Electrical System

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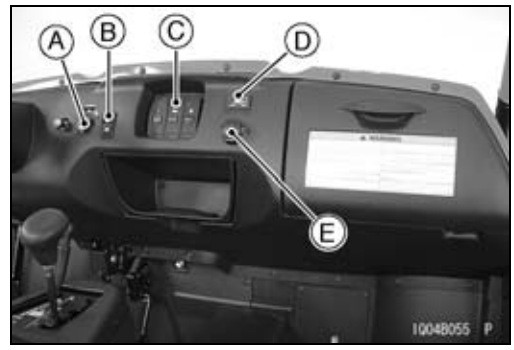
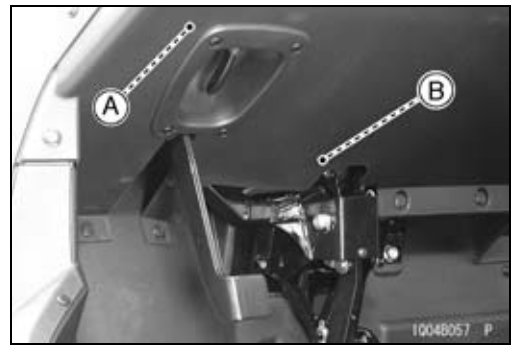
Parts Location

Ignition Switch [A]
2WD/4WD Shift Switch [B]
Indicator Lights [C]
Hour Meter [D]
Accessory Connector (12 V 120 W) (Power Outlet) [E]

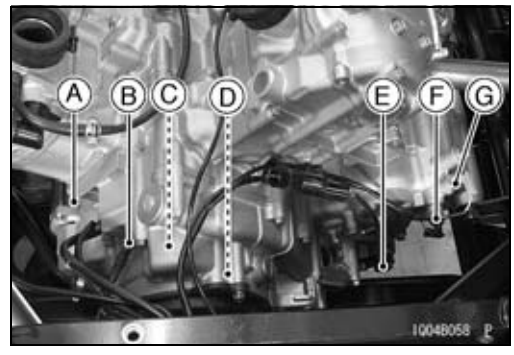


Lighting Switch [A]

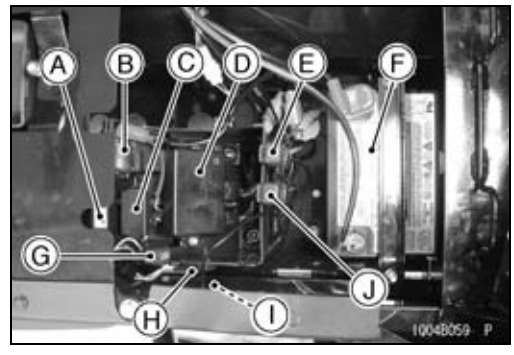
Brake Light Switch [A]
Parking Brake Light Switch [B]



Starter Motor [A]
Engine Ground Terminal [B]
Crankshaft Sensor [C]
Alternator [D]
Forward/Reverse Detecting Sensor [E]
Reverse Switch [F]
Neutral Switch [G]

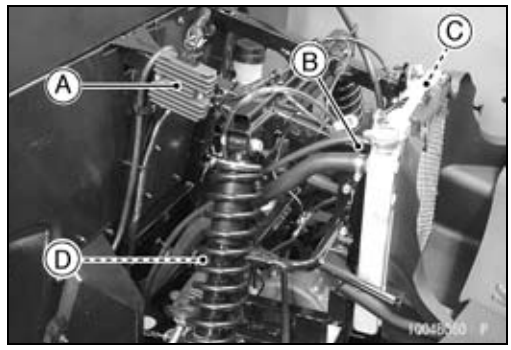


Actuator Controller [A]
Starter Relay [B]
Fuse Box [C]
Igniter [D]
Starter Circuit Relay (Brake) [E]
Battery [F]
Radiator Fan Breaker [G]
Air Temperature Sensor [H]
Frame Ground Terminal [I]
Starter Circuit Relay (Neutral) [J]

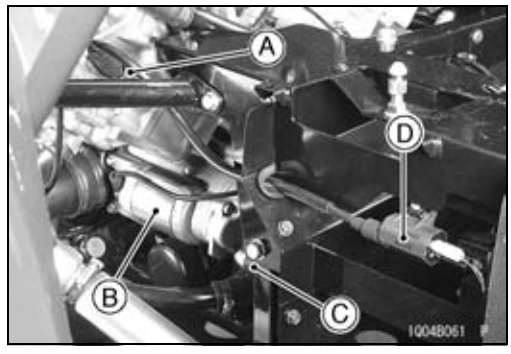


Parts Location

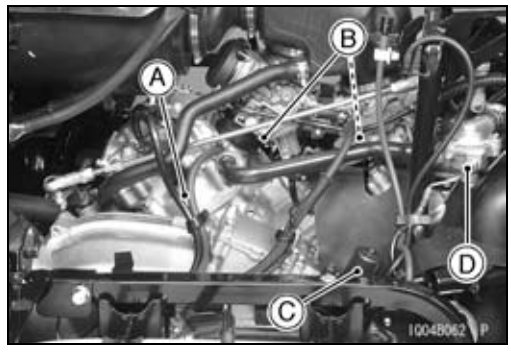
Regulator/Rectifier [A]
Radiator Fan [B]
Radiator Fan Switch [C]
4WD Position Switch [D]



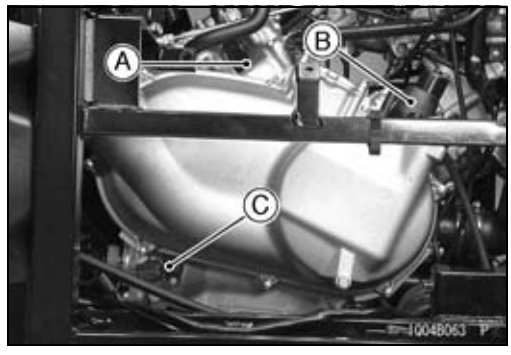
Spark Plug (Front) [A]
Starter Motor [B]
Oil Pressure Switch [C]
Ignition Coil (Front) [D]



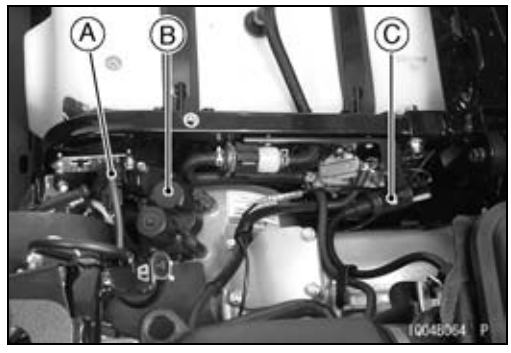
Spark Plug (Rear) [A]
Carburetor Heaters [B]
Engine Brake Actuator [C]
Water Temperature Switch [D]



Spark Plug (Rear) [A]
Engine Brake Actuator [B]
Speed Sensor [C]

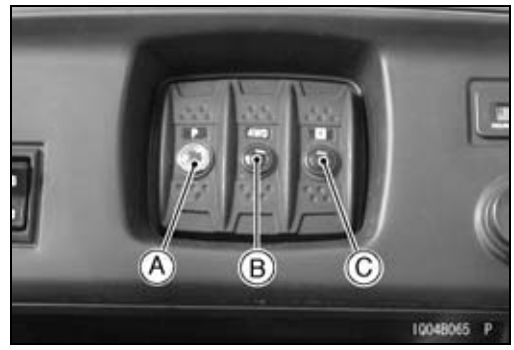


2WD/4WD Solenoid Valve [A]
Engine Brake Actuator [B]
Ignition Coil (Rear) [C]

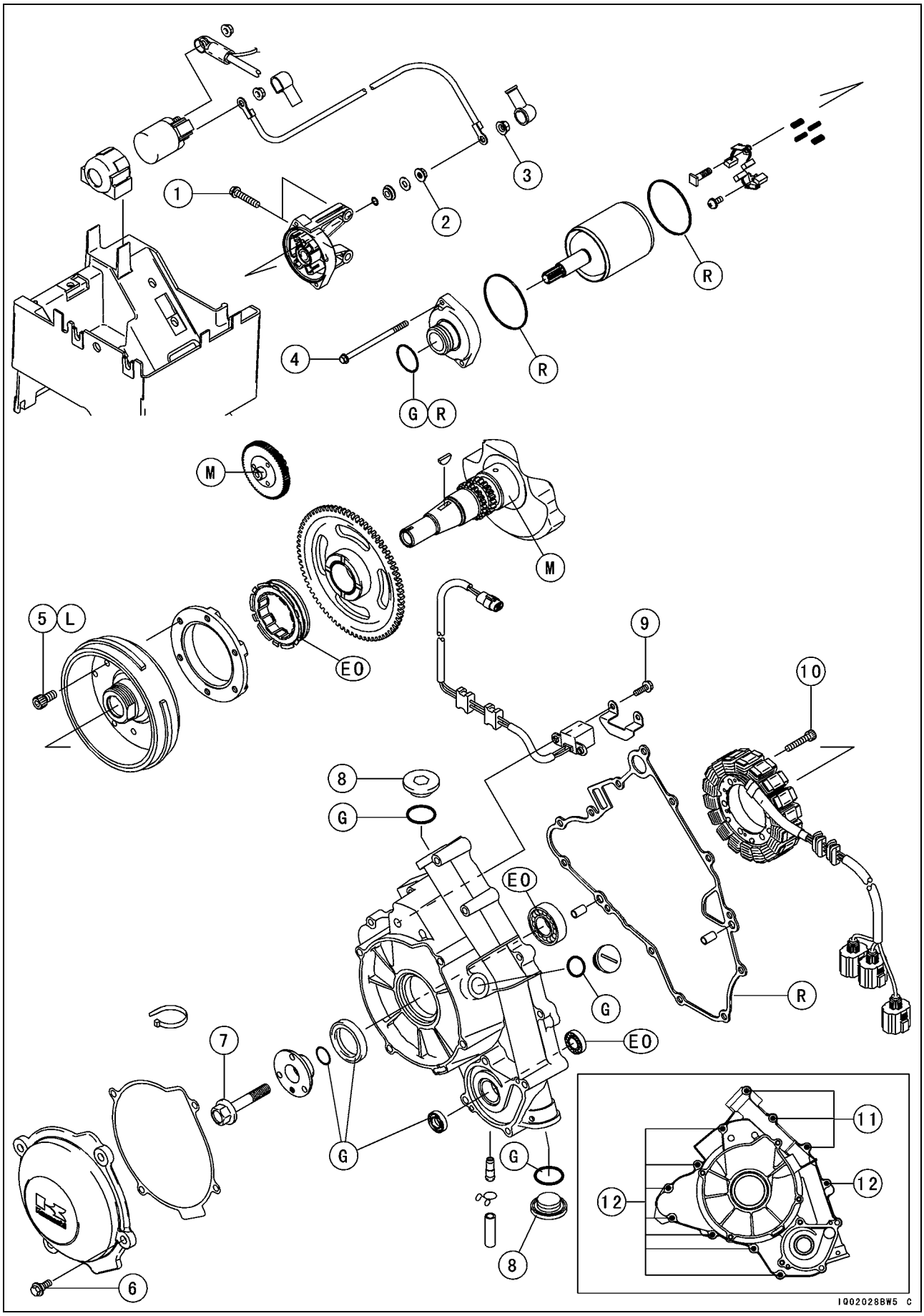


Parts Location

Parking Indicator Light [A]
4WD Indicator Light [B]
Water Temperature Warning Indicator Light [C]



Exploded View

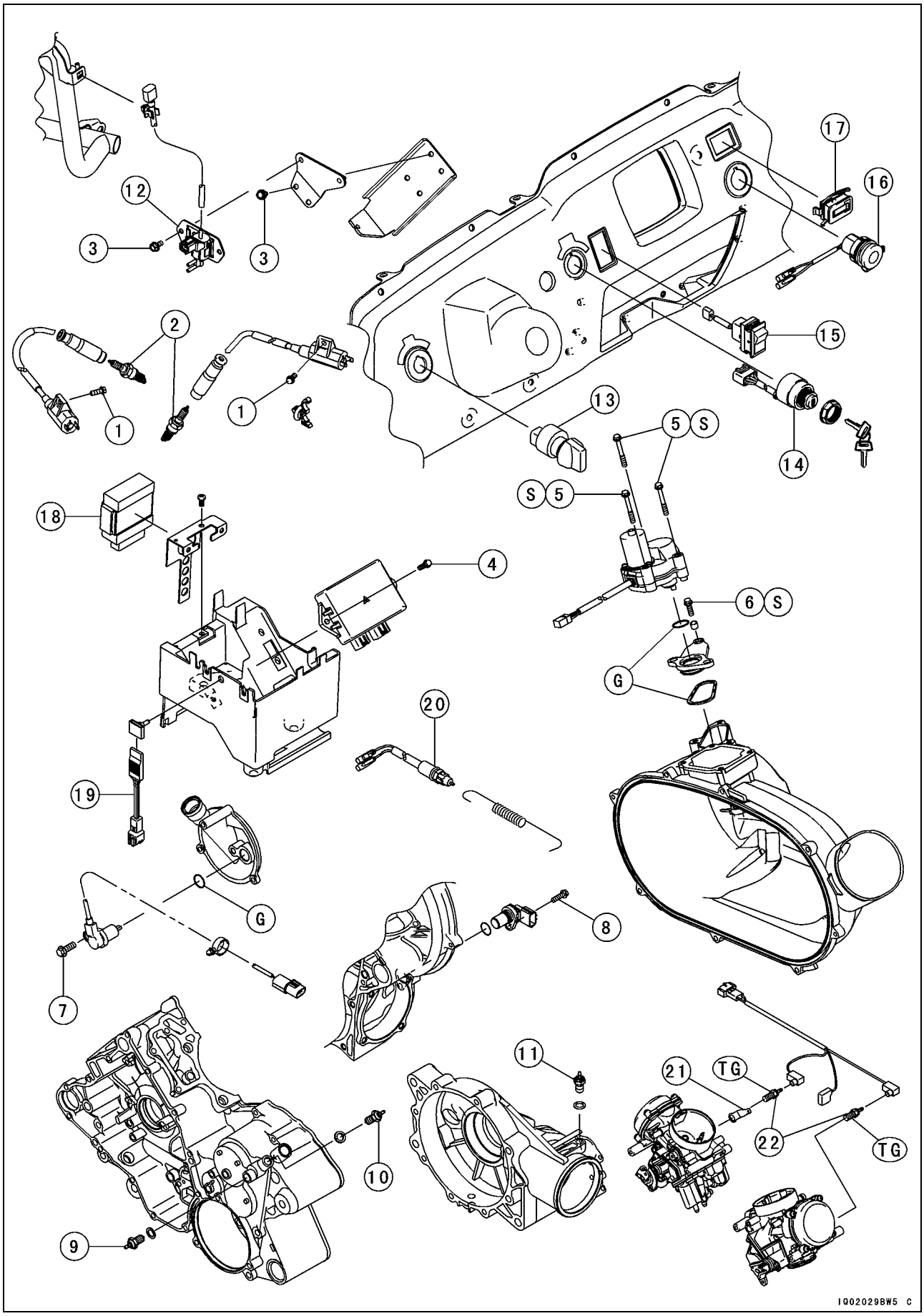


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Starter Motor Mounting Bolts	8.8	0.90	78 in·lb	
2	Starter Motor Terminal Locknut	11	1.1	97 in·lb	
3	Starter Motor Cable Mounting Nut	6.8	0.69	60 in·lb	
4	Starter Motor Through Bolts	5.0	0.51	44 in·lb	
5	Starter Motor Clutch Bolts	34	3.5	25	L
6	Left Engine Cover Bolts	5.9	0.60	52 in·lb	
7	Alternator Rotor Bolt	127	13	94	
8	Alternator Cover Plugs	17.5	1.8	13	
9	Crankshaft Sensor Mounting Bolts	5.9	0.60	52 in·lb	
10	Alternator Stator Bolts	13.5	1.4	10	
11	Alternator Cover Bolts, L = 55 mm (2.17 in.)	8.8	0.90	78 in·lb	
12	Alternator Cover Bolts, L = 30 mm (1.18 in.)	8.8	0.90	78 in·lb	

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum dislfide grease.
R: Replacement Parts

Exploded View



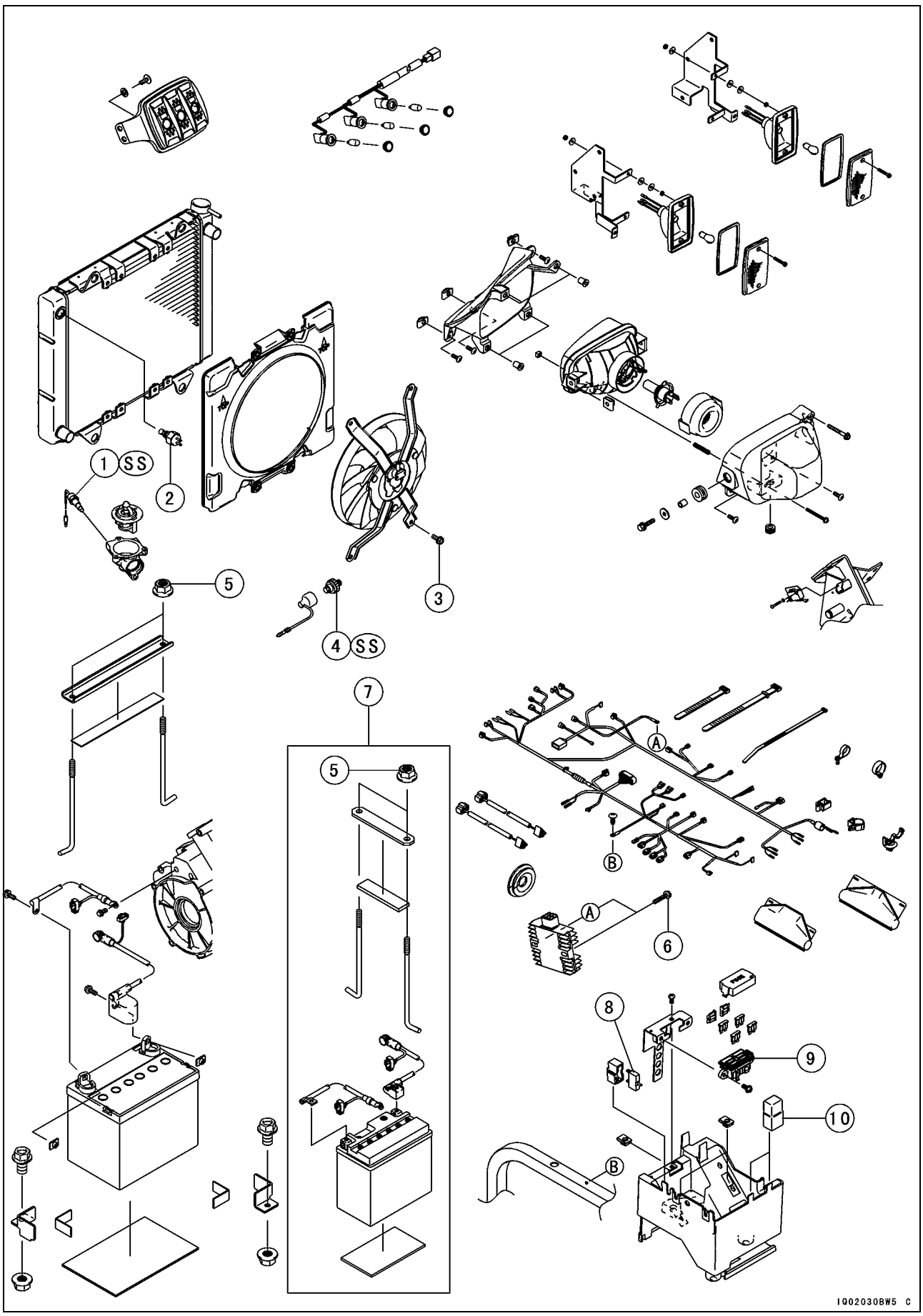
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Ignition Coil Mounting Bolts	6.9	0.70	61 in·lb	
2	Spark Plugs	13	1.3	113 in·lb	
3	Vacuum Actuator Bracket Bolts	8.8	0.90	78 in·lb	
4	Igniter Mounting Bolts	6.9	0.70	61 in·lb	
5	Engine Brake Actuator Mounting Bolts	8.8	0.90	78 in·lb	S
6	Engine Brake Actuator Cover Bolt	8.8	0.90	78 in·lb	S
7	Forward/Reverse Detecting Sensor Mounting Bolt	14.9	1.5	11	
8	Speed Sensor Mounting Bolt	8.8	0.90	78 in·lb	
9	Reverse Position Switch	15	1.5	11	
10	Neutral Position Switch	15	1.5	11	
11	4WD Position Switch	15	1.5	11	

12. 2WD/4WD Solenoid Valve
13. Lighting Switch
14. Ignition Switch
15. 2WD/4WD Shift Switch
16. Accessory Connector (12 V 120 W) (Power Outlet)
17. Hour Meter
18. Actuator Controller
19. Air Temperature Sensor
20. Brake Light Switch
21. Ground Terminal
22. Carburetor Heaters

G: Apply grease.
S: Follow the specific tightening sequence.
TG: Apply thermal transfer grease.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Temperature Switch	7.8	0.80	69 in·lb	SS
2	Radiator Fan Switch	18	1.8	13	
3	Radiator Fan Assembly Bolts	8.3	0.85	73 in·lb	
4	Oil Pressure Switch	15	1.5	11	SS
5	Battery Holder Mounting Nuts	4.9	0.50	43 in·lb	
6	Regulator/Rectifier Mounting Bolts	8.8	0.90	78 in·lb	

7. CA Model
8. Radiator Fan Breaker
9. Fuse Box
10. Starter Circuit Relays

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

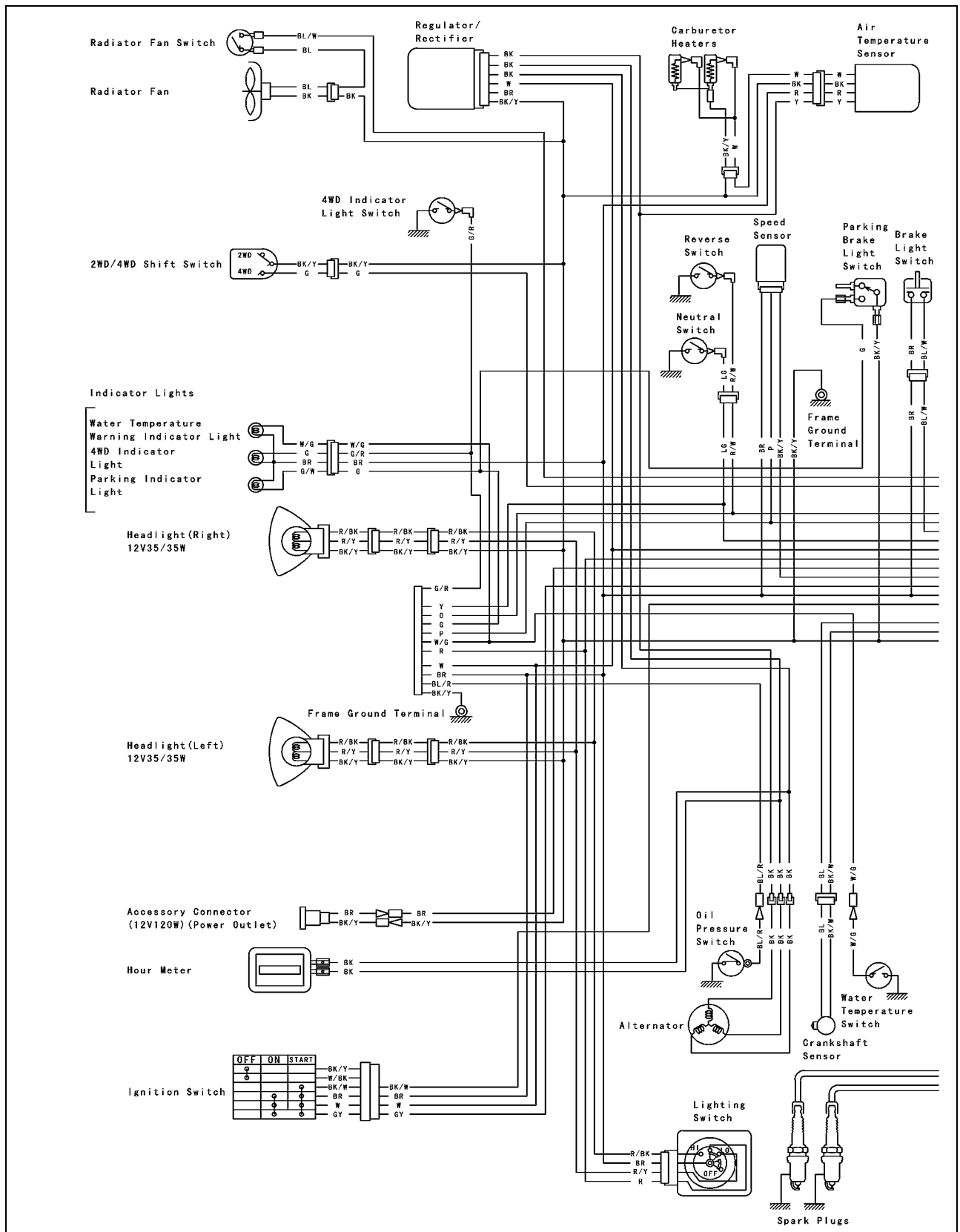
Specifications

Item	Standard	Service Limit
Battery		
Type	Sealed Battery	– – –
Model Name	KMX14-BS (CA Model)	– – –
Capacity	12 V 12 Ah (CA Model) 12 V 14 Ah (US Model)	– – – – – –
Charging System		
Alternator Type	Three-phase AC	– – –
Charging Voltage (Regulator/Rectifier Output Voltage)	14.6 ~ 15.6 V	– – –
Alternator Output Voltage	50 ~ 76 V @4 000 r/min (rpm)	– – –
Stator Coil Resistance	0.31 ~ 0.47 Ω	– – –
Ignition System		
Spark Plug:		
Spark Plug Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	– – –
Spark Plug Cap Resistance	3.75 ~ 6.25 kΩ	– – –
Ignition Coil:		
3 Needle Arcing Distance	7 mm (0.28 in.) or more	– – –
Primary Winding Resistance	0.09 ~ 0.13 Ω at 20°C (68°F)	– – –
Secondary Winding Resistance	3.8 ~ 5.8 kΩ at 20°C (68°F)	– – –
Primary Peak Voltage	120 V or more	– – –
Crankshaft Sensor Resistance	110 ~ 140 Ω at 20°C (68°F)	– – –
Crankshaft Sensor Peak Voltage	2 V or more	– – –
Electric Starter System		
Starter Motor:		
Brush Length	12 mm (0.47 in.)	6.5 mm (0.26 in.)
Actuator Control System		
Actuator Resistance	in the text	– – –
Forward/Reverse Detecting Sensor Resistance	1.2 ~ 1.6 kΩ	– – –
Carburetor Heater System		
Carburetor Heater Resistance	4.9 ~ 9.1 Ω at 21 ~ 29°C (32 ~ 84°F)	– – –
2WD/4WD Solenoid Valve		
Solenoid Valve Resistance	37 ~ 43 Ω at 20°C (68°F)	– – –
Switches		
Brake Light Switch Timing	ON after 10 mm (0.4 in.) of pedal travel	– – –
Radiator Fan Switch Resistance:		
Rising Temperature	From OFF to ON at 86 ~ 90°C (187 ~ 194°F)	– – –
Falling Temperature	From ON to OFF at 81 ~ 85°C (178 ~ 185°F)	– – –
	ON: Less than 0.5 Ω	
	OFF: More than 1 MΩ	

Specifications

Item	Standard	Service Limit
Coolant Temperature Warning Light Switch Resistance:		
Rising Temperature	From OFF to ON at 112 ~ 118°C (234 ~ 244°F)	– – –
Falling Temperature	From ON to OFF at 108 ~ 111°C (226 ~ 232°F)	– – –
	ON: Less than 0.5 Ω	
	OFF: More than 1 MΩ	

Wiring Diagram



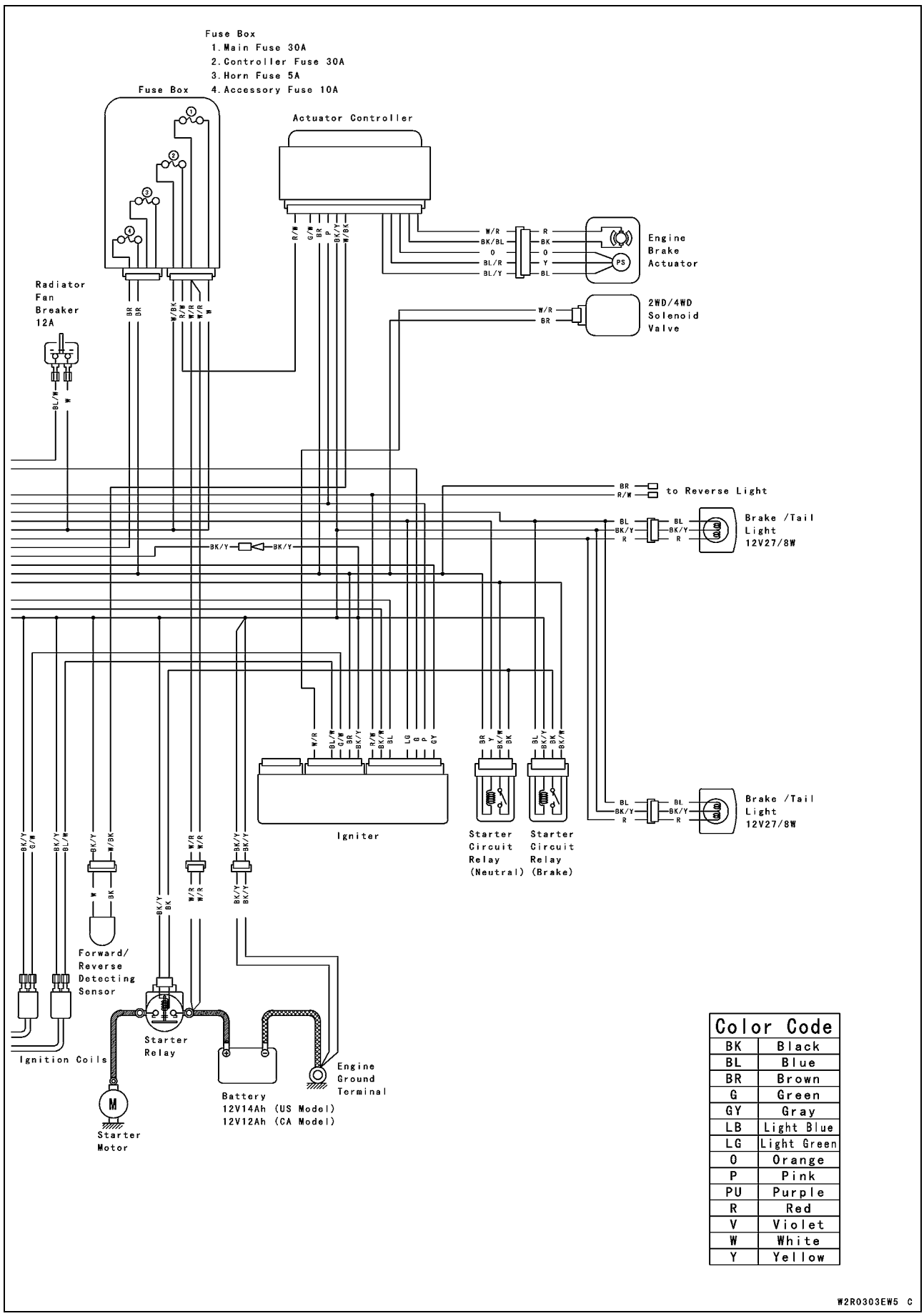
LIGHTING SWITCH CONNECTIONS				
Color	R/BK	BR	R/Y	R
OFF				
LO		○	○	○
HI	○	○	○	○

IGNITION SWITCH CONNECTIONS						
Color	BK/Y	W/BK	BK/W	BR	W	GY
OFF	○	○				
ON				○	○	○
Start			○	○	○	○

(98052-0303E)

W2L0303EW5 C

Wiring Diagram

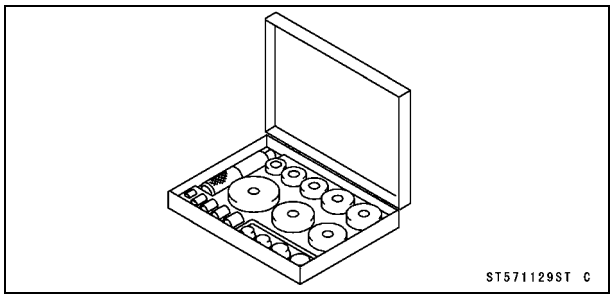


Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
V	Violet
W	White
Y	Yellow

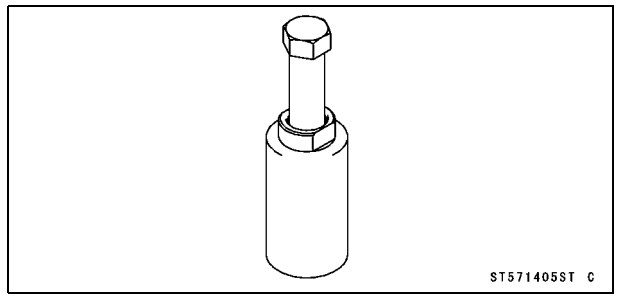
W2R0303EW5 C

Special Tools

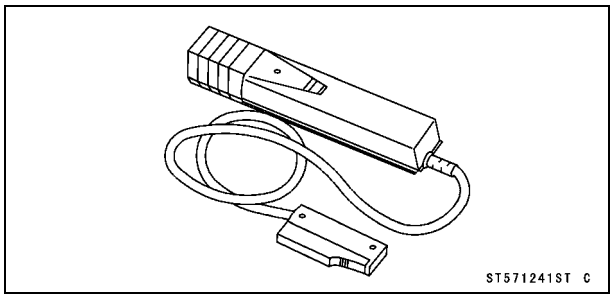
Bearing Driver Set:
57001-1129



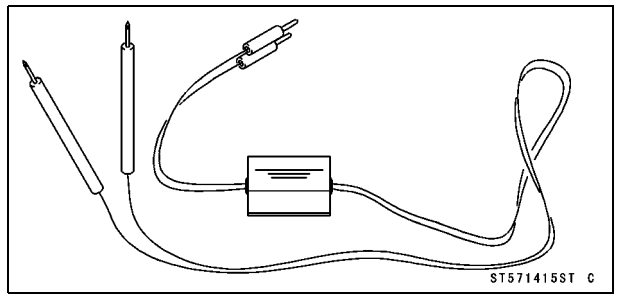
Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:
57001-1405



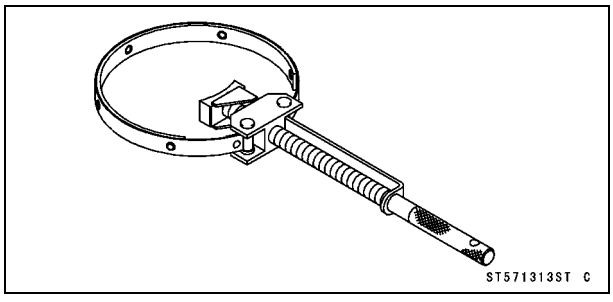
Timing Light:
57001-1241



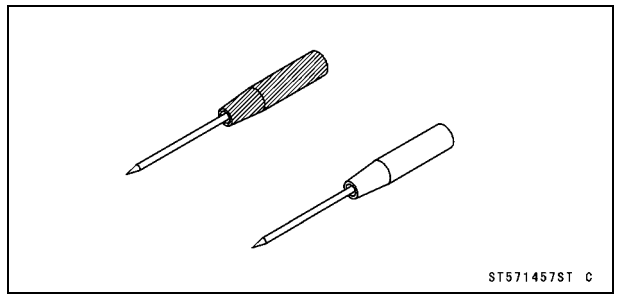
Peak Voltage Adapter:
57001-1415



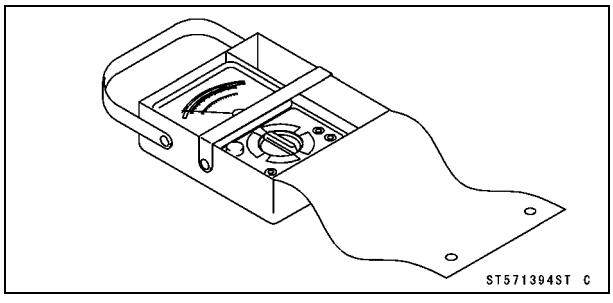
Flywheel Holder:
57001-1313



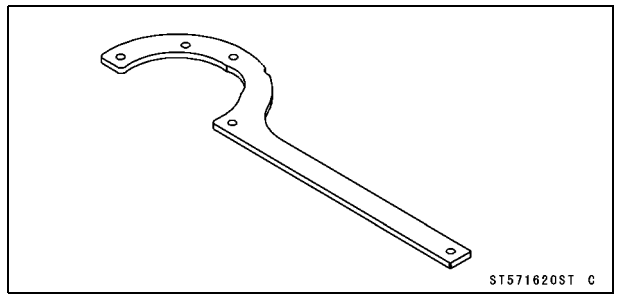
Needle Adapter Set:
57001-1457



Hand Tester:
57001-1394



Drive Pulley Holder:
57001-1620



Precautions

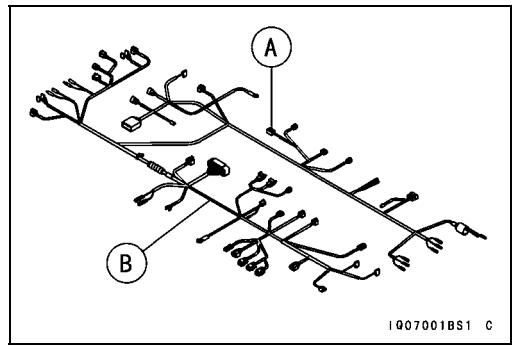
There are a number of important precautions that should be taken when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is required for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damaging electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the high current, never keep the starter button depressed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Only use an illumination bulb rated for the voltage or wattage specified in the wiring diagram, or the handle cover could be warped by excessive heat radiated from the bulb.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Defective wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).
- Color Codes:

BK	Black	G	Green	P	Pink
BL	Blue	GY	Gray	PU	Purple
BR	Brown	LB	Light blue	R	Red
CH	Chocolate	LG	Light green	W	White
DG	Dark green	O	Orange	Y	Yellow

Electrical Wiring

Wiring Inspection



- Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is defective, replace the damaged wiring.

- Pull each connector [A] apart and inspect for corrosion, dirt, and damage.

★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.

- Check the wiring for continuity.

○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

○Connect the hand tester between the ends of the leads.

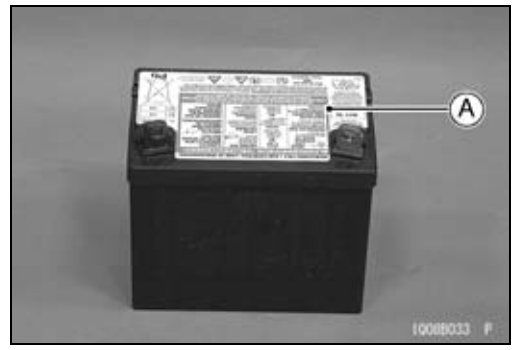
Special Tool - Hand Tester: 57001-1394

○Set the tester to the ×1 Ω range.

★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] if necessary.

Battery

○In this model, two batteries are prepared.
Pre-charged Sealed Type Battery [A] (US model)

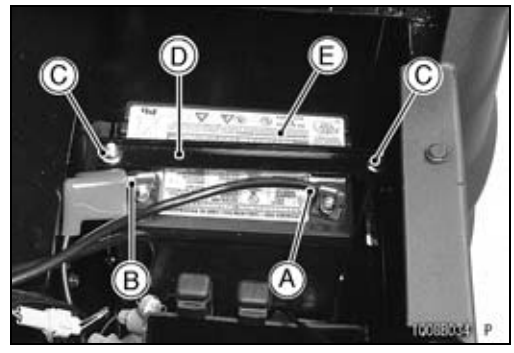


Sealed Type Battery [A] (except US model)

Battery Removal

- Turn off the ignition switch.
- Remove:
  Left Seat (see Seat Removal in the Frame chapter)
- Disconnect the battery negative (–) cable [A] first, and then the positive (+) cable [B].

CAUTION
Be sure to disconnect the negative (–) cable first.

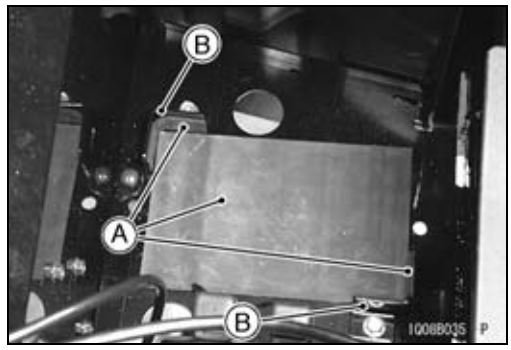


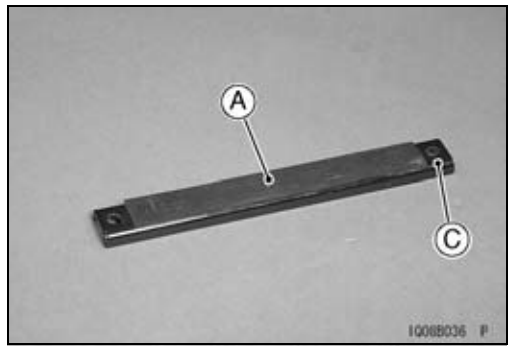
- Remove:
  Battery Holder Mounting Nuts [C] and Holder Rods
  Battery Holder [D]
  Battery [E]

Battery

Battery Installation

- Turn off the ignition switch.
- Check that the dampers [A] on the frame brackets [B] and battery holder [C] are properly in place.

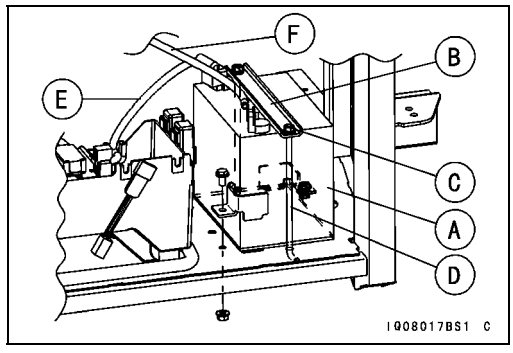




- Install:
  Battery [A]
  Battery Holder [B]
  Battery Holder Mounting Nuts [C] and Holder Rods [D] (both sides)
- Tighten:

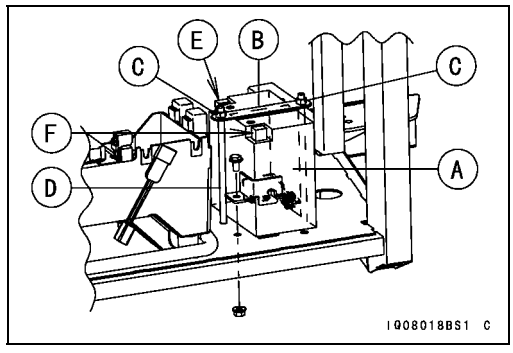
  Torque - Battery Holder Mounting Nuts: 4.9 N·m (0.50 kgf·m, 43 in·lb)

- Connect the positive (+) cable [E] first, and then negative (–) cable [F].
- Put a light coat of grease on the terminals to prevent corrosion.
- Install the terminal cap on the positive terminal.



- For Canada model, install the battery as shown in the figure.

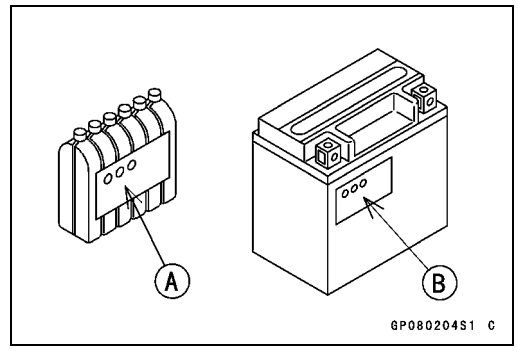
○The procedure of the installation is the same as the above mention.
  Battery [A]
  Battery Holder [B]
  Battery Holder Mounting Nuts [C] and Holder Rods [D] (both sides)
  Positive (+) Cable [E]
  Negative (–) cable [F]



Battery

Battery Activation (CA Model)

Electrolyte Filling

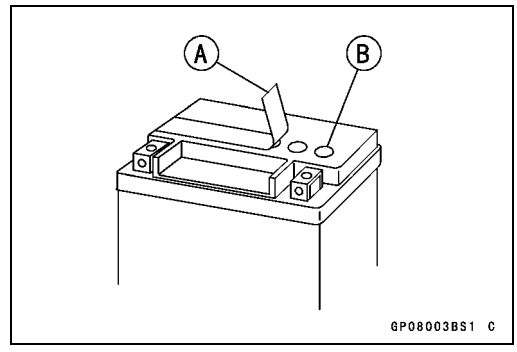


- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name: KMX 14-BS

CAUTION

Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.



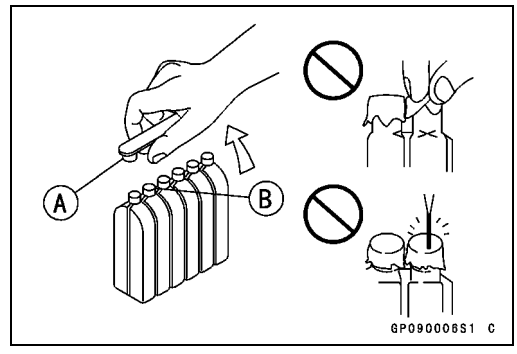
CAUTION

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.

- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

NOTE

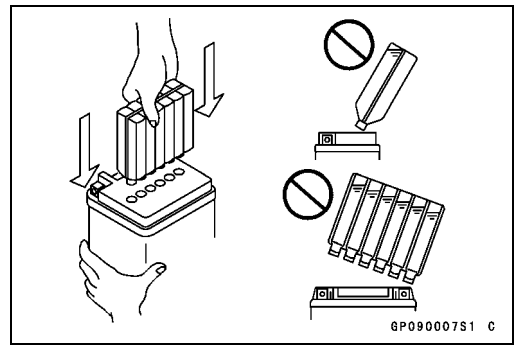
○*The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*



- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

NOTE

○*Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*



- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

NOTE

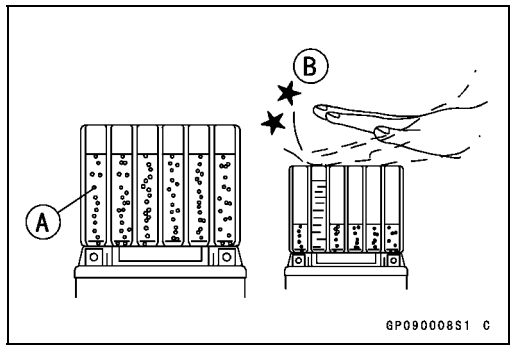
○*Do not tilt the electrolyte container*

Battery

- Check the electrolyte flow.

★If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.

- Keep the container in place for **20** minutes or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.



CAUTION

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.

- Gently remove the container from the battery.
- Let the battery sit for **60** minutes prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

NOTE

○*Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **60** minutes after filling.*

Initial Charge

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

Standard Charge 1.2 A × 5 ~ 10 hours

★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

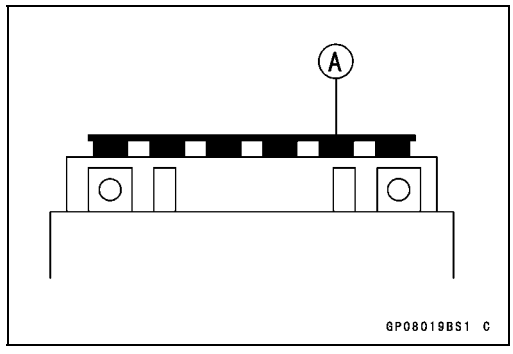
Kawasaki-recommended chargers:

Optimate III

Yuasa 1.5 Amp Automatic Charger

Battery Mate 150–9

★If the above chargers are not available, use equivalent one.

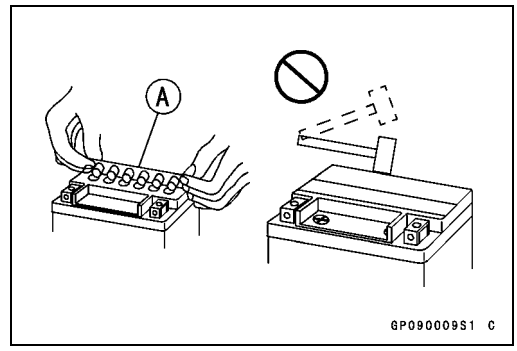


NOTE

○*Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 volts, repeat charging cycle.*

Battery

● After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer). When properly installed, the strip of the caps will be level with the top of the battery.



CAUTION

Once the strip of the caps [A] is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.

NOTE

○ *To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds. Re-check voltage and if less than 12.8 volts repeat the charging cycle and load test. If still below 12.8 volts the battery is defective.*

Precautions

1) No need of topping-up
   No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.
2) Refreshing charge
   If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see Refreshing Charge).
   When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

CAUTION

This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above.
Never remove the seal caps during refresh charge.
If by chance an excessive amount of gas is generated due to overcharging, the safety valve operates to keep the battery safe.

3) When you do not use the vehicle for months
   Give a refresh charge before you store the vehicle and store it with the negative cable removed. Give a refresh charge once a month during storage.
4) Battery life
   If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it. (Provided, however, the vehicle's starting system has no problem.)

⚠ WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.
No fire should be drawn near the battery, or no terminals should have the tightening loosened.
The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.

Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electrical system. Therefore, replace a sealed battery only on a vehicle which was originally equipped with

a sealed battery.

Be careful, if a sealed battery is installed on a vehicle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

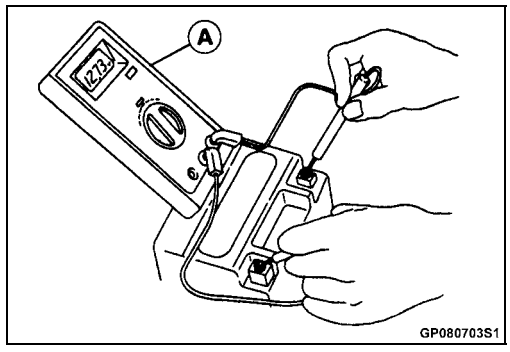
Charging Condition Inspection

Battery charging condition can be checked by measuring battery terminal voltage.

● Remove the battery (see Battery Removal).

CAUTION

Be sure to disconnect the negative (−) cable first.



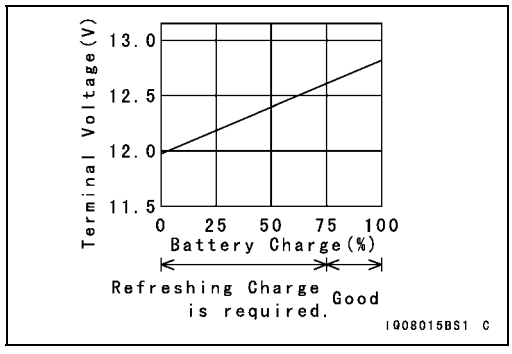
● Measure the battery terminal voltage.

NOTE

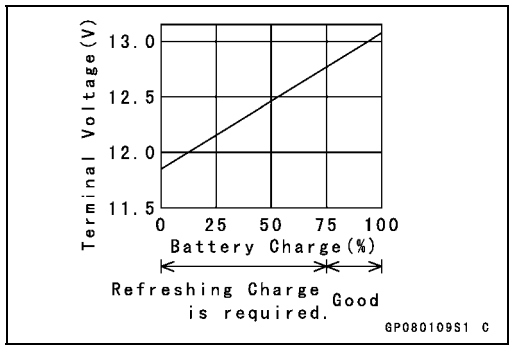
○*Measure with a digital voltmeter [A] which can be read to one decimal place voltage.*

★If the reading is below the specified, refreshing charge is required.

Battery Terminal Voltage (US model)
Standard: 12.6 V or more



Battery Terminal Voltage (except US model)
Standard: 12.8 V or more



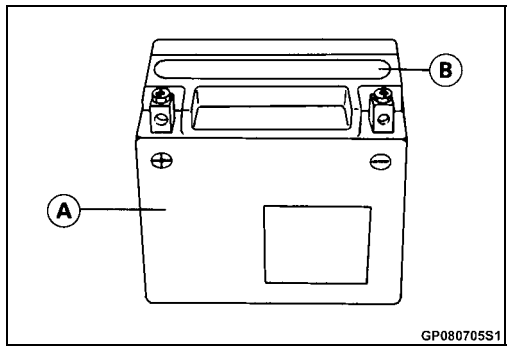
Refreshing Charge

● Remove the battery [A] (see Battery Removal).

● Refresh-charge by following method according to the battery terminal voltage.

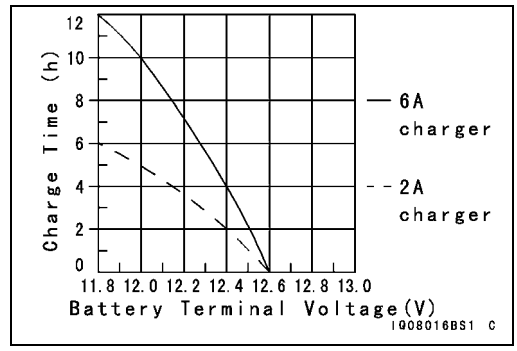
⚠ WARNING

This battery is sealed type. Never remove seal cap [B] even at charging. Never add water. Charge with current and time as stated below.

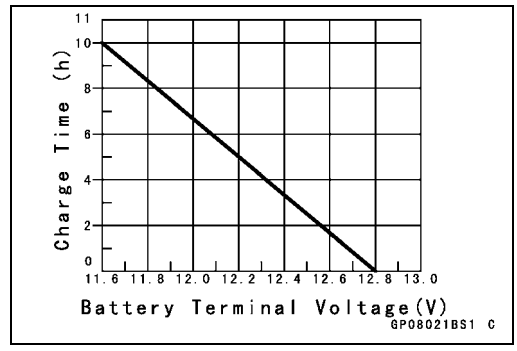


Battery

(US model)
Terminal Voltage: 11.8 ~ less than 12.6 V
Standard Charge (see following chart)
2 A × 4 ~ 12 h
6 A × 2 ~ 6 h



(except US model)
Terminal Voltage: 11.5 ~ less than 12.8 V
Standard Charge
1.2 A × 5 ~ 10 h (see following chart)
Quick Charge
6.0 A × 1.0 h



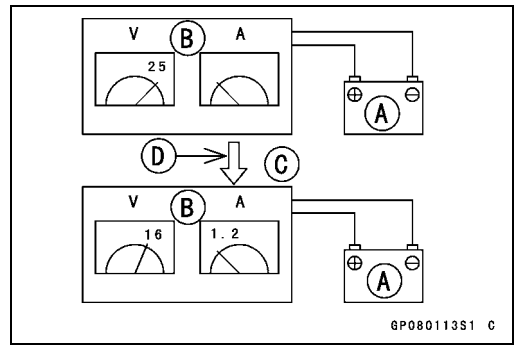
CAUTION

If possible, do not quick charge. If the quick charge is done due to unavoidable circumstances, do the standard charge later on.

Terminal Voltage: less than 11.5 V
Charging Method: 1.2 A × 20 h

NOTE

○*Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current [D], decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.*



Battery [A]
Battery Charger [B]
Standard Value [C]

Battery

● Determine battery condition after refreshing charge.
○Determine the condition of the battery 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

(US model)

Criteria	Judgement
12.6 V or higher	Good
12.0 ~ 12.5 V or lower	Charge insufficient → Recharge
12.0 V or lower	Unserviceable → Replace

(except US model)

Criteria	Judgement
12.8 V or higher	Good
12.0 ~ 12.7 V or lower	Charge insufficient → Recharge
12.0 V or lower	Unserviceable → Replace

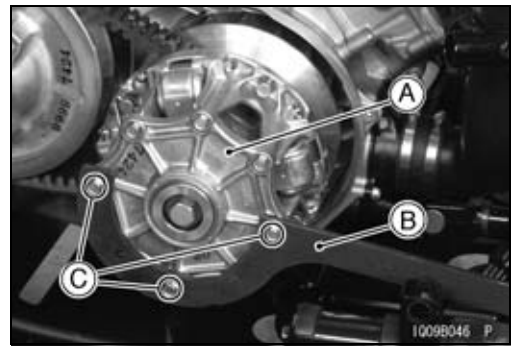
Charging System

Alternator Cover Removal

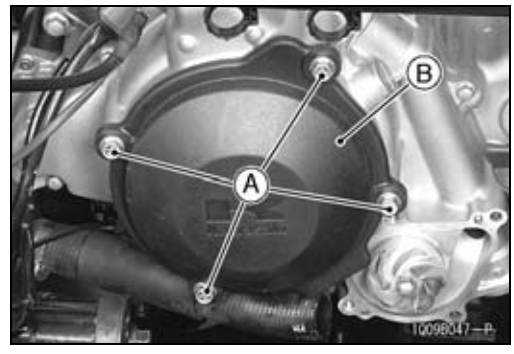
- Drain:
  Coolant (see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Torque Converter Cover (see Torque Converter Cover Removal in the Converter System chapter)

- Remove the three bolts of the drive pulley cover [A].
- Install the drive pulley holder [B], tightening the removed three bolts [C].

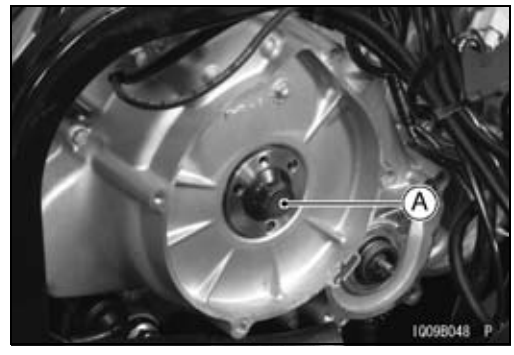
Special Tool - Drive Pulley Holder: 57001-1620



- Remove:
  Left Cover (see Left Cover Removal in the Frame chapter)
  Water Pump Impeller (see Water Pump Impeller Removal in the Cooling System chapter)
  Bolts [A] and Engine Left Cover [B]

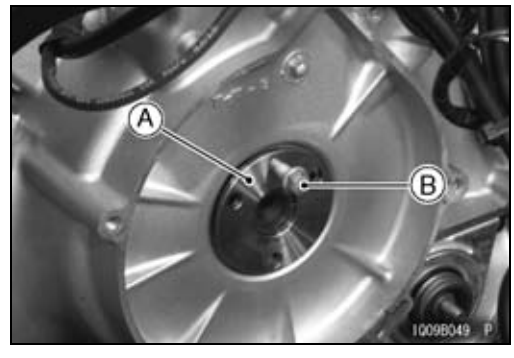


- Holding the drive pulley with the drive pulley holder, remove the alternator rotor bolt [A].



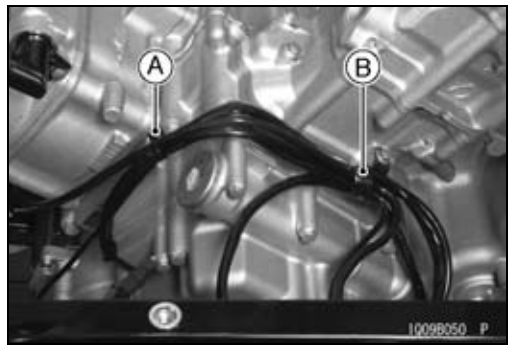
- Remove:
  Collar [A]

○Install the M6 bolt [B] to the collar, and remove it.

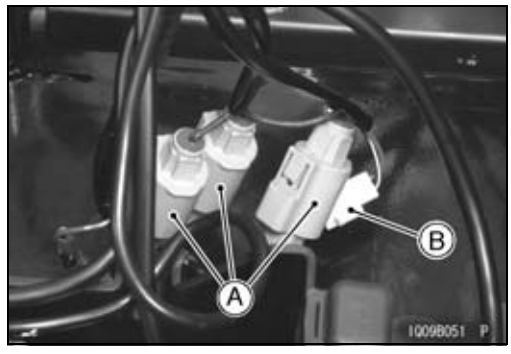


Charging System

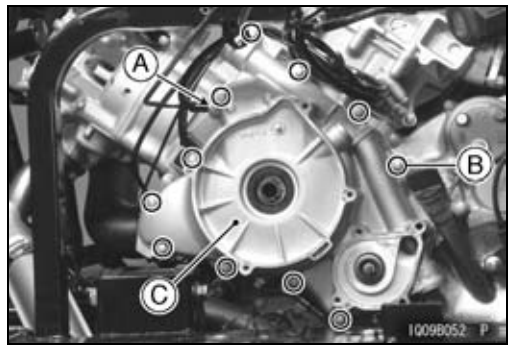
- Cut the band [A] and open the clamp [B].



- Disconnect:
  Alternator Lead Connectors [A]
  Crankshaft Sensor Lead Connector [B]



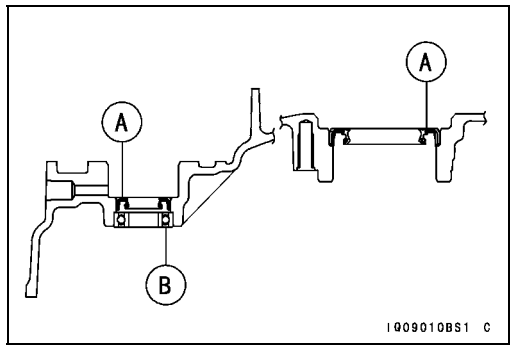
- Remove:
  Engine Ground Terminal Bolt [A]
  Alternator Cover Bolts [B]
  Alternator Cover [C]



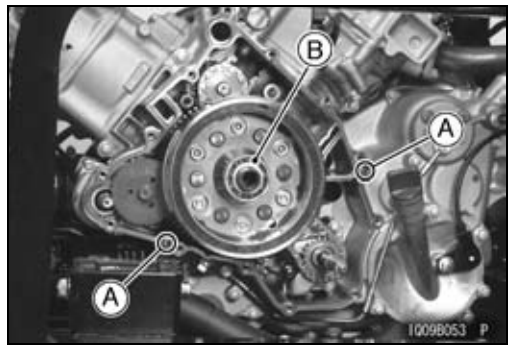
Alternator Cover Installation

- When installing the oil seals [A], press the oil seals in the alternator cover so that each oil seal surface is flush with the cover end as shown in the figure.
- Apply grease to the oil seal lips.
- When installing the ball bearing [B], press the ball bearing until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129



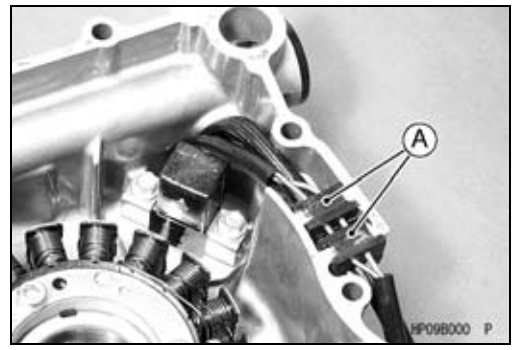
- Be sure all of the old gasket has been removed from the alternator cover and the left crankcase sealing surfaces.
- Check that the dowel pins [A] are in place, and fit a new gasket on the crankcase.
- Check that the bearing [B] is in place.



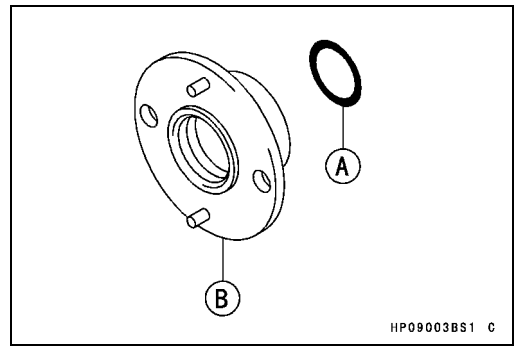
Charging System

- Fit the grommets [A] into the notch in the cover (see Crankshaft Sensor Installation).
- Apply grease to the alternator cover oil seal.
- Install the alternator cover.
- Tighten:

Torque - Alternator Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

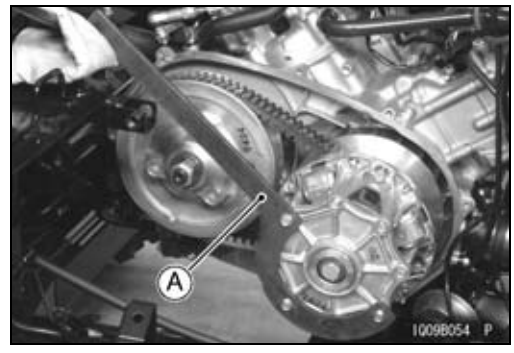


- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Install the collar [B] and O-ring on the alternator cover.



- Hold the drive pulley with the drive pulley holder [A].

Special Tool - Drive Pulley Holder: 57001-1620

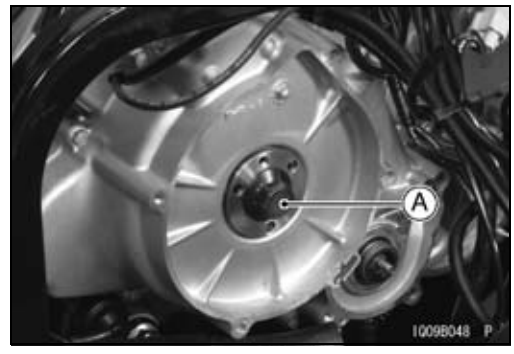


- Tighten:

Torque - Alternator Rotor Bolt [A]: 127 N·m (13 kgf·m, 94 ft·lb)

- Install the removed parts (see appropriate chapter).
- Pour:

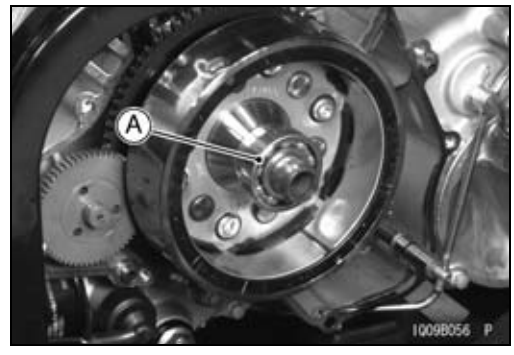
Coolant (see Coolant Change in the Periodic Maintenance chapter)
Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)



Alternator Rotor Removal

- Remove:

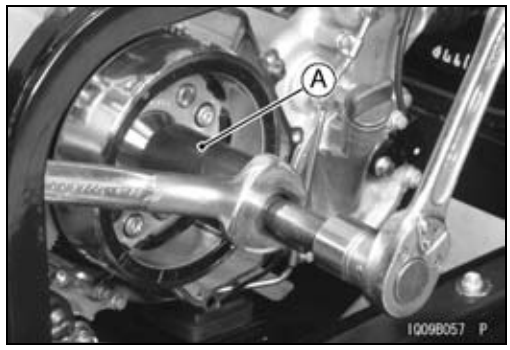
Alternator Cover (see Alternator Cover Removal)
Ball Bearing [A]



- Screw the flywheel puller [A] onto the alternator rotor.

Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405

- Holding the flywheel puller, turn the rotor puller bolt until the alternator rotor is forced off the end of the crankshaft.



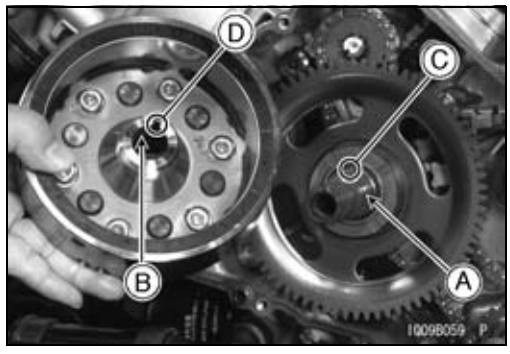
CAUTION

If the rotor is difficult to remove, turn the puller while tapping the end of the puller. Do not strike the alternator rotor. Striking the rotor can cause the magnets to lose magnetism.

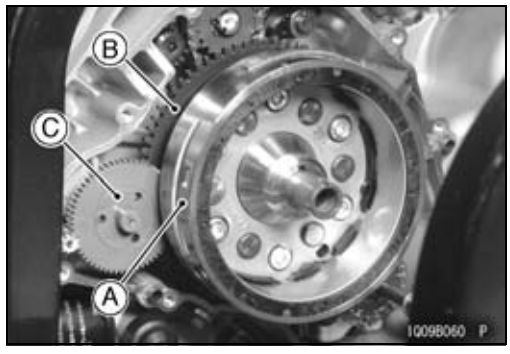
Alternator Rotor Installation

- When installing the starter clutch gear [A], apply molybdenum disulfide grease to the crankshaft [B].

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  Crankshaft Tapered Portion [A]
  Alternator Rotor Tapered Portion [B]
- Fit the rotor onto the crankshaft so that woodruff key [C] fits into the groove [D] in the hub of the rotor.

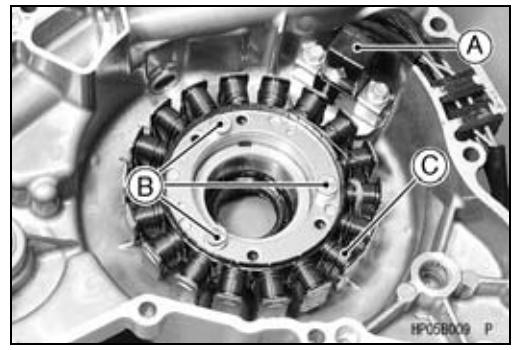


- Install the alternator rotor [A] while turning the starter clutch gear [B].
- Apply molybdenum disulfide grease to the shaft of the torque limiter [C].
- Install the torque limiter.



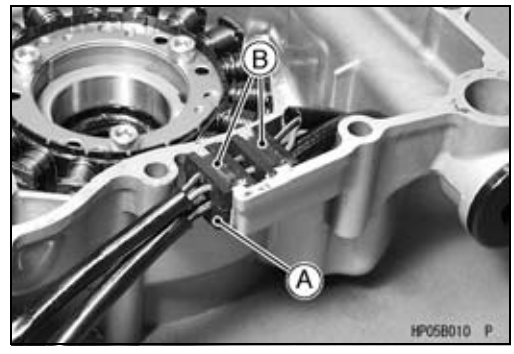
Charging System

Alternator Stator Removal



- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Crankshaft Sensor [A] (see Crankshaft Sensor Removal)
  Bolts [B] and Alternator Stator [C]

Alternator Stator Installation



- Tighten:

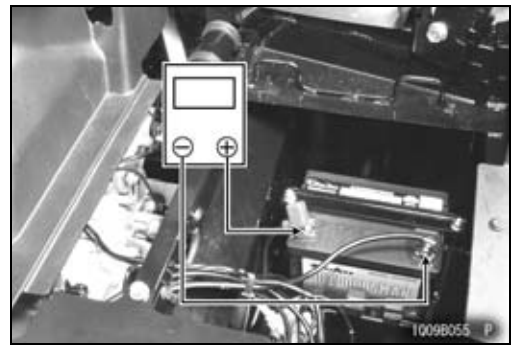
  Torque - Alternator Stator Bolts: 13.5 N·m (1.4 kgf·m, 10 ft·lb)

- Install:
  Crankshaft Sensor (see Crankshaft Sensor Installation)
- Fit the lead grommets into the notch on the alternator cover.
  Grommets [A] for Alternator Leads
  Grommets [B] for Crankshaft Sensor Leads

○Run the alternator stator leads under the crankshaft sensor leads.

○Fit the grommet for alternator leads first and then install the one of crankshaft sensor leads to the notch of the alternator cover.

Regulator/Rectifier Output Voltage Inspection



- Remove the left seat (see Seat Removal in the Frame chapter).
- Check the battery condition (see Battery section).
- Warm up the engine to obtain actual alternator operating conditions.
- Check that the ignition switch is turned off, and connect a hand tester to the battery terminals.

  Special Tool - Hand Tester: 57001-1394

- Start the engine and note the voltage readings at various engine speeds with the headlight turned on and then off. The readings should show nearly battery voltage when the engine speed is low, and as the engine speed increases, the readings should also increase.

Regulator/Rectifier Output Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
25 V DC	Battery (+)	Battery (–)	14.6 ~ 15.6 V

- Turn off the ignition switch, and disconnect the hand tester.

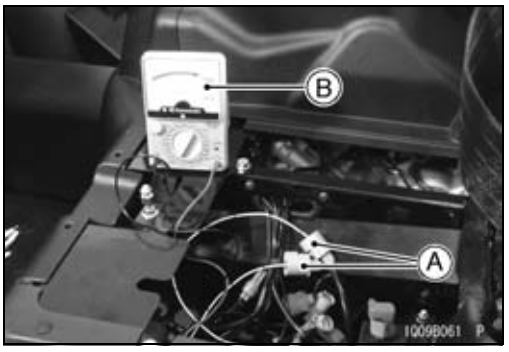
★If the regulator/rectifier output voltage is between the values given in the table, the charging system is working normally.

★If the output voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

★If the battery voltage does not increase as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

Alternator Inspection

There are three types of alternator failures: short, open, or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.



- To check the alternator output voltage, perform the following procedures.

○Disconnect the alternator lead connectors [A].
○Connect a hand tester [B] as shown in the table.
○Start the engine.
○Run it at the rpm given in the table.
○Note the voltage readings (total 3 measurements).

Alternator Output Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	@4 000 rpm
250 V AC	One black lead	Another black lead	50 ~ 76 V

★If the output voltage is within the values in the table, the alternator is operating correctly, and the regulator/rectifier is damaged. A much lower reading indicates that the alternator is defective.

- Check the stator coil resistance as follows:

○Stop the engine.
○Disconnect the alternator connector.
○Connect a hand tester as shown in the table.
○Note the readings (total 3 measurement).

Stator Coil Resistance **@20°C (68°F)**

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
× 1 Ω	One black lead	Another black lead	0.31 ~ 0.47 Ω

★If there is more resistance than shown in the table, or no reading (infinity) for any two leads, the stator has an open and must be replaced. Much less resistance means the stator is shorted and must be replaced.

- Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.

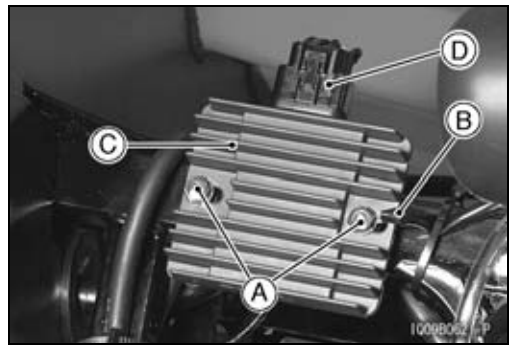
★Any reading less than infinity (∞) indicates a short, necessitating stator replacement.

★If the stator coils have normal resistance, but the voltage check shows the alternator to be defective; then the rotor magnetism has probably weakened, and the rotor must be replaced.

Special Tool - Hand Tester: 57001-1394

Charging System

Regulator/Rectifier Removal



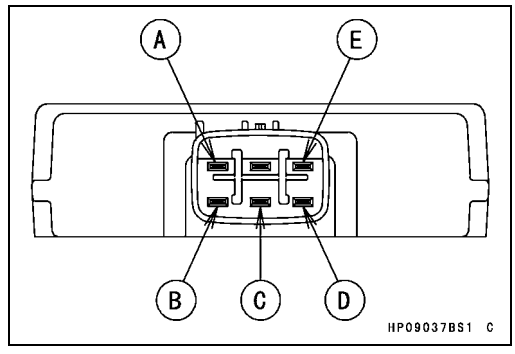
- Remove:
  Regulator/Rectifier Mounting Bolts [A]
  Ground Lead [B]
  Regulator/Rectifier [C]
- Disconnect the regulator/rectifier lead connector [D].

Regulator/Rectifier Installation

- Connect the regulator/rectifier lead connector.
- Install:
  Regulator/Rectifier
  Ground Lead
- Tighten:

Torque - Regulator/Rectifier Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Regulator/Rectifier Inspection



- Remove:
  Regulator/Rectifier (see Regulator/Rectifier Removal)
- Set the hand tester to the × 1 kΩ range and make the measurements shown in the table.

Special Tool - Hand Tester: 57001-1394

- Connect the hand tester to the regulator/rectifier.

★If the tester readings are not as specified, replace the regulator/rectifier.

CAUTION

Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.
If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.

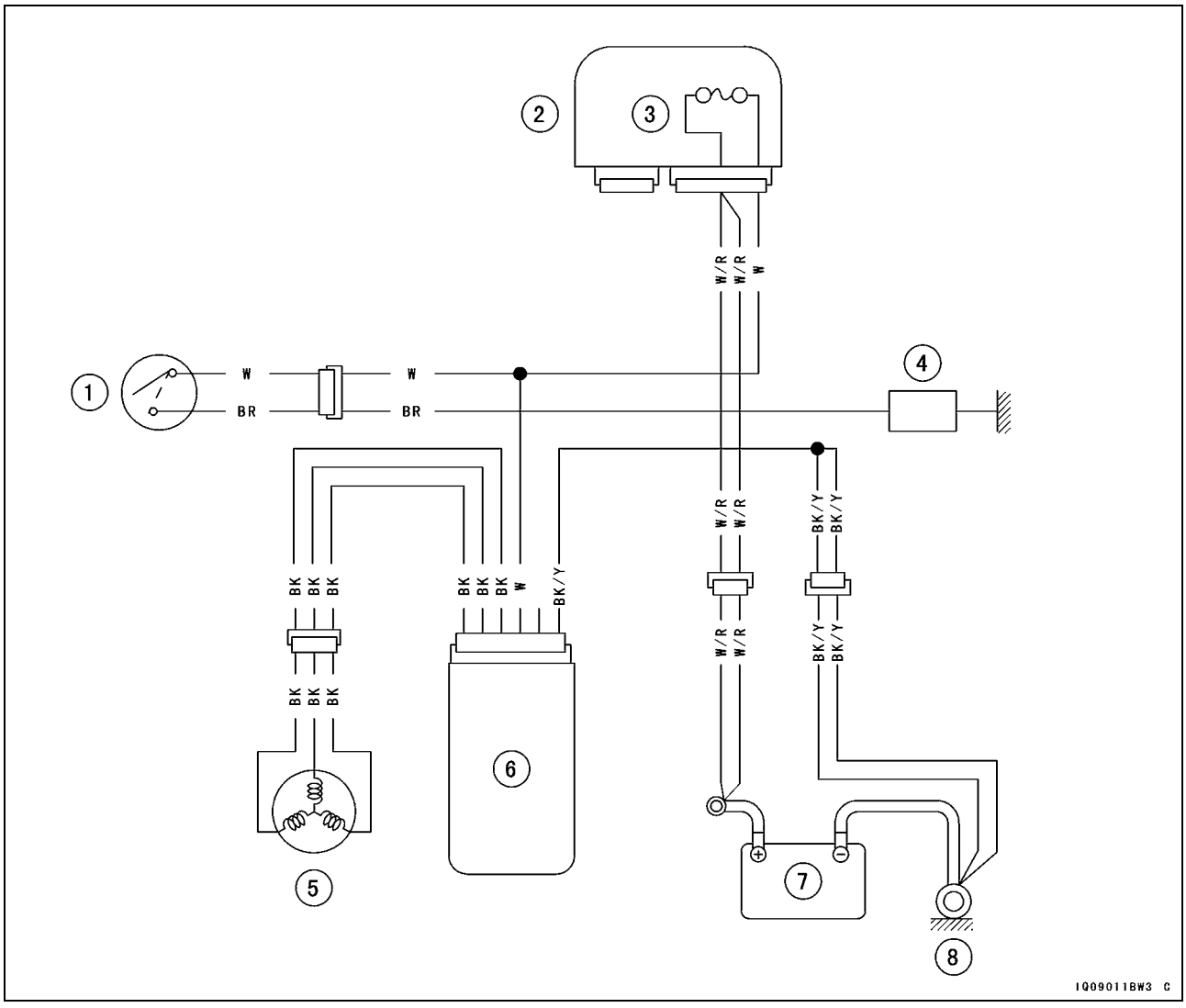
Regulator/Rectifier Resistance **(Unit: kΩ)**

		Tester (+) Lead Connection				
	Terminal	A	B	C	D	E
(–)*	A	–	∞	∞	∞	∞
	B	2 ~ 26	–	∞	∞	∞
	C	2 ~ 26	∞	–	∞	∞
	D	2 ~ 26	∞	∞	–	∞
	E	2 ~ 50	2 ~ 26	2 ~ 26	2 ~ 26	–

(−)*: Tester (−) Lead Connection

Charging System

Charging System Circuit



1. Ignition Switch
2. Fuse Box
3. Main Fuse 30 A
4. Load
5. Alternator
6. Regulator/rectifier
7. Battery
8. Engine Ground Terminal

Ignition System

⚠ WARNING

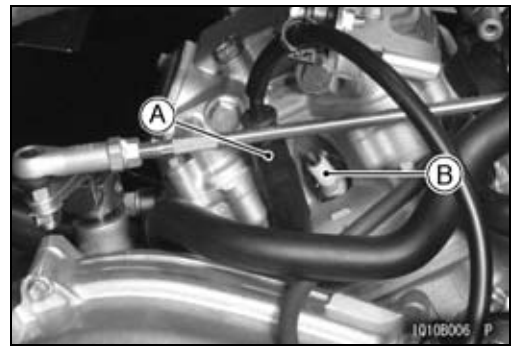
The ignition system produces extremely high voltage.
Do not touch the spark plug, ignition coil, or spark plug lead while the engine is running, or you could receive a severe electrical shock.

CAUTION

Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent igniter damage.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and igniter.
Use the standard regulator/rectifier, or the igniter will be damaged.

Spark Plug Removal

- Remove:
  Engine Upper Cover (see Engine Upper Cover Removal in the Frame chapter)
  Spark Plug Cap [A]
- Using a spark plug wrench, remove the spark plug [B].



Spark Plug Installation

- Tighten:

Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 113 in·lb)

- Fit the spark plug caps securely.
- Pull up the spark pug caps lightly to make sure of the installation of the spark plug caps.

Spark Plug Cleaning/Inspection

- Refer to the Spark Plug Cleaning/Inspection in the Periodic Maintenance chapter.

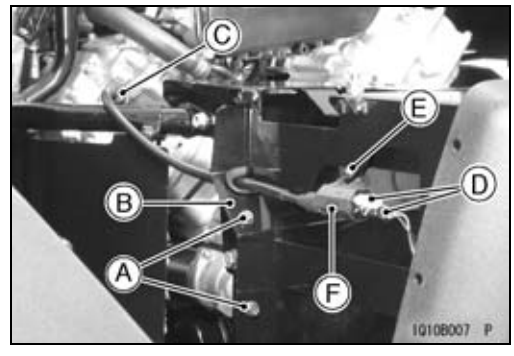
Spark Plug Gap Inspection

- Refer to the Spark Plug Gap Inspection in the Periodic Maintenance chapter.

Ignition Coil Removal

Front Side

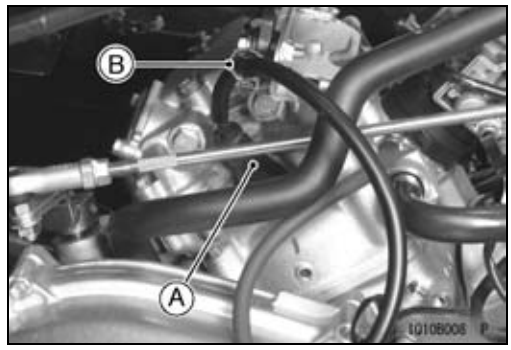
- Remove:
  Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
  Bolts [A] and Cover [B]
  Spark Plug Cap [C]
  Primary Lead Connectors [D]
  Bolt [E]
  Ignition Coil [F]



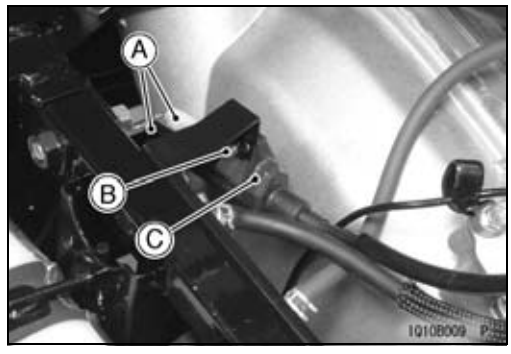
Ignition System

Rear Side

- Remove:
  Engine Upper Cover (see Engine Upper Cover Removal in the Frame chapter)
  Spark Plug Cap [A]
- Open the clamp [B].



- Remove:
  Primary Lead Connectors [A]
  Bolt [B]
  Ignition Coil [C]



Ignition Coil Installation

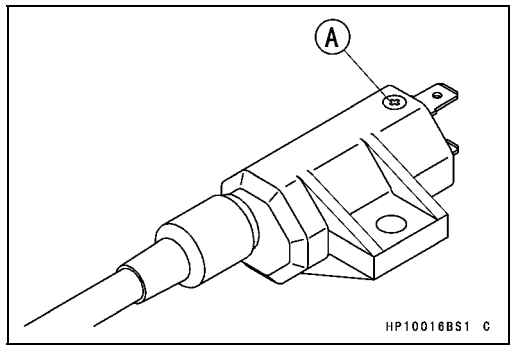
- Install:
  Ignition Coil

  Torque - Ignition Coil Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Connect the primary leads to the ignition coil terminals as shown.

Front Side

G/W Lead → (+) Mark [A]
BK/Y Lead → (–) Mark

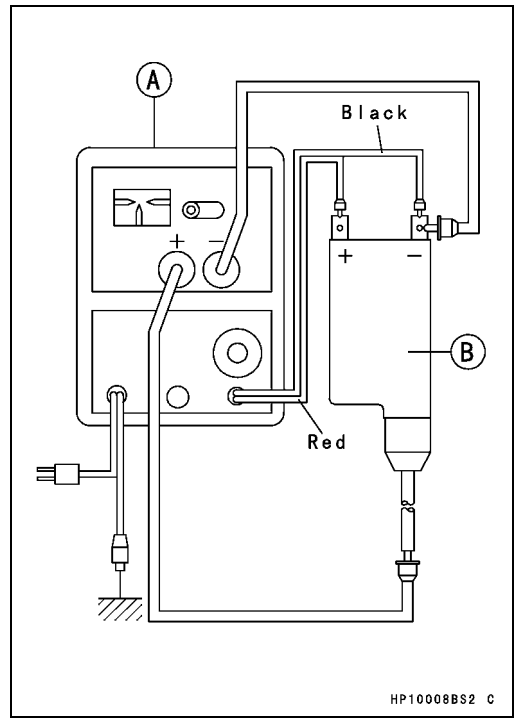


Rear Side

BL/W Lead → (+) Mark [A]
BK/Y Lead → (–) Mark

Ignition System

Ignition Coil Inspection



- Remove the ignition coil.
- Measure the arcing distance with a coil tester [A] to check the condition of the ignition coil [B].
- Connect the ignition coil (with the spark plug cap left attached at the end of the spark plug lead) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

Ignition Coil Arcing Distance
7 mm (0.28 in.) or more

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the ignition coil body or leads.

★If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

- To determine which part is defective, measure the arcing distance again with the spark plug cap removed from the ignition coil. Remove the cap by turning it counterclockwise.

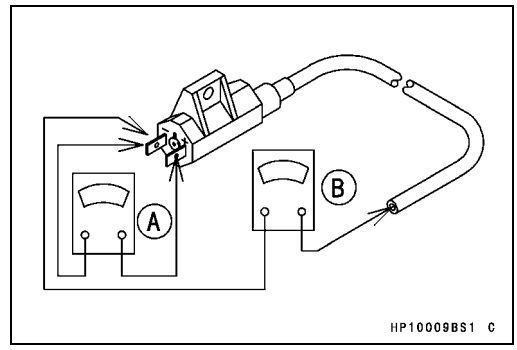
★If the arcing distance is as before, the trouble is with the ignition coil. If the arcing distance is normal, the trouble is with the spark plug cap.

★If a coil tester is not available, the coil can be checked for a broken or badly shorted winding with a hand tester.

Special Tool - Hand Tester: 57001-1394

NOTE

○*The hand tester cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.*



- Measure the primary winding resistance [A] as follows:

○Connect the tester between the coil terminals.
○Set the tester to the × 1 Ω range.

- Measure the secondary winding resistance [B] as follows:

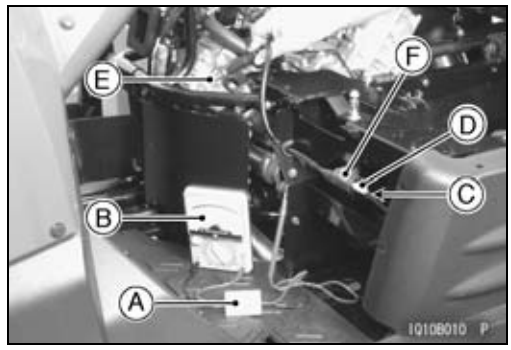
○Remove the plug cap by turning it counterclockwise.
○Connect the tester between the spark plug lead and terminal.
○Set the tester to the × 1 kΩ range.

Ignition Coil Winding Resistance
Primary Windings: 0.09 ~ 0.13 Ω at 20°C (68 °F)
Secondary Windings: 3.8 ~ 5.8 kΩ at 20°C (68 °F)

★If the hand tester does not read as specified, replace the coil.

○To install the plug cap, turn it clockwise.

Ignition Coil Primary Peak Voltage Inspection



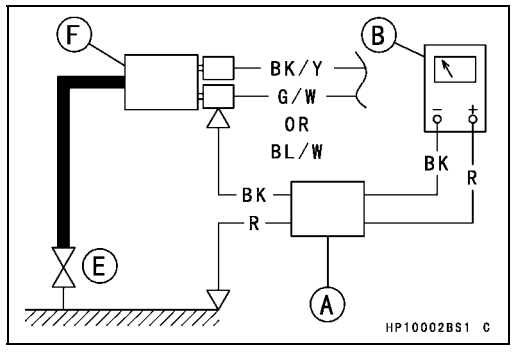
NOTE

○*Be sure the battery is fully charged.*

- Remove:
  Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
- Remove the spark plug cap (see Spark Plug Removal), but do not remove the spark plug.
- Measure the primary peak voltage as follows.

○Connect a commercially peak voltage adapter [A] to the hand tester [B] (250 V DC range). Install the needle adapter [C] on the peak voltage adapter leads.

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457
Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B



○Insert the needle adapter into the terminal of the G/W (front) or BL/W (rear) primary lead [D].

○Install a new spark plug [E] into the spark plug cap, and ground it to the engine.
[F] Ignition Coil

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the ignition switch ON, rotate the engine for 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one ignition coil.

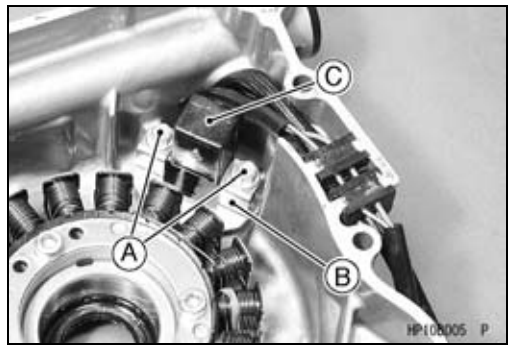
Ignition Coil Primary Peak Voltage
Standard: 120 V or more

- Repeat the test for the other ignition coil.

★If the reading is less than the specified value, check the following.
Ignition Coils (see Ignition Coil Inspection)
Crankshaft Sensor (see Crankshaft Sensor Inspection)

★If the ignition coils and crankshaft sensor are normal, see the Ignition System Troubleshooting chart on page 16-41.

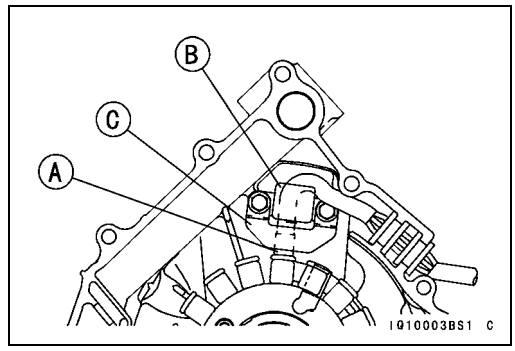
Crankshaft Sensor Removal



- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Crankshaft Sensor Mounting Bolts [A]
  Plate [B]
  Crankshaft Sensor [C]

Ignition System

Crankshaft Sensor Installation

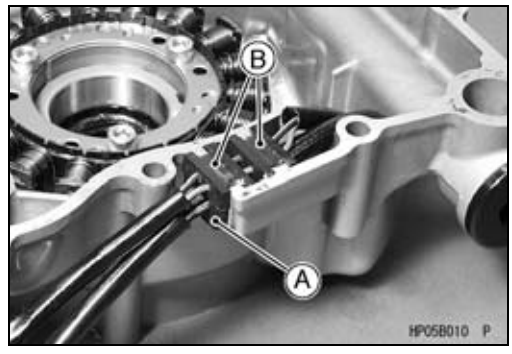


- Install:
  Stator Coil Leads [A]
  Crankshaft Sensor [B]
  Plate [C]
- Tighten:

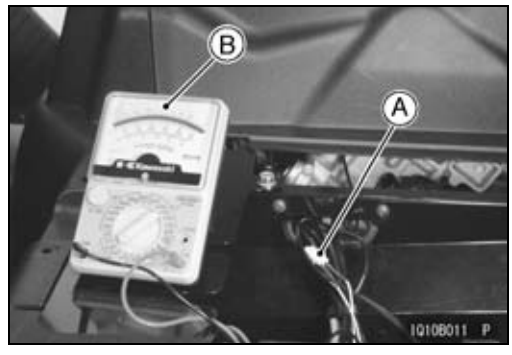
Torque - Crankshaft Sensor Mounting Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

- Fit the lead grommets into the notch on the alternator cover.
  Grommets [A] for Alternator Leads
  Grommets [B] for Crankshaft Sensor Leads

○Position the blue lead of the crankshaft sensor to outside.



Crankshaft Sensor Inspection



- Remove the seat (see Seat Removal in the Frame chapter).
- Disconnect the crankshaft sensor lead connector [A].
- Measure the crankshaft sensor resistance.

○Connect a hand tester [B] between the BK/W lead and the BL lead.
○Set the tester to the × 10 Ω range.

Special Tool - Hand Tester: 57001-1394

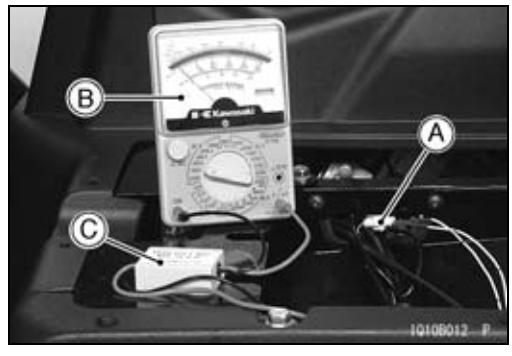
Crankshaft Sensor Resistance
110 ~ 140 Ω at 20°C (68°F)

★If the tester does not read as specified, replace the crankshaft sensor.

Crankshaft Sensor Peak Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*



- Disconnect:
  Crankshaft Sensor Lead Connector [A]
- Set the hand tester [B] to the 10 V DC range.
- Connect the peak voltage adapter [C] to the hand tester and crankshaft sensor leads in the connector.

Special Tools - Hand Tester: 57001-1394
Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B

Connections:

Crankshaft Sensor Lead		Adapter		Hand Tester
Black/White	←	Red	→	(+)
Blue	←	Black	→	(–)

- Turn the ignition switch on, and rotate the engine for 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.

● Repeat the measurement 5 or more times.

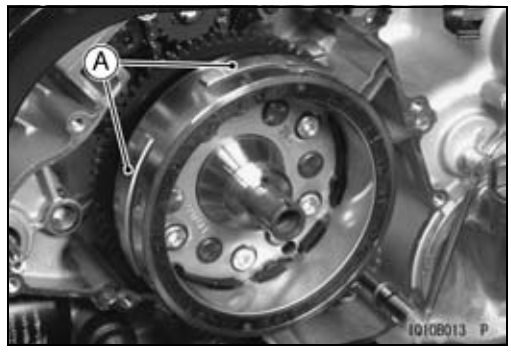
Crankshaft Sensor Peak Voltage
Standard: 2 V or more

★If the peak voltage is lower than the standard, inspect the crankshaft sensor.

Alternator Rotor Inspection

● Check the timing projection [A] for damage such as chipping or grooving.

★If the timing projection on the rotor is visibly damaged, replace the alternator rotor.



Ignition Timing Test

● Remove:
Engine Upper Cover (see Engine Upper Cover Removal in the Frame chapter)
Ignition Timing Inspection Plug

● Attach a timing light [A] and a tachometer in the manner prescribed by the manufacturer.

Special Tool - Timing Light: 57001-1241

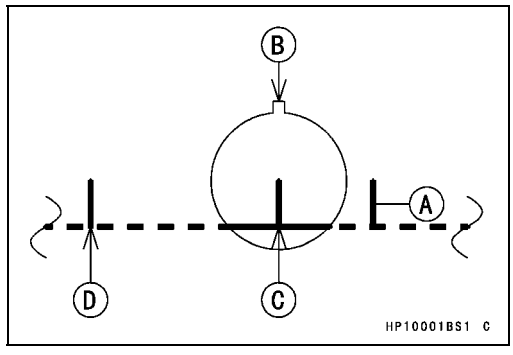
● Start the engine and aim the timing light at the timing mark on the alternator rotor.

● Run the engine at the speeds specified and note the alignment of the timing marks.

[A] F or R mark

Ignition Timing

Engine speed r/min (rpm)	Slot [B] aligned with:
1 100 and below	Advanced mark [C] on alternator rotor
5 000 and above	Advanced mark [D] on alternator rotor



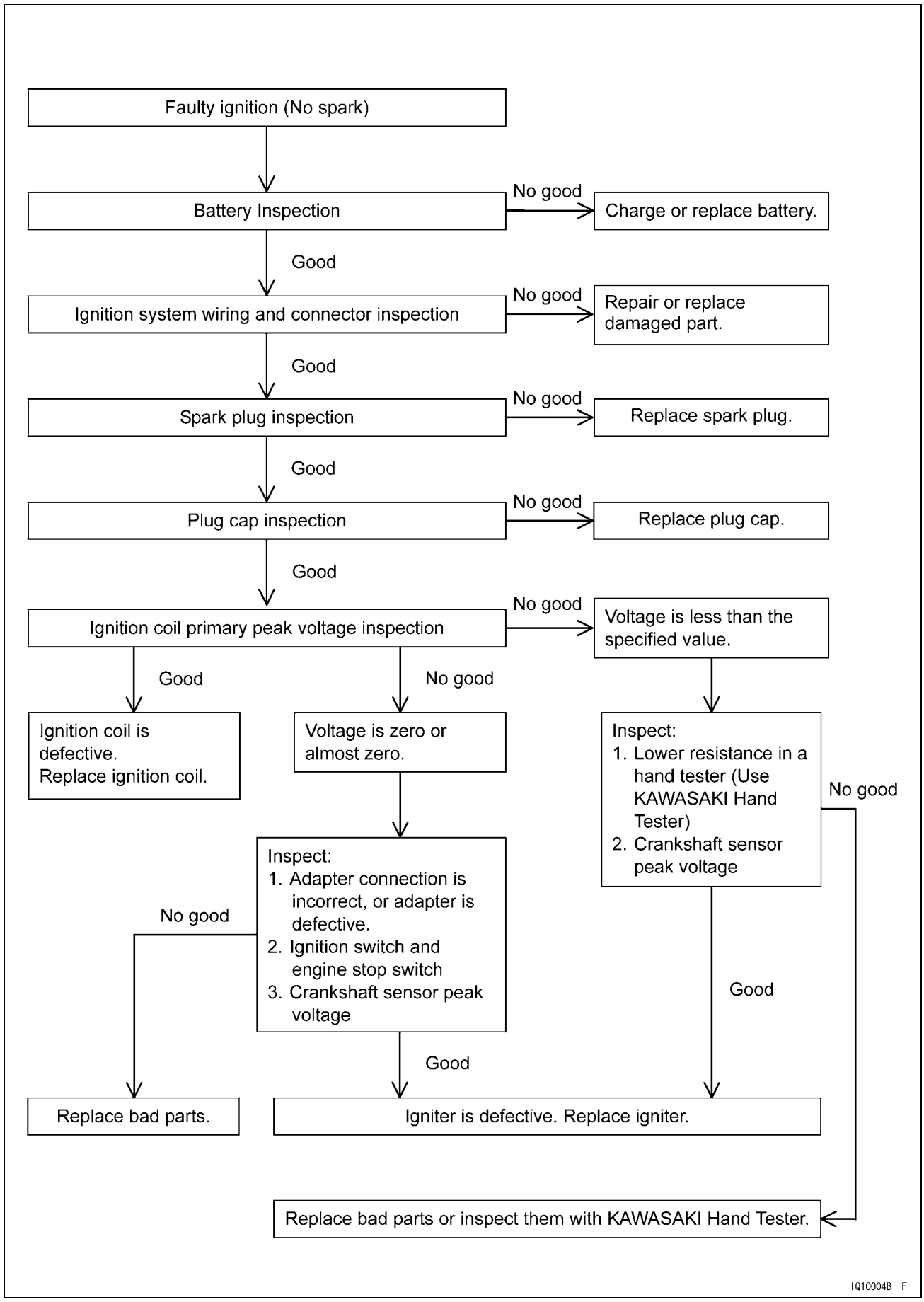
NOTE

○*Do not mix up the timing marks with mark [A].*

★If the ignition timing is incorrect, replace the igniter and the crankshaft sensor.

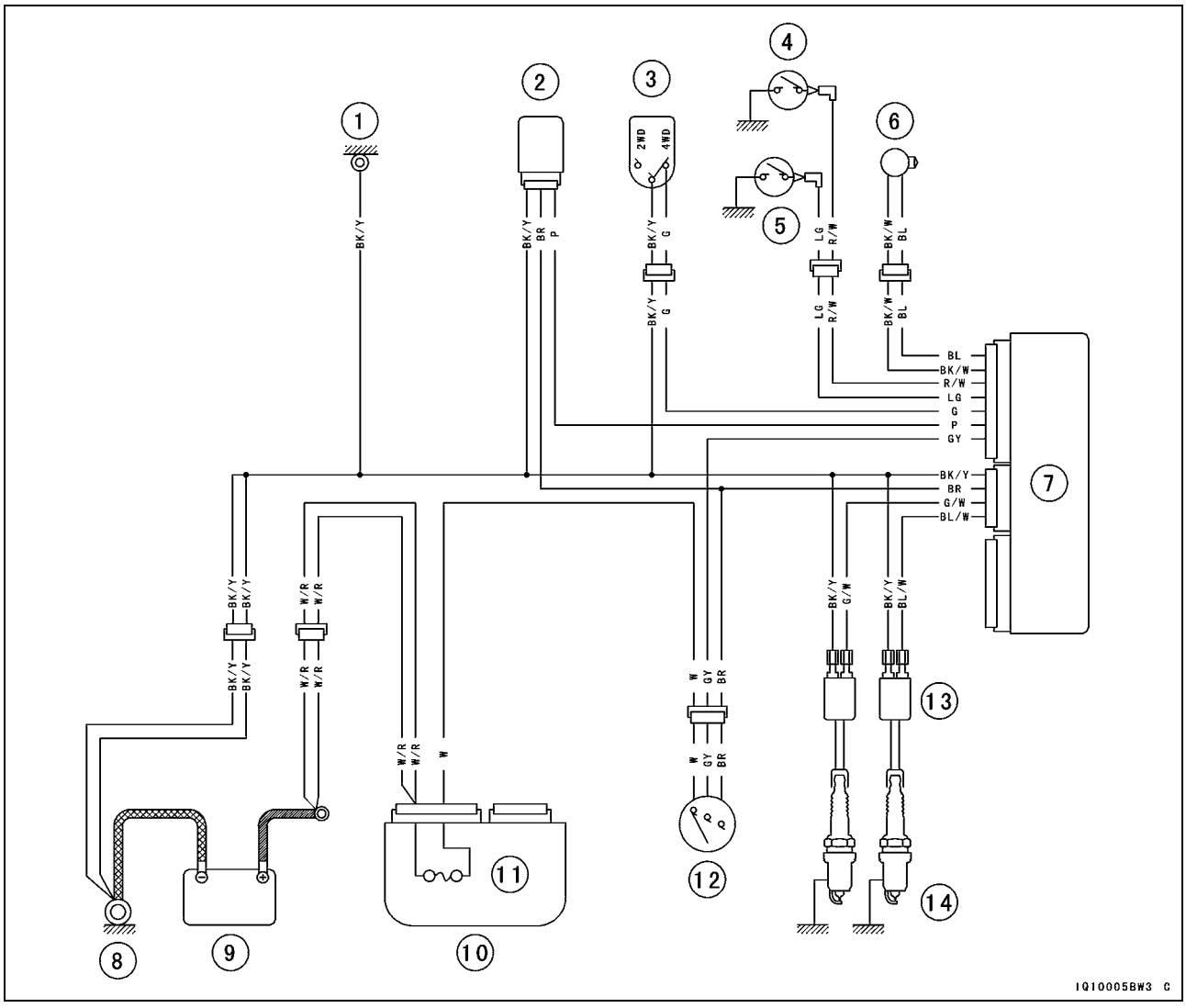
Ignition System

Ignition System Troubleshooting



Ignition System

Ignition System Circuit

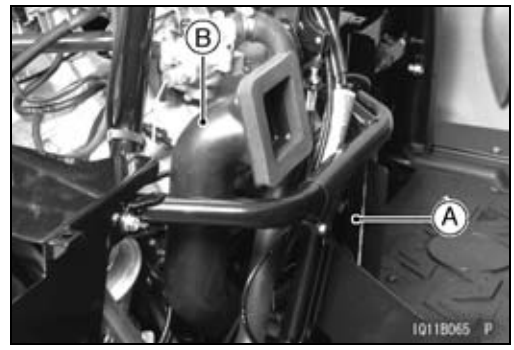


1. Frame Ground Terminal
2. Speed Sensor
3. 2WD/4WD Shift Switch
4. Reverse Switch
5. Neutral Switch
6. Crankshaft Sensor
7. Igniter
8. Engine Ground Terminal
9. Battery
10. Fuse Box
11. Main Fuse 30 A
12. Ignition Switch
13. Ignition Coils
14. Spark Plugs

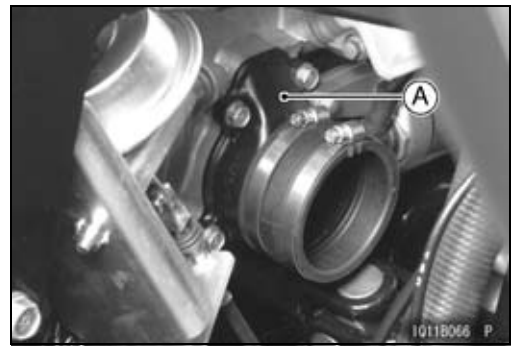
Electric Starter System

Starter Motor Removal

- Remove:
  Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
  Left Plate [A], Bolts and Bracket
  Air Inlet Duct [B]

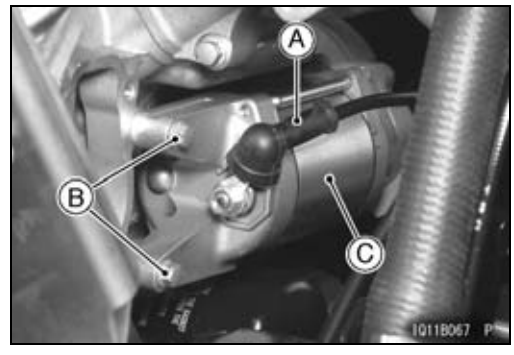


- Remove:
  Joint Duct [A], Bolts and Collars



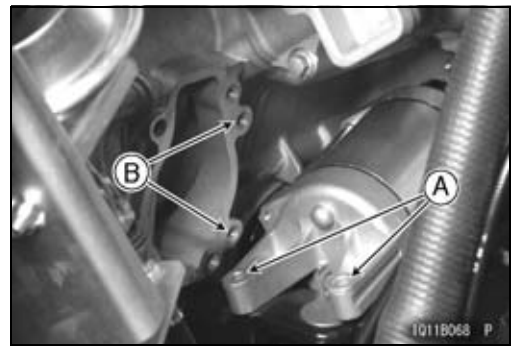
- Remove:
  Starter Motor Cable [A] and Nut
  Starter Motor Mounting Bolts [B]
  Starter Motor [C]

CAUTION
Do not tap the end of the starter motor shaft or the motor may be damaged.



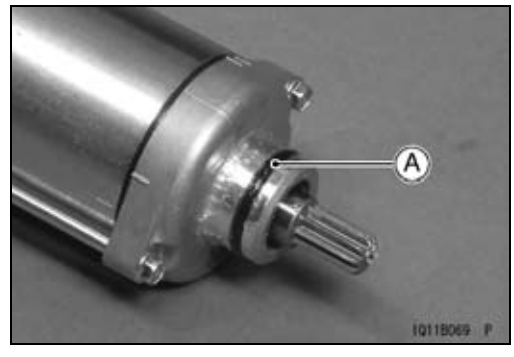
Starter Motor Installation

- Clean the starter motor lugs [A] and crankcase [B] where the starter motor is grounded.



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Install the starter motor.

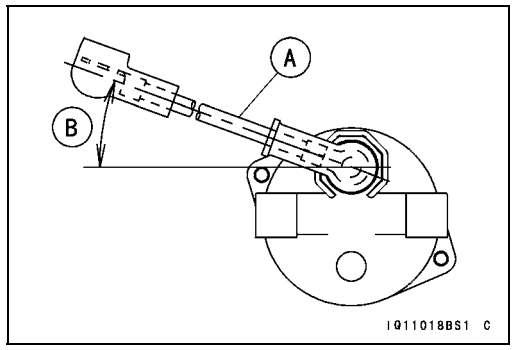
CAUTION
Do not tap the end of the starter motor shaft or the motor may be damaged.



Electric Starter System

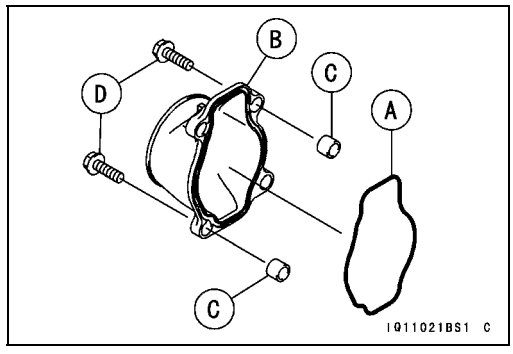
- Install the starter motor cable [A] at the angle as shown in the figure.
  [B] about 20°
- Tighten:

Torque - Starter Motor Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Starter Motor Cable Mounting Nut: 6.8 N·m (0.69 kgf·m, 60 in·lb)

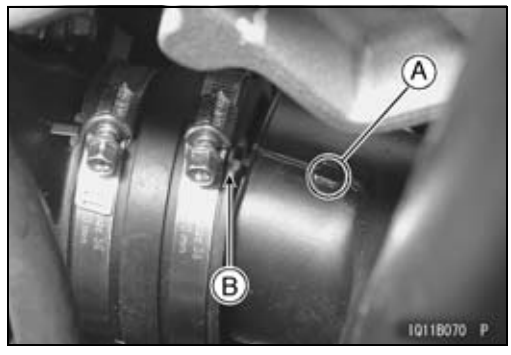


- Apply grease to the O-ring [A] in the joint duct [B].
- Install:
  Joint Duct and Collars [C]
- Tighten:

Torque - Joint Duct Bolts [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

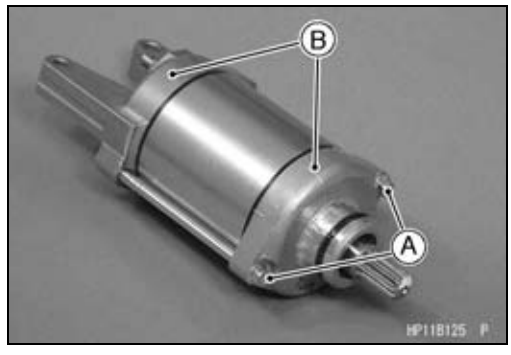


- Fit the projection [A] of the air inlet duct into the groove [B] of the rubber duct, and tighten the clamp screw.



Starter Motor Disassembly

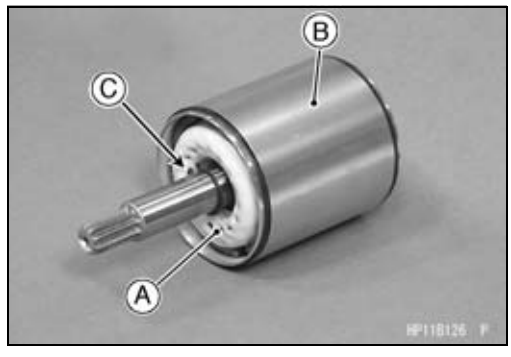
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove the both end covers [B].



- Pull out the armature [A] out of the yoke [B].

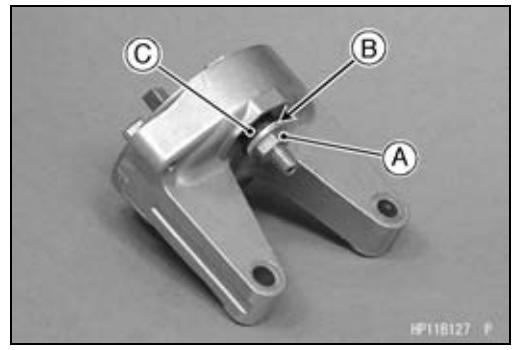
NOTE

○*Do not remove the circlip [C] from the shaft.*

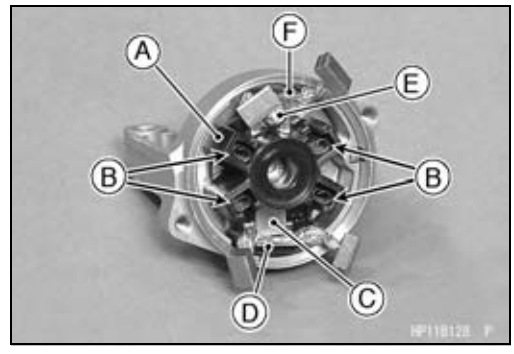


Electric Starter System

● Remove:
Starter Motor Terminal Locknut [A]
Washer [B]
Collar [C]

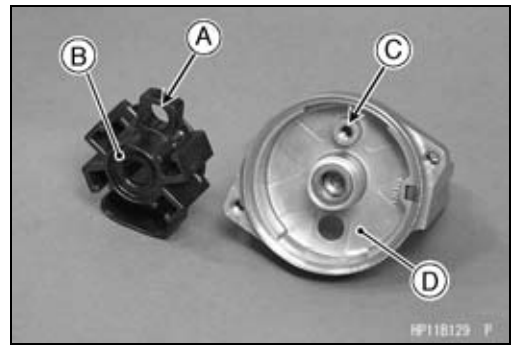


● Pull out the brushes from the brush holder [A].
● Remove:
Brush Springs [B]
Starter Motor Terminal [C]
Positive Brush Assy [D] and O-ring
Screw [E]
Negative Brush Assy [F]
Brush Holder

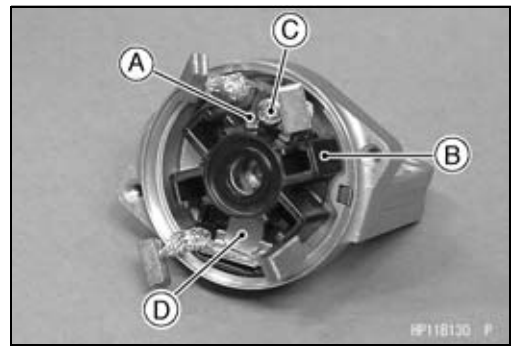


Starter Motor Assembly

● Align the hole [A] of the brush holder [B] to the boss [C] of the end cover [D].

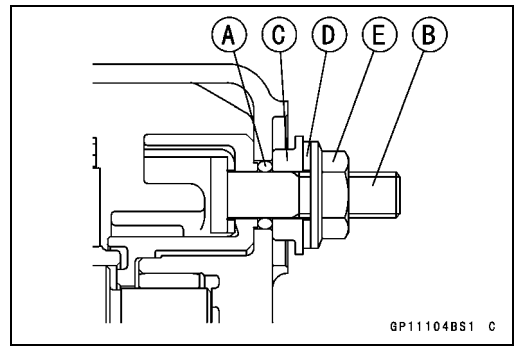


● Install the negative brush assy [A] to the brush holder [B].
● Tighten the screw [C] securely.
● Install the positive brush assy [D] to the brush holder.
● Install the starter motor terminal.



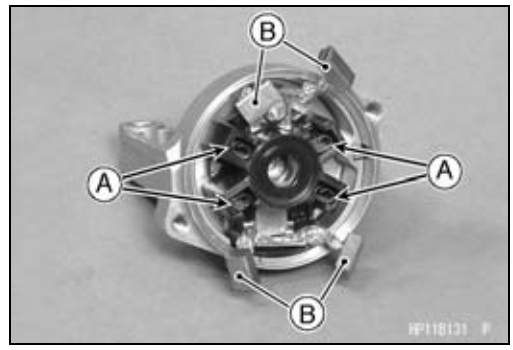
● Replace the O-ring [A] with a new one.
● Install the following parts to the starter motor terminal [B].
O-ring
Collar [C]
Washer [D]
Starter Motor Terminal Locknut [E]
○Install the collar so that stepped side faces outward.
● Tighten:

Torque - Starter Motor Terminal Locknut: 11 N·m (1.1 kgf·m, 97 in·lb)

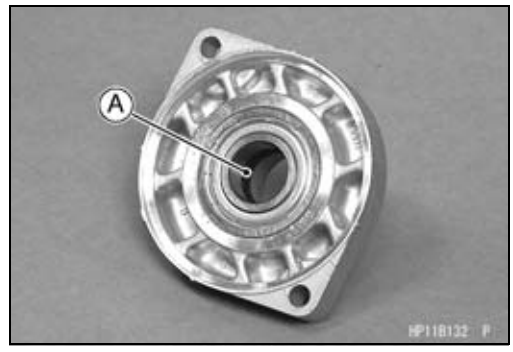


Electric Starter System

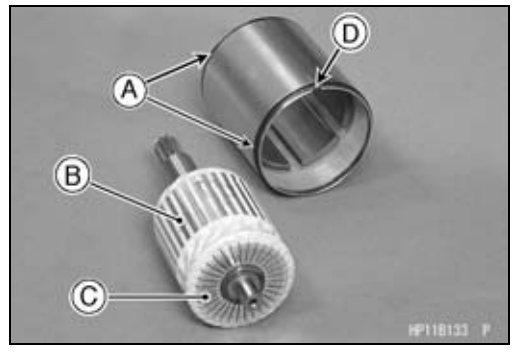
- Install the brush springs [A].
- Insert the brushes [B] to the brush holder.



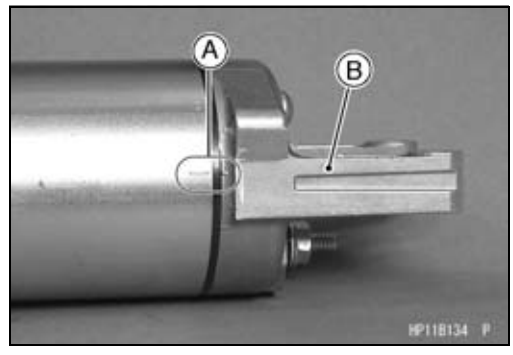
- Apply thin coat of grease to the oil seal [A].



- Replace the O-rings [A] with new ones.
- Insert the armature [B] so that commutator side [C] faces hollow side [D] of the yoke.



- Align the marks [A] to assembly the yoke and the end cover [B] as shown.

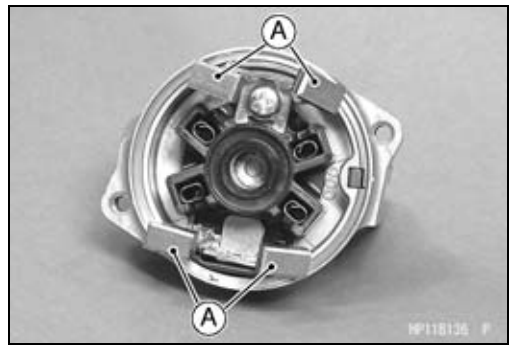


- Tighten:

Torque - Starter Motor Through Bolts [A]: 5.0 N·m (0.51 kgf·m, 44 in·lb)

Electric Starter System

Brush Inspection

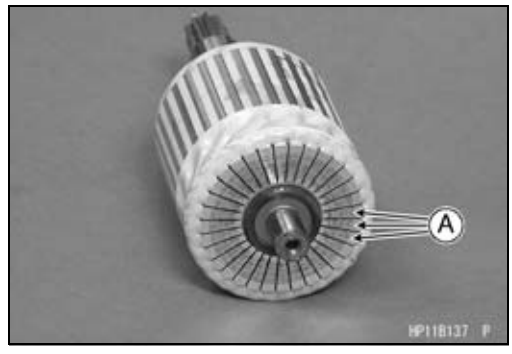


- Measure the length of each brush [A].

★If any is worn down to the service limit, replace the brush assy.

Starter Motor Brush Length
Standard: 12 mm (0.47 in.)
Service Limit: 6.5 mm (0.26 in.)

Commutator Cleaning and Inspection



- Clean the metallic debris off the between commutator segments [A].

NOTE

○*Do not use emery or sand paper on the commutator.*

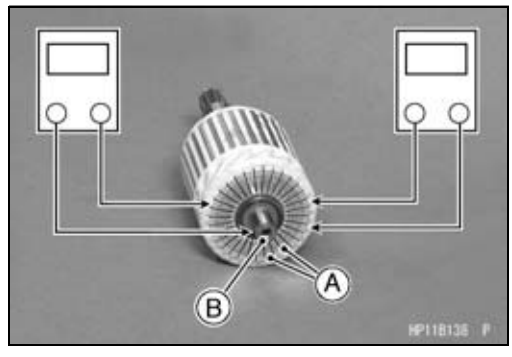
- Check the commutator for damage or abnormal wear.

★Replace the starter motor with a new one if there is any damage or wear.

- Visually inspect the commutator segments for discoloration.

★Replace the starter motor with a new one if discoloration is noticed.

Armature Inspection



- Using the × 1 Ω hand tester range, measure the resistance between any two commutator segments [A].

Special Tool - Hand Tester: 57001-1394

★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.

- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].

★If there is any reading at all, the armature has a short and the starter motor must be replaced.

NOTE

○*Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.*

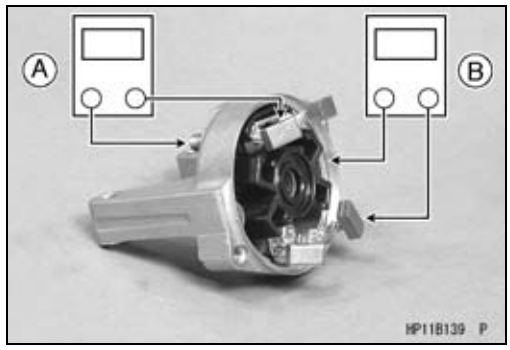
Electric Starter System

Brush Lead Inspection

- Using the × 1 Ω hand tester range, measure the resistance as shown.
  Terminal Bolt and Positive Brushes [A]
  Right-hand End Cover and Negative Brushes [B]

Special Tool - Hand Tester: 57001-1394

★If there is not close to zero ohms, the brush lead has an open. Replace the brush plate assy.

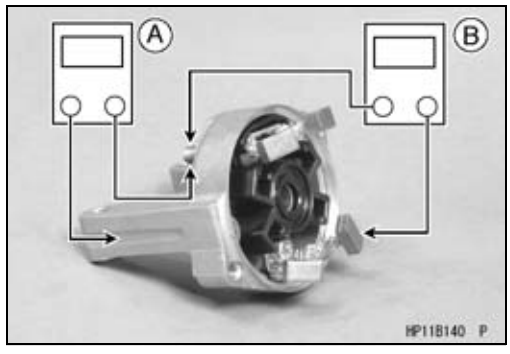


Right-hand End Cover Inspection

- Using the highest hand tester range, measure the resistance as shown.
  Terminal Bolt and Right-hand End Cover [A]
  Terminal Bolt and Negative Brushes [B]

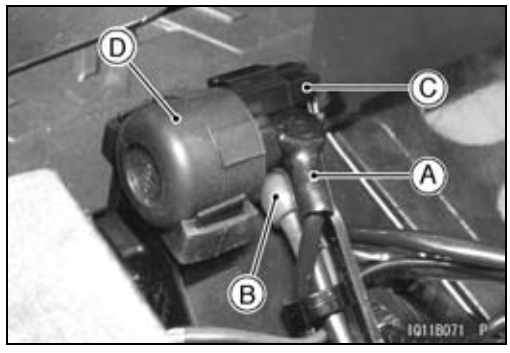
Special Tool - Hand Tester: 57001-1394

★If there is any reading, the brush assy and/or terminal bolt assy have a short. Replace the starter motor.



Starter Relay Inspection

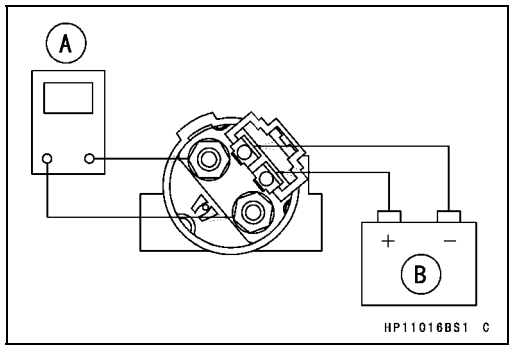
- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Disconnect:
  Starter Motor Cable [A]
  Battery Positive Cable [B]
  Connector [C]
- Remove:
  Starter Relay [D]



- Connect the hand tester [A] and a 12 V battery [B] to the starter relay as shown.

★If the relay does not work as specified, the relay is defective. Replace the relay.

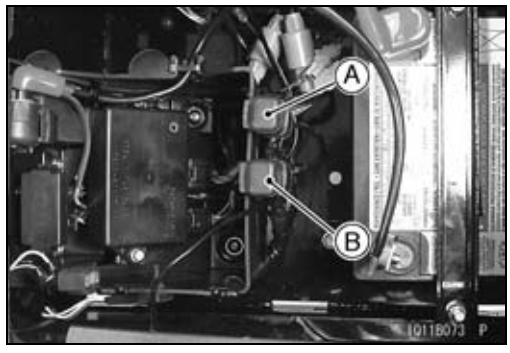
Testing Relay
Hand Tester Range: × 1Ω range
Criteria: When battery is connected ⇒ 0 Ω
When battery is disconnected ⇒ ∞Ω



Starter Circuit Relay Inspection

- Remove:
  Left Seat (see Seat Removal in the Frame chapter).
  Starter Circuit Relay [A] (Brake Switch Circuit)
  Starter Circuit Relay [B] (Neutral Switch Circuit)

○The starter circuit relays for the brake and neutral switch circuits are identical.



Electric Starter System

- Connect the hand tester [A] and a 12 V battery [B] to the starter circuit relay [C] as shown.

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

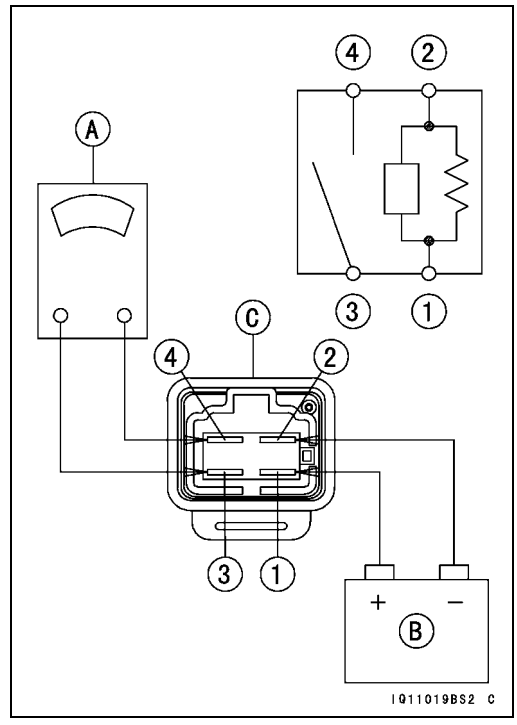
Hand Tester Range: × 1 Ω

Criteria: When battery is connected ⇒ 0 Ω

When battery is disconnected ⇒ ∞Ω

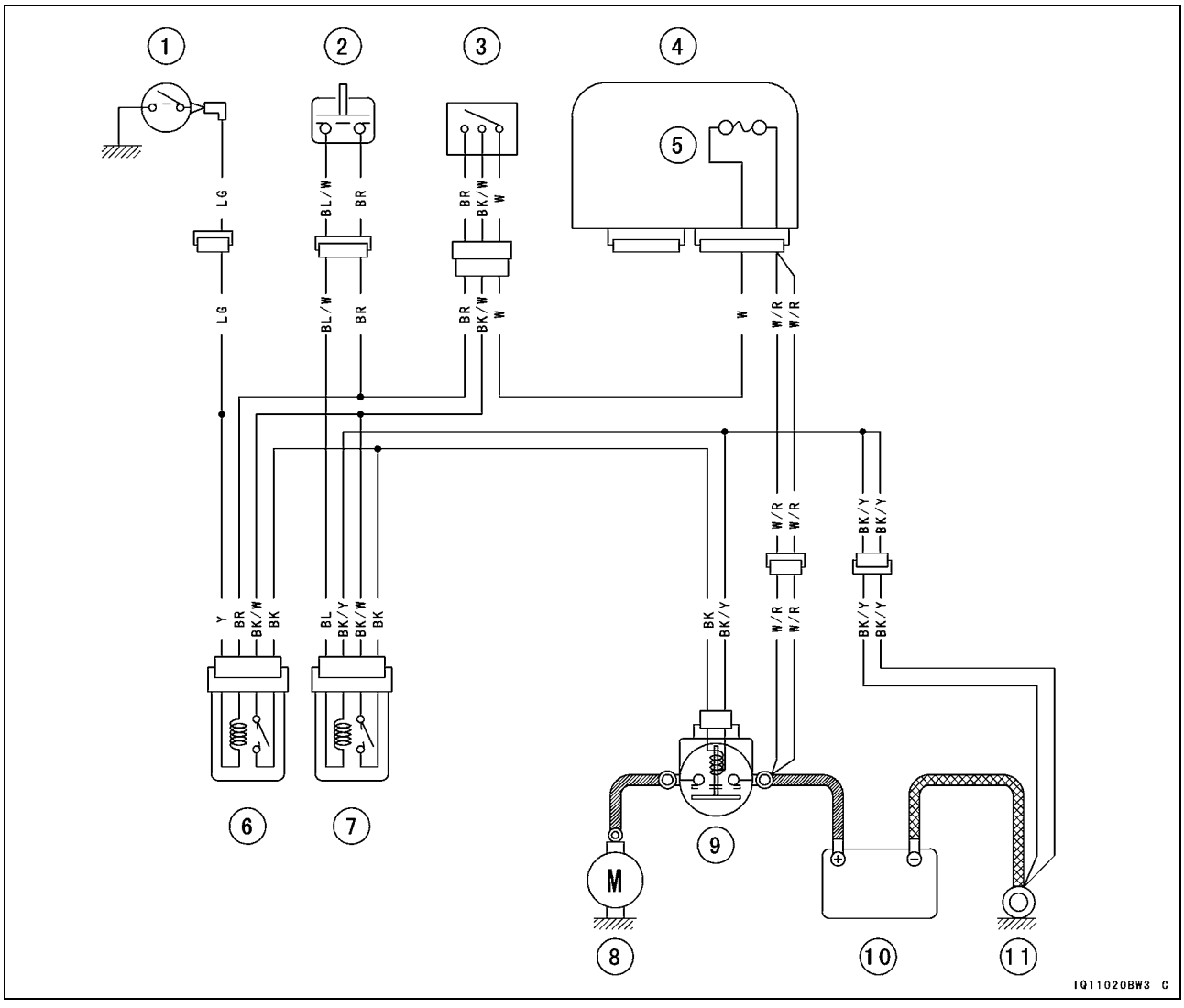
Relay Coil Terminals [1] and [2]

Relay Switch Terminals [3] and [4]



Electric Starter System

Electric Starter Circuit



1. Neutral Switch
2. Brake Light Switch
3. Ignition Switch
4. Fuse Box
5. Main Fuse 30 A
6. Starter Circuit Relay (Neutral)
7. Starter Circuit Relay (Brake)
8. Starter Motor
9. Starter Relay
10. Battery
11. Engine Ground Terminal

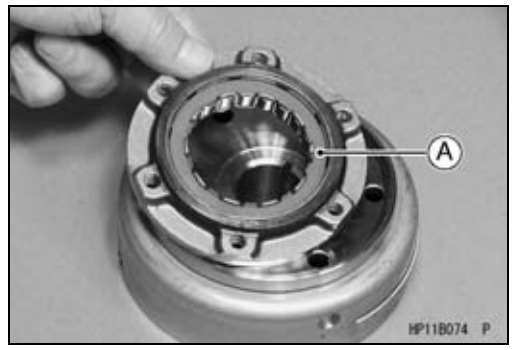
Starter Motor Clutch Removal

- Remove the alternator rotor (see Alternator Rotor Removal).
- Hold the rotor with the flywheel holder and take out the starter motor clutch bolts [A].

Special Tool - Flywheel Holder: 57001-1313

Electric Starter System

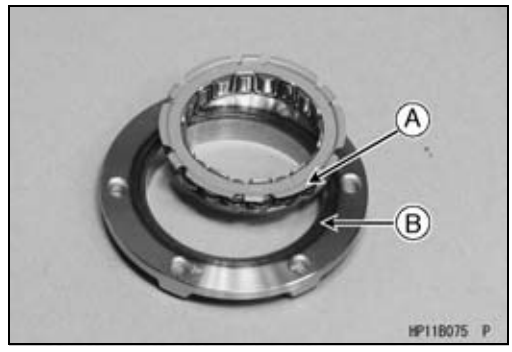
● Take out the one-way clutch [A].



Starter Motor Clutch Installation

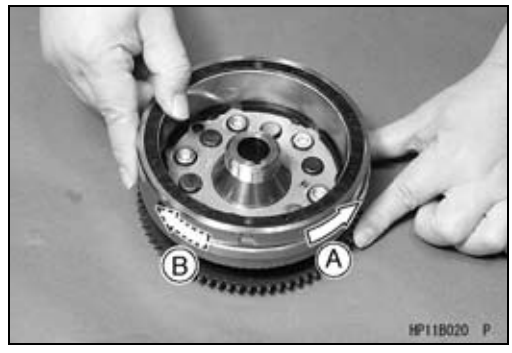
● Apply engine oil to around the cams of the one-way clutch.
● Install the one-way clutch so that the flange [A] fits on the recess [B] of the race.
● Apply a non-permanent locking agent:
Starter Motor Clutch Bolts
● Tighten:

Torque - Starter Motor Clutch Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



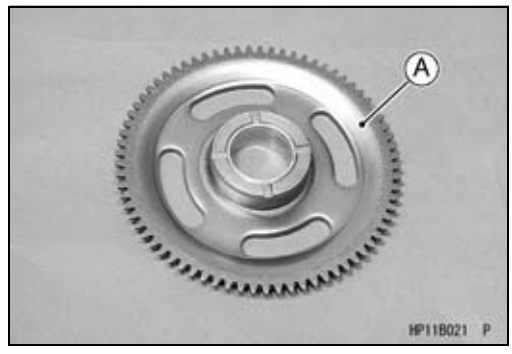
Starter Motor Clutch Inspection

● Remove:
Alternator Rotor (see Alternator Rotor Removal)
● Fit the starter clutch gear into the starter motor clutch.
★If the alternator rotor turns counterclockwise [A] freely from the starter clutch gear, but not clockwise [B], the clutch is operating correctly.
★If the clutch does not operate correctly, or if it makes noise, disassemble it and examine each part visually. Replace any worn or damaged parts.



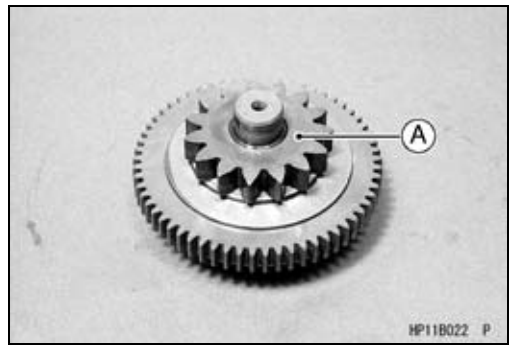
NOTE

○*Examine the starter clutch gear [A]. Replace it if it is worn or damaged.*



Torque Limiter Inspection

● Remove:
Alternator Rotor (see Alternator Rotor Removal)
● Remove the torque limiter [A] and visually inspect it.
★If the limiter has wear, discoloration, or other damage, replace it as a unit.



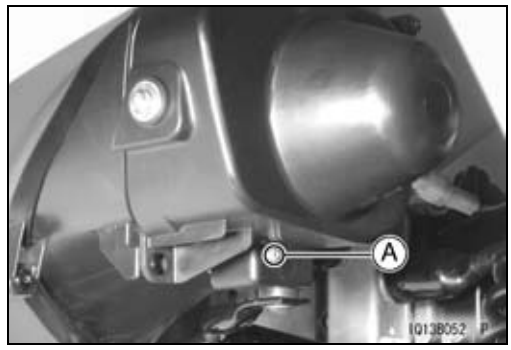
Lighting System

Headlight Beam Vertical Adjustment

- Turn the adjusting screw [A] on each headlight rim in or out to adjust the headlight vertically.

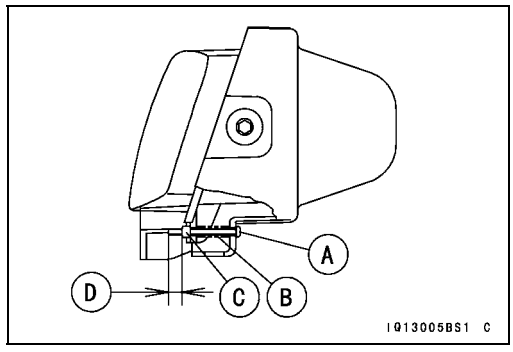
NOTE

○*On high beam, the brightest point should be slightly below horizontal with the vehicle on its wheels and the rider seated. Adjust both headlights to the same angle.*



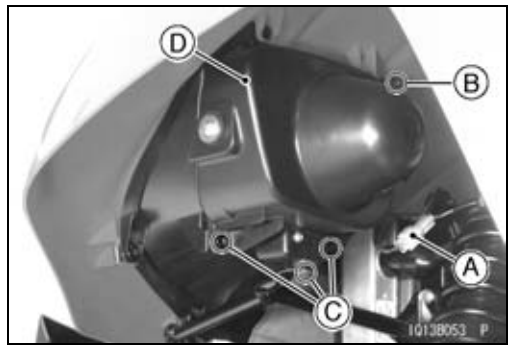
Standard Position

Adjusting Screw [A]
Spring [B]
Nut [C]
12 mm (0.47 in.) [D]

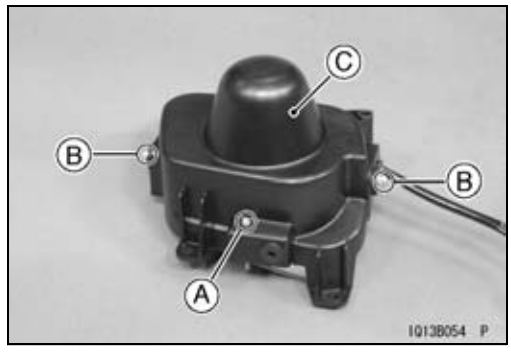


Headlight Bulb Replacement

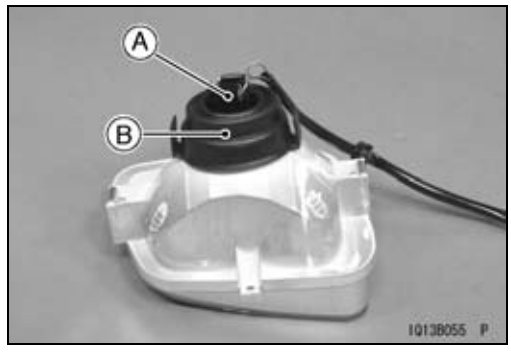
- Remove:
  Headlight Lead Connector [A]
  Bolt [B]
  Screws [C]
  Headlight Assembly [D]



- Remove:
  Vertical Adjustment Screw [A], Spring, and Nut
  Bolts [B]
  Headlight Cover [C]

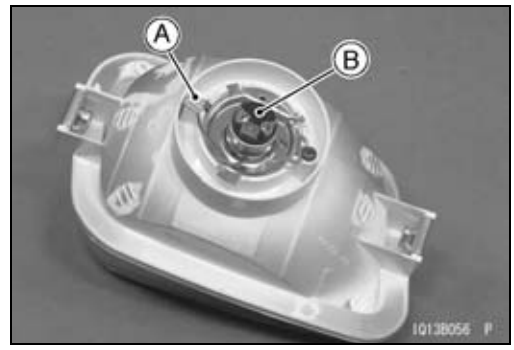


- Disconnect:
  Headlight Connector [A]
  Dust Cover [B]



Lighting System

● Remove:
Hook [A]
Headlight Bulb [B]



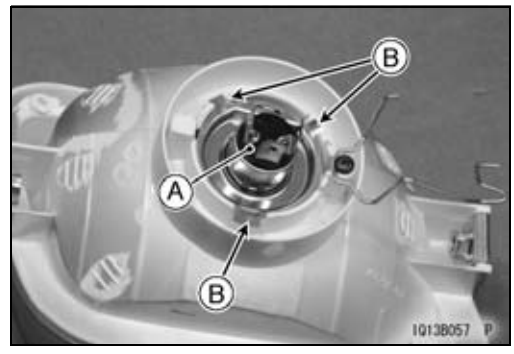
CAUTION

When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.

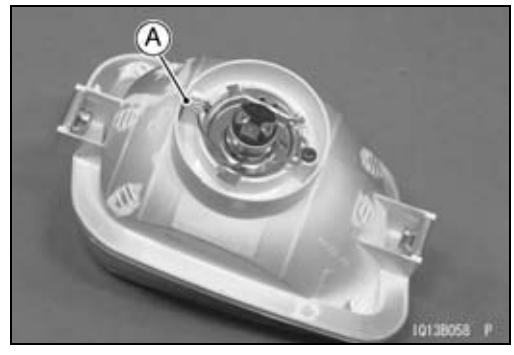
NOTE

○*Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.*

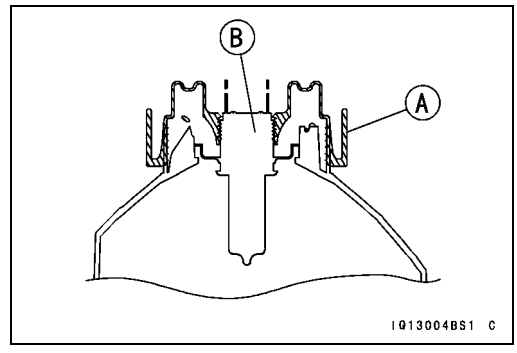
● Replace the headlight bulb [A].
● Fit the projections [B] of the bulb in the hollows of the headlight.



● Install the hook [A].

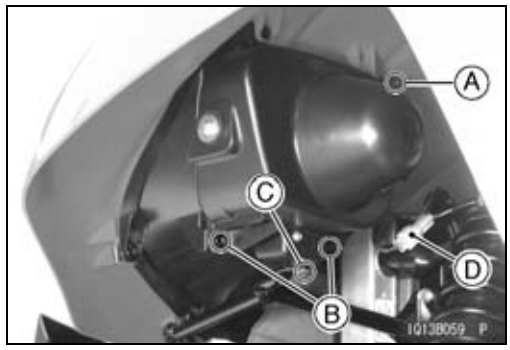


● Fit the dust cover [A] onto the bulb [B] firmly as shown in the figure.



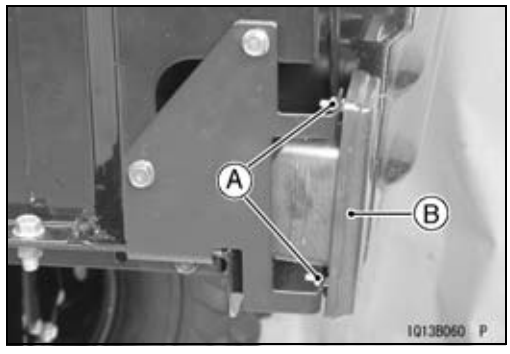
Lighting System

- Install the removed parts.
  [A] Bolt [M5, L = 45 mm (1.77 in.)]
  [B] Screws [M5, L = 15 mm (0.59 in.)]
  [C] Screw [M6, L = 18 mm (0.71 in.)]
- Connect the headlight lead connector [D].
- After installation, adjust the headlight aim (see Headlight Beam Vertical Adjustment).

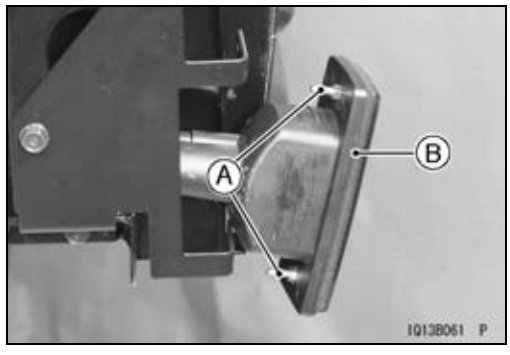


Tail/Brake Light Bulb Replacement

- Remove:
  Rear Fender (see Rear Fender Removal in the Frame chapter)
  Tail/Brake Light Mounting Screws [A] and Washers
  Tail/Brake Light [B]



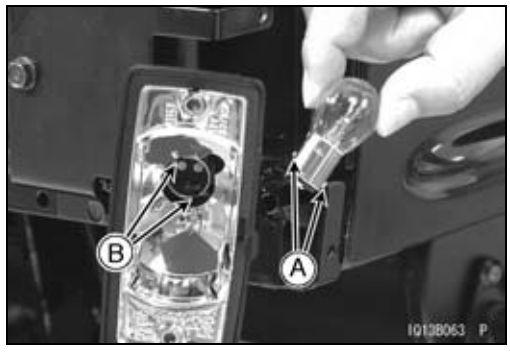
- Remove:
  Tail/Brake Light Lens Mounting Screws [A] and Nuts
  Tail/Brake Light Lens [B]



- Push and turn the bulb [A] counterclockwise and remove it.

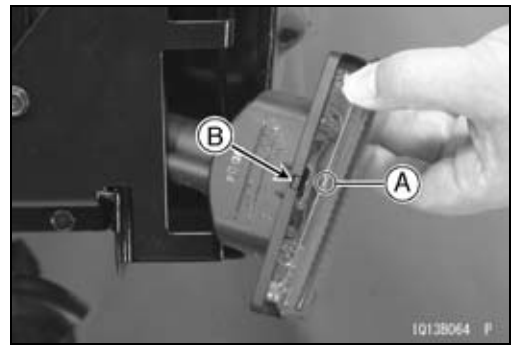
○Turn the bulb about 15°.

- Insert the new bulb by aligning its upper and lower pins [A] with the upper and lower grooves [B] in the socket, and turn the bulb clockwise.

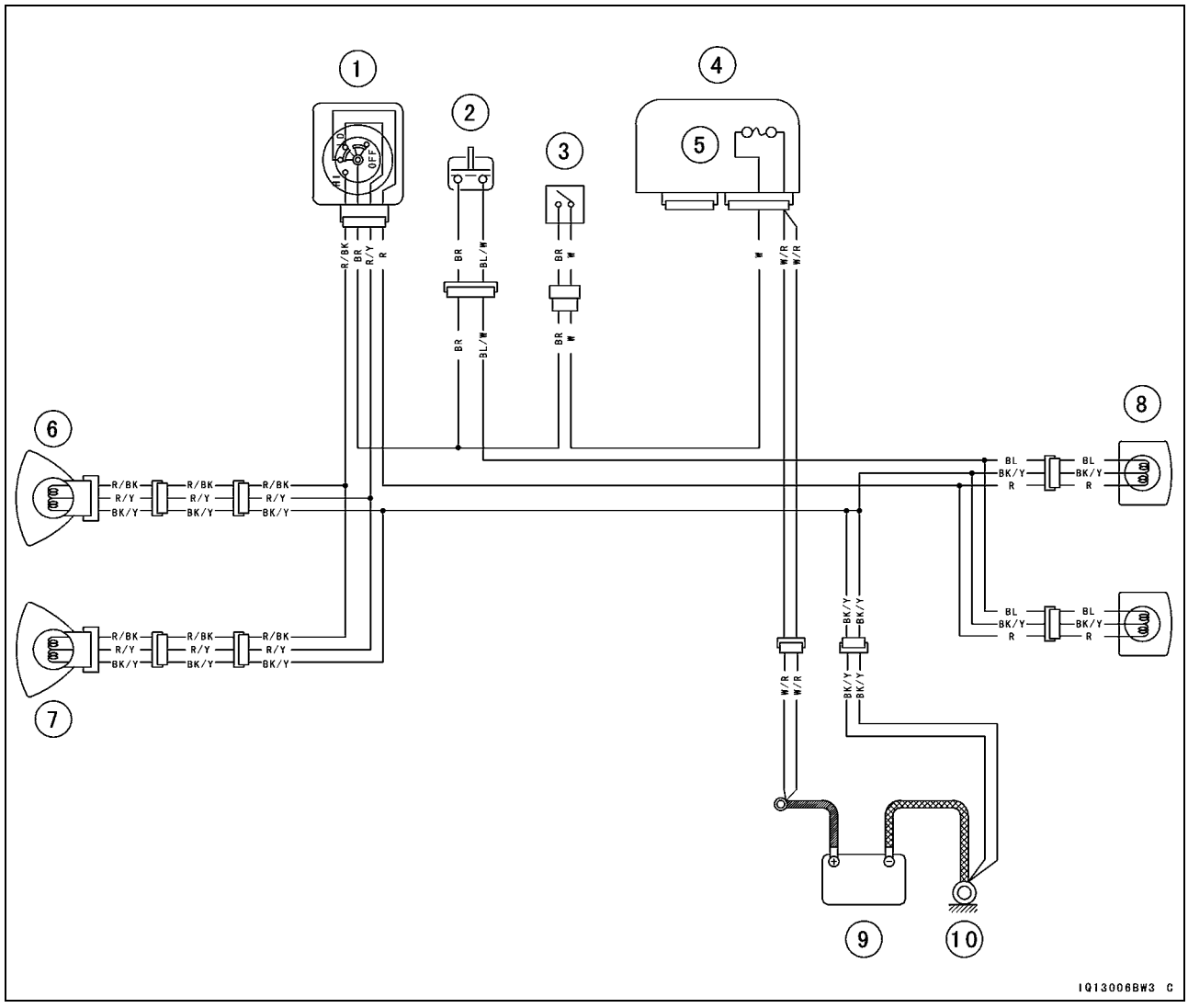


Lighting System

- Fit the projection [A] of the lens into the recess [B] of the housing.
- Install the removed parts.



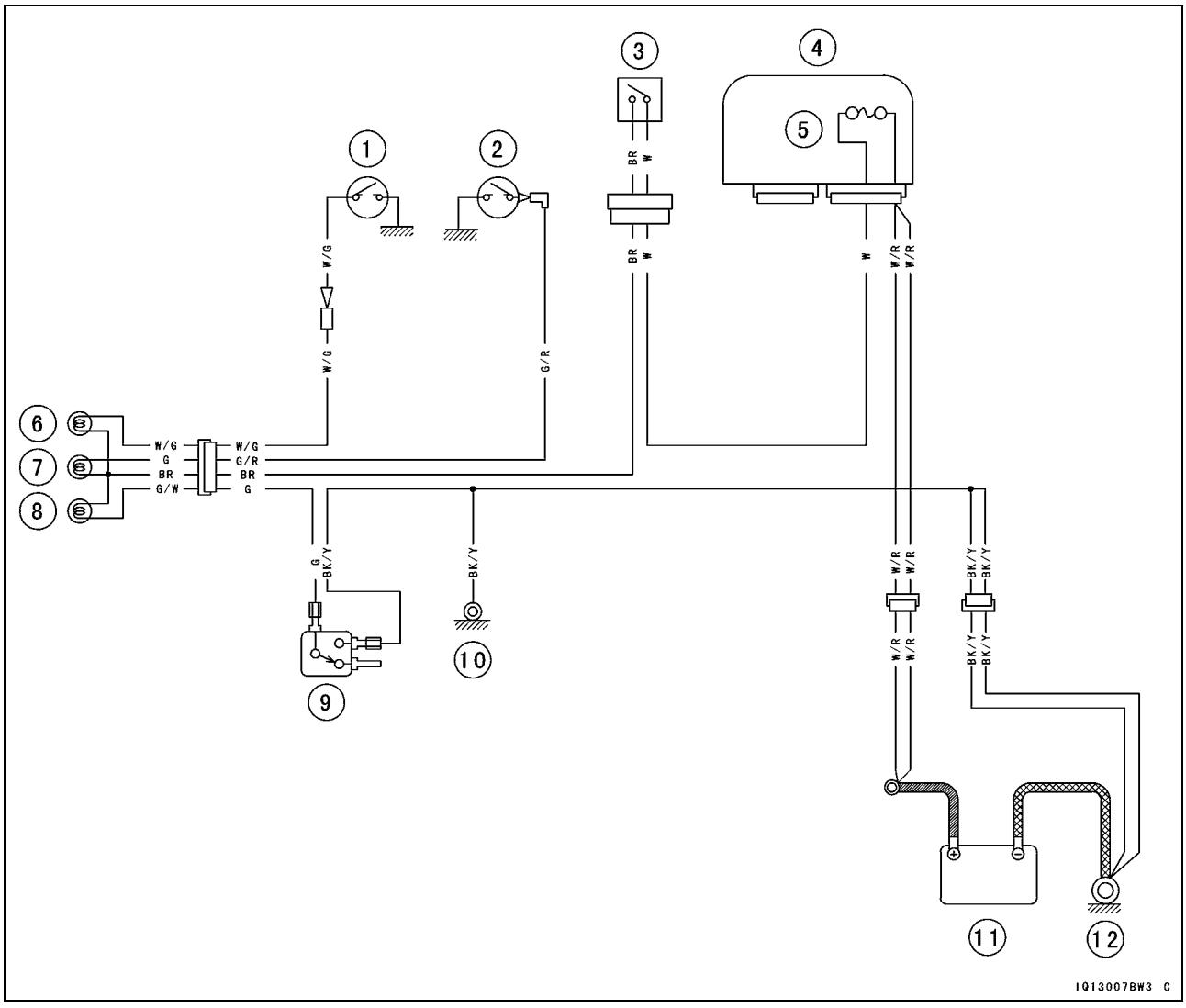
Lighting System Circuit



1. Lighting Switch
2. Brake Light Switch
3. Ignition Switch
4. Fuse Box
5. Main Fuse 30 A
6. Headlight (Right) 12 V 35/35 W
7. Headlight (Left) 12 V 35/35 W
8. Brake/Tail Lights 12 V 27/8 W
9. Battery
10. Engine Ground Terminal

Lighting System

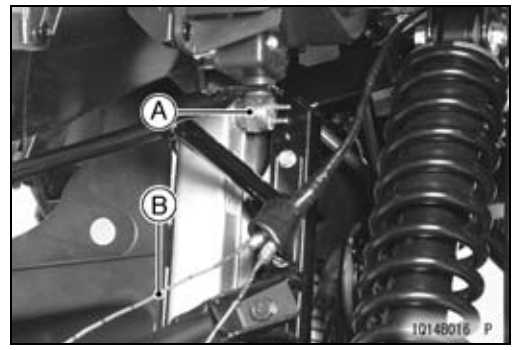
Indicator Light Circuit



1. Water Temperature Switch
2. 4WD Indicator Light Switch
3. Ignition Switch
4. Fuse Box
5. Main Fuse 30A
6. Water Temperature Warning Indicator Light
7. 4WD Indicator Light
8. Parking Indicator Light
9. Parking Brake Light Switch
10. Frame Ground Terminal
11. Battery
12. Engine Ground Terminal

Radiator Fan System

Radiator Fan Circuit Inspection

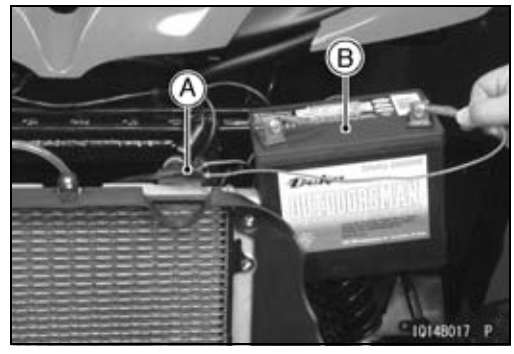


- Disconnect the leads from the radiator fan switch [A].
- Using an auxiliary wire [B], connect the radiator fan switch leads.

★If the fan rotates, inspect the fan switch.

★If the fan does not rotate, inspect the following.
Leads and Connectors
Main Fuse and Fan Breaker
Fan Motor

Radiator Fan Motor Inspection



- Disconnect the connector [A] in the fan lead.
- Using two auxiliary wires, supply battery [B] voltage to the fan motor.

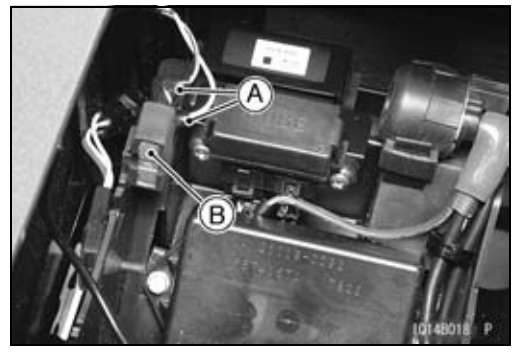
★If the fan does not rotate, the fan motor is defective and must be replaced.

Radiator Fan Motor Leads

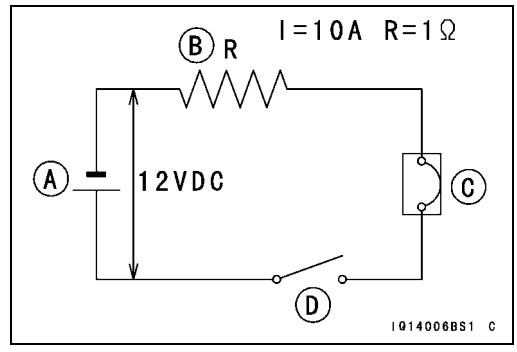
BL → Battery (+)

BK → Battery (–)

Radiator Fan Breaker Inspection



- Remove:
Left Seat (see Seat Removal in the Frame chapter)
Connectors [A] (disconnect)
Radiator Fan Breaker [B]



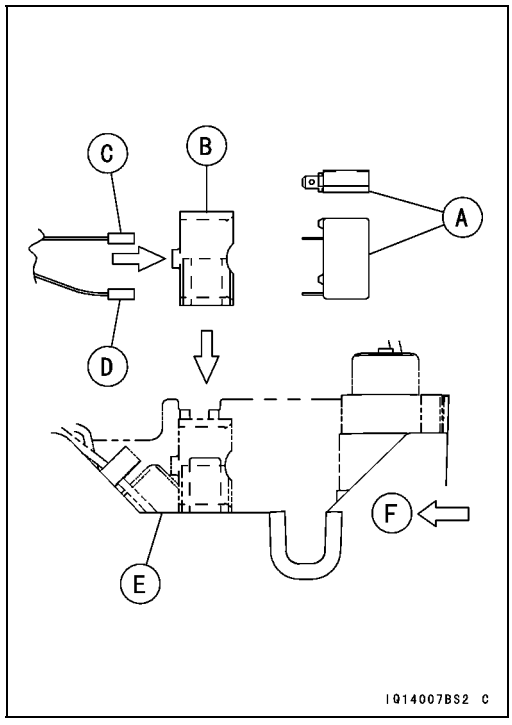
- Inspect the breaker for operation.
- Connect:
12 V Battery [A]
1 Ω Resistance [B]
Radiator Fan Breaker [C]
Switch [D]

★If the circuit in the breaker will not open within 60 seconds, replace the breaker.

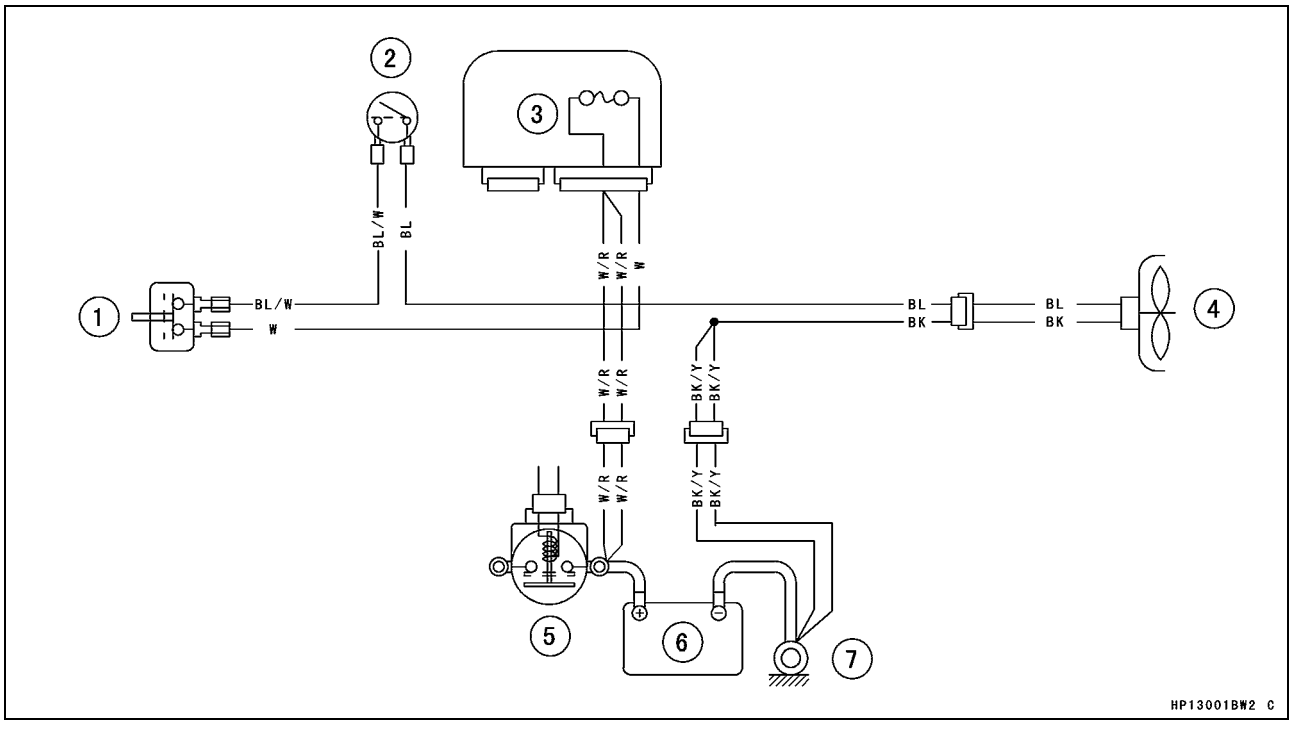
Radiator Fan System

Radiator Fan Breaker Installation

- Install:
  Radiator Fan Breaker [A]
  Holder [B]
- Connect:
  White Lead [C]
  Blue/White Lead [D]
  [E] Electrical Parts Case
  [F] Front Side



Radiator Fan Circuit

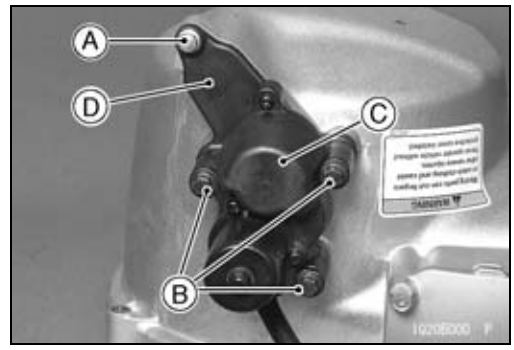


1. Radiator Fan Breaker
2. Radiator Fan Switch
3. Main Fuse 30 A
4. Radiator Fan
5. Starter Relay
6. Battery
7. Engine Ground Terminal

Actuator Control System

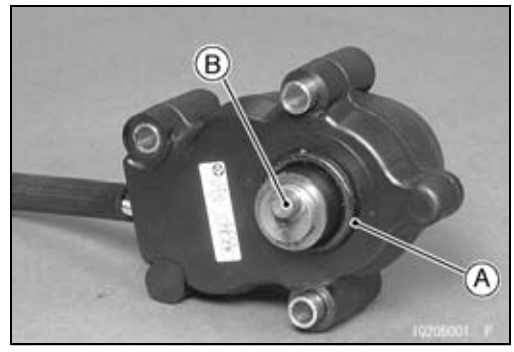
Engine Brake Actuator Removal

- Remove:
  Torque Converter Cover (see Torque Converter Cover Removal in the Converter System chapter)
  Actuator Cover Bolt [A]
  Actuator Mounting Bolts [B]
  Actuator [C]
  Actuator Cover [D]

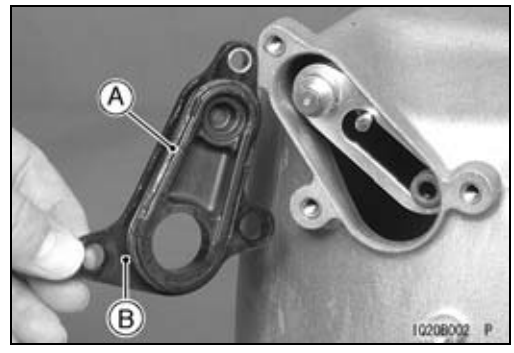


Engine Brake Actuator Installation

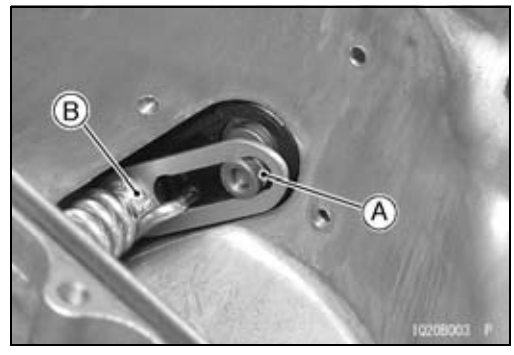
- Apply grease and Install:
  O-ring [A]
- Apply molybdenum disulfide grease to the pin [B].



- Apply grease to the trim seal [A] and install the cover [B].

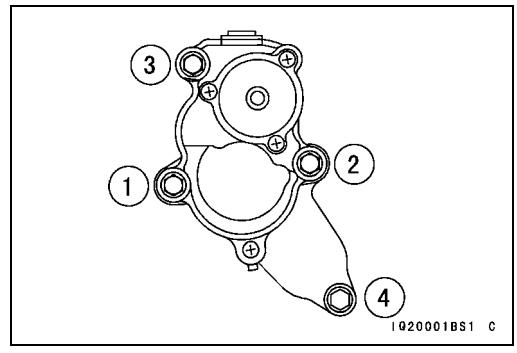


- Insert the pin into the collar [A] of the engine brake lever assembly [B].
- Wipe off any protruding grease.



- Tighten the actuator mounting bolts following the tightening sequence [1 ~ 4].

Torque - Engine Brake Actuator Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Actuator Cover Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

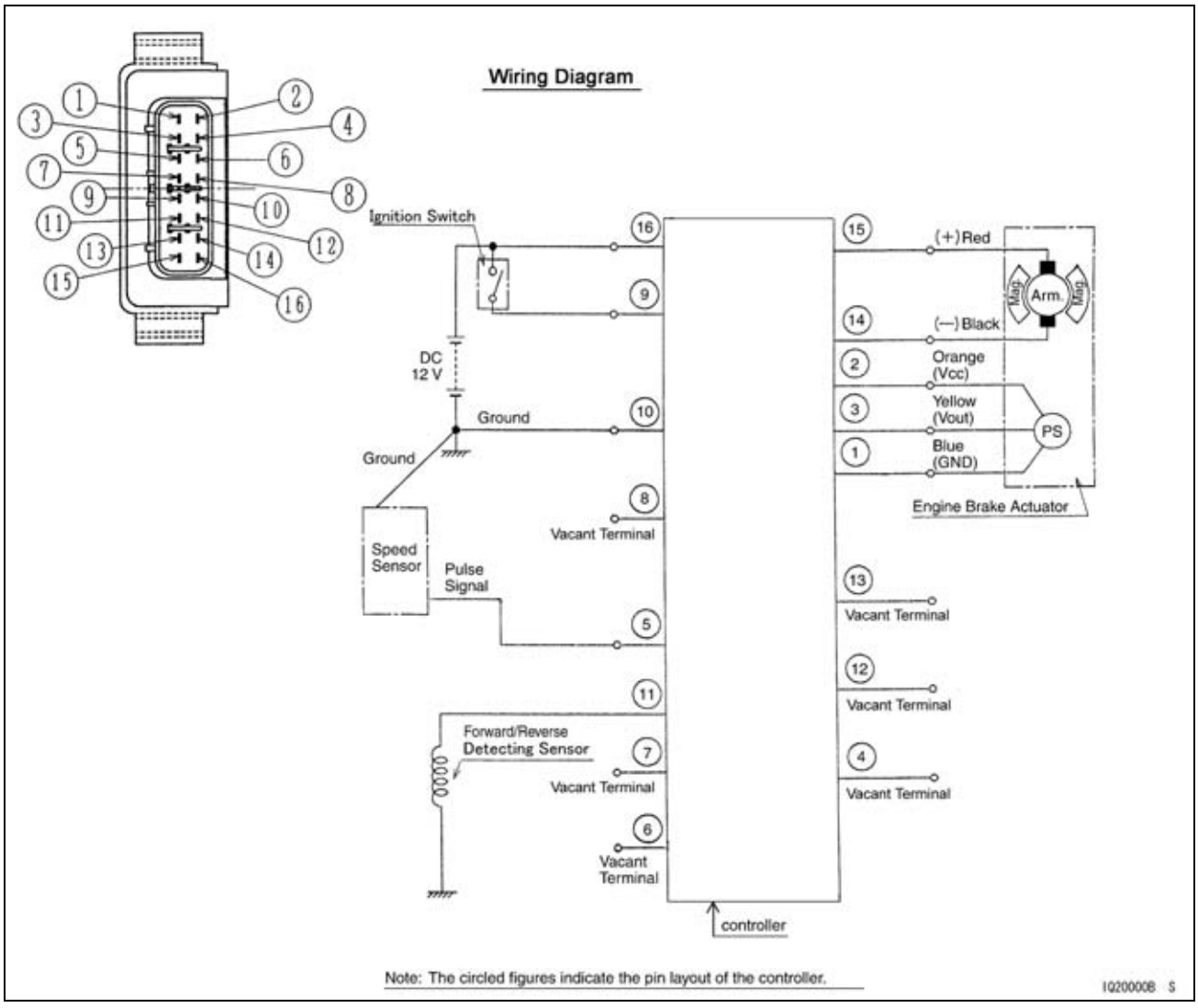


Actuator Control System

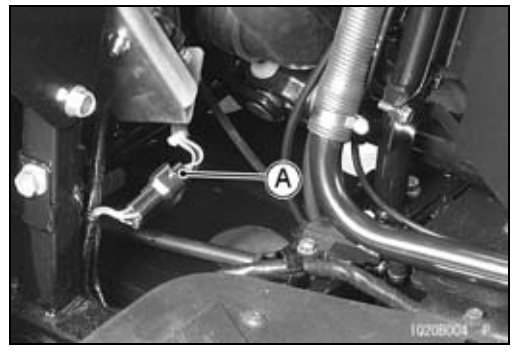
Actuator Control System Outline

The actuator controller has a microprocessor that detects vehicle speed, ignition switch, and the forward/reverse movement of the vehicle in order to control the engine brake actuator.

Actuator Control System



Engine Brake Actuator Inspection



- Remove:
  Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
  Actuator Lead Connector [A]

Actuator Control System

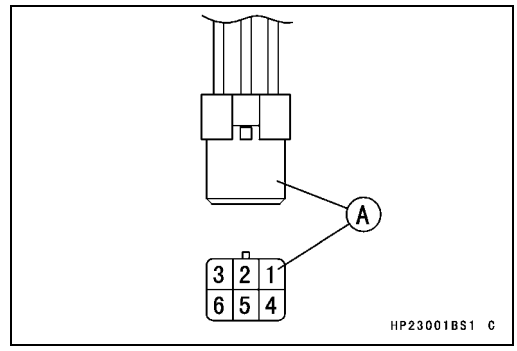
● Measure the resistance between the following terminals in the actuator lead connector [A].

Special Tool - Hand Tester: 57001-1394

Actuator Internal Resistance

4 (Red) - 6 (Black):	**3 ~ 15 Ω**
1 (Orange) - 3 (Blue):	**3.5 ~ 6.5 kΩ**
2 (Yellow) - 3 (Blue):	**630 ~ 5,330 Ω**

★If any reading is not within the specified range, replace the engine brake actuator.

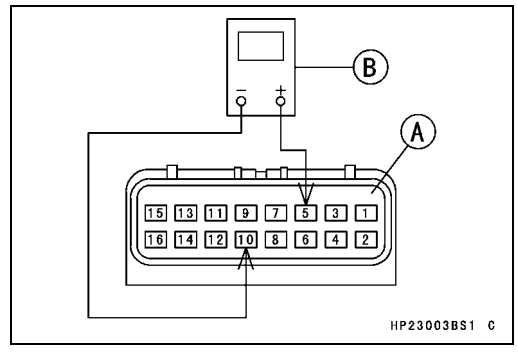


Speed Sensor Circuit Inspection

NOTE

○*Be sure the battery is fully charged.*

● Support the vehicle on a stand or a jack so that the wheels are off the ground.
● Remove:
Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
● Connect:
Controller Connector [A]
Hand Tester [B] (range: DC 25 V)
Tester (+) → Connector (P) Terminal [5]
Tester (–) → Connector (BK/Y) Terminal [10]



○Install the needle adapters on the tester leads.

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

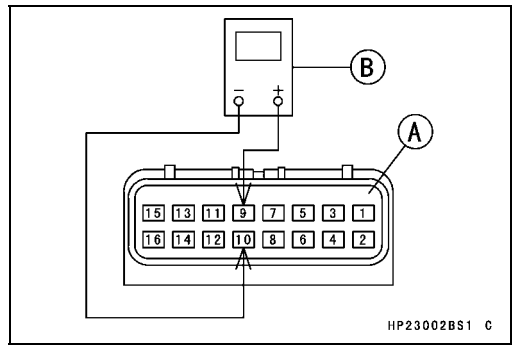
● Turn ON the ignition switch.
● Spin a rear wheel, measure the voltage.

Speed Sensor Output Voltage
Standard: repeat from 0 to 5 V

★If the reading is not standard, check the wiring.
★If the wiring is good, check the speed sensor (see Speed Sensor Inspection).

Actuator Control System

Controller Unit Inspection



NOTE

○*Be sure the battery is fully charged.*

- Remove:
  Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
- Connect:
  Controller Connector [A]
  Hand Tester [B] (range: DC 25 V)
  Tester (+) → Connector (BR) Terminal [9]
  Tester (–) → Connector (BK/Y) Terminal [10]

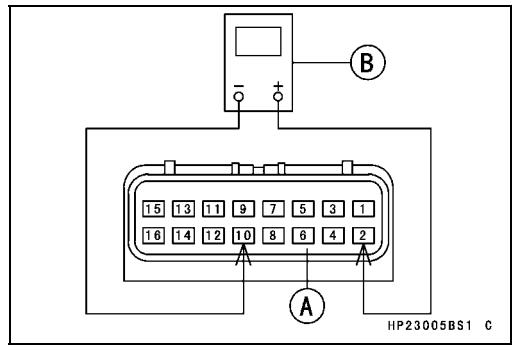
○Install the needle adapters on the tester leads.

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

- Turn ON the ignition switch.

Controller Power Supply Voltage
Standard: near Battery Voltage

★If the reading is not battery voltage, check the wiring harness, 30 A fuse, or ignition switch.



- Connect:
  Controller Connector [A]
  Hand Tester [B] (range: DC 10 V)
  Tester (+) → Connector (O) Terminal [2]
  Tester (–) → Connector (BK/Y) Terminal [10]

○Install the needle adapters on the tester leads.

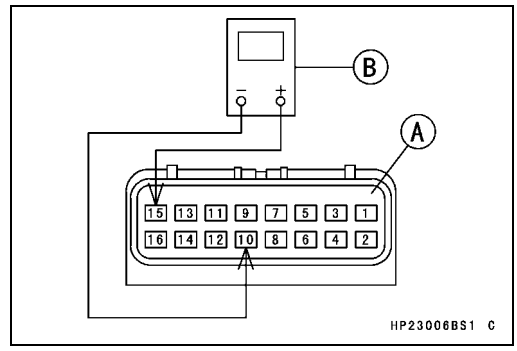
Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

- Turn ON the ignition switch.
- Measure the controller output voltage for the actuators.

Controller Output Voltage (to Actuators)
Standard: 4.8 ±0.2 V

★If the reading is not standard, replace the actuator controller unit.

Actuator Control System



- Support the vehicle on a stand or a jack so that the wheels are off the ground.
- Connect:
  Controller Connector [A]
  Hand Tester [B] (range: DC 25 V)
  Tester (+) → Connector (W/R) Terminal [15]
  Tester (–) → Connector (BK/Y) Terminal [10]

○Install the needle adapters on the tester leads.

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

- Turn ON the ignition switch.
- Spin a rear wheel as forward rotation.
- After the wheels stop and one second elapses, turn OFF the ignition switch.
- After two seconds elapses, measure the controller output voltage for the engine brake actuator until the actuator stops.

Controller Output Voltage (to engine brake actuator)
Standard: 5 ~ 12 V

★If the reading is not standard, check the forward/reverse detecting sensor.
★If the forward/reverse detecting sensor is normal, replace the actuator controller unit.

Forward/Reverse Detecting Sensor Inspection

- Remove:
  Engine Upper Cover (see Engine Upper Cover Removal in the Frame chapter)
- Disconnect forward/reverse detecting sensor lead connector [A].
- Measure the forward/reverse detecting sensor resistance.

○Connect the hand tester between the BK lead and the W lead.
○Set the tester to the × 100 Ω range.

Special Tool - Hand Tester: 57001-1394

Forward/Reverse Detecting Sensor Resistance
Standard: 1.2 ~ 1.6 kΩ

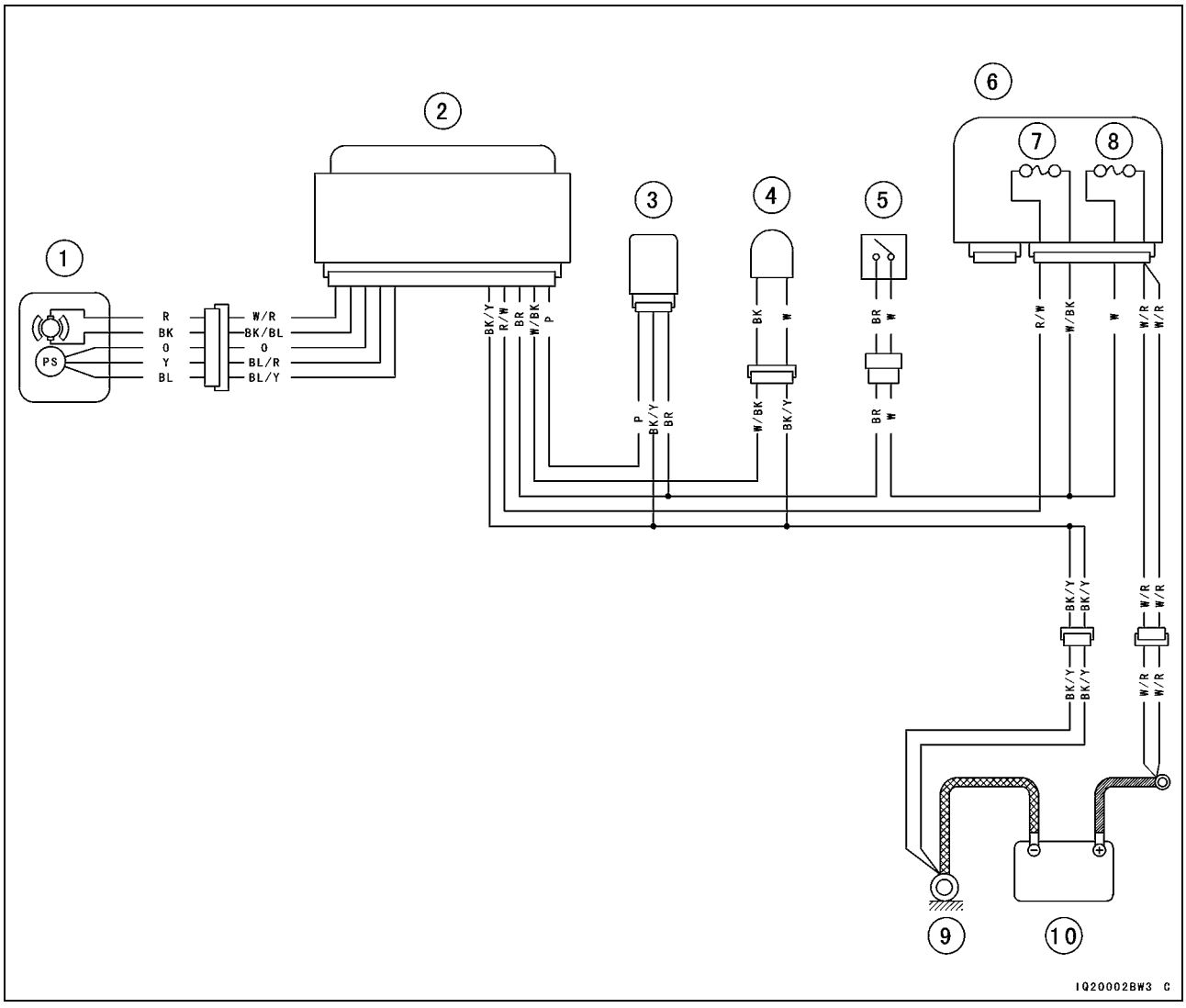
★If the reading is not within the specified range, replace the forward/reverse detecting sensor.

- Using the highest resistance, measure the resistance between forward/reverse detecting sensor leads and chassis ground.

★If the tester reading is less than infinity (∞) indicates a short, replace the forward/reverse detecting sensor.

Actuator Control System

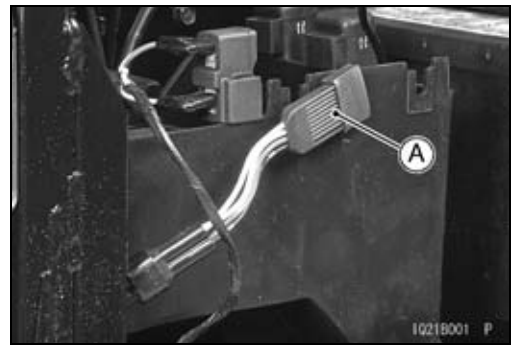
Actuator Control System Circuit



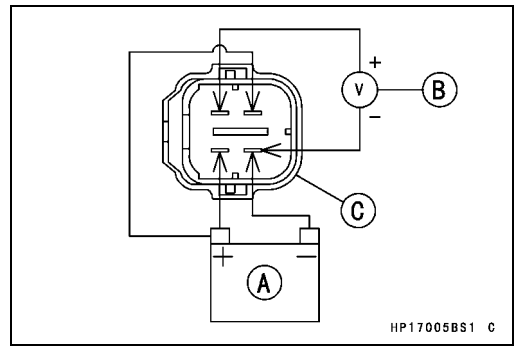
1. Engine Brake Actuator
2. Actuator Controller
3. Speed Sensor
4. Forward/Reverse Detecting Sensor
5. Ignition Switch
6. Fuse Box
7. Controller Fuse 10 A
8. Main Fuse 30 A
9. Frame Ground Terminal
10. Battery

Carburetor Heater System

Air Temperature Sensor Inspection



- Remove:
  Side Cover (see Left Side Cover Removal in the Frame chapter)
  Air Temperature Sensor [A]



- Connect the battery [A] and hand tester [B] to the sensor lead connector [C].

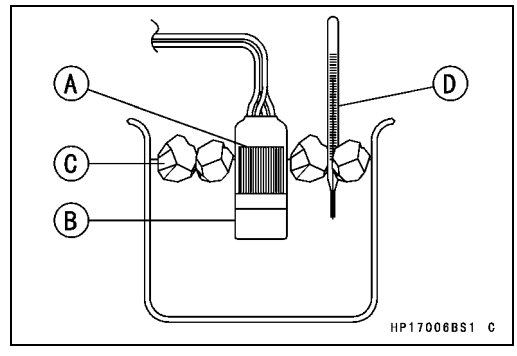
Special Tool - Hand Tester: 57001-1394

Battery
(+) → Red and Yellow Leads
(−) → Black Lead

Hand Tester
(+) → White Lead
(−) → Black Lead

CAUTION

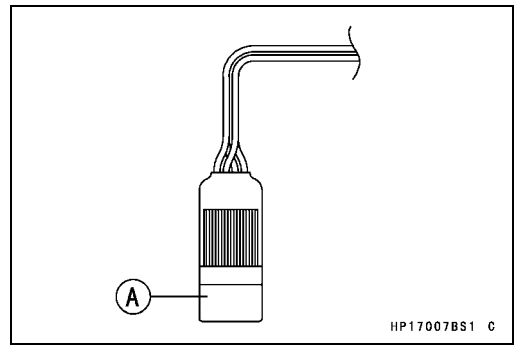
Use the sensor within −30 ~ 80°C (−22 ~ 176°F). If it is used without the specified range, the sensor will be damaged.



- Suspend the sensor [A] in a container of cold water of less than 8°C (46.4°F) so that the temperature sensing part [B] is submerged as shown.
  [C] Ice
- Suspend an accurate thermometer [D] in the water.
- Measure the output voltage between W/Y terminal and battery (–) terminal (tester range: DC 25 V).

Air Temperature Sensor: less than 8°C (46.4°F)
Output Voltage: 8 ~ 16 V (near battery voltage)

★If the voltage is less than DC 0.1 V, replace the sensor.



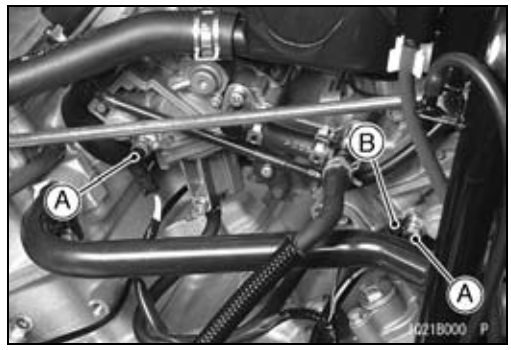
- Warm up the sensor [A] more than 22°C (71.6°F) with a hand.
- Measure the output voltage between W/Y terminal and battery (–) terminal (tester range: DC 2.5 V).

Air Temperature Sensor: more than 22°C (71.6°F)
Output Voltage: less than 0.1 V

★If the voltage is 8 ~ 16 V, replace the sensor.

Carburetor Heater System

Carburetor Heater Inspection

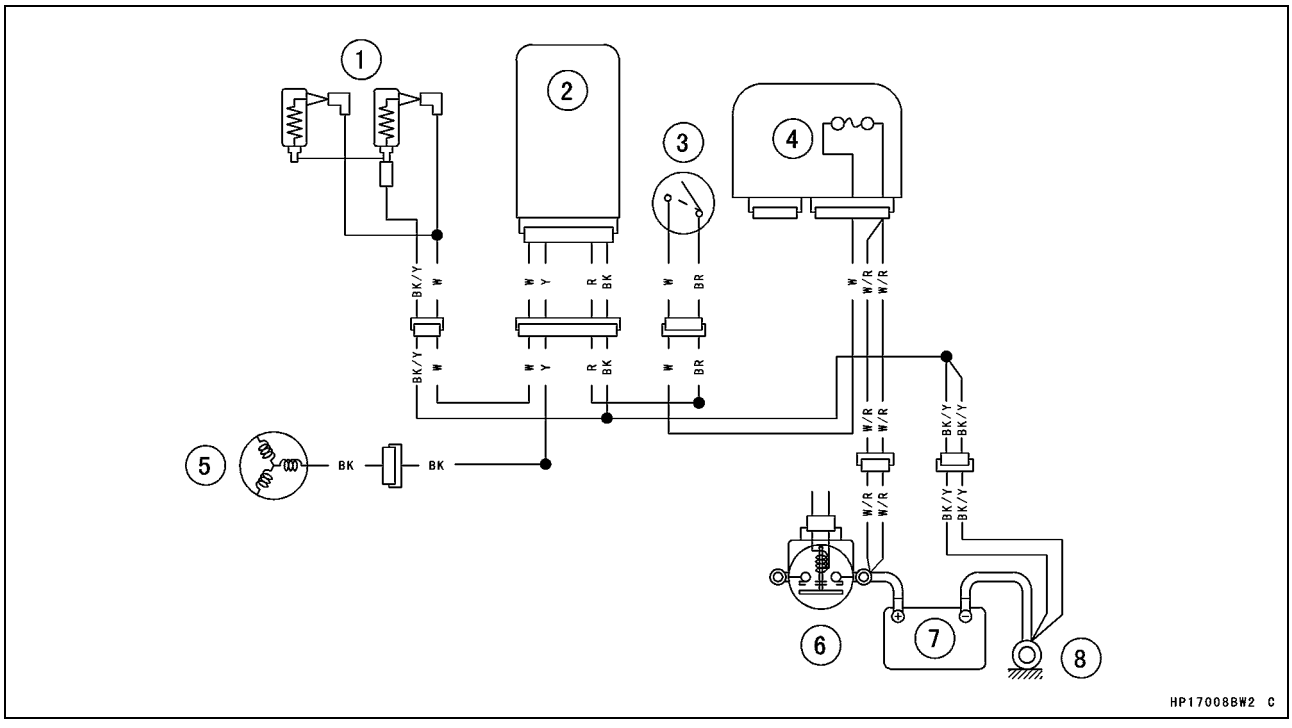


- Remove:
  Engine Upper Cover (see Engine Upper Cover Removal in the Frame chapter)
- Disconnect:
  Carburetor Heater Lead Connectors [A]
  Ground Lead Connector [B]
- Using the hand tester, measure the resistance of the heater.
- Connect the tester between the heater terminal and the ground terminal.

★If the tester does not read as specified, replace the heater.

Carburetor Heater Resistance
4.9 ~ 9.1 Ω at 21 ~ 29°C (32 ~ 84°F)

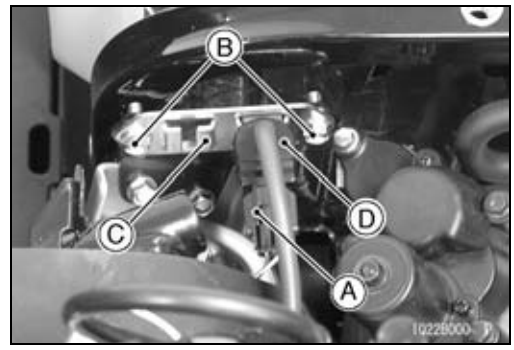
Carburetor Heater System Circuit



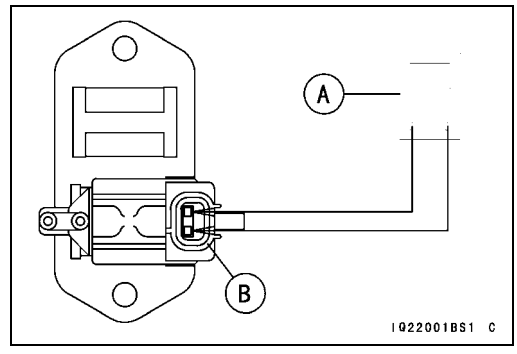
1. Carburetor Heaters 12 V 23 W
2. Air Temperature Sensor
3. Ignition Switch
4. Main Fuse 30 A
5. Alternator
6. Starter Relay
7. Battery
8. Engine Ground Terminal

2WD/4WD Solenoid Valve

2WD/4WD Solenoid Valve Inspection



- Remove:
  Right Bracket (see Right Bracket Removal in the Frame chapter)
  2WD/4WD Solenoid Valve Lead Connector [A]
  Bracket Bolts [B]
  Bracket [C] with 2WD/4WD Solenoid Valve [D]
  Hose Ends (from each part)

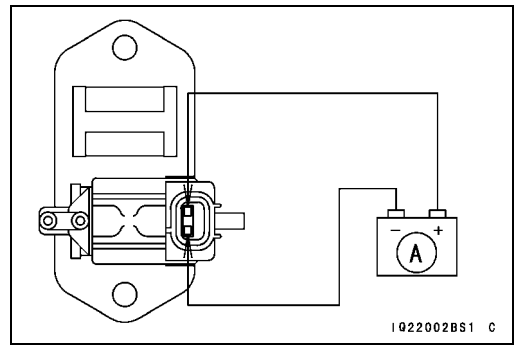


- Set the hand tester [A] to × 10 Ω range and connect the tester leads to the terminals in the 2WD/4WD solenoid valve connector [B].

Special Tool - Hand Tester: 57001-1394

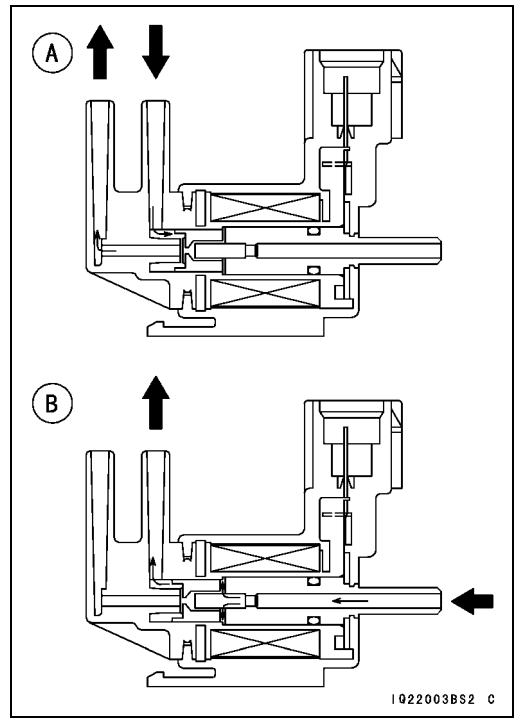
2WD/4WD Solenoid Valve Resistance
Standard: 37 ~ 43 Ω at 20°C (68°F)

★If the reading is out of the standard, replace the 2WD/4WD solenoid valve.
★If the reading is standard resistance, check the operation of the 2WD/4WD solenoid valve as follows.



- Connect the 12 V battery [A] to the terminals in the 2WD/4WD solenoid valve connector as shown in the figure.
- When the battery is connected, check that the 2WD/4WD solenoid valve makes a clicking sound (operating sound).

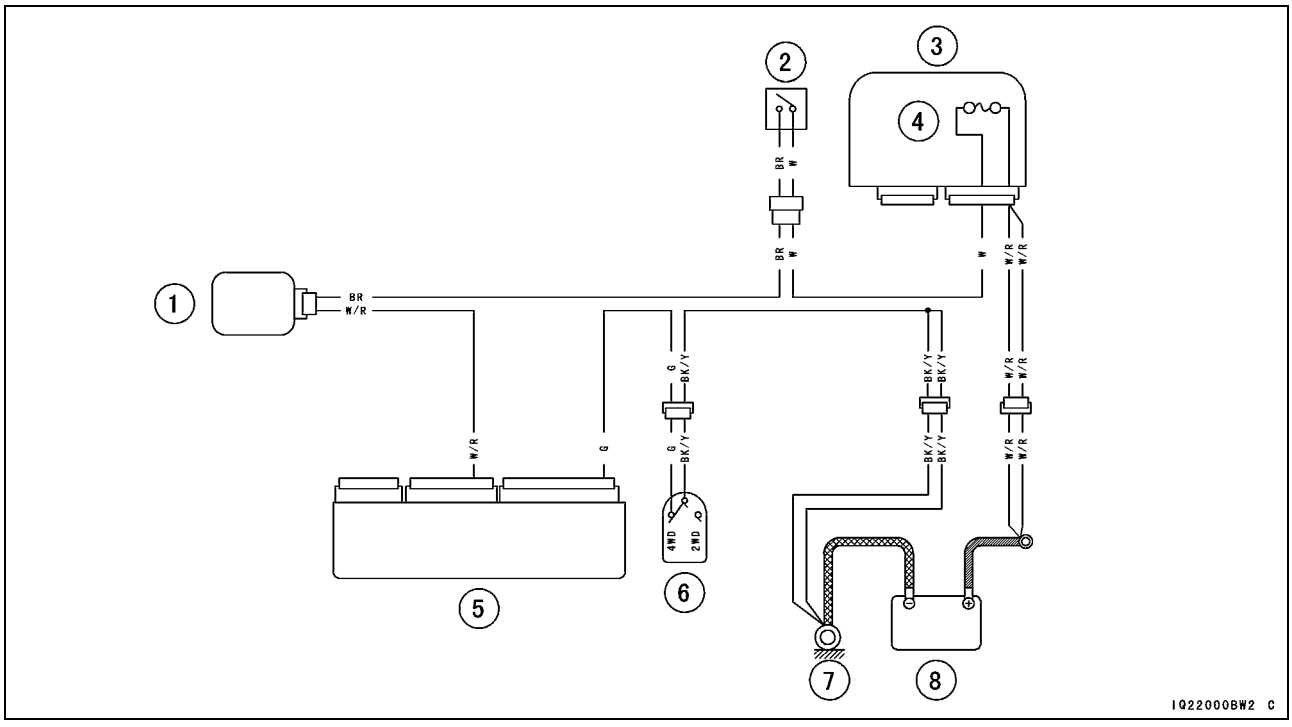
★If the 2WD/4WD solenoid valve does not click, replace it.



- When the battery is connected, check that the 2WD/4WD solenoid valve operates the air blow (arrows) as shown in the figure.
  [A] Battery is connected.
  [B] Battery is disconnected.

★If the 2WD/4WD solenoid valve does not work, replace it

2WD/4WD Solenoid Valve



1. 2WD/4WD Solenoid Valve
2. Ignition Switch
3. Fuse Box
4. Main Fuse 30 A
5. Igniter
6. 2WD/4WD Shift Switch
7. Engine Ground Terminal
8. Battery

Switches and Sensor

Brake Light Switch Adjustment

- Refer to the Brake Light Switch Inspection and Adjustment in the Periodic Maintenance chapter.

Radiator Fan Switch Inspection

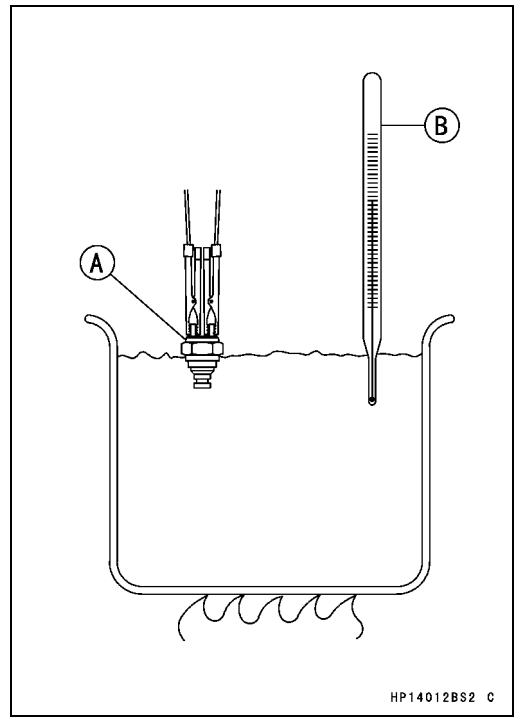
- Remove:
  Radiator Fan Switch (see Radiator Fan Switch Removal in the Cooling System chapter)
- Suspend the fan switch [A] in a container of coolant so that the temperature sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant.

NOTE

○*The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the terminals at the temperatures shown in the table.

★If the hand tester does not show the specified values, replace the switch.



Radiator Fan Switch Resistance

○**Rising Temperature:**

From OFF to ON at 86 ~ 90°C (187 ~ 194°F)

○**Falling Temperature:**

From ON to OFF at 81 ~ 85°C (178 ~ 185°F)

ON: Less than 0.5 Ω

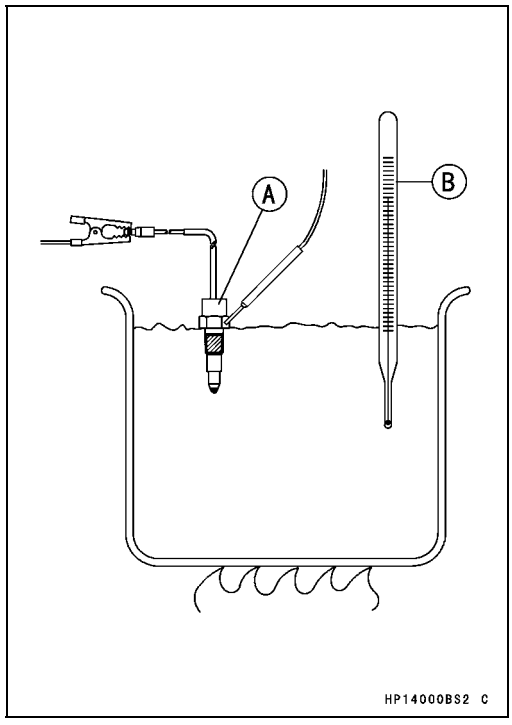
OFF: More than 1 MΩ

- Install:
  Radiator Fan Switch

Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)

Switches and Sensor

Water Temperature Switch Inspection



- Remove:
  Water Temperature Switch (see Water Temperature Switch Removal in the Cooling System chapter)
- Suspend the switch [A] in a container of coolant so that the temperature sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant.

NOTE

○*The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the connector and the body at the temperatures shown in the table.

★If the hand tester does not show the specified values, replace the switch.

Water Temperature Switch Resistance

○**Rising Temperature:**

From OFF to ON at 112 ~ 118°C (234 ~ 244°F)

○**Falling Temperature:**

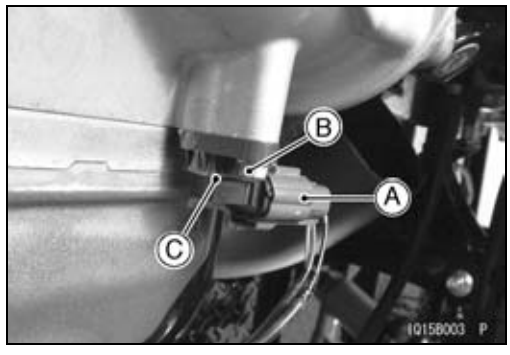
From ON to OFF at 108 ~ 111°C (226 ~ 232°F)

ON: Less than 0.5 Ω

OFF: More than 1 MΩ

- Install:
  Water Temperature Switch (see Water Temperature Switch Installation in the Cooling System chapter)

Speed Sensor Removal/Installation



- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance Chapter).
- Disconnect the speed sensor Connector [A].
- Remove:
  Bolt [B]
  Speed Sensor [C]
- Replace the O-ring with a new one.
- Apply grease to the O-ring.
- Install the speed sensor to the fully seated position before tightening the mounting bolt.

NOTE

○*If the sensor is not fully seated before tightening the bolt, the O-ring can be damaged and oil may leak.*

- Tighten:

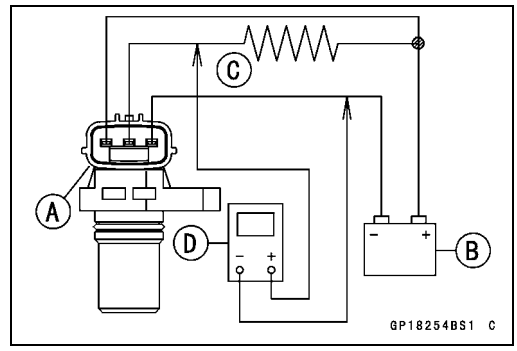
Torque - Speed Sensor Mounting Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Switches and Sensor

Speed Sensor Inspection

- Remove the speed sensor (see Speed Sensor Removal).
- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and hand tester [D] as shown.
- Set the tester to the DC 25 V range.

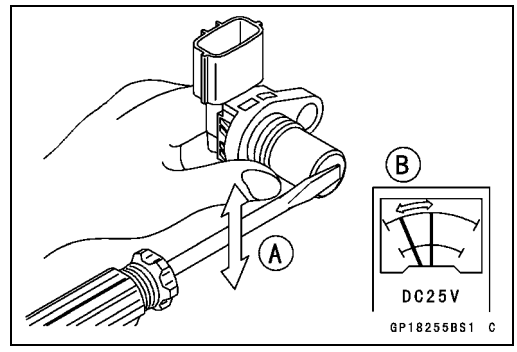
Special Tool - Hand Tester: 57001-1394



- Trace [A] each side of the speed sensor surface with the screw driver.

○Then the tester indicator should flick [B].

★If the tester indicator does not flick, replace the speed sensor.



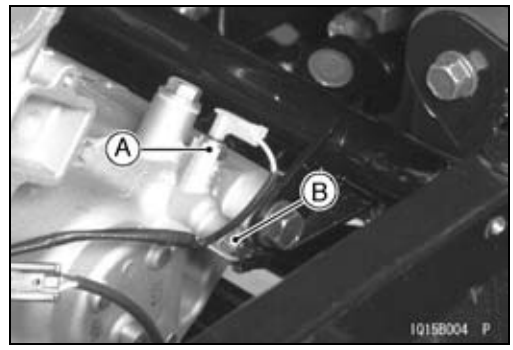
Switch Inspection

- Using the hand tester, check to see that only the connections shown in the table have continuity.

○For the ignition switch and headlight switch, refer to tables in the Wiring Diagram.

★If the switch has an open or short, repair or replace it with a new one.

Switches and Sensor



Neutral Switch Connection

	SW. Terminal	
When transmission is in neutral	○——	——○
When transmission is not in neutral		

1Q15009BN3 C

[A] Neutral Switch

Reverse Switch Connections

	SW.Terminal	
When transmission is in reverse	○——	——○
When transmission is not in reverse		

[B] Reverse Switch

4WD Indicator Light Switch Connections

	SW. Terminal	
2WD Position		
4WD Position	○——	——○

1Q15010BN3 C

2WD/4WD Shift Switch

	G	BK/Y
2WD Position		
4WD Position	○——	——○

1Q15011BN3 C

Brake Light Switch Connections

	BR	BL/W
When brake pedal is pushed down	○——	——○
When brake pedal is released		

1Q15012BN3 C

Parking Brake Light Switch Connections

	G	BK/Y
When parking brake pedal is pushed down	○——	——○
When parking brake pedal is released		

1Q15013BN3 C

Oil Pressure Switch Connections*

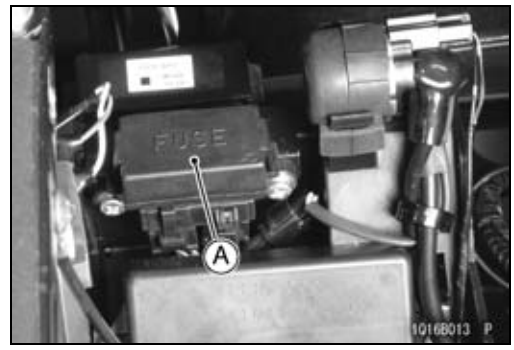
	SW. Terminal	
When engine is stopped	○——	——○
When engine is running		

*: Engine lubrication system is in good condition

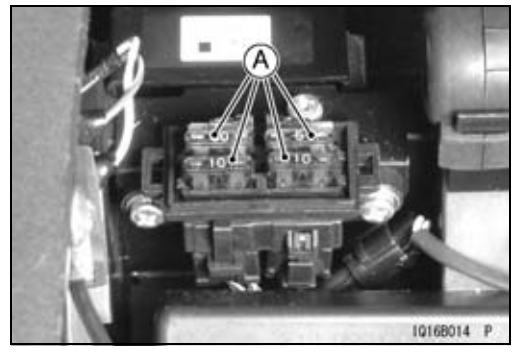
Fuses

Fuse Removal

- Remove:
  Seat (see Seat Removal in the Frame chapter)
  Fuse Box Lid [A]



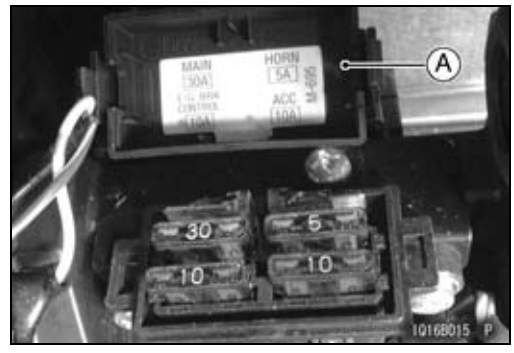
- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



Fuse Installation

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

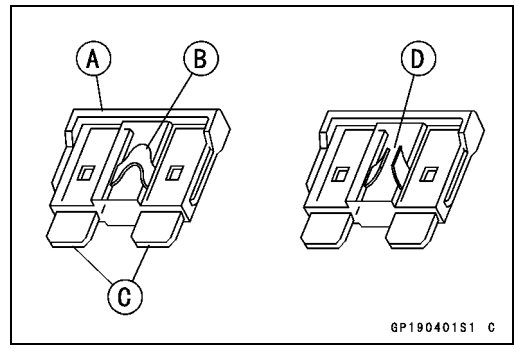
- Install the fuses on the original position as specified on the fuse box lid [A].



Fuse Inspection

- Inspect the fuse element.

★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.
  Housing [A]
  Fuse Element [B]
  Terminals [C]
  Blown Element [D]



CAUTION

When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

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