ENGINE ELECTRICAL SYSTEM

86U05X-501

OUTLINE

OUTLINE OF CONSTRUCTION

The engine electrical system is improved as follows:

Ignition System (Turbo Engine)

1. To improve fuel economy, engine performance and driveability, an Electronic Spark Advance (ESA) control system is adopted.
2. Along with adoption of the ESA control system, the structure of the distributor, igniter and ignition coil is changed.

Starting System (Starter)

A coaxial reduction-type starter is adopted to reduce size and weight.

Charging System (Alternator)

The charging rate is sensed directly from the battery instead of through the IC regulator.

A comparison of major parts of the new model and previous model is as follows:

Non-Turbo engine

Item		New model	Previous model	Remarks
Ignition system	Distributor	Construction changed (i.e. location of centrifugal advance mechanism)		Suppresses noise
		Change in spark advance characteristics		For 2.2 liter engine
	Spark plug size	Small	Standard	Weight reduction
Starter	Output	12V-1.4kW	12V-0.85kW	Improved starting
	Type	Coaxial reduction	Conventional	Smaller and lighter
Alternator	Charged voltage sensing type	Battery voltage sensing	IC regulator internal sensing	To sense real battery voltage
	Terminals	Ⓑ, Ⓛ and Ⓢ	Ⓑ, Ⓛ and Ⓡ	Due to change of voltage sensing

Turbo engine

Item		New model	Previous model	Remarks
Ignition system	System	ESA (Electronic Spark Advance)	Conventional	Improved economy and power
	Ignition coil type	Molded	Conventional	Lighter and more reliable
	Distributor	With G and Ne rotor	Without Ne rotor	Due to adoption of ESA
	Igniter	Function changed		
	Spark plug size	Small	Standard	Weight reduction
Starter	Output	12V-1.4kW	12V-0.85kW	Improved starting
	Type	Coaxial reduction	Conventional	Smaller and lighter
Alternator	Charged voltage sensing type	Battery voltage sensing	IC regulator internal sensing	To sense real battery voltage
	Terminals	Ⓑ, Ⓛ and Ⓢ	Ⓑ, Ⓛ and Ⓡ	Due to change of voltage sensing

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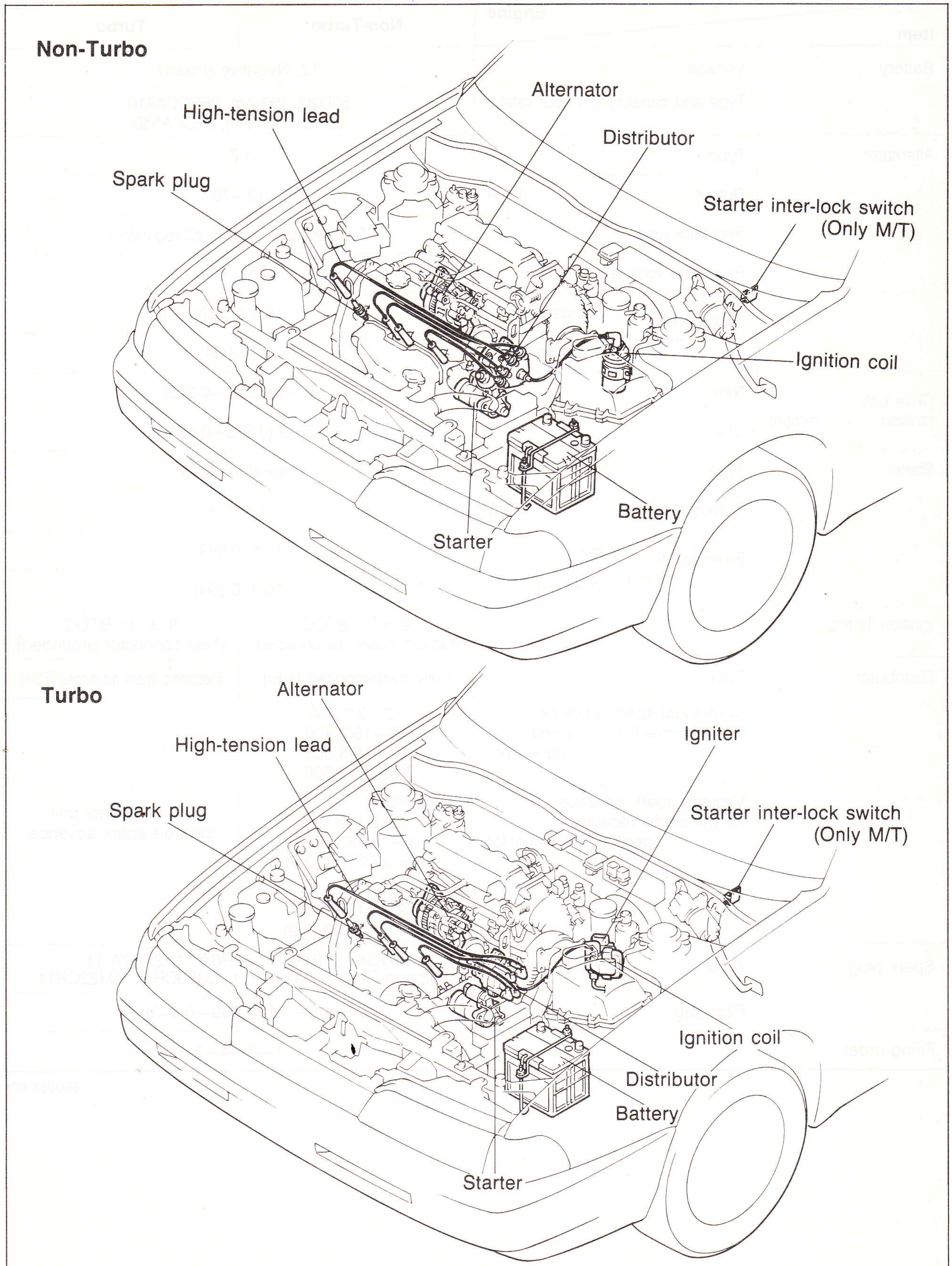
STRUCTURAL VIEW



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SPECIFICATIONS

Item			Non-Turbo	Turbo
Battery	Voltage V		12, Negative ground	
	Type and capacity (20 hour rate)		50D20L (50 Ah), 26RCCA410 55D23L (60 Ah), 85CCA550	
Alternator	Type		A.C.	
	Output V—A		12—70	
	Regulator type		Transistorized (built-in IC regulator)	
	Regulated voltage V		14.1—14.7	
	Brush length mm (in)	Standard	16.5 (0.650)	
		Minimum	8 (0.315)	
Drive belt tension mm(in)	New		6—8 (0.236—0.315)	
	Used		7—9 (0.276—0.354)	
Starter	Type		Coaxial reduction	
	Output V-kW		12—1.4	
	Brush length mm (in)	Standard	17.5 (0.689)	
		Minimum	10.0 (0.394)	
Ignition Timing			6 ± 1° BTDC (Vacuum hoses disconnected)	9 ± 1° BTDC (Test connector grounded)
Distributor	Type		Fully transistorized (HEI)	Electronic spark advanced (ESA)
	Centrifugal spark advance (Crank angle/Engine speed) degree/rpm		−2—2/1,200 12—16/2,400 12—16/3,500 16—20/4,500	Engine control unit controls spark advance
	Vacuum spark advance (Crank angle/Vacuum) degree/mmHg (inHg)		[A chamber] −2—2/110 (4.3) 8—12/193 (7.6) 18—22/275 (10.8) [B chamber] −2—2/110 (4.3) −8 — −4/200 (7.9)	
Spark plug	Type		NGK: ZFR5A-11, ZFR6A-11, ZFR7A-11 Nippon Denso: QJ16CR11, QJ20CR11, QJ22CR11	
	Plug gap mm (in)		1.0—1.1 (0.039—0.043)	
Firing order			1—3—4—2	

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IGNITION SYSTEM (TURBO ENGINE)

The ignition system has been changed to improve fuel economy and increase output power. Ignition spark advance control is changed from vacuum/centrifugal, to electronic spark advance controlled by the control unit.

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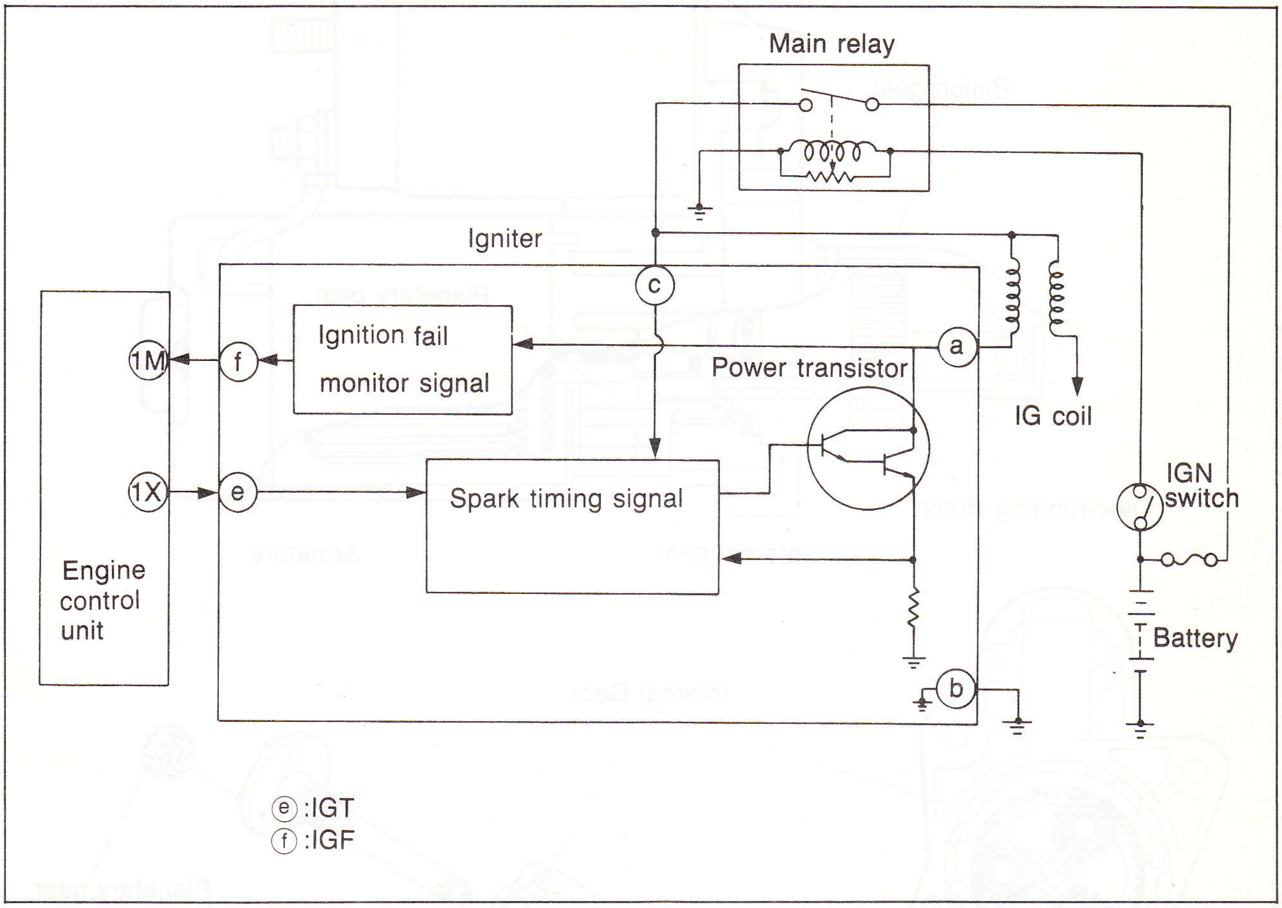

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IGNITER

The operation of the igniter is described below. Refer to page 4—69 for details of the control unit operation.

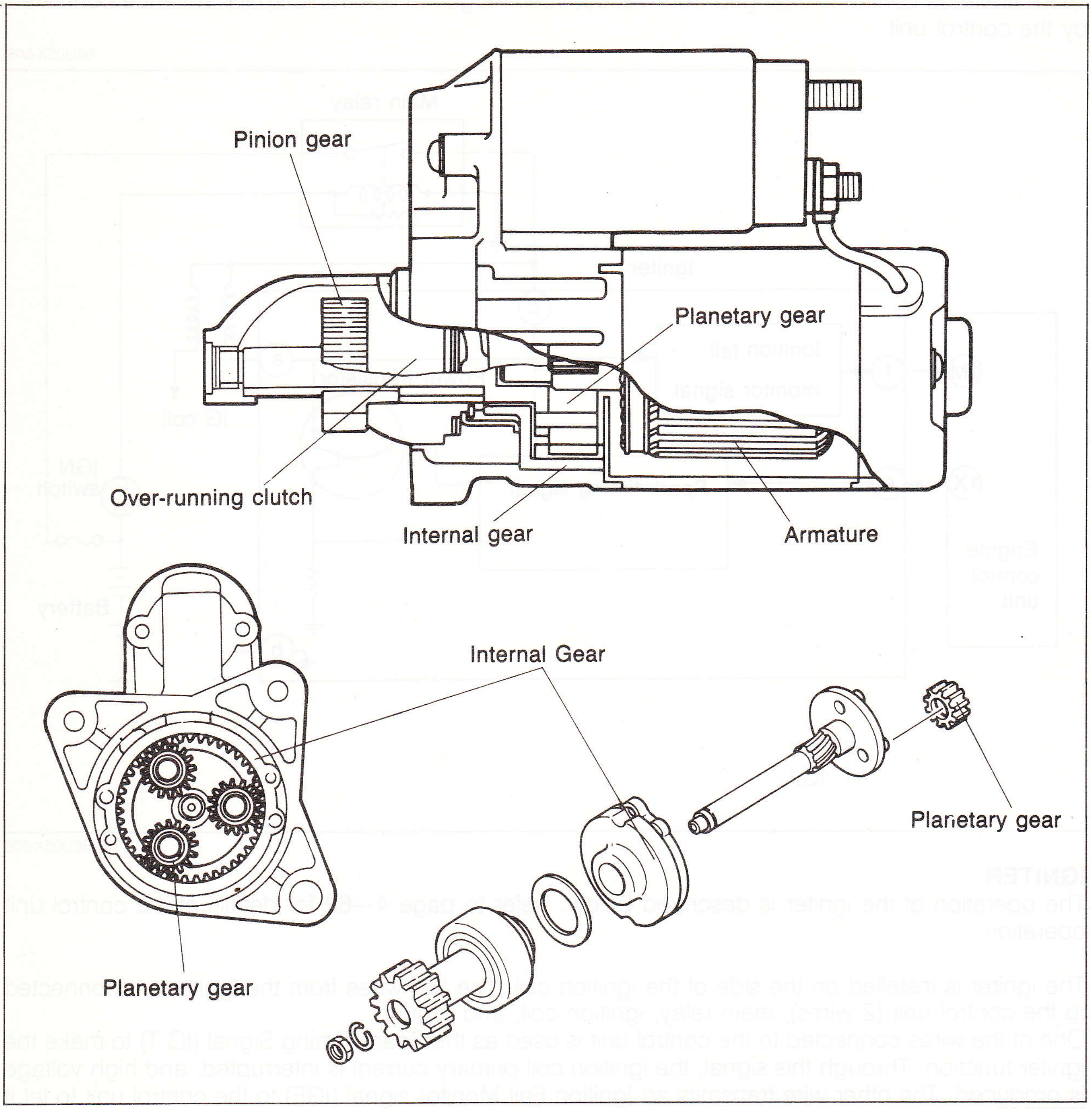
The igniter is installed on the side of the ignition coil. The five wires from the igniter are connected to the control unit (2 wires), main relay, ignition coil, and ground.
One of the wires connected to the control unit is used as the Spark Timing Signal (IG T) to make the igniter function. Through this signal, the ignition coil primary current is interrupted, and high voltage is produced. The other wire transmits an Ignition Fail Monitor signal (IGF) to the control unit to let it know that ignition is taking place normally, so that it can survey the ignition's condition.
The igniter consists of the power transistor and drive circuit.

Operation

1. When an ignition signal (IG T) is sent to the igniter from the control unit, a signal to turn OFF the power transistor is produced in the igniter body.
2. When the power transistor is turned OFF, current to the ignition coil's primary coil is cut and electromotive force is produced.
3. High voltage is produced in the secondary coil and is transmitted to the distributor cap via the high-tension lead, where it is distributed to each cylinder by the distributor rotor.
4. The ignition fail monitor signal (IGF) detects the electromotive force produced in the primary coil and is sent in the form of a wave to the control unit.

STARTING SYSTEM

STARTER



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The starter has been made smaller in size and lighter in weight by the use of a planetary gear and internal gear.

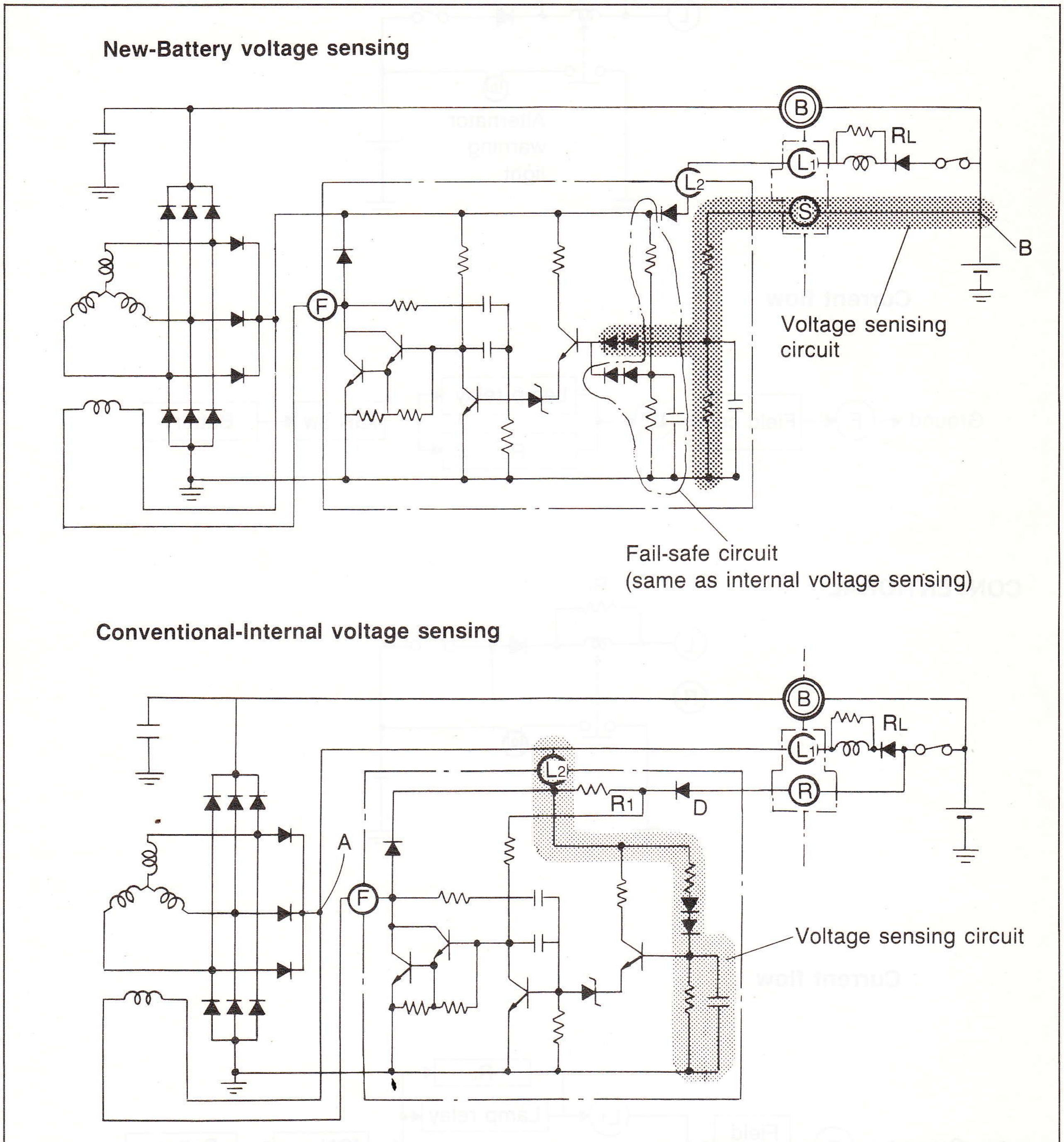
Operation

The armature speed is reduced to approximately 1/5th by the planetary gear and internal gear. This reduction is output to the pinion gear.

CHARGING SYSTEM

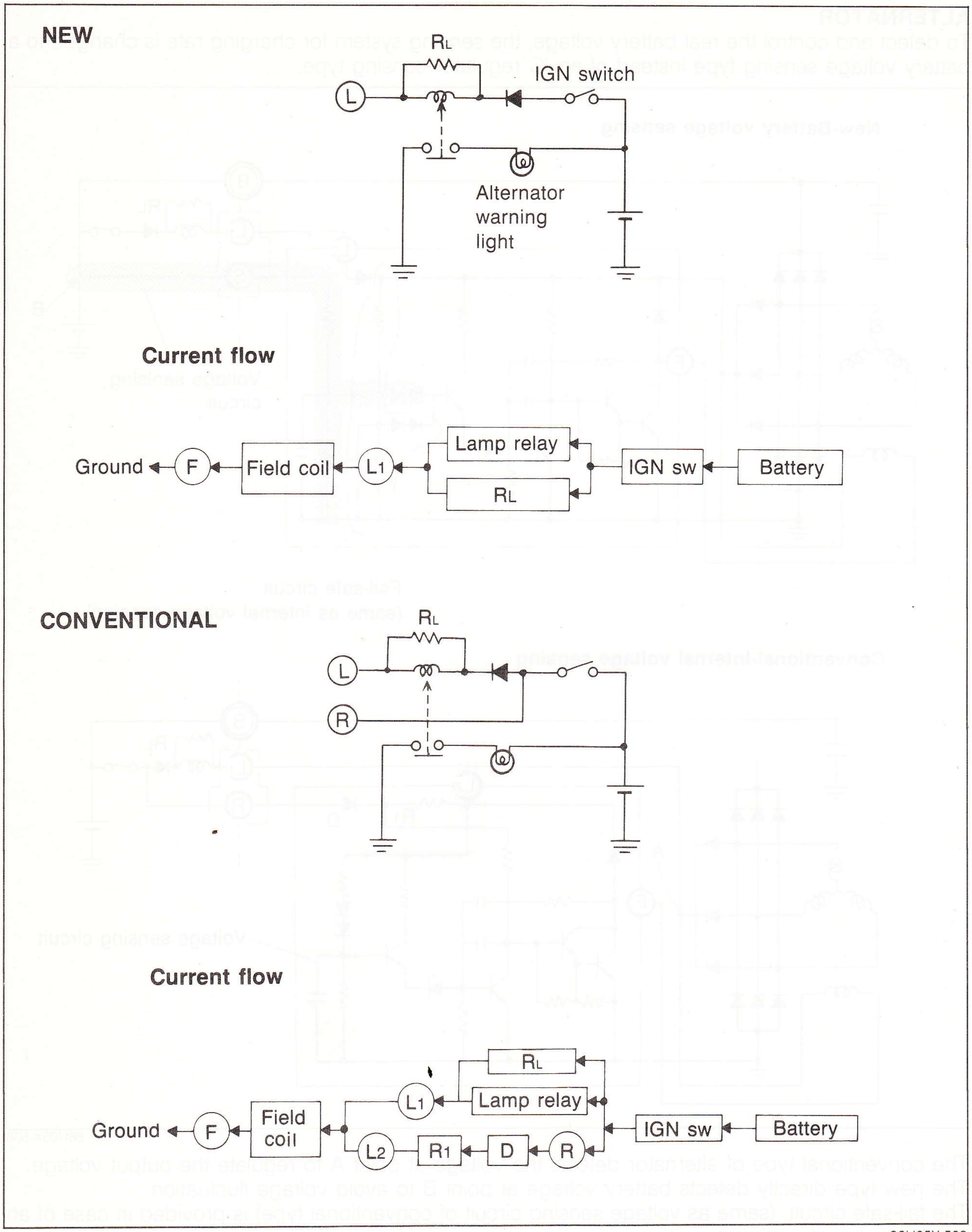
ALTERNATOR

To detect and control the real battery voltage, the sensing system for charging rate is changed to a battery voltage sensing type instead of an IC regulator sensing type.



The conventional type of alternator detects the voltage at point A to regulate the output voltage.
The new type directly detects battery voltage at point B to avoid voltage fluctuation.
The fail-safe circuit, (same as voltage sensing circuit of conventional type) is provided in case of an open circuit in the other circuit.

Difference Between New and Conventional Type



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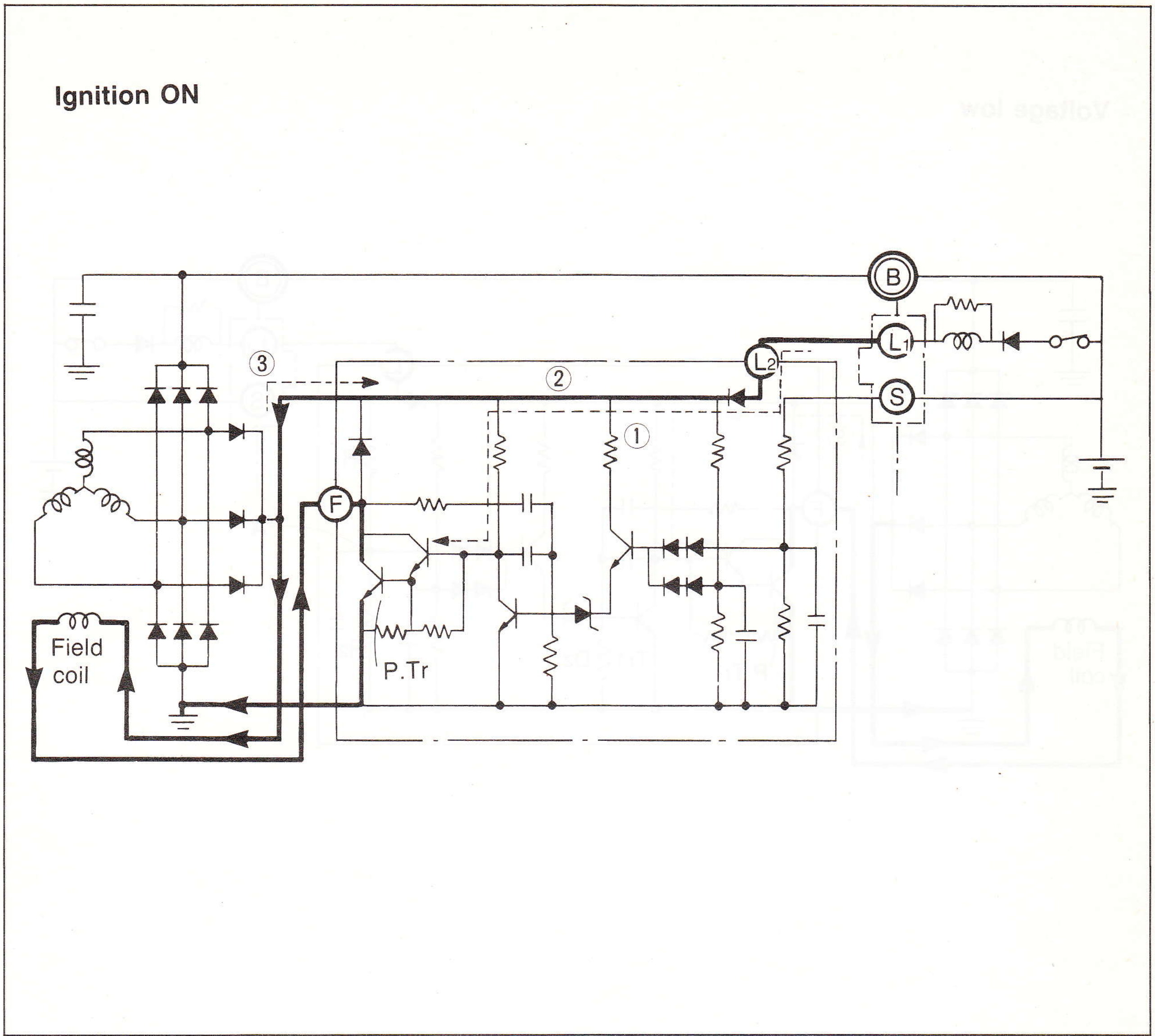
On conventional type, two lines (R and L) are used to supply the field current. The new type has only one (L). Thus, resistance of the RL circuit is reduced.



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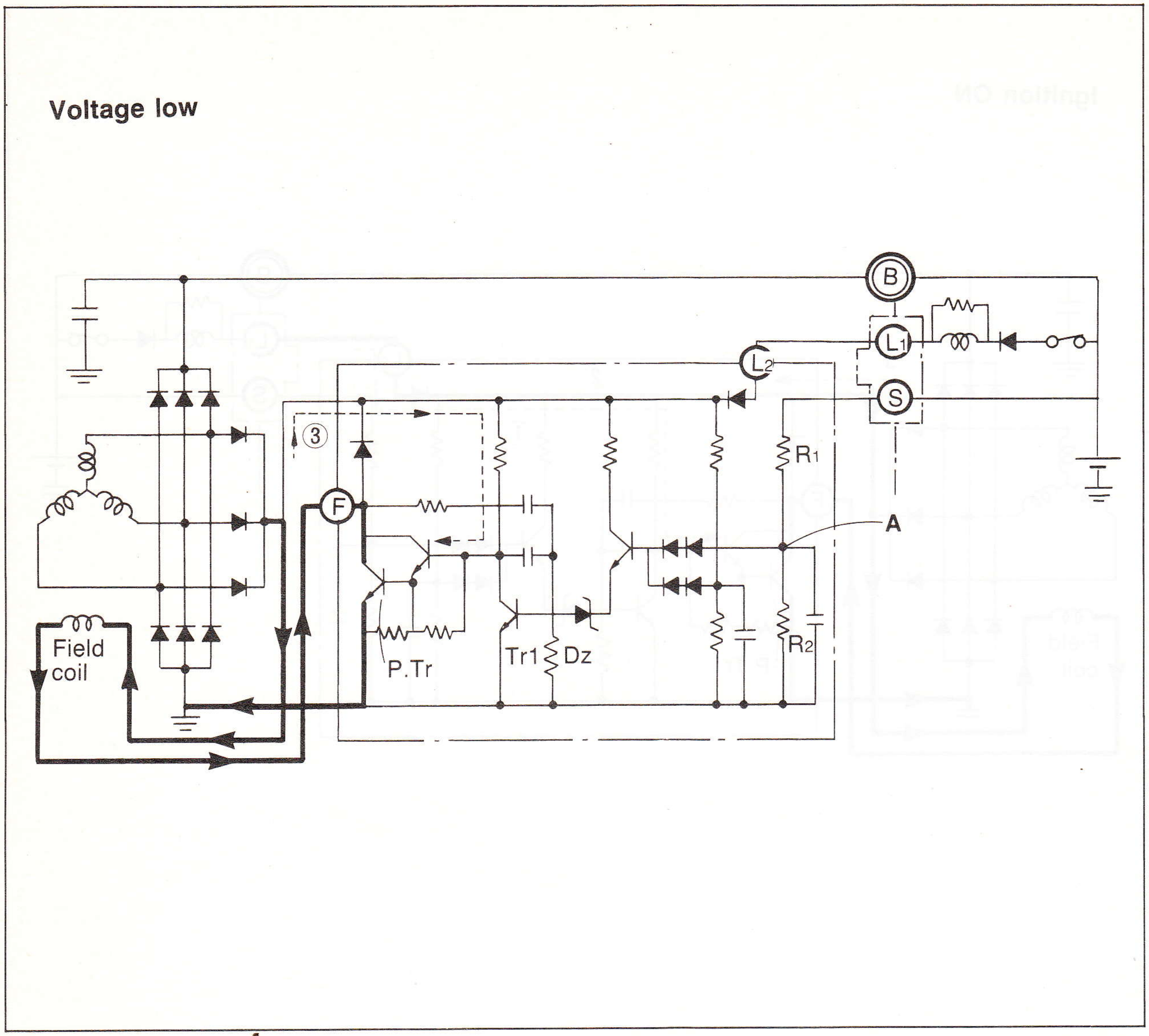
Operation

Ignition ON

(1) When the ignition switch is ON, current ① flows from Ⓛ, turning the P.Tr ON, and causing current ② to flow through the field coil and magnetize it. The charge lamp lights up.

(2) When the engine starts, and voltage begins to be generated, current ③ flows, causing the lamp to go out.
Current needed by the field coil is provided by the trio-diodes.



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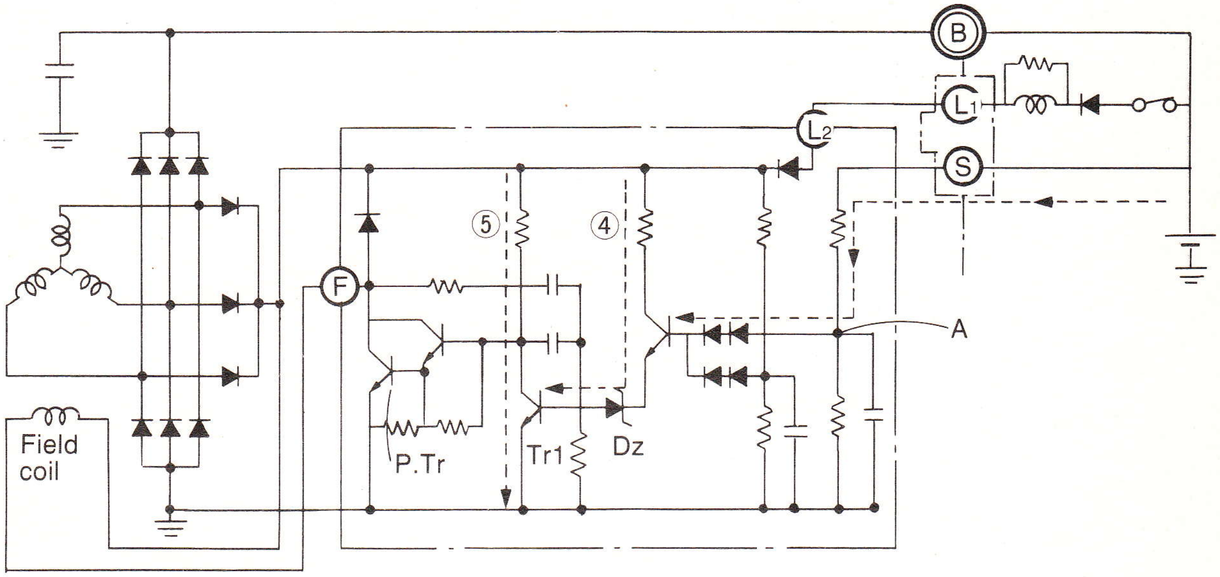
Voltage low

When generated voltage is lower than the specified voltage (14.1—14.7V), voltage at point A divided by R_1 and R_2 is not high enough for the current to pass through zener diode D_Z, and the Tr1 remains OFF.

Thus the P.Tr remains ON allowing current ③ to pass through the P.Tr, causing current to flow in the field coil. This increases terminal B voltage.

Voltage high



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Voltage high

When generated voltage is higher than the specified voltage (14.1—14.7V), voltage at point A becomes high enough for current ④ to pass through Dz, causing Tr1 to come ON and current ⑤ begins to flow. Thus current to the field coil does not flow because P.Tr is OFF, and voltage is not generated.

Through these steps, the output voltage is regulated to 14.1—14.7V.