

## SECTION 1E

**IGNITION SYSTEM**

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## GENERAL DESCRIPTION

The ignition system is provided to make combustion of the fuel-air mixture in combustion chamber with ignition by electric sparking on the adequate ignition timing. The system consist of battery, ignition coil, distributor, high tension cable and spark plug.

### IGNITION SYSTEM

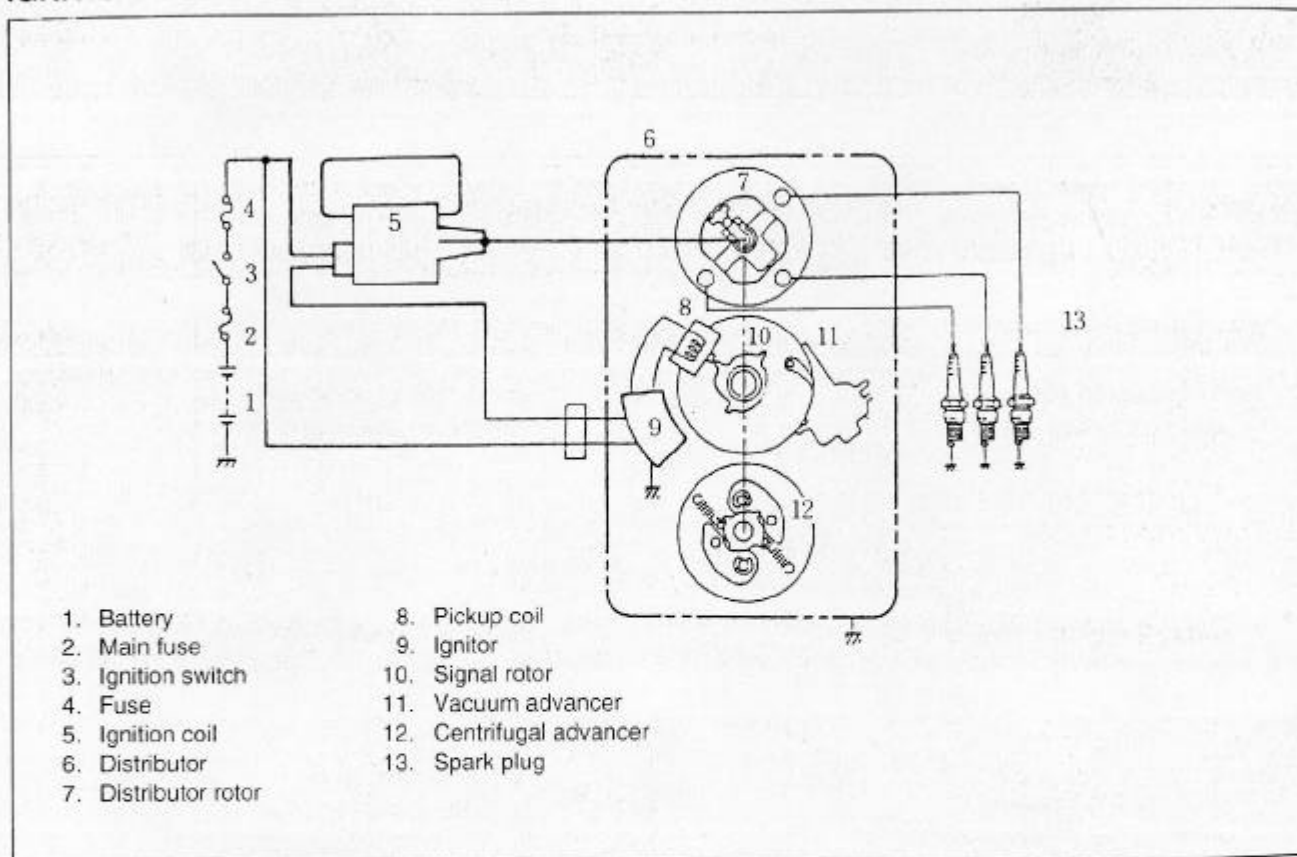


FIG. 1E-1 IGNITION SYSTEM CONFIGURATION DIAGRAM

### IGNITION COIL

Ignition coil is a sort of transformer to generate high voltage(15,000~25,000V) which can bring spark at spark plugs and has an iron cored closed magnetic type.

The closed magnetic typed ignition coil is used for high energy ignition(H.E.I.) system.

Comparing with the iron cored open magnetic type, the closed type almost has no loss of magnetic flux, and smaller in size, so it produces the high energy of secondary voltage.

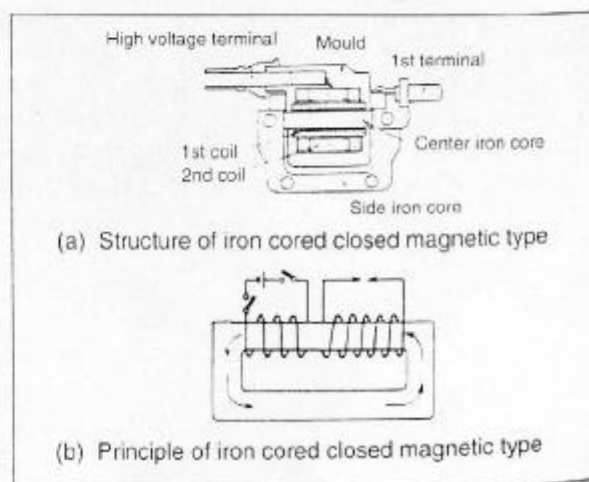


FIG. 1E-2 IGNITION COIL OF IRON CORED CLOSED MAGNETIC TYPE

## SPARK PLUG

It is a part of ignition secondary current, and it burns the compressed mixture by sparking the high voltage induced from the ignition coil.

Maker	CHAMPION
Type	RNIIYC
Spark gap (mm)	0.8

## DISTRIBUTOR

Distributor distributes the high tension voltage induced from ignition coil, to each ignition plug of each cylinder in the sequence of ignition order. It also adjusts the ignition timing according to the engine condition. Distributor also makes the intermittent 1st current to equip ignition coil with high tensioned voltage. Its components are vacuum advance angle, centrifugal advance angle, rotor, pickup coil, ignitor and signal rotor, etc.

### 1. Advance Angle System

#### a. Centrifugal advance

#### b. Vacuum advance

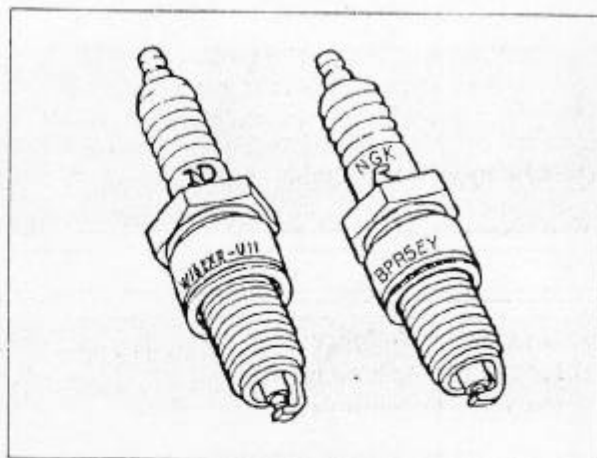


FIG. 1E — 3 IGNITION PLUG

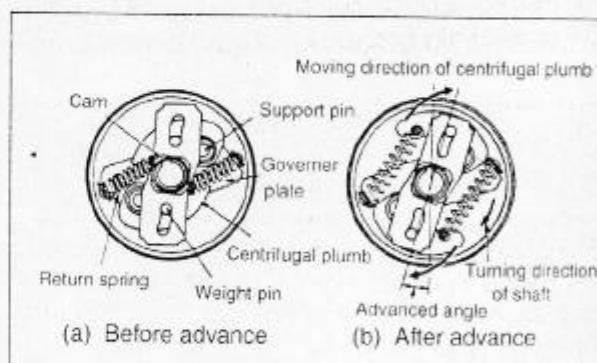


FIG. 1E — 4 OPERATION OF CENTRIFUGAL ADVANCE

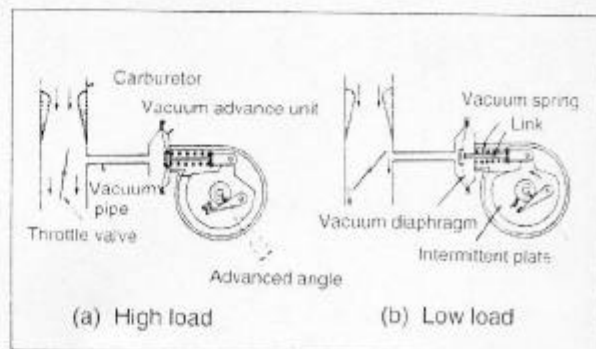


FIG. 1E — 5 OPERATION OF VACUUM ADVANCE

## 2. 2nd High Tensioned Voltage Induction Circuit

Full transistor type of semiconductor ignition is adopted to make intermittent current of the primary current by using of transistor. The built in signal generator in the distributor activates transistor(T.R.) with electrical signals induced by generator. It has no mechanical device, therefore there occurs no more defaults due to points.

### (1) Signal rotor(or generator)

The turning signal rotor in the distributor produces alternating voltage in the pickup coil due to the changing magnetic flux of the magnet. As a ignition signal, this alternating voltage activates T.R ignitor which makes the primary current intermittent.

The ignition signal generating system is composed of signal rotor which is fixed to distributor shaft to turn together, and pickup coil and magnet which is attached to brake plate.

When signal rotor does not turn, there is no change in the magnetic flux to give any change in the pickup coil. When signal rotor turns, pickup coil produces alternating voltage(ignition signal). Consequently as in (A) (B) (C) of Fig 1E — 7, the air gap in the lug of signal rotor changes to make the magnetic flux change in the passage of pickup coil. And the both ends of pickup coil get voltage which is produced according to the changing magnetic flux.

This voltage is generating in the direction against the changing magnetic flux. Because this voltage becomes reverse direction when the lug of signal rotor coming closer to pickup coil(when magnetic flux is increased due to smaller air gap as in Fig. 1E — 7 (A)), and when coming far from pickup coil(when magnetic flux is decreased due to large air gap as in Fig. 1E — 7 (C)). This situation makes alternating voltage.

The more change in magnetic flux and the shorter in changing time, the more voltage in generation. Therefore, when the lug of signal rotor comes to symmetrical position against the center of pickup coil(Fig. 1E — 7 (B)), both magnetic flux and produced voltage are coming to "0", but before or after that ((A), (C)) it become to maximum which is increasing with the increasing engine revolution.

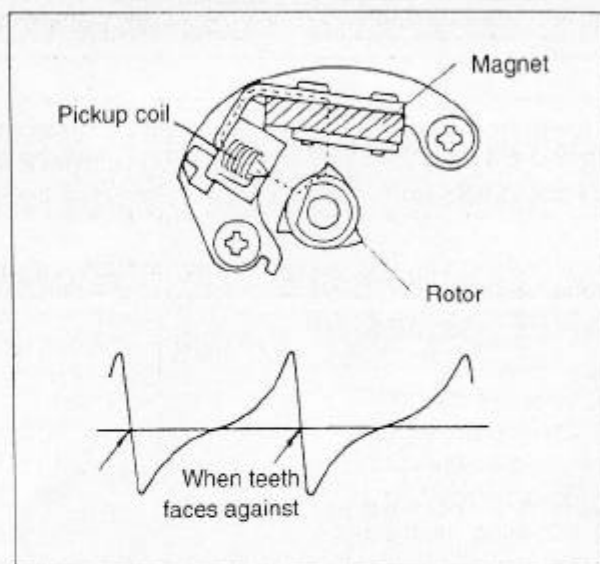


FIG. 1E — 6 SIGNAL ROTOR AND PICKUP COIL

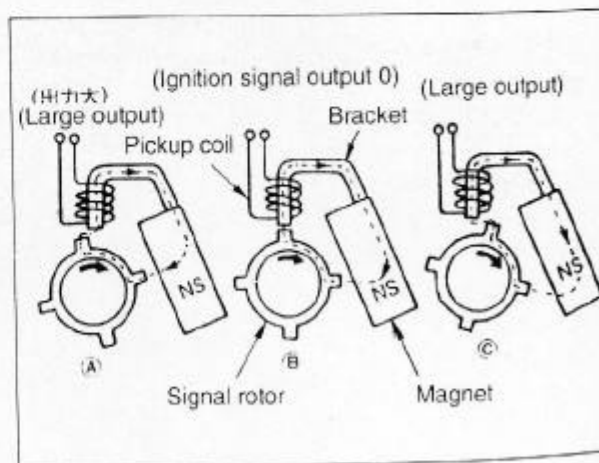


FIG. 1E — 7 IGNITION SIGNAL GENERATING SYSTEM

## (2) Operation of ignition system (principal circuit)

### ① Ignition switch "ON":

When the ignition switch is turned ON, the voltage at the point P of which voltage is divided into  $R_1$  and  $R_2$ , is a little higher than the operational voltage of Tr. Because of this, Tr becomes ON and the primary current flows in it. (For the ignitor, its point P voltage is set lower than the operational voltage not to make the primary current flow in it.)

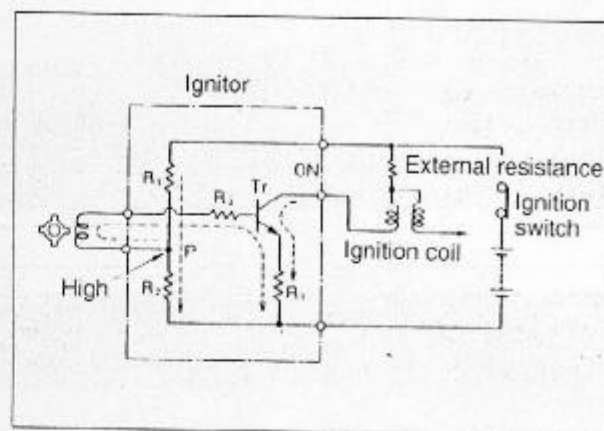


FIG. 1E-8 IGNITION SWITCH "ON"

### ② $\oplus$ voltage is generating in the pickup coil

When the engine is driven to turn the signal rotor of distributor, AC voltage is produced in pickup coil. When the output voltage is generating toward  $\oplus$  direction, point P voltage-pickup coil output voltage is applied to the base of Tr, therefore, the primary current flows in the coil with Tr ON.

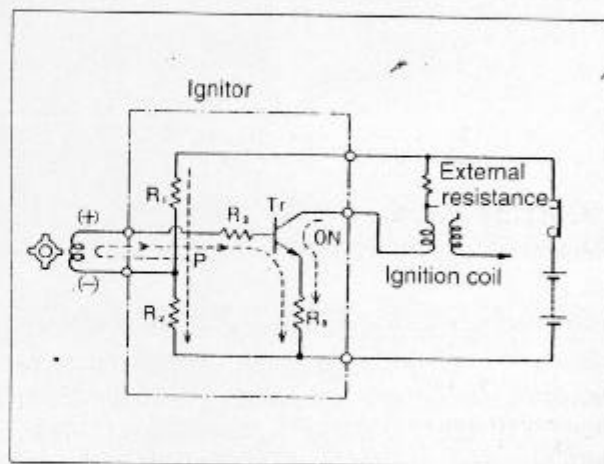


FIG. 1E-9 PICKUP COIL WITH  $\oplus$  VOLTAGE

### ③ $\ominus$ voltage is generating in the pickup coil

Tr is turned OFF due to the lower voltage at point P than the operational voltage of Tr. Because of this, the primary current in the coil is blocked and higher voltage is induced to the secondary. And while the output voltage of pickup coil is being generated toward 2 direction, Tr maintains the OFF state. During the engine is running, above ② and ③ are being repeated to make Tr in ON and OFF alternately. Whenever Tr is in OFF, the secondary high tensioned voltage is generated. In the full transistor type of principal circuit, T.R. is not turned OFF unless the  $\ominus$  voltage over the specified is generated in the pickup coil.

The principal ignition system of full transistor adopts closed angle control method due to the lowering secondary voltage in high speed.

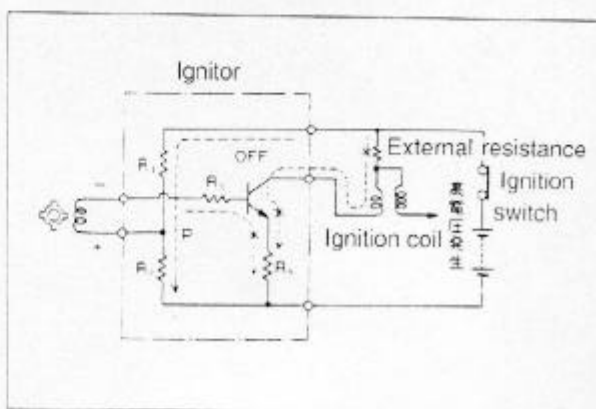


FIG. 1E-10 PICKUP COIL WITH  $\ominus$  VOLTAGE



#### ④ Full transistor ignition system with cam closing angle control.

##### a. Necessity of cam closing angle control

Cam closing angle control is to control the passing period of current (cam closing angle) on the primary circuit. That is, under the low speed, cam closing angle decreases for the limit current, and increases to prevent the lowered primary current as the speed increases. The second voltage on the ignition coil is being lowered as the engine speed increases. Full transistor ignition system with cam closing angle control is adopted to prevent such drop of the second voltage.

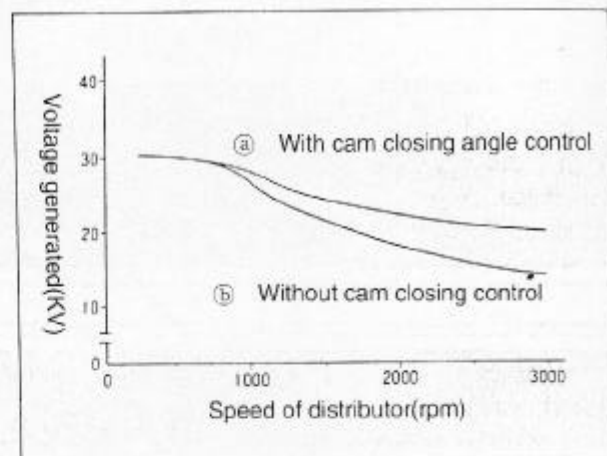


FIG. 1E — 11 COMPARISON OF THE SECONDARY VOLTAGE GENERATED

##### b. Operation of cam closing angle control.

In principle, full transistor ignition system with cam closing angle control is in the same system with that of full T.R. system. However, the primary circuit is not on current when engine stops, because the voltage at the point P is fixed less than the operational voltage of T.R. In this case, the form of signal rotor takes the stiff wave forms in the figure. That is, the increased rotation of distributor brings the increased voltage output of pickup coil, and shorten up the start of T.R. operation. In this case, as the OFF period of T.R. is not changed, the period of ON for T.R. is prolonged (with wide cam closing angle). Taking advantage of the changing wave forms of pickup coil, the cam closing angle is to increase in the high speed driving.

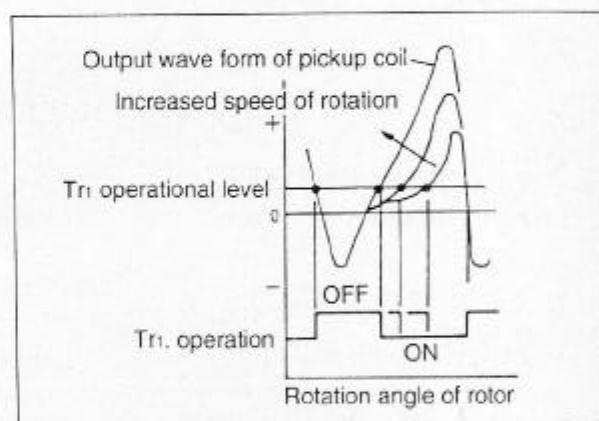


FIG. 1E — 12 THE PRINCIPLE OF CAM CLOSING ANGLE CONTROL

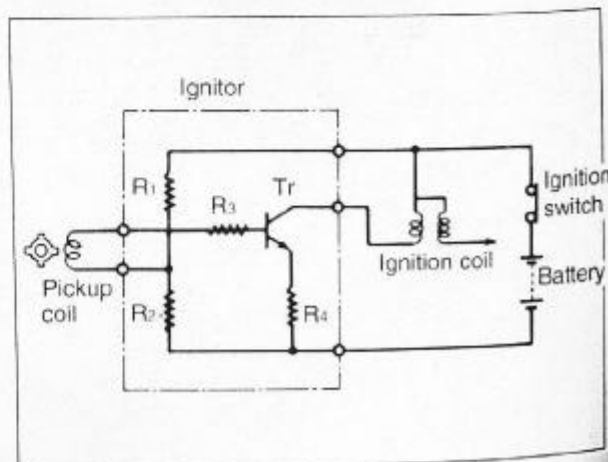


FIG. 1E — 13 BASIC CIRCUIT OF IGNITION SYSTEM WITHIN CAM CLOSING ANGLE CONTROL

## TROUBLESHOOTING

Condition	Probable Cause	Correction
No starting (Engine cranks OK)	<b>No spark</b> <ul style="list-style-type: none"> <li>• Spark plug faulty</li> <li>• Leak from high tension cord</li> <li>• Rotor or cap faulty</li> <li>• Ignitor faulty</li> <li>• Improper air gap of signal rotor</li> <li>• Ignition coil faulty</li> <li>• Poor connection of high tension cord or leads</li> <li>• Fuse faulty</li> <li>• Noise suppressor faulty</li> <li>• Improper ignition timing</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust the gap or replace</li> <li>• Replace</li> <li>• Replace</li> <li>• Replace</li> <li>• Adjust</li> <li>• Replace</li> <li>• Tighten the connection</li> <li>• Replace or Repair</li> <li>• Replace</li> <li>• Adjust</li> </ul>

## ON-CAR SERVICE

## HIGH TENSION CORD

1. Remove high tension cord from spark plug.

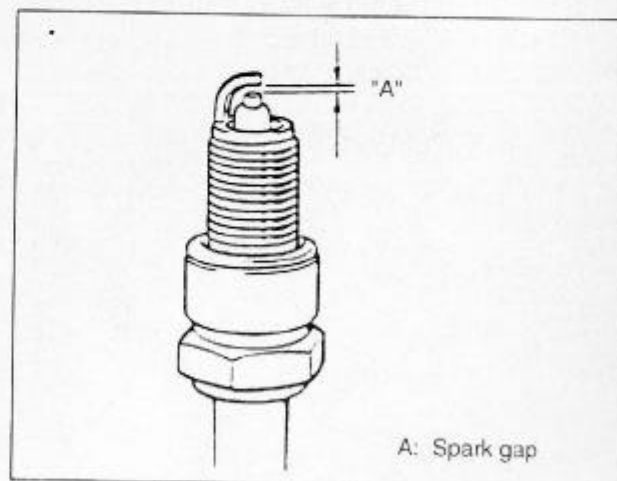
**CAUTION**

Do not pull or bend the cord not to make damage inside the high tension cord.  
When pull or push the cord, work holding rubber boot.

Spark plug

	CHAMPION	Spark gap(mm)
Specification	RNIIYC	0.7 - 0.8

2. Measure the cap and bend to adjust the grounding terminal if the measured valve is not in the specification.



A: Spark gap

FIG. 1E - 14 ADJUSTING SPARK GAP

## IGNITION COIL

Measure the ohmic resistance of each winding for its agreement with the specified limit.

Resistance	Primary winding resistance	1.2 $\Omega$
	Secondary winding resistance	12.1K $\Omega$

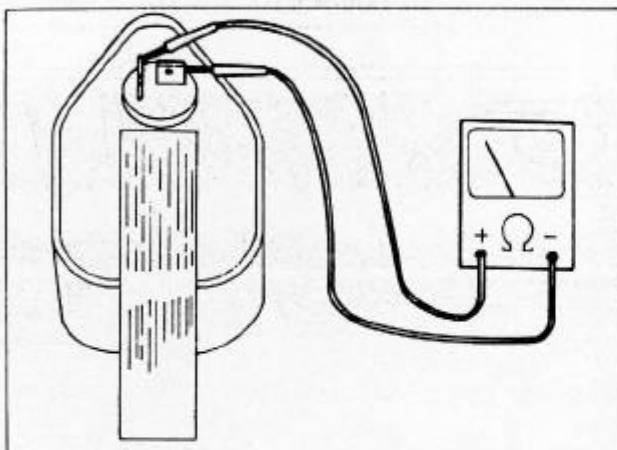


FIG. 1E — 15 CHECKING IGNITION COIL

## DISTRIBUTOR

1. Check the air gap between signal rotor and pickup coil for its specified limit. If the valve exceeds the limit, adjust it.

Air gap (mm)	0.25 — 0.35
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2. Measure the resistance of pickup coil.

Resistance of pickup coil between $\oplus \leftrightarrow \ominus$ ( $\Omega$ )	425 — 505
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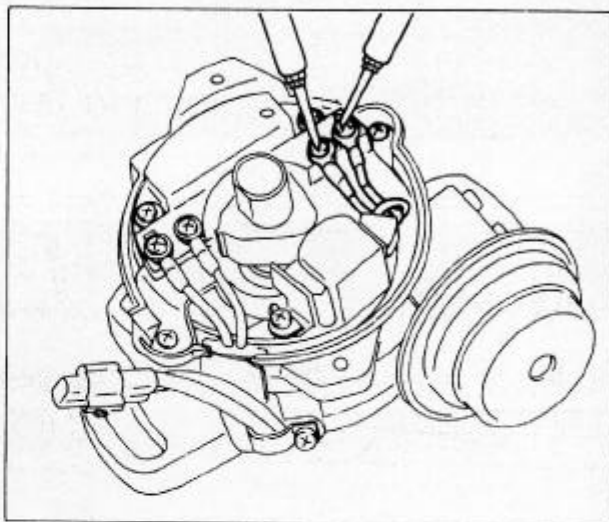


FIG. 1E — 16 CHECKING PICKUP COIL



## IGNITION TIMING

1. Make warming up driving until the cooling fan turns (adjustment should be done when the fan stops).

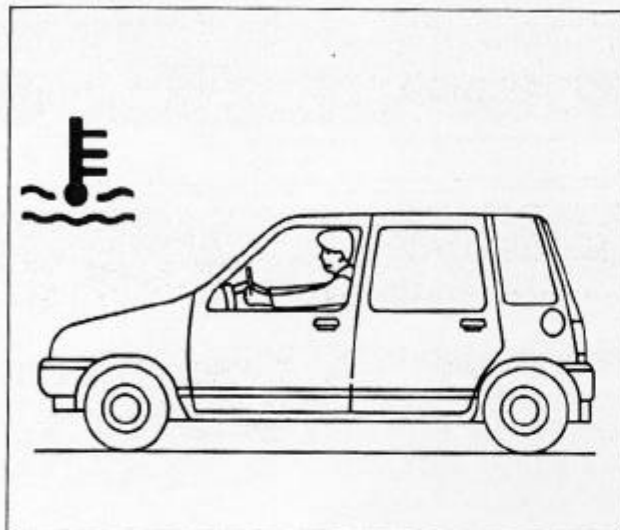


FIG. 1E — 17 WARMING UP DRIVING

2. Check the idling revolution for the specified limit.

Idling revolution(rpm)	$950 \pm 50$
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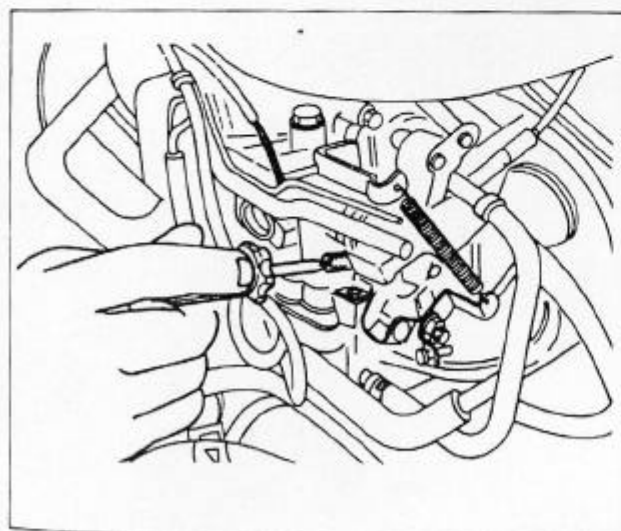


FIG. 1E — 18 ADJUSTING IDLING REVOLUTION

3. Check the ignition timing for the specified limit.

Ignition timing( $^{\circ}$ /rpm)	$8 \pm 1/950$
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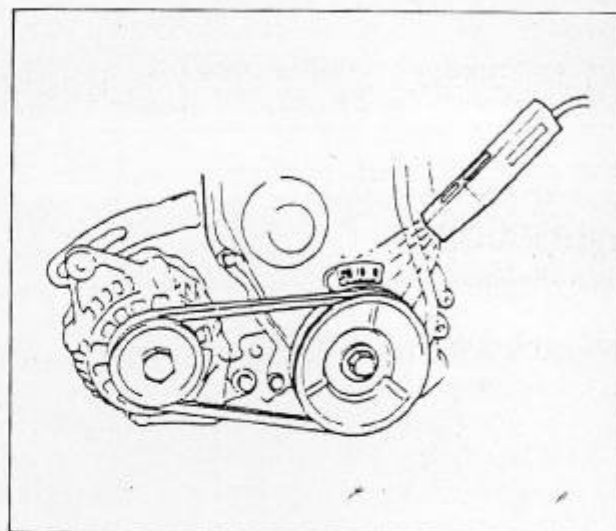


FIG. 1E — 19 ADJUSTING IGNITION TIMING

4. If the value measured exceeds the limit, adjust it to the specified ignition timing by turning the distributor body.