F.D REGULATOR WITH LEAD WIRE TYPE SPECIFICATION

	Mark of Wire	Color of Wire
L	(Lamp)	Red Stripe on the White
B	(Battery)	White
N	(Neutral)	Yellow
IG	(Ignition)	White Stripe on the Black
F	(Field)	Black Stripe on the White
E	(Ground)	Black
C	(Condenser)	Blue
CH	(Choke)	Brown
S	(Battery or Safety Switch)	Red Stripe on the Black or Blue Stripe on the White

1 Above Mark of Wire does not appear on the Goods.
2 Some of these Regulator , Even if above all Number of Wire are not arranged structurally , will not be faulty.

HOW TO FIND A CAUSE OF TROUBLES ON F.D BUILT IN TYPE IC/TR REGULATOR

1 Charging shall not be made at all.
(1) Disconnection, faulty insulation or short circuit of rotor coil or stator coil.
(2) Diode defect.
(3) Faulty contact of brushes.
(4) Faulty insulation of terminal.
(5) Disconnection (especially melting of fuse) between IG switch and regulator.
(6) Condenser defect.
(7) Regulator defect.

2 Shortage of Charging.
(1) Layer short of rotor coil or stator coil.
(2) Mono-phasic disconnection of stator coil.
(3) Diode defect
(4) Fouling of slip ring.
(5) Faulty contact of brushes.
(6) Looseness of V-belt.
(7) Faulty ground of alternator.
(8) Capacity shortage caused by overload. For example, excessive load of additional equipment such as accessories and optional parts.
(9) Shortage of charging caused by driving condition. When a car is driven several times of a congeste road in night time or the car is started frequently due to short distance running, the battery may be weak.

3 Overcharging.
(1) Concerning regulator with S-terminal, disconnection or faulty contact between S terminal and battery.
(2) Regulator defect.

4 Unstable Charge Voltage.
(1) Faulty contact of IG switch
(2) Looseness of fastening parts concerning each component part.
(3) Faulty wire contact of each part.
(4) Fouling of slip ring.
(5) Faulty contact of brushes.

5 Charge lamp is lightened weakly while the car is running.
(1) Diode defect.
(2) Concerning 3-diode magnetized type alternator, diode trio defect.
(3) Faulty contact of IG switch's point.

6 Charge lamp does not light by turning of IG switch when the engine stops.
(1) Disconnection of a charge lamp.
(2) Concerning alternator using P-terminal or N-terminal, short circuit of positive diode
(3) Disconnection of wire (especially melting of fuse) from IG switch to L-terminal of regulator by way of a charge lamp.

7 Charge lamp lights when idling.
(1) Wiring resistance is too high from IG switch to L-terminal of regulator by way of a charge lamp.
(2) Decrease of idling revolution.

HOW-TO-FIND A CAUSE OF TROUBLES ON F.D AC VOLTAGE REGULATOR (MECHANICAL TYPE)

[A] WHEN IT DOES NOT CHARGE AT ALL

1 If alternator is defective.
  (a) Disconnection or short-circuit of stator coil.
  (b) Disconnection or short-circuit of rotor coil.
  (c) Poor contact of brush.
  (d) Disconnection of diode.

2 High speed side point of regulator is being welded.

3 Others.
  (a) Disconnection or short-circuit of wiring cord.
  (b) Mis-combination of regulator and alternator.

[B] WHEN IT CHARGES INSUFFICIENTLY OR UNSTABLY.

1 If alternator is defective.
  (a) Excessive clearance between rotor and stator.
  (b) Poor contact of brush.
  (c) Diode is defective.

2 If regulator is defective.
  (a) Regulated voltage is lowering.
  (b) Low speed side point of regulator has poor contact.
  (c) Improper ground.
  (d) Poor contact of connector plug.

3 If battery is defective.
  (a) Battery is wasting away.
  (b) Binding of terminals is loosening.
  (c) Poor contact due to corrosion.

4 If wiring is defective.
  (a) Resistance has raised due to loose connection of cord or too thin cord.
  (b) Short-circuit or leakage of cord.

5 Others.
  (a) Slackness of fan belt.
  (b) Over Load.

[C] WHEN IT OVER CHARGES.

1 If alternator is defective.
  (a) Improper connection of lead wire of stator coil.
  (b) Bad insulation of diode.

2 Battery is wasting away. (Attenuate electrolyte, or short between plates)

3 If regulator is defective.
  (a) Regulated voltage is much too high.
  (b) Improper ground.
  (c) Low speed side point is being welded.
  (d) Poor contact of high speed point.
  (e) Poor contact of charge lamp (field) relay point.
  (f) Disconnection of voltage relay coil.

4 Short-circuit or leakage of wiring cords.

[D] TROUBLES ON CHARGE LAMP.

1 If lamp wouldn't go off.
- (a) Lowering of adjusted voltage of regulator.
- (b) It is not charging (ref. [A])
- (c) Disconnection of charge lamp (field) relay coil.
- (d) Improper connection of neutral wiring cord, or its disconnection.

2 If lamp is not to go off completely, or is being on dimly.
- (a) Poor contact of ignition switch, or looseness of terminal connection.
- (b) Poor contact of circuit fuse holder of ignition switch

3 If lamp wouldn't go on.
- (a) Disconnection of charge lamp.
- (b) Disconnection of fuse in ignition switch circuit.
- (c) Poor contact of charge lamp (field) relay point.
- (d) Improper ground.

4 If lamp is glimmering or unstable.
- (a) Poor contact between charge lamp and connecting cord, or charge lamp and circuit fuse.
- (b) Unstable of adjusted voltage of regulator.
- (c) Improper ground.

5 If lamp goes on when it is being off.
- (a) lowering of adjusted voltage of regulator.
- (b) Alternator is defective, or improper connection of neutral wiring cord.
- (c) Disconnection by over-charge of charge lamp (field) relay coil due to (1) loose connection or disconnection of B terminal, or (2) wearing diode of alternator.

[E] TROUBLES ON REGULATOR.

1 If Voltage is abnormally high.
- (a) Battery connecting cord is not being connected to alternator B terminal.
- (b) Due to adhesion of iron powder or other deposits, armature plate of regulator doesn't work properly.

2 If point arc is seen abnormally often.
- (a) Disconnection of regulator.
- (b) Position of connector terminal is wrong.

3 If charge lamp doesn't go on and no voltage is raised.
- (a) Spring of charge lamp (field) relay has been transformed by some hard shock like falling.

4 If voltage is higher than standard level.
- (a) Cover is being taken off.

5 If voltage is lower than standard level.
- (a) State of load is close to the rated ampere.
  Poor contact of battery terminal. (when measured at battery terminal.)
  Or voltage has dropped due to improper connection between alternator B terminal and battery cord.

6 If charge lamp (field) coil burnt out.
- (a) Voltage from neutral became abnormally high.
  Because charge lamp (field) relay has lost function due to (1) looseness or disconnection of B terminal, or (2) wearing diode of alternator.

FAILURE OF CHARGE EQUIPMENT

Failure of charge equipment is divided roughly into overcharge of battery and non charge(including insufficient charge) of battery as a phenomenon. In overcharge, a cause of the failure is almost in alternator and/or IC voltage regulator. On the other hand, in non charge, a cause can consider the slack of a fan belt, the defect of battery, the defect of the external wiring system of alternator, etc. in addition to alternator and the regulator itself. Hereafter, the phenomenon and cause of fault are explained.

[Note] Be sure to carry out check whether there is neither disconnection nor poor contact in connector or wire harness of alternator before removing the alternator from a vehicle. If cause is in connector or harness, since fault part of it may return to normal after removal of alternator without above check, cause of fault can not be detected.

【1】 Cause of Overcharge

1) IC Regulator's Short-circuit

2) Looseness of Screw fixing B-terminal of Alternator
During rotation of alternator, in case the screw fixing the output terminal 'B' loosens, poor connection occurs, and then the load current which was flowing is intercepted, the high voltage occurs transiently at the B-terminal and is applied into IC regulator.
With the rises of the voltage, the internal temperature of regulator also rises, and then power transistor is opened(disconnection state) and charge of battery will be stopped.
[Note] Above mentioned is the same also in a bench test. While alternator rotates, be sure by all means not to remove the wire by which load current is flowing from terminal 'B'.

3) Disconnected S-terminal of Regulator
In case of alternator with S-terminal, if disconnection of wiring between S-terminal and battery occurs, voltage will become about 1.0volt higher than the usual voltage.
If keep this state intact, the battery will become with some overcharge.

4) Loose Contact between Alternator and Regulator
The screws which have attached regulator in alternator serve as electrodes to connect each other. If a screw loosens by long term use or poor connection at the screw occurs due to invasion of oil, normal voltage adjustment will not be performed.
If especially grounding of regulator is imperfect, contact resistance becomes bigger, and voltage will rise and it will become the cause of overcharge of battery.

【2】 Cause of Non Charge(Insufficient Charge)

1) Alternator
- Layer short-circuit of stator coil and bad insulation between stator coil and core.
- Defective soldering of connection point between lead wire of stator coil and rectifier.
- Imperfect connection between slip ring and worn carbon brush.
- Short-circuit or open(disconnection) of rectifying diode. Refer to Test Method of Diode.
- Layer short-circuit or disconnection of rotor coil, and bad insulation between cores.
- Slack of fan belt.
- Consumption electric power exceeds capacity of alternator by equipments or accessories installed additionally.

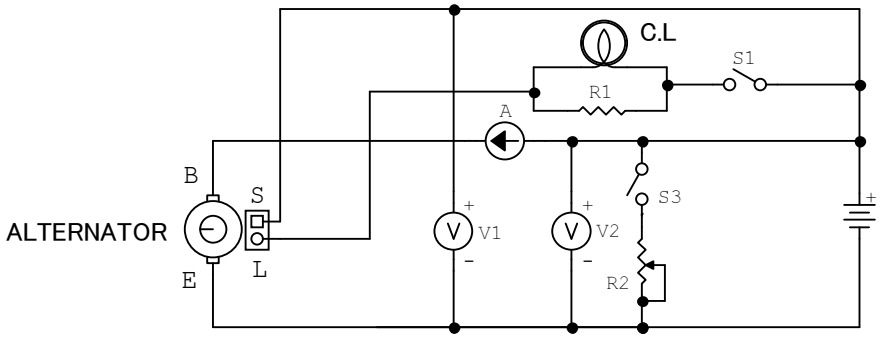
2) Imperfect Wiring
- Disconnection or imperfect contact of wiring between key switch and IG terminal of alternator with IG terminal.
- Disconnection or imperfect contact of wiring between key switch and L terminal of alternator with trio diodes.
- Disconnection or imperfect contact of wiring between key switch and R terminal of alternator with R terminal.
- Melting of fuse in IG circuit or imperfect contact between fuse and fuse holder

3) Battery
- Improper level of Battery electrolyte or lower specific gravity.
- Imperfect tightening screws of + and − terminals or imperfect connection due to corrosion.

4) IC Regulator
- Open(disconnection) of power transistor in IC regulator.
- Imperfect tightening screws used for installation of IC regulator in alternator.

BENCH TEST AFTER INSTALLATION OF IC REGULATOR INTO ALTERNATOR

Check the characteristics of IC regulator by the bench test (the following test method), after the regulator is installed into the alternator.



【1】Connect the alternator (with regulator), load resistance and the battery as shown in the above figure.
Note) The above wiring diagram of test is for reference, since the lighting system of change lamp and terminal name of connector for alternator vary with each maker. However, the test method is the same.

【2】Confirm that the charge lamp C.L is lighted when IG switch S1 is turned on, then raise the rotating speed of the alternator gradually. If the rotating speed is 1200RPM or less when charge lamp C .L goes off, the initial voltage characteristic is OK.
Note) There two types of the initially exciting resistance, of built-in type and outer installation type (as shown in above figure) which are different from maker and/or car model.
In case of outer installation type, since rise of rotating speed to be reached rated voltage varies with the resistance value, be sure in test to use the same value as resistor used in the car.

【3】Raise the speed of alternator up to 5000rpm and set the load current by 10A, and then measure the regulated voltage V1 between S-terminal and E(ground) in case of alternator with S-terminal, or between L-terminal and E(ground) in case of alternator with trio-diode and without S-terminal. The standard value of the regulated voltage is different from the products. If the voltage is within the value shown in this catalog, the regulated voltage is OK.

【4】Raise rotating speed of alternator up to rated speed (5000～6000rpm: varies with car maker), and turn on load switch S3. Then adjust load resistance to be able to get 13.5±0.1V (12V car) at voltage V2 of output terminal (in case of 24V car : 27.0±0.2V).
If current at Ammeter A is more than rated current of alternator when voltage V2 reaches above voltage, load characteristic is OK.
Note) The measurement of rated current for short time is recommendable since output current goes down when the temperature of alternator goes up.

【5】Accelerate the rotating speed of the alternator from 1200 to 8000 rpm rapidly, and confirm whether there is layer short-circuit in rotor coil due to the deflection to be occurred by centrifugal force.