

CH-1

CHARGING SYSTEM

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CH

CH-2

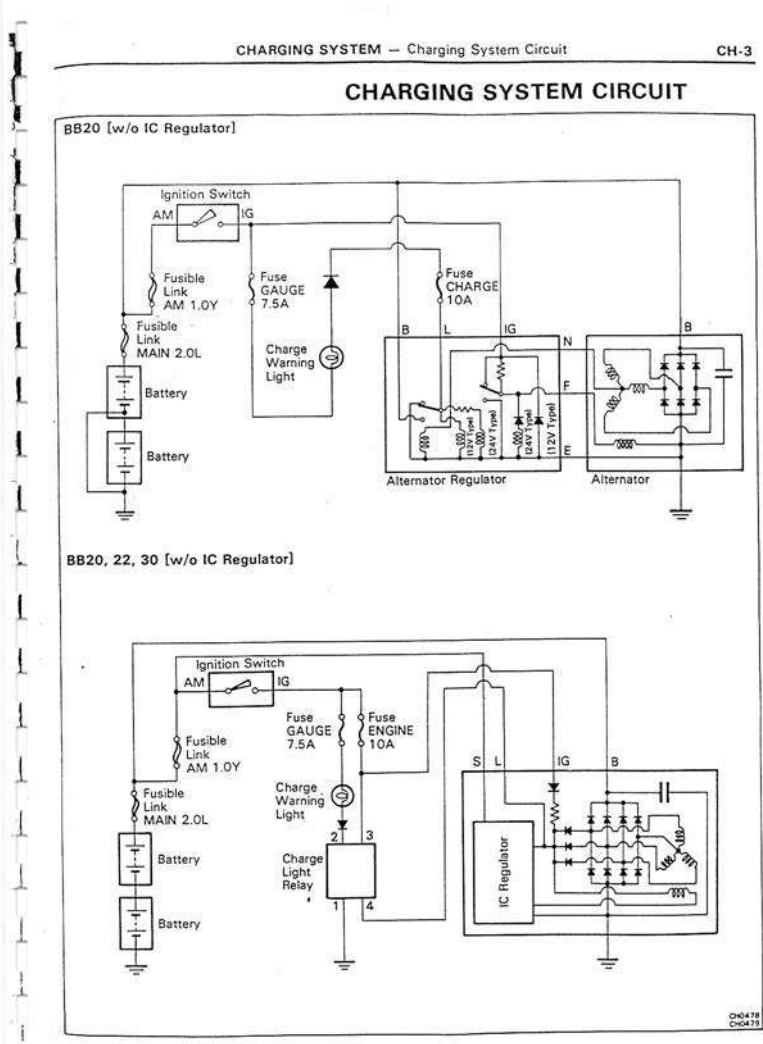
CHARGING SYSTEM — Precautions, Troubleshooting

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with starter switch at "ON" and engine not running	Fuse blown	Check fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connection	
	Alternator regulator faulty	Check regulator	CH-21
	Charge light relay faulty	Check relay	CH-23
Discharge warning light does not go out with engine running (battery requires frequent recharging)	IC regulator faulty	Replace IC regulator	CH-11
	Drive belt loose or worn	Adjust or replace drive belt	CH-7
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check fuse	
	Ignition main relay faulty	Check relay	CH-26
	Fusible link blown	Replace fusible link	
	Alternator regulator, IC regulator, charge light relay or alternator faulty	Check charging system	CH-7
	Wiring faulty	Repair wiring	

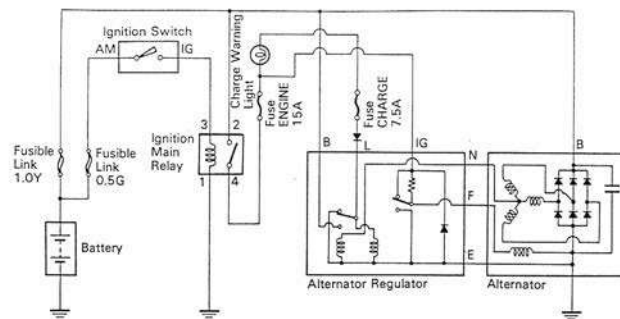


CH-4

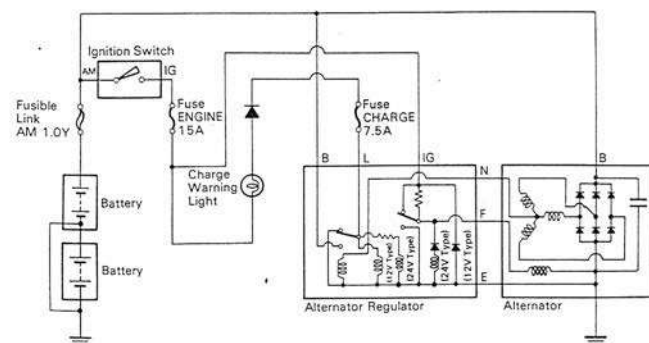
CHARGING SYSTEM — Charging System Circuit

CHARGING SYSTEM CIRCUIT (Cont'd)

BJ60



BJ70, 71, 73, 74, 75 [w/o IC Regulator]

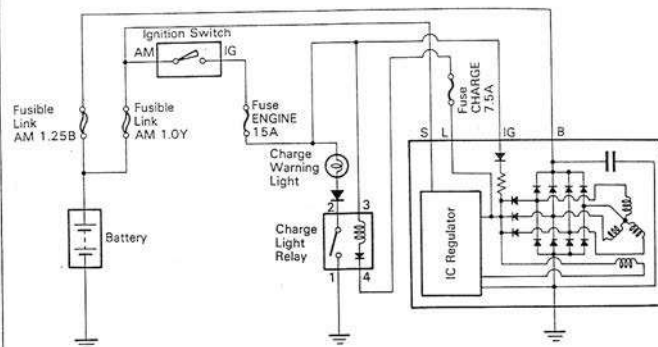
CHG481
CHG481

CHARGING SYSTEM — Charging System Circuit

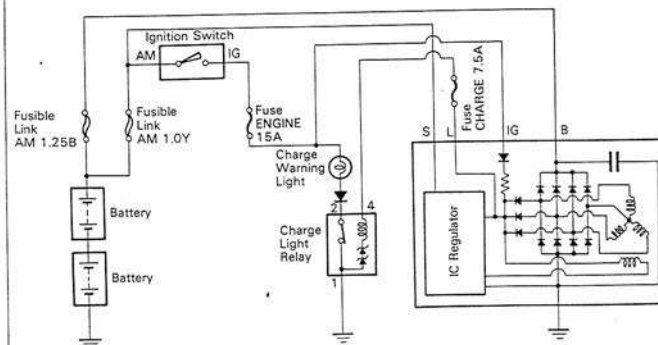
CH-5

CHARGING SYSTEM CIRCUIT (Cont'd)

BJ73 [w/ IC Regulator (12V Type)]



BJ70 [w/o IC Regulator (24V Type)]

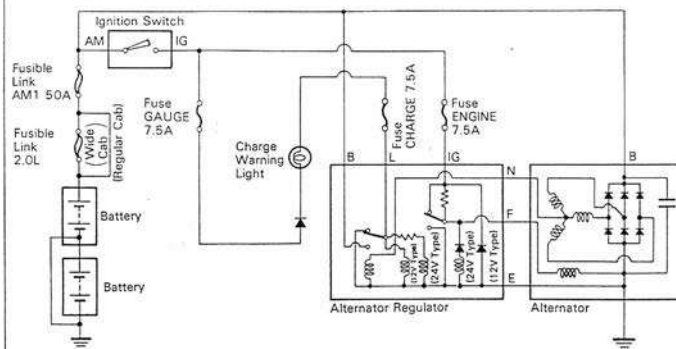
D-0428
C-0452

CH-6

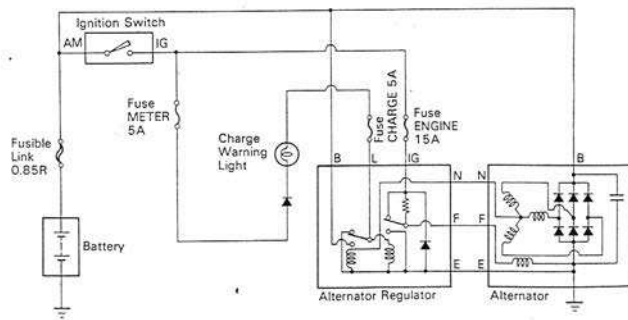
CHARGING SYSTEM — Charging System Circuit

CHARGING SYSTEM CIRCUIT (Cont'd)

BU60, 61, 62, 63, 65, 70, 75, 76, 80, 81, 82, 85, 86

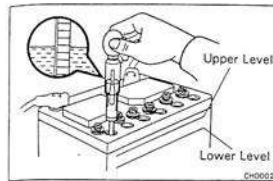


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C-483
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CHARGING SYSTEM — On-Vehicle Inspection

CH-7

**ON-VEHICLE INSPECTION****1. CHECK BATTERY SPECIFIC GRAVITY**

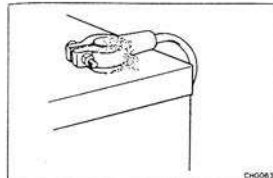
- (a) Check the specific gravity of each cell.

Standard specific gravity:

1.25 – 1.27 when fully charged at 20°C (68°F)

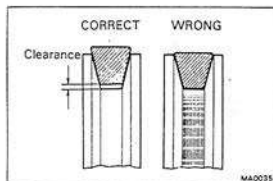
- (b) Check the electrolyte quantity of each cell.

If insufficient, refill with distilled (or purified) water.

**2. CHECK BATTERY TERMINALS, FUSIBLE LINKS AND FUSES**

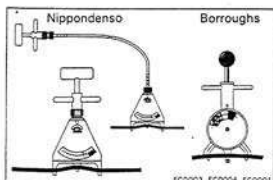
- (a) Check that the battery terminals are not loose or corroded.

- (b) Check the fusible link and fuses for continuity.

**3. INSPECT DRIVE BELT**

- (a) Visually check the drive belt for cracks, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belt.



- (b) [Canada]

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-0020) or

Borroughs No. BT-33-73F

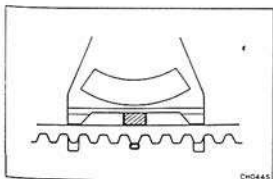
Drive belt tension: New belt 145 ± 25 lb

Used belt 100 ± 20 lb

If the belt tension is not within specification, adjust it.

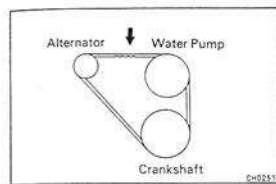
NOTE:

- When checking the tension, be sure the gauge is on the belt protrusion.
- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for about 5 minutes and recheck the deflection.



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CHARGING SYSTEM — On-Vehicle Inspection



(c) [Others]

Check the drive belt deflection by pressing on the belt at the points indicated in the figure with 10 kg (22.0 lb, 98 N) of pressure.

Drive belt deflection:

Single belt type

New belt 8 – 12 mm (0.31 – 0.47 in.)
Used belt 11 – 16 mm (0.43 – 0.63 in.)

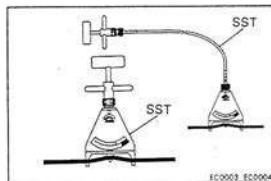
Double belt type

New belt 12 – 15 mm (0.47 – 0.59 in.)
Used belt 14 – 20 mm (0.55 – 0.79 in.)

If the belt deflection is not within specification, adjust it.

NOTE:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for about 5 minutes and recheck the deflection.



(d) [Reference]

Using SST, check the drive belt tension.

SST 09216-00020 and 09216-00030

Drive belt tension:

Single belt type

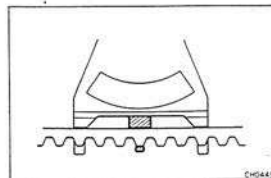
New belt 55 – 65 kg
Used belt 30 – 45 kg

Double belt type

New belt 45 – 55 kg
Used belt 20 – 35 kg

If the belt tension is not within specification, adjust it.

NOTE: When checking the tension, be sure the gauge is on the belt protrusion.



4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

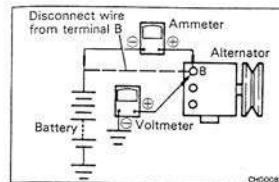
- Check that the wiring is in good condition.
- Check that there are no abnormal noises from the alternator while the engine is running.

CHARGING SYSTEM — On-Vehicle Inspection

CH-9

5. INSPECT CHARGE WARNING LIGHT CIRCUIT

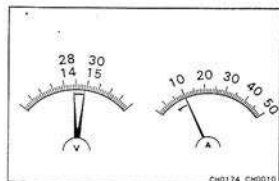
- Warm up the engine and then turn it off.
 - Turn off all accessories.
 - Turn the starter switch to "ON." Check that the charge warning light is lit.
 - Start the engine. Check that the light goes out.
- If the light does not operate as specified, troubleshoot the warning light circuit.



6. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit as per the manufacturer's instructions.

- If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:
 - Disconnect the wire from terminal B of the alternator and connect it to the negative (-) probe of the ammeter.
 - Connect the test probe from the positive (+) terminal of the ammeter to terminal B of the alternator.
 - Connect the positive (+) probe of the voltmeter to terminal B of the alternator.
 - Ground the negative (-) probe of the voltmeter.



- Check the charging circuit as follows:

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

[w/o IC Regulator]

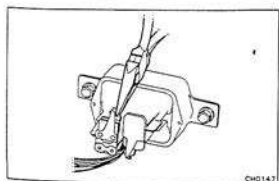
Standard amperage: 10 A or less

Standard voltage:

12V type 13.8 – 14.8 V at 25°C (77°F)

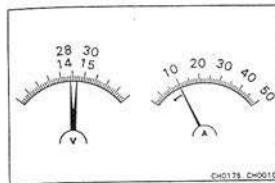
24V type 27.0 – 29.0 V at 25°C (77°F)

If the reading is not within standard voltage, adjust the regulator or replace it.

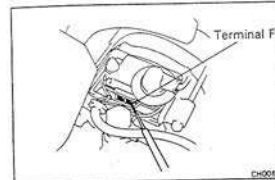


CH-10

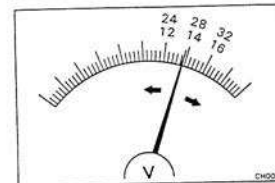
CHARGING SYSTEM — On-Vehicle Inspection



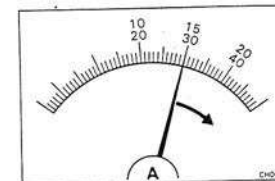
CH0015



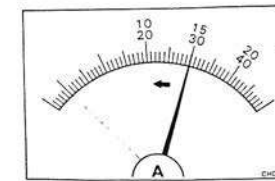
CH0055



CH0067



CH0068



CH0069

[w/ IC Regulator]

Standard amperage: 10 A or less

Standard voltage:

12V type 13.8 — 14.4 V at 25°C (77°F)

24V type 27.9 — 28.5 V at 25°C (77°F)

If the voltage reading is less than standard voltage, check the IC regulator and alternator as follows:

- Remove the brush holder cover and connect the terminal B wire to the original position.

CAUTION: Battery voltage is applied to terminal B, so disconnect the battery before beginning work.

- With terminal F grounded, start the engine and check the reading on the voltmeter.

If the voltage reading is more than standard voltage, replace the IC regulator.

If the voltage reading is less than standard voltage, check the alternator.

7. CHECK CHARGING CIRCUIT WITH LOAD

- (a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at "HI".

- (b) Check the reading on the ammeter.

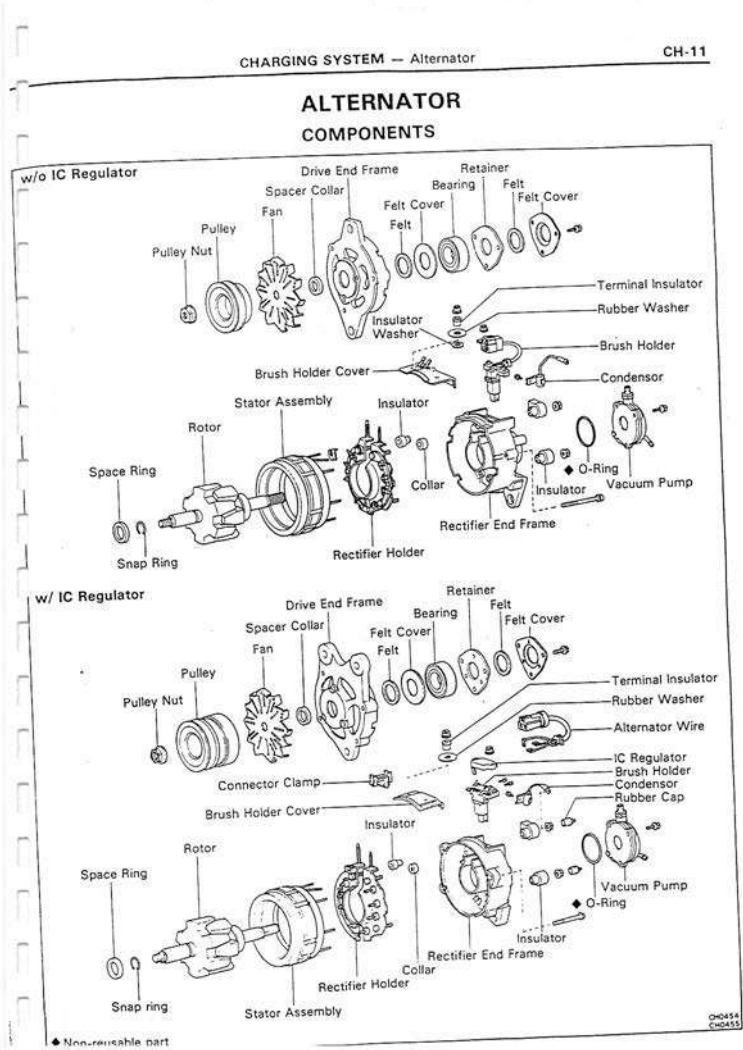
Standard amperage:

12V type 30 A or more

24V type 15 A or more

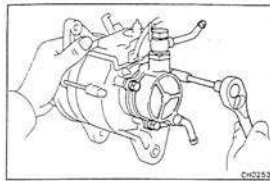
If the ammeter reading is less than standard amperage, repair the alternator. (See page CH-11)

NOTE: If the battery is fully charged, the indication will sometimes be less than standard amperage.



CH-12

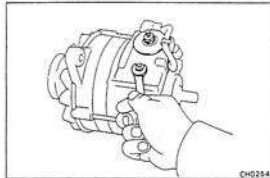
CHARGING SYSTEM — Alternator

**DISASSEMBLY OF ALTERNATOR**

(See page CH-11)

1. REMOVE VACUUM PUMP

Remove the three bolts, vacuum pump and O-ring.

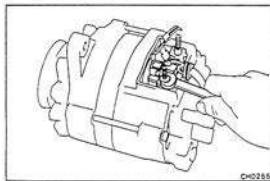
**2. REMOVE BRUSH HOLDER COVER**

[w/o IC Regulator]

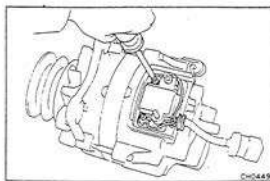
Remove the two nuts, terminal insulator, rubber washer, brush holder cover and insulator washer.

[w/ IC Regulator]

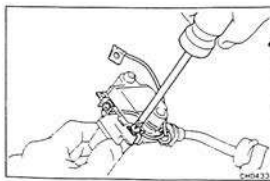
Remove the screw, two nuts, connector clamp (BB), terminal insulator, rubber washer and brush holder cover.

**3. [w/o IC REGULATOR]****REMOVE BRUSH HOLDER**

- (a) Disconnect the lead wire.
- (b) Remove the screw and disconnect the wire clamp of the brush holder.
- (c) Remove the nut and brush holder.

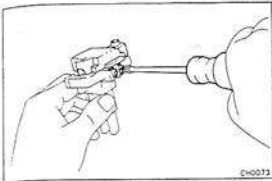
**4. [w/ IC REGULATOR]****REMOVE BRUSH HOLDER AND IC REGULATOR ASSEMBLY**

Remove the screw, brush holder and IC regulator assembly.

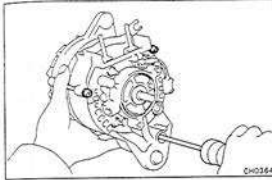
**5. [w/ IC REGULATOR]****SEPARATE BRUSH HOLDER AND IC REGULATOR**

- (a) Remove the two screws and alternator wire connector.

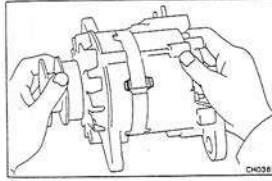
CHARGING SYSTEM — Alternator
CH-13



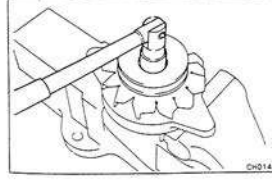
CH00773



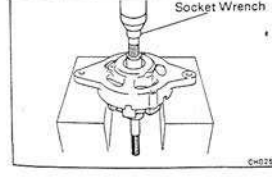
CH0364



CH0365



CH0149



CH0256

(b) Remove the two screws, and separate the brush holder and IC regulator.

6. REMOVE DRIVE END FRAME AND ROTOR ASSEMBLY FROM STATOR

(a) [BB (w/ IC Regulator)]
Remove the four through screws.

(b) [Others]
Remove the three through screws.

(c) Remove the drive end frame together with the rotor.

NOTE: If necessary, lightly tap the rotor shaft with a plastic-faced hammer.

7. REMOVE PULLEY AND FAN

(a) Mount the rotor in a soft jaw vise.

(b) Remove the nut, pulley and fan.

8. REMOVE ROTOR

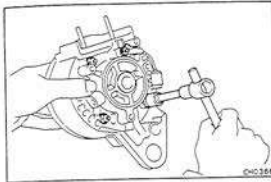
(a) Using a socket wrench and press, press out the rotor.

(b) Remove the spacer collar from the drive end frame.

(c) Remove the spacer ring and snap ring from the rotor shaft.

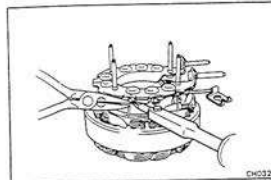
CH-14

CHARGING SYSTEM — Alternator



9. REMOVE RECTIFIER END FRAME

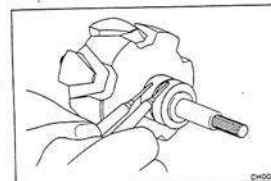
- (a) [w/ IC Regulator]
Remove the two rubber caps.
- (b) Remove the four nuts and two terminal insulators.
- (c) Remove the rectifier end frame.
- (d) Remove the two terminal bushings and collars from the rectifier holder studs.



10. REMOVE RECTIFIER HOLDER

Hold the rectifier terminal with needle-nose pliers and unsolder the leads.

CAUTION: Protect the rectifiers from heat.



INSPECTION OF ALTERNATOR

Rotor

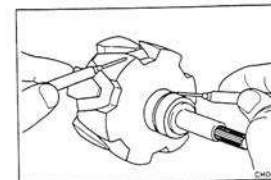
1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:

w/o IC regulator	12V type	3.9 – 4.1 Ω
	24V type	18.8 – 19.2 Ω
w/ IC regulator	12V type	2.8 – 3.0 Ω
	24V type	8.8 – 9.2 Ω

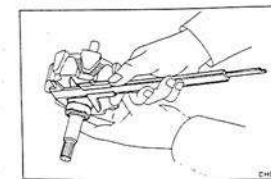
If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and the rotor.

If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

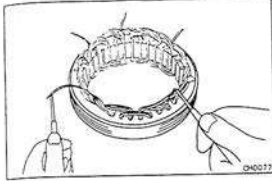
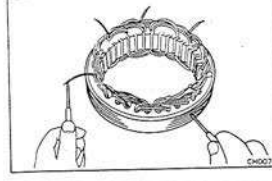
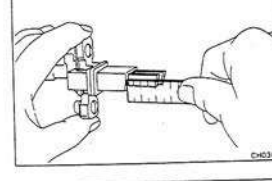
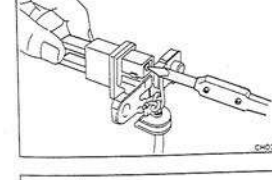
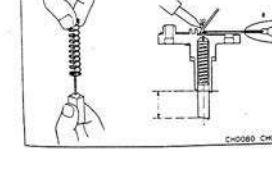
- (a) Check that the slip rings are not rough or scored. If rough or scored, replace the rotor.
- (b) Using calipers, measure the slip ring diameter.

Standard diameter: 32.3 – 32.5 mm
(1.272 – 1.280 in.)

Minimum diameter: 32.1 mm (1.264 in.)

If the diameter is less than minimum, replace the rotor.

CHARGING SYSTEM — Alternator
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Stator

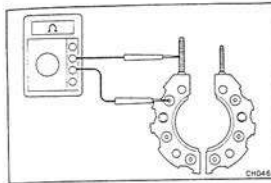
- 1. INSPECT STATOR FOR OPEN CIRCUIT**
Using an ohmmeter, check that there is continuity between the coil leads.
If there is no continuity, replace the stator.
- 2. INSPECT STATOR FOR GROUND**
Using an ohmmeter, check that there is no continuity between the coil leads and stator core.
If there is continuity, replace the stator.

Brushes

- 1. INSPECT EXPOSED BRUSH LENGTH**
Using a scale, measure the exposed brush length.
Standard exposed length: 20.0 mm (0.787 in.)
Minimum exposed length: 5.5 mm (0.217 in.)
If the length is less than minimum, replace the brushes.
- 2. IF NECESSARY, REPLACE BRUSHES**
 - Un solder and remove the brush and spring.
 - Insert the brush wire through the spring.
 - Install the brush in the brush holder.
 - Solder the wire to the brush holder at specified exposed length.
Exposed length: 20.0 mm (0.787 in.)
 - Check that the brush moves smoothly in the brush holder.
 - Cut off any excess wire.

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CHARGING SYSTEM — Alternator

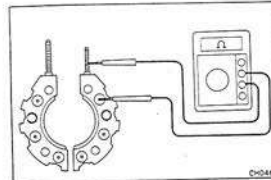


Rectifiers

1. INSPECT POSITIVE RECTIFIER

- (a) Connect the ohmmeter positive (+) probe to the rectifier terminal and the negative (-) probe to the rectifier holder, and check that there is no continuity.
- (b) Reverse the ohmmeter probes, and check that there is continuity.

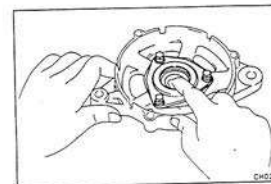
If continuity is not as specified, replace the rectifier.



2. INSPECT NEGATIVE RECTIFIER

- (a) Connect the ohmmeter positive (+) probe to the rectifier terminal and the negative (-) probe to the rectifier holder, and check that there is continuity.
- (b) Reverse the ohmmeter probes, and check that there is no continuity.

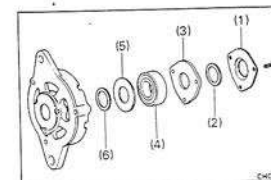
If continuity is not as specified, replace the rectifier.



Bearings

1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.



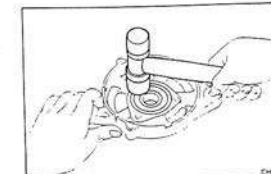
2. IF NECESSARY, REPLACE FRONT BEARING

- (a) Remove the three bolts and following parts:

- (1) Felt cover
- (2) Felt
- (3) Retainer
- (4) Bearing
- (5) Felt cover
- (6) Felt

- (b) Install the following parts with the three bolts:

- (1) Felt
- (2) Felt cover
- (3) Bearing
If necessary, lightly tap the bearing with a plastic-faced hammer.
- (4) Retainer
- (5) Felt
- (6) Felt cover



CHARGING SYSTEM — Alternator

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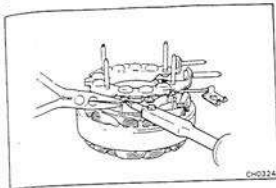
ASSEMBLY OF ALTERNATOR

(See page CH-11)

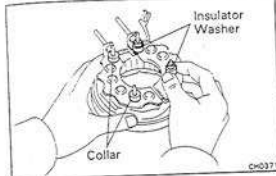
1. INSTALL RECTIFIER HOLDER TO STATOR

Hold the rectifier terminal with needle-nose pliers while soldering the leads.

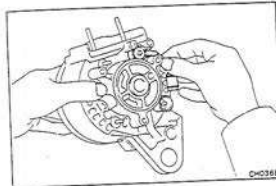
CAUTION: Protect the rectifiers from heat.

**2. INSTALL RECTIFIER END FRAME TO RECTIFIER HOLDER**

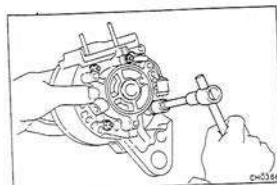
- (a) Place the two insulator washers on the positive (+) studs of the rectifier holder.
- (b) Place the two collars on the negative (-) studs of the rectifier holder.
- (c) Place the rectifier end frame on the rectifier holder.



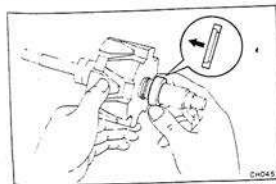
- (d) Place the two terminal insulators on the positive (+) studs of the rectifier holder.
- (e) Connect the lead wire of the condenser on the positive (+) stud of the rectifier holder.



- (f) Install the four nuts.
- (g) Check that the wires are not touching the frame.
- (h) [w/ IC Regulator]
Install the two rubber caps to the positive (+) studs of the rectifier holder.

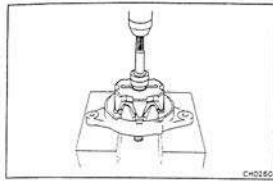
**3. INSTALL ROTOR**

- (a) Install the snap ring on the rotor shaft groove.
- (b) Slide the spacer ring onto the rotor shaft.



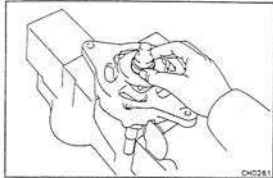
CH-18

CHARGING SYSTEM — Alternator



CH0280

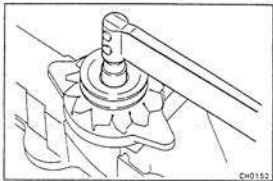
- (c) Using a press, press in the rotor.



CH0281

4. INSTALL FAN AND PULLEY

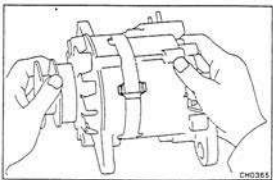
- (a) Mount the rotor in soft jaw vise.
(b) Slide the spacer collar onto the rotor shaft.



CH0282

- (c) Slide the fan, pulley and spring washer onto the rotor shaft.
(d) Install the nut.

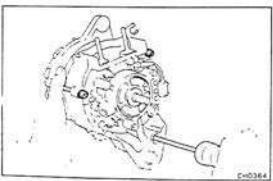
Torque: 900 kg-cm (65 ft-lb, 88 N-m)



CH0285

5. ASSEMBLE DRIVE END FRAME AND RECTIFIER END FRAME

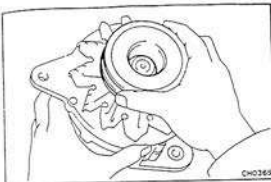
- (a) Assemble the drive end frame and rectifier end frame.



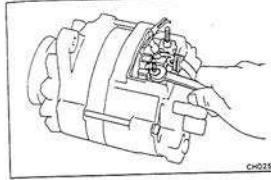
CH0286

- (b) [BB (w/ IC Regulator)]
Install the four through screws.
(c) [Others]
Install the three through screws.

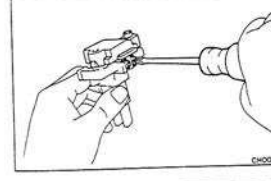
CHARGING SYSTEM — Alternator **CH-19**



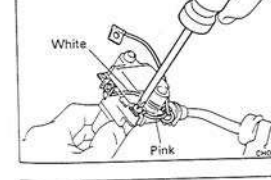
CH0389



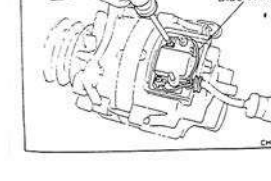
CH0355



CH0072



CH0433



CH0449

(d) Make sure the rotor rotates smoothly.

**6. [w/o IC REGULATOR]
INSTALL BRUSH HOLDER**

- (a) Install the brush holder with the nut.
- (b) Connect the brush holder wire clamp with the screw.
- (c) Connect the lead wire to terminal B.

**7. [w/ IC REGULATOR]
ASSEMBLE BRUSH HOLDER AND IC REGULATOR**

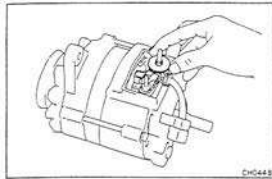
- (a) Assemble the brush holder and IC regulator with the two screws.
- (b) Connect the two alternator wires to the terminal of the IC regulator with the two screws as shown.

**8. [w/ IC REGULATOR]
INSTALL BRUSH HOLDER AND IC REGULATOR ASSEMBLY**

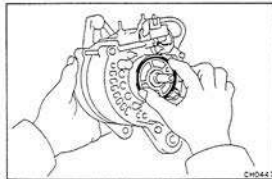
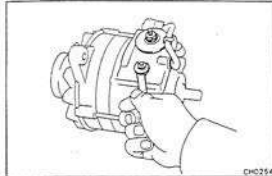
Install the brush holder and IC regulator assembly with the screw. Connect the alternator wire to the terminal of the IC regulator as shown.

CH-20

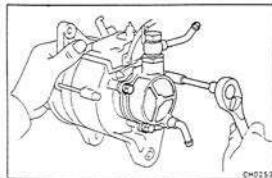
CHARGING SYSTEM — Alternator

**9. INSTALL BRUSH HOLDER COVER**

- (a) [w/o IC Regulator]
Place the insulator washer on terminal B.
- (b) Place the cover on the rectifier end frame.
- (c) Place the terminal insulator and rubber washer on terminal B.
- (d) [w/o IC Regulator]
Install the two nuts.
- (e) [w/ IC Regulator]
Install the screw and two nuts together with the connector clamp.

**10. INSTALL VACUUM PUMP**

- (a) Place a new O-ring on the rectifier end frame.

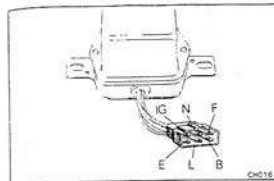


- (b) Install the vacuum pump with the three bolts.
Torque: 80 kg-cm (69 in.-lb, 7.8 N-m)

ALTERNATOR REGULATOR [w/o IC Regulator]

INSPECTION OF ALTERNATOR REGULATOR

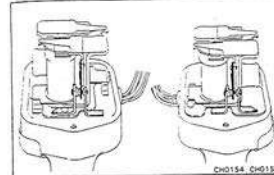
LOCATION: On the left fender apron in the engine compartment.



CH0151

1. INSPECT POINT SURFACES FOR SEIZURE AND DAMAGE

If defective, replace the regulator.



CH0154, CH0153

2. INSPECT RESISTANCE BETWEEN TERMINALS

(a) Using an ohmmeter, measure the resistance between terminals IG and F.

Resistance (Voltage regulator):

At rest	0 Ω
Pulled in	12V type Approx. 10.5 Ω
	24V type Approx. 200 Ω

CH0162

(b) Measure the resistance between terminals E and L.

Resistance (Voltage relay):

At rest	0 Ω
Pulled in	12V type Approx. 102 Ω
	24V type Approx. 199 Ω

CH0162

(c) Measure the resistance between terminals B and E.

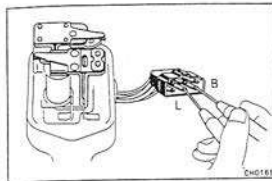
Resistance (Voltage relay):

At rest	Infinity
Pulled in	12V type Approx. 102 Ω
	24V type Approx. 199 Ω

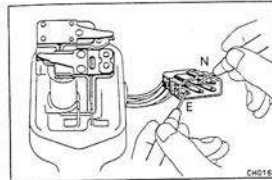
CH0164

CH-22

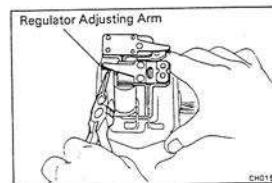
CHARGING SYSTEM — Alternator Regulator



(d) Measure the resistance between terminals B and L.
 Resistance (Voltage relay): At rest Infinity
 Pulled in 0 Ω



(e) Measure the resistance between terminals N and E.
 Resistance:
 12V type Approx. 24 Ω
 24V type Approx. 102 Ω
 If any of the above checks are not positive, replace the alternator regulator.



VOLTAGE ADJUSTMENT OF ALTERNATOR REGULATOR

1. ADJUST VOLTAGE REGULATOR

Bend the regulator adjusting arm to adjust.

Regulating voltage:

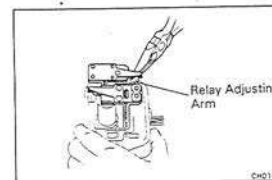
12V type 13.8 – 14.8 V
 24V type 27.0 – 29.0 V

2. ADJUST VOLTAGE RELAY

Bend the relay adjusting arm to adjust.

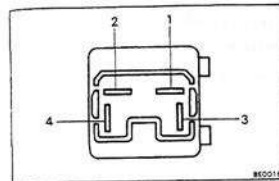
Relay actuating voltage:

12V type 4.0 – 5.8 V
 24V type 8.0 – 11.6 V



CHARGING SYSTEM — Charge Light Relay [w/ IC Regulator (BJ73 12V Type)]

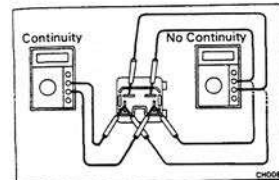
CH-23



CHARGE LIGHT RELAY [w/ IC Regulator (BJ73 12V Type)]

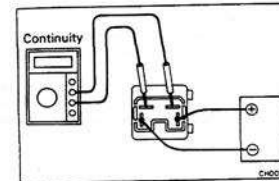
INSPECTION OF CHARGE LIGHT RELAY

LOCATION: In the cowl on the drive side.

**1. INSPECT RELAY CONTINUITY**

- Connect the ohmmeter positive (+) probe to terminal 3 and the negative (–) probe to terminal 4, and check that there is continuity.
- Connect the ohmmeter positive (+) probe to terminal 4 and the negative (–) probe to terminal 3, and check that there is no continuity.
- Check that there is no continuity between terminals 1 and 2.

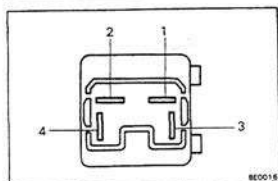
If continuity is not as specified, replace the relay.

**2. INSPECT RELAY OPERATION**

- Connect the positive (+) lead from the battery to terminal 3. Connect the negative (–) lead to terminal 4.
- Check that there is continuity between terminals 1 and 2.

If operation is not as specified, replace the relay.

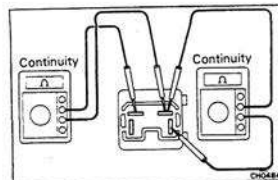
CH-24 CHARGING SYSTEM — Charge Light Relay (w/ IC Regulator (BB 24V Type))



CHARGE LIGHT RELAY
[w/ IC Regulator (BB 24V Type)]

INSPECTION OF CHARGE LIGHT RELAY

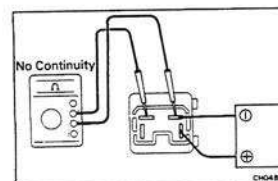
LOCATION: Inside wall adjacent to passenger door.



1. INSPECT RELAY CONTINUITY

- (a) Connect the positive (+) test probe to terminal 1. Connect the negative (-) test probe to terminal 2. Check that there is continuity between terminals 1 and 2.
- (b) Check that there is continuity between terminals 2 and 3.

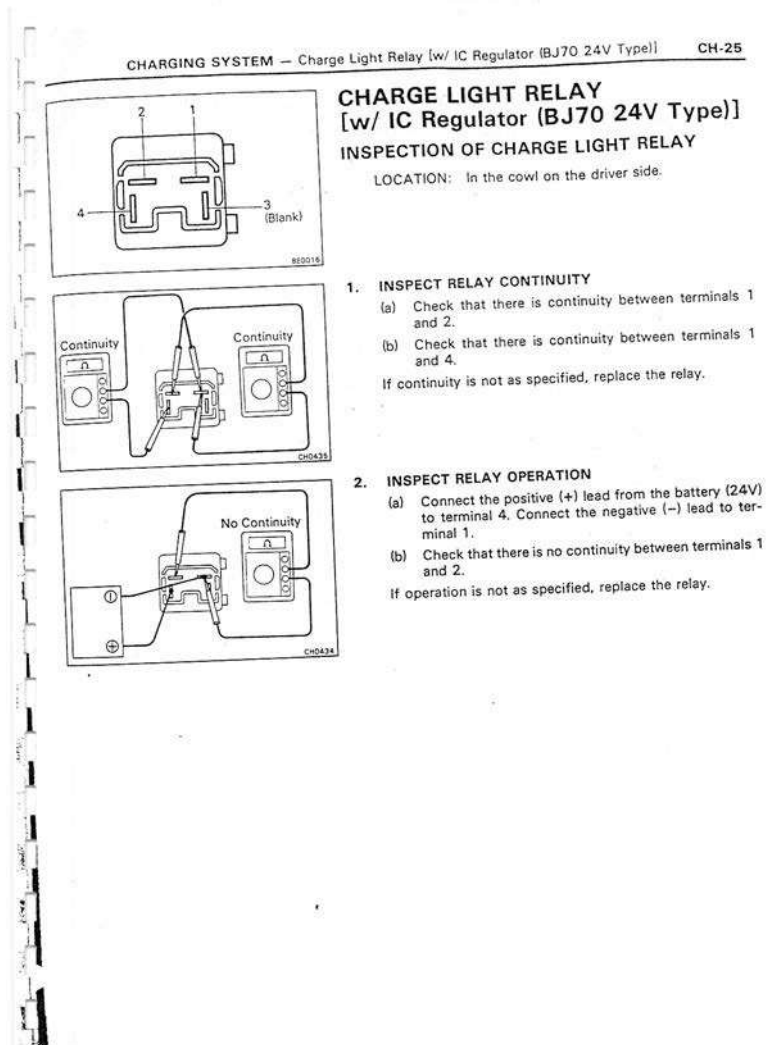
If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

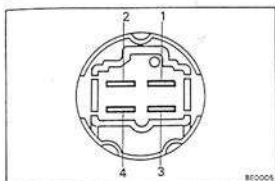
- (a) Connect the positive (+) lead from the battery (24V) to terminal 3. Connect the negative (-) lead to terminal 1.
- (b) Connect the positive (+) test probe to terminal 1. Connect the negative (-) test probe to terminal 2. Check that there is no continuity between terminals 1 and 2.

If operation is not as specified, replace the relay.

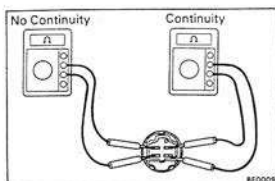


CH-26

CHARGING SYSTEM — Ignition Main Relay [BJ60]

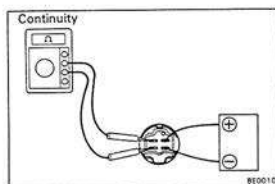
**IGNITION MAIN RELAY [BJ60]****INSPECTION OF IGNITION MAIN RELAY**

LOCATION: Under the instrument panel on the front drive side in the relay box.

**1. INSPECT RELAY CONTINUITY**

- (a) Check that there is continuity between terminals 1 and 3.
- (b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.

**2. INSPECT RELAY OPERATION**

- (a) Apply battery voltage across terminals 1 and 3.
- (b) Check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.