YAMAHA 2008

SERVICE MANUAL

YXR70FX

LIT-11616-21-58 5B4-F8197-10

EAS20170
FEATURES

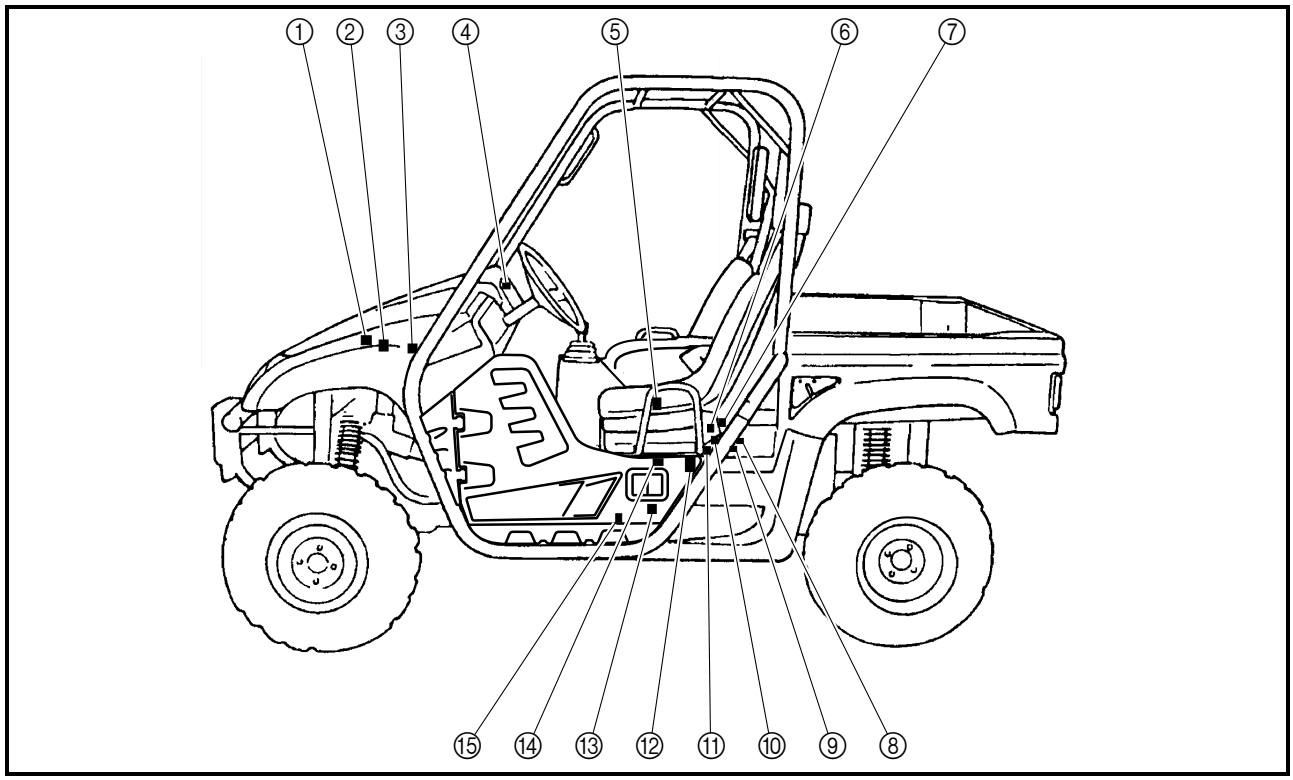
OUTLINE OF THE FI SYSTEM

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

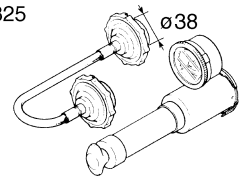
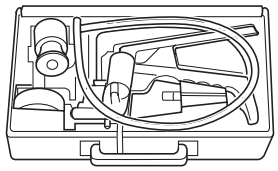
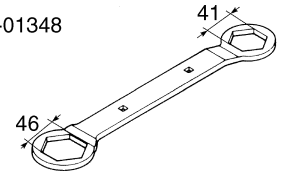
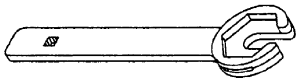
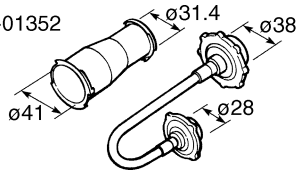
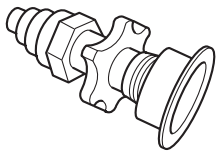
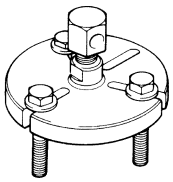
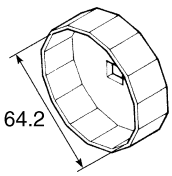
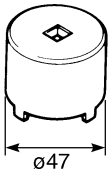
Despite the same volume of intake air, the fuel volume requirement varies with the engine operating conditions, such as acceleration, deceleration, or operating under a heavy load. Carburetors that meter the fuel through the use of jets have been provided with various auxiliary devices, so that an optimum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

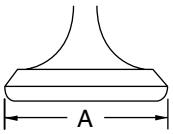
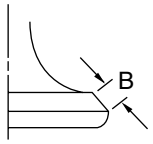
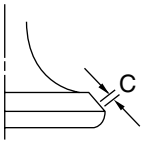
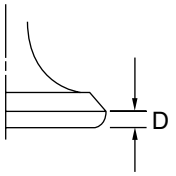
As the requirements for the engine to deliver more performance and cleaner exhaust gases increase, it becomes necessary to control the air-fuel ratio in a more precise and finely tuned manner. To accommodate this need, this model has adopted an electronically controlled fuel injection (FI) system, in 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 Fuel injection system relay
② ECU (engine control unit)
③ Lean angle sensor
④ Engine trouble warning light
⑤ Intake air temperature sensor
⑥ TPS (throttle position sensor)
⑦ Intake air pressure sensor
⑧ Spark plug
⑨ Coolant temperature sensor
⑩ Fuel injector
⑪ ISC (idle speed control) unit
⑫ Fuel pump
⑬ Crankshaft position sensor
⑭ Ignition coil
⑮ Speed sensor

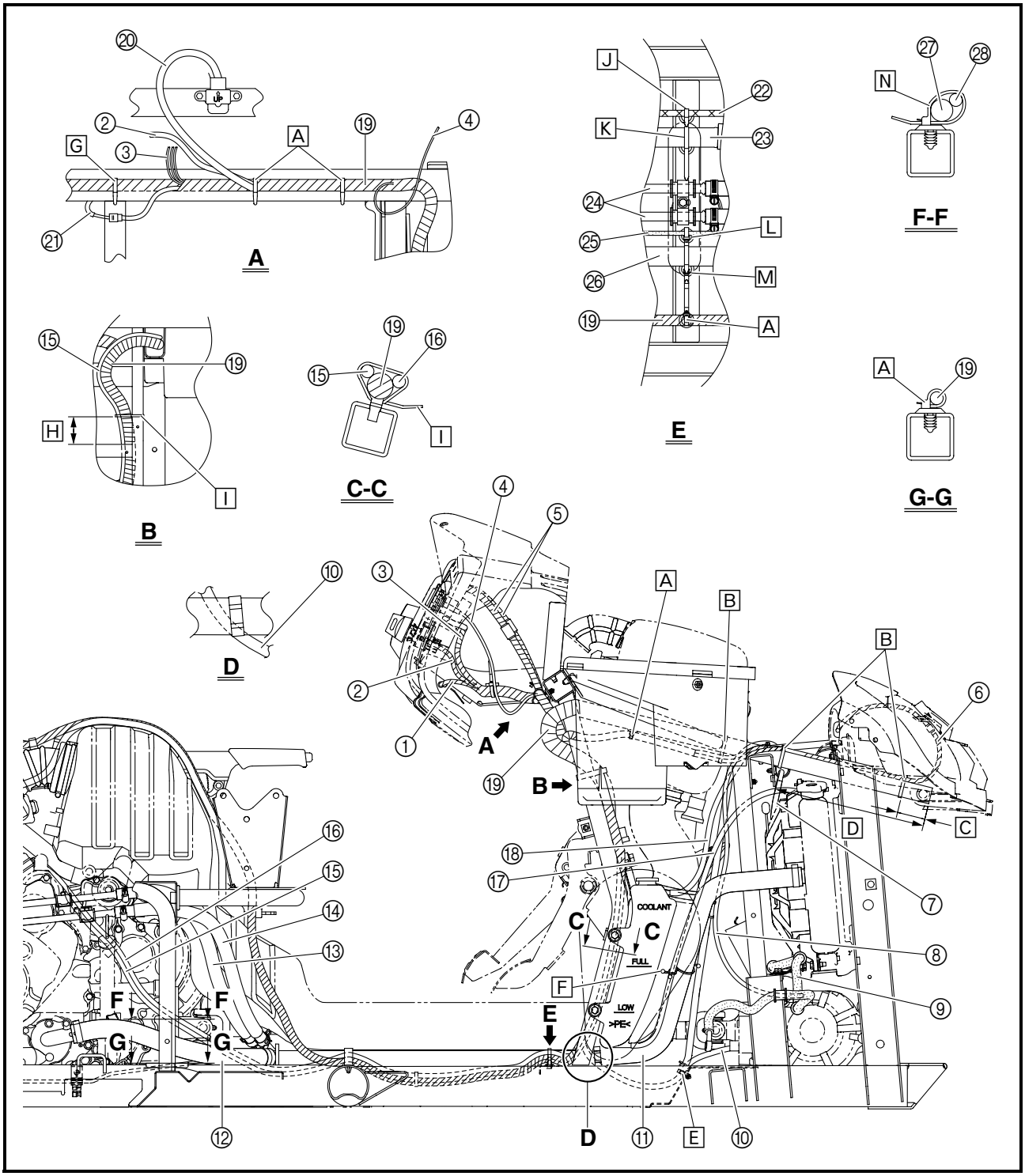
Tool No.	Tool name/How to use	Illustration
90890-01325 YU-24460-01	Radiator cap tester Radiator pressure tester This tool is used to check the cooling system.	90890-01325  YU-24460-01 
90890-01348 YM-01348	Locknut wrench This tool is needed when removing or installing the secondary sheave spring.	90890-01348  YM-01348 
90890-01352 YU-33984	Radiator cap tester adapter Radiator pressure tester adapter This tool is used to check the cooling system.	90890-01352  YU-33984 
90890-01362 YU-33270-B	Flywheel puller Heavy duty puller This tool is used to remove the AC magneto rotor.	
90890-01426 YU-38411	Oil filter wrench This tool is needed to loosen or tighten the oil filter cartridge.	
90890-01430 YM-38404	Ring nut wrench This tool is needed to remove and install the middle driven shaft bearing retainer.	

Item	Standard	Limit
Timing chain		
Model/number of links	98XRH2010/126	----
Tensioning system	Automatic	----
Rocker arm/rocker arm shaft		
Rocker arm inside diameter	12.000 ~ 12.018 mm (0.4724 ~ 0.4731 in)	----
Shaft outside diameter	11.981 ~ 11.991 mm (0.4717 ~ 0.4721 in)	----
Rocker-arm-to-rocker-arm-shaft clearance	0.009 ~ 0.037 mm (0.0004 ~ 0.0015 in)	----
Valve, valve seat, valve guide		
Valve clearance–intake (cold)	0.09 ~ 0.13 mm (0.0035 ~ 0.0051 in)	----
Valve clearance–exhaust (cold)	0.16 ~ 0.20 mm (0.0063 ~ 0.0079 in)	----
Valve dimensions		
 Head Diameter	 Face Width	 Seat Width	 Margin Thickness
Valve head diameter “A”		
Intake	37.90 ~ 38.10 mm (1.4921 ~ 1.5000 in)	----
Exhaust	31.90 ~ 32.10 mm (1.2559 ~ 1.2638 in)	----
Valve face width “B”		
Intake	2.26 mm (0.0890 in)	----
Exhaust	2.26 mm (0.0890 in)	----
Valve seat width “C”		
Intake	1.00 ~ 1.20 mm (0.0394 ~ 0.0472 in)	1.60 mm (0.0630 in)
Exhaust	1.00 ~ 1.20 mm (0.0394 ~ 0.0472 in)	1.60 mm (0.0630 in)
Valve margin thickness “D”		
Intake	0.80 ~ 1.20 mm (0.0315 ~ 0.0472 in)	----
Exhaust	0.80 ~ 1.20 mm (0.0315 ~ 0.0472 in)	----
Valve stem diameter		
Intake	5.975 ~ 5.990 mm (0.2352 ~ 0.2358 in)	5.945 mm (0.2341 in)
Exhaust	5.960 ~ 5.975 mm (0.2346 ~ 0.2352 in)	5.930 mm (0.2335 in)
Valve guide inside diameter		
Intake	6.000 ~ 6.012 mm (0.2362 ~ 0.2367 in)	6.050 mm (0.2382 in)
Exhaust	6.000 ~ 6.012 mm (0.2362 ~ 0.2367 in)	6.050 mm (0.2382 in)

Item	Standard	Limit
Starter relay		
Model/manufacturer	RC19-080A/MITSUBA	----
Amperage rating	180.0 A	----
Coil winding resistance	4.18 ~ 4.62 Ω at 20 °C (68 °F)	----
Fuel sender		
Sender unit resistance (full)	19.00 ~ 21.00 Ω	----
Sender unit resistance (empty)	137.00 ~ 143.00 Ω	----
Fuel injection system relay		
Model/manufacturer	ACM33211/MATSUSHITA	----
Coil resistance	96.0 Ω	----
Radiator fan motor relay		
Model/manufacturer	ACM33211/MATSUSHITA	----
Coil resistance	96.0 Ω	----
Load control relay		
Model/manufacturer	ACM33211/MATSUSHITA	----
Coil resistance	96.0 Ω	----
Four-wheel-drive motor relay 3		
Model/manufacturer	ACM33211/MATSUSHITA	----
Coil resistance	96.0 Ω	----
Headlight relay		
Model/manufacturer	G8HN-1C4T-DJ/OMRON	----
Coil resistance	105.0 Ω	----
Four-wheel-drive motor relay 1		
Model/manufacturer	G8HN-1C4T-DJ/OMRON	----
Coil resistance	105.0 Ω	----
Four-wheel-drive motor relay 2		
Model/manufacturer	G8HN-1C4T-DJ/OMRON	----
Coil resistance	105.0 Ω	----
Circuit breaker		
Circuit breaker type	Fuse	----
Fuses		
Main fuse	40.0 A	----
Headlight fuse	15.0 A	----
Signaling system fuse	10.0 A	----
Ignition fuse	10.0 A	----
Auxiliary DC jack fuse	10.0 A	----
Fuel injection system fuse	10.0 A	----
Four-wheel-drive motor fuse	10.0 A	----
Backup fuse	10.0 A	----
Radiator fan motor fuse	25.0 A	----
Spare fuse	25.0 A	----
	15.0 A	----
	10.0 A	----

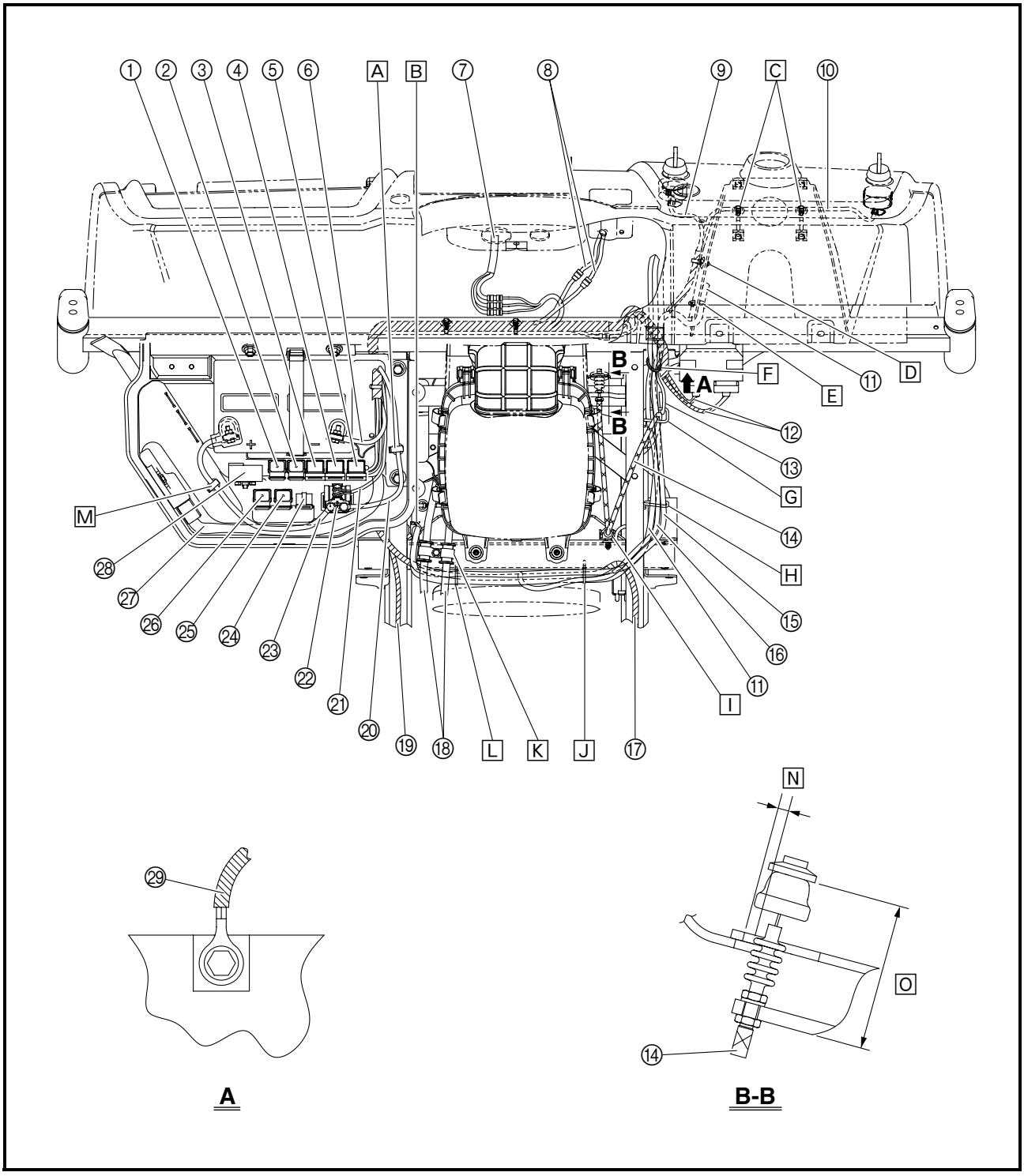
Lubrication points	Lubricant
Shift lever 1	E
Shift lever 1 gear teeth and shift lever 2 gear teeth	E
AC magneto lead grommet	Yamaha bond No.1215 (Three bond No.1215®)
Crankcase mating surface	Yamaha bond No.1215 (Three bond No.1215®)

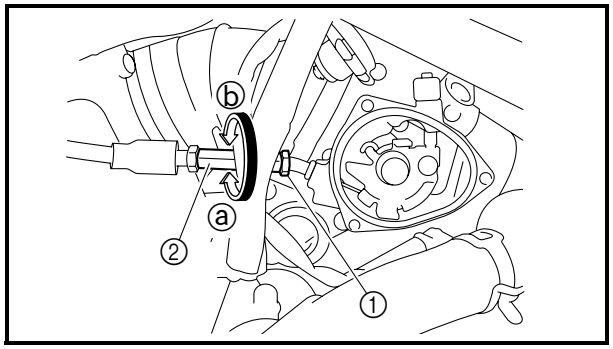
① Light switch lead
② Main switch lead
③ Meter assembly lead
④ Auxiliary DC jack lead
⑤ On-command four-wheel-drive motor switch and differential gear lock switch lead
⑥ Right headlight lead
⑦ Radiator fan motor breather hose
⑧ Differential gear case breather hose
⑨ Front brake hose
⑩ Differential gear motor lead
⑪ Radiator outlet hose
⑫ Water pump inlet hose
⑬ Oil inlet hose
⑭ Oil outlet hose
⑮ Ground lead
⑯ Starter motor lead
⑰ Coolant reservoir hose
⑱ Coolant reservoir breather hose
⑲ Wire harness
⑳ Lean angle sensor lead
㉑ Brake light switch lead

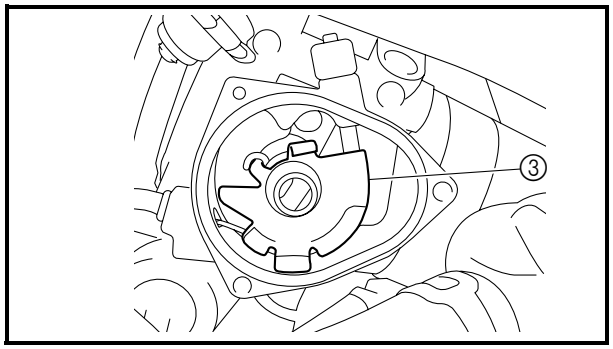


㉒ Starter relay
㉓ Positive battery lead
㉔ Main fuse
㉕ Load control relay
㉖ Four-wheel-drive motor relay 3
㉗ ECU lead
㉘ Fuse box
㉙ Ground lead

A Fasten the starter motor lead with the plastic holder.
B Fasten the differential gear case breather hose and coolant reservoir breather hose with the plastic holder.
C Fasten the light switch lead with the plastic band.
D Fasten the main switch lead and light switch lead with the plastic holder.
E Fasten the coolant reservoir breather hose with the plastic holder.







4. Adjust:
   • throttle cable

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a. Loosen the locknut ①.
b. Turn the adjusting nut ② in direction ⓐ or ⓑ until the correct free play is obtained.

Direction ⓐ	**Free play is increased.**
Direction ⓑ	**Free play is decreased.**

c. Tighten the locknut.

TIP:
After adjusting the throttle cable, depress the accelerator pedal a few times and make sure that the throttle valve ③ closes completely after releasing the accelerator pedal.

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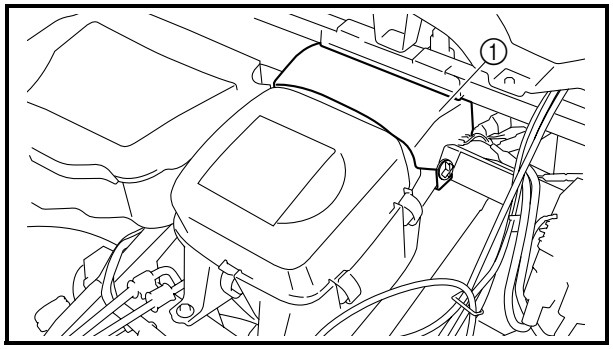
5. Install:
   • throttle valve cover
6. Install:
   • rear console
   • seats
   Refer to “SEATS, REAR CONSOLE AND INSTRUMENT PANELS” in chapter 8.

EBS00057

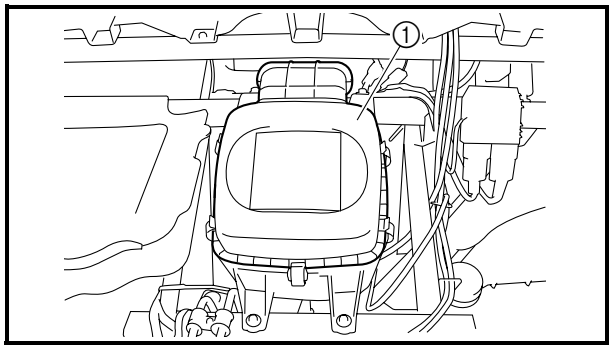
CHECKING THE SPARK PLUG

1. Remove:
   • seats
   • rear console
   Refer to “SEATS, ENCLOSURE, HOOD AND CARGO BED” in chapter 8.
2. Disconnect:
   • spark plug cap
3. Remove:
   • spark plug
4. Check:
   • spark plug type
   Incorrect → Change.

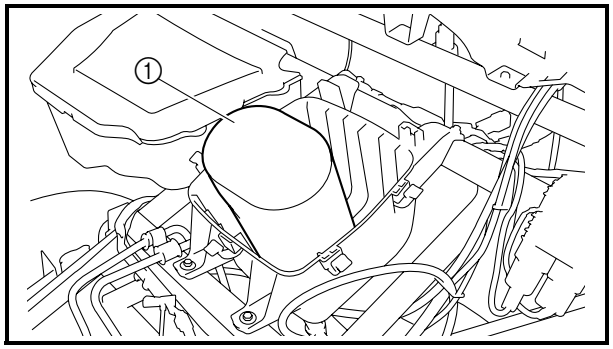
	Standard spark plug **CPR7EA-9/NGK**



2. Remove:
   • air intake duct shroud ①



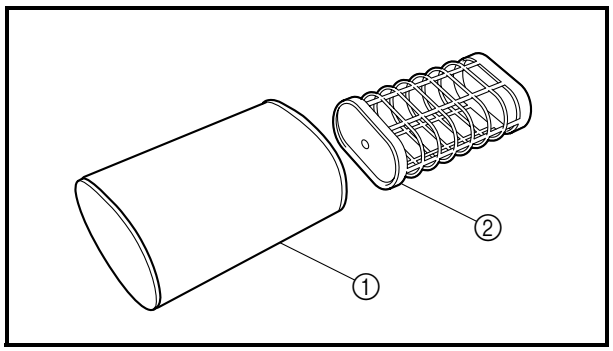
3. Remove:
   • air filter case cover ①



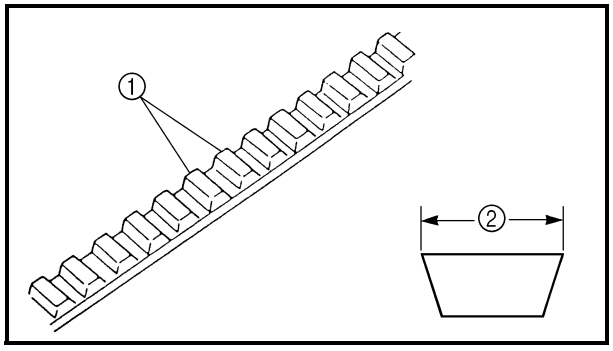
4. Remove:
   • air filter element ①
   • air filter element frame ②

NOTICE

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



5. Check:
   • air filter element
   • air filter element frame
   Damage → Replace.

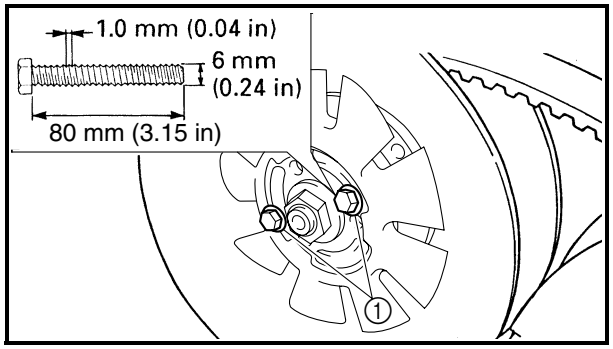


EBS00078

CHECKING AND REPLACING THE V-BELT

1. Remove:
   - drive belt cover
     Refer to "PRIMARY AND SECONDARY SHEAVES" in chapter 4.
2. Check:
   - V-belt ①
     Cracks/wear/scaling/chipping → Replace.
     Oil/grease → Check primary sheave and secondary sheave.
3. Measure:
   - V-belt width ②
     Out of specification → Replace.

V-belt width
33.3 mm (1.31 in)
<Limit>: 30.0 mm (1.18 in)



4. Replace:
   - V-belt

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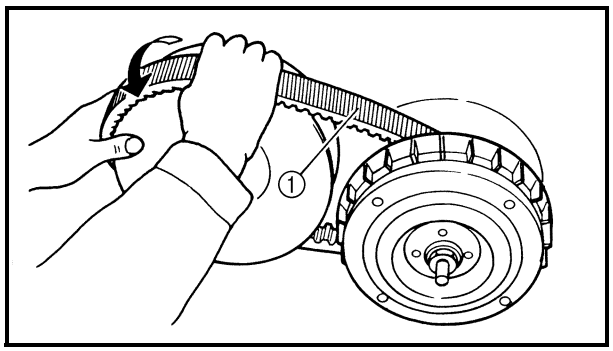
a. Install the bolts ① (90101-06018) into the secondary fixed sheave hold.

TIP:
Tightening the bolts ① will push the secondary sliding sheave away, causing the gap between the secondary fixed and sliding sheaves to widen.



b. Remove the V-belt ① from the primary sheave and secondary sheave.

k. Add brake fluid to the proper level.
Refer to “CHECKING THE BRAKE FLUID LEVEL”.

⚠ WARNING

Check the operation of the brake after bleeding the brake system.

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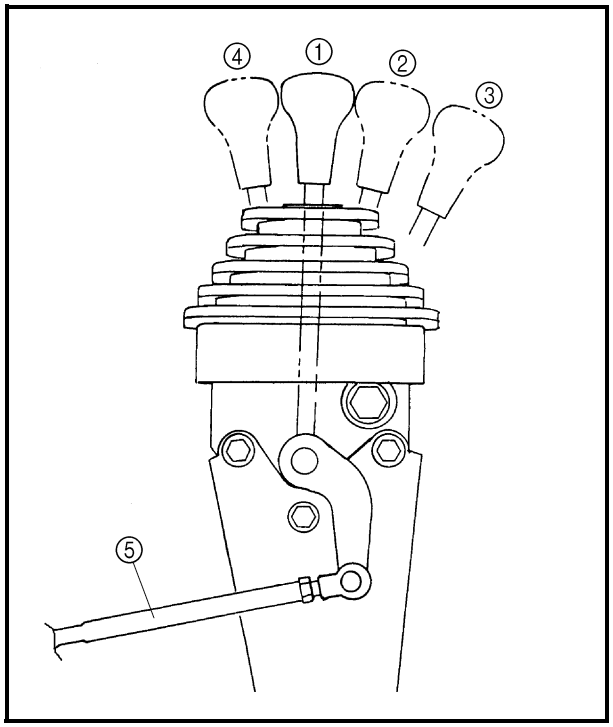
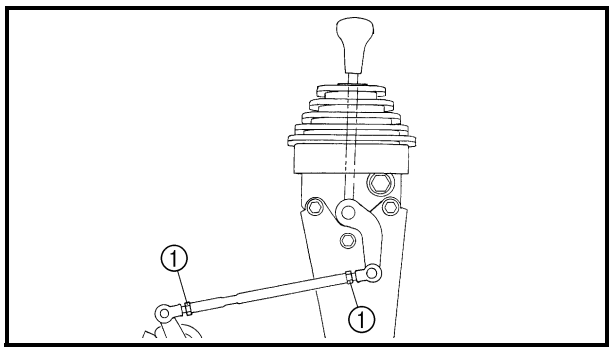


ADJUSTING THE SELECT LEVER SHIFT ROD

① Neutral
② High
③ Low
④ Reverse
⑤ Select lever shift rod

NOTICE

Before shifting, you must stop the vehicle and take your foot off the accelerator pedal. Otherwise, the transmission may be damaged.



1. Adjust:
   • select lever shift rod

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a. Make sure the select lever is in NEUTRAL.
b. Loosen both locknuts ①.

NOTICE

The select lever shift rod locknut (select lever side) has left-handed threads. To loosen the locknut, turn it clockwise.

c. Adjust the shift rod length for smooth and correct shifting.
d. Tighten the locknuts ①.

	Locknut **15 Nm (1.5 m · kg, 11 ft · lb)**

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TIP:
Always tighten the locknut against the adjusting ring, then torque it to specification.

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2. Adjust:
   • rebound damping force

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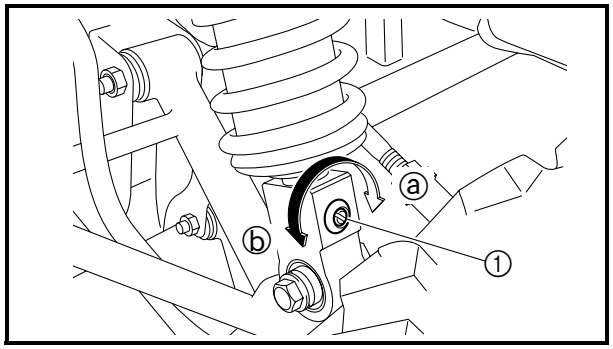
a. Turn the adjusting screw ① in direction ⓐ or ⓑ.



Direction ⓐ	**Rebound damping force is increased.**
Direction ⓑ	**Rebound damping force is decreased.**

From the fully turned-in position
Standard: 10 clicks out
Minimum: 12 clicks out
Maximum: 9 clicks out

NOTICE

Do not force the adjusting screw past the minimum or maximum extent of adjustment. The adjusting screw may be damaged.

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3. Adjust:
   • compression damping force

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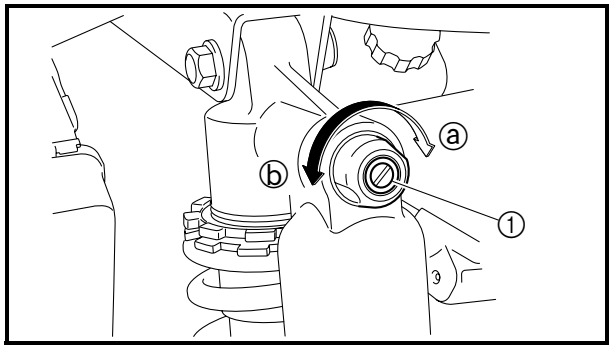
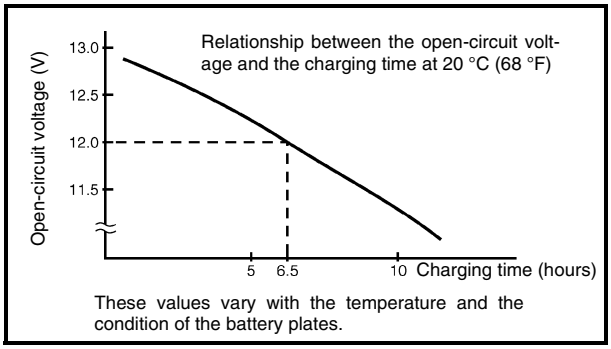
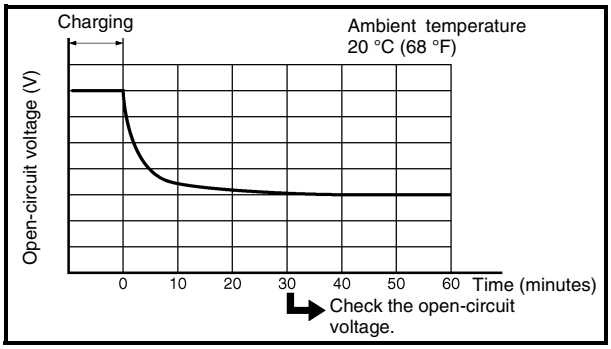
a. Turn the adjusting screw ① in direction ⓐ or ⓑ.

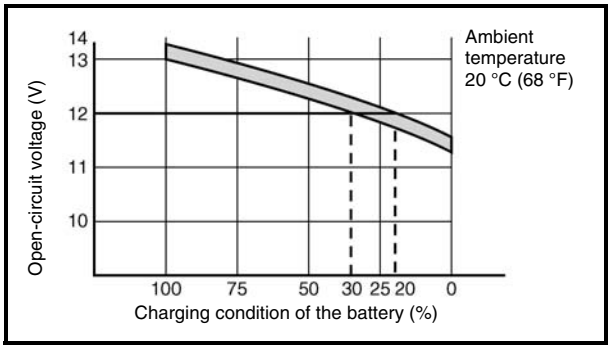


Direction ⓐ	**Compression damping force is increased.**
Direction ⓑ	**Compression damping force is decreased.**

From the fully turned-in position
Standard: 10 clicks out
Minimum: 12 clicks out
Maximum: 9 clicks out







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

Example

c. Open-circuit voltage = 12.0 V

d. Charging time = 6.5 hours

e. Charge of the battery = 20 ~ 30%

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5. Charge:
   - battery

   (refer to the appropriate charging method)

⚠ WARNING

Do not quick charge a battery.

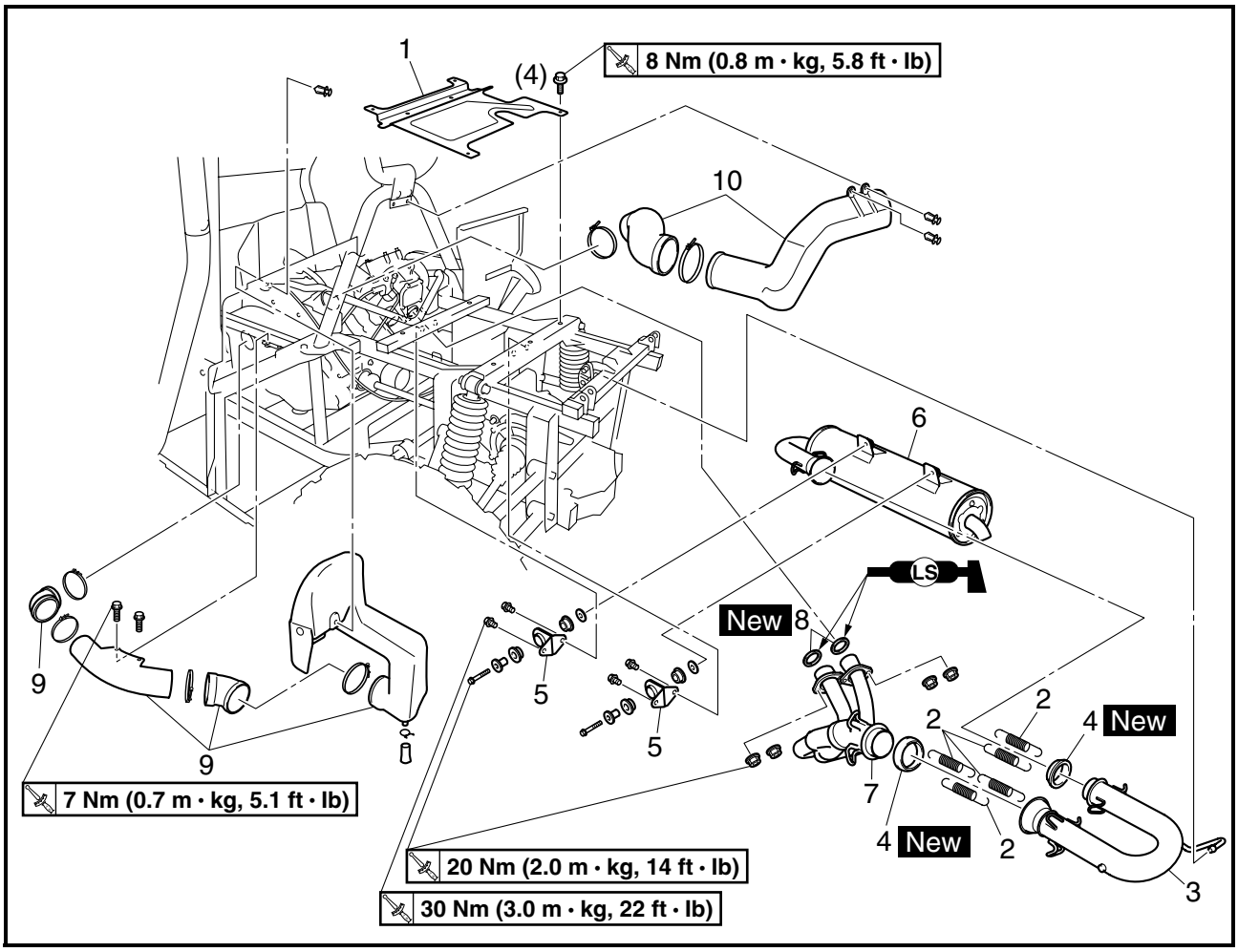
NOTICE

- **Never remove the MF battery sealing caps.**
- **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.**

ENGINE

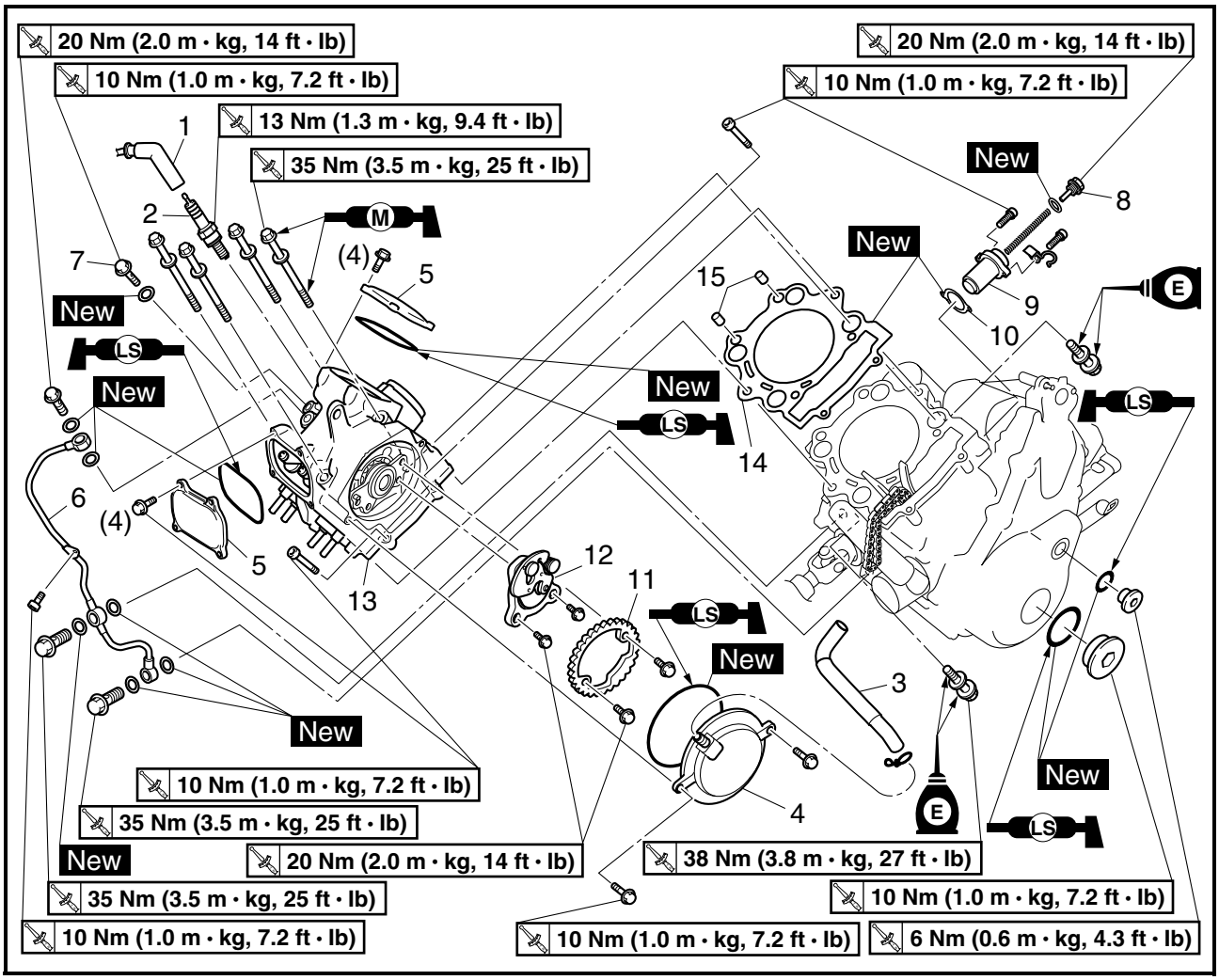
ENGINE REMOVAL

V-BELT COOLING DUCTS, MUFFLER AND EXHAUST PIPES

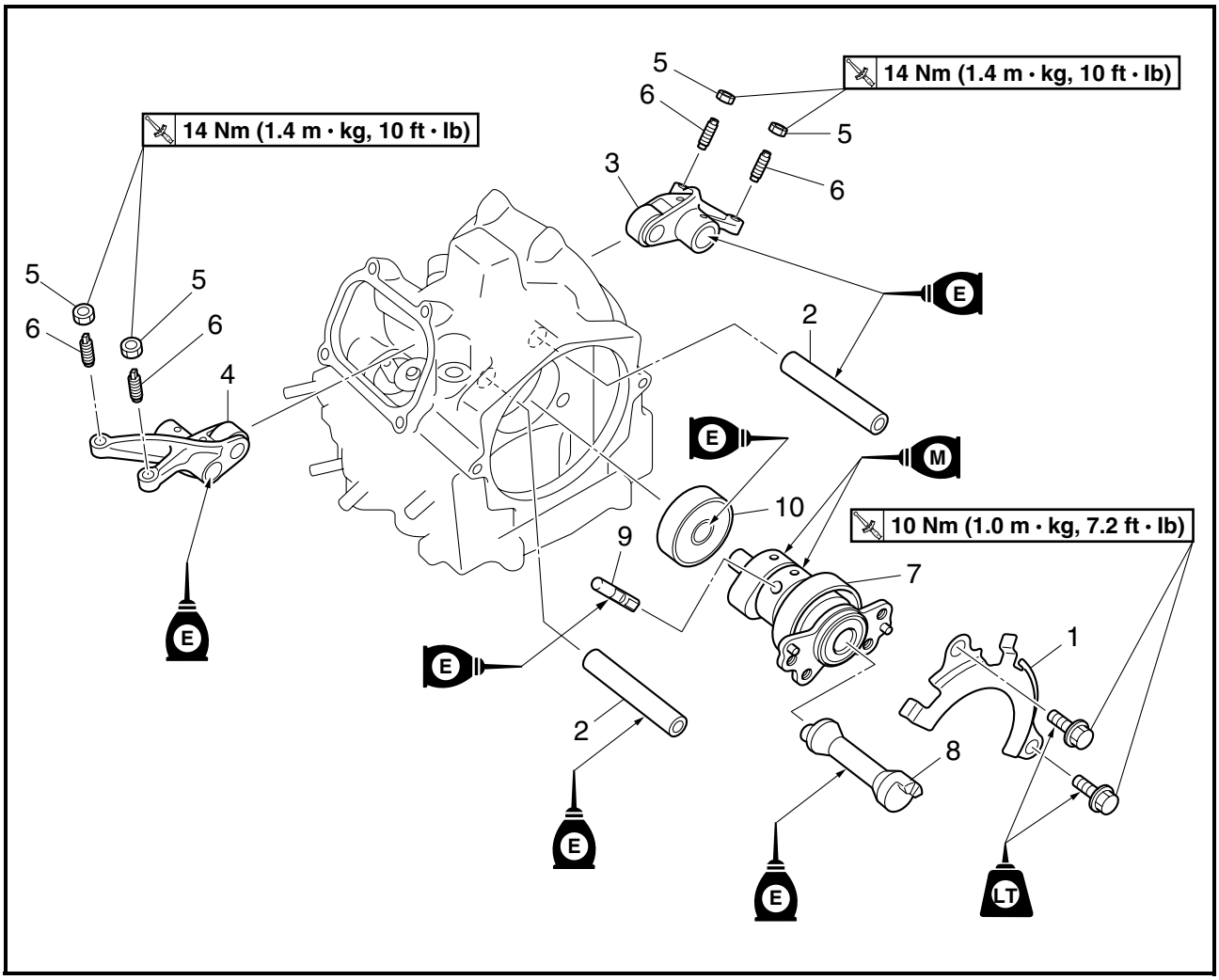


Order	Job/Part	Q'ty	Remarks
	Removing the V-belt cooling ducts, muffler and exhaust pipes		Remove the parts in the order listed.
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" in chapter 3.
	Coolant		Drain. Refer to "CHANGING THE COOLANT" in chapter 3.
	Seats/rear console		Refer to "SEATS, REAR CONSOLE AND INSTRUMENT PANELS" in chapter 8.
	Left protector		Refer to "PANELS AND FRONT CONSOLE" in chapter 8.
	Cargo bed		Refer to "CARGO BED" in chapter 8.
	Air intake duct		Refer to "AIR FILTER CASE AND AIR INTAKE DUCT" in chapter 6.

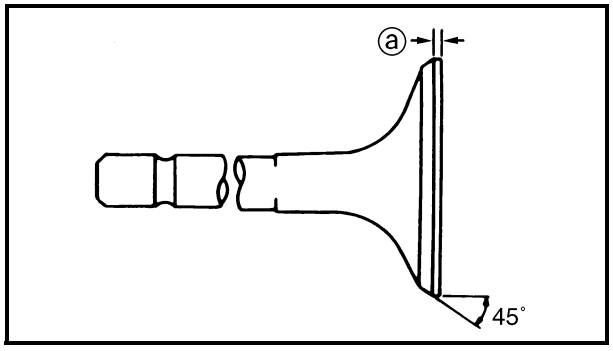
EBS00218
CYLINDER HEAD



Order	Job/Part	Q'ty	Remarks
	Removing the cylinder head		Remove the parts in the order listed.
	Engine oil		Drain. Refer to "CHANGING THE ENGINE OIL" in chapter 3.
	Coolant		Drain. Refer to "CHANGING THE COOLANT" in chapter 3.
	Seats/rear console		Refer to "SEATS, REAR CONSOLE AND INSTRUMENT PANELS" in chapter 8.
	Center protector		Refer to "PANELS AND FRONT CONSOLE" in chapter 8.
	Throttle body assembly		Refer to "THROTTLE BODY" in chapter 6.
	Fuel tank		Refer to "FUEL PUMP AND FUEL TANK" in chapter 6.

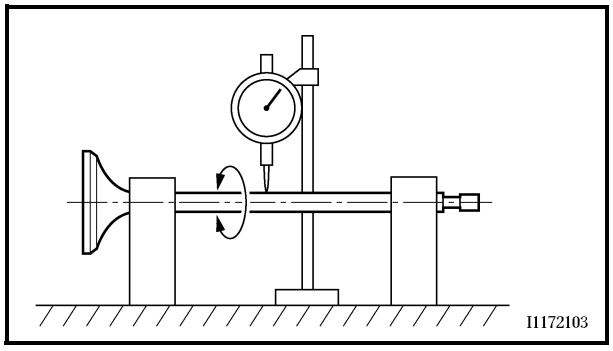


Order	Job/Part	Q'ty	Remarks
9	Decompressor lever pin	1	Refer to "REMOVING THE ROCKER ARMS AND CAMSHAFT" and "INSTALLING THE CAMSHAFT AND ROCKER ARMS". For installation, reverse the removal procedure.
10	Bearing	1	



4. Measure:
   • margin thickness ⓐ
   Out of specification → Replace.

Margin thickness
0.80 ~ 1.20 mm
(0.0315 ~ 0.0472 in)

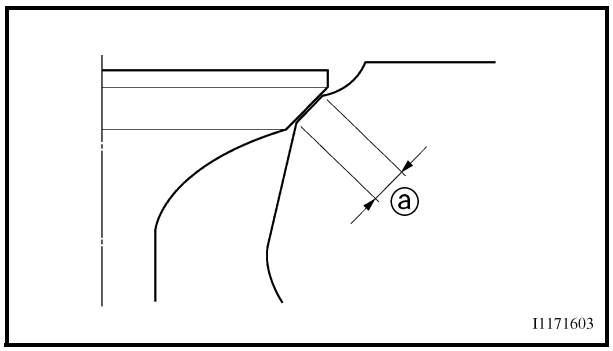


5. Measure:
   • valve stem runout
   Out of specification → Replace.

Runout limit
0.040 mm (0.0016 in)

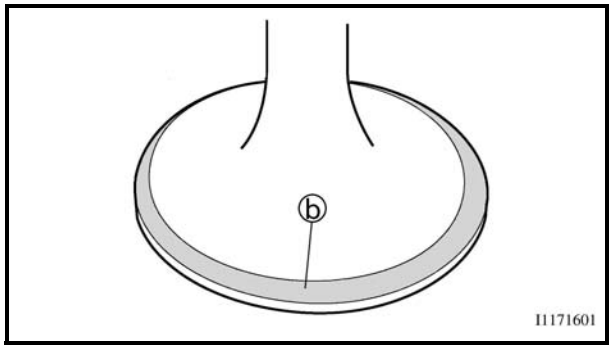
TIP:
- When installing a new valve, always replace the valve guide.
- If the valve is removed or replaced, always replace the valve stem seal.

6. Eliminate:
   • carbon deposits
   (from the valve face and valve seat)
7. Check:
   • valve seats
   Pitting/wear → Reface the valve seat.



8. Measure:
   • valve seat width ⓐ
   Out of specification → Reface the valve seat.

Valve seat width
1.00 ~ 1.20 mm
(0.0394 ~ 0.0472 in)
<Limit>: 1.60 mm (0.0630 in)



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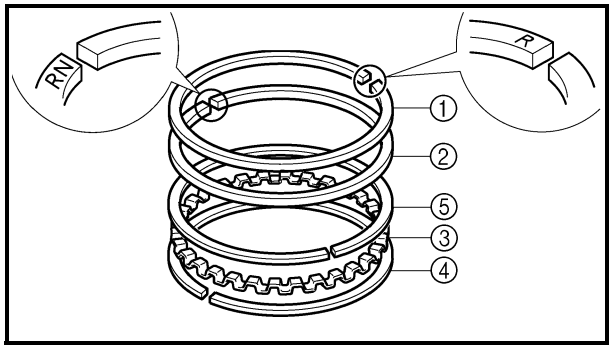
a. Apply Mechanic's blueing dye (Dykem) ⓑ to the valve face.
b. Install the valve into the cylinder head.
c. Press the valve through the valve guide and onto the valve seat to make a clear pattern.
d. Measure the valve seat width. Where the valve seat and valve face made contact, blueing will have been removed.

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 diameter ⓑ –
Piston pin outside diameter ⓐ

Piston-pin-to-piston clearance
0.004 ~ 0.024 mm
(0.0002 ~ 0.0009 in)
<Limit>: 0.074 mm (0.0029 in)

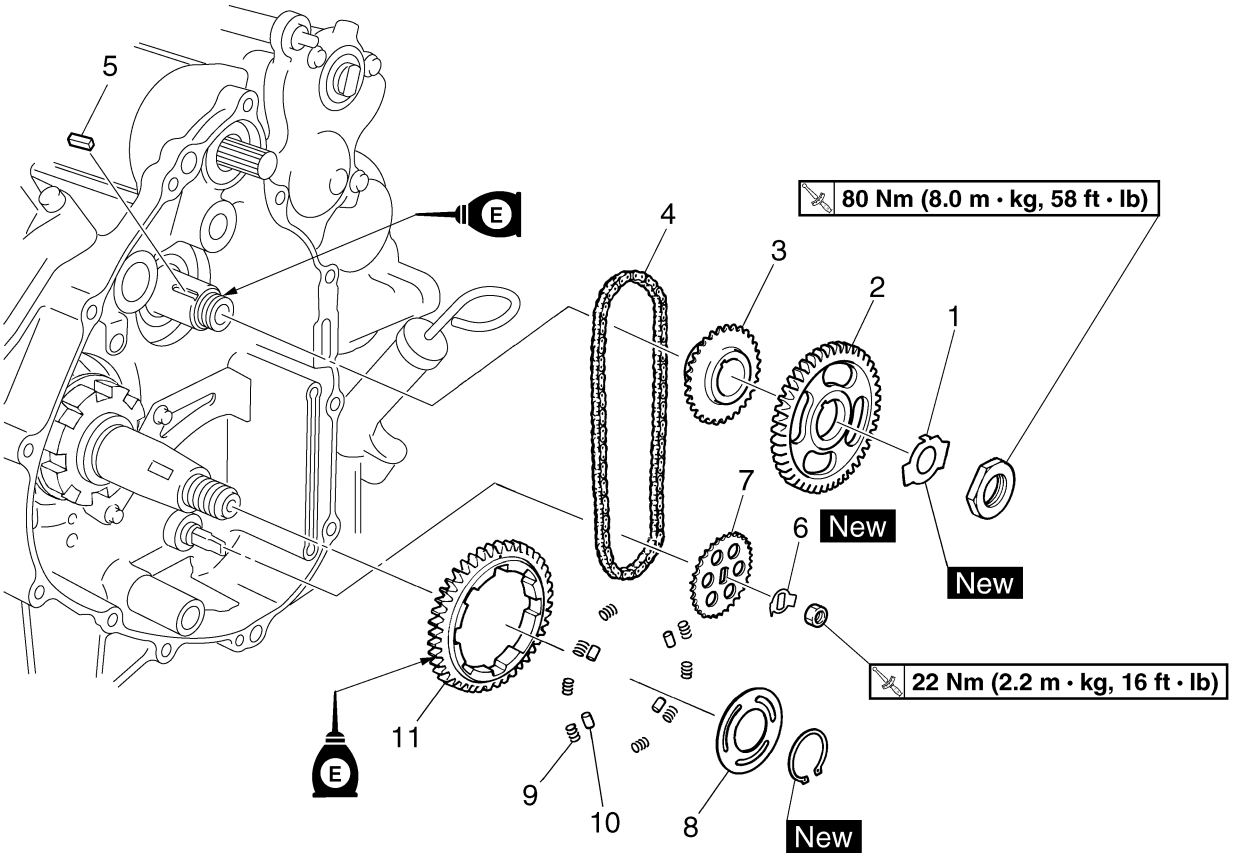


EBS00252
INSTALLING THE PISTON AND CYLINDER

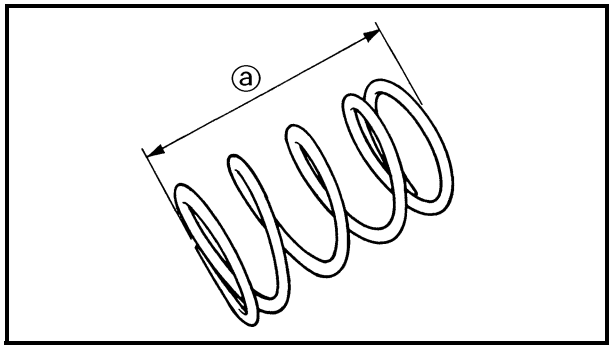
1. Install:
   • top ring ①
   • 2nd ring ②
   • oil ring expander ③
   • lower oil ring rail ④
   • upper oil ring rail ⑤

TIP:
Be sure to install the piston rings so that the manufacturer marks or numbers face up.

BALANCER GEARS AND OIL PUMP GEARS

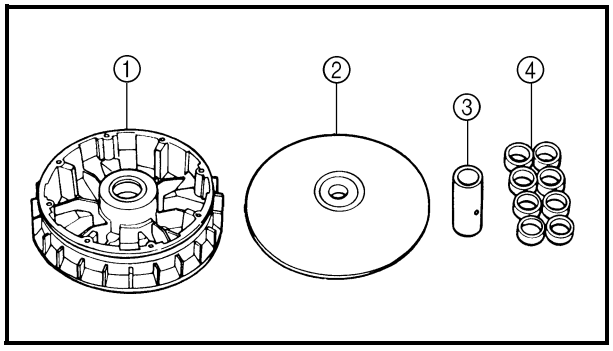


Order	Job/Part	Q'ty	Remarks
	Removing the balancer gears and oil pump gears		Remove the parts in the order listed.
	Starter wheel gear		Refer to "AC MAGNETO".
1	Lock washer	1	Refer to "REMOVING THE BALANCER DRIVEN GEAR AND OIL PUMP DRIVEN GEAR" and "INSTALLING THE BALANCER DRIVE GEAR, BALANCER DRIVEN GEAR, AND OIL PUMP DRIVEN GEAR".
2	Balancer driven gear	1	
3	Oil pump drive gear	1	
4	Chain	1	
5	Straight key	1	



5. Measure:
   • secondary sheave spring free length ⓐ
   Out of specification → Replace the secondary sheave spring.

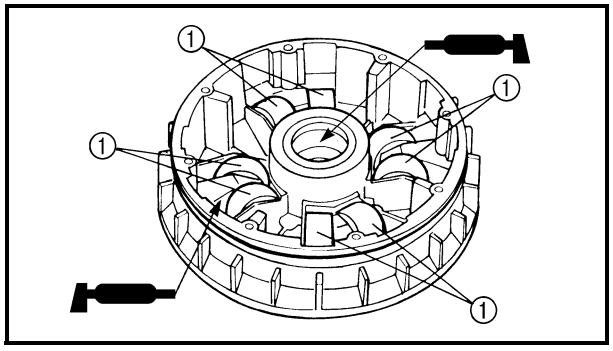
Free length
130.6 mm (5.14 in)
<Limit>: 128.0 mm (5.04 in)



EBS00276
ASSEMBLING THE PRIMARY SHEAVE

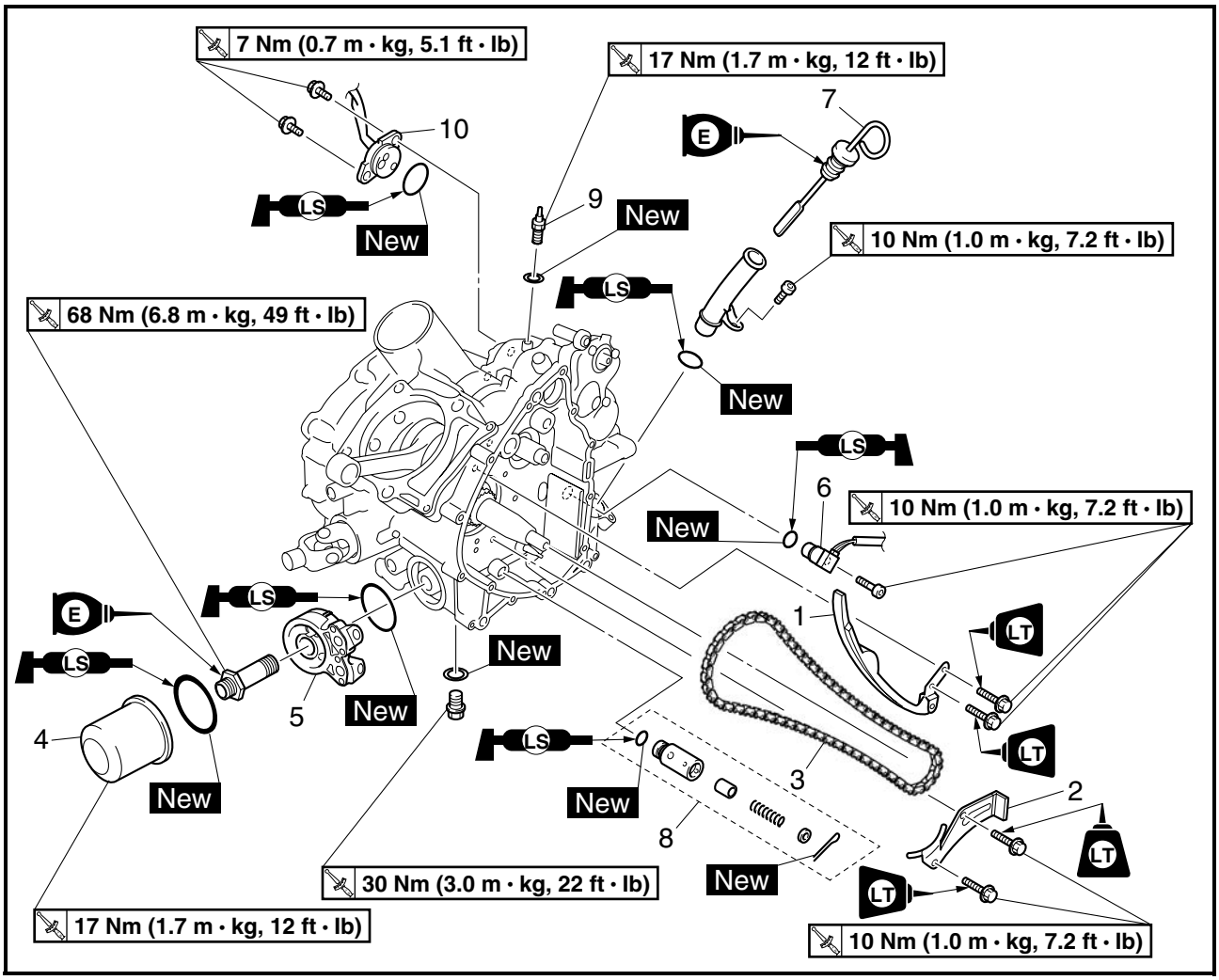
1. Clean:
   • primary sliding sheave face ①
   • primary fixed sheave face ②
   • collar ③
   • weights ④
   • primary sliding sheave cam face

TIP:
Remove any excess grease.

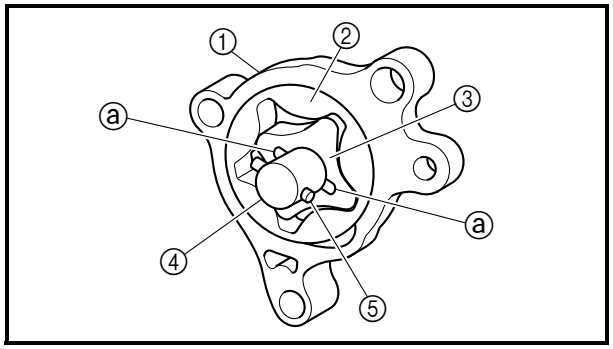


2. Install:
   • weights ①

TIP:
- Apply Yamaha Grizzly grease (90 g) to the whole outer surface of the weights and install.
- Apply Yamaha Grizzly grease (2.5 g) to the inner surface of the collar.
- Apply Yamaha Grizzly grease (2.5 g) to the inner surface of the primary sliding sheave.



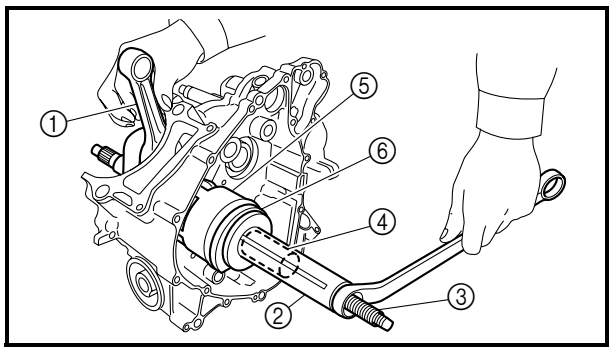
Order	Job/Part	Q'ty	Remarks
4	Oil filter cartridge	1	
5	Oil pipe adapter	1	
6	Speed sensor	1	
7	Dipstick	1	
8	Relief valve assembly	1	
9	Reverse switch	1	
10	Gear position switch	1	
			For installation, reverse the removal procedure.



EBS00318
ASSEMBLING THE OIL PUMP

1. Install:
   - oil pump housing ①
   - oil pump outer rotor ②
   - oil pump inner rotor ③
   - oil pump shaft ④
   - pin ⑤

TIP:
When installing the oil pump shaft ④ align the pin ⑤ with the groove ⓐ in the inner rotor ③.



EBS00362
INSTALLING THE CRANKSHAFT

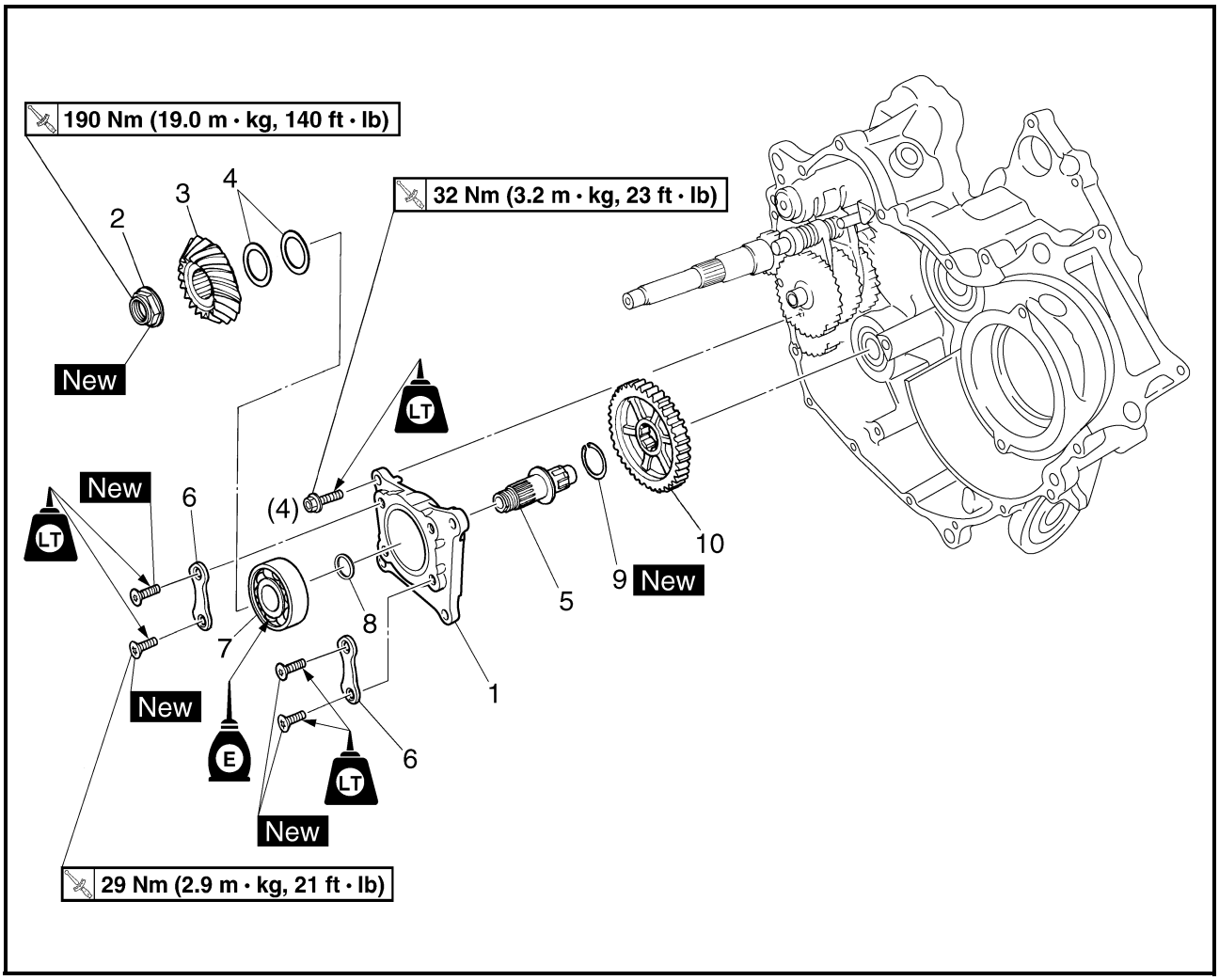
1. Install:
   - crankshaft ①

Crankshaft installer pot ②
90890-01274
YU-90058
Crankshaft installer bolt ③
90890-01275
Bolt
YU-90060
Adapter (M16) ④
90890-04130
Adapter #13
YM-04059
Spacer (crankshaft installer) ⑤
90890-04081
Pot spacer
YM-91044
Spacer ⑥
90890-01309
Pot spacer
YU-90059

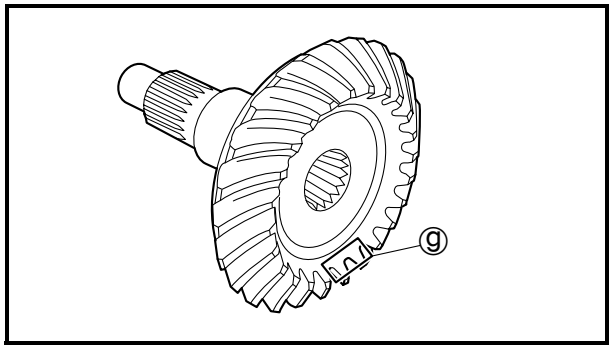
EBS00363

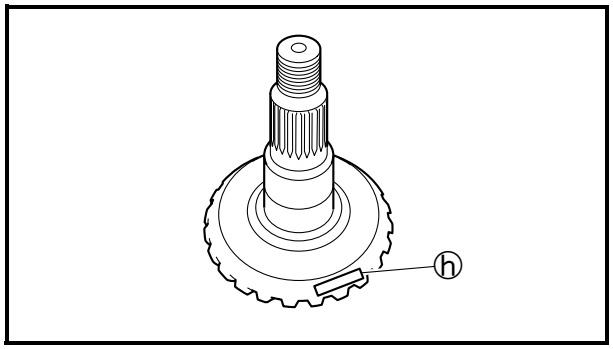
MIDDLE GEAR

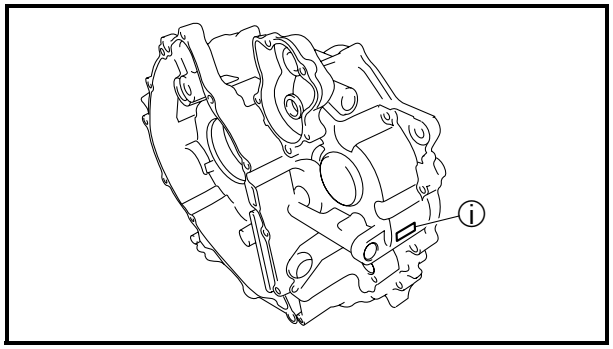
MIDDLE DRIVE SHAFT

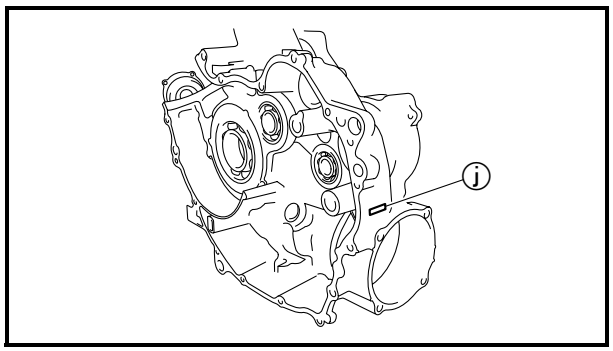


Order	Job/Part	Q'ty	Remarks
	Removing the middle drive shaft		Remove the parts in the order listed.
	Crankcase		Separate. Refer to "CRANKCASE".
1	Bearing housing	1	
2	Middle drive pinion gear nut	1	Refer to "REMOVING THE MIDDLE DRIVE SHAFT" and "INSTALLING THE MIDDLE DRIVE SHAFT".
3	Middle drive pinion gear	1	
4	Middle drive gear shim	*	
5	Middle drive shaft	1	
6	Bearing retainer	2	
7	Bearing	1	
8	Washer	1	
9	Circlip	1	
10	Middle driven gear	1	
			For installation, reverse the removal procedure.









ⓖ = a numeral (usually a decimal number) on the middle driven pinion gear is either added to or subtracted from "49.0"
ⓗ = a numeral (usually a decimal number) on the middle driven pinion gear is either added to or subtracted from "80.5"
ⓘ = a numeral (usually a decimal number) on the right crankcase specifies a thickness of "99.98"
ⓙ = a numeral (usually a decimal number) on the left crankcase specifies a thickness of "8.12"

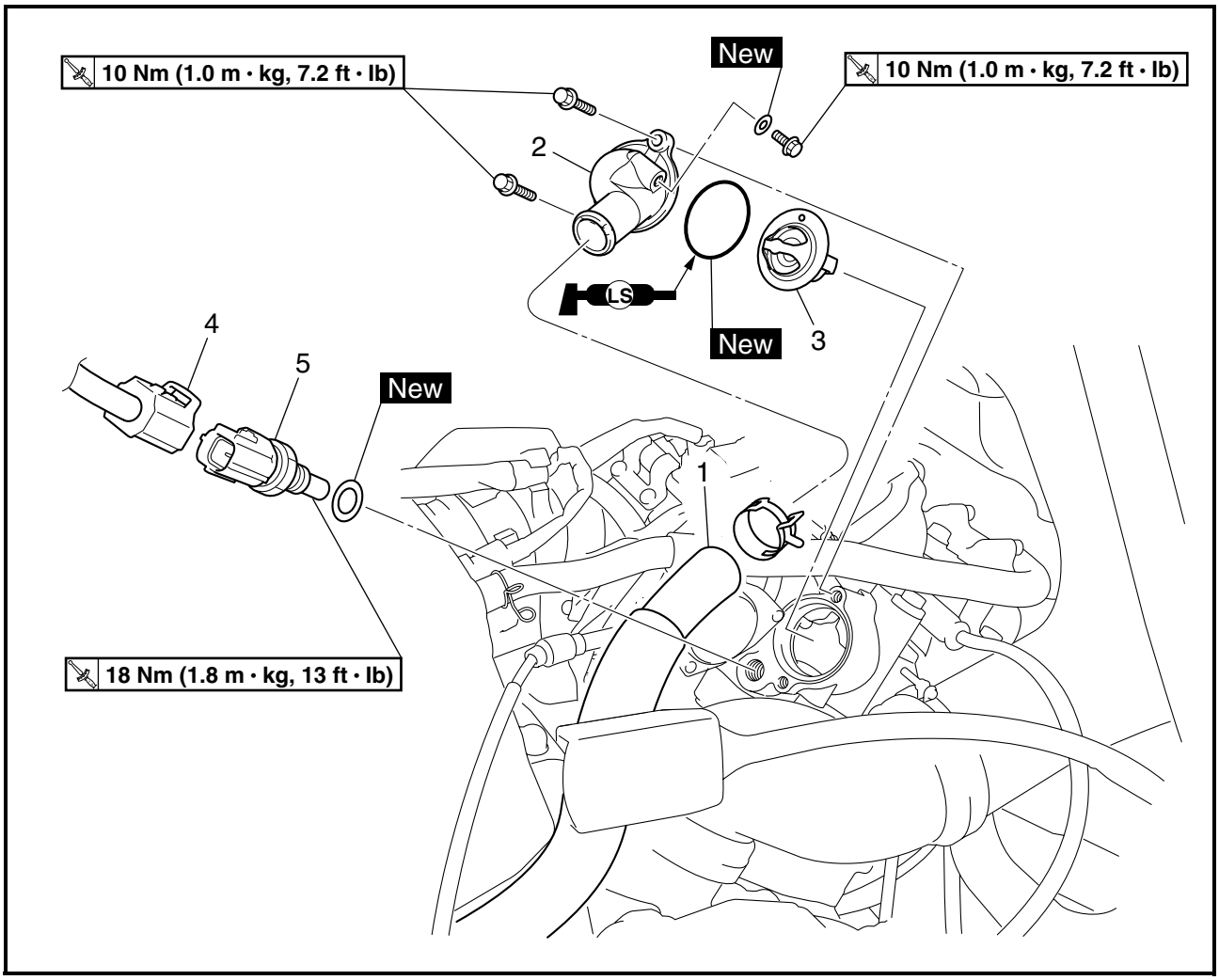
Example:

1) If the bearing housing is marked "+03", ... ⓕ is 77.53
2) If the driven pinion gear is marked "+02", ... ⓖ is 49.02
3) If the driven pinion gear is marked "+02", ... ⓗ is 80.52
4) If the right crankcase is marked "99.98", ... ⓘ is 99.98
5) If the left crankcase is marked "8.12", ... ⓙ is 8.12
6) Therefore, the shim thickness is 0.88 mm.
   "B" = 77.53 – 49.02 + 80.52 – 99.98 – 8.12 – 0.02
   = 0.91
7) Round off the hundredth digit and select the appropriate shim(s).
   In the example above, the calculated number is 0.91. The chart instructs you to round off 1 to 0. Thus, the shim thickness is 0.90 mm (0.035 in).

Hundredths	Round value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

EBS00129

THERMOSTAT



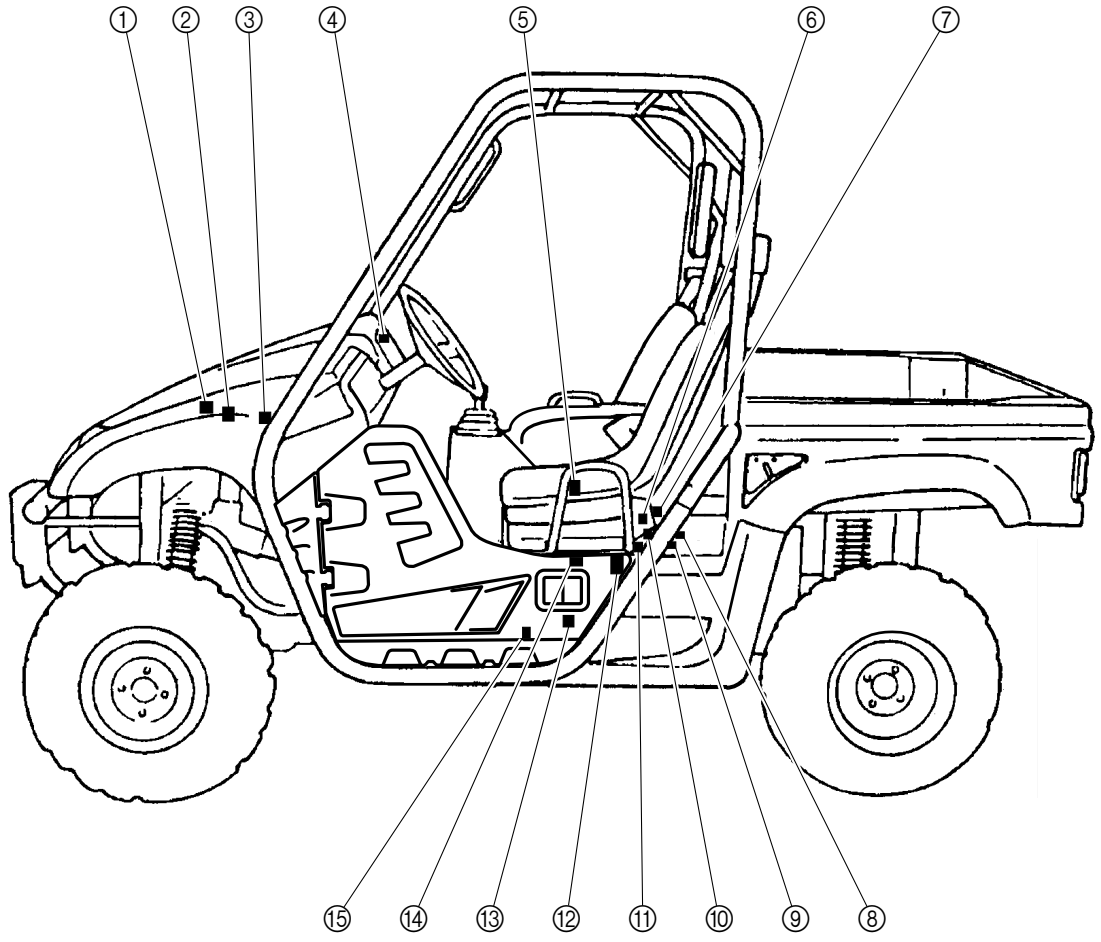
Order	Job/Part	Q'ty	Remarks
	Removing the thermostat		Remove the parts in the order listed.
	Seats/rear console		Refer to "SEATS, REAR CONSOLE AND INSTRUMENT PANELS" in chapter 8.
	Coolant		Drain. Refer to "CHANGING THE COOLANT" in chapter 3.
1	Thermostat outlet hose	1	Disconnect.
2	Thermostat cover	1	Refer to "INSTALLING THE THERMOSTAT".
3	Thermostat	1	
4	Coolant temperature sensor coupler	1	Disconnect.
5	Coolant temperature sensor	1	
			For installation, reverse the removal procedure.

EAS00894

FUEL INJECTION SYSTEM

FUEL INJECTION SYSTEM

① Fuel injection system relay
② ECU (engine control unit)
③ Lean angle sensor
④ Engine trouble warning light
⑤ Intake air temperature sensor
⑥ TPS (throttle position sensor)
⑦ Intake air pressure sensor
⑧ Spark plug
⑨ Coolant temperature sensor
⑩ Fuel injector
⑪ ISC (idle speed control) unit
⑫ Fuel pump
⑬ Crankshaft position sensor
⑭ Ignition coil
⑮ Speed sensor



Actuator operation table

• Actuator operation

Set the differential gear lock switch to “4WD” and then to “LOCK”.

Diagnostic code No.	Item	Actuation	Checking method
d30	Ignition coil	Actuates the ignition coil five times in one-second intervals. The engine trouble warning light also flashes five times.	Check the spark five times. • Connect an ignition checker.
d36	Injector	Actuates the injector five times in one-second intervals.	Check the operating sound of the injector five times.
d50	Fuel injection system relay	Actuates the fuel injection system relay five times in one-second intervals. The engine trouble warning light also flashes five times. (The engine trouble warning light is OFF when the relay is ON, and the engine trouble warning light is ON when the relay is OFF).	Check the operating sound of the fuel injection system relay five times.
d51	Radiator fan motor relay	Actuates the radiator fan motor relay and illuminates the engine trouble warning light five cycles (5 seconds per cycle–2 seconds ON, 3 seconds OFF). (ON 2 seconds, OFF 3 seconds)	Check the operating sound of the radiator fan motor relay five times.
d54	ISC valve	Actuates and fully closes the ISC valve, then opens it to the standby opening position when the engine is started. This operation takes approximately 12 seconds until it is completed. Illuminates the engine trouble warning light.	The ISC unit vibrates when the ISC valve operates.

EAS00908

TROUBLESHOOTING DETAILS

This section describes the countermeasures 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 has been completed, reset the meter display according to the “Reinstatement method”.

Fault code No.:

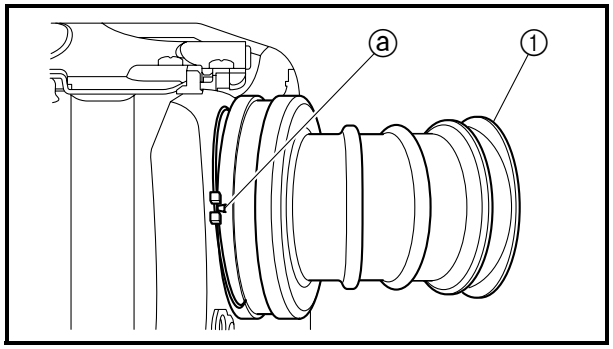
Fault code number displayed on the meter when the engine failed to work normally.

Refer to “Diagnostic code table”.

Diagnostic code No.:

Diagnostic code number to be used when the diagnostic mode is operated. Refer to “DIAGNOSTIC MODE”.

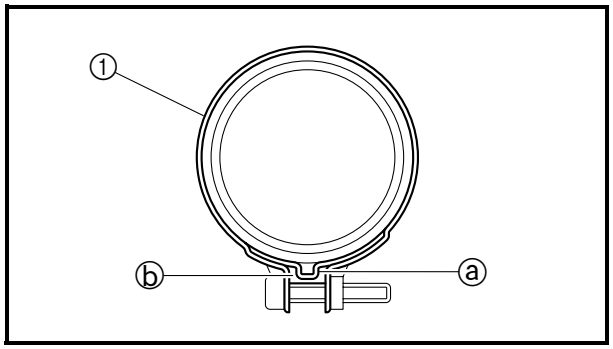
Fault code No.	39	Symptom	Open circuit detected in a injector.	
Diagnostic code No.		d36	Injector	
Order	**Item/components and probable cause**		**Check or maintenance job**	**Reinstatement method**
1	Connections • Injector coupler • Main wire harness-ECU coupler • Main wire harness fuel pump coupler		• Check the couplers for any pins that may be pulled out. • Check the locking condition of the couplers. • If there is a malfunction, repair it and connect the coupler securely.	Cranking the engine. (Connect the fuel injector coupler.)
2	Open or short circuit in the wire harness.		• Repair or replace if there is an open or short circuit. • Between injector coupler and ECU coupler. (red/blue–red/blue) (red–red)	
3	Defective injector.		• Execute the diagnostic mode. (Code No.d36) • Replace if defective. Refer to “CHECKING THE FUEL INJECTOR”.	



INSTALLING THE AIR INTAKE DUCT AND AIR FILTER CASE

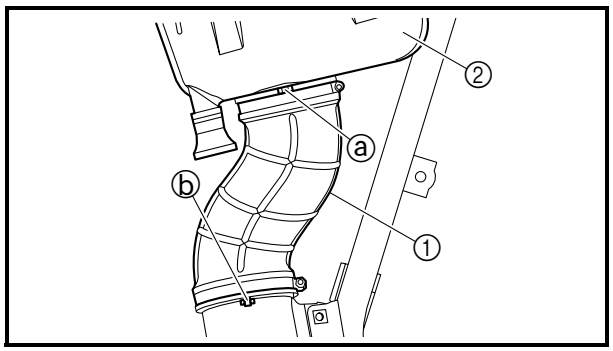
1. Install:
   - air intake duct joint ①

TIP:
Fit the projection ⓐ on the air intake duct joint between the projections on the air intake duct.



2. Install:
   - air intake duct joint clamp ① (throttle body side)

TIP:
Align the projection ⓐ on the air intake duct joint with the gap ⓑ in the air intake duct joint clamp.



3. Install:
   - air filter case joint ①
   - air filter case ②

TIP:
Fit the projections ⓐ and ⓑ on the air filter case joint between the projections on the air intake duct and air filter case.

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a. Wash the throttle body in a petroleum-based solvent.
   Do not use any caustic carburetor cleaning solution.
b. Blow out all of the passages with compressed air.

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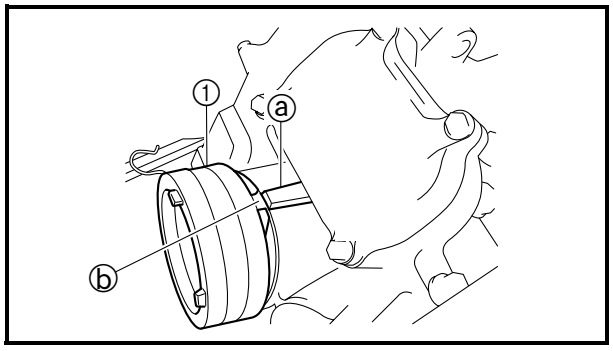
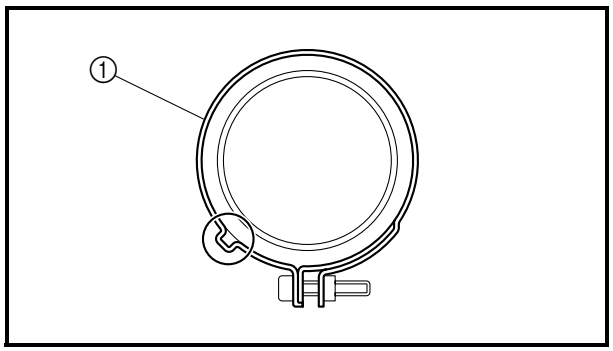


INSTALLING THE THROTTLE BODY ASSEMBLY

1. Install:
   • throttle body joint ①

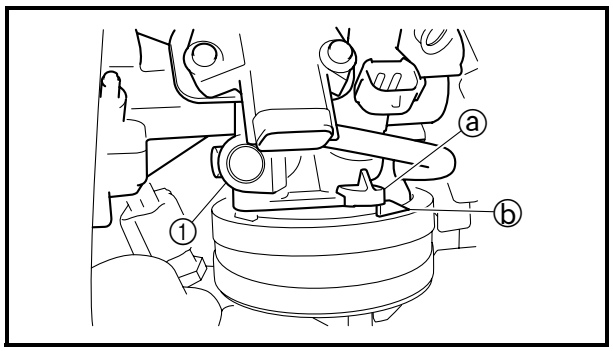
TIP:
Align the projection ⓐ on the cylinder head with the slot ⓑ in the throttle body joint.



2. Install:
   • throttle body joint clamps ①

TIP:
Align the projections on the throttle body joint with the gap in each throttle body joint clamp.

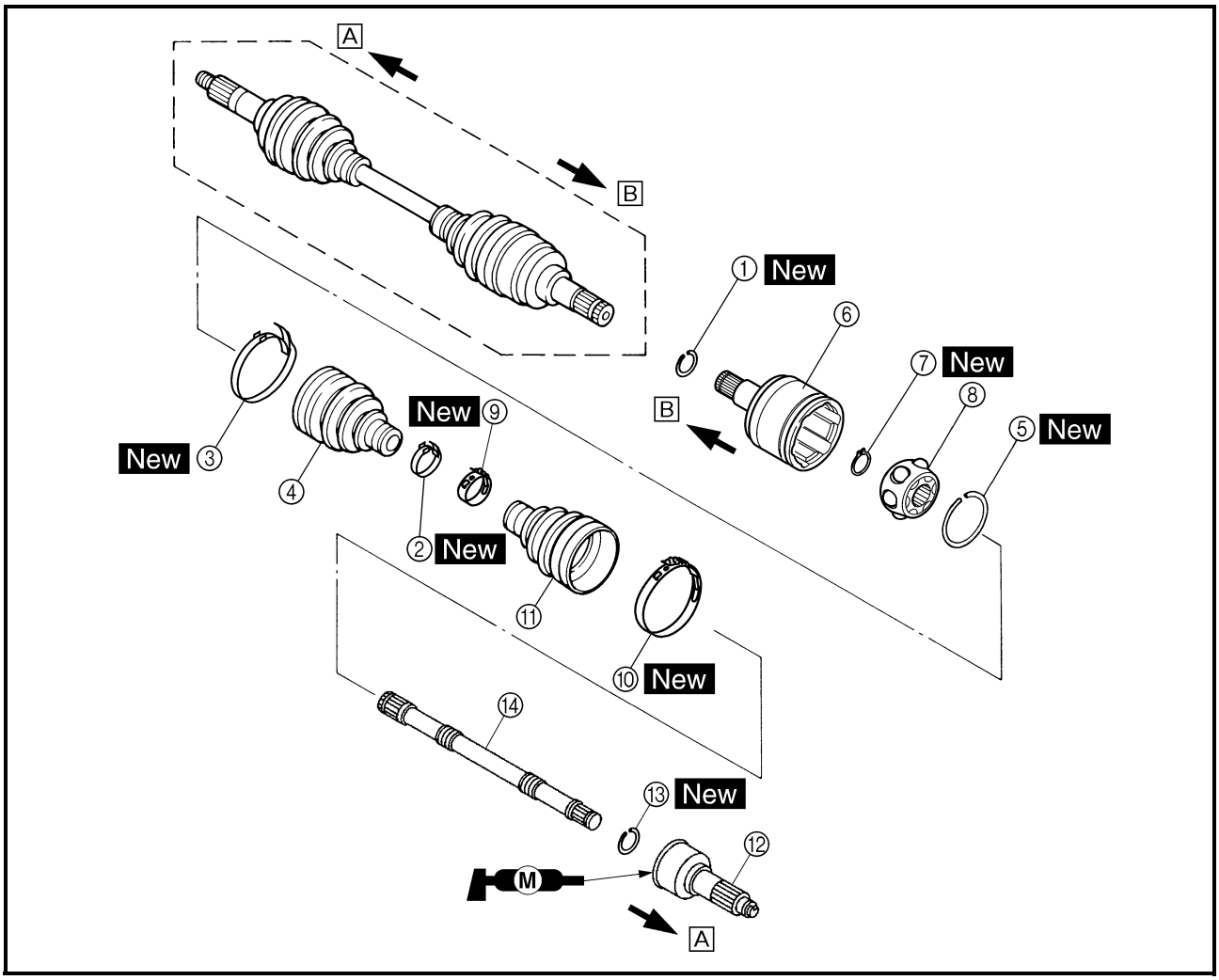
3. Install:
   • air intake duct joint
   • air intake duct joint clamp (throttle body side)
   Refer to “AIR FILTER CASE AND AIR INTAKE DUCT”.



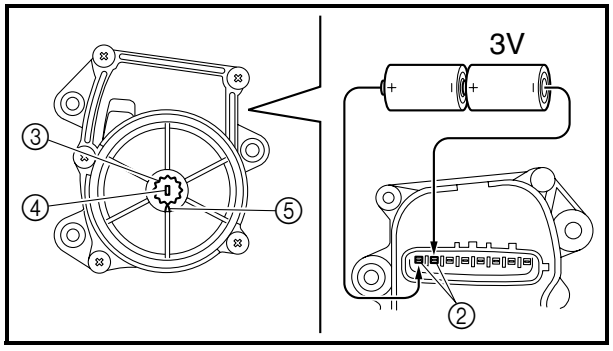
4. Install:
   • throttle body assembly ①

TIP:
Align the projection ⓐ on the throttle body assembly with the tab ⓑ on the throttle body joint.

EBS00159



Order	Job/Part	Q'ty	Remarks
	Disassembling the front constant velocity joints		Remove the parts in the order listed. The following procedure applies to both of the front constant velocity joints.
①	Clip	1	
②	Boot band	1	Refer to "DISASSEMBLING THE FRONT CONSTANT VELOCITY JOINTS" and "ASSEMBLING THE FRONT CONSTANT VELOCITY JOINTS".
③	Boot band	1	
④	Dust boot	1	
⑤	Clip	1	
⑥	Double off-set joint	1	
⑦	Circlip	1	
⑧	Ball bearing	1	
⑨	Boot band	1	
⑩	Boot band	1	
⑪	Dust boot	1	
⑫	Off-set joint	1	



b. Connect two C-size batteries to the gear motor terminal ② to operate the pinion gear ③, and operate it until the mark ④ on the gear is aligned with the mark ⑤ on the gear motor case.

NOTICE

Do not use a 12 V battery to operate the pinion gear.

c. Carefully install the differential gear motor onto the differential gear assembly, making sure that the shift fork sliding gear remains in the 2WD mode position.

NOTICE

If the position of the shift fork sliding gear is moved, the position of the differential gear and the indicator light display may differ, and the 2WD or differential lock mode may not be activated.

d. Tighten the differential gear motor bolts.

	Differential gear motor bolt **11 Nm (1.1 m · kg, 8.0 ft · lb)**

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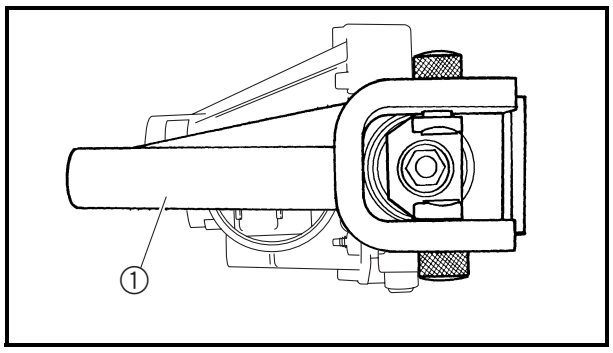


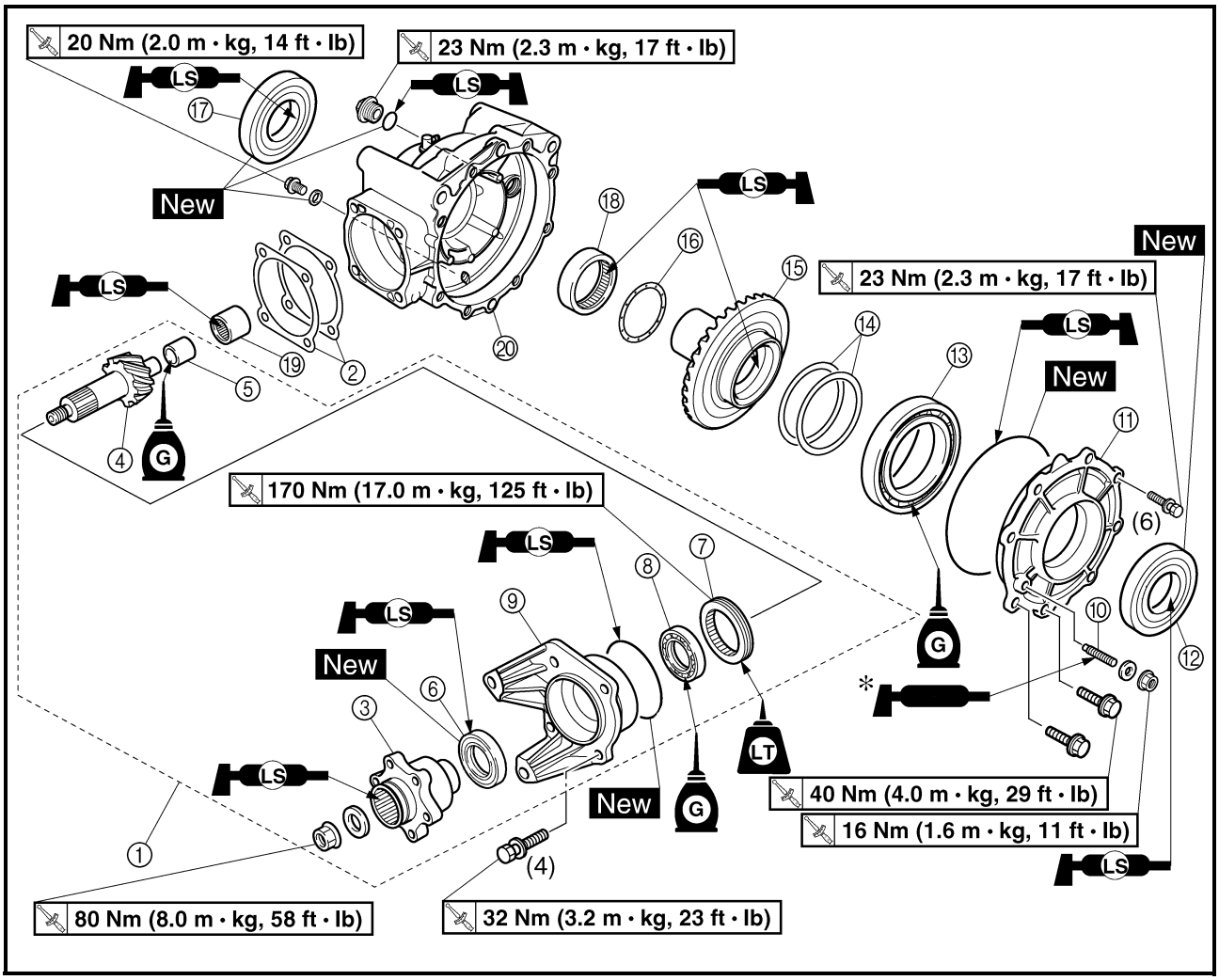
3. Install:
   - universal joint yoke
   - washer
   - nut — **62 Nm (6.2 m · kg, 45 ft · lb)**

   Use a universal joint holder ①.

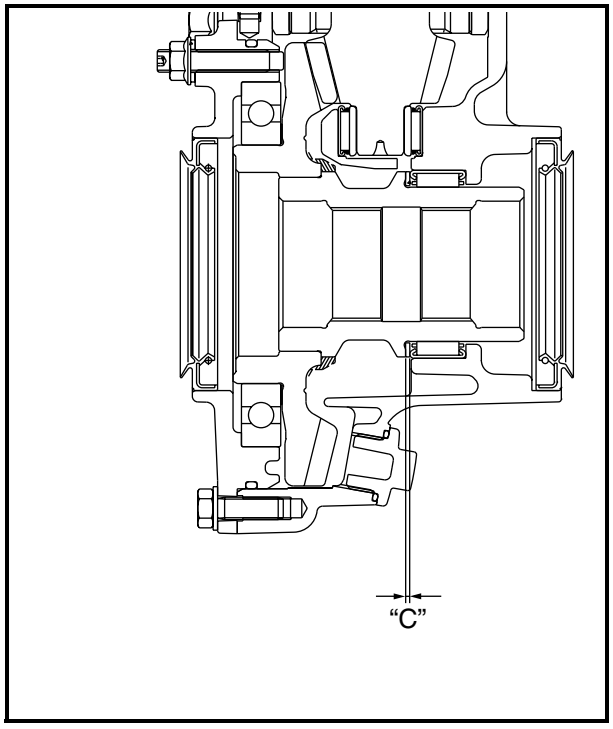
	Universal joint holder **90890-04062, YM-04062**

TIP:

Apply locking agent (LOCTITE®) to the nut threads.



Order	Job/Part	Q'ty	Remarks
⑪	Ring gear bearing housing	1	**TIP:** Working in a crisscross pattern, loosen each bolt 1/4 of a turn. After all the bolts are loosened, remove them.
⑫	Oil seal	1	
⑬	Bearing	1	
⑭	Ring gear shim	*	
⑮	Ring gear	1	
⑯	Thrust washer	1	
⑰	Oil seal	1	



Selecting thrust washer

1. Measure:
   - ring gear thrust clearance "C"

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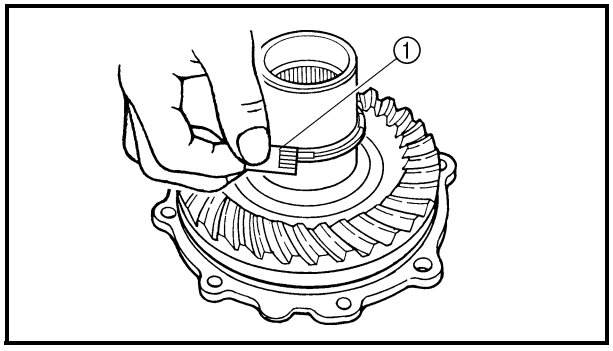
a. Place four pieces of Plastigauge® between the originally fitted thrust washer and the ring gear.
b. Install the final gear assembly and tighten the bolts to specification.

M8 bolts (ring gear bearing housing)
23 Nm (2.3 m · kg, 17 ft · lb)
M10 bolts (ring gear bearing housing)
40 Nm (4.0 m · kg, 29 ft · lb)

TIP:
Do not turn the drive pinion gear and ring gear when measuring the clearance with Plastigauge®.



c. Remove the final gear assembly.
d. Measure the thrust clearance. Calculate the width of the flattened Plastigauge® ①.

Ring gear thrust clearance
0.1 ~ 0.2 mm (0.004 ~ 0.008 in)

e. If out of specification, select the correct washer.

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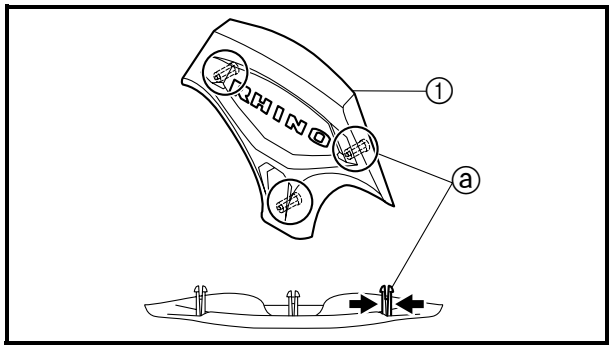
REMOVING THE STEERING WHEEL

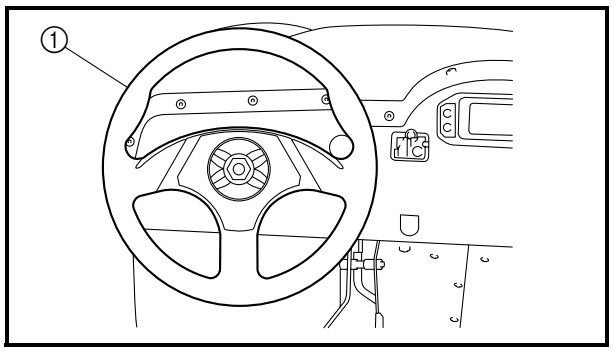
1. Turn the steering wheel so that it is straight and the front wheels are pointing straight ahead.



2. Remove:
   - steering wheel cover ①
   - steering wheel

TIP:

While pushing the ends of the projections ⓐ together, remove the steering wheel cover from the steering wheel.



INSTALLING THE STEERING WHEEL

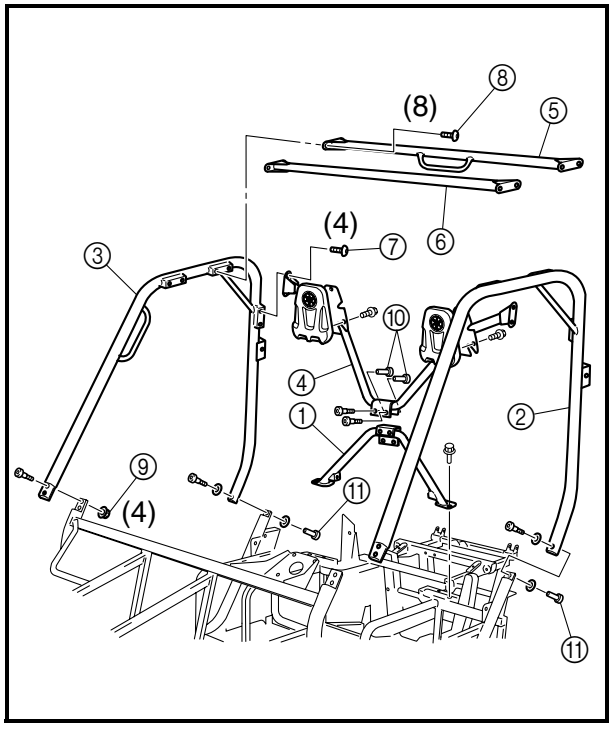
1. Install:
   - steering wheel ①

35 Nm (3.5 m · kg, 25 ft · lb)

TIP:

Install the steering wheel onto the steering column so that it is straight as shown in the illustration.

2. Operate the vehicle at low speeds and make sure that the steering wheel is straight when the vehicle is advancing straight ahead.
3. Install:
   - steering wheel cover



INSTALLING THE ENCLOSURE

1. Install:
   - lower support frame ①

     64 Nm (6.4 m · kg, 46 ft · lb)
2. Install:
   - left side frame ②
   - right side frame ③
   - upper support frame ④
   - rear top frame ⑤
   - front top frame ⑥

TIP:

Do not fully tighten the bolts and nuts.

3. Tighten:
   - upper support frame and side frame bolts ⑦

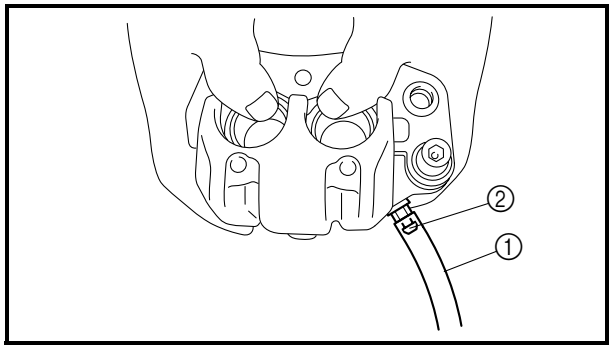
     65 Nm (6.5 m · kg, 47 ft · lb)
   - top frame and side frame bolts ⑧

     65 Nm (6.5 m · kg, 47 ft · lb)
   - side frame and frame nuts (front side) ⑨

     65 Nm (6.5 m · kg, 47 ft · lb)
   - lower support frame and upper support frame nuts ⑩

     22 Nm (2.2 m · kg, 16 ft · lb)
   - side frame and frame nuts (rear side) ⑪

     22 Nm (2.2 m · kg, 16 ft · lb)



2. Install:
   • brake pads
   • brake pad spring

TIP:
Always install new brake pads and brake pad spring as a set.

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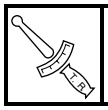
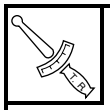
a. Connect a suitable hose ① tightly to the brake caliper bleed screw ②. Put the other end of this hose into an open container.
b. Loosen the brake caliper bleed screw and, using a finger, push the caliper piston into the brake caliper.
c. Tighten the brake caliper bleed screw.

	**Brake caliper bleed screw** **5 Nm (0.5 m · kg, 3.6 ft · lb)**

d. Install the new brake pads and a new brake pad spring.
e. Tighten the brake pad holding bolts and brake caliper bolts.

	**Brake pad holding bolt** **17 Nm (1.7 m · kg, 12 ft · lb)** **Brake caliper bolt** **48 Nm (4.8 m · kg, 35 ft · lb)**

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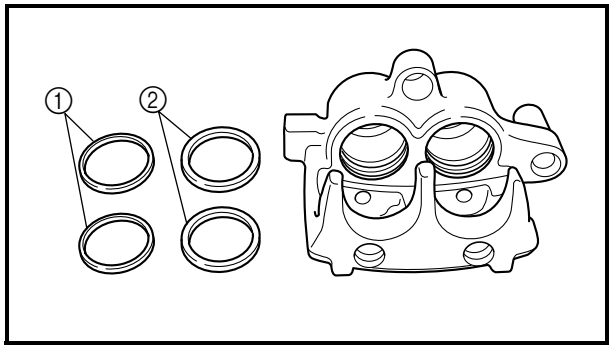
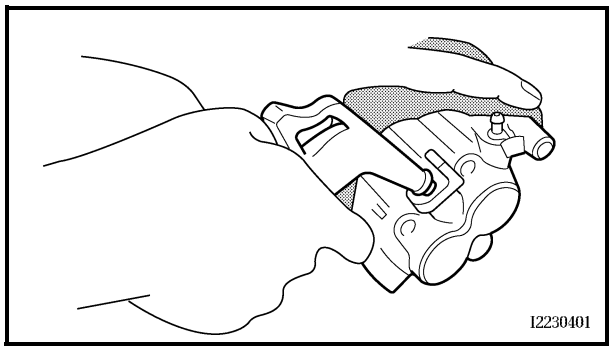
3. Check:
   • brake fluid level
   Refer to “CHECKING THE BRAKE FLUID LEVEL” in chapter 3.
4. Check:
   • brake pedal operation
   Soft or spongy feeling → Bleed the brake system.
   Refer to “BLEEDING THE HYDRAULIC BRAKE SYSTEM” in chapter 3.





EBS00427

DISASSEMBLING THE FRONT AND REAR BRAKE CALIPERS

1. Remove:
   - brake caliper pistons
   - brake caliper dust seals ①
   - brake caliper piston seals ②

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a. Blow compressed air into the hose joint opening to force out the caliper piston from the brake caliper body.

⚠ WARNING

- **Never try to pry out a caliper piston.**
- **Cover the caliper piston with a rag. Be careful not to get injured when the piston is expelled from the caliper cylinder.**

b. Remove the dust seals and piston seals.

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EB702040

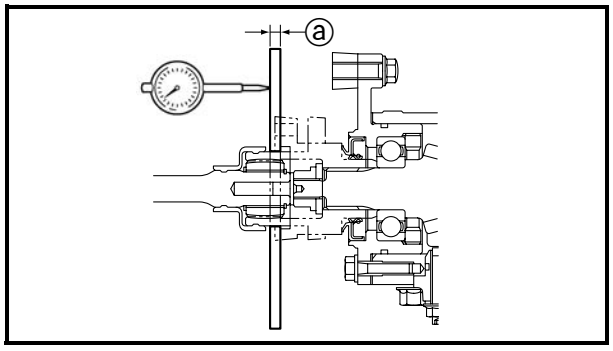
CHECKING THE FRONT AND REAR BRAKE CALIPERS

Recommended brake component replacement schedule:	
Brake pads	**As required**
Piston seals, dust seals	**Every two years**
Brake hoses	**Every four years**
Brake fluid	**Replace when brakes are disassembled.**

⚠ WARNING

All internal brake components should be cleaned in new brake fluid only. Do not use solvents as they will cause seals to swell and distort.

EB702040
CHECKING THE PARKING BRAKE
1. Check:
   - parking brake piston
     Scratches/rust/wear → Replace the parking brake assembly.
   - parking brake body
     Cracks/damage → Replace.

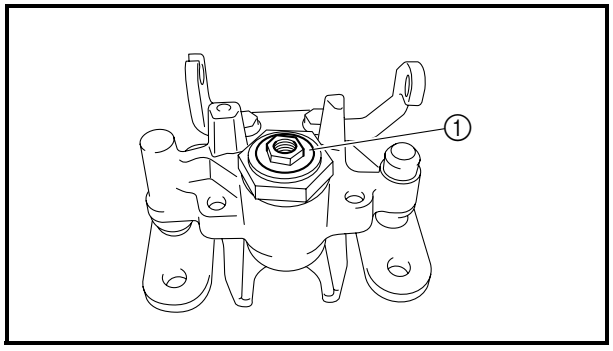


CHECKING THE PARKING BRAKE DISC
1. Check:
   - brake disc
     Galling/damage → Replace.
2. Measure:
   - brake disc deflection
     Out of specification → Replace.

Brake disc maximum deflection
0.10 mm (0.004 in)

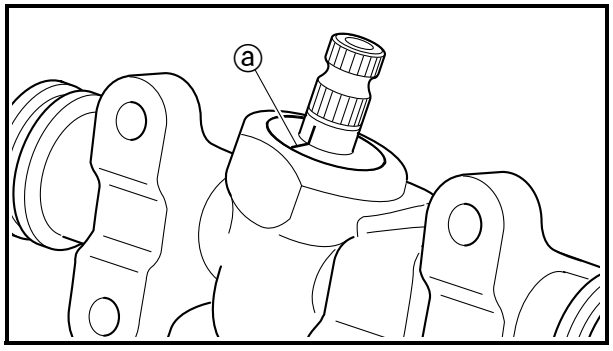
   - brake disc thickness ⓐ
     Out of specification → Replace.

Brake disc minimum thickness
3.0 mm (0.12 in)



ASSEMBLING THE PARKING BRAKE
1. Install:
   - O-ring New
   - parking brake arm shaft ①

TIP:
Fully turn in the parking brake arm shaft.

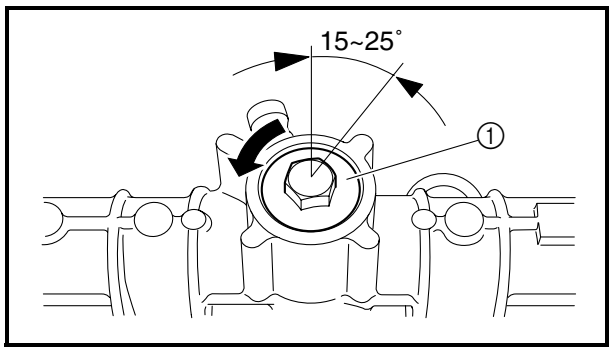


2. Install:
   - bearing
   - circlips New
   - pinion gear
   - oil seal New

TIP:
After centering the rack gear, make two alignment marks ⓐ on the pinion gear and the steering rack assembly to mark the position of the pinion gear. This is necessary to install the steering joint to the pinion gear properly.

3. Apply lithium-soap-based grease to the gear surface of the rack gear.

	Lithium-soap-based grease **5 ~ 10 g (0.2 ~ 0.4 oz)**



4. Adjust:
   - rack gear-pinion gear backlash

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a. Install the pressure pad, spring, and adjuster.
b. Tighten the adjuster ①.

	Adjuster **4 Nm (0.4 m · kg, 2.9 ft · lb)** **LOCTITE®**

c. Loosen the adjuster 15 ~ 25°.

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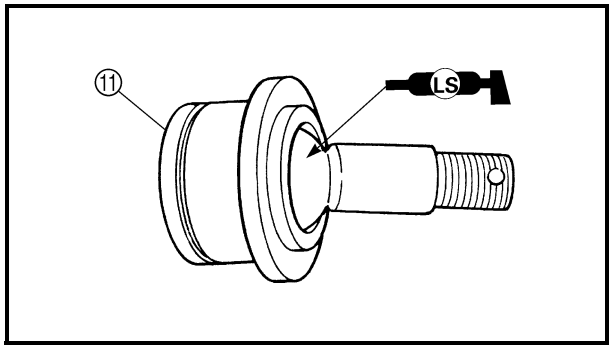
5. Install:
   - dust boots
   - plastic locking tie New
   - tie-rod end
   - tie-rod end locknut

40 Nm (4.0 m · kg, 29 ft · lb)

INSTALLING THE STEERING SYSTEM

1. Adjust:
   - toe-in

   Refer to “ADJUSTING THE TOE-IN” in chapter 3.



j. Apply lithium-soap base grease to the new ball joint ⑪.
k. Install a new rubber boot and new circlip.

TIP:
Always use a new ball joint set.

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HANDLING THE FRONT SHOCK ABSORBERS AND GAS CYLINDERS
(For models equipped with gas-oil damper shock absorbers)

⚠ WARNING

This front shock absorber and gas cylinder contain highly compressed nitrogen gas. Before handling the front shock absorber or gas cylinder, 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 front shock absorber and gas cylinder.

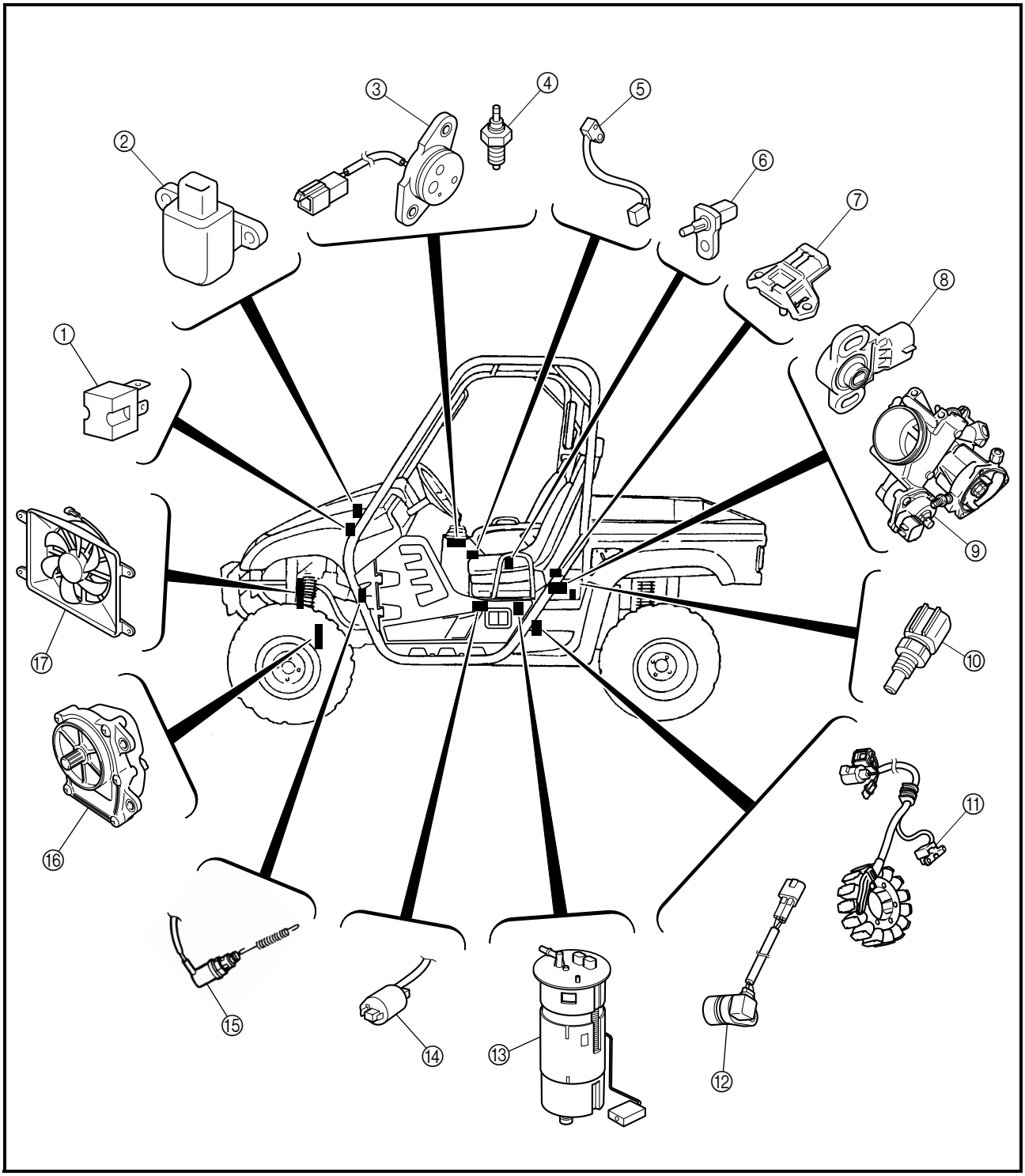
- **Do not tamper or attempt to open the front shock absorber or gas cylinder.**
- **Do not subject the front shock absorber or gas cylinder to an open flame or any other source of high heat. High heat can cause an explosion due to excessive gas pressure.**
- **Do not deform or damage the front shock absorber or gas cylinder in any way. If the front shock absorber, gas cylinder or both are damaged, damping performance will suffer.**

EB800000

ELECTRICAL

ELECTRICAL COMPONENTS

① Diode
② Lean angle sensor
③ Gear position switch
④ Reverse switch
⑤ Parking brake switch
⑥ Intake air temperature sensor
⑦ Intake air pressure sensor
⑧ TPS (throttle position sensor)
⑨ ISC (idle speed control) unit
⑩ Coolant temperature sensor
⑪ Crankshaft position sensor
⑫ Speed sensor
⑬ Fuel pump
⑭ Ignition coil
⑮ Brake light switch
⑯ Differential gear motor
⑰ Radiator fan motor



EBS01032

3. Spark plug

- Check the condition of the spark plug.
- Check the spark plug type.
- Measure the spark plug gap.
  Refer to “CHECKING THE SPARK PLUG” in chapter 3.

Standard spark plug
CPR7EA-9 (NGK)
Spark plug gap
0.8 ~ 0.9 mm (0.031 ~ 0.035 in)

- Is the spark plug in good condition, is it of the correct type, and is its gap within specification?

YES

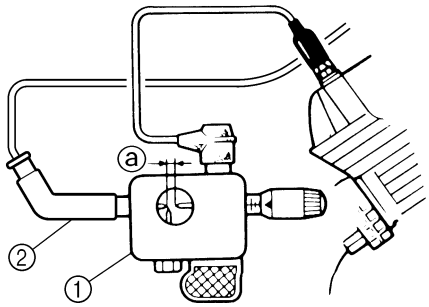
NO

Re-gap or replace the spark plug.

EBS01034

4. Ignition spark gap

- Disconnect the spark plug cap from the spark plug.
- Connect the ignition checker ① as shown.
  ② Spark plug cap
- Measure the ignition spark gap ⓐ.
- Crank the engine by setting the main switch to “START” and gradually increase the spark gap until a misfire occurs.



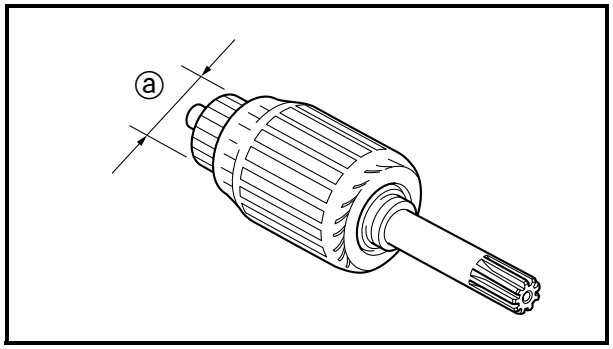
Minimum ignition spark gap
6.0 mm (0.24 in)

- Is there a spark and is the spark gap within specification?

NO

YES

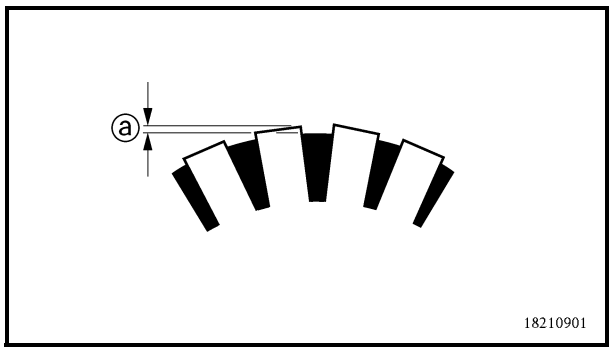
The ignition system is OK.



EBS01064
CHECKING THE STARTER MOTOR

1. Check:
   - commutator
     Dirt → Clean with 600-grit sandpaper.
2. Measure:
   - commutator diameter ⓐ
     Out of specification → Replace the starter motor.

	Commutator wear limit **27 mm (1.06 in)**



3. Measure:
   - mica undercut ⓐ
     Out of specification → Scrape the mica to the proper measurement with a hacksaw blade that has been grounded to fit the commutator.

	Mica undercut **0.70 mm (0.03 in)**

TIP:
The mica of the commutator must be undercut to ensure proper operation of the commutator.

4. Measure:
   - armature assembly resistances (commutator and insulation)
     Out of specification → Replace the starter motor.

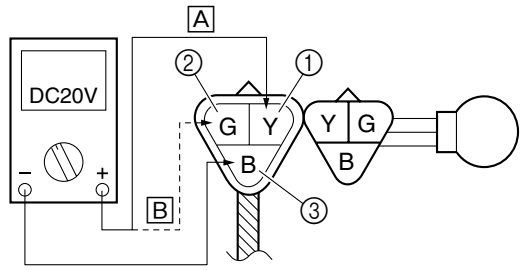
3. Voltage

- Connect the pocket tester (DC 20 V) to the headlight couplers as shown.

A When the light switch is set to "HI".
B When the light switch is set to "LO".

Headlight coupler (wire harness side)

Headlight
Positive tester probe →
yellow ① or green ②
Negative tester probe → black ③



- Set the main switch to "ON".
- Set the light switch to "LO" or "HI".
- Measure the voltage (12 V) of yellow ① or green ② on the headlight coupler (wire harness side).
- Is the voltage within specification?

YES

This circuit is OK.

NO

The wiring circuit from the main switch to the headlight coupler is faulty and must be repaired.

2. The taillight fails to come on.

1. Taillight bulb and socket

- Check the taillight bulb and socket for continuity.
  Refer to "CHECKING THE BULBS AND BULB SOCKETS".
- Are the taillight bulb and socket OK?

YES

NO

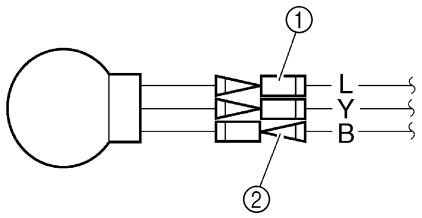
Replace the taillight bulb, socket or both.

2. Voltage

- Connect the pocket tester (DC 20 V) to the tail/brake light connectors as shown.

Tail/brake light connectors (wire harness side)

Positive tester probe → blue ①
Negative tester probe → black ②



- Set the main switch to "ON".
- Set the light switch to "LO" or "HI".
- Measure the voltage (12 V) of blue ① on the tail/brake light connectors (wire harness side).
- Is the voltage within specification?

YES

This circuit is OK.

NO

The wiring circuit from the main switch to the tail/brake light connectors is faulty and must be repaired.

EBS01083

6. The coolant temperature warning light does not come on when the main switch is set to "ON", or if the coolant temperature warning light does not come on when the temperature is high (more than 122 °C (251.6 °F)).

EBS00812

1. Coolant temperature sensor

- Remove the coolant temperature sensor from the cylinder head.
- Connect the pocket tester ($\Omega \times 100$) to the coolant temperature sensor ① as shown.
- Immerse the coolant temperature sensor in a container filled with coolant ②.

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

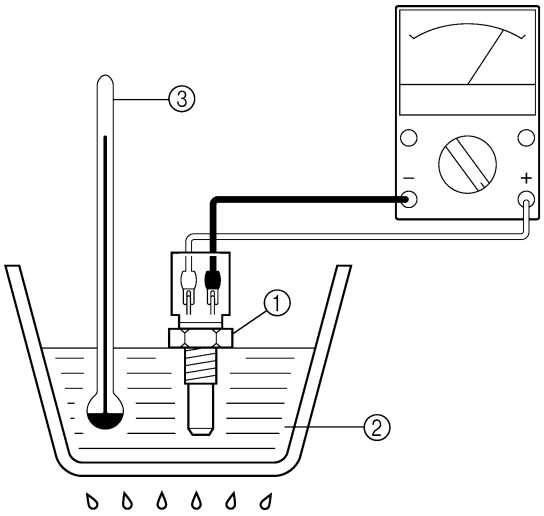
- Place a thermometer ③ in the coolant.
- Slowly heat the coolant, and then let it cool to the specified temperature indicated in the table.
- Measure the coolant temperature sensor resistance.

Coolant temperature sensor resistance
290 ~ 354 Ω at 80 °C (176 °F)

⚠ 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.**

Coolant temperature sensor
18 Nm (1.8 m · kg, 13 ft · lb)



- Does the coolant temperature sensor operate properly?

YES

NO

Replace the coolant temperature sensor.

2. Wiring

- Check the wiring circuit from the coolant temperature sensor to ECU (green/yellow) and ECU to meter assembly (yellow/blue).
- Is the wiring circuit properly connect and without defects?

YES

NO

Properly connect or repair the wiring circuit.

TROUBLESHOOTING

The fuel pump fails to operate.

Check:
1. main, ignition, and fuel injection system fuses
2. battery
3. main switch
4. fuel injection system relay
5. fuel pump
6. wiring connections
   (the entire fuel pump system)

TIP:
- Before troubleshooting, remove the following part(s):

1. rear console

- Troubleshoot with the following special tool(s).

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

EBS01043

1. Main, ignition, and fuel injection system fuses

- Check the main, ignition, and fuel injection system fuses for continuity.
  Refer to "CHECKING THE FUSES" in chapter 3.
- Are the main, ignition, and fuel injection system fuses OK?

YES

NO → Replace the fuse(s).

EBS01044

2. Battery

- Check the condition of the battery.
  Refer to "CHECKING AND CHARGING THE BATTERY" in chapter 3.

Minimum open-circuit voltage
12.8 V or more at 20 °C (68 °F)

- Is the battery OK?

YES

NO →
- Clean the battery terminals.
- Recharge or replace the battery.

EBS01041

3. Main switch

- Check the main switch for continuity.
  Refer to "CHECKING THE SWITCHES".
- Is the main switch OK?

YES

NO → Replace the main switch.

EBS00542

FAULTY GEAR SHIFTING

HARD SHIFTING

Refer to “FAULTY CLUTCH PERFORMANCE”.

SHIFT LEVER DOES NOT MOVE

Shift drum, shift forks
- Groove jammed with impurities
- Seized shift fork
- Bent shift fork guide bar

Transmission
- Seized transmission gear
- Jammed impurities
- Incorrectly assembled transmission

Shift guide
- Broken shift guide

JUMPS OUT OF GEAR

Shift forks
- Worn shift fork

Shift drum
- Improper thrust play
- Worn shift drum groove

Transmission
- Worn gear dog

EBS00543

FAULTY CLUTCH PERFORMANCE

ENGINE OPERATES BUT VEHICLE WILL NOT MOVE

V-belt
- Bent, damaged or worn V-belt
- V-belt slips

Primary pulley cam and primary pulley slider
- Damaged or worn primary pulley cam
- Damaged or worn primary pulley slider

Transmission
- Damaged transmission gears

CLUTCH SLIPPING

Clutch spring
- Damaged, loose or worn clutch shoe spring

Clutch shoe
- Damaged or worn clutch shoe

Primary sliding sheave
- Seized primary sliding sheave

POOR STARTING PERFORMANCE

V-belt
- V-belt slips
- Oil or grease on the V-belt

Primary sliding sheave
- Faulty operation
- Worn pin groove
- Worn pin

Clutch shoe
- Bent, damaged or worn clutch shoe

EBS00002

IMPORTANT

This manual was produced by the Yamaha Motor Company 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, so it is assumed that anyone who uses this book to perform maintenance and repairs on Yamaha vehicle has a basic understanding of the mechanical ideas and the procedures of vehicle repair. Repairs attempted by anyone without this knowledge are likely to render the vehicle unsafe and unfit for use.

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

Yamaha Motor Company, Ltd. is continually striving to improve all 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

- This Service Manual contains information regarding periodic maintenance to the emission control system. Please read this material carefully.
- Designs and specifications are subject to change without notice.

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.