

## Section 2

# IGNITION

### IGNITION SYSTEM

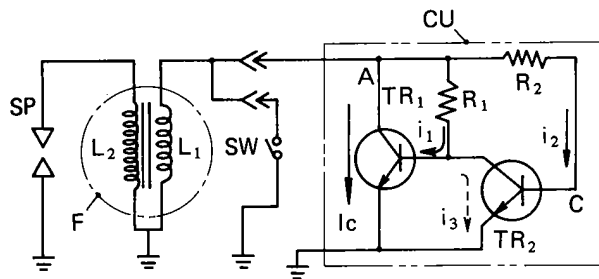
A transistor controlled ignition system is used for FB460V. This system consists of the following components.

- Ignition coil unit
- Control unit (Igniter)
- Permanent magnet flywheel
- Spark plug

The ignition coil unit is mounted outside the flywheel on the cylinder block.

Since the transistor ignition system contains no mechanical parts, no wear occurs and no periodic maintenance is required except for the spark plug.

#### Principle of Operation



|                               |                     |
|-------------------------------|---------------------|
| $L_1$ : Primary coil          | $TR_1$ : Transistor |
| $L_2$ : Secondary coil        | $TR_2$ : Transistor |
| $R_1$ : Control Resistor      | $F$ : Flywheel      |
| $CU$ : Control Unit (Igniter) | $SP$ : Spark plug   |
| $R_2$ : Control Resistor      | $SW$ : Stop switch  |

- When voltage at point (A) is plus, base current ( $i_1$ ) flows into Transistor ( $TR_1$ ). Then the Transistor ( $TR_1$ ) is turned "ON" and allows large amplified current ( $I_c$ ) to flow, during which the Transistor ( $TR_2$ ) does not operate because Resistor ( $R_2$ ) lowers voltage at point C.
- As the flywheel continues to rotate, AC power is further generated in the primary coil ( $L_1$ ). Then the Transistor ( $TR_2$ ) is turned "ON" by high voltage at point (C). As soon as the Transistor ( $TR_2$ ) is turned "ON", the base current ( $i_1$ ) through Resistor ( $R_1$ ) to Transistor ( $TR_1$ ) changes its flow to ( $i_3$ ) and to Transistor ( $TR_2$ ), thus the Transistor ( $TR_1$ ) is turned "OFF" because of voltage drop at point (B).

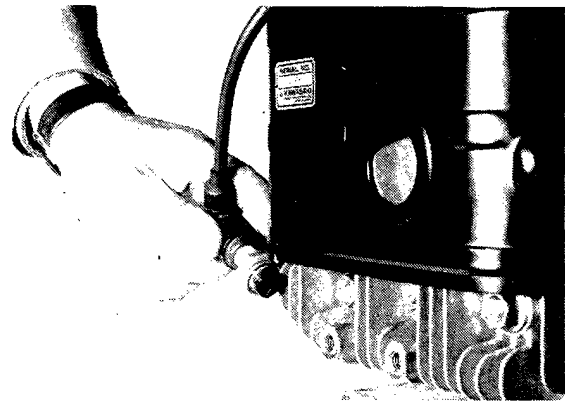
This sudden current ( $I_c$ ) change induces high voltage within the secondary coil ( $L_2$ ), which fires the spark plug.

### SPARK CHECK

Remove spark plug and check spark by cranking engine while having the plug touched against engine block.

**⚠ WARNING:** Keep the plug as far away as possible from the plug hole. To avoid an electric shock do not hold the plug itself. Make sure to hold the plug cap.

If there is good spark between electrodes, the ignition system is in good condition.



If there is no or very weak spark, clean spark plug and regap to 0.6 to 0.7mm (0.024 to 0.028 in.). Replace spark plug if electrodes are worn. See "Spark Plug Check and Cleaning" section.

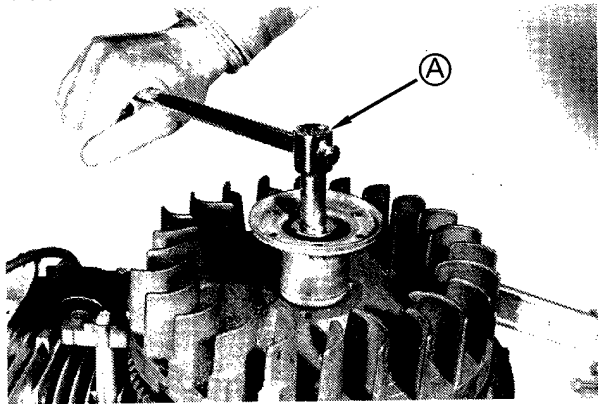
### FLYWHEEL REMOVAL

1. Remove spiral case. (Flywheel housing)
2. Disconnect spark plug cap from spark plug.
3. Carefully remove the wire out of spiral case.

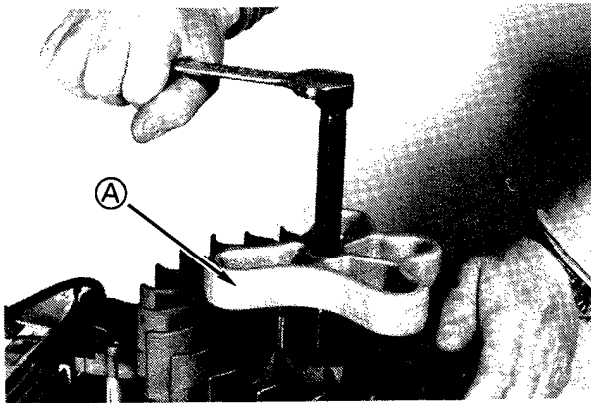
**CAUTION:** Flywheel nut has a left-hand thread.

4. Place a pry bar against the thick root of the blades to prevent the blades from breaking off.

- Use a socket wrench (A), give an impact to the end of wrench bar and remove the retaining nut.



- Remove flywheel with a flywheel puller (A).

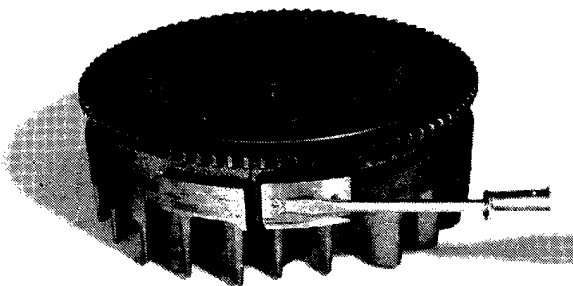


- Remove and inspect flywheel key. Replace the key if it is bent or sheared.
- Inspect crankshaft taper for nicks or burrs. If necessary, finish taper using fine emery paper.

## FLYWHEEL CHECK

**CAUTION:** Do not give impact to magnet, as impact weakens magnetic force of it.

- Put flywheel on a wooden surface.
- Hold a metal tool about 25mm (1 in.) away from flywheel magnet. The metal tool should be attracted by magnet. If magnetic force is weak, replace flywheel.



## Ring Gear Inspection (Electric starter Model)

- Inspect flywheel ring gear for worn or damaged teeth.
- Replace ring gear, if teeth are extremely worn or damaged.

## Ring Gear Replacement (Electric starter Model)

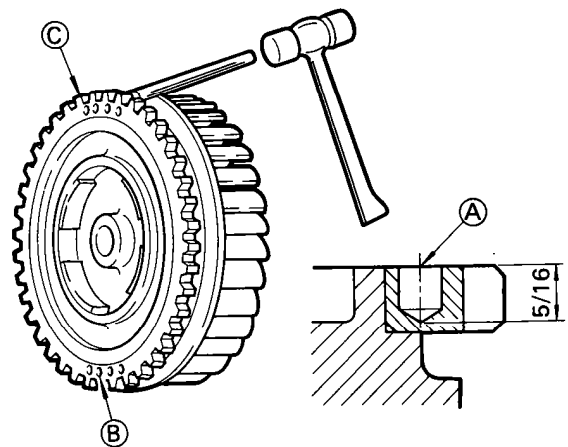
**CAUTION:** Do not give impact to magnet, as impact weakens magnetic force.

**! WARNING:** Use heat shield gloves to prevent personal injury.

- Use 1/4 in. drill bit to drill 5/16 in. deep holes into ring gear (C) as shown (A) & (B).

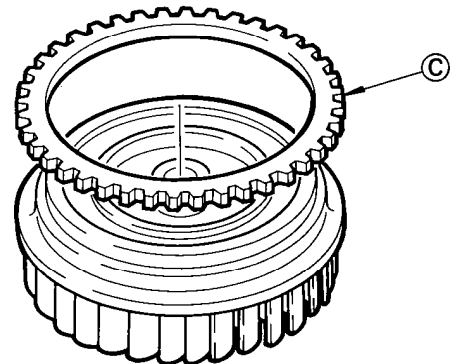
**CAUTION:** Do not cut flywheel by drilling too deep or too close.

- By using a hammer and bar, strike ring gear evenly to remove it.



Ⓐ 1/4 drill 5/16 deep Ⓑ (4~6) drill holes Ⓒ Ring gear

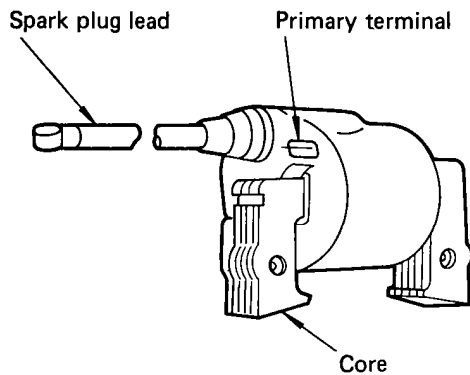
- Heat a new ring gear (C), evenly to an extent that expansion by heating facilitates following installation.
- With the beveled edge of the gear faced up, quickly install ring gear, quickly followed by tapping ring gear evenly to insure good seating.



Ⓒ New ring gear

## IGNITION COIL CHECK

1. Remove two mounting screws and remove ignition coil.
2. Remove the plug cap from high tension cord.
3. Set KAWASAKI multimeter selector switch at a specified range and connect leads as shown in the chart below. If meter reading falls within the values shown in the chart, the coil is functioning properly.



### Ignition Coil Resistance

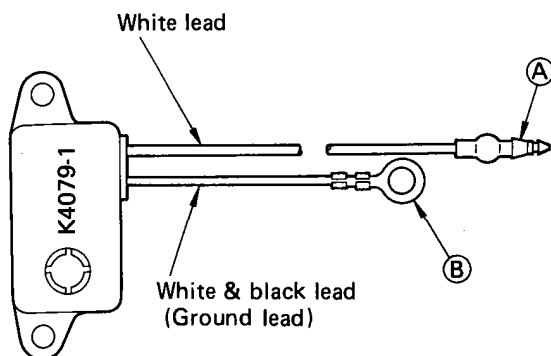
|                | Connection              | Resistance                      |
|----------------|-------------------------|---------------------------------|
| Primary coil   | Primary terminal ← core | 0.4 to 0.8 Ω<br>(R x 1 Ω Range) |
| Secondary coil | Plug lead ← core        | 10 to 18 kΩ<br>(R x 1 kΩ Range) |

\*Resistance value may vary with individual meters.

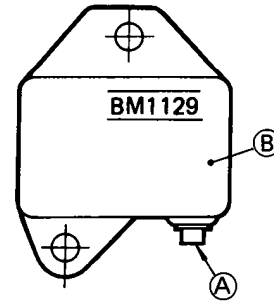
## CONTROL UNIT CHECK

1. Unfasten connectors.
2. Unscrew mounting screws and remove control unit.
3. Set KAWASAKI multimeter selector switch at Rx1 Ω scale and connect leads as shown in the chart below. If meter reading falls within the values shown in the chart, the unit is functioning properly.

### FB460V-AS. Model



### FB460V-BS. Model



(A) Terminal (B) Core

### Control Unit Resistance (AS. BS. Model)

| Tester ⊖     | Terminal (A)     | Case (B)      |
|--------------|------------------|---------------|
| Tester ⊕     |                  |               |
| Terminal (A) |                  | ON 10Ω to 40Ω |
| Case (B)     | ON 4.0Ω to 3.0kΩ |               |

\*Resistance value may vary with individual meters.

\*Do not use a megger.

## FLYWHEEL INSTALLATION

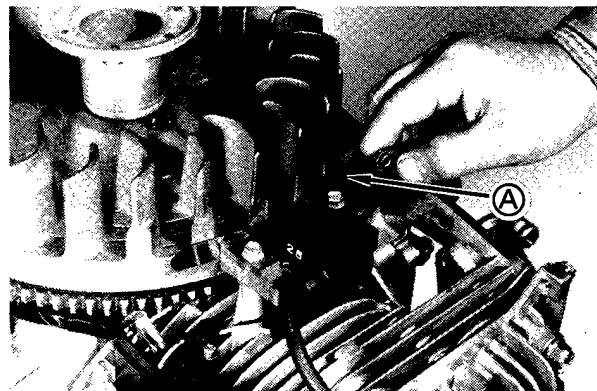
Be sure the key is in place when installing flywheel. To tighten flywheel nut, reverse the removal steps. Torque to spec. listed.

### Flywheel Nut Tightening Torque

|                                |
|--------------------------------|
| 83 to 88 N-m (62 to 65 ft-lbs) |
|--------------------------------|

## IGNITION COIL AIR-GAP ADJUSTMENT

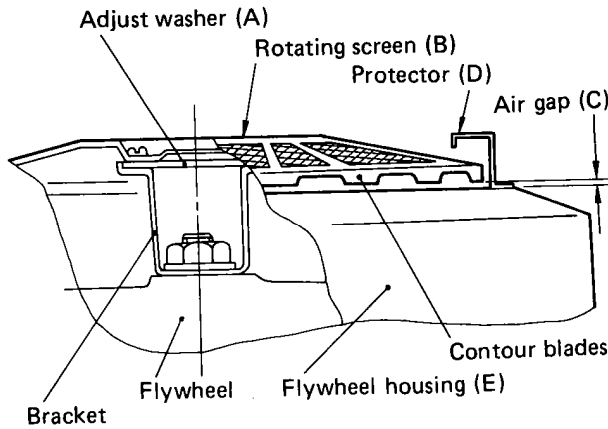
- (1) Leave ignition coil mounting screws loose so the coil can be moved for air gap adjustment.
- (2) Inserting a 0.3mm (0.012 in.) – AIR GAP – thickness gauge (A) at each area in between coil legs on flywheel rim, move the coil to adjust AIR GAP.
- (3) Tighten mounting screws firmly.



## FLYWHEEL HOUSING INSTALLATION

1. Install flywheel housing (E), rotating screen (B), protector (D) and tighten screws.

**NOTE:** The air gap (C) between contour blades (D) under screen and flywheel housing (E) should be not less than 1 mm (0.04 in.). Use washers (A) to adjust the air gap (C).



2. Install cylinder head cover and tighten screws.

**NOTE:** Push cylinder head cover firmly against flywheel housing to eliminate cooling air leakage.

3. Install dipstick and air cleaner assembly.

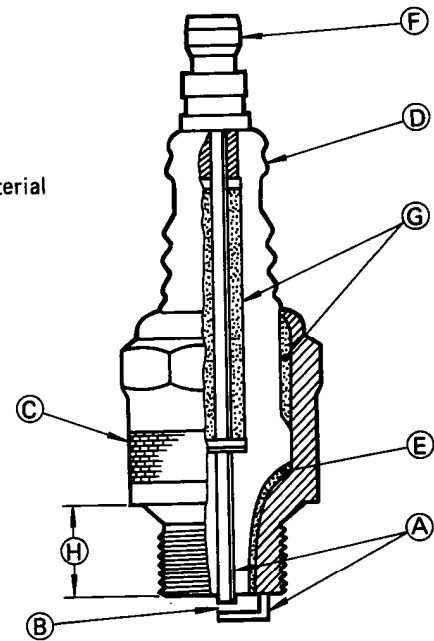
## SPARK PLUG CHECK AND CLEANING

A spark plug consists of two electrodes (A) separated from each other by spark gap (B). The side electrode is connected to shell (C) of the spark plug. The center electrode is completely insulated from the shell.

The high voltage, produced in the secondary coil winding, is applied to the center electrode and causes a spark to jump the gap (B) to the side electrode. This spark ignites the fuel-air-mixture and starts the combustion process in the cylinder.

- Gap between electrodes affects the entire range of engine performance – starting, idling, accelerating, power and top speed.
- Spark plugs must operate within a specific temperature range to give good performance.

- (A) Electrodes
- (B) Spark gap
- (C) Shell
- (D) Porcelain
- (E) Gasket
- (F) Terminal
- (G) Sealing material
- (H) Reach



The plug can be cleaned using a high flash-point solvent and a wire brush or other suitable tool. If the spark plug electrodes are burn away or damaged, or if the porcelain is cracked, replace the plug. Use the following spark plug.

### Specified Spark Plug

| Spark plug     | Gap                                   |
|----------------|---------------------------------------|
| NGK BMR-4A     | 0.6 to 0.7 mm<br>(0.024 to 0.028 in.) |
| CHAMPION RCJ-8 |                                       |

### Spark Plug Gap

- (1) Measure the gap with a wire type thickness gauge. If the gap is incorrect, carefully bend the outer electrode with a needle nose plier to obtain the correct gap.

### Spark Plug Tightening Torque

|                    |
|--------------------|
| 28 N-m (20 ft-lbs) |
|--------------------|

## ELECTRICAL SYSTEM

The electrical system for FB460V consists of an ignition system, electric starting system, charging system and monitor system (optional).

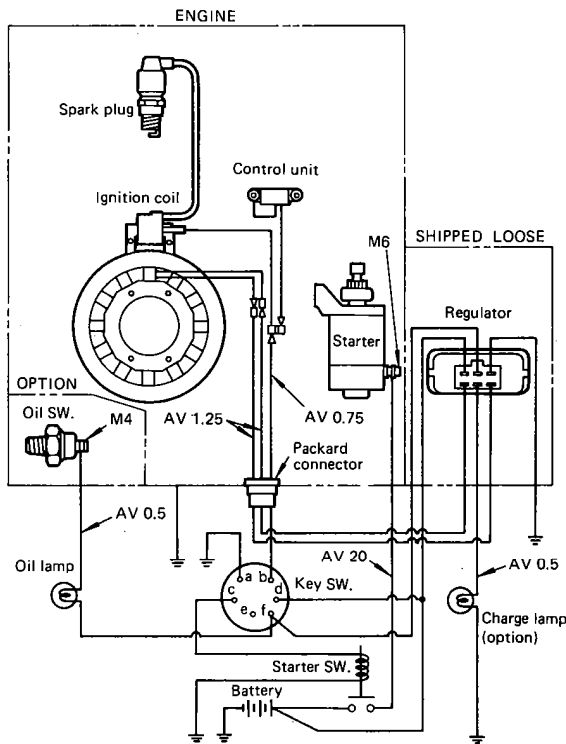
- The ignition system includes a flywheel, ignition coil, control unit, spark plug and engine stop switch (recoil starter model only).
- The starter system includes a key switch,

solenoid and starting motor.

- The charging system consists of a flywheel stator and regulator to convert AC current to DC current. The stator out put is 12 amps at 3,350 rpm.
- The monitor system consists of an oil pressure sensor (oil switch), oil pressure warning lamp and charge lamp.

### Wiring Diagram

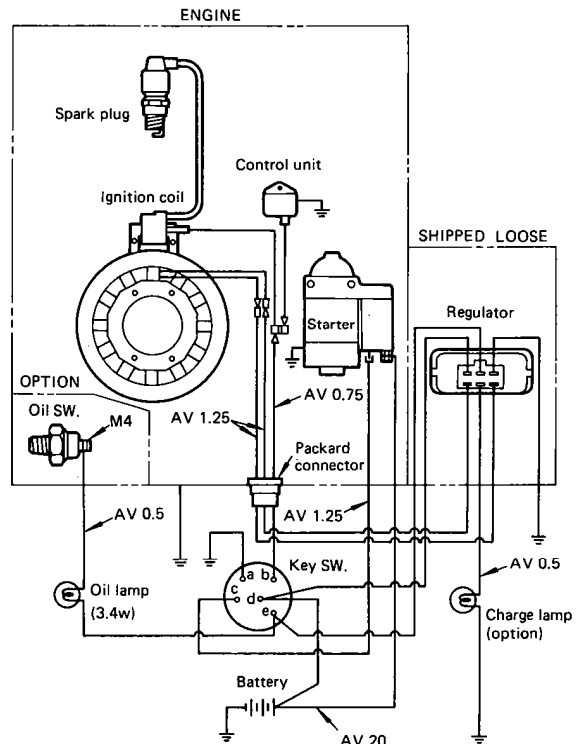
FB460V-AS. Model (Bendix Starter Motor)



Key switch

|       |   |   |   |   |   |   |
|-------|---|---|---|---|---|---|
|       | a | b | c | d | e | f |
| OFF   | ○ | ○ |   |   |   |   |
| RUN   |   |   | ○ | ○ |   |   |
| START |   |   | ○ | ○ | ○ |   |

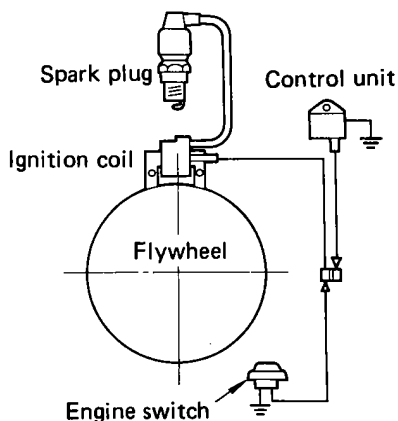
FB460V-BS. Model (Shiftlever Starter Motor)



Key switch

|       |   |   |   |   |   |
|-------|---|---|---|---|---|
|       | a | b | c | d | e |
| OFF   | ○ | ○ |   |   |   |
| RUN   |   |   | ○ | ○ |   |
| START |   |   | ○ | ○ | ○ |

FB460V. (Recoil-Starter Model)



### Specifications

#### Ignition System

| ITEM                      |                                      |
|---------------------------|--------------------------------------|
| Ignition system type      | Flywheel magneto transistor ignition |
| Spark plug                | NGK BMR-4A or CHAMPION RCJ-8         |
| Plug air gap              | 0.6 to 0.7 mm (0.024 to 0.028 in.)   |
| Primary coil resistance   | 0.4 to 0.8 Ω                         |
| Secondary coil resistance | 10 to 18 k Ω                         |
| Control unit resistance   | See CONTROL UNIT CHECK               |