure that the punch mark on the lever should align with the mark on the crankcase cover when pushing the lever towards the front by hand and then install the circlip.



6. Middle gear (installation only, refer to page 67 for the middle gear adjustment)

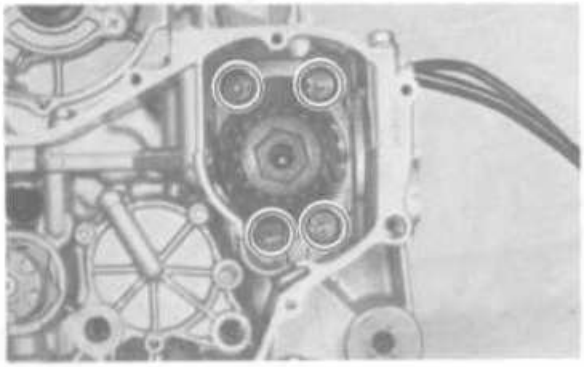
a. Install the middle drive gear assembly with the proper size of shim(s) and secure it with the bearing retainers and new "TORX" screws.

Tightening torque: 2.5 m-kg (18 ft-lb)



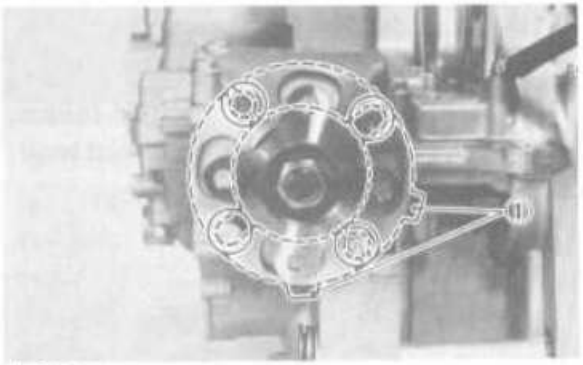
1. Shims

b. Stake the screw heads to the dents on the bearing retainers with a center punch.



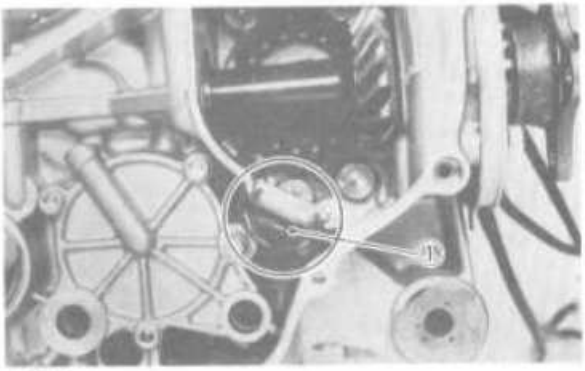
c. Install the driven gear assembly with the proper size of shims and secure it with the bolts. Apply a thread locking compound such as "LOCTITE" to the bolt threads.

Tightening torque: 2.5 m-kg (18.1 ft-lb)



1. Shims

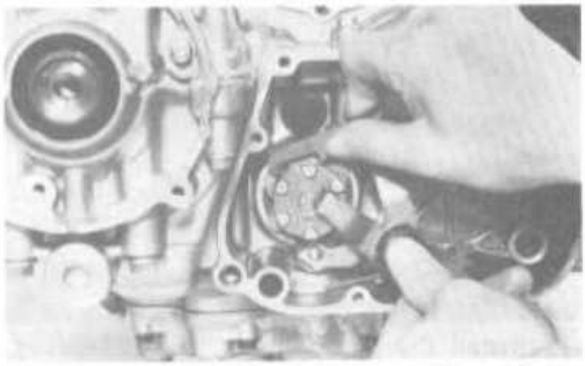
d. Install the middle gear case half moon seal onto the crankcase.



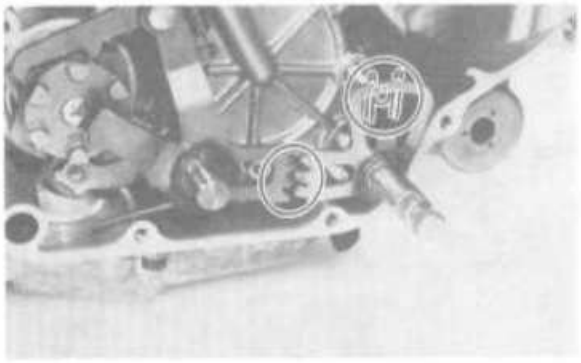
1. Seal

7. Shifter assembly

a. Install the shift shaft assembly with the stopper lever.



b. Install the shift lever assembly with the positioning spring is properly located on the stopper pin and the teeth should be set properly as shown.

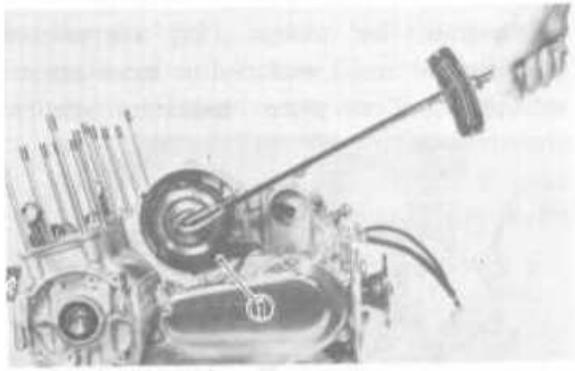


c. Install the left crankcase cover (shifter cover) using a new gasket. Make sure the wire harness clips are properly positioned.

Tightening torque:
1.0 m-kg (7.2 ft-lb)



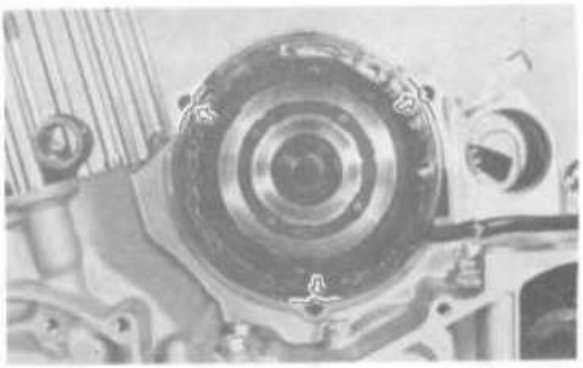
8. A.C. Generator
   a. Install the rotor onto the shaft and tighten the bolt using the rotor holding tool (special tool) as shown.



1. Rotor holding tool

Tightening torque:
5.5 m-kg (39.8 ft-lb)

   b. Install the stator coil assembly onto the crankcase and align the grooves on the stator core with the bolt holes on the crankcase.



   c. Install the A.C.G. cover assembly and tighten the bolts to the specification. Do not forget to install the new gasket.

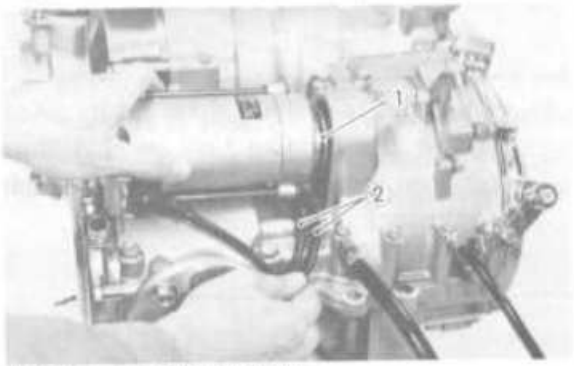
Tightening torque:
1.0 m-kg (7.2 ft-lb)

9. Starter motor
   a. Route the A.C.G. lead wires as shown.
   b. Install the starter motor and tighten the bolts to the specification.

Tightening torque:
1.2 m-kg (8.7 ft-lb)

NOTE:

Be careful the "O-ring" is not damaged when installing the starter motor.

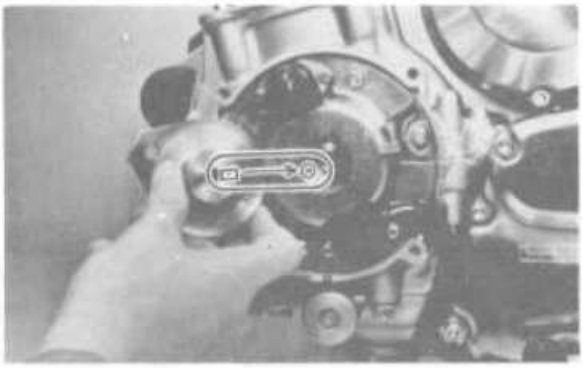


1. O-ring 2. A.C.G. lead wires

10. Pick-up coil assembly
    a. Install the pick-up coil assembly onto the crankcase.
    b. Install the timing plate on the crankshaft and tighten the bolt to the specification.

NOTE:

Note that there is the locating pin on the crankshaft and the corresponding slot in the timing plate which must be aligned to install the timing plate.

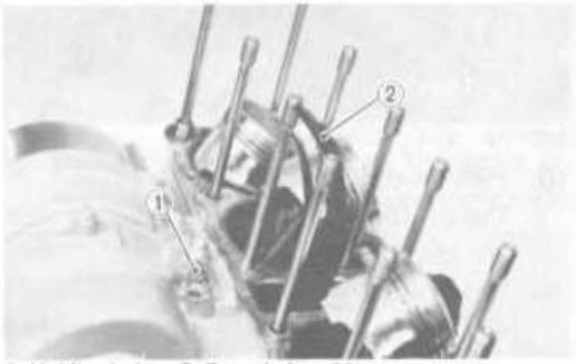


11. Pistons and Cylinder
    a. Install the pistons on the rods. The arrow on the piston must point to the front of the engine.

NOTE:
Before installing the piston pin clips, cover the crankcase with a clean rag so you will not accidentally drop the circlip into the crankcase.
Always install new piston pin circlips.

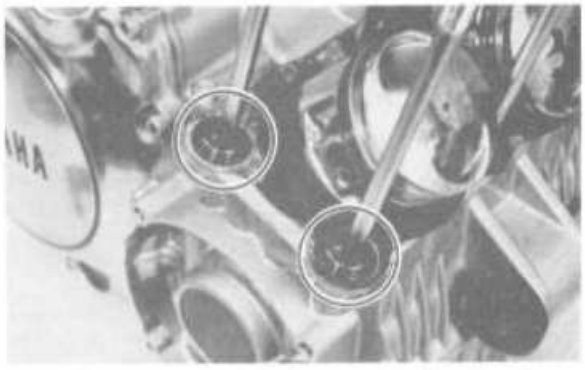


    b. Install the rear chain guide on its pivot. Tighten the holding bolt until it stops and then loosen 1/4 turn and then tighten the lock nut.

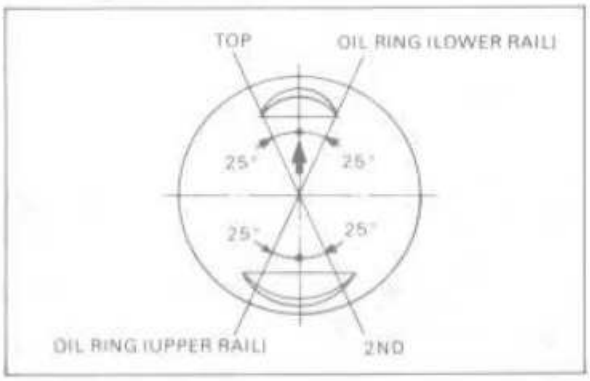


1. Holding bolt 2. Rear chain guide

    c. Install the new cylinder base gasket and dowel pins. Install the new "O-rings" to the right side dowel pins.



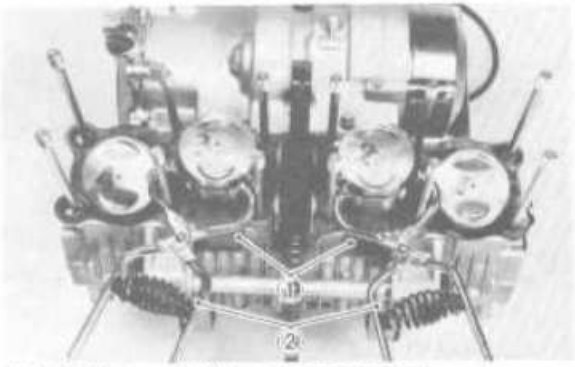
    d. Set the crankshaft so that the all pistons are equal height and align the piston rings as shown.



CAUTION:
Make sure the ends of the oil ring expanders are not overlapped.

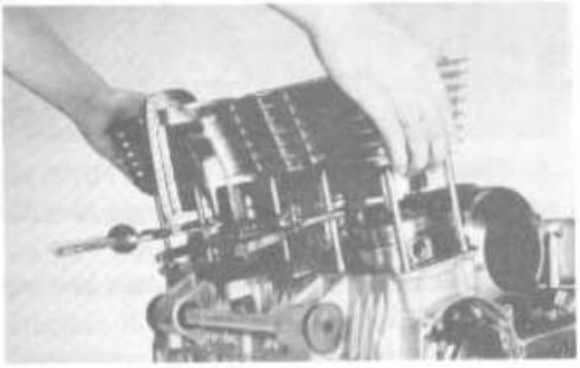
NOTE:
Manufacturer's marks or numbers stamped on the rings are on the top side of the rings. Coat the pistons and rings well with oil.

    e. Install the piston ring compressors (special tool) and piston bases (special tool). Four piston bases are required.



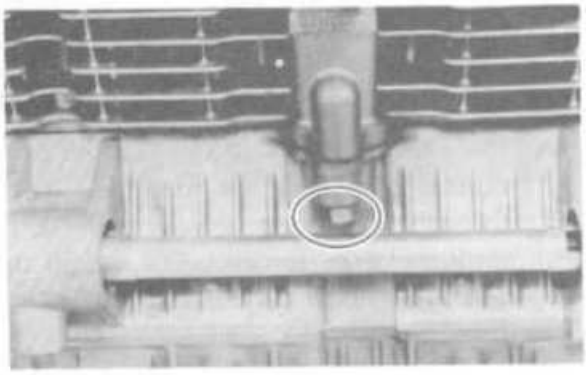
1. Piston bases 2. Piston ring compressors

f. Tie the cam chain with a piece of mechanic's wire and feed it through the chain opening. Carefully lower the cylinder onto the pistons. Remove the ring compressors and piston bases and repeat this procedure for pistons 1 and 4.

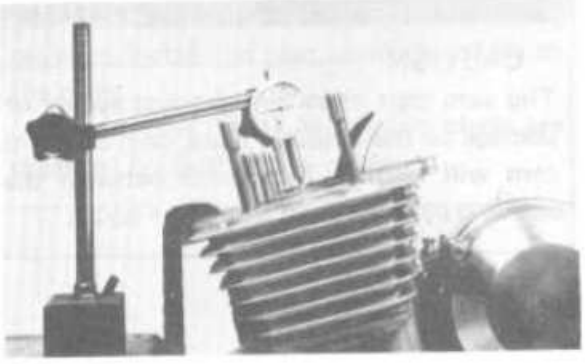


g. Install the cylinder securing nut (front side) and tighten it to the specification.

Tightening torque: 2.0 m-kg (14.5 ft-lb)

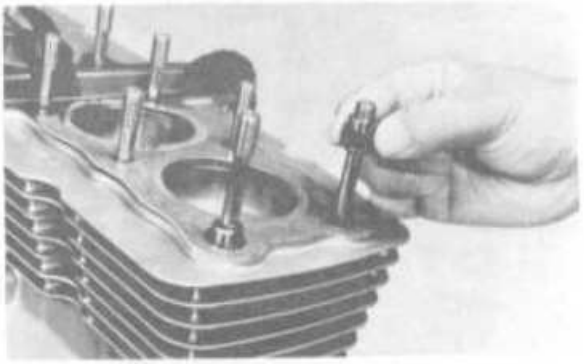


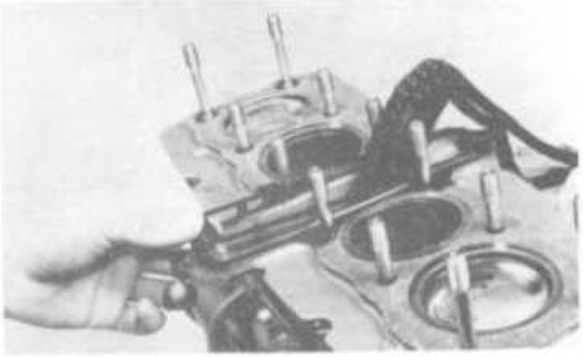
h. Set the dial gauge on the No. 1 piston head center as shown to find the No. 1 piston top dead center and check whether the "T" mark on the timing plate and stationary pointer are aligned or not. If not, loosen the pointer securing screw and adjust.



12. Cylinder head and Cam shafts

a. Install the new cylinder head gasket. Install the dowel pins and "O-rings". Locate the cam chain cavity cylinder seal with the tabs down.





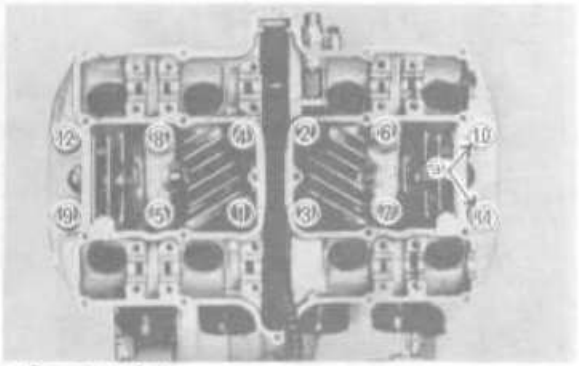
b. Install the cylinder head onto the cylinder. Pull the cam chain through the cylinder head as it is installed. Tie the cam chain so that it does not fall into the crankcase.

c. Place the upper cylinder head nuts and washers in place. Follow the illustration for the proper tightening sequence. Torque all nuts in two stages and final torque the upper nuts to the specification.

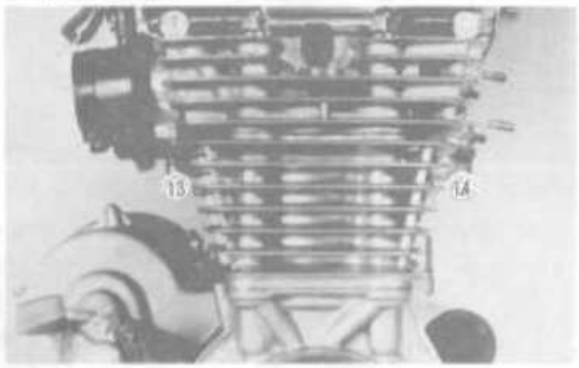
Tightening torque: 3.2 m-kg (23.1 ft-lb)

Don't forget the lower nuts on the front and rear of the cylinder head. Torque to the specification.

Tightening torque: 2.0 m-kg (14.5 ft-lb)



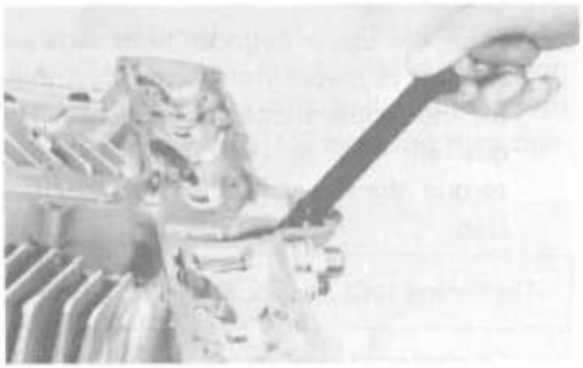
a. Copper washers



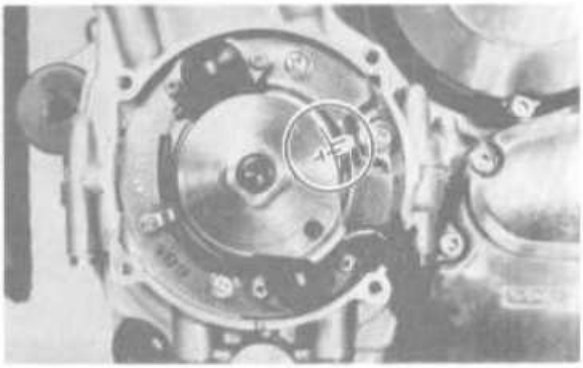
NOTE:

Tighten the nuts in two stages, 1/2 torque value and then full torque value. Also lubricate the bolt threads with the engine oil to achieve proper torque values.

d. Install the front cam chain guide being certain that it is in its holder down below.

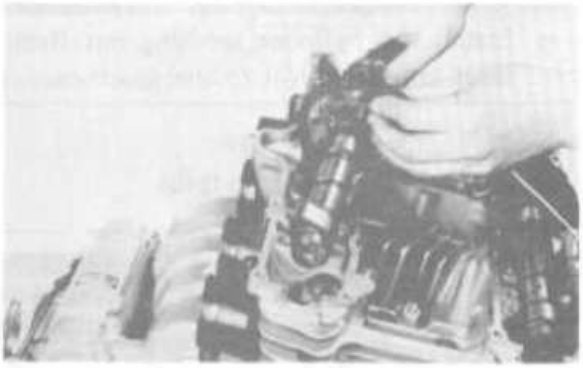


e. Rotate the engine in a counterclockwise direction until the crankcase pointer and "T" mark on the timing plate are aligned.

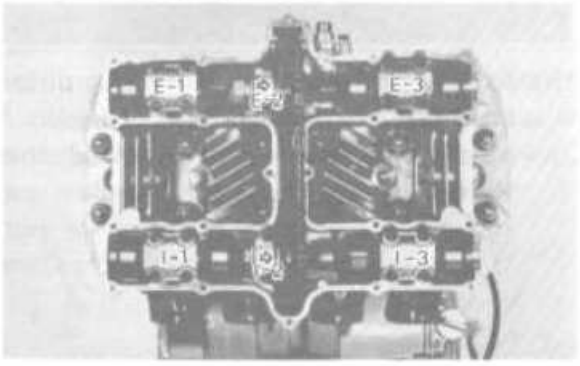


f. With the cylinders No. 1 and 4 at the top dead center, slip the cam chain over the sprocket.

g. Lubricate all cam caps and cam bearings surfaces liberally with oil.



h. Place the cam caps in their proper positions. The caps are identified "I-1" through "I-3" for intake and "E-1" through "E-3" for exhaust. Install the bolts only finger tight.



CAUTION:

The cam caps must be tightened evenly or damage to the cylinder head, cam caps and cam will result. The spaces between the caps and cylinder head should be equal.

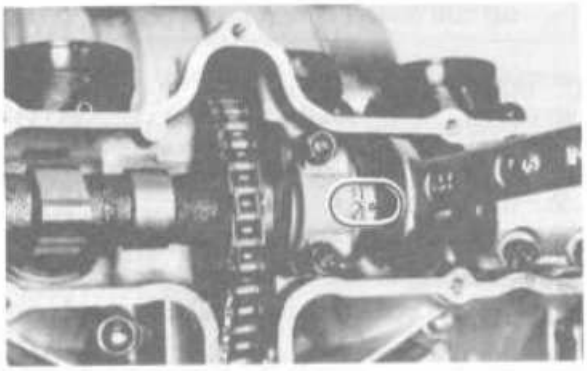
l. Torque the cam cap bolts in two stages and final torque to the specification.

Tightening torque: 1.0 m-kg (7.2 ft-lb)

13. Cam chain, cam sprockets and chain tensioner
    a. Rotate each cam shaft until the dot on the cam is aligned with the arrow on the center cam cap.

CAUTION:

Use extreme caution when rotating the cams. Two possible dangers exist. First, the wrench may contact the head and fracture it. Or second, a valve may become bent if the cam is turned the wrong way.

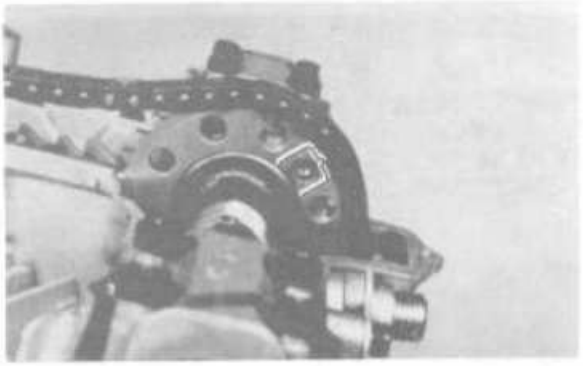


b. Carefully lift the cam chain from the exhaust cam sprocket and pull upward to remove any slack in the chain between the crankshaft and the exhaust cam sprocket. With all slack removed, place the chain back on the cam sprocket.

c. Grip each sprocket simultaneously and place them on the camshaft shoulders while continuing to keep tension on the chain from the crankshaft to the exhaust sprocket.

CAUTION:

Use only the special hardened shouldered bolts to install the cam chain sprockets to the cams.
Make sure the rollers of the cam chain are centered on both chain guides.

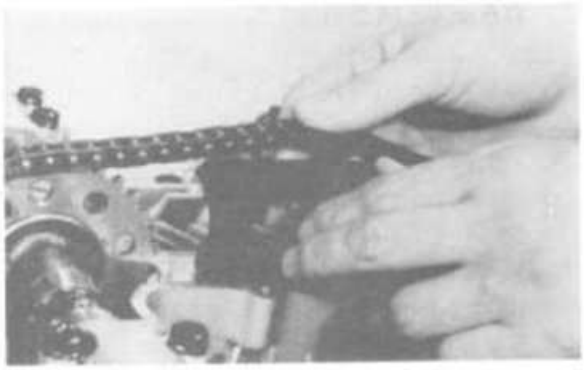


d. Rotate the sprockets slightly to align the bolt holes and insert one special bolt in each sprocket.

NOTE:

Tighten only finger tight at this time.

e. Install the center chain guide.



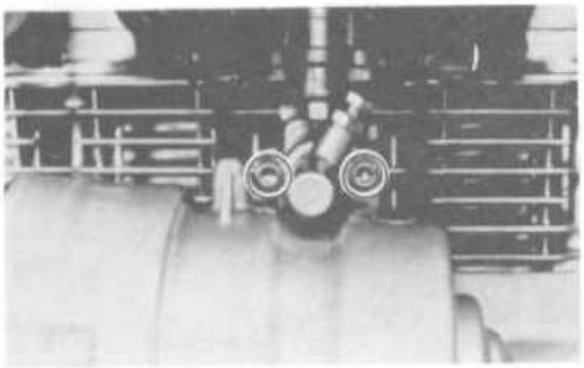
f. Rotate the crankshaft counterclockwise and align the "C" mark on the timing plate with the timing pointer.



g. Compress the cam chain tensioner and lock in the retracted position.

h. Install the chain tensioner to the engine and torque the bolts to the specification.

Tightening torque: 1.0 m-kg (7.2 ft-lb)



i. Release the tensioner holding bolt, an audible click will be heard when the tensioner is released.

j. Torque the holding bolt and the lock nut to the specifications.

Holding bolt torque: 0.6 m-kg (4.3 ft-lb) Lock nut torque: 0.9 m-kg (6.5 ft-lb)

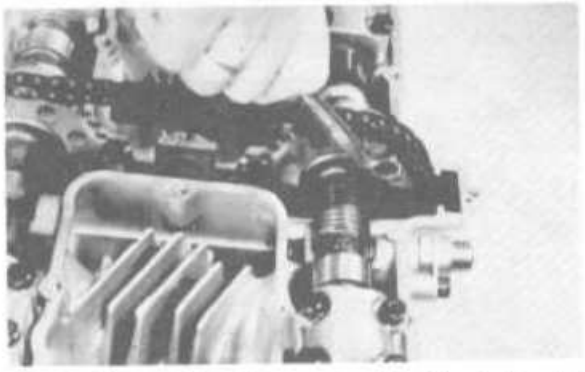
k. Rotate the crankshaft more than one full revolution and align the "T" mark on the timing plate with the timing pointer. With the crankshaft at the "T" mark, the dots on the cams should be aligned with the raised arrows on the center cam caps. If they are not aligned, disassemble the sprockets and chain tensioner and repeat above procedures.

l. Rotate the crankshaft and install the two remaining shoulder bolts into the cam sprockets. Torque all four sprocket holding bolts to the specification.

CAUTION:

Be sure to attain the specified torque value to avoid the possibility of these bolts coming loose and causing serious damage to the engine.

Tightening torque: 2.0 m-kg (14.5 ft-lb)



m. Adjust all valves as described in the "PERIODIC INSPECTIONS AND ADJUSTMENTS".

n. Install the cylinder head cover with a new gasket.

o. Install the left and right crankcase covers. The left crankcase cover (pick-up coil cover) is required a gasket.

C. Middle Gear Servicing

1. Disassembly
   Refer to page 39 for disassembly.
2. Inspection
   Refer to page 52 for inspection.
3. Gear lash check

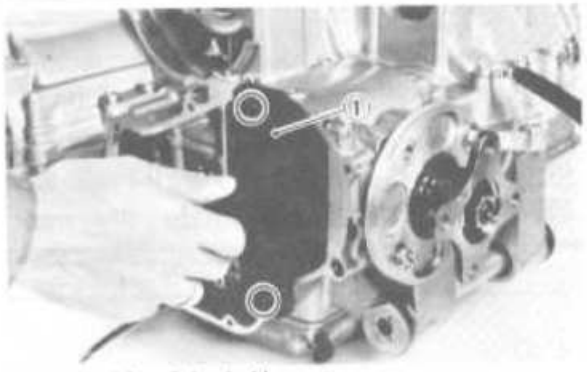
NOTE:

The middle gear lash can be checked only when the gears are installed in the crankcase.

a. Install the middle drive pinion holder (special tool) on the crankcase to hold the drive gear stationary during the lash measurement.

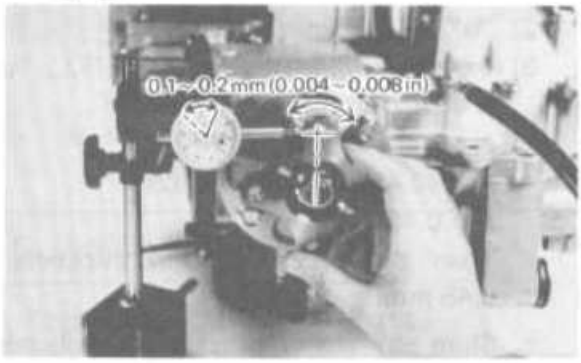
NOTE:

Before installing the tool, loosen the holder bolt all the way out and after installation tighten this bolt as tight as necessary (finger tight is generally sufficient).



1. Middle drive pinion holder

b. Set the dial gauge to the middle drive flange as shown and gently rotate the drive flange back and forth.
Note the lash measurement on the dial gauge.

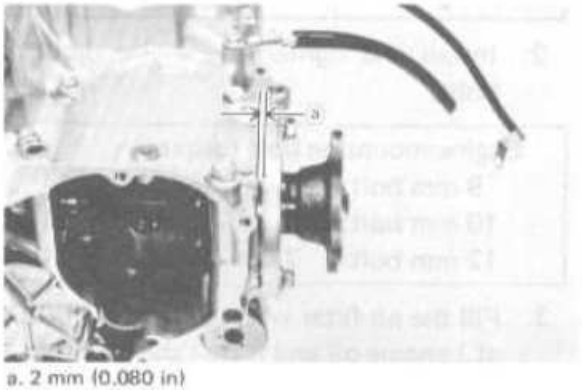


Middle gear lash:
0.1 ~ 0.2 mm (0.004 ~ 0.008 in)

c. Check this engagement at 4 positions. Rotate the drive flange 90° each time and repeat the gear lash check.

NOTE:
If the gear lash exceeds the specified limit and adjustment is necessary, the engine or swing arm should be removed from the motorcycle.

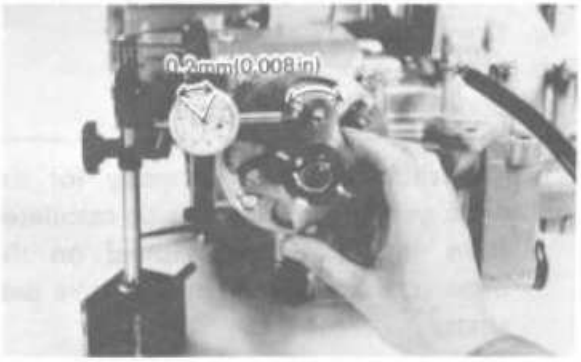
4. Gear lash adjustment
a. Install the driven gear housing assembly into the crankcase leaving about a 2 mm (0.080 in) gap between the housing and crankcase and install the two bolts to the bearing housing 180° opposite to each other.



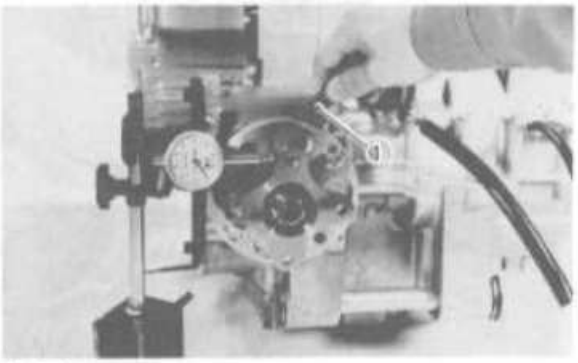
a. 2 mm (0.080 in)

b. Install the middle drive shaft holder and dial gauge (refer to "Middle gear lash check").

c. Slowly tighten the bolts alternately until the dial gauge lash measurement reaches 0.2 mm (0.008 in).



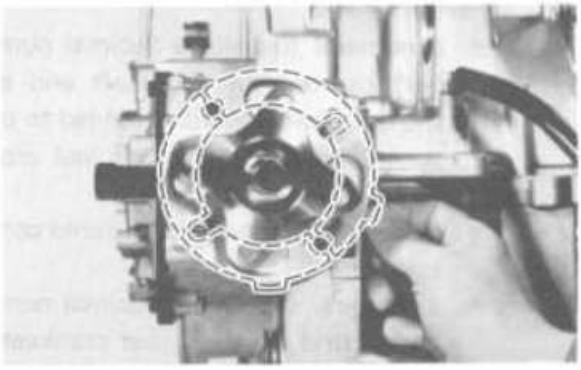
d. Measure the gap between the driven gear bearing housing flange and the crankcase with a feeler gauge.
This is the shim size required.



1. Feeler gauge

e. Install the proper sized shims as shown and tighten the driven gear housing to the specified torque.
Recheck the gear lash, it should be within the specification, if not readjust the shims.

Gear lash: 0.1 ~ 0.2 mm (0.004 ~ 0.008 in)



5. Drive gear positioning

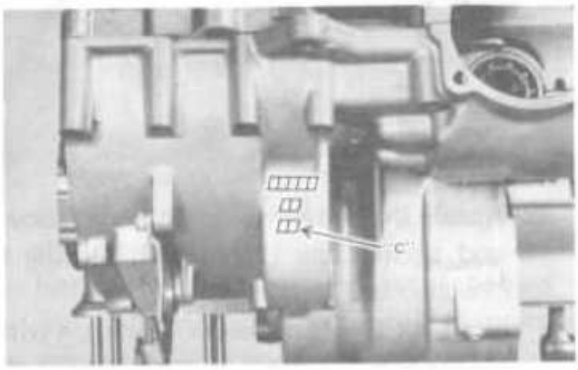
NOTE:

When the following part(s) is replaced with new one(s), drive gear positioning is necessary:

a. Crankcase
b. Middle gears
c. Middle gear bearing housing

a. The shim thickness necessary for the drive gear positioning can be calculated from the informations found on the upper crankcase and on the drive gear shaft.





b. To find shim thickness "A" use the formula:

$A = c - a - b$

Where:

a = a numeral (usually a decimal number) printed on the shaft end as shown above and either added to or subtracted from the nominal size "43".

b = a bearing thickness (considered constant)

c = a numeral (usually a decimal number) found on the upper crankcase half near the main bearing selection numbers and added to the nominal size "60".

Distance "b" = 16.94 mm

Example:

1) If the shaft is marked +03 ..... "a" is 43.03 mm.
2) "b" is 16.94 mm.
3) If the crankcase is stamped "45" ..... "c" is 60.45 mm.

$A = c - a - b$

$A = 60.45 - 16.94 - 43.03$

$A = 0.48$

Then the necessary shim thickness is 0.48 mm.

c. Shim size are supplied in the following thicknesses:

0.15 mm, 0.20 mm, 0.30 mm, 0.40 mm, and 0.50 mm.

Because the shims can only be selected in 0.05 mm increments the following chart should be used when encountering last digits that are not 5 or zero (0):

Last digits	Rounding
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

D. Remounting Engine

Refer to page 30 for engine removal. Reverse the applicable removal steps.

CAUTION:

Always use new bolts in the drive shaft coupling.

2. Install and tighten the engine mounting bolts.

Engine mounting bolt torque:

8 mm bolt:	2.0 m-kg (14.5 ft-lb)
10 mm bolt:	4.2 m-kg (30.4 ft-lb)
12 mm bolt:	7.0 m-kg (50.6 ft-lb)

3. Fill the oil filter with approx. 0.3 lit (0.3 qt.) engine oil and install the oil filter.

CAUTION:

The filter must be filled with the specified amount of oil to prime the oil pump of an overhauled engine.

4. Tighten engine oil drain plug, oil filter mounting bolt, and middle drain plug.

Torque:
Engine oil drain plug:
4.3 m-kg (31.0 ft-lb)
Oil filter mounting bolt:
1.5 m-kg (11.0 ft-lb)
Middle gear drain plug:
2.4 m-kg (17.5 ft-lb)

5. Add oil to the engine.

Engine oil: 2.9 lit (3.1 US qt.)

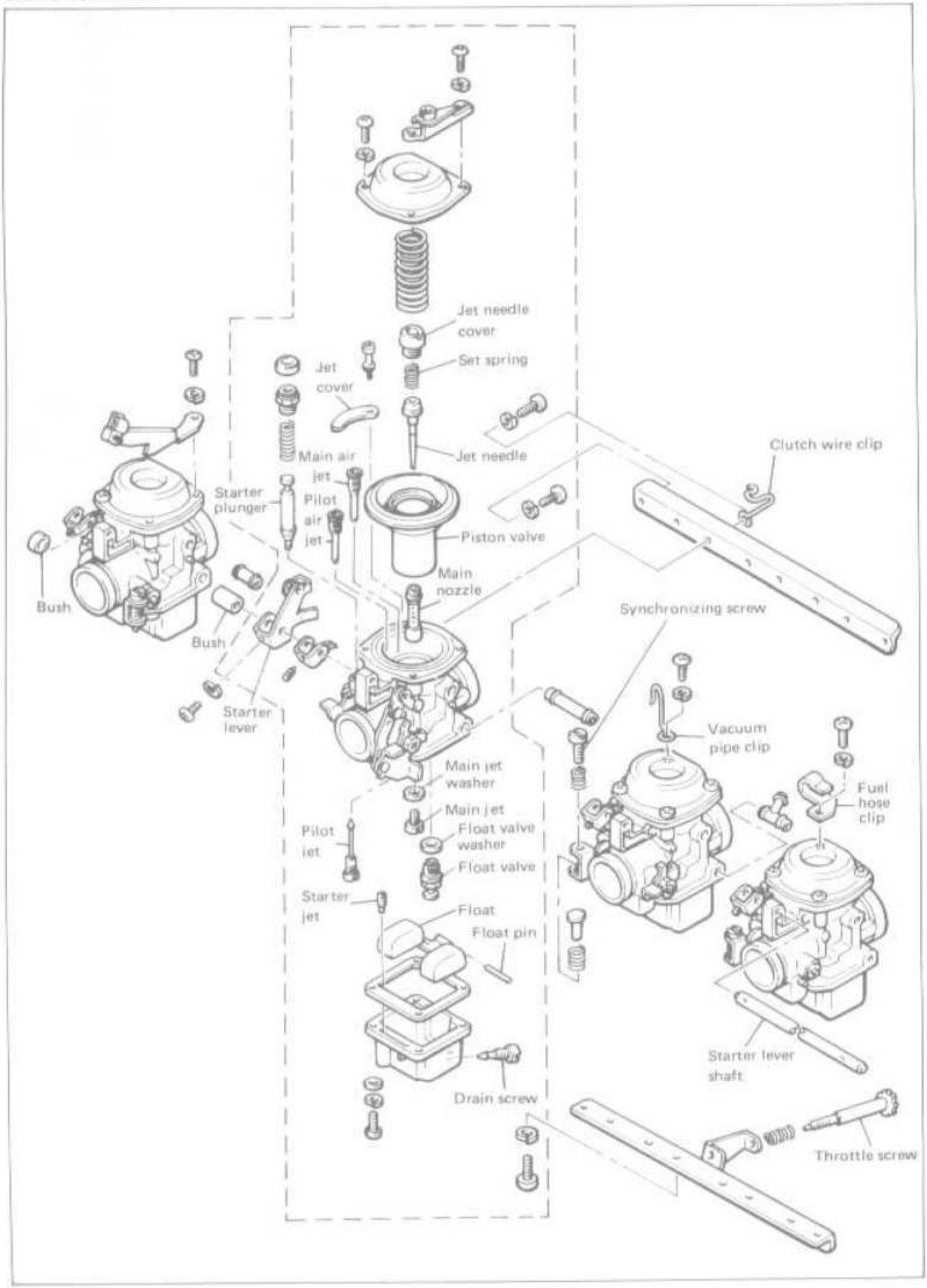
CHAPTER 4. CARBURETION

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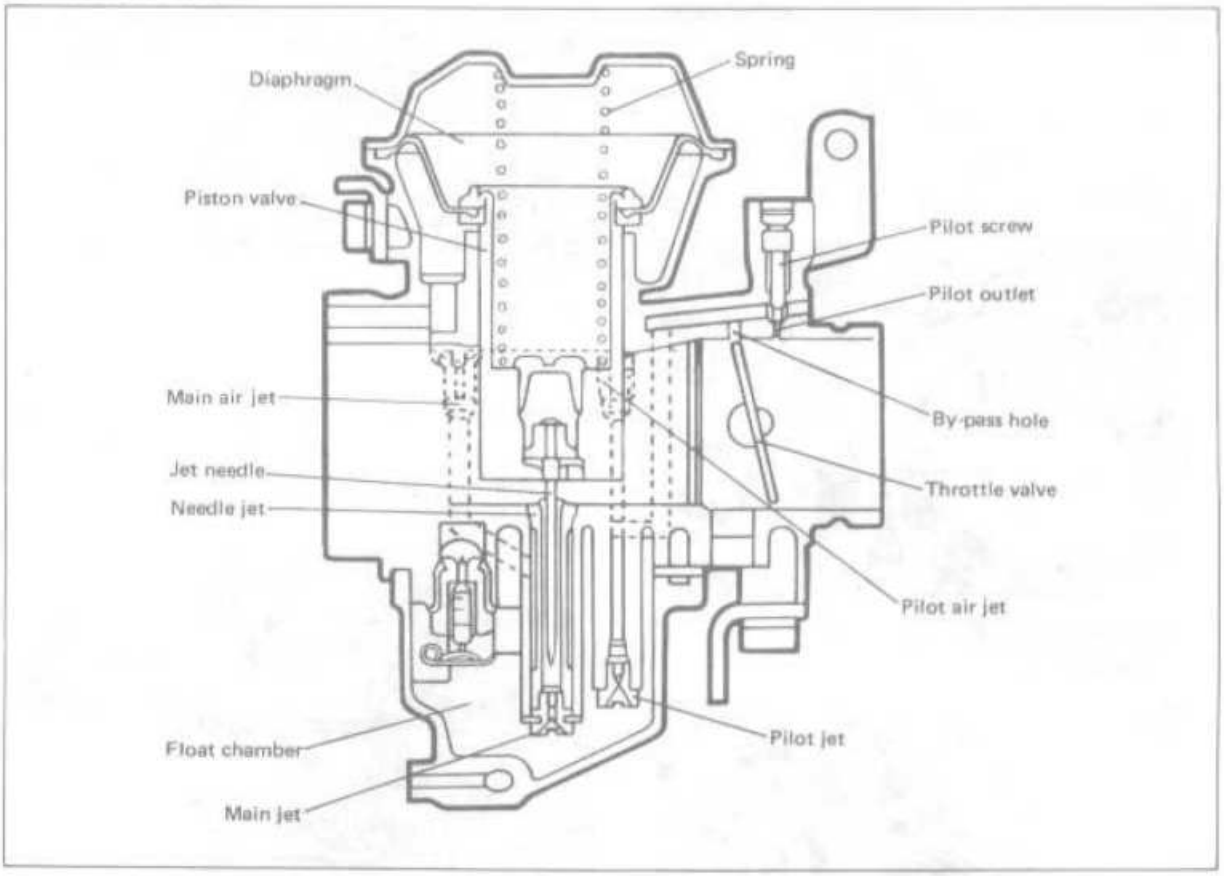
4

CHAPTER 4. CARBURETION

CARBURETOR



A. Section View



B. Specifications

Main jet	#110
Jet needle	Y-10
Needle jet	ϕ 3.2
Starter jet	#40
Fuel level	3±1mm(0.118±0.039in)
Pilot screw	Preset
Float valve seat	ϕ 2.0
Engine idle speed	1,050 r/min

CAUTION:

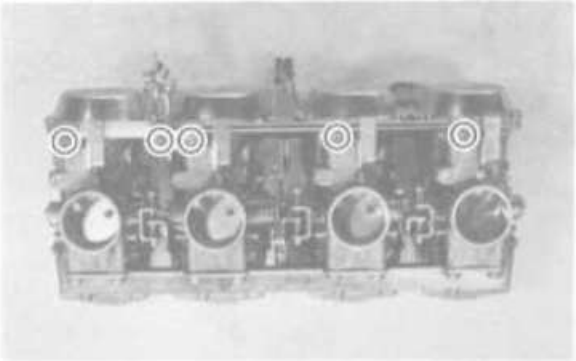
The pilot screw settings are adjusted for maximum performance at the factory with the use of specialized equipment. Do not attempt to change these settings. If all other engine systems are functioning correctly, any changes will decrease performance and cause increased exhaust emissions.

C. Disassembly

CAUTION:

Separation of the carburetor is not recommended. Usual disassembly for cleaning and inspection is not necessary to separate the carburetors. The carburetor body support screws are locked with a locking compound such "LOCTITE". If the carburetors are separated, misalignment will result.

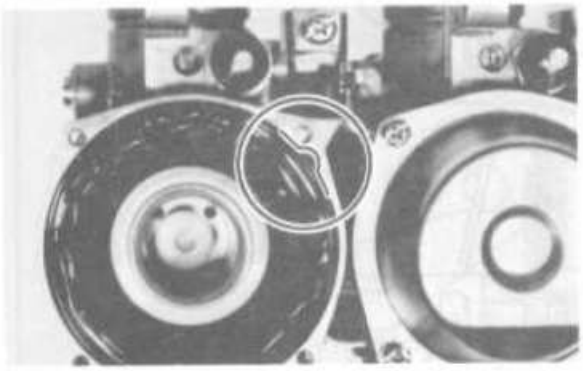
1. Loosen the starter lever securing screws and remove the starter lever shaft, bushes, and levers. Note the positions of the bushes.



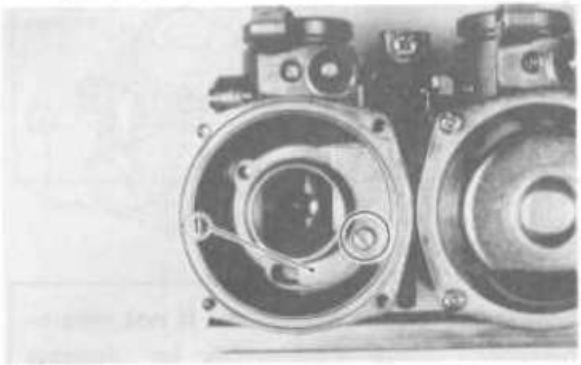
2. Remove the vacuum chamber cover and remove the spring and diaphragm (vacuum piston).

NOTE:

Note that there is the tab on the rubber diaphragm. There is the matching recess in the carburetor body for the diaphragm tab.

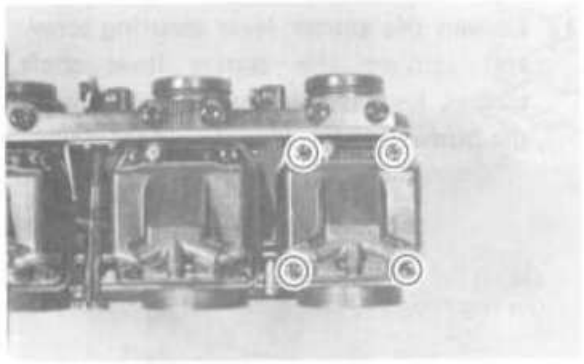


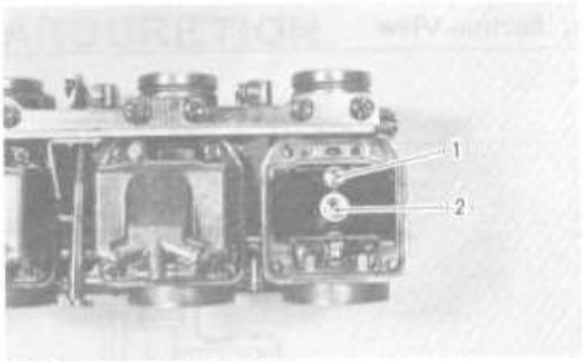
3. Remove the jet cover securing screw and remove the cover.



1. Jet cover

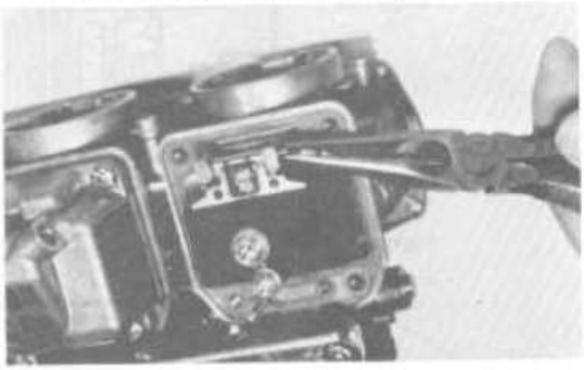
4. Remove the screws holding the float chamber cover and remove the cover. The main and pilot jets are located in the float bowl. Remove the jets if necessary.

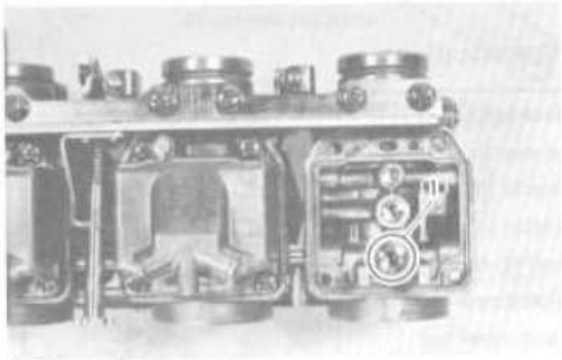




1. Pilot jet 2. Main jet

5. Pull out the float pivot pin. Remove the float assembly. Be careful to not lose the float valve under the float arm. Remove the float valve seat.

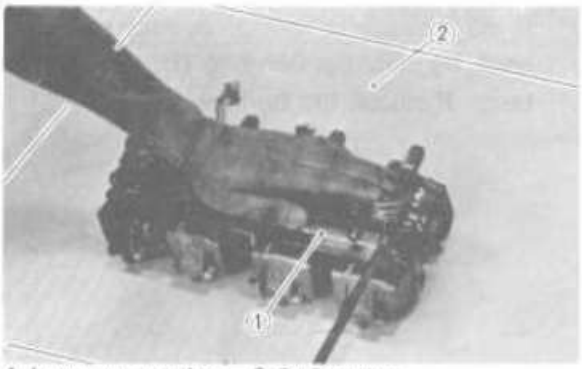




1. Float valve seat

6. Reassemble in reverse order. Pay close attention to the installation of the vacuum piston diaphragm and the location of each jet.
7. If the carburetors should be separated, care must be taken so that they are put together in place according to the following procedures:

a. Place the carburetors on a surface plate and install the lower support plate. Apply a thread locking compound such as "LOCTITE" and tighten the screws securely while holding the carburetor body.



1. Lower support plate 2. Surface plate

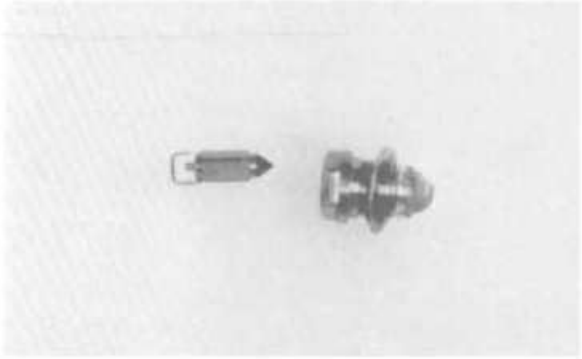
NOTE:

When reassembling, the surface plate should be used for the proper carburetor alignment.

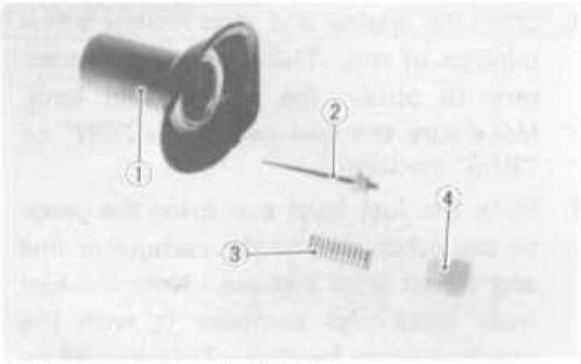
b. Install the upper support plate. Apply a thread locking compound such as "LOCTITE" to the support screw threads and tighten the screws securely.

D. Inspection

1. Examine the carburetor body and fuel passages. If contaminated, wash the carburetor in a petroleum-based solvent. Do not use caustic carburetor cleaning solutions. Blow out all passages and jets with compressed air.
2. Examine the condition of the floats. If the floats are damaged, they should be replaced.
3. Inspect the float needle valve and seat for wear or contamination. Replace these components as a set.

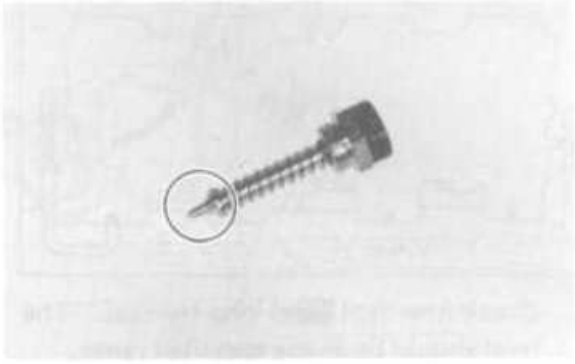


4. Inspect the vacuum piston and rubber diaphragm. If the piston is scratched or the diaphragm is torn, the assembly must be replaced.



1. Vacuum piston 3. Set spring
2. Needle jet 4. Needle jet cover

5. Inspect the starter plunger for damage. If damaged, replace.



E. Adjustment

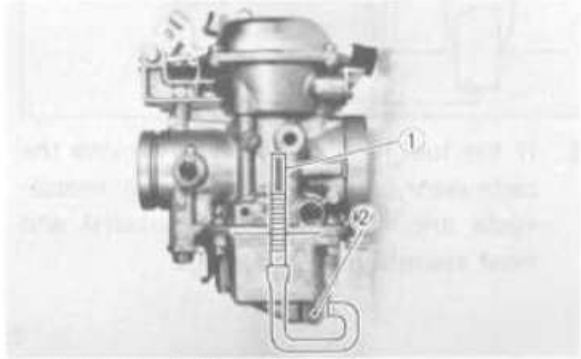
Fuel level

NOTE:

Before checking the fuel level, note the following:

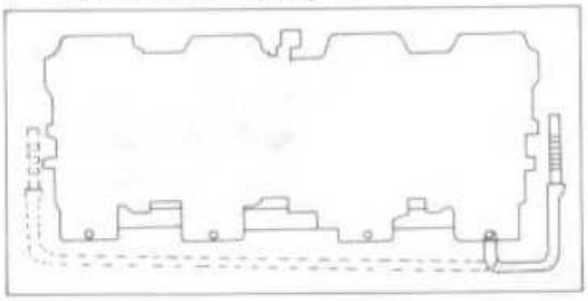
1. Place the motorcycle on a level surface.
2. Adjust the motorcycle position by placing a suitable stand or a garage jack under the engine so that the carburetor is positioned vertically.

1. Connect the level gauge (special tool) or a vinyl pipe of 6 mm (0.24 in) in inside dia. to the float bowl nozzle left or right side carburetor.
2. Set the gauge as shown and loosen the drain screw.



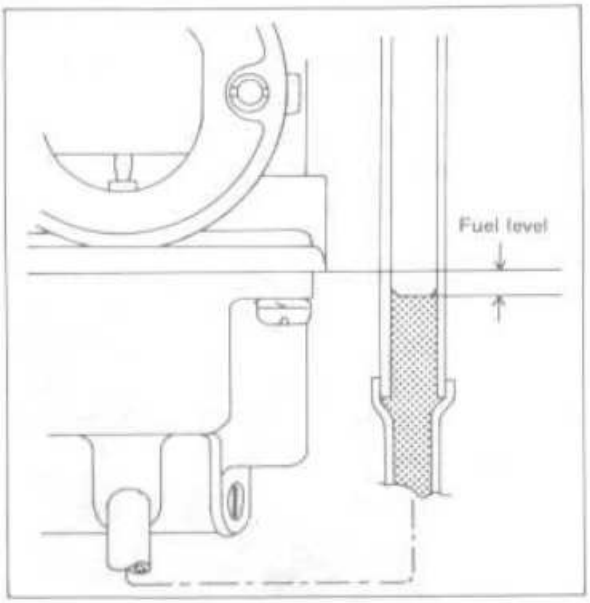
1. Level gauge 2. Drain screw

3. Start the engine and stop it after a few minutes of run. This procedure is necessary to obtain the correct fuel level. Make sure the fuel petcock is "ON" or "RES" position.
4. Note the fuel level and bring the gauge to the other end of the carburetor line and repeat step 3 above. Note the fuel level again and compare it with the previous gauge reading. They should be equal. If not, place a suitable size of wooden piece or the like under the center stand and adjust.

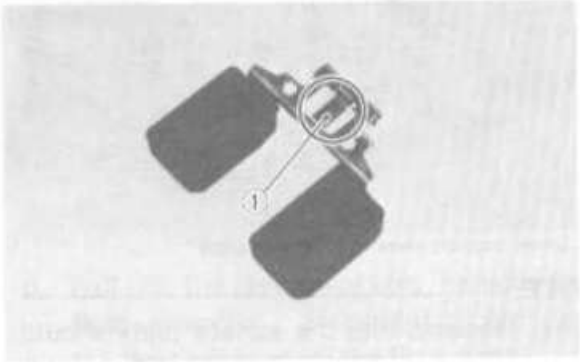


5. Check the fuel level one by one. The level should be in the specified range.

Fuel level:
3 ± 1 mm (0.118 ± 0.039 in)
below from the carburetor mixing chamber body edge.

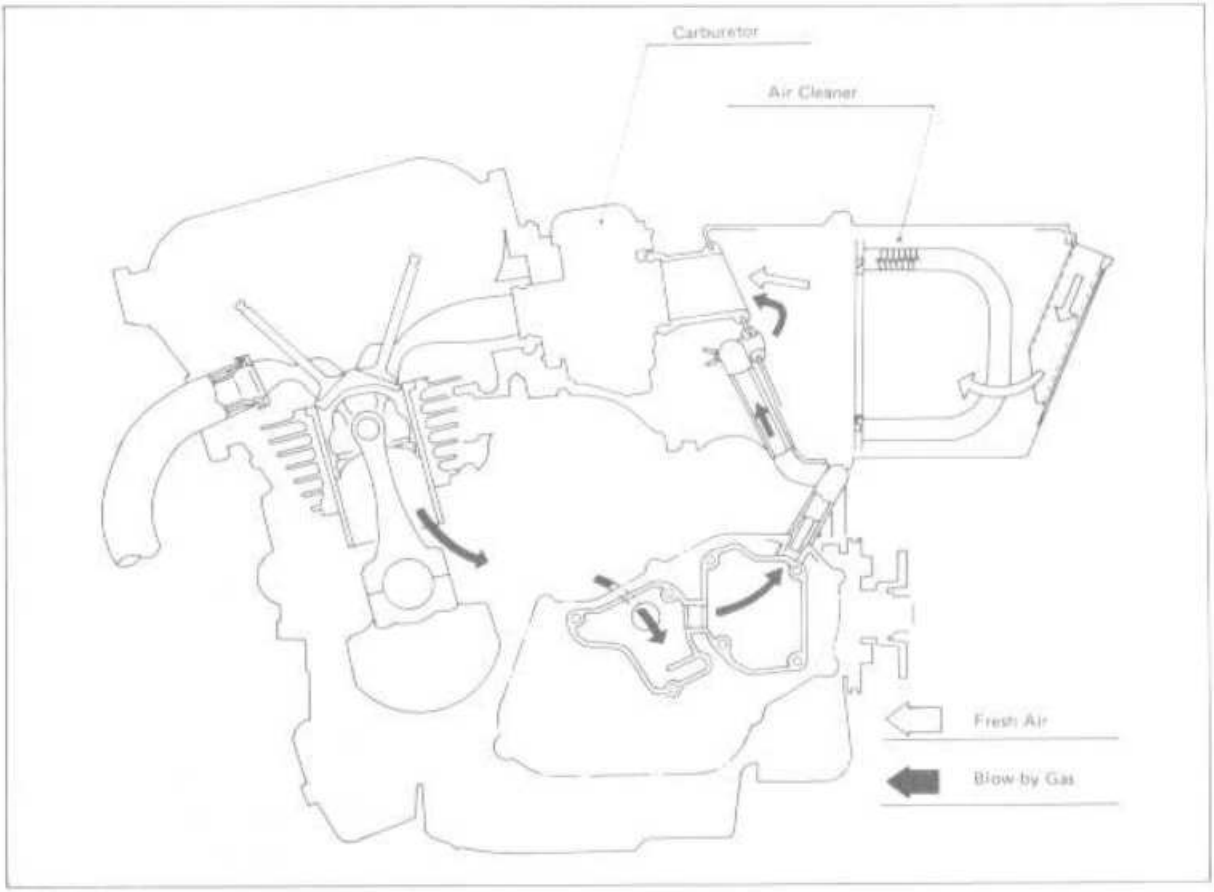


6. If the fuel level is incorrect, remove the carburetor assembly from the motorcycle and check the fuel valve(s) and float assembly(s) for damage.
7. If no damage is found, correct the fuel level by slightly bending the float arm tang. Recheck the fuel level.



1. Float arm tang

AIR CLEANER AND CRANKCASE VENTILATION SYSTEM



Refer to "CHAPTER 2" for the air cleaner maintenance.

CHAPTER 5. CHASSIS

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5

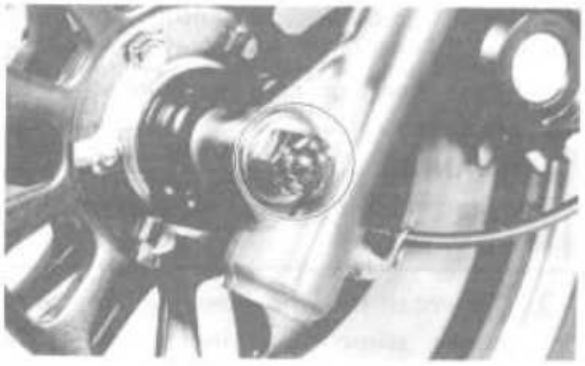
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CHAPTER 5. CHASSIS

FRONT WHEEL

A. Removal

1. Place the motorcycle on the center stand.
2. Remove the cotter pin and wheel axle



3. Remove the speedometer cable holder securing bolt.



4. Loosen the pinch bolt securing the axle.

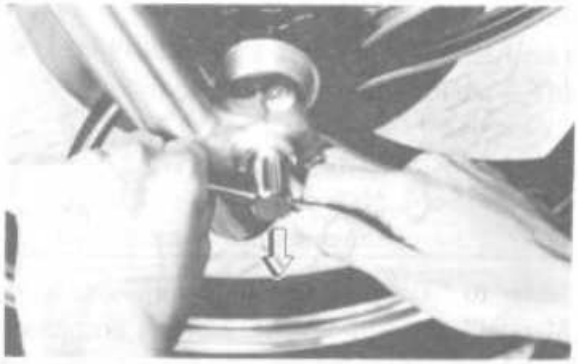


1. Pinch bolt

5. Remove the axle shaft and the front wheel. In this case, make sure the motorcycle is properly supported.

NOTE:

Do not depress the brake lever when the wheel is off the motorcycle as the brake pads will be forced to shut.



B. Front Axle Inspection

Remove any corrosion from the axle with fine emery cloth. Place the axle on a surface plate and check for bends. If bent, replace axle. Do not attempt to straighten a bent axle.

C. Front Wheel Inspection

This motorcycle is equipped with aluminum wheels designed to be compatible with either tube or tubeless tires.

Tubeless tires are installed as standard equipment.

WARNING:

Do not attempt to use tubeless tires on a wheel designed for use only with tube-type tires. Tire failure and personal injury may results from sudden deflation.

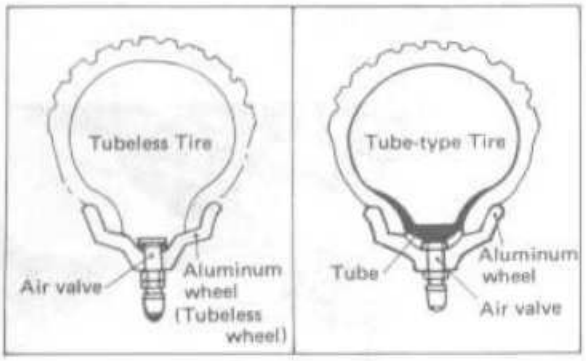
Tube-type Wheel	→ Tube-type Tires Only
Tubeless-type Wheel	→ Tube-type or Tubeless tires

WARNING:

When using tube-type tires, be sure to install the proper tube also.







Refer to "Tubeless Tire and Aluminum Wheel Manual" for the proper tubeless and aluminum wheel servicing.

1. Check for cracks, bends or warpage of wheels. If a wheel is deformed or cracked, it must be replaced.
2. Check wheel run-out. If the deflection exceeds the tolerance below, check the wheel bearings or replace the wheel as required.

Rim-run-out limits:
Vertical – 2 mm (0.079 in)
Lateral – 2 mm (0.079 in)

3. Check wheel balance. Rotate the wheel lightly several times and observe resting position. If the wheel is not statically balanced, it will come to reset at the same position each time. Install an appropriate balance weight at lightest position (at top).

NOTE:
The wheel should be balanced with the brake disc installed.

4. After installing a tire, ride conservatively to allow the tire to seat itself on the rim properly. Failure to allow proper seating may cause tire failure resulting in damage to the motorcycle and injury to the rider.
5. After repairing or replacing a tire, check to be sure the valve stem lock nut is securely fastened. If not, torque it as specified.

Tightening torque: 0.15 m-kg (1.1 ft-lb)

D. Replacing Wheel Bearings

If the bearings allow play in the wheel hub or if wheel does not turn smoothly, replace the bearings as follows:

1. Clean the outside of the wheel hub.
2. Drive the bearing out by pushing the spacer aside and tapping around the perimeter of the bearing inner race with a soft metal drift pin and hammer. The spacer "floats" between the bearings. Both bearings can be removed in this manner.

WARNING:
Eye protection is recommended when using striking tools.

3. To install the wheel bearing, reverse the above sequence. Use a socket that matches the outside race of the bearing as a tool to drive in the bearing.

CAUTION:
Do not strike the center race or balls of the bearing. Contact should be made only with the outer race.

E. Installing Front Wheel

When installing the front wheel, reverse the removal procedure. Note the following points:

1. Lightly grease the lips of the front wheel oil seals and the gear teeth of speedometer drive and driven gears. Use lightweight lithium soap base grease.
2. Install the speedometer cable holder securing bolt.
3. Make sure the projecting portion (torque stopper) of the speedometer housing is positioned correctly.



1. Torque stopper

4. Tighten the axle nut and install a new cotter pin.

Axle nut torque: 10.7 m-kg (77.4 ft-lb)

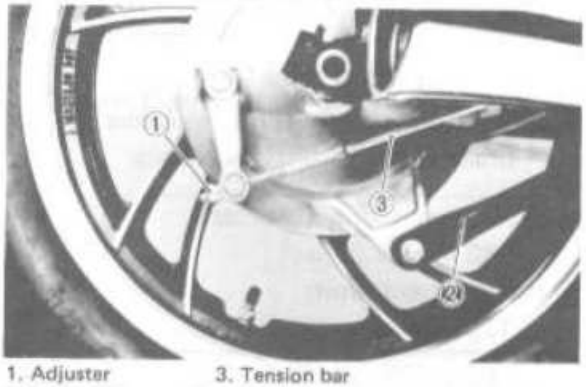
5. Install the front fender
6. Before tightening the pinch bolt, compress the front forks several times to make sure of proper fork operation.
7. Tighten the axle pinch bolt.

Axle pinch bolt torque: 2.0 m-kg (14.5 ft-lb)

REAR WHEEL

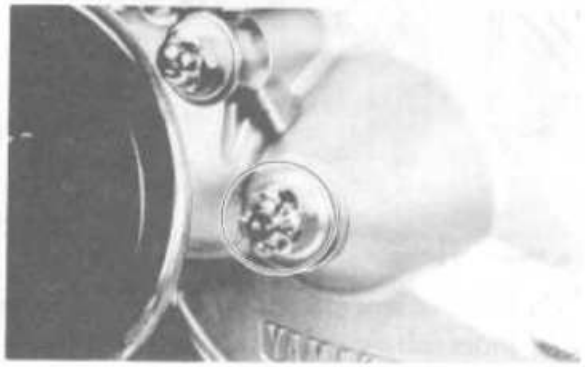
A. Removal

1. Place the motorcycle on the center stand.
2. Remove the tension bar and the brake rod from the brake shoe plate. The tension bar can be removed by removing the cotter pin and nut from the tension bar bolt. The brake rod can be removed by removing the adjuster.

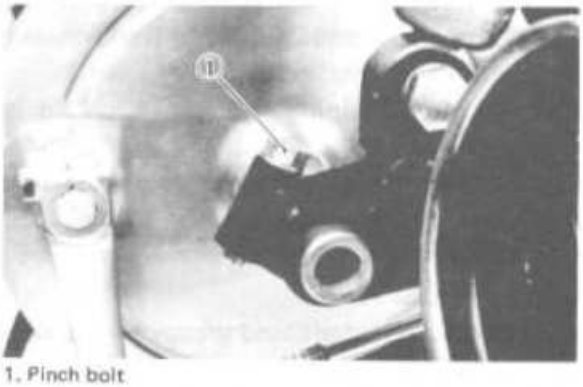


1. Adjuster
2. Brake rod
3. Tension bar

3. Remove the axle nut cotter pin and axle nut.

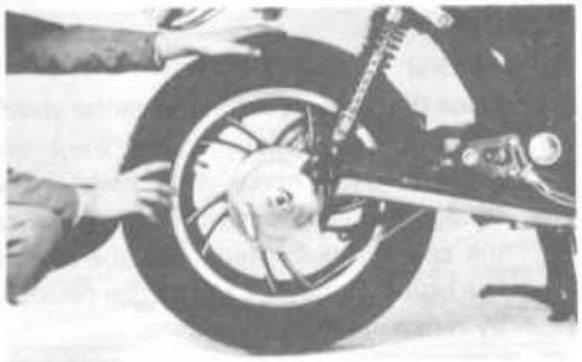


4. Loosen the rear axle pinch bolt and pull out the rear axle.



1. Pinch bolt

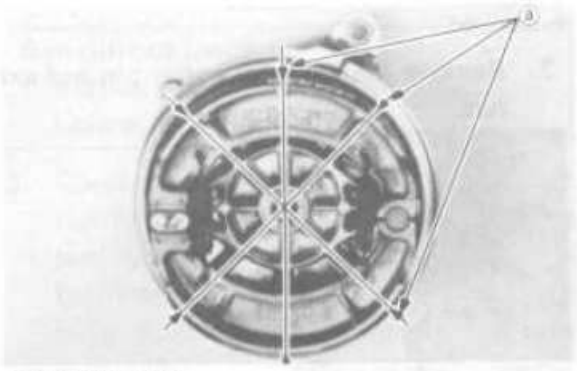
5. Move the wheel to the right side to separate it from the final gear cases and remove the rear wheel.



B. Checking Brake Shoe Wear

1. Measure the outside diameter at the brake shoes with slide calipers.

Front brake shoe diameter: 180 mm (7.09 in) Replacement limit: 176 mm min. (6.93 in)



a. Measuring points

2. Remove any glazed areas from the brake shoes using coarse sand paper.

C. Brake Drum

Oil or scratches on the inner surface or the brake drum will impair braking performance or result in abnormal noises.

Remove oil by wiping with a rag soaked in lacquer thinner or solvent.

Remove scratches by lightly and evenly polishing with emery cloth.

D. Brake Shoe Plate

Remove the camshaft and grease. If the cam face is worn, replace.

NOTE:

Before removing the cam lever, put a match mark on the cam lever and camshaft to indicate their positions for easy assembly.

E. Rear Axle Inspection

(See Front Wheel, Axle Inspection Procedure.)

F. Replacing Wheel Bearings

Rear wheel bearing replacement is similar to the procedure for the front wheel.

G. Rear Wheel Inspection

(See Front Wheel, Inspection Procedures)

H. Installing Rear Wheel

1. Lightly grease lips of rear wheel oil seals.
2. Install the wheel assembly and axle.

NOTE:

When installing the rear wheel, be sure the splines on the wheel hub fit into the final gear case. Lightly apply grease to the gear teeth.

Always use a new cotter pin on the axle nut.

Tightening torque: Axle nut: 10.7 m-kg (77.4 ft-lb) Axle pinch bolt: 0.6 m-kg (4.5 ft-lb)

FRONT BRAKE

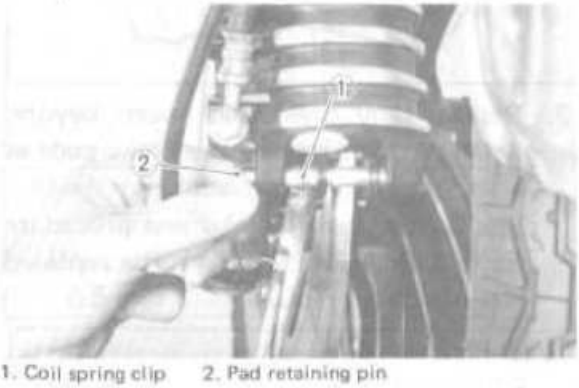
CAUTION:

Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If any hydraulic connection in the system is opened, the entire system should be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on brake internal components. Solvents will cause seals to swell and distort. Use only clean brake fluid for cleaning. Use care with brake fluid. Brake fluid is injurious to eyes and will damage painted surfaces and plastic parts.

A. Caliper Pad Replacement

It is not necessary to disassemble the brake caliper and brake hose to replace the brake pads.

1. Pull out the pad retaining pin while pinching the coil spring clip ends with pliers.

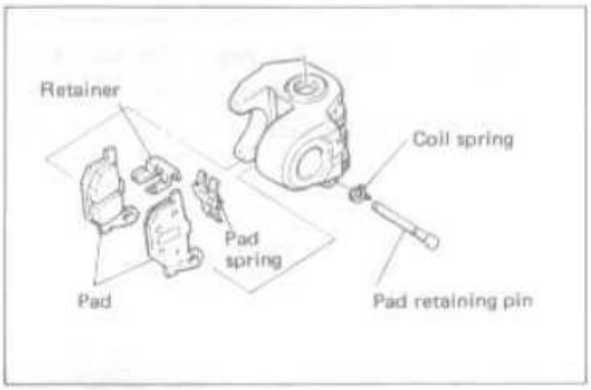


1. Coil spring clip 2. Pad retaining pin

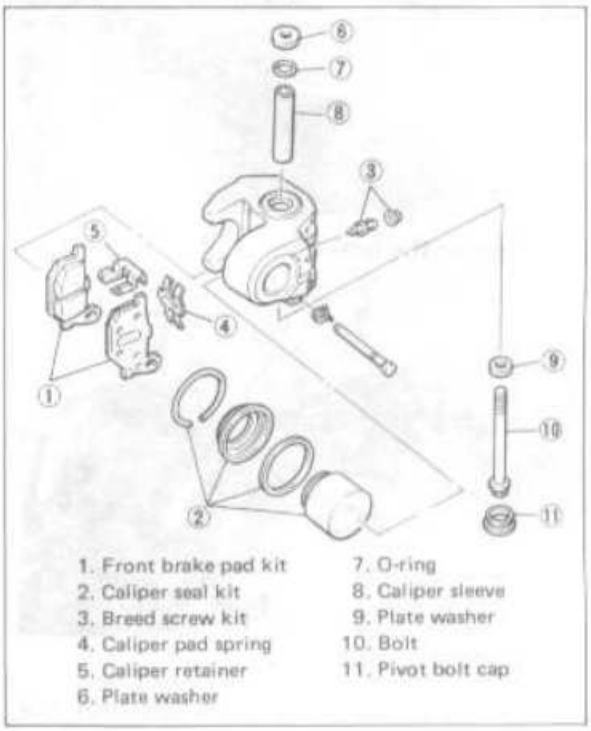
2. Install the new brake pads. Replace the following parts if pad replacement is required.
   a. Pads
   b. Coil spring
   c. Pin

NOTE:

Replace the pads as a set if either is found to be worn to the wear limit.



B. Caliper Disassembly



1. Remove the brake hose from the caliper. Allow the caliper assembly to drain into a container.
2. Place the open hose end into the container and pump the old fluid out of the master cylinder.
3. Remove the coil spring, pin and pads.
4. Remove the brake caliper holding bolt from the front fork.
5. Remove the retaining ring and the dust seal.
6. Carefully force the piston out of the caliper cylinder with compressed air. Never try to pry out the piston.

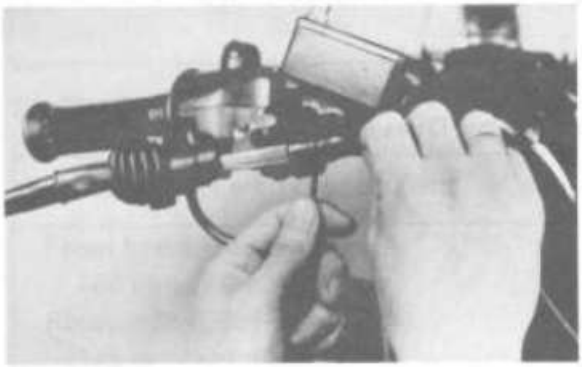
WARNING:

Cover the piston with a rag. Use care so that piston does not cause injury as it is expelled from the cylinder.

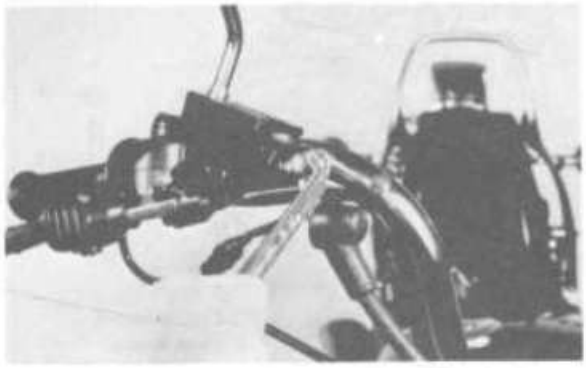
7. Remove the piston seal.

C. Master Cylinder Disassembly

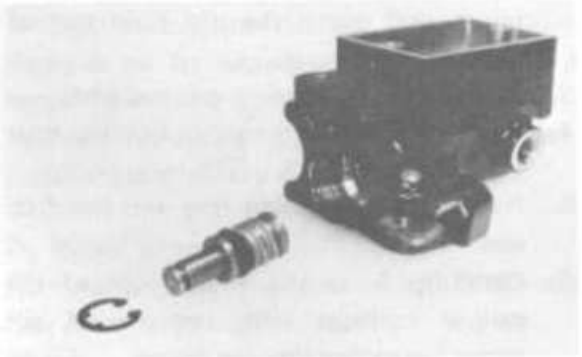
1. Remove the brake light switch.



2. Remove the brake hose.



3. Remove the brake lever and spring.
4. Remove the master cylinder from the handlebar. Remove the cap and drain the remaining fluid.
5. Remove the master cylinder dust boot.
6. Remove the snap ring.

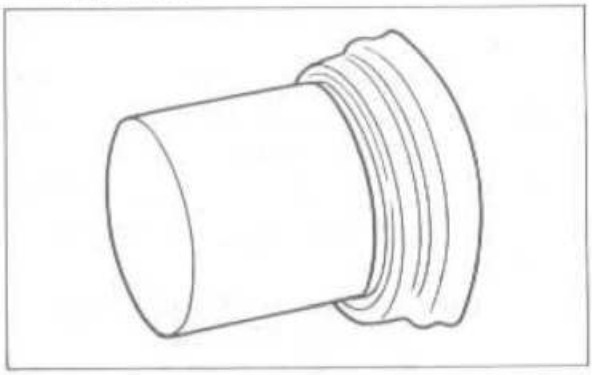


7. Remove the master cylinder cup assembly. Note that the cylinder cups are installed with the larger diameter (lips) inserted first.

D. Brake Inspection and Repair

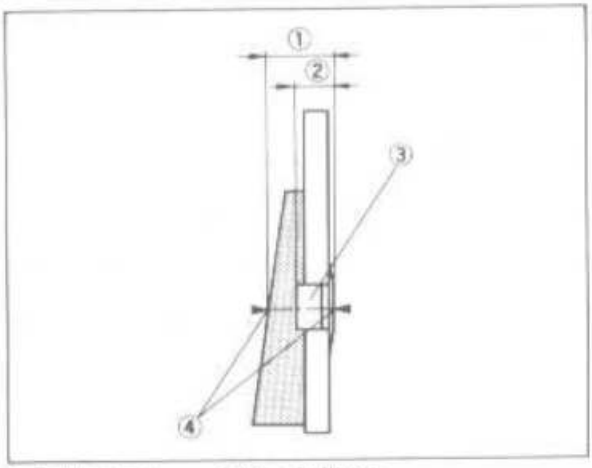
Recommended Brake Component Replacement Schedule:
- Brake pads; As required
- Piston seal, dust seal; Every two years
- Brake hoses; Every four years
- Brake fluid; Replace only when brakes are disassembled

1. Replace the caliper piston if it is scratched.



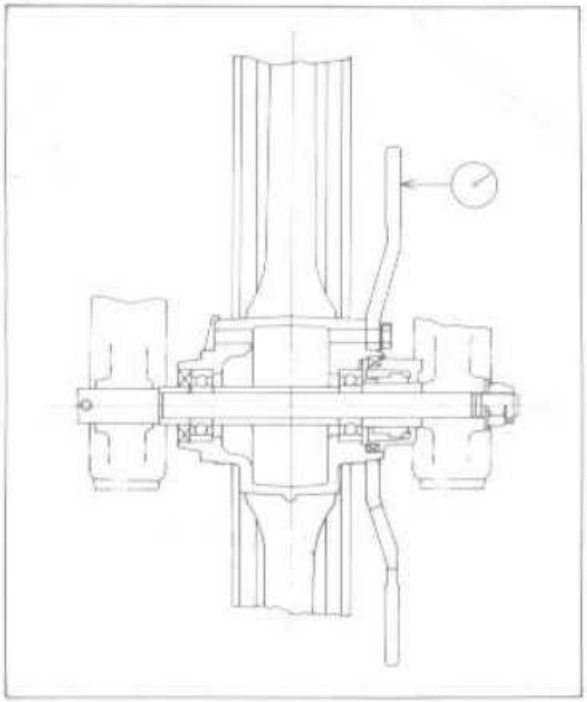
2. Replace any brake pad worn beyond limits. Always replace the brake pads as a set.
   See Caliper Pad Replacement procedure for a listing of the parts to be replaced when pads are replaced.

Wear limit:
6.5 mm (0.26 in)



1. Pad thickness
2. Wear limit
3. Wear indicator
4. Measuring points

3. Replace piston and dust seals if damaged. Replace seals every two years.
4. Inspect master cylinder body. Replace if scratched. Clean all passages with new brake fluid.
5. Inspect the brake hoses. Replace every four years or immediately if cracked, frayed, or damaged.
6. Check for wear and deflection of disc.

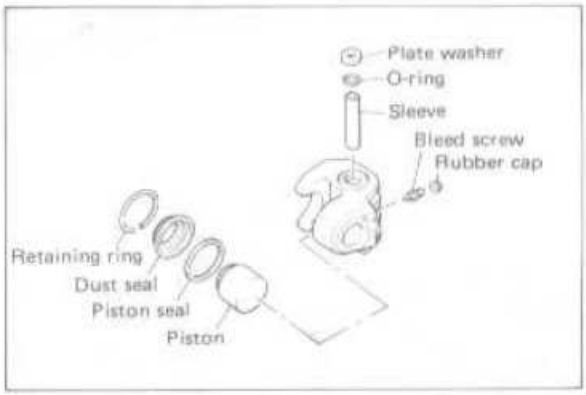


Maximum deflection:
0.15 mm (0.006 in)
Minimum disc thickness:
6.5 mm (0.26 in)

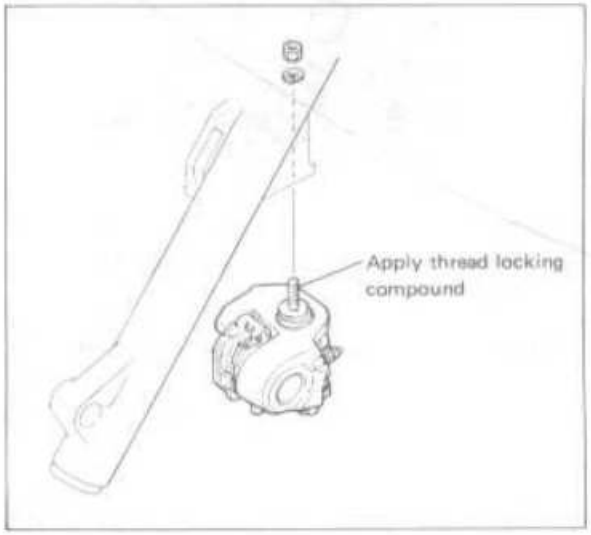
If disc is worn beyond minimum thickness or deflection exceeds specified amount, replace disc.

E. Brake Reassembly

1. Caliper reassembly
   All internal parts should be cleaned in new brake fluid only. Internal parts should be lubricated with brake fluid when installed. Replace the following parts whenever a caliper is disassembled.
   * Bleed screw and rubber cap
   * O-ring
   * Piston seal
   * Dust seal
   * Retaining ring



   a. Install the piston seal and piston.
   b. Install the pads.
2. Apply a thread locking compound such as "LOCTITE" to the pivot bolt.
3. Install the caliper assembly on the front fork.



WARNING:
When installing the pivot bolt, apply it with a thread locking compound such as "LOCTITE" and tighten to the specification.

Pivot bolt torque:
2.6 m-kg (18.8 ft-lb)

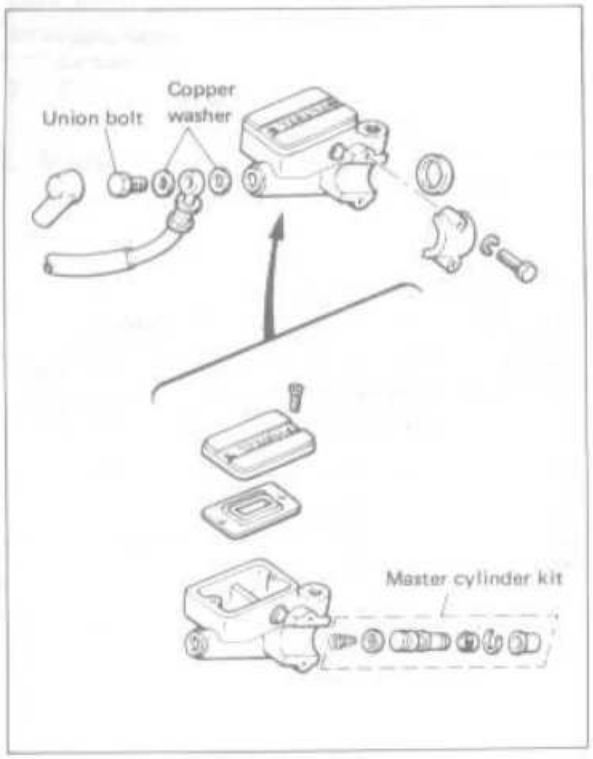
4. Attach the brake hoses.

Brake hose torque: 2.6 m-kg (18.8 ft-lb)

5. Brake disc assembly
   If brake disc has been removed from hub or is loose, tighten bolts. Use new locking washers and bend over locking tabs after bolts are tightened.

Disc bolt torque: 2.0 m-kg (14.5 ft-lb)

6. Master cylinder reassembly



Reassemble master cylinder as shown in illustration.

Brake hose torque: (all brake union bolts) 2.6 m-kg (18.8 ft-lb)

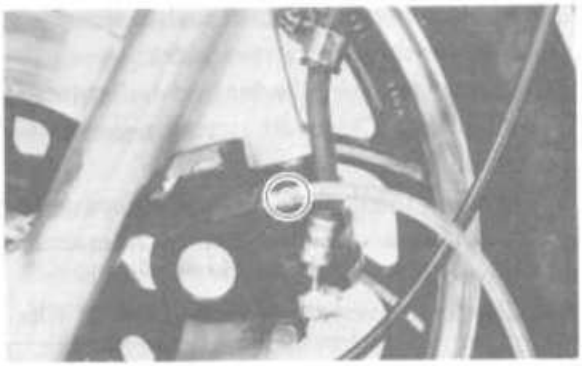
7. Air bleeding

WARNING:

If the brake system is disassembled or if any brake hose has been loosened or removed, the brake system must be bled to remove air from the brake fluid. If the brake fluid level is very low or brake operation is incorrect, bleed the brake system. Failure to bleed the brake system properly can result in a dangerous loss of braking performance.

a. Add proper brake fluid to the reservoir. Install the diaphragm, being careful not to spill or overflow the reservoir.

b. Connect the clear plastic tube of 4.5 mm (3/16 in) inside diameter tightly to the caliper bleed screw. Put the other end of the tube into a container.



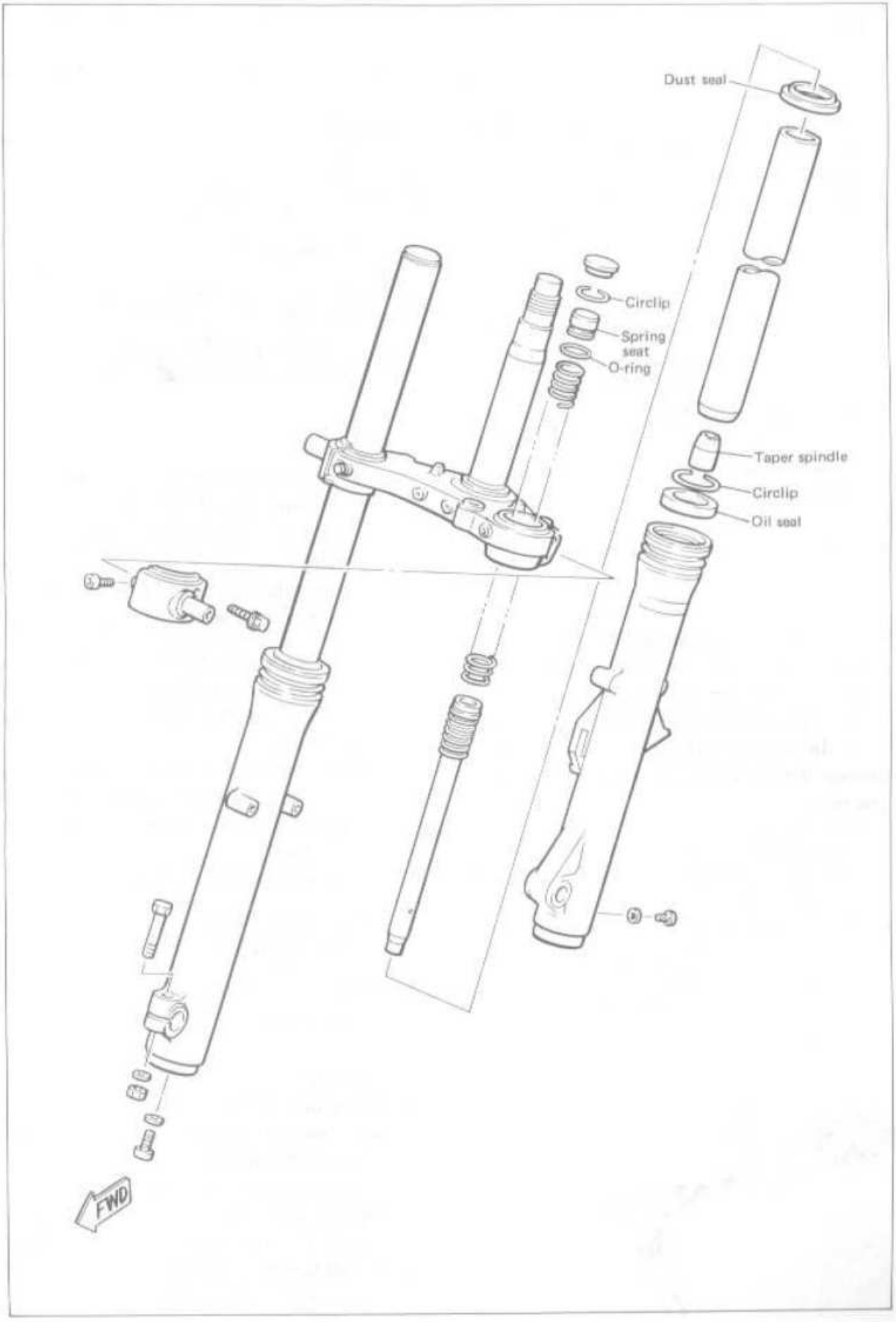
c. Slowly apply the brake lever several times. Pull in the lever. Hold the lever in "on" position. Loosen the bleed screw. Allow the lever to travel slowly toward its limit. When the limit is reached, tighten bleed screw. Then release the lever.

d. Repeat step "c" procedure until all air bubbles are removed from system.

NOTE:

If bleeding is difficult, it may be necessary to let the brake fluid system stabilize for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system settle out.

FRONT FORK


Dust seal
Circlip
Spring seat
O-ring
Taper spindle
Circlip
Oil seal
FWD

A. Removal and Disassembly

WARNING:

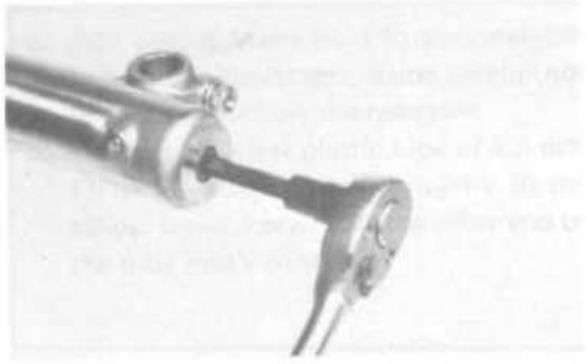
Securely support the motorcycle so there is no danger of it falling over.

1. Disconnect the speedometer cable. Disconnect the brake caliper and remove the front wheel. Place a wooden wedge or other object into the caliper assembly to keep the brake pads from falling out. Remove the front fender.
2. Remove the rubber cap from the top of each fork.
3. The spring seat and fork spring are retained by a stopper ring (spring wire circlip). It is necessary to depress the spring seat and fork spring to remove the stopper ring. Remove the stopper ring by carefully prying out one end with a small screwdriver.
4. Place an open container under each drain hole. Remove the drain screw from each outer tube.

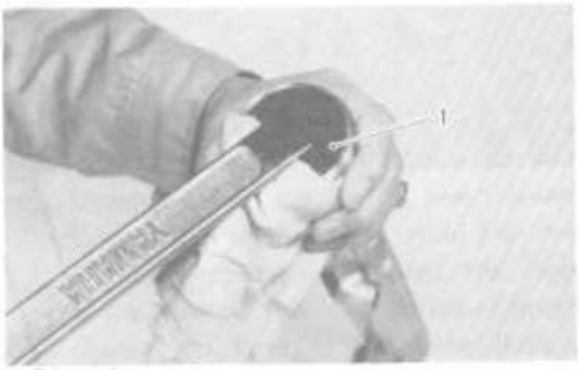
WARNING:

Do not allow oil to contact the disc brake components. If any oil should contact the brake components it must be removed before the motorcycle is operated. Oil will cause diminished braking capacity and will damage the rubber components of the brake assembly.

5. Loosen the pinch bolt on the steering stem and the two pinch bolts crown and remove fork.
6. Remove the Allen bolt from the bottom of the fork assembly while holding the inner tube with the front fork cylinder comp. holder (special tool). Pull the inner tube out of the outer tube.



7. To remove the fork seal. Pry out the dust seal and remove the spring clip over the oil seal. Pry out the oil seal, being very careful to not damage the fork tube surfaces.



1. Dust seal

B. Inspection

1. Examine fork inner tube for scratches and straightness. If the tube is scratched severely or bent, it should be replaced.

WARNING:

Do not attempt to straighten a fork tube, since this may weaken the part dangerously.

2. Check the seal outer seat. If leakage is from this area, replace the seal. If this does not cure the leakage, replace the outer tube.
3. Check the outer tube for dents. If any dent causes the inner tube to "hang up" during operation, the outer tube should be replaced.
4. Check the free length of the springs.

Fork spring free length:
606 mm (23.86 in)

5. Check the "O-ring" on the spring seat. If damaged, replace the "O-ring".

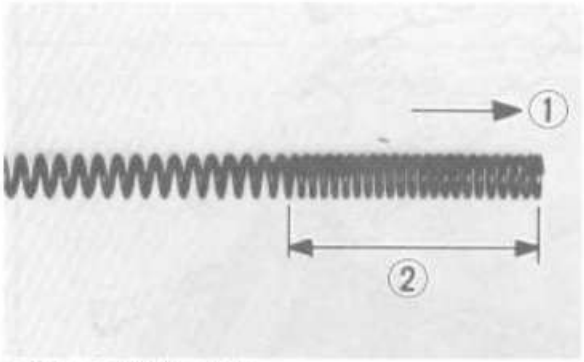
C. Assembly

1. Make sure all components are clean before assembly. Always install a new fork seal. Do not re-use a seal.
2. Apply oil to the fork seal and install the seal by pressing in with a large socket. Install the retaining clip and dust seal.
3. Install the inner tube into the outer tube. Install and tighten allen bolt and washer.

The assembly procedure is the reverse of the disassembly procedure.

NOTE:

When installing the fork springs, the greater pitch should be at the bottom. The main fork spring has a small coil diameter at the bottom.



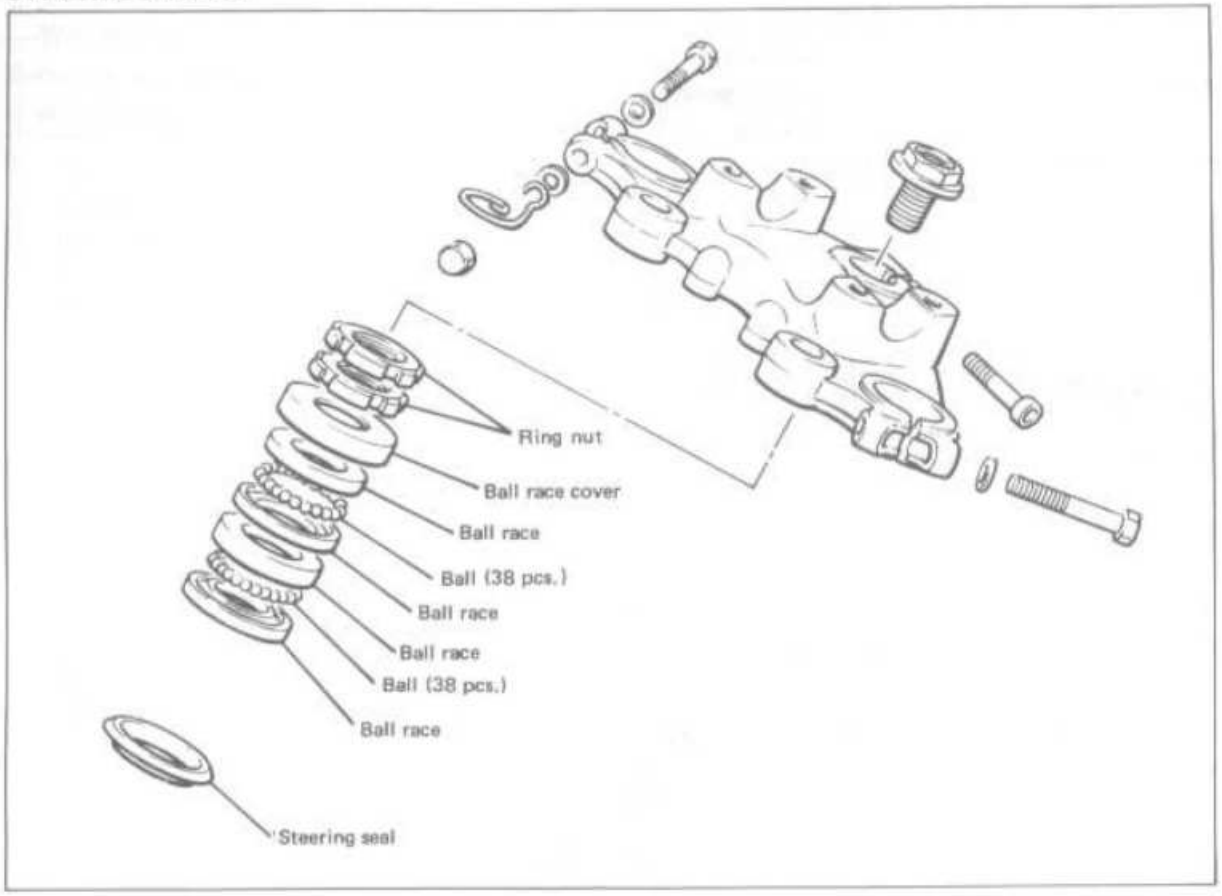
1. Top 2. Smaller pinch

4. Reinstall the spring seat.

CAUTION:

Always use a new stopper ring (spring wire circlip).

STEERING HEAD

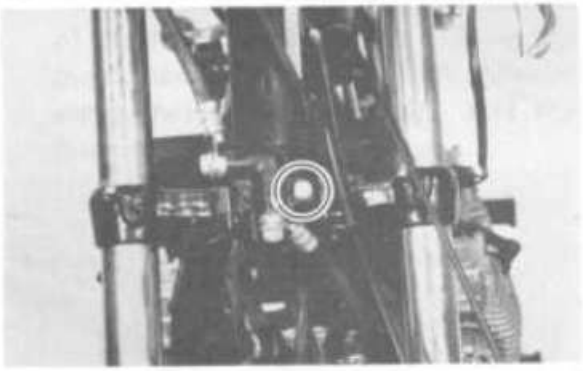


A. Adjustment

Refer to "D. Reassembly" for steering head adjustment procedure.

B. Removal

1. Remove the front wheel, front forks and handlebars.
2. Remove the front brake pipe junction.



3. Loosen the steering stem (upper bracket) pinch bolt.
4. Remove the stem bolt and steering crown.

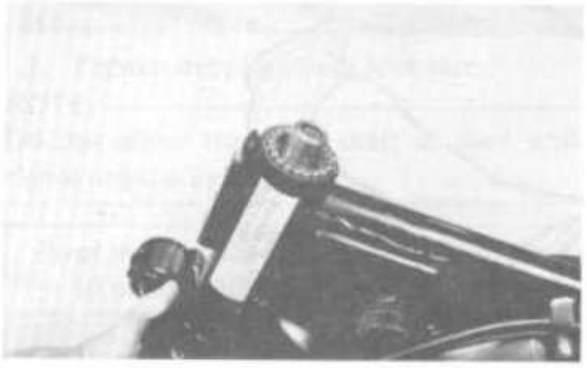


5. Remove the top fitting nut (ring nut).



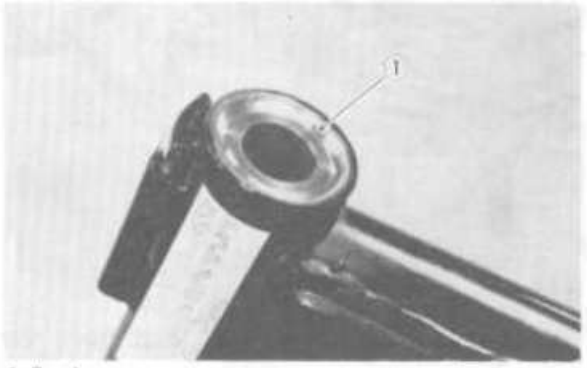
6. Support the steering stem (under bracket) and remove the bottom fitting nut (ring nut).
7. Remove the top bearing race and all of the bearing balls from the upper bearing

Ball quantity (upper and lower): 38 pcs.



C. Inspection

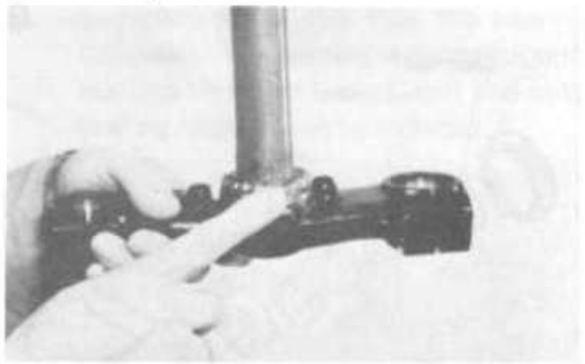
1. Wash the bearings in solvent.
2. Inspect the bearings for pitting or other damage. Replace the bearings if pitted or damaged. Replace the races when bearing balls are replaced.
3. Clean and inspect the bearing races. Spin the bearings by hand. If the bearings are not smooth in their operation in the races, replace bearing balls and races.



1. Bearing race

D. Reassembly

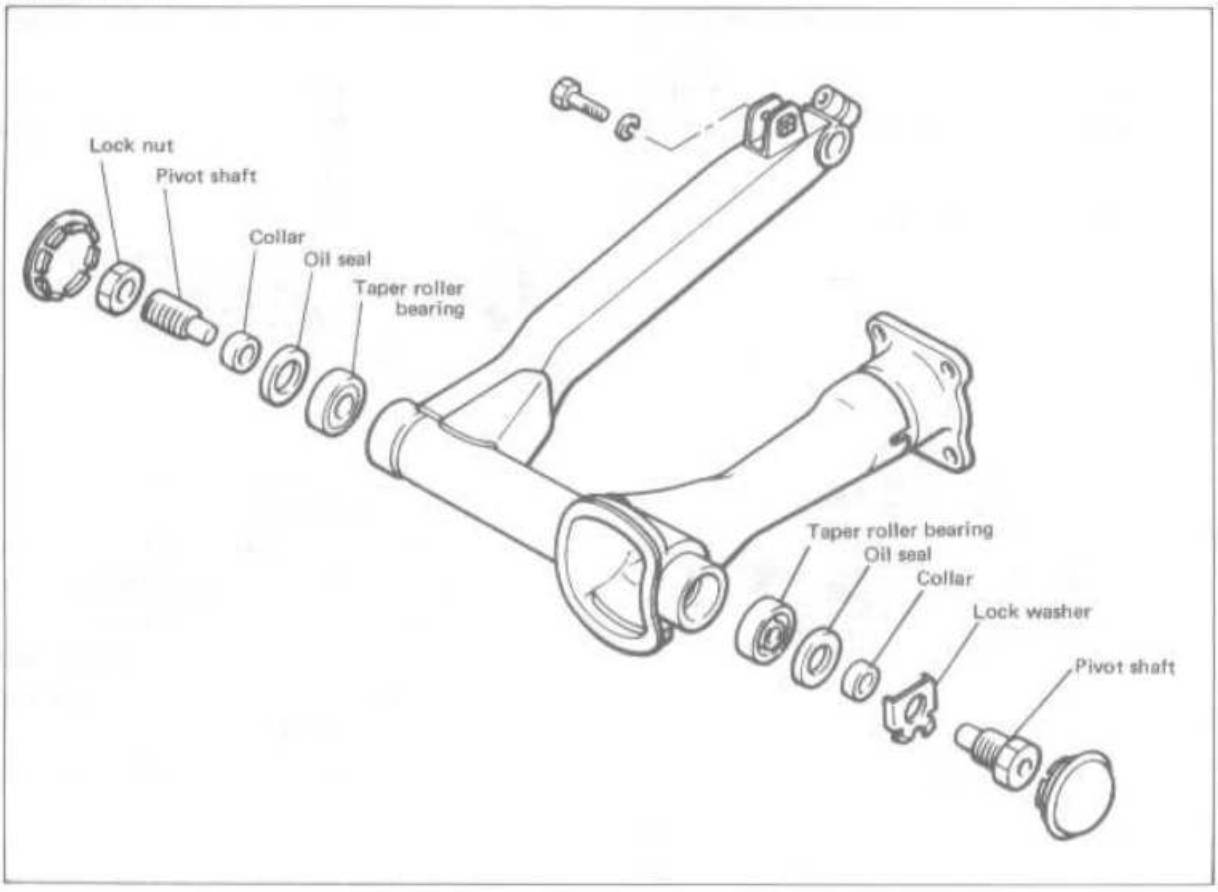
1. Grease the bearings and races with wheel bearing rease.



2. Install the steering stem (under brakcet), bearing balls, and races.
3. Install the bottom fitting nut. Tighten it to approximately 2.5 m-kg (18 ft-lb) and loosen it approximately 1/4 turn.
4. While holding the bottom fitting nut with the ring nut wrench, tighten the top fitting nut securely.
5. Continue reassembly in the reverse of disassembly order.
6. When assembly is complete, check the steering stem by turning it from lock to lock. If there is any binding or looseness, readjust the steering stem tightness.

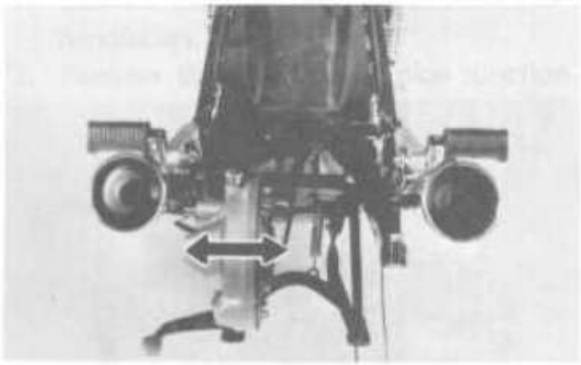
Pinch bolt torque: 2.0 m-kg (14.5 ft-lb) Steering stem bolt torque: 5.4 m-kg (39.1 ft-lb)

SWING ARM

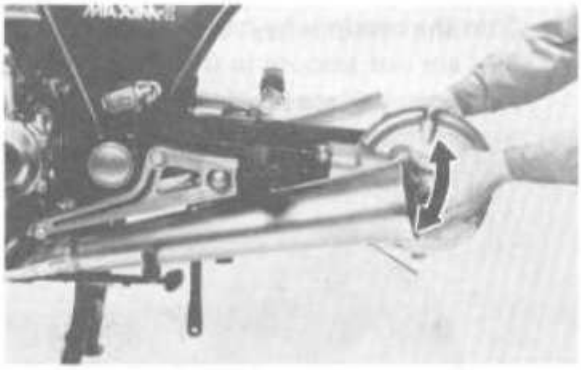


A. Inspection

1. Free play inspection
   Remove the rear wheel and both shock absorbers. Grasp the swing arm and try to move it from side to side as shown. There should be no noticeable side play.



2. The swing arm is mounted on tapered bearings. Move the swing arm up and down as shown. The swing arm should move smoothly, without tightness, binding or rough spots that could indicate damaged bearings.



B. Adjustment

1. Remove the pivot shaft cap from the right side of the swing arm.
2. Loosen the right pivot shaft lock nut and tighten the pivot shaft (clockwise) to 0.5 ~ 0.6 m-kg (43 ~ 52 in-lb).



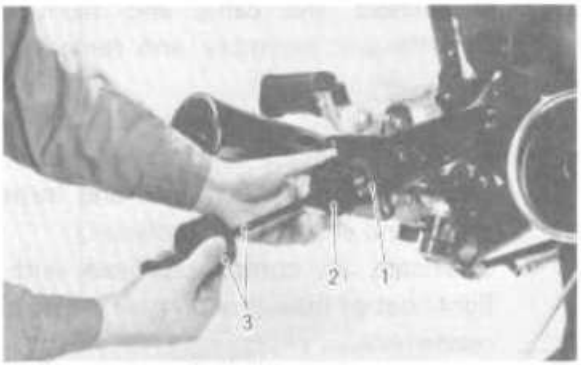
3. Tighten the pivot shaft lock nut.

NOTE:
Do not allow the pivot shaft to turn while tightening the lock nut.

Pivot shaft lock nut torque:
10 m-kg (72.3 ft-lb)

C. Removal

1. Remove the middle gear flange holding bolts.
2. Remove the rear wheel and shock absorbers.
3. Remove the final gear assembly.
4. Install the drive shaft puller attachment (special tool) on the side hammer bolt (special tool). Insert the 2 arms of the puller into the mouth of drive shaft housing. Tighten the 2 arms around the toothed flange of the drive shaft out of the universal joint. Pull out the drive shaft from the housing.



1. Drive shaft
2. Drive shaft puller
3. Slide hammer

5. Remove the swing arm pivot caps, the pivot shafts and the swing arm.

D. Inspection and Lubrication

1. Remove the oil seals and the bearings. Inspect the bearings for pitting or other damage. Make sure that the bearings roll freely. If a bearing is damaged, both bearings and both sets of inner and outer bearing races should be replaced.



CAUTION:
Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.

NOTE:
When installing new bearings, grease liberally with lithium base, waterproof wheel bearing grease.

2. Always replace the grease seals when bearings are removed.
3. Examine the rubber boot for damage. Replace if damaged.



E. Installation

Installation of the swing arm can be accomplished by reversing the removal procedure. Observe adjustment procedures for obtaining equal frame/swing arm spacing.

Tightening torque:
Left side pivot shaft: 10 m-kg (72.3 ft-lb)
Right side pivot lock nut:
10 m-kg (72.3 ft-lb)

CAUTION:
A lock washer for left side pivot bolt must be replaced with a new one and the tab should be bent over along the bolt flat after tightening.



1. Lock washer

REAR SHOCK ABSORBER

A. Removal

1. Remove one (1) rear shock absorber at a time, inspect and reinstall before removing the other.

B. Inspection

1. Check the rod. If it is bent or damaged, replace the shock absorber.
2. Check for oil leakage. If oil leakage is evident, replace the shock absorber.
3. Operate shock absorber rod to check damping. There should be no noticeable damping as the shock extends.
4. Install the shock absorber on the motorcycle.

Tightening torque:
3.0 m-kg (21.7 ft-lb)

CABLE AND FITTINGS

A. Cable Maintenance

NOTE:
See Maintenance and Lubrication intervals charts. Cable maintenance is primarily concerned with preventing deterioration through rust and weathering and providing proper lubrication to allow the cable to move freely within its housing. Cable removal is straight forward and uncomplicated. Removal will not be discussed within this section.

WARNING:
Cable routing is very important. For details of cable routing, see the cable routing diagrams at the end of this manual. Improperly routed or adjusted cables may make the motorcycle unsafe for operation.

1. Remove the cable.
2. Check for free movement of cable within its housing. If movement is obstruced, check for fraying or kinking of the cable strands. If damage is evident, replace the cable assembly.
3. To lubricate the cable, hold it in a vertical position. Apply lubricant to the uppermost end of cable. Leave it in the vertical position until lubricant appears at the bottom. Allow any excess to drain and reinstall the cable.

NOTE:
Choice of lubricant depends upon conditions and preferences. However, a semi-drying chain and cable lubricant will perform adequately under most conditions.

B. Throttle Maintenance

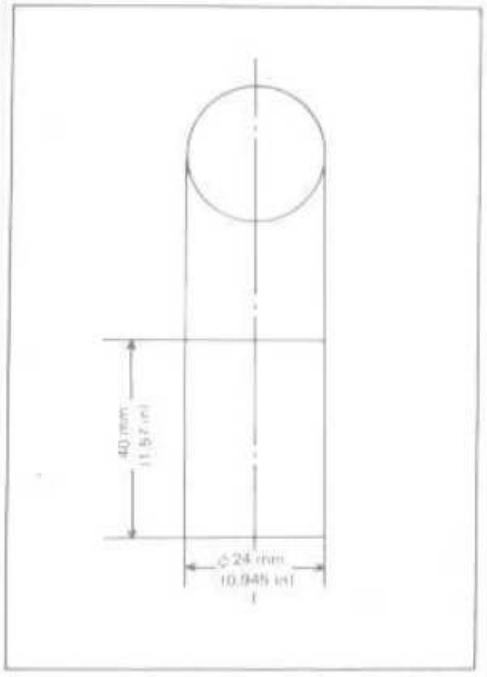
1. Remove the Phillips head screws from throttle housing assembly and separate the two halves of housing.
2. Disconnect the cable end from the throttle grip assembly and remove the grip assembly.
3. Wash all parts in a mild solvent and check all contact surfaces for burrs or other damage. (Also clean and inspect right-hand end of the handlebar.)
4. Lubricate all contact surfaces with a light coat of lithium soap base grease and reassemble.

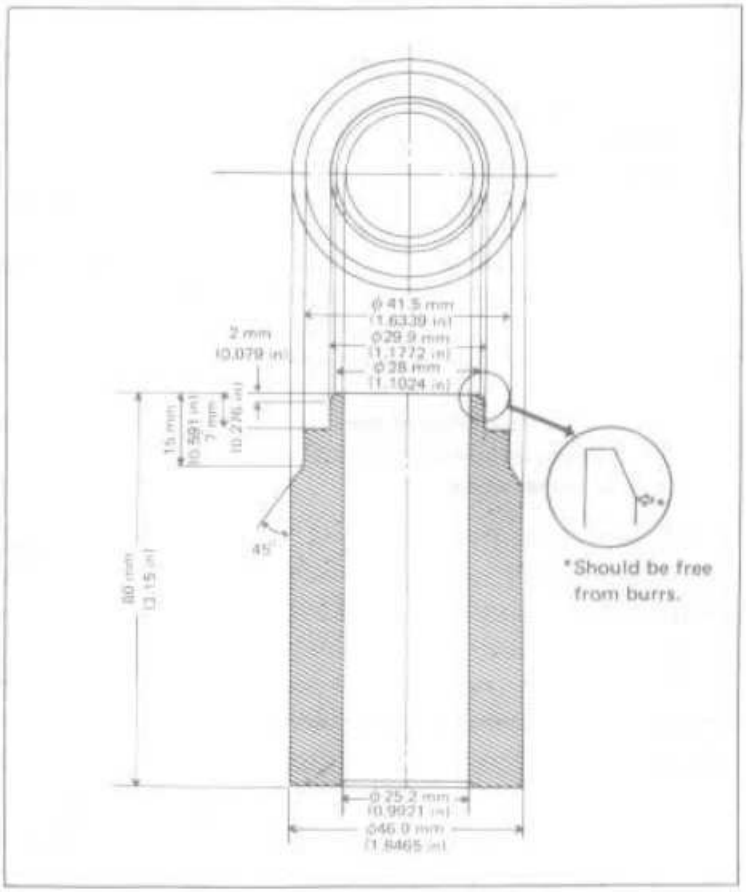
NOTE:
Tighten the housing screws evenly to maintain an even gap between the two halves.

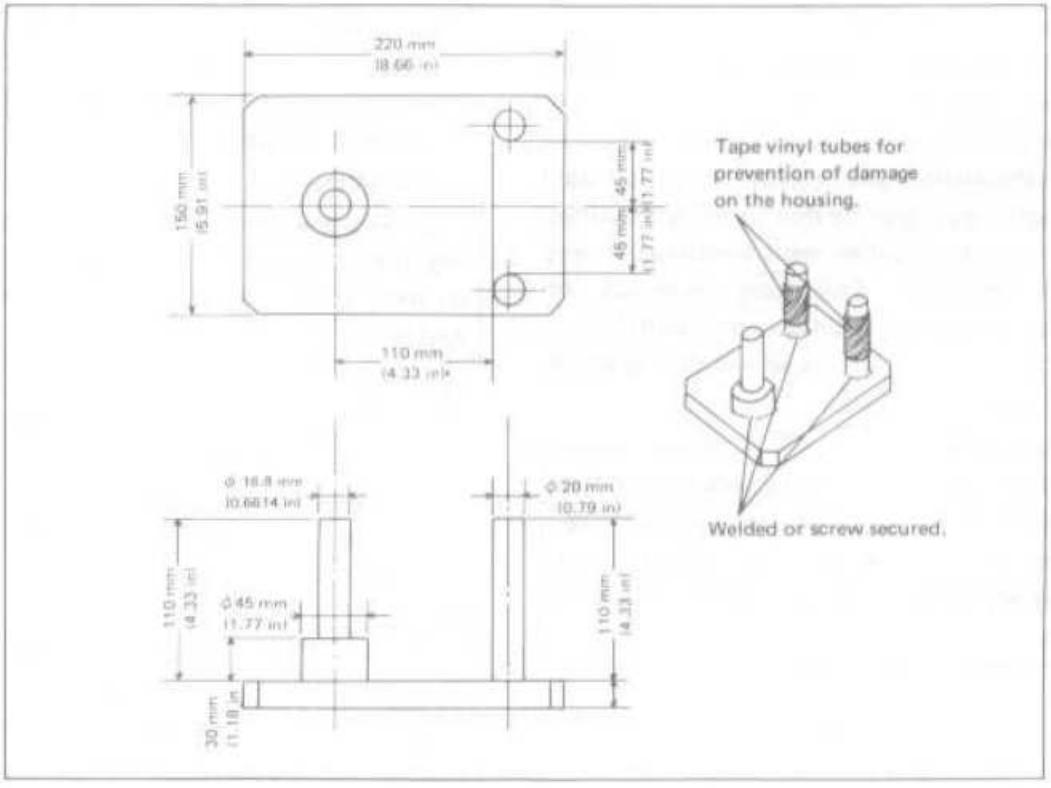
5. Check for smooth throttle operation and quick spring return when released and make certain that the housing does not rotate on the handlebar.

SHAFT DRIVE

Refer to "CHAPTER 3", for the middle gear.
The following special tools are not available but can be constructed for the final gear disassembly and assembly:







A. Troubleshooting

1. The following conditions may indicate damaged shaft drive components:

Symptoms	Possible damaged areas
1. A pronounced hesitation or "jerky" movement during acceleration, deceleration, or sustained speed. (This must not be confused with engine surging or transmission characteries). 2. A "rolling rumble" noticeable at low speed; a high-pitched whine; a "clunk" from a shaft drive component or area.	A. Damage to bearings. B. Improper gear lash. C. Gear tooth damage. D. Drive flange/universal joint bolts loose.
3. A locked-up condition of the shaft drive mechanism; no power transmitted from engine to rear wheel.	E. Broken drive-shaft. F. Disconnected flange/universal joint connection. G. Broken gear teeth. H. Seizure due to lack of lubrication. I. Small foreign object lodged between moving parts.

NOTE:

Damage areas A, B, and C above may be extremely difficult to diagnose. The symptoms are quite subtle and difficult to distinguish from normal motorcycle operating noise. If there is reason to believe component(s) are damaged, remove component(s) for specific inspection.

2. Inspection Notes:

a. During coasting, accelerating or decelerating, the "rolling rumble" will increase with rear wheel speed, not engine or transmission gear speeds. However, such noise may also be due to wheel bearings.

b. Noise that varies with acceleration and deceleration: Following incorrect reassembly, a condition of too-little gear lash may produce a whine during deceleration.

CAUTION:

Too-little gear lash is extremely destructive to gear teeth. If a test ride following reassembly indicates this condition, stop riding immediately to minimize damage to gears.

c. A slight "thunk" must be distinguished from normal motorcycle operation. It will be most noticeable at low speed and could indicate broken gear teeth.

WARNING:

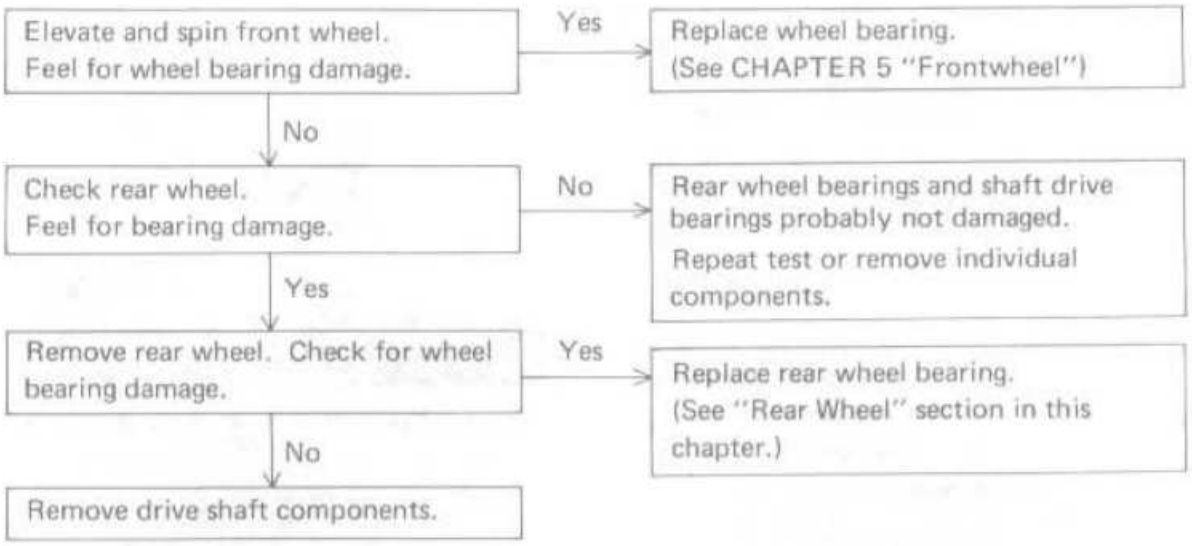
If broken gear teeth are suspected, stop riding immediately. This condition could lead to locking-up of the shaft drive assembly and result in harm to a rider.

d. If the drive flange/universal joint bolts are slightly loose, a "clunk" may be felt when slowly taking off, or when changing from slow acceleration to slow deceleration. At high speed this will result in vibration.

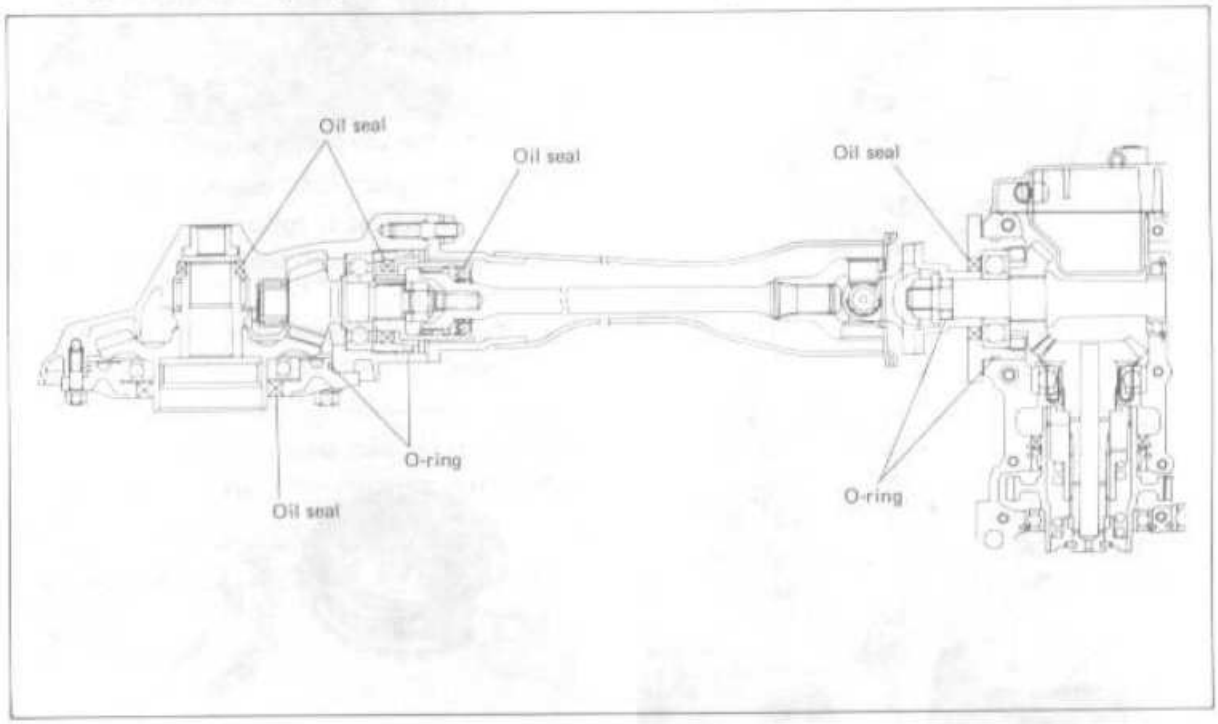
WARNING:

Do not continue riding a motorcycle suspected of having loose flange/universal joint bolts. The components may break, causing injury to a rider.

3. Troubleshooting Chart
Where Basic Conditions "a" and "b" above exist, consider the following Chart:



4. Oil Leak Inspection
If a shaft drive component is suspected of leaking oil, first thoroughly clean the entire motorcycle. The apparent location of an oil leak on a dusty motorcycle may be misleading. Dry the motorcycle and apply a leak-localizing compound or a dry-powder spray that will limit the flow of any leaking oil. Operate the motorcycle prepared in this way for the distance necessary to precisely locate the leak. There are the possibilities that a component housing may have been damaged by road debris or an accident, or a gasket or seal may be cracked or broken. However, on new or nearly new motorcycle an apparent oil leak may be the result of a rust-preventive coating or excess assembly lubrication of seals. Always clean the motorcycle and recheck the suspected location of any apparent leakage.



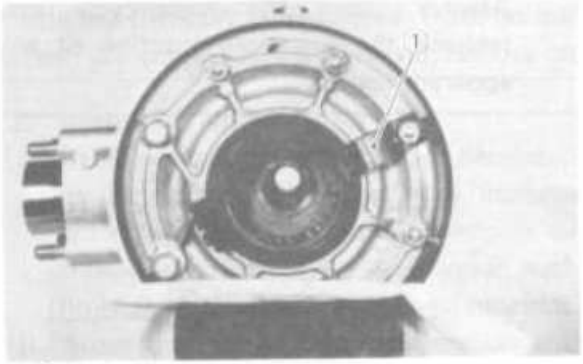
5. Checking Drained Oil
   Whenever a problem is suspected in either the middle or final gear assemblies, drain and inspect the oil. Metal particles on the drain plug or in the oil could indicate a bearing seizure or other problem in the component. However, a small amount of metal particles in the oil is normal.

B. Final Gear Removal

1. Remove the rear axle and left shock absorber. Remove the rear wheel (see "Rear Wheel" section in this chapter).
2. Remove the 4 nuts holding the Final Drive unit to the swing arm.
3. Remove the final gear assembly.

C. Gear Lash Check and Adjustment

1. Secure the gear case in a vice or other support.
2. Remove one nut from the final gear case stud bolt. Install the gear holder (special tool) over the ring gear surface and stud bolt. Tighten the holder to stud bolt with a nut.



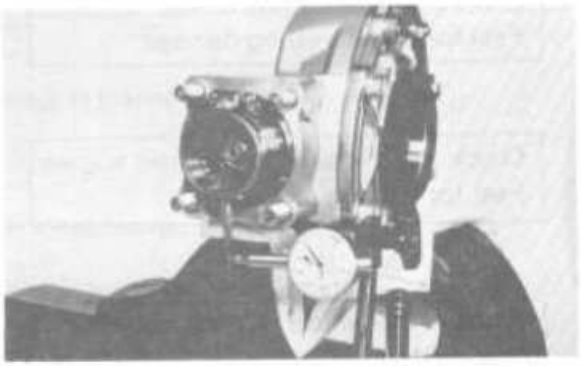
1. Final gear holding tool

3. Install the final gear lash measurement tool on the gear coupling.



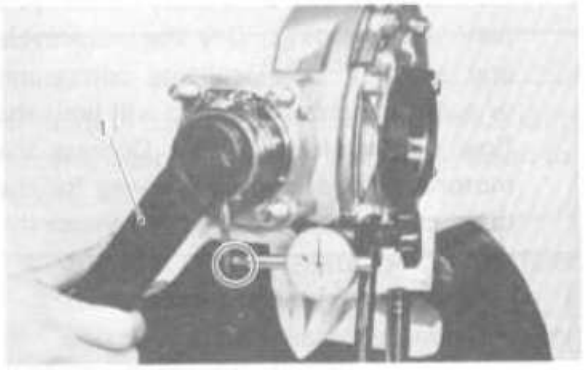
1. Gear lash measurement tool (Final gear)

4. Mount a dial gauge against the lash measurement tool at the scribed mark (60 mm, 2.36 in from the center of the shaft).



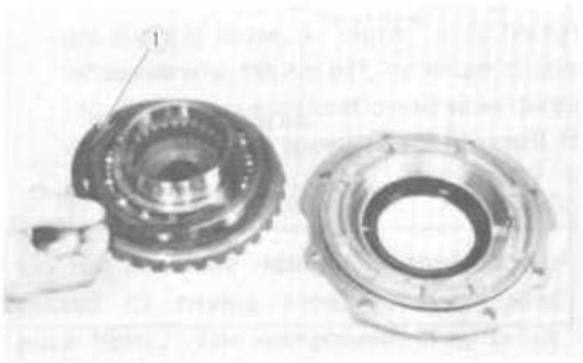
5. Use the special wrench to gently rotate the gear coupling back and forth. Note the lash measurement on the dial gauge.

Final gear lash:
0.25 ~ 0.50 mm (0.010 ~ 0.020 in):
When using the measurement tool.
0.1 ~ 0.2 mm (0.004 ~ 0.008 in):
Actual gear lash on the final gear teeth.



1. Middle and final gear holding tool

6. If the gear lash exceeds the specified limits, adjust as follows:
   a. To reduce gear lash, increase the ring gear shim.
   b. To increase gear lash, reduce ring gear shim.



1. Ring gear shim

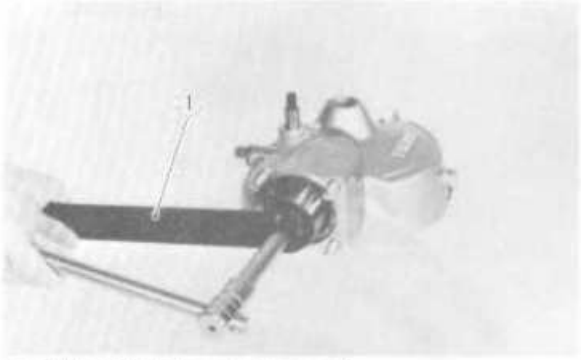
c. If it is necessary to increase the ring gear shim by more than 0.1 mm reduce the thrust washer thickness by 0.1 mm for each 0.1 mm of ring gear shim increase and if it is necessary to reduce shim by more than 0.1 mm, reverse above procedure.

D. Final Gear Disassembly

1. Remove the nuts and bolts holding the bearing housing.
2. Remove the ring gear assembly and thrust washer from the final gear case.



3. Remove the self-locking nut from drive pinion by using the holding tool (special tool) and remove the coupling.



1. Middle and final gear holding tool

4. Remove the drive pinion bearing retainer with the retainer remover (special tool).

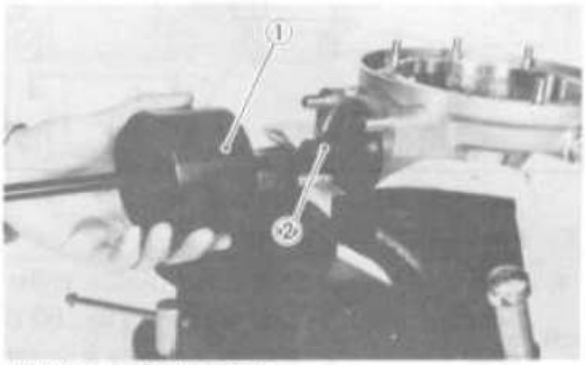
CAUTION:

The drive pinion bearing retainer nut is left hand threads. Turn the retainer nut clockwise to loosen.



1. Drive pinion bearing retainer remover

5. Remove the drive pinion and bearing with the slide hammer and adapter (special tool).

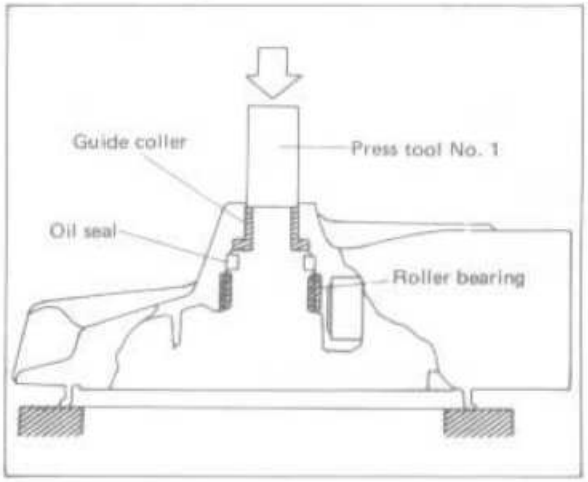


1. Slide hammer 2. Adapter

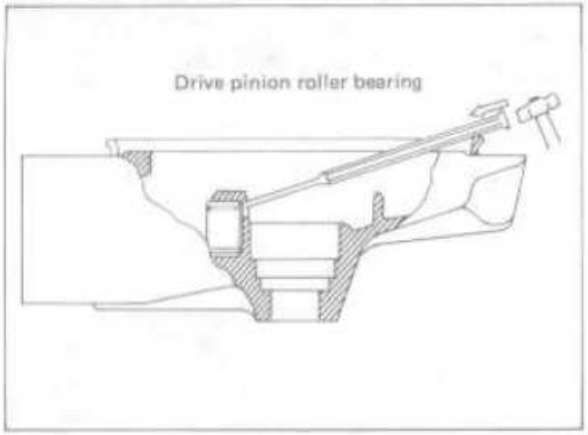
CAUTION:

This drive pinion removal should be performed only if gearing replacement is necessary. Do not re-use bearings or races after removal.

6. Remove the guide coller, oil seal, and roller bearing from the main housing by using the press tool No. 1 (special tool) and a press. Use an appropriate supports for the main housing during this operation. The roller bearing may be re-used if undamaged. Do not re-use oil seal.



7. Rear drive pinion roller bearing; removal of this bearing is difficult and seldom necessary. Heat the bare housing to 150°C (302°F). Use an appropriately shaped punch to remove the roller bearing outer race. Remove the inner race from the drive pinion.

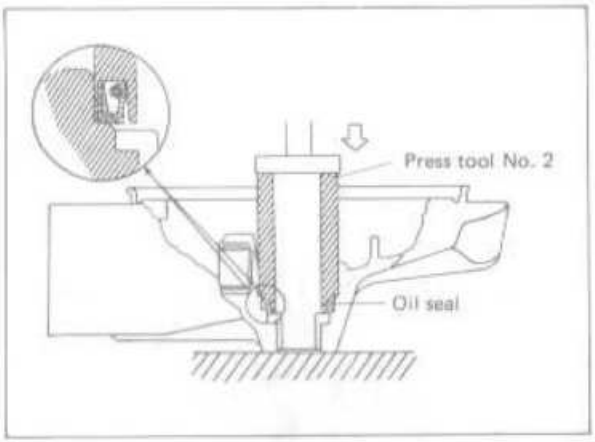


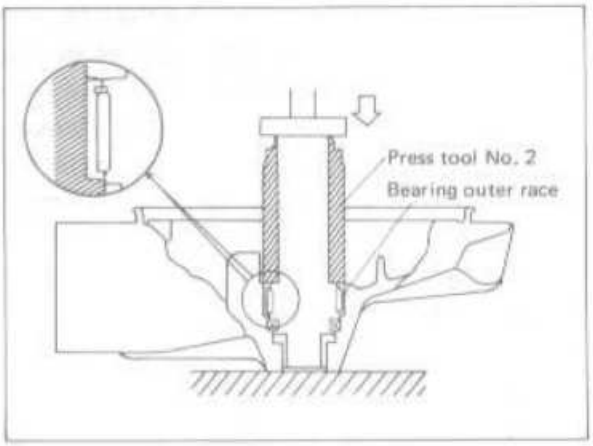
E. Final Gear Reassembly

1. Install the new rear drive pinion roller bearing. Heat the bare bearing to 150°C (302°F) and use an appropriately adapter to install the roller bearing outer race. Install the inner race onto the drive pinion.
2. Using the press tool No. 2 (special tool) and a press, install the guide coller, new oil seal, and roller bearing into the main housing in that order.

NOTE:

The removed roller bearing can be used if undamaged; however, we recommend replacement with a new one.

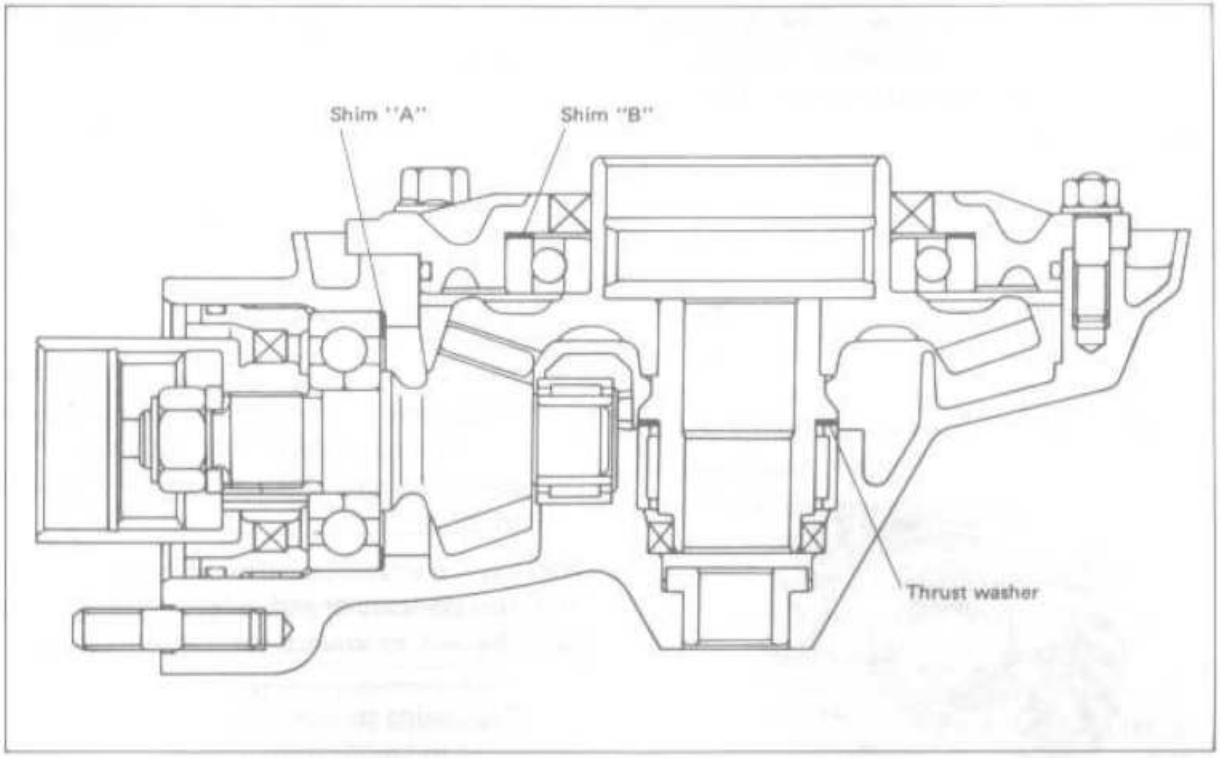




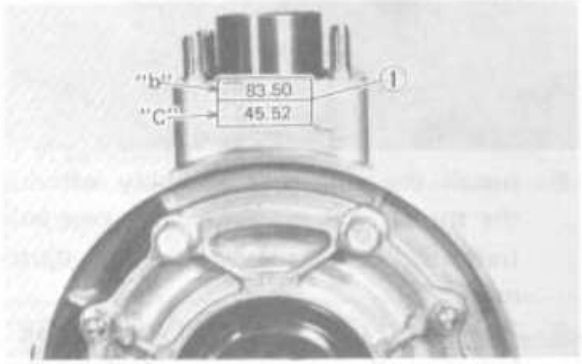
3. Final drive/ring gear positioning

NOTE:

When the following part(s) is replaced with new one(s), gear positioning is necessary:
a. Final gear case, b. Ring gear bearing housing, C. Bearing(s)



a. The shim thickness "A" necessary for the drive pinion gear positioning can be calculated from the informations found on the final gear case and on the drive gear end.



1. Size number



To fined shim thickness "A" use the formula:

$A = a - b$

Where:

a = a numeral (usually a decimal number) on the gear near the tooth and ; either added to or detracted from the nominal size "84".

b = a numeral on the gear case appearing as a whole figure (ie. 83.50).

Example:

1) If the pinion gear is marked "+01" ..... "a" is 84.01.
2) If the gear case is marked "83.50".

$A = 84.01 - 83.50$

$A = 0.51$

Then the necessary shim thickness is 0.51 mm.

Shim sizes are supplied in the following thicknesses:

0.15 mm, 0.30 mm, 0.40 mm, 0.50 mm, 0.60 mm.

Because the shims can only be selected in 0.05 mm increments the following chart should be used when encountering last digits that are not 5 or zero (0):

Last digits	Rounding
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

b. The shim thickness "B" necessary for the ring gear positioning can be calculated from the informations found on the final gear case, ring gear, and bearing.



To find shim thickness "B" use the formula:

$B = c + d - (e + f)$

Where:

c = a numeral on the gear case appearing as a whole figure (ie. 45.52)

d = a numeral (usually a decimal number) on the outside of the ring gear bearing housing and added to the nominal size "3".

e = a numeral (usually a decimal number) on the inside of the ring gear and; either added to or detracted from the nominal size "35.40".

f = a bearing thickness (considered constant)

Distance "f" = 13.00 mm

Example:

1) If the gear case is marked "45.52".
2) If the ring gear bearing housing is marked "35" ..... "d" is 3.35.
3) If the ring gear is marked "+01" ..... "e" is 35.40 + 0.01 = 35.41.
4) "f" is 13.00.

$B = c + d - (e + f)$

$B = 45.52 + 3.35 - (35.41 + 13.00)$

$B = 48.87 - (48.41)$

$B = 0.46$

Then the necessary shim thickness is 0.41 mm.

NOTE:

Use the chart for the drive pinion shim to select the ring gear shim size.

4. Install the drive pinion gear with the proper size of shim(s) and secure it with the bearing retainer nut with the drive pinion bearing retainer remover (special tool).

NOTE:

The bearing retainer nut is left hand threads; turn the nut to counterclockwise to tighten.

Tightening torque: 11 m-kg (80 ft-lb)



5. Install the ring gear assembly without the thrust washer. Adjust the gear lash (refer to "C. Gear lash check and adjustment).
6. Place four pieces of "PLASTIGAGE" between the originally fitted thrust washer and ring gear.
7. Install the gear case onto the ring gear assembly and tighten the nuts and bolts with the specified torque.



Tightening torque:	
Bolt/Nut	2.3 m-kg (16.6 ft-lb)

NOTE:

Do not turn the drive pinion/ring gear when measuring clearance with "PLASTIGAGE".

8. Remove the ring gear assembly and determine the clearance by measuring the width of the flattened "PLASTIGAGE".

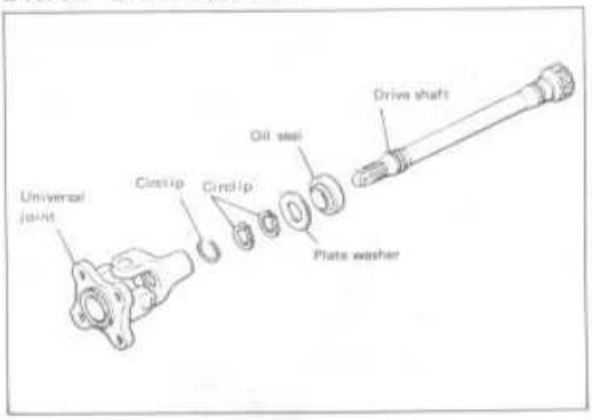


1. PLASTIGAGE

Ring gear thrust clearance:
0.1 ~ 0.2 mm

9. If the clearance exceeds the specification above, replace the thrust washer to obtain the proper clearance.

DRIVE SHAFT/JOINT



A. Removal

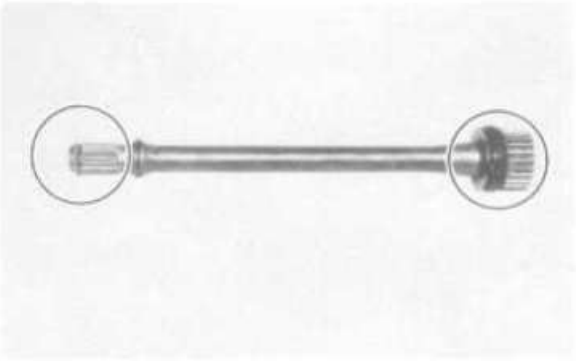
1. Remove the rear wheel. See "REAR WHEEL A. Removal" in this chapter.
2. Remove the final gear case assembly.
3. Remove the drive shaft. See "SWING ARM removal" in this chapter.
4. To remove the universal joint, it is necessary to remove the swing arm. Remove the universal joint assembly.

B. Inspection

1. Drive shaft
   Inspect the shaft splines for wear and/or damage. If excessive, replace the drive shaft.

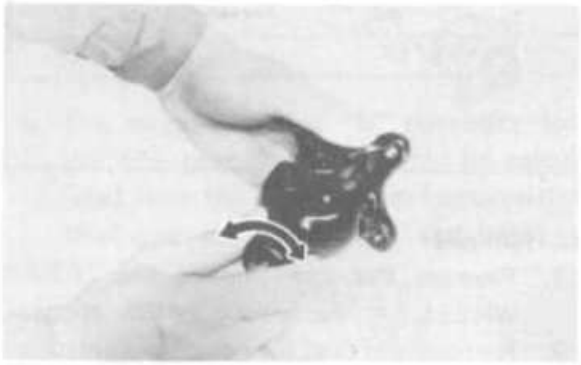
NOTE:

When installing the drive shaft, lubricate splines with molybdenum disulfied grease.



2. Universal joint
   a. There should be no noticeable play in the universal joint bearings. If there is any play in the bearing, replace the universal joint assembly.

b. Move the universal joint up and down and from side to side. The universal joint should move smoothly. Without tightness, binding or rough spots that could indicate damaged bearings. If damaged, replace the universal joint assembly.



C. Reinstallation

When installing the drive shaft and the universal joint, reverse the removal procedure. Note the following points:

1. Lubricate the shaft splines with molybdenum disulfied grease.
2. Tighten the universal joint securing bolts and final gear case securing nuts with the specified torque:

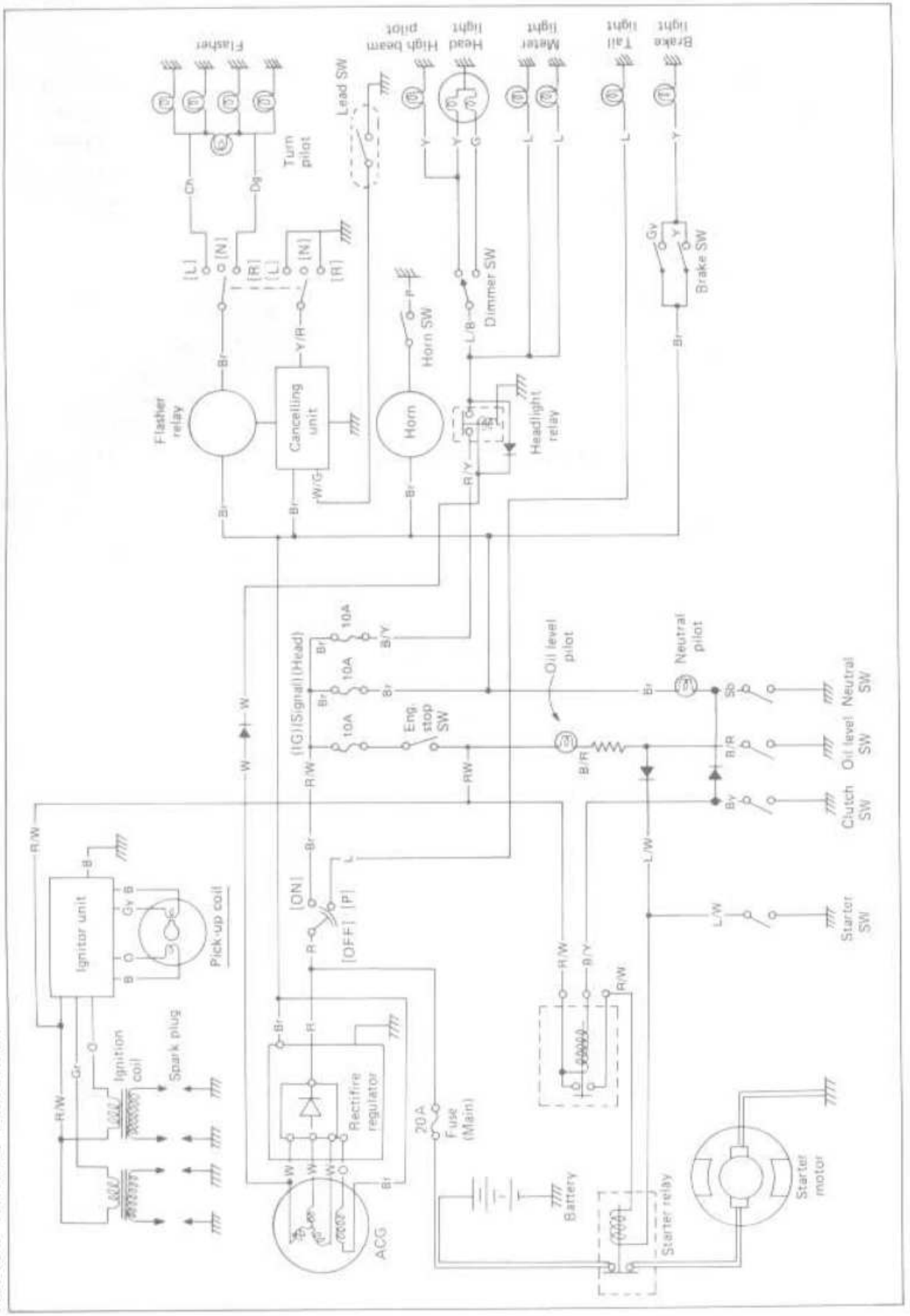
Final gear case:	4.2 m-kg (30.4 ft-lb)
Universal joint:	4.4 m-kg (31.8 ft-lb)

CHAPTER 6. ELECTRICAL

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D. Switches 124
E. Battery 124

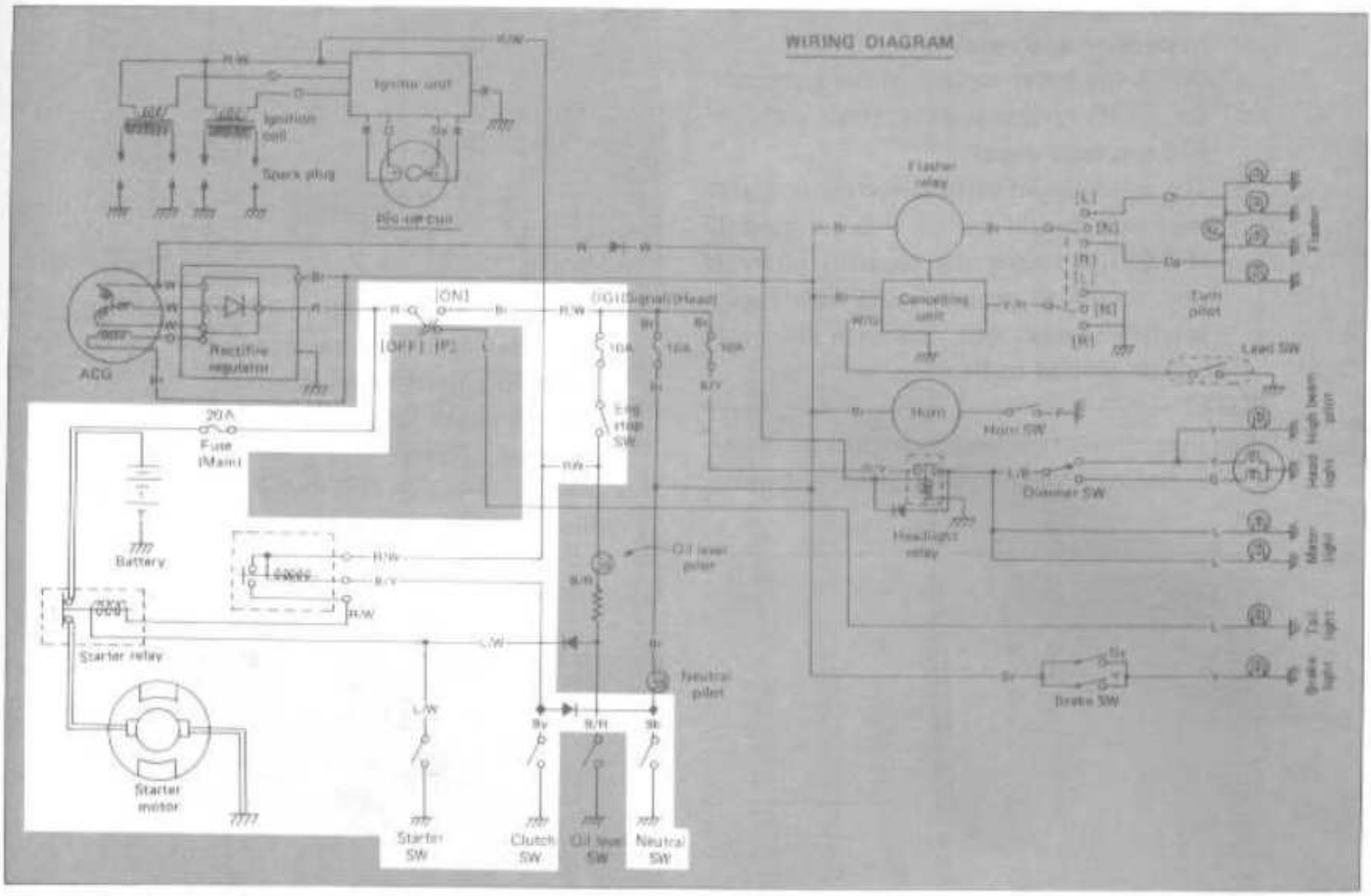
6

XJ650G WIRING DIAGRAM

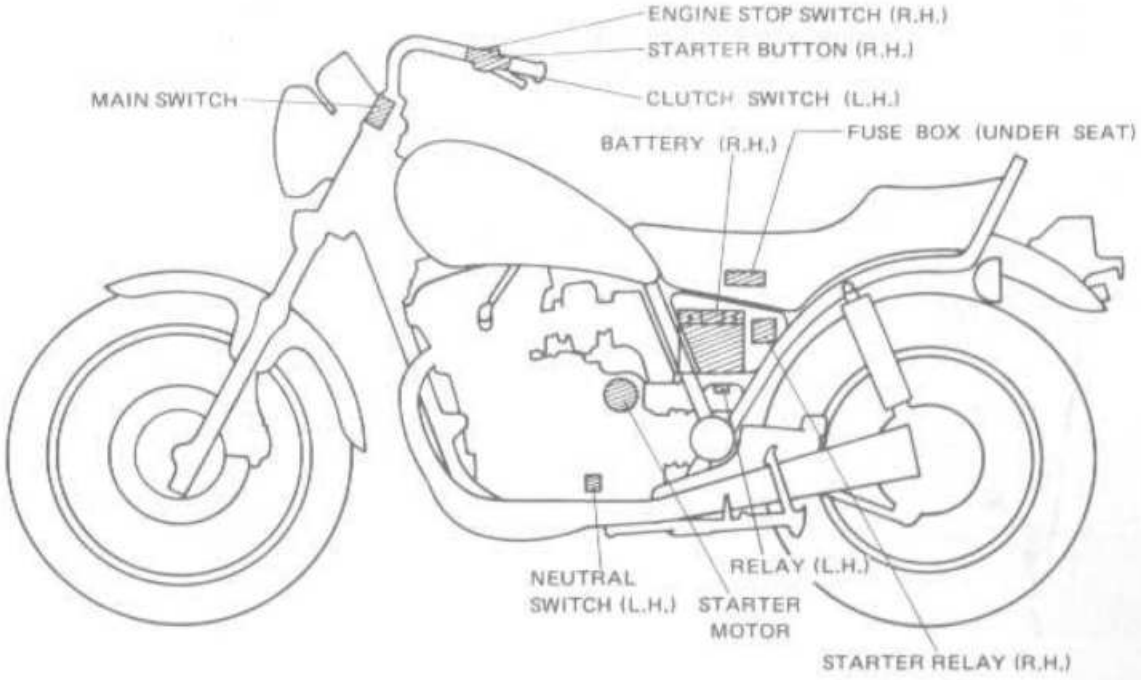


ELECTRIC STARTING SYSTEM

A. Circuit Diagram



Above circuit diagram shows starter circuit in wiring diagram.



B. Starter Motor

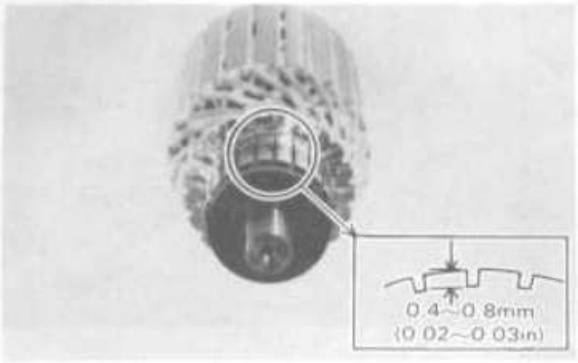
1. Removal (see CHAPTER 3. "ENGINE DISASSEMBLY")
2. Inspection and repair

a. Check the outer surface of the commutator. If its surface is dirty, clean with # 600 grit sand paper.

b. The mica insulation between commutator segments should be 0.4 ~ 0.8 mm (0.02 ~ 0.03 in) below the segment level. If not, scrape to proper limits with appropriately shaped tool. (A hack saw blade can be ground to fit.)

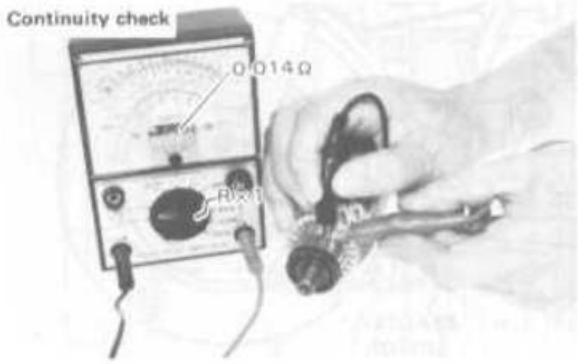
NOTE:

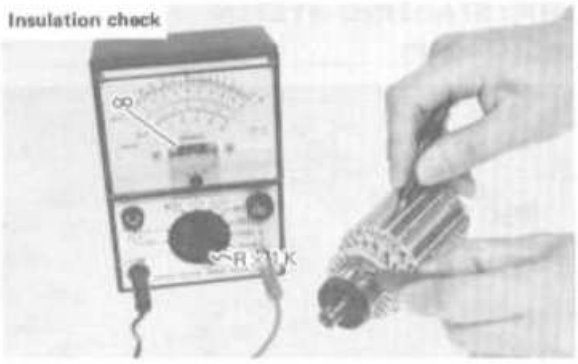
Mica insulation of commutator must be undercut to ensure proper operation of commutator.



c. The starter's armature coil should be checked with an ohm meter for insulation breakdown (shorting to each other or to ground) and for continuity. Reference figure is given below.

Coil resistance:
Armature coil: 0.014Ω at 20°C (68°F)

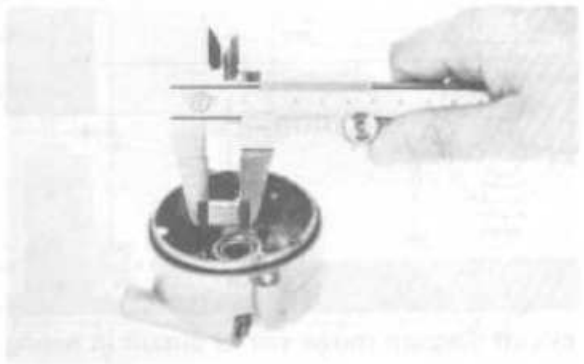




d. Check the front and rear cover bearings for damage. If damaged, the starter assembly must be replaced.

e. Check brush length. Replace brush if at, or near, limits.

Minimum brush length: 8.5 mm (0.33 in)



f. Check brush spring pressure. Compare it with a new spring. Replace the old spring if it is weak.

C. Starter Relay Switch

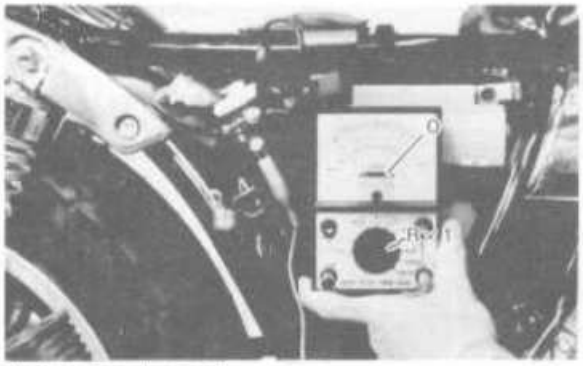
1. Inspection

a. Disconnect starter cable at the relay.

b. Connect pocket tester leads to the relay terminals (ohms x 1 scale).

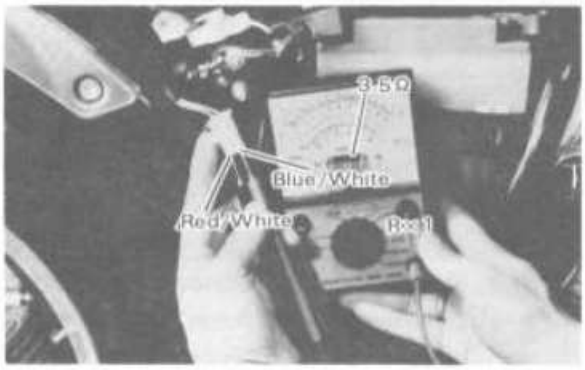
c. Turn ignition to "ON" position, engine stop switch to "RUN" and change lever to "NEUTRAL".

d. Push the starter button. The relay should click once and the scale should read zero if it does not read zero, the relay must be replaced.



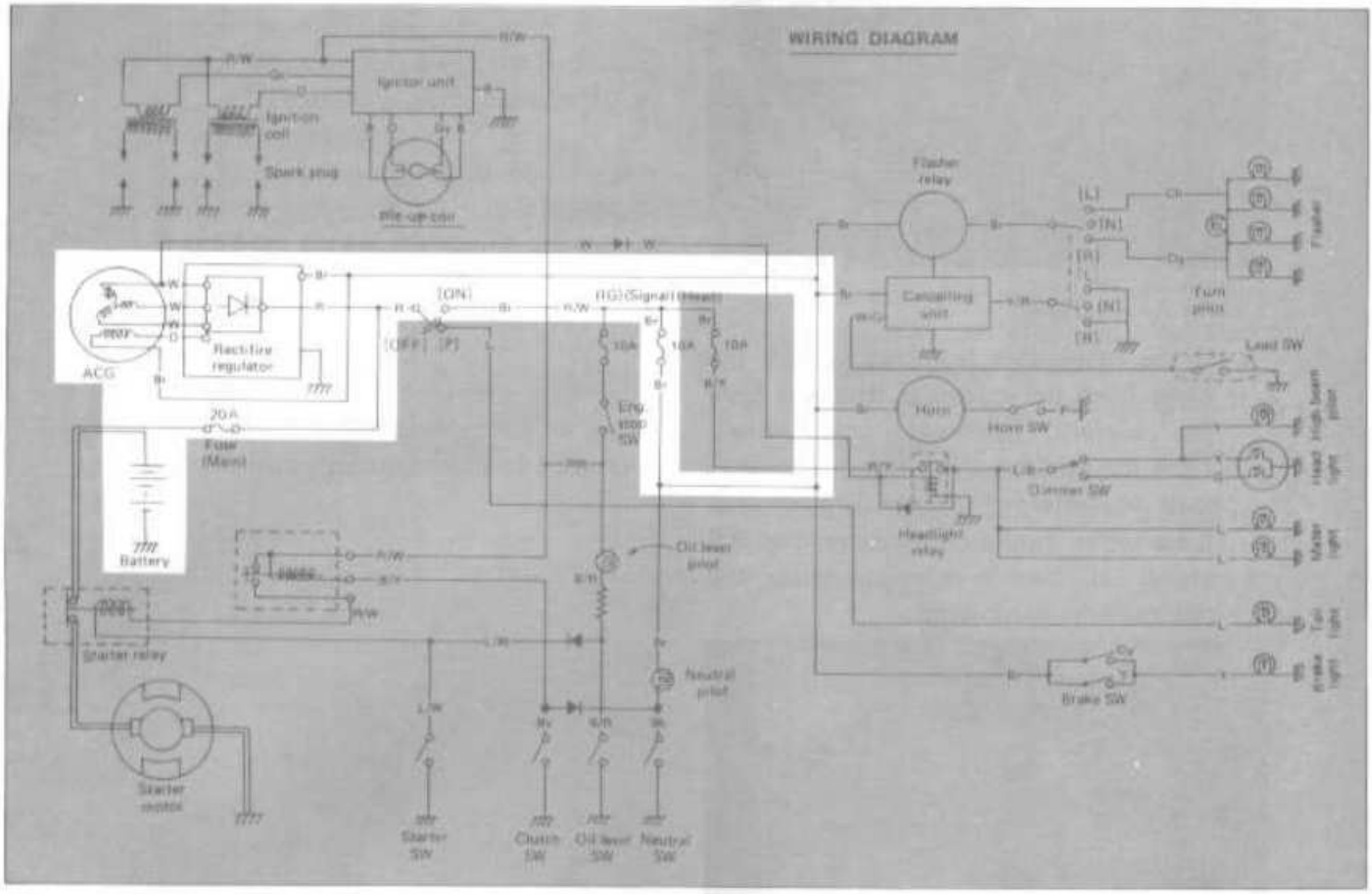
1. Battery lead wire (+)
2. Starter motor lead wire

e. If the relay does not click, check the wires from the starter button and from the battery (red/white, blue/white). Turn the ignition off. Use (ohms x 1) scale on tester. The resistance between these wires should be no more than 3.5 ohms. If there is more resistance, the relay should be replaced.

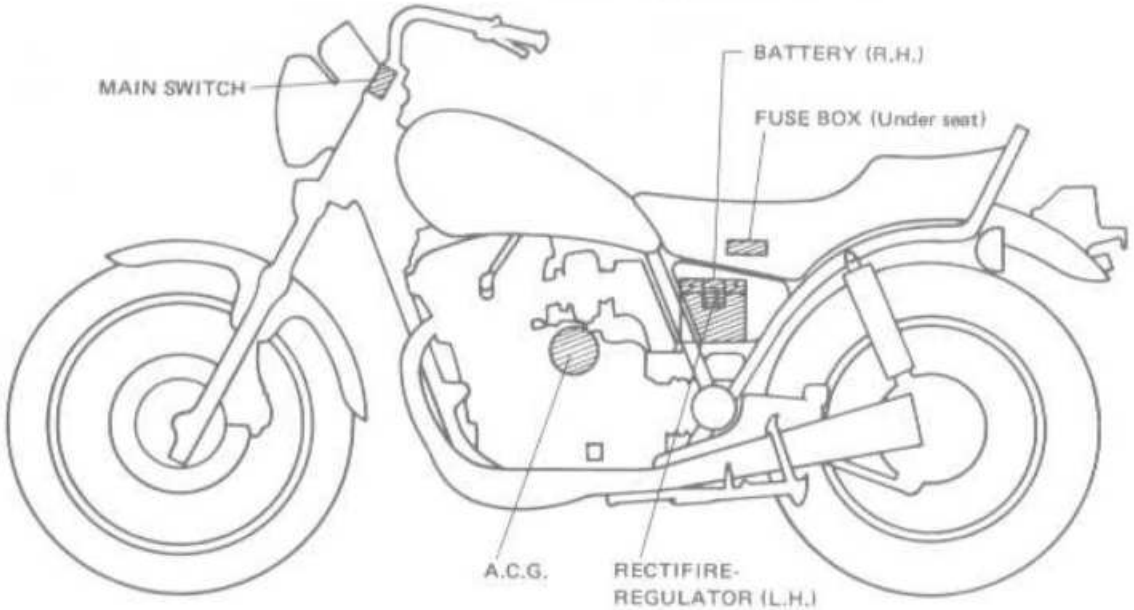


CHARGING SYSTEM

A. Circuit Diagram



Above circuit diagram shows charging circuit in wiring diagram.



B. A.C. Generator

1. Checking method.
   a. Connect D.C. voltmeter to the battery terminals.
   b. Start engine.
   c. Accelerate engine to approximately 2,000 r/min or more and check generated voltage.

Generated voltage: 14.5 ± 0.3V



   d. If the indicated voltage cannot be reached, then perform the tests in step 2.

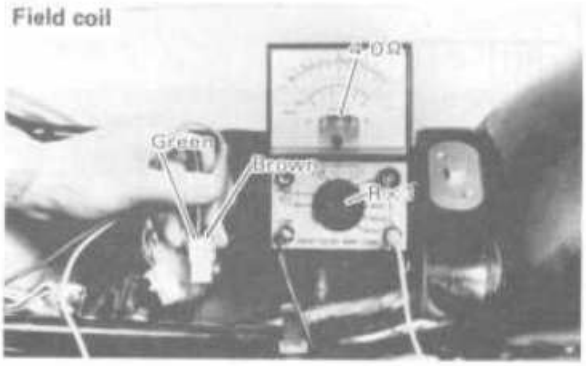
CAUTION:

Never disconnect wires from the battery while the generator is in operation. If the battery is disconnected, the voltage across the generator terminals will increase, damaging the semiconductors.

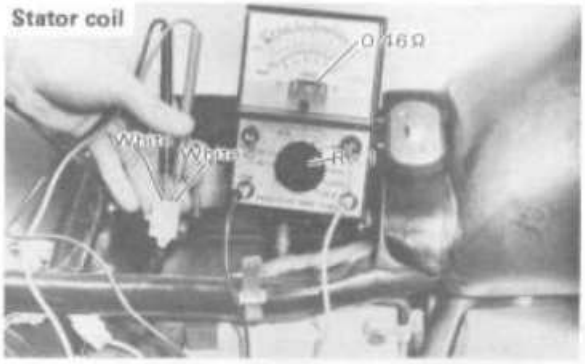
2. Resistance test of field coil and stator coil.
   Check the resistance between terminals. If resistance is out of specification, coil is broken. Check the coil connections. If the coil connections are good, then the coil is broken inside and it should be replaced.

Field coil resistance: (Green-Brown) 4.0Ω ± 10% at 20°C (68°F) Stator coil resistance: (White-White) 0.46Ω ± 10% at 20°C (68°F)

Field coil



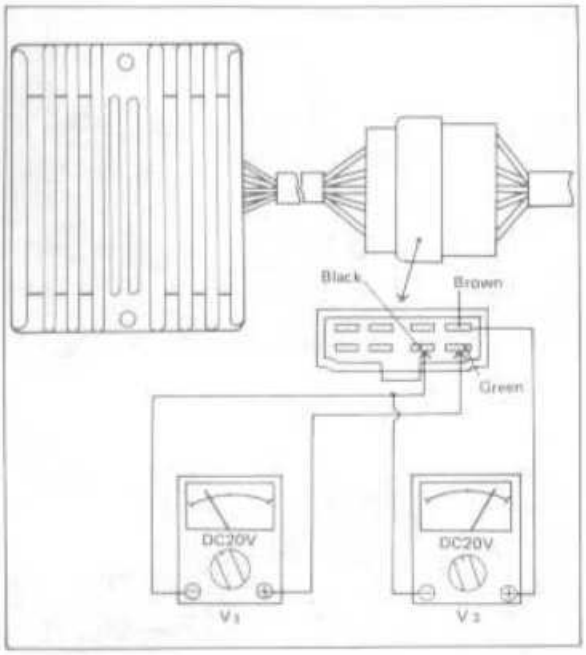
Stator coil



C. Voltage Regulator

The IC Voltage Regulator is a small and, normally, very reliable component. Due to its construction, it is lightweight and free from the wear and misadjustment associated with mechanical voltage regulators. If the following inspection reveals that the regulator is faulty, it cannot be adjusted and must be replaced.

1. Checking IC Voltage Regulator
   a. Remove the seat.
   b. Remove the left side cover.
   c. Measure the specific gravity of the battery fluid. If it is less than 1.260, remove the battery and recharge until it is more than 1.260. (See page 124 for charging procedures)
   d. Check the battery terminals and couplers for looseness.
   e. Connect two Yamaha pocket testers to the regulator coupler as illustrated.



CAUTION:

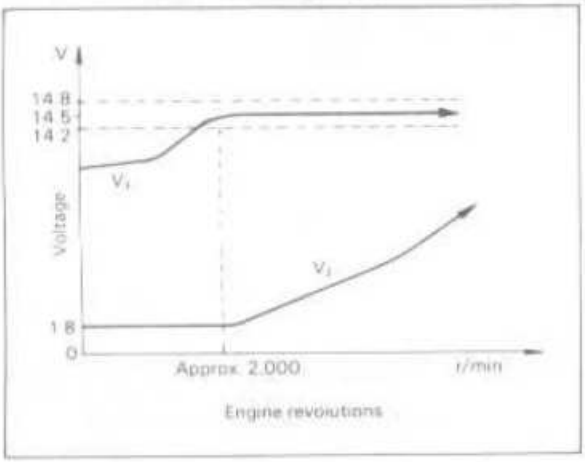
Be careful not to let the tester leads short circuit when connecting them to the regulator snap connector leads.

f. Turn the main switch on. Make sure that V_2 is less than 1.8V.

NOTE:

Do not turn on lights or signals.

g. Make sure that V_2 gradually increases up to 9 ~ 11V when the engine is started and its revolutions go up.

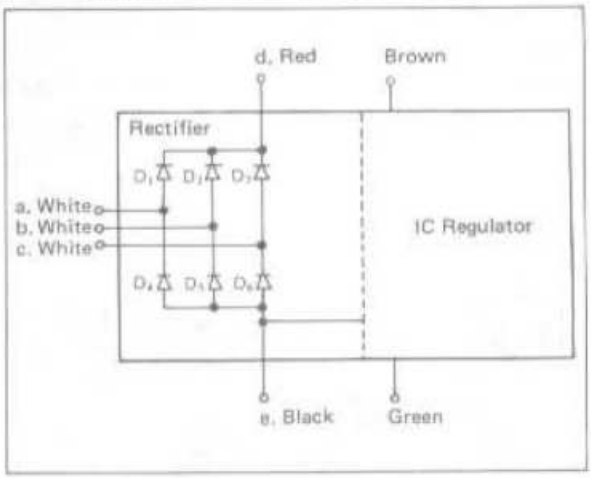


h. Make sure that V_1 maintains the level of 14.2 ~ 14.8V even when engine revolutions increase.

i. If these levels are not maintained, the regulator is defective and must be replaced.

2. Checking the silicon rectifier

a. Check the silicon rectifier as specified using the Yamaha pocket tester.



Checking element	Pocket tester connecting point (+) (red)	Pocket tester connecting point (−) (black)	Good	Replace (element shorted)	Replace (element opened)
D_1	d	a	○	○	×
	a	d	×	○	×
D_2	d	b	○	○	×
	b	d	×	○	×
D_3	d	c	○	○	×
	c	d	×	○	×
D_4	a	e	○	○	×
	e	a	×	○	×
D_5	b	e	○	○	×
	e	b	×	○	×
D_6	c	e	○	○	×
	e	c	×	○	×

○ : Continuity
× : Discontinuity (∞)

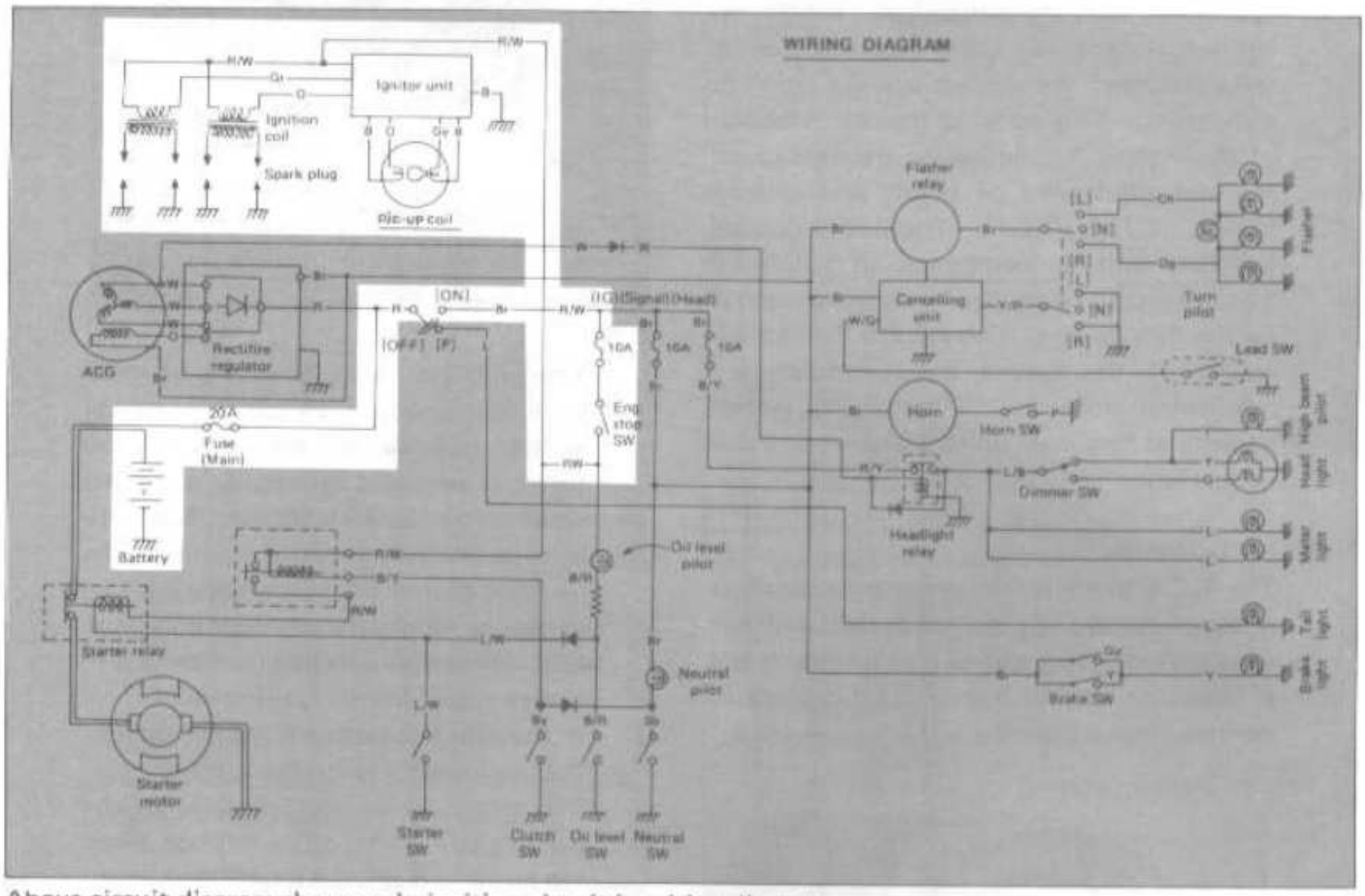
b. Even if only one of the elements is broken, replace the entire assembly.

CAUTION:

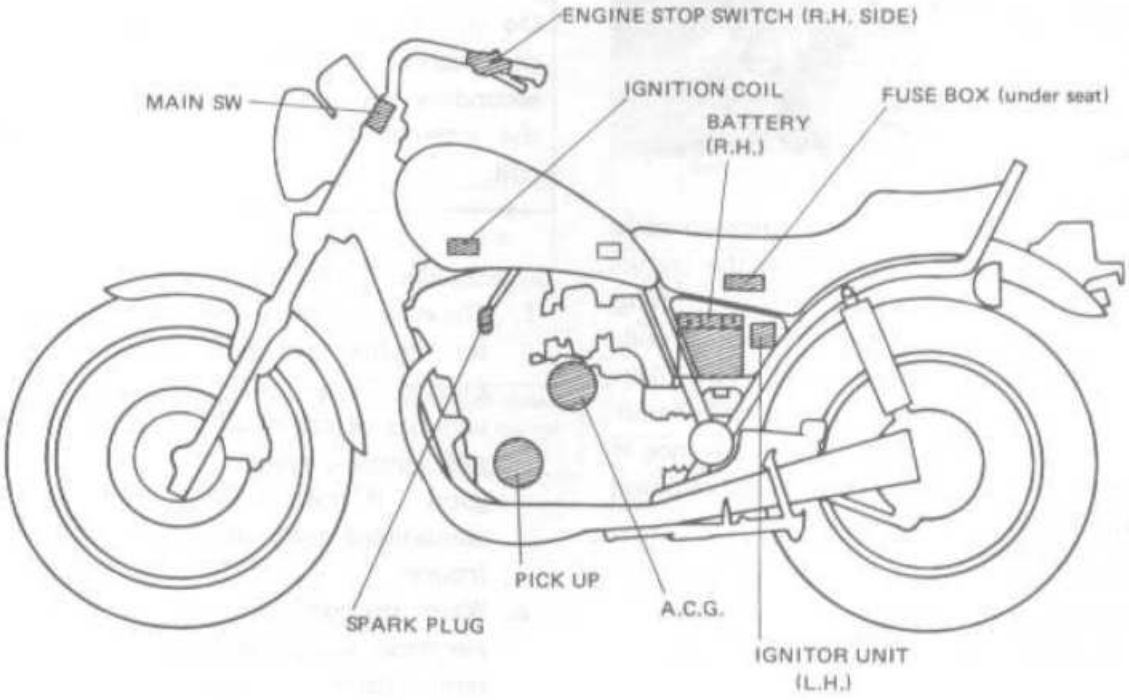
The silicon rectifier can be damaged if subjected to overcharging. Special care should be taken to avoid a short circuit and/or incorrect connection of the positive and negative leads at the battery. Never connect the rectifier directly to the battery to make a continuity check.

IGNITION SYSTEM

A. Circuit Diagram



Above circuit diagram shows only ignition circuit in wiring diagram.



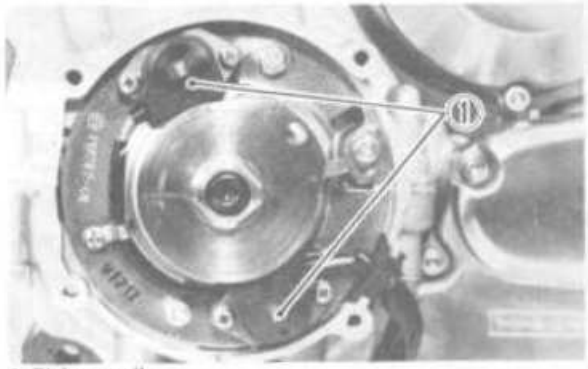
B. Description

This model is equipped with a battery operated, fully transistorized breakerless ignition system. By using magnetic pick-up coils the need for contact breaker points is eliminated. This adds to the dependability of the system by eliminating frequent cleaning and adjustment of points and ignition timing. This T.C.I. (Transistor Control Ignition) unit in corporates an automatic advance circuit controlled by signals generated by the pick-up coil. This adds to the dependability of the system by eliminating the mechanical advancer. This T.C.I. system consists of two main units; a pick-up unit and ignitor unit.

C. Operation

The T.C.I. functions on the same principle as a conventional D.C. ignition system with the exception of using magnetic pick-up coils and a transistor control box (T.C.I.) in place of contact breaker points.

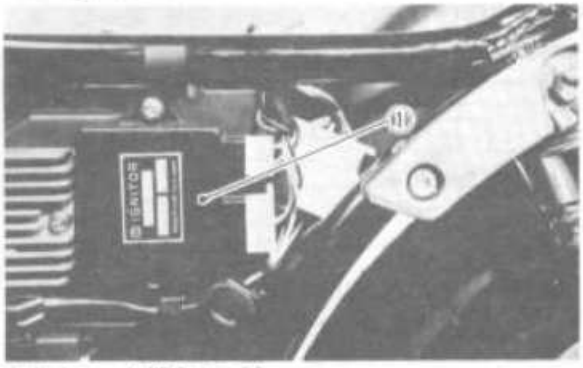
1. Pick-up unit



1. Pick-up coils

This unit consists of two pick-up coils and a magneto mounted on the crankcase (L.H.). When the reluctor (timing plate) projection passes the pick-up coil, the two signals are generated at the pick-up coil and transmited to the ignitor unit as a signal. The full ignition advance is determined by the width of the reluctor (timing plate) projection.

2. Ignitor unit



1. Ignitor unit (T.C.I. unit)

This unit has such functions of wave form, duty control, switching, electrical ignition advance, and etc. The ignition timing is advanced electrically using two signals from the pick-up coil. The duty control circuit is provided to control the on time period of the primary ignition current to reduce the electrical consumption. This unit also incorporates a protective circuit for the ignition coil.

If the ignition switch is turned on and the crankshaft is not turned, the protective circuit stops current flow to the primary coil within a few seconds. When the crankshaft is turned over, the current is turned on again by the signals generated by the pick-up coils.

CAUTION:

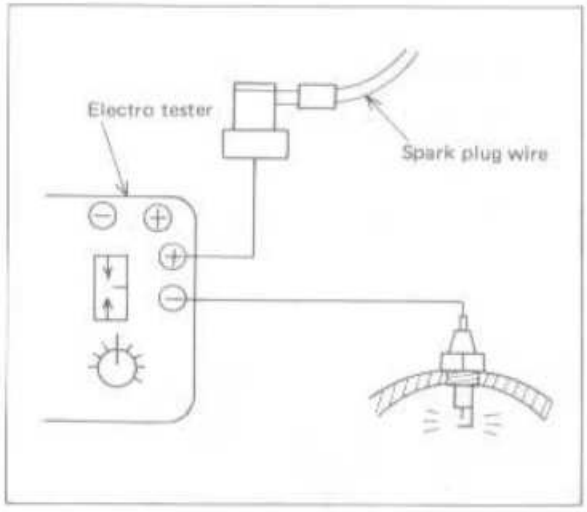
Do not run the engine without any spark plug cap(s) in place. Due to the high secondary voltage, it is possible to damage the internal insulation of the secondary coil.

D. Troubleshooting/Inspection

1. The entire ignition system can be checked for misfire and weak spark using the Electro Tester. If the ignition system will fire across a sufficient gap, the entire ignition system can be considered good. If not, proceed with individual component tests until the problem is fround.

a. Warm up engine thoroughly so that all electrical components are at operating temperature.

b. Stop the engine and connect the tester as shown.



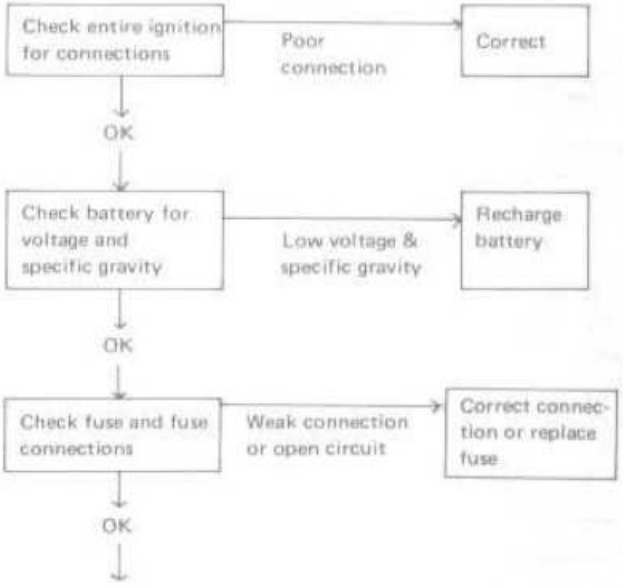
c. Start the engine and increase the spark gap until misfire occurs. (Test at various r/min between idle and red line.)

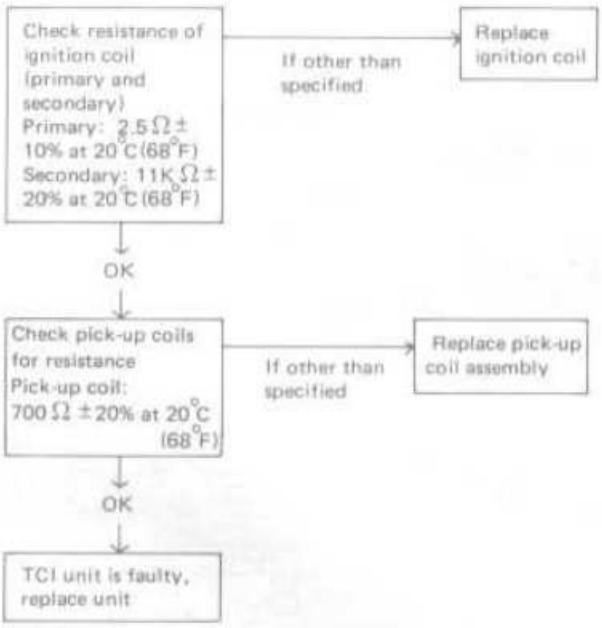
Minimum spark gap: 6 mm (0.24 in)

CAUTION:

Do not run engine in neutral above 6,000 r/min for more than 1 or 2 seconds.

2. If the ignition system should become inoperative, the following troubleshooting aids will be useful.



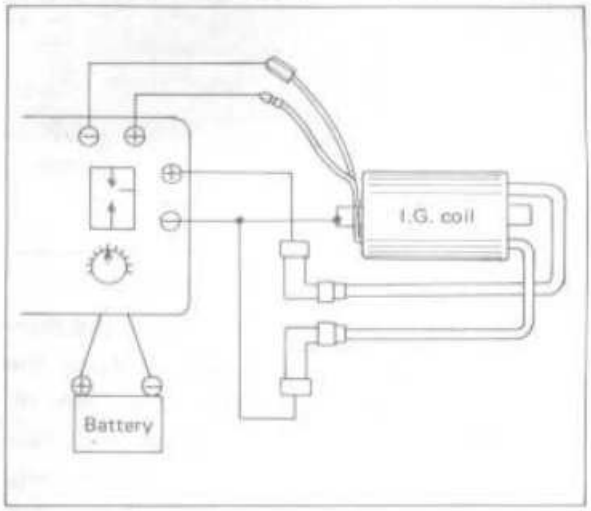


3. Ignition coil

a. Coil spark gap test.

1) Remove the fuel tank and disconnect the ignition coil from wire harness and spark plugs.

2) Connect the Electro Tester as shown.



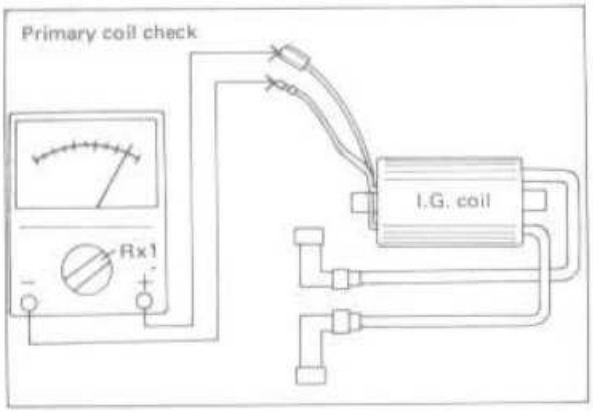
3) Connect fully charged battery to tester.

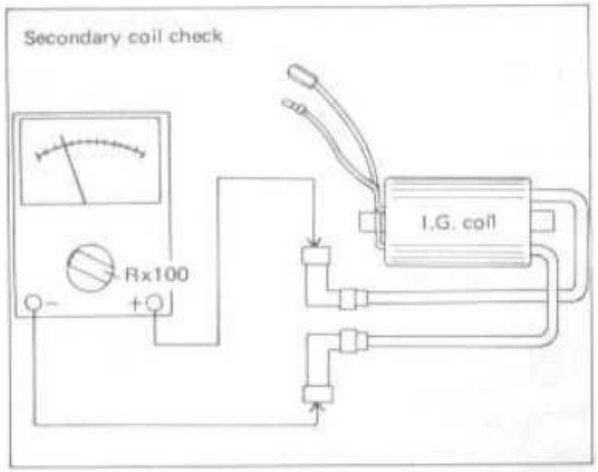
4) Turn on spark gap switch and the increase gap to maximum unless misfire occurs first.

Minimum spark gap: 6 mm (0.24 in)

b. Direct current resistance test. Use a pocket tester or equivalent ohmmeter to determine resistance and continuity of primary and secondary coil windings.

Standard value:
Primary coil resistance:
2.5Ω ± 10% at 20°C (68°F)
Secondary coil resistance:
11KΩ ± 20% at 20°C (68°F)





4. Spark plug
The life of a spark plug and its discoloring vary according to the habits of the rider. At each periodic inspection, replace burned or fouled plugs with new ones of the specified type. It is actually economical to install new plugs often since it will tend to keep the engine in good condition and prevent excessive fuel consumption.

a. Inspection

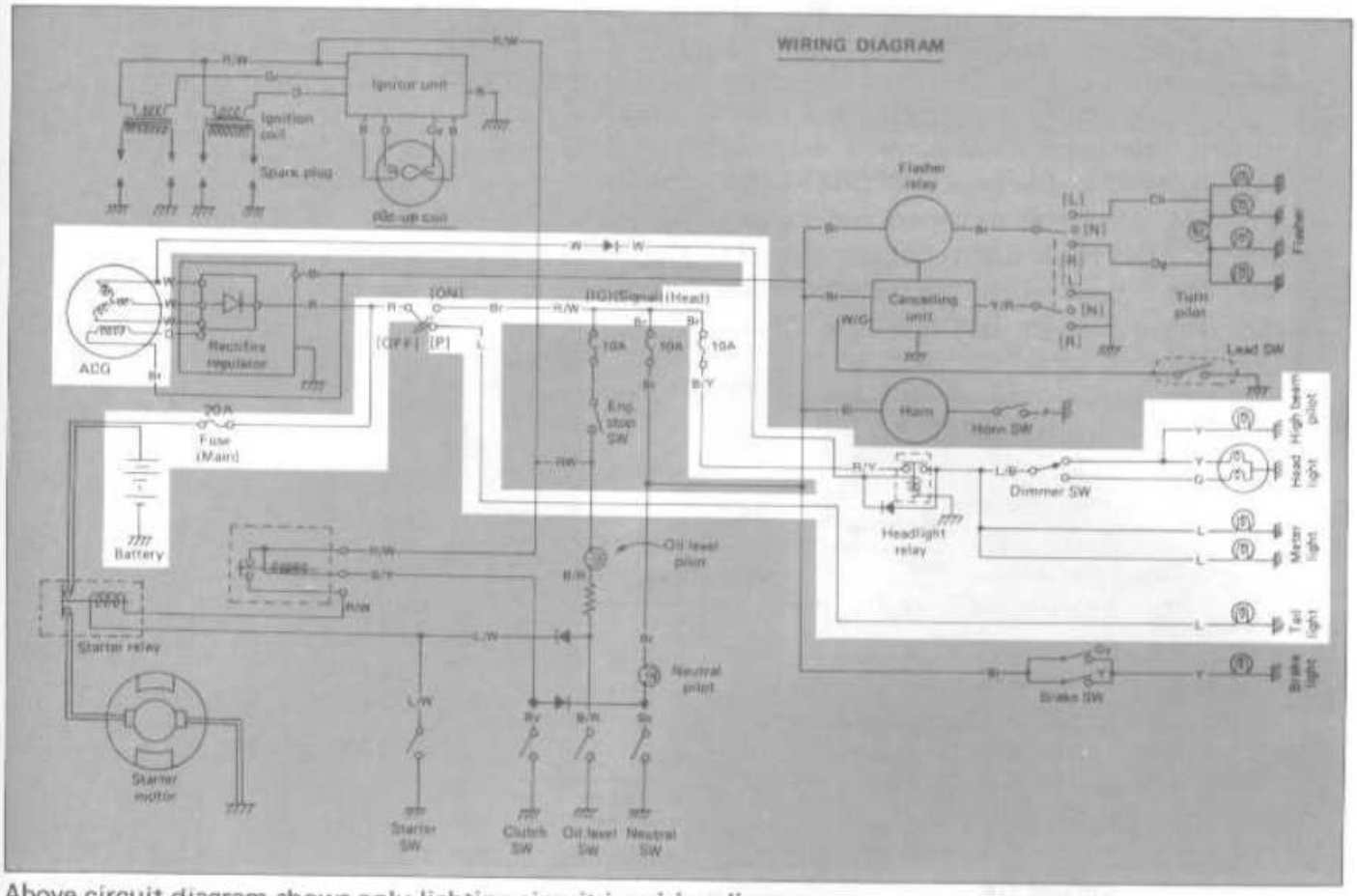
1) Inspect and clean the spark plug every 4,000 km (2,500 mi) and replace after initial 13,000 km (8,000 mi).
2) Clean the electrodes of carbon and adjust the electrode gap to the specification.

b. Installation
Be sure to use the proper reach, type and electrode gap plug(s) as a replacement to avoid overheating, fouling or piston damage.

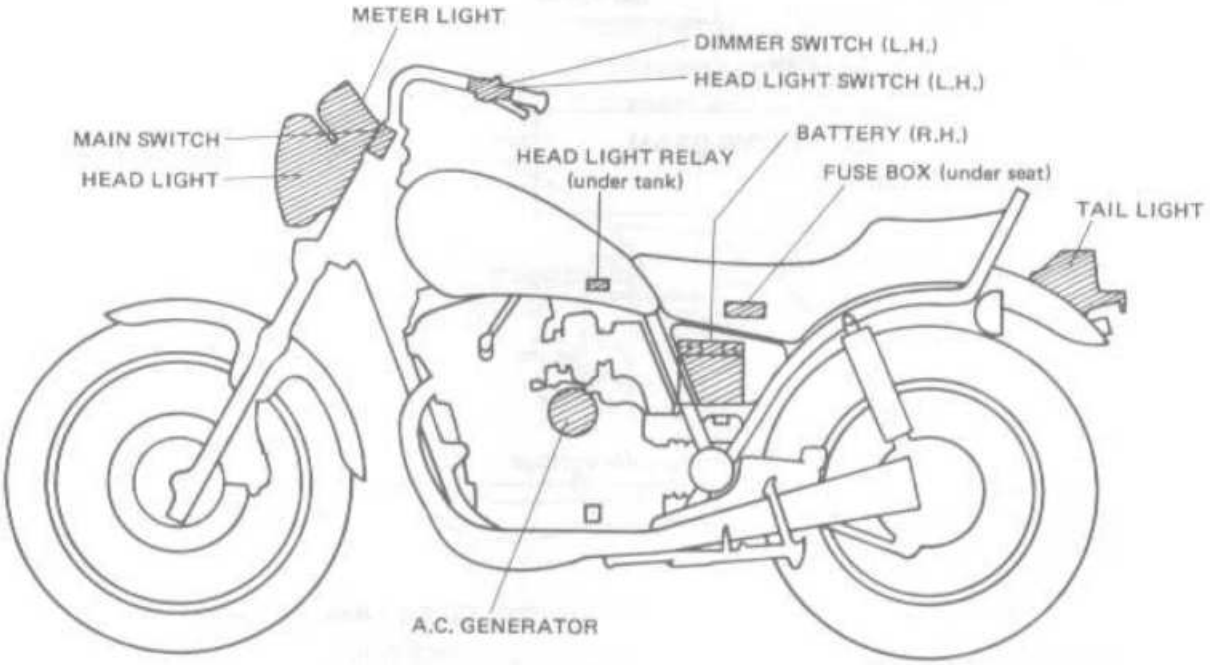
Type:
BP7ES (NGK) or W22EP (ND)
Electrode gap:
0.7 ~ 0.8 mm (0.028 ~ 0.031 in)
Tightening torque:
2.0 m-kg (14.5 ft-lb)

LIGHTING SYSTEM

A. Circuit Diagram



Above circuit diagram shows only lighting circuit in wiring diagram.



B. Lighting Tests and Checks

The battery provides power for operation of the headlight, taillight, and meter lights. If none of the above operates, always check battery voltage before proceeding further. Low battery voltage indicates either a faulty battery, low battery water, or a defective charging system. See page 113 "CHARGING SYSTEM" for checks of battery and charging system. Also check fuse condition. Replace any "open" fuses. There are individual fuses for various circuits (see complete Circuit Diagram).

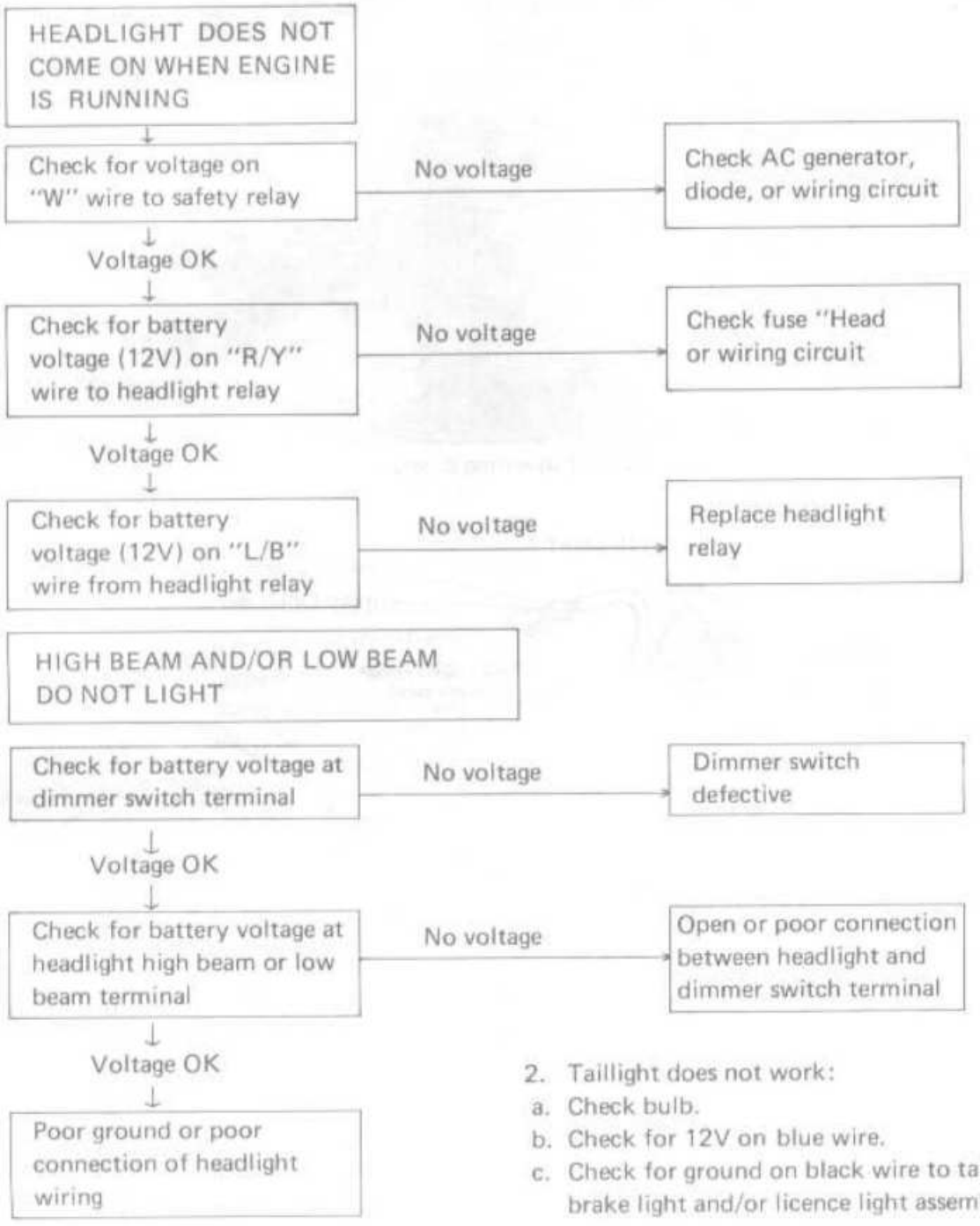
NOTE:

Check the headlight bulb first before performing the following check.

1. Headlight check

NOTE:

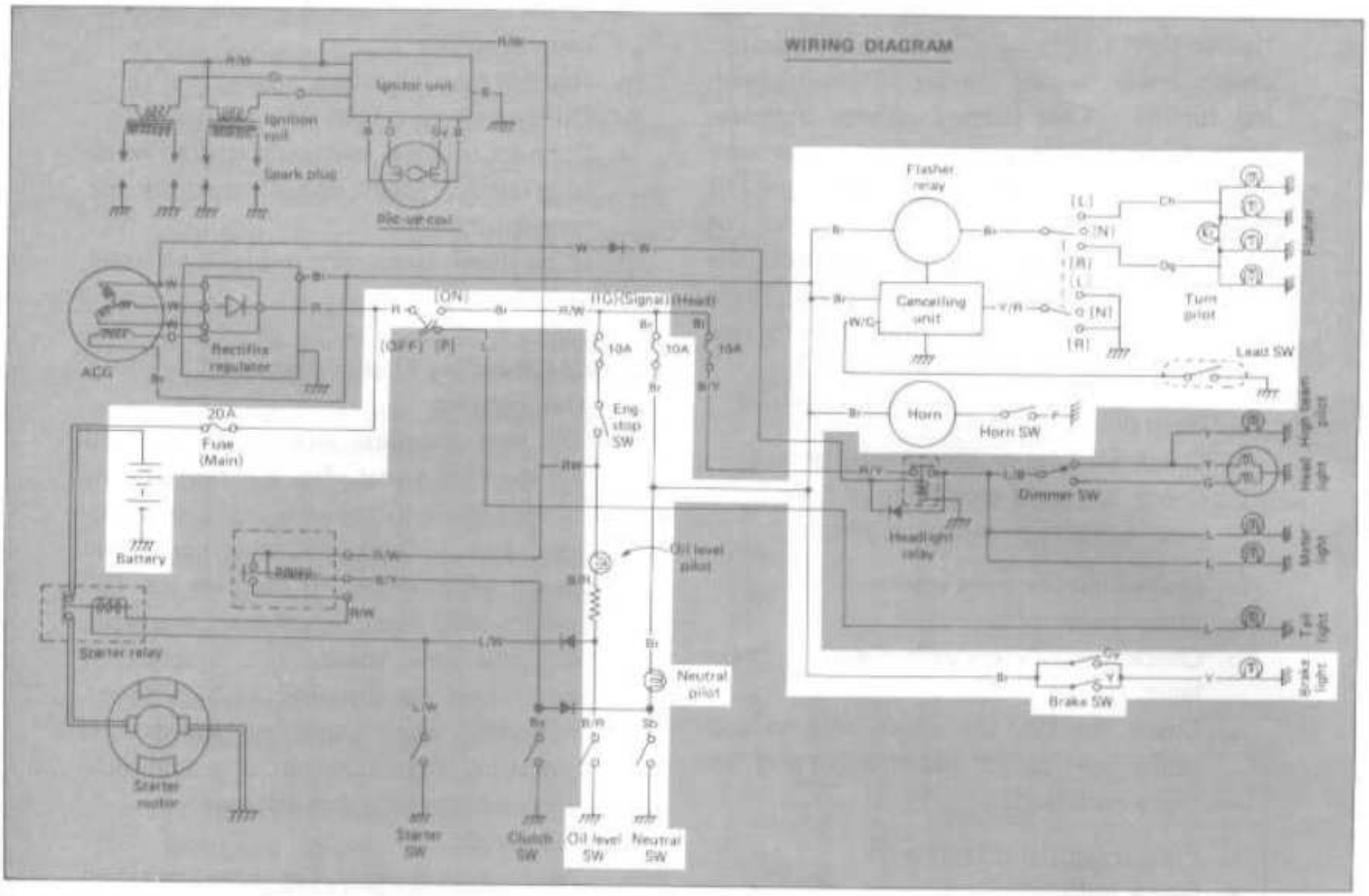
When the engine is started, the headlight and meter lights come on automatically and the lights stay on until the main switch is turned to "OFF" even if the engine stalls.



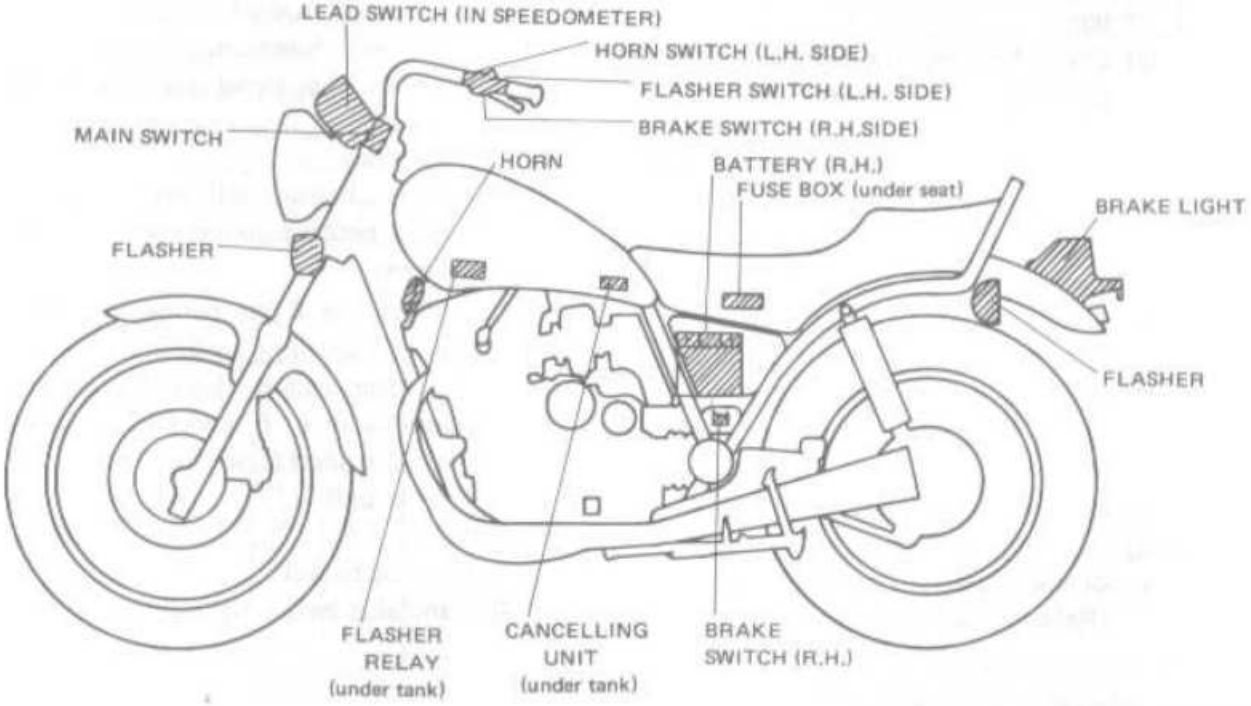
2. Taillight does not work:
   a. Check bulb.
   b. Check for 12V on blue wire.
   c. Check for ground on black wire to tail/brake light and/or licence light assembly.

SIGNAL SYSTEM

A. Circuit Diagram



Above circuit diagram shows only signal circuit in wiring diagram.



B. Signal System Tests and Checks

The battery provides power for operation of the horn, brakelight, indicator lights and flasher light. If none of the above operates, always check battery voltage before proceeding further. Low battery voltage indicates either a faulty battery, low battery water, or a defective charging system. See page 113 "CHARGING SYSTEM" for checks of battery and charging system. Also check fuse condition. Replace any "open" fuses. There are individual fuses for various circuits (see complete Circuit Diagram).

1. Horn does not work:
a. Check for 12V on brown wire to horn.
b. Check for good grounding of horn (pink wire) when horn button is pressed.

2. Brake light does not work:
a. Check bulb.
b. Check for 12V on yellow wire to brake light.
c. Check for 12V on brown wire to each brake light switch (front brake and rear brake switches).

3. Flasher light(s) do not work:
a. Check bulb.
b. Right circuit:
1) Check for 12V on dark green wire to light.
2) Check for ground on black wire to light assembly.
c. Left circuit:
1) Check for 12V on dark brown wire to light.
2) Check for ground on black wire to light assembly.
d. Right and left circuits do not work:
1) Check for 12V on brown/white wire to flasher switch on left handlebar.
2) Check for 12V on brown wire to flasher relay.
3) Replace flasher relay.
4) Replace flasher switch.
e. Check flahser self-cancelling system. (Refer to flasher self-cancelling system.)

4. Neutral light does not work:
a. Check bulb.
b. Check for 12V on sky blue wire to neutral switch.
c. Replace neutral switch.

6. Oil level warning light does not work:
a. Connect oil level switch (black/red wire) to ground. If light comes on, check for proper oil level.
b. If oil level is correct, replace oil level switch.

C. Self-Cancelling Flasher System

1. Description:
The self-cancelling flasher system turns off the turn signal after a period of time or distance involved in turning or changing lanes. Generally, the signal will cancel after either 10 seconds, or 150 meters (490 feet), whichever is greater. At very low speed, the function is determined by distance; at high speed, especially when changing speeds the cancelling determination is a combination of both times and distance.

2. Operation:
The handlebar switch has three positions: L (left), OFF, and R (right). The switch lever will return to the "OFF" position after being pushed to L or R, but the signal will function. By pushing the lever in, the signal may be cancelled manually.

3. Inspection
If the flasher self-cancelling system should become inoperative, proceed as follows:
a. Pull of the 6-pin connector from the flasher cancelling unit, and operate the handlebar switch, if the signal operates normally in L, R, and OFF, the following are in good condition.
1) Flasher unit
2) Bulb
3) Lighting circuit
4) Handlebar switch light circuit

If (1) through (4) are in good condition, the following may be faulty:

1) Flasher cancelling unit.
2) Handlebar switch reset circuit.
3) Speedometer sensor circuit.

b. Pull off the 6-pin connector from the flasher cancelling unit, and connect a tester (ohms x 100 range) across the white/green and the black lead wires on the wire harness side. Turn the speedometer shaft. If the tester needle swing back and forth between 0 and ∞, the speedometer sensor circuit is in good condition. If not, the sensor to wire harness may be inoperative.

c. Pull the 6-pin connector from the flasher cancelling unit. Check if there is continuity between the yellow/red lead wire on the wire harness side and the chassis.

Flasher switch OFF: ∞
Flasher switch L or R: 0 ohms

If the tester needle does not swing as indicated above, check the handlebar switch circuit and wire harness.

d. If no defect is found with the above three check-ups and the flasher cancelling system is still inoperative, replace the flasher cancelling unit.

e. If the signal flashes only when the handlebar switch lever is turned to L or R and it turns off immediately when the handlebar switch lever returns to center, replace the flasher cancelling unit.

D. Switches

Switches may be checked for continuity with a pocket tester on the "ohm x 1" position.

1. Main switch

Switch Position	Wire Color		
	R	Br	L/Y
ON	○——	○——	○
OFF			
LOCK			
P (parking)	○——		○

2. "ENGINE STOP" Switch

Switch Position	Wire Color	
	R/W	R/W
RUN	○——	○
OFF		

3. "START" switch

Button Position	Wire Color	
	L/W	Ground
PUSH	○——	○
OFF		

4. "LIGHTS" (Dimmer) switch

Switch Position	Wire Color					
	Y	L/Y	G	G	L/G	Y/B
HI	○——	○		○——	○	
LO		○——	○		○——	○

5. "TURN" switch

Switch Position	Wire Color				
	Ch	Br/W	Dg	Y/R	Ground
L	○——	○		○——	○
L → N	○——	○			
N → Push					
R → N		○——	○		
R		○——	○	○——	○

6. "HORN" Switch

Button Position	Wire Color	
	P	Ground
PUSH	○——	○
OFF		

E. Battery

1. Checking

If the battery shows the following defects, it should be replaced.

a. The battery voltage will not rise to a specific value or no gassing occurs in any cell even after many hours of charging.

b. Sulfation of one or more cells is indicated by the plates turning white or an accumulation of material in the bot-

tom of the cell.

c. Specific gravity readings after a long slow charge indicate a cell to be lower than any others.

d. Warpage or buckling of plates or insulators is evident.

WARNING:

Battery fluid is poisonous and dangerous, causing severe burns, etc. Contains sulfuric acid. Avoid contact with skin, eyes or clothing.

Antidote: EXTERNAL-FLUSH with water. INTERNAL-Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc., away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.

KEEP OUT OF REACH OF CHILDREN.

2. The service life of a battery is usually 2 to 3 years, but lack of care as described below will shorten the life of the battery.

a. Negligence in keeping battery topped off with distilled water.

b. Battery being left discharged.

c. Over-charging with heavy charge.

d. Freezing.

e. Filling with water or sulfuric acid containing impurities.

f. Improper charging voltage or current on new battery.

3. If the motorcycle is not to be used for a long time, remove the battery and have it stored. The following instructions should be observed:

a. Recharge the battery periodically.

b. Store the battery in a cool, dry place.

c. Recharge the battery before reinstallation.

Battery	12N12A-4A-1
Electrolyte	Specific gravity: 1.280
Initial charging current	1.2 amp for 10 hours (new battery)
Recharging current	10 hours (or until specific gravity reaches 1.280)
Refill fluid	Distilled water (to maximum level line)
Refill period	Check once per month (or more often, required)

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CHAPTER 7. APPENDICES

SPECIFICATIONS

General Specifications

	XJ650G
Basic color	Black Blue or New Ruby Red
Dimensions:	
Overall length	2,165 mm (85.2 in)
Overall width	860 mm (33.9 in)
Overall height	1,180 mm (46.5 in)
Seat height	750 mm (29.5 in)
Wheelbase	1,445 mm (56.9 in)
Minimum ground clearance	150 mm (5.9 in)
Caster (steering head angle)	29°
Trail	124 mm (4.88 in)
Weight:	
Net	203 kg (447 lb)
Engine:	
Type	D.O.H.C. air-cooled, gasoline
Bore x stroke x cylinders	63.0 x 52.4 mm x 4 (2.480 x 2.063 in x 4)
Displacement	653 cc (39.85 cu. in)
Compression ratio	9.2 : 1
Lubrication:	
Lubrication system	Pressure lubricated, wet sump
Delivery pump type	Trochoid
Carburetion:	
Manufacture	HITACHI
Type	HSC32, constant velocity
Rated venturi size	32 mm (1.26 in)
Air filter:	Dry type element
Ignition:	
Type	Battery ignition (Full transistor ignition)
Spark plug	BP7ES (NGK) or W22EP (ND)
Charging:	
Type	Three-phase, regulated alternator
Manufacture, I.D. No.	HITACHI, LD119-08
Maximum output	14V 19A
Battery type	12N12A-4A
Battery dimensions	80 x 160 x 134 mm (3.15 x 6.30 x 5.28 in)
Regulator/Rectifier	S8534, I.C. type, full wave
Regulating voltage (No. load)	14.2 ~ 14.8V
Starting:	Electric starter
Primary drive:	
Type	Spur gear
Teeth, ratio	97/58 1.672
Clutch:	Wet, multiple disc
Transmission:	
Type	Constant mesh, 5-speed drum shifter

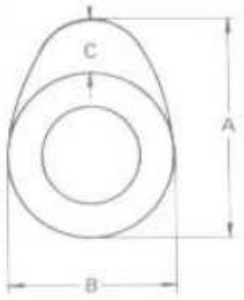
	XJ650G
Teeth, ratio 1st	35/16 2.187
2nd	30/20 1.500
3rd	30/26 1.152
4th	28/30 0.933
5th	26/32 0.812
Secondary drive:	
Type	Shaft drive
Transmission output:	
Type, teeth, ratio	Spur gear, 49/36, 1.361
Middle gear case:	
Type, teeth, ratio	Bevel gear, 19/18, 1.055
Final gear case:	
Type, teeth, ratio	Bevel gear, 32/11, 2.909
Chassis:	
Frame	Tubular steel double cradle
Suspension: Front (type, travel)	Telescopic fork 150 mm (5.91 in)
Rear (type, travel)	Swing arm, 80 mm (3.15 in)
Tires: Front	3.25H19-4PR, Tubeless
Rear	130/90-16 67H, Tubeless
Brakes: Front	Single hydraulic disc
Rear	Drum brake
Fuel tank: Total	13 Lit (3.4 US. gal)
Reserve	3.4 Lit (0.8 US. gal)
Wheels: Front	MT1.85 x 19, Cast Aluminum
Rear	MT3.00 x 16, Cast Aluminum

Maintenance Specifications

1. Engine

Engine oil capacity:	
Total amount	3,200 cc (3.4 US. qt)
Oil and filter change	2,650 cc (2.8 US. qt)
Oil change	2,350 cc (2.5 US. qt)
Recommended lubricant:	
If temperature does not go below 5°C (40°F)	SAE 20W/40 SE motor oil
If temperature does not go above 15°C (60°F)	SAE 10W/30 SE motor oil
Cranking pressure (at seal level):	11 kg/cm^2 (156 psi)
Maximum difference between cylinders:	1 kg/cm^2 (14 psi)

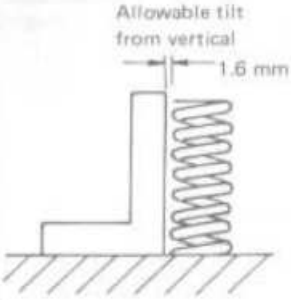
Camshafts:

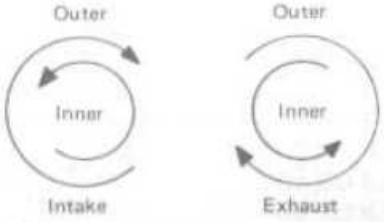


Dimensions		Standard size	Wear limit
Intake	A	36.80 mm (1.449 in)	36.65 mm (1.443 in)
	B	28.0 mm (1.102 in)	27.85 mm (1.096 in)
	C	8.50 mm (0.335 in)	–
Exhaust	A	35.80 mm (1.449 in)	35.65 mm (1.404 in)
	B	28.0 mm (1.102 in)	27.85 mm (1.096 in)
	C	7.8 mm (0.307 in)	–

Camshaft bearing surface diameter:	24.967 ~ 24.980 mm (0.9830 ~ 0.9835 in)
Camshaft-to-cap clearance:	
Standard	0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in)
Maximum	0.160 mm (0.006 in)
Camshaft runout limit	0.1 mm (0.004 in)

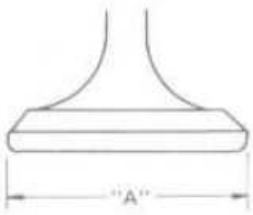
Valves:





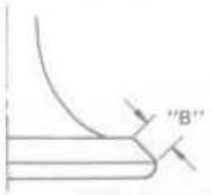
	Inner Intake/Exhaust	Outer Intake/Exhaust
Free length	35.9 mm (1.413 in)	39.5 mm (1.555 in)
Spring rate	2.36 kg/mm (132.2 lb/in)	4.58 kg/mm (256.5 lb/in)
Installed length (valve closed)	31.0 mm (1.220 in)	34.0 mm (1.339 in)
Installed pressure (valve closed)	9.0 kg (19.8 lb)	19.1 kg (42.1 lb)
Compressed length (valve open)	IN: 22.8 mm (0.898 in) EX: 23.5 mm (0.925 in)	IN: 25.8 mm (1.016 in) EX: 26.5 mm (1.043 in)
Wire diameter	2.8 mm (0.110 in)	3.9 mm (0.154 in)
Number of windings	7.75	6.1
Winding O.D.	$20.6\,^{+0.3}_{0}$ mm ($0.811\,^{+0.012}_{0}$ in)	$29.4\,^{0}_{-0.3}$ mm ($1.157\,^{0}_{-0.012}$ in)

Valve stem run-out maximum	0.03 mm (0.0012 in)
Valve seat width standard/maximum	1.0 mm (0.039 in)/2.0 mm (0.080 in)

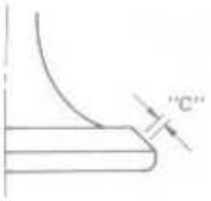


INTAKE

Clearance (Cold engine)	0.11 ~ 0.15 mm (0.004 ~ 0.006 in)
"A" head diameter	33 ± 0.1 mm (1.2992 ± 0.0039 in)
"B" face width	2.3 mm (0.0906 in)
"C" seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039 in)
"D" margin thickness (minimum)	1.2 ± 0.2 mm (0.0472 ± 0.0079 in)

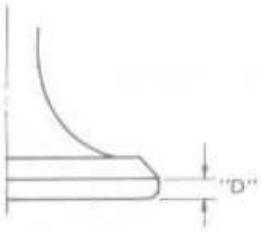


Stem diameter (O.D.)	$7^{-0.010}_{-0.025}$ mm ($0.2756^{-0.0004}_{-0.0010}$ in)
Guide diameter (I.D.)	$7^{+0.012}_{0}$ mm ($0.2756^{+0.0005}_{0}$ in)
Stem-to-guide clearance	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in)



EXHAUST

Clearance (Cold engine)	0.16 ~ 0.20 mm (0.006 ~ 0.008 in)
"A" head diameter	28 ± 0.1 mm (1.2205 ± 0.0039 in)
"B" face width	2.3 mm (0.0906 in)
"C" seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039 in)
"D" margin thickness (minimum)	1.0 ± 0.2 mm (0.0392 ± 0.0079 in)
Stem diameter (O.D.)	$7^{-0.025}_{-0.040}$ mm ($0.2756^{-0.0010}_{-0.0016}$ in)
Guide diameter (I.D.)	$7^{+0.012}_{0}$ mm ($0.2756^{+0.0005}_{0}$ in)
Stem-to-guide clearance	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in)

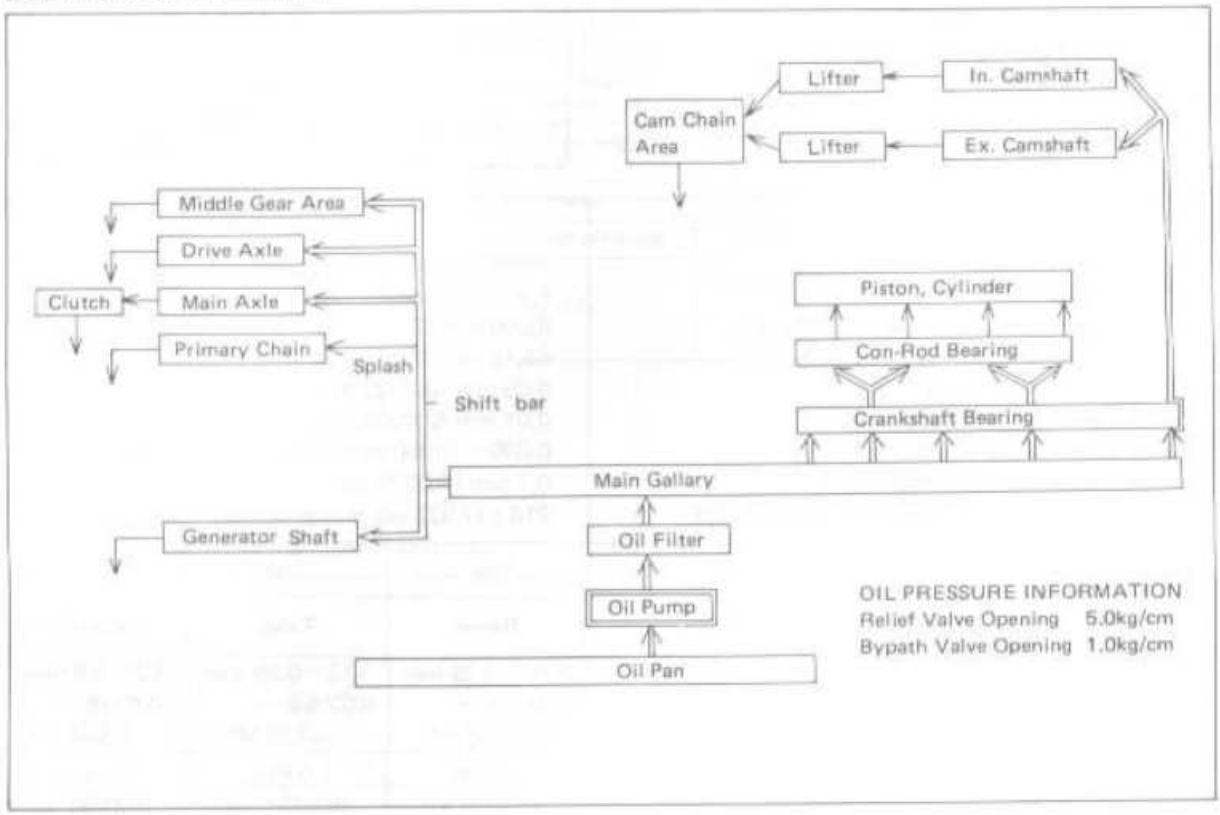


Cylinder and piston:	
Cylinder material	Aluminum alloy
Cylinder liner	Pressed in; special cast iron
Bore size: standard	63.00 mm (2.4803 in)
Wear limit	63.10 mm (2.4843 in)
Cylinder taper limit	0.05 mm (0.0020 in)
Cylinder out-of-round limit	0.01 mm (0.0004 in)
Piston clearance: standard	0.030 ~ 0.050 mm (0.0012 ~ 0.0020 in)
maximum	0.1 mm (0.0039 in)
Piston weight (include rings, pin and clips)	213 g (7.520 oz)

Piston rings:	Top	2nd	Oil
Design	Barrel	Taper	Expander
End gap (installed): standard	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	0.3 ~ 0.9 mm (0.0118 ~ 0.035 in)
limit	1.0 mm (0.0394 in)	1.0 mm (0.0394 in)	1.5 mm (0.0591 in)
Side clearance: standard	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)	0.02 ~ 0.06 mm (0.008 ~ 0.0024 in)	–
limit	0.15 mm (0.0059 in)	0.15 mm (0.0059 in)	–

Crankshaft:	
Crank journal/bearing oil clearance	0.040 ~ 0.064 mm (0.0016 ~ 0.0025 in)
Main journal run-out (maximum)	0.040 mm (0.0016 in)
Connecting rods	
Weight	345 g (12.2 oz)
Rod bearing oil clearance	0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)
Oil pump:	
Housing-to-outer rotor clearance	0.09 ~ 0.15 mm (0.0035 ~ 0.0059 in)
Outer rotor-to-inner rotor clearance	0.12 mm (0.005 in) or less
Clutch:	
Friction plate: thickness/q'ty	3.0 mm (0.12 in)/8
minimum thickness	2.8 mm (0.11 in)
Clutch plate: thickness	1.6 mm (0.063 in)/7
warp limit	0.05 mm (0.0020 in)
Clutch spring: length/q'ty	40.1 mm (1.579 in)/5
minimum length	39.1 mm (1.539 in)
spring rate	1.184 kg/mm (66.3 lb/in)
Clutch lever freeplay (at lever pivot point)	2 ~ 3 mm (0.08 ~ 0.12 in)
Transmission shaft run-out maximum:	0.08 mm (0.0031 in)
Middle gear case lash:	0.1 ~ 0.2 mm (0.0039 ~ 0.0079 in)

LUBRICATION CHART



2. Carburetion

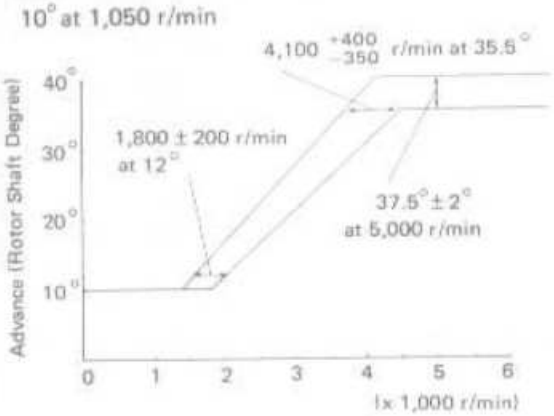
Manufacturer	HITACHI	Fuel level	3±1 mm (0.118±0.039 in)
Model I.D. No.	4H700	Pilot screw	Preset
Main jet	# 110	Air jet, Main	# 50
Needle jet	φ 3.2	Air jet, Pilot	# 195
Pilot jet	# 40	Throttle valve	32 mm (1.26 in)
Starter jet	# 40 (φ 0.9)	Float valve seat	φ 2.0
Jet needle	Y-10	Engine idle speed	1,050 r/min

3. Chassis

*Total weight of accessories, etc. excepting motorcycle.

Wheels and tires:		
Rim run-out: vertical	2.0 mm (0.079 in)	
horizontal	2.0 mm (0.079 in)	
Tire pressure (cold):	Front	Rear
Up to 90 kg (198 lb) load*	1.8 kg/cm² (26 psi)	2.0 kg/cm² (28 psi)
90 kg (198 lb) ~ 160 kg (353 lb) load*	2.0 kg/cm² (26 psi)	2.3 kg/cm² (32 psi)
160 kg (353 lb) ~ 230 kg (507 lb) load* (Maximum load)	2.0 kg/cm² (28 psi)	2.8 kg/cm² (40 psi)
High speed riding	2.3 kg/cm² (36 psi)	2.5 kg/cm² (40 psi)
Minimum tire tread depth	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Brakes:		
Recommended fluid	DOT # 3	
Pad wear limit	6.5 mm (0.26 in)	
Rear brake lining wear limit	2 mm (0.08 in)	
Brake disc maximum deflection	0.15 mm (0.006 in)	
Brake disc minimum thickness	6.5 mm (0.26 in)	
Front brake free play (end of lever)	5.0 ~ 8.0 mm (0.2 ~ 0.3 in)	
Rear brake free play (end of pedal)	20 ~ 30 mm (0.8 ~ 1.2 in)	
Front forks:		
Travel	150 mm (5.91 in)	
Spring free length	606 mm (23.86 in)	
Spring preload length	571 mm (22.48 in)	
Spring rate: 0 ~ 100 mm (0 ~ 3.94 in)	0.475 kg/mm (26.6 lb/in)	
100 ~ 150 mm (3.94 ~ 5.91 in)	0.626 kg/mm (35.1 lb/in)	
Fork oil capacity (each side)	262 cc (9.24 oz)	
Oil type	Yamaha Fork Oil 10Wt or equivalent	
Rear shock absorbers:		
Spring free length	232.5 mm (9.15 in)	
Spring preload length	216.5 mm (8.52 in)	
Spring rate: 0 ~ 55 mm (0 ~ 2.17 in)	1.6 kg/mm (89.6 lb/in)	
55 ~ 80 mm (2.17 ~ 3.15 in)	2.2 kg/mm (123.2 lb/in)	
Travel	80 mm (3.15 in)	

4. Electrical

Ignition timing retarded: Ignition timing advance:	10° at 1,050 r/min 
Spark plug: Electrode gap	NGK BP7ES or ND W22EP 0.7 ~ 0.8 mm (0.023 ~ 0.032 in)
Spark plug cap resistance:	5.0kΩ (No. 1, No. 4), 10kΩ (No. 2, No. 3)
Pick up coil: Resistance	700Ω ± 20% at 20°C (68°F)
Ignition coil type: Spark gap Primary resistance Secondary resistance	HITACHI CM12-09 2.5Ω ± 10% at 20°C (68°F) 11kΩ ± 20% at 20°C (68°F)
Starter motor type: Armature coil resistance Brush length: standard minimum Brush spring pressure Armature mica undercut	ND. AD84D2 0.014Ω ± 6% at 20°C (68°F) 12.0 mm (0.472 in) 8.5 mm (0.33 in) 800 ± 150g (28.24 ± 5.30 oz) 0.6 mm (0.024 in)
Battery type: Charging rate	G.S. 12N12A-4A 1.2 Amps for 10 Hours
Generator type: Output Field (inner) coil resistance Stator (outer) coil resistance	HITACHI LD119-08 14V-19A at 5,000 r/min 4.0Ω ± 10% at 20°C (68°F) 0.46Ω ± 10% at 20°C (68°F)
Regulator type: Regulated voltage Allowable amperage	I.C. (S8534) 14.5 ± 0.3V 3A
Starter relay switch: Cut-in voltage	HONDA LOCK 8V
Headlight: Tail/brake light: Flasher light: License light: Pilot lights: Turn High beam Neutral Oil level Meter light	12V, 50W/40W 12V, 8W (3CP)/27W (32CP) 12V, 27W (32CP) x 4 12V, 8W (3CP) x 2 12V, 3.4W x 2 12V, 3.4W x 1 12V, 3.4W x 1 12V, 3.4W x 1 12V, 3.4W x 2

Tightening torque

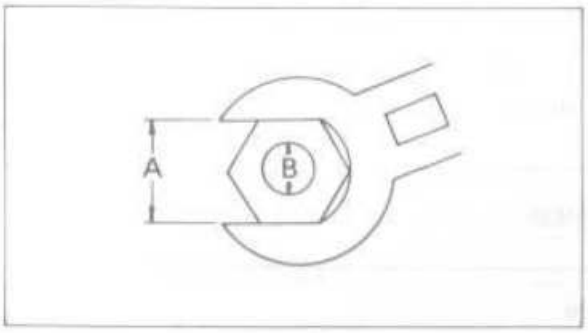
(Unit: m-kg)

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				m-kg	ft-lb	
ENGINE:						
Cylinder head	Nut	M10 P1.25	12	3.2	23.1	Apply oil.
Cylinder head cover	Bolt	M6 P1.0	20	1.0	7.2	
Spark plug	—		4	2.0	14.5	
Cylinder	Nut	M8 P1.25	2	2.0	14.5	Cam chain case Front & Rear
Cam shaft cap	Bolt	M6 P1.0	20	1.0	7.2	Tighteni in 3-stages.
Cam sprocket	Bolt	M7 P1.0	4	2.0	14.5	
Cam chain tensioner adjustment lock nut	Nut	M8 P1.25	1	0.9	6.5	
Cam chain tensioner adjustment lock bolt	Bolt	M6 P1.0	1	0.6	4.3	
Connecting rod	Nut	M7 P0.75	8	2.5	18.1	
Generator (rotor)	Bolt	M10 P1.25	1	5.5	39.8	
Drain plug	Bolt	M14 P1.5 M8 P1.25	1 1	4.3 1.6	31.0 11.6	Crankcase drain Middle gear case drain
Oil filter	Bolt	M20 P1.5	1	1.5	11.0	
Pump cover	Screw	M6 P1.0		0.7	5.1	
Strainer cover	Bolt	M6 P1.0	13	1.0	7.2	
Crankcase	Flange Bolt	M8 P1.25 M6 P1.0	12 27	2.4 1.2	17.5 8.7	
Clutch boss	Nut	M20 P1.0	1	7.2	52.0	
Clutch spring screw	Bolt	M6 P1.0	5	1.0	7.2	
Change pedal	Bolt	M6 P1.0	1	1.0	7.2	
Neutral switch	—	M10 P1.25	1	2.0	14.5	
Exhaust pipe	Nut	M6 P1.0	8	1.0	7.2	
SHAFT DRIVE:						
–Middle Gear –						
Drive Shaft	Nut	M34 P1.5	1	11	80.0	Stake.
Mount cover	Screw	M8 P1.25	4	2.5	18.1	Stake.
Driven shaft	Nut	M14 P1.5	1	12	87.0	Use LOCKTITE: Stake.
Bearing cap	Flange Bolt	M8 P1.25	4	2.5	18.1	
– Final Gear –						
Drive shaft	Nut	M14 P1.5	1	11	80.0	
Bearing housing	Flange Bolt	M10 P1.25	2	2.3	16.6	
Bearing housing	Nut	M8 P1.25	6	2.3	16.6	
Oil mount screw	Plug	M14 P1.5	1	2.3	16.6	
Oil drain screw	Plug	M14 P1.5	1	2.3	16.6	
Bearing retainer	—	M65 P1.5	1	11	80.0	Left hand screw
CHASSIS:						
Engine Mounting Bolt	Front, upper	Nut	M10 P1.25	1	4.2	30.4	
	Front, under	Bolt	M10 P1.25	2	4.2	30.4	
	Rear	Nut	M12 P1.25	1	7.0	50.6	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				m-kg	ft-lb	
Engine Mounting Stay Front	Bolt	M8 P1.25	4	2.0	14.5	
Handle crown & Steering shaft	Bolt Bolt	M14 P1.25 M8 P1.25	1 1	5.4 2.0	39.1 14.5	
Handle crown & Inner tube	Nut cap	M8 P1.25	1	2.0	14.5	
Handle crown & Handle holder	Bolt	M8 P1.25	2	2.0	14.5	
Front fork						
Under bracket & Inner tube	Bolt	M8 P1.25	4	2.0	14.5	
Front wheel shaft	Nut Castle	M14 P1.5	1	10.7	77.4	
Front wheel Axle pinch bolt	Nut salf locking	M8 P1.25	2	2.0	14.5	
Pivot shaft	Bolt	M22 P1.5	1	0.55	4.0	Taper roller bearing
Rear wheel shaft	Nut castl	M14 P1.5	1	10.7	77.4	
Rear shock absorber (Upper)	Nut cap	M10 P1.25	2	3.0	21.7	
Rear shock absorber (Lower)	L Nut cap R Bolt	M10 P1.25	2	3.0	21.7	
Footrest	Nut	M10 P1.25	2	4.2	30.4	
Tension bar & Brake plate	Bolt	M8 P1.25	1	2.0	14.5	
Tension bar & Rear arm	Bolt	M8 P1.25	1	2.0	14.5	
Camshaft lever & Camshaft	Bolt	M6 P1.0	1	0.9	6.5	
Disc brake section						
Brake disc & Hub (Front)	Bolt	M8 P1.25	12	2.0	14.5	Lock washer
Master cylinder & Brake hose (Front)	Bolt union	M10 P1.25	1	2.6	18.8	
Brake hose & Joint	Bolt union	M10 P1.25	1	2.6	18.8	
Caliper & Brake hose	Bolt union	M10 P1.25	1	2.6	18.8	
Caliper & Front fork (Front)		M8 P1.25	1	2.6	18.8	
Caliper bleed screw (Front)		M8 P1.25	1	0.6	4.3	
Front fender	Bolt	M8 P1.25	4	1.0	7.2	
Master cylinder cap	Screw	M5 P0.8	2	0.18	1.3	
Pivot shaft	Bolt	M22 P1.5	1	10.0	72.3	Lock washer
Final gear & Rear arm	Nut	M10 P1.25	4	4.2	30.4	
Cross Joint	Hexagon bolt with washer	M8 P1.25	4	4.4	31.8	
Muffler bracket & Frame	Bolt	M10 P1.25	3	4.3	31.1	
Rear fender	Bolt	M10 P1.25	2	3.2	23.1	
Muffler bracket & Muffler	Bolt	M10 P1.25	2	2.5	18.1	
Master cylinder & Master cylinder bracket	Bolt	M6 P1.0	2	0.9	6.5	

General Torque Specifications

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a criss-cross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads. Components should be at room temperature.



A (Nut)	B (Bolt)	General torque specifications	
		m-kg	ft-lb
10 mm	6 mm	0.6	4.5
12 mm	8 mm	1.5	11
14 mm	10 mm	3.0	22
17 mm	12 mm	5.5	40
19 mm	14 mm	8.5	51
22 mm	16 mm	13.0	94

CONVERSION TABLES

	METRIC TO INCH SYSTEM		
	KNOWN	MULTIPLIER	RESULT
TORQUE	m-kg	7.233	ft-lb
	m-kg	86.80	in-lb
	cm-kg	0.0723	ft-lb
	cm-kg	0.8680	in-lb
WT.	kg	2.205	lb
	g	0.03527	oz
FLOW/DISTANCE	km/lit	2.352	mpg
	km/hr	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.03937	in
VOL./CAPACITY	cc (cm^3)	0.03382	oz (US liq)
	cc (cm^3)	0.06102	cu.in
	lit (liter)	2.1134	pt (US liq)
	lit (liter)	1.057	qt (US liq)
	lit (liter)	0.2642	gal (US liq)
MISC.	kg/mm	56.007	lb/in
	kg/cm^2	14.2234	psi (lb/in^2)
	Centigrade (°C)	9/5(°C) + 32	Fahrenheit (°F)

	INCH TO METRIC SYSTEM		
	KNOWN	MULTIPLIER	RESULT
TORQUE	ft-lb	0.13826	m-kg
	in-lb	0.01152	m-kg
	ft-lb	13.831	cm-kg
	in-lb	1.1521	cm-kg
WT.	lb	0.4535	kg
	oz	28.352	g
FLOW/DISTANCE	mpg	0.4252	km/lit
	mph	1.609	km/hr
	mi	1.609	km
	ft	0.3048	m
	yd	0.9141	m
	in	2.54	cm
	in	25.4	mm
VOL./CAPACITY	oz (US liq)	29.57	cc (cm^3)
	cu.in	16.387	cc (cm^3)
	pt (US liq)	0.4732	lit (liter)
	qt (US liq)	0.9461	lit (liter)
	gal (US liq)	3.785	lit (liter)
MISC.	lb/in	0.017855	kg/mm
	psi (lb/in)	0.07031	kg/cm^2
	Fahrenheit(°C)	5/9(°F−32)	Centigrade(°F)

DEFINITION OF TERMS:

m-kg	=	Meter-kilogram(s) (usually torque)
g	=	Gram(s)
kg	=	Kilogram(s) (1,000 grams)
lit	=	Liter(s)
km/lit	=	Kilometer(s) per liter (fuel consumption)
cc	=	Cubic centimeter(s) (cm^3) (volume or capacity)
kg/mm	=	Kilogram(s) per millimeter (usually spring compression rate)
kg/cm^2	=	Kilogram(s) per square centimeter (pressure)

CONSUMER INFORMATION

Notice

The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

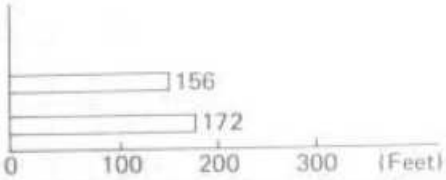
STOPPING DISTANCE

This figure indicates braking performance that can be met or exceeded by the vehicles to which it applies, without locking the wheels, under different conditions of loading and with partial failures of the braking system.

FULL OPERATIONAL SERVICE BRAKE

("Partial failure" information is not applicable and is not included)

LOAD
LIGHT
MAXIMUM

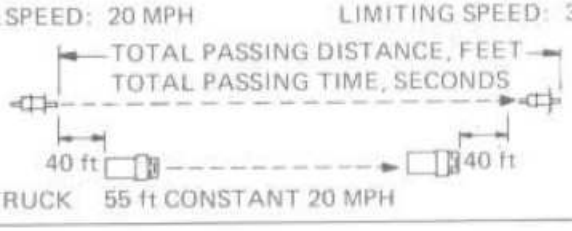


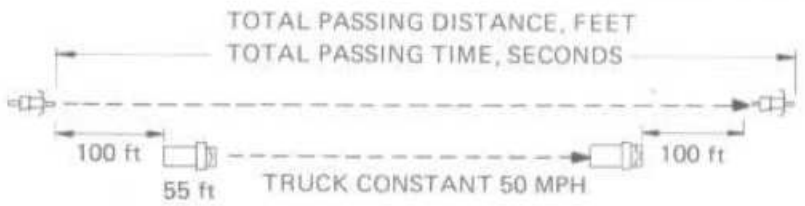
STOPPING DISTANCE IN FEET FROM 60 MPH

ACCELERATION AND PASSING ABILITY

This figure indicates passing times and distances that can be met or exceeded by the vehicles to which it applies, in the situations diagrammed below. The low-speed pass assumes an initial speed of 20 mph. and a limiting speed of 35 mph. This high-speed pass assumes an initial speed of 50 mph. and a limiting speed of 80 mph.

LOW-SPEED PASS



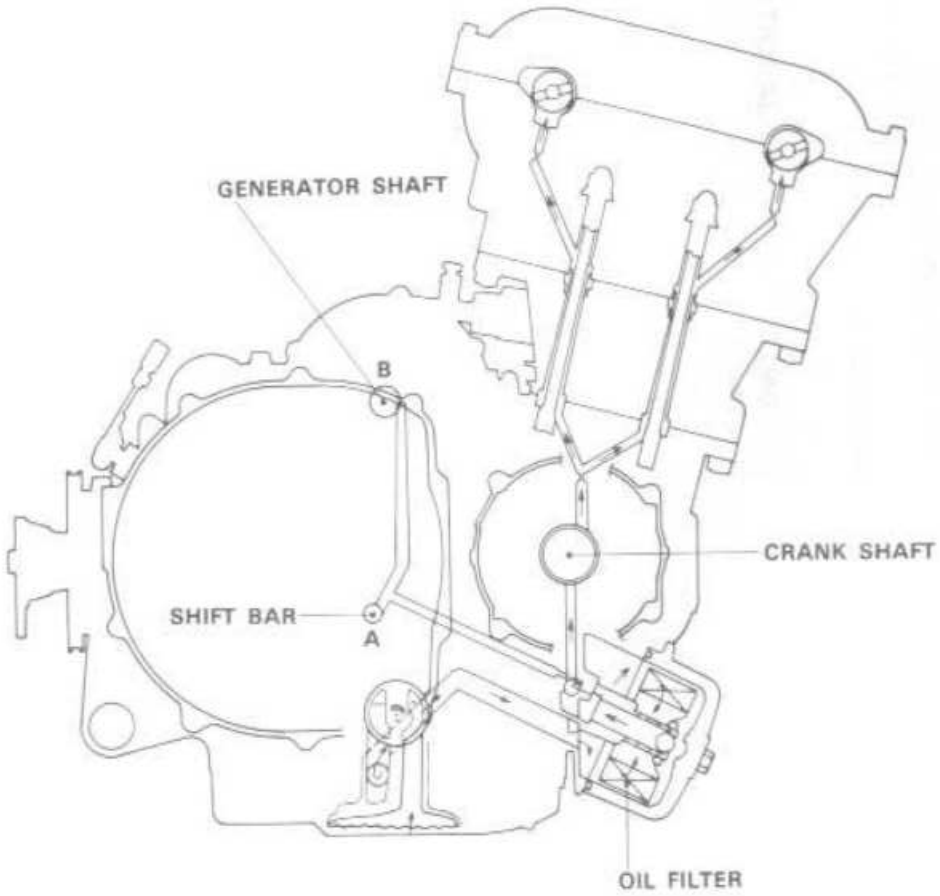
HIGH-SPEED PASS	INITIAL SPEED: 50 MPH LIMITING SPEED: 80 MPH 

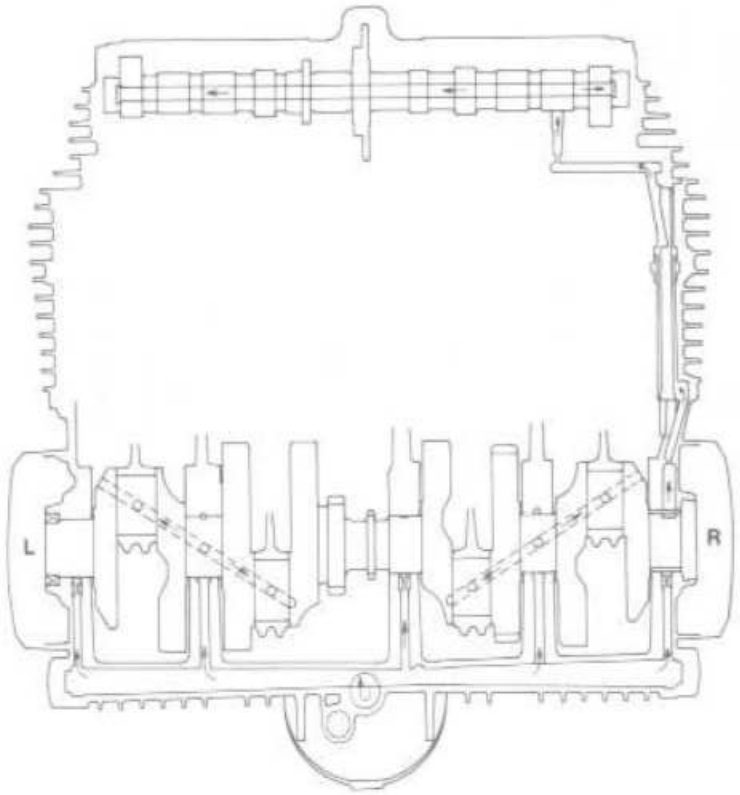
SUMMARY

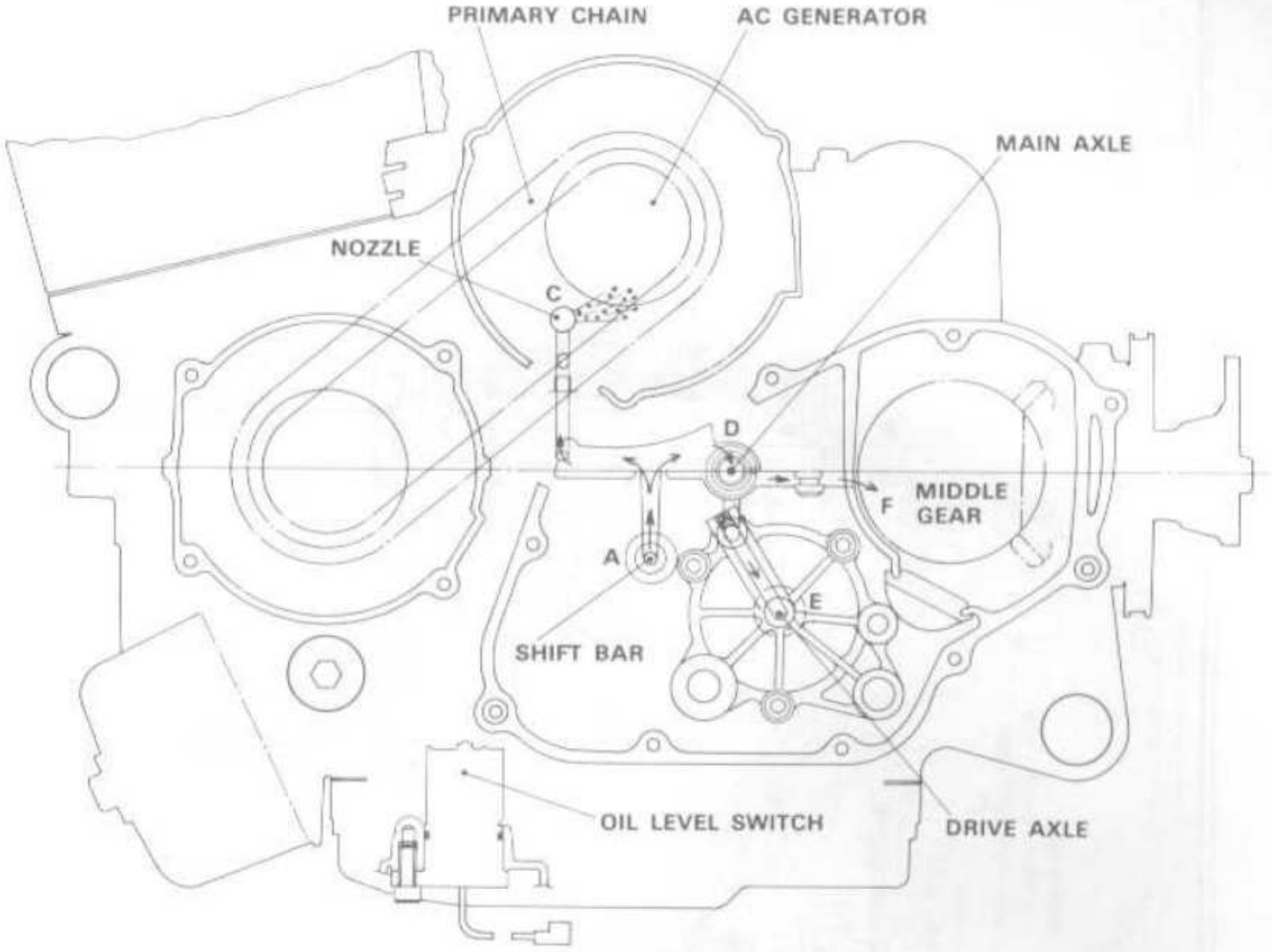
Low-speed pass ..... 353.0 feet: 7.15 seconds

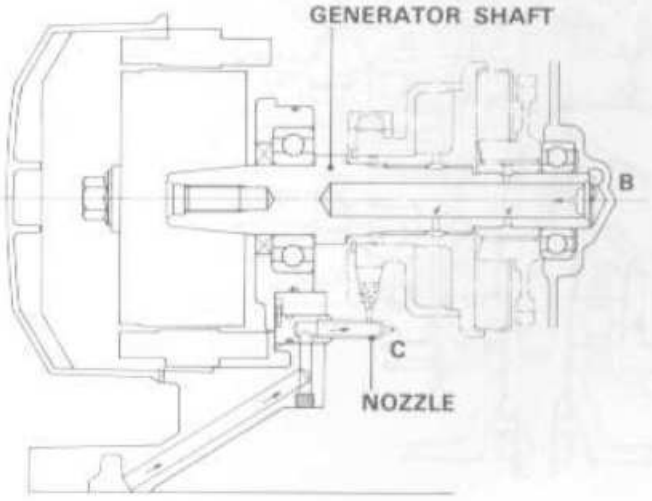
High-speed pass ..... 883.4 feet: 8.4 seconds

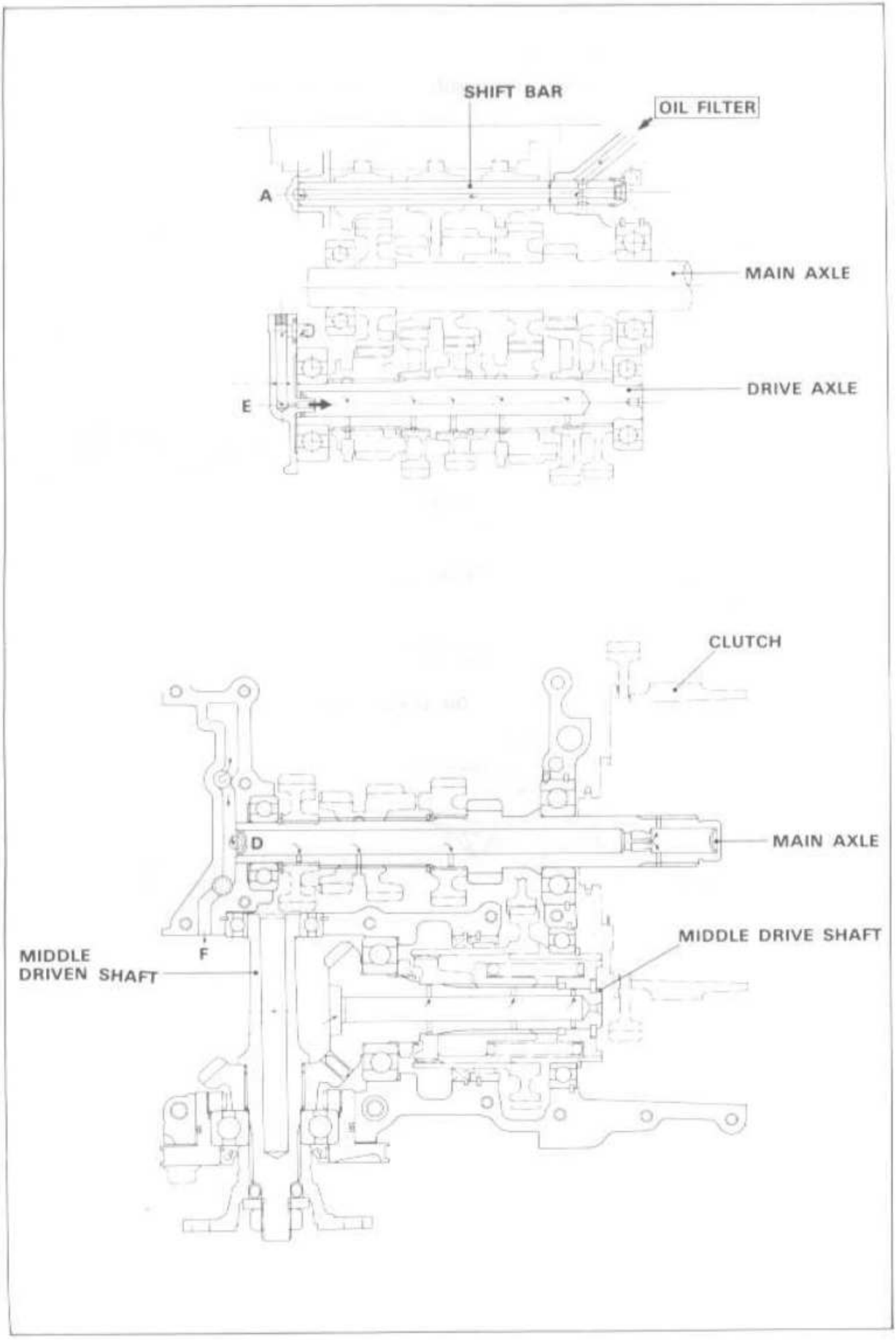
LUBRICATION DIAGRAM



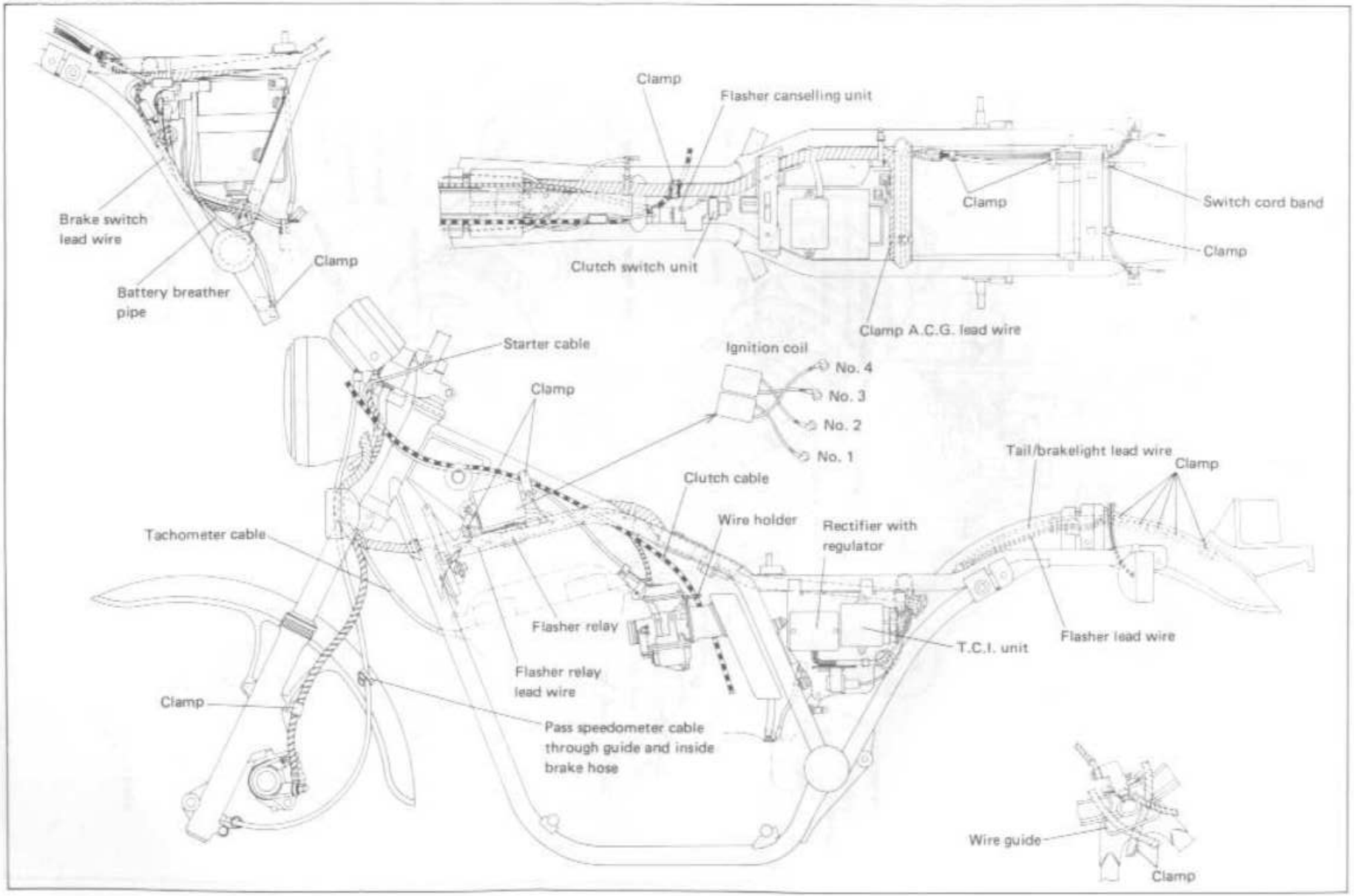


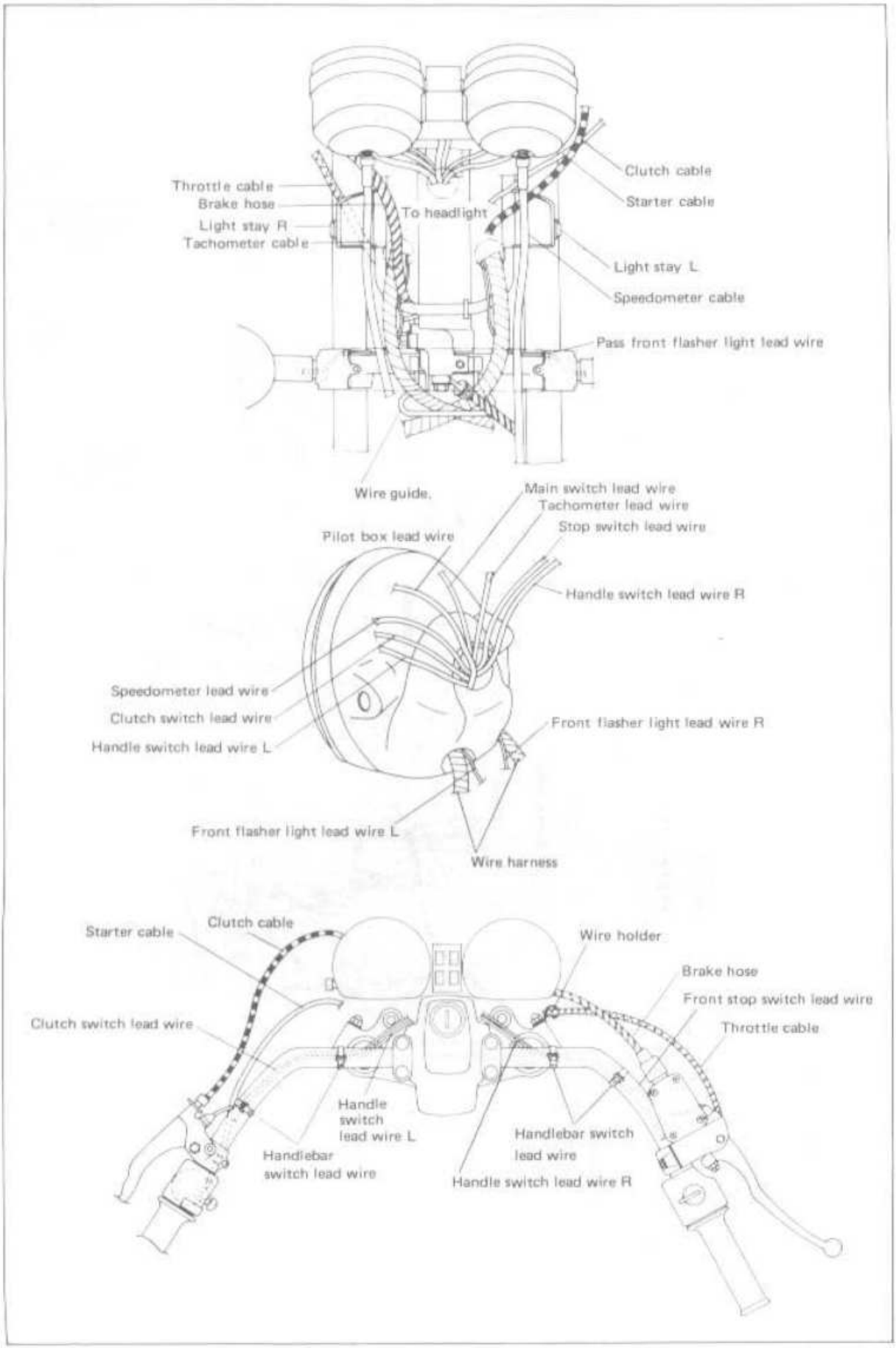

PRIMARY CHAIN
AC GENERATOR
MAIN AXLE
NOZZLE
C
D
F
MIDDLE GEAR
A
E
SHIFT BAR
OIL LEVEL SWITCH
DRIVE AXLE


GENERATOR SHAFT
B
C
NOZZLE

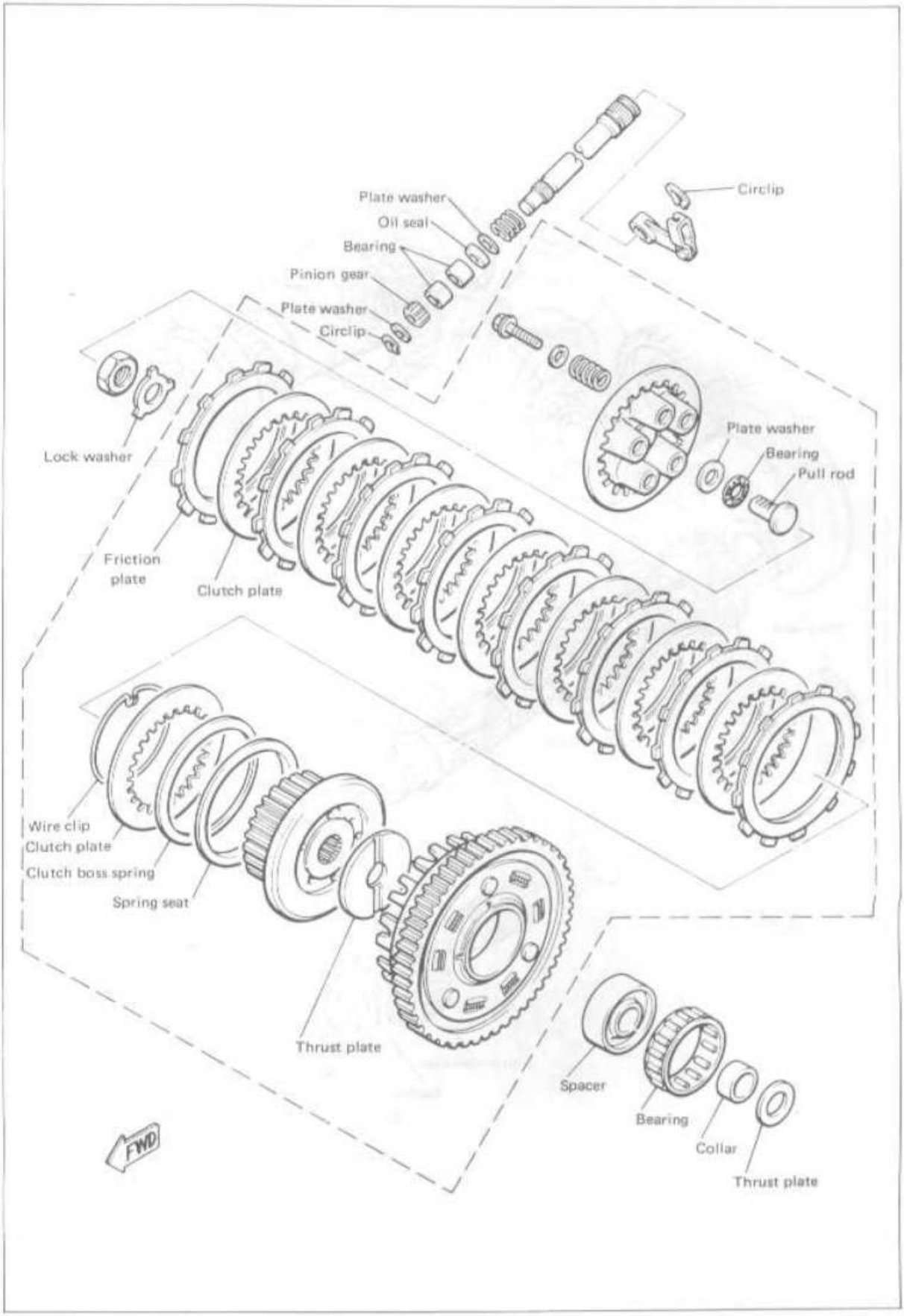

SHIFT BAR
OIL FILTER
A
MAIN AXLE
DRIVE AXLE
E
CLUTCH
D
MAIN AXLE
MIDDLE DRIVE SHAFT
MIDDLE
DRIVEN SHAFT
F

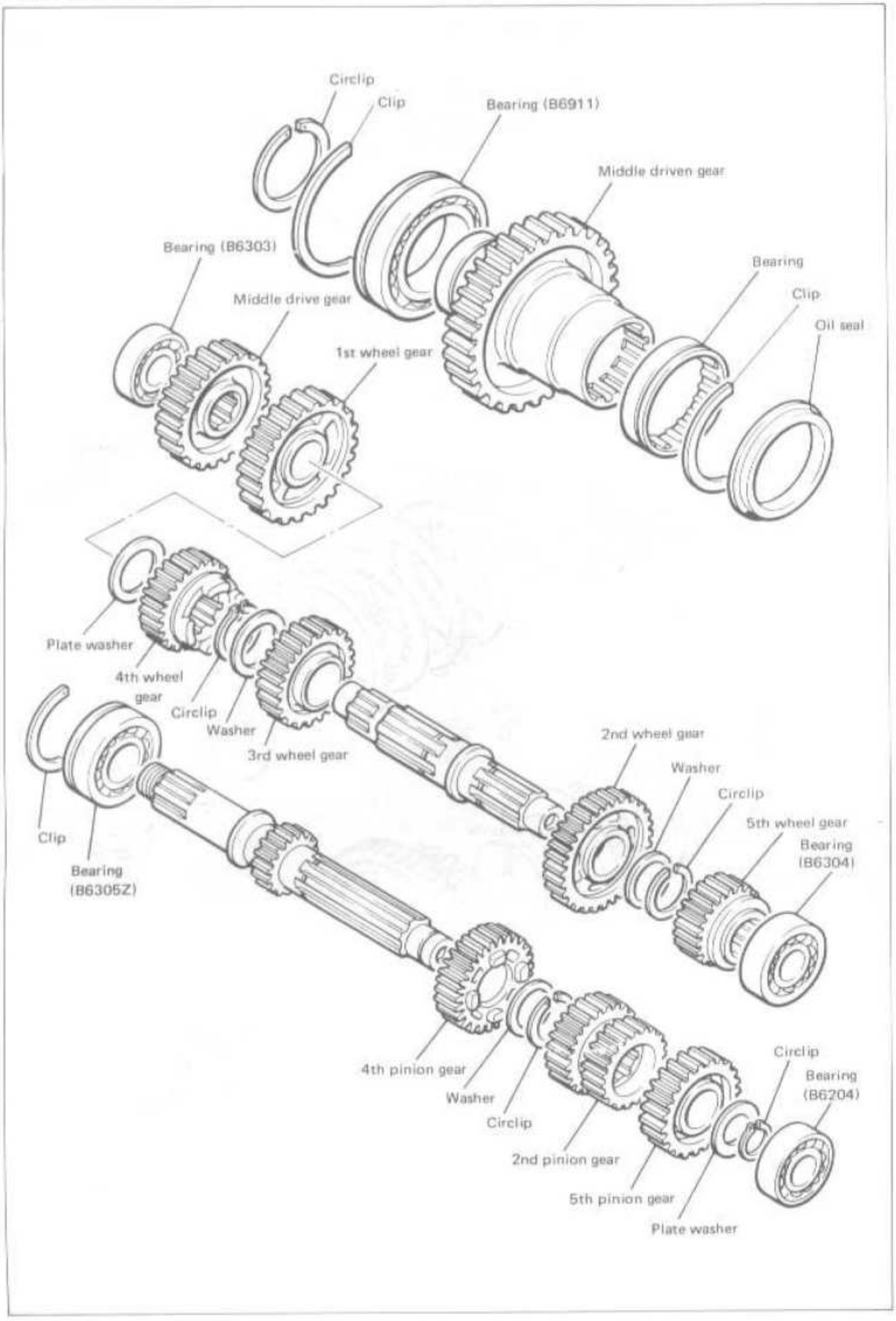
CABLE ROUTING



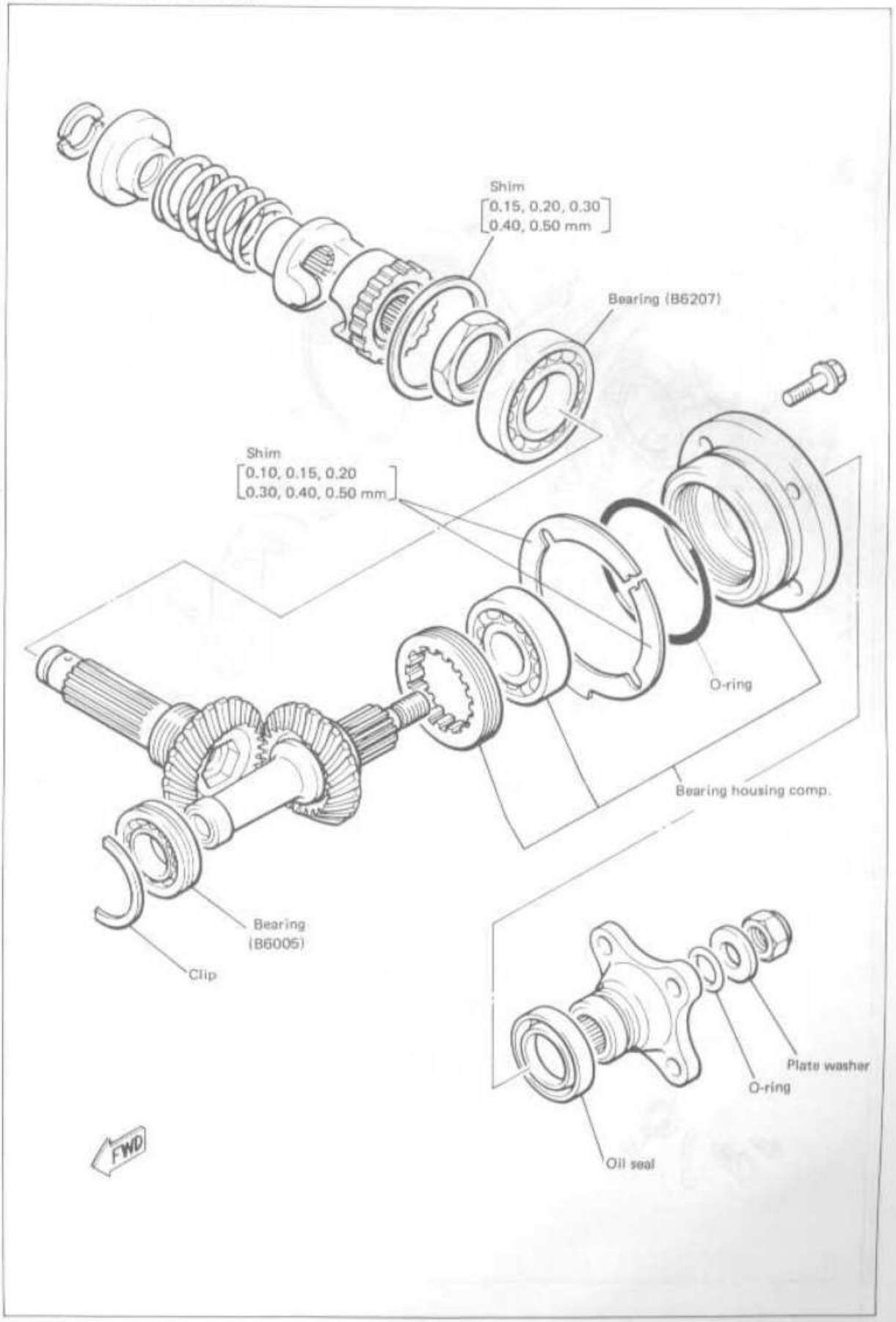

Throttle cable
Brake hose
Light stay R
Tachometer cable
To headlight
Clutch cable
Starter cable
Light stay L
Speedometer cable
Pass front flasher light lead wire
Wire guide.
Main switch lead wire
Tachometer lead wire
Stop switch lead wire
Pilot box lead wire
Handle switch lead wire R
Speedometer lead wire
Clutch switch lead wire
Handle switch lead wire L
Front flasher light lead wire R
Front flasher light lead wire L
Wire harness
Starter cable
Clutch cable
Wire holder
Brake hose
Front stop switch lead wire
Clutch switch lead wire
Throttle cable
Handle switch lead wire L
Handlebar switch lead wire
Handlebar switch lead wire
Handle switch lead wire R

PARTS ILLUSTRATIONS
CLUTCH

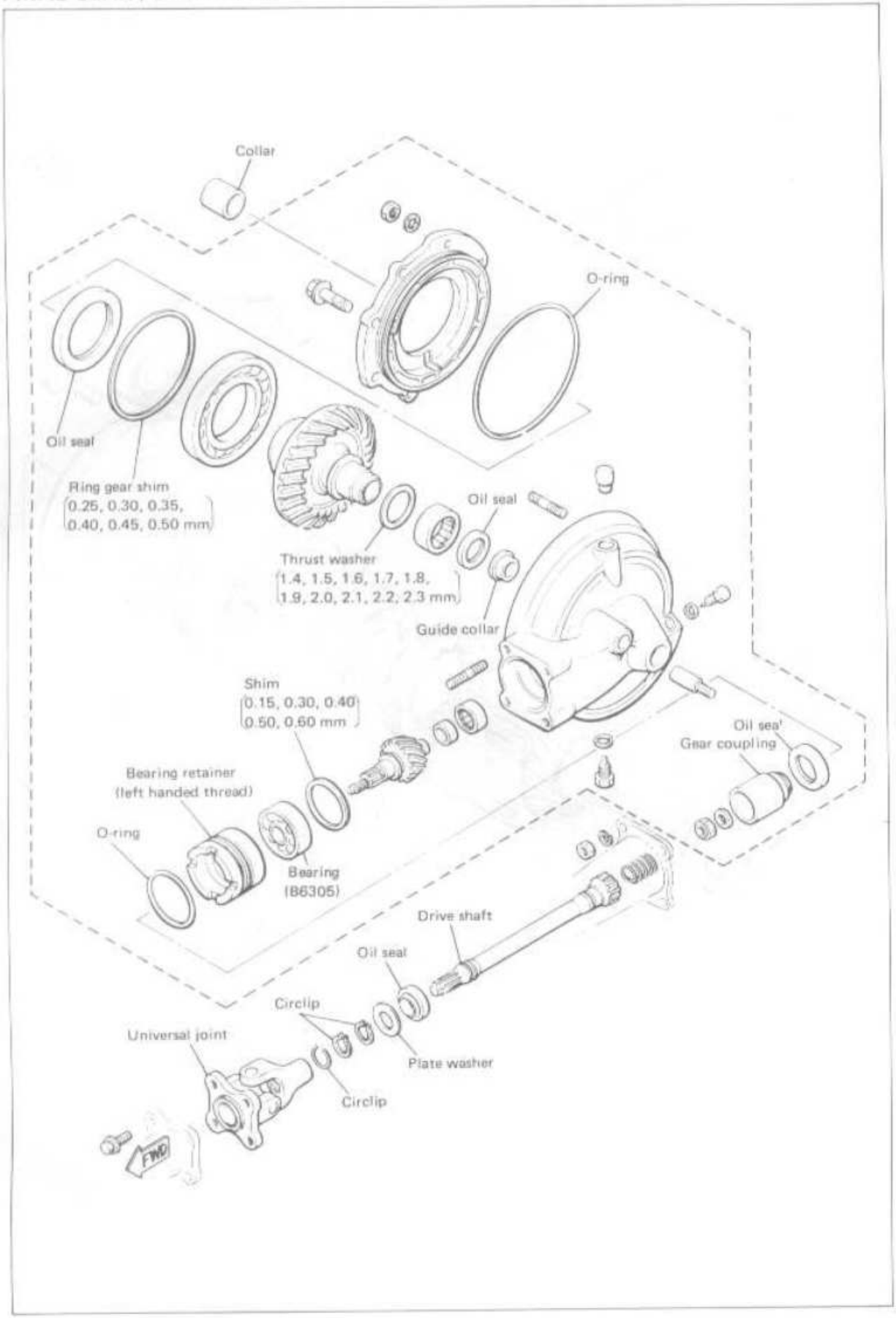



Circlip
Clip
Bearing (B6911)
Middle driven gear
Bearing (B6303)
Middle drive gear
1st wheel gear
Bearing
Clip
Oil seal
Plate washer
4th wheel gear
Circlip
Washer
3rd wheel gear
2nd wheel gear
Washer
Circlip
5th wheel gear
Bearing (B6304)
Clip
Bearing (B6305Z)
4th pinion gear
Washer
Circlip
2nd pinion gear
5th pinion gear
Plate washer
Circlip
Bearing (B6204)

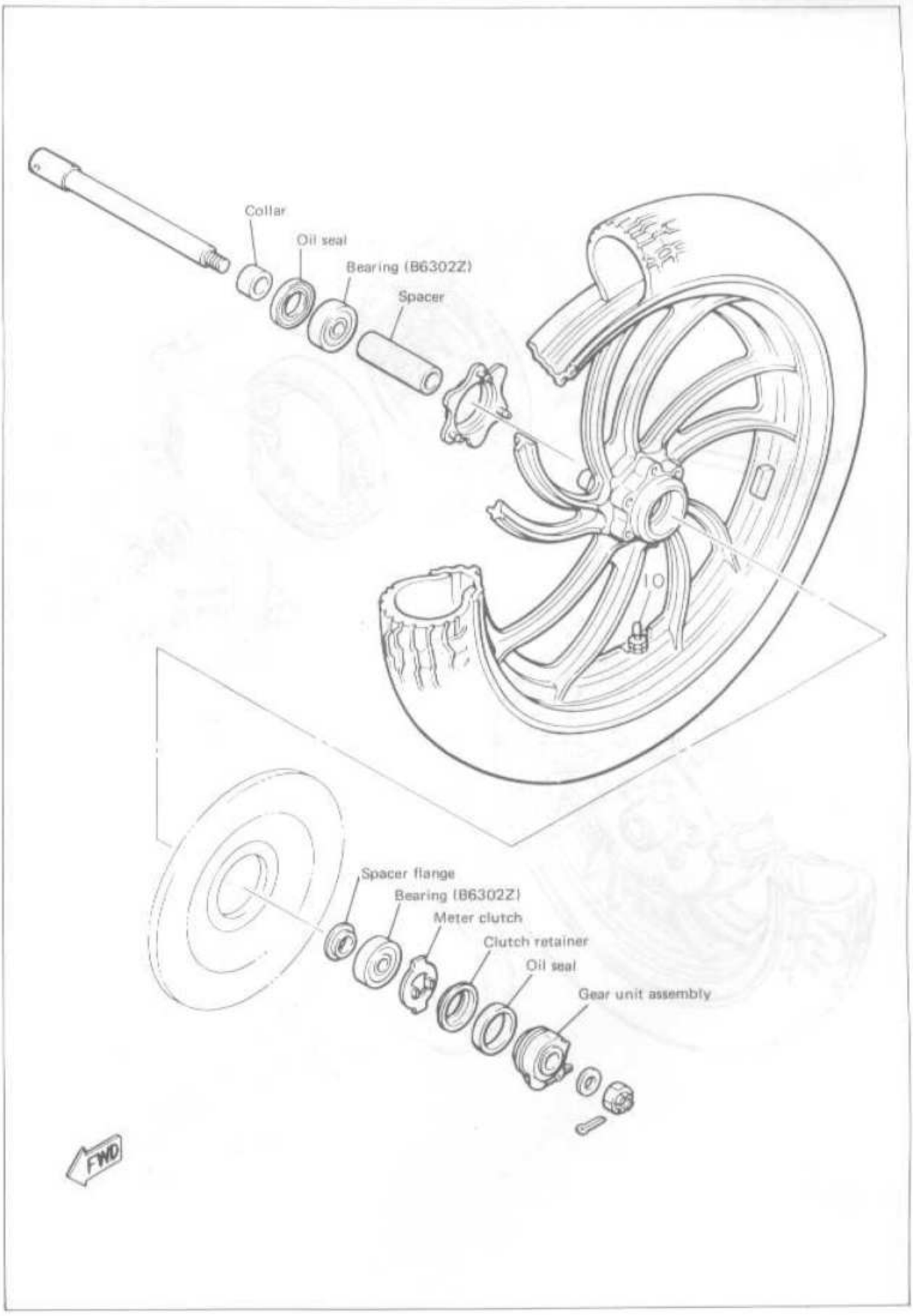
MIDDLE GEAR/DAMPER



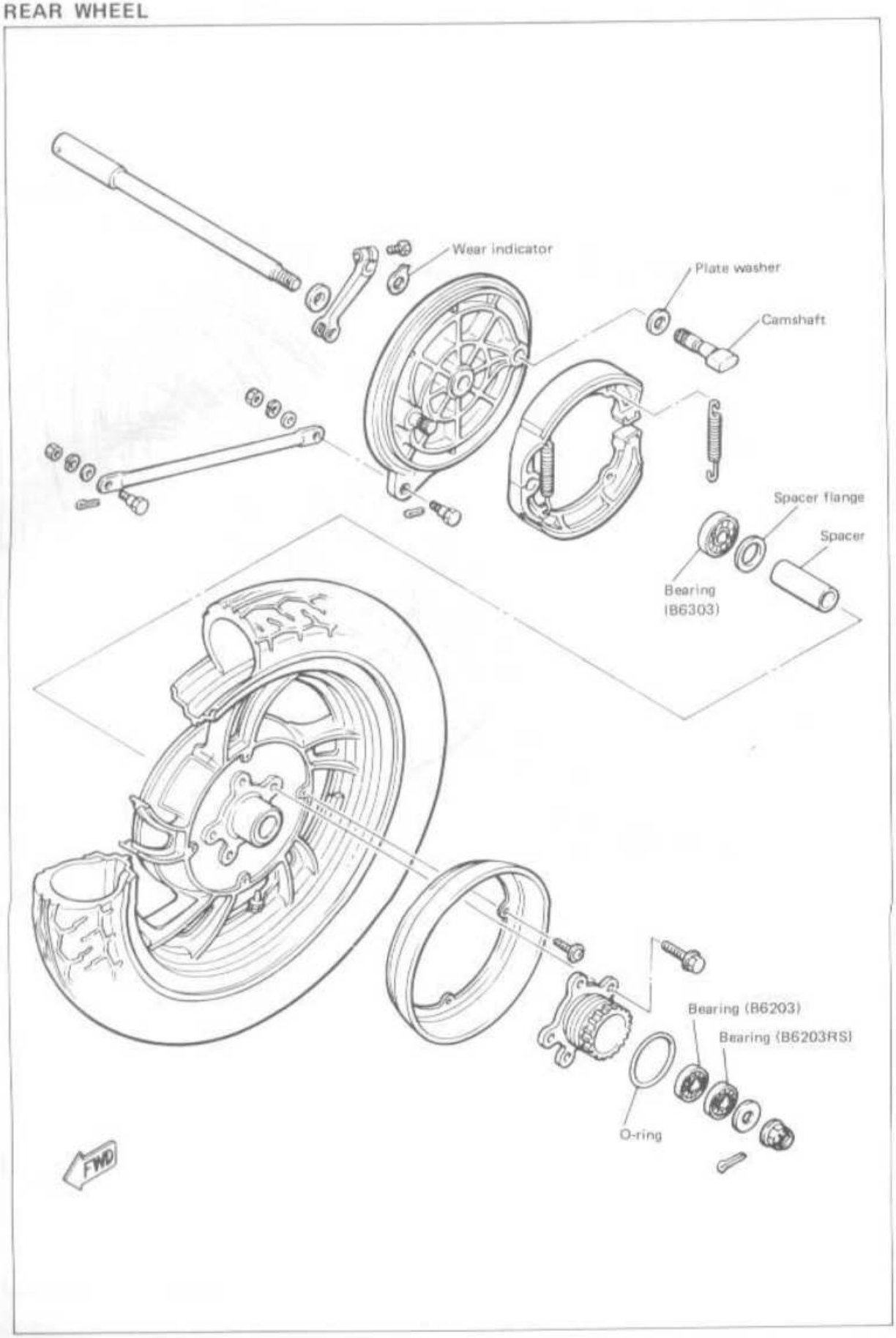
FINAL GEAR / DRIVE SHAFT



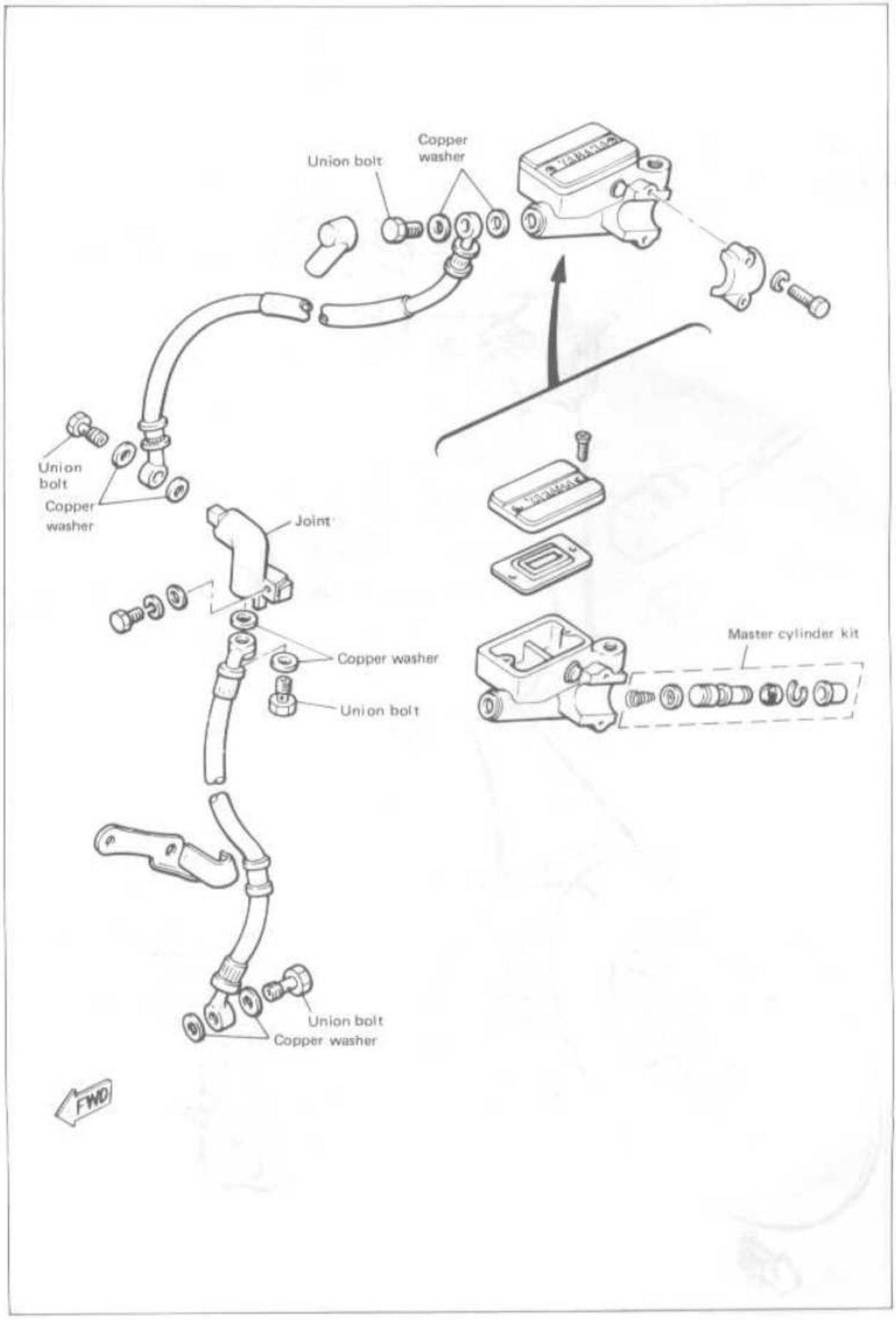
FRONT WHEEL


Collar
Oil seal
Bearing (B6302Z)
Spacer
Spacer flange
Bearing (B6302Z)
Meter clutch
Clutch retainer
Oil seal
Gear unit assembly
FWD

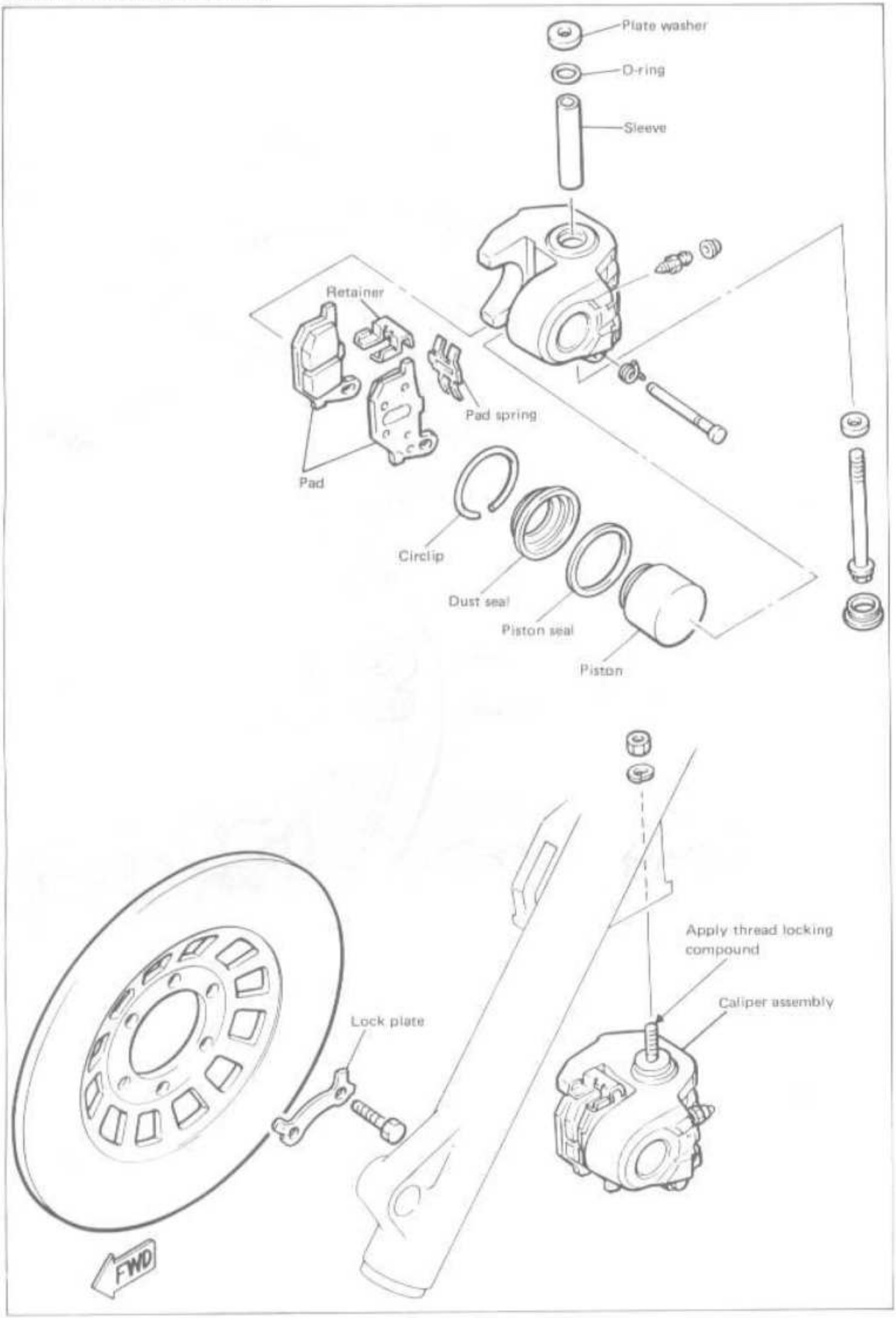
REAR WHEEL

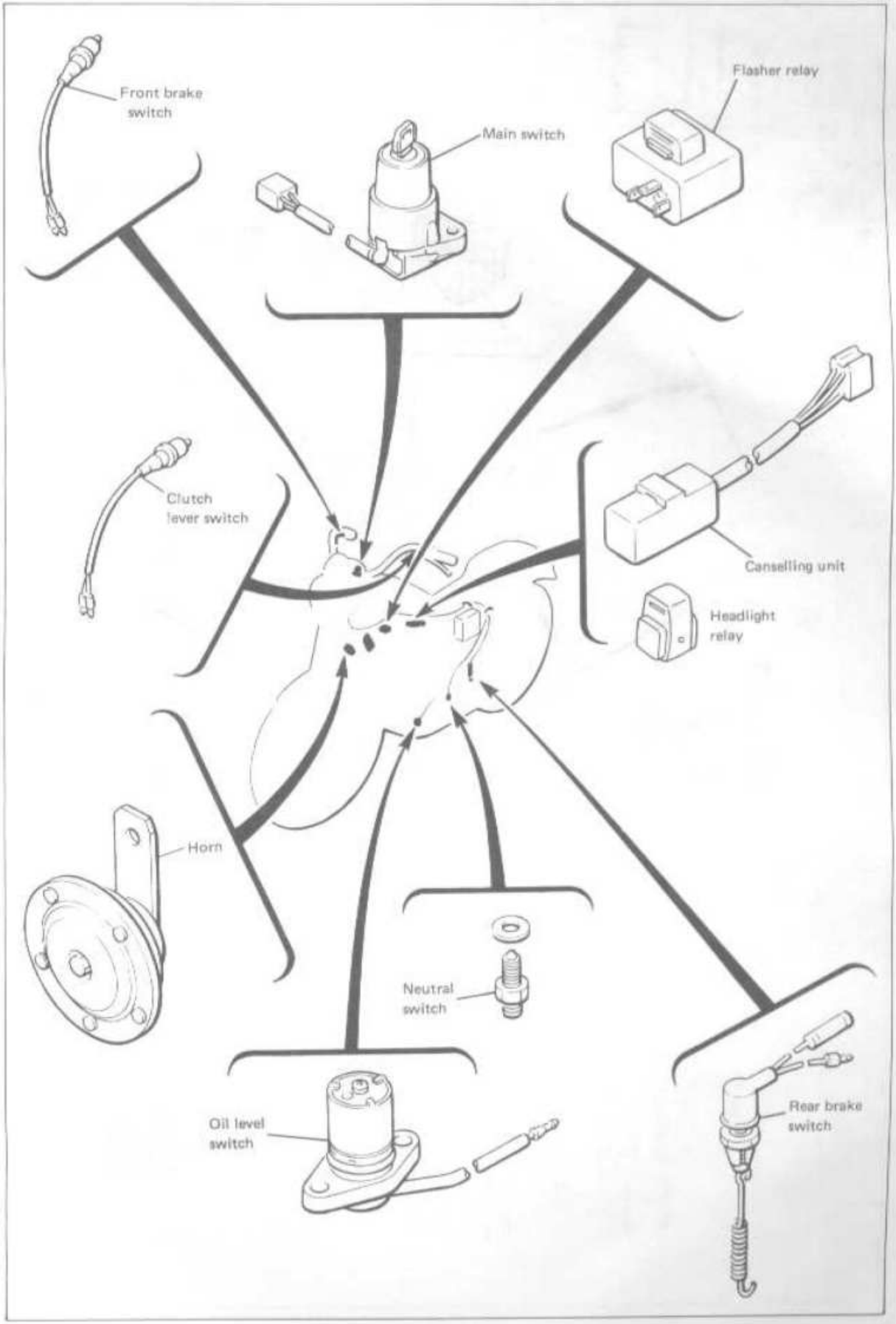

Wear indicator
Plate washer
Camshaft
Spacer flange
Spacer
Bearing
(B6303)
Bearing (B6203)
Bearing (B6203RS)
O-ring
FWD

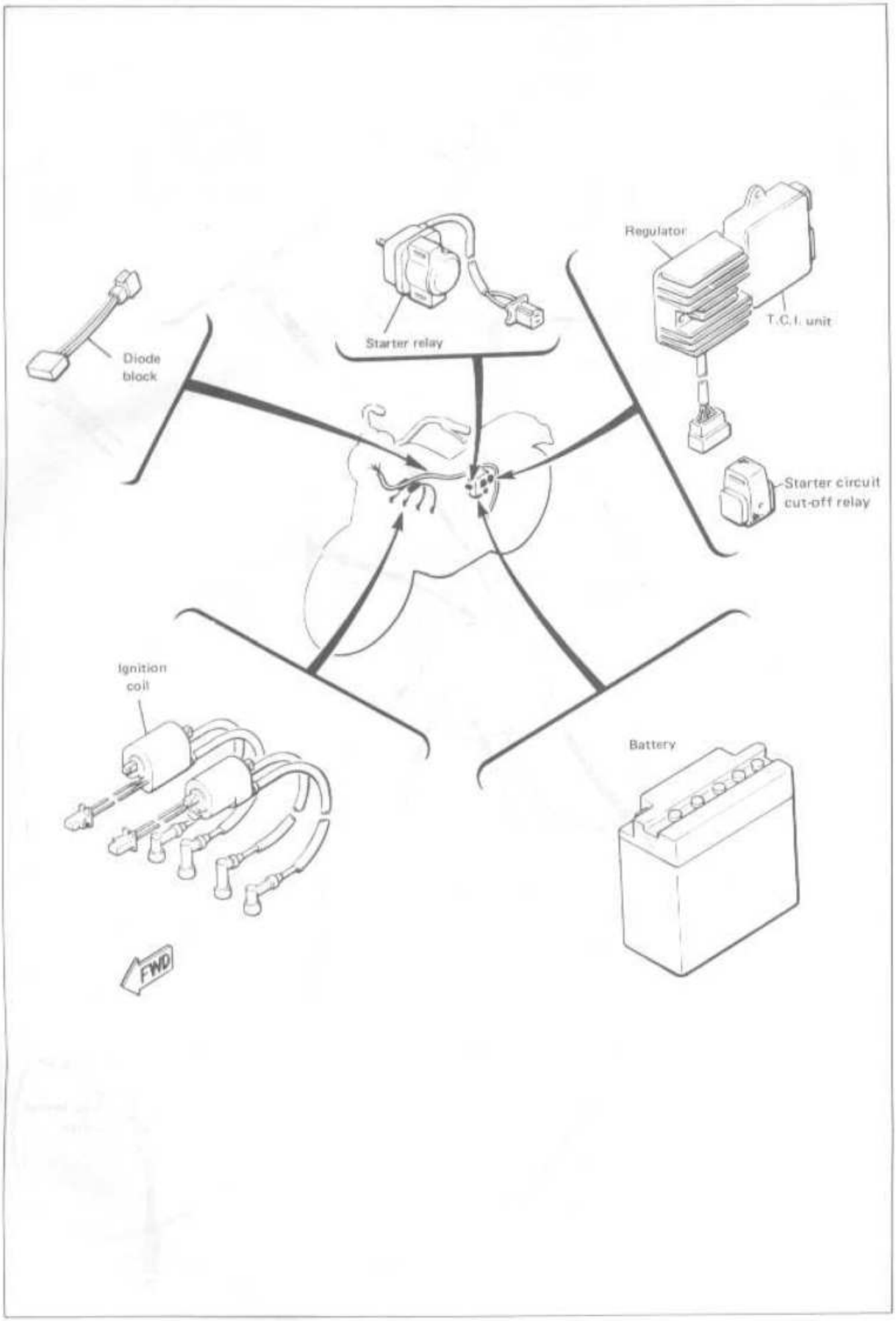
FRONT BRAKE (MASTER CYLINDER)



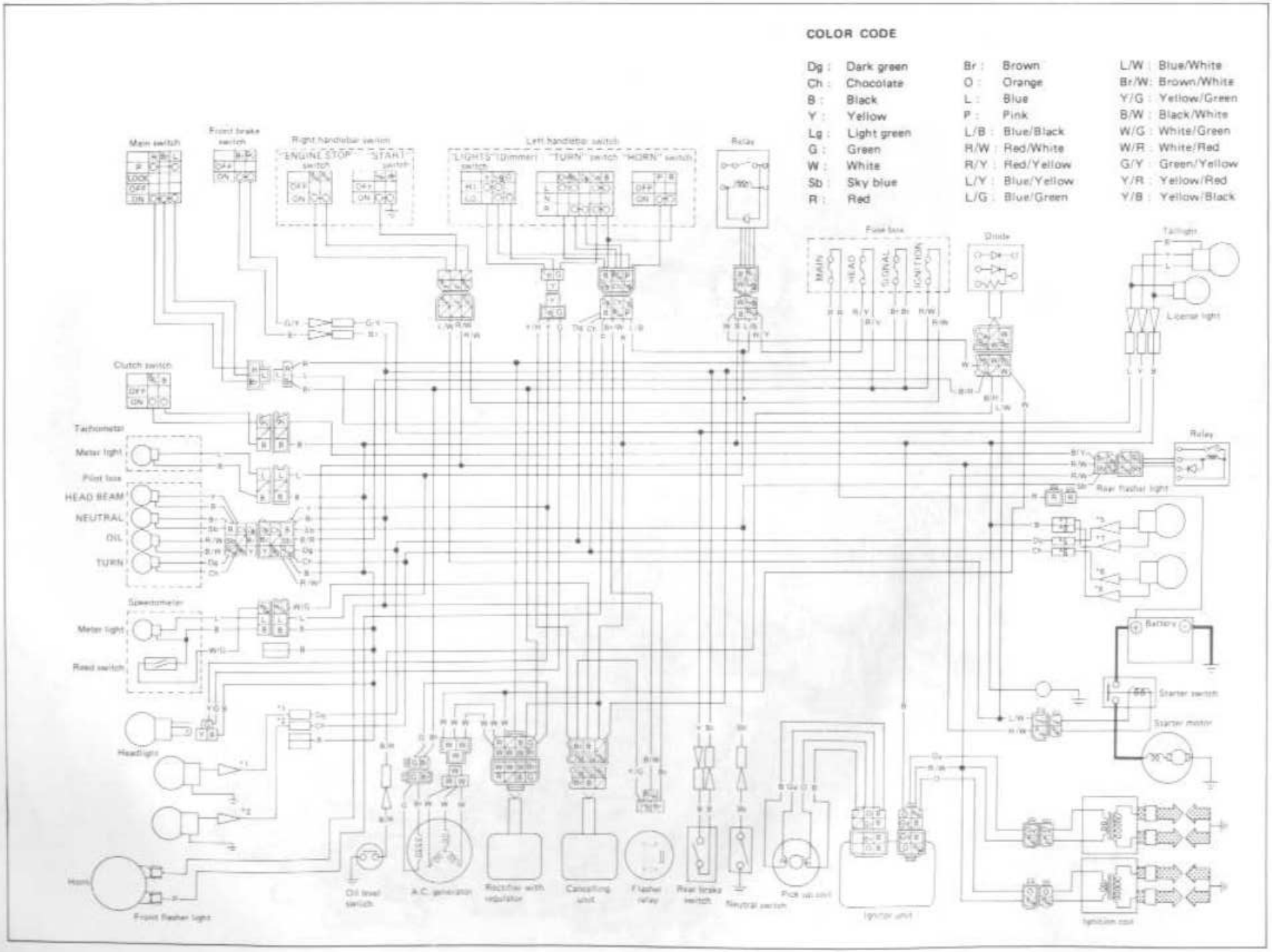
FRONT BRAKE (CALIPER)



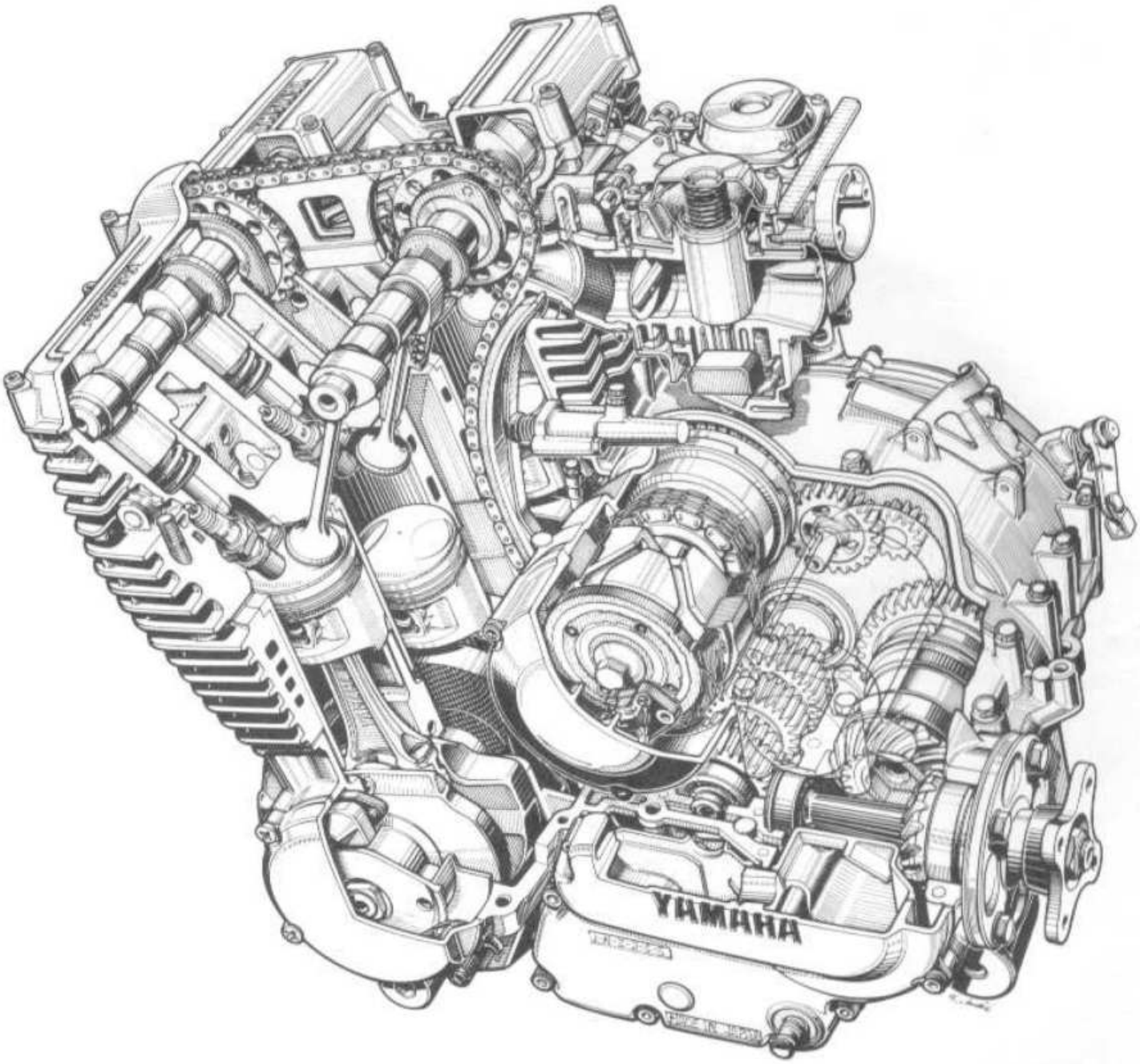

Front brake switch
Main switch
Flasher relay
Clutch lever switch
Canselling unit
Headlight relay
Horn
Neutral switch
Oil level switch
Rear brake switch


Regulator
T.C.I. unit
Starter relay
Diode block
Starter circuit cut-off relay
Ignition coil
Battery
FWD

WIRING DIAGRAM



—MEMO—


YAMAHA



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