YAMAHA 2010

SERVICE MANUAL

XT1200Z(Z)

SUPER TÉNÉRÉ

23P-28197-E0

EAS20040

XT1200Z(Z) 2010
SERVICE MANUAL
©2010 by Yamaha Motor Co., Ltd.
First edition, March 2010
All rights reserved.
Any reproduction or unauthorized use without the written permission of Yamaha Motor Co., Ltd. is expressly prohibited.

EAS20071

IMPORTANT

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.

TIP

Designs and specifications are subject to change without notice.

EAS20081

IMPORTANT MANUAL INFORMATION

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

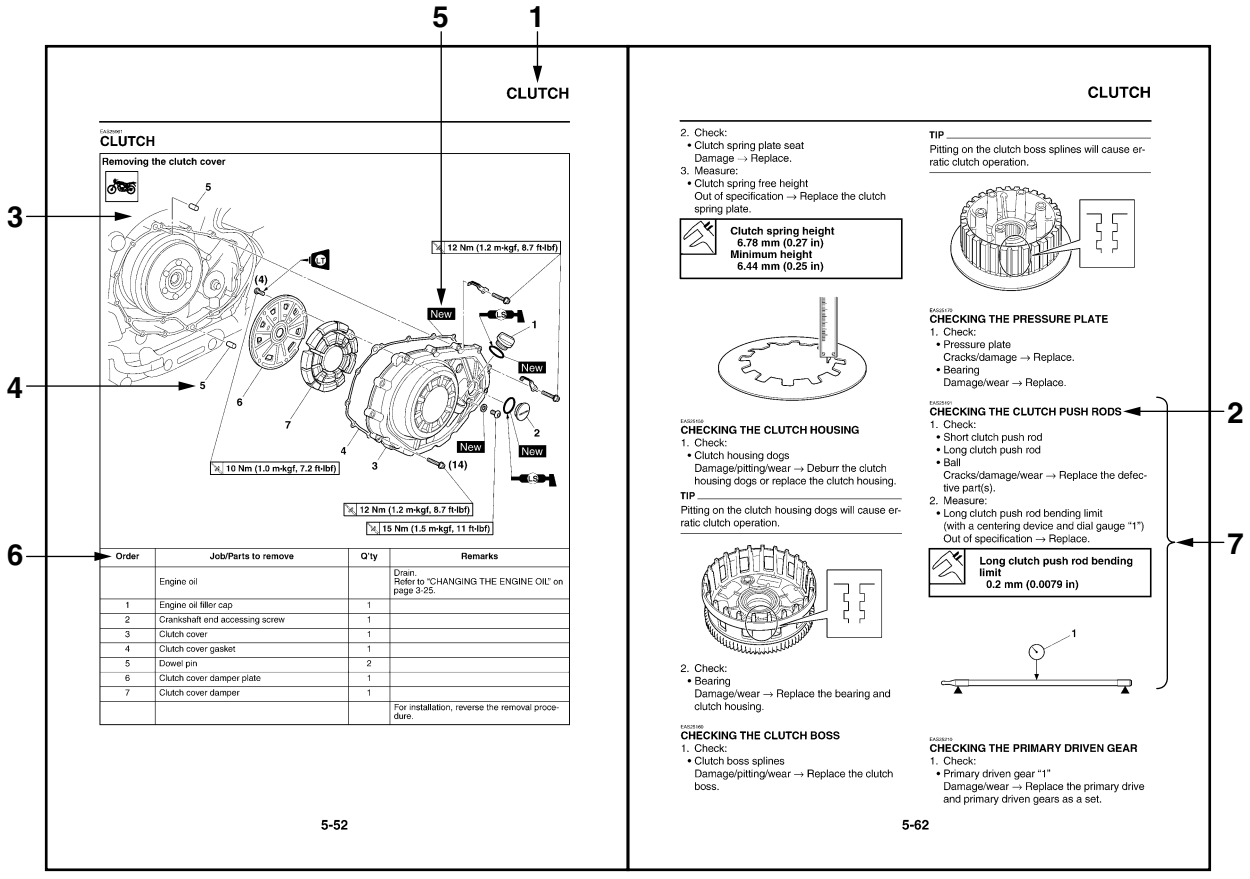
⚠	**This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.**
⚠ WARNING	**A WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
NOTICE	**A NOTICE indicates special precautions that must be taken to avoid damage to the vehicle or other property.**
TIP	A TIP provides key information to make procedures easier or clearer.

EAS20091

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.

- The manual is divided into chapters and each chapter is divided into sections. The current section title "1" is shown at the top of each page.
- Sub-section titles "2" appear in smaller print than the section title.
- To help identify parts and clarify procedure steps, there are exploded diagrams "3" at the start of each removal and disassembly section.
- Numbers "4" are given in the order of the jobs in the exploded diagram. A number indicates a disassembly step.
- Symbols "5" indicate parts to be lubricated or replaced.
  Refer to "SYMBOLS".
- A job instruction chart "6" accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.
- Jobs "7" requiring more information (such as special tools and technical data) are described sequentially.



EAS20101
SYMBOLS

The following symbols are used in this manual for easier understanding.

TIP

The following symbols are not relevant to every vehicle.

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Serviceable with engine mounted		Gear oil
	Filling fluid		Molybdenum disulfide oil
	Lubricant		Brake fluid
	Special tool		Wheel bearing grease
	Tightening torque		Lithium-soap-based grease
	Wear limit, clearance		Molybdenum disulfide grease
	Engine speed		Silicone grease
	Electrical data		Apply locking agent (LOCTITE®).
	Engine oil	New	Replace the part with a new one.

EAS20110

TABLE OF CONTENTS

GENERAL INFORMATION	1
SPECIFICATIONS	2
PERIODIC CHECKS AND ADJUSTMENTS	3
CHASSIS	4
ENGINE	5
COOLING SYSTEM	6
FUEL SYSTEM	7
ELECTRICAL SYSTEM	8
TROUBLESHOOTING	9

GENERAL INFORMATION

IDENTIFICATION 1-1
VEHICLE IDENTIFICATION NUMBER 1-1
MODEL LABEL 1-1

FEATURES 1-2
OUTLINE OF THE FI SYSTEM 1-2
FI SYSTEM 1-3
YCC-T (Yamaha Chip Controlled Throttle) 1-4
OUTLINE OF THE UBS 1-6
OUTLINE OF THE ABS 1-10
ABS COMPONENT FUNCTIONS 1-15
UBS AND ABS OPERATION 1-20
ABS SELF-DIAGNOSIS FUNCTION 1-24
ABS WARNING LIGHT AND OPERATION 1-26
OUTLINE OF THE TCS (Traction Control System) 1-28
INSTRUMENT FUNCTIONS 1-31

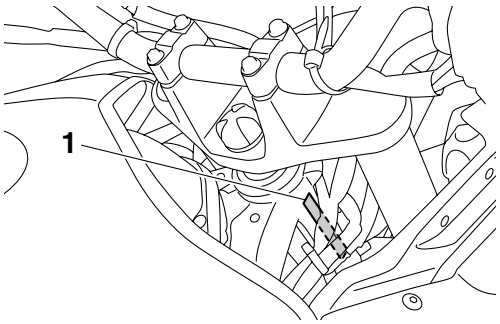
IMPORTANT INFORMATION 1-37
PREPARATION FOR REMOVAL AND DISASSEMBLY 1-37
REPLACEMENT PARTS 1-37
GASKETS, OIL SEALS AND O-RINGS 1-37
LOCK WASHERS/PLATES AND COTTER PINS 1-37
BEARINGS AND OIL SEALS 1-38
CIRCLIPS 1-38

BASIC SERVICE INFORMATION 1-39
QUICK FASTENERS 1-39
ELECTRICAL SYSTEM 1-40

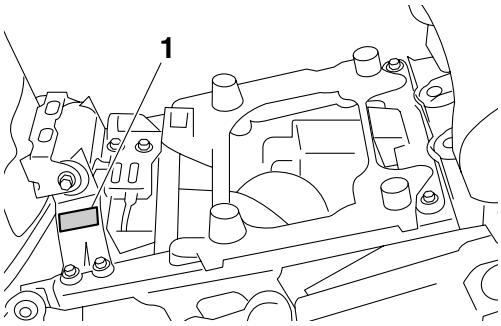
SPECIAL TOOLS 1-44

EAS20130
IDENTIFICATION

EAS20140
VEHICLE IDENTIFICATION NUMBER
The vehicle identification number “1” is stamped into the right side of the frame.



EAS20150
MODEL LABEL
The model label “1” is affixed to the frame under the rider seat. This information will be needed to order spare parts.



EAS20170
FEATURES

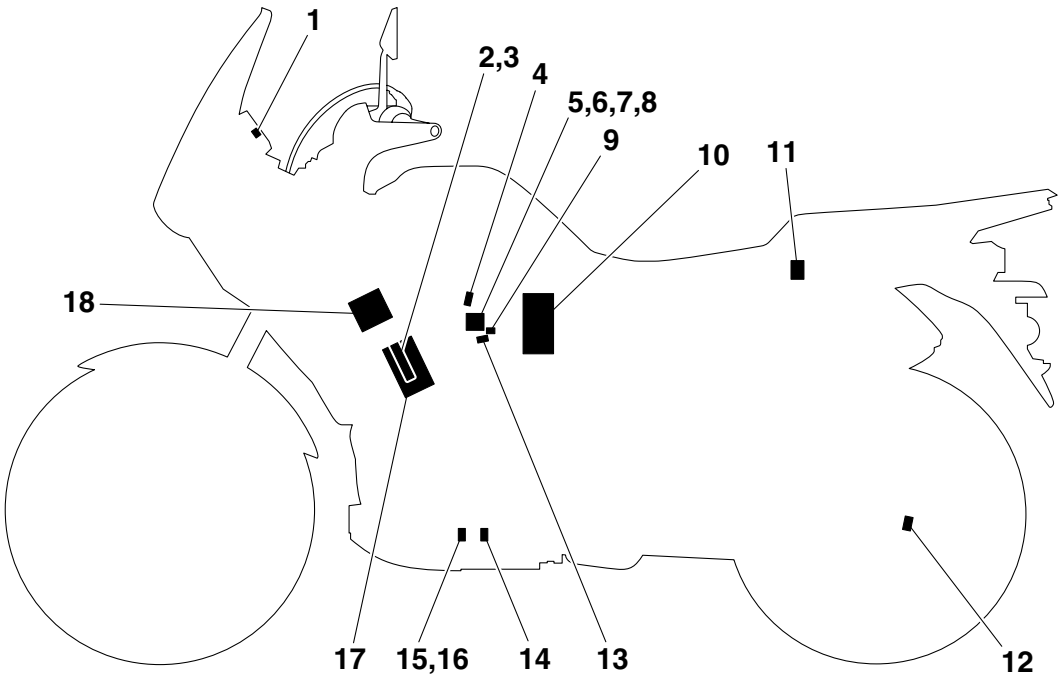
EAS30340
OUTLINE OF THE FI SYSTEM

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.

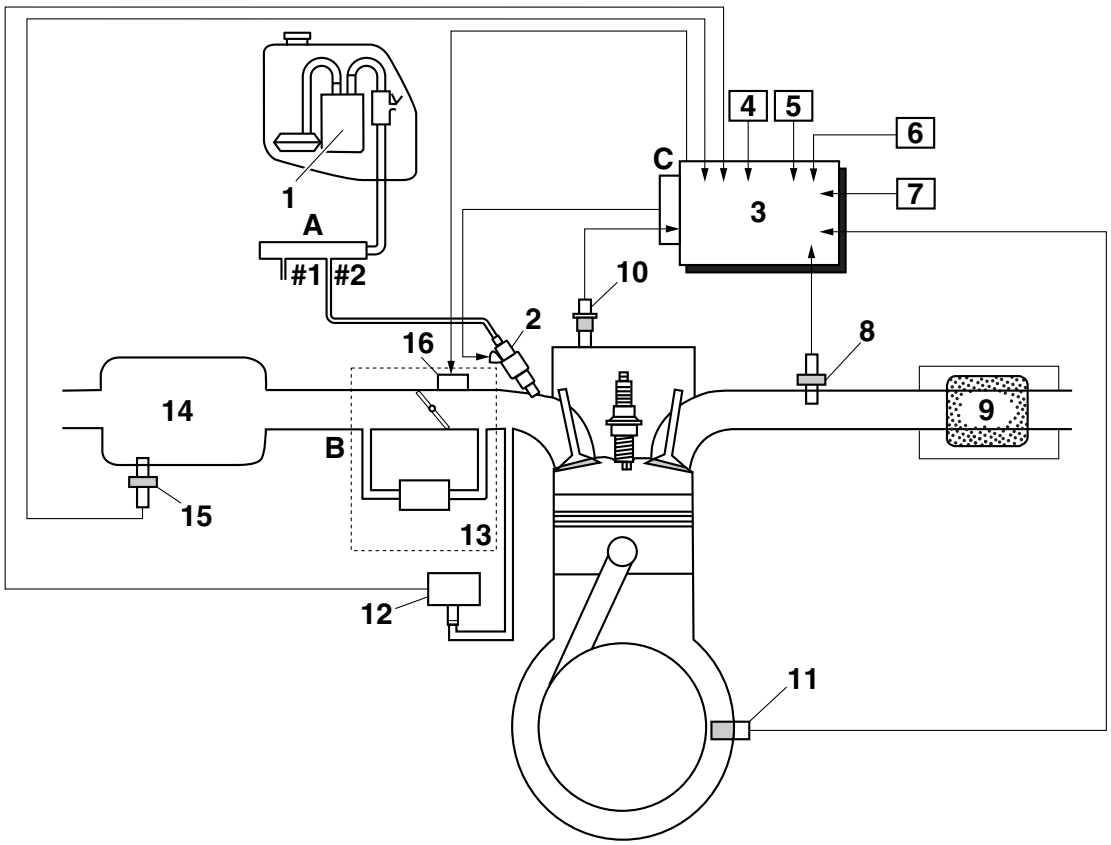


1. Engine trouble warning light
2. Ignition coils
3. Spark plugs
4. Intake air temperature sensor
5. Throttle position sensor
6. Accelerator position sensor
7. Intake air pressure sensor
8. Throttle servo motor
9. Fuel injectors
10. Fuel pump
11. Lean angle sensor
12. Rear wheel sensor
13. Coolant temperature sensor
14. Crankshaft position sensor
15. O_2 sensor #1
16. O_2 sensor #2
17. Battery
18. ECU (engine control unit)

EAS23P1100
FI SYSTEM

The fuel pump delivers fuel to the fuel injector via the fuel filter. The pressure regulator maintains the fuel pressure that is applied to the fuel injector at 324 kPa (3.24 kgf/cm², 47.0 psi). Accordingly, when the energizing signal from the ECU energizes the fuel injector, the fuel passage opens, causing the fuel to be injected into the intake manifold only during the time the passage remains open. Therefore, the longer the length of time the fuel injector is energized (injection duration), the greater the volume of fuel that is supplied. Conversely, the shorter the length of time the fuel injector is energized (injection duration), the lesser the volume of fuel that is supplied.

The injection duration and the injection timing are controlled by the ECU. Signals that are input from the throttle position sensor, accelerator position sensor, coolant temperature sensor, lean angle sensor, crankshaft position sensor, intake air pressure sensor, intake air temperature sensor, rear wheel sensor and O_2 sensors enable the ECU to determine the injection duration. The injection timing is determined through the signals from the crankshaft position sensor. As a result, the volume of fuel that is required by the engine can be supplied at all times in accordance with the driving conditions.



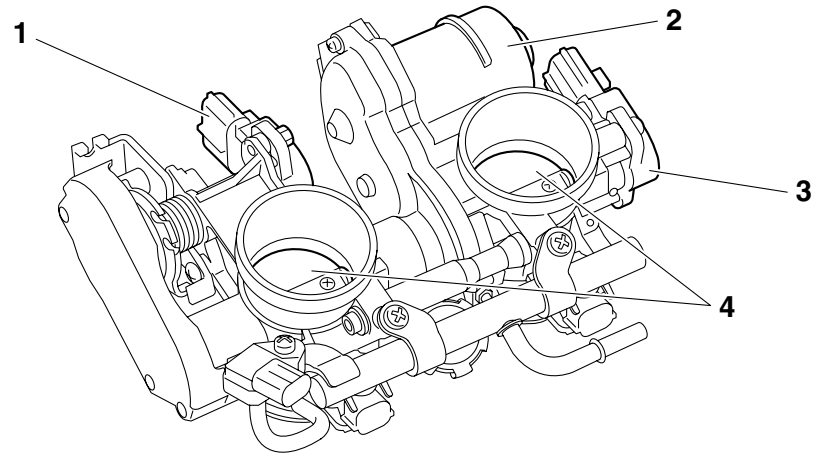
1. Fuel pump
2. Injector
3. ECU (engine control unit)
4. Throttle position sensor
5. Accelerator position sensor
6. Rear wheel sensor
7. Lean angle sensor
8. O_2 sensor
9. Catalytic converter
10. Coolant temperature sensor
11. Crankshaft position sensor
12. Intake air pressure sensor
13. Throttle body
14. Air filter case
15. Intake air temperature sensor
16. Throttle servo motor

A. Fuel system
B. Air system
C. Control system

EAS23P1098
YCC-T (Yamaha Chip Controlled Throttle)

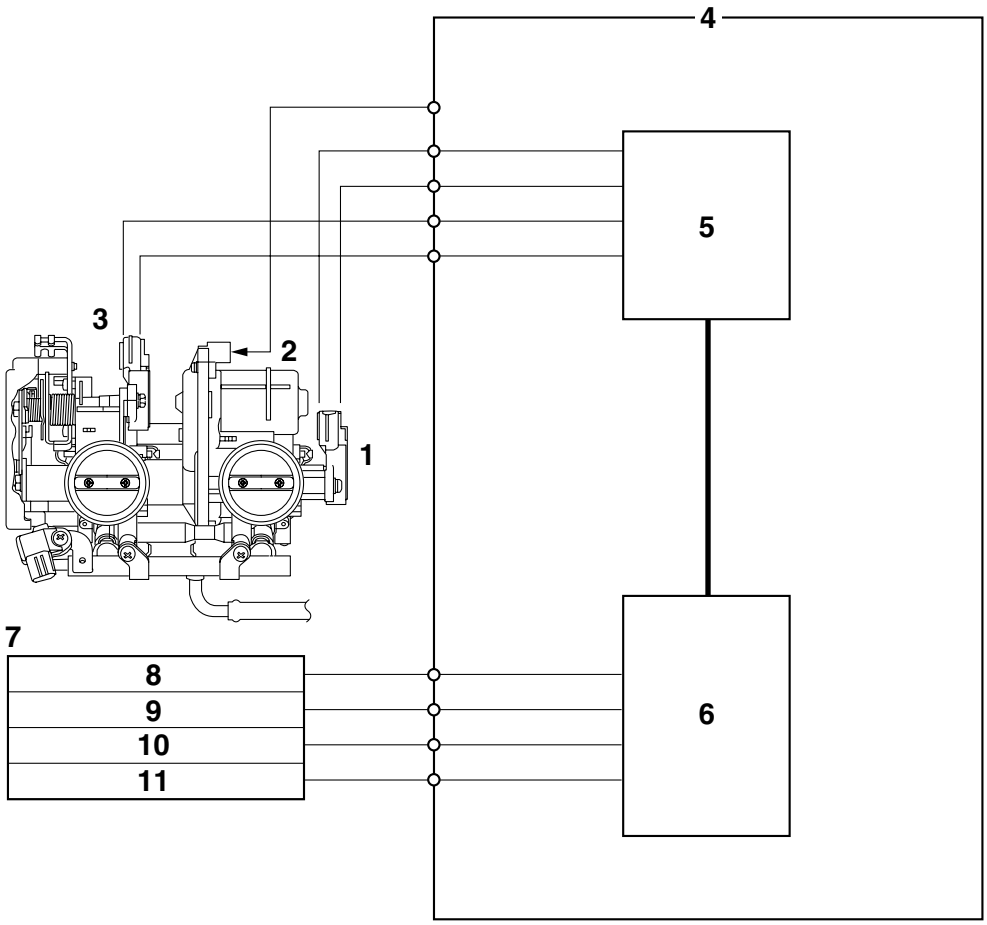
Mechanism characteristics
Yamaha developed the YCC-T system employing the most advanced electronic control technologies. Electronic control throttle systems have been used on automobiles, but Yamaha has developed a faster, more compact system specifically for the needs of a sports motorcycle. The Yamaha-developed system has a high-speed calculating capacity that produces computations of running conditions every 1/1000th of a second.
The YCC-T system is designed to respond to the throttle action of the rider by having the ECU instantaneously calculate the ideal throttle valve opening and generate signals to operate the motor-driven throttle valves and thus actively control the intake air volume.
The ECU contains two CPUs with a capacity about five times that of conventional units, making it possible for the system to respond extremely quickly to the slightest adjustments made by the rider. In particular, optimized control of the throttle valve opening provides the optimum volume of intake air for easy-to-use torque, even in a high-revving engine.

Aims and advantages of using YCC-T
- Increased engine power
  By shortening the air intake path, higher engine speed is possible → Increased engine power.
- Improved driveability
  Air intake volume is controlled according to the operating conditions → Improved throttle response to meet engine requirement.
  Driving force is controlled at the optimal level according to the transmission gear position and engine speed → Improved throttle control.
- Engine braking control
  Due to the throttle control, optimal engine braking is made possible.
- Simplified idle speed control (ISC) mechanism
  The bypass mechanism and ISC actuator are eliminated → A simple mechanism is used to maintain a steady idle speed.
- Reduced weight
  Compared to using a sub-throttle mechanism, weight is reduced.



1. Accelerator position sensor
2. Throttle servo motor
3. Throttle position sensor
4. Throttle valves

YCC-T system outline



1. Throttle position sensor
2. Throttle servo motor
3. Accelerator position sensor
4. ECU (engine control unit)
5. YCC-T CPU
6. FI CPU
7. Sensor input
8. Neutral switch
9. Crankshaft position sensor
10. Rear wheel sensor
11. Coolant temperature sensor

EAS23P1060
OUTLINE OF THE UBS

This model is equipped with a unified brake system (UBS) that operates the rear brake when the brake lever is squeezed.
When the brake lever is squeezed, the rear brake force is controlled electronically according to the brake lever input (hydraulic pressure) and vehicle speed (deceleration). During tandem riding or when the vehicle is carrying a heavy load, the rear brake force generated by the UBS is higher to increase vehicle stability.
If the brake pedal is operated before the brake lever, the UBS will not operate. However, if the brake pedal is operated while the UBS is operating, the UBS will continue to operate until the brake pedal input exceeds the rear brake force generated by the UBS. Then, the rear braking will switch to rider control.

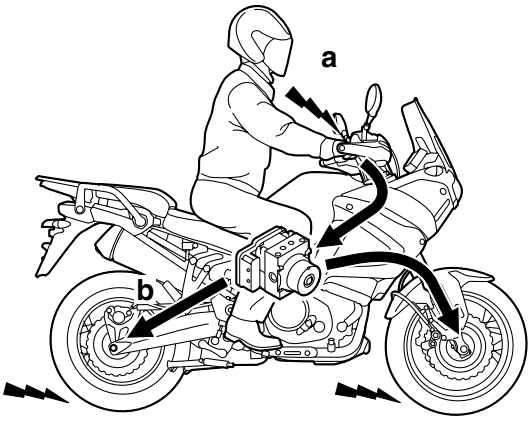
TIP

If the brakes are operated while the vehicle is traveling at low speeds, the UBS will only generate a small brake force.

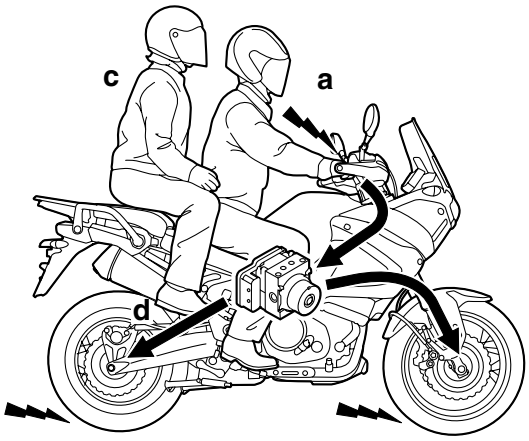
UBS operation

• Brake lever input only: Front braking and rear braking with hydraulic pump (with UBS operation)

Brake lever only operated (UBS operation)



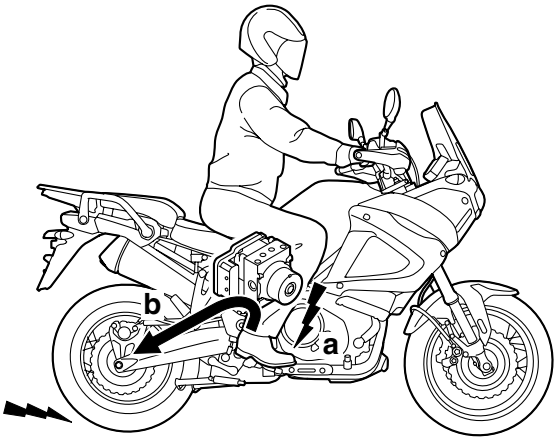
a. Input
b. Automatic pressurization (normal)



a. Input
c. During tandem riding or when carrying a load
d. Automatic pressurization (high)

• Brake pedal input only: Rear braking (without UBS operation)

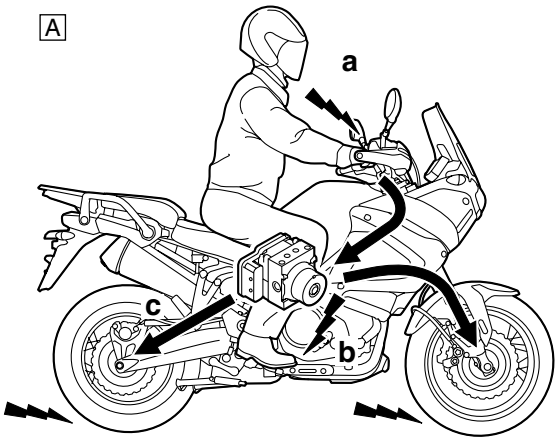
Brake pedal only operated



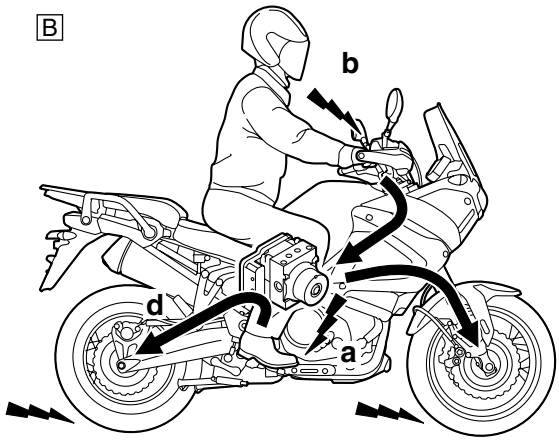
a. Input
b. No automatic pressurization

• Brake lever input and brake pedal input: Front braking and rear braking (with and without UBS operation)

Brake lever and brake pedal both operated

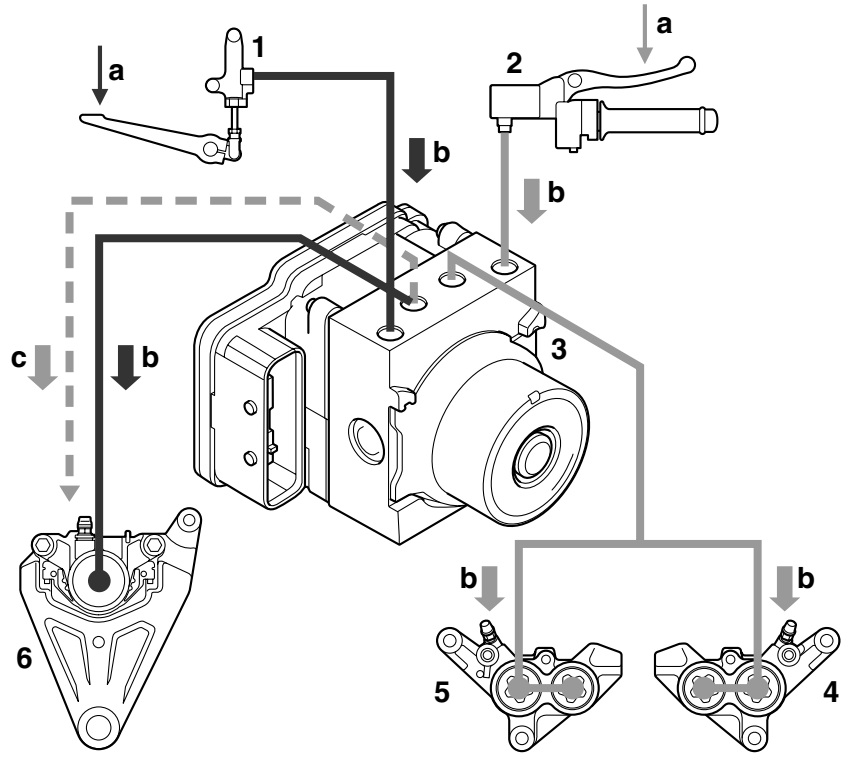


A. Brake lever is operated before brake pedal
a. First input
b. Second input
c. Brake fluid is automatically pressurized until the second input exceeds the automatic pressurization



B. Brake pedal is operated before brake lever
a. First input
b. Second input
d. No automatic pressurization

UBS diagram



1. Rear brake master cylinder
2. Front brake master cylinder
3. Hydraulic unit assembly (ABS ECU)
4. Right front brake caliper
5. Left front brake caliper
6. Rear brake caliper

a. Input
b. Pressurization
c. Pressurization (hydraulic pump pressurization by UBS)

When the brake lever is squeezed, the front brake master cylinder pressure sensor in the hydraulic unit detects the hydraulic pressure. The ABS ECU calculates the appropriate rear brake force according to the detected hydraulic pressure and sends a signal to the rear brake hydraulic pump. The hydraulic pump pressurizes the rear brake caliper using electronic control to operate the rear brake.

TIP

- If the brake pedal is depressed while the brake lever is being squeezed, the brake pedal may feel hard due to the operation of the UBS, but this does not indicate a malfunction.
- If the rider squeezes the brake lever while resting their foot on the brake pedal, a vibration can be felt at the brake pedal due to the operation of the UBS, but this does not indicate a malfunction.

ECA23P1054

NOTICE

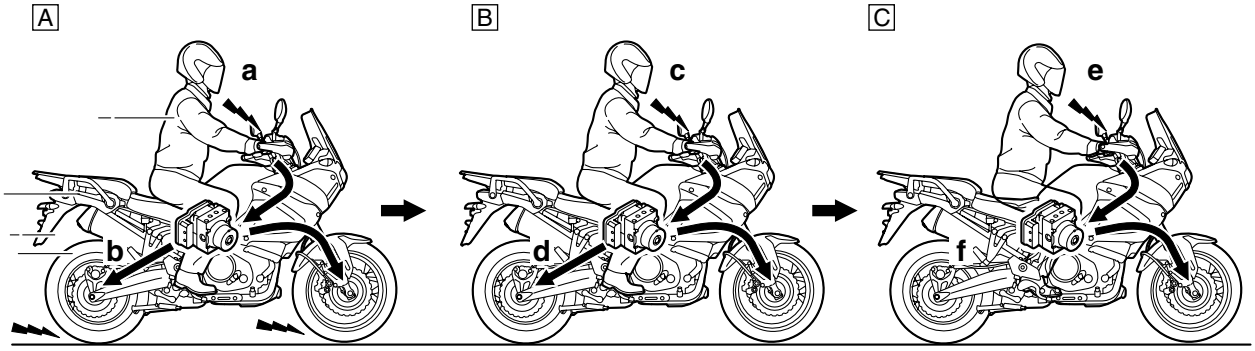
- **The UBS does not operate before the vehicle starts off.**
- **If the vehicle is stopped by operating the brake lever only, the brake force due to the operation of the UBS will be maintained while the brake lever is squeezed. However, if the brake lever is released, then squeezed again, the UBS will not operate.**

ECA23P1055

NOTICE

- **The unified brake system is a system to assist the brake operation. However, both the brake lever and the brake pedal must be operated for maximum braking effect.**
- **Because the balance between the front brake calipers and the rear brake caliper in the unified brake system is determined electronically, be sure to use the specified brake pads.**
- **Each set of brake pads should be checked individually and replaced if necessary.**

When vehicle is stopped using brake lever only



A. Deceleration
a. Input
b. Automatic pressurization

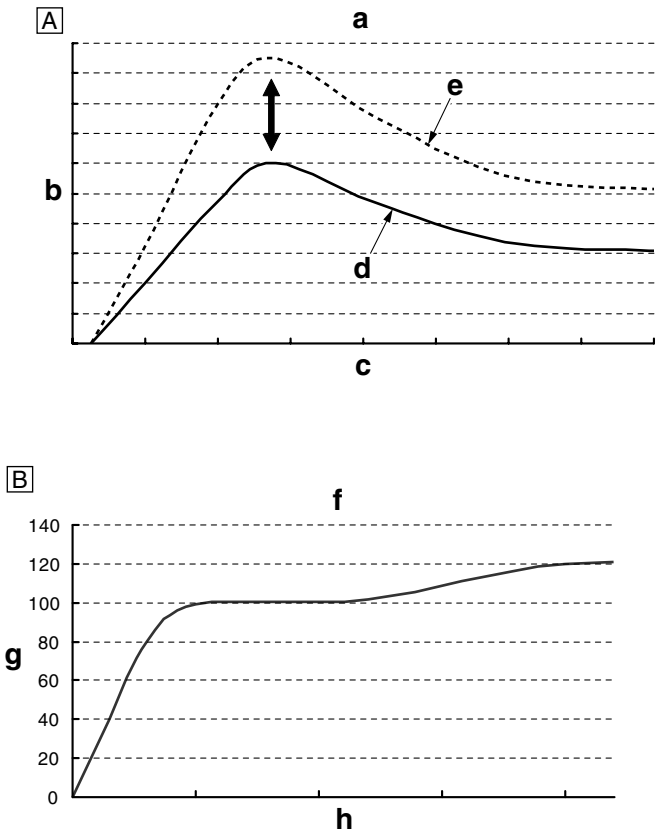
B. Vehicle stopped
c. Input maintained
d. Pressurization maintained

C. Brake lever released, then squeezed again, after vehicle stops
e. Brake lever released, then squeezed again
f. No automatic pressurization

UBS hydraulic pressure map

The appropriate hydraulic pressure is distributed according to the load being carried by the vehicle. See figure “A”.

The coefficient is set according to the vehicle speed when the brake input starts and remains constant until the brake input stops. When the brakes are operated continuously to slow the vehicle, the coefficient (UBS brake force) does not decrease together with the vehicle speed. See figure “B”.

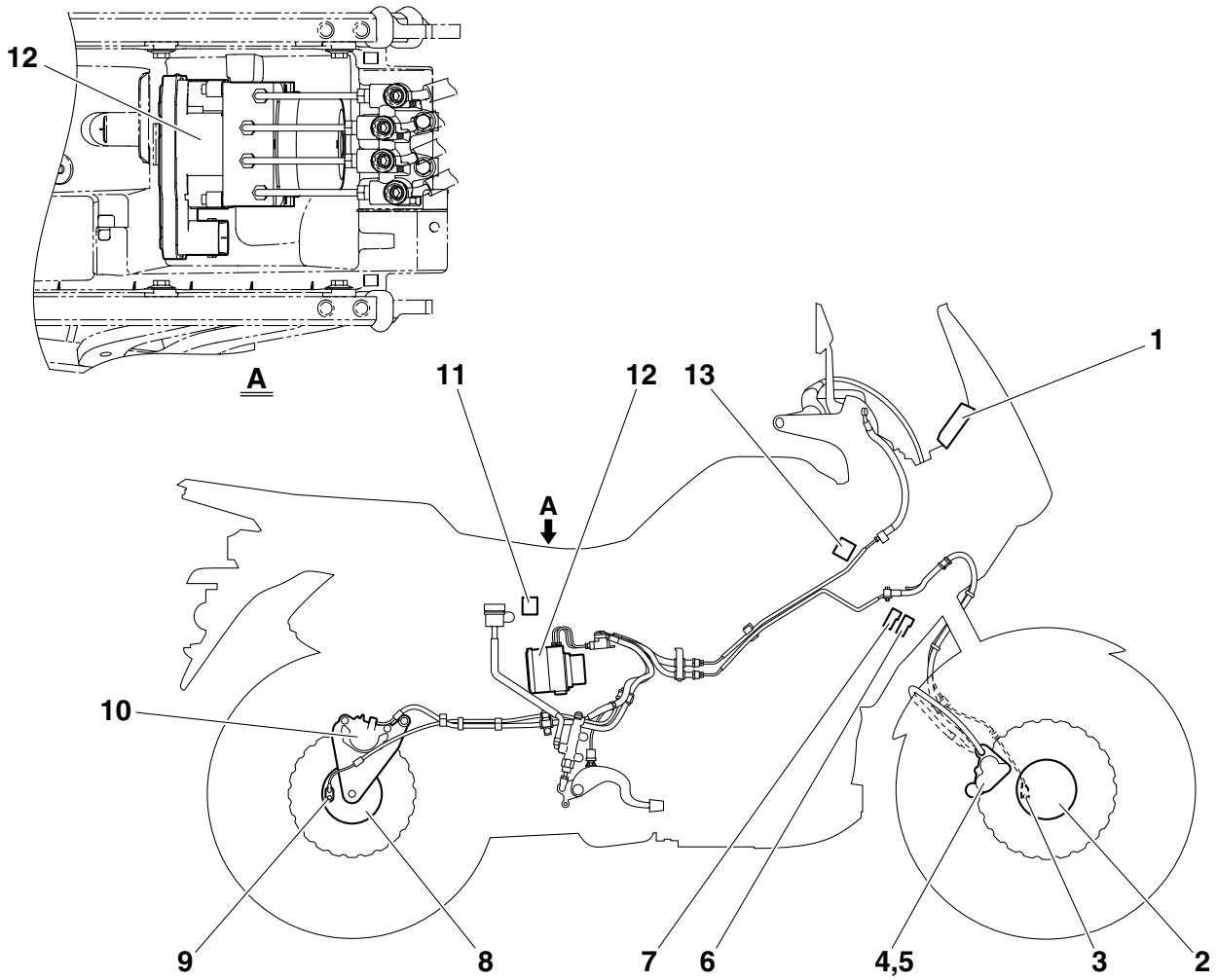


a. Hydraulic pressure distribution
b. Rear brake output (bars)
c. Front brake input (bars)
d. Rider only
e. When carrying the maximum load
f. Vehicle speed coefficient
g. Coefficient (%)
h. Speed (km/h)

EAS23P1061
OUTLINE OF THE ABS

1. This model is equipped with the latest, advanced type of ABS, which has improved feeling during operation and smoother braking than previous ABS brakes. The ABS ECU detects the hydraulic pressure using the pressure sensors and controls the pressure linearly using continuously variable adjustments to obtain the appropriate pressure when the wheels have a tendency to lock or according to the operation input (hydraulic pressure) from the brake lever or brake pedal.
2. If the wheels have a tendency to lock during brake lever input, brake pedal input, or UBS control, the ABS will operate.
3. The hydraulic unit assembly, which is the main component of the ABS, is centrally located on the vehicle to increase mass centralization.

ABS layout



1. ABS warning light
2. Front wheel sensor rotor
3. Front wheel sensor
4. Right front brake caliper
5. Left front brake caliper
6. ABS ECU fuse
7. ABS solenoid fuse
8. Rear wheel sensor rotor
9. Rear wheel sensor
10. Rear brake caliper
11. ABS test coupler
12. Hydraulic unit assembly
13. ABS motor fuse

Useful terms

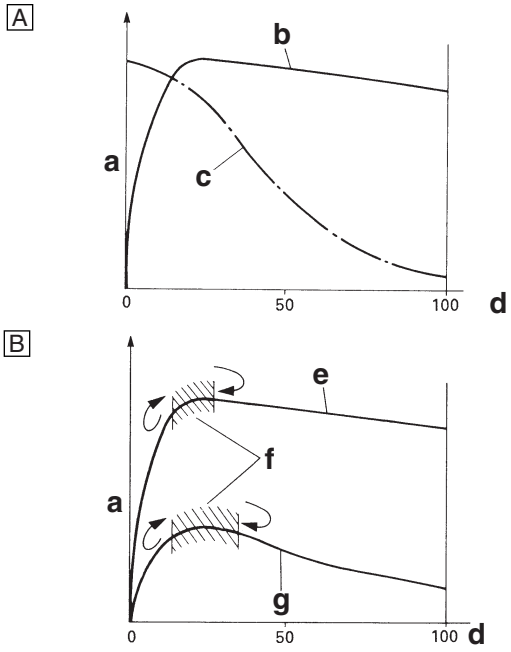
- Wheel speed:
  The rotation speed of the front and rear wheels.
- Chassis speed:
  The speed of the chassis.
  When the brakes are applied, wheel speed and chassis speed are reduced. However, the chassis travels forward by its inertia even though the wheel speed is reduced.
- Brake force:
  The force applied by braking to reduce the wheel speed.
- Wheel lock:
  A condition that occurs when the rotation of one or both of the wheels has stopped, but the vehicle continues to travel.
- Side force:
  The force on the tires which supports the vehicle when cornering.
- Slip ratio:
  When the brakes are applied, slipping occurs between the tires and the road surface. This causes a difference between the wheel speed and the chassis speed.
  Slip ratio is the value that shows the rate of wheel slippage and is defined by the following formula.

$$\text{Slip ratio} = \frac{\text{Chassis speed} - \text{Wheel speed}}{\text{Chassis speed}} \times 100\ (\%)$$

0%: There is no slipping between the wheel and the road surface. The chassis speed is equal to the wheel speed.
100%: The wheel speed is “0”, but the chassis is moving (i.e., wheel lock).

Brake force and vehicle stability

When the brake pressure is increased, wheel speed is reduced. Slipping occurs between the tire and the road surface and brake force is generated. The limit of this brake force is determined by the friction force between the tire and the road surface and is closely related to wheel slippage. Wheel slippage is represented by the slip ratio.
Side force is also closely related to wheel slippage. See figure “A”. If the brakes are applied while keeping the proper slip ratio, it is possible to obtain the maximum brake force without losing much side force. ABS allows full use of the tires’ capabilities even on slippery road surfaces or less slippery road surfaces. See figure “B”.



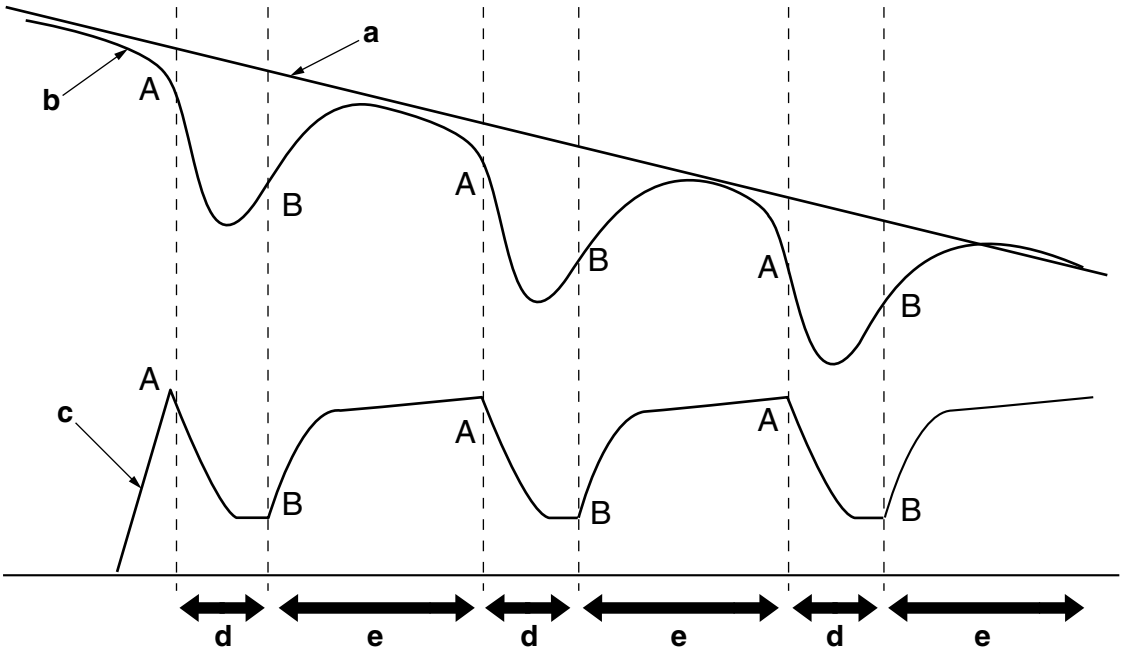
a. Friction force between the tire and road surface
b. Brake force
c. Side force
d. Slip ratio (%)
e. Less slippery road surface
f. Controlling zone
g. Slippery road surface

Wheel slip and hydraulic control

The ABS ECU calculates the wheel speed of each wheel according to the rotation signal received from the front and rear wheel sensors. In addition, the ABS ECU calculates the vehicle chassis speed and the rate of speed reduction based on the wheel speed values.

The difference between the chassis speed and the wheel speed calculated in the slip ratio formula is equal to the wheel slip. When the wheel speed is suddenly reduced, the wheel has a tendency to lock. When the wheel slip and the wheel speed reduction rate exceed the preset values, the ABS ECU determines that the wheel has a tendency to lock.

If the slip is large and the wheel has a tendency to lock (point “A” in the following figure), the ABS ECU reduces the hydraulic pressure in the brake caliper. Once the ABS ECU determines that the tendency of the wheel to lock has diminished after the hydraulic pressure is reduced, it increases the hydraulic pressure (point “B” in the following figure). The hydraulic pressure is initially increased quickly, and then it is increased gradually.



a. Chassis speed
b. Wheel speed
c. Brake force
d. Depressurizing phase
e. Pressurizing phase

ABS operation and vehicle control

If the ABS starts operating, there is a tendency of the wheel to lock, and the vehicle is approaching the limit of control. To make the rider aware of this condition, the ABS has been designed to generate a reaction-force pulsating action in the brake lever and brake pedal independently.

TIP

When the ABS is activated, a pulsating action may be felt at the brake lever or brake pedal, but this does not indicate a malfunction.

The higher the side force on a tire, the less traction there is available for braking. This is true whether the vehicle is equipped with ABS or not. Therefore, sudden braking while cornering is not recommended. Excessive side force, which ABS cannot prevent, could cause the tire to slip sideways.

EWA23P1023

⚠ WARNING

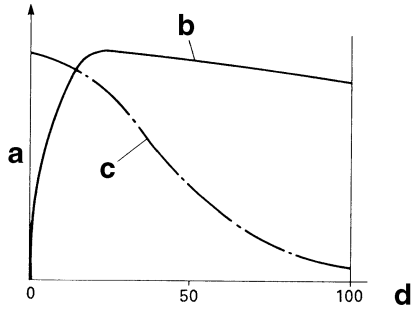
The braking of the vehicle, even in the worst case, is principally executed when the vehicle is advancing straight ahead. During a turn, sudden braking is liable to cause a loss of traction of the tires. Even vehicles equipped with ABS cannot be prevented from falling over if braked suddenly.

The ABS functions to prevent the tendency of the wheel to lock by controlling the hydraulic pressure. However, if there is a tendency of the wheel to lock on a slippery road surface, due to engine braking, the ABS may not be able to prevent the wheel from locking.

EWA23P1024

⚠ WARNING

The ABS controls only the tendency of the wheel to lock caused by applying the brakes. The ABS cannot prevent wheel lock on slippery surfaces, such as ice, when it is caused by engine braking, even if the ABS is operating.



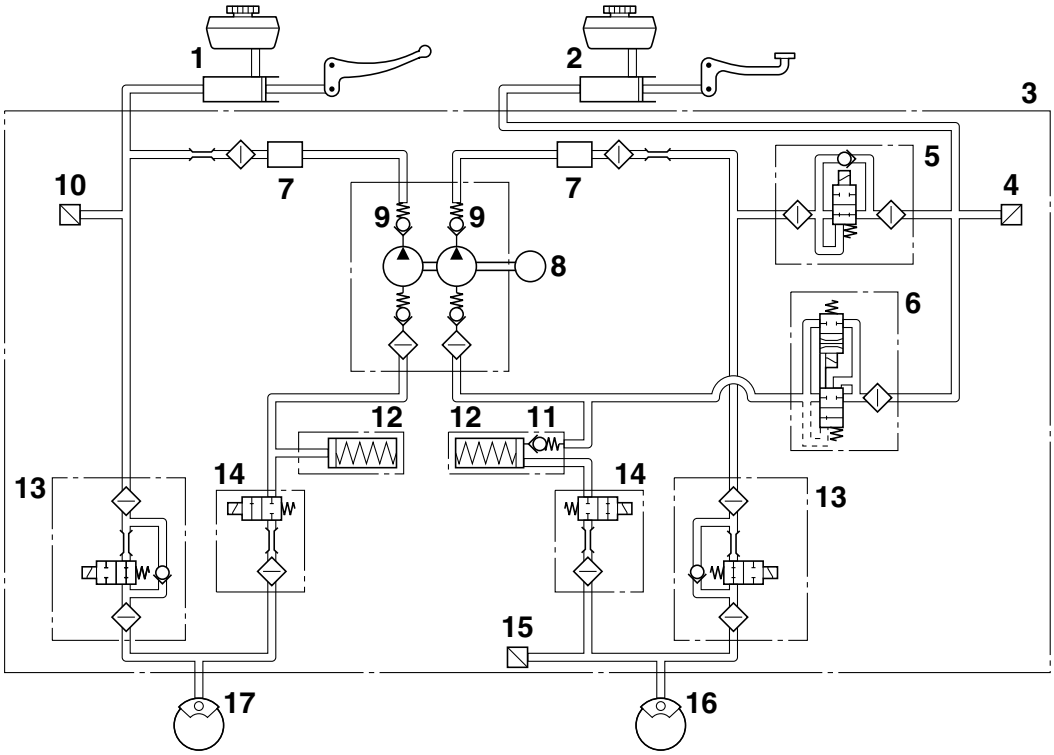
a. Friction force between the tire and road surface
b. Brake force
c. Side force
d. Slip ratio (%)

Electronic ABS features

The Yamaha ABS (anti-lock brake system) has been developed with the most advanced electronic technology.

The ABS also includes a highly developed self-diagnosis function. The ABS has been designed to operate as a conventional brake system if the ABS malfunctions. Also, there may be little or no additional rear brake force provided by the UBS. If the UBS does not operate, the front and rear brakes will operate independently according to the rider input, and the respective brake force will be the same as during normal braking. When the brake lever is squeezed, only the front brakes will operate and when the brake pedal is depressed, only the rear brake will operate.

ABS block diagram

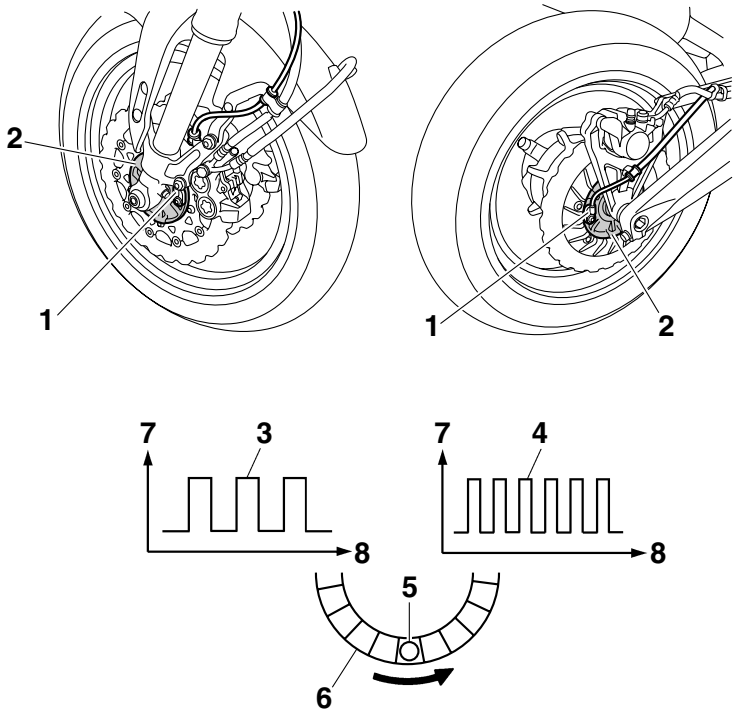


1. Front brake master cylinder
2. Rear brake master cylinder
3. Hydraulic unit assembly
4. Rear brake master cylinder pressure sensor
5. Separation solenoid valve
6. Shuttle solenoid valve
7. Damping chamber
8. ABS motor
9. Hydraulic pump
10. Front brake master cylinder pressure sensor
11. Check valve
12. Buffer chamber
13. Inlet solenoid valve
14. Outlet solenoid valve
15. Rear brake caliper pressure sensor
16. Rear brake caliper
17. Front brake calipers

EAS23P1062
ABS COMPONENT FUNCTIONS

Wheel sensors and wheel sensor rotors

Wheel sensors “1” detect the wheel rotation speed and transmit the wheel rotation signal to the ABS ECU.
Each wheel sensor contains an MR sensor. The wheel sensors are installed in the sensor housing for each wheel.
Sensor rotors “2” are installed on the inner side of the front and rear wheel hubs and rotate with the wheels.
The front and rear sensor rotors each have 92 magnetic poles (46 pairs) and are installed close to the wheel sensors. As the sensor rotor rotates, the MR element in the MR sensor installed in the wheel sensor generates the voltage which is proportional to the magnetic flux density, and the generated voltage is processed for waveform shaping in the MR sensor to output.
The ABS ECU calculates the wheel rotation speed by detecting the pulse frequency.



3. At low speed
4. At high speed
5. Wheel sensor
6. Wheel sensor rotor
7. Voltage
8. Time

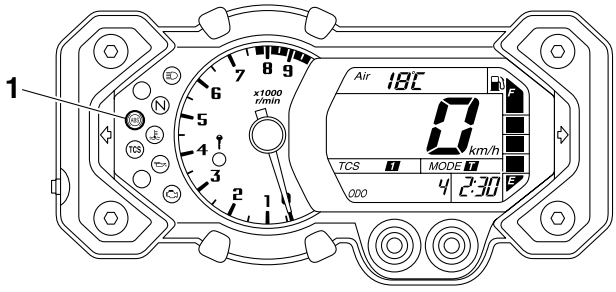
ABS warning light

The ABS warning light "1" comes on to warn the rider if a malfunction in the ABS occurs.
When the main switch is set to "ON", the ABS warning light comes on for 2 seconds, then goes off, so that the rider can check if the ABS warning light is disconnected and check if the ABS is operating properly.

ECA23P1056

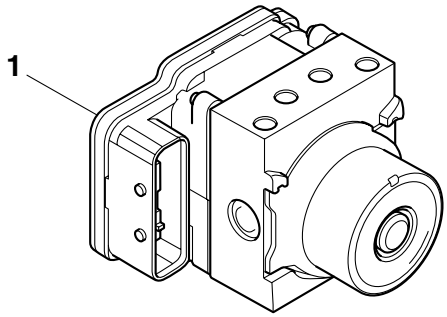
NOTICE

If the rear wheel is raced with the vehicle on the centerstand, the ABS warning light may flash or come on. If this occurs, set the main switch to "OFF", then back to "ON". The ABS operation is normal if the ABS warning light goes off after the vehicle is ridden.



Hydraulic unit assembly

The hydraulic unit assembly “1” is composed of hydraulic control valves (outlet solenoid valves, inlet solenoid valves, a shuttle solenoid valve, and a separation solenoid valve), buffer chambers, damping chambers, hydraulic pumps, an ABS motor, hydraulic pressure sensors (front brake master cylinder pressure sensor, rear brake master cylinder pressure sensor, and rear brake caliper pressure sensor), and an ABS ECU. The hydraulic unit adjusts the front and rear wheel hydraulic pressure to control the wheel speed according to signals transmitted from the ABS ECU.



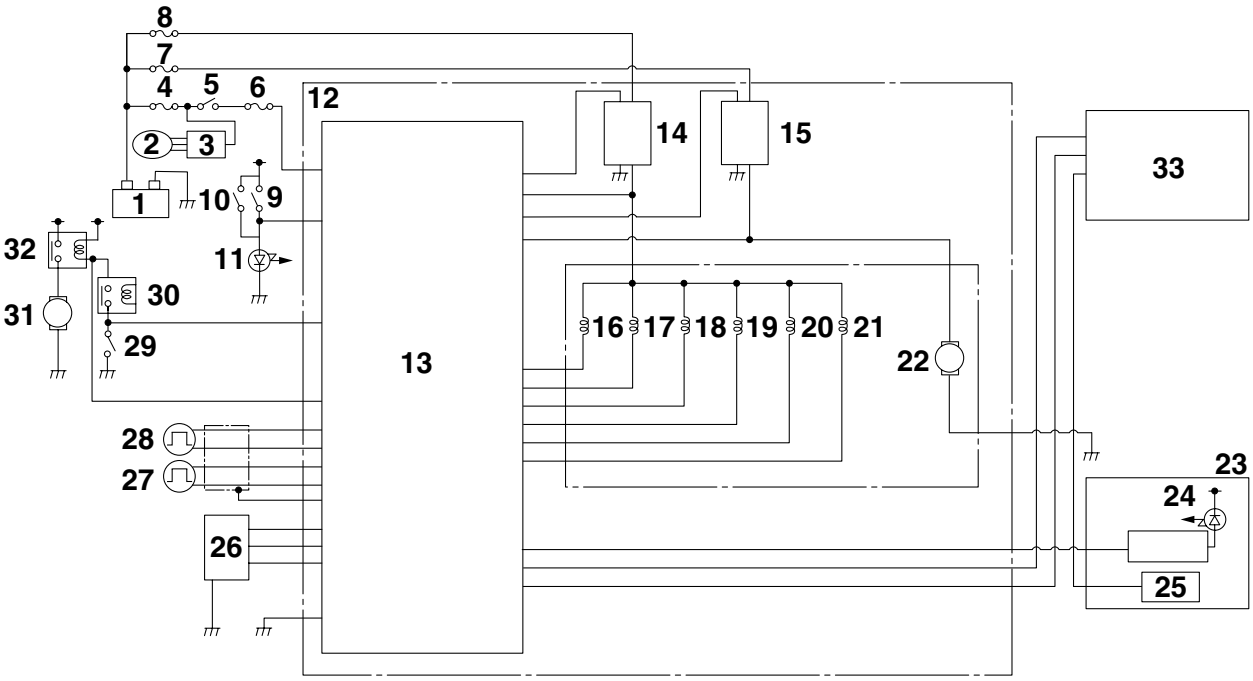
Hydraulic control valves

There are four types of hydraulic control valves: inlet solenoid valve, outlet solenoid valve, shuttle solenoid valve, and separation solenoid valve. The electromagnetic force generated in the inlet solenoid valve varies proportionally with the duty cycle control voltage that is supplied to it. Since this voltage is continuously variable, the solenoid valve moves smoothly and the hydraulic pressure is adjusted linearly.

1. Inlet solenoid valve
   This valve is open during normal braking and UBS operation.
   The valve opens and closes during ABS operation to adjust the hydraulic pressure input from the brake lever or brake pedal.
2. Outlet solenoid valve
   This valve is closed during normal braking and UBS operation.
   The valve opens during ABS operation to reduce the hydraulic pressure.
3. Separation solenoid valve
   This valve is open when the brake pedal is depressed, but the valve opens and closes during UBS operation to adjust the hydraulic pressure.
   The valve opens if the ABS operates when the brake pedal is depressed, but the valve opens and closes to adjust the hydraulic pressure if the ABS operates during UBS operation.
4. Shuttle solenoid valve
   This valve is closed when the brake pedal is depressed, but the valve opens during UBS operation to pressurize the rear brake caliper.
   The valve closes if the ABS operates when the brake pedal is depressed, but the valve opens and closes to adjust the hydraulic pressure if the ABS operates during UBS operation.

ABS ECU

The ABS ECU is integrated with the hydraulic unit to achieve a compact and lightweight design. As shown in the following block diagram, the ABS ECU receives wheel sensor signals from the front and rear wheels and also receives signals from other monitor circuits.



1. Battery
2. AC magneto
3. Rectifier/regulator
4. Main fuse
5. Main switch
6. ABS ECU fuse
7. ABS motor fuse
8. ABS solenoid fuse
9. Front brake light switch
10. Rear brake light switch
11. Tail/brake light
12. Hydraulic unit assembly
13. ABS ECU
14. Solenoid relay
15. ABS motor relay
16. Front brake inlet solenoid
17. Front brake outlet solenoid
18. Rear brake inlet solenoid
19. Rear brake outlet solenoid
20. Separation solenoid valve
21. Shuttle solenoid valve
22. ABS motor
23. Meter assembly
24. ABS warning light
25. Speedometer
26. ABS test coupler
27. Rear wheel sensor
28. Front wheel sensor
29. Start switch
30. Starting circuit cut-off relay
31. Starter motor
32. Starter relay
33. ECU (engine control unit)

The necessary actions are confirmed using the monitor circuit and control signals are transmitted to the hydraulic unit assembly.

ABS control operation

The ABS control operation performed in the ABS ECU is divided into the following two parts.

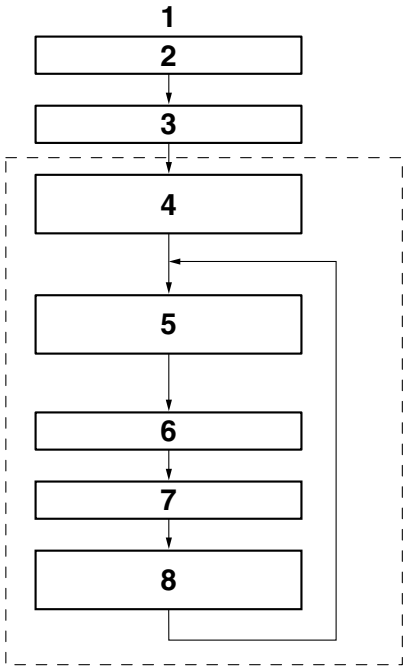
- Hydraulic control
- Self-diagnosis

When a malfunction is detected in the ABS, a fault code is stored in the memory of the ABS ECU for easy problem identification and troubleshooting.

TIP

- Some types of malfunctions are not recorded in the memory of the ABS ECU (e.g., a blown ABS solenoid fuse).

• The ABS performs a self-diagnosis test for a few seconds each time the vehicle first starts off after the main switch was set to “ON”. During this test, a “clicking” noise can be heard from under the seat, and if the brake lever or brake pedal is even slightly operated, a vibration can be felt at the lever and pedal, but these do not indicate a malfunction.



1. Software operation flow
2. Main switch “ON”
3. Initialize
4. Self-diagnosis (when static)
5. Self-diagnosis (when riding)
6. Receive signals
7. Control operation
8. Depressurize/pressurize

EAS23P1063
UBS AND ABS OPERATION

The ABS hydraulic circuit consists of two systems: one for the front wheel and one for the rear wheel.

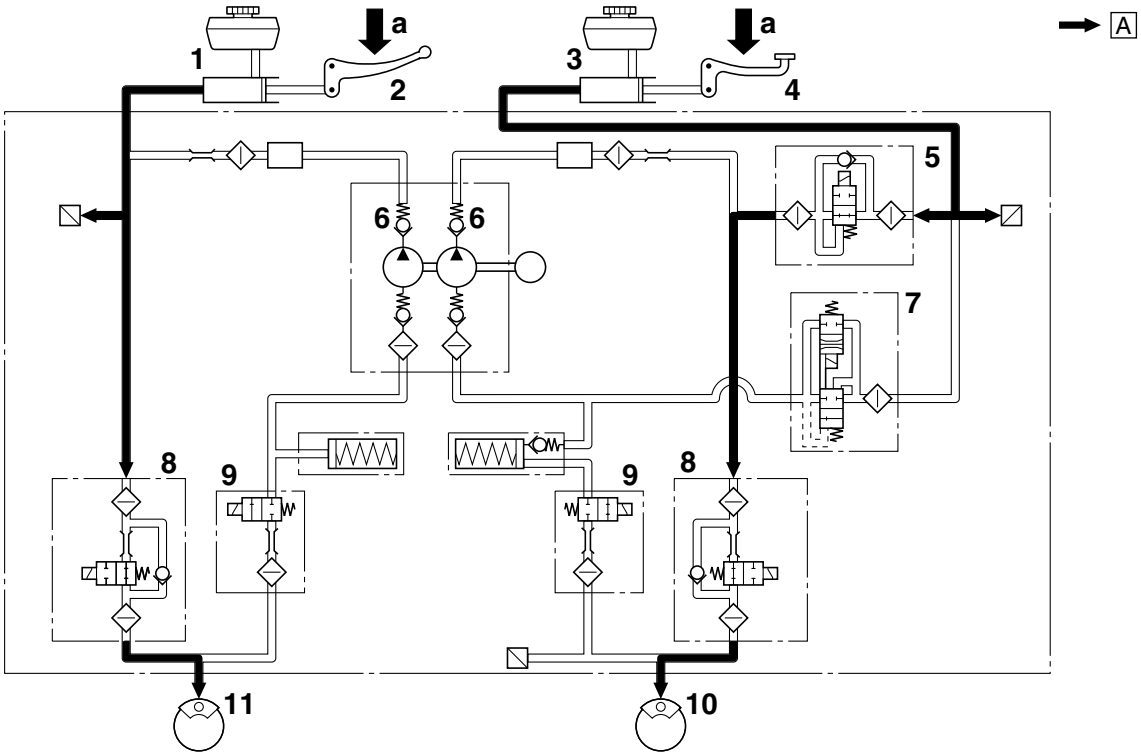
Normal braking (ABS not activated and UBS not activated)

Front brakes:

When the ABS is not activated, the inlet solenoid valve is open and the outlet solenoid valve is closed because a control signal has not been transmitted from the ABS ECU. Therefore, when the brake lever is squeezed, the hydraulic pressure in the front brake master cylinder increases and the brake fluid is sent to the front brake calipers. At this time, the hydraulic pump check valve is closed. The front brake master cylinder directly pressurizes the front brake calipers during normal braking. When the brake lever is released, the brake fluid in the front brake calipers returns to the front brake master cylinder.

Rear brake:

When the ABS is not activated, the inlet solenoid valve and separation solenoid valve are open and the outlet solenoid valve and shuttle solenoid valve are closed because a control signal has not been transmitted from the ABS ECU. Therefore, when the brake pedal is depressed, the hydraulic pressure in the rear brake master cylinder increases and the brake fluid is sent to the rear brake caliper. At this time, the hydraulic pump check valve is closed. The rear brake master cylinder directly pressurizes the rear brake caliper during normal braking. When the brake pedal is released, the brake fluid in the rear brake caliper returns to the rear brake master cylinder.



1. Front brake master cylinder
2. Brake lever
3. Rear brake master cylinder
4. Brake pedal
5. Separation solenoid valve
6. Hydraulic pump
7. Shuttle solenoid valve
8. Inlet solenoid valve
9. Outlet solenoid valve
10. Rear brake caliper
11. Front brake calipers

A. Pressurize
a. Input

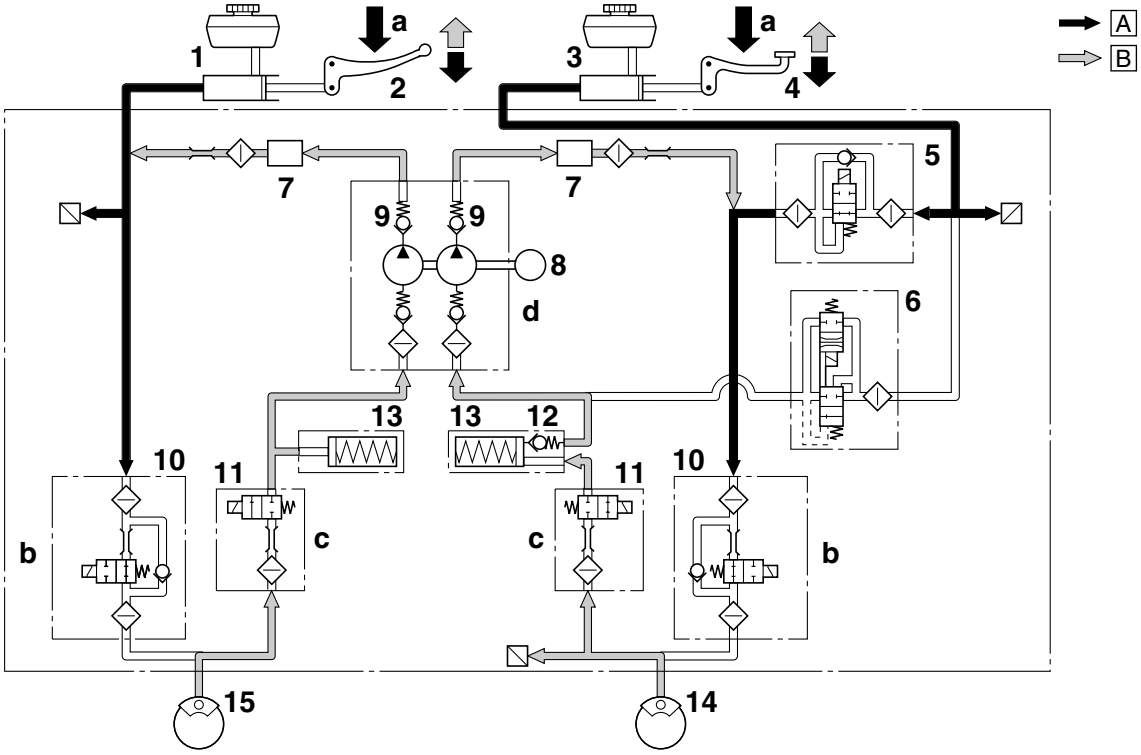
Emergency braking (ABS activated and UBS not activated)

Depressurizing phase:

When the front wheel (or the rear wheel) is about to lock, the outlet solenoid valve is opened by the "depressurization" signal transmitted from the ABS ECU. When this occurs, the inlet solenoid valve closes the brake line from the brake master cylinder. Because the outlet solenoid valve is open, the brake fluid is sent to the buffer chamber. As a result, the hydraulic pressure in the brake caliper is reduced. The brake fluid stored in the buffer chamber is pumped back to the brake master cylinder by the hydraulic pump linked to the ABS motor.

Pressurizing phase:

The outlet solenoid valve is closed by the "pressurization" signal transmitted from the ABS ECU. At this time, the ABS ECU controls the opening of the inlet solenoid valve. As the inlet solenoid valve opens, the brake line from the brake master cylinder opens, allowing the brake fluid to be sent to the brake caliper.



1. Front brake master cylinder
2. Brake lever
3. Rear brake master cylinder
4. Brake pedal
5. Separation solenoid valve
6. Shuttle solenoid valve
7. Damping chamber
8. ABS motor
9. Hydraulic pump
10. Inlet solenoid valve
11. Outlet solenoid valve
12. Check valve
13. Buffer chamber
14. Rear brake caliper
15. Front brake calipers

A. Pressurize
B. Depressurize
a. Input
b. Inlet solenoid valve is closed
c. Outlet solenoid valve is open
d. Hydraulic pump is operating

UBS (ABS not activated and UBS activated)

Brake lever input only

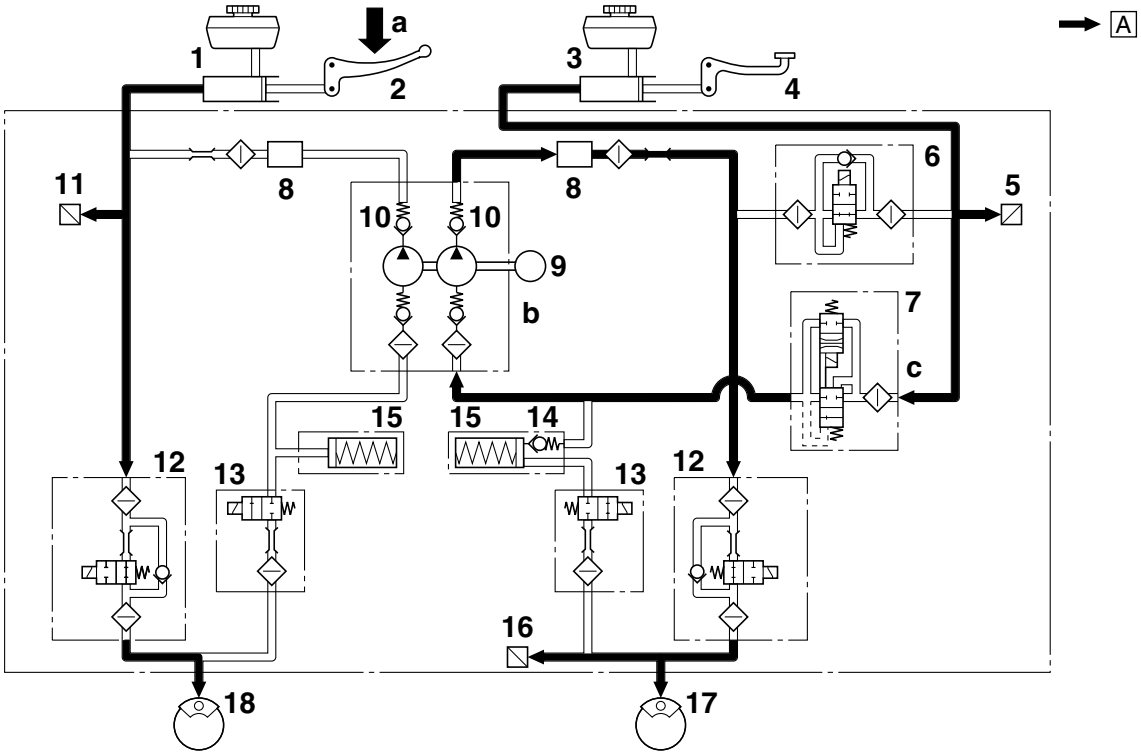
Front brakes:

When the ABS is not activated, the inlet solenoid valve is open and the outlet solenoid valve is closed because a control signal has not been transmitted from the ABS ECU. Therefore, when the brake lever is squeezed, the hydraulic pressure in the front brake master cylinder increases and the brake fluid is sent to the front brake calipers. At this time, the hydraulic pump check valve is closed. The front brake master cylinder directly pressurizes the front brake calipers during normal braking. When the brake lever is released, the brake fluid in the front brake calipers returns to the front brake master cylinder.

Rear brake:

When the brake lever is squeezed, the ABS ECU detects the hydraulic pressure using the front brake master cylinder pressure sensor and operates the hydraulic pump. At this time, the ABS is not activated, the inlet solenoid valve is open, and the outlet solenoid valve is closed because a control signal has not been transmitted from the ABS ECU. The shuttle solenoid valve opens and closes according to the UBS control signals from the ABS ECU. The hydraulic pump draws in the brake fluid from the rear brake master cylinder and automatically pressurizes the rear brake caliper.

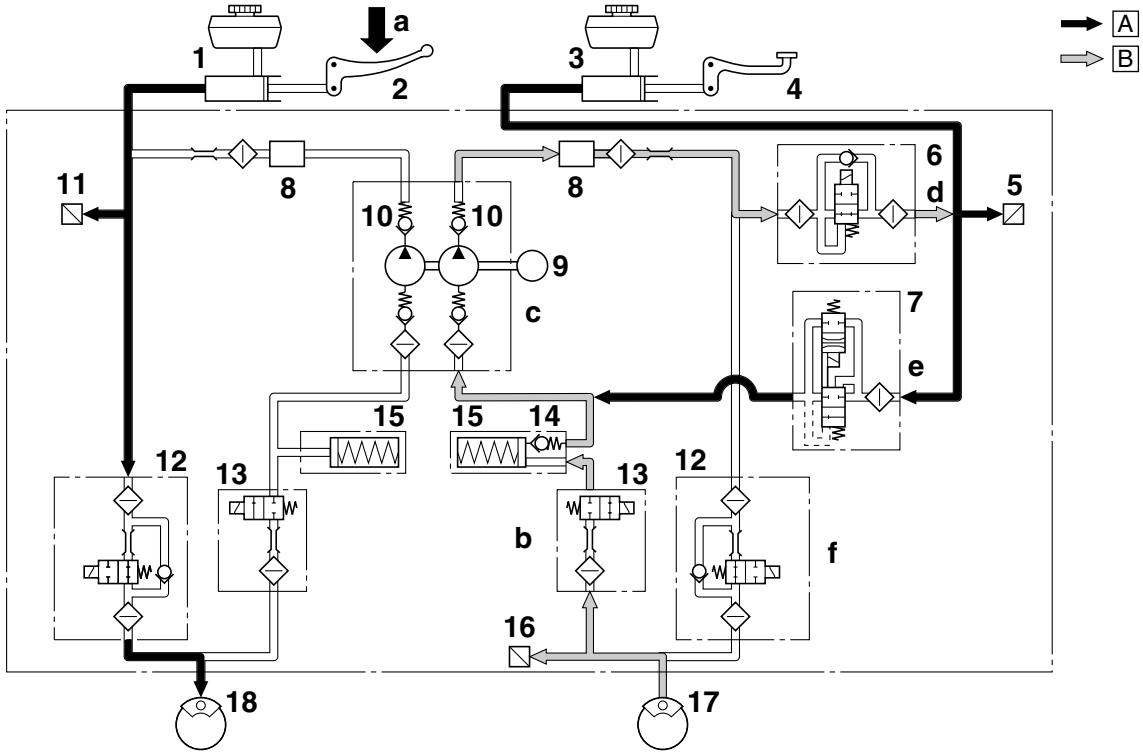
If the brake pedal is depressed, the UBS automatic pressurization stops. The ABS ECU detects and controls the hydraulic pressure in the rear brake caliper using the front brake master cylinder pressure sensor, rear brake master cylinder pressure sensor, and rear brake caliper pressure sensor.



1. Front brake master cylinder
2. Brake lever
3. Rear brake master cylinder
4. Brake pedal
5. Rear brake master cylinder pressure sensor
6. Separation solenoid valve
7. Shuttle solenoid valve
8. Damping chamber
9. ABS motor
10. Hydraulic pump
11. Front brake master cylinder pressure sensor
12. Inlet solenoid valve
13. Outlet solenoid valve
14. Check valve
15. Buffer chamber
16. Rear brake caliper pressure sensor
17. Rear brake caliper
18. Front brake calipers

A. Pressurize
a. Input
b. Hydraulic pump is operating
c. Shuttle solenoid valve is open

UBS (ABS activated and UBS activated)
Brake lever input only
Front brakes:
Refer to “Emergency braking (ABS activated and UBS not activated)”.
Rear brake:
When the rear wheel is about to lock, the outlet solenoid valve is opened by the “depressurization” signal transmitted from the ABS ECU. When this occurs, the inlet solenoid valve closes the brake line from the rear brake master cylinder. Because the outlet solenoid valve is open, the brake fluid is sent to the buffer chamber. As a result, the hydraulic pressure in the rear brake caliper is reduced.
In order to control the hydraulic pressure at the pressure required for UBS control at this time, the hydraulic pressure is detected using the rear brake master cylinder pressure sensor and rear brake caliper pressure sensor, and the separation solenoid valve and shuttle solenoid valve open and close.
The brake fluid stored in the buffer chamber is pumped back to the rear brake master cylinder by the hydraulic pump linked to the ABS motor.

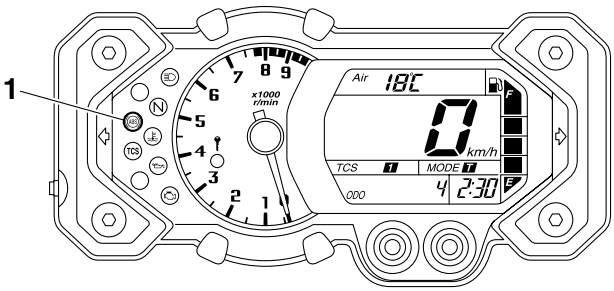


1. Front brake master cylinder
2. Brake lever
3. Rear brake master cylinder
4. Brake pedal
5. Rear brake master cylinder pressure sensor
6. Separation solenoid valve
7. Shuttle solenoid valve
8. Damping chamber
9. ABS motor
10. Hydraulic pump
11. Front brake master cylinder pressure sensor
12. Inlet solenoid valve
13. Outlet solenoid valve
14. Check valve
15. Buffer chamber
16. Rear brake caliper pressure sensor
17. Rear brake caliper
18. Front brake calipers

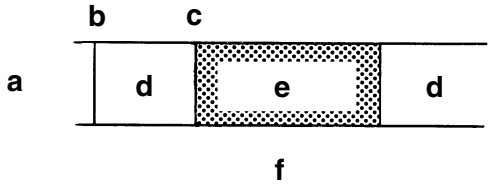
A. Pressurize
B. Depressurize
a. Input
b. Outlet solenoid valve is open
c. Hydraulic pump is operating
d. Separation solenoid valve is open or closed
e. Shuttle solenoid valve is open or closed
f. Inlet solenoid valve is closed

EAS23P1064
ABS SELF-DIAGNOSIS FUNCTION

ABS warning light
The ABS warning light “1” comes on when a malfunction is detected by the ABS self-diagnosis. The ABS warning light is located on the meter assembly.

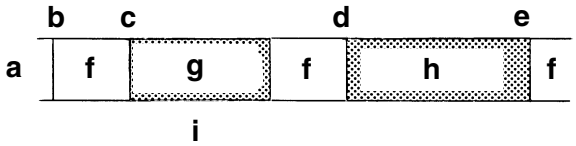


Instances when the ABS warning light comes on
1. The ABS warning light comes on when the main switch is set to “ON”.
   The ABS warning light comes on for 2 seconds while the ABS is performing a self-diagnosis, then goes off if there are no problems.



a. ABS warning light
b. Main switch “OFF”
c. Main switch “ON”
d. Goes off
e. Comes on for 2 seconds
f. ABS self-diagnosis

2. The ABS warning light comes on while the start switch is being pushed.
   When the engine is being started, the ABS warning light comes on while the start switch is being pushed. (Refer to “ELECTRIC STARTING SYSTEM” on page 8-7.)



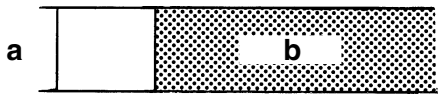
a. ABS warning light
b. Main switch “OFF”
c. Main switch “ON”
d. Start switch “ON”
e. Start switch “OFF”
f. Goes off
g. Comes on for 2 seconds
h. Comes on while the start switch is being pushed
i. ABS self-diagnosis

3. The ABS warning light comes on while riding.
   If the ABS warning light comes on while riding, a malfunction has been detected in the ABS or UBS. The ABS hydraulic control will not be performed. The ABS will have recourse to manual braking if this occurs.

ECA23P1057

NOTICE

There may be little or no additional rear brake force provided by the UBS if the ABS warning light comes on while riding. If the UBS does not operate, the front and rear brakes will operate independently according to the rider input. When the brake lever is squeezed, only the front brakes will operate and when the brake pedal is depressed, only the rear brake will operate.

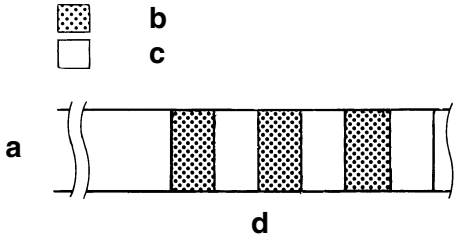


a. ABS warning light
b. Comes on

4. The ABS warning light flashes while riding.
   If the ABS warning light flashes while riding, there is no problem with the function of the ABS and UBS. However, the ABS ECU input has unstable factors. (For details, refer to "ABS TROUBLE-SHOOTING OUTLINE" on page 8-95.)

TIP

The ABS warning light comes on or flashes if the vehicle is ridden with the test coupler adapter connected to the ABS test coupler.



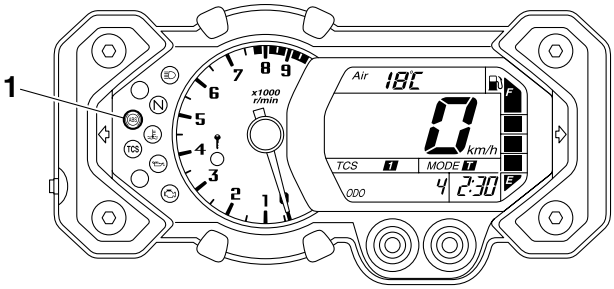
a. ABS warning light
b. Comes on
c. Goes off
d. Unstable ABS ECU input

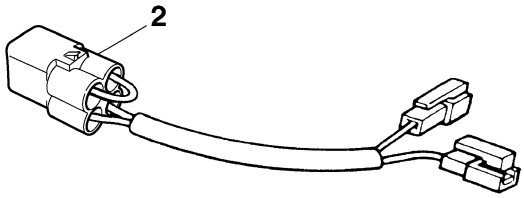
5. The ABS warning light "1" flashes when the test coupler adapter "2" is connected to the ABS test coupler "3" for troubleshooting the ABS. The ABS test coupler can be accessed by removing the rider seat.
   When the test coupler adapter is connected to the ABS test coupler, the ABS warning light starts flashing and the ABS warning light flash pattern indicates all the fault codes recorded in the ABS ECU.

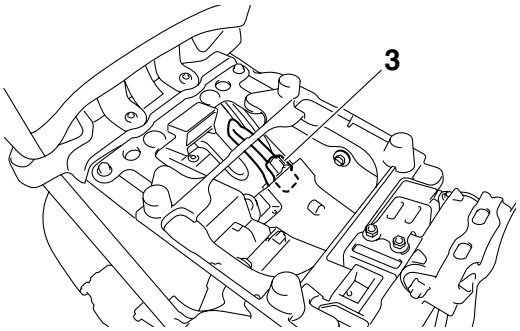
	Test coupler adapter **90890-03149**

TIP

The ABS warning light comes on or flashes if the vehicle is ridden with the test coupler adapter connected to the ABS test coupler.







EAS23P1065

ABS WARNING LIGHT AND OPERATION

ABS warning light

- When the main switch is set to “ON”, the ABS warning light comes on for 2 seconds, then goes off.
- The ABS warning light comes on while the start switch is being pushed.
- If the ABS warning light comes on while riding, stop the vehicle, and then set the main switch to “OFF”, then back to “ON”. The ABS operation is normal if the ABS warning light comes on for 2 seconds, then goes off.
- If the rear wheel is raced with the vehicle on the centerstand, the ABS warning light may flash or come on. If this occurs, set the main switch to “OFF”, then back to “ON”. The ABS operation is normal if the ABS warning light goes off when the vehicle first starts off after the main switch was set back to “ON”.
- The ABS operation is normal if the ABS warning light flashes.
- If the ABS warning light comes on or flashes while riding, the ABS and UBS will not work correctly. There may be little or no additional rear brake force provided by the UBS. If the UBS does not operate, the front and rear brakes will operate independently according to the rider input. When the brake lever is squeezed, only the front brakes will operate and when the brake pedal is depressed, only the rear brake will operate.

ABS and UBS function

EWA23P1038

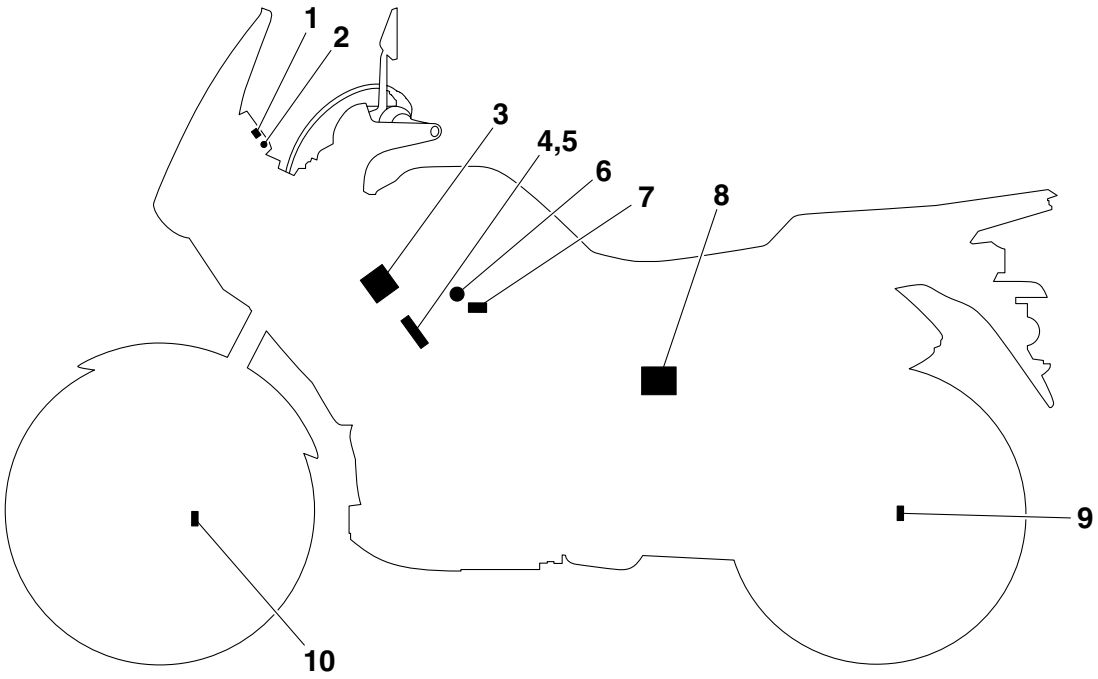
WARNING

- **When hydraulic control is performed by the ABS, the brake system alerts the rider that the wheels have a tendency to lock by generating a reaction-force pulsating action in the brake lever or brake pedal. When the ABS is activated, the grip between the road surface and tires is close to the limit. The ABS cannot prevent wheel lock* on slippery surfaces, such as ice, when it is caused by engine braking, even if the ABS is activated.**
- **The ABS and UBS is not designed to shorten the braking distance or improve the cornering performance.**
- **Depending on the road conditions, the braking distance may be longer compared to that of vehicles not equipped with ABS. Therefore, ride at a safe speed and keep a safe distance between yourself and other vehicles.**
- **The braking of the vehicle, even in the worst case, is principally executed when the vehicle is advancing straight ahead. During a turn, sudden braking is liable to cause a loss of traction of the tires. Even vehicles equipped with ABS cannot be prevented from falling over if braked suddenly.**
- **The ABS and UBS do not work when the main switch is set to "OFF". The conventional braking function can be used.**

*** Wheel lock: A condition that occurs when the rotation of one or both of the wheels has stopped, but the vehicle continues to travel.**

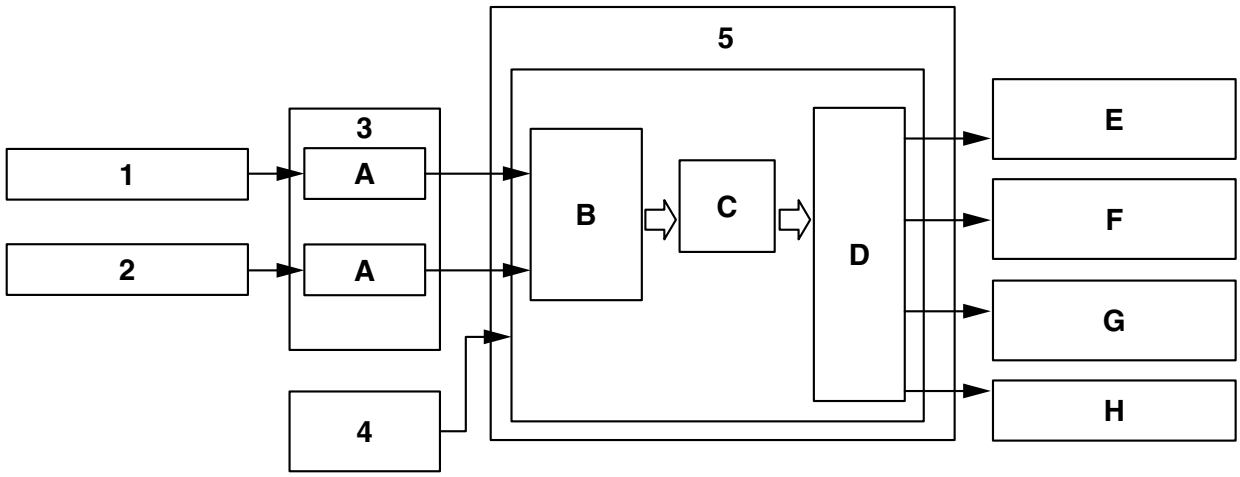
EAS23P1099
OUTLINE OF THE TCS (Traction Control System)
The traction control system controls excessive spinning (slipping) of the rear wheel when accelerating on slippery surfaces, such as unpaved or wet roads.
The ECU monitors the front and rear wheel speeds using the signals from the front and rear wheel sensors, and detects rear wheel slipping according to the difference between the wheel speeds. If the slipping exceeds the preset value, the ECU controls the slipping using integrated control of the ignition timing, fuel cut-off, and throttle valve opening of the YCC-T system.
The traction control system can be set to one of two operation modes or turned off.

TCS (Traction control system) layout



1. Traction control system indicator light
2. Traction control system switch
3. ECU (engine control unit)
4. Ignition coils
5. Spark plugs
6. Throttle servo motor
7. Fuel injector
8. ABS ECU (electronic control unit)
9. Rear wheel sensor
10. Front wheel sensor

TCS (Traction control system) block diagram
The signals from the front and rear wheel sensors are sent to the ECU through the ABS ECU, and the ECU calculates the amount of slip according to the difference between the detected front and rear wheel speeds.
If the amount of slip exceeds the preset value, the ECU controls the ignition timing, fuel cut-off, and throttle valve opening of the YCC-T system so that the amount of slip is less than the preset value. The traction control system indicator light in the meter assembly flashes when the traction control system has activated.



1. Front wheel sensor
2. Rear wheel sensor
3. ABS ECU (electronic control unit)
4. Traction control system switch
5. ECU (engine control unit)
A. Signal conversion
B. Slip amount calculation
C. Exceeds preset value
D. Actuator control
E. Fuel cut-off
F. Ignition timing (retarded)
G. Traction control system indicator light (flashes)
H. YCC-T motor throttle valve opening (decreased)

TCS (Traction control system) function

The traction control system helps maintain traction when accelerating on slippery surfaces, such as unpaved or wet roads. If sensors detect that the rear wheel is starting to slip (uncontrolled spinning), the traction control system assists by regulating engine power as needed until traction is restored. The traction control system indicator light flashes to let the rider know that traction control has engaged.

TIP

The rider may also notice slight changes in engine and exhaust sounds when the traction control system is engaged.

EWA23P1039

⚠ WARNING

The traction control system is not a substitute for riding appropriately for the conditions. Traction control cannot prevent loss of traction due to excessive speed when entering turns, when accelerating hard at a sharp lean angle, or while braking, and cannot prevent front wheel slipping. As with any motorcycle, approach surfaces that may be slippery with caution and avoid especially slippery surfaces.

There are two traction control system modes. The traction control system can also be turned off:

- "TCS" mode "1": Default mode
- "TCS" mode "2": Sporty mode
  This mode decreases traction control system assist, allowing the rear wheel to spin more freely than "TCS" mode "1".

• “TCS” “Off”: The traction control system is turned off. The system may also be automatically disabled in some riding conditions (Refer to “Resetting”).

When the key is turned to “ON”, the traction control system is enabled and “TCS” “1” displays in the multi-function meter.

The traction control system mode can be changed and the system can be turned off only when the key is in the “ON” position and the vehicle is not moving.

TIP

Turn the traction control system “Off” to help free the rear wheel if the motorcycle gets stuck in mud, sand, or other soft surfaces.

ECA23P1085

NOTICE

Use only the specified tires. Using different sized tires will prevent the traction control system from controlling tire rotation accurately.

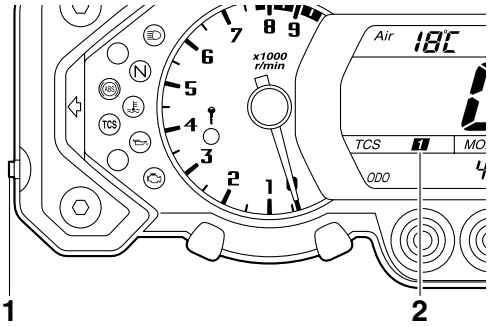
Setting the traction control system

EWA23P1040

⚠ WARNING

Be sure to stop the vehicle before making any setting changes to the traction control system. Changing settings while riding can distract the operator and increase the risk of an accident.

Push the traction control system switch on the multi-function meter for less than one second to change between “TCS” modes “1” and “2”. Push the switch for at least two seconds to select “TCS” “Off” and turn the traction control system off. Push the switch again to return to the previously selected mode “1” or “2”.



1. Traction control system switch
2. Traction control system mode display

Resetting

The traction control system will be disabled in the following condition:

• The rear wheel is rotated with the centerstand down and the key in the “ON” position.

If the traction control system has been disabled, both the traction control system indicator light and the engine trouble warning light come on.

To reset the traction control system:

Turn the key to “OFF”. Wait at least one second, then turn the key back to “ON”. The traction control system indicator light should go off and the system will be enabled. The engine trouble warning light should go off after the motorcycle reaches at least 20 km/h (12 mi/h). If the traction control system indicator light and/or engine trouble warning light still remain on after resetting, check the fuel injection system (Refer to “FUEL INJECTION SYSTEM”).

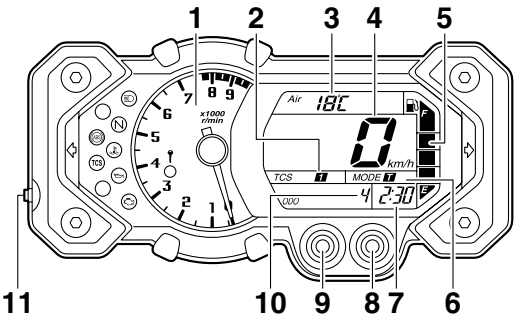
EAS23P1106
INSTRUMENT FUNCTIONS

Multi-function meter unit

EWA23P1041

⚠ WARNING

Be sure to stop the vehicle before making any setting changes to the multi-function meter unit. Changing settings while riding can distract the operator and increase the risk of an accident.



1. Tachometer
2. Traction control system mode display
3. Coolant temperature display/air intake temperature display/instantaneous fuel consumption display/average fuel consumption display
4. Speedometer
5. Fuel meter
6. Drive mode display
7. Clock
8. Right set button
9. Left set button
10. Odometer/tripmeter/fuel reserve tripmeter
11. Traction control system switch

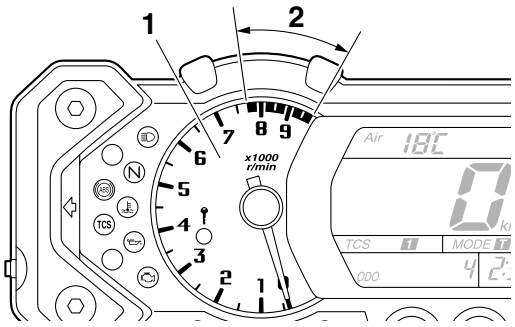
The multi-function meter unit is equipped with the following:
- a speedometer
- a tachometer
- an odometer
- two tripmeters (which show the distance traveled since they were last set to zero)
- a fuel reserve tripmeter (which shows the distance traveled since the last segment of the fuel meter started flashing)
- a clock
- a fuel meter
- an air intake temperature display
- a coolant temperature display
- a fuel consumption display (instantaneous and average consumption functions)
- a drive mode display (which shows the selected drive mode)
- a traction control system mode display (which shows the selected traction control system mode)
- a self-diagnosis device
- an LCD and tachometer brightness control mode

The left and right set buttons, located under the display, allow you to control or change the settings in the multi-function meter unit.

TIP

- To use the left and right buttons, the key must be turned to “ON”, except for the brightness mode.
- For the U.K. only: To switch the speedometer and odometer/tripmeter/fuel consumption displays between kilometers and miles, press the left button for at least two seconds.

Tachometer



1. Tachometer
2. Tachometer red zone

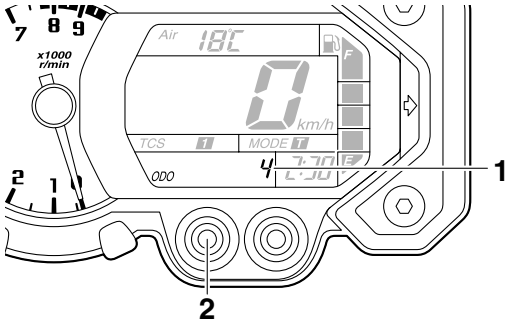
The electric tachometer allows the rider to monitor the engine speed and keep it within the ideal power range.
When the key is turned to “ON”, the tachometer needle sweeps once across the r/min range and then returns to zero r/min in order to test the electrical circuit.

ECA23P1086

NOTICE

Do not operate the engine in the tachometer red zone.
Red zone: 7750 r/min and above

Odometer and tripmeter modes



1. Odometer/tripmeter/fuel reserve tripmeter
2. Left set button

Pushing the left button switches the display between the odometer mode “ODO” and the tripmeter modes “TRIP 1” and “TRIP 2” in the following order:
ODO → TRIP 1 → TRIP 2 → ODO

TIP

When selecting “TRIP 1” or “TRIP 2”, the display flashes for five seconds.

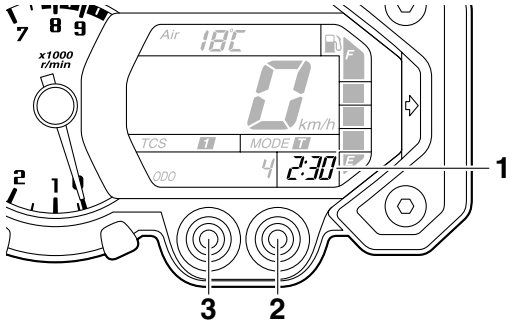
When approximately 3.9 L (1.03 US gal, 0.86 Imp.gal) of fuel remains in the fuel tank, the display automatically changes to the fuel reserve tripmeter mode “TRIP F” and starts counting the distance traveled from that point. In that case, pushing the left button switches the display between the various tripmeter and odometer modes in the following order:
TRIP F → ODO → TRIP 1 → TRIP 2 → TRIP F

TIP

When selecting “TRIP 1”, “TRIP 2” or “TRIP F”, the display flashes for five seconds.

To reset a tripmeter, select it by pushing the left button, and then push this button for at least one second while the display is flashing. If you do not reset the fuel reserve tripmeter manually, it resets itself automatically and the display returns to the prior mode after refueling and traveling 5 km (3 mi).

Clock

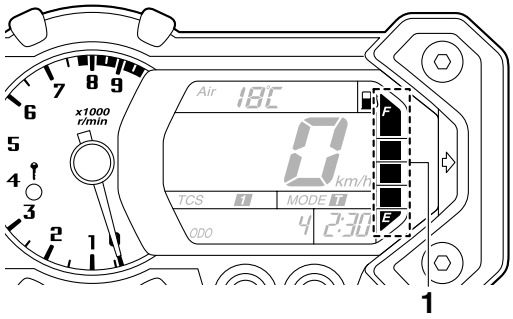


1. Clock
2. Right set button
3. Left set button

The clock displays when the key is turned to “ON”. In addition, the clock can be displayed for 10 seconds by pushing the left button when the main switch is in the “OFF”, “LOCK” or “Parking” position.
To set the clock:

1. Push the left button and right button together for at least three seconds.
2. When the hour digits start flashing, push the right button to set the hours.
3. Push the left button; the minute digits start flashing.
4. Push the right button to set the minutes.
5. Push the left button; the clock starts after the button is released.

Fuel meter



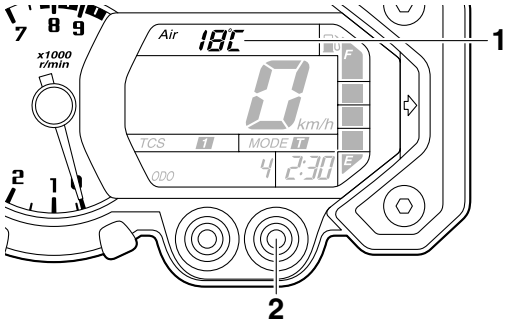
1. Fuel meter

The fuel meter indicates the amount of fuel in the fuel tank. The display segments of the fuel meter disappear towards “E” (Empty) as the fuel level decreases. When the last segment starts flashing, refuel as soon as possible.
When the key is turned to “ON”, all display segments come on once in order to test the electrical circuit.

TIP

This fuel meter is equipped with a self-diagnosis system. If a problem is detected in the electrical circuit, all display segments start flashing. If this occurs, check the electrical circuit.
Refer to "SIGNALING SYSTEM" on page 8-21.

Air intake temperature, coolant temperature, instantaneous fuel consumption and average fuel consumption modes



1. Coolant temperature display/air intake temperature display/instantaneous fuel consumption display/average fuel consumption display
2. Right set button

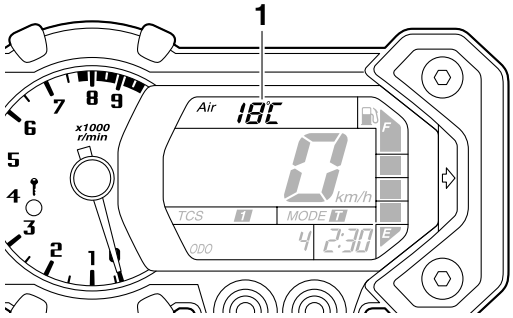
Push the right button to switch the display between the air intake temperature mode, the coolant temperature mode, the instantaneous fuel consumption mode "km/L" or "L/100 km", and the average fuel consumption mode "AVE_ _._ km/L" or "AVE_ _._ L/100 km" in the following order:

air intake temperature → coolant temperature → km/L or L/100 km → AVE_ _._ km/L or AVE_ _._ L/100 km → air intake temperature

For the UK only:
Push the right button to switch the display between the air intake temperature mode, the coolant temperature mode, the instantaneous fuel consumption mode "km/L", "L/100 km" or "MPG", and the average fuel consumption mode "AVE_ _._ km/L", "AVE_ _._ L/100 km" or "AVE_ _._ MPG" in the following order:

air intake temperature → coolant temperature → km/L, L/100 km or MPG → AVE_ _._ km/L, AVE_ _._ L/100 km or AVE_ _._ MPG → air intake temperature

Air intake temperature mode



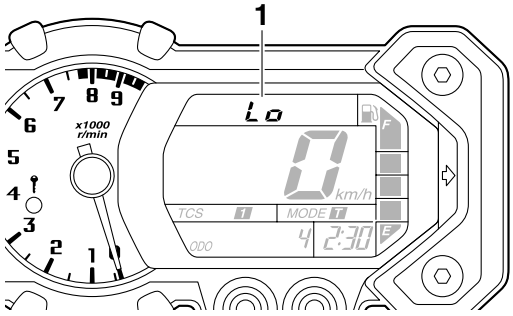
1. Air intake temperature display

The air intake temperature display indicates the temperature of the air drawn into the air filter case.

TIP

Even if the air intake temperature is set to be displayed, the coolant temperature warning light comes on if the engine overheats.

Coolant temperature mode



1. Coolant temperature display

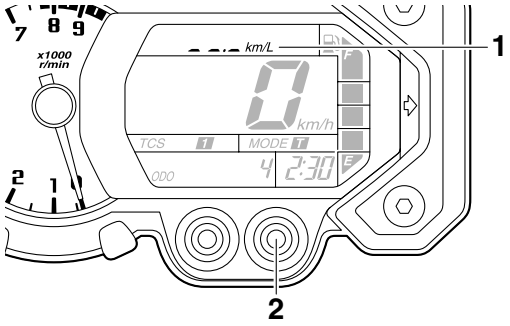
The coolant temperature display indicates the temperature of the coolant.

ECA23P1087

NOTICE

Do not continue to operate the engine if it is overheating.

Instantaneous fuel consumption mode



1. Instantaneous fuel consumption
2. Right set button

The instantaneous fuel consumption display modes “km/L”, “L/100 km” or “MPG” (for the UK only) show the fuel consumption under the current riding conditions.

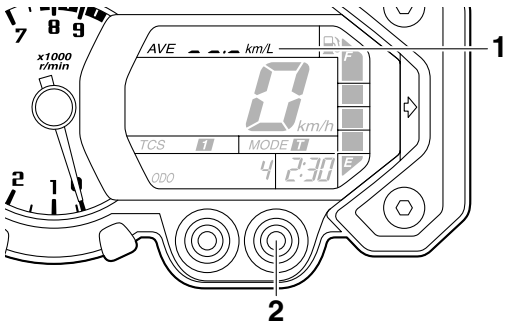
- The “km/L” display shows the distance that can be traveled on 1.0 L of fuel.
- The “L/100 km” display shows the amount of fuel necessary to travel 100 km.
- For the UK only: The “MPG” display shows the distance that can be traveled on 1.0 Imp.gal of fuel.

To switch between the instantaneous fuel consumption displays, push the right button when one of the displays is shown.

TIP

The instantaneous fuel consumption displays when the vehicle speed reaches 20 km/h (12 mi/h).

Average fuel consumption mode



1. Average fuel consumption
2. Right set button

The average fuel consumption display modes “AVE_ _._ km/L”, “AVE_ _._ L/100 km” or “AVE_ _._ MPG” (for the UK only) show the average fuel consumption since the display was last reset.

- The “AVE_ _._ km/L” display shows the average distance that can be traveled on 1.0 L of fuel.
- The “AVE_ _._ L/100 km” display shows the average amount of fuel necessary to travel 100 km.
- For the UK only: The “AVE_ _._ MPG” display shows the average distance that can be traveled on 1.0 Imp.gal of fuel.

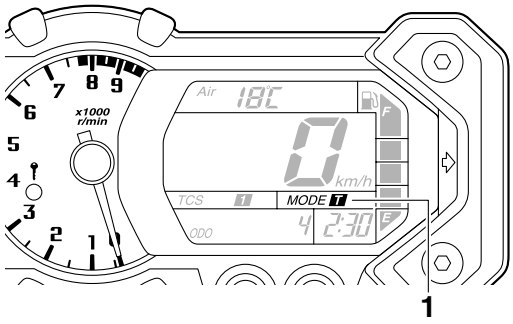
To switch between the average fuel consumption displays, push the right button when one of the displays is shown.

To reset the average fuel consumption display, select it by pushing the right button, and then push the right button for at least one second while the display is flashing.

TIP

After the display is reset, the average fuel consumption is not displayed until the vehicle has traveled 1 km (0.6 mi).

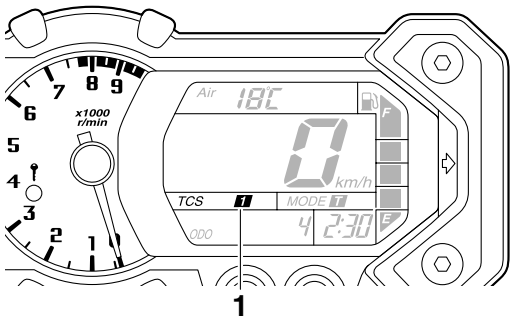
Drive mode display



1. Drive mode display

This display indicates which drive mode has been selected: Touring mode “T” or sports mode “S”. For more details on the modes and on how to select them, refer to “D-mode (drive mode)”.

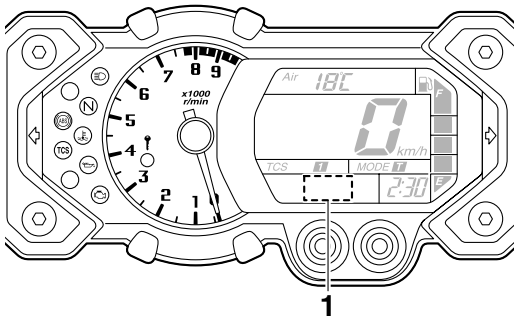
Traction control system mode display



1. Traction control system mode display

This display indicates which traction control system mode has been selected: “1”, “2” or “Off”. For more details on the modes and on how to select them, refer to “TCS (Traction Control System) function”.

Self-diagnosis device



1. Fault code display

This model is equipped with a self-diagnosis device for various electrical circuits.
If a problem is detected in the immobilizer system circuits, the immobilizer system indicator light flashes and the display indicates a fault code.
If a problem is detected in any other circuit, the engine trouble warning light comes on and the display indicates a fault code.

TIP

If the display indicates immobilizer system circuit fault code 52, this could be caused by transponder interference. If this fault code appears, try following the procedure below.

1. Use the code re-registering key to start the engine.

TIP

Make sure there are no other immobilizer keys close to the main switch, and do not keep more than one immobilizer key on the same key ring! Immobilizer system keys may cause signal interference, which may prevent the engine from starting.

2. If the engine starts, turn it off and try starting the engine with the standard keys.
3. If one or both of the standard keys do not start the engine, take the vehicle, the code re-registering key and both standard keys.

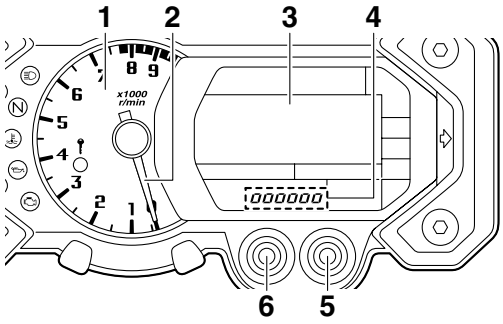
If the display indicates any fault codes, note the code number, and then check the vehicle.

EWA23P1042

NOTICE

If the display indicates a fault code, the vehicle should be checked as soon as possible in order to avoid engine damage.

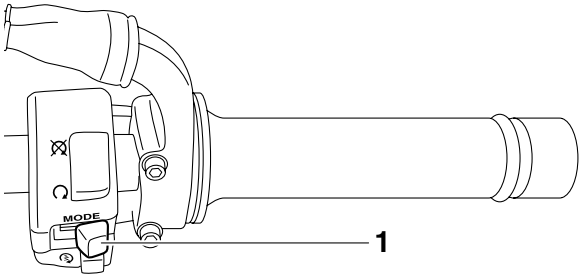
LCD and tachometer brightness control mode



1. Tachometer panel
2. Tachometer needle
3. LCD
4. Brightness level display
5. Right set button
6. Left set button

This function allows you to adjust the brightness of the LCD, and the tachometer panel and needle to suit the outside lighting conditions.
To set the brightness
1. Turn the key to “OFF”.
2. Push and hold the left button.
3. Turn the key to “ON”, and then release the left button after five seconds.
4. Push the right button to select the desired brightness level.
5. Push the left button to confirm the selected brightness level. The display returns to the odometer or tripmeter mode.

D-mode (drive mode)
D-mode is an electronically controlled engine performance system with two mode selections (touring mode “T” and sports mode “S”).
Push the drive mode switch “MODE” to switch between modes.



1. Drive mode switch “MODE”

TIP

Before using D-mode, make sure you understand its operation along with the operation of the drive mode switch.

Touring mode “T”

The touring mode “T” is suitable for various riding conditions.
This mode allows the rider to enjoy smooth drivability from the low-speed range to the high-speed range.

Sports mode “S”

This mode offers a sportier engine response in the low- to mid-speed range compared to the touring mode.

Drive mode switch “MODE”

EWA23P1043

⚠ WARNING

Do not change the D-mode while the vehicle is moving.

Using this switch changes the drive mode to touring mode “T” or sports mode “S”.
The throttle grip must be completely closed in order to change the drive mode.
The selected mode is shown on the drive mode display.

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 1-44.
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.

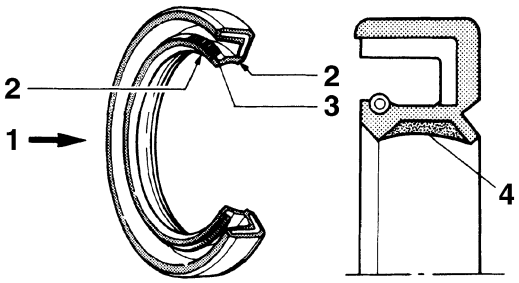
4. During disassembly, clean all of the parts and place them in trays in the order of disassembly. This will speed up assembly and allow for the correct installation of all parts.
5. Keep all parts away from any source of fire.

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

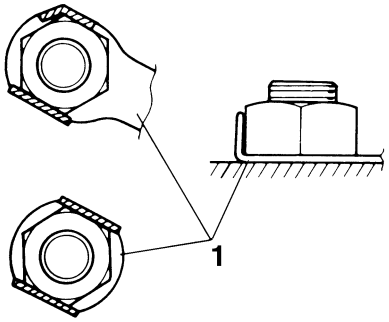
1. When overhauling the engine, replace all gaskets, seals and O-rings. All gasket surfaces, oil seal lips and O-rings must be cleaned.
2. During reassembly, properly oil all mating parts and bearings and lubricate the oil seal lips with grease.



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

EAS20220
LOCK WASHERS/PLATES AND COTTER PINS

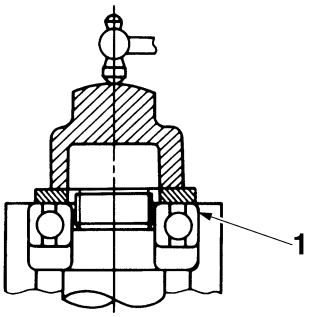
After removal, replace all lock washers/plates "1" and cotter pins. After the bolt or nut has been tightened to specification, bend the lock tabs along a flat of the bolt or nut.

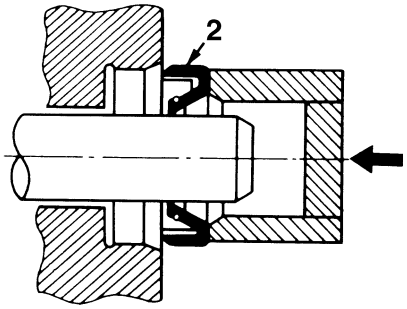


EAS20231
BEARINGS AND OIL SEALS
Install bearings “1” and oil seals “2” so that the manufacturer marks or numbers are visible. When installing oil seals, lubricate the oil seal lips with a light coat of lithium-soap-based grease. Oil bearings liberally when installing, if appropriate.

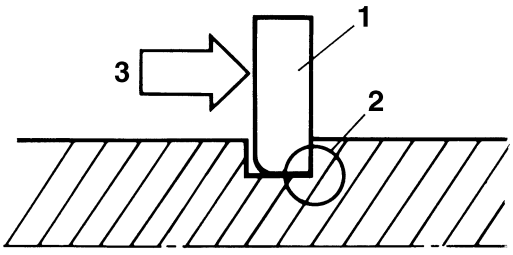
ECA13300
NOTICE

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





EAS20240
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 the sharp-edged corner “2” is positioned opposite the thrust “3” that the circlip receives.



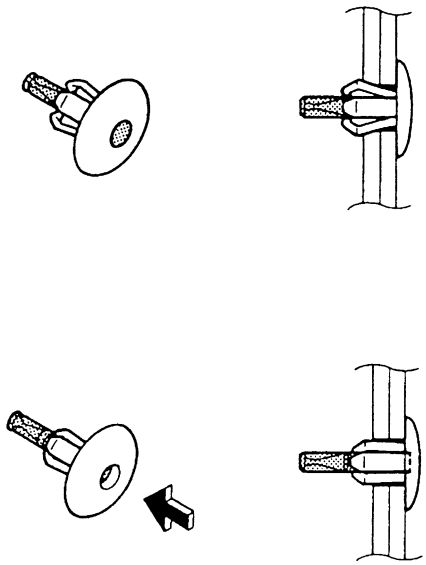
EAS30380
BASIC SERVICE INFORMATION

EAS30390
QUICK FASTENERS

Rivet type
1. Remove:
   • Quick fastener

TIP

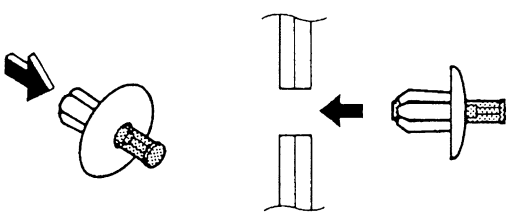
To remove the quick fastener, push its pin with a screwdriver, then pull the fastener out.

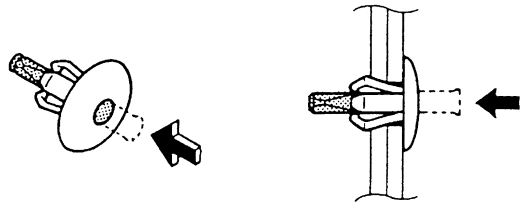


2. Install:
   • Quick fastener

TIP

To install the quick fastener, push its pin so that it protrudes from the fastener head, then insert the fastener into the part to be secured and push the pin in with a screwdriver. Make sure that the pin is flush with the fastener's head.

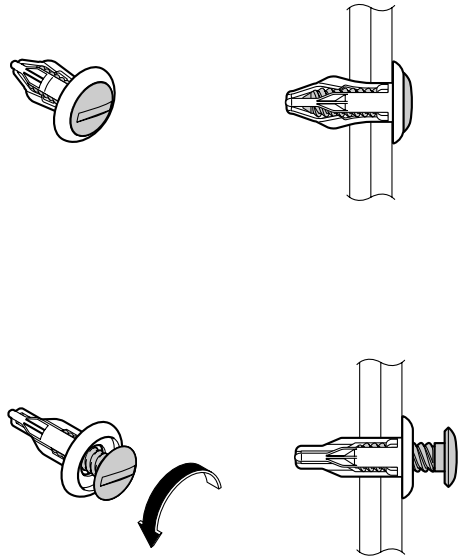




Screw type
1. Remove:
   • Quick fastener

TIP

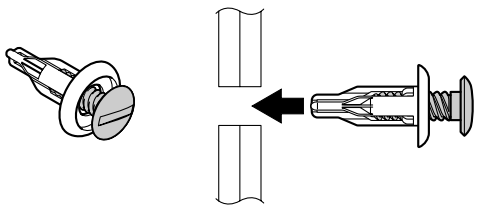
To remove the quick fastener, loosen the screw with a screwdriver, then pull the fastener out.

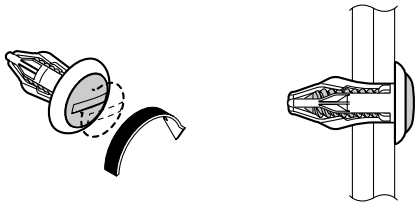


2. Install:
   • Quick fastener

TIP

To install the quick fastener, insert the fastener into the part to be secured and tighten the screw.



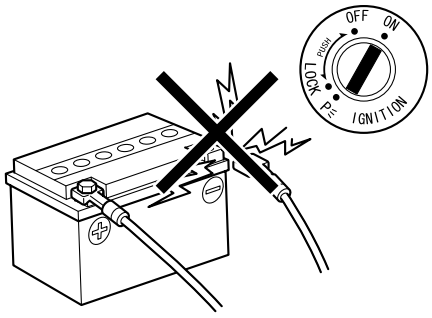


EAS30402
ELECTRICAL SYSTEM

Electrical parts handling

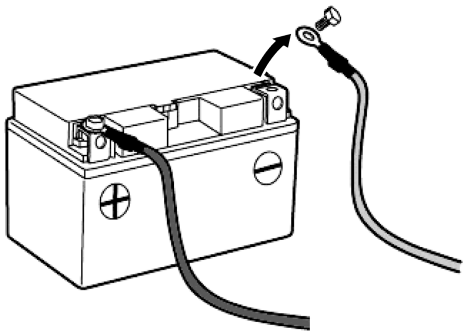
ECA16600
NOTICE

Never disconnect a battery lead while the engine is running; otherwise, the electrical components could be damaged.



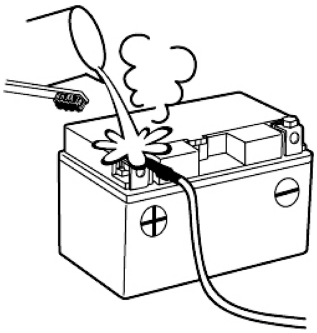
ECA16751
NOTICE

When disconnecting the battery leads from the battery, be sure to disconnect the negative battery lead first, then the positive battery lead. If the positive battery lead is disconnected first and a tool or similar item contacts the vehicle, a spark could be generated, which is extremely dangerous.



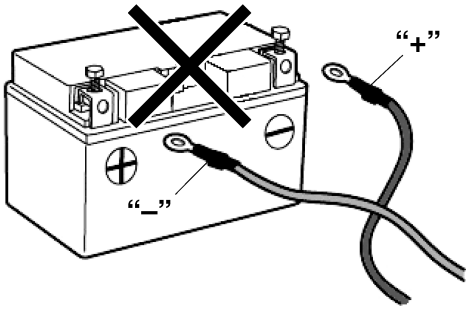
TIP

If a battery lead is difficult to disconnect due to rust on the battery terminal, remove the rust using hot water.



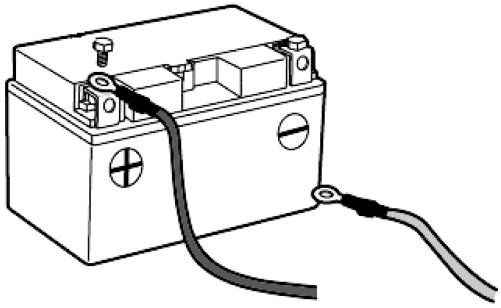
ECA16760
NOTICE

Be sure to connect the battery leads to the correct battery terminals. Reversing the battery lead connections could damage the electrical components.



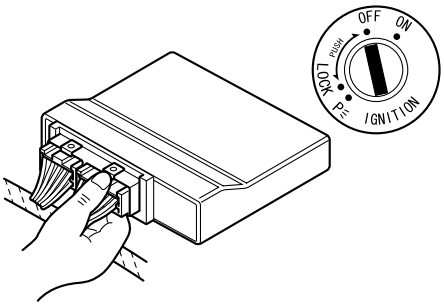
ECA16771
NOTICE

When connecting the battery leads to the battery, be sure to connect the positive battery lead first, then the negative battery lead. If the negative battery lead is connected first and a tool or similar item contacts the vehicle while the positive battery lead is being connected, a spark could be generated, which is extremely dangerous.



ECA16610
NOTICE

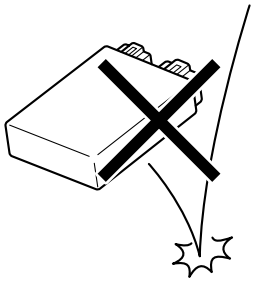
Turn the main switch to "OFF" before disconnecting or connecting an electrical component.



ECA16620

NOTICE

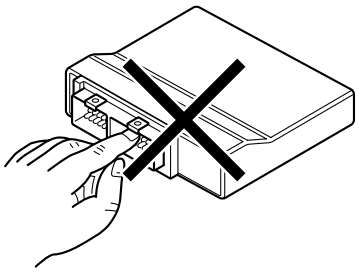
Handle electrical components with special care, and do not subject them to strong shocks.



ECA16630

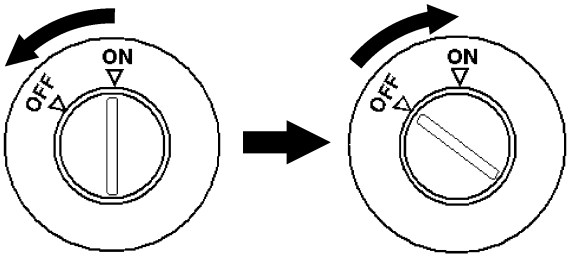
NOTICE

Electrical components are very sensitive to and can be damaged by static electricity. Therefore, never touch the terminals and be sure to keep the contacts clean.



TIP

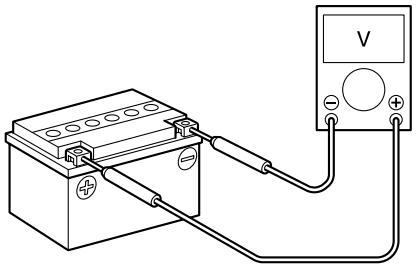
When resetting the ECU by turning the main switch to "OFF", be sure to wait approximately 5 seconds before turning the main switch back to "ON".



Checking the electrical system

TIP

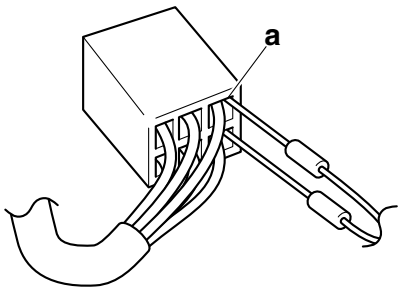
Before checking the electrical system, make sure that the battery voltage is at least 12 V.



ECA14371

NOTICE

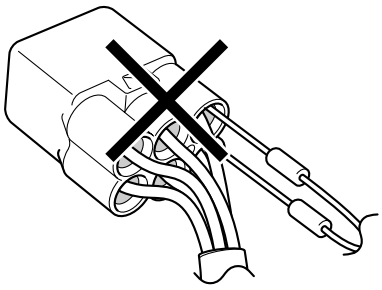
Never insert the tester probes into the coupler terminal slots. Always insert the probes from the opposite end "a" of the coupler, taking care not to loosen or damage the leads.



ECA16640

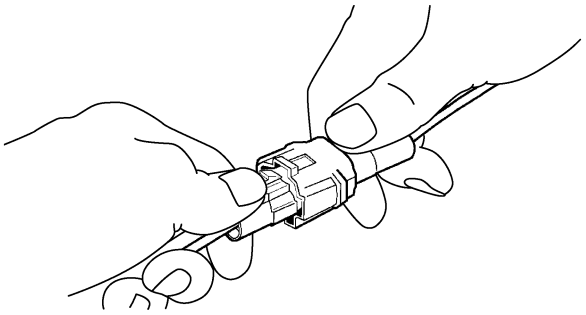
NOTICE

For waterproof couplers, never insert the tester probes directly into the coupler. When performing any checks using a waterproof coupler, use the specified test harness or a suitable commercially available test harness.

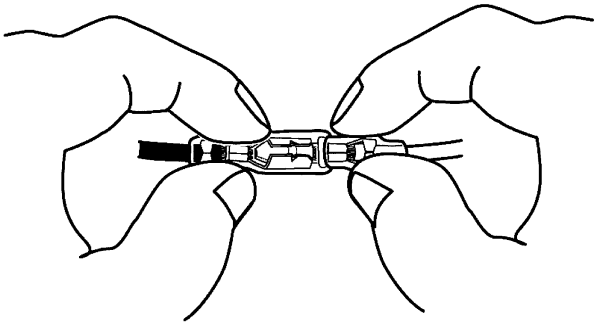


Checking the connections
Check the leads, couplers, and connectors for stains, rust, moisture, etc.
1. Disconnect:
   • Lead
   • Coupler
   • Connector

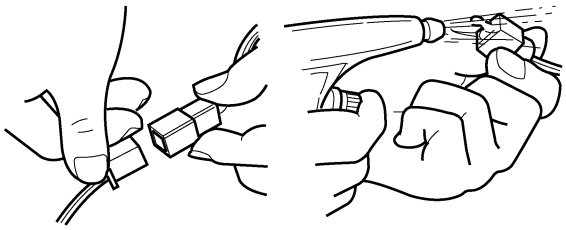
ECA16780
NOTICE
• When disconnecting a coupler, release the coupler lock, hold both sections of the coupler securely, and then disconnect the coupler.
• There are many types of coupler locks; therefore, be sure to check the type of coupler lock before disconnecting the coupler.



ECA16790
NOTICE
When disconnecting a connector, do not pull the leads. Hold both sections of the connector securely, and then disconnect the connector.

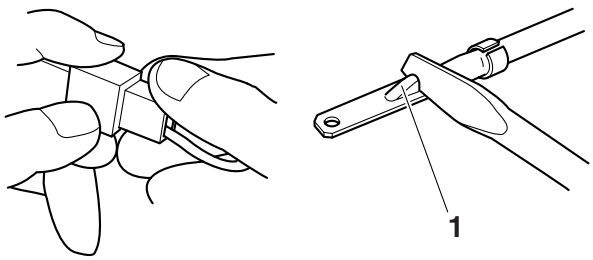


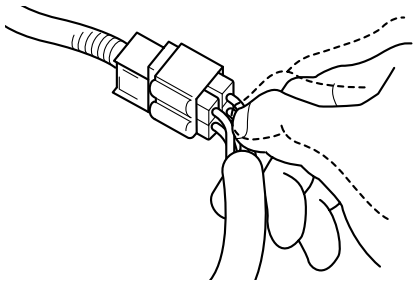
2. Check:
   • Lead
   • Coupler
   • Connector
   Moisture → Dry with an air blower.
   Rust/stains → Connect and disconnect several times.



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

TIP
• If the pin "1" on the terminal is flattened, bend it up.
• After disassembling and assembling a coupler, pull on the leads to make sure that they are installed securely.

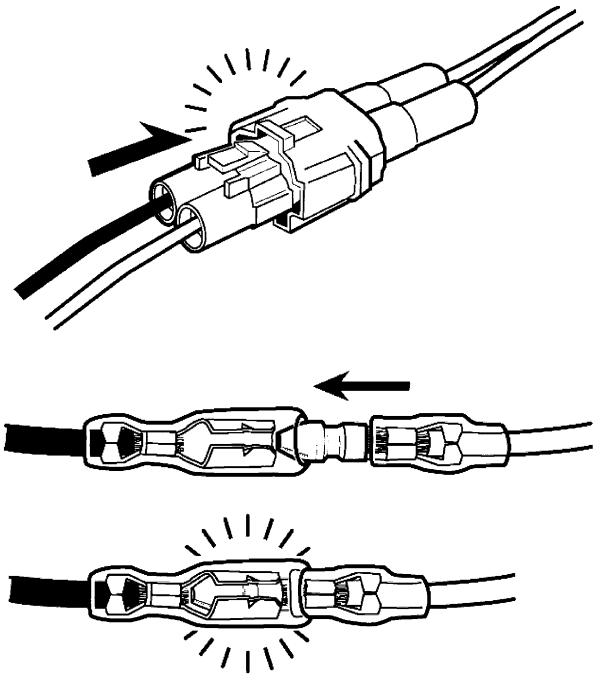




4. Connect:
   • Lead
   • Coupler
   • Connector

TIP

- When connecting a coupler or connector, push both sections of the coupler or connector together until they are connected securely.
- Make sure all connections are tight.



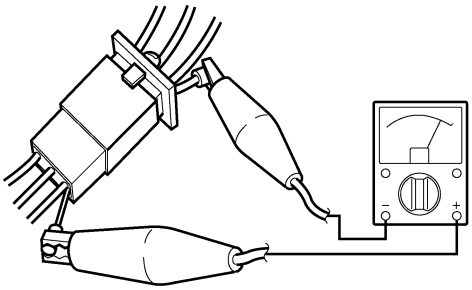
5. Check:
   • Continuity
   (with the pocket tester)

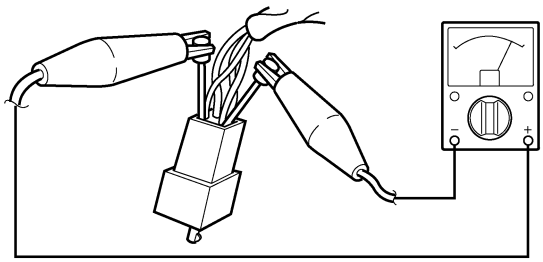
	Pocket tester **90890-03132**

TIP

- If there is no continuity, clean the terminals.
- When checking the wire harness, perform steps (1) to (4).

- As a quick remedy, use a contact revitalizer available at most part stores.



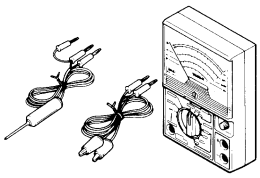
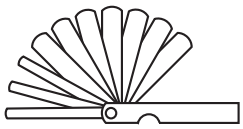
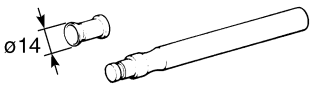
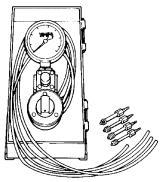
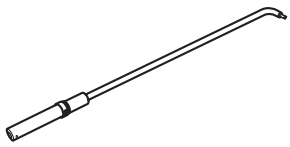


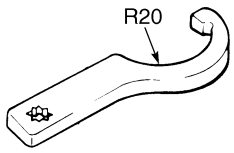
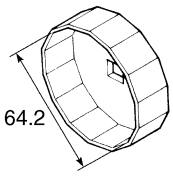
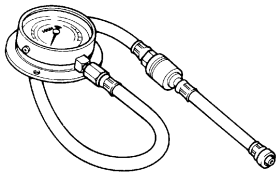
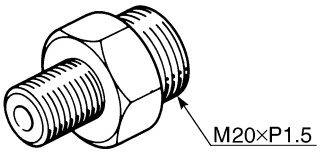
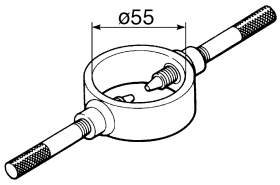
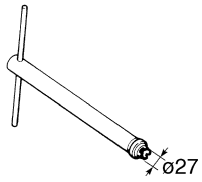
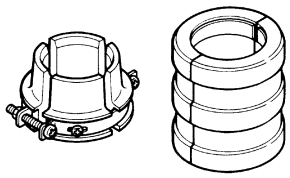
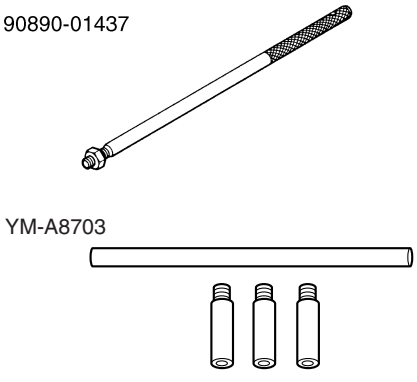
EAS20260
SPECIAL TOOLS

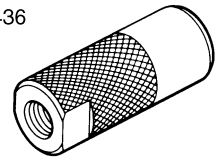
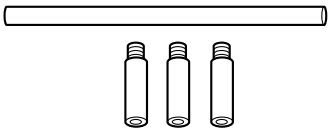
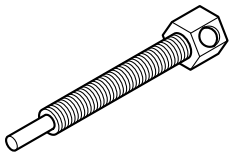
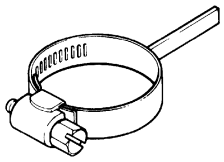
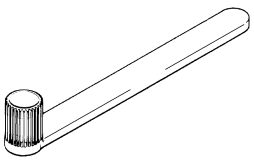
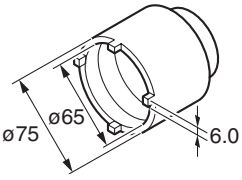
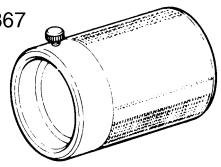
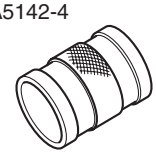
The following special tools are necessary for complete and accurate tune-up and assembly. Use only the appropriate special tools as this will help prevent damage caused by the use of inappropriate tools or improvised techniques. Special tools, part numbers or both may differ depending on the country.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

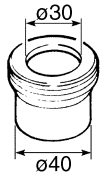
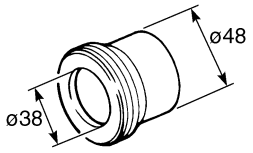
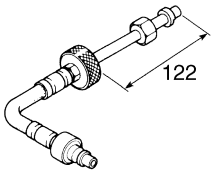
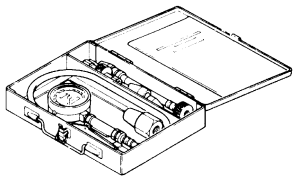
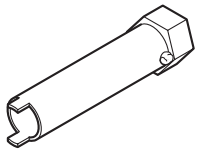
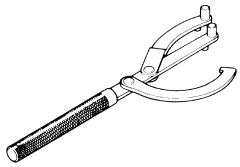
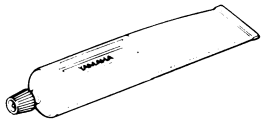
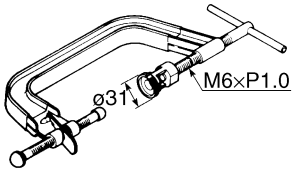
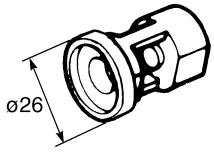
TIP

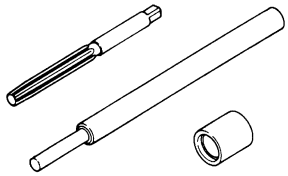
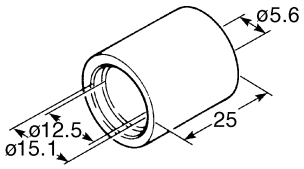
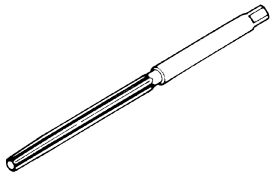
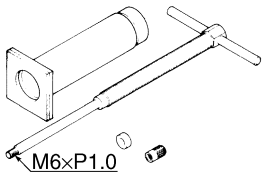
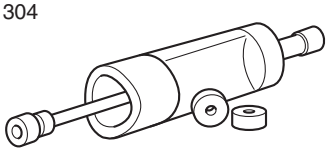
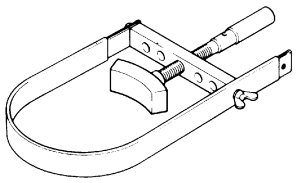
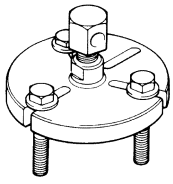
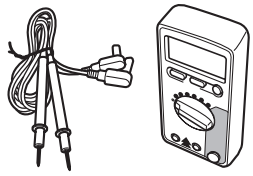
- For U.S.A. and Canada, use part number starting with “YM-”, “YU-”, or “ACC-”.
- For others, use part number starting with “90890-”.

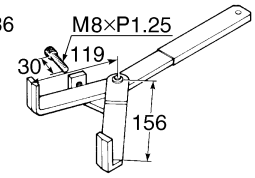
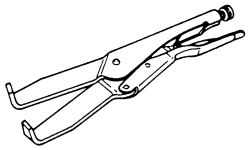
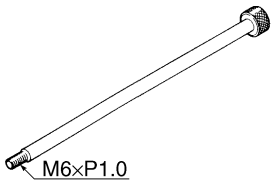
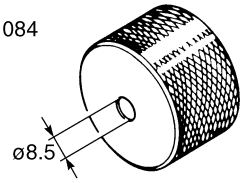
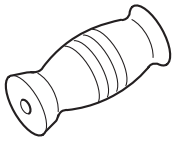
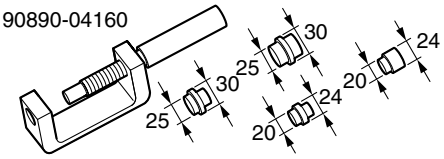
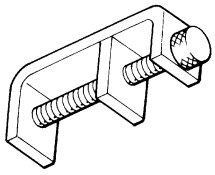
Tool name/Tool No.	Illustration	Reference pages
Test coupler adapter 90890-03149		1-25, 4-72, 4-73
Pocket tester 90890-03132		1-43
Thickness gauge 90890-03180 Feeler gauge set YU-26900-9		3-6, 5-61
Valve lapper 90890-04101 Valve lapping tool YM-A8998		3-6
Vacuum gauge 90890-03094 Vacuummate YU-44456	90890-03094  YU-44456 	3-8
Carburetor angle driver 2 90890-03173		3-9

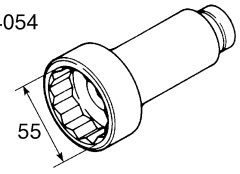
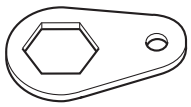
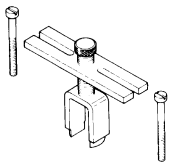
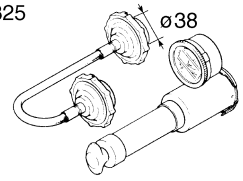
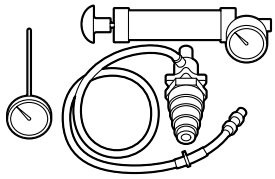
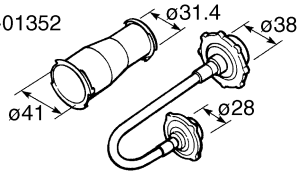
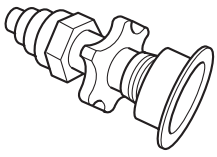
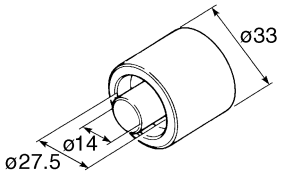
Tool name/Tool No.	Illustration	Reference pages
Steering nut wrench 90890-01403 Exhaust flange nut wrench YU-A9472		3-20, 4-94
Oil filter wrench 90890-01426 YU-38411		3-25, 5-87
Oil pressure gauge set 90890-03120		3-26
Oil pressure adapter B 90890-03124		3-26
Fork spring compressor 90890-01441 YM-01441		4-85, 4-90
Damper rod holder 90890-01423 Damping rod holder YM-01423		4-86, 4-88
Fork seal driver 90890-01442 Adjustable fork seal driver (36–46 mm) YM-01442		4-87, 4-88
Rod puller 90890-01437 Universal damping rod bleeding tool set YM-A8703		4-89

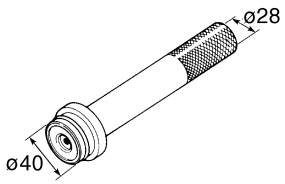
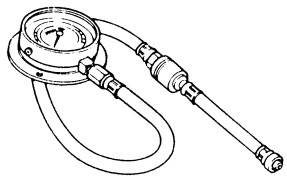
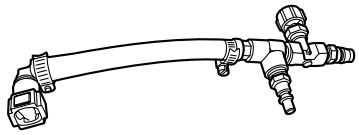
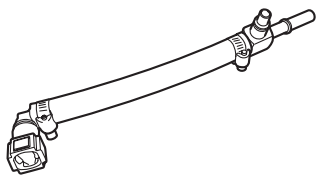
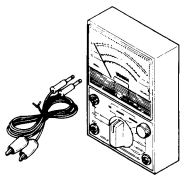
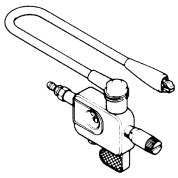
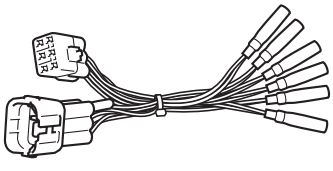
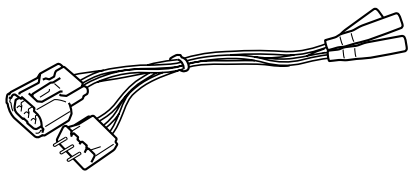
Tool name/Tool No.	Illustration	Reference pages
Rod puller attachment (M10) 90890-01436 Universal damping rod bleeding tool set YM-A8703	90890-01436  YM-A8703 	4-89
Ring gear fix bolt (M14) 90890-01548 YM-01548		4-110
Final gear backlash band 90890-01511 Middle drive gear lash tool YM-01230		4-110
Coupling gear holding tool 90890-01560		4-112, 4-116
Bearing retainer wrench 90890-01561		4-112, 4-116
Fork seal driver weight 90890-01367 Replacement hammer YM-A9409-7	90890-01367  YM-A9409-7/YM-A5142-4 	4-118

Tool name/Tool No.	Illustration	Reference pages
Fork seal driver attachment (ø30) 90890-01400		4-118
Fork seal driver attachment (ø38) 90890-01372 Replacement 38 mm YM-A5142-1		4-118
Extension 90890-04136		5-1
Compression gauge 90890-03081 Engine compression tester YU-33223		5-1
Pivot shaft wrench 90890-01485 Frame mount insert wrench YM-01485		5-9
Rotor holding tool 90890-01235 Universal magneto & rotor holder YU-01235		5-17, 5-20
Yamaha bond No. 1215 90890-85505 (Three Bond No.1215®)		5-23, 5-47, 5-88
Valve spring compressor 90890-04019 YM-04019		5-30, 5-35
Valve spring compressor attachment 90890-01243 Valve spring compressor adapter (26 mm) YM-01253-1		5-30, 5-35

Tool name/Tool No.	Illustration	Reference pages
Valve guide remover & installer set (ø5.5) 90890-04016 Valve guide remover (5.5 mm) YM-01122		5-32
Valve guide installer (ø5.5) 90890-04015 Valve guide installer (5.5 mm) YM-04015		5-32
Valve guide reamer (5.5 mm) 90890-01196 YM-01196		5-32
Piston pin puller set 90890-01304 Piston pin puller YU-01304	90890-01304  YU-01304 	5-38
Sheave holder 90890-01701 Primary clutch holder YS-01880-A		5-45, 5-46, 5-70
Flywheel puller 90890-01362 Heavy duty puller YU-33270-B		5-45
Digital circuit tester 90890-03174 Model 88 Multimeter with tachometer YU-A1927		5-50

Tool name/Tool No.	Illustration	Reference pages
Universal clutch holder 90890-04086 YM-91042	90890-04086  YM-91042 	5-60, 5-63
Slide hammer bolt 90890-01083 Slide hammer bolt 6 mm YU-01083-1		5-109
Weight 90890-01084 YU-01083-3	90890-01084  YU-01083-3 	5-109
Universal joint holder 90890-04160	90890-04160 	5-117, 5-119
Damper spring compressor 90890-04090		5-117, 5-119

Tool name/Tool No.	Illustration	Reference pages
Middle drive shaft nut wrench (55 mm) 90890-04054 Offset wrench 55 mm YM-04054	90890-04054  YM-04054 	5-118
Middle gear backlash tool 90890-04080 Middle drive gear holder YM-33222		5-121
Radiator cap tester 90890-01325 Mityvac cooling system tester kit YU-24460-A	90890-01325  YU-24460-A 	6-3
Radiator cap tester adapter 90890-01352 Pressure tester adapter YU-33984	90890-01352  YU-33984 	6-3
Mechanical seal installer 90890-04132 Water pump seal installer YM-33221-A		6-9

Tool name/Tool No.	Illustration	Reference pages
Middle driven shaft bearing driver 90890-04058 Middle drive bearing installer 40 & 50 mm YM-04058		6-9
Pressure gauge 90890-03153 YU-03153		7-11
Fuel injector pressure adapter 90890-03210 YU-03210		7-11
Fuel pressure adapter 90890-03176 YM-03176		7-11
Pocket tester 90890-03112 Analog pocket tester YU-03112-C		8-130, 8-131, 8-139, 8-140, 8-141, 8-145, 8-146, 8-147, 8-148, 8-149, 8-150, 8-151, 8-152, 8-153, 8-154, 8-155, 8-156
Ignition checker 90890-06754 Oppama pet-4000 spark checker YM-34487		8-148
Test harness- lean angle sensor (6P) 90890-03209 YU-03209		8-149
Test harness S- pressure sensor (3P) 90890-03207 YU-03207		8-154

SPECIFICATIONS

GENERAL SPECIFICATIONS 2-1

ENGINE SPECIFICATIONS 2-2

CHASSIS SPECIFICATIONS 2-10

ELECTRICAL SPECIFICATIONS 2-13

TIGHTENING TORQUES 2-16
- GENERAL TIGHTENING TORQUE SPECIFICATIONS 2-16
- ENGINE TIGHTENING TORQUES 2-17
- CHASSIS TIGHTENING TORQUES 2-22

LUBRICATION POINTS AND LUBRICANT TYPES 2-28
- ENGINE 2-28
- CHASSIS 2-30

LUBRICATION SYSTEM CHART AND DIAGRAMS 2-31
- ENGINE OIL LUBRICATION CHART 2-31
- LUBRICATION DIAGRAMS 2-33

COOLING SYSTEM DIAGRAMS 2-41

CABLE ROUTING 2-43

EAS20280
GENERAL SPECIFICATIONS

Model	
Model	23P1 (Europe except (B) and (F)) (ZA) 23P2 (B) (F) 23P3 (AUS)
Dimensions	
Overall length	2255 mm (88.8 in)
Overall width	980 mm (38.6 in)
Overall height	1410 mm (55.5 in)
Seat height	845 mm (33.3 in) (low position) 870 mm (34.3 in) (high position)
Wheelbase	1540 mm (60.6 in)
Ground clearance	205 mm (8.07 in)
Minimum turning radius	2700 mm (106.3 in)
Weight	
With oil and fuel	261 kg (575 lb)
Maximum load (total weight of rider, passenger, cargo and accessories)	209 kg (461 lb)

EAS20290
ENGINE SPECIFICATIONS

Engine	
Engine type	Liquid cooled 4-stroke, DOHC
Displacement	1199 cm^3
Cylinder arrangement	Forward-inclined parallel 2-cylinder
Bore × stroke	98.0 × 79.5 mm (3.86 × 3.13 in)
Compression ratio	11.00 :1
Standard compression pressure (at sea level)	680 kPa/250 r/min (6.8 kgf/cm^2/250 r/min, 96.7 psi/250 r/min)
Minimum–maximum	590–760 kPa (5.9–7.6 kgf/cm^2, 83.9–108.1 psi)
Starting system	Electric starter
Fuel	
Recommended fuel	Premium unleaded gasoline only
Fuel tank capacity	23.0 L (6.08 US gal, 5.06 Imp.gal)
Fuel reserve amount	3.9 L (1.03 US gal, 0.86 Imp.gal)
Engine oil	
Lubrication system	Dry sump
Recommended brand	YAMALUBE
Type	SAE 10W-30, 10W-40, 10W-50, 15W-40, 20W-40 or 20W-50
Recommended engine oil grade	API service SG type or higher, JASO standard MA
Engine oil quantity	
Total amount	4.20 L (4.44 US qt, 3.70 Imp.qt)
Without oil filter cartridge replacement	3.10 L (3.28 US qt, 2.73 Imp.qt)
With oil filter cartridge replacement	3.40 L (3.59 US qt, 2.99 Imp.qt)
Oil pressure	65.0 kPa/1100 r/min (0.65 kgf/cm^2/1100 r/min, 9.4 psi/1100 r/min) at oil temperature of 65.0–75.0 °C (149.00–167.00 °F)
Final gear oil	
Type	Yamaha genuine shaft drive gear oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil
Quantity	0.20 L (0.21 US qt, 0.18 Imp.qt)
Oil filter	
Oil filter type	Cartridge
Bypass valve opening pressure	80.0–120.0 kPa (0.80–1.20 kgf/cm^2, 11.6–17.4 psi)
Oil pump	
Oil pump type	Trochoid
Inner-rotor-to-outer-rotor-tip clearance	Less than 0.120 mm (0.0047 in)
Limit	0.20 mm (0.0079 in)
Outer-rotor-to-oil-pump-housing clearance	0.09–0.19 mm (0.0035–0.0075 in)
Limit	0.26 mm (0.0102 in)
Oil-pump-housing-to-inner-and-outer-rotor clearance (oil feed pump)	0.03–0.08 mm (0.0012–0.0032 in)
Limit	0.15 mm (0.0059 in)

Oil-pump-housing-to-inner-and-outer-rotor clearance (scavenging pump)	0.06–0.13 mm (0.0024–0.0051 in)
Limit	0.20 mm (0.0079 in)
Relief valve operating pressure	540.0–660.0 kPa (5.40–6.60 kgf/cm², 78.3–95.7 psi)

Cooling system

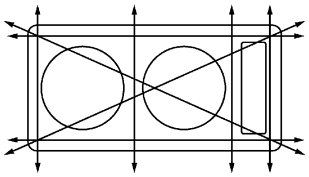
Radiator capacity (including all routes)	1.83 L (1.93 US qt, 1.61 Imp.qt)
Coolant reservoir capacity (up to the maximum level mark)	0.26 L (0.27 US qt, 0.23 Imp.qt)
Radiator cap opening pressure	93.3–122.7 kPa (0.93–1.23 kgf/cm², 13.5–17.8 psi)
Thermostat	
Valve opening temperature	69.0–73.0 °C (156.2–163.4 °F)
Valve full open temperature	84.0 °C (183.20 °F)
Valve lift (full open)	8.0 mm (0.31 in)
Radiator core	
Width	171.4 mm (6.75 in)
Height	320.0 mm (12.60 in)
Depth	22.0 mm (0.87 in)
Water pump	
Water pump type	Single suction centrifugal pump
Reduction ratio	48/48 (1.000)
Impeller shaft tilt limit	0.15 mm (0.0059 in)

Spark plug(s)

Manufacturer/model	NGK/CPR8EB9
Spark plug gap	0.8–0.9 mm (0.031–0.035 in)

Cylinder head

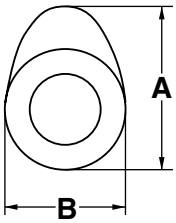
Volume	50.17–51.57 cm³ (3.06–3.15 cu.in)
Warpage limit	0.03 mm (0.0012 in)



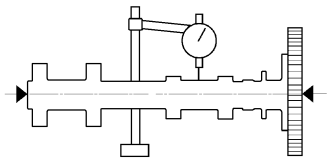
Camshaft

Drive system	Chain drive (right)
Camshaft cap inside diameter	24.500–24.521 mm (0.9646–0.9654 in)
Camshaft journal diameter	24.459–24.472 mm (0.9630–0.9635 in)
Camshaft-journal-to-camshaft-cap clearance	0.028–0.062 mm (0.0011–0.0024 in)
Camshaft lobe dimensions	
Intake A	40.250–40.350 mm (1.5846–1.5886 in)
Limit	40.150 mm (1.5807 in)
Intake B	29.976–30.076 mm (1.1802–1.1841 in)
Limit	29.876 mm (1.1762 in)
Exhaust A	39.250–39.350 mm (1.5453–1.5492 in)
Limit	39.150 mm (1.5413 in)
Exhaust B	29.950–30.050 mm (1.1791–1.1831 in)

Limit	29.850 mm (1.1752 in)



Camshaft runout limit	0.030 mm (0.0012 in)

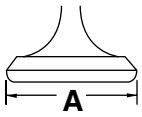


Timing chain

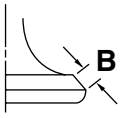
Tensioning system	Automatic

Valve, valve seat, valve guide

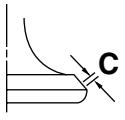
Valve clearance (cold)	
Intake	0.10–0.16 mm (0.0039–0.0063 in)
Exhaust	0.22–0.28 mm (0.0087–0.0110 in)
Valve dimensions	
Valve head diameter A (intake)	36.90–37.10 mm (1.4528–1.4606 in)
Valve head diameter A (exhaust)	30.90–31.10 mm (1.2165–1.2244 in)



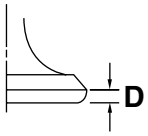
Valve face width B (intake)	2.050–2.480 mm (0.0807–0.0976 in)
Valve face width B (exhaust)	2.050–2.480 mm (0.0807–0.0976 in)



Valve seat width C (intake)	1.10–1.30 mm (0.0433–0.0512 in)
Valve seat width C (exhaust)	0.90–1.10 mm (0.0354–0.0433 in)

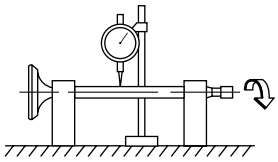


Valve margin thickness D (intake)	1.00–1.40 mm (0.0394–0.0551 in)
Valve margin thickness D (exhaust)	1.00–1.40 mm (0.0394–0.0551 in)



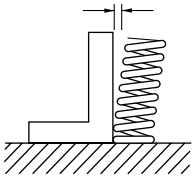
Valve stem diameter (intake)	5.475–5.490 mm (0.2156–0.2161 in)
Limit	5.445 mm (0.2144 in)

Valve stem diameter (exhaust)	5.460–5.475 mm (0.2150–0.2156 in)
Limit	5.430 mm (0.2138 in)
Valve guide inside diameter (intake)	5.500–5.512 mm (0.2165–0.2170 in)
Limit	5.550 mm (0.2185 in)
Valve guide inside diameter (exhaust)	5.500–5.512 mm (0.2165–0.2170 in)
Limit	5.550 mm (0.2185 in)
Valve-stem-to-valve-guide clearance (intake)	0.010–0.037 mm (0.0004–0.0015 in)
Limit	0.080 mm (0.0032 in)
Valve-stem-to-valve-guide clearance (exhaust)	0.025–0.052 mm (0.0010–0.0020 in)
Limit	0.100 mm (0.0039 in)
Valve stem runout	0.010 mm (0.0004 in)



Valve spring

Free length (intake)	40.22 mm (1.58 in)
Limit	38.21 mm (1.50 in)
Free length (exhaust)	40.22 mm (1.58 in)
Limit	38.21 mm (1.50 in)
Installed length (intake)	32.00 mm (1.26 in)
Installed length (exhaust)	32.00 mm (1.26 in)
Spring rate K1 (intake)	25.00 N/mm (2.55 kgf/mm, 142.75 lb/in)
Spring rate K2 (intake)	32.53 N/mm (3.32 kgf/mm, 185.75 lb/in)
Spring rate K1 (exhaust)	25.00 N/mm (2.55 kgf/mm, 142.75 lb/in)
Spring rate K2 (exhaust)	32.53 N/mm (3.32 kgf/mm, 185.75 lb/in)
Installed compression spring force (intake)	192.00–220.00 N (19.58–22.43 kgf, 43.16–49.46 lbf)
Installed compression spring force (exhaust)	192.00–220.00 N (19.58–22.43 kgf, 43.16–49.46 lbf)
Spring tilt (intake)	2.5°/1.8 mm (2.5°/0.07 in)
Spring tilt (exhaust)	2.5°/1.8 mm (2.5°/0.07 in)



Winding direction (intake)	Clockwise
Winding direction (exhaust)	Clockwise

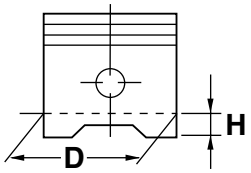
Cylinder

Bore	98.000–98.010 mm (3.8583–3.8587 in)
Taper limit	0.05 mm (0.002 in)
Out of round limit	0.05 mm (0.002 in)

Piston

Piston-to-cylinder clearance	0.020–0.045 mm (0.0008–0.0018 in)
Limit	0.15 mm (0.0059 in)

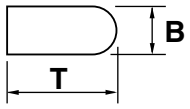
Diameter D	97.965–97.980 mm (3.8569–3.8575 in)
Height H	8.0 mm (0.31 in)



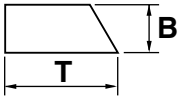
Offset	0.50 mm (0.0197 in)
Offset direction	Intake side
Piston pin bore inside diameter	22.004–22.015 mm (0.8663–0.8667 in)
Limit	22.045 mm (0.8679 in)
Piston pin outside diameter	21.991–22.000 mm (0.8658–0.8661 in)
Limit	21.971 mm (0.8650 in)
Piston-pin-to-piston-pin-bore clearance	0.004–0.024 mm (0.00016–0.00094 in)

Piston ring

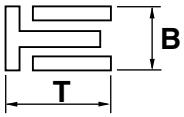
Top ring	
Ring type	Barrel
Dimensions (B × T)	1.20 × 3.45 mm (0.05 × 0.14 in)



End gap (installed)	0.20–0.35 mm (0.0079–0.0138 in)
Limit	0.60 mm (0.0236 in)
Ring side clearance	0.030–0.070 mm (0.0012–0.0028 in)
Limit	0.120 mm (0.0047 in)
2nd ring	
Ring type	Taper
Dimensions (B × T)	1.20 × 4.20 mm (0.04 × 0.17 in)



End gap (installed)	0.35–0.50 mm (0.0138–0.0197 in)
Limit	0.85 mm (0.0335 in)
Ring side clearance	0.020–0.060 mm (0.0008–0.0024 in)
Limit	0.120 mm (0.0047 in)
Oil ring	
Dimensions (B × T)	2.00 × 2.65 mm (0.08 × 0.10 in)

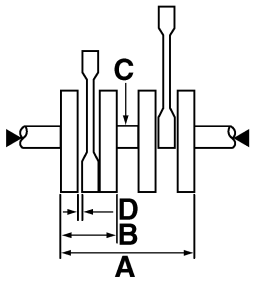


End gap (installed)	0.20–0.70 mm (0.0079–0.0276 in)

Connecting rod

Oil clearance	0.029–0.053 mm (0.0011–0.0021 in)
Bearing color code	1.Blue 2.Black 3.Brown 4.Green

Crankshaft	
Width A	165.60–166.40 mm (6.520–6.551 in)
Width B	67.75–68.25 mm (2.67–2.69 in)
Runout limit C	0.020 mm (0.0008 in)
Big end side clearance D	0.160–0.262 mm (0.0063–0.0103 in)



Journal oil clearance	0.020–0.044 mm (0.0008–0.0017 in)
Bearing color code	1.Blue 2.Black 3.Brown 4.Green 5.Yellow
Balancer	
Balancer drive method	Gear
Balancer shaft-journal-to-balancer shaft-journal-bearing clearance	0.016–0.040 mm (0.0006–0.0016 in)
Clutch	
Clutch type	Wet, multiple-disc
Clutch release method	Hydraulic inner push
Friction plate 1, 2 thickness	2.92–3.08 mm (0.115–0.121 in)
Wear limit	2.82 mm (0.1110 in)
Plate quantity	8 pcs
Friction plate 3 thickness	2.90–3.10 mm (0.144–0.122 in)
Wear limit	2.80 mm (0.1110 in)
Plate quantity	1 pc
Clutch plate thickness	1.90–2.10 mm (0.075–0.083 in)
Plate quantity	8 pcs
Warpage limit	0.10 mm (0.0039 in)
Clutch spring height	6.78 mm (0.27 in)
Minimum height	6.44 mm (0.25 in)
Spring quantity	1 pc
Long clutch push rod bending limit	0.2 mm (0.0079 in)
Transmission	
Transmission type	Constant mesh 6-speed
Primary reduction system	Spur gear
Primary reduction ratio	85/58 (1.466)
Secondary reduction system	Shaft drive
Secondary reduction ratio	21/25 × 32/9 (2.987)
Operation	Left foot operation
Gear ratio	
1st	36/13 (2.769)
2nd	33/16 (2.063)
3rd	33/21 (1.571)
4th	30/24 (1.250)

5th	25/24 (1.042)
6th	26/28 (0.929)
Main axle runout limit	0.08 mm (0.0032 in)
Drive axle runout limit	0.08 mm (0.0032 in)
Shifting mechanism	
Shift mechanism type	Shift drum and guide bar
Shift fork guide bar bending limit	0.100 mm (0.0039 in)
Shift fork thickness	6.26–6.39 mm (0.2465–0.2516 in)
Air filter	
Air filter element	Oil-coated paper element
Fuel pump	
Pump type	Electrical
Output pressure	324.0 kPa (3.24 kgf/cm², 47.0 psi)
Fuel injector	
Model/quantity	297500–0820/2
Resistance	12.0 Ω at 20 °C (68 °F)
Throttle body	
Type/quantity	46EIS/2
ID mark	23P1 00
Throttle position sensor	
Resistance	1.20–2.80 kΩ
Output voltage (at idle)	0.63–0.73 V
Accelerator position sensor	
Resistance	1.20–2.80 kΩ
Output voltage	0.63–0.73 V
Fuel injection sensor	
Crankshaft position sensor resistance	336–504 Ω at 20 °C (68 °F)
Intake air pressure sensor output voltage	3.57–3.71 V at 101.3 kPa
Intake air temperature sensor resistance	5.40–6.60 kΩ at 0 °C (32 °F) 290–390 Ω at 80 °C (176 °F)
Coolant temperature sensor resistance	5.21–6.37 kΩ at 0 °C (32 °F) 290–354 Ω at 80 °C (176 °F)
Idling condition	
Engine idling speed	1050–1150 r/min
Intake vacuum	35.3–39.3 kPa (265–295 mmHg, 10.4–11.6 inHg)
Water temperature	85.0–105.0 °C (185.00–221.00 °F)
Oil temperature	65.0–75.0 °C (149.00–167.00 °F)
Throttle cable free play	3.0–5.0 mm (0.12–0.20 in)
Shaft drive	
Middle gear backlash	0.045–0.090 mm (0.002–0.004 in)
Ring-gear-to-stopper-bolt clearance	0.30–0.60 mm (0.012–0.024 in)
Ring-gear-to-thrust-washer clearance	0.10–0.20 mm (0.004–0.008 in)

Final gear backlash	0.20–0.40 mm (0.008–0.016 in)

EAS20300
CHASSIS SPECIFICATIONS

Chassis	
Frame type	Steel tube backbone
Caster angle	28.00°
Trail	126.0 mm (4.96 in)
Front wheel	
Wheel type	Spoke wheel
Rim size	19M/C × MT2.50
Rim material	Aluminum
Wheel travel	190.0 mm (7.48 in)
Radial wheel runout limit	2.0 mm (0.08 in)
Lateral wheel runout limit	2.0 mm (0.08 in)
Rear wheel	
Wheel type	Spoke wheel
Rim size	17M/C × MT4.00
Rim material	Aluminum
Wheel travel	190.0 mm (7.48 in)
Radial wheel runout limit	2.0 mm (0.08 in)
Lateral wheel runout limit	2.0 mm (0.08 in)
Front tire	
Type	Tubeless
Size	110/80R19M/C 59V
Manufacturer/model	BRIDGESTONE/BW-501 METZELER/TOURANCE EXP FRONT C
Wear limit (front)	1.6 mm (0.06 in) (Europe) 1.0 mm (0.04 in) (AUS)
Rear tire	
Type	Tubeless
Size	150/70R17M/C 69V
Manufacturer/model	BRIDGESTONE/BW-502 METZELER/TOURANCE EXP C
Wear limit (rear)	1.6 mm (0.06 in) (Europe) 1.0 mm (0.04 in) (AUS)
Tire air pressure (measured on cold tires)	
Loading condition	0–90 kg (0–198 lb)
Front	225 kPa (2.25 kgf/cm², 33 psi)
Rear	250 kPa (2.50 kgf/cm², 36 psi)
Loading condition	90–209 kg (198–461 lb)
Front	225 kPa (2.25 kgf/cm², 33 psi)
Rear	290 kPa (2.90 kgf/cm², 42 psi)
Front brake	
Type	Dual disc brake
Operation	Right hand operation
Front disc brake	
Disc outside diameter × thickness	310.0 × 4.5 mm (12.20 × 0.18 in)

Brake disc thickness limit	4.0 mm (0.16 in)
Brake disc deflection limit	0.10 mm (0.0039 in)
Brake pad lining thickness (inner)	4.5 mm (0.18 in)
Limit	0.5 mm (0.02 in)
Brake pad lining thickness (outer)	4.5 mm (0.18 in)
Limit	0.5 mm (0.02 in)
Master cylinder inside diameter	16.00 mm (0.63 in)
Caliper cylinder inside diameter	30.23 mm (1.19 in)
Caliper cylinder inside diameter	27.00 mm (1.06 in)
Recommended fluid	DOT 4

Rear brake

Type	Single disc brake
Operation	Right foot operation
Rear disc brake	
Disc outside diameter × thickness	282.0 × 5.0 mm (11.10 × 0.20 in)
Brake disc thickness limit	4.5 mm (0.18 in)
Brake disc deflection limit	0.15 mm (0.0059 in)
Brake pad lining thickness (inner)	5.8 mm (0.23 in)
Limit	0.8 mm (0.03 in)
Brake pad lining thickness (outer)	5.8 mm (0.23 in)
Limit	0.8 mm (0.03 in)
Master cylinder inside diameter	14.0 mm (0.55 in)
Caliper cylinder inside diameter	41.30 mm (1.63 in)
Recommended fluid	DOT 4

Clutch

Recommended fluid	DOT 4
Master cylinder inside diameter	12.70 mm (0.50 in)
Release cylinder inside diameter	29.6 mm (1.17 in)

Steering

Steering bearing type	Taper roller bearing
Center to lock angle (left)	39.0°
Center to lock angle (right)	39.0°

Front suspension

Type	Telescopic fork
Spring/shock absorber type	Coil spring/oil damper
Front fork travel	190.0 mm (7.48 in)
Fork spring free length	427.4 mm (16.83 in)
Limit	418.9 mm (16.49 in)
Collar length	30.0 mm (1.18 in)
Installed length	262.0 mm (10.31 in)
Spring rate K1	8.34 N/mm (0.85 kgf/mm, 47.62 lb/in)
Spring rate K2	11.97 N/mm (1.22 kgf/mm, 68.35 lb/in)
Spring stroke K1	0.0–75.0 mm (0.00–2.95 in)
Spring stroke K2	75.0–190.1 mm (2.95–7.48 in)
Inner tube outer diameter	43.0 mm (1.69 in)
Optional spring available	No
Recommended oil	Suspension oil 01 or equivalent
Quantity	485.0 cm³ (16.40 US oz, 17.11 Imp.oz)
Level	150.0 mm (5.91 in)

Spring preload adjusting positions	
Minimum	8
Standard	5.5
Maximum	0
Rebound damping adjusting positions	
*With the adjusting screw fully turned in	
Minimum	10 click(s) out*
Standard	8 click(s) out*
Maximum	1 click(s) out*
Compression damping adjusting positions	
*With the adjusting screw fully turned in	
Minimum	13 click(s) out*
Standard	6 click(s) out*
Maximum	1 click(s) out*

Rear suspension

Type	Swingarm (link suspension)
Spring/shock absorber type	Coil spring/gas-oil damper
Rear shock absorber assembly travel	70.0 mm (2.76 in)
Spring free length	213.0 mm (8.39 in)
Installed length	203.0 mm (7.99 in)
Spring rate K1	132.30 N/mm (13.49 kgf/mm, 755.43 lb/in)
Spring stroke K1	0.0–70.0 mm (0.00–2.76 in)
Optional spring available	No
Enclosed gas/air pressure (STD)	1600 kPa (16.0 kgf/cm^2, 227.6 psi)
Spring preload adjusting positions	
Minimum	6
Standard	4
Maximum	1
Rebound damping adjusting positions	
*With the adjusting knob fully turned in	
Minimum	20 click(s) out*
Standard	10 click(s) out*
Maximum	3 click(s) out*

Swingarm

Swingarm end free play limit (radial)	0 mm (0 in)
Swingarm end free play limit (axial)	0 mm (0 in)

EAS20310
ELECTRICAL SPECIFICATIONS

Voltage	
System voltage	12 V
Ignition system	
Ignition system	TCI
Ignition timing (B.T.D.C.)	5.0°/1100 r/min
Engine control unit	
Model/manufacturer	TBDF77/DENSO (Europe except (B) and (F)) (ZA) (AUS) TBDFD2/DENSO (B) (F)
Ignition coil	
Minimum ignition spark gap	6.0 mm (0.24 in)
Primary coil resistance	1.19–1.61 Ω
Secondary coil resistance	8.50–11.50 kΩ
AC magneto	
Standard output	14.0 V, 42.9 A at 5000 r/min
Stator coil resistance	0.112–0.168 Ω at 20 °C (68 °F)
Rectifier/regulator	
Regulator type	Semi conductor-short circuit
No load regulated voltage	14.2–14.8 V
Rectifier capacity	50.0 A
Battery	
Model	YTZ12S
Voltage, capacity	12 V, 11.0 Ah
Manufacturer	GS YUASA
Ten hour rate amperage	1.10 A
Headlight	
Bulb type	Halogen bulb
Bulb voltage, wattage × quantity	
Headlight	12 V, 55 W × 2
Auxiliary light	12 V, 5.0 W × 2
Tail/brake light	LED
Front turn signal light	12 V, 10.0 W × 2
Rear turn signal light	12 V, 10.0 W × 2
License plate light	12 V, 5.0 W × 1
Meter lighting	LED
Indicator light	
Neutral indicator light	LED
Turn signal indicator light	LED
Oil level warning light	LED
High beam indicator light	LED
Coolant temperature warning light	LED

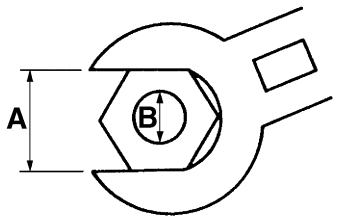
Engine trouble warning light	LED
ABS warning light	LED
Immobilizer system indicator light	LED
Traction control system indicator light	LED
Electric starting system	
System type	Constant mesh
Starter motor	
Power output	0.75 kW
Armature coil resistance	0.0100–0.0200 Ω
Brush overall length	12.0 mm (0.47 in)
Limit	6.50 mm (0.26 in)
Brush spring force	6.02–6.51 N (614–664 gf, 21.69–23.45 oz)
Mica undercut (depth)	0.70 mm (0.03 in)
Starter relay	
Amperage	180.0 A
Coil resistance	4.18–4.62 Ω
Horn	
Horn type	Plane
Quantity	1 pc
Maximum amperage	3.0 A
Turn signal/hazard relay	
Relay type	Full transistor
Built-in, self-canceling device	No
Fuel sender unit	
Sender unit resistance (full)	19.0–21.0 Ω
Sender unit resistance (empty)	139.0–141.0 Ω
Starting circuit cut-off relay	
Coil resistance	180.0 Ω
Headlight relay	
Coil resistance	96.00 Ω
Throttle servo motor	
Resistance	0–100 Ω
Fuses	
Main fuse	50.0 A
Headlight fuse	20.0 A
Taillight fuse	7.5 A
Signaling system fuse	10.0 A
Ignition fuse	20.0 A
Radiator fan motor fuse	20.0 A
Auxiliary DC jack fuse	3.0 A
Fuel injection system fuse	10.0 A
ABS motor fuse	30.0 A
ABS ECU fuse	7.5 A

ABS solenoid fuse	20.0 A
Backup fuse	7.5 A
Electronic throttle valve fuse	7.5 A
Accessory light fuse (OPTION)	20.0 A
Spare fuse	30.0 A
Spare fuse	20.0 A
Spare fuse	10.0 A
Spare fuse	7.5 A
Spare fuse	3.0 A

EAS20320
TIGHTENING TORQUES

EAS20331
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·kgf	ft·lbf
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

EAS20340
ENGINE TIGHTENING TORQUES

Item	Thread size	Q'ty	Tightening torque	Remarks
Exhaust pipe nut	M8	4	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Exhaust pipe bolt	M8	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Exhaust pipe protector screw	M6	2	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Exhaust pipe joint bolt	M8	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
O_2 sensor	M18	2	45 Nm (4.5 m·kgf, 33 ft·lbf)	
Muffler bolt	M10	1	47 Nm (4.7 m·kgf, 34 ft·lbf)	
Muffler cover bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Muffler cover nut	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Muffler silencer cap bolt	M6	4	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Muffler silencer cap bracket bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Air filter case bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Air filter case cover screw	M5	10	1.6 Nm (0.16 m·kgf, 1.2 ft·lbf)	
Air chamber screw	M5	1	1.6 Nm (0.16 m·kgf, 1.2 ft·lbf)	
Air filter case joint clamp screw	M5	2	2.8 Nm (0.28 m·kgf, 2.0 ft·lbf)	
Intake air temperature sensor	M5	1	1.2 Nm (0.12 m·kgf, 0.87 ft·lbf)	
Throttle body joint bolt	M6	4	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Throttle body joint clamp screw	M5	2	3.0 Nm (0.30 m·kgf, 2.2 ft·lbf)	
Intake air pressure sensor screw	M5	1	3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)	
Accelerator position sensor bolt	M5	2	3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)	
Throttle position sensor bolt	M5	2	3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)	
Fuel rail screw	M5	1	5 Nm (0.5 m·kgf, 3.6 ft·lbf)	
Radiator outlet pipe bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Radiator outlet hose clamp screw	M6	2	2.0 Nm (0.20 m·kgf, 1.4 ft·lbf)	
Radiator inlet hose clamp screw (radiator side)	M6	1	2.0 Nm (0.20 m·kgf, 1.4 ft·lbf)	
Radiator inlet hose clamp screw (thermostat side)	M6	1	2.5 Nm (0.25 m·kgf, 1.8 ft·lbf)	
Thermostat cover bolt	M6	3	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Coolant temperature sensor	M12	1	18 Nm (1.8 m·kgf, 13 ft·lbf)	
Water pump assembly bolt	M6	3	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Water pump housing cover and lead holder bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Water pump breather hose holder bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Water pump inlet hose clamp screw (radiator outlet pipe side)	M6	1	2.0 Nm (0.20 m·kgf, 1.4 ft·lbf)	
Water pump inlet hose clamp screw (water pump side)	M6	1	2.5 Nm (0.25 m·kgf, 1.8 ft·lbf)	
Water pump housing cover bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Coolant drain bolt (water pump)	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Generator cover bolt	M6	2	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	l=55 mm (2.17 in)
Generator cover bolt	M6	12	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	l=25 mm (0.99 in)
Generator rotor bolt	M12	1	130 Nm (13 m·kgf, 94 ft·lbf)	
Stator coil bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Stator coil lead holder bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Starter clutch bolt	M8	3	32 Nm (3.2 m·kgf, 23 ft·lbf)	
Clutch cover bolt	M6	16	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Timing mark accessing screw	M8	1	15 Nm (1.5 m·kgf, 11 ft·lbf)	
Clutch cover damper plate screw	M6	4	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Clutch spring plate retainer bolt	M6	6	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Clutch boss nut	M20	1	125 Nm (12.5 m·kgf, 90 ft·lbf)	Stake.
Clutch release cylinder bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Clutch release cylinder bleed screw	M8	1	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Pickup rotor bolt	M10	1	65 Nm (6.5 m·kgf, 47 ft·lbf)	
Crankshaft position sensor holder bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Cylinder head cover bolt	M6	6	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Cylinder head breather plate bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Ignition coil bolt	M6	4	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Spark plug	M10	4	13 Nm (1.3 m·kgf, 9.4 ft·lbf)	
Camshaft cap bolt	M6	12	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Intake camshaft sprocket bolt	M7	2	24 Nm (2.4 m·kgf, 17 ft·lbf)	
Exhaust camshaft sprocket bolt	M7	2	24 Nm (2.4 m·kgf, 17 ft·lbf)	
Timing chain tensioner bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Cylinder head bolt	M12	6	See TIP.	
Cylinder head bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Engine oil check bolt	M8	2	15 Nm (1.5 m·kgf, 11 ft·lbf)	
Cylinder head blind plug	M12	2	28 Nm (2.8 m·kgf, 20 ft·lbf)	
Cylinder head stud bolt	M8	4	15 Nm (1.5 m·kgf, 11 ft·lbf)	
Water jacket cover bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Rear balancer cover bolt	M6	11	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Rear balancer shaft retainer screw	M6	1	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Rear balancer holder bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Crankcase bolt	M10	6	See TIP.	l=130 mm (5.12 in) E
Crankcase bolt	M8	6	24 Nm (2.4 m·kgf, 17 ft·lbf)	l=78 mm (3.07 in) E
Crankcase bolt	M8	7	24 Nm (2.4 m·kgf, 17 ft·lbf)	l=80 mm (3.15 in) E
Crankcase bolt	M8	5	24 Nm (2.4 m·kgf, 17 ft·lbf)	l=60 mm (2.36 in) E
Crankcase bolt	M6	6	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	l=50 mm (1.97 in) E
Crankcase bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	l=65 mm (2.56 in) E
Timing chain guide retainer bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Neutral switch	M10	1	17 Nm (1.7 m·kgf, 12 ft·lbf)	
Negative battery lead and upper crankcase bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Engine ground lead bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Oil plug holder bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Main-galley bolt	M16	1	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Sub-galley bolt	M20	1	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Oil nozzle 1 bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Oil nozzle 2	M6	1	0.5 Nm (0.05 m·kgf, 0.36 ft·lbf)	
Oil nozzle 3	M8	1	3.0 Nm (0.30 m·kgf, 2.2 ft·lbf)	
Oil filter cartridge	M20	1	17 Nm (1.7 m·kgf, 12 ft·lbf)	
Oil filter cartridge union bolt	M20	1	80 Nm (8.0 m·kgf, 58 ft·lbf)	
Oil delivery passage cover bolt	M6	4	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	LT
Oil pan bolt	M6	19	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Oil strainer cover screw	M6	6	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	l=20 mm (0.79 in)
Oil strainer cover screw	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	l=70 mm (2.76 in) LT
Engine oil drain bolt (crankcase)	M12	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Engine oil drain bolt (oil tank)	M12	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Oil level switch bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	

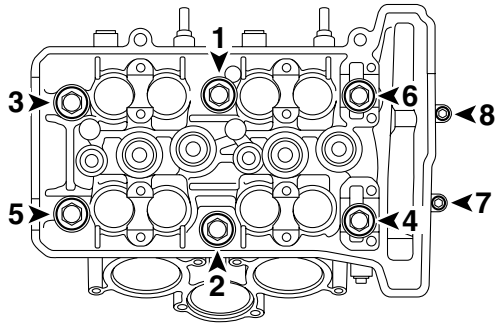
Item	Thread size	Q'ty	Tightening torque	Remarks
Oil pipe bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Oil pump assembly bolt	M6	3	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Oil pump housing cover bolt	M6	6	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Oil strainer (oil pump) bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Main axle assembly bolt	M6	3	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	LT
Shift drum retainer screw	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Shift shaft spring stopper bolt	M8	1	22 Nm (2.2 m·kgf, 16 ft·lbf)	LT
Connecting rod nut	M9	4	See TIP.	M
Middle gear side cover screw	M6	6	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Middle gear side cover damper plate screw	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	LT
Engine oil drain bolt (middle gear)	M8	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Middle driven pinion gear bearing housing bolt	M8	4	33 Nm (3.3 m·kgf, 24 ft·lbf)	LT
Middle drive pinion gear bearing retainer bolt	M8	4	28 Nm (2.8 m·kgf, 20 ft·lbf)	LT
Middle drive pinion gear nut	M44	1	110 Nm (11 m·kgf, 80 ft·lbf)	Stake.
Starter motor assembly bolt	M6	2	12 Nm (1.2 m·kgf, 8.7 ft·lbf)	
Starter motor terminal nut	M6	1	5 Nm (0.5 m·kgf, 3.6 ft·lbf)	
Starter motor front cover bolt	M5	2	5 Nm (0.5 m·kgf, 3.6 ft·lbf)	
Starter motor terminal and rear cover nut	M6	1	11 Nm (1.1 m·kgf, 8.0 ft·lbf)	

TIP

Cylinder head bolt

Tighten the cylinder head bolts "1"–"8" in the proper tightening sequence as follows:

- Tighten the cylinder head bolts "1"–"6" to 20 Nm (2.0 m·kgf, 14 ft·lbf).
- Tighten the cylinder head bolts "1"–"6" to 30 Nm (3.0 m·kgf, 22 ft·lbf), and then tighten them further to reach the specified angle. Tighten each bolt to the specified angle before tightening the next bolt to 30 Nm (3.0 m·kgf, 22 ft·lbf).
  "1", "2", "4": 215–225°
  "3", "5", "6": 180–190°
- Tighten the cylinder head bolts "7" and "8" to 10 Nm (1.0 m·kgf, 7.2 ft·lbf).



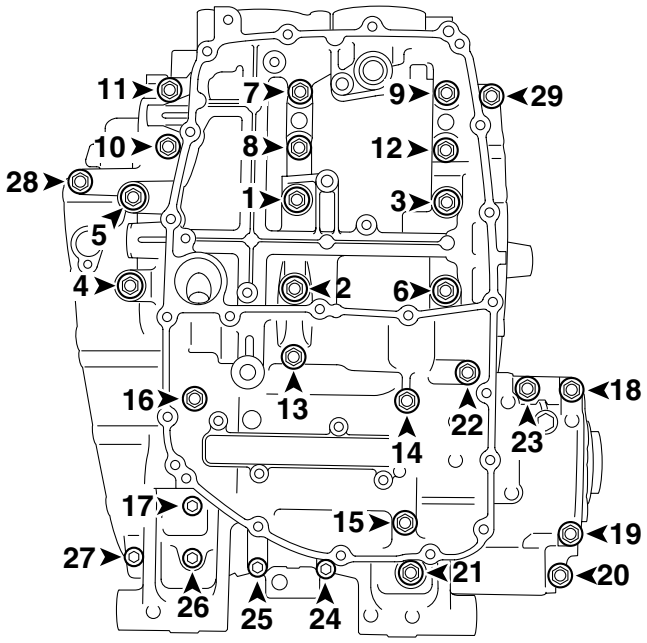
TIP

Crankcase bolt

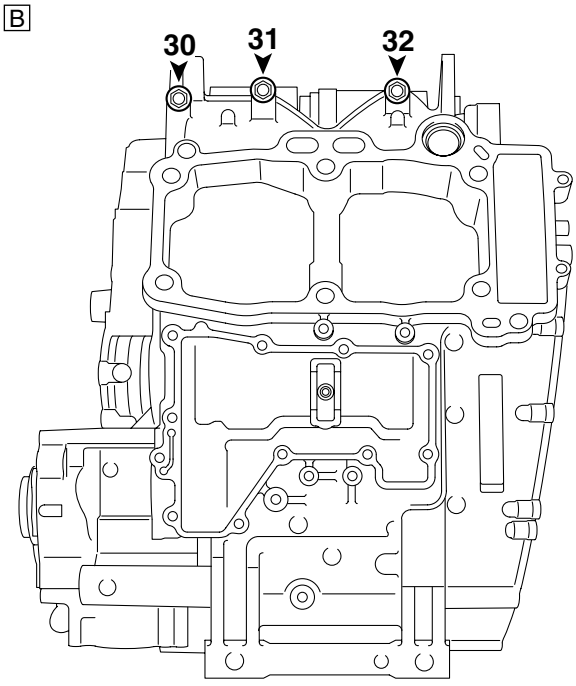
Tighten the crankcase bolts “1”–“6” to 10 Nm (1.0 m·kgf, 7.2 ft·lbf) in the proper tightening sequence. Then, retighten the bolts one at a time as follows:

- Tighten the crankcase bolts “1”–“6” to 20 Nm (2.0 m·kgf, 14 ft·lbf).
- Tighten the crankcase bolts “1”–“6” further to reach the specified angle 90–100°.
- Tighten the crankcase bolts “7”–“32”.
  “7”–“21”, “30”–“32”: 24 Nm (2.4 m·kgf, 17 ft·lbf)
  “22”–“29”: 10 Nm (1.0 m·kgf, 7.2 ft·lbf)

A



B



A. Lower crankcase
B. Upper crankcase

TIP

Connecting rod nut

Tighten the connecting rod bolts to 20 Nm (2.0 m·kgf, 14 ft·lbf), and then tighten them further to reach the specified angle 145–155°.

EAS20350
CHASSIS TIGHTENING TORQUES

Item	Thread size	Q'ty	Tightening torque	Remarks
Engine mounting bolt (front right side)	M12	2	75 Nm (7.5 m·kgf, 54 ft·lbf)	
Engine mounting bolt (front left side)	M12	2	75 Nm (7.5 m·kgf, 54 ft·lbf)	
Engine mounting bolt (rear right lower side)	M10	1	68 Nm (6.8 m·kgf, 49 ft·lbf)	
Engine mounting bolt (rear left lower side)	M10	1	68 Nm (6.8 m·kgf, 49 ft·lbf)	
Engine mounting nut	M10	1	68 Nm (6.8 m·kgf, 49 ft·lbf)	
Engine bracket bolt	M12	4	75 Nm (7.5 m·kgf, 54 ft·lbf)	
Engine positioning bolt	M12	1	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Rear frame bolt	M10	4	59 Nm (5.9 m·kgf, 43 ft·lbf)	
Centerstand nut	M10	2	73 Nm (7.3 m·kgf, 53 ft·lbf)	
Sidestand nut	M10	1	69 Nm (6.9 m·kgf, 50 ft·lbf)	
Sidestand bracket bolt	M10	2	63 Nm (6.3 m·kgf, 46 ft·lbf)	
Sidestand switch screw	M5	2	4.0 Nm (0.40 m·kgf, 2.9 ft·lbf)	
Passenger footrest bolt	M8	4	28 Nm (2.8 m·kgf, 20 ft·lbf)	
Left passenger footrest plate bolt	M5	2	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	
Muffler protector bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Brake pedal bolt	M8	1	26 Nm (2.6 m·kgf, 19 ft·lbf)	
Shift pedal bolt	M8	2	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Shift arm bolt	M6	1	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Shift rod locknut (shift arm side)	M6	1	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Shift rod locknut (shift pedal side)	M6	1	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	Left-hand thread
Radiator bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Radiator bracket bolt	M8	2	19 Nm (1.9 m·kgf, 14 ft·lbf)	
Radiator cover bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Coolant reservoir bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Fuel tank bolt (front side)	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Fuel tank bolt (rear side)	M8	1	16 Nm (1.6 m·kgf, 12 ft·lbf)	
Front fuel tank bracket bolt	M6	4	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear fuel tank bracket bolt	M6	4	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Fuel pump bolt	M5	6	4.0 Nm (0.40 m·kgf, 2.9 ft·lbf)	
Fuel tank cap bolt	M5	3	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Filler neck bolt	M6	1	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Throttle cable locknut	M6	2	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	
Engine guard bolt	M6	2	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	
Engine guard nut	M6	2	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Engine guard bracket bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Right side panel bolt	M5	4	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Right side inner panel bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Left side cowling bolt	M5	5	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Left side panel bolt	M6	3	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	
Passenger seat bolt	M8	2	16 Nm (1.6 m·kgf, 12 ft·lbf)	
Standard carrier bolt (110 mm)	M8	2	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Standard carrier bolt (45 mm)	M8	1	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Standard carrier bracket bolt	M8	2	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Additional carrier bolt	M6	4	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Grab bar bolt	M10	4	32 Nm (3.2 m·kgf, 23 ft·lbf)	
Seat bracket bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Seat lock latch nut	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Seat lock bolt	M6	2	3.0 Nm (0.30 m·kgf, 2.2 ft·lbf)	
Rear fender bolt	M6	7	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear mudguard bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Hydraulic unit assembly bolt	M6	3	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Hydraulic unit brake pipe joint bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Hydraulic unit brake pipe flare nut	M10	8	16 Nm (1.6 m·kgf, 12 ft·lbf)	
Tail/brake light assembly bolt	M6	2	15 Nm (1.5 m·kgf, 11 ft·lbf)	
Tail/brake light assembly bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Tail/brake light unit screw	M6	1	0.4 Nm (0.04 m·kgf, 0.29 ft·lbf)	
Tail/brake light unit screw	M5	2	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
License plate light bolt	M5	2	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	
Rear reflector nut	M5	1	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Lean angle sensor screw	M4	2	1.0 Nm (0.10 m·kgf, 0.72 ft·lbf)	
Frame ground lead bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Windshield screw	M5	4	0.5 Nm (0.05 m·kgf, 0.36 ft·lbf)	
Meter assembly screw	M5	3	1.3 Nm (0.13 m·kgf, 0.94 ft·lbf)	
Headlight assembly bolt	M6	4	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Headlight bracket nut	M8	1	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Headlight cover bolt	M6	4	0.7 Nm (0.07 m·kgf, 0.51 ft·lbf)	
Auxiliary DC jack nut	M27	1	2.8 Nm (0.28 m·kgf, 2.0 ft·lbf)	
Rearview mirror	M10	2	17 Nm (1.7 m·kgf, 12 ft·lbf)	
Grip end bolt	M8	2	27 Nm (2.7 m·kgf, 20 ft·lbf)	
Upper hand shield bolt	M5	4	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	
Lower hand shield bolt	M5	2	4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)	
Hand shield bracket nut	M6	2	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Front brake master cylinder holder bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Brake master cylinder reservoir cap bolt	M4	2	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Brake lever pivot bolt	M6	1	1.0 Nm (0.10 m·kgf, 0.72 ft·lbf)	
Brake lever pivot nut	M6	1	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Clutch master cylinder holder bolt	M6	2	14 Nm (1.4 m·kgf, 10 ft·lbf)	
Clutch master cylinder reservoir cap screw	M4	2	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Clutch lever pivot bolt	M6	1	1.0 Nm (0.10 m·kgf, 0.72 ft·lbf)	
Clutch lever pivot nut	M6	1	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Clutch hose union bolt	M10	2	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Clutch hose holder bolt	M6	1	9 Nm (0.9 m·kgf, 6.5 ft·lbf)	
Throttle cable housing bolt	M5	2	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	
Right handlebar switch screw	M5	2	3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)	
Left handlebar switch screw	M5	2	3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)	
Front brake light switch screw	M4	1	1.2 Nm (0.12 m·kgf, 0.87 ft·lbf)	
Clutch switch screw	M4	1	1.2 Nm (0.12 m·kgf, 0.87 ft·lbf)	
Upper handlebar holder bolt	M8	4	28 Nm (2.8 m·kgf, 20 ft·lbf)	
Steering stem nut	M24	1	130 Nm (13 m·kgf, 94 ft·lbf)	
Lower ring nut	M28	1	See TIP.	
Horn bolt	M6	2	14 Nm (1.4 m·kgf, 10 ft·lbf)	LT
Front brake hose holder and horn nut	M6	1	9 Nm (0.9 m·kgf, 6.5 ft·lbf)	
Front fender bolt (front side)	M6	4	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Front fender bolt (rear side)	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Front reflector nut	M6	2	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	For Oceania
Upper bracket pinch bolt	M8	2	26 Nm (2.6 m·kgf, 19 ft·lbf)	
Lower bracket pinch bolt	M8	4	20 Nm (2.0 m·kgf, 14 ft·lbf)	
Front fork cap bolt	M46	2	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Damper rod assembly bolt	M10	2	23 Nm (2.3 m·kgf, 17 ft·lbf)	LT
Damper rod assembly locknut	M10	2	15 Nm (1.5 m·kgf, 11 ft·lbf)	
Front wheel axle bolt	M8	1	72 Nm (7.2 m·kgf, 52 ft·lbf)	
Front wheel axle pinch bolt	M8	2	See TIP.	
Front wheel sensor bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Front wheel sensor rotor bolt	M6	5	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	LT
Front brake disc bolt	M6	10	18 Nm (1.8 m·kgf, 13 ft·lbf)	LT
Rear wheel axle nut	M18	1	125 Nm (12.5 m·kgf, 90 ft·lbf)	
Rear wheel axle pinch bolt	M10	1	25 Nm (2.5 m·kgf, 18 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Rear wheel sensor bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear wheel sensor rotor bolt	M6	5	8 Nm (0.8 m·kgf, 5.8 ft·lbf)	
Rear brake disc bolt	M8	6	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Spoke	BC4	64	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Front brake caliper bolt	M10	4	40 Nm (4.0 m·kgf, 29 ft·lbf)	
Front brake caliper bleed screw	M8	2	5 Nm (0.5 m·kgf, 3.6 ft·lbf)	
Front brake hose union bolt	M10	4	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Front brake hose union bolt (left front brake caliper)	M10	1	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Front brake hose holder and front brake hose holder bracket bolt	M6	1	9 Nm (0.9 m·kgf, 6.5 ft·lbf)	
Front brake hose holder bracket bolt	M6	1	9 Nm (0.9 m·kgf, 6.5 ft·lbf)	
Front brake hose joint bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Front brake hose joint bracket bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Front brake hose holder and frame bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear brake caliper bolt	M10	2	27 Nm (2.7 m·kgf, 20 ft·lbf)	
Rear brake caliper bleed screw	M7	1	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Rear brake hose union bolt	M10	4	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Rear brake hose holder and swingarm bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear brake hose holder and frame bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rear brake hose guide bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Brake torque rod bolt	M8	2	30 Nm (3.0 m·kgf, 22 ft·lbf)	
Rear brake master cylinder bolt	M8	2	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Rear brake master cylinder lock-nut	M10	1	17 Nm (1.7 m·kgf, 12 ft·lbf)	
Brake fluid reservoir bolt	M5	1	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	
Brake fluid reservoir cap	M42	1	1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)	
Rear shock absorber assembly upper nut	M10	1	40 Nm (4.0 m·kgf, 29 ft·lbf)	
Rear shock absorber assembly lower nut	M12	1	49 Nm (4.9 m·kgf, 35 ft·lbf)	
Relay arm and frame nut	M14	1	59 Nm (5.9 m·kgf, 43 ft·lbf)	
Connecting arm and relay arm nut	M14	1	59 Nm (5.9 m·kgf, 43 ft·lbf)	
Connecting arm and swingarm nut	M14	1	59 Nm (5.9 m·kgf, 43 ft·lbf)	
Swingarm pivot shaft	M22	1	120 Nm (12 m·kgf, 87 ft·lbf)	

Item	Thread size	Q'ty	Tightening torque	Remarks
Swingarm pivot shaft end plate bolt	M5	2	6 Nm (0.6 m·kgf, 4.3 ft·lbf)	
Rubber boot cover bolt	M6	2	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Rubber boot joint bolt	M5	3	3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)	
Final drive assembly nut	M10	4	42 Nm (4.2 m·kgf, 30 ft·lbf)	
Final gear oil drain bolt	M14	1	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Final gear oil filler bolt	M14	1	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Ring gear bearing housing bolt	M10	2	40 Nm (4.0 m·kgf, 29 ft·lbf)	
Ring gear bearing housing bolt	M8	6	23 Nm (2.3 m·kgf, 17 ft·lbf)	
Coupling gear nut	M20	1	150 Nm (15 m·kgf, 108 ft·lbf)	Stake.
Bearing retainer	M75	1	130 Nm (13 m·kgf, 94 ft·lbf)	Left-hand thread
Final driven pinion gear bearing holder screw	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Ring gear stopper bolt	M10	1	9 Nm (0.9 m·kgf, 6.5 ft·lbf)	Left-hand thread
Electrical components tray bolt	M6	3	10 Nm (1.0 m·kgf, 7.2 ft·lbf)	
Electrical components tray bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Electrical components tray bracket bolt	M8	2	19 Nm (1.9 m·kgf, 14 ft·lbf)	
ECU bracket bolt	M6	1	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Rectifier/regulator bolt	M6	2	7 Nm (0.7 m·kgf, 5.1 ft·lbf)	
Fuse box bracket screw	M5	1	0.8 Nm (0.08 m·kgf, 0.58 ft·lbf)	
Positive battery lead and starter relay bolt	M6	1	3.6 Nm (0.36 m·kgf, 2.6 ft·lbf)	
Negative battery lead and starter relay bolt	M6	1	3.6 Nm (0.36 m·kgf, 2.6 ft·lbf)	

TIP

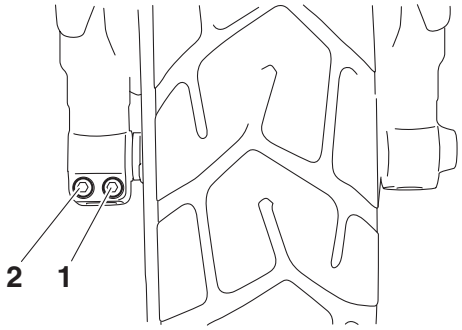
Lower ring nut

1. First, tighten the lower ring nut to approximately 52 Nm (5.2 m·kgf, 38 ft·lbf) with a torque wrench, then loosen the lower ring nut completely.
2. Retighten the lower ring nut to 18 Nm (1.8 m·kgf, 13 ft·lbf) with a torque wrench.

TIP

Front wheel axle pinch bolt

1. Insert the front wheel axle from the right side and tighten it to 72 Nm (7.2 m·kgf, 52 ft·lbf).
2. In the order pinch bolt "1" → pinch bolt "2" → pinch bolt "1", tighten each bolt to 21 Nm (2.1 m·kgf, 15 ft·lbf) without performing temporary tightening.


2
1

EAS20360
LUBRICATION POINTS AND LUBRICANT TYPES

EAS20370
ENGINE

Lubrication point	Lubricant
Oil seal lips	LS
O-rings	LS
Bearings	E
Camshaft lobes and camshaft journals	M
Valve stems (intake and exhaust)	M
Valve stem ends (intake and exhaust)	M
Crankshaft big ends	E
Piston surfaces	E
Piston pins	E
Connecting rod bolts	M
Crankshaft journals	E
Primary driven gear	E
Balancer gears	E
Balancer shaft journals	E
Decompression camshaft moving point	E
Oil pump rotors (inner and outer)	E
Crankcase bolt O-rings (balancer shaft journal)	E
Rear balancer holder	E
Torque limiter	E
Starter clutch idle gear shaft	E
Starter clutch gear	E
Primary driven gear (clutch housing)	E
Thrust washer	E
Spacers	E
Long clutch push rod	LS
Short clutch push rod	LS
Ball	LS
Clutch boss nut thread and conical spring washer	E
Transmission gears (wheel and pinion) and collars	M
Main axle and drive axle	M
Torque damper cam inner surface and contact surfaces	M
Middle drive pinion gear inner surface	M
Middle driven pinion gear	E

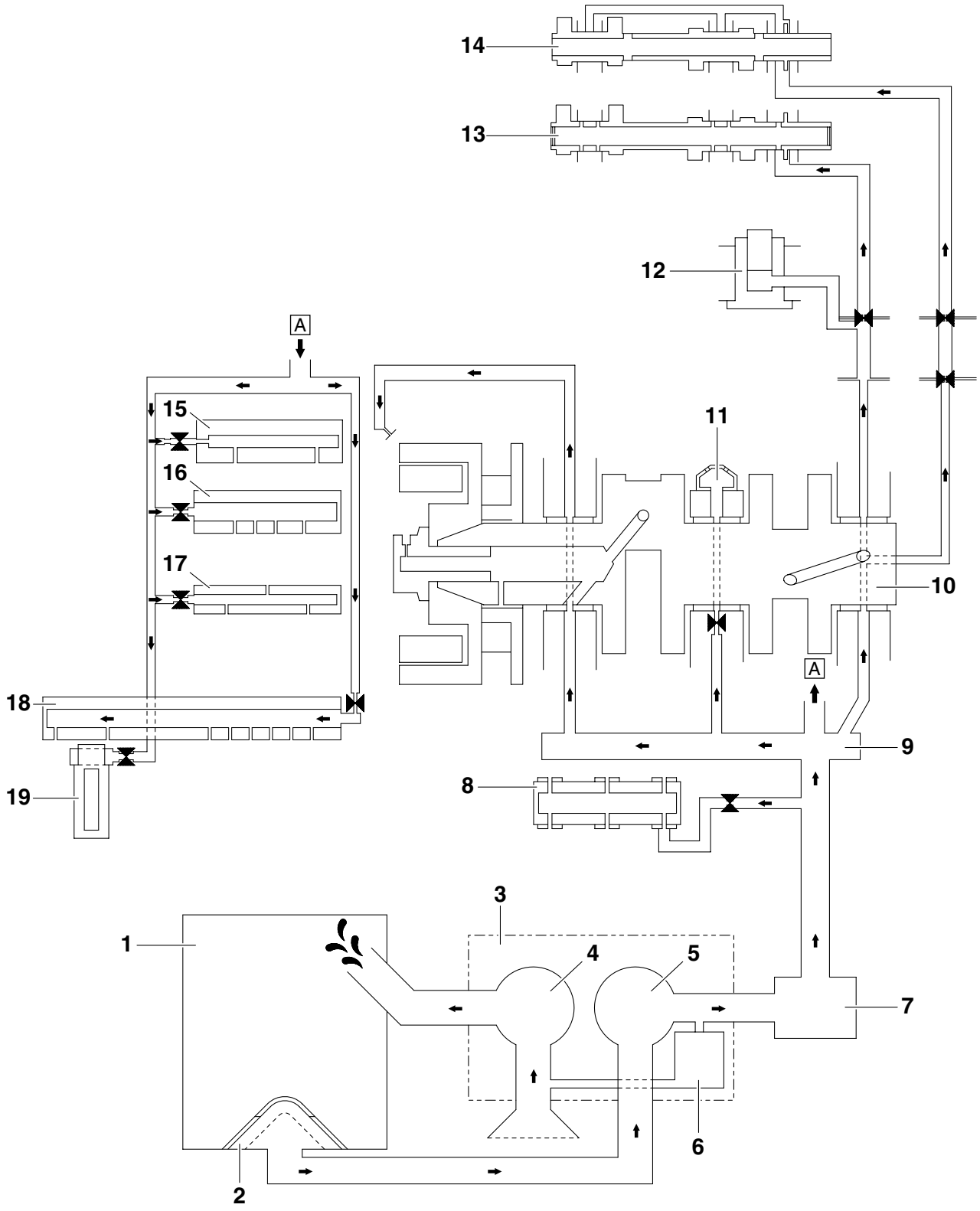
Lubrication point	Lubricant
Shift forks and shift fork guide bars	
Shift drum assembly	
Shift shaft washer	
Universal joint inner surface	
Ring gear thrust washer	Yamaha genuine shaft drive oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil
Ring gear splines	
Ring gear bearing	Yamaha genuine shaft drive oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil
Drive shaft splines	
Universal joint bearing	
Drive shaft oil seal	
Cylinder head cover and gasket	Three bond No.1541C®
Cylinder head and gasket	Yamaha bond No.1215 (Three bond No.1215®)
Crankcase mating surfaces	Yamaha bond No.1215 (Three bond No.1215®)
Stator assembly lead grommet	Yamaha bond No.1215 (Three bond No.1215®)

EAS20380
CHASSIS

Lubrication point	Lubricant
Steering bearings	LS
Steering bearing oil seal lips	LS
Steering shaft and nut thread	LS
Front wheel oil seal lips (right and left)	LS
Rear wheel oil seal lip	LS
Rear wheel drive hub mating surface	LS
Rear brake pedal pivoting point and metal-to-metal moving parts	LS
Passenger footrest pivoting point and ball	LS
Shift pedal pivoting point and metal-to-metal moving parts	LS
Centerstand pivoting point and metal-to-metal moving parts	LS
Centerstand spring hook metal-to-metal moving parts	LS
Sidestand pivoting point and metal-to-metal moving parts	LS
Link and sidestand switch contact point	LS
Sidestand hook and link contact point	LS
Tube guide (throttle grip) inner surface and throttle cables	LS
Brake lever pivoting point, brake master cylinder push rod contact surface, and metal-to-metal moving parts	S
Clutch lever pivoting point, clutch master cylinder push rod contact surface, and metal-to-metal moving parts	S
Pivot shaft and pivot shaft thread	LS
Pivot shaft bearing	LS
Pivot shaft dust cover inner surface	LS
Relay arm bearings and oil seal lips	LS

EAS20390
LUBRICATION SYSTEM CHART AND DIAGRAMS

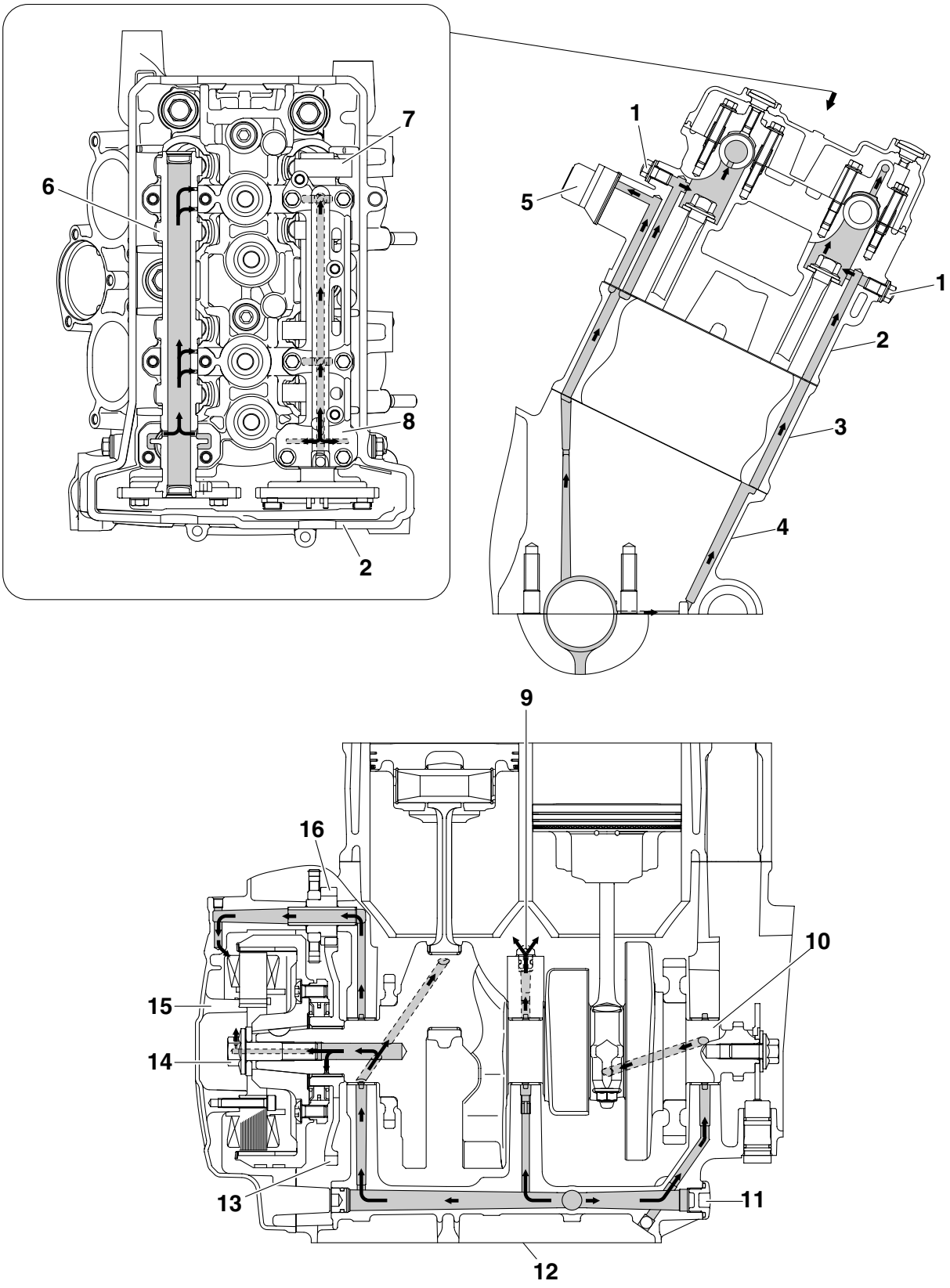
EAS20400
ENGINE OIL LUBRICATION CHART



1. Oil pan (oil tank)
2. Oil strainer (oil pan)
3. Oil pump assembly
4. Oil pump (scavenging)
5. Oil pump (feed)
6. Relief valve
7. Oil filter cartridge
8. Front balancer shaft
9. Main gallery
10. Crankshaft
11. Oil nozzle 1
12. Timing chain tensioner
13. Intake camshaft
14. Exhaust camshaft
15. Rear balancer shaft
16. Main axle
17. Shift fork upper guide bar
18. Drive axle
19. Middle driven pinion gear

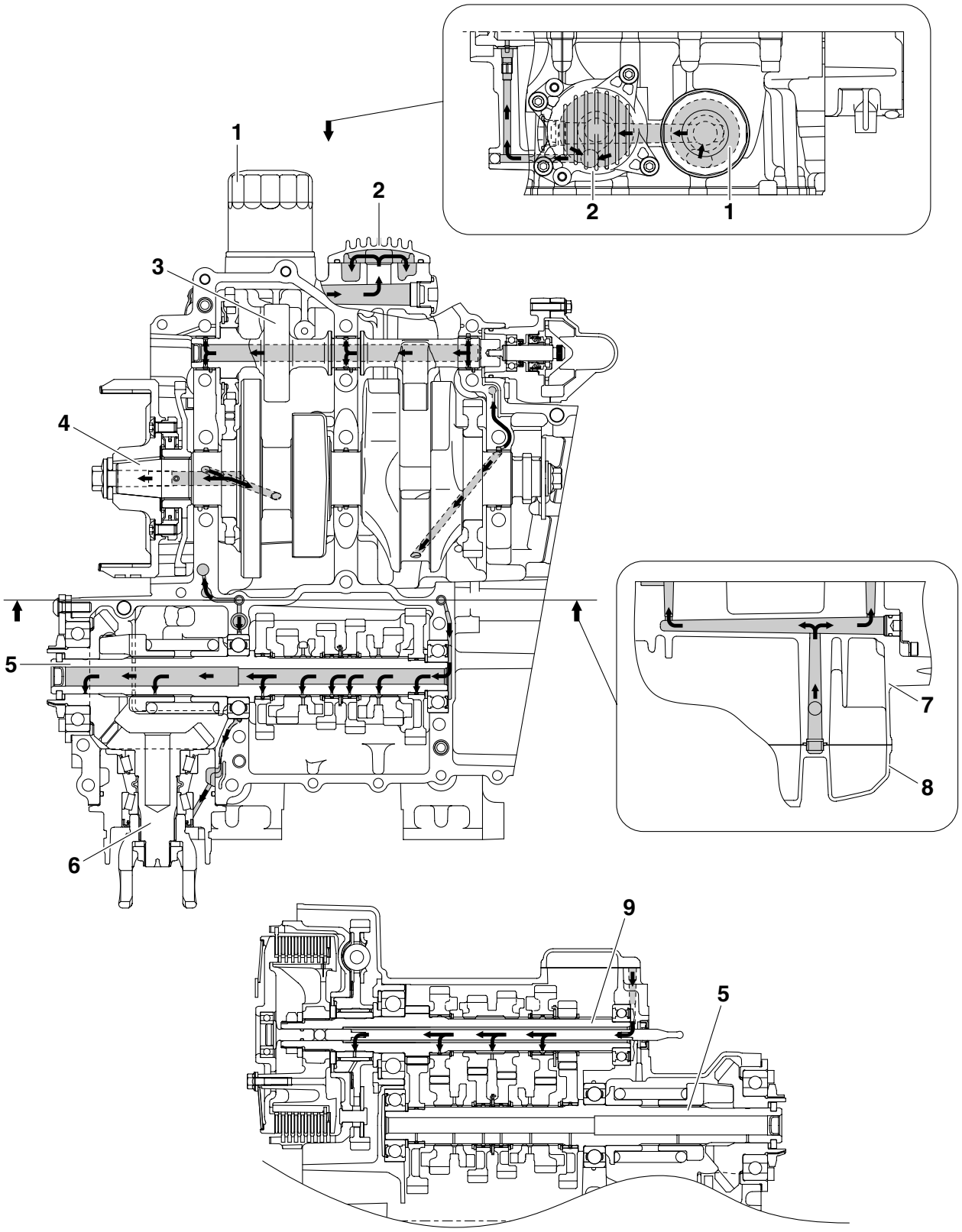
EAS20410
LUBRICATION DIAGRAMS

Cylinder (right side view) and crankshaft (rear view)



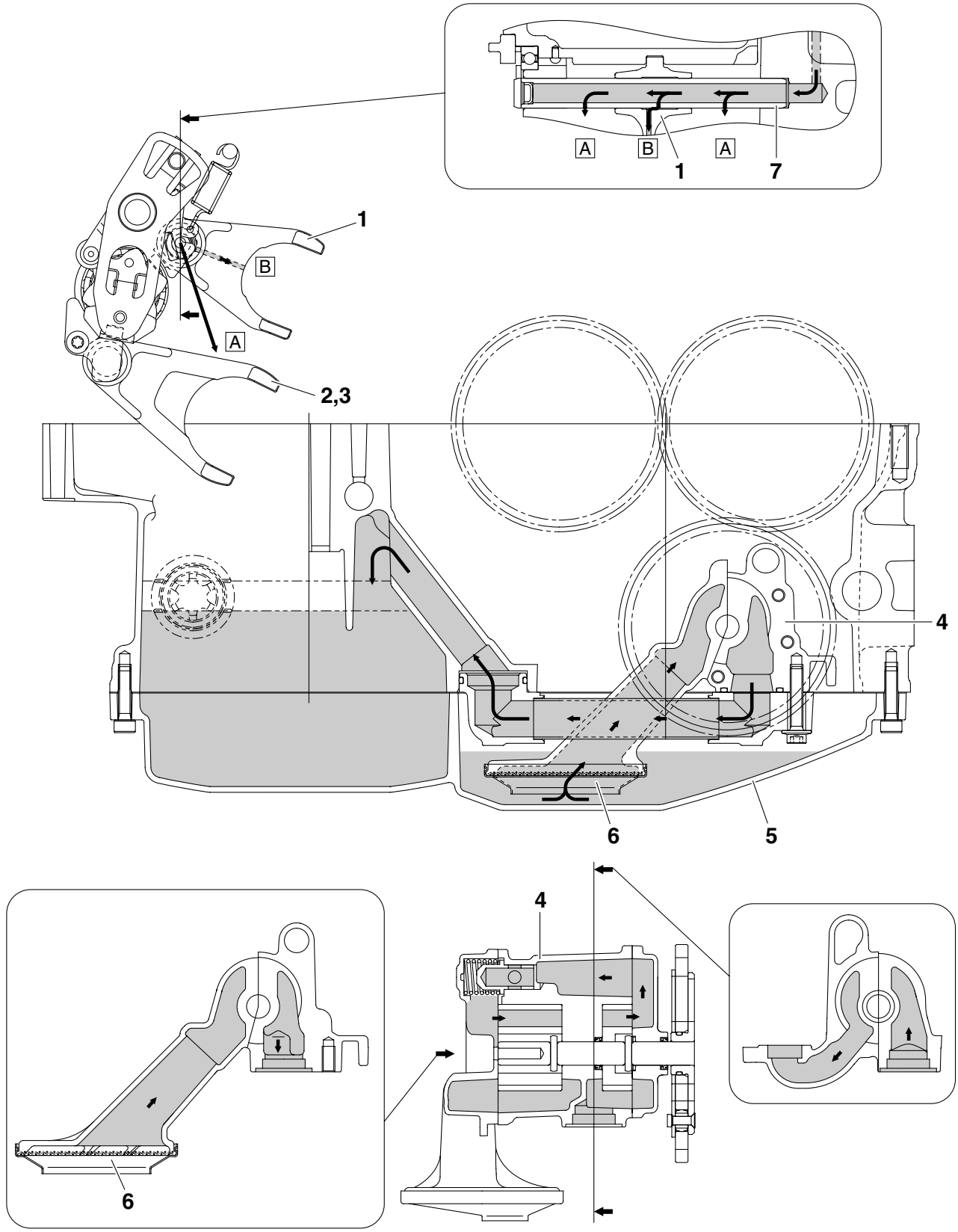
1. Oil check bolt
2. Cylinder head
3. Cylinder
4. Upper crankcase
5. Timing chain tensioner
6. Intake camshaft
7. Exhaust camshaft
8. Exhaust camshaft cap
9. Oil nozzle 1
10. Crankshaft
11. Main gallery bolt
12. Lower crankcase
13. Starter clutch gear
14. Generator rotor bolt
15. Generator rotor cover
16. Starter clutch idle gear

Crankcase (top view) and transmission (front view)



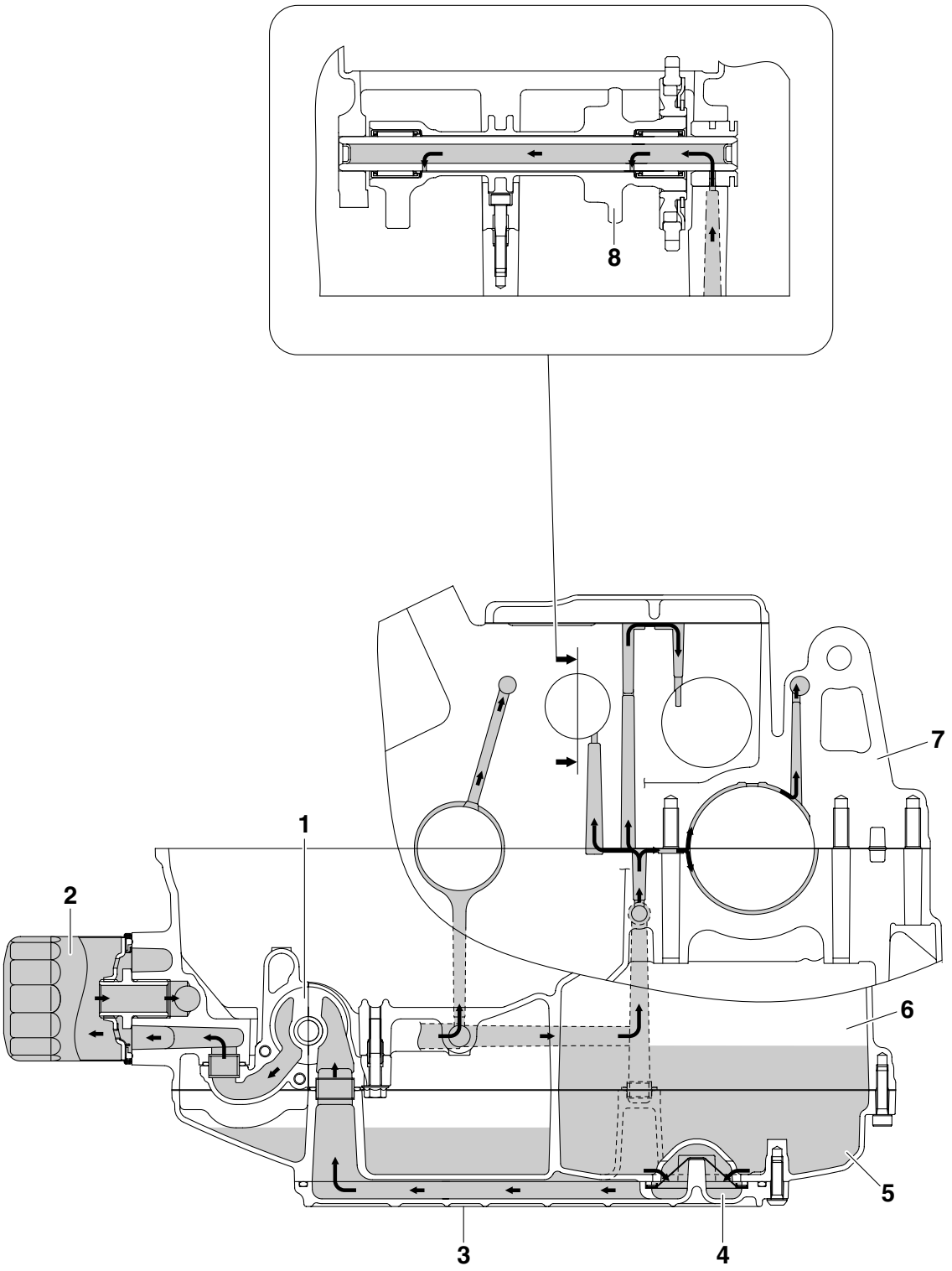
1. Oil filter cartridge
2. Oil delivery passage cover
3. Front balancer shaft
4. Crankshaft
5. Drive axle
6. Middle driven pinion gear
7. Lower crankcase
8. Oil pan
9. Main axle

Oil pump (right side view)



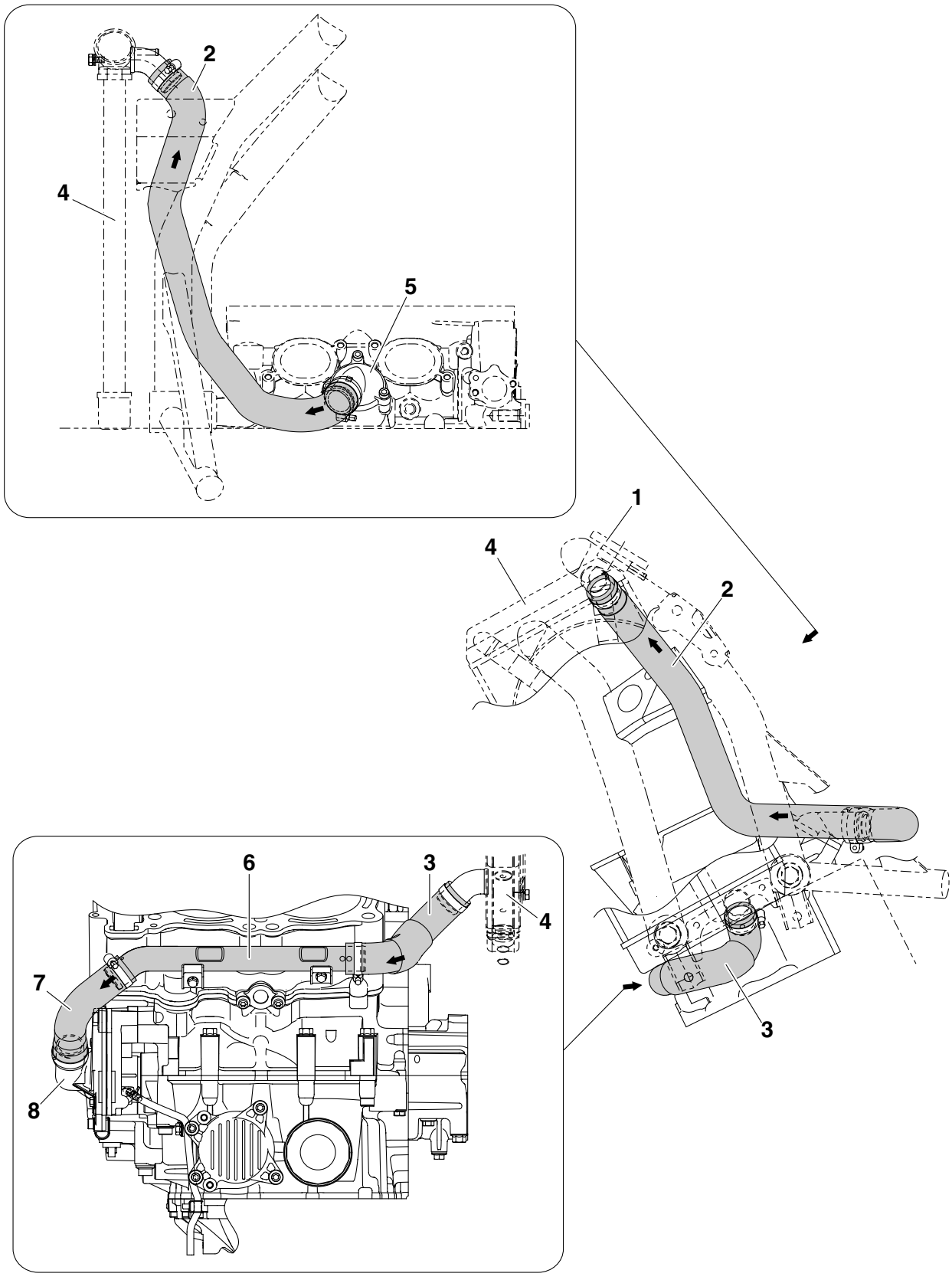
1. Shift fork-C
2. Shift fork-R
3. Shift fork-L
4. Oil pump assembly
5. Oil pan
6. Oil strainer (oil pump)
7. Shift fork upper guide bar

Oil pump (left side view)



1. Oil pump assembly
2. Oil filter cartridge
3. Oil strainer cover
4. Oil strainer (oil pan)
5. Oil pan
6. Lower crankcase
7. Upper crankcase
8. Rear balancer shaft

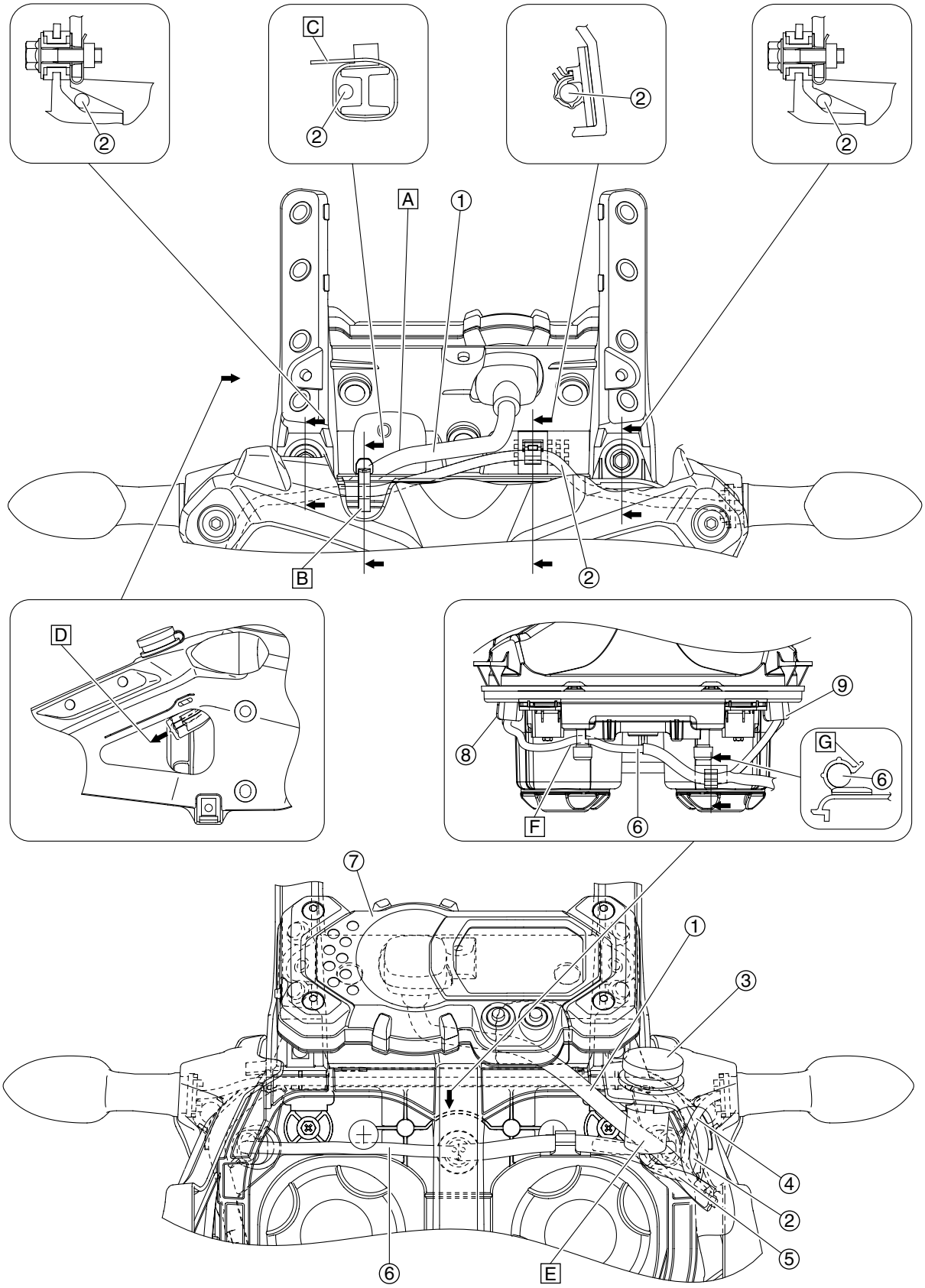
EAS20420
COOLING SYSTEM DIAGRAMS



1. Radiator cap
2. Radiator inlet hose
3. Radiator outlet hose
4. Radiator
5. Thermostat
6. Radiator outlet pipe
7. Water pump inlet hose
8. Water pump

EAS20430
CABLE ROUTING

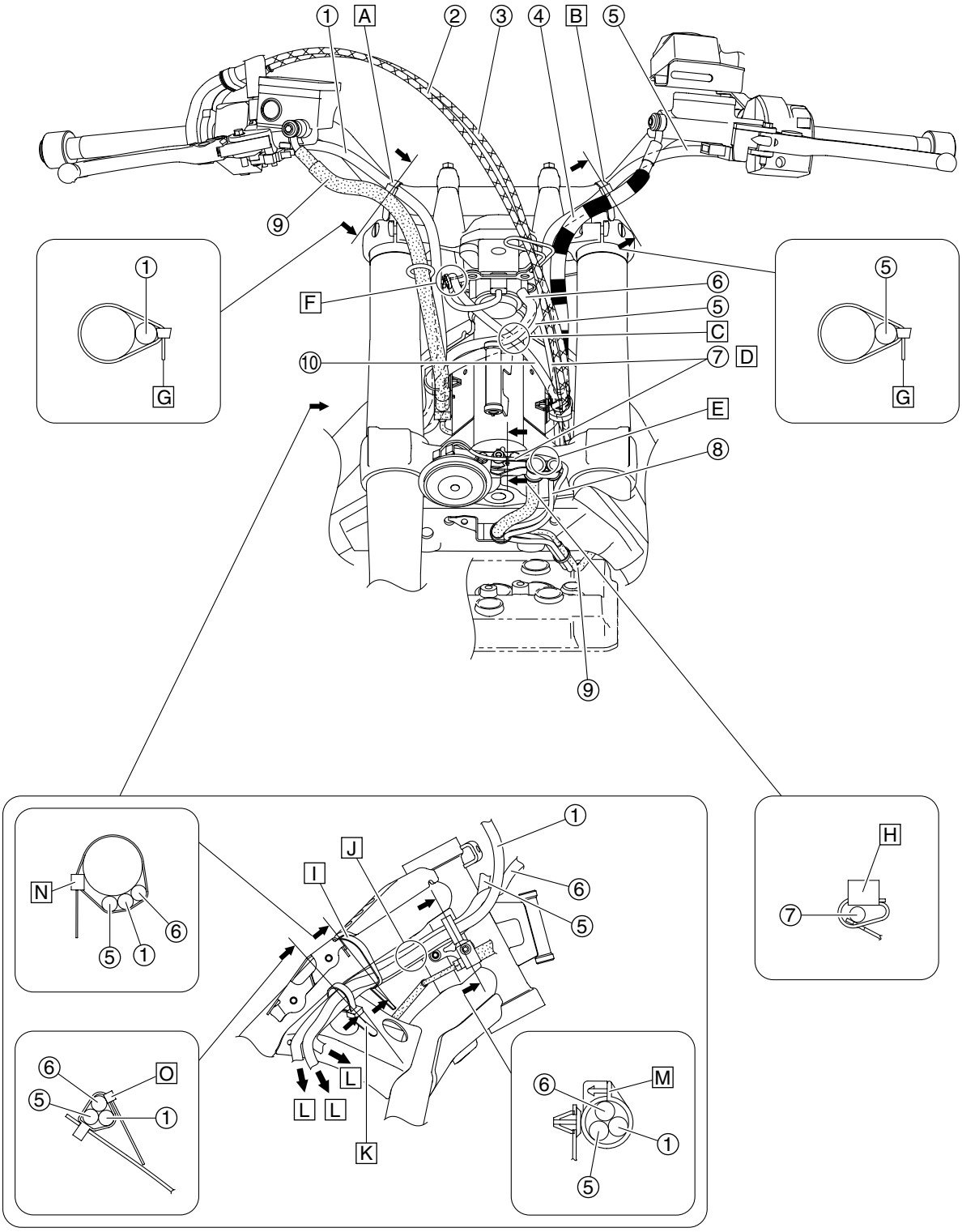
Headlight assembly (front and rear view)



1. Meter assembly lead
2. Front left turn signal light lead
3. Auxiliary DC jack
4. Front right turn signal light lead
5. Auxiliary DC jack lead
6. Headlight sub-wire harness
7. Meter assembly
8. Left auxiliary light
9. Right auxiliary light

A. Route the meter lead through the hole in the windshield bracket.
B. Position the plastic locking tie at the location shown in the illustration.
C. Point the end of the plastic locking tie forward.
D. Route the headlight sub-wire harness, auxiliary DC jack lead, front left turn signal light lead, front right turn signal light lead, and meter assembly lead though the hole in the headlight assembly bracket.
E. Route the meter assembly lead to the rear of the headlight sub-wire harness. Make sure that the meter assembly lead crosses the headlight sub-wire harness between the holder and the right auxiliary light.
F. Fit the headlight sub-wire harness in between the cap and the headlight assembly, making sure to push the headlight sub-wire harness all the way in.
G. Point the open ends of the holder forward.

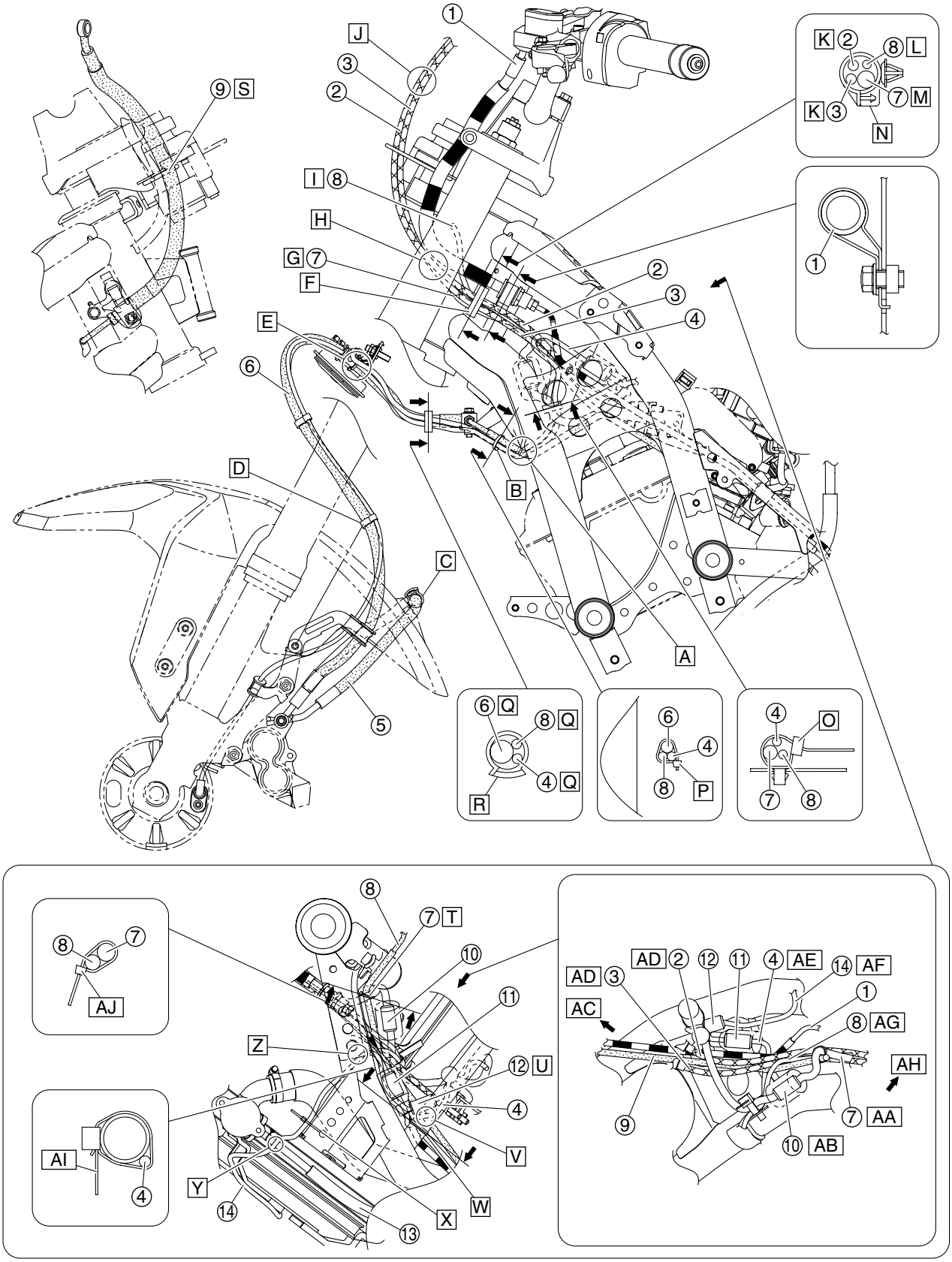
Handlebar (front view)



1. Right handlebar switch lead
2. Throttle cable (accelerator cable)
3. Throttle cable (decelerator cable)
4. Clutch hose
5. Left handlebar switch lead
6. Main switch lead
7. Horn lead
8. Front wheel sensor lead
9. Brake hose (hydraulic unit to left front brake caliper)
10. Immobilizer unit lead

A. Fasten the right handlebar switch lead to the handlebar with the plastic band at the location shown in the illustration.
B. Fasten the left handlebar switch lead to the handlebar with the plastic band at the location shown in the illustration.
C. Route the main switch lead and left handlebar switch lead to the front of the immobilizer unit lead in the order listed from front to rear.
D. Connect the horn connectors, turn the handlebar completely to the right, and then fasten the horn lead to the brake hose holder at the white tape with a plastic locking tie.
E. Route the horn lead over the brake hose (hydraulic unit to left front brake caliper) and front wheel sensor lead.
F. Route the immobilizer unit lead over the guide as shown in the illustration.
G. Face the buckle of the plastic band forward with the end pointing downward. Do not cut off the excess end of the plastic band.
H. Fasten the horn lead with a plastic locking tie so that the lead does not contact the horn. Be sure to fasten the plastic locking tie around the protective sleeve of the lead, not the lead itself.
I. Position the plastic locking tie at the location shown in the illustration.
J. Make sure that there is no slack in the leads in the area shown in the illustration.
K. Point the end of the plastic band downward. Do not cut off the excess end of the plastic band.
L. To electrical components tray
M. Face the catch of the holder upward.
N. Face the buckle of the plastic locking tie inward with the end pointing downward so that the end does not protrude to the outside of the frame. Do not cut off the excess end of the plastic locking tie.
O. Fasten the right handlebar switch lead, left handlebar switch lead, and main switch lead at the white tape on each lead with a plastic locking tie. Point the end of the plastic locking tie downward. Do not cut off the excess end of the plastic locking tie.

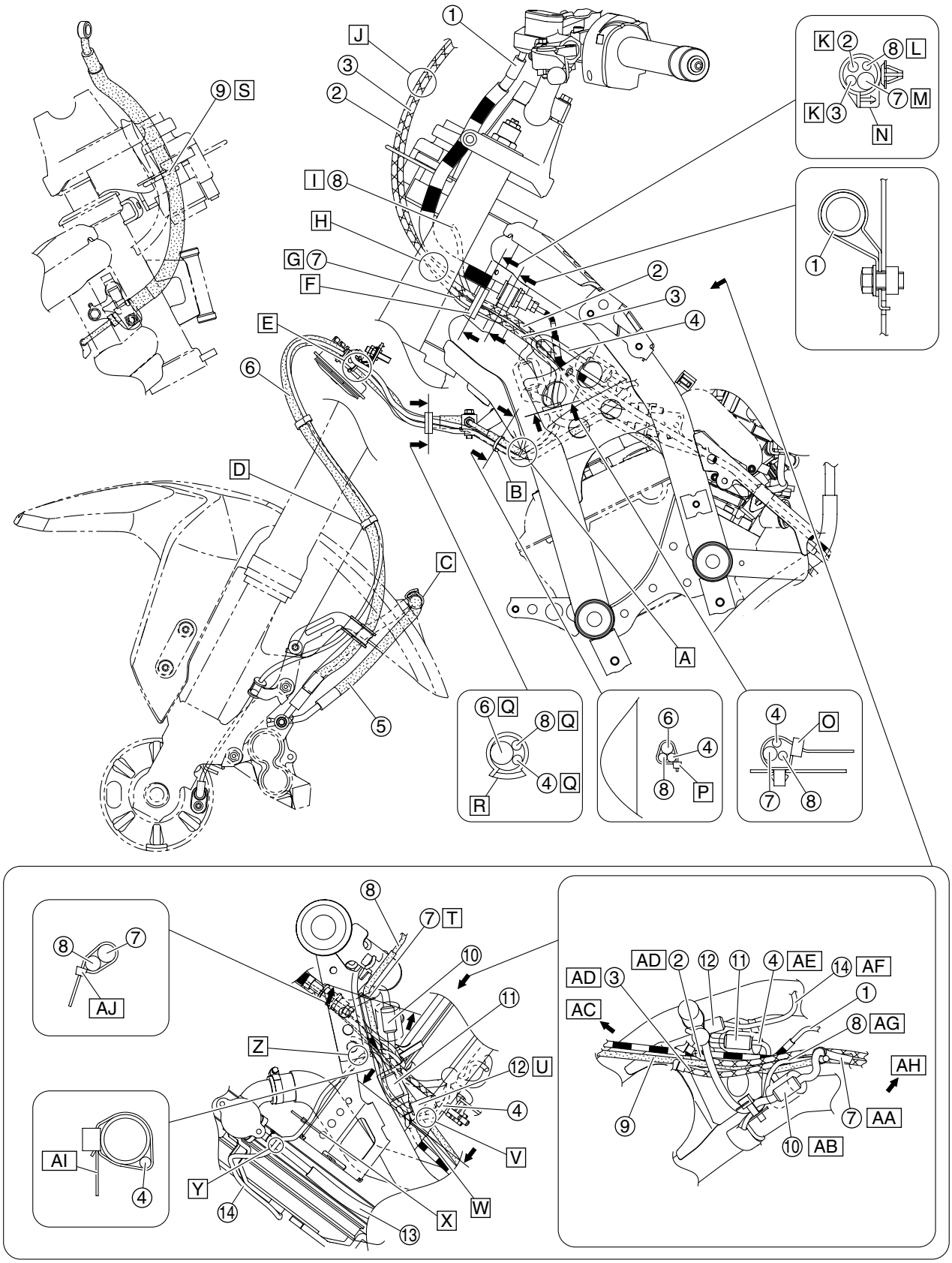
Front brake hose (left side view)



1. Clutch hose
2. Throttle cable (decelerator cable)
3. Throttle cable (accelerator cable)
4. Front wheel sensor lead
5. Brake hose (left front brake caliper to right front brake caliper)
6. Brake hose (hydraulic unit to left front brake caliper)
7. Immobilizer unit lead
8. Horn lead
9. Brake hose (front brake master cylinder to hydraulic unit)
10. Immobilizer unit coupler
11. Front wheel sensor coupler
12. Radiator fan motor coupler
13. Coolant reservoir hose
14. Radiator fan motor lead

A. Route the front wheel sensor lead and horn lead to the inside of the brake hose (hydraulic unit to left front brake caliper).
B. Fasten the front wheel sensor lead and horn lead to the pipe section of the brake hose (hydraulic unit to left front brake caliper) with a plastic locking tie at the location shown in the illustration.
C. Face the catch of the holder upward, and then close the holder until three clicks or more are heard.
D. Fasten the front wheel sensor lead to the brake hose (hydraulic unit to left front brake caliper) with the holder, making sure that the lead is positioned to the rear of the hose. Align the holder with the line shown extending from the brake hose holder bolt in the illustration.
E. Make sure that the protective sleeve of the front wheel sensor lead is positioned 0–2 mm (0–0.08 in) from the grommet on the lead.
F. Route the throttle cable (decelerator cable) to the outside of the throttle cable (accelerator cable) between the guide on the upper bracket and the holder. Make sure that the throttle cables do not cross between the holder and the throttle body.
G. Route the immobilizer unit lead to the inside of the clutch hose and throttle cables.
H. Cross the throttle cables at the location shown in the illustration. Either throttle cable may be routed to the inside.
I. Route the horn lead to the inside of the clutch hose and throttle cables.
J. Make sure that the throttle cables do not cross between the guide and the throttle cable housing.
K. Route the throttle cables to the outside of the leads.
L. Route the horn lead to the inside of the throttle cables.
M. Route the immobilizer unit lead to the inside of the throttle cables. Fasten the immobilizer unit lead at the purple tape with the holder.
N. Face the catch of the holder downward.
O. Fasten the front wheel sensor lead, immobilizer unit lead, and horn lead at the white tape on each lead with the plastic band. Point the end of the plastic band inward. Do not cut off the excess end of the plastic band.
P. Point the end of the plastic locking tie outward, and then cut off the excess end of the tie to 0–2 mm (0–0.08 in).
Q. Route the front wheel sensor lead, brake hose (hydraulic unit to left front brake caliper), and horn lead in the order shown in the illustration.
R. Fasten the front wheel sensor lead and horn lead at the white tape on each lead to the brake hose (hydraulic unit to left front brake caliper) with the holder. Position the holder 0–5 mm (0–0.20 in) from the end of the hose protector on the brake hose. The catch of the holder may be facing in any direction.
S. Route the brake hose (front brake master cylinder to hydraulic unit) through the guide.
T. Route the immobilizer unit lead over the brake hose (front brake master cylinder to hydraulic unit), and then fasten the lead to the hose with a plastic locking tie. Position the plastic locking tie at the bend in the brake hose (front brake master cylinder to hydraulic unit).
U. Insert the projection on the radiator fan motor coupler into the hole in the frame.
V. Route the front wheel sensor lead over the throttle cables.
W. Fasten the front wheel sensor lead with the plastic band. Position the plastic band to the left of the radiator fan motor coupler.
X. After assembling the headlight assembly, pass a plastic locking tie through the hole in the frame, and then fasten the radiator fan motor lead at the white tape with the tie. Point the end of the plastic locking tie forward. Do not cut off the excess end of the plastic locking tie.
Y. Route the radiator fan motor lead over the coolant reservoir hose.
Z. Route the radiator fan motor lead under the frame.

Front brake hose (left side view)



AA. Route the immobilizer unit lead to the inside of the throttle cables.

AB. Position the immobilizer unit coupler below the brake hose (front brake master cylinder to hydraulic unit).

AC. Upward

AD. Route the throttle cables between the brake hose (front brake master cylinder to hydraulic unit) and the clutch hose.

AE. Route the front wheel sensor lead to the outside of the brake hose (front brake master cylinder to hydraulic unit), clutch hose, and throttle cables.

AF. Route the radiator fan motor lead over the front wheel sensor lead.

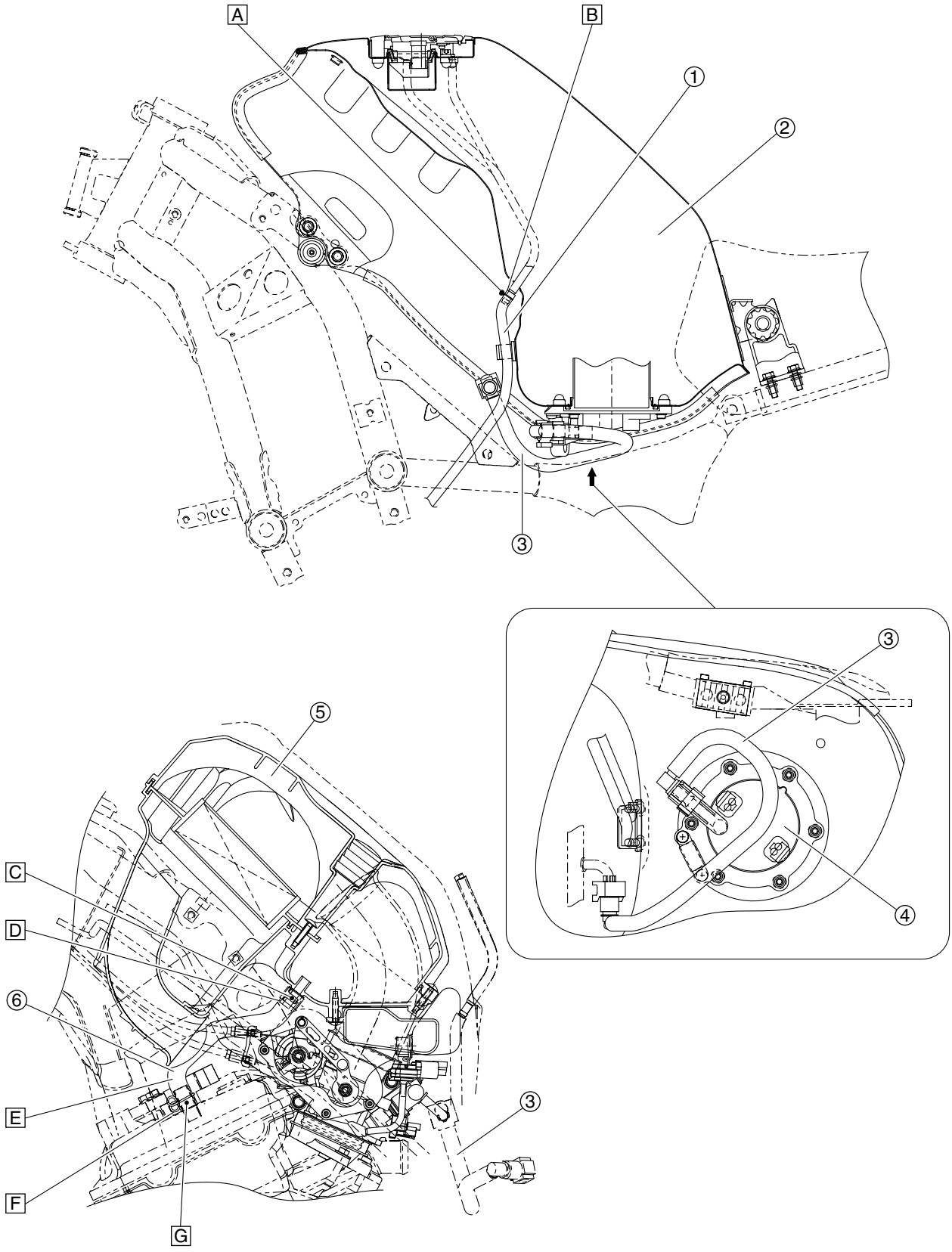
AG. Route the horn lead between the brake hose (front brake master cylinder to hydraulic unit) and the clutch hose, and to the inside of the throttle cables.

AH. Forward

AI. Face the buckle of the plastic band rearward with the end pointing downward. Do not cut off the excess end of the plastic locking tie.

AJ. Fasten the immobilizer unit lead at the white tape to the brake hose (front brake master cylinder to hydraulic unit) with a plastic locking tie. Face the buckle of the plastic locking tie forward with the end pointing downward. Do not cut off the excess end of the plastic locking tie.

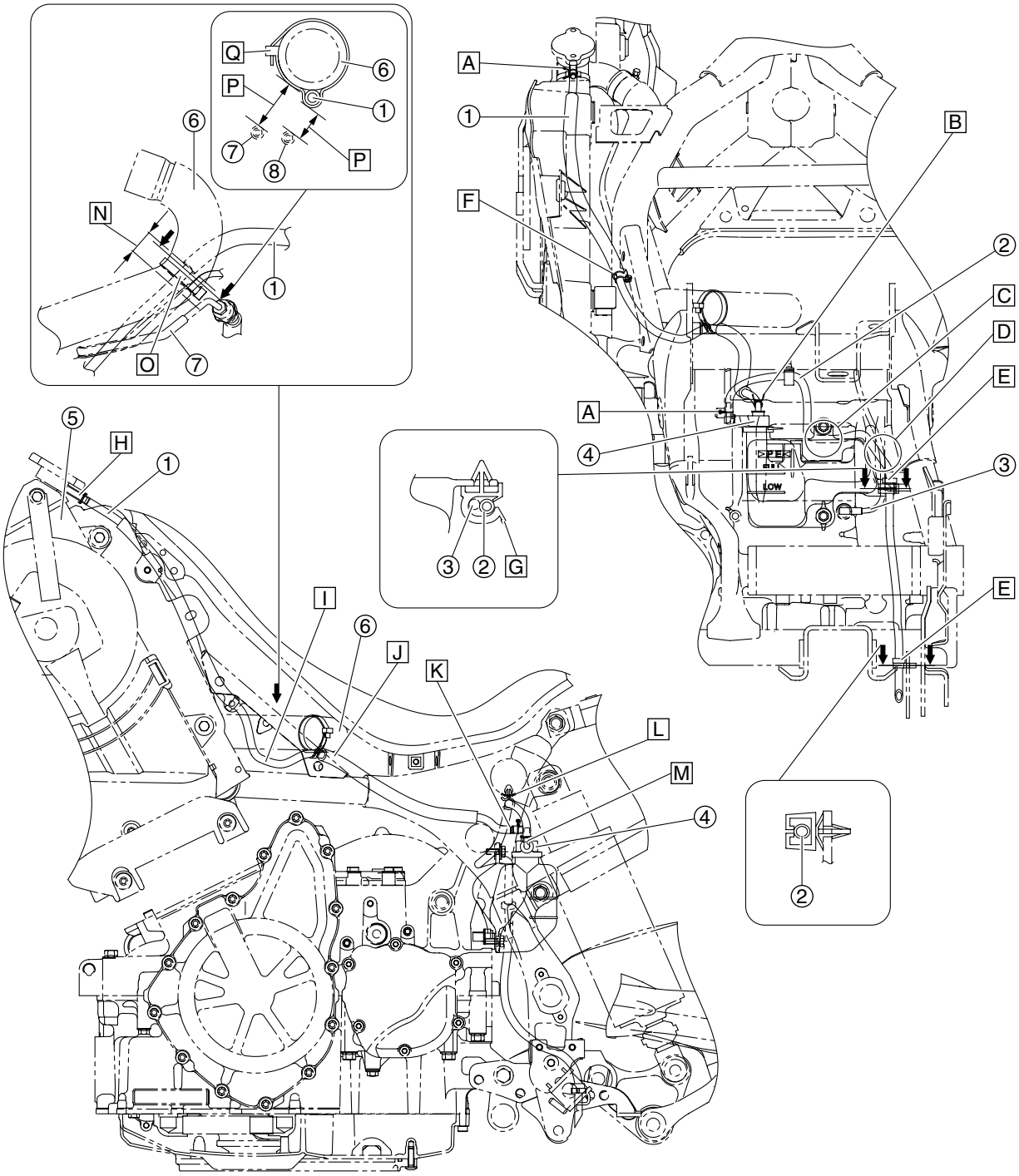
Fuel tank and throttle bodies (left side view)



1. Fuel tank overflow hose and fuel tank breather hose
2. Fuel tank
3. Fuel hose
4. Fuel pump
5. Air filter case
6. Cylinder head breather hose

A. Align the hose clamps with the white paint marks on the fuel tank overflow hose and fuel tank breather hose. Do not install the hose clamps on the flange at the end of each hose fitting on the fuel tank.
B. Install the fuel tank overflow hose and fuel tank breather hose with their white paint marks facing forward. Install each hose onto the hose fitting of the fuel tank up to the wide portion at the base of the fitting.
C. Install the cylinder head breather hose with its yellow paint mark facing to the left.
D. Point the ends of the hose clamp to the left.
E. Make sure that the gap between the end of the cylinder head breather hose and the cylinder head cover is 1 mm (0.04 in) or less.
F. Point the ends of the hose clamp forward.
G. Install the cylinder head breather hose with its white paint mark facing to the left.

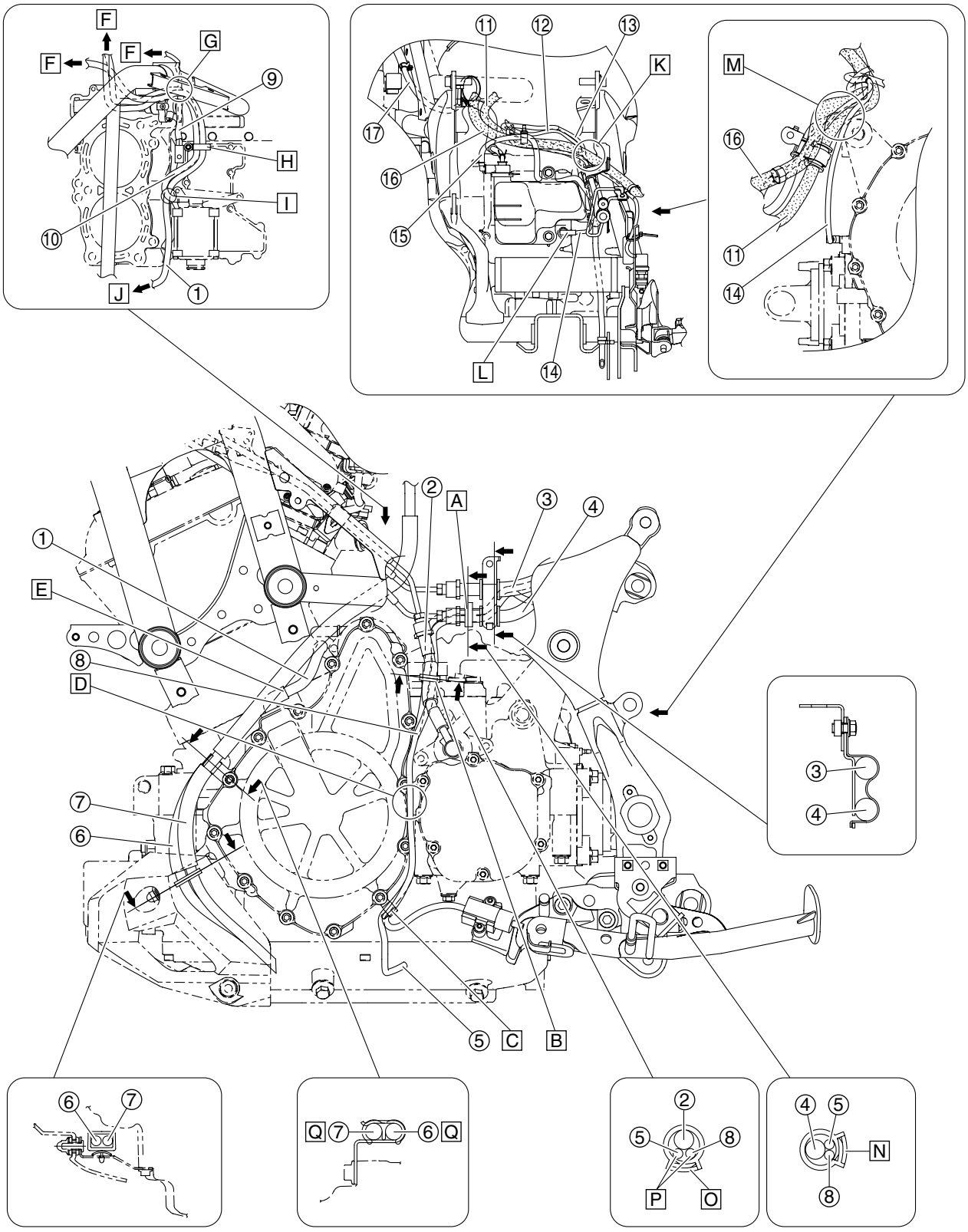
Coolant reservoir (rear and left side view)



1. Coolant reservoir hose
2. Coolant reservoir breather hose
3. Neutral switch lead
4. Coolant reservoir cap
5. Radiator
6. Radiator inlet hose
7. Clutch pipe
8. Brake hose (front brake master cylinder to hydraulic unit)

A. Point the ends of the hose clamp to the left.
B. Point the ends of the hose clamp upward.
C. Route the coolant reservoir breather hose to the front of the coolant reservoir.
D. Route the coolant reservoir breather hose to the rear of the neutral switch lead.
E. Make sure that the grommet on the coolant reservoir breather hose contacts the holder.
F. Fasten the coolant reservoir hose with the holder at the location shown in the illustration. Make sure that the end of the hose protector on the coolant reservoir hose contacts the holder.
G. Point the open ends of the holder to the right. Route the neutral switch lead to the inside of the coolant reservoir breather hose.
H. Install the coolant reservoir hose onto the radiator pipe, making sure that it contacts the radiator.
I. Route the coolant reservoir hose through the opening in the frame as shown in the illustration and to the inside of the frame.
J. Fasten the coolant reservoir hose to the radiator inlet hose with a plastic locking tie.
K. Connect the end of the coolant reservoir hose that is identified by the white paint mark to the coolant reservoir. Install the hose onto the hose fitting of the coolant reservoir cap up to the bend in the fitting.
L. Point the open ends of the holder forward.
M. Connect the coolant reservoir breather hose to the coolant reservoir. Install the hose onto the hose fitting of the coolant reservoir cap up to the bend in the fitting.
N. Position the plastic locking tie at the bend in the clutch pipe within the 20 mm (0.79 in) range shown in the illustration.
O. Fasten the coolant reservoir hose at the white paint mark with a plastic locking tie.
P. 10 mm (0.40 in) or more
Q. Position the coolant reservoir hose directly under the radiator inlet hose. Point the end of the plastic locking tie downward, and then cut off the excess end of the tie to 5 mm (0.20 in) or less.

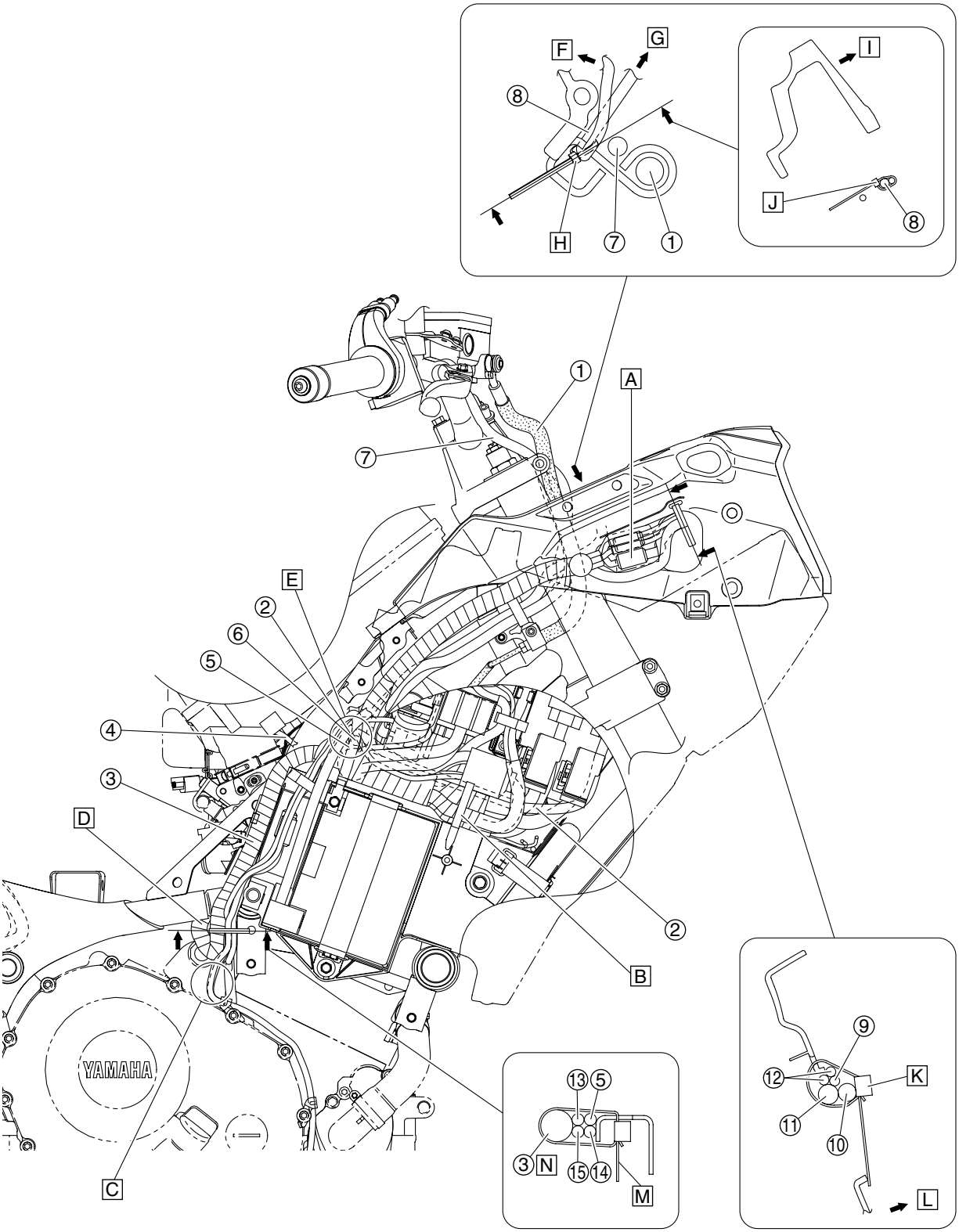
Engine (left side view)



1. Stator coil lead
2. Clutch hose
3. Brake hose (front brake master cylinder to hydraulic unit)
4. Brake hose (hydraulic unit to left front brake caliper)
5. Oil level switch lead
6. Fuel tank overflow hose
7. Fuel tank breather hose
8. Sidestand switch lead
9. Engine ground lead
10. Starter motor lead
11. Brake hose (hydraulic unit to rear brake caliper)
12. Rear wheel sensor lead
13. Rear brake light switch lead
14. Neutral switch lead
15. Coolant reservoir breather hose
16. Brake hose (rear brake master cylinder to hydraulic unit)
17. Coolant reservoir hose

A. Fasten the brake hose (hydraulic unit to left front brake caliper), oil level switch lead, and sidestand switch lead with the holder. Position the holder between the brake hose flare nut and the grommet on the hose.
B. Fasten the clutch hose, oil level switch lead, and sidestand switch lead with the holder. Position the holder in the middle of the hose protector on the clutch hose.
C. Route the sidestand switch lead to the outside of the oil level switch lead, and then fasten the leads with the holder.
D. Route the sidestand switch lead to the outside of the oil level switch lead, and then fit the leads in between the generator cover and the middle gear side cover.
E. Make sure that the stator coil lead is covered completely by the protective sleeve and rubber boot.
F. To electrical components tray
G. Route the engine ground lead, stator coil lead, and starter motor lead to the outside of the timing chain tensioner.
H. Fasten the stator coil lead and starter motor lead with the holder.
I. Route the starter motor lead over the stator coil lead.
J. To stator coil
K. Route the rear wheel sensor lead and rear brake light switch lead between the brake hose (rear brake master cylinder to hydraulic unit) and the brake hose (hydraulic unit to rear brake caliper).
L. Install the neutral switch lead terminal so that the lead is routed in the direction shown in the illustration.
M. Route the neutral switch lead to the front of the brake hose (rear brake master cylinder to hydraulic unit) and brake hose (hydraulic unit to rear brake caliper).
N. The catch of the holder may be facing in any direction.
O. Face the catch of the holder inward.
P. Route the oil level switch lead and sidestand switch lead to the inside of the clutch hose.
Q. Route the fuel tank overflow hose and fuel tank breather hose so that the hoses cross no more than once between the fuel tank and the holder.

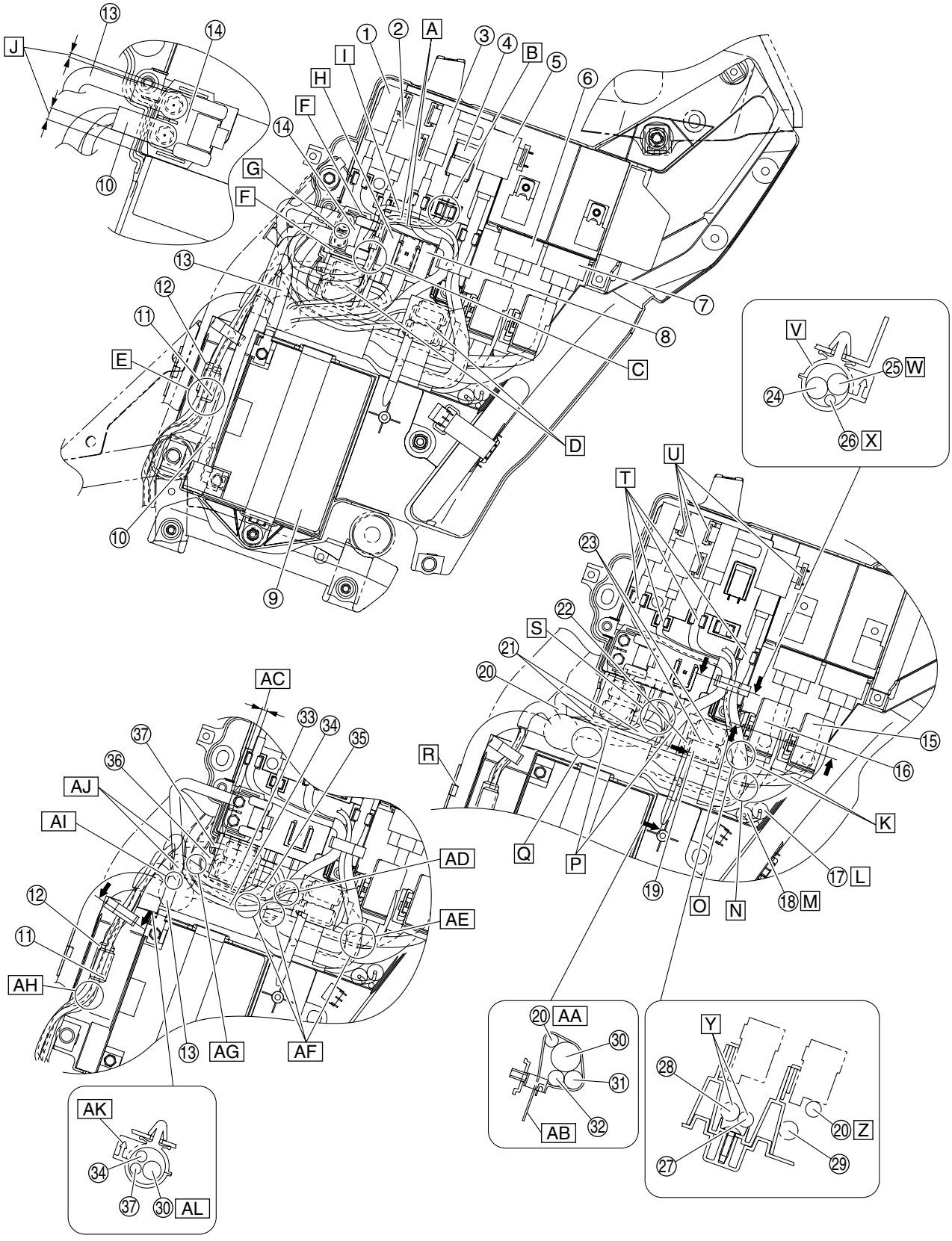
Front brake hose (right side view)



1. Brake hose (front brake master cylinder to hydraulic unit)
2. Stator coil lead
3. Wire harness
4. Intake air temperature sensor lead
5. Negative battery lead
6. Starter motor lead
7. Right handlebar switch lead
8. Immobilizer unit lead
9. Auxiliary DC jack lead
10. Headlight sub-wire harness
11. Meter assembly lead
12. Front turn signal light leads
13. Crankshaft position sensor lead
14. O_2 sensor #1 lead
15. O_2 sensor #2 lead

A. Slide the rubber cover over the headlight sub-wire harness coupler, auxiliary DC jack coupler, and front turn signal light connectors.
B. Fasten the wire harness and stator coil lead with the plastic band.
C. Make sure that there is no slack in the crankshaft position sensor lead, O_2 sensor #1 lead, and O_2 sensor #2 lead in the area shown in the illustration.
D. Route the wire harness to the rear of the starter motor lead and stator coil lead.
E. Route the stator coil lead, negative battery lead, and starter motor lead over the wire harness, and then route the leads outward at the location shown in the illustration.
F. To wire harness
G. To immobilizer unit
H. Fasten the immobilizer unit lead to the guide with a plastic locking tie.
I. Forward
J. Align the white tape on the immobilizer unit lead with the plastic locking tie. Face the buckle of the plastic locking tie upward with the end pointing rearward. Do not cut off the excess end of the plastic locking tie.
K. Pass a plastic locking tie through the hole in the right side panel from the outside, and then fasten the auxiliary DC jack lead, headlight sub-wire harness, meter assembly lead, and front turn signal light leads with the tie. Face the buckle of the plastic band outward with the end positioned to the outside of the right side panel and pointing downward. Do not cut off the excess end of the plastic locking tie.
L. Outward
M. Pass the plastic locking tie through the hole in the frame from the outside. Point the end of the plastic locking tie inward. Do not cut off the excess end of the plastic locking tie.
N. Route the wire harness to the rear of the other leads.

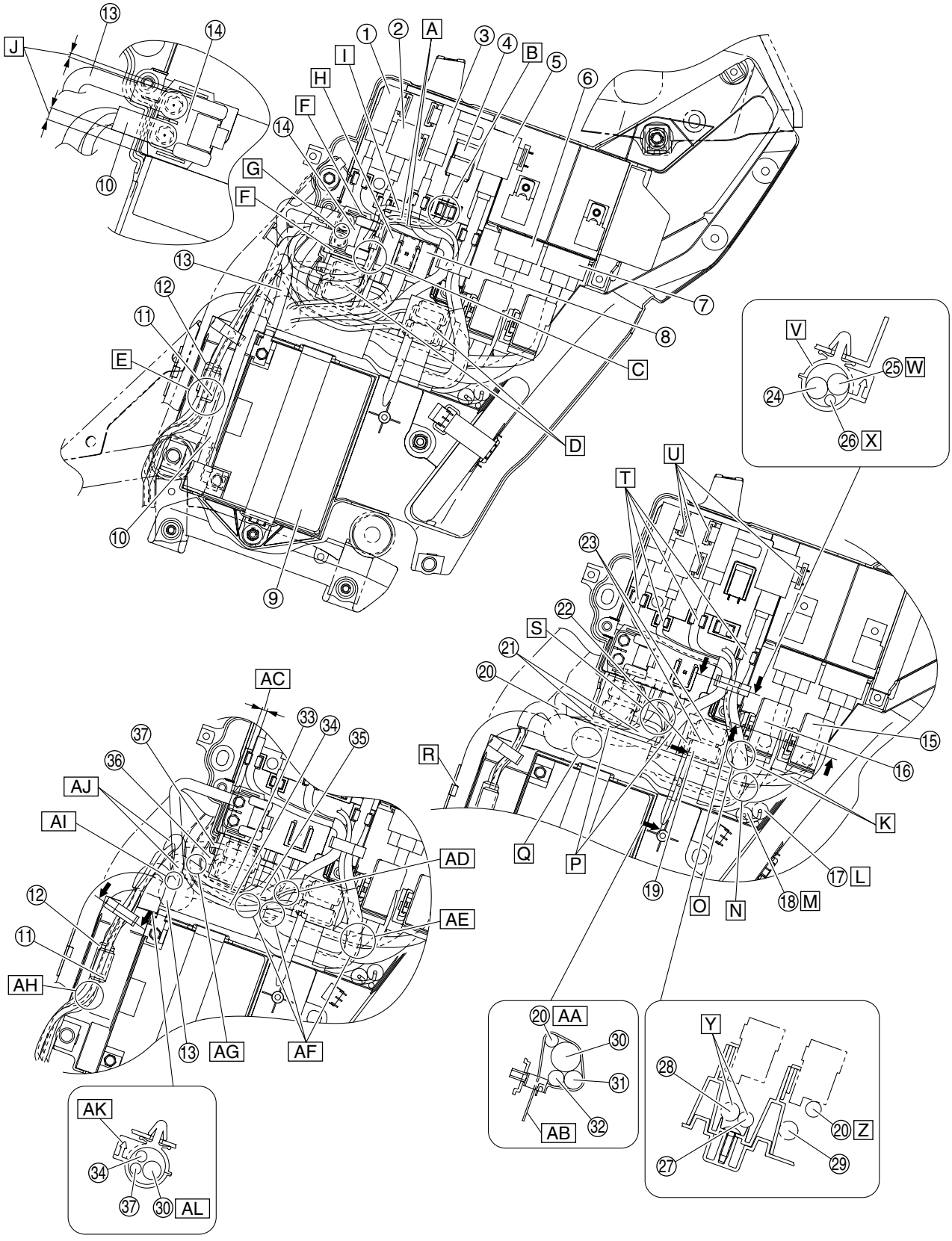
Electrical components tray (right side view)



1. Headlight relay
2. Turn signal/hazard relay
3. Radiator fan motor relay
4. Main fuse
5. Starting circuit cut-off relay
6. Rectifier/regulator coupler
7. Stator coil coupler
8. Joint connector
9. Battery
10. Positive battery lead
11. Crankshaft position sensor coupler
12. Negative battery lead coupler
13. Negative battery lead
14. Starter relay
15. Fuse box 1
16. Fuse box 2
17. Grip warmer coupler
18. Accessory light coupler
19. Left handlebar switch coupler
20. Stator coil lead
21. ECU leads
22. O_2 sensor #1 coupler
23. Right handlebar switch couplers
24. Wire harness (turn signal/hazard relay lead and radiator fan motor relay lead)
25. Starting circuit cut-off relay lead
26. Starter relay lead
27. Rectifier/regulator lead
28. Fuse box 2 lead
29. Fuse box 1 lead
30. Wire harness
31. Wire harness (starting circuit cut-off relay lead and starter relay lead)
32. Wire harness (rectifier/regulator lead and stator coil lead)
33. Left handlebar switch lead
34. O_2 sensor #1 lead
35. Right handlebar switch lead
36. Main switch lead
37. O_2 sensor #2 lead

A. Route the main fuse leads to the outside of the headlight relay lead and turn signal/hazard relay lead.
B. Fasten the main fuse leads with the holder on the ECU bracket.
C. Route the main fuse leads between the starter relay and the joint connector.
D. Slide the rubber cover over the couplers, making sure that the couplers are covered completely.
E. Either coupler, the crankshaft position sensor coupler or negative battery lead coupler, may be positioned to the outside.
F. Install the starter relay rubber holder completely onto the tabs on the ECU bracket.
G. Make sure that the terminal covers for the positive battery lead and negative battery lead are not fitted over the rib on the starter relay.
H. Fit the joint connector into the holder on the ECU bracket.
I. Route the starter relay lead to the outside of the main fuse leads.
J. Install the positive battery lead terminal and negative battery lead terminal to the starter relay so that the terminals are parallel to the relay as shown in the illustration.
K. Route the fuse box 1 lead and fuse box 2 lead to the inside of the wire harness (starting circuit cut-off relay lead and starter relay lead).
L. Install the grip warmer coupler so that the coupler cap is facing inward.
M. Install the accessory light coupler so that the coupler cap is facing inward.
N. Route the leads that pass through the rubber cover to the inside of the fuse box 1 lead and fuse box 2 lead.
O. Route the leads that pass through the rubber cover to the inside of the wire harness (starting circuit cut-off relay lead and starter relay lead).
P. Route the wire harness (turn signal/hazard relay lead, radiator fan motor relay lead, and headlight relay lead) and ECU leads upward, making sure to route the ECU leads to the rear of the wire harness.
Q. Route the stator coil lead to the rear of the wire harness.
R. Fasten the wire harness with the holder on the electrical components tray.
S. Route the leads that pass through the rubber cover to the outside of the ECU leads.
T. Fasten the headlight relay lead, turn signal/hazard relay lead, radiator fan motor relay lead and starting circuit cut-off relay lead with the holders on the ECU bracket.
U. Install the rubber holder on each relay completely onto its respective tab on the ECU bracket.
V. Face the catch of the holder forward.
W. Route the starting circuit cut-off relay lead to the front of the wire harness (turn signal/hazard relay lead, radiator fan motor relay lead, and headlight relay lead).
X. Route the starter relay lead to the front of the wire harness (turn signal/hazard relay lead, radiator fan motor relay lead, and headlight relay lead).
Y. Route the rectifier/regulator lead and fuse box 2 lead as shown in the illustration.
Z. Route the stator coil lead to the outside and to the front of the fuse box 1 lead.

Electrical components tray (right side view)



AA. Route the stator coil lead over the wire harness.

AB. Fasten the stator coil lead, wire harness, wire harness (starting circuit cut-off relay lead and starter relay lead), and wire harness (rectifier/regulator lead and stator coil lead) with the plastic band. Route the leads in the order shown in the illustration. Point the end of the plastic band downward. Do not cut off the excess end of the plastic band.

AC. Position the rubber cover at the location shown in the illustration.

AD. Route the O_2 sensor #1 lead, left handlebar switch lead, and right handlebar switch lead to the outside of the wire harness (turn signal/hazard relay lead and radiator fan motor relay lead).

AE. Route the stator coil lead to the inside of the wire harness (starting circuit cut-off relay lead and starter relay lead).

AF. Route the stator coil lead to the outside of the ECU leads, headlight relay lead, turn signal/hazard relay lead, fuse box 1 lead, fuse box 2 lead, and leads that pass through the rubber cover.

AG. Route the left handlebar switch lead and right handlebar switch lead to the outside of the O_2 sensor #2 lead and main switch lead.

AH. Connect the crankshaft position sensor coupler and negative battery lead coupler, making sure that the leads are not twisted.

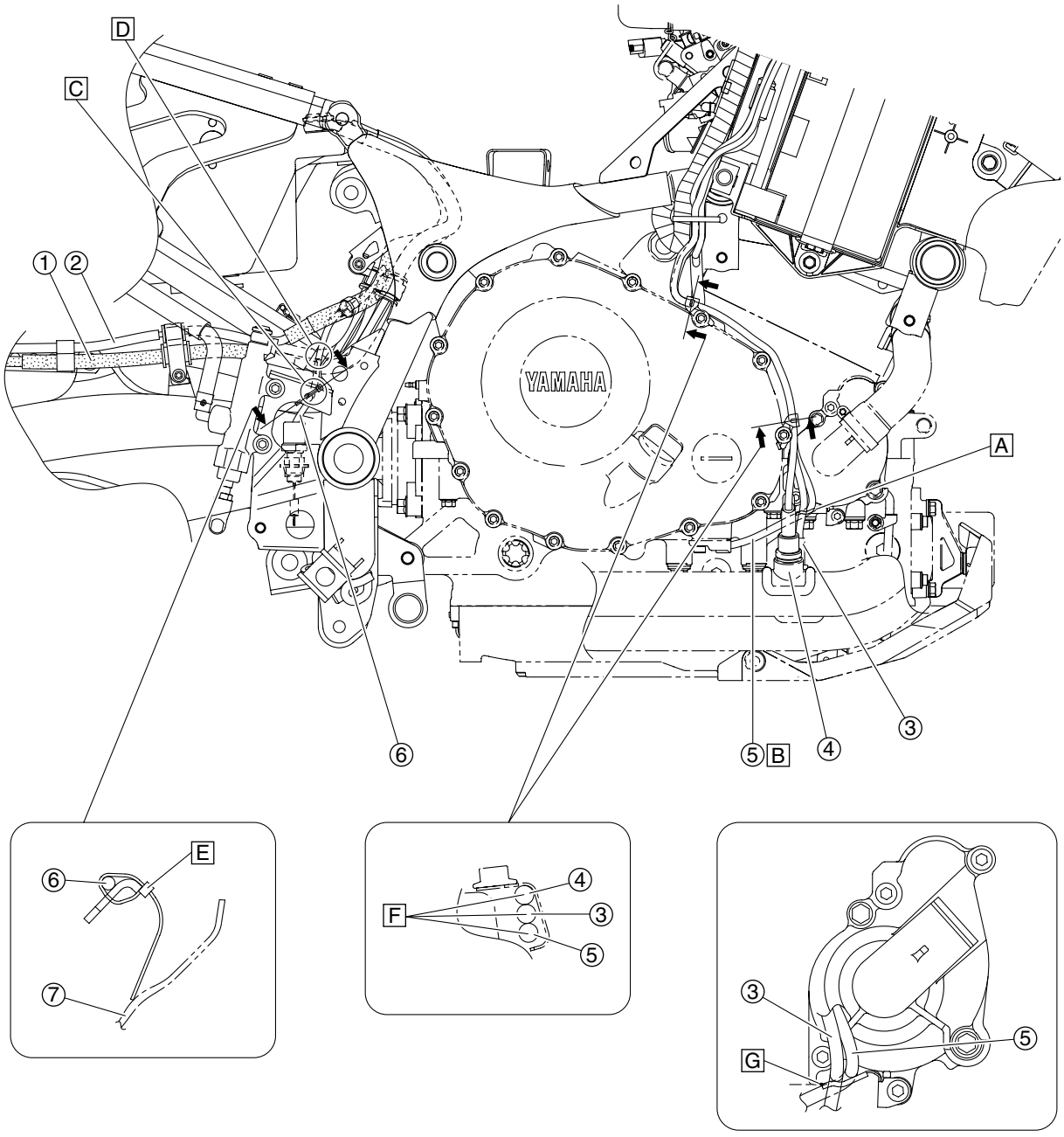
AI. Route the O_2 sensor #1 lead and O_2 sensor #2 lead under the negative battery lead.

AJ. Route the starter relay lead and negative battery lead over the wire harness.

AK. Fasten the O_2 sensor #1 lead, O_2 sensor #2 lead, and wire harness with the holder. Face the catch of the holder rearward.

AL. Align the white tape on the wire harness with the holder.

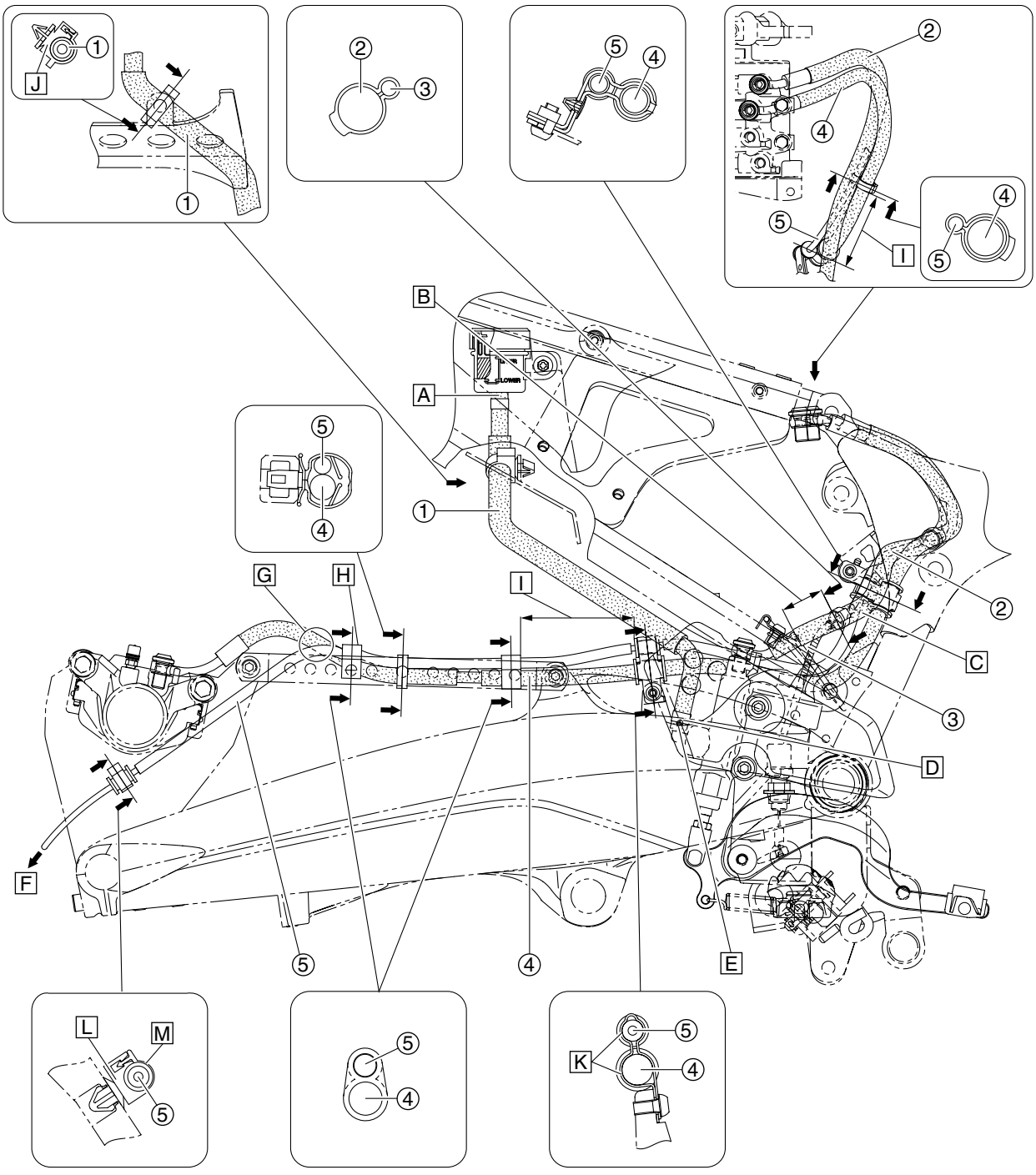
Engine (right side view)



1. Brake hose (hydraulic unit to rear brake caliper)
2. Rear wheel sensor lead
3. O_2 sensor #1 lead
4. O_2 sensor #2 lead
5. Crankshaft position sensor lead
6. Rear brake light switch lead
7. Footrest plate

A. Route the crankshaft position sensor lead to the front of the O_2 sensor #1 lead, and then fasten the leads with the holder.
B. Make sure that there is no slack in the crankshaft position sensor lead.
C. Route the rear brake light switch lead to the inside of the frame.
D. Route the rear brake light switch lead to the outside of the frame.
E. Face the buckle of the plastic locking tie outward with the end pointing downward and positioned between the frame and the footrest plate. Do not cut off the excess end of the plastic locking tie.
F. Route the leads in the order shown in the illustration.
G. Bend the holder so that the end of the holder is higher than the line shown in the illustration.

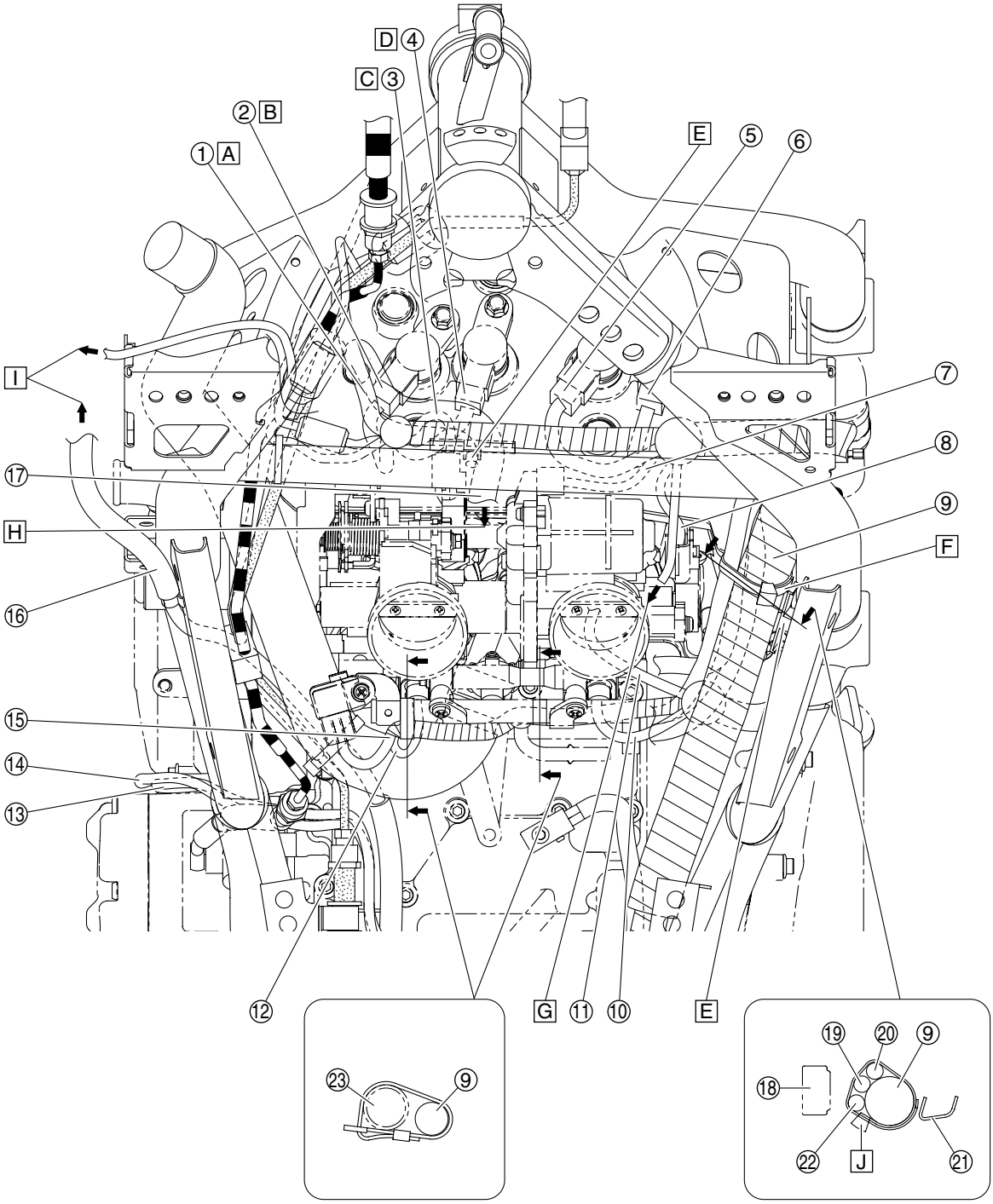
Rear brake hose (right side view)



1. Brake fluid reservoir hose
2. Brake hose (rear brake master cylinder to hydraulic unit)
3. Rear brake light switch lead
4. Brake hose (hydraulic unit to rear brake caliper)
5. Rear wheel sensor lead

A. Install the brake fluid reservoir hose onto the hose fitting of the brake fluid reservoir, making sure that the hose contacts the reservoir.
B. Fasten the brake hose (rear brake master cylinder to hydraulic unit) with the holder. Position the holder 20–40 mm (0.79–1.57 in) from the end of the pipe section of the hose.
C. Make sure that there is no slack in the portion of the brake hose (rear brake master cylinder to hydraulic unit) that is routed to the outside of the frame.
D. Install the brake fluid reservoir hose with its white paint mark facing toward the swingarm.
E. Install the brake fluid reservoir hose onto the hose fitting of the rear brake master cylinder, making sure that the hose contacts the master cylinder.
F. To rear wheel sensor
G. Route the rear wheel sensor lead to the outside of the brake hose (hydraulic unit to rear brake caliper) at the location shown in the illustration.
H. Align the center of the holder with the fourth hole from the rear on the inner side of the brake torque rod.
I. Position the holder 85–95 mm (3.35–3.74 in) from the grommet on the rear wheel sensor lead.
J. Install the holder as shown in the illustration.
K. Fasten the grommets on the rear wheel sensor lead and the brake hose (hydraulic unit to rear brake caliper) with the holder.
L. Face the catch of the holder upward.
M. Fasten the rear wheel sensor lead with the holder.

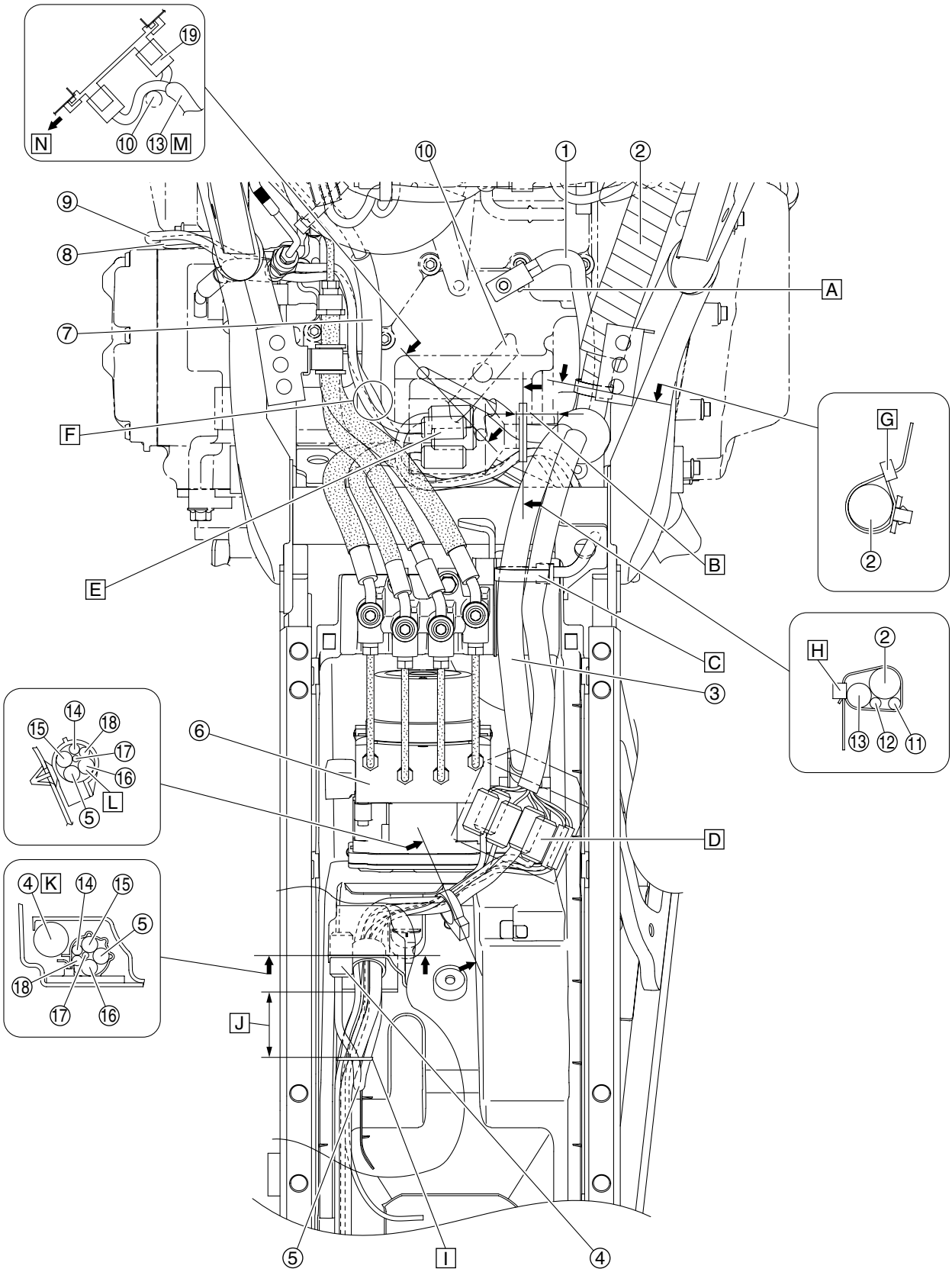
Throttle bodies (top view)



1. Immobilizer unit lead
2. Cylinder-#1 left ignition coil lead
3. Accelerator position sensor lead
4. Cylinder-#1 right ignition coil lead (white tape)
5. Cylinder-#2 left ignition coil lead
6. Cylinder-#2 right ignition coil lead (white tape)
7. Throttle servo motor lead (yellow tape)
8. Throttle position sensor lead
9. Wire harness
10. Injector #2 lead
11. Coolant temperature sensor lead
12. Injector #1 lead
13. Oil level switch lead
14. Sidestand switch lead
15. Intake air pressure sensor lead
16. Coolant reservoir hose
17. Cylinder head breather hose
18. Throttle position sensor
19. Starter motor lead
20. Negative battery lead
21. Frame
22. Stator coil lead
23. Fuel rail

A. Route the immobilizer unit lead over the cylinder head breather hose.
B. Route the cylinder-#1 left ignition coil lead under the cylinder head breather hose.
C. Route the accelerator position sensor lead under the cylinder head breather hose.
D. Route the cylinder-#1 right ignition coil lead under the cylinder head breather hose.
E. Insert the projection on the wire harness holder into the hole in the frame.
F. Position the plastic band to the front of the wire harness holder, making sure not to install the band around the holder.
G. To intake air temperature sensor
H. To air filter case
I. To radiator
J. Fasten the leads with the plastic band so that they do not contact the throttle position sensor. Face the buckle of the plastic band upward and place the end of the band between the frame and the wire harness. Do not cut off the excess end of the plastic band.

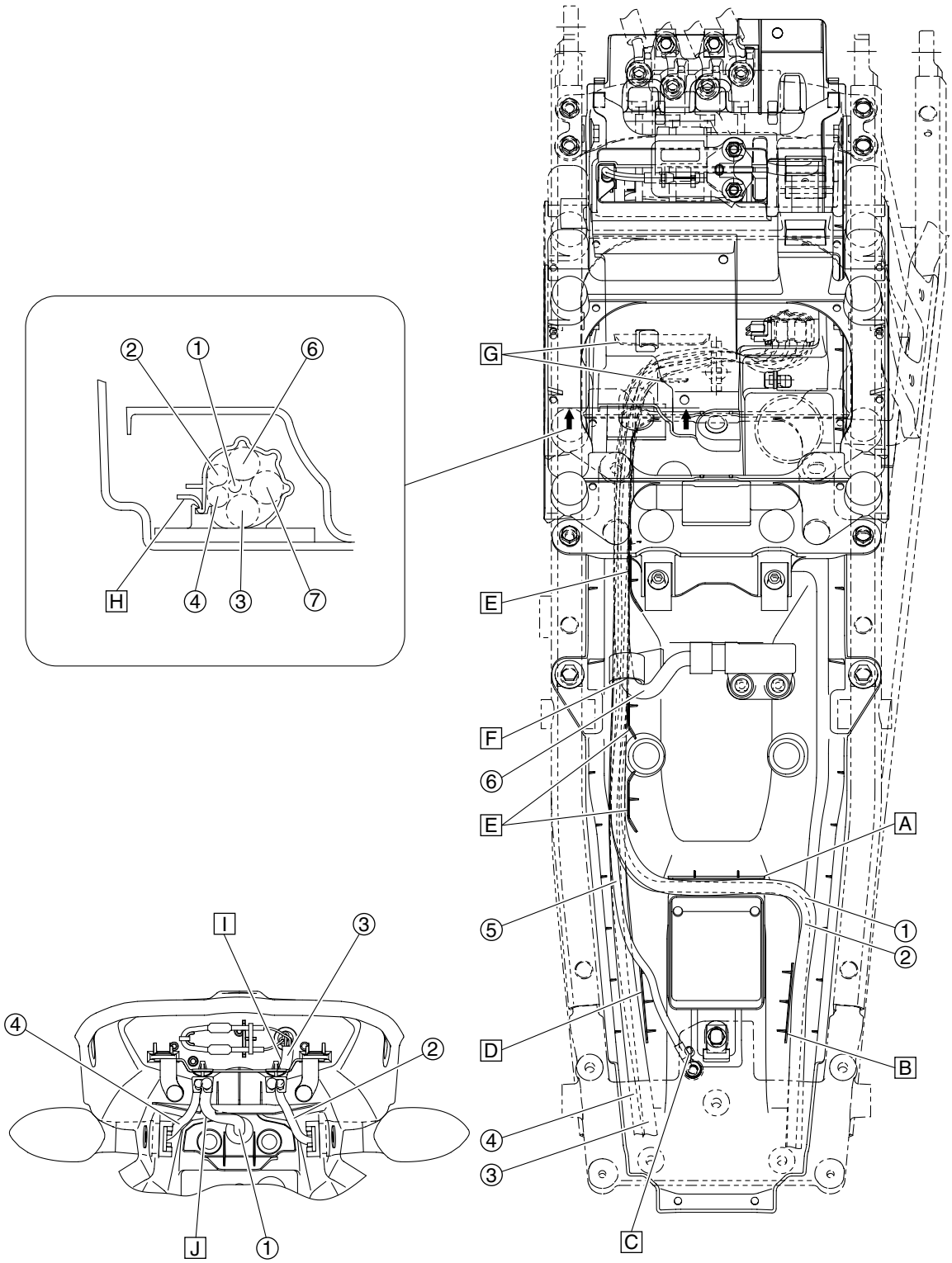
Hydraulic unit assembly (top view)



1. Engine ground lead
2. Wire harness
3. ABS ECU lead
4. ABS test coupler
5. ABS test coupler lead
6. Hydraulic unit assembly
7. Coolant reservoir hose
8. Oil level switch lead
9. Sidestand switch lead
10. Fuel hose
11. Rear brake light switch lead
12. Neutral switch lead
13. Fuel pump lead
14. Rear right turn signal light lead
15. Lean angle sensor sub-wire harness/frame ground lead
16. Tail/brake light lead
17. License plate light lead
18. Rear left turn signal light lead
19. Fuel pump coupler

A. Make sure that the engine ground lead terminal contacts the stopper on the crankcase.
B. Position the plastic band between the rubber cover and the split in the wire harness.
C. Insert the projection on the plastic band into the hole in the rear fender, and then fasten the ABS ECU lead and wire harness with the band. Route the wire harness to the outside of the ABS ECU lead. Point the end of the plastic band to the right and insert it into the hole in the frame. Do not cut off the excess end of the plastic band.
D. Slide the rubber cover over the rear turn signal light connectors, license plate light coupler, tail/brake light coupler, lean angle sensor sub-wire harness coupler, and alarm couplers, making sure that the connectors and couplers are covered completely.
E. Slide the rubber cover over the sidestand switch coupler, rear brake light switch coupler, neutral switch coupler, rear wheel sensor coupler, and oil level switch coupler, making sure that the couplers are covered completely.
F. Route the sidestand switch lead and oil level switch lead over the coolant reservoir hose.
G. Connect the ABS ECU coupler, and then fasten the wire harness at the white tape with the plastic band. Point the end of the plastic band downward. Do not cut off the excess end of the plastic band.
H. Point the end of the plastic band rearward. Do not cut off the excess end of the plastic band.
I. Fold the ABS test coupler lead, and then fasten the ABS test coupler lead, lean angle sensor sub-wire harness, rear right turn signal light lead, rear left turn signal light lead, tail/brake light lead, and license plate light lead with the plastic locking tie.
J. Position the plastic locking tie 40–60 mm (1.57–2.36 in) from the edge of the holder.
K. Fit the ABS test coupler in between the ABS unit cover and the holder.
L. Face the catch of the holder forward or rearward.
M. Route the fuel pump lead above and to the rear of the fuel hose.
N. Forward

Rear fender (top view)



1. License plate light lead
2. Rear right turn signal light lead
3. Tail/brake light lead
4. Rear left turn signal light lead
5. Frame ground lead
6. Lean angle sensor sub-wire harness
7. ABS test coupler lead

A. Route the license plate light lead and rear right turn signal light lead between the rib and the carrier support on the rear fender.
B. Route the license plate light lead and rear right turn signal light lead to the outside of the rib on the rear fender.
C. Make sure that the frame ground lead terminal contacts the stopper on the frame.
D. Route the tail/brake light lead and rear left turn signal light lead to the outside of the rib on the rear fender.
E. Route the tail/brake light lead, rear left turn signal light lead, rear right turn signal light lead, and frame ground lead to the outside of the rib on the rear fender.
F. Fasten the lean angle sensor sub-wire harness, license plate light lead, tail/brake light lead, frame ground lead, rear left turn signal light lead, and rear right turn signal light lead with the holder.
G. Route all of the leads between the ribs on the rear fender.
H. Face the catch of the holder to the left.
I. Route the tail/brake light lead to the front of the tail/brake light assembly bracket.
J. Route the license plate light lead through the cutout in the tail/brake light assembly.

PERIODIC CHECKS AND ADJUSTMENTS

PERIODIC MAINTENANCE 3-1
INTRODUCTION 3-1
PERIODIC MAINTENANCE CHART FOR THE EMISSION CONTROL SYSTEM 3-1
GENERAL MAINTENANCE AND LUBRICATION CHART 3-1
CHECKING THE FUEL LINE 3-4
CHECKING THE SPARK PLUGS 3-4
ADJUSTING THE VALVE CLEARANCE 3-5
SYNCHRONIZING THE THROTTLE BODIES 3-8
CHECKING THE EXHAUST SYSTEM 3-10
ADJUSTING THE EXHAUST GAS VOLUME 3-10
CHECKING THE CYLINDER HEAD BREATHER HOSE 3-11
REPLACING THE AIR FILTER ELEMENT 3-11
ADJUSTING THE CLUTCH LEVER 3-12
CHECKING THE CLUTCH FLUID LEVEL 3-13
BLEEDING THE HYDRAULIC CLUTCH SYSTEM 3-13
ADJUSTING THE FRONT DISC BRAKE 3-14
CHECKING THE BRAKE FLUID LEVEL 3-14
BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS) 3-15
CHECKING THE FRONT BRAKE PADS 3-16
CHECKING THE REAR BRAKE PADS 3-16
CHECKING THE BRAKE HOSES 3-17
CHECKING THE WHEELS 3-17
CHECKING AND TIGHTENING THE SPOKES 3-17
CHECKING THE TIRES 3-18
CHECKING THE WHEEL BEARINGS 3-19
CHECKING THE SWINGARM PIVOT 3-19
LUBRICATING THE SWINGARM PIVOT 3-19
CHECKING AND ADJUSTING THE STEERING HEAD 3-20
LUBRICATING THE STEERING HEAD 3-21
CHECKING THE FASTENERS 3-21
LUBRICATING THE LEVERS 3-21
LUBRICATING THE PEDALS 3-21
CHECKING THE SIDESTAND 3-21
CHECKING THE CENTERSTAND 3-21
LUBRICATING THE SIDESTAND 3-21
LUBRICATING THE CENTERSTAND 3-21
CHECKING THE SIDESTAND SWITCH 3-21
CHECKING THE FRONT FORK 3-21
ADJUSTING THE FRONT FORK LEGS 3-21
CHECKING THE REAR SUSPENSION 3-23
ADJUSTING THE REAR SHOCK ABSORBER ASSEMBLY 3-23
CHECKING THE ENGINE OIL LEVEL 3-24
CHANGING THE ENGINE OIL 3-25
MEASURING THE ENGINE OIL PRESSURE 3-26
CHECKING THE COOLANT LEVEL 3-27
CHECKING THE COOLING SYSTEM 3-27
CHANGING THE COOLANT 3-28
CHECKING THE FINAL GEAR OIL LEVEL 3-29
CHANGING THE FINAL GEAR OIL 3-30

CHECKING THE BRAKE LIGHT SWITCHES 3-30
ADJUSTING THE REAR BRAKE LIGHT SWITCH 3-30
CHECKING AND LUBRICATING THE CABLES 3-31
CHECKING THE THROTTLE GRIP OPERATION 3-31
CHECKING THE SWITCHES, LIGHTS AND SIGNALS 3-32
ADJUSTING THE HEADLIGHT BEAMS 3-32
REPLACING THE HEADLIGHT BULBS 3-32
REPLACING THE AUXILIARY LIGHT BULBS 3-33

EAS20450
PERIODIC MAINTENANCE

EAS20460
INTRODUCTION
This chapter includes all information necessary to perform recommended checks and adjustments. If followed, these preventive maintenance procedures will ensure more reliable vehicle operation, a longer service life and reduce the need for costly overhaul work. This information applies to vehicles already in service as well as to new vehicles that are being prepared for sale. All service technicians should be familiar with this entire chapter.

EAU46910
PERIODIC MAINTENANCE CHART FOR THE EMISSION CONTROL SYSTEM
TIP
- **The annual checks must be performed every year, except if a kilometer-based maintenance, or for the UK, a mileage-based maintenance, is performed instead.**
- From 50000 km (30000 mi), repeat the maintenance intervals starting from 10000 km (6000 mi).
- Items marked with an asterisk should be performed by a Yamaha dealer as they require special tools, data and technical skills.

NO.		ITEM	CHECK OR MAINTENANCE JOB	ODOMETER READING					ANNUAL CHECK
				1000 km (600 mi)	10000 km (6000 mi)	20000 km (12000 mi)	30000 km (18000 mi)	40000 km (24000 mi)	
1	*	**Fuel line**	• Check fuel hoses for cracks or damage.		√	√	√	√	√
2	*	**Spark plugs**	• Check condition. • Clean and regap.		√		√		
			• Replace.			√		√	
3	*	**Valves**	• Check valve clearance. • Adjust.	Every 40000 km (24000 mi)					
4	*	**Fuel injection system**	• Adjust synchronization.		√	√	√	√	√
5	*	**Muffler and exhaust pipe**	• Check the screw clamp(s) for looseness.	√	√	√	√	√	

EAU1770C
GENERAL MAINTENANCE AND LUBRICATION CHART
TIP
- **The annual checks must be performed every year, except if a kilometer-based maintenance, or for the UK, a mileage-based maintenance, is performed instead.**
- From 50000 km (30000 mi), repeat the maintenance intervals starting from 10000 km (6000 mi).
- Items marked with an asterisk should be performed by a Yamaha dealer as they require special tools, data and technical skills.

NO.		ITEM	CHECK OR MAINTENANCE JOB	ODOMETER READING					ANNUAL CHECK
				1000 km (600 mi)	10000 km (6000 mi)	20000 km (12000 mi)	30000 km (18000 mi)	40000 km (24000 mi)	
1	*	**Air filter element**	• Replace.					√	
2	*	**Clutch**	• Check operation, fluid level and vehicle for fluid leakage.	√	√	√	√	√	
3	*	**Front brake**	• Check operation, fluid level and vehicle for fluid leakage.	√	√	√	√	√	√
			• Replace brake pads.	Whenever worn to the limit					
4	*	**Rear brake**	• Check operation, fluid level and vehicle for fluid leakage.	√	√	√	√	√	√
			• Replace brake pads.	Whenever worn to the limit					
5	*	**Brake hoses**	• Check for cracks or damage.		√	√	√	√	√
			• Replace.	Every 4 years					
6	*	**Wheels**	• Check runout, spoke tightness and for damage. • Tighten spokes if necessary.	At the initial 1000 km (600 mi) and every 5000 km (3000 mi) thereafter.					

NO.		ITEM	CHECK OR MAINTENANCE JOB	ODOMETER READING					ANNUAL CHECK
				1000 km (600 mi)	10000 km (6000 mi)	20000 km (12000 mi)	30000 km (18000 mi)	40000 km (24000 mi)	
7	*	**Tires**	• Check tread depth and for damage. • Replace if necessary. • Check air pressure. • Correct if necessary.		√	√	√	√	√
8	*	**Wheel bearings**	• Check bearing for looseness or damage.		√	√	√	√	
9	*	**Swingarm**	• Check operation and for excessive play.		√	√	√	√	
			• Lubricate with lithium-soap-based grease.	Every 50000 km (30000 mi)					
10	*	**Steering bearings**	• Check bearing play and steering for roughness.	√	√	√	√	√	
			• Lubricate with lithium-soap-based grease.	Every 50000 km (30000 mi)					
11	*	**Chassis fasteners**	• Make sure that all nuts, bolts and screws are properly tightened.		√	√	√	√	√
12		**Brake lever pivot shaft**	• Lubricate with silicone grease.		√	√	√	√	√
13		**Brake pedal pivot shaft**	• Lubricate with lithium-soap-based grease.		√	√	√	√	√
14		**Clutch lever pivot shaft**	• Lubricate with silicone grease.		√	√	√	√	√
15		**Shift pedal pivot shaft**	• Lubricate with lithium-soap-based grease.		√	√	√	√	√
16		**Sidestand, centerstand**	• Check operation. • Lubricate with lithium-soap-based grease.		√	√	√	√	√
17	*	**Sidestand switch**	• Check operation.	√	√	√	√	√	√
18	*	**Front fork**	• Check operation and for oil leakage.		√	√	√	√	
19	*	**Shock absorber assembly**	• Check operation and shock absorber for oil leakage.		√	√	√	√	
20	*	**Rear suspension relay arm and connecting arm pivoting points**	• Check operation.		√	√	√	√	
21		**Engine oil**	• Change. • Check oil level and vehicle for oil leakage.	√	√	√	√	√	√
22		**Engine oil filter cartridge**	• Replace.	√		√		√	
23	*	**Cooling system**	• Check coolant level and vehicle for coolant leakage.		√	√	√	√	√
			• Change.	Every 3 years					
24		**Final gear oil**	• Check oil level and vehicle for oil leakage.	√	√		√		
			• Change.	√		√		√	
25	*	**Front and rear brake switches**	• Check operation.	√	√	√	√	√	√
26		**Moving parts and cables**	• Lubricate.		√	√	√	√	√
27	*	**Throttle grip housing and cable**	• Check operation and free play. • Adjust the throttle cable free play if necessary. • Lubricate the throttle grip housing and cable.		√	√	√	√	√
28	*	**Lights, signals and switches**	• Check operation. • Adjust headlight beam.	√	√	√	√	√	√

EAU36771

TIP

- Air filter
  - This model's air filter is equipped with a disposable oil-coated paper element, which must not be cleaned with compressed air to avoid damaging it.

  - The air filter element needs to be replaced more frequently when riding in unusually wet or dusty areas.
- Hydraulic brake and clutch service
  - Regularly check and, if necessary, correct the brake fluid and clutch fluid levels.
  - Every two years replace the internal components of the brake master cylinders and calipers as well as clutch master and release cylinders, and change the brake and clutch fluids.
  - Replace the brake and clutch hoses every four years and if cracked or damaged.

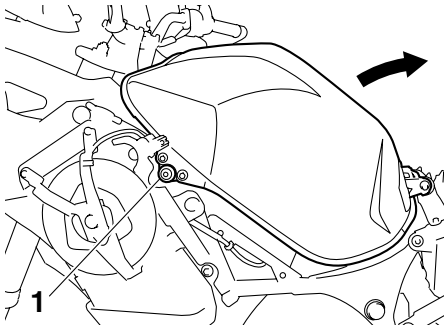
EAS21030
CHECKING THE FUEL LINE
1. Remove:
   • Rider seat
   • Left side cowling
   • Right side panel
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Remove:
   • Fuel tank bolts "1"

TIP

After removing the fuel tank bolts, lift up the front of the fuel tank.

ECA23P1003
NOTICE

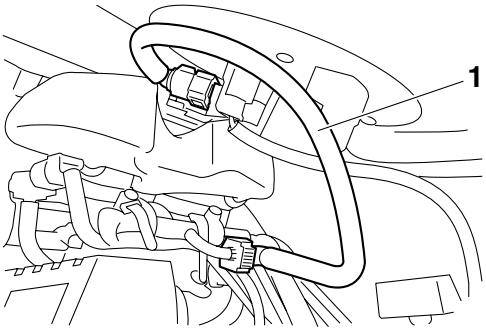
When lifting up the fuel tank, be careful not to pull the fuel tank overflow hose and fuel tank breather hose.

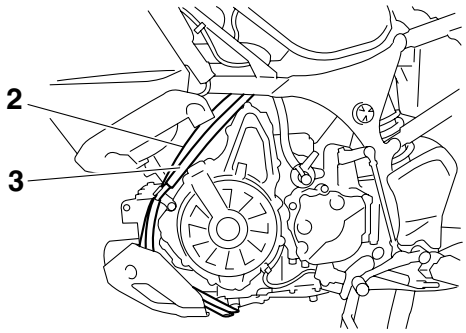


3. Check:
   • Fuel hose "1"
   • Fuel tank breather hose "2"
   • Fuel tank overflow hose "3"
   Cracks/damage → Replace.
   Loose connection → Connect properly.

ECA23P1078
NOTICE

Make sure the fuel tank breather/overflow hose is routed correctly.





4. Install:
   • Fuel tank bolts

	Fuel tank bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

5. Install:
   • Right side panel
   • Left side cowling
   • Rider seat
   Refer to "GENERAL CHASSIS" on page 4-1.

EAS20680
CHECKING THE SPARK PLUGS
The following procedure applies to all of the spark plugs.
1. Remove:
   • Air filter case
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Remove:
   • Ignition coil
3. Remove:
   • Spark plug

ECA13320
NOTICE

Before removing the spark plugs, blow away any dirt accumulated in the spark plug wells with compressed air to prevent it from falling into the cylinders.

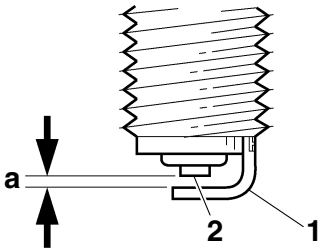
4. Check:
   • Spark plug type
   Incorrect → Change.

	Manufacturer/model **NGK/CPR8EB9**

5. Check:
   • Electrode "1"
   Damage/wear → Replace the spark plug.
   • Insulator "2"
   Abnormal color → Replace the spark plug.
   Normal color is medium-to-light tan.

6. Clean:
   • Spark plug
   (with a spark plug cleaner or wire brush)
7. Measure:
   • Spark plug gap "a"
   (with a wire thickness gauge)
   Out of specification → Regap.

Spark plug gap
0.8–0.9 mm (0.031–0.035 in)



8. Install:
   • Spark plug

Spark plug
13 Nm (1.3 m·kgf, 9.4 ft·lbf)

TIP

Before installing the spark plug, clean the spark plug and gasket surface.

9. Install:
   • Ignition coil

Ignition coil bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)
LOCTITE®

10. Install:
    • Air filter case
    Refer to "GENERAL CHASSIS" on page 4-1.

EAS20490
ADJUSTING THE VALVE CLEARANCE

The following procedure applies to all of the valves.

TIP

- 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.

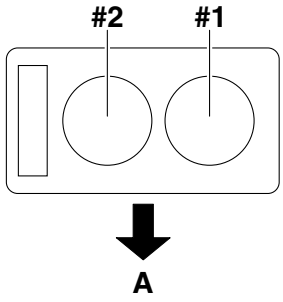
1. Remove:
   • Air filter case
   Refer to "GENERAL CHASSIS" on page 4-1.
   • Throttle bodies
   Refer to "THROTTLE BODIES" on page 7-5.
   • Clutch cover
   Refer to "CLUTCH" on page 5-52.
   • Cylinder head cover
   Refer to "CAMSHAFTS" on page 5-11.
2. Measure:
   • Valve clearance
   Out of specification → Adjust.

Valve clearance (cold)
Intake
0.10–0.16 mm (0.0039–0.0063 in)
Exhaust
0.22–0.28 mm (0.0087–0.0110 in)

TIP

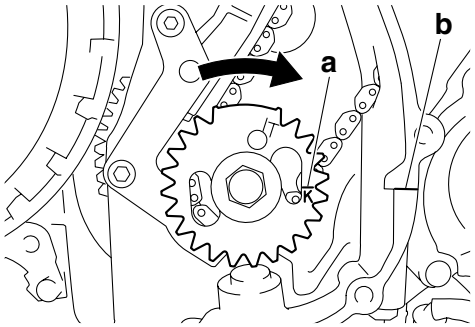
- If the valve clearance is incorrect, record the measured reading.
- Measure the valve clearance in the following sequence.

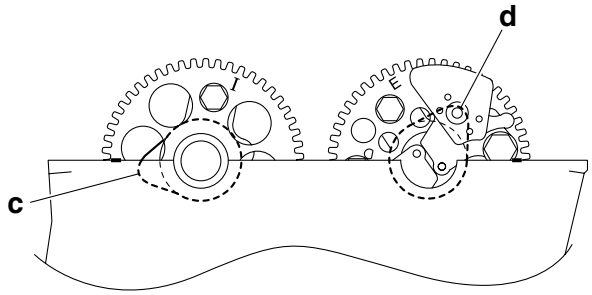
Valve clearance measuring sequence
Cylinder #1 → #2



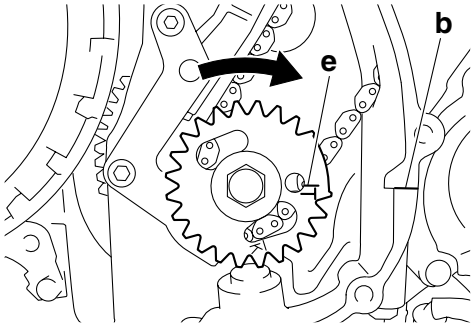
A. Front

a. Turn the crankshaft clockwise and align the pickup rotor K mark "a" and crankcase mating surface "b".
   (At this time, check that the intake cam lobes "c" and exhaust cam lobes "d" for cylinder #1 are positioned as shown in the illustration. If the cam lobes are not positioned as shown, turn the crankshaft clockwise 360 degrees and recheck the positions of the cam lobes.)



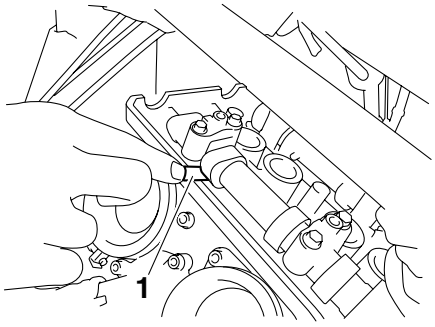


b. Turn the crankshaft 71 degrees in clockwise and align the pickup rotor T mark "e" and crankcase mating surface "b".

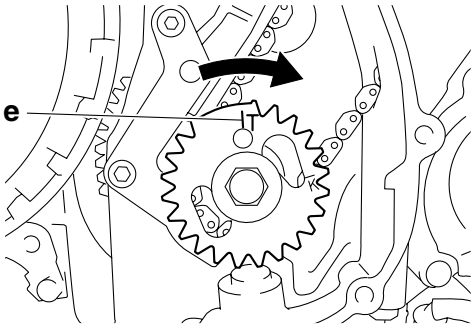


c. Measure the valve clearance #1 with a thickness gauge "1".

Thickness gauge
90890-03180
Feeler gauge set
YU-26900-9



d. Turn the crankshaft clockwise 270 degrees so that the pickup rotor T mark "e" is pointing up as shown in the illustration.



e. Measure the valve clearance #2 with a thickness gauge.

Thickness gauge
90890-03180
Feeler gauge set
YU-26900-9

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Remove:
   • Camshafts

TIP

- Refer to "CAMSHAFTS" on page 5-11.
- When removing the timing chain and camshafts, fasten the timing chain with a wire to retrieve it if it falls into the crankcase.

4. Adjust:
   • Valve clearance

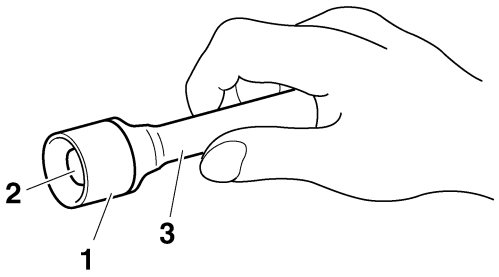
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

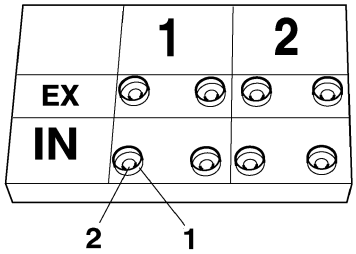
a. Remove the valve lifter "1" and the valve pad "2" with a valve lapper "3".

Valve lapper
90890-04101
Valve lapping tool
YM-A8998

TIP

- Cover the timing chain opening and spark plug holes with a rag to prevent the valve pad from falling into the crankcase.
- Make a note of the position of each valve lifter "1" and valve pad "2" so that they can be installed in the correct place.



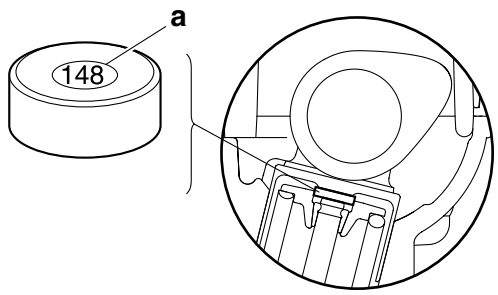


b. Calculate the difference between the specified valve clearance and the measured valve clearance.
   Example:
   Specified valve clearance = 0.10–0.16 mm (0.0039–0.0063 in)
   Measured valve clearance = 0.20 mm (0.0079 in)
   0.20 mm (0.0079 in) - 0.16 mm (0.0063 in) = 0.04 mm (0.002 in)
c. Check the thickness of the current valve pad.

TIP

The thickness "a" of each valve pad is marked in hundredths of millimeters on the side that touches the valve lifter.

Example:
If the valve pad is marked "148", the pad thickness is 1.48 mm (0.058 in).



d. Calculate the sum of the values obtained in steps (b) and (c) to determine the required valve pad thickness and the valve pad number.
   Example:
   1.48 mm (0.058 in) + 0.04 mm (0.002 in) = 1.52 mm (0.060 in)
   The valve pad number is 152.
e. Round off the valve pad number according to the following table, and then select the suitable valve pad.

Last digit	Rounded value
0, 1, 2	0
3, 4, 5, 6	5
7, 8, 9	10

TIP

Refer to the following table for the available valve pads.

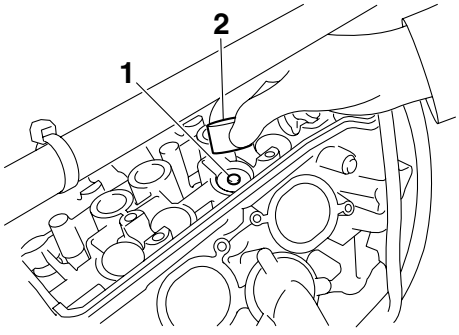
Valve pad range	No. 120–240
Valve pad thickness	1.20–2.40 mm (0.0472–0.0945 in)
Available valve pads	25 thicknesses in 0.05 mm (0.002 in) increments

Example:
Valve pad number = 152
Rounded value = 150
New valve pad number = 150

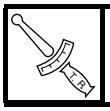
f. Install the new valve pad "1" and the valve lifter "2".

TIP

- Lubricate the valve pad with molybdenum disulfide oil.
- Lubricate the valve lifter with engine oil.
- The valve lifter must turn smoothly when rotated by hand.
- Install the valve lifter and the valve pad in the correct place.



g. Install the exhaust and intake camshafts, timing chain and camshaft caps.

	**Camshaft cap bolt** **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

TIP

- Refer to “CAMSHAFTS” on page 5-11.
- Lubricate the camshaft lobes and camshaft journals with molybdenum disulfide oil.
- First, install the exhaust camshaft.
- Align the camshaft marks with the cylinder head mating surface.
- Turn the crankshaft clockwise several full turns to seat the parts.

h. Measure the valve clearance again.
i. If the valve clearance is still out of specification, repeat all of the valve clearance adjustment steps until the specified clearance is obtained.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

5. Install:
   - All removed parts

TIP

For installation, reverse the removal procedure.

EAS20571
SYNCHRONIZING THE THROTTLE BODIES

TIP

Before synchronizing the throttle bodies, check the following items:

- Valve clearance
- Spark plugs
- Air filter element
- Throttle body joints
- Fuel hose
- Exhaust system
- Cylinder head breather hose

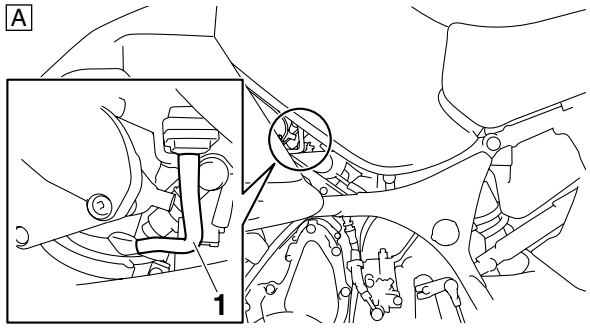
Checking the throttle body synchronization

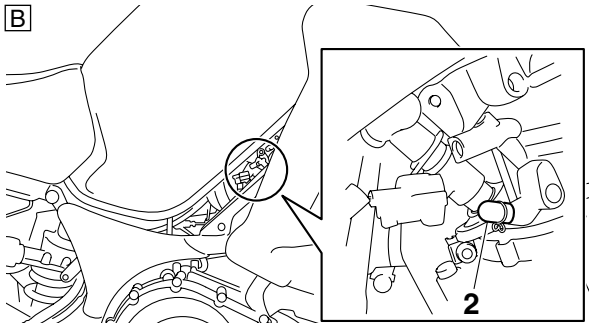
1. Stand the vehicle on a level surface.

TIP

Place the vehicle on the centerstand.

2. Disconnect:
   - Intake air pressure sensor hose “1”
3. Remove:
   - Cap “2”

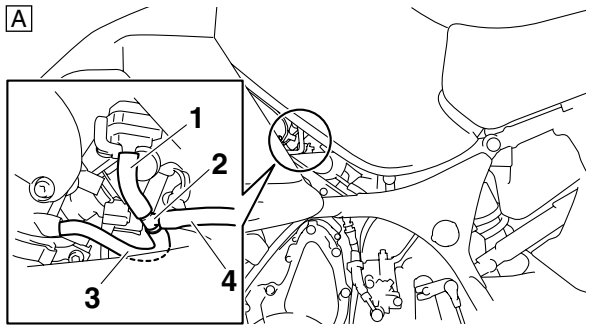


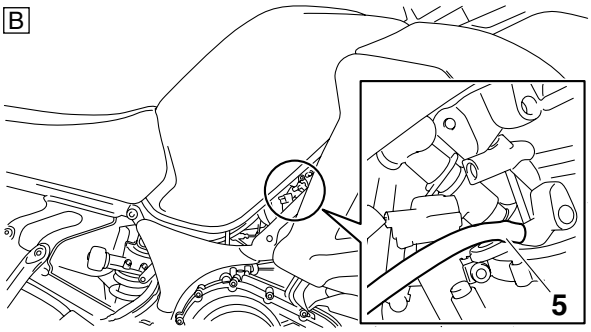


A. Left side
B. Right side

4. Install:
   - Vacuum hose “1” (Parts No.: 5FL-14348-10)
   - 3-way joint “2” (Parts No.: 68V-24376-00)
   - Intake air pressure sensor hose “3”
   - Vacuum gauge hose for #1 “4”
   - Vacuum gauge hose for #2 “5”
   - Vacuum gauge
   - Digital tachometer

	Vacuum gauge **90890-03094** **Vacuummate** **YU-44456**





A. Left side
B. Right side

5. Check:
• Throttle body synchronization

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Start the engine, warm it up for several minutes, and then let it run at the specified engine idling speed.

Engine idling speed
1050–1150 r/min

b. Check the vacuum pressure.

The difference in vacuum pressure between the throttle bodies should not exceed 1.33 kPa (10 mmHg).

If out of specification → Adjust the throttle body synchronization.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Adjusting the throttle body synchronization

1. Adjust:
• Throttle body synchronization

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Start the engine, warm it up for several minutes, and then let it run at the specified engine idling speed.

Engine idling speed
1050–1150 r/min

b. Using the throttle body that has the bypass air screw “1” with a white paint mark as the standard, adjust the other throttle body by turning its bypass air screw in or out.

ECA23P1079

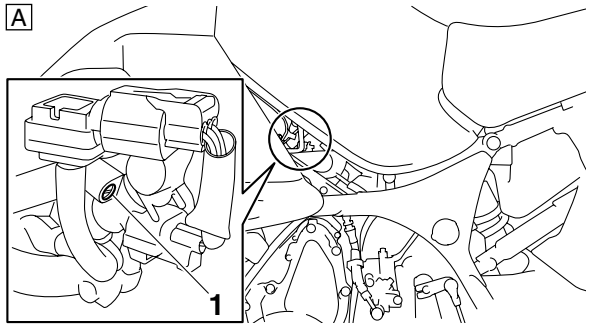
NOTICE

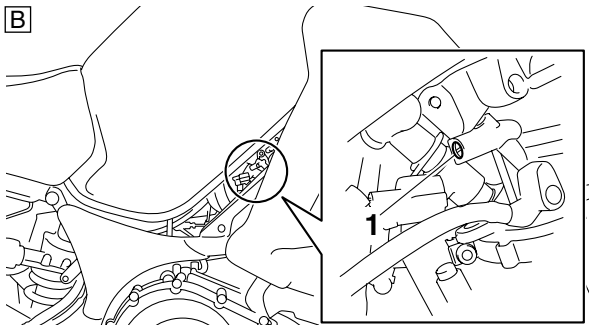
Do not turn the bypass air screw of the throttle body that is the standard.
Otherwise, the engine may run roughly at idle and the throttle bodies may not operate properly.

TIP

- Turn the cylinder #1 air screw or cylinder #2 air screw using the carburetor angle driver.
- After each step, rev the engine two or three times, each time for less than a second, and check the synchronization again.
- If a bypass air screw was removed, turn the screw in fully and be sure to synchronize the throttle bodies.
- If the throttle body synchronization can not be adjusted using the bypass air screw, clean or replace the throttle bodies.
- The difference in vacuum pressure between the throttle bodies should not exceed 1.33 kPa (10 mmHg).

Carburetor angle driver 2
90890-03173





A. Left side
B. Right side

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

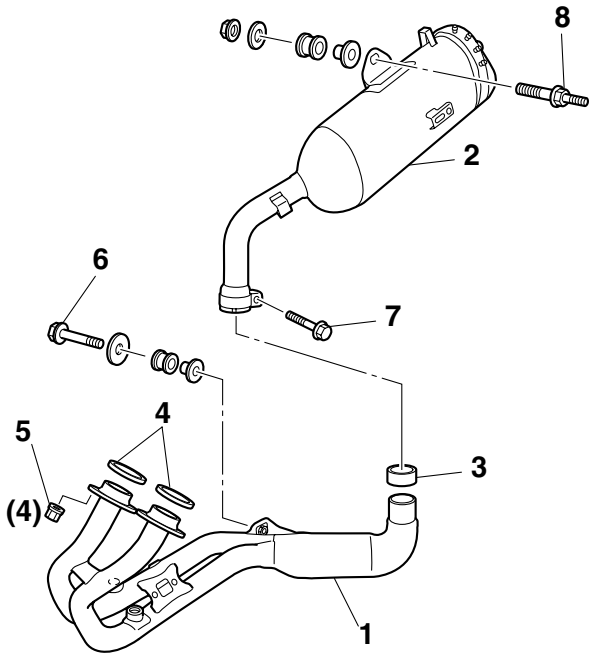
2. Stop the engine and remove the measuring equipment.
3. Install:
   • Cap
   • Intake air pressure sensor hose
4. Adjust:
   • Throttle cable free play
   Refer to "CHECKING THE THROTTLE GRIP OPERATION" on page 3-31.

Throttle cable free play
3.0–5.0 mm (0.12–0.20 in)

EAS21081
CHECKING THE EXHAUST SYSTEM

1. Check:
   • Exhaust pipe "1"
   • Muffler "2"
   Cracks/damage → Replace.
   • Gasket "3", "4"
   Exhaust gas leaks → Replace.
2. Check:
   Tightening torque
   • Exhaust pipe nuts "5"
   • Exhaust pipe bolt "6"
   • Exhaust pipe joint bolt "7"
   • Muffler bolt "8"

Exhaust pipe nut
20 Nm (2.0 m·kgf, 14 ft·lbf)
Exhaust pipe bolt
20 Nm (2.0 m·kgf, 14 ft·lbf)
Exhaust pipe joint bolt
20 Nm (2.0 m·kgf, 14 ft·lbf)
Muffler bolt
47 Nm (4.7 m·kgf, 34 ft·lbf)

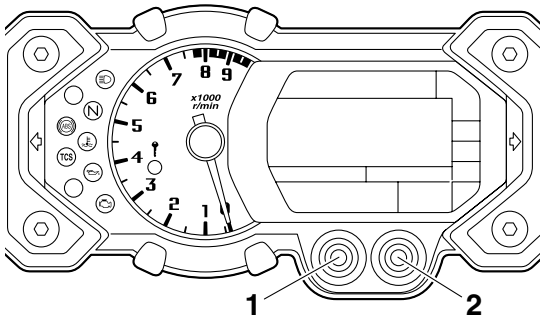


EAS20600
ADJUSTING THE EXHAUST GAS VOLUME

TIP

Be sure to set the CO density level to standard, and then adjust the exhaust gas volume.

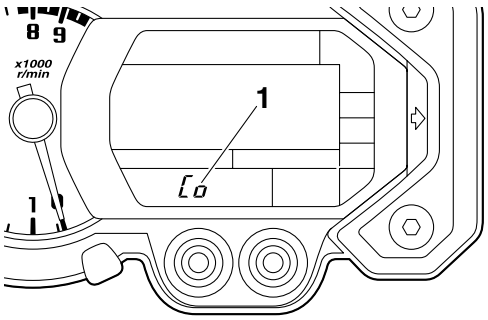
1. Turn the main switch to "OFF".
2. Simultaneously press and hold the left set button "1" and right set button "2", turn the main switch to "ON", and continue to press the buttons for 8 seconds or more.



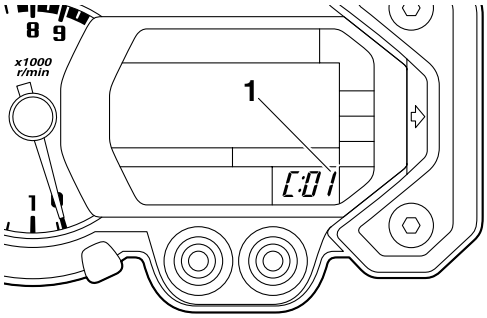
TIP

• All displays on the meter disappear except the odometer displays.
• "dIAG" appears on the odometer LCD.

3. Press the left set button to select the CO adjustment mode “Co” “1” or the diagnostic mode “dIAG”.



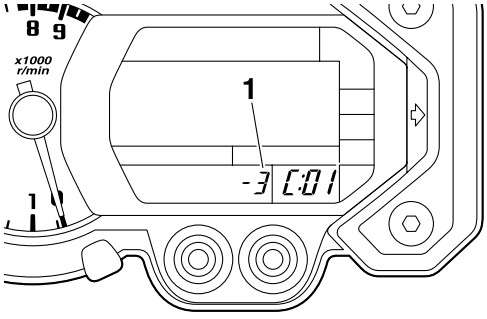
4. After selecting “Co”, simultaneously press the left set button and right set button for 2 seconds or more to execute the selection.
5. Press the left set button or right set button to select a cylinder number “1”.



TIP

The selected cylinder number appears on the clock LCD.
- To decrease the selected cylinder number, press the right set button.
- To increase the selected cylinder number, press the left set button.

6. After selecting the cylinder, simultaneously press the left set button and right set button for 2 seconds or more to execute the selection.
7. Change the CO adjustment volume “1” by pressing the left set button or right set button.



TIP

The CO adjustment volume appears on the odometer LCD.
- To decrease the CO adjustment volume, press the right set button.
- To increase the CO adjustment volume, press the left set button.

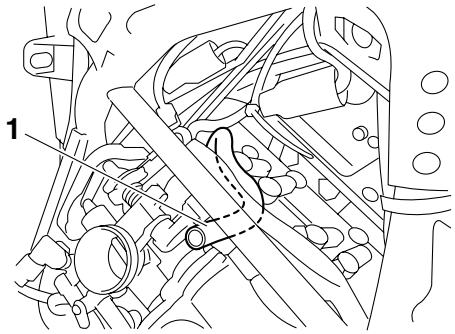
8. Simultaneously press the left set button and right set button to return to the cylinder selection (step 5).
9. Turn the main switch to “OFF” to cancel the mode.

EAS21050
CHECKING THE CYLINDER HEAD BREATHER HOSE

1. Remove:
   - Air filter case
     Refer to “GENERAL CHASSIS” on page 4-1.
2. Check:
   - Cylinder head breather hose “1”
     Cracks/damage → Replace.
     Loose connection → Connect properly.

ECA14920
NOTICE

Make sure the cylinder head breather hose is routed correctly.



3. Install:
   - Air filter case
     Refer to “GENERAL CHASSIS” on page 4-1.

EAS20961
REPLACING THE AIR FILTER ELEMENT

1. Remove:
   - Rider seat
   - Left side cowling
   - Right side panel
     Refer to “GENERAL CHASSIS” on page 4-1.
2. Remove:
   - Fuel tank bolts “1”

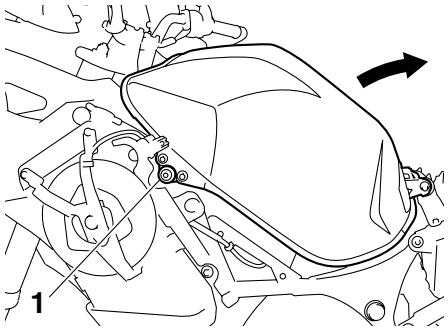
TIP

After removing the fuel tank bolts, lift up the front of the fuel tank.

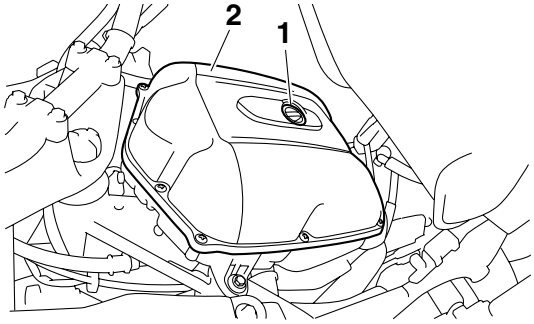
ECA23P1003

NOTICE

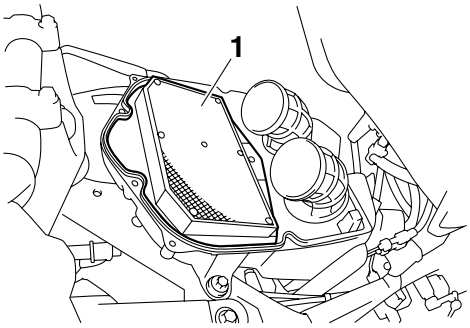
When lifting up the fuel tank, be careful not to pull the fuel tank overflow hose and fuel tank breather hose.



3. Remove:
   - Cap "1"
   - Air filter case cover "2"



4. Remove:
   - Air filter element "1"



5. Check:
   - Air filter element
     Damage → Replace.

TIP

- Replace the air filter element every 40000 km (24000 mi) of operation.
- The air filter needs more frequent service if you are riding in unusually wet or dusty areas.

6. Install:
   - Air filter case cover
   - Cap

	Air filter case cover screw **1.6 Nm (0.16 m·kgf, 1.2 ft·lbf)**

ECA23P1035

NOTICE

Never operate the engine without the air filter element installed. Unfiltered air will cause rapid wear of engine parts and may damage the engine. Operating the engine without the air filter element will also affect throttle body synchronization, leading to poor engine performance and possible overheating.

TIP

When installing the air filter element into the air filter case cover, make sure that the sealing surfaces are aligned to prevent any air leaks.

7. Install:
   - Fuel tank bolts

	Fuel tank bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

8. Install:
   - Right side panel
   - Left side cowling
   - Rider seat
     Refer to "GENERAL CHASSIS" on page 4-1.

EAS20860

ADJUSTING THE CLUTCH LEVER

1. Adjust:
   - Clutch lever position
     (distance "a" from the handlebar grip to the clutch lever)

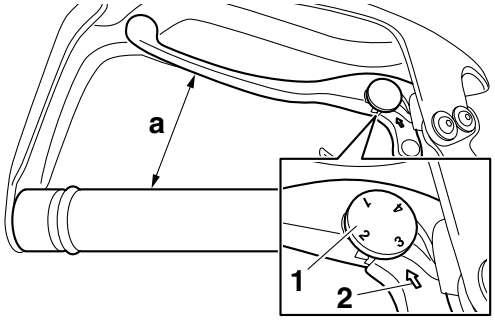
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. While pushing the clutch lever forward, turn the adjusting dial "1" until the clutch lever is in the desired position.

TIP

Be sure to align the setting on the adjusting dial with the arrow mark "2" on the clutch lever holder.

Position #1
Distance "a" is the largest.
Position #4
Distance "a" is the smallest.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS20890

CHECKING THE CLUTCH FLUID LEVEL

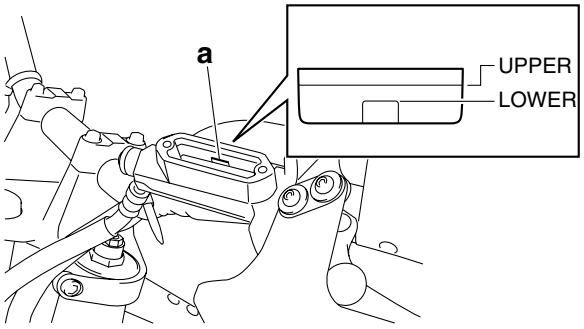
1. Stand the vehicle on a level surface.

TIP

Place the vehicle on the centerstand.

2. Remove:
   - Clutch master cylinder reservoir cap
   - Clutch master cylinder reservoir diaphragm holder
   - Clutch master cylinder reservoir diaphragm
   Refer to "CLUTCH" on page 5-52.
3. Check:
   - Clutch fluid level
   Below the minimum level mark "a" → Add the recommended clutch fluid to the proper level.

Recommended fluid
DOT 4



EWA23P1010

⚠ WARNING

- **Use only the designated clutch fluid. Other clutch fluids may cause the rubber seals to deteriorate, causing leakage and poor clutch performance.**
- **Refill with the same type of clutch fluid that is already in the system. Mixing clutch fluids may result in a harmful chemical reaction, leading to poor clutch performance.**
- **When refilling, be careful that water does not enter the clutch master cylinder reservoir. Water will significantly lower the boiling point of the clutch fluid and could cause vapor lock.**

ECA13420

NOTICE

Clutch fluid may damage painted surfaces or plastic parts. Therefore, always clean up any spilt clutch fluid immediately.

TIP

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

4. Install:
   - Clutch master cylinder reservoir diaphragm
   - Clutch master cylinder reservoir diaphragm holder
   - Clutch master cylinder reservoir cap
   Refer to "CLUTCH" on page 5-52.

EAS20900

BLEEDING THE HYDRAULIC CLUTCH SYSTEM

EWA13000

⚠ WARNING

Bleed the hydraulic clutch system whenever:
- **the system was disassembled,**
- **a clutch hose was loosened or removed,**
- **the clutch fluid level is very low,**
- **clutch operation is faulty.**

TIP

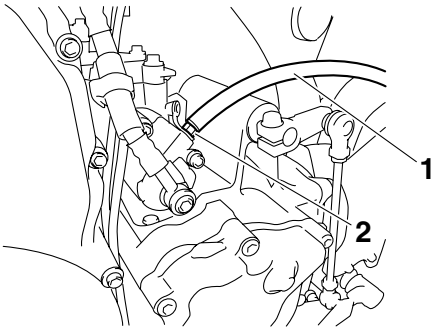
- Be careful not to spill any clutch fluid or allow the clutch master cylinder reservoir to overflow.
- When bleeding the hydraulic clutch system, make sure there is always enough clutch fluid before applying the clutch lever. Ignoring this precaution could allow air to enter the hydraulic clutch system, considerably lengthening the bleeding procedure.
- If bleeding is difficult, it may be necessary to let the clutch fluid settle for a few hours. Repeat the bleeding procedure when the tiny bubbles in the hose have disappeared.

1. Bleed:
   - Hydraulic clutch system

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Fill the clutch master cylinder reservoir to the proper level with the recommended clutch fluid.

b. Install the clutch master cylinder reservoir diaphragm.
c. Connect a clear plastic hose "1" tightly to the bleed screw "2".



d. Place the other end of the hose into a container.
e. Slowly squeeze the clutch lever several times.
f. Fully squeeze the clutch lever without releasing it.
g. Loosen the bleed screw. This will release the tension and cause the clutch lever to contact the handlebar grip.
h. Tighten the bleed screw and then release the clutch lever.
i. Repeat steps (e) to (h) until all of the air bubbles have disappeared from the clutch fluid in the plastic hose.
j. Tighten the bleed screw to specification.

Bleed screw
6 Nm (0.6 m·kgf, 4.3 ft·lbf)

k. Fill the clutch master cylinder reservoir to the proper level with the recommended clutch fluid.
Refer to "CHECKING THE CLUTCH FLUID LEVEL" on page 3-13.

EWA13010
WARNING

After bleeding the hydraulic clutch system, check the clutch operation.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21160
ADJUSTING THE FRONT DISC BRAKE

1. Adjust:
• Brake lever position
(distance "a" from the throttle grip to the brake lever)

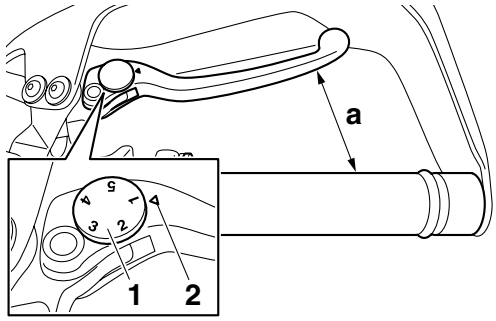
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. While pushing the brake lever forward, turn the adjusting dial "1" until the brake lever is in the desired position.

TIP

Be sure to align the setting on the adjusting dial with the arrow mark "2" on the brake lever.

Position #1
Distance "a" is the largest.
Position #5
Distance "a" is the smallest.



EWA13050
WARNING

A soft or spongy feeling in the brake lever can indicate the presence of air in the brake system. Before the vehicle is operated, the air must be removed by bleeding the brake system. Air in the brake system will considerably reduce braking performance.

ECA13490
NOTICE

After adjusting the brake lever position, make sure there is no brake drag.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21240
CHECKING THE BRAKE FLUID LEVEL

1. Stand the vehicle on a level surface.

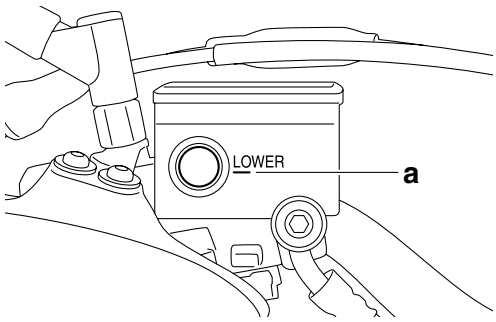
TIP

• Place the vehicle on the centerstand.
• Make sure the vehicle is upright.

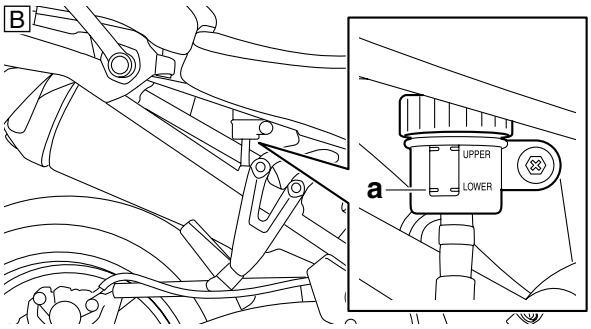
2. Check:
• Brake fluid level
Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.

Recommended fluid
DOT 4

A



B



A. Front brake
B. Rear brake

EWA23P1036

⚠ WARNING

- **Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.**
- **When refilling, be careful that water does not enter the brake master cylinder reservoir or brake fluid reservoir. Water will significantly lower the boiling point of the brake fluid and could cause vapor lock.**

ECA13540

NOTICE

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

TIP

In order to ensure a correct reading of the brake fluid level, make sure the tops of the brake master cylinder reservoir and brake fluid reservoir are horizontal.

EAS23P1020

BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)

EWA14000

⚠ WARNING

Always bleed the brake system when the brake related parts are removed.

ECA23P1037

NOTICE

- **Bleed the brake system in the following order.**
- **1st step: Right front brake caliper**
- **2nd step: Left front brake caliper**
- **3rd step: Rear brake caliper**

EWA23P1011

⚠ WARNING

Bleed the ABS whenever:
- **the system is disassembled.**
- **a brake hose is loosened, disconnected or replaced.**
- **the brake fluid level is very low.**
- **brake operation is faulty.**

TIP

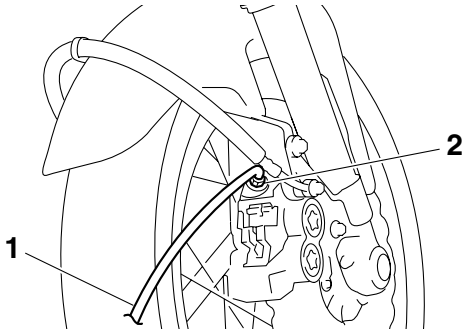
- Be careful not to spill any brake fluid or allow the brake master cylinder reservoir or brake fluid reservoir to overflow.
- When bleeding the ABS, make sure that there is always enough brake fluid before applying the brake. Ignoring this precaution could allow air to enter the ABS, considerably lengthening the bleeding procedure.
- If bleeding is difficult, it may be necessary to let the brake fluid settle for a few hours.
- Repeat the bleeding procedure when the tiny bubbles in the hose have disappeared.

1. Bleed:
   - ABS

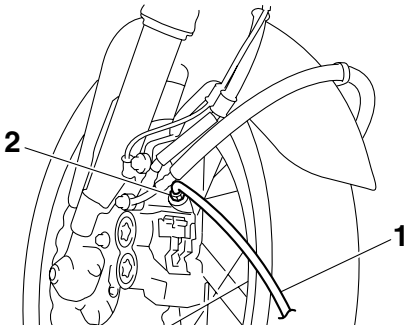
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Fill the brake master cylinder reservoir or brake fluid reservoir to the proper level with the recommended brake fluid.
b. Install the diaphragm (brake master cylinder reservoir or brake fluid reservoir).
c. Connect a clear plastic hose “1” tightly to the bleed screw “2”.

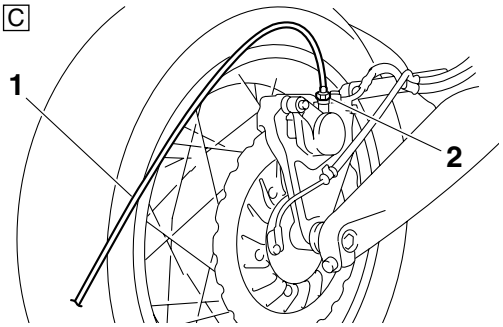
A



B



C



A. Right front brake caliper
B. Left front brake caliper
C. Rear brake caliper

d. Place the other end of the hose into a container.
e. Slowly apply the brake several times.
f. Fully squeeze the brake lever or fully depress the brake pedal and hold it in position.
g. Loosen the bleed screw.

TIP

Loosening the bleed screw will release the pressure and cause the brake lever to contact the throttle grip or the brake pedal to fully extend.

h. Tighten the bleed screw and then release the brake lever or brake pedal.
i. Repeat steps (e) to (h) until all of the air bubbles have disappeared from the brake fluid in the plastic hose.
j. Check the operation of the hydraulic unit.
   Refer to "HYDRAULIC UNIT OPERATION TESTS" on page 4-71.

ECA23P1038

NOTICE

Make sure that the main switch is turned to "OFF" before checking the operation of the hydraulic unit.

k. After operating the ABS, repeat steps (e) to (i), and then fill the brake master cylinder reservoir or brake fluid reservoir to the proper level with the recommended brake fluid.
l. Tighten the bleed screw to specification.

Front brake caliper bleed screw
5 Nm (0.5 m·kgf, 3.6 ft·lbf)
Rear brake caliper bleed screw
6 Nm (0.6 m·kgf, 4.3 ft·lbf)

m. Fill the brake fluid reservoir to the proper level with the recommended brake fluid.
   Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.

EWA13110

⚠ WARNING

After bleeding the hydraulic brake system, check the brake operation.

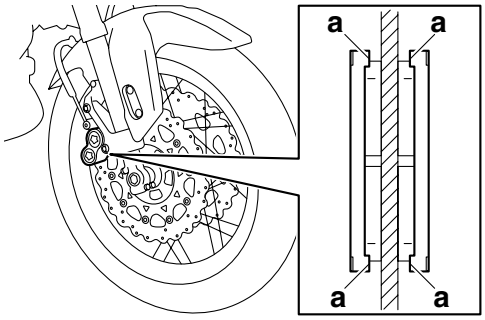
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

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 4-36.



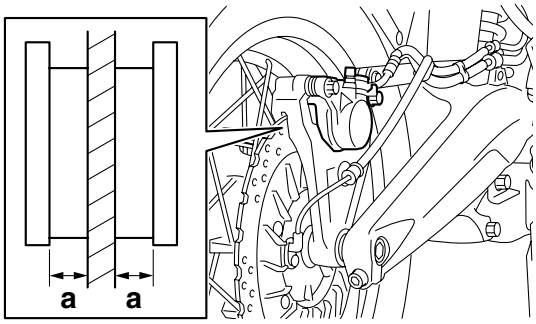
EAS21260

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 limit “a”
   Out of specification → Replace the brake pads as a set.
   Refer to “REAR BRAKE” on page 4-52.

Brake pad lining thickness (inner)
5.8 mm (0.23 in)
Limit
0.8 mm (0.03 in)
Brake pad lining thickness (outer)
5.8 mm (0.23 in)
Limit
0.8 mm (0.03 in)



EAS23P1018
CHECKING THE BRAKE HOSES
The following procedure applies to all of the brake hoses and brake hose holders.
1. Check:
   • Brake hoses
   Cracks/damage/wear → Replace.
2. Check:
   • Brake hose holders
   Loose → Tighten the holder bolts.
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 4-36, “REAR BRAKE” on page 4-52 and “ABS (Anti-Lock Brake System)” on page 4-66.

EAS21670
CHECKING THE WHEELS
The following procedure applies to both of the wheels.
1. Check:
   • Wheel
   Damage/out-of-round → Replace.

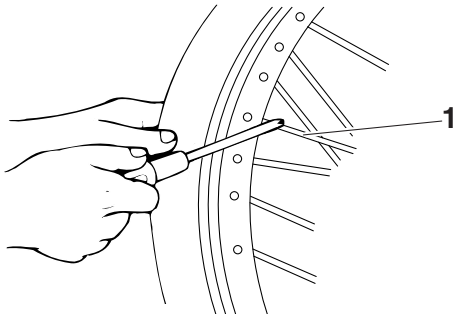
EWA13260
WARNING
Never attempt to make any repairs to the wheel.

TIP
After a tire or wheel has been changed or replaced, always balance the wheel.

2. Measure:
   • Radial wheel runout
   • Lateral wheel runout
   Refer to “CHECKING THE FRONT WHEEL” on page 4-23 and “CHECKING THE REAR WHEEL” on page 4-32.
3. Check:
   • Wheel bearings
   Refer to “CHECKING THE FRONT WHEEL” on page 4-23 and “CHECKING THE REAR WHEEL” on page 4-32.

EAS21681
CHECKING AND TIGHTENING THE SPOKES
The following procedure applies to all of the spokes.
1. Check:
   • Spoke “1”
   Bends/damage → Replace.
   Loose → Tighten.
   Tap the spoke with a screwdriver.

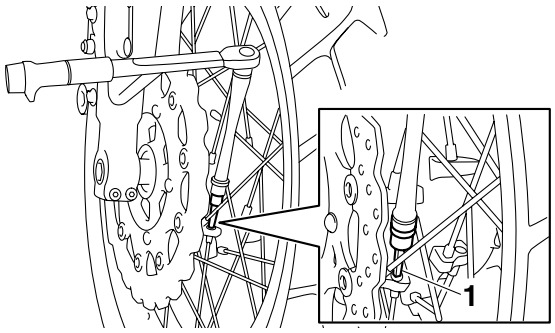
TIP
A tight spoke will emit a clear, ringing tone; a loose spoke will sound flat.



2. Tighten:
   • Spoke

Spoke
6 Nm (0.6 m·kgf, 4.3 ft·lbf)

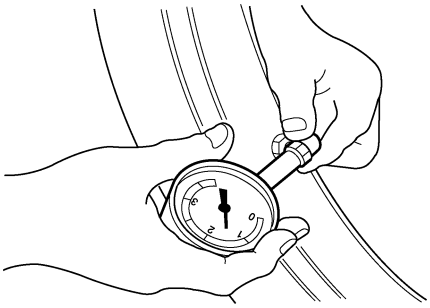
TIP
- Tighten the spoke with a hexagon wrench (5.0 mm) “1”.
- Be sure to tighten the spoke before and after break-in.



EAS21650
CHECKING THE TIRES

The following procedure applies to both of the tires.

1. Check:
   - Tire pressure
     Out of specification → Regulate.



EWA13180
⚠ WARNING

- **The tire pressure should only be checked and regulated when the tire temperature equals the ambient air temperature.**
- **The tire pressure and the suspension must be adjusted according to the total weight (including cargo, rider, passenger and accessories) and the anticipated riding speed.**
- **Operation of an overloaded vehicle could cause tire damage, an accident or an injury.**

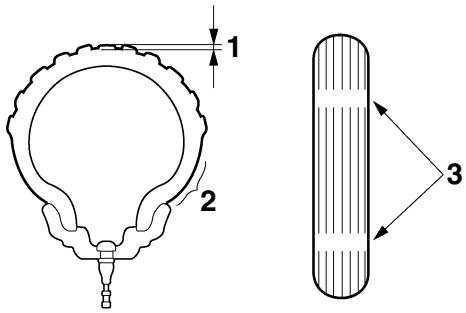
NEVER OVERLOAD THE VEHICLE.

Tire air pressure (measured on cold tires)
Loading condition
0–90 kg (0–198 lb)
Front
225 kPa (2.25 kgf/cm², 33 psi)
Rear
250 kPa (2.50 kgf/cm², 36 psi)
Loading condition
90–209 kg (198–461 lb)
Front
225 kPa (2.25 kgf/cm², 33 psi)
Rear
290 kPa (2.90 kgf/cm², 42 psi)
Maximum load (total weight of rider, passenger, cargo and accessories)
209 kg (461 lb)

EWA13190
⚠ WARNING

It is dangerous to ride with a worn-out tire. When the tire tread reaches the wear limit, replace the tire immediately.

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



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

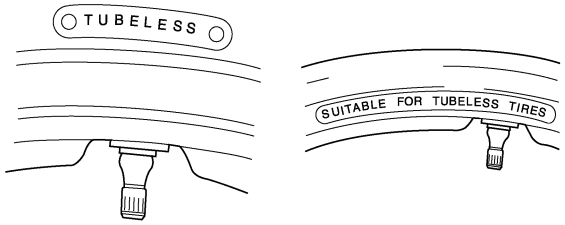
Wear limit (front)
1.6 mm (0.06 in) (Europe)
1.0 mm (0.04 in) (AUS)
Wear limit (rear)
1.6 mm (0.06 in) (Europe)
1.0 mm (0.04 in) (AUS)

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 B



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
110/80R19M/C 59V
Manufacturer/model
BRIDGESTONE/BW-501
METZELER/TOURANCE EXP FRONT C

Rear tire
Size
150/70R17M/C 69V
Manufacturer/model
BRIDGESTONE/BW-502
METZELER/TOURANCE EXP C

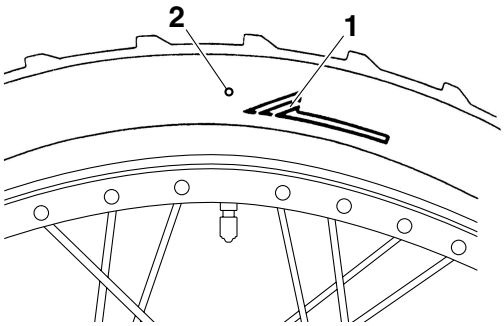
EWA13210

⚠ 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.

TIP

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.



EAS23P1108

CHECKING THE WHEEL BEARINGS

The following procedure applies to all of the wheel bearings.

1. Check:
   - Wheel bearings
     Refer to "CHECKING THE FRONT WHEEL" on page 4-23 and "CHECKING THE REAR WHEEL" on page 4-32.

EAS23P1022

CHECKING THE SWINGARM PIVOT

1. Measure:
   - Swingarm side play
   - Swingarm vertical movement
     Refer to "REMOVING THE SWINGARM" on page 4-102.

EAS23P1025

LUBRICATING THE SWINGARM PIVOT

1. Lubricate:
   - Bearings
   - Oil seals

Recommended lubricant
Lithium-soap-based grease

Refer to "INSTALLING THE SWINGARM" on page 4-102.

EAS21510
CHECKING AND ADJUSTING THE STEERING HEAD

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

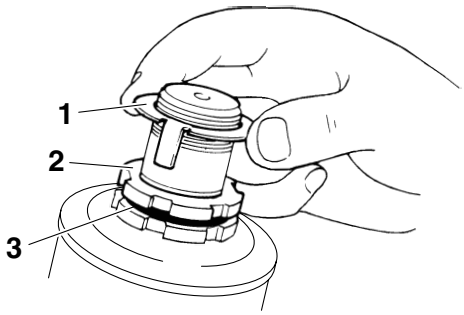
TIP

Place the vehicle on a suitable stand so that the front wheel is elevated.

2. Check:
   - Steering head
     Grasp the bottom of the front fork legs and gently rock the front fork.
     Binding/looseness → Adjust the steering head.
3. Remove:
   - Upper bracket
     Refer to "STEERING HEAD" on page 4-92.
4. Adjust:
   - Steering head

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the lock washer "1", the upper ring nut "2", and the rubber washer "3".



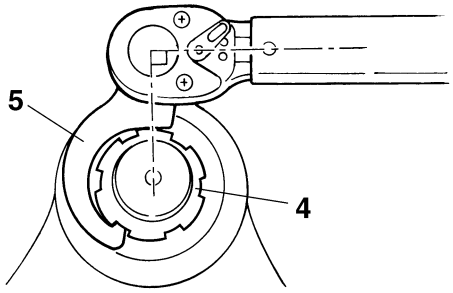
b. Loosen the lower ring nut "4" and then tighten it to specification with a steering nut wrench "5".

	Steering nut wrench **90890-01403** **Exhaust flange nut wrench** **YU-A9472**

	Lower ring nut (initial tightening torque) **52 Nm (5.2 m·kgf, 38 ft·lbf)**

TIP

Set the torque wrench at a right angle to the steering nut wrench.



c. Loosen the lower ring nut completely and then tighten it to specification with a steering nut wrench.

EWA13140
⚠ WARNING

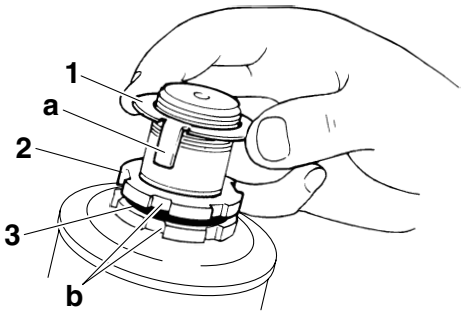
Do not overtighten the lower ring nut.

	Lower ring nut (final tightening torque) **18 Nm (1.8 m·kgf, 13 ft·lbf)**

d. Check the steering head for looseness or binding by turning the front fork all the way in both directions. If any binding is felt, remove the lower bracket and check the upper and lower bearings.
   Refer to "STEERING HEAD" on page 4-92.
e. Install the rubber washer "3".
f. Install the upper ring nut "2".
g. Finger tighten the upper ring nut, then align the slots of both ring nuts. If necessary, hold the lower ring nut and tighten the upper ring nut until their slots are aligned.
h. Install the lock washer "1".

TIP

Make sure the lock washer tabs "a" sit correctly in the ring nut slots "b".



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

5. Install:
   - Upper bracket
     Refer to "STEERING HEAD" on page 4-92.

EAS23P1026
LUBRICATING THE STEERING HEAD
1. Lubricate:
   • Upper bearing
   • Lower bearing
   • Bearing races
   • Ring nut threads

	Recommended lubricant **Lithium-soap-based grease**

EAS23P1027
CHECKING THE FASTENERS
1. Check:
   • Fasteners
   Damage/pitting → Replace.
   Refer to “GENERAL CHASSIS” on page 4-1.

EAS21700
LUBRICATING THE LEVERS
Lubricate the pivoting point and metal-to-metal moving parts of the levers.

	Recommended lubricant **Silicone grease**

EAS23P1101
LUBRICATING THE PEDALS
Lubricate the pivoting point and metal-to-metal moving parts of the pedals.

	Recommended lubricant **Lithium-soap-based grease**

EAS23P1023
CHECKING THE SIDESTAND
1. Check:
   • Sidestand operation
   Check that the sidestand moves smoothly.
   Rough movement → Repair or replace.

EAS23P1024
CHECKING THE CENTERSTAND
1. Check:
   • Centerstand operation
   Check that the centerstand moves smoothly.
   Rough movement → Repair or replace.

EAS21720
LUBRICATING THE SIDESTAND
Lubricate the pivoting point and metal-to-metal moving parts of the sidestand.

	Recommended lubricant **Lithium-soap-based grease**

EAS21730
LUBRICATING THE CENTERSTAND
Lubricate the pivoting point and metal-to-metal moving parts of the centerstand.

	Recommended lubricant **Lithium-soap-based grease**

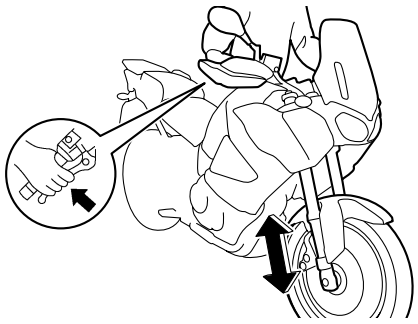
EAS23P1075
CHECKING THE SIDESTAND SWITCH
Refer to “CHECKING THE SWITCHES” on page 8-137.

EAS21531
CHECKING THE FRONT FORK
1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

2. Check:
   • Inner tube
   Damage/scratches → Replace.
   • Front fork leg
   Oil leaks between inner tube and outer tube → Replace the oil seal.
3. Hold the vehicle upright and apply the front brake.
4. Check:
   • Front fork operation
   Push down hard on the handlebar several times and check if the front fork rebounds smoothly.
   Rough movement → Repair.
   Refer to “FRONT FORK” on page 4-82.



EAS21580
ADJUSTING THE FRONT FORK LEGS
The following procedure applies to both of the front fork legs.

EWA23P1012
⚠ WARNING

• Always adjust both front fork legs evenly. Uneven adjustment can result in poor handling and loss of stability.

• Securely support the vehicle so that there is no danger of it falling over.

Spring preload

ECA13570

NOTICE

• Grooves are provided to indicate the adjustment position.
• Never go beyond the maximum or minimum adjustment positions.

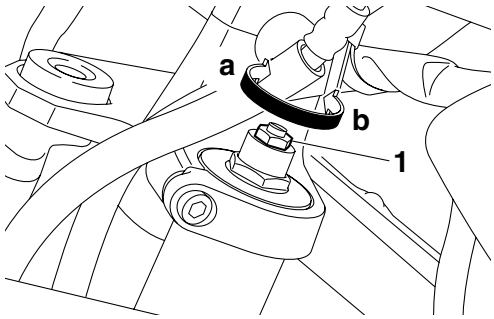
1. Adjust:
   • Spring preload

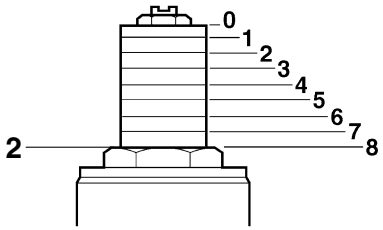
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting bolt "1" in direction "a" or "b".

Direction "a"
Spring preload is increased (suspension is harder).
Direction "b"
Spring preload is decreased (suspension is softer).

Spring preload adjusting positions
Minimum
8
Standard
5.5
Maximum
0





2. Current setting

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Rebound damping

ECA13590

NOTICE

Never go beyond the maximum or minimum adjustment positions.

1. Adjust:
   • Rebound damping

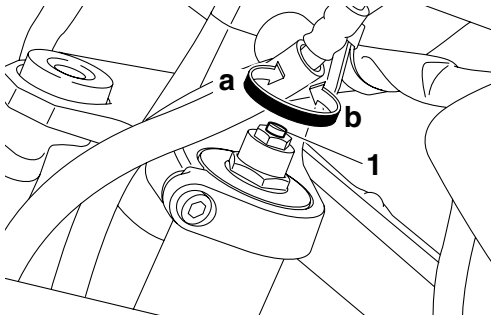
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting screw "1" in direction "a" or "b".

Direction "a"
Rebound damping is increased (suspension is harder).
Direction "b"
Rebound damping is decreased (suspension is softer).

Rebound damping adjusting positions
Minimum
10 click(s) out*
Standard
8 click(s) out*
Maximum
1 click(s) out*

*** With the adjusting screw fully turned in**



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Compression damping

ECA13590

NOTICE

Never go beyond the maximum or minimum adjustment positions.

1. Adjust:
   • Compression damping

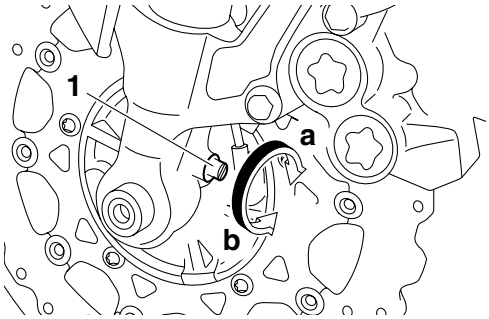
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting screw "1" in direction "a" or "b".

Direction "a"
Compression damping is increased (suspension is harder).
Direction "b"
Compression damping is decreased (suspension is softer).

Compression damping adjusting positions
Minimum
13 click(s) out*
Standard
6 click(s) out*
Maximum
1 click(s) out*

*** With the adjusting screw fully turned in**



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1021

CHECKING THE REAR SUSPENSION

1. Stand the vehicle on a level surface.

EWA13120

⚠ WARNING

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

2. Check:
   • Rear shock absorber assembly
   Gas leaks/oil leaks → Replace the rear shock absorber assembly.
   Refer to "CHECKING THE REAR SHOCK ABSORBER ASSEMBLY" on page 4-98.
3. Check:
   • Rear shock absorber assembly operation
   • Rear suspension link pivots
   Push down seat on the vehicle several times and check if the rear shock absorber assembly rebounds smoothly.
   Rough movement → Repair.
   Refer to "REAR SHOCK ABSORBER ASSEMBLY" on page 4-96.

EAS21610

ADJUSTING THE REAR SHOCK ABSORBER ASSEMBLY

EWA13120

⚠ WARNING

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

Spring preload

ECA13590

NOTICE

Never go beyond the maximum or minimum adjustment positions.

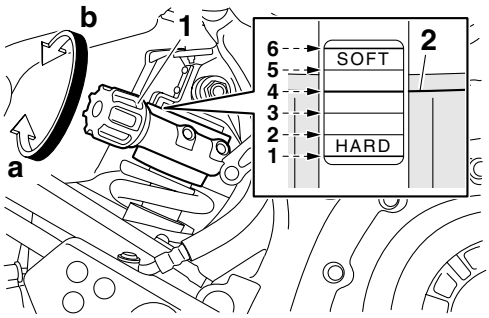
1. Adjust:
   • Spring preload

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting knob "1" in direction "a" or "b".
b. Align the appropriate mark on the rear shock absorber assembly with the matching edge "2".

Direction "a"
Spring preload is increased (suspension is harder).
Direction "b"
Spring preload is decreased (suspension is softer).

Spring preload adjusting positions
Minimum
6
Standard
4
Maximum
1



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Rebound damping

ECA13590

NOTICE

Never go beyond the maximum or minimum adjustment positions.

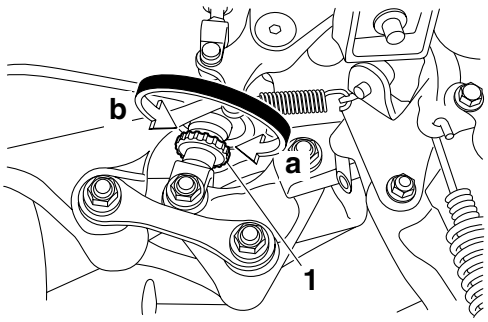
1. Adjust:
   - Rebound damping

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting knob "1" in direction "a" or "b".

Direction "a"
Rebound damping is increased (suspension is harder).
Direction "b"
Rebound damping is decreased (suspension is softer).

Rebound damping adjusting positions
Minimum
20 click(s) out*
Standard
10 click(s) out*
Maximum
3 click(s) out*
*** With the adjusting knob fully turned in**



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS20731

CHECKING THE ENGINE OIL LEVEL

1. Stand the vehicle on a level surface.

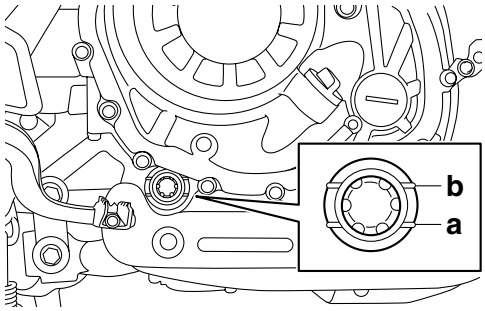
TIP

- Place the vehicle on the centerstand.
- Make sure the vehicle is upright.

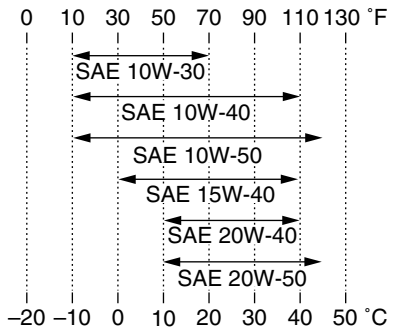
2. Start the engine and warm it up for ten minutes until the engine oil has reached a normal temperature of 60 °C (140 °F), and then turn the engine off.
3. Check:
   - Engine oil level
     The engine oil level should be between the minimum level mark "a" and maximum level mark "b".
     Below the minimum level mark → Add the recommended engine oil to the proper level.

TIP

Before checking the engine oil level, wait a few minutes until the oil has settled.



Recommended brand
YAMALUBE
Type
SAE 10W-30, 10W-40, 10W-50, 15W-40, 20W-40 or 20W-50
Recommended engine oil grade
API service SG type or higher, JASO standard MA



ECA23P1072

NOTICE

- **Engine oil also lubricates the clutch and the wrong oil types or additives could cause clutch slippage. Therefore, do not add any chemical additives or use engine oils with a grade of CD or higher and do not use oils labeled "ENERGY CONSERVING II".**
- **Do not allow foreign materials to enter the crankcase.**

4. Start the engine, warm it up for several minutes, and then turn it off.
5. Check the engine oil level again.

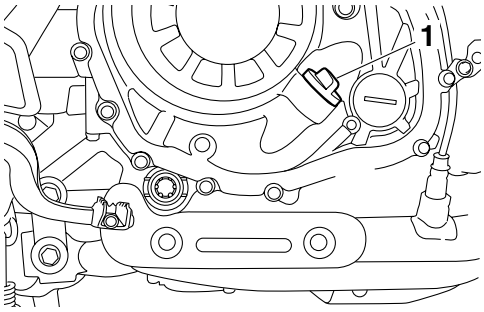
TIP

Before checking the engine oil level, wait a few minutes until the oil has settled.

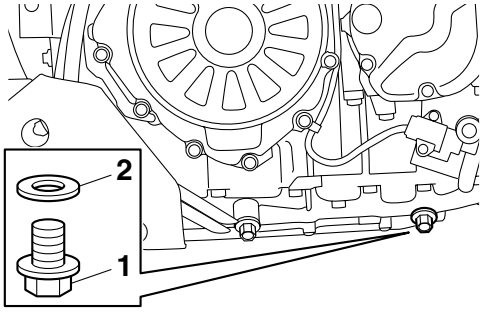
EAS20781

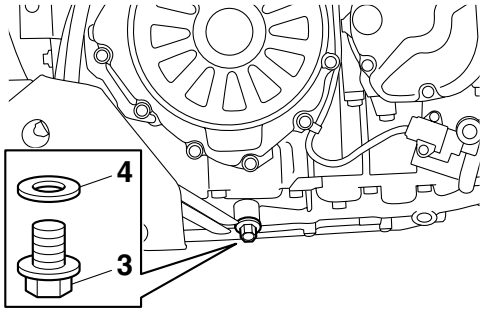
CHANGING THE ENGINE OIL

1. Start the engine, warm it up for several minutes, and then turn it off.
2. Place a container under the engine oil drain bolts.
3. Remove:
   - Engine oil filler cap "1" (along with the O-ring)



4. Remove:
   - Engine oil drain bolt (oil tank) "1" (along with the gasket "2")
   - Engine oil drain bolt (crankcase) "3" (along with the gasket "4")



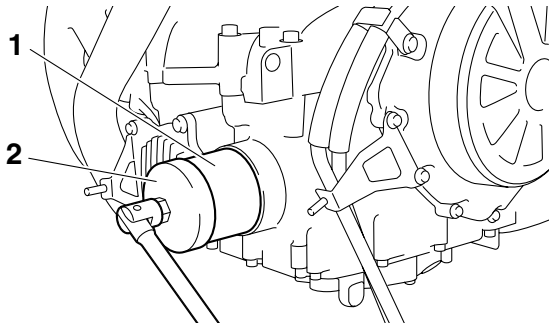


5. Drain:
   - Engine oil (completely from the oil tank and crankcase)
6. If the oil filter cartridge is also to be replaced, perform the following procedure.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the engine guard.
   Refer to "GENERAL CHASSIS" on page 4-1.
b. Remove the oil filter cartridge "1" with an oil filter wrench "2".

Oil filter wrench
90890-01426
YU-38411

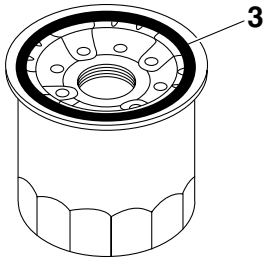


c. Lubricate the O-ring "3" of the new oil filter cartridge with a thin coat of lithium-soap-based grease.

ECA13390

NOTICE

Make sure the O-ring "3" is positioned correctly in the groove of the oil filter cartridge.



d. Tighten the new oil filter cartridge to specification with an oil filter wrench.

Oil filter cartridge
17 Nm (1.7 m·kgf, 12 ft·lbf)

e. Install the engine guard.
Refer to "GENERAL CHASSIS" on page 4-1.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

7. Install:
   • Engine oil drain bolt (crankcase)
   (along with the gasket New)
   • Engine oil drain bolt (oil tank)
   (along with the gasket New)

Engine oil drain bolt (crankcase)
20 Nm (2.0 m·kgf, 14 ft·lbf)
Engine oil drain bolt (oil tank)
20 Nm (2.0 m·kgf, 14 ft·lbf)

8. Fill:
   • Crankcase
   (with the specified amount of the recommended engine oil)

Engine oil quantity
Total amount
4.20 L (4.44 US qt, 3.70 Imp.qt)
Without oil filter cartridge replacement
3.10 L (3.28 US qt, 2.73 Imp.qt)
With oil filter cartridge replacement
3.40 L (3.59 US qt, 2.99 Imp.qt)

TIP

When assembling the engine after disassembly, pour the engine oil in two stages. First, pour in 3.50 L (3.70 US qt, 3.08 Imp.qt) of oil, then start the engine and allow it to idle for 10–20 seconds. Stop the engine, and then pour in the remainder of the specified amount.

ECA23P1065

NOTICE

When starting the engine, make sure the oil filler cap is securely fitted into the crankcase.

9. Install:
   • Engine oil filler cap
   (along with the O-ring New)

10. Start the engine, warm it up for several minutes, and then turn it off.
11. Check:
   • Engine
   (for engine oil leaks)
12. Check:
   • Engine oil level
   Refer to "CHECKING THE ENGINE OIL LEVEL" on page 3-24.
13. Check:
   • Engine oil pressure
   Refer to "MEASURING THE ENGINE OIL PRESSURE" on page 3-26.

EAS20820

MEASURING THE ENGINE OIL PRESSURE

1. Check:
   • Engine oil level
   Below the minimum level mark → Add the recommended engine oil to the proper level.
2. Start the engine, warm it up for several minutes, and then turn it off.

ECA13410

NOTICE

When the engine is cold, the engine oil will have a higher viscosity, causing the engine oil pressure to increase. Therefore, be sure to measure the engine oil pressure after warming up the engine.

3. Remove:
   • Engine guard
   Refer to "GENERAL CHASSIS" on page 4-1.
4. Remove:
   • Sub-gallery bolt

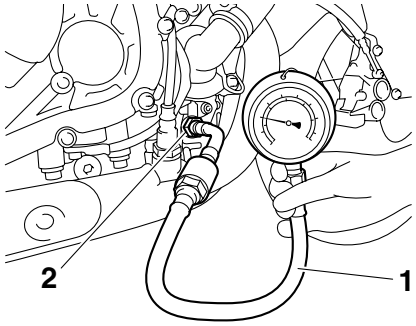
EWA12980

⚠ WARNING

The engine, muffler and engine oil are extremely hot.

5. Install:
   • Oil pressure gauge set "1"
   • Oil pressure adapter B "2"

Oil pressure gauge set
90890-03120
Oil pressure adapter B
90890-03124



6. Measure:
   • Engine oil pressure

Oil pressure
65.0 kPa/1100 r/min (0.65 kgf/cm²/1100 r/min, 9.4 psi/1100 r/min) at oil temperature of 65.0–75.0 °C (149.00–167.00 °F)

Out of specification → Adjust.

Engine oil pressure	Possible causes
Below specification	• Faulty oil pump • Clogged oil strainer • Leaking oil passage • Broken or damaged oil seal
Above specification	• Leaking oil passage • Faulty oil strainer • Oil viscosity too high

7. Install:
   • Sub-gallery bolt

Sub-gallery bolt
8 Nm (0.8 m·kgf, 5.8 ft·lbf)

8. Install:
   • Engine guard
   Refer to “GENERAL CHASSIS” on page 4-1.

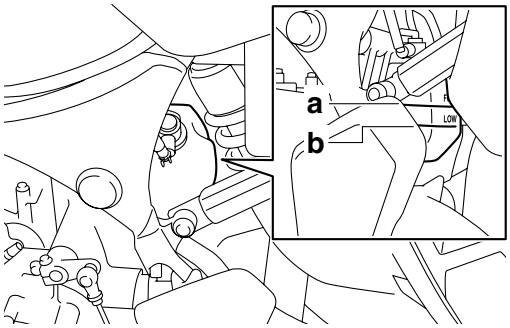
EAS21110
CHECKING THE COOLANT LEVEL

1. Stand the vehicle on a level surface.

TIP

• Place the vehicle on the centerstand.
• Make sure the vehicle is upright.

2. Check:
   • Coolant level
   The coolant level should be between the maximum level mark “a” and minimum level mark “b”.
   Below the minimum level mark → Add the recommended coolant to the proper level.



ECA13470
NOTICE

• Adding water instead of coolant lowers the antifreeze content of the coolant. If water is used instead of coolant check, and if necessary, correct the antifreeze concentration of the coolant.
• Use only distilled water. However, if distilled water is not available, soft water may be used.

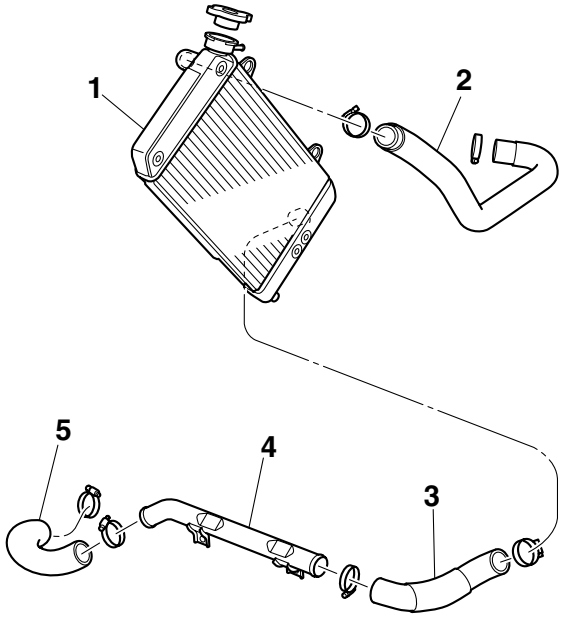
3. Start the engine, warm it up for several minutes, and then turn it off.
4. Check:
   • Coolant level

TIP

Before checking the coolant level, wait a few minutes until it settles.

EAS21120
CHECKING THE COOLING SYSTEM

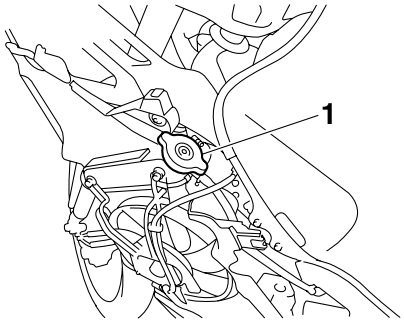
1. Remove:
   • Throttle bodies
   Refer to “THROTTLE BODIES” on page 7-5.
2. Check:
   • Radiator “1”
   • Radiator inlet hose “2”
   • Radiator outlet hose “3”
   • Radiator outlet pipe “4”
   • Water pump inlet hose “5”
   Cracks/damage → Replace.
   Refer to “RADIATOR” on page 6-1, “THERMOSTAT” on page 6-4 and “WATER PUMP” on page 6-6.



3. Install:
   • Throttle bodies
   Refer to "THROTTLE BODIES" on page 7-5.

EAS21131
CHANGING THE COOLANT

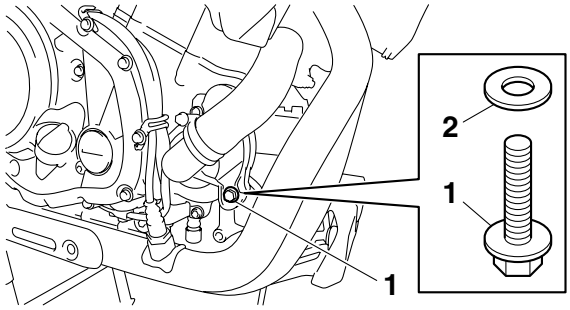
1. Remove:
   • Left side cowling
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Remove:
   • Radiator cap "1"



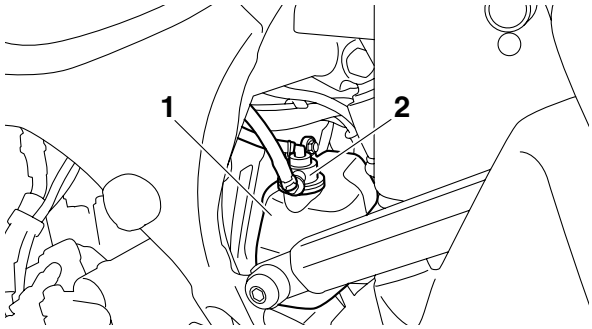
EWA13030
⚠ WARNING

A hot radiator is under pressure. Therefore, do not remove the radiator cap when the engine is hot. Scalding hot fluid and steam may be blown out, which could cause serious injury. When the engine has cooled, open the radiator cap as follows:
Place a thick rag or a towel over the radiator cap and slowly turn the radiator cap counterclockwise toward the detent to allow any residual pressure to escape. When the hissing sound has stopped, press down on the radiator cap and turn it counterclockwise to remove.

3. Remove:
   • Coolant drain bolt (water pump) "1"
   (along with the copper washer "2")



4. Drain:
   • Coolant
   (from the engine and radiator)
5. Remove:
   • Coolant reservoir "1"
   • Coolant reservoir cap "2"



6. Drain:
   • Coolant
   (from the coolant reservoir)
7. Install:
   • Coolant reservoir

	Coolant reservoir bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

8. Install:
   • Coolant drain bolt (water pump)
   (along with the copper washer New)

	Coolant drain bolt (water pump) **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

9. Fill:
   • Cooling system
   (with the specified amount of the recommended coolant)

Recommended antifreeze
High-quality ethylene glycol antifreeze containing corrosion inhibitors for aluminum engines
Mixing ratio
1:1 (antifreeze:water)
Radiator capacity (including all routes)
1.83 L (1.93 US qt, 1.61 Imp.qt)
Coolant reservoir capacity (up to the maximum level mark)
0.26 L (0.27 US qt, 0.23 Imp.qt)

Handling notes for coolant
Coolant is potentially harmful and should be handled with special care.

EWA13040

⚠ WARNING

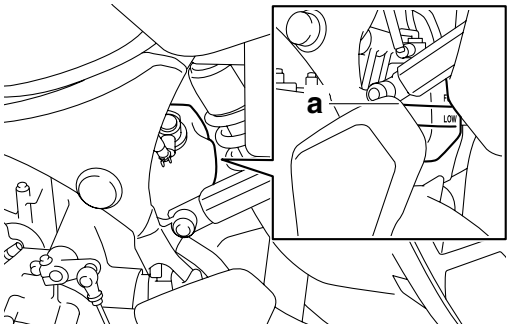
- **If coolant splashes in your eyes, thoroughly wash them with water and consult a doctor.**
- **If coolant splashes on your clothes, quickly wash it away with water and then with soap and water.**
- **If coolant is swallowed, induce vomiting and get immediate medical attention.**

ECA13480

NOTICE

- **Adding water instead of coolant lowers the antifreeze content of the coolant. If water is used instead of coolant check, and if necessary, correct the antifreeze concentration of the coolant.**
- **Use only distilled water. However, if distilled water is not available, soft water may be used.**
- **If coolant comes into contact with painted surfaces, immediately wash them with water.**
- **Do not mix different types of antifreeze.**

10. Install:
    - Radiator cap
11. Fill:
    - Coolant reservoir
      (with the recommended coolant to the maximum level mark “a”)



12. Install:
    - Coolant reservoir cap
13. Start the engine, warm it up for several minutes, and then stop it.
14. Check:
    - Coolant level
      Refer to “CHECKING THE COOLANT LEVEL” on page 3-27.

TIP

Before checking the coolant level, wait a few minutes until the coolant has settled.

15. Install:
    - Left side cowling
      Refer to “GENERAL CHASSIS” on page 4-1.

EAS21460

CHECKING THE FINAL GEAR OIL LEVEL

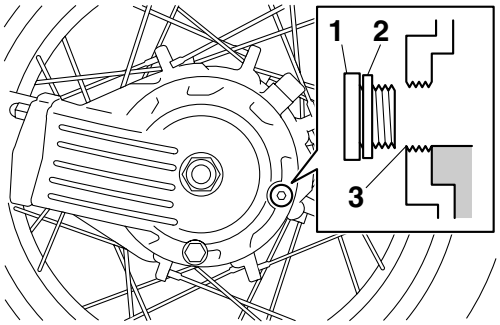
1. Stand the vehicle on a level surface.

TIP

- Place the vehicle on the centerstand.
- Make sure the vehicle is upright.

2. Remove:
   - Final gear oil filler bolt “1”
     (along with the gasket “2”)
3. Check:
   - Final gear oil level
     The final gear oil level should be to the bottom brim “3” of the filler hole.
     Below the bottom brim → Add the recommended final gear oil to the proper level.

Type
Yamaha genuine shaft drive gear oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil

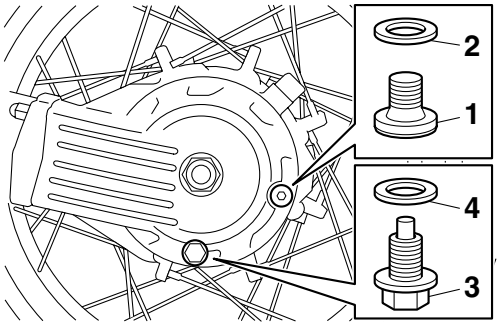


4. Install:
   • Final gear oil filler bolt
   (along with the gasket New)

	Final gear oil filler bolt **23 Nm (2.3 m·kgf, 17 ft·lbf)**

EAS21471
CHANGING THE FINAL GEAR OIL

1. Place the vehicle on a level surface.
2. Place a container under the final gear case.
3. Remove:
   • Final gear oil filler bolt "1"
   (along with the gasket "2")
   • Final gear oil drain bolt "3"
   (along with the gasket "4")
   Completely drain the final gear case of its oil.



4. Install:
   • Final gear oil drain bolt
   (along with the gasket New)

	Final gear oil drain bolt **23 Nm (2.3 m·kgf, 17 ft·lbf)**

5. Fill:
   • Final gear case
   (with the specified amount of the recommended final gear oil)

	Quantity **0.20 L (0.21 US qt, 0.18 Imp.qt)**

ECA23P1039
NOTICE

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

6. Check:
   • Oil level
   Refer to "CHECKING THE FINAL GEAR OIL LEVEL" on page 3-29.
7. Install:
   • Final gear oil filler bolt
   (along with the gasket New)

	Final gear oil filler bolt **23 Nm (2.3 m·kgf, 17 ft·lbf)**

EAS23P1019
CHECKING THE BRAKE LIGHT SWITCHES

1. Check:
   • Front brake light switch operation
   • Rear brake light switch operation
   When operating the brake lever and brake pedal, confirm that the brake light turns on.
   Faulty → Refer to "CHECKING THE SWITCHES" on page 8-137.

EAS21330
ADJUSTING THE REAR BRAKE LIGHT SWITCH

TIP

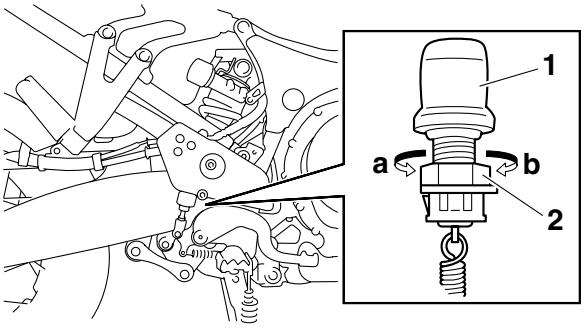
The rear brake light switch is operated by movement of the brake pedal. The rear brake light switch is properly adjusted when the brake light comes on just before the braking effect starts.

1. Check:
   • Rear brake light operation timing
   Incorrect → Adjust.
2. Adjust:
   • Rear brake light operation timing

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Hold the main body "1" of the rear brake light switch so that it does not rotate and turn the adjusting nut "2" in direction "a" or "b" until the rear brake light comes on at the proper time.

Direction "a"
Brake light comes on sooner.
Direction "b"
Brake light comes on later.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21690
CHECKING AND LUBRICATING THE CABLES

The following procedure applies to all of the inner and outer cables.

EWA13270
⚠ WARNING

Damaged outer cable may cause the cable to corrode and interfere with its movement. Replace damaged outer cable and inner cables as soon as possible.

1. Check:
   - Outer cable
     Damage → Replace.
2. Check:
   - Cable operation
     Rough movement → Lubricate.

	Recommended lubricant **Suitable cable lubricant**

TIP

Hold the cable end upright and pour a few drops of lubricant into the cable sheath or use a suitable lubricating device.

EAS23P1073
CHECKING THE THROTTLE GRIP OPERATION

1. Check:
   - Throttle cables
     Damage/deterioration → Replace.
   - Throttle cable installation
     Incorrect → Reinstall the throttle cables.
     Refer to "HANDLEBAR" on page 4-76.
2. Check:
   - Throttle grip movement
     Rough movement → Lubricate or replace the defective part(s).

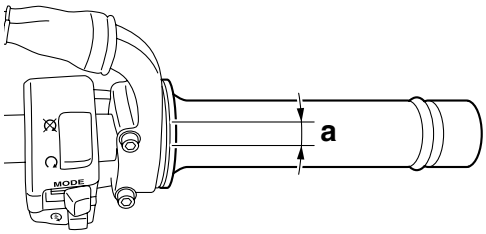
	Recommended lubricant **Suitable cable lubricant**

TIP

With the engine stopped, turn the throttle grip slowly and release it. Make sure that the throttle grip turns smoothly and returns properly when released.
Repeat this check with the handlebar turned all the way to the left and right.

3. Check:
   - Throttle cable free play "a"
     Out of specification → Adjust.

	Throttle cable free play **3.0–5.0 mm (0.12–0.20 in)**



4. Adjust:
   - Throttle cable free play

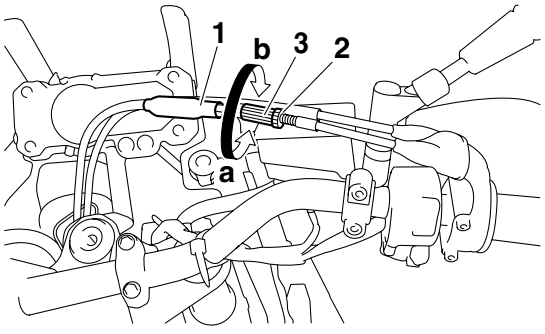
TIP

Prior to adjusting the throttle cable free play, throttle body synchronization should be adjusted properly.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Slide back the rubber cover "1".
b. Loosen the locknut "2".
c. Turn the adjusting nut "3" in direction "a" or "b" until the specified throttle cable free play is obtained.

Direction "a"
Throttle cable free play is increased.
Direction "b"
Throttle cable free play is decreased.



d. Tighten the locknut.
e. Slide the rubber cover to its original position.

TIP

Make sure that the adjusting nut is covered completely by the rubber cover.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1074

CHECKING THE SWITCHES, LIGHTS AND SIGNALS

1. Check that all switches operate and that all lights come on.
   Refer to "INSTRUMENT AND CONTROL FUNCTIONS" in Owner's manual.
   Faulty → Refer to "CHECKING THE SWITCHES" on page 8-137 and "CHECKING THE BULBS AND BULB SOCKETS" on page 8-140.

EAS21810

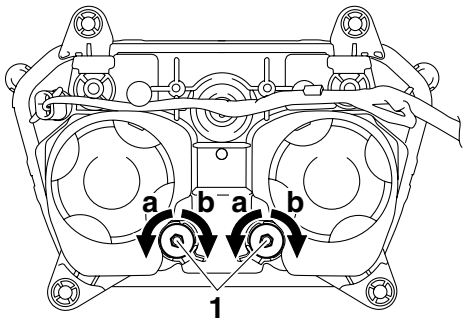
ADJUSTING THE HEADLIGHT BEAMS

1. Adjust:
   • Headlight beam (vertically)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting screws "1" in direction "a" or "b".

Direction "a"
Headlight beam is raised.
Direction "b"
Headlight beam is lowered.



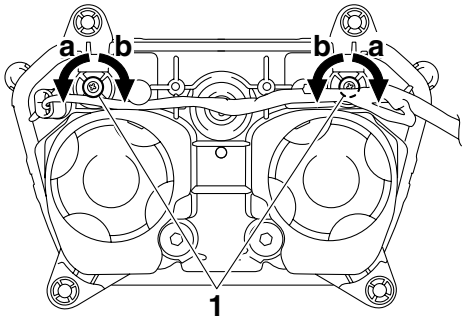
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Adjust:
   • Headlight beam (horizontally)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the adjusting screws "1" in direction "a" or "b".

Direction "a"
Headlight beam moves to the right.
Direction "b"
Headlight beam moves to the left.



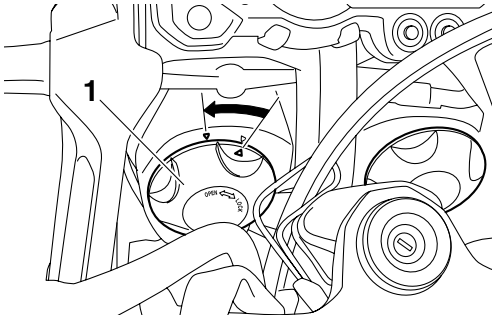
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21790

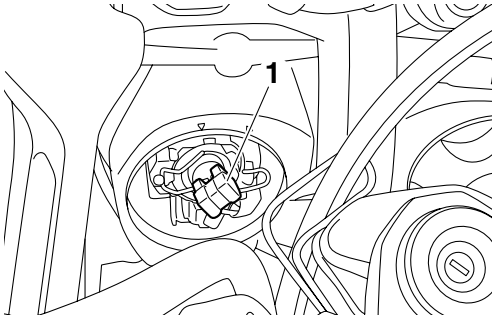
REPLACING THE HEADLIGHT BULBS

The following procedure applies to both of the headlight bulbs.

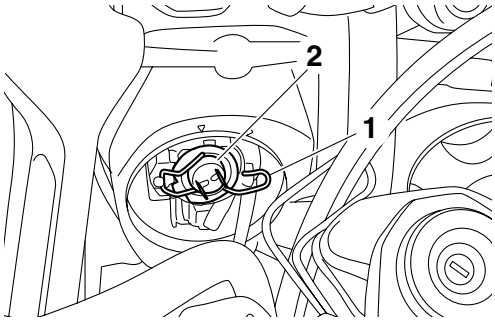
1. Remove:
   • Headlight bulb cover "1"



2. Disconnect:
   • Headlight coupler "1"



3. Detach:
   • Headlight bulb holder "1"
4. Remove:
   • Headlight bulb "2"



EWA13320

⚠ WARNING

Since the headlight bulb gets extremely hot, keep flammable products and your hands away from the bulb until it has cooled down.

5. Install:
   - Headlight bulb New
     Secure the new headlight bulb with the headlight bulb holder.

ECA13690

NOTICE

Avoid touching the glass part of the headlight bulb to keep it free from oil, otherwise the transparency of the glass, the life of the bulb and the luminous flux will be adversely affected. If the headlight bulb gets soiled, thoroughly clean it with a cloth moistened with alcohol or lacquer thinner.

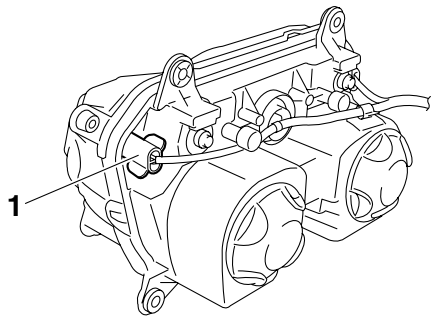
6. Attach:
   - Headlight bulb holder
7. Connect:
   - Headlight coupler
8. Install:
   - Headlight bulb cover

EAS23P1076

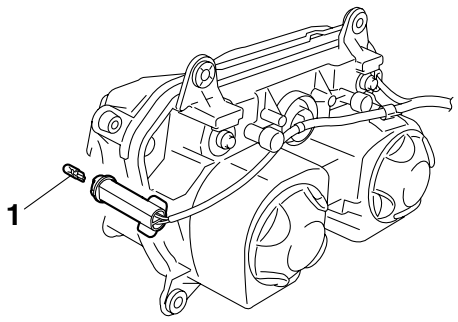
REPLACING THE AUXILIARY LIGHT BULBS

The following procedure applies to both of the auxiliary light bulbs.

1. Remove:
   - Headlight assembly
     Refer to "GENERAL CHASSIS" on page 4-1.
2. Remove:
   - Auxiliary light socket "1"



3. Remove:
   - Auxiliary light bulb "1"



4. Install:
   - Auxiliary light bulb New
   - Auxiliary light socket
5. Install:
   - Headlight assembly
     Refer to "GENERAL CHASSIS" on page 4-1.

CHASSIS

GENERAL CHASSIS 4-1
- INSTALLING THE SEATS 4-2
- INSTALLING THE CARRIERS 4-2
- REMOVING THE ABS UNIT COVER 4-7
- INSTALLING THE ABS UNIT COVER 4-7
- REMOVING THE SIDE COWLINGS 4-9
- INSTALLING THE SIDE COWLINGS 4-9
- INSTALLING THE ELECTRICAL COMPONENTS TRAY 4-14
- ASSEMBLING THE HEADLIGHT 4-17
- INSTALLING THE HEADLIGHT ASSEMBLY AND WINDSHIELD 4-17
- REMOVING THE AIR FILTER CASE 4-19

FRONT WHEEL 4-20
- REMOVING THE FRONT WHEEL 4-23
- DISASSEMBLING THE FRONT WHEEL 4-23
- CHECKING THE FRONT WHEEL 4-23
- MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR 4-24
- ASSEMBLING THE FRONT WHEEL 4-25
- ADJUSTING THE FRONT WHEEL STATIC BALANCE 4-26
- INSTALLING THE FRONT WHEEL (FRONT BRAKE DISCS) 4-27

REAR WHEEL 4-29
- REMOVING THE REAR WHEEL 4-32
- DISASSEMBLING THE REAR WHEEL 4-32
- CHECKING THE REAR WHEEL 4-32
- MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR 4-33
- ASSEMBLING THE REAR WHEEL 4-33
- ADJUSTING THE REAR WHEEL STATIC BALANCE 4-34
- INSTALLING THE REAR WHEEL (REAR BRAKE DISC) 4-34

FRONT BRAKE 4-36
- INTRODUCTION 4-44
- CHECKING THE FRONT BRAKE DISCS 4-44
- REPLACING THE FRONT BRAKE PADS 4-45
- REMOVING THE FRONT BRAKE CALIPERS 4-46
- DISASSEMBLING THE FRONT BRAKE CALIPERS 4-46
- CHECKING THE FRONT BRAKE CALIPERS 4-47
- ASSEMBLING THE FRONT BRAKE CALIPERS 4-47
- INSTALLING THE FRONT BRAKE CALIPERS 4-48
- REMOVING THE FRONT BRAKE MASTER CYLINDER 4-49
- CHECKING THE FRONT BRAKE MASTER CYLINDER 4-49
- ASSEMBLING THE FRONT BRAKE MASTER CYLINDER 4-49
- INSTALLING THE FRONT BRAKE MASTER CYLINDER 4-50

REAR BRAKE 4-52
INTRODUCTION 4-59
CHECKING THE REAR BRAKE DISC 4-59
REPLACING THE REAR BRAKE PADS 4-59
REMOVING THE REAR BRAKE CALIPER 4-60
DISASSEMBLING THE REAR BRAKE CALIPER 4-60
CHECKING THE REAR BRAKE CALIPER 4-61
ASSEMBLING THE REAR BRAKE CALIPER 4-61
INSTALLING THE REAR BRAKE CALIPER 4-61
REMOVING THE REAR BRAKE MASTER CYLINDER 4-63
DISASSEMBLING THE REAR BRAKE MASTER CYLINDER 4-63
CHECKING THE REAR BRAKE MASTER CYLINDER 4-63
ASSEMBLING THE REAR BRAKE MASTER CYLINDER 4-64
INSTALLING THE REAR BRAKE MASTER CYLINDER 4-64

ABS (Anti-Lock Brake System) 4-66
REMOVING THE HYDRAULIC UNIT ASSEMBLY 4-69
CHECKING THE HYDRAULIC UNIT ASSEMBLY 4-70
CHECKING THE BRAKE PIPES 4-70
INSTALLING THE HYDRAULIC UNIT ASSEMBLY 4-70
HYDRAULIC UNIT OPERATION TESTS 4-71
TRIAL RUN 4-75

HANDLEBAR 4-76
REMOVING THE HANDLEBAR 4-79
CHECKING THE HANDLEBAR 4-79
INSTALLING THE HANDLEBAR 4-79

FRONT FORK 4-82
REMOVING THE FRONT FORK LEGS 4-85
DISASSEMBLING THE FRONT FORK LEGS 4-85
CHECKING THE FRONT FORK LEGS 4-86
ASSEMBLING THE FRONT FORK LEGS 4-87
INSTALLING THE FRONT FORK LEGS 4-91

STEERING HEAD 4-92
REMOVING THE LOWER BRACKET 4-94
CHECKING THE STEERING HEAD 4-94
INSTALLING THE STEERING HEAD 4-94

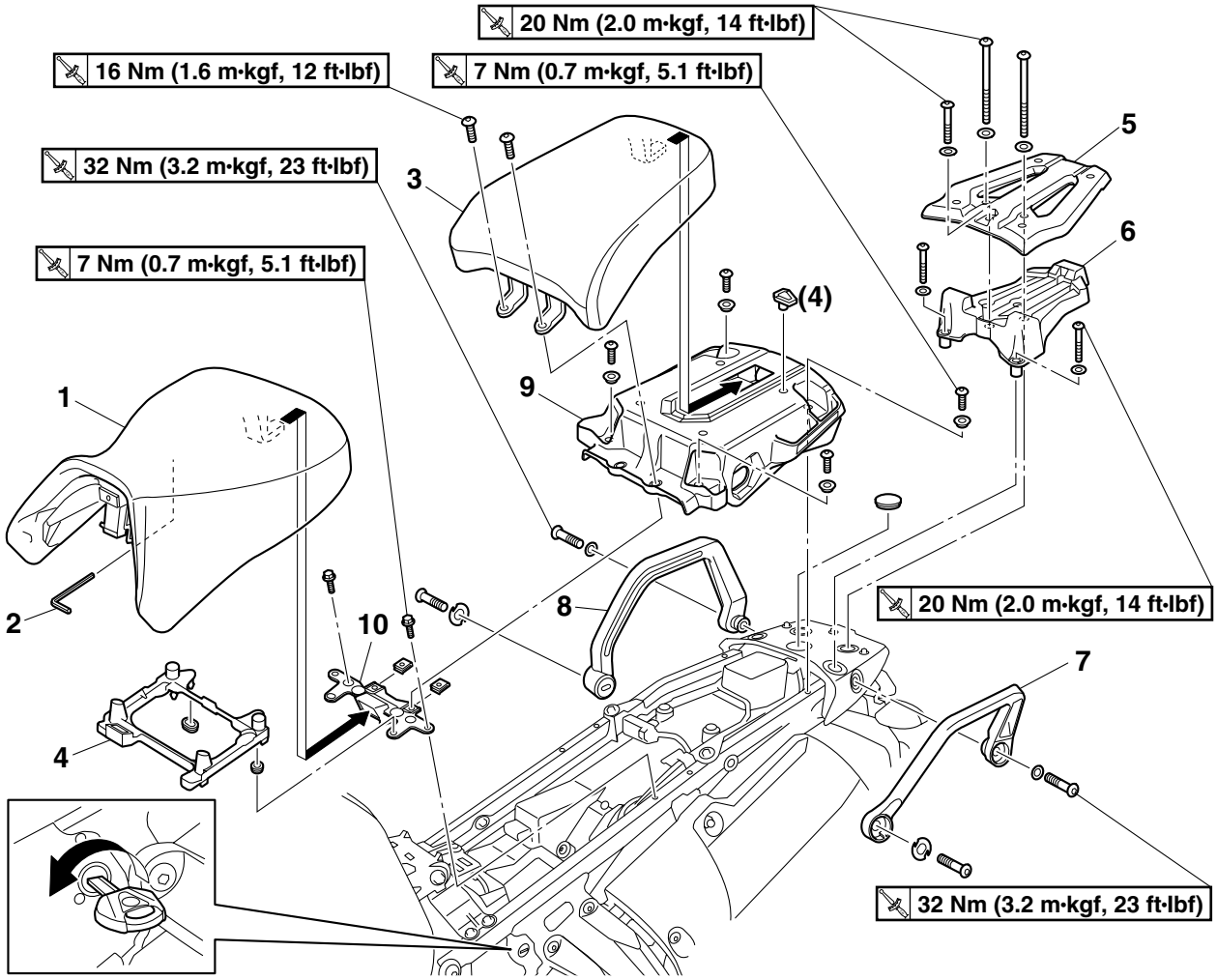
REAR SHOCK ABSORBER ASSEMBLY 4-96
HANDLING THE REAR SHOCK ABSORBER 4-98
DISPOSING OF A REAR SHOCK ABSORBER 4-98
REMOVING THE REAR SHOCK ABSORBER ASSEMBLY 4-98
CHECKING THE REAR SHOCK ABSORBER ASSEMBLY 4-98
CHECKING THE CONNECTING ARM AND RELAY ARM 4-99
INSTALLING THE RELAY ARM 4-99
INSTALLING THE REAR SHOCK ABSORBER ASSEMBLY 4-99

SWINGARM 4-100
REMOVING THE SWINGARM 4-102
CHECKING THE SWINGARM 4-102
INSTALLING THE SWINGARM 4-102

SHAFT DRIVE 4-104
TROUBLESHOOTING 4-108
CHECKING THE FINAL DRIVE OIL FOR CONTAMINATION AND CHECKING THE SHAFT DRIVE FOR LEAKS 4-109
MEASURING THE FINAL GEAR BACKLASH 4-109
ADJUSTING THE FINAL GEAR BACKLASH 4-110
MEASURING THE RING-GEAR-TO-STOPPER-BOLT CLEARANCE 4-111
ADJUSTING THE RING-GEAR-TO-STOPPER-BOLT CLEARANCE 4-111
DISASSEMBLING THE FINAL DRIVE ASSEMBLY 4-112
REMOVING AND INSTALLING THE BEARINGS 4-113
ASSEMBLING THE FINAL DRIVE ASSEMBLY 4-114
ALIGNING THE FINAL DRIVE PINION GEAR AND RING GEAR 4-114
CHECKING THE DRIVE SHAFT 4-117
INSTALLING THE DRIVE SHAFT AND FINAL DRIVE ASSEMBLY 4-117

EAS21830
GENERAL CHASSIS

Removing the seats and carriers



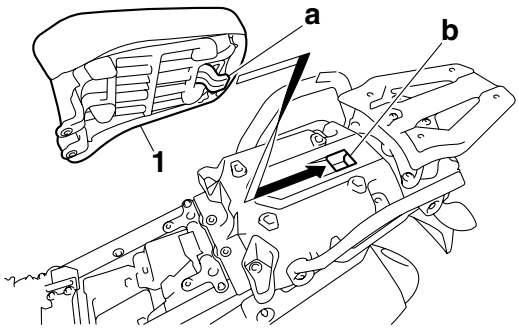
Order	Job/Parts to remove	Q'ty	Remarks
1	Rider seat	1	
2	Hexagon wrench	1	
3	Passenger seat	1	
4	Rider seat height position adjuster	1	
5	Standard carrier	1	
6	Standard carrier bracket	1	
7	Left grab bar	1	
8	Right grab bar	1	
9	Additional carrier	1	
10	Seat bracket	1	
			For installation, reverse the removal procedure.

EAS23P1003
INSTALLING THE SEATS

1. Install:
   • Passenger seat “1”

TIP

Insert the projection “a” on the rear of the passenger seat into the seat holder “b” in the additional carrier.



2. Install:
   • Rider seat height position adjuster “1”
   • Rider seat “2”

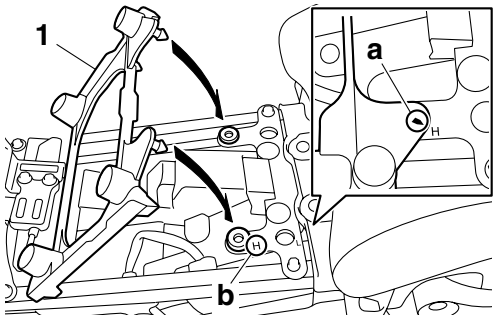
TIP

The rider seat height can be adjusted to one of two positions to suit the rider’s preference.

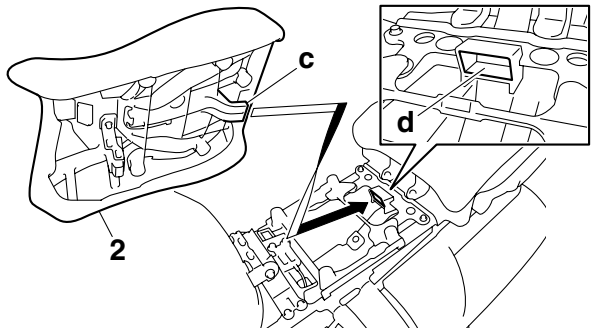
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

To install the rider seat in the high position

a. Install the rider seat height position adjuster so that the match mark “a” on the adjuster is aligned with the “H” mark “b” on the seat bracket.



b. Insert the projection “c” on the rear of the rider seat into the seat holder “d” in the seat bracket, and then push the front of the seat down to lock it in place.

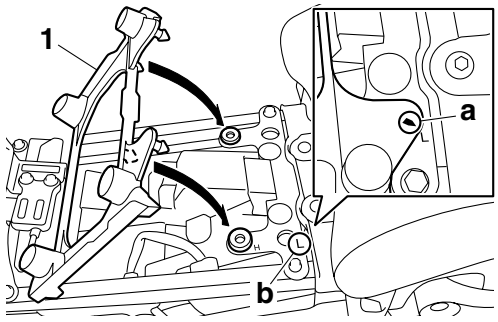


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

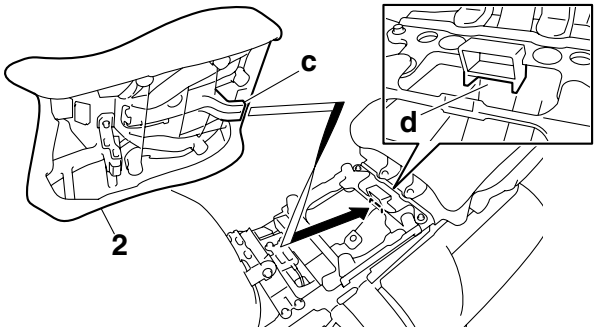
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

To install the rider seat in the low position

a. Install the rider seat height position adjuster so that the match mark “a” on the adjuster is aligned with the “L” mark “b” on the seat bracket.



b. Insert the projection “c” on the rear of the rider seat into the seat holder “d” in the seat bracket, and then push the front of the seat down to lock it in place.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1005
INSTALLING THE CARRIERS

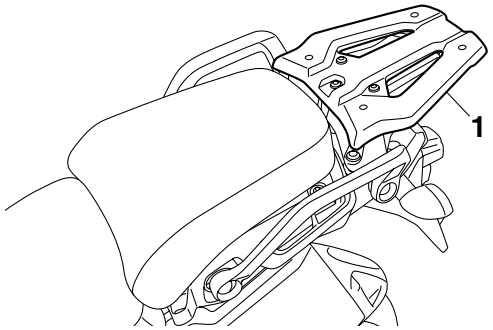
ECA23P1058

NOTICE

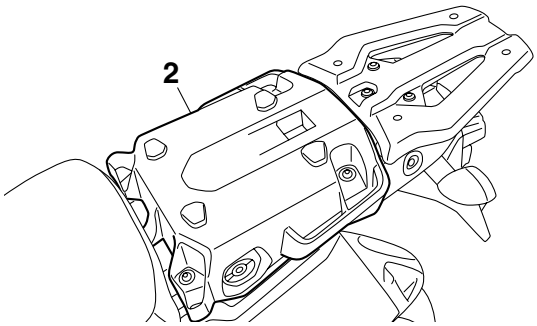
Do not lift the vehicle by either carrier.

This vehicle is equipped with a standard carrier “1” and an additional carrier “2”. To use the standard carrier only, perform steps (1) to (4). To use the standard carrier and additional carrier, perform steps (1) to (3), (5), and (6).

Standard carrier



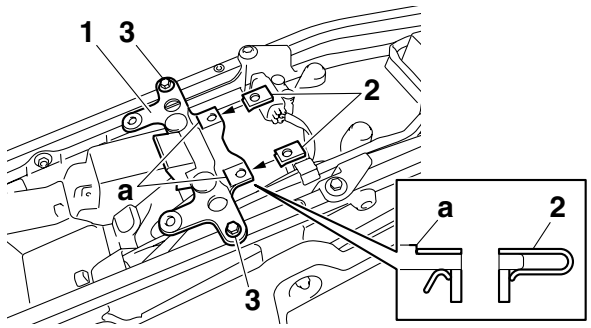
Additional carrier



1. Install:
   • Seat bracket “1”

TIP

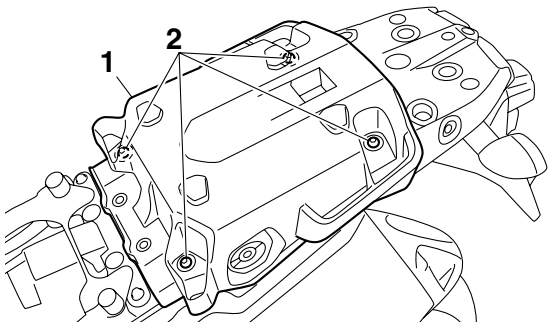
• Make sure that the spring nuts “2” contact the edges “a” of the recesses in the seat bracket.
• Temporarily tighten the seat bracket bolts “3”.



2. Install:
   • Additional carrier “1”

TIP

Temporarily tighten the additional carrier bolts “2”.

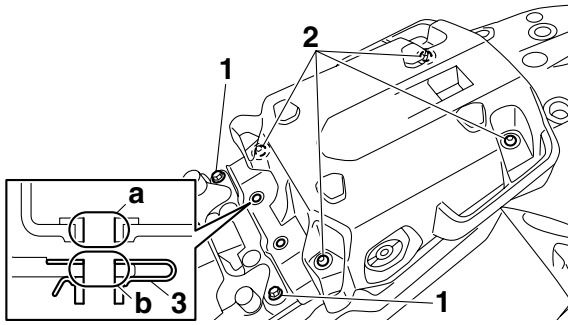


3. Tighten:
   • Seat bracket bolts “1”
   • Additional carrier bolts “2”

Seat bracket bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)
Additional carrier bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)

TIP

Before tightening the bolts, make sure to align the bolt holes “a” in the additional carrier with the bolt holes “b” in the seat bracket.



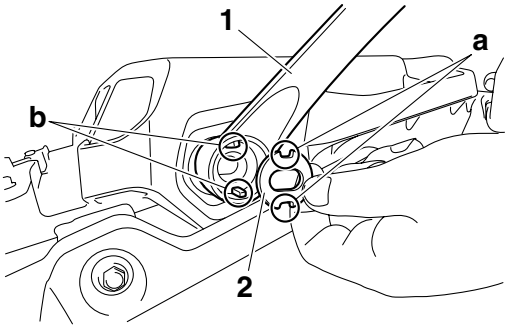
3. Spring nut

4. Install:
   • Grab bars “1”
   • Washers “2”
   • Standard carrier bracket
   • Standard carrier
   • Passenger seat

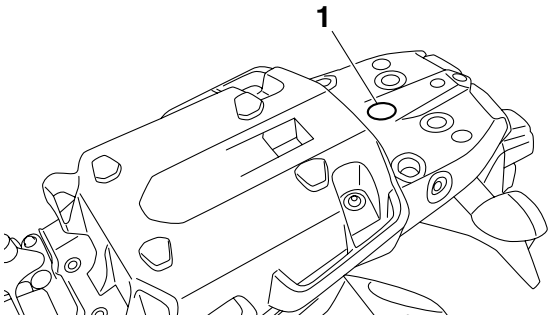
Grab bar bolt
32 Nm (3.2 m·kgf, 23 ft·lbf)
Standard carrier bracket bolt
20 Nm (2.0 m·kgf, 14 ft·lbf)
Standard carrier bolt
20 Nm (2.0 m·kgf, 14 ft·lbf)
Passenger seat bolt
16 Nm (1.6 m·kgf, 12 ft·lbf)

TIP

Align the slots “a” in the washer with the projections “b” on the grab bar.



5. Remove:
   • Rubber plug “1”

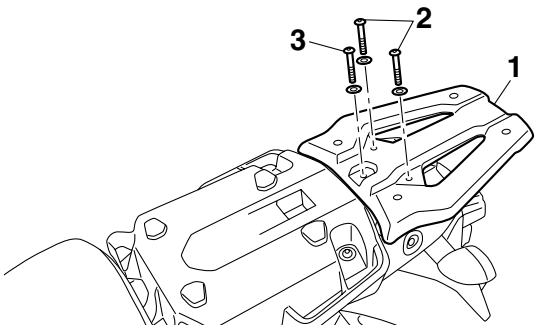


6. Install:
   • Standard carrier “1”

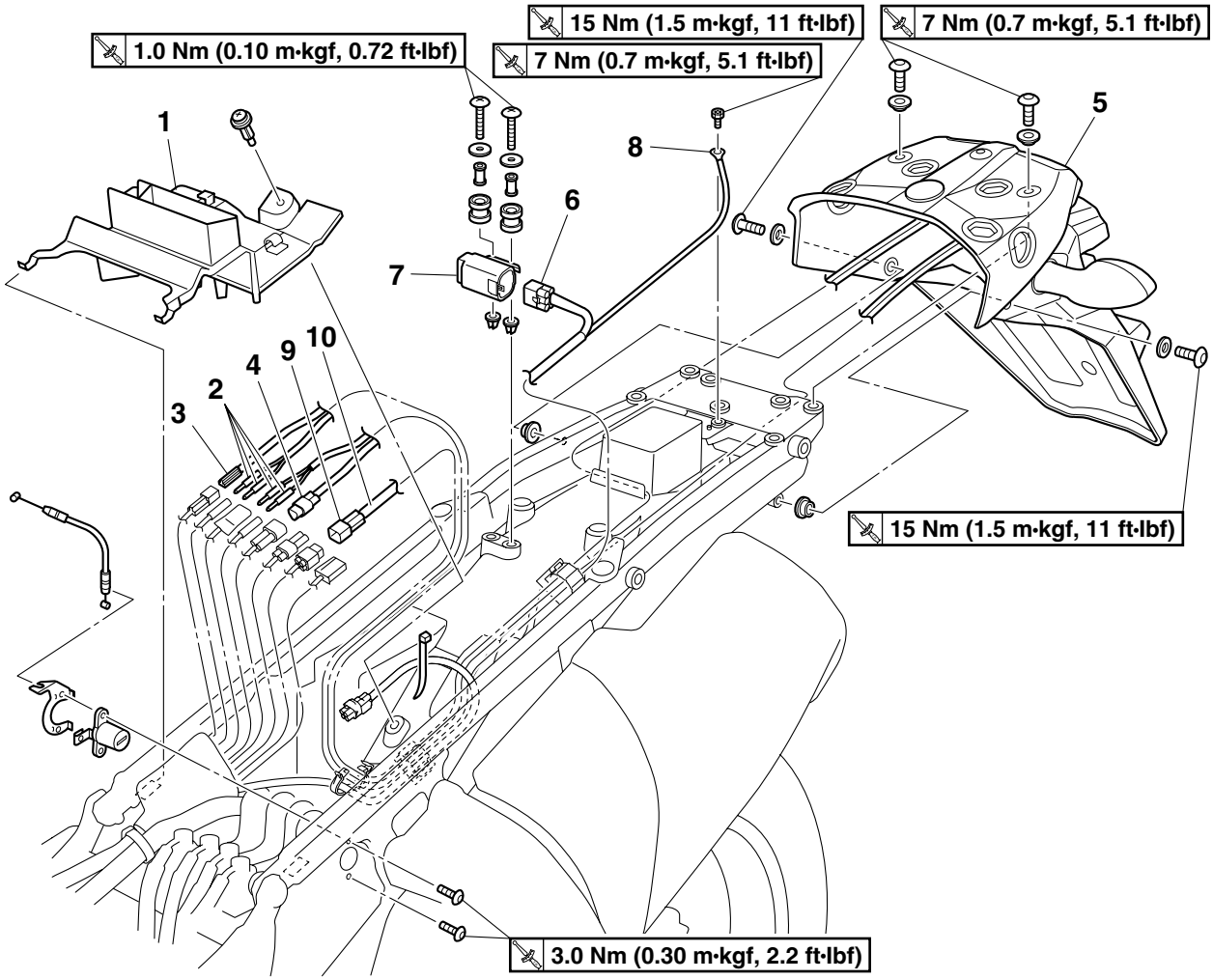
	Standard carrier bolt **20 Nm (2.0 m·kgf, 14 ft·lbf)**

TIP

Use the two standard carrier bracket bolts “2” and the standard carrier bolt (45 mm) “3”.

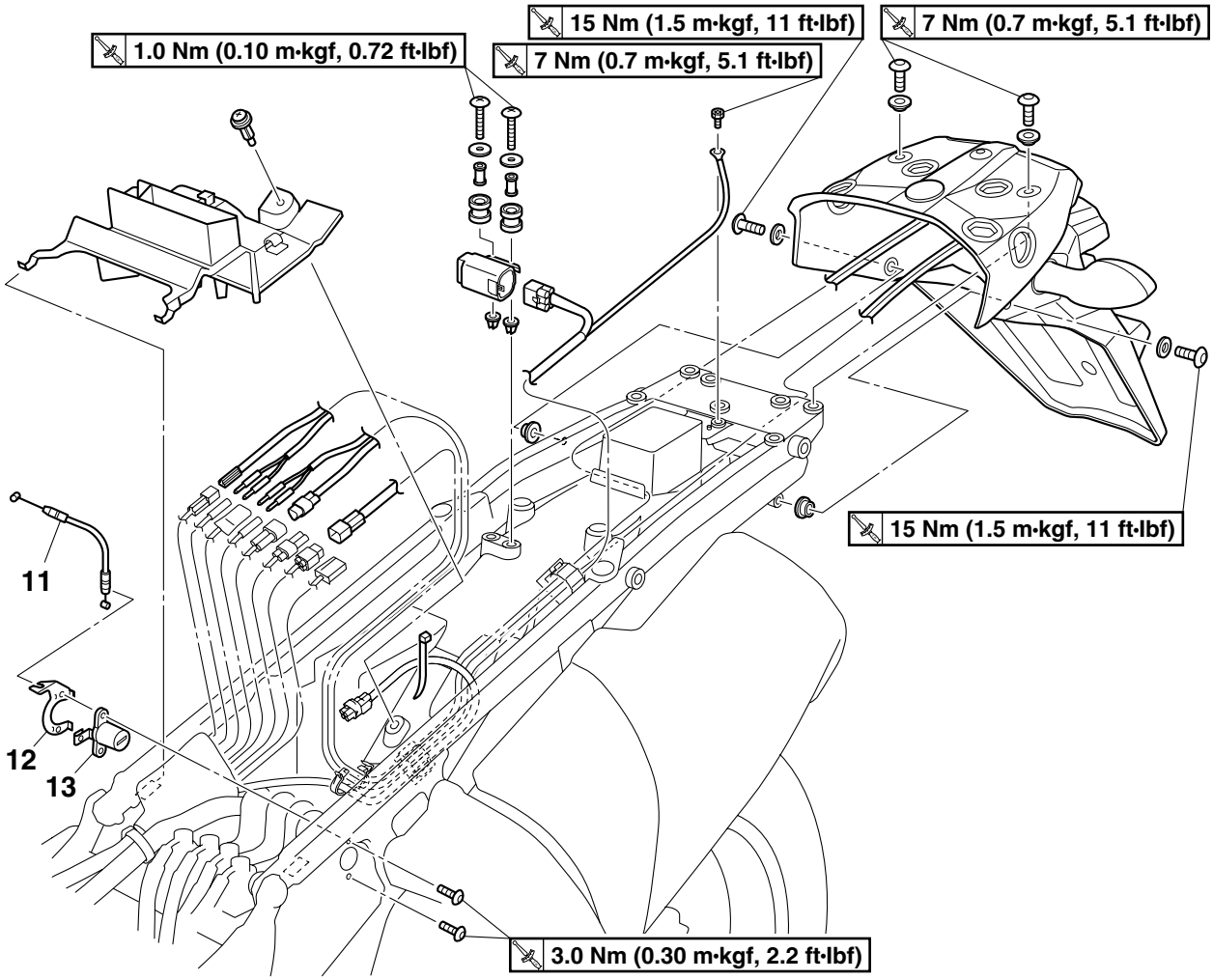


Removing the tail/brake light assembly



Order	Job/Parts to remove	Q'ty	Remarks
	Rear fuel tank bracket/Seat lock assembly		Refer to "FUEL TANK" on page 7-1.
	Standard carrier bracket/Seat bracket		Refer to "Removing the seats and carriers".
1	ABS unit cover	1	
2	Rear turn signal light connector	4	Disconnect.
3	License plate light coupler	1	Disconnect.
4	Tail/brake light coupler	1	Disconnect.
5	Tail/brake light assembly	1	
6	Lean angle sensor coupler	1	Disconnect.
7	Lean angle sensor	1	
8	Frame ground lead	1	
9	Lean angle sensor sub-wire harness coupler	1	Disconnect.
10	Lean angle sensor sub-wire harness	1	

Removing the tail/brake light assembly



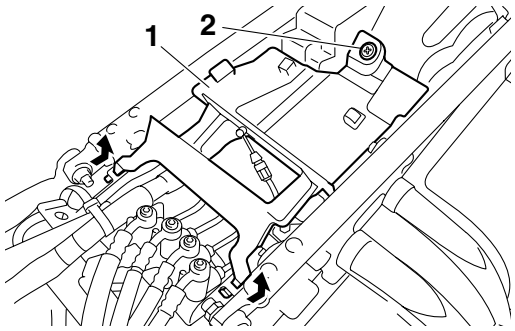
Order	Job/Parts to remove	Q'ty	Remarks
11	Seat lock cable	1	
12	Seat lock bracket	1	
13	Seat lock	1	
			For installation, reverse the removal procedure.

EAS23P1103
REMOVING THE ABS UNIT COVER

1. Remove:
   • ABS unit cover “1”

TIP

Remove the quick fastener screw “2”, and then pull the ABS unit cover off as shown in the illustration.



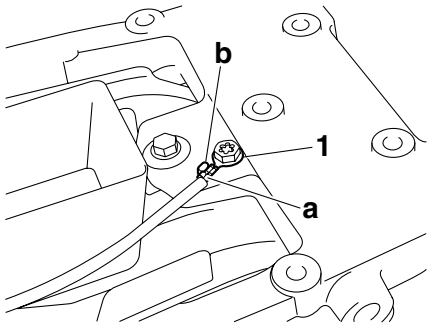
EAS23P1068
INSTALLING THE ABS UNIT COVER

1. Install:
   • Frame ground lead “1”

	Frame ground lead bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

TIP

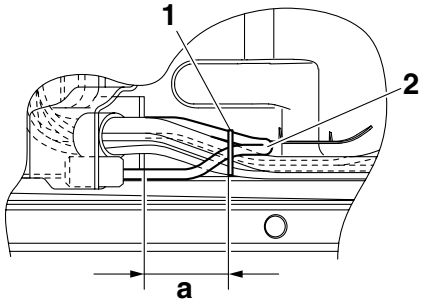
Make sure that the frame ground lead terminal “a” contacts the stopper “b” on the frame.



2. Install:
   • Plastic locking tie “1”

TIP

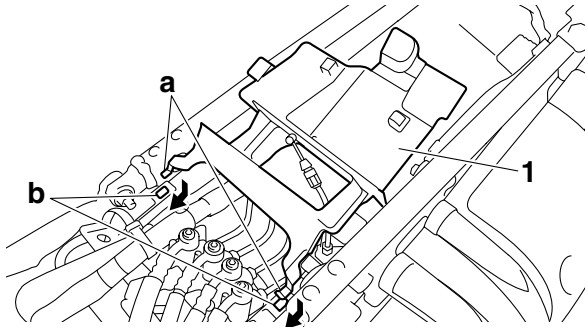
- Fold the ABS test coupler lead “2”, and then fasten the ABS test coupler lead, lean angle sensor sub-wire harness, rear turn signal light leads, tail/brake light lead, and license plate light lead with the plastic locking tie.
- Position the plastic locking tie 40–60 mm (1.57–2.36 in) “a” from the edge of the holder.



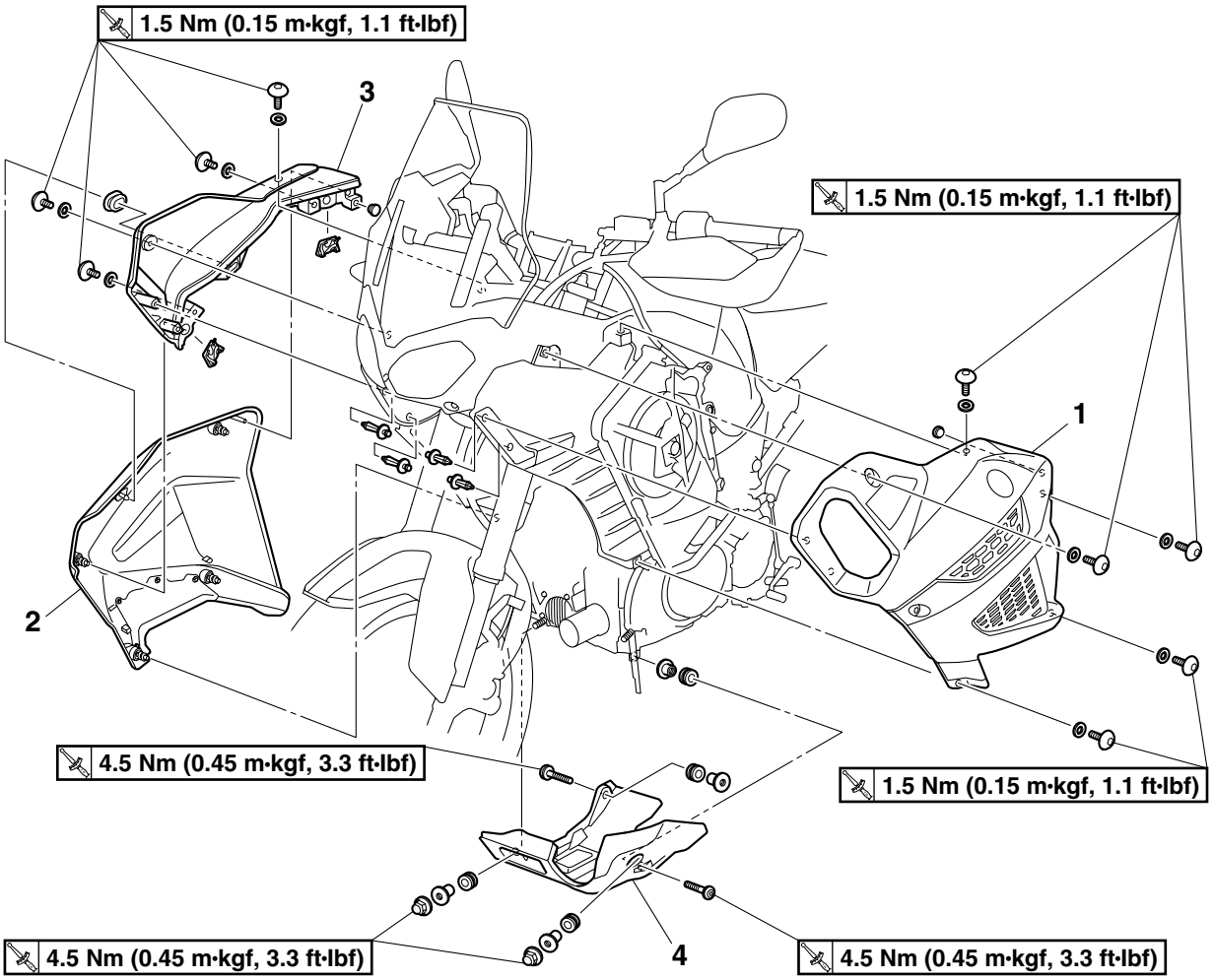
3. Install:
   • ABS unit cover “1”

TIP

Insert the projections “a” on the ABS unit cover into the slots “b” in the rear fender assembly, and then install the quick fastener screw.



Removing the side cowlings, side panel, and engine guard



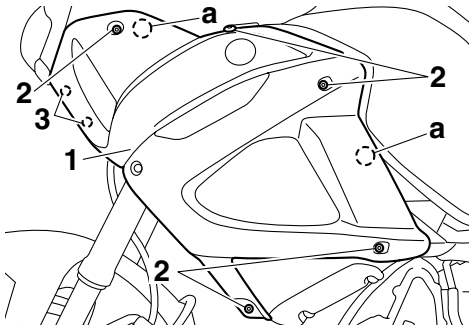
Order	Job/Parts to remove	Q'ty	Remarks
1	Left side cowling	1	
2	Right side cowling	1	
3	Right side panel	1	
4	Engine guard	1	
			For installation, reverse the removal procedure.

EAS23P1104
REMOVING THE SIDE COWLINGS

1. Remove:
   • Left side cowling “1”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the left side cowling bolts “2” and quick fasteners “3”.
b. Pull the cowling off at the areas “a” shown.

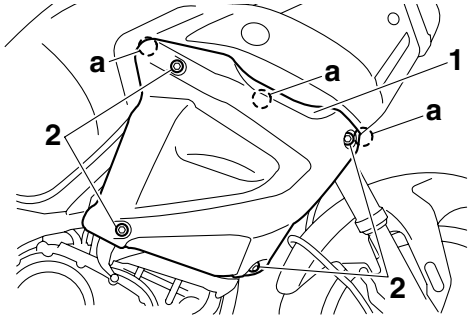


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Remove:
   • Right side cowling “1”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Loosen the quick fastener screws “2”.
b. Pull the cowling off at the areas “a” shown.



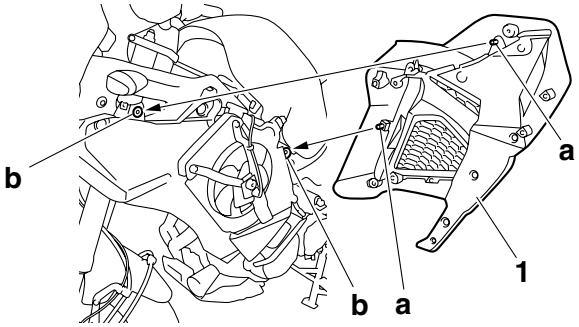
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1006
INSTALLING THE SIDE COWLINGS

1. Install:
   • Left side cowling “1”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Insert the projections “a” on the left side cowling into the grommets “b”.



b. Install the left side cowling bolts and quick fastener screws, and then tighten the bolts to specification.

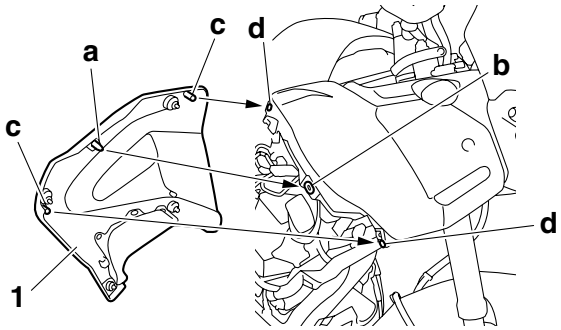
	Left side cowling bolt **1.5 Nm (0.15 m·kgf, 1.1 ft·lbf)**

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   • Right side cowling “1”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

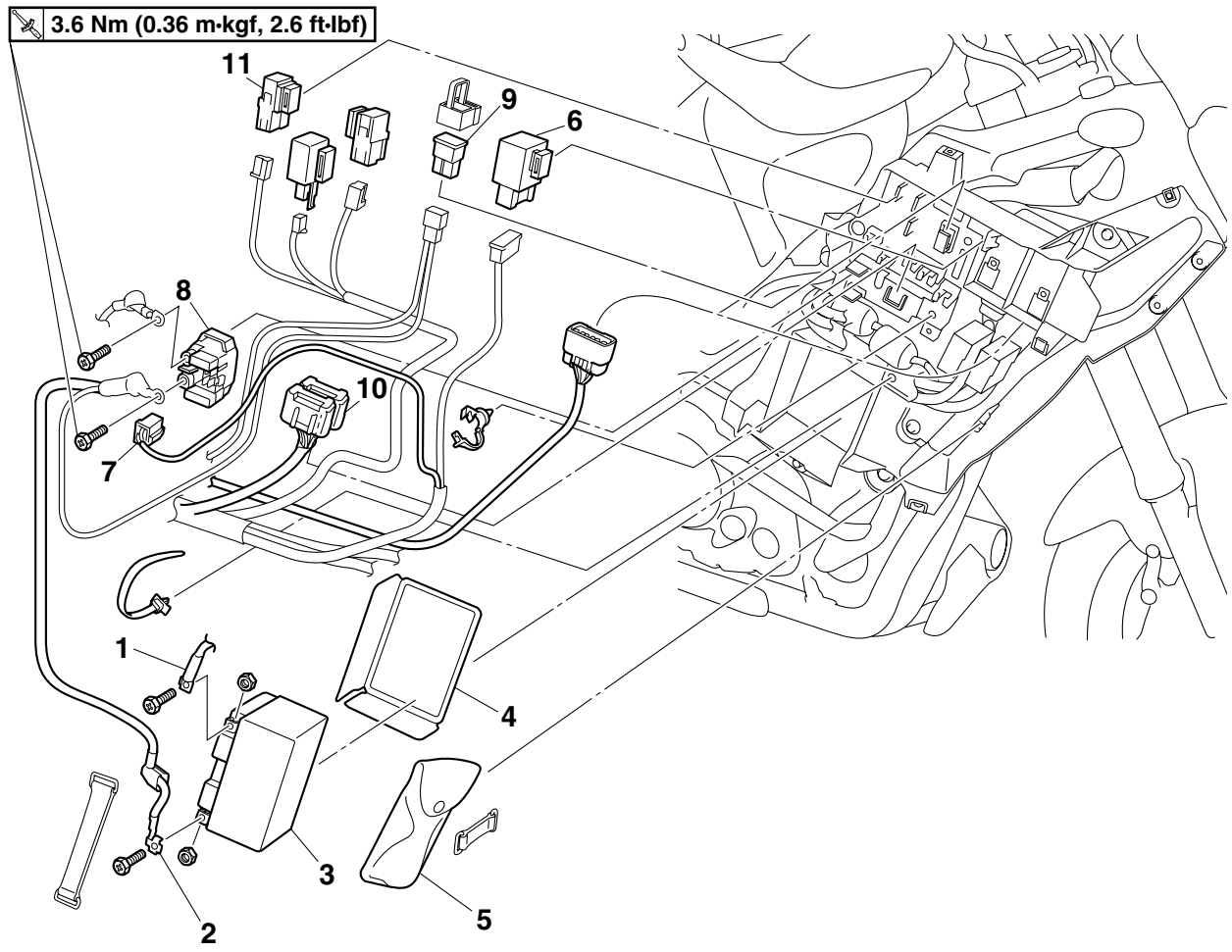
a. Insert the projection “a” on the right side cowling into the grommet “b” and insert the projections “c” on the cowling into the slots “d”.



b. Tighten the quick fastener screws.

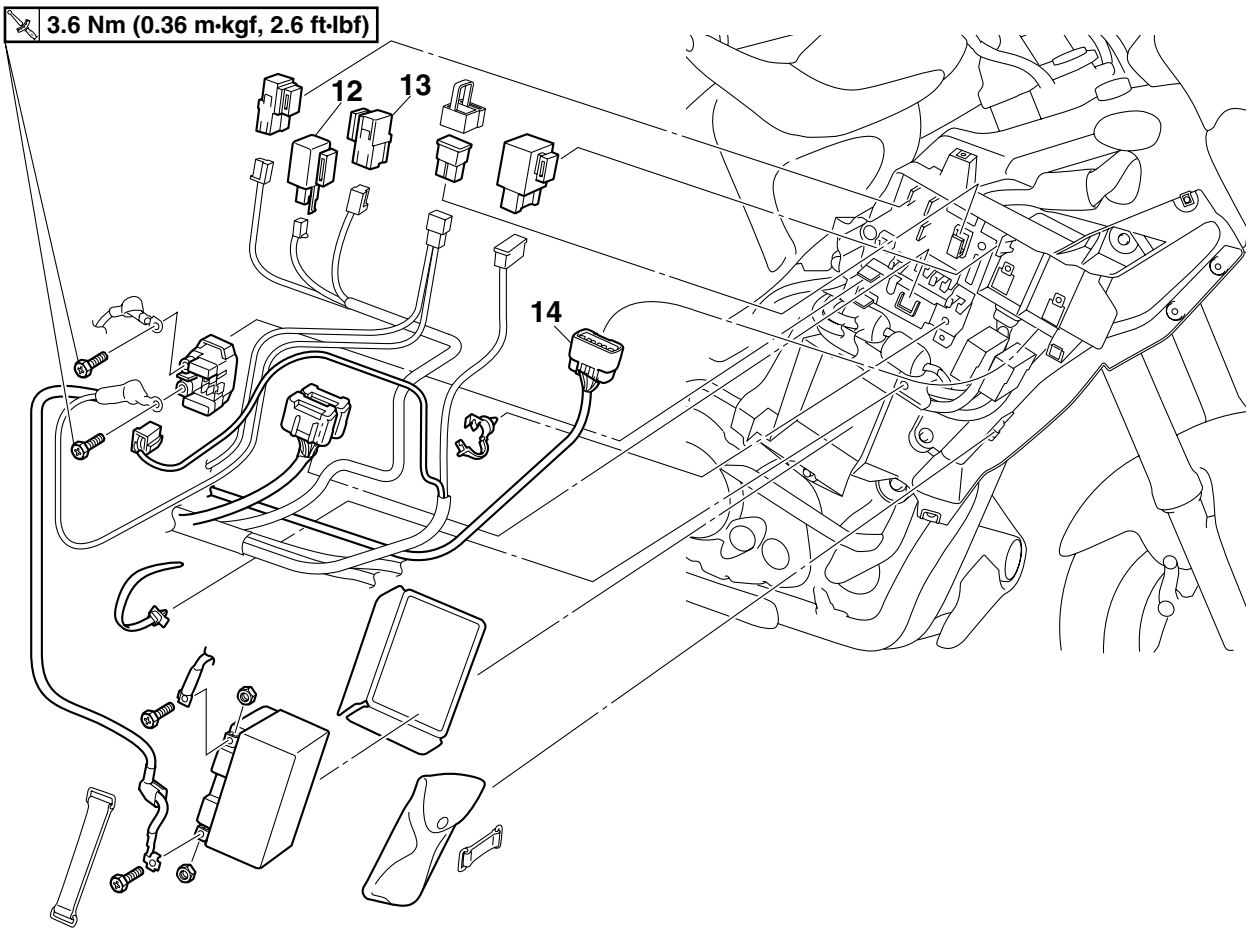
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Removing the electrical components tray 1/2



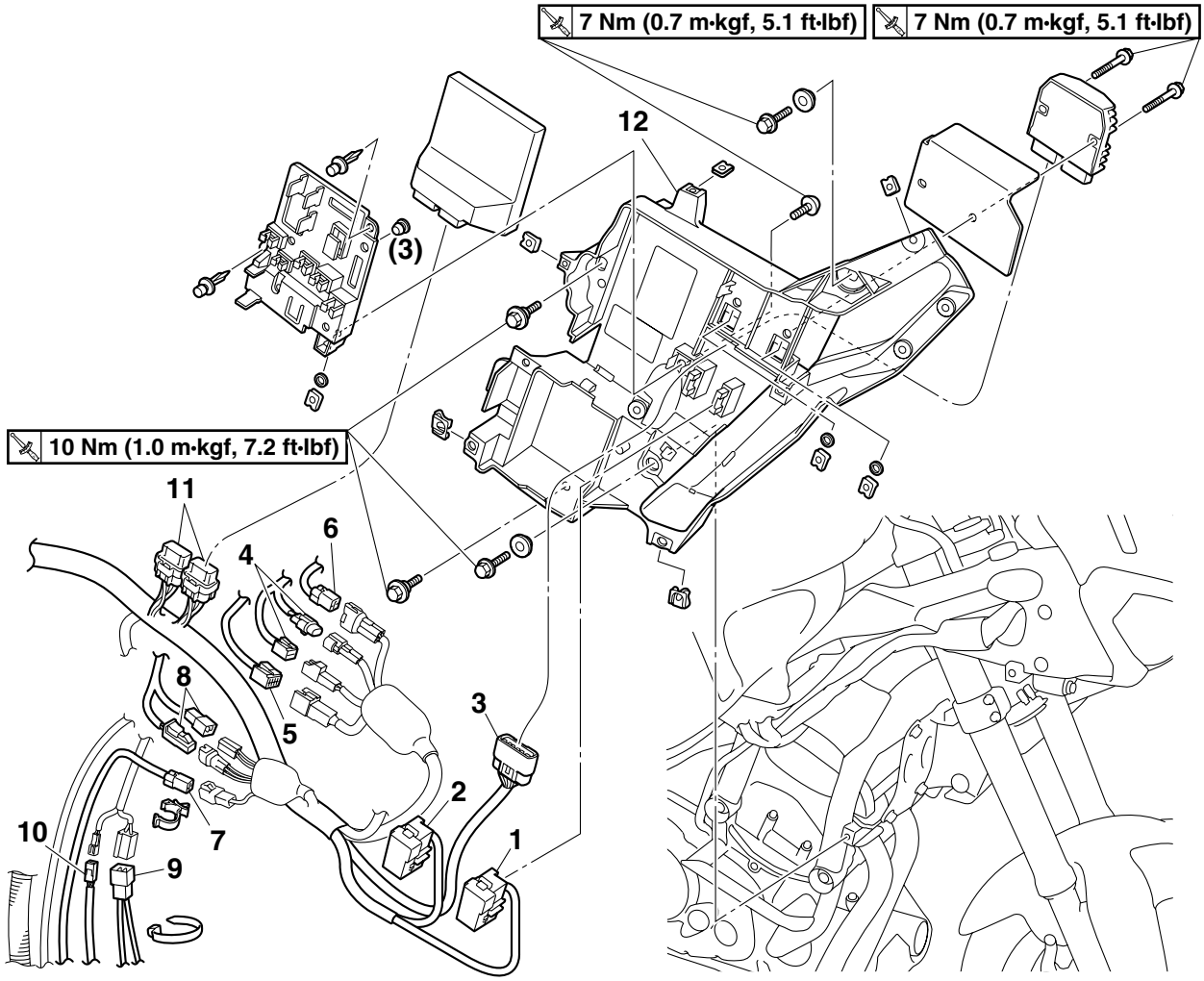
Order	Job/Parts to remove	Q'ty	Remarks
	Right side panel		Refer to "Removing the side cowlings, side panel, and engine guard".
1	Negative battery lead	1	Disconnect.
2	Positive battery lead	1	Disconnect.
3	Battery	1	
4	Battery seat	1	
5	Owner's tool kit	1	
6	Starting circuit cut-off relay	1	
7	Starter relay coupler	1	Disconnect.
8	Starter relay	1	
9	Main fuse	1	
10	Joint coupler	2	Disconnect.
11	Headlight relay	1	

Removing the electrical components tray 1/2



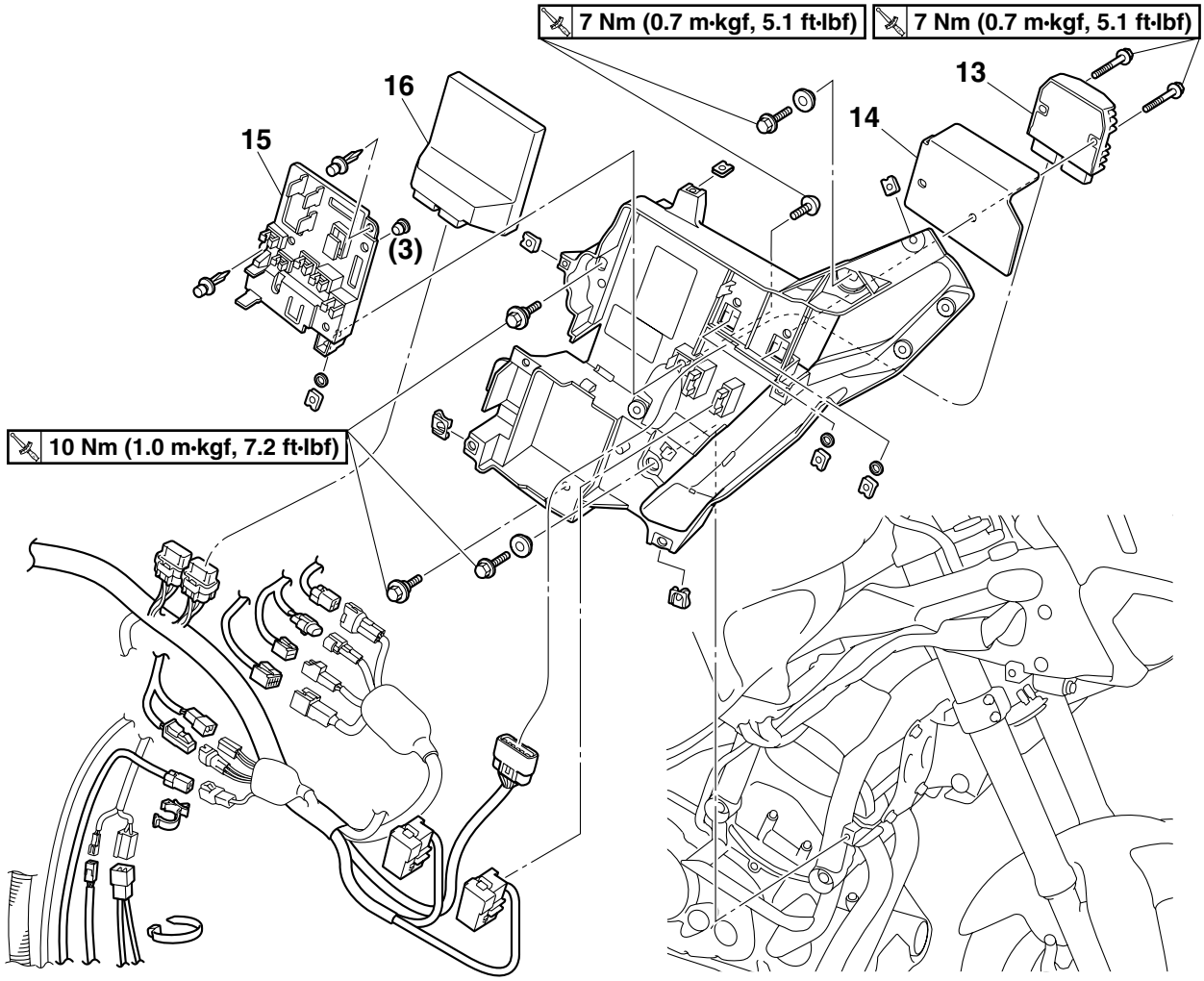
Order	Job/Parts to remove	Q'ty	Remarks
12	Turn signal/hazard relay	1	
13	Radiator fan motor relay	1	
14	Stator coil coupler	1	Disconnect.
			For installation, reverse the removal procedure.

Removing the electrical components tray 2/2



Order	Job/Parts to remove	Q'ty	Remarks
1	Fuse box 1	1	
2	Fuse box 2	1	
3	Rectifier/regulator coupler	1	Disconnect.
4	Right handlebar switch coupler	2	Disconnect.
5	Left handlebar switch coupler	1	Disconnect.
6	O_2 sensor #1 coupler	1	Disconnect.
7	O_2 sensor #2 coupler	1	Disconnect.
8	Main switch coupler	2	Disconnect.
9	Negative battery coupler	1	Disconnect.
10	Crankshaft position sensor coupler	1	Disconnect.
11	ECU coupler	2	Disconnect.
12	Electrical components tray	1	

Removing the electrical components tray 2/2



Order	Job/Parts to remove	Q'ty	Remarks
13	Rectifier/regulator	1	
14	Rectifier/regulator bracket	1	
15	ECU bracket	1	
16	ECU (engine control unit)	1	
			For installation, reverse the removal procedure.

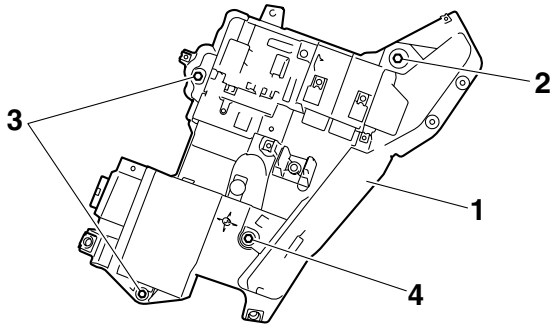
EAS23P1069
INSTALLING THE ELECTRICAL COMPONENTS TRAY

1. Install:
   • Electrical components tray “1”

Electrical components tray bolt “2”
7 Nm (0.7 m·kgf, 5.1 ft·lbf)
Electrical components tray bolt “3” and “4”
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

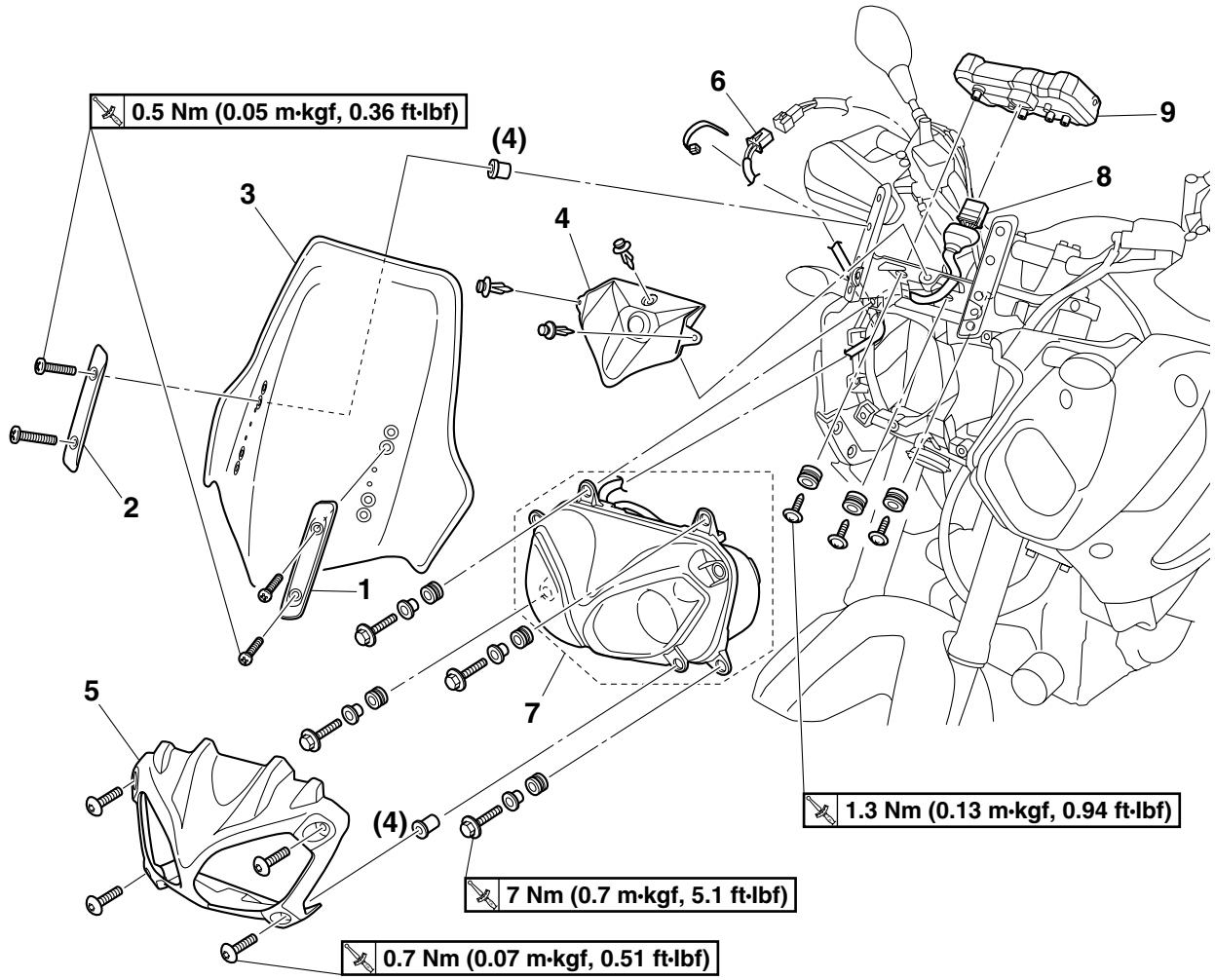
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the electrical components tray bolts “2” and “3” temporarily.
b. Tighten electrical components tray bolts “3”.
c. Tighten electrical components tray bolt “2”.
d. Tighten electrical components tray bolt “4”.



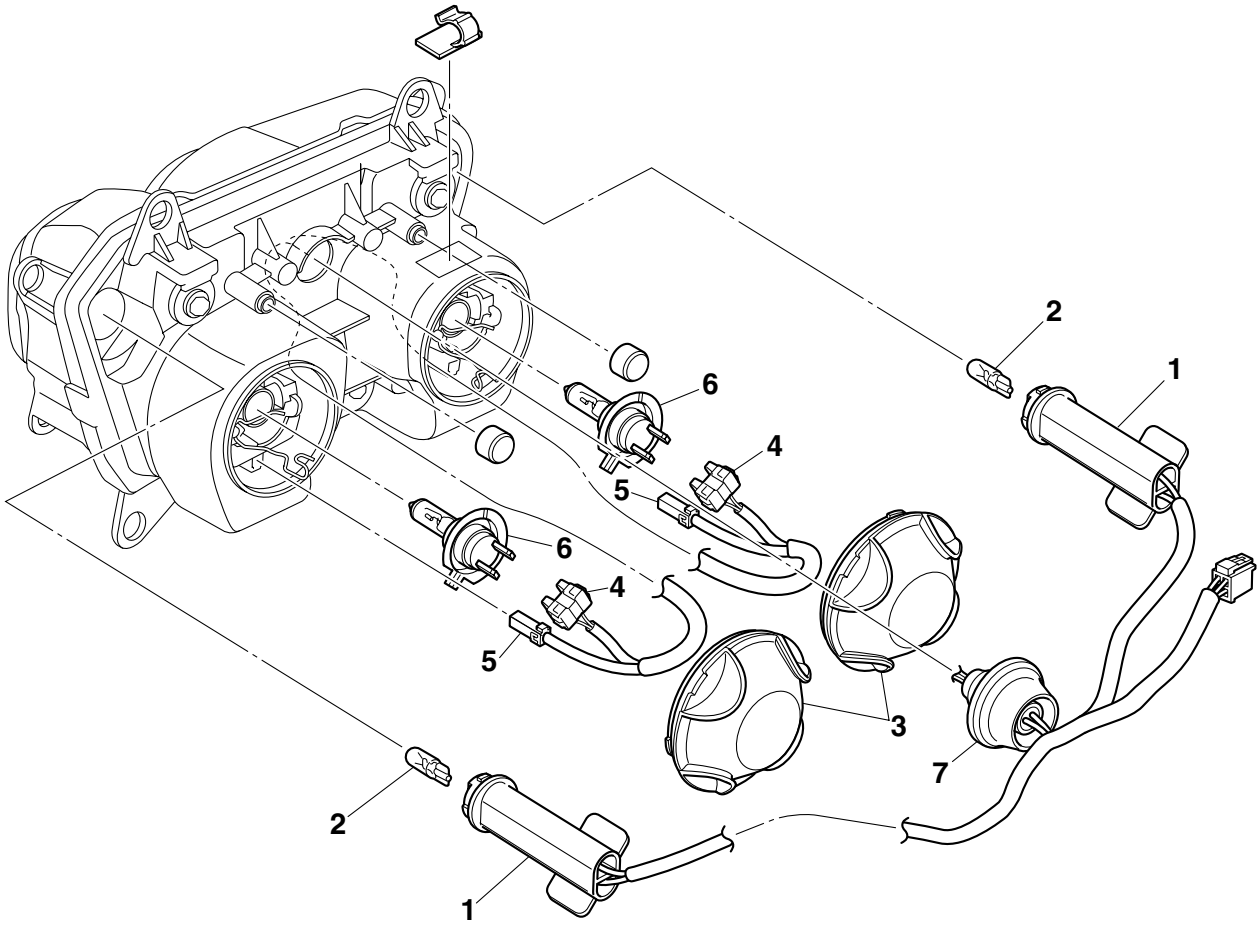
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

Removing the headlight assembly



Order	Job/Parts to remove	Q'ty	Remarks
	Right side panel		Refer to "Removing the side cowlings, side panel, and engine guard".
1	Left windshield bracket	1	
2	Right windshield bracket	1	
3	Windshield	1	
4	Meter assembly cover	1	
5	Headlight cover	1	
6	Headlight sub-wire harness coupler	1	Disconnect.
7	Headlight assembly	1	
8	Meter assembly coupler	1	Disconnect.
9	Meter assembly	1	
			For installation, reverse the removal procedure.

Disassembling the headlight



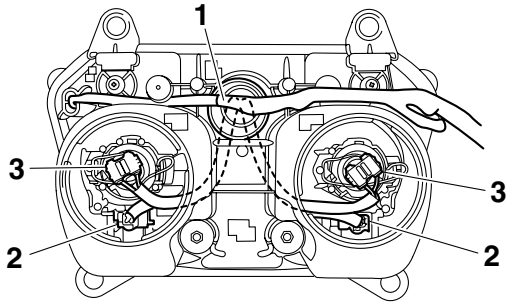
Order	Job/Parts to remove	Q'ty	Remarks
1	Auxiliary light socket	2	
2	Auxiliary light bulb	2	
3	Headlight bulb cover	2	
4	Headlight coupler	2	Disconnect.
5	Headlight solenoid coupler	2	Disconnect.
6	Headlight bulb	2	
7	Headlight sub-wire harness	1	
			For assembly, reverse the disassembly procedure.

EAS23P1012
ASSEMBLING THE HEADLIGHT

1. Install:
   • Headlight sub-wire harness “1”

TIP

Route the headlight sub-wire harness through the hole in the headlight, and then connect the headlight solenoid couplers “2” and headlight couplers “3”.



EAS23P1105
INSTALLING THE HEADLIGHT ASSEMBLY AND WINDSHIELD

1. Install:
   • Headlight assembly

	Headlight assembly bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

2. Connect:
   • Headlight sub-wire harness coupler

TIP

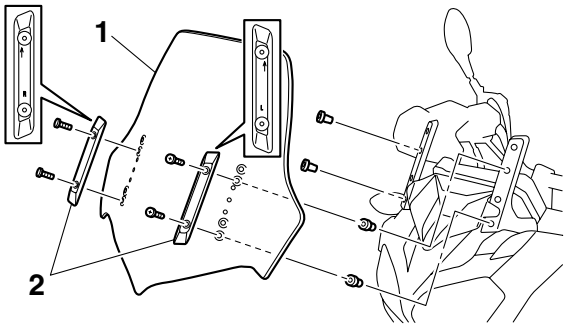
Make sure that the headlight sub-wire harness is routed properly. Refer to “CABLE ROUTING” on page 2-43.

3. Install:
   • Windshield “1”
   • Windshield brackets “2”

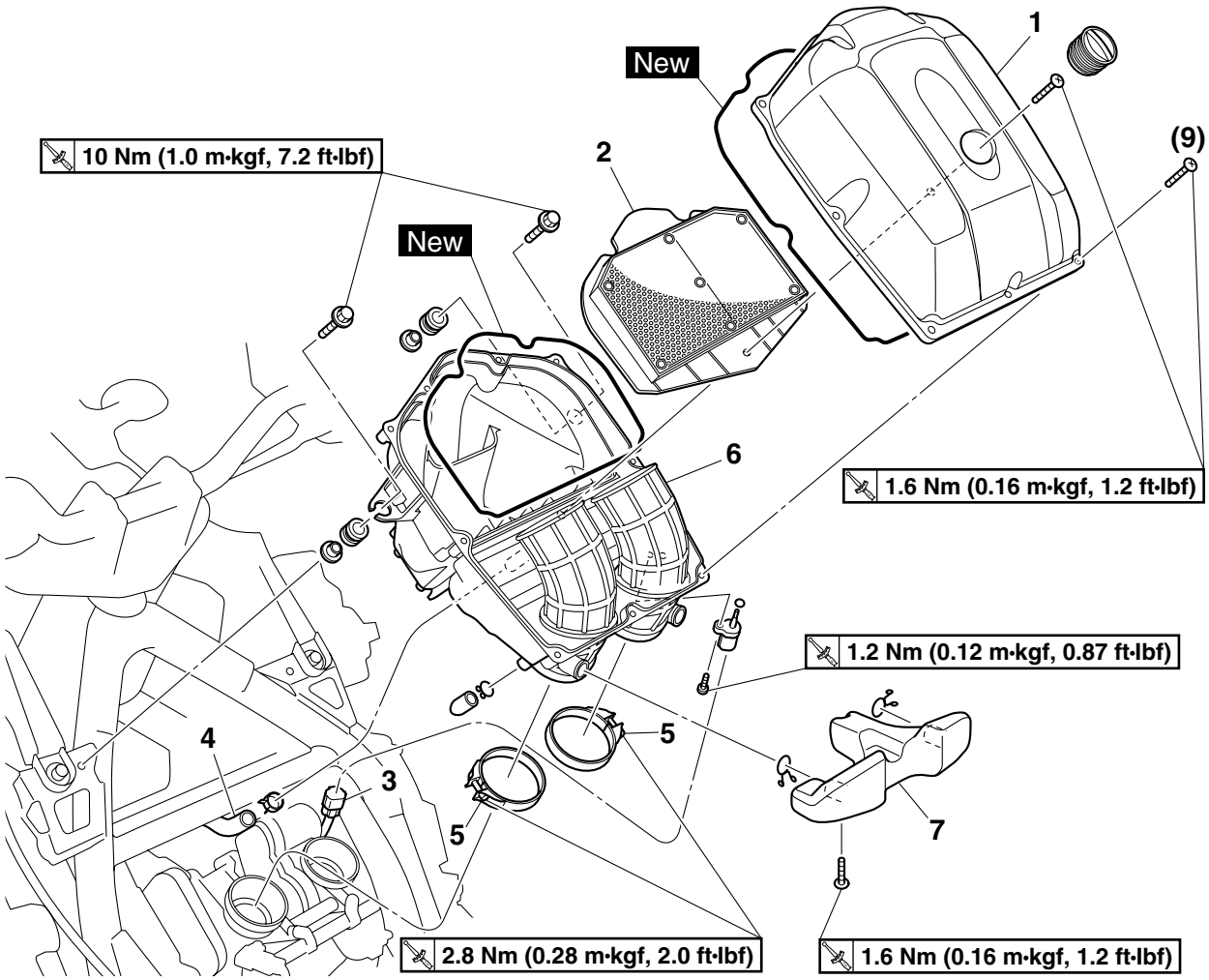
	Windshield screw **0.5 Nm (0.05 m·kgf, 0.36 ft·lbf)**

TIP

- Install the windshield in the position shown in the illustration.
- Install the windshield bracket with the “L” mark on the left side of the windshield and the windshield bracket with the “R” mark on the right side. Point the arrow mark on each windshield bracket upward.



Removing the air filter case



Order	Job/Parts to remove	Q'ty	Remarks
	Rider seat		Refer to "Removing the seats and carriers".
	Left side cowling/Right side panel		Refer to "Removing the side cowlings, side panel, and engine guard".
1	Air filter case cover	1	
2	Air filter element	1	
3	Intake air temperature sensor coupler	1	Disconnect.
4	Cylinder head breather hose	1	Disconnect.
5	Air filter case joint clamp screw	2	Loosen.
6	Air filter case	1	
7	Air chamber	1	
			For installation, reverse the removal procedure.

EAS23P1013
REMOVING THE AIR FILTER CASE

1. Remove:
   - Fuel tank bolts “1”
   - Air filter case

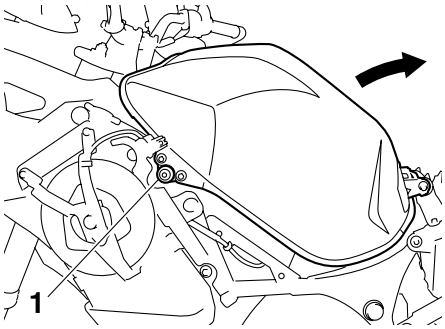
TIP

After removing the fuel tank bolts, lift up the front of the fuel tank.

ECA23P1003

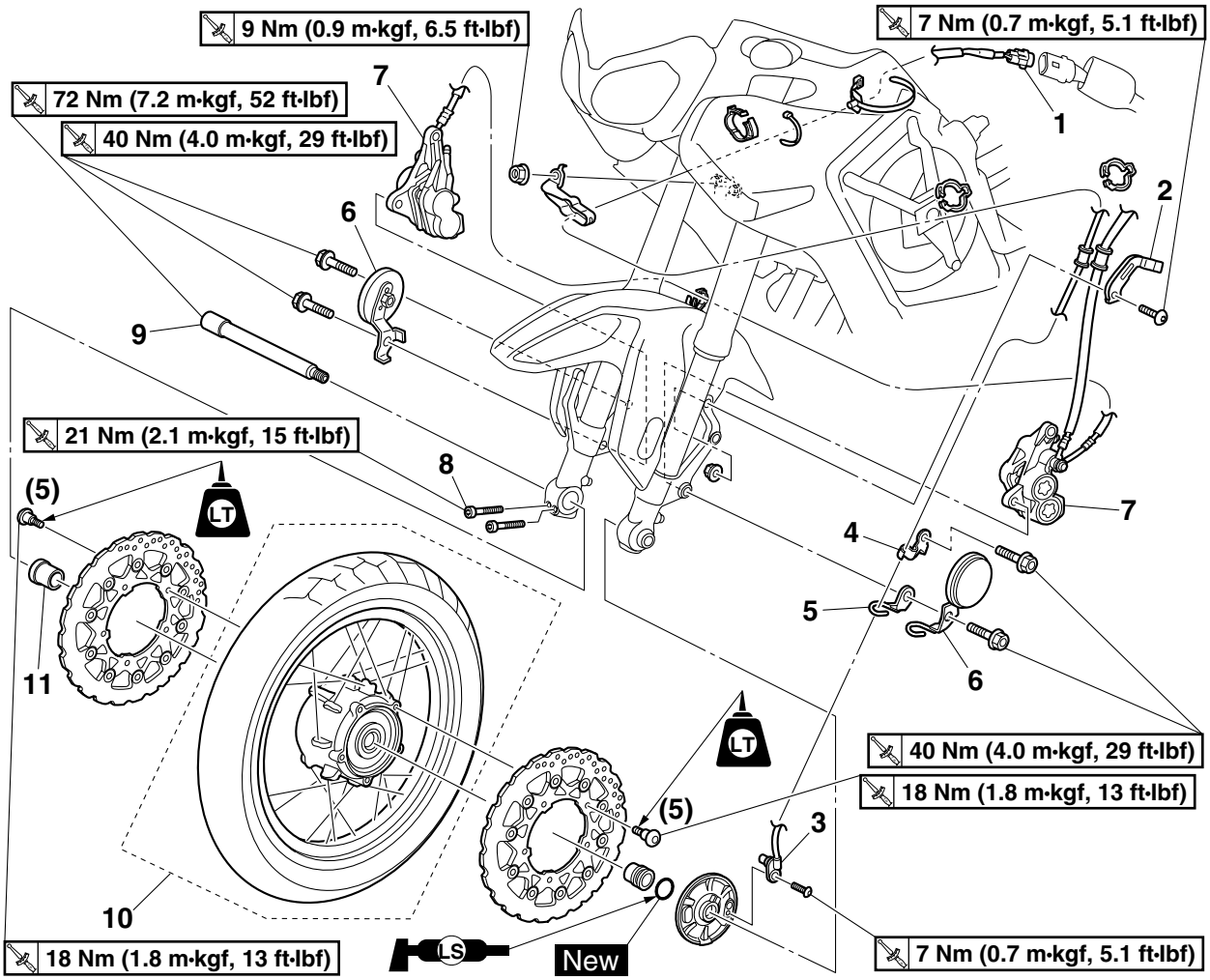
NOTICE

When lifting up the fuel tank, be careful not to pull the fuel tank overflow hose and fuel tank breather hose.



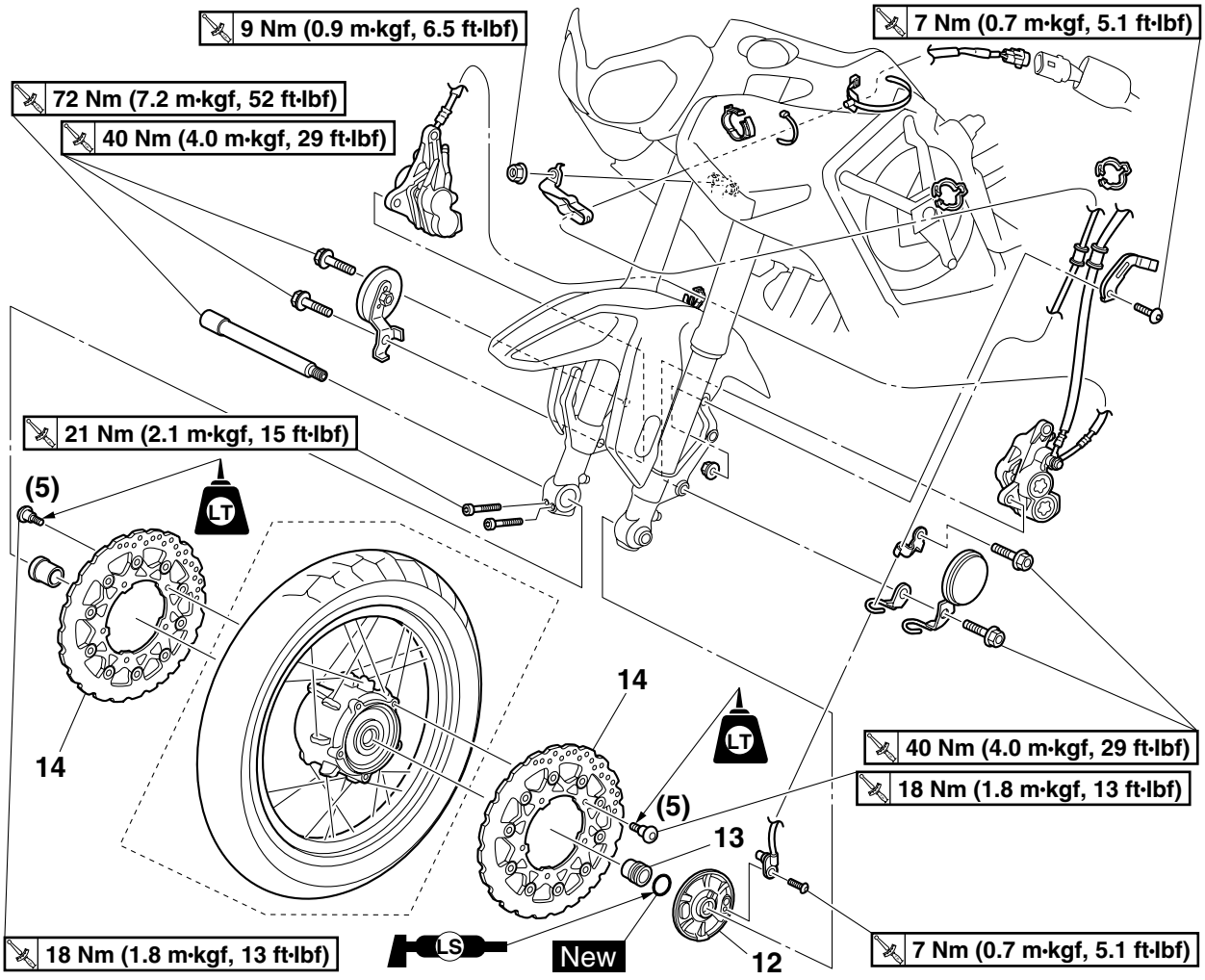
EAS21880
FRONT WHEEL

Removing the front wheel sensor, front wheel and brake discs



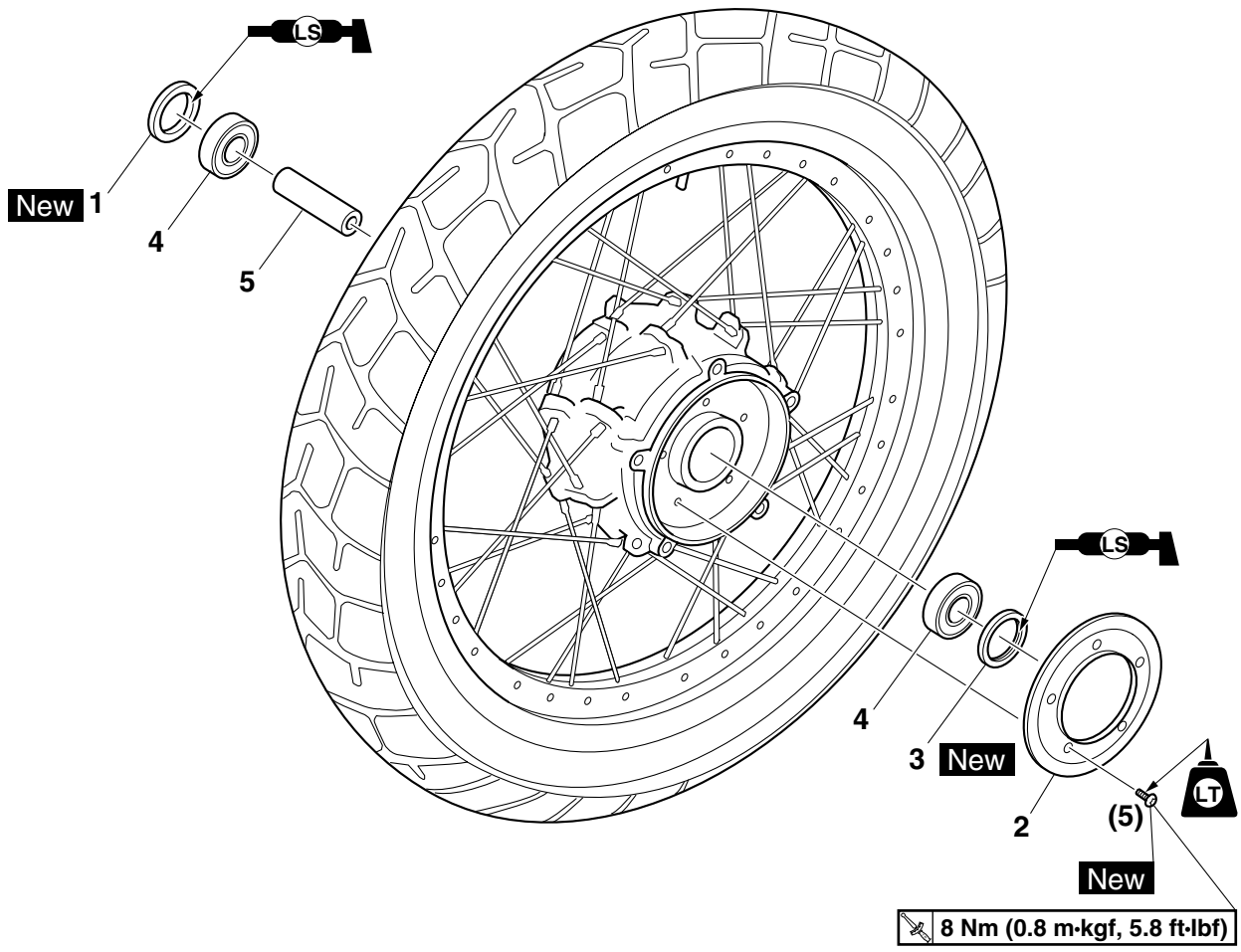
Order	Job/Parts to remove	Q'ty	Remarks
	Air filter case		Refer to "GENERAL CHASSIS" on page 4-1.
1	Front wheel sensor coupler	1	Disconnect.
2	Front brake hose holder	1	
3	Front wheel sensor	1	
4	Front wheel sensor lead holder	1	
5	Front wheel sensor lead guide	1	For Europe
6	Front reflector	2	For Oceania
7	Front brake caliper	2	
8	Front wheel axle pinch bolt	2	Loosen.
9	Front wheel axle	1	
10	Front wheel	1	
11	Collar (right side)	1	

Removing the front wheel sensor, front wheel and brake discs



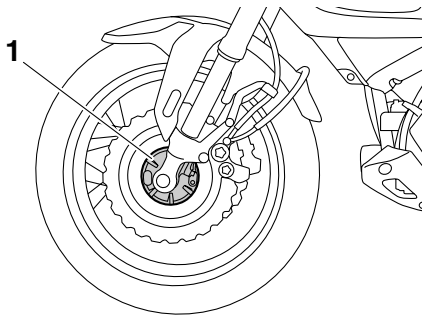
Order	Job/Parts to remove	Q'ty	Remarks
12	Front wheel sensor housing	1	
13	Collar (left side)	1	
14	Front brake disc	2	
			For installation, reverse the removal procedure.

Disassembling the front wheel



Order	Job/Parts to remove	Q'ty	Remarks
1	Oil seal	1	
2	Front wheel sensor rotor	1	
3	Oil seal	1	
4	Wheel bearing	2	
5	Spacer	1	
			For assembly, reverse the disassembly procedure.

EAS21900
REMOVING THE FRONT WHEEL
ECA23P1004
NOTICE
Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the front wheel hub "1", otherwise the wheel sensor rotor equipped in the wheel hub may be damaged, resulting in improper performance of the ABS system.



1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING
Securely support the vehicle so that there is no danger of it falling over.

2. Remove:
   • Front brake calipers

TIP
Do not apply the brake lever when removing the brake calipers.

3. Elevate:
   • Front wheel

TIP
Place the vehicle on a suitable stand so that the front wheel is elevated.

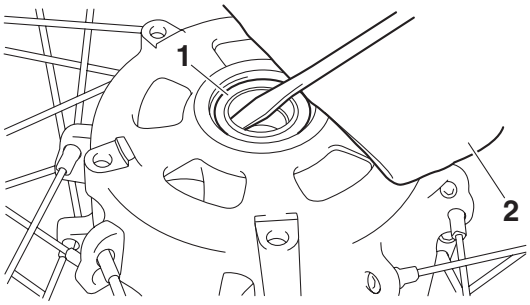
EAS21910
DISASSEMBLING THE FRONT WHEEL
ECA23P1005
NOTICE
- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop the wheel sensor rotor or subject it to shocks.**
- **If any solvent gets on the wheel sensor rotor, wipe it off immediately.**

1. Remove:
   • Oil seals
   • Wheel bearings

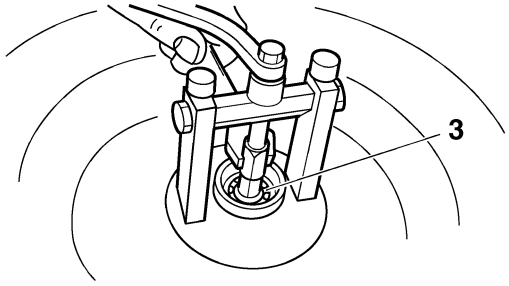
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Clean the outside of the front wheel hub.
b. Remove the oil seals "1" with a flat-head screwdriver.

TIP
To prevent damaging the wheel, place a rag "2" between the screwdriver and the surface of the wheel.



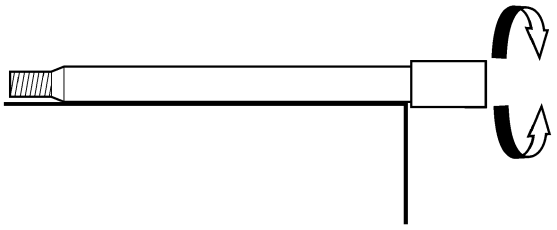
c. Remove the wheel bearings "3" with a general bearing puller.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21932
CHECKING THE FRONT WHEEL
1. Check:
   • Wheel axle
   Roll the wheel axle on a flat surface.
   Bends → Replace.

EWA13460
⚠ WARNING
Do not attempt to straighten a bent wheel axle.



2. Check:
   • Tire

- Front wheel
  Damage/wear → Replace.
  Refer to "CHECKING THE TIRES" on page 3-18 and "CHECKING THE WHEELS" on page 3-17.

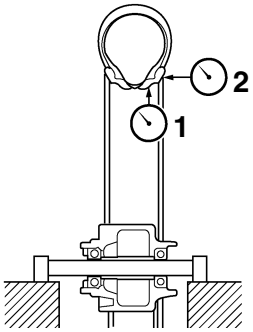
3. Check:
   - Spokes
     Bends/damage → Replace.
     Loose → Tighten.
     Refer to "CHECKING AND TIGHTENING THE SPOKES" on page 3-17.

TIP

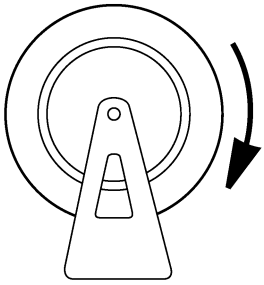
After tightening the spokes, measure the front wheel runout.

4. Measure:
   - Front wheel radial runout "1"
   - Front wheel lateral runout "2"
     Over the specified limits → Replace.

Radial wheel runout limit
2.0 mm (0.08 in)
Lateral wheel runout limit
2.0 mm (0.08 in)



5. Check:
   - Wheel bearings
     Front wheel turns roughly or is loose → Replace the wheel bearings.
   - Oil seals
     Damage/wear → Replace.



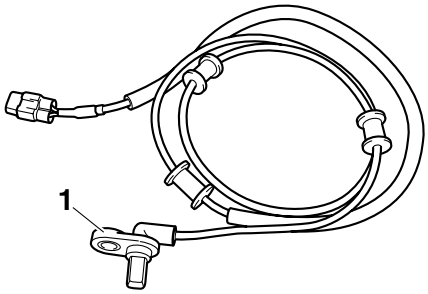
EAS22010
MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR

ECA23P1006

NOTICE

- **Handle the ABS components with care since they have been accurately adjusted. Keep them away from dirt and do not subject them to shocks.**
- **The front wheel sensor cannot be disassembled. Do not attempt to disassemble it. If faulty, replace with a new one.**
- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop or shock the wheel sensor or the wheel sensor rotor.**

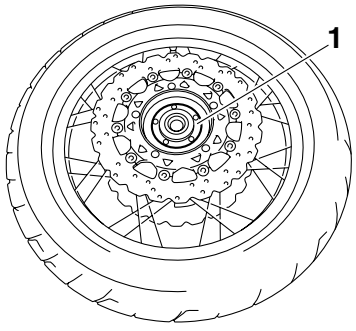
1. Check:
   - Front wheel sensor "1"
     Cracks/bends/distortion → Replace.
     Iron powder/dust → Clean.



2. Check:
   - Front wheel sensor rotor "1"
     Cracks/damage/scratches → Replace the front wheel sensor rotor.
     Iron powder/dust/solvent → Clean.

TIP

- The wheel sensor rotor is installed on the inner side of the wheel hub.
- When cleaning the wheel sensor rotor, be careful not to damage the surface of the rotor magnet.



3. Measure:
   • Wheel sensor rotor deflection
   Out of specification → Clean the installation surface of the wheel sensor rotor and correct the wheel sensor rotor deflection, or replace the wheel sensor rotor.

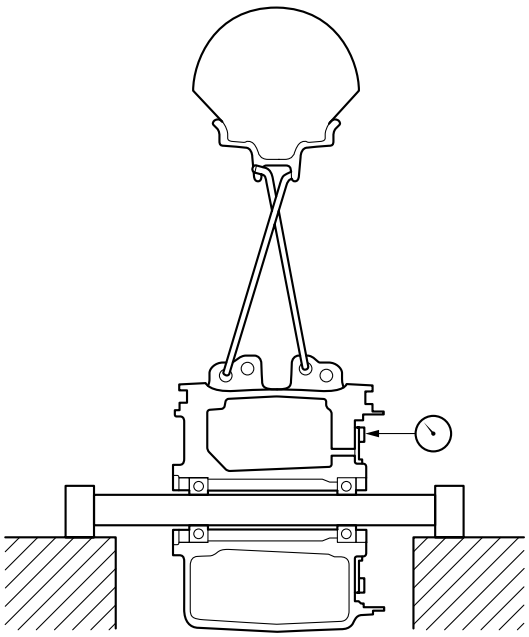
Wheel sensor rotor deflection limit
0.15 mm (0.0059 in)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Hold the dial gauge at a right angle against the wheel sensor rotor surface.
b. Measure the wheel sensor rotor deflection.

TIP

Do not touch the surface of the rotor magnet with a sharp object.



c. If the deflection is above specification, remove the sensor rotor from the wheel, rotate it by two or three bolt holes, and then install it.

Wheel sensor rotor bolt
8 Nm (0.8 m·kgf, 5.8 ft·lbf)
LOCTITE®

ECA23P1007

NOTICE

Replace the wheel sensor rotor bolts with new ones.

d. If the deflection is still above specification, replace the wheel sensor rotor.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS21960

ASSEMBLING THE FRONT WHEEL

ECA23P1008

NOTICE

- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop the wheel sensor rotor or subject it to shocks.**
- **If any solvent gets on the wheel sensor rotor, wipe it off immediately.**

1. Install:
   • Wheel bearings New

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the new wheel bearing (left side).

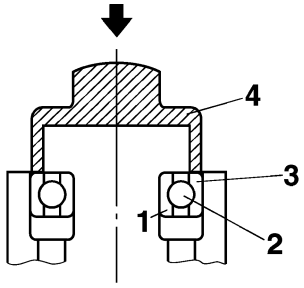
ECA23P1009

NOTICE

Do not contact the wheel bearing inner race "1" or balls "2". Contact should be made only with the outer race "3".

TIP

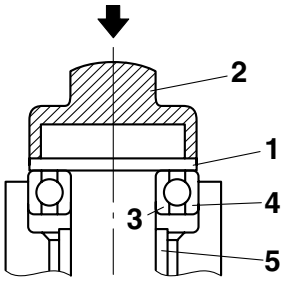
Use a socket "4" that matches the diameter of the wheel bearing outer race.



b. Install the spacer.
c. Install the new wheel bearing (right side).

TIP

Place a suitable washer "1" between the socket "2" and the bearing so that both the inner race "3" and outer race "4" are pressed at the same time, and then press the bearing until the inner race makes contact with the spacer "5".



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   • Front wheel sensor rotor

	Front wheel sensor rotor bolt **8 Nm (0.8 m·kgf, 5.8 ft·lbf)** **LOCTITE®**

ECA23P1010

NOTICE

Replace the wheel sensor rotor bolts with new ones.

3. Measure:
   • Wheel sensor rotor deflection
   Out of specification → Correct the wheel sensor rotor deflection or replace the wheel sensor rotor.
   Refer to "MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR" on page 4-24.

	Wheel sensor rotor deflection limit **0.15 mm (0.0059 in)**

EAS21970

ADJUSTING THE FRONT WHEEL STATIC BALANCE

TIP

- After replacing the tire, wheel, or both, the front wheel static balance should be adjusted.
- Adjust the front wheel static balance with the brake discs installed.

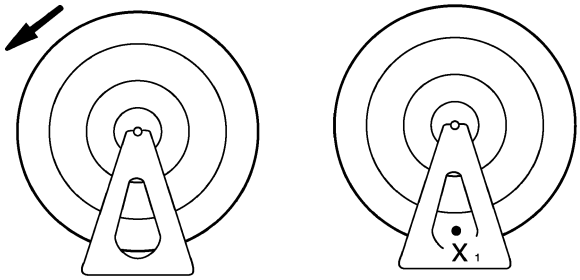
1. Remove:
   • Balancing weight(s)
2. Find:
   • Front wheel's heavy spot

TIP

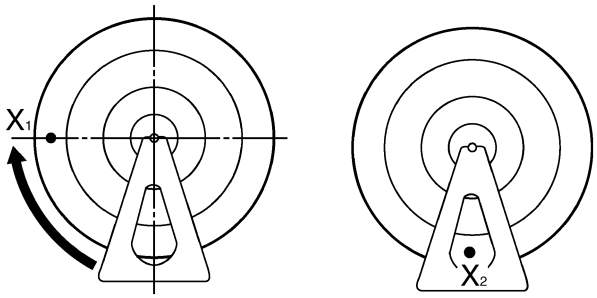
Place the front wheel on a suitable balancing stand.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Spin the front wheel.
b. When the front wheel stops, put an "X_1" mark at the bottom of the wheel.



c. Turn the front wheel 90° so that the "X_1" mark is positioned as shown.
d. Release the front wheel.
e. When the wheel stops, put an "X_2" mark at the bottom of the wheel.



f. Repeat steps (c) through (e) several times until all the marks come to rest at the same spot.
g. The spot where all the marks come to rest is the front wheel's heavy spot "X".

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

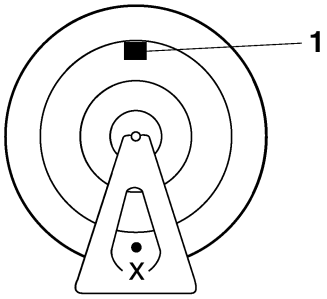
3. Adjust:
   • Front wheel static balance

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

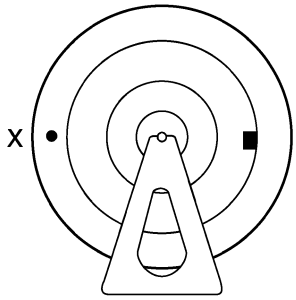
a. Install a balancing weight "1" onto the rim exactly opposite the heavy spot "X".

TIP

Start with the lightest weight.



b. Turn the front wheel 90° so that the heavy spot is positioned as shown.



c. If the heavy spot does not stay in that position, install a heavier weight.
d. Repeat steps (b) and (c) until the front wheel is balanced.

TIP

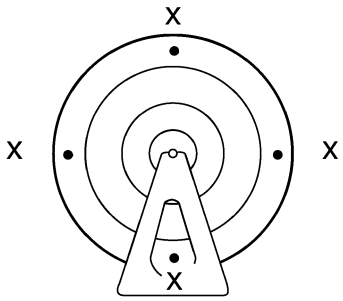
Install up to four balancing weights on the rim. When installing three or four balancing weights, install the third and fourth weights on the opposite side of the rim.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Check:
   • Front wheel static balance

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the front wheel and make sure it stays at each position shown.



b. If the front wheel does not remain stationary at all of the positions, rebalance it.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS22000

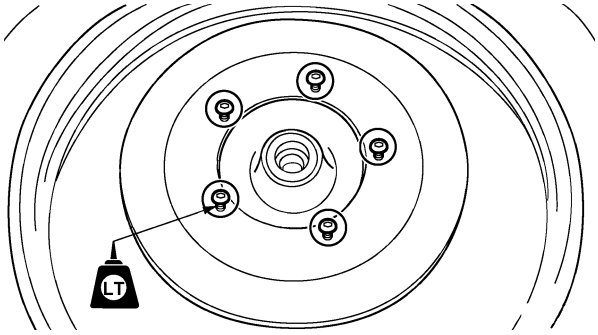
INSTALLING THE FRONT WHEEL (FRONT BRAKE DISCS)

1. Install:
   • Front brake discs

	Front brake disc bolt **18 Nm (1.8 m·kgf, 13 ft·lbf)** **LOCTITE®**

TIP

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



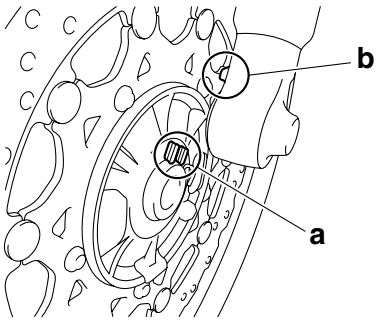
2. Check:
   • Front brake discs
   Refer to "CHECKING THE FRONT BRAKE DISCS" on page 4-44.
3. Lubricate:
   • Oil seal lips

	Recommended lubricant **Lithium-soap-based grease**

4. Install:
   • Collars
   • Front wheel sensor housing
   • Front wheel

TIP

Align the slot "a" in the front wheel sensor housing with the projection "b" of the front fork before assembly.



5. Install:
   • Front wheel axle
   • Front wheel axle pinch bolts

	Front wheel axle **72 Nm (7.2 m·kgf, 52 ft·lbf)** **Front wheel axle pinch bolt** **21 Nm (2.1 m·kgf, 15 ft·lbf)**

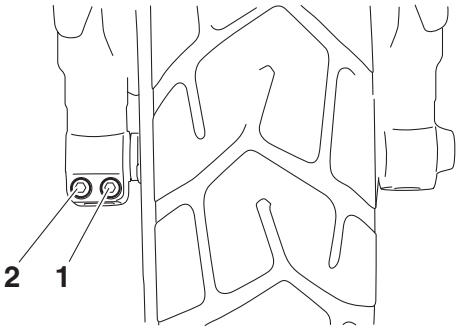
ECA23P1011

NOTICE

Before tightening the wheel axle, push down hard on the handlebars several times and check if the front fork rebounds smoothly.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Insert the front wheel axle from the right side and tighten it to 72 Nm (7.2 m·kgf, 52 ft·lbf).
b. In the order pinch bolt "1" → pinch bolt "2" → pinch bolt "1", tighten each bolt to 21 Nm (2.1 m·kgf, 15 ft·lbf) without performing temporary tightening.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

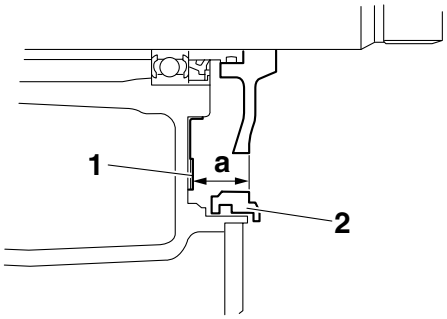
6. Measure:

TIP

Measure the distance "a" only if the wheel bearings, wheel sensor rotor, or both were replaced.

- Distance "a"
  (between the wheel sensor rotor "1" and wheel sensor housing "2")
  Out of specification → Reinstall the bearing or replace the wheel sensor rotor.

Distance "a" (between the wheel sensor rotor and wheel sensor housing)
18.0–18.2 mm (0.71–0.72 in)



7. Install:
   - Front brake calipers
   - Front reflectors (for Oceania)
   - Front wheel sensor lead guide (for Europe)
   - Front wheel sensor lead holder
   - Front wheel sensor
   - Front brake hose holder

Front brake caliper bolt
40 Nm (4.0 m·kgf, 29 ft·lbf)
Front wheel sensor bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)
Front brake hose holder bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)

TIP

When installing the front wheel sensor, check the wheel sensor lead for twists and the sensor electrode for foreign materials.

ECA23P1012

NOTICE

- **Make sure there are no foreign materials in the wheel hub. Foreign materials cause damage to the inner sensor rotor and wheel sensor.**
- **To route the front wheel sensor lead, refer to "CABLE ROUTING" on page 2-43.**

EWA13500

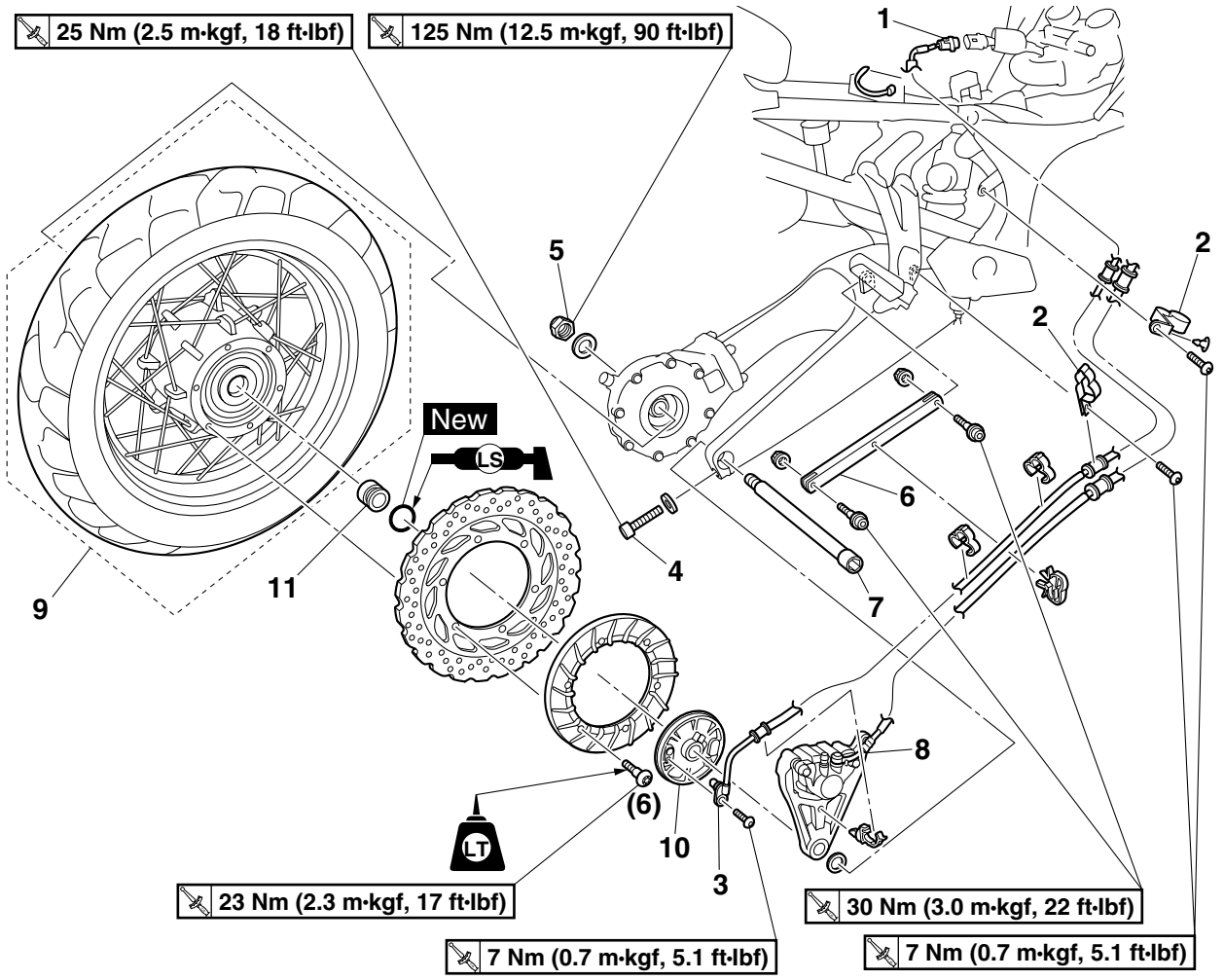
⚠ WARNING

Make sure the brake hose is routed properly.

8. Check:
   - Front wheel sensor installation
     Check if the wheel sensor housing is installed properly.

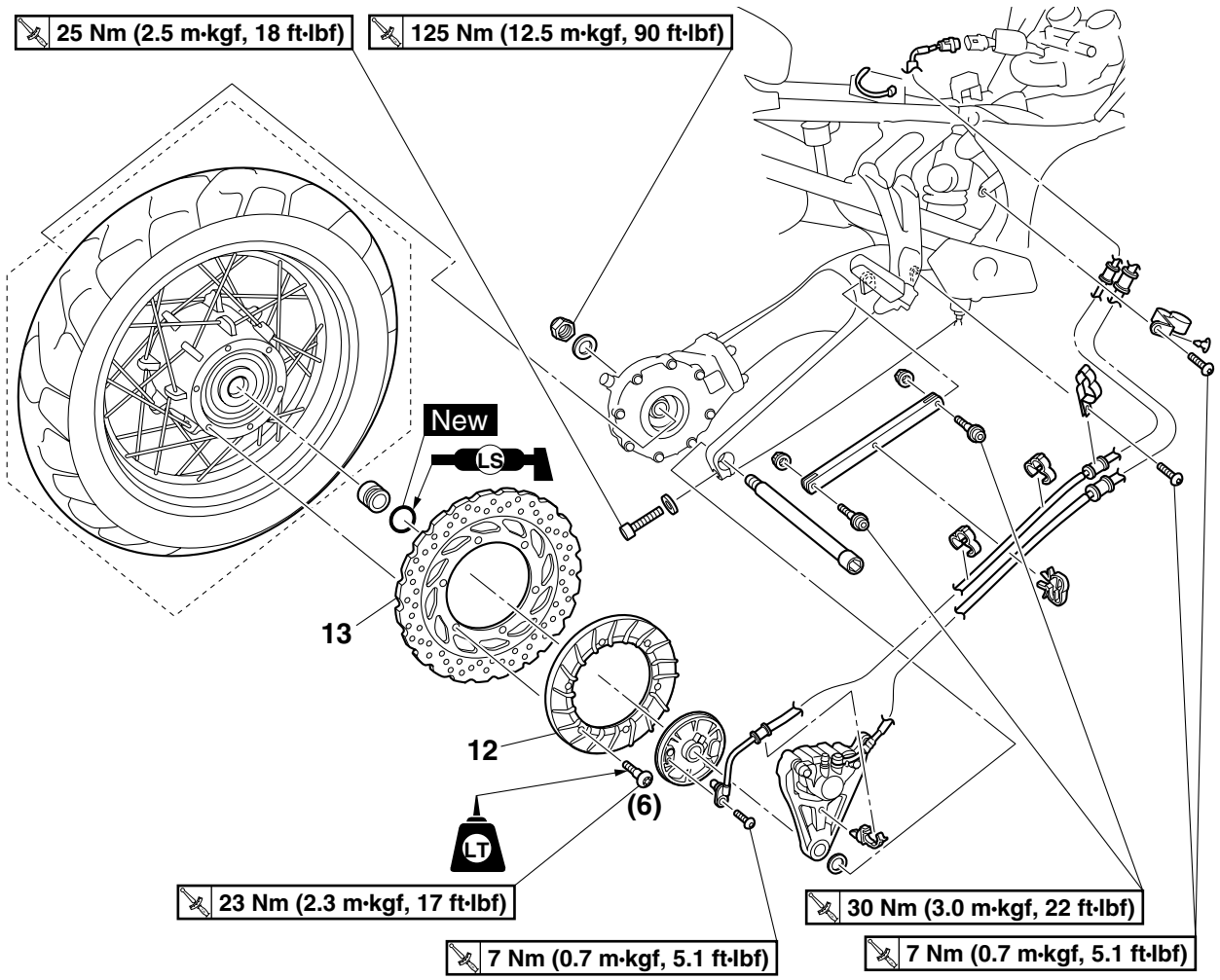
EAS22030
REAR WHEEL

Removing the rear wheel sensor, rear wheel and brake disc



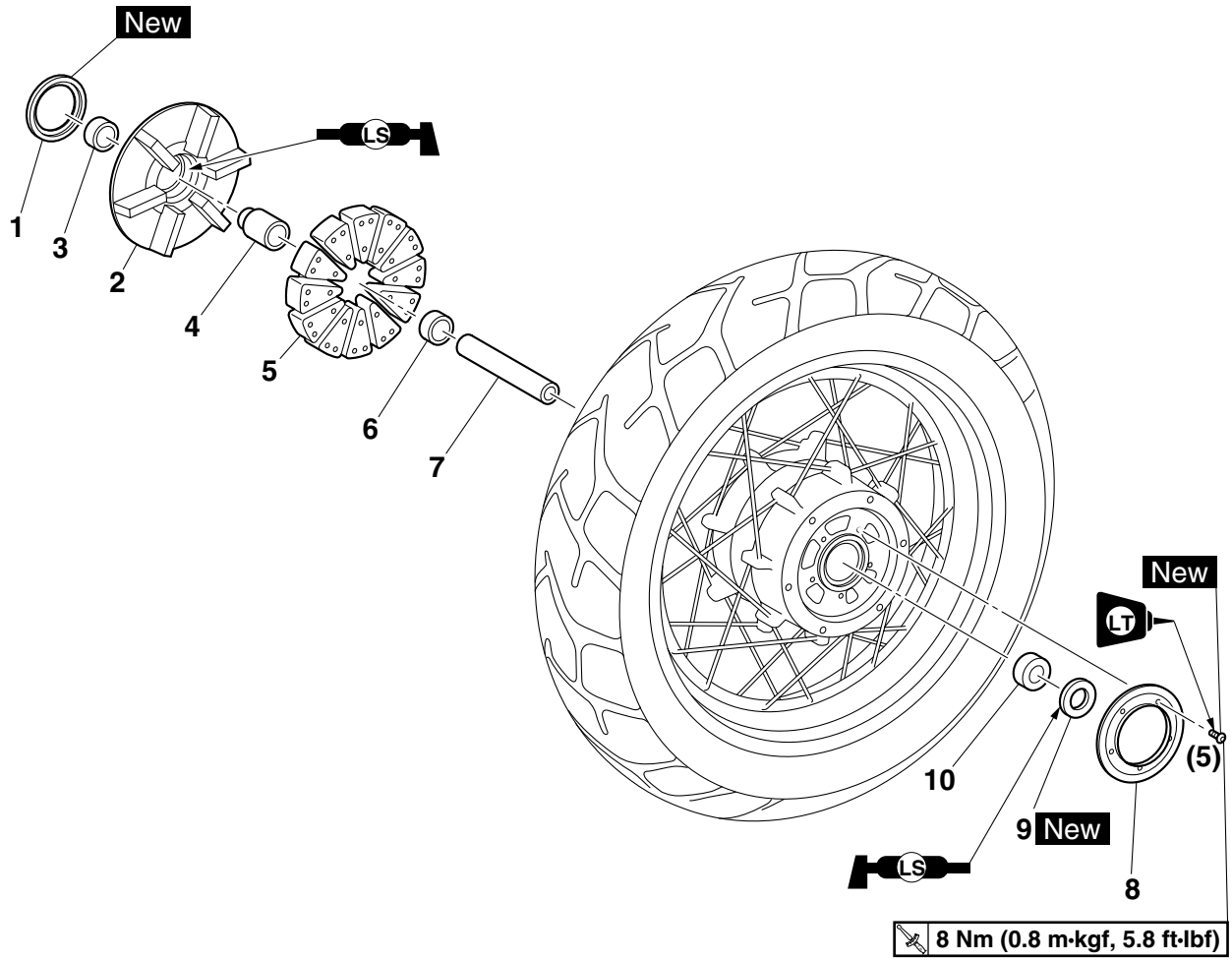
Order	Job/Parts to remove	Q'ty	Remarks
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
1	Rear wheel sensor coupler	1	Disconnect.
2	Rear brake hose holder	2	
3	Rear wheel sensor	1	
4	Rear wheel axle pinch bolt	1	Loosen.
5	Rear wheel axle nut	1	
6	Brake torque rod	1	
7	Rear wheel axle	1	
8	Rear brake caliper	1	
9	Rear wheel	1	
10	Rear wheel sensor housing	1	
11	Collar	1	

Removing the rear wheel sensor, rear wheel and brake disc



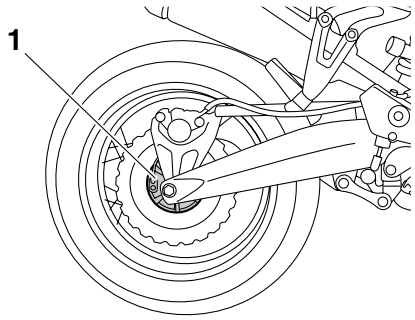
Order	Job/Parts to remove	Q'ty	Remarks
12	Rear brake disc cover	1	
13	Rear brake disc	1	
			For installation, reverse the removal procedure.

Disassembling the rear wheel



Order	Job/Parts to remove	Q'ty	Remarks
1	Dust seal	1	
2	Rear wheel drive hub	1	
3	Wheel bearing	1	
4	Collar	1	
5	Rear wheel drive hub damper	6	
6	Bearing	1	
7	Spacer	1	
8	Rear wheel sensor rotor	1	
9	Oil seal	1	
10	Wheel bearing	1	
			For assembly, reverse the disassembly procedure.

EAS22050
REMOVING THE REAR WHEEL
ECA23P1013
NOTICE
Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the rear wheel hub "1", otherwise the wheel sensor rotor equipped in the wheel hub may be damaged, resulting in improper performance of the ABS system.



1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING
Securely support the vehicle so that there is no danger of it falling over.

TIP
Place the vehicle on the centerstand so that the rear wheel is elevated.

2. Remove:
   - Rear wheel sensor
   - Rear wheel axle nut
   - Brake torque rod
   - Rear wheel axle
   - Rear brake caliper
   - Rear wheel
   - Rear wheel sensor housing
   - Collar

ECA23P1014
NOTICE
- **Do not operate the brake pedal when removing the brake caliper.**
- **Be sure to remove the rear wheel sensor before removing the rear wheel sensor housing, otherwise the sensor could be damaged.**

TIP
Move the rear wheel to the right to separate it from the final drive assembly.

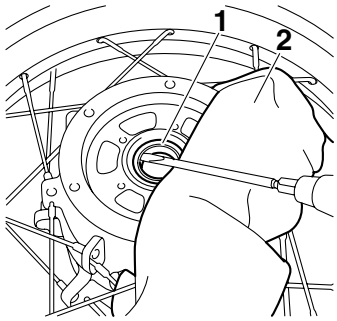
EAS22080
DISASSEMBLING THE REAR WHEEL
ECA23P1015
NOTICE
- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop the wheel sensor rotor or subject it to shocks.**
- **If any solvent gets on the wheel sensor rotor, wipe it off immediately.**

1. Remove:
   - Oil seal
   - Wheel bearings

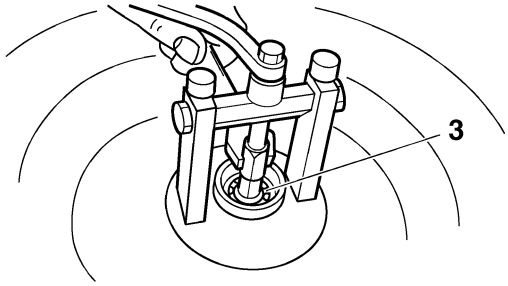
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Clean the surface of the rear wheel hub.
b. Remove the oil seal "1" with a flathead screwdriver.

TIP
To prevent damaging the wheel or wheel sensor rotor, place a rag "2" between the screwdriver and the surface of the wheel or rotor.



c. Remove the wheel sensor rotor.
d. Remove the wheel bearings "3" with a general bearing puller.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS22101
CHECKING THE REAR WHEEL
1. Check:
   - Wheel axle
   - Wheel bearings
   - Dust seal

- Oil seal
  Refer to “CHECKING THE FRONT WHEEL” on page 4-23.

2. Check:
   - Tire
   - Rear wheel
     Damage/wear → Replace.
     Refer to “CHECKING THE TIRES” on page 3-18 and “CHECKING THE WHEELS” on page 3-17.
3. Check:
   - Spokes
     Refer to “CHECKING AND TIGHTENING THE SPOKES” on page 3-17.
4. Measure:
   - Radial wheel runout
   - Lateral wheel runout
     Refer to “CHECKING THE FRONT WHEEL” on page 4-23.

Radial wheel runout limit
2.0 mm (0.08 in)
Lateral wheel runout limit
2.0 mm (0.08 in)

EAS22200
MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR

ECA23P1016
NOTICE

- **Handle the ABS components with care since they have been accurately adjusted. Keep them away from dirt and do not subject them to shocks.**
- **The rear wheel sensor cannot be disassembled. Do not attempt to disassemble it. If faulty, replace with a new one.**
- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop or shock the wheel sensor or the wheel sensor rotor.**

1. Check:
   - Rear wheel sensor
     Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.
2. Check:
   - Rear wheel sensor rotor
     Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.
3. Measure:
   - Wheel sensor rotor deflection
     Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.

EAS22140
ASSEMBLING THE REAR WHEEL

ECA23P1018
NOTICE

- **Keep magnets (including magnetic pick-up tools, magnetic screwdrivers, etc.) away from the wheel sensor rotor.**
- **Do not drop the wheel sensor rotor or subject it to shocks.**
- **If any solvent gets on the wheel sensor rotor, wipe it off immediately.**

1. Install:
   - Wheel bearing New
   - Bearing New

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

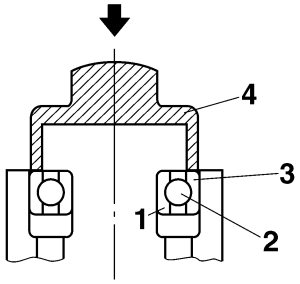
a. Install the new wheel bearing. (right side)

ECA23P1059
NOTICE

Do not contact the wheel bearing inner race “1” or balls “2”. Contact should be made only with the outer race “3”.

TIP

Use a socket “4” that matches the diameter of the wheel bearing outer race.

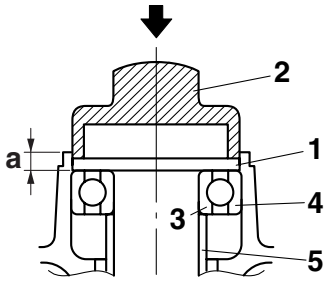


b. Install the spacer.
c. Install the new bearing. (left side)

TIP

Place a suitable washer “1” between the socket “2” and the bearing so that both the inner race “3” and outer race “4” are pressed at the same time, and then press the bearing until the inner race makes contact with the spacer “5”.

Installed depth of bearing “a”
5.9 mm (0.23 in)



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   • Rear wheel sensor rotor

Rear wheel sensor rotor bolt
8 Nm (0.8 m·kgf, 5.8 ft·lbf)
LOCTITE®

ECA23P1019

NOTICE

Replace the wheel sensor rotor bolts with new ones.

3. Measure:
   • Wheel sensor rotor deflection
   Out of specification → Correct the wheel sensor rotor deflection or replace the wheel sensor rotor.
   Refer to "MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR" on page 4-33.

Wheel sensor rotor deflection limit
0.15 mm (0.0059 in)

EAS22150

ADJUSTING THE REAR WHEEL STATIC BALANCE

TIP

- After replacing the tire, wheel or both, the rear wheel static balance should be adjusted.
- Adjust the rear wheel static balance with the brake disc and rear wheel drive hub installed.

1. Adjust:
   • Rear wheel static balance
   Refer to "ADJUSTING THE FRONT WHEEL STATIC BALANCE" on page 4-26.

EAS22170

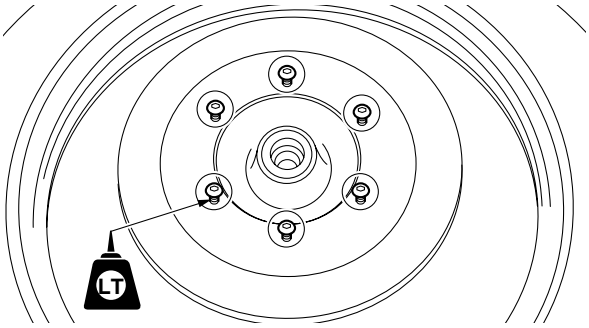
INSTALLING THE REAR WHEEL (REAR BRAKE DISC)

1. Install:
   • Rear brake disc
   • Rear brake disc cover

Rear brake disc bolt
23 Nm (2.3 m·kgf, 17 ft·lbf)
LOCTITE®

TIP

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



2. Check:
   • Rear brake disc
   Refer to "CHECKING THE REAR BRAKE DISC" on page 4-59.
3. Lubricate:
   • Oil seal lips

Recommended lubricant
Lithium-soap-based grease

4. Install:
   • Rear wheel sensor housing
   • Rear wheel
   • Rear brake caliper
   • Rear wheel axle
   • Brake torque rod
   • Rear wheel axle nut

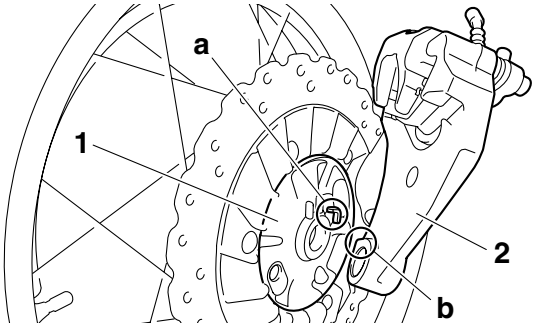
TIP

Align the slot "a" of the rear wheel sensor housing "1" with the projection "b" of the rear brake caliper bracket "2", and then assemble them.

ECA14470

NOTICE

Make sure there are no foreign materials in the wheel hub. Foreign materials cause damage to the inner sensor rotor and wheel sensor.



5. Tighten:
   - Brake torque rod bolts
   - Rear wheel axle nut
   - Rear wheel axle pinch bolt

Brake torque rod bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)
Rear wheel axle nut
125 Nm (12.5 m·kgf, 90 ft·lbf)
Rear wheel axle pinch bolt
25 Nm (2.5 m·kgf, 18 ft·lbf)

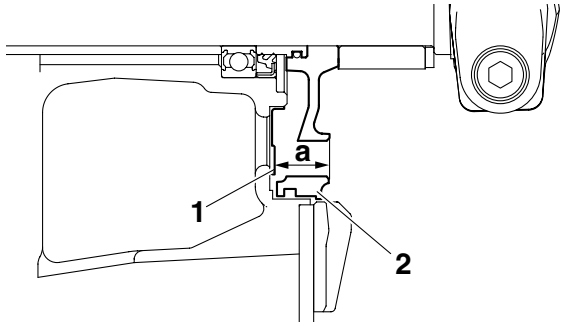
6. Measure:

TIP

Measure the distance "a" only if the wheel bearings, wheel sensor rotor, or both were replaced.

   - Distance "a"
     (between the wheel sensor rotor "1" and wheel sensor housing "2")
     Out of specification → Reinstall the bearing or replace the wheel sensor rotor.

Distance "a" (between the wheel sensor rotor and wheel sensor housing)
18.0–18.2 mm (0.71–0.72 in)



7. Install:
   - Rear wheel sensor

Rear wheel sensor bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)

ECA23P1017

NOTICE

To route the rear wheel sensor lead, refer to "CABLE ROUTING" on page 2-43.

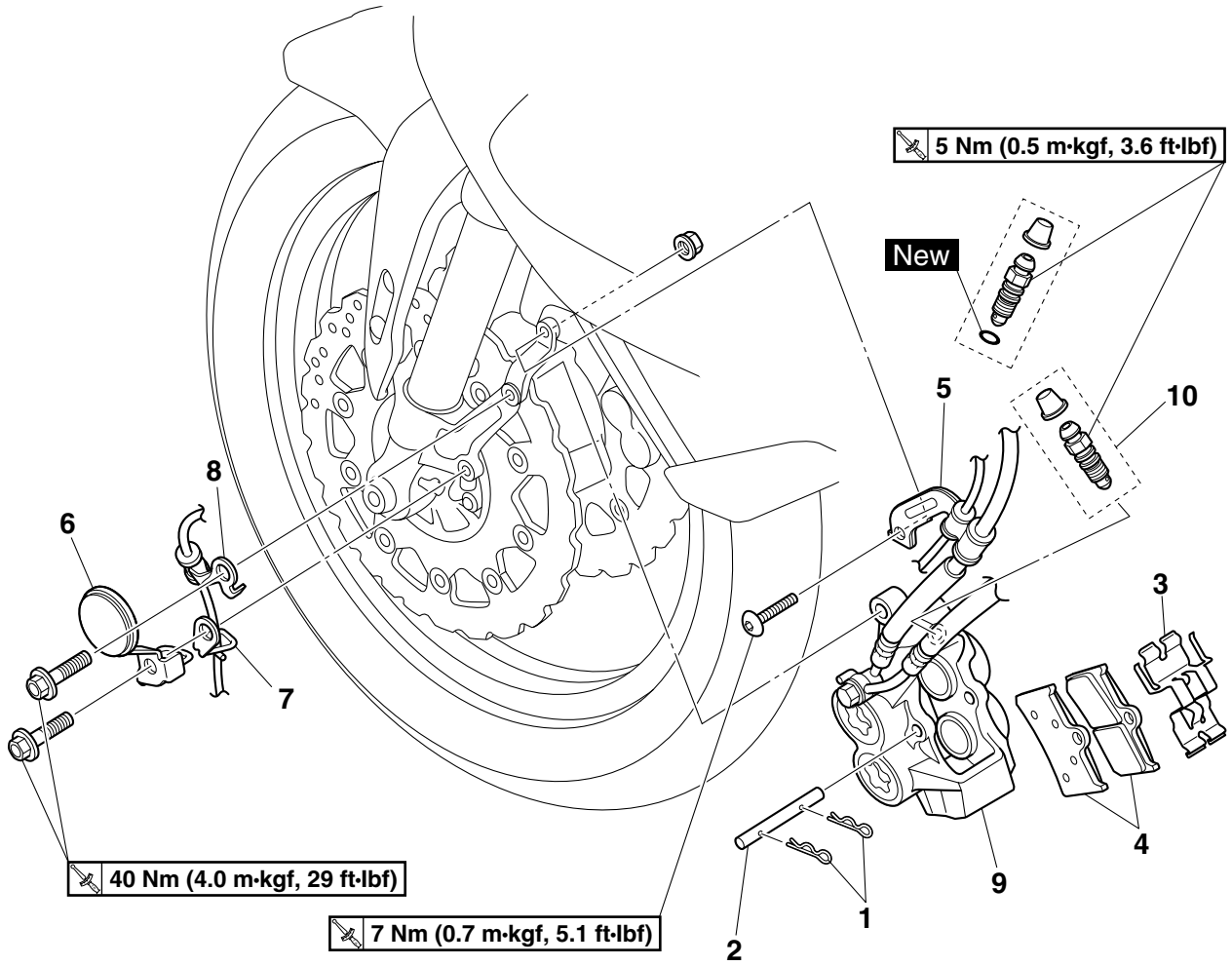
TIP

When installing the rear wheel sensor, check the rear wheel sensor lead for twists and the sensor electrode for foreign materials.

8. Check:
   - Rear wheel sensor installation
     Check if the wheel sensor housing is installed properly.

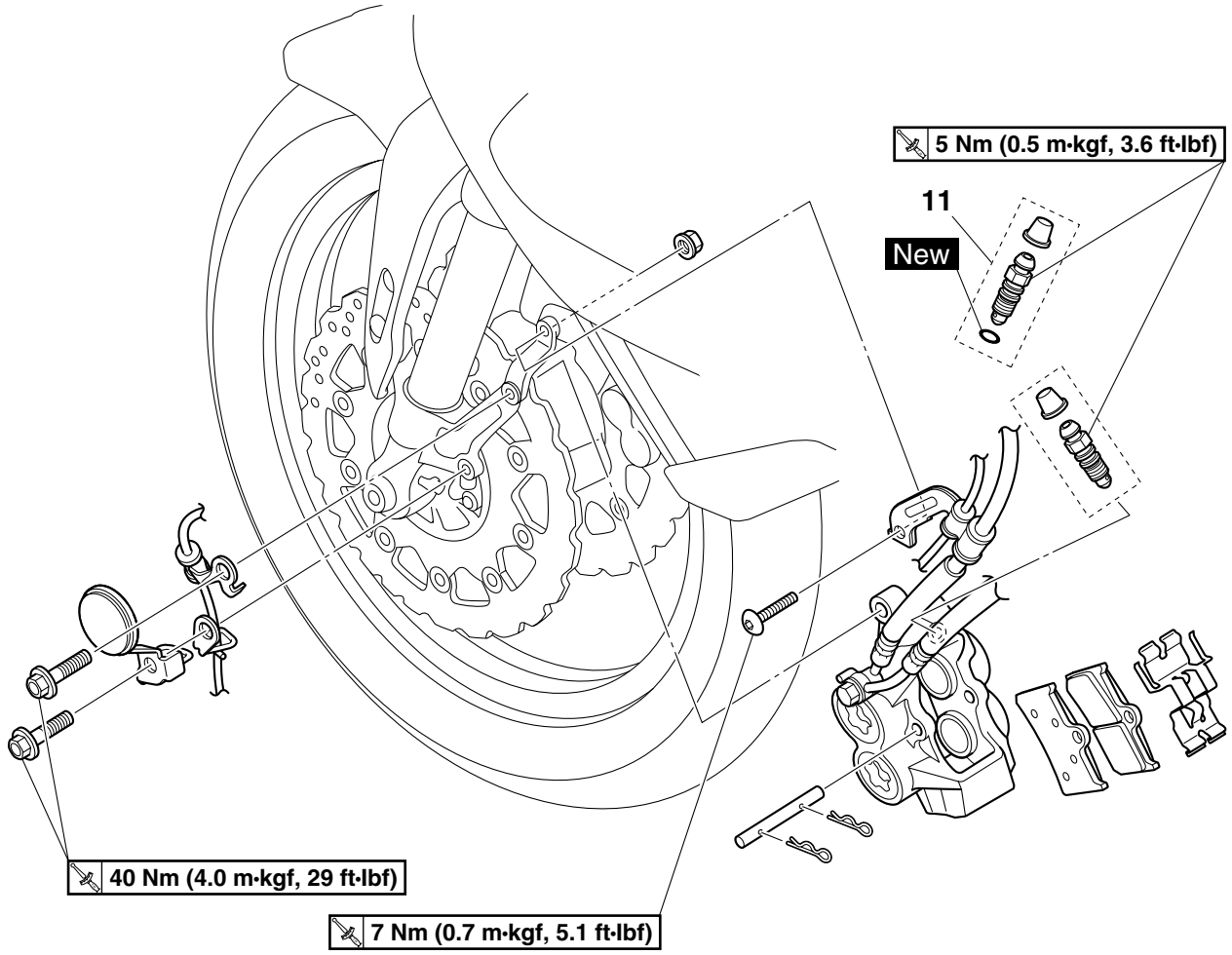
EAS22210
FRONT BRAKE

Removing the front brake pads



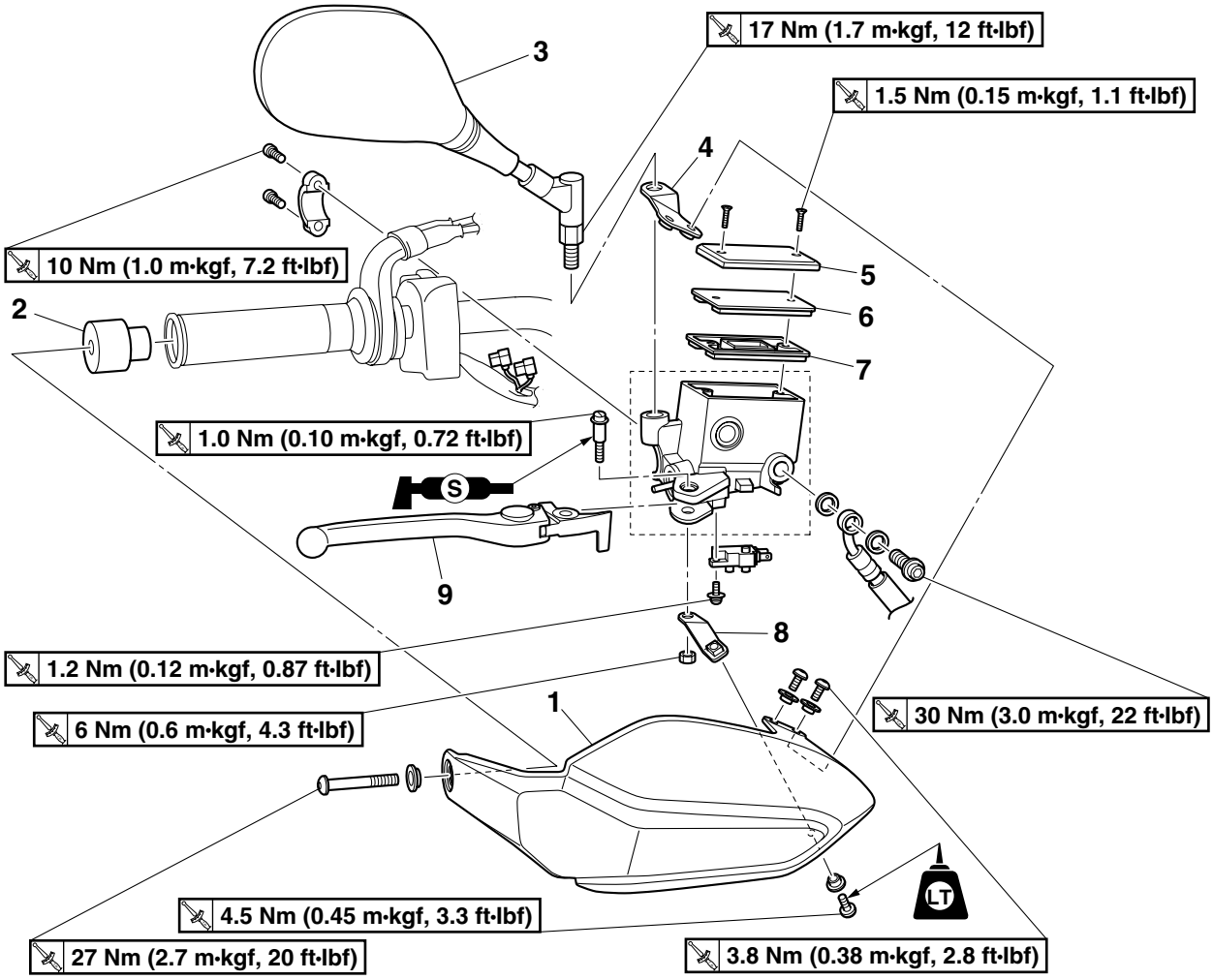
Order	Job/Parts to remove	Q'ty	Remarks
			The following procedure applies to both of the front brake calipers.
1	Brake pad clip	2	
2	Brake pad pin	1	
3	Brake pad spring	1	
4	Front brake pad	2	
5	Front brake hose holder	1	Left side only.
6	Front reflector	1	For Oceania
7	Front wheel sensor lead guide	1	For Europe Left side only.
8	Front wheel sensor lead holder	1	Left side only.
9	Front brake caliper	1	
10	Bleed screw	1	Left brake caliper side.

Removing the front brake pads



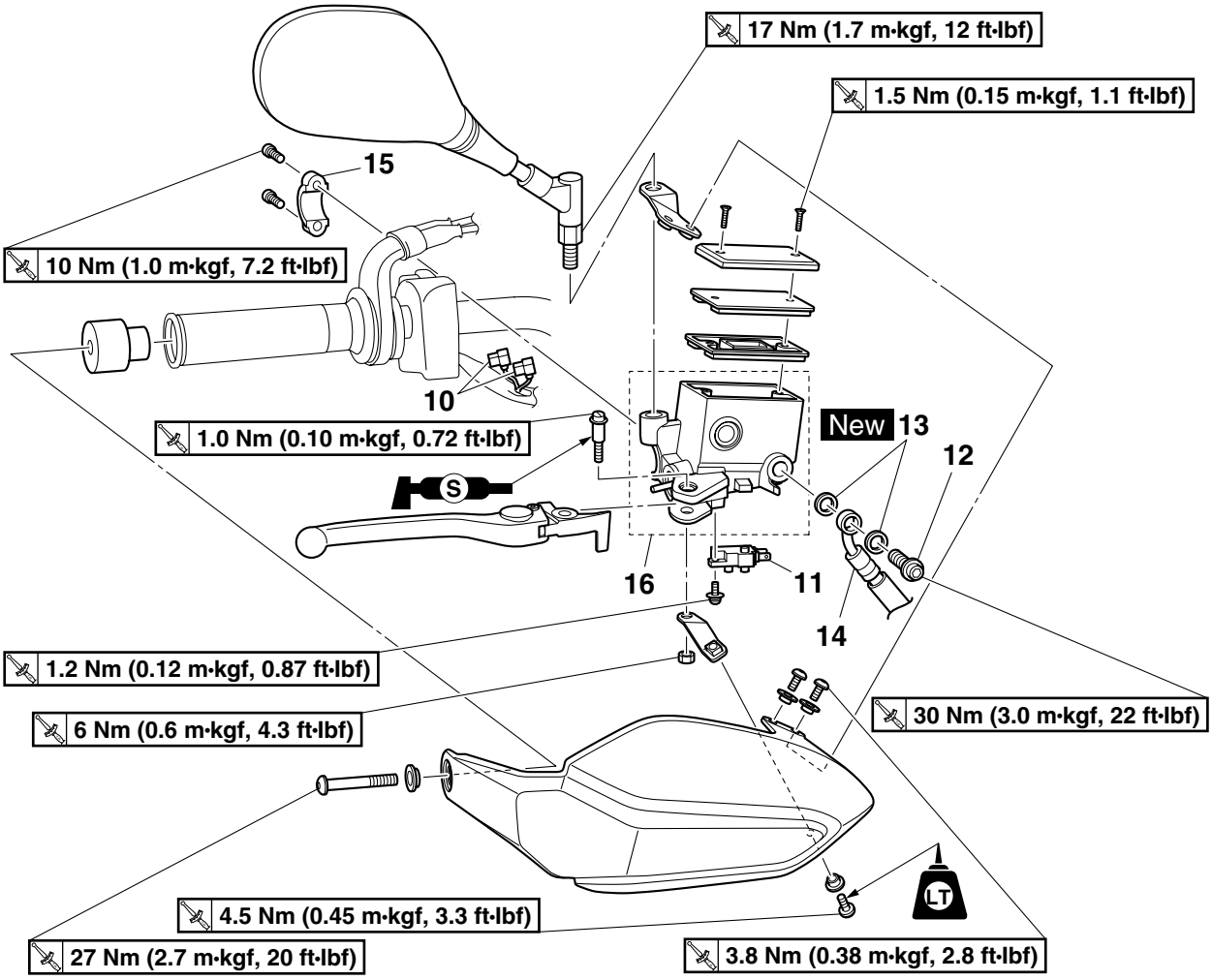
Order	Job/Parts to remove	Q'ty	Remarks
11	Bleed screw	1	Right brake caliper side.
			For installation, reverse the removal procedure.

Removing the front brake master cylinder



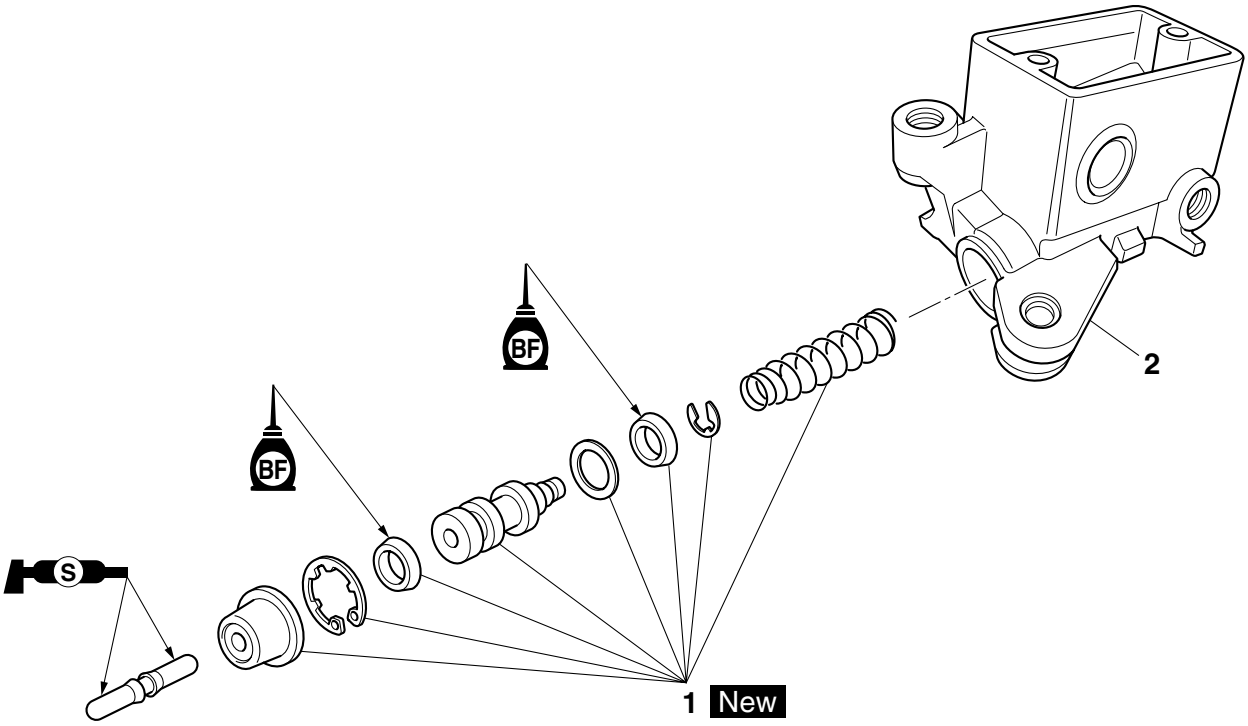
Order	Job/Parts to remove	Q'ty	Remarks
	Brake fluid		Drain. Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
1	Hand shield	1	
2	Grip end	1	
3	Rearview mirror	1	
4	Upper hand shield bracket	1	
5	Brake master cylinder reservoir cap	1	
6	Brake master cylinder reservoir diaphragm holder	1	
7	Brake master cylinder reservoir diaphragm	1	
8	Lower hand shield bracket	1	
9	Brake lever	1	

Removing the front brake master cylinder



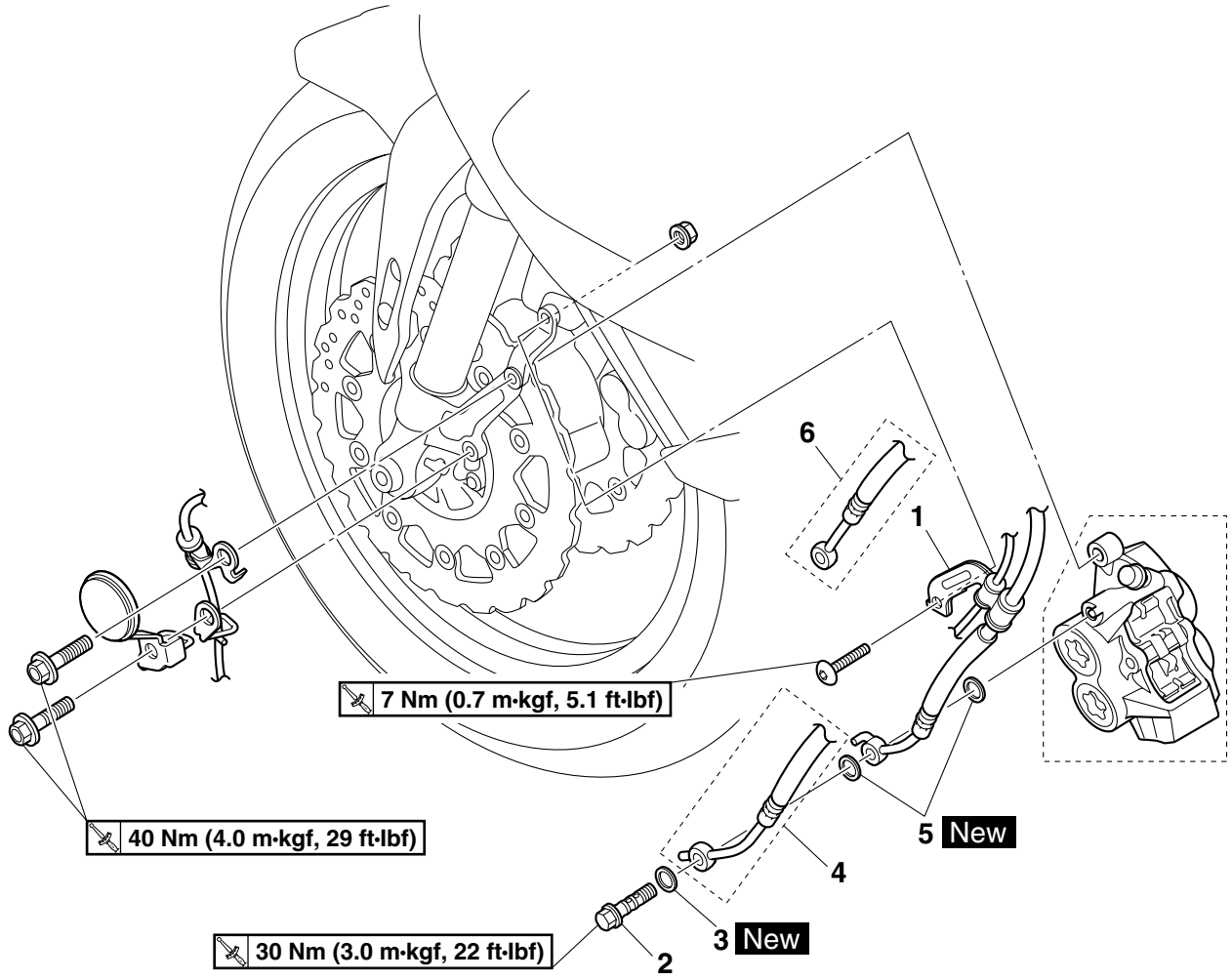
Order	Job/Parts to remove	Q'ty	Remarks
10	Front brake light switch connector	2	Disconnect.
11	Front brake light switch	1	
12	Brake hose union bolt	1	
13	Front brake hose gasket	2	
14	Brake hose (front brake master cylinder to hydraulic unit)	1	
15	Front brake master cylinder holder	1	
16	Front brake master cylinder	1	
			For installation, reverse the removal procedure.

Disassembling the front brake master cylinder



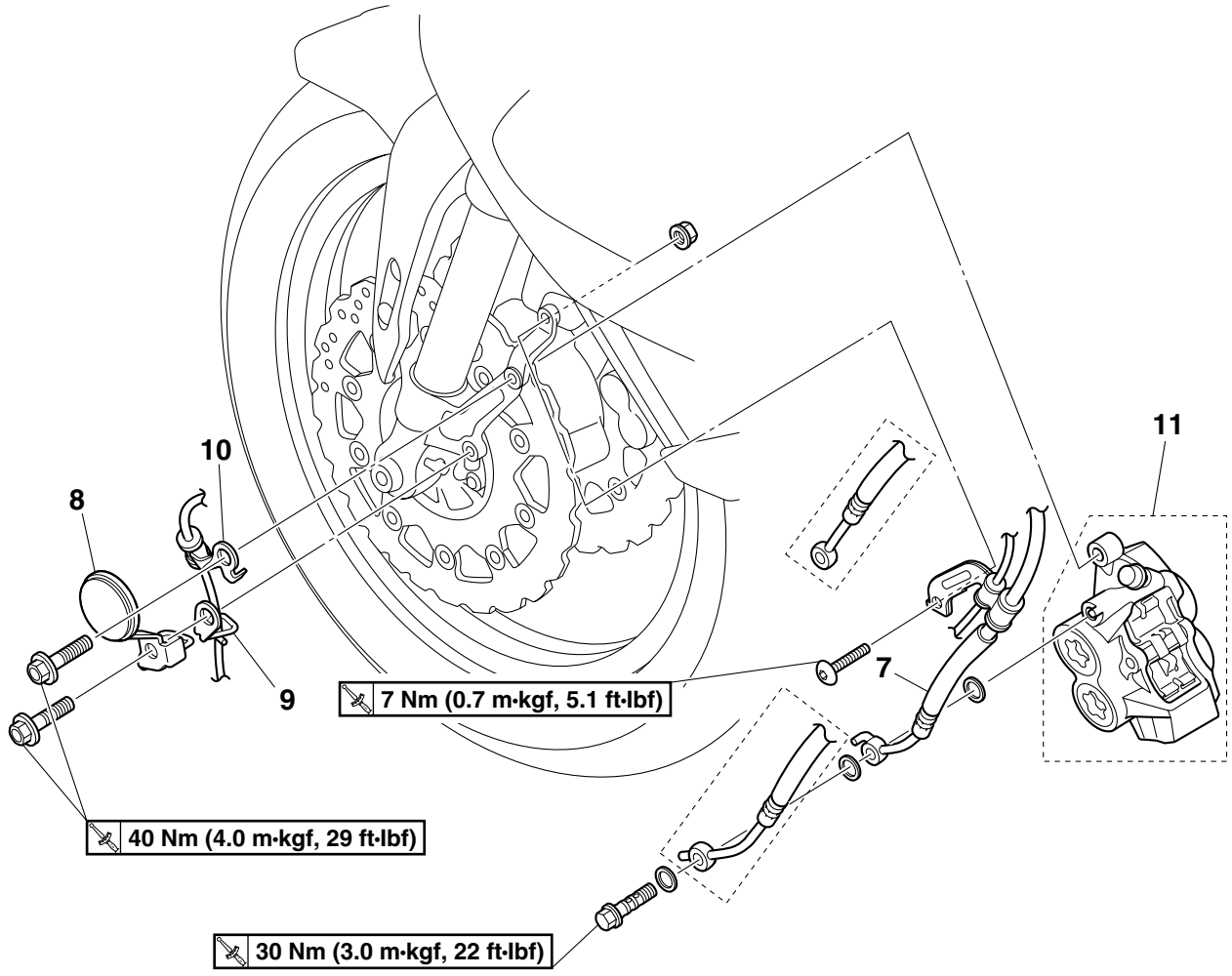
Order	Job/Parts to remove	Q'ty	Remarks
1	Brake master cylinder kit	1	
2	Brake master cylinder body	1	
			For assembly, reverse the disassembly procedure.

Removing the front brake calipers



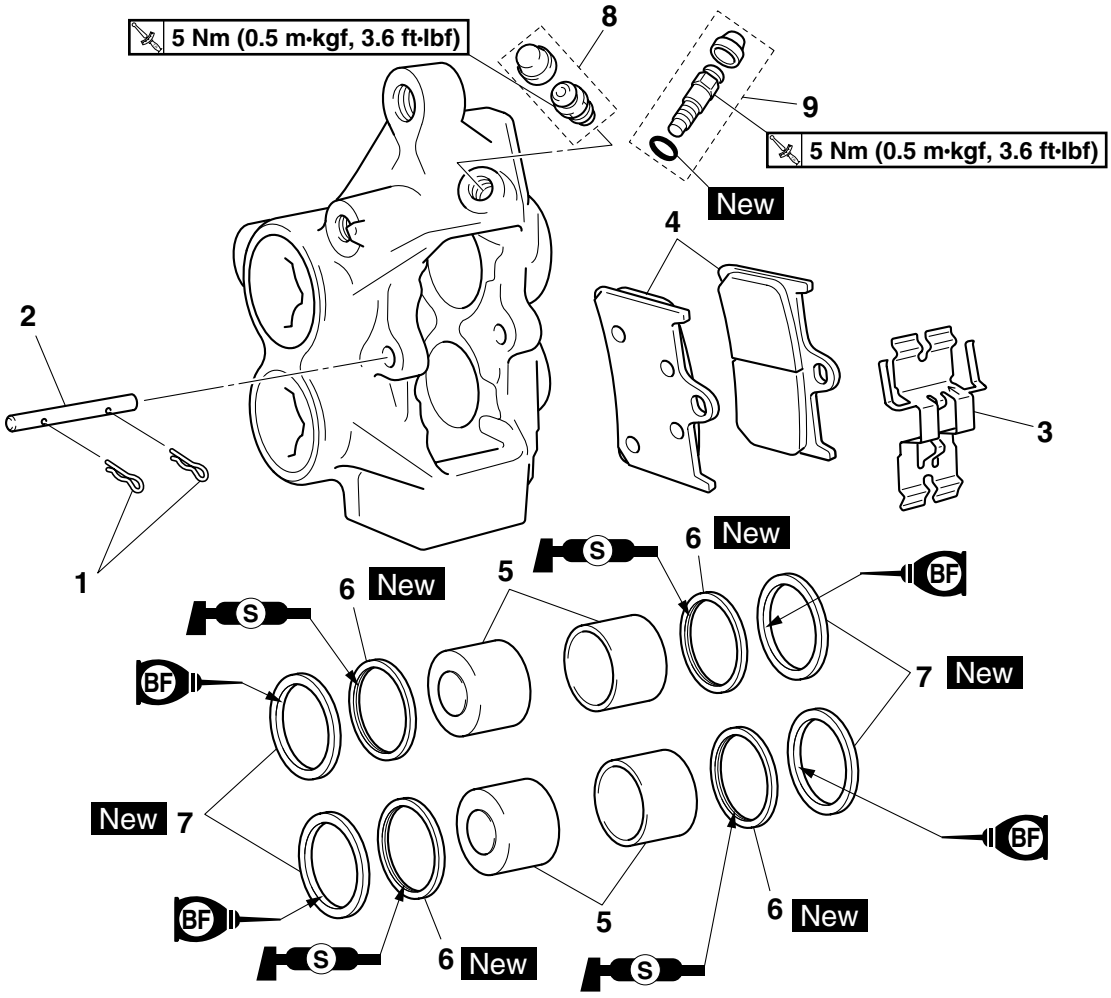
Order	Job/Parts to remove	Q'ty	Remarks
			The following procedure applies to both of the front brake calipers.
	Brake fluid		Drain. Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
1	Front brake hose holder	1	Left side only.
2	Brake hose union bolt	1	
3	Brake hose gasket	1	Left side only.
4	Brake hose (left front brake caliper to right front brake caliper)	1	Left brake caliper side.
5	Brake hose gasket	2	
6	Brake hose (left front brake caliper to right front brake caliper)	1	Right brake caliper side.

Removing the front brake calipers



Order	Job/Parts to remove	Q'ty	Remarks
7	Brake hose (hydraulic unit to left front brake caliper)	1	Left side only.
8	Front reflector	1	For Oceania
9	Front wheel sensor lead guide	1	For Europe Left side only.
10	Front wheel sensor lead holder	1	Left side only.
11	Front brake caliper	1	
			For installation, reverse the removal procedure.

Disassembling the front brake calipers



Order	Job/Parts to remove	Q'ty	Remarks
			The following procedure applies to both of the front brake calipers.
1	Brake pad clip	2	
2	Brake pad pin	1	
3	Brake pad spring	1	
4	Front brake pad	2	
5	Brake caliper piston	4	
6	Brake caliper piston dust seal	4	
7	Brake caliper piston seal	4	
8	Bleed screw	1	Left brake caliper side.
9	Bleed screw	1	Right brake caliper side.
			For assembly, reverse the disassembly procedure.

EAS22221
INTRODUCTION
EWA14101
⚠ 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.**

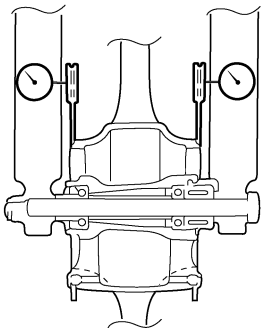
FIRST AID FOR BRAKE FLUID ENTERING THE EYES:
- **Flush with water for 15 minutes and get immediate medical attention.**

EAS22240
CHECKING THE FRONT BRAKE DISCS
The following procedure applies to both brake discs.
1. Remove:
   - Front wheel
   Refer to "FRONT WHEEL" on page 4-20.
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)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

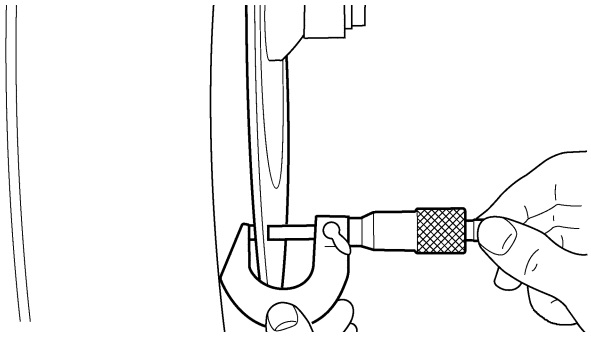
a. Place the vehicle on a suitable stand so that the front wheel is elevated.
b. Before measuring the front brake disc deflection, turn the handlebar to the left or right to ensure that the front wheel is stationary.
c. Remove the brake caliper.
d. Hold the dial gauge at a right angle against the brake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



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

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

Brake disc thickness limit
4.0 mm (0.16 in)



5. Adjust:
   - Brake disc deflection

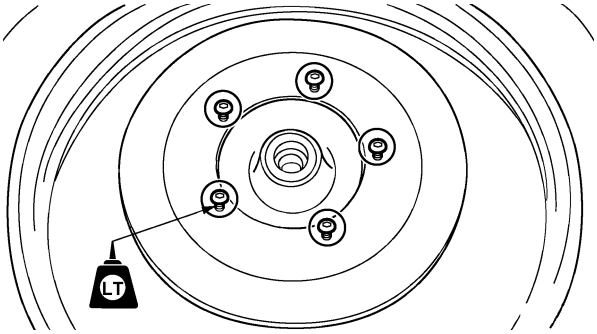
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the brake disc.
b. Rotate the brake disc by two bolt holes.
   For the rear brake disc: Rotate the brake disc by three bolt holes.
c. Install the brake disc.

Brake disc bolt
18 Nm (1.8 m·kgf, 13 ft·lbf)
LOCTITE®

TIP

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



d. Measure the brake disc deflection.
e. If out of specification, repeat the adjustment steps until the brake disc deflection is within specification.
f. If the brake disc deflection cannot be brought within specification, replace the brake disc and brake disc bolts.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

6. Install:
   • Front wheel
   Refer to "FRONT WHEEL" on page 4-20.

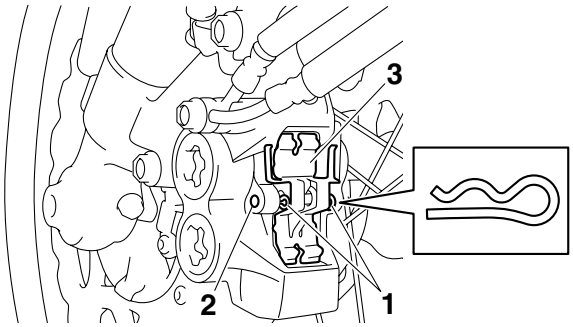
EAS22271
REPLACING THE FRONT BRAKE PADS

The following procedure applies to both brake calipers.

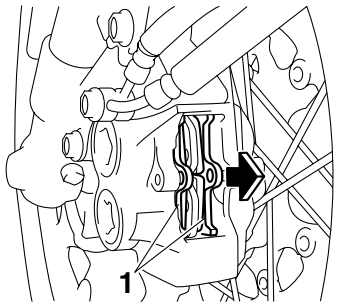
TIP

When replacing the brake pads, it is not necessary to disconnect the brake hose or disassemble the brake caliper.

1. Remove:
   • Brake pad clips "1"
   • Brake pad pin "2"
   • Brake pad spring "3"

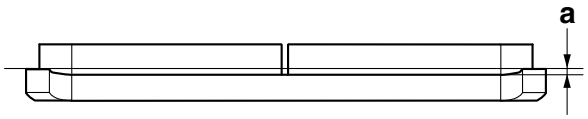


2. Remove:
   • Brake pads "1"



3. Measure:
   • Brake pad wear limit "a"
   Out of specification → Replace the brake pads as a set.

Brake pad lining thickness (inner)
4.5 mm (0.18 in)
Limit
0.5 mm (0.02 in)
Brake pad lining thickness (outer)
4.5 mm (0.18 in)
Limit
0.5 mm (0.02 in)



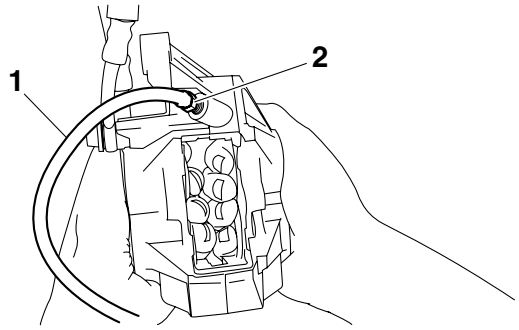
4. Remove:
   • Brake caliper bolts
5. Install:
   • Brake pads
   • Brake pad spring

TIP

Always install new brake pads and a new brake pad spring as a set.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect a clear plastic hose "1" tightly to the bleed screw "2". Put the other end of the hose into an open container.
b. Loosen the bleed screw and push the brake caliper pistons into the brake caliper with your finger.



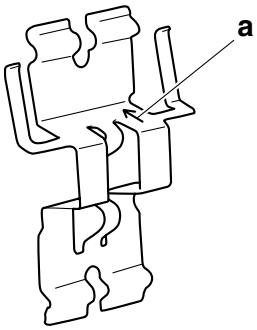
c. Tighten the bleed screw.

	Front brake caliper bleed screw **5 Nm (0.5 m·kgf, 3.6 ft·lbf)**

d. Install the brake pads and brake pad spring.

TIP

The arrow mark "a" on the brake pad spring must point in the direction of disc rotation.

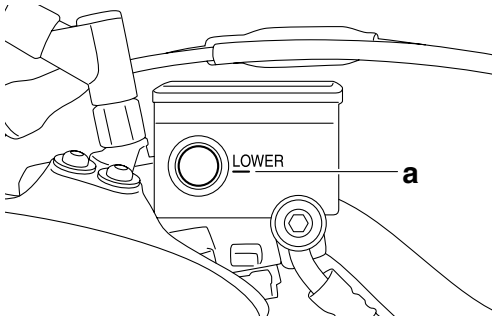


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

6. Install:
   - Brake caliper bolts
   - Brake pad pin
   - Brake pad clips

	Front brake caliper bolt **40 Nm (4.0 m·kgf, 29 ft·lbf)**

7. Check:
   - Brake fluid level
     Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.
     Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.



8. Check:
   - Brake lever operation
     Soft or spongy feeling → Bleed the brake system.
     Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.

EAS22300

REMOVING THE FRONT BRAKE CALIPERS

The following procedure applies to both of the brake calipers.

TIP

Before removing the brake caliper, drain the brake fluid from the entire brake system.

1. Remove:
   - Brake hose union bolt
   - Brake hose gaskets
   - Brake hose (left front brake caliper to right front brake caliper)
   - Brake hose (hydraulic unit to left front brake caliper)

TIP

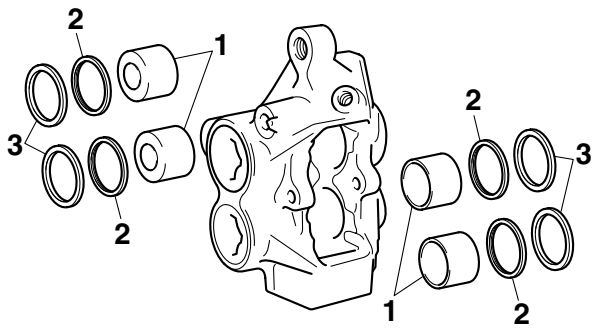
Put the end of the brake hose into a container and pump out the brake fluid carefully.

EAS22361

DISASSEMBLING THE FRONT BRAKE CALIPERS

The following procedure applies to both of the brake calipers.

1. Remove:
   - Brake caliper pistons "1"
   - Brake caliper piston dust seals "2"
   - Brake caliper piston seals "3"



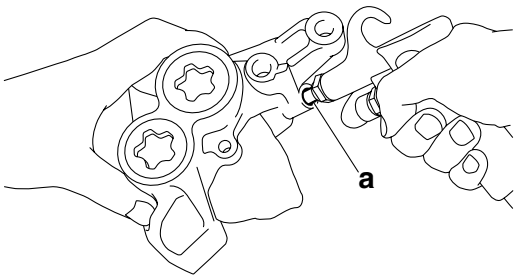
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

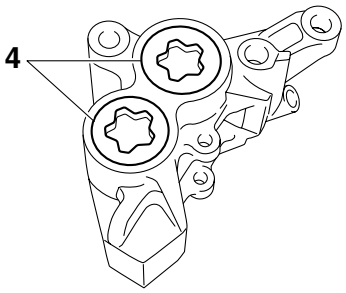
a. Blow compressed air into the brake hose joint opening "a" to force out the pistons from the brake caliper.

EWA23P1004

⚠ WARNING

- **Cover the brake caliper pistons with a rag. Be careful not to get injured when the pistons are expelled from the brake caliper.**
- **Never try to pry out the brake caliper pistons.**
- **Do not loosen the bolts "4".**





b. Remove the brake caliper piston dust seals and brake caliper piston seals.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS22391

CHECKING THE FRONT BRAKE CALIPERS

The following procedure applies to both of the brake calipers.

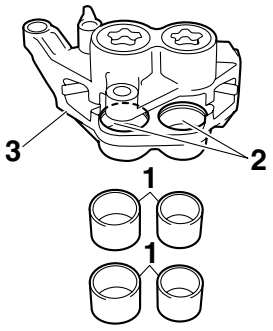
Recommended brake component replacement schedule	
Brake pads	If necessary
Piston seals	Every two years
Piston dust seals	Every two years
Brake hoses	Every four years
Brake fluid	Every two years and whenever the brake is disassembled

1. Check:
   - Brake caliper pistons "1"
     Rust/scratches/wear → Replace the brake caliper pistons.
   - Brake caliper cylinders "2"
     Scratches/wear → Replace the brake caliper assembly.
   - Brake caliper body "3"
     Cracks/damage → Replace the brake caliper assembly.
   - Brake fluid delivery passages (brake caliper body)
     Obstruction → Blow out with compressed air.

EWA13611

⚠ WARNING

Whenever a brake caliper is disassembled, replace the brake caliper piston dust seals and brake caliper piston seals.



EAS22411

ASSEMBLING THE FRONT BRAKE CALIPERS

EWA13621

⚠ WARNING

- **Before installation, all internal brake components should be cleaned and lubricated with clean or new brake fluid.**
- **Never use solvents on internal brake components as they will cause the brake caliper piston dust seals and brake caliper piston seals to swell and distort.**

• Whenever a brake caliper is disassembled, replace the brake caliper piston dust seals and brake caliper piston seals.

Recommended fluid
DOT 4

EAS22440
INSTALLING THE FRONT BRAKE CALIPERS

The following procedure applies to both of the brake calipers.

1. Install:
   - Front brake caliper (temporarily)
   - Brake hose gaskets New
   - Brake hose (hydraulic unit to left front brake caliper) "1"
   - Brake hose (left front brake caliper to right front brake caliper) "2"
   - Brake hose union bolt "3"

Brake hose union bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)

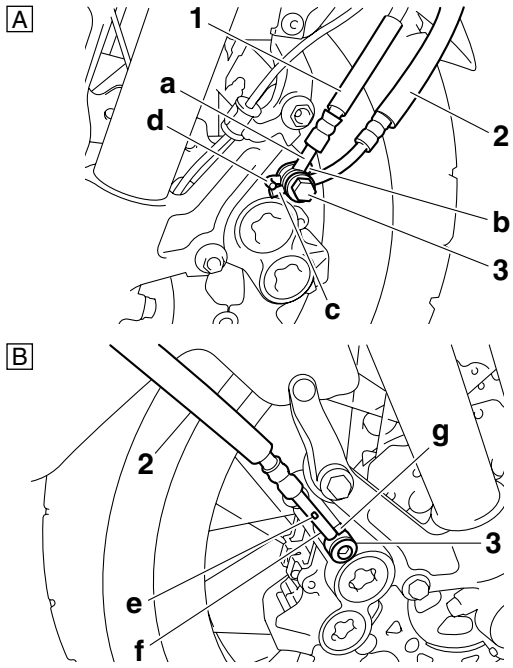
EWA13530
WARNING

Proper brake hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

ECA23P1020
NOTICE

Left side
- **When installing the brake hose "1" onto the brake caliper, make sure that the brake pipe "a" contacts the projection "b" on the brake caliper.**
- **When installing the brake hose "2" onto the brake caliper, make sure that the projection "c" on the brake hose "2" contacts the projection "d" on the brake hose "1".**

Right side
- **When installing the brake hose "2" onto the brake caliper, make sure that the paint mark "e" on the brake hose "2" faces outward and that the brake pipe "f" contacts the projection "g" on the brake caliper.**



A. Left side
B. Right side

2. Remove:
   - Front brake caliper
3. Install:
   - Brake pads
   - Brake pad spring
   - Brake pad pin
   - Brake pad clips
   - Front brake caliper
   Refer to "REPLACING THE FRONT BRAKE PADS" on page 4-45.

Front brake caliper bolt
40 Nm (4.0 m·kgf, 29 ft·lbf)

4. Fill:
   - Brake master cylinder reservoir (with the specified amount of the recommended brake fluid)

Recommended fluid
DOT 4

EWA13090
WARNING

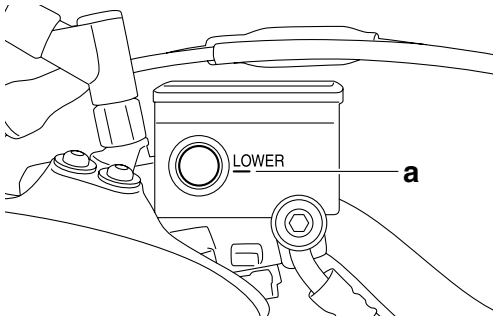
• Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.

• Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.
• 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
NOTICE

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

5. Bleed:
   • Brake system
   Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
6. Check:
   • Brake fluid level
   Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.
   Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.



7. Check:
   • Brake lever operation
   Soft or spongy feeling → Bleed the brake system.
   Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.

EAS22490
REMOVING THE FRONT BRAKE MASTER CYLINDER

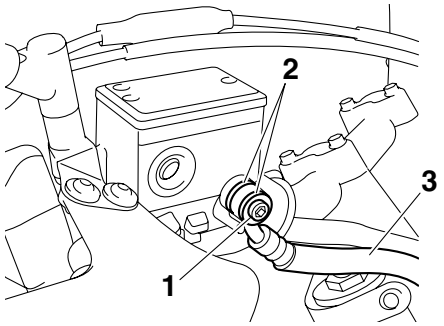
TIP

Before removing the front brake master cylinder, drain the brake fluid from the entire brake system.

1. Remove:
   • Brake hose union bolt "1"
   • Brake hose gaskets "2"
   • Brake hose (front brake master cylinder to hydraulic unit) "3"

TIP

To collect any remaining brake fluid, place a container under the master cylinder and the end of the brake hose.



EAS22500
CHECKING THE FRONT BRAKE MASTER CYLINDER

1. Check:
   • Brake master cylinder
   Damage/scratches/wear → Replace.
   • Brake fluid delivery passages (brake master cylinder body)
   Obstruction → Blow out with compressed air.
2. Check:
   • Brake master cylinder kit
   Damage/scratches/wear → Replace.
3. Check:
   • Brake master cylinder reservoir
   Cracks/damage → Replace.
   • Brake master cylinder reservoir diaphragm
   Damage/wear → Replace.
4. Check:
   • Brake hose
   Cracks/damage/wear → Replace.

EAS22520
ASSEMBLING THE FRONT BRAKE MASTER CYLINDER

EWA13520
⚠ WARNING

• Before installation, all internal brake components should be cleaned and lubricated with clean or new brake fluid.
• Never use solvents on internal brake components.

Recommended fluid
DOT 4

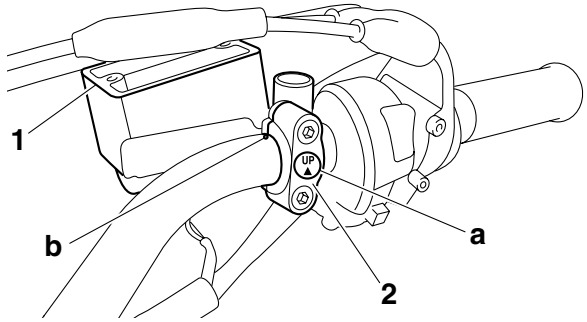
EAS22530
INSTALLING THE FRONT BRAKE MASTER CYLINDER

1. Install:
   • Brake master cylinder "1"
   • Brake master cylinder holder "2"

	Brake master cylinder holder bolt 10 Nm (1.0 m·kgf, 7.2 ft·lbf)

TIP

- Install the brake master cylinder holder with the "UP" mark "a" facing up.
- Align the mating surfaces of the brake master cylinder holder with the punch mark "b" on the handlebar.
- First, tighten the upper bolt, then the lower bolt.



2. Install:
   • Brake hose gaskets New
   • Brake hose (front brake master cylinder to hydraulic unit) "1"
   • Brake hose union bolt "2"

	Brake hose union bolt 30 Nm (3.0 m·kgf, 22 ft·lbf)

EWA13530
⚠ WARNING

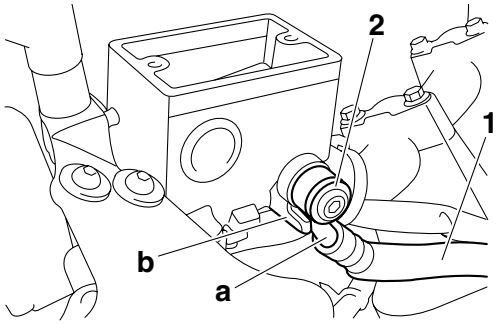
Proper brake hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

ECA23P1021
NOTICE

When installing the brake hose onto the brake master cylinder, make sure the brake pipe "a" touches the projection "b" on the brake master cylinder.

TIP

- While holding the brake hose, tighten the union bolt.
- Turn the handlebar to the left and right to make sure the brake hose does not touch other parts (e.g., wire harness, cables, leads). Correct if necessary.



3. Fill:
   • Brake master cylinder reservoir (with the specified amount of the recommended brake fluid)

	Recommended fluid DOT 4

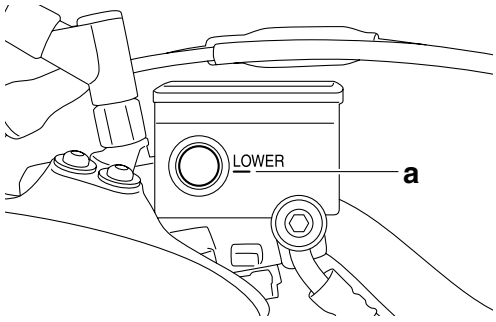
EWA13540
⚠ WARNING

- **Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.**
- **When refilling, be careful that water does not enter the brake master cylinder reservoir. Water will significantly lower the boiling point of the brake fluid and could cause vapor lock.**

ECA13540
NOTICE

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

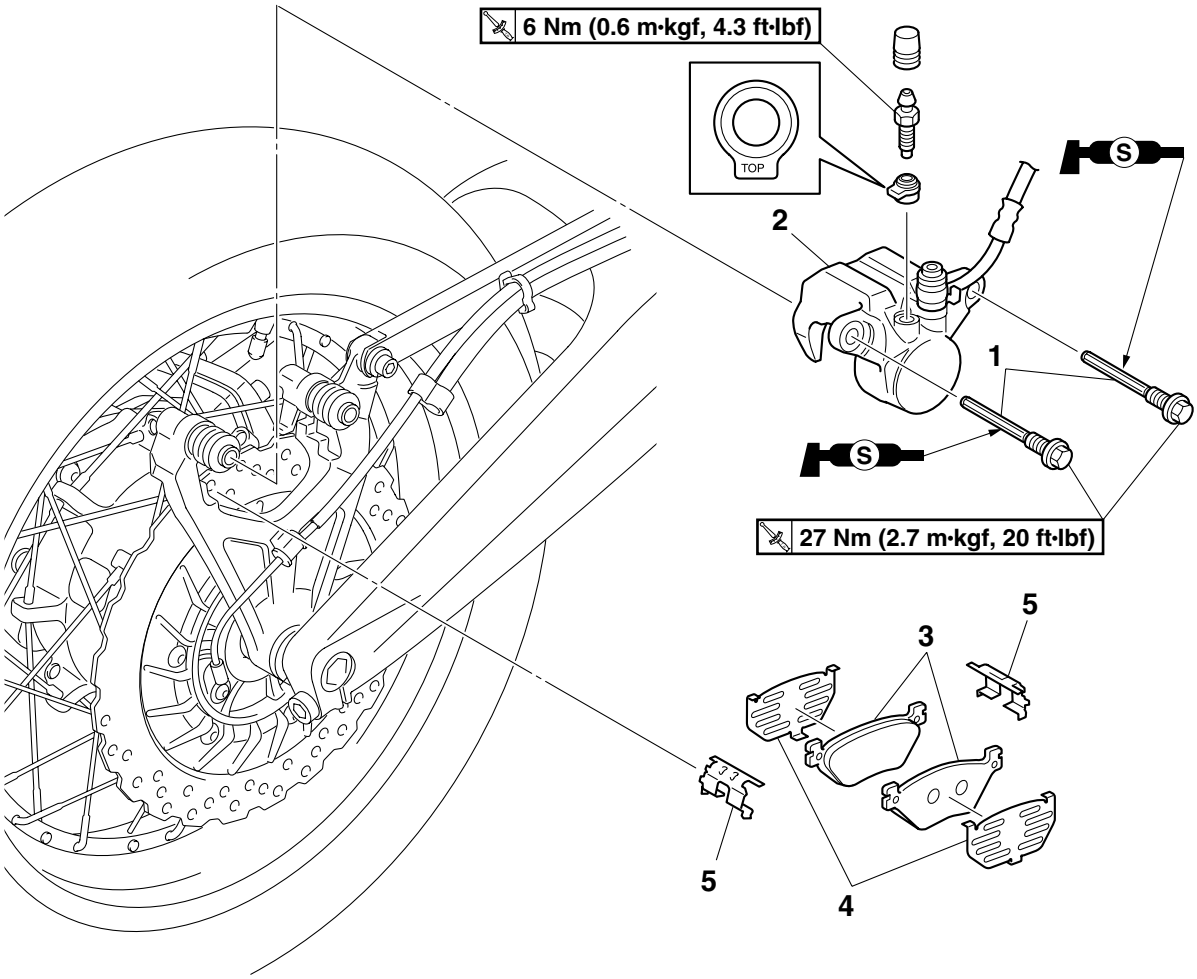
4. Bleed:
   • Brake system
   Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
5. Check:
   • Brake fluid level
   Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.
   Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.



6. Check:
   • Brake lever operation
   Soft or spongy feeling → Bleed the brake system.
   Refer to “BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)” on page 3-15.

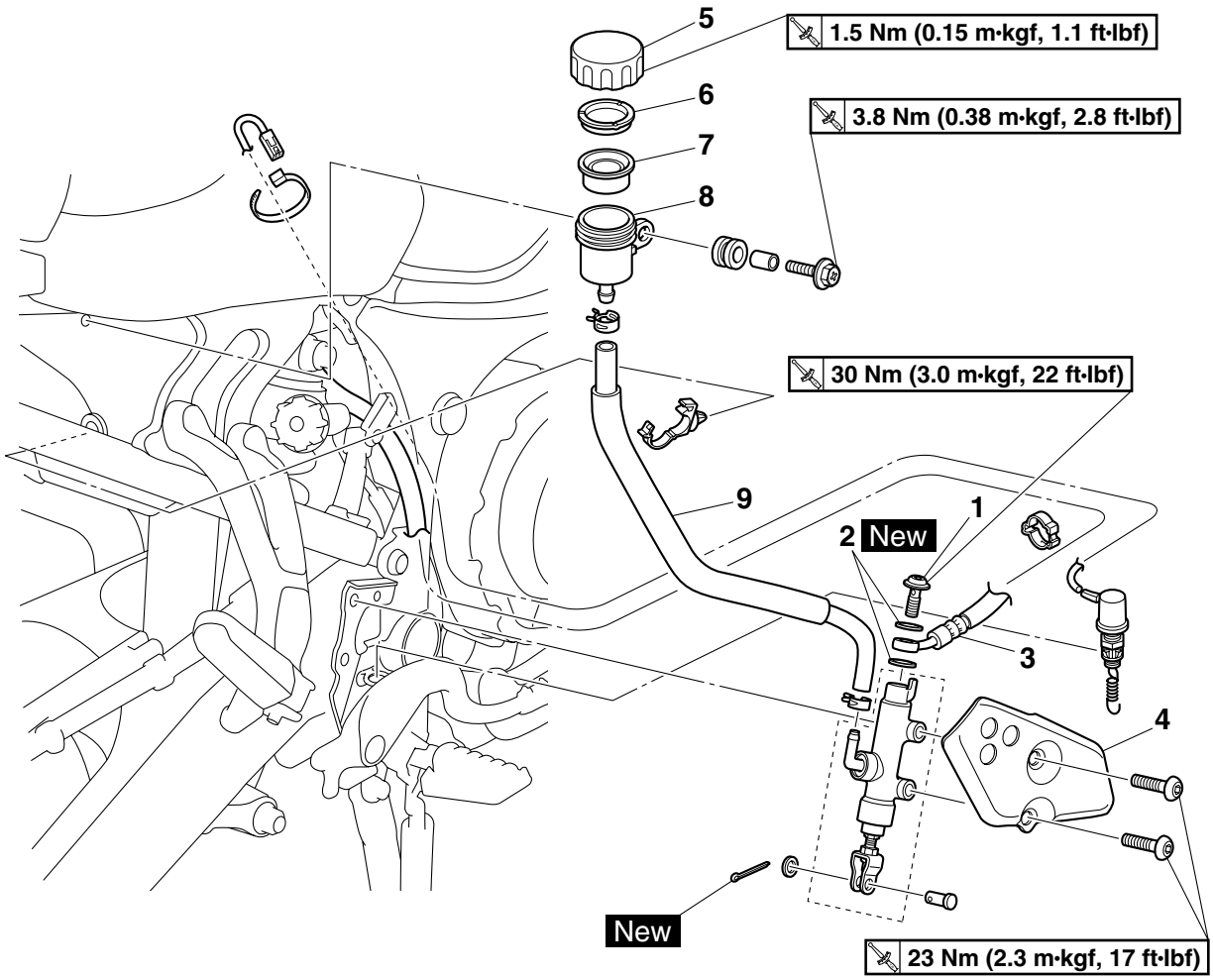
EAS22550
REAR BRAKE

Removing the rear brake pads



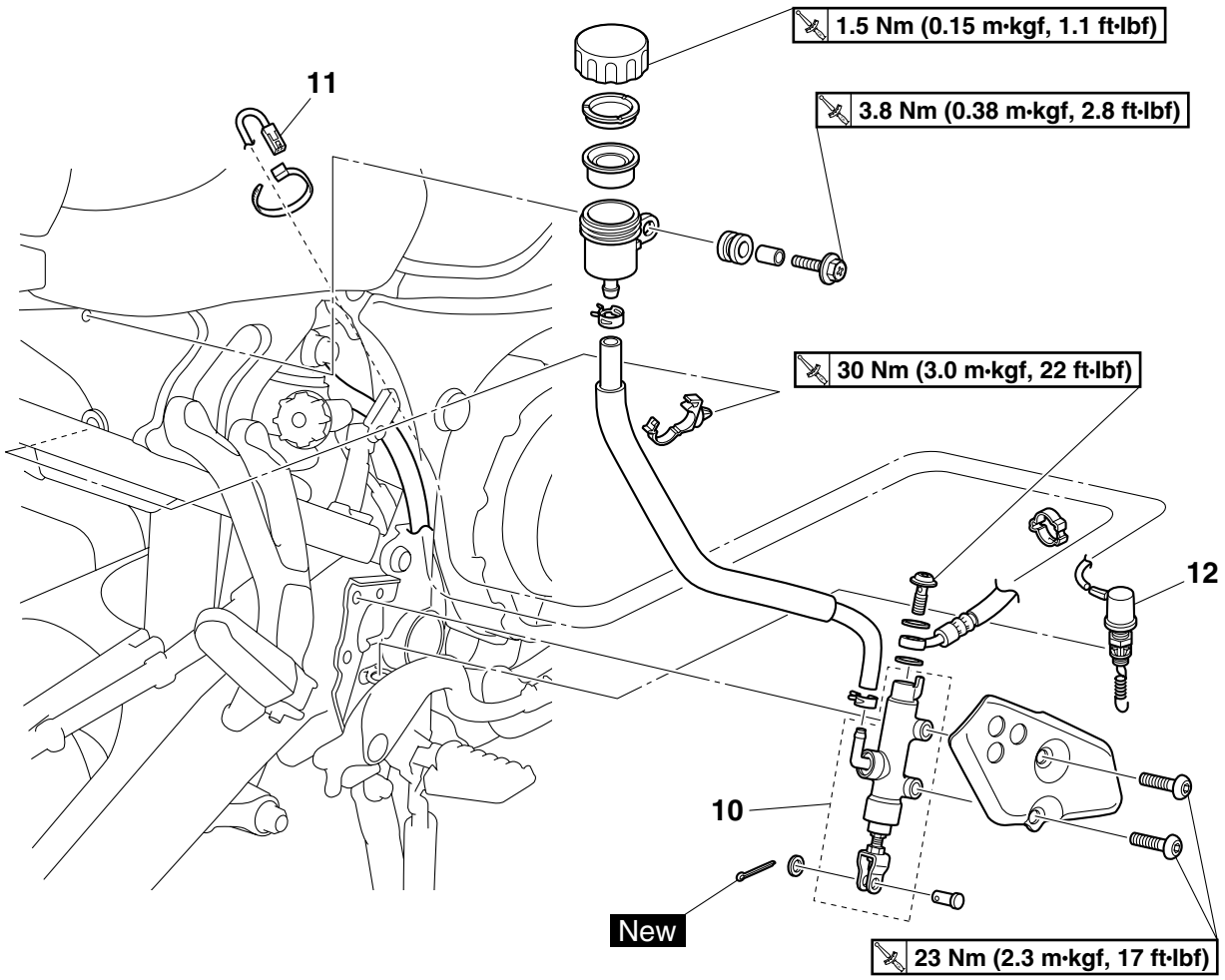
Order	Job/Parts to remove	Q'ty	Remarks
1	Rear brake caliper bolt	2	
2	Rear brake caliper	1	
3	Rear brake pad	2	
4	Brake pad shim	2	
5	Brake pad support	2	
			For installation, reverse the removal procedure.

Removing the rear brake master cylinder



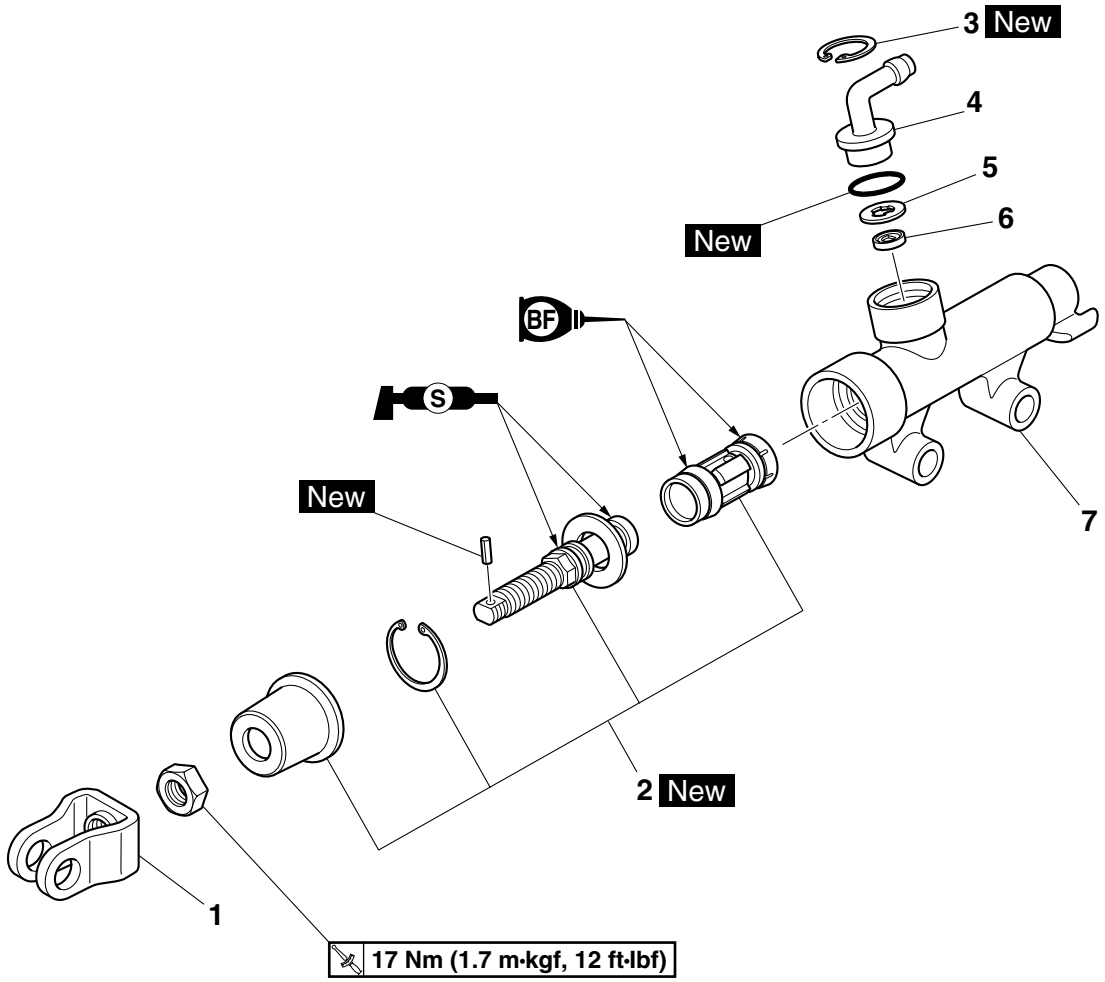
Order	Job/Parts to remove	Q'ty	Remarks
	Brake fluid		Drain. Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
1	Brake hose union bolt	1	
2	Brake hose gasket	2	
3	Brake hose (rear brake master cylinder to hydraulic unit)	1	
4	Footrest plate	1	
5	Brake fluid reservoir cap	1	
6	Brake fluid reservoir diaphragm holder	1	
7	Brake fluid reservoir diaphragm	1	
8	Brake fluid reservoir	1	
9	Brake fluid reservoir hose	1	

Removing the rear brake master cylinder



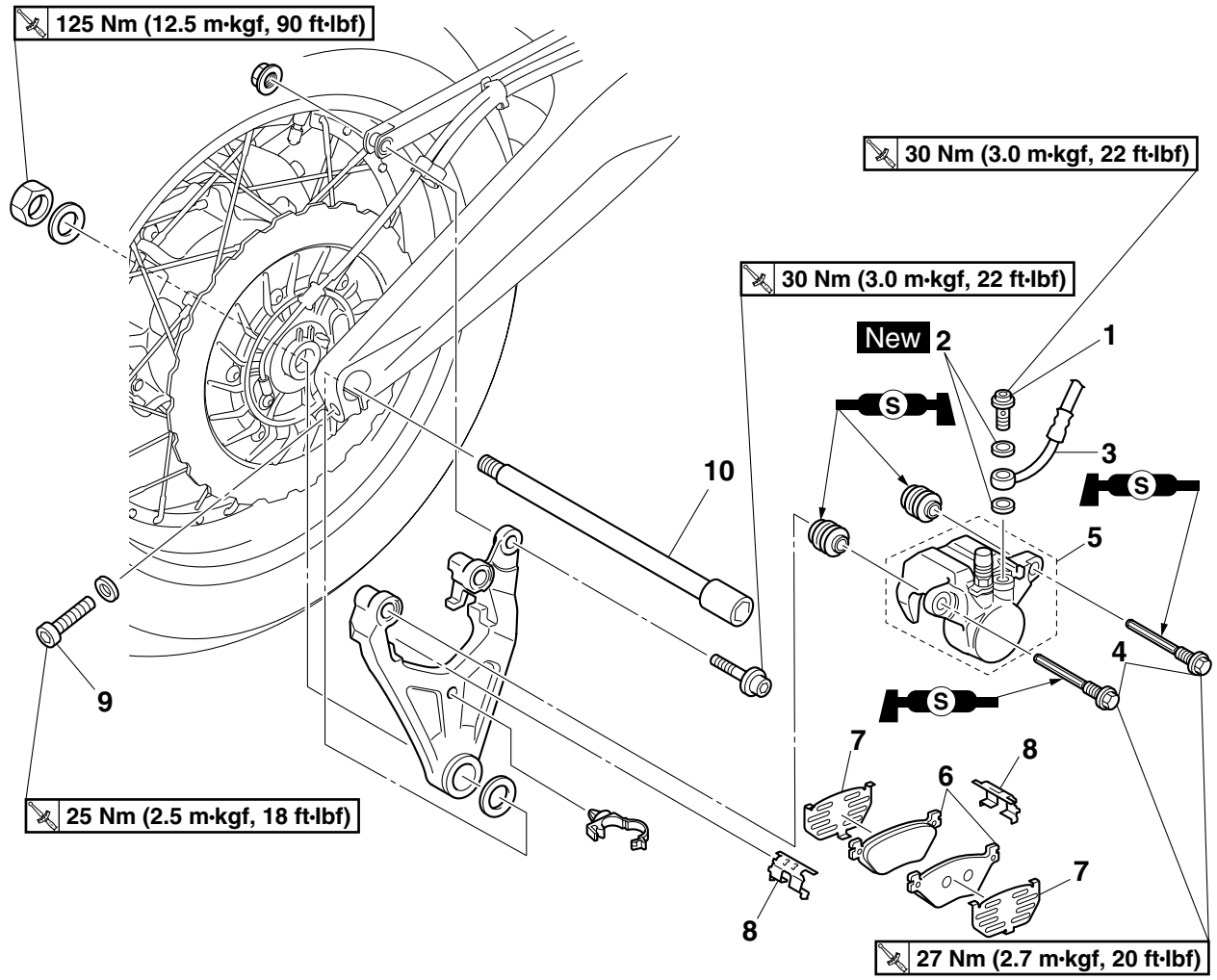
Order	Job/Parts to remove	Q'ty	Remarks
10	Rear brake master cylinder	1	
11	Rear brake light switch coupler	1	Disconnect.
12	Rear brake light switch	1	
			For installation, reverse the removal procedure.

Disassembling the rear brake master cylinder



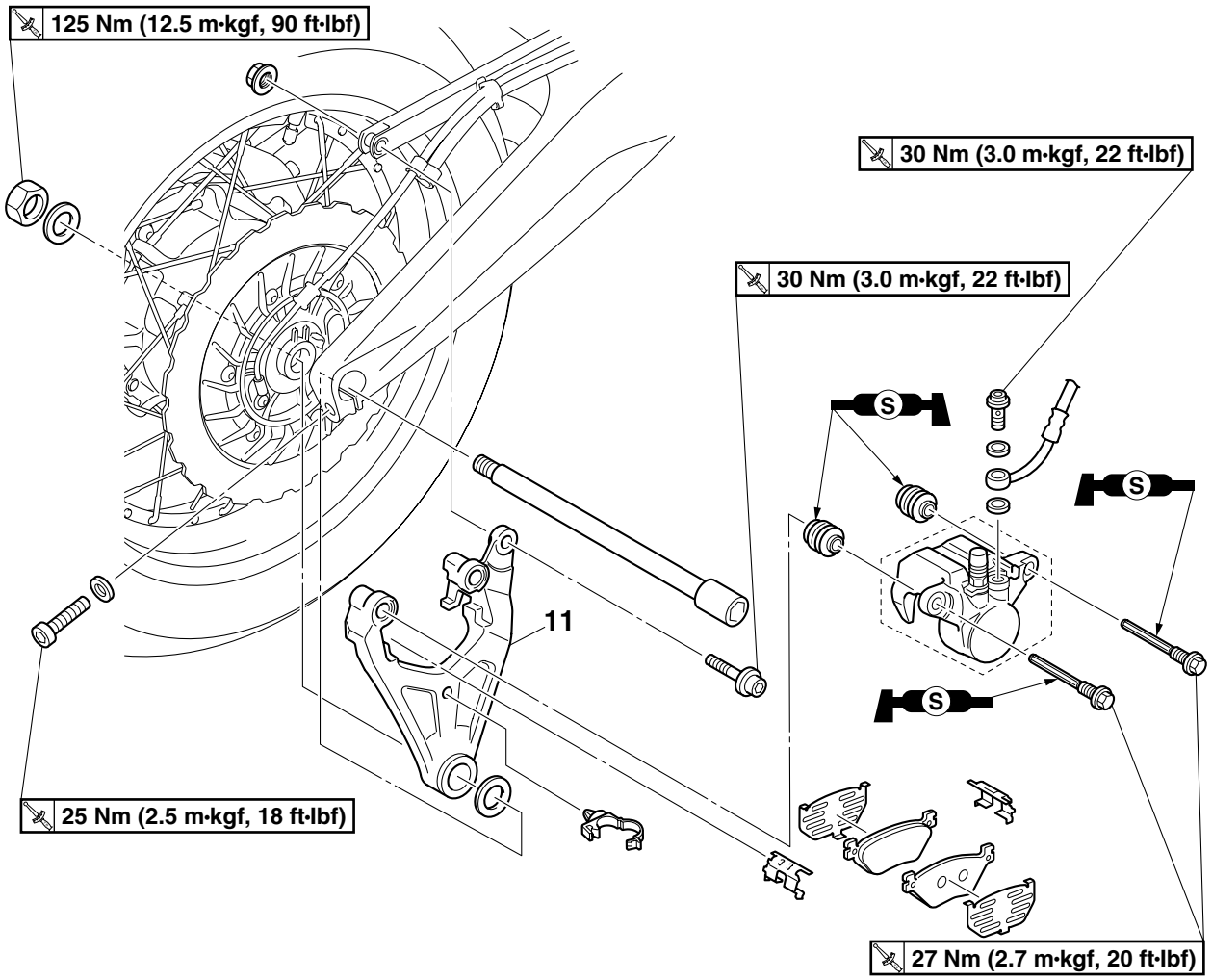
Order	Job/Parts to remove	Q'ty	Remarks
1	Rear brake master cylinder joint	1	
2	Brake master cylinder kit	1	
3	Circlip	1	
4	Brake hose joint	1	
5	Filter plate	1	
6	Filter	1	
7	Brake master cylinder body	1	
			For assembly, reverse the disassembly procedure.

Removing the rear brake caliper



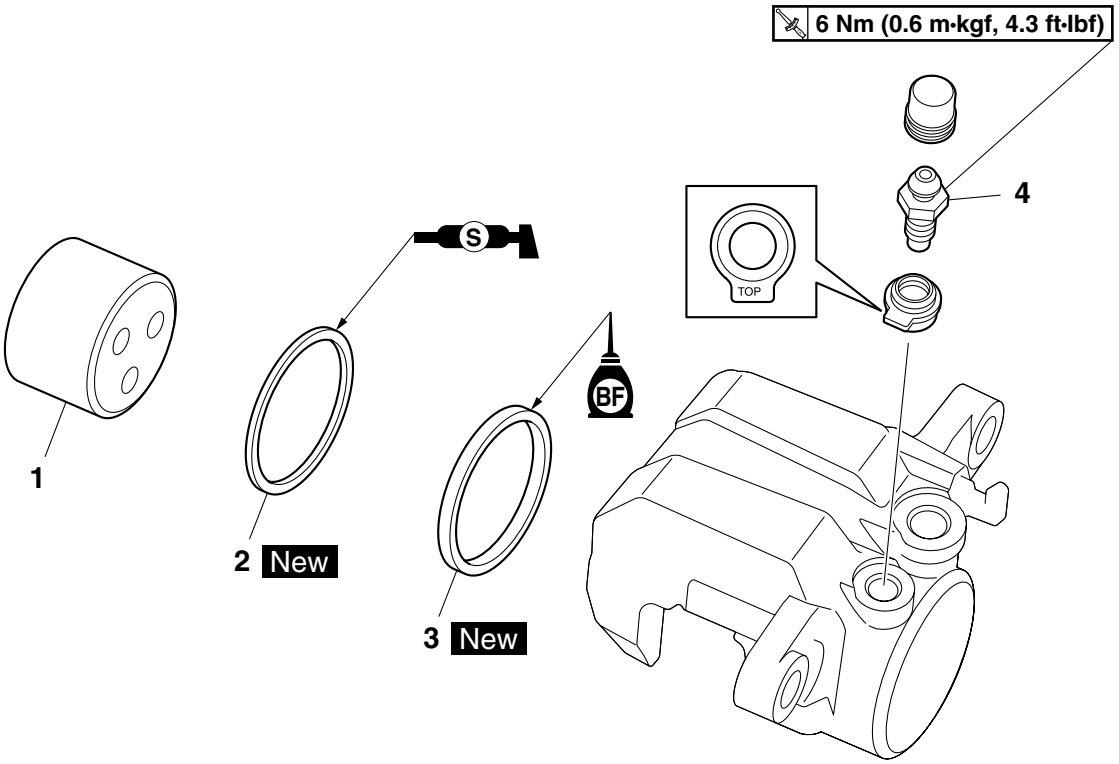
Order	Job/Parts to remove	Q'ty	Remarks
	Brake fluid		Drain. Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
1	Brake hose union bolt	1	
2	Brake hose gasket	2	
3	Brake hose (hydraulic unit to rear brake caliper)	1	
4	Rear brake caliper bolt	2	
5	Rear brake caliper	1	
6	Rear brake pad	2	
7	Brake pad shim	2	
8	Brake pad support	2	
9	Rear wheel axle pinch bolt	1	Loosen.
10	Rear wheel axle	1	

Removing the rear brake caliper



Order	Job/Parts to remove	Q'ty	Remarks
11	Rear brake caliper bracket	1	
			For installation, reverse the removal procedure.

Disassembling the rear brake caliper



Order	Job/Parts to remove	Q'ty	Remarks
1	Brake caliper piston	1	
2	Brake caliper piston dust seal	1	
3	Brake caliper piston seal	1	
4	Bleed screw	1	
			For assembly, reverse the disassembly procedure.

EAS22561
INTRODUCTION
EWA14101
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.**

EAS22570
CHECKING THE REAR BRAKE DISC
1. Remove:
   - Rear wheel
     Refer to "REAR WHEEL" on page 4-29.
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.
     Refer to "CHECKING THE FRONT BRAKE DISCS" on page 4-44.

Brake disc deflection limit
0.15 mm (0.0059 in)

4. Measure:
   - Brake disc thickness
     Measure the brake disc thickness at a few different locations.
     Out of specification → Replace.
     Refer to "CHECKING THE FRONT BRAKE DISCS" on page 4-44.

Brake disc thickness limit
4.5 mm (0.18 in)

5. Adjust:
   - Brake disc deflection
     Refer to "CHECKING THE FRONT BRAKE DISCS" on page 4-44.

Brake disc bolt
23 Nm (2.3 m·kgf, 17 ft·lbf)
LOCTITE®

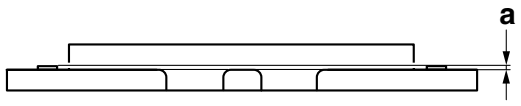
6. Install:
   - Rear wheel
     Refer to "REAR WHEEL" on page 4-29.

EAS22581
REPLACING THE REAR BRAKE PADS
TIP

When replacing the brake pads, it is not necessary to disconnect the brake hose or disassemble the brake caliper.

1. Measure:
   - Brake pad wear limit "a"
     Out of specification → Replace the brake pads as a set.

Brake pad lining thickness (inner)
5.8 mm (0.23 in)
Limit
0.8 mm (0.03 in)
Brake pad lining thickness (outer)
5.8 mm (0.23 in)
Limit
0.8 mm (0.03 in)



2. Remove:
   - Brake caliper bolts
3. Install:
   - Brake pad supports
   - Brake pad shims
     (onto the brake pads)

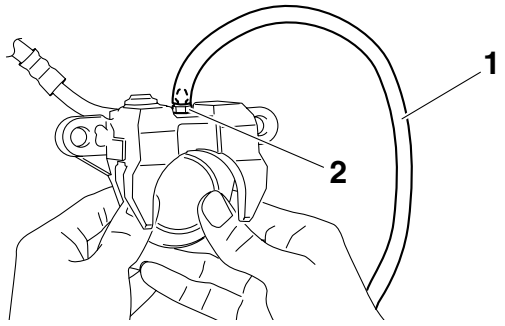
• Brake pads

TIP

Always install new brake pads, brake pad shims and brake pad supports as a set.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect a clear plastic hose "1" tightly to the bleed screw "2". Put the other end of the hose into an open container.
b. Loosen the bleed screw and push the brake caliper piston into the brake caliper with your finger.



c. Tighten the bleed screw.

	Rear brake caliper bleed screw 6 Nm (0.6 m·kgf, 4.3 ft·lbf)

d. Install new brake pad supports, brake pad shims, and brake pads.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Lubricate:
   • Rear brake caliper bolts

	Recommended lubricant Silicone grease

ECA23P1022

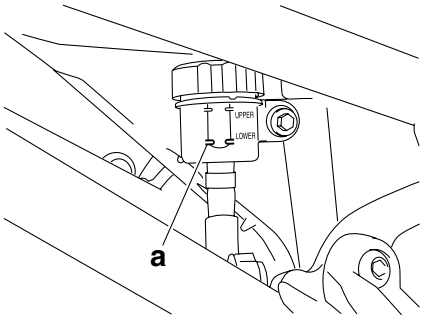
NOTICE

• Do not allow grease to contact the brake pads.
• Remove any excess grease.

5. Install:
   • Rear brake caliper

	Rear brake caliper bolt 27 Nm (2.7 m·kgf, 19 ft·lbf)

6. Check:
   • Brake fluid level
   Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.
   Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.



7. Check:
   • Brake pedal operation
   Soft or spongy feeling → Bleed the brake system.
   Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.

EAS22590

REMOVING THE REAR BRAKE CALIPER

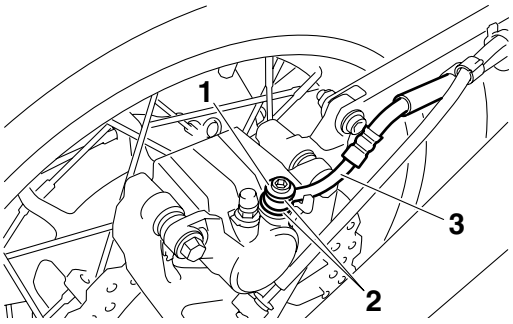
TIP

Before disassembling the brake caliper, drain the brake fluid from the entire brake system.

1. Remove:
   • Brake hose union bolt "1"
   • Brake hose gaskets "2"
   • Brake hose (hydraulic unit to rear brake caliper) "3"

TIP

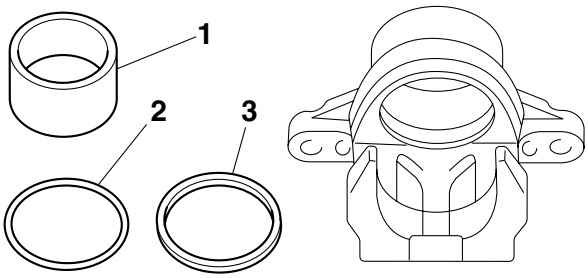
Put the end of the brake hose into a container and pump out the brake fluid carefully.



EAS22601

DISASSEMBLING THE REAR BRAKE CALIPER

1. Remove:
   • Brake caliper piston "1"
   • Brake caliper piston dust seal "2"
   • Brake caliper piston seal "3"



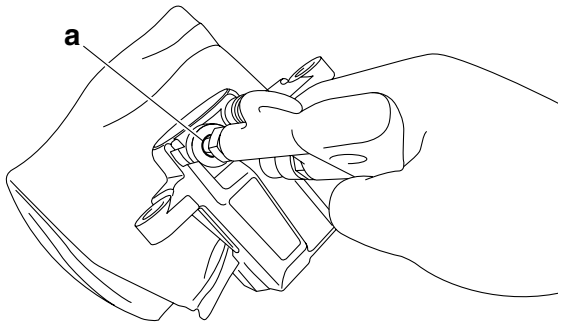
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Blow compressed air into the brake hose joint opening "a" to force out the piston from the brake caliper.

EWA13550

⚠ WARNING

• Cover the brake caliper piston with a rag. Be careful not to get injured when the piston is expelled from the brake caliper.
• Never try to pry out the brake caliper piston.



b. Remove the brake caliper piston dust seal and brake caliper piston seal.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS22642

CHECKING THE REAR BRAKE CALIPER

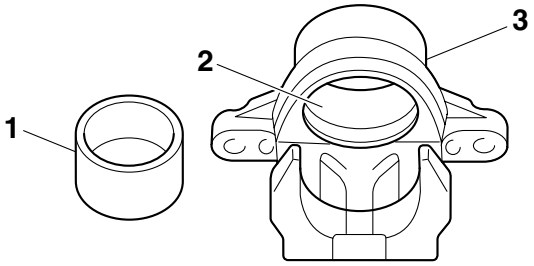
Recommended brake component replacement schedule	
Brake pads	If necessary
Piston seals	Every two years
Piston dust seals	Every two years
Brake hoses	Every four years
Brake fluid	Every two years and whenever the brake is disassembled

1. Check:
   • Brake caliper pistons "1"
   Rust/scratches/wear → Replace the brake caliper pistons.
   • Brake caliper cylinder "2"
   Scratches/wear → Replace the brake caliper assembly.
   • Brake caliper body "3"
   Cracks/damage → Replace the brake caliper assembly.
   • Brake fluid delivery passages (brake caliper body)
   Obstruction → Blow out with compressed air.

EWA23P1005

⚠ WARNING

Whenever a brake caliper is disassembled, replace the brake caliper piston dust seal and brake caliper piston seal.



2. Check:
   • Brake caliper bracket
   Cracks/damage → Replace.

EAS22651

ASSEMBLING THE REAR BRAKE CALIPER

EWA23P1006

⚠ WARNING

• Before installation, all internal brake components should be cleaned and lubricated with clean or new brake fluid.
• Never use solvents on internal brake components as they will cause the brake caliper piston dust seal and brake caliper piston seal to swell and distort.
• Whenever a brake caliper is disassembled, replace the brake caliper piston dust seal and brake caliper piston seal.

Recommended fluid
DOT 4

EAS22670

INSTALLING THE REAR BRAKE CALIPER

1. Install:
   • Rear brake caliper bracket
   • Rear wheel axle
   • Rear wheel axle nut

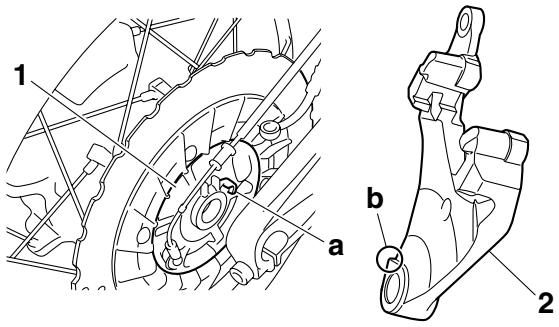
TIP

Align the slot "a" of the rear wheel sensor housing "1" with the projection "b" of the rear brake caliper bracket "2", and then assemble them.

ECA14470

NOTICE

Make sure there are no foreign materials in the wheel hub. Foreign materials cause damage to the inner sensor rotor and wheel sensor.



2. Tighten:
   - Brake torque rod bolt
   - Rear wheel axle nut
   - Rear wheel axle pinch bolt

Brake torque rod bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)
Rear wheel axle nut
125 Nm (12.5 m·kgf, 90 ft·lbf)
Rear wheel axle pinch bolt
25 Nm (2.5 m·kgf, 18 ft·lbf)

3. Install:
   - Brake pad supports
   - Brake pad shims (onto the brake pads)
   - Brake pads
   - Brake caliper bolts
   - Rear brake caliper
     Refer to "REPLACING THE REAR BRAKE PADS" on page 4-59.

Brake caliper bolt
27 Nm (2.7 m·kgf, 19 ft·lbf)

4. Install:
   - Brake hose gaskets New
   - Brake hose (hydraulic unit to rear brake caliper) "1"
   - Brake hose union bolt "2"

Brake hose union bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)

EWA13530

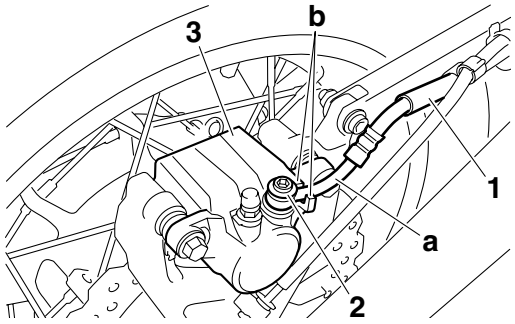
⚠ WARNING

Proper brake hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

ECA23P1060

NOTICE

When installing the brake hose onto the brake caliper "3", make sure the brake pipe "a" is installed between the projections "b" on the brake caliper.



5. Fill:
   - Brake fluid reservoir (with the specified amount of the recommended brake fluid)

Recommended fluid
DOT 4

EWA13090

⚠ WARNING

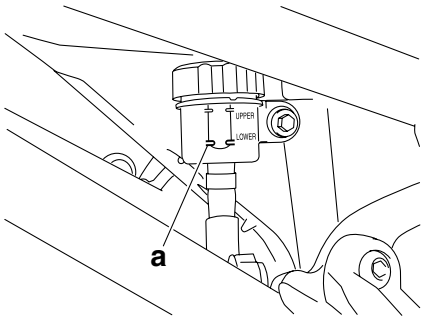
- **Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.**
- **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

NOTICE

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

6. Bleed:
   • Brake system
   Refer to “BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)” on page 3-15.
7. Check:
   • Brake fluid level
   Below the minimum level mark “a” → Add the recommended brake fluid to the proper level.
   Refer to “CHECKING THE BRAKE FLUID LEVEL” on page 3-14.



8. Check:
   • Brake pedal operation
   Soft or spongy feeling → Bleed the brake system.
   Refer to “BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)” on page 3-15.

EAS22700
REMOVING THE REAR BRAKE MASTER CYLINDER

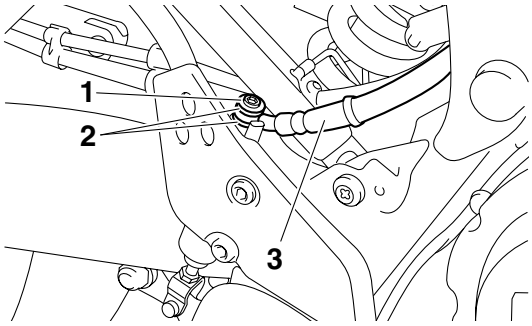
TIP

Before removing the rear brake master cylinder, drain the brake fluid from the entire brake system.

1. Remove:
   • Brake hose union bolt “1”
   • Brake hose gaskets “2”
   • Brake hose (rear brake master cylinder to hydraulic unit) “3”

TIP

To collect any remaining brake fluid, place a container under the master cylinder and the end of the brake hose.

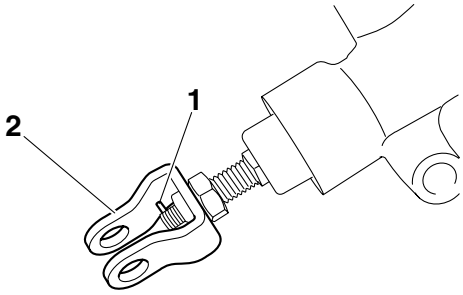


EAS23P1070
DISASSEMBLING THE REAR BRAKE MASTER CYLINDER

1. Remove:
   • Adjuster rod pin “1”
   • Rear brake master cylinder joint “2”

TIP

Remove the adjuster rod pin, and then remove the rear brake master cylinder joint.



EAS22720
CHECKING THE REAR BRAKE MASTER CYLINDER

1. Check:
   • Brake master cylinder
   Damage/scratches/wear → Replace.
   • Brake fluid delivery passages (brake master cylinder body)
   Obstruction → Blow out with compressed air.
2. Check:
   • Brake master cylinder kit
   Damage/scratches/wear → Replace.
3. Check:
   • Brake fluid reservoir
   Cracks/damage → Replace.
   • Brake fluid reservoir diaphragm
   Cracks/damage → Replace.
4. Check:
   • Brake hose
   Cracks/damage/wear → Replace.

EAS22730
ASSEMBLING THE REAR BRAKE MASTER CYLINDER

EWA13520
⚠ WARNING

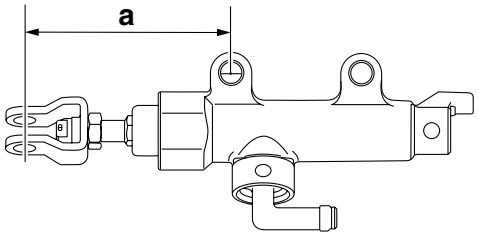
• Before installation, all internal brake components should be cleaned and lubricated with clean or new brake fluid.
• Never use solvents on internal brake components.

Recommended fluid
DOT 4

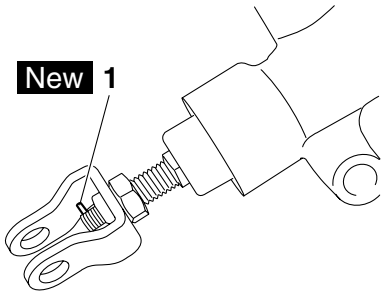
1. Install:
   • Brake hose joint
   • Brake master cylinder kit New
   • Rear brake master cylinder joint

TIP

The rear brake master cylinder joint installation length "a" should be 76.3–77.3 mm (3.00–3.04 in).



2. Install:
   • Adjuster rod pin "1" New

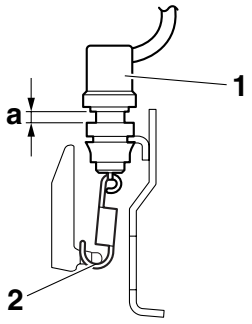


EAS22740
INSTALLING THE REAR BRAKE MASTER CYLINDER

1. Install:
   • Rear brake light switch "1"

TIP

• The rear brake light switch installation length "a" should be 3.8–4.8 mm (0.15–0.19 in).
• Install the rear brake light switch spring "2" as shown in the illustration.



2. Install:
   • Brake hose gaskets New
   • Brake hose (rear brake master cylinder to hydraulic unit) "1"
   • Brake hose union bolt "2"

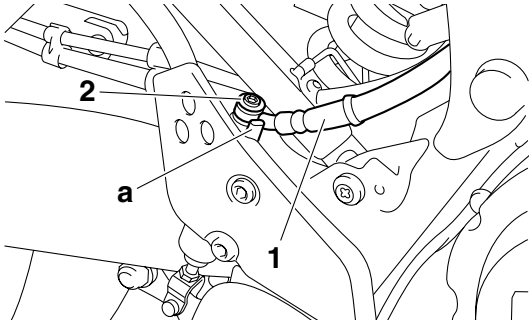
Brake hose union bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)

EWA13530
⚠ WARNING

Proper brake hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

ECA14160
NOTICE

When installing the brake hose onto the brake master cylinder, make sure the brake pipe touches the projection "a" as shown.



3. Fill:
   • Brake fluid reservoir
   (with the specified amount of the recommended brake fluid)

Recommended fluid
DOT 4

EWA13090

⚠ WARNING

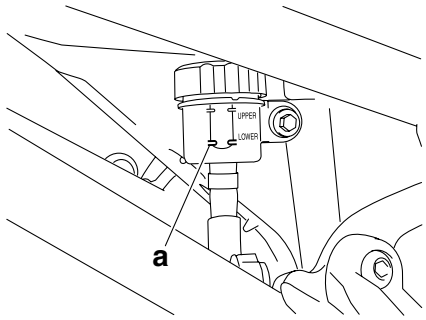
- **Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.**
- **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

NOTICE

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

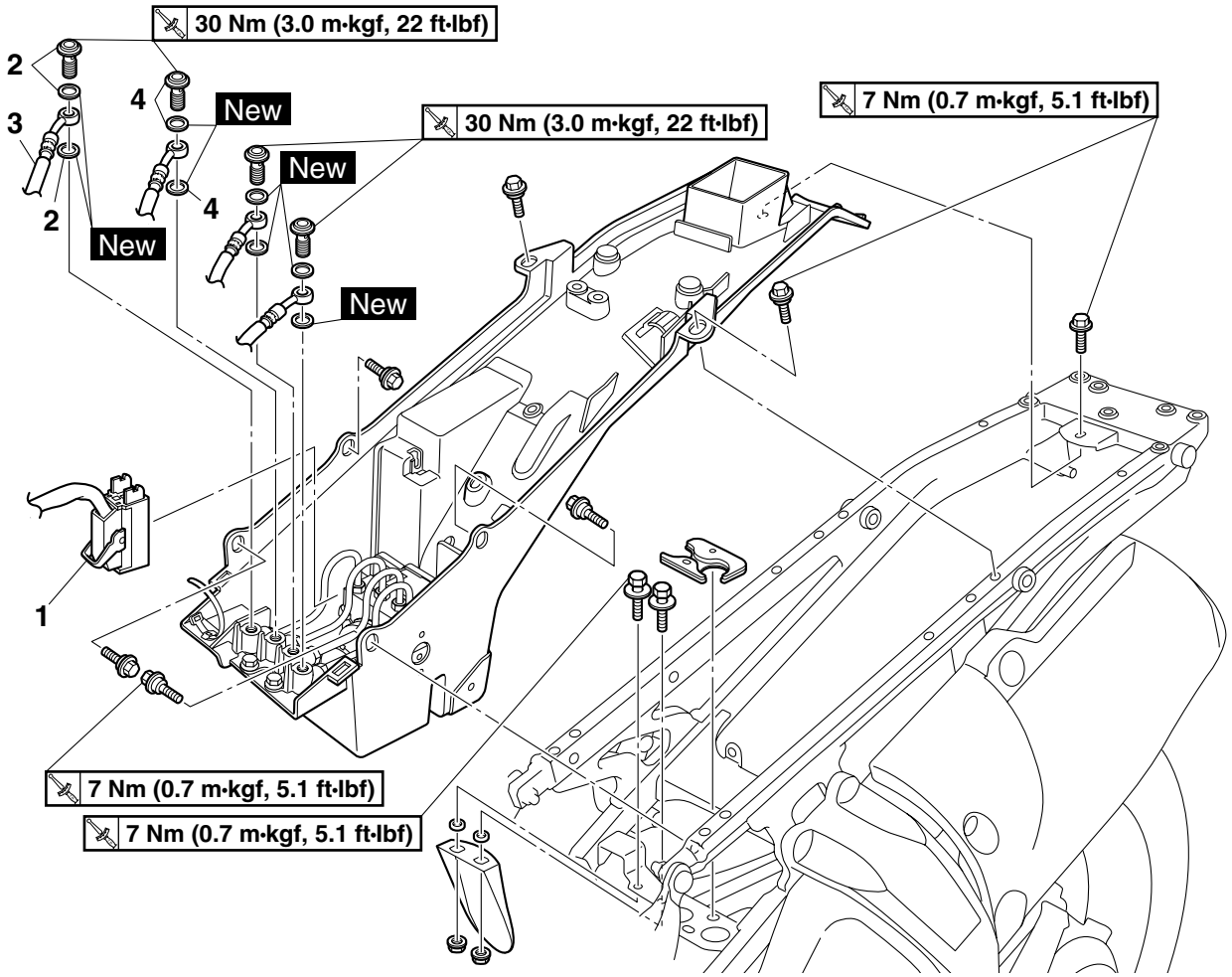
4. Bleed:
   - Brake system
     Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
5. Check:
   - Brake fluid level
     Below the minimum level mark "a" → Add the recommended brake fluid to the proper level.
     Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.



6. Check:
   - Brake pedal operation
     Soft or spongy feeling → Bleed the brake system.
     Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
7. Adjust:
   - Rear brake light operation timing
     Refer to "ADJUSTING THE REAR BRAKE LIGHT SWITCH" on page 3-30.

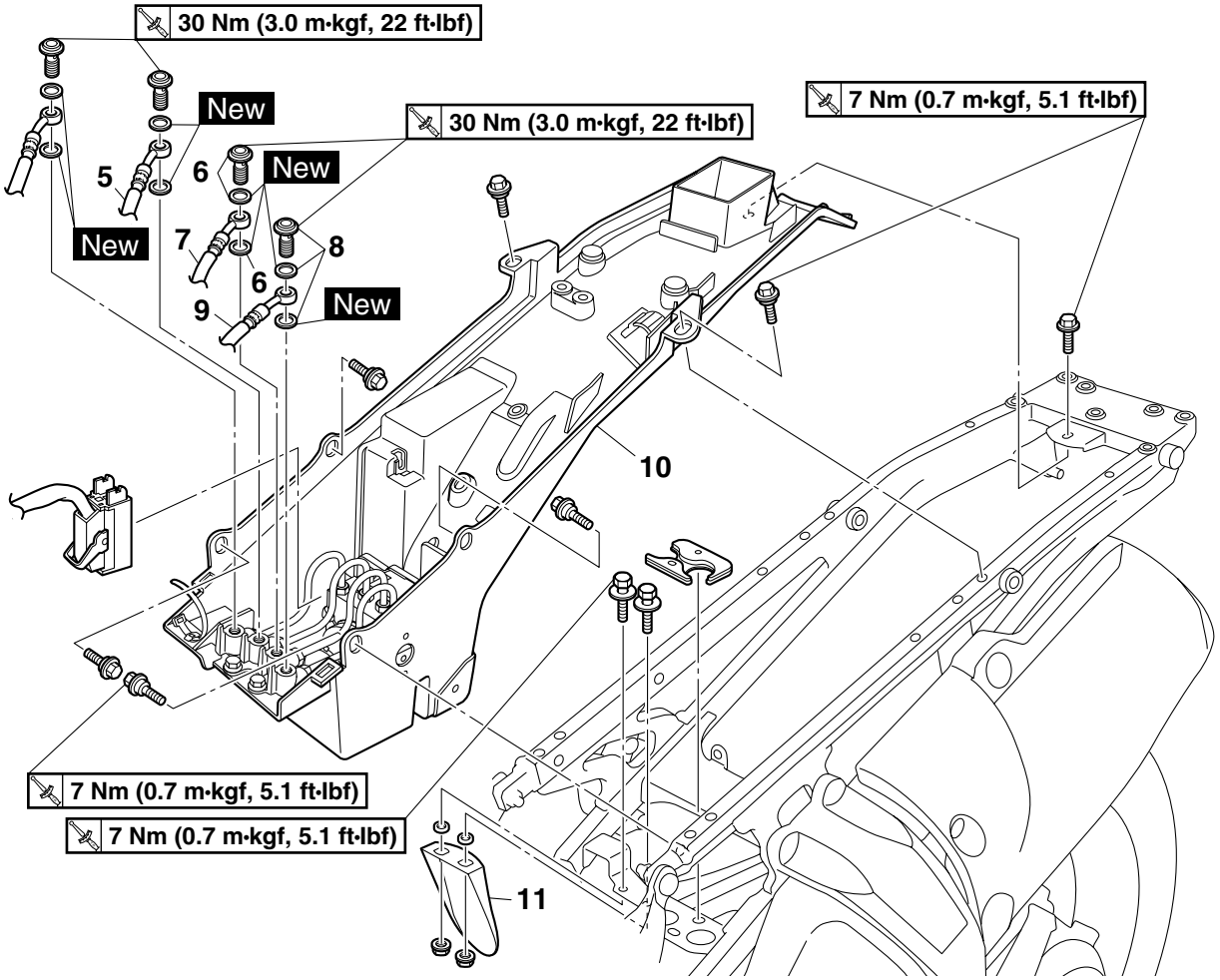
EAS22760
ABS (Anti-Lock Brake System)

Removing the rear fender assembly and brake hoses



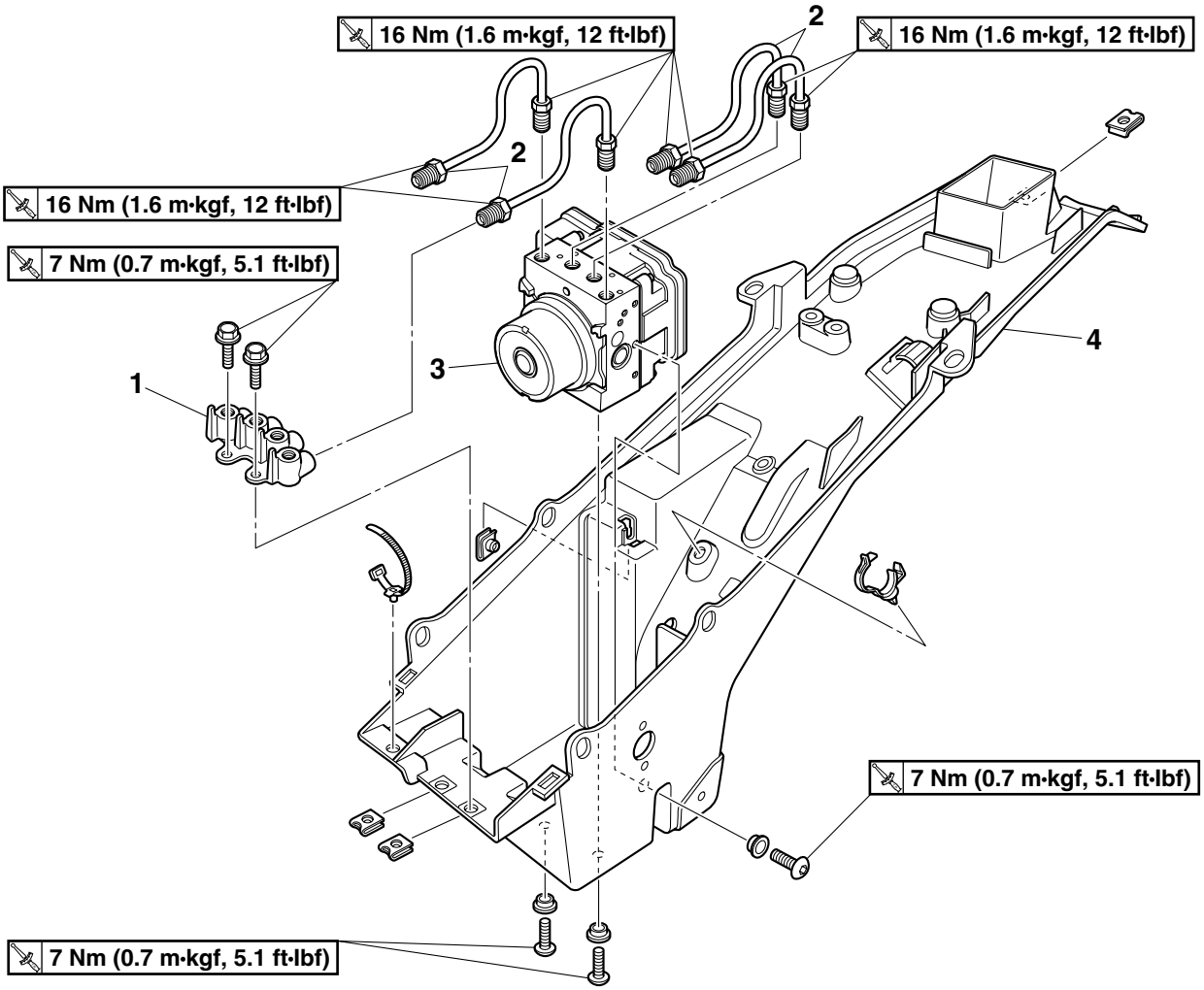
Order	Job/Parts to remove	Q'ty	Remarks
	Brake fluid		Drain. Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
	Tail/brake light assembly/Seat lock		Refer to "GENERAL CHASSIS" on page 4-1.
	Rear brake fluid reservoir		Refer to "REAR BRAKE" on page 4-52.
	Fuel tank bracket		Refer to "FUEL TANK" on page 7-1.
1	ABS ECU coupler	1	Disconnect.
2	Brake hose union bolt/Gasket	1/2	
3	Brake hose (front brake master cylinder to hydraulic unit brake pipe joint)	1	Disconnect.
4	Brake hose union bolt/Gasket	1/2	

Removing the rear fender assembly and brake hoses



Order	Job/Parts to remove	Q'ty	Remarks
5	Brake hose (hydraulic unit brake pipe joint to left front brake caliper)	1	Disconnect.
6	Brake hose union bolt/Gasket	1/2	
7	Brake hose (hydraulic unit brake pipe joint to rear brake caliper)	1	Disconnect.
8	Brake hose union bolt/Gasket	1/2	
9	Brake hose (rear brake master cylinder to hydraulic unit brake pipe joint)	1	Disconnect.
10	Rear fender assembly	1	
11	Rear mudguard	1	
			For installation, reverse the removal procedure.

Removing the hydraulic unit assembly



Order	Job/Parts to remove	Q'ty	Remarks
1	Hydraulic unit brake pipe joint	1	
2	Hydraulic unit brake pipe	4	
3	Hydraulic unit assembly	1	
4	Rear fender	1	
			For installation, reverse the removal procedure.

EAS23P1014
REMOVING THE HYDRAULIC UNIT ASSEMBLY

ECA23P1023
NOTICE

Unless necessary, avoid removing and installing the brake pipes of the hydraulic unit assembly.

EWA13930
⚠ WARNING

Refill with the same type of brake fluid that is already in the system. Mixing fluids may result in a harmful chemical reaction, leading to poor braking performance.

ECA23P1024
NOTICE

- **Handle the ABS components with care since they have been accurately adjusted. Keep them away from dirt and do not subject them to shocks.**
- **Do not set the main switch to "ON" when removing the hydraulic unit assembly.**
- **Do not clean with compressed air.**
- **Do not reuse the brake fluid.**
- **Brake fluid may damage painted surfaces and plastic parts. Therefore, always clean up any spilt brake fluid immediately.**
- **Do not allow any brake fluid to contact the couplers. Brake fluid may damage the couplers and cause bad contacts.**
- **If the brake pipe flare nuts for the hydraulic unit assembly have been removed, be sure to tighten them to the specified torque and bleed the brake system.**

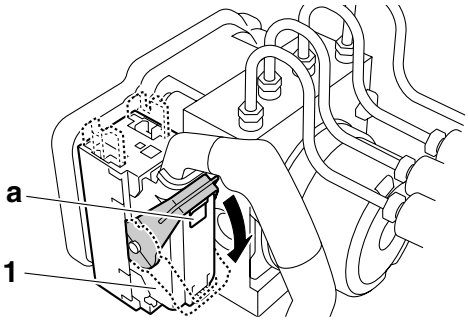
1. Disconnect:
   - ABS ECU coupler "1"

TIP

While pushing the portion "a" of the ABS ECU coupler, push the lock lever down to release the lock.

ECA23P1053
NOTICE

Do not use a tool to disconnect the ABS ECU coupler.



2. Remove:
   - Brake hoses
   - Brake pipes

TIP

- Do not operate the brake lever and brake pedal while removing the brake hoses and brake pipes.
- Do not bend the brake pipe when loosening the brake pipe flare nuts.

ECA23P1025
NOTICE

- **When removing the brake hoses and brake pipes, cover the area around the hydraulic unit assembly to catch any spilt brake fluid. Do not allow the brake fluid to contact other parts.**
- **Before disconnecting the brake pipes from the hydraulic unit assembly, do not lift up or move the brake pipes.**

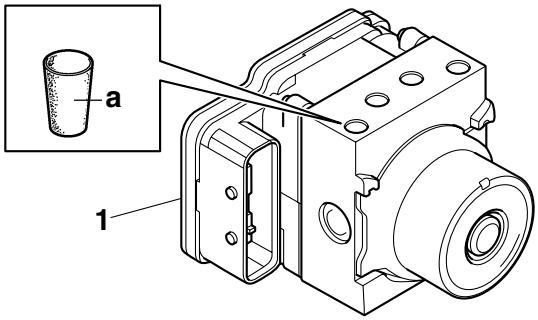
3. Remove:
   - Hydraulic unit assembly "1"

TIP

To avoid brake fluid leakage and to prevent foreign materials from entering the hydraulic unit assembly, insert a rubber plug "a" or a bolt (M10 × 1.00) into each flare nut hole.

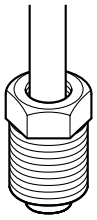
ECA23P1026
NOTICE

When using a bolt, do not tighten the bolt until the bolt head touches the hydraulic unit. Otherwise, the brake pipe seating surface could be deformed.



EAS23P1015
CHECKING THE HYDRAULIC UNIT ASSEMBLY
1. Check:
   • Hydraulic unit assembly
   Cracks/damage → Replace the hydraulic unit assembly and the brake pipes that are connected to the assembly as a set.

EAS23P1016
CHECKING THE BRAKE PIPES
The following procedure applies to all of the brake pipes.
1. Check:
   • Brake pipe end (flare nut)
   Damage → Replace the hydraulic unit assembly, brake pipes, and related parts as a set.



EAS23P1017
INSTALLING THE HYDRAULIC UNIT ASSEMBLY
1. Assemble:
   • Hydraulic unit assembly
   • Hydraulic unit brake pipes
   • Hydraulic unit brake pipe joint

TIP

Do not allow any foreign materials to enter the hydraulic unit assembly or the brake hoses or brake pipes when installing the hydraulic unit assembly.

ECA23P1027
NOTICE

Do not remove the rubber plugs or bolts (M10 × 1.00) installed in the flare nut holes before installing the hydraulic unit assembly.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the rubber plugs or bolts (M10 × 1.00).
b. Assemble the hydraulic unit assembly, hydraulic unit brake pipes, and hydraulic unit brake pipe joint.

TIP

Temporarily tighten the brake pipe flare nuts.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   • Hydraulic unit assembly
   • Hydraulic unit brake pipe joint
   (to the rear fender)

	Hydraulic unit assembly bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)** **Hydraulic unit brake pipe joint bolt** **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

3. Tighten:
   • Hydraulic unit brake pipe flare nuts

	Hydraulic unit brake pipe flare nut **16 Nm (1.6 m·kgf, 12 ft·lbf)**

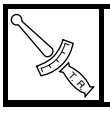
ECA23P1028
NOTICE

If the brake pipe flare nut does not turn easily, replace the hydraulic unit assembly, brake pipes, and related parts as a set.

TIP

Do not bend the brake pipe when tightening the brake pipe flare nuts.

4. Install:
   • Rear fender assembly
   (to the rear frame)

	**Rear fender assembly bolt** **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

5. Install:
   • Gaskets New
   • Brake hose union bolts
   • Brake hoses “1”

	Brake hose union bolt **30 Nm (3.0 m·kgf, 22 ft·lbf)**

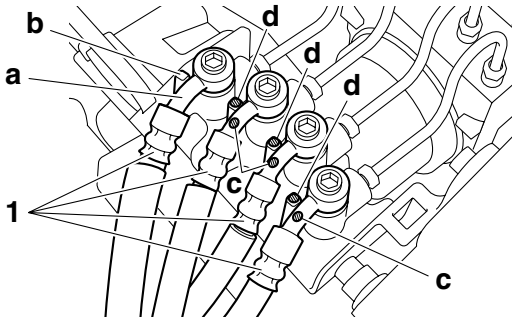
ECA23P1029

NOTICE

When installing each brake hose onto the hydraulic unit brake pipe joint (four locations), make sure that the brake pipe "a" touches the projection "b" on the joint.

TIP

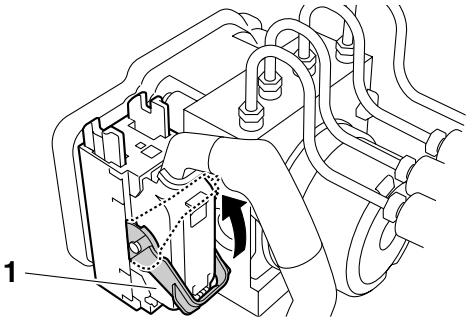
Except for the brake hose (front brake master cylinder to hydraulic unit brake pipe joint), each brake hose is color-coded to its corresponding projection on the hydraulic unit brake pipe joint (three locations); therefore, be sure to match the paint colors "c" and "d".



6. Connect:
   - ABS ECU coupler "1"

TIP

Pull the lock lever up until a click is heard, making sure that the ABS ECU coupler is installed securely.



7. Fill:
   - Brake master cylinder reservoir
   - Brake fluid reservoir
     (with the specified amount of the recommended brake fluid)

	Recommended fluid **DOT 4**

EWA23P1007

⚠ WARNING

- **Use only the designated brake fluid. Other brake fluids may cause the rubber seals to deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid that is already in the system. Mixing brake fluids may result in a harmful chemical reaction, leading to poor brake performance.**
- **When refilling, be careful that water does not enter the brake master cylinder reservoir or brake fluid reservoir. Water will significantly lower the boiling point of the brake fluid and could cause vapor lock.**

ECA13540

NOTICE

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

8. Bleed:
   - Brake system
     Refer to "BLEEDING THE HYDRAULIC BRAKE SYSTEM (ABS)" on page 3-15.
9. Check the operation of the hydraulic unit according to the brake lever and the brake pedal response. (Refer to "HYDRAULIC UNIT OPERATION TESTS" on page 4-71.)

ECA14770

NOTICE

Always check the operation of the hydraulic unit according to the brake lever and the brake pedal response.

10. Delete the fault codes. (Refer to "[D-1] DELETING THE FAULT CODES" on page 8-129.)
11. Perform a trial run. (Refer to "TRIAL RUN" on page 4-75.)

EAS22800

HYDRAULIC UNIT OPERATION TESTS

The reaction-force pulsating action generated in the brake lever and brake pedal when the ABS is activated can be tested when the vehicle is stopped.

The hydraulic unit operation can be tested using the following two methods.

- Hydraulic unit operation test 1: this test checks the function of the ABS after the system was disassembled, adjusted, or serviced.

• Hydraulic unit operation test 2: this test generates the same reaction-force pulsating action that is generated in the brake lever and brake pedal when the ABS is activated.

Hydraulic unit operation test 1

EWA13120

⚠ WARNING

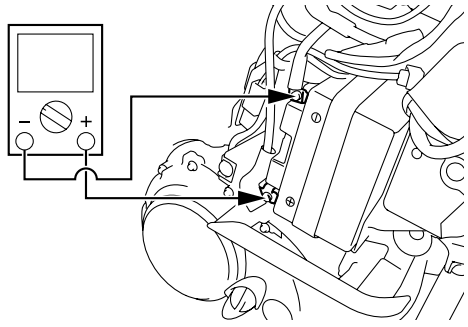
Securely support the vehicle so that there is no danger of it falling over.

1. Place the vehicle on the centerstand.
2. Set the main switch to "OFF".
3. Remove:
   • Rider seat
   • Right side cowling
   Refer to "GENERAL CHASSIS" on page 4-1.
4. Check:
   • Battery voltage
   Lower than 12.8 V → Charge or replace the battery.

Battery voltage
Higher than 12.8 V

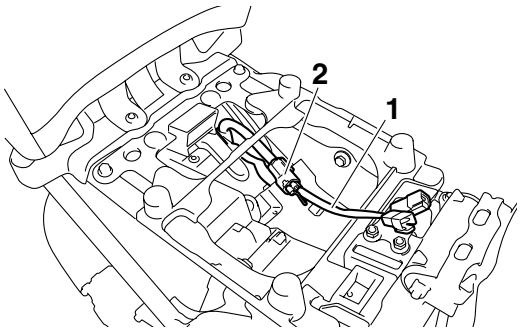
TIP

• If the battery voltage is lower than 12.8 V, charge the battery, and then perform hydraulic unit operation test 1.
• If the battery voltage is lower than 10 V, the ABS warning light comes on and the ABS does not operate.



5. Remove the protective cap, and then connect the test coupler adapter "1" to the ABS test coupler "2".

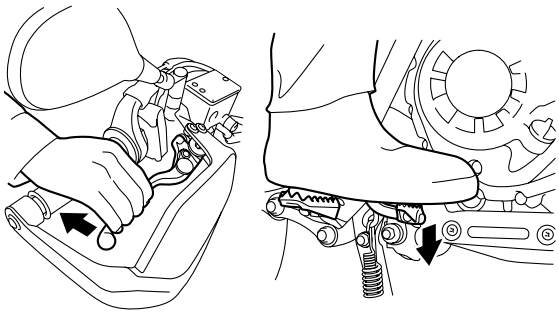
Test coupler adapter
90890-03149



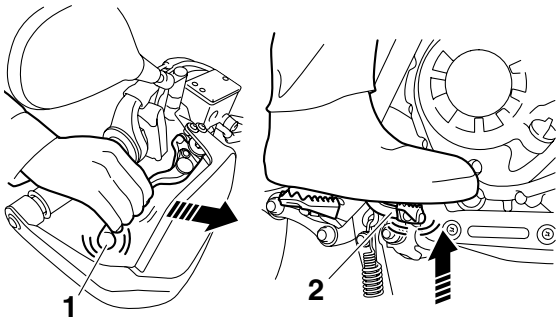
6. Set the main switch to "ON" while operating the brake lever and the brake pedal simultaneously.

TIP

Do not push the start switch when setting the main switch to "ON", otherwise the operation test will not begin.



7. Check:
   • Hydraulic unit operation
   When the main switch is set to "ON", a single pulse will be generated in the brake lever "1", brake pedal "2", and again in the brake lever "1", in this order.



ECA23P1030

NOTICE

• Check that the pulse is felt in the brake lever, brake pedal, and again in the brake lever, in this order.
• If the pulse is felt in the brake pedal before it is felt in the brake lever, check that the brake hoses and brake pipes are connected correctly to the hydraulic unit assembly.

• If the pulse is hardly felt in either the brake lever or brake pedal, check that the brake hoses and brake pipes are connected correctly to the hydraulic unit assembly.

- If the operation of the hydraulic unit is normal, delete all of the fault codes.

8. Release the brake lever and brake pedal, and then set the main switch to "OFF".

ECA23P1089

NOTICE

If the main switch is set back to "ON" while the brake lever and brake pedal are operated, the hydraulic unit operation test cannot be restarted.

Hydraulic unit operation test 2

EWA13120

⚠ WARNING

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

1. Place the vehicle on the centerstand.
2. Set the main switch to "OFF".
3. Remove:
   - Rider seat
   - Right side cowling

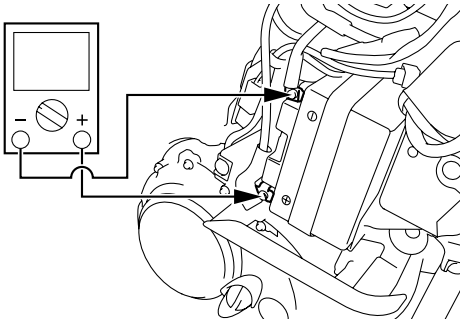
   Refer to "GENERAL CHASSIS" on page 4-1.
4. Check:
   - Battery voltage

   Lower than 12.8 V → Charge or replace the battery.

Battery voltage
Higher than 12.8 V

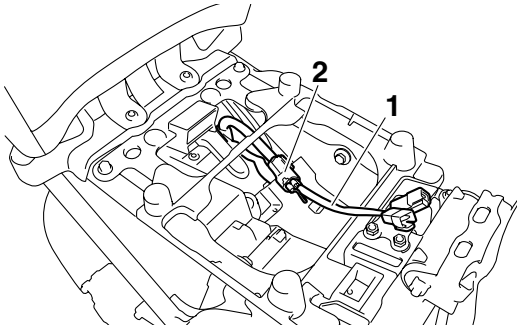
TIP

- If the battery voltage is lower than 12.8 V, charge the battery, and then perform hydraulic unit operation test 2.
- If the battery voltage is lower than 10 V, the ABS warning light comes on and the ABS does not operate.

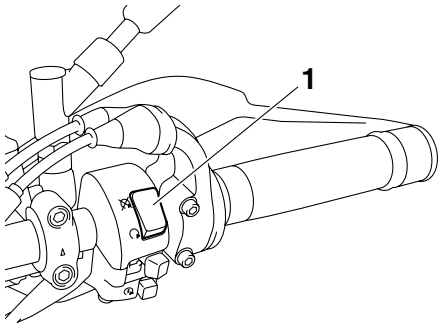


5. Remove the protective cap and then connect the test coupler adapter "1" to the ABS test coupler "2".

Test coupler adapter
90890-03149



6. Set the engine stop switch "1" to "⊗".
7. Set the main switch to "ON".

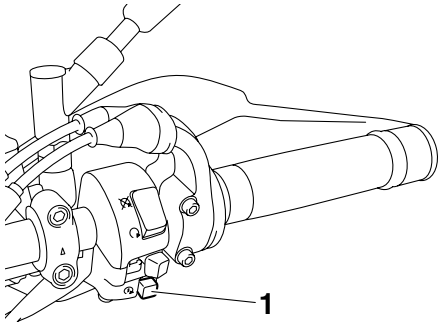


8. Push the start switch "1" for at least 4 seconds.

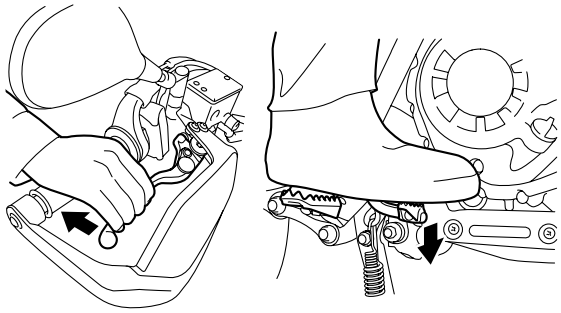
ECA14790

NOTICE

Do not operate the brake lever or the brake pedal.



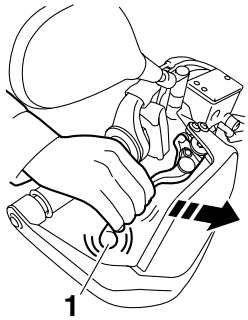
9. After releasing the start switch, operate the brake lever and the brake pedal simultaneously.



10. A reaction-force pulsating action is generated in the brake lever "1" 0.5 second after the brake lever and the brake pedal are operated simultaneously and continues for approximately 2.5 seconds.

TIP

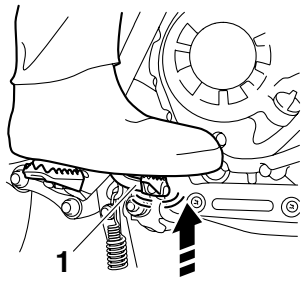
- The reaction-force pulsating action consists of quick pulses.
- Be sure to continue operating the brake lever and brake pedal even after the pulsating action has stopped.



11. After the pulsating action has stopped in the brake lever, it is generated in the brake pedal "1" 0.5 second later and continues for approximately 2.5 seconds.

TIP

- The reaction-force pulsating action consists of quick pulses.
- Be sure to continue operating the brake lever and brake pedal even after the pulsating action has stopped.



12. After the pulsating action has stopped in the brake pedal, it is generated in the brake lever 0.5 second later and continues for approximately 2.5 seconds.

TIP

The reaction-force pulsating action consists of quick pulses.

ECA23P1032

NOTICE

- **Check that the pulsating action is felt in the brake lever, brake pedal, and again in the brake lever, in this order.**
- **If the pulsating action is felt in the brake pedal before it is felt in the brake lever, check that the brake hoses and brake pipes are connected correctly to the hydraulic unit assembly.**
- **If the pulsating action is hardly felt in either the brake lever or brake pedal, check that the brake hoses and brake pipes are connected correctly to the hydraulic unit assembly.**

13. Release the brake lever and brake pedal, and then set the main switch to "OFF".

ECA23P1031

NOTICE

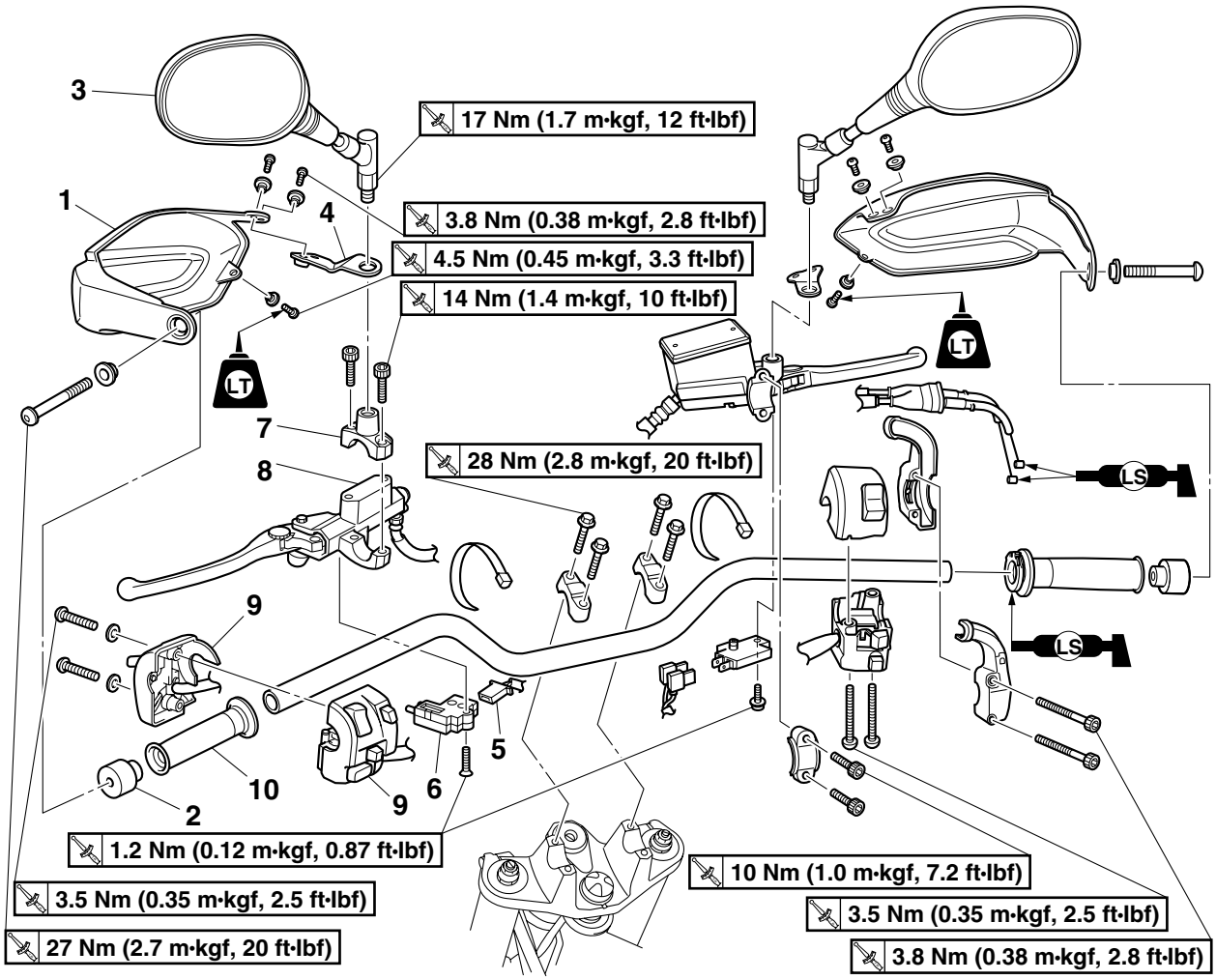
If the main switch is set back to "ON" while the brake lever and brake pedal are operated, the hydraulic unit operation test cannot be restarted.

14. Remove the test coupler adapter from the ABS test coupler, and then install the protective cap.
15. Set the main switch to "ON".
16. Set the engine stop switch to "$\cap$".
17. Check for brake fluid leakage around the hydraulic unit.
    Brake fluid leakage → Replace the hydraulic unit assembly, brake pipes, and related parts as a set.

EAS22820
TRIAL RUN
After all checks and servicing are completed, always ensure the vehicle has no problems by performing a trial run at a speed of faster than 30 km/h.

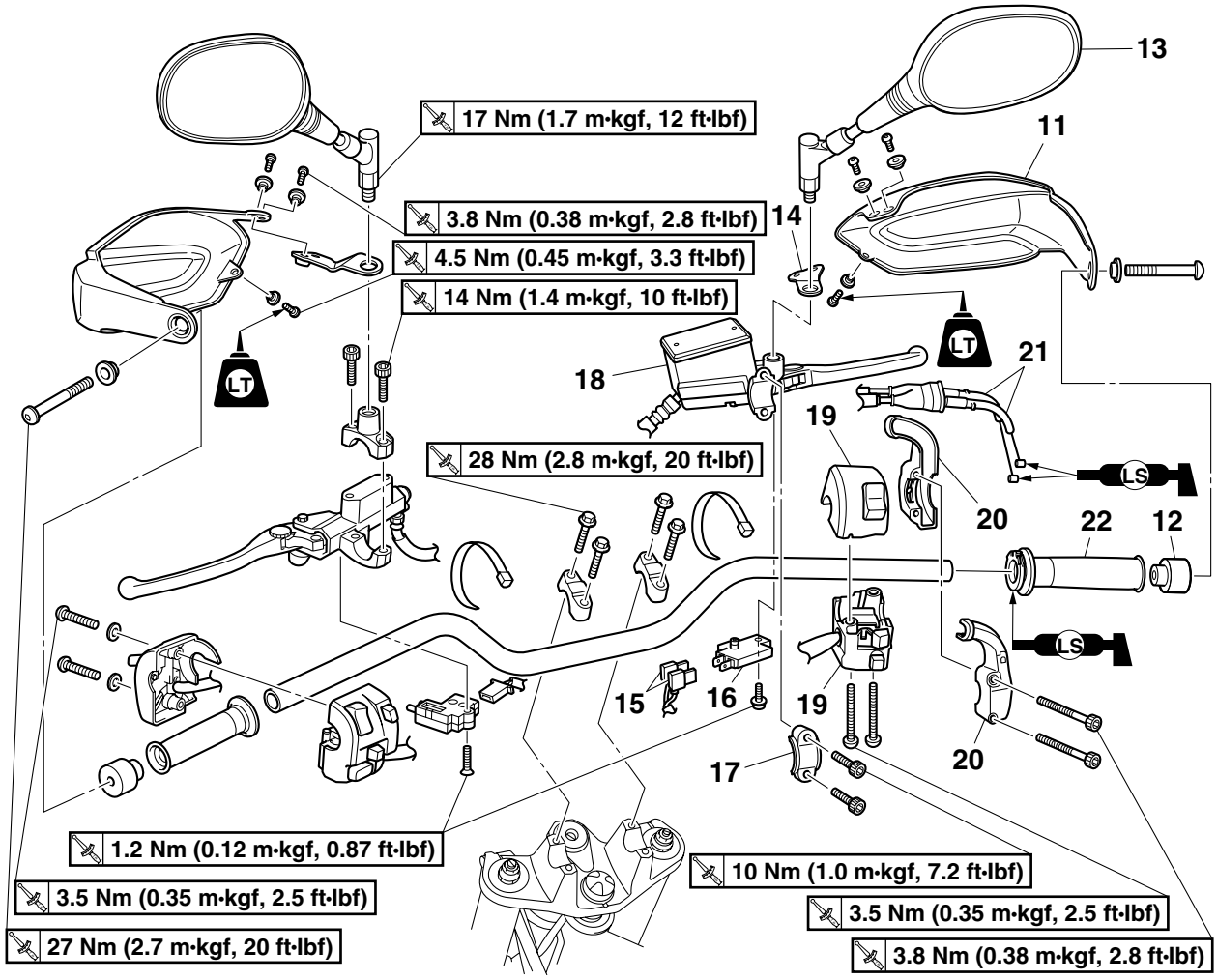
EAS22840
HANDLEBAR

Removing the handlebar



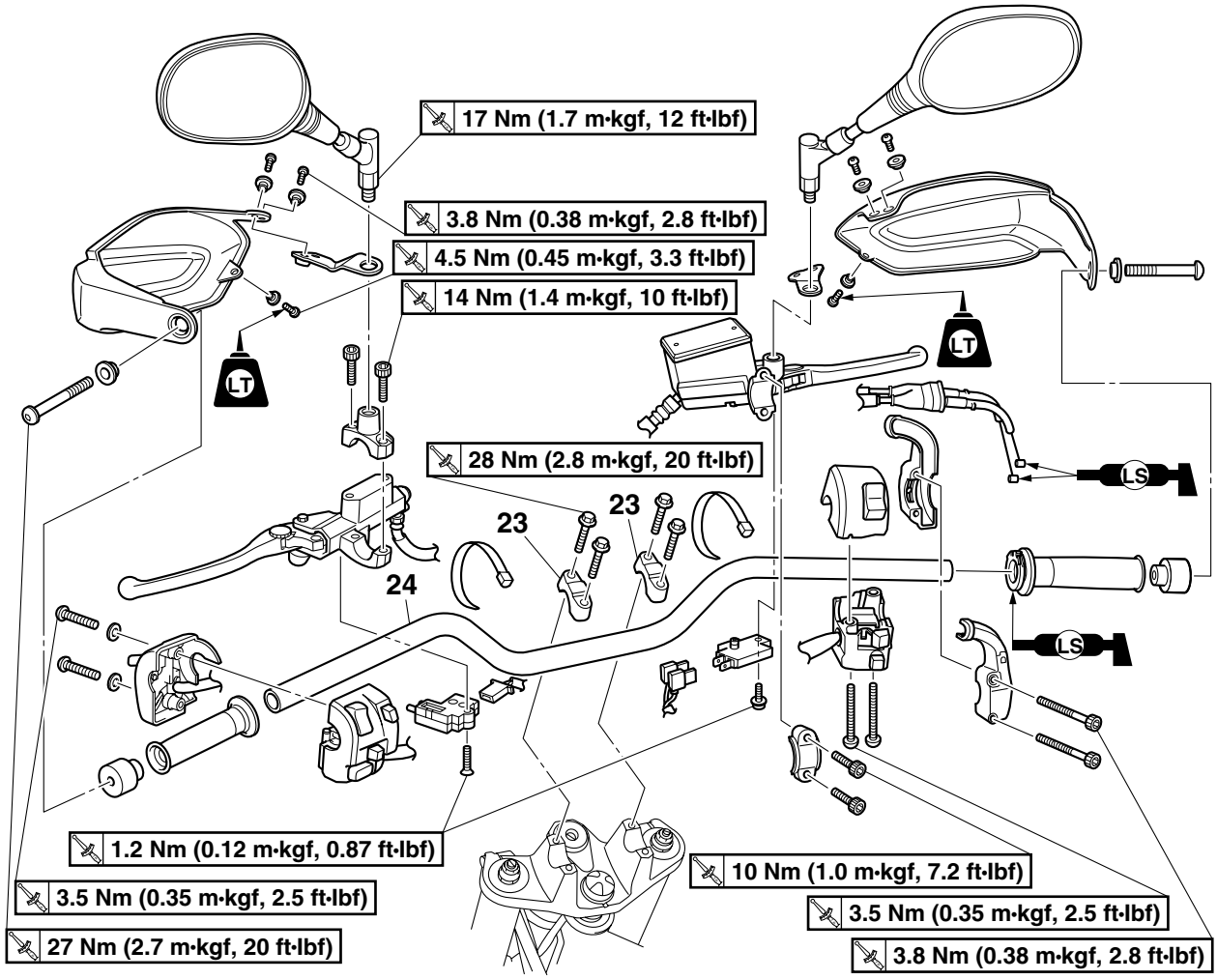
Order	Job/Parts to remove	Q'ty	Remarks
	Right side cowling		Refer to "GENERAL CHASSIS" on page 4-1.
1	Left hand shield	1	
2	Left grip end	1	
3	Left rearview mirror	1	
4	Left hand shield upper bracket	1	
5	Clutch switch coupler	1	Disconnect.
6	Clutch switch	1	
7	Clutch master cylinder holder	1	
8	Clutch master cylinder assembly	1	
9	Left handlebar switch	1	
10	Handlebar grip	1	

Removing the handlebar



Order	Job/Parts to remove	Q'ty	Remarks
11	Right hand shield	1	
12	Right grip end	1	
13	Right rearview mirror	1	
14	Right hand shield upper bracket	1	
15	Front brake light switch connector	2	Disconnect.
16	Front brake light switch	1	
17	Front brake master cylinder holder	1	
18	Front brake master cylinder assembly	1	
19	Right handlebar switch	1	
20	Throttle cable housing	2	
21	Throttle cable	2	Disconnect.
22	Throttle grip	1	

Removing the handlebar



Order	Job/Parts to remove	Q'ty	Remarks
23	Upper handlebar holder	2	
24	Handlebar	1	
			For installation, reverse the removal procedure.

EAS22860
REMOVING THE HANDLEBAR

1. Stand the vehicle on a level surface.

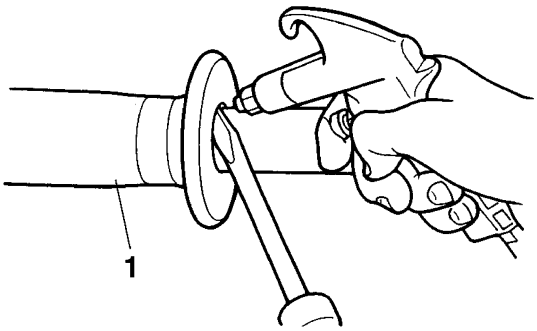
EWA13120
⚠ WARNING

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

2. Remove:
   • Handlebar grip "1"

TIP

Blow compressed air between the left handlebar and the handlebar grip, and gradually push the grip off the handlebar.



EAS22880
CHECKING THE HANDLEBAR

1. Check:
   • Handlebar
   Bends/cracks/damage → Replace.

EWA13690
⚠ WARNING

Do not attempt to straighten a bent handlebar as this may dangerously weaken it.

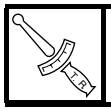
EAS22931
INSTALLING THE HANDLEBAR

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

2. Install:
   • Handlebar "1"
   • Upper handlebar holders "2"

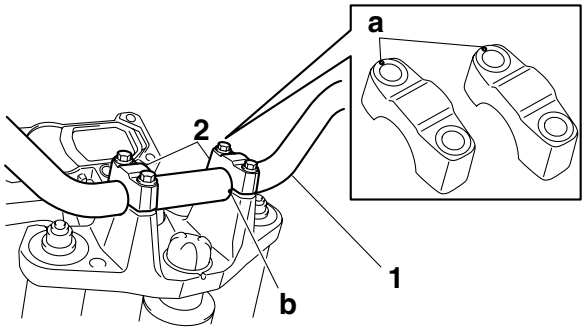
	**Upper handlebar holder bolt 28 Nm (2.8 m·kgf, 20 ft·lbf)**

ECA23P1061
NOTICE

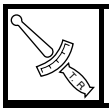
First, tighten the bolts on the front side of the handlebar holder, and then on the rear side.

TIP

- The upper handlebar holders should be installed with the punch marks "a" facing forward.
- Align the punch mark "b" on the handlebar with the upper surface of the lower handlebar holder.

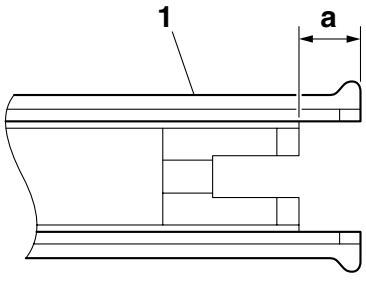


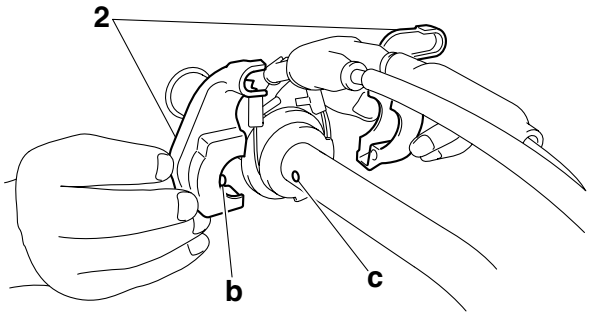
3. Install:
   • Throttle grip "1"
   • Throttle cables
   • Throttle cable housings "2"

	**Throttle cable housing bolt 3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)**

TIP

- Make sure that the distance "a" between the end of the handlebar and the end of the throttle grip is 11–13 mm (0.43–0.51 in).
- Align the projection "b" on the throttle cable housing with the hole "c" in the handlebar.



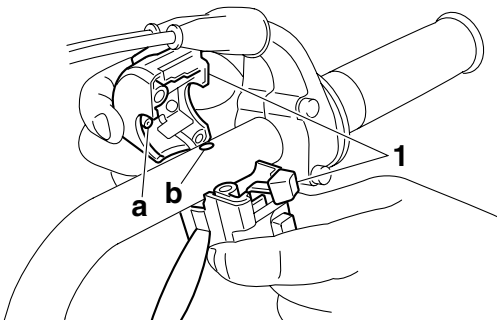


4. Install:
   • Right handlebar switch “1”

	Right handlebar switch screw **3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)**

TIP

Align the projection “a” on the right handlebar switch with the hole “b” on the handlebar.

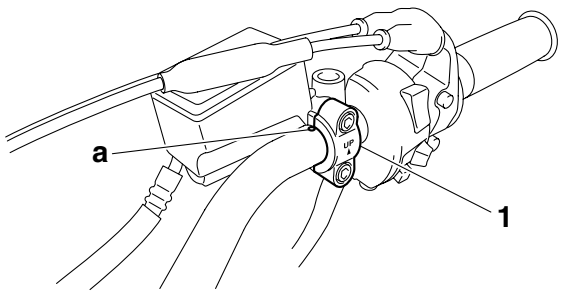


5. Install:
   • Front brake master cylinder assembly
   • Front brake master cylinder holder “1”

	Front brake master cylinder holder bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

TIP

- Install the brake master cylinder holder with the “UP” mark facing up.
- Align the mating surfaces of the brake master cylinder holder with the punch mark “a” on the handlebar.
- First, tighten the upper bolt, then the lower bolt.

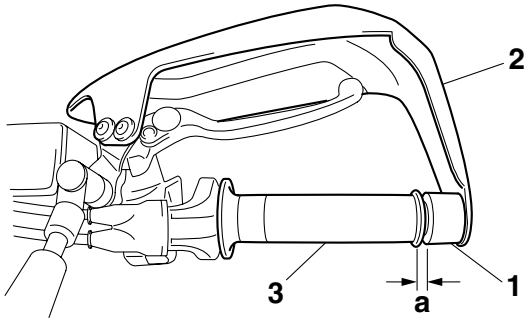


6. Install:
   • Right grip end “1”
   • Right hand shield “2”

	Right grip end bolt **27 Nm (2.7 m·kgf, 20 ft·lbf)** **Right upper hand shield bolt** **3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)** **Right lower hand shield bolt** **4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)** **LOCTITE®**

TIP

There should be 1–3 mm (0.04–0.12 in) of clearance “a” between the throttle grip “3” and the grip end.

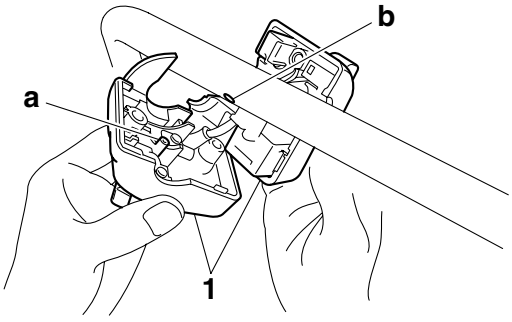


7. Install:
   • Left handlebar switch “1”

	Left handlebar switch screw **3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)**

TIP

Align the projection “a” on the left handlebar switch with the hole “b” in the handlebar.



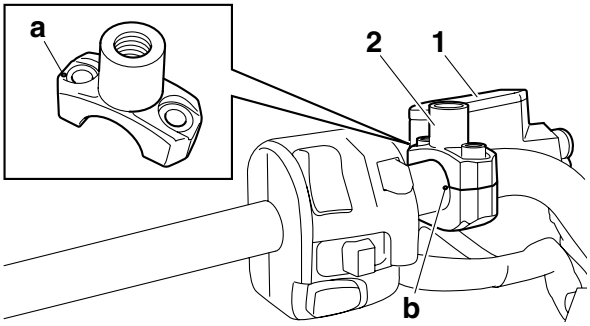
8. Install:
   • Clutch master cylinder assembly “1”
   • Clutch master cylinder holder “2”

	Clutch master cylinder holder bolt **14 Nm (1.4 m·kgf, 10 ft·lbf)**

TIP

- The clutch master cylinder holder should be installed with the punch mark “a” forward.

- Align the mating surfaces of the clutch master cylinder holder with the punch mark “b” on the handlebar.
- First, tighten the front bolt, then the rear bolt.



9. Install:
   - Handlebar grip “1”
   - Left grip end “2”
   - Left hand shield “3”

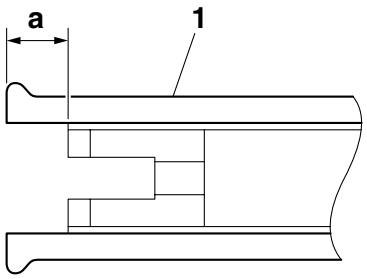
Left grip end bolt
27 Nm (2.7 m·kgf, 20 ft·lbf)
Left upper hand shield bolt
3.8 Nm (0.38 m·kgf, 2.8 ft·lbf)
Left lower hand shield bolt
4.5 Nm (0.45 m·kgf, 3.3 ft·lbf)
LOCTITE®

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Apply a thin coat of rubber adhesive onto the end of the left handlebar.
b. Slide the handlebar grip over the end of the left handlebar.

TIP

Make sure that the distance “a” between the end of the handlebar and the end of the handlebar grip is 11–13 mm (0.43–0.51 in).



c. Wipe off any excess rubber adhesive with a clean rag.

EWA13700

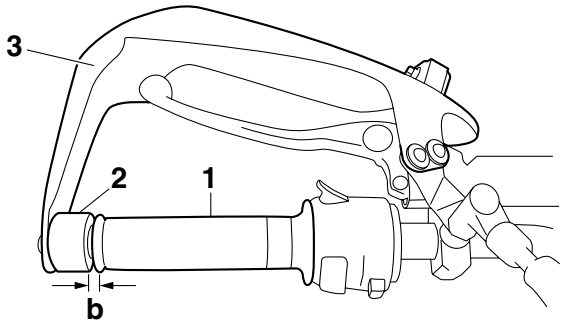
⚠ WARNING

Do not touch the handlebar grip until the rubber adhesive has fully dried.

d. Install the left grip end and left hand shield.

TIP

There should be 1–3 mm (0.04–0.12 in) of clearance “b” between the handlebar grip and the grip end.



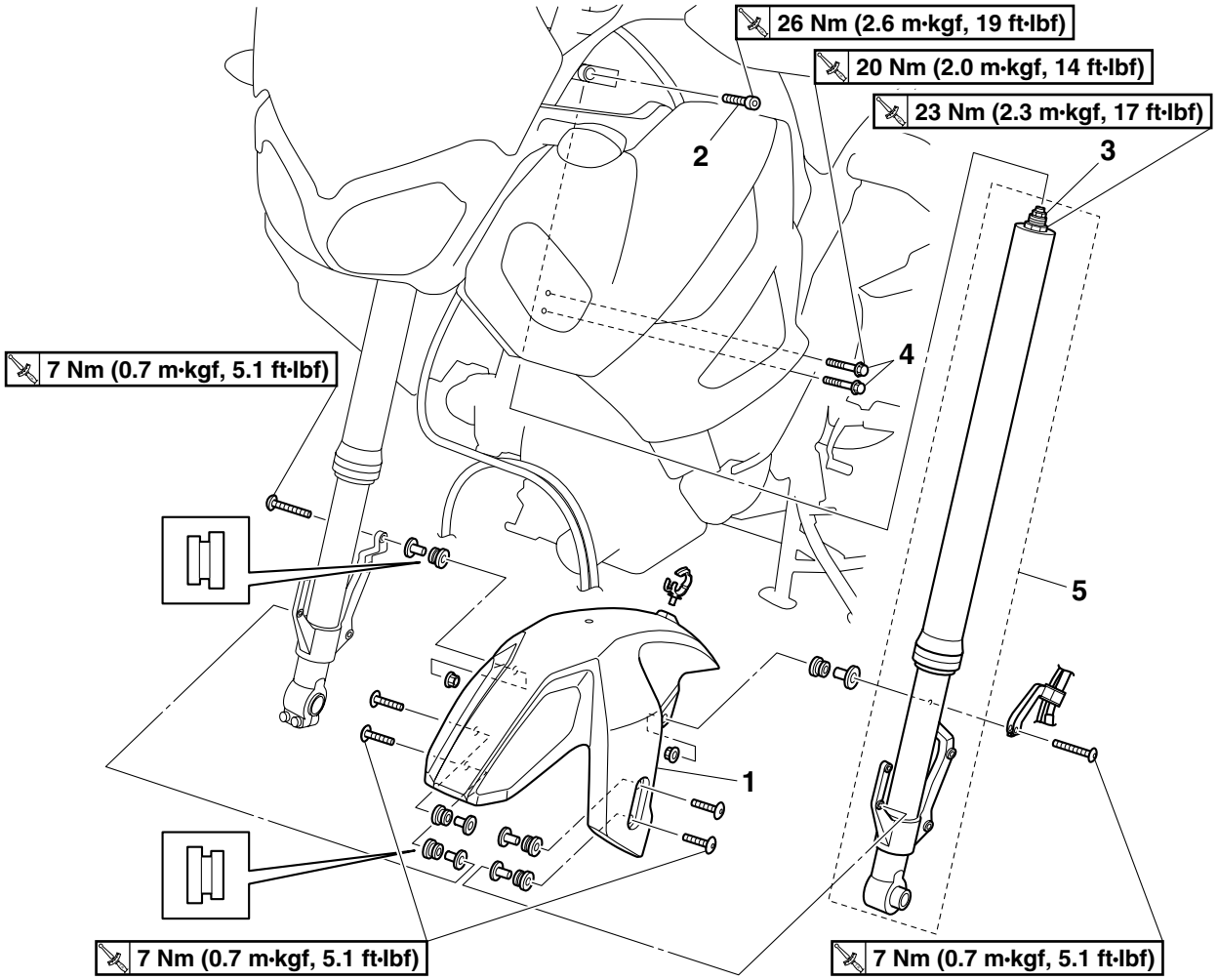
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

10. Adjust:
    - Throttle cable free play
      Refer to “CHECKING THE THROTTLE GRIP OPERATION” on page 3-31.

Throttle cable free play
3.0–5.0 mm (0.12–0.20 in)

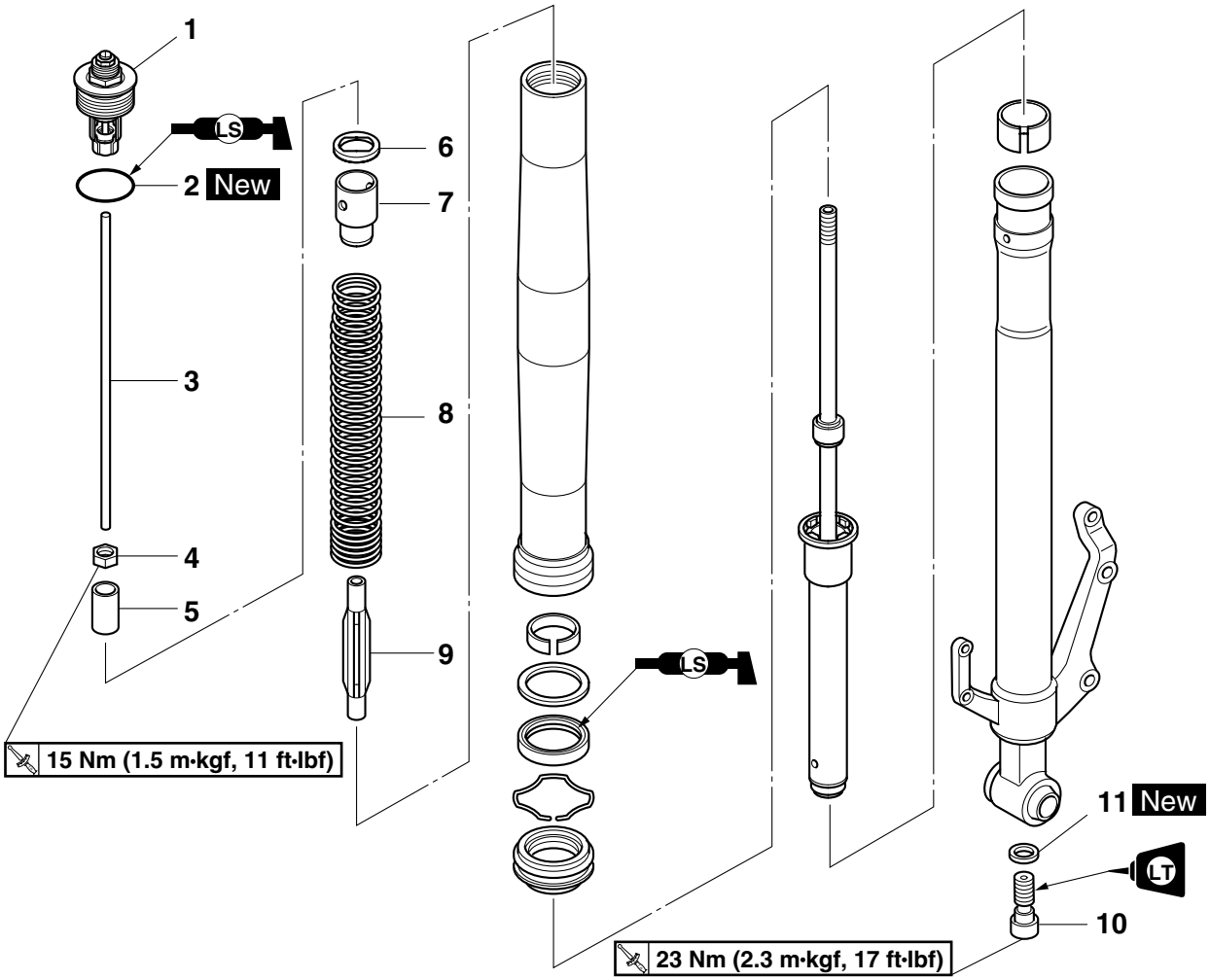
EAS22950
FRONT FORK

Removing the front fork legs



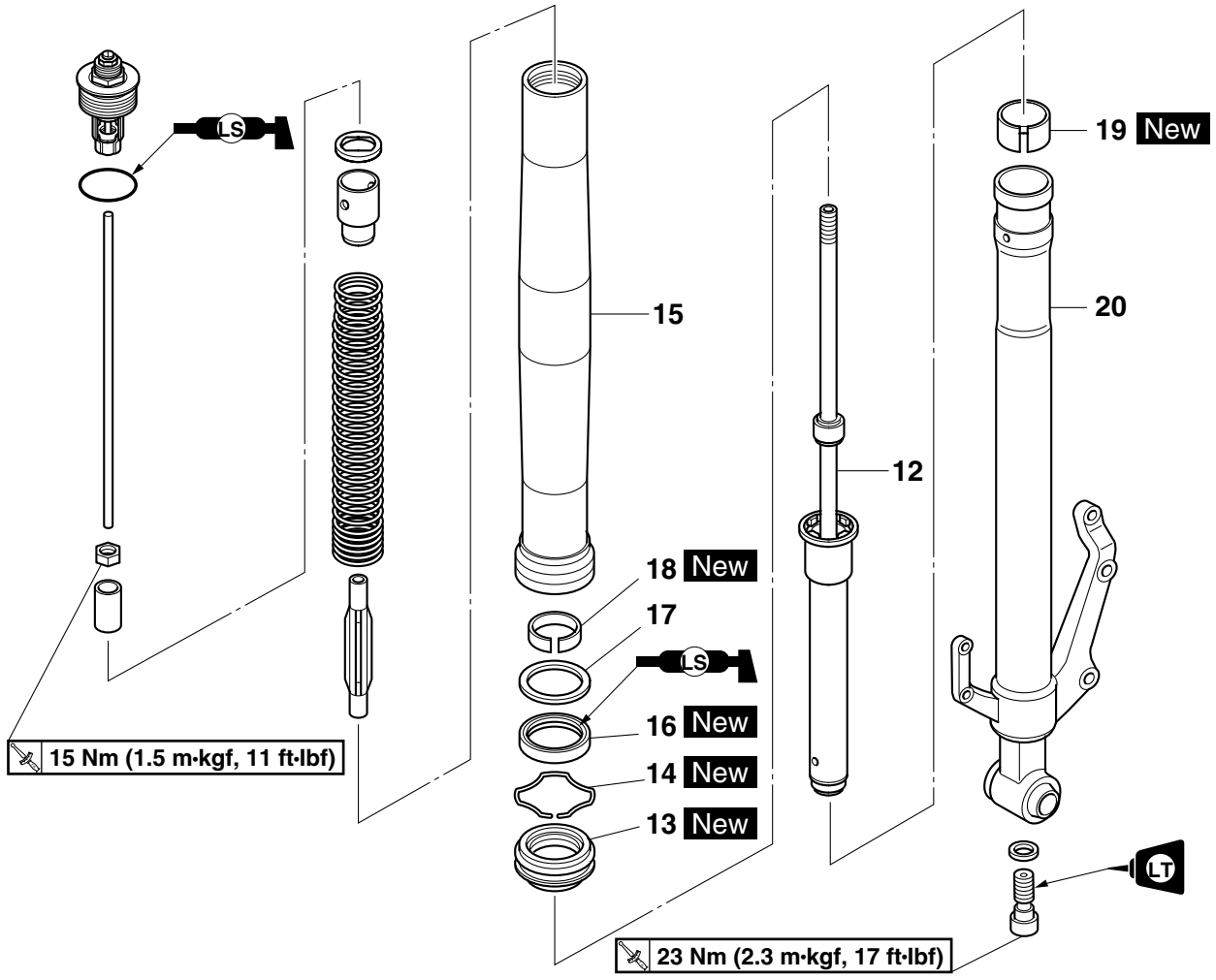
Order	Job/Parts to remove	Q'ty	Remarks
			The following procedure applies to both of the front fork legs.
	Front wheel		Refer to "FRONT WHEEL" on page 4-20.
1	Front fender	1	
2	Upper bracket pinch bolt	1	Loosen.
3	Cap bolt	1	Loosen.
4	Lower bracket pinch bolt	2	Loosen.
5	Front fork leg	1	
			For installation, reverse the removal procedure.

Disassembling the front fork legs



Order	Job/Parts to remove	Q'ty	Remarks
			The following procedure applies to both of the front fork legs.
1	Cap bolt	1	
2	O-ring	1	
3	Damper adjusting rod	1	
4	Nut	1	
5	Collar	1	
6	Washer	1	
7	Spacer	1	
8	Fork spring	1	
9	Fork spring guide	1	
10	Damper rod assembly bolt	1	
11	Copper washer	1	

Disassembling the front fork legs



Order	Job/Parts to remove	Q'ty	Remarks
12	Damper rod assembly	1	
13	Dust seal	1	
14	Oil seal clip	1	
15	Outer tube	1	
16	Oil seal	1	
17	Washer	1	
18	Outer tube bushing	1	
19	Inner tube bushing	1	
20	Inner tube	1	
			For assembly, reverse the disassembly procedure.

EAS22960
REMOVING THE FRONT FORK LEGS

The following procedure applies to both of the front fork legs.

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

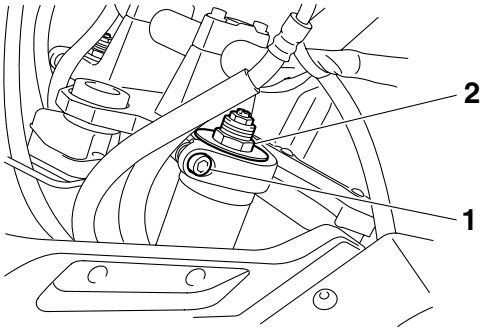
TIP

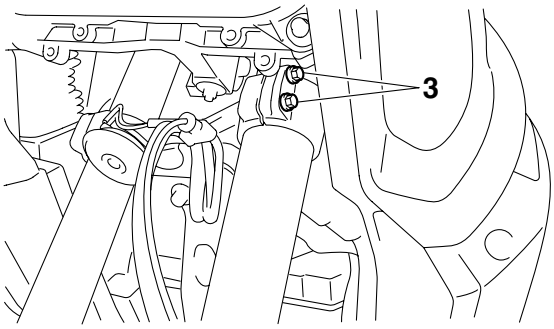
Place the vehicle on a suitable stand so that the front wheel is elevated.

2. Loosen:
   - Upper bracket pinch bolt “1”
   - Cap bolt “2”
   - Lower bracket pinch bolts “3”

EWA13640
⚠ WARNING

Before loosening the upper and lower bracket pinch bolts, support the front fork leg.





3. Remove:
   - Front fork leg

EAS22990
DISASSEMBLING THE FRONT FORK LEGS

The following procedure applies to both of the front fork legs.

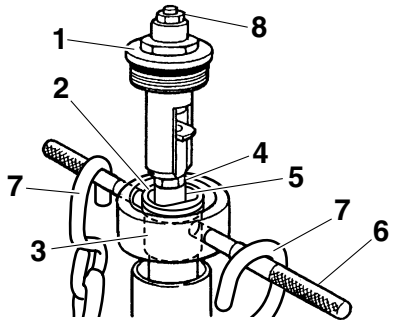
1. Remove:
   - Cap bolt “1” (from the damper rod assembly)
   - Washer “2”
   - Spacer “3”
   - Nut “4”
   - Collar “5”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Press down on the spacer with the fork spring compressor “6” and then secure the compressor with a suitable tool “7”.

Fork spring compressor
90890-01441
YM-01441

b. Hold the spring preload adjusting bolt “8” and loosen the nut “4”.



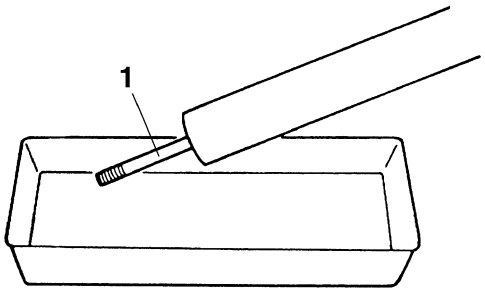
c. Remove the cap bolt.
d. Remove the fork spring compressor.
e. Remove the washer, spacer, nut, and collar.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Drain:
   - Fork oil

TIP

Stroke the damper rod “1” several times while draining the fork oil.

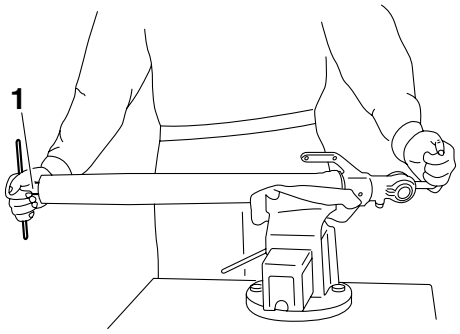


3. Remove:
   - Damper rod assembly bolt
   - Damper rod assembly

TIP

While holding the damper rod with the damper rod holder “1”, loosen the damper rod assembly bolt.

Damper rod holder
90890-01423
Damping rod holder
YM-01423

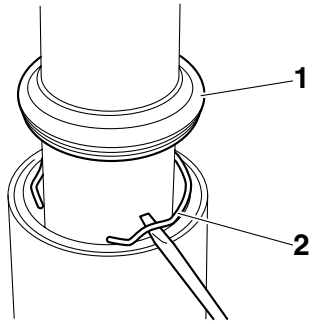


4. Remove:
   • Dust seal “1”
   • Oil seal clip “2”
   (with a flat-head screwdriver)

ECA23P1033

NOTICE

Do not scratch the outer tube.



5. Remove:
   • Outer tube

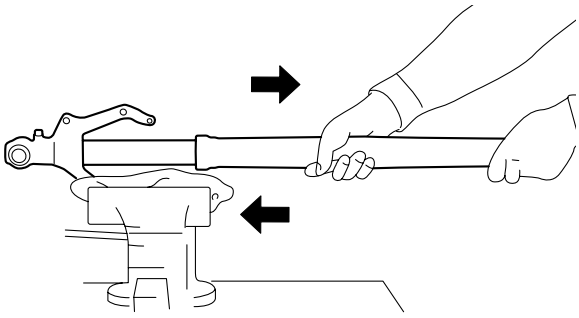
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Hold the front fork leg horizontally.
b. Securely clamp the brake caliper bracket in a vise with soft jaws.
c. Separate the outer tube from the inner tube by pulling the outer tube forcefully but carefully.

ECA23P1062

NOTICE

Excessive force will damage the bushings. Damaged bushings must be replaced.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23011

CHECKING THE FRONT FORK LEGS

The following procedure applies to both of the front fork legs.

1. Check:
   • Inner tube
   • Outer tube
   Bends/damage/scratches → Replace.

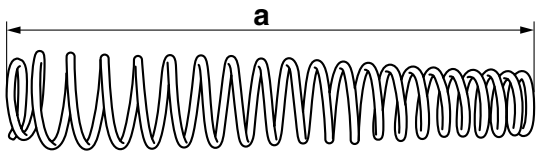
EWA13650

⚠ WARNING

Do not attempt to straighten a bent inner tube as this may dangerously weaken it.

2. Measure:
   • Fork spring free length “a”
   Out of specification → Replace.

Fork spring free length
427.4 mm (16.83 in)
Limit
418.9 mm (16.49 in)



3. Check:
   • Damper rod assembly
   Damage/wear → Replace.
   Obstruction → Blow out all of the oil passages with compressed air.
   • Damper adjusting rod
   Bends/damage → Replace.

ECA14200
NOTICE
- **The front fork leg has a built-in damper adjusting rod and a very sophisticated internal construction, which are particularly sensitive to foreign material.**
- **When disassembling and assembling the front fork leg, do not allow any foreign material to enter the front fork.**

4. Check:
   - Cap bolt O-ring
     Damage/wear → Replace.

EAS23041
ASSEMBLING THE FRONT FORK LEGS
The following procedure applies to both of the front fork legs.

EWA13660
⚠ WARNING
- **Make sure the oil levels in both front fork legs are equal.**
- **Uneven oil levels can result in poor handling and a loss of stability.**

TIP
- When assembling the front fork leg, be sure to replace the following parts:
  –Inner tube bushing
  –Outer tube bushing
  –Oil seal
  –Dust seal
  –O-ring
- Before assembling the front fork leg, make sure all of the components are clean.

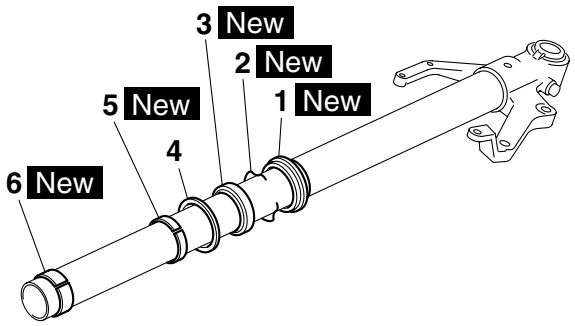
1. Lubricate:
   - Inner tube's outer surface

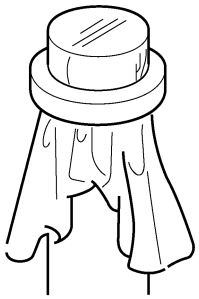
	Recommended oil **Suspension oil 01 or equivalent**

2. Install:
   - Dust seal "1" New
   - Oil seal clip "2" New
   - Oil seal "3" New
   - Washer "4"
   - Outer tube bushing "5" New
   - Inner tube bushing "6" New

ECA23P1034
NOTICE
Make sure to face the numbered side of the oil seal toward the bottom end of the inner tube.

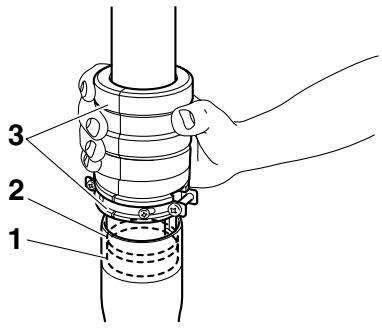
TIP
- Before installing the oil seal, lubricate its lips with lithium-soap-based grease.
- Lubricate the outer surface of the inner tube with fork oil.
- Before installing the oil seal, cover the top of the front fork leg with a plastic bag to protect the oil seal during installation.





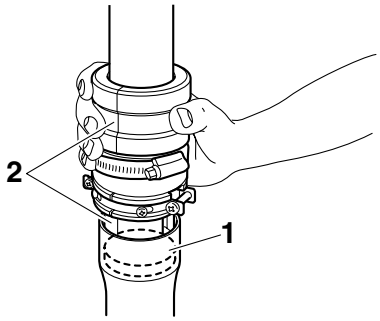
3. Install:
   - Outer tube
     (to the inner tube)
4. Install:
   - Outer tube bushing "1"
   - Washer "2"
     (with the fork seal driver "3")

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



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

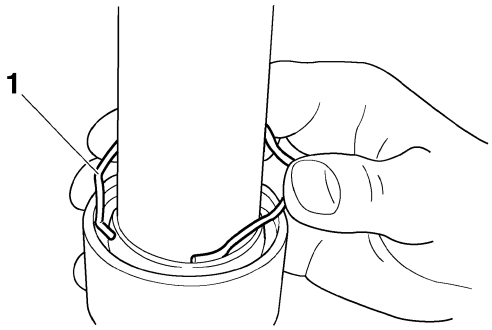
	Fork seal driver **90890-01442** **Adjustable fork seal driver (36–46 mm)** **YM-01442**



6. Install:
   • Oil seal clip “1”

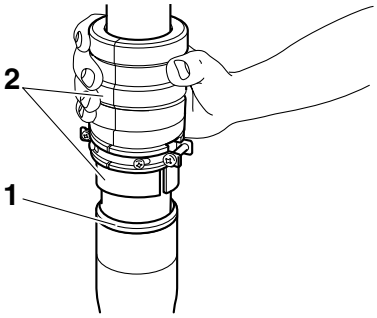
TIP

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**

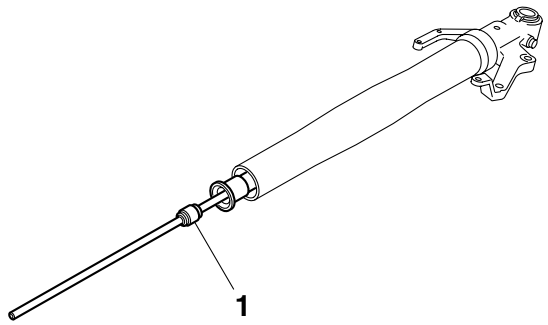


8. Install:
   • Damper rod assembly “1”
   • Inner tube

ECA23P1063

NOTICE

Allow the damper rod assembly to slide slowly down the inner tube until it contacts the bottom of the inner tube. Be careful not to damage the inner tube.



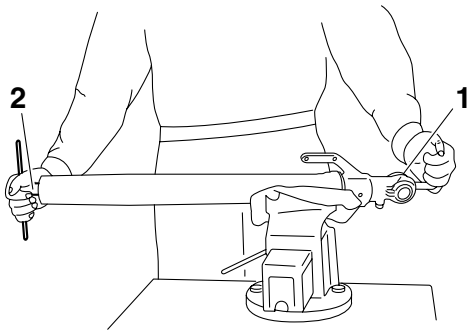
9. Tighten:
   • Damper rod assembly bolt “1”

	Damper rod assembly bolt **23 Nm (2.3 m·kgf, 17 ft·lbf)** **LOCTITE®**

TIP

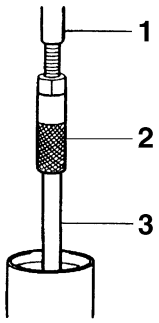
While holding the damper rod assembly with the damper rod holder “2”, tighten the damper rod assembly bolt.

	Damper rod holder **90890-01423** **Damping rod holder** **YM-01423**



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

Rod puller
90890-01437
Universal damping rod bleeding tool set
YM-A8703
Rod puller attachment (M10)
90890-01436
Universal damping rod bleeding tool set
YM-A8703



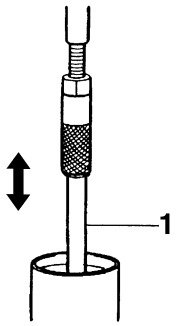
11.Fully compress the front fork leg.
12.Fill:
- Front fork leg
  (with the specified amount of the recommended fork oil)

Recommended oil
Suspension oil 01 or equivalent
Quantity
485.0 cm³ (16.40 US oz, 17.11 Imp.oz)

ECA14230
NOTICE
- **Be sure to use the recommended fork oil. Other oils may have an adverse effect on front fork performance.**
- **When disassembling and assembling the front fork leg, do not allow any foreign material to enter the front fork.**

13.After filling the front fork leg, slowly stroke the damper rod “1” up and down (at least ten times) to distribute the fork oil.

TIP
Be sure to stroke the damper rod slowly because the fork oil may spurt out.

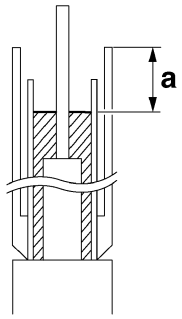


14.Before measuring the fork oil level, wait ten minutes until the oil has settled and the air bubbles have dispersed.

TIP
Be sure to bleed the front fork leg of any residual air.

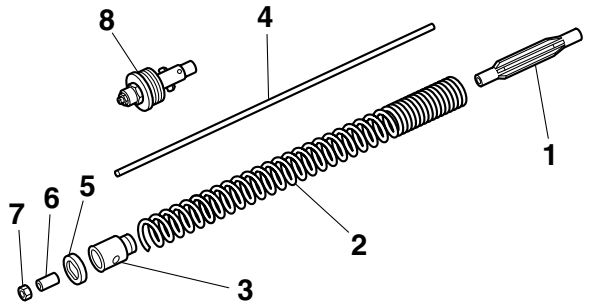
15.Measure:
- Front fork leg oil level “a”
  (from the top of the outer tube, with the outer tube fully compressed and without the fork spring and fork spring guide)
  Out of specification → Correct.

Level
150.0 mm (5.91 in)



16.Install:
- Fork spring guide “1”
- Fork spring “2”
- Spacer “3”
- Damper adjusting rod “4”
- Washer “5”

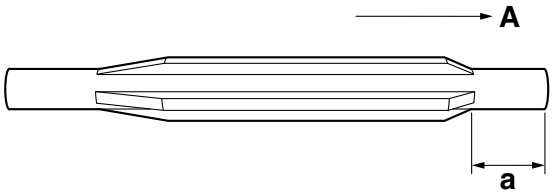
- Collar “6”
- Nut “7”
- Cap bolt “8”



a. Remove the rod puller and rod puller attachment.
b. Install the fork spring guide.

TIP

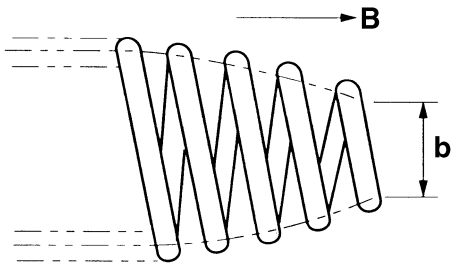
Install the fork spring guide with its shorter end “a” pointing up “A”.



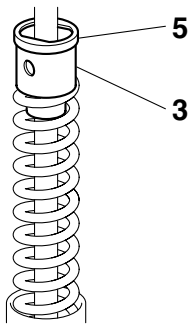
c. Install the collar and nut.
d. Reinstall the rod puller attachment and rod puller.
e. Install the fork spring.

TIP

Install the spring with the smaller pitch “b” facing up “B”.

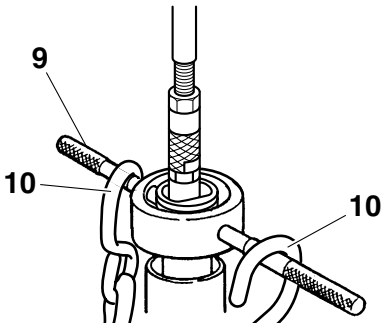


f. Install the spacer “3” and washer “5”.



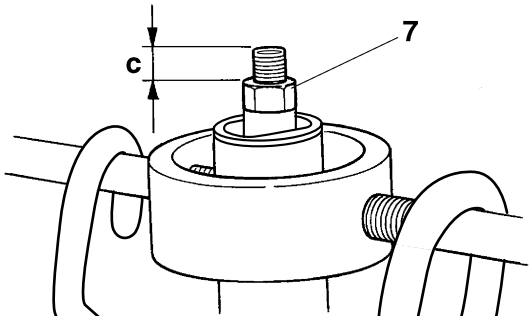
g. Press down on the spacer with the fork spring compressor “9” and then secure the compressor with a suitable tool “10”.

Fork spring compressor
90890-01441
YM-01441



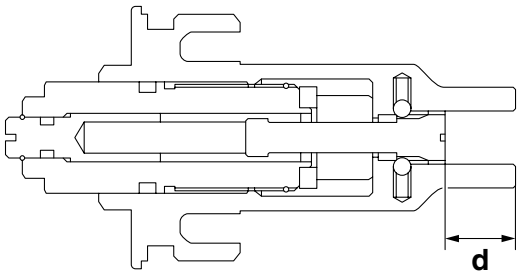
h. Remove the rod puller and the rod puller attachment.
i. Position the nut “7” as specified “c”.

Distance “c”
12 mm (0.47 in)



j. Set the cap bolt distance “d” to specification.

Distance “d”
13 mm (0.51 in)



k. Install the damper adjusting rod and cap bolt, and then finger tighten the cap bolt.

EWA23P1008

WARNING

Always use a new cap bolt O-ring.

l. Hold the cap bolt and tighten the nut to specification.

	Nut **15 Nm (1.5 m·kgf, 11 ft·lbf)**

m. Remove the fork spring compressor.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

17. Install:
- Cap bolt
  (to the outer tube)

TIP

Temporarily tighten the cap bolt.

EAS23050

INSTALLING THE FRONT FORK LEGS

The following procedure applies to both of the front fork legs.

1. Install:
- Front fork leg
  Temporarily tighten the upper and lower bracket pinch bolts.

TIP

Make sure the outer tube is flush with the top of the upper bracket.

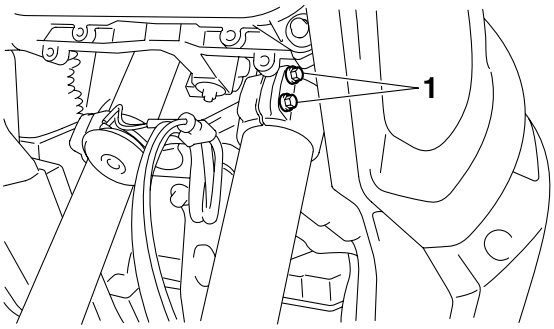
2. Tighten:
- Lower bracket pinch bolts “1”
- Cap bolt “2”
- Upper bracket pinch bolt “3”

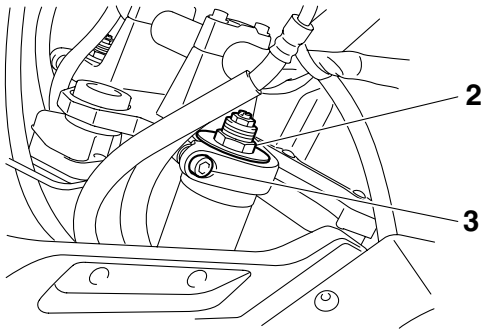
	Lower bracket pinch bolt **20 Nm (2.0 m·kgf, 14 ft·lbf)** **Cap bolt** **23 Nm (2.3 m·kgf, 17 ft·lbf)** **Upper bracket pinch bolt** **26 Nm (2.6 m·kgf, 19 ft·lbf)**

EWA13680

WARNING

Make sure the brake hoses are routed properly.

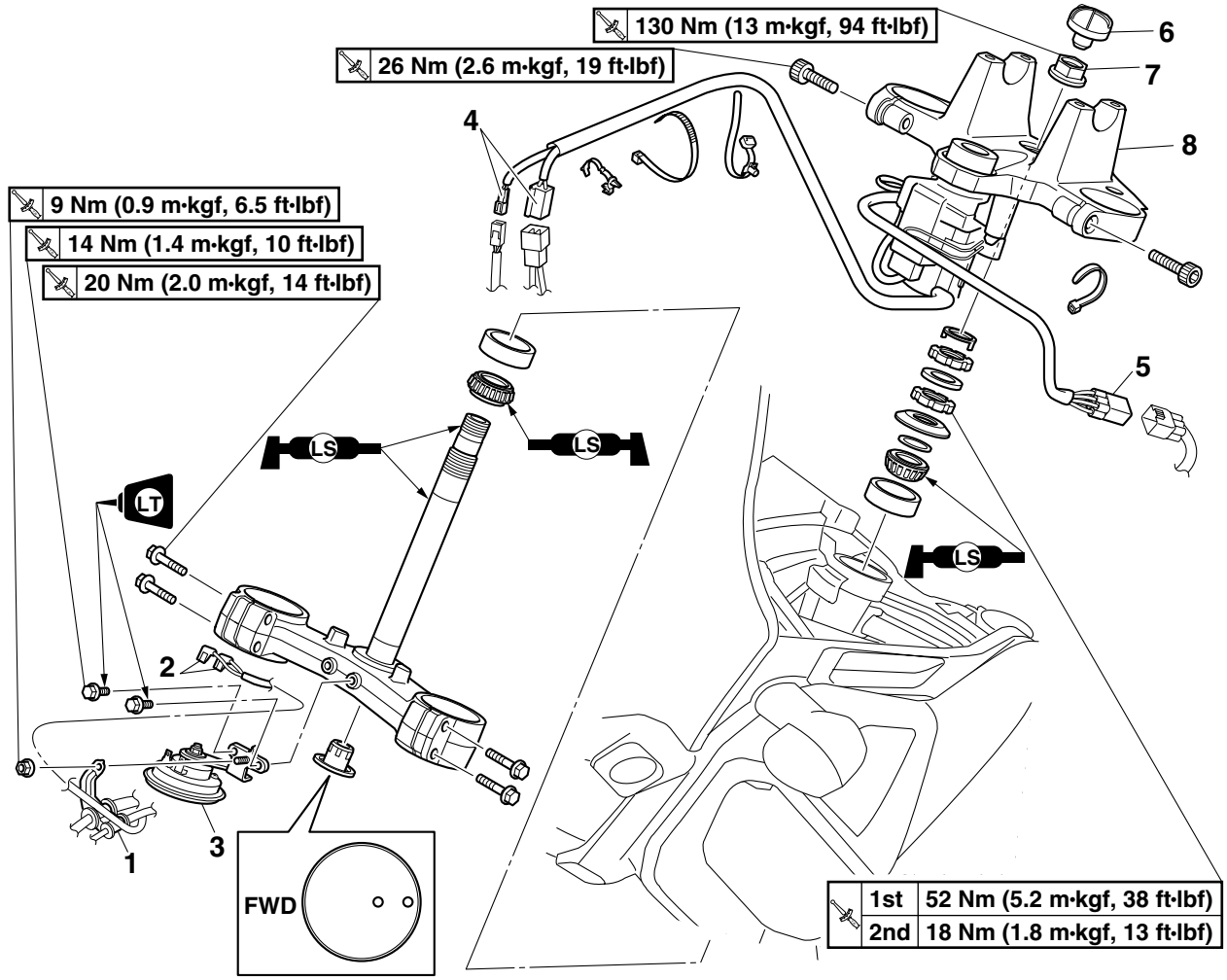




3. Adjust:
- Spring preload
- Rebound damping
- Compression damping
  Refer to “ADJUSTING THE FRONT FORK LEGS” on page 3-21.

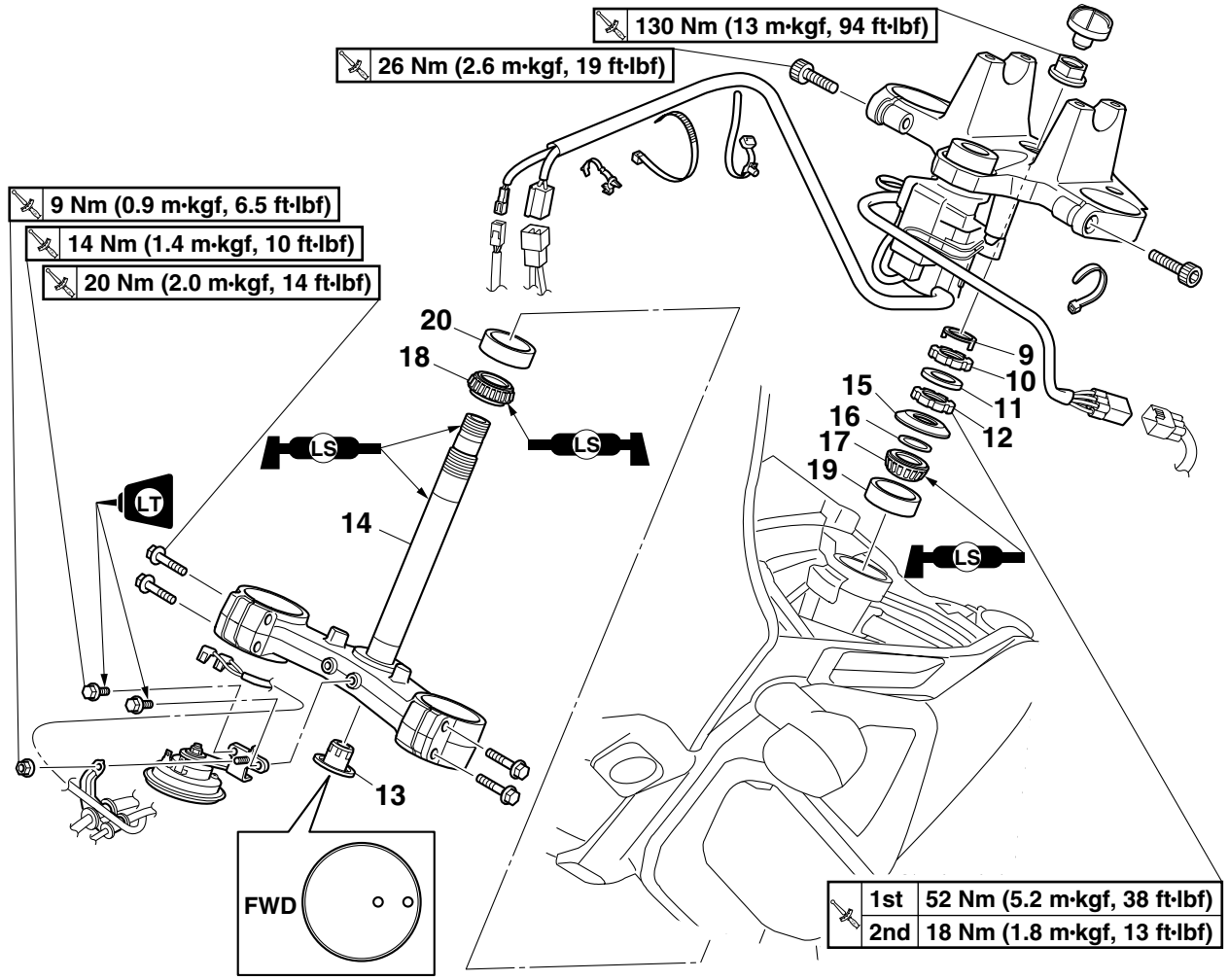
EAS23090
STEERING HEAD

Removing the lower bracket



Order	Job/Parts to remove	Q'ty	Remarks
	Air filter case		Refer to "GENERAL CHASSIS" on page 4-1.
	Handlebar		Refer to "HANDLEBAR" on page 4-76.
	Front fork leg		Refer to "FRONT FORK" on page 4-82.
1	Brake hose holder	1	
2	Horn connector	2	Disconnect.
3	Horn	1	
4	Main switch coupler	2	Disconnect.
5	Immobilizer unit coupler	1	Disconnect.
6	Steering stem nut cap	1	
7	Steering stem nut	1	
8	Upper bracket	1	

Removing the lower bracket



Order	Job/Parts to remove	Q'ty	Remarks
9	Lock washer	1	
10	Upper ring nut	1	
11	Rubber washer	1	
12	Lower ring nut	1	
13	Lower bracket cap	1	
14	Lower bracket	1	
15	Upper bearing cover	1	
16	Washer	1	
17	Upper bearing	1	
18	Lower bearing	1	
19	Upper bearing outer race	1	
20	Lower bearing outer race	1	
			For installation, reverse the removal procedure.

EAS23110
REMOVING THE LOWER BRACKET

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

2. Remove:
   - Upper ring nut
   - Rubber washer
   - Lower ring nut "1"
   - Lower bracket

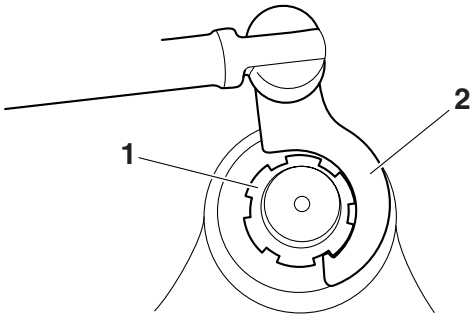
EWA13730
⚠ WARNING

Securely support the lower bracket so that there is no danger of it falling.

TIP

Remove the lower ring nut with the steering nut wrench "2".

Steering nut wrench
90890-01403
Exhaust flange nut wrench
YU-A9472



EAS23120
CHECKING THE STEERING HEAD

1. Wash:
   - Bearings
   - Bearing races

Recommended cleaning solvent
Kerosene

2. Check:
   - Bearings
   - Bearing races
     Damage/pitting → Replace.
3. Replace:
   - Bearings
   - Bearing races

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

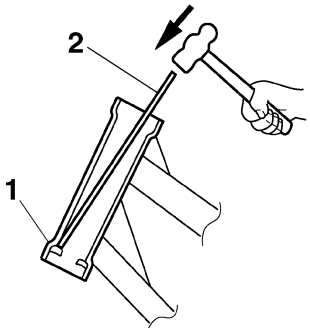
a. Remove the bearing races from the steering head pipe "1" with a long rod "2" and hammer.
b. Remove the bearing race from the lower bracket "3" with a floor chisel "4" and hammer.
c. Install new bearing races.

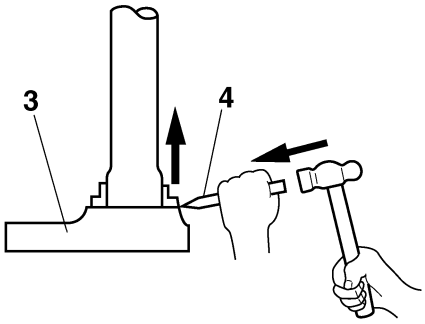
ECA14270
NOTICE

If the bearing race is not installed properly, the steering head pipe could be damaged.

TIP

Always replace the bearings and bearing races as a set.





▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Check:
   - Upper bracket
   - Lower bracket
     (along with the steering stem)
     Bends/cracks/damage → Replace.

EAS23140
INSTALLING THE STEERING HEAD

1. Lubricate:
   - Upper bearing
   - Lower bearing
   - Bearing races

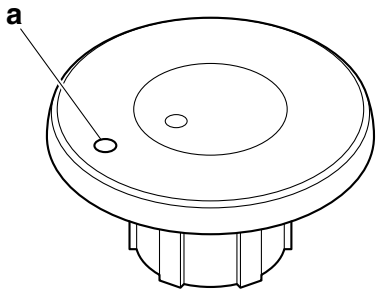
Recommended lubricant
Lithium-soap-based grease

2. Install:
   - Lower bracket

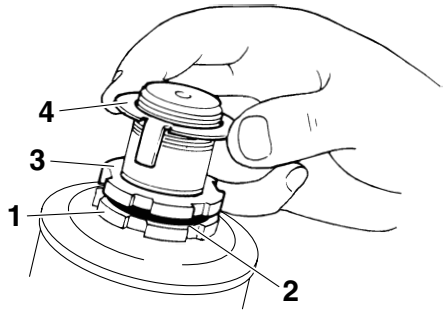
• Lower bracket cap

TIP

Face the hole “a” in the lower bracket cap rearward.



3. Install:
   • Lower ring nut “1”
   • Rubber washer “2”
   • Upper ring nut “3”
   • Lock washer “4”
   Refer to “CHECKING AND ADJUSTING THE STEERING HEAD” on page 3-20.



4. Install:
   • Upper bracket
   • Steering stem nut

TIP

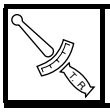
Temporarily tighten the steering stem nut.

5. Install:
   • Front fork legs
   Refer to “FRONT FORK” on page 4-82.

TIP

Temporarily tighten the upper and lower bracket pinch bolts.

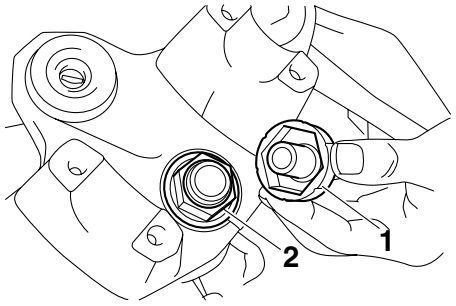
6. Tighten:
   • Steering stem nut

	**Steering stem nut** **130 Nm (13 m·kgf, 94 ft·lbf)**

7. Install:
   • Steering stem nut cap “1”

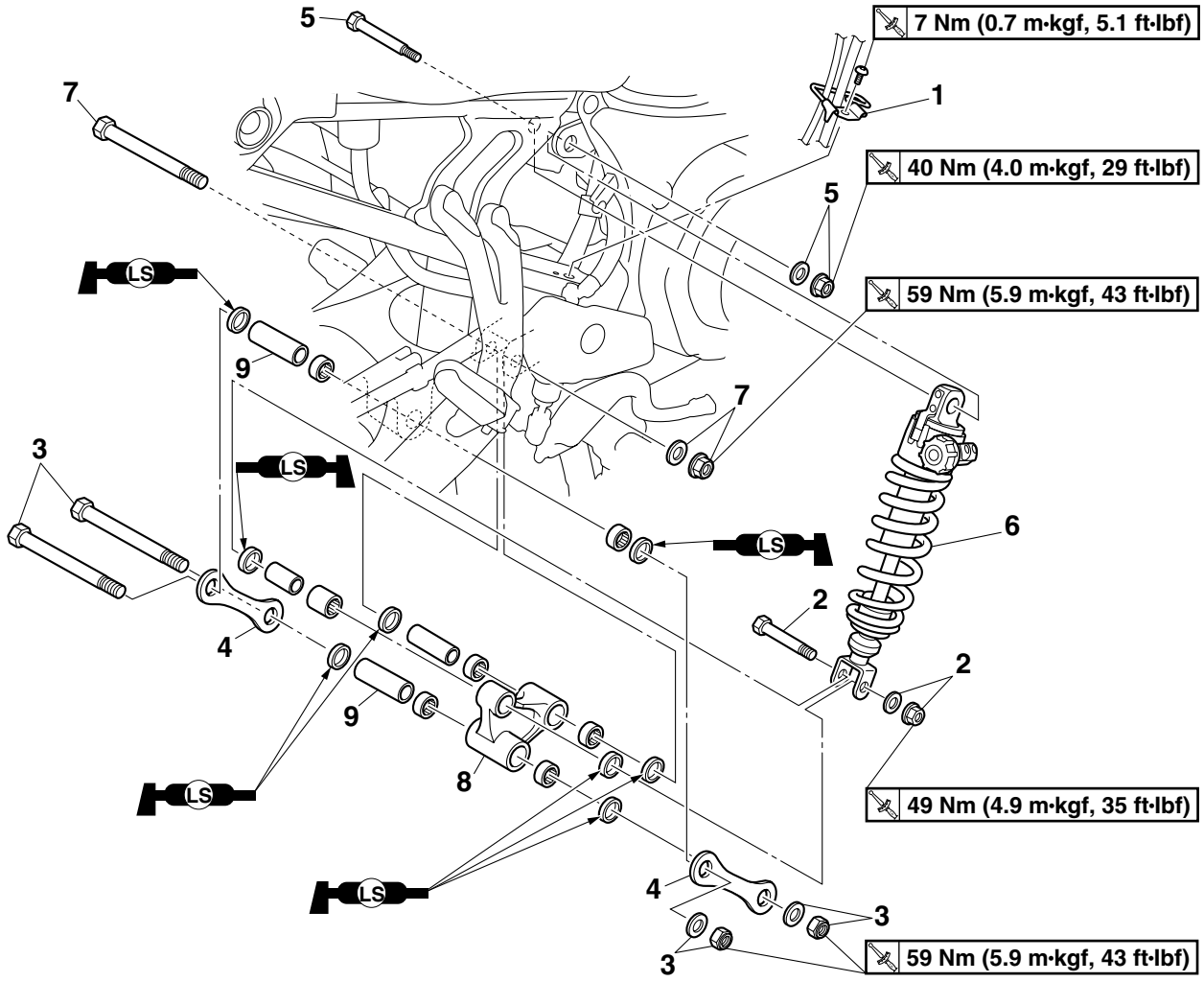
TIP

Be sure to fit the hexagonal portion of the steering stem nut “2” into the hexagonal recess in the steering stem nut cap and push the cap down until it contacts the nut flange.



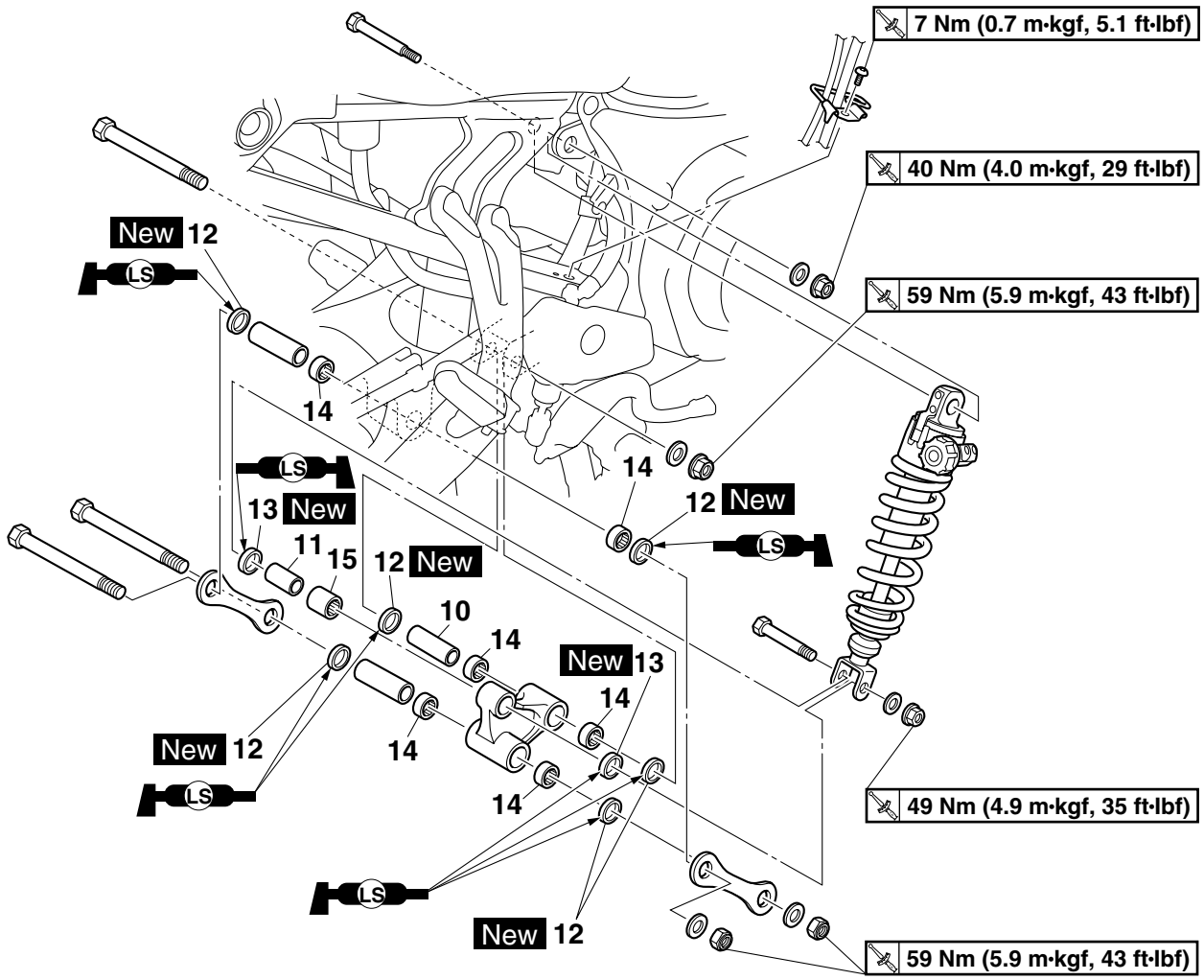
EAS23160
REAR SHOCK ABSORBER ASSEMBLY

Removing the rear shock absorber assembly



Order	Job/Parts to remove	Q'ty	Remarks
	Muffler/Exhaust pipe assembly		Refer to "ENGINE REMOVAL" on page 5-3.
1	Rear brake hose guide	1	
2	Rear shock absorber assembly lower nut/washer/bolt	1/1/1	
3	Connecting arm nut/washer/bolt	2/2/2	
4	Connecting arm	2	
5	Rear shock absorber assembly upper nut/washer/bolt	1/1/1	
6	Rear shock absorber assembly	1	
7	Relay arm nut/washer/bolt	1/1/1	
8	Relay arm	1	
9	Spacer	2	l=79 mm (3.11 in)

Removing the rear shock absorber assembly



Order	Job/Parts to remove	Q'ty	Remarks
10	Spacer	1	l=55 mm (2.17 in)
11	Spacer	1	l=36 mm (1.41 in)
12	Oil seal	6	D=27 mm (1.06 in)
13	Oil seal	2	D=24 mm (0.94 in)
14	Bearing	6	D=27 mm (1.06 in)
15	Bearing	1	D=24 mm (0.94 in)
			For installation, reverse the removal procedure.

EAS23180
HANDLING THE REAR SHOCK ABSORBER

EWA13740
⚠ WARNING

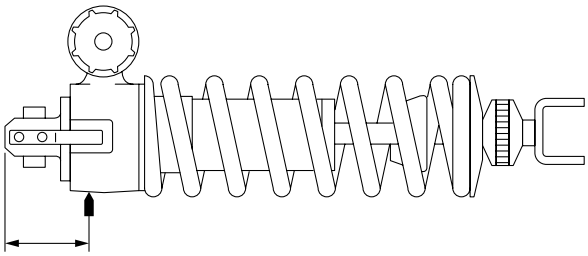
This rear shock absorber contains highly compressed nitrogen gas. Before handling the rear shock absorber, read and make sure you understand the following information. The manufacturer cannot be held responsible for property damage or personal injury that may result from improper handling of the rear shock absorber.
- **Do not tamper or attempt to open the rear shock absorber.**
- **Do not subject the rear shock absorber to an open flame or any other source of high heat. High heat can cause an explosion due to excessive gas pressure.**
- **Do not deform or damage the rear shock absorber in any way. Rear shock absorber damage will result in poor damping performance.**

EAS23190
DISPOSING OF A REAR SHOCK ABSORBER

1. Gas pressure must be released before disposing of a rear shock absorber. To release the gas pressure, drill a 2–3 mm (0.08–0.12 in) hole through the rear shock absorber at a point 50–55 mm (1.97–2.17 in) from its end as shown.

EWA13760
⚠ WARNING

Wear eye protection to prevent eye damage from released gas or metal chips.



EAS23230
REMOVING THE REAR SHOCK ABSORBER ASSEMBLY

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

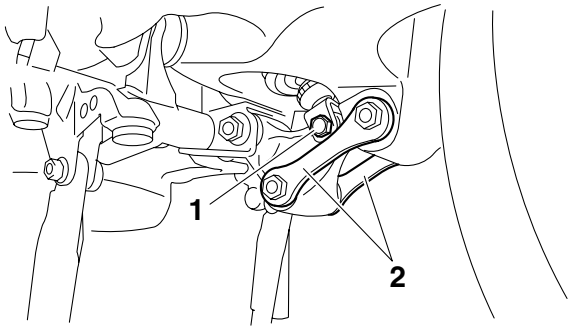
TIP

Place the vehicle on the centerstand so that the rear wheel is elevated.

2. Remove:
   - Rear shock absorber assembly lower bolt “1”
   - Connecting arms “2”

TIP

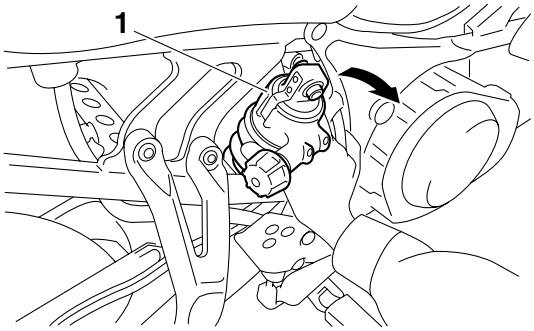
While removing the connecting arm bolts, hold the swingarm so that it does not drop down.



3. Remove:
   - Rear shock absorber assembly upper bolt
   - Rear shock absorber assembly “1”

TIP

Remove the rear shock absorber assembly from between the main frame and sub frame.



EAS23240
CHECKING THE REAR SHOCK ABSORBER ASSEMBLY

1. Check:
   - Rear shock absorber rod
     Bends/damage → Replace the rear shock absorber assembly.
   - Rear shock absorber
     Gas leaks/oil leaks → Replace the rear shock absorber assembly.
   - Spring
     Damage/wear → Replace the rear shock absorber assembly.
   - Bushings
     Damage/wear → Replace.

- Spacer
  Damage/scratches → Replace.
- Bolts
  Bends/damage/wear → Replace.

EAS23261
CHECKING THE CONNECTING ARM AND RELAY ARM

1. Check:
   - Connecting arms
   - Relay arm
     Damage/wear → Replace.
2. Check:
   - Bearings
   - Oil seals
     Damage/pitting → Replace.
3. Check:
   - Spacers
     Damage/scratches → Replace.

EAS23272
INSTALLING THE RELAY ARM

1. Lubricate:
   - Oil seals

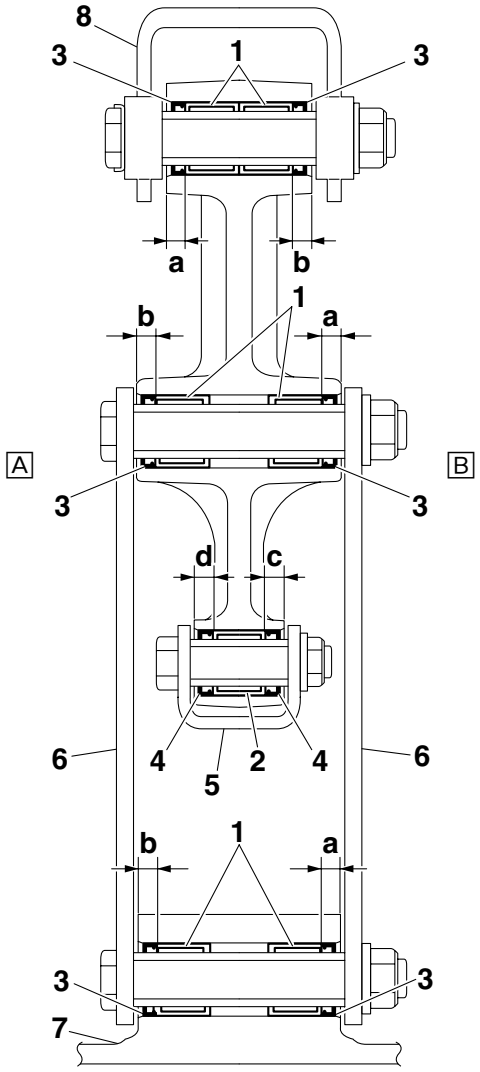
Recommended lubricant
Lithium-soap-based grease

2. Install:
   - Bearings “1”, “2”
     (to the swingarm and relay arm)
   - Oil seals “3”, “4” New
     (to the swingarm and relay arm)

Installed depth “a”
5.5–6.5 mm (0.22–0.26 in)
Installed depth “b”
6.0 mm (0.24 in)
Installed depth “c”
3.5–4.5 mm (0.14–0.18 in)
Installed depth “d”
4.0 mm (0.16 in)

TIP

- When installing the oil seals “3” to the relay arm or swingarm, face the paint mark of the oil seals outside.
- When installing the oil seals “4” to the relay arm, face the character stamp of the oil seals outside.



5. Relay arm
6. Connecting arm
7. Swingarm
8. Frame

A. Left side
B. Right side

EAS23311
INSTALLING THE REAR SHOCK ABSORBER ASSEMBLY

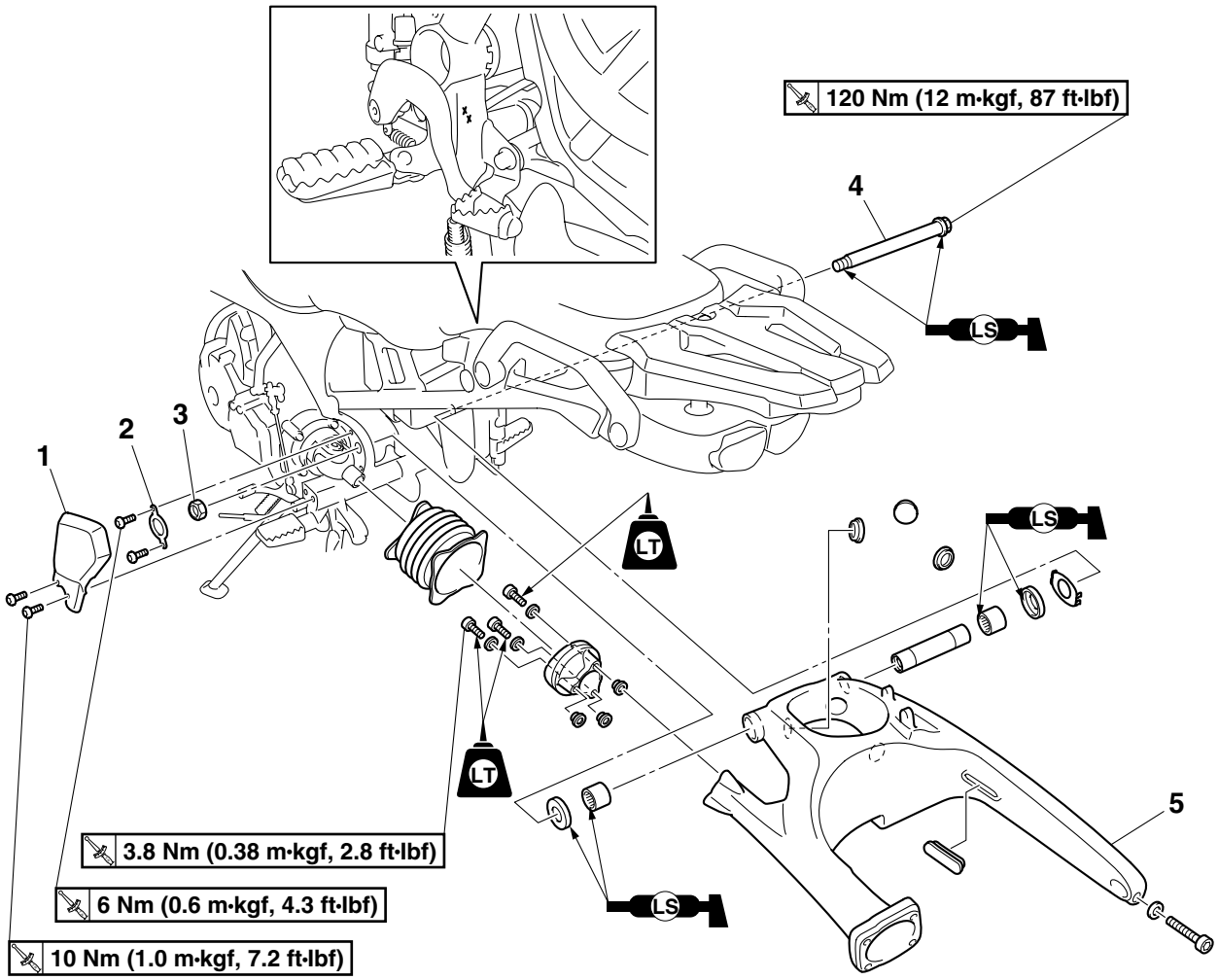
1. Install:
   - Rear shock absorber assembly

TIP

When installing the rear shock absorber assembly, lift up the swingarm.

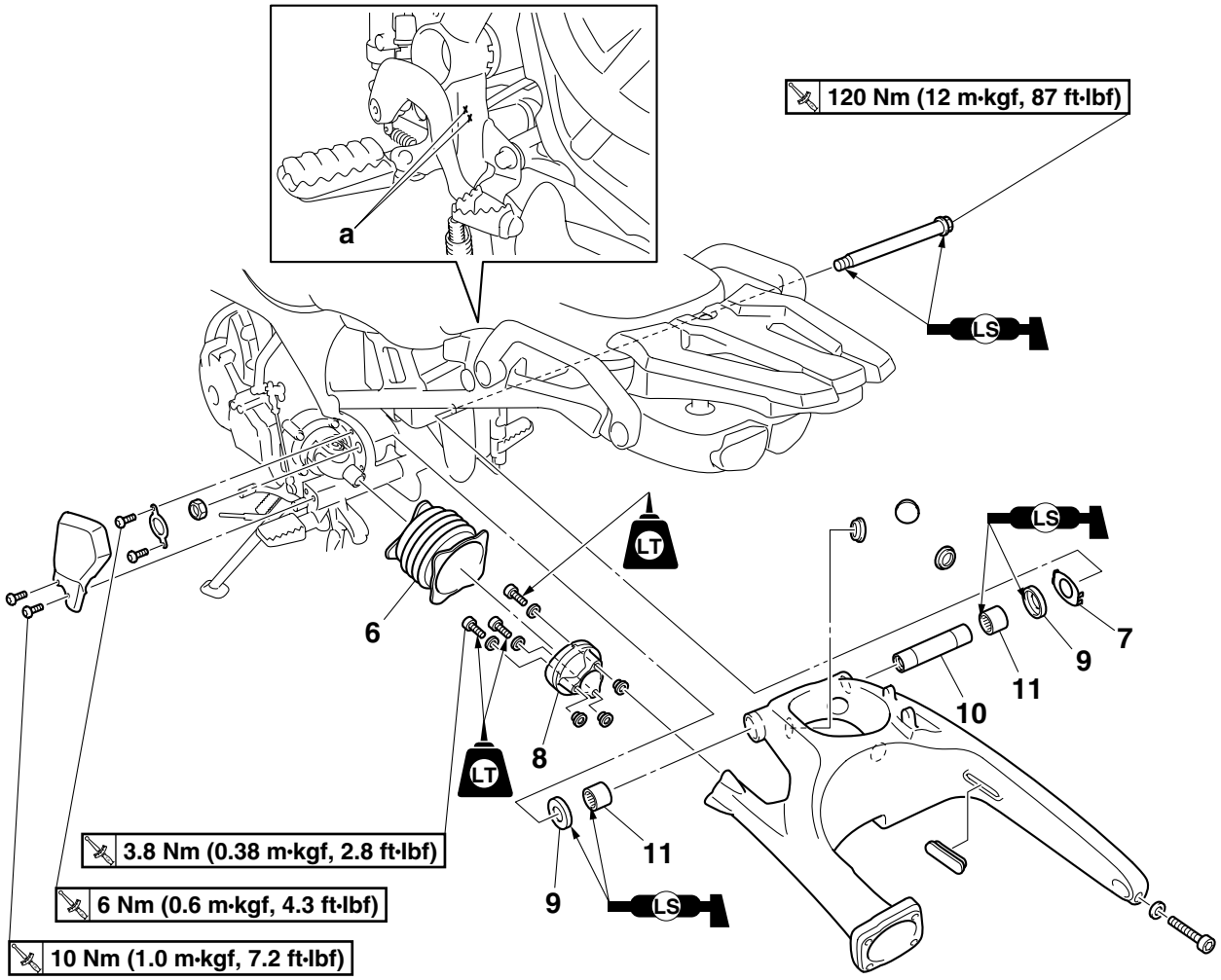
EAS23330
SWINGARM

Removing the swingarm



Order	Job/Parts to remove	Q'ty	Remarks
	Rear wheel		Refer to "REAR WHEEL" on page 4-29.
	Rear shock absorber assembly		Refer to "REAR SHOCK ABSORBER ASSEMBLY" on page 4-96.
	Final drive assembly		Refer to "SHAFT DRIVE" on page 4-104.
	Footrest plate		Refer to "REAR BRAKE" on page 4-52.
	Muffler		Refer to "ENGINE REMOVAL" on page 5-3.
1	Rubber boot cover	1	
2	Pivot shaft end plate	1	
3	Pivot shaft nut	1	
4	Pivot shaft	1	
5	Swingarm	1	

Removing the swingarm



Order	Job/Parts to remove	Q'ty	Remarks
6	Rubber boot	1	
7	Plate	1	**TIP** The plate is only installed on vehicles that have the "XX" marks "a" shown in the detailed view.
8	Rubber boot joint	1	
9	Dust cover	2	
10	Spacer	1	
11	Bearing	2	
			For installation, reverse the removal procedure.

EAS23350
REMOVING THE SWINGARM

1. Stand the vehicle on a level surface.

EWA13120
⚠ WARNING

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

TIP

Place the vehicle on the centerstand so that the rear wheel is elevated.

2. Measure:
   - Swingarm side play
   - Swingarm vertical movement

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

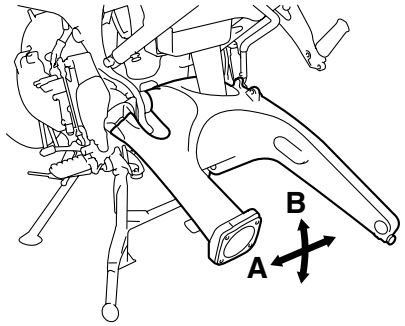
a. Measure the tightening torque of the swingarm pivot shaft.

	Swingarm pivot shaft **120 Nm (12 m·kgf, 87 ft·lbf)**

b. Measure the swingarm side play "A" by moving the swingarm from side to side.
c. If the swingarm side play is out of specification, check the spacer, bearings, plate, and dust covers.

	Swingarm end free play limit (radial) **0 mm (0 in)** **Swingarm end free play limit (axial)** **0 mm (0 in)**

d. Check the swingarm vertical movement "B" by moving the swingarm up and down.
If swingarm vertical movement is not smooth or if there is binding, check the spacer, bearings, plate, and dust covers.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

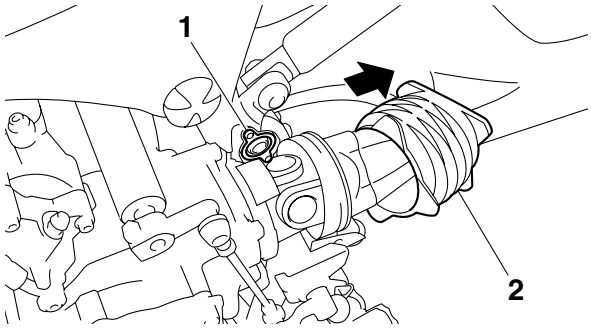
3. Remove:
   - Pivot shaft end plate "1"
   - Pivot shaft nut
   - Pivot shaft
   - Swingarm

ECA23P1064
NOTICE

Before loosening the pivot shaft, be sure to remove the pivot shaft end plate.

TIP

Slide the rubber boot "2" toward the swingarm, and then remove the pivot shaft end plate.



EAS23361
CHECKING THE SWINGARM

1. Check:
   - Swingarm
     Bends/cracks/damage → Replace.
2. Check:
   - Pivot shaft
     Bends/cracks/damage → Replace.
3. Wash:
   - Pivot shaft
   - Dust covers
   - Spacer
   - Bearings
   - Plate

	Recommended cleaning solvent **Kerosene**

4. Check:
   - Dust covers
   - Spacer
   - Plate
     Damage/wear → Replace.
   - Bearings
     Damage/pitting → Replace.

EAS23390
INSTALLING THE SWINGARM

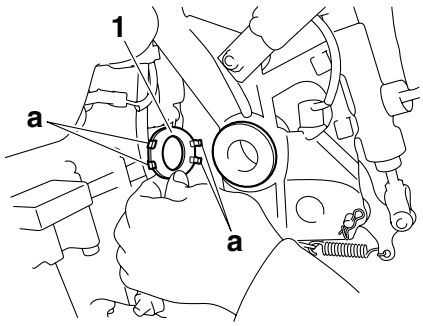
1. Lubricate:
   - Bearings
   - Dust covers

	Recommended lubricant **Lithium-soap-based grease**

2. Install:
   - Plate "1"

TIP

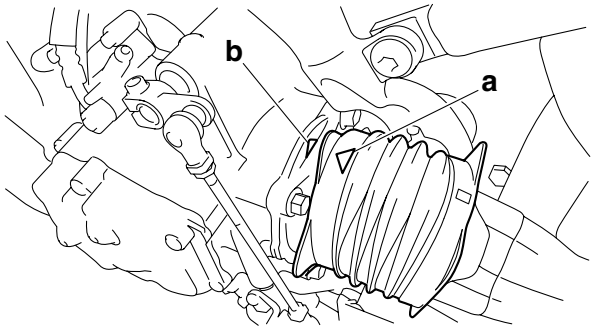
Make sure that the four projections “a” on the plate are securely fitted onto the frame.

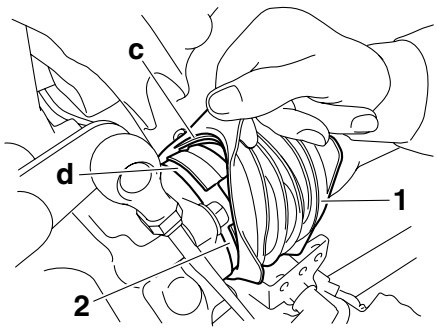


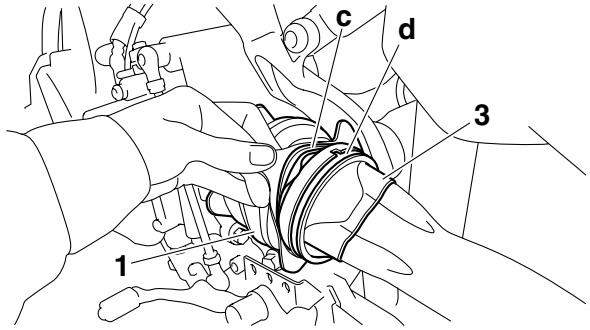
3. Install:
   • Rubber boot “1”

TIP

- Align the “▲” mark “a” on the rubber boot with the “▲” mark “b” on the middle driven pinion gear bearing housing “2”.
- Be sure to fit the lips “c” on the ends of the rubber boot into the grooves “d” in the middle driven pinion gear bearing housing “2” and rubber boot joint “3”.

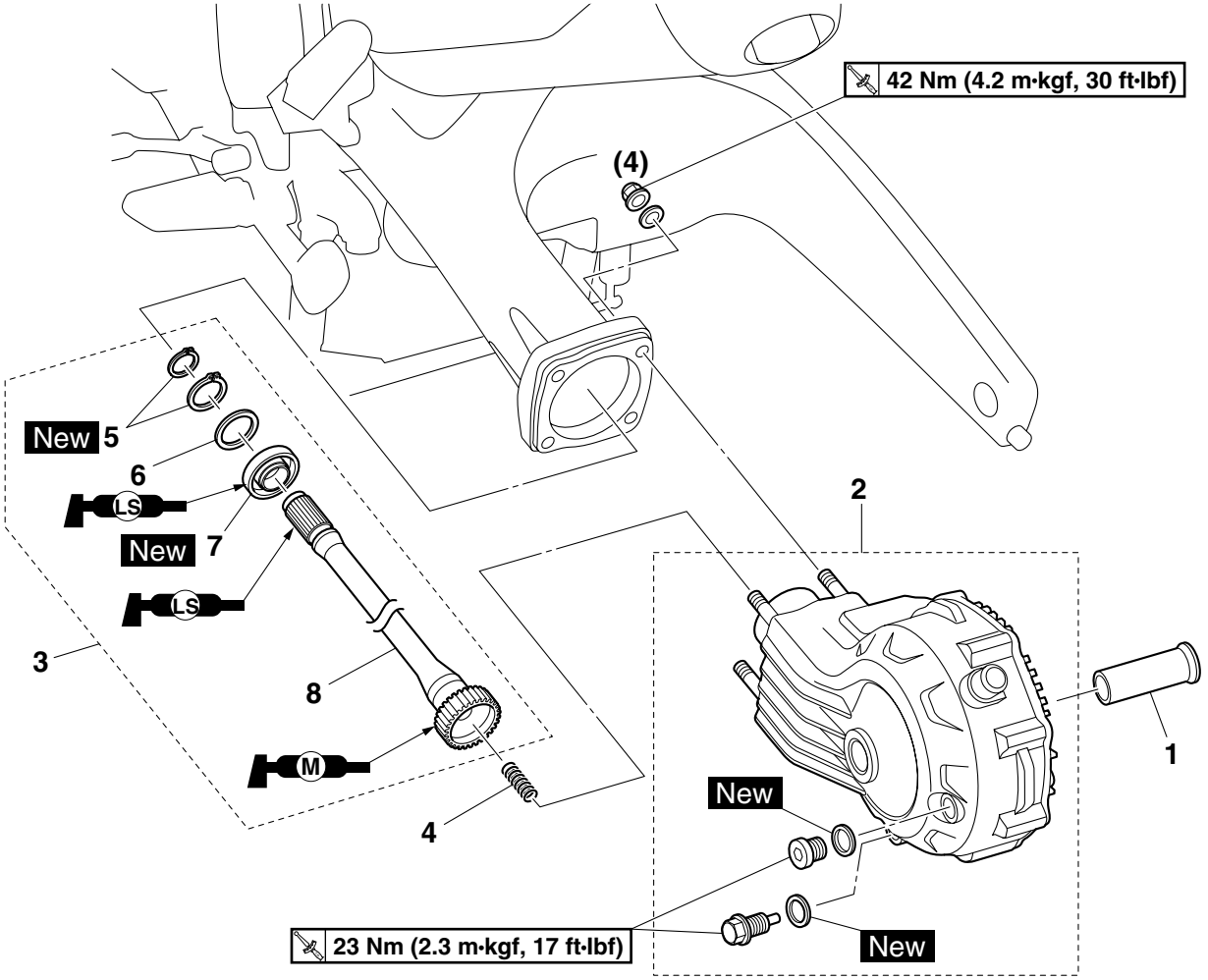






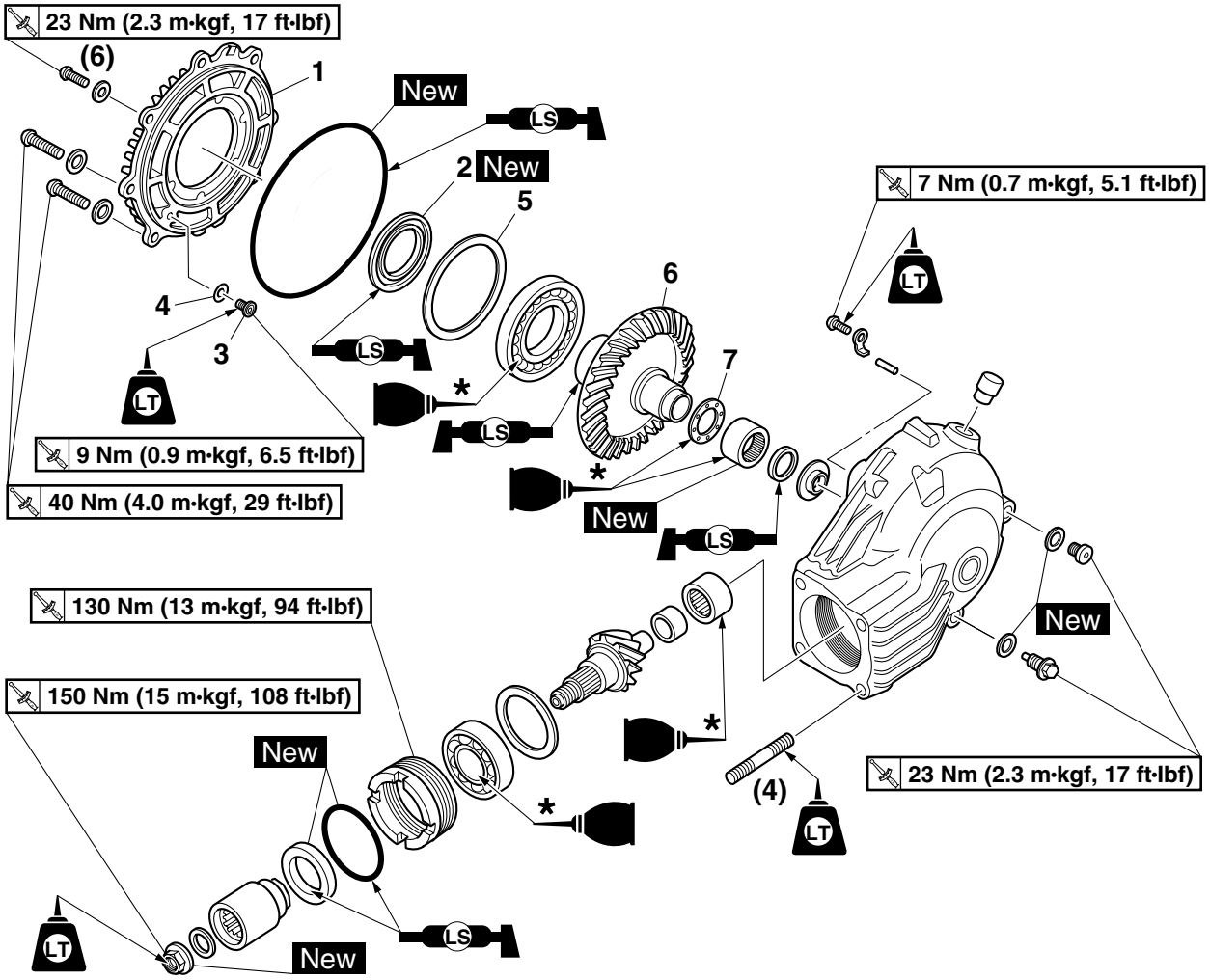
EAS23551
SHAFT DRIVE

Removing the final drive assembly and drive shaft



Order	Job/Parts to remove	Q'ty	Remarks
	Final gear oil		Drain. Refer to "CHANGING THE FINAL GEAR OIL" on page 3-30.
	Rear wheel		Refer to "REAR WHEEL" on page 4-29.
1	Collar	1	
2	Final drive assembly	1	
3	Drive shaft assembly	1	
4	Spring	1	
5	Circlip	2	
6	Washer	1	
7	Oil seal	1	
8	Drive shaft	1	
			For installation, reverse the removal procedure.

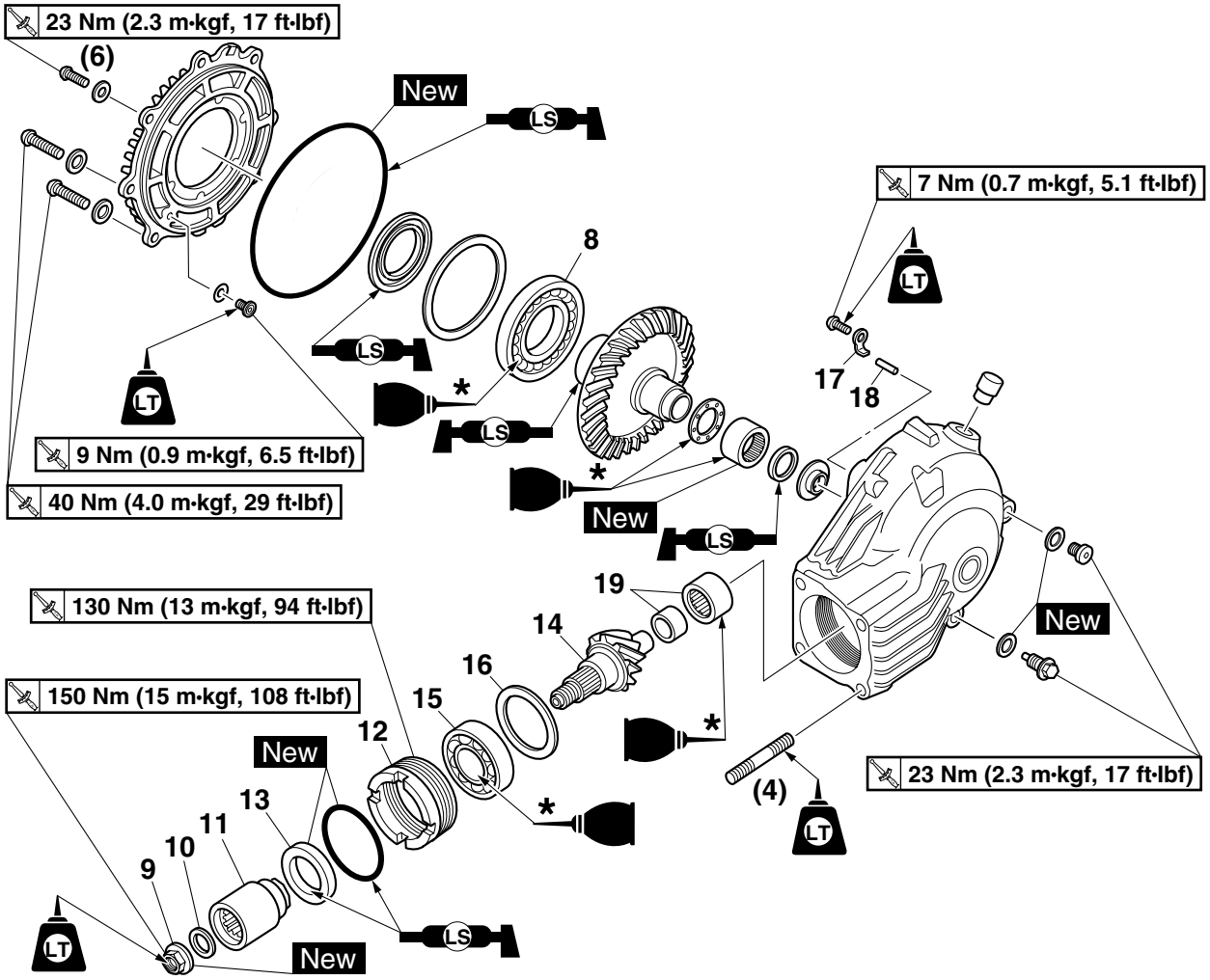
Disassembling the final drive assembly



Order	Job/Parts to remove	Q'ty	Remarks
1	Ring gear bearing housing	1	
2	Oil seal	1	
3	Stopper bolt	1	Left-hand threads
4	Stopper bolt shim		Refer to "ADJUSTING THE RING-GEAR-TO-STOPPER-BOLT CLEARANCE" on page 4-111.
5	Ring gear shim		Refer to "ADJUSTING THE FINAL GEAR BACKLASH" on page 4-110 and "ALIGNING THE FINAL DRIVE PINION GEAR AND RING GEAR" on page 4-114.
6	Ring gear	1	
7	Thrust washer	1	Refer to "ADJUSTING THE FINAL GEAR BACKLASH" on page 4-110 and "ALIGNING THE FINAL DRIVE PINION GEAR AND RING GEAR" on page 4-114.

* Yamaha genuine shaft drive oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil

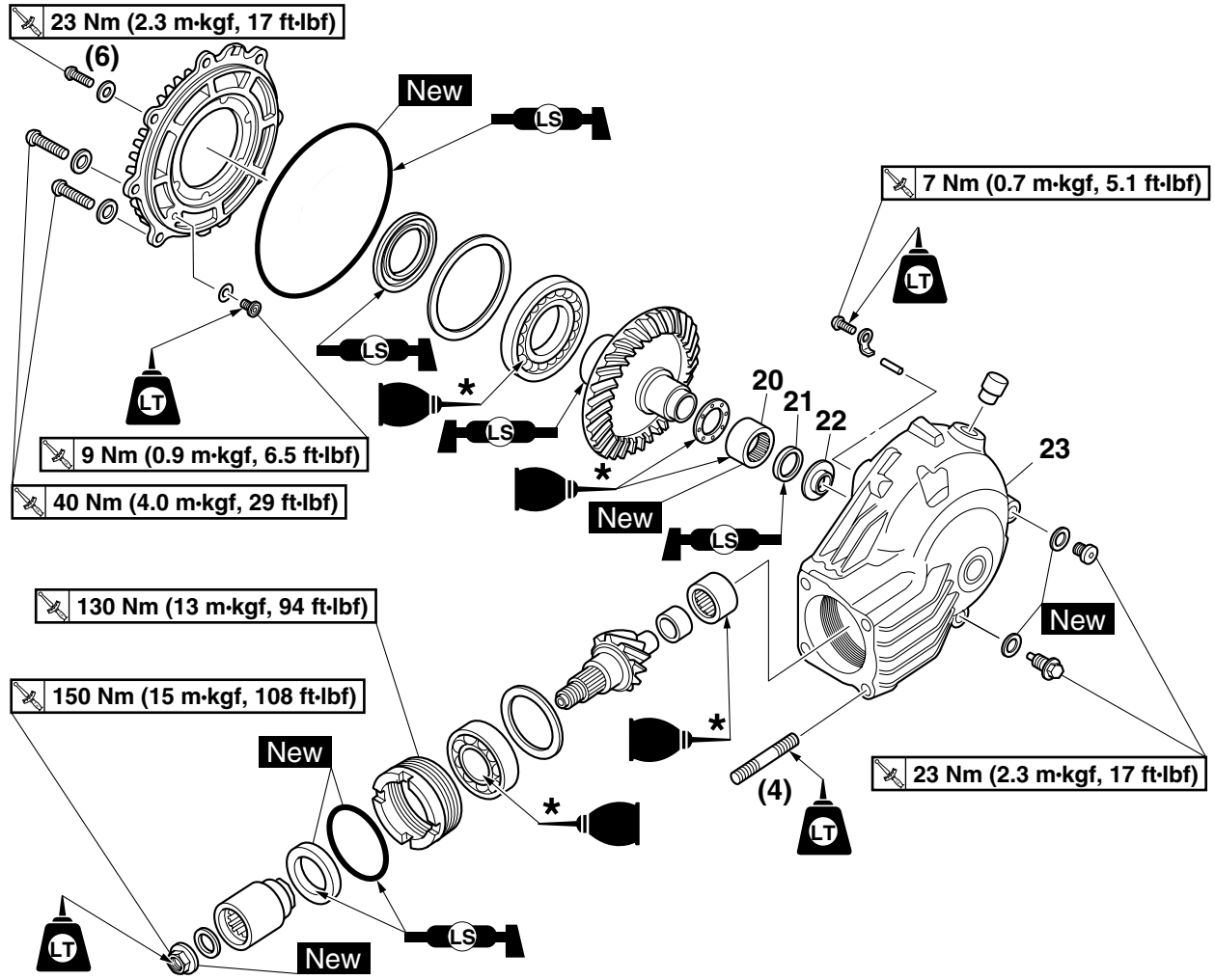
Disassembling the final drive assembly



Order	Job/Parts to remove	Q'ty	Remarks
8	Bearing	1	
9	Coupling gear nut	1	
10	Washer	1	
11	Coupling gear	1	
12	Bearing retainer	1	Left-hand threads
13	Oil seal	1	
14	Final drive pinion gear	1	
15	Bearing	1	
16	Final drive pinion gear shim		Refer to "ALIGNING THE FINAL DRIVE PINION GEAR AND RING GEAR" on page 4-114.
17	Bearing holder	1	
18	Dowel pin	1	
19	Final drive pinion gear bearing	1	

* Yamaha genuine shaft drive oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil

Disassembling the final drive assembly



Order	Job/Parts to remove	Q'ty	Remarks
20	Ring gear bearing	1	
21	Oil seal	1	
22	Collar	1	
23	Final gear case	1	
			For assembly, reverse the disassembly procedure.

* Yamaha genuine shaft drive oil SAE 80 API GL-5 or SAE 80 API GL-4 Hypoid gear oil

EAS23560
TROUBLESHOOTING

Symptom	Possible cause
1. A pronounced hesitation or jerky movement during acceleration, deceleration or sustained speeds (not to be confused with engine surging or transmission-related movements) 2. A rolling “rumble” noticeable at low speeds, a high-pitched whine or a “clunk” from a shaft drive component, or from the vicinity of the shaft drive 3. The shaft drive is locked up or no power is transmitted from the engine to the rear wheel.	A. Bearing damage B. Improper gear backlash C. Damaged gear teeth D. Broken drive shaft E. Broken gear teeth F. Seizure due to lack of lubrication G. Small foreign objects lodged between moving parts

TIP

Causes A, B, and C may be extremely difficult to diagnose. The symptoms are quite subtle and difficult to distinguish from normal operating noises. If there is reason to believe that these components are damaged, remove them and check them individually.

Inspection notes

1. Investigate any unusual noises.

▼▼

The following noises may indicate a mechanical defect:

a. A rolling “rumble” during coasting, acceleration or deceleration (increases with the rear wheel speed, but does not increase with higher engine or transmission speeds)
   Wheel bearing damage
b. A whining noise that varies with acceleration and deceleration
   Incorrect reassembly or too little gear backlash

EWA13780

⚠ WARNING

Insufficient gear backlash is extremely destructive to the gear teeth. If a test ride, following reassembly, indicates these symptoms, stop riding immediately to minimize gear damage.

c. A slight “clunk” evident at low speed operation (not to be confused with normal vehicle operation)
   Broken gear teeth

EWA13790

⚠ WARNING

Stop riding immediately if broken gear teeth are suspected. This condition could result in the shaft drive assembly locking up, causing a loss of control and possible injury to the rider.

▲▲

Troubleshooting chart

When causes (A) or (B) shown in the table at the beginning of the “TROUBLESHOOTING” section exist, check the following points.

1. Place the vehicle on a suitable stand so that the front wheel is elevated and then spin the front wheel. Is the wheel bearing damaged?

YES → • Replace the wheel bearing.
• Refer to “FRONT WHEEL” on page 4-20.

NO ↓

2. Place the vehicle on the center-stand so that the rear wheel is elevated and then spin the rear wheel. Is the wheel bearing damaged?	NO →	Rear wheel bearings and shaft drive bearings are probably not damaged. Repeat the test or remove and check the components.
YES ↓		
3. Remove the rear wheel. Is the wheel bearing damaged?	YES →	• Replace the rear wheel bearing. • Refer to “REAR WHEEL” on page 4-29.
NO ↓		
Remove and check the drive shaft components.		

EAS23570
CHECKING THE FINAL DRIVE OIL FOR CONTAMINATION AND CHECKING THE SHAFT DRIVE FOR LEAKS

1. Drain:
   • Final gear oil
   (from the final gear case)
   Refer to “CHANGING THE FINAL GEAR OIL” on page 3-30.
2. Check:
   • Final gear oil
   Large amount of metal particles → Check for bearing seizure.

TIP

A small amount of metal particles in the final gear oil is normal.

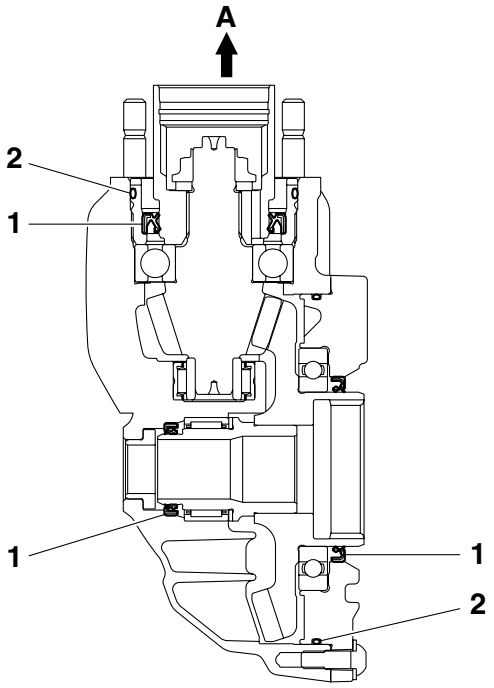
3. Check:
   • Shaft drive housing
   (for oil leaks)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Thoroughly clean the entire vehicle and then completely dry it.
b. Apply a leak-locating compound or dry powder spray to the shaft drive.
c. Test ride the vehicle long enough to locate a leak.
   Oil leak → Repair or replace the faulty part(s).

TIP

- What may appear to be an oil leak on a new or fairly new vehicle, may result from the application of a rust preventive coating or excessive seal lubrication.
- Always clean the vehicle and recheck the area where the leak is thought to originate from.



1. Oil seal
2. O-ring
A. Forward

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23581
MEASURING THE FINAL GEAR BACKLASH

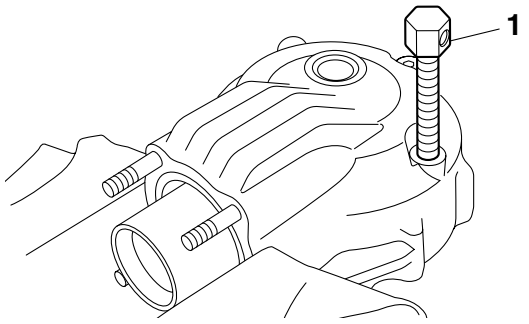
1. Secure the final drive assembly in a vise.
2. Remove:
   • Final gear oil drain bolt
3. Drain:
   • Final gear oil
   (from the final drive assembly)
4. Measure:
   • Final gear backlash
   Out of specification → Adjust.

Final gear backlash
0.20–0.40 mm (0.008–0.016 in)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the ring gear fix bolt "1", into the final gear oil drain hole.

Ring gear fix bolt (M14)
90890-01548
YM-01548



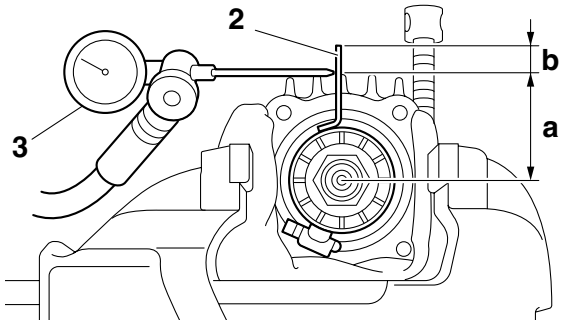
b. Finger tighten the ring gear fix bolt until it stops the ring gear from moving.

TIP

Do not overtighten the ring gear fix bolt.

c. Install the final gear backlash band "2" and dial gauge "3".

Final gear backlash band
90890-01511
Middle drive gear lash tool
YM-01230



a. Measuring point is 61.0 mm (2.40 in)
b. Measuring point is 7.1 mm (0.28 in)

d. Gently rotate the coupling gear from engagement to engagement.
e. Record the reading on the dial gauge.
f. Remove the dial gauge, final gear backlash band, and ring gear fix bolt.
g. Rotate the final drive pinion gear 90°.
h. Reinstall the ring gear fix bolt, final gear backlash band, and dial gauge.
i. Repeat steps (d) to (h) three more times (for a total of four measurements).
j. If any of the readings are over specification, adjust the final gear backlash.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

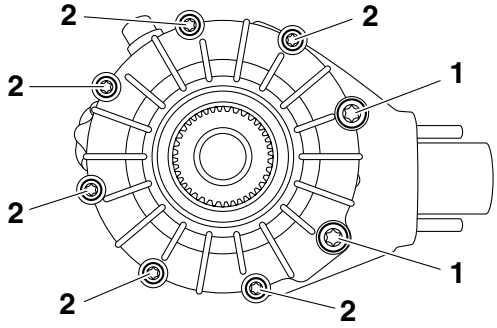
EAS23591

ADJUSTING THE FINAL GEAR BACKLASH

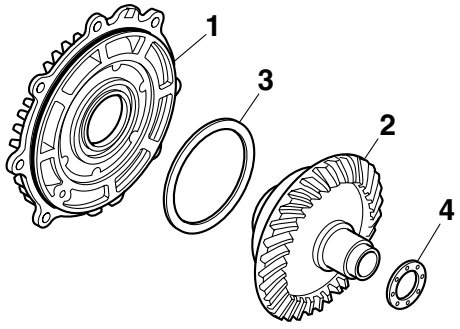
1. Remove:
   • Ring gear bearing housing bolts (M10) "1"
   • Ring gear bearing housing bolts (M8) "2"

TIP

Working in a crisscross pattern, loosen each bolt 1/4 of a turn. After all of the bolts are fully loosened, remove them.



2. Remove:
   • Ring gear bearing housing "1"
   • Ring gear "2"
   • Ring gear shim(s) "3"
   • Thrust washer "4"



3. Adjust:
   • Final gear backlash

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Select the suitable shim(s) and thrust washer with the following chart.

Thinner shim	Final gear backlash is increased.
Thicker shim	Final gear backlash is decreased.

b. If it is necessary to increase the final gear backlash by more than 0.2 mm (0.008 in), reduce the ring gear shim thickness by 0.2 mm (0.008 in) for every 0.2 mm (0.008 in) increase of thrust washer thickness.
c. If it is necessary to reduce the final gear backlash by more than 0.2 mm (0.008 in), increase the ring gear shim thickness by 0.2 mm (0.008 in) for every 0.2 mm (0.008 in) decrease of thrust washer thickness.

Ring gear shims
Thickness (mm)
0.25 0.30 0.40 0.50

Thrust washer
Thickness (mm)
1.2 1.4 1.6 1.8 2.0

TIP

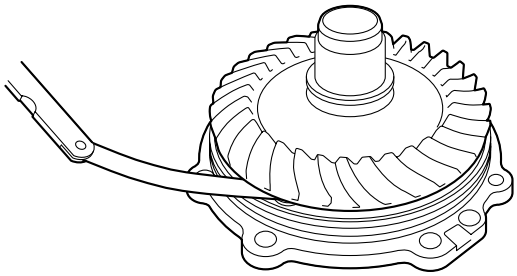
Be sure to use only one thrust washer to obtain the thrust washer thickness.

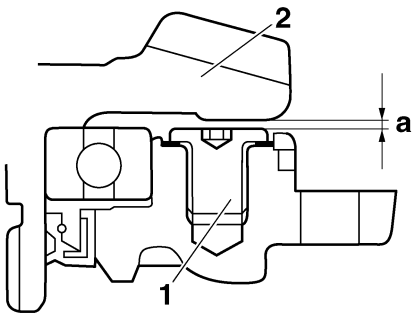
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23600
MEASURING THE RING-GEAR-TO-STOPPER-BOLT CLEARANCE

1. Remove:
   • Ring gear bearing housing (along with the ring gear)
   Refer to "ADJUSTING THE FINAL GEAR BACKLASH" on page 4-110.
2. Measure:
   • Ring-gear-to-stopper-bolt clearance "a"
   Out of specification → Adjust.

Ring-gear-to-stopper-bolt clearance
0.30–0.60 mm (0.012–0.024 in)



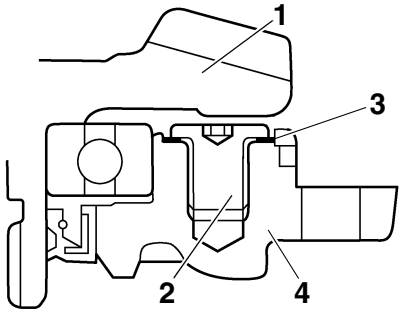


1. Stopper bolt
2. Ring gear

3. Install:
   • Ring gear bearing housing (along with the ring gear)

EAS23610
ADJUSTING THE RING-GEAR-TO-STOPPER-BOLT CLEARANCE

1. Remove:
   • Ring gear "1"
   • Stopper bolt "2"
   • Stopper bolt shim(s) "3"
   • Ring gear bearing housing "4"



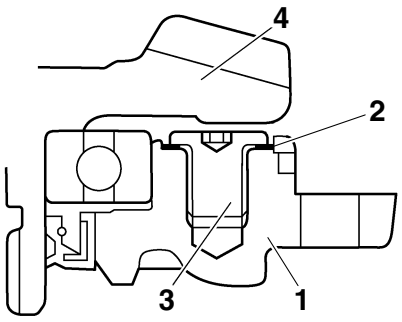
2. Select:
   • Stopper bolt shim(s)

Stopper bolt shims
Thickness (mm)
0.15 0.20

3. Install:
   • Ring gear bearing housing "1"
   • Stopper bolt shim(s) "2"
   • Stopper bolt "3"
   • Ring gear "4"

Stopper bolt
9 Nm (0.9 m·kgf, 6.5 ft·lbf)
LOCTITE®

ECA14320
NOTICE
• The stopper bolt has left-hand threads. To tighten the stopper bolt, turn it counterclockwise.
• Apply LOCTITE® onto the stopper bolt.



4. Measure:
   • Ring-gear-to-stopper-bolt clearance

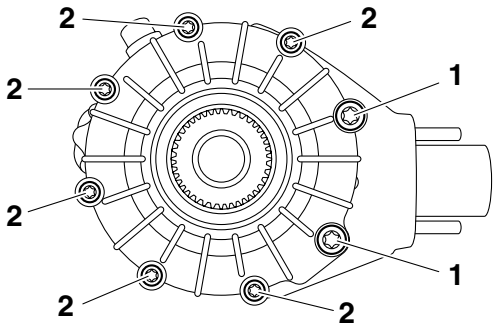
	Ring-gear-to-stopper-bolt clearance **0.30–0.60 mm (0.012–0.024 in)**

TIP
If the ring-gear-to-stopper-bolt clearance is out of specification, repeat the above procedure.

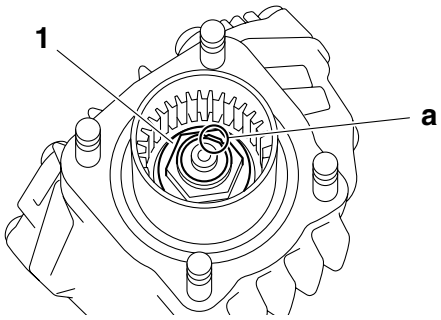
EAS23620
DISASSEMBLING THE FINAL DRIVE ASSEMBLY

1. Remove:
   • Ring gear bearing housing bolts (M10) “1”
   • Ring gear bearing housing bolts (M8) “2”

TIP
Working in a crisscross pattern, loosen each nut 1/4 of a turn. After all of the nuts are fully loosened, remove them and the bolts.

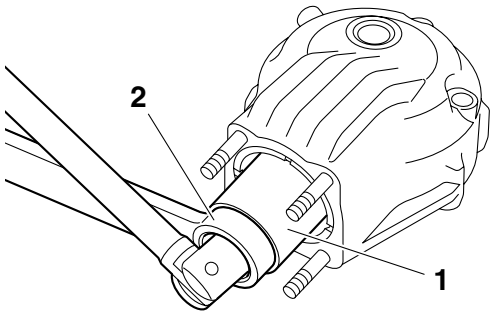


2. Straighten:
   • Punched portion “a” of the coupling gear nut “1”



3. Remove:
   • Coupling gear nut
   • Washer
   • Coupling gear “1”
   (with the coupling gear holding tool “2”)

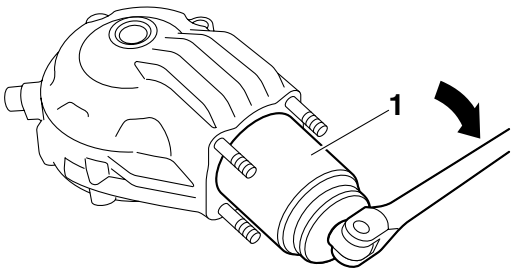
	Coupling gear holding tool **90890-01560**



4. Remove:
   • Bearing retainer
   (with the bearing retainer wrench “1”)

	Bearing retainer wrench **90890-01561**

ECA14330
NOTICE
The bearing retainer has left-hand threads. To loosen the bearing retainer, turn it clockwise.



5. Remove:
   • Final drive pinion gear

ECA14340

NOTICE

The final drive pinion gear should only be removed if ring gear replacement is necessary.

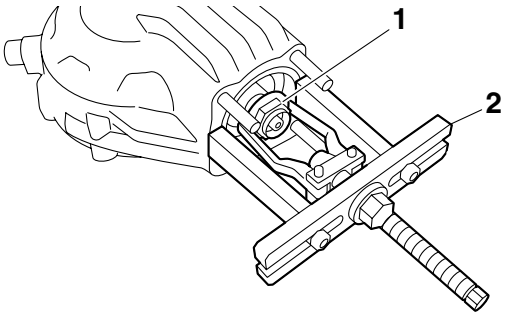
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the coupling gear nut "1".
b. Install the general puller "2".

TIP

Fit the jaws of the general puller onto the coupling gear nut.

c. Separate the final drive pinion gear from the final gear case.

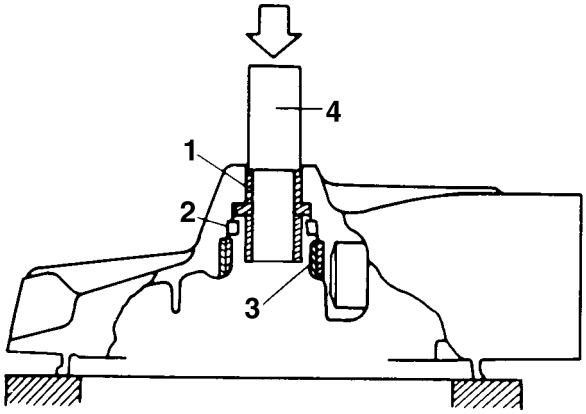


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23630

REMOVING AND INSTALLING THE BEARINGS

1. Check:
   - Bearings
     Damage → Replace.
2. Remove:
   - Collar "1"
   - Oil seal "2"
   - Bearing "3"
     (with an appropriate press tool "4" and an appropriate support for the final drive housing)



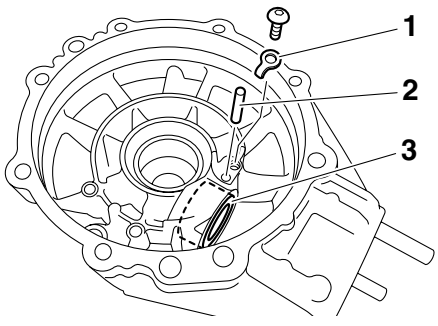
3. Remove:
   - Bearing holder "1"
   - Dowel pin "2"
   - Bearing "3"

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Heat the final gear case to approximately 150 °C (302 °F).
b. Remove the inner race from the final drive pinion gear.

TIP

The removal of the final drive pinion gear bearing is a difficult procedure and is rarely necessary.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Install:
   - Bearing New
   - Dowel pin
   - Bearing holder

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Heat the final gear case to approximately 150 °C (302 °F).

b. Install the bearing outer races with a socket or appropriate tool that matches the diameter of the races.
c. Install the inner race onto the final drive pinion gear.
d. Install the bearing holder and tighten the bolt to specification.

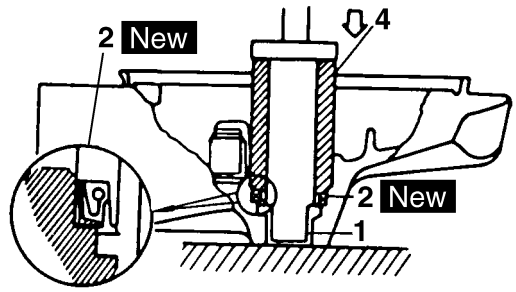
Bearing holder bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)
LOCTITE®

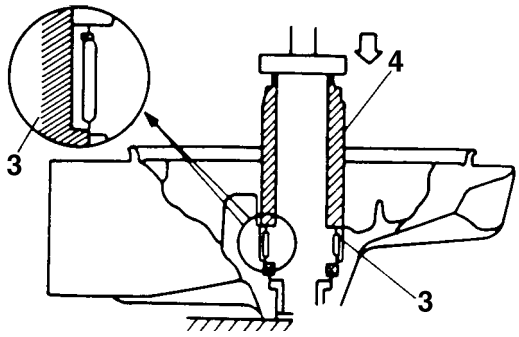
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

5. Install:
   • Collar "1"
   • Oil seal "2" New
   • Bearing "3"
   (with an appropriate press tool "4" and press)

TIP

The bearing can be reused, but Yamaha recommends installing a new one.





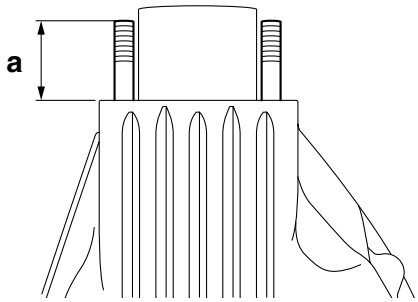
EAS23P1028

ASSEMBLING THE FINAL DRIVE ASSEMBLY

1. Install:
   • Final drive case stud bolts

TIP

• Apply LOCTITE® to the threads of the final drive case stud bolts.
• Install the final drive case stud bolts so that the specified installed length "a" is obtained.



a. 34.5–35.5 mm (1.36–1.40 in)

EAS23640

ALIGNING THE FINAL DRIVE PINION GEAR AND RING GEAR

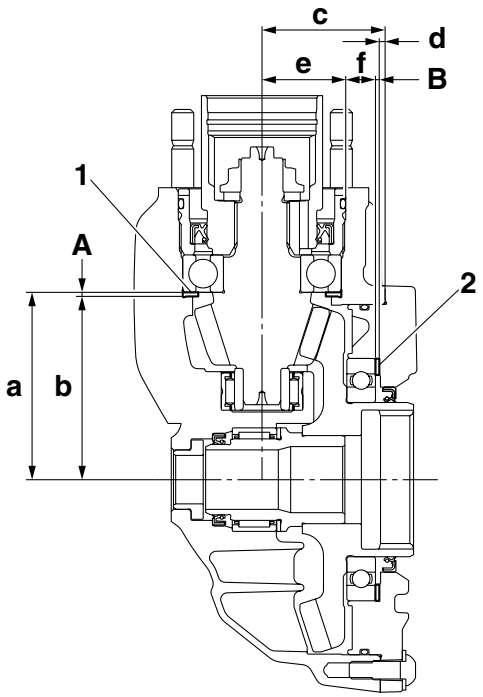
TIP

Aligning the final drive pinion gear and ring gear is necessary when any of the following parts are replaced:
• Final gear case
• Ring gear bearing housing
• Any bearing

1. Select:
   • Final drive pinion gear shim(s) "1"
   • Ring gear shim(s) "2"

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

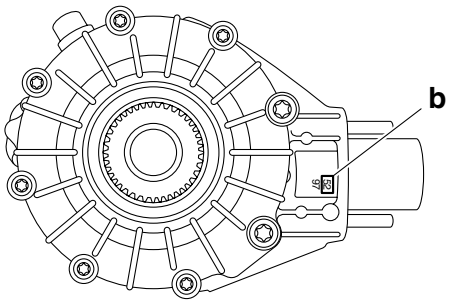
a. Position the final drive pinion gear shim(s) and the ring gear with shim(s). Calculate the respective thicknesses from information marked on the final gear case, ring gear bearing housing, and ring gear.



b. To find final drive pinion gear shim thickness "A", use the following formula:

Final drive pinion gear shim thickness A = a - b - 0.2

Where:
a = 85.00
b = a numeral on the final gear case, to be divided by 100 and added to "84".



Example:
If the final gear case is marked "52":

A = 85.00 - (84 + 52/100) - 0.2
= 85.00 - (84 + 0.52) - 0.2
= 85.00 - 84.52 - 0.2
= 0.28

Round off to the hundredths digit and select the appropriate shim(s).

TIP

In the example above, the calculated final drive pinion gear shim thickness is 0.28 mm (0.011 in). The chart instructs you to round off the 8 to 10. Thus, you should use a 0.30 mm (0.012 in) final drive pinion gear shim.

Hundredth	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

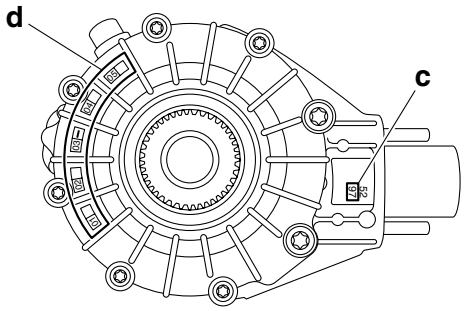
Shim sizes are supplied in the following thicknesses.

Final drive pinion gear shims
Thickness (mm)
0.15 0.30 0.40 0.45 0.50 0.60

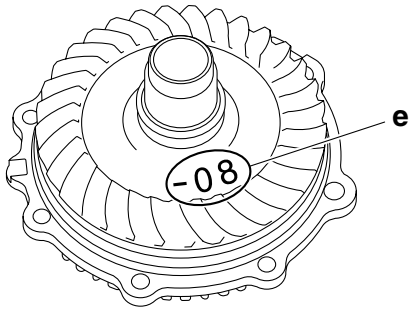
c. To find ring gear shim thickness "B", use the following formula:

Ring gear shim thickness B = c - d - e - f

Where:
c = a numeral on the final gear case, to be divided by 100 and added to "52".
d = a numeral indicated by the punch mark on the ring gear bearing housing, to be divided by 100 and added to "1".



e = a numeral (positive or negative) on the inside of the ring gear, to be divided by 100 and added to "38.50".



f = the bearing thickness constant.

Bearing thickness
13.00 mm (0.51 in)

Example:
If the final drive housing is marked "97", the ring gear bearing housing is marked "03", the ring gear is marked "- 08", and "f" is 13.00:

B = (52 + 97/100) - (1 + 03/100) - (38.50 - 08/100) - 13.00
= (52 + 0.97) - (1 + 0.03) - (38.50 - 0.08) - 13.00
= 52.97 - 1.03 - 38.42 - 13.00
= 0.52

Round off the hundredths digit and select appropriate shim(s).

TIP

In the example above, the calculated ring gear shim thickness is 0.52 mm (0.0205 in). The chart instructs you to round off the 2 to 0. Thus, you should use a 0.50 mm (0.0197 in) ring gear shim.

Hundredth	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

Shim sizes are supplied in the following thicknesses.

Ring gear shims
Thickness (mm)
0.25 0.30 0.40 0.50

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   - Shims (as calculated)
   - Final drive pinion gear
   - Bearing retainer
     (with the bearing retainer wrench "1")

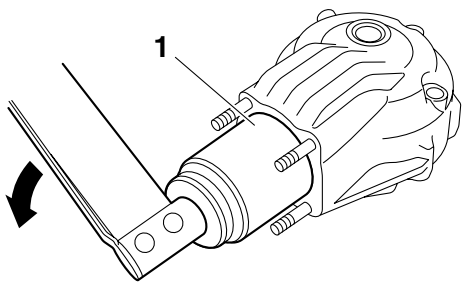
Bearing retainer
130 Nm (13 m·kgf, 94 ft·lbf)

ECA14350

NOTICE

The bearing retainer has left-hand threads. To tighten the bearing retainer, turn it counterclockwise.

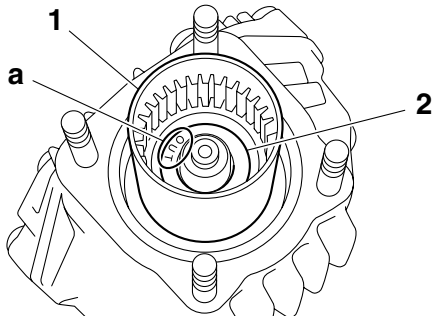
Bearing retainer wrench
90890-01561



3. Install:
   - Coupling gear "1"
   - Washer "2"

TIP

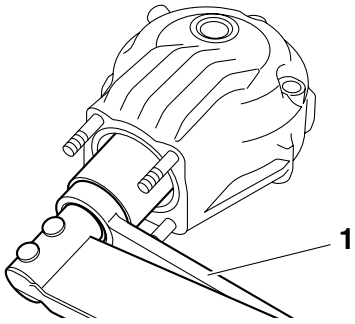
Install the washer with its "OUT" mark "a" facing outward.



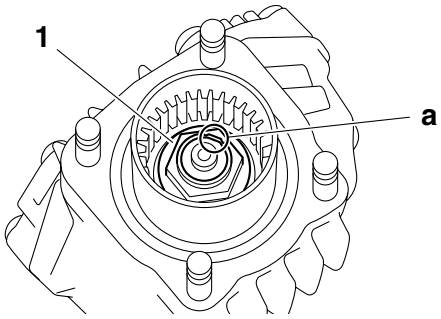
4. Install:
   - Coupling gear nut New
     (with the coupling gear holding tool "1")

Coupling gear nut
150 Nm (15 m·kgf, 108 ft·lbf)
LOCTITE®

Coupling gear holding tool
90890-01560

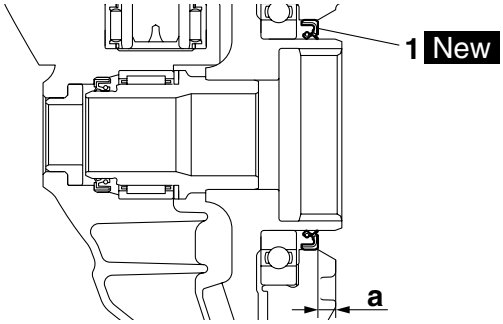


5. Stake the coupling gear nut "1" at a cutout "a" in the final drive pinion gear.



6. Install:
   - Oil seal "1" New

Installed depth "a"
6.0–6.5 mm (0.24–0.26 in)



7. Install:
   • Ring gear bearing housing (along with the ring gear)
8. Adjust:
   • Final gear backlash
   Refer to "MEASURING THE FINAL GEAR BACKLASH" on page 4-109 and "ADJUSTING THE FINAL GEAR BACKLASH" on page 4-110.
9. Measure:
   • Ring-gear-to-thrust-washer clearance

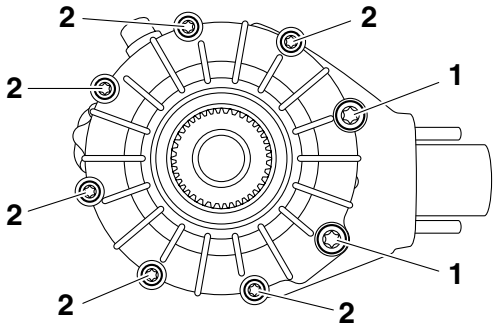
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the ring gear bearing housing (along with the ring gear).
b. Place four pieces of Plastigauge® between the original thrust washer and the ring gear.
c. Install the ring gear bearing housing and tighten the bolts "1" and bolts "2" to specification.

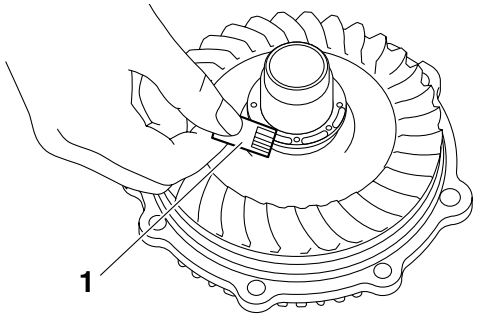
Ring gear bearing housing bolt (M10) "1"
40 Nm (4.0 m·kgf, 29 ft·lbf)
Ring gear bearing housing bolt (M8) "2"
23 Nm (2.3 m·kgf, 17 ft·lbf)

TIP

Do not turn the final drive pinion gear and ring gear while measuring the ring-gear-to-thrust-washer clearance with Plastigauge®.



d. Remove the ring gear bearing housing.
e. Measure the width of the flattened Plastigauge® "1".



Ring-gear-to-thrust-washer clearance
0.10–0.20 mm (0.004–0.008 in)

f. If the ring-gear-to-thrust-washer clearance is within specification, install the ring gear bearing housing (along with the ring gear).
g. If the ring-gear-to-thrust-washer clearance is out of specification, select the correct thrust washer as follows.
h. Select the suitable thrust washer from the following chart.

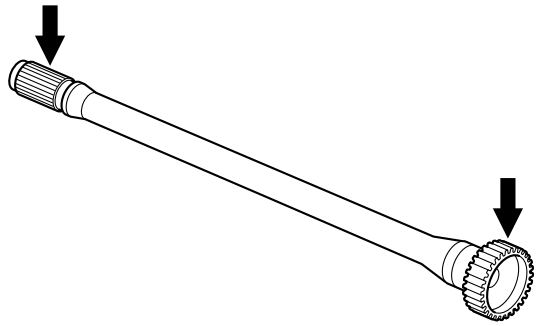
Thrust washer
Thickness (mm)
1.2 1.4 1.6 1.8 2.0

i. Repeat the measurement steps until the ring-gear-to-thrust-washer clearance is within the specified limits.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23650
CHECKING THE DRIVE SHAFT

1. Check:
   • Drive shaft splines
   Damage/wear → Replace the drive shaft.



EAS23660
INSTALLING THE DRIVE SHAFT AND FINAL DRIVE ASSEMBLY

1. Lubricate:
   • Drive shaft spline (final drive pinion gear side)

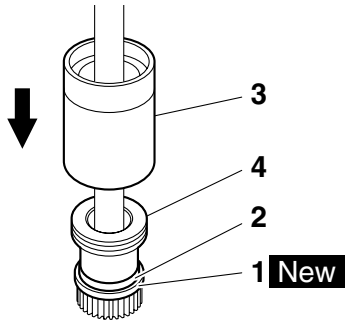
Recommended lubricant
Molybdenum disulfide grease

2. Lubricate:
   • Drive shaft spline (universal joint side)

Recommended lubricant
Lithium-soap-based grease

3. Install:
   • Oil seal “1” New
   • Washer “2”
   (to the drive shaft with the fork seal driver weight “3” and fork seal driver attachment (ø 30) “4”)

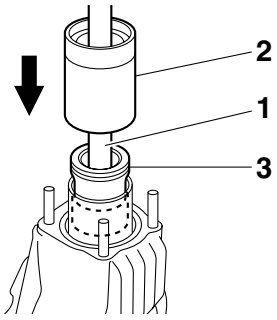
Fork seal driver weight
90890-01367
Replacement hammer
YM-A9409-7
Fork seal driver attachment (ø30)
90890-01400

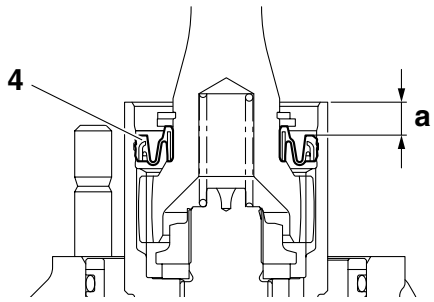


4. Install:
   • Circlips New
5. Install:
   • Drive shaft assembly “1”
   (to the final gear case with the fork seal driver weight “2” and fork seal driver attachment (ø38) “3”)

Fork seal driver weight
90890-01367
Replacement hammer
YM-A9409-7
Fork seal driver attachment (ø38)
90890-01372
Replacement 38 mm
YM-A5142-1

Installed depth “a”
8.5–10.0 mm (0.33–0.39 in)





4. Oil seal

6. Install:
   • Final drive assembly

TIP

Align the drive shaft splines with the driven yoke of the universal joint.

7. Tighten:
   • Final drive assembly nuts

Final drive assembly nut
42 Nm (4.2 m·kgf, 30 ft·lbf)

8. Install:
   • Rear wheel
   Refer to “REAR WHEEL” on page 4-29.
9. Fill:
   • Final gear case
   Refer to “CHECKING THE FINAL GEAR OIL LEVEL” on page 3-29.

ENGINE

ENGINE INSPECTION 5-1
MEASURING THE COMPRESSION PRESSURE 5-1

ENGINE REMOVAL 5-3
REMOVING THE ENGINE 5-9
INSTALLING THE ENGINE 5-9
INSTALLING THE EXHAUST PIPE AND MUFFLER 5-10

CAMSHAFTS 5-11
REMOVING THE CYLINDER HEAD COVER 5-15
REMOVING THE CAMSHAFTS 5-16
CHECKING THE CAMSHAFTS 5-17
CHECKING THE CAMSHAFT SPROCKET 5-18
CHECKING THE TIMING CHAIN TENSIONERS 5-19
CHECKING THE DECOMPRESSION SYSTEM 5-19
INSTALLING THE CAMSHAFTS 5-19
INSTALLING THE CYLINDER HEAD COVER 5-23

CYLINDER HEAD 5-26
REMOVING THE CYLINDER HEAD 5-27
CHECKING THE TIMING CHAIN GUIDE (EXHAUST SIDE) 5-27
CHECKING THE CYLINDER HEAD 5-27
INSTALLING THE CYLINDER HEAD 5-27

VALVES AND VALVE SPRINGS 5-29
REMOVING THE VALVES 5-30
CHECKING THE VALVES AND VALVE GUIDES 5-30
CHECKING THE VALVE SEATS 5-32
CHECKING THE VALVE SPRINGS 5-34
CHECKING THE VALVE LIFTERS 5-34
INSTALLING THE VALVES 5-34

CYLINDER AND PISTONS 5-37
REMOVING THE PISTONS 5-38
CHECKING THE CYLINDERS AND PISTONS 5-38
CHECKING THE PISTON RINGS 5-39
CHECKING THE PISTON PINS 5-40
INSTALLING THE PISTONS AND CYLINDER 5-40

GENERATOR AND STARTER CLUTCH 5-43
REMOVING THE GENERATOR 5-45
REMOVING THE STARTER CLUTCH 5-45
CHECKING THE STARTER CLUTCH 5-45
CHECKING THE TORQUE LIMITER 5-46
INSTALLING THE STARTER CLUTCH 5-46
INSTALLING THE GENERATOR 5-46

ELECTRIC STARTER 5-48
CHECKING THE STARTER MOTOR 5-50
ASSEMBLING THE STARTER MOTOR 5-51

CLUTCH 5-52
REMOVING THE CLUTCH 5-60
CHECKING THE FRICTION PLATES 5-61
CHECKING THE CLUTCH PLATES 5-61
CHECKING THE CLUTCH SPRING PLATE 5-61
CHECKING THE CLUTCH HOUSING 5-62
CHECKING THE CLUTCH BOSS 5-62
CHECKING THE PRESSURE PLATE 5-62
CHECKING THE CLUTCH PUSH RODS 5-62
CHECKING THE PRIMARY DRIVEN GEAR 5-62
INSTALLING THE CLUTCH 5-63
DISASSEMBLING THE CLUTCH MASTER CYLINDER 5-64
CHECKING THE CLUTCH MASTER CYLINDER 5-65
ASSEMBLING THE CLUTCH MASTER CYLINDER 5-65
INSTALLING THE CLUTCH MASTER CYLINDER 5-65
REMOVING THE CLUTCH RELEASE CYLINDER 5-66
ASSEMBLING THE CLUTCH RELEASE CYLINDER 5-67
INSTALLING THE CLUTCH RELEASE CYLINDER 5-67

PICKUP ROTOR 5-69
REMOVING THE PICKUP ROTOR 5-70
INSTALLING THE PICKUP ROTOR 5-70

SHIFT SHAFT 5-72
CHECKING THE SHIFT SHAFT 5-74
CHECKING THE STOPPER LEVER 5-74
INSTALLING THE SHIFT SHAFT 5-74
ADJUSTING THE SHIFT PEDAL 5-74

OIL PUMP 5-76
REMOVING THE OIL PAN AND OIL STRAINER COVER 5-80
CHECKING THE OIL PUMP 5-80
CHECKING THE RELIEF VALVE 5-80
CHECKING THE OIL PIPE 5-80
CHECKING THE OIL STRAINER 5-81
ASSEMBLING THE OIL PUMP 5-81
INSTALLING THE OIL PAN 5-81
INSTALLING THE OIL STRAINER COVER 5-81

CRANKCASE 5-82
REMOVING THE REAR BALANCER 5-87
DISASSEMBLING THE CRANKCASE 5-87
CHECKING THE CRANKCASE 5-88
CHECKING THE REAR BALANCER 5-88
CHECKING THE TIMING CHAIN AND TIMING CHAIN GUIDE (INTAKE SIDE) 5-88
CHECKING THE OIL NOZZLES 5-88
ASSEMBLING THE CRANKCASE 5-88
INSTALLING THE REAR BALANCER 5-92

CRANKSHAFT AND BALANCER 5-93
REMOVING THE FRONT BALANCER SHAFT 5-95
REMOVING THE BALANCER SHAFT JOURNAL BEARINGS 5-95
REMOVING THE CRANKSHAFT JOURNAL BEARINGS 5-95
REMOVING THE CONNECTING RODS 5-95
CHECKING THE CRANKSHAFT 5-95
CHECKING THE CONNECTING RODS 5-97
CHECKING THE FRONT BALANCER 5-98
INSTALLING THE CONNECTING RODS 5-100
INSTALLING THE CRANKSHAFT 5-101
INSTALLING THE FRONT BALANCER SHAFT 5-102

TRANSMISSION 5-103
REMOVING THE TRANSMISSION 5-109
CHECKING THE SHIFT FORKS 5-109
CHECKING THE SHIFT DRUM ASSEMBLY 5-109
CHECKING THE TRANSMISSION 5-109
ASSEMBLING THE MAIN AXLE AND DRIVE AXLE 5-110
INSTALLING THE TRANSMISSION 5-111

MIDDLE GEAR 5-113
REMOVING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY 5-117
DISASSEMBLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY 5-117
REMOVING THE MIDDLE DRIVE PINION GEAR ASSEMBLY 5-117
DISASSEMBLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY 5-117
CHECKING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY 5-118
CHECKING THE MIDDLE DRIVE PINION GEAR ASSEMBLY 5-118
ASSEMBLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY 5-118
INSTALLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY 5-119
ASSEMBLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY 5-119
INSTALLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY 5-120
MEASURING THE MIDDLE GEAR BACKLASH 5-121
ADJUSTING THE MIDDLE GEAR BACKLASH 5-121
ALIGNING THE MIDDLE GEAR 5-123

EAS23P1087
ENGINE INSPECTION

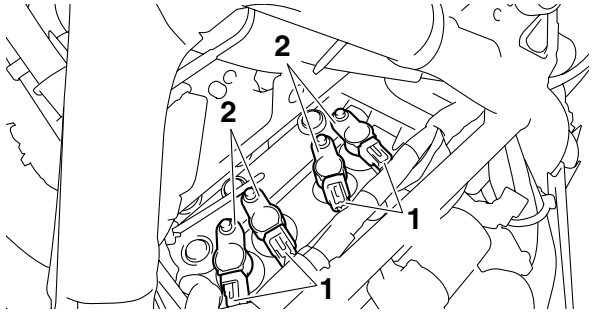
EAS20710
MEASURING THE COMPRESSION PRESSURE

The following procedure applies to all of the cylinders.

TIP

Insufficient compression pressure will result in a loss of performance.

1. Measure:
   - Valve clearance
     Out of specification → Adjust.
     Refer to "ADJUSTING THE VALVE CLEARANCE" on page 3-5.
2. Start the engine, warm it up for several minutes, and then turn it off.
3. Remove:
   - Air filter case
     Refer to "GENERAL CHASSIS" on page 4-1.
4. Disconnect:
   - Ignition coil couplers "1"
5. Remove:
   - Ignition coils "2"



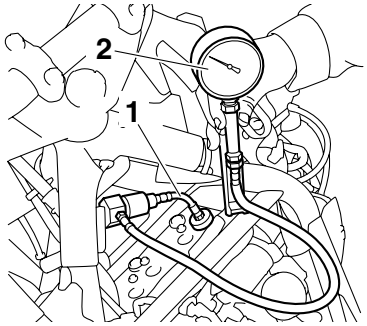
6. Remove:
   - Spark plug

ECA13340
NOTICE

Before removing the spark plugs, use compressed air to blow away any dirt accumulated in the spark plug wells to prevent it from falling into the cylinders.

7. Install:
   - Extension "1"
   - Compression gauge "2"

Extension
90890-04136
Compression gauge
90890-03081
Engine compression tester
YU-33223



8. Measure:
   - Compression pressure
     Out of specification → Refer to steps (c) and (d).

Standard compression pressure (at sea level)
680 kPa/250 r/min (6.8 kgf/cm²/250 r/min, 96.7 psi/250 r/min)
Minimum–maximum
590–760 kPa (5.9–7.6 kgf/cm², 83.9–108.1 psi)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the main switch to "ON".
b. With the throttle wide open, crank the engine until the reading on the compression gauge stabilizes.

EWA12940
⚠ WARNING

To prevent sparking, ground all spark plug leads before cranking the engine.

TIP

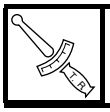
The difference in compression pressure between cylinders should not exceed 100 kPa (1 kg/cm², 14 psi).

c. If the compression pressure is above the maximum specification, check the cylinder head, valve surfaces and piston crown for carbon deposits.
   Carbon deposits → Eliminate.
d. If the compression pressure is below the minimum specification, pour a teaspoonful of engine oil into the spark plug bore and measure again.
   Refer to the following table.

Compression pressure (with oil applied into the cylinder)	
Reading	Diagnosis
Higher than without oil	Piston ring(s) wear or damage → Repair.
Same as without oil	Pistons, valves, cylinder head gasket or piston ring(s) possibly defective → Repair.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

9. Install:
   • Spark plug



Spark plug
13 Nm (1.3 m·kgf, 9.4 ft·lbf)

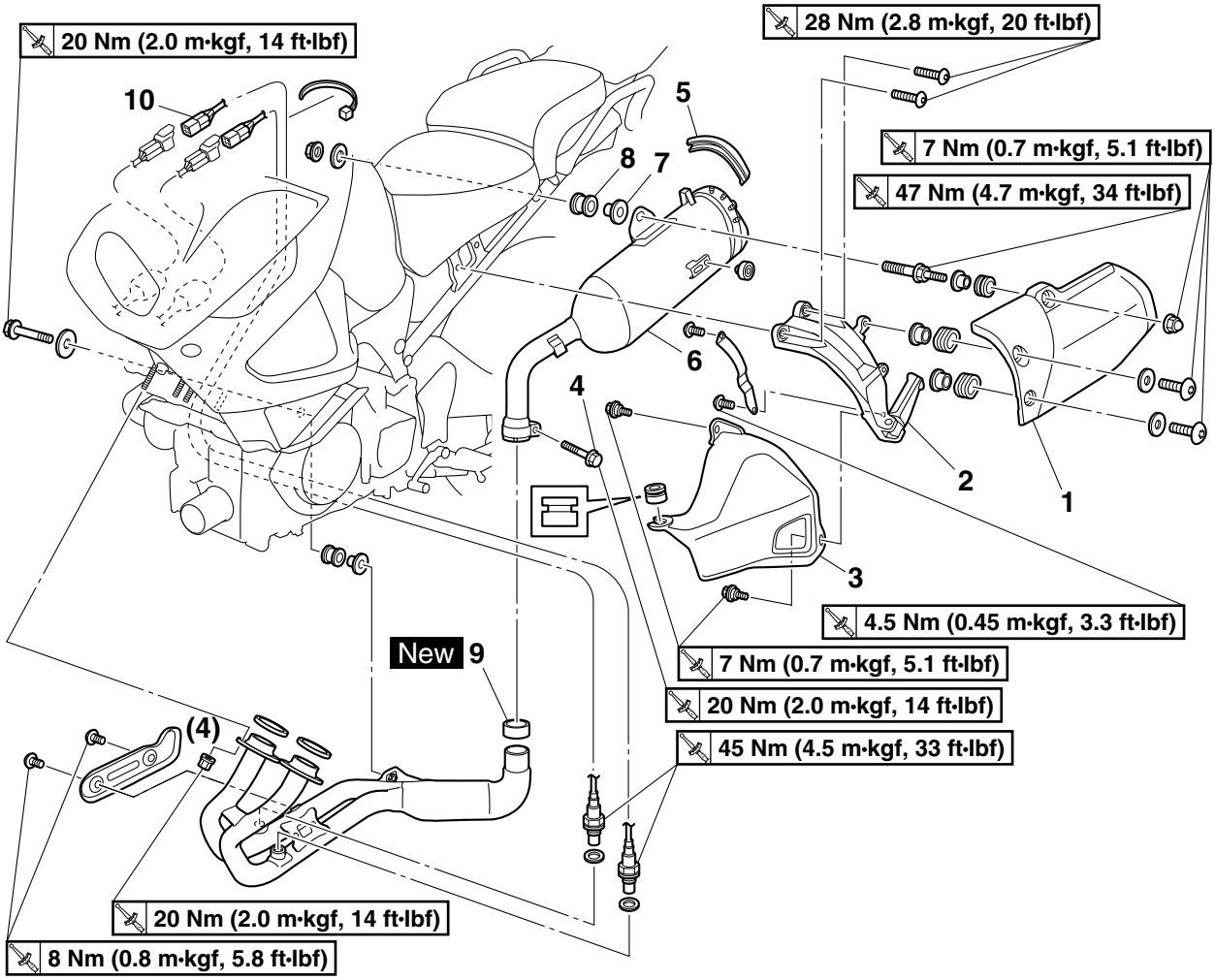
10. Install:
    • Ignition coil

Ignition coil bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)
LOCTITE®

11. Connect:
    • Ignition coil couplers
12. Install:
    • Air filter case
    Refer to “GENERAL CHASSIS” on page 4-1.

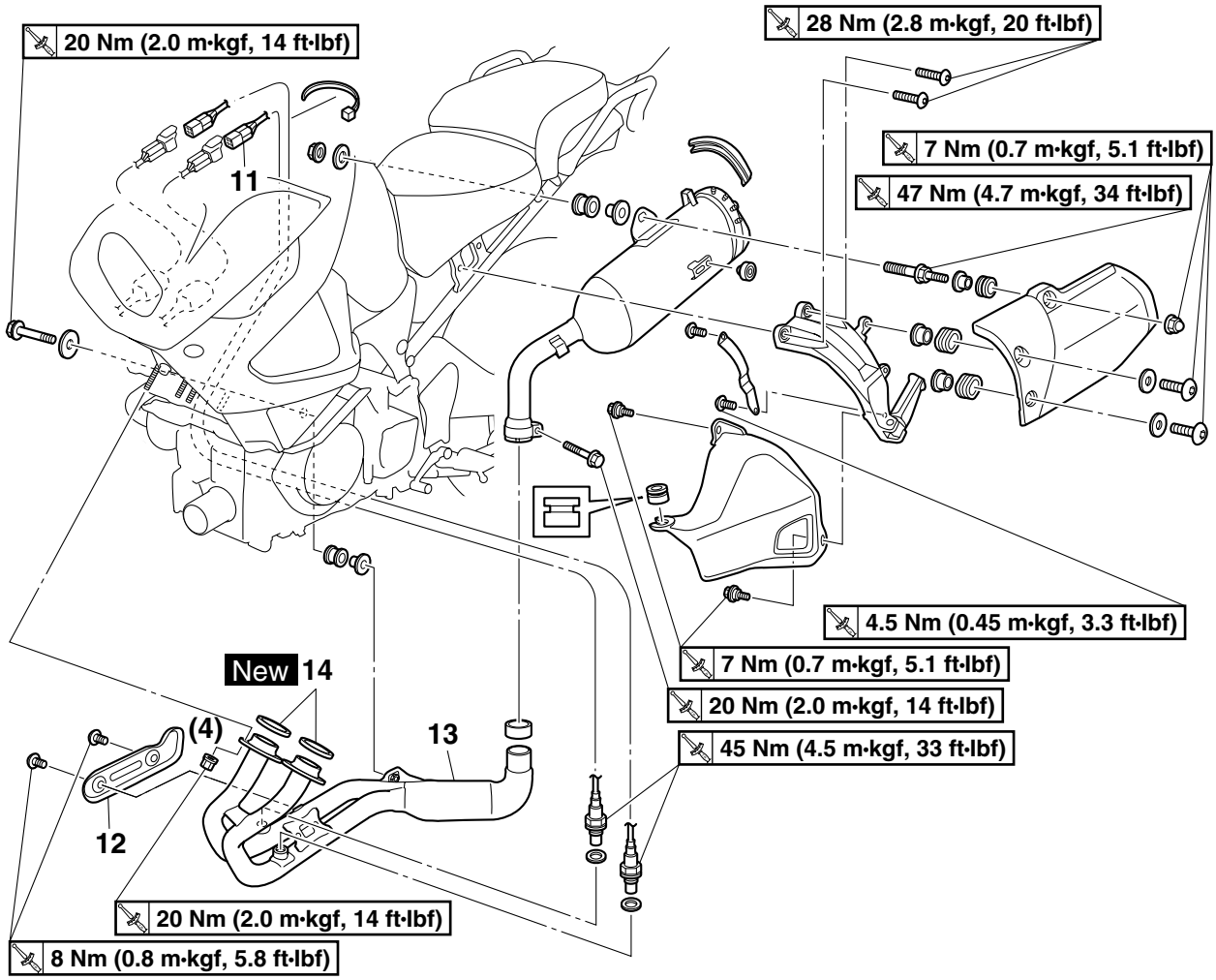
EAS23711
ENGINE REMOVAL

Removing the exhaust pipe



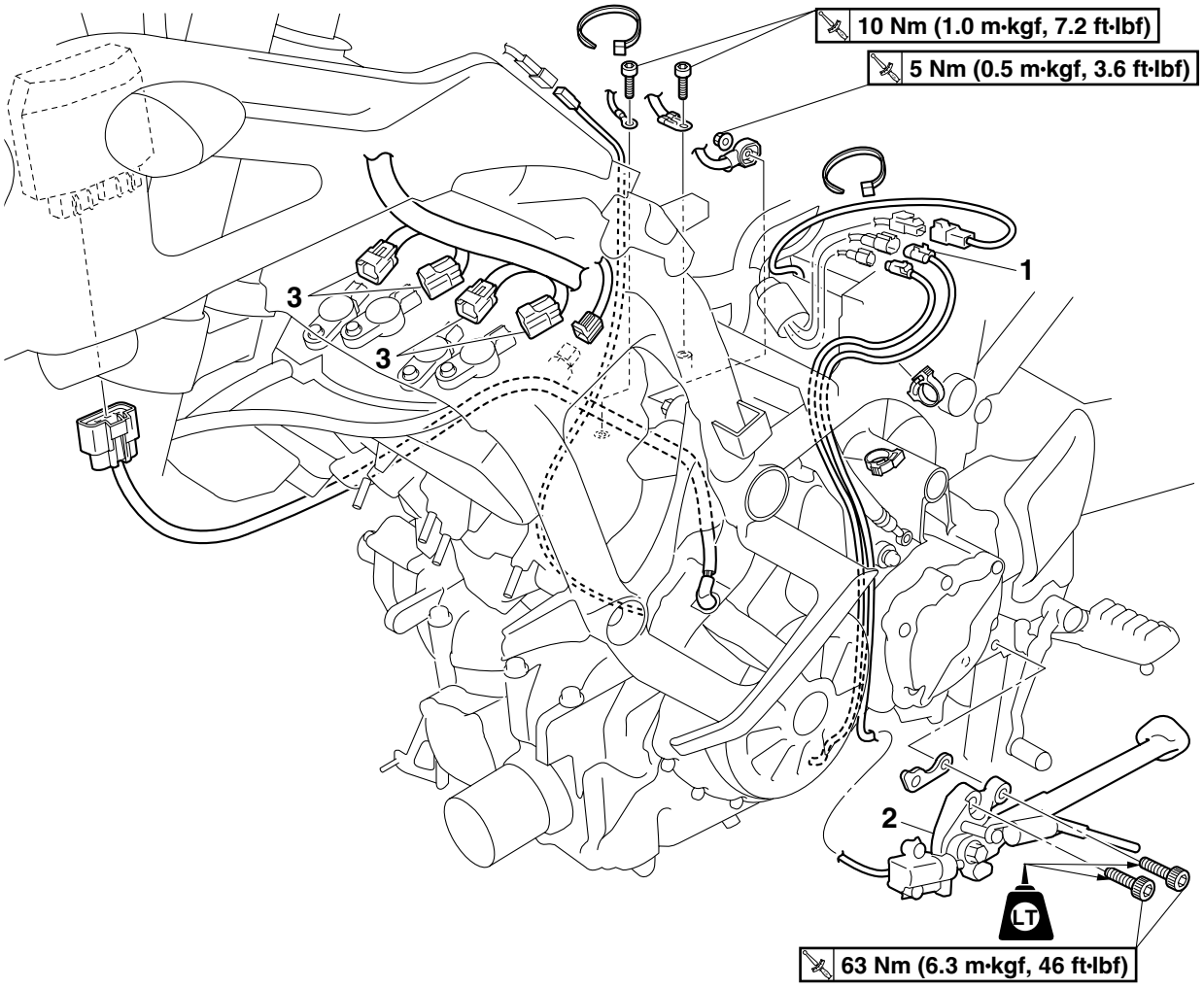
Order	Job/Parts to remove	Q'ty	Remarks
	Right side cowling/Engine guard		Refer to "GENERAL CHASSIS" on page 4-1.
1	Muffler cover	1	
2	Left passenger footrest	1	
3	Muffler protector	1	
4	Exhaust pipe joint bolt	1	
5	Rubber cover	1	
6	Muffler	1	
7	Collar	1	
8	Rubber damper	1	
9	Gasket	1	
10	O_2 sensor #1 coupler	1	Disconnect.

Removing the exhaust pipe



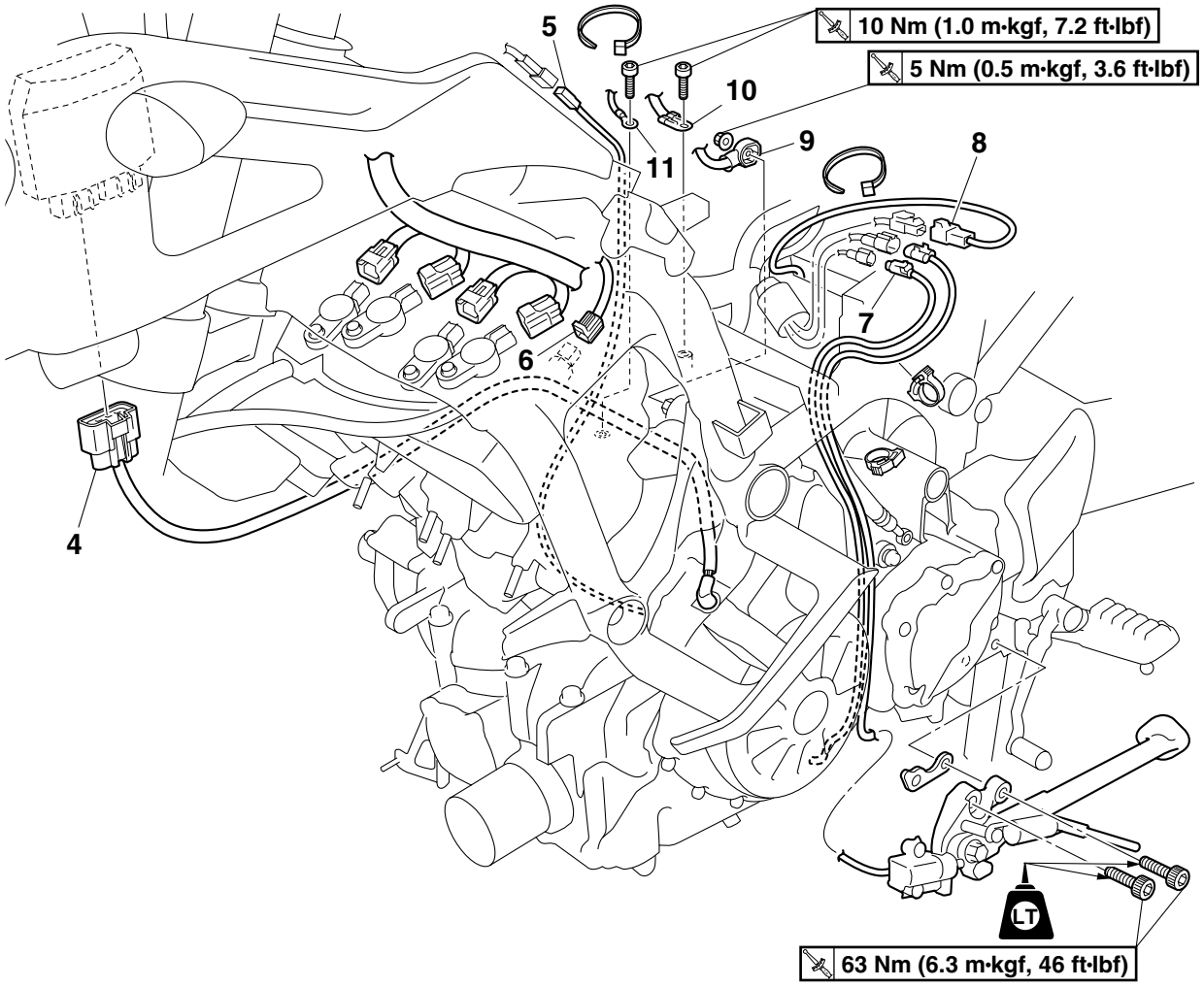
Order	Job/Parts to remove	Q'ty	Remarks
11	O_2 sensor #2 coupler	1	Disconnect.
12	Exhaust pipe protector	1	
13	Exhaust pipe	1	
14	Gasket	2	
			For installation, reverse the removal procedure.

Disconnecting the leads



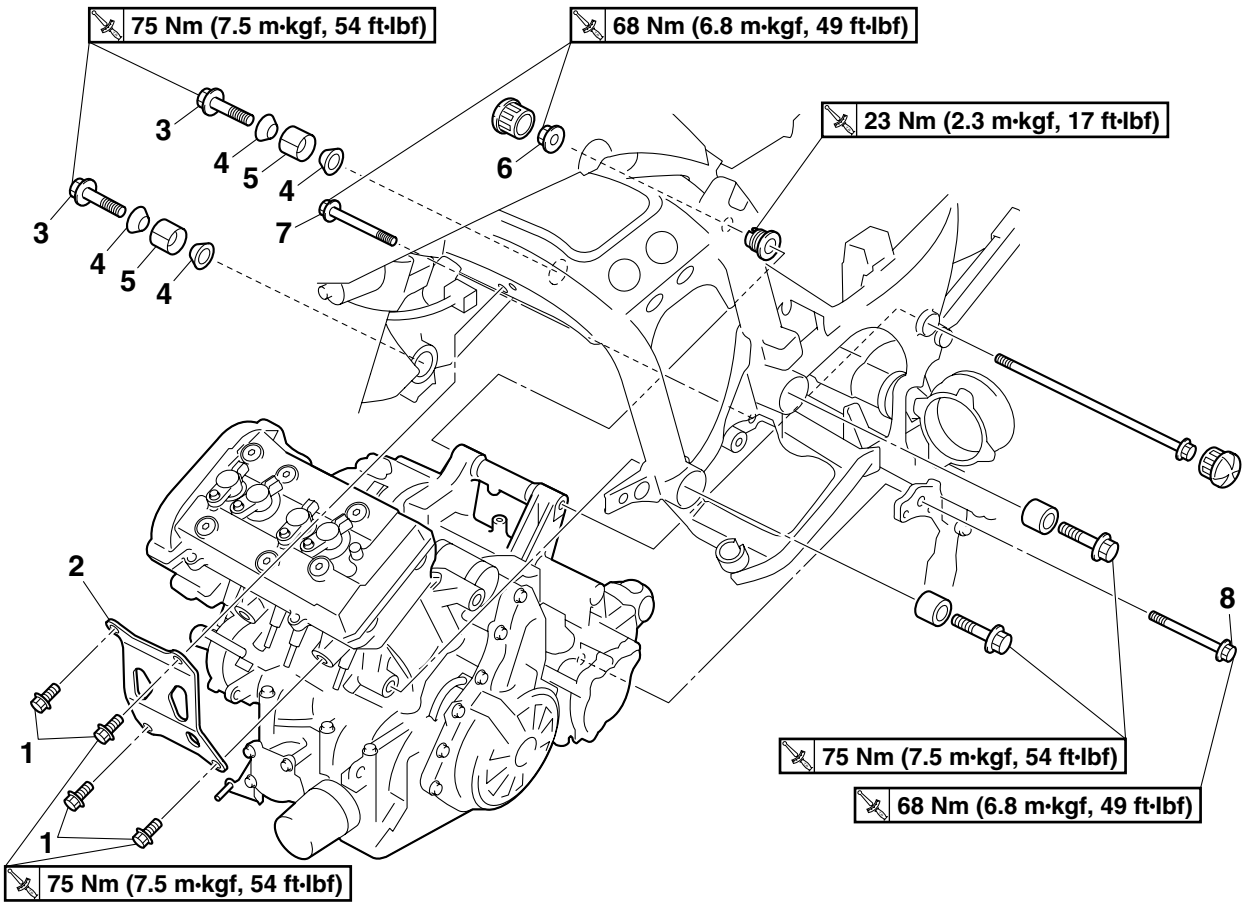
Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-25.
	Drive shaft		Refer to "SHAFT DRIVE" on page 4-104.
	Clutch hose		Disconnect. Refer to "CLUTCH" on page 5-52.
	Shift arm		Refer to "SHIFT SHAFT" on page 5-72.
	Radiator		Refer to "RADIATOR" on page 6-1.
	Thermostat		Refer to "THERMOSTAT" on page 6-4.
	Radiator outlet pipe		Refer to "WATER PUMP" on page 6-6.
1	Sidestand switch coupler	1	Disconnect.
2	Sidestand	1	
3	Ignition coil coupler	4	Disconnect.

Disconnecting the leads



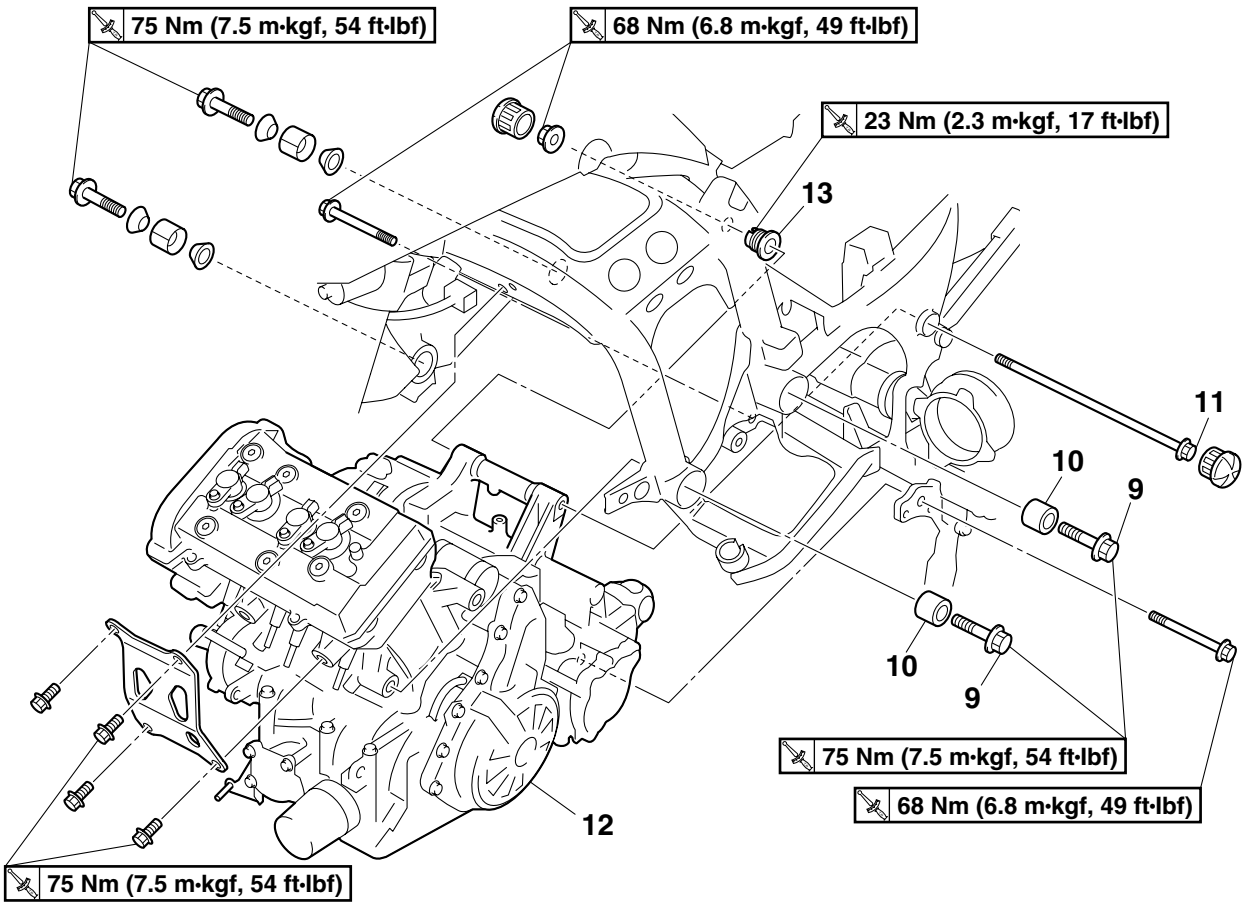
Order	Job/Parts to remove	Q'ty	Remarks
4	Stator coil coupler	1	Disconnect.
5	Crankshaft position sensor coupler	1	Disconnect.
6	Coolant temperature sensor coupler	1	Disconnect.
7	Oil level switch coupler	1	Disconnect.
8	Neutral switch coupler	1	Disconnect.
9	Starter motor lead	1	Disconnect.
10	Engine ground lead	1	Disconnect.
11	Negative battery lead	1	Disconnect.
			For installation, reverse the removal procedure.

Removing the engine



Order	Job/Parts to remove	Q'ty	Remarks
			TIP Place a suitable stand under the engine.
1	Engine bracket bolt	4	
2	Engine bracket	1	
3	Engine mounting bolt (front right side)	2	
4	Engine mounting collar (front right outside)	4	
5	Engine mounting collar (front right inside)	2	
6	Engine mounting nut	1	
7	Engine mounting bolt (rear right lower side)	1	100 mm (3.94 in)
8	Engine mounting bolt (rear left lower side)	1	110 mm (4.33 in)

Removing the engine



Order	Job/Parts to remove	Q'ty	Remarks
9	Engine mounting bolt (front left side)	2	
10	Engine mounting collar (front left side)	2	
11	Engine mounting bolt (rear upper side)	1	
12	Engine	1	
13	Engine positioning bolt	1	
			For installation, reverse the removal procedure.

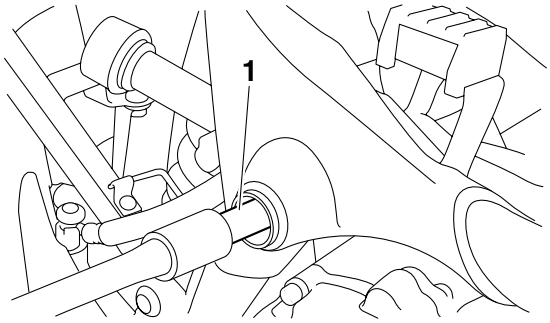
EAS23P1029
REMOVING THE ENGINE

1. Loosen:
   • Engine positioning bolt

TIP

Loosen the engine positioning bolt with the pivot shaft wrench “1”.

Pivot shaft wrench
90890-01485
Frame mount insert wrench
YM-01485



EAS23P1088
INSTALLING THE ENGINE

1. Install:
   • Engine positioning bolt “1”
   (to the frame)
2. Install:
   • Engine “2”
   • Engine mounting bolt (rear left lower side) “3”
   • Engine mounting bolt (rear right lower side) “4”
   • Engine mounting bolt (rear upper side) “5”
   • Engine mounting collars (front left side) “6”
   • Engine mounting bolts (front left side) “7”
   • Engine mounting collars (front right outside) “8”
   • Engine mounting collars (front right inside) “9”
   • Engine mounting bolts (front right side) “10”
   • Engine bracket “11”
   • Engine bracket bolts “12”

TIP

Do not fully tighten the bolts and nut.

3. Tighten:
   • Engine positioning bolt “1”

Engine positioning bolt
23 Nm (2.3 m·kgf, 17 ft·lbf)

Pivot shaft wrench
90890-01485
Frame mount insert wrench
YM-01485

TIP

- Tighten the engine positioning bolt with a pivot shaft wrench.
- Make sure that the flange on the engine positioning bolt contacts the engine.

4. Install:
   • Engine mounting nut “13”

TIP

Do not fully tighten the nut.

5. Tighten:
   • Engine mounting bolts (front left side) “7”

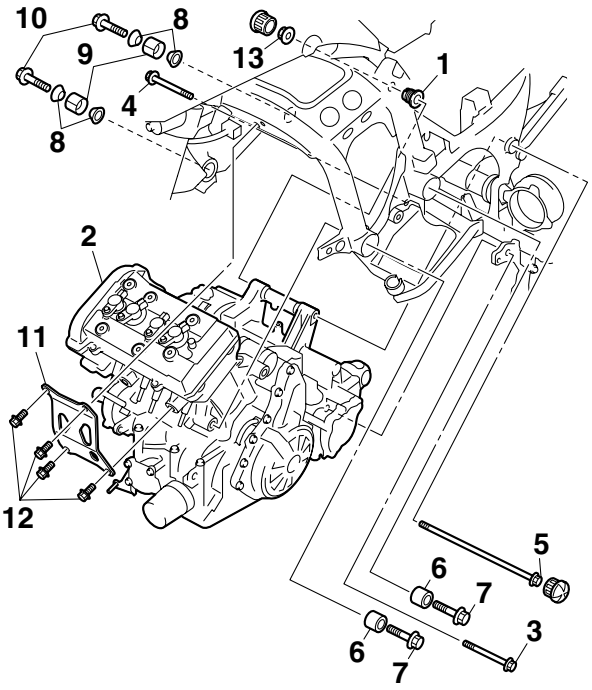
Engine mounting bolt (front left side)
75 Nm (7.5 m·kgf, 54 ft·lbf)

TIP

Make sure that the engine contacts the frame.

6. Tighten:
   • Engine mounting bolt (rear left lower side) “3”
   • Engine mounting bolt (rear right lower side) “4”
   • Engine mounting nut “13”
   • Engine mounting bolts (front right side) “10”
   • Engine bracket bolts “12”

Engine mounting bolt (rear left lower side)
68 Nm (6.8 m·kgf, 49 ft·lbf)
Engine mounting bolt (rear right lower side)
68 Nm (6.8 m·kgf, 49 ft·lbf)
Engine mounting nut
68 Nm (6.8 m·kgf, 49 ft·lbf)
Engine mounting bolt (front right side)
75 Nm (7.5 m·kgf, 54 ft·lbf)
Engine bracket bolt
75 Nm (7.5 m·kgf, 54 ft·lbf)



EAS23P1030

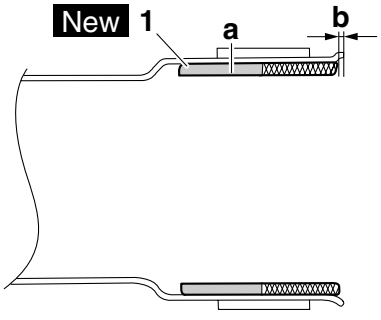
INSTALLING THE EXHAUST PIPE AND MUFFLER

1. Install:
   - Gasket “1” New
     (to muffler)

TIP

Install the muffler gasket with its carbon side facing to the back.

	Installed depth “b” **1.0 mm (0.04 in)**

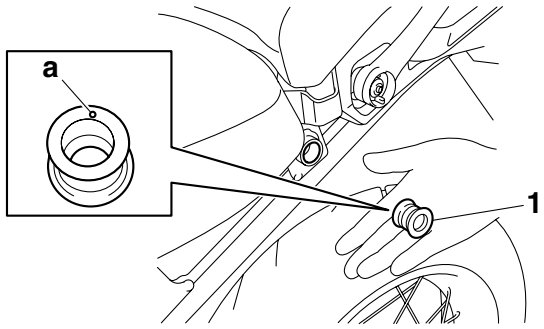


2. Install:
   - Rubber damper “1”
   - Collar
   - Muffler

	Muffler bolt **47 Nm (4.7 m·kgf, 34 ft·lbf)**

TIP

Install the rubber damper to the frame so that the “O” mark “a” on the damper is facing inward.

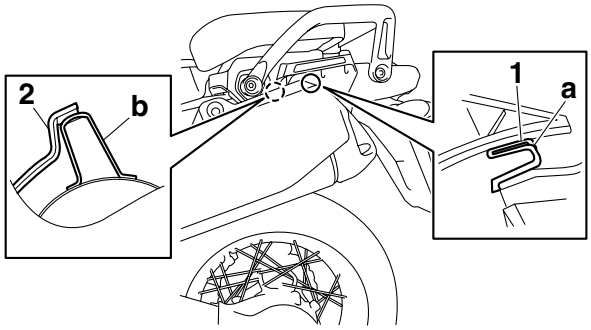


3. Install:
   - Rubber cover “1”
   - Muffler cover “2”

	Muffler cover bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)** **Muffler cover nut** **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

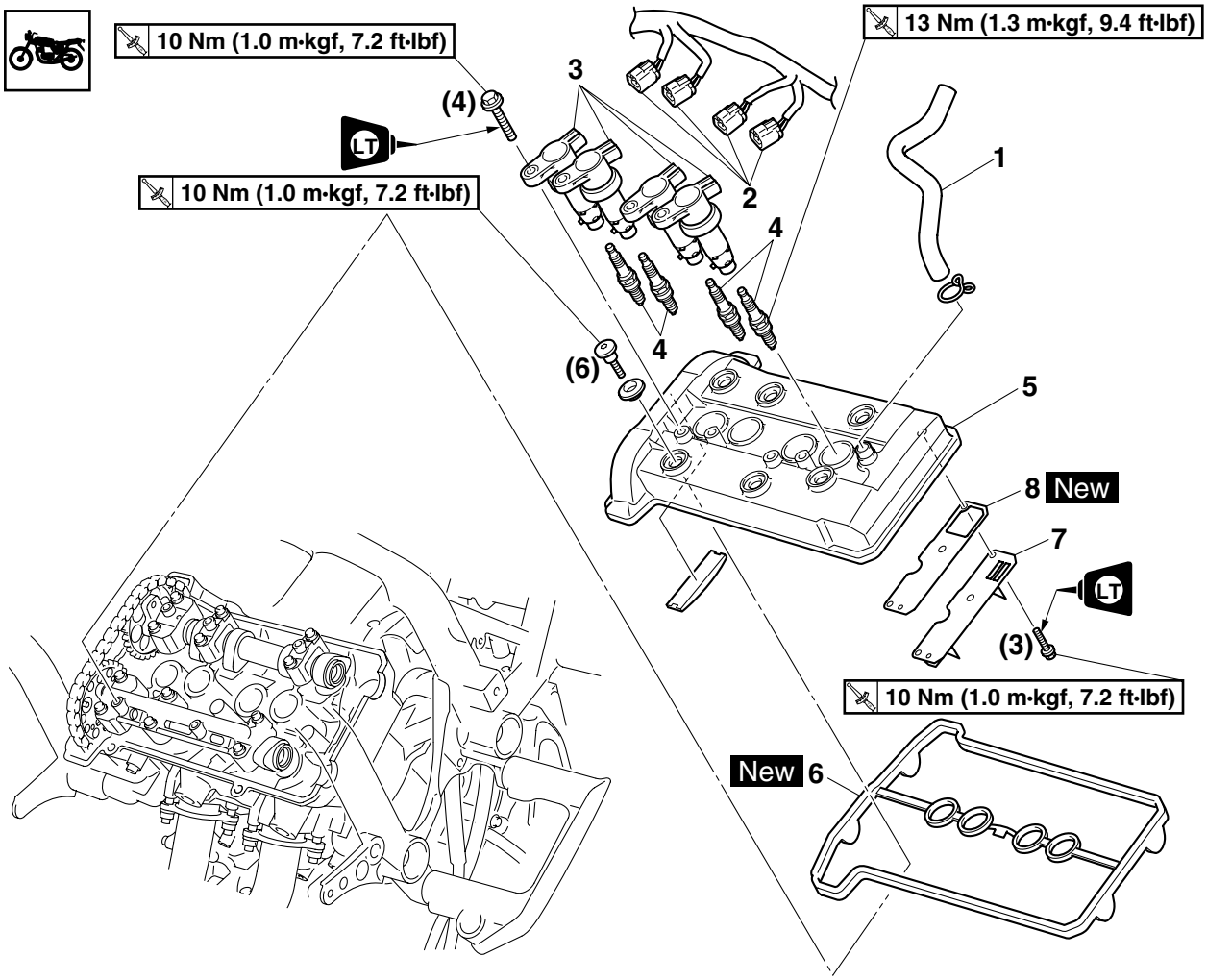
TIP

- Install the rubber cover so that its lip “a” is folded as shown in the illustration.
- Make sure that the muffler cover contacts the muffler cover support “b”.



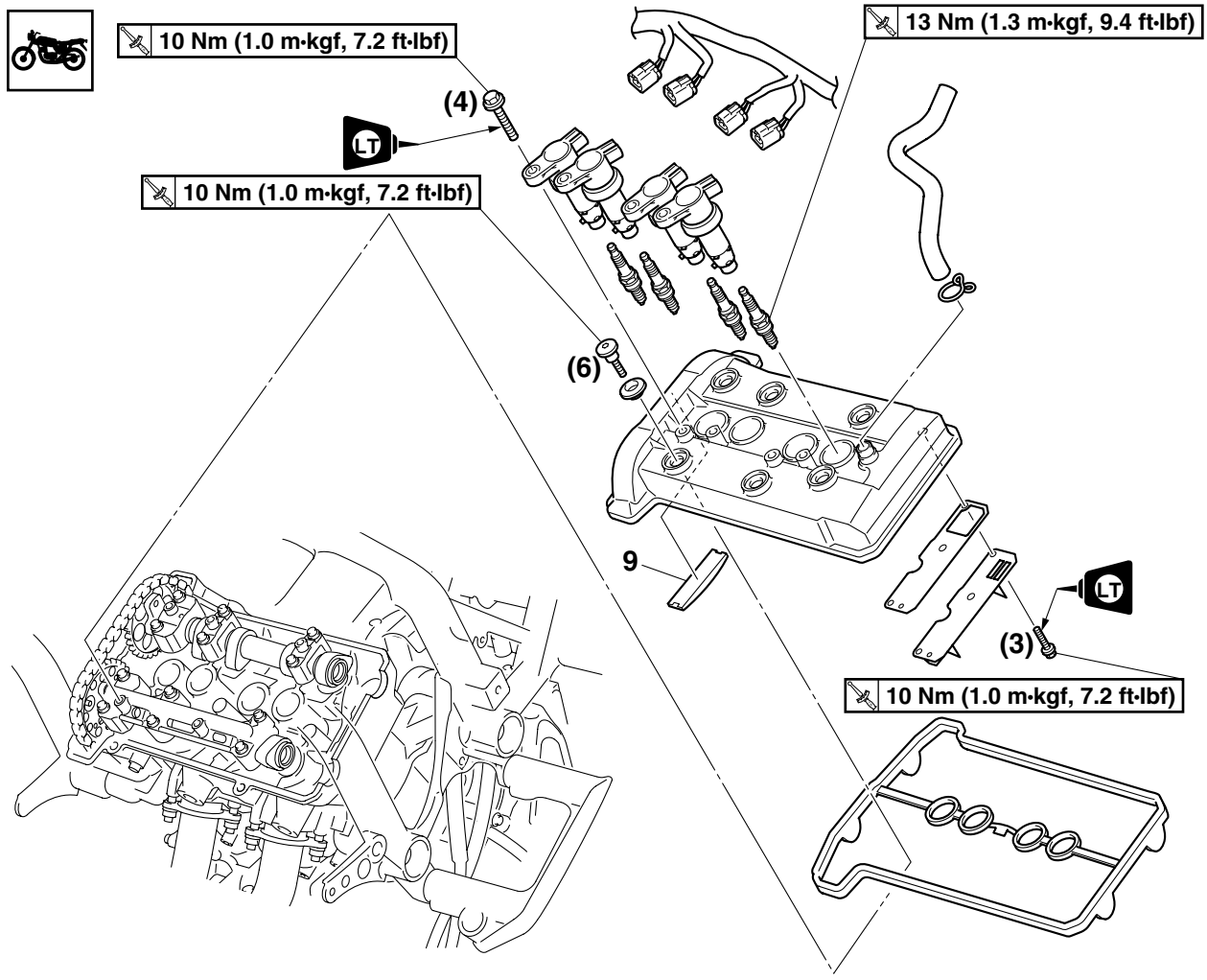
EAS23760
CAMSHAFTS

Removing the cylinder head cover



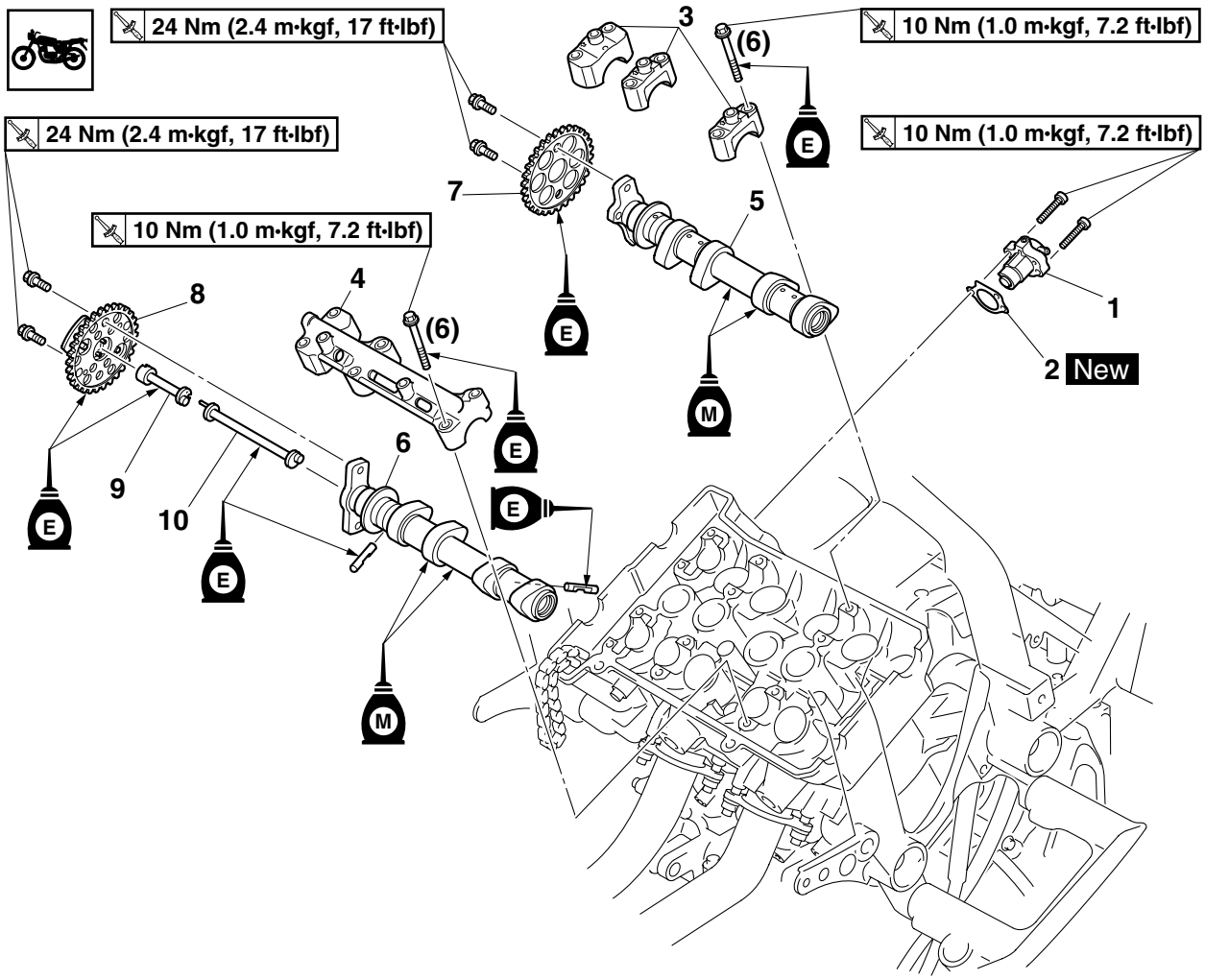
Order	Job/Parts to remove	Q'ty	Remarks
			TIP Place a suitable stand under the engine.
	Engine bracket		Refer to "ENGINE REMOVAL" on page 5-3.
	Throttle bodies		Refer to "THROTTLE BODIES" on page 7-5.
1	Cylinder head breather hose	1	
2	Ignition coil coupler	4	Disconnect.
3	Ignition coil	4	
4	Spark plug	4	
5	Cylinder head cover	1	
6	Cylinder head cover gasket	1	
7	Breather plate	1	
8	Breather plate gasket	1	

Removing the cylinder head cover



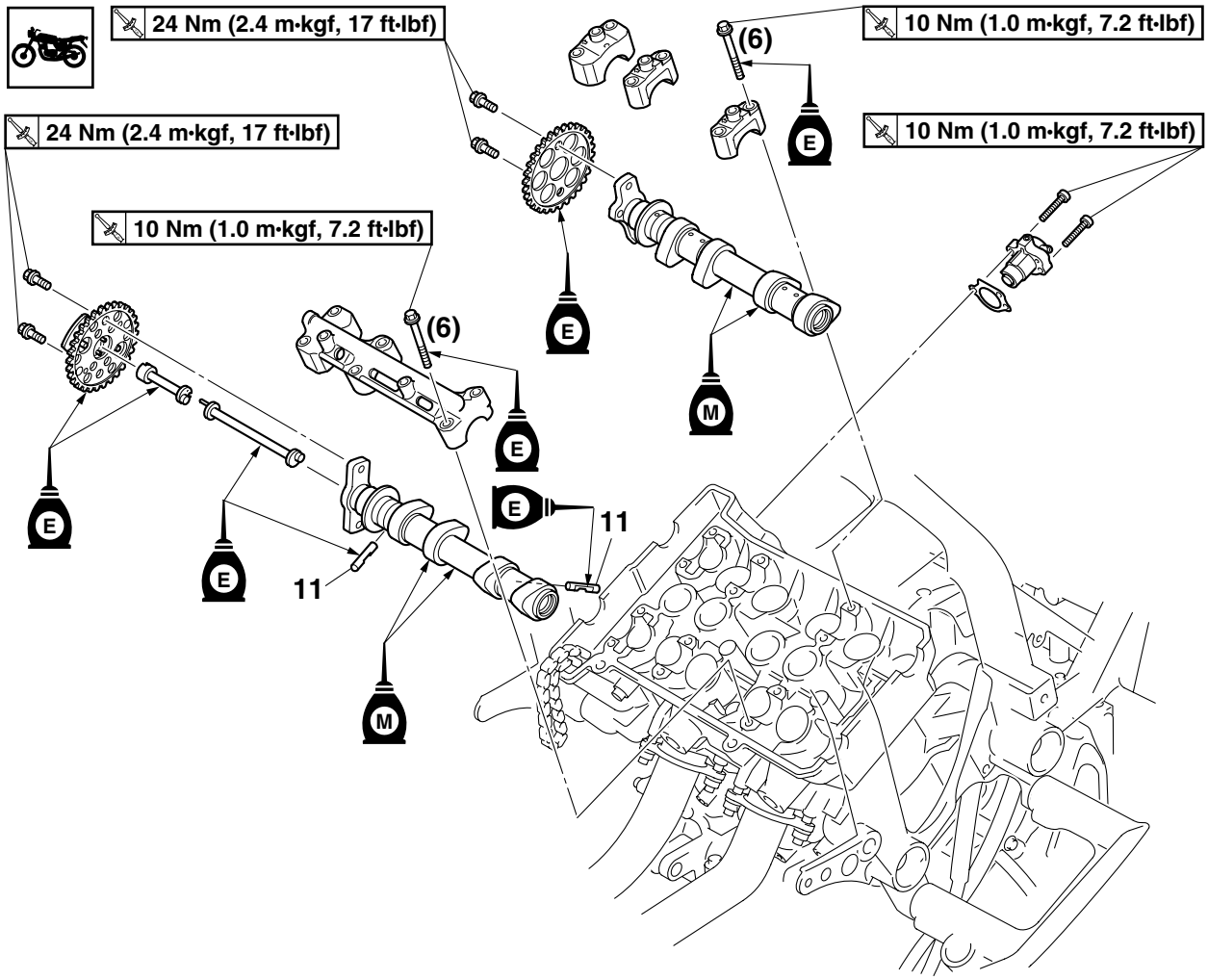
Order	Job/Parts to remove	Q'ty	Remarks
9	Timing chain guide (upper side)	1	
			For installation, reverse the removal procedure.

Removing the camshafts



Order	Job/Parts to remove	Q'ty	Remarks
	Electrical components tray		Refer to "GENERAL CHASSIS" on page 4-1.
	Clutch cover		Refer to "CLUTCH" on page 5-52.
1	Timing chain tensioner	1	
2	Timing chain tensioner gasket	1	
3	Intake camshaft cap	3	
4	Exhaust camshaft cap	1	
5	Intake camshaft	1	
6	Exhaust camshaft	1	
7	Intake camshaft sprocket	1	
8	Exhaust camshaft sprocket	1	
9	Decompressor lever #2	1	
10	Decompressor lever #1	1	

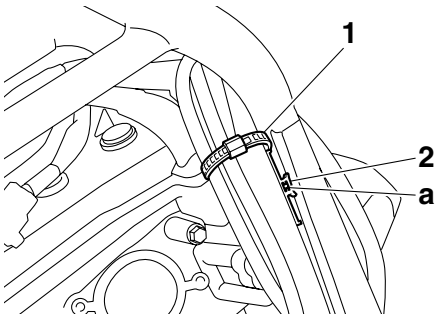
Removing the camshafts



Order	Job/Parts to remove	Q'ty	Remarks
11	Decompressor lever pin	2	
			For installation, reverse the removal procedure.

EAS23P1089
REMOVING THE CYLINDER HEAD COVER

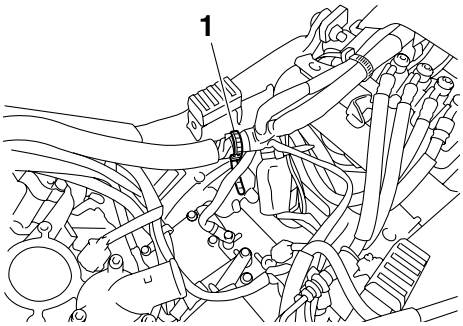
1. Remove:
   • Plastic band “1”
   • Wire harness holder “2”



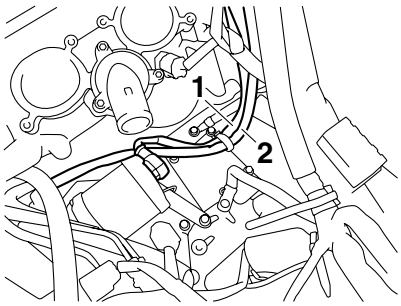
TIP

To remove the wire harness holder, push in the tab “a” of the holder with a thin, flat-head screwdriver.

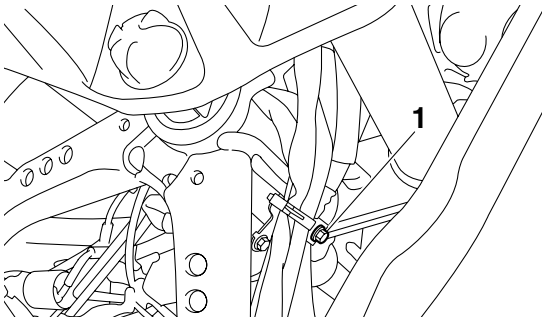
2. Remove:
   • Plastic band “1”



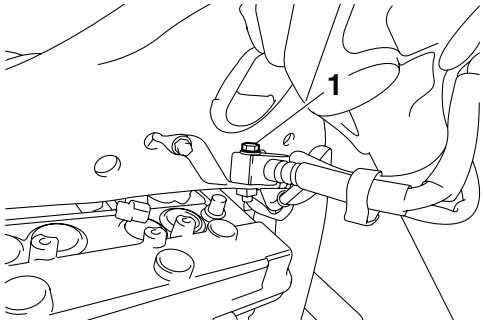
3. Remove:
   • Starter motor lead “1”
   • Stator coil lead “2”



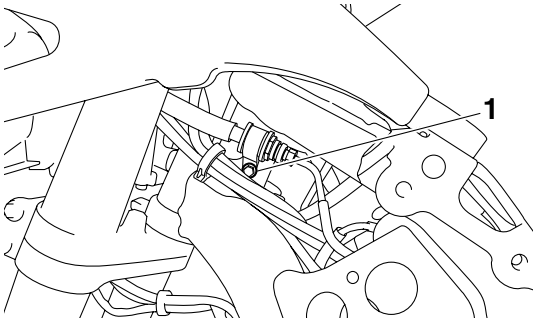
4. Remove:
   • Brake hose joint bolt (front brake master cylinder to hydraulic unit) “1”



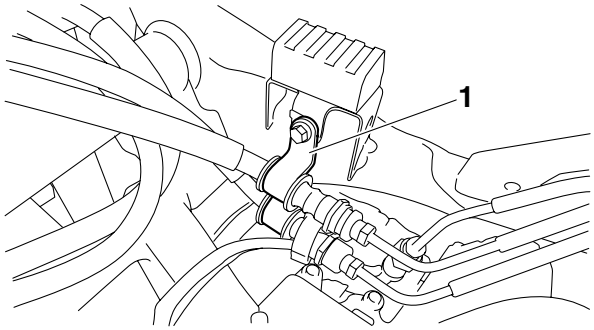
5. Remove:
   • Brake hose joint bolt (hydraulic unit to left front brake caliper) “1”



6. Remove:
   • Clutch hose holder bolt “1”

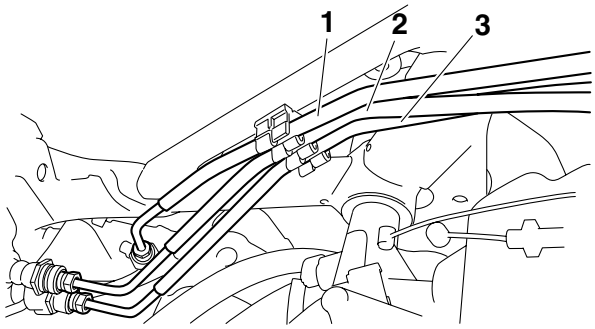


7. Remove:
   • Brake hose holders “1”



8. Remove:
   • Clutch pipe “1”
   • Brake pipe (front brake master cylinder to hydraulic unit) “2”

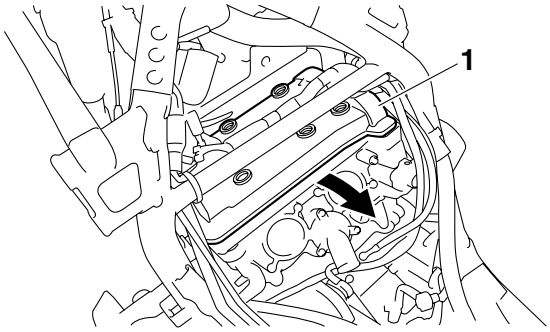
• Brake pipe (hydraulic unit to left front brake caliper) “3”



9. Remove:
   • Cylinder head cover “1”
   • Cylinder head cover gasket

TIP

Lift up the wire harness, brake pipes, clutch pipe, and clutch hose, and then pull the cylinder head cover rearward to remove it.



EAS23810

REMOVING THE CAMSHAFTS

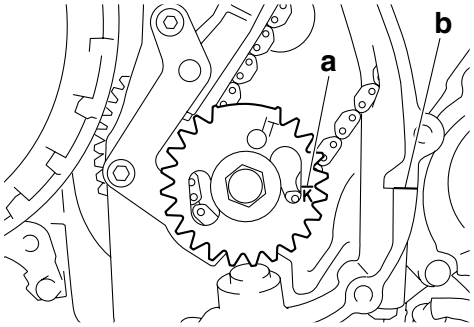
1. Align:
   • “K” mark “a” on the pickup rotor (with the crankcase mating surface “b”)

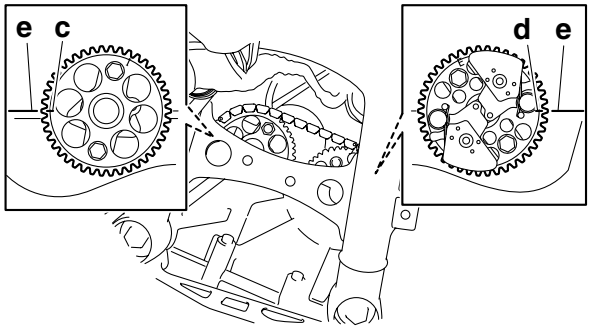
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

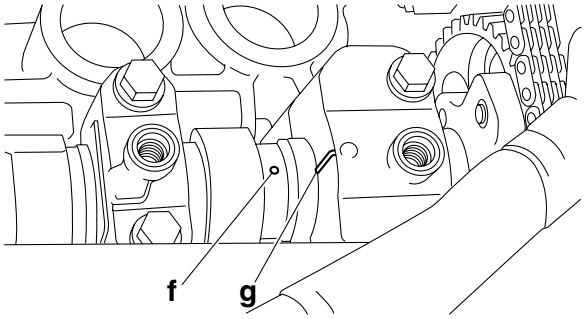
a. Turn the crankshaft clockwise.
b. Align the “K” mark “a” with the crankcase mating surface “b”.

TIP

When the “K” mark “a” is aligned with the crankcase mating surface “b”, check that the match mark “c” on the intake camshaft sprocket and match mark “d” on the exhaust camshaft sprocket are aligned with the cylinder head surface “e”. Also, check that the hole “f” in the intake camshaft is aligned with the match mark “g” on the intake camshaft cap. If the match marks or hole are not aligned, turn the crankshaft clockwise 360 degrees.

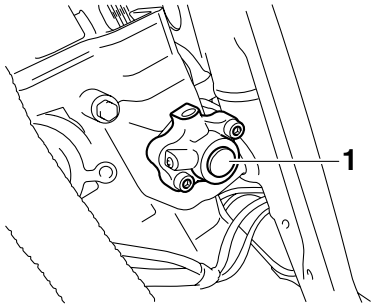






▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Remove:
   • Timing chain tensioner “1”
   • Timing chain tensioner gasket



3. Remove:
   • Camshaft caps

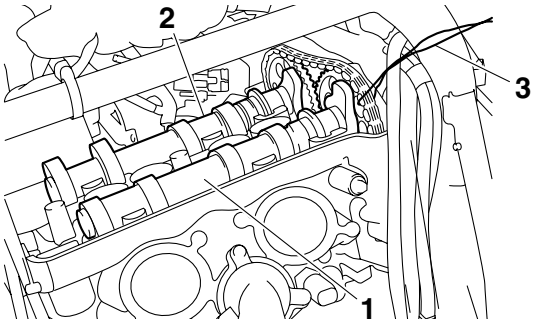
ECA13720
NOTICE

To prevent damage to the cylinder head, camshafts or camshaft caps, loosen the camshaft cap bolts in stages and in a criss-cross pattern, working from the outside in.

4. Remove:
   - Intake camshaft "1"
   - Exhaust camshaft "2"

TIP

To prevent the timing chain from falling into the crankcase, fasten it with a wire "3".

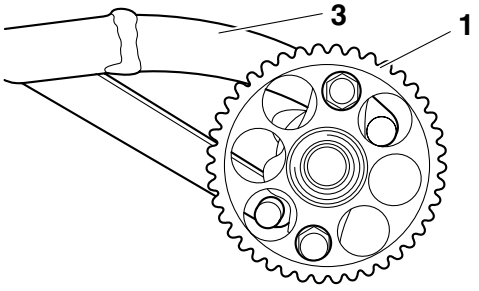


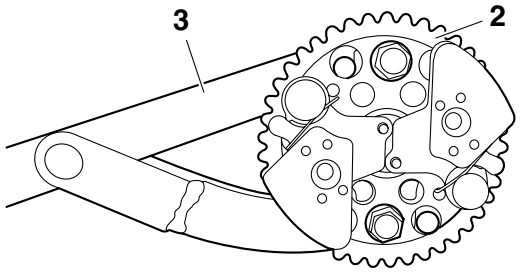
5. Remove:
   - Intake camshaft sprocket "1"
   - Exhaust camshaft sprocket "2"

TIP

While holding the intake camshaft sprocket and exhaust camshaft sprocket with the rotor holding tool "3", loosen the intake camshaft sprocket bolts and exhaust camshaft sprocket bolts.

Rotor holding tool
90890-01235
Universal magneto & rotor holder
YU-01235

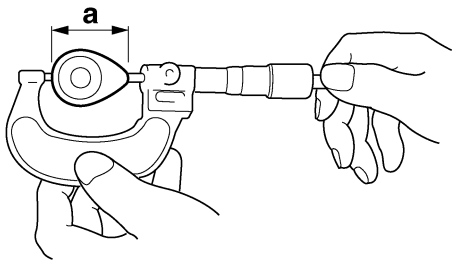


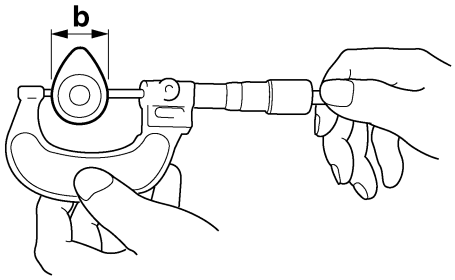


EAS23850
CHECKING THE CAMSHAFTS

1. Check:
   - Camshaft lobes
     Blue discoloration/pitting/scratches → Replace the camshaft.
2. Measure:
   - Camshaft lobe dimensions "a" and "b"
     Out of specification → Replace the camshaft.

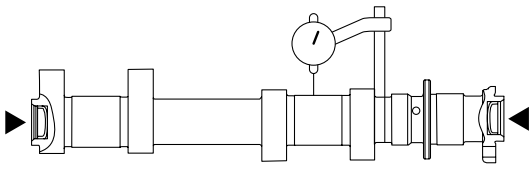
Camshaft lobe dimensions
Intake A
40.250–40.350 mm (1.5846–1.5886 in)
Limit
40.150 mm (1.5807 in)
Intake B
29.976–30.076 mm (1.1802–1.1841 in)
Limit
29.876 mm (1.1762 in)
Exhaust A
39.250–39.350 mm (1.5453–1.5492 in)
Limit
39.150 mm (1.5413 in)
Exhaust B
29.950–30.050 mm (1.1791–1.1831 in)
Limit
29.850 mm (1.1752 in)





3. Measure:
   • Camshaft runout
   Out of specification → Replace.

Camshaft runout limit
0.030 mm (0.0012 in)

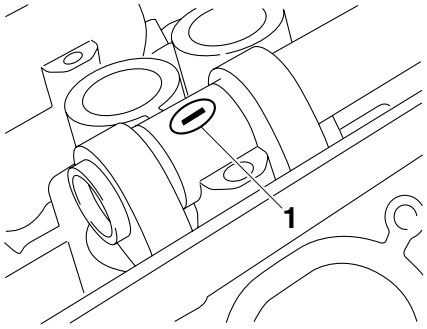


4. Measure:
   • Camshaft-journal-to-camshaft-cap clearance
   Out of specification → Measure the camshaft journal diameter.

Camshaft-journal-to-camshaft-cap clearance
0.028–0.062 mm (0.0011–0.0024 in)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the camshaft into the cylinder head (without the camshaft caps).
b. Position a strip of Plastigauge® "1" onto the camshaft journal as shown.



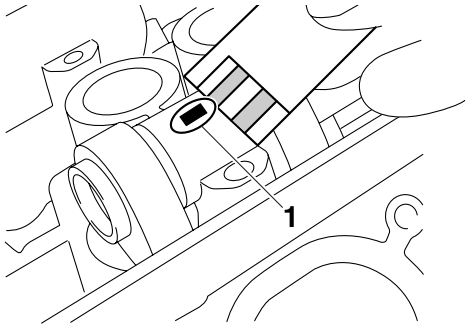
c. Install the camshaft caps.

TIP

- Tighten the camshaft cap bolts in stages and in a crisscross pattern, working from the inner caps out.
- Do not turn the camshaft when measuring the camshaft journal-to-camshaft cap clearance with the Plastigauge®.

Camshaft cap bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

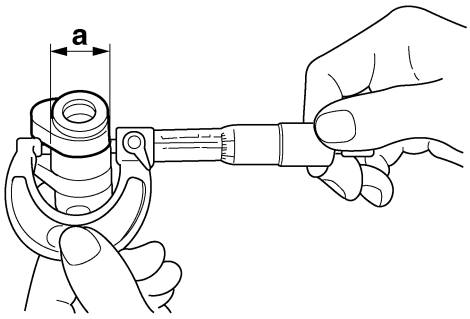
d. Remove the camshaft caps and then measure the width of the Plastigauge® "1".



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

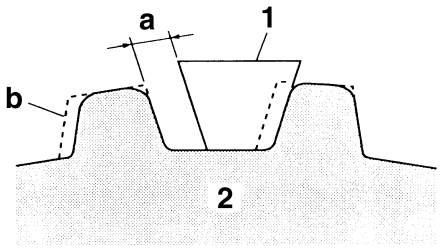
5. Measure:
   • Camshaft journal diameter "a"
   Out of specification → Replace the camshaft.
   Within specification → Replace the cylinder head and the camshaft caps as a set.

Camshaft journal diameter
24.459–24.472 mm (0.9630–0.9635 in)



EAS23P1090
CHECKING THE CAMSHAFT SPROCKET

1. Check:
   • Camshaft sprocket
   More than 1/4 tooth wear "a" → Replace the camshaft sprocket, timing chain, and crankshaft as a set.



a. 1/4 tooth
b. Correct
1. Timing chain roller
2. Camshaft sprocket

EAS23960
CHECKING THE TIMING CHAIN TENSIONERS

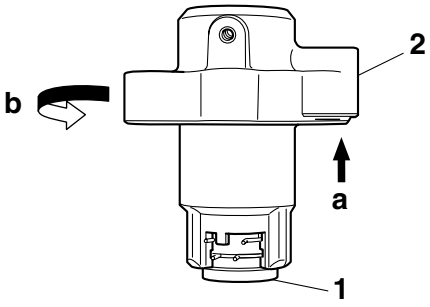
1. Check:
   • Timing chain tensioner
   Cracks/damage → Replace.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

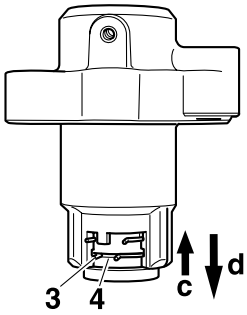
a. Push and insert timing chain tensioner rod "1" into the timing chain tensioner housing.

TIP

Push the timing chain tensioner rod in direction "a", and turn the timing chain tensioner body "2" in direction "b" until it stops.



b. Keep pressing the timing chain tensioner rod, mount clip "3" into groove "4", and lock the timing chain tensioner rod.
c. Push the timing chain tensioner rod in direction "c".
d. Make sure that the timing chain tensioner rod can smoothly move out from the timing chain tensioner housing in direction "d". If not smooth, replace the timing chain tensioner assembly.



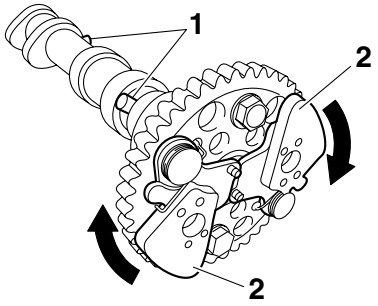
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23980
CHECKING THE DECOMPRESSION SYSTEM

1. Check:
   • Decompression system

TIP

- Check that the decompression pins "1" projects from the camshaft.
- Check that the decompression cams "2" and decompression pins "1" moves smoothly.



EAS24000
INSTALLING THE CAMSHAFTS

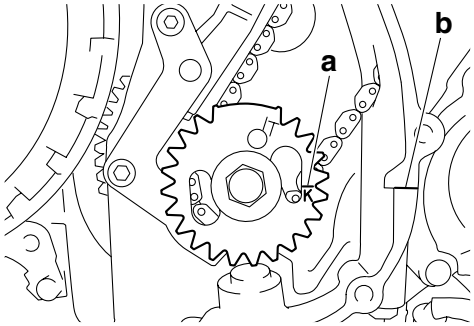
1. Align:
   • "K" mark "a" on the pickup rotor
   (with the crankcase mating surface "b")

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Turn the crankshaft clockwise.
b. Align the "K" mark "a" with the crankcase mating surface "b".

TIP

When piston #1 is before 71° of TDC on the compression stroke, align the "K" mark with the crankcase mating surface.

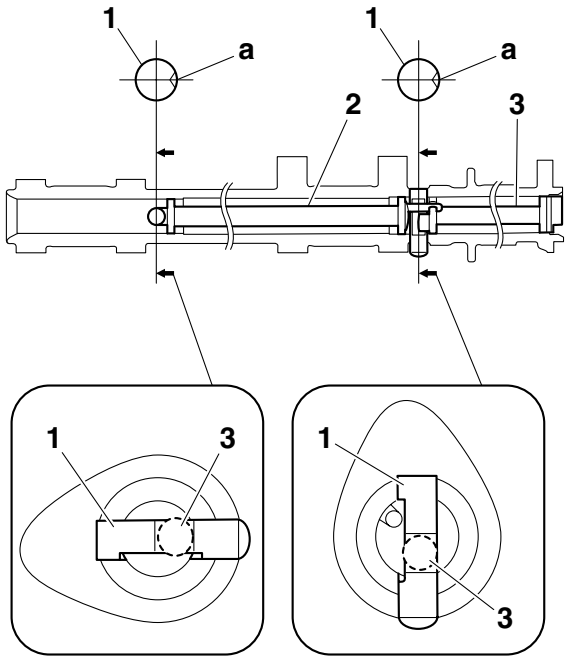


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Install:
   • Decompressor lever pins “1”
   • Decompressor lever #1 “2”
   • Decompressor lever #2 “3”

TIP

• Face the cutout “a” in each decompressor lever pin toward the exhaust camshaft sprocket.
• Install the decompressor lever pins, decompressor lever #1, and decompressor lever #2 in the exhaust camshaft as shown in the illustration.



3. Install:
   • Intake camshaft sprocket “1”
   • Exhaust camshaft sprocket “2”

	Camshaft sprocket bolt **24 Nm (2.4 m·kgf, 17 ft·lbf)**

ECA23P1077

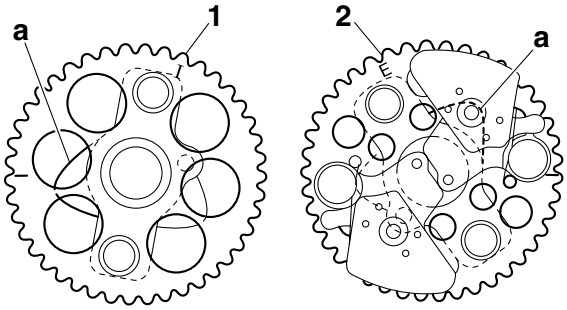
NOTICE

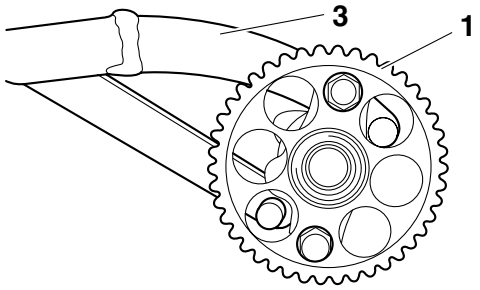
Be sure to tighten the camshaft sprocket bolts to the specified torque to avoid the possibility of the bolts coming loose and damaging the engine.

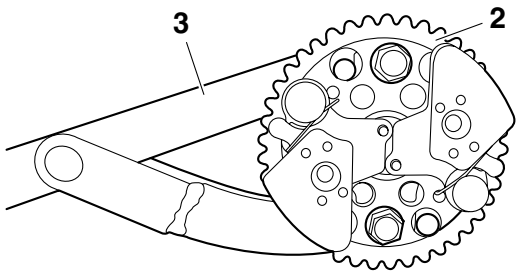
TIP

• Install the cam lobe #1 “a” at the position shown in the illustration.
• Tighten the camshaft sprocket bolt with the rotor holding tool “3”.

	Rotor holding tool **90890-01235** **Universal magneto & rotor holder** **YU-01235**







4. Install:
   • Timing chain “1”
   • Exhaust camshaft “2”
   • Exhaust camshaft cap

ECA23P1073

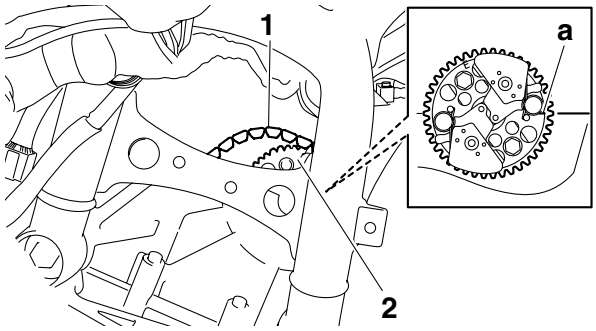
NOTICE

Do not turn the crankshaft when installing the camshaft to avoid damage or improper valve timing.

TIP

- When installing the timing chain, start with the exhaust camshaft and be sure to keep the timing chain as tight as possible on the exhaust side.
- Make sure the match mark "a" on the exhaust camshaft sprocket are aligned with the cylinder head edge.

	Exhaust camshaft cap bolt 10 Nm (1.0 m·kgf, 7.2 ft·lbf)



5. Install:
   - Timing chain "1"
   - Intake camshaft "2"
   - Intake camshaft caps

ECA23P1073

NOTICE

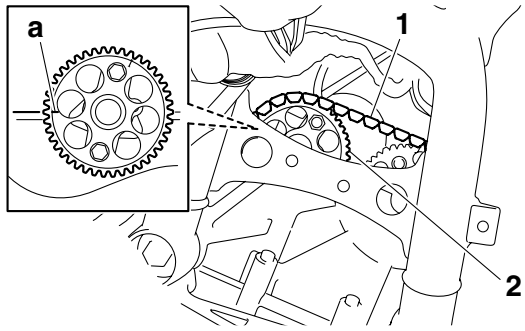
Do not turn the crankshaft when installing the camshaft to avoid damage or improper valve timing.

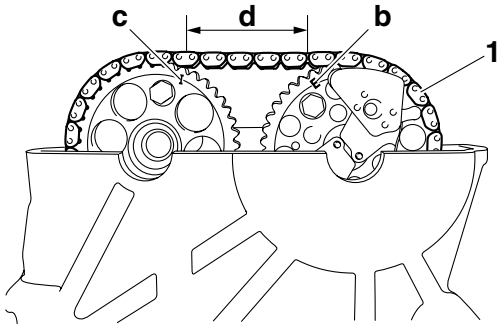
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the timing chain onto intake camshaft sprocket, and then install the intake camshaft onto the cylinder head.

TIP

- Make sure the match mark "a" on the intake camshaft sprocket are aligned with the cylinder head edge.
- Make sure that the distance between the "E" mark "b" on the exhaust camshaft sprocket and the "I" mark "c" on the intake camshaft sprocket is 4.5 timing chain links "d" as shown in the illustration.

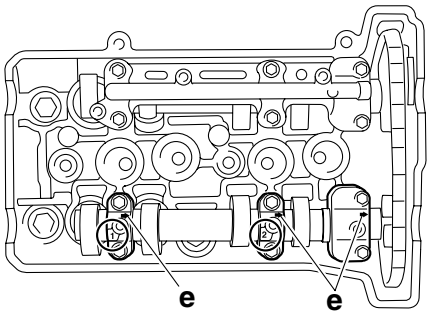




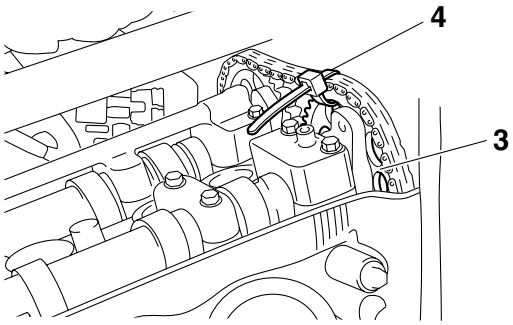
b. Install the intake camshaft caps and then finger tighten the intake camshaft cap bolts.

TIP

- Make sure each camshaft cap is installed in its original place. Refer to the identification marks as follows:
  "1": Left intake camshaft cap
  "2": Center intake camshaft cap
- Make sure the arrow mark "e" on each intake camshaft cap points towards the right side of the engine.



c. Fasten the timing chain securely to the intake camshaft sprocket "3" with a plastic locking tie "4".



d. Tighten the intake camshaft cap bolts.

TIP

To prevent the timing chain from skipping a tooth on the intake camshaft sprocket, do not remove the plastic locking tie before installing the timing chain tensioner.

	Intake camshaft cap bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

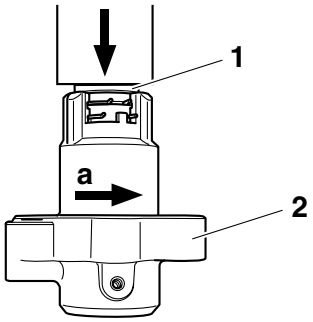
6. Install:
   - Timing chain tensioner
   - Timing chain tensioner gasket New

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

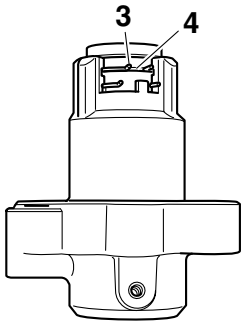
a. Push and insert timing chain tensioner rod "1" into the timing chain tensioner housing.

TIP

Push the timing chain tensioner rod in direction "a", and turn the timing chain tensioner body "2" in direction "a" until it stops.



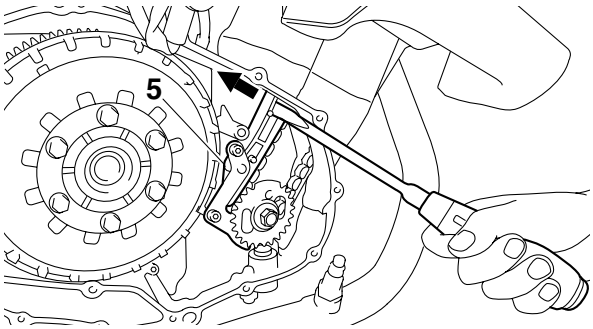
b. Keep pressing the timing chain tensioner rod, mount clip "3" into groove "4", and lock the timing chain tensioner rod.



c. Install the timing chain tensioner in the cylinder block.

	Timing chain tensioner bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

d. Push the timing chain guide "5" as shown in the illustration to release the timing chain tensioner rod.



e. Check that the timing chain is taut. If the chain is slack, reinstall the timing chain tensioner.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

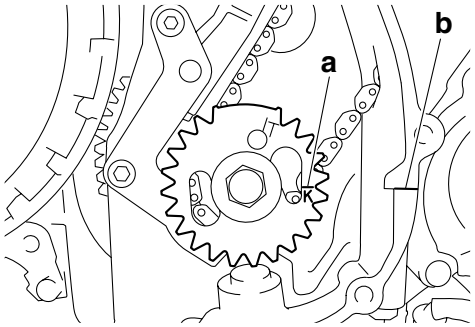
7. Remove:
   - Plastic locking tie

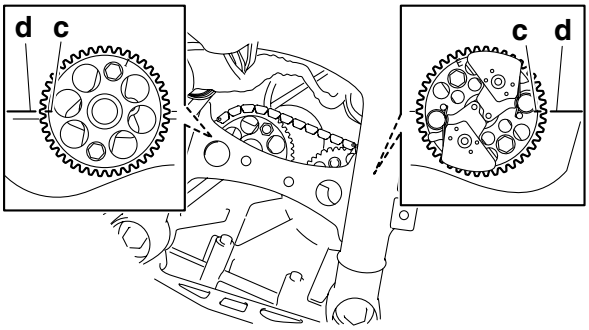
TIP

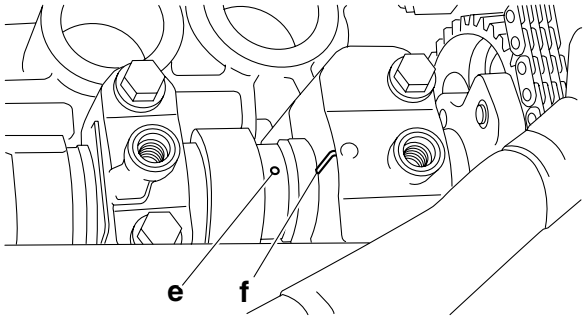
Remove the plastic locking tie that was used to fasten the timing chain to the intake camshaft sprocket.

8. Turn:
   - Crankshaft
     (several turns clockwise)
9. Check:
   - "K" mark
     Make sure the "K" mark "a" on the pickup rotor is aligned with the crankcase mating surface "b".
   - Camshaft sprocket match mark
     Make sure the match marks "c" on the camshaft sprockets are aligned with the cylinder head mating surface "d".
     Out of alignment → Adjust.

Refer to the installation steps above.
- Intake camshaft hole
  Make sure the hole "e" in the intake camshaft is aligned with the match mark "f" on the intake camshaft cap.
  Out of alignment → Adjust.
  Refer to the installation steps above.







10. Measure:
- Valve clearance
  Out of specification → Adjust.
  Refer to "ADJUSTING THE VALVE CLEARANCE" on page 3-5.

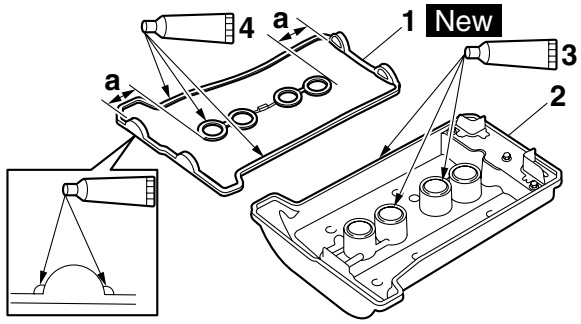
EAS23P1091
INSTALLING THE CYLINDER HEAD COVER

1. Install:
- Cylinder head cover gasket "1" New
  (to the cylinder head cover "2")

TIP

- Apply Three Bond No.1541C® "3" onto the mating surfaces of the cylinder head cover and cylinder head cover gaskets.
- Apply Yamaha bond No.1215 "4" onto the mating surfaces of the cylinder head cover gasket and cylinder head.
- Install a cylinder head cover gasket "1", and then cut the portions "a".

Yamaha bond No. 1215
90890-85505
(Three Bond No.1215®)



2. Install:
- Cylinder head cover

ECA23P1074

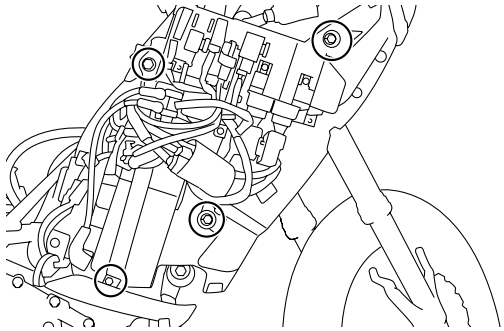
NOTICE

When installing the cylinder head cover to the cylinder head, make sure that the cylinder head cover gasket remains in place.

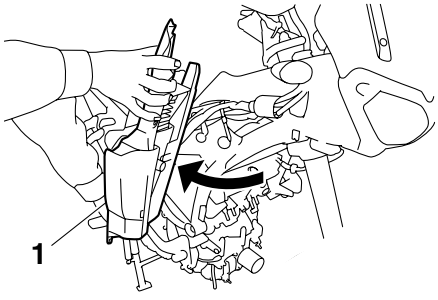
3. Check:
- Cylinder head cover gasket

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

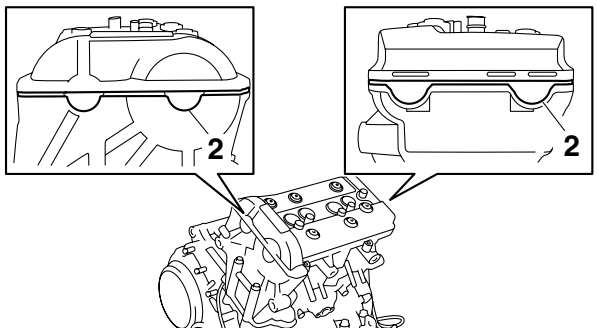
a. Remove the electrical components tray bolts.



b. Move the electrical components tray "1" away from the engine as shown in the illustration.



c. Check that the cylinder head cover gasket "2" is installed properly between the cylinder head cover and the cylinder head.



d. Install the electrical components tray bolts. Refer to "GENERAL CHASSIS" on page 4-1.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Tighten:
   • Cylinder head cover bolts

	Cylinder head cover bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

TIP

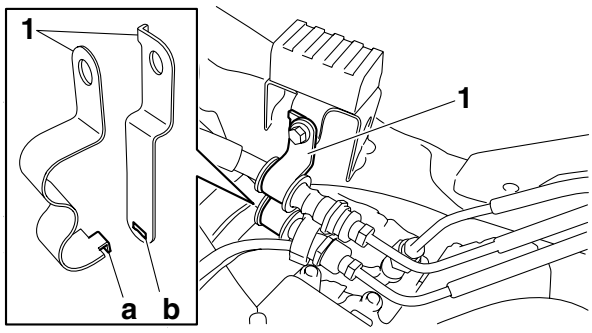
Tighten the cylinder head cover bolts in stages and in a crisscross pattern.

5. Install:
   • Brake pipe (hydraulic unit to left front brake caliper)
   • Brake pipe (front brake master cylinder to hydraulic unit)
   • Clutch pipe
6. Install:
   • Brake hose holders "1"

	Brake hose holder bolt **7 Nm (0.7 m·kgf, 5.1 ft·lbf)**

TIP

Be sure to fit the projection "a" on the outer section of the brake hose holder into the hole "b" in the inner section.

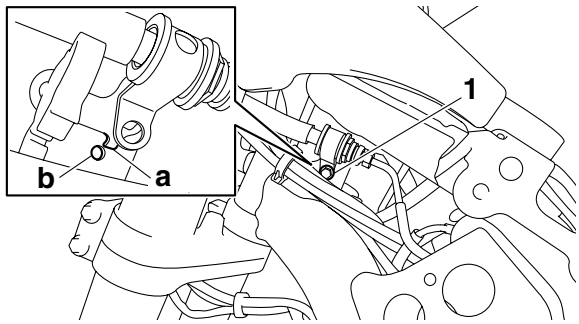


7. Install:
   • Clutch hose holder bolt "1"

	Clutch hose holder bolt **9 Nm (0.9 m·kgf, 6.5 ft·lbf)**

TIP

Insert the tab "a" on the clutch hose holder into the slot "b" in the frame.

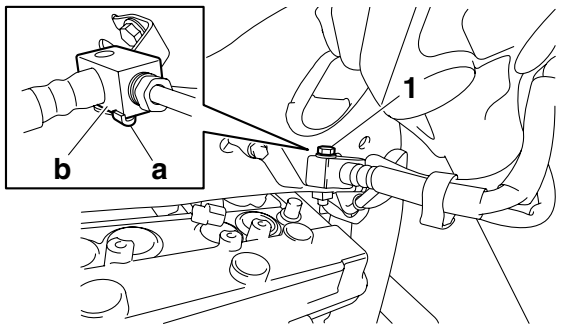


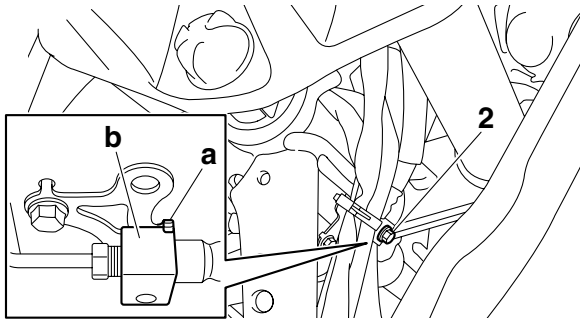
8. Install:
   • Brake hose joint bolt (hydraulic unit to left front brake caliper) "1"
   • Brake hose joint bolt (front brake master cylinder to hydraulic unit) "2"

	Brake hose joint bolt (hydraulic unit to left front brake caliper) **7 Nm (0.7 m·kgf, 5.1 ft·lbf)** **Brake hose joint bolt (front brake master cylinder to hydraulic unit)** **9 Nm (0.9 m·kgf, 6.5 ft·lbf)**

TIP

Make sure that the tab "a" on the brake hose joint bracket contacts the side of the brake hose joint "b".

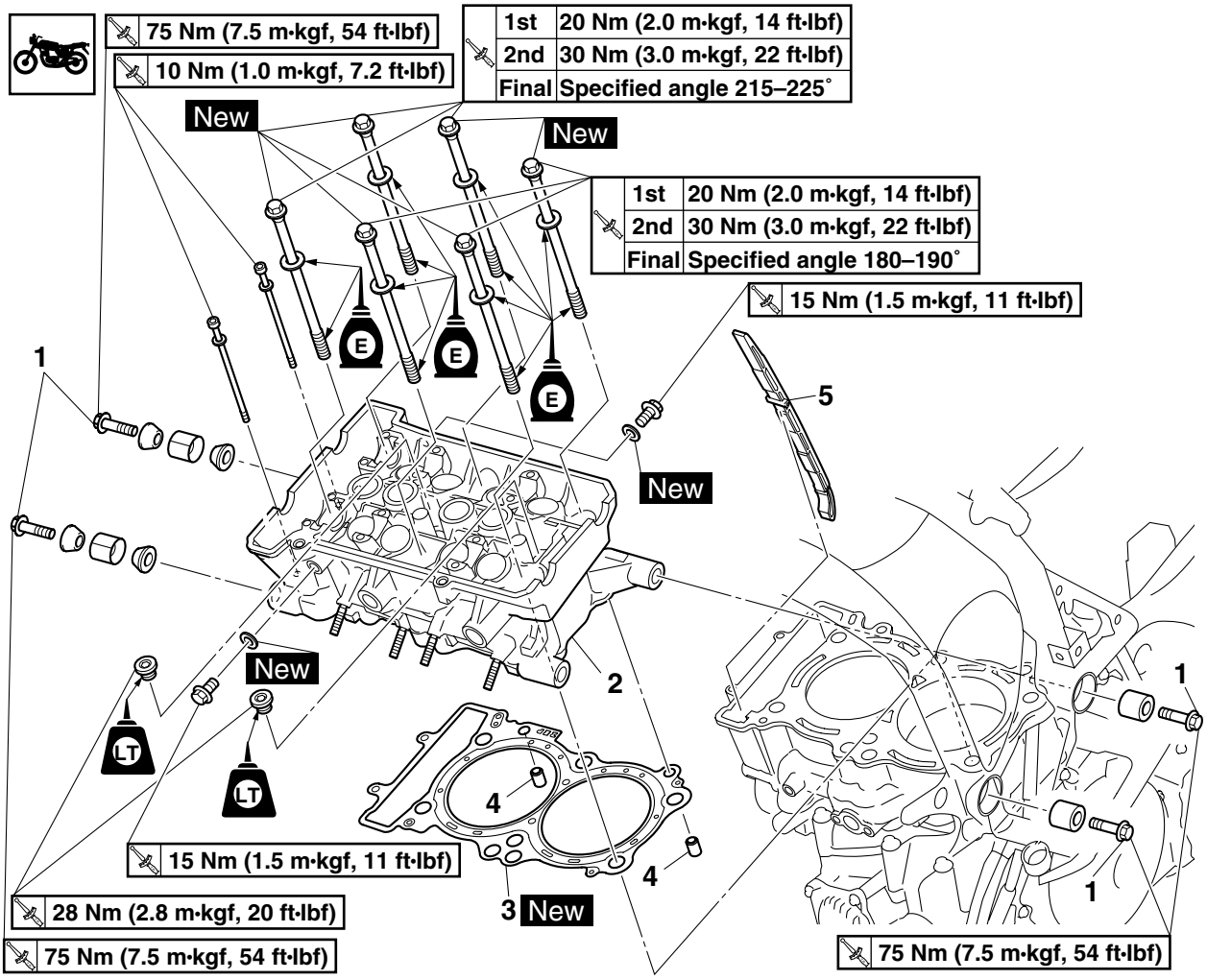




9. Install:
   - Stator coil lead
   - Starter motor lead
   - Plastic bands
   - Wire harness holder

EAS24100
CYLINDER HEAD

Removing the cylinder head



Order	Job/Parts to remove	Q'ty	Remarks
			TIP Place a suitable stand under the engine.
	Exhaust pipe/Muffler		Refer to "ENGINE REMOVAL" on page 5-3.
	Intake camshaft/Exhaust camshaft		Refer to "CAMSHAFTS" on page 5-11.
	Thermostat/Coolant temperature sensor		Refer to "THERMOSTAT" on page 6-4.
1	Engine mounting bolt (front side)	4	
2	Cylinder head	1	
3	Cylinder head gasket	1	
4	Dowel pin	2	
5	Timing chain guide (exhaust side)	1	
			For installation, reverse the removal procedure.

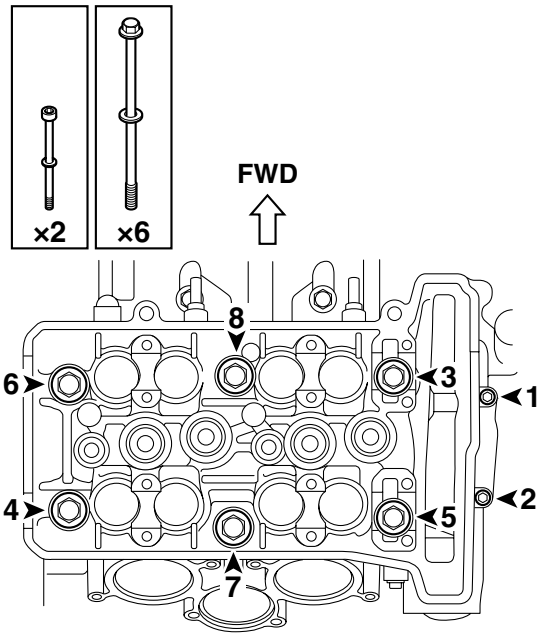
EAS24120
REMOVING THE CYLINDER HEAD

1. Remove:
   • Cylinder head bolts

TIP

• Loosen the bolts in the proper sequence as shown.
• Loosen each bolt 1/2 of a turn at a time. After all of the bolts are fully loosened, remove them.

   • M6 × 125 mm: “1”, “2”
   • M12 × 185 mm: “3”–“8”



EAS23P1107
CHECKING THE TIMING CHAIN GUIDE (EXHAUST SIDE)

1. Check:
   • Timing chain guide (exhaust side)
   Damage/wear→Replace.

EAS24170
CHECKING THE CYLINDER HEAD

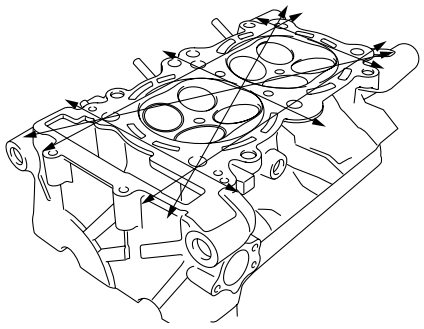
1. Eliminate:
   • Combustion chamber carbon deposits (with a rounded scraper)

TIP

Do not use a sharp instrument to avoid damaging or scratching:
• Spark plug bore threads
• Valve seats

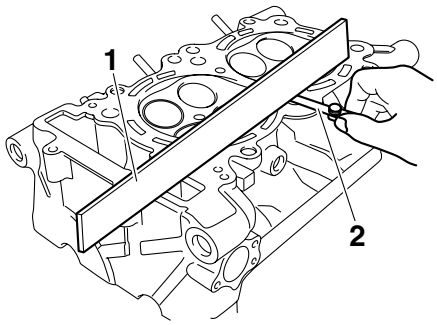
2. Check:
   • Cylinder head
   Damage/scratches → Replace.
   • Cylinder head water jacket
   Mineral deposits/rust → Eliminate.
3. Measure:
   • Cylinder head warpage
   Out of specification → Resurface the cylinder head.

Warpage limit
0.03 mm (0.0012 in)



▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Place a straightedge “1” and a thickness gauge “2” across the cylinder head.



b. Measure the warpage.
c. If the limit is exceeded, resurface the cylinder head as follows.
d. Place a 400–600 grit wet sandpaper on the surface plate and resurface the cylinder head using a figure-eight sanding pattern.

TIP

To ensure an even surface, rotate the cylinder head several times.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS24240
INSTALLING THE CYLINDER HEAD

1. Install:
   • Cylinder head

TIP

Pass the timing chain through the timing chain cavity.

2. Tighten:
   • Cylinder head bolts New

EWA23P1013

⚠ WARNING

Replace the bolts with new ones.

TIP

Tighten the bolts using the following procedure.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Lubricate the cylinder head bolts with engine oil.
b. Install the cylinder head bolts.
c. Tighten the cylinder head bolts in the proper tightening sequence as shown.

Cylinder head bolt "1"–"6"
1st
20 Nm (2.0 m·kgf, 14 ft·lbf)

d. Tighten the cylinder head bolts, and then tighten them further to reach the specified angle in the proper tightening sequence as shown.

TIP

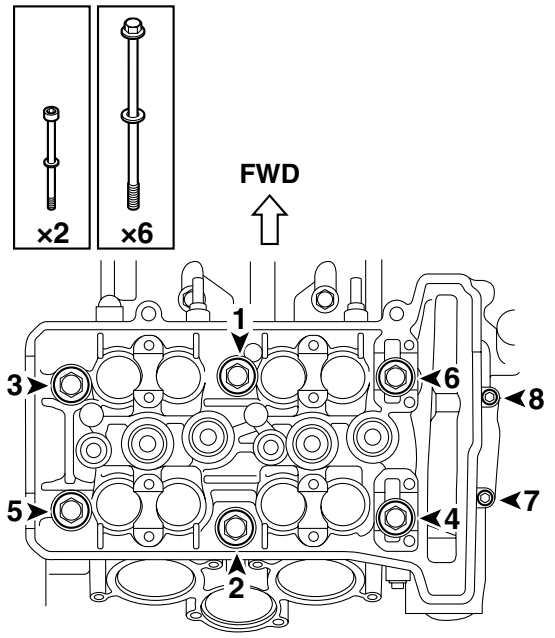
Tighten each bolt to the specified angle before tightening the next bolt to the specified torque.

Cylinder head bolt "1"–"6"
2nd
30 Nm (3.0 m·kgf, 22 ft·lbf)
Cylinder head bolt
Final
Bolt "1", "2", "4"
Specified angle 215–225°
Bolt "3", "5", "6"
Specified angle 180–190°

e. Tighten the cylinder head bolts in the proper tightening sequence as shown.

Cylinder head bolt "7", "8"
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

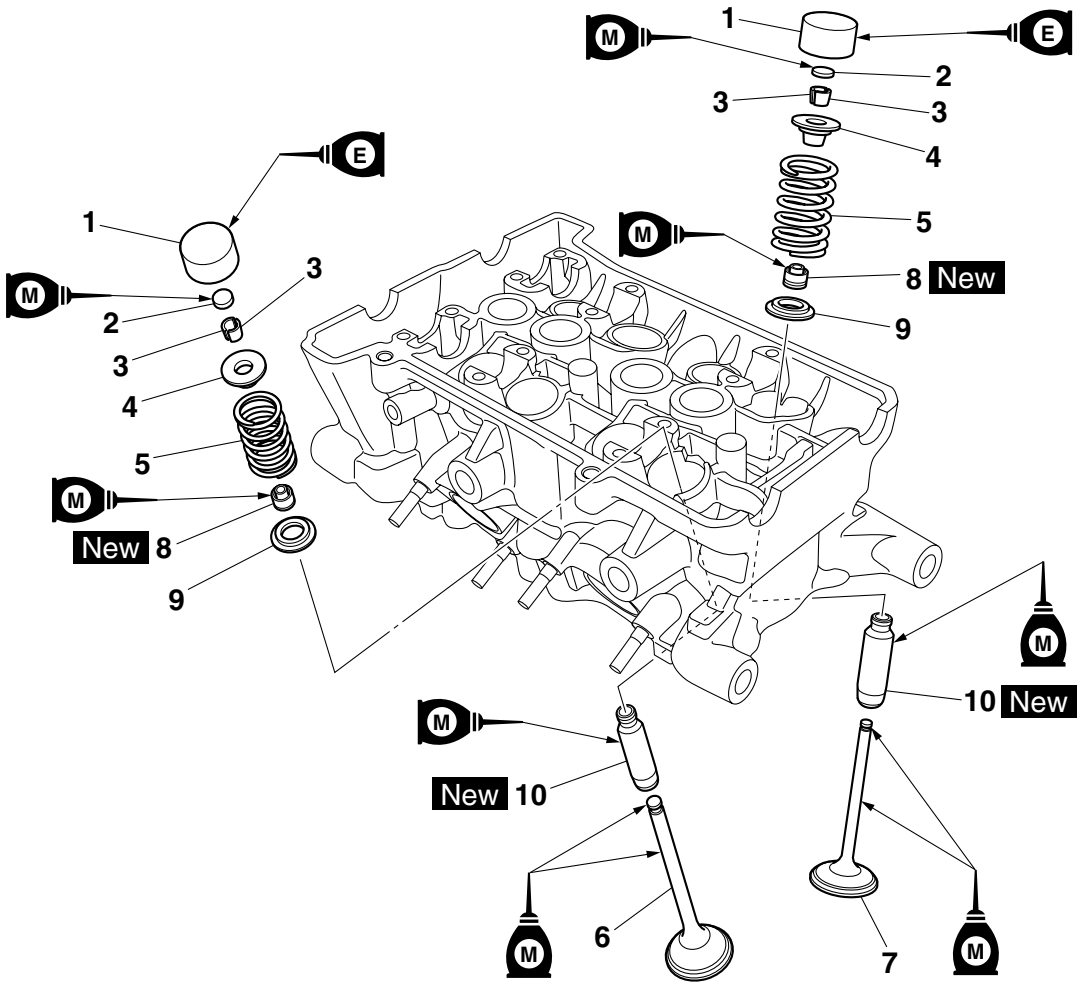
• M12 × 185 mm: "1"–"6"
• M6 × 125 mm: "7", "8"



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS24270
VALVES AND VALVE SPRINGS

Removing the valves and valve springs



Order	Job/Parts to remove	Q'ty	Remarks
	Cylinder head		Refer to "CYLINDER HEAD" on page 5-26.
1	Valve lifter	8	
2	Valve pad	8	
3	Valve cotter	16	
4	Valve spring retainer	8	
5	Valve spring	8	
6	Exhaust valve	4	
7	Intake valve	4	
8	Valve stem seal	8	
9	Valve spring seat	8	
10	Valve guide	8	
			For installation, reverse the removal procedure.

EAS24280
REMOVING THE VALVES
The following procedure applies to all of the valves and related components.

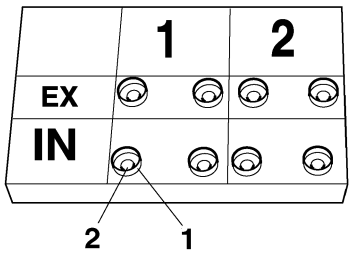
TIP

Before removing the internal parts of the cylinder head (e.g., valves, valve springs, valve seats), make sure the valves properly seal.

1. Remove:
   - Valve lifter "1"
   - Valve pad "2"

TIP

Make a note of the position of each valve lifter and valve pad so that they can be reinstalled in their original place.



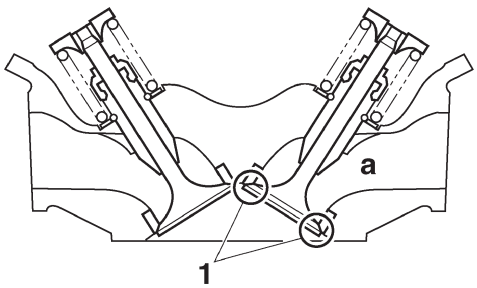
2. Check:
   - Valve sealing
     Leakage at the valve seat → Check the valve face, valve seat, and valve seat width.
     Refer to "CHECKING THE VALVE SEATS" on page 5-32.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Pour a clean solvent "a" into the intake and exhaust ports.
b. Check that the valves properly seal.

TIP

There should be no leakage at the valve seat "1".



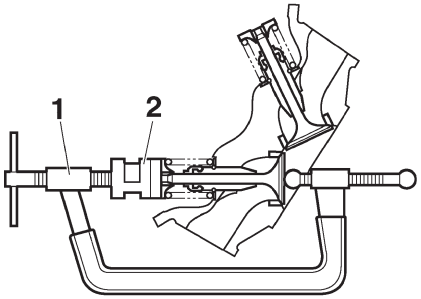
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Remove:
   - Valve cotters

TIP

Remove the valve cotters by compressing the valve spring with the valve spring compressor "1" and the valve spring compressor attachment "2".

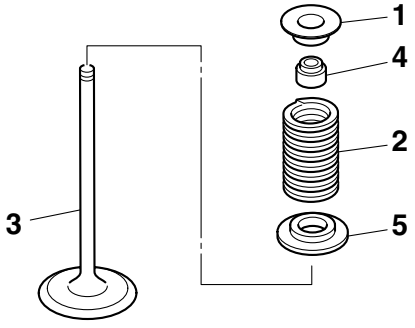
Valve spring compressor
90890-04019
YM-04019
Valve spring compressor attachment
90890-01243
Valve spring compressor adapter (26 mm)
YM-01253-1



4. Remove:
   - Valve spring retainer "1"
   - Valve spring "2"
   - Valve "3"
   - Valve stem seal "4"
   - Valve spring seat "5"

TIP

Identify the position of each part very carefully so that it can be reinstalled in its original place.

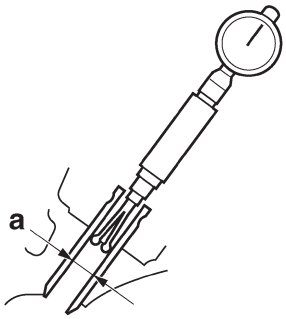


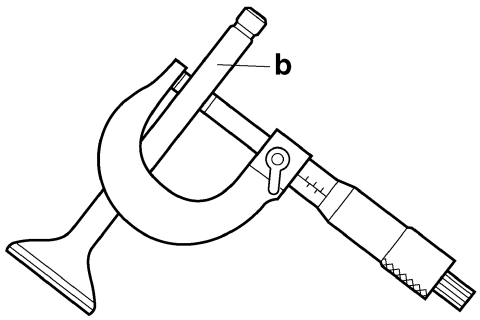
EAS24290
CHECKING THE VALVES AND VALVE GUIDES
The following procedure applies to all of the valves and valve guides.

1. Measure:
   • Valve-stem-to-valve-guide clearance
   Out of specification → Replace the valve guide.

• Valve-stem-to-valve-guide clearance = Valve guide inside diameter "a" - Valve stem diameter "b"

Valve-stem-to-valve-guide clearance (intake)
0.010–0.037 mm (0.0004–0.0015 in)
Limit
0.080 mm (0.0032 in)
Valve-stem-to-valve-guide clearance (exhaust)
0.025–0.052 mm (0.0010–0.0020 in)
Limit
0.100 mm (0.0039 in)





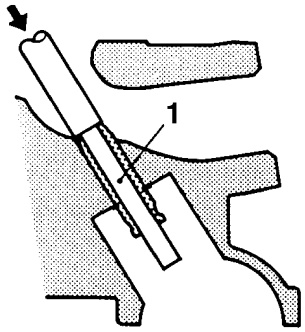
2. Replace:
   • Valve guide

TIP

To ease valve guide removal and installation, and to maintain the correct fit, heat the cylinder head to 100 °C (212 °F) in an oven.

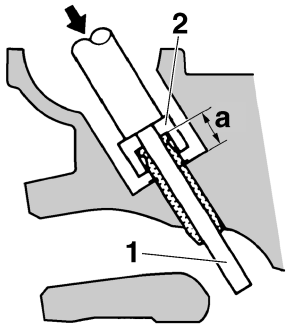
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the valve guide with the valve guide remover "1".



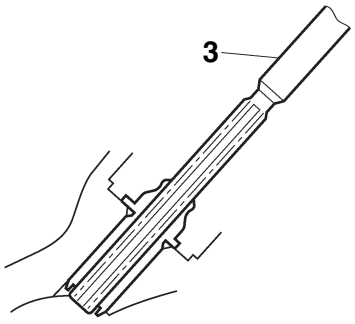
b. Install the new valve guide with the valve guide installer "2" and valve guide remover "1".

Valve guide position
10.7–11.1 mm (0.42–0.44 in)



a. Valve guide position

c. After installing the valve guide, bore the valve guide with the valve guide reamer "3" to obtain the proper valve-stem-to-valve-guide clearance.



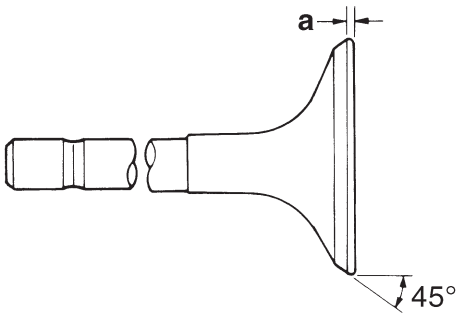
TIP

After replacing the valve guide, reface the valve seat.

Valve guide remover & installer set (ø5.5)
90890-04016
Valve guide remover (5.5 mm)
YM-01122
Valve guide installer (ø5.5)
90890-04015
Valve guide installer (5.5 mm)
YM-04015
Valve guide reamer (5.5 mm)
90890-01196
YM-01196

3. Eliminate:
   • Carbon deposits
   (from the valve face and valve seat)
4. Check:
   • Valve face
   Pitting/wear → Grind the valve face.
   • Valve stem end
   Mushroom shape or diameter larger than the body of the valve stem → Replace the valve.
5. Measure:
   • Valve margin thickness D "a"
   Out of specification → Replace the valve.

Valve margin thickness D (intake)
1.00–1.40 mm (0.0394–0.0551 in)
Valve margin thickness D (exhaust)
1.00–1.40 mm (0.0394–0.0551 in)

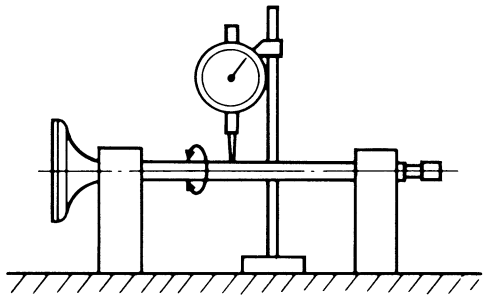


6. Measure:
   • Valve stem runout
   Out of specification → Replace the valve.

TIP

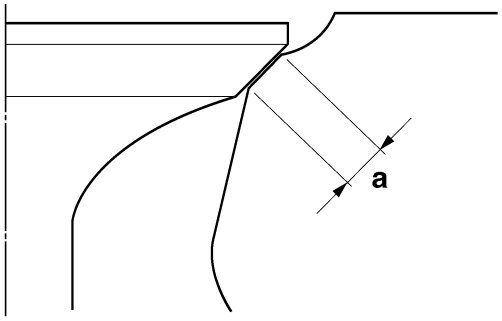
- When installing a new valve, always replace the valve guide.
- If the valve is removed or replaced, always replace the valve stem seal.

Valve stem runout
0.010 mm (0.0004 in)

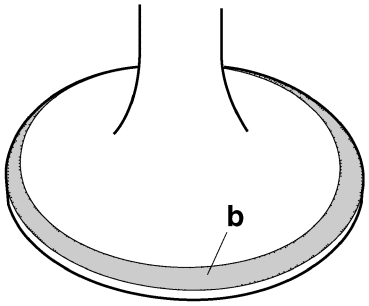


EAS24300
CHECKING THE VALVE SEATS
The following procedure applies to all of the valves and valve seats.
1. Eliminate:
   • Carbon deposits
   (from the valve face and valve seat)
2. Check:
   • Valve seat
   Pitting/wear → Replace the cylinder head.
3. Measure:
   • Valve seat width C "a"
   Out of specification → Replace the cylinder head.

Valve seat width C (intake)
1.10–1.30 mm (0.0433–0.0512 in)
Valve seat width C (exhaust)
0.90–1.10 mm (0.0354–0.0433 in)



a. Apply Mechanic's blueing dye (Dykem) "b" onto the valve face.



b. Install the valve into the cylinder head.
c. Press the valve through the valve guide and onto the valve seat to make a clear impression.
d. Measure the valve seat width.

TIP

Where the valve seat and valve face contacted one another, the blueing will have been removed.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Lap:
   - Valve face
   - Valve seat

TIP

After replacing the cylinder head or replacing the valve and valve guide, the valve seat and valve face should be lapped.

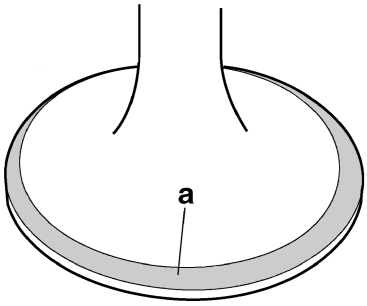
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Apply a coarse lapping compound “a” to the valve face.

ECA13790

NOTICE

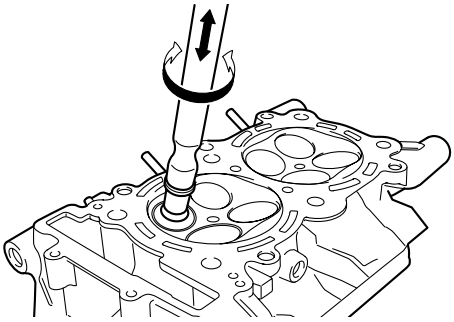
Do not let the lapping compound enter the gap between the valve stem and the valve guide.



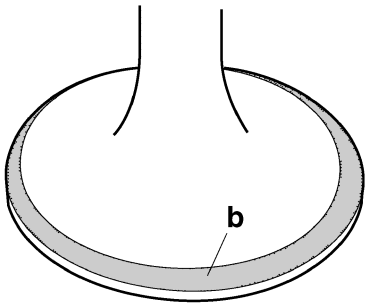
b. Apply molybdenum disulfide oil onto the valve stem.
c. Install the valve into the cylinder head.
d. Turn the valve until the valve face and valve seat are evenly polished, then clean off all of the lapping compound.

TIP

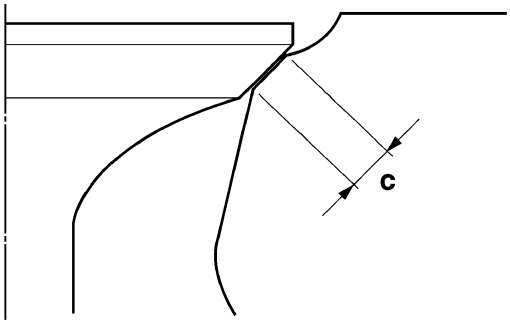
For the best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hands.



e. Apply a fine lapping compound to the valve face and repeat the above steps.
f. After every lapping procedure, be sure to clean off all of the lapping compound from the valve face and valve seat.
g. Apply Mechanic’s blueing dye (Dykem) “b” onto the valve face.



h. Install the valve into the cylinder head.
i. Press the valve through the valve guide and onto the valve seat to make a clear impression.
j. Measure the valve seat width “c” again. If the valve seat width is out of specification, reface and lap the valve seat.



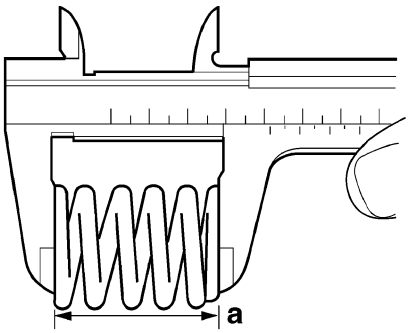
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS24310
CHECKING THE VALVE SPRINGS

The following procedure applies to all of the valve springs.

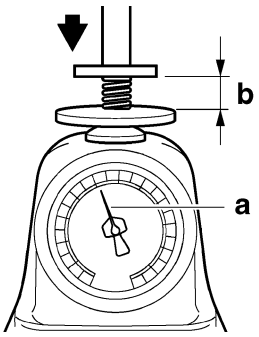
1. Measure:
   • Valve spring free length “a”
   Out of specification → Replace the valve spring.

Free length (intake)
40.22 mm (1.58 in)
Limit
38.21 mm (1.50 in)
Free length (exhaust)
40.22 mm (1.58 in)
Limit
38.21 mm (1.50 in)



2. Measure:
   • Compressed valve spring force “a”
   Out of specification → Replace the valve spring.

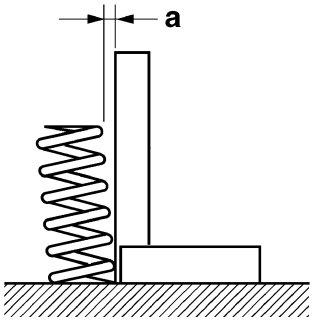
Installed compression spring force (intake)
192.00–220.00 N (19.58–22.43 kgf, 43.16–49.46 lbf)
Installed compression spring force (exhaust)
192.00–220.00 N (19.58–22.43 kgf, 43.16–49.46 lbf)
Installed length (intake)
32.00 mm (1.26 in)
Installed length (exhaust)
32.00 mm (1.26 in)



b. Installed length

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

Spring tilt (intake)
2.5°/1.8 mm (2.5°/0.07 in)
Spring tilt (exhaust)
2.5°/1.8 mm (2.5°/0.07 in)



EAS24320
CHECKING THE VALVE LIFTERS

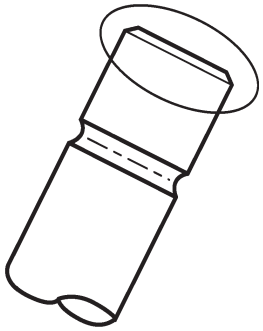
The following procedure applies to all of the valve lifters.

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

EAS24340
INSTALLING THE VALVES

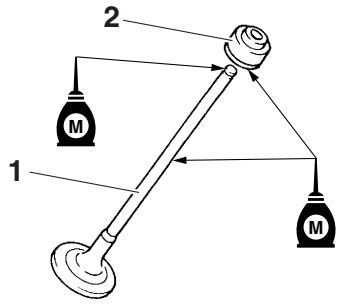
The following procedure applies to all of the valves and related components.

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



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

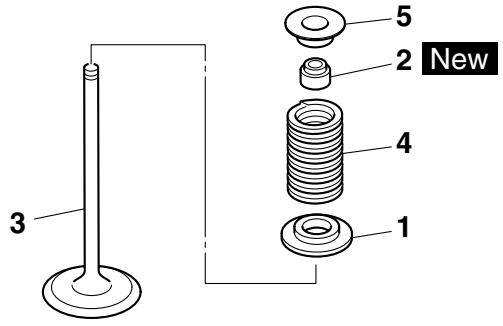
	Recommended lubricant **Molybdenum disulfide oil**

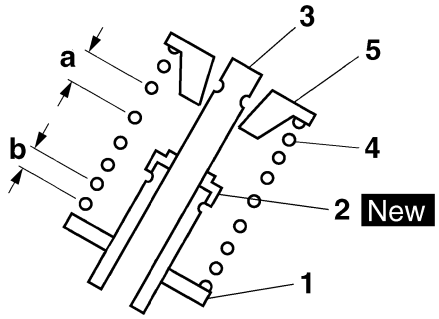


3. Install:
   • Valve spring seat “1”
   (into the cylinder head)
   • Valve stem seal “2” New
   • Valve “3”
   • Valve spring “4”
   • Valve spring retainer “5”

TIP

• Make sure each valve is installed in its original place.
• Install the valve springs with the larger pitch “a” facing up.





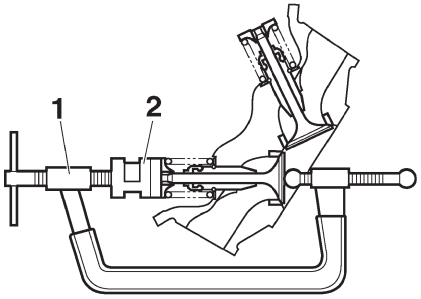
b. Smaller pitch

4. Install:
   • Valve cotters

TIP

Install the valve cotters by compressing the valve spring with the valve spring compressor “1” and the valve spring compressor attachment “2”.

	Valve spring compressor **90890-04019** **YM-04019** **Valve spring compressor attachment** **90890-01243** **Valve spring compressor adapter (26 mm)** **YM-01253-1**

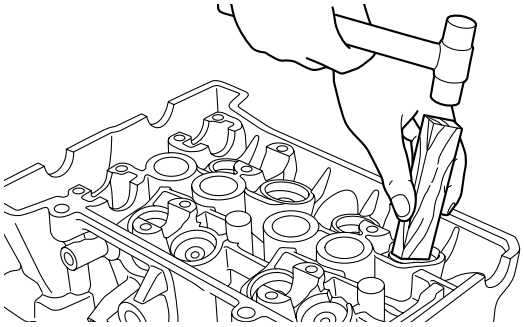


5. To secure the valve cotters onto the valve stem, lightly tap the valve tip with a soft-face hammer.

ECA13800

NOTICE

Hitting the valve tip with excessive force could damage the valve.



6. Lubricate:
   • Valve pad
   (with the recommended lubricant)

	Recommended lubricant **Molybdenum disulfide oil**

   • Valve lifter
   (with the recommended lubricant)

	Recommended lubricant **Engine oil**

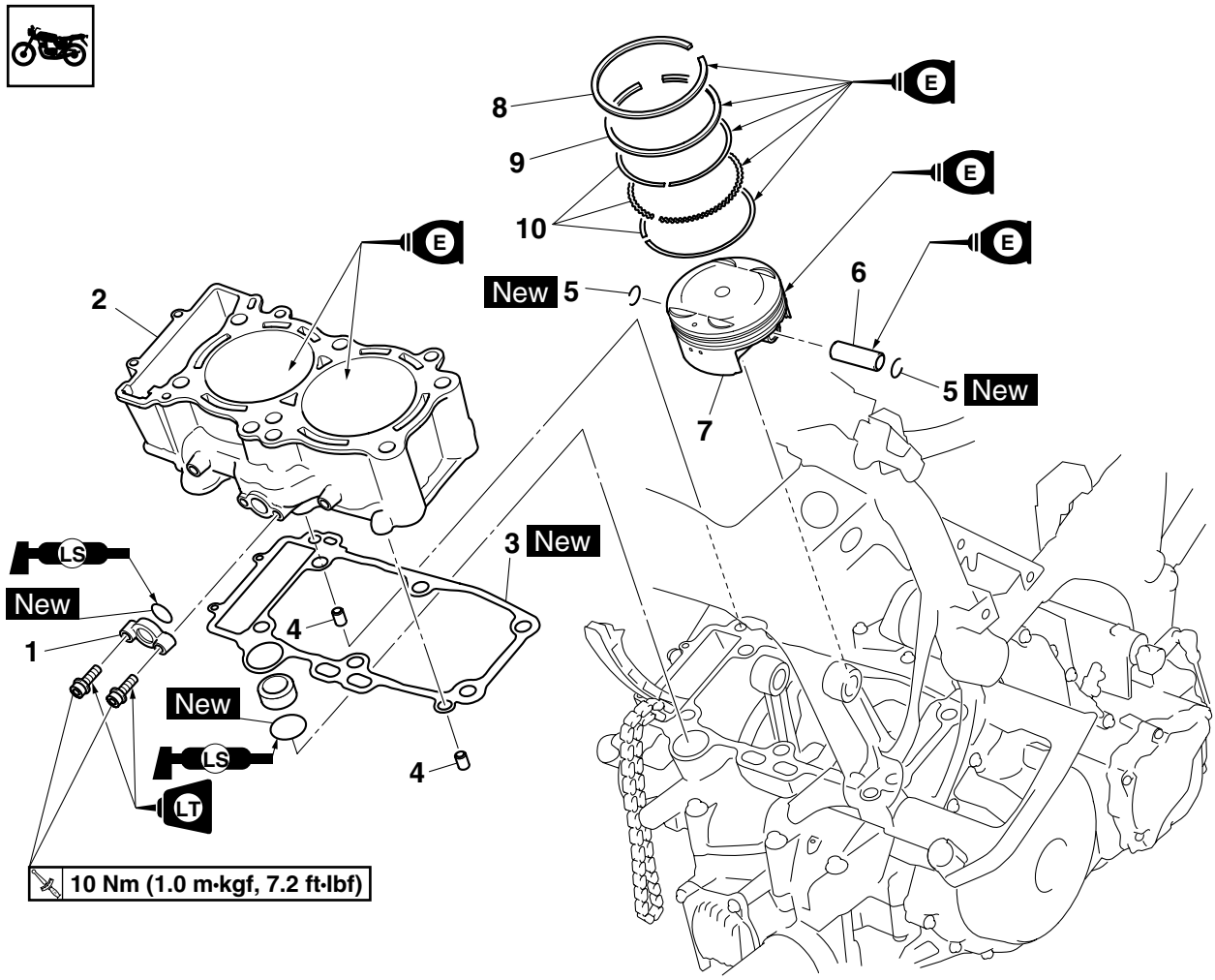
7. Install:
   • Valve pad
   • Valve lifter

TIP

- The valve lifter must move smoothly when rotated with a finger.
- Each valve lifter and valve pad must be reinstalled in their original position.

EAS24370
CYLINDER AND PISTONS

Removing the cylinder and pistons



Order	Job/Parts to remove	Q'ty	Remarks
	Cylinder head		Refer to "CYLINDER HEAD" on page 5-26.
1	Water jacket cover	1	
2	Cylinder	1	
3	Cylinder gasket	1	
4	Dowel pin	2	
5	Piston pin clip	4	
6	Piston pin	2	
7	Piston	2	
8	Top ring	2	
9	2nd ring	2	
10	Oil ring	2	
			For installation, reverse the removal procedure.

EAS24380
REMOVING THE PISTONS

The following procedure applies to both of the pistons.

1. Remove:
   - Piston pin clips “1”
   - Piston pin “2”
   - Piston “3”

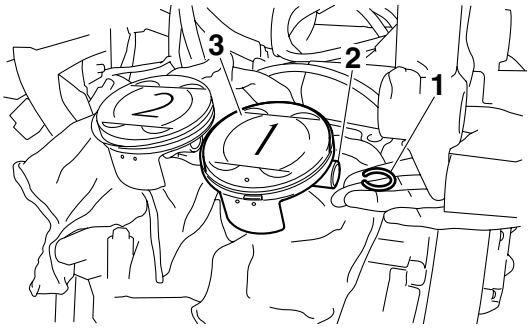
ECA13810
NOTICE

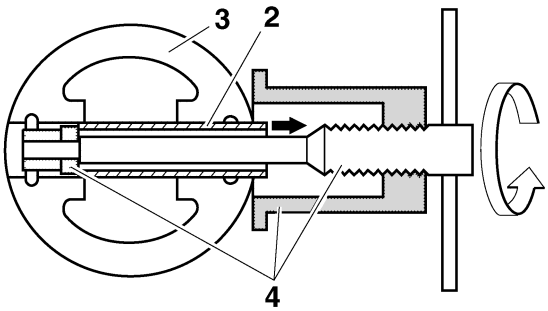
Do not use a hammer to drive the piston pin out.

TIP

- Before removing the piston pin clips, cover the crankcase opening with a clean rag to prevent the piston pin clips from falling into the crankcase.
- For reference during installation, put an identification mark on each piston crown.
- Before removing the piston pin, deburr the piston pin clip grooves and the piston pin bore area. If both areas are deburred and the piston pin is still difficult to remove, remove it with the piston pin puller set “4”.

Piston pin puller set
90890-01304
Piston pin puller
YU-01304

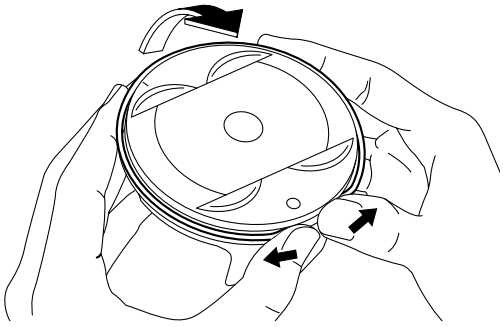




2. Remove:
   - Top ring
   - 2nd ring
   - Oil ring

TIP

When removing a piston ring, open the end gap with your fingers and lift the other side of the ring over the piston crown.



EAS24390
CHECKING THE CYLINDERS AND PISTONS

The following procedure applies to both of the cylinders and pistons.

1. Check:
   - Piston wall
   - Cylinder wall
     Vertical scratches → Rebore or replace the cylinder, and replace the piston and piston rings as a set.
2. Measure:
   - Piston-to-cylinder clearance

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

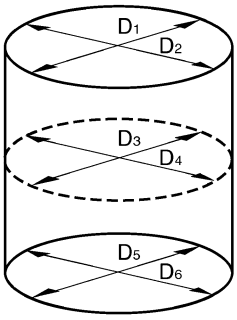
a. Measure cylinder bore “C” with the cylinder bore gauge.

TIP

Measure cylinder bore “C” by taking side-to-side and front-to-back measurements of the cylinder. Then, find the average of the measurements.

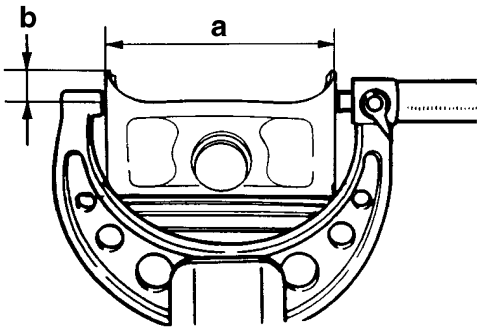
Bore
98.000–98.010 mm (3.8583–3.8587 in)
Taper limit
0.05 mm (0.002 in)
Out of round limit
0.05 mm (0.002 in)

Cylinder bore “C” = maximum of D_1–D_6
Taper limit “T” = maximum of D_1 or D_2 - maximum of D_5 or D_6
Out of round limit “R” = maximum of D_1, D_3 or D_5 - minimum of D_2, D_4 or D_6



b. If out of specification, replace the cylinder, and replace the piston and piston rings as a set.
c. Measure piston skirt diameter D “a” with the micrometer.

Diameter D
97.965–97.980 mm (3.8569–3.8575 in)



b. 8.0 mm (0.31 in) from the bottom edge of the piston

d. If out of specification, replace the piston and piston rings as a set.
e. Calculate the piston-to-cylinder clearance with the following formula.

• Piston-to-cylinder clearance =
Cylinder bore “C” -
Piston skirt diameter “D”

Piston-to-cylinder clearance
0.020–0.045 mm (0.0008–0.0018 in)
Limit
0.15 mm (0.0059 in)

f. If out of specification, replace the cylinder, and replace the piston and piston rings as a set.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

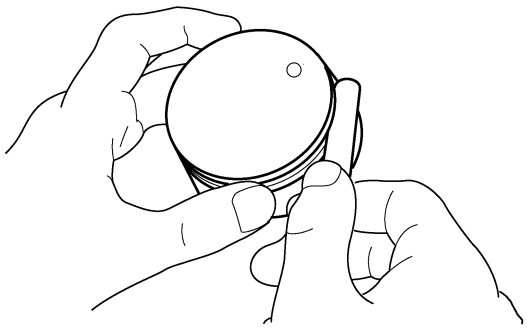
EAS24430
CHECKING THE PISTON RINGS

The following procedure applies to both of the piston rings.
1. Measure:
• Piston ring side clearance
Out of specification → Replace the piston and piston rings as a set.

TIP

Before measuring the piston ring side clearance, eliminate any carbon deposits from the piston ring grooves and piston rings.

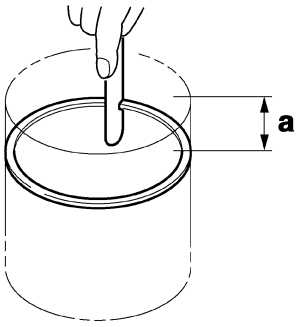
Piston ring
Top ring
Ring side clearance
0.030–0.070 mm (0.0012–0.0028 in)
Limit
0.120 mm (0.0047 in)
2nd ring
Ring side clearance
0.020–0.060 mm (0.0008–0.0024 in)
Limit
0.120 mm (0.0047 in)



2. Install:
• Piston ring
(into the cylinder)

TIP

Level the piston ring into the cylinder with the piston crown.



a. 40.0 mm (1.57 in)

3. Measure:
   • Piston ring end gap
   Out of specification → Replace the piston ring.

TIP

The oil ring expander spacer's end gap cannot be measured. If the oil ring rail's gap is excessive, replace all three piston rings.

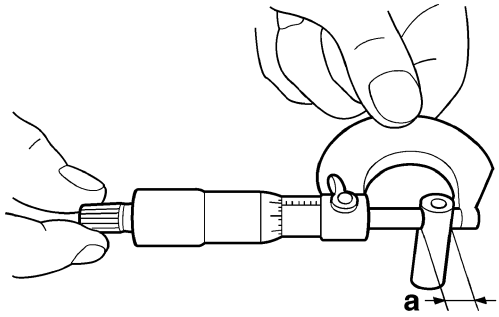
Piston ring
Top ring
End gap (installed)
0.20–0.35 mm (0.0079–0.0138 in)
2nd ring
Limit
0.60 mm (0.0236 in)
End gap (installed)
0.35–0.50 mm (0.0138–0.0197 in)
Limit
0.85 mm (0.0335 in)
Oil ring
End gap (installed)
0.20–0.70 mm (0.0079–0.0276 in)

EAS24440
CHECKING THE PISTON PINS

The following procedure applies to both of the piston pins.

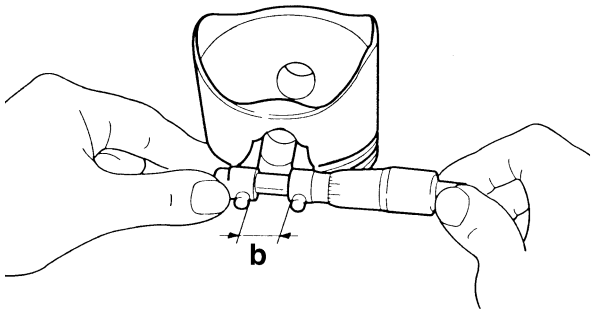
1. Check:
   • Piston pin
   Blue discoloration/grooves → Replace the piston pin and then check the lubrication system.
2. Measure:
   • Piston pin outside diameter "a"
   Out of specification → Replace the piston pin.

Piston pin outside diameter
21.991–22.000 mm (0.8658–0.8661 in)
Limit
21.971 mm (0.8650 in)



3. Measure:
   • Piston pin bore diameter "b"
   Out of specification → Replace the piston.

Piston pin bore inside diameter
22.004–22.015 mm (0.8663–0.8667 in)
Limit
22.045 mm (0.8679 in)



4. Calculate:
   • Piston-pin-to-piston-pin-bore clearance
   Out of specification → Replace the piston pin and piston as a set.

• Piston-pin-to-piston-pin-bore clearance = Piston pin bore inside diameter "b" - Piston pin outside diameter "a"

Piston-pin-to-piston-pin-bore clearance
0.004–0.024 mm (0.00016–0.00094 in)

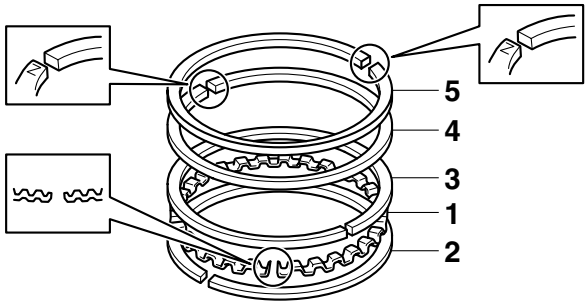
EAS24470
INSTALLING THE PISTONS AND CYLINDER

The following procedure applies to both of the pistons.

1. Install:
   • Oil ring expander “1”
   • Lower oil ring rail “2”
   • Upper oil ring rail “3”
   • 2nd ring “4”
   • Top ring “5”

TIP

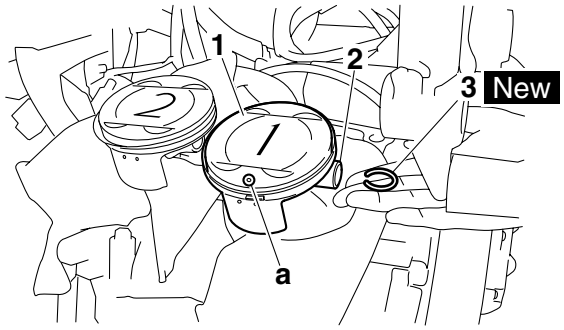
- Install the oil ring expander as shown in the illustration.
- Be sure to install the piston rings so that the manufacturer marks face up.

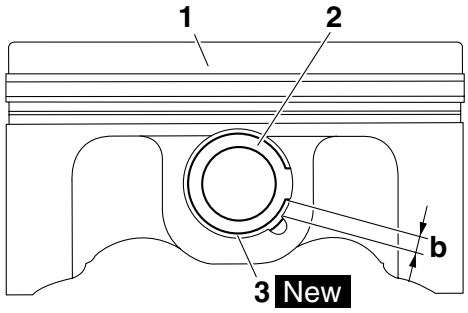


2. Install:
   • Piston “1”
   • Piston pin “2”
   • Piston pin clips “3” New

TIP

- Apply engine oil onto the piston pin.
- Make sure the punch mark “a” on the piston points towards the exhaust side of the engine.
- Before installing the piston pin clips, cover the crankcase opening with a clean rag to prevent the piston pin clips from falling into the crankcase.
- Install the piston pin clips so that the clip ends are 3 mm (0.12 in) “b” or more from the cutout in the piston.
- Reinstall each piston into its original cylinder (numbering order starting from the left: #1 to #2).

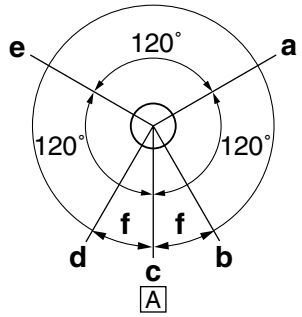




3. Lubricate:
   • Piston
   • Piston rings
   • Cylinder
   (with the recommended lubricant)

	Recommended lubricant **Engine oil**

4. Offset:
   • Piston ring end gaps

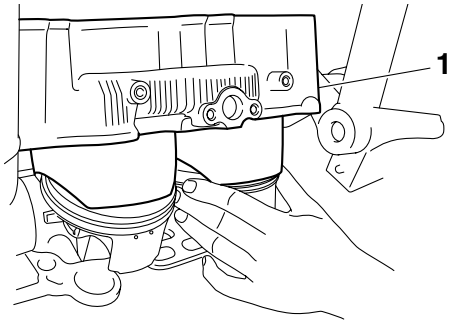


a. Top ring
b. Upper oil ring rail
c. Oil ring expander
d. Lower oil ring rail
e. 2nd ring
f. 40 mm (1.57 in)
A. Exhaust side

5. Install:
   • Dowel pins
   • Cylinder gasket New
6. Install:
   • Cylinder “1”

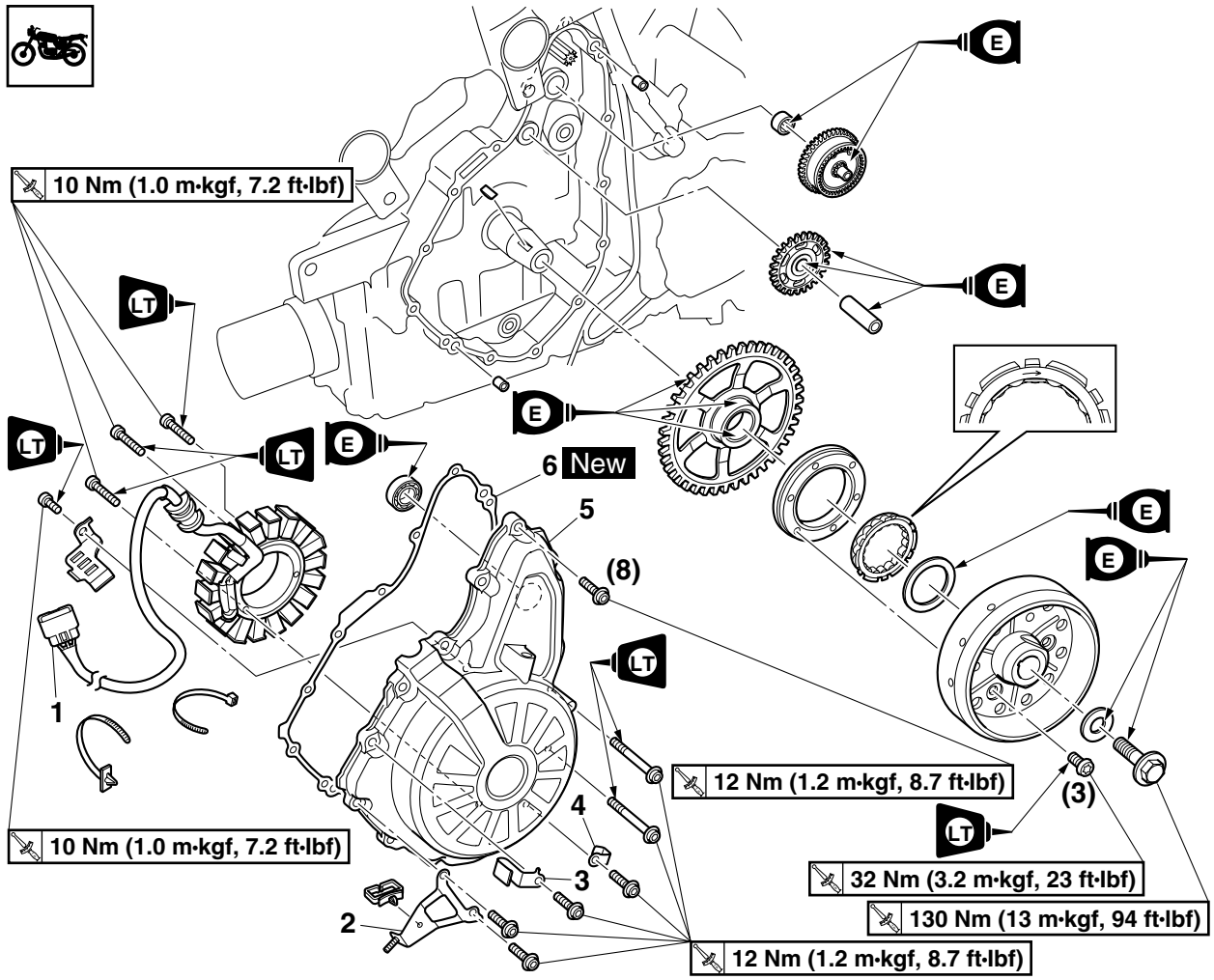
TIP

- While compressing the piston rings, install the cylinder.
- Pass the timing chain and timing chain guide (intake side) through the timing chain cavity.


1

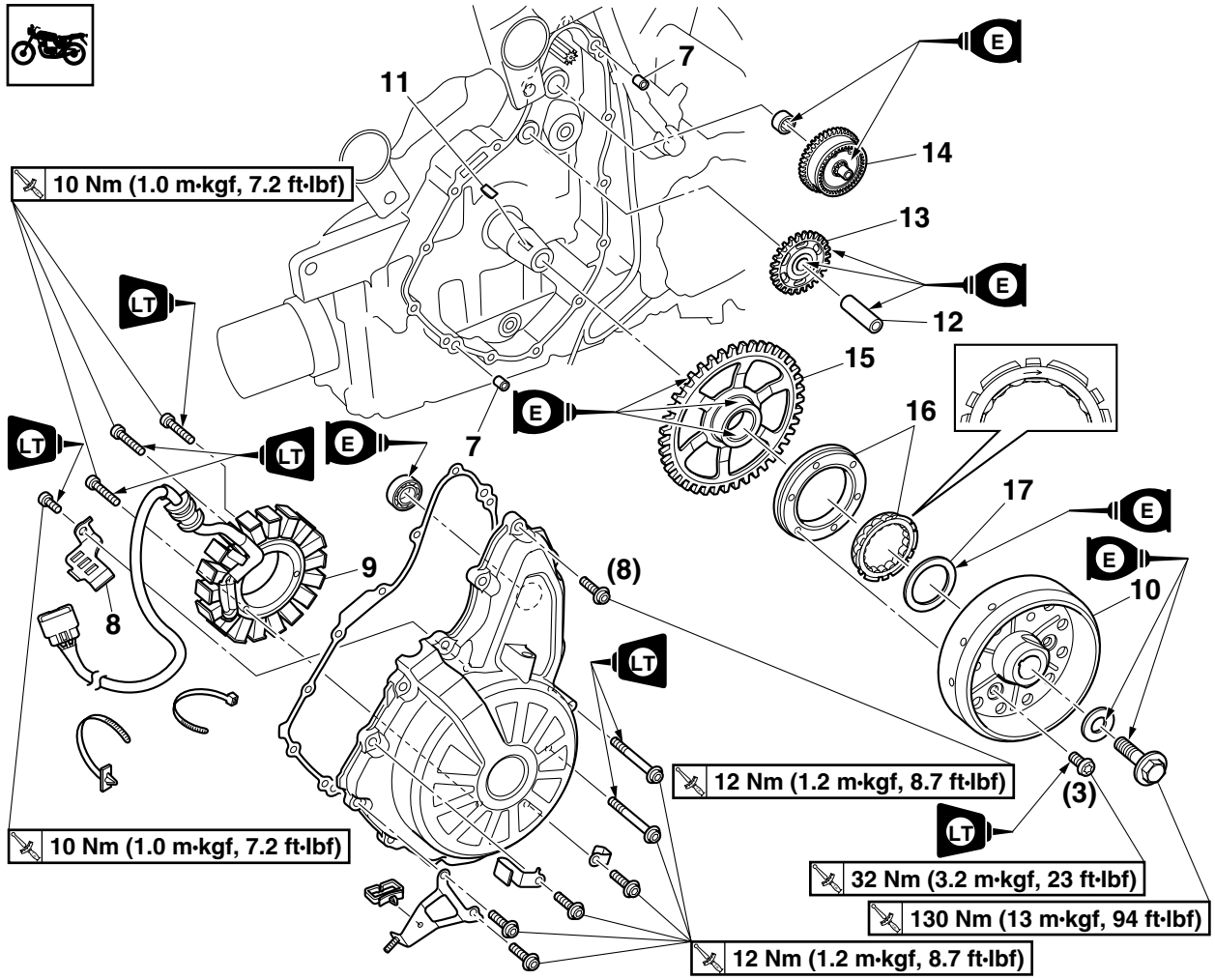
EAS24480
GENERATOR AND STARTER CLUTCH

Removing the stator coil, generator rotor and starter clutch



Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-25.
	Side cowlings		Refer to "GENERAL CHASSIS" on page 4-1.
	Engine guard		Refer to "ENGINE REMOVAL" on page 5-3.
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
1	Stator coil coupler	1	Disconnect.
2	Engine guard bracket	1	
3	Holder (fuel tank overflow hose and fuel tank breather hose)	1	
4	Holder (sidestand switch lead and oil level switch lead)	1	
5	Generator cover	1	
6	Generator cover gasket	1	

Removing the stator coil, generator rotor and starter clutch



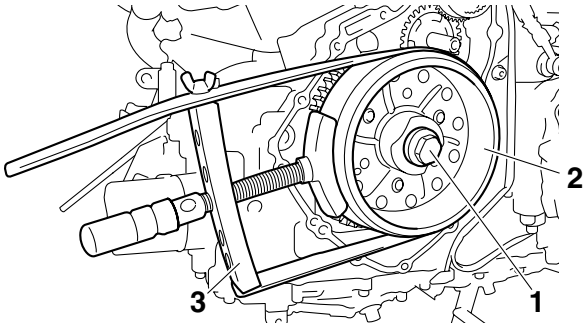
Order	Job/Parts to remove	Q'ty	Remarks
7	Dowel pin	2	
8	Stator coil lead holder	1	
9	Stator coil	1	
10	Generator rotor	1	
11	Woodruff key	1	
12	Starter clutch idle gear shaft	1	
13	Starter clutch idle gear	1	
14	Torque limiter	1	
15	Starter clutch gear	1	
16	Starter clutch	1	
17	Washer	1	
			For installation, reverse the removal procedure.

EAS24490
REMOVING THE GENERATOR
1. Remove:
   • Generator rotor bolt “1”
   • Washer

TIP

While holding the generator rotor “2” with the sheave holder “3”, loosen the generator rotor bolt.

Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



2. Remove:
   • Generator rotor “1”
   (with the flywheel puller “2”)
   • Woodruff key

ECA13880

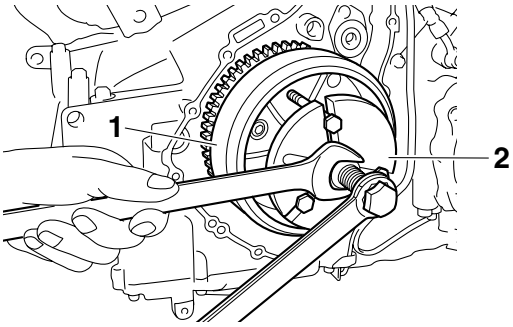
NOTICE

To protect the end of the crankshaft, place an appropriate sized socket between the flywheel puller set center bolt and the crankshaft.

TIP

• Install the flywheel puller bolts to the threaded holes of the starter clutch.
• Make sure the flywheel puller is centered over the generator rotor.

Flywheel puller
90890-01362
Heavy duty puller
YU-33270-B

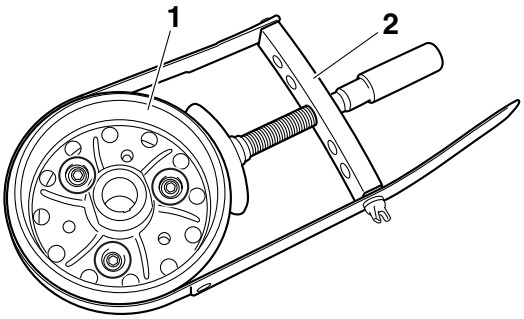


EAS24560
REMOVING THE STARTER CLUTCH
1. Remove:
   • Starter clutch bolts
   • Starter clutch

TIP

While holding the generator rotor “1” with the sheave holder “2”, loosen the starter clutch bolts.

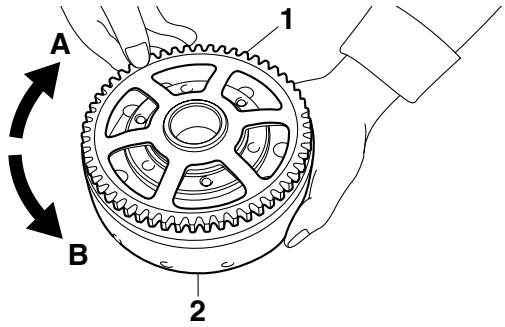
Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



EAS24570
CHECKING THE STARTER CLUTCH
1. Check:
   • Starter clutch rollers
   Damage/wear → Replace.
2. Check:
   • Starter clutch idle gear
   • Starter clutch gear
   Burrs/chips/roughness/wear → Replace the defective part(s).
3. Check:
   • Starter clutch gear contact surfaces
   Damage/pitting/wear → Replace the starter clutch gear.
4. Check:
   • Starter clutch operation

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the starter clutch gear "1" onto the generator rotor "2" and hold the generator rotor.
b. When turning the starter clutch gear clockwise "A", the starter clutch and the starter clutch gear should engage, otherwise the starter clutch is faulty and must be replaced.
c. When turning the starter clutch gear counterclockwise "B", it should turn freely, otherwise the starter clutch is faulty and must be replaced.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS3D81022
CHECKING THE TORQUE LIMITER

1. Check:
   • Torque limiter
   Damage/wear → Replace.

TIP

Do not disassemble the torque limiter.

EAS24600
INSTALLING THE STARTER CLUTCH

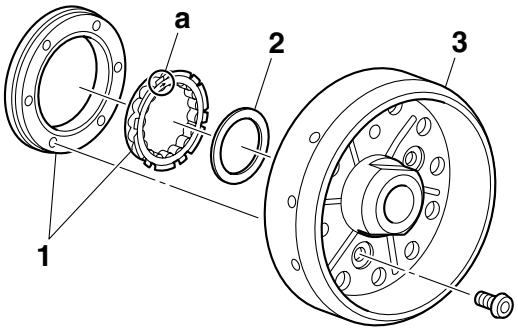
1. Install:
   • Starter clutch "1"
   • Washer "2"

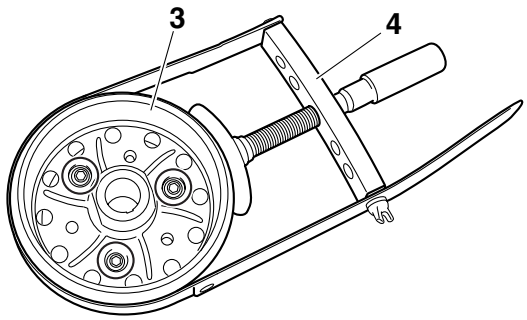
Starter clutch bolt
32 Nm (3.2 m·kgf, 23 ft·lbf)
LOCTITE®

TIP

- Install the starter clutch so that the side of the starter clutch roller assembly with the arrow mark "a" is toward the generator rotor "3".
- While holding the generator rotor with the sheave holder "4", tighten the starter clutch bolts.

Sheave holder
90890-01701
Primary clutch holder
YS-01880-A





EAS24500
INSTALLING THE GENERATOR

1. Install:
   • Woodruff key
   • Generator rotor
   • Washer
   • Generator rotor bolt

TIP

- Clean the tapered portion of the crankshaft and the generator rotor hub.
- When installing the generator rotor, make sure the woodruff key is properly seated in the keyway of the crankshaft.
- Lubricate the generator rotor bolt threads and washer mating surfaces with engine oil.

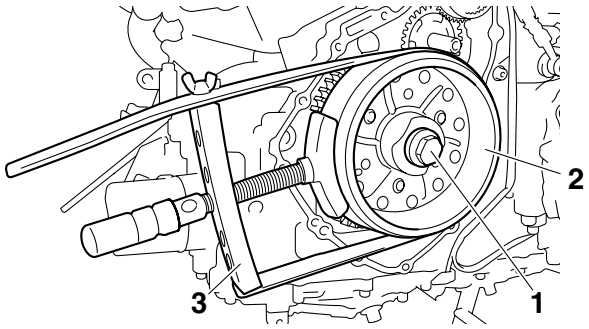
2. Tighten:
   • Generator rotor bolt "1"

Generator rotor bolt
130 Nm (13 m·kgf, 94 ft·lbf)

TIP

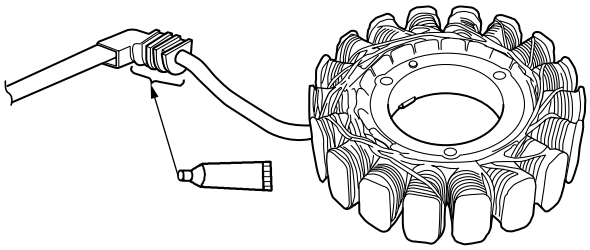
While holding the generator rotor "2" with the sheave holder "3", tighten the generator rotor bolt.

Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



3. Apply:
   • Sealant
   (onto the stator coil lead grommet)

	Yamaha bond No. 1215 **90890-85505** **(Three Bond No.1215®)**



4. Install:
   • Generator cover gasket New
   • Generator cover

	Generator cover bolt (M6 × 55) **12 Nm (1.2 m·kgf, 8.7 ft·lbf)** **LOCTITE®** **Generator cover bolt (M6 × 25)** **12 Nm (1.2 m·kgf, 8.7 ft·lbf)**

TIP

Tighten the generator cover bolts in stages and in a crisscross pattern.

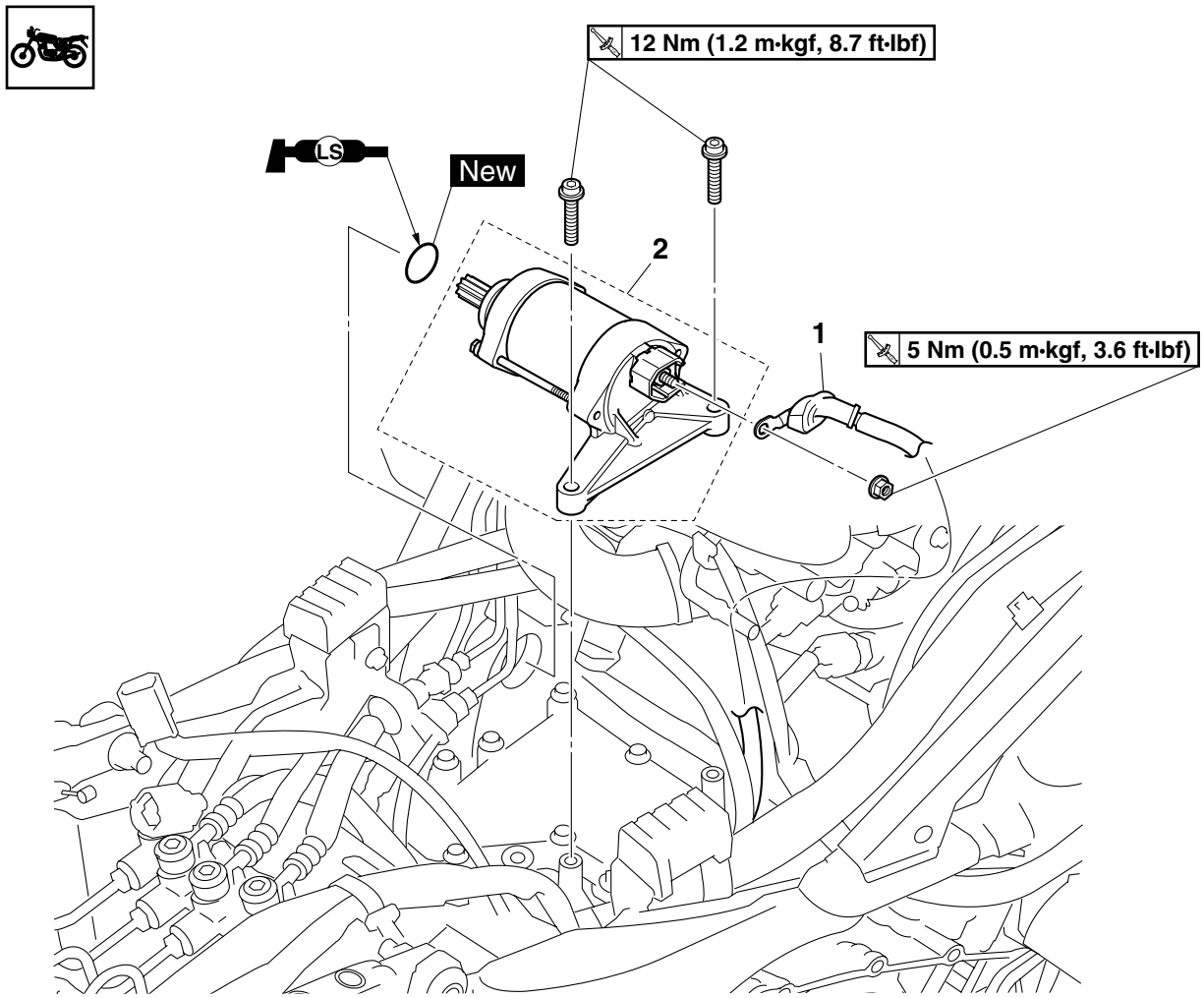
5. Connect:
   • Stator coil coupler

TIP

To route the stator coil lead, refer to “CABLE ROUTING” on page 2-43.

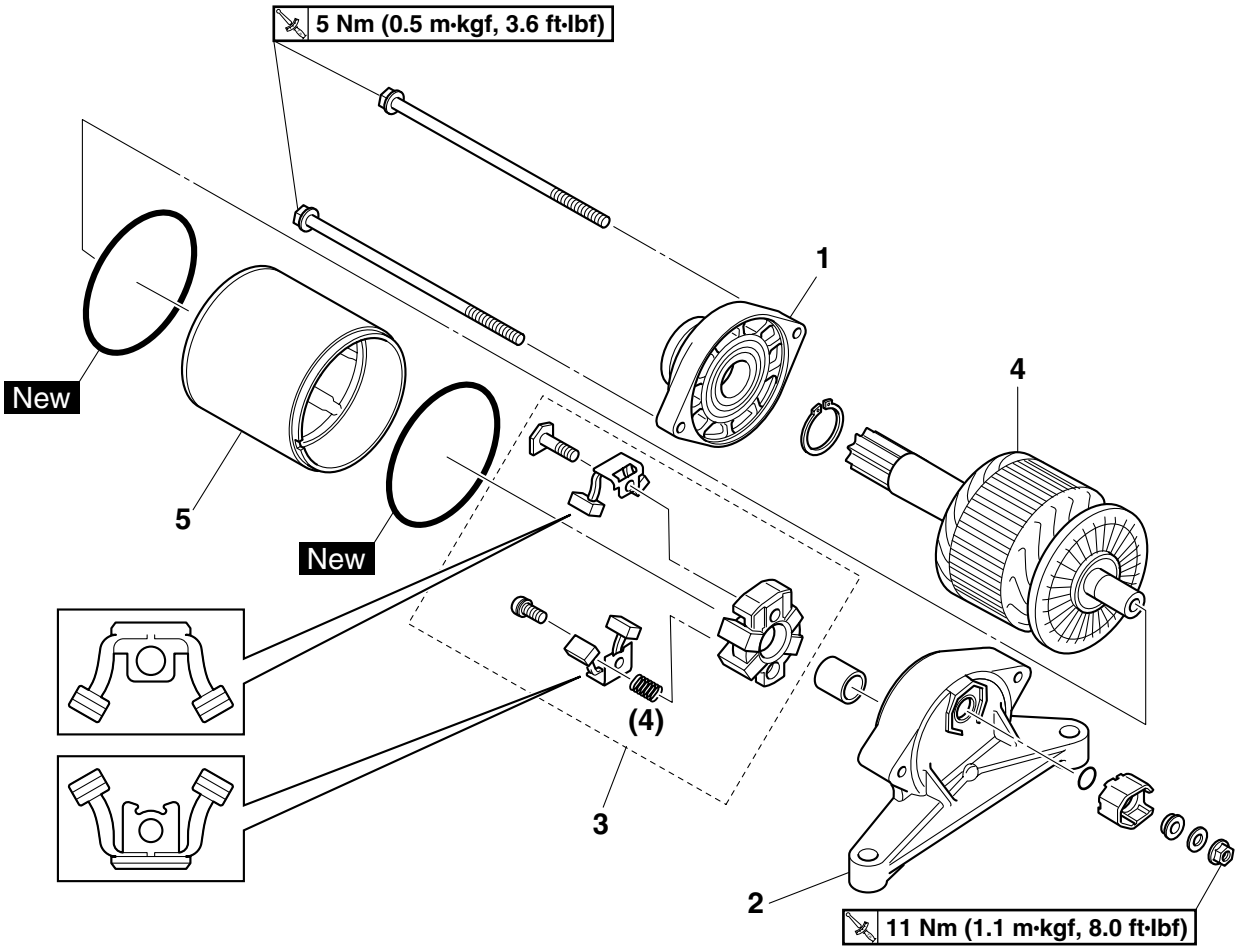
EAS24780
ELECTRIC STARTER

Removing the starter motor



Order	Job/Parts to remove	Q'ty	Remarks
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
1	Starter motor lead	1	Disconnect.
2	Starter motor assembly	1	
			For installation, reverse the removal procedure.

Disassembling the starter motor



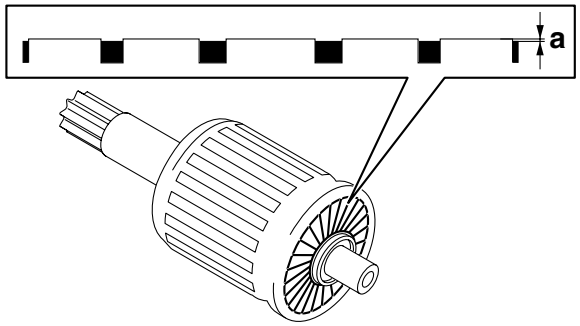
Order	Job/Parts to remove	Q'ty	Remarks
1	Starter motor front cover	1	
2	Starter motor rear cover	1	
3	Brush holder set	1	
4	Armature assembly	1	
5	Starter motor yoke	1	
			For assembly, reverse the disassembly procedure.

EAS24790
CHECKING THE STARTER MOTOR

1. Check:
   • Commutator
   Dirt → Clean with 600 grit sandpaper.
2. Measure:
   • Mica undercut “a”
   Out of specification → Cut the mica to the proper measurement with a hacksaw blade that has been grounded to fit the commutator.

Mica undercut (depth)
0.70 mm (0.03 in)

TIP
The mica of the commutator must be undercut to ensure proper operation of the commutator.



3. Measure:
   • Armature assembly resistances (commutator and insulation)
   Out of specification → Replace the starter motor.

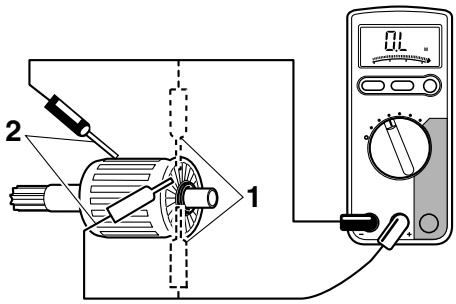
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Measure the armature assembly resistances with the digital circuit tester.

Digital circuit tester
90890-03174
Model 88 Multimeter with tachometer
YU-A1927

Armature coil
Commutator resistance “1”
Continuity (0.010–0.020 Ω at 20 °C (68 °F))
Insulation resistance “2”
No continuity (Above 1 MΩ at 20 °C (68 °F))

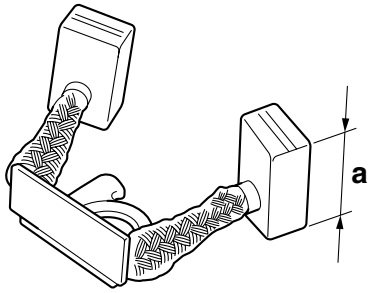
b. If any resistance is out of specification, replace the starter motor.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

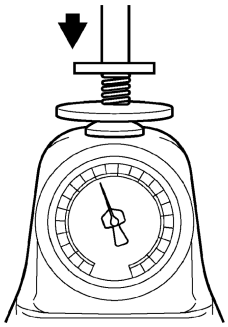
4. Measure:
   • Brush length “a”
   Out of specification → Replace the brush holder set.

Brush overall length
12.0 mm (0.47 in)
Limit
6.50 mm (0.26 in)



5. Measure:
   • Brush spring force
   Out of specification → Replace the brush holder set.

Brush spring force
6.02–6.51 N (614–664 gf, 21.69–23.45 oz)



6. Check:
   • Gear teeth
   Damage/wear → Replace the starter motor.

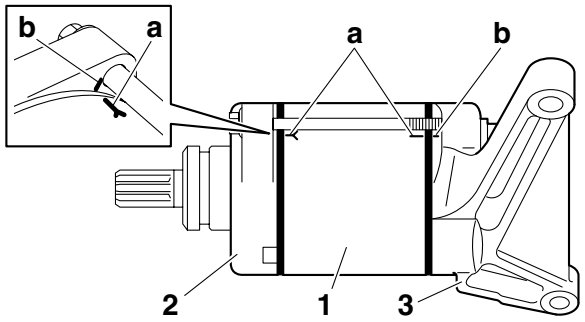
7. Check:
   • Bearing
   • Oil seal
   Damage/wear → Replace the starter motor front cover.

EAS24800
ASSEMBLING THE STARTER MOTOR

1. Install:
   • Starter motor yoke “1”
   • Starter motor front cover “2”
   • Starter motor rear cover “3”

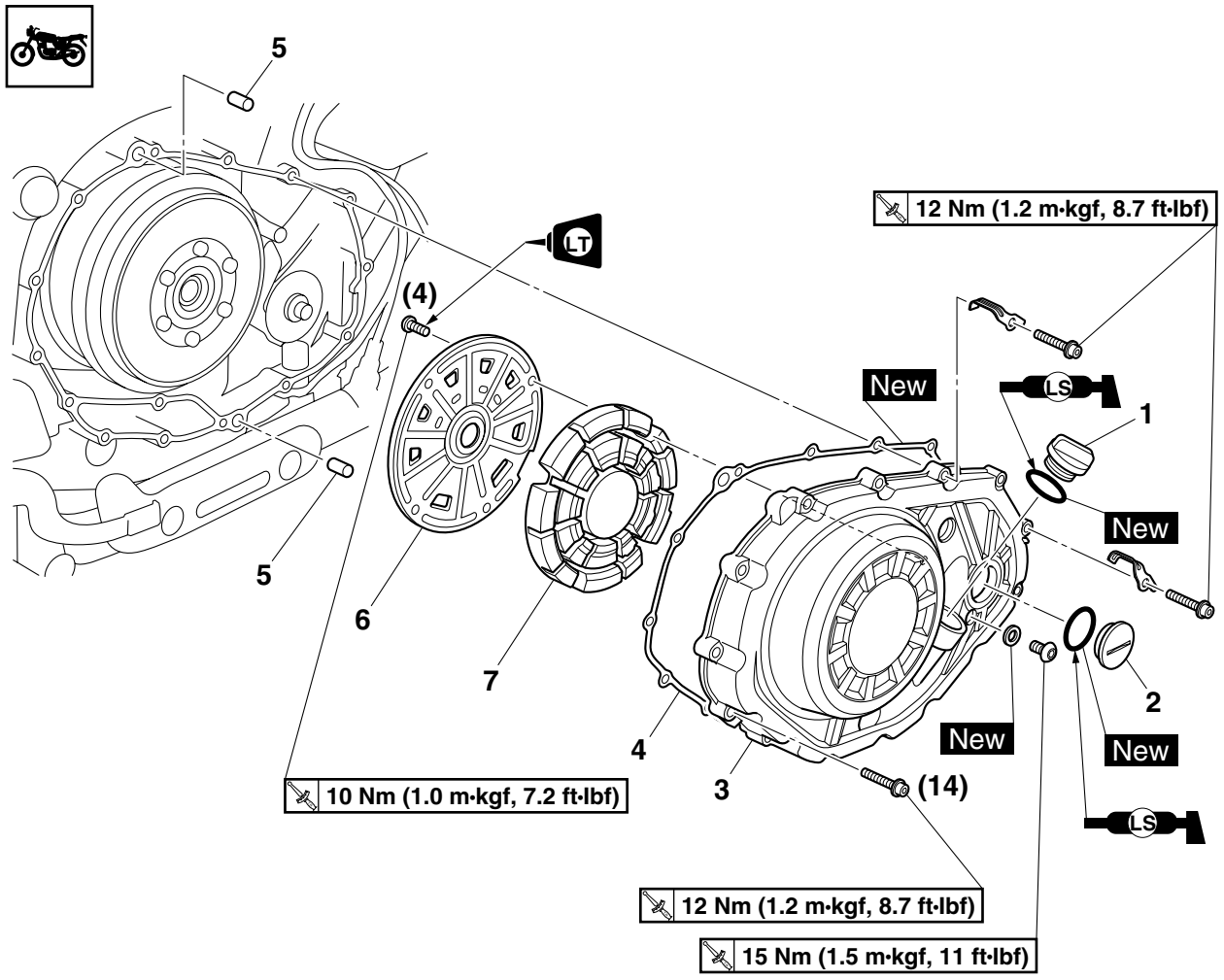
TIP

Align the match marks “a” on the starter motor yoke with the match marks “b” on the starter motor front and rear covers.



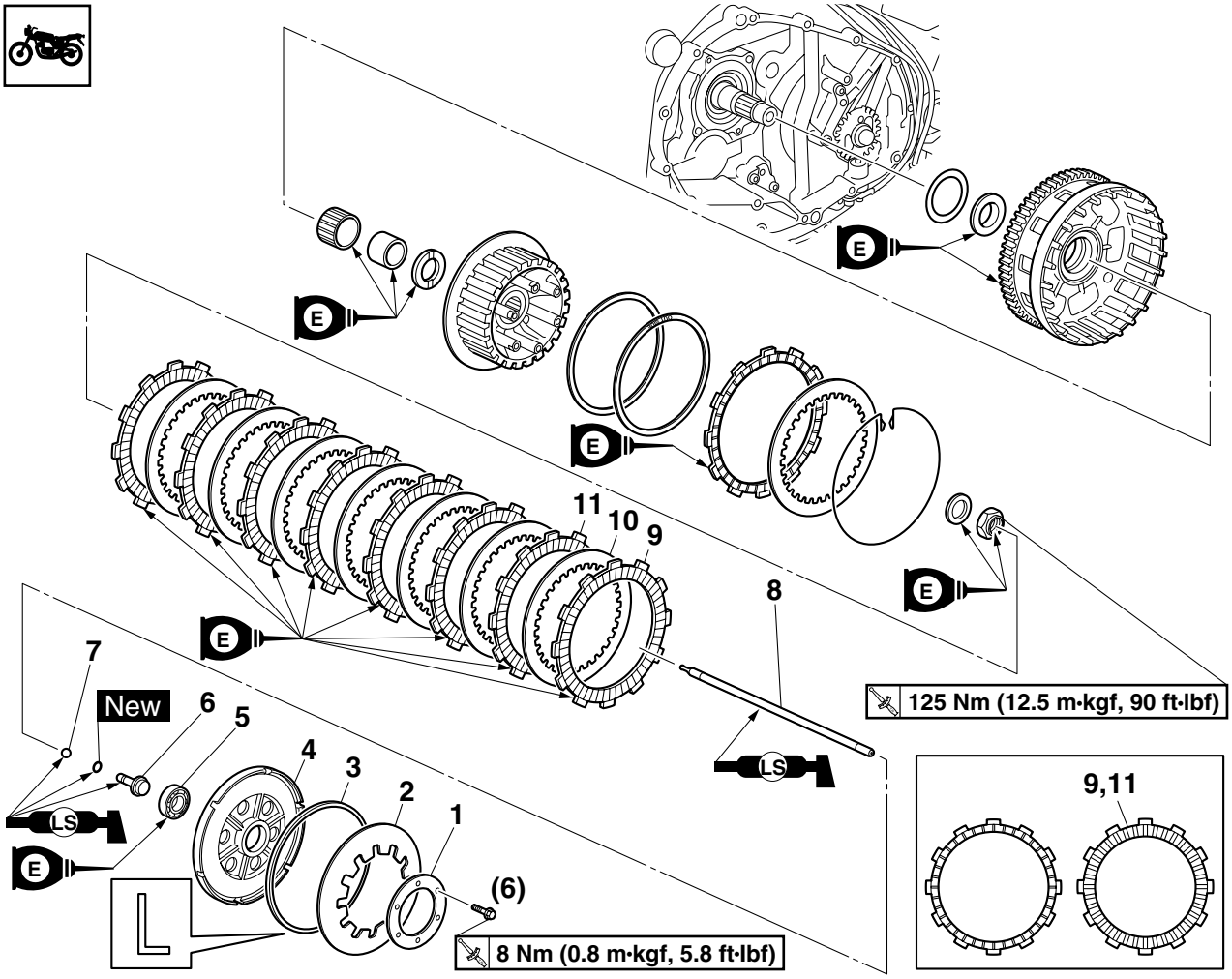
EAS25061
CLUTCH

Removing the clutch cover



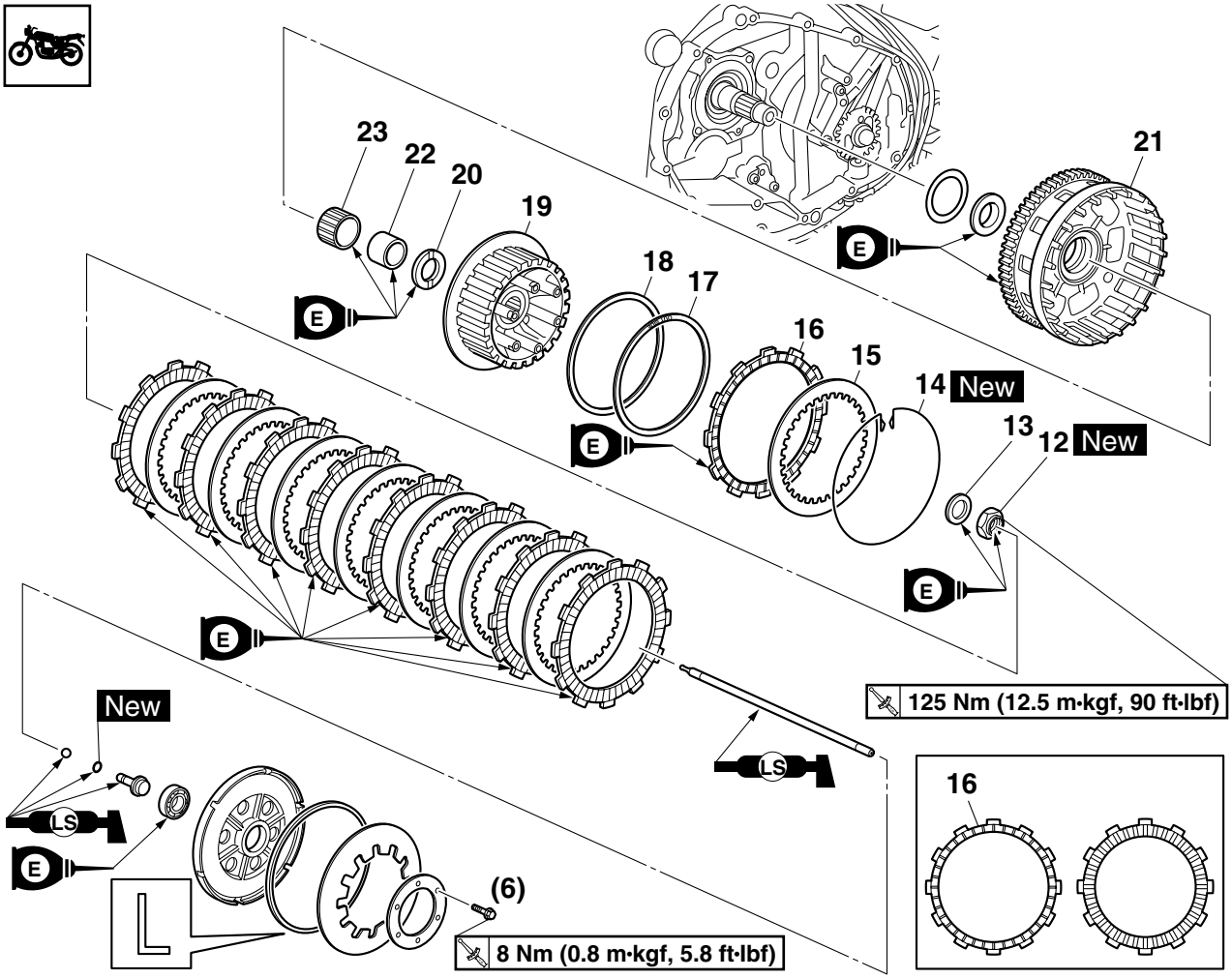
Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-25.
1	Engine oil filler cap	1	
2	Crankshaft end accessing screw	1	
3	Clutch cover	1	
4	Clutch cover gasket	1	
5	Dowel pin	2	
6	Clutch cover damper plate	1	
7	Clutch cover damper	1	
			For installation, reverse the removal procedure.

Removing the clutch



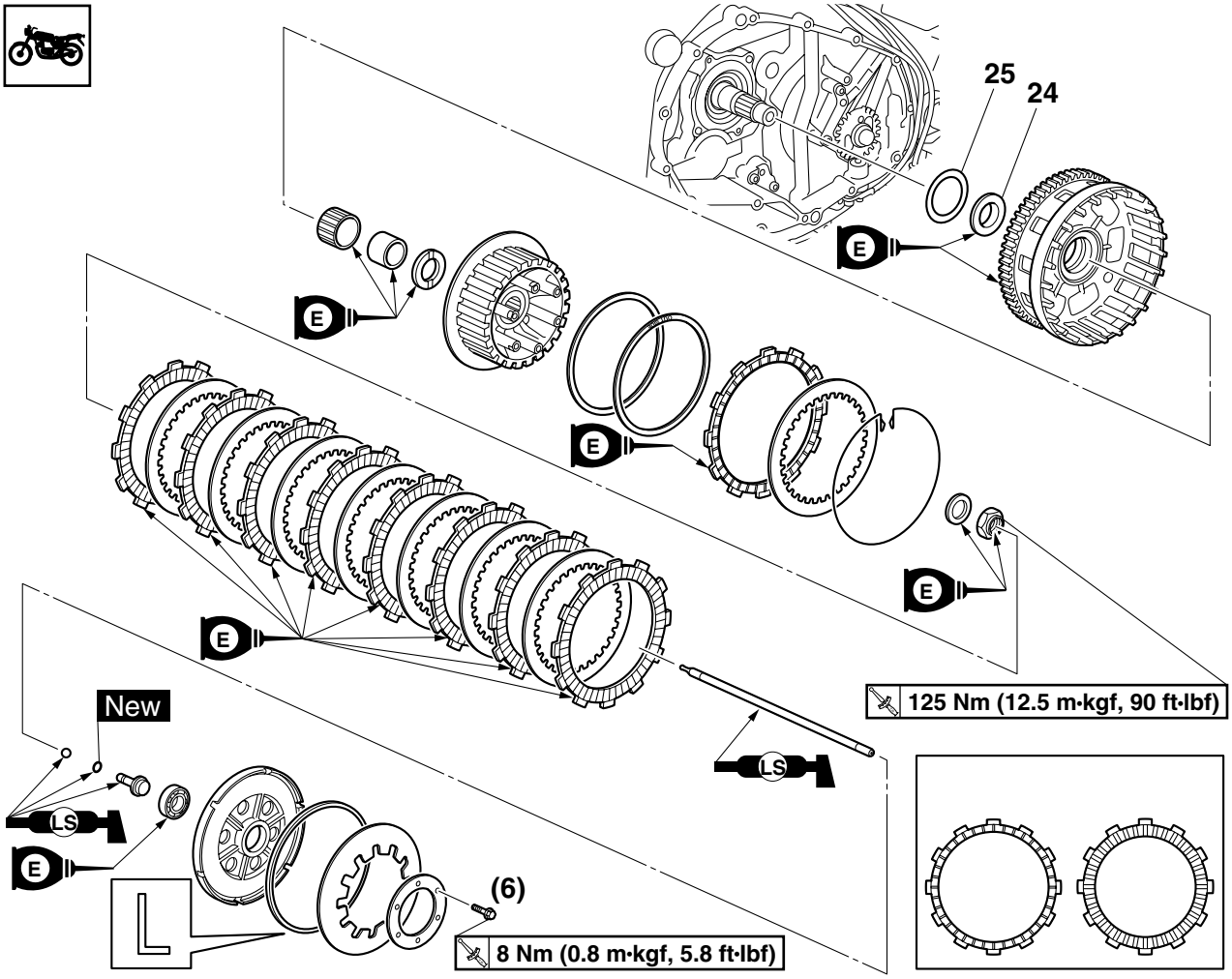
Order	Job/Parts to remove	Q'ty	Remarks
	Clutch release cylinder		Refer to "Removing the clutch release cylinder".
1	Clutch spring plate retainer	1	
2	Clutch spring plate	1	
3	Clutch spring plate seat	1	
4	Pressure plate	1	
5	Bearing	1	
6	Short clutch push rod	1	
7	Ball	1	
8	Long clutch push rod	1	
9	Friction plate 1	1	Inside diameter: 124 mm (4.88 in)
10	Clutch plate	7	
11	Friction plate 2	7	Inside diameter: 124 mm (4.88 in)

Removing the clutch



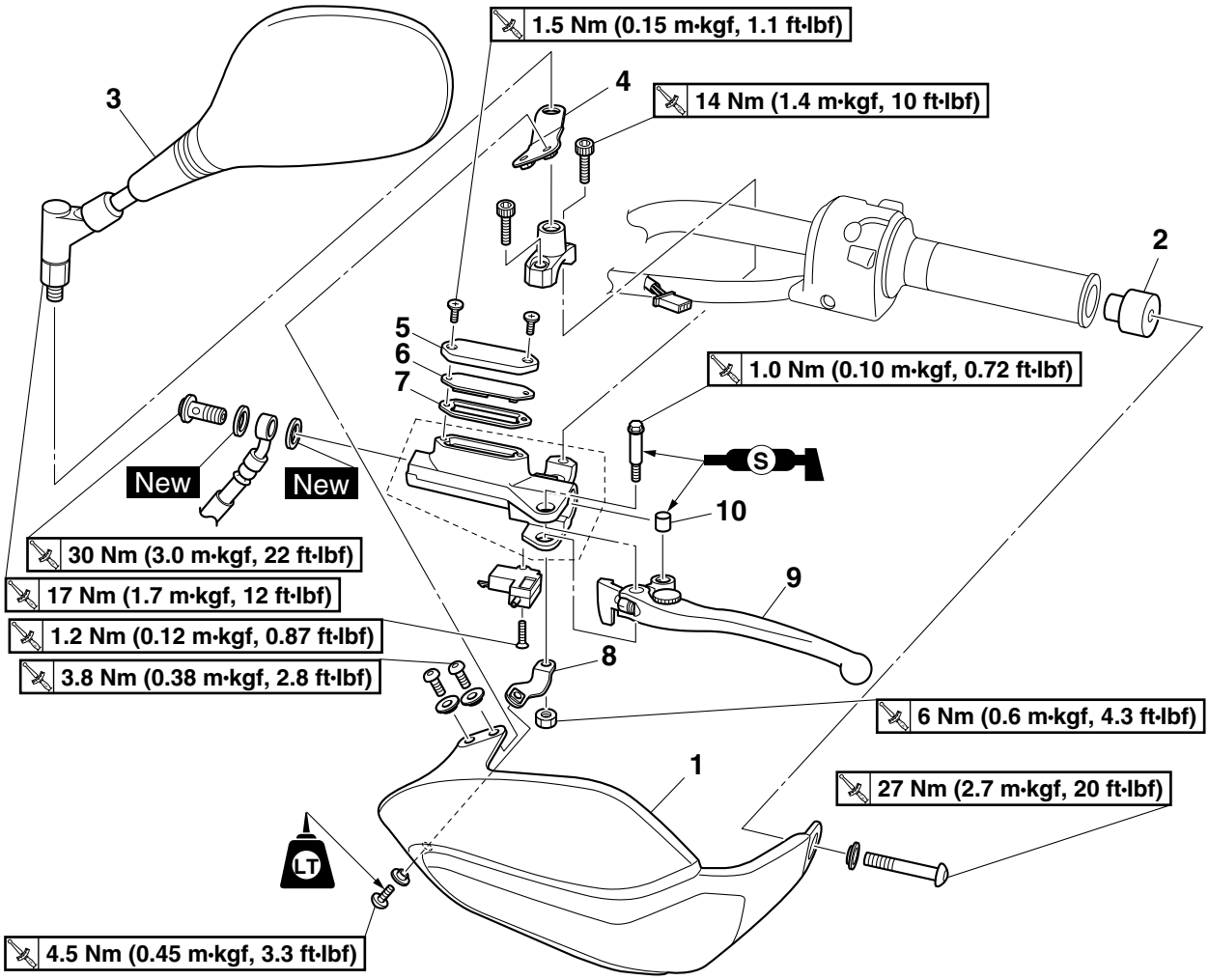
Order	Job/Parts to remove	Q'ty	Remarks
12	Clutch boss nut	1	
13	Conical spring washer	1	
14	Wire circlip	1	
15	Clutch plate	1	
16	Friction plate 3	1	Inside diameter: 135 mm (5.31 in)
17	Clutch damper spring	1	
18	Clutch damper spring seat	1	
19	Clutch boss	1	
20	Thrust washer	1	
21	Clutch housing	1	
22	Spacer	1	
23	Bearing	1	

Removing the clutch



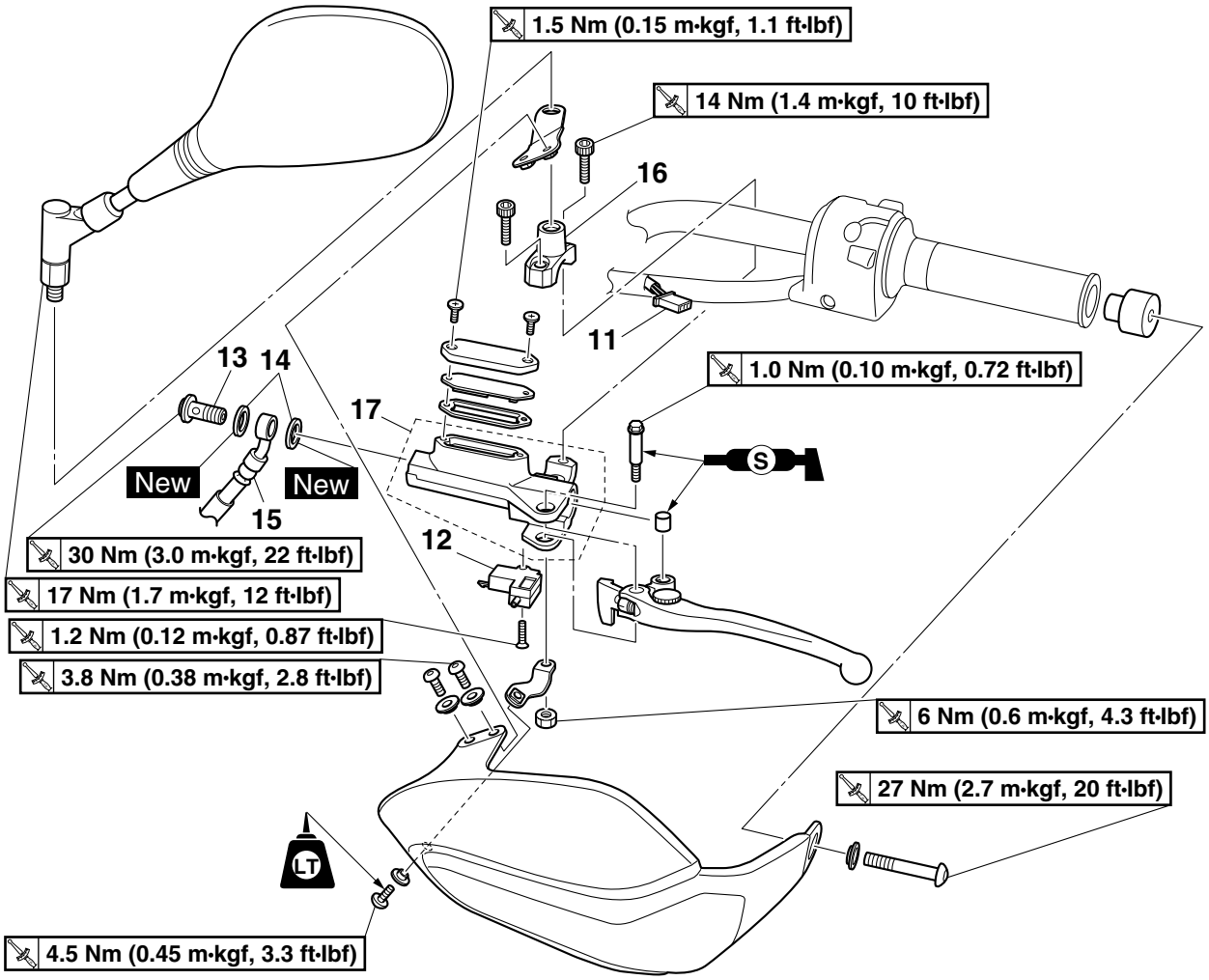
Order	Job/Parts to remove	Q'ty	Remarks
24	Spacer	1	
25	Thrust plate	1	
			For installation, reverse the removal procedure.

Removing the clutch master cylinder



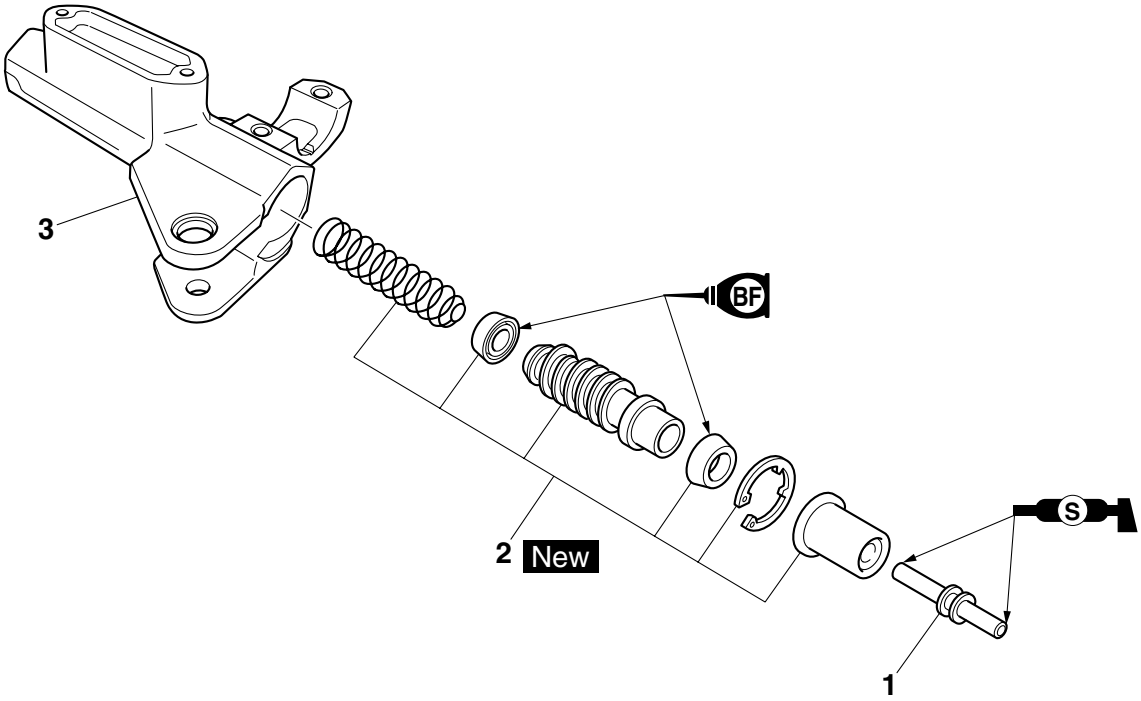
Order	Job/Parts to remove	Q'ty	Remarks
	Clutch fluid		Drain. Refer to "BLEEDING THE HYDRAULIC CLUTCH SYSTEM" on page 3-13.
1	Hand shield	1	
2	Grip end	1	
3	Rearview mirror	1	
4	Upper hand shield bracket	1	
5	Clutch master cylinder reservoir cap	1	
6	Clutch master cylinder reservoir diaphragm holder	1	
7	Clutch master cylinder reservoir diaphragm	1	
8	Lower hand shield bracket	1	
9	Clutch lever	1	
10	Bushing	1	

Removing the clutch master cylinder



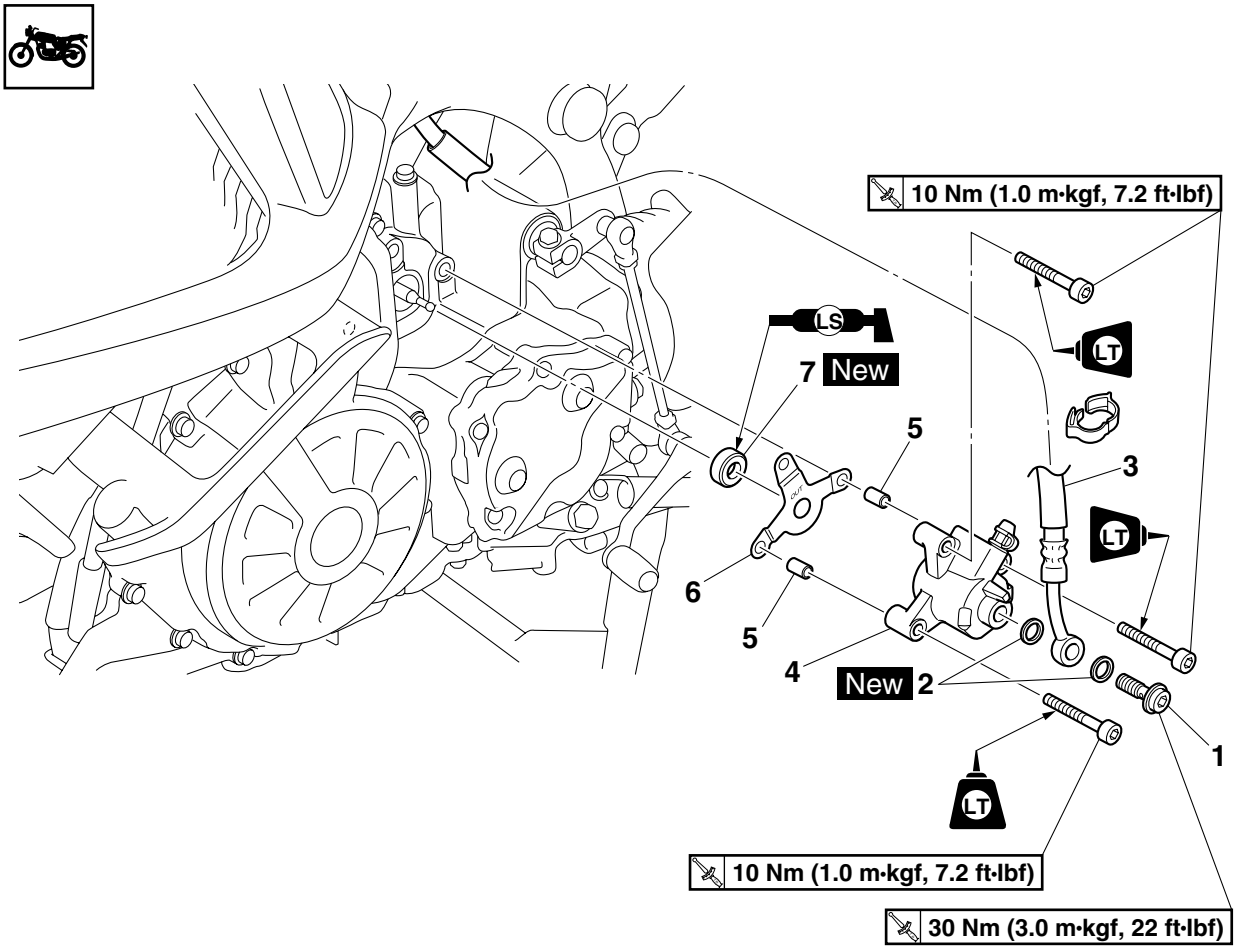
Order	Job/Parts to remove	Q'ty	Remarks
11	Clutch switch coupler	1	Disconnect.
12	Clutch switch	1	
13	Clutch hose union bolt	1	
14	Clutch hose gasket	2	
15	Clutch hose	1	
16	Clutch master cylinder holder	1	
17	Clutch master cylinder	1	
			For installation, reverse the removal procedure.

Disassembling the clutch master cylinder



Order	Job/Parts to remove	Q'ty	Remarks
1	Clutch master cylinder push rod	1	
2	Clutch master cylinder kit	1	
3	Clutch master cylinder body	1	
			For assembly, reverse the disassembly procedure.

Removing the clutch release cylinder



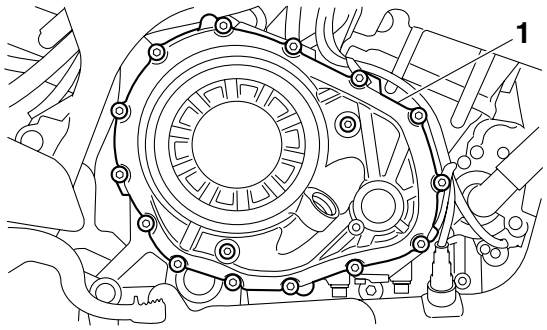
Order	Job/Parts to remove	Q'ty	Remarks
	Clutch fluid		Drain. Refer to "BLEEDING THE HYDRAULIC CLUTCH SYSTEM" on page 3-13.
1	Clutch hose union bolt	1	
2	Clutch hose gasket	2	
3	Clutch hose	1	Disconnect.
4	Clutch release cylinder	1	
5	Dowel pin	2	
6	Clutch release cylinder plate	1	
7	Oil seal	1	
			For installation, reverse the removal procedure.

EAS25070
REMOVING THE CLUTCH

1. Remove:
   • Clutch cover “1”

TIP

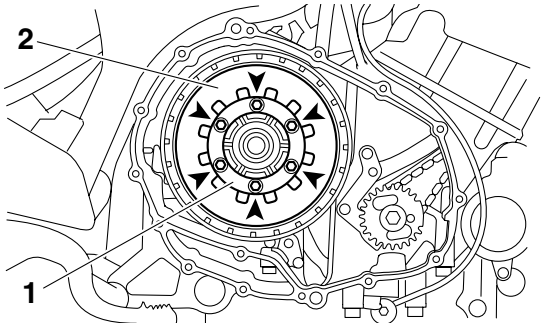
Loosen each bolt 1/4 of a turn at a time, in stages and in a crisscross pattern. After all of the bolts are fully loosened, remove them.



2. Remove:
   • Clutch spring plate retainer “1”
   • Clutch spring plate “2”

TIP

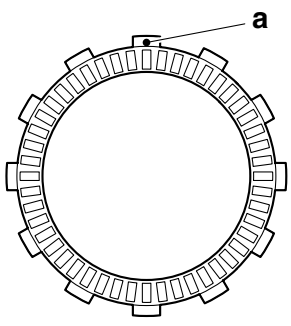
Loosen the clutch spring plate retainer bolts in stages and in a crisscross pattern.



3. Remove:
   • Friction plates
   • Clutch plates

TIP

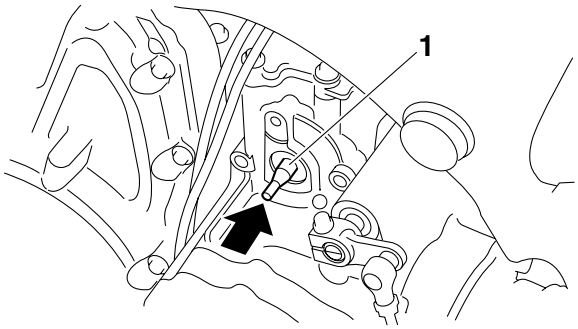
Before removing friction plate 1, put an identification mark “a” on the plate.



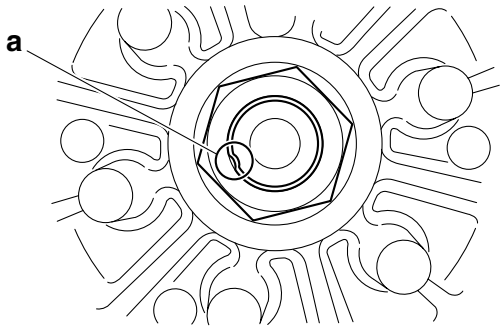
4. Remove:
   • Long clutch push rod “1”

TIP

Push the long clutch push rod into the clutch release cylinder side of the engine, and remove it from the clutch side of the engine.



5. Straighten the clutch boss nut rib “a”.

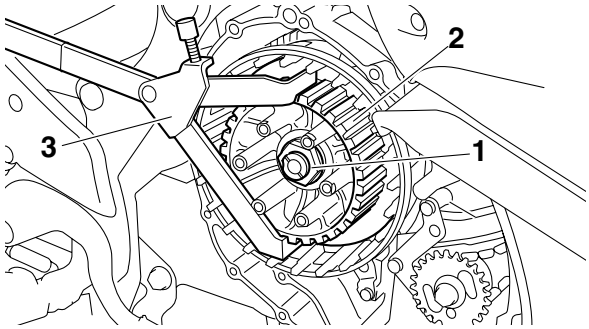


6. Loosen:
   • Clutch boss nut “1”

TIP

While holding the clutch boss “2” with the universal clutch holder “3”, loosen the clutch boss nut.

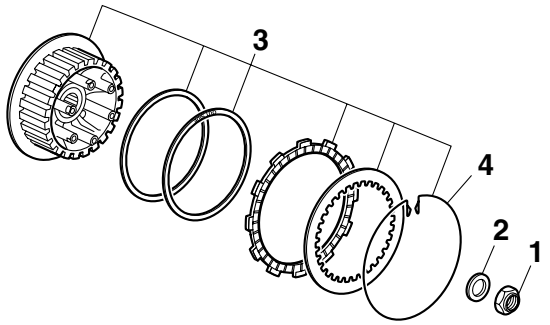
Universal clutch holder
90890-04086
YM-91042



7. Remove:
   • Clutch boss nut “1”
   • Conical spring washer “2”
   • Clutch boss assembly “3”

TIP

There is a built-in damper between the clutch boss and the clutch plate. It is not necessary to remove the wire circlip "4" and disassemble the built-in damper unless there is serious clutch chattering.



EAS25100

CHECKING THE FRICTION PLATES

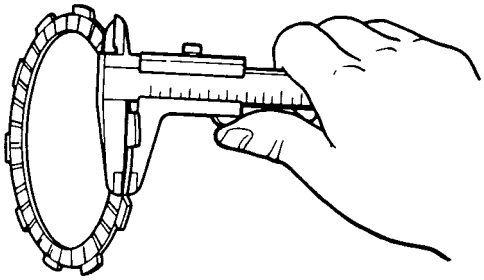
The following procedure applies to all of the friction plates.

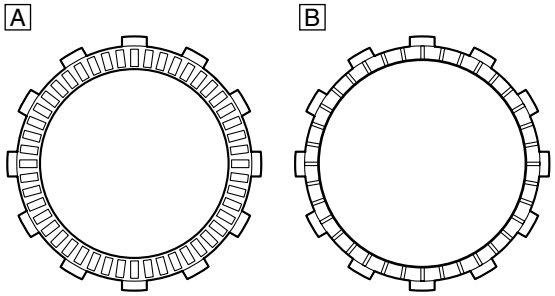
1. Check:
   - Friction plate
     Damage/wear → Replace the friction plates as a set.
2. Measure:
   - Friction plate thickness
     Out of specification → Replace the friction plates as a set.

TIP

Measure the friction plate at four places.

Friction plate 1, 2 thickness
2.92–3.08 mm (0.115–0.121 in)
Wear limit
2.82 mm (0.1110 in)
Friction plate 3 thickness
2.90–3.10 mm (0.144–0.122 in)
Wear limit
2.80 mm (0.1110 in)





A. Friction plate 1, 2
B. Friction plate 3

EAS25111

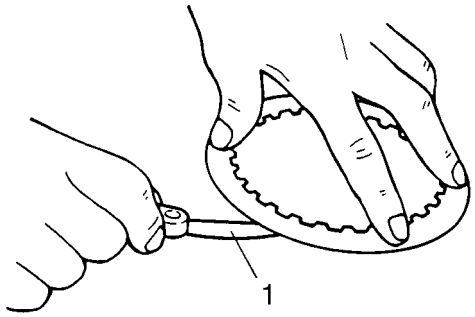
CHECKING THE CLUTCH PLATES

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.

Thickness gauge
90890-03180
Feeler gauge set
YU-26900-9

Clutch plate thickness
1.90–2.10 mm (0.075–0.083 in)
Warpage limit
0.10 mm (0.0039 in)



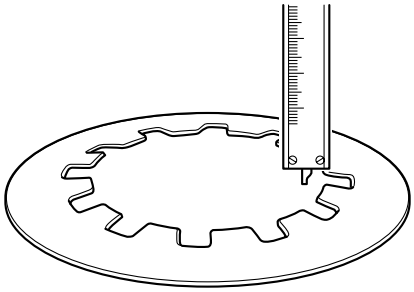
EAS25130

CHECKING THE CLUTCH SPRING PLATE

1. Check:
   - Clutch spring plate retainer
     Damage → Replace.

2. Check:
   • Clutch spring plate seat
   Damage → Replace.
3. Measure:
   • Clutch spring free height
   Out of specification → Replace the clutch spring plate.

Clutch spring height
6.78 mm (0.27 in)
Minimum height
6.44 mm (0.25 in)

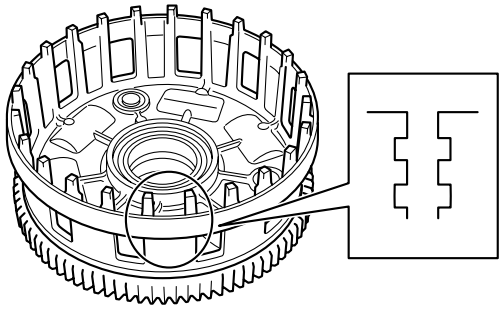


EAS25150
CHECKING THE CLUTCH HOUSING

1. Check:
   • Clutch housing dogs
   Damage/pitting/wear → Deburr the clutch housing dogs or replace the clutch housing.

TIP

Pitting on the clutch housing dogs will cause erratic clutch operation.



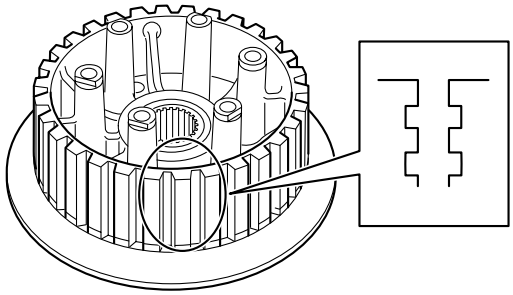
2. Check:
   • Bearing
   Damage/wear → Replace the bearing and clutch housing.

EAS25160
CHECKING THE CLUTCH BOSS

1. Check:
   • Clutch boss splines
   Damage/pitting/wear → Replace the clutch boss.

TIP

Pitting on the clutch boss splines will cause erratic clutch operation.



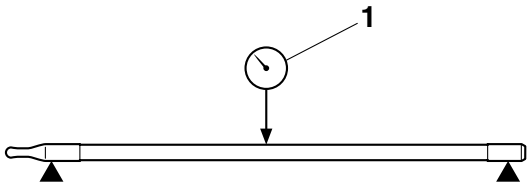
EAS25170
CHECKING THE PRESSURE PLATE

1. Check:
   • Pressure plate
   Cracks/damage → Replace.
   • Bearing
   Damage/wear → Replace.

EAS25191
CHECKING THE CLUTCH PUSH RODS

1. Check:
   • Short clutch push rod
   • Long clutch push rod
   • Ball
   Cracks/damage/wear → Replace the defective part(s).
2. Measure:
   • Long clutch push rod bending limit
   (with a centering device and dial gauge “1”)
   Out of specification → Replace.

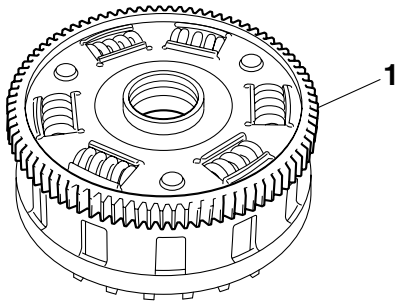
Long clutch push rod bending limit
0.2 mm (0.0079 in)



EAS25210
CHECKING THE PRIMARY DRIVEN GEAR

1. Check:
   • Primary driven gear “1”
   Damage/wear → Replace the primary drive and primary driven gears as a set.

Excessive noise during operation → Replace the clutch housing and crankshaft as a set.

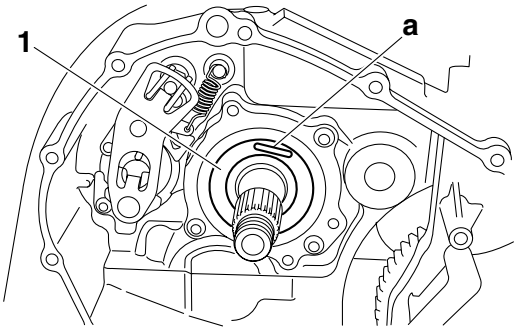


EAS25250
INSTALLING THE CLUTCH

1. Install:
   - Thrust plate “1”
   - Spacer
   - Clutch housing

TIP

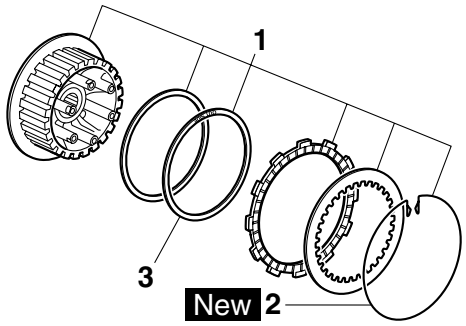
Install the thrust plate “1” with the paint mark “a” facing out.



2. Install:
   - Clutch boss assembly “1”

TIP

- If the wire circlip “2” has been removed, carefully install a new one.
- Install the clutch damper spring “3” with the “OUTSIDE” mark facing out.



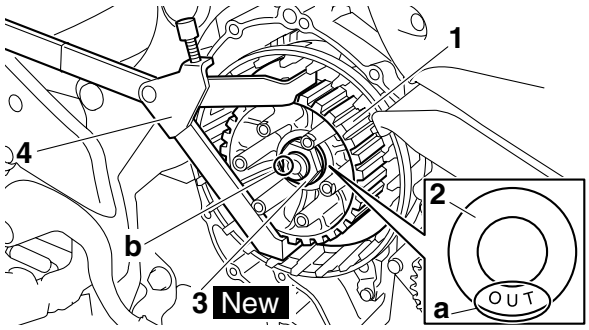
3. Install:
   - Clutch boss assembly “1”
   - Conical spring washer “2”
   - Clutch boss nut “3” New

	Clutch boss nut **125 Nm (12.5 m·kgf, 90 ft·lbf)**

TIP

- Lubricate the conical spring washer and clutch boss nut threads with engine oil.
- Install the conical spring washer “2” with the “OUT” mark “a” facing out.
- While holding the clutch boss with the universal clutch holder “4”, tighten the clutch boss nut.
- Stake the clutch boss nut “3” at cutouts “b” in the main axle.

	Universal clutch holder **90890-04086** **YM-91042**



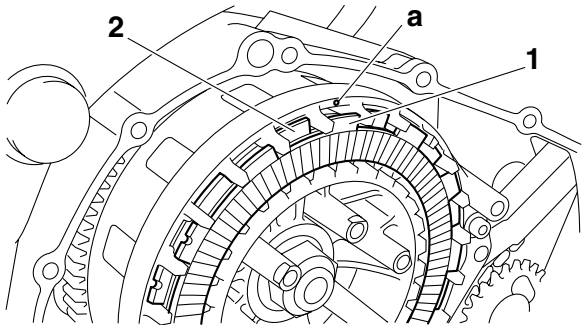
4. Lubricate:
   - Friction plates
   - Clutch plates
   (with the recommended lubricant)

	Recommended lubricant **Engine oil**

5. Install:
   - Friction plates
   - Clutch plates

TIP

- First, install a friction plate and then alternate between a clutch plate and a friction plate.
- Friction plate 1 “1”, which has an identification mark made before removal, must be installed last.
- Offset friction plate 1 “1” from the other friction plates “2”, making sure to align a projection on friction plate 1 with the punch mark “a” on the clutch housing.

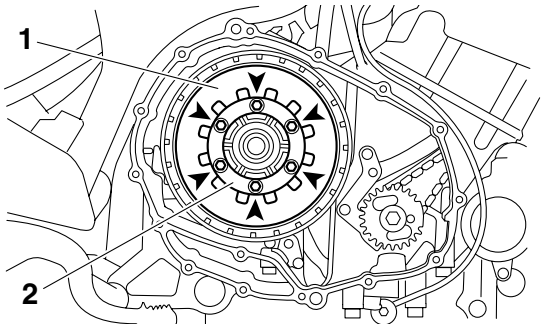


6. Install:
   • Clutch spring plate “1”
   • Clutch spring plate retainer “2”

	Clutch spring plate retainer bolt **8 Nm (0.8 m·kgf, 5.8 ft·lbf)**

TIP

Tighten the clutch spring plate retainer bolts in stages and in a crisscross pattern.

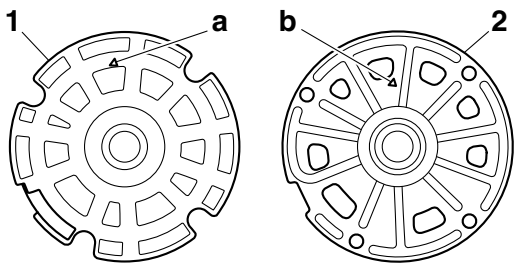


7. Install:
   • Clutch cover damper “1”
   • Clutch cover damper plate “2”

	Clutch cover damper plate bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

TIP

Align the arrow mark “a” on the clutch cover damper with the arrow mark “b” on the clutch cover damper plate.

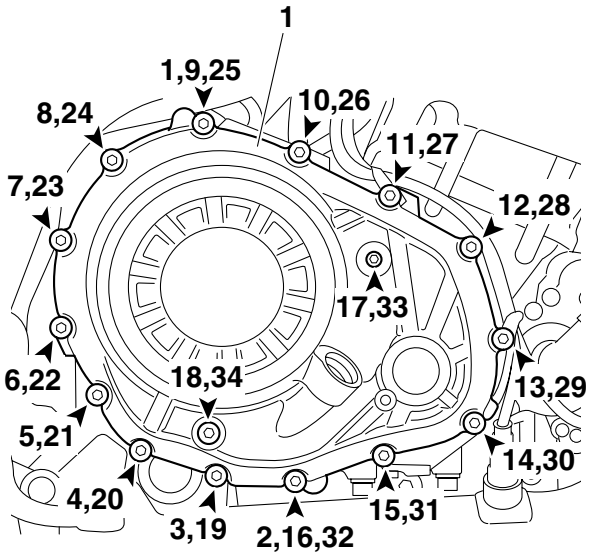


8. Install:
   • Clutch cover “1”

	Clutch cover bolt **12 Nm (1.2 m·kgf, 8.7 ft·lbf)** **LOCTITE®**

TIP

Tighten the clutch cover bolts in the proper tightening sequence as shown.



EAS25280

DISASSEMBLING THE CLUTCH MASTER CYLINDER

ECA13840

NOTICE

- **Clutch components rarely require disassembly.**
- **Therefore, always follow these preventive measures:**
- **Never disassemble clutch components unless absolutely necessary.**
- **If any connection on the hydraulic clutch system is disconnected, the entire clutch system must be disassembled, drained, cleaned, properly filled, and bled after reassembly.**
- **Never use solvents on internal clutch components.**
- **Use only clean or new clutch fluid for cleaning clutch components.**

- **Clutch fluid may damage painted surfaces and plastic parts. Therefore, always clean up any spilt fluid immediately.**
- **Avoid clutch fluid coming into contact with the eyes as it can cause serious injury.**
- **First aid for clutch fluid entering the eyes:**
- **Flush with water for 15 minutes and get immediate medical attention.**

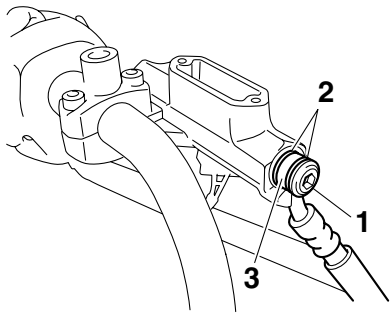
TIP

Before disassembling the clutch master cylinder, drain the clutch fluid from the entire clutch system.

1. Remove:
   - Clutch hose union bolt "1"
   - Clutch hose gaskets "2"
   - Clutch hose "3"

TIP

To collect any remaining clutch fluid, place a container under the master cylinder and the end of the clutch hose.



EAS25290

CHECKING THE CLUTCH MASTER CYLINDER

Recommended clutch component replacement schedule	
Piston seals	Every two years
Clutch hose	Every four years
Clutch fluid	Every two years and whenever the clutch is disassembled

1. Check:
   - Clutch master cylinder body
     Cracks/damage → Replace the clutch master cylinder.
   - Clutch fluid delivery passage
     (clutch master cylinder body)
     Obstruction → Blow out with compressed air.
2. Check:
   - Clutch master cylinder kit
     Rust/scratches/wear → Replace.
3. Check:
   - Clutch master cylinder reservoir
     Cracks/damage → Replace.
   - Clutch master cylinder reservoir diaphragm
     Damage/wear → Replace.
4. Check:
   - Clutch hose
     Cracks/damage/wear → Replace.

EAS25300

ASSEMBLING THE CLUTCH MASTER CYLINDER

EWA13340

WARNING

- **Before installation, all internal clutch components must be cleaned and lubricated with clean or new clutch fluid.**
- **Never use solvents on internal clutch components as they will cause the piston seals to swell and distort.**
- **Whenever a clutch master cylinder is disassembled, replace the piston seals.**

Recommended fluid
DOT 4

EAS25310

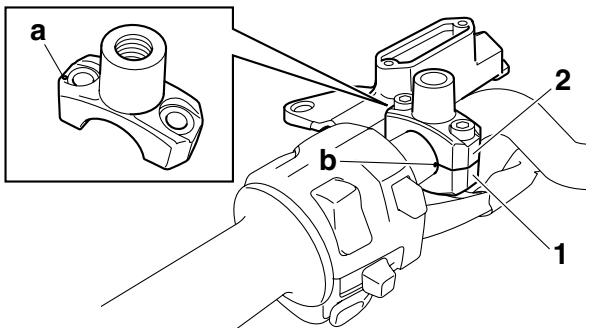
INSTALLING THE CLUTCH MASTER CYLINDER

1. Install:
   - Clutch master cylinder "1"
   - Clutch master cylinder holder "2"

Clutch master cylinder holder bolt
14 Nm (1.4 m·kgf, 10 ft·lbf)

TIP

- The clutch master cylinder holder should be installed with the punch mark "a" forward.
- Align the mating surfaces of the clutch master cylinder holder with the punch mark "b" on the handlebar.
- First, tighten the front bolt, then the rear bolt.



2. Install:
   - Clutch hose gaskets "1" New
   - Clutch hose "2"
   - Clutch hose union bolt "3"

	Clutch hose union bolt **30 Nm (3.0 m·kgf, 22 ft·lbf)**

EWA23P1014

⚠ WARNING

Proper clutch hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

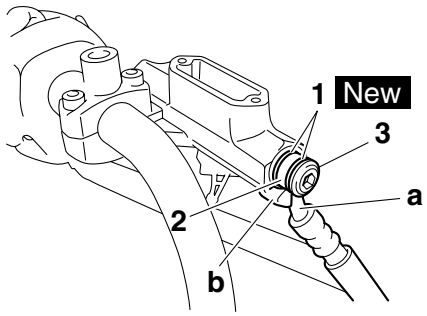
ECA23P1041

NOTICE

When installing the clutch hose onto the clutch master cylinder, make sure the clutch pipe "a" touches the projection "b" as shown.

TIP

Turn the handlebars to the left and to the right to make sure the clutch hose does not touch other parts (e.g., wire harness, cables, leads). Correct if necessary.



3. Fill:
   - Clutch master cylinder reservoir
     (with the specified amount of the recommended clutch fluid)

	Recommended fluid **DOT 4**

EWA13370

⚠ WARNING

- **Use only the designated clutch fluid. Other clutch fluids may cause the rubber seals to deteriorate, causing leakage and poor clutch performance.**
- **Refill with the same type of clutch fluid that is already in the system. Mixing clutch fluids may result in a harmful chemical reaction, leading to poor clutch performance.**
- **When refilling, be careful that water does not enter the clutch fluid reservoir. Water will significantly lower the boiling point of the clutch fluid and could cause vapor lock.**

ECA13420

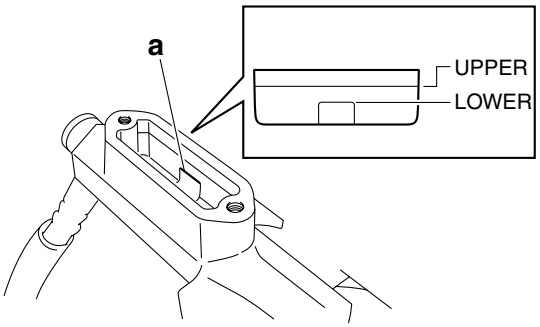
NOTICE

Clutch fluid may damage painted surfaces or plastic parts. Therefore, always clean up any spilt clutch fluid immediately.

TIP

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

4. Bleed:
   - Clutch system
     Refer to "BLEEDING THE HYDRAULIC CLUTCH SYSTEM" on page 3-13.
5. Check:
   - Clutch fluid level
     Below the minimum level mark "a" → Add the recommended clutch fluid to the proper level. Refer to "CHECKING THE CLUTCH FLUID LEVEL" on page 3-13.



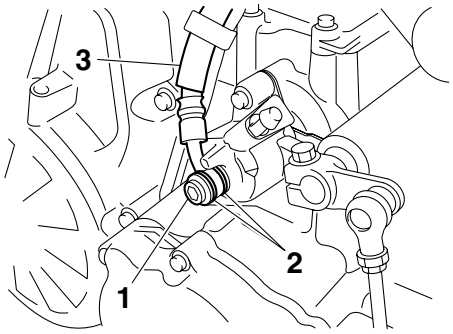
EAS23P1097

REMOVING THE CLUTCH RELEASE CYLINDER

1. Remove:
   - Clutch hose union bolt "1"
   - Clutch hose gaskets "2"
   - Clutch hose "3"

TIP

Put the end of the clutch hose into a container and pump out the clutch fluid carefully.



EAS25340
ASSEMBLING THE CLUTCH RELEASE CYLINDER

EWA23P1044
WARNING

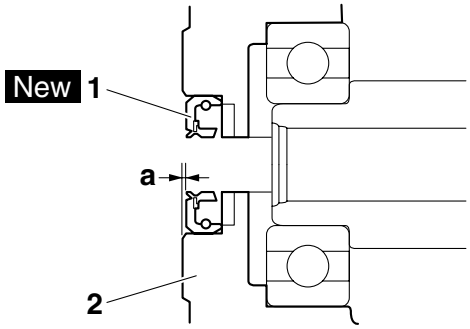
- **Before installation, all internal clutch components must be cleaned and lubricated with clean or new clutch fluid.**
- **Never use solvents on internal clutch components as they will cause the piston seal to swell and distort.**
- **Whenever a clutch release cylinder is disassembled, replace the piston seal.**

Recommended fluid
DOT 4

EAS25350
INSTALLING THE CLUTCH RELEASE CYLINDER

1. Install:
   - Oil seal "1" New
     (to the crankcase)

Installed depth "a"
0–0.5 mm (0–0.02 in)



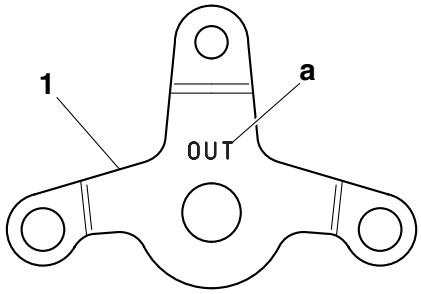
2. Crankcase

2. Install:
   - Clutch release cylinder plate "1"
   - Dowel pins
   - Clutch release cylinder

Clutch release cylinder bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)
LOCTITE®

TIP

Install the clutch release cylinder plate with its "OUT" mark "a" facing out.



3. Check:
   - Clutch hose gaskets "1" New
   - Clutch hose "2"
   - Clutch hose union bolt "3"

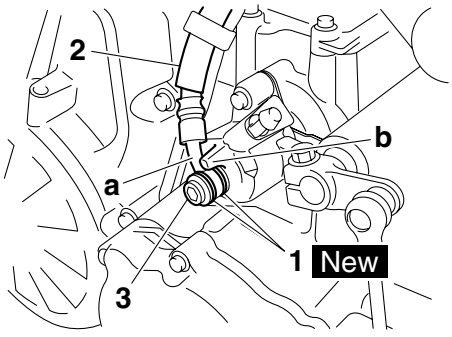
Clutch hose union bolt
30 Nm (3.0 m·kgf, 22 ft·lbf)

EWA23P1014
WARNING

Proper clutch hose routing is essential to insure safe vehicle operation. Refer to "CABLE ROUTING" on page 2-43.

ECA23P1042
NOTICE

When installing the clutch hose onto the clutch release cylinder, make sure the pipe "a" touches the projection "b" on the clutch release cylinder body.



4. Fill:
   • Clutch master cylinder reservoir
   (with the specified amount of the recommended clutch fluid)

Recommended fluid
DOT 4

EWA13370

⚠ WARNING

- **Use only the designated clutch fluid. Other clutch fluids may cause the rubber seals to deteriorate, causing leakage and poor clutch performance.**
- **Refill with the same type of clutch fluid that is already in the system. Mixing clutch fluids may result in a harmful chemical reaction, leading to poor clutch performance.**
- **When refilling, be careful that water does not enter the clutch fluid reservoir. Water will significantly lower the boiling point of the clutch fluid and could cause vapor lock.**

ECA13420

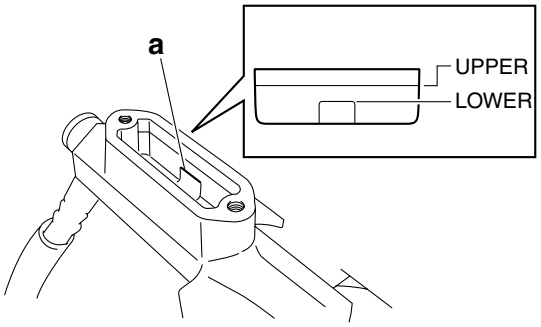
NOTICE

Clutch fluid may damage painted surfaces or plastic parts. Therefore, always clean up any spilt clutch fluid immediately.

TIP

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

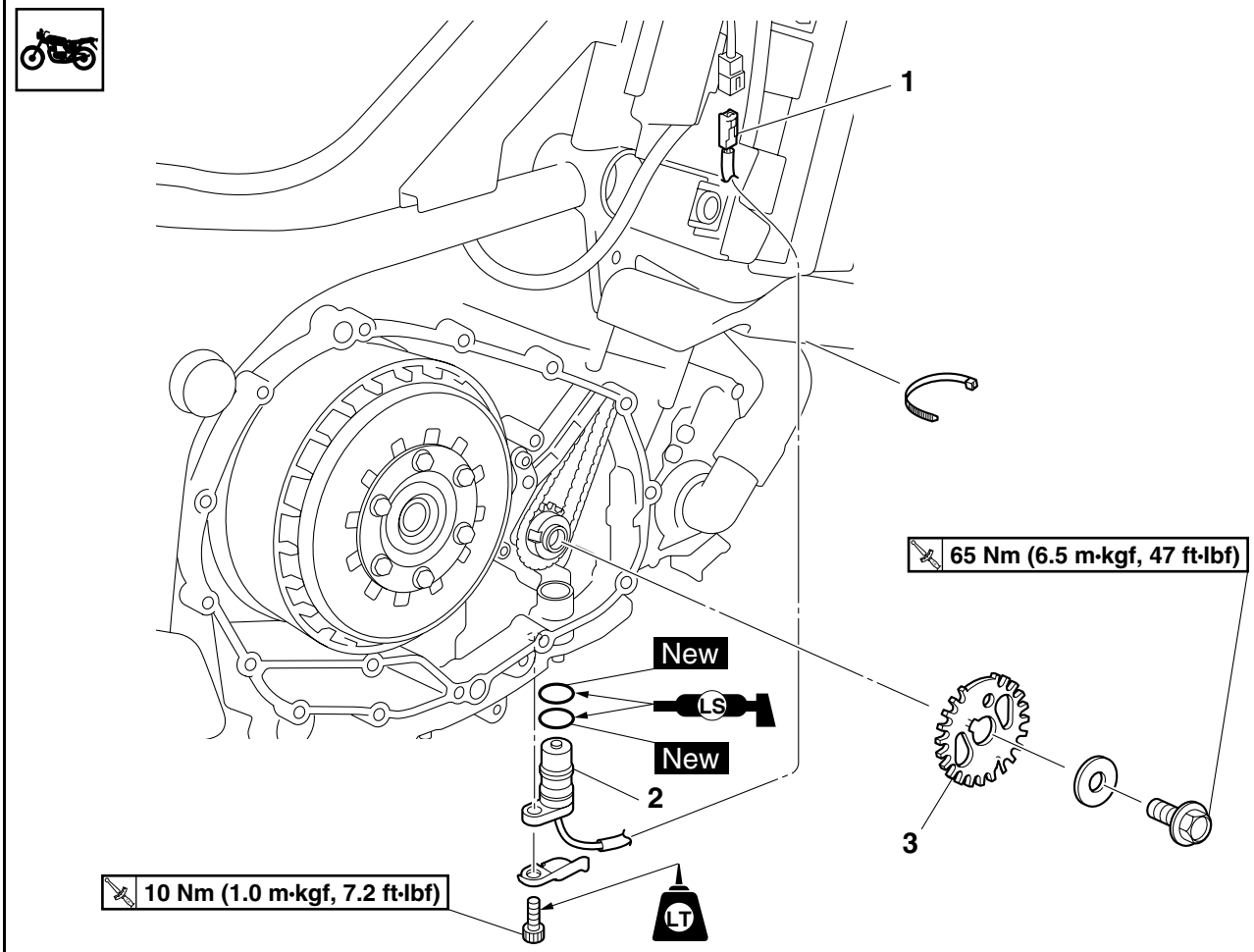
5. Bleed:
   • Clutch system
   Refer to "BLEEDING THE HYDRAULIC CLUTCH SYSTEM" on page 3-13.
6. Check:
   • Clutch fluid level
   Below the minimum level mark "a" → Add the recommended clutch fluid to the proper level.
   Refer to "CHECKING THE CLUTCH FLUID LEVEL" on page 3-13.



7. Check:
   • Clutch lever operation
   Soft or spongy feeling → Bleed the clutch system.
   Refer to "BLEEDING THE HYDRAULIC CLUTCH SYSTEM" on page 3-13.

EAS24520
PICKUP ROTOR

Removing the pickup rotor



Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" on page 3-25.
	Right side cowling		Refer to "GENERAL CHASSIS" on page 4-1.
	Exhaust pipe		Refer to "ENGINE REMOVAL" on page 5-3.
	Generator cover		Refer to "GENERATOR AND STARTER CLUTCH" on page 5-43.
	Clutch cover		Refer to "CLUTCH" on page 5-52.
1	Crankshaft position sensor coupler	1	Disconnect.
2	Crankshaft position sensor	1	
3	Pickup rotor	1	
			For installation, reverse the removal procedure.

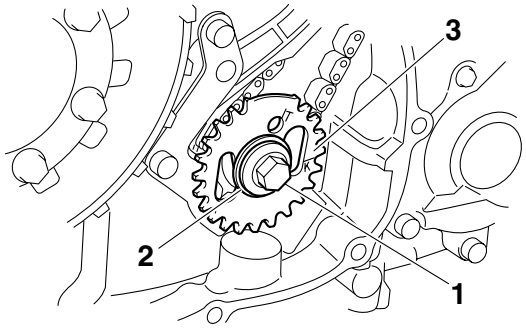
EAS24530
REMOVING THE PICKUP ROTOR

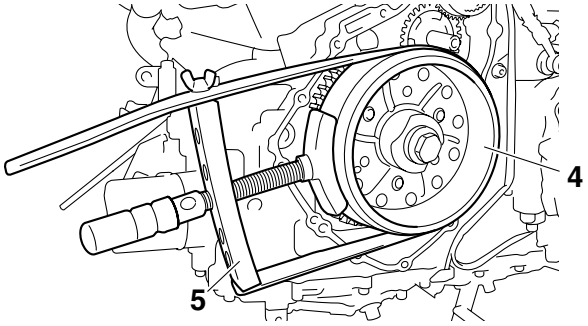
1. Remove:
   - Pickup rotor bolt “1”
   - Washer “2”
   - Pickup rotor “3”

TIP

While holding the generator rotor “4” with the sheave holder “5”, loosen the pickup rotor bolt.

Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



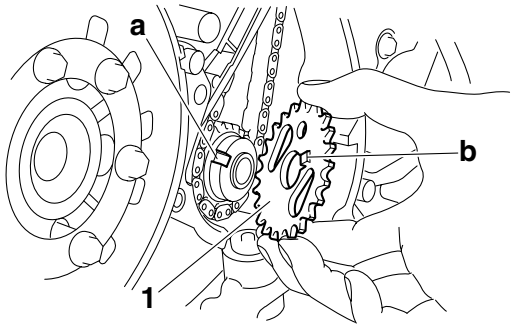


EAS24540
INSTALLING THE PICKUP ROTOR

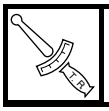
1. Install:
   - Pickup rotor “1”
   - Washer
   - Pickup rotor bolt

TIP

- When installing the pickup rotor, align the groove “a” in the crankshaft sprocket with the projection “b” on the pickup rotor.
- Install the pickup rotor with “K” mark facing out.



2. Tighten:
   - Pickup rotor bolt “1”

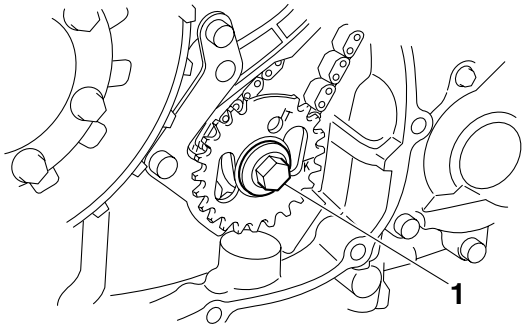


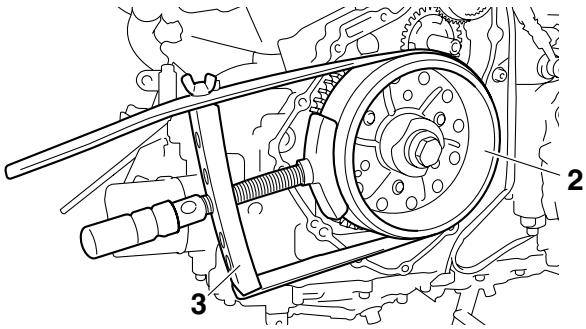
Pickup rotor bolt
65 Nm (6.5 m·kgf, 47 ft·lbf)

TIP

While holding the generator rotor “2” with the sheave holder “3”, tighten the pickup rotor bolt.

Sheave holder
90890-01701
Primary clutch holder
YS-01880-A



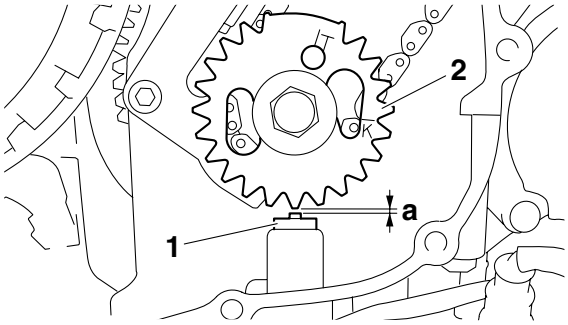


3. Install:
   - O-rings New
   - Crankshaft position sensor
   - Crankshaft position sensor holder

Crankshaft position sensor holder bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)
LOCTITE®

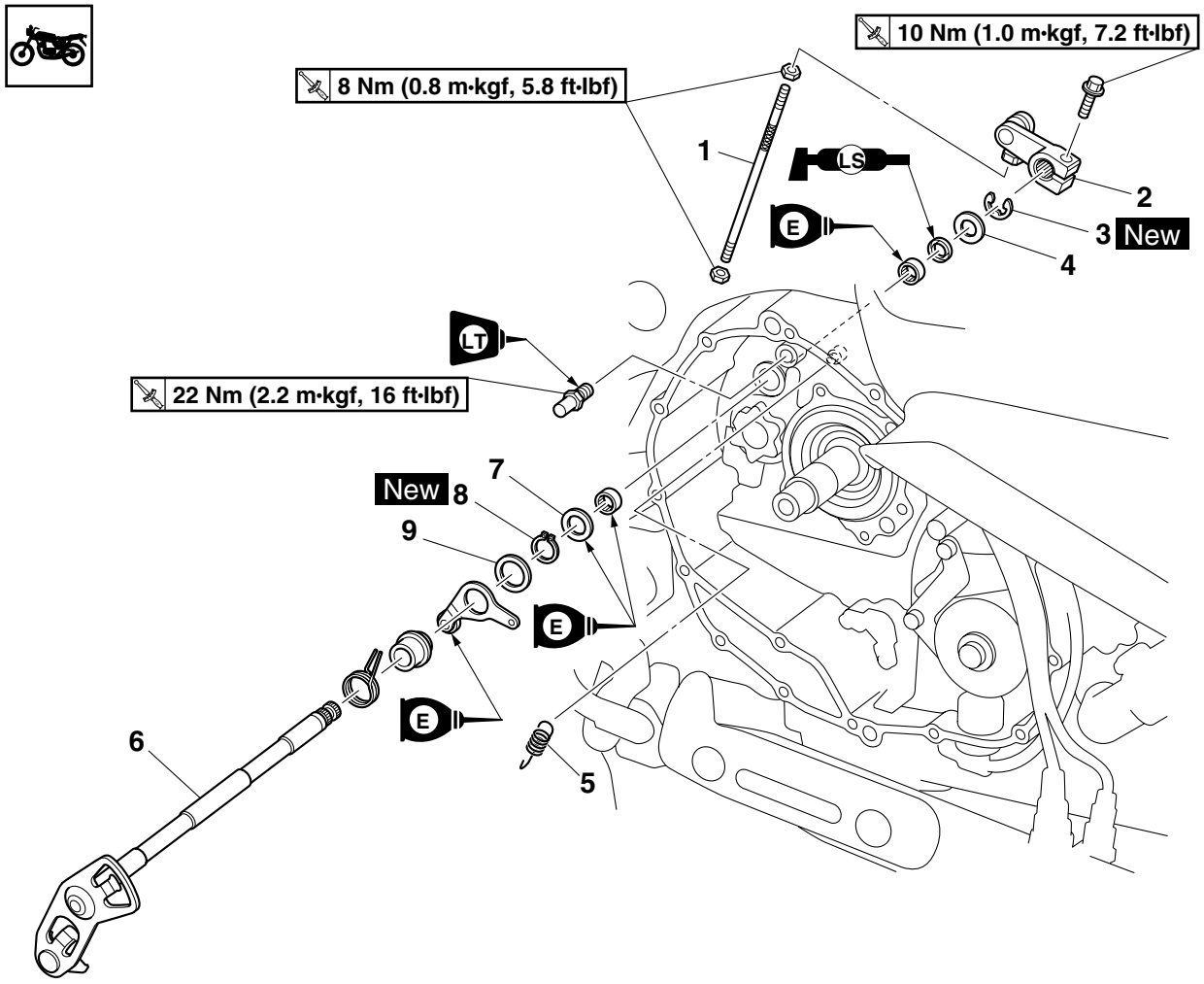
4. Measure:
   • Gap (between the crankshaft position sensor "1" and pickup rotor "2") "a"
   Out of specification → Reinstall or replace.

Gap (between the crankshaft position sensor and pickup rotor)
1.0 mm (0.04 in)



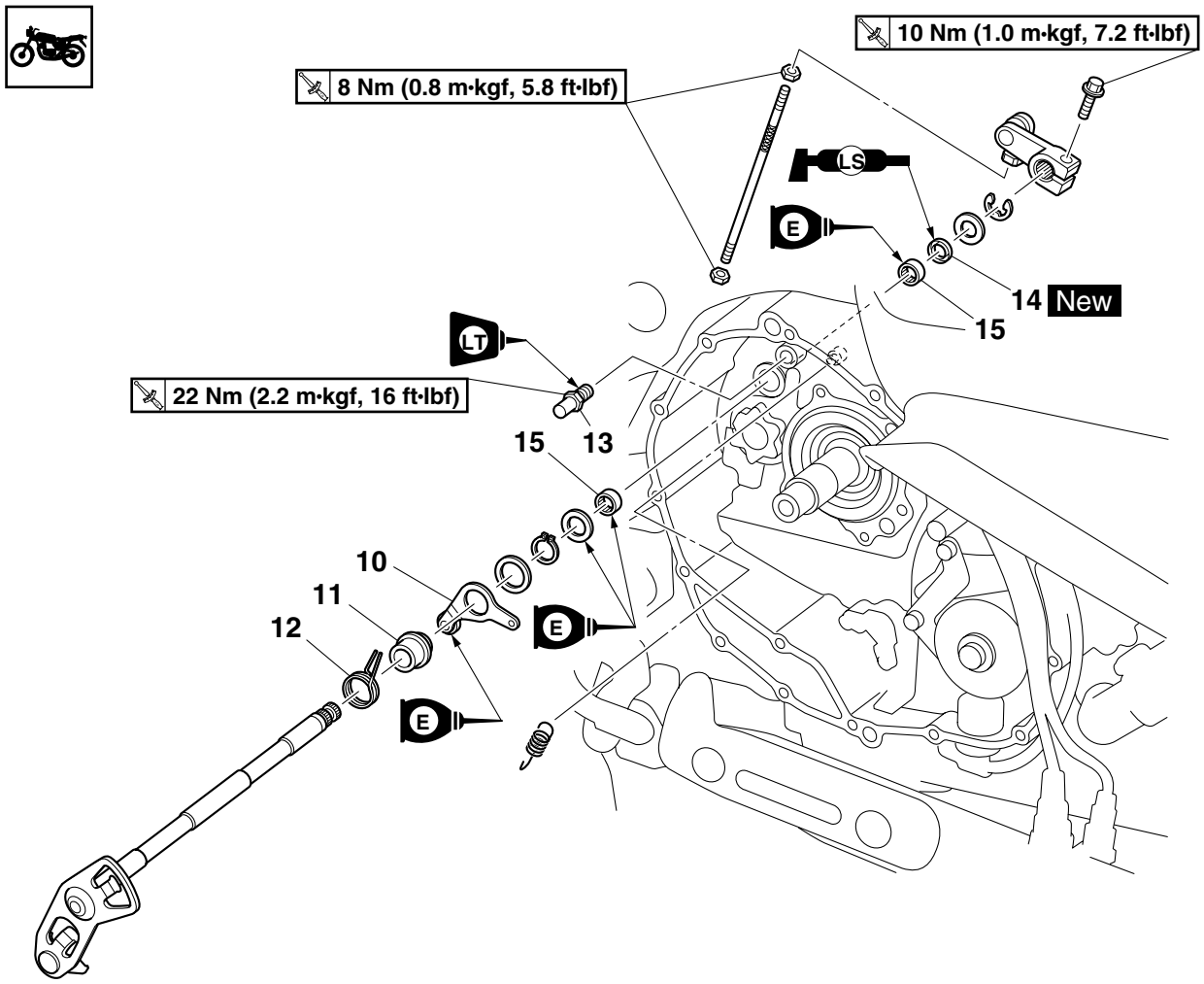
EAS25410
SHIFT SHAFT

Removing the shift shaft and stopper lever



Order	Job/Parts to remove	Q'ty	Remarks
	Clutch housing		Refer to "CLUTCH" on page 5-52.
1	Shift rod	1	**TIP** The shift rod locknut (shift pedal side) has left-hand threads.
2	Shift arm	1	
3	Circlip	1	
4	Washer	1	
5	Stopper lever spring	1	
6	Shift shaft	1	
7	Washer	1	
8	Circlip	1	
9	Washer	1	

Removing the shift shaft and stopper lever



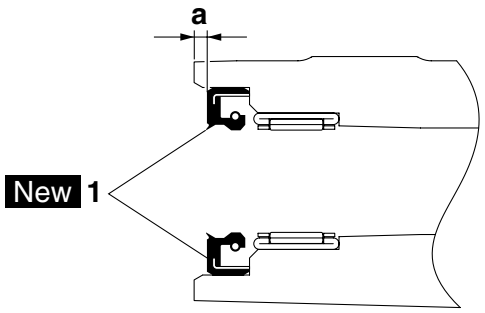
Order	Job/Parts to remove	Q'ty	Remarks
10	Stopper lever	1	
11	Spacer	1	
12	Shift shaft spring	1	
13	Shift shaft spring stopper	1	
14	Oil seal	1	
15	Bearing	2	
			For installation, reverse the removal procedure.

EAS25420
CHECKING THE SHIFT SHAFT
1. Check:
   - Shift shaft
     Bends/damage/wear → Replace.
   - Shift shaft spring
     Damage/wear → Replace.

EAS25430
CHECKING THE STOPPER LEVER
1. Check:
   - Stopper lever
     Bends/damage → Replace.
     Roller turns roughly → Replace the stopper lever.
   - Stopper lever spring
     Damage/wear → Replace.

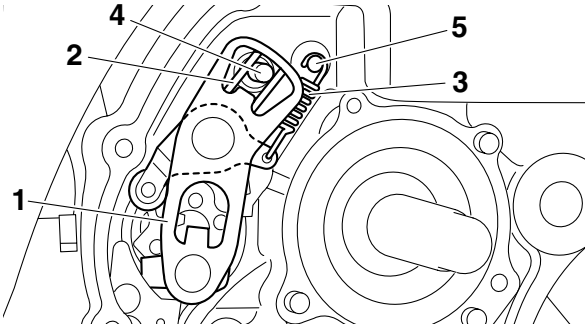
EAS25451
INSTALLING THE SHIFT SHAFT
1. Install:
   - Oil seal “1” New
     (to the upper crankcase)

	Installed depth “a” **0.6–1.1 mm (0.024–0.043 in)**



2. Install:
   - Shift shaft “1”
   - Shift shaft spring “2”
   - Stopper lever spring “3”

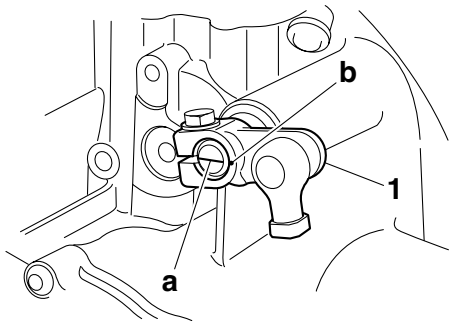
TIP
- Hook the end of the shift shaft spring onto the shift shaft spring stopper “4”.
- Hook the ends of the stopper lever spring onto the stopper lever and the crankcase boss “5”.
- Mesh the stopper lever with the shift drum segment assembly.



3. Install:
   - Shift arm “1”

	Shift arm bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

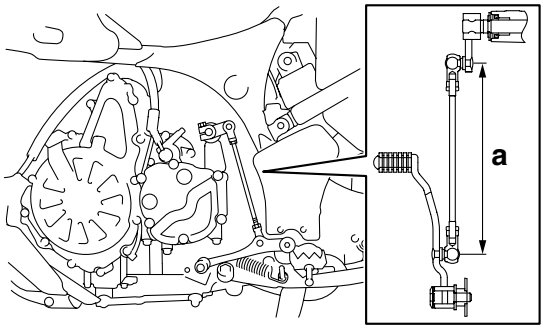
TIP
Align the match mark “a” in the shift shaft with the punch mark “b” in the shift arm.



EAS21380
ADJUSTING THE SHIFT PEDAL
TIP
The shift pedal position is determined by the installed shift rod length.

1. Measure:
   - Installed shift rod length “a”
     Incorrect → Adjust.

	Installed shift rod length **176.0–178.0 mm (6.93–7.01 in)**



2. Adjust:
   • Installed shift rod length

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Loosen both locknuts “1”.

ECA23P1088

NOTICE

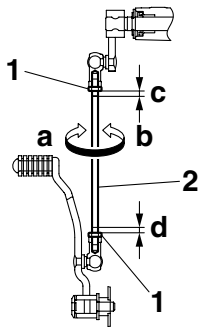
The shift rod locknut (shift pedal side) has left-hand threads.

b. Turn the shift rod “2” in direction “a” or “b” until the specified installed shift rod length is obtained.

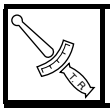
Direction “a”
Installed shift rod length increases.
Direction “b”
Installed shift rod length decreases.

TIP

Make sure that the distances “c” and “d” are equal.



c. Tighten both locknuts to specification.



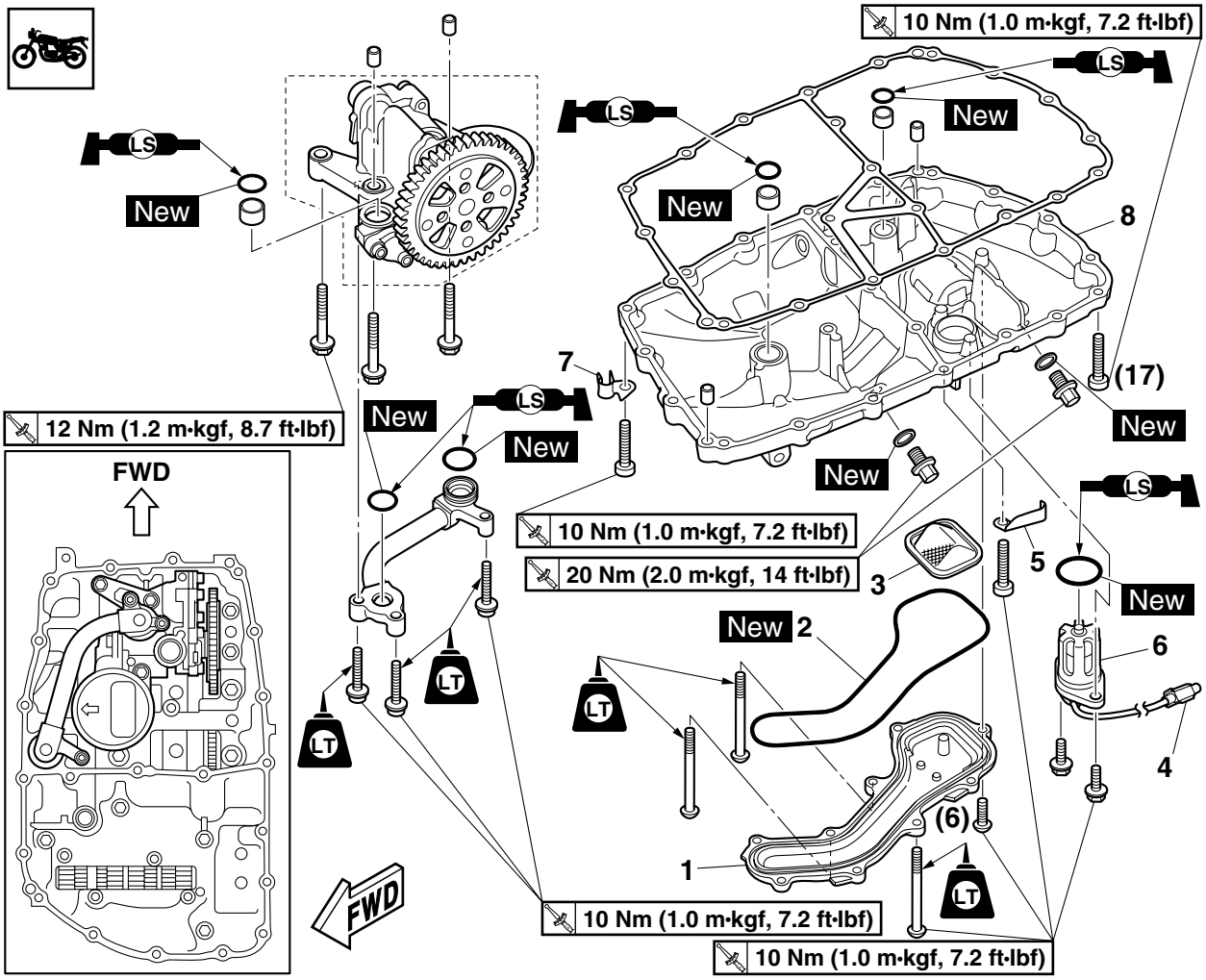
Locknut
8 Nm (0.8 m·kgf, 5.8 ft·lbf)

d. Make sure the installed shift rod length is within specification.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

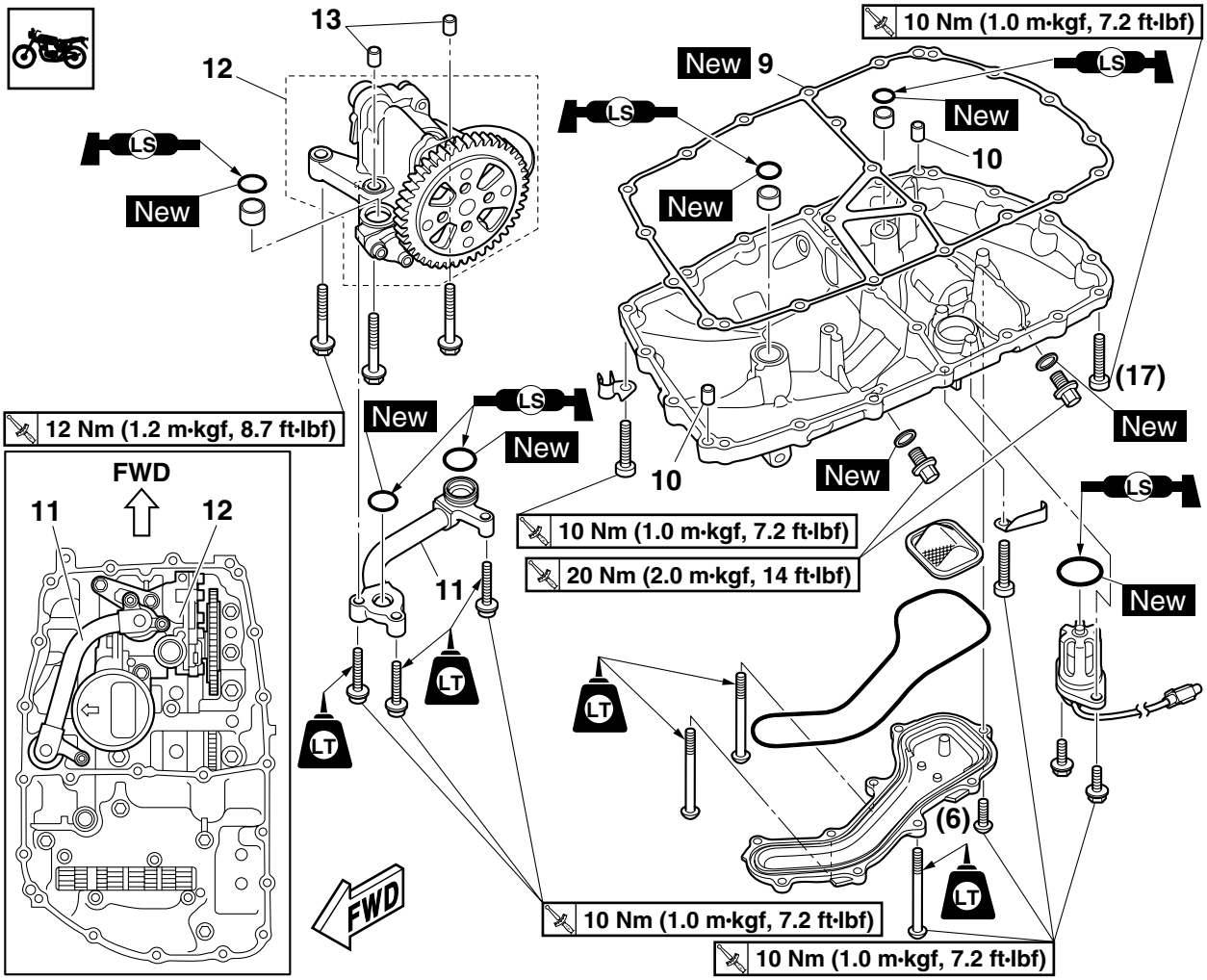
EAS24921
OIL PUMP

Removing the oil pan and oil pump assembly



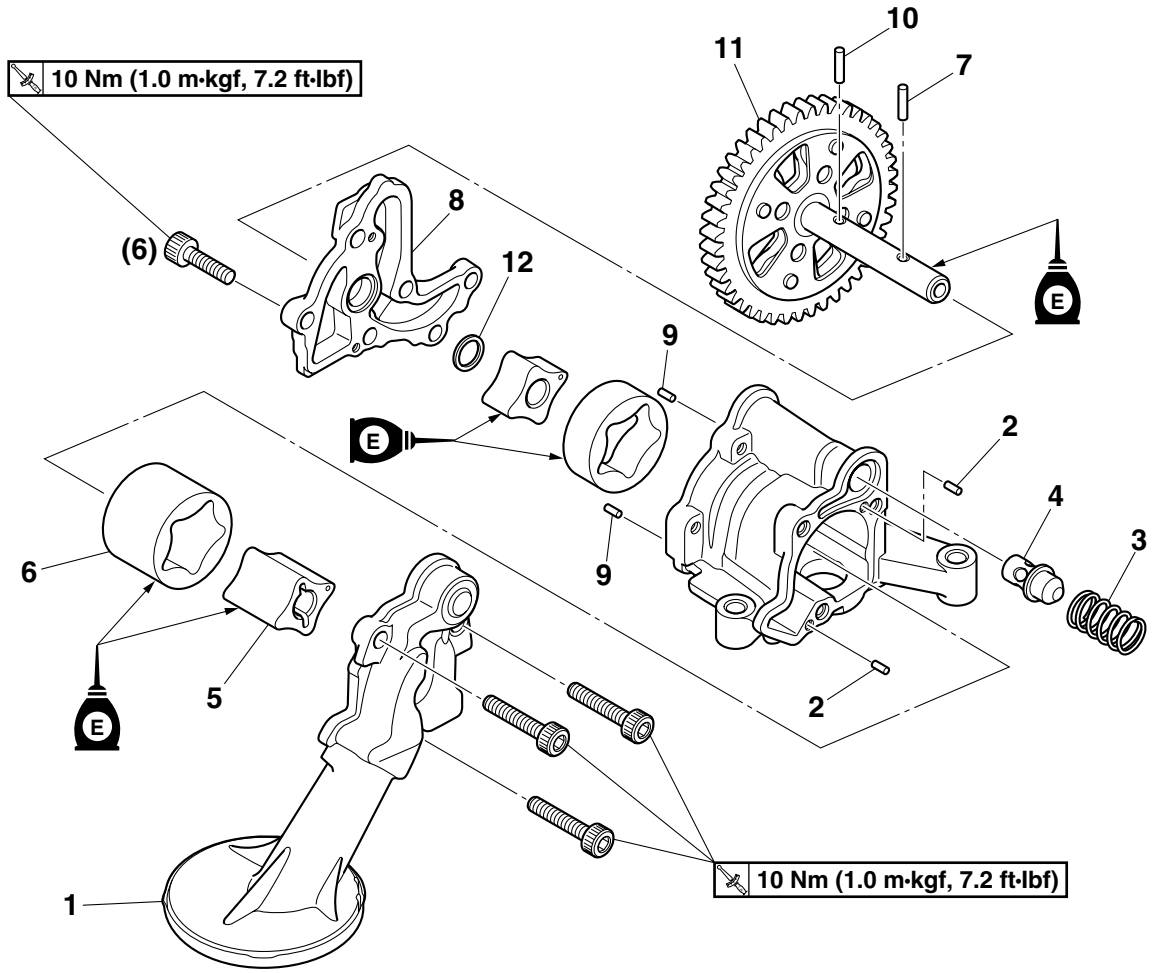
Order	Job/Parts to remove	Q'ty	Remarks
	Engine oil		Refer to "CHANGING THE ENGINE OIL" on page 3-25.
	Engine guard		Refer to "GENERAL CHASSIS" on page 4-1.
1	Oil strainer cover	1	
2	Oil strainer cover gasket	1	
3	Oil strainer (oil pan)	1	
4	Oil level switch coupler	1	Disconnect.
5	Oil level switch lead holder	1	
6	Oil level switch	1	
7	Water pump breather hose holder	1	
8	Oil pan	1	

Removing the oil pan and oil pump assembly



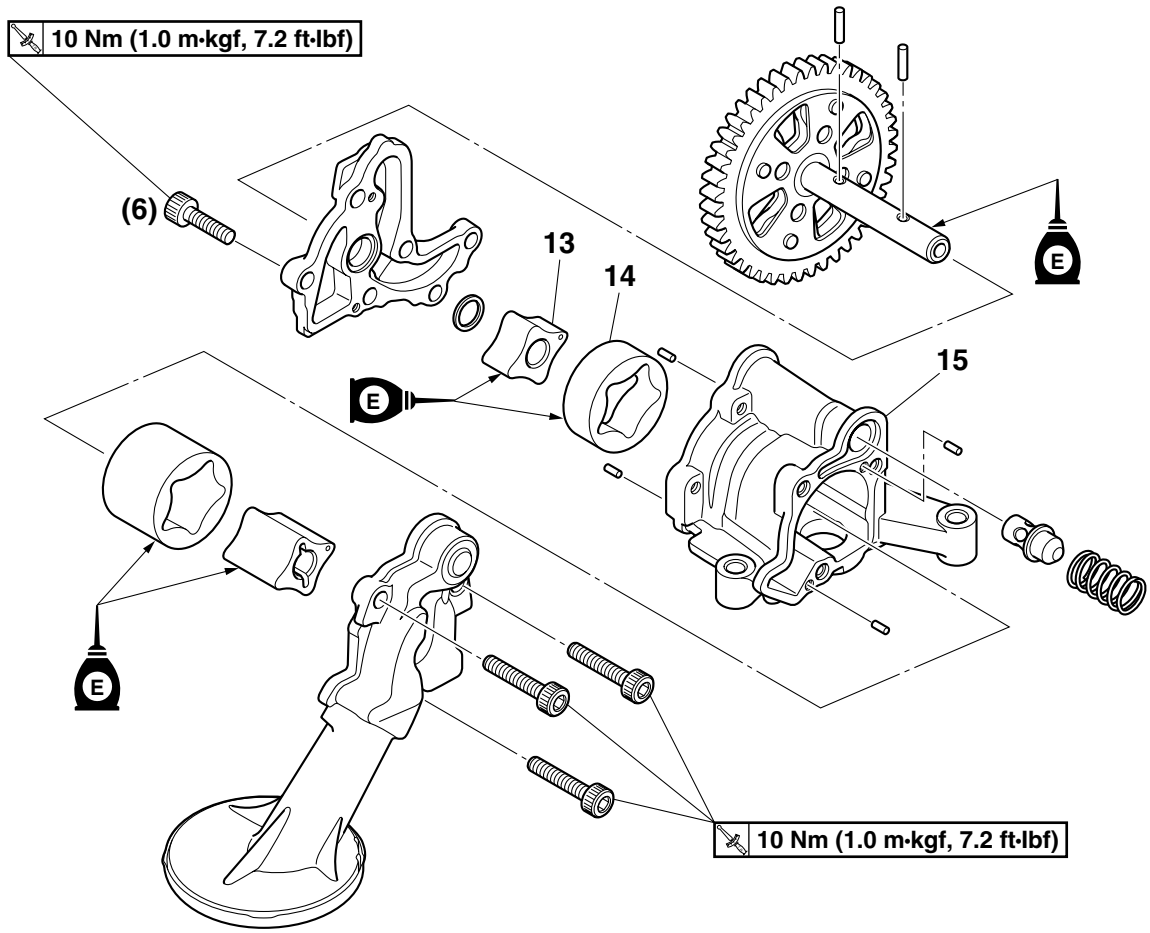
Order	Job/Parts to remove	Q'ty	Remarks
9	Oil pan gasket	1	
10	Dowel pin	2	
11	Oil pipe	1	
12	Oil pump assembly	1	
13	Dowel pin	2	
			For installation, reverse the removal procedure.

Disassembling the oil pump



Order	Job/Parts to remove	Q'ty	Remarks
1	Oil strainer (oil pump)	1	
2	Pin	2	
3	Spring	1	
4	Relief valve	1	
5	Oil pump inner rotor 1	1	
6	Oil pump outer rotor 1	1	
7	Pin	1	
8	Oil pump housing cover	1	
9	Pin	2	
10	Pin	1	
11	Oil pump driven gear	1	
12	Washer	1	

Disassembling the oil pump



Order	Job/Parts to remove	Q'ty	Remarks
13	Oil pump inner rotor 2	1	
14	Oil pump outer rotor 2	1	
15	Oil pump housing	1	
			For assembly, reverse the disassembly procedure.

EAS24930
REMOVING THE OIL PAN AND OIL STRAINER COVER

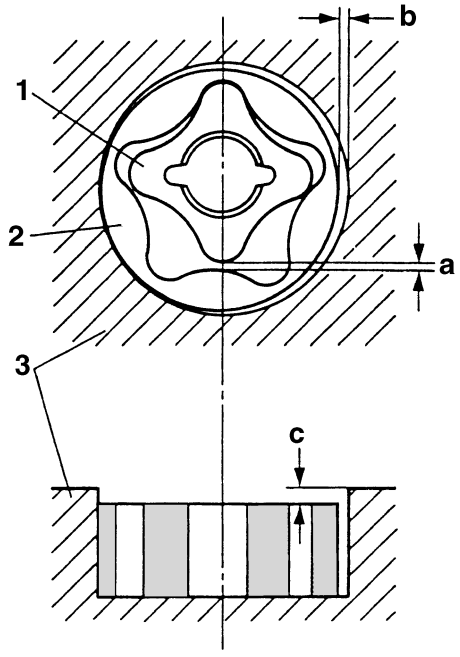
1. Remove:
   - Oil strainer cover
   - Oil strainer (oil pan)
   - Oil pan
   - Gaskets
   - Dowel pins

TIP

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.

EAS24960
CHECKING THE OIL PUMP

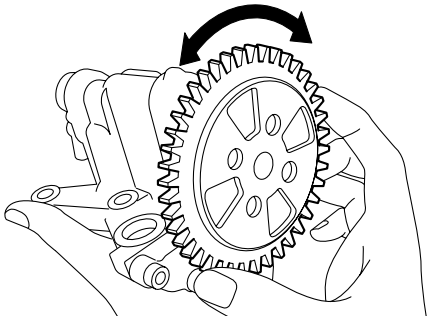
1. Check:
   - Oil pump driven gear
   - Oil pump housing
   - Oil pump housing cover
   Cracks/damage/wear → Replace the oil pump assembly.
2. Measure:
   - Inner-rotor-to-outer-rotor-tip clearance “a”
   - Outer-rotor-to-oil-pump-housing clearance “b”
   - Oil-pump-housing-to-inner-rotor-and-outer-rotor clearance “c”
   Out of specification → Replace the oil pump assembly.



1. Inner rotor
2. Outer rotor
3. Oil pump housing

Inner-rotor-to-outer-rotor-tip clearance
Less than 0.120 mm (0.0047 in)
Limit
0.20 mm (0.0079 in)
Outer-rotor-to-oil-pump-housing clearance
0.09–0.19 mm (0.0035–0.0075 in)
Limit
0.26 mm (0.0102 in)
Oil-pump-housing-to-inner-and-outer-rotor clearance (oil feed pump)
0.03–0.08 mm (0.0012–0.0032 in)
Limit
0.15 mm (0.0059 in)
Oil-pump-housing-to-inner-and-outer-rotor clearance (scavenging pump)
0.06–0.13 mm (0.0024–0.0051 in)
Limit
0.20 mm (0.0079 in)

3. Check:
   - Oil pump operation
   Rough movement → Repeat steps (1) and (2) or replace the defective part(s).



EAS24971
CHECKING THE RELIEF VALVE

1. Check:
   - Relief valve
   - Spring
   Damage/wear → Replace the oil pump assembly.

EAS24980
CHECKING THE OIL PIPE

1. Check:
   - Oil pipe
   Damage → Replace.
   Obstruction → Wash and blow out with compressed air.

EAS24990
CHECKING THE OIL STRAINER
1. Check:
   - Oil strainer (oil pan)
     Damage → Replace.
     Contaminants → Clean with solvent.
   - Oil strainer (oil pump)
     Damage → Replace the oil pump assembly.
     Contaminants → Clean with solvent.

EAS25010
ASSEMBLING THE OIL PUMP
1. Lubricate:
   - Inner rotors
   - Outer rotors
   - Oil pump driven gear
     (with the recommended lubricant)

	Recommended lubricant **Engine oil**

2. Install:
   - Oil pump driven gear
   - Pins
   - Oil pump outer rotors
   - Oil pump inner rotors

TIP

When installing the inner rotors, align the pins in the oil pump driven gear with the groove in the inner rotors.

3. Check:
   - Oil pump operation
     Refer to "CHECKING THE OIL PUMP" on page 5-80.

EAS25050
INSTALLING THE OIL PAN
1. Install:
   - Dowel pins
   - Gasket New
   - Oil pan

	Oil pan bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

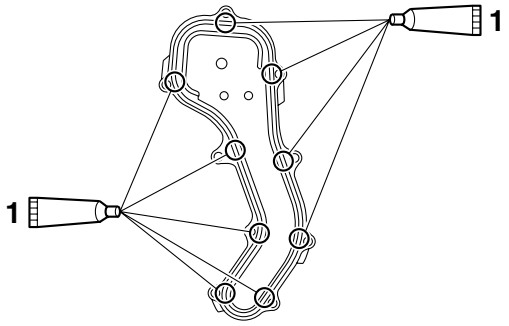
TIP

Tighten the oil pan bolts in stages and in a crisscross pattern.

EAS23P1031
INSTALLING THE OIL STRAINER COVER
1. Apply:
   - Sealant
     (on to the oil strainer cover and oil strainer cover gasket)

TIP

Apply Three Bond No.1541C® "1" onto the mating surfaces of the oil strainer cover and oil strainer cover gasket.

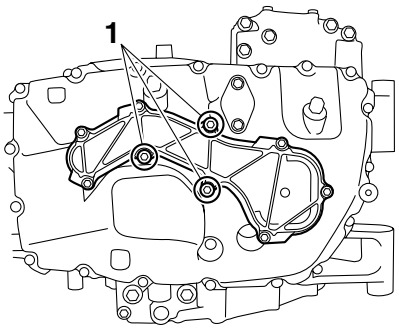


2. Install:
   - Oil strainer (oil pan)
   - Oil strainer cover gasket New
   - Oil strainer cover

	Oil strainer cover bolt **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

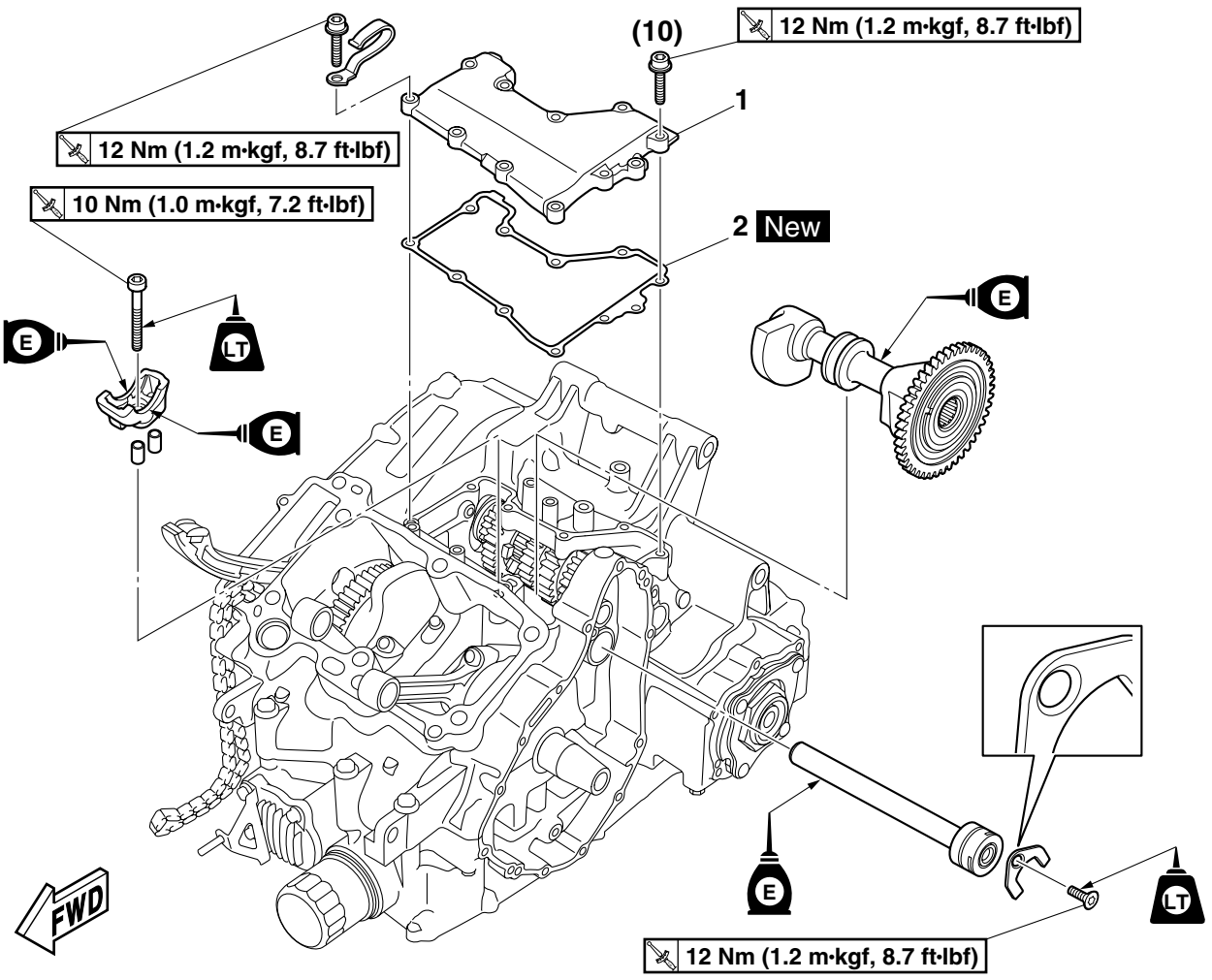
TIP

- Apply locking agent (LOCTITE®) to the threads of bolts "1".
- Tighten the oil strainer cover bolts in stages and in a crisscross pattern.



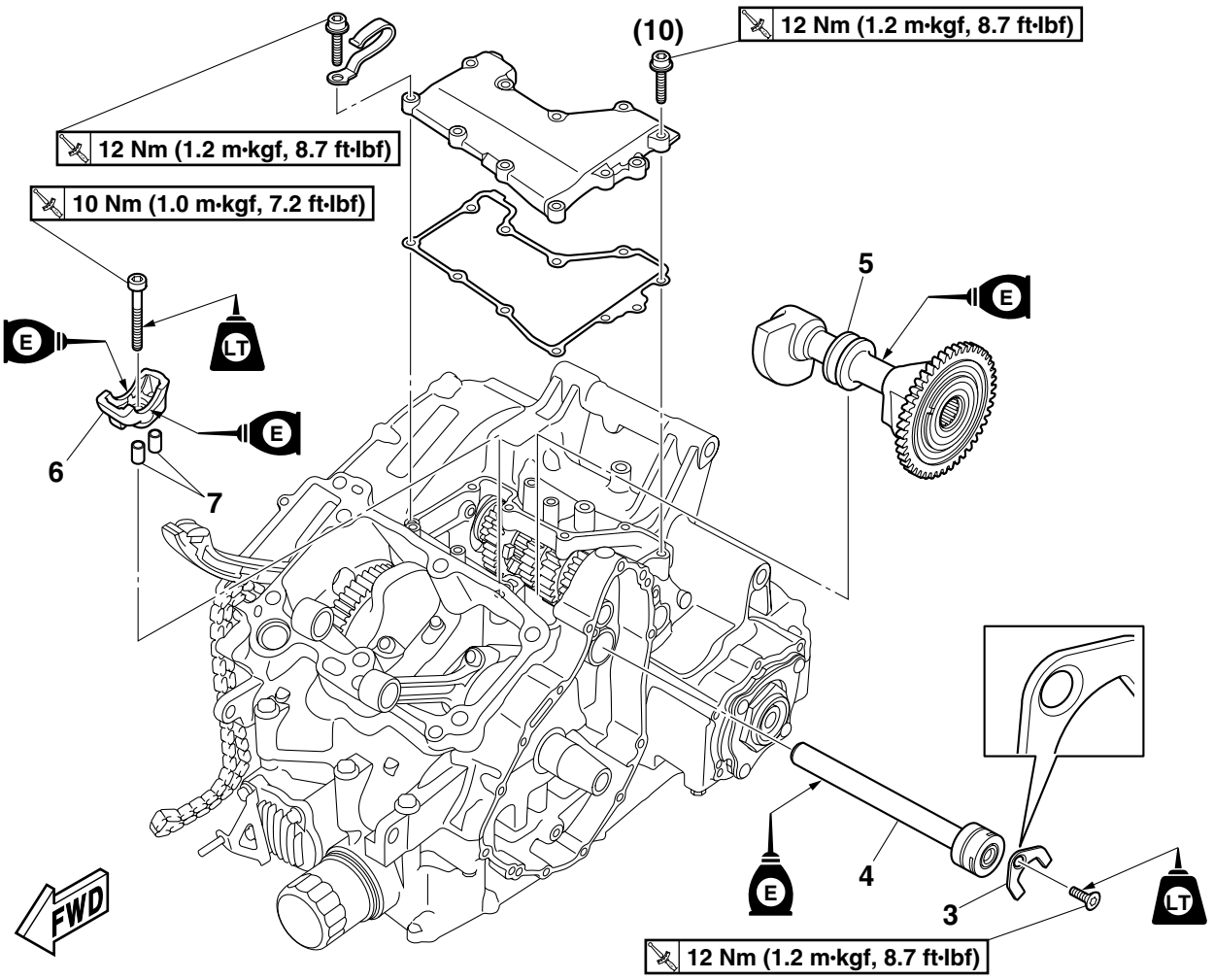
EAS25540
CRANKCASE

Removing the rear balancer



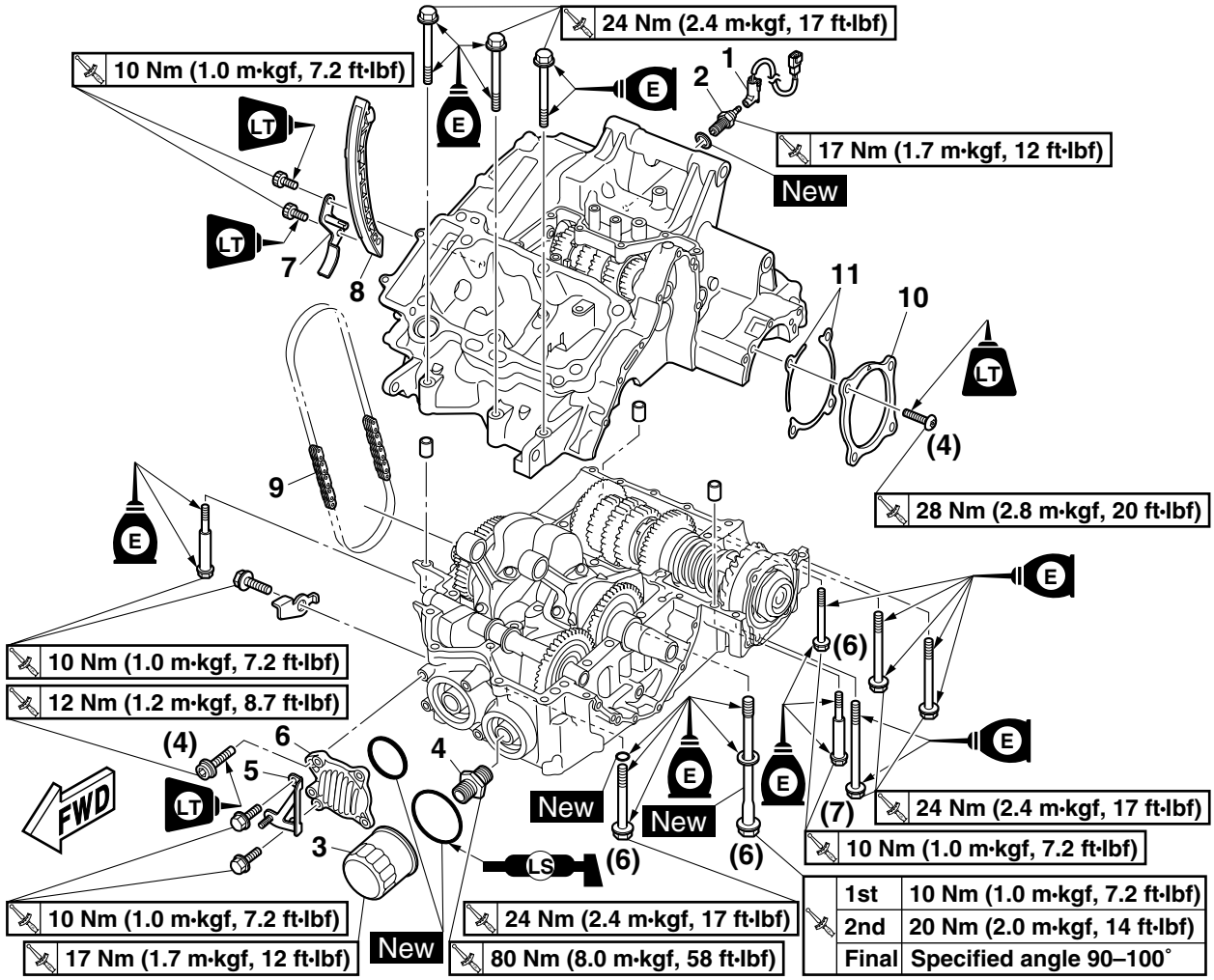
Order	Job/Parts to remove	Q'ty	Remarks
	Engine		Refer to "ENGINE REMOVAL" on page 5-3.
	Pistons		Refer to "CYLINDER AND PISTONS" on page 5-37.
	Starter clutch		Refer to "GENERATOR AND STARTER CLUTCH" on page 5-43.
	Pickup rotor		Refer to "PICKUP ROTOR" on page 5-69.
	Starter motor assembly		Refer to "ELECTRIC STARTER" on page 5-48.
	Oil pump assembly		Refer to "OIL PUMP" on page 5-76.
	Clutch housing/Clutch release cylinder		Refer to "CLUTCH" on page 5-52.
	Middle driven pinion gear assembly		Refer to "MIDDLE GEAR" on page 5-113.
	Water pump assembly		Refer to "WATER PUMP" on page 6-6.
1	Rear balancer cover	1	
2	Rear balancer cover gasket	1	

Removing the rear balancer



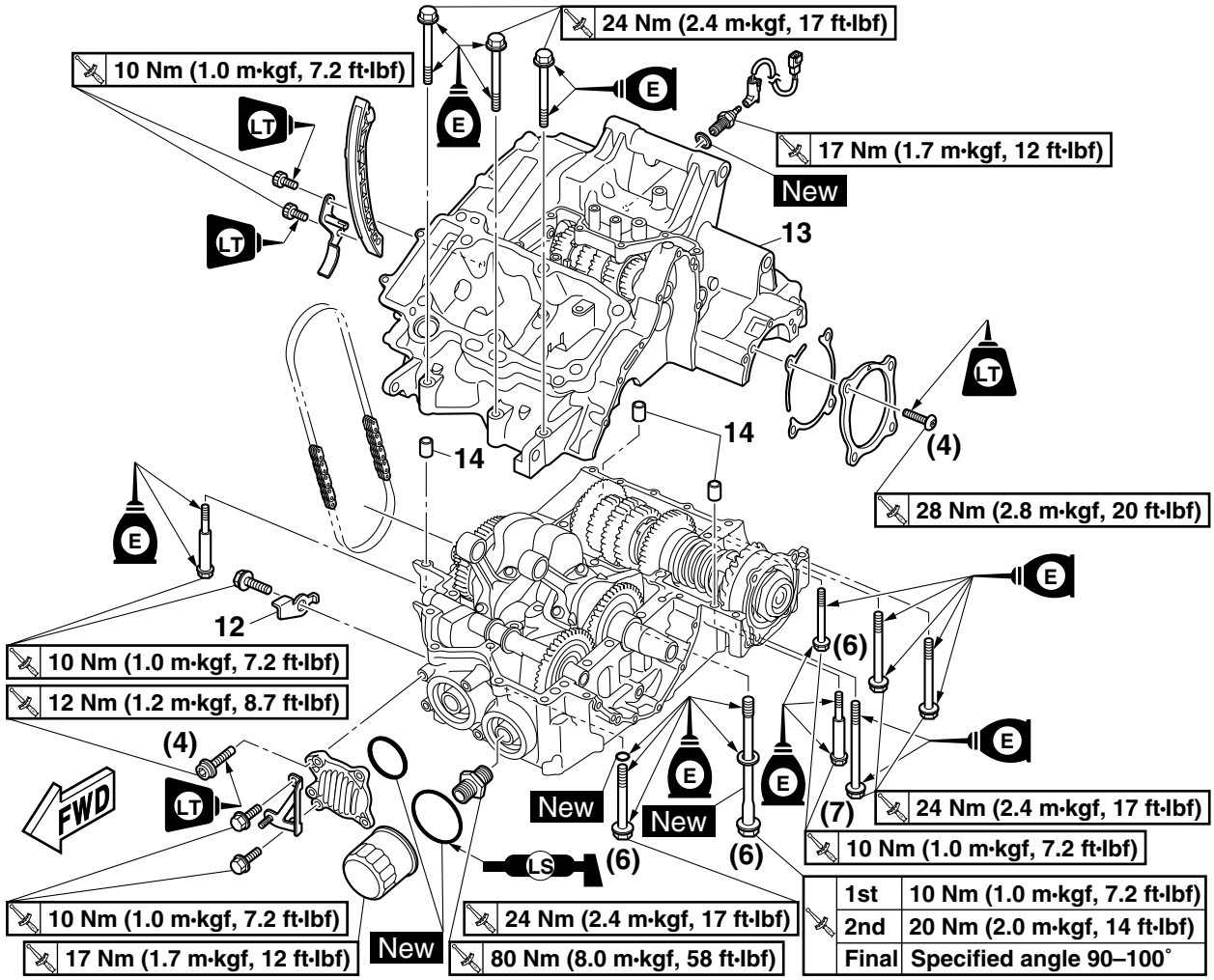
Order	Job/Parts to remove	Q'ty	Remarks
3	Rear balancer shaft retainer	1	
4	Rear balancer shaft	1	
5	Rear balancer	1	ECA23P1075 ***NOTICE*** **The rear balancer should not be disassembled.**
6	Rear balancer holder	1	
7	Dowel pin	2	
			For installation, reverse the removal procedure.

Separating the crankcase



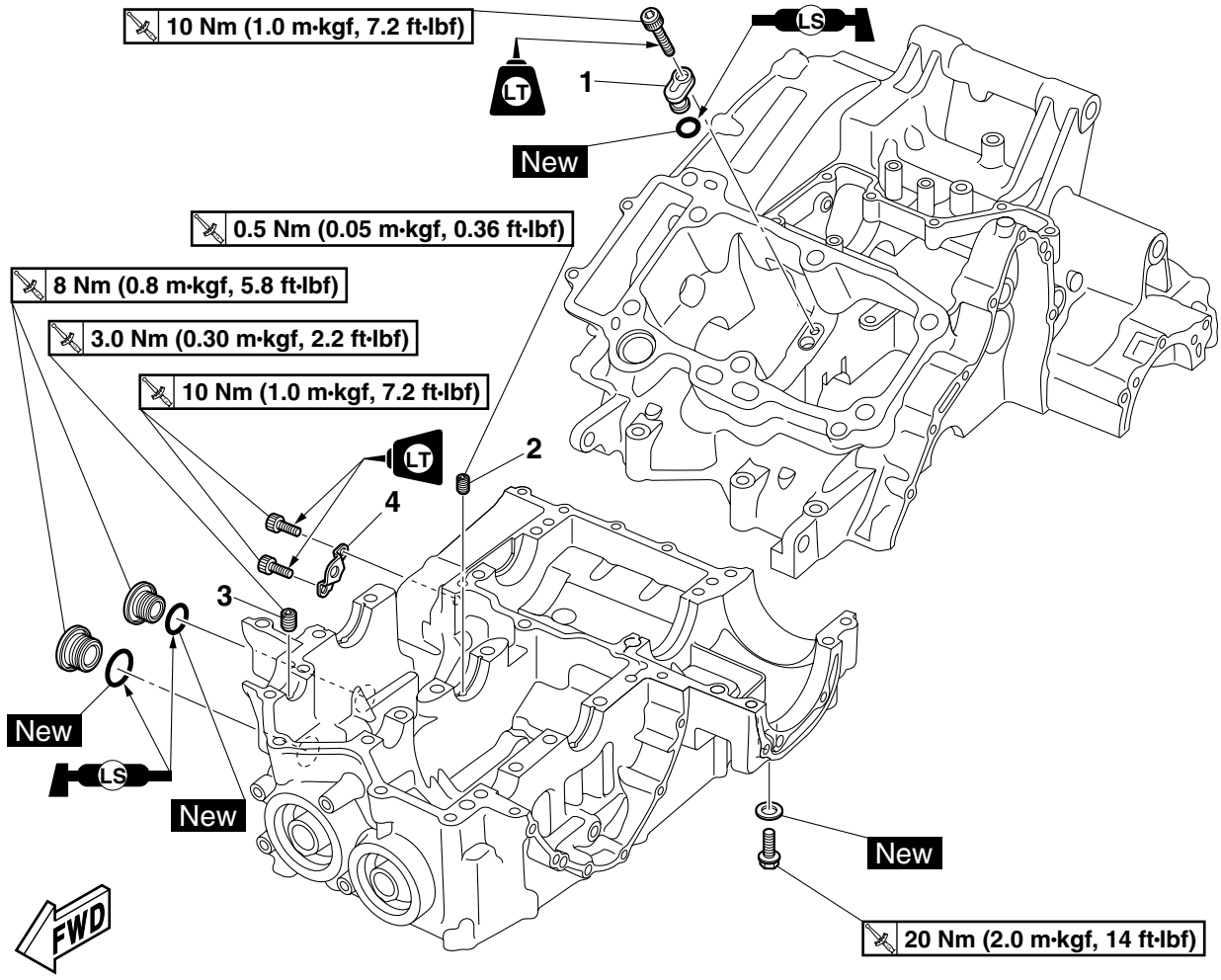
Order	Job/Parts to remove	Q'ty	Remarks
	Rear balancer		Refer to "Removing the rear balancer".
1	Neutral switch lead	1	
2	Neutral switch	1	
3	Oil filter cartridge	1	
4	Oil filter cartridge union bolt	1	
5	Engine guard bracket	1	
6	Oil delivery passage cover	1	
7	Timing chain guide retainer	1	
8	Timing chain guide (intake side)	1	
9	Timing chain	1	
10	Middle drive pinion gear bearing retainer	1	
11	Middle drive pinion gear shim		Refer to "ALIGNING THE MIDDLE GEAR" on page 5-123.

Separating the crankcase



Order	Job/Parts to remove	Q'ty	Remarks
12	Water pump breather hose holder	1	
13	Upper crankcase	1	
14	Dowel pin	3	
			For installation, reverse the removal procedure.

Removing the oil nozzle



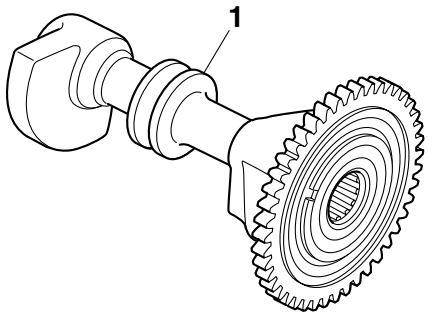
Order	Job/Parts to remove	Q'ty	Remarks
	Rear balancer		Refer to "Removing the rear balancer".
	Crankshaft/Front balancer		Refer to "CRANKSHAFT AND BALANCER" on page 5-93.
	Transmission		Refer to "TRANSMISSION" on page 5-103.
1	Oil nozzle 1	1	
2	Oil nozzle 2	1	
3	Oil nozzle 3	1	
4	Oil plug holder	1	
			For installation, reverse the removal procedure.

EAS23P1092
REMOVING THE REAR BALANCER

1. Remove:
   • Rear balancer “1”

ECA23P1075
NOTICE

The rear balancer should not be disassembled.



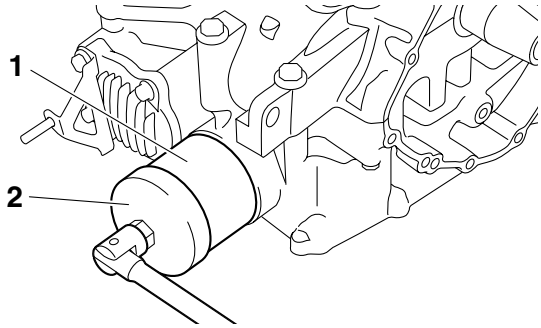
EAS25550
DISASSEMBLING THE CRANKCASE

1. Remove:
   • Oil filter cartridge “1”

TIP

Remove the oil filter cartridge with an oil filter wrench “2”.

Oil filter wrench
90890-01426
YU-38411

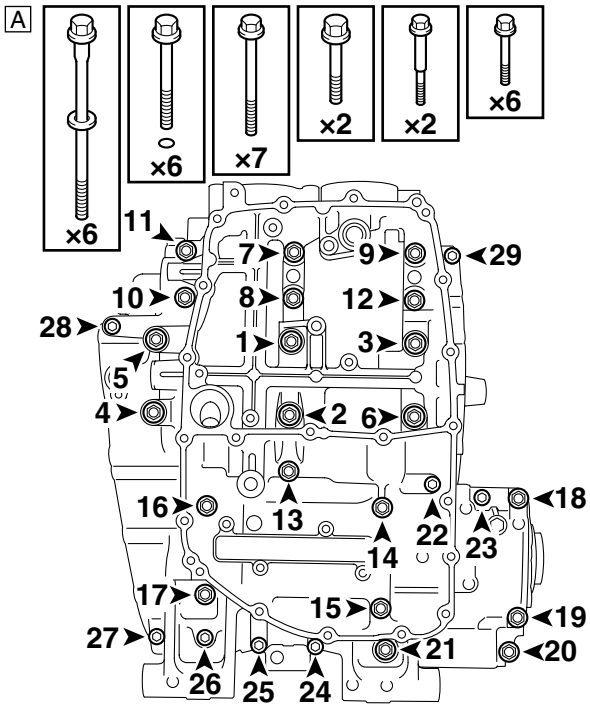


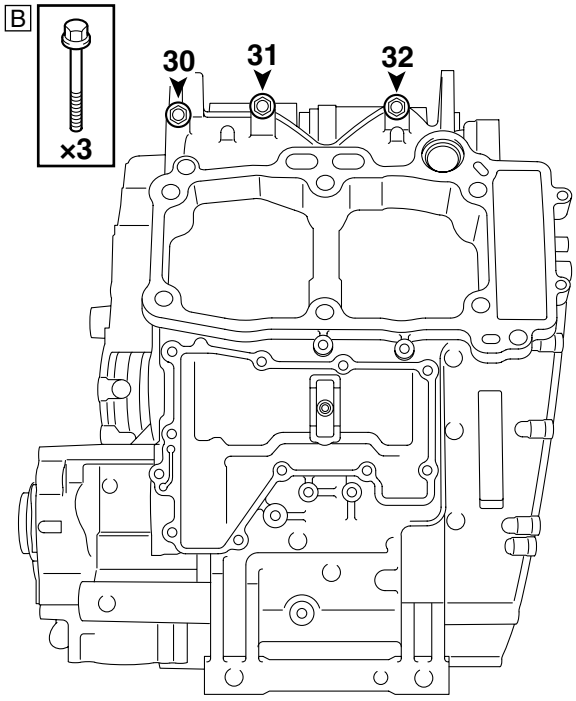
2. Remove:
   • Crankcase bolts
   • O-rings

TIP

- 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.
- Loosen the bolts in decreasing numerical order (refer to the numbers in the illustration).
- The numbers embossed on the crankcase indicate the crankcase tightening sequence.

- M10 × 130 mm bolts: “1”–“6”
- M8 × 78 mm bolts: “7”–“12”
- M8 × 80 mm bolts: “13”–“19”
- M8 × 60 mm bolts: “20”, “21”, “30”–“32”
- M6 × 50 mm bolts: “22”, “24”–“27”, “29”
- M6 × 65 mm bolts: “23”, “28”





A. Lower crankcase
B. Upper crankcase

3. Remove:
   • Upper crankcase

ECA13900
NOTICE

Tap on one side of the crankcase with a soft-face hammer. Tap only on reinforced portions of the crankcase, not on the crankcase mating surfaces. Work slowly and carefully and make sure the crankcase halves separate evenly.

EAS25580
CHECKING THE CRANKCASE
1. Thoroughly wash the crankcase halves in a mild solvent.
2. Thoroughly clean all the gasket surfaces and crankcase mating surfaces.
3. Check:
   - Crankcase
     Cracks/damage → Replace.
   - Oil delivery passages
     Obstruction → Blow out with compressed air.

EAS23P1032
CHECKING THE REAR BALANCER
1. Check:
   - Rear balancer
   - Rear balancer shaft
     Damage/wear → Replace the rear balancer and rear balancer shaft as a set.
     Dirt → Clean.

EAS23P1044
CHECKING THE TIMING CHAIN AND TIMING CHAIN GUIDE (INTAKE SIDE)
1. Check:
   - Timing chain
     Damage/stiffness → Replace the timing chain, camshaft sprockets, and crankshaft as a set.
   - Timing chain guide (intake side)
     Damage/wear → Replace.

EAS23P1094
CHECKING THE OIL NOZZLES
The following procedure applies to all of the oil nozzles.
1. Check:
   - Oil nozzle
     Damage/wear → Replace.
   - Oil passage
     Obstruction → Blow out with compressed air.

EAS25680
ASSEMBLING THE CRANKCASE
1. Lubricate:
   - Crankshaft journal bearings
     (with the recommended lubricant)
   - Front balancer shaft journal bearings
     (with the recommended lubricant)

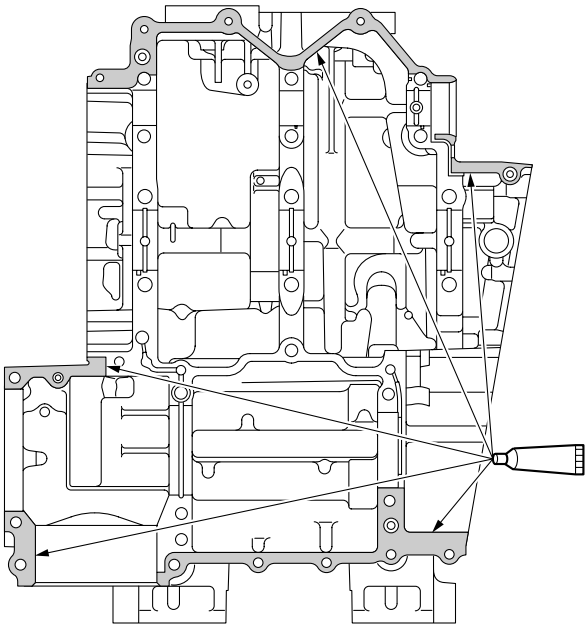
	Recommended lubricant **Engine oil**

2. Apply:
   - Sealant
     (onto the crankcase mating surfaces)

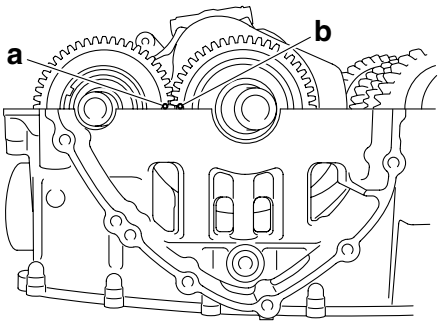
	Yamaha bond No. 1215 **90890-85505** **(Three Bond No.1215®)**

ECA23P1043
NOTICE

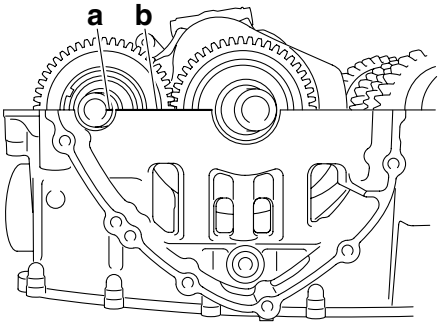
Do not allow any sealant to come into contact with the oil gallery, crankshaft journal bearings, or front balancer shaft journal bearings.



3. Install:
   - Dowel pins
4. Set the shift drum assembly and transmission gears in the neutral position.
5. Check:
   - Alignment of punch mark “a” in the front balancer shaft and punch mark “b” in the crankshaft
     Out of alignment → Adjust.
     Refer to “INSTALLING THE FRONT BALANCER SHAFT” on page 5-102.



6. Align:
   • Match mark “a” in the front balancer shaft (with the crankcase mating surface “b”)

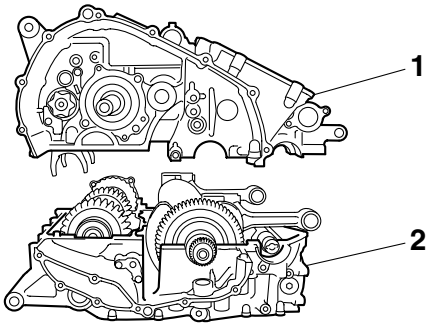


7. Install:
   • Upper crankcase “1”
     (onto the lower crankcase “2”)

ECA23P1044

NOTICE

• Before tightening the crankcase bolts, make sure the transmission gears shift correctly when the shift drum assembly is turned by hand.
• Make sure that the punch mark in the crankshaft remains aligned with the punch mark in the front balancer gear.



8. Install:
   • O-rings New
   • Crankcase bolts

EWA23P1015

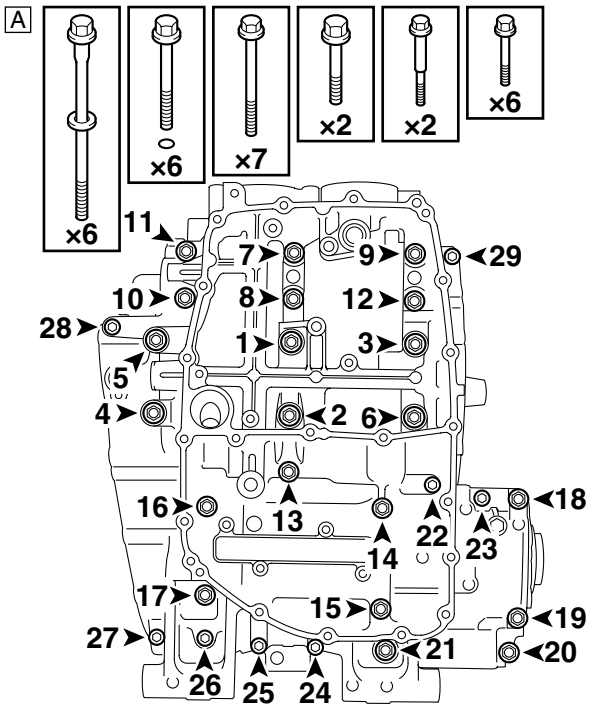
⚠ WARNING

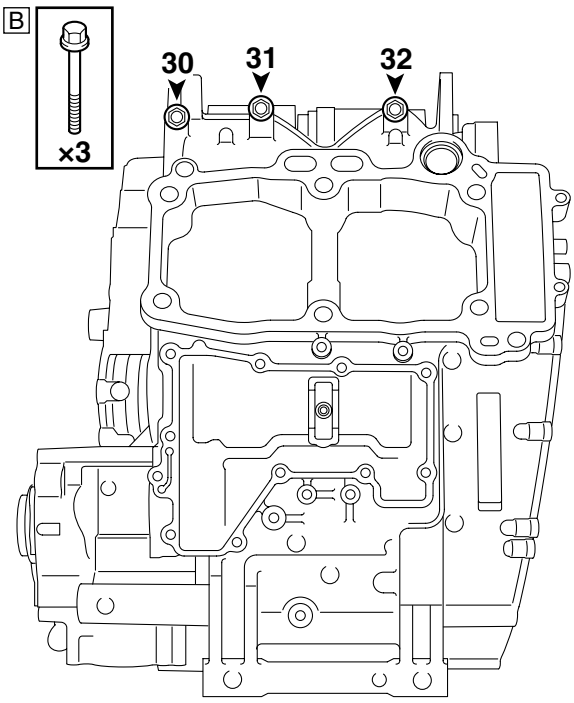
Replace the bolts “1”–“6” with new ones.

TIP

- Before installing the crankcase bolts “7”–“12”, install the O-rings onto the bolts, making sure that each O-ring contacts the bolt flange.
- Lubricate the bolts “1”–“6” threads and washers with engine oil.
- Lubricate the bolts “7”–“32” threads and mating surfaces with engine oil.
- Finger tighten the crankcase bolts.

• M10 × 130 mm bolts: “1”–“6” New
• M8 × 78 mm bolts: “7”–“12”
• M8 × 80 mm bolts: “13”–“19”
• M8 × 60 mm bolts: “20”, “21”, “30”–“32”
• M6 × 50 mm bolts: “22”, “24”–“27”, “29”
• M6 × 65 mm bolts: “23”, “28”





A. Lower crankcase
B. Upper crankcase

9. Tighten:
• Crankcase bolts (M10 × 130 mm) “1”–“6”

TIP

The tightening procedure of crankcase bolts “1”–“6” is angle controlled; therefore, tighten the bolts using the following procedure.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Tighten the crankcase bolts in the proper tightening sequence as shown.

Crankcase bolt “1”–“6”
1st
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

b. Tighten the crankcase bolts in the proper tightening sequence as shown.

Crankcase bolt “1”–“6”
2nd
20 Nm (2.0 m·kgf, 14 ft·lbf)

c. Tighten the crankcase bolts further to reach the specified angle 90–100°.

Crankcase bolt “1”–“6”
Final
Specified angle 90–100°

EWA23P1016

WARNING

If the bolt is tightened more than the specified angle, do not loosen the bolt and then retighten it. Instead, replace the bolt with a new one and perform the procedure again.

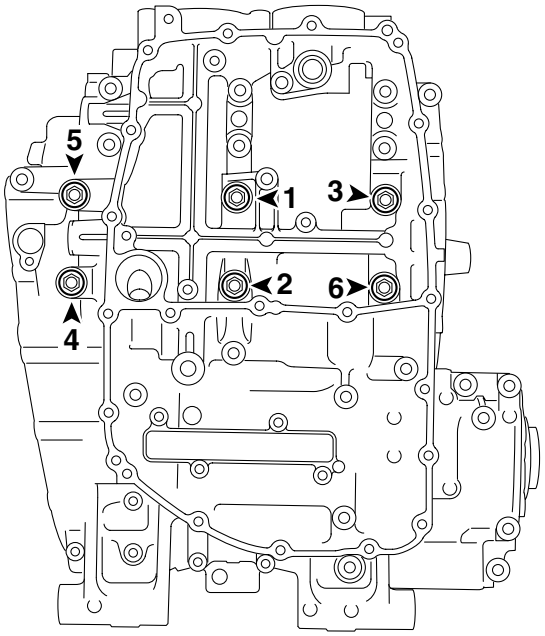
ECA23P1045

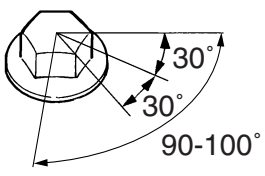
NOTICE

- **Do not use a torque wrench to tighten the bolt to the specified angle.**
- **Tighten the bolt until it is at the specified angle.**

TIP

On a hexagonal bolt, note that the angle from one corner to another is 60°.





▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

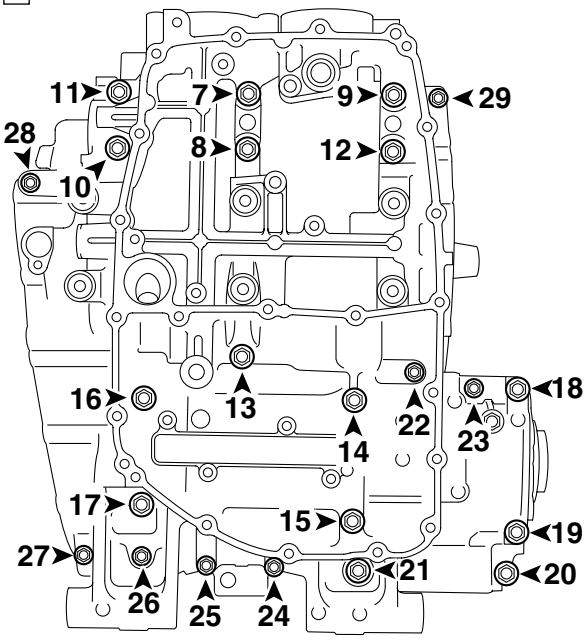
10.Tighten:
• Crankcase bolts “7”–“32”

Crankcase bolt "7"–"21", "30"–"32"
24 Nm (2.4 m·kgf, 17 ft·lbf)
Crankcase bolt "22"–"29"
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

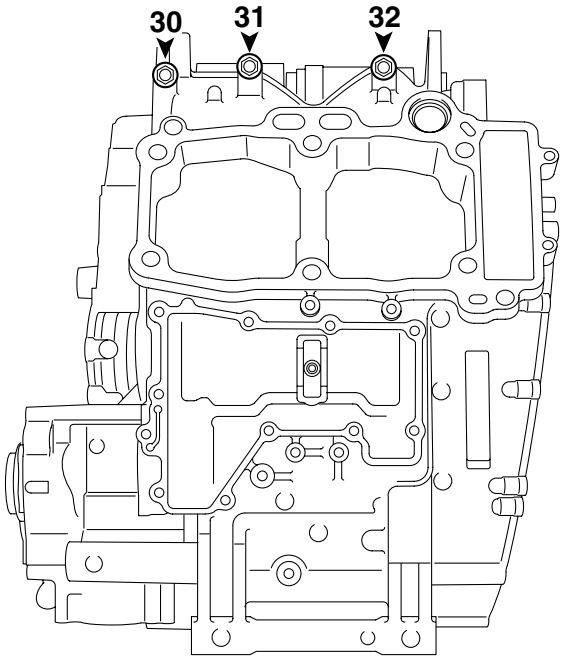
TIP

Tighten the crankcase bolts in the proper tightening sequence as shown.

A



B



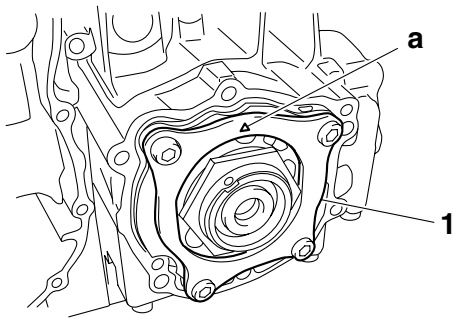
A. Lower crankcase
B. Upper crankcase

11.Install:
• Middle drive pinion gear bearing retainer "1"

Middle drive pinion gear bearing retainer bolt
28 Nm (2.8 m·kgf, 20 ft·lbf)
LOCTITE®

TIP

Install the middle drive pinion gear bearing retainer with its arrow mark "a" facing up.

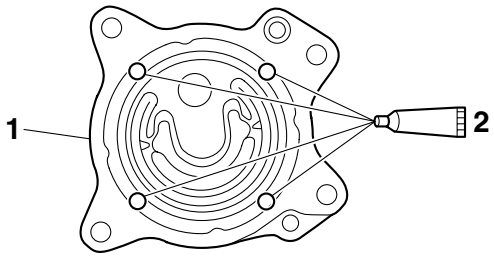


12.Install:
• Oil delivery passage cover "1"

Oil delivery passage cover
12 Nm (1.2 m·kgf, 8.7 ft·lbf)
LOCTITE®

TIP

Apply Three Bond No.1541C® "2" onto the mating surfaces of the oil delivery passage cover and oil delivery passage cover O-ring.



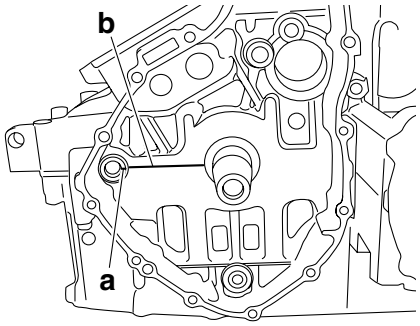
EAS23P1095

INSTALLING THE REAR BALANCER

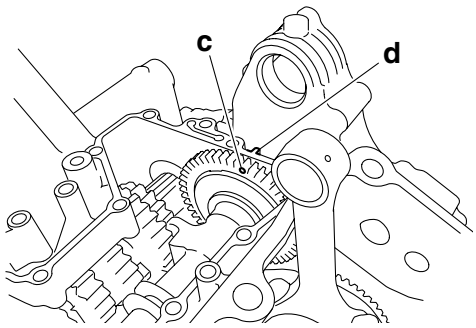
1. Install:
   - Rear balancer
   - Rear balancer shaft
   - Rear balancer shaft retainer

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Check that the match mark "a" in the front balancer shaft is aligned with the crankcase mating surface "b".



b. Align the punch mark "c" in the rear balancer with the match mark "d" on the upper crankcase.



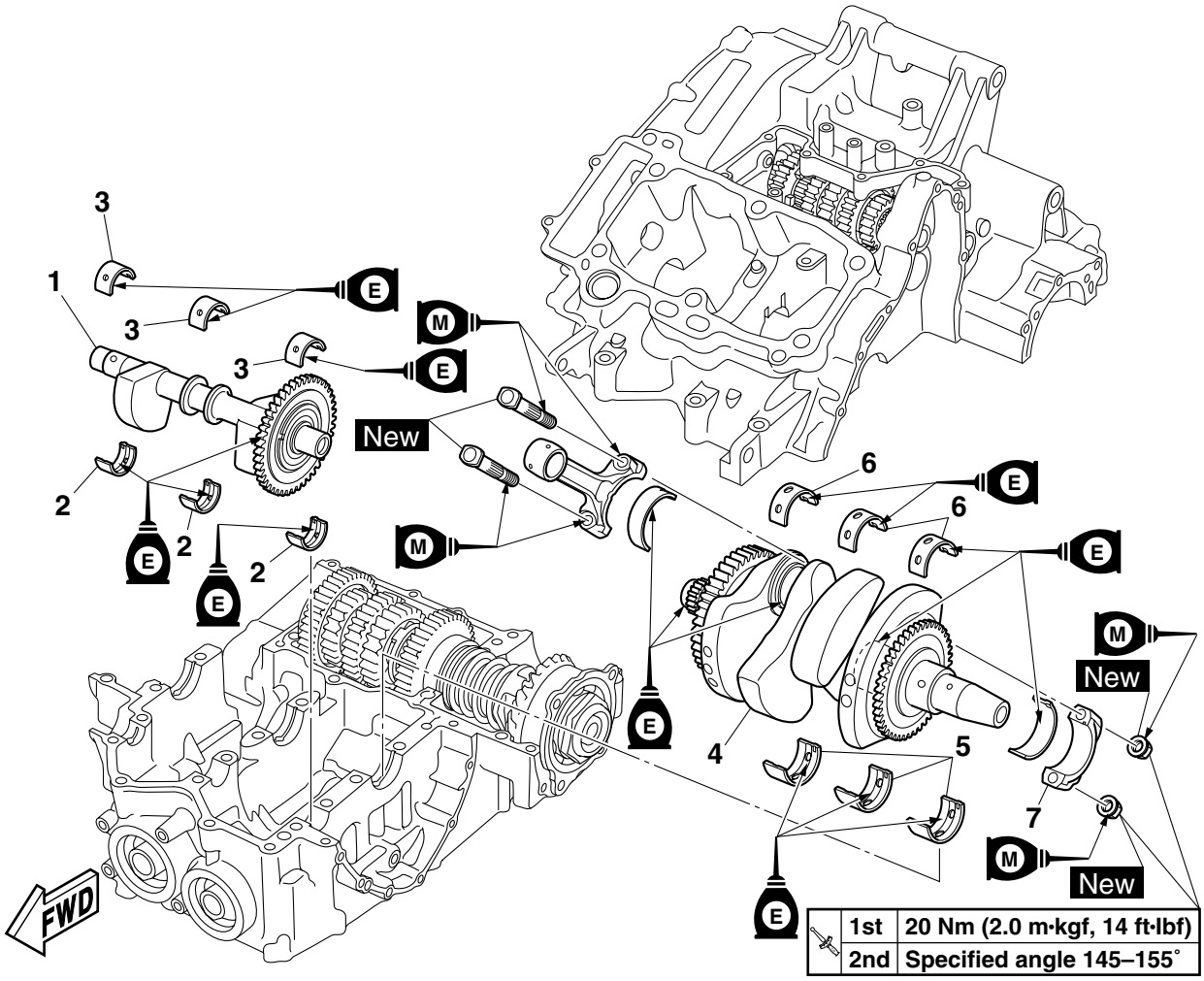
c. Install the rear balancer shaft, and then tighten the bolt to specification.

Rear balancer shaft retainer bolt
12 Nm (1.2 m·kgf, 8.7 ft·lbf)
LOCTITE®

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

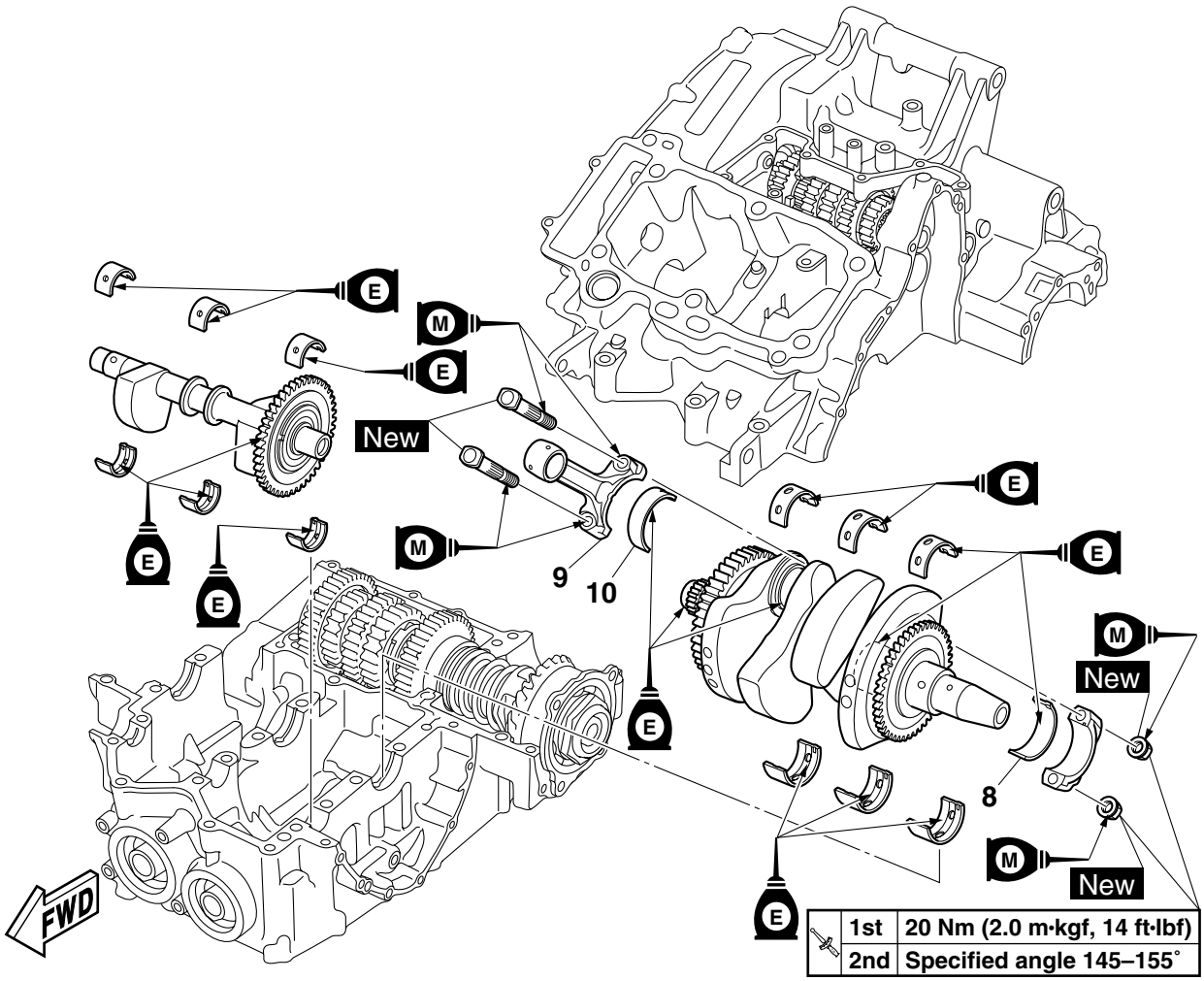
EAS25950
CRANKSHAFT AND BALANCER

Removing the crankshaft, connecting rods and front balancer



Order	Job/Parts to remove	Q'ty	Remarks
	Crankcase		Separate. Refer to "CRANKCASE" on page 5-82.
1	Front balancer shaft	1	ECA23P1076 ***NOTICE*** **The front balancer shaft should not be disassembled.**
2	Front balancer shaft journal lower bearing	3	
3	Front balancer shaft journal upper bearing	3	
4	Crankshaft	1	
5	Crankshaft journal lower bearing	3	
6	Crankshaft journal upper bearing	3	
7	Connecting rod cap	2	

Removing the crankshaft, connecting rods and front balancer

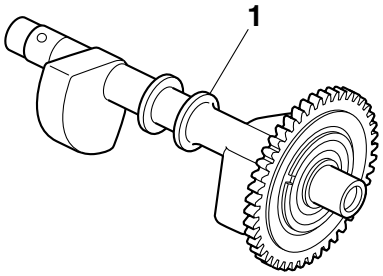


Order	Job/Parts to remove	Q'ty	Remarks
8	Big end lower bearing	2	
9	Connecting rod	2	
10	Big end upper bearing	2	
			For installation, reverse the removal procedure.

EAS23P1096
REMOVING THE FRONT BALANCER SHAFT
1. Remove:
   • Front balancer shaft “1”

ECA23P1076
NOTICE

The front balancer shaft should not be disassembled.



EAS23P1043
REMOVING THE BALANCER SHAFT JOURNAL BEARINGS
1. Remove:
   • Front balancer shaft journal lower bearings (from the lower crankcase)
   • Front balancer shaft journal upper bearings (from the upper crankcase)

TIP

Identify the position of each front balancer shaft journal bearing so that it can be reinstalled in its original place.

EAS26040
REMOVING THE CRANKSHAFT JOURNAL BEARINGS
1. Remove:
   • Crankshaft journal lower bearings (from the lower crankcase)
   • Crankshaft journal upper bearings (from the upper crankcase)

TIP

Identify the position of each crankshaft journal bearing so that it can be reinstalled in its original place.

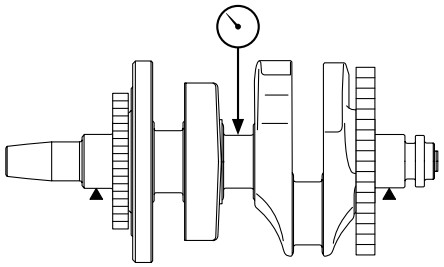
EAS26010
REMOVING THE CONNECTING RODS
The following procedure applies to all of the connecting rods.
1. Remove:
   • Connecting rod cap
   • Connecting rod
   • Big end bearings

TIP

Identify the position of each connecting rod cap, connecting rod, and big end bearing so that it can be reinstalled in its original place.

EAS26070
CHECKING THE CRANKSHAFT
1. Measure:
   • Crankshaft runout
   Out of specification → Replace the crankshaft.

Runout limit C
0.020 mm (0.0008 in)



2. Check:
   • Crankshaft journal surfaces
   • Crankshaft pin surfaces
   • Bearing surfaces
   Scratches/wear → Replace the crankshaft.
3. Measure:
   • Crankshaft-journal-to-crankshaft-journal-bearing clearance
   Out of specification → Replace the crankshaft journal bearings.

Journal oil clearance
0.020–0.044 mm (0.0008–0.0017 in)

ECA13920
NOTICE

Do not interchange the crankshaft journal bearings. To obtain the correct crankshaft-journal-to-crankshaft-journal-bearing clearance and prevent engine damage, the crankshaft journal bearings must be installed in their original positions.

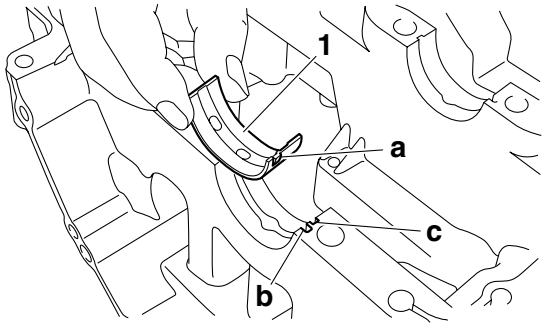
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Clean the crankshaft journal bearings, crankshaft journals, and bearing portions of the crankcase.

b. Install the crankshaft journal lower bearings "1" and the crankshaft into the lower crankcase.

TIP

Align the projections "a" on the crankshaft journal lower bearings with the notches "b" in the lower crankcase.

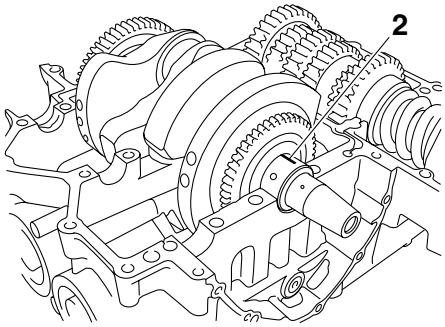


c. Oil groove

c. Put a piece of Plastigauge® "2" on each crankshaft journal.

TIP

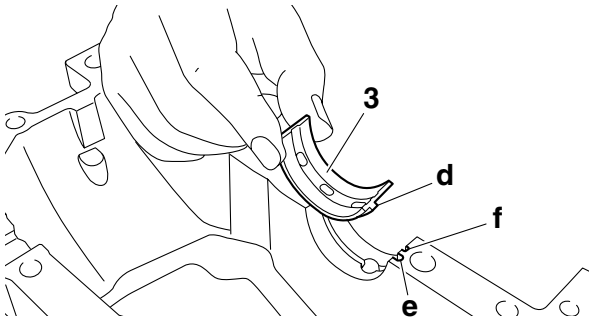
Do not put the Plastigauge® over the oil hole in the crankshaft journal.



d. Install the crankshaft journal upper bearings "3" into the upper crankcase and assemble the crankcase halves.

TIP

- Align the projections "d" of the crankshaft journal upper bearings with the notches "e" in the upper crankcase.
- Do not move the crankshaft until the clearance measurement has been completed.

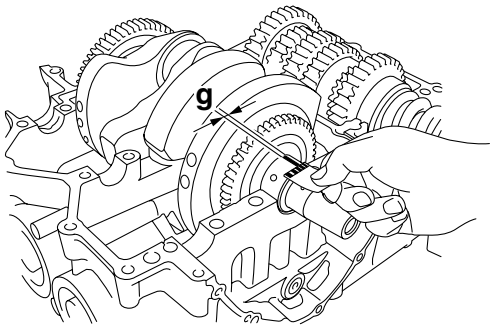


f. Oil groove

e. Tighten the bolts to specification in the tightening sequence cast on the crankcase.
Refer to "CRANKCASE" on page 5-82.

f. Remove the upper crankcase and the crankshaft journal upper bearings.

g. Measure the compressed Plastigauge® width "g" on each crankshaft journal.
If the crankshaft-journal-to-crankshaft-journal-bearing clearance is out of specification, select replacement crankshaft journal bearings.

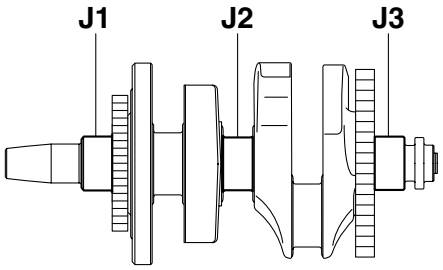


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

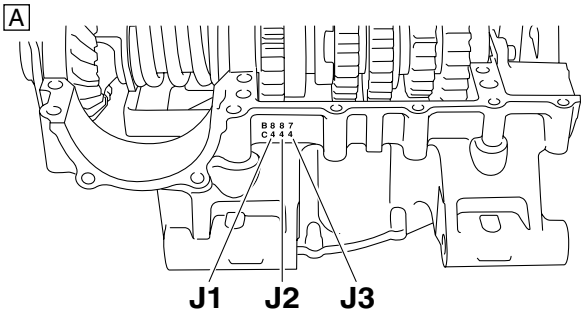
4. Select:
   - Crankshaft journal bearings (J_1–J_3)

TIP

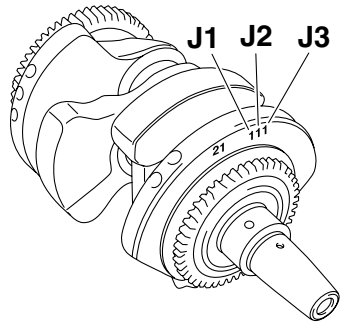
- The numbers "A" stamped into the lower crankcase and the numbers "B" stamped into the crankshaft web are used to determine the replacement crankshaft journal bearing sizes.
- J_1–J_3 refer to the bearings shown in the lower crankcase and crankshaft web illustration.
- If J_1–J_3 are the same, use the same size for all of the bearings.



A



B



For example, if the lower crankcase J_1 and crankshaft web J_1 numbers are 4 and 1 respectively, then the bearing size for J_1 is:

J_1 (crankcase) - J_1 (crankshaft web)
=
4 - 1 = 3 (brown)

Bearing color code
1.Blue 2.Black 3.Brown 4.Green 5.Yellow

EAS23P1045

CHECKING THE CONNECTING RODS

1. Measure:
   - Crankshaft-pin-to-big-end-bearing clearance
     Out of specification → Replace the big end bearings.

Oil clearance
0.029–0.053 mm (0.0011–0.0021 in)

The following procedure applies to all of the connecting rods.

ECA13930

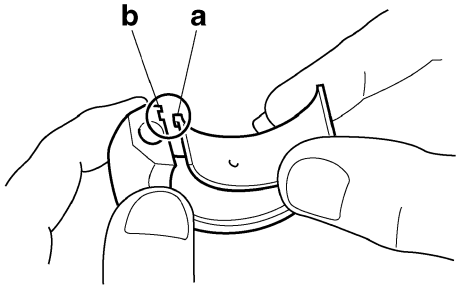
NOTICE

Do not interchange the big end bearings and connecting rods. To obtain the correct crankshaft-pin-to-big-end-bearing clearance and prevent engine damage, the big end bearings must be installed in their original positions.

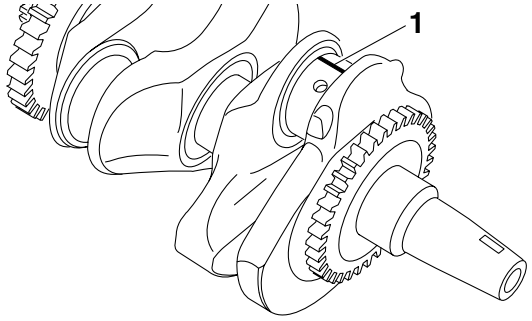
a. Clean the big end bearings, crankshaft pins, and the inside of the connecting rod halves.
b. Install the big end upper bearing into the connecting rod and the big end lower bearing into the connecting rod cap.

TIP

Align the projections “a” on the big end bearings with the notches “b” in the connecting rod and connecting rod cap.



c. Put a piece of Plastigauge® “1” on the crankshaft pin.

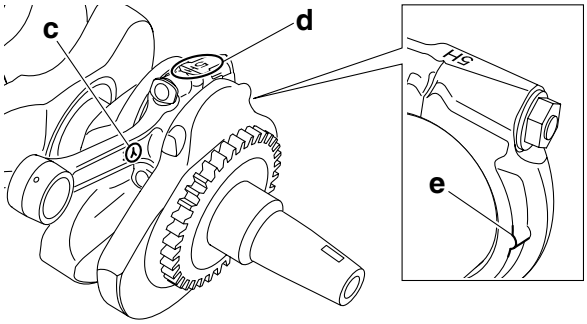


d. Assemble the connecting rod halves.

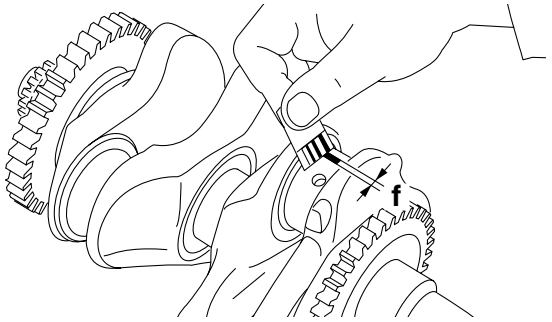
TIP

- Do not move the connecting rod or crankshaft until the clearance measurement has been completed.
- Lubricate the bolt threads and nut seats with molybdenum disulfide oil.
- Make sure the “Y” mark “c” on the connecting rod faces towards the left side of the crankshaft.

- Make sure the characters “d” on both the connecting rod and connecting rod cap are aligned.
- Make sure that the projection “e” on the connecting rod cap faces the same direction as the “Y” mark “c” on the connecting rod.



e. Tighten the connecting rod nuts.
   Refer to “INSTALLING THE CONNECTING RODS” on page 5-100.
f. Remove the connecting rod and big end bearings.
   Refer to “REMOVING THE CONNECTING RODS” on page 5-95.
g. Measure the compressed Plastigauge® width “f” on the crankshaft pin.
   If the crankshaft-pin-to-big-end-bearing clearance is out of specification, select replacement big end bearings.

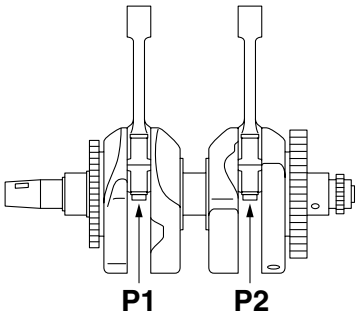


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

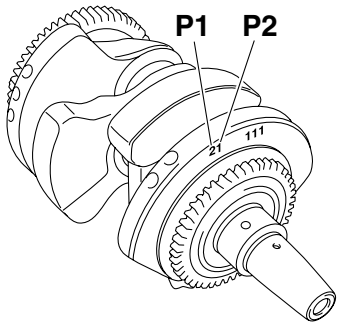
2. Select:
   - Big end bearings (P_1–P_2)

TIP

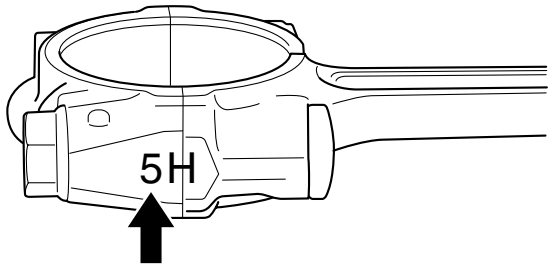
- The numbers “A” stamped into the crankshaft web and the numbers “B” on the connecting rods are used to determine the replacement big end bearing sizes.
- P_1–P_2 refer to the bearings shown in the crankshaft illustration.



A



B



For example, if the connecting rod P_1 and the crankshaft web P_1 numbers are 5 and 2 respectively, then the bearing size for P_1 is:

P_1 (connecting rod) - P_1 (crankshaft web)
=
5 - 2 = 3 (brown)

	Bearing color code **1.Blue 2.Black 3.Brown 4.Green**

EAS26120

CHECKING THE FRONT BALANCER

1. Check:
   - Front balancer shaft
     Cracks/damage/wear → Replace the front balancer shaft and journal bearings.
     Dirt → Clean.
   - Bearings
     Damage/wear → Replace.

2. Measure:
   • Balancer shaft-journal-to-balancer shaft-journal-bearing clearance
   Out of specification → Replace the balancer shaft journal bearings.

Balancer shaft-journal-to-balancer shaft-journal-bearing clearance
0.016–0.040 mm (0.0006–0.0016 in)

ECA23P1048

NOTICE

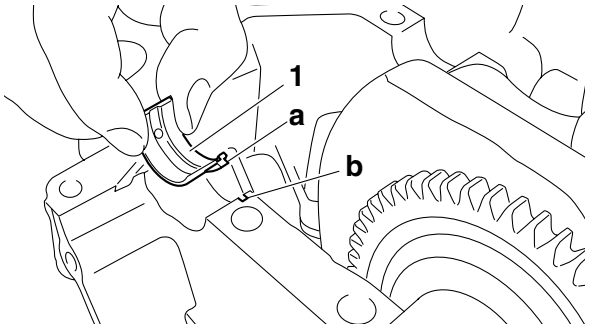
Do not interchange the balancer shaft journal bearings. To obtain the correct balancer shaft-journal-to-balancer shaft-journal-bearing clearance and prevent engine damage, the balancer shaft journal bearings must be installed in their original positions.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Clean the front balancer shaft journal bearings, front balancer shaft journals, and bearing portions of the crankcase.
b. Install the front balancer shaft journal lower bearings "1" and the front balancer shaft into the lower crankcase.

TIP

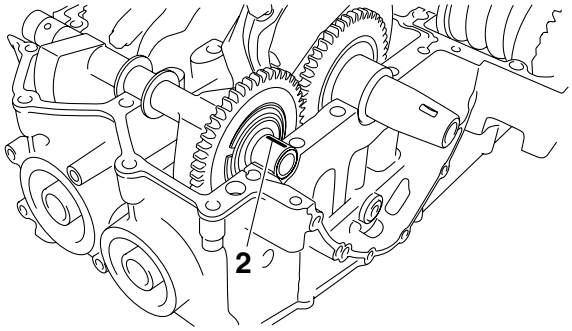
Align the projections "a" on the front balancer shaft journal lower bearings with the notches "b" in the lower crankcase.



c. Put a piece of Plastigauge® "2" on each front balancer shaft journal.

TIP

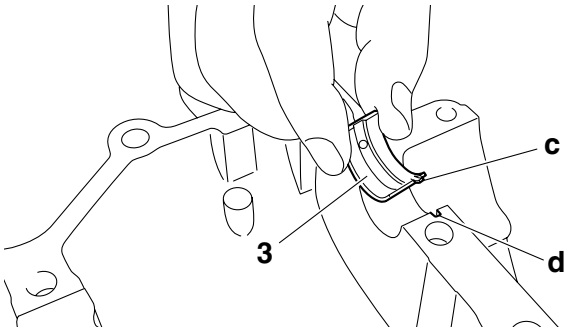
Do not put the Plastigauge® over the oil hole in the front balancer shaft journal.



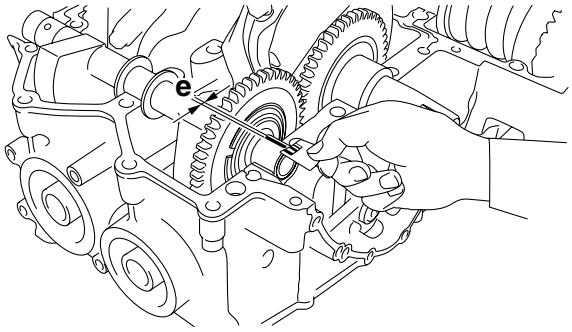
d. Install the front balancer shaft journal upper bearings "3" into the upper crankcase and assemble the crankcase halves.

TIP

• Align the projections "c" of the front balancer shaft journal upper bearings with the notches "d" in the upper crankcase.
• Do not move the front balancer shaft until the clearance measurement has been completed.



e. Tighten the bolts to specification in the tightening sequence cast on the crankcase. Refer to "CRANKCASE" on page 5-82.
f. Remove the upper crankcase and the balancer shaft journal upper bearings.
g. Measure the compressed Plastigauge® width "e" on each front balancer shaft journal. If the balancer shaft-journal-to-balancer shaft-journal-bearing clearance is out of specification, select replacement front balancer shaft journal bearings.

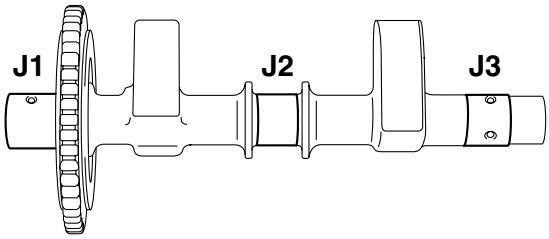


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

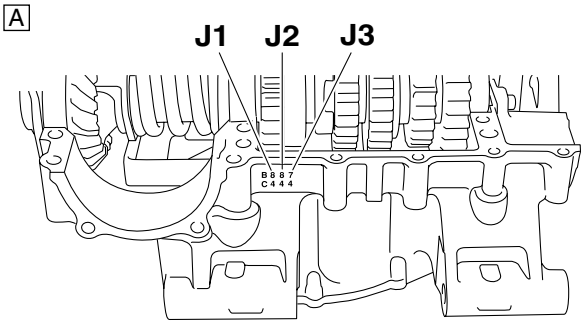
3. Select:
   • Front balancer shaft journal bearings (J_1–J_3)

TIP

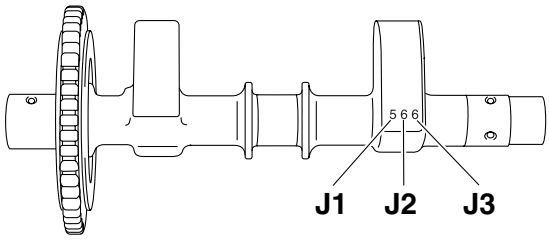
- The numbers “A” stamped into the lower crankcase and the numbers “B” stamped into the front balancer shaft web are used to determine the replacement front balancer shaft journal bearing sizes.
- J_1–J_3 refer to the bearings shown in the lower crankcase and front balancer shaft web illustration.
- If J_1–J_3 are the same, use the same size for all of the bearings.



A



B



For example, if the lower crankcase J_1 and front balancer shaft web J_1 numbers are 6 and 5 respectively, then the bearing size for J_1 is:

J_1 (crankcase) - J_1 (balancer shaft web) = 8 - 5 = 3 (brown)

	Bearing color code 1.Blue 2.Black 3.Brown 4.Green

EAS26150

INSTALLING THE CONNECTING RODS

1. Lubricate:
   • Bolt threads
   • Nut seats
   (with the recommended lubricant)

	Recommended lubricant Molybdenum disulfide oil

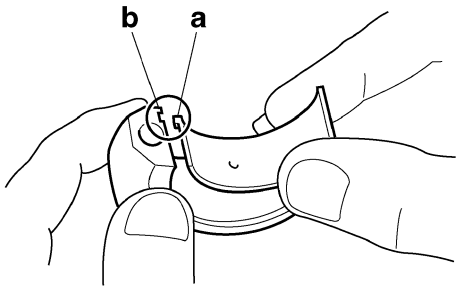
2. Lubricate:
   • Crankshaft pins
   • Big end bearings
   • Connecting rod inner surface
   (with the recommended lubricant)

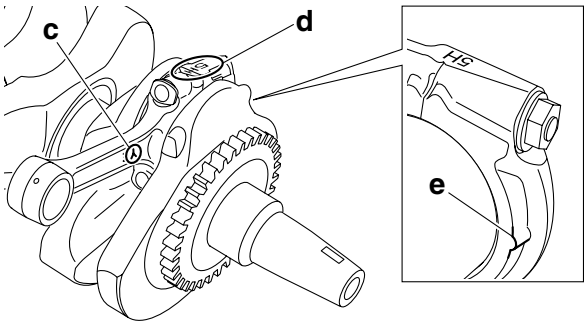
	Recommended lubricant Engine oil

3. Install:
   • Big end bearings
   • Connecting rods
   • Connecting rod caps
   (onto the crankshaft pins)

TIP

- 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 the “Y” marks “c” on the connecting rods face towards the left side of the crankshaft.
- Make sure the characters “d” on both the connecting rod and connecting rod cap are aligned.
- Make sure that the projection “e” on the connecting rod cap faces the same direction as the “Y” mark “c” on the connecting rod.





4. Tighten:
   • Connecting rod nuts

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

EWA13390

⚠ WARNING

• Replace the connecting rod bolts and nuts with new ones.
• Clean the connecting rod bolts and nuts.

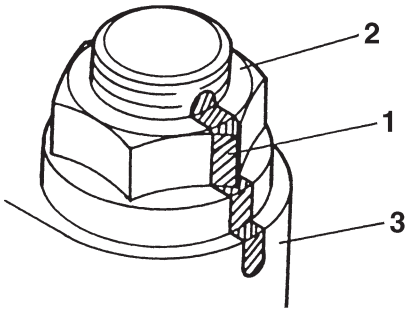
TIP

Tighten the connecting rod bolts using the following procedure.

a. Tighten the connecting rod nuts with a torque wrench.

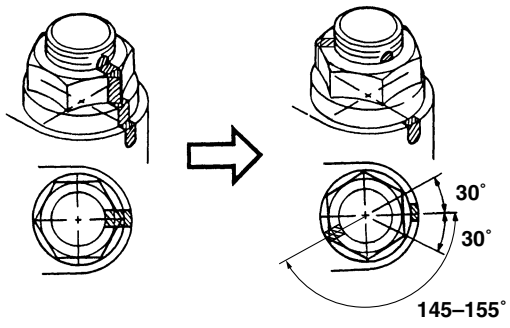
	Connecting rod nut (1st) **20 Nm (2.0 m·kgf, 14 ft·lbf)**

b. Put a mark "1" on the corner of the connecting rod nut "2" and the connecting rod cap "3".



c. Tighten the connecting rod nuts further to reach the specified angle 145–155°.

	Connecting rod nut (final) **Specified angle 145–155°**



EWA13400

⚠ WARNING

If the connecting rod nut is tightened more than the specified angle, do not loosen the nut and then retighten it. Instead, replace the connecting rod bolt and nut with a new one and perform the procedure again.

ECA23P1049

NOTICE

• Do not use a torque wrench to tighten the connecting rod nut to the specified angle.
• Tighten the nut until it is at the specified angle.

TIP

On a hexagonal nut, note that the angle from one corner to another is 60°.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

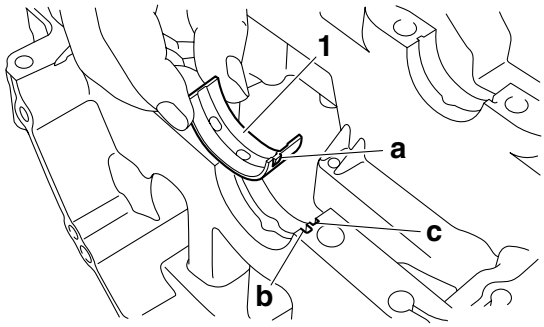
EAS26200

INSTALLING THE CRANKSHAFT

1. Install:
   • Crankshaft journal upper bearings (into the upper crankcase)
   • Crankshaft journal lower bearings (into the lower crankcase)

TIP

• Align the projections "a" on the crankshaft journal bearings "1" with the notches "b" in the crankcase.
• Be sure to install each crankshaft journal bearing in its original place.



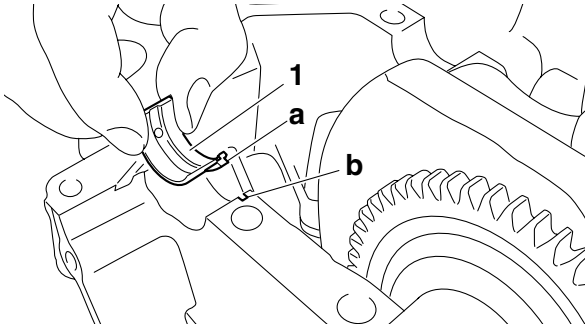
c. Oil groove

EAS26220
INSTALLING THE FRONT BALANCER SHAFT

1. Install:
   - Front balancer shaft journal upper bearings (into the upper crankcase)
   - Front balancer shaft journal lower bearings (into the lower crankcase)

TIP

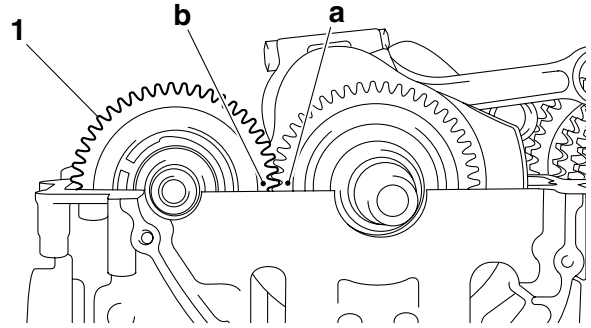
- Align the projections “a” on the front balancer shaft journal bearings “1” with the notches “b” in the crankcase.
- Be sure to install each front balancer shaft journal bearing in its original place.



2. Install:
   - Front balancer shaft “1”

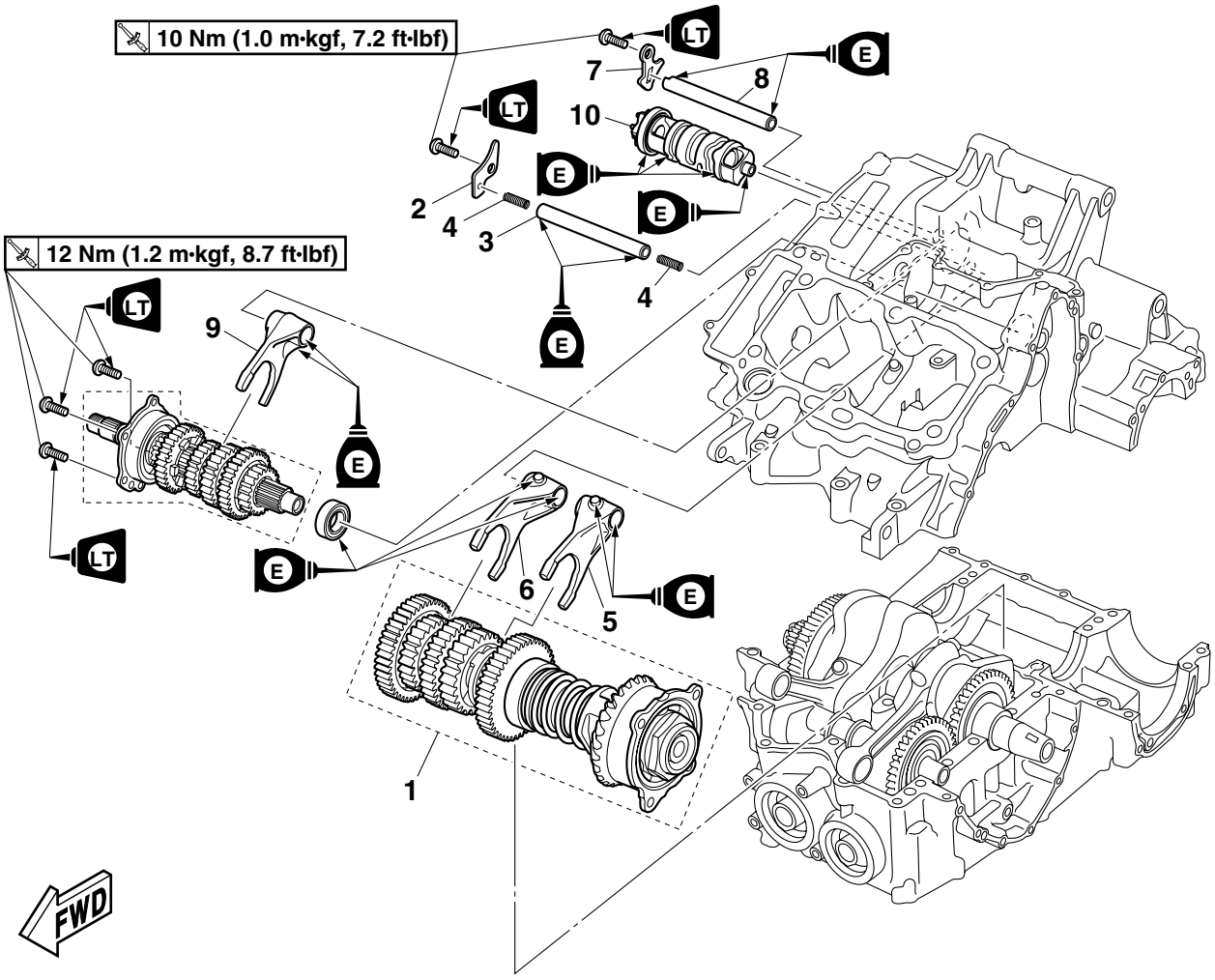
TIP

Align the punch mark “a” in the crankshaft with the punch mark “b” in the front balancer shaft.



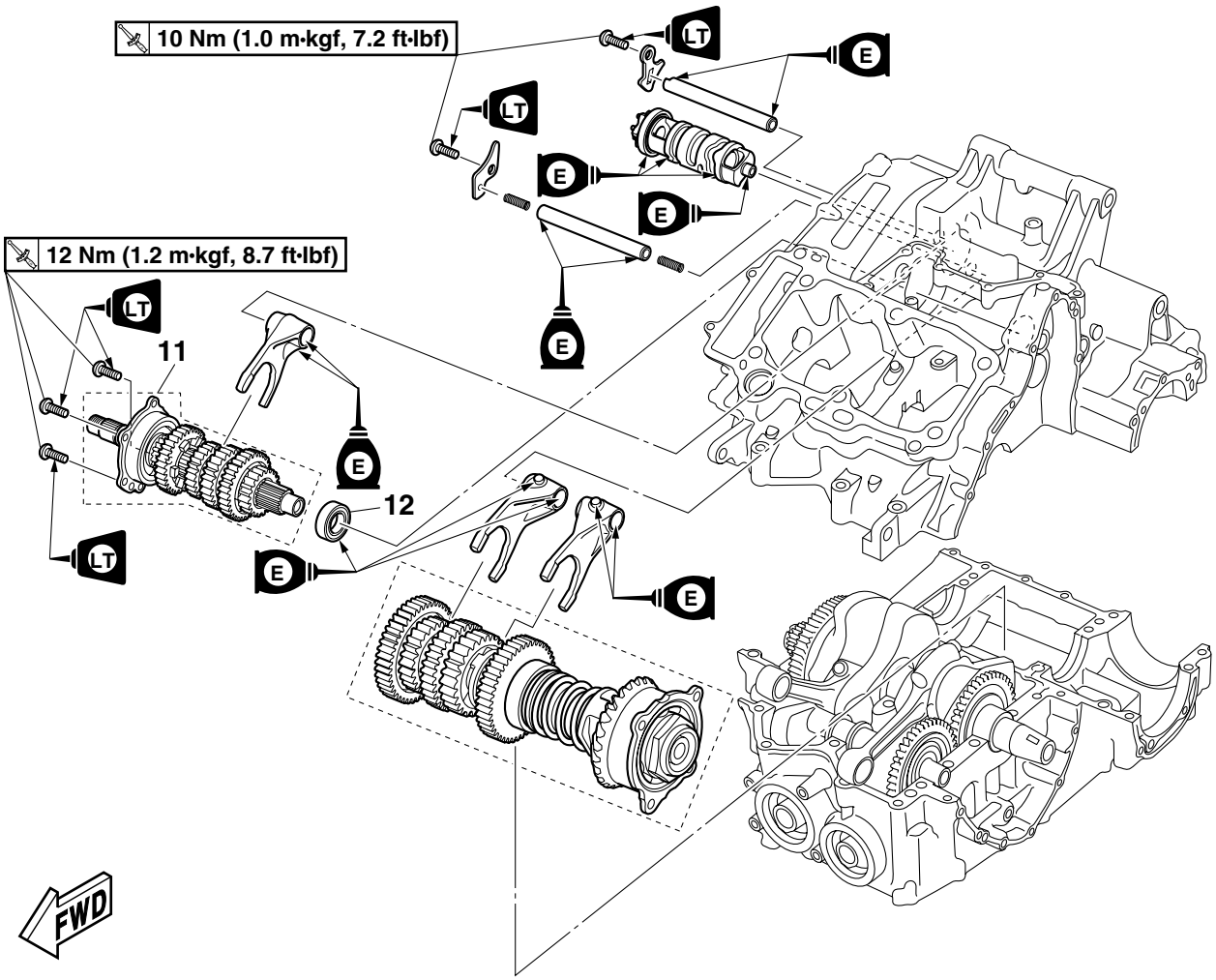
EAS26241
TRANSMISSION

Removing the transmission, shift drum assembly, and shift forks



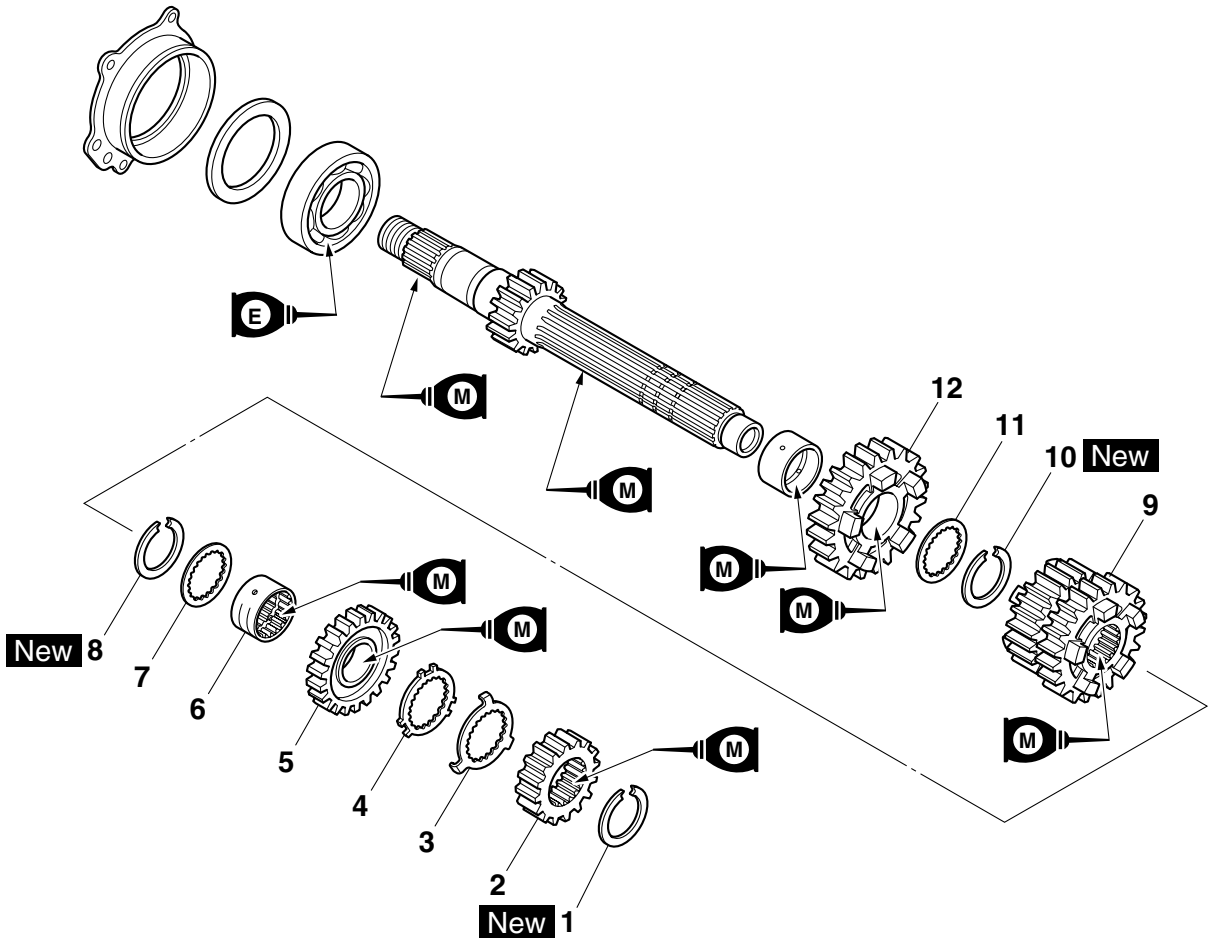
Order	Job/Parts to remove	Q'ty	Remarks
	Crankcase		Separate. Refer to "CRANKCASE" on page 5-82.
1	Drive axle/middle drive pinion gear assembly	1	
2	Shift drum lower retainer	1	
3	Shift fork lower guide bar	1	124.5 mm (4.90 in)
4	Spring	2	
5	Shift fork-L	1	
6	Shift fork-R	1	
7	Shift drum upper retainer	1	
8	Shift fork upper guide bar	1	127.8 mm (5.03 in)
9	Shift fork-C	1	
10	Shift drum assembly	1	

Removing the transmission, shift drum assembly, and shift forks



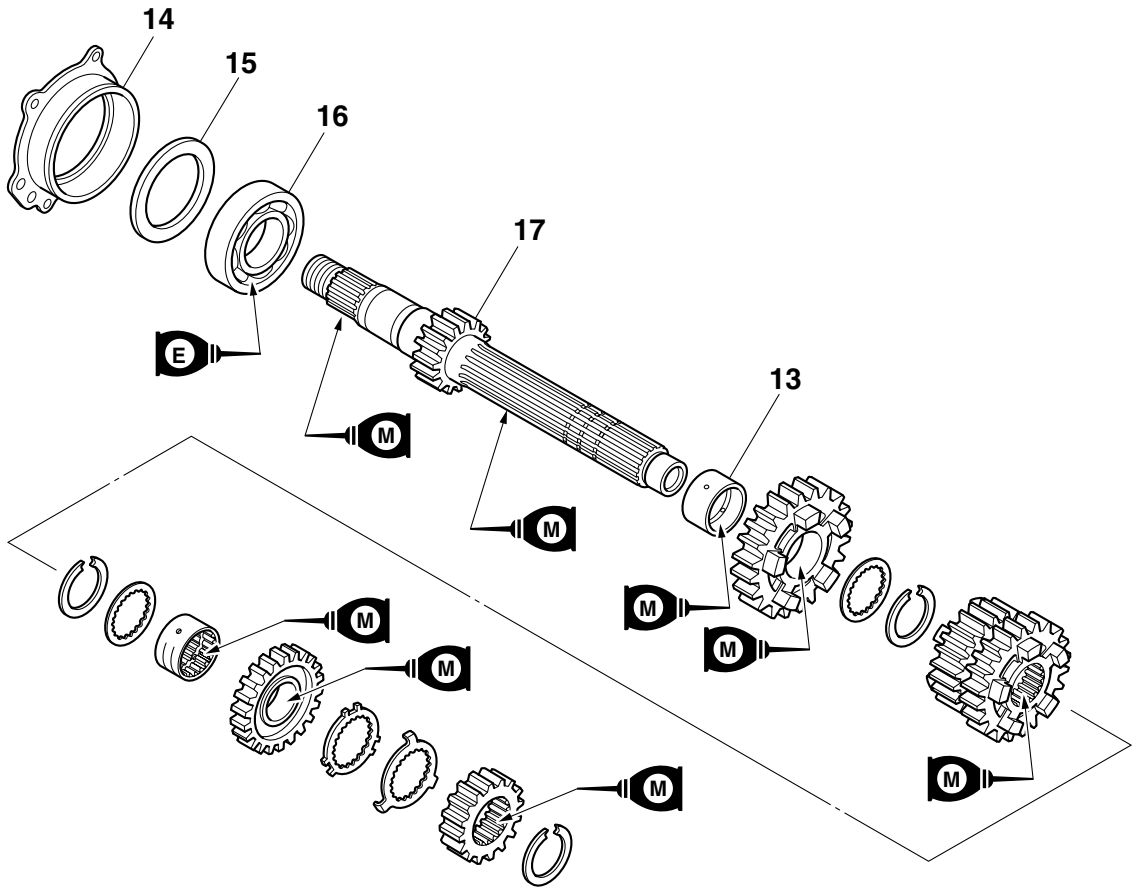
Order	Job/Parts to remove	Q'ty	Remarks
11	Main axle assembly	1	
12	Bearing	1	
			For installation, reverse the removal procedure.

Disassembling the main axle



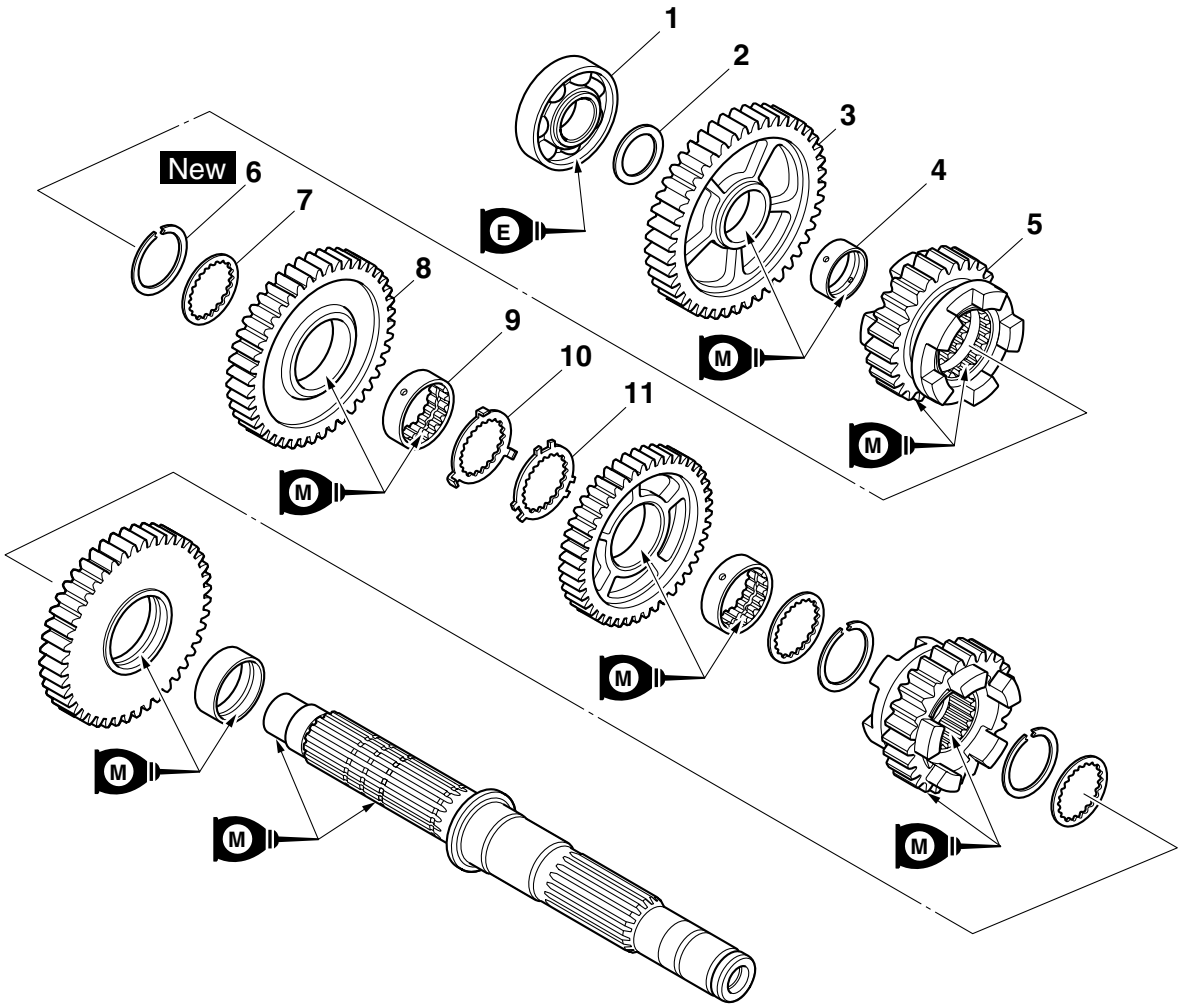
Order	Job/Parts to remove	Q'ty	Remarks
1	Circlip	1	
2	2nd pinion gear	1	
3	Toothed lock washer	1	
4	Toothed lock washer retainer	1	
5	6th pinion gear	1	
6	Toothed spacer	1	
7	Toothed washer	1	
8	Circlip	1	
9	3rd/4th pinion gear	1	
10	Circlip	1	
11	Toothed washer	1	
12	5th pinion gear	1	

Disassembling the main axle



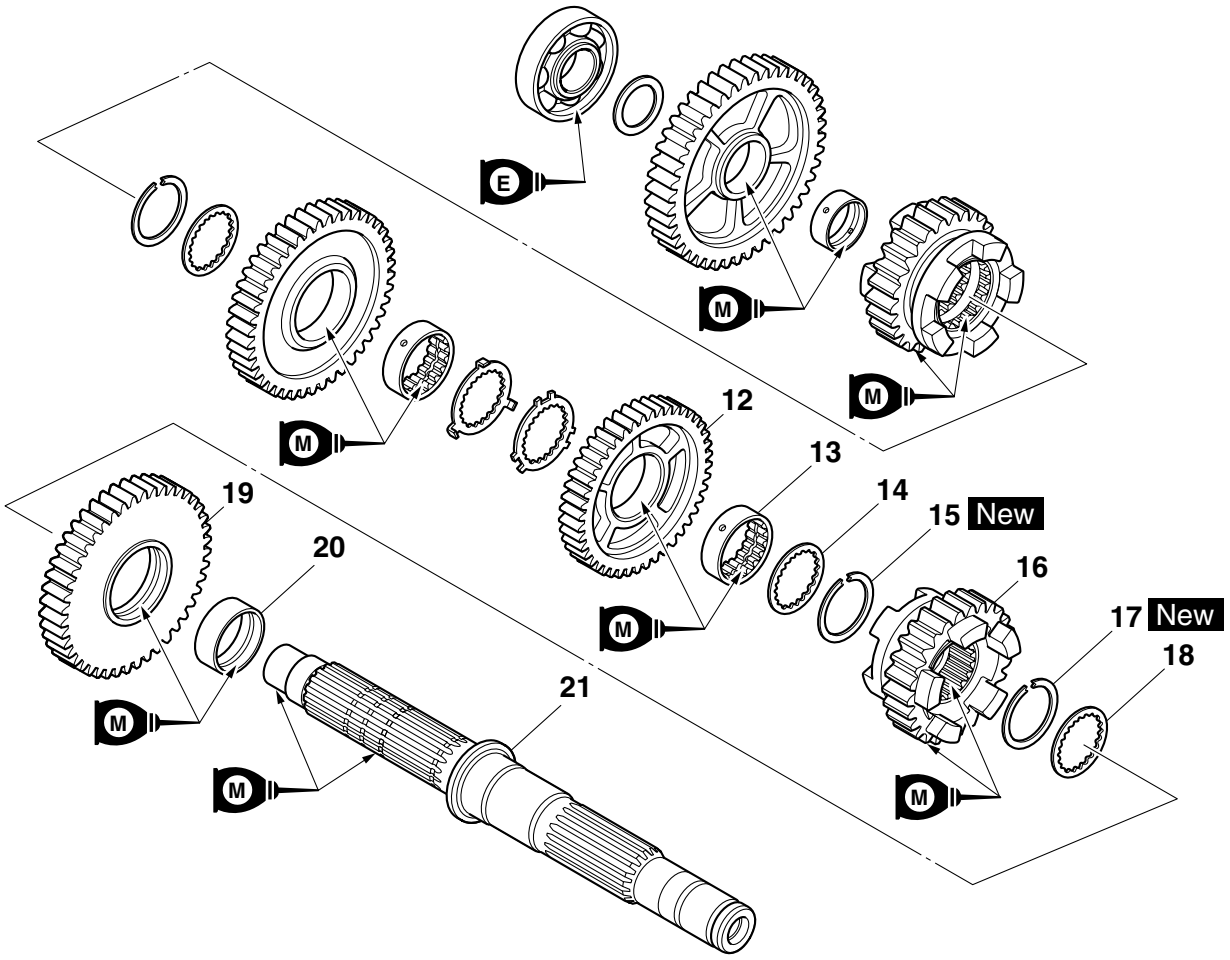
Order	Job/Parts to remove	Q'ty	Remarks
13	Collar	1	
14	Bearing housing	1	
15	Spacer	1	
16	Bearing	1	
17	Main axle/1st pinion gear	1	
			For assembly, reverse the disassembly procedure.

Disassembling the drive axle/middle drive pinion gear



Order	Job/Parts to remove	Q'ty	Remarks
	Middle drive pinion gear assembly		Refer to "MIDDLE GEAR" on page 5-113.
1	Bearing	1	
2	Washer	1	
3	1st wheel gear	1	
4	Collar	1	
5	5th wheel gear	1	
6	Circlip	1	
7	Toothed washer	1	
8	3rd wheel gear	1	
9	Toothed spacer	1	
10	Toothed lock washer	1	
11	Toothed lock washer retainer	1	

Disassembling the drive axle/middle drive pinion gear



Order	Job/Parts to remove	Q'ty	Remarks
12	4th wheel gear	1	
13	Collar	1	
14	Toothed washer	1	
15	Circlip	1	
16	6th wheel gear	1	
17	Circlip	1	
18	Toothed washer	1	
19	2nd wheel gear	1	
20	Collar	1	
21	Drive axle	1	
			For assembly, reverse the disassembly procedure.

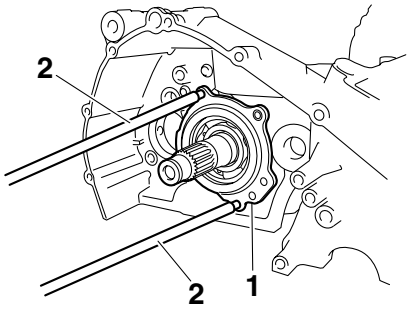
EAS26250
REMOVING THE TRANSMISSION

1. Remove:
   • Main axle assembly “1”

TIP

Remove the main axle assembly with the slide hammer bolts “2” and weight.

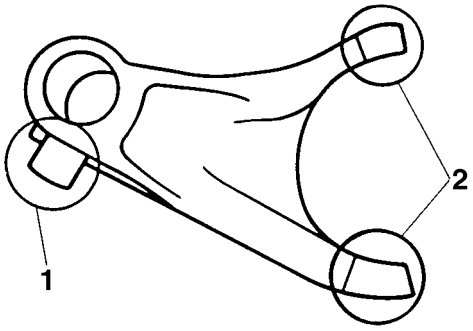
Slide hammer bolt
90890-01083
Slide hammer bolt 6 mm
YU-01083-1
Weight
90890-01084
YU-01083-3



EAS26260
CHECKING THE SHIFT FORKS

The following procedure applies to all of the shift forks.

1. Check:
   • Shift fork cam follower “1”
   • Shift fork pawl “2”
   Bends/damage/scoring/wear → Replace the shift fork.

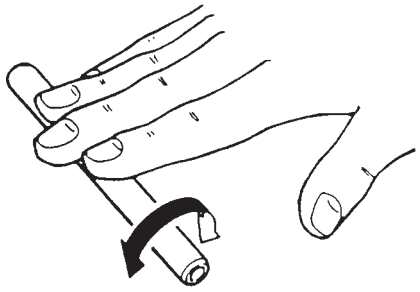


2. Check:
   • Shift fork guide bar
   Roll the shift fork guide bar on a flat surface.
   Bends → Replace.

EWA12840

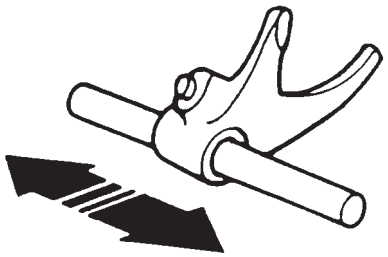
⚠ WARNING

Do not attempt to straighten a bent shift fork guide bar.



319-010

3. Check:
   • Shift fork movement
   (along the shift fork guide bar)
   Rough movement → Replace the shift forks and shift fork guide bar as a set.

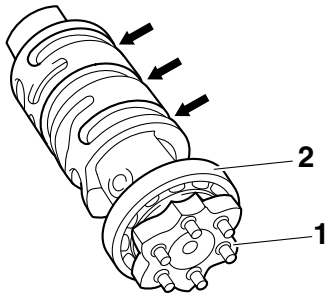


319-011

4. Check:
   • Springs
   Cracks/damage → Replace.

EAS26270
CHECKING THE SHIFT DRUM ASSEMBLY

1. Check:
   • Shift drum groove
   Damage/scratches/wear → Replace the shift drum assembly.
   • Shift drum segment “1”
   Damage/wear → Replace the shift drum assembly.
   • Shift drum bearing “2”
   Damage/pitting → Replace the shift drum assembly.

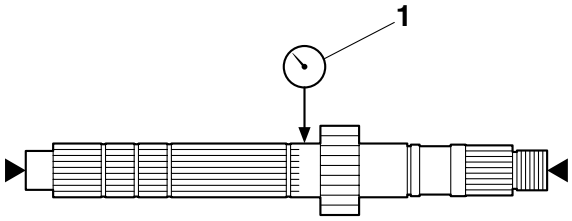


EAS26300
CHECKING THE TRANSMISSION

1. Measure:
   • Main axle runout
   (with a centering device and dial gauge “1”)

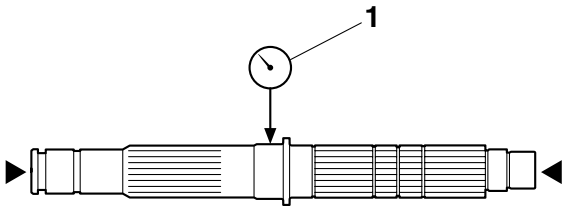
Out of specification → Replace the main axle.

Main axle runout limit
0.08 mm (0.0032 in)

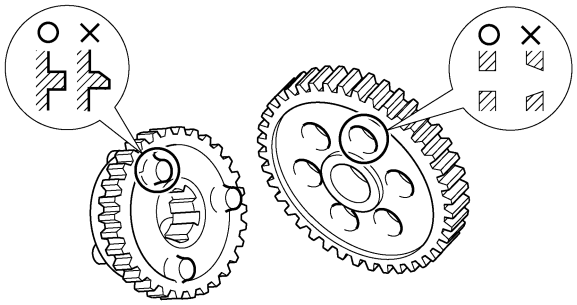


2. Measure:
   • Drive axle runout
   (with a centering device and dial gauge "1")
   Out of specification → Replace the drive axle.

Drive axle runout limit
0.08 mm (0.0032 in)



3. Check:
   • Transmission gears
   Blue discoloration/pitting/wear → Replace the defective gear(s).
   • Transmission gear dogs
   Cracks/damage/rounded edges → Replace the defective gear(s).



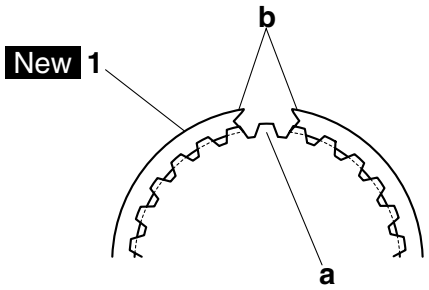
4. Check:
   • Transmission gear engagement
   (each pinion gear to its respective wheel gear)
   Incorrect → Reassemble the transmission axle assemblies.
5. Check:
   • Transmission gear movement
   Rough movement → Replace the defective part(s).

EAS23P1046
ASSEMBLING THE MAIN AXLE AND DRIVE AXLE

1. Install:
   • Circlip "1" New

TIP

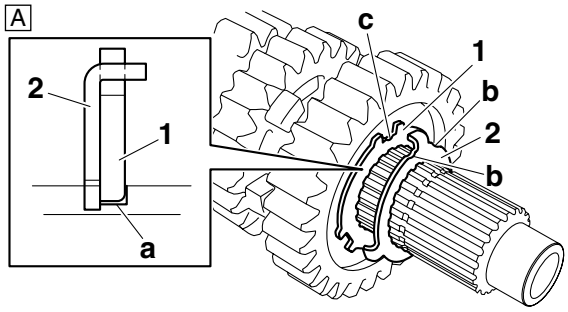
Install the circlip so that a spline "a" is in the center of the gap between the circlip ends "b" as shown.

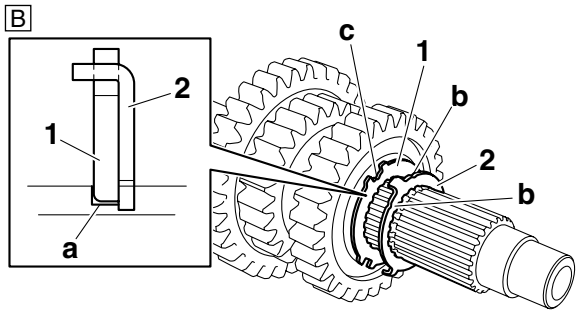


2. Install:
   • Toothed lock washer retainer "1"
   • Toothed lock washer "2"

TIP

- With the toothed lock washer retainer in the groove "a" in the axle, align the projection on the retainer with an axle spline, and then install the toothed lock washer.
- Be sure to align the projection on the toothed lock washer that is between the alignment marks "b" with the alignment mark "c" on the retainer.



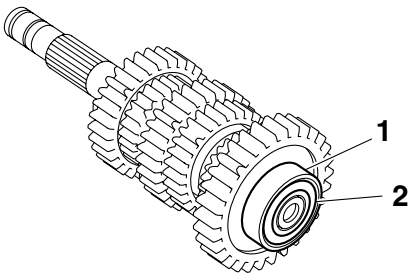


A. Main axle
B. Drive axle

3. Install:
   • Bearing “1”

TIP

Be sure to install the bearing so that the seal “2” is facing outward.

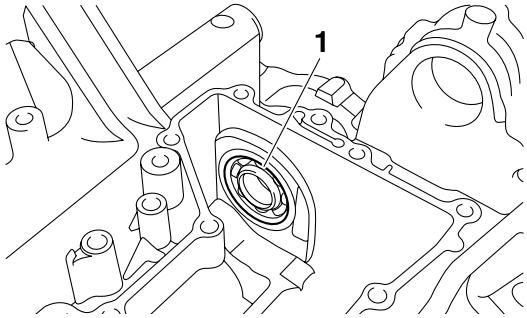


EAS26350
INSTALLING THE TRANSMISSION

1. Install:
   • Bearing “1”

TIP

Face the seal side of the bearing to the outside and install it close to the left side end of the upper crankcase.

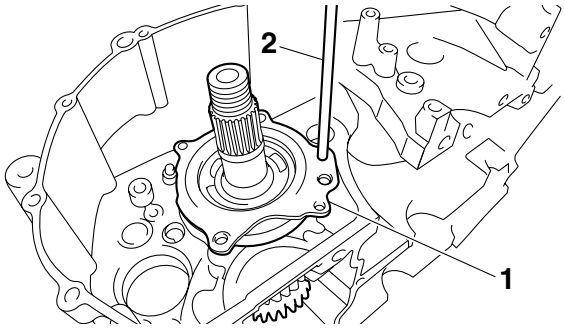


2. Install:
   • Main axle assembly “1”
   • Main axle bearing housing bolts

Main axle bearing housing bolt
12 Nm (1.2 m·kgf, 8.7 ft·lbf)
LOCTITE®

TIP

When installing the main axle assembly, use a pin “2” to align the bearing housing hole with the corresponding hole in the upper crankcase.



3. Install:
   • Shift drum assembly
   • Shift fork-C
   • Shift fork upper guide bar
   • Shift fork-R
   • Shift fork-L
   • Springs
   • Shift fork lower guide bar

TIP

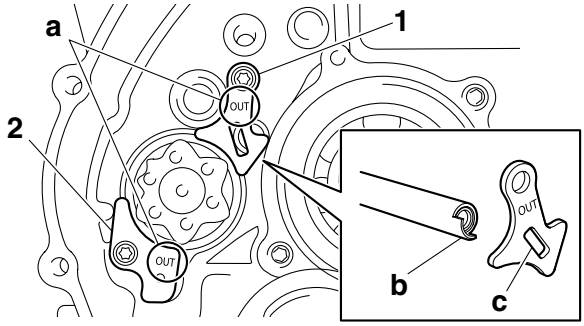
The embossed marks on the shift forks should face towards the right side of the engine and be in the following sequence: “R”, “C”, “L”.

4. Install:
   • Shift drum upper retainer “1”
   • Shift drum lower retainer “2”

Shift drum retainer screw
10 Nm (1.0 m·kgf, 7.2 ft·lbf)
LOCTITE®

TIP

- Install each shift drum retainer with its “OUT” mark “a” facing outward.
- Align the projection “b” on the shift fork upper guide bar with the slot “c” in the shift drum upper retainer.



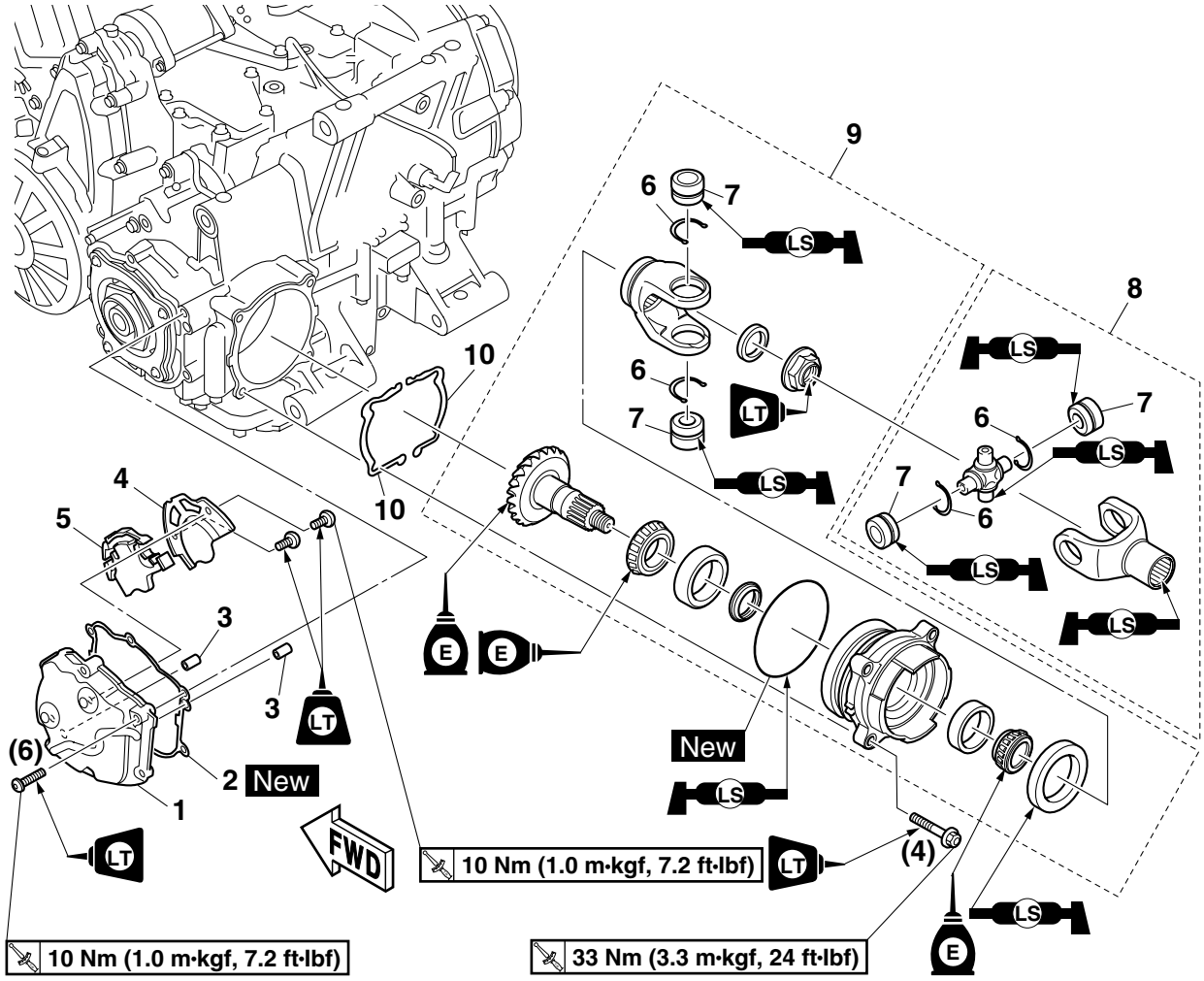
5. Check:
   - Transmission
     Rough movement → Repair.

TIP

Oil each gear, shaft, and bearing thoroughly.

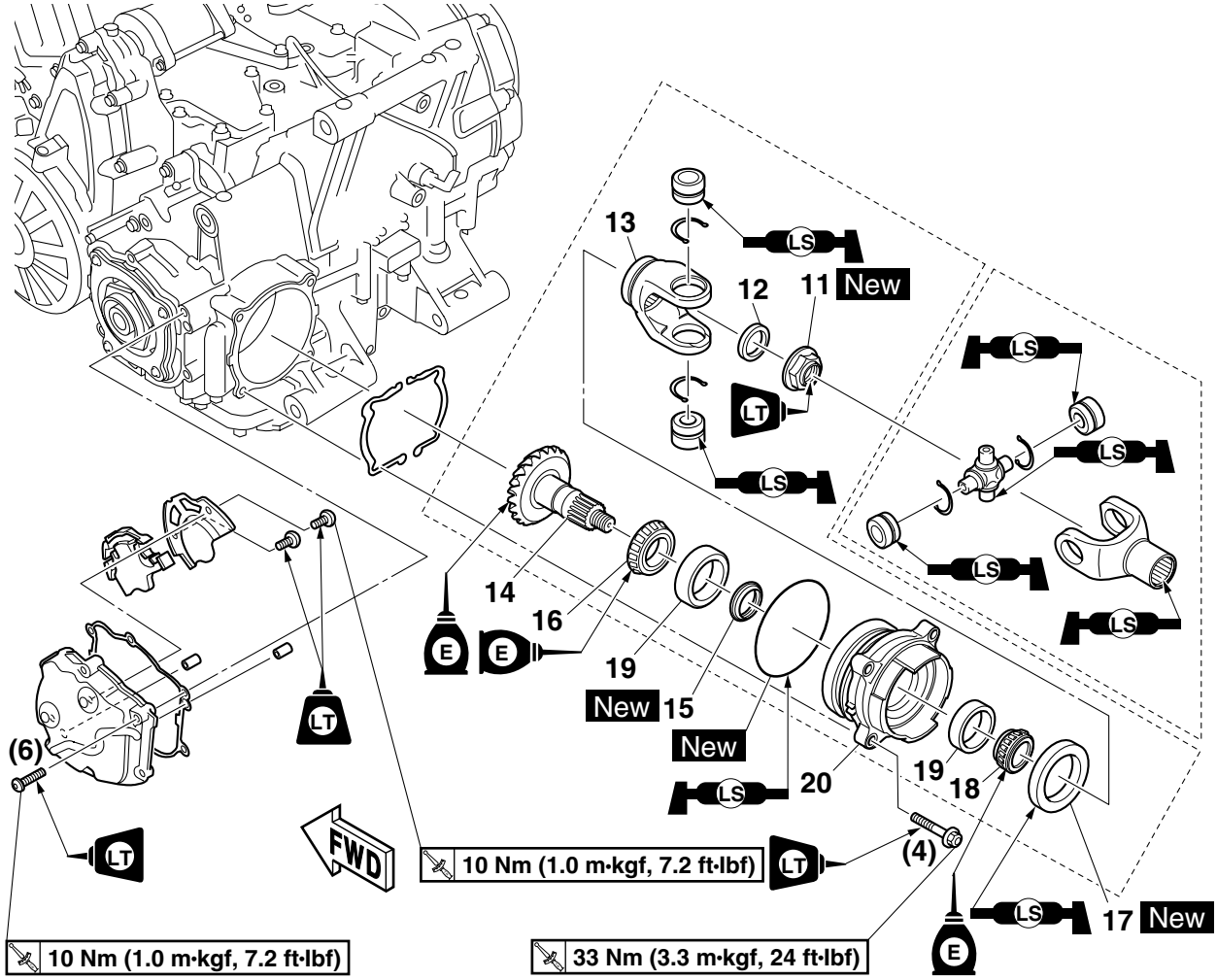
EAS25711
MIDDLE GEAR

Removing the middle driven pinion gear



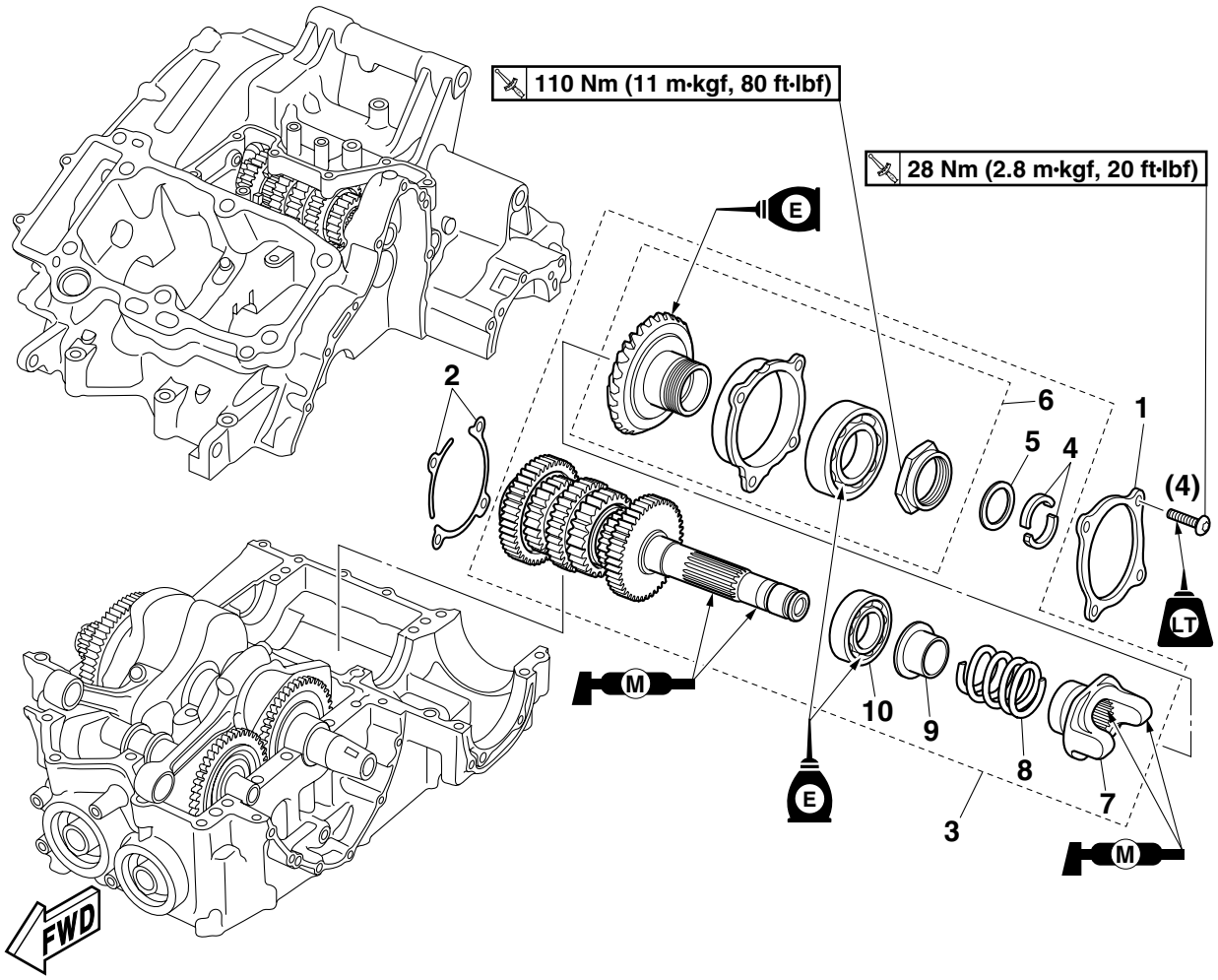
Order	Job/Parts to remove	Q'ty	Remarks
	Engine		Refer to "ENGINE REMOVAL" on page 5-3.
1	Middle gear side cover	1	
2	Middle gear side cover gasket	1	
3	Dowel pin	2	
4	Middle gear side cover damper plate	1	
5	Middle gear side cover damper	1	
6	Circlip	4	
7	Bearing	4	
8	Universal joint	1	
9	Middle driven pinion gear assembly	1	
10	Middle driven pinion gear shim		Refer to "ADJUSTING THE MIDDLE GEAR BACKLASH" on page 5-121 and "ALIGNING THE MIDDLE GEAR" on page 5-123.

Removing the middle driven pinion gear



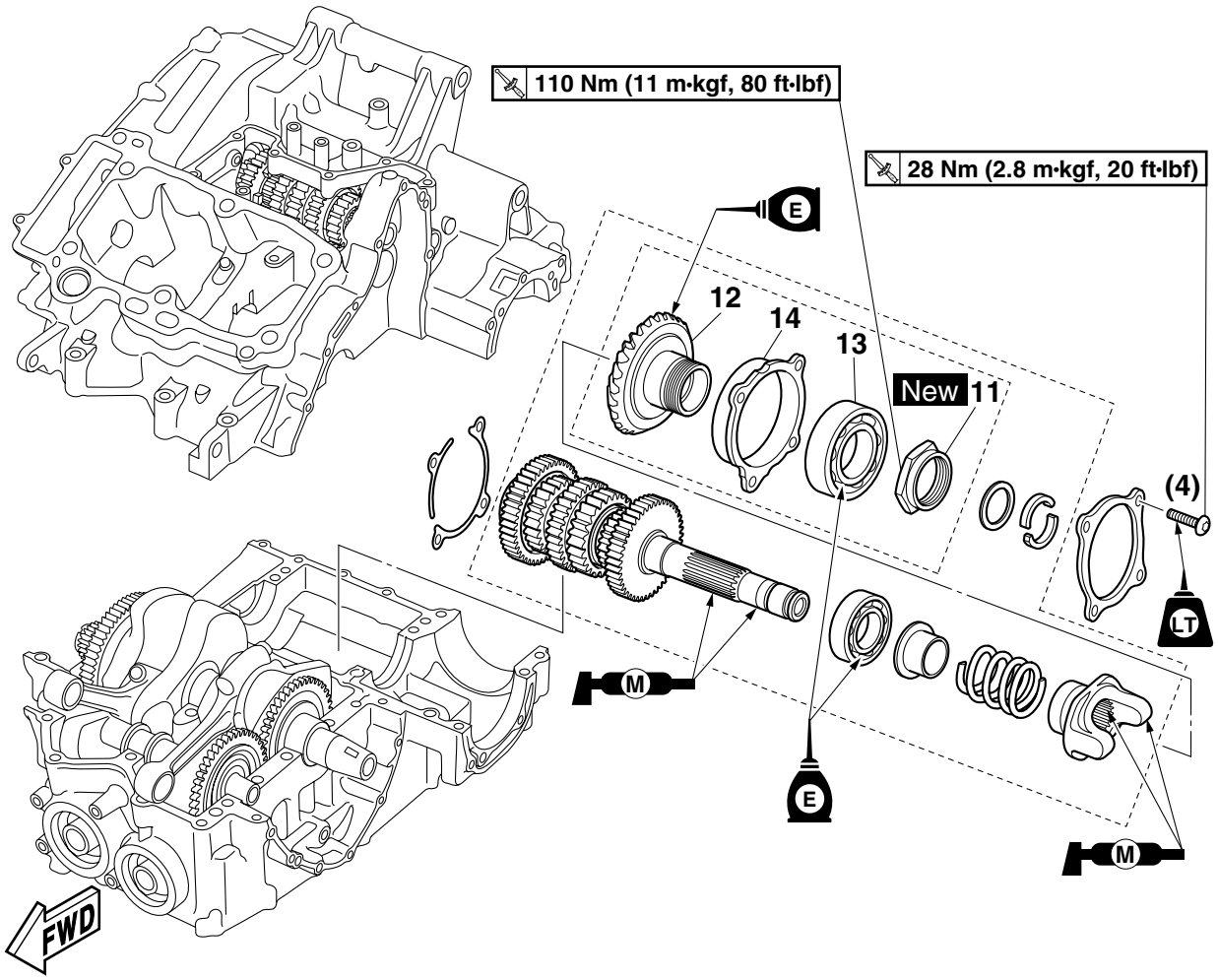
Order	Job/Parts to remove	Q'ty	Remarks
11	Universal joint yoke nut	1	
12	Washer	1	
13	Universal joint yoke	1	
14	Middle driven pinion gear	1	
15	Expander	1	
16	Bearing	1	
17	Oil seal	1	
18	Bearing	1	
19	Bearing race	2	
20	Middle driven pinion gear bearing housing	1	
			For installation, reverse the removal procedure.

Removing the middle drive pinion gear



Order	Job/Parts to remove	Q'ty	Remarks
	Crankcase		Separate. Refer to "CRANKCASE" on page 5-82.
1	Middle drive pinion gear bearing retainer	1	
2	Middle drive pinion gear shim		Refer to "ALIGNING THE MIDDLE GEAR" on page 5-123.
3	Drive axle/middle drive pinion gear assembly	1	
4	Spring retainer	2	
5	Washer	1	
6	Middle drive pinion gear assembly	1	
7	Torque damper cam	1	
8	Spring	1	
9	Spring seat	1	
10	Bearing	1	

Removing the middle drive pinion gear



Order	Job/Parts to remove	Q'ty	Remarks
11	Middle drive pinion gear nut	1	
12	Middle drive pinion gear	1	
13	Bearing	1	
14	Middle drive pinion gear bearing housing	1	
			For installation, reverse the removal procedure.

EAS23P1033
REMOVING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY

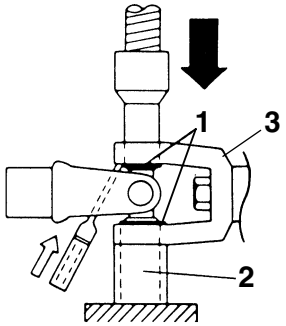
1. Remove:
   • Universal joint

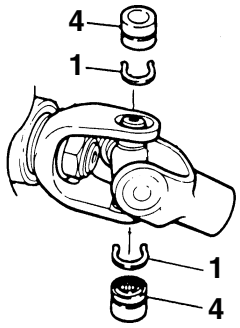
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the circlips "1".
b. Place the universal joint in a press.
c. With a pipe "2" of the proper diameter positioned beneath the universal joint yoke "3" as shown, press out the bearings "4".

TIP

It may be necessary to lightly tap the universal joint yoke.





d. Repeat the above steps to remove the opposite side's bearing.
e. Separate the universal joint yokes.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

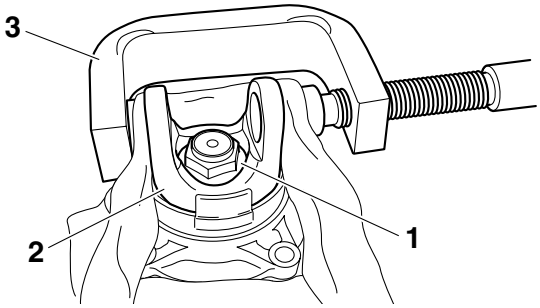
ECA23P1047
DISASSEMBLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY

1. Remove:
   • Universal joint yoke nut "1"

TIP

- Straighten the collar on the universal joint yoke nut.
- Wrap the middle driven pinion gear bearing housing in a folded rag, and then secure it in a vise.
- While holding the universal joint yoke "2" with the universal joint holder "3" and the 20 mm (0.79 in) diameter attachment, loosen the universal joint yoke nut. Place a rag between the attachment and the universal joint yoke as shown in the illustration.

Universal joint holder
90890-04160



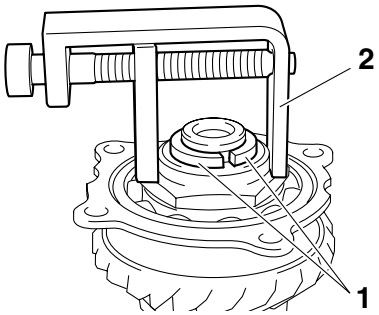
EAS23P1035
REMOVING THE MIDDLE DRIVE PINION GEAR ASSEMBLY

1. Remove:
   • Spring retainers "1"
   • Washer

TIP

While compressing the spring with the damper spring compressor "2", remove the spring retainers and washer.

Damper spring compressor
90890-04090



EAS23P1036
DISASSEMBLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY

1. Remove:
   • Middle drive pinion gear nut

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

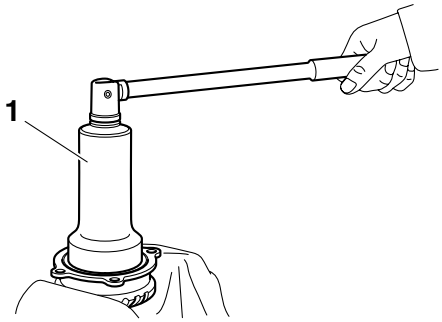
a. Straighten the collar on the middle drive pinion gear nut.

b. Attach the middle drive shaft nut wrench (55 mm) “1”.

Middle drive shaft nut wrench (55 mm)
90890-04054
Offset wrench 55 mm
YM-04054

TIP

Wrap the middle drive pinion gear in a folded rag, and then secure it in a vise.



c. Loosen the middle drive pinion gear nut.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1037

CHECKING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY

1. Check:
   • Middle driven pinion gear
   Galling/pitting/wear → Replace the middle driven pinion gear and middle drive pinion gear as a set.
2. Check:
   • Bearings
   Damage/pitting → Replace.
3. Check:
   • Universal joint movement
   Rough movement → Replace the universal joint.

EAS23P1038

CHECKING THE MIDDLE DRIVE PINION GEAR ASSEMBLY

1. Check:
   • Middle drive pinion gear
   Galling/pitting/wear → Replace the middle drive pinion gear and middle driven pinion gear as a set.
2. Check:
   • Torque damper cam surface
   Scratches/wear → Replace.
3. Check:
   • Spring
   Cracks/damage → Replace.
4. Check:
   • Bearings
   Damage/pitting → Replace.

EAS23P1039

ASSEMBLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY

1. Install:
   • Middle drive pinion gear nut New

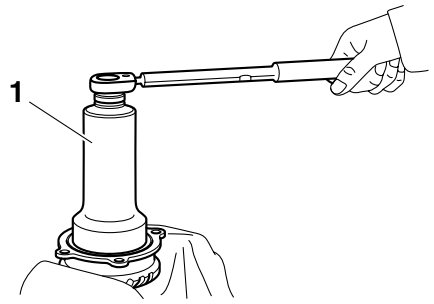
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Attach the middle drive shaft nut wrench (55 mm) “1”.

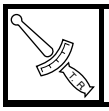
Middle drive shaft nut wrench (55 mm)
90890-04054
Offset wrench 55 mm
YM-04054

TIP

Wrap the middle drive pinion gear in a folded rag, and then secure it in a vise.

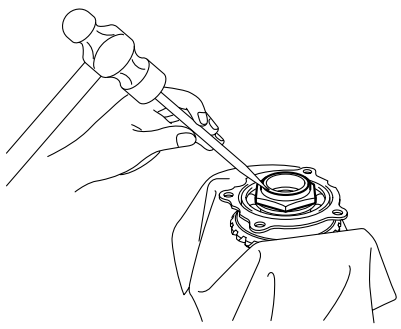


b. Tighten the middle drive pinion gear nut to specification.



Middle drive pinion gear nut
110 Nm (11.0 m·kgf, 80 ft·lbf)

c. Lock the threads with a drift punch.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

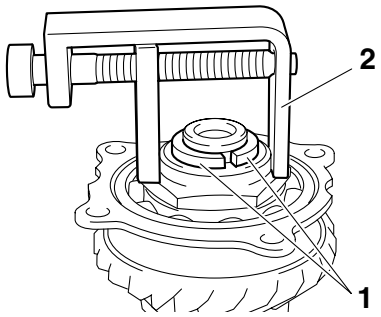
EAS23P1040
INSTALLING THE MIDDLE DRIVE PINION GEAR ASSEMBLY

1. Install:
   • Washer
   • Spring retainers “1”

TIP

While compressing the spring with the damper spring compressor “2”, install the washer and spring retainers.

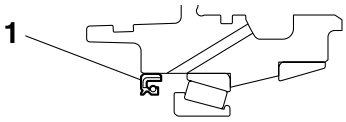
	Damper spring compressor 90890-04090

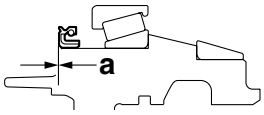


EAS23P1041
ASSEMBLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY

1. Install:
   • Oil seal “1”
   (to the middle driven pinion gear bearing housing)

	Installed depth “a” -0.5–0.5 mm (-0.02–0.02 in)

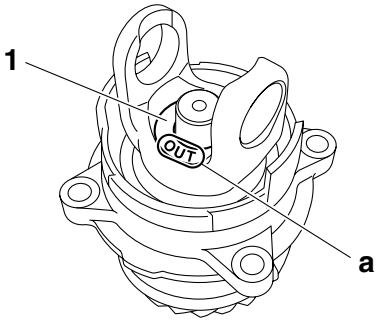




2. Install:
   • Washer “1”

TIP

Install the washer with its “OUT” mark “a” facing outward.



3. Install:
   • Universal joint yoke nut “1” New

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

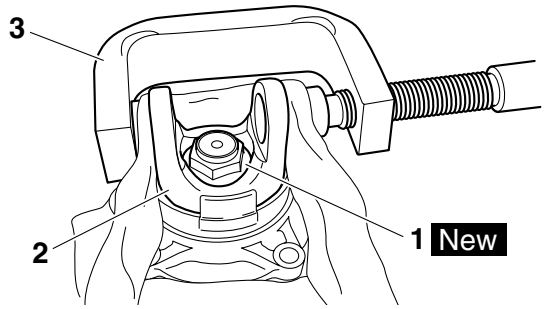
a. Tighten the universal joint yoke nut. (temporarily)

	Universal joint yoke nut (temporarily) 140–230 Nm (14–23 m·kgf, 100–166 ft·lbf) LOCTITE®

TIP

- Apply LOCTITE® to the universal joint yoke nut.
- Wrap the middle driven pinion gear bearing housing in a folded rag, and then secure it in a vise.
- While holding the universal joint yoke “2” with the universal joint holder “3” and the 20 mm (0.79 in) diameter attachment, tighten the universal joint yoke nut. Place a rag between the attachment and the universal joint yoke as shown in the illustration.
- After tightening the nut, check the operation of the middle driven pinion gear assembly. If there is looseness in the assembly, disassemble it and check if the bearings are installed properly.
- When reassembling the middle driven pinion gear assembly, replace the expander with a new one.

	Universal joint holder 90890-04160



b. Remove the universal joint holder, and then turn the nut with a torque wrench to check the starting torque.

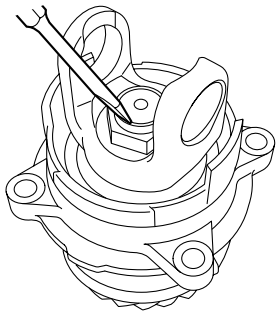
Middle driven pinion gear starting torque (middle driven pinion gear preload)
0.3–0.6 Nm (0.03–0.06 m·kgf, 0.022–0.43 ft·lbf)

c. Out of specification → Tighten the nut further.
d. Repeat steps (a) to (c) until the starting torque is within specification.

TIP

- Be careful not to exceed the specified starting torque.
- If the specified starting torque is exceeded, replace the expander with a new one and reassemble the middle driven pinion gear assembly.

e. Lock the threads with a drift punch.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Check:
   - Middle driven pinion gear operation
     Rough operation → Replace the middle driven pinion gear assembly.
5. Check:
   - Middle gear backlash
     Out of specification → Adjust the backlash.

EAS23P1042

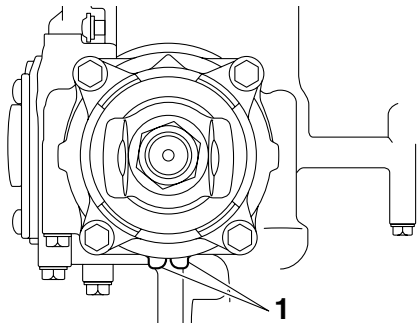
INSTALLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY

1. Install:
   - Middle driven pinion gear shim(s) “1”
   - Middle driven pinion gear assembly

Middle driven pinion gear bearing housing bolt
33 Nm (3.3 m·kgf, 24 ft·lbf)
LOCTITE®

TIP

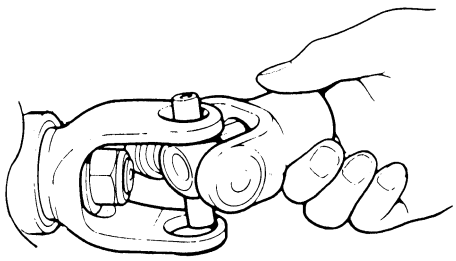
Install the shim(s) so that the tabs are positioned as shown in the illustration.



2. Install:
   - Universal joint

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Fit the universal joint into the yoke.

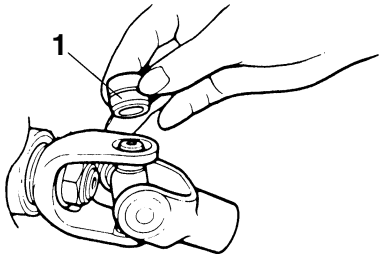


b. Apply lithium-soap-based grease to the bearings.
c. Install the bearing “1” into the yoke.

ECA23P1046

NOTICE

Check each bearing. The needle bearings can easily fall out of their races. Slide the yoke back and forth on the bearings; the yoke will not go all the way onto a bearing if a needle is out of place.

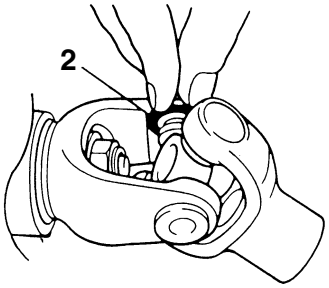


d. Press each bearing into the yoke using a suitable socket.

TIP

The bearing must be inserted far enough into the yoke so that the circlip can be installed.

e. Install the circlips "2" into the groove of each bearing.

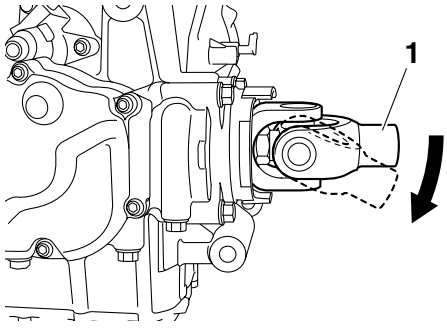


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Check:
   • Universal joint operation
   Rough operation → Replace the universal joint or bearing.

TIP

Lift the universal joint "1" and make sure that it falls freely when released.



EAS25880

MEASURING THE MIDDLE GEAR BACKLASH

1. Remove:
   • Universal joint
   • Middle gear side cover
2. Measure:
   • Middle gear backlash
   Out of specification → Refer to "ADJUSTING THE MIDDLE GEAR BACKLASH" on page 5-121.

Middle gear backlash
0.045–0.090 mm (0.002–0.004 in)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

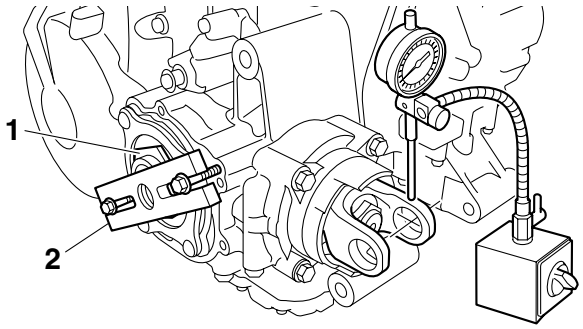
a. Hold the middle drive pinion gear "1" with the middle gear backlash tool "2".

TIP

Finger tighten the middle gear backlash tool bolts.

Middle gear backlash tool
90890-04080
Middle drive gear holder
YM-33222

b. Make sure the dial gauge plunger contacts the measuring point on the centerline of the yoke bearing hole as shown.



c. While gently turning the universal joint yoke back and forth, measure the middle gear backlash.

TIP

Measure the middle gear backlash at four positions. Rotate the universal joint yoke 90° each time and observe the reading on the dial gauge.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS25900

ADJUSTING THE MIDDLE GEAR BACKLASH

1. Loosen:
   • Middle driven pinion gear bearing housing bolts
2. Remove:
   • Middle driven pinion gear shim(s)
3. Tighten:
   • Middle driven pinion gear bearing housing bolts

Middle driven pinion gear bearing housing bolt
33 Nm (3.3 m·kgf, 24 ft·lbf)

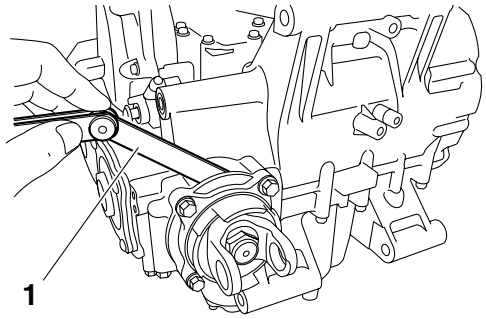
ECA23P1047

NOTICE

Do not overtighten the middle driven pinion gear bearing housing bolts or you may obtain too little middle gear backlash and damage the middle gears. If the bolts are overtightened, loosen them until the crankcase-to-middle-driven-pinion gear-bearing-housing clearance is within specification, as stated below. Then, repeat all of the previous steps.

TIP

- Tighten the middle driven pinion gear bearing housing bolts carefully, one thread turn at a time only. Push in the middle driven pinion gear bearing housing and then tighten the bolts to specification.
- Clearance between the crankcase and the middle driven pinion gear bearing housing should be approximately 2 mm (0.08 in), when measured with a thickness gauge "1".

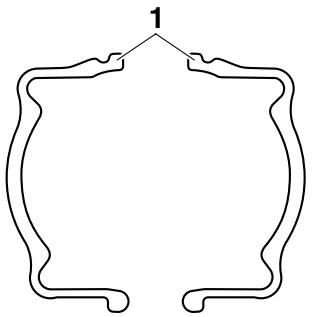


4. Hold the middle drive pinion gear.
5. Turn:
   - Universal joint yoke

TIP

While carefully tightening the middle driven pinion gear bearing housing bolts in stages and in a crisscross pattern, turn the universal joint yoke back and forth until the dial gauge reads 0.045–0.090 mm (0.002–0.004 in).

6. Measure:
   - Crankcase-to-middle-driven-pinion gear-bearing-housing clearance (with a thickness gauge)
7. Select:
   - Middle driven pinion gear shim(s) "1"



▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Shims are only available in 0.05 mm increments, therefore round off to the hundredth's digit of the calculated thickness and select the appropriate shim(s) with the following chart.
b. For example, the clearance between the crankcase and the middle driven pinion gear bearing housing is 0.46 mm. Therefore, the chart instructs you to round off the 6 to 5. Thus, you should use one 0.15 mm and one 0.30 mm shim.

Hundredth	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

Shims are supplied in the following thicknesses.

Middle driven pinion gear shim Thickness (mm)
0.10 0.15 0.20 0.30 0.40 0.50

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

8. Loosen:
   - Middle driven pinion gear bearing housing bolts
9. Install:
   - Middle driven pinion gear shim(s)
     Refer to "INSTALLING THE MIDDLE DRIVEN PINION GEAR ASSEMBLY" on page 5-120.
10. Tighten:
   - Middle driven pinion gear bearing housing bolts

Middle driven pinion gear bearing housing bolt
33 Nm (3.3 m·kgf, 24 ft·lbf)
LOCTITE®

11.Measure:
• Middle gear backlash
Out of specification → Refer to “MEASURING THE MIDDLE GEAR BACKLASH” on page 5-121.

EAS25930
ALIGNING THE MIDDLE GEAR

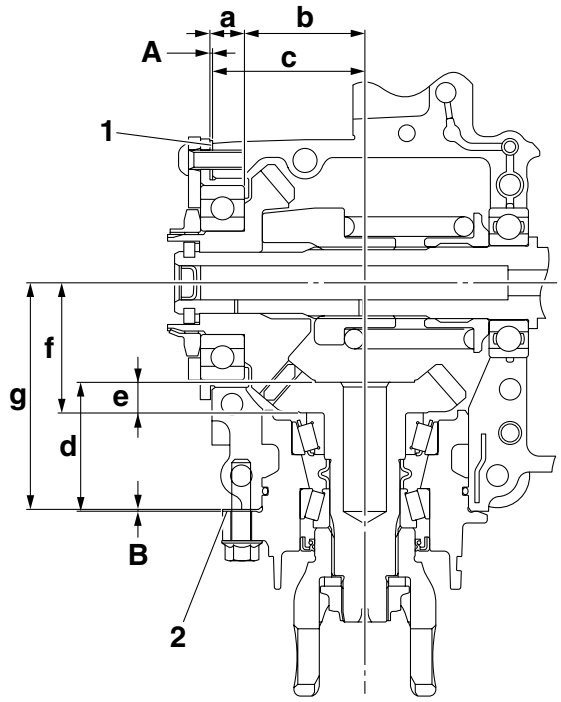
TIP

Aligning the middle gear is necessary when any of the following parts are replaced:
• Crankcase
• Middle drive pinion gear
• Middle driven pinion gear
• Middle driven pinion gear bearing housing

1. Select:
• Middle drive pinion gear shim(s) “1”
• Middle driven pinion gear shim(s) “2”

TIP

Select the middle driven pinion gear shim(s) “2” by calculating the middle drive pinion gear shim thickness and then measuring the middle gear backlash.



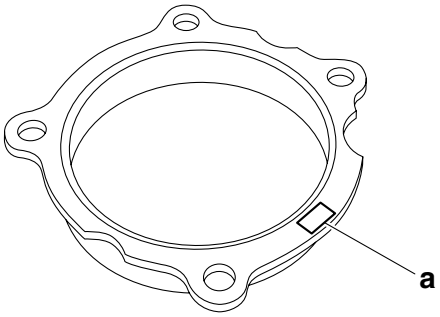
A. Middle drive pinion gear shim thickness
B. Middle driven pinion gear shim thickness

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

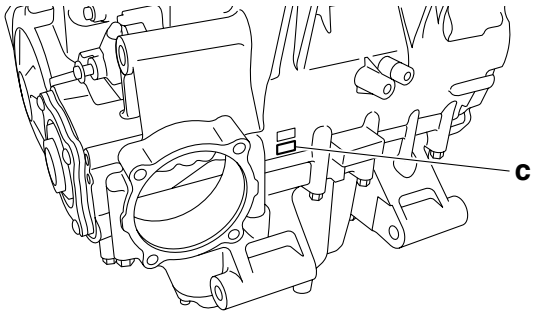
a. Position the middle gears with the appropriate shim(s) that has had its respective thickness calculated from information marked on the upper crankcase, middle driven pinion gear, and bearing housings.
b. To find middle drive pinion gear shim thickness “A”, use the following formula.

Middle drive pinion gear shim thickness
“A” = “a” + “b” - “c” - 0.1

“a”= a numeral on the middle drive pinion gear bearing housing, to be divided by 100 and added to “14.00”



“b”= 52.20
“c”= a numeral on the upper crankcase, to be divided by 100 and added to “66.00”



Example:
If the middle drive pinion gear bearing housing is marked “57”
“a” is 14.57 (i.e., 14.00 + 0.57 = 14.57)
“b” is 52.20
If the upper crankcase is marked “18”
“c” is 66.18 (i.e., 66.00 + 0.18 = 66.18)
“A” = 14.57 + 52.20 - 66.18 - 0.1 = 0.49
Round off to the hundredths digit and select the appropriate shim(s).

TIP

In the above example, the calculated number is 0.49. The chart instructs you to round off the 9 to 10. Thus, the shim thickness is 0.50 mm.

Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

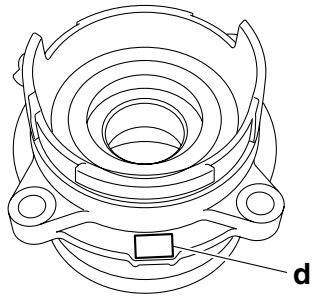
Shims are supplied in the following thicknesses.

Middle drive pinion gear shim Thickness (mm)
0.10 0.15 0.20 0.30 0.40 0.50

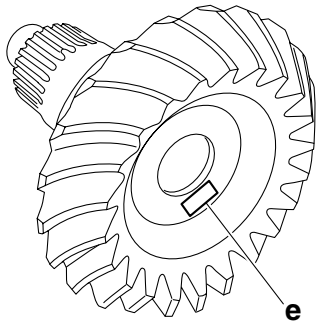
c. To find middle driven pinion gear shim thickness "B", use the following formula.

Middle driven pinion gear shim thickness
"B" = "d" - "e" + "f" - "g"

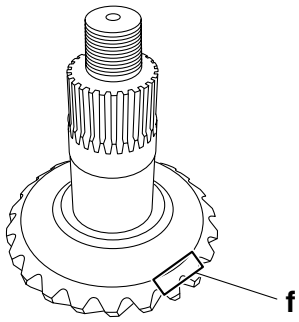
"d"= a numeral on the middle driven pinion gear bearing housing, to be divided by 100 and either added to or subtracted from "55.95"



"e"= a numeral on the middle driven pinion gear, to be divided by 100 and either added to or subtracted from "13.40"



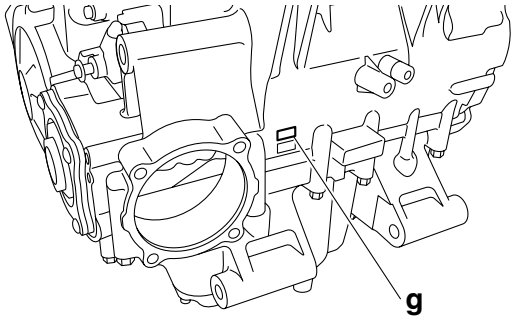
"f"= a numeral on the middle driven pinion gear, to be divided by 100 and either added to or subtracted from "57.00"



"g"= a numeral on the upper crankcase, to be divided by 100 and added to "98.00"

TIP

If the upper crankcase is marked "00", "g" is 99.00.



Example:
If the middle driven pinion gear bearing housing is marked "+17"
"d" is 56.12 (i.e., 55.95 + 0.17 = 56.12)
If the middle driven pinion gear is marked "+03"
"e" is 13.43 (i.e., 13.40 + 0.03 = 13.43)
If the middle driven pinion gear is marked "-02"
"f" is 56.98 (i.e., 57.00 - 0.02 = 56.98)
If the upper crankcase is marked "93"
"g" is 98.93 (i.e., 98.00 + 0.93 = 98.93)

TIP

If the upper crankcase is marked "00", "g" is 99.00.

"B" = 56.12 - 13.43 + 56.98 - 98.93 = 0.74
Round off to the hundredths digit and select the appropriate shim(s).

TIP

In the above example, the calculated number is 0.74. The chart instructs you to round off the 4 to 5. Thus, the shim thickness is 0.75 mm.

Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

Shims are supplied in the following thicknesses.

Middle driven pinion gear shim
Thickness (mm)
0.10 0.15 0.20 0.30 0.40 0.50

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

COOLING SYSTEM

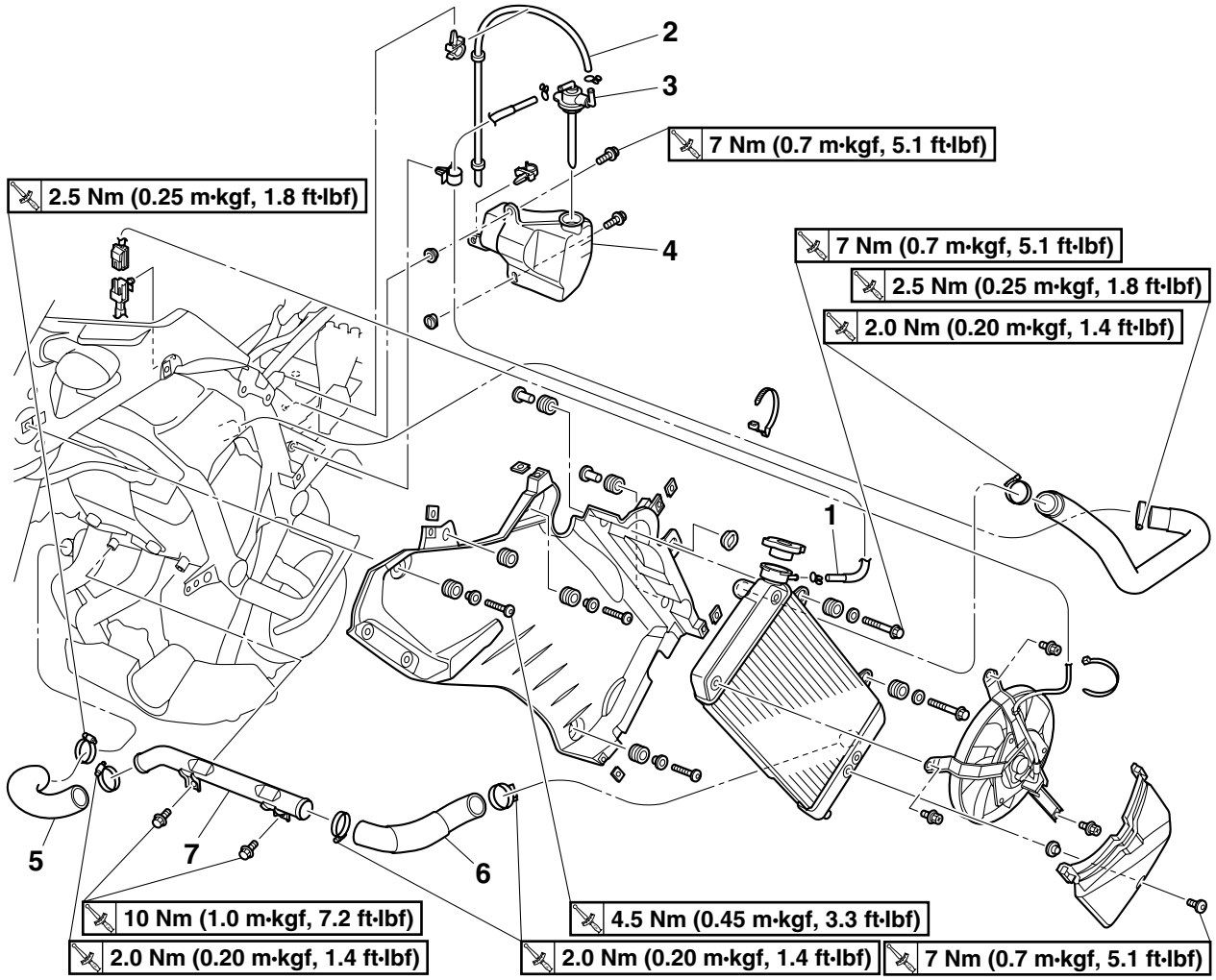
RADIATOR 6-1
CHECKING THE RADIATOR 6-3
INSTALLING THE RADIATOR 6-3

THERMOSTAT 6-4
CHECKING THE THERMOSTAT 6-5
INSTALLING THE THERMOSTAT 6-5

WATER PUMP 6-6
DISASSEMBLING THE WATER PUMP 6-8
CHECKING THE WATER PUMP 6-8
ASSEMBLING THE WATER PUMP 6-8
INSTALLING THE WATER PUMP 6-10

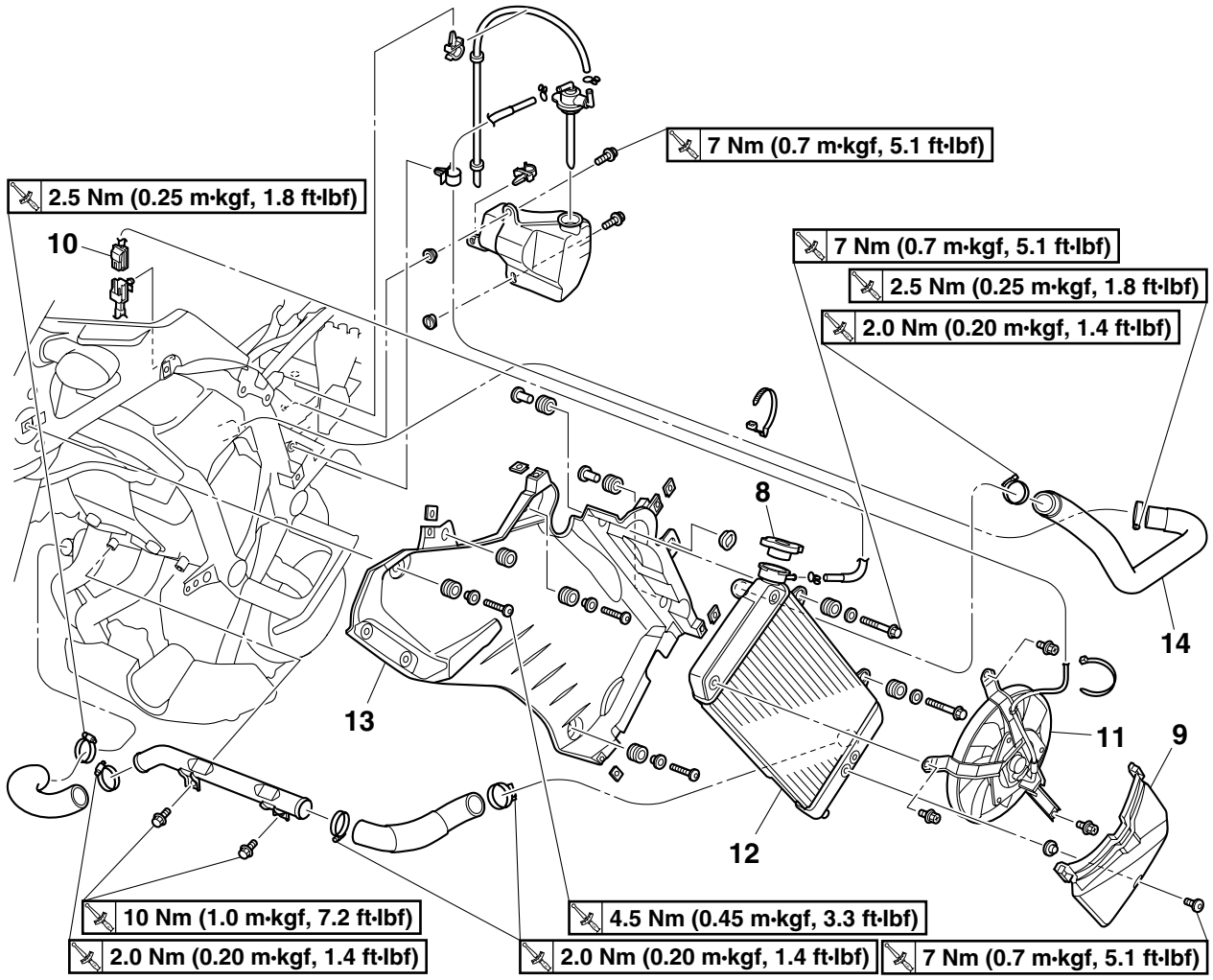
EAS26380
RADIATOR

Removing the radiator



Order	Job/Parts to remove	Q'ty	Remarks
	Coolant		Drain. Refer to "CHANGING THE COOLANT" on page 3-28.
	Air filter case		Refer to "GENERAL CHASSIS" on page 4-1.
1	Coolant reservoir hose	1	
2	Coolant reservoir breather hose	1	
3	Coolant reservoir cap	1	
4	Coolant reservoir	1	
5	Water pump inlet hose	1	
6	Radiator outlet hose	1	
7	Radiator outlet pipe	1	

Removing the radiator



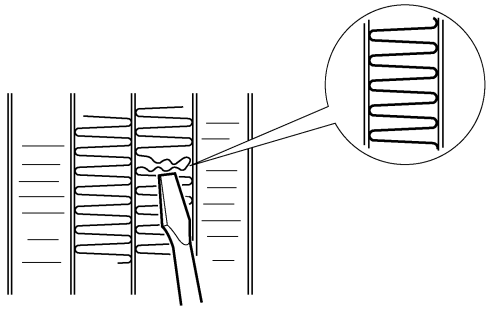
Order	Job/Parts to remove	Q'ty	Remarks
8	Radiator cap	1	
9	Radiator cover	1	
10	Radiator fan motor coupler	1	Disconnect.
11	Radiator fan	1	
12	Radiator	1	
13	Left side panel	1	
14	Radiator inlet hose	1	
			For installation, reverse the removal procedure.

EAS26390
CHECKING THE RADIATOR

1. Check:
   • Radiator fins
   Obstruction → Clean.
   Apply compressed air to the inner side of the radiator.
   Damage → Repair or replace.

TIP

Straighten any flattened fins with a thin, flat-head screwdriver.



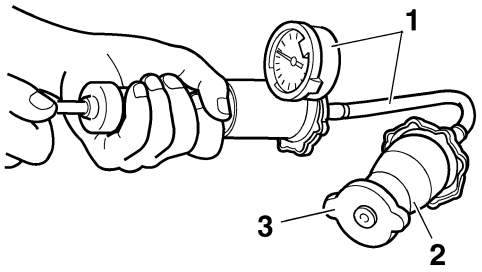
2. Check:
   • Radiator hoses
   • Radiator pipe
   Cracks/damage → Replace.
3. Measure:
   • Radiator cap opening pressure
   Below the specified pressure → Replace the radiator cap.

Radiator cap opening pressure
93.3–122.7 kPa (0.93–1.23 kgf/cm², 13.5–17.8 psi)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the radiator cap tester "1" and radiator cap tester adapter "2" to the radiator cap "3".

Radiator cap tester
90890-01325
Mityvac cooling system tester kit
YU-24460-A
Radiator cap tester adapter
90890-01352
Pressure tester adapter
YU-33984



b. Apply the specified pressure for ten seconds and make sure there is no drop in pressure.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

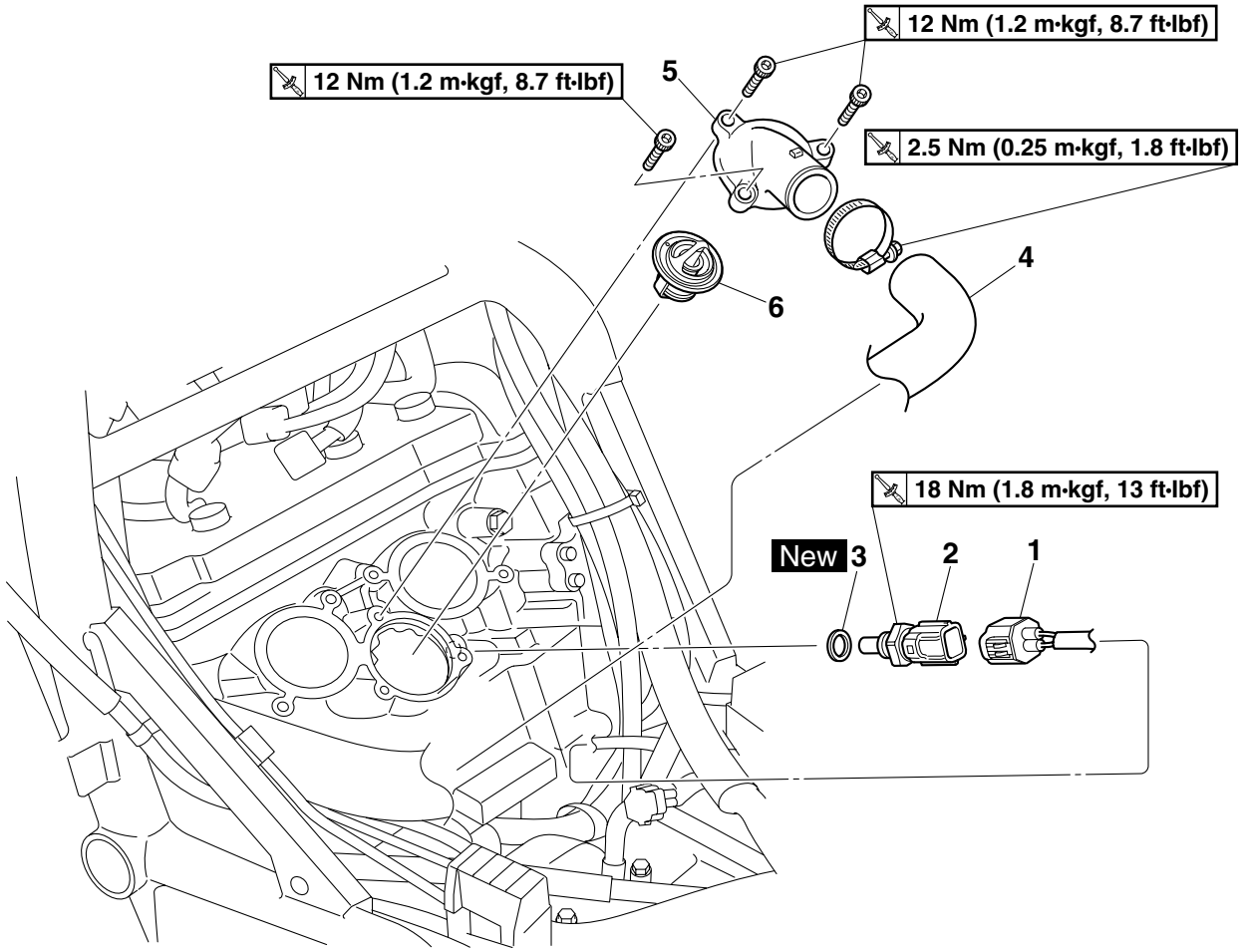
4. Check:
   • Radiator fan
   Damage → Replace.
   Malfunction → Check and repair.
   Refer to "COOLING SYSTEM" on page 8-27.

EAS26400
INSTALLING THE RADIATOR

1. Fill:
   • Cooling system
   (with the specified amount of the recommended coolant)
   Refer to "CHANGING THE COOLANT" on page 3-28.
2. Check:
   • Cooling system
   Leaks → Repair or replace any faulty part.
3. Measure:
   • Radiator cap opening pressure
   Below the specified pressure → Replace the radiator cap.
   Refer to "CHECKING THE RADIATOR" on page 6-3.

EAS26440
THERMOSTAT

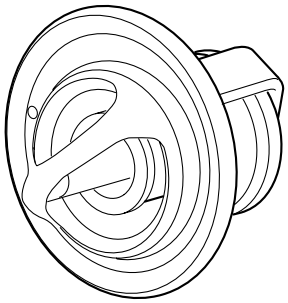
Removing the thermostat



Order	Job/Parts to remove	Q'ty	Remarks
	Coolant		Drain. Refer to "CHANGING THE COOLANT" on page 3-28.
	Throttle bodies		Refer to "THROTTLE BODIES" on page 7-5.
1	Coolant temperature sensor coupler	1	Disconnect.
2	Coolant temperature sensor	1	
3	Copper washer	1	
4	Radiator inlet hose	1	
5	Thermostat cover	1	
6	Thermostat	1	
			For installation, reverse the removal procedure.

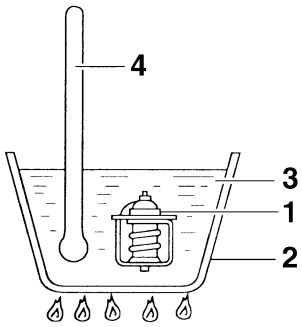
EAS26450
CHECKING THE THERMOSTAT

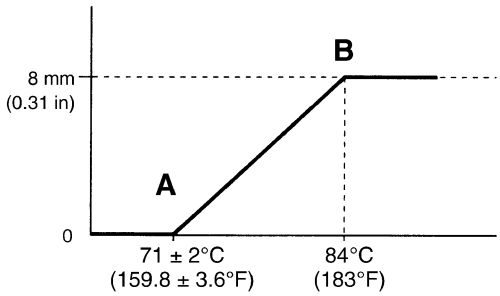
1. Check:
   • Thermostat
   Does not open at 69–73 °C (156.2–163.4 °F) → Replace.



▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Suspend the thermostat "1" in a container "2" filled with water.
b. Slowly heat the water "3".
c. Place a thermometer "4" in the water.
d. While stirring the water, observe the thermostat and thermometer's indicated temperature.





A. Fully closed
B. Fully open

TIP

If the accuracy of the thermostat is in doubt, replace it. A faulty thermostat could cause serious overheating or overcooling.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

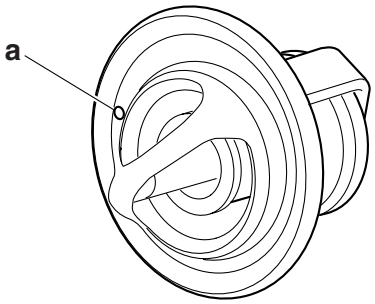
2. Check:
   • Thermostat cover
   Cracks/damage → Replace.

EAS26480
INSTALLING THE THERMOSTAT

1. Install:
   • Thermostat

TIP

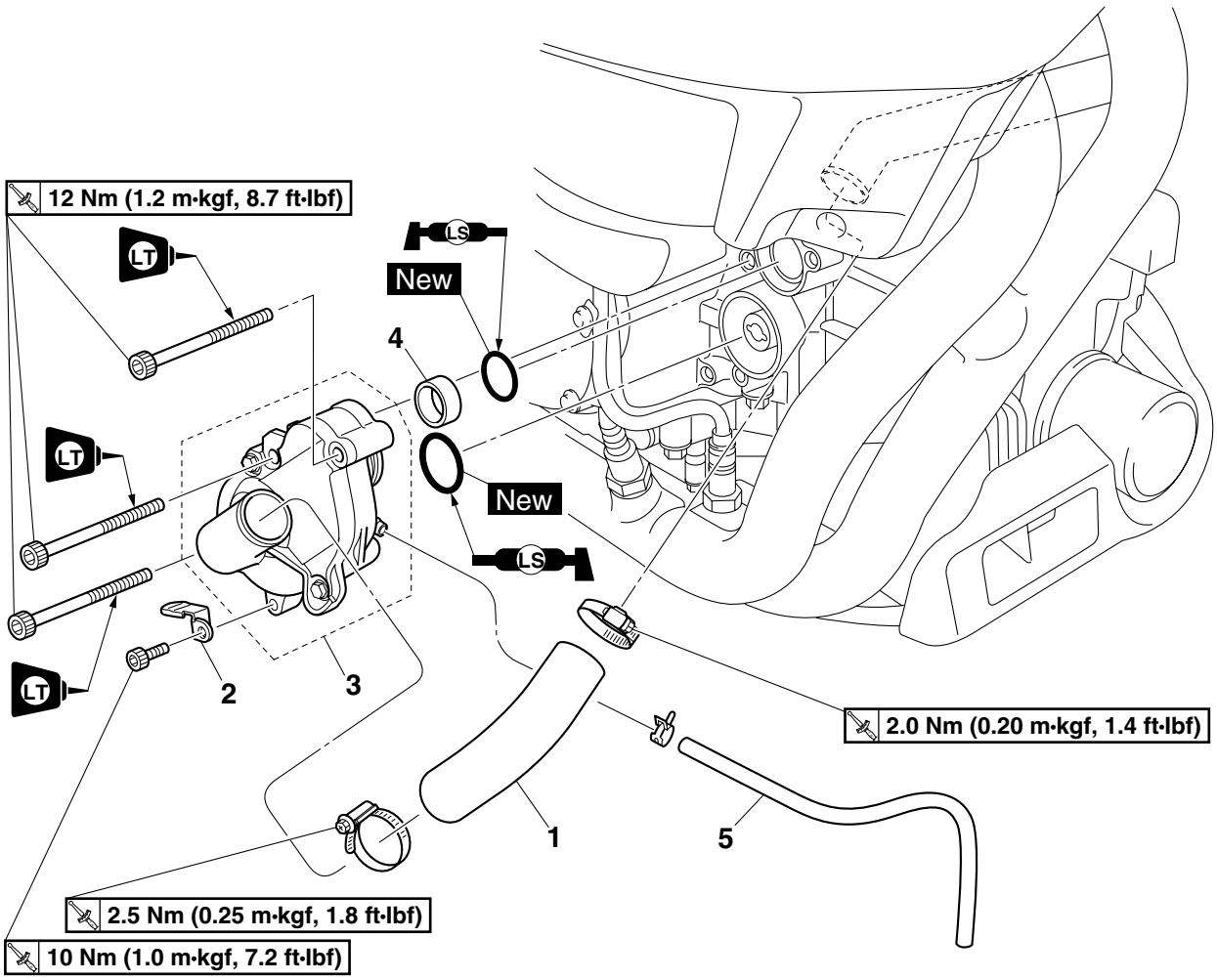
Install the thermostat with its breather hole "a" facing forward.



2. Fill:
   • Cooling system
   (with the specified amount of the recommended coolant)
   Refer to "CHANGING THE COOLANT" on page 3-28.
3. Check:
   • Cooling system
   Leaks → Repair or replace any faulty part.
4. Measure:
   • Radiator cap opening pressure
   Below the specified pressure → Replace the radiator cap.
   Refer to "CHECKING THE RADIATOR" on page 6-3.

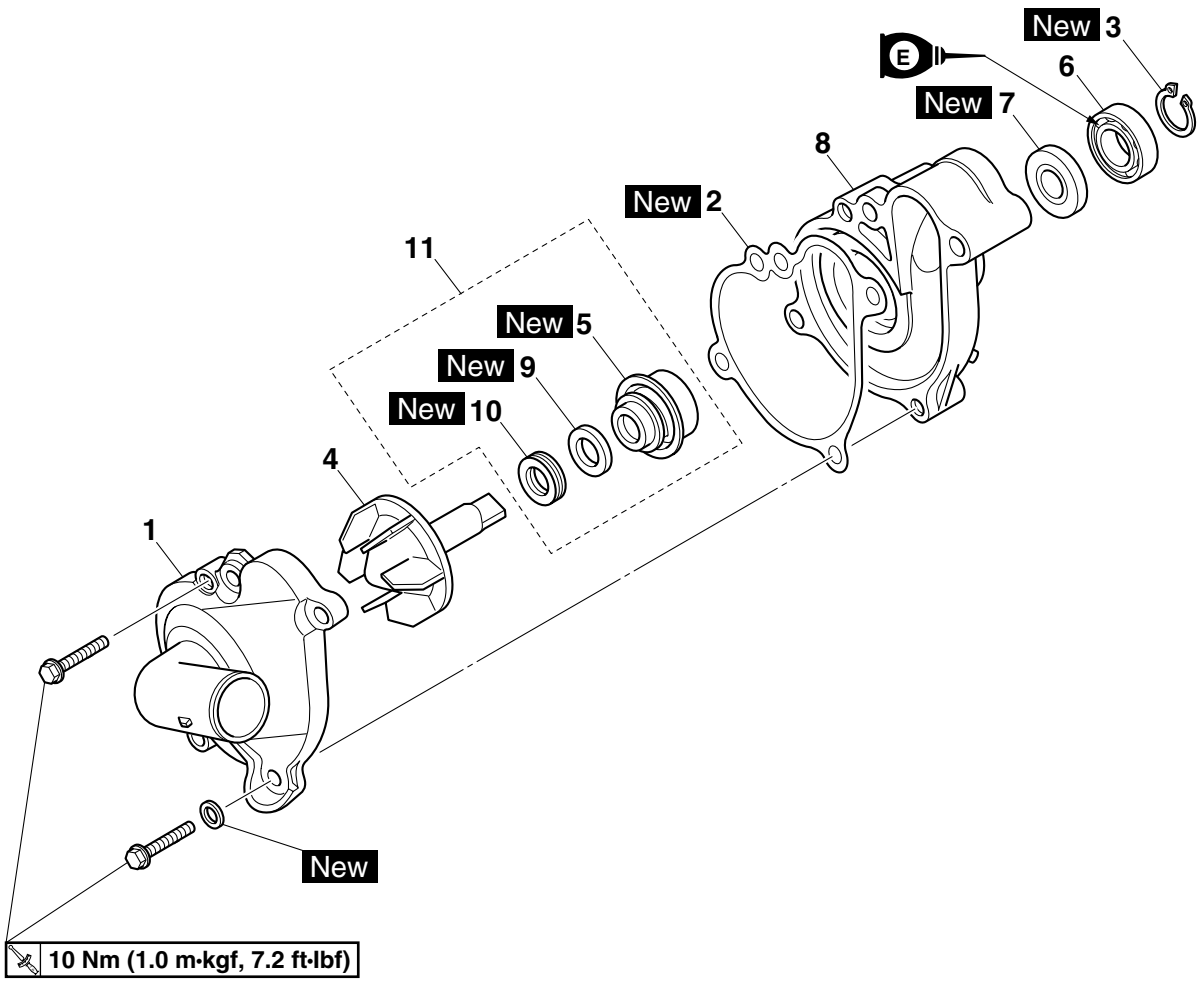
EAS26500
WATER PUMP

Removing the water pump



Order	Job/Parts to remove	Q'ty	Remarks
	Coolant		Drain. Refer to "CHANGING THE COOLANT" on page 3-28.
1	Water pump inlet hose	1	
2	Lead holder	1	
3	Water pump assembly	1	
4	Water pump outlet pipe	1	
5	Water pump breather hose	1	
			For installation, reverse the removal procedure.

Disassembling the water pump



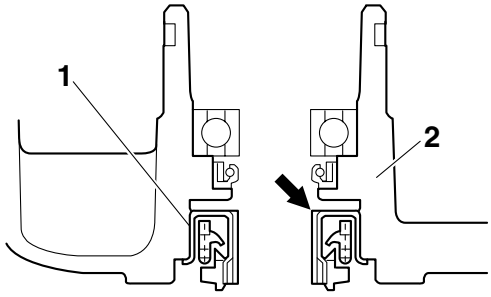
Order	Job/Parts to remove	Q'ty	Remarks
1	Water pump housing cover	1	
2	Gasket	1	
3	Circlip	1	
4	Impeller shaft	1	
5	Water pump seal	1	
6	Bearing	1	
7	Oil seal	1	
8	Water pump housing	1	
9	Rubber damper holder	1	
10	Rubber damper	1	
11	Water pump seal assembly	1	
			For assembly, reverse the disassembly procedure.

EAS26510
DISASSEMBLING THE WATER PUMP

1. Remove:
   • Water pump seal “1”

TIP

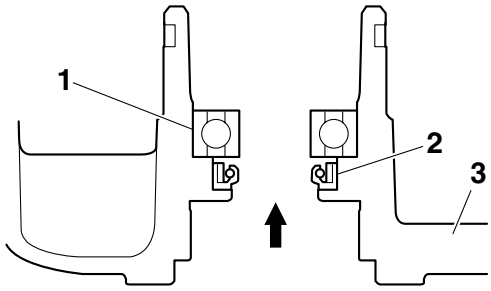
Remove the water pump seal from the inside of the water pump housing “2”.



2. Remove:
   • Bearing “1”
   • Oil seal “2”

TIP

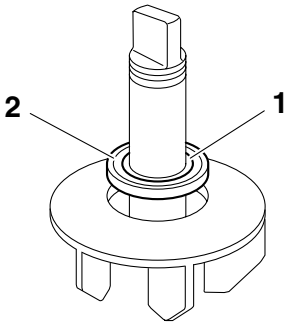
Remove the bearing and oil seal from the outside of the water pump housing “3”.



3. Remove:
   • Rubber damper holder “1”
   • Rubber damper “2”
   (from the impeller, with a thin, flat-head screwdriver)

TIP

Do not scratch the impeller shaft.



EAS26541
CHECKING THE WATER PUMP

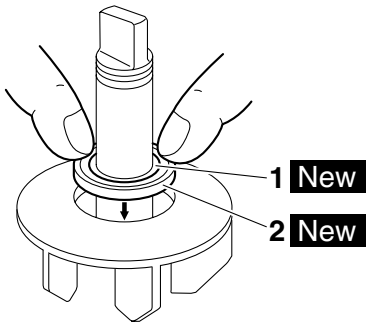
1. Check:
   • Water pump housing cover
   • Water pump housing
   • Impeller shaft
   • Water pump seal
   • Oil seal
   Cracks/damage/wear → Replace.
2. Check:
   • Bearing
   Rough movement → Replace.
3. Check:
   • Water pump outlet pipe
   • Water pump inlet hose
   Cracks/damage/wear → Replace.

EAS26560
ASSEMBLING THE WATER PUMP

1. Install:
   • Rubber damper holder “1” New
   • Rubber damper “2” New

TIP

Before installing the rubber damper, apply tap water or coolant onto its outer surface.



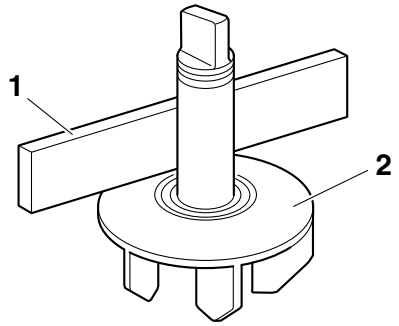
2. Measure:
   • Impeller shaft tilt
   Out of specification → Repeat steps (1) and (2).

ECA14090

NOTICE

Make sure the rubber damper and rubber damper holder are flush with the impeller.

	Impeller shaft tilt limit **0.15 mm (0.0059 in)**



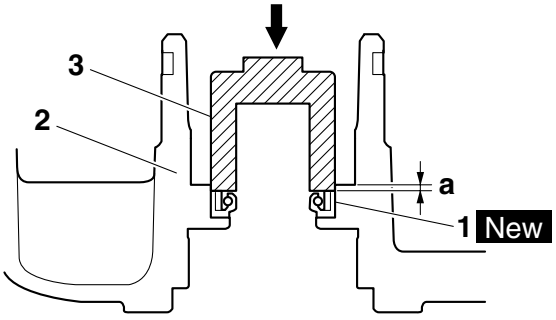
1. Straightedge
2. Impeller

3. Install:
   • Oil seal “1” New
   (into the water pump housing “2”)

TIP

Install the oil seal with a socket “3” that matches its outside diameter.

Installed depth of oil seal “a”
0.5–1.0 mm (0.02–0.04 in)



4. Install:
   • Water pump seal “1” New
   (into the water pump housing “2”)

ECA14080

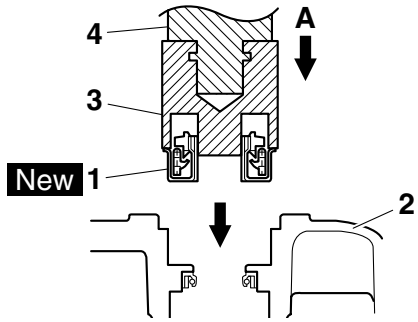
NOTICE

Never lubricate the water pump seal surface with oil or grease.

TIP

- Apply coolant to the lip of the water pump seal.
- Install the water pump seal with the special tools.

Mechanical seal installer
90890-04132
Water pump seal installer
YM-33221-A
Middle driven shaft bearing driver
90890-04058
Middle drive bearing installer 40 & 50 mm
YM-04058

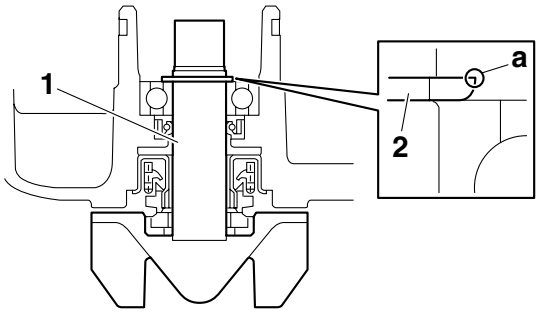


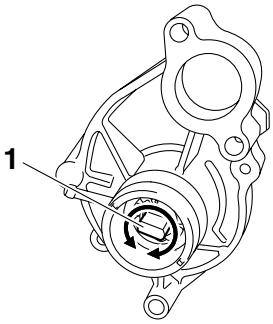
3. Mechanical seal installer
4. Middle driven shaft bearing driver
A. Push down

5. Install:
   • Impeller shaft “1”
   • Circlip “2”

TIP

- Be sure the circlip sharp-edged corner “a” is positioned opposite side to the bearing.
- After installation, check that the impeller shaft rotates smoothly.



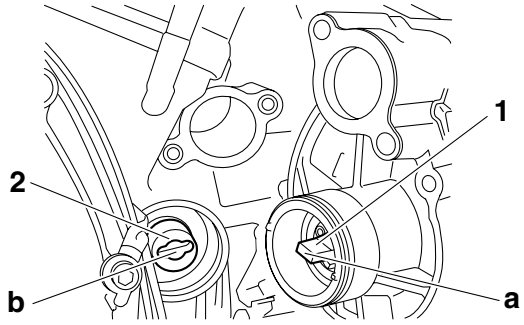


EAS26590
INSTALLING THE WATER PUMP

1. Install:
   • Water pump assembly

TIP

Align the projection “a” on the impeller shaft “1” with the slot “b” in the front balancer shaft “2”.



2. Fill:
   • Cooling system
   (with the specified amount of the recommended coolant)
   Refer to “CHANGING THE COOLANT” on page 3-28.
3. Check:
   • Cooling system
   Leaks → Repair or replace the faulty part.
4. Measure:
   • Radiator cap opening pressure
   Below the specified pressure → Replace the radiator cap.
   Refer to “CHECKING THE RADIATOR” on page 6-3.

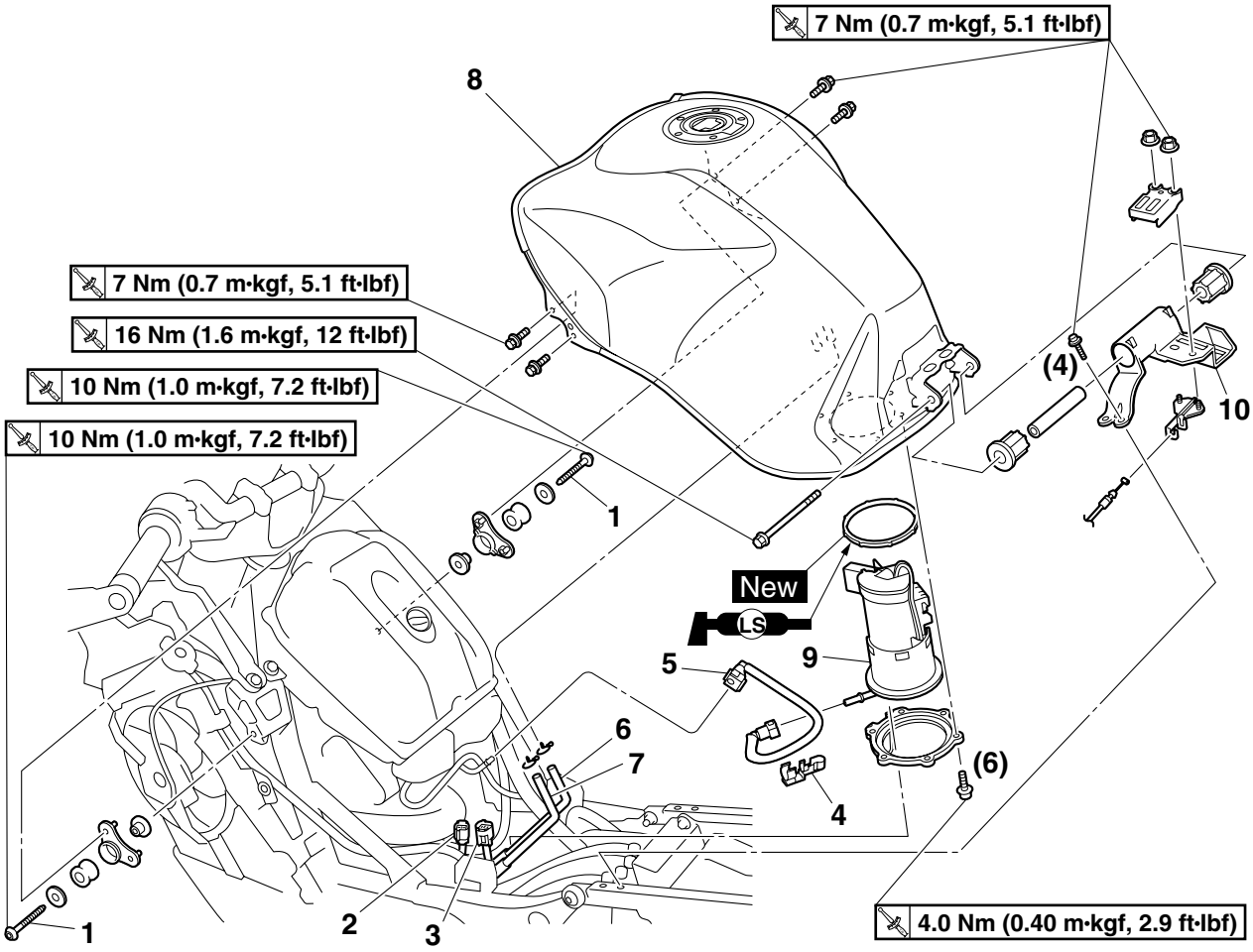
FUEL SYSTEM

FUEL TANK 7-1
REMOVING THE FUEL TANK 7-3
REMOVING THE FUEL PUMP 7-3
CHECKING THE FUEL PUMP BODY 7-3
INSTALLING THE FUEL PUMP 7-3
INSTALLING THE FUEL TANK 7-4

THROTTLE BODIES 7-5
CHECKING THE INJECTORS (BEFORE REMOVING) 7-8
REMOVING THE INJECTORS 7-8
CHECKING THE INJECTORS 7-8
CHECKING AND CLEANING THE THROTTLE BODIES 7-8
CHECKING THE THROTTLE BODY JOINTS 7-10
INSTALLING THE INJECTORS 7-10
CHECKING THE INJECTOR PRESSURE 7-10
CHECKING THE FUEL PRESSURE 7-11
ADJUSTING THE THROTTLE POSITION SENSOR 7-12
ADJUSTING THE ACCELERATOR POSITION SENSOR 7-12
INSTALLING THE THROTTLE BODY JOINTS 7-13

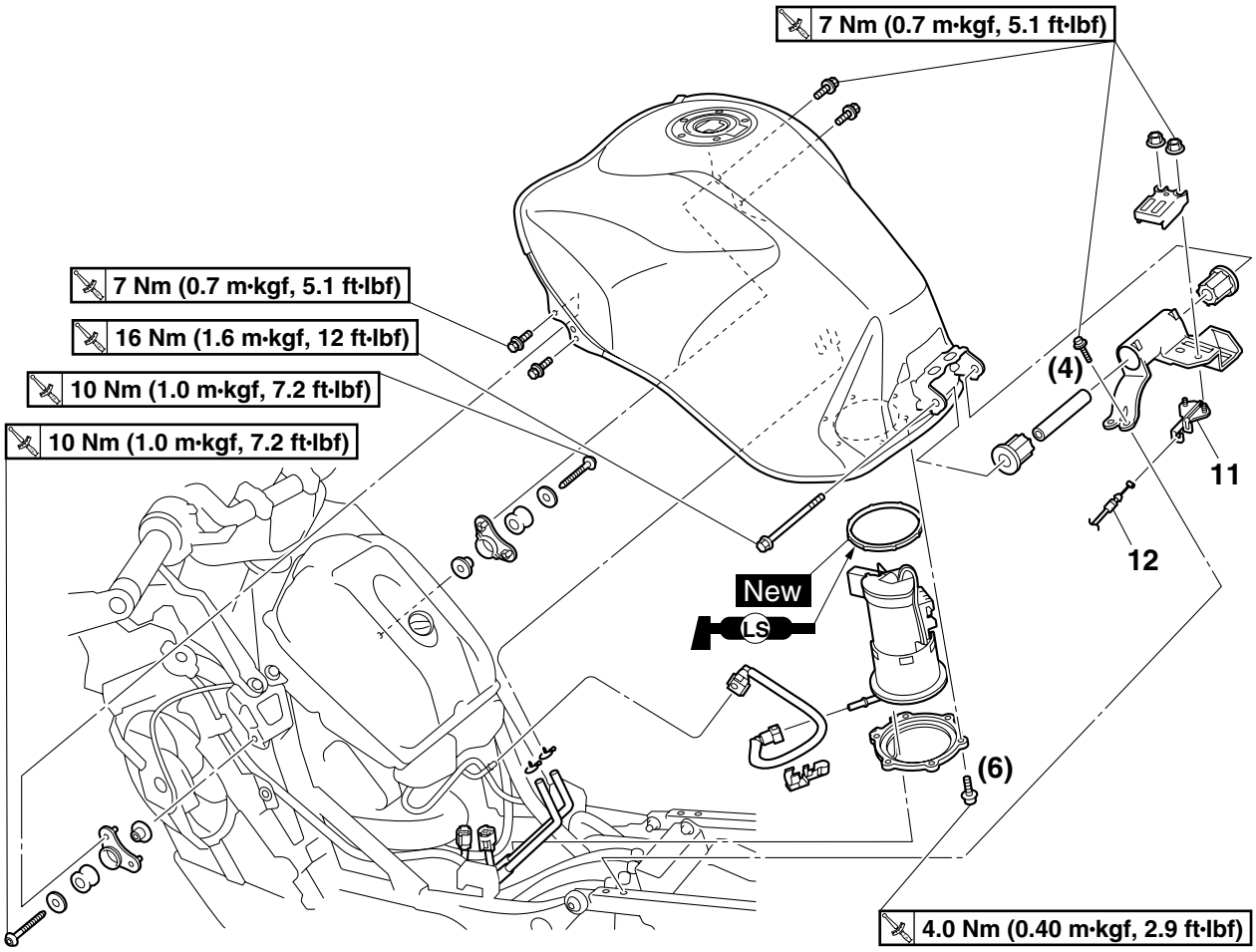
EAS26620
FUEL TANK

Removing the fuel tank and fuel pump



Order	Job/Parts to remove	Q'ty	Remarks
	Left side cowling/Right side cowling/Rider seat height position adjuster		Refer to "GENERAL CHASSIS" on page 4-1.
1	Front fuel tank bolt	2	
2	Fuel pump coupler	1	Disconnect.
3	Fuel sender coupler	1	Disconnect.
4	Fuel hose holder	1	
5	Fuel hose	1	
6	Fuel tank overflow hose	1	Disconnect.
7	Fuel tank breather hose	1	Disconnect.
8	Fuel tank	1	
9	Fuel pump	1	
10	Rear fuel tank bracket	1	

Removing the fuel tank and fuel pump



Order	Job/Parts to remove	Q'ty	Remarks
11	Seat lock assembly	1	
12	Seat lock cable	1	Disconnect.
			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

EWA23P1001
⚠ WARNING

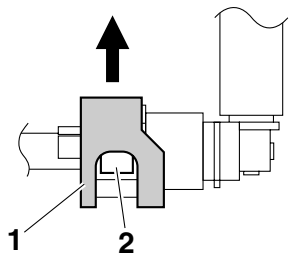
Cover fuel hose connections with a cloth when disconnecting them. Residual pressure in the fuel lines could cause fuel to spurt out when removing the hose.

ECA23P1090
NOTICE

Although the fuel has been removed from the fuel tank, be careful when removing the fuel hose, since there may be fuel remaining in it.

TIP

- To remove the fuel hose from the fuel rail, slide the fuel hose connector cover "1" on the end of the hose in the direction of the arrow shown, press the two buttons "2" on the sides of the connector, and then remove the hose.
- Remove the fuel hose manually without using any tools.
- Before removing the hose, place a few rags in the area under where it will be removed.



3. Remove:
   • Fuel tank

TIP

Do not set the fuel tank down on the installation surface of the fuel pump. Be sure to lean the fuel tank against a wall or the like.

EAS26640
REMOVING THE FUEL PUMP

1. Remove:
   • Fuel pump

ECA14720
NOTICE

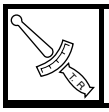
- **Do not drop the fuel pump or give it a strong shock.**
- **Do not touch the base section of the fuel sender.**

EAS26670
CHECKING THE FUEL PUMP BODY

1. Check:
   • Fuel pump body
   Obstruction → Clean.
   Cracks/damage → Replace fuel pump assembly.

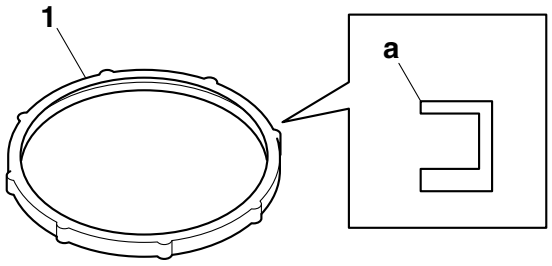
EAS26700
INSTALLING THE FUEL PUMP

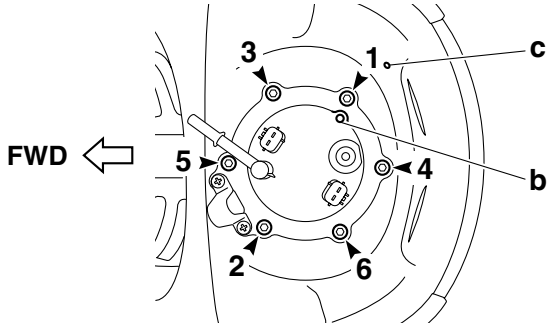
1. Install:
   • Fuel pump gasket "1" New
   • Fuel pump
   • Fuel pump bracket

	**Fuel pump bolt** **4.0 Nm (0.40 m·kgf, 2.9 ft·lbf)**

TIP

- Do not damage the installation surfaces of the fuel tank when installing the fuel pump.
- Always use a new fuel pump gasket.
- Install the fuel pump gasket with its lip "a" facing up.
- Align the projection "b" on the fuel pump with the punch mark "c" on the fuel tank.
- Align the slot in the fuel pump bracket with the projection "b" on the fuel pump.
- Tighten the fuel pump bolts in the proper tightening sequence as shown.





EAS23P1001
INSTALLING THE FUEL TANK

1. Temporarily:
   • Fuel tank bolt (rear side)

TIP

Temporarily tighten the fuel tank bolt.

2. Install:
   • Fuel hose (fuel rail side)

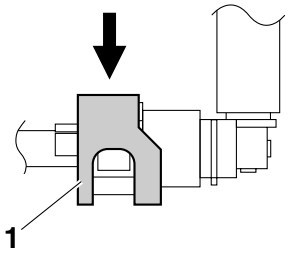
ECA23P1091

NOTICE

When installing the fuel hose, make sure that it is securely connected, and that the fuel hose connector cover on the fuel hose is in the correct position, otherwise the fuel hose will not be properly installed.

TIP

- Install the fuel hose securely onto the fuel rail until a distinct “click” is heard.
- To install the fuel hose onto the fuel rail, slide the fuel hose connector cover “1” on the end of the hose in the direction of the arrow shown.



3. Install:
   • Fuel hose (fuel pump side)
   • Fuel hose holder

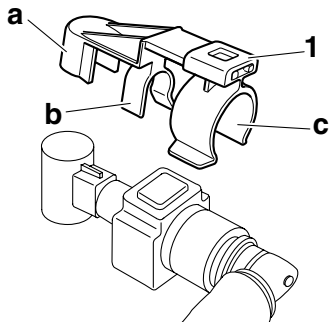
ECA23P1001

NOTICE

When installing the fuel hose, make sure that it is securely connected, and that the fuel hose holder is in the correct position, otherwise the fuel hose will not be properly installed.

TIP

- Install the fuel hose connector securely onto the fuel tank until a distinct “click” is heard, and then make sure that it does not come loose.
- After installing the fuel hose holder “1”, make sure that the sections “a”, “b”, and “c” of the holder are installed securely.



4. Tighten:
   • Fuel tank bolts (front side)

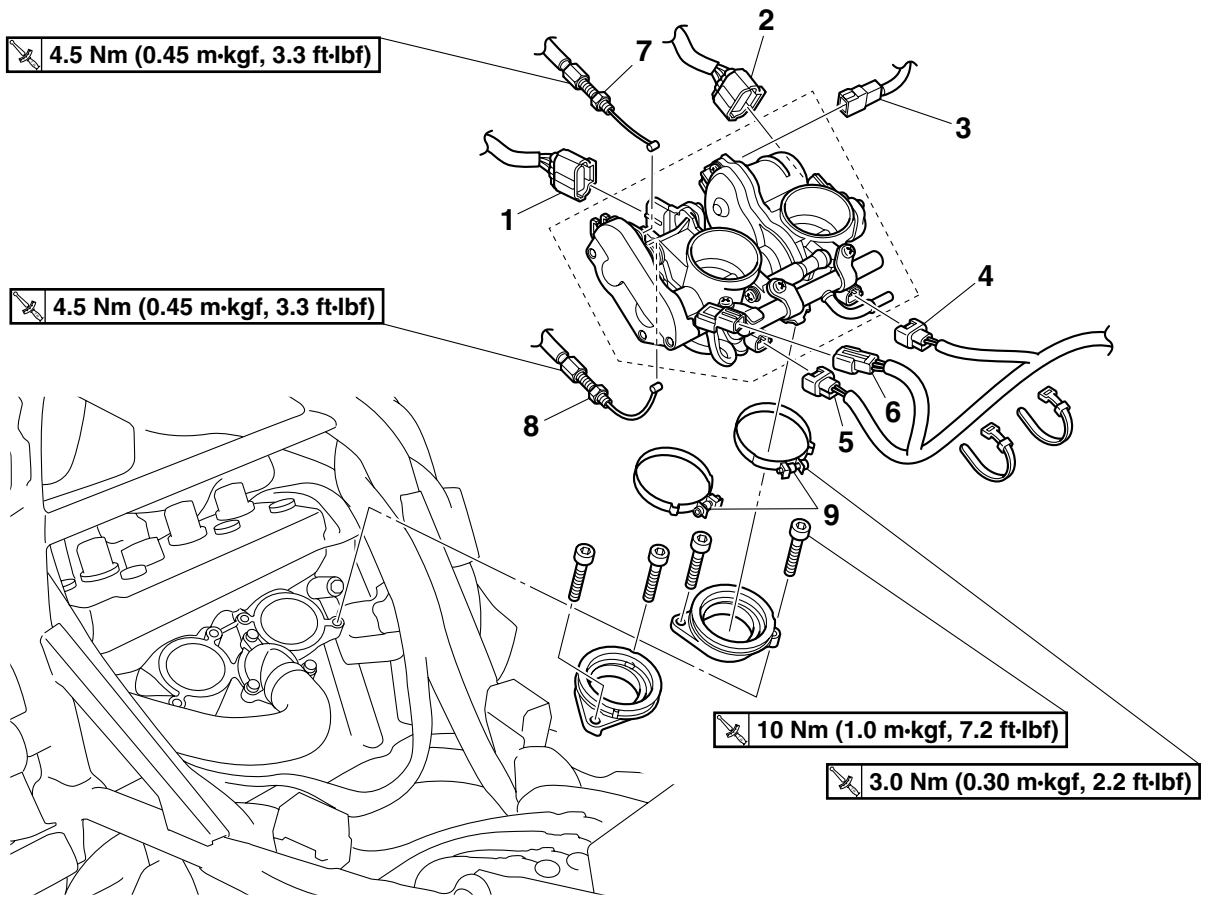
	Fuel tank bolt (front side) **10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

5. Tighten:
   • Fuel tank bolt (rear side)

	Fuel tank bolt (rear side) **16 Nm (1.6 m·kgf, 12 ft·lbf)**

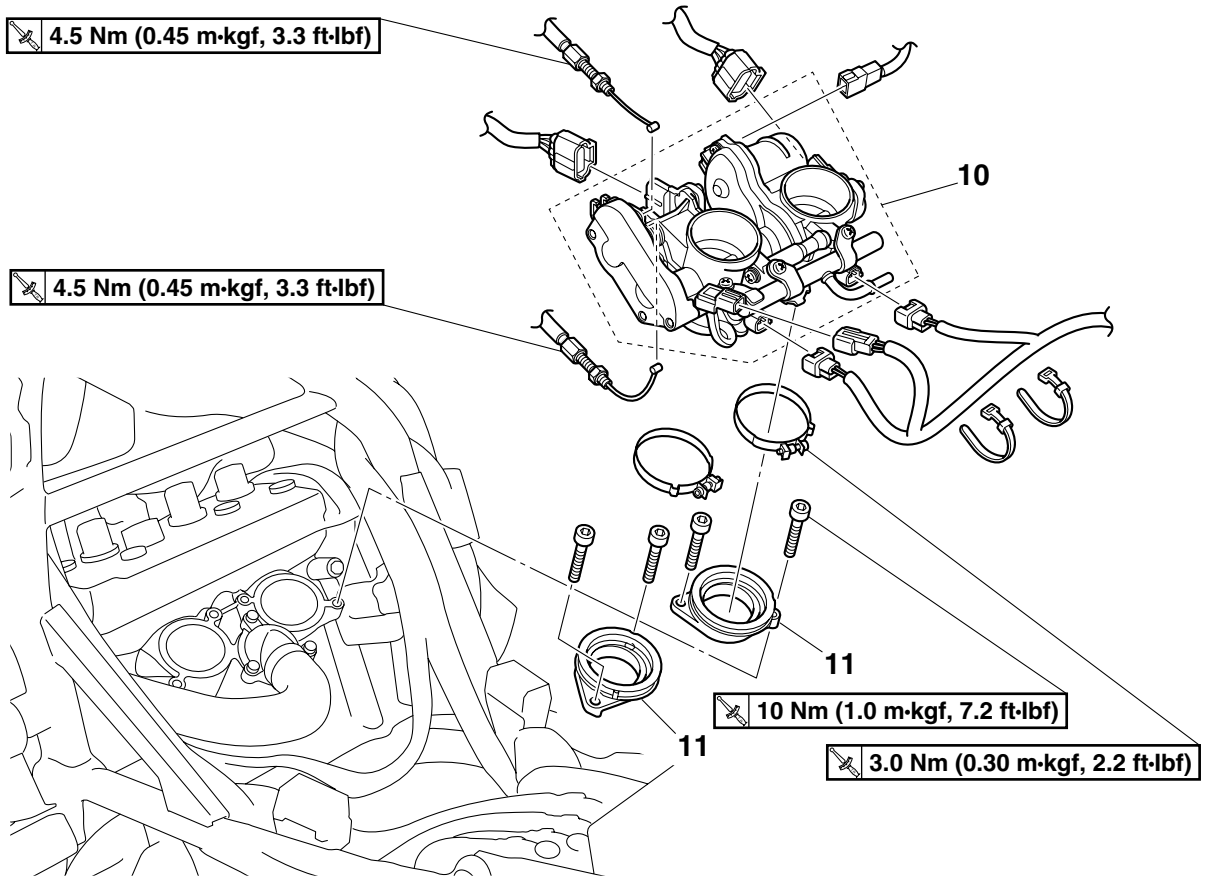
EAS26970
THROTTLE BODIES

Removing the throttle bodies



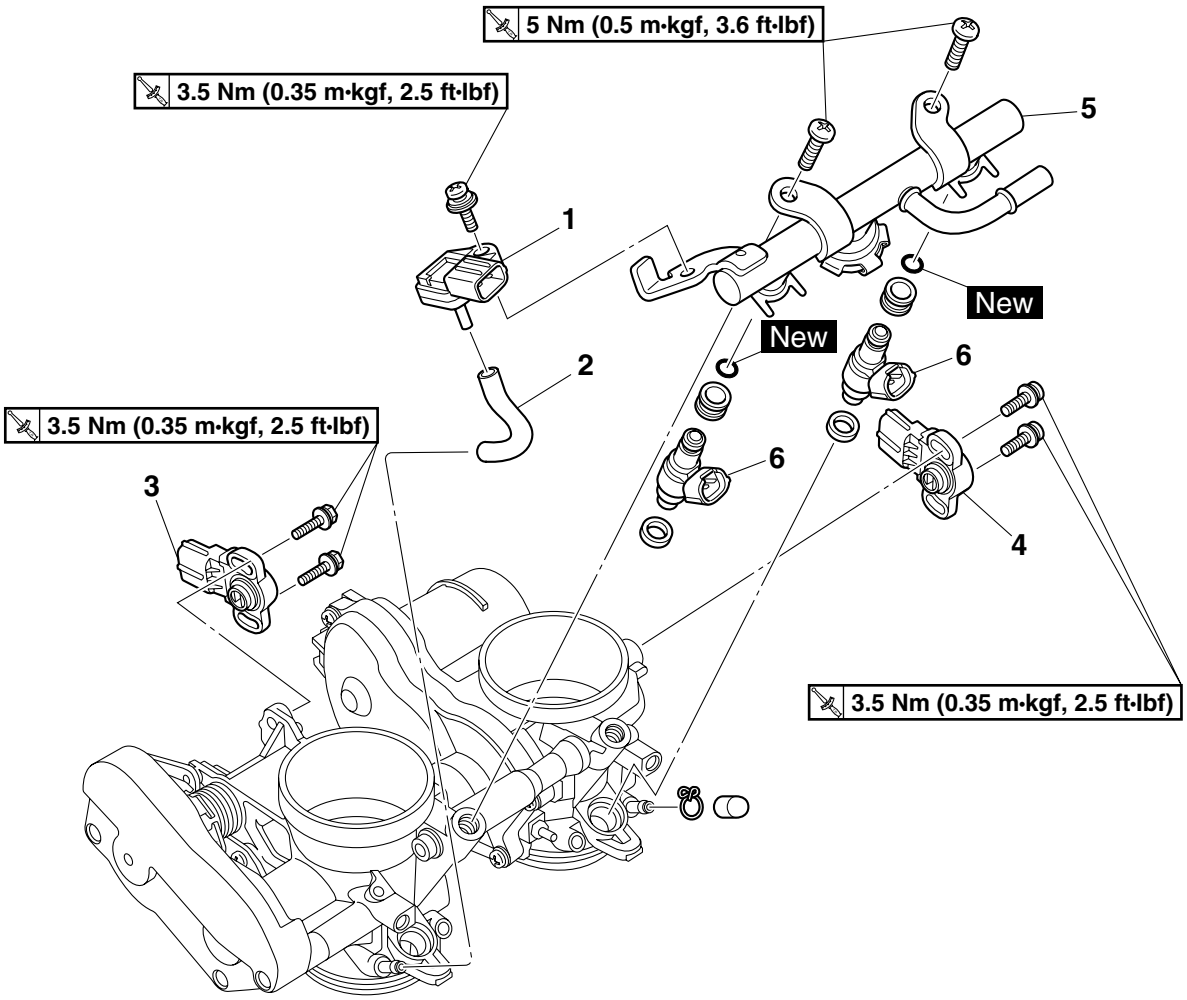
Order	Job/Parts to remove	Q'ty	Remarks
	Fuel tank		Refer to "FUEL TANK" on page 7-1.
	Air filter case		Refer to "GENERAL CHASSIS" on page 4-1.
1	Accelerator position sensor coupler	1	Disconnect.
2	Throttle position sensor coupler	1	Disconnect.
3	Throttle servo motor coupler	1	Disconnect.
4	Injector #2 coupler	1	Disconnect.
5	Injector #1 coupler	1	Disconnect.
6	Intake air pressure sensor coupler	1	Disconnect.
7	Throttle cable (decelerator cable)	1	Disconnect.
8	Throttle cable (accelerator cable)	1	Disconnect.
9	Throttle body joint clamp screw	2	Loosen.

Removing the throttle bodies



Order	Job/Parts to remove	Q'ty	Remarks
10	Throttle bodies	1	
11	Throttle body joint	2	
			For installation, reverse the removal procedure.

Removing the injectors



Order	Job/Parts to remove	Q'ty	Remarks
1	Intake air pressure sensor	1	
2	Negative pressure hose	1	
3	Accelerator position sensor	1	
4	Throttle position sensor	1	
5	Fuel rail	1	
6	Injector	2	
			For installation, reverse the removal procedure.

EAS23P1077
CHECKING THE INJECTORS (BEFORE REMOVING)

1. Check:
   • Injectors
   Use the diagnostic code number “d:36–d:37”.
   Refer to “DIAGNOSTIC MODE” on page 8-34.

EAS23P1078
REMOVING THE INJECTORS

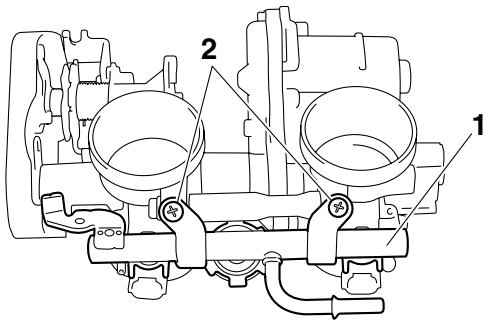
EWA23P1029
⚠ WARNING

- **Check the injectors in a well-ventilated area free of combustible materials. Make sure that there is no smoking or use of electric tools in the vicinity of the injectors.**
- **Be careful when disconnecting the fuel hose. Any remaining pressure in the fuel hose may cause the fuel to spray out. Place a container or rag under the hose to catch any fuel that spills. Always clean up any spilt fuel immediately.**
- **Turn the main switch to “OFF” and disconnect the negative battery lead from the battery terminal before removing the injectors.**

1. Remove:
   • Fuel rail “1”

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the fuel rail screws “2” as shown.



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1079
CHECKING THE INJECTORS

1. Check:
   • Injectors
   Obstruction → Replace and check the fuel pump/fuel supply system.
   Deposit → Replace.
   Damage → Replace.
2. Check:
   • Injector resistance
   Refer to “CHECKING THE FUEL INJECTORS” on page 8-155.

EAS23P1080
CHECKING AND CLEANING THE THROTTLE BODIES

TIP

Clean the throttle bodies only if they cannot be synchronized using the bypass air screws. Before cleaning the throttle bodies, check the following items:

- Valve clearance
- Spark plugs
- Air filter element
- Throttle body joints
- Fuel hose
- Exhaust system
- Cylinder head breather hose

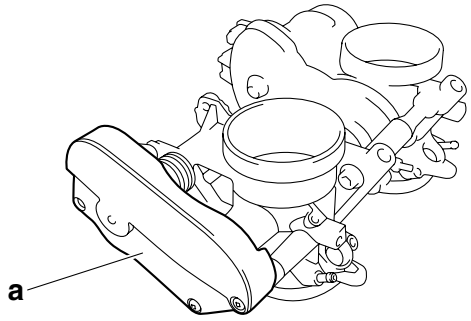
EWA23P1030
⚠ WARNING

If the throttle bodies are subjected to strong shocks or dropped during cleaning, replace them as a set.

1. Check:
   • Throttle bodies
   Cracks/damage → Replace the throttle bodies.

TIP

If the protector “a” is scratched or damaged, replace the throttle bodies.

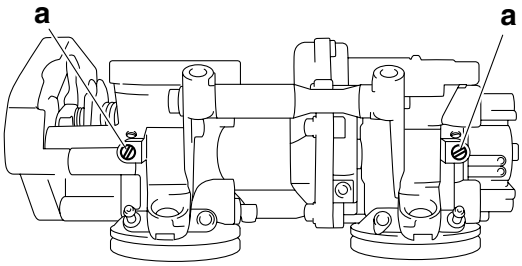


2. Clean:
   • Throttle bodies

ECA23P1066
NOTICE

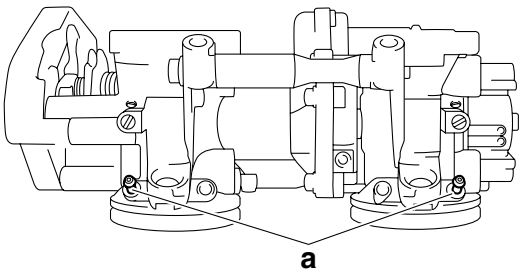
- **Observe the following precautions; otherwise, the throttle bodies may not operate properly.**
- **Do not open the throttle valves quickly.**
- **Do not subject the throttle bodies to excessive force.**
- **Wash the throttle bodies in a petroleum-based solvent.**
- **Do not use any caustic carburetor cleaning solution.**

• Do not apply cleaning solvent directly to any plastic parts, sensors, or seals.
• Do not directly push the throttle valves to open them.
• Be careful not to remove the white paint mark that identifies the standard throttle body. Do not turn the bypass air screws "a"; otherwise, the throttle body synchronization will be affected.



▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Place the throttle bodies on a flat surface with the air filter case side facing up.
b. Install the caps (895-14169-00) onto the hose fittings "a".



c. Push the lever in the direction shown in the illustration to hold the throttle valves in the open position.

EWA23P1031

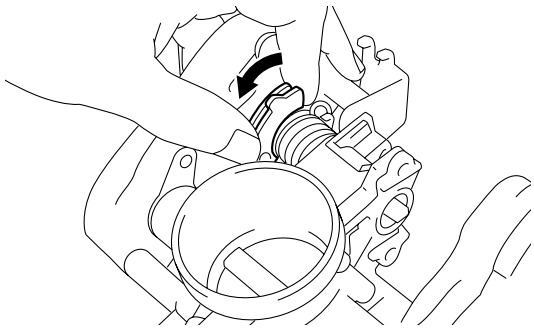
⚠ WARNING

When cleaning the throttle bodies, be careful not to injure yourself on the throttle valves or other components of the throttle bodies.

ECA23P1067

NOTICE

Do not open the throttle valves by supplying electrical power to the throttle bodies.



d. Apply a petroleum-based solvent to the throttle valves and the inside of the throttle bodies to remove any carbon deposits.

TIP

• Do not allow any petroleum-based solvent to enter the opening for the injectors.
• Do not apply any petroleum-based solvent to the portions of the throttle valve shafts between the throttle bodies.

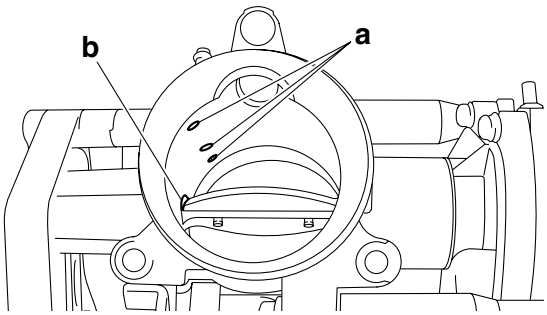
e. Remove the carbon deposits from the inside of each throttle body in a downward direction, from the air filter case side of the throttle body to the engine side.

ECA23P1068

NOTICE

• Do not use a tool, such as a wire brush, to remove the carbon deposits; otherwise, the inside of the throttle bodies may be damaged.
• Do not allow carbon deposits or other foreign materials to enter any of the passages in each throttle body or in the space between the throttle valve shaft and the throttle body.

f. After removing the carbon deposits, clean the inside of the throttle bodies with a petroleum-based solvent, and then dry the throttle bodies using compressed air.
g. Make sure that there are no carbon deposits or other foreign materials in any of the passages "a" in each throttle body or in the space "b" between the throttle valve shaft and the throttle body.

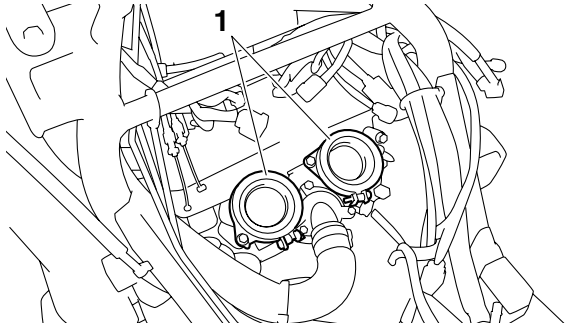


▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Adjust:
   • Throttle bodies synchronizing
   Out of specification → Replace the throttle bodies.
   Refer to "SYNCHRONIZING THE THROTTLE BODIES" on page 3-8.

EAS21010
CHECKING THE THROTTLE BODY JOINTS

1. Remove:
   • Air filter case
   Refer to "GENERAL CHASSIS" on page 4-1.
   • Throttle bodies
   Refer to "THROTTLE BODIES" on page 7-5.
2. Check:
   • Throttle body joints "1"
   Cracks/damage → Replace.



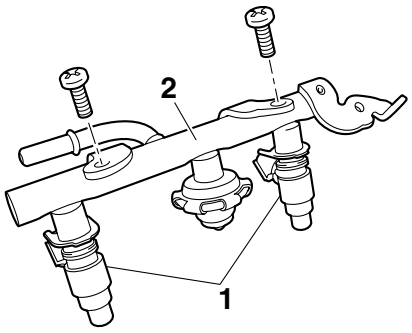
3. Install:
   • Throttle bodies
   Refer to "THROTTLE BODIES" on page 7-5.
   • Air filter case
   Refer to "GENERAL CHASSIS" on page 4-1.

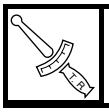
EAS23P1081
INSTALLING THE INJECTORS

ECA23P1069
NOTICE

• Always use new O-rings.
• When checking the injectors, do not allow any foreign material to enter or adhere to the injectors, fuel rail, or O-rings.
• Be careful not to twist or pinch the O-rings when installing the injectors.
• If an injector is subject to strong shocks or excessive force, replace it.
• If installing the original fuel rail and screws, remove the white paint marks using a cleaning solvent. Otherwise, paint chips on the screw seats could prevent the screws from being tightened to the specified torque.

1. Install a new seals onto the end of each injector.
2. Install the injectors "1" to the fuel rail "2".



	**Fuel rail screw** **5 Nm (0.5 m·kgf, 3.6 ft·lbf)**

3. Install the injector assemblies to the throttle bodies.
4. Check the injector pressure after the injectors are installed to the throttle bodies.
   Refer to "CHECKING THE INJECTOR PRESSURE" on page 7-10.

EAS23P1082
CHECKING THE INJECTOR PRESSURE

TIP

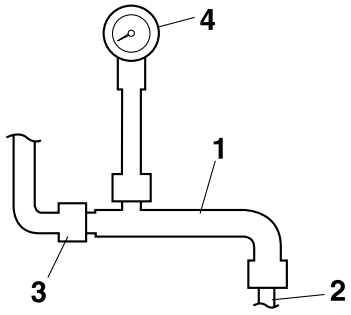
- After installing the injectors, perform the following steps to check the injector pressure.
- Do not allow any foreign materials to enter the fuel lines.

1. Check:
   • Injector pressure

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the injector pressure adapter "1" to the fuel rail "2", and then connect an air compressor "3" to the adapter.
b. Connect the pressure gauge "4" to the injector pressure adapter "1".

Pressure gauge
90890-03153
YU-03153
Fuel injector pressure adapter
90890-03210
YU-03210



c. Close the valve on the injector pressure adapter.
d. Apply air pressure with the air compressor.
e. Open the valve on the injector pressure adapter until the specified pressure is reached.

Specific air pressure
490 kPa (4.9 kgf/cm^2, 69.7 psi)

ECA23P1070
NOTICE
Never exceed the specified air pressure or damage could occur.

f. Close the valve on the injector pressure adapter.
g. Check that the specified air pressure is held for about one minute.
Pressure drops → Check the pressure gauge and adapter.
Check the seals and O-rings and then reinstall.
Replace the fuel injectors.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

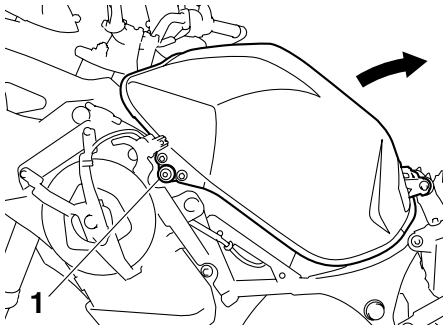
EAS23P1083
CHECKING THE FUEL PRESSURE

1. Check:
• Fuel pressure

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the fuel tank bolts “1” and holdup the fuel tank.

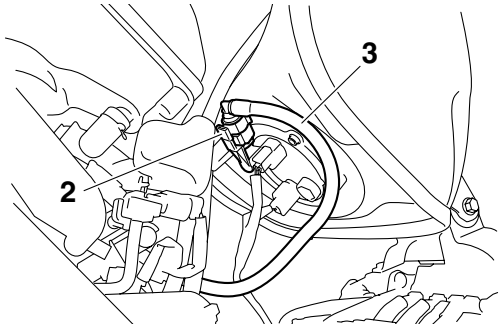
ECA23P1003
NOTICE
When lifting up the fuel tank, be careful not to pull the fuel tank overflow hose and fuel tank breather hose.



b. Remove the fuel hose holder “2” and then disconnect the fuel hose “3” from the fuel tank.

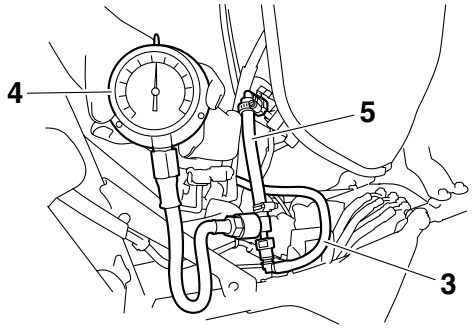
EWA23P1032
⚠ WARNING
Cover fuel hose connections with a cloth when disconnecting them. Residual pressure in the fuel lines could cause fuel to spurt out when removing the hose.

ECA23P1071
NOTICE
Be sure to disconnect the fuel hose by hand. Do not forcefully disconnect the hose with tools.



c. Connect the pressure gauge “4” and adapter “5” to the fuel hose “3”.

Pressure gauge
90890-03153
YU-03153
Fuel pressure adapter
90890-03176
YM-03176



d. Start the engine.
e. Measure the fuel pressure.

Output pressure
324.0 kPa (3.24 kgf/cm², 47.0 psi)

Faulty → Replace the fuel pump.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1084
ADJUSTING THE THROTTLE POSITION SENSOR

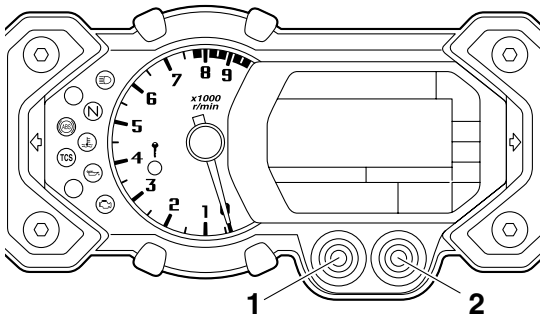
EWA23P1033
⚠ WARNING

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

1. Check:
   - Throttle position sensor
     Refer to "CHECKING THE THROTTLE POSITION SENSOR" on page 8-153.
2. Adjust:
   - Throttle position sensor angle

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Temporary tighten the throttle position sensor.
b. Check that the throttle valves are fully closed.
c. Connect the throttle position sensor to the wire harness.
d. Turn the main switch to "OFF".
e. Simultaneously press and hold the left set button "1" and right set button "2", turn the main switch to "ON", and continue to press the buttons for 8 seconds more.

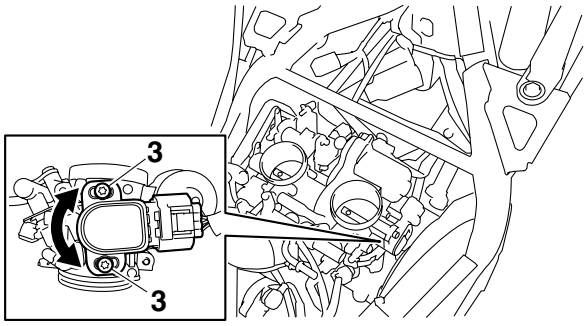


TIP

"dIAG" appears on the odometer LCD.

f. Diagnostic code number "d:01" is selected.
g. Adjust the position of the throttle position sensor angle so that 9–20 can appear in the meter.
h. After adjusting the throttle position sensor angle, tighten the throttle position sensor screws "3".

Throttle position sensor screw
3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)



▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1085
ADJUSTING THE ACCELERATOR POSITION SENSOR

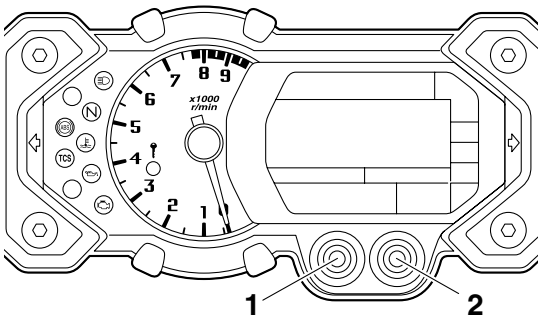
EWA23P1034
⚠ WARNING

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

1. Check:
   - Accelerator position sensor
     Refer to "CHECKING THE ACCELERATOR POSITION SENSOR" on page 8-153.
2. Adjust:
   - Accelerator position sensor angle

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Temporary tighten the accelerator position sensor.
b. Check that the throttle valves are fully closed.
c. Connect the accelerator position sensor to the wire harness.
d. Connect the throttle cables to the throttle bodies.
e. Turn the main switch to "OFF".
f. Simultaneously press and hold the left set button "1" and right set button "2", turn the main switch to "ON", and continue to press the buttons for 8 seconds more.

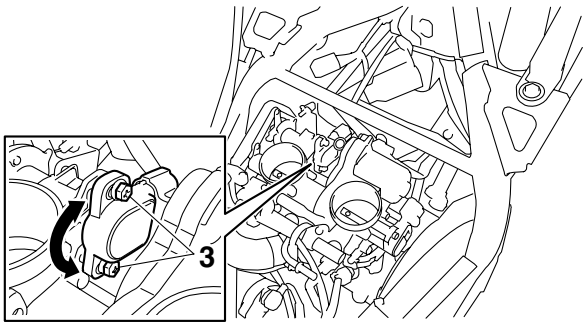


TIP

"dIAG" appears on the odometer LCD.

g. Diagnostic code number "d:14" is selected.
h. Turn the throttle grip to the fully closed position.
i. Adjust the position of the accelerator position sensor angle so that 12–22 can appear in the meter.
j. After adjusting the accelerator position sensor angle, tighten the accelerator position sensor screws "3".

Accelerator position sensor screw
3.5 Nm (0.35 m·kgf, 2.5 ft·lbf)



k. Turn the throttle grip to the fully open position.
l. Check the meter display value. If the meter display value is not 97–113, adjust the accelerator position sensor angle.
m. Select the diagnostic code number "d:15".
n. Turn the throttle grip to the fully closed position.
o. Check the meter display value. If the meter display value is not 9–25, adjust the accelerator position sensor angle.
p. Turn the throttle grip to the fully open position.
q. Check the meter display value. If the meter display value is not 97–113, adjust the accelerator position sensor angle.
r. Repeat steps (g) to (q) until the meter display values are within the specified ranges.
s. If the meter display values are not within the specified ranges after repeating steps (g) to (q) several times, replace the accelerator position sensor.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1086

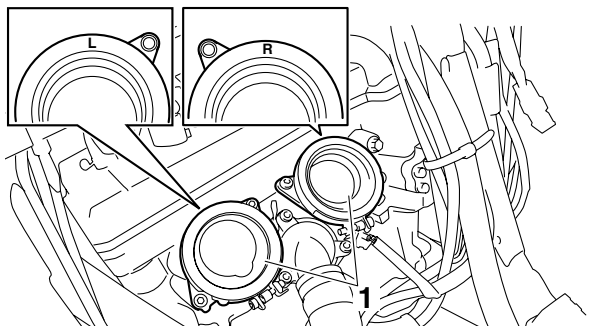
INSTALLING THE THROTTLE BODY JOINTS

1. Install:
   • Throttle body joints "1"

Throttle body joint bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

TIP

Be sure to install the throttle body joint with the "L" mark onto the throttle body openings for cylinders #1 and the joint with the "R" mark onto the openings for cylinders #2.



ELECTRICAL SYSTEM

IGNITION SYSTEM 8-1
- CIRCUIT DIAGRAM 8-1
- ENGINE STOPPING DUE TO SIDESTAND OPERATION 8-3
- TROUBLESHOOTING 8-4

ELECTRIC STARTING SYSTEM 8-7
- CIRCUIT DIAGRAM 8-7
- STARTING CIRCUIT CUT-OFF SYSTEM OPERATION 8-9
- TROUBLESHOOTING 8-10

CHARGING SYSTEM 8-13
- CIRCUIT DIAGRAM 8-13
- TROUBLESHOOTING 8-15

LIGHTING SYSTEM 8-17
- CIRCUIT DIAGRAM 8-17
- TROUBLESHOOTING 8-19

SIGNALING SYSTEM 8-21
- CIRCUIT DIAGRAM 8-21
- TROUBLESHOOTING 8-23

COOLING SYSTEM 8-27
- CIRCUIT DIAGRAM 8-27
- TROUBLESHOOTING 8-29

FUEL INJECTION SYSTEM 8-31
- CIRCUIT DIAGRAM 8-31
- ECU SELF-DIAGNOSTIC FUNCTION 8-33
- TROUBLESHOOTING METHOD 8-34
- DIAGNOSTIC MODE 8-34
- TROUBLESHOOTING DETAILS 8-36
- DIAGNOSTIC CODE TABLE 8-73

FUEL PUMP SYSTEM 8-75
- CIRCUIT DIAGRAM 8-75
- TROUBLESHOOTING 8-77

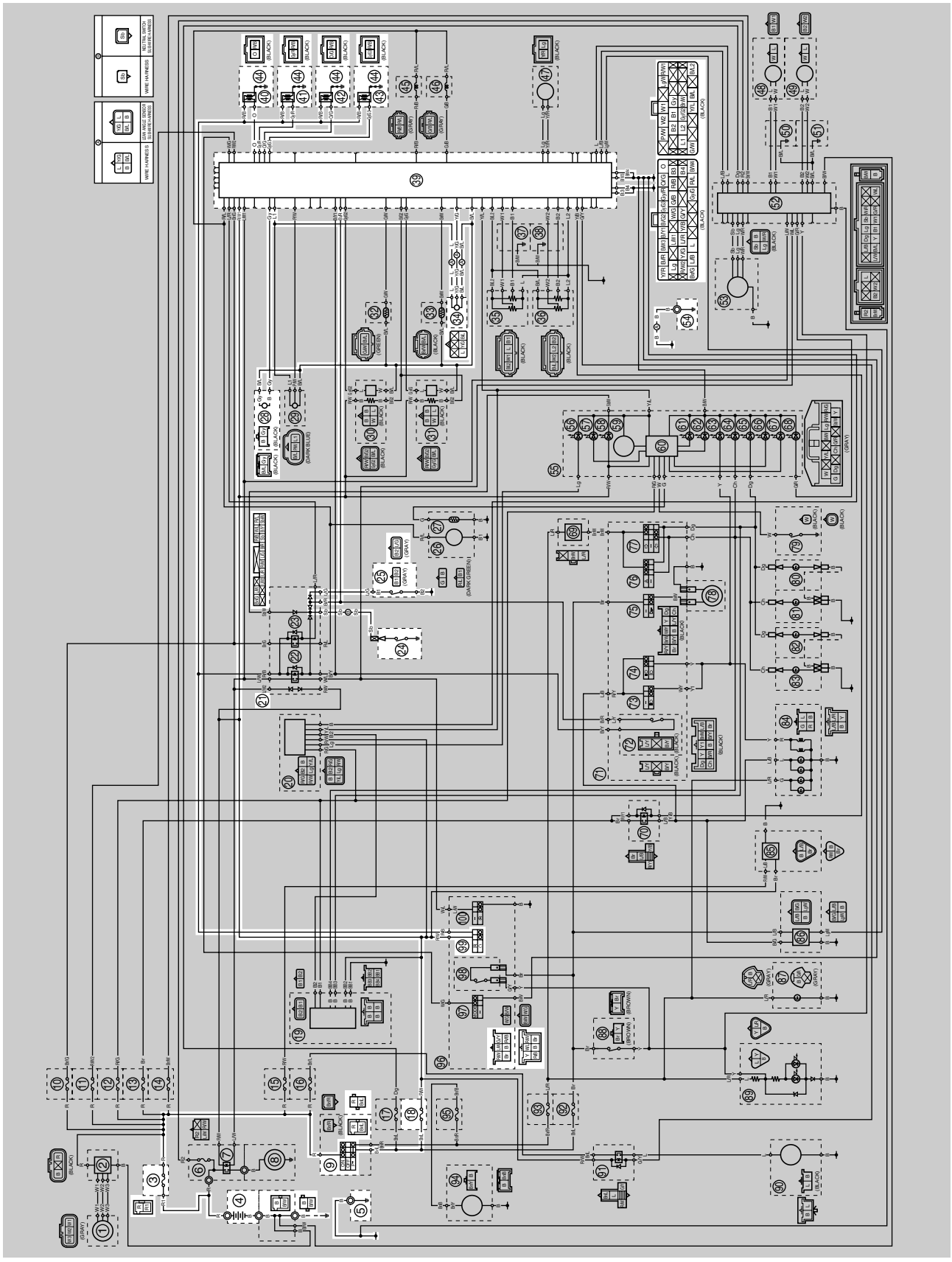
IMMOBILIZER SYSTEM 8-79
- CIRCUIT DIAGRAM 8-79
- GENERAL INFORMATION 8-81
- PART REPLACEMENT AND KEY CODE REGISTRATION REQUIREMENTS 8-81
- TROUBLESHOOTING 8-85
- SELF-DIAGNOSIS FAULT CODE INDICATION 8-85

ABS (ANTI-LOCK BRAKE SYSTEM) 8-89
CIRCUIT DIAGRAM 8-89
ABS COMPONENTS CHART 8-91
ABS COUPLER LOCATION CHART 8-93
MAINTENANCE OF THE ABS ECU 8-95
ABS TROUBLESHOOTING OUTLINE 8-95
BASIC INSTRUCTIONS FOR TROUBLESHOOTING 8-96
BASIC PROCESS FOR TROUBLESHOOTING 8-97
[A] CHECKING THE ABS WARNING LIGHT 8-98
[B-1] THE ABS WARNING LIGHT FAILS TO COME ON 8-98
[B-2] THE ABS WARNING LIGHT FLASHES 8-98
[B-3] THE ABS WARNING LIGHT REMAINS ON 8-98
[B-4] THE ABS WARNING LIGHT COMES ON FOR 2 SECONDS, THEN GOES OFF 8-98
[B-5] MALFUNCTIONS ARE CURRENTLY DETECTED 8-99
[C-1] ONLY THE ABS WARNING LIGHT FAILS TO COME ON 8-99
[C-2] ALL INDICATOR LIGHTS FAIL TO COME ON 8-99
[C-3] THE ABS WARNING LIGHT REMAINS ON 8-100
[C-4] THE ABS WARNING LIGHT FLASHES 8-101
[C-5] DIAGNOSIS USING THE FAULT CODES 8-101
[D-1] DELETING THE FAULT CODES 8-129
[D-2] DELETE FUNCTION TEST 8-129
[D-3] FINAL CHECK 8-131

ELECTRICAL COMPONENTS 8-133
CHECKING THE SWITCHES 8-137
CHECKING THE BULBS AND BULB SOCKETS 8-140
CHECKING THE FUSES 8-141
CHECKING AND CHARGING THE BATTERY 8-142
CHECKING THE RELAYS 8-145
CHECKING THE TURN SIGNAL/HAZARD RELAY 8-146
CHECKING THE RELAY UNIT (DIODE) 8-147
CHECKING THE IGNITION COILS 8-147
CHECKING THE IGNITION SPARK GAP 8-148
CHECKING THE CRANKSHAFT POSITION SENSOR 8-148
CHECKING THE LEAN ANGLE SENSOR 8-149
CHECKING THE STARTER MOTOR OPERATION 8-149
CHECKING THE STATOR COIL 8-150
CHECKING THE RECTIFIER/REGULATOR 8-150
CHECKING THE OIL LEVEL SWITCH 8-150
CHECKING THE FUEL SENDER 8-151
CHECKING THE FUEL METER/FUEL LEVEL WARNING LIGHT 8-151
CHECKING THE OIL LEVEL WARNING LIGHT 8-152
CHECKING THE RADIATOR FAN MOTOR 8-152
CHECKING THE COOLANT TEMPERATURE SENSOR 8-152
CHECKING THE THROTTLE POSITION SENSOR 8-153
CHECKING THE ACCELERATOR POSITION SENSOR 8-153
CHECKING THE INTAKE AIR PRESSURE SENSOR 8-154
CHECKING THE INTAKE AIR TEMPERATURE SENSOR 8-155
CHECKING THE FUEL INJECTORS 8-155
CHECKING THE THROTTLE SERVO MOTOR 8-155

EAS27090
IGNITION SYSTEM

EAS27110
CIRCUIT DIAGRAM

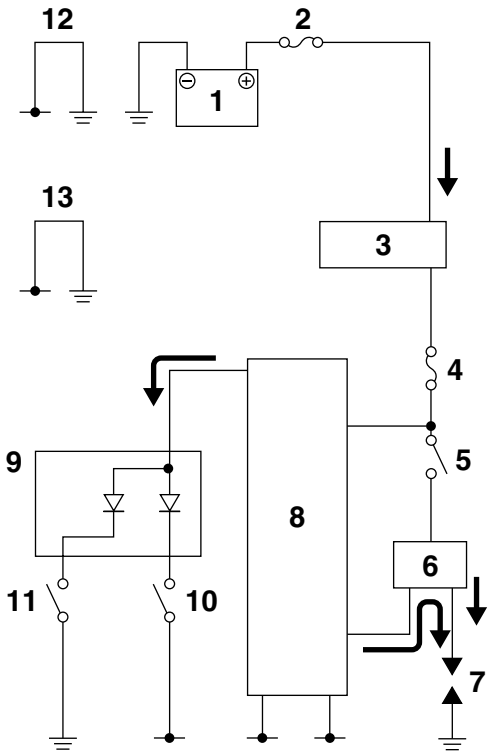


3. Main fuse
4. Battery
5. Engine ground
9. Main switch
18. Ignition fuse
21. Relay unit
24. Neutral switch
25. Sidestand switch
28. Crankshaft position sensor
34. Lean angle sensor
39. ECU (engine control unit)
40. Cylinder-#1 left ignition coil
41. Cylinder-#1 right ignition coil
42. Cylinder-#2 left ignition coil
43. Cylinder-#2 right ignition coil
44. Spark plug
54. Frame ground
99. Engine stop switch

EAS23P1071
ENGINE STOPPING DUE TO SIDESTAND OPERATION

When the engine is running and the transmission is in gear, the engine will stop if the sidestand is moved down. This is because the electric current from the ECU does not flow to the ignition coils or injectors when the neutral switch circuit or sidestand switch circuit is open. However, the engine continues to run under the following conditions:

- The transmission is in gear (the neutral switch circuit is open) and the sidestand is up (the sidestand switch circuit is closed).
- The transmission is in neutral (the neutral switch circuit is closed) and the sidestand is down (the sidestand switch circuit is open).



1. Battery
2. Main fuse
3. Main switch
4. Ignition fuse
5. Engine stop switch
6. Ignition coil
7. Spark plug
8. ECU (engine control unit)
9. Relay unit (diode)
10. Sidestand switch
11. Neutral switch
12. Engine ground
13. Frame ground

EAS27140
TROUBLESHOOTING

The ignition system fails to operate (no spark or intermittent spark).

TIP

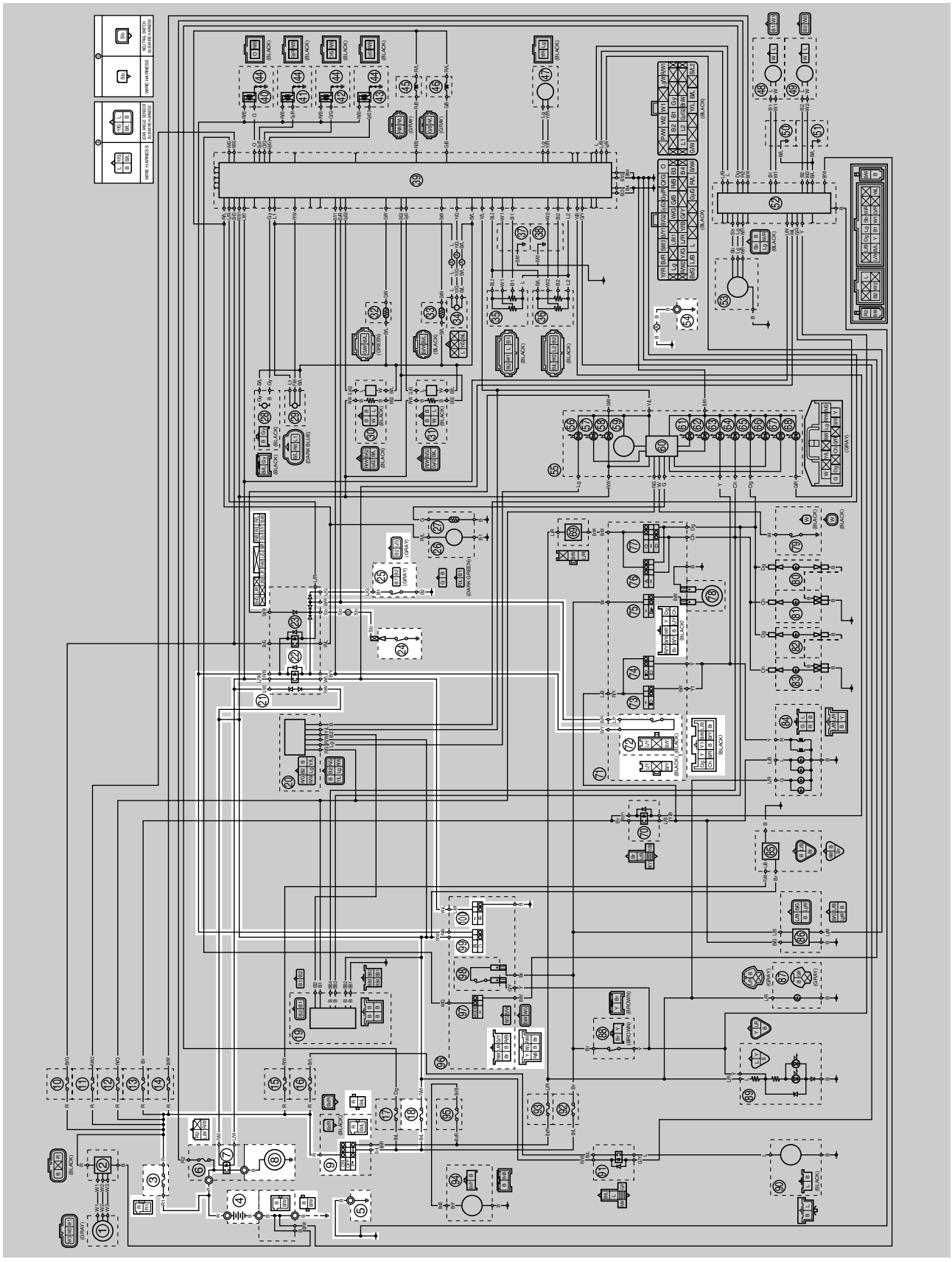
• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel
3. Air filter case

1. Check the fuses. (Main and ignition) Refer to “CHECKING THE FUSES” on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the spark plugs. Refer to “CHECKING THE SPARK PLUGS” on page 3-4.	NG →	Re-gap or replace the spark plug(s).
OK ↓		
4. Check the ignition spark gap. Refer to “CHECKING THE IGNITION SPARK GAP” on page 8-148.	OK →	Ignition system is OK.
NG ↓		
5. Check the ignition coils. Refer to “CHECKING THE IGNITION COILS” on page 8-147.	NG →	Replace the ignition coil(s).
OK ↓		
6. Check the crankshaft position sensor. Refer to “CHECKING THE CRANKSHAFT POSITION SENSOR” on page 8-148.	NG →	Replace the crankshaft position sensor.
OK ↓		
7. Check the main switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
8. Check the engine stop switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	The engine stop switch is faulty. Replace the right handlebar switch.
OK ↓		

9. Check the neutral switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the neutral switch.
OK ↓		
10. Check the sidestand switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the sidestand switch.
OK ↓		
11. Check the relay unit (diode). Refer to “CHECKING THE RELAY UNIT (DIODE)” on page 8-147.	NG →	Replace the relay unit.
OK ↓		
12. Check the lean angle sensor. Refer to “CHECKING THE LEAN ANGLE SENSOR” on page 8-149.	NG →	Replace the lean angle sensor.
OK ↓		
13. Check the entire ignition system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-1.	NG →	Properly connect or repair the ignition system wiring.
OK ↓		
Replace the ECU.		

EAS27160
ELECTRIC STARTING SYSTEM

EAS27170
CIRCUIT DIAGRAM



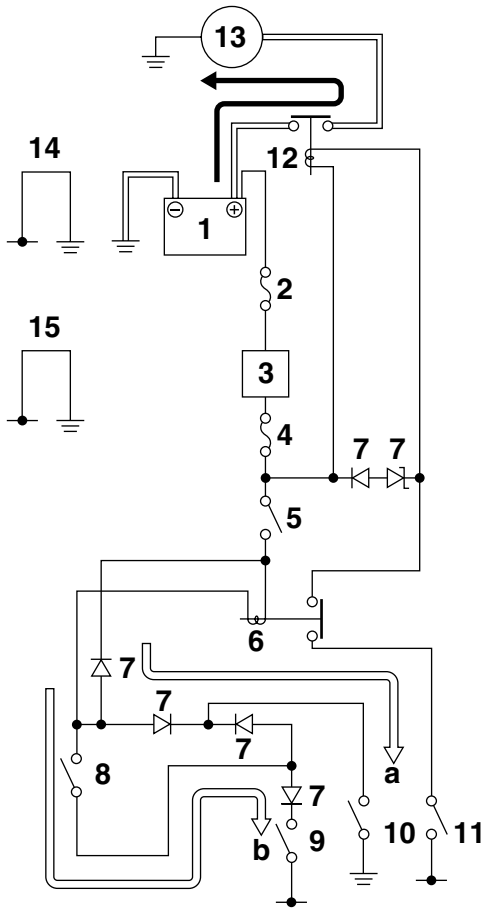
3. Main fuse
4. Battery
5. Engine ground
7. Starter relay
8. Starter motor
9. Main switch
18. Ignition fuse
21. Relay unit
22. Starting circuit cut-off relay
24. Neutral switch
25. Sidestand switch
54. Frame ground
72. Clutch switch
99. Engine stop switch
100. Start switch

EAS27180
STARTING CIRCUIT CUT-OFF SYSTEM OPERATION

If the engine stop switch is set to "○" and the main switch is set to "ON" (both switches are closed), the starter motor can only operate if at least one of the following conditions is met:

- The transmission is in neutral (the neutral switch circuit is closed).
- The clutch lever is pulled to the handlebar (the clutch switch is closed) and the sidestand is up (the sidestand switch is closed).

The starting circuit cut-off relay prevents the starter motor from operating when neither of these conditions has been met. In this instance, the starting circuit cut-off relay is open so current cannot reach the starter motor. When at least one of the above conditions has been met, the starting circuit cut-off relay is closed and the engine can be started by pressing the start switch "⏻".



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. Relay unit (diode)
8. Clutch switch
9. Sidestand switch
10. Neutral switch
11. Start switch
12. Starter relay
13. Starter motor
14. Engine ground
15. Frame ground

EAS27190
TROUBLESHOOTING

The starter motor fails to turn.

TIP

• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel
3. Fuel tank

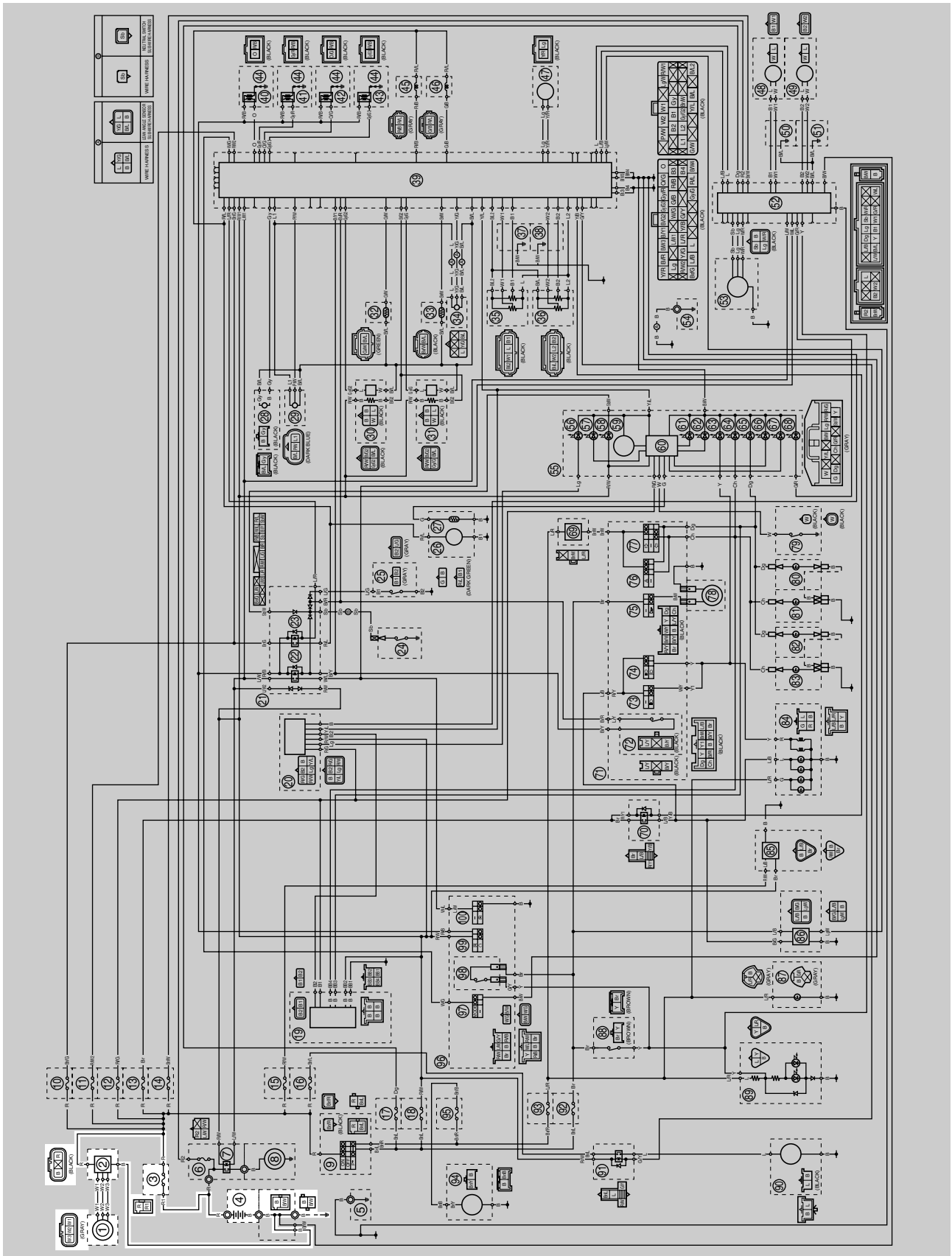
1. Check the fuses. (Main and ignition) Refer to “CHECKING THE FUSES” on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the starter motor operation. Refer to “CHECKING THE STARTER MOTOR OPERATION” on page 8-149.	OK →	Starter motor is OK. Perform the electric starting system troubleshooting, starting with step 5.
NG ↓		
4. Check the starter motor. Refer to “CHECKING THE STARTER MOTOR” on page 5-50.	NG →	Repair or replace the starter motor.
OK ↓		
5. Check the relay unit (starting circuit cut-off relay). Refer to “CHECKING THE RELAYS” on page 8-145.	NG →	Replace the relay unit.
OK ↓		
6. Check the relay unit (diode). Refer to “CHECKING THE RELAY UNIT (DIODE)” on page 8-147.	NG →	Replace the relay unit.
OK ↓		
7. Check the starter relay. Refer to “CHECKING THE RELAYS” on page 8-145.	NG →	Replace the starter relay.
OK ↓		
8. Check the main switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		

9. Check the engine stop switch.
   Refer to “CHECKING THE SWITCHES” on page 8-137.
   NG → The engine stop switch is faulty. Replace the right handlebar switch.
   OK ↓
10. Check the neutral switch.
   Refer to “CHECKING THE SWITCHES” on page 8-137.
   NG → Replace the neutral switch.
   OK ↓
11. Check the sidestand switch.
   Refer to “CHECKING THE SWITCHES” on page 8-137.
   NG → Replace the sidestand switch.
   OK ↓
12. Check the clutch switch.
   Refer to “CHECKING THE SWITCHES” on page 8-137.
   NG → Replace the clutch switch.
   OK ↓
13. Check the start switch.
   Refer to “CHECKING THE SWITCHES” on page 8-137.
   NG → The start switch is faulty. Replace the right handlebar switch.
   OK ↓
14. Check the entire starting system wiring.
   Refer to “CIRCUIT DIAGRAM” on page 8-7.
   NG → Properly connect or repair the starting system wiring.
   OK ↓

The starting system circuit is OK.

EAS27200
CHARGING SYSTEM

EAS27210
CIRCUIT DIAGRAM



1. AC magneto
2. Rectifier/regulator
3. Main fuse
4. Battery

EAS27230
TROUBLESHOOTING

The battery is not being charged.

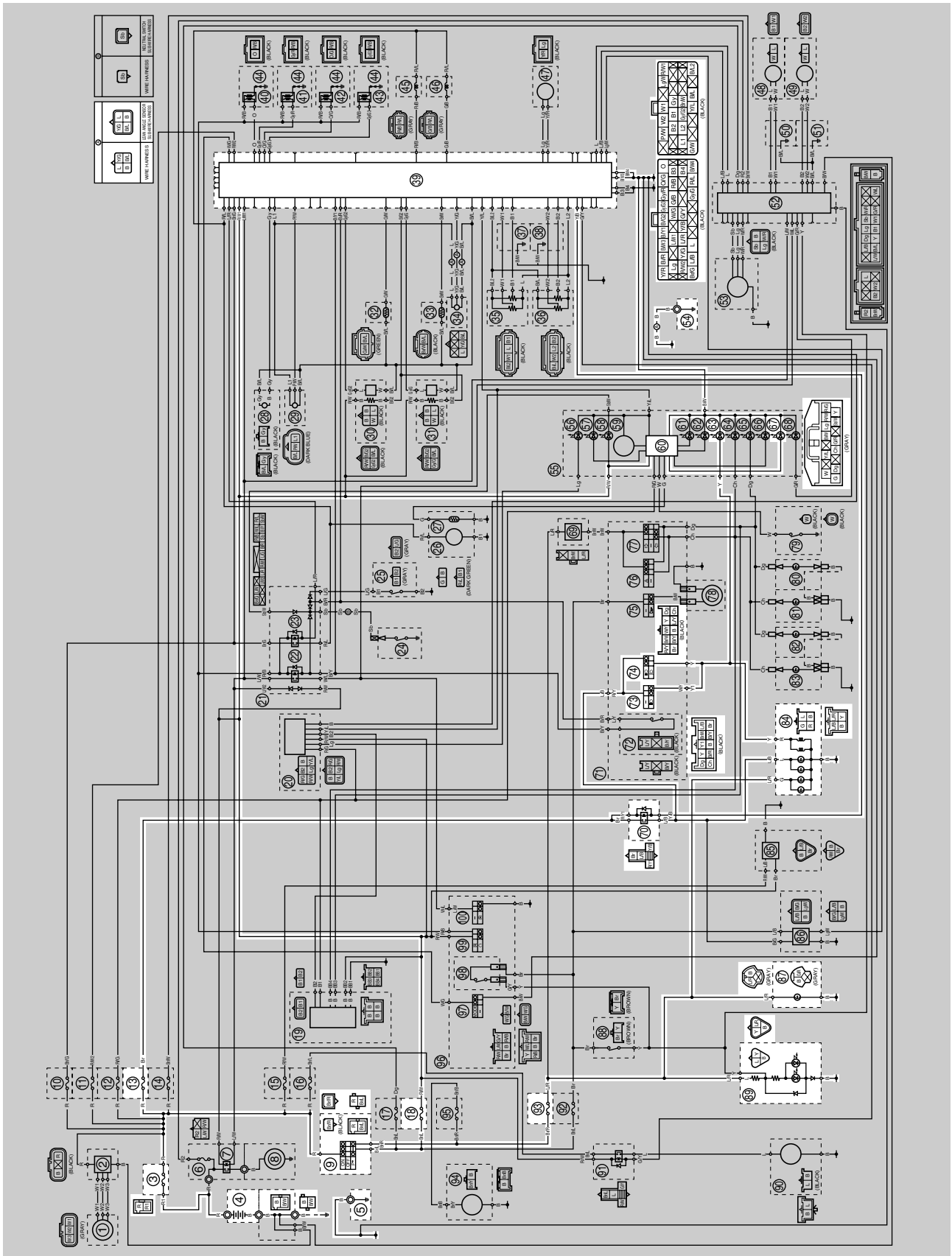
TIP

• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel

1. Check the fuse. (Main) Refer to “CHECKING THE FUSES” on page 8-141.	NG →	Replace the fuse.
OK ↓		
2. Check the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the stator coil. Refer to “CHECKING THE STATOR COIL” on page 8-150.	NG →	Replace the stator coil.
OK ↓		
4. Check the rectifier/regulator. Refer to “CHECKING THE RECTIFIER/REGULATOR” on page 8-150.	NG →	Replace the rectifier/regulator.
OK ↓		
5. Check the entire charging system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-13.	NG →	Properly connect or repair the charging system wiring.
OK ↓		
The charging system circuit is OK.		

EAS27240
LIGHTING SYSTEM

EAS27250
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
9. Main switch
13. Headlight fuse
18. Ignition fuse
39. ECU (engine control unit)
54. Frame ground
60. Multi-function meter
63. High beam indicator light
67. Meter light
70. Headlight relay
73. Pass switch
74. Dimmer switch
84. Headlight
87. License plate light
89. Tail/brake light
93. Taillight fuse

EAS27260
TROUBLESHOOTING

Any of the following fail to light: headlight, high beam indicator light, taillight, license plate light or meter light.

TIP

• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel

1. Check the each bulbs and bulb sockets condition. Refer to "CHECKING THE BULBS AND BULB SOCKETS" on page 8-140.	NG →	Replace the bulb(s) and bulb socket(s).
OK ↓		
2. Check the fuses. (Main, headlight, ignition and tail-light) Refer to "CHECKING THE FUSES" on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
3. Check the battery. Refer to "CHECKING AND CHARGING THE BATTERY" on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
4. Check the main switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
5. Check the dimmer switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	The dimmer switch is faulty. Replace the left handlebar switch.
OK ↓		
6. Check the pass switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	The pass switch is faulty. Replace the left handlebar switch.
OK ↓		
7. Check the headlight relay. Refer to "CHECKING THE RELAYS" on page 8-145.	NG →	Replace the headlight relay.
OK ↓		

8. Check the entire lighting system wiring.
   Refer to “CIRCUIT DIAGRAM” on page 8-17.

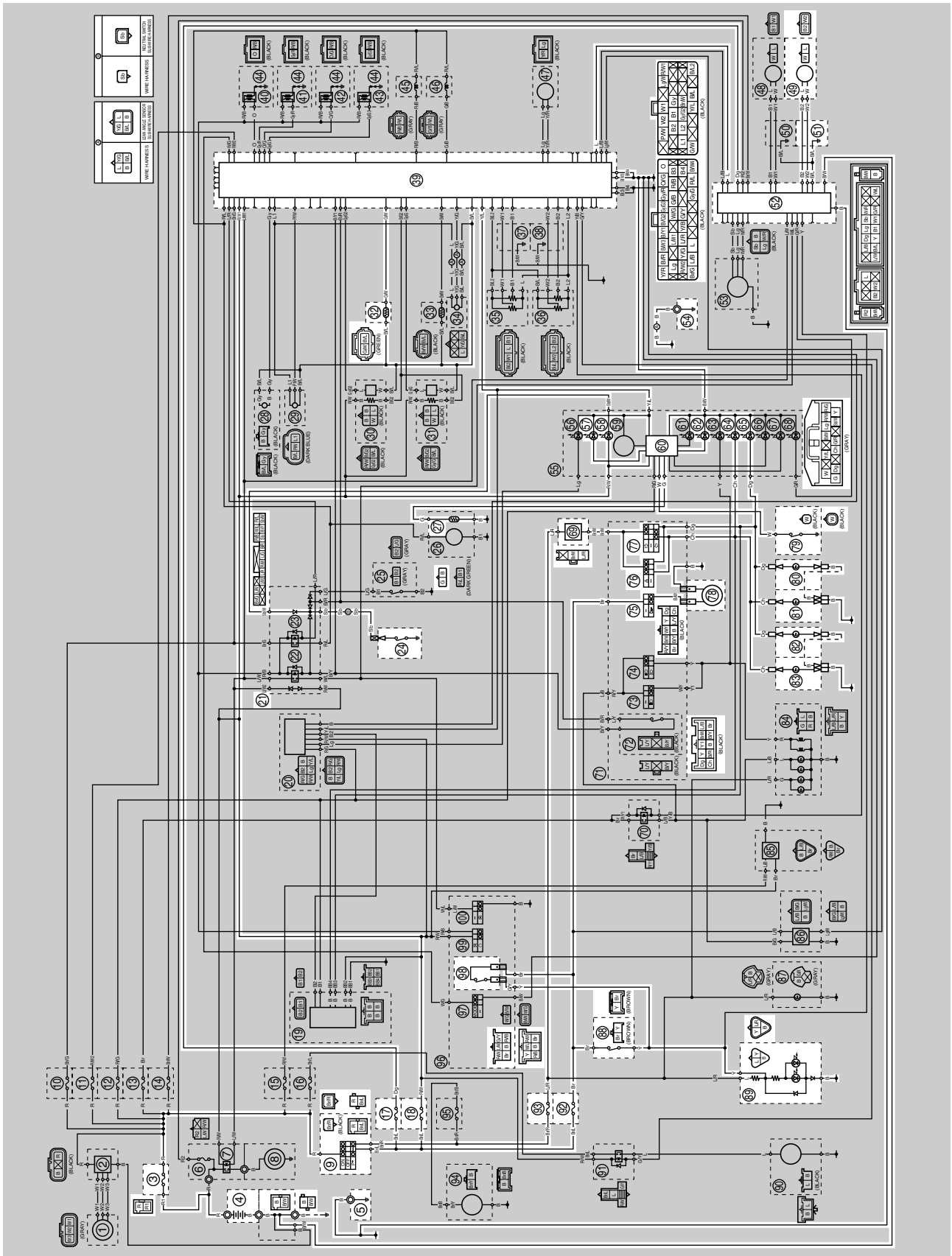
NG → Properly connect or repair the lighting system wiring.

OK ↓

Replace the ECU, meter assembly, head light assembly, or tail/brake light.

EAS27270
SIGNALING SYSTEM

EAS27280
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
9. Main switch
17. ABS ECU fuse
18. Ignition fuse
21. Relay unit
24. Neutral switch
27. Fuel sender
32. Coolant temperature sensor
39. ECU (engine control unit)
49. Rear wheel sensor
51. Rear wheel sensor lead shield
52. ABS ECU (electronic control unit)
54. Frame ground
57. Oil level warning light
58. Neutral indicator light
60. Multi-function meter
62. Coolant temperature warning light
64. Left turn signal indicator light
65. Right turn signal indicator light
69. Turn signal/hazard relay
75. Horn switch
76. Hazard switch
77. Turn signal switch
78. Horn
79. Oil level switch
80. Front right turn signal light
81. Front left turn signal light
82. Rear right turn signal light
83. Rear left turn signal light
88. Rear brake light switch
89. Tail/brake light
92. Signaling system fuse
93. Taillight fuse
98. Front brake light switch

EAS27290
TROUBLESHOOTING

- Any of the following fail to light: turn signal light, brake light or an indicator light.
- The horn fails to sound.
- The fuel meter fails to come on.
- The speedometer fails to operate.

TIP

- Before troubleshooting, remove the following part(s):

1. Right side cowling
2. Right side panel
3. Fuel tank

1. Check the fuses. (Main, ABS ECU, ignition, signaling system and taillight) Refer to "CHECKING THE FUSES" on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to "CHECKING AND CHARGING THE BATTERY" on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the main switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
4. Check the entire signaling system wiring. Refer to "CIRCUIT DIAGRAM" on page 8-21.	NG →	Properly connect or repair the signaling system wiring.
OK ↓		
Check the condition of each of the signaling system circuits. Refer to "Checking the signaling system".		

Checking the signaling system

The horn fails to sound.

1. Check the horn switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	The horn switch is faulty. Replace the left handlebar switch.
OK ↓		

2. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.
NG → Properly connect or repair the signaling system wiring.
OK ↓
Replace the horn.

The tail/brake light fails to come on.

1. Check the front brake light switch. Refer to “CHECKING THE SWITCHES” on page 8-137.
NG → Replace the front brake light switch.
OK ↓
2. Check the rear brake light switch. Refer to “CHECKING THE SWITCHES” on page 8-137.
NG → Replace the brake light switch.
OK ↓
3. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.
NG → Properly connect or repair the signaling system wiring.
OK ↓
Replace the tail/brake light.

The turn signal light, turn signal indicator light or both fail to blink.

1. Check the turn signal light bulbs and sockets. Refer to “CHECKING THE BULBS AND BULB SOCKETS” on page 8-140.
NG → Replace the turn signal light bulb, socket or both.
OK ↓
2. Check the turn signal switch. Refer to “CHECKING THE SWITCHES” on page 8-137.
NG → The turn signal switch is faulty. Replace the left handlebar switch.
OK ↓
3. Check the hazard switch. Refer to “CHECKING THE SWITCHES” on page 8-137.
NG → The hazard switch is faulty. Replace the left handlebar switch.
OK ↓
4. Check the turn signal/hazard relay. Refer to “CHECKING THE RELAYS” on page 8-145.
NG → Replace the turn signal/hazard relay.
OK ↓

5. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.	NG →	Properly connect or repair the signaling system wiring.

OK ↓

Replace the meter assembly.

The neutral indicator light fails to come on.

1. Check the neutral switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the neutral switch.

OK ↓

2. Check the relay unit (diode). Refer to “CHECKING THE RELAY UNIT (DIODE)” on page 8-147.	NG →	Replace the relay unit.

OK ↓

3. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.	NG →	Properly connect or repair the signaling system wiring.

OK ↓

Replace the meter assembly.

The oil level warning light fails to come on.

1. Check the oil level switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the oil level switch.

OK ↓

2. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.	NG →	Properly connect or repair the signaling system wiring.

OK ↓

Replace the meter assembly.

The fuel meter, fuel level warning light, or both fail to come on.

1. Check the fuel sender. Refer to “CHECKING THE FUEL SENDER” on page 8-151.	NG →	Replace the fuel pump assembly.

OK ↓

2. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.	NG →	Properly connect or repair the signaling system wiring.

OK ↓

Replace the meter assembly.

The coolant temperature meter, coolant temperature warning light, or both fail to come on.

1. Check the coolant temperature sensor. Refer to “CHECKING THE COOLANT TEMPERATURE SENSOR” on page 8-152.	NG →	Replace the coolant temperature sensor.

OK ↓

2. Check the entire signaling system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-21.	NG →	Properly connect or repair the signaling system wiring.

OK ↓

Replace the ECU or meter assembly.

The speedometer fails to operate.

1. Check the rear wheel sensor. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	NG →	Replace the rear wheel sensor.

OK ↓

2. Check the entire speed sensor wiring. Refer to TIP.	NG →	Properly connect or repair the speed sensor wiring.

OK ↓

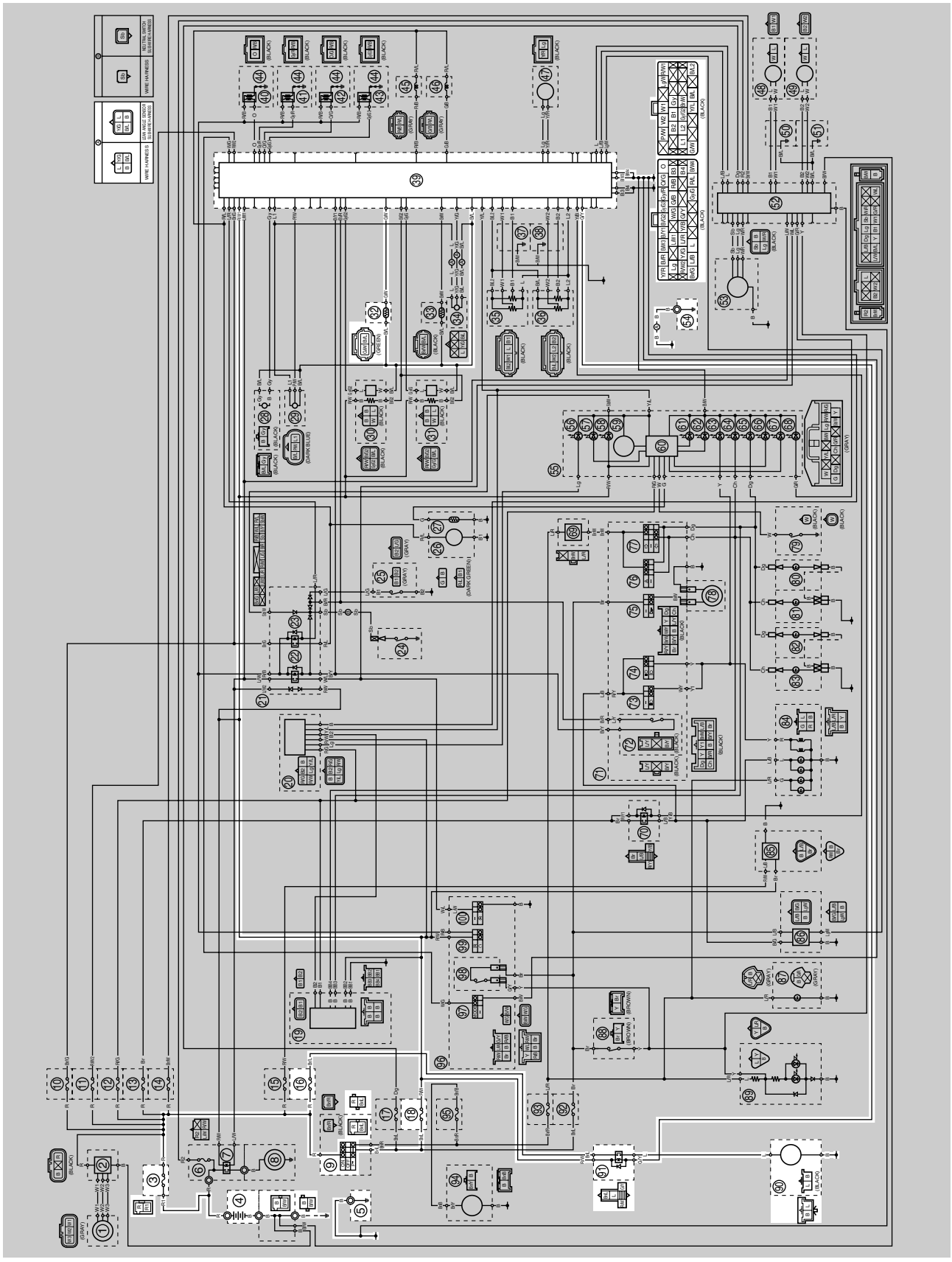
Replace the hydraulic unit assembly, ECU, or meter assembly.

TIP

Repair or replace if there is an open or short circuit.
- Between rear wheel sensor coupler and ABS ECU coupler.
  (white–white)
  (black–black)
- Between ABS ECU coupler and ECU coupler.
  (blue–blue)
- Between ECU coupler and meter assembly coupler.
  (yellow/blue–yellow/blue)

EAS27300
COOLING SYSTEM

EAS27310
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
9. Main switch
16. Radiator fan motor fuse
18. Ignition fuse
32. Coolant temperature sensor
39. ECU (engine control unit)
54. Frame ground
90. Radiator fan motor
91. Radiator fan motor relay

EAS27320
TROUBLESHOOTING

The radiator fan motor fails to turn.

TIP

• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel
3. Fuel tank
4. Left side cowling
5. Air filter case

1. Check the fuses. (Main, ignition and radiator fan motor) Refer to "CHECKING THE FUSES" on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to "CHECKING AND CHARGING THE BATTERY" on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the main switch. Refer to "CHECKING THE SWITCHES" on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
4. Check the radiator fan motor. Refer to "CHECKING THE RADIATOR FAN MOTOR" on page 8-152.	NG →	Replace the radiator fan motor.
OK ↓		
5. Check the radiator fan motor relay. Refer to "CHECKING THE RELAYS" on page 8-145.	NG →	Replace the radiator fan motor relay.
OK ↓		
6. Check the coolant temperature sensor. Refer to "CHECKING THE COOLANT TEMPERATURE SENSOR" on page 8-152.	NG →	Replace the coolant temperature sensor.
OK ↓		

7. Check the entire cooling system wiring.
   Refer to “CIRCUIT DIAGRAM” on page 8-27.

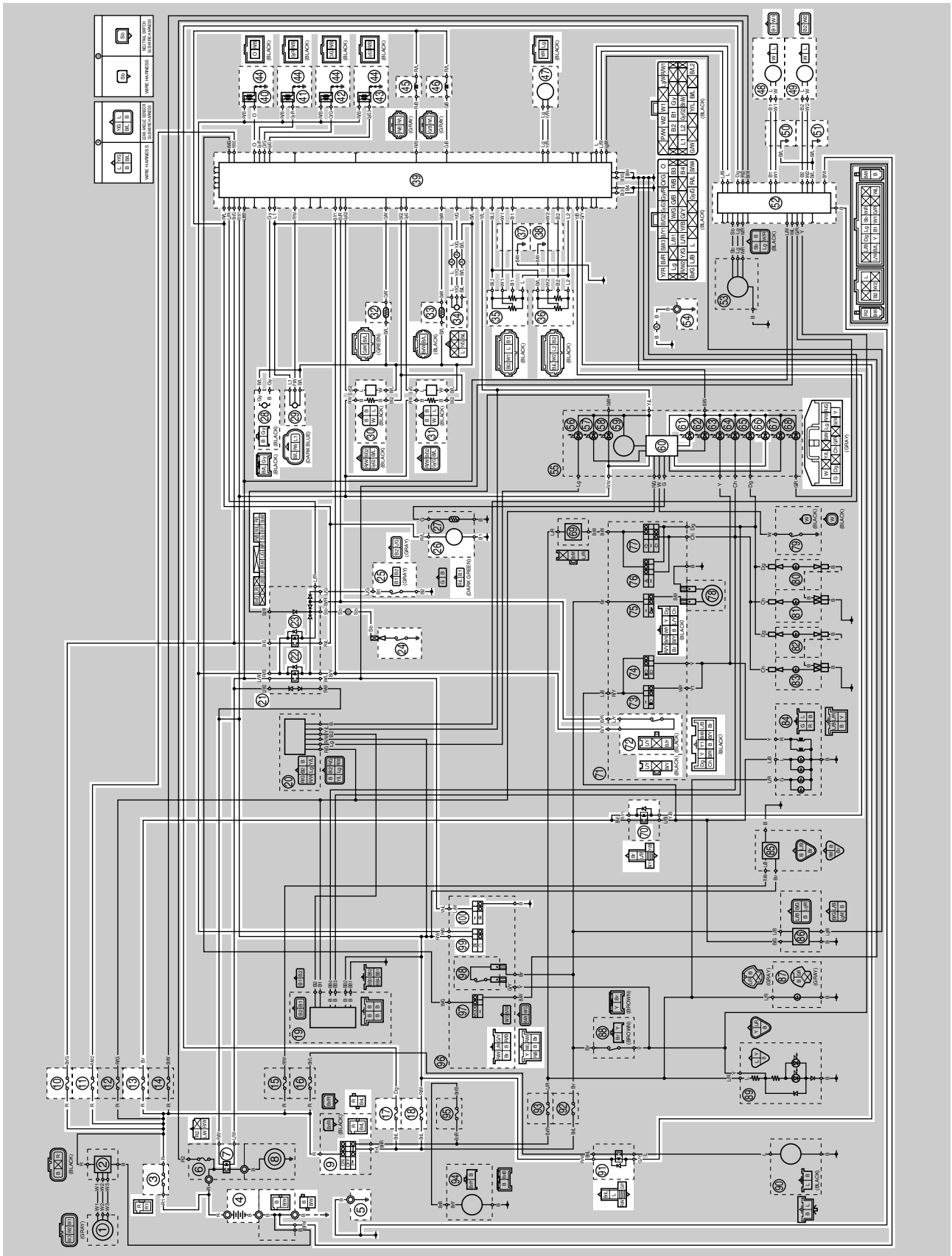
NG → Properly connect or repair the cooling system wiring.

OK ↓

Replace the ECU.

EAS27331
FUEL INJECTION SYSTEM

EAS27340
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
7. Starter relay
9. Main switch
10. Fuel injection system fuse
11. Electric throttle valve fuse
13. Headlight fuse
17. ABS ECU fuse
18. Ignition fuse
21. Relay unit
22. Starting circuit cut-off relay
23. Fuel pump relay
24. Neutral switch
25. Sidestand switch
26. Fuel pump
28. Crankshaft position sensor
29. Intake air pressure sensor
30. O_2 sensor #1
31. O_2 sensor #2
32. Coolant temperature sensor
33. Intake air temperature sensor
34. Lean angle sensor
35. Accelerator position sensor
36. Throttle position sensor
37. Accelerator position sensor lead shield
38. Throttle position sensor lead shield
39. ECU (engine control unit)
40. Cylinder-#1 left ignition coil
41. Cylinder-#1 right ignition coil
42. Cylinder-#2 left ignition coil
43. Cylinder-#2 right ignition coil
44. Spark plug
45. Injector #1
46. Injector #2
47. Throttle servo motor
48. Front wheel sensor
49. Rear wheel sensor
50. Front wheel sensor lead shield
51. Rear wheel sensor lead shield
52. ABS ECU (electronic control unit)
54. Frame ground
60. Multi-function meter
61. Engine trouble warning light
66. Traction control system indicator light
70. Headlight relay
72. Clutch switch
91. Radiator fan motor relay
99. Engine stop switch
100. Start switch

EAS27351
ECU SELF-DIAGNOSTIC FUNCTION

The ECU is equipped with a self-diagnostic function in order to ensure that the fuel injection system is operating normally. If this function detects a malfunction in the system, it immediately operates the engine under substitute characteristics and illuminates the engine trouble warning light to alert the rider that a malfunction has occurred in the system. Once a malfunction has been detected, a fault code number is stored in the memory of the ECU.

- To inform the rider that the fuel injection system is not functioning, the engine trouble warning light flashes while the start switch is being pushed to start the engine.
- If a malfunction is detected in the system by the self-diagnostic function, the ECU provides an appropriate substitute characteristic operation, and alerts the rider of the detected malfunction by illuminating the engine trouble warning light.
- After the engine has been stopped, the lowest fault code number appears on the clock LCD. This number remains stored in the memory of the ECU until it is deleted.

Engine trouble warning light indication and fuel injection system operation

Warning light indication	ECU operation	Fuel injection operation	Vehicle operation
Flashing*	Warning provided when unable to start engine	Operation stopped	Cannot be operated
Remains on	Malfunction detected	Operated with substitute characteristics in accordance with the description of the malfunction	Can or cannot be operated depending on the fault code

* The warning light flashes when any one of the following conditions is present and the start switch is pushed:

12: Crankshaft position sensor
19: Black/red ECU lead (broken or disconnected)
30: Lean angle sensor (latch up detected)
41: Lean angle sensor (open or short circuit)
50: ECU internal malfunction (memory check error)

Checking the engine trouble warning light

The engine trouble warning light comes on for around 2 seconds after the main switch has been set to "ON" and it comes on while the start switch is being pushed. If the warning light does not come on under these conditions, the warning light (LED) may be defective.

ECU detects an abnormal signal from a sensor

If the ECU detects an abnormal signal from a sensor while the vehicle is being driven, the ECU illuminates the engine trouble warning light and provides the engine with alternate operating instructions that are appropriate for the type of malfunction.

When an abnormal signal is received from a sensor, the ECU processes the specified values that are programmed for each sensor in order to provide the engine with alternate operating instructions that enable the engine to continue operating or stop operating, depending on the conditions.

EAS30580
TROUBLESHOOTING METHOD

The engine operation is not normal and the engine trouble warning light comes on.

1. Check:
   • Fault code number

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Check the fault code number displayed on the meter.
b. Identify the faulty system with the fault code number.
c. Identify the probable cause of the malfunction.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Check and repair the probable cause of the malfunction.

Fault code No.	No fault code No.
Check and repair. Refer to “TROUBLESHOOTING DETAILS” on page 8-36. Monitor the operation of the sensors and actuators in the diagnostic mode. Refer to “TROUBLESHOOTING DETAILS” on page 8-36 and “DIAGNOSTIC CODE TABLE” on page 8-73.	Check and repair.

3. Perform the reinstatement action for the fuel injection system.
   Refer to “Reinstatement method” in the appropriate table in “TROUBLESHOOTING DETAILS” on page 8-36.
4. Set the main switch to “OFF”, then to “ON” again, and then check that no fault code number is displayed.

TIP

If another fault code number is displayed, repeat steps (1) to (4) until no fault code number is displayed.

5. Erase the malfunction history in the diagnostic mode. Refer to “Sensor operation table (Diagnostic code No. d:62)”.

TIP

Setting the main switch to “OFF” will not erase the malfunction history.

The engine operation is not normal, but the engine trouble warning light does not come on.

1. Check the operation of the following sensors and actuators in the diagnostic mode. Refer to “TROUBLESHOOTING DETAILS” on page 8-36.

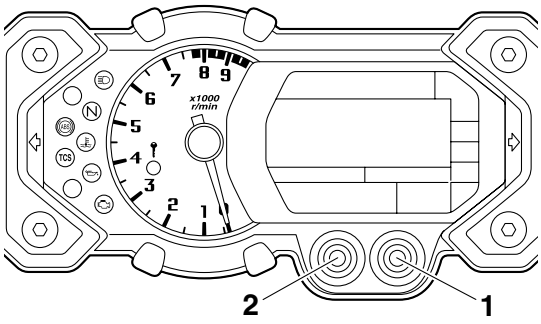
d:01: Throttle position sensor signal 1 (throttle angle)
d:13: Throttle position sensor signal 2 (throttle angle)
d:14: Accelerator position sensor signal 1 (throttle angle)
d:15: Accelerator position sensor signal 2 (throttle angle)
d:30: Cylinder-#1 ignition coil
d:31: Cylinder-#2 ignition coil
d:32: Cylinder-#3 ignition coil
d:33: Cylinder-#4 ignition coil
d:36: Injector #1
d:37: Injector #2

   If a malfunction is detected in the sensors or actuators, repair or replace all faulty parts.
   If no malfunction is detected in the sensors and actuators, check and repair the inner parts of the engine.

EAS30610
DIAGNOSTIC MODE

Setting the diagnostic mode

1. Turn the main switch to “OFF”.
2. Disconnect the wire harness coupler from the fuel pump.
3. Simultaneously press and hold the right set button “1” and left set button “2”, turn the main switch to “ON”, and continue to press the buttons for 8 seconds or more.



TIP

- All displays on the meter disappear except the odometer displays.
- "dIAG" appears on the odometer LCD. If "Co" appears on the odometer LCD, press the left set button to select "dIAG".

4. Simultaneously press the right set button and left set button for 2 seconds or more to set the diagnostic mode.

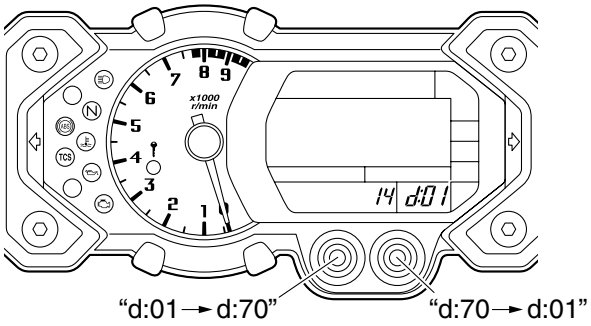
TIP

The diagnostic code number "d:01" appears on the clock LCD.

5. Select the diagnostic code number corresponding to the fault code number by pressing the right set button and left set button.

TIP

- To decrease the selected diagnostic code number, press the right set button. Press the right set button for 1 second or more to automatically decrease the diagnostic code numbers.
- To increase the selected diagnostic code number, press the left set button. Press the left set button for 1 second or more to automatically increase the diagnostic code numbers.



6. Check the operation of the sensor or actuator.
   - Sensor operation
     The data representing the operating conditions of the sensor appears on the odometer LCD.
   - Actuator operation
     Set the engine stop switch to "∩" to operate the actuator.

TIP

If the engine stop switch is set to "∩", set it to "⊠", and then set it to "∩" again.

7. Turn the main switch to "OFF" to cancel the diagnostic mode.

TIP

Information about each diagnostic code No. is organized in this manual as follows:

- If a diagnostic code No. has a corresponding fault code No., the information is shown in "TROUBLESHOOTING DETAILS". (Refer to "TROUBLESHOOTING DETAILS" on page 8-36.)

• If a diagnostic code No. does not have a corresponding fault code number, the information is shown in “DIAGNOSTIC CODE TABLE”. (Refer to “DIAGNOSTIC CODE TABLE” on page 8-73.)

8. Connect the wire harness coupler to the fuel pump.

EAS27462
TROUBLESHOOTING DETAILS

This section describes the measures per fault code number displayed on the meter. Check and service the items or components that are the probable cause of the malfunction following the order given. After the check and service of the malfunctioning part have been completed, reset the meter display according to the reinstatement method.
Fault code No.:
Fault code number displayed on the meter when the engine failed to work normally.
Diagnostic code No.:
Diagnostic code number to be used when the diagnostic mode is operated. Refer to “DIAGNOSTIC MODE” on page 8-34.

Fault code No.	**12**
Item	**Crankshaft position sensor: no normal signals are received from the crankshaft position sensor.**
Fail-safe system	Unable to start engine
	Unable to drive vehicle
Diagnostic code No.	—
Meter display	—
Procedure	—

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Connection of crankshaft position sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Crank the engine. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Crank the engine. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between the crankshaft position sensor coupler and ECU coupler. black/blue–black/blue gray–gray	Crank the engine. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.

Fault code No.		12	
Item		Crankshaft position sensor: no normal signals are received from the crankshaft position sensor.	
4	Installed condition of crankshaft position sensor. Check for looseness or pinching. Check the gap between the crankshaft position sensor and the pickup rotor.	Improperly installed sensor → Reinstall or replace the sensor. Refer to “PICKUP ROTOR” on page 5-69.	Crank the engine. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective crankshaft position sensor.	Check the crankshaft position sensor. Refer to “CHECKING THE CRANKSHAFT POSITION SENSOR” on page 8-148.	Crank the engine. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		13	
Item		Intake air pressure sensor: open or short circuit detected.	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		d:03	
Meter display		Displays the intake air pressure.	
Procedure		Set the engine stop switch to “○”, and then operate the throttle while pushing the start switch “≋”. (If the display value changes, the performance is OK.)	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of intake air pressure sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.

Fault code No.		**13**	
Item		**Intake air pressure sensor: open or short circuit detected.**	
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between intake air pressure sensor coupler and ECU coupler. black/blue–black/blue pink/white–pink/white blue–blue	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of intake air pressure sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective intake air pressure sensor.	Execute the diagnostic mode. (Code No. d:03) When engine is stopped: Atmospheric pressure at the current altitude and weather conditions is indicated. At sea level: Approx. 101 kPa 1000 m above sea level: Approx. 90 kPa 2000 m above sea level: Approx. 80 kPa 3000 m above sea level: Approx. 70 kPa When engine is cranking: Make sure that the indication value changes. The value does not change when engine is cranking. → Replace the intake air pressure sensor. Refer to "CHECKING THE INTAKE AIR PRESSURE SENSOR" on page 8-154.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**14**
Item	**Intake air pressure sensor: hose system malfunction (clogged or detached hose).**
Fail-safe system	Able to start engine
	Able to drive vehicle
Diagnostic code No.	d:03
Meter display	Displays the intake air pressure.

Fault code No.		14	
Item		Intake air pressure sensor: hose system malfunction (clogged or detached hose).	
Procedure		Set the engine stop switch to "○", and then operate the throttle while pushing the start switch "≋". (If the display value changes, the performance is OK.)	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Condition of intake air pressure sensor hose. Check the intake air pressure sensor hose condition.	Clogged or detached hose → Repair or replace the sensor hose.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Proceed to the next item.
2	Defective intake air pressure sensor.	Execute the diagnostic mode. (Code No. d:03) When engine is stopped: Atmospheric pressure at the current altitude and weather conditions is indicated. At sea level: Approx. 101 kPa 1000 m above sea level: Approx. 90 kPa 2000 m above sea level: Approx. 80 kPa 3000 m above sea level: Approx. 70 kPa When engine is cranking: Make sure that the indication value changes. The value does not change when engine is cranking. → Replace the intake air pressure sensor. Refer to "CHECKING THE INTAKE AIR PRESSURE SENSOR" on page 8-154.	

Fault code No.		15
Item		Throttle position sensor: open or short circuit detected.
Fail-safe system		Able/Unable to start engine
		Able/Unable to drive vehicle
Diagnostic code No.		d:01, d:13
d:01	Meter display	Throttle position sensor signal 1 • 9–20 (fully closed position)
	Procedure	• Check with throttle valves fully closed.

Fault code No.		15	
Item		Throttle position sensor: open or short circuit detected.	
d:13	Meter display	Throttle position sensor signal 2 • 7–23 (fully closed position)	
	Procedure	• Check with throttle valves fully closed.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of throttle position sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between throttle position sensor coupler and ECU coupler. black/blue–black/blue white–white black–black blue–blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of throttle position sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor. Refer to “CHECKING THE THROTTLE POSITION SENSOR” on page 8-153.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.

Fault code No.		15	
Item		Throttle position sensor: open or short circuit detected.	
5	Throttle position sensor output voltage	Check for disconnected lead in the throttle position sensor circuit. (black/blue–blue) Refer to "CHECKING THE THROTTLE POSITION SENSOR" on page 8-153.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
		Location of disconnected lead / Output voltage	
		Disconnected ground lead / 5V	
		Disconnected output lead / 0V	
		Disconnected power supply lead / 0V	
6	Defective throttle position sensor.	Execute the diagnostic mode. (Code No. d:01 and/or d:13) Replace if defective. Refer to "CHECKING THE THROTTLE POSITION SENSOR" on page 8-153.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	

Fault code No.		19	
Item		Sidestand switch: a break or disconnection of the black/red lead of the ECU is detected.	
Fail-safe system		Unable to start engine	
		Unable to drive vehicle	
Diagnostic code No.		d:20	
Meter display		Sidestand switch • on (sidestand retracted) • oFF (sidestand extended)	
Procedure		Extend and retract the sidestand (with the transmission in gear).	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of sidestand switch coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON", and then extend and retract the sidestand. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.

Fault code No.		19	
Item		Sidestand switch: a break or disconnection of the black/red lead of the ECU is detected.	
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON", and then extend and retract the sidestand. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Connection of main switch coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON", and then extend and retract the sidestand. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the wire harness. A break or disconnection of the black/red lead of the ECU is detected.	Set the main switch to "ON", and then extend and retract the sidestand. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective sidestand switch.	Execute the diagnostic mode. (Code No.d:20) Shift the transmission into gear. Stand retracted: on Stand extended: oFF Replace if defective. Refer to "CHECKING THE SWITCHES" on page 8-137.	Set the main switch to "ON", and then extend and retract the sidestand. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		21	
Item		Coolant temperature sensor: open or short circuit detected.	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		d:06	
Meter display		Displays the coolant temperature.	
Procedure		Compare the actually measured coolant temperature with the meter display value.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		21	
Item		**Coolant temperature sensor: open or short circuit detected.**	
1	Connection of coolant temperature sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between coolant temperature sensor coupler and ECU coupler. green/white–green/white black/blue–black/blue	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of coolant temperature sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective coolant temperature sensor.	Execute the diagnostic mode. (Code No. d:06) Replace if defective. Refer to "CHECKING THE COOLANT TEMPERATURE SENSOR" on page 8-152.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		22	
Item		**Intake air temperature sensor: open or short circuit detected.**	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		d:05	
Meter display		Displays the intake air temperature.	
Procedure		Compare the actually measured intake air temperature with the meter display value.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		**22**	
Item		**Intake air temperature sensor: open or short circuit detected.**	
1	Connection of intake air temperature sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between intake air temperature sensor coupler and ECU coupler. black/blue–black/blue brown/white–brown/white	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of intake air temperature sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective intake air temperature sensor.	Execute the diagnostic mode. (Code No. d:05) Replace if defective. Refer to "CHECKING THE INTAKE AIR TEMPERATURE SENSOR" on page 8-155.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**24**
Item	**O_2 sensor #1: no normal signals are received from the O_2 sensor #1.**
Fail-safe system	Able to start engine
	Able to drive vehicle
Diagnostic code No.	—
Meter display	—
Procedure	—

Fault code No.	24
Item	O_2 sensor #1: no normal signals are received from the O_2 sensor #1.

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Installed condition of O_2 sensor.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of O_2 sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between O_2 sensor coupler and ECU coupler. red/white–red/white black/green–black/green black/blue–black/blue gray/green–gray/green	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Check fuel pressure.	Refer to “CHECKING THE FUEL PRESSURE” on page 7-11.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.

Fault code No.		**24**	
Item		**O_2 sensor #1: no normal signals are received from the O_2 sensor #1.**	
6	Defective O_2 sensor.	Replace the O_2 sensor. Refer to “ENGINE REMOVAL” on page 5-3.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	

Fault code No.		**30**	
Item		**Latch up detected.** **No normal signals are received from the lean angle sensor.**	
Fail-safe system		Unable to start engine	
		Unable to drive vehicle	
Diagnostic code No.		d:08	
Meter display		Lean angle sensor output voltage • 0.4–1.4 (upright) • 3.7–4.4 (overturned)	
Procedure		Remove the lean angle sensor and incline it more than 45 degrees.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	The vehicle has overturned.	Raise the vehicle upright.	Set the main switch to “ON”, then to “OFF”, and then back to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Installed condition of lean angle sensor.	Check the installed direction and condition of the sensor.	Set the main switch to “ON”, then to “OFF”, and then back to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Defective lean angle sensor.	Execute the diagnostic mode. (Code No. d:08) Replace if defective. Refer to “CHECKING THE LEAN ANGLE SENSOR” on page 8-149.	Set the main switch to “ON”, then to “OFF”, and then back to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**33**
Item	**Cylinder-#1 left ignition coil: open or short circuit detected in the primary lead of the cylinder-#1 left ignition coil.**
Fail-safe system	Able to start engine (depending on the number of faulty cylinders)
	Able to drive vehicle (depending on the number of faulty cylinders)
Diagnostic code No.	d:30
Actuation	Actuates the cylinder-#1 left ignition coil five times at one-second intervals. Illuminates the engine trouble warning light.
Procedure	Check that a spark is generated five times. • Connect an ignition checker.

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Connection of cylinder-#1 left ignition coil coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between cylinder-#1 left ignition coil coupler and ECU coupler. orange–orange	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of cylinder-#1 left ignition coil. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective cylinder-#1 left ignition coil.	Execute the diagnostic mode. (Code No. d:30) Measure the primary coil resistance of the cylinder-#1 left ignition coil. Replace if defective. Refer to “CHECKING THE IGNITION COILS” on page 8-147.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.

Fault code No.		33	
Item		Cylinder-#1 left ignition coil: open or short circuit detected in the primary lead of the cylinder-#1 left ignition coil.	
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		34	
Item		Cylinder-#1 right ignition coil: open or short circuit detected in the primary lead of the cylinder-#1 right ignition coil.	
Fail-safe system		Able to start engine (depending on the number of faulty cylinders)	
		Able to drive vehicle (depending on the number of faulty cylinders)	
Diagnostic code No.		d:31	
Actuation		Actuates the cylinder-#1 right ignition coil five times at one-second intervals. Illuminates the engine trouble warning light.	
Procedure		Check that a spark is generated five times. • Connect an ignition checker.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of cylinder-#1 right ignition coil coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between cylinder-#1 right ignition coil coupler and ECU coupler. gray/red–gray/red	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of cylinder-#1 right ignition coil. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.

Fault code No.		34	
Item		Cylinder-#1 right ignition coil: open or short circuit detected in the primary lead of the cylinder-#1 right ignition coil.	
5	Defective cylinder-#1 right ignition coil.	Execute the diagnostic mode. (Code No. d:31) Measure the primary coil resistance of the cylinder-#1 right ignition coil. Replace if defective. Refer to "CHECKING THE IGNITION COILS" on page 8-147.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		35	
Item		Cylinder-#2 left ignition coil: open or short circuit detected in the primary lead of the cylinder-#2 left ignition coil.	
Fail-safe system		Able to start engine (depending on the number of faulty cylinders)	
		Able to drive vehicle (depending on the number of faulty cylinders)	
Diagnostic code No.		d:32	
Actuation		Actuates the cylinder-#2 left ignition coil five times at one-second intervals. Illuminates the engine trouble warning light.	
Procedure		Check that a spark is generated five times. • Connect an ignition checker.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of cylinder-#2 left ignition coil coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.

Fault code No.		35	
Item		**Cylinder-#2 left ignition coil: open or short circuit detected in the primary lead of the cylinder-#2 left ignition coil.**	
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between cylinder-#2 left ignition coil coupler and ECU coupler. orange/green–orange/green	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of cylinder-#2 left ignition coil. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective cylinder-#2 left ignition coil.	Execute the diagnostic mode. (Code No. d:32) Measure the primary coil resistance of the cylinder-#2 left ignition coil. Replace if defective. Refer to “CHECKING THE IGNITION COILS” on page 8-147.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		36	
Item		**Cylinder-#2 right ignition coil: open or short circuit detected in the primary lead of the cylinder-#2 right ignition coil.**	
Fail-safe system		Able to start engine (depending on the number of faulty cylinders)	
		Able to drive vehicle (depending on the number of faulty cylinders)	
Diagnostic code No.		d:33	
Actuation		Actuates the cylinder-#2 right ignition coil five times at one-second intervals. Illuminates the engine trouble warning light.	
Procedure		Check that a spark is generated five times. • Connect an ignition checker.	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of cylinder-#2 right ignition coil coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.

Fault code No.		36	
Item		Cylinder-#2 right ignition coil: open or short circuit detected in the primary lead of the cylinder-#2 right ignition coil.	
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between cylinder-#2 right ignition coil coupler and ECU coupler. gray/green–gray/green	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of cylinder-#2 right ignition coil. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective cylinder-#2 right ignition coil.	Execute the diagnostic mode. (Code No. d:33) Measure the primary coil resistance of the cylinder-#2 right ignition coil. Replace if defective. Refer to “CHECKING THE IGNITION COILS” on page 8-147.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.		39
Item		Injector: open or short circuit detected.
Fail-safe system		Able to start engine (depending on the number of faulty cylinders)
		Able to drive vehicle (depending on the number of faulty cylinders)
Diagnostic code No.		d:36, d:37
d:36	Actuation	Actuates injector #1 five times at one-second intervals. Illuminates the engine trouble warning light.
	Procedure	Check that injector #1 is actuated five times by listening for the operating sound.
d:37	Actuation	Actuates injector #2 five times at one-second intervals. Illuminates the engine trouble warning light.
	Procedure	Check that injector #2 is actuated five times by listening for the operating sound.

Fault code No.	39		
Item	Injector: open or short circuit detected.		
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Identify the malfunctioning injector	Execute the diagnostic mode (Code No. d:36, 37). Identify the injector that does not produce an operating sound. Perform the following procedures for the defective injector. Refer to “CHECKING THE FUEL INJECTORS” on page 8-155.	—
2	Connection of injector #1 and/or injector #2 coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Defective injector #1 and/or injector #2.	Measure the injector resistance. If the resistance is not 12 Ω, replace the injector.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between injector coupler and ECU coupler. Injector #1 red/black–red/black red/blue–red/blue Injector #2 green/black–green/black red/blue–red/blue	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**41**
Item	**Lean angle sensor: open or short circuit detected.**
Fail-safe system	Unable to start engine
	Unable to drive vehicle
Diagnostic code No.	d:08
Meter display	Lean angle sensor output voltage • 0.4–1.4 (upright) • 3.7–4.4 (overturned)
Procedure	Remove the lean angle sensor and incline it more than 65 degrees.

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Connection of lean angle sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON.” Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of main harness ECU coupler and/or lean angle sensor sub-wire harness coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the main harness or lean angle sensor sub-wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Main harness and/or lean angle sensor sub-wire harness continuity.	Open or short circuit → Replace the wire harness. Between lean angle sensor coupler and lean angle sensor sub-wire harness coupler. blue–blue yellow/green–yellow/green black/blue–black/blue Between lean angle sensor sub-wire harness coupler and ECU coupler. blue–blue yellow/green–yellow/green black/blue–black/blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Defective lean angle sensor.	Execute the diagnostic mode. (Code No. d:08) Replace if defective. Refer to “CHECKING THE LEAN ANGLE SENSOR” on page 8-149.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.

Fault code No.		**41**	
Item		**Lean angle sensor: open or short circuit detected.**	
5	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**42**	
Item	**A**	**Rear wheel sensor: no normal signals are received from the rear wheel sensor.**
	B	Neutral switch: open or short circuit is detected.
	C	Clutch switch: open or short circuit is detected.
Fail-safe system	Able to start engine	
	Able to drive vehicle	
Diagnostic code No.	d:07	
Meter display	Rear wheel speed pulse 0–999	
Procedure	Check that the number increases when the rear wheel is rotated. The number is cumulative and does not reset each time the wheel is stopped.	

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Connection of rear wheel sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Execute the diagnostic mode. (Code No. d:07) Rotate the rear wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 2.

Fault code No.		42	
Item		**A**	**Rear wheel sensor: no normal signals are received from the rear wheel sensor.**
		B	Neutral switch: open or short circuit is detected.
		C	Clutch switch: open or short circuit is detected.
2	Connection of ABS ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Execute the diagnostic mode. (Code No. d:07) Rotate the rear wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 3.
3	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Execute the diagnostic mode. (Code No. d:07) Rotate the rear wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the rear wheel sensor. Between rear wheel sensor coupler and ABS ECU coupler. black–black white–white Between ABS ECU coupler and ECU coupler. blue/black–blue/black blue–blue	Execute the diagnostic mode. (Code No. d:07) Rotate the rear wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 5.

Fault code No.		**42**		
Item		**A**	**Rear wheel sensor: no normal signals are received from the rear wheel sensor.**	
		B	Neutral switch: open or short circuit is detected.	
		C	Clutch switch: open or short circuit is detected.	
5	Malfunction in ECU.		Replace the ECU.	Execute the diagnostic mode. (Code No. d:07) Rotate the rear wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 6.
6	Malfunction in ABS ECU.		Replace the ABS ECU.	Execute the diagnostic mode. (Code No. d:63)

Fault code No.		**42**		
Item		A	Rear wheel sensor: no normal signals are received from the rear wheel sensor.	
		B	**Neutral switch: open or short circuit is detected.**	
		C	Clutch switch: open or short circuit is detected.	
Fail-safe system		Able to start engine		
		Able to drive vehicle		
Diagnostic code No.		d:21		
Meter display		Neutral • “on” (When the transmission is in neutral) • “oFF” (When the transmission is in gear or the clutch lever released.)		
Procedure		Shift the transmission.		
Item	**Probable cause of malfunction and check**		**Maintenance job**	**Confirmation of service completion**

Fault code No.		**42**		
Item		A	Rear wheel sensor: no normal signals are received from the rear wheel sensor.	
		B	**Neutral switch: open or short circuit is detected.**	
		C	Clutch switch: open or short circuit is detected.	
1	Connection of neutral switch coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or neutral switch sub wire harness.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or neutral switch sub wire harness.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness and/or neutral switch sub-wire harness continuity.	Open or short circuit → Replace the wire harness and/or neutral switch sub-wire harness. sky blue–sky blue	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Defective neutral switch.	Check the neutral switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Faulty shift drum (neutral detection area).	Malfunction → Replace the shift drum. Refer to “TRANSMISSION” on page 5-103.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	Execute the diagnostic mode. (Code No. d:63)

Fault code No.	**42**	
Item	A	Rear wheel sensor: no normal signals are received from the rear wheel sensor.
	B	Neutral switch: open or short circuit is detected.
	C	**Clutch switch: open or short circuit is detected.**
Fail-safe system	Able to start engine	
	Able to drive vehicle	
Diagnostic code No.	d:21	
Meter display	Clutch switch • "on" (when the clutch lever is squeezed with the transmission in gear and when the sidestand is retracted) • "oFF" (when the clutch lever is squeezed with the transmission in neutral and when the sidestand is extended)	
Procedure	Operate the transmission, clutch lever, and sidestand.	

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Clutch lever adjustment.	Refer to "ADJUSTING THE CLUTCH LEVER" on page 3-12.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of clutch switch coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or sub wire harness.	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the wire harness. black/yellow–black/yellow black/red–black/red	Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.

Fault code No.		**42**			
Item		A	Rear wheel sensor: no normal signals are received from the rear wheel sensor.		
		B	Neutral switch: open or short circuit is detected.		
		C	**Clutch switch: open or short circuit is detected.**		
5	Defective clutch switch.		Check the clutch switch. Refer to “CHECKING THE SWITCHES” on page 8-137.		Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.		Replace the ECU.		Execute the diagnostic mode. (Code No. d:63)

Fault code No.		**43**		
Item		**Fuel system voltage: the ECU is unable to monitor the battery voltage (an open or short circuit in the wire harness to the ECU).**		
Fail-safe system		Able to start engine		
		Able to drive vehicle		
Diagnostic code No.		d:09, d:50		
d:09	**Meter display**	Fuel system voltage (battery voltage) Approximately 12.0		
	Procedure	Set the engine stop switch to “∩”, and then compare the actually measured battery voltage with the meter display value. (If the actually measured battery voltage is low, recharge the battery.)		
d:50	**Actuation**	Actuates the main relay five times at one-second intervals. Illuminates the engine trouble warning light.		
	Procedure	Check that the main relay is actuated five times by listening for the operating sound.		
Item	**Probable cause of malfunction and check**		**Maintenance job**	**Confirmation of service completion**
1	Connection of main relay coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).		Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.

Fault code No.		**43**	
Item		**Fuel system voltage: the ECU is unable to monitor the battery voltage (an open or short circuit in the wire harness to the ECU).**	
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit →Replace the wire harness. Between relay unit coupler and ECU coupler. red/blue–red/blue Between relay unit coupler and fuel injection system fuse. red/black–red/black Between fuel injection system fuse and battery terminal. red–red	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Malfunction or open circuit in main relay.	Execute the diagnostic mode. (Code No. d:50). No operation sound of fuel injection system relay is heard. → Replace the relay unit.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Malfunction or open circuit in main relay.	Execute the diagnostic mode. (Code No. d:09) Fuel system voltage is below 3V → Replace the relay unit.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**44**
Item	**EEPROM cylinder fault code number: an error is detected while reading or writing on EEPROM (CO adjustment value).**
Fail-safe system	Able/Unable to start engine
	Able/Unable to drive vehicle
Diagnostic code No.	d:60

Fault code No.	**44**
Item	**EEPROM cylinder fault code number: an error is detected while reading or writing on EEPROM (CO adjustment value).**
Meter display	EEPROM fault code display • 00 (no history) • 01–04: Cylinder fault code number (history exists) If more than one cylinder is defective, the display switches every two seconds to show the cylinder fault code numbers of all defective cylinders in a repeating cycle.
Procedure	—

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Locate the malfunction	Execute the diagnostic mode (Code No. d:60). 00: Perform the procedure in item 4. 01: Perform the procedure in item 2. 02: Perform the procedure in item 3.	—
2	"01" is indicated in Diagnostic mode (Code No. d:60) EEP-ROM data error for adjustment of CO concentration of cylinder #1	Change the CO concentration of cylinder #1, and rewrite in EEPROM. Refer to "ADJUSTING THE EXHAUST GAS VOLUME" on page 3-10. After this adjustment is made, the memory is not recovered when the main switch is turned OFF and ON again. → Replace the ECU.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Repeat the procedure in item 1. If the same number is indicated, perform the procedure in item 4.
3	"02" is indicated in Diagnostic mode (Code No. d:60) EEP-ROM data error for adjustment of CO concentration of cylinder #2	Change the CO concentration of cylinder #2, and rewrite in EEPROM. Refer to "ADJUSTING THE EXHAUST GAS VOLUME" on page 3-10. After this adjustment is made, the memory is not recovered when the main switch is turned OFF and ON again. → Replace the ECU.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Repeat the procedure in item 1. If the same number is indicated, perform the procedure in item 4.
4	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**46**
Item	**Charging voltage is abnormal.**
Fail-safe system	Able to start engine
	Able to drive vehicle
Diagnostic code No.	—

Fault code No.		46	
Item		Charging voltage is abnormal.	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Malfunction in charging system.	Check the charging system. Refer to “CHARGING SYSTEM” on page 8-13. Defective rectifier/regulator or AC magneto → Replace. Defective connection in the charging system circuit → Properly connect or repair the charging system wiring.	Start the engine and let it idle for approximately 5 seconds. Fault code number is not displayed → Service is finished. Fault code number is displayed → Repeat the procedure in item 1.

Fault code No.		50	
Item		Faulty ECU memory. (When this malfunction is detected in the ECU, the fault code number might not appear on the meter.)	
Fail-safe system		Able/Unable to start engine	
		Able/Unable to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Malfunction in ECU.	Replace the ECU. **TIP** Do not perform this procedure with the main switch turned to “ON”.	Set the main switch to “ON”. Check that the fault code number is not displayed.

Fault code No.		59
Item		Accelerator position sensor: open or short circuit detected.
Fail-safe system		Able/Unable to start engine
		Able/Unable to drive vehicle
Diagnostic code No.		d:14, d:15
d:14	Meter display	Accelerator position sensor signal 1 • 12–22 (fully closed position) • 97–113 (fully open position)
	Procedure	• Check with throttle grip in fully closed position. • Check with throttle grip in fully open position.

Fault code No.		59
Item		Accelerator position sensor: open or short circuit detected.
d:15	Meter display	Accelerator position sensor signal 2 • 9–25 (fully closed position) • 97–113 (fully open position)
	Procedure	• Check with throttle grip in fully closed position. • Check with throttle grip in fully open position.

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Connection of accelerator position sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between accelerator position sensor coupler and ECU coupler. black/blue–black/blue white–white black–black blue–blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Installed condition of accelerator position sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor. Refer to “CHECKING THE ACCELERATOR POSITION SENSOR” on page 8-153.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.

Fault code No.		59	
Item		Accelerator position sensor: open or short circuit detected.	
5	Accelerator position sensor output voltage	Check for disconnected lead in the accelerator position sensor circuit. (black/blue–blue) Refer to “CHECKING THE ACCELERATOR POSITION SENSOR” on page 8-153.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
		Location of disconnected lead: Output voltage	
		Disconnected ground lead: 5V	
		Disconnected output lead: 0V	
		Disconnected power supply lead: 0V	
6	Defective throttle position sensor.	Execute the diagnostic mode. (Code No. d:14 and/or d:15) Replace if defective. Refer to “CHECKING THE ACCELERATOR POSITION SENSOR” on page 8-153.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	

Fault code No.		60	
Item		YCC-T drive system: malfunction detected.	
Fail-safe system		Able/Unable to start engine	
		Able/Unable to drive vehicle	
Diagnostic code No.		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Connection of throttle servo motor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or sub wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.

Fault code No.		60	
Item		**YCC-T drive system: malfunction detected.**	
3	Check the ETV (Electronic Throttle Valve) fuse.	Abnormality → Replace the ETV (Electronic Throttle Valve) fuse.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the wire harness. light green–light green yellow/red–yellow/red	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Defective throttle servo motor.	Check the throttle servo motor. Refer to "CHECKING THE THROTTLE SERVO MOTOR" on page 8-155.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Defective throttle bodies.	Check the throttle bodies. Refer to "CHECKING THE THROTTLE SERVO MOTOR" on page 8-155.	Set the main switch to "ON". Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	

Fault code No.		68	
Item		**O_2 sensor #2: no normal signals are received from the O_2 sensor #2.**	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**
1	Installed condition of O_2 sensor. Check for looseness or pinching.	Improperly installed sensor → Reinstall or replace the sensor.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.

Fault code No.		**68**	
Item		**O_2 sensor #2: no normal signals are received from the O_2 sensor #2.**	
2	Connection of O_2 sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between O_2 sensor coupler and ECU coupler. red/white–red/white black/green–black/green black/blue–black/blue gray/green–gray/green	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Check fuel pressure.	Refer to “CHECKING THE FUEL PRESSURE” on page 7-11.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 6.
6	Defective O_2 sensor.	Replace the O_2 sensor. Refer to “ENGINE REMOVAL” on page 5-3.	Start the engine, warm it up, and then race it. Execute the diagnostic mode. (Code No. d:63) Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	

Fault code No.	**69**
Item	**Front wheel sensor: no normal signals are received from the rear wheel sensor.**
Fail-safe system	Able to start engine
	Able to drive vehicle
Diagnostic code No.	d:16
Meter display	Front wheel speed pulse 0–999
Procedure	Check that the number increases when the front wheel is rotated. The number is cumulative and does not reset each time the wheel is stopped.

Item	Probable cause of malfunction and check	Maintenance job	Confirmation of service completion
1	Locate the malfunction.	If the ABS warning light is on, refer to “BASIC INSTRUCTIONS FOR TROUBLESHOOTING” on page 8-96. If the ABS warning light is off, perform the following procedure. Rotate the front wheel by hand and check that the indicated value increases. Value increases → Proceed to item 9 and delete the fault code. Value does not increase → Perform the procedure in item 2.	—
2	Connection of front wheel sensor coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d:63” Value does not increase → Go to item 3.

Fault code No.		69	
Item		Front wheel sensor: no normal signals are received from the rear wheel sensor.	
3	Connection of ABS ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or sub wire harness.	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 4.
4	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness or sub wire harness.	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 5.
5	Wire harness continuity.	Open or short circuit → Replace the wire harness. Between front wheel sensor coupler and ABS ECU coupler. black–black white–white Between ABS ECU coupler and ECU coupler. blue/black–blue/black blue–blue	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 6.

Fault code No.		69	
Item		Front wheel sensor: no normal signals are received from the rear wheel sensor.	
6	Defective rear wheel sensor.	Improperly installed sensor → Reinstall or repair the sensor. Check whether the front wheel sensor is defective. → Execute the diagnostic mode. (Code No. d:16) Front wheel stopped: Check that the cumulative pulse value does not increase. Front wheel is rotated several turns by hand: Check that the cumulative pulse value increases. Replace the rear wheel sensor.	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 7.
7	Malfunction in ECU.	Replace the ECU.	Execute the diagnostic mode. (Code No. d:16) Rotate the front wheel by hand and check that the indicated value increases. Value increases → Start the engine, and input the vehicle speed signals by operating the vehicle at 20 to 30 km/h. The fault code can also be deleted by activating the diagnostic mode and selecting diagnostic code number “d: 63” Value does not increase → Go to item 8.
8	Malfunction in ABS ECU.	Replace the ABS ECU.	Execute the diagnostic mode. (Code No. d:63)

Fault code No.		Er-1	
Item		ECU internal malfunction (output signal error): no signals are received from the ECU.	
Fail-safe system		Able/Unable to start engine	
		Able/Unable to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		Er-1	
Item		**ECU internal malfunction (output signal error): no signals are received from the ECU.**	
1	Connection of multi-function meter coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. yellow/blue–yellow/blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Abnormal meter unit operation	Replace the meter assembly.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Malfunction in ECU.	Replace the ECU.	

Fault code No.		Er-2	
Item		**ECU internal malfunction (output signal error): no signals are received from the ECU within the specified duration.**	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		Er-2	
Item		ECU internal malfunction (output signal error): no signals are received from the ECU within the specified duration.	
1	Connection of multi-function meter coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. yellow/blue–yellow/blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Abnormal meter unit operation	Replace the meter assembly.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Malfunction in ECU.	Replace the ECU.	

Fault code No.		Er-3	
Item		ECU internal malfunction (output signal error): data from the ECU cannot be received correctly.	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		Er-3	
Item		ECU internal malfunction (output signal error): data from the ECU cannot be received correctly.	
1	Connection of multi-function meter coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. yellow/blue–yellow/blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Abnormal meter unit operation	Replace the meter assembly.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Malfunction in ECU.	Replace the ECU.	

Fault code No.		Er-4	
Item		ECU internal malfunction (input signal error): non-registered data has been received from the meter.	
Fail-safe system		Able to start engine	
		Able to drive vehicle	
Diagnostic code No.		—	
Meter display		—	
Procedure		—	
Item	**Probable cause of malfunction and check**	**Maintenance job**	**Confirmation of service completion**

Fault code No.		Er-4	
Item		ECU internal malfunction (input signal error): non-registered data has been received from the meter.	
1	Connection of multi-function meter coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 2.
2	Connection of wire harness ECU coupler. Check the locking condition of the coupler. Disconnect the coupler and check the pins (bent or broken terminals and locking condition of the pins).	Improperly connected → Connect the coupler securely or repair/replace the wire harness.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 3.
3	Wire harness continuity.	Open or short circuit → Replace the wire harness. yellow/blue–yellow/blue	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 4.
4	Abnormal meter unit operation	Replace the meter assembly.	Set the main switch to “ON”. Fault code number is not displayed → Service is finished. Fault code number is displayed → Go to item 5.
5	Malfunction in ECU.	Replace the ECU.	

EAS30670
DIAGNOSTIC CODE TABLE

TIP

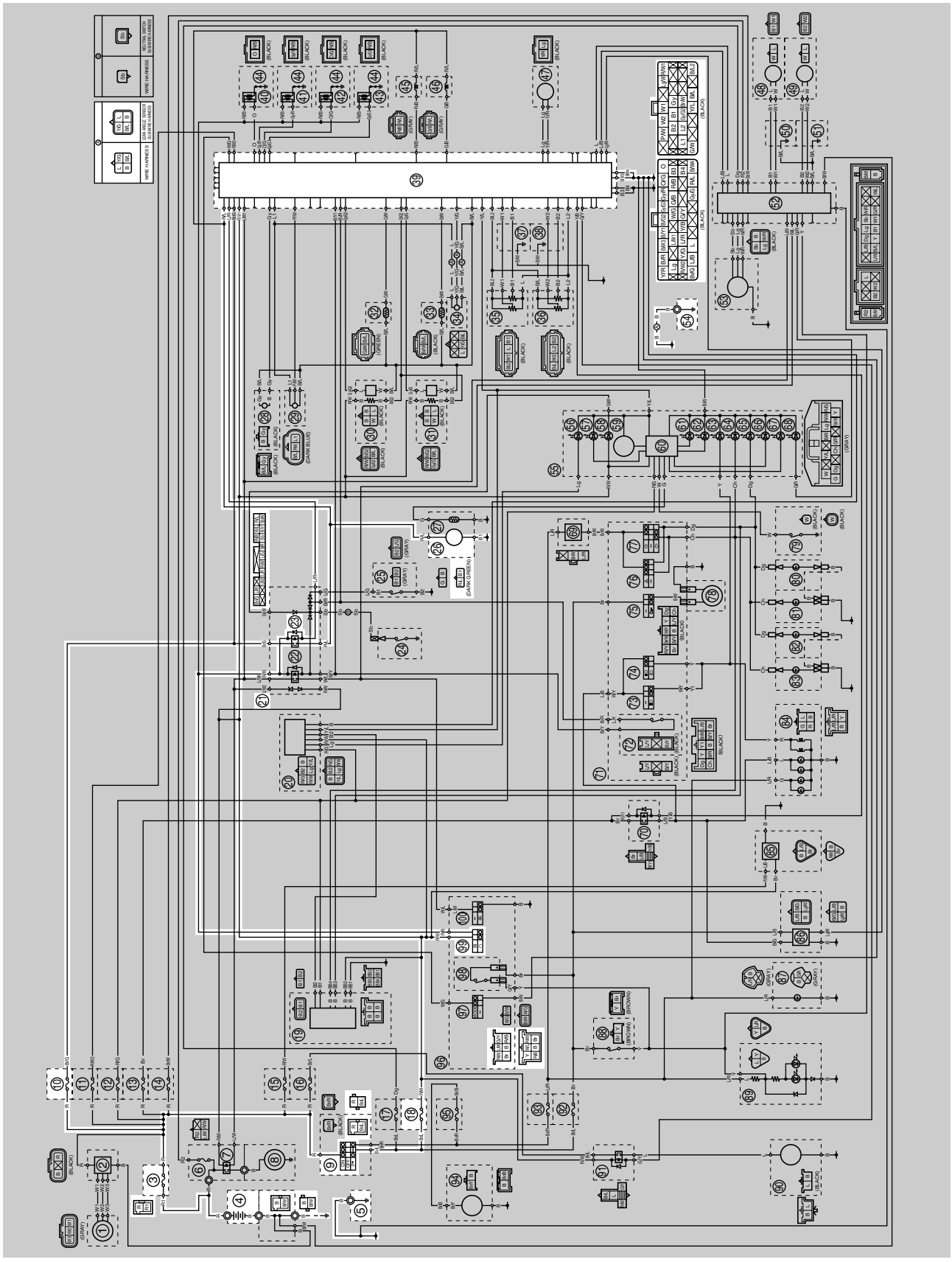
The following tables contain information about diagnostic code numbers that do not have a corresponding fault code number. (These items are not listed in “TROUBLESHOOTING DETAILS”.)

Diagnostic code No.	Item	Meter display/Actuation	Procedure
d:51	Radiator fan motor relay	Actuates the radiator fan motor relay five times at five-second intervals. (2 seconds on, 3 seconds off) Illuminates the engine trouble warning light.	Check that the radiator fan motor relay is actuated five times by listening for the operating sound.
d:52	Headlight relay	Actuates the headlight relay five times at five-second intervals. (2 seconds on, 3 seconds off) Illuminates the engine trouble warning light.	Check that the headlight relay is actuated five times by listening for the operating sound.

Diagnostic code No.	Item	Meter display/Actuation	Procedure
d:57	Grip warmer relay	Illuminates the engine trouble warning light.	—
d:61	Malfunction history code display • No history • History exists	 00 11–70: Fault code number • If more than one malfunction is detected, the display switches every two seconds to show the fault code numbers of all malfunctions in a repeating cycle.	—
d:62	Malfunction history code erasure • No history • History exists	 00 • Displays the total number of malfunctions, including the current malfunction, that have occurred since the history was last erased. (For example, if there have been three malfunctions, "03" is displayed.)	 — To erase the history, set the engine stop switch from "⊠" to "∩".
d:63	Malfunction code reinstatement (for fault code No. 24, 42, 68, 69) • No malfunction code • Malfunction code exists	 00 24, 42, 68, 69: Fault code number • If more than one malfunction is detected, the display switches every two seconds to show the fault code numbers of all malfunctions in a repeating cycle.	 — To reinstate, set the engine stop switch from "⊠" to "∩".
d:70	Control number	0–254 [-]	—

EAS27550
FUEL PUMP SYSTEM

EAS27560
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
9. Main switch
10. Fuel injection system fuse
18. Ignition fuse
21. Relay unit
23. Fuel pump relay
26. Fuel pump
39. ECU (engine control unit)
54. Frame ground
99. Engine stop switch

EAS27570
TROUBLESHOOTING

If the fuel pump fails to operate.

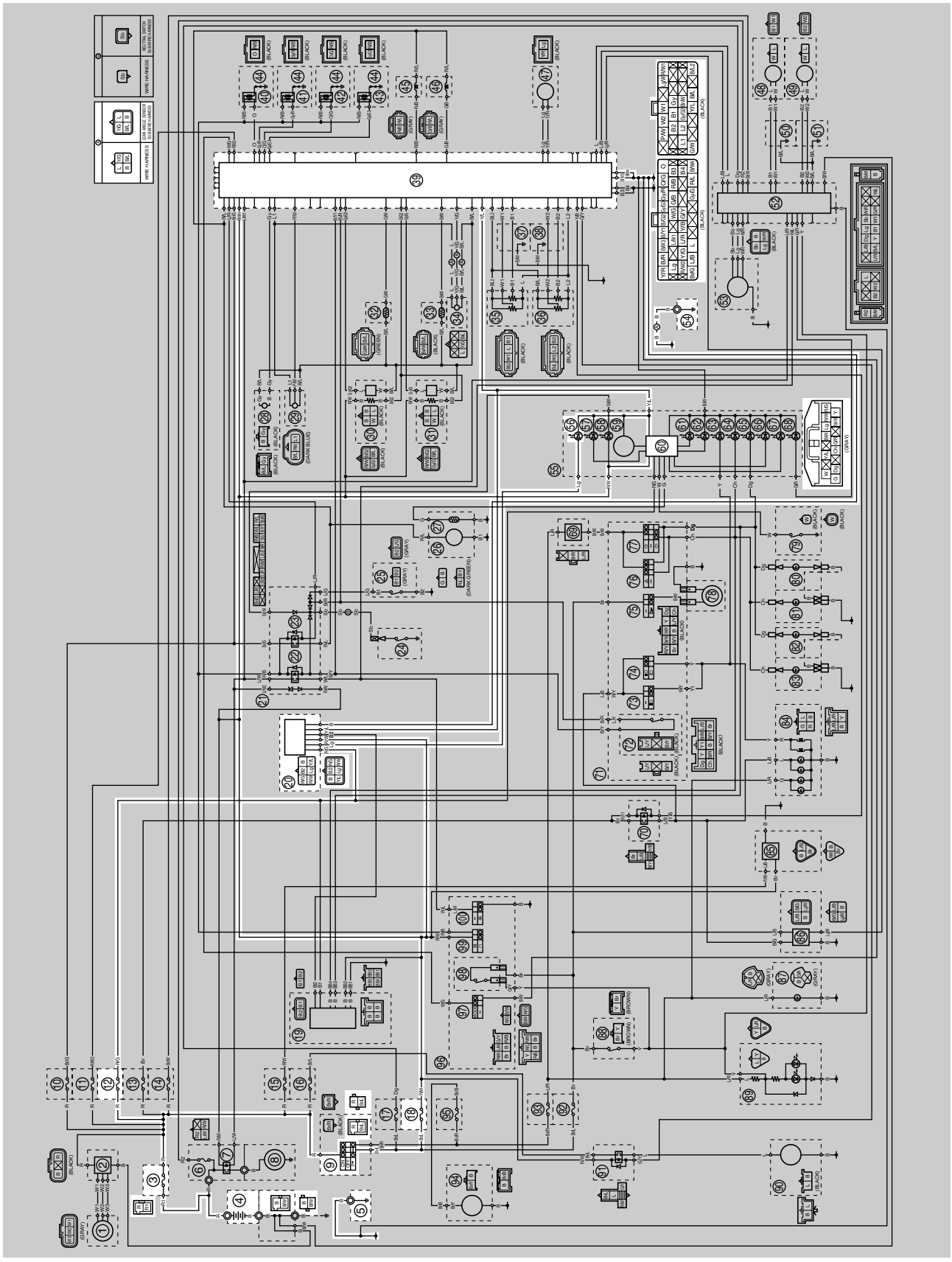
TIP

• Before troubleshooting, remove the following part(s):
1. Right side cowling
2. Right side panel
3. Fuel tank

1. Check the fuses. (Main, ignition and fuel injection system) Refer to “CHECKING THE FUSES” on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the main switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
4. Check the engine stop switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	The engine stop switch is faulty. Replace the right handlebar switch.
OK ↓		
5. Check the relay unit (fuel pump relay). Refer to “CHECKING THE RELAYS” on page 8-145.	NG →	Replace the relay unit.
OK ↓		
6. Check the fuel pump. Refer to “CHECKING THE FUEL PUMP BODY” on page 7-3.	NG →	Replace the fuel pump assembly.
OK ↓		
7. Check the entire fuel pump system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-75.	NG →	Properly connect or repair the fuel pump system wiring.
OK ↓		
Replace the ECU.		

EAS27640
IMMOBILIZER SYSTEM

EAS27650
CIRCUIT DIAGRAM



3. Main fuse
4. Battery
5. Engine ground
9. Main switch
12. Backup fuse (odometer, clock, and immobilizer system)
18. Ignition fuse
20. Immobilizer unit
39. ECU (engine control unit)
54. Frame ground
56. Immobilizer system indicator light
60. Multi-function meter

EAS27671
GENERAL INFORMATION
This vehicle is equipped with an immobilizer system to help prevent theft by re-registering codes in the standard keys. This system consists of the following:
- a code re-registering key (with a red bow)
- two standard keys (with a black bow) that can be re-registered with new codes
- a transponder (which is installed in the code re-registering key)
- an immobilizer unit
- the ECU
- an immobilizer system indicator light

The key with the red bow is used to register codes in each standard key. Do not use the key with the red bow for driving. It should only be used for re-registering new codes in the standard keys. The immobilizer system cannot be operated with a new key until the key is registered with a code. If you lose the code re-registering key, the ECU and main switch (equipped with the immobilizer unit) need to be replaced.
Therefore, always use a standard key for driving. (See NOTICE.)

TIP

Each standard key is registered during production, therefore re-registering at purchase is not necessary.

ECA14971
NOTICE

- **DO NOT LOSE THE CODE RE-REGISTERING KEY! If the code re-registering key is lost, registering new codes in the standard keys is impossible. The standard keys can still be used to start the vehicle. However, if code re-registering is required (e.g., if a new standard key is made or all keys are lost) the entire immobilizer system must be replaced. Therefore, it is highly recommended to use either standard key for driving, and to keep the code re-registering key in a safe place.**
- **Do not submerse the keys in water.**
- **Do not expose the keys to excessively high temperatures.**
- **Do not place the keys close to magnets (this includes, but is not limited to, products such as speakers, etc.).**
- **Do not place heavy items on the keys.**
- **Do not grind the keys or alter their shape.**
- **Do not disassemble the key bows.**
- **Do not put two keys of any immobilizer system on the same key ring.**
- **Keep the standard keys as well as other immobilizer system keys away from the code re-registering key.**
- **Keep other immobilizer system keys away from the main switch as they may cause signal interference.**

EAS27691
PART REPLACEMENT AND KEY CODE REGISTRATION REQUIREMENTS
In the course of use, you may encounter the following cases where replacement of parts and registration of code re-registering/standard keys are required.

TIP

Each standard key is registered during production, therefore re-registering at purchase is not necessary.

	Parts to be replaced					Key registration requirement
	Main switch/immobilizer unit		Standard key	ECU	Accessory lock* and key	
	Main switch	Immobilizer unit				
Standard key is lost			√			New standard key
All keys have been lost (including code re-registering key)	√		√	√	√	Code re-registering key and standard keys
ECU is defective				√		Code re-registering key and standard keys
Immobilizer unit is defective		√				Code re-registering key and standard keys
Main switch is defective	√		√	√	√	Code re-registering key and standard keys
Accessory lock* is defective					√	Not required

* Accessory locks mean the seat lock and fuel tank cap.

Code re-registering key registration:
When the immobilizer unit or ECU is replaced, the code re-registering key must be registered to the unit.
To register a code re-registering key:
1. Turn the main switch to “ON” with the code re-registering key.

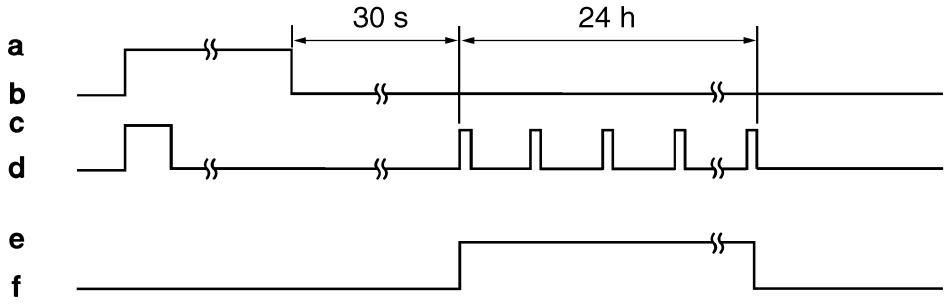
TIP

Check that the immobilizer system indicator light comes on for one second, then goes off. When the immobilizer system indicator light goes off, the code re-registering key has been registered.

2. Check that the engine can be started.
3. Register the standard key, following the instructions in the section below.

Standby mode:
To enable the immobilizer system, turn the ignition key to “OFF”. 30 seconds later, the indicator light will start flashing continuously in the standby flashing mode pattern for up to 24 hours. After that time, the indicator light will stop flashing, but the immobilizer system is still enabled.

Standby mode



a. Main switch “ON”
b. Main switch “OFF”
c. LED on
d. LED off
e. Standby mode on
f. Standby mode off

Standard key registration:
Standard key registration is required when a standard key is lost and needs to be replaced, or when the code re-registering key is re-registered after the immobilizer unit or ECU are replaced.

TIP

Do not start the engine with a standard key that has not been registered. If the main switch is turned “ON” with a standard key that has not been registered, the immobilizer system indicator light flashes to indicate fault code “52”. (Refer to “SELF-DIAGNOSIS FAULT CODE INDICATION” on page 8-85).

1. Check that the immobilizer system indicator light signals the standby mode.
2. Using the code re-registering key, turn the main switch to “ON”, then “OFF”, and then remove the key within 5 seconds.
3. Insert the first standard key to be registered into the main switch, then turn the key to “ON” within 5 seconds to activate the key registration mode.

TIP

The existing standard key code is erased from the memory when the key registration mode is activated. When the key registration mode is activated, the immobilizer system indicator light flashes rapidly.

4. While the indicator light is flashing, turn the main switch to “OFF”, remove the key, and within 5 seconds, insert the second standard key to be registered into the main switch.

TIP

If the immobilizer system indicator light stops flashing 5 seconds after the first standard key is registered, the registration mode is deactivated. If this occurs, the second standard key cannot be registered, and steps 2 to 4 need to be repeated to register both standard keys.

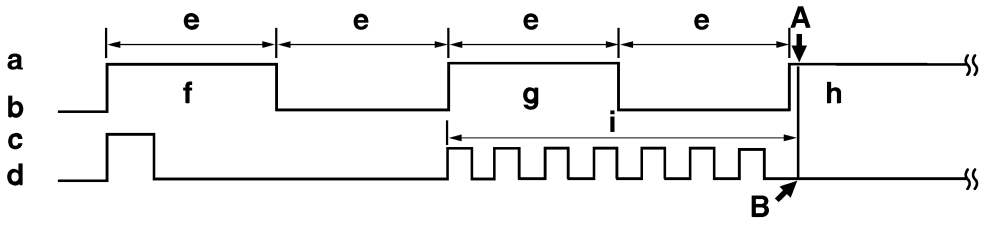
5. Turn the main switch to “ON”.

TIP

When the indicator light goes off, the registration is complete.

6. Check that the engine can be started with the two registered standard keys.

Standard key registration

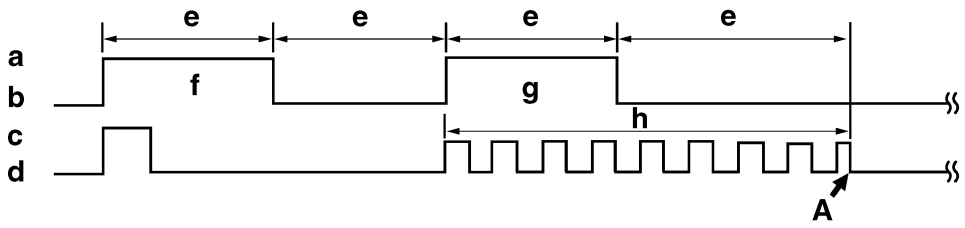


a. Main switch “ON”
b. Main switch “OFF”
c. LED on
d. LED off
e. Less than 5.0 s
f. Code re-registering key
g. First standard key
h. Second standard key
i. Registration mode
A. Registration of the second standard key is complete.
B. Immobilizer system indicator light stops flashing when the registration of the second standard key is complete.

Voiding the standard key code:

If a standard key has been lost, it is possible to disable its use by re-registering the remaining standard key. Standard key registration erases the stored standard key code from the memory, thus disabling the lost standard key. To re-register, refer to “Standard key registration”.

Standard key code voiding method



a. Main switch “ON”
b. Main switch “OFF”
c. LED on
d. LED off
e. Less than 5.0 s
f. Code re-registering key
g. Remaining standard key
h. Registration mode
A. If the immobilizer system indicator light stops flashing 5 seconds after the first standard key is registered, the second standard key cannot be registered.

EAS27701
TROUBLESHOOTING

When the main switch is turned to “ON”, the immobilizer system indicator light does not come on nor flashes.

1. Check the fuses. (Main, ignition, and backup) Refer to “CHECKING THE FUSES” on page 8-141.	NG →	Replace the fuse(s).
OK ↓		
2. Check the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	NG →	• Clean the battery terminals. • Recharge or replace the battery.
OK ↓		
3. Check the main switch. Refer to “CHECKING THE SWITCHES” on page 8-137.	NG →	Replace the main switch/immobilizer unit.
OK ↓		
4. Check the entire immobilizer system wiring. Refer to “CIRCUIT DIAGRAM” on page 8-79.	NG →	Properly connect or repair the immobilizer system wiring.
OK ↓		
• Check the condition each of the immobilizer system circuits. • Refer to “SELF-DIAGNOSIS FAULT CODE INDICATION” on page 8-85.		

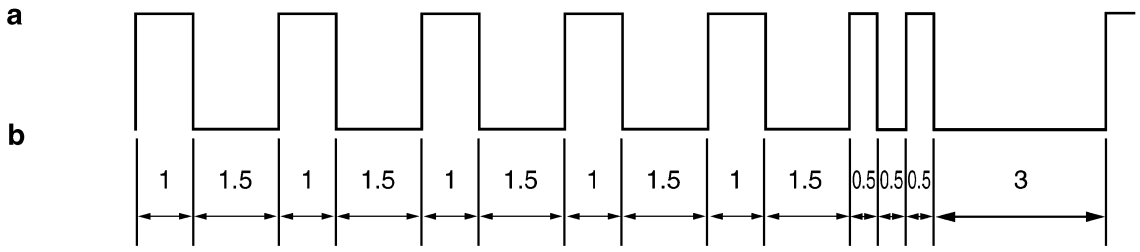
EAS27721
SELF-DIAGNOSIS FAULT CODE INDICATION

When a system malfunction occurs, the fault code number is indicated in the LCD display of meter assembly 2 and the immobilizer system indicator light flashes at the same time. The pattern of flashing also shows the fault code.

Fault code	Part	Symptom	Cause	Action
51	IMMOBILIZER UNIT	Code cannot be transmitted between the key and the immobilizer unit.	1. Radio wave interference caused by objects around the keys and antennas. 2. Immobilizer unit malfunction. 3. Key malfunction.	1. Keep magnets, metal objects, and other immobilizer system keys away from the keys and antennas. 2. Replace the main switch/immobilizer unit. 3. Replace the key.

Fault code	Part	Symptom	Cause	Action
52	IMMOBILIZER UNIT	Codes between the key and immobilizer unit do not match.	1. Signal received from other transponder (failed to recognize code after ten consecutive attempts). 2. Signal received from unregistered standard key.	1. Place the immobilizer unit at least 50 mm away from the transponder of other vehicles. 2. Register the standard key.
53	IMMOBILIZER UNIT	Codes cannot be transmitted between the ECU and the immobilizer unit.	Noise interference or disconnected lead/cable. 1. Interference due to radio wave noise. 2. Disconnected communication harness. 3. Immobilizer unit malfunction. 4. ECU malfunction.	1. Check the wire harness and connector. 2. Replace the main switch/immobilizer unit. 3. Replace the ECU.
54	IMMOBILIZER UNIT	Codes transmitted between the ECU and the immobilizer unit do not match.	Noise interference or disconnected lead/cable. 1. Interference due to radio wave noise. 2. Disconnected communication harness. 3. Immobilizer unit malfunction. 4. ECU failure. (The ECU or immobilizer unit was replaced with a used unit from another vehicle.)	1. Register the code re-registering key. 2. Check the wire harness and connector. 3. Replace the main switch/immobilizer unit. 4. Replace the ECU.
55	IMMOBILIZER UNIT	Key code registration malfunction.	Same standard key was attempted to be registered two consecutive times.	Register another standard key.
56	ECU	Unidentified code is received.	Noise interference or disconnected lead/cable.	1. Check the wire harness and connector. 2. Replace the main switch/immobilizer unit. 3. Replace the ECU.

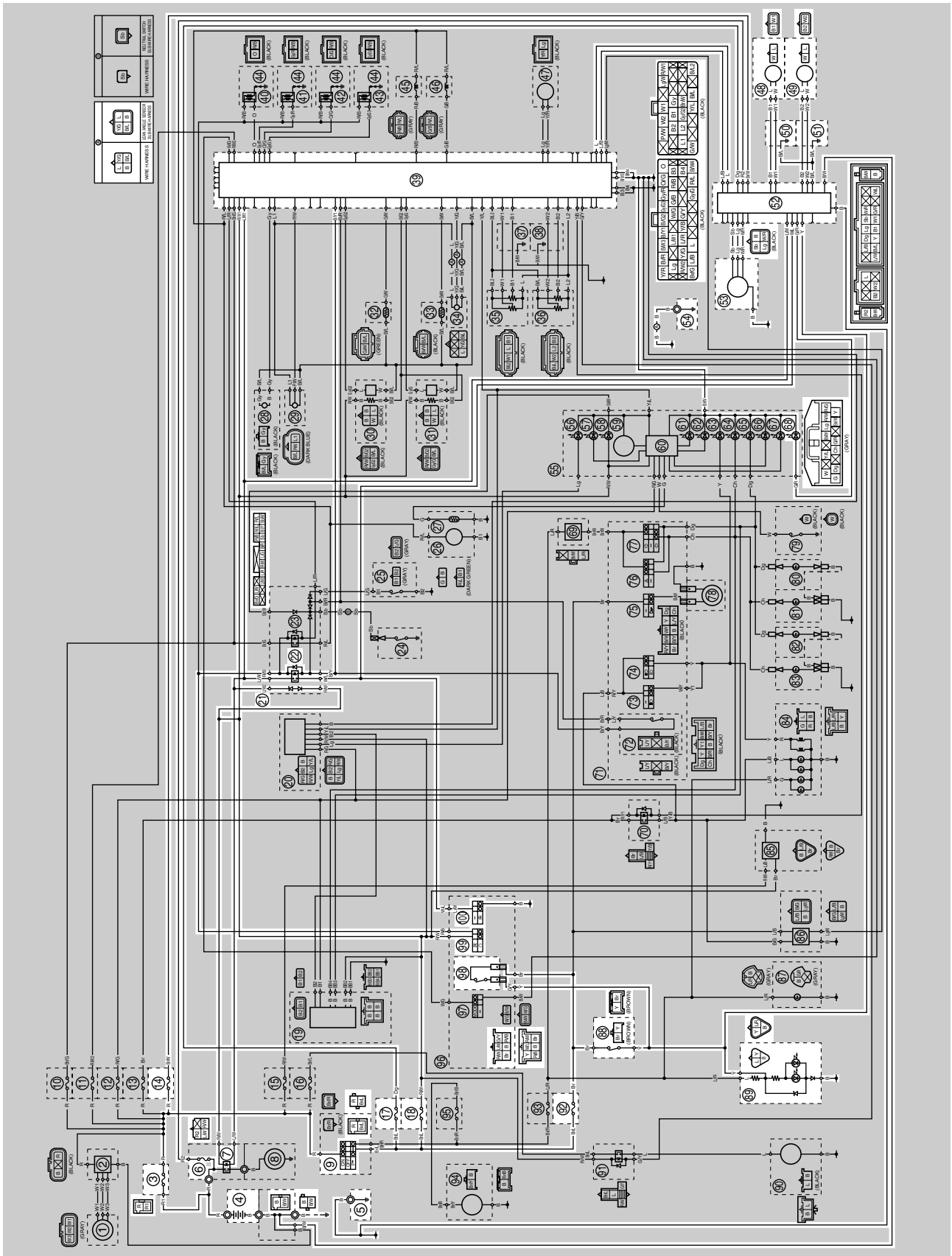
Immobilizer system indicator light fault code indication
Units of 10: Cycles of on for 1 second and off for 1.5 seconds.
Units of 1: Cycles of on for 0.5 second and off for 0.5 second.
Example: fault code 52



a. Light on
b. Light off

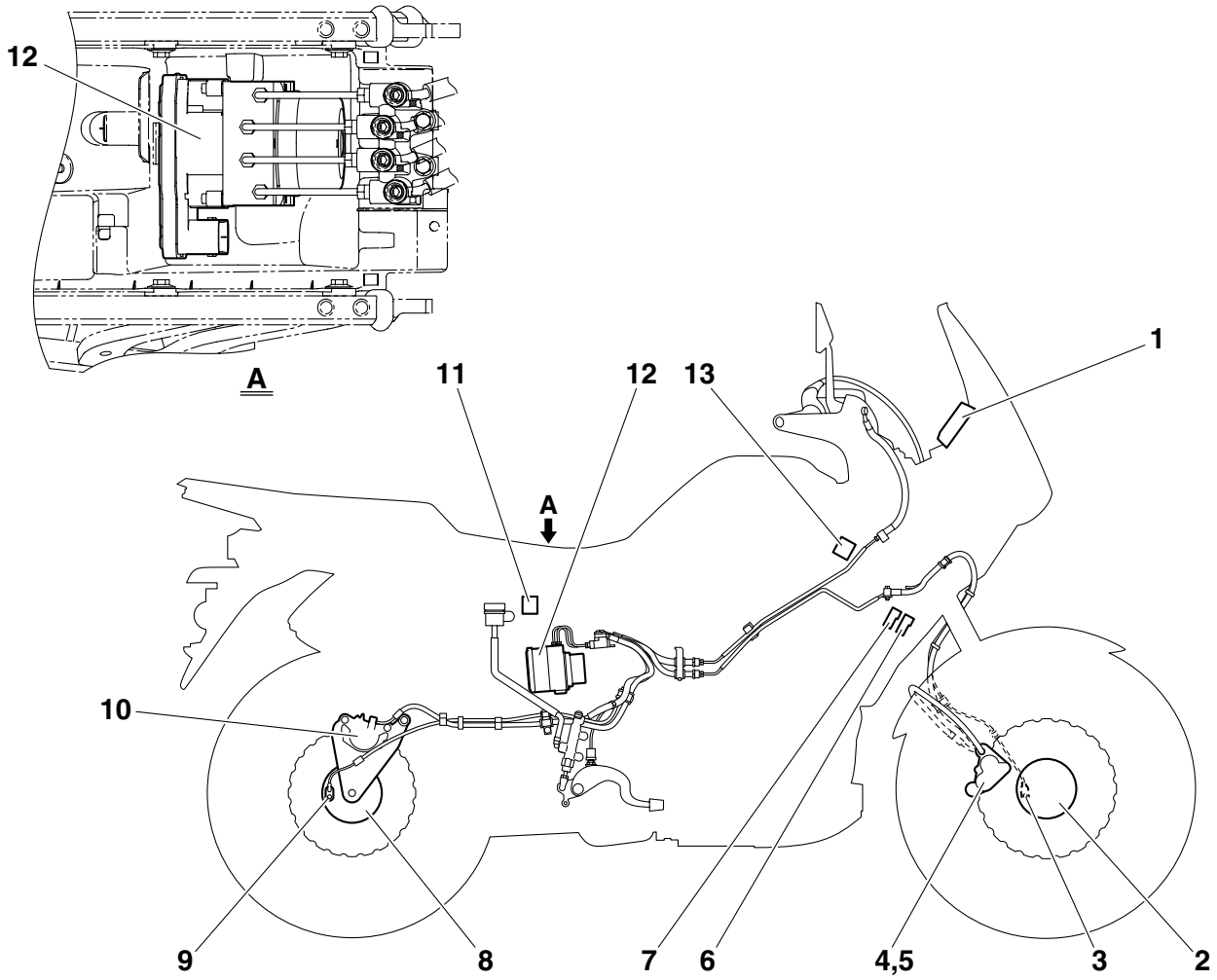
EAS28790
ABS (ANTI-LOCK BRAKE SYSTEM)

EAS27730
CIRCUIT DIAGRAM



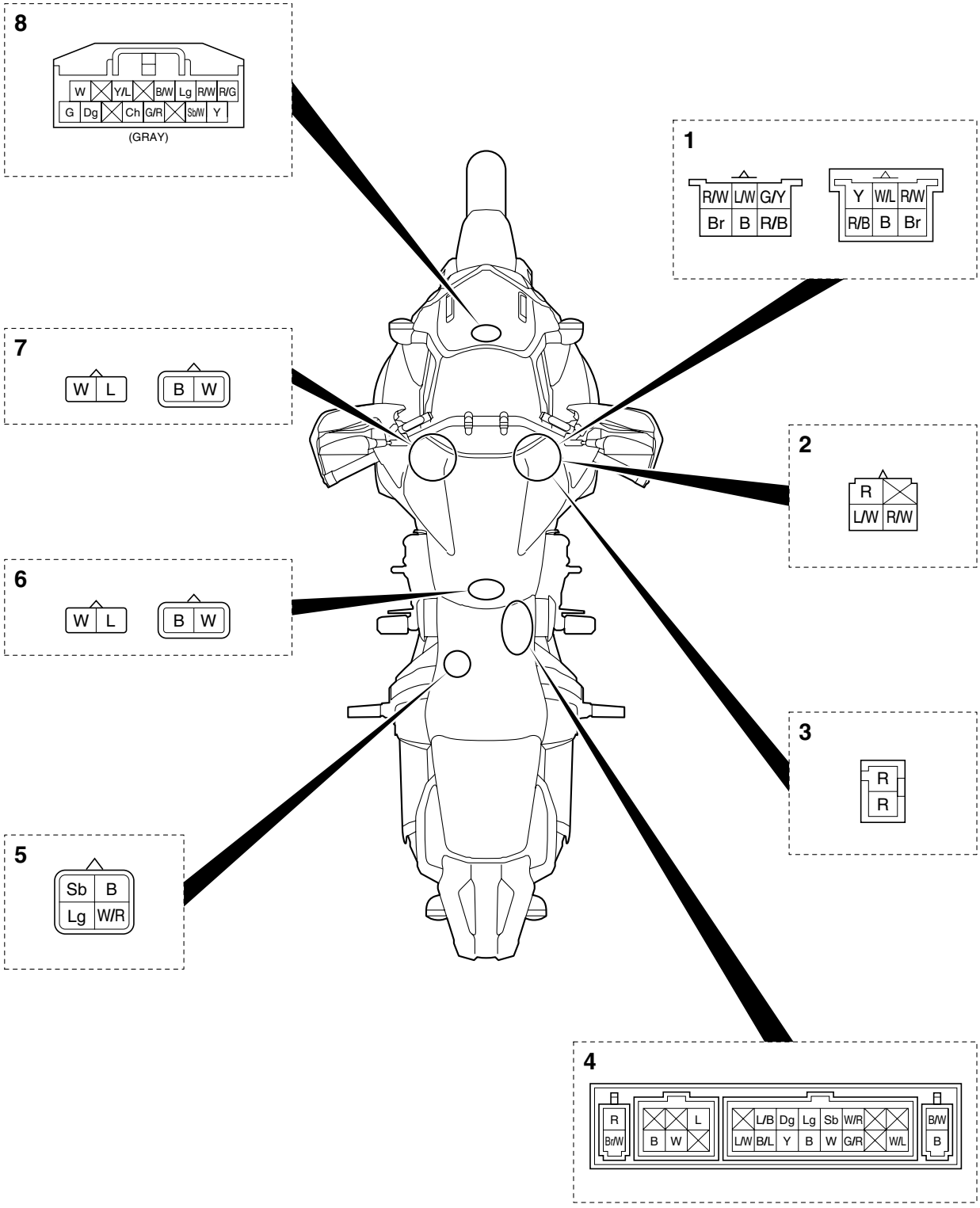
3. Main fuse
4. Battery
5. Engine ground
6. ABS motor fuse
7. Starter relay
9. Main switch
14. ABS solenoid fuse
17. ABS ECU fuse
18. Ignition fuse
21. Relay unit
22. Starting circuit cut-off relay
39. ECU (engine control unit)
48. Front wheel sensor
49. Rear wheel sensor
50. Front wheel sensor lead shield
51. Rear wheel sensor lead shield
52. ABS ECU (electronic control unit)
53. ABS test coupler
54. Frame ground
68. ABS warning light
88. Rear brake light switch
89. Tail/brake light
92. Signaling system fuse
98. Front brake light switch
99. Engine stop switch
100. Start switch

EAS27740
ABS COMPONENTS CHART



1. ABS warning light
2. Front wheel sensor rotor
3. Front wheel sensor
4. Right front brake caliper
5. Left front brake caliper
6. ABS ECU fuse
7. ABS solenoid fuse
8. Rear wheel sensor rotor
9. Rear wheel sensor
10. Rear brake caliper
11. ABS test coupler
12. Hydraulic unit assembly
13. ABS motor fuse

EAS27750
ABS COUPLER LOCATION CHART



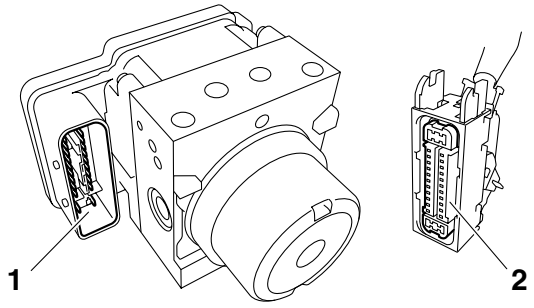
1. Right handlebar switch coupler
2. Starter relay coupler
3. Main fuse coupler
4. ABS ECU coupler
5. ABS test coupler
6. Rear wheel sensor coupler
7. Front wheel sensor coupler
8. Meter assembly coupler

EAS27770
MAINTENANCE OF THE ABS ECU

Checking the ABS ECU
1. Check:
   - Terminals “1” of the ABS ECU
     Cracks/damage → Replace the hydraulic unit assembly and the brake pipes that are connected to the assembly as a set.
   - Terminals “2” of the ABS ECU coupler
     Defective connections/contamination/disconnections → Repair or clean.

TIP

If the ABS ECU coupler is clogged with mud or dirt, clean with compressed air.



EAS27790
ABS TROUBLESHOOTING OUTLINE
This section describes the troubleshooting for the ABS in detail. Read this service manual carefully and make sure you fully understand the information provided before repairing any malfunctions or performing service.
The ABS ECU (electronic control unit) has a self-diagnosis function. When failures occur in the system, the ABS warning light on the meter assembly indicates a malfunction.
The following troubleshooting describes the problem identification and service method according to the fault codes indicated by the ABS warning light flash pattern. For troubleshooting items other than the following items, follow the normal service method.

EWA23P1017
⚠ WARNING

When maintenance or checks have been performed on components related to the ABS, be sure to perform a final check before delivering the vehicle to the customer. (Refer to “[D-3] FINAL CHECK” on page 8-131.)

ABS operation when the ABS warning light comes on
1. ABS is canceled and the braking reverts to normal braking. Futhermore, the braking performance of the unified brake system could be reduced.
   - A malfunction was detected using the ABS self-diagnosis function.
2. The ABS warning light comes on, and then goes off when starting the engine → ABS and UBS operation is normal.
   - The ABS warning light comes on for 2 seconds, and then goes off every time the main switch is set to “ON”.
   - The ABS warning light comes on while the start switch is being pushed.
3. The ABS warning light flashes → ABS and UBS operation is normal.
   - Refer to “BASIC INSTRUCTIONS FOR TROUBLESHOOTING” on page 8-96.

Self-diagnosis and servicing
The ABS ECU has a self-diagnosis function. By utilizing this function, quick problem identification and service are possible. Previous malfunctions can be checked since the ABS ECU also stores the malfunction history.
The ABS warning light flash pattern indicates all the fault codes recorded in the ABS ECU.
Note all of the indicated fault codes if more than two fault codes are stored in the memory. When the service is finished, check the normal operation of the vehicle, and then delete the fault code(s). (Refer to “[D-3] FINAL CHECK” on page 8-131.) By deleting the fault codes stored in the ABS ECU memory, it is possible to pursue the cause correctly if another malfunction occurs.

TIP

The ABS performs a self-diagnosis test for a few seconds each time the vehicle first starts off after the main switch was set to “ON”. During this test, a “clicking” noise can be heard from under the rider seat, and if the brake lever or brake pedal are even slightly applied, a vibration can be felt at the lever and pedal, but these do not indicate a malfunction.

Self-diagnosis using the ABS ECU
The ABS ECU performs a static check of the entire system when the main switch is set to “ON”. It also checks for malfunctions while the vehicle is ridden. Since all malfunctions are recorded after they are detected, it is possible to check the recorded malfunction data using the ABS warning light flash pattern when the ABS ECU has entered the self-diagnosis mode.

Special precautions for handling and servicing a vehicle equipped with ABS

ECA23P1050

NOTICE

Care should be taken not to damage components by subjecting them to shocks or pulling on them with too much force since the ABS components are precisely adjusted.

- The ABS ECU and hydraulic unit are a united assembly and cannot be disassembled.
- The malfunction history is stored in the memory of the ABS ECU. Delete the fault codes when the service is finished. (This is because the past fault codes will be indicated again if another malfunction occurs.)

EAS27800

BASIC INSTRUCTIONS FOR TROUBLESHOOTING

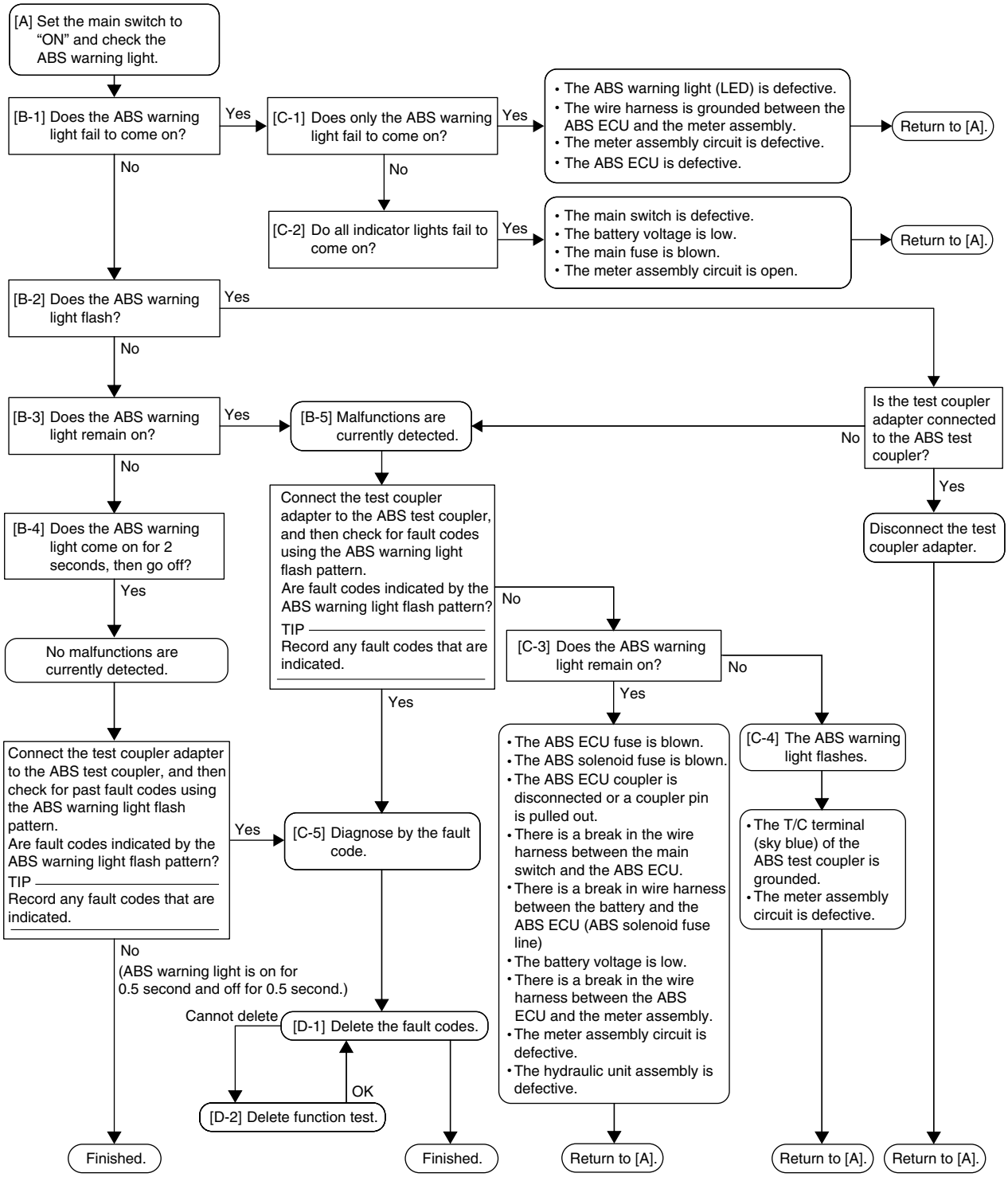
EWA23P1018

⚠ WARNING

- **Perform the troubleshooting [A] → [B] → [C] → [D] in order. Be sure to follow the order since a wrong diagnosis could result if the steps are followed in a different order or omitted.**
- **Use sufficiently charged regular batteries only.**

[A] Malfunction check using the ABS warning light
[B] Detailed check of the malfunction
The results of the self-diagnosis by the ABS ECU can be indicated using the ABS warning light flash pattern.
[C] Determining the cause and location of the malfunction
Determine the cause of the malfunction from the condition and place where the malfunction occurred.
[D] Servicing the ABS
Execute the final check after disassembly and assembly.

EAS27810
BASIC PROCESS FOR TROUBLESHOOTING



EWA23P1019

⚠ WARNING

When maintenance or checks have been performed on components related to the ABS, be sure to perform a final check before delivering the vehicle to the customer. (Refer to "[D-3] FINAL CHECK" on page 8-131.)

EAS27830

[A] CHECKING THE ABS WARNING LIGHT

Set the main switch to "ON". (Do not start the engine.)

1. The ABS warning light does not come on. [B-1]
2. The ABS warning light flashes. [B-2]
3. The ABS warning light remains on. [B-3]
4. The ABS warning light comes on for 2 seconds, then goes off. [B-4]

EAS23P1048

[B-1] THE ABS WARNING LIGHT FAILS TO COME ON

1. Only the ABS warning light fails to come on when the main switch is set to "ON". [C-1]
2. The ABS warning light and all other indicator lights fail to come on. [C-2]

EAS23P1049

[B-2] THE ABS WARNING LIGHT FLASHES

1. Test coupler adapter
   - Check if the test coupler adapter is connected to the ABS test coupler.
   - If the test coupler adapter is connected, disconnect it, and then install the protective cap onto the ABS test coupler.
   - If the test coupler adapter is not connected, refer to "[B-5] MALFUNCTIONS ARE CURRENTLY DETECTED" on page 8-99.

EAS23P1050

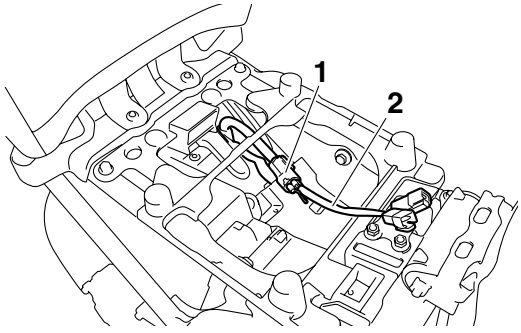
[B-3] THE ABS WARNING LIGHT REMAINS ON

1. A malfunction is detected. [B-5]

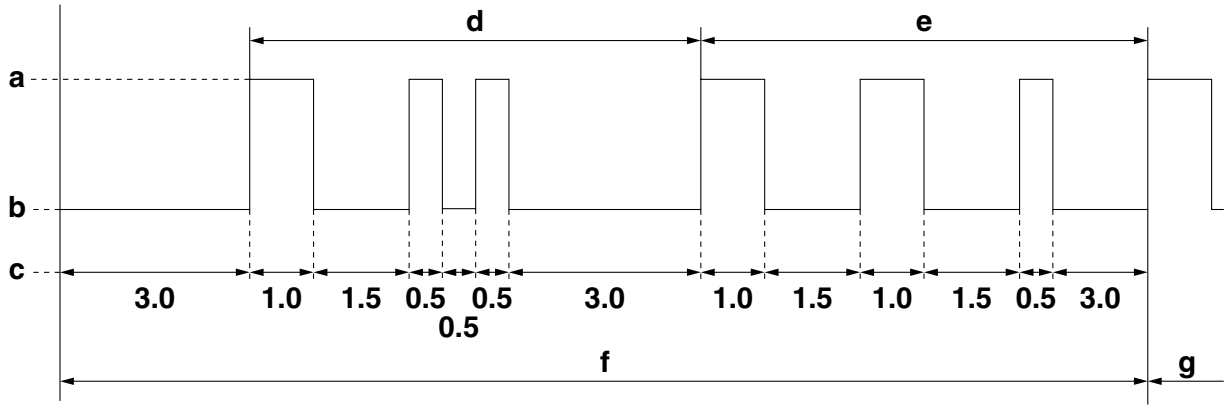
EAS23P1051

[B-4] THE ABS WARNING LIGHT COMES ON FOR 2 SECONDS, THEN GOES OFF

Remove the rider seat to access the ABS test coupler "1". Remove the protective cap from the ABS test coupler, and then connect the test coupler adapter "2" to the coupler. The T/C terminal (sky blue) is now grounded.



1. A fault code is indicated by the ABS warning light (example: fault codes 12, 21).



a. Light on
b. Light off
c. Time (second)
d. Fault code 12
e. Fault code 21
f. 1 cycle
g. Repeats

2. The ABS warning light flashes every 0.5 second for more than 6 seconds.
   The ABS warning light flashes every 0.5 second if no fault code for a past malfunction is stored in the memory of the ABS ECU. If no fault code is indicated, make sure that the customer understands the possible conditions that may cause the ABS warning light to come on or flash even if the system is normal.

TIP

The test coupler adapter must be connected to the ABS test coupler to indicate the fault codes. If the adapter is not connected, the ABS warning light will come on or flash, but no fault codes will be indicated.

EAS23P1047

[B-5] MALFUNCTIONS ARE CURRENTLY DETECTED

Remove the rider seat to access the ABS test coupler. Connect the test coupler adapter to the ABS test coupler.
When the test coupler adapter is connected to the ABS test coupler, the fault codes will be indicated by the ABS warning light. Record all of the indicated fault codes.
1. The ABS warning light is on. [C-3]
2. The ABS warning light is flashing. [C-4]

EAS23P1052

[C-1] ONLY THE ABS WARNING LIGHT FAILS TO COME ON

1. Check for a short circuit to the ground between the green/red terminal of the ABS ECU coupler and green/red terminal of the meter assembly.
   - If there is no short circuit to the ground, the wire harness is defective. Properly repair or replace the wire harness.
2. Disconnect the ABS ECU coupler and check that the ABS warning light comes on when the main switch is set to “ON”.
   - If the ABS warning light does not come on, the meter assembly circuit (including the ABS warning light [LED]) is defective. Replace the meter assembly.
   - If the ABS warning light comes on, the ABS ECU is defective. Replace the hydraulic unit assembly.

EAS23P1053

[C-2] ALL INDICATOR LIGHTS FAIL TO COME ON

1. Main switch
   - Check the main switch for continuity.
     Refer to “CHECKING THE SWITCHES” on page 8-137.
   - If there is no continuity, replace the main switch/immobilizer unit.

2. Battery
   • Check the condition of the battery.
   Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.
   • If the battery is defective, clean the battery terminals and recharge it, or replace the battery.
3. Main fuse
   • Check the fuse for continuity.
   Refer to “CHECKING THE FUSES” on page 8-141.
   • If the main fuse is blown, replace the fuse.
4. Circuit
   • Check the meter assembly circuit.
   Refer to “CIRCUIT DIAGRAM” on page 8-89.
   • If the meter assembly circuit is open, properly repair or replace the wire harness.

EAS23P1059
[C-3] THE ABS WARNING LIGHT REMAINS ON

1. The battery voltage is low.
   • Check the condition of the battery.
   Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.
   • If the battery voltage is low, clean the battery terminals and recharge it, or replace the battery.
2. ABS ECU fuse and ABS solenoid fuse
   • Check the fuses for continuity.
   Refer to “CHECKING THE FUSES” on page 8-141.
   • If a fuse is blown, replace the fuse.
3. ABS ECU coupler
   • Check that the ABS ECU coupler is connected properly.
   • Connect the coupler properly if necessary.
4. There is a break in the wire harness between the main switch and the ABS ECU or between the ABS ECU and the ground.
   • Check for continuity between the brown/blue terminal of the main switch coupler and the brown/blue terminal of the ABS ECU fuse.
   • Check for continuity between the dark green terminal of the ABS ECU fuse and the dark green terminal of the ABS ECU coupler.
   • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness.
   • Check for continuity between the black/white terminal of the ABS ECU coupler and the ground.
   • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness.
5. There is a break in the wire harness between the battery and the ABS ECU or between the ABS ECU and the ground.
   • Check for continuity between the red terminal of the battery and the red terminal of the main fuse coupler.
   • Check for continuity between the red terminal of the main fuse coupler and the red terminal of the ABS solenoid fuse.
   • Check for continuity between the brown/white terminal of the ABS solenoid fuse and the brown/white terminal of the ABS ECU coupler.
   • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness.
   • Check for continuity between the black/white terminal of the ABS ECU coupler and the ground.
   • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness.
6. There is a break in the wire harness between the ABS ECU and the meter assembly (ABS warning light).
   • Check for continuity between the green/red terminal of the ABS ECU coupler and the green/red terminal of the meter assembly coupler.
   • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness.
7. The meter assembly circuit is defective.
   • Disconnect the ABS ECU coupler.
   • The green/red terminal of the ABS ECU coupler is short-circuited to the ground.

- Set the main switch to “ON”, and then check the ABS warning light.
- If the ABS warning light is on, the internal circuit of the meter assembly is defective. Replace the meter assembly.
- If the ABS warning light does not come on, the ABS ECU is defective. Replace the hydraulic unit assembly.

8. The hydraulic unit assembly is defective.

EAS23P1054
[C-4] THE ABS WARNING LIGHT FLASHES

1. Check whether the T/C terminal (sky blue) of the ABS test coupler is short-circuited to the ground when the test coupler adapter is removed.
   - If the T/C terminal is short-circuited to the ground, the wire harness is defective. Properly repair or replace the wire harness.
   - If the T/C terminal is not short-circuited to the ground, the internal circuit of the meter assembly is defective. Replace the meter assembly.

EAS23P1055
[C-5] DIAGNOSIS USING THE FAULT CODES

Connect the test coupler adapter to the ABS test coupler, and then set the main switch to “ON”. Information for the fault codes from the ABS ECU is contained in the following table. Refer to this table for troubleshooting.

TIP

Record all of the indicated fault codes and inspect the check points.

Fault code table

Fault code No.	Symptom	Check point
11* 25*	Front wheel sensor signal is not received properly.	• Installation of the front wheel sensor • Front wheel • Front wheel sensor housing • Front wheel sensor rotor
12	Rear wheel sensor signal is not received properly.	• Installation of the rear wheel sensor • Rear wheel • Rear wheel sensor housing • Rear wheel sensor rotor
13 26	Incorrect signal from the front wheel sensor is detected.	• Installation of the front wheel sensor • Front wheel • Front wheel sensor housing • Front wheel sensor rotor • Hydraulic unit assembly
14 27	Incorrect signal from the rear wheel sensor is detected.	• Installation of the rear wheel sensor • Rear wheel • Rear wheel sensor housing • Rear wheel sensor rotor • Hydraulic unit assembly
15	Front wheel sensor circuit is short-circuited.	• Front wheel sensor circuit • Wire harness (ABS circuit) • Connection of the front wheel sensor coupler and ABS ECU coupler • Front wheel sensor

Fault code No.	Symptom	Check point
16	Rear wheel sensor circuit is short-circuited.	• Rear wheel sensor circuit • Wire harness (ABS circuit) • Connection of the rear wheel sensor coupler and ABS ECU coupler • Rear wheel sensor
17	Missing pulses detected in the front wheel sensor signal.	• Front wheel sensor rotor • Front wheel sensor housing • Front wheel
18	Missing pulses detected in the rear wheel sensor signal.	• Rear wheel sensor rotor • Rear wheel sensor housing • Rear wheel
21	Hydraulic unit solenoid circuit is open or short-circuited.	• Hydraulic unit assembly
22	Start switch signal is not received properly (start switch circuit or start switch monitor circuit).	• Wire harness • Connection of the starter relay coupler, ABS ECU coupler, and right handlebar switch coupler.
31	Solenoid relay is defective. Power is not supplied to the solenoid relay.	• Battery voltage • Hydraulic unit assembly
33	ABS motor is defective. Power is not supplied to the ABS motor.	• Battery voltage • ABS motor fuse • Wire harness (ABS circuit) • Connection of the ABS ECU coupler and starter relay coupler • Hydraulic unit assembly
34	Hydraulic unit ABS motor is short-circuited.	• Hydraulic unit assembly
41	Front wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	• Brake dragging • Brake fluid • Hydraulic unit operation tests • Front wheel brake lines • Hydraulic unit assembly
42	Rear wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	• Brake dragging • Brake fluid • Hydraulic unit operation tests • Rear wheel brake lines • Hydraulic unit assembly
51	Power voltage is too high.	• Battery voltage • Refer to “CHARGING SYSTEM” on page 8-13.
53	Power voltage is too low.	• Battery voltage • Connection of the ABS ECU coupler • Wire harness • Refer to “CHARGING SYSTEM” on page 8-13.
56	ABS ECU has internal malfunction.	• Hydraulic unit assembly

Fault code No.	Symptom	Check point
59	Solenoid valve data is abnormal.	• Hydraulic unit assembly
62	Hydraulic pressure sensor power is abnormal.	• Hydraulic unit assembly
63	Front brake master cylinder pressure sensor is defective.	• Hydraulic unit assembly
64	Rear brake master cylinder pressure sensor is defective.	• Hydraulic unit assembly
69	Rear brake caliper pressure sensor is defective.	• Hydraulic unit assembly
73	Difference between the rear brake master cylinder pressure and the rear brake caliper pressure is abnormal.	• Brake fluid • Hydraulic unit operation tests • Rear wheel brake lines • Rear brake master cylinder • Rear brake caliper • Hydraulic unit assembly
74	Difference between the actual hydraulic pressure and the hydraulic pressure required by the unified brake system is abnormal.	• Brake fluid • Hydraulic unit operation tests • Rear wheel brake lines • Rear brake master cylinder • Rear brake caliper • Hydraulic unit assembly

* A fault code is indicated if the rear wheel rotates for longer than about 20 seconds (fault code No. 11) or for longer than about 2 seconds (fault code No. 25) with the front wheel stopped (e.g., when the vehicle is on the centerstand).

TIP

Fault codes No. 15 (front wheel) and 16 (rear wheel) are indicated if a defective connection is detected in the front or rear wheel sensor when the vehicle is not being ridden.

Fault code No.	11 25	Symptom	Front wheel sensor signal is not received properly.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Installed condition of wheel sensor.		Check for looseness. Repair or replace the wheel sensor if necessary.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.		Check the components for looseness, distortion, and bends. Refer to “CHECKING THE FRONT WHEEL” on page 4-23.	
3	Foreign material inside sensor housing.		Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	
4	Defective sensor rotor.		Check the surface of the sensor rotor for damage. Replace the sensor rotor if there is visible damage. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	

TIP

With the front wheel stopped, the rear wheel was rotated for longer than about 20 seconds (fault code No. 11) or for longer than about 2 seconds (fault code No. 25).

Fault code No.	12	Symptom	Rear wheel sensor signal is not received properly.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Installed condition of wheel sensor.	Check for looseness. Repair or replace the wheel sensor if necessary.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.	Check the components for looseness, distortion, and bends. Refer to “CHECKING THE REAR WHEEL” on page 4-32.	
3	Foreign material inside sensor housing.	Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	
4	Defective sensor rotor.	Check the surface of the sensor rotor for damage. Replace the sensor rotor if there is visible damage. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	

Fault code No.	13 26	Symptom	Incorrect signal from the front wheel sensor is detected.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Installed condition of wheel sensor.		Check for looseness. Repair or replace the wheel sensor if necessary.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.		Check the components for looseness, distortion, and bends. Refer to “CHECKING THE FRONT WHEEL” on page 4-23.	
3	Foreign material inside sensor housing.		Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	
4	Defective sensor rotor.		Check the surface of the sensor rotor for damage. If there is visible damage, replace the sensor rotor. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	
5	Hydraulic unit assembly internal malfunction.		Replace the hydraulic unit assembly.	

TIP

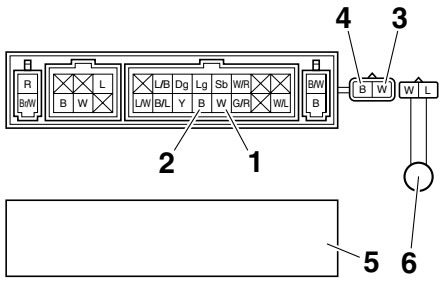
Vehicle possibly ridden on uneven roads.

Fault code No.	14 27	Symptom	Incorrect signal from the rear wheel sensor is detected.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Installed condition of wheel sensor.		Check for looseness. Repair or replace the wheel sensor if necessary.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.		Check the components for looseness, distortion, and bends. Refer to “CHECKING THE REAR WHEEL” on page 4-32.	
3	Foreign material inside sensor housing.		Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	
4	Defective sensor rotor.		Check the surface of the sensor rotor for damage. If there is visible damage, replace the sensor rotor. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	
5	Hydraulic unit assembly internal malfunction.		Replace the hydraulic unit assembly.	

TIP

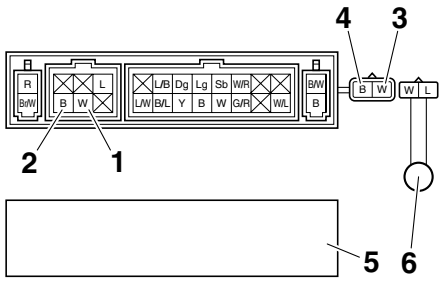
Vehicle possibly ridden on uneven roads.

Fault code No.	15	Symptom	Front wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Connections • Front wheel sensor coupler • ABS ECU coupler		• Check the coupler for any pins that may be pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely. **TIP** Set the main switch to "OFF" before disconnecting or connecting a coupler.	• Set the main switch to "ON" and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.

Fault code No.	15	Symptom	Front wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
2	Wire harness continuity.		• Check for continuity between the white terminal “1” and the white terminal “3” and between the black terminal “2” and the black terminal “4”. • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness. • Check that there is no continuity between the ground and the white terminal “1” or white terminal “3”. • If there is continuity, the wire harness is defective. Properly repair or replace the wire harness. • Check that there is no continuity between the white terminal “1” and the black terminal “2” and between the white terminal “3” and the black terminal “4”. • If there is continuity, the wire harness is defective. Properly repair or replace the wire harness.  5. ABS ECU 6. Front wheel sensor	

Fault code No.	15	Symptom	Front wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
3	Defective wheel sensor.		If the above items were performed and no malfunctions were found, connect the ABS ECU coupler and front wheel sensor coupler, and then delete the fault codes. If fault code No. 15 could not be deleted, the front wheel sensor is defective. Replace the front wheel sensor. **TIP** Before deleting the fault codes, record all of the fault codes and perform the related checks and maintenance.	

Fault code No.	16	Symptom	Rear wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Connections • Rear wheel sensor coupler • ABS ECU coupler		• Check the coupler for any pins that may be pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely. **TIP** Set the main switch to “OFF” before disconnecting or connecting a coupler.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.

Fault code No.	16	Symptom	Rear wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
2	Wire harness continuity.		• Check for continuity between the white terminal “1” and the white terminal “3” and between the black terminal “2” and the black terminal “4”. • If there is no continuity, the wire harness is defective. Properly repair or replace the wire harness. • Check that there is no continuity between the ground and the white terminal “1” or white terminal “3”. • If there is continuity, the wire harness is defective. Properly repair or replace the wire harness. • Check that there is no continuity between the white terminal “1” and the black terminal “2” and between the white terminal “3” and the black terminal “4”. • If there is continuity, the wire harness is defective. Properly repair or replace the wire harness.  5. ABS ECU 6. Rear wheel sensor	

Fault code No.	16	Symptom	Rear wheel sensor circuit is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
3	Defective wheel sensor.		If the above items were performed and no malfunctions were found, connect the ABS ECU coupler and rear wheel sensor coupler, and then delete the fault codes. If fault code No. 16 could not be deleted, the rear wheel sensor is defective. Replace the rear wheel sensor. **TIP** Before deleting the fault codes, record all of the fault codes and perform the related checks and maintenance.	

Fault code No.	17	Symptom	Missing pulses detected in the front wheel sensor signal.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.		Check the components for looseness, distortion, and bends. Refer to “CHECKING THE FRONT WHEEL” on page 4-23.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Foreign material inside sensor housing.		Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	
3	Defective sensor rotor.		• Check the surface of the sensor rotor for damage. • If there is visible damage, replace the sensor rotor. Refer to “MAINTENANCE OF THE FRONT WHEEL SENSOR AND SENSOR ROTOR” on page 4-24.	

Fault code No.	18	Symptom	Missing pulses detected in the rear wheel sensor signal.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Installed condition of wheel bearings, axle, sensor housing, and sensor rotor.		Check the components for looseness, distortion, and bends. Refer to “CHECKING THE REAR WHEEL” on page 4-32.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Foreign material inside sensor housing.		Check the interior of the sensor housing and the surface of the sensor rotor for foreign material, such as metal particles. Clean the sensor housing and sensor rotor if necessary. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	
3	Defective sensor rotor.		• Check the surface of the sensor rotor for damage. • If there is visible damage, replace the sensor rotor. Refer to “MAINTENANCE OF THE REAR WHEEL SENSOR AND SENSOR ROTOR” on page 4-33.	

Fault code No.	21	Symptom	Hydraulic unit solenoid circuit is open or short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Open or short circuit in solenoid circuit.		Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.

Fault code No.	22	Symptom	Start switch signal is not received properly (start switch circuit or start switch monitor circuit).

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Engine startability.	Check the electric starting system. Refer to “ELECTRIC STARTING SYSTEM” on page 8-7.	• Push the start switch and check that the engine starts. • Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Check that the ABS warning light comes on while the start switch is being pushed.
2	Connections • Starter relay coupler • ABS ECU coupler • Right handlebar switch coupler	• Check the coupler for any pins that may be pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely. **TIP** Set the main switch to “OFF” before disconnecting or connecting a coupler.	
3	Open or short circuit in wire harness.	• Repair or replace if there is an open or short circuit. • Between ABS ECU coupler and starter relay coupler. (blue/white–blue/white) • Between ABS ECU coupler and right handlebar switch (start switch) coupler. (white/blue–white/blue)	

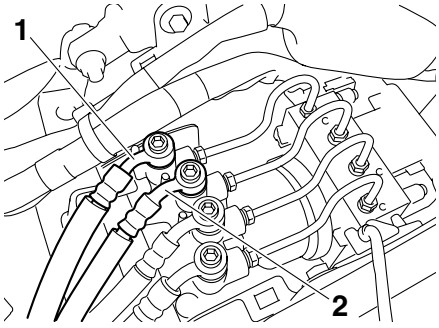
Fault code No.	31	Symptom	Solenoid relay is defective. Power is not supplied to the solenoid relay.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Battery voltage	Recharge or replace the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Short circuit in solenoid relay.	Replace the hydraulic unit assembly.	
3	Hydraulic unit assembly internal malfunction.	Replace the hydraulic unit assembly.	

Fault code No.	33	Symptom	ABS motor is defective. Power is not supplied to the ABS motor.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Battery voltage		Recharge or replace the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Blown ABS motor fuse.		Check the ABS motor fuse. If the ABS motor fuse is blown, replace the fuse and check the wire harness. Refer to “CHECKING THE FUSES” on page 8-141.	
3	Connections • ABS ECU coupler • Starter relay coupler		• Check the coupler for any pins that may be pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely. **TIP** Set the main switch to “OFF” before disconnecting or connecting a coupler.	
4	Open or short circuit in wire harness.		• Repair or replace if there is an open or short circuit. • Between ABS ECU coupler and starter relay coupler. (red–red) • Between ABS ECU coupler and ground. (brown/white–brown/white)	
5	Hydraulic unit assembly internal malfunction.		Replace the hydraulic unit assembly.	

Fault code No.	34	Symptom	Hydraulic unit ABS motor is short-circuited.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Short circuit in ABS motor relay.		Replace the hydraulic unit assembly.	• Set the main switch to "ON" and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.

Fault code No.	41	Symptom	Front wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Rotation of wheel		• Check that there is no brake disc drag on the front wheel and make sure that it rotates smoothly. • Check the front wheel axle for loose bearings and bends, and the brake discs for distortion. Refer to "CHECKING THE FRONT WHEEL" on page 4-23 and "CHECKING THE FRONT BRAKE DISCS" on page 4-44.	Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Brake master cylinder and brake calipers		• Check that the hydraulic pressure is correctly transmitted to the brake calipers when the brake lever is operated and that the pressure decreases when the lever is released.	
3	Brake fluid		• Visually check the brake fluid in the brake master cylinder reservoir for water, foreign materials, solidification, and contamination. • Check for air in the brake lines.	

Fault code No.	41	Symptom	Front wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
4	Brake lines		• Check the brake lines for kinks and deterioration. EWA23P1020 **⚠ WARNING** **Only use genuine Yamaha parts. Using other brake pipes, hoses and union bolts may close the brake lines.** • Check that the connections of the brake lines from the brake master cylinder to the hydraulic unit and from the hydraulic unit to the left front brake caliper are correct.  See WARNING and TIP.	

Fault code No.	41	Symptom	Front wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
5	Hydraulic unit assembly		If the malfunction is not corrected after checking items (1) to (4), replace the hydraulic unit assembly. Be sure to connect the brake hoses, hydraulic unit brake pipe joint, brake pipes, and coupler correctly and securely. Check the hydraulic unit operation. Refer to "HYDRAULIC UNIT OPERATION TESTS" on page 4-71.	

EWA23P1021

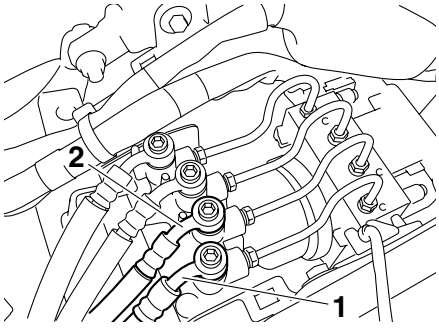
⚠ WARNING

The front brakes will not function properly if the connections are reversed.

- **Brake hose (front brake master cylinder to hydraulic unit brake pipe joint) "1" inlet: from the front brake master cylinder**
- **Brake hose (hydraulic unit brake pipe joint to front brake calipers) "2" outlet: to the front brake calipers**

TIP

- If the brake hose inlet and outlet connections are incorrect on the hydraulic unit brake pipe joint, the brake lever will be pulled to its full-stroke position without responding, and then it will be pushed back slowly without pulsating when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.
- If the front and rear brake hose connections are reversed on the hydraulic unit brake pipe joint, the pulsating action in the brake lever and brake pedal will be performed in the reverse order when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.

Fault code No.	42	Symptom	Rear wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Rotation of wheel		• Check that there is no brake disc drag on the rear wheel and make sure that it rotates smoothly. • Check for brake disc distortion. Refer to “CHECKING THE REAR WHEEL” on page 4-32 and “CHECKING THE REAR BRAKE DISC” on page 4-59.	Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Brake master cylinder and brake caliper		• Check that the hydraulic pressure is correctly transmitted to the brake caliper when the brake pedal is operated and that the pressure decreases when the pedal is released.	
3	Brake fluid		• Visually check the brake fluid in the brake fluid reservoir for water, foreign materials, solidification, and contamination. • Check for air in the brake lines.	
4	Brake lines		• Check the brake lines for kinks and deterioration (particularly between the hydraulic unit and the rear brake caliper). EWA23P1020 **⚠ WARNING** **Only use genuine Yamaha parts. Using other brake pipes, hoses and union bolts may close the brake lines.** • Check that the connections of the brake lines from the brake master cylinder to the hydraulic unit are correct.  See WARNING and TIP.	

Fault code No.	42	Symptom	Rear wheel will not recover from the locking tendency even though the signal is continuously transmitted from the ABS ECU to release the hydraulic pressure (when the battery voltage is normal).

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
5	Hydraulic unit assembly	If the malfunction is not corrected after checking items (1) to (4), replace the hydraulic unit assembly. Be sure to connect the brake hoses, hydraulic unit brake pipe joint, brake pipes, and coupler correctly and securely. Check the hydraulic unit operation. Refer to “HYDRAULIC UNIT OPERATION TESTS” on page 4-71.	

EWA23P1022

⚠ WARNING

The rear brake will not function properly if the connections are reversed.

- **Brake hose (rear brake master cylinder to hydraulic unit brake pipe joint) “1” inlet: from the rear brake master cylinder**
- **Brake hose (hydraulic unit brake pipe joint to rear brake caliper) “2” outlet: to the rear brake caliper**

TIP

- If the brake hose inlet and outlet connections are reversed on the hydraulic unit brake pipe joint, the brake pedal will be pressed down to its full-stroke position without responding, and then it will be pushed back slowly without pulsating when the final check on page “[D-3] FINAL CHECK” on page 8-131 is performed.
- If the front and rear brake hose connections are reversed on the hydraulic unit brake pipe joint, the pulsating action in the brake lever and brake pedal will be performed in the reverse order when the final check on page “[D-3] FINAL CHECK” on page 8-131 is performed.

Fault code No.	51	Symptom	Power voltage is too high.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Battery voltage		Replace the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Charging system		Check the charging system. Refer to “CHARGING SYSTEM” on page 8-13.	

Fault code No.	53	Symptom	Power voltage is too low.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Battery voltage		Recharge or replace the battery. Refer to “CHECKING AND CHARGING THE BATTERY” on page 8-142.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.
2	Connections • ABS ECU coupler		• Check the coupler for any pins that may be pulled out. • Check the locking condition of the coupler. • If there is a malfunction, repair it and connect the coupler securely. **TIP** Set the main switch to “OFF” before disconnecting or connecting a coupler.	
3	Open or short circuit in wire harness.		• Repair or replace if there is an open or short circuit. • Between ABS ECU coupler and ABS solenoid fuse. (brown/white–brown/white)	
4	Charging system		Check the charging system. Refer to “CHARGING SYSTEM” on page 8-13.	

Fault code No.	56	Symptom	ABS ECU has internal malfunction.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Hydraulic unit assembly internal malfunction.		Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.

Fault code No.	59	Symptom	Solenoid valve data is abnormal.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Hydraulic unit assembly internal malfunction.		Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.

Fault code No.	62	Symptom	Hydraulic pressure sensor power is abnormal.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Defective internal monitor circuit (hydraulic pressure sensor power).		Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.

Fault code No.	63	Symptom	Front brake master cylinder pressure sensor is defective.	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement confirmation method**
1	Front brake master cylinder pressure sensor malfunction.		Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.

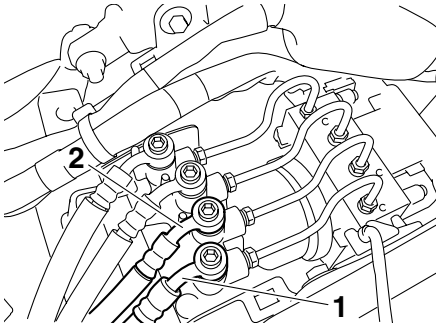
Fault code No.	64	Symptom	Rear brake master cylinder pressure sensor is defective.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Rear brake master cylinder pressure sensor malfunction.	Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.

Fault code No.	69	Symptom	Rear brake caliper pressure sensor is defective.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Rear brake caliper pressure sensor malfunction.	Replace the hydraulic unit assembly.	• Set the main switch to “ON” and check that the ABS warning light comes on for 2 seconds, then goes off. • Perform a trial run at a constant speed of 30 km/h and check that the ABS warning light does not come on.

Fault code No.	73	Symptom	Difference between the rear brake master cylinder pressure and the rear brake caliper pressure is abnormal.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Brake master cylinder and brake caliper	• Check that the hydraulic pressure is correctly transmitted to the brake caliper when the brake pedal is operated and that the pressure decreases when the pedal is released.	Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Brake fluid	• Visually check the brake fluid in the brake fluid reservoir for water, foreign materials, solidification, and contamination. • Check for air in the brake lines.	
3	Brake lines	• Check the brake lines for kinks and deterioration (particularly between the hydraulic unit and the rear brake caliper). EWA23P1020 **⚠ WARNING** **Only use genuine Yamaha parts. Using other brake pipes, hoses and union bolts may close the brake lines.** • Check that the connections of the brake lines from the brake master cylinder to the hydraulic unit are correct.  See WARNING and TIP.	
4	Hydraulic unit assembly	If the malfunction is not corrected after checking items (1) to (3), replace the hydraulic unit assembly. Be sure to connect the brake hoses, hydraulic unit brake pipe joint, brake pipes, and coupler correctly and securely. Check the hydraulic unit operation. Refer to “HYDRAULIC UNIT OPERATION TESTS” on page 4-71.	

EWA23P1022

⚠ WARNING

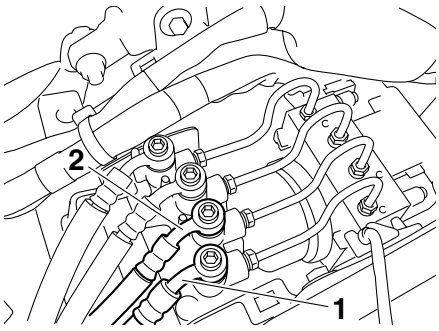
The rear brake will not function properly if the connections are reversed.

- **Brake hose (rear brake master cylinder to hydraulic unit brake pipe joint) "1" inlet: from the rear brake master cylinder**
- **Brake hose (hydraulic unit brake pipe joint to rear brake caliper) "2" outlet: to the rear brake caliper**

TIP

- If the brake hose inlet and outlet connections are reversed on the hydraulic unit brake pipe joint, the brake pedal will be pressed down to its full-stroke position without responding, and then it will be pushed back slowly without pulsating when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.
- If the front and rear brake hose connections are reversed on the hydraulic unit brake pipe joint, the pulsating action in the brake lever and brake pedal will be performed in the reverse order when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.

Fault code No.	74	Symptom	Difference between the actual hydraulic pressure and the hydraulic pressure required by the unified brake system is abnormal.

Order	Item/components and probable cause	Check or maintenance job	Reinstatement confirmation method
1	Brake master cylinder and brake caliper	• Check that the hydraulic pressure is correctly transmitted to the brake caliper when the brake pedal is operated and that the pressure decreases when the pedal is released.	Perform hydraulic unit operation test 1 and check that the operation of the hydraulic unit is normal.
2	Brake fluid	• Visually check the brake fluid in the brake fluid reservoir for water, foreign materials, solidification, and contamination. • Check for air in the brake lines.	
3	Brake lines	• Check the brake lines for kinks and deterioration (particularly between the hydraulic unit and the rear brake caliper). EWA23P1020 **⚠ WARNING** **Only use genuine Yamaha parts. Using other brake pipes, hoses and union bolts may close the brake lines.** • Check that the connections of the brake lines from the brake master cylinder to the hydraulic unit are correct.  See WARNING and TIP.	
4	Hydraulic unit assembly	If the malfunction is not corrected after checking items (1) to (3), replace the hydraulic unit assembly. Be sure to connect the brake hoses, hydraulic unit brake pipe joint, brake pipes, and coupler correctly and securely. Check the hydraulic unit operation. Refer to “HYDRAULIC UNIT OPERATION TESTS” on page 4-71.	

EWA23P1022

⚠ WARNING

The rear brake will not function properly if the connections are reversed.

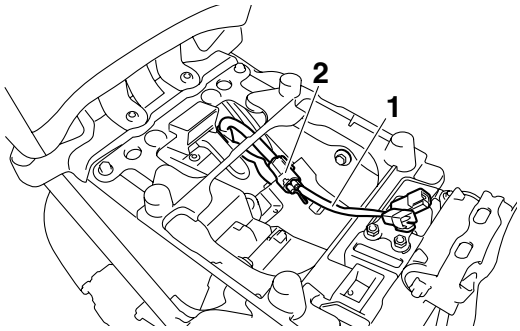
- **Brake hose (rear brake master cylinder to hydraulic unit brake pipe joint) "1" inlet: from the rear brake master cylinder**
- **Brake hose (hydraulic unit brake pipe joint to rear brake caliper) "2" outlet: to the rear brake caliper**

TIP

- If the brake hose inlet and outlet connections are reversed on the hydraulic unit brake pipe joint, the brake pedal will be pressed down to its full-stroke position without responding, and then it will be pushed back slowly without pulsating when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.
- If the front and rear brake hose connections are reversed on the hydraulic unit brake pipe joint, the pulsating action in the brake lever and brake pedal will be performed in the reverse order when the final check on page "[D-3] FINAL CHECK" on page 8-131 is performed.

EAS23P1056
[D-1] DELETING THE FAULT CODES

1. Remove the protective cap, and then connect the test coupler adapter "1" to the ABS test coupler "2". Refer to "[B-5] MALFUNCTIONS ARE CURRENTLY DETECTED" on page 8-99.

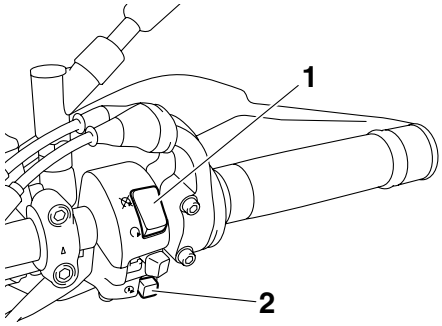


2. Set the main switch to "ON".
   Fault codes will be indicated by the ABS warning light.
3. Set the engine stop switch "1" to "⊠".

ECA23P1051
NOTICE

If the start switch is pushed without setting the engine stop switch to "⊠", the starter motor gears or other parts may be damaged.

4. Without operating the brake lever, push the start switch "2" at least 10 times in 4 seconds to delete the fault codes.



5. The ABS warning light flashes in 0.5-second intervals while the fault codes are being deleted.
6. Set the main switch to "OFF".
7. Set the main switch to "ON" again.

TIP

If the ABS warning light does not flash in 0.5-second intervals, the malfunctions have not been repaired. Diagnose the malfunctions using the fault codes.

8. Set the main switch to "OFF".
9. Disconnect the test coupler adapter from the ABS test coupler, and then install the protective cap onto the ABS test coupler. Deleting the fault codes is now finished.

TIP

Do not forget to install the protective cap onto the ABS test coupler.

ECA23P1052
NOTICE

Since the fault codes remain in the memory of the ABS ECU until they are deleted, always delete the fault codes after the service has been completed.

EAS23P1057
[D-2] DELETE FUNCTION TEST

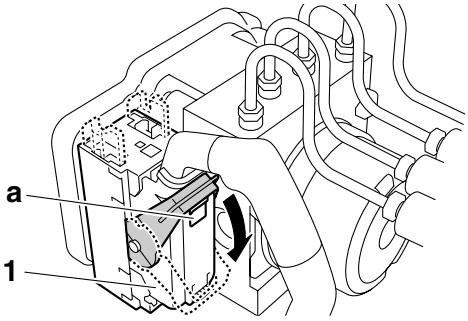
1. Place the vehicle on the centerstand.
2. Disconnect the ABS ECU coupler "1".

TIP

While pushing the portion "a" of the ABS ECU coupler, push the lock lever down to release the lock.

ECA23P1053
NOTICE

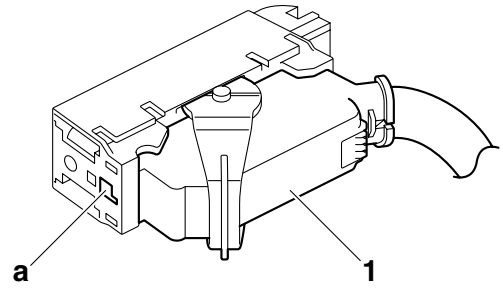
Do not use a tool to disconnect the ABS ECU coupler.



3. Remove the coupler cover "1" from the ABS ECU coupler.

TIP

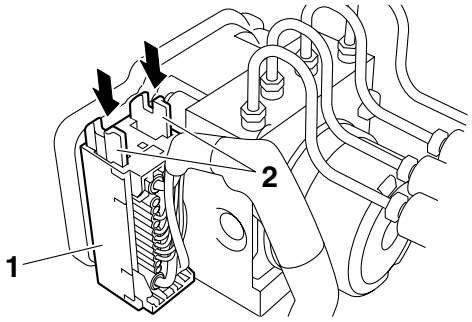
While pushing the portion "a" of the coupler cover, remove the cover.



4. Connect the ABS ECU coupler (without coupler cover) “1”.

TIP

Push both lock plates “2” down simultaneously to lock the ABS ECU coupler in place.



5. Set the main switch to “OFF”.
6. Remove the protective cap and then connect the test coupler adapter to the ABS test coupler.
7. Set the main switch to “ON”.
8. Check:
   - ABS ECU voltage
     Lower than 12.8 V → Charge or replace the battery.

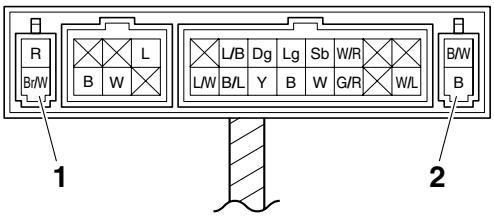
Battery voltage
Higher than 12.8 V

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (DC 20 V) to the ABS ECU coupler.

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

- Positive tester probe → brown/white “1”
- Negative tester probe → black “2”



b. Measure the ABS ECU voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

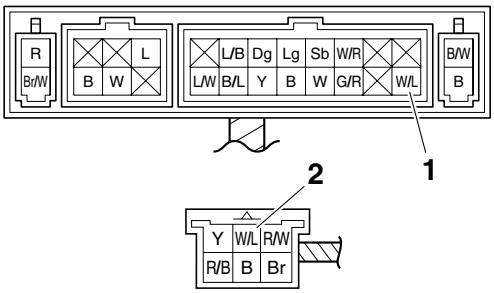
9. Check:
   - ABS-ECU-to-start-switch-lead continuity
     No continuity → Replace or repair the wire harness.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1) to the ABS ECU coupler and right handlebar switch coupler.

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

- Positive tester probe → white/blue “1” (ABS ECU)
- Negative tester probe → white/blue “2” (right handlebar switch)



b. Check for continuity between the ABS ECU and the start switch lead.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

10. Check:
    - ABS ECU voltage
      Out of specification → Replace the right handlebar switch.

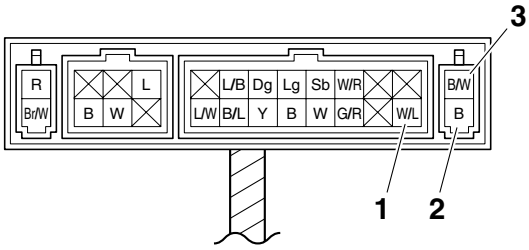
Start switch “ON”: less than 1 V
Start switch “OFF”: more than 12 V

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (DC 20 V) to the ABS ECU coupler.

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

- Positive tester probe → white/blue "1"
- Negative tester probe → black "2" or black/white "3"



b. Push the start switch.
c. Measure the ABS ECU voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

11. If the above-mentioned checks are within specification, replace the hydraulic unit assembly.
12. Install the coupler cover "1" to the ABS ECU coupler.

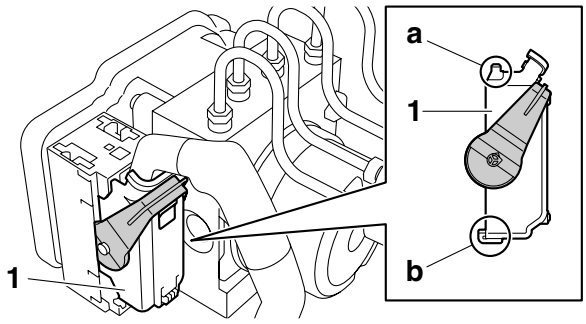
ECA23P1080

NOTICE

Before installing the coupler cover, make sure that the lock lever is positioned toward the top of the cover as shown in the illustration. Otherwise, you will not be able to disconnect the ABS ECU coupler from the hydraulic unit.

TIP

Fit the projections "a" on the top of the coupler cover into the ABS ECU coupler, and then fit the projections "b" on the bottom of the cover into the coupler.



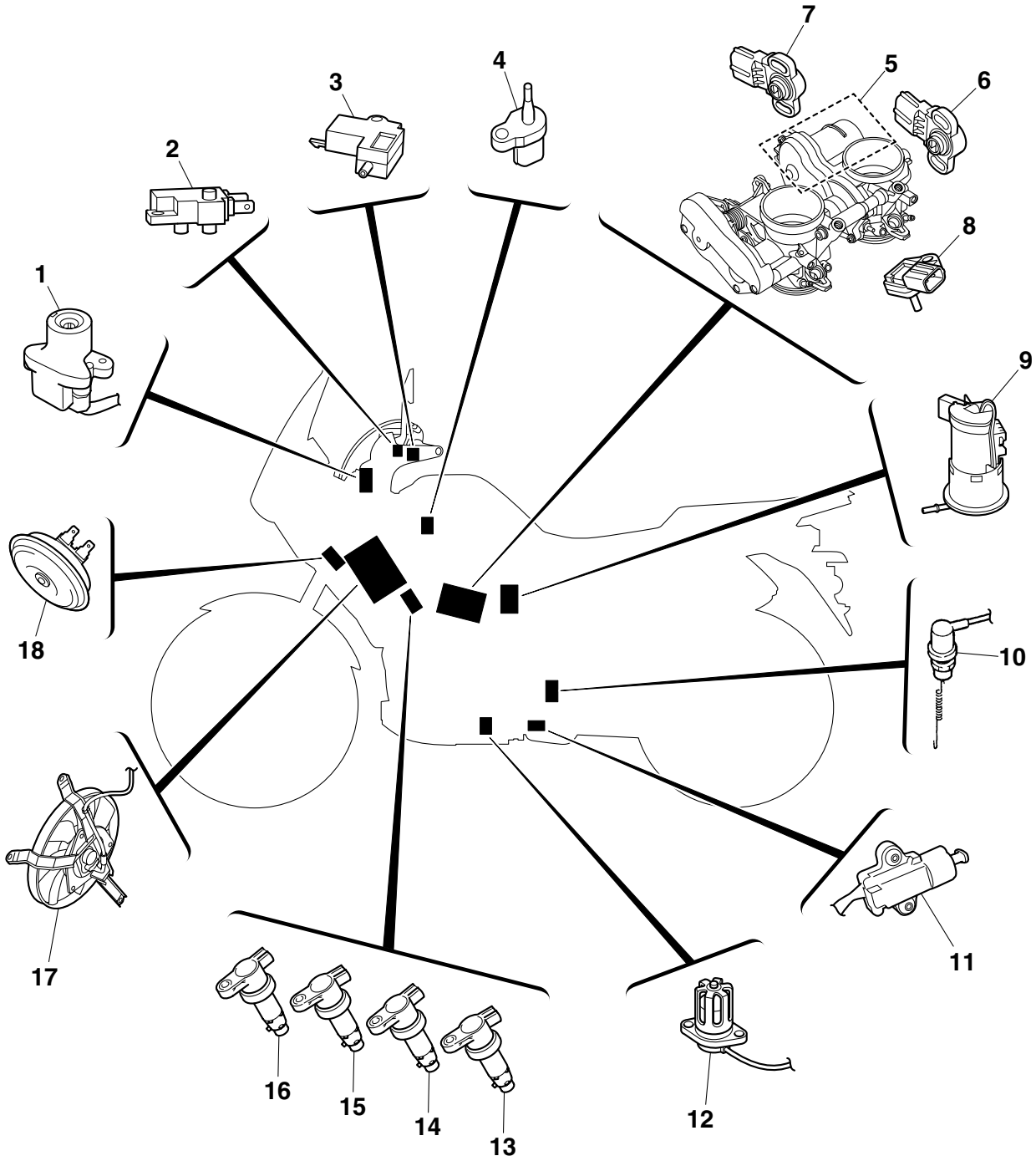
EAS23P1058

[D-3] FINAL CHECK

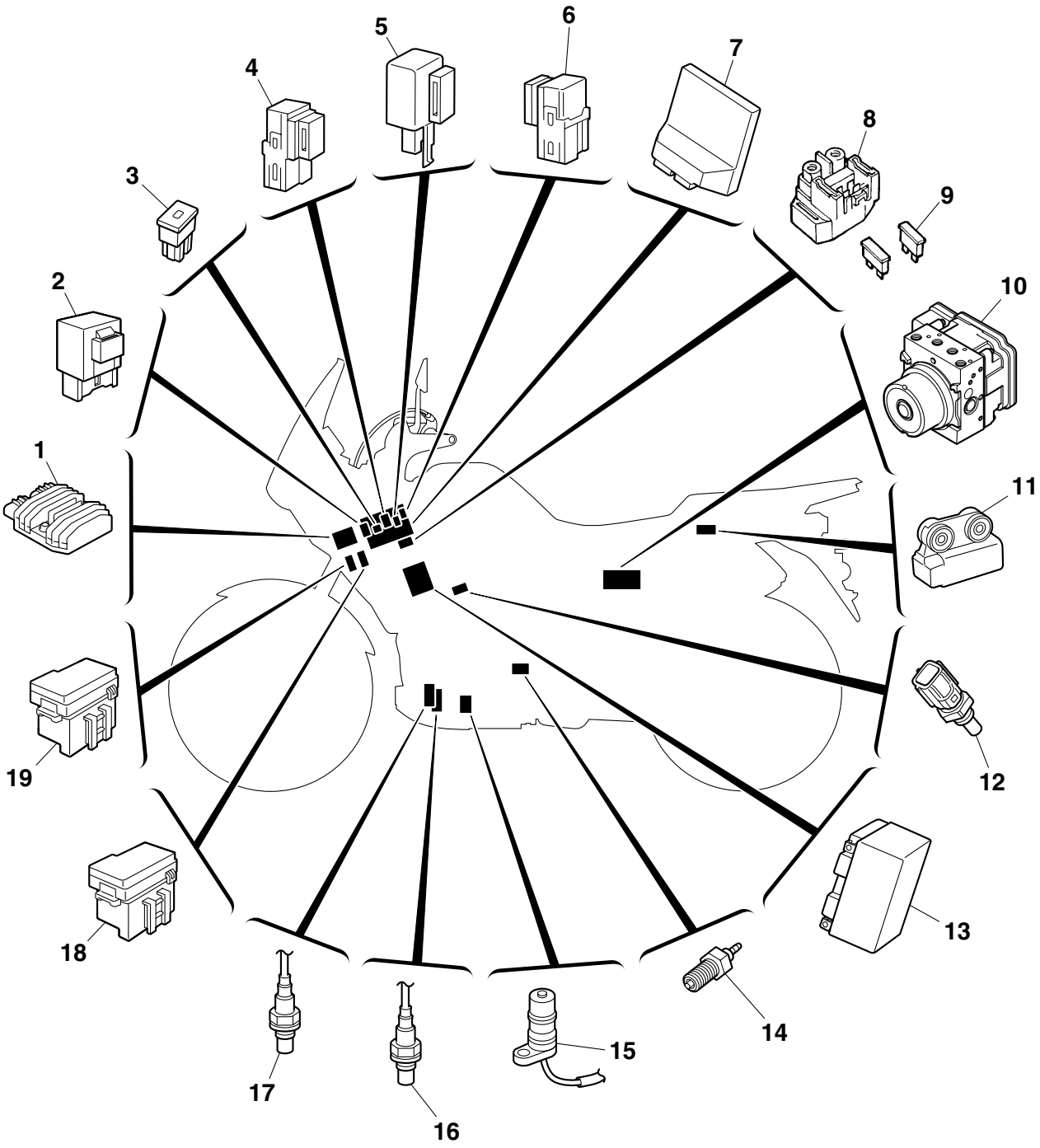
Checking procedures

1. Check the brake fluid level in the brake master cylinder reservoir and brake fluid reservoir.
   Refer to "CHECKING THE BRAKE FLUID LEVEL" on page 3-14.
2. Check the wheel sensor housings and wheel sensors for proper installation.
   Refer to "INSTALLING THE FRONT WHEEL (FRONT BRAKE DISCS)" on page 4-27 and "INSTALLING THE REAR WHEEL (REAR BRAKE DISC)" on page 4-34.
3. Perform hydraulic unit operation test 1 or 2.
   Refer to "HYDRAULIC UNIT OPERATION TESTS" on page 4-71.
4. Delete the fault codes.
   Refer to "[D-1] DELETING THE FAULT CODES" on page 8-129.
5. Perform a trial run.
   Refer to "TRIAL RUN" on page 4-75.

EAS27973
ELECTRICAL COMPONENTS

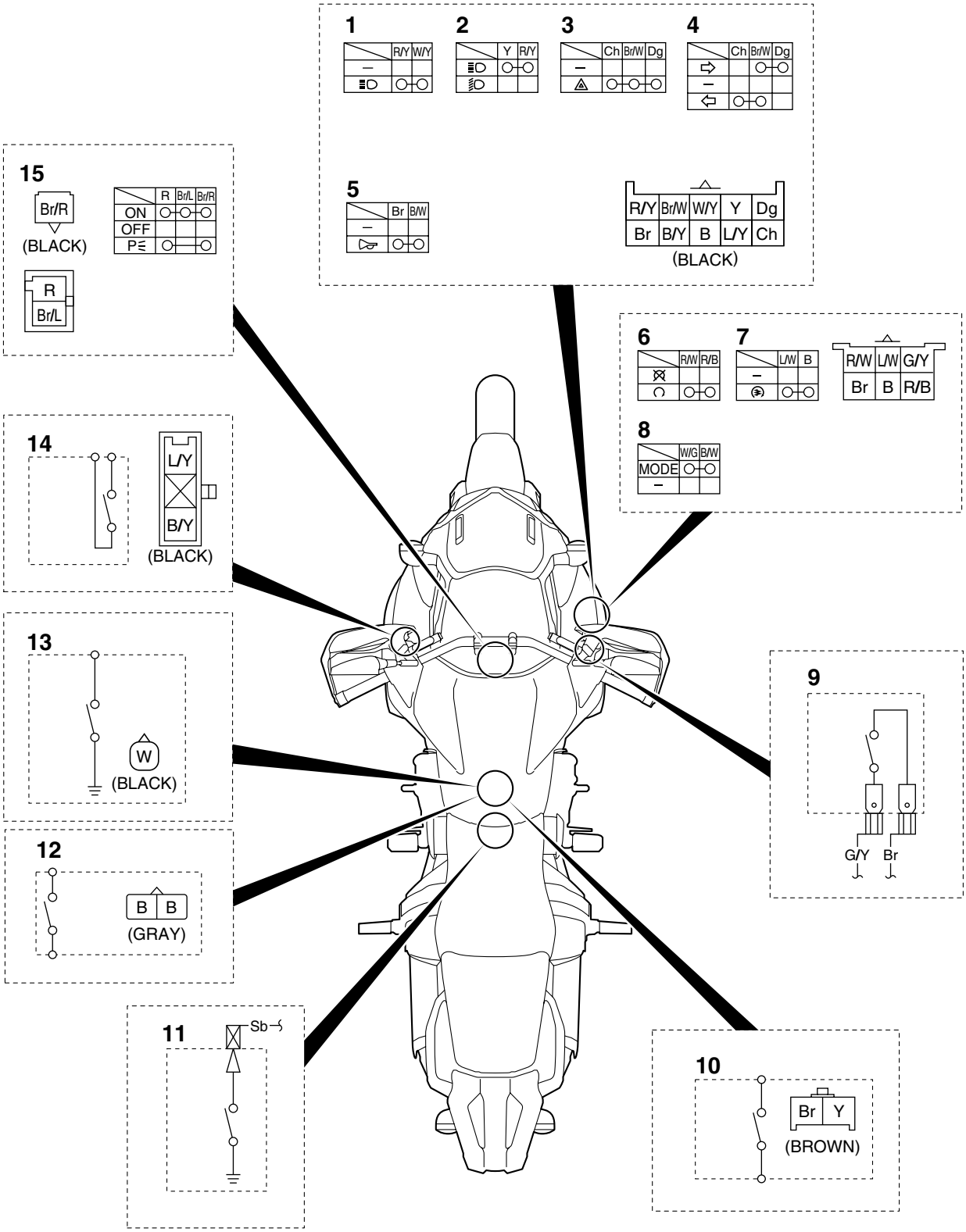


1. Main switch
2. Front brake light switch
3. Clutch switch
4. Intake air temperature sensor
5. Throttle servo motor
6. Throttle position sensor
7. Accelerator position sensor
8. Intake air pressure sensor
9. Fuel pump
10. Rear brake light switch
11. Sidestand switch
12. Oil level switch
13. Cylinder-#1 left ignition coil
14. Cylinder-#1 right ignition coil
15. Cylinder-#2 left ignition coil
16. Cylinder-#2 right ignition coil
17. Radiator fan motor
18. Horn


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

1. Rectifier/regulator
2. Relay unit
3. Main fuse
4. Radiator fan motor relay
5. Turn signal/hazard relay
6. Headlight relay
7. ECU (engine control unit)
8. Starter relay
9. ABS motor fuse
10. Hydraulic unit assembly
11. Lean angle sensor
12. Coolant temperature sensor
13. Battery
14. Neutral switch
15. Crankshaft position sensor
16. O_2 sensor #1
17. O_2 sensor #2
18. Fuse box 1
19. Fuse box 2

EAS27981
CHECKING THE SWITCHES



1. Pass switch
2. Dimmer switch
3. Hazard switch
4. Turn signal switch
5. Horn switch
6. Engine stop switch
7. Start switch
8. D-mode switch
9. Front brake light switch
10. Rear brake light switch
11. Neutral switch
12. Sidestand switch
13. Oil level switch
14. Clutch switch
15. Main switch

Check each switch for continuity with the pocket tester. If the continuity reading is incorrect, check the wiring connections and if necessary, replace the switch.

ECA14370

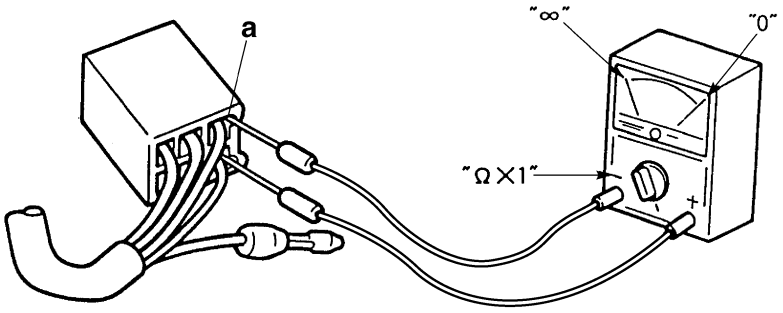
NOTICE

Never insert the tester probes into the coupler terminal slots "a". Always insert the probes from the opposite end of the coupler, taking care not to loosen or damage the leads.

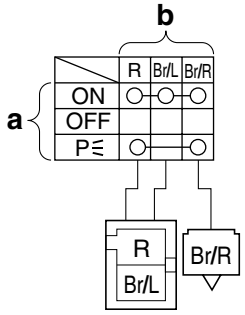
Pocket tester
90890-03112
Analog pocket tester
YU-03112-C

TIP

- Before checking for continuity, set the pocket tester to "0" and to the "Ω × 1" range.
- When checking for continuity, switch back and forth between the switch positions a few times.



The switches and their terminal connections are illustrated as in the following example of the main switch.
The switch positions "a" are shown in the far left column and the switch lead colors "b" are shown in the top row.
The continuity (i. e., a closed circuit) between switch terminals at a given switch position is indicated by " ○——○ ".
There is continuity between red, brown/blue, and brown/red when the switch is set to "ON" and between red and brown/red when the switch is set to "P≷".



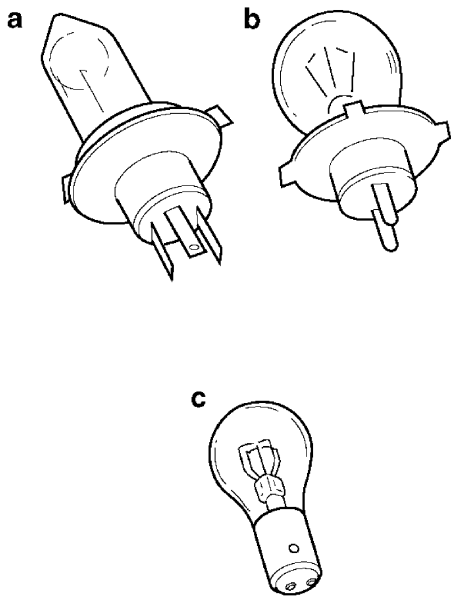
EAS27990
CHECKING THE BULBS AND BULB SOCKETS

TIP

Do not check any of the lights that use LEDs.

Check each bulb and bulb socket for damage or wear, proper connections, and also for continuity between the terminals.
Damage/wear → Repair or replace the bulb, bulb socket or both.
Improperly connected → Properly connect.
No continuity → Repair or replace the bulb, bulb socket or both.

Types of bulbs
The bulbs used on this vehicle are shown in the illustration on the left.
- Bulbs "a" and "b" are used for the headlights and usually use a bulb holder that must be detached before removing the bulb. The majority of these types of bulbs can be removed from their respective socket by turning them counterclockwise.
- Bulbs "c" are used for turn signal and tail/brake lights and can be removed from the socket by pushing and turning the bulb counterclockwise.



Checking the condition of the bulbs
The following procedure applies to all of the bulbs.
1. Remove:
   - Bulb

EWA13320
WARNING

Since the headlight bulb gets extremely hot, keep flammable products and your hands away from the bulb until it has cooled down.

ECA14380
NOTICE

- **Be sure to hold the socket firmly when removing the bulb. Never pull the lead, otherwise it may be pulled out of the terminal in the coupler.**
- **Avoid touching the glass part of the headlight bulb to keep it free from oil, otherwise the transparency of the glass, the life of the bulb, and the luminous flux will be adversely affected. If the headlight bulb gets soiled, thoroughly it with a cloth moistened with alcohol or lacquer thinner.**

2. Check:
   - Bulb (for continuity)
     (with the pocket tester)
     No continuity → Replace.

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

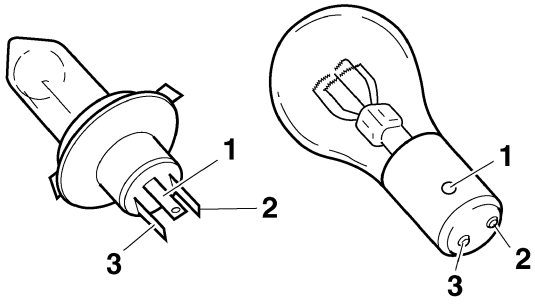
TIP

Before checking for continuity, set the pocket tester to "0" and to the "Ω × 1" range.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the positive tester probe to terminal "1" and the negative tester probe to terminal "2", and check the continuity.
b. Connect the positive tester probe to terminal "1" and the negative tester probe to terminal "3", and check the continuity.
c. If either of the readings indicate no continuity, replace the bulb.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲



Checking the condition of the bulb sockets
The following procedure applies to all of the bulb sockets.
1. Check:
   • Bulb socket (for continuity)
   (with the pocket tester)
   No continuity → Replace.

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

TIP

Check each bulb socket for continuity in the same manner as described in the bulb section; however, note the following.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install a good bulb into the bulb socket.
b. Connect the pocket tester probes to the respective leads of the bulb socket.
c. Check the bulb socket for continuity. If any of the readings indicate no continuity, replace the bulb socket.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28000
CHECKING THE FUSES
The following procedure applies to all of the fuses.
ECA23P1081

NOTICE

To avoid a short circuit, always turn the main switch to "OFF" when checking or replacing a fuse.

1. Remove:
   • Right side cowling
   • Right side panel
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Check:
   • Fuse

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester to the fuse and check the continuity.

TIP

Set the pocket tester selector to "Ω × 1".

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

b. If the pocket tester indicates "∞", replace the fuse.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Replace:
   • Blown fuse

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Set the main switch to "OFF".
b. Install a new fuse of the correct amperage rating.
c. Set on the switches to verify if the electrical circuit is operational.
d. If the fuse immediately blows again, check the electrical circuit.

Fuses	Amperage rating	Q'ty
Main	50.0 A	1
ABS motor	30.0 A	1
Ignition	20.0 A	1
ABS solenoid	20.0 A	1
Headlight	20.0 A	1
Radiator fan motor	20.0 A	1
Fuel injection system	10.0 A	1
Signaling system	10.0 A	1
Taillight	7.5 A	1
Electric throttle valve	7.5 A	1
Backup (odometer, clock, and immobilizer system)	7.5 A	1
ABS ECU	7.5 A	1
Auxiliary DC jack	3.0 A	1
Accessory light (OPTION)	20.0 A	1
Spare	30.0 A	1
Spare	20.0 A	1
Spare	10.0 A	1
Spare	7.5 A	1
Spare	3.0 A	1

EWA13310

⚠ WARNING

Never use a fuse with an amperage rating other than that specified. Improvising or using a fuse with the wrong amperage rating may cause extensive damage to the electri-

cal system, cause the lighting and ignition systems to malfunction and could possibly cause a fire.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Install:
   - Right side panel
   - Right side cowling
   Refer to "GENERAL CHASSIS" on page 4-1.

EAS28031
CHECKING AND CHARGING THE BATTERY

EWA13290
⚠ WARNING

Batteries generate explosive hydrogen gas and contain electrolyte which is made of poisonous and highly caustic sulfuric acid. Therefore, always follow these preventive measures:
- **Wear protective eye gear when handling or working near batteries.**
- **Charge batteries in a well-ventilated area.**
- **Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes).**
- **DO NOT SMOKE when charging or handling batteries.**
- **KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.**
- **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.**

ECA13661
NOTICE

- **This is a VRLA (Valve Regulated Lead Acid) 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 a VRLA (Valve Regulated Lead Acid) battery are different from those of conventional batteries. The VRLA (Valve Regulated Lead Acid) battery should be charged according to the appropriate charging method. If the battery is overcharged, the electrolyte level will drop considerably. Therefore, take special care when charging the battery.**

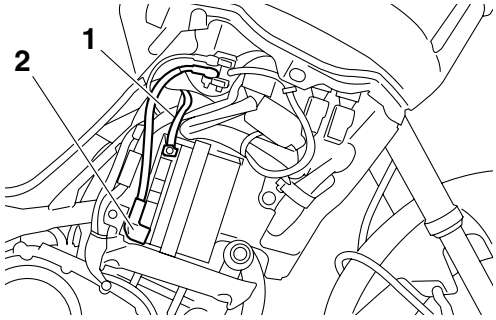
TIP

Since VRLA (Valve Regulated Lead Acid) 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:
   - Right side cowling
   Refer to "GENERAL CHASSIS" on page 4-1.
2. Disconnect:
   - Battery leads
   (from the battery terminals)

ECA13640
NOTICE

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



3. Remove:
   - Battery
   Refer to "GENERAL CHASSIS" on page 4-1.
4. Check:
   - Battery charge

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect a pocket tester to the battery terminals.

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

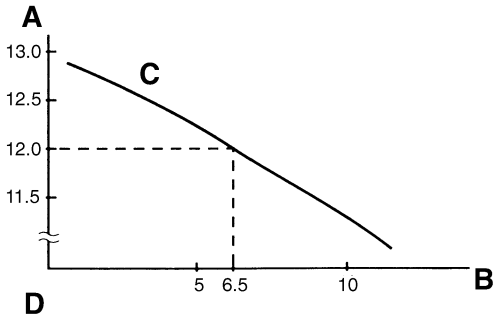
TIP

- The charge state of a VRLA (Valve Regulated Lead Acid) battery can be checked by measuring its open-circuit voltage (i.e., the voltage when the positive battery terminal is disconnected).

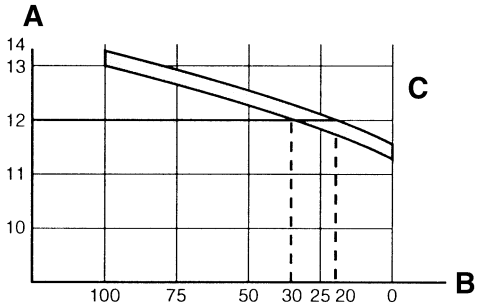
• No charging is necessary when the open-circuit voltage equals or exceeds 12.8 V.

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%



A. Open-circuit voltage (V)
B. Charging time (hours)
C. Relationship between the open-circuit voltage and the charging time at 20 °C (68 °F)
D. These values vary with the temperature, the condition of the battery plates, and the electrolyte level.



A. Open-circuit voltage (V)
B. Charging condition of the battery (%)
C. Ambient temperature 20 °C (68 °F)

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

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

EWA13300

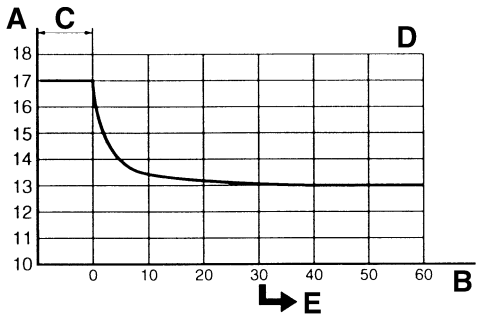
⚠ WARNING

Do not quick charge a battery.

ECA13671

NOTICE

• Do not use a high-rate battery charger since it forces a high-amperage current into the battery quickly and can cause battery overheating and battery plate damage.
• If it is impossible to regulate the charging current on the battery charger, be careful not to overcharge the battery.
• When charging a battery, be sure to remove it from the vehicle. (If charging has to be done with the battery mounted on the vehicle, disconnect the negative battery lead from the battery terminal.)
• To reduce the chance of sparks, do not plug in the battery charger until the battery charger leads are connected to the battery.
• Before removing the battery charger lead clips from the battery terminals, be sure to turn off the battery charger.
• Make sure the battery charger lead clips are in full contact with the battery terminal and that they are not shorted. A corroded battery charger lead clip may generate heat in the contact area and a weak clip spring may cause sparks.
• If the battery becomes hot to the touch at any time during the charging process, disconnect the battery charger and let the battery cool before reconnecting it. Hot batteries can explode!
• As shown in the following illustration, the open-circuit voltage of a VRLA (Valve Regulated Lead Acid) battery stabilizes about 30 minutes after charging has been completed. Therefore, wait 30 minutes after charging is completed before measuring the open-circuit voltage.



A. Open-circuit voltage (V)
B. Time (minutes)
C. Charging
D. Ambient temperature 20 °C (68 °F)
E. Check the open-circuit voltage.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

Charging method using a variable-current (voltage) charger

a. Measure the open-circuit voltage prior to charging.

TIP

Voltage should be measured 30 minutes after the engine is stopped.

b. Connect a charger and ammeter to the battery and start charging.

TIP

Set the charging voltage to 16–17 V. If the setting is lower, charging will be insufficient. If too high, the battery will be over-charged.

c. Make sure that the current is higher than the standard charging current written on the battery.

TIP

If the current is lower than the standard charging current written on the battery, set the charging voltage adjust dial at 20–24 V and monitor the amperage for 3–5 minutes to check the battery.

• Standard charging current is reached Battery is good. • Standard charging current is not reached Replace the battery.

d. Adjust the voltage so that the current is at the standard charging level.
e. Set the time according to the charging time suitable for the open-circuit voltage.
f. If charging requires more than 5 hours, it is advisable to check the charging current after a lapse of 5 hours. If there is any change in the amperage, readjust the voltage to obtain the standard charging current.
g. Measure the battery open-circuit voltage after leaving the battery unused for more than 30 minutes.

12.8 V or more --- Charging is complete. 12.7 V or less --- Recharging is required. Under 12.0 V --- Replace the battery.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

Charging method using a constant voltage charger

a. Measure the open-circuit voltage prior to charging.

TIP

Voltage should be measured 30 minutes after the engine is stopped.

b. Connect a charger and ammeter to the battery and start charging.

c. Make sure that the current is higher than the standard charging current written on the battery.

TIP

If the current is lower than the standard charging current written on the battery, this type of battery charger cannot charge the VRLA (Valve Regulated Lead Acid) battery. A variable voltage charger is recommended.

d. Charge the battery until the battery's charging voltage is 15 V.

TIP

Set the charging time at 20 hours (maximum).

e. Measure the battery open-circuit voltage after leaving the battery unused for more than 30 minutes.

12.8 V or more --- Charging is complete. 12.7 V or less --- Recharging is required. Under 12.0 V --- Replace the battery.

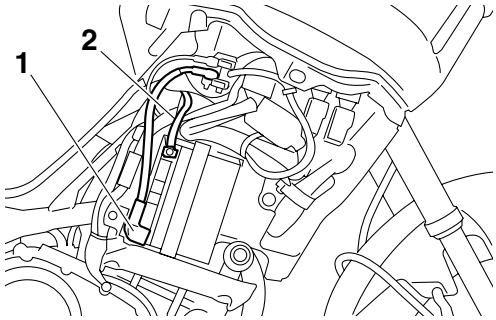
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

6. Install:
   • Battery
   Refer to "GENERAL CHASSIS" on page 4-1.
7. Connect:
   • Battery leads
   (to the battery terminals)

ECA13630

NOTICE

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



8. Check:
   • Battery terminals
   Dirt → Clean with a wire brush.
   Loose connection → Connect properly.
9. Lubricate:
   • Battery terminals

	Recommended lubricant **Dielectric grease**

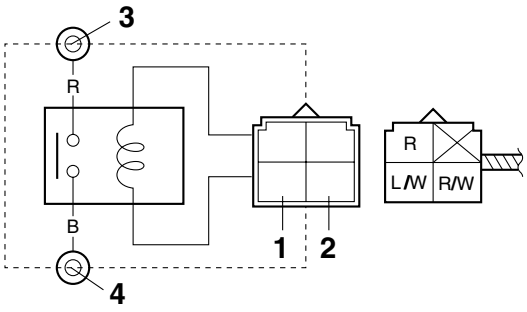
10.Install:
- Right side cowling
  Refer to “GENERAL CHASSIS” on page 4-1.

EAS28040
CHECKING THE RELAYS
Check each switch for continuity with the pocket tester. If the continuity reading is incorrect, replace the relay.

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

1. Disconnect the relay from the wire harness.
2. Connect the pocket tester ($\Omega \times 1$) and battery (12 V) to the relay terminal as shown.
   Check the relay operation.
   Out of specification → Replace.

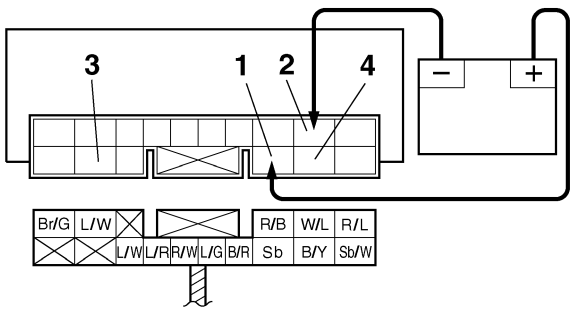
Starter relay



1. Positive battery terminal
2. Negative battery terminal
3. Positive tester probe
4. Negative tester probe

Result
Continuity
(between “3” and “4”)

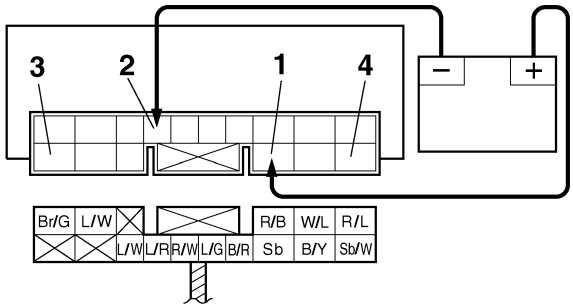
Relay unit (starting circuit cut-off relay)



1. Positive battery terminal
2. Negative battery terminal
3. Positive tester probe
4. Negative tester probe

Result
Continuity
(between “3”and “4”)

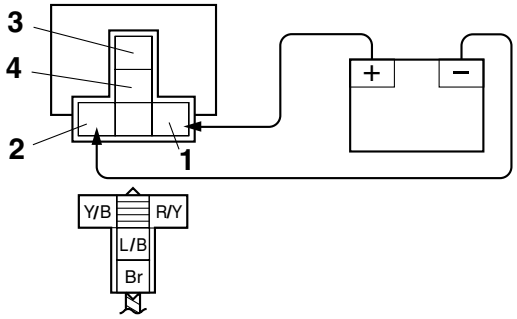
Relay unit (fuel pump relay)



1. Positive battery terminal
2. Negative battery terminal
3. Positive tester probe
4. Negative tester probe

Result
Continuity
(between “3” and “4”)

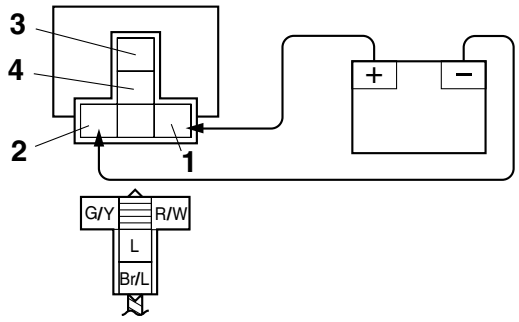
Headlight relay



1. Positive battery terminal
2. Negative battery terminal
3. Positive tester probe
4. Negative tester probe

Result
Continuity
(between “3” and “4”)

Radiator fan motor relay



1. Positive battery terminal
2. Negative battery terminal
3. Positive tester probe
4. Negative tester probe

Result
Continuity
(between "3" and "4")

EAS30520
CHECKING THE TURN SIGNAL/HAZARD RELAY

1. Check:
   • Turn signal/hazard relay input voltage
   Out of specification → The wiring circuit from the main switch to the turn signal/hazard relay coupler is faulty and must be repaired.

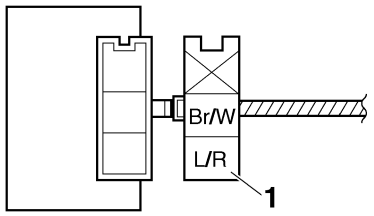
Turn signal/hazard relay input voltage
DC 12 V

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (DC 20 V) to the turn signal/hazard relay terminal as shown.

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

• Positive tester probe → blue/red "1"
• Negative tester probe → ground



b. Turn the main switch to "ON".
c. Measure the turn signal/hazard relay input voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Check:
   • Turn signal/hazard relay output voltage
   Out of specification → Replace.

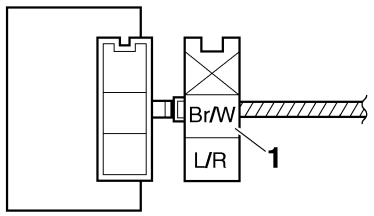
Turn signal/hazard relay output voltage
DC 12 V

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (DC 20 V) to the turn signal/hazard relay terminal as shown.

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

• Positive tester probe → brown/white "1"
• Negative tester probe → ground



b. Turn the main switch to "ON".
c. Measure the turn signal/hazard relay output voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28050
CHECKING THE RELAY UNIT (DIODE)

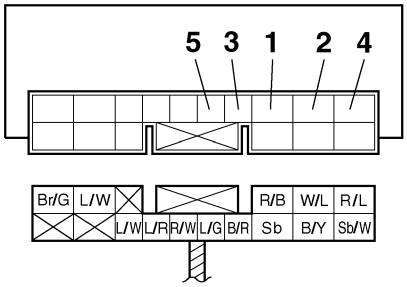
1. Check:
   • Relay unit (diode)
   Out of specification → Replace.

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

TIP

The pocket tester and the analog pocket tester readings are shown in the following table.

Continuity
Positive tester probe → sky blue "1"
Negative tester probe → black/yellow "2"
No continuity
Positive tester probe → black/yellow "2"
Negative tester probe → sky blue "1"
Continuity
Positive tester probe → sky blue "1"
Negative tester probe → black/red "3"
No continuity
Positive tester probe → black/red "3"
Negative tester probe → sky blue "1"
Continuity
Positive tester probe → sky blue "1"
Negative tester probe → sky blue/white "4"
No continuity
Positive tester probe → sky blue/white "4"
Negative tester probe → sky blue "1"
Continuity
Positive tester probe → blue/green "5"
Negative tester probe → black/red "3"
No continuity
Positive tester probe → black/red "3"
Negative tester probe → blue/green "5"



▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Disconnect the relay unit from the wire harness.
b. Connect the pocket tester (Ω × 1) to the relay unit terminals as shown.
c. Check the relay unit (diode) for continuity.
d. Check the relay unit (diode) for no continuity.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28100
CHECKING THE IGNITION COILS

The following procedure applies to all of the ignition coils.

1. Check:
   • Primary coil resistance
   Out of specification → Replace.

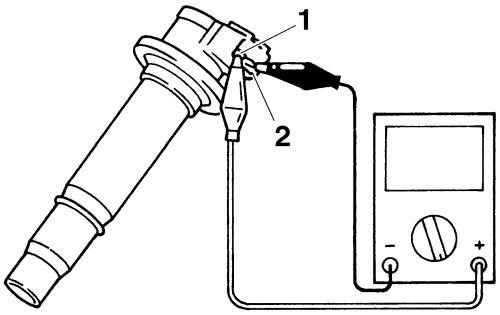
Primary coil resistance
1.19–1.61 Ω

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the ignition coil from the spark plug.
b. Connect the pocket tester (Ω × 1) to the ignition coil as shown.

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

• Positive tester probe → red/black "1"
• Negative tester probe → Cylinder-#1 left ignition coil orange "2"
Cylinder-#1 right ignition coil gray/red "2"
Cylinder-#2 left ignition coil orange/green "2"
Cylinder-#2 right ignition coil gray/green "2"



c. Measure the primary coil resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

2. Check:
   • Secondary coil resistance
   Out of specification → Replace.

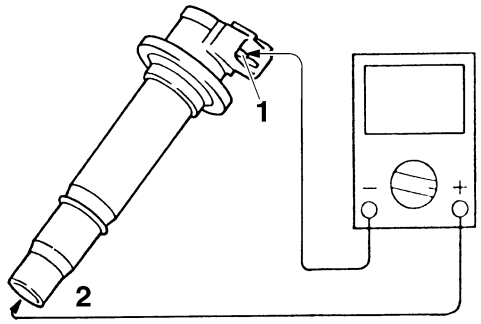
Secondary coil resistance
8.50–11.50 kΩ

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1k) to the ignition coil as shown.

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

• Negative tester probe → red/black "1"
• Positive tester probe → spark plug terminal "2"



b. Measure the secondary coil resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28930
CHECKING THE IGNITION SPARK GAP

1. Check:
   • Ignition spark gap
   Out of specification → Perform the ignition system troubleshooting, starting with step 5. Refer to "TROUBLESHOOTING" on page 8-4.

Minimum ignition spark gap
6.0 mm (0.24 in)

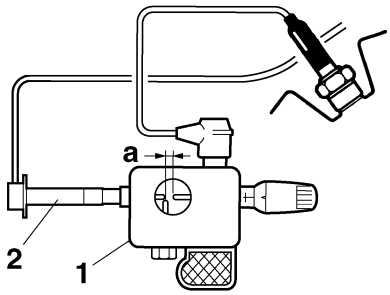
TIP

If the ignition spark gap is within specification, the ignition system circuit is operating normally.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Remove the ignition coil from the spark plug.
b. Connect the ignition checker "1" as shown.

Ignition checker
90890-06754
Oppama pet-4000 spark checker
YM-34487



2. Ignition coil

c. Turn the main switch to "ON" and engine stop switch to "○".
d. Measure the ignition spark gap "a".
e. Crank the engine by pushing the start switch "⏲" and gradually increase the spark gap until a misfire occurs.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28120
CHECKING THE CRANKSHAFT POSITION SENSOR

1. Disconnect:
   • Crankshaft position sensor coupler (from the wire harness)
2. Check:
   • Crankshaft position sensor resistance
   Out of specification → Replace the crankshaft position sensor.

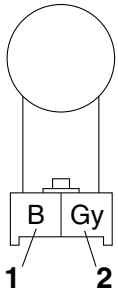
Crankshaft position sensor resistance
336–504 Ω at 20 °C (68 °F)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 100) to the crankshaft position sensor coupler as shown.

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

- Positive tester probe → black “1”
- Negative tester probe → gray “2”



b. Measure the crankshaft position sensor resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28131
CHECKING THE LEAN ANGLE SENSOR

1. Remove:
   - Lean angle sensor
2. Check:
   - Lean angle sensor output voltage
     Out of specification → Replace.

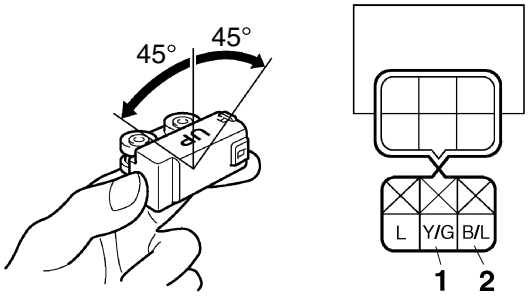
Lean angle sensor output voltage
Less than 45°
0.4–1.4 V
More than 45°
3.7–4.4 V

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the test harness-lean angle sensor (6P) between the lean angle sensor and wire harness.
b. Connect the pocket tester (DC 20 V) to the test harness-lean angle sensor (6P).

Pocket tester
90890-03112
Analog pocket tester
YU-03112-C
Test harness- lean angle sensor (6P)
90890-03209
YU-03209

- Positive tester probe → yellow/green “1”
- Negative tester probe → black/blue “2”



c. Turn the main switch to “ON”.
d. Turn the lean angle sensor to 45°.
e. Measure the lean angle sensor output voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28940
CHECKING THE STARTER MOTOR OPERATION

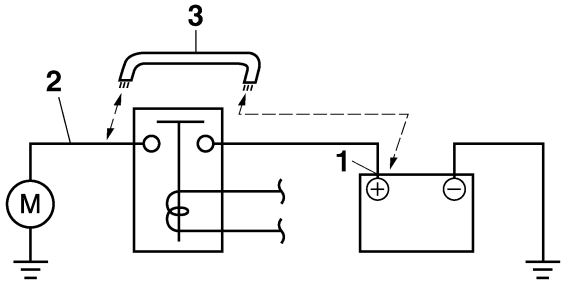
1. Check:
   - Starter motor operation
     Does not operate → Perform the electric starting system troubleshooting, starting with step 4.
     Refer to “TROUBLESHOOTING” on page 8-10.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the positive battery terminal “1” and starter motor lead “2” with a jumper lead “3”.

EWA13810
⚠ WARNING

- **A wire that is used as a jumper lead must have at least the same capacity of the battery lead, otherwise the jumper lead may burn.**
- **This check is likely to produce sparks, therefore, make sure no flammable gas or fluid is in the vicinity.**



b. Check the starter motor operation.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28150
CHECKING THE STATOR COIL

1. Disconnect:
   • Stator coil coupler
   (from the wire harness)
2. Check:
   • Stator coil resistance
   Out of specification → Replace the stator coil.

Stator coil resistance
0.112–0.168 Ω at 20 °C (68 °F)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

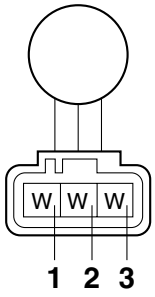
a. Connect the pocket tester (Ω × 1) to the stator coil coupler as shown.

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

• Positive tester probe → white “1”
• Negative tester probe → white “2”

• Positive tester probe → white “1”
• Negative tester probe → white “3”

• Positive tester probe → white “2”
• Negative tester probe → white “3”



b. Measure the stator coil resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28170
CHECKING THE RECTIFIER/REGULATOR

1. Check:
   • Charging voltage
   Out of specification → Replace the rectifier/regulator.

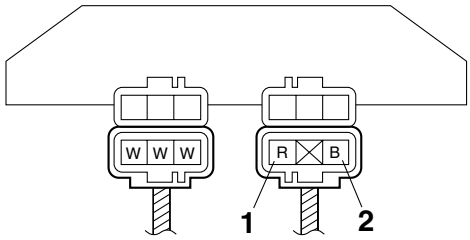
Charging voltage
14 V at 5000 r/min

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Set the engine tachometer to the ignition coil of cylinder #1.
b. Connect the pocket tester (DC 20 V) to the rectifier/regulator coupler as shown.

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

• Positive tester probe → red “1”
• Negative tester probe → black “2”



c. Start the engine and let it run at approximately 5000 r/min.
d. Measure the charging voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28190
CHECKING THE OIL LEVEL SWITCH

1. Drain:
   • Engine oil
2. Remove:
   • Oil level switch
   (from the oil pan)
3. Check:
   • Oil level switch resistance

Oil level switch resistance
Maximum level position
484–536 Ω
Minimum level position
114–126 Ω

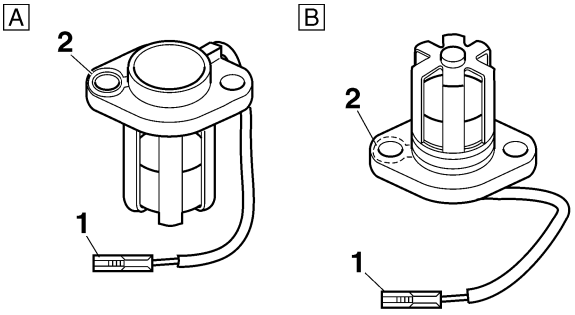
▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 100) to the engine oil level gauge terminal as shown.

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

Maximum level position "A"
- Positive tester probe → Connector (white) "1"
- Negative tester probe → Body earth "2"

Minimum level position "B"
- Positive tester probe → Connector (white) "1"
- Negative tester probe → Body earth "2"



b. Measure the oil level switch resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28220

CHECKING THE FUEL SENDER

1. Remove:
   - Fuel pump (from the fuel tank)
2. Check:
   - Fuel sender resistance
     Out of specification → Replace the fuel pump assembly.

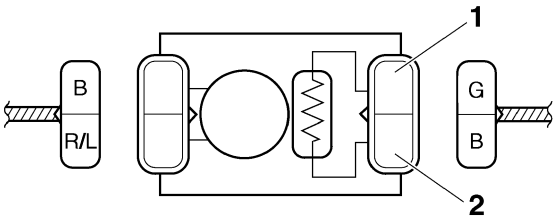
Sender unit resistance (full)
19.0–21.0 Ω
Sender unit resistance (empty)
139.0–141.0 Ω

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

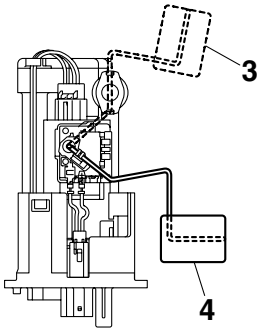
a. Connect the pocket tester (Ω × 10/ × 100) to the fuel sender coupler as shown.

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

- Positive tester probe → green "1"
- Negative tester probe → black "2"



b. Move the fuel sender float to maximum "3" and minimum "4" level position.



c. Measure the fuel sender resistance.

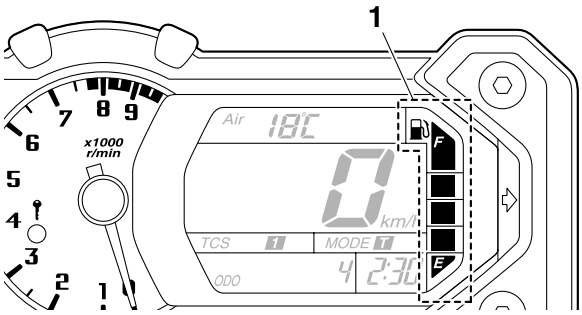
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS29040

CHECKING THE FUEL METER/FUEL LEVEL WARNING LIGHT

This model is equipped with a self-diagnosis device for the fuel level detection circuit.

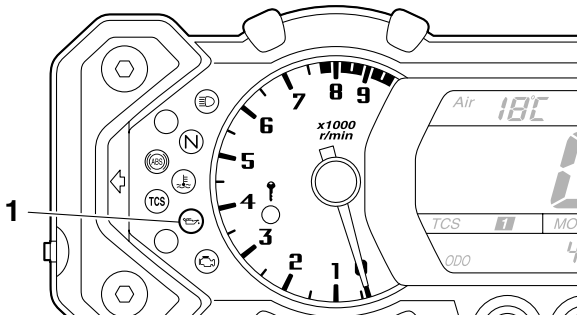
1. Check:
   - Fuel meter/fuel level warning light "1"
     (Turn the main switch to "ON".)
     Warning light comes on for a few seconds, then goes off → Warning light is OK.
     Warning light does not come on → Replace the meter assembly.
     Warning light flashes eight times, then goes off for 3 seconds in a repeated cycle (malfunction detected in fuel sender) → Replace the fuel pump assembly.



EAS29050
CHECKING THE OIL LEVEL WARNING LIGHT

This model is equipped with a self-diagnosis device for the oil level detection circuit.

1. Check:
   - Oil level warning light "1"
     (Turn the main switch to "ON".)
     Warning light comes on for a few seconds, then goes off → Warning light is OK.
     Warning light does not come on → Replace the meter assembly.
     Warning light flashes ten times, then goes off for 3 seconds in a repeated cycle (malfunction detected in oil level switch) → Replace the oil level switch.



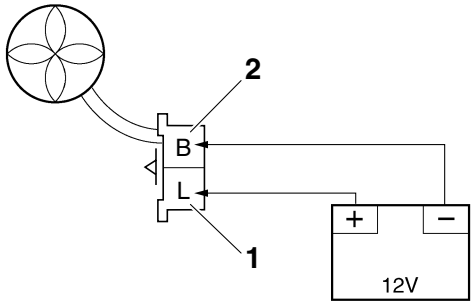
EAS28250
CHECKING THE RADIATOR FAN MOTOR

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

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

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.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28261
CHECKING THE COOLANT TEMPERATURE SENSOR

1. Remove:
   - Coolant temperature sensor
     Refer to "THERMOSTAT" on page 6-4.

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
5.21–6.37 kΩ at 0 °C (32 °F)
290–354 Ω at 80 °C (176 °F)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

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

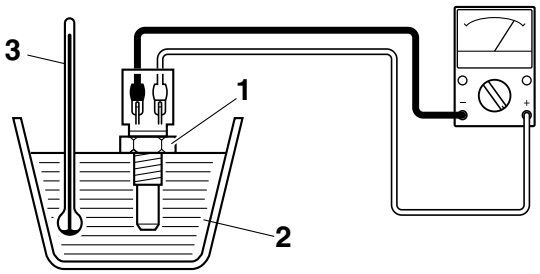
Pocket tester
90890-03112
Analog pocket tester
YU-03112-C

b. Immerse the coolant temperature sensor "1" in a container filled with coolant "2".

TIP

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

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



d. Heat the coolant or let it cool down to the specified temperatures.
e. Measure the coolant temperature sensor resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Install:
   • Coolant temperature sensor

	Coolant temperature sensor 18 Nm (1.8 m·kgf, 13 ft·lbf)

EAS28300
CHECKING THE THROTTLE POSITION SENSOR

1. Remove:
   • Throttle position sensor (from the throttle body)

EWA23P1027
⚠ WARNING

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

2. Check:
   • Throttle position sensor maximum resistance
   Out of specification → Replace the throttle position sensor.

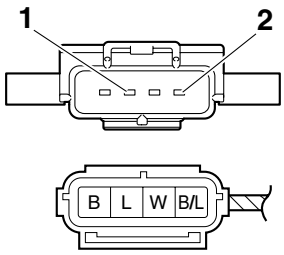
	Resistance 1.20–2.80 kΩ

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1k) to the throttle position sensor as shown.

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

• Positive tester probe → blue “1”
• Negative tester probe → black/blue “2”



b. Check the throttle position sensor maximum resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Install:
   • Throttle position sensor

TIP

When installing the throttle position sensor, adjust its angle properly. Refer to “ADJUSTING THE THROTTLE POSITION SENSOR” on page 7-12.

EAS29100
CHECKING THE ACCELERATOR POSITION SENSOR

1. Remove:
   • Accelerator position sensor (from the throttle body)

EWA23P1028
⚠ WARNING

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

2. Check:
   • Accelerator position sensor maximum resistance
   Out of specification → Replace the accelerator position sensor.

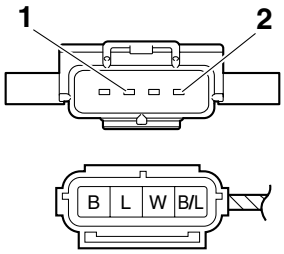
	Resistance 1.20–2.80 kΩ

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1k) to the accelerator position sensor terminals as shown.

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

- Positive tester probe → blue "1"
- Negative tester probe → black/blue "2"



b. Measure the accelerator position sensor maximum resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Install:
   - Accelerator position sensor

TIP

When installing the accelerator position sensor, adjust its angle properly. Refer to "ADJUSTING THE ACCELERATOR POSITION SENSOR" on page 7-12.

EAS28411
CHECKING THE INTAKE AIR PRESSURE SENSOR

1. Remove:
   - Intake air pressure sensor (from the throttle bodies)

EWA23P1037
⚠ WARNING

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

2. Check:
   - Intake air pressure sensor output voltage
     Out of specification → Replace.

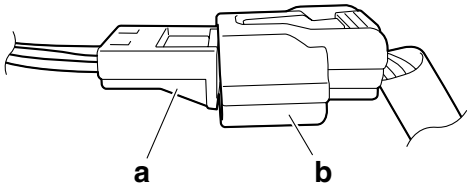
Intake air pressure sensor output voltage
3.57–3.71 V at 101.3 kPa

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the test harness S-pressure sensor (3P) between the intake air pressure sensor and wire harness.

ECA23P1082
NOTICE

Pay attention to the installing direction of the test harness S-pressure sensor (3P) coupler "a".

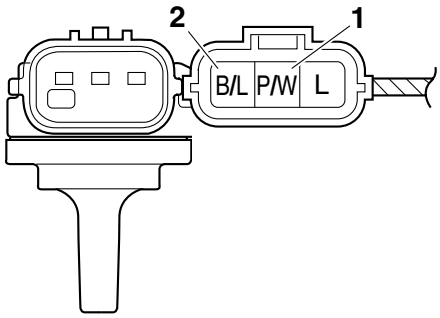


b. Wire harness

b. Connect the pocket tester (DC 20 V) to the test harness S-pressure sensor (3P).

Pocket tester
90890-03112
Analog pocket tester
YU-03112-C
Test harness S- pressure sensor (3P)
90890-03207
YU-03207

- Positive tester probe → pink/white "1"
- Negative tester probe → black/blue "2"



c. Turn the main switch to "ON".
d. Measure the intake air pressure sensor output voltage.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS28421
CHECKING THE INTAKE AIR TEMPERATURE SENSOR

1. Remove:
   • Intake air temperature sensor (from the air filter case.)

EWA14110
⚠ WARNING

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

2. Check:
   • Intake air temperature sensor resistance
   Out of specification → Replace.

Intake air temperature sensor resistance
5.40–6.60 kΩ at 0 °C (32 °F)
290–390 Ω at 80 °C (176 °F)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1k/ × 100) to the intake air temperature sensor terminals as shown.

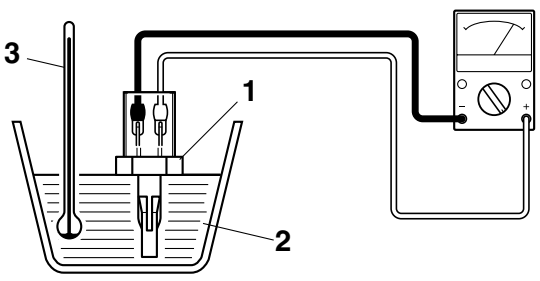
Pocket tester
90890-03112
Analog pocket tester
YU-03112-C

b. Immerse the intake air temperature sensor "1" in a container filled with water "2".

TIP

Make sure the intake air temperature sensor terminals do not get wet.

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



d. Heat the water or let it cool down to the specified temperatures.
e. Measure the intake air temperature sensor resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

3. Install:
   • Intake air temperature sensor

Intake air temperature sensor screw
1.2 Nm (0.12 m·kgf, 0.87 ft·lbf)

EAS23P1072
CHECKING THE FUEL INJECTORS

The following procedure applies to all of the fuel injectors.

1. Remove:
   • Fuel injector
   Refer to "THROTTLE BODIES" on page 7-5.
2. Check:
   • Fuel injector resistance
   Out of specification → Replace the fuel injector.

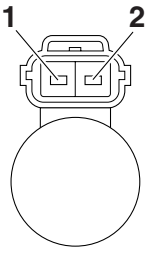
Resistance
12.0 Ω at 20 °C (68 °F)

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Disconnect the fuel injector coupler from the fuel injector.
b. Connect the pocket tester (Ω × 10) to the fuel injector coupler as shown.

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

- Positive tester probe → Injector terminal "1"
- Negative tester probe → Injector terminal "2"



c. Measure the fuel injector resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

EAS23P1102
CHECKING THE THROTTLE SERVO MOTOR

1. Remove:
   • Air filter case
   Refer to "GENERAL CHASSIS" on page 4-1.

2. Disconnect:
   • Throttle servo motor coupler
3. Check:
   • Throttle servo motor resistance
   Out of specification → Replace the throttle bodies.

Resistance
0–100 Ω

ECA23P1083

NOTICE

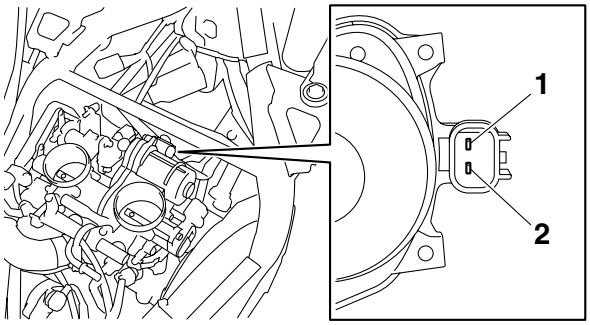
Do not disassemble the throttle servo motor.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect the pocket tester (Ω × 1) to the throttle servo motor terminal as shown.

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

• Positive tester probe →
Throttle servo motor terminal “1”
• Negative tester probe →
Throttle servo motor terminal “2”



b. Measure the throttle servo motor resistance.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

4. Check:
   • Throttle valve operation
   Throttle valves do not fully close → Replace the throttle bodies.

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Connect two C-size batteries to the throttle servo motor terminals “1” as shown.

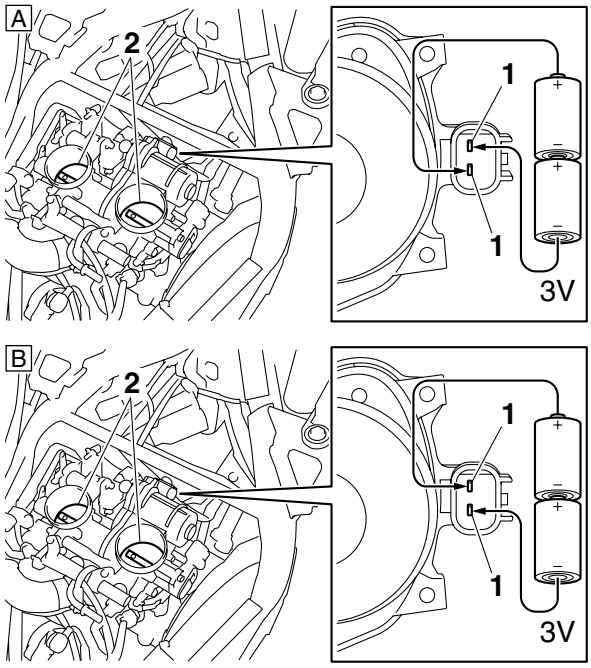
ECA23P1084

NOTICE

Do not use a 12 V battery to operate the throttle servo motor.

TIP

Do not use old batteries to operate the throttle servo motor.



A. Check that the throttle valves “2” open.
B. Check that the throttle valves “2” fully close.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

TROUBLESHOOTING

TROUBLESHOOTING 9-1
GENERAL INFORMATION 9-1
STARTING FAILURES 9-1
INCORRECT ENGINE IDLING SPEED 9-1
POOR MEDIUM-AND-HIGH-SPEED PERFORMANCE 9-2
FAULTY GEAR SHIFTING 9-2
SHIFT PEDAL DOES NOT MOVE 9-2
JUMPS OUT OF GEAR 9-2
FAULTY CLUTCH 9-2
OVERHEATING 9-3
OVERCOOLING 9-3
POOR BRAKING PERFORMANCE 9-3
FAULTY FRONT FORK LEGS 9-3
UNSTABLE HANDLING 9-3
FAULTY LIGHTING OR SIGNALING SYSTEM 9-4

EAS28451
TROUBLESHOOTING

EAS28460
GENERAL INFORMATION

TIP

The following guide for troubleshooting does not cover all the possible causes of trouble. It should be helpful, however, as a guide to basic troubleshooting. Refer to the relative procedure in this manual for checks, adjustments, and replacement of parts.

EAS30410
STARTING FAILURES

Engine
1. Cylinder(s) and cylinder head
   - Loose spark plug
   - Loose cylinder head or cylinder
   - Damaged cylinder head gasket
   - Damaged cylinder gasket
   - Worn or damaged cylinder
   - Incorrect valve clearance
   - Improperly sealed valve
   - Incorrect valve-to-valve-seat contact
   - Incorrect valve timing
   - Faulty valve spring
   - Seized valve
2. Piston(s) and piston ring(s)
   - Improperly installed piston ring
   - Damaged, worn or fatigued piston ring
   - Seized piston ring
   - Seized or damaged piston
3. Air filter
   - Improperly installed air filter
   - Clogged air filter element
4. Crankcase and crankshaft
   - Improperly assembled crankcase
   - Seized crankshaft

Fuel system
1. Fuel tank
   - Empty fuel tank
   - Clogged fuel tank overflow hose
   - Clogged fuel tank breather hose
   - Deteriorated or contaminated fuel
   - Clogged or damaged fuel hose
2. Fuel pump
   - Faulty fuel pump
   - Faulty fuel pump relay
3. Throttle body (-ies)
   - Deteriorated or contaminated fuel
   - Sucked-in air

Electrical system
1. Battery
   - Discharged battery
   - Faulty battery
2. Fuse(s)
   - Blown, damaged or incorrect fuse
   - Improperly installed fuse
3. Spark plug(s)
   - Incorrect spark plug gap
   - Incorrect spark plug heat range
   - Fouled spark plug
   - Worn or damaged electrode
   - Worn or damaged insulator
4. Ignition coil(s)
   - Cracked or broken ignition coil body
   - Broken or shorted primary or secondary coils
5. Ignition system
   - Faulty ECU
   - Faulty crankshaft position sensor
   - Broken generator rotor woodruff key
6. Switches and wiring
   - Faulty main switch
   - Faulty engine stop switch
   - Broken or shorted wiring
   - Faulty neutral switch
   - Faulty start switch
   - Faulty sidestand switch
   - Faulty clutch switch
   - Improperly grounded circuit
   - Loose connections
7. Starting system
   - Faulty starter motor
   - Faulty starter relay
   - Faulty starting circuit cut-off relay
   - Faulty starter clutch

EAS30440
INCORRECT ENGINE IDLING SPEED

Engine
1. Cylinder(s) and cylinder head
   - Incorrect valve clearance
   - Damaged valve train components
2. Air filter
   - Clogged air filter element

Fuel system
1. Throttle body (-ies)
   - Damaged or loose throttle body joint
   - Improperly synchronized throttle bodies
   - Improper throttle cable free play
   - Flooded throttle body

Electrical system
1. Battery
   • Discharged battery
   • Faulty battery
2. Spark plug(s)
   • Incorrect spark plug gap
   • Incorrect spark plug heat range
   • Fouled spark plug
   • Worn or damaged electrode
   • Worn or damaged insulator
3. Ignition coil(s)
   • Broken or shorted primary or secondary coils
   • Cracked or broken ignition coil
4. Ignition system
   • Faulty ECU
   • Faulty crankshaft position sensor
   • Broken generator rotor woodruff key

EAS30460
POOR MEDIUM-AND-HIGH-SPEED PERFORMANCE

Refer to “STARTING FAILURES” on page 9-1.

Engine
1. Air filter
   • Clogged air filter element

Fuel system
1. Throttle body (-ies)
   • Faulty throttle body
2. Fuel pump
   • Faulty fuel pump

EAS28530
FAULTY GEAR SHIFTING

Shifting is difficult

Refer to “Clutch drags”.

EAS28540
SHIFT PEDAL DOES NOT MOVE

Shift shaft
• Improperly adjusted shift rod
• Bent shift shaft

Shift drum and shift forks
• Foreign object in a shift drum groove
• Seized shift fork
• Bent shift fork guide bar

Transmission
• Seized transmission gear
• Foreign object between transmission gears
• Improperly assembled transmission

EAS28550
JUMPS OUT OF GEAR

Shift shaft
• Incorrect shift pedal position
• Improperly returned stopper lever

Shift forks
• Worn shift fork

Shift drum
• Incorrect axial play
• Worn shift drum groove

Transmission
• Worn gear dog

EAS28570
FAULTY CLUTCH

Clutch slips
1. Clutch
   • Improperly assembled clutch
   • Improperly assembled clutch master cylinder
   • Improperly assembled clutch release cylinder
   • Incorrect clutch fluid level
   • Damaged clutch hose
   • Loose or fatigued clutch spring
   • Loose union bolt
   • Worn friction plate
   • Worn clutch plate
   • Damaged clutch release cylinder
2. Engine oil
   • Incorrect oil level
   • Incorrect oil viscosity (low)
   • Deteriorated oil

Clutch drags
1. Clutch
   • Air in hydraulic clutch system
   • Unevenly tensioned clutch springs
   • Warped pressure plate
   • Bent clutch plate
   • Swollen friction plate
   • Bent clutch push rod
   • Damaged clutch boss
   • Burnt primary driven gear bushing
   • Damaged clutch release cylinder
   • Match marks not aligned
2. Engine oil
   • Incorrect oil level
   • Incorrect oil viscosity (high)
   • Deteriorated oil

EAS30480
OVERHEATING

Engine
1. Clogged coolant passages
   - Cylinder head and piston(s)
   - Heavy carbon buildup
2. Engine oil
   - Incorrect oil level
   - Incorrect oil viscosity
   - Inferior oil quality

Cooling system
1. Coolant
   - Low coolant level
2. Radiator
   - Damaged or leaking radiator
   - Faulty radiator cap
   - Bent or damaged radiator fin
3. Water pump
   - Damaged or faulty water pump
   - Thermostat
   - Thermostat stays closed
   - Hose(s) and pipe(s)
   - Damaged hose
   - Improperly connected hose
   - Damaged pipe
   - Improperly connected pipe

Fuel system
1. Throttle body (-ies)
   - Damaged or loose throttle body joint
2. Air filter
   - Clogged air filter element

Chassis
1. Brake(s)
   - Dragging brake

Electrical system
1. Spark plug(s)
   - Incorrect spark plug gap
   - Incorrect spark plug heat range
2. Ignition system
   - Faulty ECU

EAS28610
OVERCOOLING

Cooling system
1. Thermostat
   - Thermostat stays open

EAS28620
POOR BRAKING PERFORMANCE
- Worn brake pad
- Worn brake disc
- Air in hydraulic brake system
- Leaking brake fluid
- Faulty brake caliper kit
- Faulty brake caliper seal
- Loose union bolt
- Damaged brake hose
- Oil or grease on the brake disc
- Oil or grease on the brake pad
- Incorrect brake fluid level

EAS28660
FAULTY FRONT FORK LEGS

Leaking oil
- Bent, damaged or rusty inner tube
- Cracked or damaged outer tube
- Improperly installed oil seal
- Damaged oil seal lip
- Incorrect oil level (high)
- Loose damper rod assembly bolt
- Damaged damper rod assembly bolt copper washer
- Cracked or damaged cap bolt O-ring

Malfunction
- Bent or damaged inner tube
- Bent or damaged outer tube
- Damaged fork spring
- Worn or damaged outer tube bushing
- Bent or damaged damper rod
- Incorrect oil viscosity
- Incorrect oil level

EAS28690
UNSTABLE HANDLING
1. Handlebar
   - Bent or improperly installed handlebar
2. Steering head components
   - Improperly installed upper bracket
   - Improperly installed lower bracket (improperly tightened ring nut)
   - Bent steering stem
   - Damaged ball bearing or bearing race
3. Front fork leg(s)
   - Uneven oil levels (both front fork legs)
   - Unevenly tensioned fork spring (both front fork legs)
   - Broken fork spring
   - Bent or damaged inner tube
   - Bent or damaged outer tube

4. Swingarm
   • Worn bearing or bushing
   • Bent or damaged swingarm
5. Rear shock absorber assembly(-ies)
   • Faulty rear shock absorber spring
   • Leaking oil or gas
6. Tire(s)
   • Uneven tire pressures (front and rear)
   • Incorrect tire pressure
   • Uneven tire wear
7. Wheel(s)
   • Incorrect wheel balance
   • Broken or loose spoke
   • Damaged wheel bearing
   • Bent or loose wheel axle
   • Excessive wheel runout
8. Frame
   • Bent frame
   • Damaged steering head pipe
   • Improperly installed bearing race

EAS28710
FAULTY LIGHTING OR SIGNALING SYSTEM

Headlight does not come on
• Wrong headlight bulb
• Too many electrical accessories
• Hard charging
• Incorrect connection
• Improperly grounded circuit
• Poor contacts (main or light switch)
• Burnt-out headlight bulb

Headlight bulb burnt out
• Wrong headlight bulb
• Faulty battery
• Faulty rectifier/regulator
• Improperly grounded circuit
• Faulty main switch
• Headlight bulb life expired

Tail/brake light does not come on
• Wrong tail/brake light LED
• Too many electrical accessories
• Incorrect connection
• Burnt-out tail/brake light LED

Tail/brake light LED burnt out
• Wrong tail/brake light LED
• Faulty battery
• Incorrectly adjusted rear brake light switch
• Tail/brake light LED life expired

Turn signal does not come on
• Faulty turn signal switch
• Faulty turn signal/hazard relay
• Burnt-out turn signal bulb
• Incorrect connection
• Damaged or faulty wire harness
• Improperly grounded circuit
• Faulty battery
• Blown, damaged or incorrect fuse

Turn signal blinks slowly
• Faulty turn signal/hazard relay
• Faulty main switch
• Faulty turn signal switch
• Incorrect turn signal bulb

Turn signal remains lit
• Faulty turn signal/hazard relay
• Burnt-out turn signal bulb

Turn signal blinks quickly
• Incorrect turn signal bulb
• Faulty turn signal/hazard relay
• Burnt-out turn signal bulb

Horn does not sound
• Damaged or faulty horn
• Faulty main switch
• Faulty horn switch
• Faulty battery
• Blown, damaged or incorrect fuse
• Faulty wire harness

EAS28740

WIRING DIAGRAM

XT1200Z(Z) 2010

1. AC magneto
2. Rectifier/regulator
3. Main fuse
4. Battery
5. Engine ground
6. ABS motor fuse
7. Starter relay
8. Starter motor
9. Main switch
10. Fuel injection system fuse
11. Electric throttle valve fuse
12. Backup fuse (odometer, clock, and immobilizer system)
13. Headlight fuse
14. ABS solenoid fuse
15. Accessory light fuse (OPTION)
16. Radiator fan motor fuse
17. ABS ECU fuse
18. Ignition fuse
19. Anti-theft alarm (OPTION)
20. Immobilizer unit
21. Relay unit
22. Starting circuit cut-off relay
23. Fuel pump relay
24. Neutral switch
25. Sidestand switch
26. Fuel pump
27. Fuel sender
28. Crankshaft position sensor
29. Intake air pressure sensor
30. O_2 sensor #1
31. O_2 sensor #2
32. Coolant temperature sensor
33. Intake air temperature sensor
34. Lean angle sensor
35. Accelerator position sensor
36. Throttle position sensor
37. Accelerator position sensor lead shield
38. Throttle position sensor lead shield
39. ECU (engine control unit)
40. Cylinder-#1 left ignition coil
41. Cylinder-#1 right ignition coil
42. Cylinder-#2 left ignition coil
43. Cylinder-#2 right ignition coil
44. Spark plug
45. Injector #1
46. Injector #2
47. Throttle servo motor
48. Front wheel sensor
49. Rear wheel sensor
50. Front wheel sensor lead shield
51. Rear wheel sensor lead shield
52. ABS ECU (electronic control unit)
53. ABS test coupler
54. Frame ground
55. Meter assembly
56. Immobilizer system indicator light
57. Oil level warning light
58. Neutral indicator light
59. Tachometer
60. Multi-function meter
61. Engine trouble warning light
62. Coolant temperature warning light
63. High beam indicator light
64. Left turn signal indicator light
65. Right turn signal indicator light
66. Traction control system indicator light
67. Meter light
68. ABS warning light
69. Turn signal/hazard relay
70. Headlight relay
71. Left handlebar switch
72. Clutch switch
73. Pass switch
74. Dimmer switch
75. Horn switch
76. Hazard switch
77. Turn signal switch
78. Horn
79. Oil level switch
80. Front right turn signal light
81. Front left turn signal light
82. Rear right turn signal light
83. Rear left turn signal light
84. Headlight
85. Accessory light (OPTION)
86. Grip warmer (OPTION)
87. License plate light
88. Rear brake light switch
89. Tail/brake light
90. Radiator fan motor
91. Radiator fan motor relay
92. Signaling system fuse
93. Taillight fuse
94. Auxiliary DC jack
95. Auxiliary DC jack fuse
96. Right handlebar switch
97. D-Mode switch
98. Front brake light switch
99. Engine stop switch
100. Start switch

EAS28750

COLOR CODE

B	Black
Br	Brown
Ch	Chocolate
Dg	Dark green
G	Green
Gy	Gray
L	Blue
Lg	Light green
O	Orange
P	Pink
R	Red
Sb	Sky blue
W	White
Y	Yellow
B/G	Black/Green
B/L	Black/Blue
B/R	Black/Red
B/W	Black/White
B/Y	Black/Yellow
Br/B	Brown/Black
Br/G	Brown/Green
Br/L	Brown/Blue
Br/R	Brown/Red
Br/W	Brown/White
Br/Y	Brown/Yellow
G/B	Green/Black
G/R	Green/Red
G/W	Green/White
G/Y	Green/Yellow
Gy/G	Gray/Green
Gy/R	Gray/Red
L/B	Blue/Black
L/G	Blue/Green
L/R	Blue/Red
L/W	Blue/White
L/Y	Blue/Yellow
Lg/W	Light green/White
O/G	Orange/Green
P/W	Pink/White
R/B	Red/Black
R/G	Red/Green
R/L	Red/Blue
R/W	Red/White
R/Y	Red/Yellow
Sb/W	Sky blue/White
W/G	White/Green
W/L	White/Blue
W/R	White/Red
W/Y	White/Yellow
Y/B	Yellow/Black
Y/G	Yellow/Green
Y/L	Yellow/Blue
Y/R	Yellow/Red

YAMAHA MOTOR CO., LTD.
2500 SHINGAI IWATA SHIZUOKA JAPAN

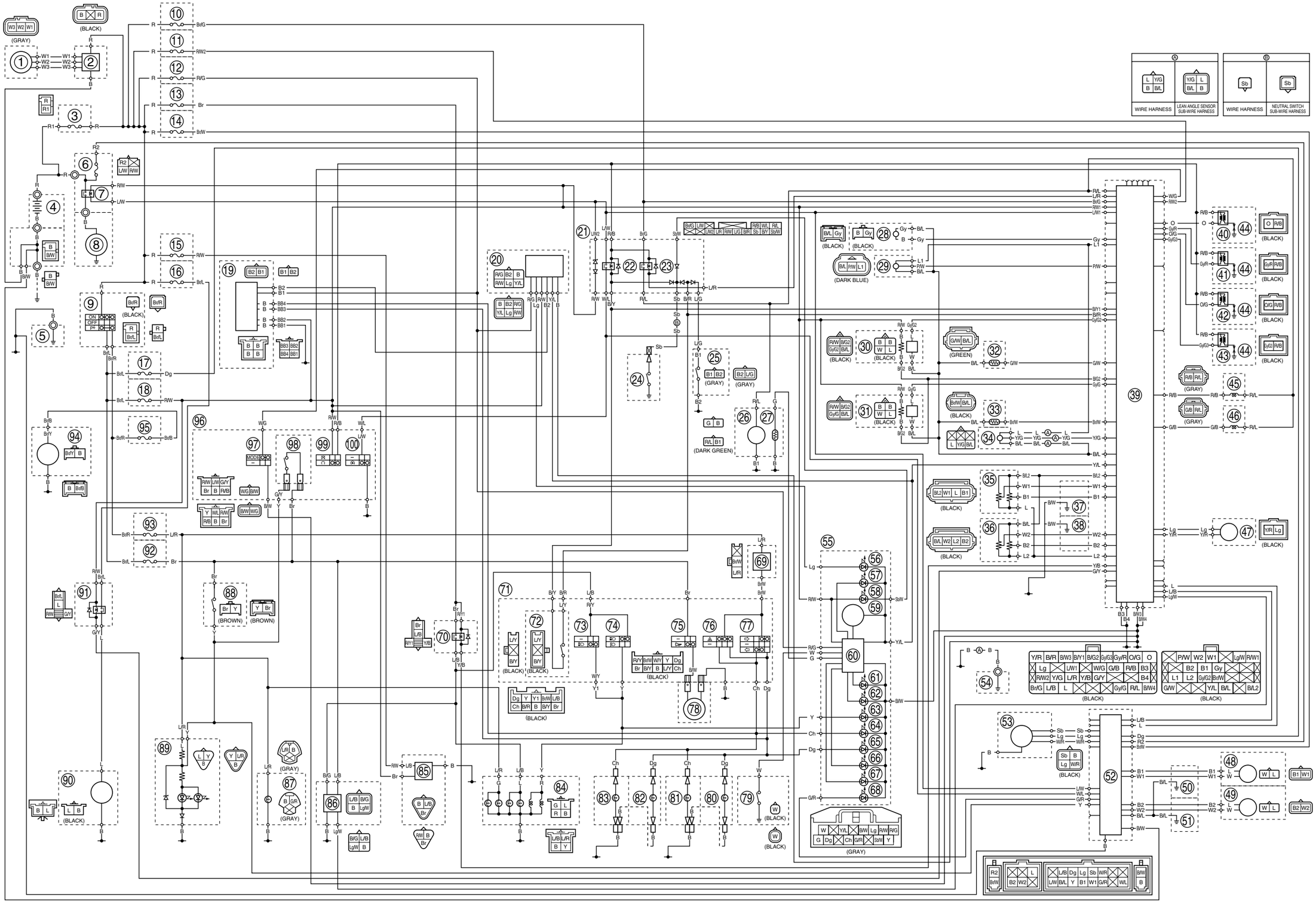
XT1200Z(Z) 2010
WIRING DIAGRAM

XT1200Z(Z) 2010
SCHÉMA DE CÂBLAGE

XT1200Z(Z) 2010
SCHALTPLAN

XT1200Z(Z) 2010
SCHEMA ELETTRICO

XT1200Z(Z) 2010
DIAGRAMA ELÉCTRICO



XT1200Z(Z) 2010
WIRING DIAGRAM

XT1200Z(Z) 2010
SCHÉMA DE CÂBLAGE

XT1200Z(Z) 2010
SCHALTPLAN

XT1200Z(Z) 2010
SCHEMA ELETTRICO

XT1200Z(Z) 2010
DIAGRAMA ELÉCTRICO