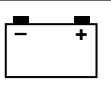


CHAPTER 8 ELECTRICAL SYSTEMS

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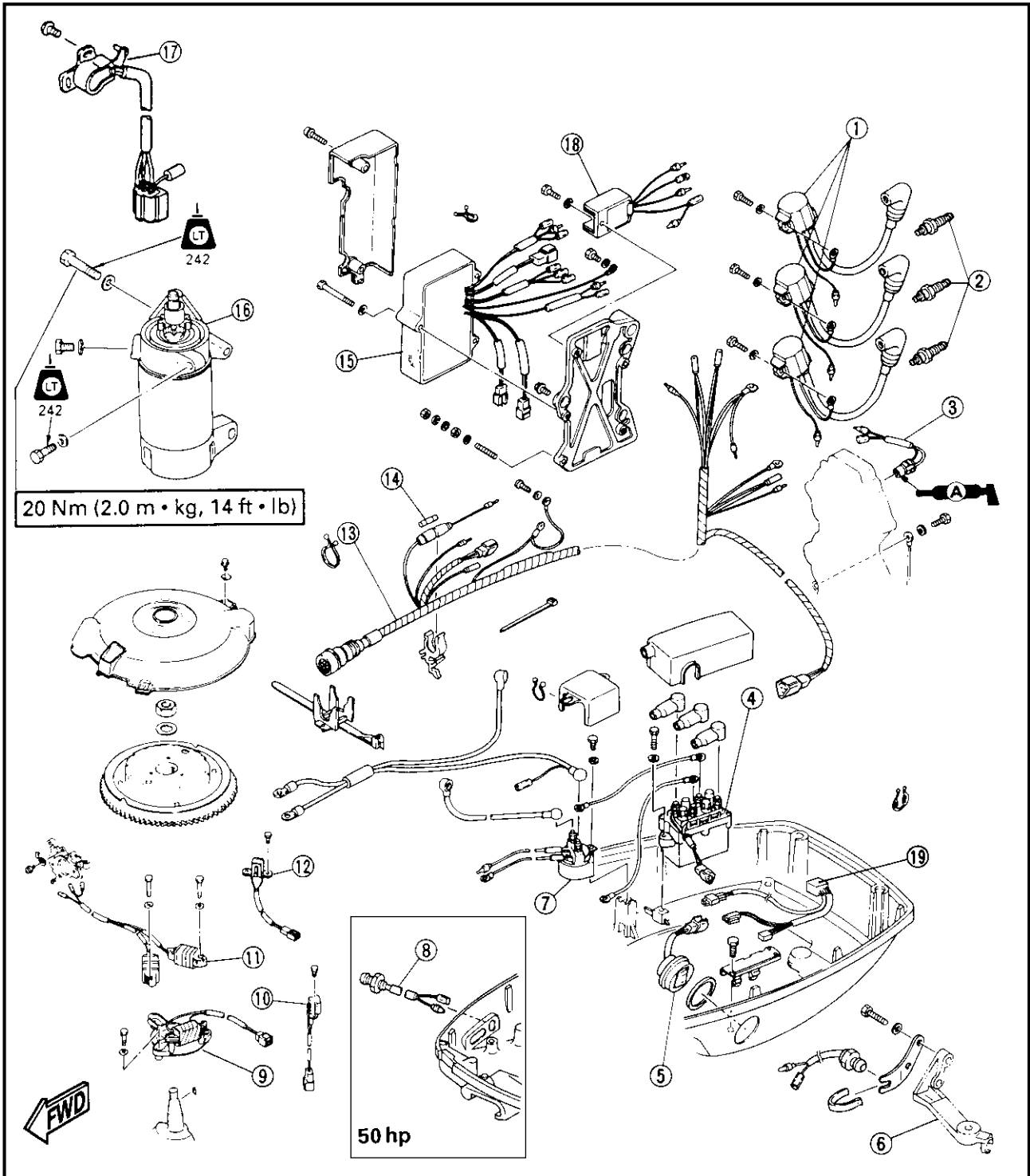


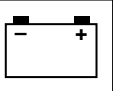
M20000-0

ELECTRICAL COMPONENTS

50, 60, 70 hp

- | | | |
|---|----------------------------------|---------------------------|
| ① Ignition coil | ⑥ Neutral switch (P60TH/60FEHTO) | ⑭ Fuse |
| ② Spark-plug | ⑦ Starter relay | ⑮ CDI unit |
| ③ Thermo switch | ⑧ Oil warning lamp (50GETO) | ⑯ Starter motor |
| ④ Power trim and tilt replay (PTT model) | ⑨ Charge coil | ⑰ Trim sensor (PTT model) |
| ⑤ Trailer switch (PTT model except for USA, Canada and Oceania model) | ⑩ Crank position sensor | ⑱ Rectifier/regulator |
| | ⑪ Lighting coil | |
| | ⑫ Pulsar coil | |
| | ⑬ Wire harness | |

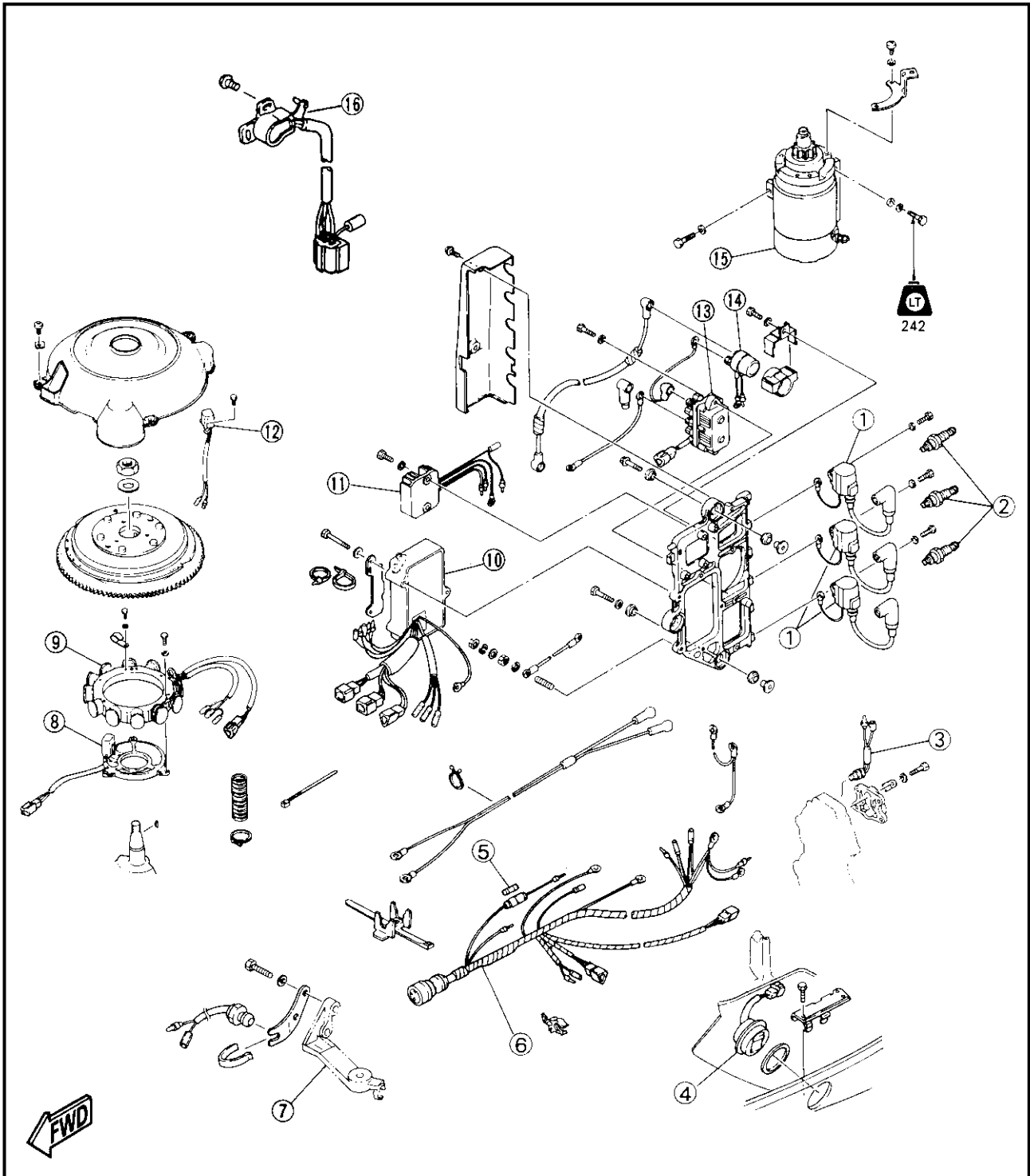




M20001-0

75, 80, 90 hp

- | | | |
|---|---|--|
| ① Ignition coil | ⑦ Neutral switch (P75TH/
75CEHTO, 90AEHD, 90TR/
90AETO, B90TR/90AETO) | ⑬ Power trim and tilt relay
(PTT model) |
| ② Spark-plug | ⑧ Pulser coil | ⑭ Starter relay |
| ③ Thermo switch | ⑨ Stator assembly | ⑮ Starter motor |
| ④ Trailer switch
(PTT model except for C75TR/
75CET, C90TR/90AET) | ⑩ CDI unit | ⑯ Trim sensor (PTT model) |
| ⑤ Fuse | ⑪ Rectifier/regulator | |
| ⑥ Wire harness | ⑫ Crank position sensor | |



D22000-0

ELECTRICAL WIRING

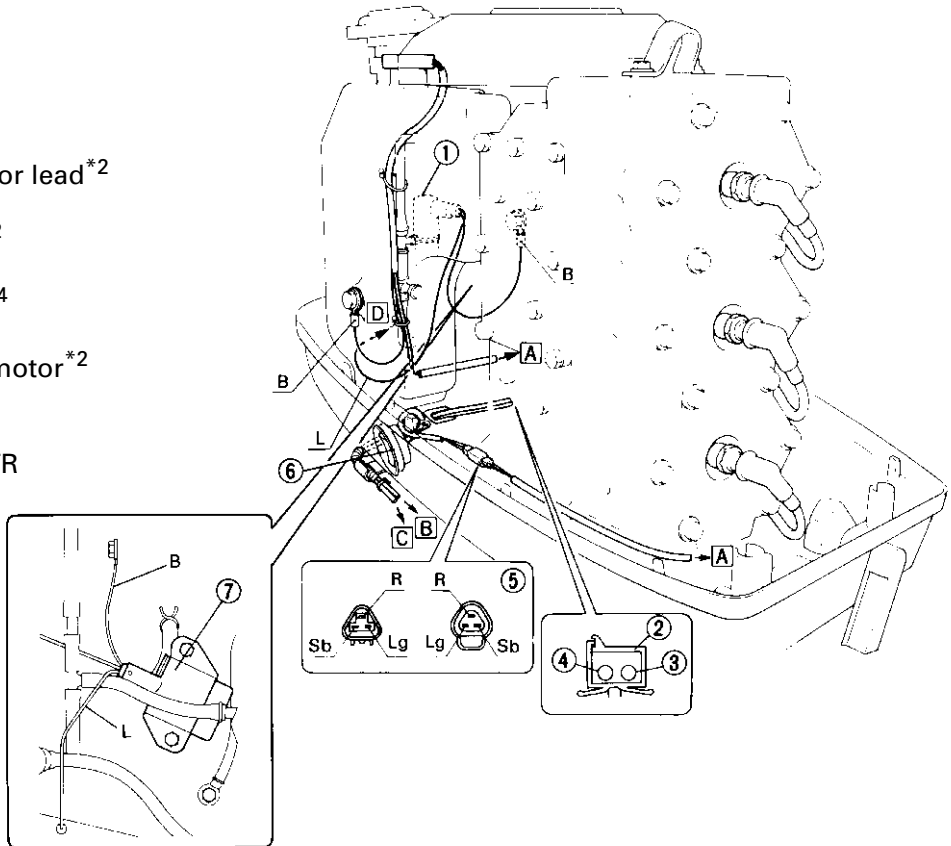
Check that all leads and connectors are properly connected.

50, 60, 70 hp

- ① Electrothermal valve*1
- ② Clamp
- ③ Power trim and tilt motor lead*2
- ④ Trim sensor lead*2
- ⑤ Trailer switch coupler*2
- ⑥ Trailer switch*3
- ⑦ Fuel enrichment valve*4
- A To wire harness
- B To power trim and tilt motor*2
- C To trim sensor*2
- D To lighting coil

- *1: Except for C60ER, C60TR
- *2: For PTT model
- *3: For PTT model except for USA, Canada and Oceania model
- *4: For C60ER, C60TR

- B : Black
- L : Blue
- Lg : Light green
- R : Red
- Sb : Sky blue



P60TH/60FEHTO*1, P75TH/75CEHTO, 90AEHD*2

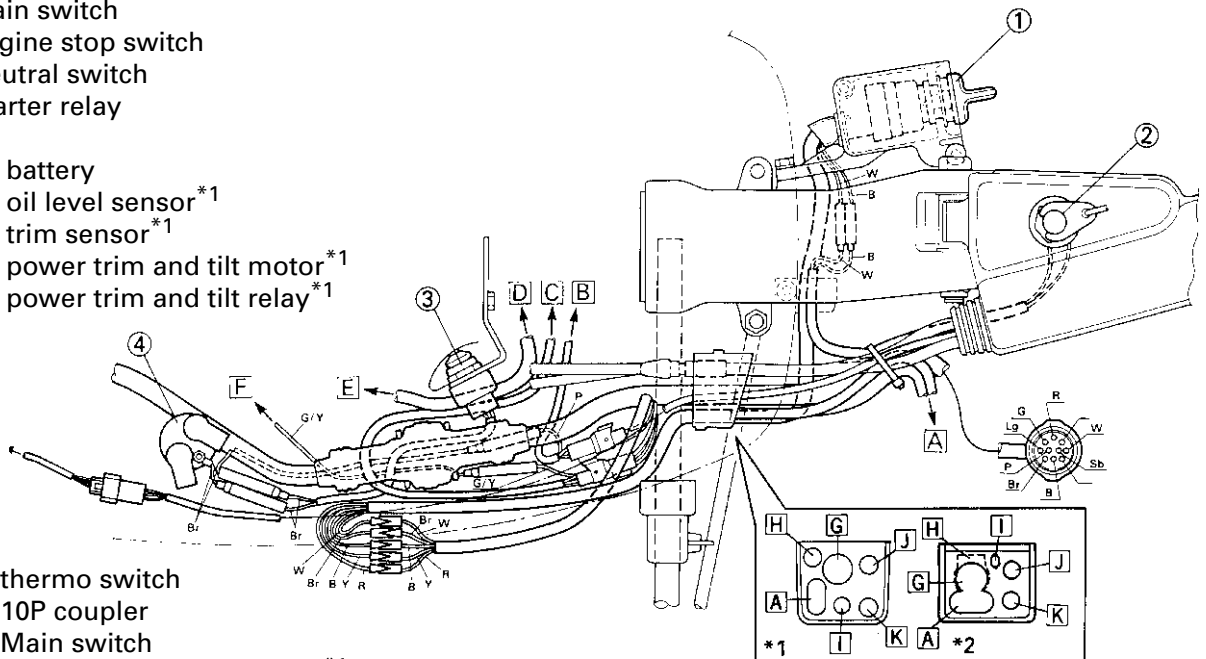
- ① Main switch
- ② Engine stop switch
- ③ Neutral switch
- ④ Starter relay

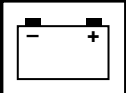
- A To battery
- B To oil level sensor*1
- C To trim sensor*1
- D To power trim and tilt motor*1
- E To power trim and tilt relay*1

- F To thermo switch
- G To 10P coupler
- H To Main switch
- I To power trim and tilt switch*1
- J Throttle cable
- K Shift cable

*1: Except for 90AEHD

- B : Black
- Br : Brown
- G : Green
- G/Y : Green/Yellow
- P : Pink
- R : Red
- W : White
- Y : Yellow





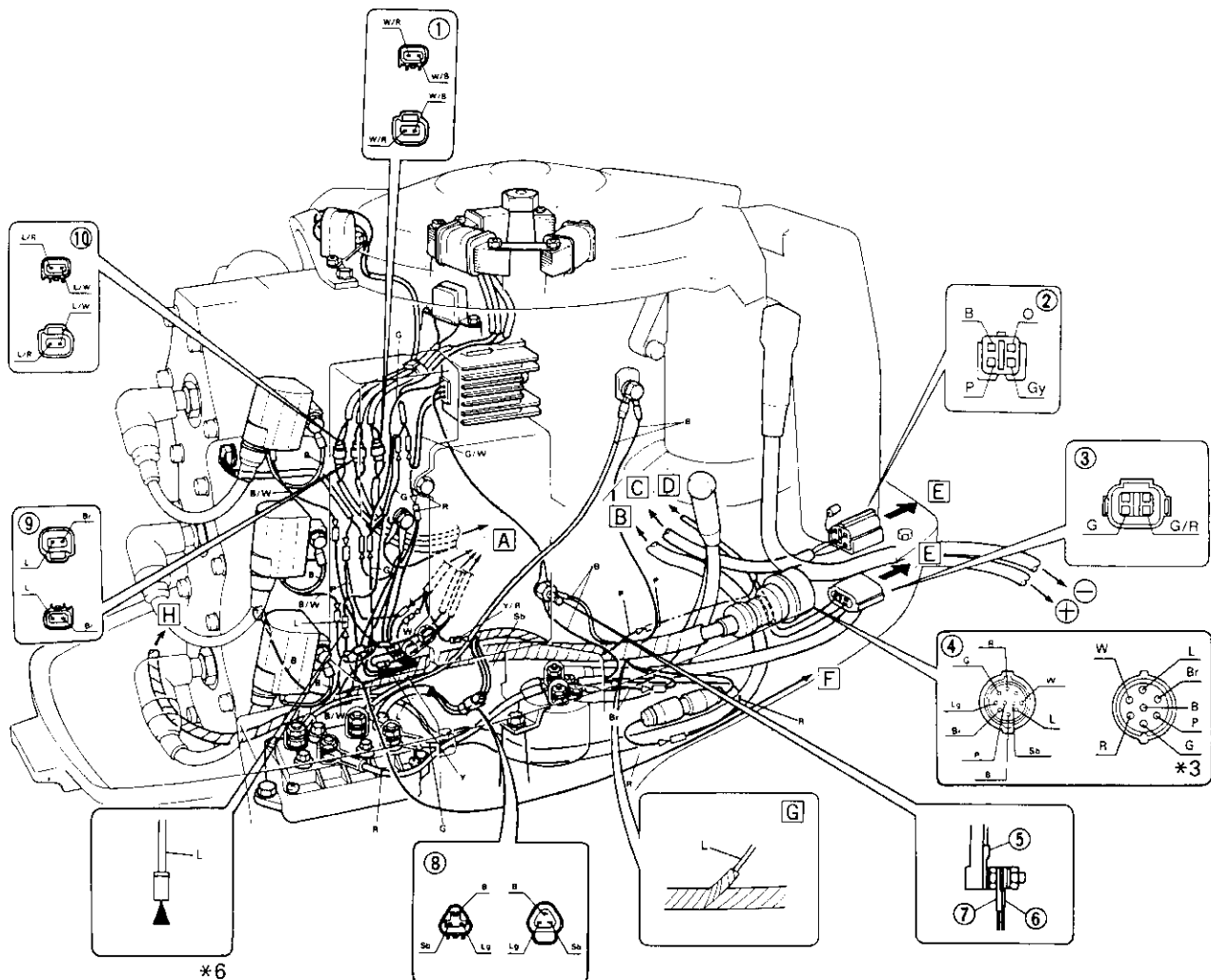
50, 60, 70 hp

- ① Pulser coil coupler
- ② Trim sensor coupler*1
- ③ Oil level sensor coupler*2
- ④ Wire harness coupler (7P*3/10P*4)
- ⑤ Ground lead from rectifier/regulator
- ⑥ Ground lead from starter relay
- ⑦ Ground lead from wire harness
- ⑧ Power trim and tilt relay coupler*1
- ⑨ Charge coil coupler
- ⑩ Crank position sensor coupler

- [A] To CDI unit
- [B] To power trim and tilt motor*1
- [C] To trim sensor*1
- [D] To oil level sensor*2
- [E] To meter
- [F] To electrothermal valve*5
- [G] To fuel enrichment valve*6
- [H] To trailer switch coupler*1

- B : Black
- Br : Brown
- G : Green
- Gy : Gray
- L : Blue
- Lg : Light green
- O : Orange
- P : Pink
- R : Red
- Sb : Sky blue
- W : White
- Y : Yellow

- *1: For PTT model
- *2: For oil injection model
- *3: For C60ER/60FED
- *4: Except for C60ER/60FED
- *5: Except for C60ER, C60TR
- *6: For C60ER, C60TR



75, 80, 90 hp

① Trailer switch coupler*1

A To electrothermal valve*2

B To battery

C To starter relay

D To lighting coil

E To wire harness

F To meter

G To trim sensor*1

H To power trim and tilt motor*1

*1: For PTT model

*2: Except for C75TR

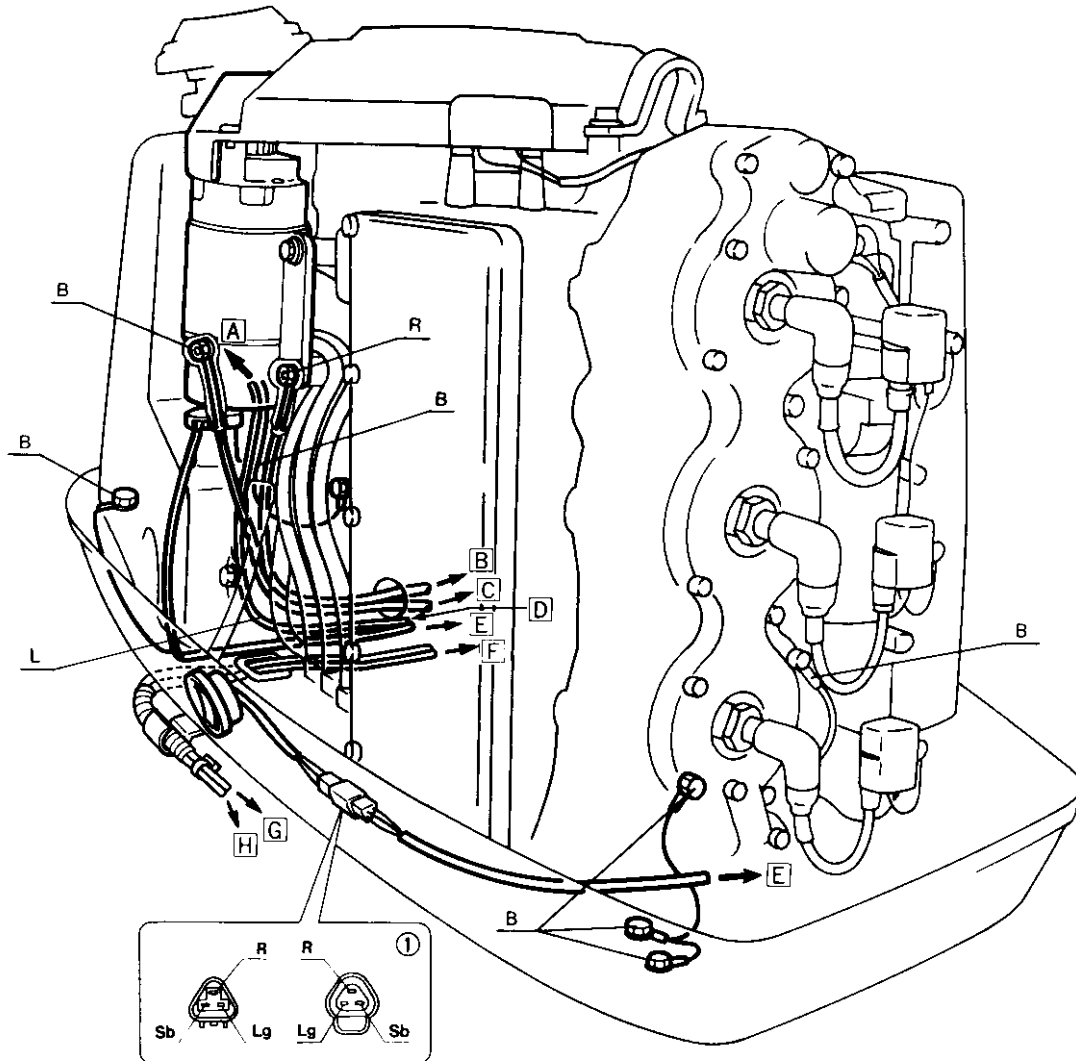
B : Black

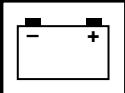
L : Blue

Lg : Light green

R : Red

Sb : Sky blue





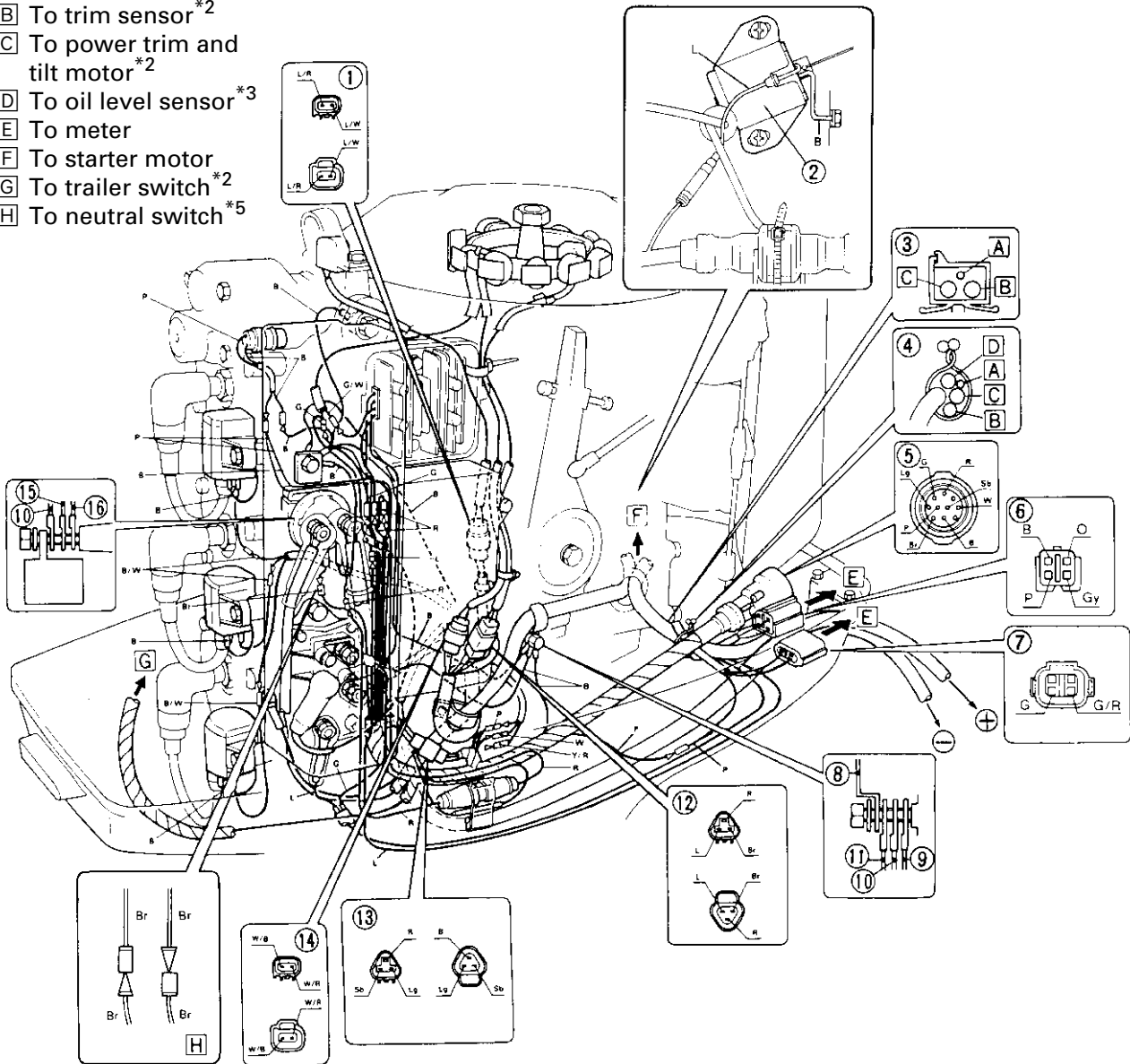
75, 80, 90 hp

- ① Crank position sensor coupler
- ② Fuel enrichment valve *1
- ③ Clamp
- ④ Clamp
- ⑤ Wire harness coupler
- ⑥ Trim sensor coupler *2
- ⑦ Oil level sensor coupler *3
- ⑧ Clamp
- ⑨ Ground lead from power trim and tilt relay *2
- ⑩ Ground lead from wire harness
- ⑪ Ground lead from rectifier/regulator
- ⑫ Charge coil coupler
- ⑬ Power trim and tilt relay coupler *2
- ⑭ Pulser coil coupler
- ⑮ Ground lead from starter relay
- ⑯ Ground lead from CDI unit

- B : Black
- Br : Brown
- G : Green
- Gy : Gray
- L : Blue
- Lg : Light green
- O : Orange
- P : Pink
- R : Red
- Sb : Sky blue
- W : White
- Y : Yellow

- *1: For C75TR
- *2: For PTT model
- *3: For oil injection model
- *4: Except for C75TR
- *5: For P75TH/75CEHTO, 90AEHD, 90TR/90AETO, B90TR/90AETO

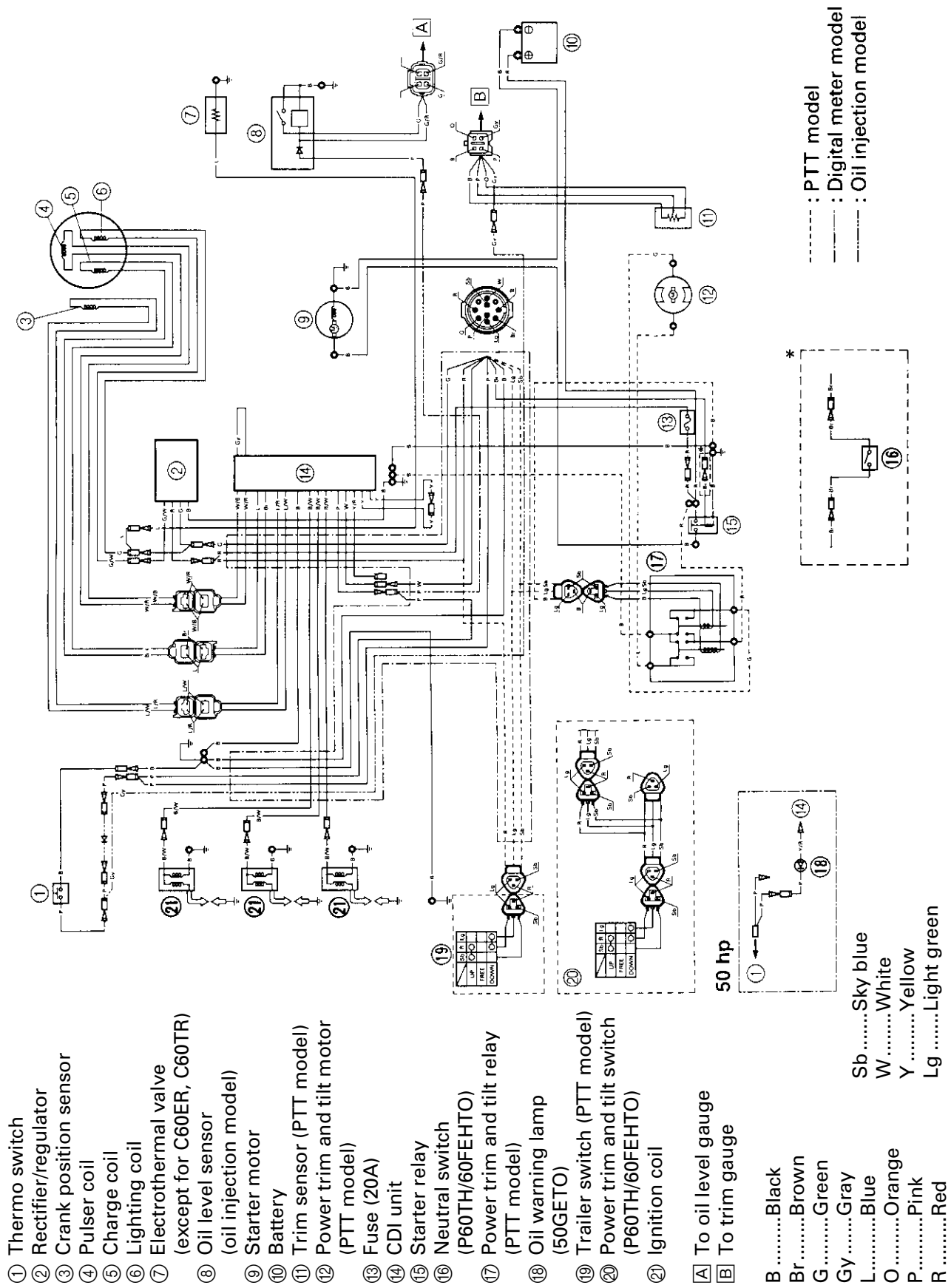
- A To electrothermal valve *4
- B To trim sensor *2
- C To power trim and tilt motor *2
- D To oil level sensor *3
- E To meter
- F To starter motor
- G To trailer switch *2
- H To neutral switch *5



M30000-0

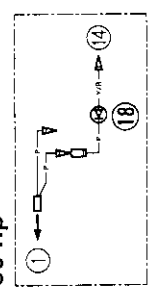
WIRING DIAGRAM

50, 60, 70 hp



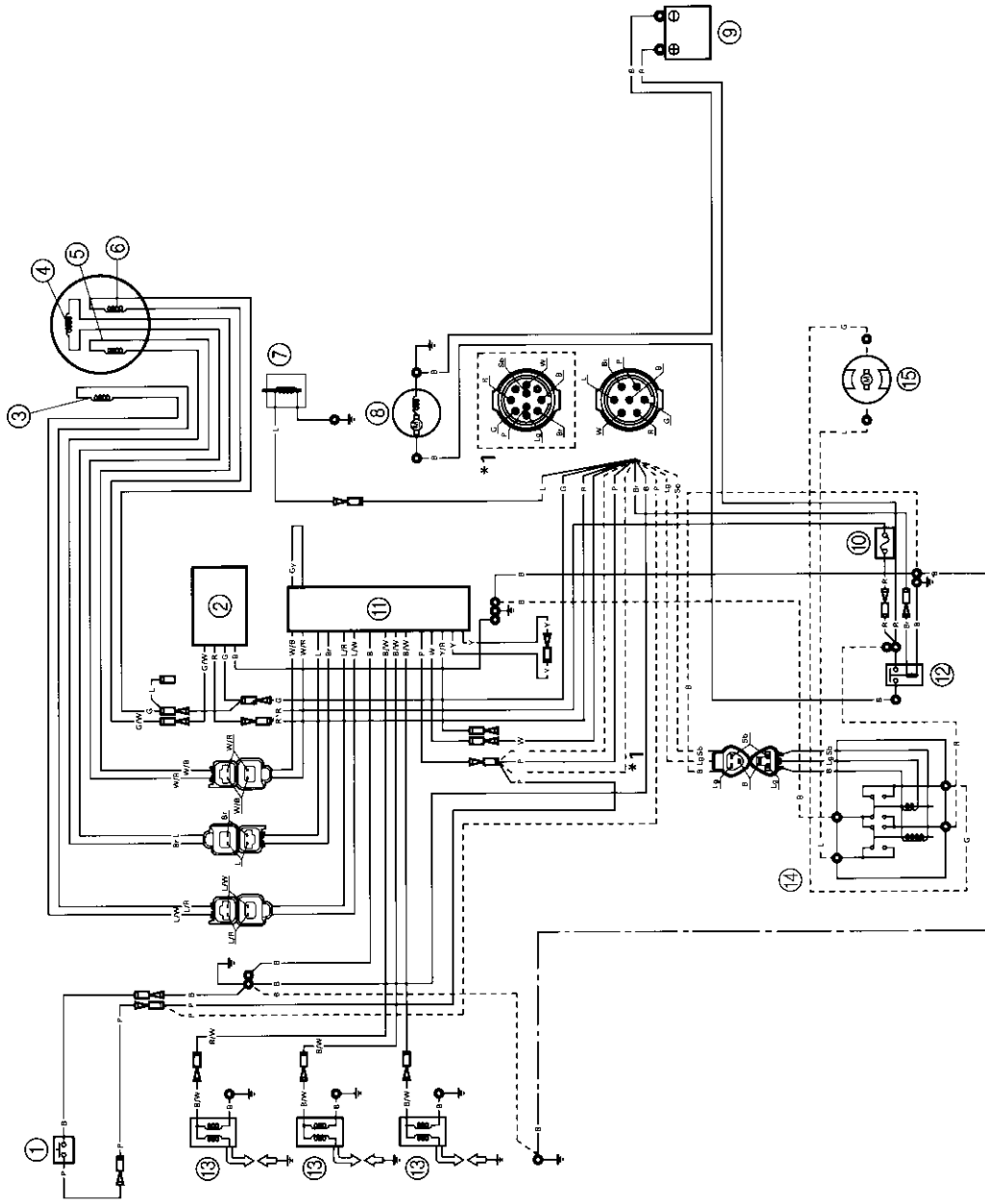
- ① Thermo switch
- ② Rectifier/regulator
- ③ Crank position sensor
- ④ Pulser coil
- ⑤ Charge coil
- ⑥ Lighting coil
- ⑦ Electrothermal valve (except for C60ER, C60TR)
- ⑧ Oil level sensor (oil injection model)
- ⑨ Starter motor
- ⑩ Battery
- ⑪ Trim sensor (PTT model)
- ⑫ Power trim and tilt motor (PTT model)
- ⑬ Fuse (20A)
- ⑭ CDI unit
- ⑮ Starter relay
- ⑯ Neutral switch (P60TH/60FEHTO)
- ⑰ Power trim and tilt relay (PTT model)
- ⑱ Oil warning lamp (50GETO)
- ⑲ Trailer switch (PTT model)
- ⑳ Power trim and tilt switch (P60TH/60FEHTO)
- ㉑ Ignition coil
- A To oil level gauge
- B To trim gauge

--- : PTT model
 - · - : Digital meter model
 — : Oil injection model



- B Black
- Br Brown
- G Green
- Gy Gray
- L Blue
- O Orange
- P Pink
- R Red
- Sb Sky blue
- W White
- Y Yellow
- Lg Light green

C60ER, C60TR



---: For C60TR
 - - - : For C60ER
 * 1: For C60TR

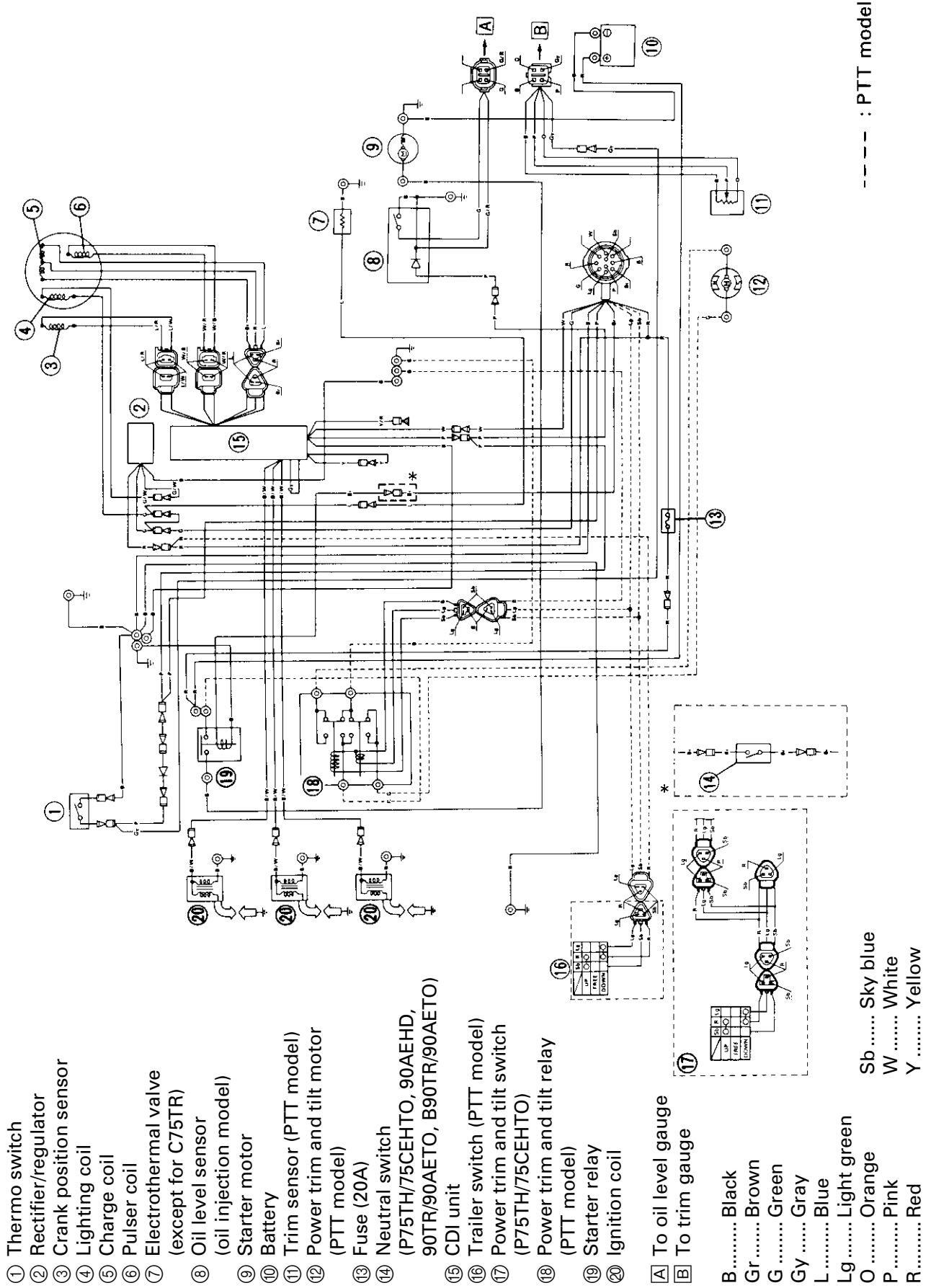


- ① Thermo switch
- ② Rectifier/regulator
- ③ Crank position sensor
- ④ Pulsar coil
- ⑤ Charge coil
- ⑥ Lighting coil
- ⑦ Fuel enrichment valve
- ⑧ Starter motor
- ⑨ Battery
- ⑩ Fuse (20A)
- ⑪ CDI unit
- ⑫ Starter relay
- ⑬ Ignition coil
- ⑭ Power trim and tilt relay (For C60TR)
- ⑮ Power trim and tilt motor (For C60TR)

- B..... Black
- Br..... Brown
- G..... Green
- Gy..... Gray
- L..... Blue
- O..... Orange
- P..... Pink
- R..... Red
- Sb..... Sky blue
- W..... White
- Y..... Yellow
- Lg..... Light green

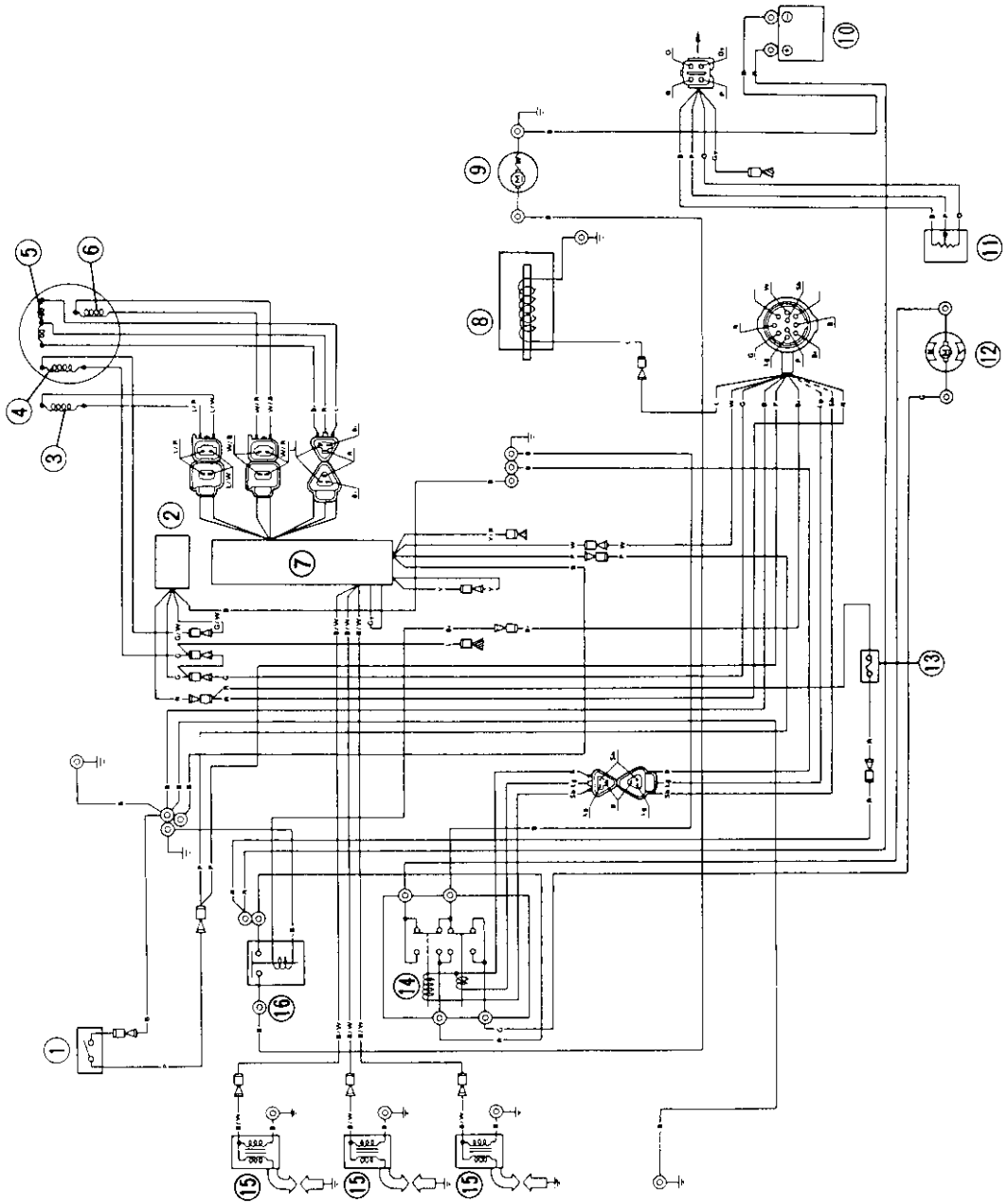
M30000-0

75, 80, 90 hp



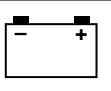
- ① Thermo switch
 - ② Rectifier/regulator
 - ③ Crank position sensor
 - ④ Lighting coil
 - ⑤ Charge coil
 - ⑥ Pulser coil
 - ⑦ Electrothermal valve (except for C75TR)
 - ⑧ Oil level sensor (oil injection model)
 - ⑨ Starter motor
 - ⑩ Battery
 - ⑪ Trim sensor (PTT model)
 - ⑫ Power trim and tilt motor (PTT model)
 - ⑬ Fuse (20A)
 - ⑭ Neutral switch (P75TH/75CEHTO, 90AEHD, 90TR/90AETO, B90TR/90AETO)
 - ⑮ CDI unit
 - ⑯ Trailer switch (PTT model)
 - ⑰ Power trim and tilt switch (P75TH/75CEHTO)
 - ⑱ Power trim and tilt relay (PTT model)
 - ⑳ Starter relay
 - ㉑ Ignition coil
 - A To oil level gauge
 - B To trim gauge
- B Black
 Gr Brown
 G Green
 GY Gray
 L Blue
 Lg Light green
 O Orange
 P Pink
 R Red
 Sb Sky blue
 W White
 Y Yellow

C75TR



- ① Thermo switch
- ② Rectifier/regulator
- ③ Crank position sensor
- ④ Lighting coil
- ⑤ Charge coil
- ⑥ Pulser coil
- ⑦ CDI unit
- ⑧ Fuel enrichment valve
- ⑨ Starter motor
- ⑩ Battery
- ⑪ Trim sensor
- ⑫ Power trim and tilt motor
- ⑬ Fuse
- ⑭ Power trim and tilt relay
- ⑮ Ignition coil
- ⑯ Starter relay

- B..... Black
- Gr..... Brown
- G..... Green
- GY..... Gray
- L..... Blue
- Lg..... Light green
- O..... Orange
- P..... Pink
- R..... Red
- Sb..... Sky blue
- W..... White
- Y..... Yellow

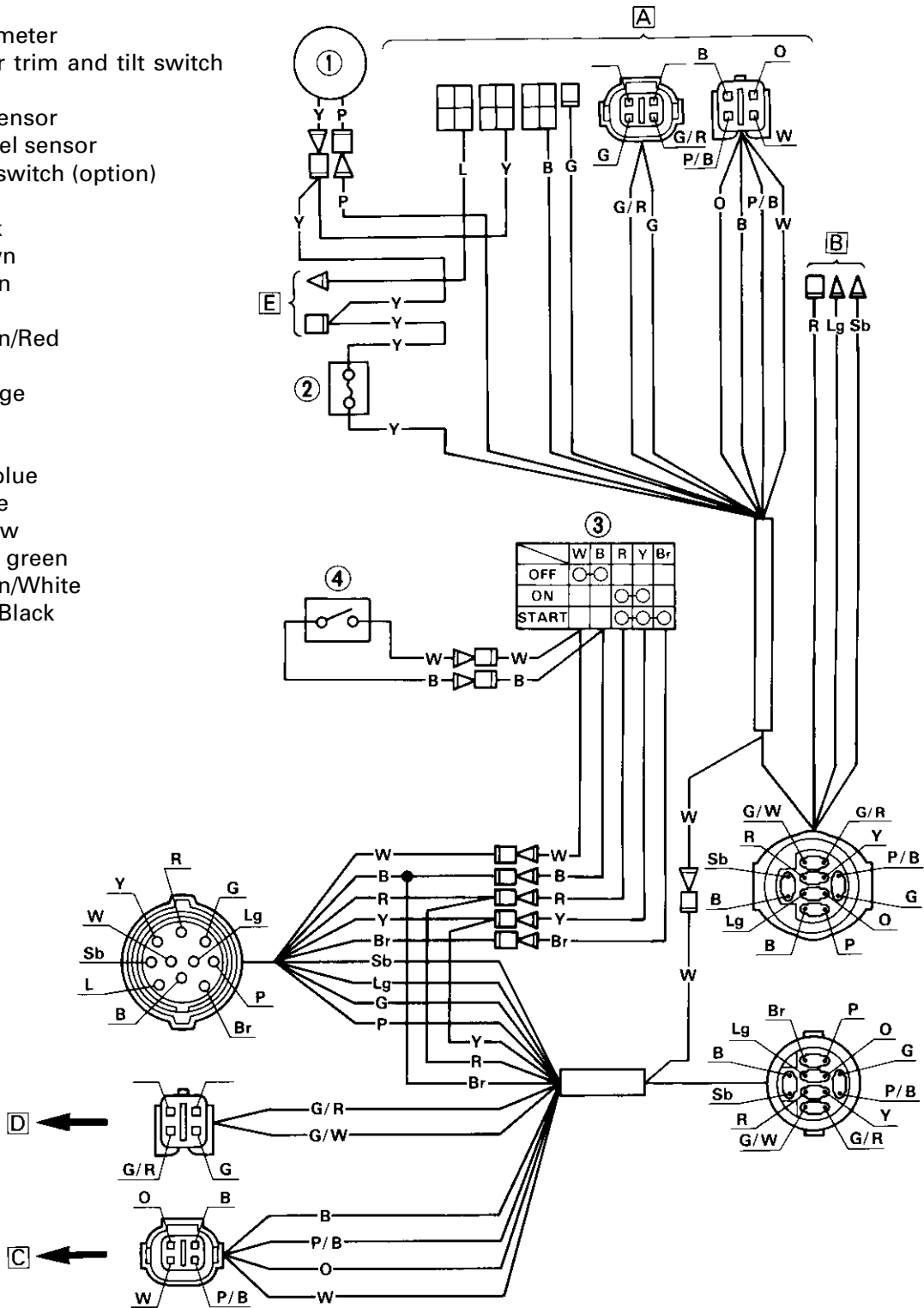


P60TH/60FEHTO

- ① Buzzer
- ② Fuse (10A)
- ③ Main switch
- ④ Engine stop switch

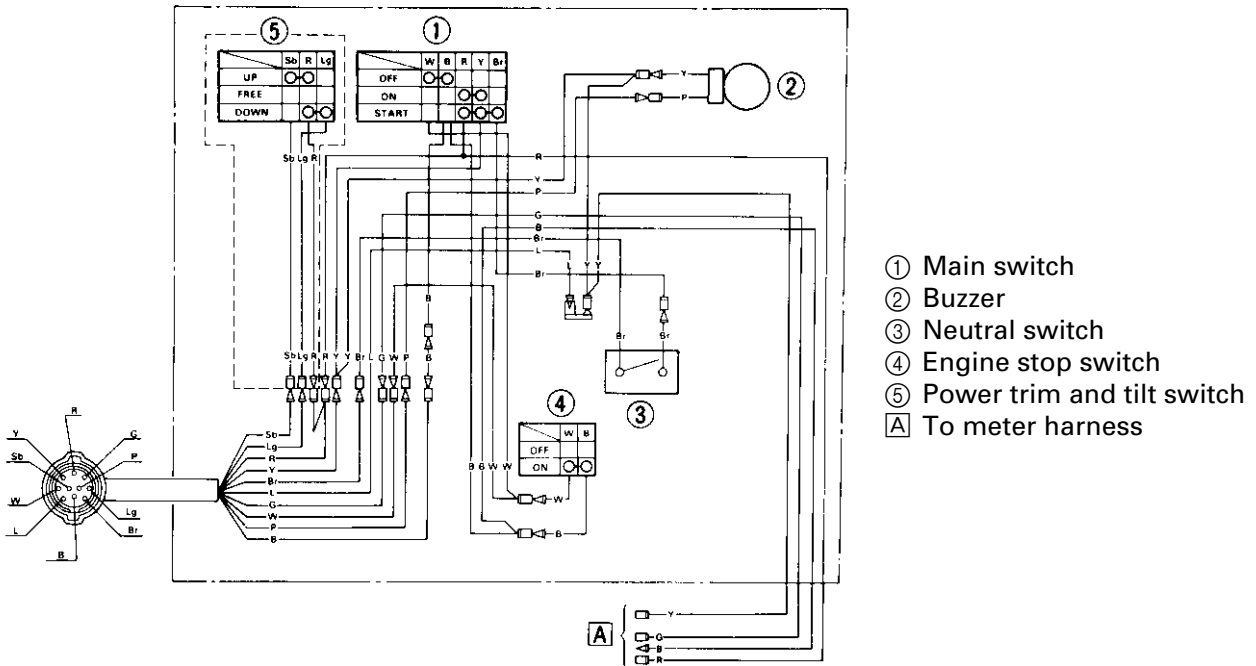
- [A] To tachometer
- [B] To power trim and tilt switch (option)
- [C] To trim sensor
- [D] To oil level sensor
- [E] To lamp switch (option)

- BBlack
- Br.....Brown
- GGreen
- Gy.....Gray
- G/RGreen/Red
- LBlue
- OOrange
- PPink
- RRed
- Sb.....Sky blue
- WWhite
- YYellow
- LgLight green
- G/WGreen/White
- P/BPink/Black

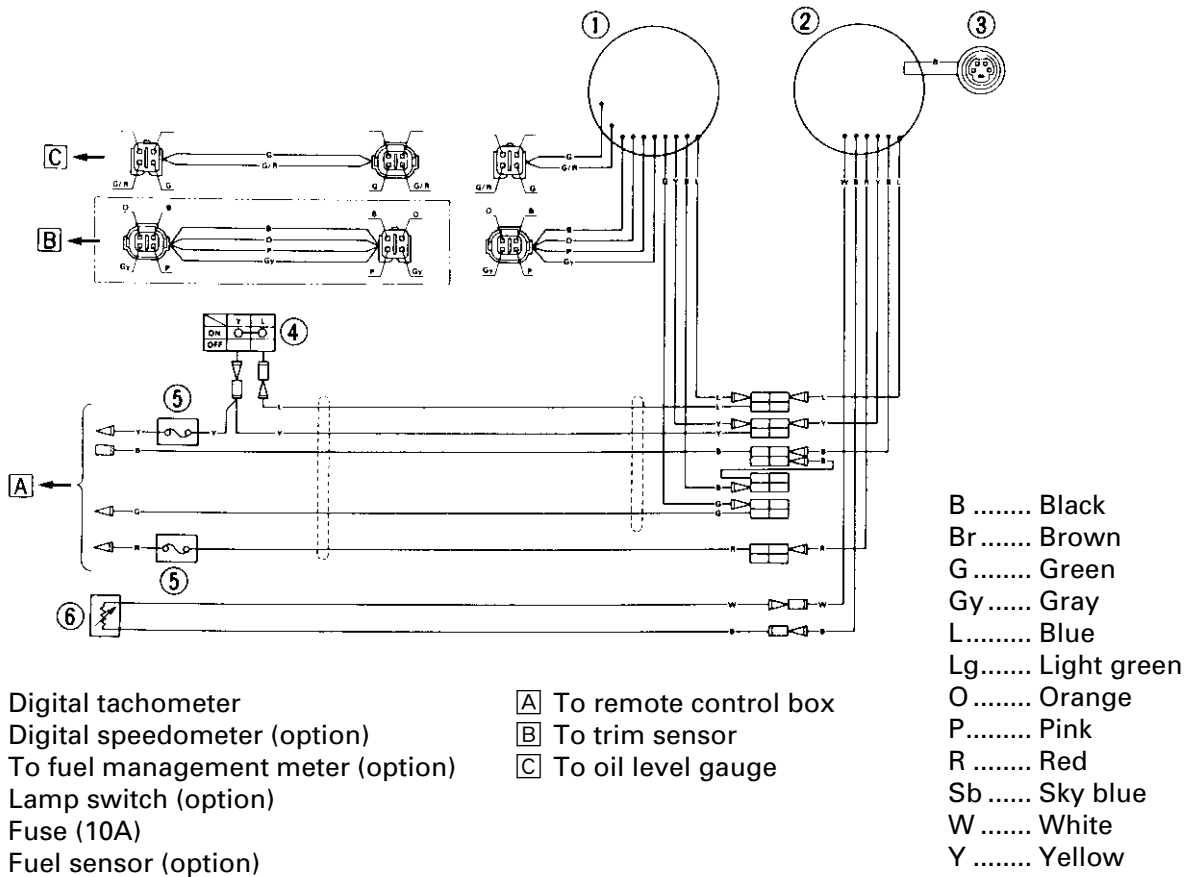


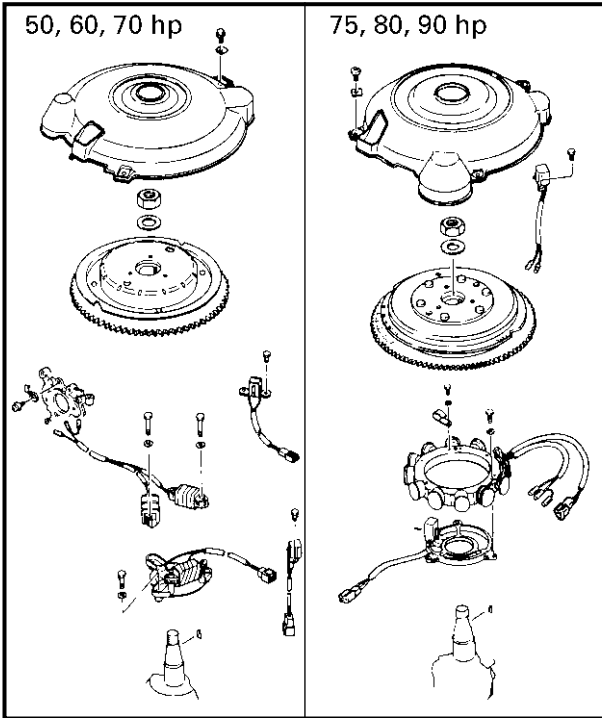
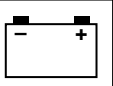
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REMOTE CONTROL BOX



DIGITAL METER

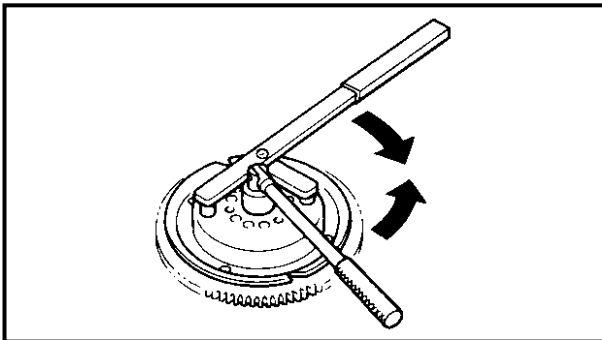




M40003-0

**REMOVAL
MAGNETO BASE**

1. Remove the flywheel cover.
2. Remove the starter-pulley.

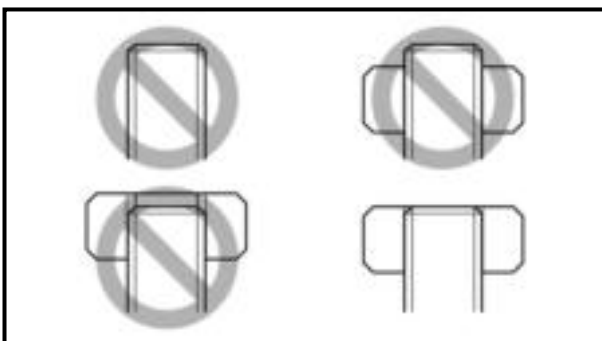


3. Loosen the flywheel nut until it is flush with the crankshaft.

	<p>Flywheel holder: YB-6139/90890-06522</p>
--	--

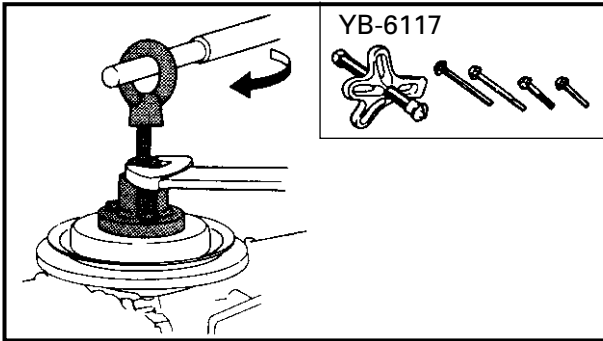
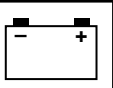
CAUTION: _____

The major load must be carried in the direction of the arrows. If not, the holder may easily slip off.



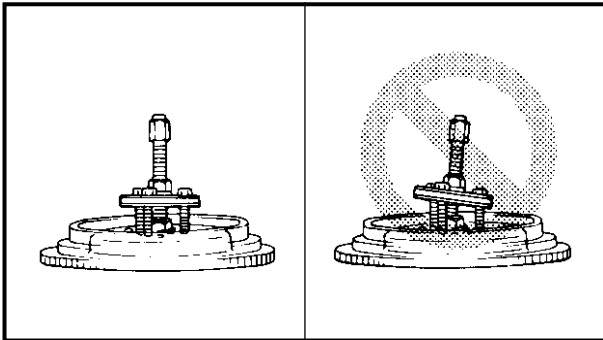
CAUTION: _____

Keep the nut side flush with the crankshaft end until the flywheel comes off the tapered portion of the crankshaft.



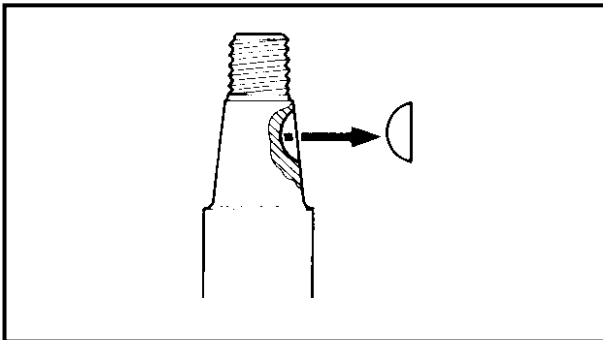
4. Remove the flywheel magneto.

	<p>Flywheel puller: YB-6117/90890-06521</p>
--	--

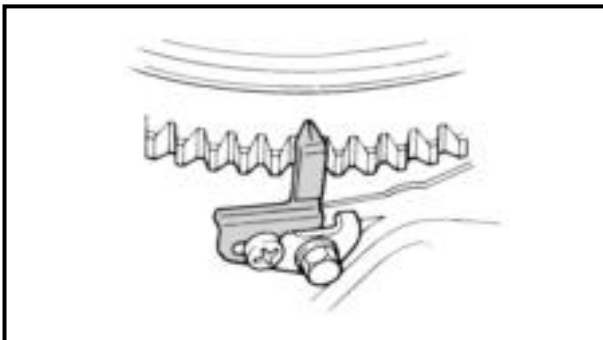


CAUTION:

To prevent damage to the engine or tools, screw in the flywheel magneto-puller set-bolts evenly and completely so that the puller plate is parallel to the flywheel.



5. Remove the woodruff key from the crankshaft keyway using a screwdriver.



CAUTION:

Take special care not to damage the surface of the crankshaft. When removing the flywheel magneto, lift it up while tilting it slightly. Do not allow the magneto to contact the timing plate.

**ELECTRICAL ANALYSIS
INSPECTION**

CAUTION: _____

All measuring instruments should be handled with special care or the correct measurement is impossible.

On an instrument powered by dry batteries, the latter should be checked for voltage periodically and replaced, if necessary.

NOTE: _____

"○—○" indicates the terminals between which there is a continuity of electricity; i.e., a closed circuit at the respective switch position.

Peak voltage measurement

NOTE: _____

- The coil output varies greatly at cranking speed.
- Cranking a cold engine with the plugs in and a weak battery does not enable proper readings.



Digital multimeter:
J-39299/90890-06752
Peak volt adapter:
YU-39991/90890-03169

Low resistance measurement

When measuring a resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained because of the tester's internal resistance.

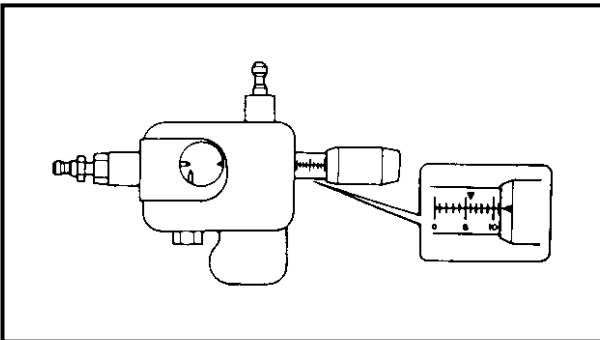
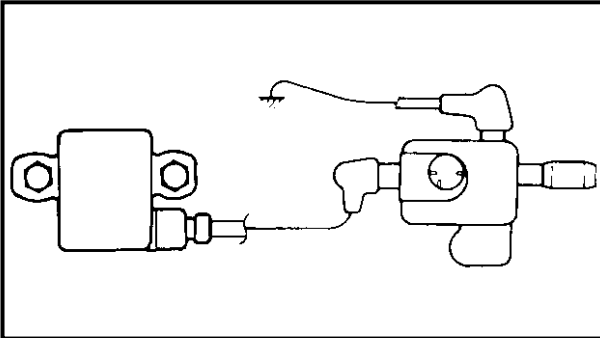
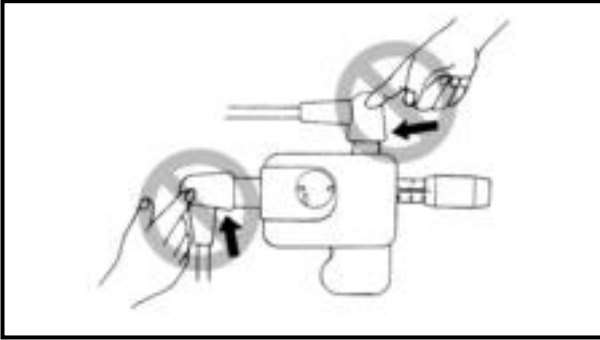
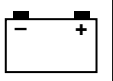
To obtain the correct value, subtract this internal resistance from the displayed measurement.



Correct value =
Displayed measurement –
Internal resistance

NOTE: _____

The internal resistance of the tester can be obtained by connecting both of its terminals.



IGNITION SPARK GAP

⚠ WARNING

- While checking the spark be careful not to touch any connection of lead wires of the "Ignition spark gap tester".
- When doing the spark test, take special care not to allow leakage from the plug cap which has been removed.

This check is likely to produce sparks, so be sure that no flammable gas or fluid is present.

1. Ignition spark gap:

- 1) Adjust the spark gap to specification by turning the adjusting knob.



Spark gap tester:
YM-34487/90890-06754

- 2) Connect the spark plug cap to the spark gap tester.
- 3) Remove the spark plugs from the engine.
- 4) Crank the engine and check the sparks from the ignition system through the discharge window.
- 5) Measure the ignition spark gap.
- 6) If the output is out of specification, measure the CDI SYSTEM PEAK VOLTAGE.



Spark gap:
9 mm (0.35 in)

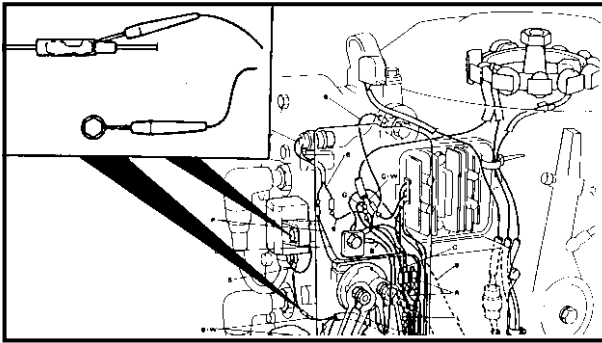
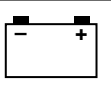
CDI SYSTEM PEAK VOLTAGE

⚠ WARNING

While taking CDI unit check be careful not to touch any connection of lead wires of the "Digital tester".

NOTE:


- If there is no spark or the spark is weak, continue with the CDI test.
- If a good spark is obtained, the problem is not with the CDI system, but possibly the spark plug or other component is defective.




1. CDI unit output:

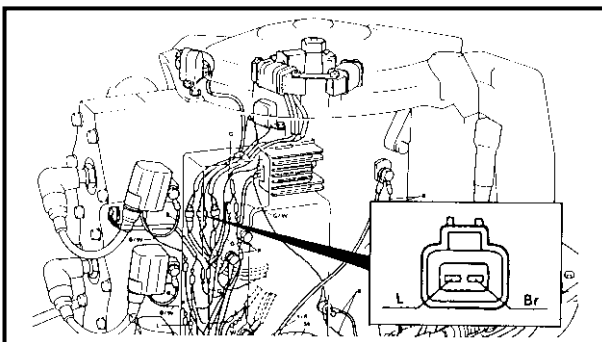
- 1) Connect the tester to the CDI unit as shown.
- 2) Set the tester dial to specification.
- 3) Crank or start the engine.
- 4) Measure all the CDI unit output.
- 5) If the output is beyond specification, replace the ignition coil.
- 6) If the output is below specification, measure the charge coil output.

50, 60, 70 hp

 CDI unit Output peak voltage (minimum) B/W – B				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	—	#1, 3: 105 #2: —	145	105


75, 80, 90 hp

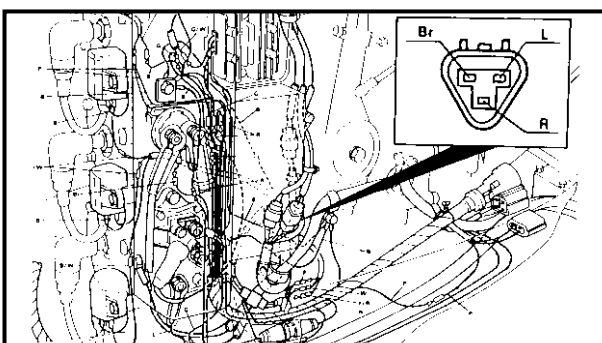
 CDI unit Output peak voltage (minimum) B/W – B				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	—	#1, 3: 130 #2: —	155	130



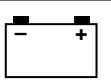
2. Charge coil output:

- 1) Disconnect the charge coil coupler. Connect the 2/3 pins test harness.


	50, 60, 70 hp			
	2 pins test harness:			
	YB-38831/90890-06767			
	75, 80, 90 hp			
	3 pins tester harness:			
	YB-06443/90890-06757			




- 2) Connect the tester to the measurement terminal.
- 3) Set the tester dial to specification.
- 4) Crank or start the engine.
- 5) Measure the charge coil output.
- 6) If the output is below specification, replace the charge coil.
- 7) If the output is beyond specification, measure pulser coil output.




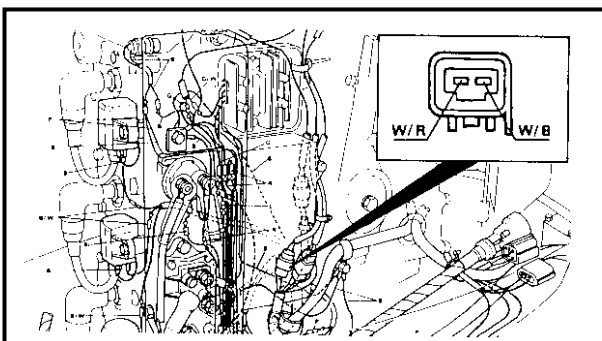
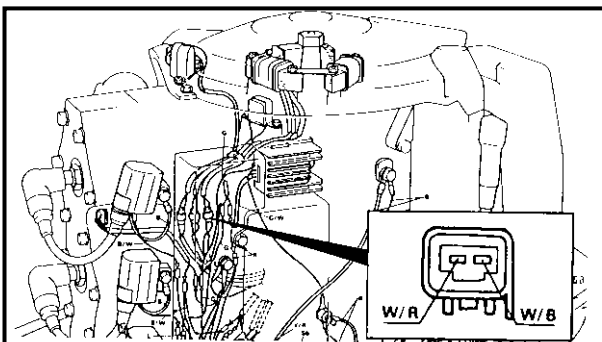
50, 60, 70 hp

 Charge coil Output peak voltage (minimum) Br – L				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	120	150	160	120

75, 80, 90 hp


 Charge coil Output peak voltage (minimum) R – Br				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	55	60	170	150

 Charge coil Output peak voltage (minimum) R – L				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	90	100	135	135

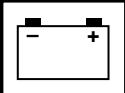


3. Pulser coil output:


- 1) Disconnect the pulse coil couple. Connect the 2 pins test harness.

	2 pins test harness: YB-38831/90890-06767
---	--


- 2) Connect the tester to the measurement terminal.
- 3) Set the tester dial to specification.
- 4) Crank or start the engine.
- 5) Measure the pulser coil output.
- 6) If the output is beyond specification, replace CDI unit.
- 7) If the output is below specification, replace pulser coil.

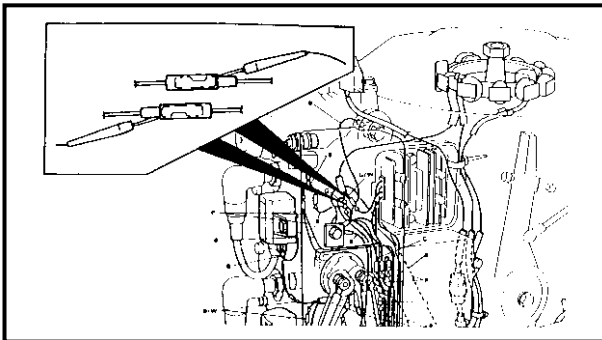


50, 60, 70 hp

 Pulser coil Output peak voltage (minimum) W/R – W/B				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	4.5	2.5	6.5	10

75, 80, 90 hp


 Pulser coil Output peak voltage (minimum) W/R – W/B				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	7.0	5.0	14	20




4. Lighting coil output:

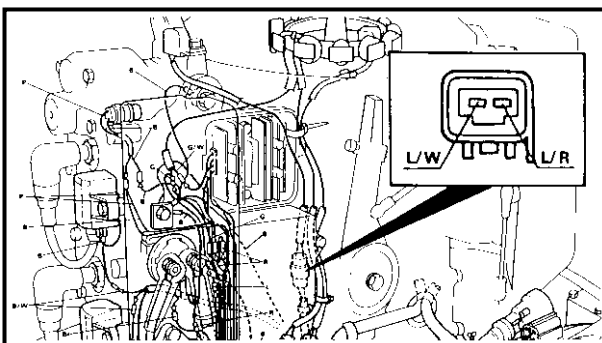
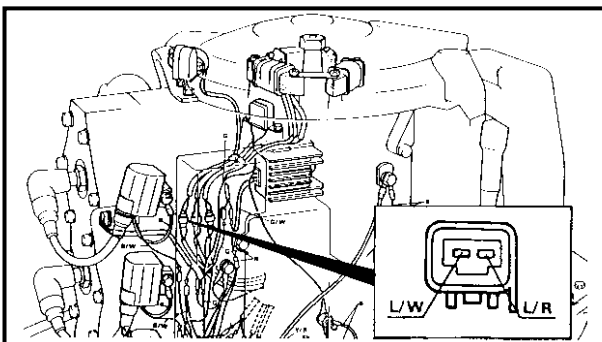
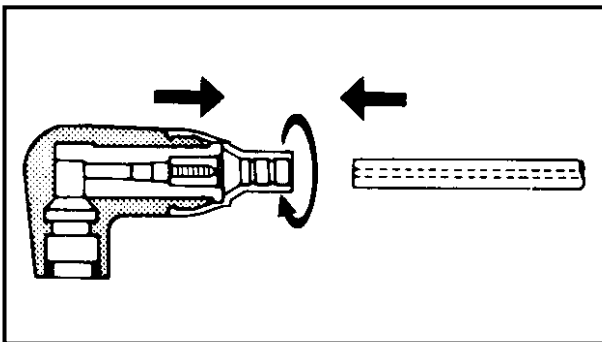
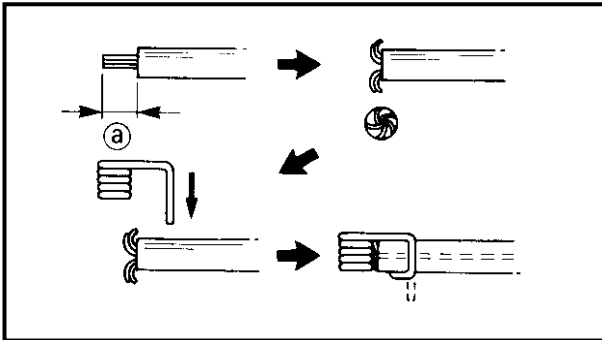
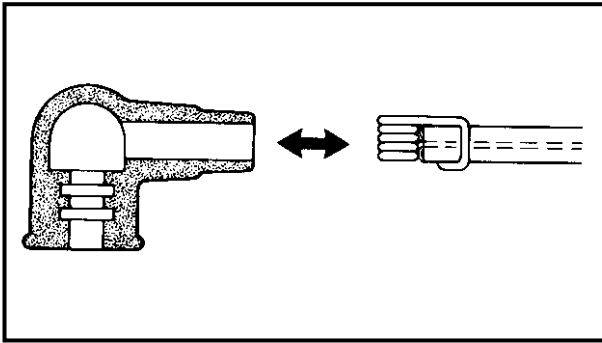
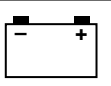
- 1) Connect the tester to the lighting coil as shown.
- 2) Set the tester dial to specification.
- 3) Start the engine.
- 4) Measure the lighting coil output.
- 5) If the output is beyond specification, replace rectifier/regulator.
- 6) If the output is below specification, replace lighting coil.

50, 60, 70 hp

 Lighting coil Output peak voltage (minimum) G – G/W				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	8.5	8.0	25	25

75, 80, 90 hp

 Lighting coil Output peak voltage (minimum) G – G/W				
r/min	Cranking		1,500	3,500
	Open	Connect		
V	10	11	25	25



M53005-0

REPLACEMENT OF SPARK-PLUG CAP
[Standard type]

1. Remove the spark-plug cap by pulling the cap and remove the plug-cap spring from the high-tension cable.

2. Cut an amount of about (a) off the end of the high-tension cable.

	Distance (a): 5 mm (0.2 in)
--	---------------------------------------

3. Fit onto the plug cap-spring.

4. Push the cap-spring into the plug-cap.

[Resistance specification type]

1. Remove the spark-plug cap by turning the cap.

2. Install the spark-plug cap onto the high-tension cable.

CRANK POSITION SENSOR

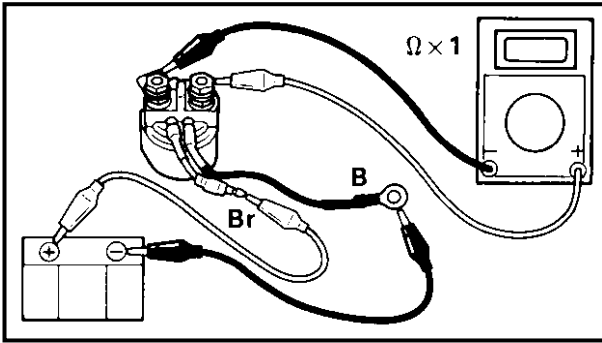
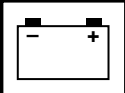
Measure the peak voltage of the crank position sensor as shown.

50, 60, 70 hp

	Crank position sensor Output peak voltage (minimum) L/R – L/W			
r/min	Cranking		1,500	3,500
	Open	Connect		
V	5.0	5.0	20	16

75, 80, 90 hp

	Crank position sensor Output peak voltage (minimum) L/R – L/W			
r/min	Cranking		1,500	3,500
	Open	Connect		
V	5.5	5.5	25	20



M55000-0

STARTER RELAY

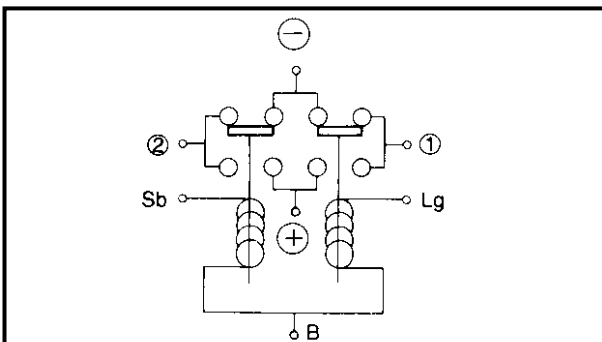
1. Check for continuity between the terminals and the ends of the black and brown leads.
2. Test to ensure there is no continuity between terminals.
3. Check the relay operation.
 - 1) Connect a tester between the terminals of the starter relay. Connect the leads of the starter-relay to a 12-V battery.

Brown lead	(+)
Black lead	(-)

	Battery voltage: 12V
--	---------------------------------------

B : Black
Br : Brown

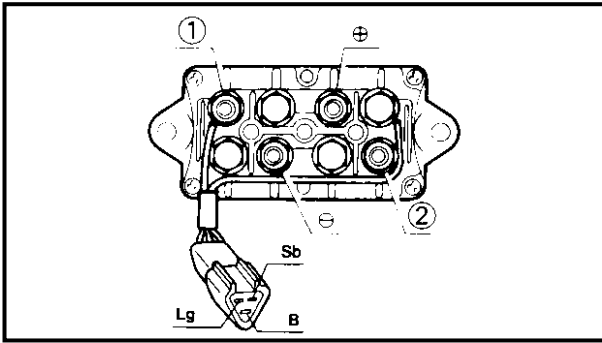
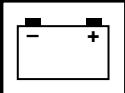
4. Check that there is continuity between the starter relay terminals. If the operation is not as specified, replace the starter relay.



M51410-0

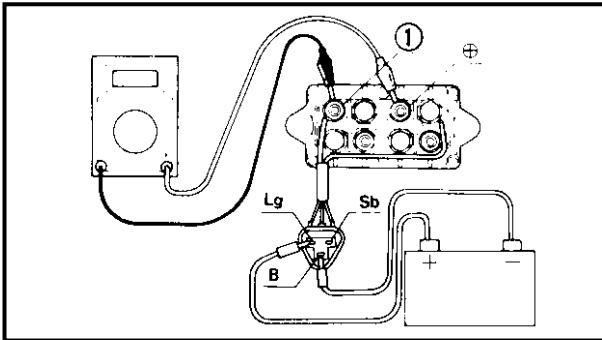
POWER TRIM AND TILT RELAY

1. Check the relay for terminal looseness and for wiring rust and corrosion. Replace the relay if any of the three defects is found.
2. Connect the (+) terminal and ① terminal and the (+) terminal and ② terminal to the tester and check that the resistance becomes ∞ in each case.

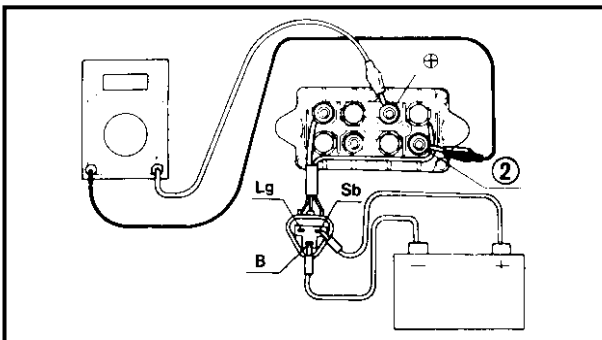


3. Connect the (-) terminal and ① terminal and the (-) terminal and ② terminal to the tester and check the continuity in each case.

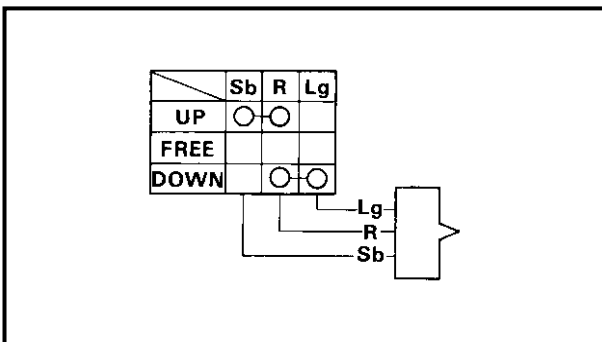
- Sb : Sky blue
- Lg : Light green
- B : Black



4. Connect the black terminal to the (-) terminal of the battery and the light green terminal to the (+) terminal of the battery. Then, connect the (+) terminal and ① terminal to the tester and check the continuity.



5. Connect the black terminal to the (-) terminal of the battery and the sky-blue terminal to the (+) terminal of the battery. Then, connect the (+) terminal and ② terminal to the tester and check the continuity.



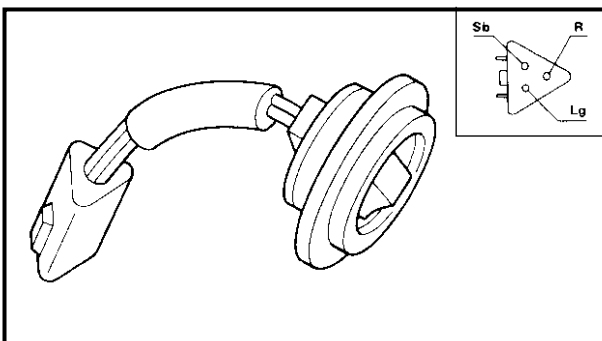
M56100-0

TRAILER SWITCH

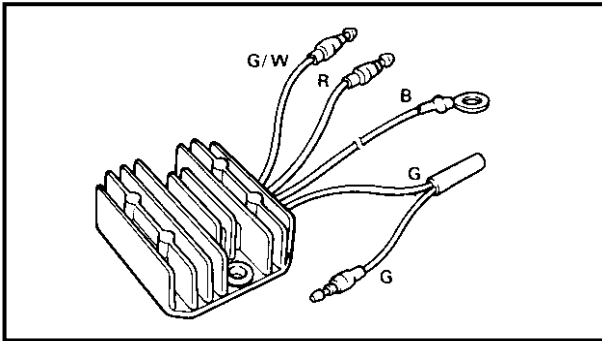
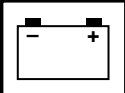
1. To see that there is continuity, push the switch.

Unit: Ω

		Checking leads	
		Sky blue Red	Light green Red
Switch Position	UP	Continuity	Discontinuity
	FREE	Discontinuity	Discontinuity
	DOWN	Discontinuity	Continuity




2. Check rubber seal.
Replace the seal if it has any damage.



M56501-0

RECTIFIER/REGULATOR

1. Check the continuity of the rectifier/regulator.

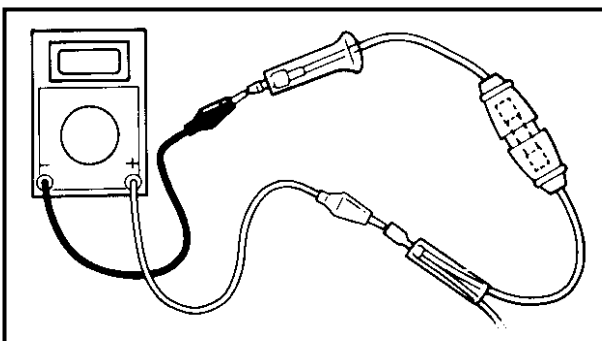
 Rectifier/regulator check				
Tester ⊕	Green	Green/White	Red	Black
Tester ⊖	Green	Green/White	Red	Black
Green		∞	Continuity	∞
Green/White	Continuity		Continuity	Continuity
Red	∞	∞		∞
Black	Continuity	Continuity	Continuity	

∞ : Discontinuity

If continuity is not as specified, replace the rectifier/regulator.

NOTE:

- The digital tester cannot be used for this inspection.
- Never connect the rectifier/regulator directly to the battery to check continuity.
- When testing, disconnect the battery terminals.
- When resistance is measured at less than 100 Ω, it can be said that there is continuity.

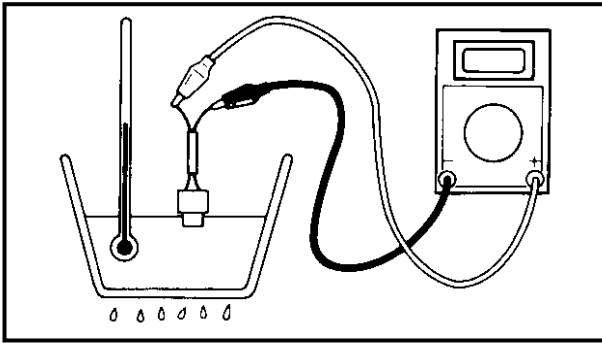
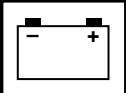


M57001-0*

FUSE

1. Referring to the diagram, check the continuity of the fuse. If the fuse is blown, replace with a fuse of correct rating.

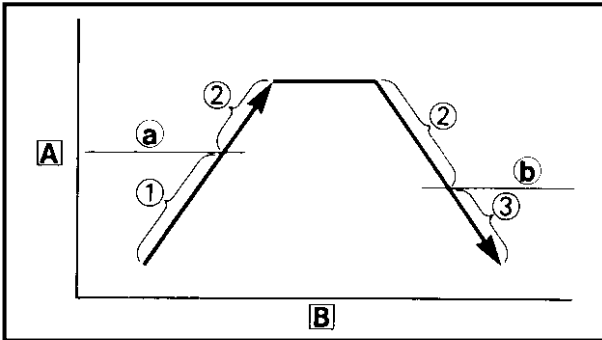
	Fuse rating: 20A
---	-----------------------------------



M57300-0

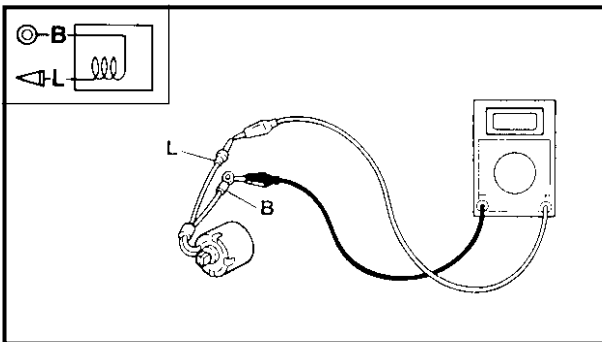
THERMO SWITCH

1. Immerse the thermo switch in water. While heating the water, check the continuity at the specified temperature.
2. While cooling the water, check the continuity at the specified temperature. If continuity is not as specified, replace the thermo switch.



ON temperature (a):
 84 ~ 90°C (183 ~ 194°F)
OFF temperature (b):
 60 ~ 74°C (140 ~ 165°F)

- ① Discontinuity
- ② Continuity
- ③ Discontinuity
- A Temperature
- B Time



FUEL ENRICHMENT VALVE

1. Measure the resistance of the fuel enrichment valve.



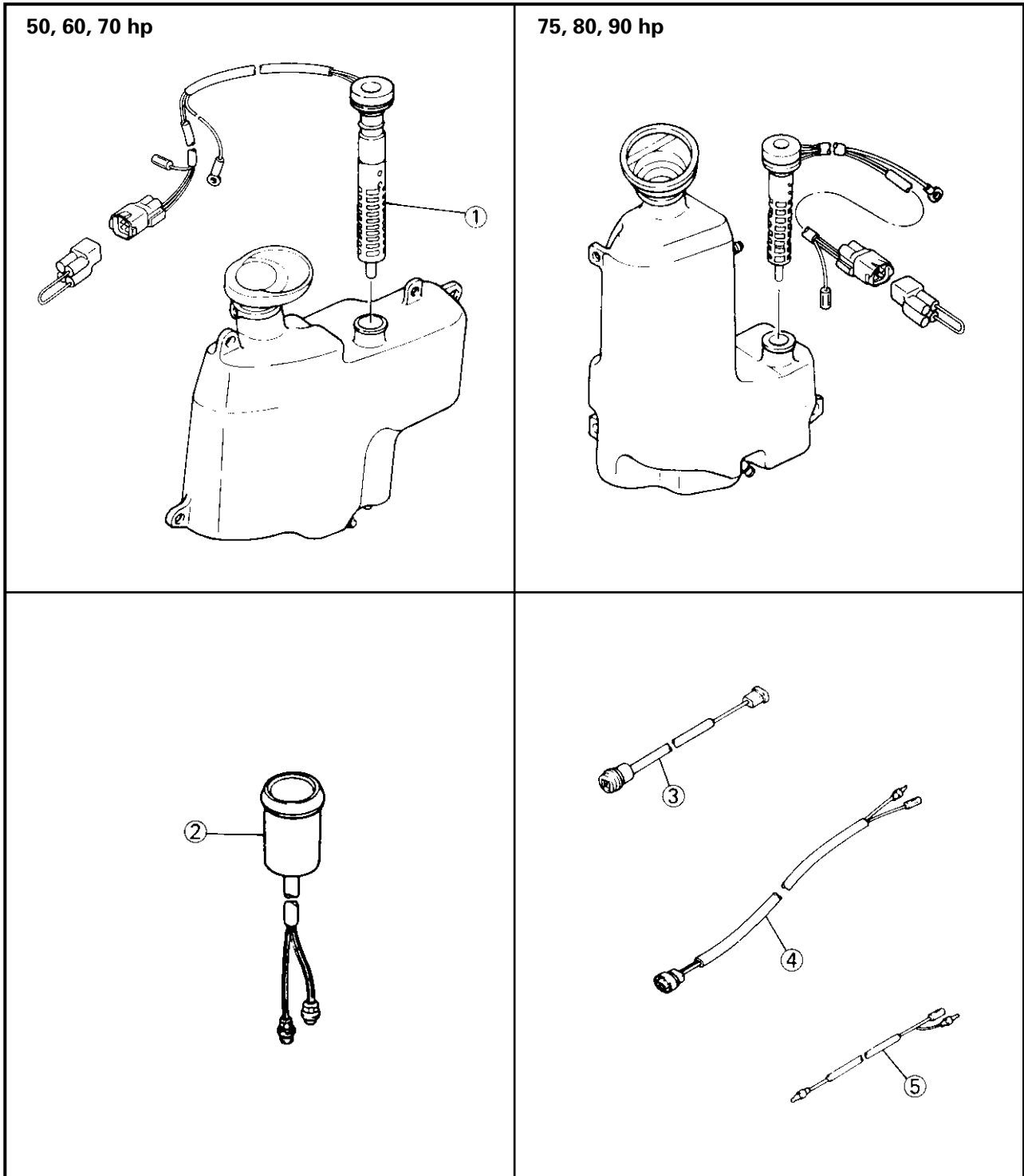
Fuel enrichment valve resistance:
 at 20°C (68°F)
 L – B: 3.4 ~ 4.0 Ω

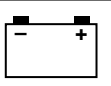
NOTE: _____
 Refer to "Low resistance measurement" for this inspection.

M57500-0

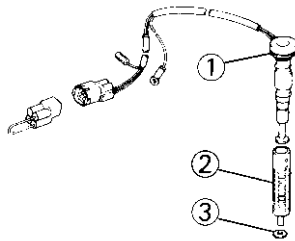
OIL INJECTION SYSTEM (Oil injection model)

- ① Oil level sensor
- ② Digital Meter
(Oil level warning lamps/control unit)
- ③ Lead wire
- ④ Lead wire
- ⑤ Lead wire assembly

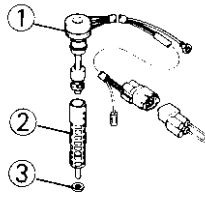




50, 60, 70 hp



75, 80, 90 hp



M58004-0

OIL-LEVEL SENSOR

1. Remove the circlip and disassemble the oil-level sensor.

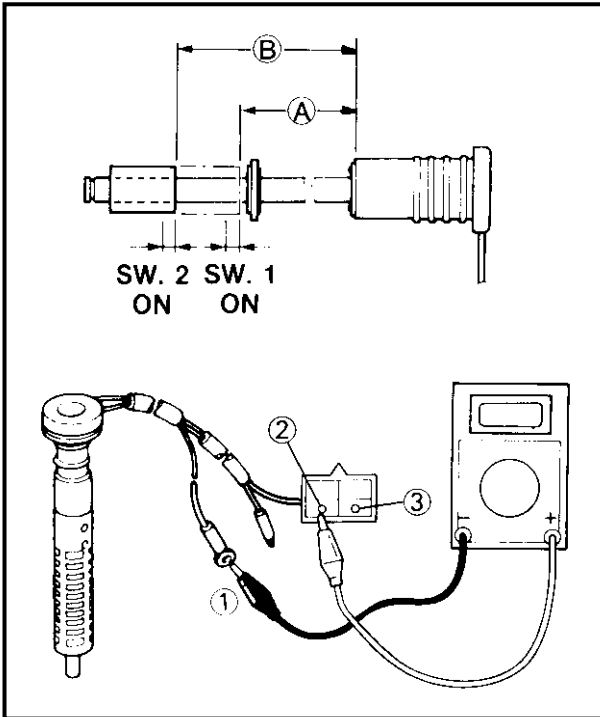
- ① Oil-level sensor
- ② Strainer cover
- ③ Gasket

2. Referring to the illustrations and tables, check the continuity and resistance.

50, 60, 70 hp

Marking: 6H3-16

Unit: Ω

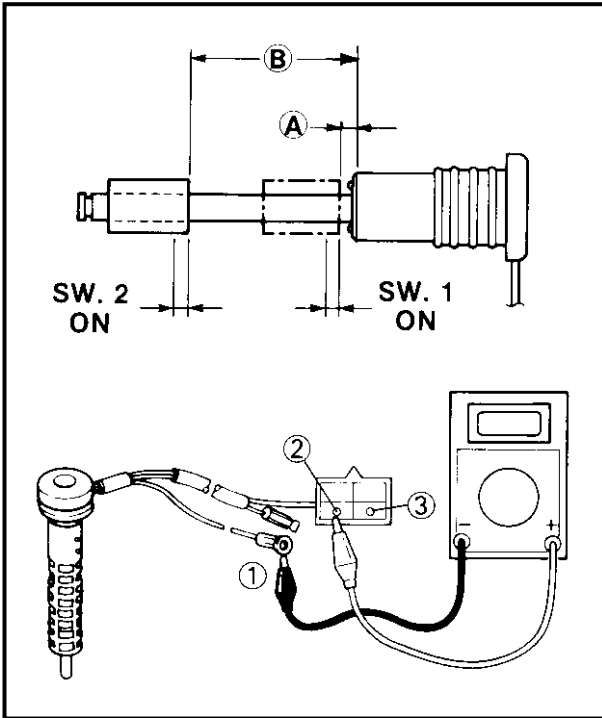
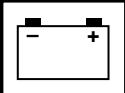


Oil level sensor resistance					
Float SW.1 ON Ⓐ 79.5 ~ 82.5 mm (3.13 ~ 3.25 in)			Float SW. 2 ON Ⓑ 114.5 ~ 117.3 mm (4.51 ~ 4.62 in)		
Tester +	① Black	② Green	Tester +	① Black	③ Green/Red
Tester -	① Black	0	Tester -	① Black	*∞
	② Green	0		③ Green/Red	640

Oil level sensor resistance			
Float SW. 1, SW. 2, both OFF			
Tester +	② Green	② Green	③ Green/Red
Tester -	① Black	∞	*∞
	② Green	∞	∞
	③ Green/Red	*∞	∞

* "∞" indicates that the pointer deflects once and returns to "∞".

∞ : Discontinuity



75, 80, 90 hp
Marking: 6H1-15

Unit: Ω

Oil level sensor resistance					
Float SW.1 ON Ⓐ 5.8 ~ 8.8 mm (0.23 ~ 0.35 in)			Float SW. 2 ON Ⓑ 42.3 ~ 45.3 mm (1.67 ~ 1.78 in)		
Tester ⊖	Ⓚ Black	Ⓛ Green	Tester ⊖	Ⓚ Black	Ⓛ Green/ Red
Ⓚ Black		0	Ⓚ Black		*∞
Ⓛ Green	0		Ⓛ Green/ Red	640	

Oil level sensor resistance					
Float SW. 1, SW. 2, both OFF					
Tester ⊖	Ⓚ Black	Ⓛ Green	Ⓛ Green	Ⓛ Green	Ⓛ Green/ Red
Ⓚ Black			∞		*∞
Ⓛ Green		∞			∞
Ⓛ Green/Red	*∞		∞		

* "∞" indicates that the pointer deflects once and returns to "∞".

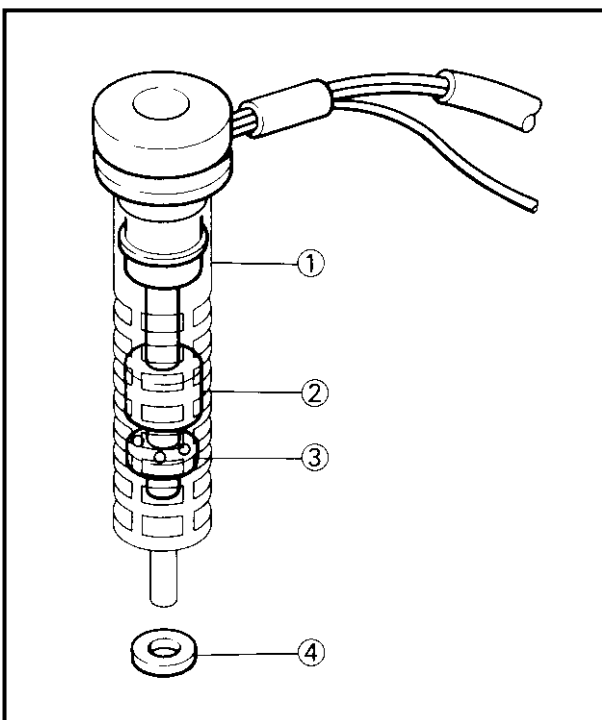
∞ : Discontinuity

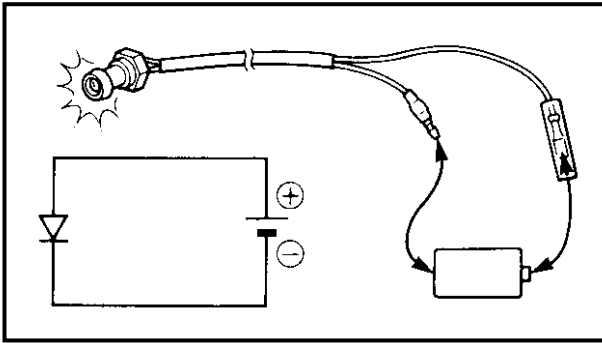
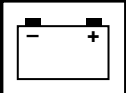
3. Assemble as shown in the diagram.

- Ⓚ Strainer cover
- Ⓛ Float (Magnet)
- Ⓛ Plate
- Ⓛ Gasket

NOTE:

- Place the float with the magnet side upward.
- Assemble the plate which has a hole at the bottom.





M57602-0

OIL-LEVEL WARNING LAMP (L.E.D.) (50GETO)

Test the Light Emitting Diode (L.E.D.) using a 1.5-V dry-cell battery.

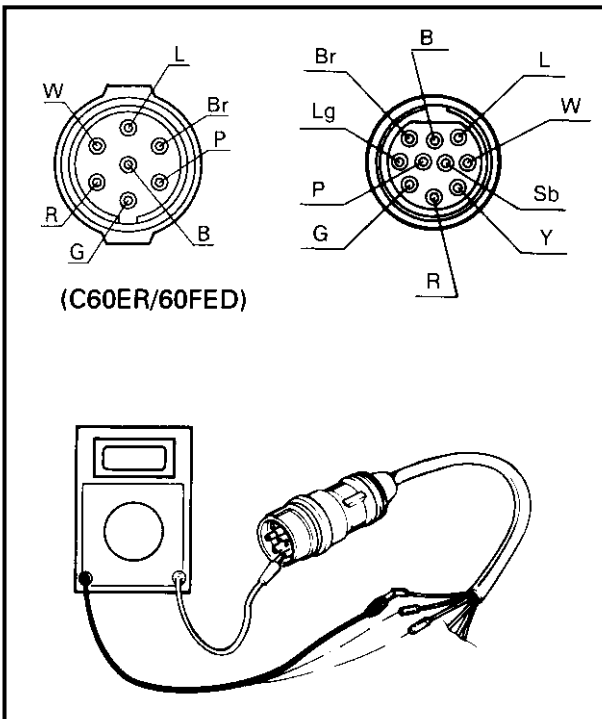
If no light is emitted, replace the warning lamp.



Battery voltage:
1.5V

CAUTION:

Do not use a 12-V battery or a larger capacity type, as this may damage the L.E.D. We recommend using a pen light battery.

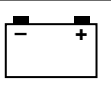


M58300-0

WIRING HARNESS

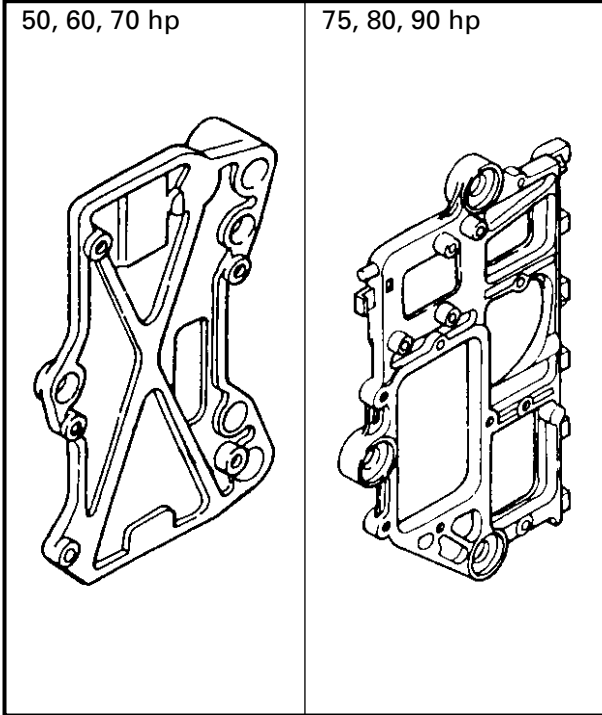
1. Check the continuity between the coupler side and each connector. Cores and pins of identical colors must be connected or a continuity test can not be made.
2. If any of the cores is open-circuit, replace the wiring harness.

- Lg : Light green
- P : Pink
- Br : Brown
- B : Black
- L : Blue
- Sb : Sky blue
- W : White
- Y : Yellow
- R : Red
- G : Green



50, 60, 70 hp

75, 80, 90 hp



M58800-0

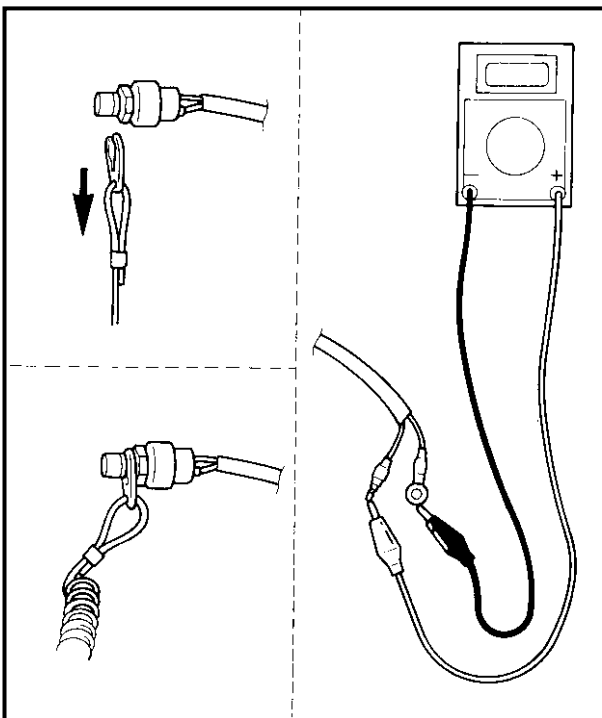
BRACKET

1. Inspect the bracket and replace it if it's cracked.

M58900-0*

BATTERY


Refer to "PERIODIC SERVICE" section in chapter 3.

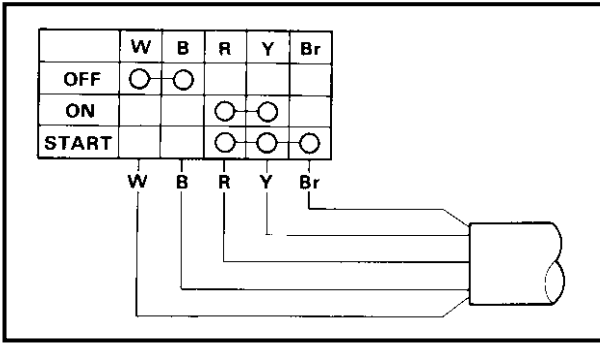
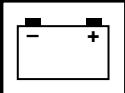


M59000-0

**ENGINE STOP SWITCH
(P60TH/60FEHTO, P75TH/75CEHTO,
90AEHD)**

1. When removing and installing the lock-plate, check for continuity according to the chart below.

 Lock plate	Wire color	
	W	B
Removed	○	○
Installed		



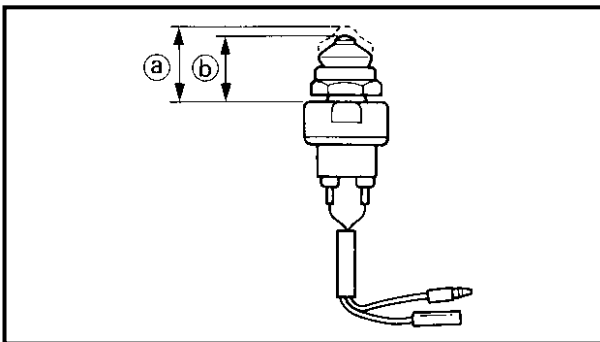
MAIN SWITCH (P60TH/60FEHTO, P75TH/75CEHTO, 90AEHD)

1. Check the continuity of the main switch.
Replace if continuity is not as specified.

		Checking leads		
		White Black	Red Yellow	Red Yellow Brown
Switch Position	OFF	Continuity	Discontinuity	Discontinuity
	ON	Discontinuity	Continuity	Discontinuity
	START	Discontinuity	Discontinuity	Continuity

NEUTRAL SWITCH (P60TH/60FEHTO, P75TH/75CEHTO, 90AEHD, 90TR/90AETO, B90TR/90AETO)

1. Check the continuity of the neutral switch.
Replace if continuity is not as specified.



	Distance	Color: Brown – Brown
Free Ⓐ	19.6 ~ 20.5 mm (0.77 ~ 0.81 in)	Discontinuity
Push Ⓑ	18.5 ~ 19.5 mm (0.73 ~ 0.77 in)	Continuity

M61002-0*

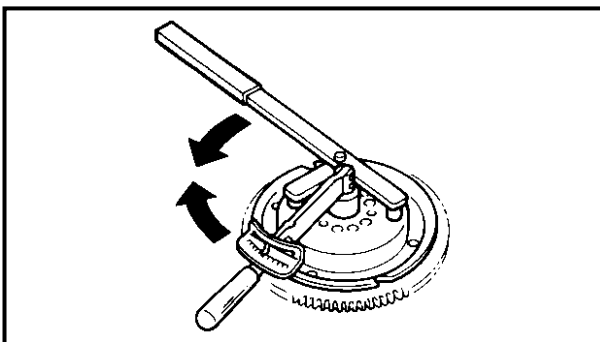
**INSTALLATION
FLYWHEEL MAGNETO**

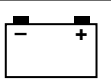
1. Install the magneto base onto the retainer-plate.
2. Install so that the woodruff key in the keyways fits in the crankshaft.
3. Lock the flywheel rotor with the washer and nut. Tighten the nut to the specified torque.

	Flywheel nut: 160 Nm (16 m • kg, 115 ft • lb)
--	---

	Flywheel holder: YB-6139/90890-06522
--	--

4. Install the flywheel cover.





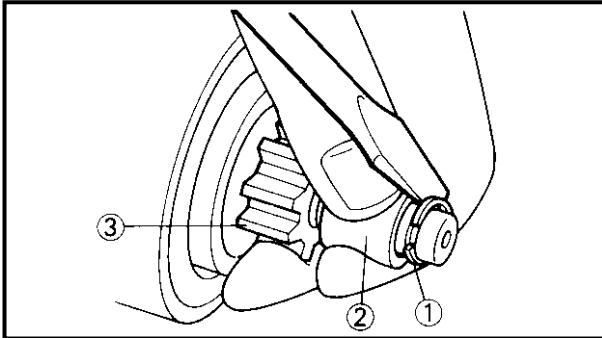
M71001-0*

STARTER MOTOR REMOVAL

1. Disconnect the cables and remove the starter-motor.

DISASSEMBLY

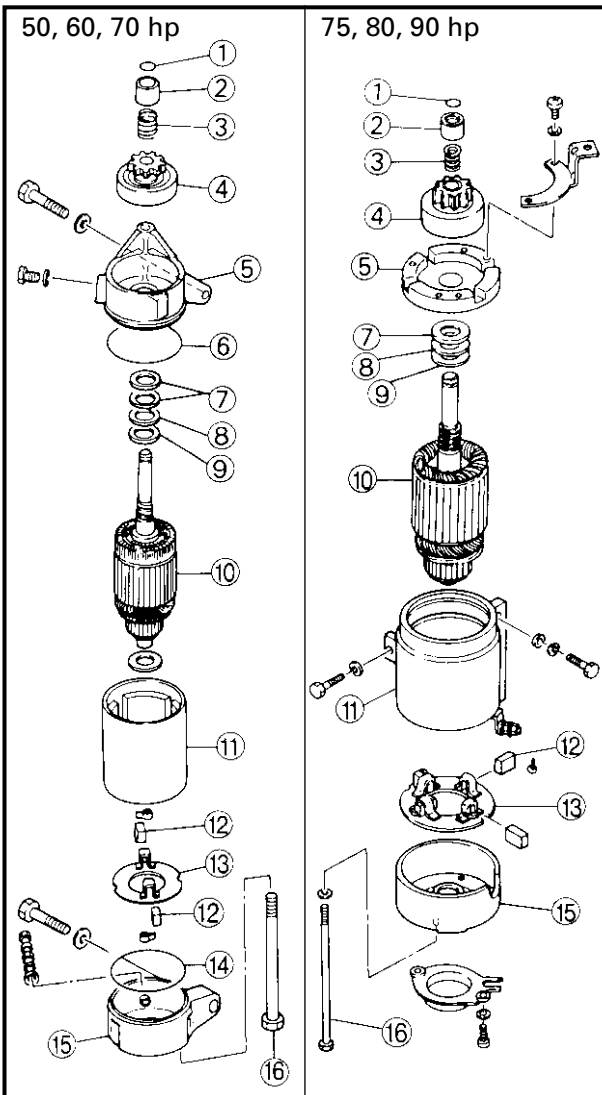
1. Remove the starter-clutch. Using a screw-driver, pry off the clip.



- ① Clip
- ② Pinion Stopper
- ③ Pinion (starter clutch)

NOTE: _____

Push the pinion stopper by hand toward the pinion and remove the clip.

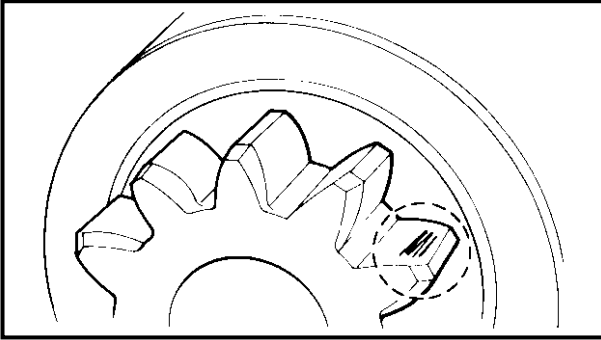
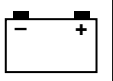


2. Remove the two through-bolts and pull out the front cover lightly tapping it with a plastic hammer, if necessary.

3. Using a piece of steel wire, separate the brush springs and remove the brushes from the brush-holders.

4. Remove the yoke assembly by lightly tapping it with a plastic hammer and remove the armature.

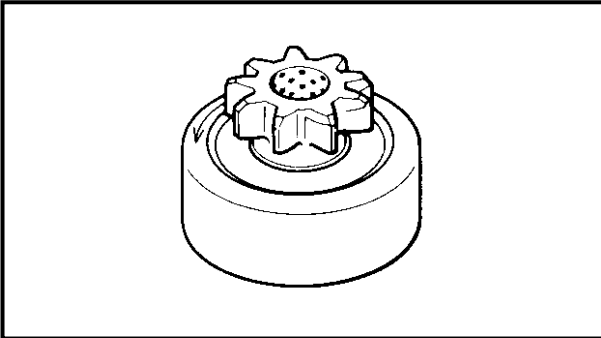
- ① Clip
- ② Pinion stopper
- ③ Spring
- ④ Pinion (starter clutch)
- ⑤ Front cover
- ⑥ O-ring
- ⑦ Washer
(50, 60, 70 hp: t = 1.0 mm,
75, 80, 90 hp: t = 2.0 mm)
- ⑧ Washer
(50, 60, 70 hp: t = 0.15 mm,
75, 80, 90 hp: t = 0.3 mm)
- ⑨ Washer
(50, 60, 70 hp: t = 2.0 mm,
75, 80, 90 hp: t = 1.0 mm)
- ⑩ Armature
- ⑪ Yoke assembly
- ⑫ Brush
- ⑬ Brush holder
- ⑭ O-ring (50, 60, 70 hp)
- ⑮ Rear cover
- ⑯ Through-bolt



INSPECTION

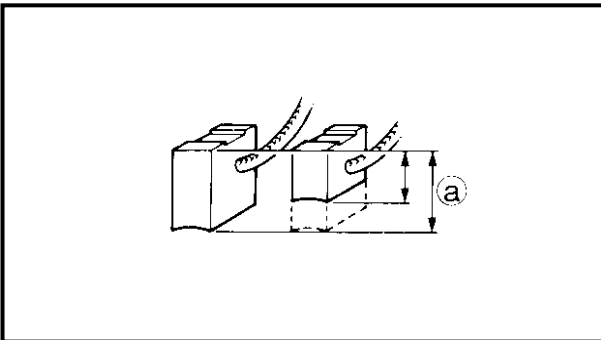
PINION

1. Inspect the pinion and inner teeth for wear or damage and check ease of pinion sliding motion and replace, if damaged.
2. Inspect the flywheel gear and replace, if worn or damaged.



STARTER CLUTCH

1. Check the clutch movement. Rotate the pinion clockwise and check that it turns freely. Also, try to rotate the pinion counterclockwise and confirm that it locks.



BRUSH

1. Measure the brushes for wear.



Brush size (a):

Standard:

50, 60, 70 hp: 12.5 mm (0.49 in)

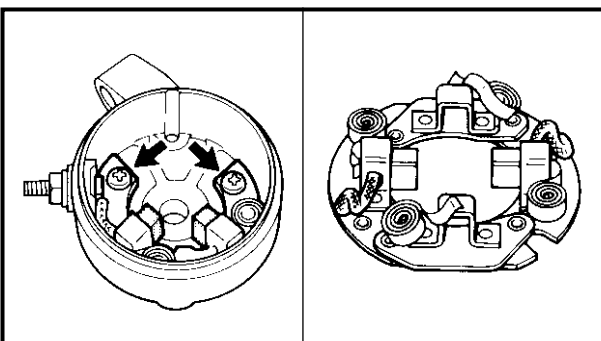
75, 80, 90 hp: 16.0 mm (0.63 in)

Minimum:

50, 60, 70 hp: 9.0 mm (0.35 in)

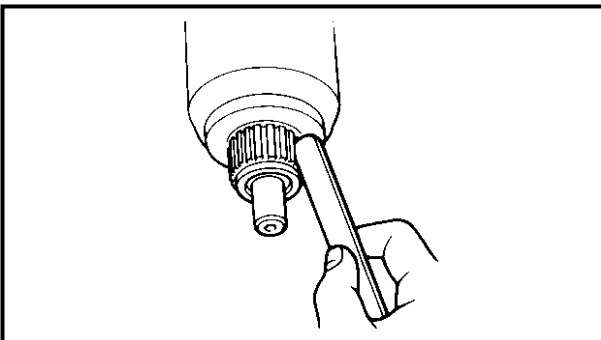
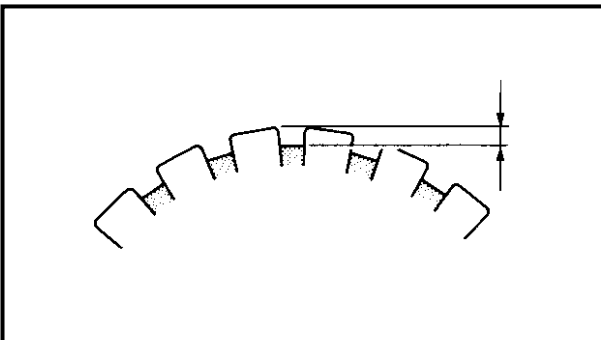
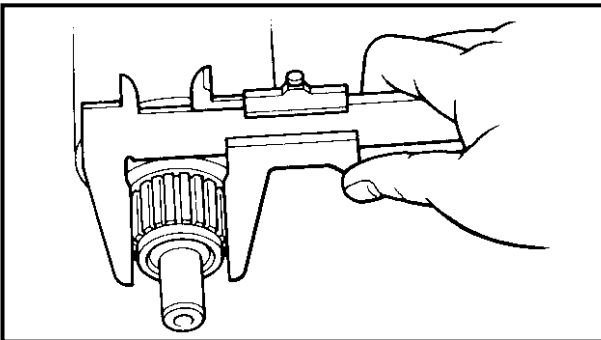
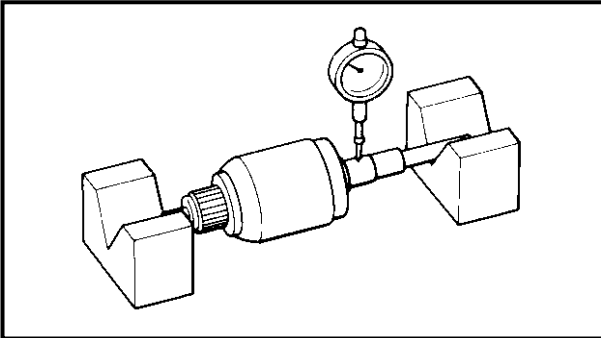
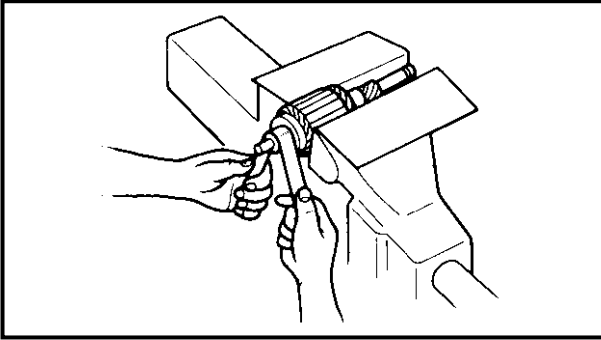
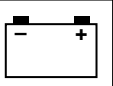
75, 80, 90 hp: 12.0 mm (0.47 in)

If the size is less than the minimum specification, replace the complete brush-holder assemblies.



BRUSH-HOLDER

1. Check the insulation between the brush-holder and ground. If there is any continuity, replace the brush-holder assembly.



ARMATURE

1. Inspect the commutator surfaces and if these are dirty or burnt, clean with 400-grit wet-or-dry sandpaper.

2. Inspect the commutator deflection with a dial gauge and block and replace the armature if the deflection is out of specification.



Maximum deflection:
0.05 mm (0.0020 in)

If the deflection is greater than the specified deflection, replace the armature.

3. Measure the diameter of the commutator.



Standard diameter:
50, 60, 70 hp: 30 mm (1.18 in)
75, 80, 90 hp: 33 mm (1.30 in)
Minimum diameter:
50, 60, 70 hp: 29 mm (1.14 in)
75, 80, 90 hp: 31 mm (1.12 in)

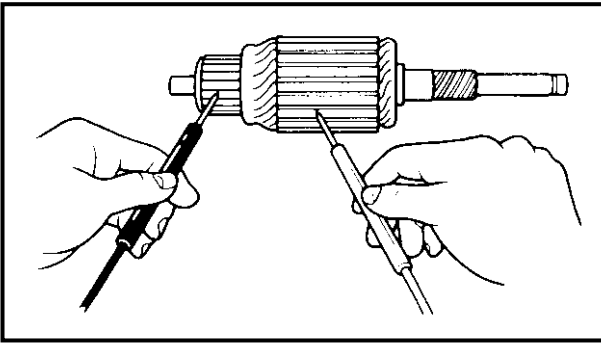
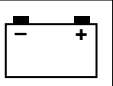
If the commutator diameter is out of specification, replace the armature.

4. Measure the commutator mica undercut depth.

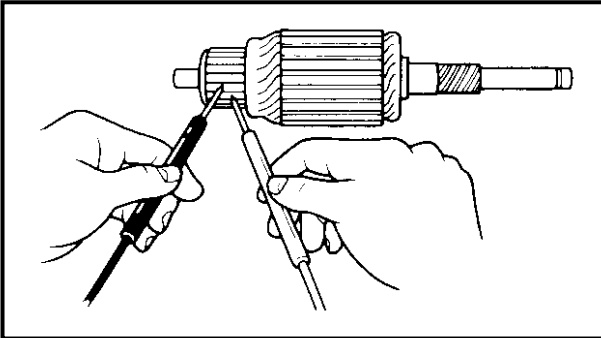


Standard mica undercut depth:
0.8 mm (0.03 in)
Minimum undercut depth:
0.2 mm (0.01 in)

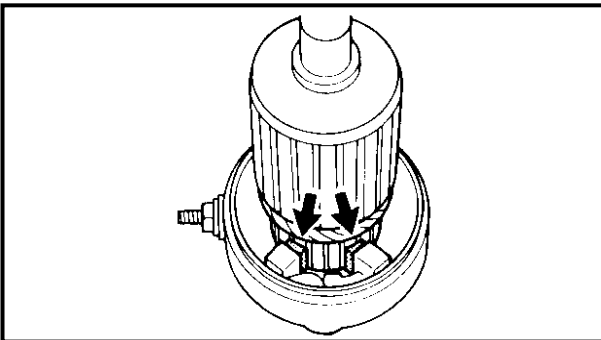
If the undercut depth is less than the specified minimum, scrape between the segments with a hacksaw blade, then remove all particles of mica and metal with compressed air.



5. Check the insulation between the shaft or laminations and ground. If there is any continuity, replace the armature.



6. Inspect that the commutator is an open circuit by checking for continuity between segments. If any segment is not continuous, replace the armature.

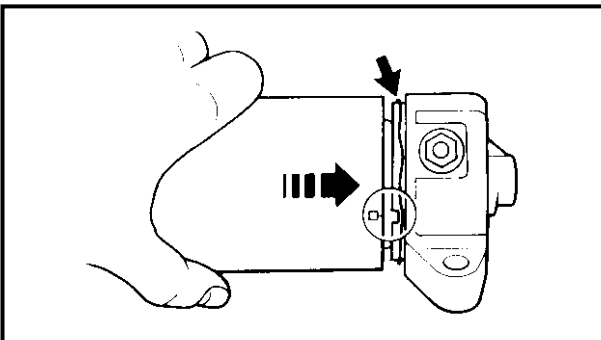


ASSEMBLY (50, 60, 70 hp)

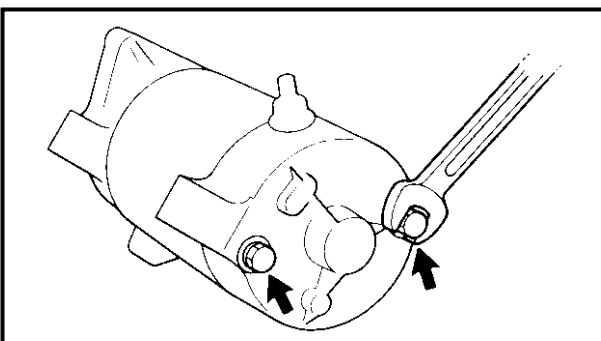
1. Apply a thin coat of water resistant grease to the rear cover bushing and install the armature in the rear cover assembly.

NOTE:

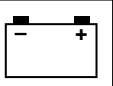
Install by lifting the brushes, and inserting the armature straight into the bushing taking care not to scratch the brush or contaminate it with grease.



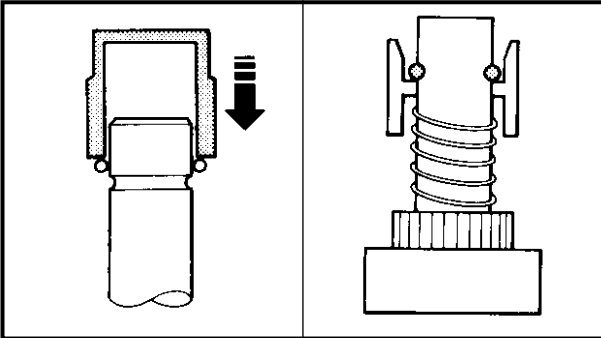
2. Install the yoke assembly, aligning the recess on the rear cover with the projection on the stator and ensuring that the O-ring fits correctly in the rear cover groove.



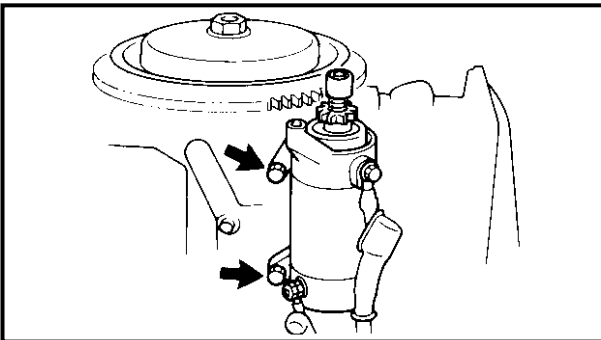
3. Mount the two washers on the armature shaft. Sparingly apply water resistant grease to the front cover bushing, ensure that the O-ring fits into the armature shaft and insert the shaft into the front cover.



4. Insert the through-bolts into the rear cover and screw them into the front cover.
5. Mount the pinion, spring and pinion-stopper on the armature shaft.



6. Hold down the pinion-stopper and fit the circlip into the groove in the shaft. Use a socket-wrench that fits properly over the armature shaft. Reform the circlip by using pliers. Lift up the pinion-stopper until its bottom contacts the circlip.



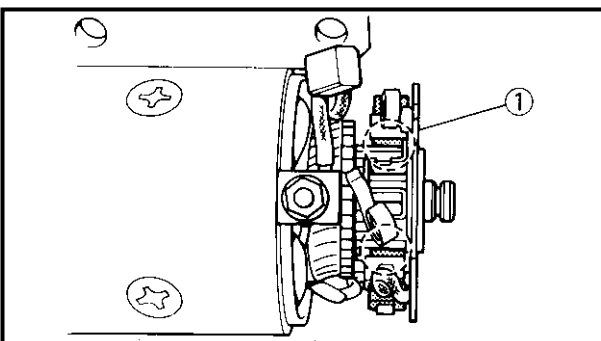
INSTALLATION (50, 60, 70 hp)

1. Place the starter-motor on the starter motor stay and tighten the bolts to the specified torque.



**Starter motor mounting bolt:
20 Nm (2.0 m · kg, 14 ft · lb)**

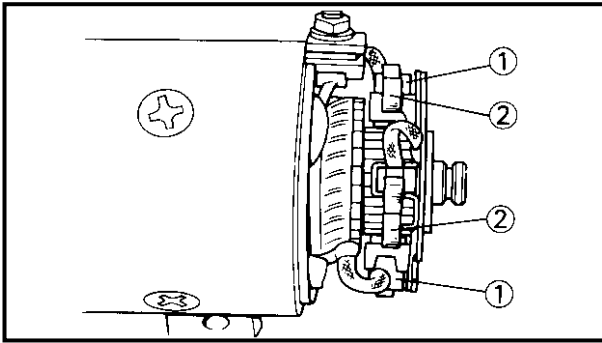
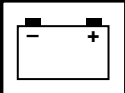
2. Secure the starter-motor to the engine with the four starter-motor mounting bolts.
3. Connect the positive and negative wires to the starter-motor.



ASSEMBLY (75, 80, 90 hp)

1. Insert the armature into the yoke assembly. Fit the brush attached to the negative side of the brush holder into the armature.

① Brush holder

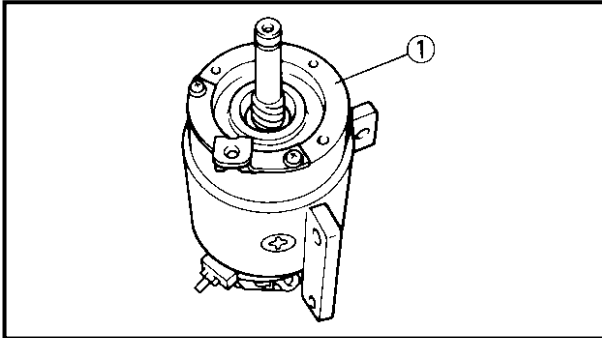


2. Install the positive brush (on the stator coil side) in the brush holder and hold it with the spring.

NOTE:

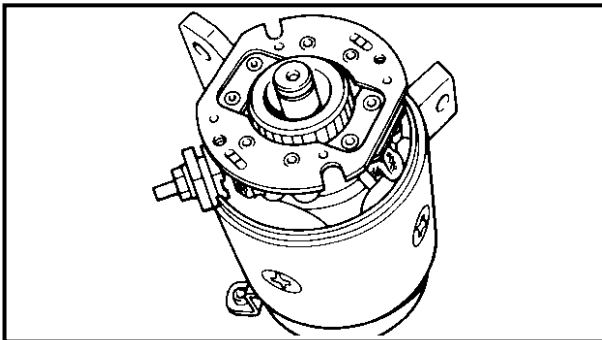
Use care not to scratch the brushes when installing.

- ① Positive brush
- ② Spring



3. Mount the two steel washers and resin washer, in that order, on the armature shaft and install the front cover onto the yoke assembly.

- ① Front cover

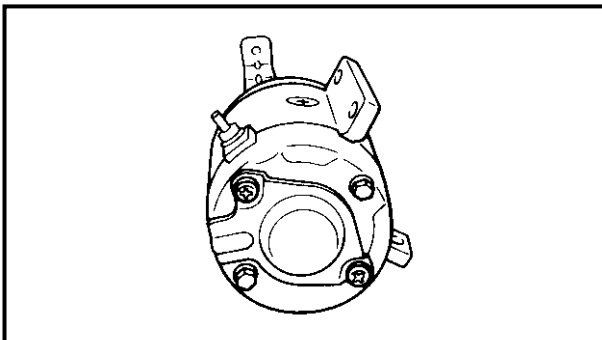


4. Align the cut (for the through-bolt) in the brush holder with the gap in the brush holder so that the through-bolt can be inserted.

5. Install the rear cover onto the yoke assembly, insert the through-bolt into the rear cover and screw it into the front cover.

NOTE:

- Apply a thin coat of grease (anti-freeze grease) to the front and rear cover bearings.
- To seal out water, the mating surfaces are coated with sealing compound.

**INSTALLATION (75, 80, 90 hp)**

1. Place the starter-motor on the starter-motor stay and tighten the bolts.
2. Secure the starter-motor to the engine with the four starter-motor mounting-bolts.
3. Connect the positive and negative wires to the starter-motor.