YAMAHA

YZF-R1 '98

4XV1-AE1

SERVICE MANUAL

EB000000

YZF - R1
SERVICE MANUAL

EB001000

NOTICE

This manual was produced by the Yamaha Motor Company, Ltd. primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to include all the knowledge of a mechanic in one manual. Therefore, anyone who uses this book to perform maintenance and repairs on Yamaha vehicles should have a basic understanding of mechanics and the techniques to repair these types of vehicles. Repair and maintenance work attempted by anyone without this knowledge is likely to render the vehicle unsafe and unfit for use.

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

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

EB002000

IMPORTANT MANUAL INFORMATION

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

⚠ — The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ WARNING — Failure to follow WARNING instructions could result in severe injury or death to the motorcycle operator, a bystander or a person checking or repairing the motorcycle.

CAUTION: — A CAUTION indicates special precautions that must be taken to avoid damage to the motorcycle.

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

EB003000

HOW TO USE THIS MANUAL

This manual is intended as a handy, easy-to-read reference book for the mechanic. Comprehensive explanations of all installation, removal, disassembly, assembly, repair and check procedures are laid out with the individual steps in sequential order.

① The manual is divided into chapters. An abbreviation and symbol in the upper right corner of each page indicate the current chapter.
Refer to “SYMBOLS”.

② Each chapter is divided into sections. The current section title is shown at the top of each page, except in Chapter 3 (“PERIODIC CHECKS AND ADJUSTMENTS”), where the sub-section title(-s) appears.

③ Sub-section titles appear in smaller print than the section title.

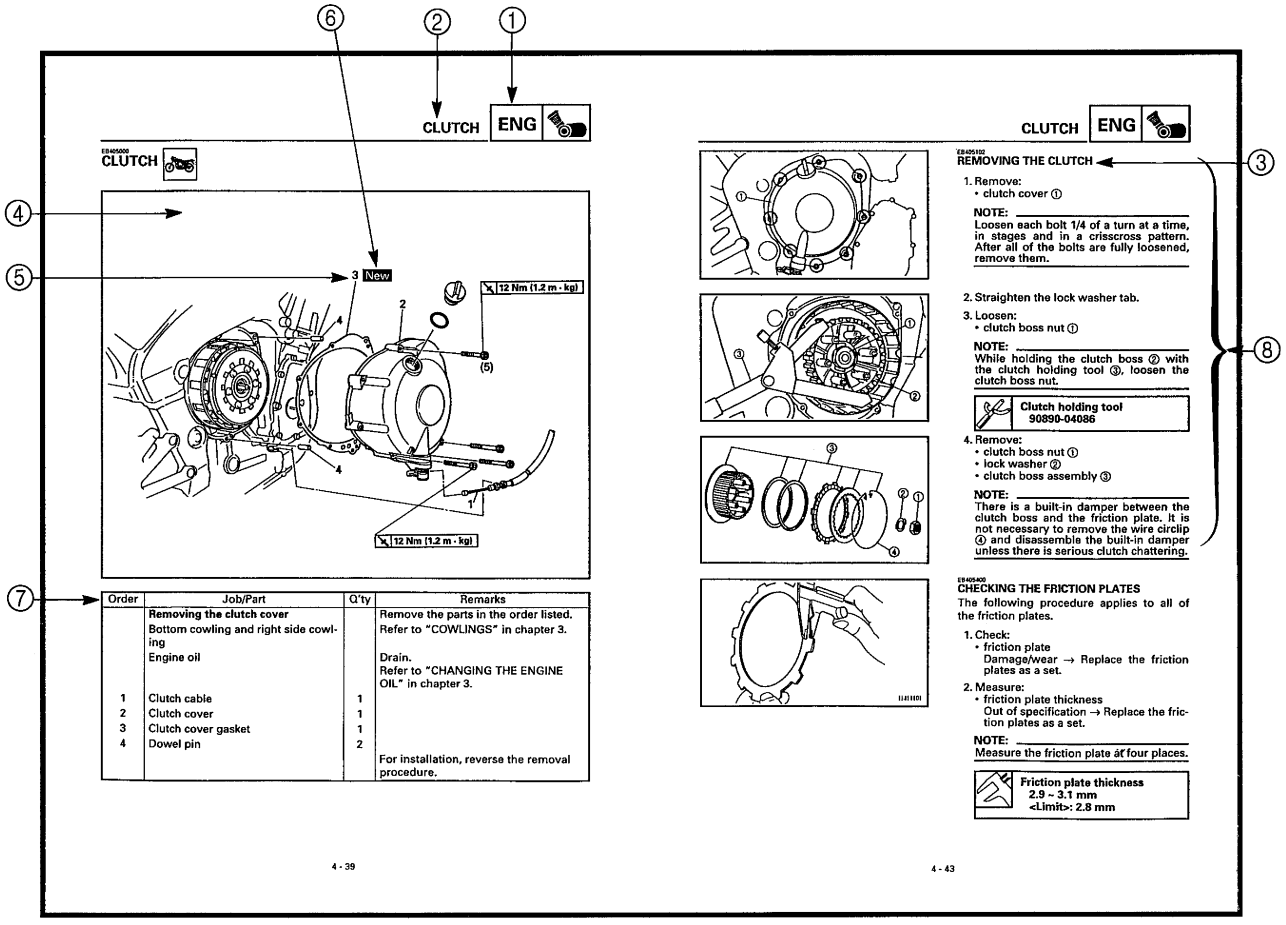
④ To help identify parts and clarify procedure steps, there are exploded diagrams at the start of each removal and disassembly section.

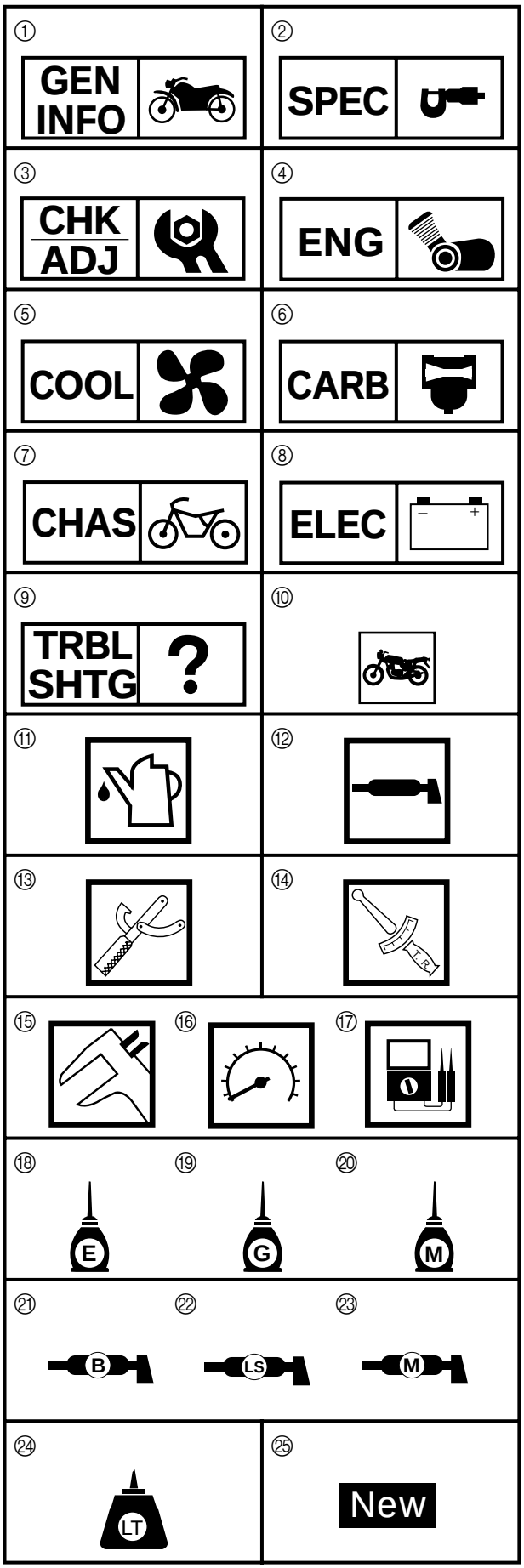
⑤ Numbers are given in the order of the jobs in the exploded diagram. A circled number indicates a disassembly step.

⑥ Symbols indicate parts to be lubricated or replaced.
Refer to “SYMBOLS”.

⑦ A job instruction chart accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.

⑧ Jobs requiring more information (such as special tools and technical data) are described sequentially.





EB004000

SYMBOLS

The following symbols are not relevant to every vehicle.

Symbols ① to ⑨ indicate the subject of each chapter.

① General information
② Specifications
③ Periodic checks and adjustments
④ Engine
⑤ Cooling system
⑥ Carburetor(-s)
⑦ Chassis
⑧ Electrical system
⑨ Troubleshooting

Symbols ⑩ to ⑰ indicate the following.

⑩ Serviceable with engine mounted
⑪ Filling fluid
⑫ Lubricant
⑬ Special tool
⑭ Tightening torque
⑮ Wear limit, clearance
⑯ Engine speed
⑰ Electrical data

Symbols ⑱ to ㉓ in the exploded diagrams indicate the types of lubricants and lubrication points.

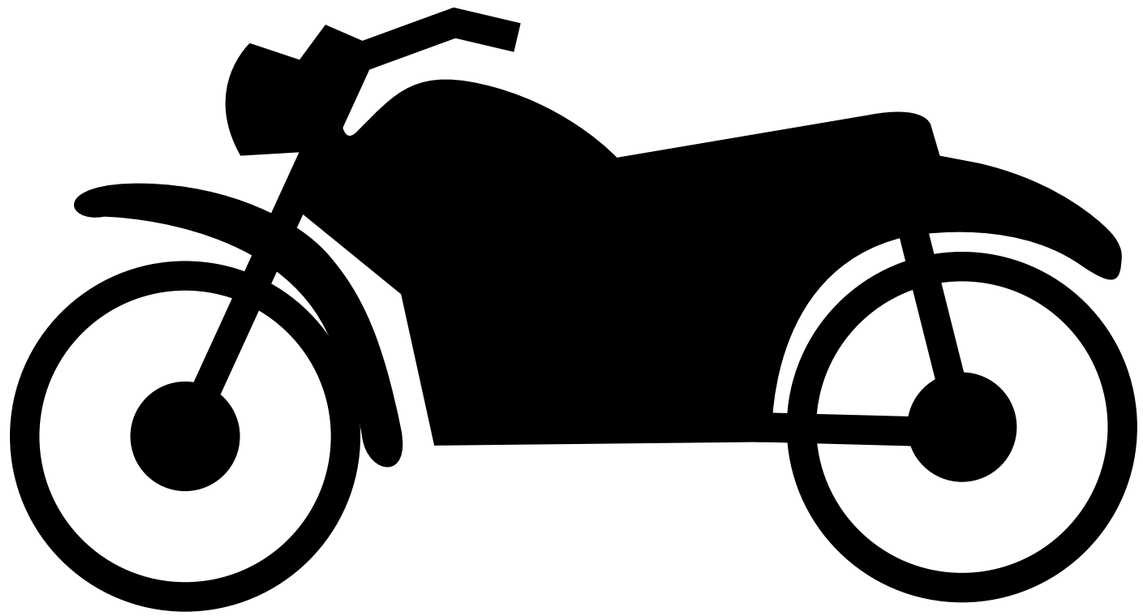
⑱ Engine oil
⑲ Gear oil
⑳ Molybdenum disulfide oil
㉑ Wheel bearing grease
㉒ Lithium soap base grease
㉓ Molybdenum disulfide grease

Symbols ㉔ to ㉕ in the exploded diagrams indicate the following.

㉔ Apply locking agent (LOCTITE®)
㉕ Replace the part

CHAPTER TITLES

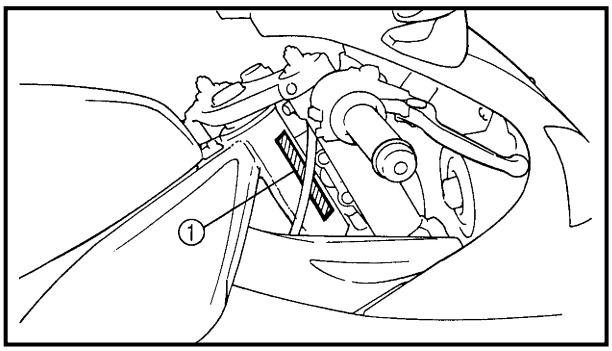
GENERAL INFORMATION	 GEN INFO 1
SPECIFICATIONS	 SPEC 2
PERIODIC CHECKS AND ADJUSTMENTS	 CHK / ADJ 3
ENGINE	 ENG 4
COOLING	 COOL 5
CARBURETION	 CARB 6
CHASSIS	 CHAS 7
ELECTRICAL	 ELEC 8
TROUBLESHOOTING	? TRBL SHTG 9

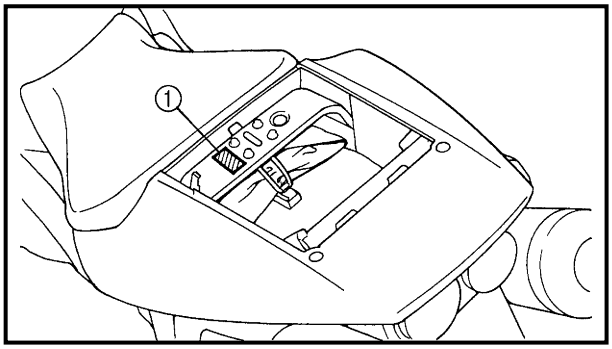


GEN INFO

1

CHAPTER 1.
GENERAL INFORMATION





EB100000

GENERAL INFORMATION

MOTORCYCLE IDENTIFICATION

EB100010

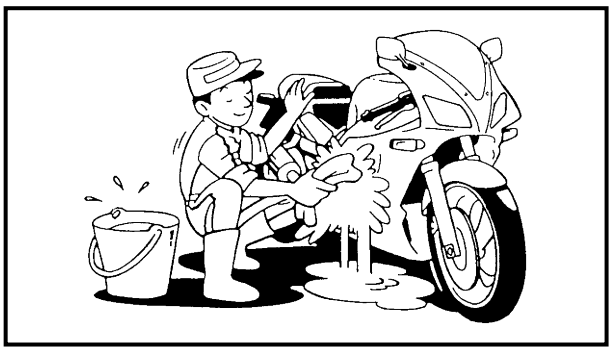
VEHICLE IDENTIFICATION NUMBER

The vehicle identification number ① is stamped into the right side of the steering head pipe.

EB100020

MODEL CODE

The model code label ① is affixed to the frame. This information will be needed to order spare parts.

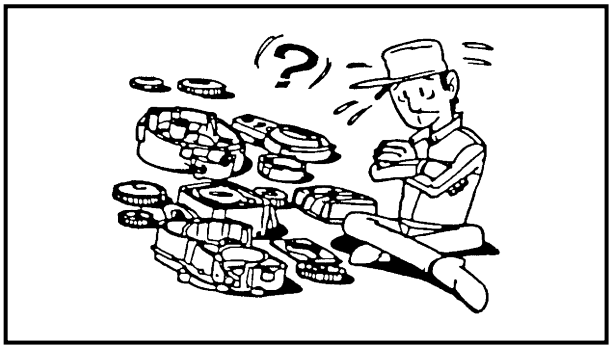


EB102000

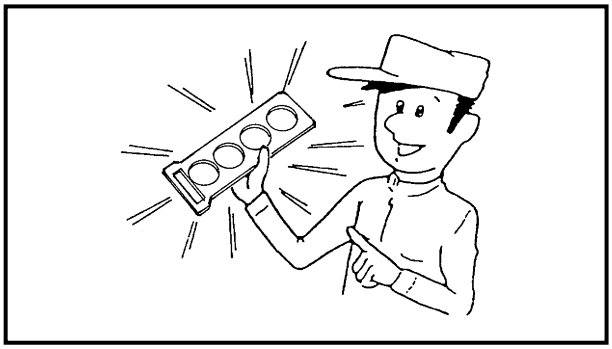
IMPORTANT INFORMATION

PREPARATION FOR REMOVAL AND DISASSEMBLY

1. Before removal and disassembly, remove all dirt, mud, dust, and foreign material.



2. Use only the proper tools and cleaning equipment.
   Refer to "SPECIAL TOOLS".
3. When disassembling, always keep mated parts together. This includes gears, cylinders, pistons and other parts that have been "mated" through normal wear. Mated parts must always be reused or replaced as an assembly.
4. During disassembly, clean all of the parts and place them in trays in the order of disassembly. This will speed up assembly and allow for the correct installation of all parts.
5. Keep all parts away from any source of fire.



EB102010

REPLACEMENT PARTS

Use only genuine Yamaha parts for all replacements. Use oil and grease recommended by Yamaha for all lubrication jobs. Other brands may be similar in function and appearance, but inferior in quality.

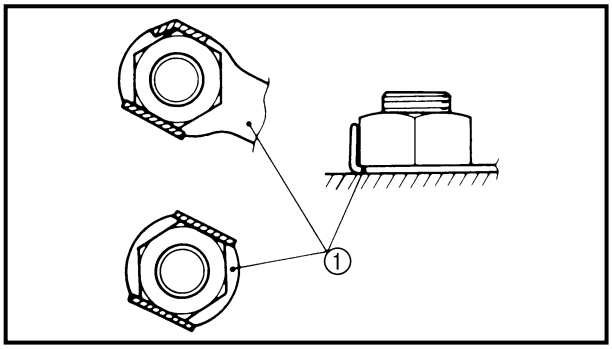
EB102020

GASKETS, OIL SEALS AND O-RINGS

1. When overhauling the engine, replace all gaskets, seals, and O-rings. All gasket surfaces, oil seal lips, and O-rings must be cleaned.
2. During reassembly, properly oil all mating parts and bearings and lubricate the oil seal lips with grease.

USING A DYNAMOMETER

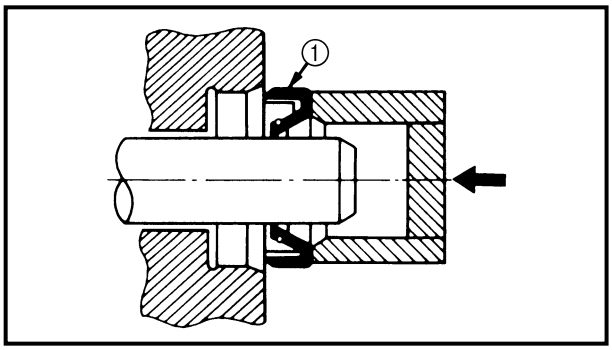
The YZF-R1 has a carbon muffler that may change color when exposed to high temperatures. Therefore, when using a dynamometer always use a fan to cool the muffler.



EB102030

LOCK WASHERS/PLATES AND COTTER PINS

After removal, replace all lock washers/plates ① and cotter pins. After the bolt or nut has been tightened to specification, bend the lock washer tabs and the cotter pin ends along a flat of the bolt or nut.



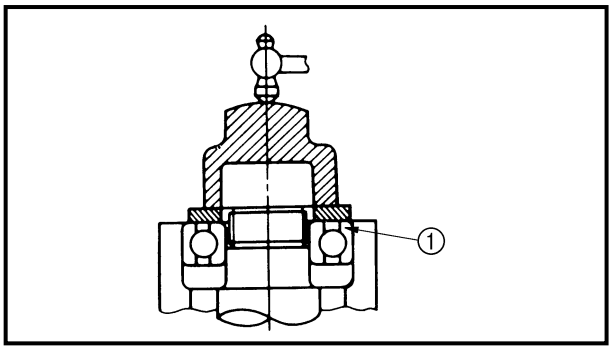
EB102040

BEARINGS AND OIL SEALS

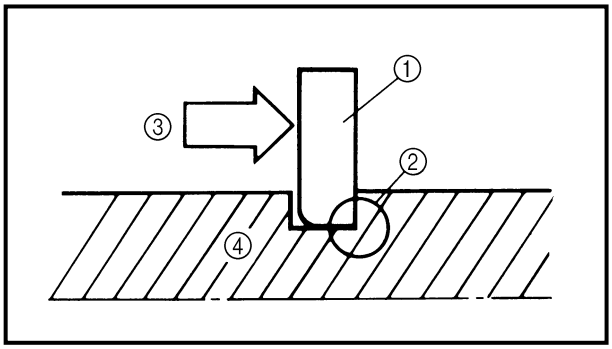
1. Install bearings and oil seals so that the manufacturer's marks or numbers are visible. When installing oil seals, lubricate the oil seal lips with a light coat of lithium soap base grease. Oil bearings liberally when installing, if appropriate.
   ① Oil seal

CAUTION:

Do not spin the bearing with compressed air because this will damage the bearing surfaces.



① Bearing



EB102050

CIRCLIPS

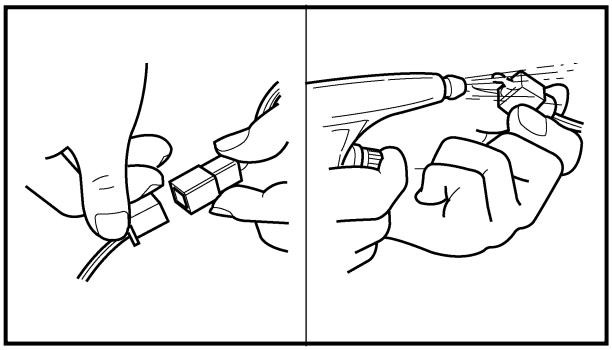
Before reassembly, check all circlips carefully and replace damaged or distorted circlips. Always replace piston pin clips after one use. When installing a circlip ①, make sure that the sharp-edged corner ② is positioned opposite the thrust ③ that the circlip receives.

④ Shaft

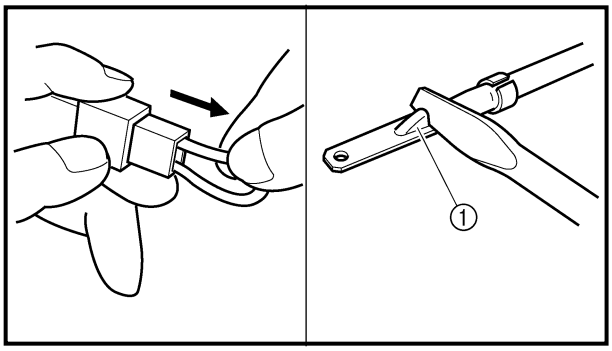
EB103000
CHECKING THE CONNECTIONS

Check the leads, couplers, and connectors for stains, rust, moisture, etc.

1. Disconnect:
   • lead
   • coupler
   • connector

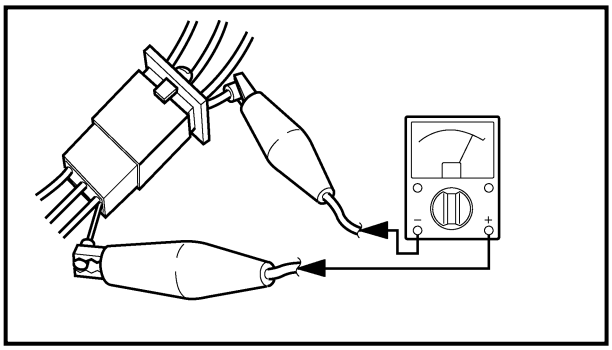


2. Check:
   • lead
   • coupler
   • connector
   Moisture → Dry with an air blower.
   Rust/stains → Connect and disconnect several times.



3. Check:
   • all connections
   Loose connection → Connect properly.

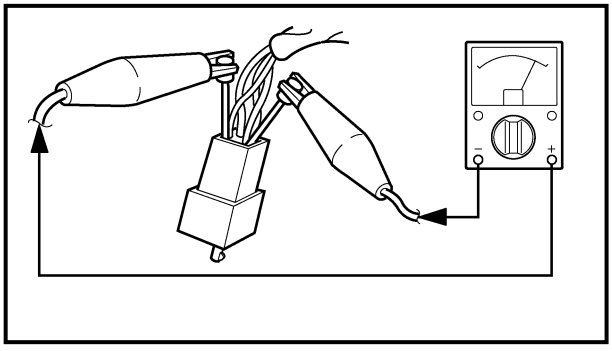
NOTE:
If the pin ① on the terminal is flattened, bend it up.



4. Connect:
   • lead
   • coupler
   • connector

NOTE:
Make sure that all connections are tight.

5. Check:
   • continuity
   (with the pocket tester)

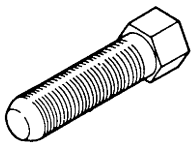
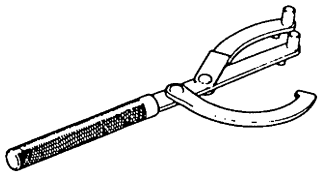
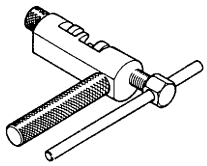
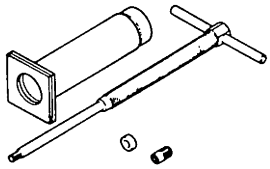
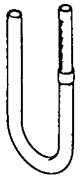
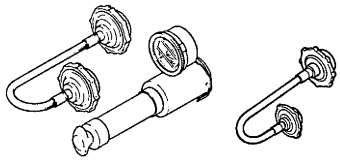
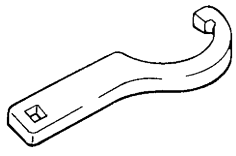
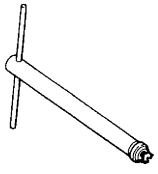


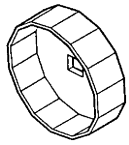
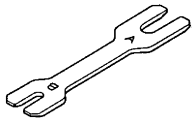
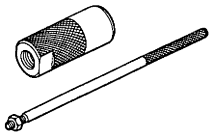
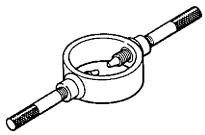
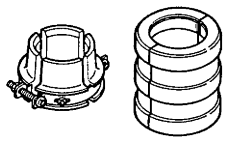
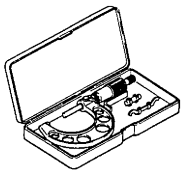
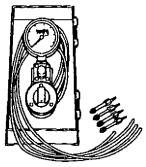
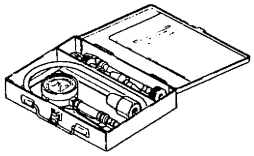
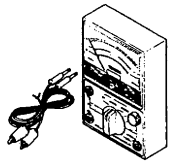
	**Pocket tester** **90890-03112**

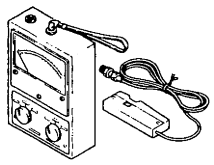
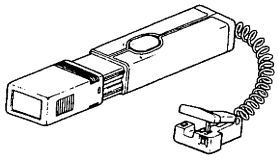
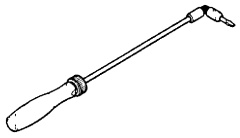
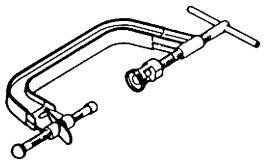
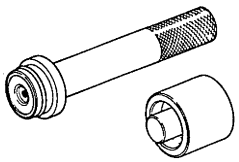
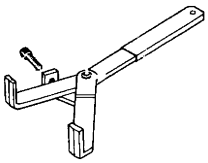
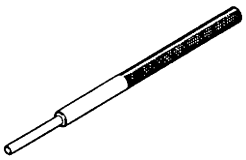
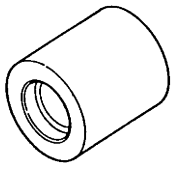
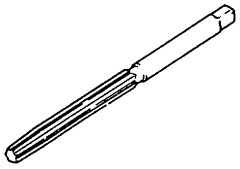
NOTE:
- If there is no continuity, clean the terminals.
- When checking the wire harness, perform steps (1) to (3).
- As a quick remedy, use a contact revitalizer available at most part stores.

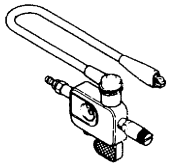
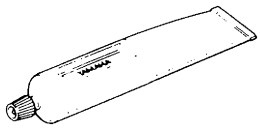
EB104000
SPECIAL TOOLS

The following special tools are necessary for complete and accurate tune-up and assembly. Use only the appropriate special tools as this will help prevent damage caused by the use of inappropriate tools or improvised techniques.
When placing an order, refer to the list provided below to avoid any mistakes.

Tool No.	Tool name/Function	Illustration
90890-01080	Flywheel puller This tool is used to remove the generator rotor.	
90890-01235	Rotor holding tool This tool is used to hold the generator rotor when removing or installing the generator rotor bolt or pickup coil rotor bolt.	
90890-01286	Drive chain cutter This tool is used to remove the drive chain.	
90890-01304	Piston pin puller This tool is used to remove the piston pins.	
90890-01312	Fuel level gauge This tool is used to measure the fuel level in the float chamber.	
Radiator cap tester 90890-01325 Adapter 90890-01352	Radiator cap tester Adapter These tools are used to check the cooling system.	
90890-01403	Steering nut wrench This tool is used to loosen or tighten the steering stem ring nuts.	
90890-01423	Damper rod holder This tool is used to hold the damper rod assembly when loosening or tightening the damper rod assembly bolt.	

Tool No.	Tool name/Function	Illustration
90890-01426	Oil filter wrench This tool is needed to loosen or tighten the oil filter cartridge.	
90890-01434	Rod holder This tool is used to support the damper adjusting rod.	
Rod puller 90890-01437 Rod puller attachment 90890-01436	Rod puller Rod puller attachment These tools are used to pull up the front fork damper rod.	
90890-01441	Fork spring compressor This tool is used to disassemble or assemble the front fork legs.	
90890-01442	Fork seal driver This tool is used to install the front fork's oil seal and dust seal.	
90890-03008	Micrometer This tool is used to measure the piston skirt diameter.	
Vacuum gauge 90890-03094 Vacuum gauge attachment 90890-03060	Vacuum gauge Vacuum gauge attachment This gauge is used to synchronize the carburetors.	
Compression gauge 90890-03081 Adapter 90890-04136	Compression gauge Adapter These tools are used to measure engine compression.	
90890-03112	Pocket tester This tool is used to check the electrical system.	

Tool No.	Tool name/Function	Illustration
90890-03113	Engine tachometer This tool is used to check engine speed.	
90890-03141	Timing light This tool is used to check the ignition timing.	
90890-03158	Carburetor angle driver This tool is used to turn the pilot screw when adjusting the engine idling speed.	
Valve spring compressor 90890-04019 Attachment 90890-04108 90890-04114	Valve spring compressor Attachment These tools are used to remove or install the valve assemblies.	
Middle driven shaft bearing driver 90890-04058 Mechanical seal installer 90890-04078	Middle driven shaft bearing driver Mechanical seal installer These tools are used to install the water pump seal.	
90890-04086	Clutch holding tool This tool is used to hold the clutch boss when removing or installing the clutch boss nut.	
90890-04111 90890-04116	Valve guide remover This tool is used to remove or install the valve guides.	
90890-04112 90890-04117	Valve guide installer This tool is used to install the valve guides.	
90890-04113 90890-04118	Valve guide reamer This tool is used to rebore the new valve guides.	

Tool No.	Tool name/Function	Illustration
90890-06754	Ignition checker This tool is used to check the ignition system components.	
90890-85505	Yamaha bond No. 1215 This bond is used to seal two mating surfaces (e.g., crankcase mating surfaces).	

SPEC 2

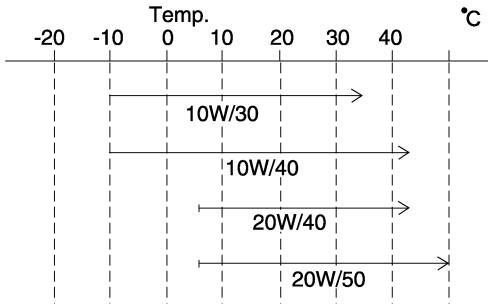
CHAPTER 2.
SPECIFICATIONS

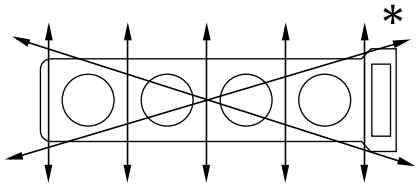
SPECIFICATIONS

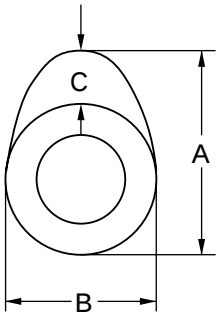
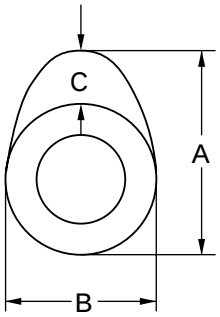
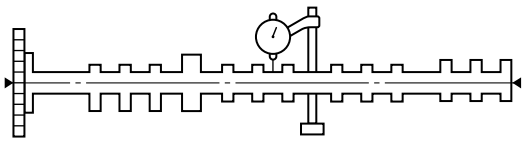
GENERAL SPECIFICATIONS

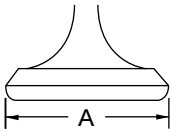
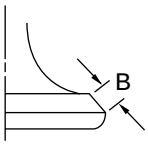
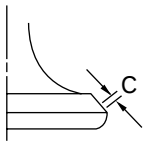
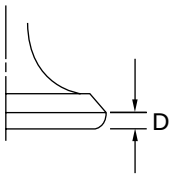
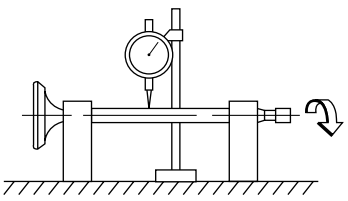
Item	Standard	Limit
Dimensions		
Overall length	2,035 mm (except for N, S, SF)	----
	2,095 mm (for N, S, SF)	----
Overall width	695 mm	----
Overall height	1,095 mm	----
Seat height	815 mm	----
Wheelbase	1,395 mm	----
Minimum ground clearance	140 mm	----
Minimum turning radius	3,400 mm	----
Weight		
Wet (with oil and a full fuel tank)	198 kg	----
Dry (without oil and fuel)	177 kg	----
Maximum load (total of cargo, rider, passenger, and accessories)	197 kg	----

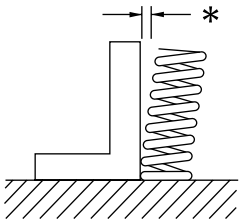
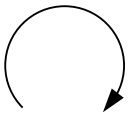
ENGINE SPECIFICATIONS

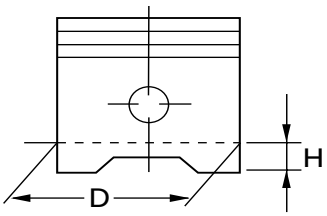
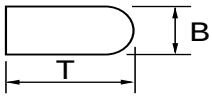
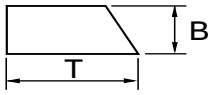
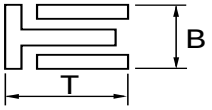
Item	Standard	Limit
Engine		
Engine type	Liquid-cooled, 4-stroke, DOHC	----
Displacement	998 cm^3	----
Cylinder arrangement	Forward-inclined parallel 4-cylinder	----
Bore × stroke	74 × 58 mm	----
Compression ratio	11.8:1	----
Engine idling speed	1,050 ~ 1,150 r/min	----
Vacuum pressure at engine idling speed	29.3 kPa (220 mm Hg)	----
Standard compression pressure (at sea level)	1,450 kPa (14.5 kgf/cm^2) at 400 r/min	----
Fuel		
Recommended fuel	Regular gasoline	----
Fuel tank capacity		
Total (including reserve)	18 L	----
Reserve only	5.5 L	----
Engine oil		
Lubrication system	Wet sump	----
Recommended oil		----
	SAE20W40SE or SAE10W30SE	
Quantity		
Total amount	3.6 L	----
Without oil filter cartridge replacement	2.7 L	----
With oil filter cartridge replacement	2.9 L	----
Oil pressure (hot)	45 kPa at 1,100 r/min (0.45 kgf/cm^2 at 1,100 r/min)	----
Relief valve opening pressure	490 ~ 570 kPa (4.9 ~ 5.7 kgf/cm^2)	----

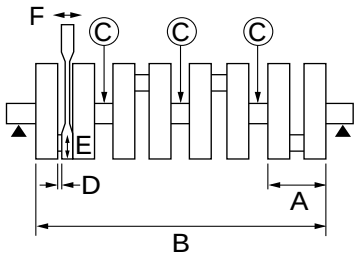
Item	Standard	Limit
Oil filter		
Oil filter type	Cartridge (paper)	----
Bypass valve opening pressure	180 ~ 220 kPa (1.8 ~ 2.2 kgf/cm^2)	----
Oil pump		
Oil pump type	Trochoidal	----
Inner-rotor-to-outer-rotor-tip clearance	0.09 ~ 0.15 mm	----
Outer-rotor-to-oil-pump-housing clearance	0.03 ~ 0.08 mm	----
Cooling system		
Radiator capacity	2.55 L	
Radiator cap opening pressure	95 ~ 125 kPa (0.95 ~ 1.25 kgf/cm^2)	----
Radiator core		
Width	340 mm	----
Height	298 mm	----
Depth	24 mm	----
Coolant reservoir		
Capacity	0.45 L	----
Water pump		
Water pump type	Single-suction centrifugal pump	----
Reduction ratio	68/43 × 28/28 (1.581)	----
Max. impeller shaft tilt	----	0.15 mm
Starting system type	Electric starter	
Spark plugs		
Model (manufacturer) × quantity	CR9E/U27ESR-N (NGK/DENSO) × 4	----
Spark plug gap	0.7 ~ 0.8 mm	----
Cylinder head		
Max. warpage	----	0.1 mm
		

Item	Standard	Limit
Camshafts		
Drive system	Chain drive (right)	----
Camshaft cap inside diameter	24.500 ~ 24.521 mm	----
Camshaft journal diameter	24.437 ~ 24.450 mm	----
Camshaft-journal-to-camshaft-cap clearance	0.050 ~ 0.084 mm	----
Intake camshaft lobe dimensions		
		
Measurement A	32.5 ~ 32.6 mm	32.4 mm
Measurement B	24.95 ~ 25.05 mm	24.85 mm
Measurement C	7.45 ~ 7.65 mm	----
Exhaust camshaft lobe dimensions		
		
Measurement A	32.95 ~ 33.05 mm	32.85 mm
Measurement B	24.95 ~ 25.05 mm	24.85 mm
Measurement C	7.75 ~ 7.95 mm	----
Max. camshaft runout	----	0.03 mm
		

Item	Standard	Limit
Timing chain		
Model/number of links	RH2015 / 130	----
Tensioning system	Automatic	----
Valves, valve seats, valve guides		
Valve clearance (cold)		
Intake	0.11 ~ 0.20 mm	----
Exhaust	0.21 ~ 0.30 mm	----
Valve dimensions		
 Head Diameter	 Face Width	 Seat Width	 Margin Thickness
Valve head diameter A		
Intake	22.9 ~ 23.1 mm	----
Exhaust	24.4 ~ 24.6 mm	----
Valve face width B		
Intake	1.76 ~ 2.90 mm	----
Exhaust	1.76 ~ 2.90 mm	----
Valve seat width C		
Intake	0.9 ~ 1.1 mm	----
Exhaust	0.9 ~ 1.1 mm	----
Valve margin thickness D		
Intake	0.5 ~ 0.9 mm	----
Exhaust	0.5 ~ 0.9 mm	----
Valve stem diameter		
Intake	3.975 ~ 3.900 mm	3.945 mm
Exhaust	4.460 ~ 4.475 mm	4.43 mm
Valve guide inside diameter		
Intake	4.000 ~ 4.012 mm	4.05 mm
Exhaust	4.500 ~ 4.512 mm	4.55 mm
Valve-stem-to-valve-guide clearance		
Intake	0.010 ~ 0.037 mm	0.08 mm
Exhaust	0.025 ~ 0.052 mm	0.1 mm
Valve stem runout	----	0.01 mm
		
Valve seat width		
Intake	0.9 ~ 1.1 mm	----
Exhaust	0.9 ~ 1.1 mm	----

Item	Standard	Limit
Valve springs		
Free length		
Intake	38.9 mm	----
Exhaust	40.67 mm	----
Installed length (valve closed)		
Intake	34.5 mm	----
Exhaust	35 mm	----
Compressed spring force (installed)		
Intake	82 ~ 96 N (8.36 ~ 9.79 kgf)	----
Exhaust	110 ~ 126 N (11.22 ~ 12.85 kgf)	----
Spring tilt		
		
Intake	----	2.5° / 1.7 mm
Exhaust	----	2.5° / 1.8 mm
Winding direction (top view)		
Intake	Clockwise	----
Exhaust	Clockwise	----
		
Cylinders		
Cylinder arrangement	Forward-inclined, parallel 4-cylinder	----
Bore × stroke	74 × 58 mm	----
Compression ratio	11.8:1	----
Bore	74.00 ~ 74.010 mm	----
Max. taper	----	0.05 mm
Max. out-of-round	----	0.05 mm

Item	Standard	Limit
Pistons		
Piston-to-cylinder clearance	0.03 ~ 0.055 mm	0.12 mm
Diameter D	73.955 ~ 73.970 mm	----
		
Height H	5 mm	----
Piston pin bore (in the piston)		
Diameter	17.002 ~ 17.013 mm	----
Offset	0.5 mm	----
Offset direction	Intake side	----
Piston pins		
Outside diameter	16.991 ~ 17.000 mm	----
Piston-pin-to-piston-pin-bore clearance	0.002 ~ 0.022 mm	0.072 mm
Piston rings		
Top ring		
		
Ring type	Barrel	----
Dimensions (B × T)	0.90 × 2.75 mm	----
End gap (installed)	0.19 ~ 0.31 mm	----
Ring side clearance	0.030 ~ 0.065 mm	----
2nd ring		
		
Ring type	Taper	----
Dimensions (B × T)	0.8 × 2.8 mm	----
End gap (installed)	0.30 ~ 0.45 mm	----
Ring side clearance	0.020 ~ 0.055 mm	----
Oil ring		
		
Dimensions (B × T)	1.5 × 2.6 mm	----
End gap (installed)	0.10 ~ 0.35 mm	----

Item	Standard	Limit
Connecting rods		
Crankshaft-pin-to-big-end-bearing clearance	0.016 ~ 0.040 mm	----
Bearing color code	–1 = Violet 0 = White 1 = Blue 2 = Black	----
Crankshaft		
		
Width A	52.40 ~ 57.25 mm	----
Width B	300.75 ~ 302.65 mm	----
Max. runout C		0.03 mm
Big end side clearance D	0.160 ~ 0.262 mm	----
Crankshaft-journal-to-crankshaft-journal-bearing clearance	0.004 ~ 0.028 mm	----
Bearing color code	–1 = Pink/violet 0 = Pink/white 1 = Pink/blue 2 = Pink/black 3 = Pink/brown	----
Clutch		
Clutch type	Wet, multiple disc	----
Clutch release method	Rack and pinion (pull rod type)	----
Clutch release method operation	Cable operation	----
Operation	Right-foot operation	----
Clutch cable free play (at the end of the clutch lever)	10 ~ 15 mm	----
Friction plates		
Thickness	2.9 ~ 3.1 mm	2.8 mm
Plate quantity	8	----
Clutch plates		
Thickness	1.9 ~ 2.1 mm	----
Plate quantity	7	----
Max. warpage	----	0.1 mm
Clutch springs		
Free length	6.5 mm	----
Spring quantity	1 spring per valve	----

Item	Standard	Limit
Transmission		
Transmission type	Constant mesh, 6-speed	----
Primary reduction system	Spur gear	----
Primary reduction ratio	68/43 (1.581)	----
Secondary reduction system	Chain drive	----
Secondary reduction ratio	43/16 (2.688)	----
Operation	Left-foot operation	----
Gear ratios		
1st gear	39/15 (2.600)	----
2nd gear	35/19 (1.842)	----
3rd gear	30/20 (1.500)	----
4th gear	28/21 (1.333)	----
5th gear	30/25 (1.200)	----
6th gear	29/26 (1.115)	----
Max. main axle runout	----	0.08 mm
Max. drive axle runout	----	0.08 mm
Shifting mechanism		
Shift mechanism type	Shift drum	----
Max. shift fork guide bar bending	----	0.1 mm
Installed shift rod length	305 mm	----
Air filter type	Dry element	----
Fuel pump		
Pump type	Electrical	----
Model (manufacturer)	4SV (MITSUBISHI)	----
Output pressure	20 kPa (0.2 kgf/cm^2)	----
Carburetors		
Model (manufacturer) × quantity	BDSR40 (MIKUNI) × 4	----
Throttle cable free play (at the flange of the throttle grip)	3 ~ 5 mm	----
ID mark	4XV1 00	----
Main jet	#130	----
Main air jet	Carburetors 1 and 4: #60 Carburetors 2 and 3: #65	----
Jet needle	6DEY5-53-3	----
Needle jet	P-0	----
Pilot air jet	#120	----
Pilot outlet	1.0	----
Pilot jet	#17.5	----
Bypass 1	0.8	----
Bypass 2	0.9	----
Bypass 3	0.8	----
Pilot screw turns out	2.5	----
Valve seat size	1.5	----

Item	Standard	Limit
Starter jet 1	#35	----
Starter jet 2	0.7	----
Butterfly valve size	#100	----
Fuel level (below the line on the float chamber)	4.1 ~ 5.1 mm	----
Max. EXUP cable free play (at the EXUP valve pulley)	1.5 mm	----