Alternators & Regulators

HITACHI ALTERNATORS

Datsun/Nissan, Isuzu, LUV, Subaru

DESCRIPTION

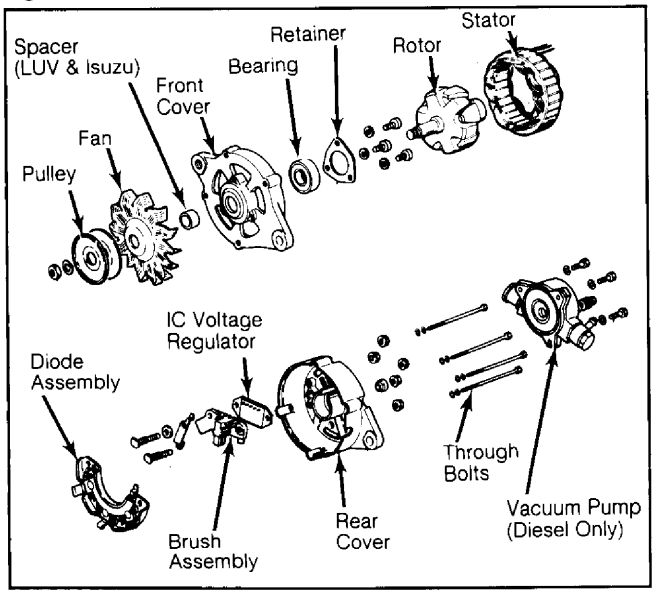
Hitachi alternators are conventional 3-phase, self-rectifying type alternators. Six diodes (3 positive and 3 negative) are used to rectify current.

All models are equipped with integral-type IC regulators, except Isuzu and LUV models equipped with gasoline engines. Isuzu and LUV models with diesel engines have IC regulators.

APPLICATION

Model	Hitachi No.
Datsun/Nissan	
200SX	LR160-78B
210	LR150-99B
280ZX	LR160-82B
310	LR150-125B
Maxima	
Gasoline	LR160-82B
Diesel	LR160-97B
Pickup	
Gasoline	
Standard	LR150-98B
Heavy Duty	LR160-78, LR160-78B
Diesel	LR160-97B
Sentra	LR150-125B
Stanza	LR160-104
Isuzu	
Gasoline	
2-WD	LT150-144
4-WD	LT150-131B
Diesel	LR150-78
LUV	
Gasoline	
2-WD	LT150-144
4-WD	LT150-131B
Diesel	LR150-78
Subaru	1LR155-1

Fig. 1: Disassembled View of Typical Hitachi Alternator



Datsun/Nissan Pickup alternator is illustrated.

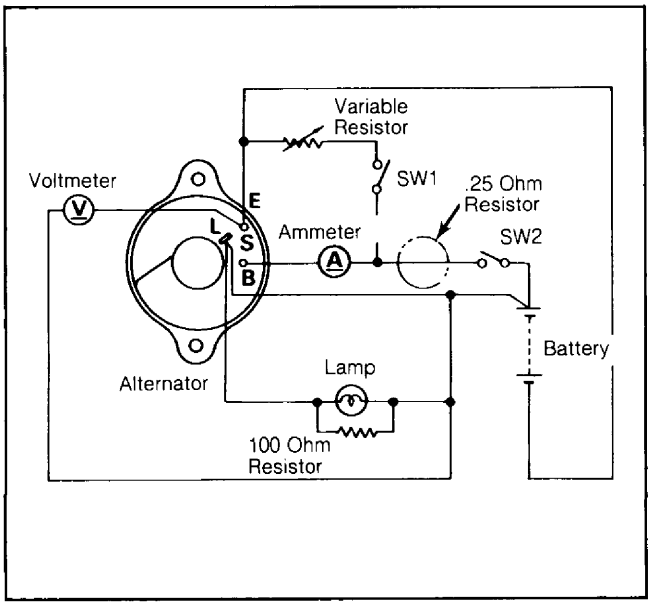
ON-VEHICLE TESTING

NOTE: Some testing is described as part of Overhaul procedure. The following testing is performed with alternator on the vehicle.

NO LOAD TEST

1) Connect a voltmeter, ammeter and battery leads to alternator as shown in *Figs. 2 and 3.* Open switch "SW1" and close switch "SW2". Gradually raise alternator speed, and read speed when voltage os 13.5 volts.

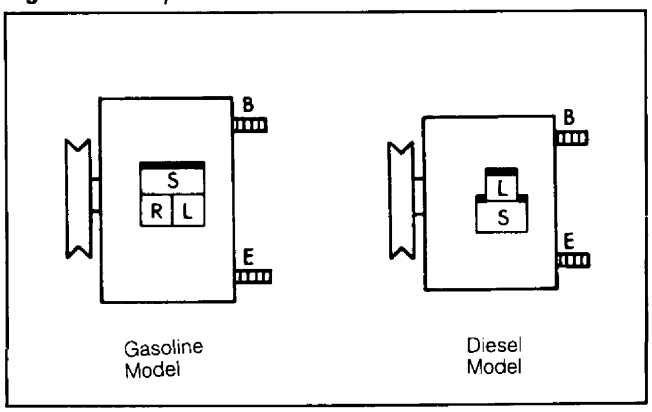
Fig. 2: Subaru Alternator Test Connections



Datsun/Nissan meter hookup is similar.

2) Alternator is working properly if it turns at less than 900 RPM on Subaru and Datsun 310 and Sentra models; less than 1000 RPM on Isuzu, LUV and all other Datsun models.

Fig. 3: Datsun/Nissan Alternator Terminal Identification



Terminals "S", "L", "BAT" and "E" are marked on rear cover.

REGULATED VOLTAGE TEST

Open switch "SW1" and close "SW2". *See Fig.* 2. Turn alternator at 5000 RPM. The IC regulator is normal if voltage is within range shown in Regulated Voltage Specifications table.

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REGULATED VOLTAGE SPECIFICATIONS [1]

Application	[2] Volts
Datsun/Nissan	14.4-15.0
Isuzu & LUV	
Gasoline Models	13.8-14.8
Diesel Models	14.5-16.6
Subaru	14.2-14.8

[1] — At 68°F (20°C).
[2] — With fully-charged battery.

OUTPUT TEST

1) Set variable resistor to minimum resistance position. *See Fig. 2.* Close switches "SW1" and "SW2" in order to turn alternator.

2) Keep voltage constant while raising alternator speed by adjusting variable resistor. Measure alternator output current at 2500 and 5000 alternator RPM. See Output Specifications table.

OUTPUT SPECIFICATIONS

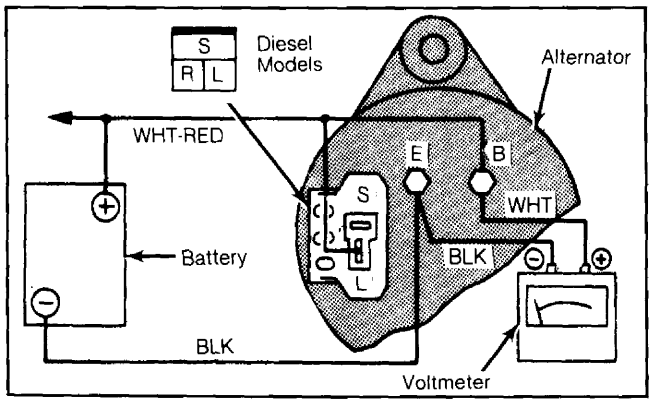
Alternator	Alternator Output [1] Amps@ 2500 RPM	[1] Amps@ 5000 RPM
LR150-78	40	50
LR150-98B	40	50
LR150-99	40	50
LR150-125B	42	50
LR155-15	50	55
LR160-78B	50	60
LR160-82B	50	60
LR160-97B	52	60
LR160-104	50	60
LT150-131B	40	50
LT150-144	40	50

[1] — Alternator RPM.

DATSUN/NISSAN ALTERNATOR OPERATING TEST

Ensure that battery has a full charge. Connect a 30-volt voltmeter as illustrated in *Fig. 4.* Turn ignition switch "ON" and test as follows.

Fig. 4: Datsun Alternator Operating Test Connections



Diesel alternator terminals vary slightly.

1) If charge light remains OFF, disconnect connector from rear of alternator and ground "L" lead wire.

NOTE: With alternator side "L" terminal grounded, internal short occurs when positive diode is short-circuited.

2) If light remains OFF, replace indicator bulb and retest. If light is ON, reconnect connector. On gasoline models, ground "F" terminal by touching brush with grounded wire. On diesel models, use a screwdriver to ground brush to alternator body. If light stays on, replace IC regulator. If light goes out, remove and repair alternator.

3) If light came ON when ignition was turned "ON", start and idle engine. If light is dim, flickers or remains bright, remove and repair alternator. If light went off at idle, run engine at 1500 RPM, and turn headlights on high beam.

4) If charge light is on dim, idle engine, and measure voltage between terminals "B" and "L". If less than .5 volt, alternator is OK. If more than .5 volt, remove and repair alternator.

NOTE: Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

5) If charge light went OFF at 1500 RPM with lights on high beam, measure "B" voltage. If more than 15.5 volts, replace IC regulator. If 13-15 volts, idle engine and check indicator light. If OFF, system is OK. If ON, repair faulty alternator.

RESISTANCE & CONTINUITY TEST

All Models

1) Measure rotor coil resistance, using an ohmmeter, across "F" and "E" terminals. Rotor coil circuit is normal if resistance is 4-5 ohms.

2) If resistance is high, there is poor contact between brushes and commutator. If no continuity exists between "F" and "E" terminals, there is either an open rotor coil circuit, brush sticking or a broken lead wire.

3) If resistance is low, it indicates a rotor coil layer short or grounded circuit.

NOTE: The following test will not indicate an open state of the diodes. Tester will indicate continuity regardless of diode conditions, if tester leads are connected to the terminals with polarity reversed.

4) Connect positive lead of tester to alternator "N" terminal, and tester negative lead to alternator "A" terminal. If tester shows continuity, one or more positive diodes are shorted.

5) Next, connect positive lead of tester to alternator "E" terminal, and tester negative lead to alternator "N" terminal. If continuity is indicated, one or more of the negative diodes are shorted.

INTEGRATED CIRCUIT (IC) REGULATOR TEST

An integrated circuit regulator is used on all models, except Isuzu and LUV models equipped with gasoline engines. The IC voltage regulator is soldered to the brush assembly and mounted inside the alternator. To test regulator, proceed as follows.

1) Secure a 10-ohm, 3-watt resistor, a 0 to 300-ohm, 3-watt variable resistor, two 12-volt batteries and a DC voltmeter. Connect as shown in *Fig. 5.*

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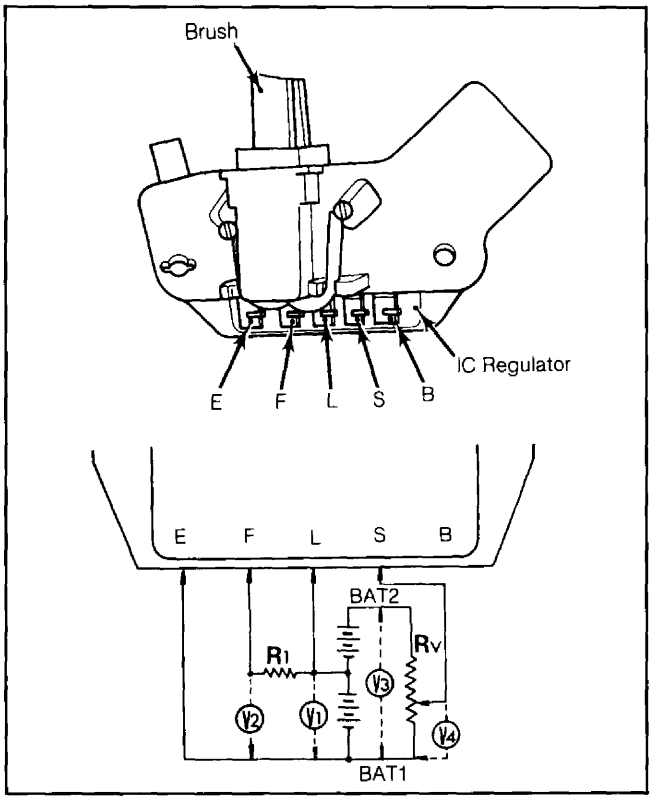
NOTE: Isuzu & LUV diesel models may have a terminal "R" instead of the terminal "L" used by Datsun/Nissan and Subaru.

Fig. 5: IC Regulator Testing Hookup



Terminal letters may be different for Isuzu & LUV diesel models.

2) Check voltage at "BAT1" (V-1 voltage). If V-1 voltage is not 10-13 volts, charge or replace battery as necessary.

3) Disconnect lead at terminal "S", and check voltage between terminals "F" and "E" (V-2). If less than 2.0 volts, regulator is functioning properly. If higher, replace regulator.

4) Measure total voltage of batteries 1 and 2 (V-3). If not 20-26 volts, recharge or replace batteries.

5) Gradually increase variable resistance (Rv) from 0 ohms and check voltage (V-2) between terminals "F" and "E". At some point, voltage reading (V-2) should increase to 10-13 volts to equal V-1 reading, measured in step **2).**

6) If variation does not occur in V-2 voltage reading, as described, regulator is defective.

7) Measure voltage (V-4) between center tap of variable resistor (Rv) and terminal "E". With resistance set as in previous step, voltage should be as shown in Regulated Voltage Specifications table, appearing earlier in this article.

NOTE: At extremely high case temperatures, voltage may be 1 volt lower, while at extremely cold temperatures, voltage may be 1 volt higher.

8) Remove test lead from terminal "S" and connect it to terminal "B". Measure voltage between terminals "B" and "E", as you gradually increase voltage with variable resistor (Rv).

9) Voltage should increase from below 2 volts to 10-13 volts. If voltage does not vary, the regulator is defective and should be replaced.

10) Measure voltage (V-4) between center tap of variable resistor (Rv) and terminal "E", without actuating variable resistor. Voltage should now be 0.5-2.0 volts higher than Regulated Voltage Specifications table indicates. If voltage does not meet specifications, replace the regulator.

OVERHAUL

DISASSEMBLY

NOTE: Alternators for vehicles with diesel engines may vary slightly, due to vacuum pump mounted on alternator.

1) Remove through bolts. Separate front cover with rotor from rear cover with stator by lightly tapping on front cover with plastic hammer.

2) Place front cover and rotor assembly in protected vise with pulley nut up. Use aluminum plates if necessary to prevent vise surfaces from damaging rotor.

3) Remove pulley nut, and take off pulley, fan, and washers. Pull out spacer. Remove rotor. Remove screws from front cover and lift out bearing retainer and bearing.

4) Remove attaching nuts, and lift stator, diode assembly and brush assembly from rear cover. Using a soldering iron, disconnect diode assembly, brush assembly and IC regulator togethe from stator leads.

NOTE: Melting of solder should be done as rapidly as possible to prevent damage to diodes and IC regulator.

5) To disconnect diode assembly from brush assembly and IC regulator, remove 3 mm rivet and melt solder on terminal "L".

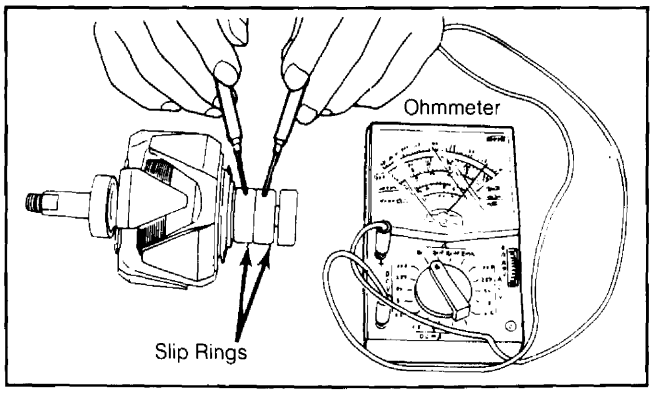
6) To replace IC regulator, first undsolder regulator terminals, and then remove 2 bolts. Do not remove these bolts unless regulator is to be replaced.

INSPECTION & REPAIR

Rotor

1) Apply tester to slip rings of rotor. If ohm reading is within 4-5 ohms, rotor continuity is satisfactory. If not, an open connection to the field coil may exist.

Fig. 6: Rotor Field Coil Conduction Test



Touch probes to each slip ring; then to rotor core and each slip ring.

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2) Next, apply probes to slip ring and rotor core to check for ground. If continuity exists, replace rotor assembly.

Stator

1) The stator is normal when there is continuity between individual stator core terminals. When there is no continuity between terminals, cable is broken and stator must be replaced.

2) Touch ohmmeter leads to stator core and to each stator coil lead wire (including neutral wire). If there is no continuity, stator condition is satisfactory. If continuity exists, stator is grounded and must be replaced.

Diodes

1) Perform a continuity test on all diodes in both directions using an ohmmeter. Test the continuity between each terminal and plate. Diode installed on a "+" plate is a positive diode, which allows current to flow from terminal to "+" plate only. Current does NOT flow from "+" plate to the terminal.

2) A diode installed on the "-" plate is a negative diode, and allows current to flow from the "-" plate to the terminal only. Current does NOT flow from the terminal to the "-" plate.

3) If current flows in both directions, the diode is shorted. If current does not flow in either direction, the diode is open. If any diode is defective, replace the entire diode assembly (individual diodes are not serviceable).

Brushes & Brush Springs

1) Inspect brushes for freedom of movement in holder. Clean brush holder if necessary. Check brushes for cracks and wear. Replace if beyond wear limit lines.

2) Brush wear limit is .22" (5.5 mm) on Isuzu gasoline models; .24" (6 mm) on Datsun/Nissan Maxima & Pickup diesel models; .55" on Isuzu and LUV diesel models; and .28" (7 mm) on all other models.

3) Check brush springs for corrosion, damage and proper tension. Tension should be 9-12.2 oz. (2.5-3.4 N) on all gasoline models; 11-15 oz. (3.0-4.1 N) on diesel models with .08" (2 mm) protrusion from holder.

4) Test brush holder to assure that no continuity exists between holder and brush. Replace if required.

REASSEMBLY

1) Reinstall diode assembly and stator to rear cover. Solder stator coil lead wires to terminals of diode assembly, taking as little time as possible. Reinstall diode cover.

NOTE: Soldering must be done quickly to avoid damage to diodes.

2) Assemble brushes to brush holder, with approximately .43" (11 mm) protruding. Insert holder into alternator.Reinstall rotor to front cover.

3) Place assembly in vise and replace pulley and components. Tighten pulley nut to 29-43 ft. lbs. (39-59 N.m). Insert and tighten housing through bolts to 27-35 INCH lbs. (3-4 N.m).

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