YAMAHA

YZFR1W
YZFR1WC

SERVICE MANUAL

LIT-11616-20-53 4C8-28197-10

EAS20170
FEATURES

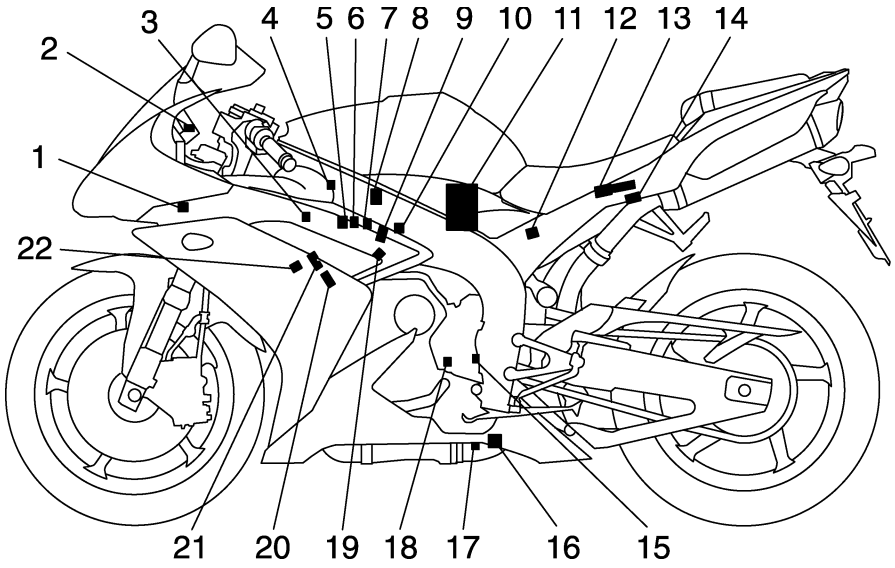
OUTLINE OF THE FI SYSTEM

The main function of a fuel supply system is to provide fuel to the combustion chamber at the optimum air-fuel ratio in accordance with the engine operating conditions and the atmospheric temperature. In the conventional carburetor system, the air-fuel ratio of the mixture that is supplied to the combustion chamber is created by the volume of the intake air and the fuel that is metered by the jet used in the respective carburetor.

Despite the same volume of intake air, the fuel volume requirement varies by the engine operating conditions, such as acceleration, deceleration, or operating under a heavy load. Carburetors that meter the fuel through the use of jets have been provided with various auxiliary devices, so that an optimum air-fuel ratio can be achieved to accommodate the constant changes in the operating conditions of the engine.

As the requirements for the engine to deliver more performance and cleaner exhaust gases increase, it becomes necessary to control the air-fuel ratio in a more precise and finely tuned manner. To accommodate this need, this model has adopted an electronically controlled fuel injection (FI) system, in place of the conventional carburetor system. This system can achieve an optimum air-fuel ratio required by the engine at all times by using a microprocessor that regulates the fuel injection volume according to the engine operating conditions detected by various sensors.

The adoption of the FI system has resulted in a highly precise fuel supply, improved engine response, better fuel economy, and reduced exhaust emissions.



1. Intake air temperature sensor
2. Engine trouble warning light
3. Air induction system solenoid
4. Atmospheric pressure sensor
5. Throttle position sensor (for throttle cable pulley)
6. Throttle servo motor
7. Throttle position sensor (for throttle valves)
8. Intake funnel servo motor
9. Injector
10. Intake air pressure sensor
11. Fuel pump
12. Lean angle sensor
13. ECU (engine control unit)
14. Starting circuit cut-off relay
15. Speed sensor
16. EXUP servo motor
17. O_2 sensor
18. Crankshaft position sensor
19. Coolant temperature sensor
20. Spark plug
21. Ignition coil
22. Cylinder identification sensor

EAS20180
IMPORTANT INFORMATION

EAS20190
PREPARATION FOR REMOVAL AND DISASSEMBLY

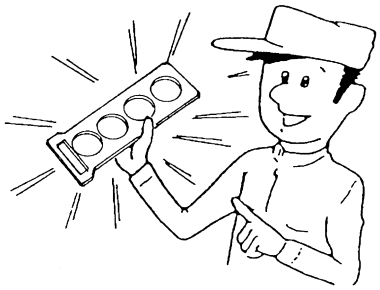
1. Before removal and disassembly, remove all dirt, mud, dust and foreign material.

2. Use only the proper tools and cleaning equipment.
   Refer to "SPECIAL TOOLS" on page 1-15.
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.

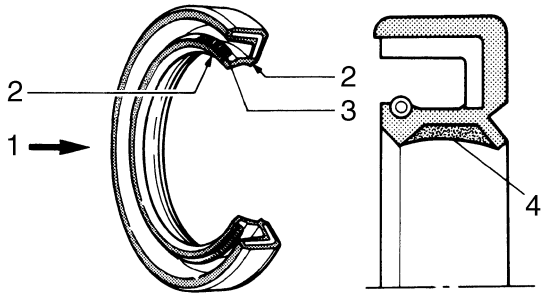
EAS20200
REPLACEMENT PARTS

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.



EAS20210
GASKETS, OIL SEALS AND O-RINGS

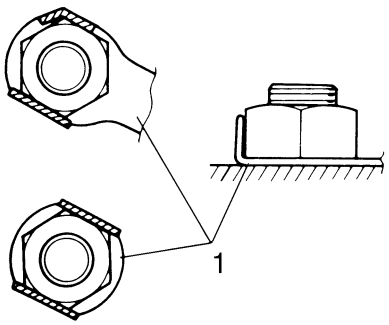
1. When overhauling the engine, replace all gaskets, seals and O-rings. All gasket surfaces, oil seal lips and O-rings must be cleaned.
2. During reassembly, properly oil all mating parts and bearings and lubricate the oil seal lips with grease.



1. Oil
2. Lip
3. Spring
4. Grease

EAS20220
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 tabs along a flat of the bolt or nut.



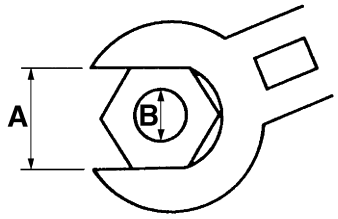
EAS20290
ENGINE SPECIFICATIONS

Engine	
Engine type	Liquid cooled 4-stroke, DOHC
Displacement	998.0 cm^3
Cylinder arrangement	Forward-inclined parallel 4-cylinder
Bore × stroke	77.0 × 53.6 mm (3.03 × 2.11 in)
Compression ratio	12.70 :1
Standard compression pressure (at sea level)	1480 kPa/350 r/min (210.5 psi/350 r/min) (14.8 kgf/cm^2/350 r/min)
Starting system	Electric starter
Fuel	
Recommended fuel	Premium unleaded gasoline only
Fuel tank capacity	18.0 L (4.76 US gal) (3.96 Imp.gal)
Fuel reserve amount	3.2 L (0.85 US gal) (0.70 Imp.gal)
Engine oil	
Lubrication system	Wet sump
Type	YAMALUBE 4, SAE 10W30 or SAE 20W40
Recommended engine oil grade	API service, SG type or higher, JASO standard MA
Engine oil quantity	
Total amount	3.83 L (4.05 US qt) (3.37 Imp.qt)
Without oil filter cartridge replacement	2.90 L (3.07 US qt) (2.55 Imp.qt)
With oil filter cartridge replacement	3.10 L (3.28 US qt) (2.73 Imp.qt)
Oil filter	
Oil filter type	Formed
Oil pump	
Oil pump type	Trochoid
Inner-rotor-to-outer-rotor-tip clearance	0.010–0.100 mm (0.0004–0.0039 in)
Limit	0.18 mm (0.0071 in)
Outer-rotor-to-oil-pump-housing clearance	0.090–0.190 mm (0.0035–0.0074 in)
Limit	0.26 mm (0.0102 in)
Oil-pump-housing-to-inner-and-outer-rotor clearance	0.06–0.13 mm (0.0024–0.0051 in)
Limit	0.20 mm (0.0079 in)
Bypass valve opening pressure	80.0–120.0 kPa (11.6–17.4 psi) (0.80–1.20 kgf/cm^2)
Relief valve operating pressure	600.0–680.0 kPa (87.0–98.6 psi) (6.00–6.80 kgf/cm^2)
Cooling system	
Radiator capacity (including all routes)	2.76 L (2.92 US qt) (2.43 Imp.qt)
Coolant reservoir capacity (up to the maximum level mark)	0.25 L (0.26 US qt) (0.22 Imp.qt)
Radiator cap opening pressure	108–137 kPa (15.4–19.5 psi) (1.08–1.37 kgf/cm^2)
Radiator core	
Width	374.0 mm (14.72 in)
Height	257.8 mm (10.15 in)
Depth	24.0 mm (0.94 in)
Water pump	
Water pump type	Single suction centrifugal pump
Reduction ratio	65/43 × 25/32 (1.181)
Spark plug (s)	

EAS20320
TIGHTENING TORQUES

EAS20330
GENERAL TIGHTENING TORQUE SPECIFICATIONS

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided for each chapter of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross pattern and progressive stages until the specified tightening torque is reached. Unless otherwise specified, tightening torque specifications require clean, dry threads. Components should be at room temperature.



A. Distance between flats
B. Outside thread diameter

A (nut)	B (bolt)	General tightening torques		
		Nm	m·kg	ft·lb
10 mm	6 mm	6	0.6	4.3
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	61
22 mm	16 mm	130	13.0	94

1. Main axle
2. Oil delivery pipe
3. Drive axle

1. Right handlebar switch lead
2. Clutch cable
3. Main switch lead
4. Left handlebar switch lead
5. Horn lead
6. Horn
7. Throttle cables
8. Brake hose
9. Throttle cable (return side)
10. Throttle cable (pull side)

A. Route the clutch cable so as to get along the front side of the main switch after passing it through the guide.
B. Pass the main switch lead through the guide wire.
C. Pass the left handlebar switch lead through the guide wire.
D. Pass the clutch switch lead through outside of the left handlebar switch lead.
E. Point the tip of the band (excessive part) to the left side of the vehicle and cut the surplus section.
F. Clamp the section between 0 and 20 mm (0 and 0.79 in) from the split of the under bracket.
G. Clamp the leads inside the front fork of the vehicle. Point the exit of the horn lead to the left front fork side.
H. Fit in the clamp from the inner side to the outer side of the vehicle so that the return side is positioned upper and the pull side is lower at the upper side of the vehicle above the brake hose.
I. 0 to 30 mm (0 to 1.18 in)
J. Route two throttle cables behind the brake hose, pass between the inside of the under bracket's upper side front fork.
K. 20 to 40 mm (0.8 to 1.6 in)
L. Point the tip of the band (excessive part) to the right side of the vehicle and cut the surplus section.
M. Pass the left handlebar switch lead through upper side of the steering damper bracket.
N. Cut the clamp tip leaving 2 to 4 mm (0.08 to 0.16 in).
O. Outside of the vehicle.
P. Inside of the vehicle.

1. Fuel tank
2. O-ring
3. Fuel hose
4. Fuel tank drain hose
5. Fuel tank breather hose
6. Air filter stay
7. Clip
8. Fuel tank bracket
9. Fuel hose clamp
10. Fuel pump assembly

A. Install the lip of O-ring facing upward.
B. Install the part pointing the white paint part of the hose to the left side of the vehicle.
C. Point the clip grip to the inside of the vehicle.
D. Fuel piping connector attachment directions. (fuel pump side)
Always use hands to connect/disconnect the connector without using tool.
E. Insert the connector until the click sound is heard and check that the connector does not come off.
Make sure that no foreign matter is caught in the sealing section.
(It is prohibited to wear the cotton work gloves or equivalent coverings.)
F. After item “E” mentioned above is finished, check that the clamp is inserted from the down side “a”, “b” and “c” sections are perfectly equipped.
G. This part works as a dropout stopper.
H. Fuel piping connector attachment directions. (engine side)
Always use hands to connect/disconnect the connector without using tool.
I. After Step “H” as above is finished, check that the connector is completely attached by sliding the double lock (orange part) “d” on the connector as shown in the illustration and seeing if it touches firmly or not.

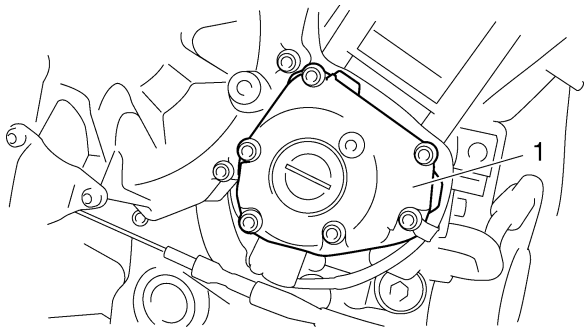
EAS20470
ENGINE

EAS20490
ADJUSTING THE VALVE CLEARANCE

The following procedure applies to all of the valves.

NOTE:
- Valve clearance adjustment should be made on a cold engine, at room temperature.
- When the valve clearance is to be measured or adjusted, the piston must be at top dead center (TDC) on the compression stroke.

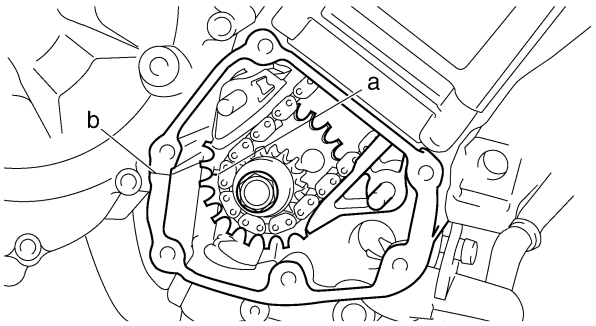
1. Remove:
   - Rider seat
     Refer to "GENERAL CHASSIS" on page 4-1.
   - Fuel tank
     Refer to "FUEL TANK" on page 7-1.
   - Air filter case
     Refer to "GENERAL CHASSIS" on page 4-1.
   - Lower cowlings
   - Side cowlings
     Refer to "GENERAL CHASSIS" on page 4-1.
   - Throttle body assembly
     Refer to "THROTTLE BODIES" on page 7-4.
   - Air cut-off valve
     Refer to "AIR INDUCTION SYSTEM" on page 7-9.
   - Radiator
   - Radiator fan motor
     Refer to "RADIATOR" on page 6-1.
2. Remove:
   - Ignition coils
   - Spark plugs
   - Cylinder head cover
   - Cylinder head cover gasket
     Refer to "CAMSHAFTS" on page 5-9.
3. Remove:
   - Pickup rotor cover “1”



4. Measure:
   - Valve clearance
     Out of specification → Adjust.

Valve clearance (cold)
Intake
0.11–0.20 mm (0.0043–0.0079 in)
Exhaust
0.26–0.30 mm (0.0102–0.0118 in)

a. Turn the crankshaft counterclockwise.
b. When piston #1 is at TDC on the compression stroke, align the TDC mark “a” on the generator rotor with the mark “b” on the crankcase.



NOTE:
TDC on the compression stroke can be found when the camshaft lobes are turned away from each other.

c. Measure the valve clearance with a thickness gauge “2”.

NOTE:
- If the valve clearance is incorrect, record the measured reading.
- Measure the valve clearance in the following sequence.

EAS20870
ADJUSTING THE CLUTCH CABLE FREE PLAY

1. Check:
   - Clutch cable free play “a”
     Out of specification → Adjust.

Clutch lever free play
10.0–15.0 mm (0.39–0.59 in)

2. Adjust:
   - Clutch cable free play

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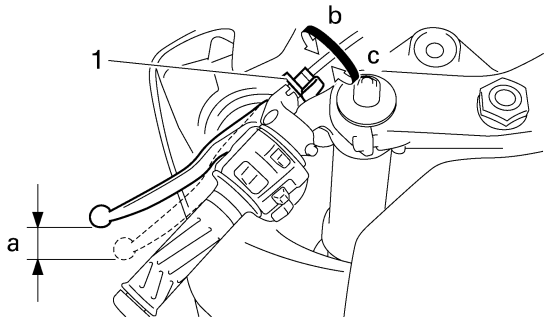
Handlebar side

a. Turn the adjusting bolt “1” in direction “b” or “c” until the specified clutch cable free play is obtained.

Direction “b”
Clutch cable free play is increased.
Direction “c”
Clutch cable free play is decreased.

b. Tighten the locknut “1”.



NOTE:
If the specified clutch cable free play cannot be obtained on the handlebar side of the cable, use the adjusting nut on the engine side.

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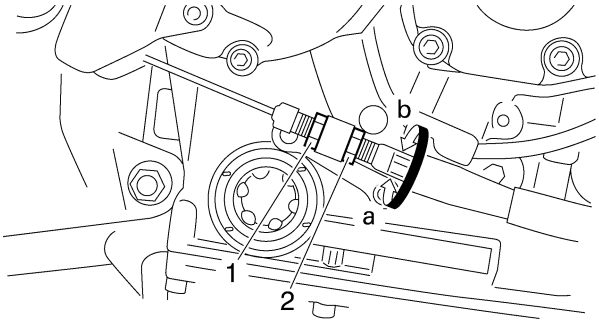
Engine side

a. Loosen the locknuts “1”.
b. Turn the adjusting bolt “2” in direction “a” or “b” until the specified clutch cable free play is obtained.

Direction “a”
Clutch cable free play is increased.
Direction “b”
Clutch cable free play is decreased.

Locknut
7 Nm (0.7 m·kg, 5.1 ft·lb)

c. Tighten the locknuts “1”.



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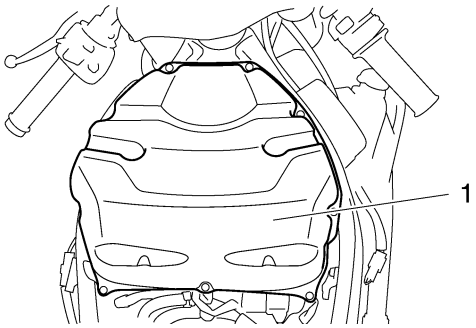
EAS20960
REPLACING THE AIR FILTER ELEMENT

1. Remove:
   - Rider seat
     Refer to "GENERAL CHASSIS" on page 4-1.
   - Fuel tank side covers
   - Fuel tank
     Refer to "FUEL TANK" on page 7-1.
2. Remove:
   - Air filter case cover “1”
     Refer to "GENERAL CHASSIS" on page 4-1.



3. Check:
   - Air filter element “1”
     Damage → Replace.

NOTE:
The air filter needs more frequent service if you are riding in unusually wet or dusty areas.

- **When refilling, be careful that water does not enter the brake fluid reservoir. Water will significantly lower the boiling point of the brake fluid and could cause vapor lock.**

ECA13540

CAUTION:

Brake fluid may damage painted surfaces and plastic parts. Therefore, always clean up any spilt brake fluid immediately.

NOTE:

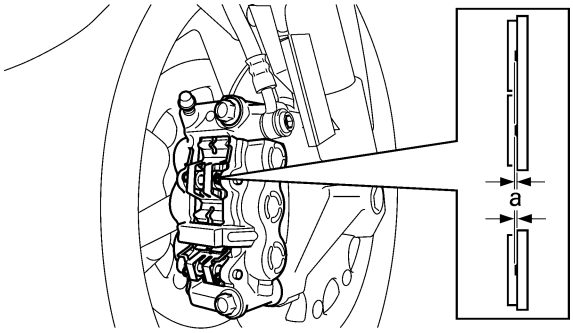
In order to ensure a correct reading of the brake fluid level, make sure the top of the brake fluid reservoir is horizontal.

EAS21250

CHECKING THE FRONT BRAKE PADS

The following procedure applies to all of the brake pads.

1. Operate the brake.
2. Check:
   - Front brake pad
     Wear indicators "a" almost touch the brake disc → Replace the brake pads as a set.
     Refer to "FRONT BRAKE" on page 4-19.

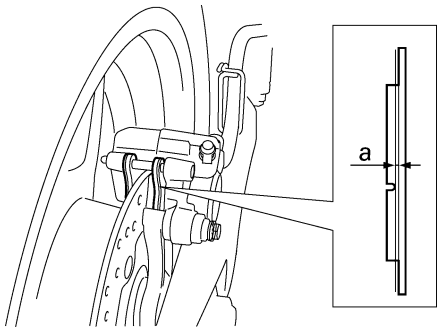


EAS21260

CHECKING THE REAR BRAKE PADS

The following procedure applies to all of the brake pads.

1. Operate the brake.
2. Check:
   - Rear brake pad
     Wear indicators "a" almost touch the brake disc → Replace the brake pads as a set.
     Refer to "REAR BRAKE" on page 4-32.

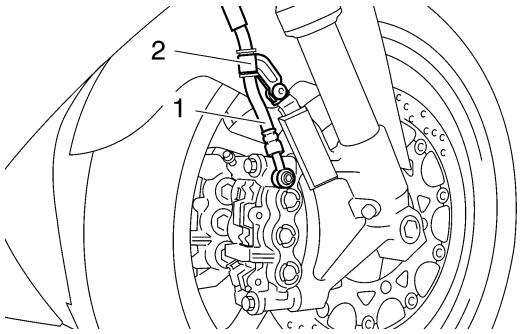


EAS21280

CHECKING THE FRONT BRAKE HOSES

The following procedure applies to all of the brake hoses and brake hose clamps.

1. Check:
   - Brake hose "1"
     Cracks/damage/wear → Replace.
2. Check:
   - Brake hose clamp "2"
     Loose → Tighten the clamp bolt.



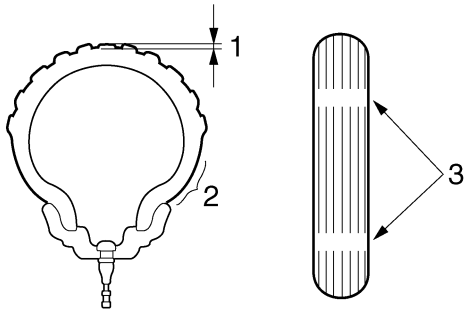
3. Hold the vehicle upright and apply the brake several times.
4. Check:
   - Brake hose
     Brake fluid leakage → Replace the damaged hose.
     Refer to "FRONT BRAKE" on page 4-19.

EAS21290

CHECKING THE REAR BRAKE HOSE

1. Check:
   - Brake hose "1"
     Cracks/damage/wear → Replace.
2. Check:
   - Brake hose clamp "2"
     Loose Connection → Tighten the clamp bolt.

2. Check:
   • Tire surfaces
   Damage/wear → Replace the tire.



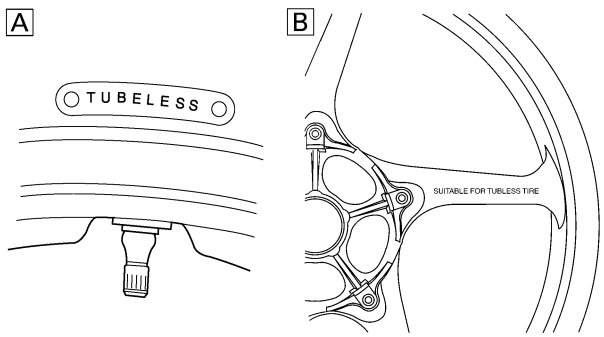
1. Tire tread depth
2. Side wall
3. Wear indicator

Wear limit (front)
0.8 mm (0.03 in)
Wear limit (rear)
0.8 mm (0.03 in)

EWA14080

⚠ WARNING

- **Do not use a tubeless tire on a wheel designed only for tube tires to avoid tire failure and personal injury from sudden deflation.**
- **When using a tube tire, be sure to install the correct tube.**
- **Always replace a new tube tire and a new tube as a set.**
- **To avoid pinching the tube, make sure the wheel rim band and tube are centered in the wheel groove.**
- **Patching a punctured tube is not recommended. If it is absolutely necessary to do so, use great care and replace the tube as soon as possible with a good quality replacement.**



A. Tire
B. Wheel

Tube wheel	Tube tire only
Tubeless wheel	Tube or tubeless tire

EWA14090

⚠ WARNING

After extensive tests, the tires listed below have been approved by Yamaha Motor Co., Ltd. for this model. The front and rear tires should always be by the same manufacturer and of the same design. No guarantee concerning handling characteristics can be given if a tire combination other than one approved by Yamaha is used on this vehicle.

Front tire
Size
120/70 ZR17M/C (58W)
Manufacturer/model
PIRELLI/DIABLO CORSA E
Manufacturer/model
MICHELIN/Pilot POWER

Rear tire
Size
190/50 ZR17M/C (73W)
Manufacturer/model
PIRELLI/DIABLO CORSA L
Manufacturer/model
MICHELIN/ Pilot POWER

EWA13210

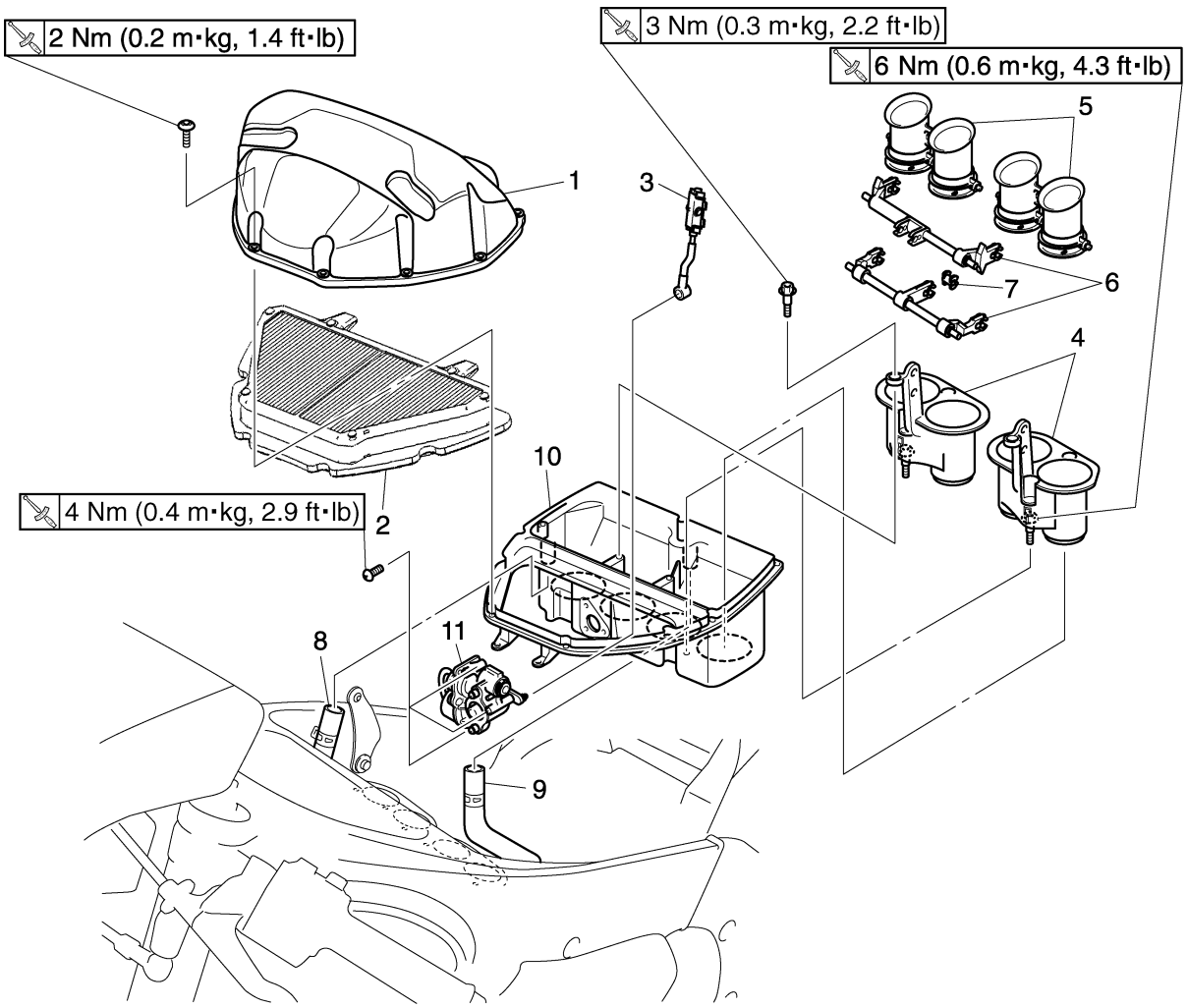
⚠ WARNING

New tires have a relatively low grip on the road surface until they have been slightly worn. Therefore, approximately 100 km should be traveled at normal speed before any high-speed riding is done.

NOTE:

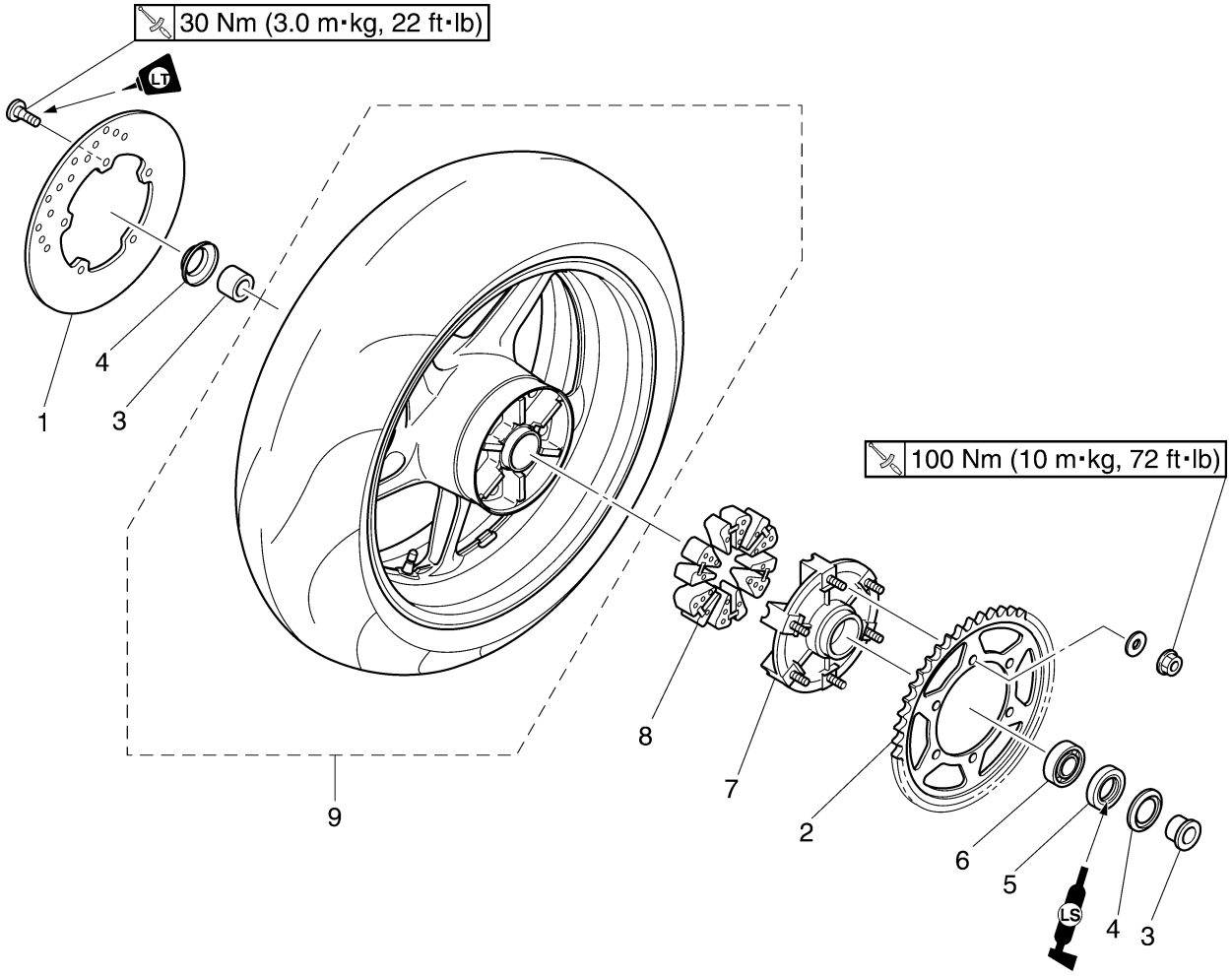
For tires with a direction of rotation mark “1”:
- Install the tire with the mark pointing in the direction of wheel rotation.
- Align the mark “2” with the valve installation point.

Removing the air filter case



Order	Job/Parts to remove	Q'ty	Remarks
	Rider seat		Refer to "GENERAL CHASSIS" on page 4-1.
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
1	Air filter case cover	1	
2	Air filter	1	
3	Intake funnel servo motor rod assembly	1	
4	Intake funnel joint	2	
5	Intake funnel	2	
6	Intake funnel rod	2	
7	Bushing 2	5	
8	Air induction system hose	1	
9	Crankcase breather hose	1	
10	Air filter case	1	
11	Intake funnel servo motor	1	
			For installation, reverse the removal procedure.

Removing the brake disc and rear wheel sprocket



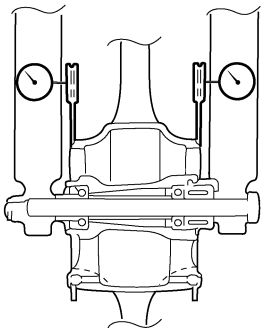
Order	Job/Parts to remove	Q'ty	Remarks
1	Rear brake disc	1	
2	Rear wheel sprocket	1	
3	Collar	2	
4	Dust cover	2	
5	Oil seal	1	
6	Bearing	1	
7	Rear wheel drive hub	1	
8	Rear wheel drive hub damper	6	
9	Rear wheel	1	
			For installation, reverse the removal procedure.

EAS22220
INTRODUCTION
EWA14100
⚠ WARNING

Disc brake components rarely require disassembly. Therefore, always follow these preventive measures:
- **Never disassemble brake components unless absolutely necessary.**
- **If any connection on the hydraulic brake system is disconnected, the entire brake system must be disassembled, drained, cleaned, properly filled, and bled after reassembly.**
- **Never use solvents on internal brake components.**
- **Use only clean or new brake fluid for cleaning brake components.**
- **Brake fluid may damage painted surfaces and plastic parts. Therefore, always clean up any spilt brake fluid immediately.**
- **Avoid brake fluid coming into contact with the eyes as it can cause serious injury.**
- **FIRST AID FOR BRAKE FLUID ENTERING THE EYES:**
- **Flush with water for 15 minutes and get immediate medical attention.**

EAS22240
CHECKING THE FRONT BRAKE DISCS
The following procedure applies to both brake discs.
1. Remove:
   - Front wheel
     Refer to "FRONT WHEEL" on page 4-8.
2. Check:
   - Brake disc
     Damage/galling → Replace.
3. Measure:
   - Brake disc deflection
     Out of specification → Correct the brake disc deflection or replace the brake disc.

Brake disc deflection limit
0.10 mm (0.0039 in)



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a. Place the vehicle on a suitable stand so that the front wheel is elevated.
b. Before measuring the front brake disc deflection, turn the handlebar to the left or right to ensure that the front wheel is stationary.
c. Remove the brake caliper.
d. Hold the dial gauge at a right angle against the brake disc surface.
e. Measure the deflection 1.5 mm (0.06 in) below the edge of the brake disc.

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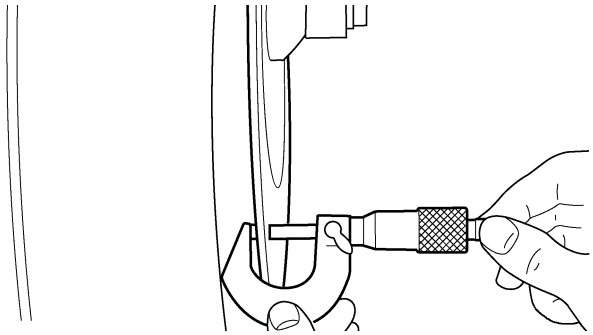
4. Measure:
   - Brake disc thickness
     Measure the brake disc thickness at a few different locations.
     Out of specification → Replace.

Brake disc thickness limit
4.5 mm (0.18 in)



5. Adjust:
   - Brake disc deflection

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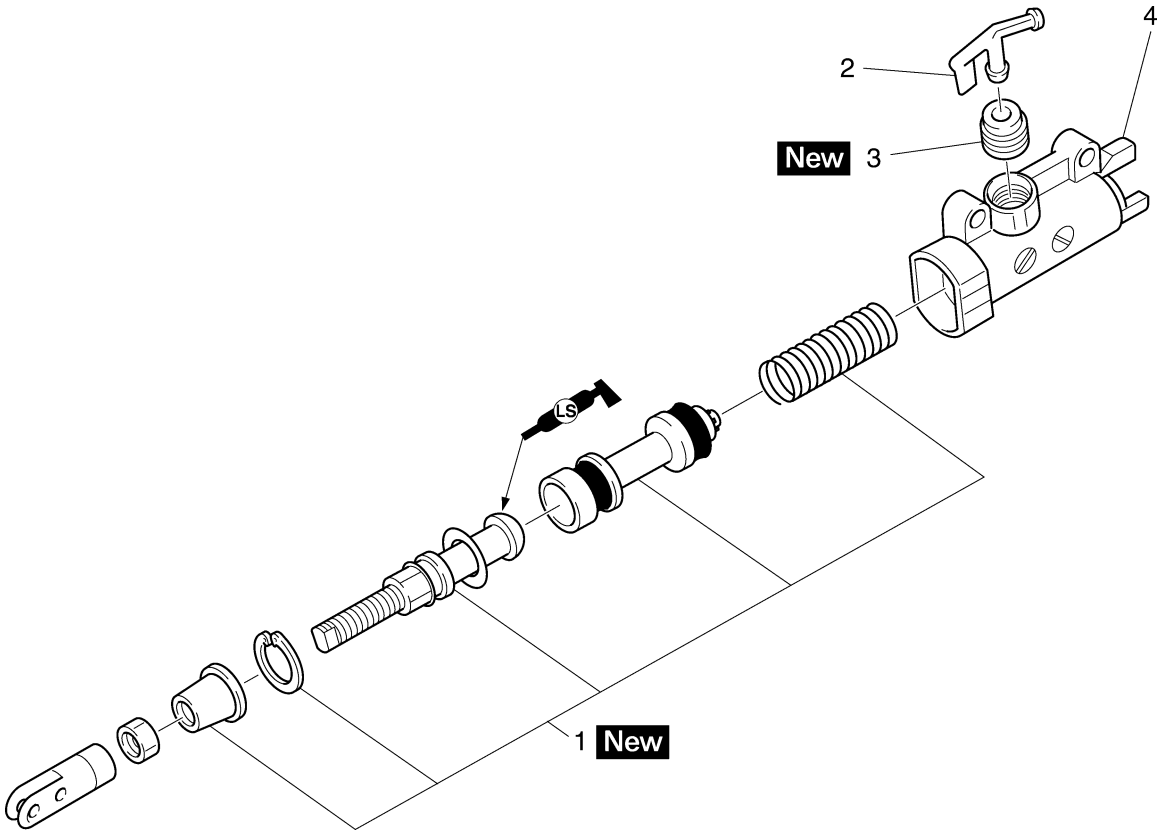
a. Remove the brake disc.
b. Rotate the brake disc by one bolt hole.
c. Install the brake disc.

NOTE:
Tighten the brake disc bolts in stages and in a crisscross pattern.

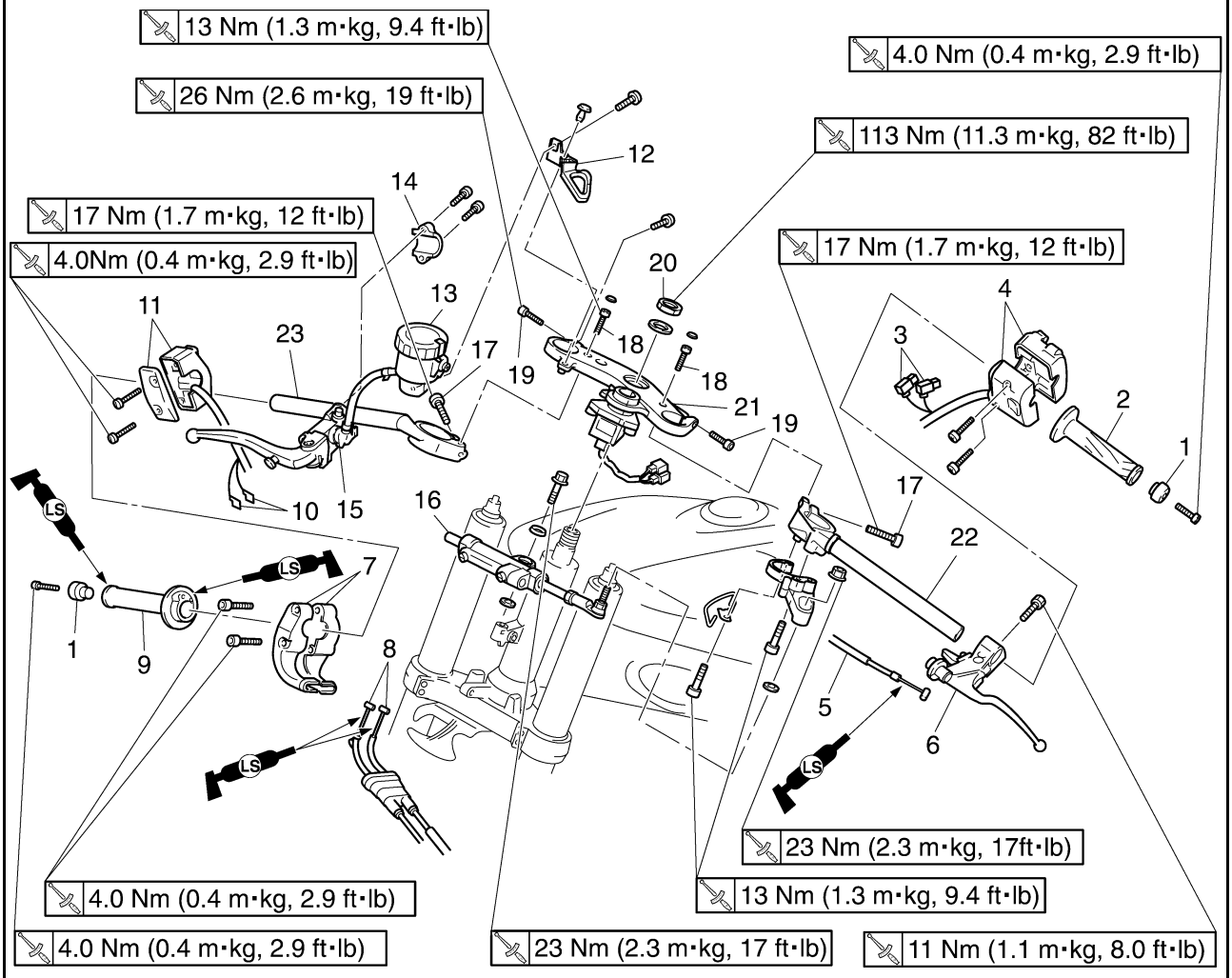
Disassembling the rear brake master cylinder



Order	Job/Parts to remove	Q'ty	Remarks
1	Brake master cylinder kit	1	
2	Hose joint	1	
3	Bush	1	
4	Brake master cylinder body	1	
			For assembly, reverse the disassembly procedure.

EAS22850
HANDLEBARS

Removing the handlebars



Order	Job/Parts to remove	Q'ty	Remarks
	Front cowling		Refer to "GENERAL CHASSIS" on page 4-1.
	Side cowling		Refer to "GENERAL CHASSIS" on page 4-1.
1	Grip end	2	
2	Handlebar grip	1	
3	Clutch switch connector	2	Disconnect.
4	Left handlebar switch	1	
5	Clutch cable	1	
6	Clutch lever holder	1	
7	Throttle cable housing	1	
8	Throttle cable	2	
9	Throttle grip	1	
10	Front brake light switch lead connector	2	Disconnect.
11	Right handlebar switch	1	
12	Clutch cable holder	1	
13	Brake fluid reservoir tank	1	
14	Brake master cylinder holder	1	
15	Brake master cylinder	1	
16	Steering damper	1	
17	Handlebar pinch bolt	2	Loosen.

- Oil seal clip “2”
- Oil seal “3”
- Washer “4”

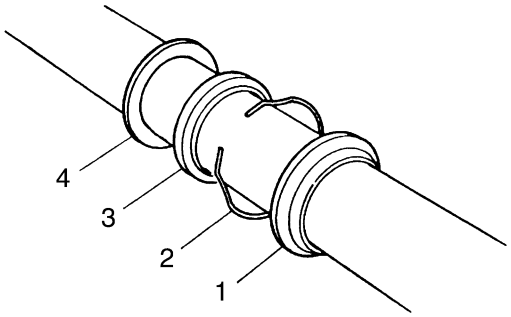
ECA14220

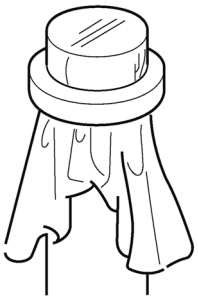
CAUTION:

Make sure the numbered side of the oil seal faces up.

NOTE:

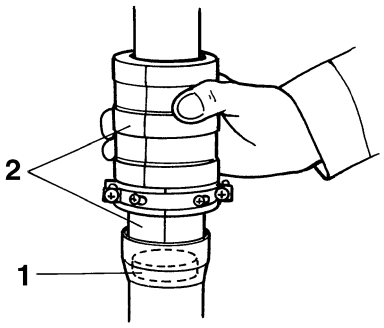
- Before installing the oil seal, lubricate its lips with lithium-soap-based grease.
- Lubricate the outer surface of the inner tube with fork oil.
- Before installing the oil seal, cover the top of the front fork leg with a plastic bag to protect the oil seal during installation.





5. Install:
   - Washer
   - Oil seal “1”
     (with the fork seal driver “2”)

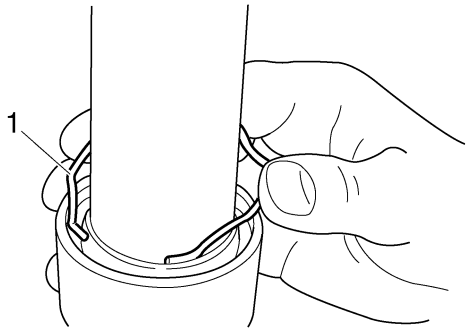
Fork seal driver
90890-01442
Adjustable fork seal driver (36–46 mm)
YM-01442



6. Install:
   - Oil seal clip “1”

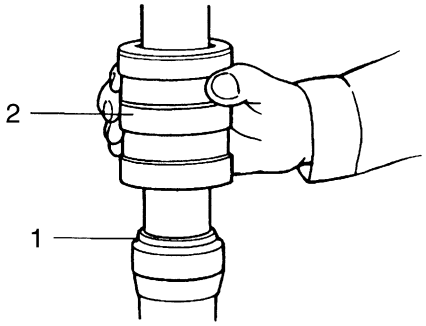
NOTE:

Adjust the oil seal clip so that it fits into the outer tube’s groove.



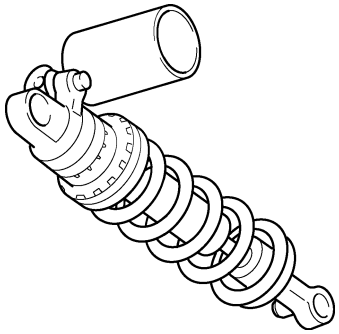
7. Install:
   - Dust seal “1”
     (with the fork seal driver “2”)

Fork seal driver
90890-01442
Adjustable fork seal driver (36–46 mm)
YM-01442



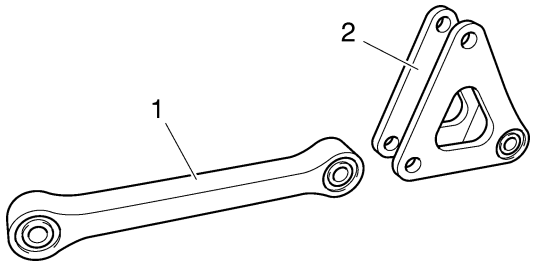
8. Install:
   - Rod puller “1”
   - Rod puller attachment “2”
     (onto the damper rod “3”)

- Dust seals
  Damage/wear → Replace.
- Bolts
  Bends/damage/wear → Replace.



EAS23260
CHECKING THE CONNECTING ARM AND RELAY ARM

1. Check:
   - Connecting arm “1”
   - Relay arm “2”
     Damage/wear → Replace.



2. Check:
   - Bearings
   - Oil seals
     Damage/pitting → Replace.
3. Check:
   - Collars
     Damage/scratches → Replace.

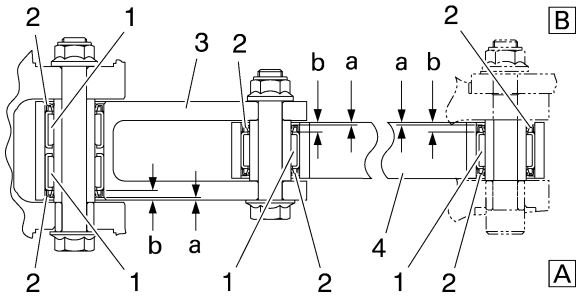
EAS23270
INSTALLING THE RELAY ARM

1. Lubricate:
   - Collars
   - Bearings

Recommended lubricant
Lithium soap base grease

2. Install:
   - Bearing “1”
   - Oil seals “2”
     (to the relay arm)
   - Relay arm “3”
   - Connecting arm “4”

Installed depth “a”
1.0 mm (0.04 in)
Installed depth “b”
4.0 mm (0.16 in)



A. Left side
B. Right side

EAS23310
INSTALLING THE REAR SHOCK ABSORBER ASSEMBLY

1. Lubricate:
   - Collars
   - Bearings

Recommended lubricant
Molybdenum disulfide grease

2. Install:
   - Rear shock absorber assembly

NOTE:
Install the connecting arm front bolt from the left.

3. Tighten:
   - Rear shock absorber upper bracket nut

Rear shock absorber upper bracket nut
92 Nm (9.2 m·kg, 67 ft·lb)

   - Rear shock absorber assembly lower nut

Rear shock absorber assembly lower nut
44 Nm (4.4 m·kg, 32 ft·lb)

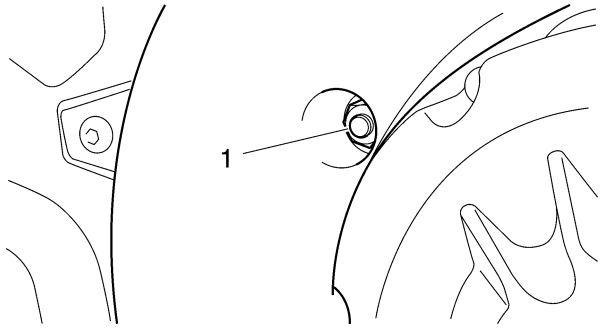
   - Relay-arm-to-swingarm nut

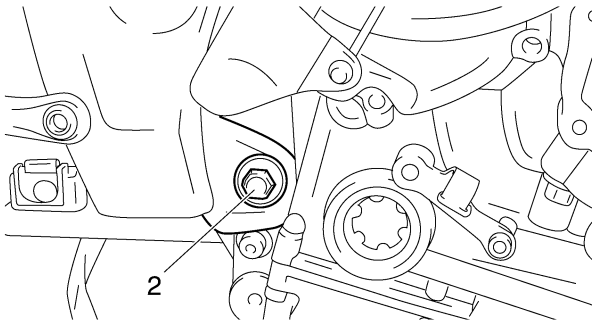
Relay-arm-to-swingarm nut
44 Nm (4.4 m·kg, 32 ft·lb)

ENGINE

Upper locknut
51 Nm (5.1 m·kg, 37 ft·lb)
Lower locknut
51 Nm (5.1 m·kg, 37 ft·lb)

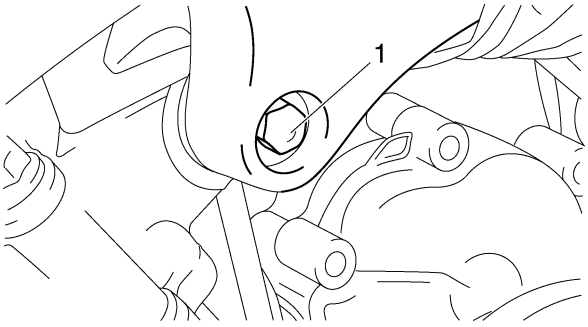
NOTE:
First tighten the lower locknut, and then tighten the upper locknut.





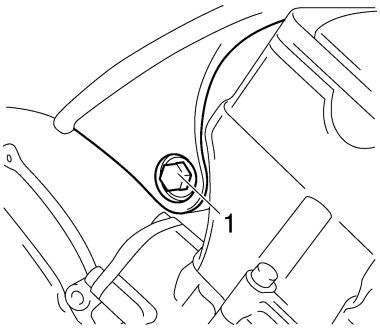
8. Tighten:
   • Left front engine mounting bolt “1”

Engine mounting bolt (front left side)
45 Nm (4.5 m·kg, 33 ft·lb)



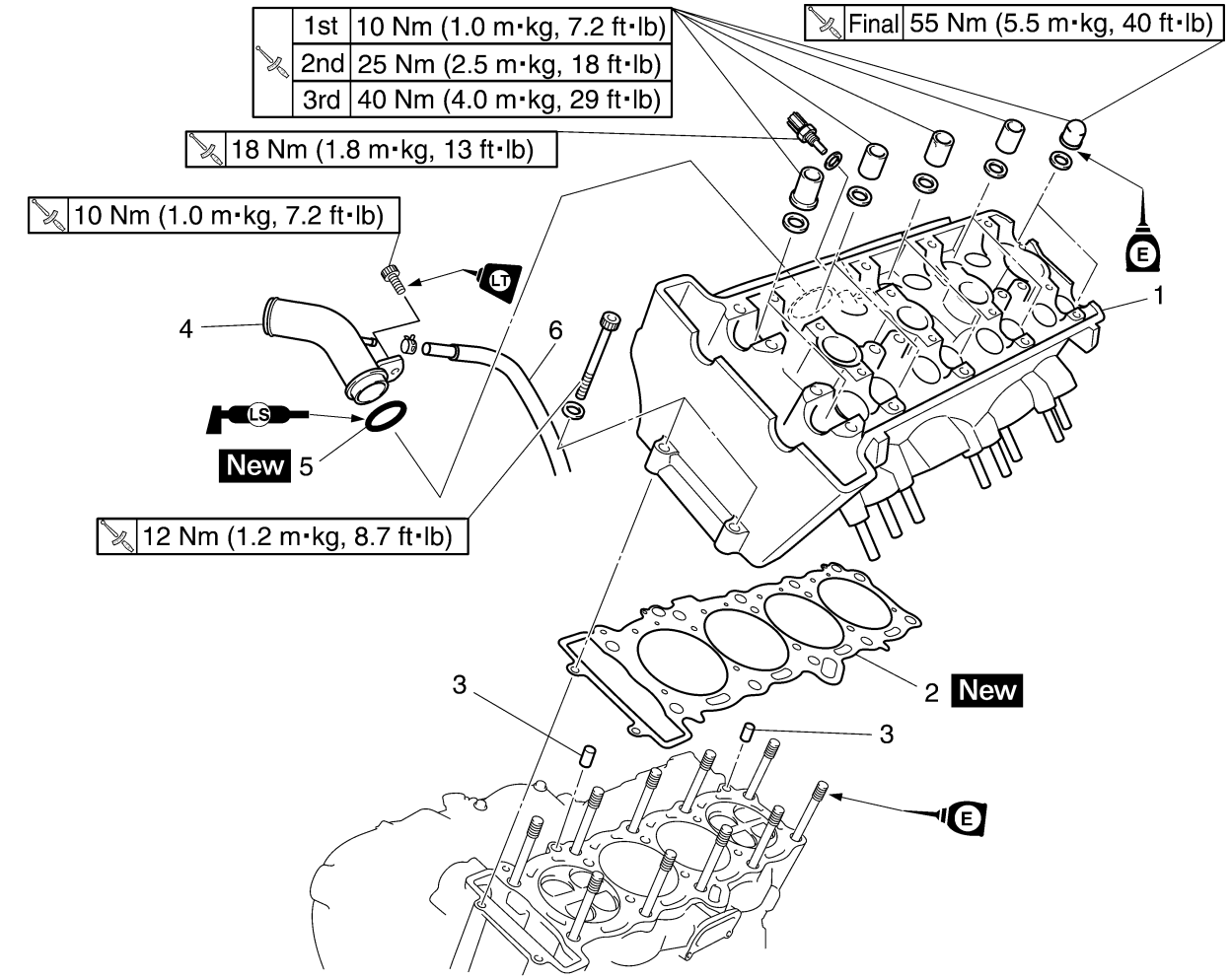
9. Tighten:
   • Right front engine mounting bolt “1”

Engine mounting bolt (front right side)
45 Nm (4.5 m·kg, 33 ft·lb)



EAS24100
CYLINDER HEAD

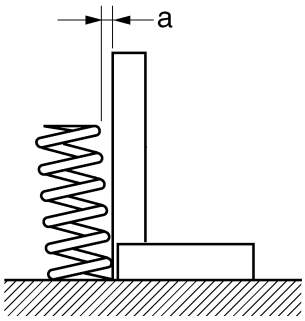
Removing the cylinder head



Order	Job/Parts to remove	Q'ty	Remarks
	Engine		Refer to "ENGINE REMOVAL" on page 5-1.
	Intake camshaft		Refer to "CAMSHAFTS" on page 5-9.
	Exhaust camshaft		Refer to "CAMSHAFTS" on page 5-9.
1	Cylinder head	1	
2	Cylinder head gasket	1	
3	Dowel pin	2	
4	Coolant pipe	1	
5	O-ring	1	
6	Water pump breather hose	1	
			For installation, reverse the removal procedure.

3. Measure:
   • Valve spring tilt “a”
   Out of specification → Replace the valve spring.

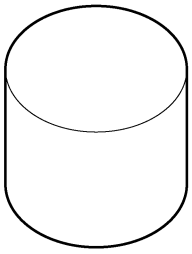
Spring tilt limit
Spring tilt (intake)
2.5 °/1.7 mm
Spring tilt (exhaust)
2.5 °/1.7 mm



EAS24320
CHECKING THE VALVE LIFTERS

The following procedure applies to all of the valve lifters.

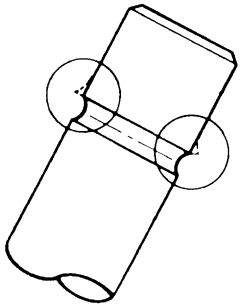
1. Check:
   • Valve lifter
   Damage/scratches → Replace the valve lifters and cylinder head.



EAS24340
INSTALLING THE VALVES

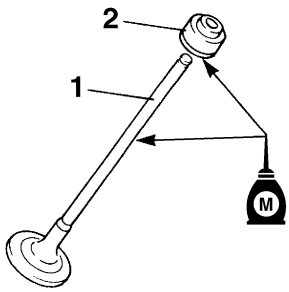
The following procedure applies to all of the valves and related components.

1. Deburr:
   • Valve stem end
   (with an oil stone)



2. Lubricate:
   • Valve stem “1”
   • Valve stem seal “2”
   (with the recommended lubricant)

Recommended lubricant
Molybdenum disulfide oil



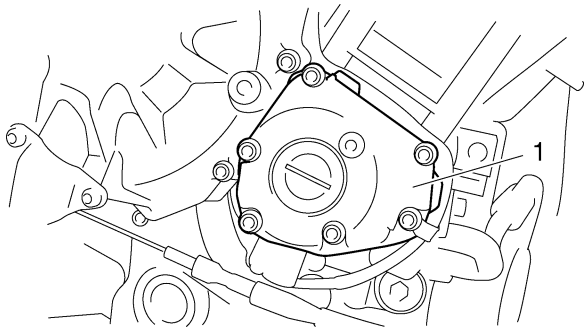
3. Install:
   • Valve “1”
   • Lower spring seat “2”
   • Valve stem seal “3”
   • Valve spring “4”
   • Upper spring seat “5”
   (into the cylinder head)

NOTE:
- Make sure each valve is installed in its original place. Refer to the following embossed marks.
  Intake valve: Pink paint mark
  Exhaust valve: “4C8”
- Install the valve springs with the larger pitch “a” facing up.

EAS24530
REMOVING THE CRANKSHAFT POSITION SENSOR

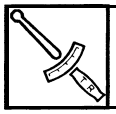
1. Disconnect:
   - Crankshaft position sensor lead coupler
2. Remove:
   - Crankshaft position sensor
   - O-ring
   - Pickup coil rotor cover “1”

NOTE:
Loosen each bolt 1/4 of a turn at a time, in stages and in a crisscross pattern.
After all of the bolts are fully loosened, remove them.



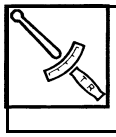
EAS24540
INSTALLING THE CRANKSHAFT POSITION SENSOR

1. Install:
   - Gasket New
   - Pickup rotor cover “1”

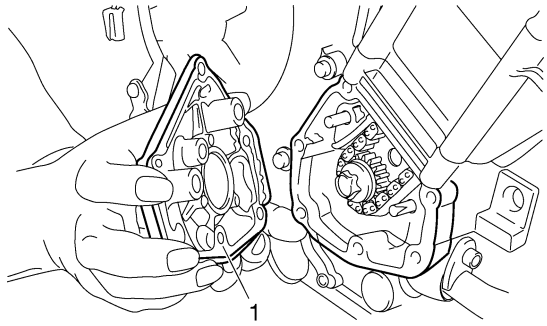


Pickup rotor cover
12 Nm (1.2 m·kg, 8.7 ft·lb)

   - O-ring New
   - Crankshaft position sensor



Crankshaft position sensor bolt
10 Nm (1.0 m·kg, 7.2 ft·lb)
LOCTITE®



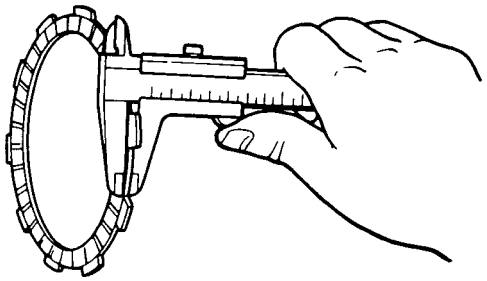
2. Connect
   - Crankshaft position sensor lead coupler

- Springs
- Pressure plate 2
- Conical spring washer
- Thrust plate 2

EAS25100
CHECKING THE FRICTION PLATES
The following procedure applies to all of the friction plates.
1. Check:
   - Friction plate
     Damage/wear → Replace the friction plates as a set.
2. Measure:
   - Friction plate thickness
     Out of specification → Replace the friction plates as a set.

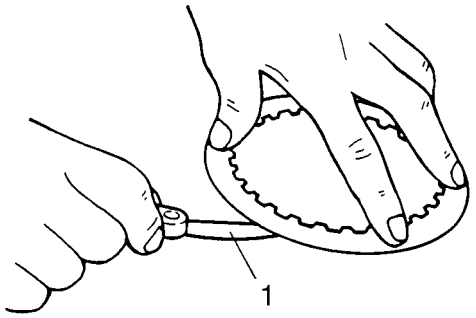
NOTE:
Measure the friction plate at four places.

Friction plate thickness
2.90–3.10 mm (0.114–0.122 in)
Wear limit
2.80 mm (0.1102 in)



EAS25110
CHECKING THE CLUTCH PLATES
The following procedure applies to all of the clutch plates.
1. Check:
   - Clutch plate
     Damage → Replace the clutch plates as a set.
2. Measure:
   - Clutch plate warpage
     (with a surface plate and thickness gauge “1”)
     Out of specification → Replace the clutch plates as a set.

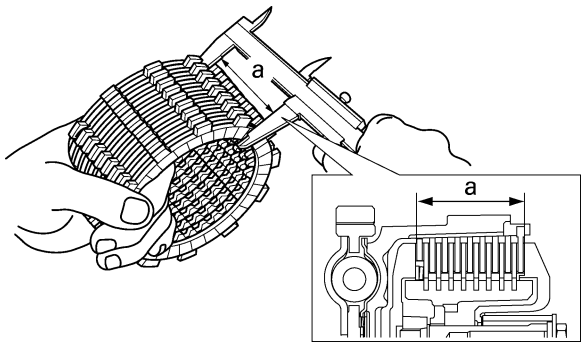
Warpage limit
0.10 mm (0.0039 in)



3. Measure:
   - assembly width “a” of the friction plates and clutch plates
     Out of specification → Adjust.

Assembly width
42.4–43.0 mm (1.67–1.69 in)

NOTE:
Perform the thickness measurement without applying the oil.



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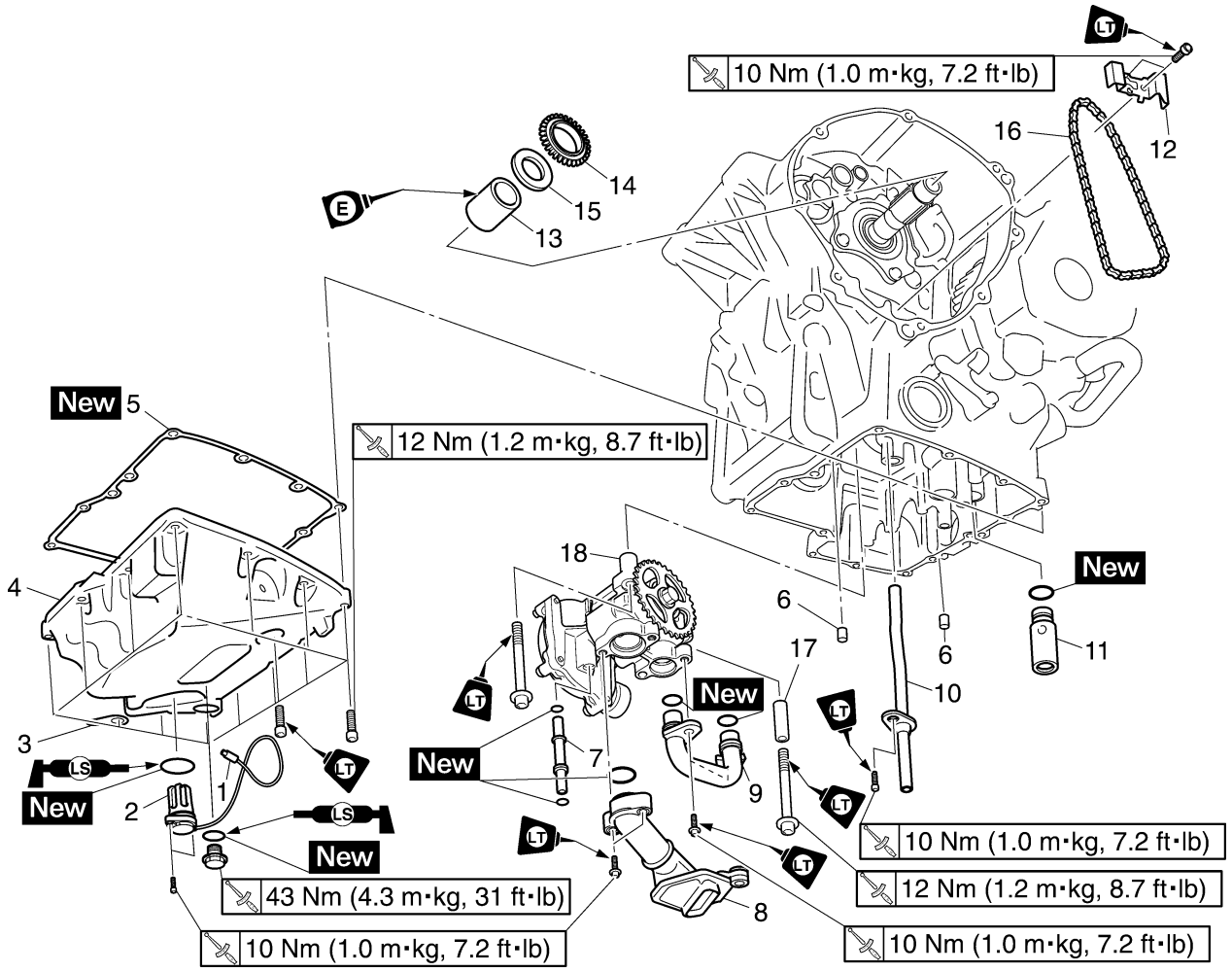
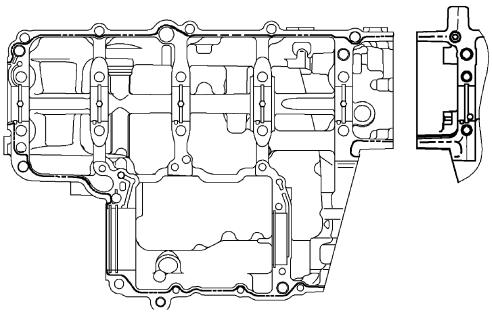
a. Assembly width adjusted by clutch plate “1” and “2”.
b. Select the clutch plate from the following table.
   Clutch plate “1”

Part No.	Thickness	
4B1-16324-00	1.6 mm (0.062 in)	
5VY-16325-00	2.0 mm (0.079 in)	STD
4B1-16325-00	2.3 mm (0.091 in)	

Removing the oil pan and oil pump



Order	Job/Parts to remove	Q'ty	Remarks
8	Oil strainer	1	
9	Oil pipe	1	
10	Oil delivery pipe	1	
11	Relief valve assembly	1	
12	Oil/water pump assembly drive chain guide	1	
13	Collar	1	
14	Oil/water pump assembly drive sprocket	1	
15	Washer	1	
16	Oil/water pump assembly drive chain	1	
17	Dowel pin	1	
18	Oil/water pump assembly	1	
			For installation, reverse the removal procedure.

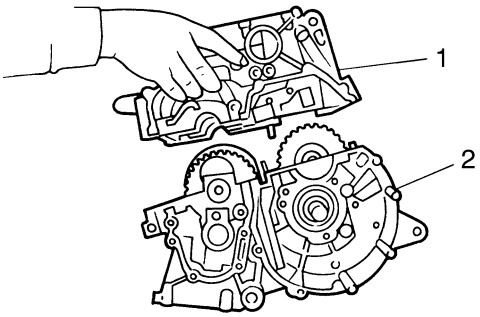


3. Install:
   - Dowel pin
4. Set the shift drum assembly and transmission gears in the neutral position.
5. Install:
   - Lower crankcase “1”
     (onto the upper crankcase “2”)

ECA13980

CAUTION:

Before tightening the crankcase bolts, make sure the transmission gears shift correctly when the shift drum assembly is turned by hand.



6. Install:
   - Crankcase bolts

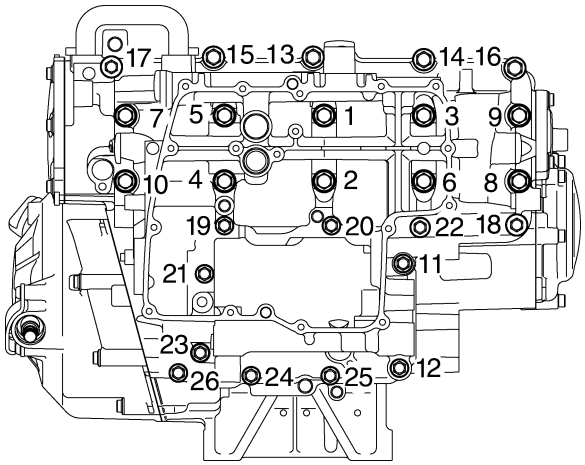
NOTE:

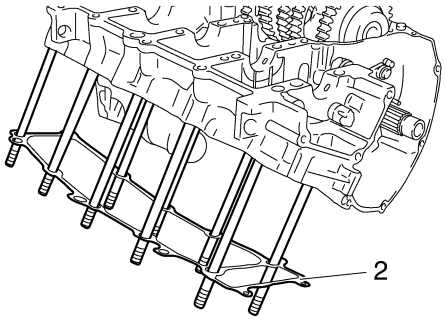
- Lubricate the bolt threads with engine oil.
- Install a washer on bolts “1” – “10” and “22”.
- Seal bolt “18”
- Tighten the bolts in the tightening sequence cast on the crankcase.

M9 × 105 mm (4.1 in) bolts: “1” – “10”
M8 × 60 mm (2.4 in) bolt: “11” LOCTITE®
M8 × 60 mm (2.4 in) bolts: “12”, “16”
M8 × 50 mm (2.0 in) bolts: “13” – “15”
M6 × 65 mm (2.5 in) bolts: “17”, “18”
M6 × 70 mm (2.8 in) bolts: “19”, “21”, “23”
M6 × 50 mm (2.0 in) bolts: “20”, “26”
M6 × 60 mm (2.4 in) bolt and washer: “22”
M6 × 60 mm (2.4 in) bolts: “24”, “25”

Crankcase bolt
Bolt “1”–“10”
1st: 20 Nm (2.0 m·kg, 14 ft·lb)
2nd*: 20 Nm (2.0 m·kg, 14 ft·lb)
3rd: +60°
Bolt “11”–“16”
24 Nm (2.4 m·kg, 17 ft·lb)
Bolt “17”–“26”
10 Nm (1.0 m·kg, 7.2 ft·lb)

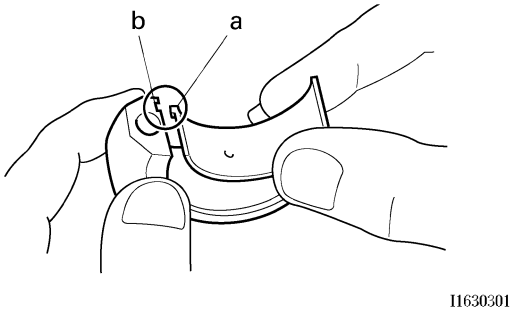
*Following the tightening order, loosen the bolt one by one and then retighten it to the specific torque.

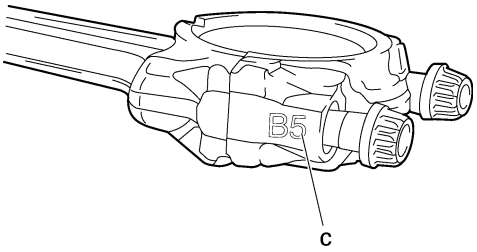




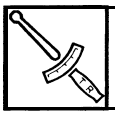
8. Install:
   • Big end bearings
   (onto the connecting rods and connecting rod caps)

NOTE:
- Align the projections “a” on the big end bearings with the notches “b” in the connecting rods and connecting rod caps.
- Be sure to reinstall each big end bearing in its original place.
- Make sure that the characters “c” a on both the connecting rod and connecting rod cap are aligned.





9. Tighten:
   • Connecting rod bolts

	**Connecting rod bolt** **29.4 Nm (3.0 m·kg, 21 ft·lb)**

NOTE:
- Install by carrying out the following procedures in order to assemble in the most suitable condition.
- First tighten the bolts to 15 Nm (1.5 m·kg, 11 ft·lb)
- Retighten the bolts to 29.4 Nm (3.0 m·kg, 21 ft·lb)

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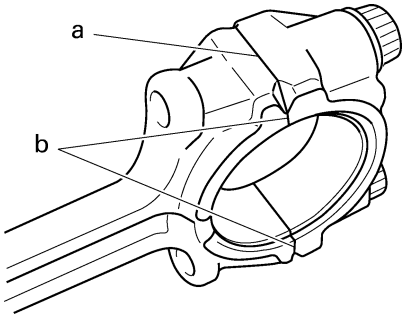
a. Replace the connecting rod bolts with new ones.
b. Clean the connecting rod bolts.
c. After installing the big end bearing, assemble the connecting rod and connecting rod cap once using a single unit of the connecting rod.
d. Tighten the connecting rod bolt while checking that the sections shown “a” and “b” are flush with each other by touching the surface.

NOTE:
To install the big end bearing, care should be taken not to install it at an angle and the position should not be out of alignment.



a. Side machined face
b. Thrusting faces (4 places at front and rear)

e. Loosen the connecting rod bolt, remove the connecting rod and connecting rod cap and install these parts to the crankshaft with the big end bearing kept in the current condition.

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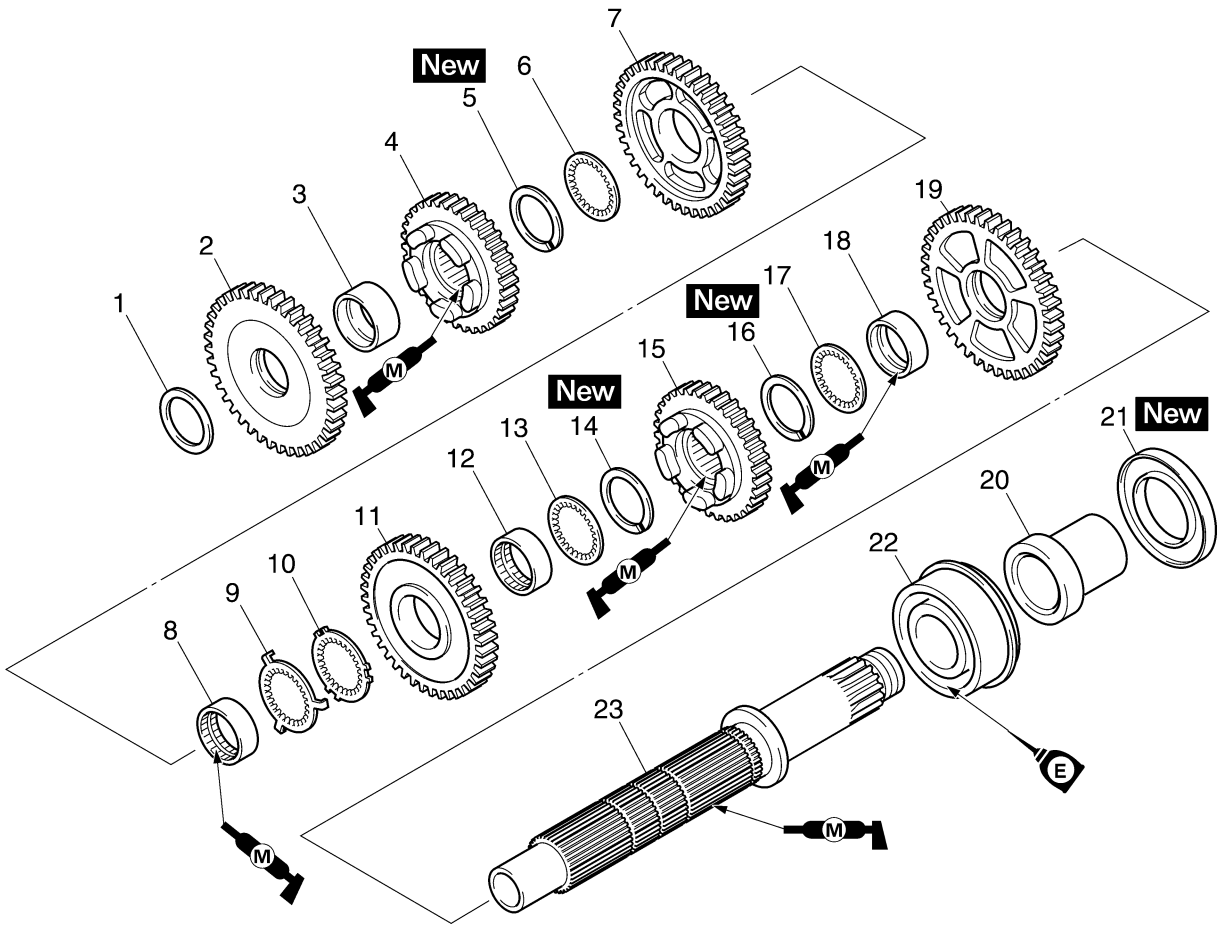
10. Install:
   • Piston assemblies “1”
   (into the cylinder)

NOTE:
While compressing the piston rings with one hand, install the connecting rod assembly into the cylinder with the other hand.

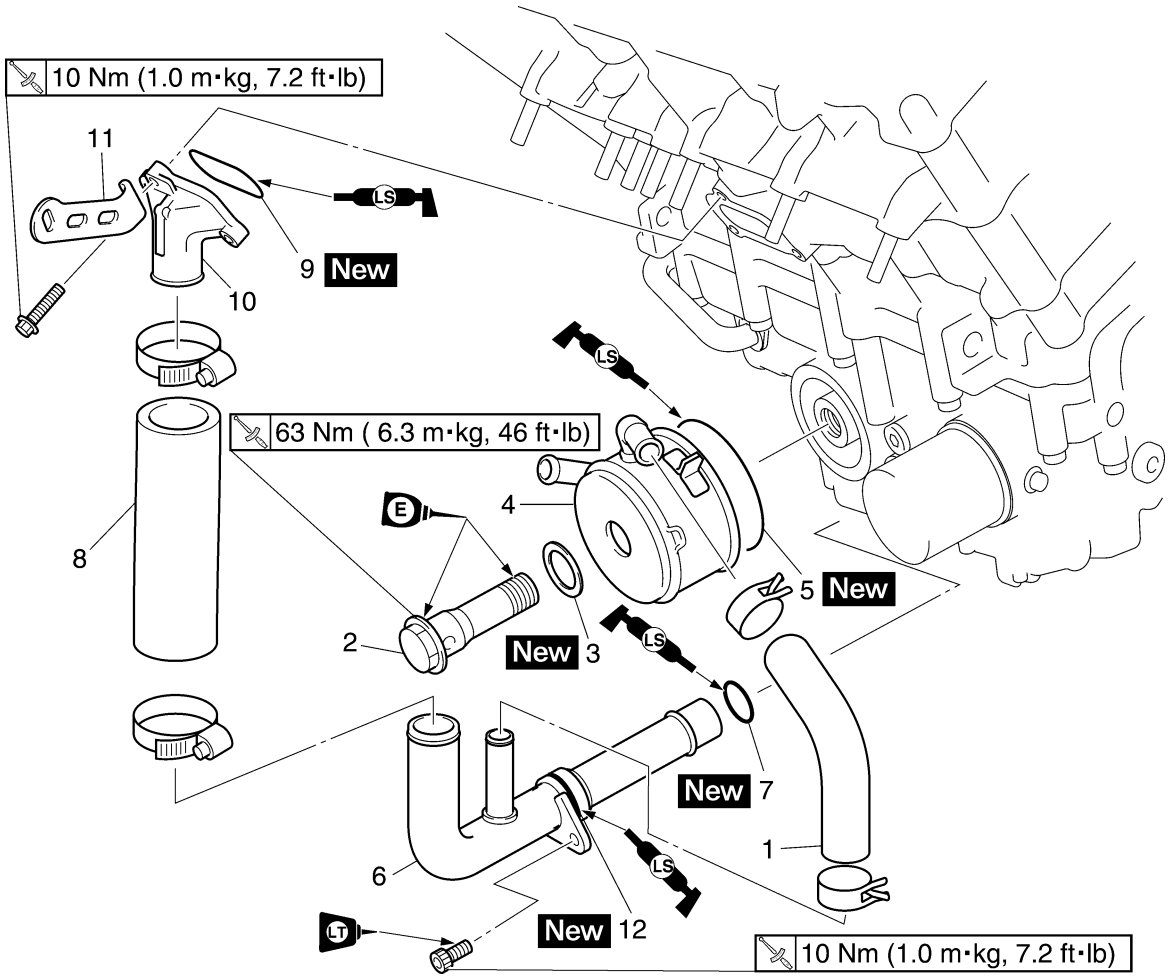
Disassembling the drive axle assembly



Order	Job/Parts to remove	Q'ty	Remarks
			For assembly, reverse the disassembly procedure.

EAS26410
OIL COOLER

Removing the oil cooler

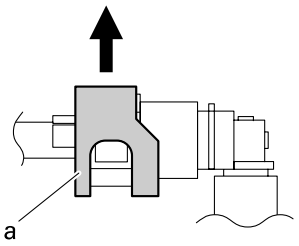


Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-11.
	Coolant		Drain. Refer to "CHANGING THE COOLANT" on page 3-19.
1	Oil cooler inlet hose	1	
2	Oil cooler bolt	1	Loosen.
3	Washer	1	Disconnect.
4	Oil cooler	1	Disconnect.
5	O-ring	1	
6	Water pump outlet pipe	1	
7	O-ring	1	
8	Water jacket joint inlet hose	1	
9	O-ring	1	
10	Water jacket joint	1	
11	Stay	1	
12	O-ring	1	
			For installation, reverse the removal procedure.

EAS26630
REMOVING THE FUEL TANK
1. Extract the fuel in the fuel tank through the fuel tank cap with a pump.
2. Remove:
   - Fuel hose connector cover
   - Fuel hose
   - Fuel sender coupler
   - Fuel pump coupler
   - Fuel tank drain hose
   - Fuel tank breather hose
   - Fuel tank side cover

ECA4C81002
CAUTION:
- **Be sure to disconnect the fuel hose by hand. Do not forcefully disconnect the hose with tools.**
- **Although the fuel has been removed from the fuel tank be careful when removing the fuel hoses, since there may be fuel remaining in it.**

NOTE:
- To remove the fuel hose from the fuel injection pipe, slide the cover "a" on the end of the hose in the direction of the arrow shown and then remove the hose.
- Before removing the hoses, place a few rags in the area under where it will be removed.



3. Remove:
   - Fuel tank

NOTE:
Do not set the fuel tank down so that the installation surface of the fuel pump is directly under the tank. Be sure to lean the fuel tank in an upright position.

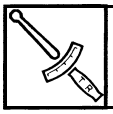
EAS26640
REMOVING THE FUEL PUMP
1. Remove:
   - Fuel pump

ECA14720
CAUTION:
- **Do not drop the fuel pump or give it a strong shock.**
- **Do not touch the base section of the fuel sender.**

EAS26670
CHECKING THE FUEL PUMP BODY
1. Check:
   - Fuel pump body
     Obstruction → Clean.
     Cracks/damage → Replace the fuel pump assembly.
2. Check:
   - Diaphragms and gaskets
     Turn/fatigue/cracks → Replace the fuel pump assembly.

EAS26690
CHECKING THE FUEL PUMP OPERATION
1. Check:
   - Fuel pump operation
     Refer to "CHECKING THE FUEL PRESSURE" on page 7-6.

EAS26710
INSTALLING THE FUEL PUMP
1. Install:
   - Fuel pump



Fuel pump bolt
4 Nm (0.4 m·kg, 2.9 ft·lb)

NOTE:
- Do not damage the installation surface of the fuel tank when installing the fuel pump.
- Always use a new fuel pump gasket.
- Install the fuel pump as shown in the illustration.
- Align the projection "a" on the fuel pump with the slot in the fuel pump bracket.
- Tighten the fuel pump bolts in stages in a crisscross pattern and to the specified torque.

ELECTRICAL SYSTEM

a. WHEN THE TRANSMISSION IS IN NEUTRAL
b. WHEN THE SIDESTAND IS UP AND THE CLUTCH LEVER IS PULLED TO THE HANDLEBAR

1. Battery
2. Main fuse
3. Main switch
4. Ignition fuse
5. Engine stop switch
6. Starting circuit cut-off relay
7. Diode
8. Clutch switch
9. Sidestand switch
10. Neutral switch
11. Start switch
12. Starter relay
13. Starter motor
14. Battery negative lead
15. Ground

8 Check the headlight relay (dimmer). Refer to "CHECKING THE RELAYS" on page 8-80.	NG→	Replace the headlight relay.
OK↓		
9 Check the entire lighting system's wiring. Refer to "LIGHTING SYSTEM" on page 8-15.	NG→	Properly connect or repair the lighting system's wiring.
OK↓		
This circuit is OK.		

Fault code No.	Symptom	Probable cause of malfunction	Diagnostic code No.
20	When the main switch is turned to “ON”, the atmospheric pressure sensor voltage and intake air pressure sensor voltage differ greatly.	• Atmospheric pressure sensor hose is clogged. • Intake air pressure sensor hose is clogged, kinked, or pinched. • Malfunction of the atmospheric pressure sensor in the intermediate electrical potential. • Malfunction of the intake air pressure sensor in the intermediate electrical potential. • Malfunction in ECU.	03 02
21	Coolant temperature sensor: open or short circuit detected.	• Open or short circuit in wire harness. • Defective coolant temperature sensor. • Malfunction in ECU. • Improperly installed coolant temperature sensor.	06
22	Air temperature sensor: open or short circuit detected.	• Open or short circuit in wire harness. • Defective air temperature sensor. • Malfunction in ECU. • Improperly installed air temperature sensor.	05
23	Atmospheric pressure sensor: open or short circuit detected.	• Open or short circuit in wire harness. • Defective atmospheric pressure sensor. • Improperly installed atmospheric pressure sensor. • Malfunction in ECU.	02
24	No normal signal is received from the O_2 sensor.	• Open or short circuit in wire harness. • Defective O_2 sensor. • Malfunction in ECU. • Improperly installed O_2 sensor.	—
30	Latch up detected. No normal signal is received from the lean angle sensor.	• The vehicle has overturned. • Defective lean angle sensor. • Malfunction in ECU. • Improperly installed lean angle sensor.	08
33	Open circuit detected in the primary lead of the cylinder-#1 ignition coil.	• Open circuit in wire harness. • Malfunction in ignition coil. • Malfunction in ECU.	30
34	Open circuit detected in the primary lead of the cylinder-#2 ignition coil.	• Open circuit in wire harness. • Malfunction in ignition coil. • Malfunction in ECU.	31
35	Open circuit detected in the primary lead of the cylinder-#3 ignition coil.	• Open circuit in wire harness. • Malfunction in ignition coil. • Malfunction in ECU.	32
36	Open circuit detected in the primary lead of the cylinder-#4 ignition coil.	• Open circuit in wire harness. • Malfunction in ignition coil. • Malfunction in ECU.	33
39	Open circuit detected in a injector.	• Open or short circuit in wire harness. • Defective primary injector. • Malfunction in ECU. • Improperly installed primary injector.	36 37 38 39

Fault code No.	17	Symptom	EXUP servo motor circuit: open or short circuit detected.	
Diagnostic code No.		53	EXUP servo motor	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement method**
1	Connections • EXUP servo motor coupler • Main wire harness ECU coupler		• Check the coupler for any pins that may have pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely.	Reinstated automatically if a normal signal is received.
2	Open or short circuit in wire harness.		• Repair or replace if there is an open or short circuit. • Between EXUP servo motor coupler and ECU coupler. (Blue–Blue) (White/Red–White/Red) (Black/Blue–Black/Blue)	
3	Defective EXUP servo motor (potentiometer circuit).		• Execute the diagnostic mode. (Code No.53) • Replace if defective.	

Fault code No.	18	Symptom	EXUP servo motor is stuck.	
Diagnostic code No.		53	EXUP servo motor	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement method**
1	Connections • EXUP servo motor coupler • Main wire harness ECU coupler		• Check the coupler for any pins that may be pulled out. • Check the locking condition of the couplers. • If there is a malfunction, repair it and connect the coupler securely.	Turning the main switch to “ON”. It takes 3 seconds at the maximum before the original state returns.
2	Open or short circuit in wire harness.		• Repair or replace if there is an open or short circuit. • Between EXUP servo motor coupler and ECU coupler. (Black/Green–Black/Green) (Black/Red–Black/Red)	
3	Defective EXUP servo motor		• Execute the diagnostic mode. (Code No.53) • Replace if defective.	
4	Defective EXUP valve, pulley, and cables		Replace if defective.	

Fault code No.	42	Symptom		A No normal signals are received from the speed sensor. B Open circuit is detected in the neutral switch.
Diagnostic code No.		A	07	Speed sensor
		B	21	Neutral switch

Order	Item/components and probable cause	Check or maintenance job	Reinstatement method
A-1	Installed state of speed sensor.	Check for looseness or pinching.	Starting the engine, and activating the speed sensor by operating the vehicle.
A-2	Connections • Speed sensor coupler • Main wire harness ECU coupler	• Check the couplers for any pins that may be pulled out. • Check the locking condition of the couplers. • If there is a malfunction, repair it and connect the coupler securely.	
A-3	Open or short circuit in lead.	• Repair or replace if there is an open or short circuit. • Between speed sensor coupler and ECU coupler. (Blue–Blue) (White/Yellow–White/Yellow) (Black/Blue–Black/Blue)	
A-4	Defective speed sensor.	• Execute the diagnostic mode. (Code No. 07) • Replace if defective. Refer to "CHECKING THE SPEED SENSOR" on page 8-87.	
B-1	Installed state of neutral switch.	Check for looseness or pinching.	
B-2	Connections • Neutral switch coupler • Main wire harness ECU coupler	• Check the couplers for any pins that may be pulled out. • Check the locking condition of the couplers. • If there is a malfunction, repair it and connect the coupler securely.	
B-3	Open circuit in neutral switch lead.	• Repair or replace if there is an open circuit. • Between neutral switch coupler and relay unit coupler. (Sky blue–Sky blue) • Between relay unit coupler and ECU coupler. (Blue/Yellow–Blue/Yellow)	
B-4	Defective neutral switch.	• Execute the diagnostic mode. (Code No.21) • Replace if defective. Refer to "CHECKING THE SWITCHES" on page 8-73.	
B-5	Faulty shift drum (neutral detection area).	• Replace if defective. Refer to "TRANSMISSION" on page 5-84.	

7 Check the entire fuel pump system's wiring. Refer to "FUEL PUMP SYSTEM" on page 8-65.	NG→	Properly connect or repair the fuel pump system's wiring.
OK↓		
Replace the ECU.		

• Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.

FIRST AID IN CASE OF BODILY CONTACT:

EXTERNAL

• Skin — Wash with water.

• Eyes — Flush with water for 15 minutes and get immediate medical attention.

INTERNAL

• Drink large quantities of water or milk followed with milk of magnesia, beaten egg or vegetable oil. Get immediate medical attention.

ECA13660

CAUTION:

• This is a sealed battery. Never remove the sealing caps because the balance between cells will not be maintained and battery performance will deteriorate.

• Charging time, charging amperage and charging voltage for an MF battery are different from those of conventional batteries. The MF battery should be charged as explained in the charging method illustrations. If the battery is overcharged, the electrolyte level will drop considerably. Therefore, take special care when charging the battery.

NOTE:

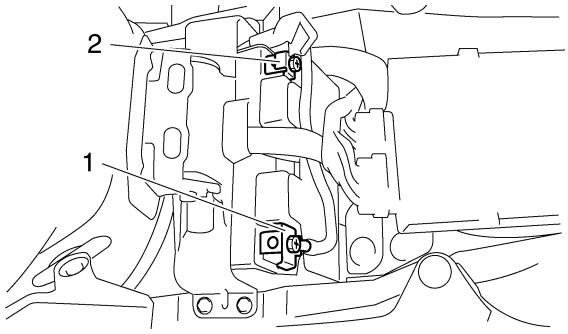
Since MF batteries are sealed, it is not possible to check the charge state of the battery by measuring the specific gravity of the electrolyte. Therefore, the charge of the battery has to be checked by measuring the voltage at the battery terminals.

1. Remove:
   • Rider seat
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Disconnect:
   • Battery leads
   (from the battery terminals)

ECA13640

CAUTION:

First, disconnect the negative battery lead "1", and then positive battery lead "2".



3. Remove:
   • Battery
4. Check:
   • Battery charge

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a. Connect a pocket tester to the battery terminals.

• Positive tester probe → positive battery terminal • Negative tester probe → negative battery terminal

NOTE:

- The charge state of an MF battery can be checked by measuring its open-circuit voltage (i.e., the voltage when the positive battery terminal is disconnected).
- No charging is necessary when the open-circuit voltage equals or exceeds 12.8 V.

b. Check the charge of the battery, as shown in the charts and the following example.

Example Open-circuit voltage = 12.0 V Charging time = 6.5 hours Charge of the battery = 20–30%

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5. Charge:
   • Battery
   (refer to the appropriate charging method illustration)

EWA13300

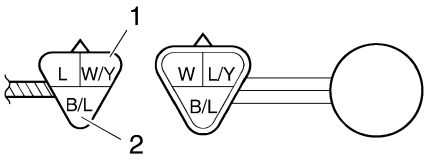
⚠ WARNING

Do not quick charge a battery.

ECA13670

CAUTION:

• Never remove the MF battery sealing caps.



b. Set the main switch to "ON".
c. Elevate the rear wheel and slowly rotate it.
d. Measure the voltage (DC 5 V) of White/Yellow and Black/Blue. With each full rotation of the rear wheel, the voltage reading should cycle from 0.6 V 4.8V to 0.6 V to 4.8 V.

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EAS4C81021
CHECKING THE RADIATOR FAN MOTORS

1. Check:
   - Radiator fan motor
     Faulty/rough movement → Replace.

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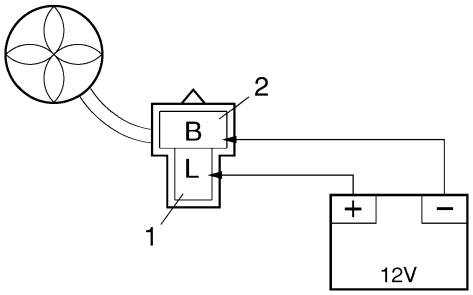
a. Disconnect the radiator fan motor coupler from the wire harness.
b. Connect the battery (DC 12 V) as shown.

- Positive tester probe
  Blue "1"
- Negative tester probe
  Black "2"



c. Measure the radiator fan motor movement.

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EAS28260
CHECKING THE COOLANT TEMPERATURE SENSOR

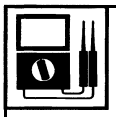
1. Remove:
   - Coolant temperature sensor

EWA14130

⚠ WARNING

- **Handle the coolant temperature sensor with special care.**
- **Never subject the coolant temperature sensor to strong shocks. If the coolant temperature sensor is dropped, replace it.**

2. Check:
   - Coolant temperature sensor resistance
     Out of specification → Replace.



Coolant temperature sensor resistance
0°C (32°F): 5.21–6.37 kΩ
80°C (176°F): 0.29–0.35 kΩ

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a. Connect the pocket tester (Ω × 100) to the coolant temperature sensor "1" as shown.

Pocket tester
90890-03112
Analog pocket tester
YU-03112-C

- Positive tester probe
  Coolant temperature sensor terminal
- Negative tester probe
  Coolant temperature sensor terminal

b. Immerse the coolant temperature sensor in a container filled with coolant "2".

NOTE:
Make sure the coolant temperature sensor terminals do not get wet.

c. Place a thermometer "3" in the coolant.