

**1**

**9**

**8**

**7**

# ***IMPORT SERVICE MANUAL***

*Volume – 2*

*Electrical,*

*Heater & Air Conditioning*

# ***RAM RAIDER***



## SAFETY NOTICE

### CAUTION

ALL SERVICE AND REBUILDING INSTRUCTIONS CONTAINED HERE-IN ARE APPLICABLE TO, AND FOR THE CONVENIENCE OF, THE AUTOMOTIVE TRADE ONLY. All test and repair procedures on components or assemblies in non automotive applications should be repaired in accordance with instructions supplied by the manufacturer of the total product.

Proper service and repair is important to the safe, reliable, operation of all motor vehicles. The service procedures recommended and described in this publication were developed for professional service personnel and are effective methods for performing vehicle repair. Following these procedures will help assure efficient economical vehicle performance and service reliability. Some of these service procedures require the use of special tools designed for specific procedures. These special tools should be used when recommended throughout this publication.

**Special attention should be exercised when working with spring or tension loaded fasteners and devices such as E-Clips, Circlips, Snaprings etc. as careless removal can cause personal injury. Always wear safety goggles whenever working on vehicles or vehicle components.**

It is important to note that this publication contains various **Cautions** and **Warnings**. These should be carefully read in order to minimize the risk of personal injury, or the possibility that improper service methods may damage the vehicle or render it unsafe. It is important to note these **Cautions** and **Warnings** cover only the situations and procedures Chrysler Motors has encountered and recommended. Chrysler Motors could not possibly know, evaluate, and advise the service trade of all conceivable ways that service may be performed or of the possible hazards of each. Consequently Chrysler Motors has not undertaken any such broad service review. Accordingly, anyone who uses a service procedure or tool that is not recommended in this publication must assure oneself thoroughly that neither personal safety nor vehicle safety be jeopardized by the service methods they select.





# Service Manual

## **RAM RAIDER**

### 1987

Volume-2  
Electrical,  
Heater & Air-conditioning

#### FOREWORD

This Service Manual has been prepared with the latest service information available at the time of publication. It is subdivided into various group categories and each section contains diagnosis, disassembly, repair, and installation procedures along with complete specifications and tightening references. Use of this manual will aid in properly performing any servicing necessary to maintain or restore the high levels of performance and reliability designed into these outstanding vehicles.



Chrysler Motors reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.

#### GROUP/SECTION INDEX

N00AA-B

INTRODUCTION .....

Electrical .....

Electrical System Parts

Location .....

Relays, Control Units, Sensors,  
Fuses, Groundings

Inspection of Harness

Connector .....

Wiring Harness .....

Charging System .....

Starting System .....

Ignition System .....

Meters and Gauges .....

Lighting System .....

Wiper and Washer System .....

Horn .....

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Heaters and Air-conditioning .....

Heaters .....

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#### NOTE

For Engine, Chassis & Body, refer to  
... Volume-1  
"Engine, Chassis & Body"



## HOW TO USE THIS MANUAL

N00BAAA

### CONTENTS

The preceding page contains the GROUP INDEX which lists the group title and group number.

### PAGE NUMBERS

All page numbers consist of two sets of digits separated by a dash. The digits preceding the dash identify the number of the group. The digits following the dash represent the consecutive page number within the group. The page numbers can be found on the top left or right of each page.

### TEXT

Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transmission type, etc.). A description of these designations is covered in this unit under "VEHICLE IDENTIFICATION".

### SERVICE PROCEDURES

The service steps are arranged in numerical order and attentions to be paid in performing vehicle service are described in detail in SERVICE POINTS.

### DEFINITION OF TERMS

#### STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

#### LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

Indicates incidental operation to be performed before removal or after installation

Removal steps : The numbers before part names correspond to numbers in the illustration and indicate the order of removal.

Disassembly steps : The numbers before part names correspond to numbers in the illustration, and indicate the order of disassembly.

Installation steps : This is provided if installation cannot be made in the reverse order of "Removal steps"; omitted if installation in the reverse order of "Removal steps" is possible.

Reassembly steps : This is provided if reassembly cannot be made in the reverse order of "Disassembly steps"; omitted if reassembly in the reverse order of "Disassembly steps" is possible.

#### Classification of SERVICE POINTS

◀▶ : Removal  
 ▶▶ : Installation  
 ◀◀ : Disassembly  
 ▶◀ : Reassembly



Page number

Group title

Section title

7-10

COOLING – Thermostat

**THERMOSTAT****REMOVAL AND INSTALLATION****Pre-removal Operation**

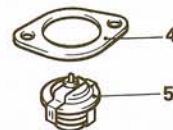
- Draining of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

**Post-installation Operation**

- Supplying of the Coolant (Refer to GROUP 0 LUBRICATION AND MAINTENANCE – Maintenance Service.)

10-13 Nm  
7-9 ft.lbs.

Indicates tightening torque



04B0031

Thermostat kit

Repair kit or set parts are shown. (Only very frequently used parts are shown.)

Indicates non-reusable part.

**Removal steps**

1. Connection of water temperature switch connector (Vehicles with an air conditioner)
2. Connection of radiator upper hose
3. Water outlet fitting
4. Water outlet fitting gasket
5. Thermostat

This number corresponds to the number in "Removal steps", "Disassembly steps", "Installation steps" or "Reassembly steps".

**NOTE**

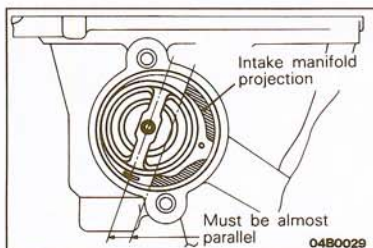
- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦ : Refer to "Service Points of Installation"
- (3) N : Non-reusable parts

**SERVICE POINTS OF INSTALLATION****5. INSTALLATION OF THERMOSTAT**

Install the thermostat to the intake manifold as illustrated.

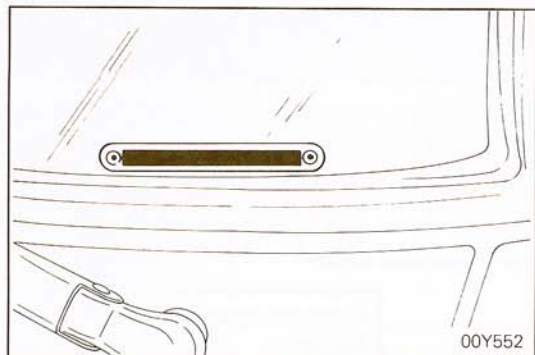
**Caution**

The thermostat flange fits over the manifold seat; ensure that the thermostat is not installed at an angle.



An explanation of procedures, notes, etc. regarding removal, installation, disassembly and reassembly.





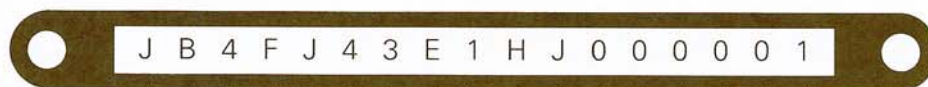
## VEHICLE IDENTIFICATION

### VEHICLE IDENTIFICATION NUMBER LOCATION

The vehicle identification number (V.I.N.) is located on a plate attached to the left top side of the instrument panel.

### VEHICLE IDENTIFICATION CODE CHART PLATE

All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.



1st digit	2nd digit	3rd digit	4th digit	5th digit	6th digit	7th digit	8th digit	9th digit	10th digit	11th digit	12th thru 17th digit
Country	Make	Vehicle type	Others	Line	Price class	Body	Engine	Check digit	Model year	Plant	Serial number
J- Japan	B- Dodge	4- Multi- purpose vehicle (MPV)  7-Truck	F- 4001 lbs. or more with hydraulic brakes	J- RAM RAIDER	4- High	3- 3-door metal- top or van	E- 2.6 liters (155.9 C.I.D.)	0 1 2 3 . . . 9 X	H- 1987 year	J- Nagoya -3	000001 to 999999

#### NOTE

\*"Check digit" means a single number or letter X used to verify the accuracy of transcription of vehicle identification number.



## VEHICLE IDENTIFICATION NUMBER LIST

## FEDERAL

N00CC-A

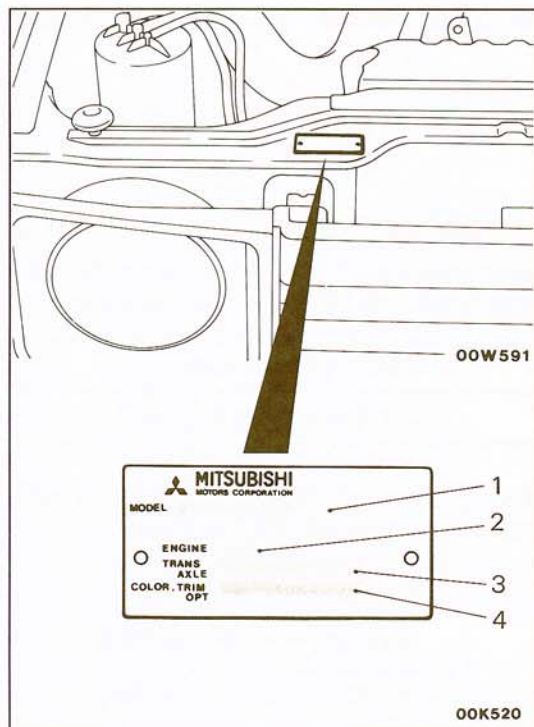
VIN (except sequence number)	Brand	Engine displacement	Model code
JB7FJ43E □ HJ	Dodge	2.555 liters	L042GTN JL2
JB7FJ43E □ HJ	RAM RAIDER	(155.9 C.I.D.)	L042GTR JL2

## CALIFORNIA (Can also be sold in Federal states.)

VIN (except sequence number)	Brand	Engine displacement	Model code
JB7FJ43E □ HJ	Dodge	2.555 liters	L042GTN JL7
JB7FJ43E □ HJ	RAM RAIDER	(155.9 C.I.D.)	L042GTR JL7

## CANADA

VIN (except sequence number)	Brand	Engine displacement	Model code
JB4FJ43E □ HJ	Dodge	2.555 liters	L042GVN JL3
JB4FJ43E □ HJ	RAM RAIDER	(155.9 C.I.D.)	L042GVR JL3



## VEHICLE INFORMATION CODE PLATE

N00CD-A

Vehicle information code plate is riveted on the headlight support panel in the engine compartment.

The plate shows model code, engine model, transmission model, and body color code.

- MODEL  
L042G VN JL2  
Model series  
Vehicle model
- ENGINE  
G54B  
Engine model
- TRANS AXLE  
KM145  
Transmission model
- COLOR, TRIM OPT  
B76  
Montone exterior color code  
B07B76H43  
Two-tone color code  
Exterior code  
Two-tone exterior is shown by the exterior code followed by the two color codes.



**CHASSIS NUMBER****STAMPING LOCATION**

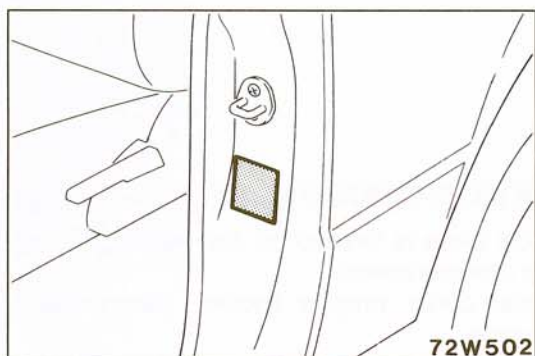
N00CE-A

The chassis number is stamped on the side of the frame near the right rear shock absorber.

**CHASSIS NUMBER CODE CHART**

L04 2 V HJ000001

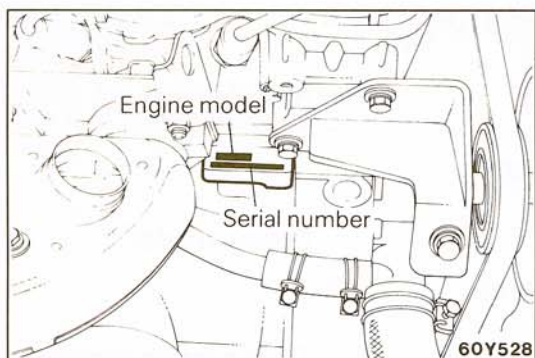
Vehicle line	Engine displacement	Body type	Refer to 10th thru 17th digits of V.I.N. plate
L04- RAM RAIDER	2- 2.555 liters (155.9 C.I.D.)	V- 3-door metal-top T-Van	

**VEHICLE SAFETY CERTIFICATION LABEL**

N00CF--

The vehicle safety certification label is attached to face of left door pillar.

This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (G.V.W.R.), front and rear Gross Axle Weight Rating (G.A.W.R.), and Vehicle Identification Number (V.I.N.).

**ENGINE MODEL STAMPING**

N00CG--

The engine model number is stamped at the right front side on the top edge of the cylinder block as shown in the following:

Engine model	Engine displacement
G54B	2.555 liters (155.9 C.I.D.)

The engine serial number is stamped near the engine model number, and the serial number cycles, as shown below.

Engine serial number	Number cycling
AA0201 to YY9999	AA0201 ----> AA9999
	AB0001 ----> AY9999
	BA0001 ----> YY9999

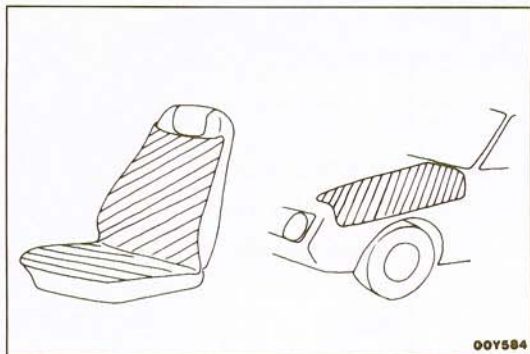


## BODY COLOR CODE

N00CH-A

Exterior code	Body color
Monotone	
B76	Dark blue (Metallic)
H43	Silver (Metallic)
K78	Gold (Metallic)
R52	Red
W18	White
X15	Black
Two-tone	
B07B76H43	Silver (Metallic)/ Dark blue (Metallic)
H63 H43X15	Black/ Silver (Metallic)
R02 R52 H43	Silver (Metallic)/ Red
X97 X15 K78	Black/ Gold (Metallic)





00Y584

## PRECAUTIONS BEFORE SERVICE

### PROTECTING THE VEHICLE

N00DAAR

If there is a likelihood of damaging painted or interior parts during service operations, protect them with suitable covers (such as seat covers, fender covers, etc.).



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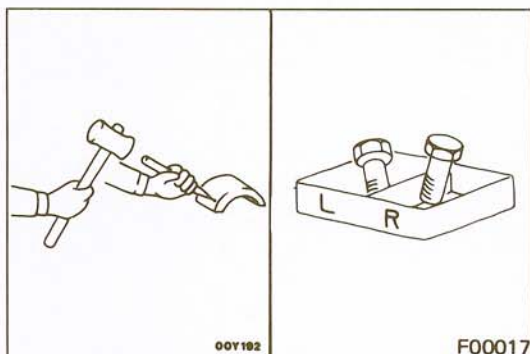
### REMOVAL AND DISASSEMBLY

When checking a malfunction, find the cause of the problem. If it is determined that removal and/or disassembly is necessary, perform the work by following the procedures contained in this Workshop Manual.

If punch marks or mating marks are made to avoid error in assembly and facilitate the assembly work, be sure to make them in locations which will have no detrimental effect on performance and/or appearances.

If an area having many parts, similar parts, and/or parts which are symmetrical right and left is disassembled, be sure to arrange the parts so that they do not become mixed during the assembly process.

1. Arrange the parts removed in the proper order.
2. Determine which parts are to be reused and which are to be replaced.
3. If bolts, nuts, etc., are to be replaced, be sure to use only the exact size specified.

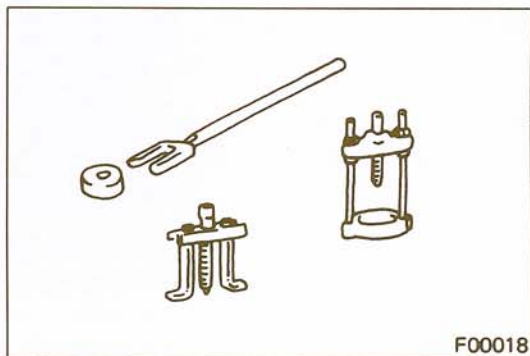


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### SPECIAL TOOLS

If other tools are substituted for the special tools to do service or repair work, there is the danger that vehicle parts might be damaged, or the mechanic might be injured; therefore, be sure to use the special tool whenever doing any work for which the use of one is specified.

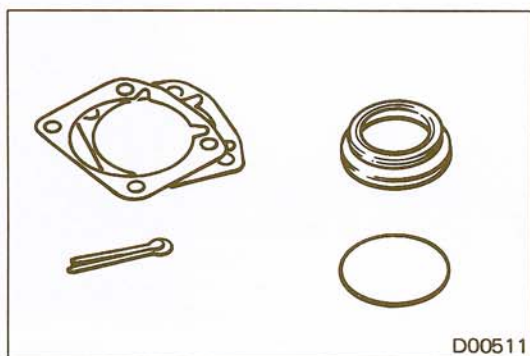


F00018

### PARTS TO BE REPLACED

If any of the following parts are removed, they must be replaced with new parts.

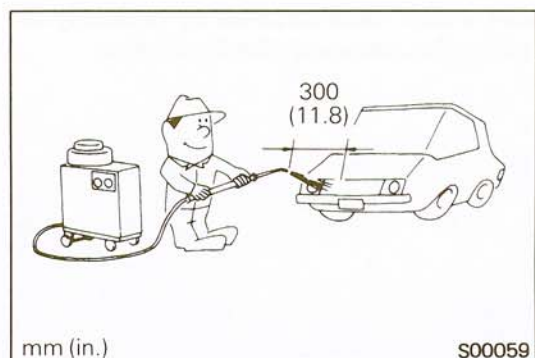
1. Oil seals
2. Gaskets (except rocker cover gasket)
3. Packings
4. O-rings
5. Lock washers
6. Cotter pins
7. Self-locking nuts



D00511

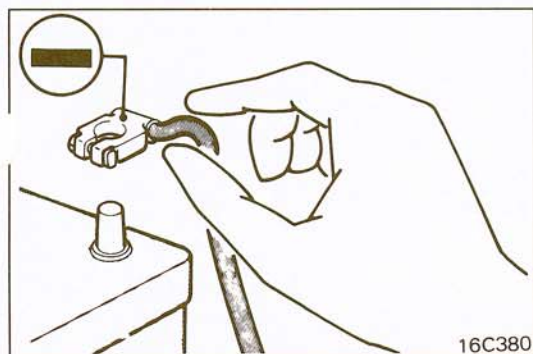
## PARTS

When replacing parts, use MOPAR genuine parts.



## VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least 300 mm (11.8 in.) from any plastic parts and all opening parts (doors, luggage compartment, etc.).

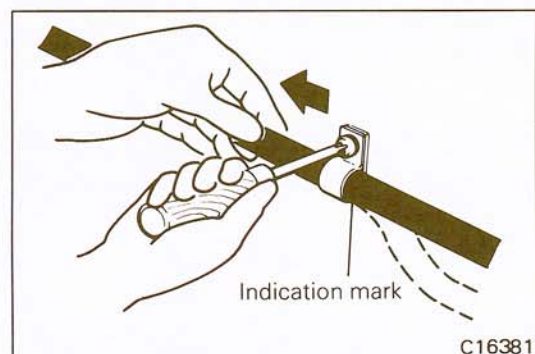


## SERVICING THE ELECTRICAL SYSTEM

When servicing the electrical system, disconnect the negative cable terminal from the battery.

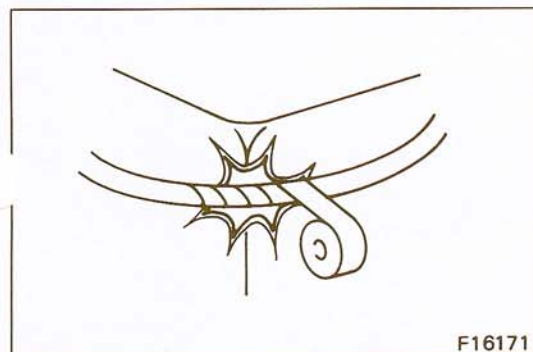
### Caution

**Before connecting or disconnecting the negative cable, be sure to turn off the ignition switch and the lighting switch. (If this is not done, there is the possibility of semiconductor parts being damaged.)**

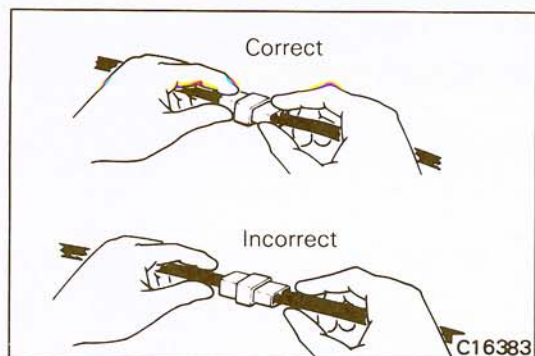


## WIRING HARNESSES

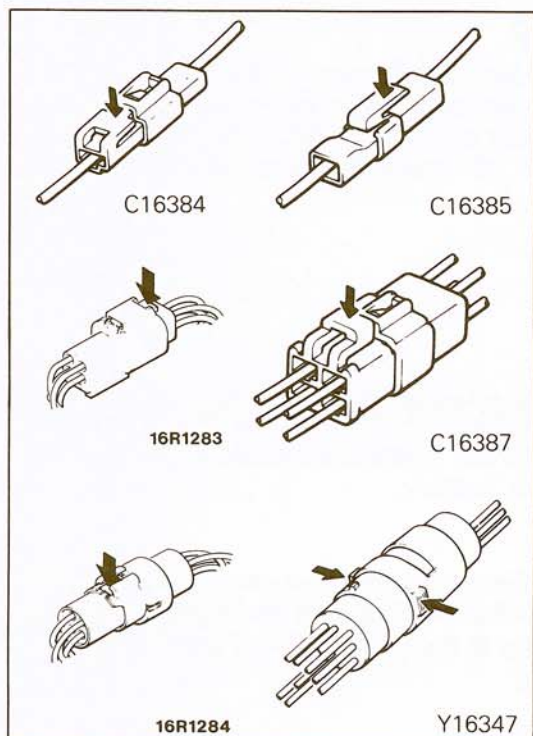
1. Secure the wiring harnesses by using clamps so that there is no slack. However, for any harness which passes to the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts. Then secure the harness by using a clamp.  
In addition, if a mounting indication mark (yellow tape) is on a harness, secure the indication mark in the specified location.
2. If any section of a wiring harness contacts the edge of a part, or a corner, wrap the section of the harness with tape or something similar in order to protect it from damage



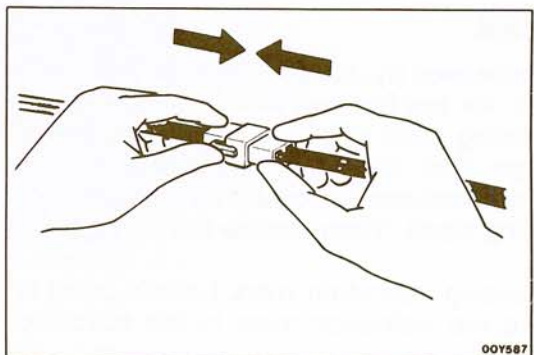




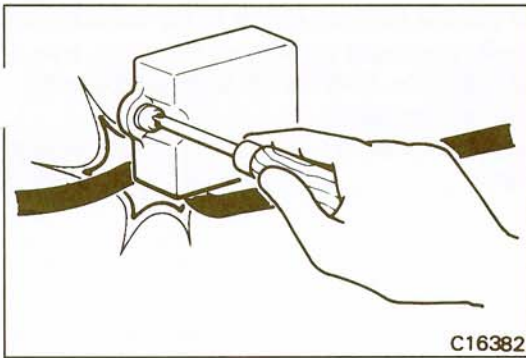
3. When disconnecting a connector, be sure to pull only the connector, not the harness.



4. Disconnect connectors which have catches by pressing in the direction indicated by the arrows in the illustration.

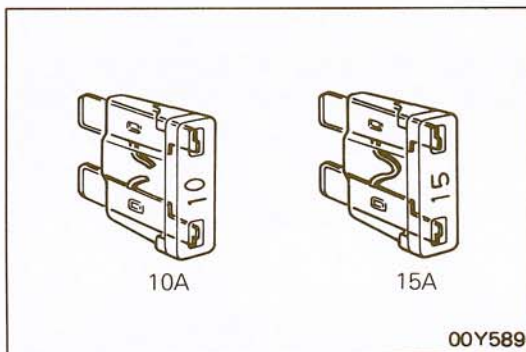
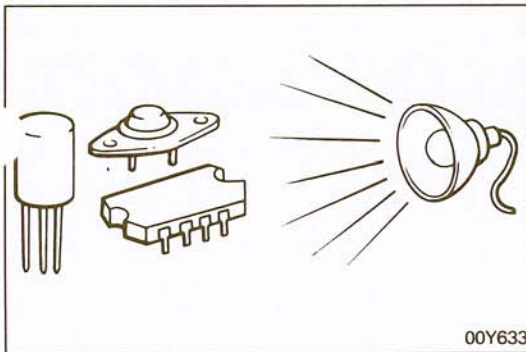
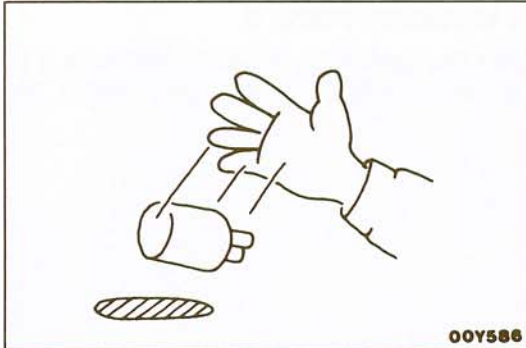


5. Connect connectors which have catches by inserting the connectors until they snap.



## ELECTRICAL COMPONENTS

1. When installing any of the vehicle parts, be careful not to pinch or damage any of the wiring harnesses.
2. Sensors, relays, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.
3. The electronic parts used for relays, etc., are sensitive to heat. If any service which causes a temperature of 80°C (176°F) or more is performed, remove the part or parts in question before carrying out the service.



## FUSES AND FUSIBLE LINKS

1. If a blown-out fuse is to be replaced, be sure to use only a fuse of the specified capacity. If a fuse of a capacity larger than that specified is used, parts may be damaged and the circuit may not be protected adequately.

### Caution

**If a fuse is blown-out, be sure to eliminate the cause of the problem before installing a new fuse.**

2. If additional optional equipment is to be installed in the vehicle, follow the procedure listed in the appropriate instruction manual; however, be sure to pay careful attention to the following points:
  - (1) In order to avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.
  - (2) Where possible, route the wiring through the existing harnesses.

Nominal size	SAE gauge No.	Permissible current	
		In engine compartment	Other areas
0.3 mm <sup>2</sup>	AWG 22	—	5A
0.5 mm <sup>2</sup>	AWG 20	7A	13A
0.85 mm <sup>2</sup>	AWG 18	9A	17A
1.25 mm <sup>2</sup>	AWG 16	12A	22A
2.0 mm <sup>2</sup>	AWG 14	16A	30A
3.0 mm <sup>2</sup>	AWG 12	21A	40A
5.0 mm <sup>2</sup>	AWG 10	31A	54A



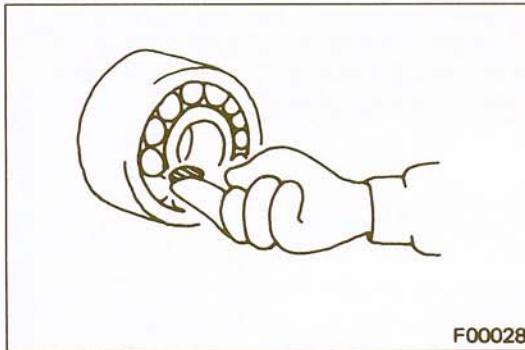
- (3) If an ammeter or similar instrument is to be connected to a live-wire circuit, use tape to protect the wire, use a clamp to secure the wire, and make sure that there is no contact with any other parts.
- (4) Be sure to provide a fuse for the load circuit of the optional equipment.



00Y585

### TUBES AND OTHER RUBBER PARTS

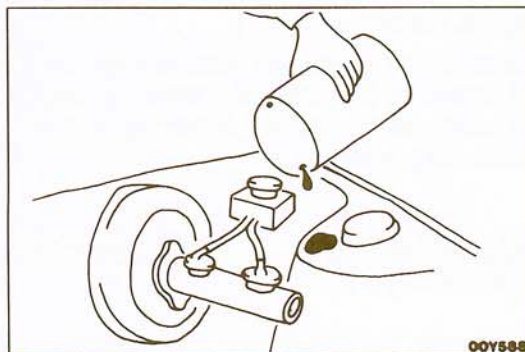
Be careful to avoid spilling any gasoline, oil, etc., because if it adheres to any tubes or other rubber parts, they might be adversely affected.



F00028

### LUBRICANTS

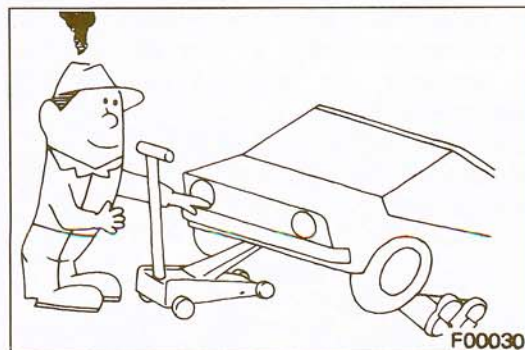
In accordance with the instructions in this Workshop Manual, apply the specified lubricants in the specified locations during assembly and installation.



00Y588

### BRAKE FLUID

Be careful to avoid spilling any brake fluid, because if it adheres to the vehicle body, the paint coat might be discolored.



F00030

### DOING SERVICE WORK IN GROUPS OF TWO OR MORE TECHNICIANS

If the service work is to be done by two or more technicians extra caution must be taken.

**NOTE ON INSTALLATION OF RADIO EQUIPMENT**

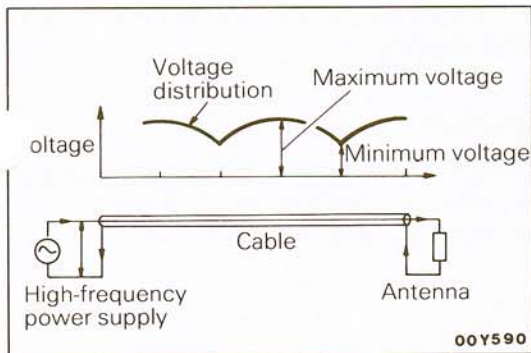
N00EA--

The computers of the electronic control system has been designed so that external radio waves will not interfere with their operation.

However, if antenna or cable of amateur transceiver etc. is routed near the computers, it may affect the operation of the computers, even if the output of the transceiver is no more than 25W.

To protect each of the computers from interference by transmitter (hum, transceiver, etc.), the following should be observed.

1. Install the antenna on the roof.
2. Because radio waves are emitted from the coaxial cable of the antenna, keep it 200 mm (8 in.) away from the computers and the wiring harness. If the cable must cross the wiring harness, route it so that it runs at right angles to the wiring harness.
3. The antenna and the cable should be well matched, and the standing-wave ratio\* should be kept low.
4. A transmitter having a large output should not be installed in the vehicle.
5. After installation of transmitter, run the engine at idle, emit radio waves from the transmitter and make sure that the engine is not affected.

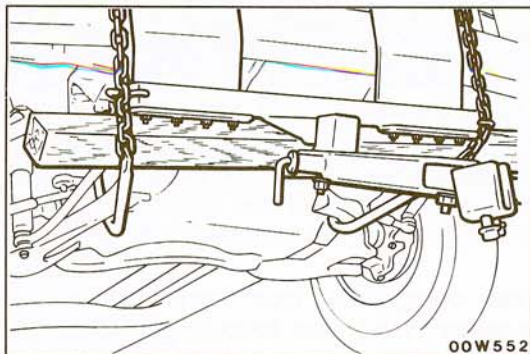
**\*STANDING-WAVE RATIO**

If an antenna and a cable having different impedances are connected, the input impedance  $Z_i$  will vary in accordance with the length of the cable and the frequency of the transmitter, and the voltage distribution will also vary in accordance with the location.

The ratio between this maximum voltage and minimum voltage is called the standing-wave ratio. It can also be represented by the ratio between the impedances of the antenna and the cable.

The amount of radio waves emitted from the cable increases as the standing-wave ratio increases, and this increases the possibility of the electronic components being adversely affected.





## TOWING AND HOISTING

N00GA--

This vehicle can only be towed from the front with conventional sling-type equipment and tow chain with grab hooks.

If a vehicle is towed from the rear, use a tow dolly.

A lumber spacer (4" x 4" x 55" wood beam) should be placed forward of under guard and under towing hook/shipping tie down hook.

Then, attach J-hook to the lower arm.

A safety chain system must be used. This system must be completely independent of the primary lifting and towing attachment. Care must be taken in the installation of safety chains to insure they do not cause damage to bumper, painted surfaces or lights.

## LIFTING-GROUND CLEARANCE

Towed vehicle should be raised until wheels are a minimum of 10 cm (4 in.) from the ground. Be sure there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or when crossing sharp rises such as curbs. If necessary, ground clearance can be increased by removing the wheels from the lifted end of the disabled vehicle and carrying the lifted end closer to the ground. A 20 cm (8 in.) ground clearance must be maintained between brake drums and ground.

## FRONT TOWING PICKUP

The vehicle may be towed on its rear wheels for extended distances, provided the parking brake is released.

Make certain the transmission remains in "NEUTRAL".

## SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle.

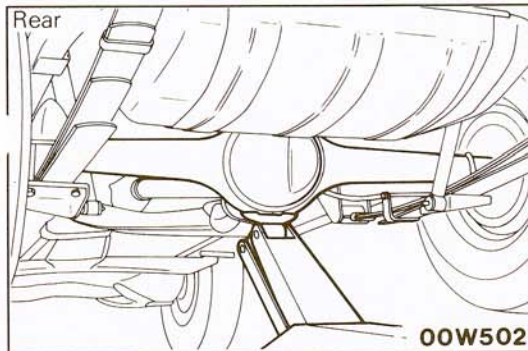
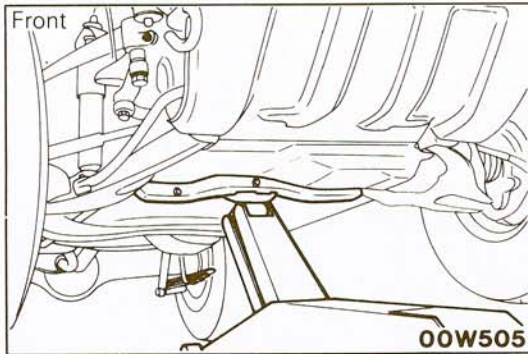
1. Remove exhaust tips and any other optional equipment, that interface with the towing sling. Padding (heavy shop towel or carpeting) should be placed between the towing sling cross bar and any painted surfaces, and bumper surfaces.
2. A safety chain system completely independent of the primary lifting and towing attachment must be used.
3. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured prior to moving the vehicle.
4. Operator should refrain from going under a vehicle unless the vehicle is adequately supported by safety stands.
5. Never allow passengers to ride in a towed vehicle.
6. State and local rules and regulations must be followed when towing a vehicle.

## HOISTING

### POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order to support the vehicle at the proper locations. (See next page)

Conventional hydraulic hoists may be used after determining that the adapter plates will make firm contact with the side frame.



### FLOOR JACK

A regular floor jack may be used under the front crossmember or rear axle housing.

#### Caution

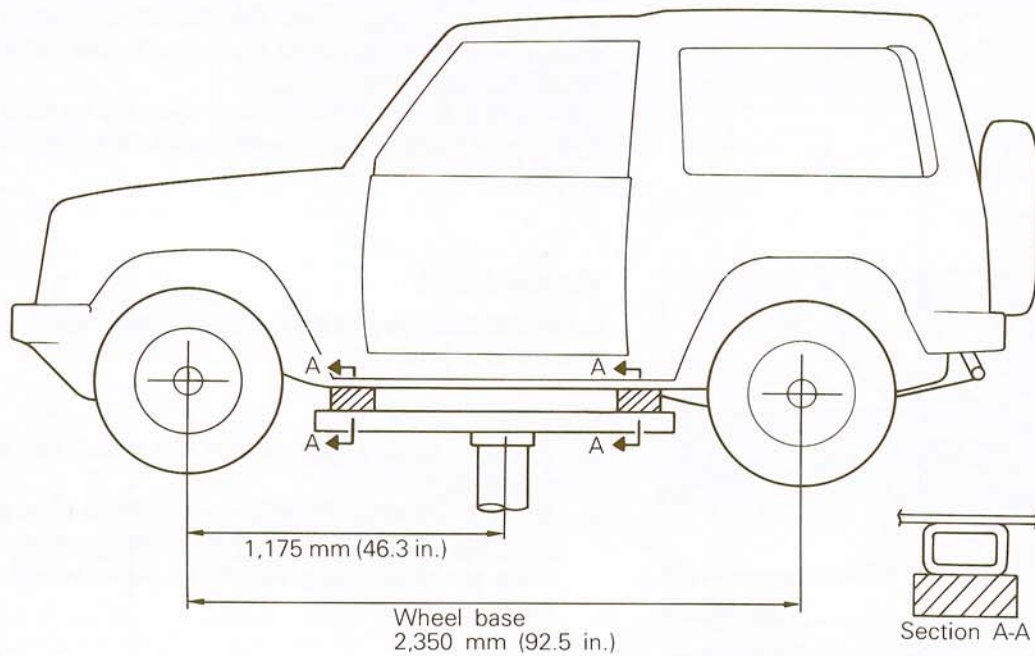
1. A floor jack must never be used on any part of the underbody.
2. Do not attempt to raise one entire side of the vehicle by placing a jack midway between front and rear wheels. This practice may result in permanent damage to the body.

### EMERGENCY JACKING

Jack receptacles are located at the No. 2 crossmember and rear axle housing to accept the jack supplied with the vehicle for emergency road service. Always block the opposite wheels and jack only on a level surface.



## FRAME CONTACT SUPPORT LOCATIONS

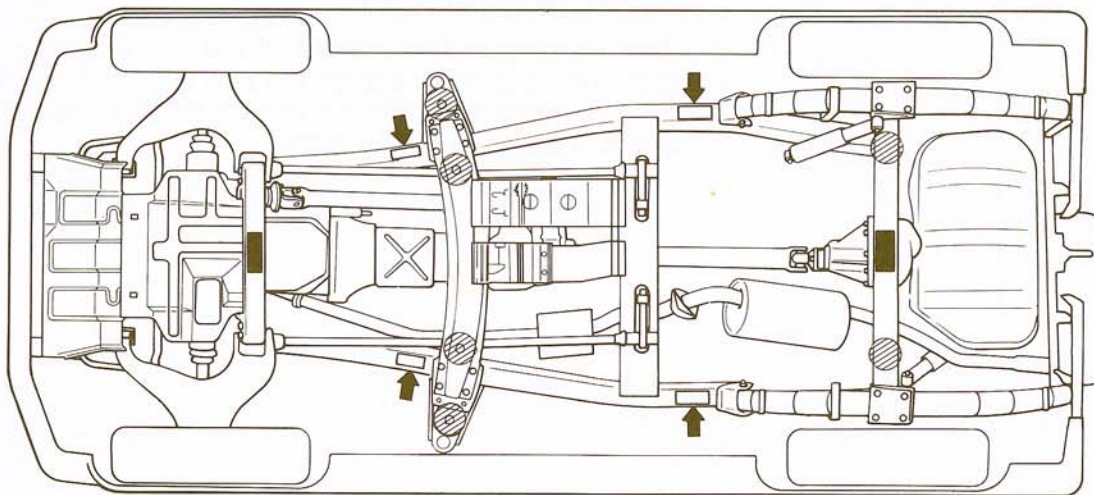


## NOTE

The locations of the support point shown as Section A-A are the same as those of the twin post hoist shown in the illustration (00W588) below.

00W553

## LIFTING AND JACKING SUPPORT LOCATIONS



← Twin post hoist

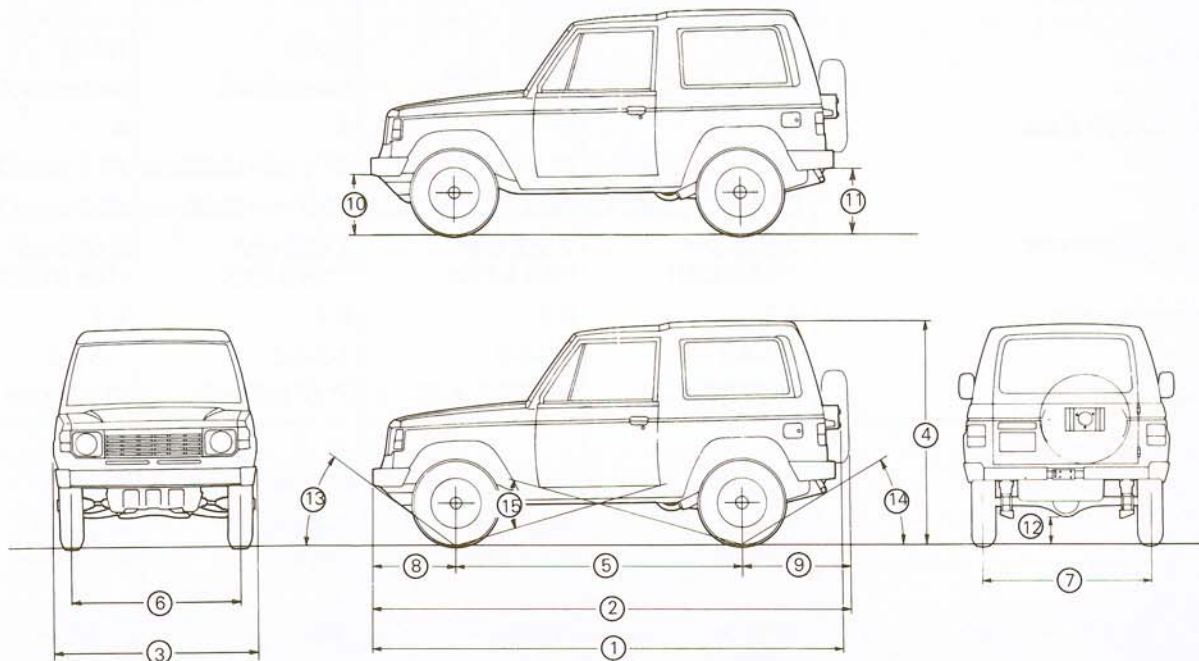
■ Floor jack

● Emergency jacking (jack supplied with the vehicle)

00W588

## GENERAL DATE AND SPECIFICATIONS

N00HA-A



00W556

Description		L042G	VN JL3	VR JL3	TN JL2/7	TR JL2/7
Vehicle dimensions		mm (in.)				
Overall length						
Without spare tire	①	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)	3,960 (155.9)
With spare tire	②	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)	3,995 (157.3)
Overall width		③	1,680 (66.1)	1,680 (66.1)	1,680 (66.1)	1,680 (66.1)
Overall height		④	1,840 (72.4)	1,840 (72.4)	1,850 (72.8)	1,850 (72.8)
Wheelbase		⑤	2,350 (92.5)	2,350 (92.5)	2,350 (92.5)	2,350 (92.5)
Tread	Front	⑥	1,400 (55.1)	1,400 (55.1)	1,400 (55.1)	1,400 (55.1)
	Rear	⑦	1,375 (54.1)	1,375 (54.1)	1,375 (54.1)	1,375 (54.1)
Overhang	Front	⑧	745 (29.3)	745 (29.3)	745 (29.3)	745 (29.3)
	Rear	⑨	900 (35.4)	900 (35.4)	900 (35.4)	900 (35.4)
Height at curb weight		(wt.)				
Front bumper to ground	⑩	480 (18.9)	480 (18.9)	480 (18.9)	480 (18.9)	480 (18.9)
Rear bumper to ground	⑪	440 (17.3)	440 (17.3)	440 (17.3)	440 (17.3)	440 (17.3)
Minimum running ground clearance	⑫	210 (8.3)	210 (8.3)	210 (8.3)	210 (8.3)	210 (8.3)
Angle of approach	⑬	38°	38°	38°	38°	38°
Angle of departure	⑭	28°	28°	28°	28°	28°
Ramp breakover angle	⑮	21°	21°	21°	21°	21°
Vehicle weights		kg (lbs.)				
Curb weight			1,479 (3,260)	1,493 (3,290)	1,440 (3,175)	1,460 (3,219)
Gross vehicle weight rating			1,910 (4,210)	1,910 (4,210)	1,910 (4,210)	1,910 (4,210)
Gross axle weight rating	Front		1,100 (2,425)	1,100 (2,425)	1,100 (2,425)	1,100 (2,425)
	Rear		1,450 (3,197)	1,450 (3,197)	1,450 (3,197)	1,450 (3,197)
Seating capacity			4	4	2	2



Description	L042G	VNJL3	VRJL3	TNJL2/7	TRJL2/7
<b>Engine</b>					
Model No.		G54B	G54B	G54B	G54B
Type		In-line OHC	In-line OHC	In-line OHC	In-line OHC
Number of cylinders		4	4	4	4
Bore		91.1 mm (3.59 in.)	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)	91.1 mm (3.59 in.)
Stroke		98.0 mm (3.86 in.)	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)	98.0 mm (3.86 in.)
Piston displacement		2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)	2,555 cm <sup>3</sup> (155.9 CID)
Compression ratio		8.7	8.7	8.7	8.7
Firing order		1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Basic ignition timing		7° BTDC ± 2°	7° BTDC ± 2°	7° BTDC ± 2°	7° BTDC ± 2°
<b>Transmission &amp; transfer case</b>					
Model No.		KM145	KM148	KM145	KM148
Type		5-speed manual	4-speed automatic	5-speed manual	4-speed automatic
<b>Gear ratio</b>					
Transmission	1st	3.967	2.826	3.967	2.826
	2nd	2.136	1.493	2.136	1.493
	3rd	1.360	1.000	1.360	1.000
	4th	1.000	0.688	1.000	0.688
	5th	0.856	–	0.856	–
	Reverse	3.578	2.703	3.578	2.703
Transfer case	High	1.000	1.000	1.000	1.000
	Low	1.944	1.944	1.944	1.944
Final ring gear ratio		4.625	4.625	4.625	4.625
<b>Clutch</b>					
Type		Dry single disc & diaphragm spring	–	Dry single disc & diaphragm spring	–
<b>Chassis</b>					
Tire size		P225/75R15			
Front suspension					
Type					
Spring constant		Wishbone compression type			
(Wheel position)		22 N/mm (123 lbs./in.)			
Rear suspension					
Type		Asymmetrical semi-elliptic leaf spring			
Spring constant					
At load of 1,000–2,500 N (220–551 lbs.)		22 N/mm (123 lbs./in.)			
At load of 4,670–8,870 N (1,030–1,955 lbs.)		50 N/mm (280 lbs./in.)			

Description	L042G	VN3L	VR3L	TN3L2/7	TR3L2/7
Brakes					
Type	Front Rear		Disc Drum (Leading and trailing)		
Power steering					
Gear type			Integral type (Recirculating ball nut)		
Gear ratio			16.4		
Fuel tank capacity			60 liters (15.9 U.S. gal./13.2 Imp. gal.)		

## TIGHTENING TORQUE

N00JA--

Description	Head mark ④		Head mark ⑦	
	Nm	ft.lbs.	Nm	ft.lbs.
Thread for general purposes (size x pitch) mm				
6 x 1.0	3.0–3.9	2.2–2.9	4.9–7.8	3.6–5.8
8 x 1.25	7.9–12	5.8–8.7	13–19	9.4–14
10 x 1.25	16–23	12–17	27–39	20–29
12 x 1.25	29–43	21–32	47–72	35–53
14 x 1.5	48–70	35–52	77–110	57–85
16 x 1.5	67–100	51–77	130–160	90–120
18 x 1.5	100–150	74–110	180–230	130–170
20 x 1.5	150–190	110–140	160–320	190–240
22 x 1.5	200–260	150–190	340–430	250–320
24 x 1.5	260–320	190–240	420–550	310–410

Description	Nm	ft.lbs.	Remarks
Taper thread for pipes (size)			
PT 1/8	7.9–12 16–19	5.8–8.7 12–14	Internal thread: Aluminum Internal thread: Cast iron
PT 1/4	19–30 34–45	14–22 25–33	Internal thread: Aluminum Internal thread: Cast iron
PT 3/8	39–54 58–73	29–40 43–54	Internal thread: Aluminum Internal thread: Cast iron
Tape thread for dry sealed pipes (size)			
NPTF 1/16	4.9–7.8 7.9–12	3.6–5.8 5.8–8.7	Internal thread: Aluminum Internal thread: Cast iron
NPTF 1/8	7.9–12 16–19	5.8–8.7 12–14	Internal thread: Aluminum Internal thread: Cast iron
NPTF 1/4	19–13 34–45	14–22 25–33	Internal thread: Aluminum Internal thread: Cast iron





# ELECTRICAL

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N08AA--

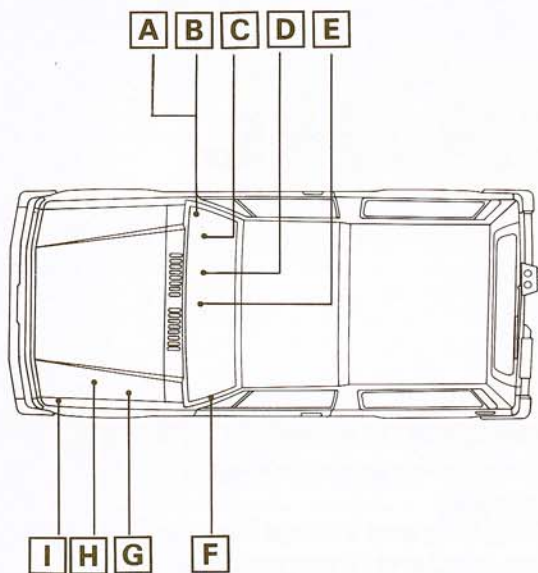
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## ELECTRICAL SYSTEM PARTS LOCATION

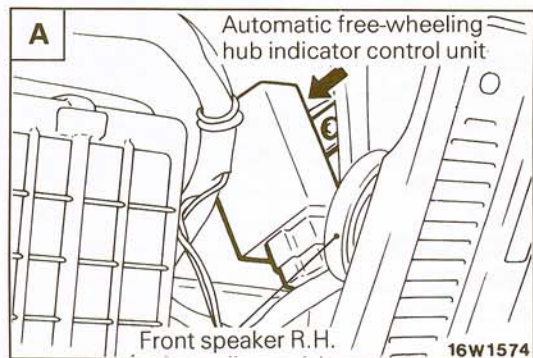
N08BAB-A

## RELAY AND CONTROL UNIT

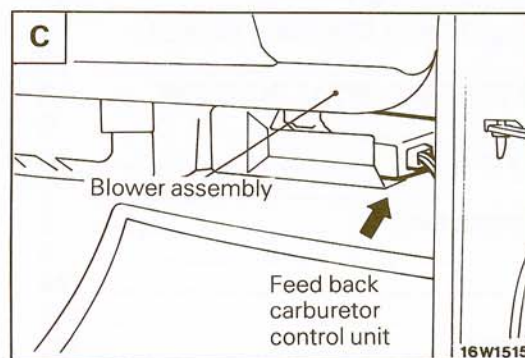


16W722

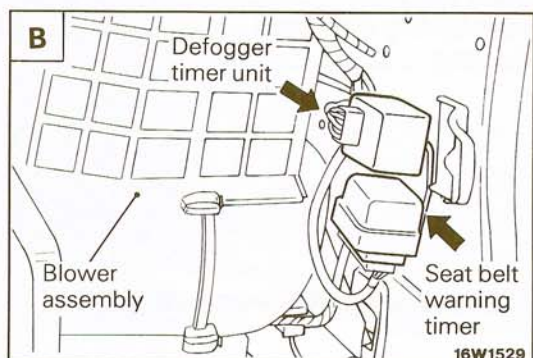
Items	Symbol
Air conditioner relay	D
Auto choke relay	G
Automatic free-wheeling hub indicator control unit	A
Condenser blower motor relay	H
Defogger timer unit	B
Feed back carburetor control unit	C
Hazard warning flasher unit	F
Headlight washer relay	F
Heater relay	E
Intermittent wiper relay	F
Light control relay	I
Over drive relay	F
Seat belt warning timer	B
Turn-signal flasher unit	F



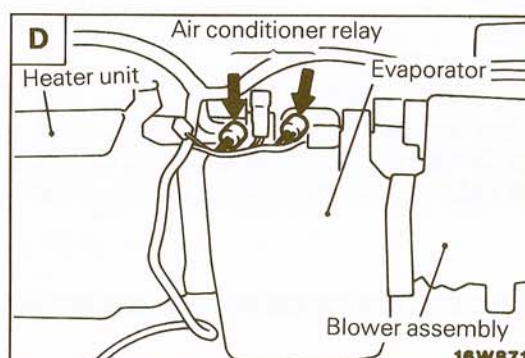
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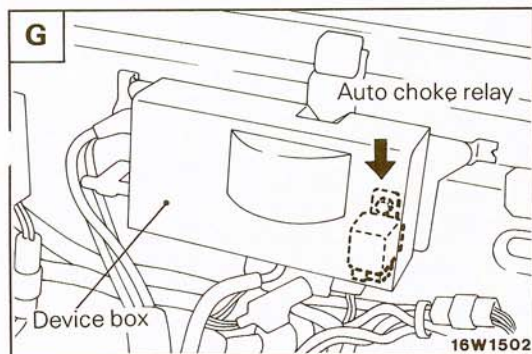
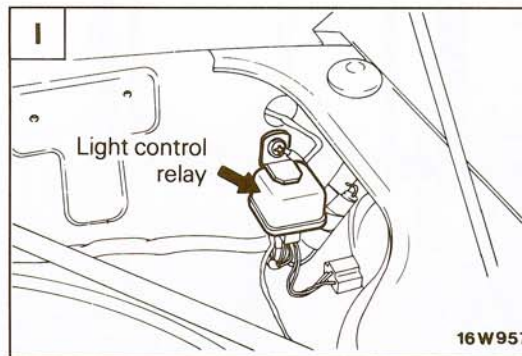
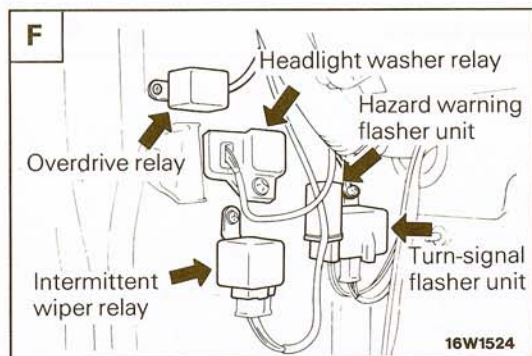
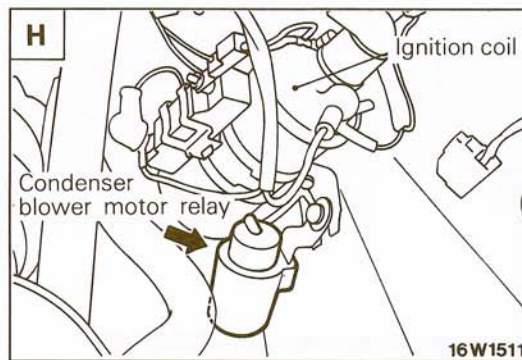
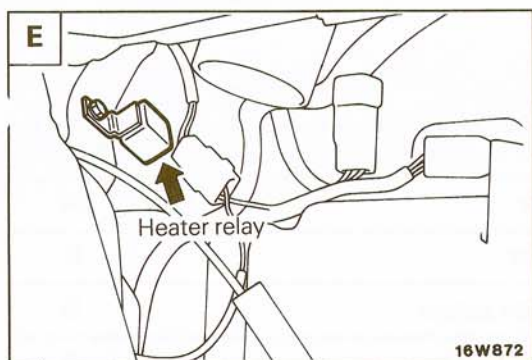
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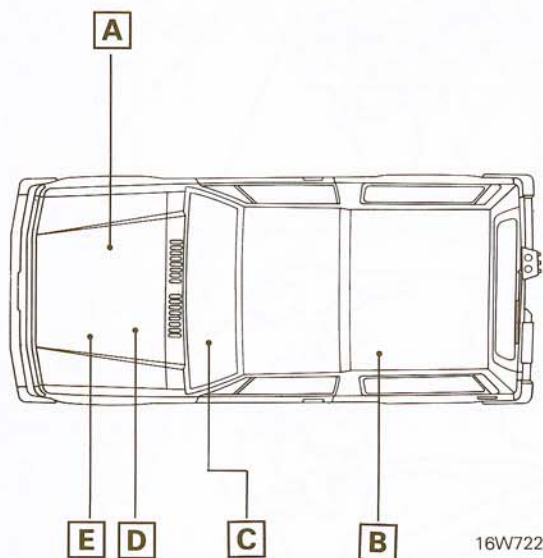


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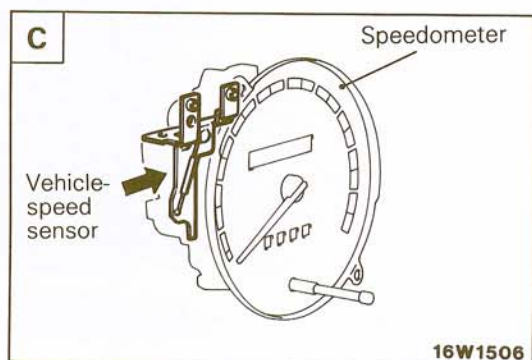
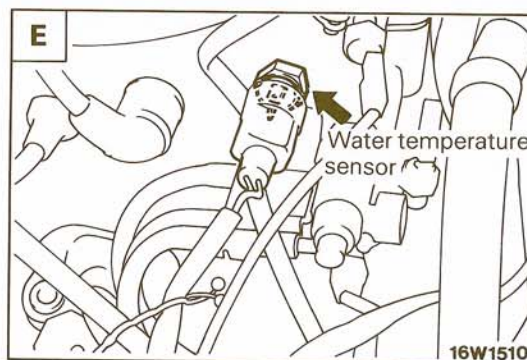
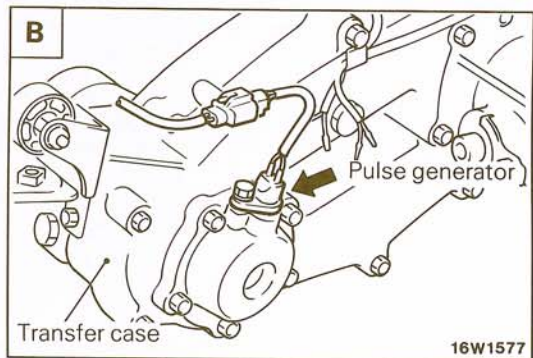
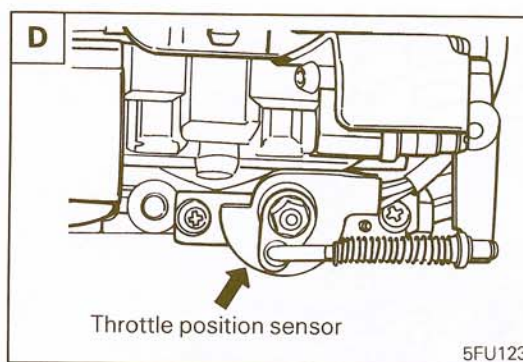
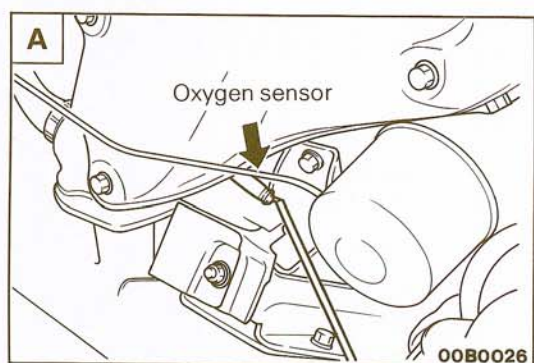


## SENSOR



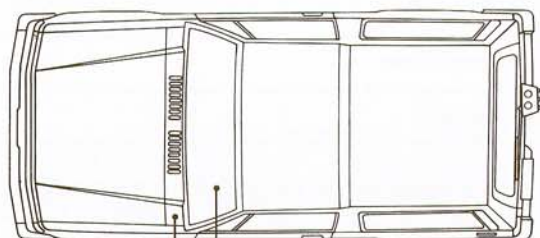
16W722

Items	Symbol
Oxygen sensor	A
Pulse generator	B
Throttle position sensor	D
Vehicle-speed sensor	C
Water temperature sensor	E



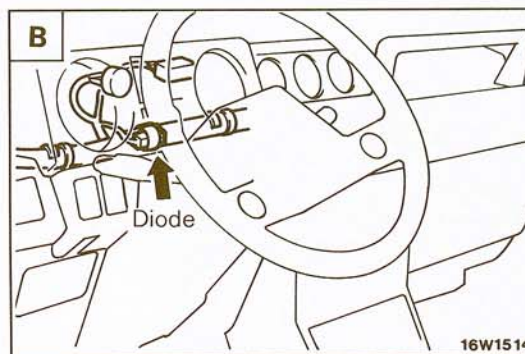
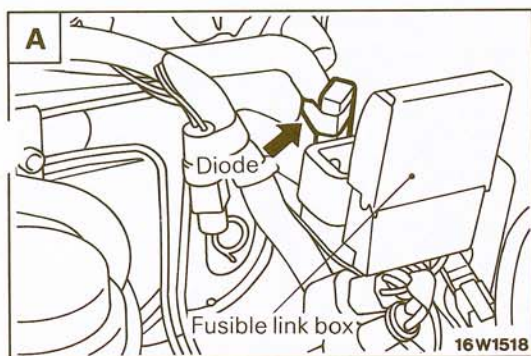
## DIODE

Items	Symbol
Diode (for automatic transmission oil temperature warning light)	A
Diode (for EGR warning light)	B



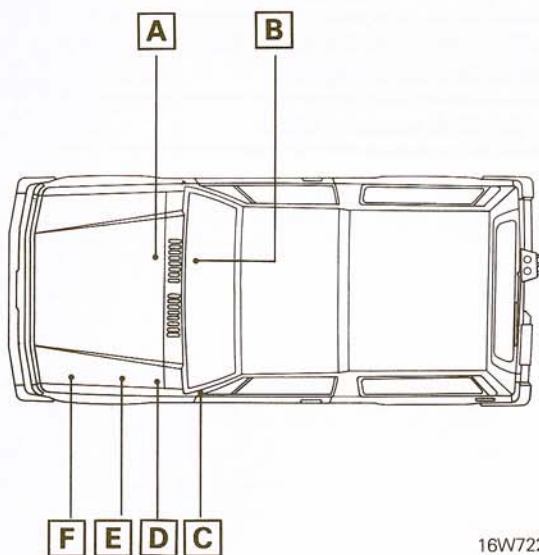
A B

16W722





## FUSIBLE LINK AND FUSE

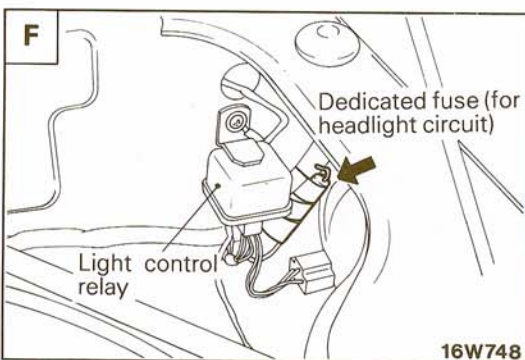
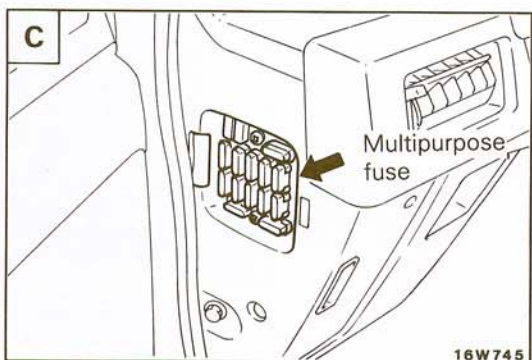
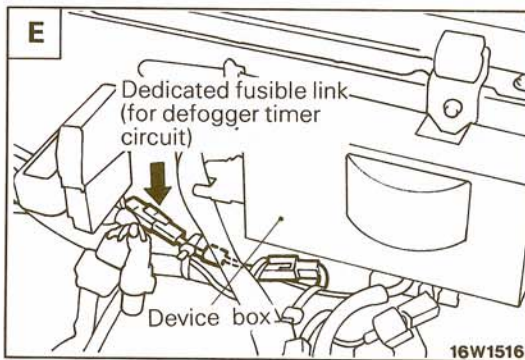
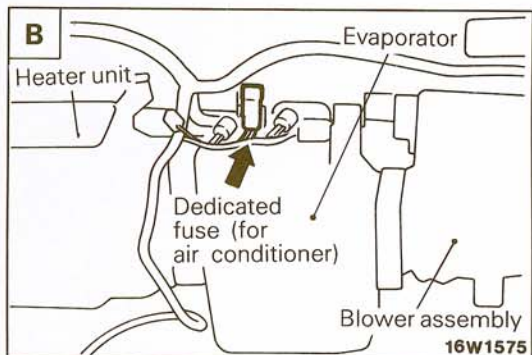
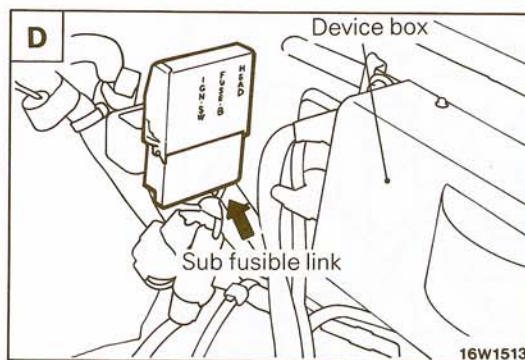
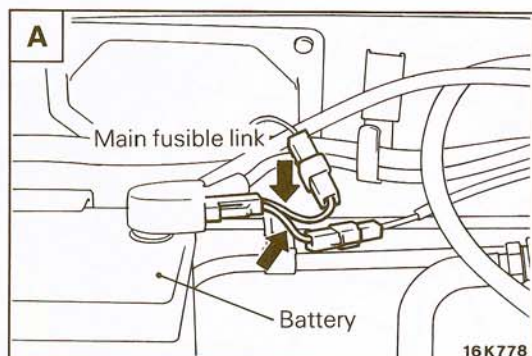


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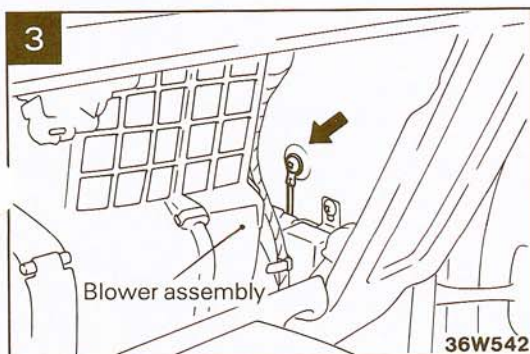
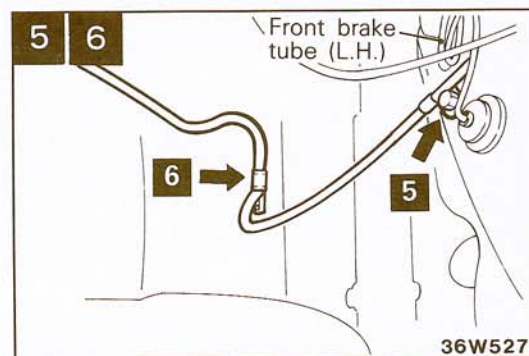
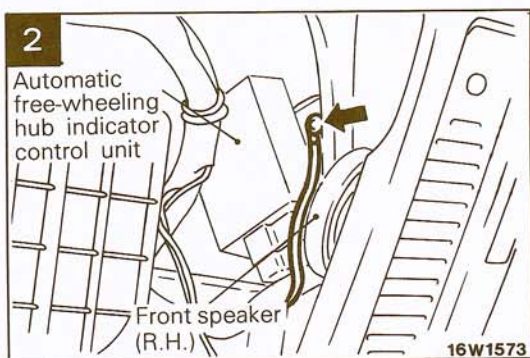
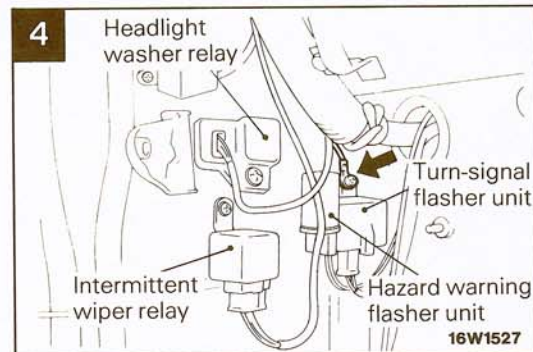
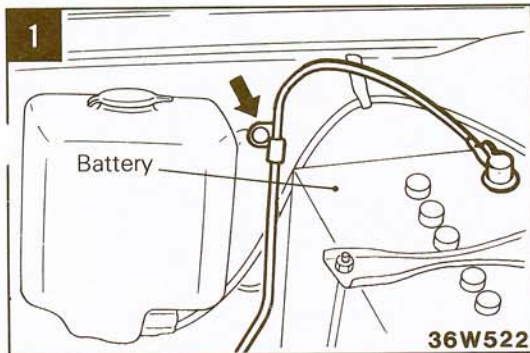
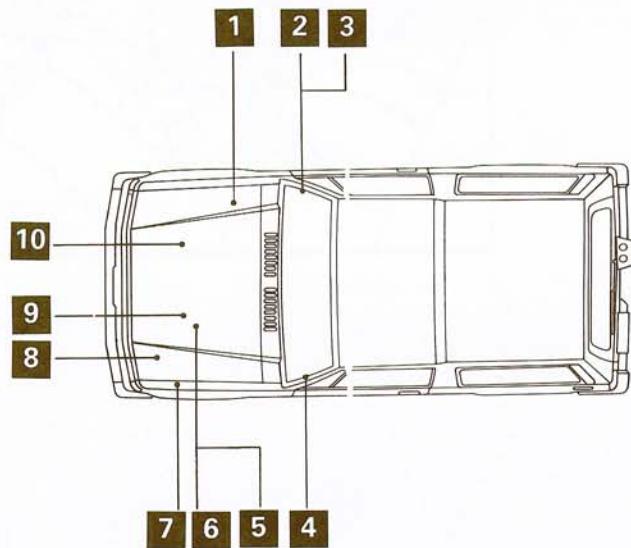
Items	Symbol
Dedicated fuse (for air conditioner circuit)	B
Dedicated fuse (for headlight circuit)	F
Dedicated fusible link (for defogger timer circuit)	E
Main fusible link	A
Multipurpose fuse	C
Sub fusible link	D

## NOTE

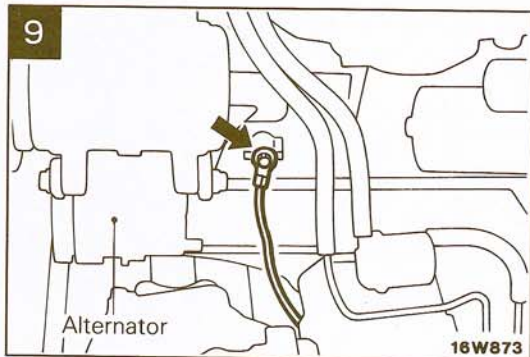
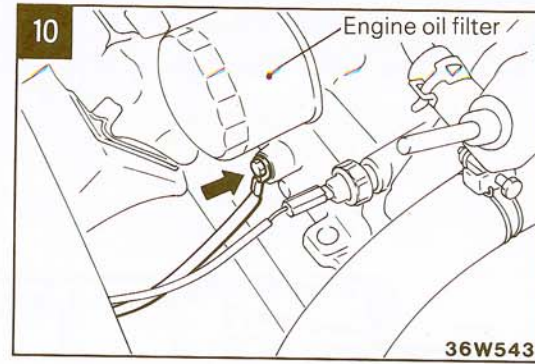
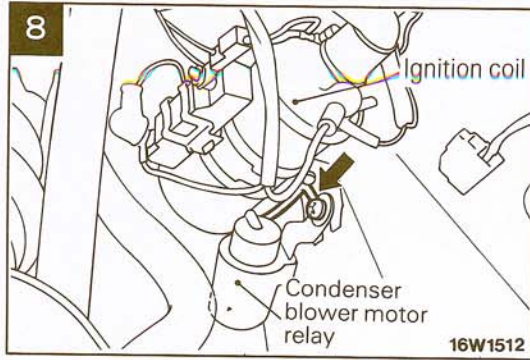
For detailed information concerning the fusible links and fuses, refer to the section regarding CENTRALIZED JUNCTION (P.8-67, 68)

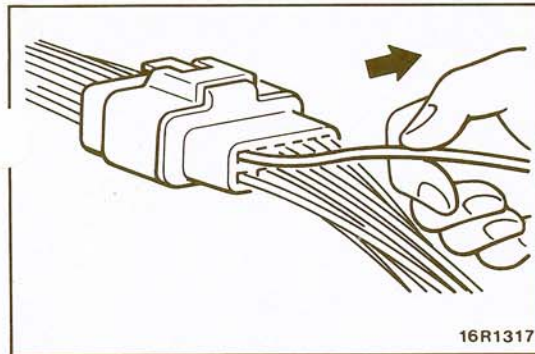
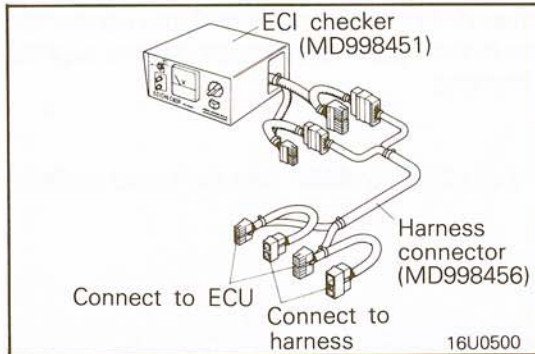
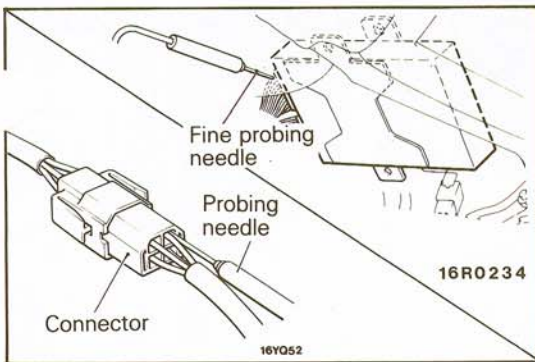


## GROUNDING









## INSPECTION OF HARNESS CONNECTOR

N08CAAA

### CONTINUITY AND VOLTAGE TEST FOR CONNECTOR

Following procedures shall be followed for testing continuity and voltage at connector in order to prevent improper contact and deterioration of waterproof in connector.

#### CONVENTIONAL (NON-WATERPROOF) CONNECTOR

Check shall be done by inserting a probing needle from harness side.

#### WATER PROOF CONNECTOR

##### Caution

**Do not insert probing needle from harness side as it will deteriorates waterproof and cause for rusting. To inspect the energized circuit, use the ECI checker.**

### CHECK FOR IMPROPER ENGAGEMENT OF TERMINAL

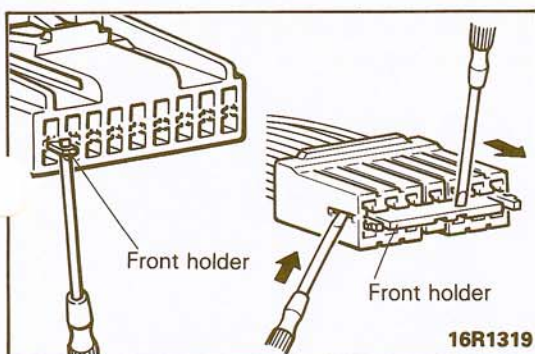
When terminal stopper of connector is out of order, engagement of male and female terminals becomes improper even when connector itself is engaged perfectly and terminal sometimes slips out to rear side of connector. Ascertain, therefore, that each terminal does not come off connector by pulling each harness wire.

### ENGAGING AND DISENGAGING OF CONNECTOR TERMINAL

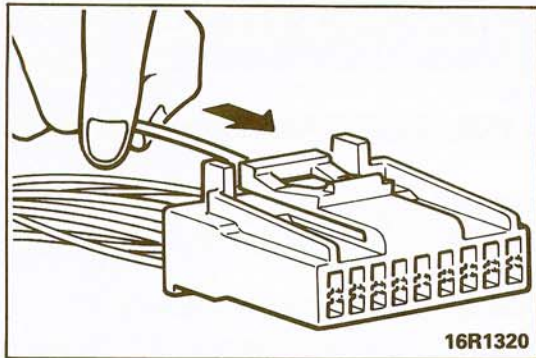
Connector which gives loose engagement shall be rectified by removing female terminal from connector housing and raise its lance to establish securer engagement. Removal of connector housing and raise its lance to establish securer engagement. Removal of connector terminal used for ECI and ELC 4 A/T control circuit shall be done in the following manner.

#### COMPUTER CONNECTOR

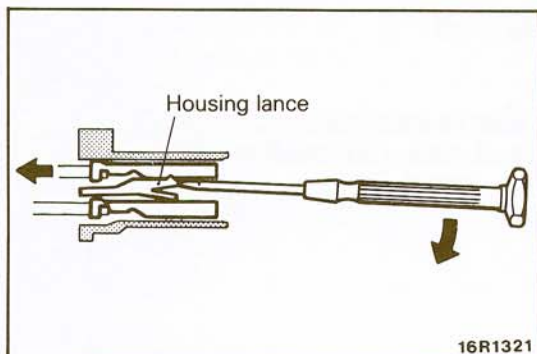
- (1) Insert screwdriver [1.4 mm (.06 in.) width] as shown in the figure, disengage front holder and remove it.







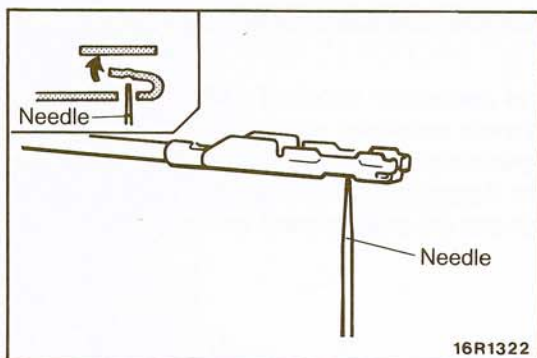
- (2) Insert harness of terminal to be rectified deep into connector from harness side and hold it there.



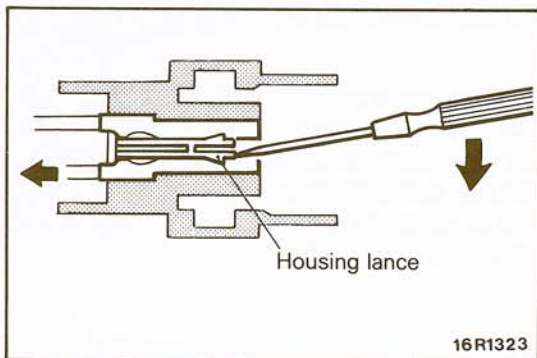
- (3) Insert tip of screwdriver [1.4 mm (.06 in.) width] into connector in a manner as shown in the figure, raise housing lance slightly with it and pull out harness.

#### NOTE

Tool No. 753787-1 supplied by AMP can be used instead of screwdriver.

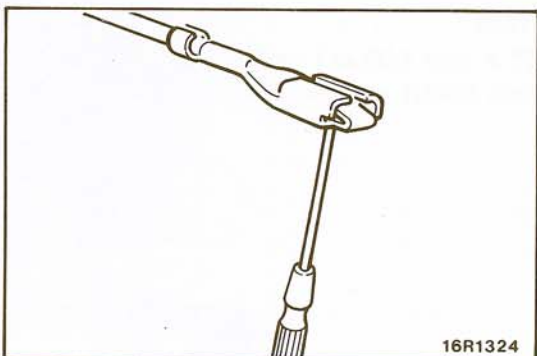


- (4) Insert needle through a hole provided on terminal and raise contact point of male terminal.

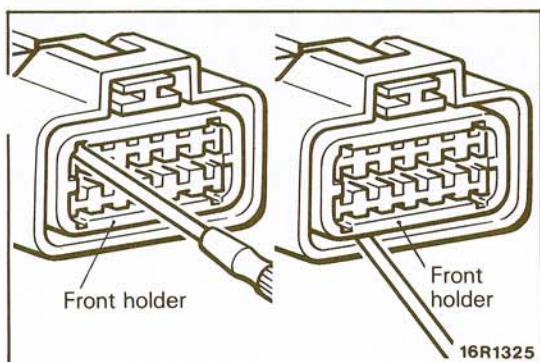


#### ROUND WATERPROOF CONNECTOR

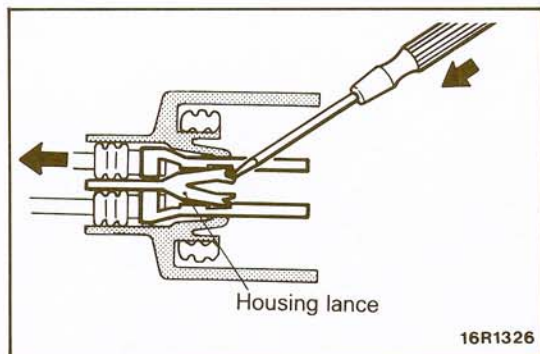
- (1) Remove waterproof cap by using a screwdriver.  
 (2) Insert tip of screwdriver [1.4 mm (.06 in.) or 2.0 mm (.08 in.) width] into connector in a manner as shown in the figure, raise housing lance slightly with it and pull out harness.



- (3) Insert screwdriver through a hole provided on terminal and raise contact point of male terminal.

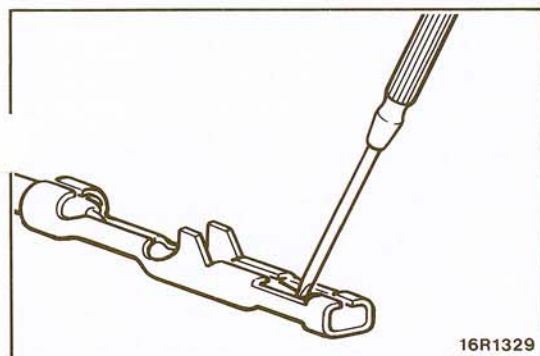
**RECTANGULAR WATERPROOF CONNECTOR**

- (1) Disengage front holder by using a screwdriver and remove it.

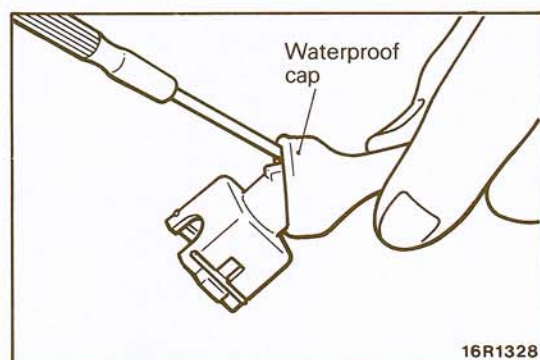


- (2) Insert tip of screwdriver [\*0.8 mm (.03 in.) width] into connector in a manner as shown in the figure, push it lightly to raise housing lance and pull out harness.

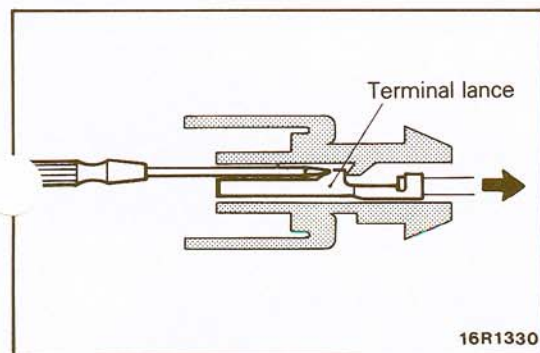
\*If right size screwdriver is not available, convert a conventional driver to suit the size.



- (3) Press contact point of male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] in a manner as shown in the figure.

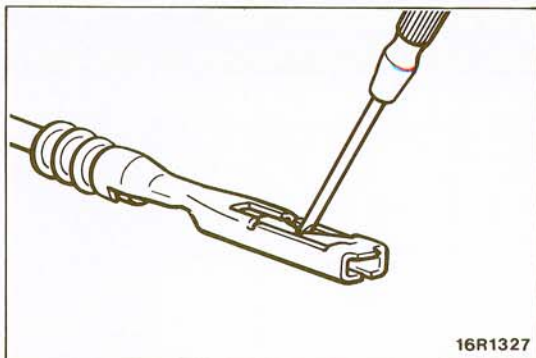
**INJECTOR CONNECTOR**

- (1) Remove waterproof cap.



- (2) Insert tip of screwdriver [1.4 mm (.06 in.) width] into connector in a manner as shown in the figure, press in terminal lance and pull out harness.





- (3) Press contact point of male terminal down by holding a screwdriver [1.4 mm (.06 in.) width] in a manner as shown in the figure.

**Caution**

**Correct lancer to be in proper condition before terminal is inserted into connector.**

# WIRING HARNESS

## TROUBLESHOOTING

N08DAAA

The most important point in troubleshooting is to determine "Probable Causes". Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. Therefore, unnecessary checks can be eliminated. The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

### TROUBLESHOOTING STEPS

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the problem symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.

#### 1 Observation of Problem Symptoms

Observe the symptom carefully. Check if there are also other problems.



#### 2 Determination of Probable Causes

In determining the probable causes, it is necessary to check the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate determination. The causes of similar problems in the past must be taken into account.



#### 3 Checking of Parts Associated with Probable Causes and Determination of Faulty Parts

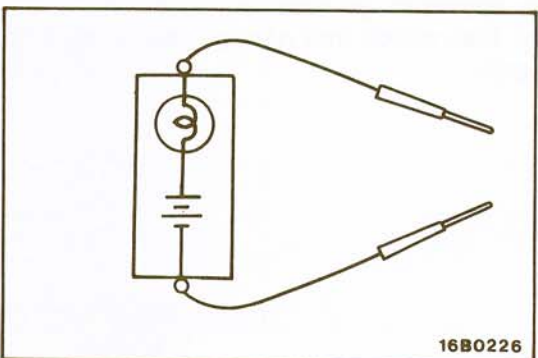
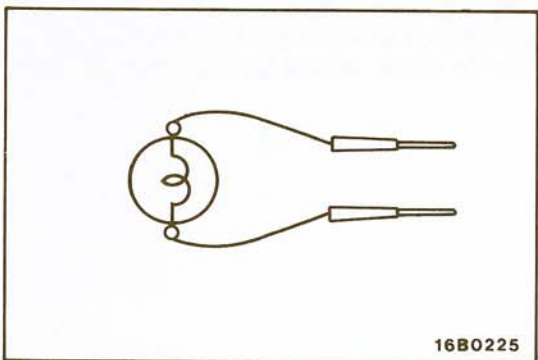
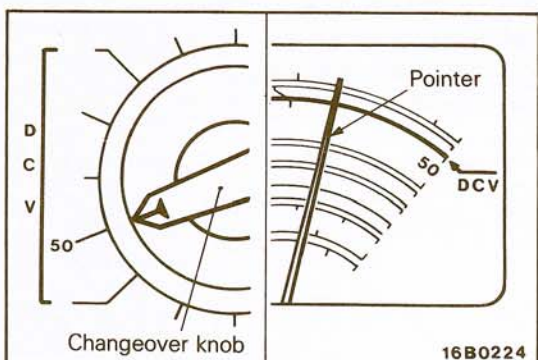
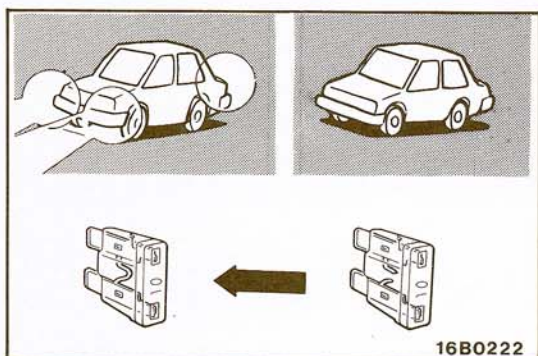
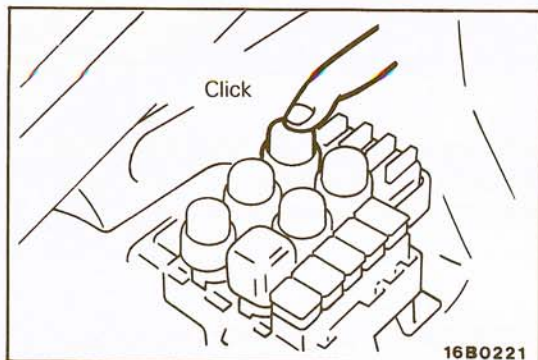
Troubleshooting is carried out by making step by step checks until the true cause is found. Always go through the procedures considering what check is to be made where for the best results.



#### 4 Repair and Confirmation

After the problems are corrected, be sure to check that the system operates correctly. Also check that new problems have not been caused by the repair.





## INSPECTION

### 1. Visual and aural checks

Check relay operation, blower motor rotation, light illumination, etc. visually or aurally. The flow of current is invisible but can be checked by the operation of the parts.

### 2. Simple checks

For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected, replace the fuse with a new one or ground the light to the body by a jumper wire to determine which part is responsible for the problem.

### 3. Checking with instruments

Use an appropriate instrument in an adequate range and read the indication correctly. You must have sufficient knowledge and experience to handle instruments correctly.

## INSPECTION INSTRUMENTS

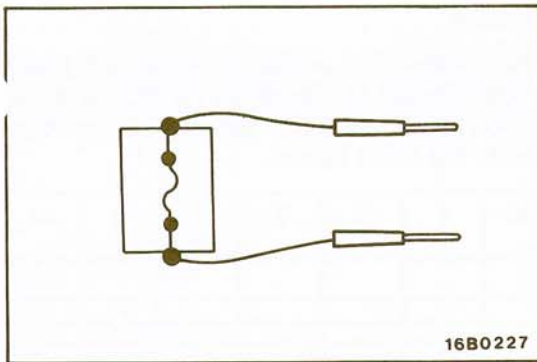
In inspection, make use of the following instruments.

### 1. Test lamps

A test lamp consists of a 12 V bulb and lead wires. It is used to check voltages or shortcircuits.

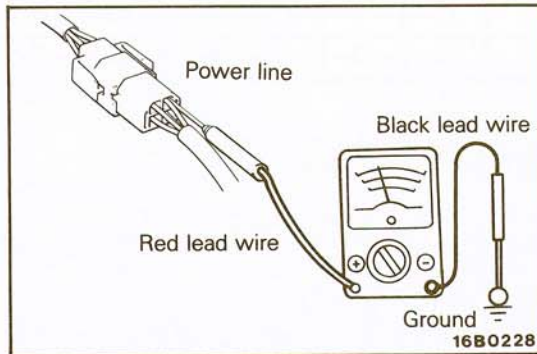
### 2. Self-power test lamp

A self-power test lamp consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.



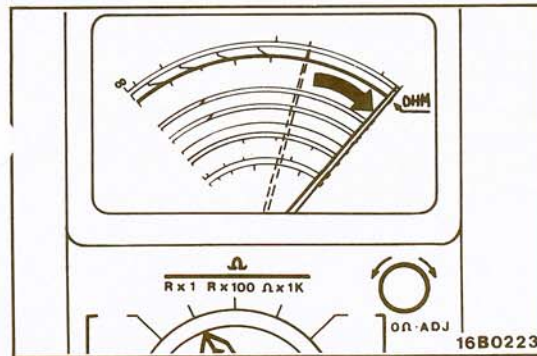
### 3. Jumper wire

A jumper wire is used to close an open circuit. Never use one to connect a power supply directly to a load.



### 4. Voltmeter

A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground.



### 5. Ohmmeter

An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.

## CHECKING SWITCHES

In a circuit diagram, a switch is represented by a symbol and in the idle state.

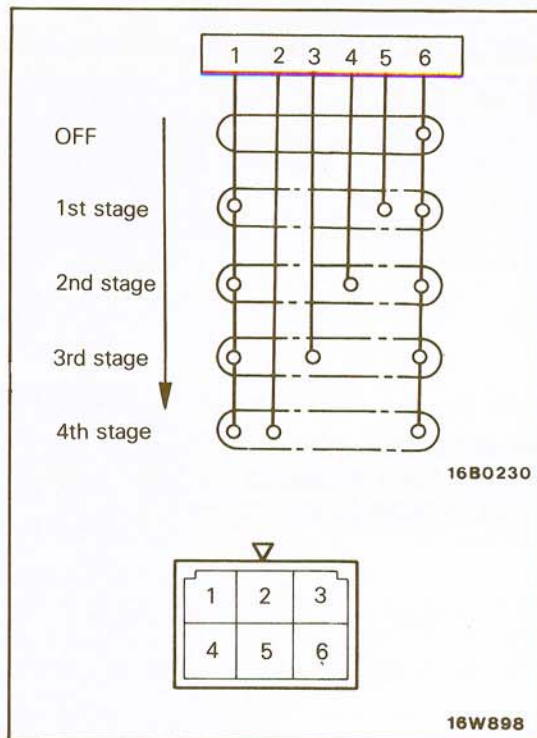
### 1. Normal open or normal close switch

Switches are classified into those which make the circuit open and those which make the circuit closed when off.

Normal open (NO) type	
OFF	ON
  Current does not flow	  Current flows
Normal close (NC) type	
OFF	ON
  Current flows	  Current does not flow

16B0229





## 2. SWITCH CONNECTION

This figure illustrates a complex switch. The switch plates indicated by solid lines move in the direction of the arrow when operated. The continuity between terminals at each position is as indicated in the table below.

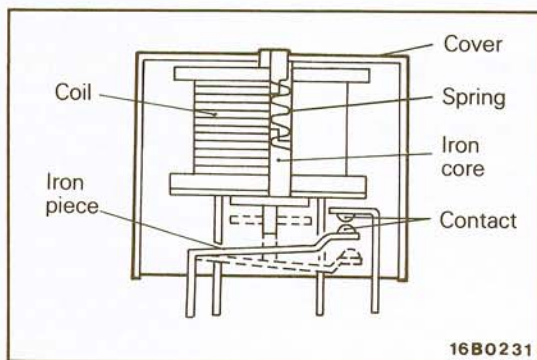
Terminal No.	1	2	3	4	5	6
Position						
OFF						
1st stage	○				○	○
2nd stage	○			○		○
3rd stage	○		○			○
4th stage	○	○				○

### NOTE

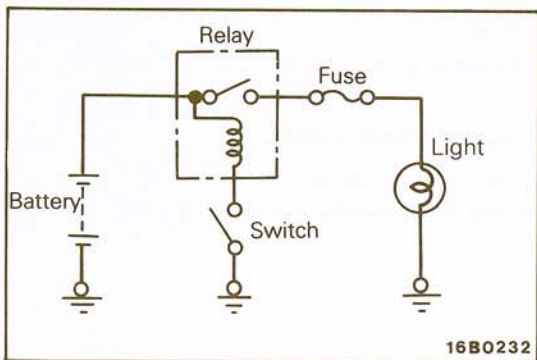
○—○ denotes continuity between terminals.

## CHECKING RELAYS

1. When current flows through the coil of a relay, its core is magnetized to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off the iron piece is made to return to its original position by a spring, opening the contact (OFF).



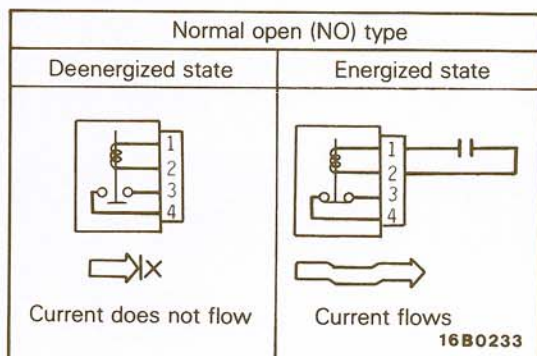
2. By using a relay, a heavy current can be turned on and off by a switch of small capacity. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing at this time to the switch is the relay coil current only and is very small.



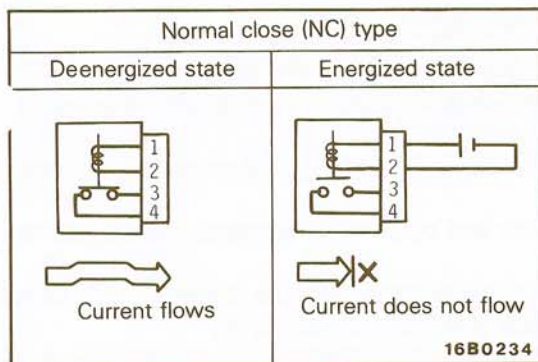
3. The relays may be classified into the normal open type and the normal close type by their contact construction.

### NOTE

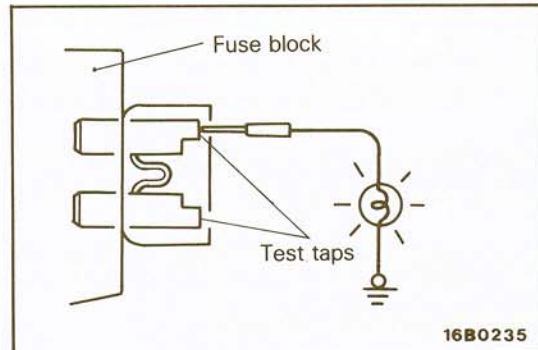
The deenergized state means that no current is flowing through the coil and the energized state means that current is flowing through the coil.







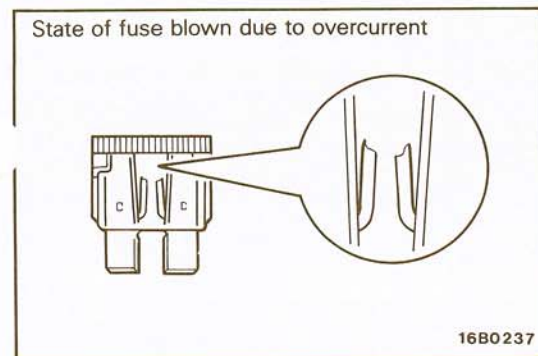
When a normal close type relay as illustrated here is checked, there should be continuity between terminals (1) and (2) and between terminals 3 and 4 when the relay is deenergized, and the continuity should be lost between terminals 3 and 4 when the battery voltage is applied to the terminals 1 and 2. A relay can be checked in this manner and it cannot be determine if a relay is okay or faulty by checking its state only when it is deenergized (or energized).



## CHECKING FUSES

A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded.

(Change the ignition switch position adequately so that the fuse circuit beomes live.)

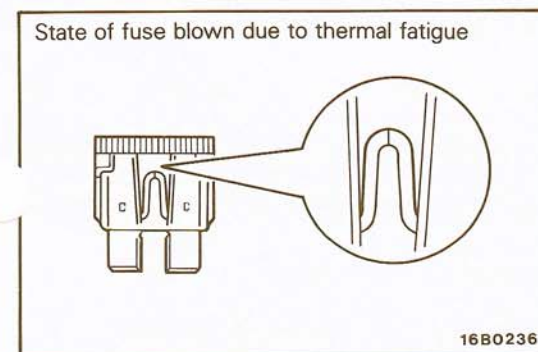


## CAUTIONS IN EVENT OF BLOWN FUSE

When a fuse is blown, there are two probable causes as follows : One is that it is blown due to flow of current exceeding its rating. The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.

### (1) Fuse blown due to current exceeding rating

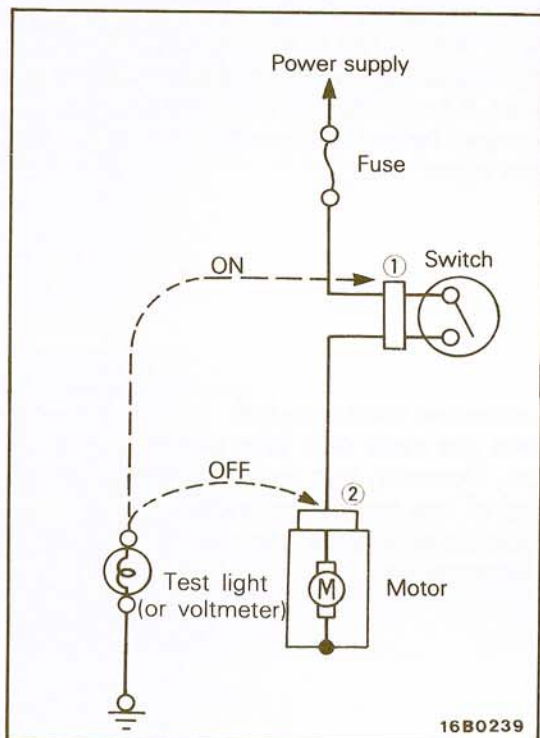
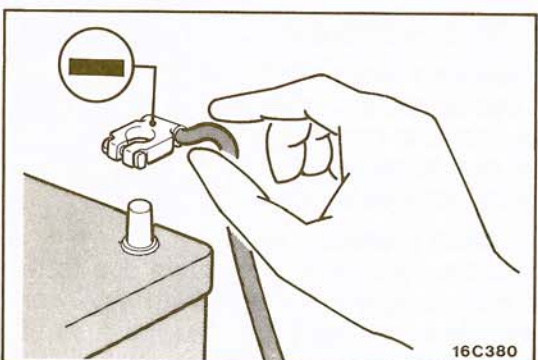
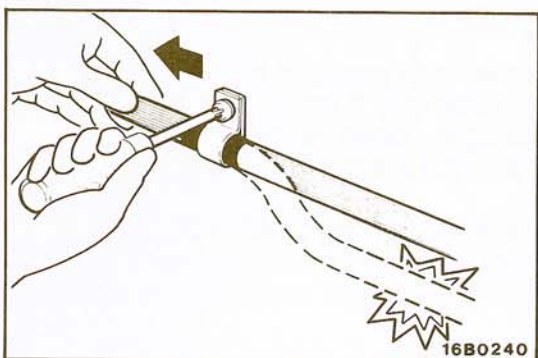
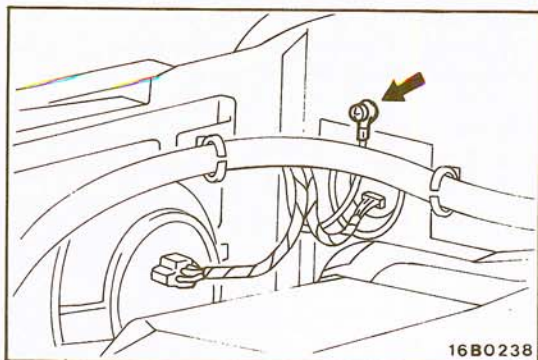
The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit for shorting and check for abnormal electric parts. Only after the correction of such shorting or parts, fuse of the same capacity should be used as a replacement. Never use a fuse of lager capacity than the one that has blown. If such a fuse is used, electric parts or wirings could be damaged before the fuse blows in the event an overcurrent occurs again.



### (2) Fuse blown due to repeated current on/off

The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after fairly long period of use and hence is less frequent than the above type. In this case, you may simply replace with a new fuse of the same capacity.





## CHECKING CABLES AND WIRES

1. Check connections for looseness, rust and stains.
2. Check terminals and wires for corrosion by battery electrolyte etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that wirings are so clamped as to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, pipe, etc.).
9. Check that wirings are clamped firmly to secure enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wirings between the fixed parts such as the vehicle body and the vibrating parts such as the engine are made with adequate allowance for vibrations.

## HANDLING ON-VEHICLE BATTERY

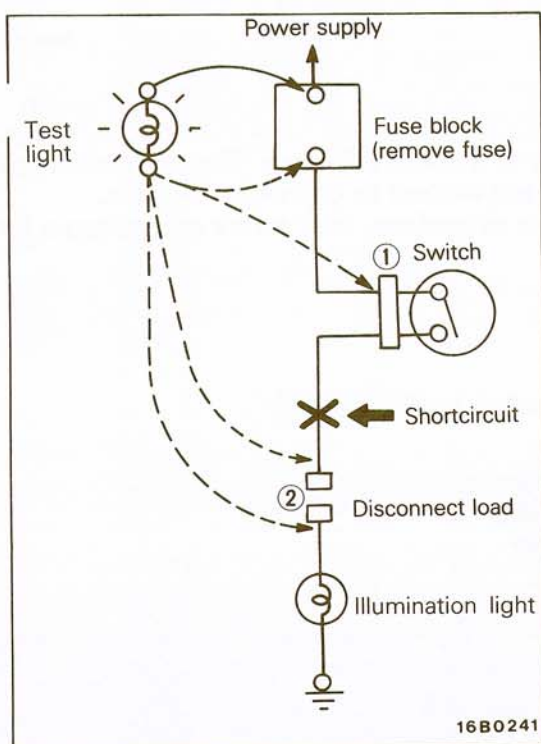
When checking or servicing does not require power from the on-vehicle battery, be sure to disconnect the cable from the battery (–) terminal. This is to prevent problems that could be caused by shorting of the circuit. Disconnect the (–) terminal first and reconnect it last.

## TROUBLESHOOTING

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, shortcircuit check and continuity check. Each of these methods is briefly described in the following.

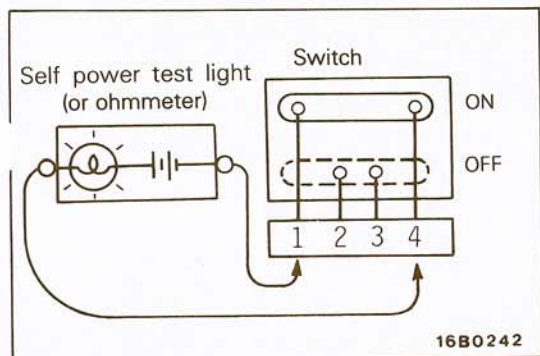
1. Voltage check
  - (1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.
  - (2) Connect the other lead wire of the test light to the power side terminal of the connector ①. The test light should come on or the voltmeter should indicate a voltage.
  - (3) Then, connect the test light or voltmeter to the connector ②. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned on in this state, the test light should come on or the voltmeter should indicate a voltage, with the motor starting to run.
  - (4) The circuit illustrated here is normal but if there is any problem such as the motor failing to run, check voltages beginning at the connector nearest to the motor unit the faulty part is identified.





## 2. CHECKING SHORTCIRCUITS

- (1) Remove the blown fuse connect the test light to the disconnected terminal. The test light should not come on.
- (2) Connect a lead wire of the test light to the power side of the connector ①. The test light should not come on.
- (3) Connect a lead wire of the test light to the load side of the connector ①. The test light should come on and the load light should also come on.
- (4) Disconnect the load at the connector ② and connect the test light lead wire to the load side of the connector ②. The test light should come on and the load light should also come on.
- (5) Connect the test light lead wire to the switch side of the connector ②. The test light should come on.
- (6) If the test conforms to any of the above conditions, there is a shortcircuit in the wiring between the connector ① and the connector ②.



## 3. CHECKING CONTINUITY

- (1) When the switch is in the OFF position, the self power test light should come on or the ohmmeter should read  $0 \Omega$  only when the terminals 2 and 3 are interconnected.
- (2) When the switch is in the ON position, the self power test light should come on or the ohmmeter should read  $0 \Omega$  only when the terminals 1 and 4 are interconnected.



## HOW TO READ WIRING DIAGRAMS

N08DBAE

### HOW TO READ CONFIGURATION DIAGRAMS

#### (1) Connector symbols

A wiring diagram shows the installed condition of each connector in a schematic style. The connectors are shown and classified as follows, depending on their locations and are marked by connector symbols. In case connectors of the same shape (same number of wires) are centralized, their colors are indicated for identification.

Example : A-12 (Black)

Connector color

Connector's unique number (serial number)

Connector symbol

A : Engine compartment

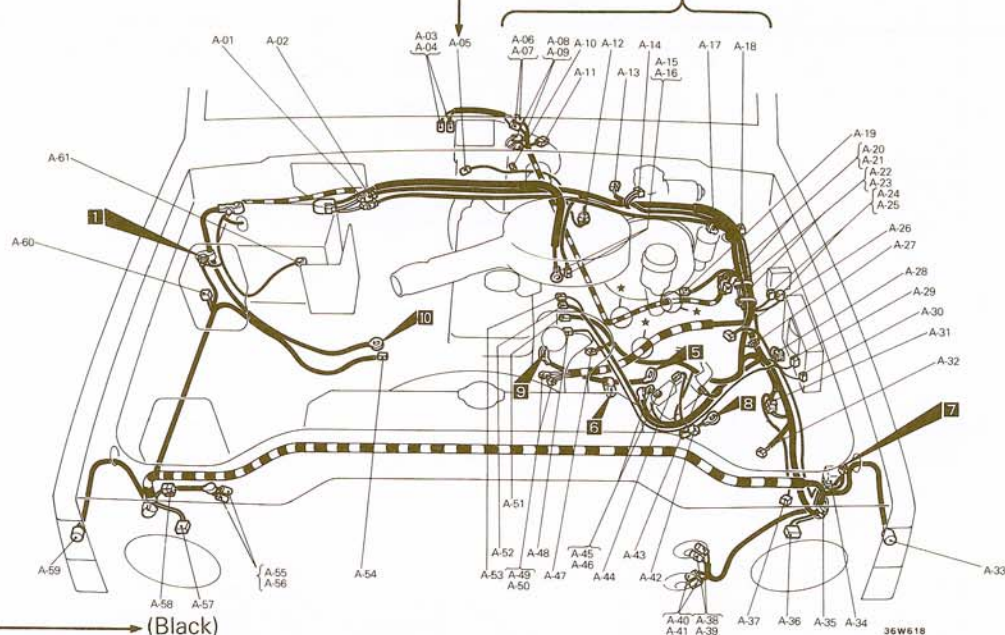
B : Interior and frame

C : Instrument panel

- A-01 } Main fusible link
- A-02 }
- A-03 } 4WD indicator switch
- A-04 }
- A-05 } Automatic transmission oil temperature switch

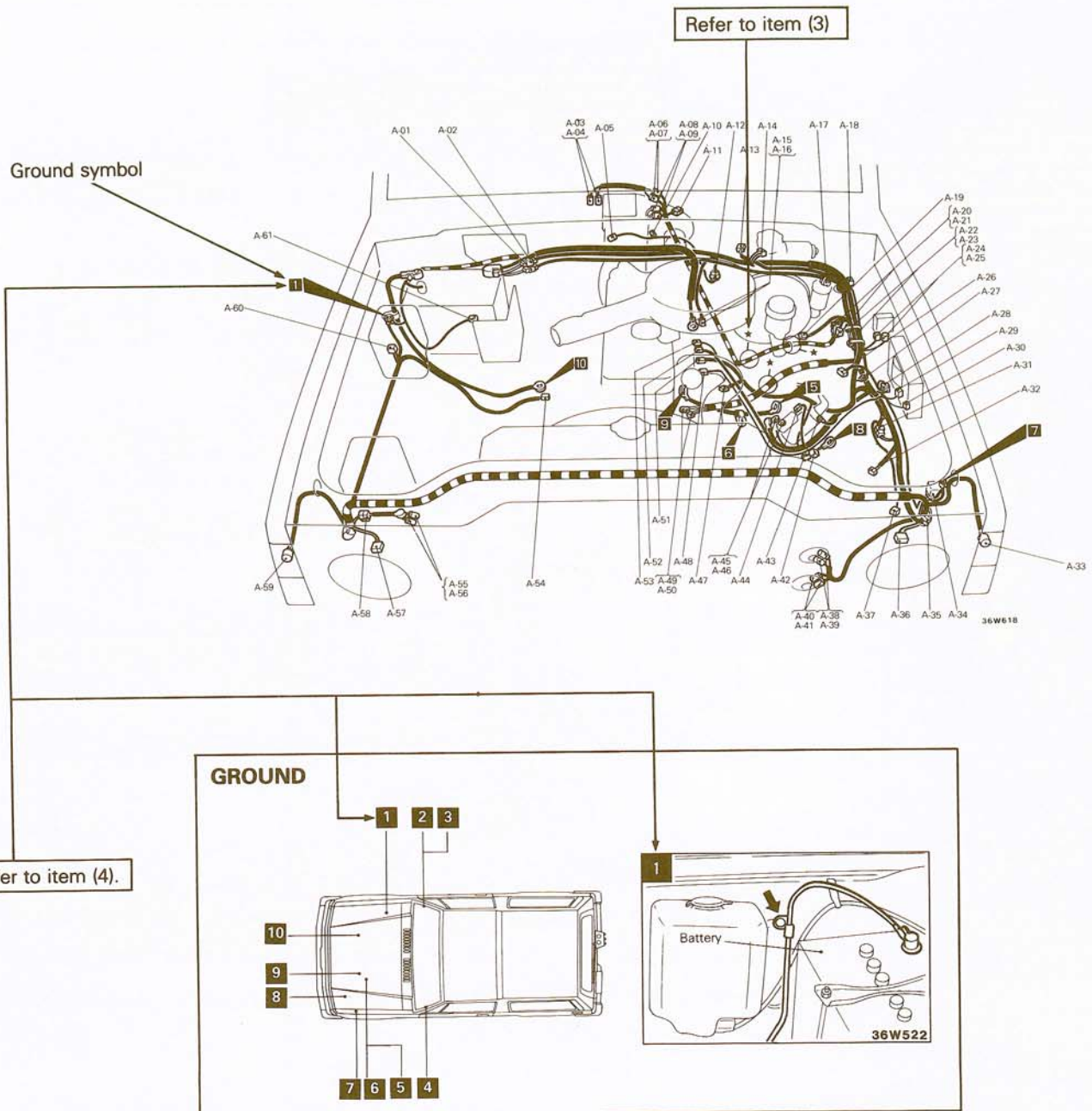
Same connector No. is used in the wiring diagram and the circuit diagram.

The first letter A of the connector symbol indicates that the connector is located in the engine compartment and the serial number (two digits) as a rule is assigned clockwise in the wiring diagram.



Indicates color of the A-58 connector.

- (2) Identification of connectors differing according to different vehicle specifications  
Without wiring harness connectors, the inter-device or -wiring harness connectors which vary in shape or position on different vehicle specifications are given the specification-dependent connector identification symbol (lower case alphabet) after a serial number.  
For detailed information on this specification-dependent symbol, refer to Item (8) under "HOW TO READ CIRCUIT DIAGRAMS".
- (3) Indication of standard mounting positions of harnesses  
The standard mounting positions of harnesses are shown with the mark ★ in wiring harness configuration diagrams.
- (4) Indication of ground point  
The position of ground points are shown in wiring harness configuration diagrams. For detailed information on the ground portion, refer to ELECTRICAL SYSTEM PARTS LOCATION (Grounding).





## HOW TO READ CIRCUIT DIAGRAMS

The circuit diagrams are functionally separated.

(1) Indication of circuit connected to another circuit

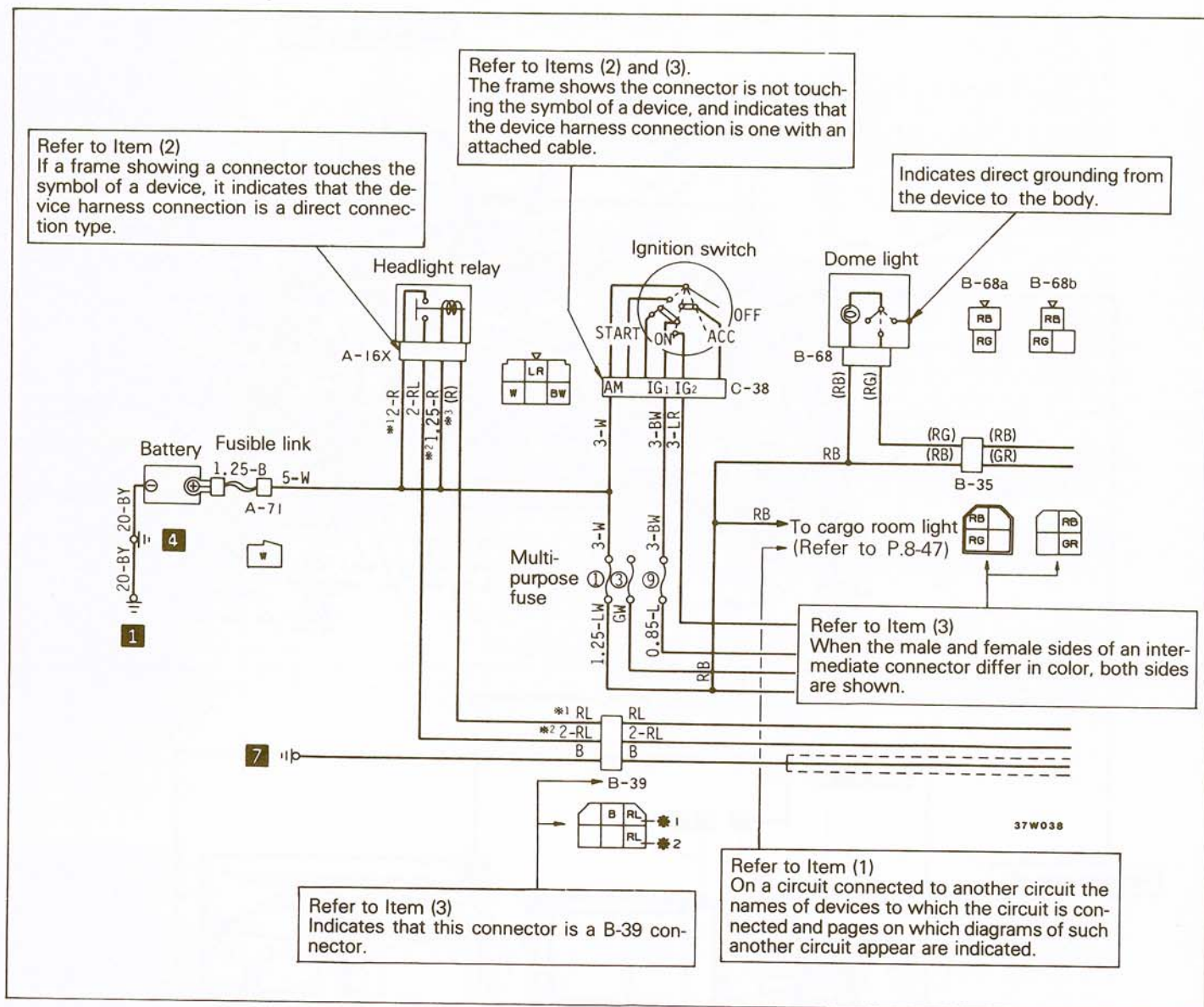
When the circuit in a circuit diagram connected to another circuit in a different diagram, the page number of that different diagram is indicated so that it can be referred to.

(2) Indication of device connections

The circuit diagram shows whether a device harness connection is one with an attached cable or is a direct connection type.

(3) Indication of connectors in circuit diagrams

A connector in a circuit diagram is shown in a frame and is assigned a connector symbol. This symbol corresponds to the symbol in a wiring harness configuration diagram so that the connector location can be known easily. An intermediate connector has its female side only shown as a rule. However both of the male and female sides are shown when they differ in wiring color.



## (4) Indication of fuses, fusible links and centralized relays

The fuses and fusible links in a circuit diagram are indicated by a wave symbol (~) and a double wave symbol (≈), respectively. At a centralized junction, the fuses are given fuse numbers and centralized relays are given connector symbols.

Example of centralized junction symbol: A – 01 x

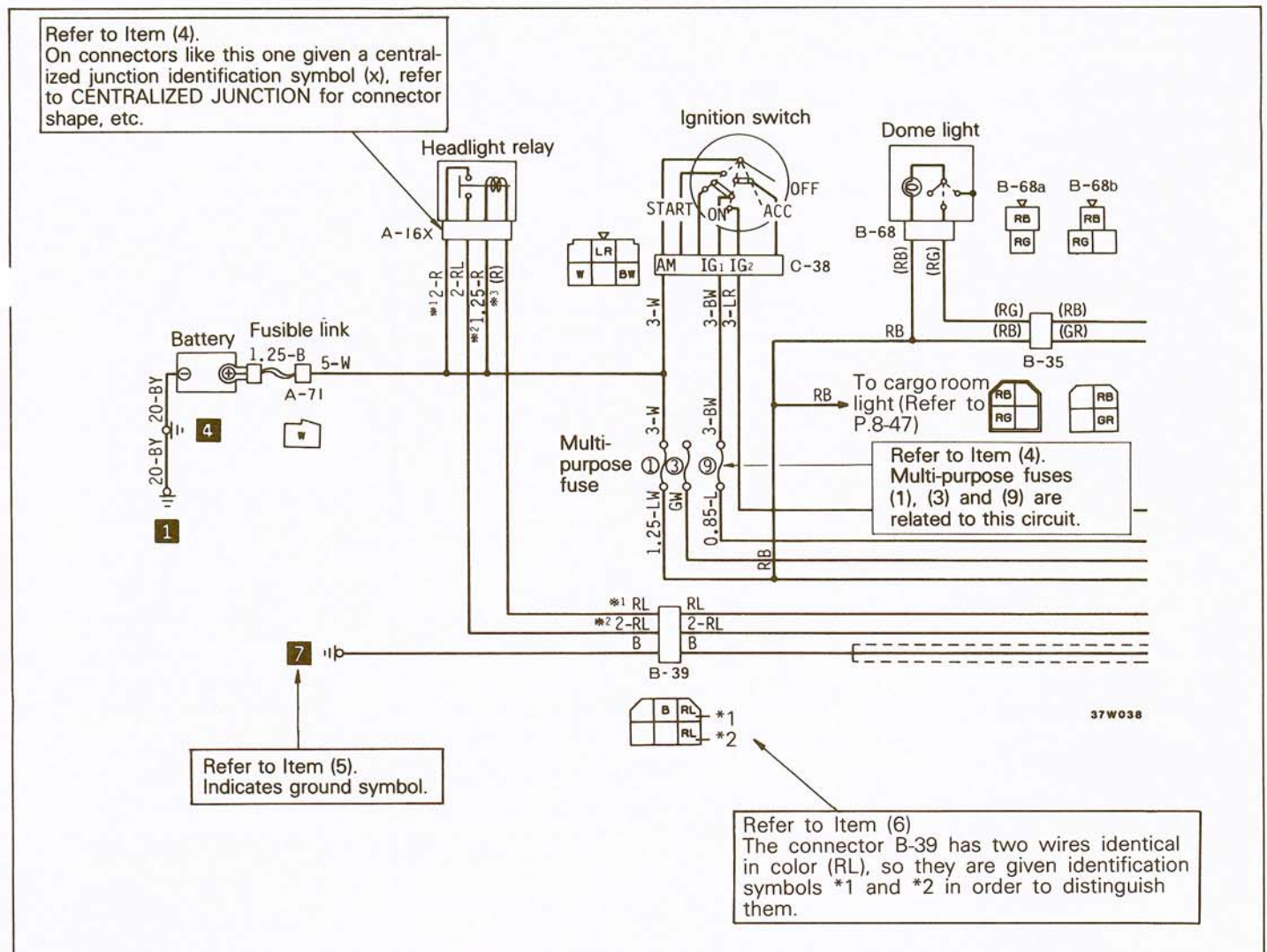
- Centralized junction indication symbol
- Connector's unique number (serial number)
- Connector symbol

## (5) Indication of ground point

The ground point in a circuit diagram is marked by a ground symbol, making it possible for you to refer to a wiring harness configuration diagram and to ELECTRICAL SYSTEM PARTS LOCATION (Grounding).

## (6) Indication of wires

In a circuit diagram, the wire diameter and wire color are shown for each wire. If there are several wires of the same color in a connector, their wire color indication symbols should be such symbols as \*1 and \*2 for identification.





## (7) Indication of shielded cables

A shielded cable used, for example, in an electronic control circuit for prevention of malfunctions that may otherwise be caused by radio interference is indicated by a solid line sandwiched between dashed lines ( ——— )

## (8) Indication of specification-dependent connectors

With regard to harness connectors, the inter-device and -harness connectors which vary in shape or position on different vehicle specifications, such as those with rear wipers and turbocharger and those without turbocharger, are given a specification-dependent connector identification symbol (lower case alphabet) following the connector symbol.

Example: A – 01a

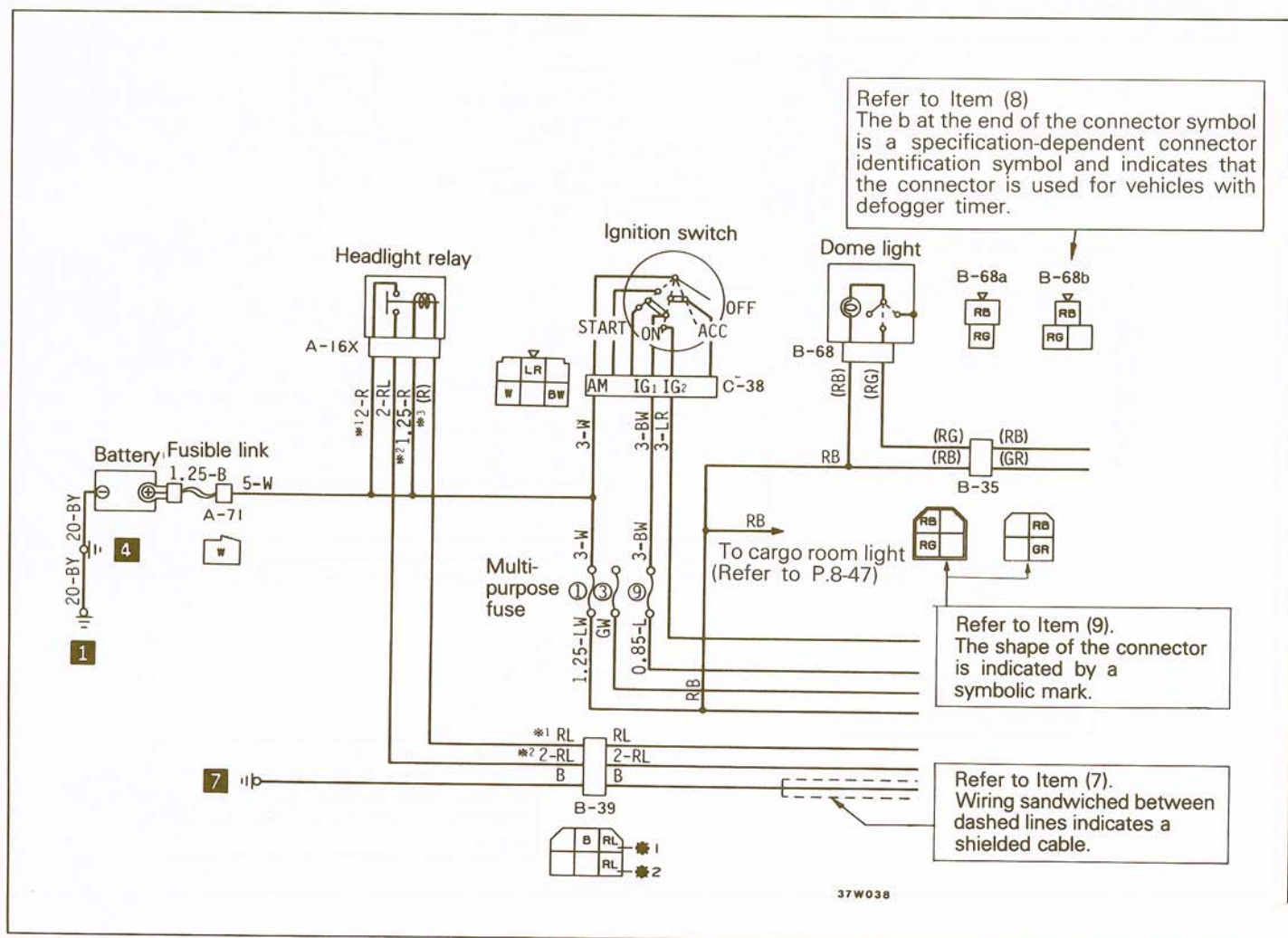
Specification – dependent connector identification symbol

a : Vehicles without defogger timer

b : Vehicles with defogger timer

## (9) Shapes of connectors

The connector shapes are indicated by simplified symbolic marks. For distinction between male and female connectors, refer to HOW TO IDENTIFY CONNECTORS.

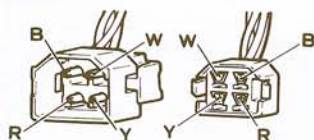


Position of guide to prevent improper connection



9-wire connector

16B0219



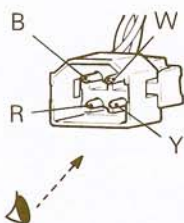
Male terminal

Female terminal



16R0458

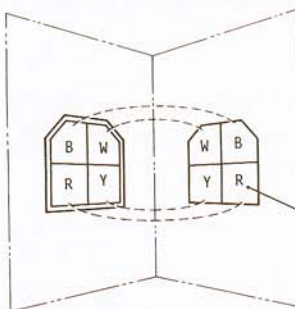
On-vehicle connector



Connector in wiring diagram



16B0220



Color code

16R0459

Guide to prevent improper connection



Double lines indicate male.



Number of divisions indicates number of wires

36K037

## IDENTIFYING CONNECTORS

In circuit diagrams, the connectors are indicated by symbolic marks which show the number of their wires and whether they are male or female connectors.

### (1) Number of connector wires

The number of divisions in the connector diagram indicates the number of wires. A cross in a division, however, indicates the position of a guide to prevent improper connection. The connector shown here, therefore, is a 9-wire connector.

### (2) Identification of male and female connectors

Connectors drawn with double outer lines are male, and those with single outer lines are female.

### (3) Connector direction

The connector marks show on-vehicle connectors as viewed from the direction shown here.

### (4) Identification of connector terminals

The color codes of a pair of connectors (male and female), if viewed at their joining surfaces, will appear symmetrical as illustrated here. When the connectors are connected, their joining surfaces are put together in the way a book is closed, so the terminals of identical codes are connected together.

### NOTE

The color codes of male and female connectors are not always identical.

### (5) Identification of sealed connectors

Identification of round, sealed connectors (water-proof pin terminal connectors) used in radiator fan motor circuits, turbo circuits, etc. is accomplished by the same method as described above.



## SYMBOLIC MARKS

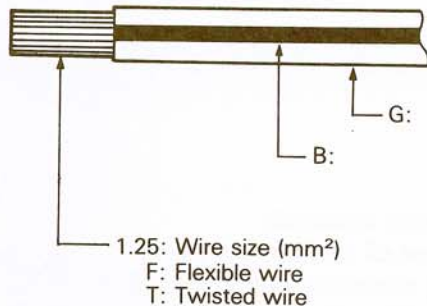
Various equipment is indicated symbolically in circuit diagrams as shown below.

Battery 	Body ground 	Single bulb 	Resistor 	Diode 	Capacitor 
Fuse 	Equipment ground 	Dual bulb 	Variable resistor 	Zener diode 	Crossing of wires without connection 
Fusible link 	Motor 	Speaker 	Coil 	Transistor 	Crossing of lines with connection 

## WIRE COLOR CODES

Wire colors are identified by the following color codes.

Example: 1.25 - GB



- (1) No code indicates 0.5 mm<sup>2</sup> (.0008 in.<sup>2</sup>).  
 (2) Cable color code in parentheses indicates 0.3 mm<sup>2</sup> (.0005 in.<sup>2</sup>).

Code	Wire color	Code	Wire color
B	Black	LI	Light blue
Br	Brown	O	Orange
G	Green	P	Pink
Gr	Gray	R	Red
L	Blue	Y	Yellow
Lg	Light green	W	White

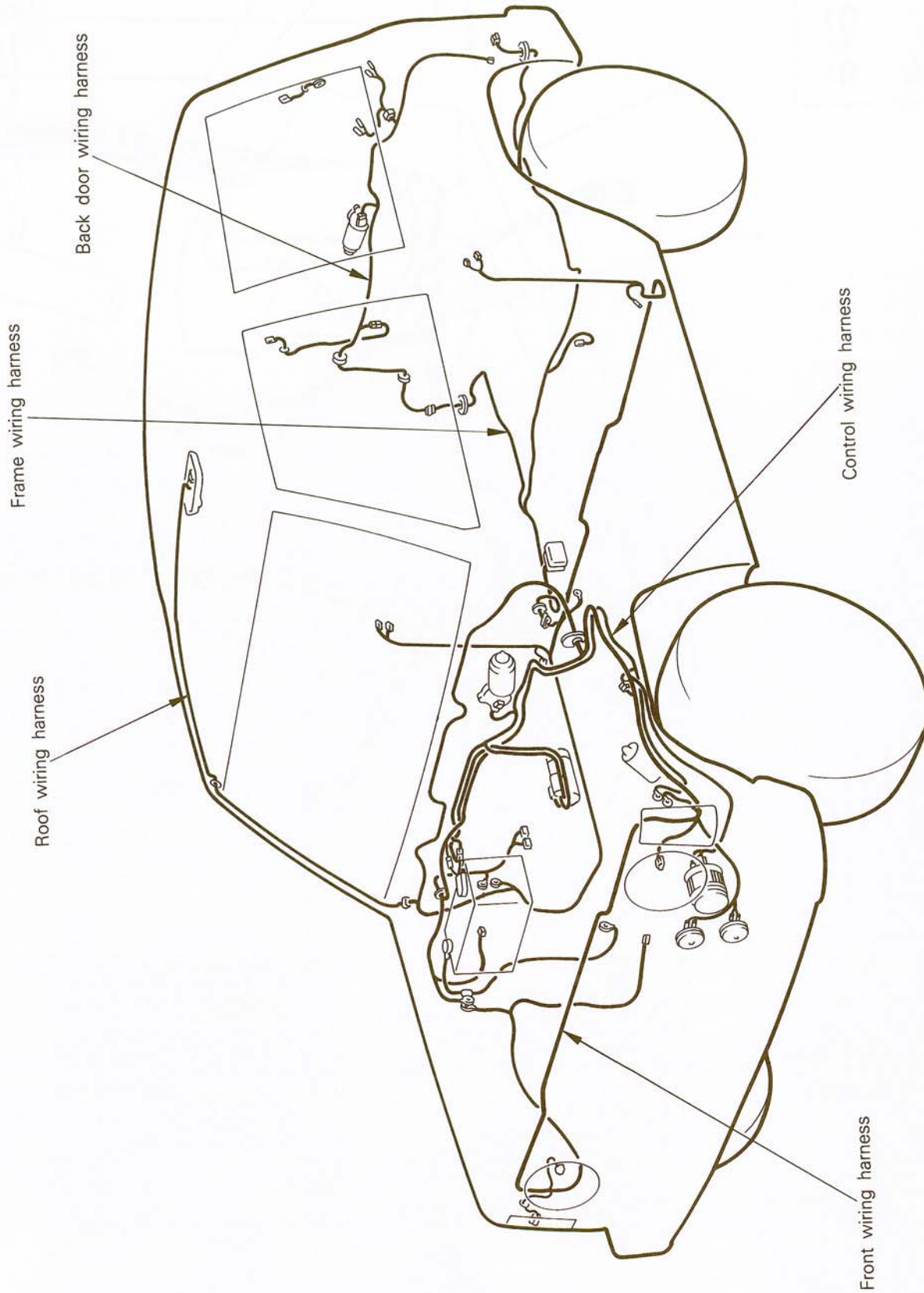
## NOTE

If a cable has two colors, the first of the two color code characters indicates the basic color (color of the cable coating) and the second indicates the marking color.

# OVERALL WIRING DIAGRAM

N08DC-A

16W1552



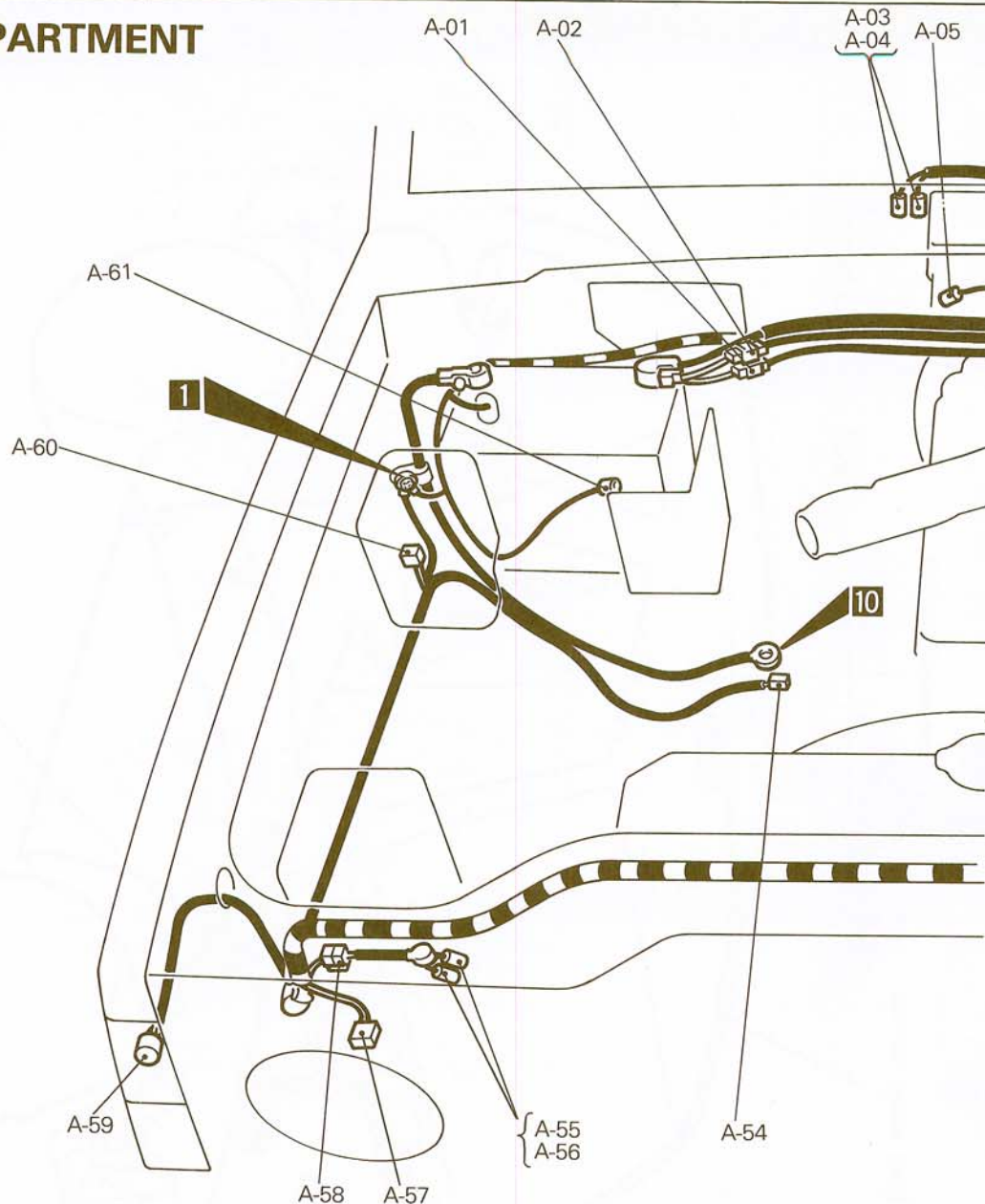
Remark  
This diagram shows the main wiring harnesses.



## 1 ENGINE COMPARTMENT

Connector symbol

**A** 01  
to  
61



A-01 } Main fusible link

A-02 }

A-03 } 4WD indicator switch

A-04 }

A-05 } Automatic transmission oil temperature switch

A-06 } Back-up light and 4WD indicator wiring harness and cord assembly combination

A-07 }

A-08 } Back-up light switch

A-09 }

A-10 } OD-OFF solenoid

A-11 } Pulse generator

A-12 } Front wiring harness and transmission wiring harness combination

A-13 } Air conditioner solenoid valve

A-14 } Front wiper motor

A-15 } Starter

A-16 }

A-17 } Checker

A-18 }

A-19 } Brake fluid level sensor

A-20 } Front harness and back-up light and 4WD indicator wiring harness combination

A-21 }

A-22 } Dedicated fusible link (L042GV only)

A-23 }

A-24 } Sub fusible link

A-25 }

A-26 } Carburetor assembly control wiring harness and air conditioner wiring harness combination

A-27 }

A-28 } Front wiring harness and control wiring harness combination

A-29 }

A-30 } Auto choke relay

A-31 } Front wiring harness and air conditioner wiring harness combination

A-32 } Headlight washer motor

A-33 } Front combination light (L.H.)

A-34 } Light control relay

A-35 } Dedicated fuse (Upper beam indicator circuit)

A-36 } Headlight (L.H.)

A-37 } Condenser fan motor

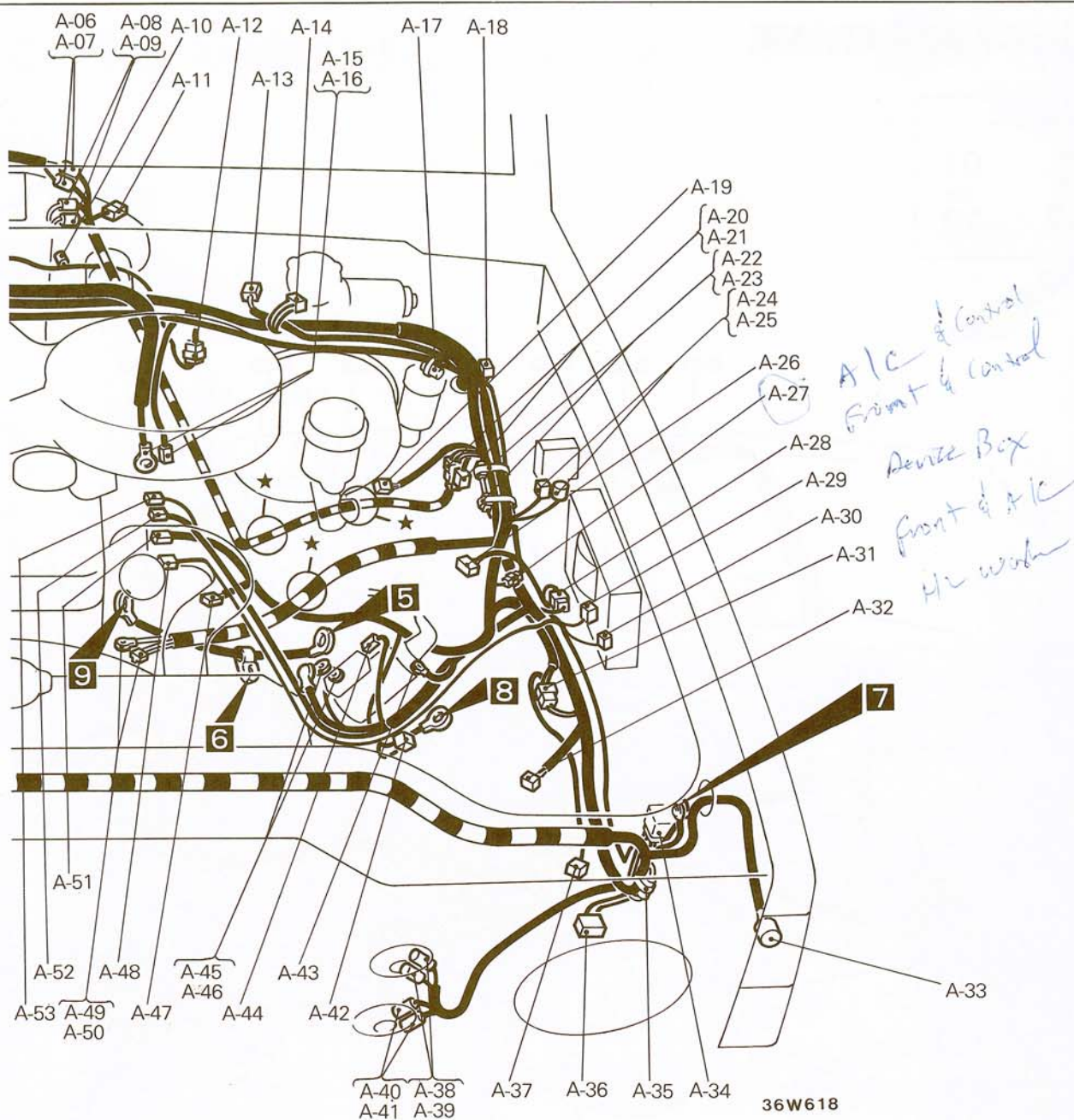
A-38 }

A-39 }

A-40 }

A-41 } Horn

A-42 } Condenser fan motor relay



- A-43 } Ignition coil
- A-44 }
- A-45 }
- A-46 }
- A-47 Magnetic clutch
- A-48 Water temperature sensor (FBC circuit)
- A-49 } Alternator
- A-50 }
- A-51 Water temperature switch (Air conditioner circuit)
- A-52 Water temperature gauge unit
- A-53 Water temperature switch (OD control circuit)
- A-54 Oil pressure gauge unit
- A-55 } Low pressure switch
- A-56 }

- A-57 Headlight (R.H.)
- A-58 Front harness and air conditioner wiring harness combination
- A-59 Front combination light (R.H.)
- A-60 Front washer motor
- A-61 Oxygen sensor

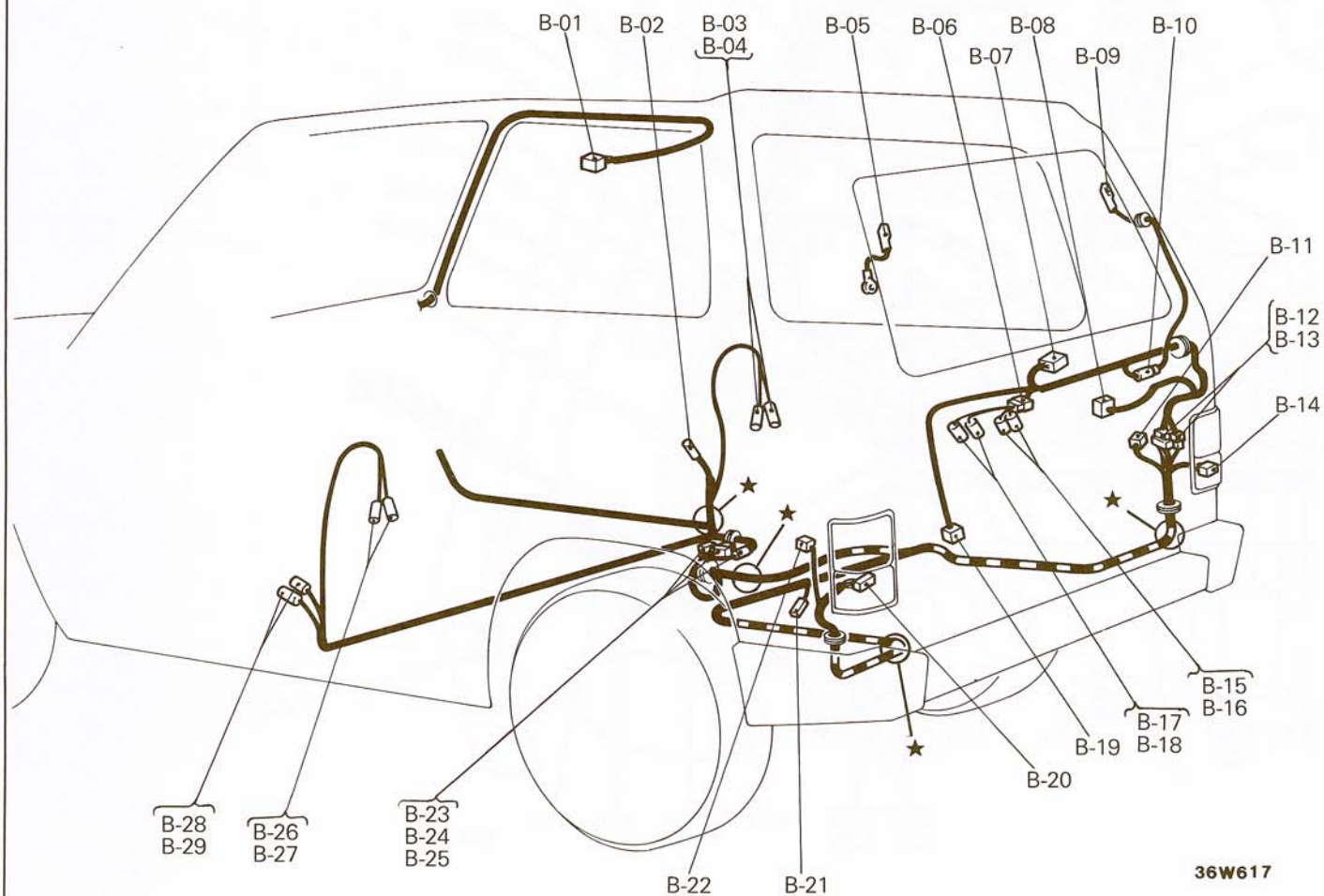
#### Remarks

- (1) The mark ★ shows the reference mounting position of wiring harness.
- (2) For information concerning the ground points (example: 1), refer to P.8-7.



## 2 INTERIOR AND FRAME

Connector symbol

**B**01  
to  
29

B-01	Dome light	B-14	Rear combination light (R.H.)
B-02	Door switch (R.H.)	B-15	License plate light (R.H.)
B-03	Rear speaker (R.H.)	B-16	
B-04		B-17	License plate light (L.H.)
B-05	Defogger (–)	B-18	
B-06	Back door wiring harness and license plate light wiring harness combination	B-19	Back door lock actuator
B-07	Rear wiper motor	B-20	Rear combination light (L.H.)
B-08	Rear washer motor	B-21	Fuel gauge unit
B-09	Defogger (+)	B-22	Rear side marker light (L.H.)
B-10	Back door wiring harness and defogger cable (+) combination	B-23	Front wiring harness and frame wiring harness combination
B-11	Rear side marker light (R.H.)	B-24	
B-12	Frame wiring harness and back door wiring harness	B-25	
B-13	combination	B-26	Rear speaker (L.H.)
		B-27	
		B-28	Door switch (L.H.)
		B-29	

## Remark

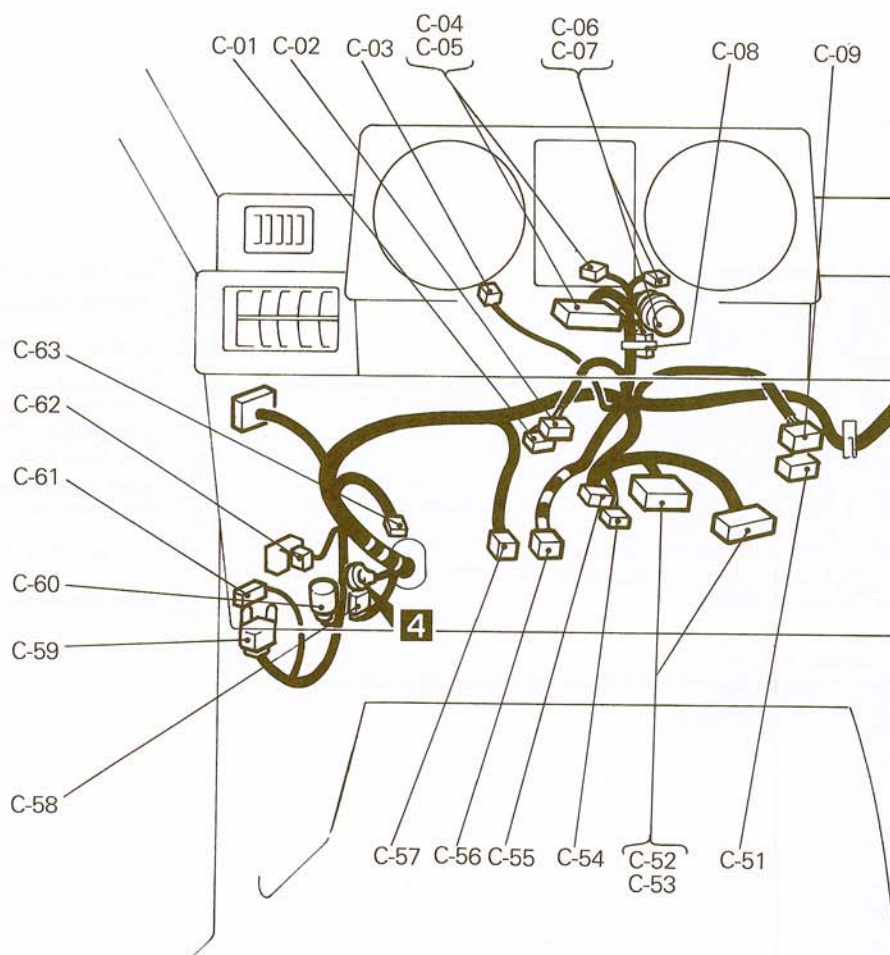
The mark ★ shows the reference mounting position of wiring harness.



## 3 INSTRUMENT PANEL

Connector symbol

C

01  
to  
63

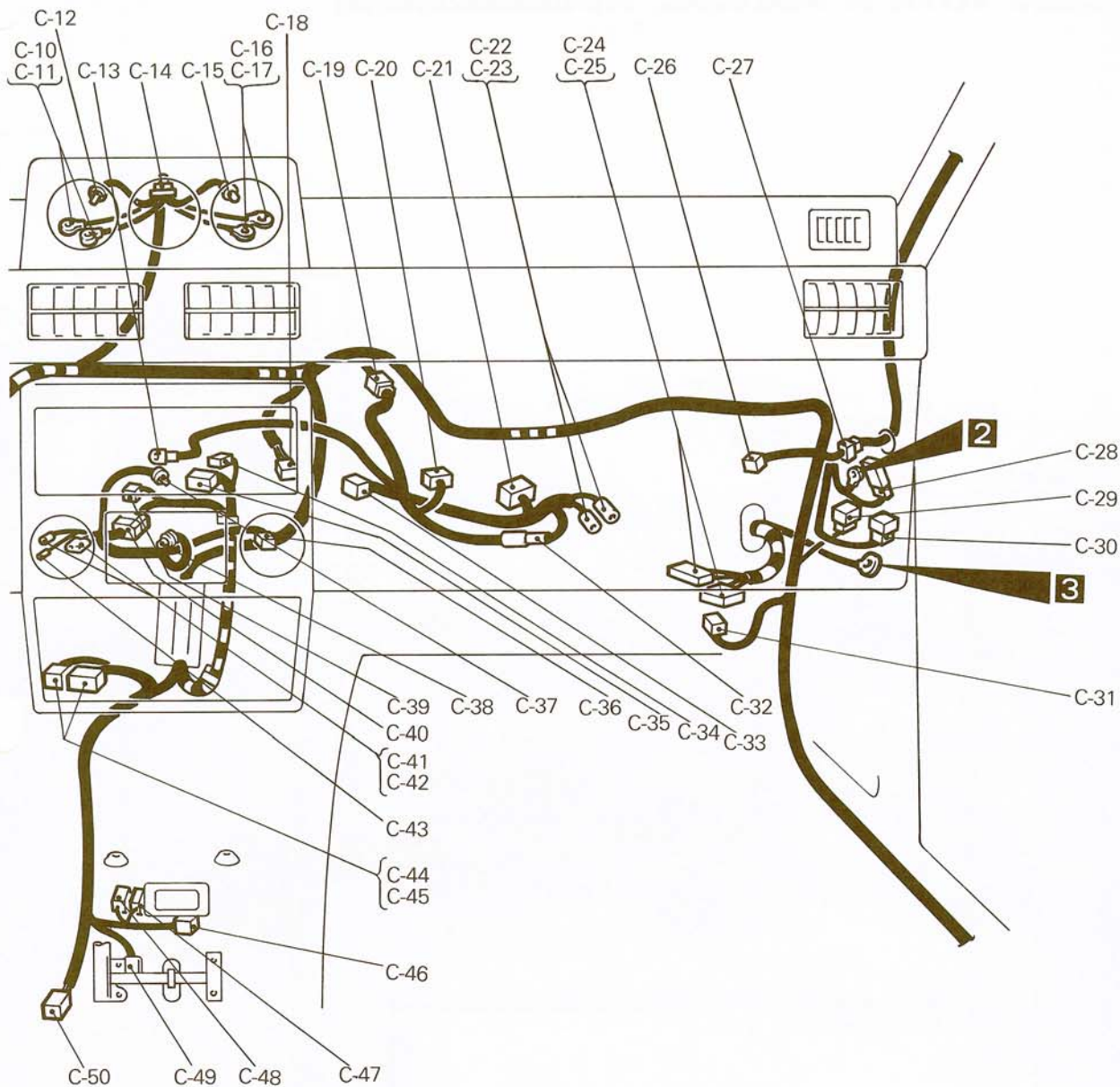
## Remarks

For information concerning the ground points (example: **4**), refer to P.8-7.

- C-01 Back door lock switch
- C-02 Defogger switch
- C-03 Key reminder and seat belt warning buzzer
- C-04 } Combination meter
- C-05 }
- C-06 }
- C-07 }
- C-08 Diode
- C-09 Rear wiper and washer switch
- C-10 Oil pressure gauge
- C-11 }
- C-12 Combination gauge illumination light
- C-13 Blower switch
- C-14 Combination gauge wiring harness and front wiring harness combination
- C-15 Combination gauge illumination light
- C-16 } Voltage meter
- C-17 }

- C-18 Heater relay
- C-19 Air conditioner wiring harness and front wiring harness combination
- C-20 } Air conditioner relay
- C-21 }
- C-22 } Thermostat
- C-23 }
- C-24 } Feed back carburetor control unit
- C-25 }
- C-26 Front speaker (R.H.)
- C-27 Front wiring harness and roof wiring harness combination
- C-28 Automatic free-wheeling hub indicator control unit
- C-29 Defogger timer unit
- C-30 Seat belt warning timer

- C-31 Blower motor resistor
- C-32 Dedicated fuse (Air conditioner circuit)
- C-33 Air conditioner switch
- C-34 Heater control knob illumination light
- C-35 Blower switch
- C-36 Clock
- C-37 Heater control panel illumination light
- C-38 Ashtray illumination light
- C-39 Air conditioner switch illumination light
- C-40 Front wiring harness and center panel wiring harness combination



36W616

- C-41 } Cigarette lighter
- C-42 } Cigarette lighter illumination light
- C-43 } Cigarette lighter illumination light
- C-44 } Radio
- C-45 } Radio
- C-46 } Shift position illumination light
- C-47 } Inhibitor switch
- C-48 } OD-OFF switch
- C-49 } Parking brake switch
- C-50 } Seat belt switch
- C-51 } Hazard switch
- C-52 } Column switch
- C-53 } Column switch
- C-54 } Key reminder switch
- C-55 } Ignition switch
- C-56 } Stop light switch

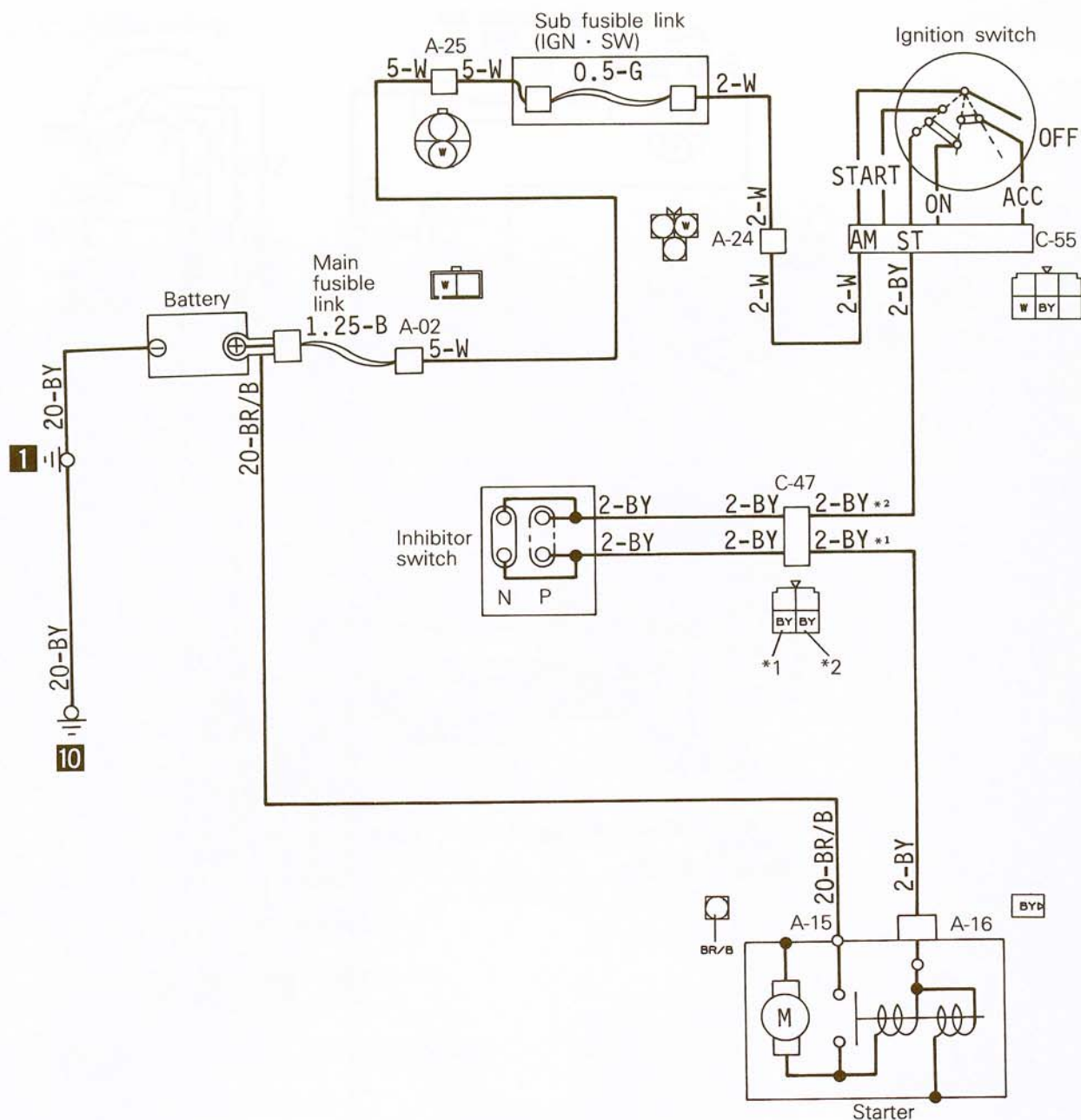
- C-57 } Dimmer control switch
- C-58 } Turn-signal flasher unit
- C-59 } Intermittent wiper relay
- C-60 } Hazard flasher unit
- C-61 } OD-OFF relay
- C-62 } Headlight washer motor relay
- C-63 } Front speaker (L.H.)



[illegible]

37W626

## (VEHICLES WITH AN AUTOMATIC TRANSMISSION)



37W613

Remark  
For information concerning the ground points (example: **1**),  
refer to P.8-7.

Wiring color code

B: Black

Br: Brown

G: Green

Gr: Gray

L: Blue

Lg: Light green

LI: Light blue

O: Orange

P: Pink

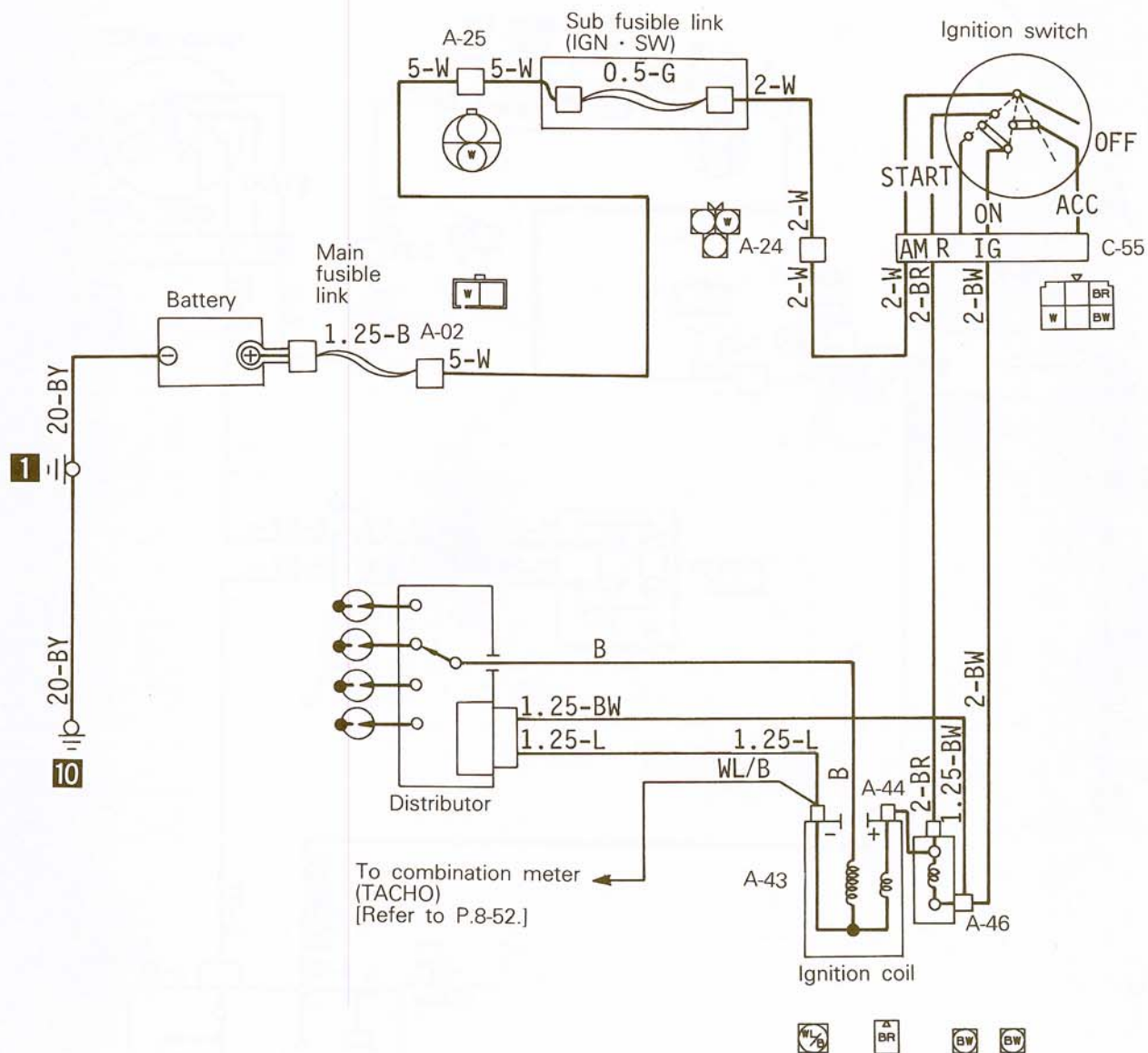
R: Red

Y: Yellow

W: White



## 2 IGNITION CIRCUIT



37W609

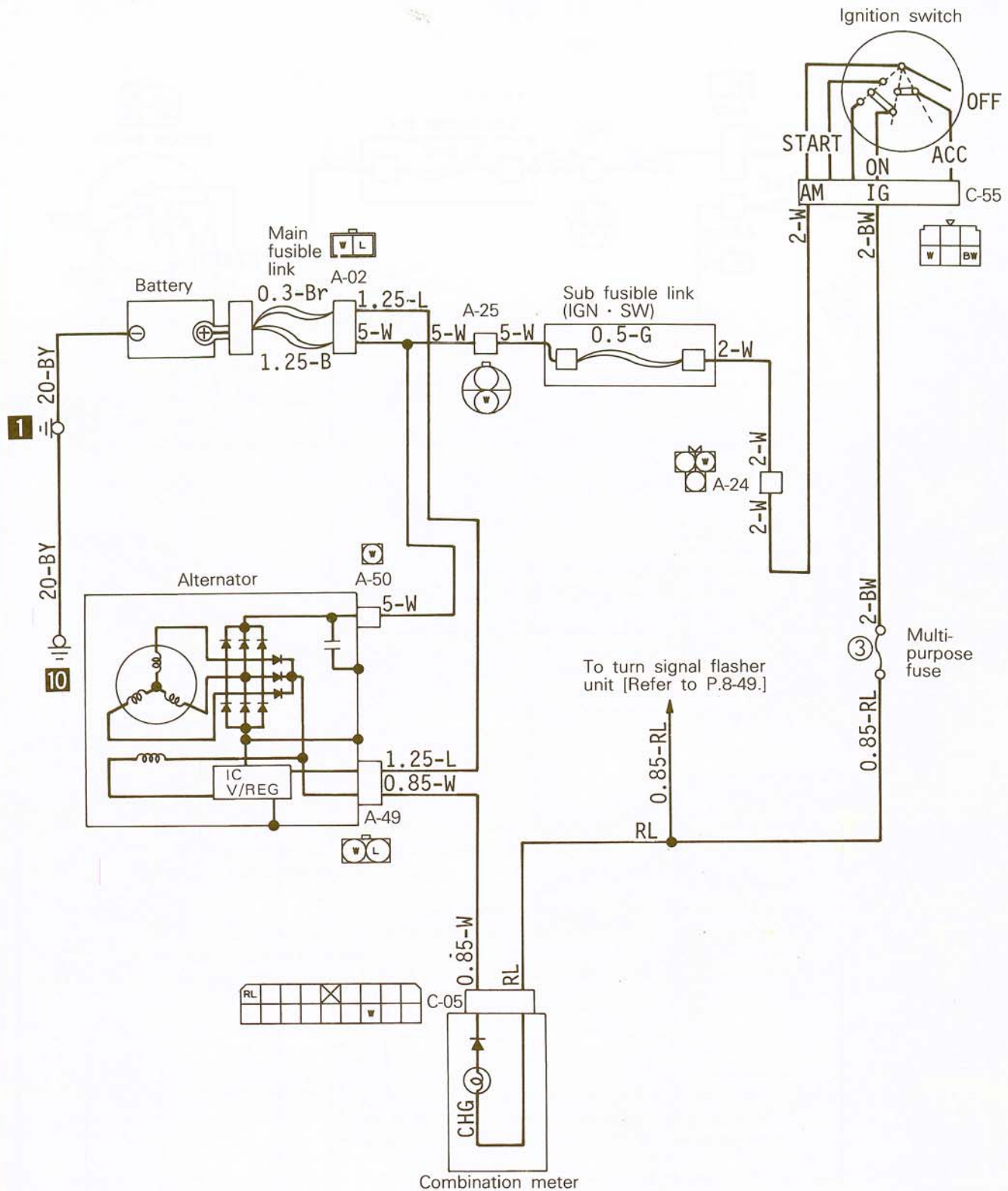
## Remark

For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

## 3 CHARGING CIRCUIT



Remark  
For information concerning the ground points (example: 1 ), refer to P.8-7.

37W605

## Wiring color code

B: Black  
Ll: Light blue

Br: Brown  
O: Orange

G: Green  
P: Pink

Gr: Gray  
R: Red

L: Blue  
Y: Yellow

Lg: Light green  
W: White

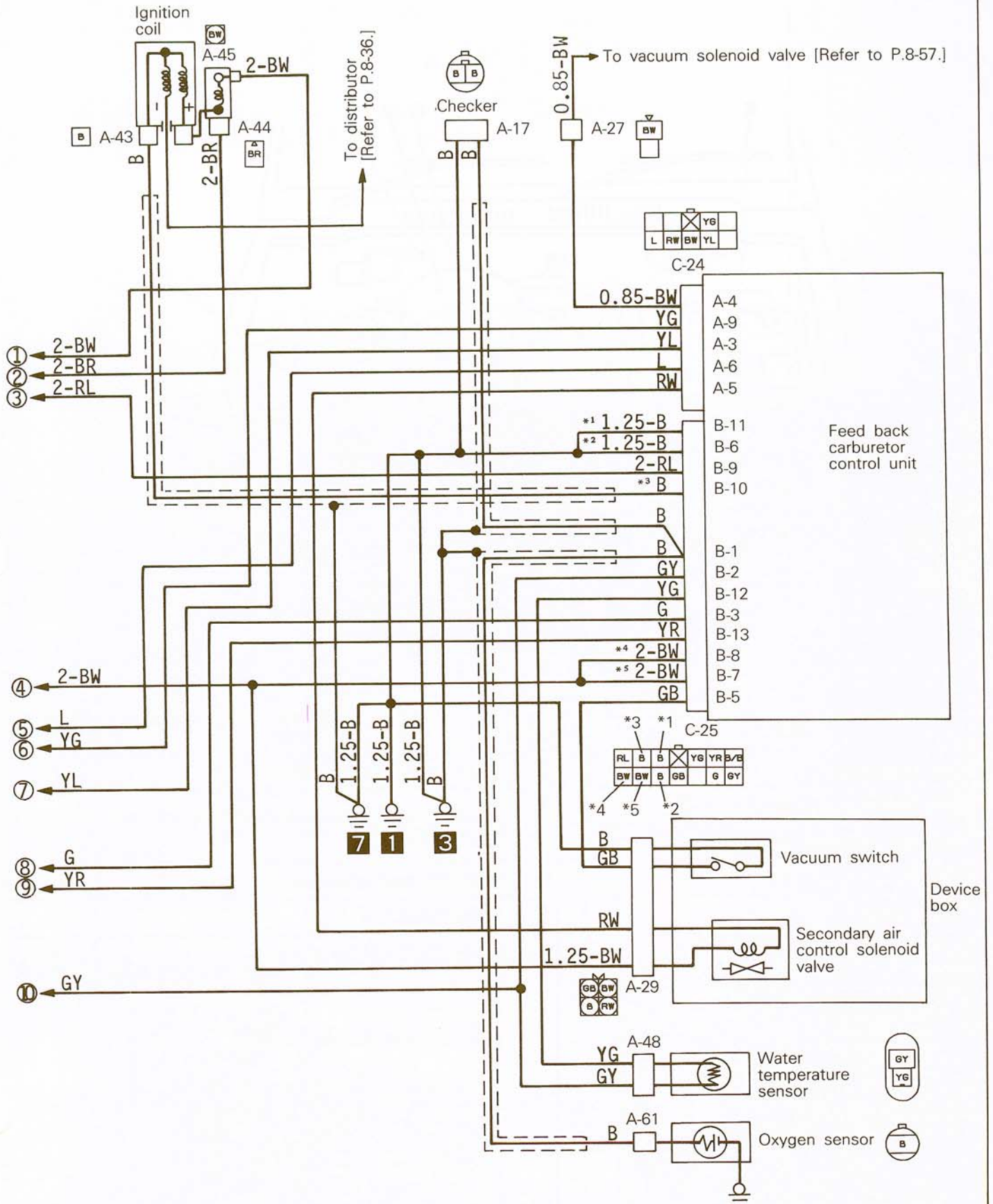


**Remarks**

(1) For information concerning the ground points (example: 1), refer to P.8-7.

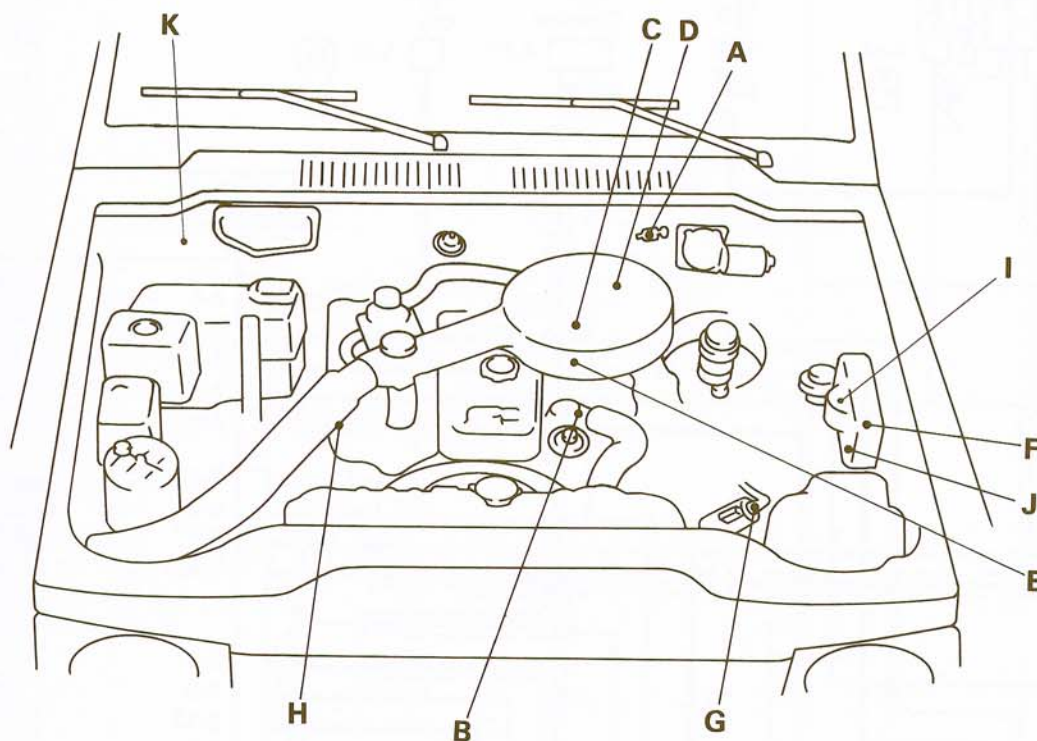
(2) The symbols ①, ②, etc. indicate that the wiring is common to the following components.

- Remarks
- (1) For information concerning the ground points (example: 1), refer to P.8-7.
- (2) The symbols ①, ② etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page. (In other words, ① on the right page is connected to ① on the left page.)



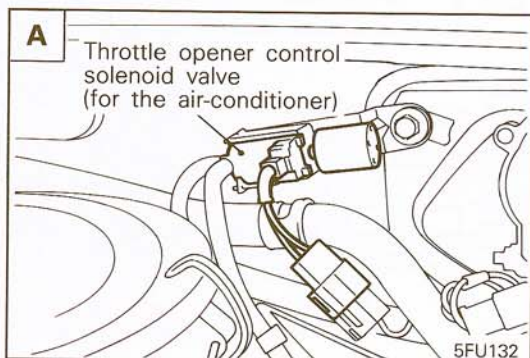


## LAYOUT OF COMPONENTS (FBC)

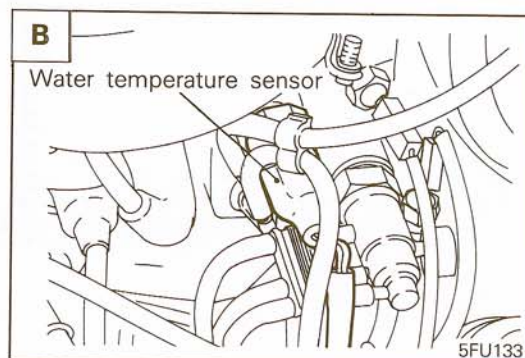


5FU131

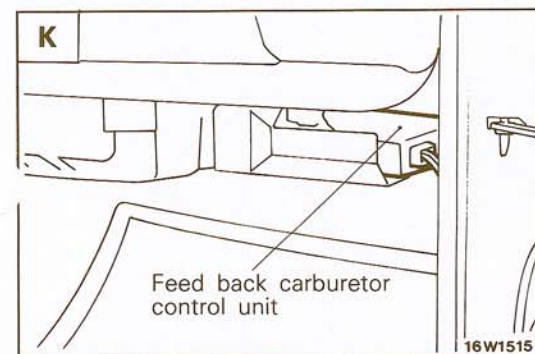
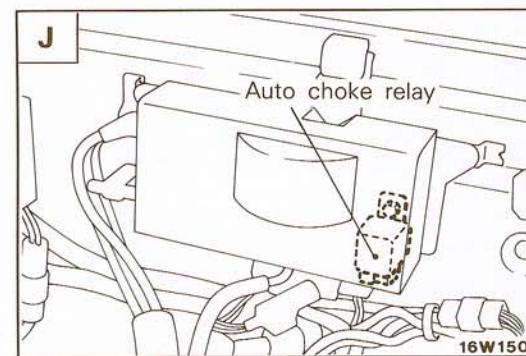
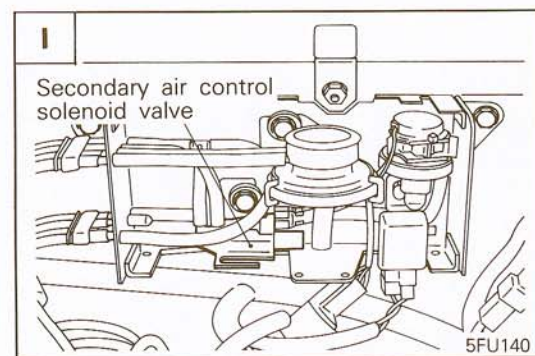
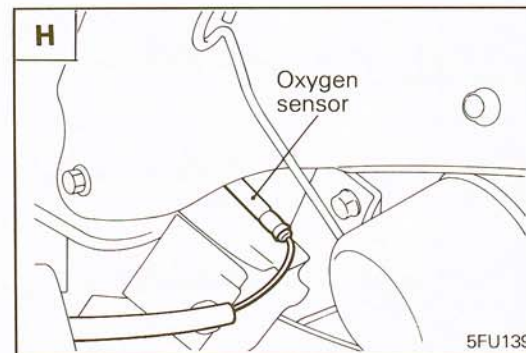
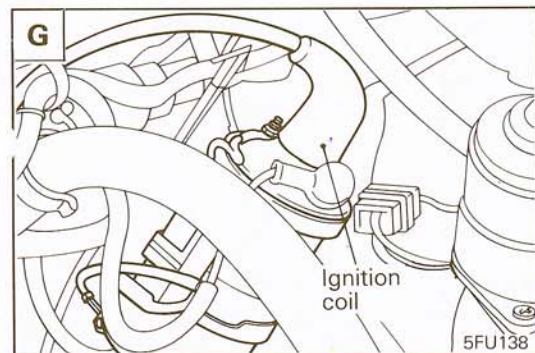
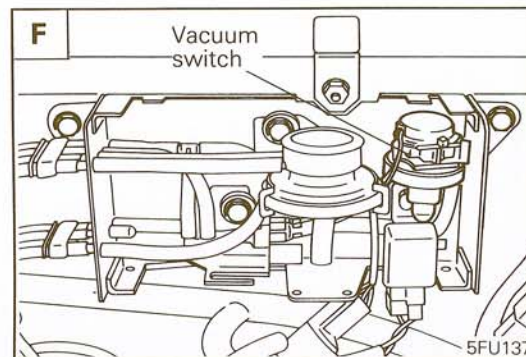
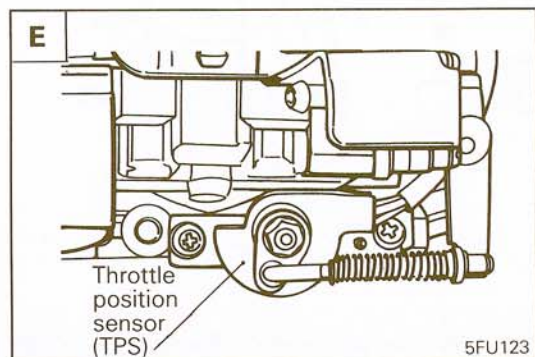
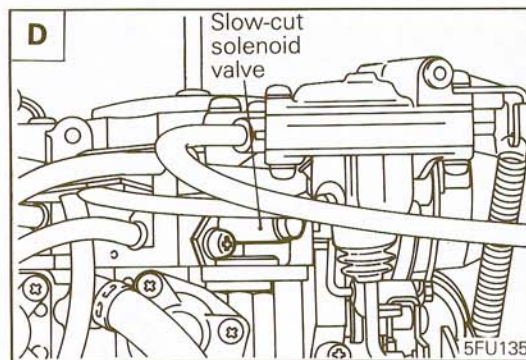
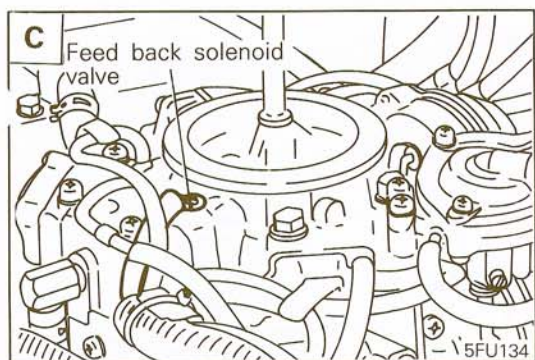
Items	Symbol	Items	Symbol
Auto choke relay	<b>J</b>	Slow-cut solenoid valve	<b>D</b>
Engine speed sensor (Ignition coil $\ominus$ )	<b>G</b>	Throttle opener control solenoid valve (for the air-conditioner)	<b>A</b>
Feed back carburetor control unit	<b>K</b>	Throttle position sensor	<b>E</b>
Feed back solenoid valve	<b>C</b>	Vacuum switch	<b>F</b>
Oxygen sensor	<b>H</b>	Water temperature sensor	<b>B</b>
Secondary air control solenoid valve	<b>I</b>		



5FU132

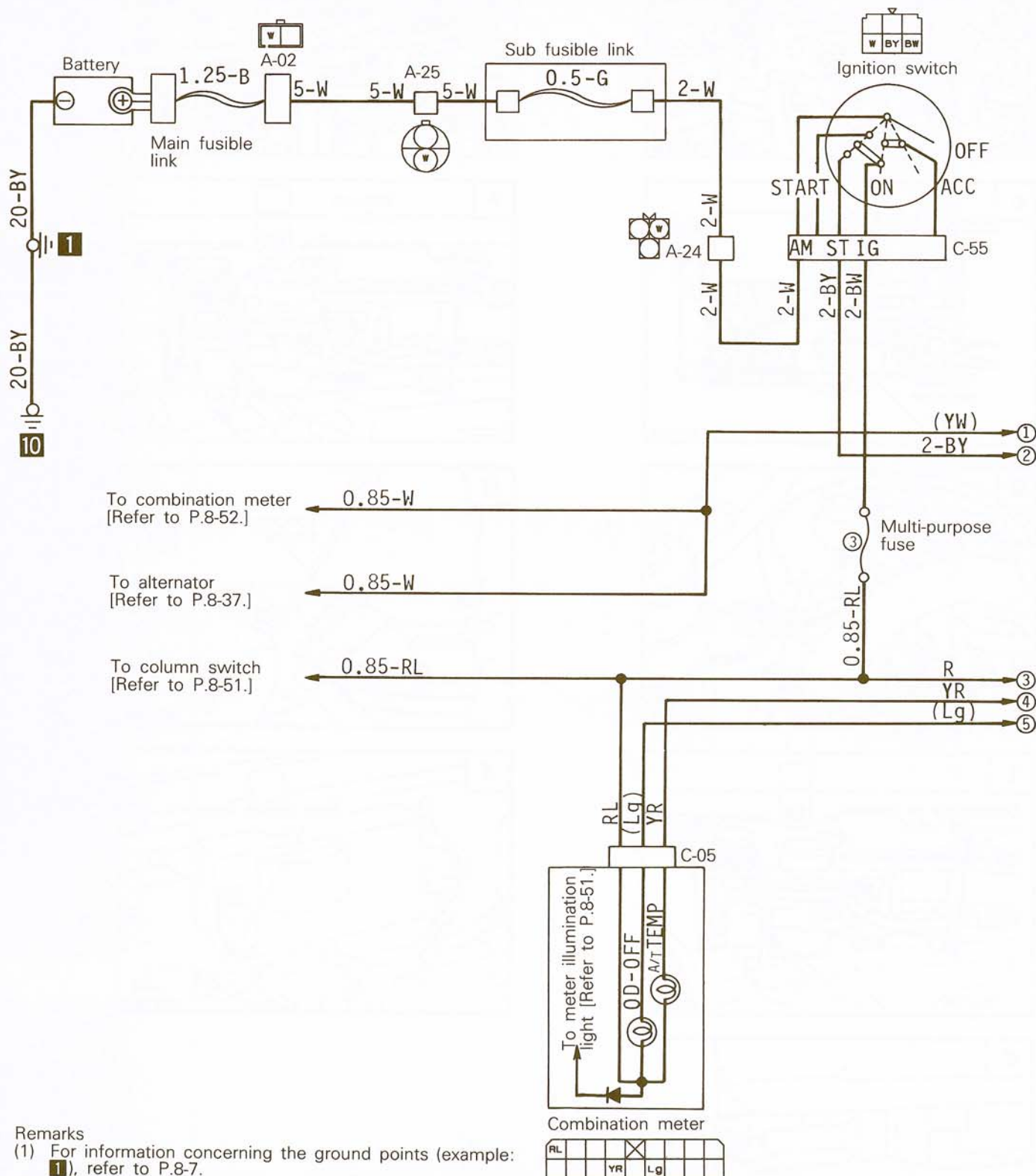


5FU133



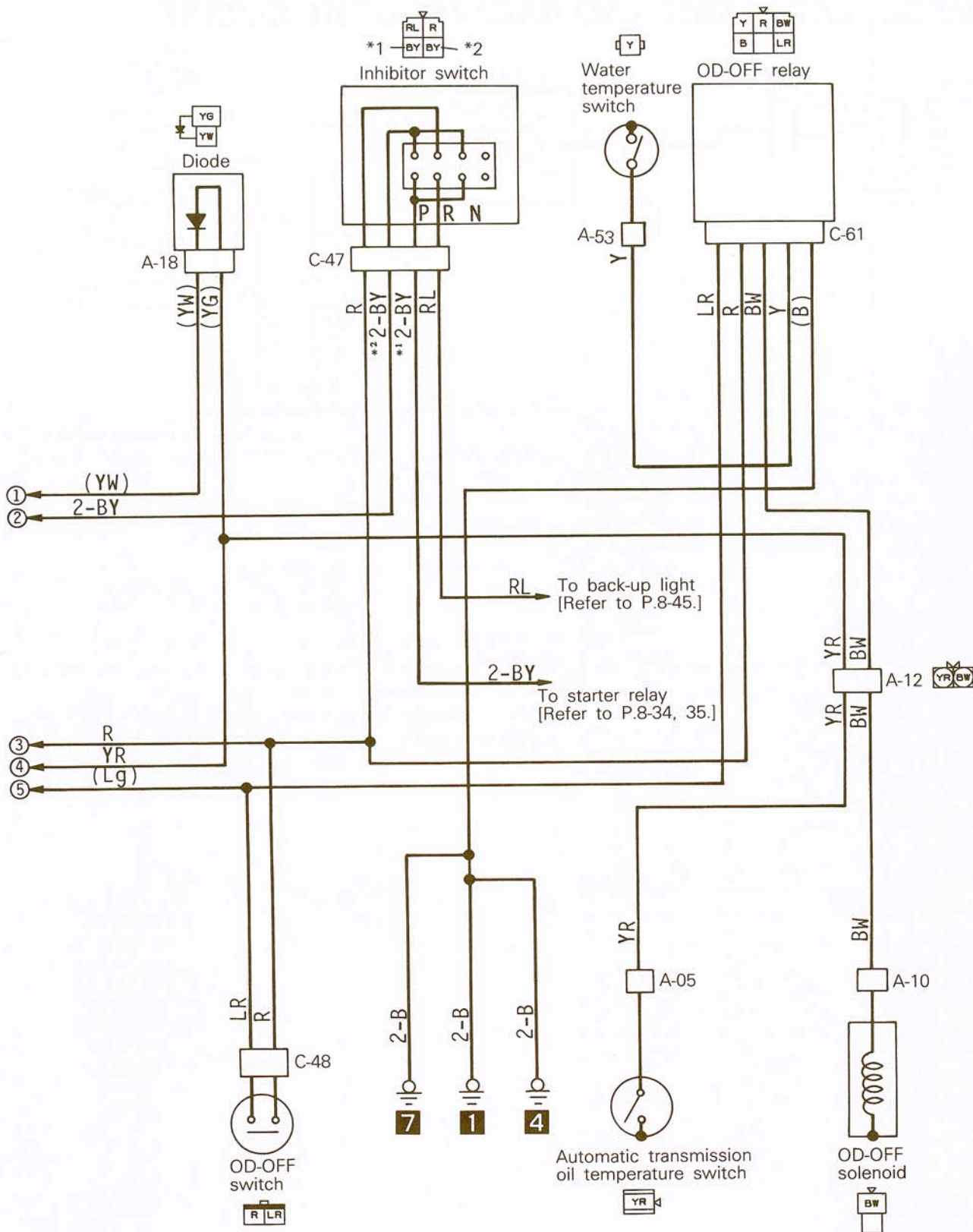


## 5 OVERDRIVE CONTROL SYSTEM CIRCUIT



## Remarks

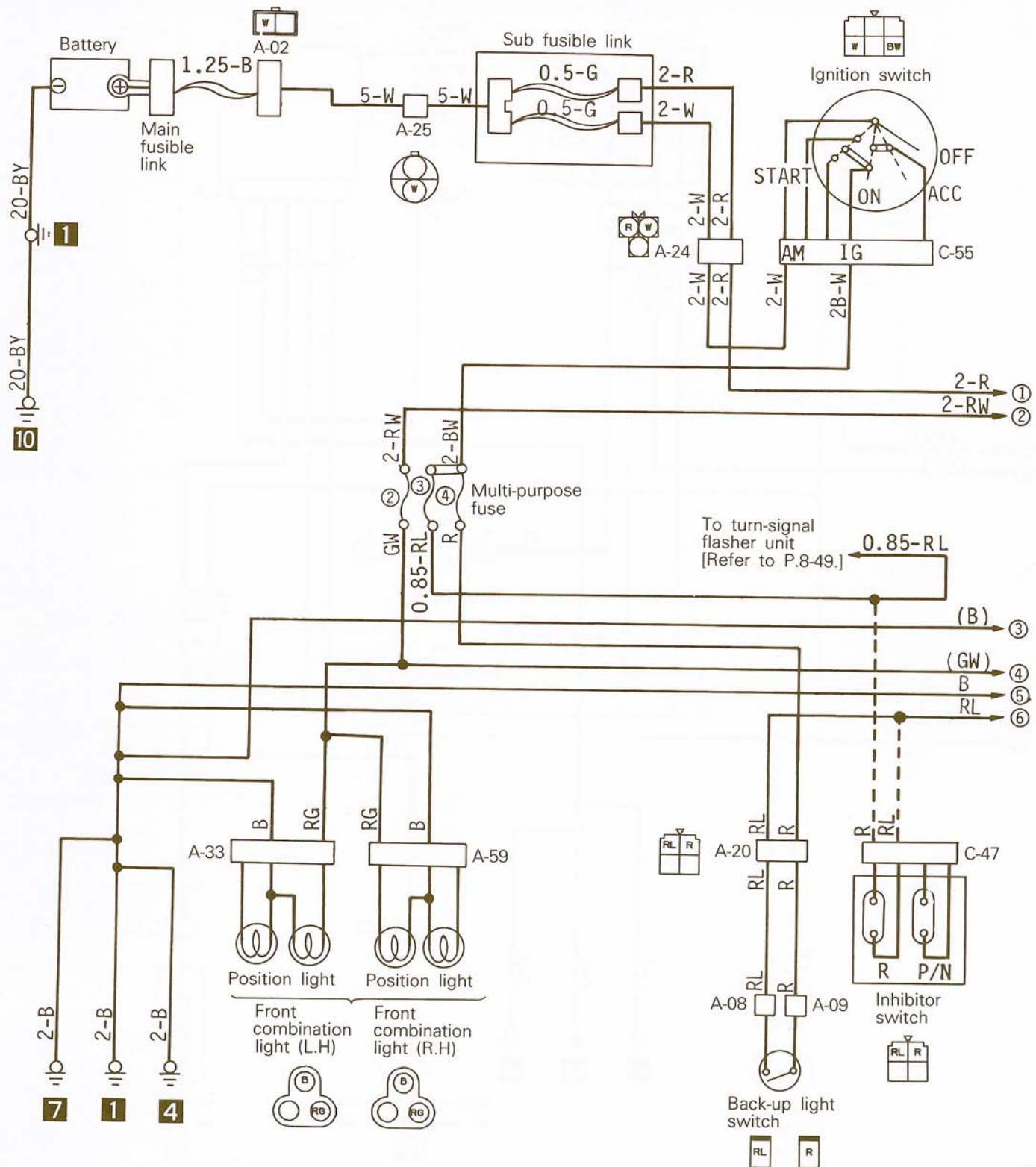
- (1) For information concerning the ground points (example: 1), refer to P.8-7.
- (2) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)



Wiring color code  
 B: Black Br: Brown G: Green Gr: Gray L: Blue Lg: Light green  
 LI: Light blue O: Orange P: Pink R: Red Y: Yellow W: White

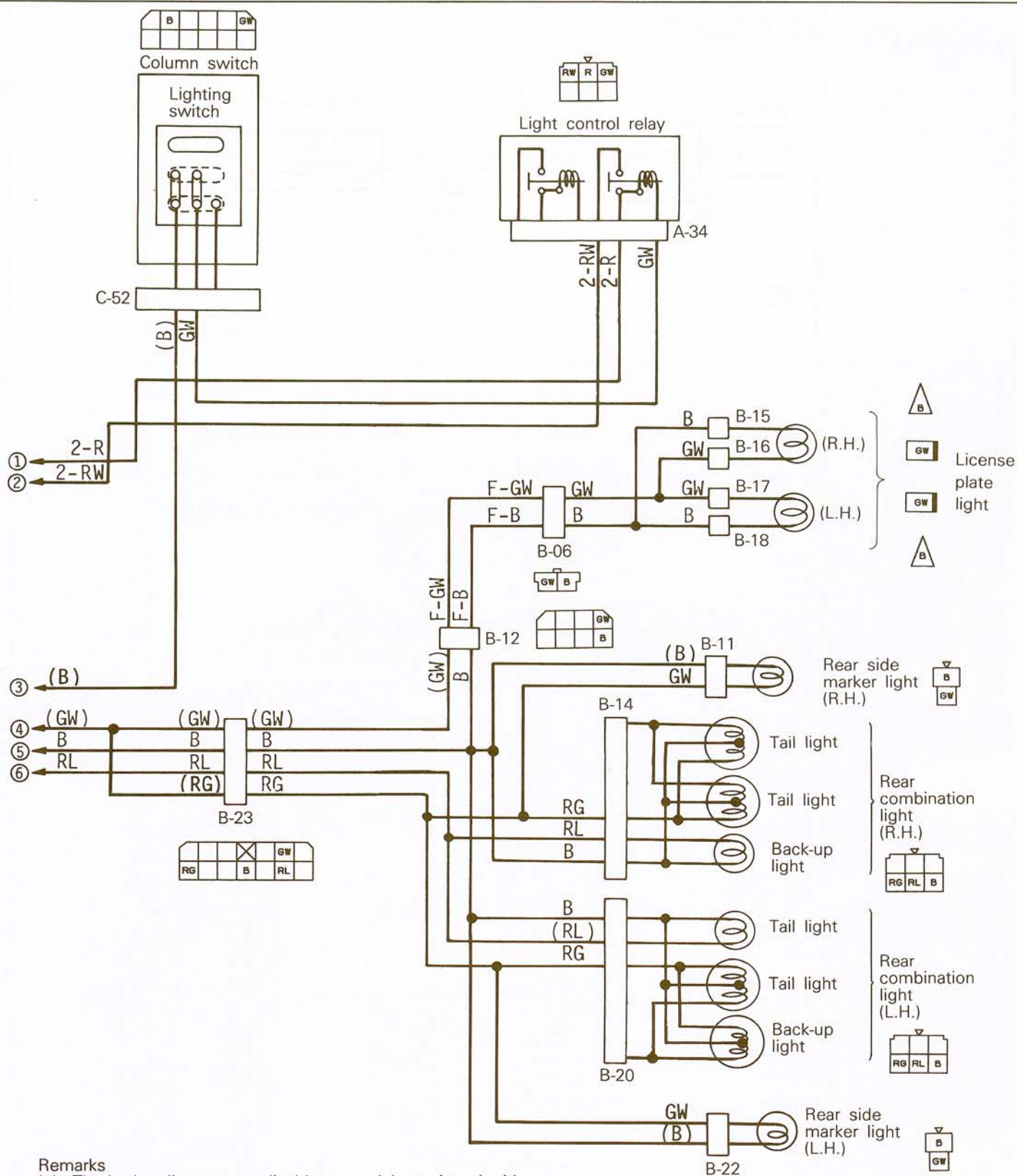


# 6 TAIL LIGHT, POSITION LIGHT, REAR SIDE MARKER LIGHT, LICENSE PLATE LIGHT AND BACK-UP LIGHT CIRCUIT



Wiring color code

B: Black  
Li: Light blueBr: Brown  
O: OrangeG: Green  
P: PinkGr: Gray  
R: RedL: Blue  
Y: YellowLg: Light green  
W: White



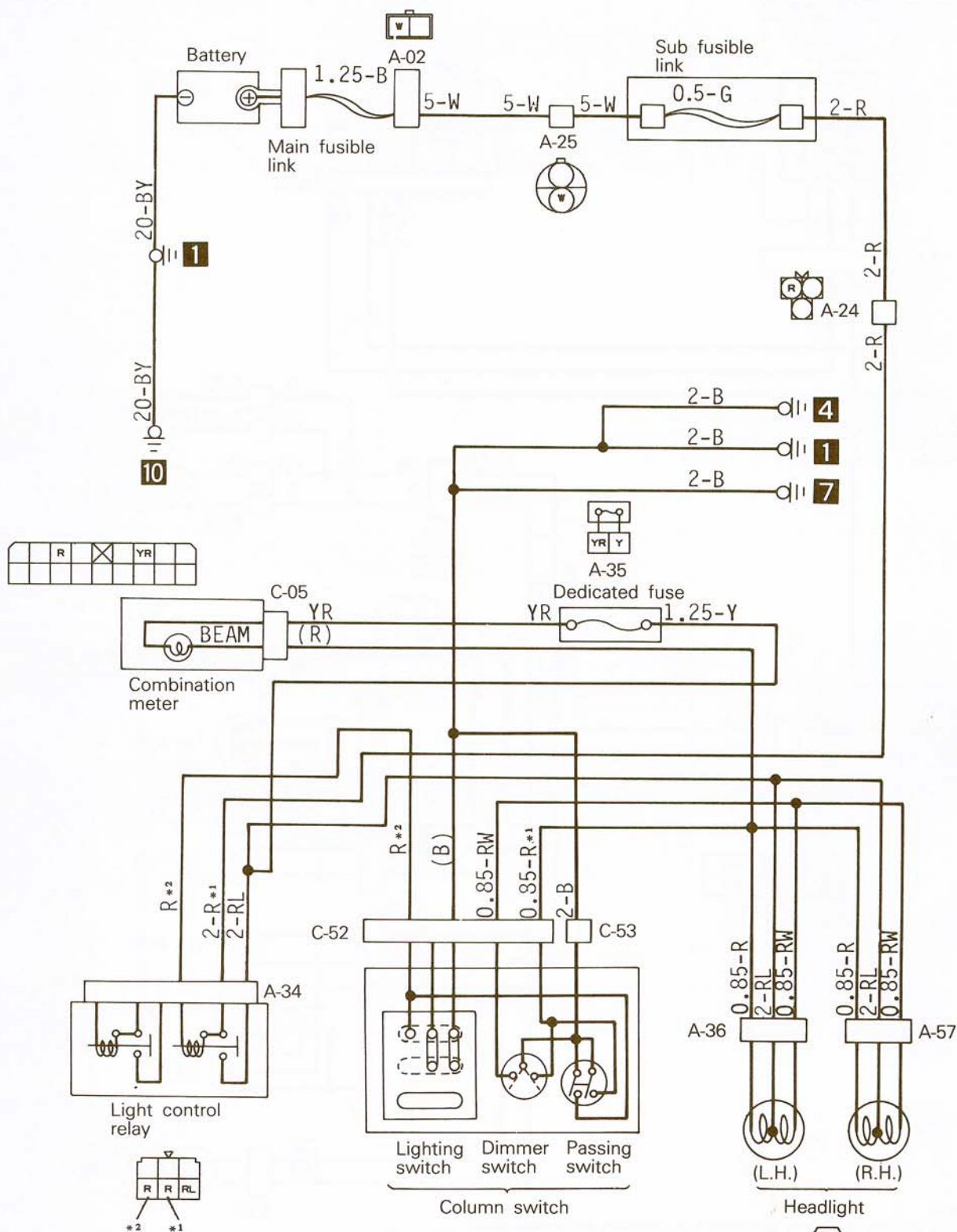
**Remarks**

- (1) The broken lines are applicable to models equipped with an automatic transmission.
- (2) For information concerning the ground points (example: ), refer to P.8-7.
- (3) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)

**37W623**



## 7 HEADLIGHT CIRCUIT



Remark  
For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

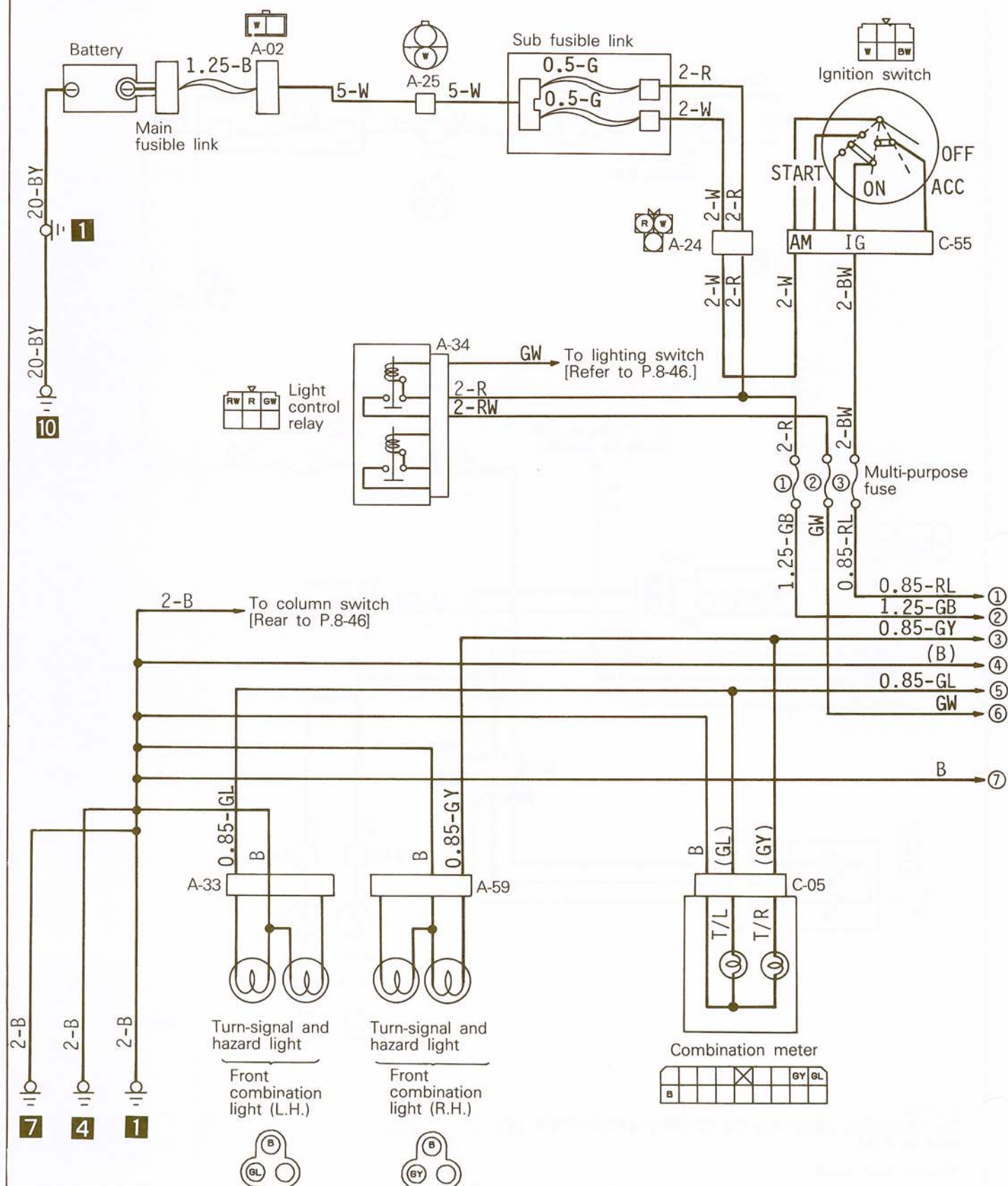
B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

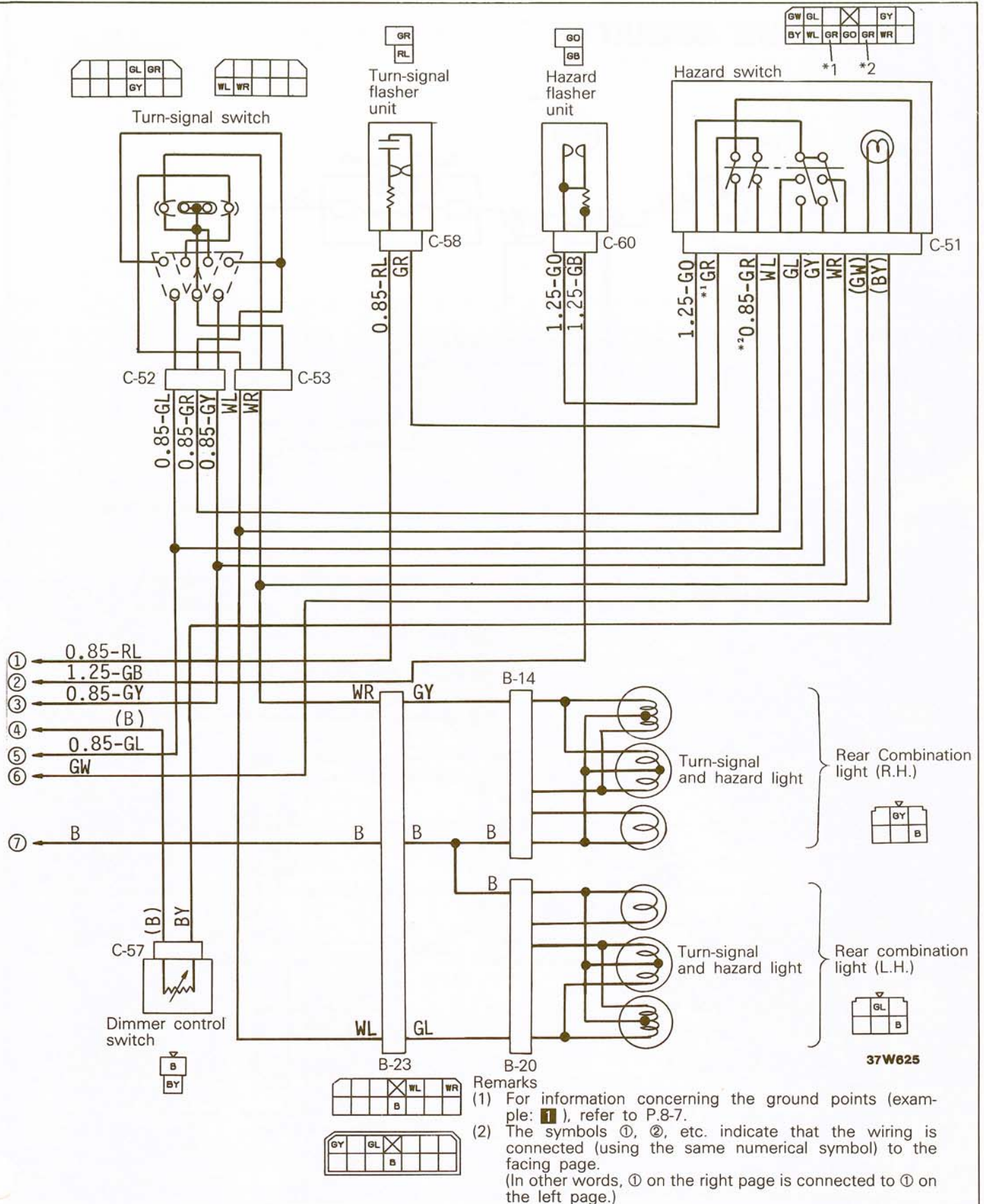
37W621

[illegible]

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
LI: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White



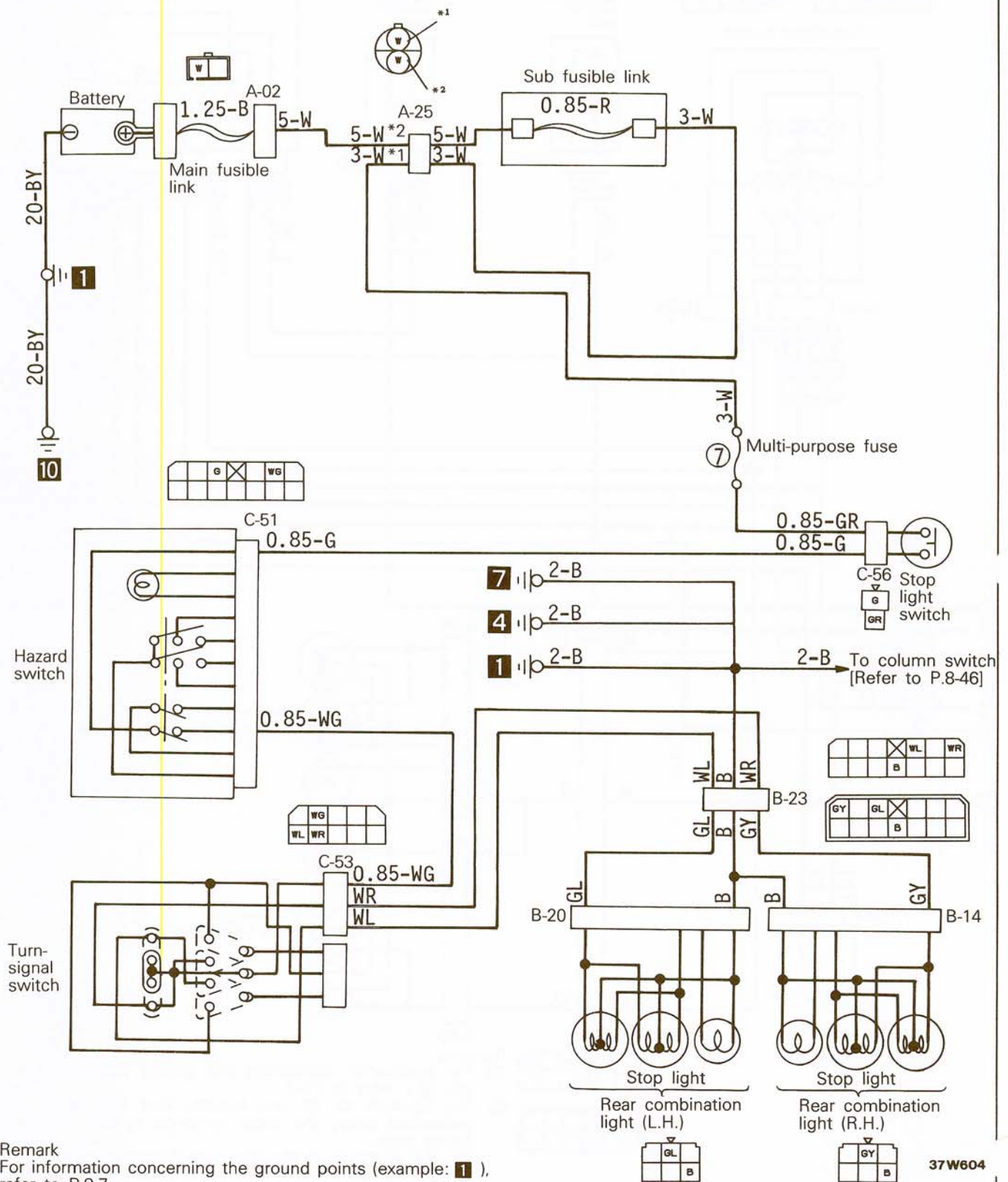




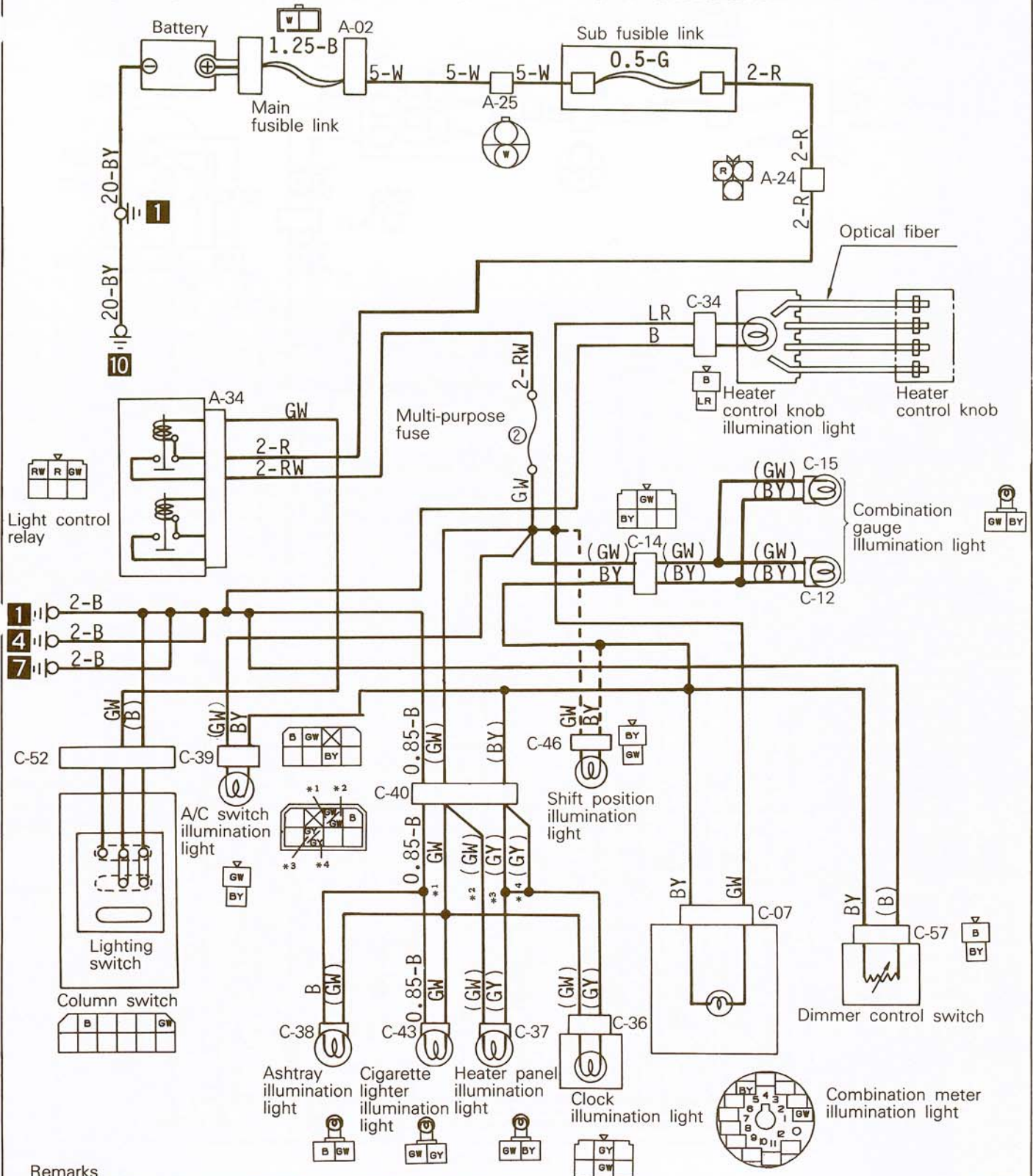
37W625



## 10 STOP LIGHT CIRCUIT



## 11 INSTRUMENT PANEL ILLUMINATION CIRCUIT



## Remarks

- (1) The broken lines are applicable to models equipped with an automatic transmission.
- (2) For information concerning the ground points (example: 1), refer to P.8-7.

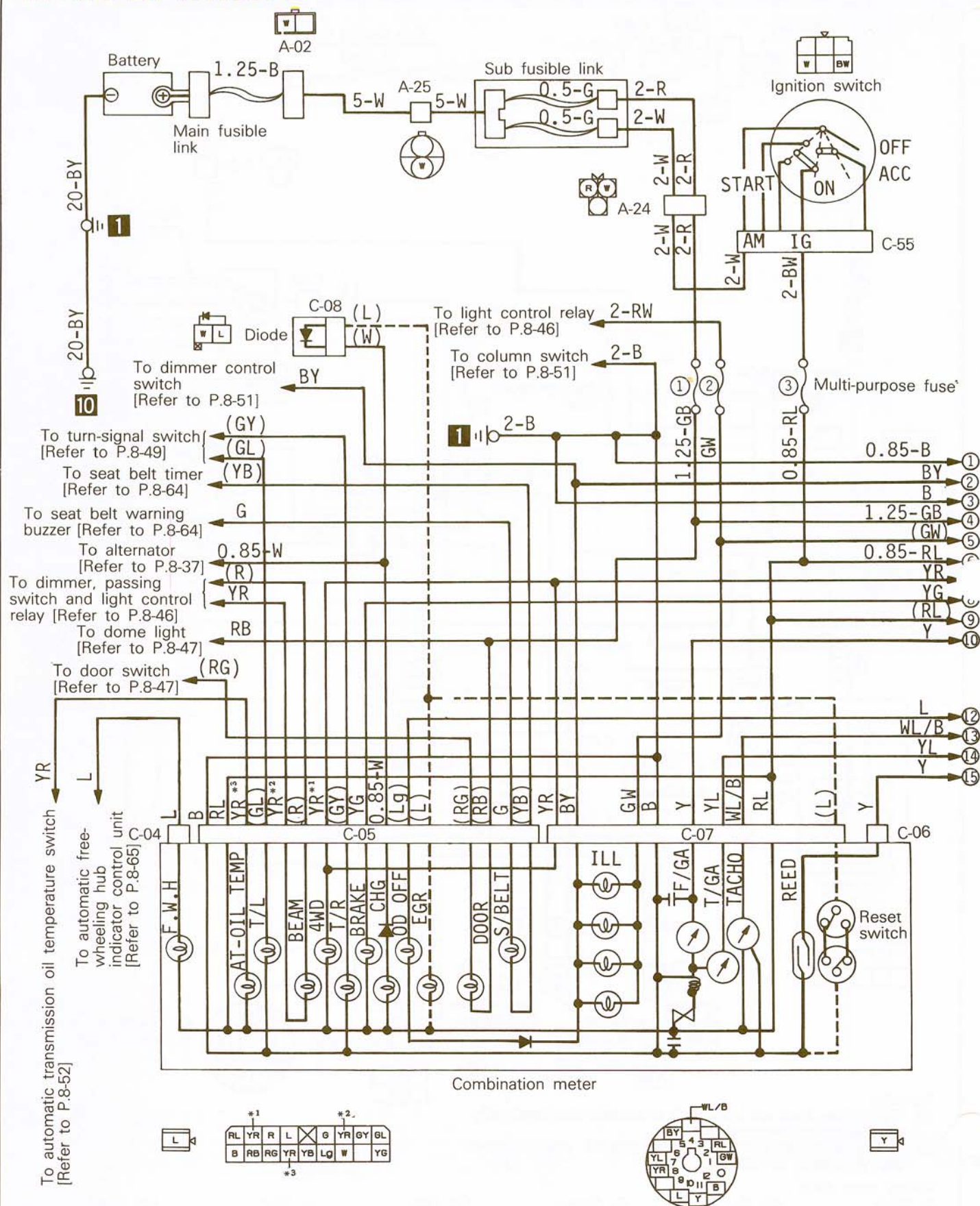
## Wiring color code

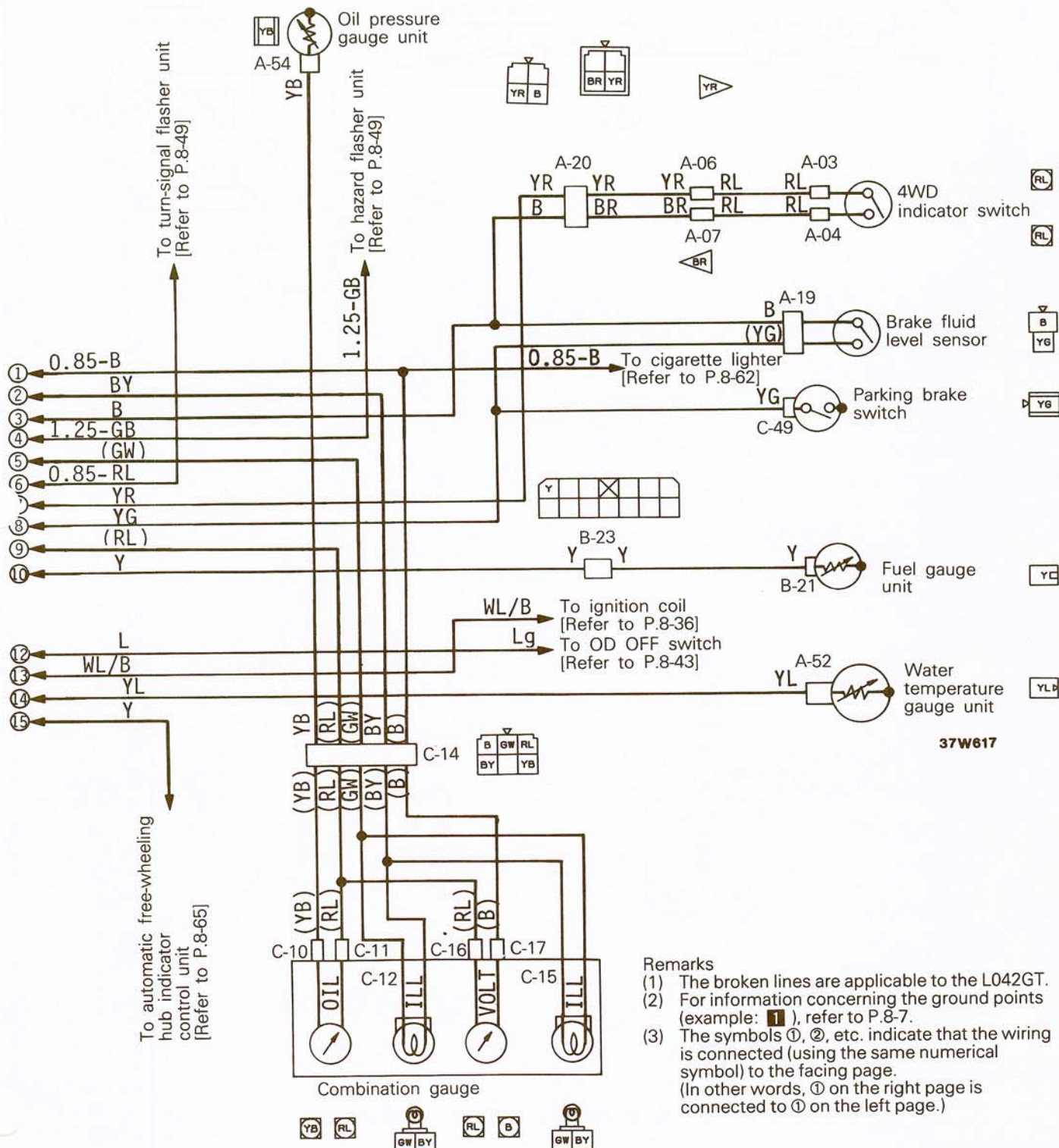
B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
LI: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

37W622



## 12 METER CIRCUIT

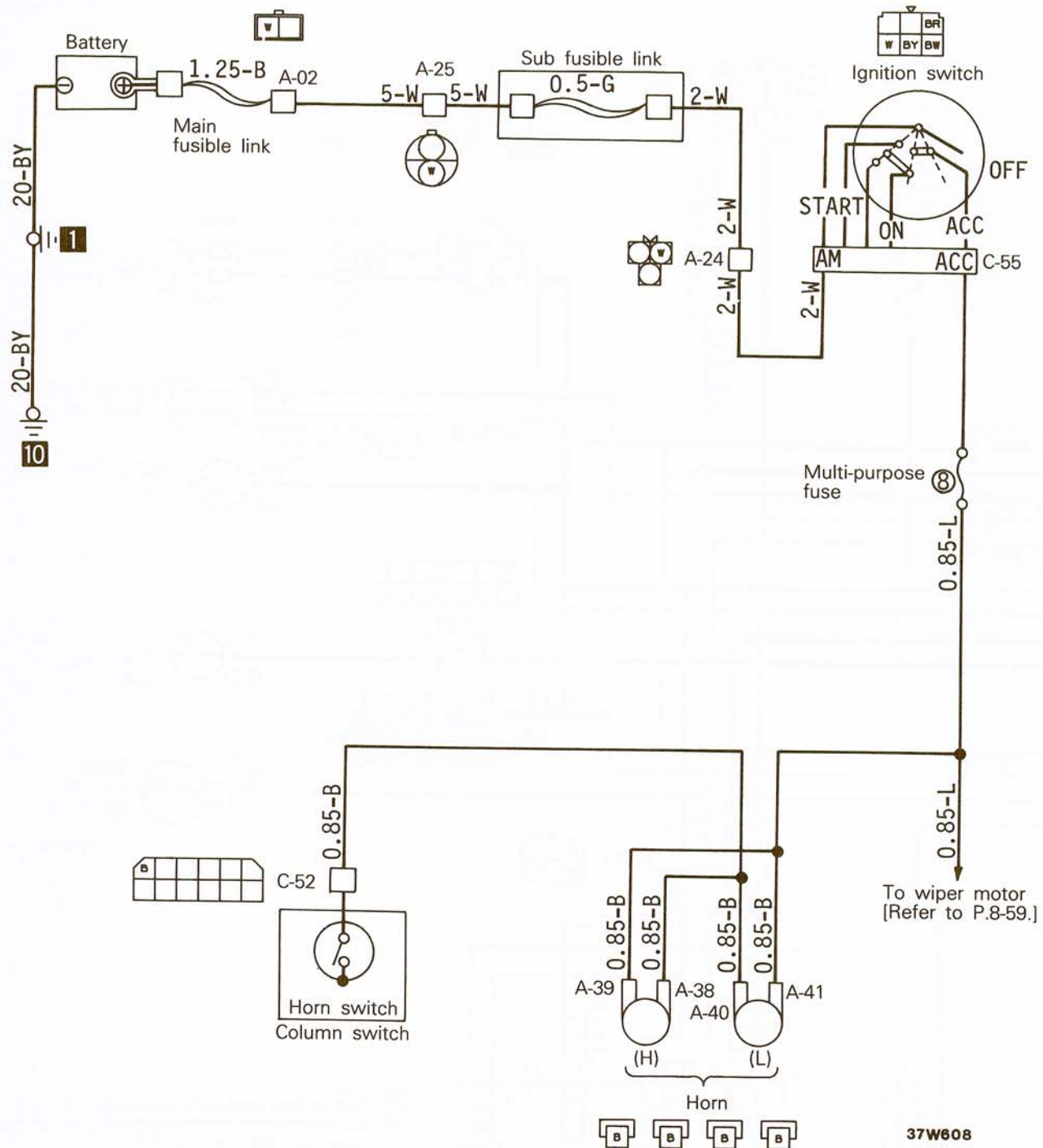




37W617



## 13 HORN CIRCUIT



## Remark

For information concerning the ground points (example: 1), refer to P.8-7.

## Wiring color code

B: Black

Br: Brown

G: Green

Gr: Gray

L: Blue

Lg: Light green

LI: Light blue

O: Orange

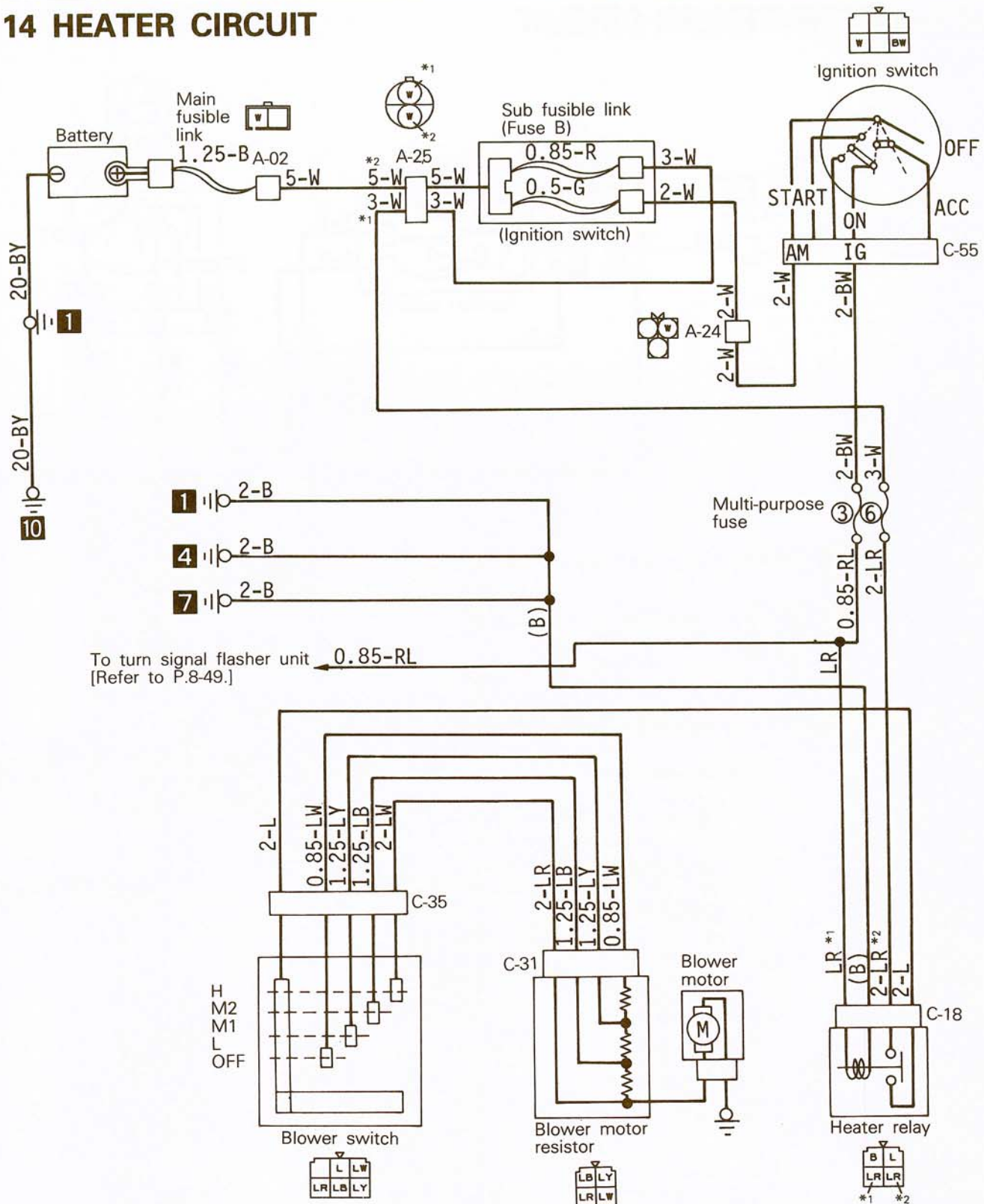
P: Pink

R: Red

Y: Yellow

W: White

# 14 HEATER CIRCUIT



37W614

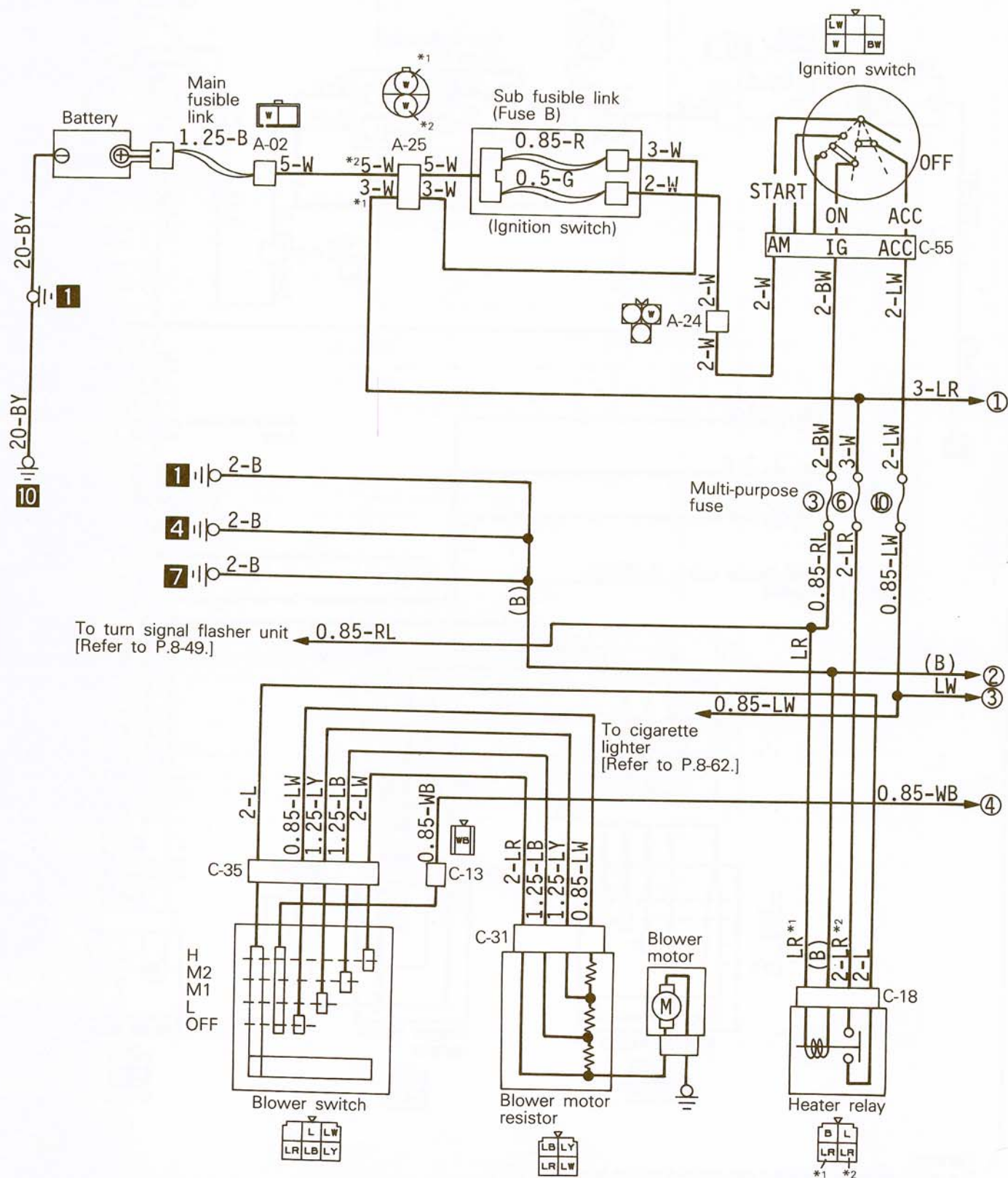
Remark  
For information concerning the ground points (example: 1),  
refer to P.8-7.

Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White



## 15 AIR CONDITIONER CIRCUIT



## Wiring color code

B: Black

Br: Brown

G: Green

Gr: Gray

L: Blue

Lg: Light green

LI: Light blue

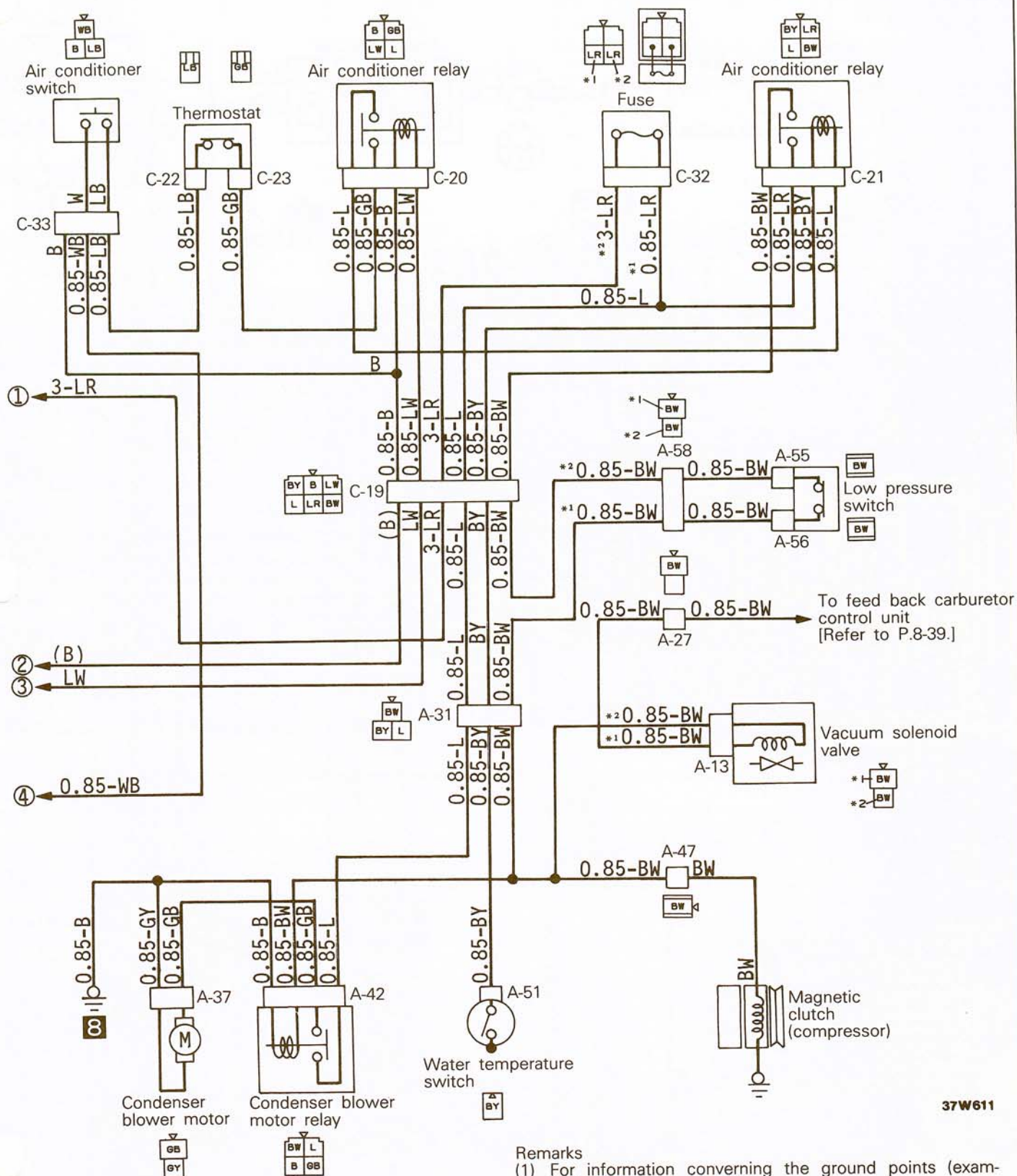
O: Orange

P: Pink

R: Red

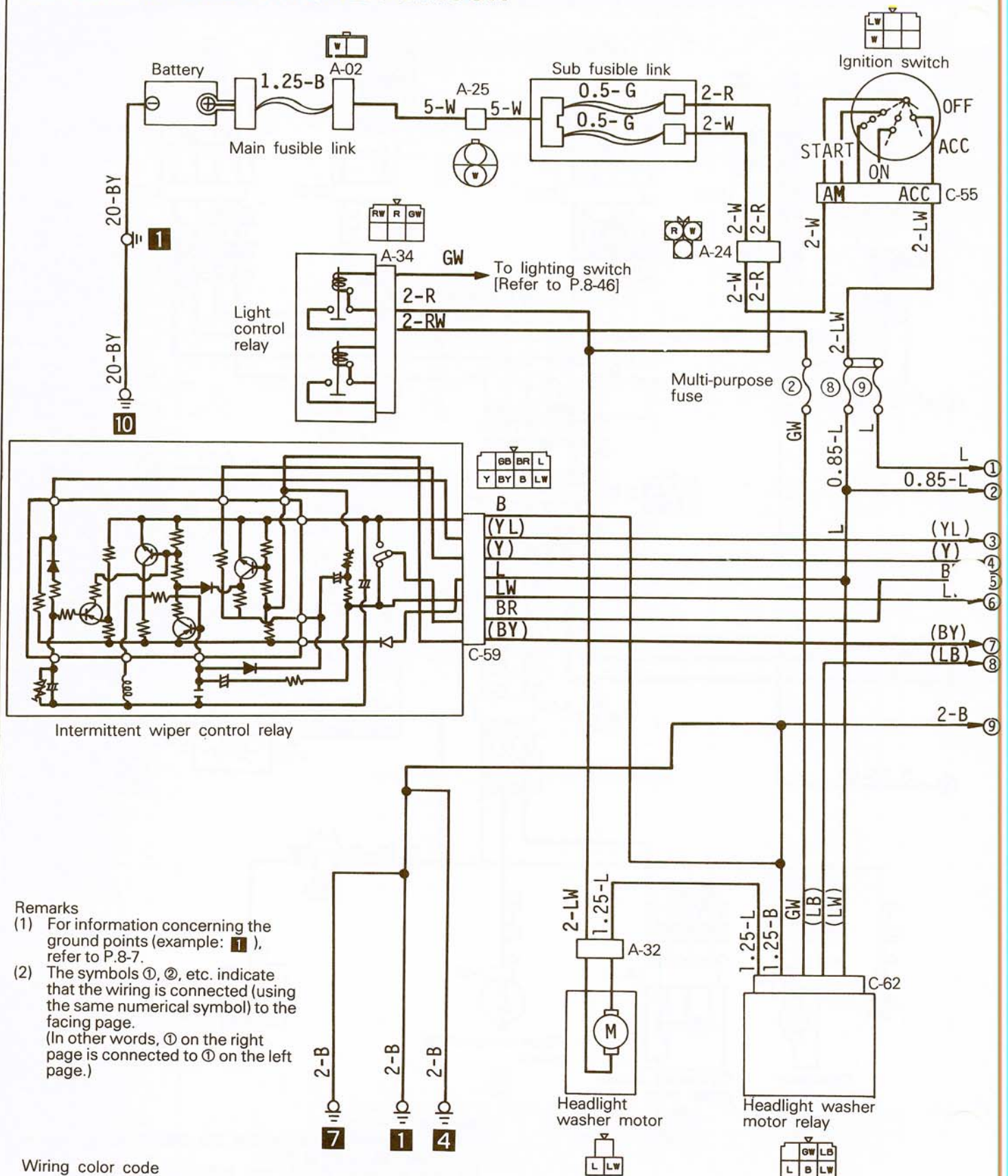
Y: Yellow

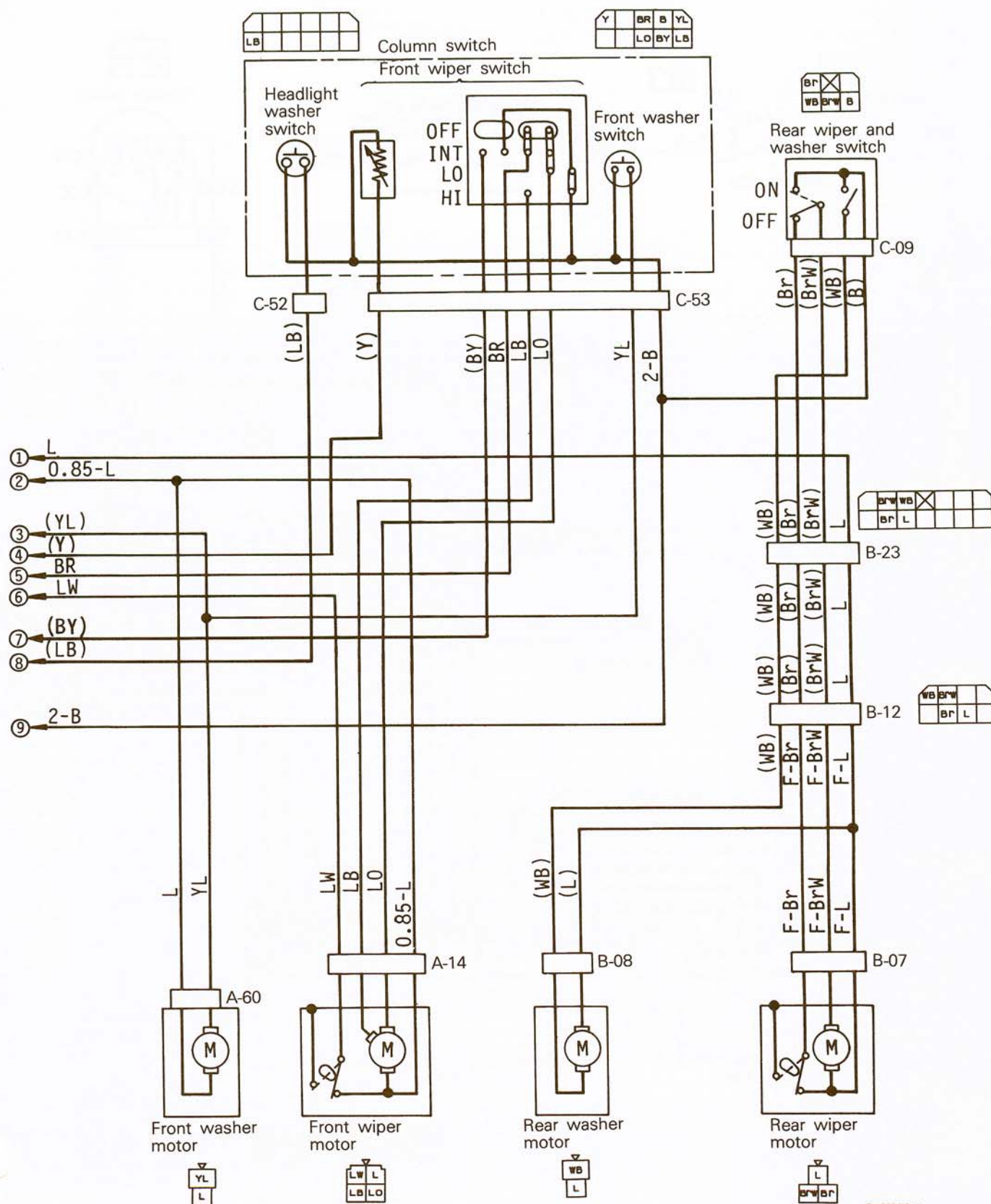
W: White





## 16 WIPER AND WASHER CIRCUIT

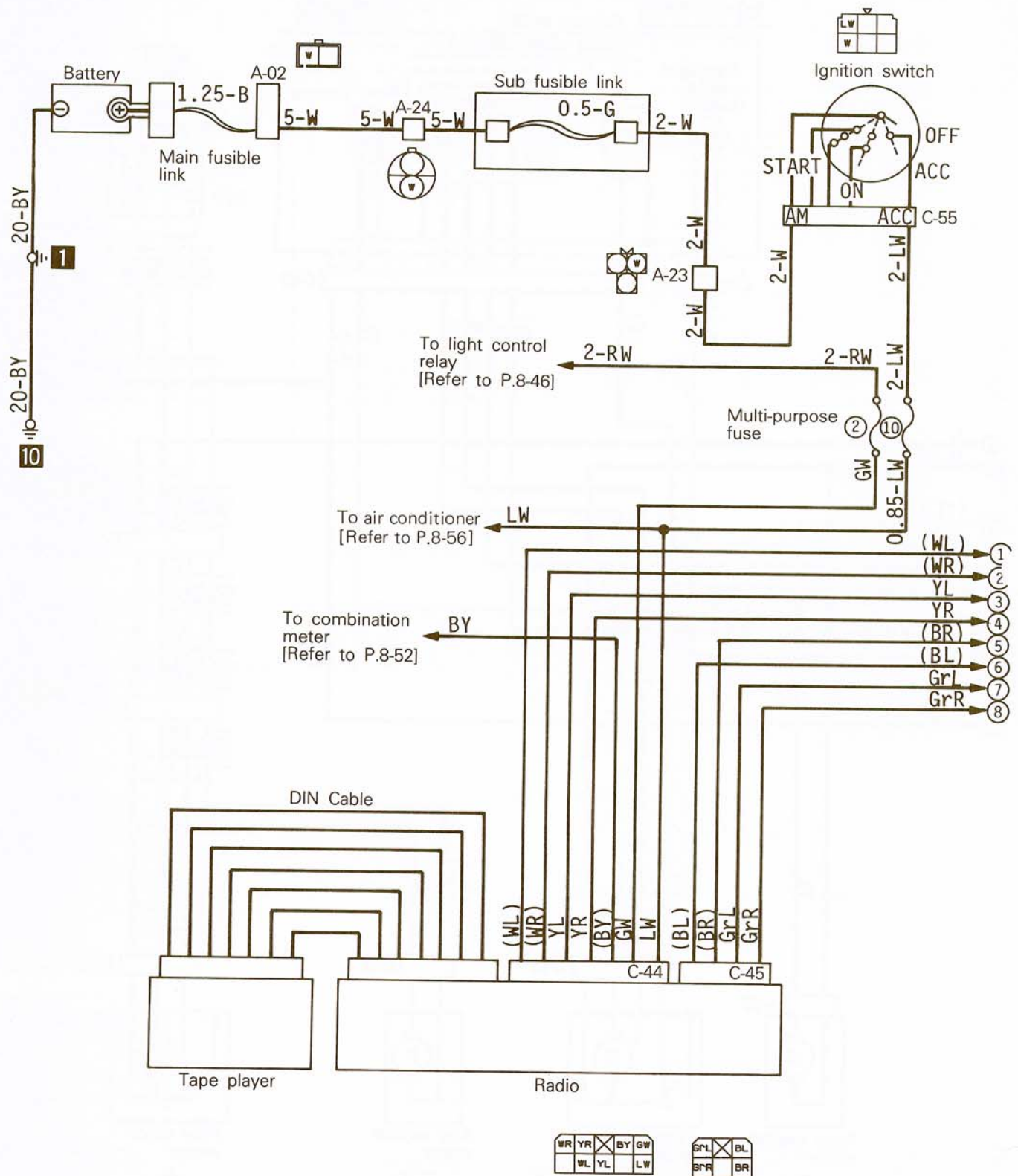


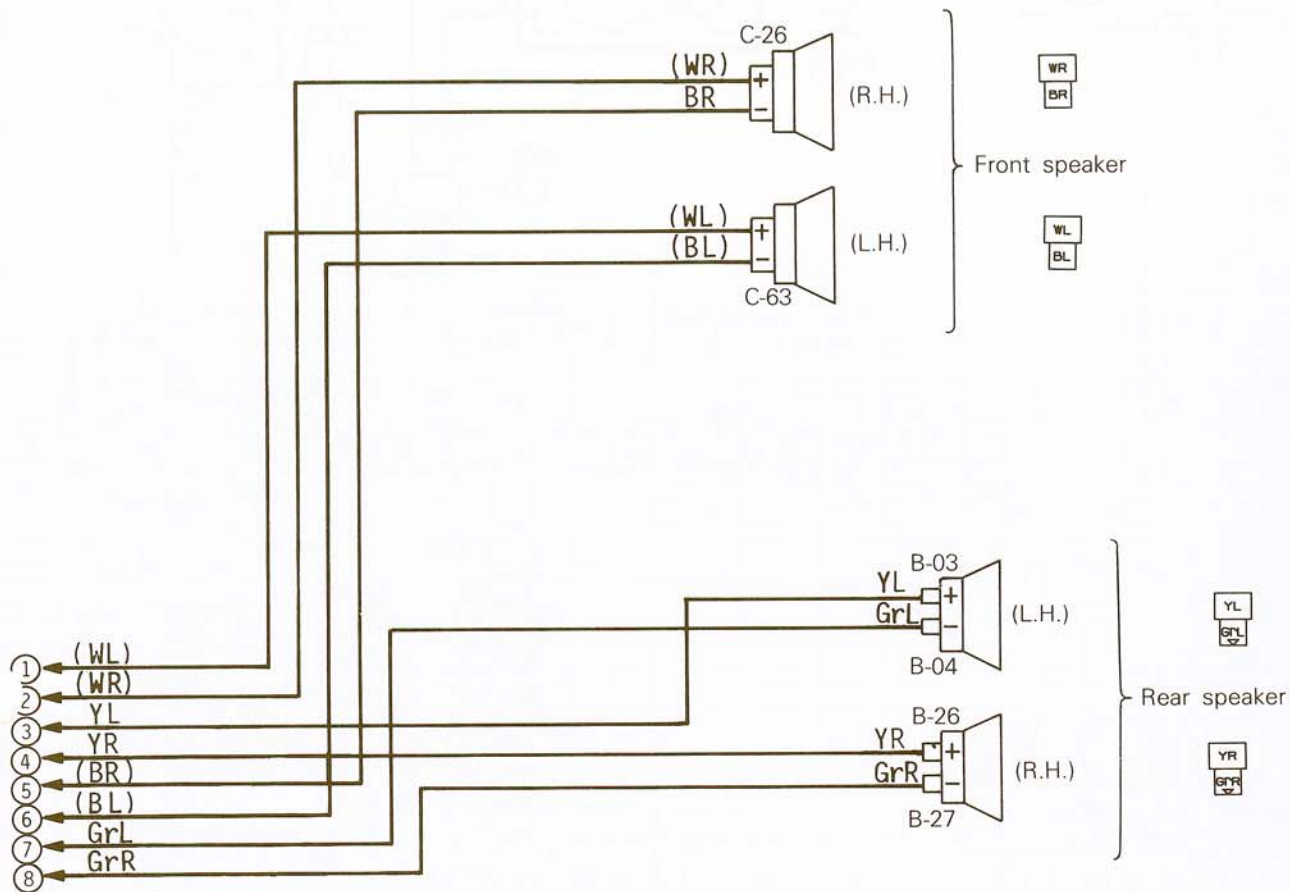


**37W624**



## 17 RADIO/CASSETTE DECK CIRCUIT





37W618

## Remarks

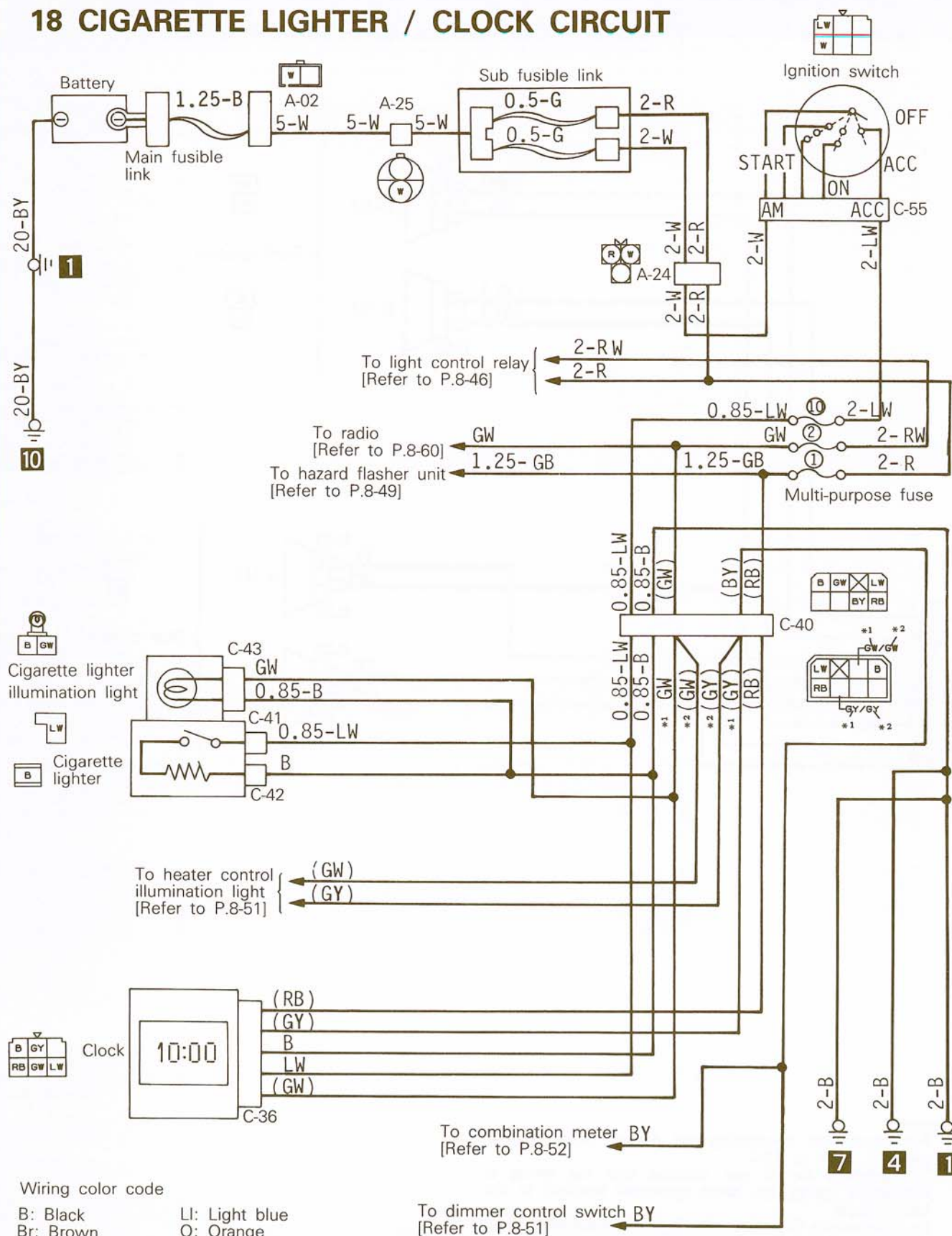
- (1) For information concerning the ground points (example: **1**), refer to P.8-7.
- (2) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)

## Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
LI: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White



## 18 CIGARETTE LIGHTER / CLOCK CIRCUIT



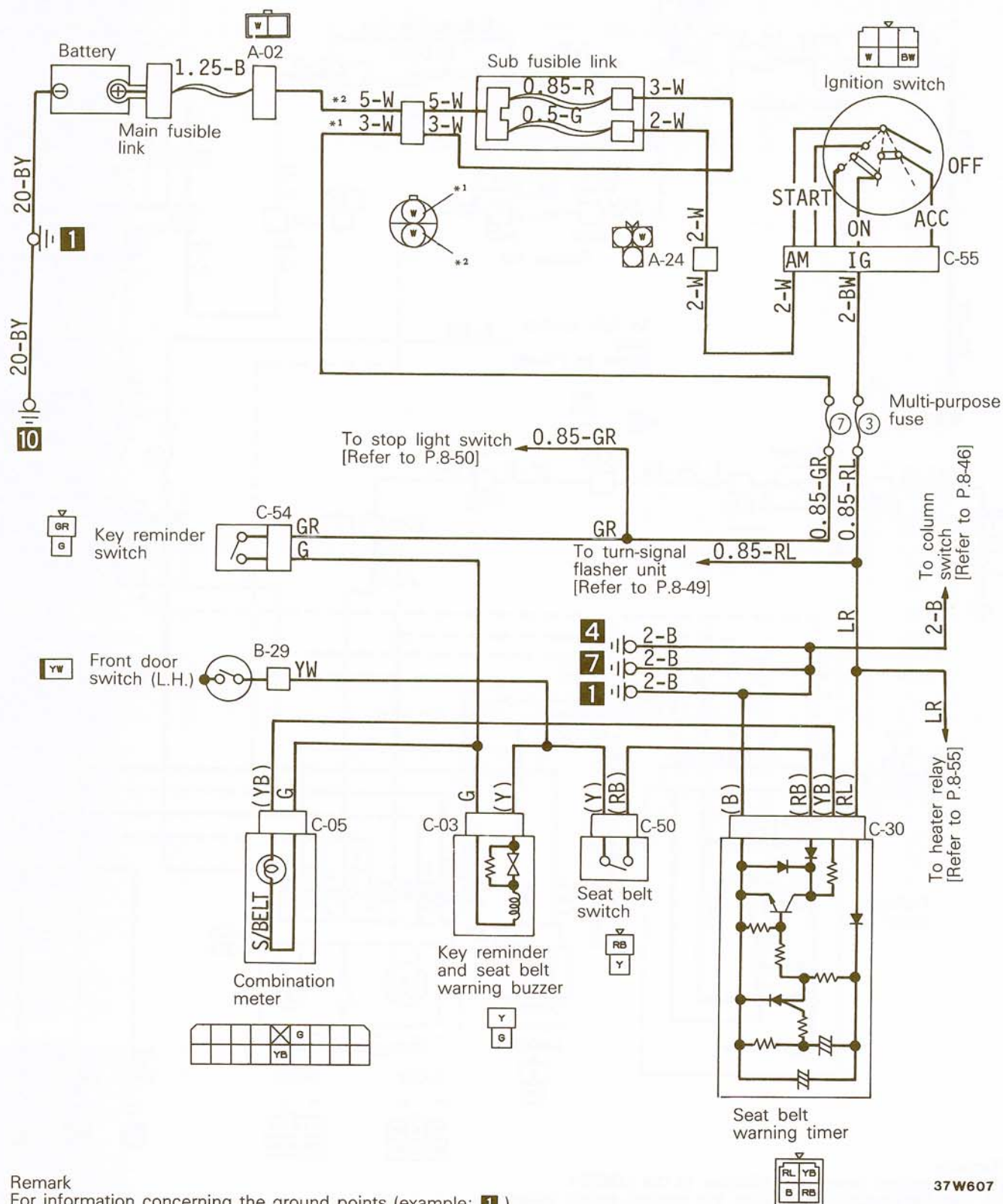
37W615

(1) The broken lines are applicable to the L042GV.  
(2) For information concerning the ground points (example: 1), refer to P.8-7.

Lg: Light green  
W: White

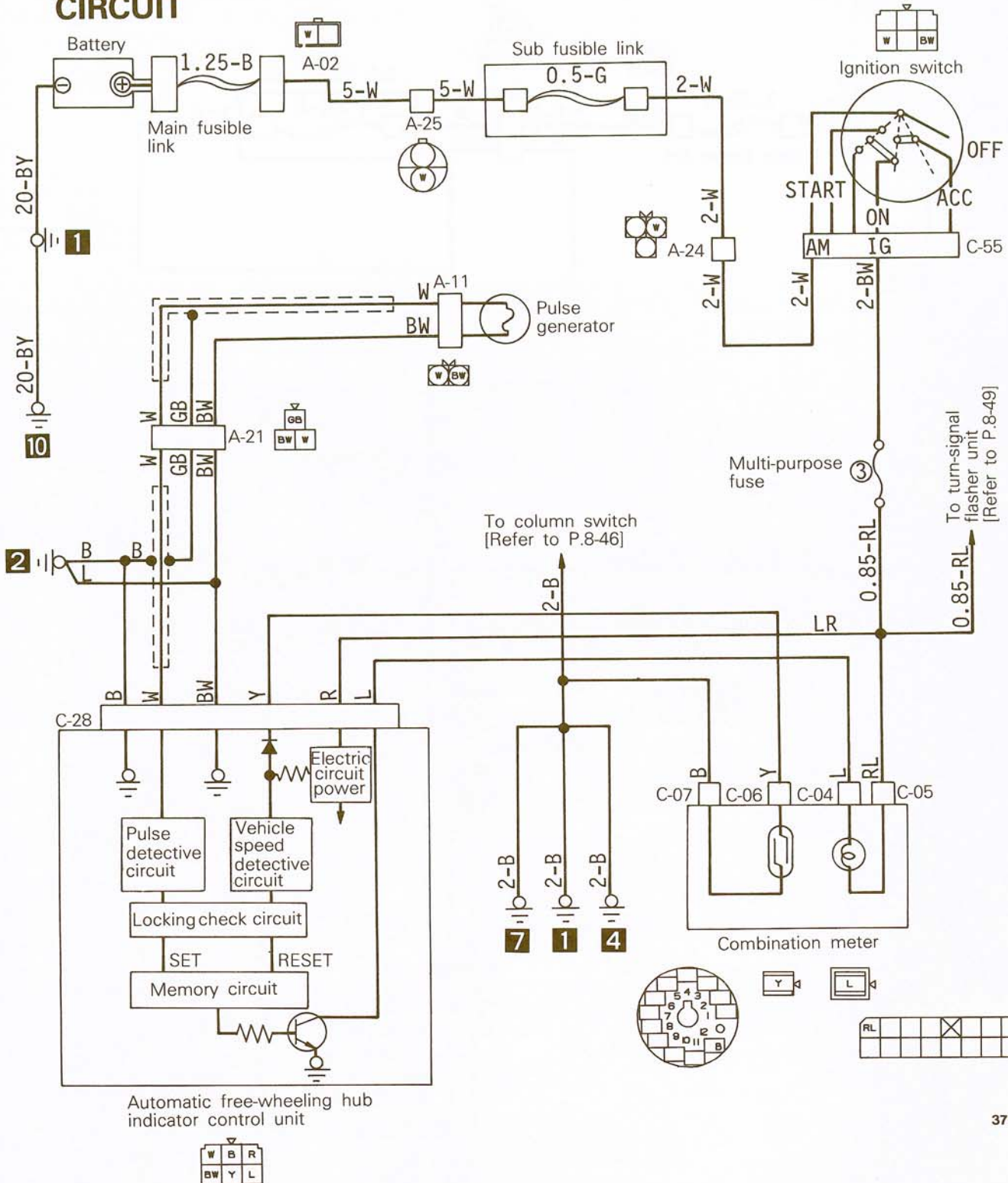


## 20 BUZZER CIRCUIT



37W607

## 21 AUTOMATIC FREE-WHEELING HUB INDICATOR SYSTEM CIRCUIT



37W610

Remark  
For information concerning the ground points (example: **1**), refer to P.8-7.

Wiring color code

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
Li: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White



This wiring diagram illustrates the electrical system for the back door lock actuator and switch. The power source is a battery connected through a main fusible link (A-02) and a sub fusible link (0.85-R). The circuit includes several fuses: a multi-purpose fuse (6), a 2-LR fuse, and three 2-B fuses. The back door lock actuator (M) is connected to the 2-LR line. The back door lock switch (C-01) is connected to the 2-B lines. The diagram also shows various relays and switches, including a heater relay and a column switch, which are referenced to other pages (P.8-55 and P.8-51).

37W602

Wiring color code

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
 Ll: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White

## CENTRALIZED JUNCTION

### Main Fusible Link

Item \ Circuit	Main circuit	Alternator circuit	Feed back carburetor control circuit
Cable color	Black	Brown	Green
Fusible link size mm <sup>2</sup> (in. <sup>2</sup> )	1.25 (.0019)	0.3 (.0005)	0.5 (.0008)
Permissible continuous current A	40	19	27
Fusing current A	190	65	100

### Sub Fusible Link

Item \ Circuit	Lighting circuit	Stop light, door lock and heater circuit	Ignition circuit
Cable color	Green	Red	Green
Fusible link size mm <sup>2</sup> (in. <sup>2</sup> )	0.5 (.0008)	0.85 (.0013)	0.5 (.0008)
Permissible continuous current A	27	34	27
Fusing current A	100	150	100

### Dedicated Fusible Link

Item \ Circuit	Defogger circuit
Cable color	Red
Fusible link size mm <sup>2</sup> (in. <sup>2</sup> )	0.85 (.0013)
Permissible continuous current A	34
Fusing current A	150

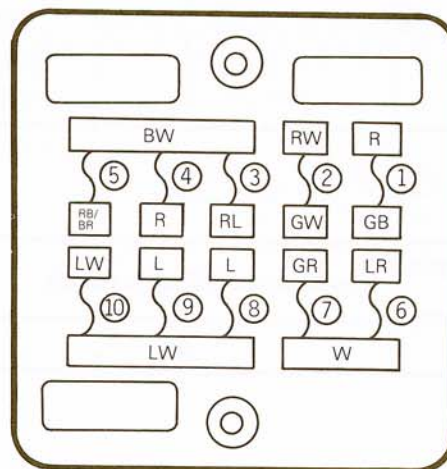
### Dedicated Fuse

Item \ Circuit	Upper beam indicator circuit	Air conditioner circuit
Rated capacity A	5	20



## Multi-purpose Fuse

Power supply circuit	Fuse No.	Rated capacity A	Applicable circuits
Battery	1	20	Clock, Dome light, Hazard warning flashers
Headlight relay	2	10	Tail lights, License plate lights, Illumination lights, Headlight washer relay, Position lights
Ignition switch (IG)	3	10	Heater relay, Seat belt warning timer, Turn-signal lights, Alternator, Seat belt switches, Fuel and water temperature gauges, Oil pressure gauge, Voltage meter, Indicator and warning lights, Inhibitor switch, Automatic free-wheeling hub indicator control unit
	4	10	Back-up lights, Auto choke relay, OD-OFF relay
	5	15	Rear window defogger
Battery	6	20	Heater, Back door lock
	7	15	Key-reminder switch, Stop lights, Buzzer
Ignition switch (ACC)	8	15	Windshield wipers and washer, Headlight washer relay, Intermittent wiper relay, Horn
	9	10	Rear window wiper and washer
	10	15	Cigarette lighter, Radio, Tape player, Clock (ACC), Spare terminal, Air conditioner relay



37W594

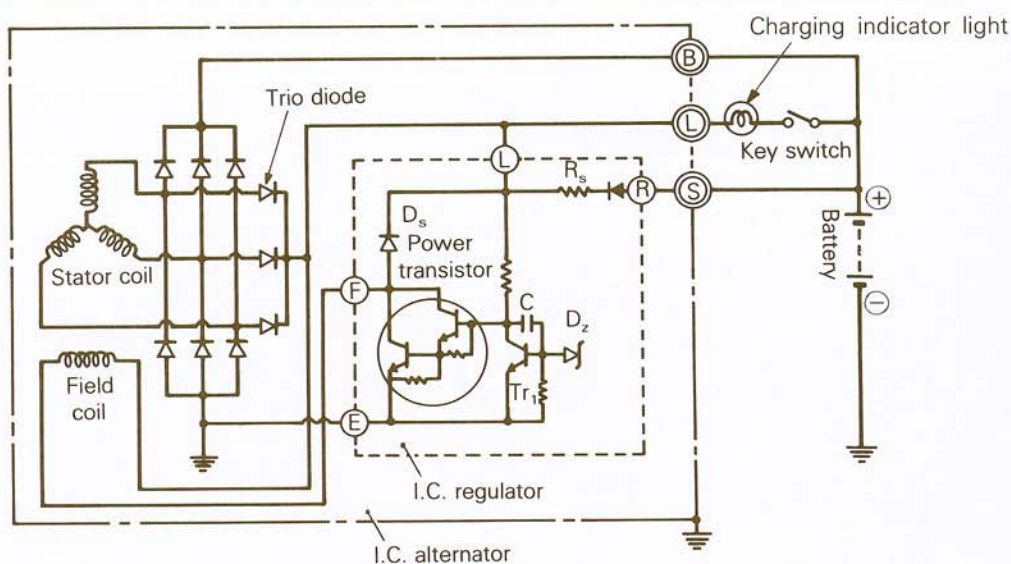
## CHARGING SYSTEM

### GENERAL INFORMATION

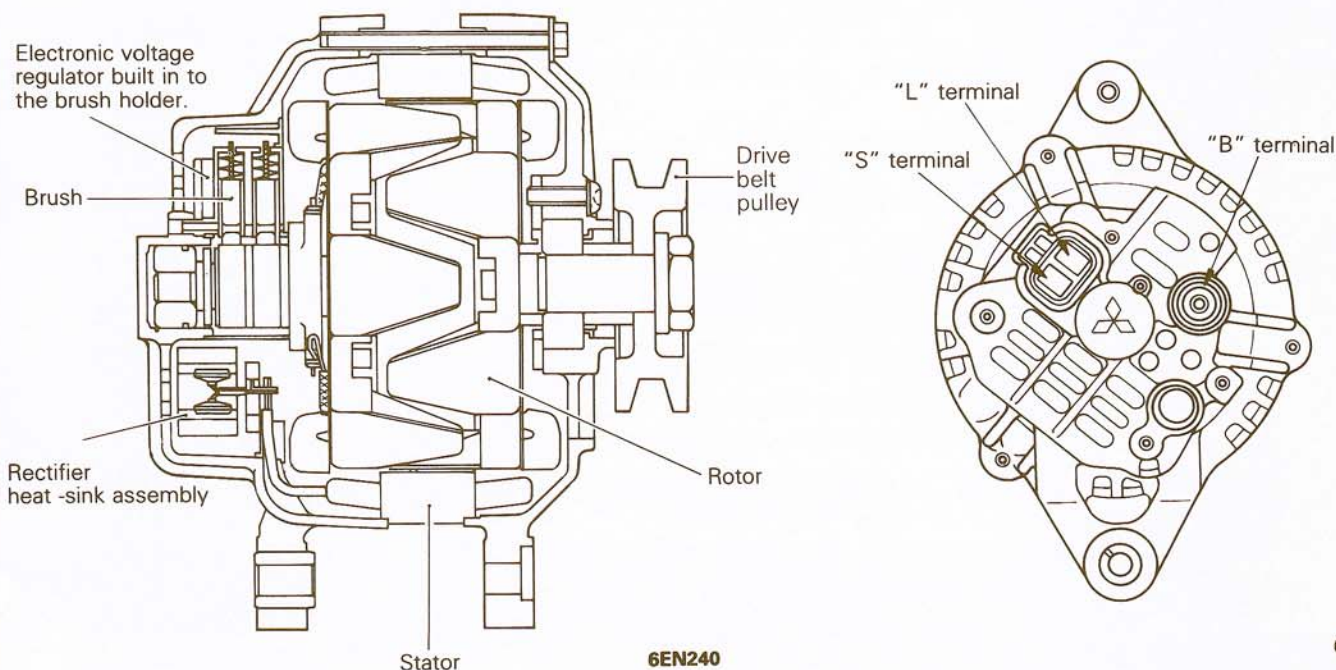
N08EAAD

The charging system comprises battery, alternator with regulator, charging indicator light and wire. The alternator has 6 built in rectifiers (3 positive and 3 negative), which rectify alternating current to direct current. Accordingly, the alternator terminal B is D/C. Furthermore the alternator regulates the charge voltage through the use of battery voltage detection system.

The main parts of the alternator are: rotor, stator, rectifier, condenser, brush, bearing, drive belt pulley and a brush holder with built in electronic voltage regulator.



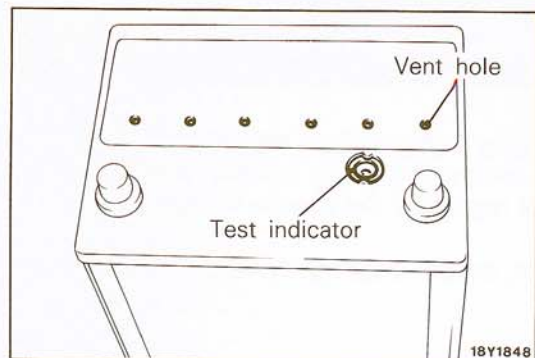
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6EN240

6EN211





### MAINTENANCE FREE TYPE BATTERY

The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps. Water never needs to be added to the maintenance-free battery.

The battery is completely sealed, except for small vent holes in the cover. These vent holes allow what small amount of gasses are produced in the battery to escape. The special chemical composition inside the battery reduces the production of gas to an extremely small amount at normal charging voltages. The battery contains a visual test indicator which indicates the condition of the battery.

**SPECIFICATIONS****GENERAL SPECIFICATIONS****ALTERNATOR**

N08EB-A

Items	Specifications
Type	Battery voltage sensing
Model No.	A2T03477
Part No.	MD110318
Rated output V/A	12 / 50
Voltage regulator	Electronic built-in type

**BATTERY**

Items	U.S.A.	CANADA
Type	55B24R (S)-MF	65D23R-MF
Ampere hours (5 HR) Ah	36	52
Cranking rating [at $-17.8^{\circ}\text{C}$ ( $0^{\circ}\text{F}$ )] A	420	410
Reserve capacity min.	75	115

**NOTES**

1. CRANKING RATING is the current a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 or greater at a specified temperature.
2. RESERVE CAPACITY RATING is the amount of time a battery can deliver 25 A and maintain a minimum terminal voltage of 10.5 at  $26.7^{\circ}\text{C}$  ( $80^{\circ}\text{F}$ ).

**SERVICE SPECIFICATIONS**

N08EC--

Items	Specifications
Standard values	
Regulated voltage V	
Ambient temp. at voltage regulator	
$-20^{\circ}\text{C}$ ( $-4^{\circ}\text{F}$ )	14.2–15.4
$20^{\circ}\text{C}$ ( $68^{\circ}\text{F}$ )	13.9–14.9
$60^{\circ}\text{C}$ ( $140^{\circ}\text{F}$ )	13.4–14.6
$80^{\circ}\text{C}$ ( $176^{\circ}\text{F}$ )	13.1–14.5
Slip ring O.D. mm (in.)	23 (.906)
Field coil resistance $\Omega$	3.1
Limit	
Output current A	Min. 35
Slip ring O.D. mm (in.)	22.2 (.874)



## TORQUE SPECIFICATIONS

N08ED--

Items	Nm	ft.lbs.
Alternator brace bolt	12–15	9–11
Alternator support bolt nut	20–22	14–16
High pressure hose nut	20–25	14–18
Low pressure hose nut	30–35	22–25

## TROUBLESHOOTING

N08EH--

Symptom	Probable cause	Remedy	Reference page
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown	Check fuses	8-68
	Light burned out	Replace light	–
	Wiring connection loose	Tighten loose connections	–
	Electronic voltage regulator faulty	Replace voltage regulator	8-77
Charging warning indicator does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn	Adjust tension or replace drive belt	Refer to GROUP 9.
	Battery cables loose, corroded or worn	Repair or replace cables	8-79
	Fuse blown	Check fuses	8-68
	Fusible link blown	Replace fusible link	8-67
	Electronic voltage regulator or alternator faulty	Test alternator	8-75 8-77
	Wiring faulty	Repair wiring	–
Run-down battery	Drive belt loose or worn	Adjust tension or replace drive belt	Refer to GROUP 9.
	Wiring connection loose or open circuit	Tighten loose connection or repair wiring	–
	Fusible link blown	Replace fusible link	8-67
	Poor grounding	Repair	–
	Electronic voltage regulator or alternator faulty	Test alternator	8-75 8-77
	Decrease in life of battery	Replace battery	8-79
Overcharge	Electronic voltage regulator faulty	Replace voltage regulator	8-77



[illegible]

37W605

Remark  
For information concerning the ground points (example: **1** ),  
refer to P.8-7.

### Wiring color code

B: Black

LI: Light blue

Br: Brown

O: Orange

G: Green

P: Pink

Gr: Gray

R: Red

L: Blue

L: Blue  
Y: Yellow

Lg: Light green

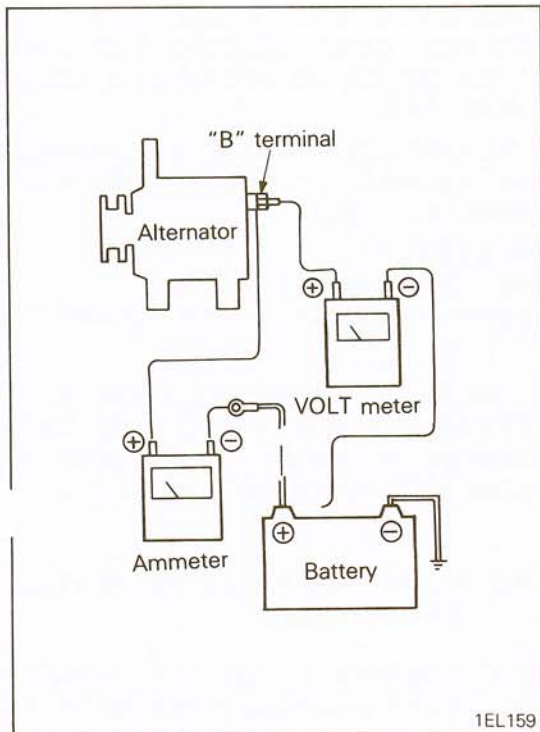
W: White

**SERVICE ADJUSTMENT PROCEDURES**

N08E1AB

**INSPECTION OF THE CHARGING SYSTEM****VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE**

This test judges whether or not the wiring (including the fusible link) between the alternator B terminal and the battery (+) terminal is sound by the voltage drop method.

**Preparation**

- (1) Turn the ignition switch to "OFF".
- (2) Disconnect the battery ground cable.
- (3) Disconnect the alternator output lead from the alternator "B" terminal.
- (4) Connect a DC ammeter (0 to 100 A) in series to the "B" terminal and the disconnected output lead. Connect the (+) lead of the ammeter to the "B" terminal and the (-) lead to the disconnected output wire.

**NOTE**

Use of a clamp type ammeter that can measure current without disconnecting the harness is preferred. The reason is that when checking a vehicle that has a low output current due to poor connection of the alternator "B" terminal, such poor connection is corrected as the "B" terminal is loosened and a test ammeter is connected in its place and as a result, causes for the trouble may not be determined.

- (5) Connect a digital voltmeter between the alternator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (-) lead wire to the battery (+) terminal.
- (6) Connect the battery ground cable.
- (7) Leave the hood open.

**Test**

- (1) Start the engine.
- (2) Turn on or off the headlights and small lights and adjust the engine speed so that the ammeter reads 20 A and read off the voltmeter indication under this condition.

**Result**

- (1) It is okay if the voltmeter indicates the standard value.

**Standard value : 0.2 V max.**

- (2) If the voltmeter indicates a value that is larger than the standard value, poor wiring is suspected, in which case check the wiring from the alternator "B" terminal to fusible link to battery (+) terminal. Check for loose connection, color change due to overheated harness, etc. and correct them before testing again.
- (3) Upon completion of the test, set the engine speed at idle. Turn off the lights and turn off the ignition switch.
- (4) Disconnect the battery ground cable.
- (5) Disconnect the ammeter and voltmeter that have been connected for the test purpose.
- (6) Connect the alternator output wire to the alternator "B" terminal.
- (7) Connect the battery ground cable.



**OUTPUT CURRENT TEST**

This test judges whether or not the alternator gives an output current that is equivalent to the nominal output.

**Preparation**

- (1) Prior to the test, check the following items and correct as necessary.
  - (a) Check the battery installed in the vehicle to ensure that it is in sound state\*. The battery checking method is described in "BATTERY".

**NOTE**

\*The battery that is used to test the output current should be one that has been rather discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.

- (b) Check tension of the alternator drive belt. The belt tension check method is described in "GROUP 7 COOLING – Service Adjustment Procedures".
- (2) Turn off the ignition switch.
- (3) Disconnect the battery ground cable.
- (4) Disconnect the alternator output wire from the alternator "B" terminal.
- (5) Connect a DC ammeter (0 to 100 A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead of the ammeter to the "B" terminal and connect the (-) lead wire to the disconnected output wire.

**NOTE**

Tighten each connection by bolt and nut securely as a heavy current will flow. Do not rely on clips.

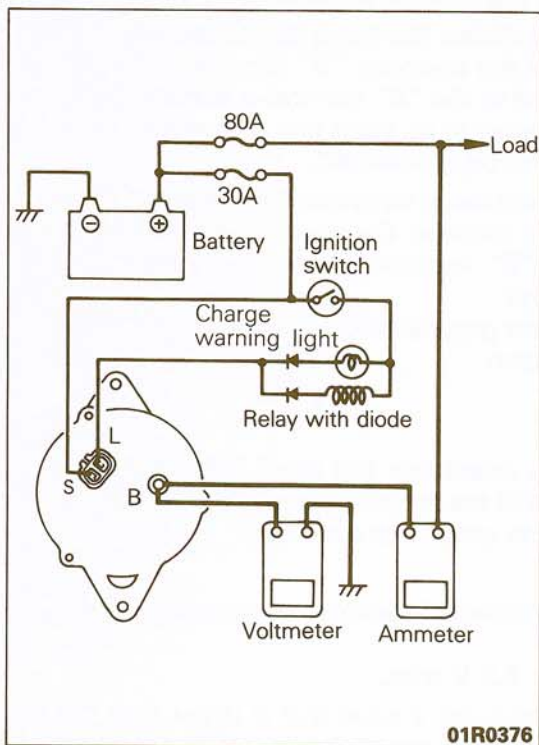
- (6) Connect a voltmeter (0 to 20 V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wire to a sound ground.
- (7) Set the engine tachometer and connect the battery ground cable.
- (8) Leave the engine hood open.

**Test**

- (1) Check to see that the voltmeter reads the same value as the battery voltage.  
If the voltmeter reads 0 V, an open circuit in the wire between the alternator "B" terminal and battery (-) terminal, a blown fusible link or poor grounding is suspected.
- (2) Turn on the headlight switch and start the engine.
- (3) Set the headlight at high beam and the heater blower switch at HIGH, quickly increase the engine speed to 2500 rpm and read the maximum output current value indicated by the ammeter.

**NOTE**

After the engine start up, the charging current quickly drops; therefore, above operation must be done quickly to read minimum current value correctly.



**Result**

- (1) The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is normal, remove the alternator from the vehicle and check it.

**Limit value : 31 A min.**

**Caution**

1. **The nominal output current value is shown on the nameplate affixed to the alternator body.**
  2. **The output current value changes with the electrical load and the temperature of the alternator itself. Therefore, the nominal output current may not be obtained if the vehicle electrical load at the time of test is small. In such a case, keep the headlights on to cause discharge of the battery or use lights of another vehicle as a load to increase the electrical load. The nominal output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high. In such a case, reduce the temperature before testing again.**
- (2) Upon completion of the output current test, lower the engine speed to the idle speed and turn off the ignition switch.
  - (3) Disconnect the battery ground cable.
  - (4) Remove the test ammeter and voltmeter and the engine tachometer.
  - (5) connect the alternator output wire to the alternator "B" terminal.
  - (6) Connect the battery ground cable.

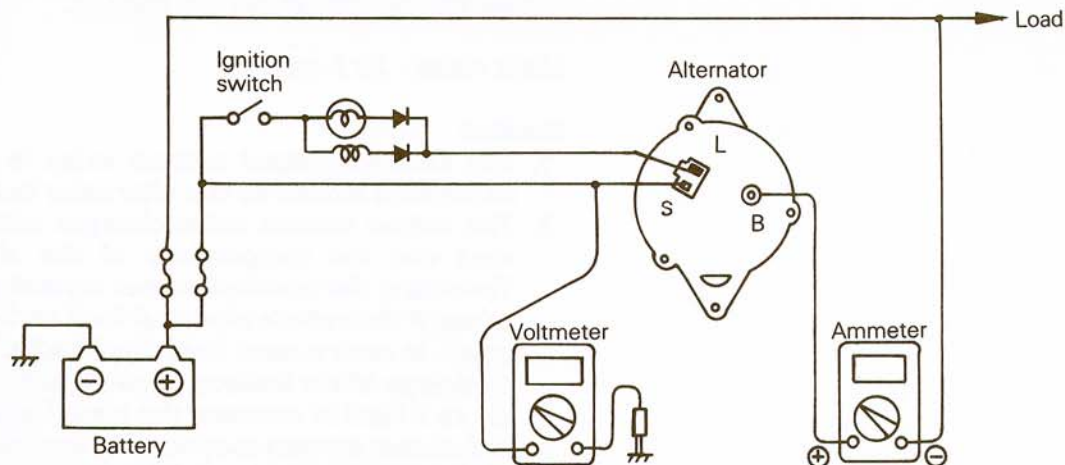
**REGULATED VOLTAGE TEST**

The purpose of this test is to check that the electronic voltage regulator controls the voltage correctly.

**Preparation**

- (1) Prior to the test, check the following items and correct if necessary.
  - (a) Check the battery installed on the vehicle to see that it is fully charged. For battery checking method, see "BATTERY".
  - (b) Check the alternator drive belt tension. For belt tension check, see "GROUP 7 COOLING – Service Adjustment Procedures".
- (2) Turn the ignition switch to "OFF".
- (3) Disconnect the battery ground cable.
- (4) Connect a digital voltmeter between the "S" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "S" terminal of the alternator, inserting from the wire side of the 2-way connector and connect the (–) lead to sound ground or battery (–) terminal.





6EL252

- (5) Disconnect the alternator output wire from the alternator "B" terminal.
- (6) Connect a DC ammeter (0 to 100 A) in series between the "B" terminal and the disconnected output wire. Connect the (+) lead of the ammeter to the "B" terminal and connect the (–) lead wire to the disconnected output wire.
- (7) Set the engine tachometer and connect the battery ground cable.

#### Test

- (1) Turn on the ignition switch and check that the voltmeter indicates the following value.

#### Voltage : Battery voltage

If it reads 0 V, there is an open circuit in the wire between the alternator "S" terminal and the battery (+) or the fusible link is blown.

- (2) Start the engine. Keep all lights and accessories off.
- (3) Run the engine at a speed of about 2500 rpm and read the voltmeter when the alternator output current drops to 10 A or less.

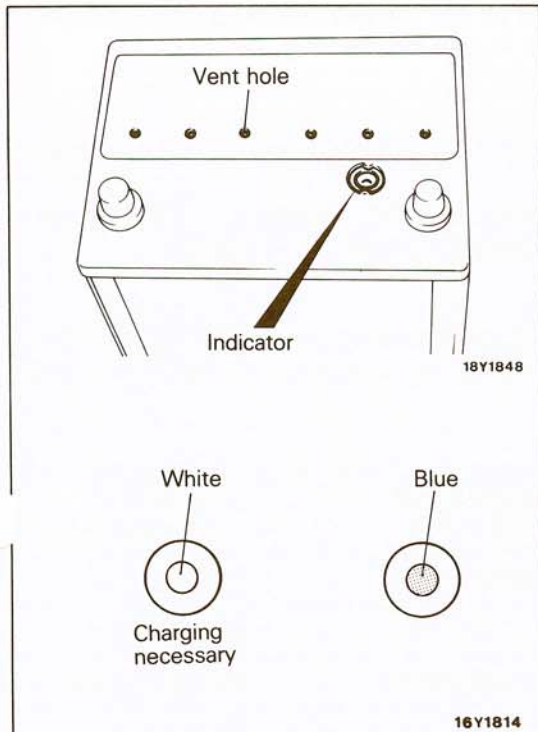
#### Result

- (1) If the voltmeter reading agrees with the value listed in the regulating voltage table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.

**Regulating voltage table**

Voltage regulator ambient temperature °C (°F)	Regulating voltage V
–20 (–4)	14.2–15.4
20 (68)	13.9–14.9
60 (140)	13.4–14.6
80 (176)	13.1–14.5

- (2) Upon completion of the test, set the engine speed at idle and turn off the ignition switch.
- (3) Disconnect the battery ground cable.
- (4) Remove the test voltmeter and ammeter and the engine tachometer.
- (5) Connect the alternator output wire to the alternator "B" terminal.
- (6) Connect the battery ground cable.



## INSPECTION OF BATTERY

N08EIBA

### VISUAL INSPECTION OF BATTERY (1)

The battery contains a visual test indicator which gives blue signal when an adequate charge level exists, and white signal when charging is required.

### VISUAL INSPECTION OF BATTERY (2)

Make sure ignition switch is in Off position and all battery feed accessories are Off.

1. Disconnect ground cable from battery before disconnecting (+) cable.
2. Remove battery from vehicle.

#### Caution

**Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.**

3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it will be necessary to clean area with a solution of clean warm water and baking soda. Scrub area with a stiff bristle brush and wipe off with a cloth moistened with ammonia or baking soda in water.
4. Clean top of battery with same solutions as described in Step (3).
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminals clamps.
8. Install the battery in vehicle.
9. Connect (+) and (–) cables to battery in the order of mention.
10. Tighten the clamp nut securely.



**BATTERY CHARGING**

NO8E1CD

**Caution**

When batteries are being charged, an explosive gas form beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from the battery.

Battery electrolyte temperature may temporarily be allowed to rise to 55°C (131°F). Increase of electrolyte temperature above 55°C (131°F) is harmful to the battery, causing deformation of battery cell, decrease in life of battery, etc.

**CHARGE RATE**

If the test indicator is white, the battery should be charged as outlined below.

When the dot appears or when maximum charge shown below is reached, charging should be stopped.

**NOTE**

If the indicator does not turn to blue even after the battery is charged, the battery should be replaced; do not overcharge.

**Charge Rate Chart**

Battery	55B24R (S)-MF (420 amps)	65D23R-MF (410 amps)
Slow Charging	5 amps 10 hrs.	5 amps 10 hrs.
	10 amps 5 hrs.	10 amps 5 hrs.
Fast Charging	20 amps 2.5 hrs.	20 amps 2.5 hrs.
	30 amps 1.5 hrs.	30 amps 1.5 hrs.

**ALTERNATOR****REMOVAL AND INSTALLATION (Vehicles without Air Conditioner)**

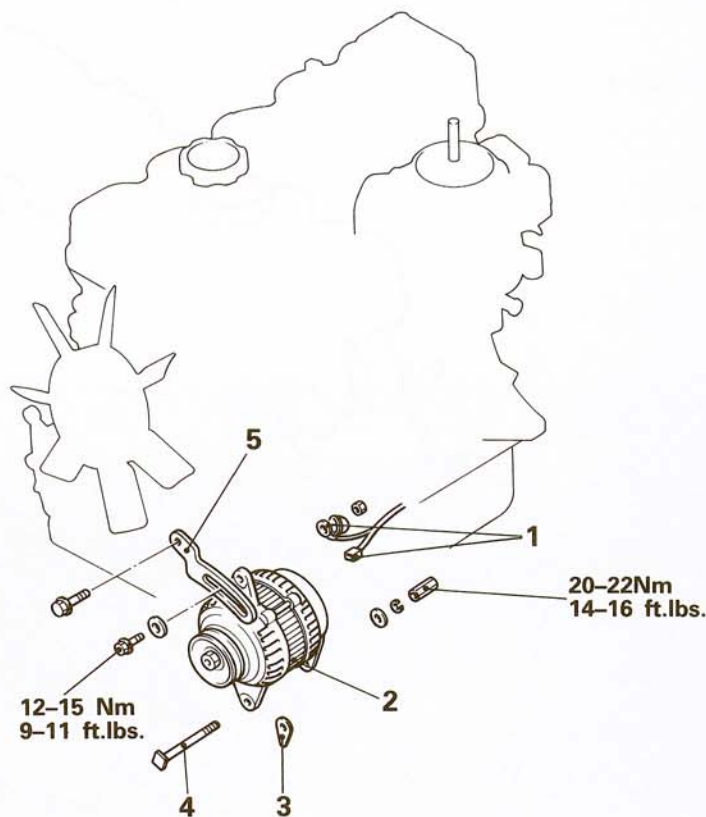
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**Post-installation Operation**

- Adjustment of the Drive Belt Tension (Refer to GROUP 7 COOLING-Service Adjustment Procedures)

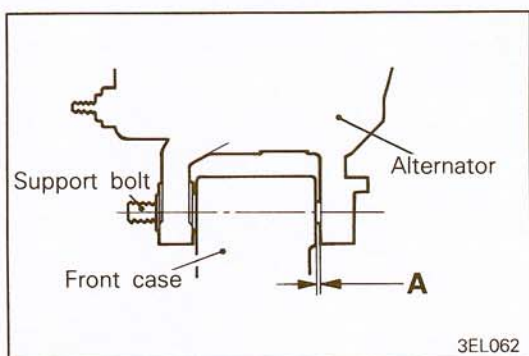
**Removal steps**

1. Connection of alternator connector
- ➡➡ 2. Alternator
3. Shim
4. Support bolt
5. Brace

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ➡➡ : Refer to "Service Points of installation".

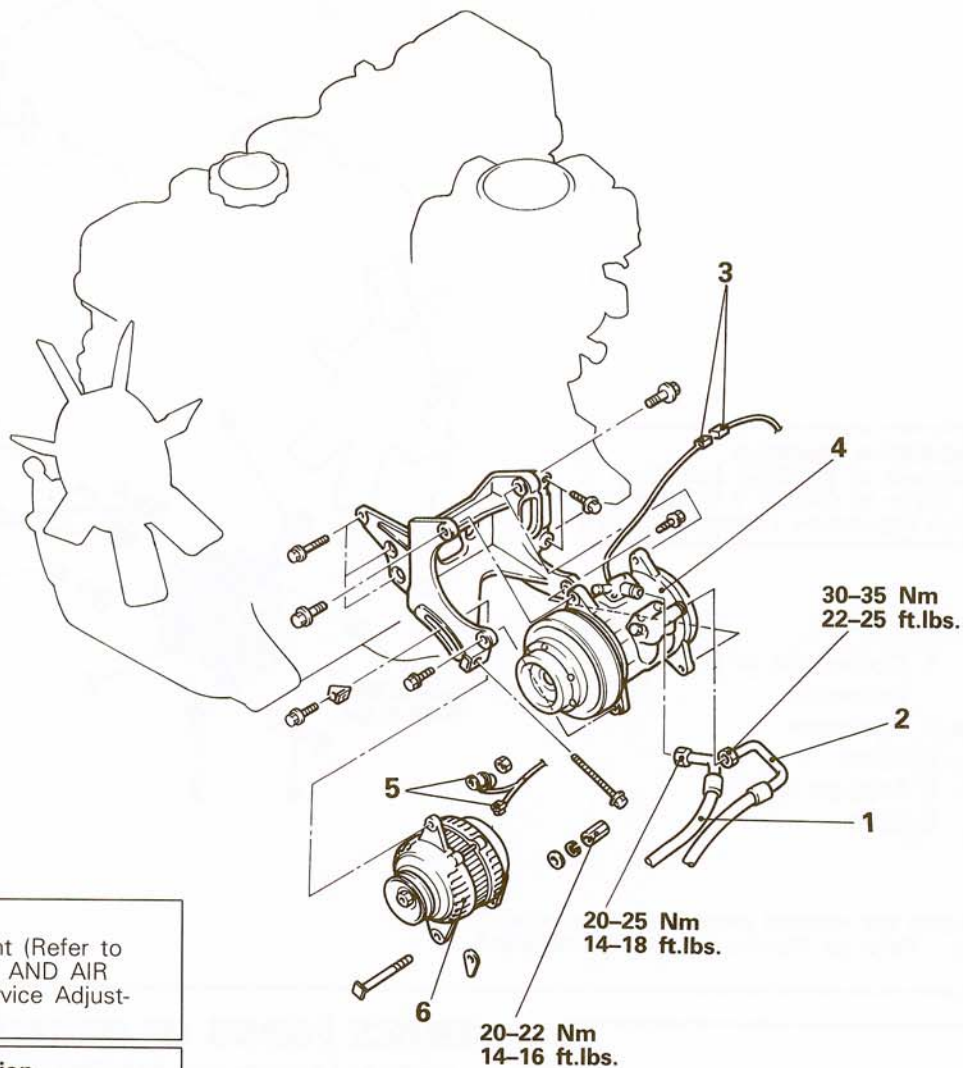
16W1565

**SERVICE POINTS OF INSTALLATION****2. INSTALLATION OF ALTERNATOR**

- (1) Position the alternator and insert the support bolt. (Do not attach the nut.)
- (2) Push the alternator forward and determine how many spacers [thickness: 0.198 mm (.0078 in.)] should be inserted between the front leg of the alternator and the front case (space A in the illustration). (There should be enough spacers so that they do not fall out when you let go of them.)
- (3) Insert the spacers (space A in the illustration), attach the nut, and complete the installation.



## REMOVAL AND INSTALLATION (Vehicles with Air Conditioner)

**Pre-removal Operation**

- Draining of Refrigerant (Refer to GROUP 24 HEATERS AND AIR CONDITIONING – Service Adjustment Procedures)

**Post-installation Operation**

- Charging of Refrigerant (Refer to GROUP 24 HEATERS AND AIR CONDITIONING – Service Adjustment Procedures)
- Adjustment of Drive Belt Tension (Refer to GROUP 7 COOLING and GROUP 24 HEATERS AND AIR CONDITIONING – Service Adjustment Procedures)

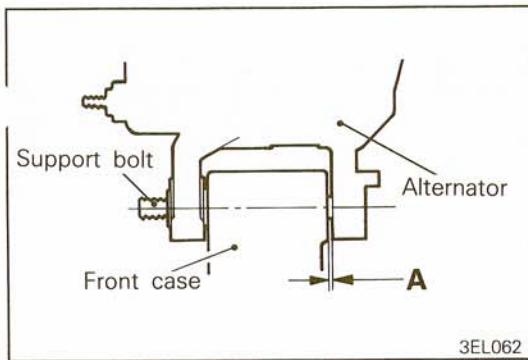
**Removal steps**

1. Connection of high pressure hose
2. Connection of low pressure hose
3. Connection of compressor connector
4. Compressor
5. Connection of alternator connector
- ◆◆ 6. Alternator

16W1566

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of installation".



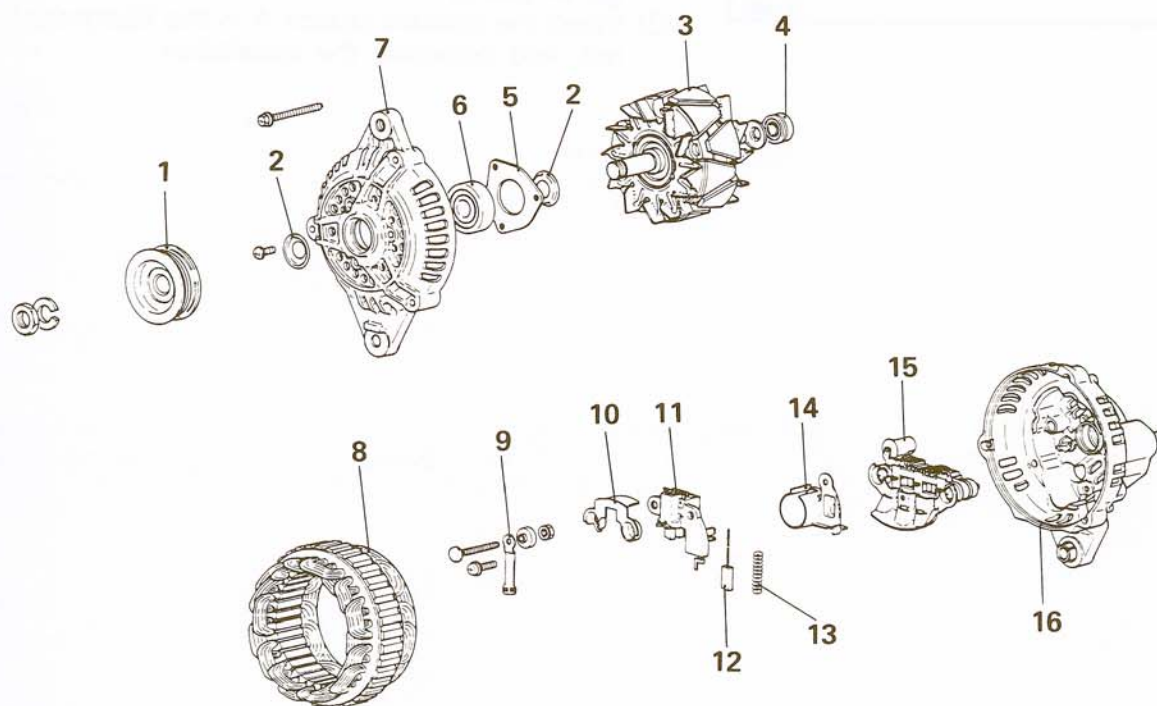
## SERVICE POINTS OF INSTALLATION

### 6. INSTALLATION OF ALTERNATOR

- (1) Position the alternator and insert the support bolt. (Do not attach the nut.)
- (2) Push the alternator forward and determine how many spacers [thickness: 0.198 mm (.0078 in.)] should be inserted between the front leg of the alternator and the front case (space A in the illustration). (There should be enough spacers so that they do not fall out when you let go of them.)
- (3) Insert the spacers (space A in the illustration), attach the nut, and complete the installation.



## DISASSEMBLY AND REASSEMBLY



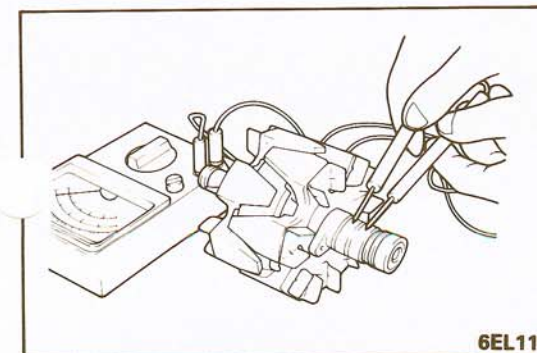
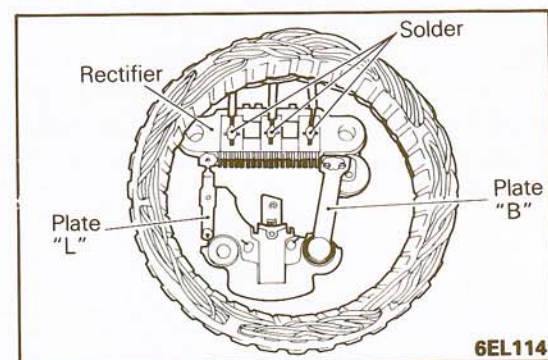
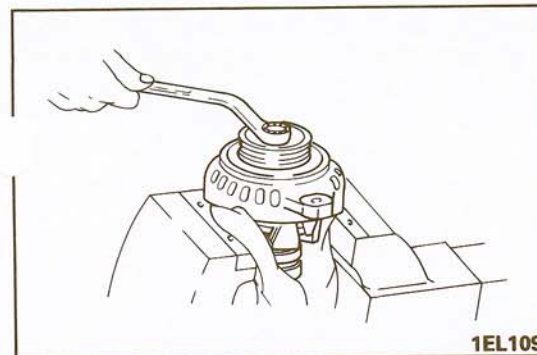
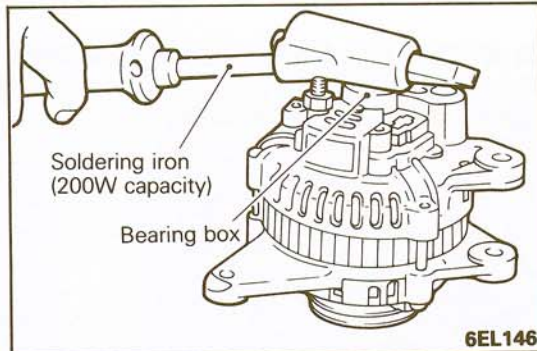
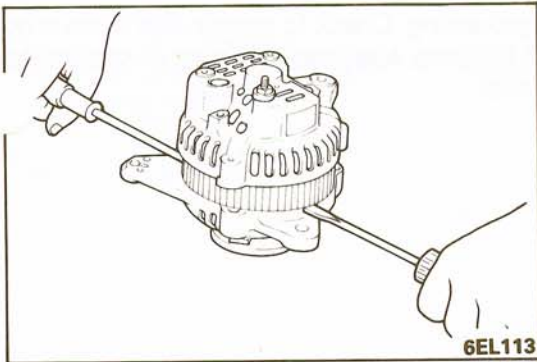
1EL096

## Disassembly steps

- ◆◆ 1. Pulley
- 2. Seal
- ◆◆ 3. Rotor assembly
- 4. Rear bearing
- 5. Bearing retainer
- 6. Front bearing
- ◆◆ 7. Front bracket
- 8. Stator
- 9. Terminal
- 10. Plate
- ◆◆ 11. Regulator and brush holder
- 12. Brush
- 13. Brush spring
- 14. Slinger
- 15. Rectifier assembly
- ◆◆ 16. Rear bracket

## NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".



## SERVICE POINTS OF DISASSEMBLY

### 7. REMOVAL OF FRONT BRACKET/16. REAR BRACKET

- (1) Insert plain screwdriver between front bracket and stator core and pry downward.

#### Caution

**Do not insert screwdriver too deep, as there is danger of damage to stator coil.**

- (2) Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200-W soldering iron.  
Do not use a heat gun, as it can damage diode assembly.

### 1. REMOVAL OF PULLEY

Clamp the rotor in a vise with soft jaws.

### 11. REMOVAL OF REGULATOR AND BRUSH HOLDER

- (1) Unsolder three stator leads soldered to main diodes on rectifier.
- (2) Unsolder two plates soldered to rectifier.

#### Caution

1. When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to diodes for a long period. Finish soldering or unsoldering in as short a time as possible.
2. Use care that no undue force is exerted to leads of diodes.

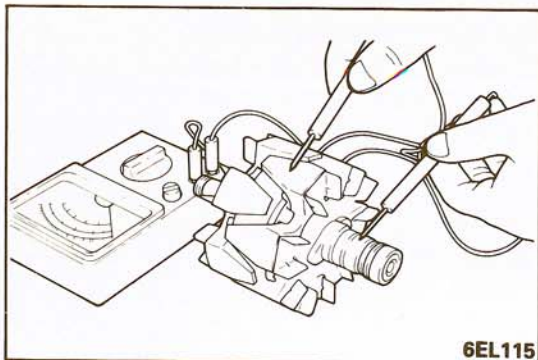
## INSPECTION

### ROTOR

- Check rotor coil for continuity. Check to ensure that there is continuity between slip rings.  
If resistance is extremely small, it means that there is a short. If there is no continuity or if there is short circuit, replace rotor assembly.

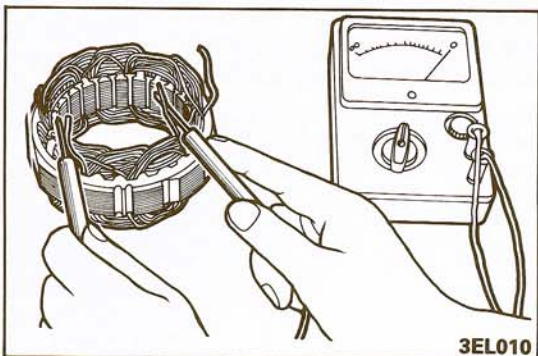
**Standard value : 3.1  $\Omega$**





6EL115

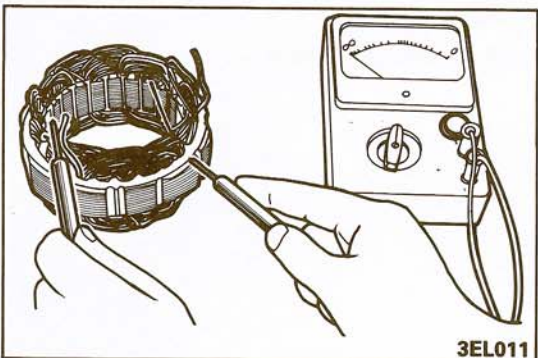
- Check rotor coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.



3EL010

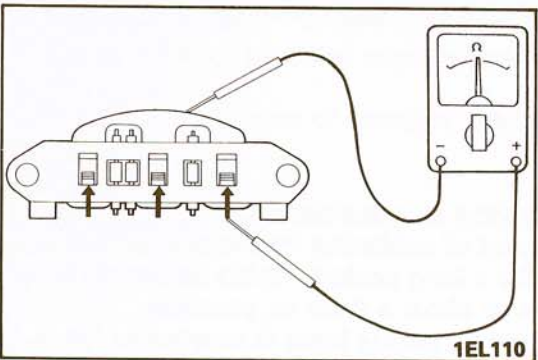
### STATOR

- Make continuity test on stator coil. Check to ensure that there is continuity between coil leads.  
If there is no continuity, replace stator assembly.



3EL011

- Check coil for grounding. Check to ensure that there is no continuity between coil and core. If there is continuity, replace stator assembly.

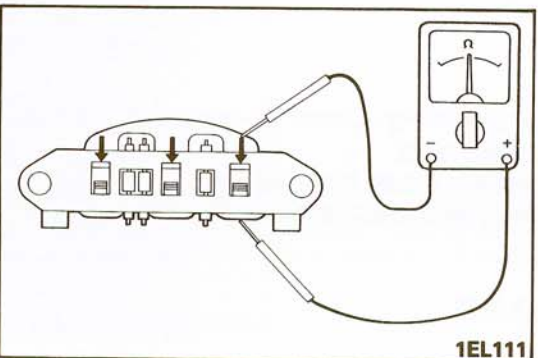


1EL110

### RECTIFIERS

#### • Positive rectifier test

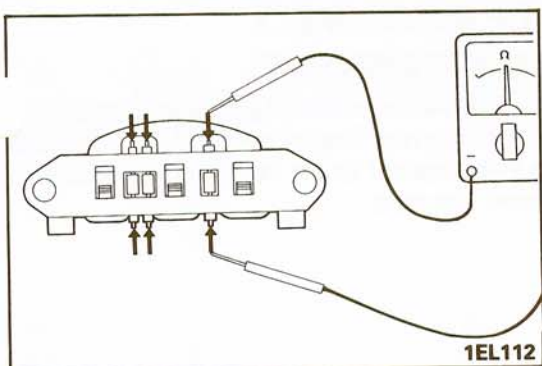
Check for continuity between positive rectifier and stator coil lead connection terminal with a circuit tester. If there is continuity in both directions, diode is shorted. Replace rectifier assembly.



1EL111

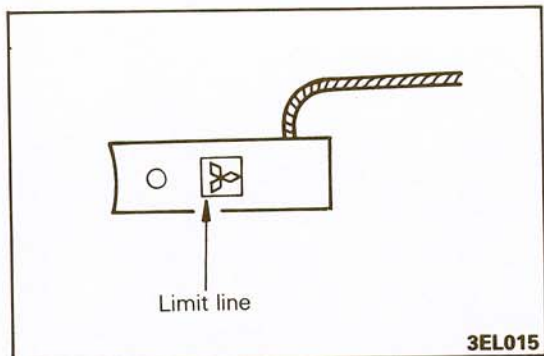
#### • Negative rectifier test

Check for continuity between negative rectifier and stator coil lead connection terminal. If there is continuity in both directions, diode is shorted, and rectifier assembly must be replaced.



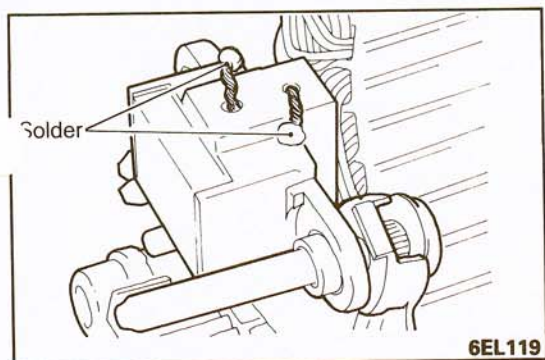
- **Diode trio test**

Check three diodes for continuity by connecting a circuit tester to both ends of each diode. If there is no continuity or no continuity in both directions, diode is defective and heatsink assembly must be replaced.

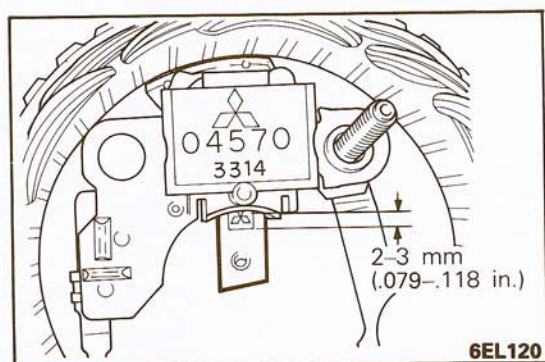


### REPLACEMENT OF BRUSH

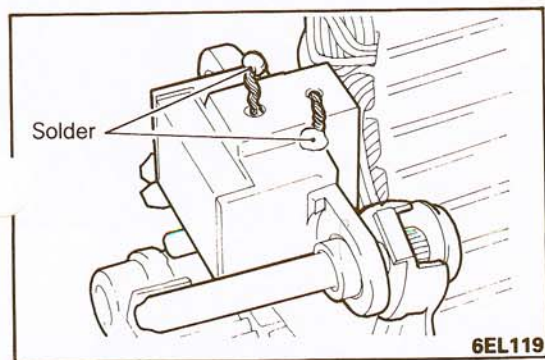
A brush worn away to the limit is replaced using the procedure below.



- (1) Remove the pigtail solder and take out the old brush and spring.

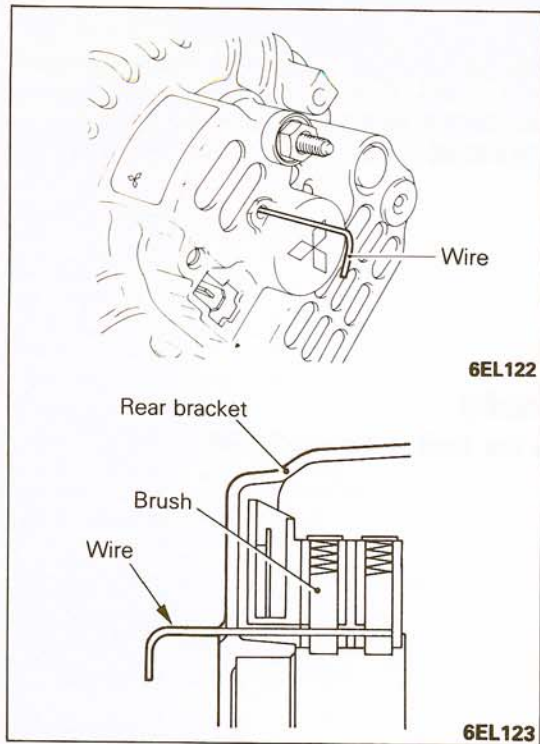


- (2) Install brush spring and new brush in brush holder.
- (3) Insert the brush to where there is a space 2-3 mm (.079-.118 in.) between the limit line and the end of the brush holder.



- (4) While maintaining the position of the step, solder the pigtails to the end of the brush holder.





## SERVICE POINTS OF REASSEMBLY

### 3. REASSEMBLY OF ROTOR ASSEMBLY

Perform reassembly in reverse procedure of disassembly. Before rotor is attached to rear bracket, insert wire through small hole made in rear bracket to lift brush. After rotor has been installed, remove the wire.

## STARTING SYSTEM

### GENERAL INFORMATION

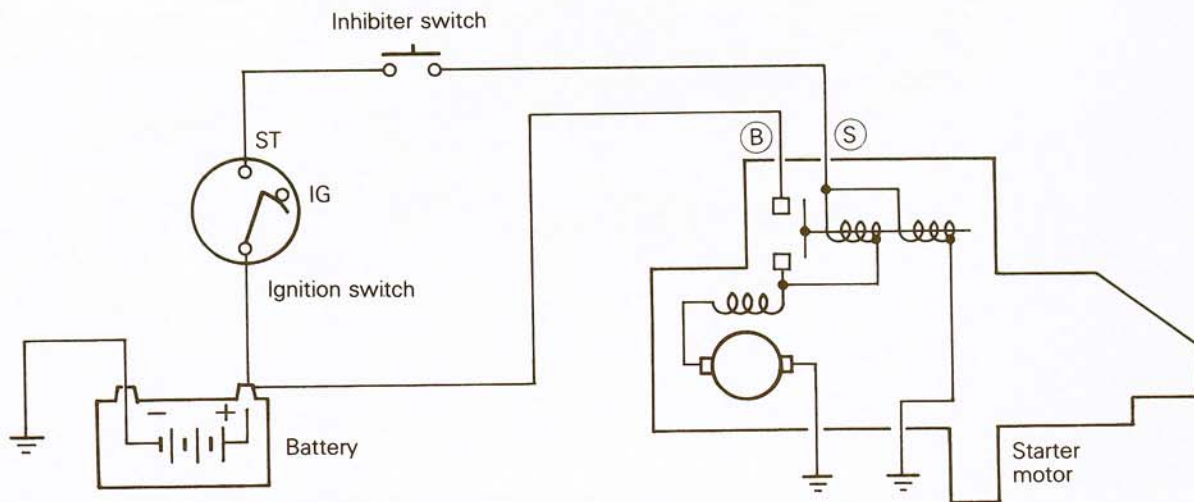
N08FAAJ

The electrical circuit of the starter system consists of battery, starter motor, solenoid switch, ignition switch, inhibitor switch, connecting wire and battery cable.

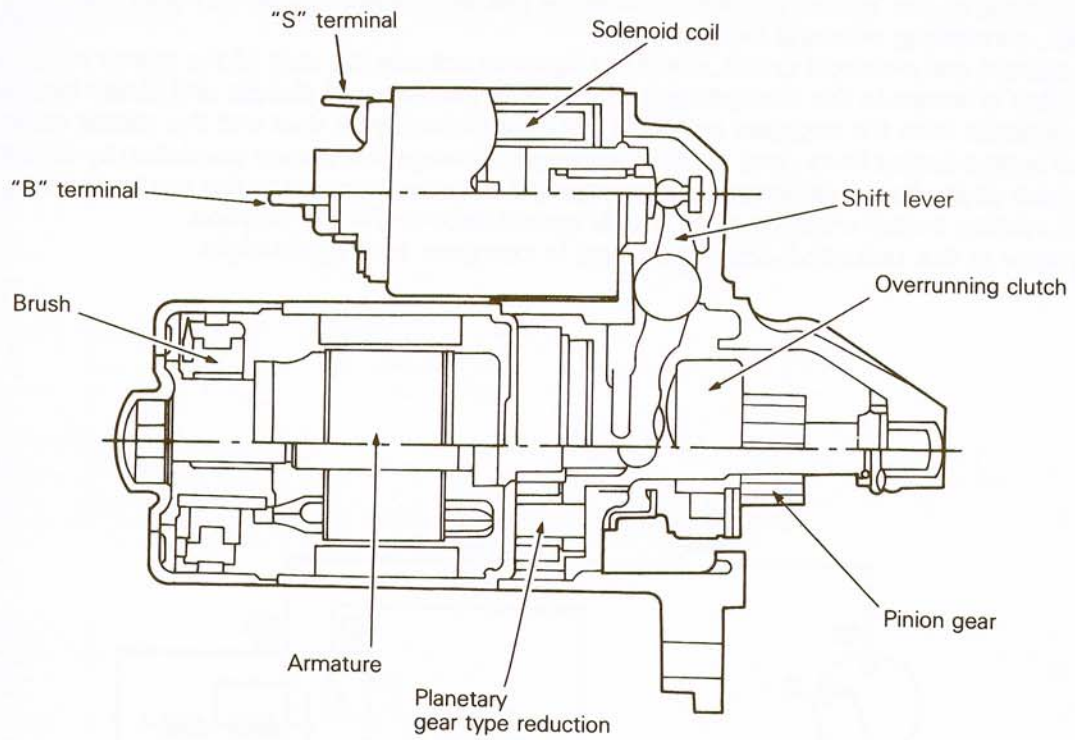
In the starter system and electrical circuit, electricity flows to activate the coils of the starter motor solenoid when the ignition switch is turned to the start position. In so doing, the solenoid plunger and clutch shift lever move, the clutch pinion engages with the ring gear and then the solenoid contacts shut and the starter motor cranks.

As soon as the engine begins to run and, in order to prevent damage due to over-revolution by the armature starter, the running clutch pinion gear over-rides. Thus in order not to cause damage to the starter motor once the engine is running, the ignition switch must be immediately turned back to the ON position.

The starter motor is the reduction-drive type, and is compact and lightweight.







**SPECIFICATIONS****GENERAL SPECIFICATIONS**

N08FB--

Items	Specifications
Starter motor	
Type	Reduction drive
Model No.	MIT70481
Part No.	MD099667
Rated output   kW/V	1.2/12
No. of pinion teeth	8

**SERVICE SPECIFICATIONS**

N08FC--

Items	Specifications
Standard values	
Starter motor	
Free running characteristics	
Terminal voltage   V	11
Current   A	Max. 90
Speed   r.p.m	Min. 3000
Under-cut depth   mm (in.)	0.5–0.8 (.020–.031)
Commutator diameter   mm (in.)	29.4 (1.157)
Pinion gap   mm (in.)	0.5–2.0 (.020–.079)
Commutator runout   mm (in.)	0.05 (.0020)
Limit	
Commutator diameter   mm (in.)	28.8 (1.134)
Commutator runout   mm (in.)	0.1 (.004)

**TORQUE SPECIFICATIONS**

N08FD--

Items	Nm	ft.lbs.
Starter motor mounting bolts	27–34	20–24
Air filter mounting nuts	16–19	12–14



## TROUBLESHOOTING

N08FH--

Symptom	Probable cause	Remedy	Reference page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	8-79 8-80
	Battery cables loose, corroded or worn	Repair or replace cables	8-79
	Inhibitor Switch faulty (Vehicle with automatic transmission only)	Adjust or replace switch	Refer to GROUP 21.
	Fusible link blown	Replace fusible link	8-67
	Starter motor faulty	Repair starter motor	8-95
	Ignition switch faulty	Replace ignition switch	8-120
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	8-79 8-80
	Battery cables loose, corroded or worn	Repair or replace cables	8-79
	Starter motor faulty	Repair starter motor	8-95
Starter keeps running	Starter motor faulty	Repair starter motor	8-95
	Ignition switch faulty	Replace ignition switch	8-120
	Short in wiring	Repair wiring	—
Starter spins but engine will not crank	Pinion gear teeth broken or starter motor faulty	Repair starter motor	8-95
	Ring gear teeth broken	Replace flywheel ring gear or torque converter	Refer to GROUP 9.

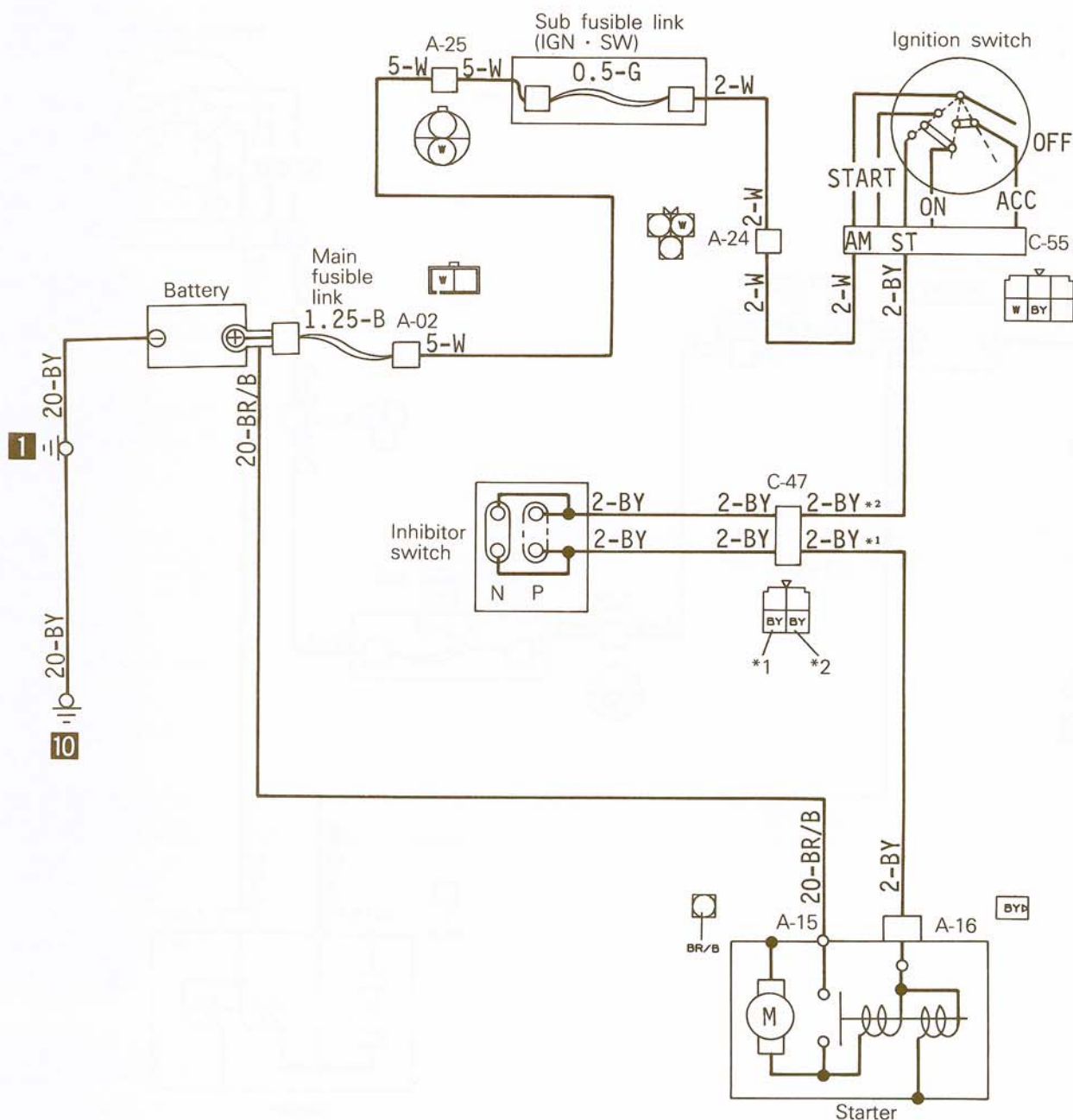
## STARTING CIRCUIT (VEHICLES WITH A MANUAL TRANSMISSION)



W: White



# STARTING CIRCUIT (VEHICLES WITH AN AUTOMATIC TRANSMISSION)



37W613

## Remark

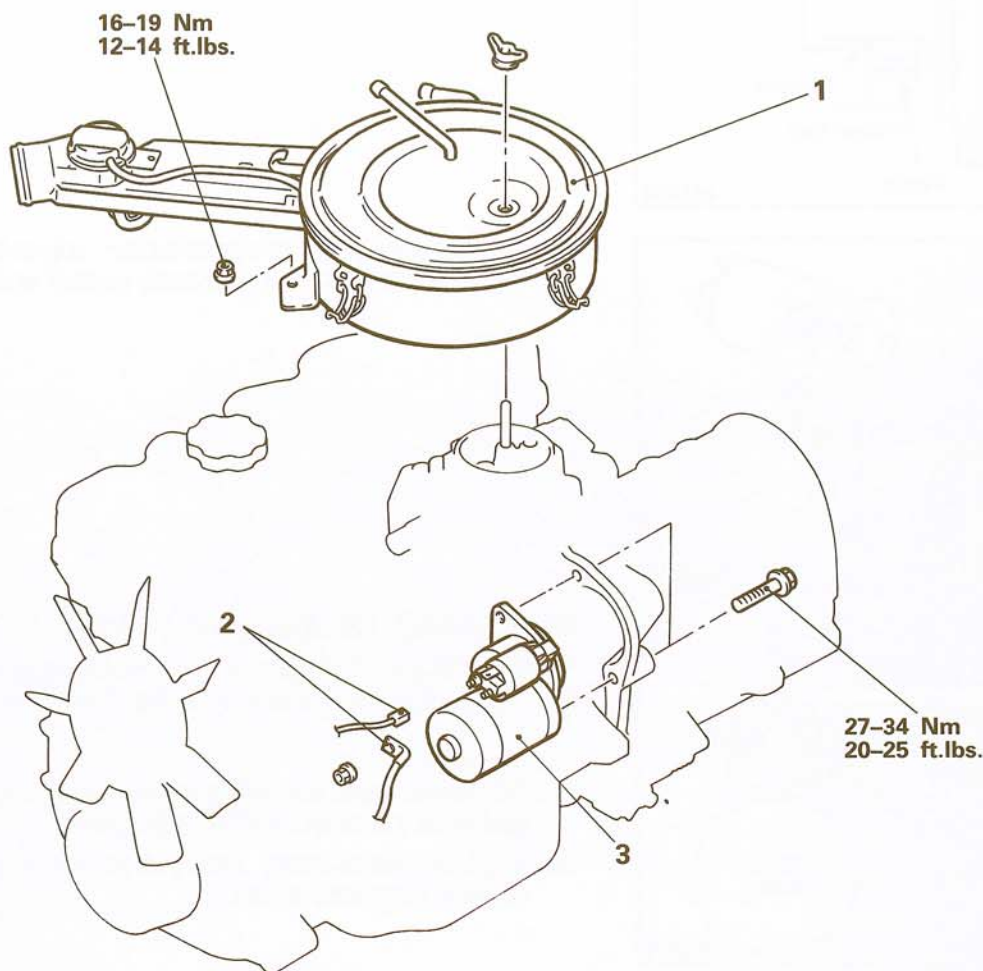
For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

## STARTER MOTOR REMOVAL AND INSTALLATION

N08FJAE



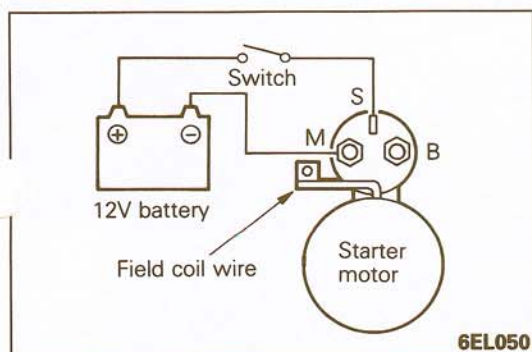
15W1564

### Removal steps

1. Air filter
2. Connection of starter motor connector
- ➡➡ 3. Starter motor

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ➡➡ : Refer to "Service Points of Installation".



### INSPECTION

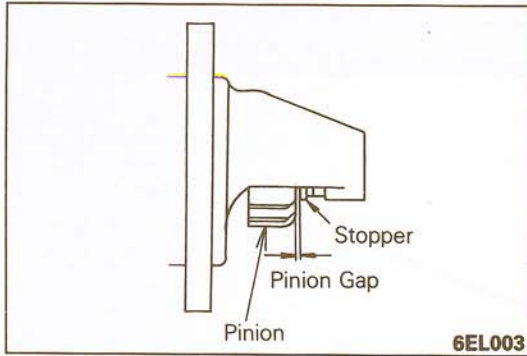
#### PINION GAP ADJUSTMENT

1. Disconnect field coil wire from "M" -terminal of magnetic switch.
2. Connect a 12V battery between "S" -terminal and "M" -terminal.
3. Set switch to "ON", and pinion will move out.

### Caution

**This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.**

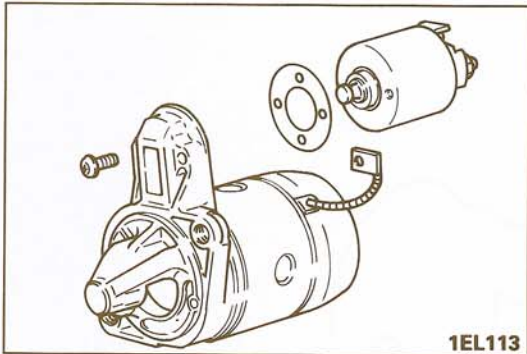




6EL003

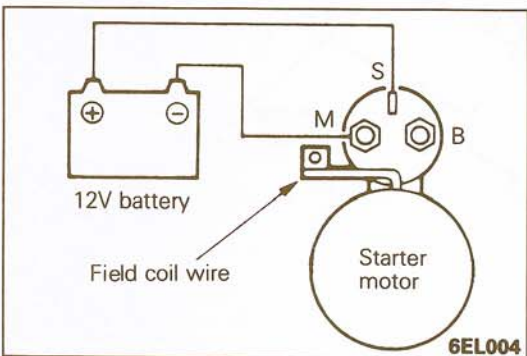
4. Check pinion to stopper clearance (pinion gap) with a feeler gauge.

**Standard value : 0.5–2.0 mm (.020–.079 in.)**



1EL113

5. If pinion gap is out of specification, adjust by adding or removing gaskets between magnetic switch and front bracket.



6EL004

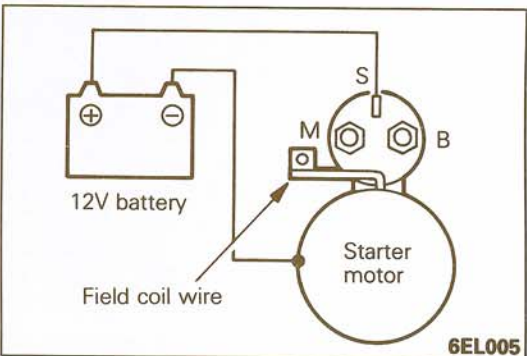
#### PULL-IN TEST OF MAGNETIC SWITCH

1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and M-terminal.

##### Caution

**This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.**

3. If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.



6EL005

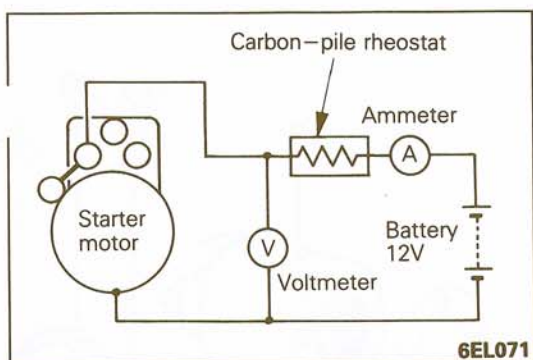
#### HOLD-IN TEST OF MAGNETIC SWITCH

1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and body.

##### Caution

**This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.**

3. If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.

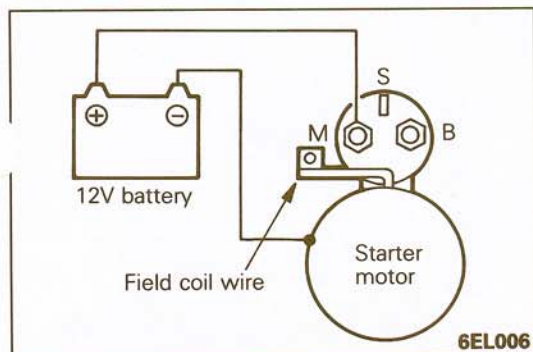


## FREE RUNNING TEST

1. Place starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series with battery positive post and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect battery cable from battery negative post to starter motor body.
6. Adjust rheostat until battery voltage shown on the voltmeter reads 11V.
7. Confirm that the maximum amperage is within the standard value and that the starter motor turns smoothly and freely.

**Standard value :** Current  
Speed

**Max. 90A**  
**Min. 3,000 rpm**



## RETURN TEST OF MAGNETIC SWITCH

1. Disconnect field coil wire from "M" terminal of magnetic switch.
2. Connect a 12V battery between M-terminal and body.

### Caution

**This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.**

3. Pull pinion out and release. If pinion quickly returns to its original position, everything is in order. If it doesn't, replace magnetic switch.

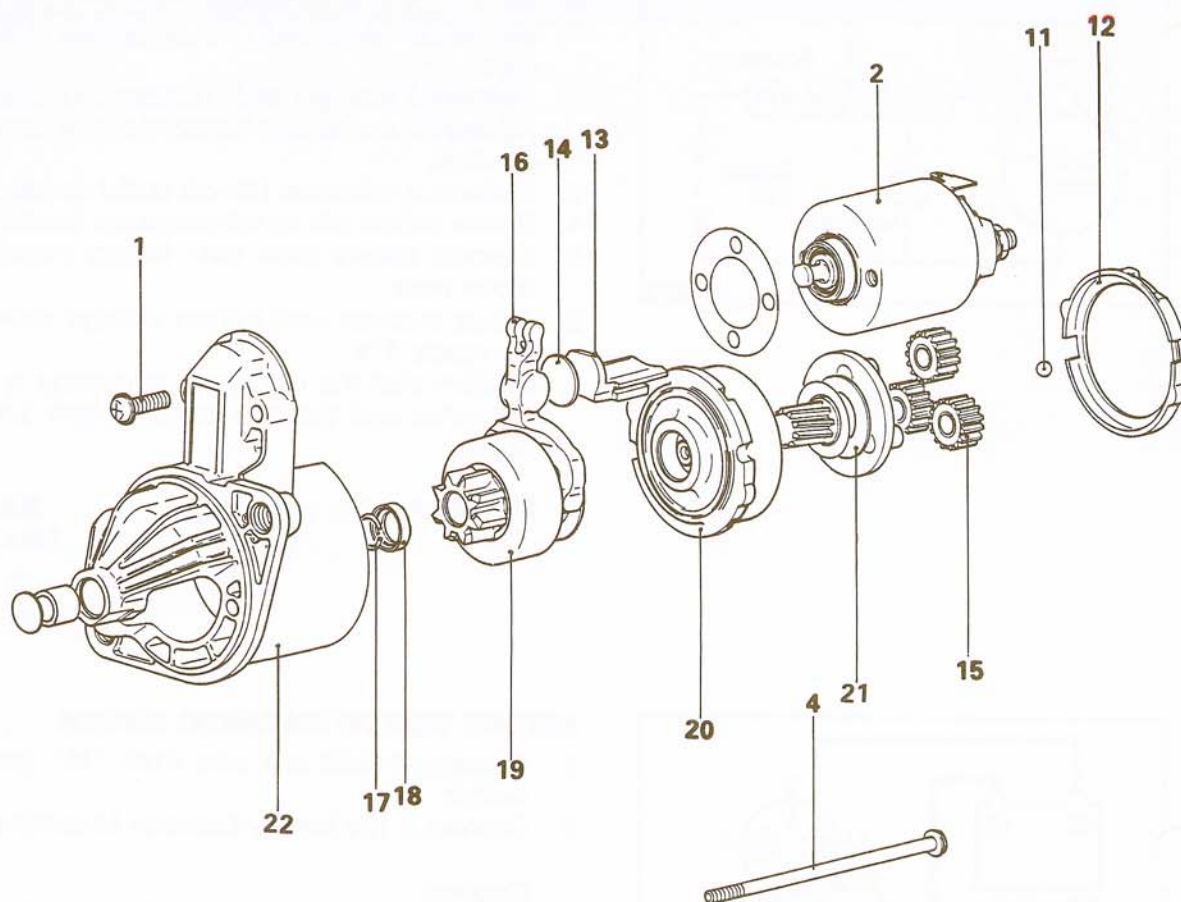
## SERVICE POINTS OF INSTALLATION

### 3. INSTALLATION OF STARTER MOTOR

Clean both surfaces of starter motor flange and rear plate.

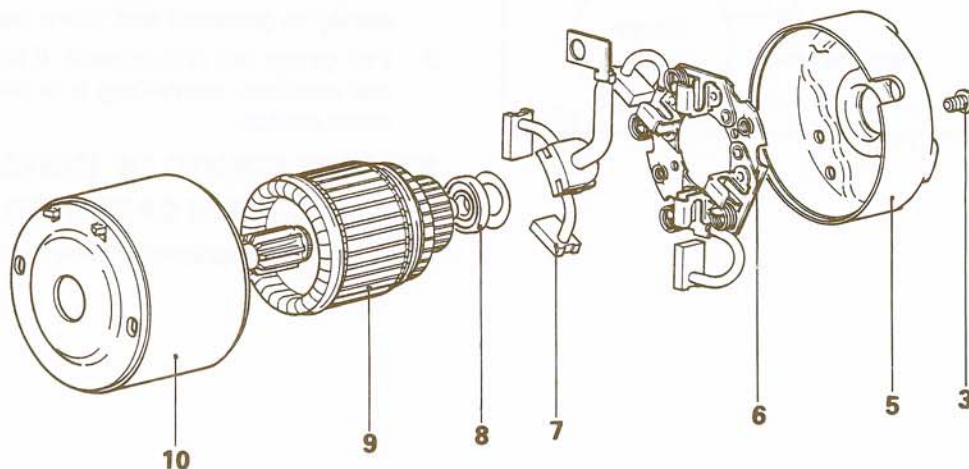


## DISASSEMBLY AND REASSEMBLY



## Disassembly steps

1. Screw
2. Magnetic switch
3. Screw
4. Screw
5. Rear bracket
6. Brush holder
7. Brush
8. Rear bearing
9. Armature
10. Yoke assembly
11. Ball
12. Packing A
13. Packing B
14. Plate
15. Planetary gear
16. Lever
17. Snap ring
18. Stop ring
19. Over running clutch
20. Internal gear
21. Planetary gear holder
22. Front bracket



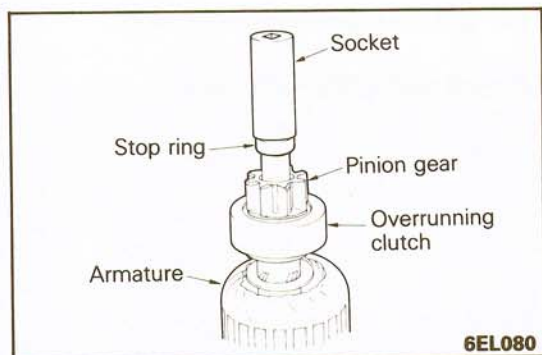
6EL199

## NOTE

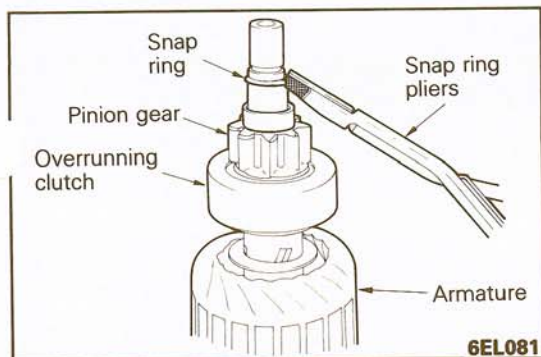
- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆: Refer to "Service Points of Disassembly".
- (3) ◆◆◆: Refer to "Service Points of Reassembly".

**SERVICE POINTS OF DISASSEMBLY****9. CAUTION OF ARMATURE/11. BALL**

When removing the armature, do not lose the ball which acts as a bearing for the armature and tip.

**17. DISASSEMBLY OF SNAP RING/18. STOP RING**

- (1) Push the stop ring towards the snap ring using the proper socket.



- (2) After removal of the snap ring with the snap ring pliers, remove the stop ring and the over-running clutch.

**CLEANING STARTER MOTOR PARTS**

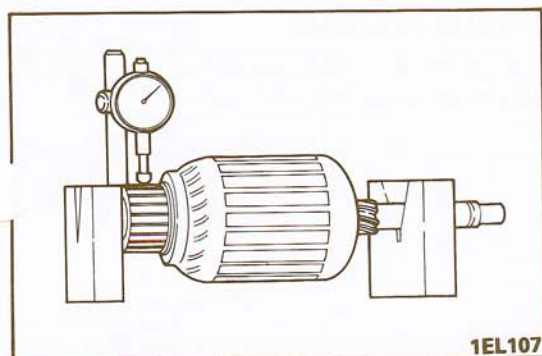
1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

**INSPECTION****CHECKING COMMUTATOR**

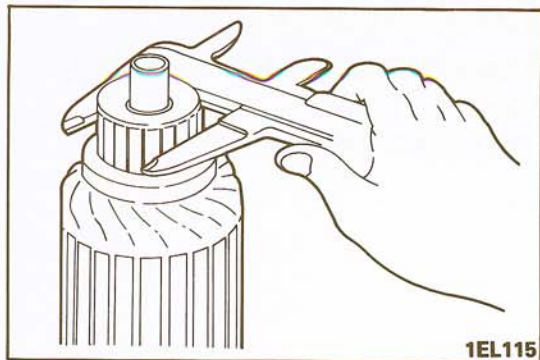
- (1) Place the armature on a pair of V blocks and check run-out with a dial gauge.

**Standard value : 0.05 mm (.0020 in.)**

**Limit : 0.1 mm (.0039 in.)**

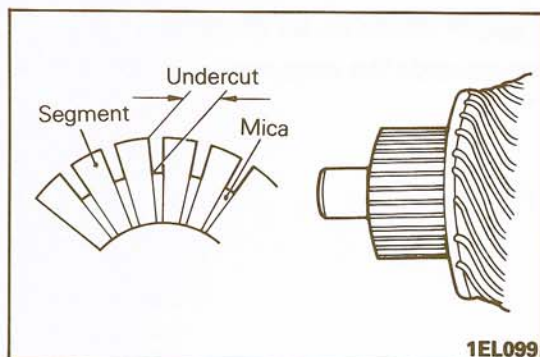






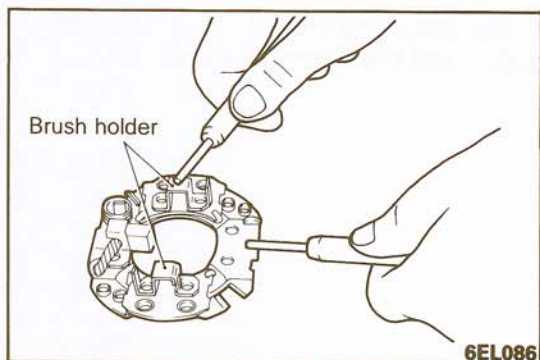
- (2) Check the outer diameter.

**Standard value : 29.4 mm (1.157 in.)**  
**Limit : 28.8 mm (1.134 in.)**



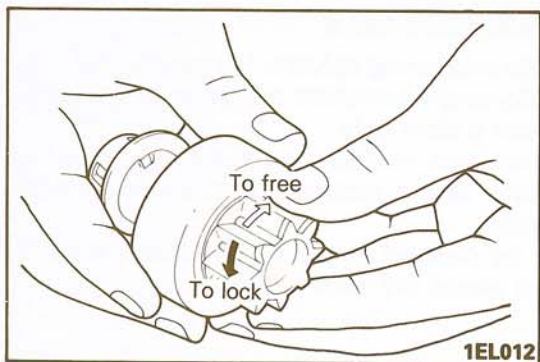
- (3) Check the depth of the undercut between segments.

**Standard value : 0.5–0.8 mm (.020–.031 in.)**



### BRUSH HOLDER

Check conductivity between the brush holder plate and brush holder. If there is no conductivity this is normal.

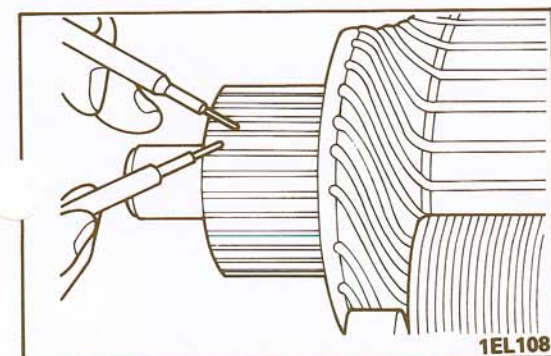
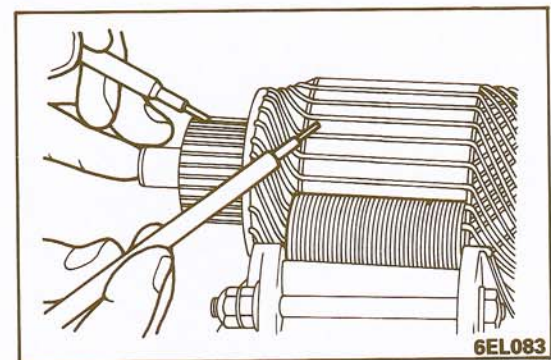
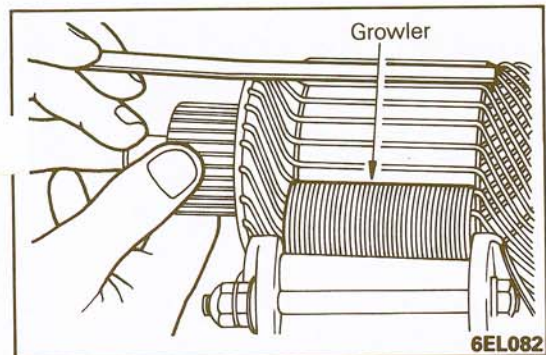
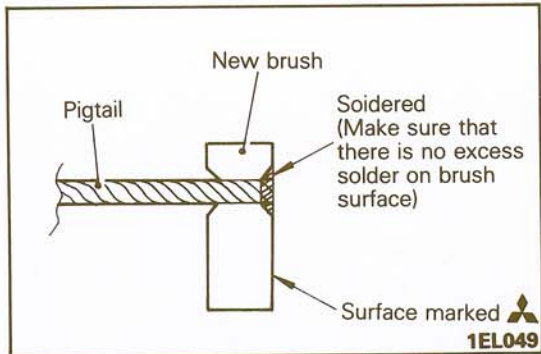
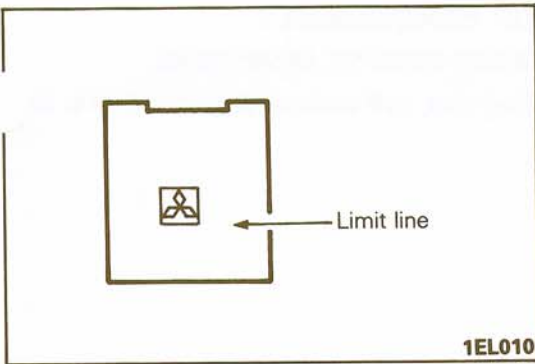


### OVERRUNNING CLUTCH

1. While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
2. Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

### FRONT AND REAR BRACKET BUSHING

Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.



### REPLACEMENT OF BRUSHES AND SPRINGS

1. Brushes that are worn beyond limit line, or are oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.
3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it. Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retaining spring back.

### TESTING ARMATURE

#### TESTING ARMATURE FOR SHORT-CIRCUIT

1. Place armature in a growler.
2. Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.

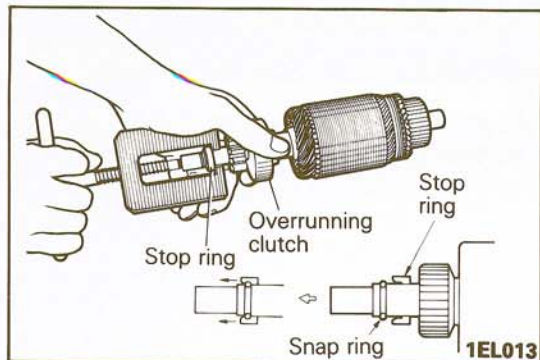
#### TESTING ARMATURE FOR GROUNDING

Check the insulation in the space between the segments of the commutator and the armature and coil core. If there is no conductivity this is normal.

#### CHECKING CIRCUIT BREAK BETWEEN ARMATURE AND COIL

Check conductivity between each segment. If there is conductivity this is normal.



**SERVICE POINTS OF REASSEMBLY****18. REASSEMBLY OF STOP RING/17. SNAP RING**

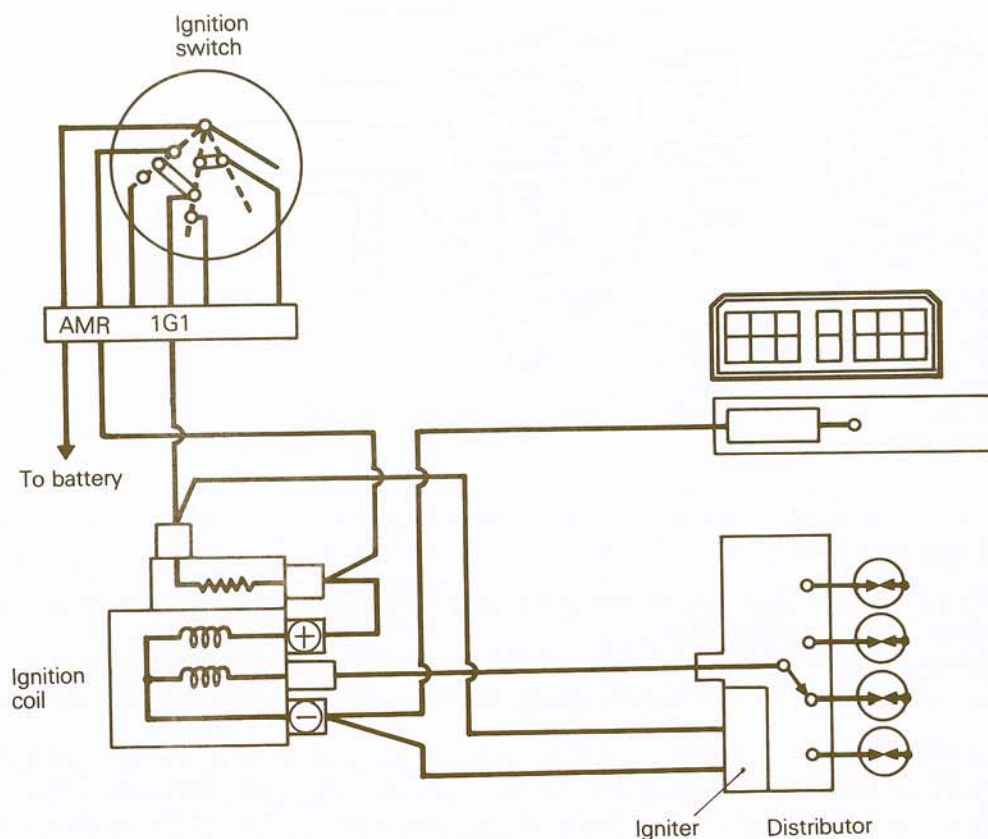
Using a suitable pulling tool, pull overrunning clutch stop ring over snap ring.

## IGNITION SYSTEM

## GENERAL INFORMATION

N08GAAB

The ignition system consists of battery, distributor, (igniter-integrated) ignition coil, spark plug, high tension cable, ignition switch and connecting wire.

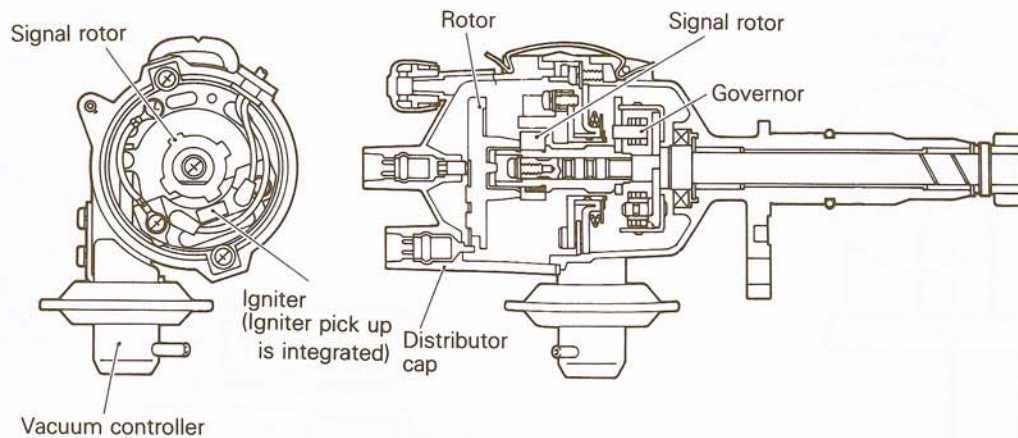


1EL117

The distributor is composed of signal generator (signal rotor and igniter internalized pickup), linear current control unit (igniter) advance control unit (governor and vacuum controller) and distribution unit (rotor plus distributor cap).



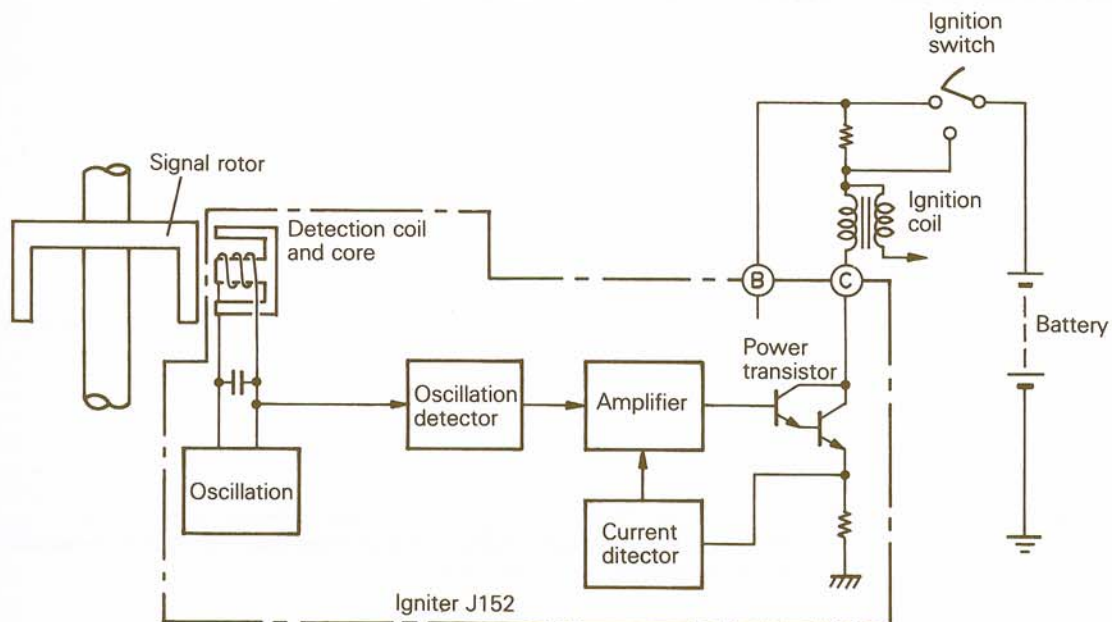
## DISTRIBUTOR



1EL153

## IGNITER OPERATION

- (1) When the signal rotor revolves a projection inside the signal rotor alternately moves away from and faces towards the core detector inside the igniter.
- (2) When the projection is separated from the core, an oscillating electrical circuit begins to oscillate, and when faces, magnetic flux issuing from the core moves across the inside of the signal rotor, so when loss increase oscillation ceases.
- (3) This oscillation introduces power to the oscillation detector circuit, and after output is amplified it drives the power transistor. During oscillation (when the projection and core are apart) electricity flowing through the ignition coil and when oscillation stops (when the projection and core are facing) the electric current is interrupted.
- (4) The electrical detection circuit, in preventing excessive electrical flow to the power transistor, protects the transistor.



1EL154

**SPECIFICATIONS****GENERAL SPECIFICATIONS****DISTRIBUTOR**

N08GB-A

Items	Federal, Canada	California
Type	Contact pointless type	Contact pointless type
Model No.	T3T61980A	T3T65571
Part No.	MD109013	MD110264
Igniter	Built-in type	Built-in type
Firing order	1-3-4-2	1-3-4-2

**IGNITION COIL**

Items	Specifications
Type	Oil filled
Model No.	E-089
Part No.	MD073079

**SPARK PLUG**

Items	Model No.	Manufacturer
Factory installed plug	W20EP-U10 W20EPR-S11	NIPPON DENSO
	BUR6EA-11	NGK
Alternate plug	BP6ES-11 BPR6ES-11 BU6EA-11	
	N-9Y RN-9Y	CHAMPION
	W20EPR-U10 W20EP-S11	NIPPON DENSO

**IGNITION SWITCH**

Items	Specifications
Ignition switch	
Load capacity	
AM-ACC	15A
AM-IG	30A
AM-ST	15A
AM-R	15A
Voltage drop (under actual load)	0.1 V or less
Key reminder switch	
Rated load	1 W
Voltage drop	0.2 V or less



## SERVICE SPECIFICATIONS

N08GC-A

Items	Specifications
Basic ignition timing at curb idle speed	7°BTDC
Distributor	
Federal, Canada	
Governor (crank deg/rpm)	
Initial	0/1600
Middle	9/2800
Final	19/6000
Vacuum (crank deg/mmHg)	
Initial	0/80
Middle	12/150
Final	23/280
California	
Governor (crank deg/rpm)	
Initial	0/1600
Middle	9/2800
Final	19/6000
Vacuum (crank deg/mmHg)	
Initial	0/80
Middle	8/150
Final	20/360
Idle advance (crank deg/mmHg)	
Initial	0/60
Final	5/80
Ignition coil	
Primary resistance at 20°C (68°F) $\Omega$	1.1–1.3
Secondary resistance at 20°C (68°F) $k\Omega$	14.5–19.5
External resistor resistance at 20°C (68°F) $\Omega$	1.22–1.48
Spark plug gap    mm (in.)	1.0–1.1 (.039–0.43)

## TORQUE SPECIFICATIONS

N08GD--

Items	Nm	ft.lbs.
Spark plug	20–30	15–21

## TROUBLESHOOTING

N08GH--

Symptom	Probable cause	Remedy	Reference page
Engine will not start or hard to start (cranks OK)	Incorrect ignition timing	Adjust ignition timing	8-109
	Ignition coil faulty	Inspect ignition coil	8-114
	Ignition faulty	Inspect igniter	8-118
	Distributor faulty	Inspect distributor	8-118
	High tension cord faulty	Inspect high tension cord	8-114
	Spark plugs faulty	Replace plugs	8-113
	Ignition wiring disconnected or broken	Inspect wiring	—
Rough idle or stalls	Spark plugs faulty	Replace plugs	8-113
	Ignition wiring faulty	Inspect wiring	—
	Incorrect ignition timing	Adjust ignition timing	8-109
	Ignition coil faulty	Inspect ignition coil	8-114
	Ignition faulty	Inspect igniter	8-118
	High tension cord faulty	Inspect high tension cord	8-114
Engine hesitates/poor acceleration	Spark plugs faulty	Replace plugs	8-113
	Ignition wiring faulty	Inspect wiring	—
	Incorrect ignition timing	Adjust timing	8-109
Poor gasoline mileage	Spark plugs faulty	Replace plugs	8-113
	Incorrect ignition timing	Adjust ignition timing	8-109
Engine overheats	Incorrect ignition timing	Adjust ignition timing	8-109





# SERVICE ADJUSTMENT PROCEDURES

## CHECKING IGNITION TIMING

N08GIBA

### IGNITION TIMING ADJUSTMENT

Adjustment conditions:

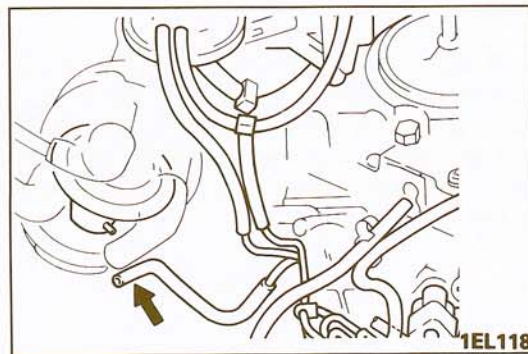
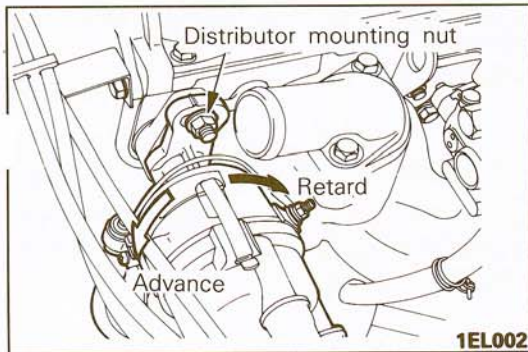
Coolant temperature: 80–90°C (170–190°F)

Lights and all accessories: Off

Transmission: N (Neutral)

1. Connect tachometer and timing light.
2. Start engine and run at curb idle speed.

	Curb idle speed rpm
First 500 km (300 mile)	$725^{+150}_{-100}$
After 500 km (300 mile)	$800 \pm 100$



3. To make adjustment at high altitude, disconnect pressure sensor connector before stopping engine. Then restart engine and run it at curb idle speed.
4. Check basic ignition timing and adjust if necessary.

**Basic ignition timing:  $7^\circ \pm 2^\circ \text{BTDC}$**

5. To adjust ignition timing, loosen distributor mounting nut and turn distributor housing.
6. After adjustment, securely tighten mounting nut.
7. Reconnect pressure sensor connector disconnected in Step 3. Then run engine at curb idle speed to make sure that actual ignition timing is obtained.

## CHECKING IGNITION SYSTEM

N08DIDB

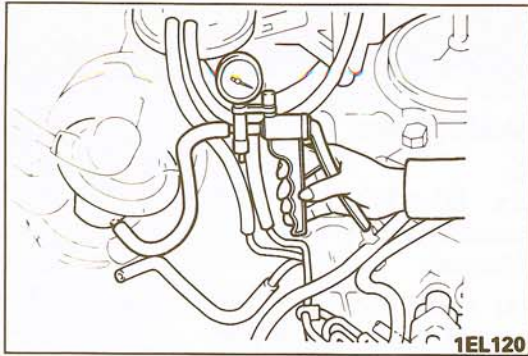
### CHECKING CENTRIFUGAL ADVANCE EQUIPMENT

1. Set the tachometer and timing light.
2. Start the engine and allow it to idle.
3. Pull out vacuum hose from vacuum controller.
4. Check the advance while slowly raising RPM. If the advance is smooth when accompanying the increasing RPM, this is normal.

Symptom	Assumed causes
Excessive advance	Weakness of the governor spring
Sudden advance rise	Broken spring
Insufficient advance or large hysteresis	Impaired movement of the governor weight or cam.

5. If the malfunction indicators above are confirmed, dismantle and check the distributor.
6. After checking, let the engine idle and then turn the ignition switch to OFF.
7. Remove the tachometer and timing light.

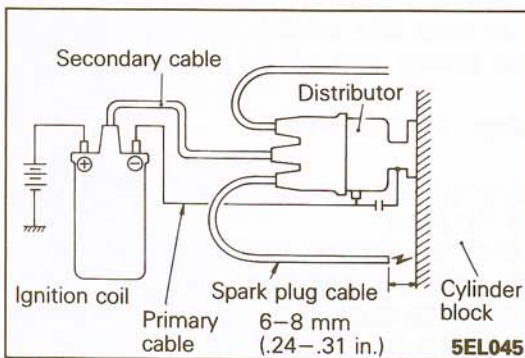


**CHECKING NEGATIVE PRESSURE ADVANCE EQUIPMENT**

1. Set the timing light.
2. Start the engine and allow it to idle.
3. Pull out the vacuum hose from vacuum controller and attach vacuum pump to nipple.
4. Check the advance while slowly applying negative pressure to the vacuum pump. If the advance is smooth when accompanying the increase in negative pressure, this is normal.

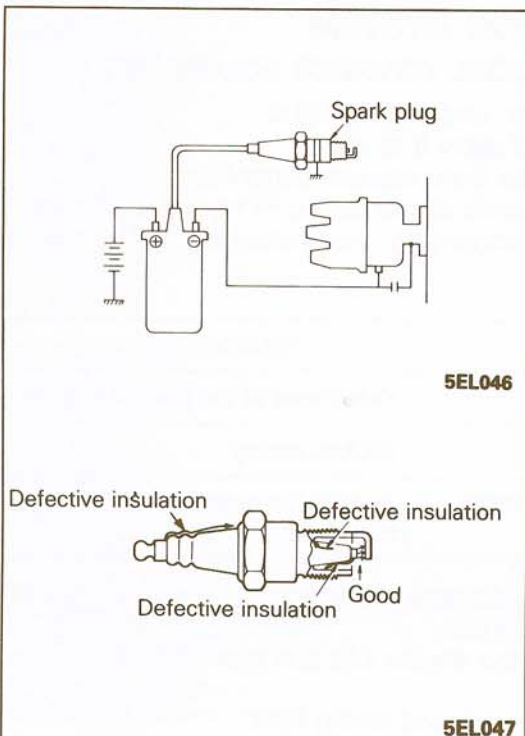
Symptom	Assumed causes
Excessive advances	Weakness of vacuum controller spring
Sudden advance rise	Broken spring
Insufficient advance or large hysteresis	Impaired movement of breaker base
No advance	Broken diaphragm

5. If the malfunction indicators above are confirmed, dismantle and check the distributor.
6. Allow the engine to idle and then turn the ignition switch to OFF.
7. Remove the vacuum pump and attach the vacuum hose to the vacuum controller nipple.
8. Remove the timing light.

**SPARK PLUG CABLE TEST**

N08GIGB

Hold the spark plug cable about 6–8 mm (.24–.31 in.) away from engine proper (grounding portion such as cylinder block) and crank engine to verify that sparks are produced.

**SPARK PLUG TEST**

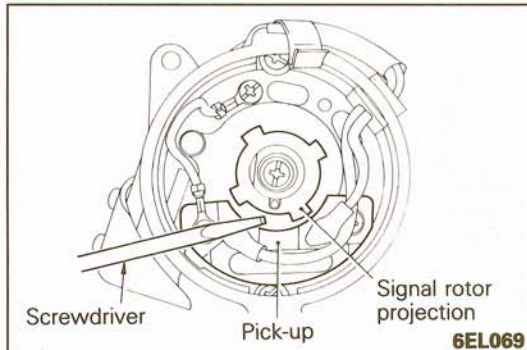
N08GIHB

Connect the spark plug to the high tension cable, ground outer electrode (main body), and crank engine. In the atmosphere, only short sparks are produced because of small discharge gap. If the spark plug is good, however, sparks will occur in discharge gap (between electrodes). In a defective spark plug, no sparks will occur because of leak of insulation puncture.

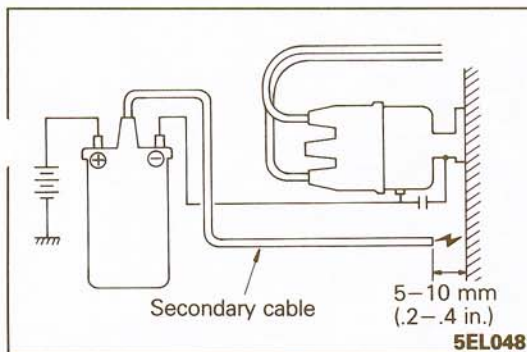
**SPARK TEST — ENGINE CANNOT BE CRANKED**

If spark test is performed by cranking while the catalyst is hot, unburned gas will be supplied to the catalyst, and this is not desirable to the catalyst.

For this reason, use the following methods which allow spark test to be performed without cranking.



1. Remove the distributor cap.
2. Check signal rotor position in relation to the pick-up. If it is not the position shown in the illustration, turn the crankshaft manually so that the projection of the signal rotor is moved away from the center part of the pick-up. In other words, the signal rotor should be positioned so that current can flow to the ignition coil.



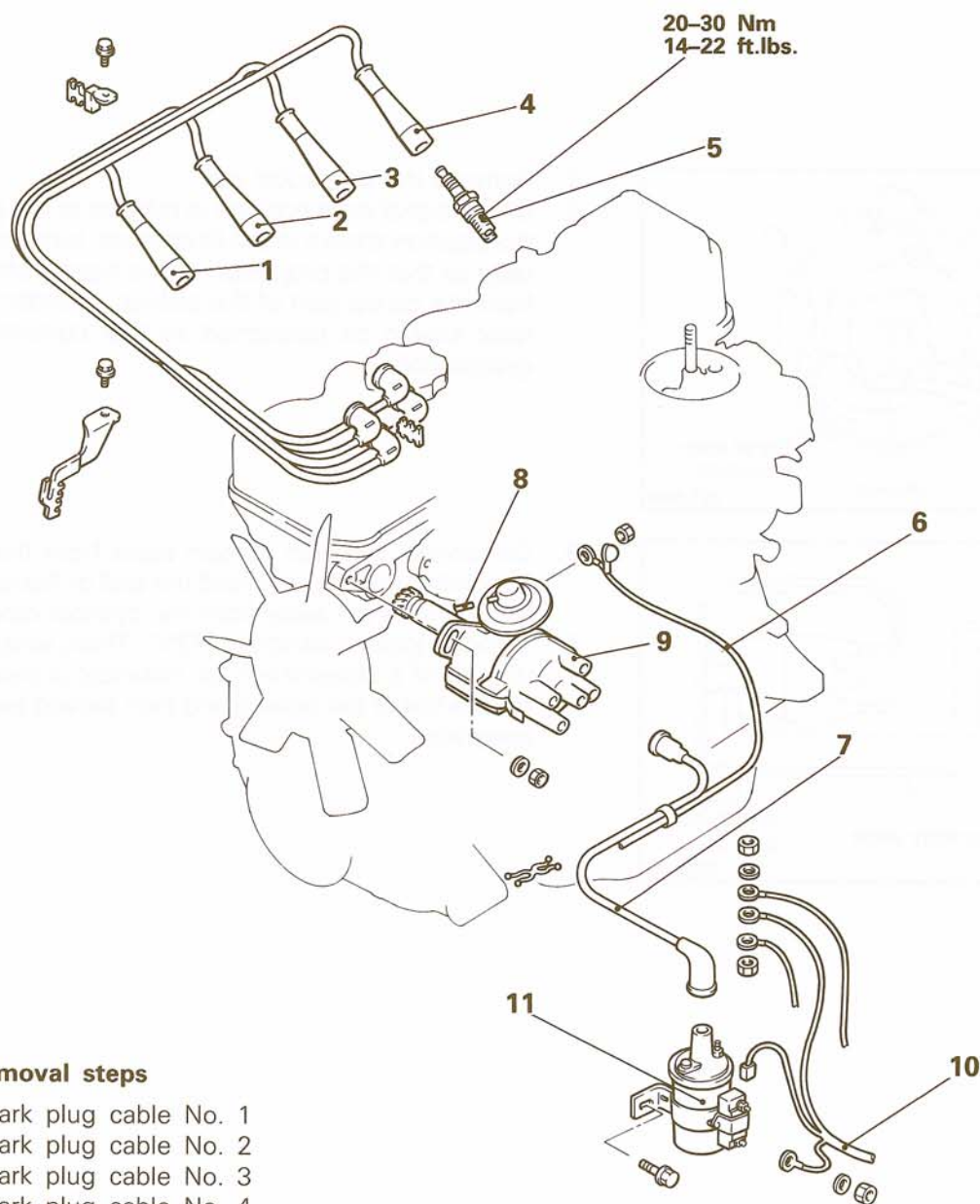
3. Disconnect the high tension cable from the center tower of the distributor cap, and hold the end of the cable about 5 – 10 mm (.2 – .4 in.) away from the cylinder block of the engine.
4. Turn the ignition switch to "ON". Then, when a piece of metal (the tip of a screwdriver for instance) is inserted into the detection coil of the pick-up and then moved away, a spark can be generated.



## IGNITION SYSTEM

## REMOVAL AND INSTALLATION

N08GJAF

**Spark plug removal steps**

- ◆◆◆◆ 1. Spark plug cable No. 1
- ◆◆◆◆ 2. Spark plug cable No. 2
- ◆◆◆◆ 3. Spark plug cable No. 3
- ◆◆◆◆ 4. Spark plug cable No. 4
- ◆◆◆◆ 5. Spark plug

**Distributor removal steps**

- ◆◆◆◆ 1-4. Spark plug cables
- ◆◆◆◆ 6. Connection of distributor connector
- ◆◆◆◆ 7. High tension cable
- ◆◆◆◆ 8. Connection of vacuum hose
- ◆◆◆◆ 9. Distributor

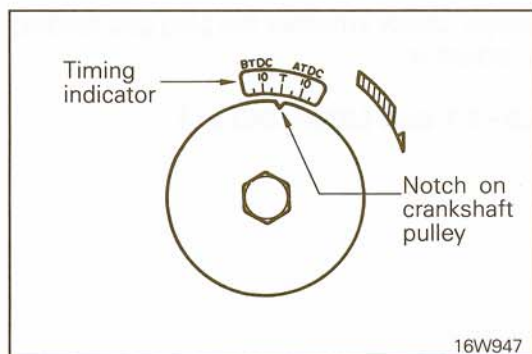
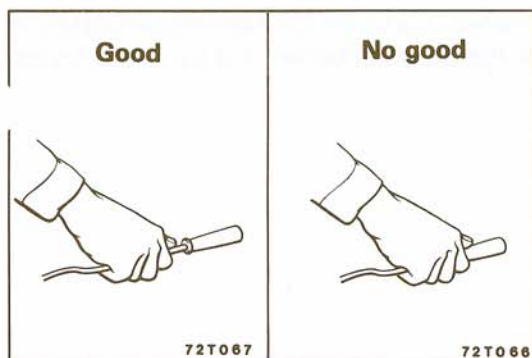
**Ignition coil removal steps**

- ◆◆◆◆ 7. High tension cable
- ◆◆◆◆ 10. Connection of ignition coil connector
- ◆◆◆◆ 11. Ignition coil

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆◆ : Refer to "Service Points of Installation".

16W1563



## SERVICE POINTS OF REMOVAL

### 1-4. CAUTION OF SPARK PLUG CABLES/7. HIGH TENSION CABLE

The cable is to be pulled out by grasping the cap part.

## 9. REMOVAL OF DISTRIBUTOR

Before removing the distributor, position the piston in No. 1 cylinder at the top dead center on compression stroke by the following procedure.

- (1) Remove the cap from the distributor.
- (2) Turn the crankshaft until the distributor rotor lines up with the No. 1 spark plug cable electrode on the distributor cap.
- (3) Align the notch on the crankshaft pulley with the timing mark "T" on the timing indicator to set the engine so that the piston in No. 1 cylinder is at the compression top dead center.

## INSPECTION

### CLEANING AND INSPECTION OF SPARK PLUGS

1. Pull the spark plug cables out of the spark plugs.
2. Using a spark plug wrench, take all the spark plugs out of the cylinder head.

#### Caution

**Ensure that no foreign bodies fall from the spark plug holes.**

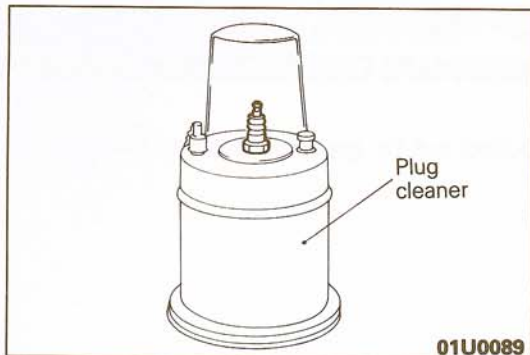
3. Using the following criteria check that there is no electrode spark loss, that there is no damage to the outer insulation, and that sparking is good.
  - Existence of insulation damage
  - Spark dissipation
  - Carbon accumulation

Using either plug cleaner or wire brush, clean both the upper part and the glass part.

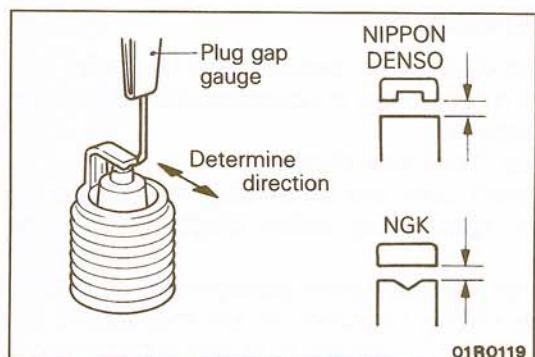
  - Damage to or breakage of gaskets
  - Spark action in spark glass area

In cases where there are black deposits due to carbon, this indicates excessive passage of mixed gases so that air intake becomes extremely deficient. Owing to the excessively large spark gap, spark loss and so on can be expected. In case of white scorching, this indicates an excessively thin gas mixture and prolongment of sparking time, which suggests poorly fitted plugs.



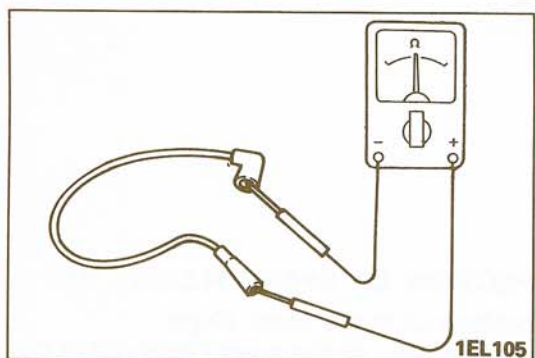


4. Clean with plug cleaner. Sand which has accumulated in the screw thread of the plugs is blown out by compressed air.



5. Using the plug gap gauge, check whether the plug gap reading is normal, and if not, adjust it.

**Standard value : 1.0–1.1 mm (.039–.043 in.)**

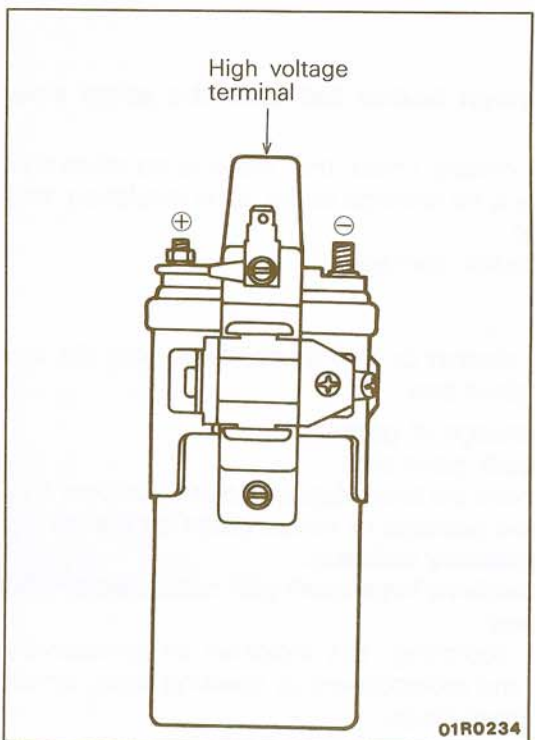


#### CHECKING SPARK PLUG CABLE

- (1) Check that there are no cracks in the cap or in the insulating coating.
- (2) Check the resistance value.

High tension cable	Spark plug cable			
	No. 1	No. 2	No. 3	No. 4
7	9	11	13	14

kΩ



#### CHECKING THE IGNITION COIL

- (1) Measurement of the resistance of the external resistor  
Measure the resistance of the external resistor.

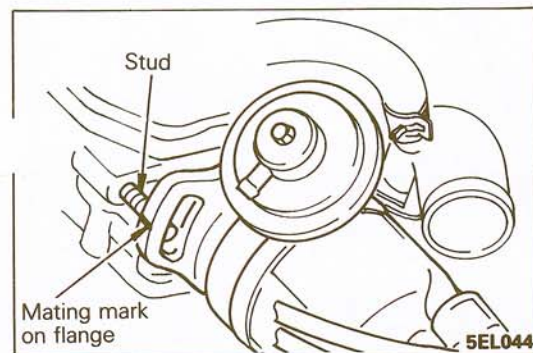
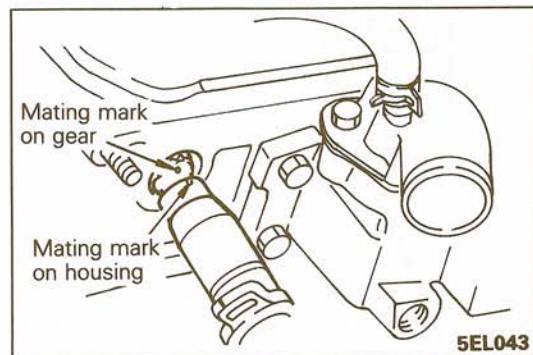
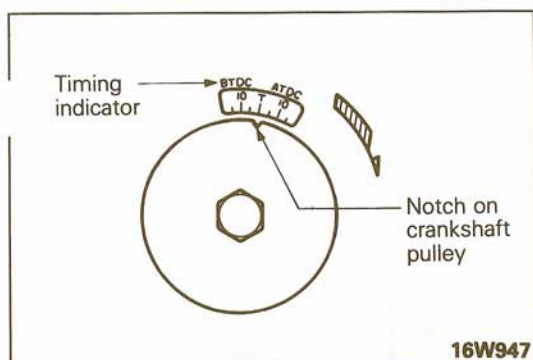
**Standard value : 1.2–1.4 Ω**

- (2) Measurement of the resistance of the primary coil  
Measure the resistance between the positive (+) terminal and the negative (–) terminal of the ignition coil.

**Standard value : 1.1–1.3 Ω**

- (3) Measurement of the resistance of the secondary coil  
Measure the resistance between the high voltage terminal and the positive (+) terminal of the ignition coil.

**Standard value : 14.5–19.5 kΩ**



## SERVICE POINTS OF INSTALLATION

### 9. INSTALLATION OF DISTRIBUTOR

- (1) Align the notch on the crankshaft pulley with the timing mark "T" on the timing indicator to set the engine so that the No. 1 cylinder is at the compression top dead center.
- (2) Align mating mark on distributor housing with mating mark on distributor driven gear.
- (3) Install distributor to cylinder head while aligning mating mark on distributor attaching flange with center of distributor installing stud and tighten nut.

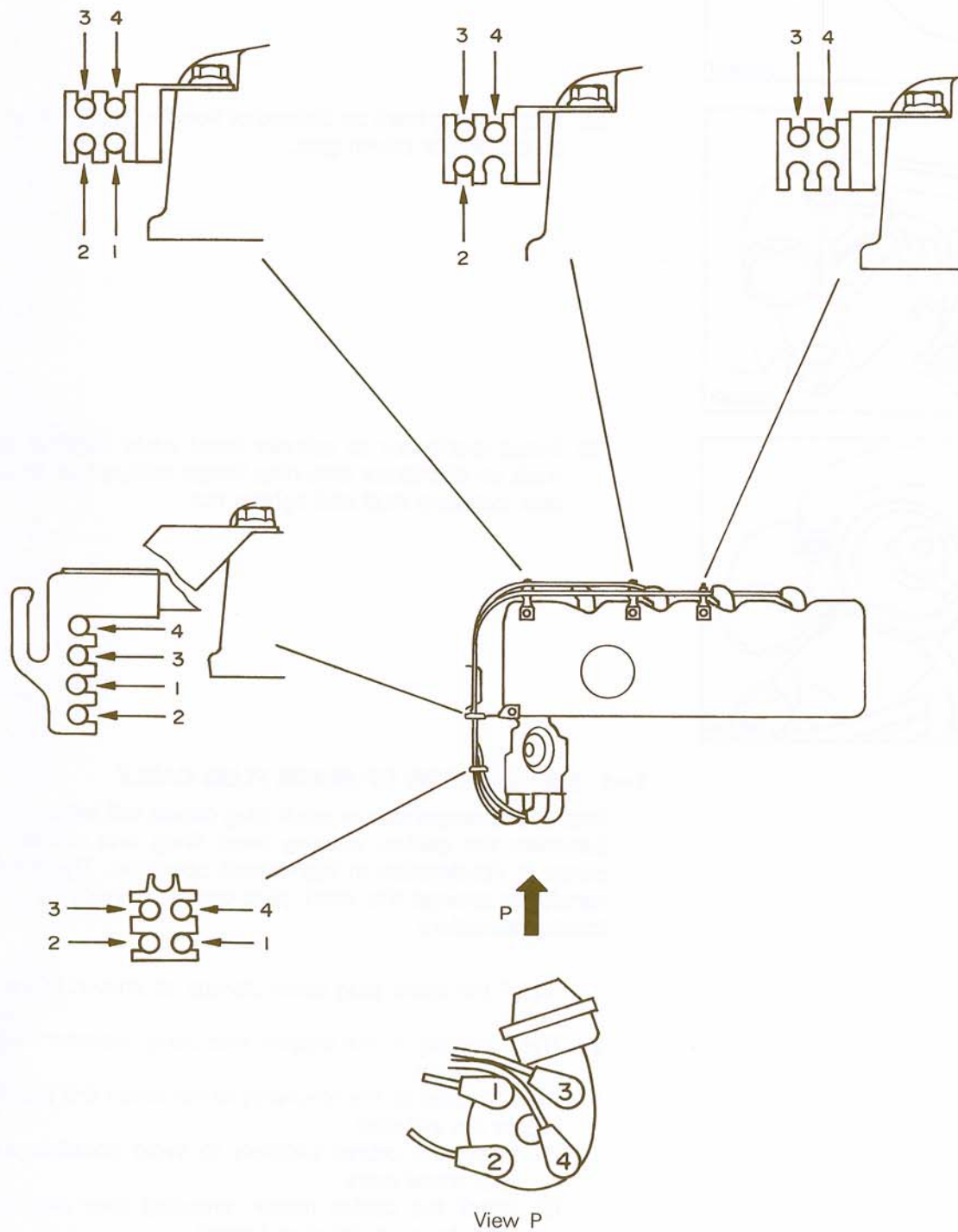
### 1-4. INSTALLATION OF SPARK PLUG CABLE

Improper arrangement of spark plug cables will induce voltage between the cables, causing miss firing and developing a surge at acceleration in high-speed operation. Therefore, be careful to arrange the spark plug cables properly by the following procedure.

1. Install the spark plug cable clamps as shown in the illustration.
2. The numerals on the support and clamp indicate the spark plug cable No.
3. Pay attention to the following items when the spark plug cables are installed.
  - (1) Install the cables securely to avoid possible contact with metal parts.
  - (2) Install the cables neatly, ensuring they are not too tight, loose, twisted or kinked.

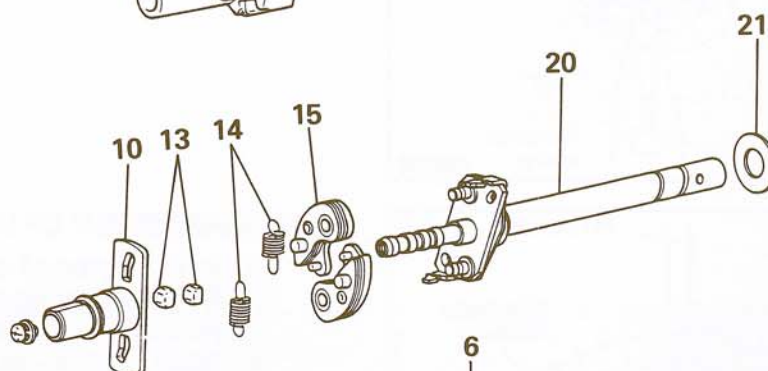
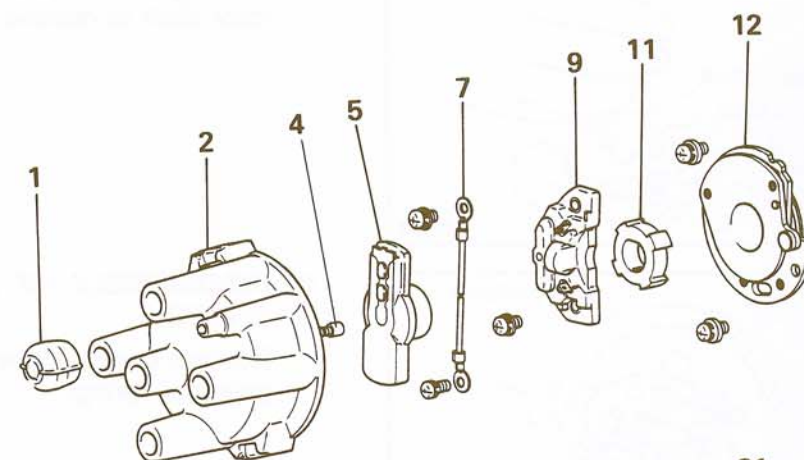


## SPARK PLUG CABLE INSTALLATION



# DISTRIBUTOR

## DISASSEMBLY AND REASSEMBLY

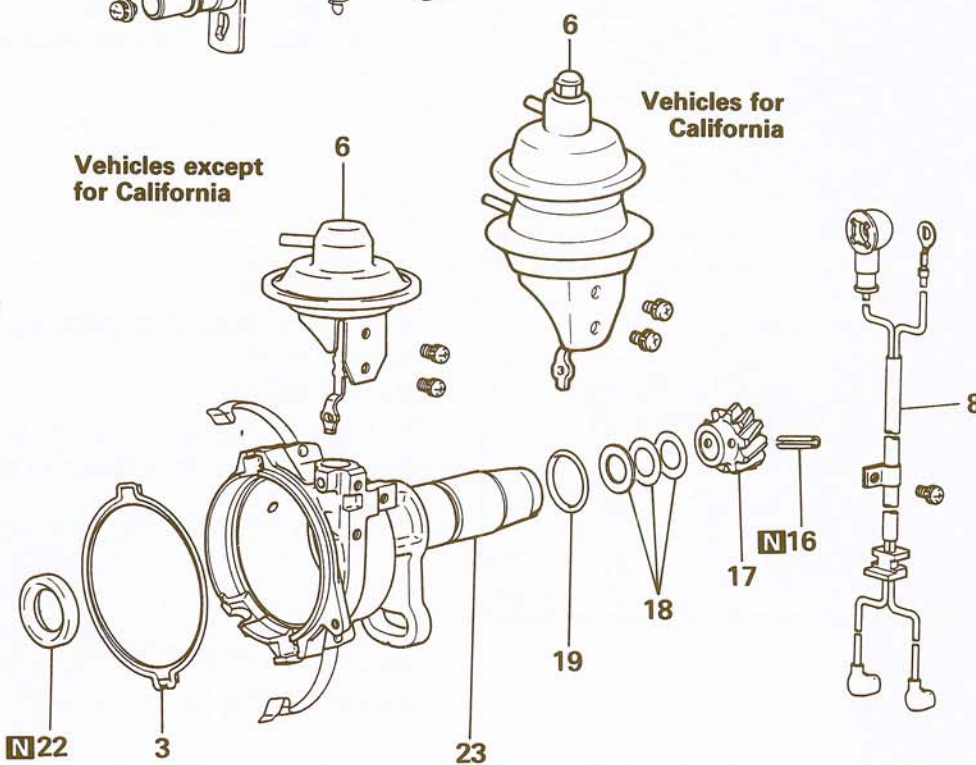


### Disassembly steps

1. Breather
2. Distributor cap
3. Packing
4. Contact carbon
5. Rotor
6. Vacuum control
7. Ground wire
8. Lead wire
- ◆◆ Adjustment of air gap
9. Igniter
- ◆◆ 10. Rotor shaft
- ◆◆◆ 11. Signal rotor
- ◆◆ 12. Breaker plate
- ◆◆ 13. Spring retainer
- ◆◆ 14. Governor spring
15. Governor weight
16. Lock pin
- ◆◆◆ 17. Driven gear
18. Washer
19. "O" ring
20. Distributor shaft
21. Washer
22. Oil seal
23. Distributor housing

Vehicles except  
for California

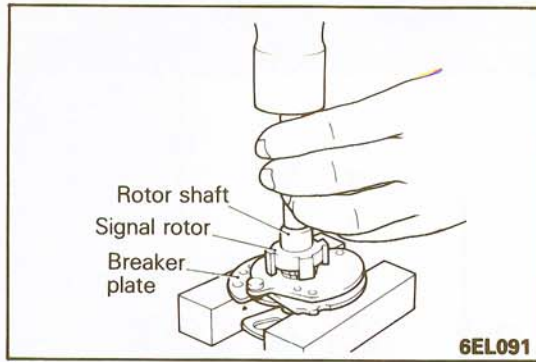
Vehicles for  
California



### NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆: Refer to "Service Points of Disassembly".
- (3) ◆◆◆: Refer to "Service Points of Reassembly".
- (4) **N**: Non-reusable parts

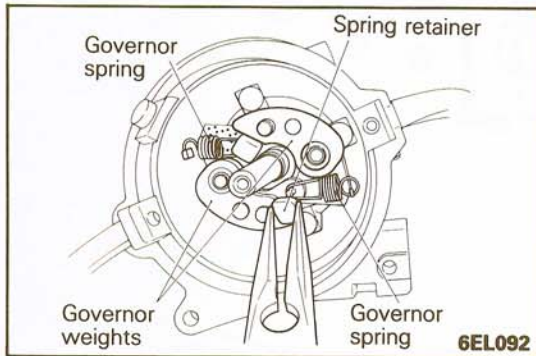




6EL091

**SERVICE POINTS OF DISASSEMBLY****10. DISASSEMBLY OF ROTOR SHAFT/11. SIGNAL ROTOR**

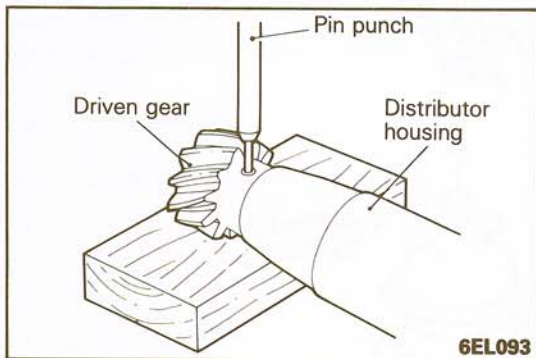
Place igniter base on soft base (wooden block) and lightly tap rotor shaft to remove it from signal rotor.



6EL092

**13. DISASSEMBLY OF SPRING RETAINER/14. GOVERNOR SPRING**

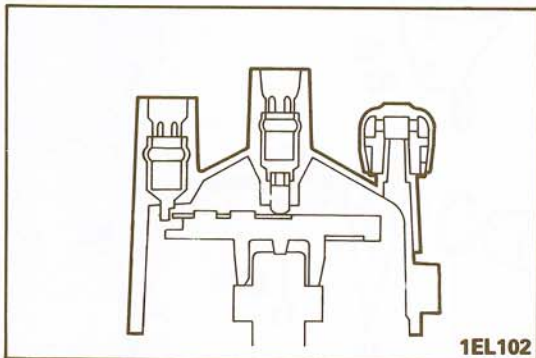
Remove two spring retainers with pliers and then remove two governor springs.



6EL093

**17. DISASSEMBLY OF DRIVEN GEAR**

- (1) Mark location of driven gear on distributor shaft.
- (2) Place driven gear on soft base (wood block) so that spring pin can be removed.
- (3) Using a pin punch, remove spring pin.



1EL102

**INSPECTION**

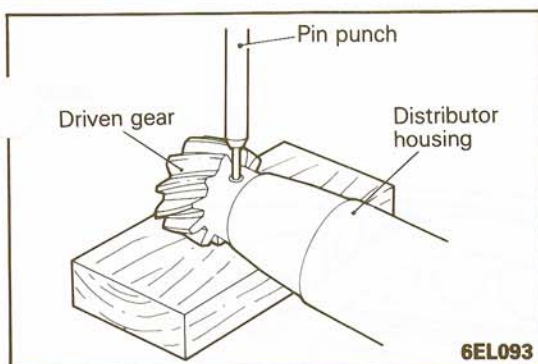
Check according to the following provisions and repair or replace anything faulty.

**CAP ROTOR**

- (1) Ensure there are no cracks in the cap.
- (2) Ensure that the electrodes of the cap and of the rotor are undamaged.
- (3) Wipe off any dirt from the cap or the rotor.

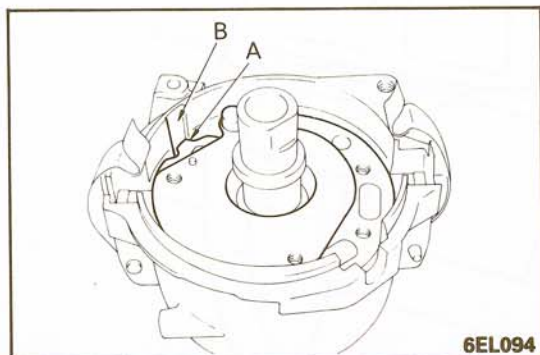
**SERVICE POINTS OF REASSEMBLY**

Before servicing be sure to clean and inspect all parts.



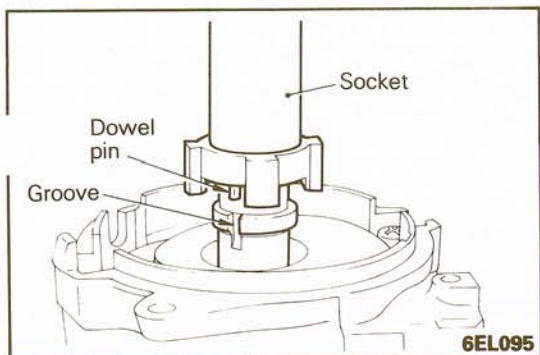
### 17. REASSEMBLY OF DRIVEN GEAR

Install driven gear into distributor shaft at previously marked location.



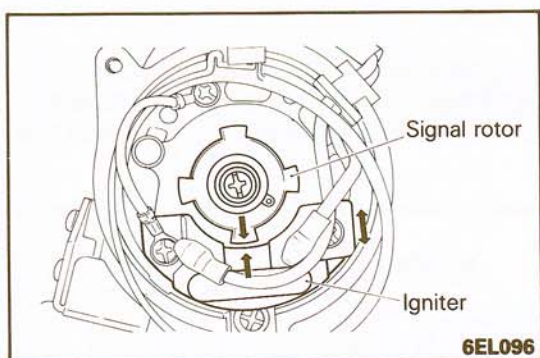
### 12. REASSEMBLY OF BREAKER PLATE

Install igniter base to housing. Position the igniter base so that the projection (A) fits into the groove (B).



### 11. REASSEMBLY OF SIGNAL ROTOR

Install signal rotor to rotor shaft. Position the signal rotor so that the dowel pin fits into the groove.



### ● ADJUSTMENT OF AIR GAP

Adjust air gap between signal rotor and pick-up of igniter.

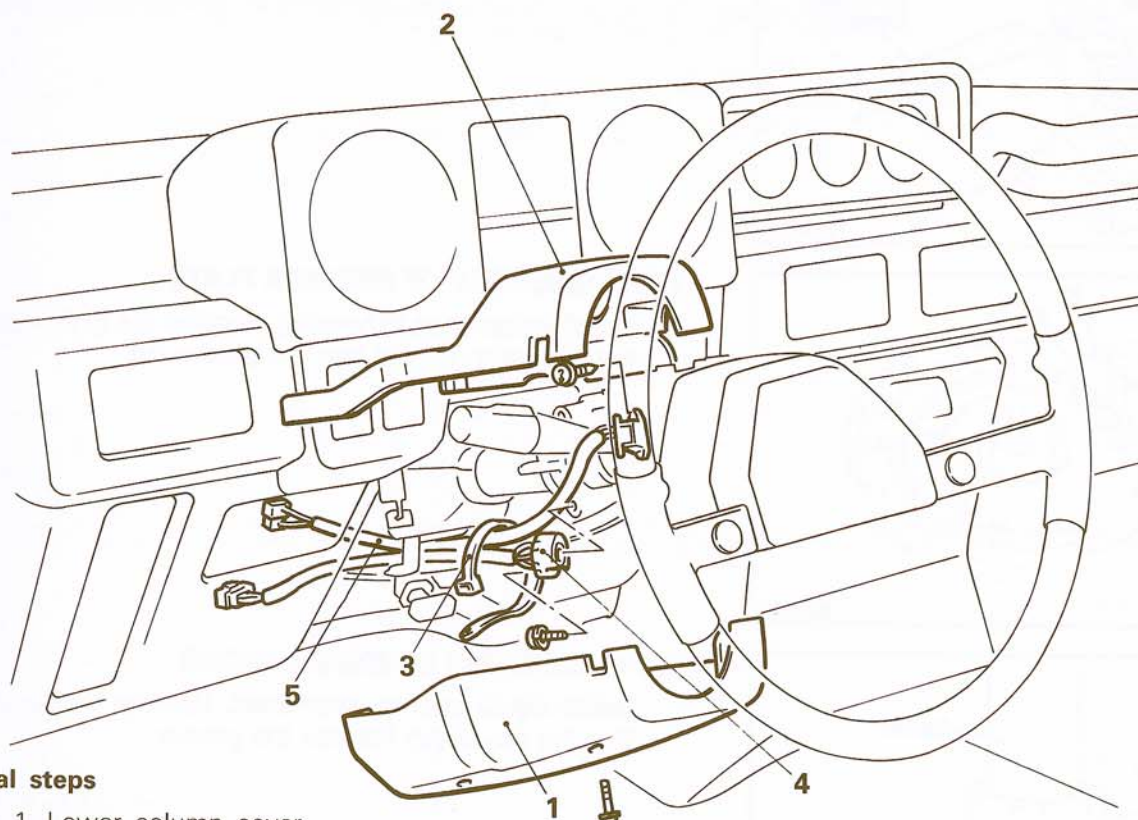
**Standard value : 0.8 mm (.0315 in.)**



## IGNITION SWITCH

## REMOVAL AND INSTALLATION

N08GLP



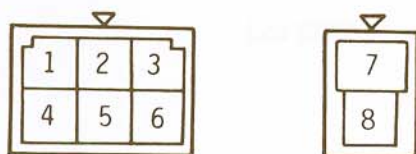
## Removal steps

1. Lower column cover
2. Upper column cover
3. Cable band
4. Ignition switch
5. Key reminder switch

## NOTE

Reverse the removal procedures to reinstall.

16W1557



16U0360

## INSPECTION

- (1) Disconnect the wiring connector from the ignition switch, and connect an ohmmeter to the switch side connector.
- (2) Operate the switch, and check the continuity between the terminals.

Terminal		Ignition switch						Key remind switch	
Position	Key	4	2	3	6	1	5	7	8
LOCK	Removed								
	Inserted			○—○					
ACC									
ON		○—○	○—○	○—○				○—○	
START		○—○			○—○	○—○	○—○		

## NOTE

○—○ indicates that there is continuity between the terminals.

# METERS AND GAUGES

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

#### METERS AND GAUGES

N08HB--

Items	Specifications
Speedometer	
Type	Electromagnetic type
Tachometer	
Type	Pulse type
Detection source	Ignition coil
Fuel gauge	
Type	Bimetal type (constant-voltage relay incorporated for 7V)
Fuel gauge unit	
Type	Variable resistance type
Water temperature gauge	
Type	Bimetal type (7V operation)
Water temperature gauge unit	
Type	Thermistor type
Oil pressure gauge	
Type	Bimetal type
Oil pressure gauge unit	
Type	Bimetal type
Inclinometer	
Type	Gravity type
Damping system	Oil-filled system
Voltage meter	
Type	Bimetal type

#### INDICATOR AND WARNING LIGHTS

N08HC-A

Items	Specifications
Turn signal indicator lights   W	1.4 (74)
High beam indicator light   W	1.4 (74)
Door-ajar warning light   W	1.4 (74)
Fasten seat belt indicator light   W	1.4 (74)
Brake warning light   W	1.4 (74)
Charging warning light   W	1.4 (74)
4WD indicator light   W	1.4 (74)
EGR warning light   W	1.4 (74)
A/T oil temperature warning light   W	1.4 (74)
Overdrive indicator light   W	1.4 (74)
Free-wheeling hub indicator light   W	1.4 (74)

#### NOTE

The values in parentheses denote SAE grade numbers.



## BUZZER

Items	Specifications
Range of voltage used V	10–16
While buzzing (Terminal voltage at 13 V)	
Sound pressure dB	53 ± 7
Fundamental frequency Hz	900 ± 150

## SERVICE SPECIFICATIONS

N08HC--

Items	Specifications
Standard values	
Speedometer indication error	
Meter with "km/h" indication km/h	
20 km/h	+4 -1
40 km/h	+4 0
80 km/h	+5 0
120 km/h	+5.5 +0.5
Meter with "mph" indication mph	
10 mph	± 1.5
25 mph	± 1.5
50 mph	± 1.5
75 mph	± 1.5
Tachometer indication error r/min	
1,000 r/min	± 100
3,000 r/min	± 150
5,000 r/min	± 250
Fuel gauge resistance value Ω	
Between terminals 1 (power supply) and 2 (fuel gauge unit)	23-27
Between terminals 2 (fuel gauge unit) and 3 (ground)	122-148
Between terminals 1 (power supply) and 3 (ground)	100-120
Fule gauge unit resistance value Ω	
Float point "F"	14.9-19.1
Float point "E"	113.5-126.5
Fuel gauge unit float position mm (in.)	
Float point "F"	29.7-34.7 (1.169-1.366)
Float point "E"	183.8-185.8 (7.236-7.315)
Water temperature gauge resistance value Ω	
Between terminals 1 (power supply) and 2 (water temperature gauge unit)	50-60
Water temperature gauge unit resistance value Ω [at 70°C (158°F)]	90.5-117.5
Oil pressure gauge resistance value Ω	45-55
Voltage meter indication error V	
10V	± 0.5
16V	± 0.5

**TORQUE SPECIFICATIONS**

N08HD--

Items	Nm	ft.lbs.
Water temperature gauge unit	8–10	6–7

**TROUBLESHOOTING****TACHOMETER**

N08HH--

Symptom	Inspection items				
	Fuse No. 3	Tachometer	Print circuit board	Wiring harness and connector connection	Ground
The tachometer fails to operate	①	②	③	④	⑤
The tachometer pointer is faulty		①			

**NOTE**

Number in circle indicates inspection sequence.

**FUEL GAUGE**

Symptom	Inspection items					
	Fuse No. 3	Fuel gauge unit	Fuel gauge	Print circuit board	Wiring harness and connector connection	Ground
The fuel gauge fails to operate	①	②	③	④	⑤	⑥
The fuel gauge pointer is faulty		①	②			

**NOTE**

Number in circle indicates inspection sequence.



**WATER TEMPERATURE GAUGE**

Symptom	Inspection items						
	Fuse No. 3	Water temperature gauge unit	Water temperature gauge	Fuel gauge (Voltage limiter)	Print circuit board	Wiring harness and connector connection	Ground
The water temperature gauge fails to operate	①	②	③	④	⑤	⑥	⑦
The water temperature gauge pointer is faulty		①	②	③			

**NOTE**

Number in circle indicates inspection sequence.

**OIL PRESSURE GAUGE**

Symptom	Inspection items					
	Fuse No. 3	Oil pressure gauge unit	Oil pressure gauge	Print circuit board	Wiring harness and connector connection	Ground
The oil pressure gauge fails to operate	①	②	③	④	⑤	⑥
The oil pressure gauge pointer is faulty		①	②			

**NOTE**

Number in circle indicates inspection sequence.

**BRAKE WARNING LIGHT**

Symptom	Inspection items							Other inspection items
	Fuse No. 3	Parking brake switch	Brake fluid level sensor	Indicator bulb	Print circuit board	Wiring harness and connector connection	Ground	
When the ignition key is at ON (without starting the engine) the indicator fails to illuminate	①			②	③	④		
Starting the engine does not make the indicator go off (when the parking brake is not engaged)		①	②			④	③	● Brake fluid line
The indicator does not illuminate when the parking brake is on, when the brake fluid falls below the regulation volume	①	②	③	④	⑤	⑥	⑦	

**NOTE**

Number in circle indicates inspection sequence.

**EGR WARNING LIGHT**

Symptom	Inspection items						
	Fuse No. 3	Indicator bulb	Speedometer	Reset switch	Print circuit board	Wiring harness and connector connection	Ground
When the ignition key is at ON (without starting the engine) the indicator fails to illuminate	①	②			③	④	⑤
The EGR warning indicator fails to illuminate after the car has travelled every 50,000 miles (Light bulb is OK.)			①	②			
Even when the reset switch is turned over the light does not go off				①	④	③	②

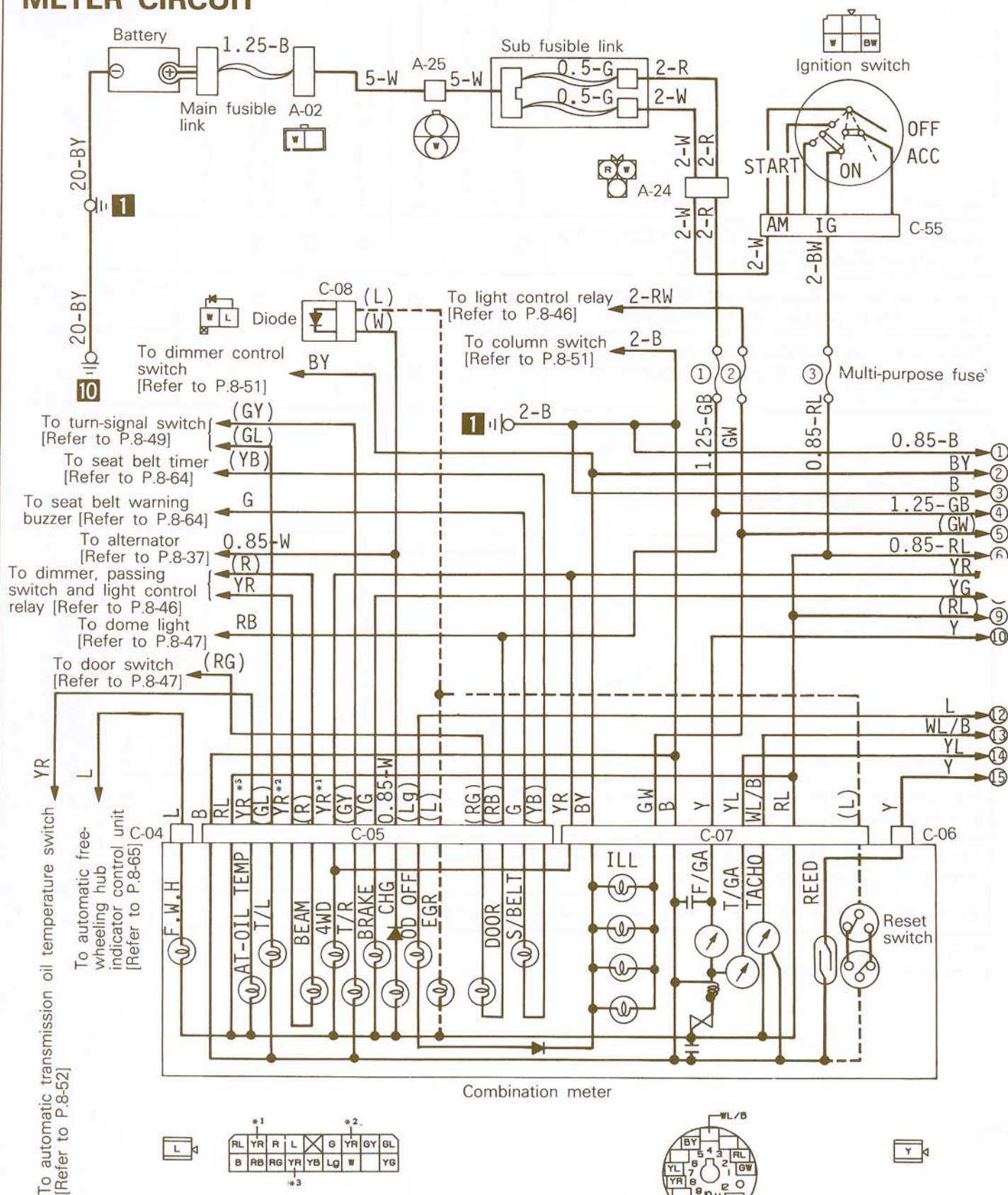
**NOTE**

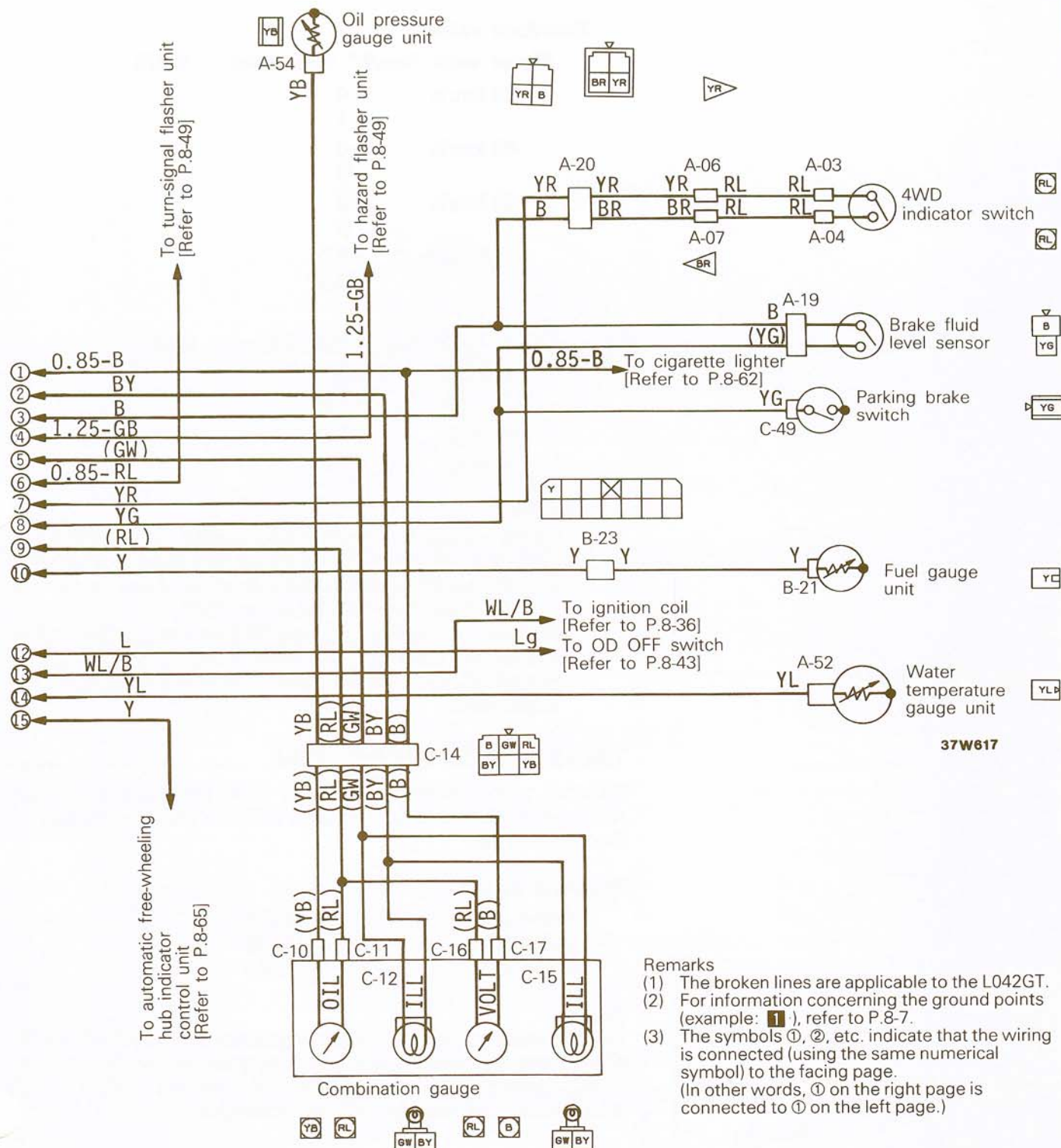
Number in circle indicates inspection sequence.



## CIRCUIT DIAGRAM

### METER CIRCUIT





37W617



## SERVICE ADJUSTMENT PROCEDURES

## SPEEDOMETER INSPECTION

N08HIA

1. Adjust tire inflation pressure to the standard value. (Refer to GROUP 22 WHEELS AND TIRES-General Specifications)
2. Use speedometer tester to make sure that the speedometer indication error is within the standard value.

Standard value :

Meter with "km/h" indication	km/h
20 km/h	+4 -1
40 km/h	+4 0
80 km/h	+5 0
120 km/h	+5.5 +0.5

Meter with "mph" indication	mph
10 mph	± 1.5
25 mph	± 1.5
50 mph	± 1.5
75 mph	± 1.5

## Caution

- 1 When using a speedometer tester to inspect the speedometer, be sure to chock the non-drive wheels to prevent the vehicle from moving. Also be sure to set the transfer shift lever to "2H".
- 2 If there is a special regulation for speedometer indication error in the area where the vehicle is operated, be sure to meet the requirement of the regulation.

## TACHOMETER INSPECTION

N08HIBA

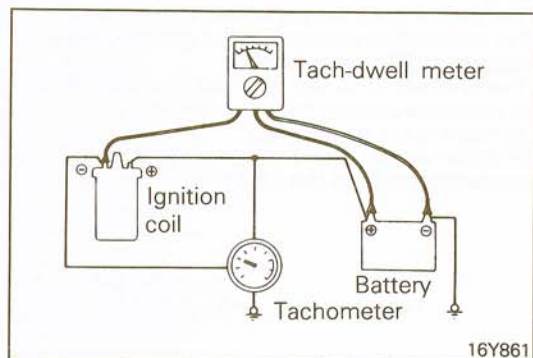
Connect a tach-dwell meter, and then compare the meter readings at various engine speeds with the values indicated on the tachometer.

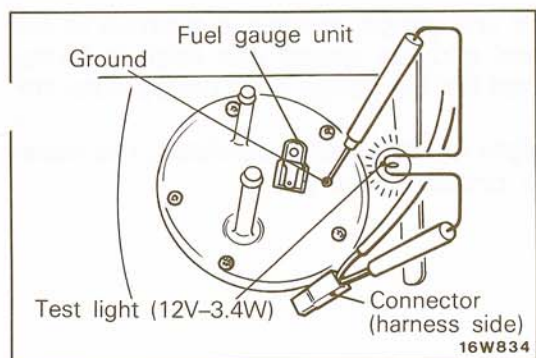
Standard value:

1,000 r/min	± 100 r/min
3,000 r/min	± 150 r/min
5,000 r/min	± 250 r/min

## Caution

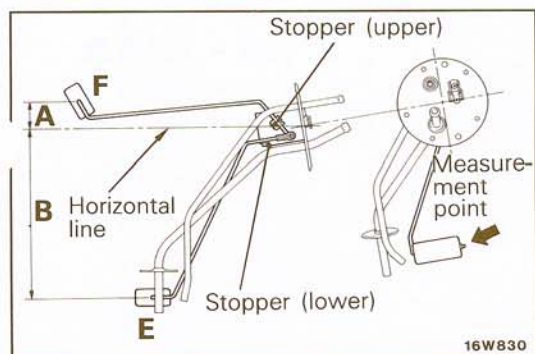
The tachometer is the negative-ground type, and therefore should not be connected in reverse polarity to the battery. If the tachometer is connected in reverse polarity, the transistors and diodes will be damaged.



**FUEL GAUGE SIMPLE TEST**

N08HICE

- (1) Disconnect, from below the vehicle, the wiring connector from the fuel gauge unit.
- (2) Ground the connector at the harness through a test light.
- (3) Turn the ignition key to the ON position.
- (4) Check to be sure that the test light flashes and the fuel gauge indicator moves.
- (5) If both the test light and gauge operate, the circuit to the gauge unit is normal and the gauge unit itself is faulty. If the test light flashes but the gauge does not operate, the gauge is faulty. If neither the test light nor the gauge operates, the fuel gauge circuit is faulty.

**FUEL GAUGE UNIT INSPECTION**

N08HIIF

To check the fuel gauge unit, first remove it from the fuel tank. For detailed information concerning installation of the fuel gauge unit, refer to GROUP 4, FUEL SYSTEM – Fuel Tank.

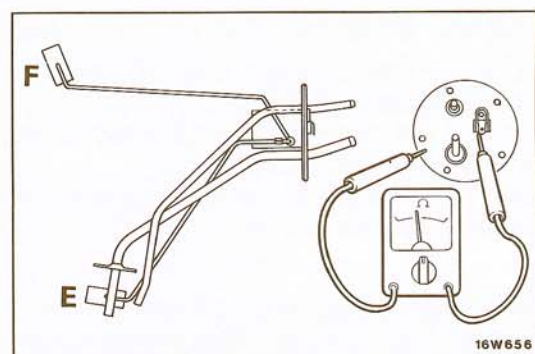
**FUEL GAUGE UNIT FLOAT POSITION CHECK**

Check to be sure that the height of the fuel gauge float (relative to the center part of the fuel gauge unit) is within the standard value range when the float is at the "F" position (upper limit) and "E" position (lower limit).

**Standard value:**

**A** 29.7–34.7 mm (1.170–1.366 in.)

**B** 183.8–185.8 mm (7.236–7.315 in.)

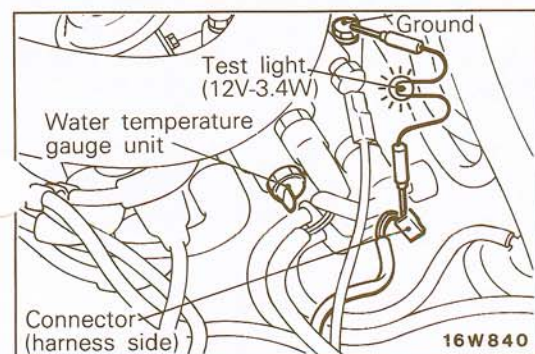
**FUEL GAUGE UNIT RESISTANCE CHECK**

Confirm that the resistances when the float of the fuel gauge unit is at the "F" position (top) and the "E" position (bottom) are within the standard value ranges.

**Standard value:**

**Float position "F" point** 14.9–19.1  $\Omega$

**Float position "E" point** 113.5–126.5  $\Omega$

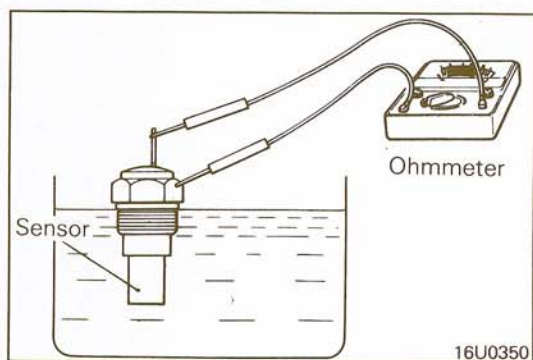
**WATER TEMPERATURE GAUGE SIMPLE TEST**

N08HIDB

- (1) Disconnect the wiring connector from the water temperature gauge unit inside the engine compartment.
- (2) Ground the connector at the harness through a test light.
- (3) Turn the ignition key to the ON position.
- (4) Check to be sure that the test light flashes and the water temperature gauge indicator moves.



- (5) If both the test light and gauge operate, the circuit to the gauge unit is normal and the gauge unit itself is faulty. If the test light flashes but the gauge does not operate, the gauge is faulty. If neither the test light nor the gauge operates, the water temperature gauge circuit is faulty.



### WATER TEMPERATURE GAUGE UNIT INSPECTION

N08HIKD

To check the water temperature gauge unit, first remove it from the intake manifold.

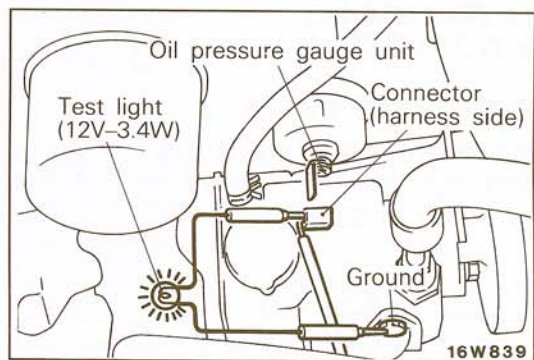
For detailed information concerning installation of the water temperature gauge unit, refer to GROUP 11, INTAKE AND EXHAUST SYSTEM – Intake Manifold.

### WATER TEMPERATURE GAUGE UNIT RESISTANCE CHECK

Immerse the gauge unit in hot water at 70°C (158°F) and measure the resistance value with an ohmmeter.

**Standard value:**

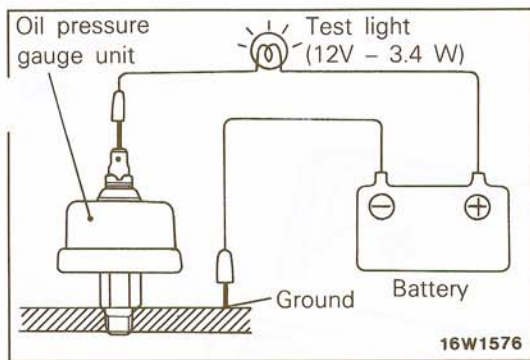
**90.5 – 117.5  $\Omega$**



### OIL PRESSURE GAUGE SIMPLE TEST

N08HIFA

- (1) Disconnect the wiring connector from the oil pressure gauge unit inside the engine compartment.
- (2) Ground the connector at the harness through a test light.
- (3) Turn the ignition key to the ON position.
- (4) Check to be sure that the test light illuminates steadily and the indicator of the oil pressure gauge moves.
- (5) If both the test light and gauge operate, the circuit to the gauge unit is normal and the gauge unit itself is faulty. If the test light flashes but the gauge does not operate, the gauge is faulty. If neither the test light nor the gauge operates, the oil pressure gauge circuit is faulty.



## OIL PRESSURE GAUGE UNIT CURRENT CHECK

- (1) Disconnect the wiring connector from the oil pressure gauge unit inside the engine compartment.
- (2) Apply battery voltage (through the test light) to the gauge unit side terminal.
- (3) Check to be sure that the test light switches OFF when the engine is stopped, and that it flashes while the engine is running.

## VOLTAGE METER SIMPLE TEST

- (1) Connect a voltmeter for testing.
- (2) Turn the ignition key to the ON position.
- (3) Compare the readings of the voltmeter for testing and of the vehicle's voltage meter.

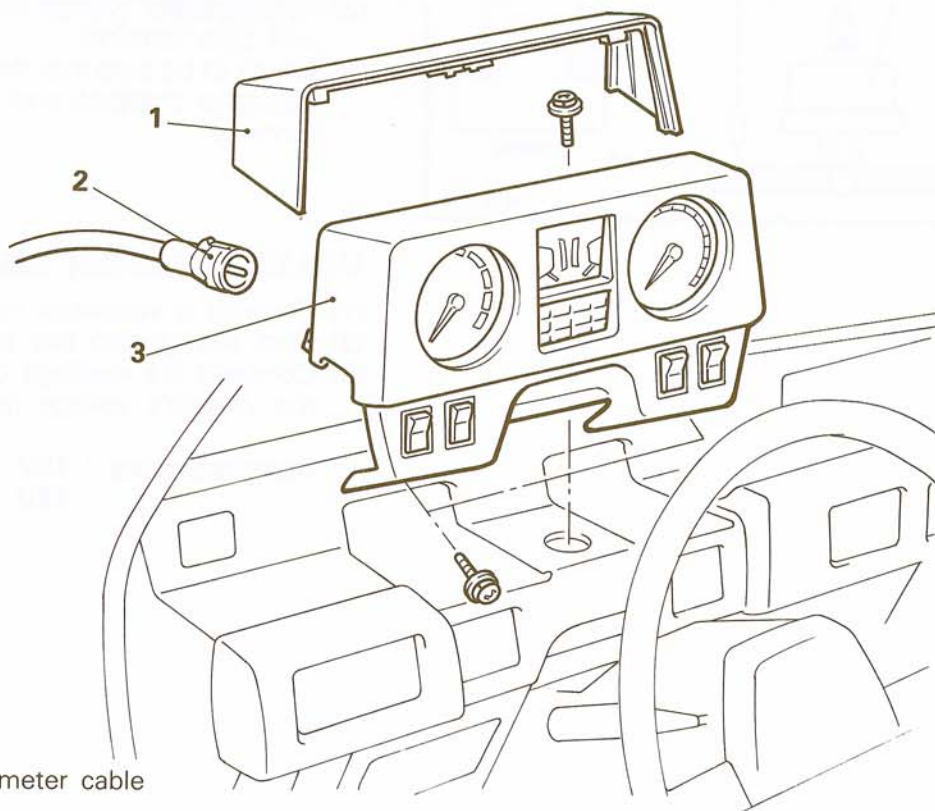
**Standard value : 10V      ± 0.5V**  
**16V      ± 0.5V**



## COMBINATION METER

## REMOVAL AND INSTALLATION

N08HJA



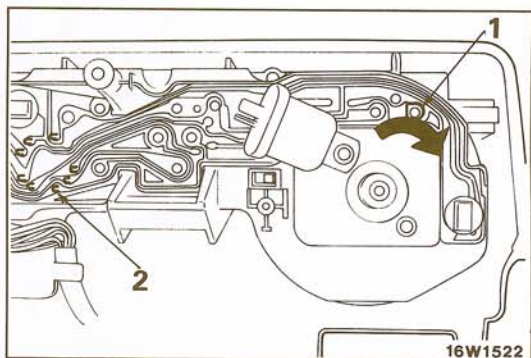
## Removal steps

1. Meter cover
- ◆◆ 2. Connection of speedometer cable
3. Meter assembly

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".

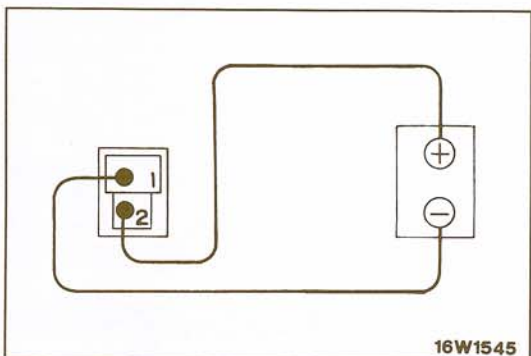
16W1553



16W1522

INSPECTION  
REED SWITCH

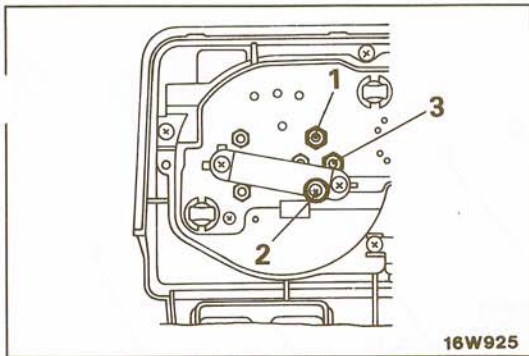
Using an ohmmeter, check that continuity and discontinuity alternate between terminals 1 and 2 four times at every rotation of the shaft of the speedometer cable connection.



16W1545

## BUZZER

Check to be sure that buzzer sounds when the battery's positive (+) terminal is connected to terminal 2 and the battery's negative (–) terminal is connected to terminal 1.

**FUEL GAUGE**

Measure the resistance value between the terminals by using an ohmmeter.

**Standard value :**

1-2 terminals:

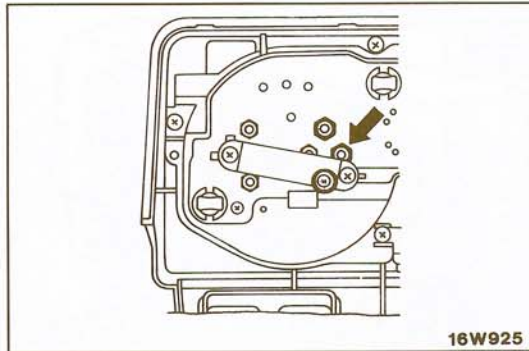
23-27  $\Omega$

2-3 terminals:

122-148  $\Omega$

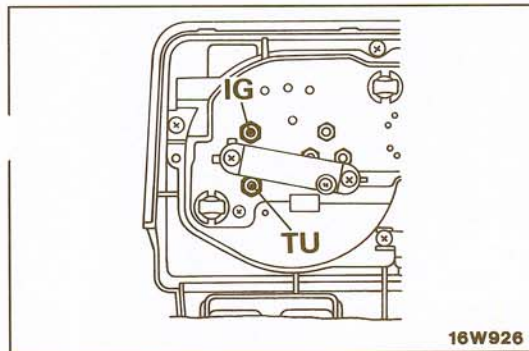
1-3 terminals:

100-120  $\Omega$

**Caution**

If there is a malfunction of the ground contact of the voltage regulator even once during vehicle operation, the excessive current flowing through the heat coil of the water temperature gauge and the fuel gauge will cause permanent distortion of the bimetal, resulting in the indications being consistently lower than the actual value.

For this reason, therefore, be sure to make the earth contact securely.

**WATER TEMPERATURE GAUGE**

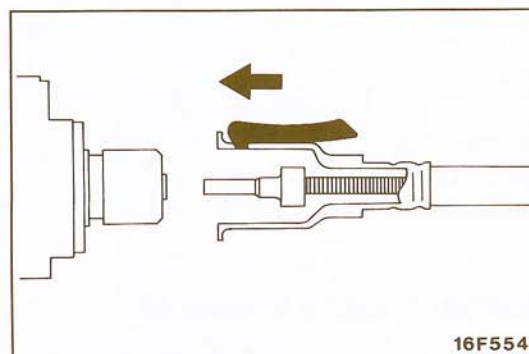
Measure the resistance value between the terminals by using an ohmmeter.

**Standard value:**

Bimetal type

1-2 terminals:

50-60  $\Omega$

**SERVICE POINTS OF INSTALLATION****2. INSTALLATION OF SPEEDOMETER CABLE**

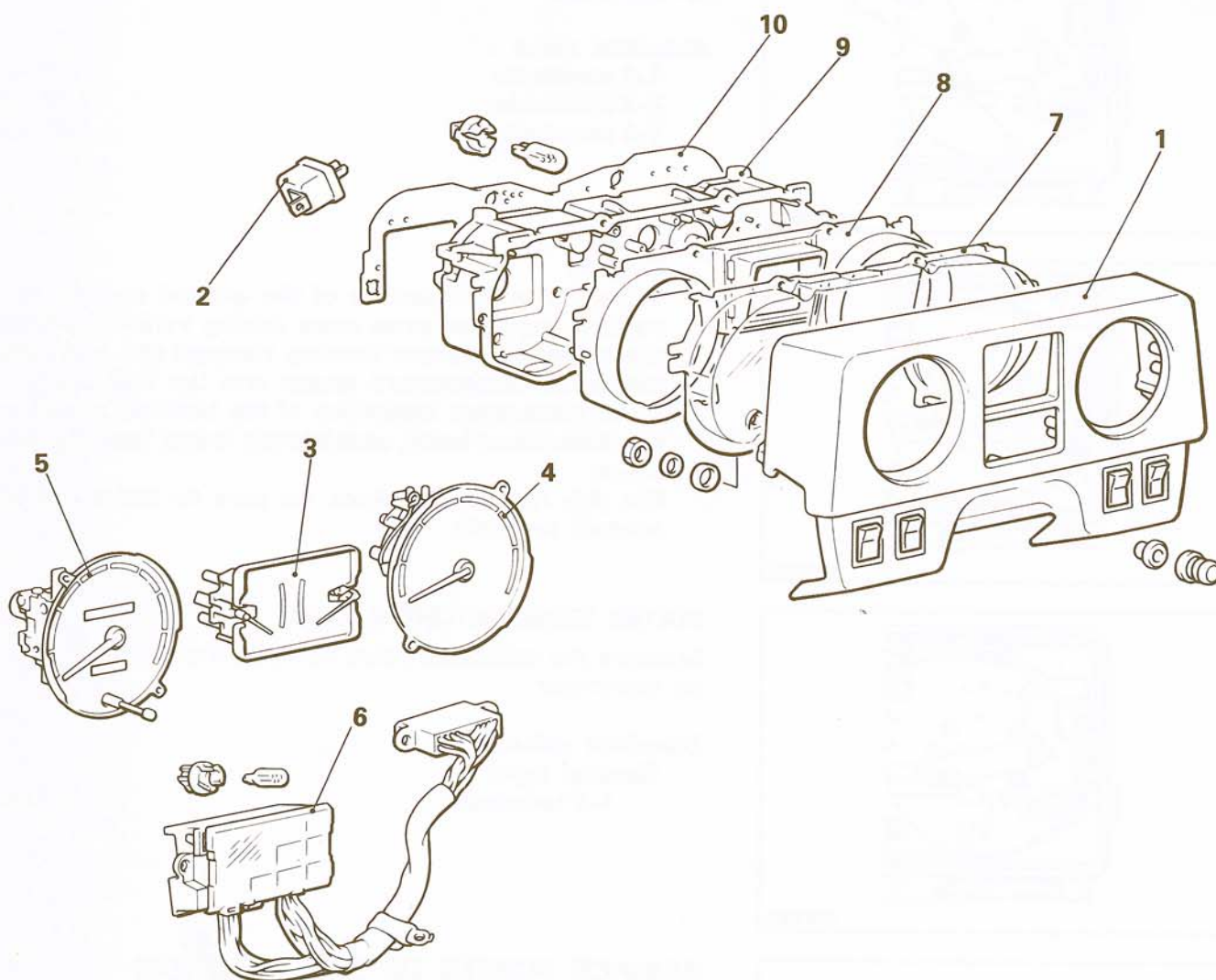
Insert the cable until its stopper properly fits to the speedometer groove.

**Caution**

Poor installation of the cable may cause a fluctuating meter pointer, or noise and a damaged harness inside the instrument panel.



## DISASSEMBLY AND REASSEMBLY



16W1554

**Disassembly steps**

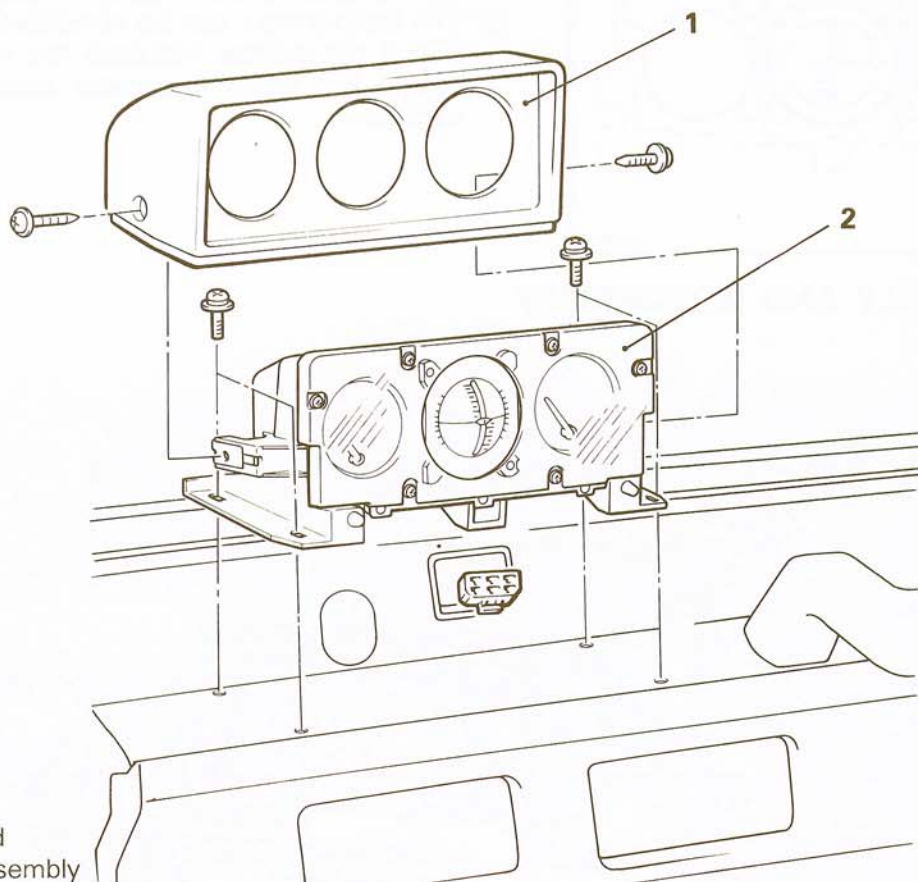
1. Meter cover
2. Buzzer
3. Fuel and water temperature gauge
4. Tachometer
5. Speedometer
6. Indicator panel
7. Meter glass

8. Window plate
9. Meter case
10. Printed circuit board

**NOTE**

Reverse the disassembly procedures to reassemble.

## 3-METER UNIT REMOVAL AND INSTALLATION



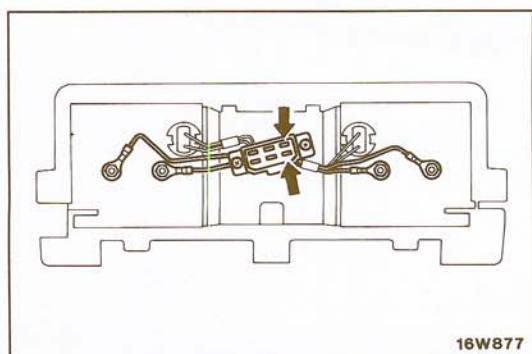
### Removal steps

1. Meter pad
2. Gauge assembly

### NOTE

Reverse the removal procedures to reinstall.

16W1560

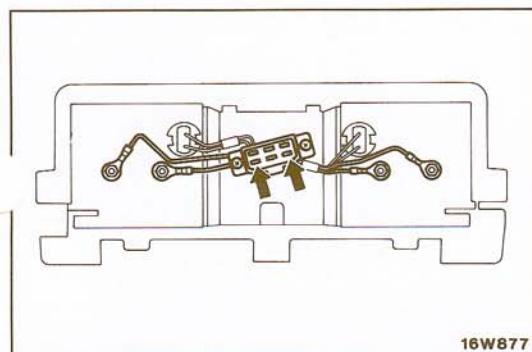


### INSPECTION

#### OIL PRESSURE GAUGE

Measure the resistance value between the terminals with an ohmmeter.

**Standard value : Approx. 50  $\Omega$**

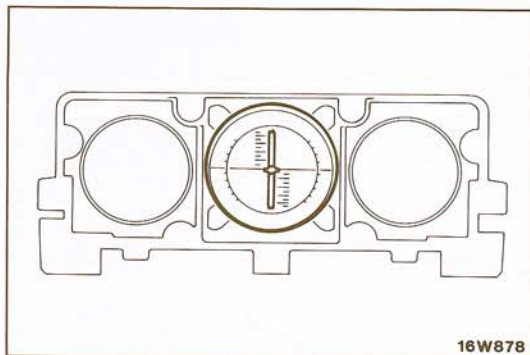


#### VOLTAGE METER

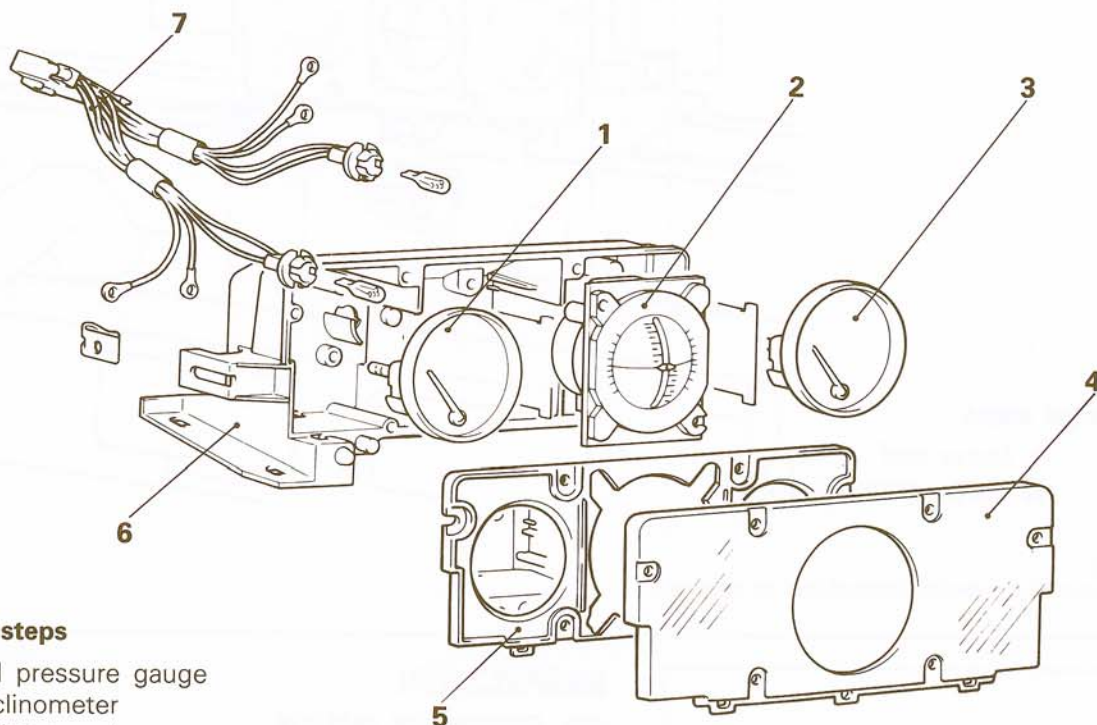
Measure the resistance value between the terminals with an ohmmeter.

**Standard value : 380–460 $\Omega$**



**INCLINOMETER**

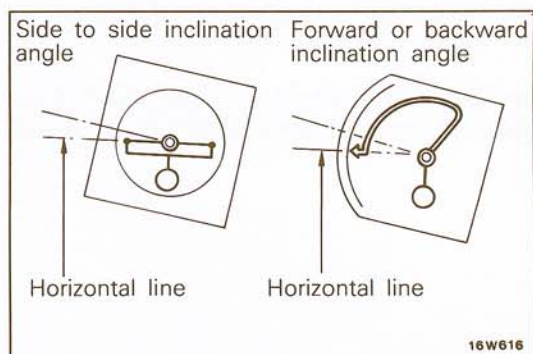
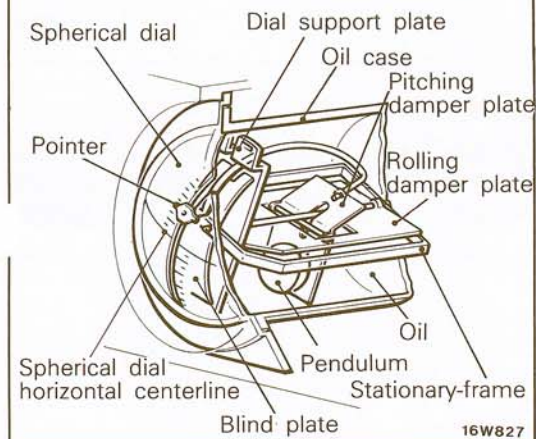
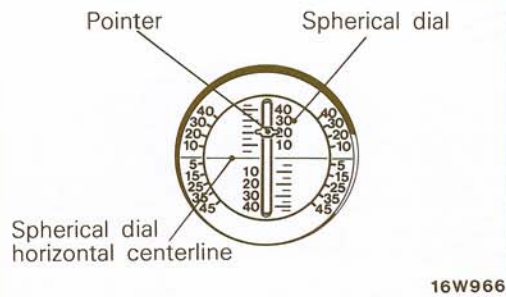
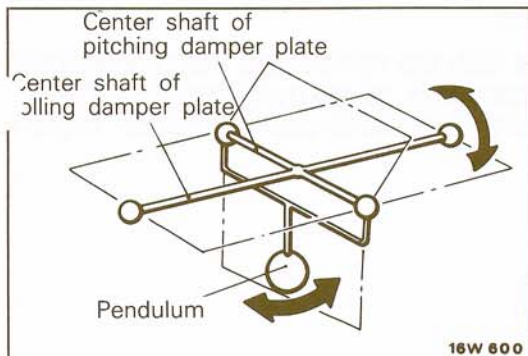
- (1) Check to be sure that operation is smooth when the inclinometer is tilted up/down and to the left and right
- (2) The inclinometer can be considered to be in good condition if the pointer indicates the spherical dial horizontal centre line when the meter case is placed on a level surface.

**DISASSEMBLY AND REASSEMBLY****Disassembly steps**

1. Oil pressure gauge
2. Inclinometer
3. Voltage meter
4. Meter glass
5. Window plate
6. Meter case
7. Meter harness

**NOTE**

Reverse the disassembly procedures to reassemble.



## INCLINOMETER

### OUTLINE

The inclinometer is an instrument which indicates the forward or backward inclination (pitching) or side to side inclination (rolling) of vehicle.

Motion of a pendulum in the system is displayed on the system. The pitching and rolling pointer is supported by a double support mechanism in which the rolling fulcrum is supported in such a way as to be rotative around the case and the pitching fulcrum supported on the rolling system

### CONSTRUCTION

The inclinometer consists of an outer case which inclines with the vehicle, a pointer which is provided in an oil case and always maintains a level position, and a spherical dial. The spherical dial is coupled through the dial support plate to the rolling damper plate. The rolling damper plate is swivel bearing coupled to a stationary frame by the center axis, so it can incline side-to-side, but is always held in a level position by a pendulum. The pointer is coupled with the pitching damper plate.

Since the pitching damper plate is swivel bearing coupled to the rolling damper plate by the center axis, it can incline forward and backward, but is always maintained in a level position by the pendulum.

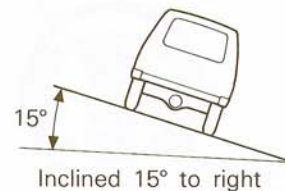
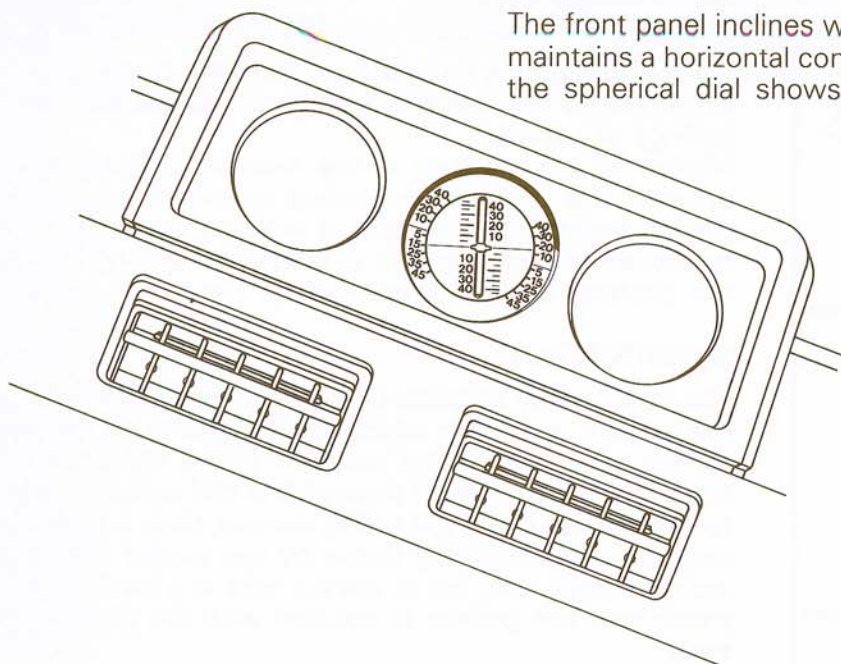
### OPERATION

The side-to-side inclination angle should be read on a scale of the front panel as indicated by the horizontal centerline of the spherical dial, whereas the forward or backward inclination angle should be read on a scale of the spherical dial as indicated by the pointer.



**Side-to-Side Inclination**

The front panel inclines with the vehicle, but the spherical dial maintains a horizontal condition, so the horizontal centerline of the spherical dial shows the side-to-side inclination angle.



16W969

**Forward or Backward Inclination**

The spherical dial inclines forward or backward with the vehicle, but the pointer maintains a level position, so the pointer indicates the forward or backward inclination angle.



16W967

**Combined Forward or Backward and Side-to-Side Inclination**





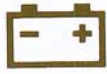

The forward or backward inclination angle and the side-to-side inclination angle are indicated by the pointer and spherical dial.



16W968

## INDICATORS AND WARNINGS

N08HKAC

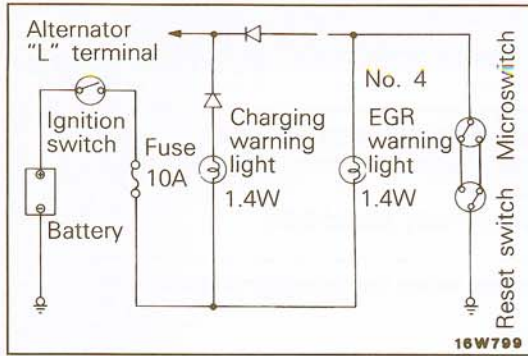
Symbol		Operation
	Turn-signal indicator	This indicator flashes, as do the same side of turn-signal light flashes. If the turn-signal light is burnt out, the blinking of indicator slows down. This indicator is common with hazard light.
	High beam indicator	This indicator illuminates when the headlights are on high beam.
	Door-ajar warning light	This warning comes on when the door is either open or not completely closed.
	Fasten seat belt indicator	This indicator goes on for four to eight seconds when the ignition key is in "ON" position, even if the driver has fastened his seat belt.
<b>BRAKE</b> *1 (ⓘ)	Brake warning light	This warning comes on when the ignition key is in "ON" position, and goes off after the engine has started. This warning comes on when the parking brake is applied or brake fluid level falls less than the specific level.
	Charging warning light	This warning comes on when the ignition key in "ON" position, and goes off after the engine has started. This warning comes on when the drive belt breaks or the trouble occurs in the charging system.
<b>O D</b> <b>OFF</b> 68R0133	Overdrive indicator	This indicator will illuminates when the overdrive control switch is switched to the "OFF" position.
<b>A/T</b> <b>TEMP</b> 68W068	A/T oil temperature warning light	This A/T oil temperature warning comes on when automatic transmission fluid temperature becomes abnormally high.
<b>WHEEL</b> <b>LOCK</b> 68W080	Free-wheeling hub indicator	This indicator comes on when the automatic free-wheeling hubs are locked.
	4WD indicator	This indicator will light up when the transfer case shift lever is shifted to the four wheel driving position (either the "4H" or the "4L" position) and the ignition key is in the "ON" position.
<b>*2CHECK</b> <b>EGR</b>	EGR warning light	The EGR warning light will illuminate every 50,000 miles of driving. When this occurs, bring the vehicle to an authorized dealer to have the EGR system checked.

## NOTE

\*1 indicates vehicles for Canada.

\*2 indicates vehicles other than those destined for Canada.

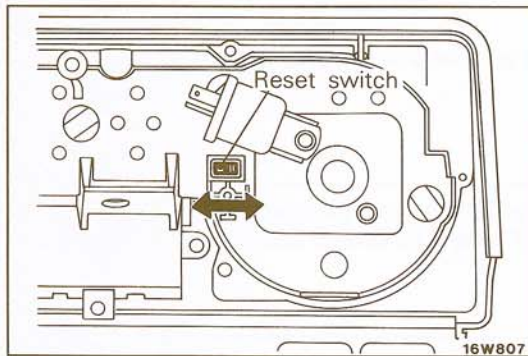




## EGR WARNING SYSTEM

The EGR warning system consists of a microswitch connected to the odometer, a reset switch, and a warning light bulb. This system will cause the EGR warning light to light up every 50,000 miles that the vehicle is driven in order to inform the driver that it is time to check the EGR system.

The warning light bulb will light up when the ignition switch is set to "ON" while the engine is not running, thus allowing the driver to confirm that the bulb is not burned out.



## RESET SWITCH

Use the switch on the back of the odometer to reset the EGR warning system.

### NOTE

If the speedometer is to be replaced, set the new odometer to the same reading as the odometer being removed.

# LIGHTING SYSTEM

## SPECIFICATIONS

### GENERAL SPECIFICATIONS EXTERIOR AND INTERIOR LIGHTS

N081B--

Items	Specifications
Exterior lights	
Head lights W	60/50
Front combination lights cp	
Turn-signal lights	32
Front side marker and position lights	2
Rear combination lights cp	
Turn-signal light	32
Stop and tail lights	32/3
Back-up lights	32
Rear side marker lights W	3.8 (194)
Licence plate lights W	6
Interior lights	
Dome light W	10
Heater panel illumination light W	1.4 (74)
Combination meter and gauge illumination light W	3.4 (158)
Cigarette lighter illumination light W	1.4 (74)
Ashtray illumination light W	1.4 (74)
Shift illumination light (automatic transmission) W	1.4 (74)

#### NOTE

The values in parentheses denote SAE grade numbers.

### RELAY AND FLASHER UNIT

Items	Specifications
Light control relay	
Rated load W	Max. 200
Range of voltage used V	10–16
Voltage drop between terminals V	0.2 or less
Turn-signal flasher unit	
Type	Condenser type
Rated load W	84.4
Blinking frequency [12.8 V, 20°C (68°F)] cycle/min	85 ± 10
Hazard flasher unit	
Type	Heat band type
Rated load W	49.4–168.8
Blinking frequency [12.8 V, 20°C (68°F)] cycle/min	90 ± 10



## COLUMN SWITCH

Items	Specifications
Lighting switch	
Rated load    A	0.17–0.27
Voltage drop (at 12V and the rated load)    V	0.2 or less
Dimmer-passing switch	
Dimmer switch	
Rated load    A	
Upper beam	16.1–18.7
Lower beam	9.4–10.8
Voltage drop (at 12V and the rated load)    V	0.2 or less
Passing switch	
Rated load    A	
Upper beam	16.1–18.7
Lower beam	0.17–0.27
Voltage drop (at 12V and the rated load)    V	0.2 or less
Turn signal switch	
Rated load    A	
TB-FL, TB-FR	2.2–2.8
TB-RL, TB-RR	4.2–4.8
ST-RL, ST-RR	4.2–4.8
Voltage drop (at 12V and the rated load)    V	0.2 or less

## HAZARD WARNING SWITCH

Items	Specifications
Voltage drop (at 12V the rated load)    V	0.1 or less

## DIMMER CONTROL SWITCH

Items	Specifications
Type	Variable-resistance type
Rated load $\Omega$	15 (Min.)–26.6 (Max.)
Voltage drop (at 14V the rated load)    V	0.15 or less

## SERVICE SPECIFICATIONS

N081C--

Items	Specifications
Limit	
Headlight intensity    cd	20,000 or more

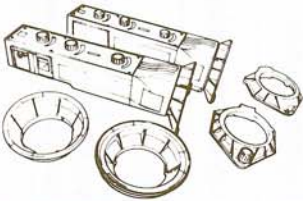


## TORQUE SPECIFICATIONS

N081D--

Items	Nm	ft.lbs.
Steering wheel lock unt	35–45	26–33

## SPECIAL TOOLS

N08IG-A

Tool (Number and name)	Use	Tool (Number and name)	Use
C-4466 Headlight aimer 	Aiming of headlight	C-4755 Trim stick 	Removal of hazard warning switch
DT-1001-A Steering wheel puller 	Removal of steering wheel		

## TROUBLESHOOTING

## HEADLIGHT

N08IH--

Symptom	Inspection items				
	Lighting switch	Dimmer passing switch	Light control relay	Wiring harness and connector connection	Ground
Headlights do not illuminate, or illuminate intermittently	①	②	③	④	⑤
It is not possible to change the headlight's beam		①		②	
Headlights are dim			①	②	③
Headlights on only one side illuminate				①	②

## NOTE

Number in circle indicates inspection sequence.



## TAIL LIGHT, POSITION LIGHT, SIDE MARKER LIGHT AND LICENSE PLATE LIGHT

Symptom	Inspection items					
	Fuse No.2	Lighting switch	Light control relay	Bulb	Wiring harness and connector connection	Ground
Lights fail to illuminate	①	②	③	④	⑤	⑥
Lights on only one side illuminate				①	②	

## NOTE

Number in circle indicates inspection sequence.

## BACK-UP LIGHT

Symptom	Inspection items					
	Fuse No. 4	Back-up light switch (Vehicles with a manual transmission)	Inhibitor switch (Vehicles with an automatic transmission)	Bulb	Wiring harness and connector connection	Ground
Back-up light does not illuminate	①	②	③	④	⑤	⑥
Only back-up light on one side illuminates				①	②	

## NOTE

Number in circle indicates inspection sequence.

**DOMELIGHT**

Symptom	Inspection items					
	Fuse No. 1	Door switch	Dome light switch	Bulb	Wiring harness and connector connection	Ground
The dome light does not illuminate when the door is opened (illuminates when the dome light switch is ON)		①	②		③	④
Dome light does not illuminate	①		②	③	④	⑤

**NOTE**

Number in circle indicates inspection sequence.

**TURN SIGNAL LIGHT AND HAZARD LIGHT**

Symptom	Inspection items							
	Fuse No. 1	Fuse No. 3	Turn-signal flasher unit	Hazard flasher unit	Turn signal switch	Hazard switch	Bulb	Wiring harness and connector connection
All turn signal lights fail to flash	①		③		②			④
The turn signal light will not flash (illumination remained)			③				①	②
The hazard light fails to operate		①		③		②		④
The turn signal indicator fails to flash							①	②

**NOTE**

Number in circle indicates inspection sequence.



## STOP LIGHT

Symptom	Inspection items							Other inspection items
	Fuse No. 7	Stop light switch	Hazard switch	Turn signal switch	Bulb	Wiring harness and connector connection	Ground	
The stop light fails to illuminate	①	②	③	④	⑤	⑥	⑦	
The stop light does not go off		①				②		● Installation parts of the stop light switch
The stop light on one side does not illuminate					①	②		

## NOTE

Number in circle indicates inspection sequence.

## INSTRUMENT PANEL ILLUMINATION CIRCUIT

Symptom	Inspection items						
	Fuse No. 2	Light control relay	Lighting switch	Dimmer control switch	Bulb	Wiring harness and connector connection	Ground
Illumination light fails to illuminate (the tail light also fails to illuminate)	①	②	③			④	⑤
Illumination light fails to illuminate (the tail light illuminates)				①	②	③	④
Illumination light cannot be dimmed				①		②	③

## NOTE

Number in circle indicates inspection sequence.

[illegible]

Remark  
For information concerning the ground points (example: **1** ), refer to P.8-7.

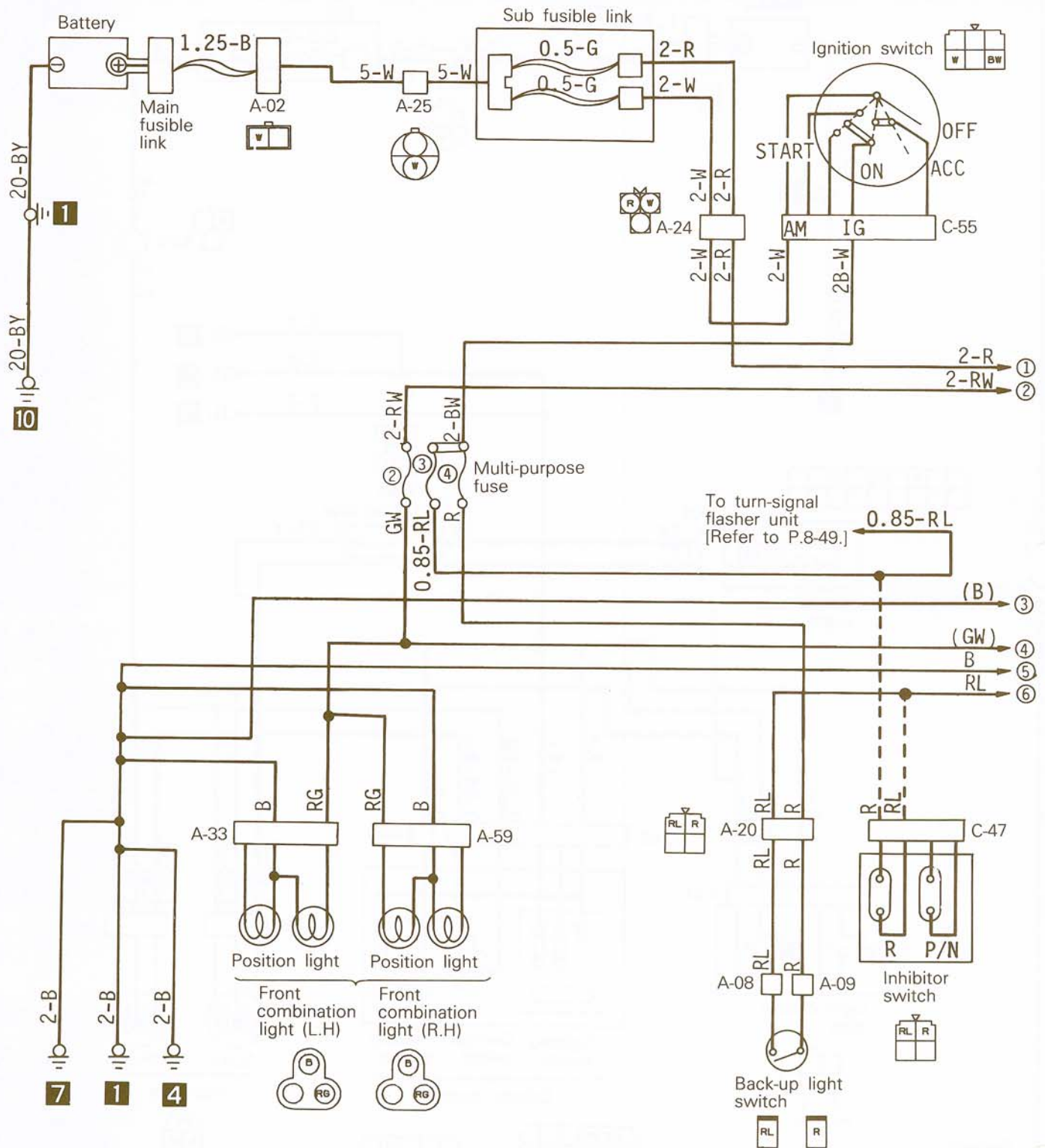
### Wiring color code

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
 Ll: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White



## CIRCUIT DIAGRAM

## TAIL LIGHT, POSITION LIGHT, REAR SIDE MARKER LIGHT, LICENSE PLATE LIGHT AND BACK-UP LIGHT CIRCUIT



## Wiring color code

B: Black  
LI: Light blue

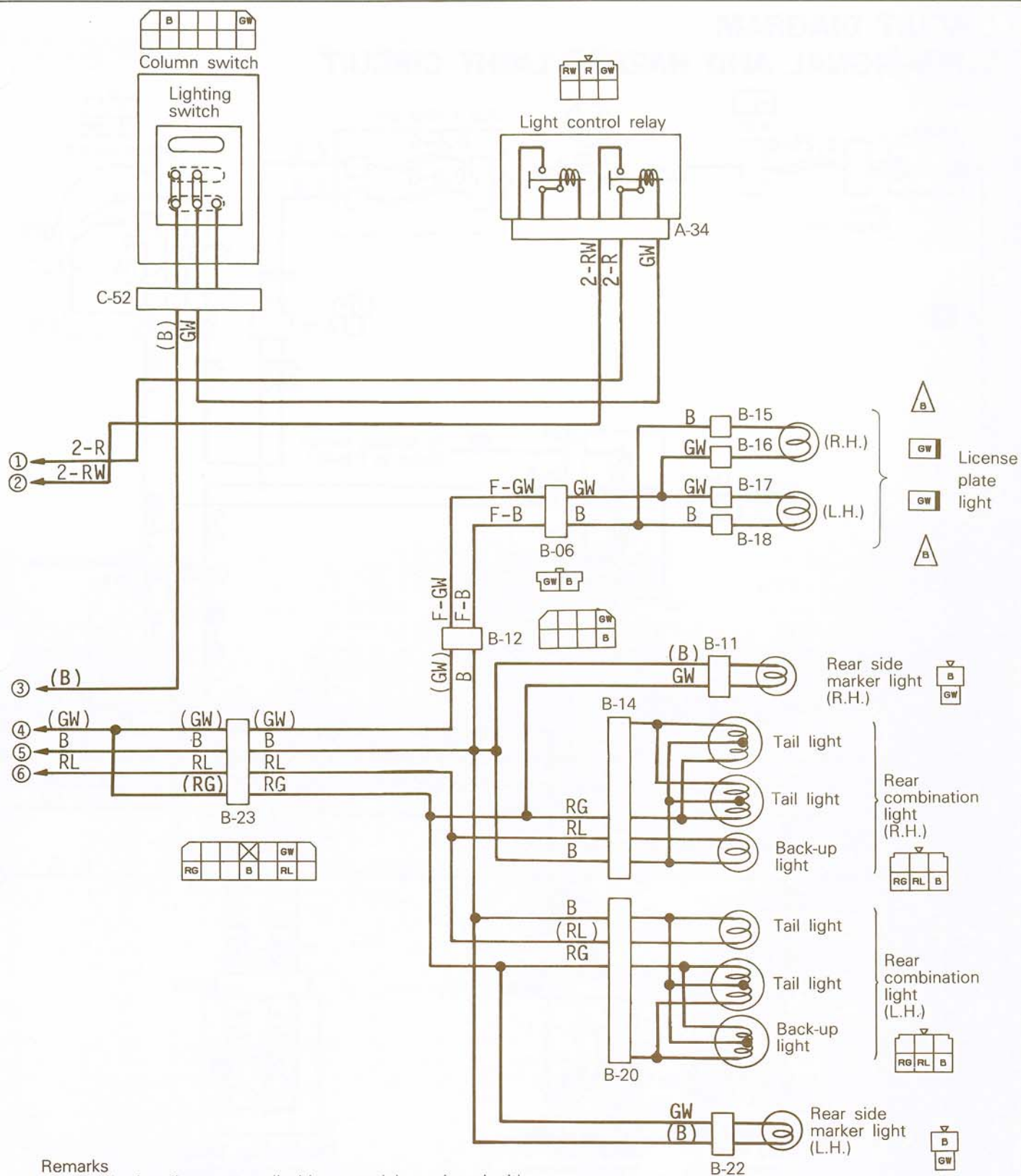
Br: Brown  
O: Orange

G: Green  
P: Pink


Gr: Gray  
R: Red

L: Blue  
Y: Yellow

Lg: Light green  
W: White

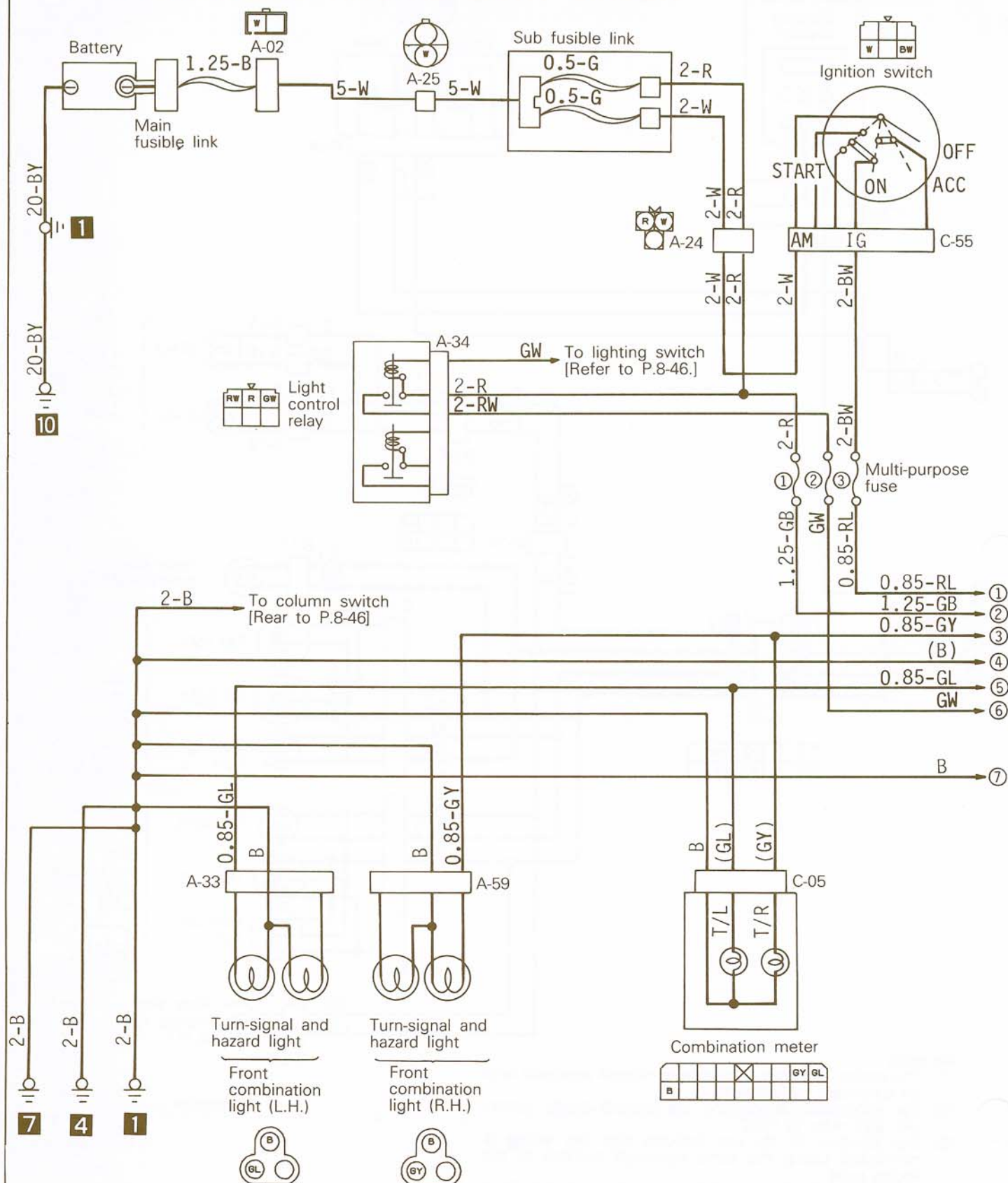


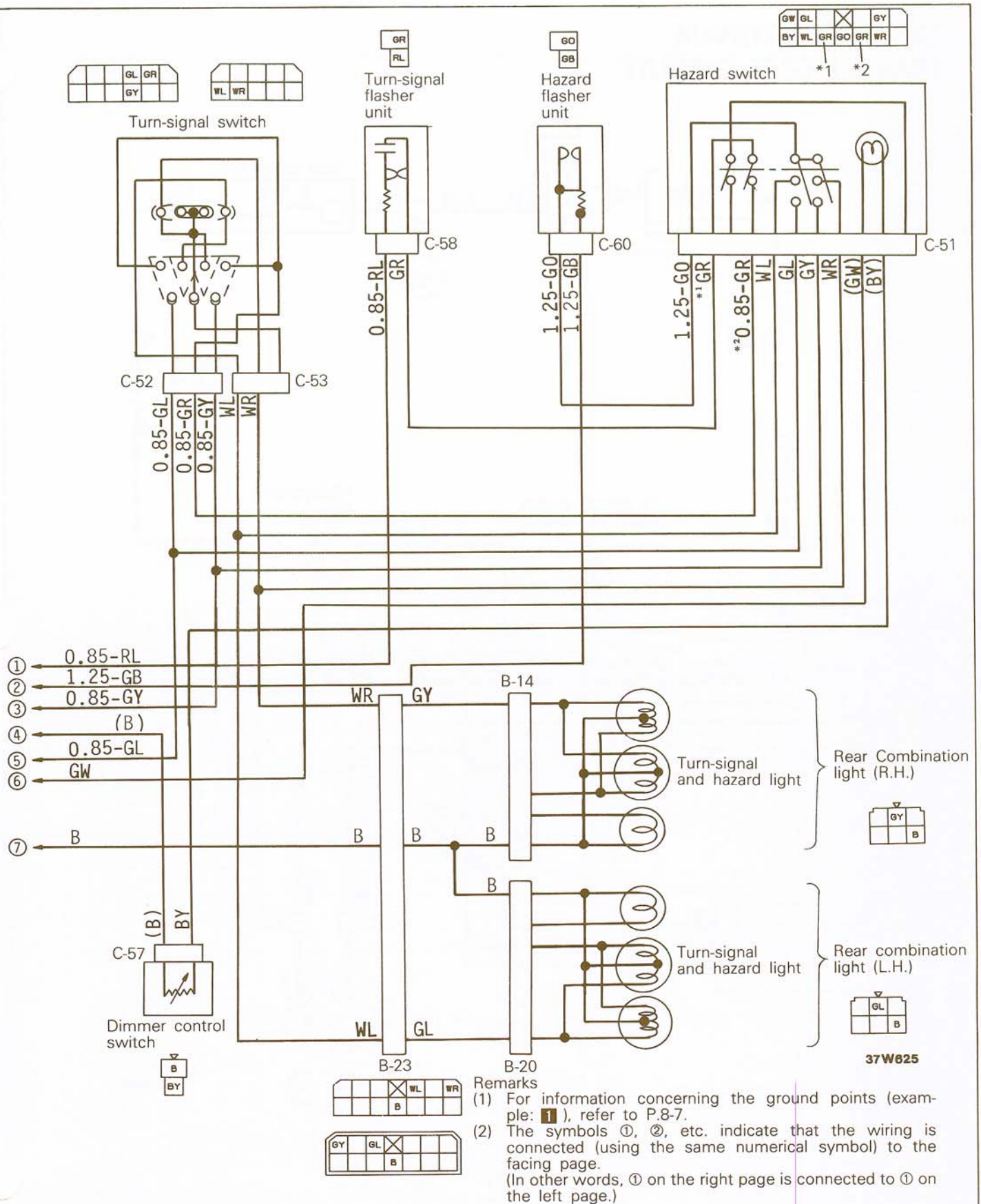
Remarks

- (1) The broken lines are applicable to models equipped with an automatic transmission.
- (2) For information concerning the ground points (example: ) , refer to P.8-7.
- (3) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)

37W623



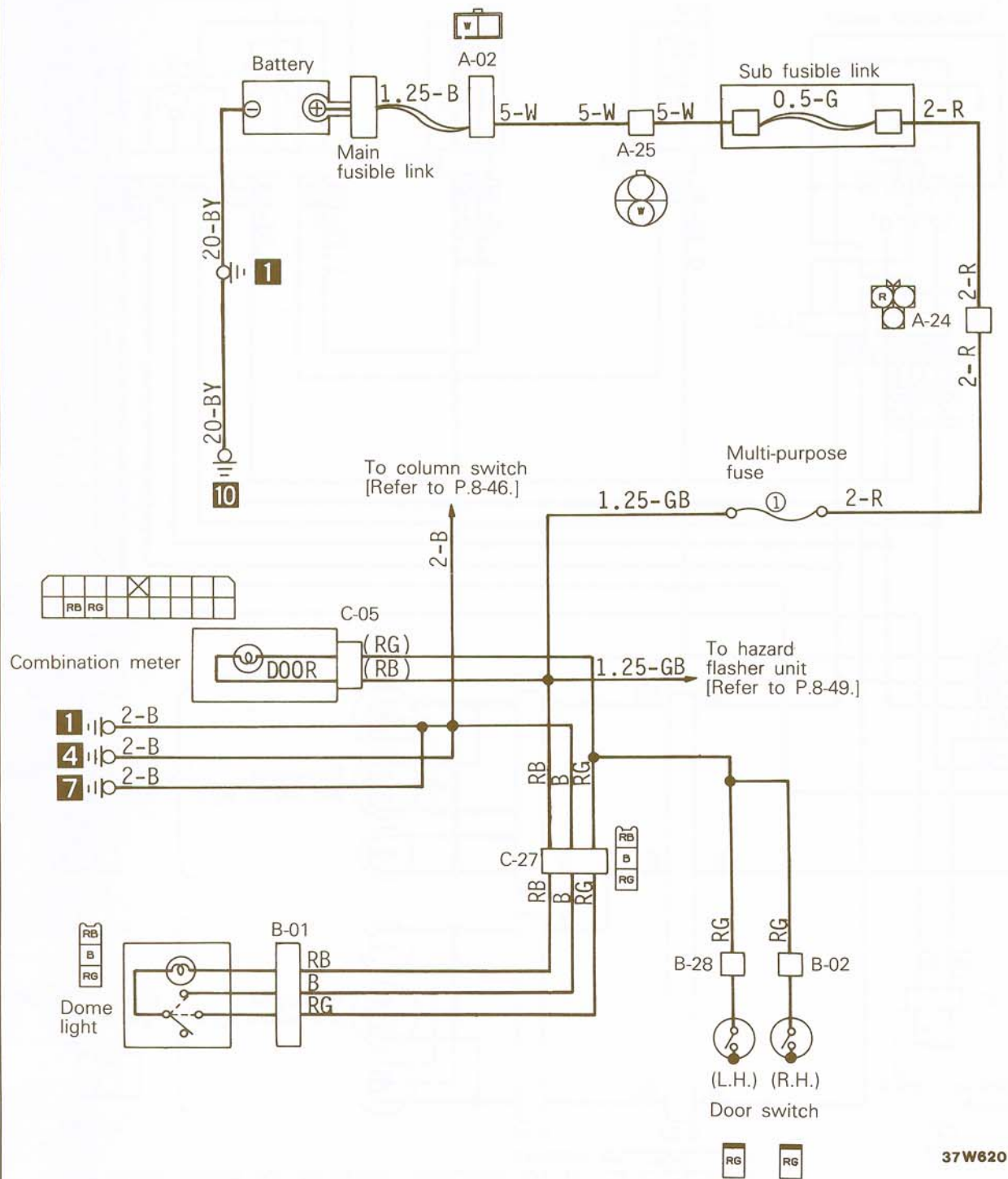




37W625



# CIRCUIT DIAGRAM DOME LIGHT CIRCUIT



## Remark

For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

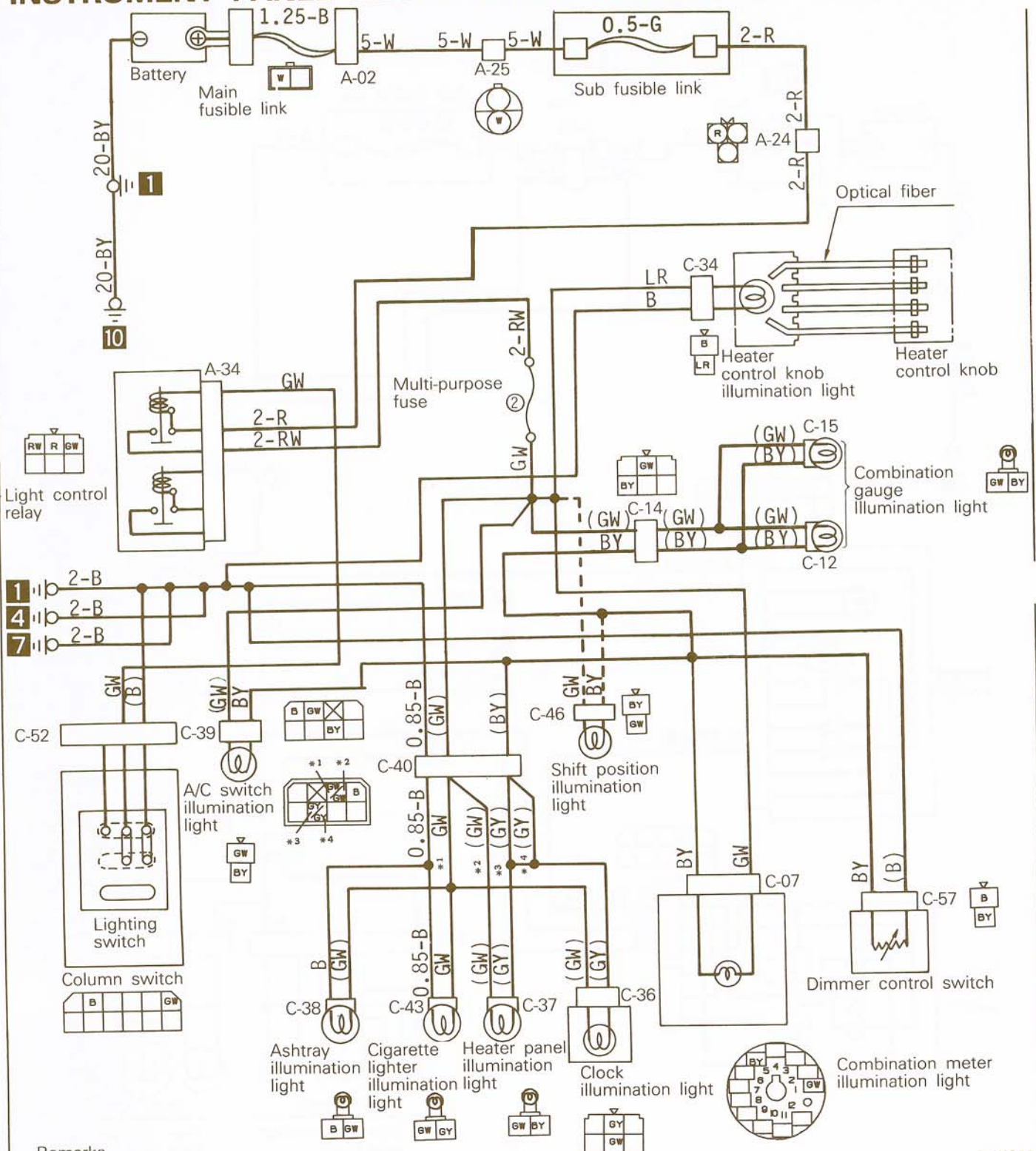
B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

[illegible]

37 W604



# CIRCUIT DIAGRAM INSTRUMENT PANEL ILLUMINATION CIRCUIT



## Remarks

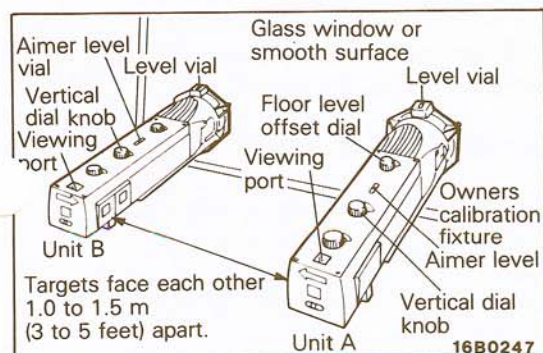
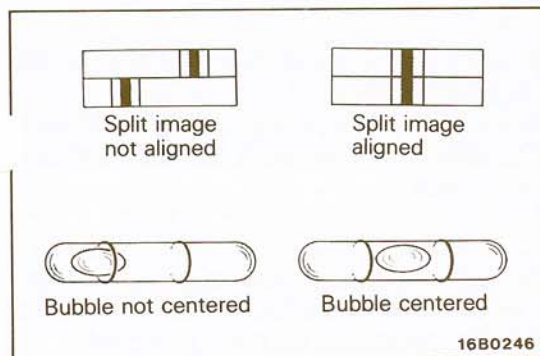
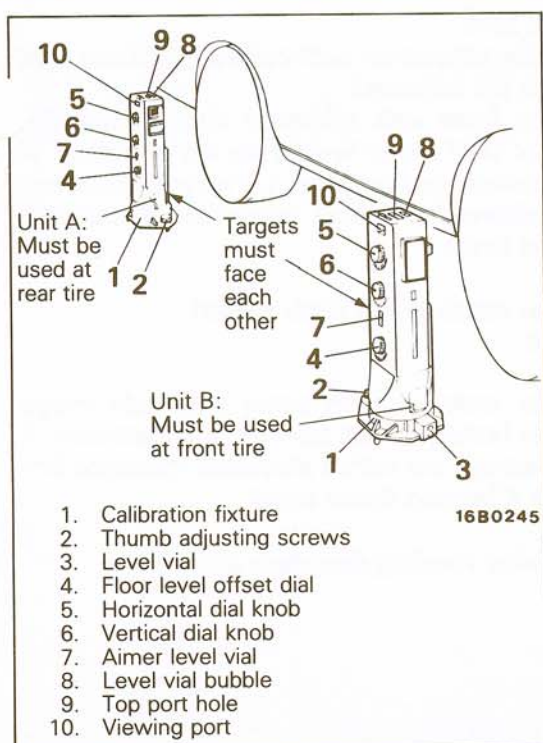
- (1) The broken lines are applicable to models equipped with an automatic transmission.
- (2) For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
Ll: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White

37W622





## SERVICE ADJUSTMENT PROCEDURES

### HEADLIGHT AIMING

N0811AC

#### PRE-AIMING INSTRUCTIONS

1. Test dimmer switch operation.
2. Observe operation of high beam indicator light mounted in instrument cluster.
3. Inspect for badly rusted or faulty headlight assemblies. These conditions must be corrected before a satisfactory adjustment can be made.
4. Place vehicle on a level floor.
5. Jounce front suspension through three (3) oscillations by applying body weight to hood or bumper.
6. Inspect tire inflation.
7. Rock vehicle sideways to allow vehicle to assume its normal position.
8. If fuel tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank [3 kg (6.5 lbs.) per gallon].
9. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg (150 lbs.) placed in driver's position.
10. Thoroughly clean headlight lenses.

#### COMPENSATING THE AIMERS (C-4466) FOR FLOOR SLOPE

The floor level offset dial must coincide with the floor slope for accurate aiming. Calibration fixtures are included with the aimers.

1. Attach one calibration fixture to each aimer. Fixtures will easily snap into position on aimer when properly positioned.
2. Place aimers at center line of each wheel on one side of vehicle. Unit A must be placed at rear wheel with target facing forward. Unit B must be placed at front wheel with target facing rearward.
3. Adjust thumb adjusting screw on each calibration fixture by turning either clockwise or counterclockwise until level vial bubble registers in a centered level position.
4. Look into top port hole of Unit A. Turn horizontal knob until split image is aligned.
5. Transfer plus or minus reading indicated on horizontal dial to floor level offset dial on each aimer. Press floor level dial inward to set reading.
6. Remove calibration fixtures from both units.

#### TESTING AIMER CALIBRATION

The aimer calibration may be off due to extended use. Calibration fixtures used in conjunction with aimers can be used to check and adjust aimers.

1. Turn thumb adjusting screw on each calibration fixture until it is approximately the same distance as the supporting posts.
2. Attach calibration fixtures to each unit with level vials on top.
3. Locate a true vertical plate glass window or smooth surface and secure aimers 1.0 to 1.5 m (3 to 5 feet) apart so split image targets can be located in viewing ports.

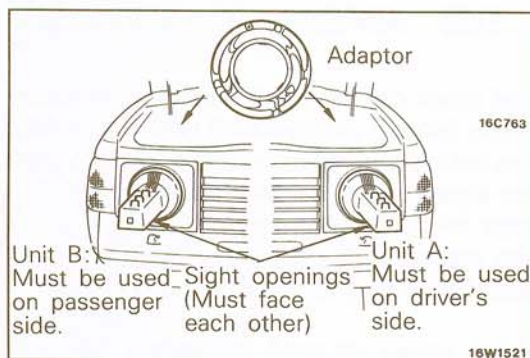


4. Set floor level dial at zero.
5. Rotate thumb adjusting screws on each calibration fixture until level vials on fixtures are centered.
6. With both calibration level vials centered turn vertical dial knobs on each aimer until aimer level vials are centered. If aimer vertical dial pointers read between 1/2 up and 1/2 down, aimers are within allowable vertical tolerance. Recalibrate units if beyond these limits.

**Vertical dial pointer reading (on each aimer) :**  
**1/2 up to 1/2 down**

7. Adjust horizontal dial knob on each aimer until split image targets align. If aimer horizontal dial pointers read between 1 left and 1 right, the aimers are within allowable tolerance limits. Recalibrate units if beyond these limits.

**Horizontal dial pointer reading (on each aimer) :**  
**1 left to 1 right**



## MOUNTING AIMERS

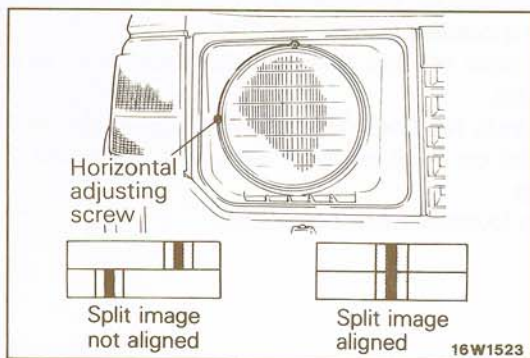
1. Snap proper adaptor into position on each aimer making full contact with aimer mounting flange.
2. Position aimers on headlights by pushing piston handle forward, engaging rubber suction cup. Immediately pull back piston handle until locks in place.

### NOTE

Steel inserts are molded into position on the adaptor to insure accuracy. These inserts must be in contact with the three guide points on the lights when the aimers are properly positioned.

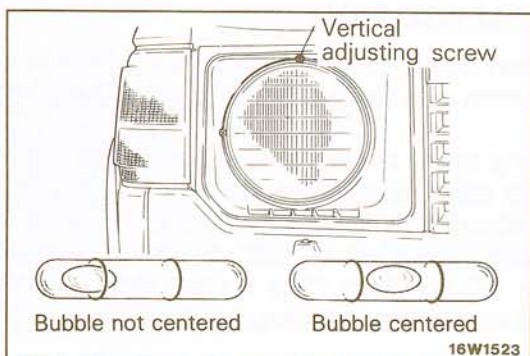
## HORIZONTAL ADJUSTMENT

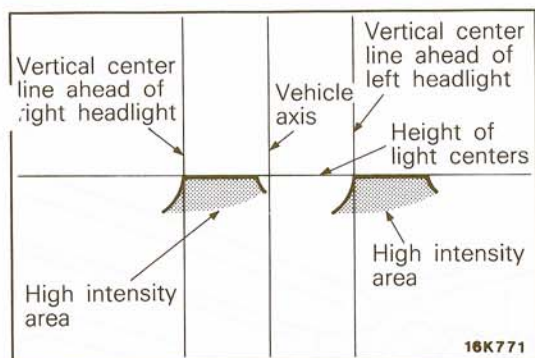
1. Set horizontal dial to zero.
2. Check to see that the split image target lines are visible in the viewing port. If necessary, rotate each aimer slightly to locate the target.
3. Turn horizontal screw on side of headlight until split image of target line appears in mirrors as one solid line. To remove "backlash", make final adjustment by turning adjusting screw in a clockwise direction.
4. Repeat the last three steps on opposite headlight.



## VERTICAL ADJUSTMENT

1. The vertical dial should be set at zero. (For passenger vehicles "0" setting is generally required. For special settings, consult local state laws.)
2. Turn vertical adjusting screw until the level bubble is centered between the lines.
3. Repeat the last two steps on the opposite headlight.
4. Re-check target alignment on both aimers and readjust horizontal aim if necessary.
5. Remove aimers by pressing "vacuum release" button located in piston handle.





## AIMING WITH SCREEN

### HEADLIGHT AIM PREPARATION

Place vehicle on a known level floor 7.6 m (25 feet) from aiming screen or light colored wall. Four lines of adhesive tape or like are required on screen or wall:

1. Position a vertical tape so that it is aligned with the vehicle center line.
2. Position a horizontal tape with reference to center line of headlight.
3. Position a vertical tape on the screen with reference to the center line of each of headlights.

### VISUAL HEADLIGHT ADJUSTMENT

1. A properly aimed lower beam will appear on the aiming screen 7.6 m (25 feet) in front of the vehicle. The shaded area as shown in the illustration indicates high intensity zone.
2. Adjust low beam of headlights to match the low beam pattern of the right and left headlights.

## LUMINOUS INTENSITY MEASUREMENT

Measure the luminous intensity of headlights with a photometer in accordance with the instruction manual prepared by the manufacturer of the photometer and make sure that the luminous intensity is within the following limit.

Luminous intensity at the center of high intensity zone for high beam.

**Limit : 20,000 cd or more**

### NOTE

1. When measuring the luminous intensity of headlight, keep the engine at 2,000 rpm and have the battery charged.
2. If there are specific regulations for luminous intensity of headlights in the region where the vehicle is operated, make sure that the intensity conforms to the requirements of such regulations.



## HEADLIGHT

## REMOVAL AND INSTALLATION

N081JA\*

**Post-installation Operation**

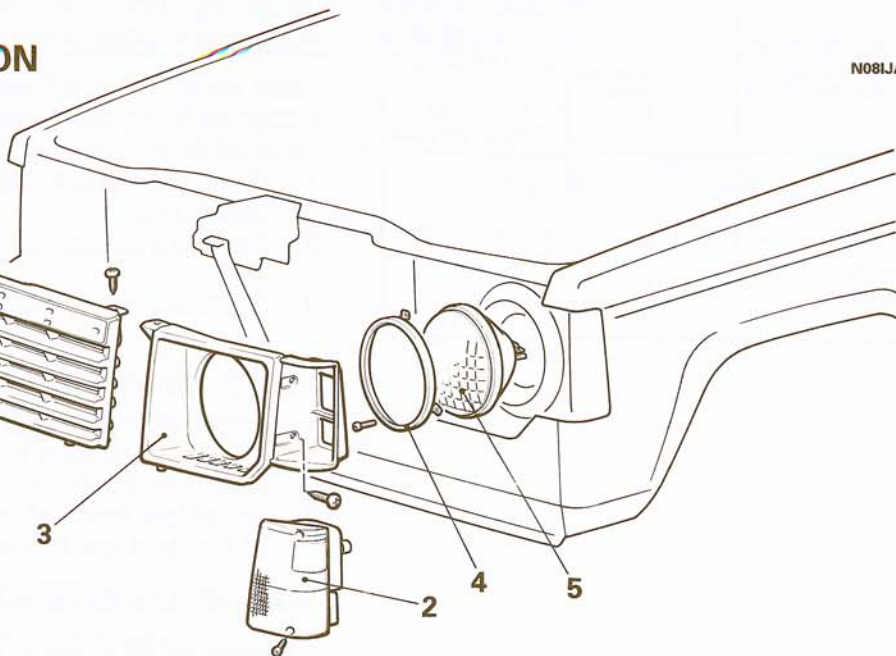
- Adjustment of Headlight Aiming (Refer to P.8-155.)

**Removal steps**

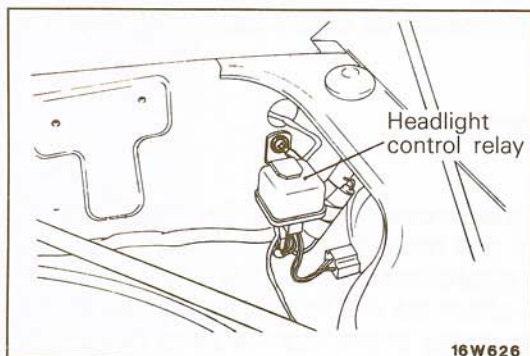
1. Radiator grille
2. Front combination light
3. Headlight bezel
4. Retaining ring
5. Headlight

**NOTE**

Reverse the removal procedure to reinstall.



16W963



16W626

**INSPECTION****HEADLIGHT CONTROL RELAY**

Remove the headlight control relay from the inner side of the left fender shield.

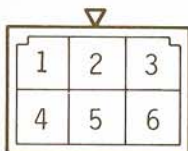
For models equipped with headlight washers, remove the headlight washer tank, and then remove the headlight control relay.

Check for continuity between the terminals while power is being supplied and while it is not.

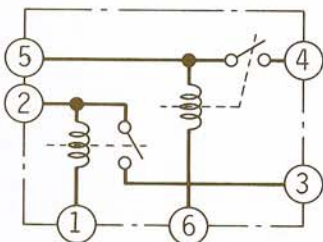
Terminal	1	2	3	4	5	6
Battery voltage not applied	○—○				○—○	
Battery voltage applied	⊖---⊕	○—○		○—○	⊕---⊖	

**NOTE**

- (1) ○—○ indicates that there is continuity between the terminals.
- (2) ⊕---⊖ indicates the connection with the power supply.



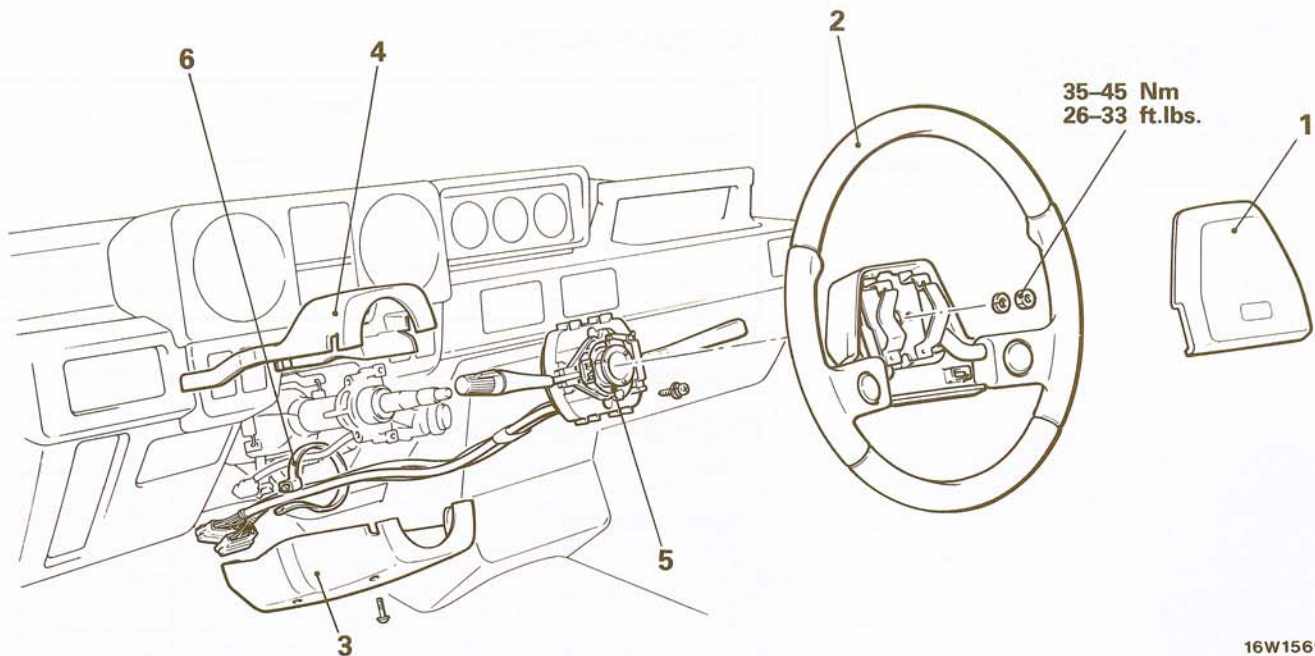
16W898



16W899

## COLUMN SWITCH REMOVAL AND INSTALLATION

N08IPAF



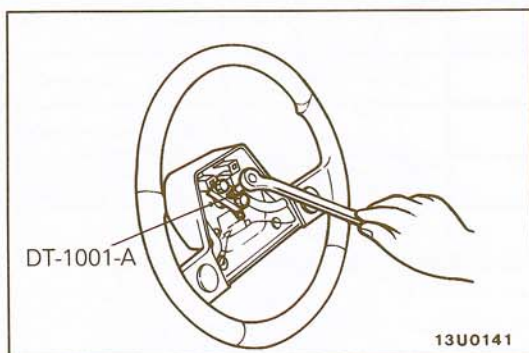
16W1569

### Removal steps

- 1. Steering wheel center pad
- 2. Steering wheel
- 3. Lower column cover
- 4. Upper column cover
- 5. Column switch
- 6. Cable band

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) : Refer to "Service Points of Removal".



13U0141

## SERVICE POINTS OF REMOVAL

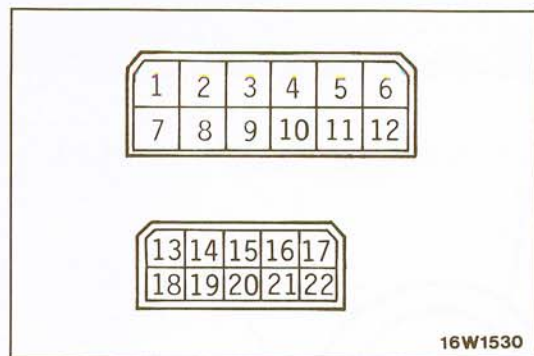
### 2. REMOVAL OF STEERING WHEEL

Remove the steering wheel by using the special tool.

### Caution

**Do not hammer on the steering wheel to remove it; doing so may damage the collapsible mechanism.**



**INSPECTION**

Remove the steering lower cover, and then detach the connector of the column switch from the wiring harness. Operate the switch and check the continuity between the terminals.

**LIGHTING SWITCH**

Switch position \ Terminal	1	7	5
OFF			
	○		○
	○	○	○

**NOTE**

○—○ indicates that there is continuity between the terminals.

**DIMMER-PASSING SWITCH**

Switch position \ Terminal	14	4	10	7
D <sub>1</sub>	○—○			
D <sub>2</sub>	○		○	
P <sub>1</sub>	○—○		○	○
P <sub>2</sub>	○	○	○	○

**NOTE**

○—○ indicates that there is continuity between the terminals.

**TURN SIGNAL SWITCH**

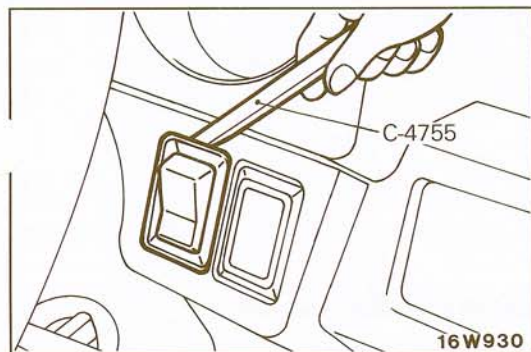
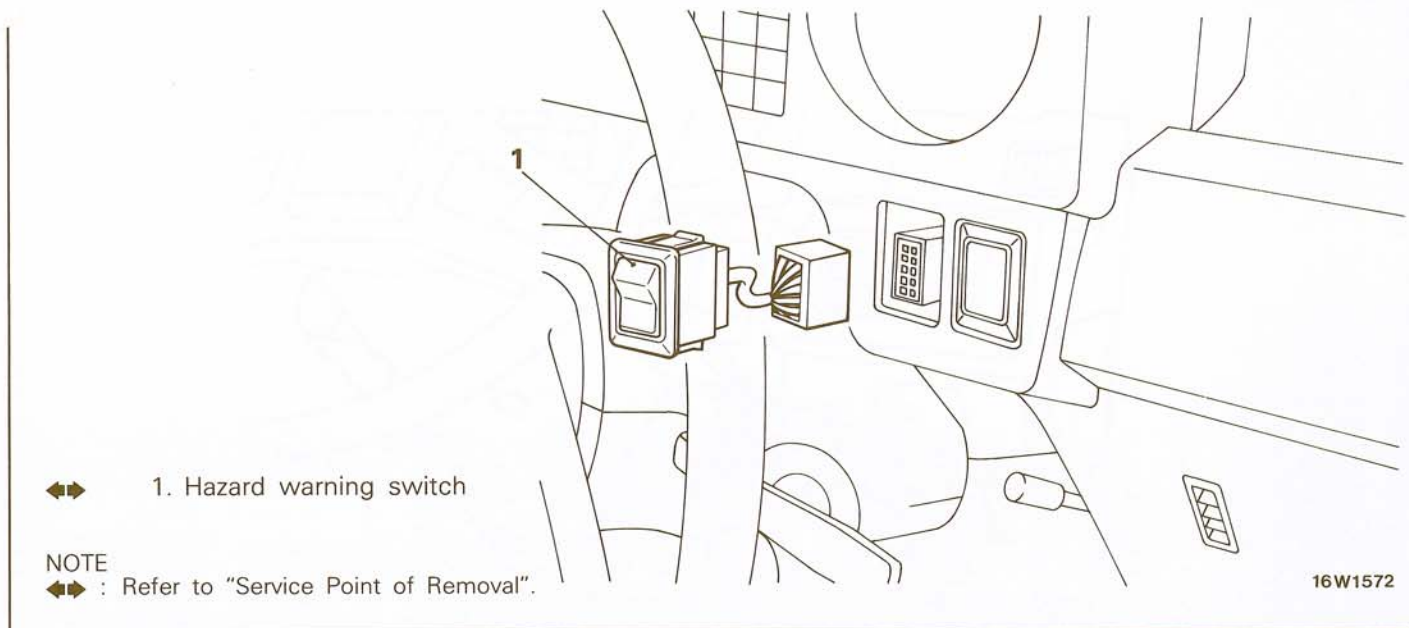
Switch position \ Terminal	2	3	9	22	21	16
Left	○	○		○	○	○
Neutral				○	○	○
Right	○		○		○	○

**NOTE**

○—○ indicates that there is continuity between the terminals.

# HAZARD WARNING SWITCH REMOVAL AND INSTALLATION

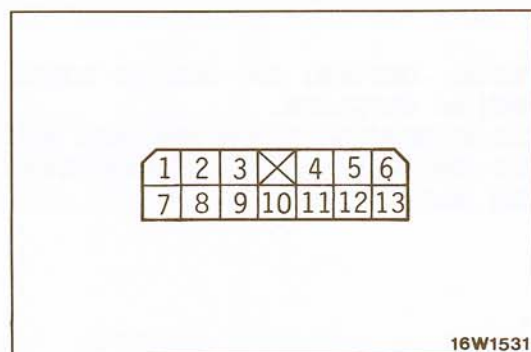
N08IQAC



## SERVICE POINTS OF REMOVAL

### 1. HAZARD WARNING SWITCH

Insert the special tool into the switch and pry the switch to remove it from the instrument panel.



## INSPECTION

Operate the switch and check the continuity between the terminals.

Terminal	10	11	4	3	7	12	5	2	8	6	Indicator light	13
Switch position												
OFF		○	○	○	○						○	○
ON	○					○	○	○	○	○	○	○

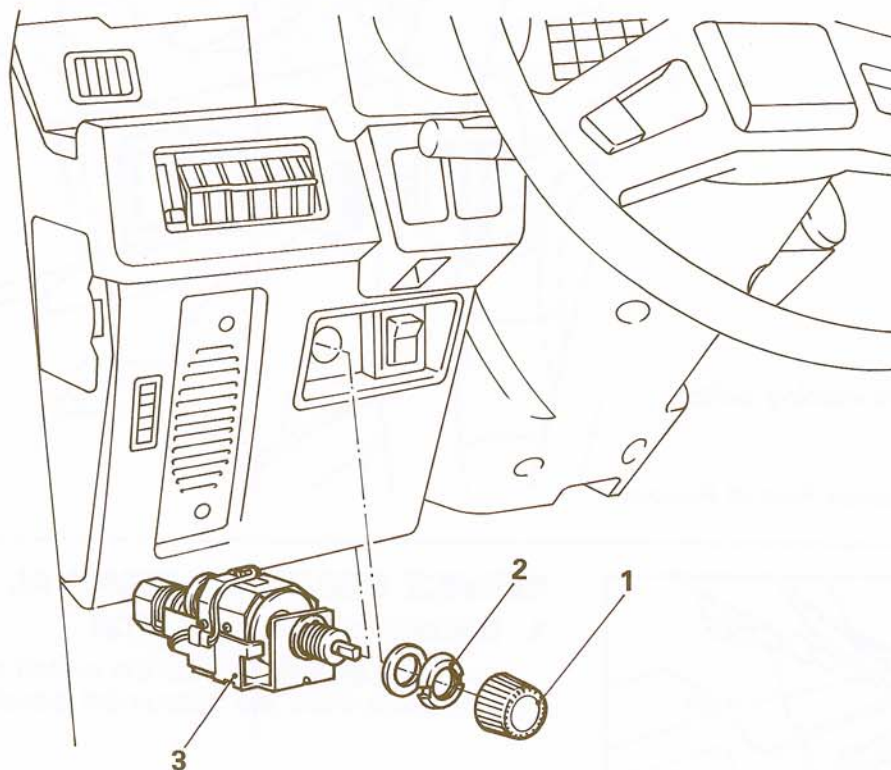
### NOTE

○—○ indicates that there is continuity between the terminals.



## DIMMER CONTROL SWITCH REMOVAL AND INSTALLATION

N08IRAP

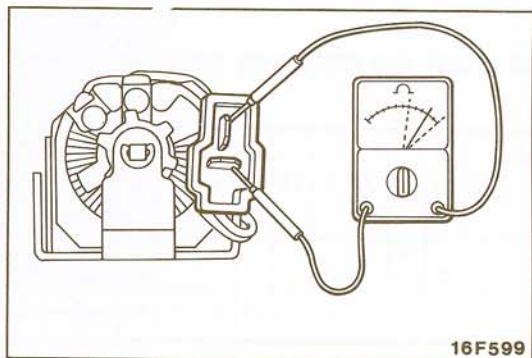


### Removal steps

1. Knob
2. Ring nut
3. Dimmer control switch

NOTE  
Reverse the removal procedures to reinstall.

16W936



16F599

### INSPECTION

- (1) Measure the continuity between the dimmer control switch terminals with an ohmmeter.
- (2) If the resistance value varies smoothly between 0 and 10  $\Omega$  throughout the entire operation range, the dimmer control switch is functioning properly.

# WIPER AND WASHER SYSTEM

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

#### WINDSHIELD WIPERS AND WASHER

N08KB--

Items	Specifications
Windshield wiper motor	
Type	Permanent-magnet type
Speed control system	Third brush system
Braking system	Dynamic brake system
Revolution under load   rpm	
Low speed [1.9 Nm (1.4 ft.lbs.)]	35 ± 4
High speed [1.3 Nm (.9 ft.lbs.)]	45 ± 8
Nominal torque   Nm (ft.lbs.)	13 (9)
Windshield wiper blade	
Wiping angle	
Driver's side	85.5° ± 1.5°
Passenger's side	114° ± 1.5°
Wiper blade length   mm (in.)	401 (16)
Window washer motor and pump	
Motor type	Direct current ferrite magnet type
Pump type	Centrifugal type
Power consumption   A	3.5 or less
Allowable period of continuous use   sec.	
With washer fluid	Max. 20
Nozzle jet pressure   kPa (psi)	70 (12.8) or more
Tank capacity   lit. (U.S. qts., Imp.qts.)	1.5 (1.6, 1.3) or more
Intermittent wiper relay	
Intermittent time   sec.	1.5 ± 0.7-10.5 ± 3
Delay time in washer moving   sec.	0.4-1.2
Working load   W	60

#### HEADLIGHT WASHER

Items	Specifications
Washer motor and pump	
Motor type	Ferrite magnet type
Pump type	Centrifugal type
Power consumption   A	21 or less
Nozzle injection pressure   kPa (psi)	177 (25.6) or more
Tank capacity   lit. (U.S. qts., Imp.qts.)	3.0 (3.2, 2.6)
Headlight washer control unit	
Time setting   sec.	0.52 ± 0.1
Check valve	
Valve opening and closing pressure   kPa (psi)	49-108 (7.1-15.6)



## COLUMN SWITCH

Items	Specifications
Wiper-washer switch	
Wiper switch	
Rated load    A	
Low	3.5
Intermittent	0.17–0.27
High	4.5
Lock	18
Voltage drop (at 12V and the rated load)    V	0.2 or less
Washer switch	
Rated load    A	3
Voltage drop (at 12V and the rated load)    V	0.5 or less
Headlight washer switch	
Rated load    A	0.5
Voltage drop (at 12V and the rated load)    V	0.2 or less

## REAR WIPER AND WASHER

Items	Specifications
Wiper motor	
Motor type	Ferrite magnet type
Braking system	Dynamic braking system
Revolution under no-load    rpm	$40 \pm 5$
Nominal torque    Nm (ft.lbs.)	8 (6)
Wiper blade	
Wiping angle	108°
Blade length    mm (in.)	380 (15)
Window washer motor and pump	
Motor type	Direct current ferrite magnet type
Pump type	Centrifugal type
Power consumption    A	3.5 or less
Allowable period of continuous use    sec.	
With washer fluid	Max. 60
Empty operation	Max. 20
Nozzle jet-spray pressure    kPa (psi)	78 (11.4) or more
Tank capacity    lit. (U.S.qts., Imp.qts.)	1.1 (1.2, 1.0) or more

## REAR WIPER AND WASHER SWITCH

Items	Specifications
Rated load    A	
Wiper switch	3
Washer switch	5
Voltage drop (at 12V and the rated load)    V	0.1 or less

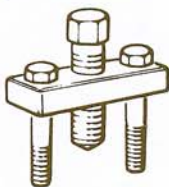

## TORQUE SPECIFICATIONS

N08KD--

Items	Nm	ft.lbs.
Windshield wiper pivot shaft installing nut	10–16	7–12
Windshield wiper arm locking nut	10–16	7–12
Windshield wiper motor	7–10	5–7
Steering wheel lock nut	35–45	26–33
Rear wiper pivot shaft installing nut	8–12	6–9
Rear wiper arm locking nut	7–10	5–7
Rear wiper motor	7–10	5–7

## SPECIAL TOOLS

N08KG-A

Tool (Number and name)	Use	Tool (Number and name)	Use
DT-1001-A Steering wheel puller 	Removal of steering wheel	C-4755 Trim stick 	Removal of rear wiper and washer switch



## TROUBLESHOOTING

## WINDSHIELD/REAR WIPERS AND WASHER

N08K1\*

Symptom	Inspection items		Wiper switch	Washer switch	Intermittent wiper control relay	Wiper motor	Washer motor	Wiring harness and connector connection	Ground	Other inspection items
	Front	Rear								
Wiper fails to operate	①		②			③		④	⑤	● Wiper link mechanism
Even when the wiper switch is at OFF, the wiper continues to operate			①			②		③		
Wiper's 'auto stop' fails to operate (stops with the switch at OFF position)			①		③	②		④		
*The wiper does not operate at intervals			①		②			③		
*When the washer is operated the wiper fails to function					①			②		
*The wiper intervals cannot be regulated			①		②			③		
The washer fails to operate	①			②			③	④	⑤	

## NOTE

- (1) Number in circle indicates inspection sequence.  
 (2) The \*symbol indicates vehicle with intermittent wipers.

**HEADLIGHT WASHER**

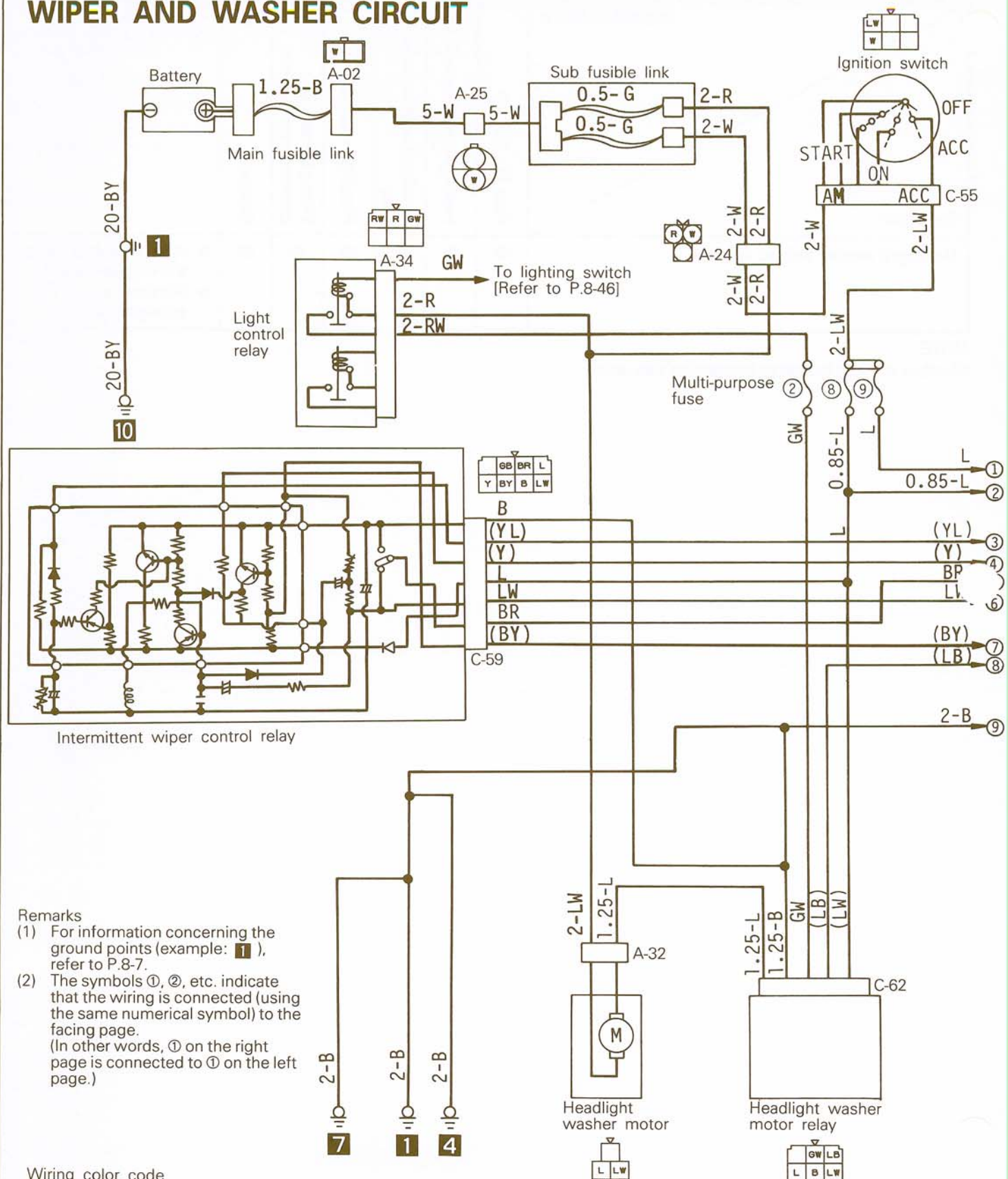
Symptom	Inspection items						Other inspection items
	Fuse No. 2 and 9	Headlight washer switch	Headlight washer motor relay	Headlight washer motor	Wiring harness and connector connection	Ground	
Headlight washer fails to operate	①	②	③	④	⑤	⑥	<ul style="list-style-type: none"> <li>● Washer fluid level in the washer tank</li> <li>● Washer tube arrangement</li> </ul>

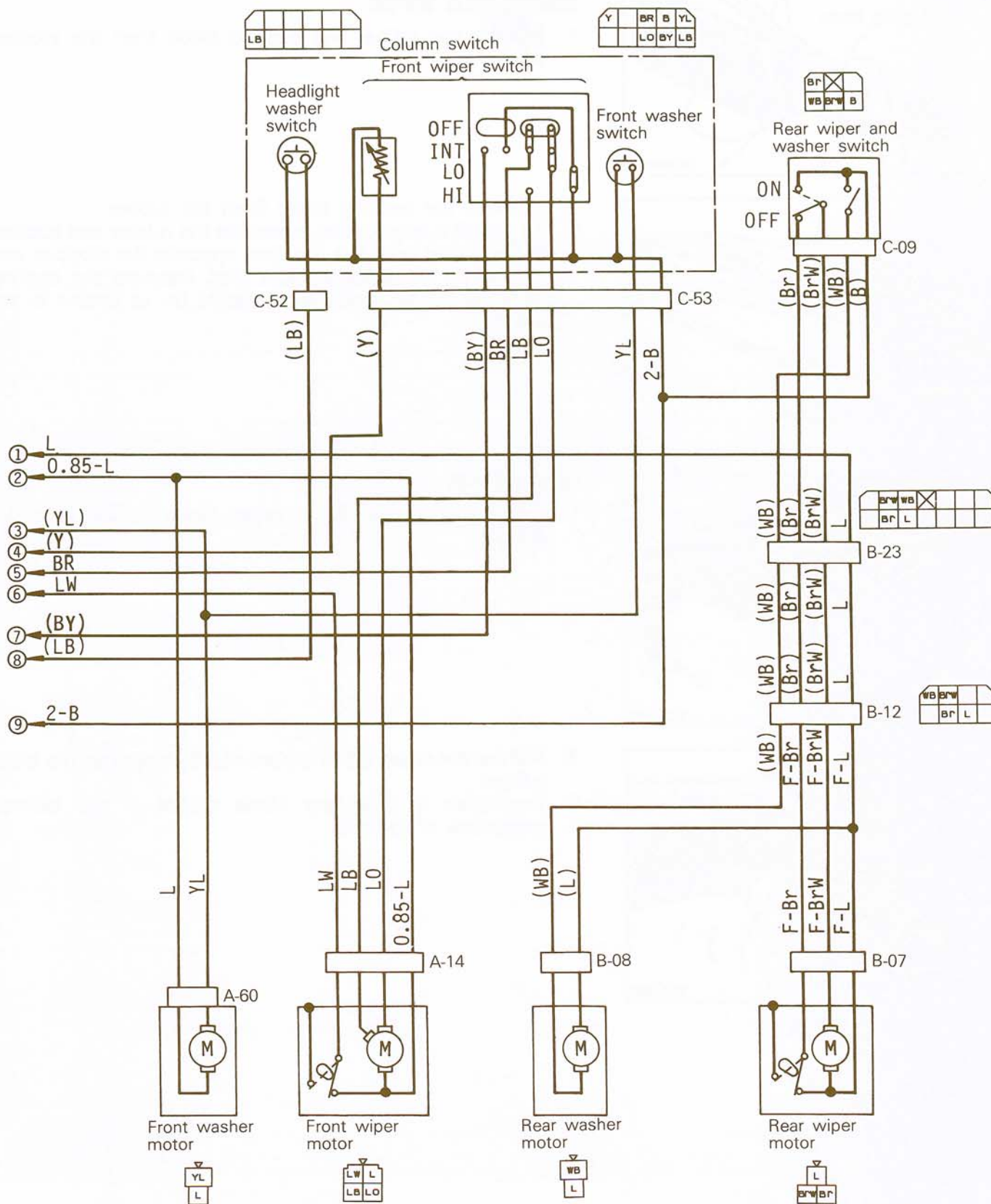
**NOTE**

Number in circle indicates inspection sequence.

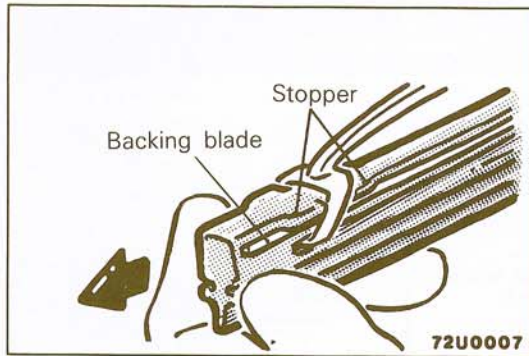


# CIRCUIT DIAGRAM WIPER AND WASHER CIRCUIT









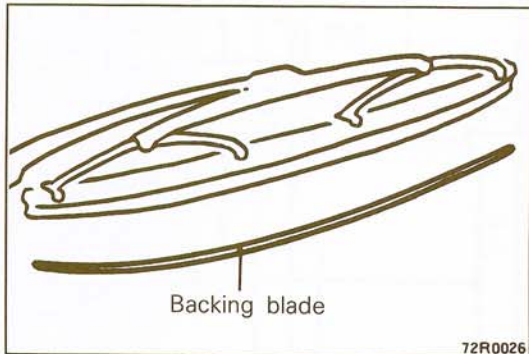
## SERVICE ADJUSTMENT PROCEDURES

### WIPER BLADE RUBBER REPLACEMENT

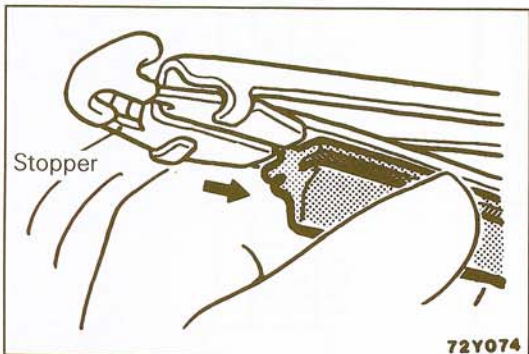
N08KIA

#### WINDSHIELD WIPER

1. Pull out the rubber and backing blade from the stopper side.

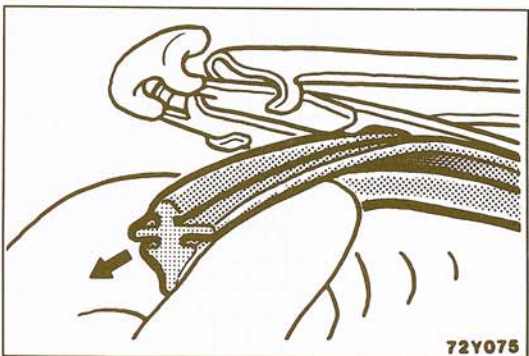


2. Remove the backing blade from the rubber.
3. To attach a new rubber, assemble the rubber and backing blade, insert from the direction opposite the stopper, and secure by the stopper. Note that, because the backing blade is curved, installation should be as shown in the figure.



#### REAR WIPER

1. Pull out one side of the wiper blade rubber from the stopper.

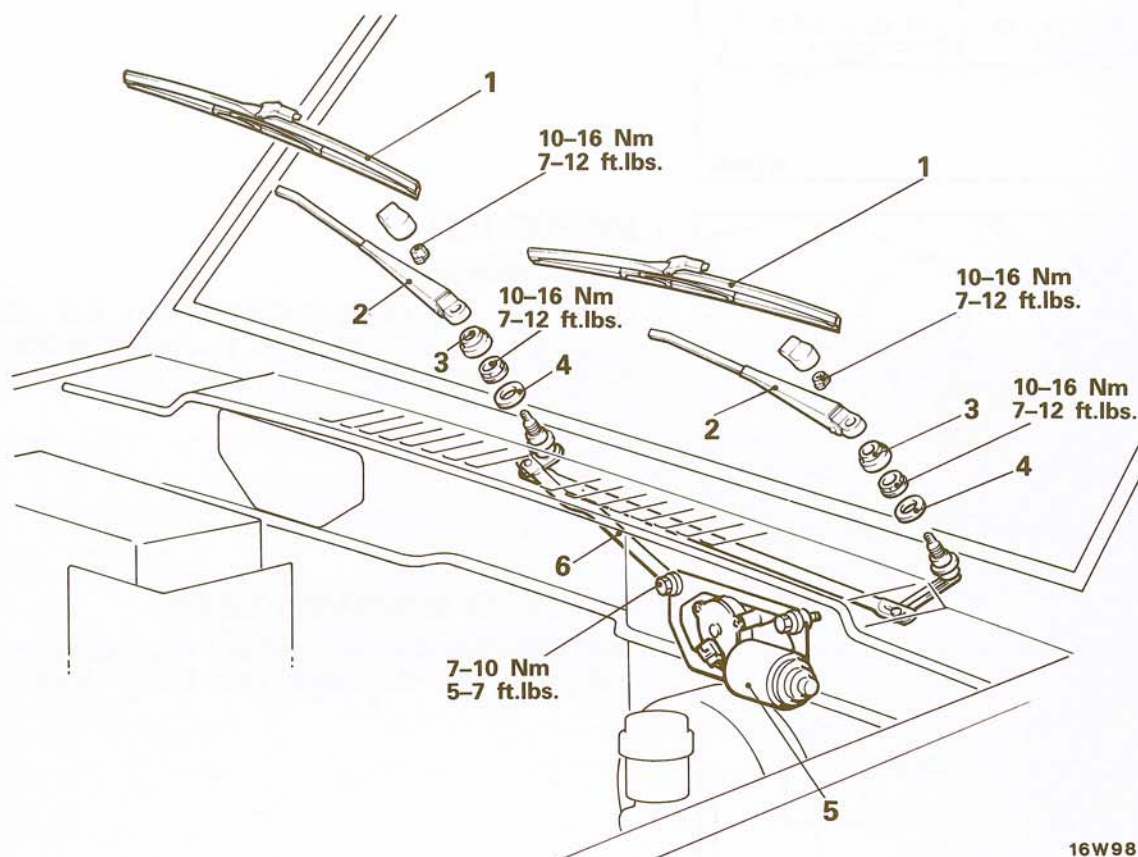


2. Pull out the wiper blade rubber, and then remove the blade rubber.
3. Installation of the new blade rubber is the reverse procedure of removal.

## WINDSHIELD WIPERS

### REMOVAL AND INSTALLATION

N08KJAD



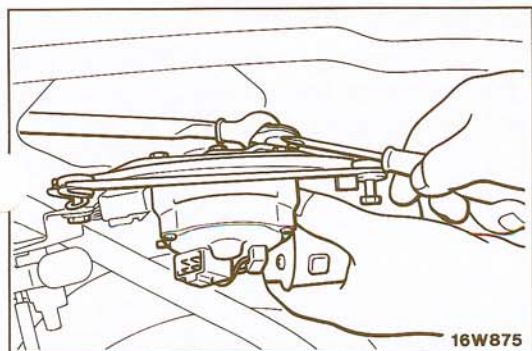
16W981

#### Removal steps

1. Wiper blades
- ➡➡ 2. Wiper arms
3. Wiper pivot shield caps
4. Wiper pivot collars
- ➡➡ 5. Wiper motor
6. Wiper link

#### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ➡➡ : Refer to "Service Points of Removal".
- (3) ➡➡ : Refer to "Service Points of Installation".



16W875

## SERVICE POINTS OF REMOVAL

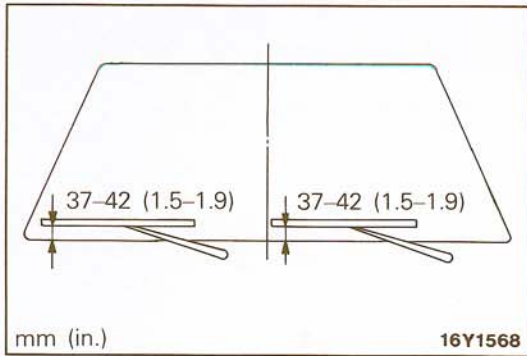
### 5. WIPER MOTOR

Uncouple the linkage and motor (with the wiper motor pulled slightly outward).

#### Caution

Because the installation position of the crank arm and the motor determine the wiper auto stop angle, do not disassemble them unless it is necessary to do so. If the crank arm must be removed from the motor, remove it only after marking their mounting positions.

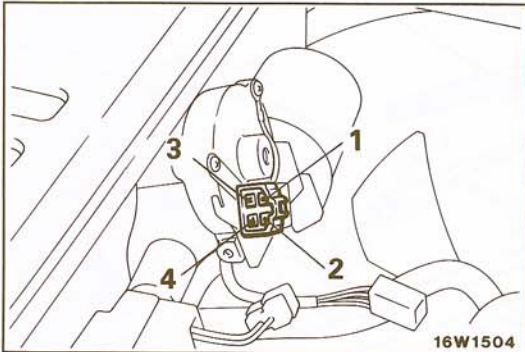




## SERVICE POINTS OF INSTALLATION

### 2. INSTALLATION OF WIPER ARMS

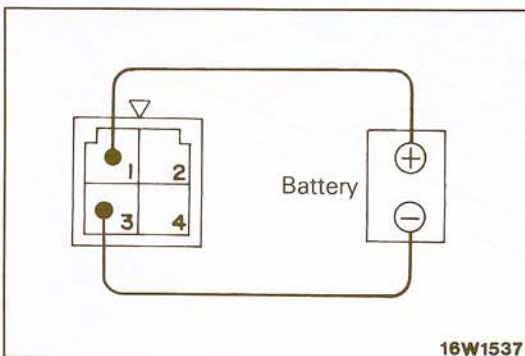
Install the wiper arm to the pivot shaft so that the wiper blade's stop position is the position shown in the illustration.



## INSPECTION

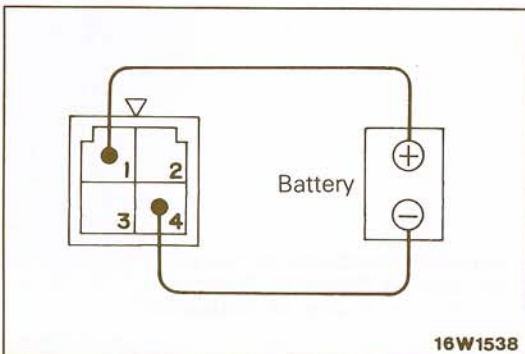
### WIPER MOTOR

Disconnect the wiring connector from the wiper motor and connect battery to the wiper motor connector to check that the wiper motor runs.



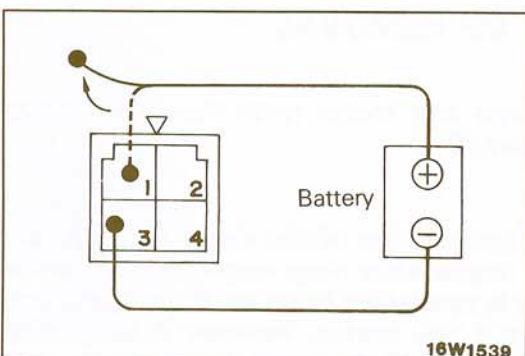
### LOW SPEED OPERATION CHECK

Connect battery (+) to terminal 1 and battery (–) to terminal 3 and check that the motor runs at low speed.



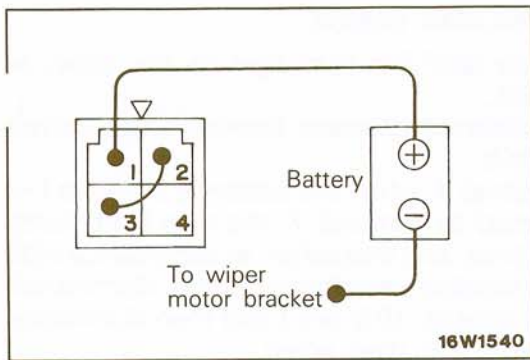
### HIGH SPEED OPERATION CHECK

Connect battery (+) to terminal 1 and battery (–) to terminal 4 and check that the motor runs at high speed.

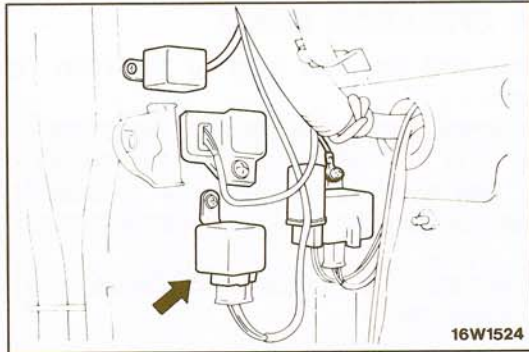


### AUTOMATIC STOP OPERATION CHECK

- (1) Connect battery (+) to terminal 1 and battery (–) to terminal 3 to run the motor at low speed.
- (2) Disconnect terminal 1 during operation to stop the motor.

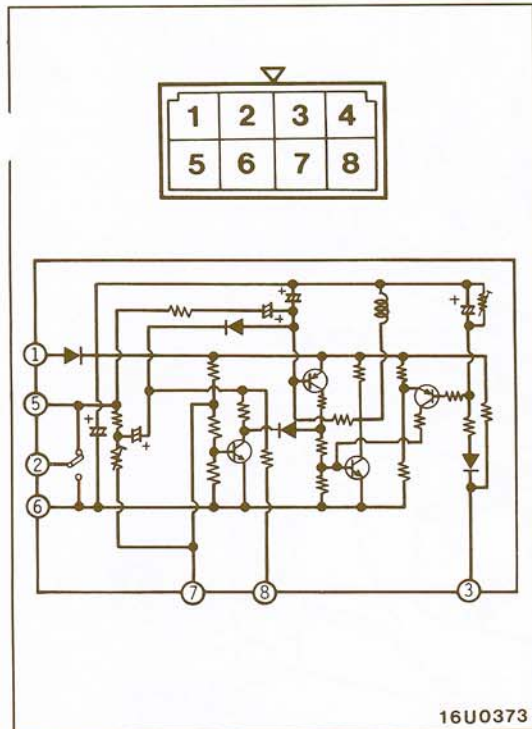


- (3) Connect terminal 2 to terminal 3 and connect battery (+) to terminal 1 and battery (–) to the wiper motor bracket to check that the motor starts to run at low speed and then stops.



## INTERMITTENT WIPER RELAY

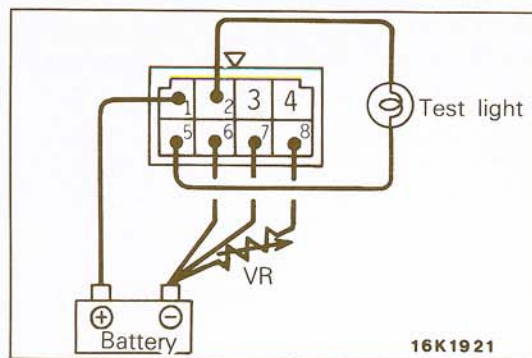
Remove the intermittent wiper relay (located at the upper part of the left side cowl side trim).



## CONTINUITY CHECK

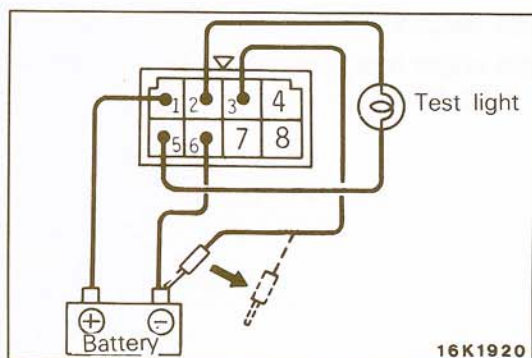
Check to see that there is continuity between terminals 2 and 5.





### INTERMITTENT OPERATION CHECK

- (1) Connect the battery and the test light to the relay, as shown in the figure.
- (2) Insert a variable resistance between terminal 8 and battery (-) (VR = 0–50 kΩ)
- (3) The condition is normal if, when the battery's negative (-) terminal is connected to terminal 7, the test light illuminates at the same time, and thereafter, in accordance with the value of the variable resistance, stops illumination (approx. 1.5 sec. – approx. 10.5 sec.) and then illuminates (approx. 1 sec.) over and over again.



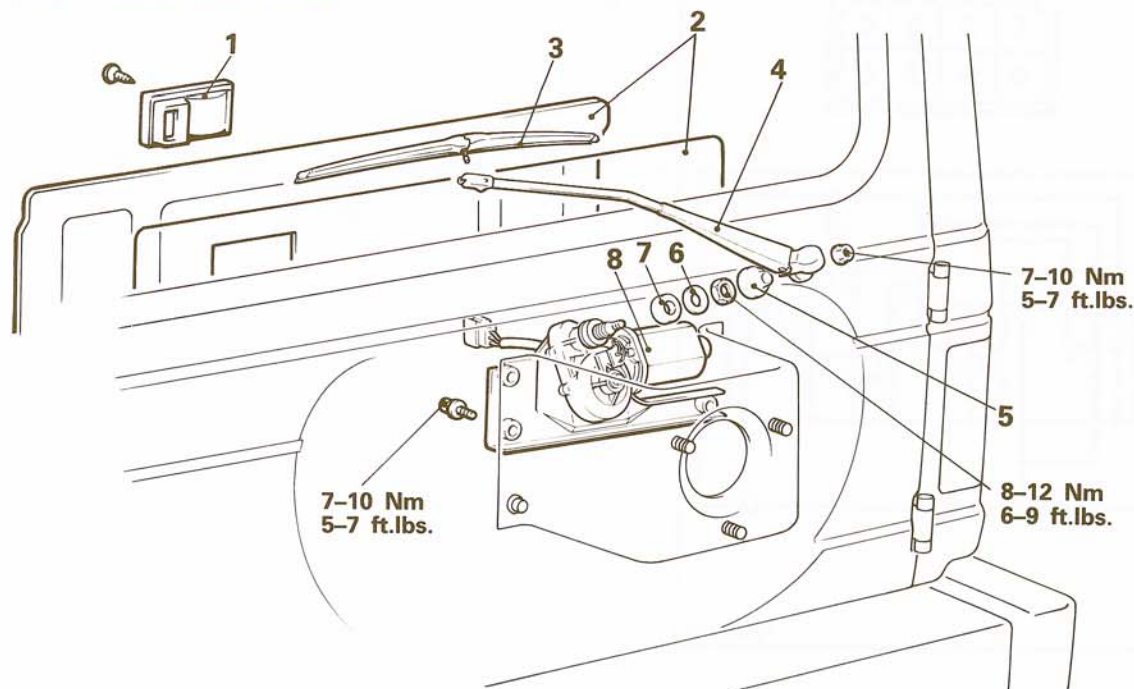
### WASHER INTERLOCK OPERATION CHECK

- (1) Connect the battery and the test light to the relay, as shown in the figure.
- (2) When terminal 3 is connected to the battery's negative (-) terminal, the test light will illuminate approximately 1 second thereafter, and then there will be a release for about seconds after connecting to the battery's negative (-) terminal.
- (3) The condition is normal if about 3 seconds thereafter the test light stops illumination.

## REAR WIPER

### REMOVAL AND INSTALLATION

N08KKAC



16W982

#### Removal steps

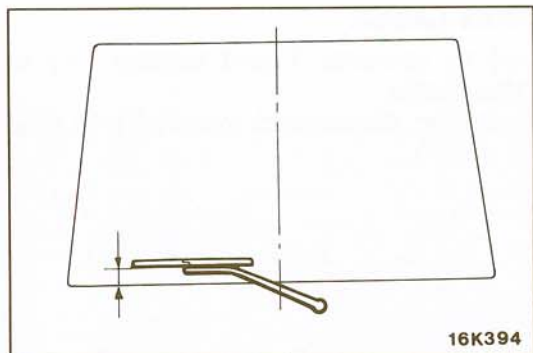
1. Inside handle cover
2. Back door trim and waterproof film
3. Wiper blade
4. Wiper arm
5. Wiper pivot cap
6. Wiper pivot washer
7. Wiper pivot packing
8. Wiper motor

#### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL****2. REMOVAL OF BACK DOOR TRIM AND WATERPROOF FILM**

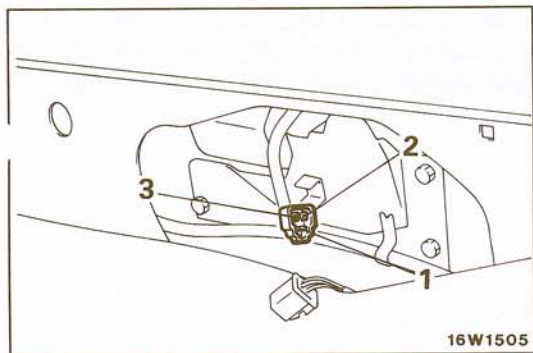
Refer to GROUP 23 BODY – Back Door Trim and Waterproof Film.

**SERVICE POINTS OF INSTALLATION****3. INSTALLATION OF WIPER BLADE**

Install the wiper arm so that the wiper blade is parallel to the lower edge of the window glass.

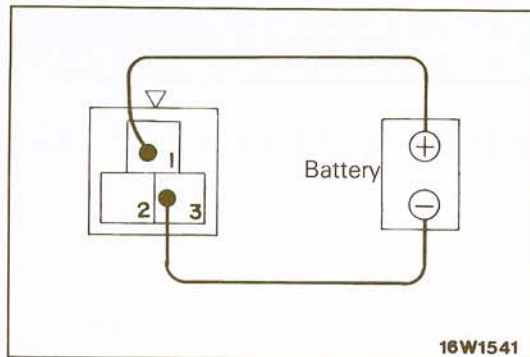
**2. INSTALLATION OF BACK DOOR TRIM AND WATERPROOF FILM**

Refer to GROUP 23 BODY – Back Door Trim and Waterproof Film.

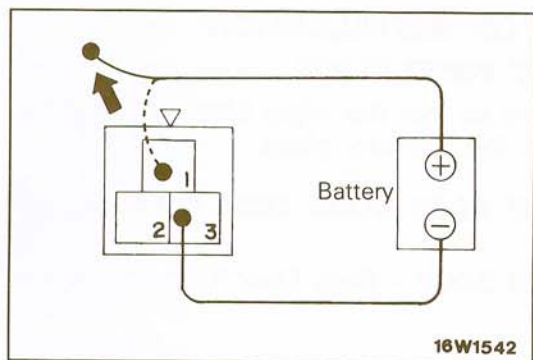
**INSPECTION****WIPER MOTOR**

Disconnect the wiring connector from the wiper motor and connect battery to the wiper motor connector to check that the wiper motor runs.

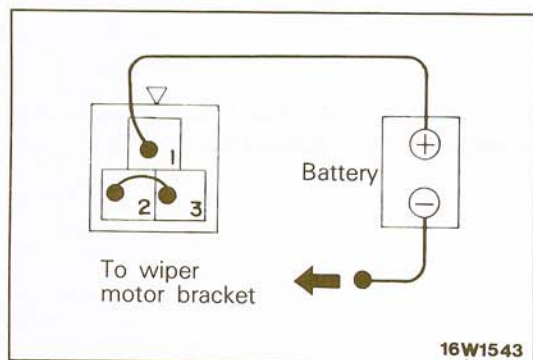


**OPERATION CHECK**

Connect battery (+) to terminal 1 and battery (–) to terminal 3 to check that the motor runs.

**AUTOMATIC OPERATION CHECK**

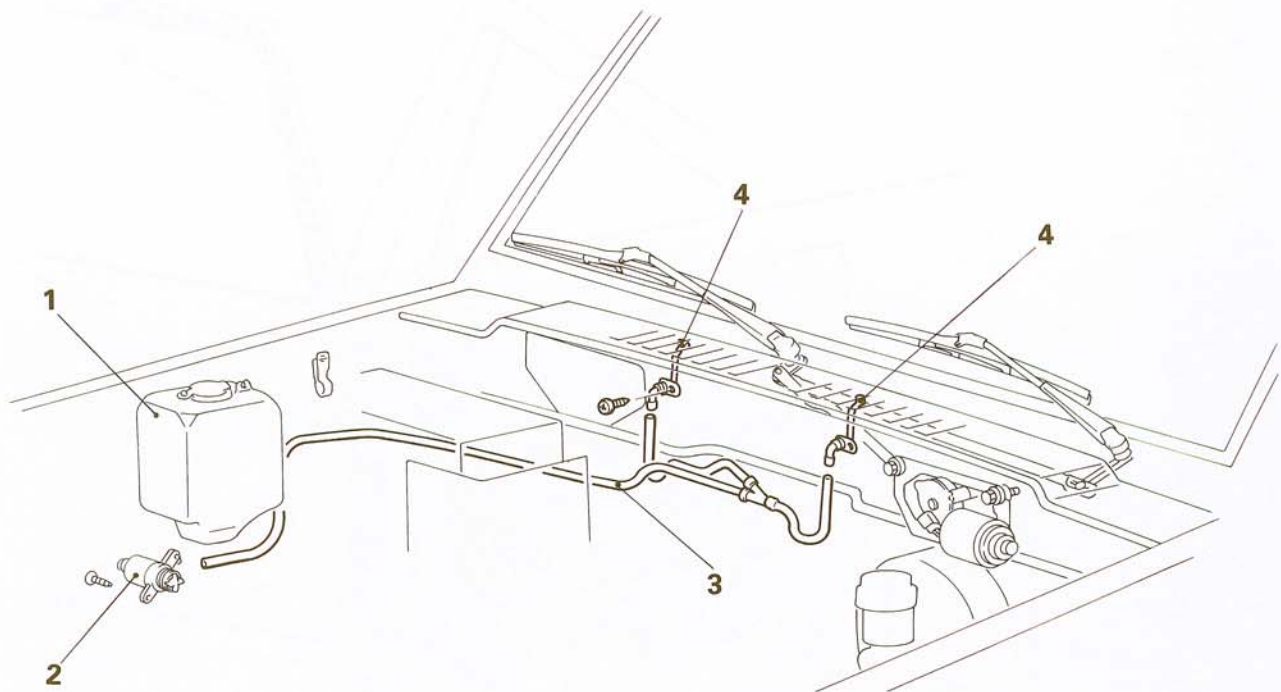
- (1) Connect battery (+) to terminal 1 and battery (–) to terminal 3 to run the motor.
- (2) While the motor is running, disconnect terminal 1 to stop the motor.



- (3) Connect terminal 2 to terminal 3 and connect battery (+) to terminal 1 and battery (–) to wiper motor bracket to check that the motor starts to run again and then stops.

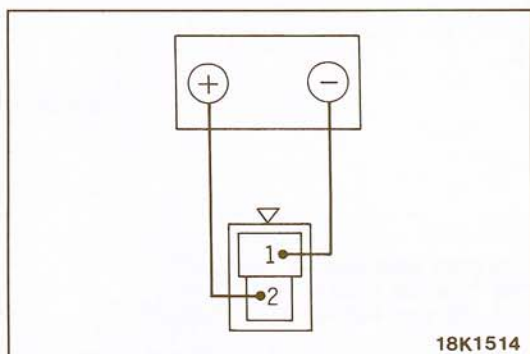
## WINDSHIELD WASHER REMOVAL AND INSTALLATION

N08KLAD



16W1556

1. Windshild washer tank
2. Washer motor and pump
3. Washer tube
4. Washer nozzle



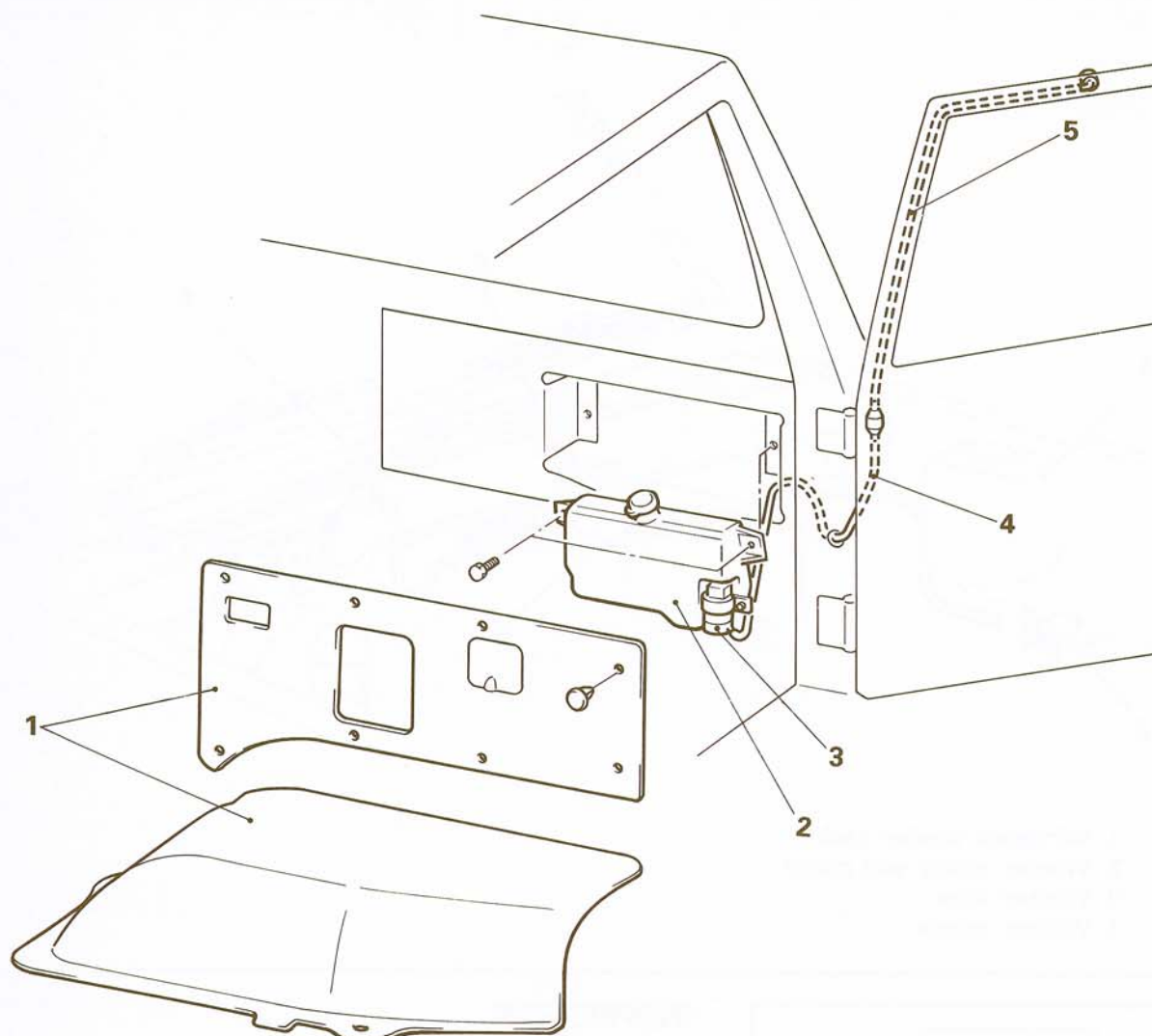
### INSPECTION

#### WASHER MOTOR AND PUMP

Make the check while the motor is installed to the washer tank.

- (1) Check to be sure that there is washer fluid in the washer tank.
- (2) Check to be sure that the washer motor operates and the fluid is forced out under pressure when the battery's positive (+) terminal is connected to terminal 2 and the negative (-) terminal is connected to terminal 1.



**REAR WASHER****REMOVAL AND INSTALLATION**N08KLC<sup>A</sup>

16W1559

**Removal steps**

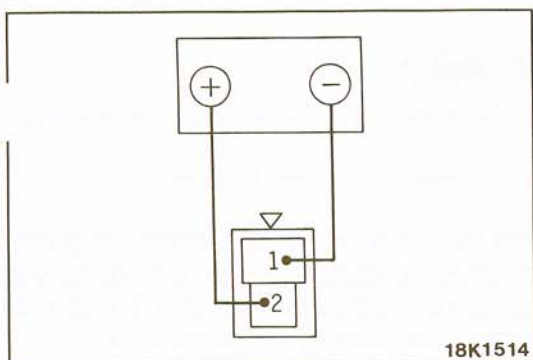
- ◆◆◆◆ 1. Rear wheelhouse trim and quarter trim
- 2. Rear washer tank
- 3. Washer motor and pump
- 4. Washer tube
- 5. Washer nozzle and tube

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL****1. REMOVAL OF REAR WHEELHOUSE TRIM AND QUARTER TRIM**

Refer to GROUP 23 BODY – Trims.



## INSPECTION

### WASHER MOTOR AND PUMP

Make the check while the motor is installed to the washer tank.

- (1) Check to be sure that there is washer fluid in the washer tank.
- (2) Check to be sure that the washer motor operates and the fluid is forced out under pressure when the battery's positive (+) terminal is connected to terminal 2 and the negative (-) terminal is connected to terminal 1.

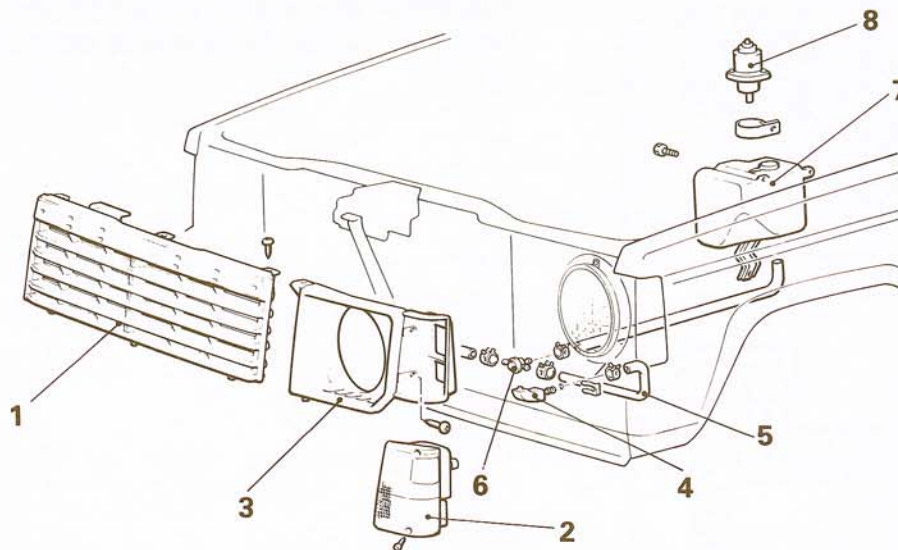
## SERVICE POINTS OF INSTALLATION

### 1. INSTALLATION OF REAR WHEELHOUSE TRIM AND QUARTER TRIM

Refer to GROUP 23 BODY – Trims.

## HEADLIGHT WASHER REMOVAL AND INSTALLATION

N08KPAA



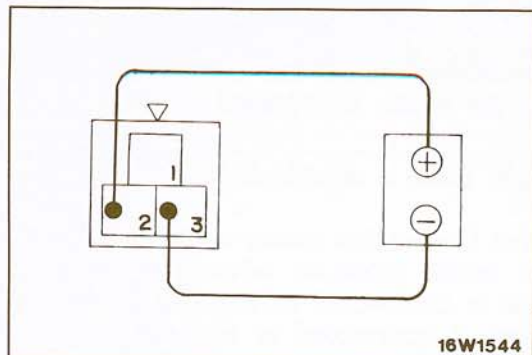
### Removal steps

1. Radiator grille
2. Front combination light
3. Headlight bezel
4. Headlight washer nozzle
5. Washer tube
6. Check valve
7. Headlight washer tank
8. Washer motor and pump

16W1562

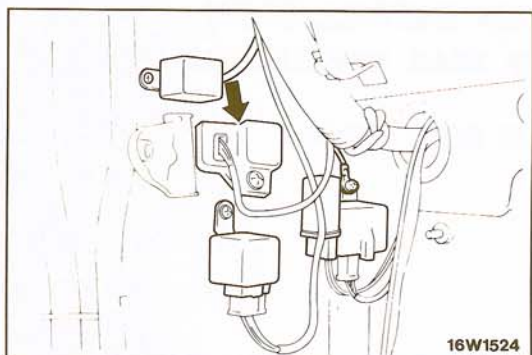
NOTE  
Reverse the removal procedures to reinstall.



**INSPECTION****WASHER MOTOR AND PUMP**

Make the check while the motor is installed to the washer tank.

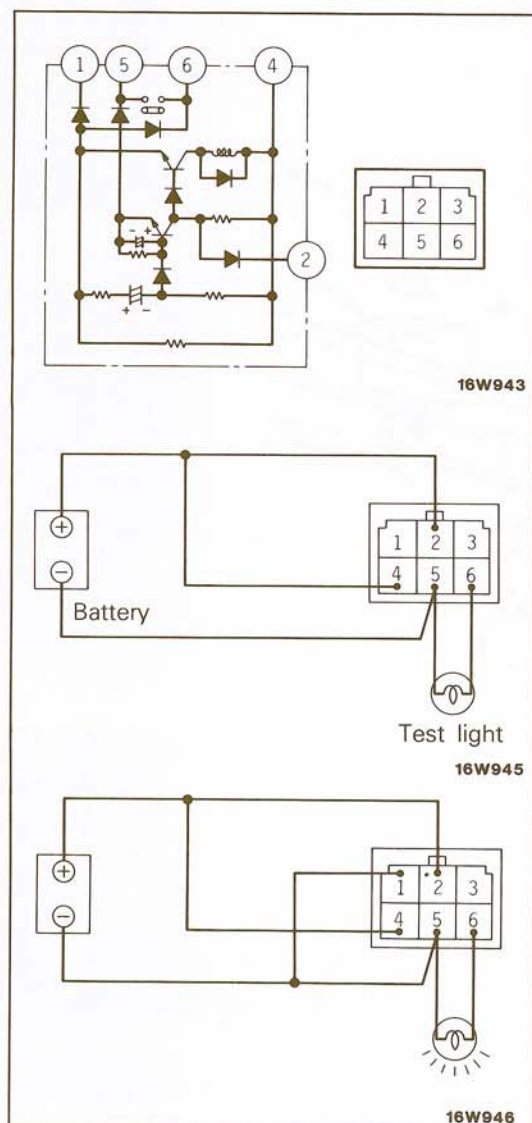
- (1) Check to be sure that there is washer fluid in the washer tank.
- (2) Check to be sure that the washer motor operates and the fluid is forced out under pressure when the battery's positive (+) terminal is connected to terminal 2 and the negative (-) terminal is connected to terminal 3.

**HEADLIGHT WASHER RELAY**

Remove the headlight washer relay (located at the upper part of the left side cowl side trim).

**WASHER OPERATION CHECK**

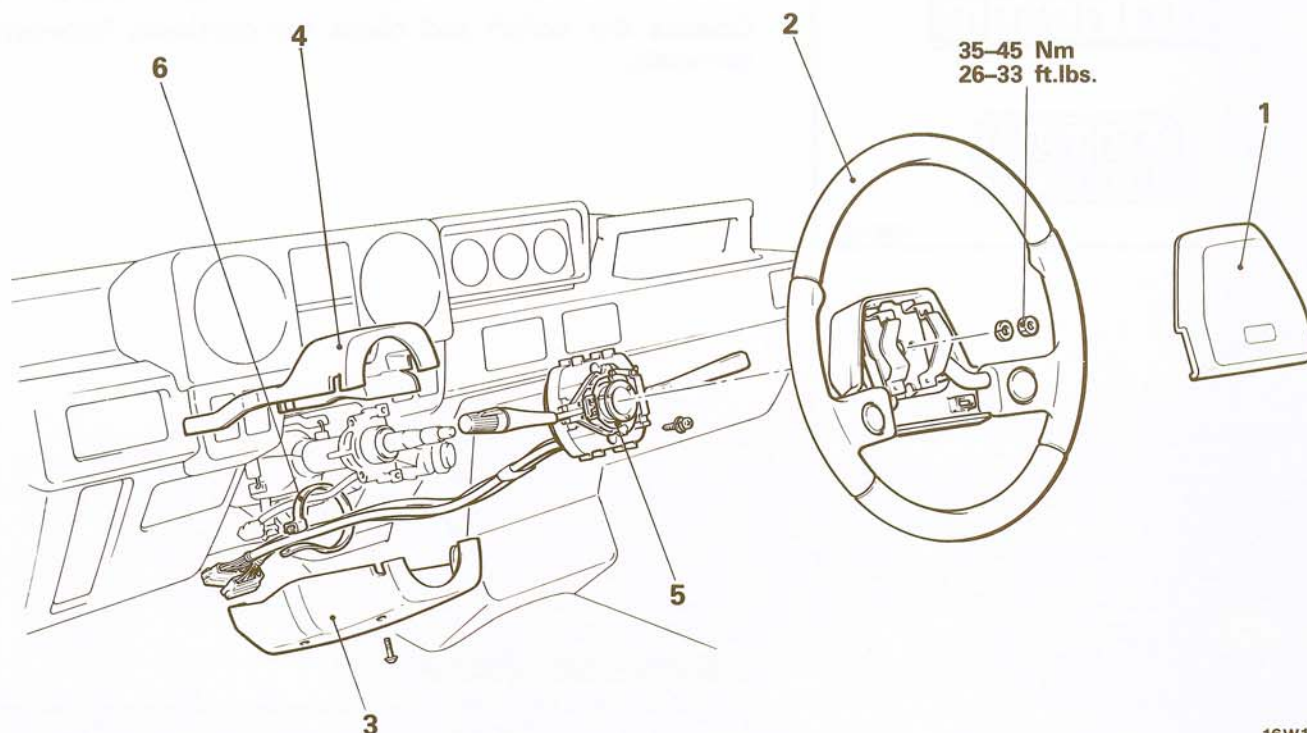
- (1) Connect the battery and the test light to the relay as shown in the figure.
- (2) If, when terminal 1 is connected to the negative (-) terminal of the battery, the light illuminates (for about 0.1 second), the unit is operating normally.



## COLUMN SWITCH

### REMOVAL AND INSTALLATION

N08KMAD



16W1569

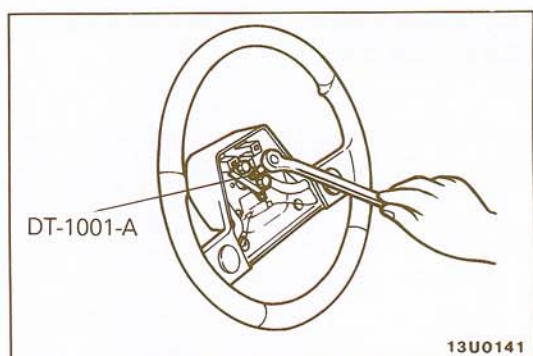
#### Removal steps



1. Steering wheel center pad
2. Steering wheel
3. Lower column cover
4. Upper column cover
5. Column switch
6. Cable band

#### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2)  : Refer to "Service Points of Removal".



13U0141

## SERVICE POINTS OF REMOVAL

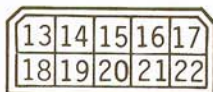
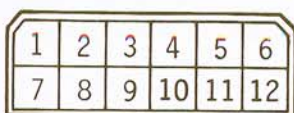
### 2. REMOVAL OF STEERING WHEEL

Remove the steering wheel by using the special tool.

#### Caution

**Do not hammer on the steering wheel to remove it; doing so may damage the collapsible mechanism.**





16W1530

**INSPECTION**

Remove the steering lower cover, and then detach the connector of the column switch from the wiring harness.

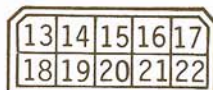
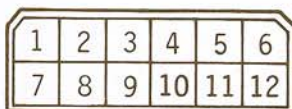
Operate the switch and check the continuity between the terminals.

**WIPER-WASHER SWITCH**

Terminal \ Switch position	20	18	15	14	19	13
OFF	○		○	○	---	○
INT	○		○	○	○	○
LO	○			○	○	○
HI		○		○	○	○

**NOTE**

- (1) ○—○ indicates that there is continuity between the terminals.  
 (2) The dotted lines indicate that the washer switch ON.



16W1530

**HEADLIGHT WASHER**

Switch Position \ Terminal	12	5
OFF		
ON	○	○

**NOTE**

○—○ indicates that there is continuity between the terminals.

## REAR WIPER AND WASHER SWITCH

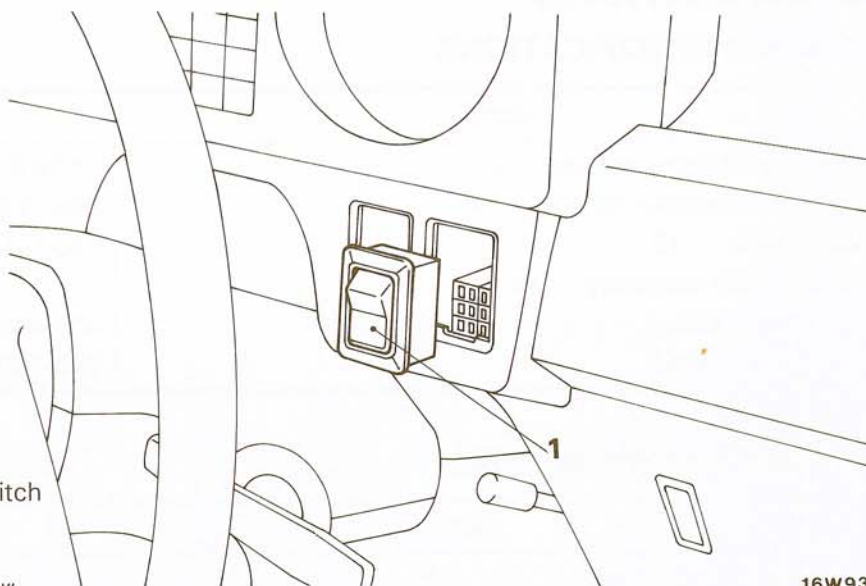
### REMOVAL AND INSTALLATION

N08KOAB

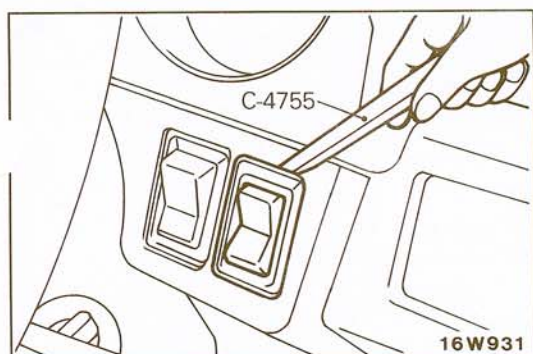
1. Rear wiper and washer switch

#### NOTE

Refer to "Service Points of Removal".



16W935

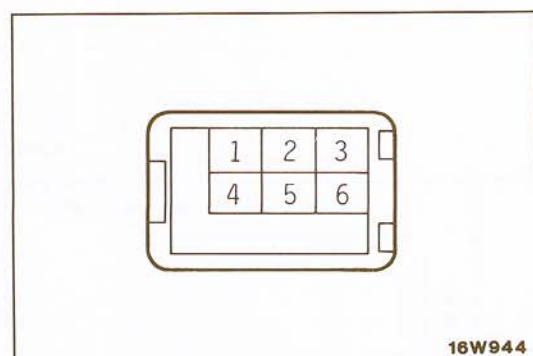


16W931

### SERVICE POINTS OF REMOVAL

#### 1. REMOVAL OF REAR WIPER AND WASHER SWITCH

Insert the special tool into the switch and pry the switch to remove it from the instrument panel.



16W944

### INSPECTION

Operate the switch, and check the continuity between the terminals.

Terminal	5	3	6	4
Switch position				
Washer			○—○	
Wiper OFF	○—○			
Wiper ON	○—○			○—○
Wiper Washer	○—○		○—○	○—○

#### NOTE

○—○ indicates that there is continuity between the terminals.



# HORN

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

N08LB--

Items	Specifications
Effective sounding voltage V	11-14.5
Power consumption (at 12V) A	Max. 3.5
Sound level dB	100-110
Fundamental frequency Hz	
"High" sound	400-440
"Low" sound	340-380

### TORQUE SPECIFICATIONS

N08LD--

Items	Nm	ft.lbs.
Steering wheel lock nut	35-45	26-33

### SPECIAL TOOLS

N08LG--

Tool (Number and name)	Use
DT-1001-A Steering wheel puller	Removal of steering wheel



## TROUBLESHOOTING

### HORN

N08LH--

Symptom	Inspection items					Other inspection items
	Fuse No. 8	Horn switch	Horn	Wiring harness and connector connection	Ground	
Horn does not sound	①	②	③	④	⑤	● Horn contact plate
Horn will not stop sounding		①		②		

#### NOTE

Number in circle indicates inspection sequence.

[illegible]

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
 Ll: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White



**HORN****REMOVAL AND INSTALLATION**

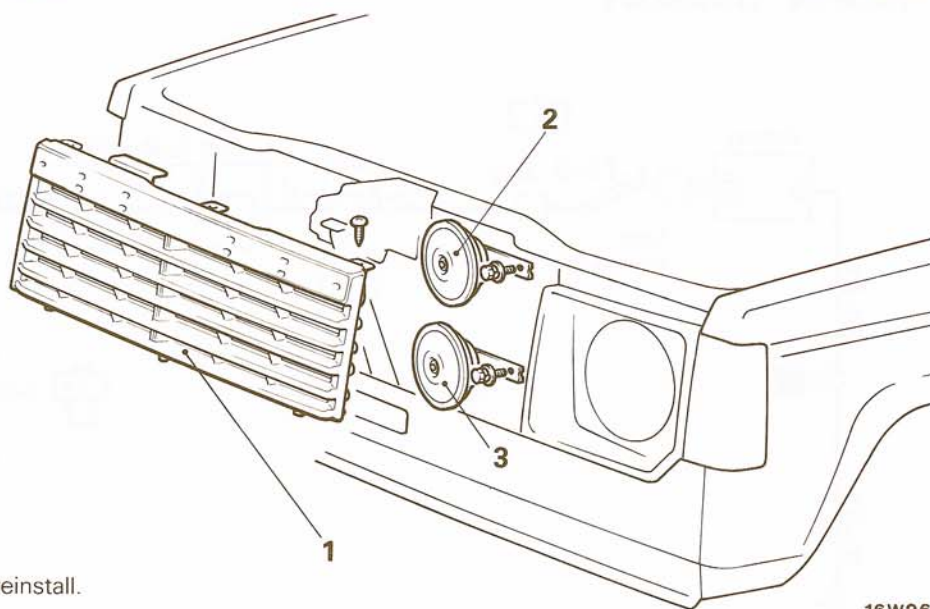
N08LJ/

**Removal steps**

1. Radiator grille
2. Horn (High)
3. Horn (Low)

**NOTE**

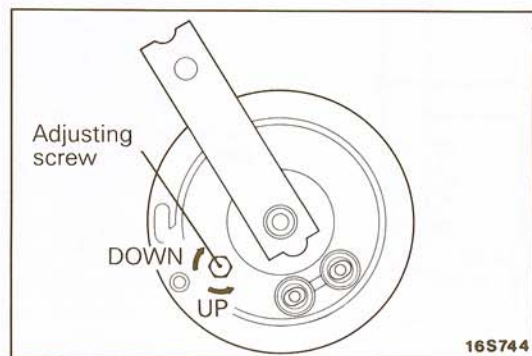
Reverse the removal procedures to reinstall.



16W964

**INSPECTION**

- A loose horn adjustment screw.
- Water, dirt, or other foreign matter lodged inside the horn.
- A loose horn bracket mounting bolt.



16S744

**HORN ADJUSTMENT**

- (1) Secure the horn bracket in a vice, and then connect a battery of the 12 volts.
- (2) Sound the horn, and adjust it by turning the adjusting screw.
  - ① The sound volume is too low.  
Turn the adjusting screw in the "UP" direction within a range of about 180°, and then set it in position when a satisfactory sound volume has been obtained.
  - ② The sound volume is too loud:  
Turn the adjusting screw 20° to 30° in the "DOWN" direction, and then set it in position when a satisfactory sound volume has been obtained.
  - ③ Horn will not sound:  
Turn the adjusting screw slightly in the "UP" direction until the horn sounds, find a satisfactory sound volume by continuing to turn the screw within a range of 180° and then set the screw in place. If a satisfactc volume cannot be obtained, replace the horn.

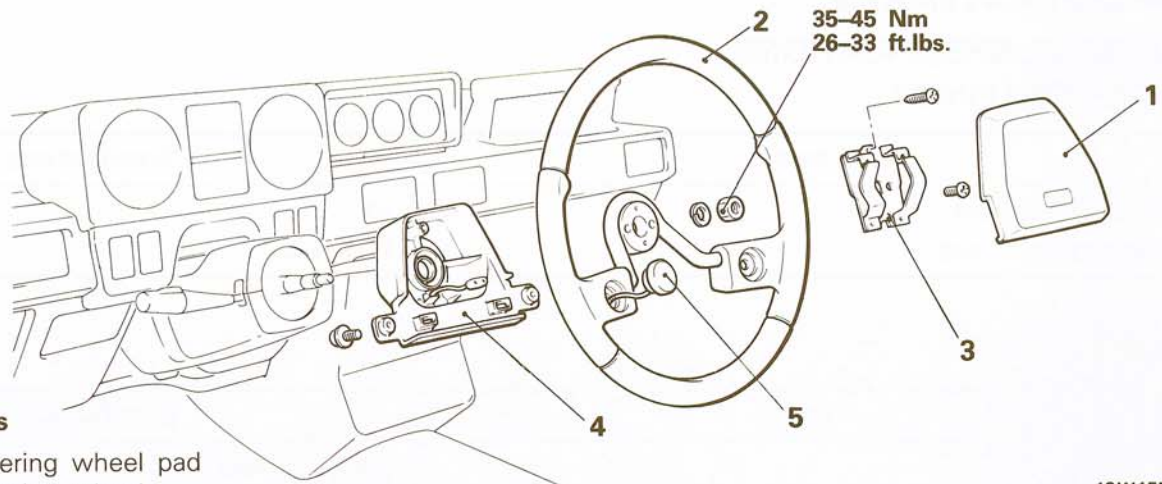
**Caution**

After the adjustment apply lacquer to prevent the adjusting screw from becoming loose.

## HORN SWITCH

## REMOVAL AND INSTALLATION

N08LKAD



## Removal steps

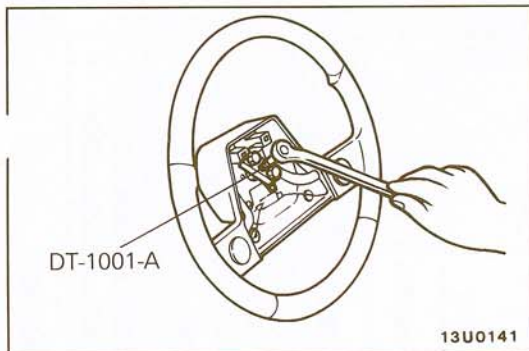


1. Steering wheel pad
2. Steering wheel
3. Steering bossplate
4. Steering wheel cover
5. Horn switch

16W1570

## NOTE

- (1) Reverse the removal procedure to reinstall.
- (2) : Refer to "Service Points of Removal"



13U0141

## SERVICE POINTS OF REMOVAL

## 2. REMOVAL OF STEERING WHEEL

Remove the steering wheel by using the special tool.

**Caution**

**Do not hammer on the steering wheel to remove it; doing so may damage the collapsible mechanism.**

## INSPECTION

- A burned out or short-circuited horn switch contact.
- A broken or damaged horn switch spring.
- A damaged horn switch harness.



# ACCESSORY

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

#### CIGARETTE LIGHTER

N08MB--

Items	Specifications
Maximum current    A	10
Return time       sec.	18 or less

#### CLOCK

Items	Specifications
Type	Crystal oscillating type
Display type	Fluorescent digital display

## TROUBLESHOOTING

N08MH--

### CIGARETTE LIGHTER AND CLOCK

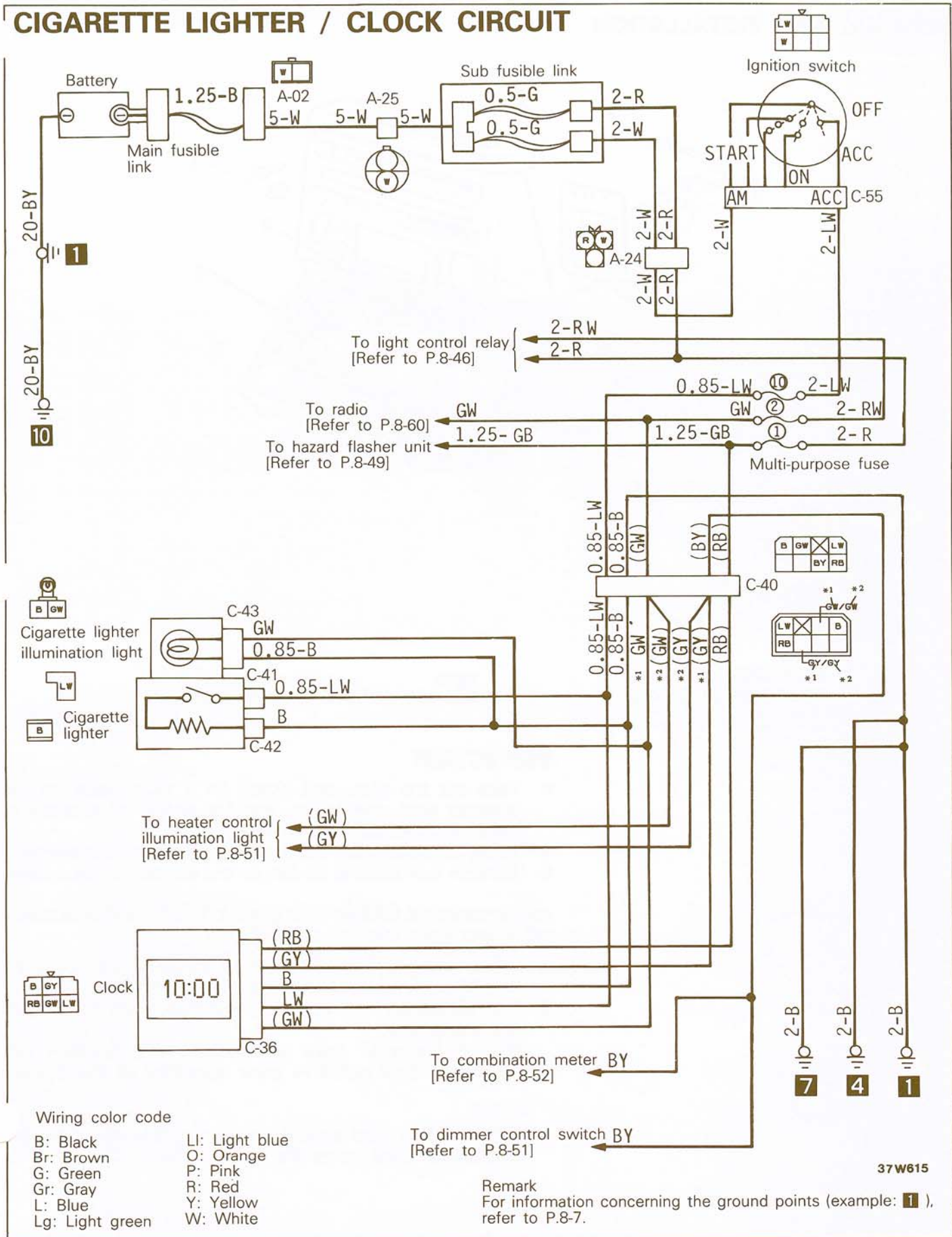
Symptom	Inspection items					
	Fuse No. 1	Fuse No. 10	Cigarette lighter	Clock	Wiring harness and connector connection	Ground
Cigarette lighter fails to operate		①	②		③	④
Clock stopped	①	②		⑤	③	④

#### NOTE

Number in circle indicates inspection sequence.

## CIRCUIT DIAGRAM

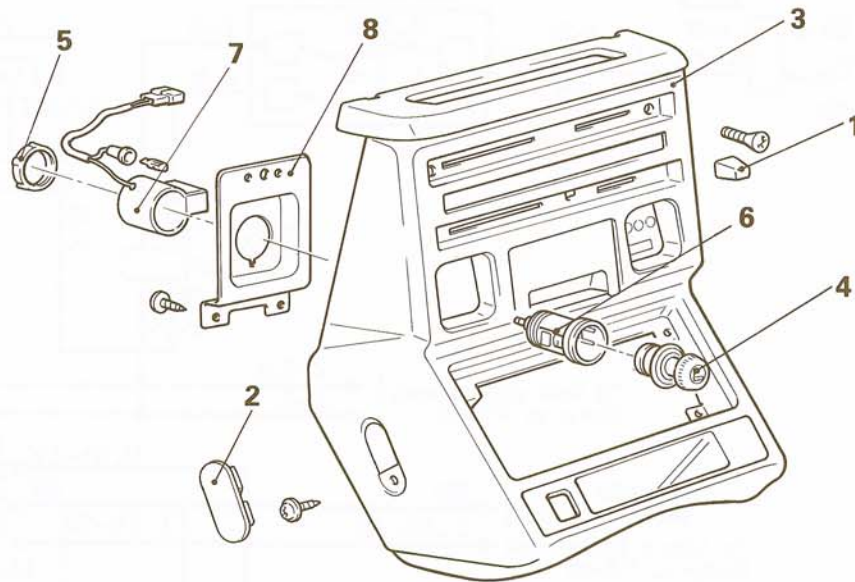
## CIGARETTE LIGHTER / CLOCK CIRCUIT





## CIGARETTE LIGHTER REMOVAL AND INSTALLATION

N08MJ/



### Removal steps

1. Knob
2. Plug
3. Center panel
4. Plug
5. Nut
6. Socket
7. Outer case
8. Cigarette lighter bracket

### NOTE

Reverse the removal procedure to reinstall.

16W1555

## INSPECTION

- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using an ohmmeter, check the continuity of the element.
- Confirm that there is no dirt on the surface of the socket.

## CAUTIONS FOR USE OF THE CIGARETTE LIGHTER SOCKET AS AUXILIARY POWER SOURCE

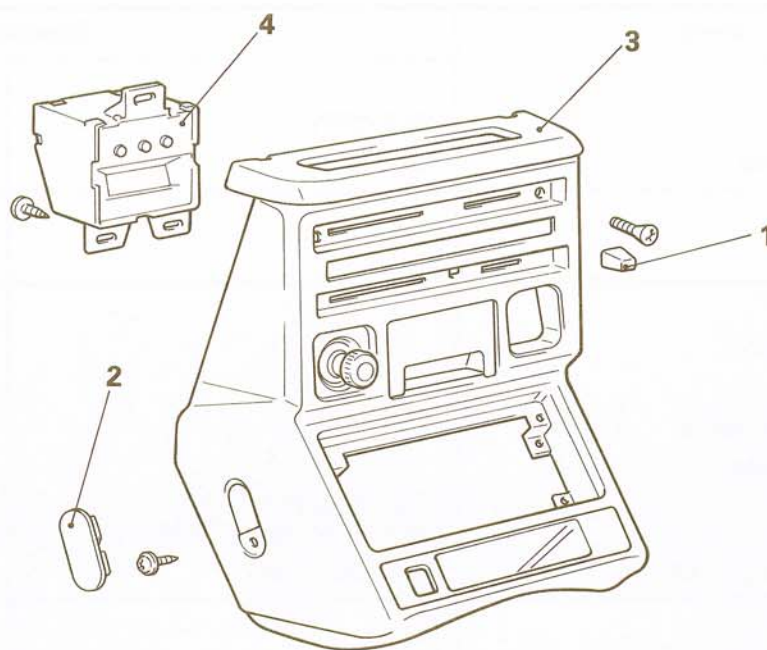
1. When using a "plug-in" type of accessory, do not use anything with a load of more than 120W.
2. It is recommended that only the lighter be inserted in the receptacle.  
Use of "plug-in" type accessories may damage the receptacle and result in poor retention of the lighter.

### NOTE

The specified load should be strictly observed, because overloaded cord burns the ignition switch and harness.

**CLOCK****REMOVAL AND INSTALLATION**

N08MKAD

**Removal steps**

1. Knob
2. Plug
3. Center panel
4. Clock

16W1558

**NOTE**

Reverse the removal procedures to reinstall.



# AUDIO SYSTEM

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

N08NB--

Items	Specifications	
Radio		
Model	AR-7127PY	AR-7177PY
Receiving band	AM/FM	AM/FM
Tape player		
Model	—	CX-25Y
Speaker		
Instrument panel		
Model	—	SR-28A4-YK-2
Rated input power		
Center pillar trim		
Model	SG-13SL4-G2 (GRAY) or SG-13SL4-BE87 (BEIGE)	SG-13SL4-G2 (GRAY) or SG-13SL4-BE87 (BEIGE)
Rated input power	15W (Max. 30W)	15W (Max. 30W)
Antenna		
Type	Pole antenna	Pole antenna

## TROUBLESHOOTING

N08NH--

Symptom	Inspection items								
	Fuse No. 10	Radio	Tape player	Speaker	Wiring harness and connector connection	Antenna and feeder wire	Antenna trimmer	DIN cable	Noise suppression parts
No sound.	①	②	③		④			⑤	
No sound from speaker at one side; low sound.		①	②	③	④				
Only noise can be heard.		①				②	③		④
Poor output or sensitivity; noise is heard.		①				③	②		④
Sound is distorted.		①		②					

#### NOTE

Number in circle indicates inspection sequence.

**NOISE SOURCES****Source of Electrical System Noise**

Ignition system	Power generation system	Other electrical device
(1) Spark plug (2) High tension cable (3) Distributor	(1) Ripple at contact between alternator armature and carbon brush (2) Spark from voltage regulator contact	(1) Armature of wiper, blower and other motors. (2) Starter and switch when starting engine (3) Spark from changeover switch (4) Horn (5) Contact of turn signal (6) Loose contact of wiring harness (7) Static electricity generated by tire or generator drive-belt (8) Voltage stability unit for instrument

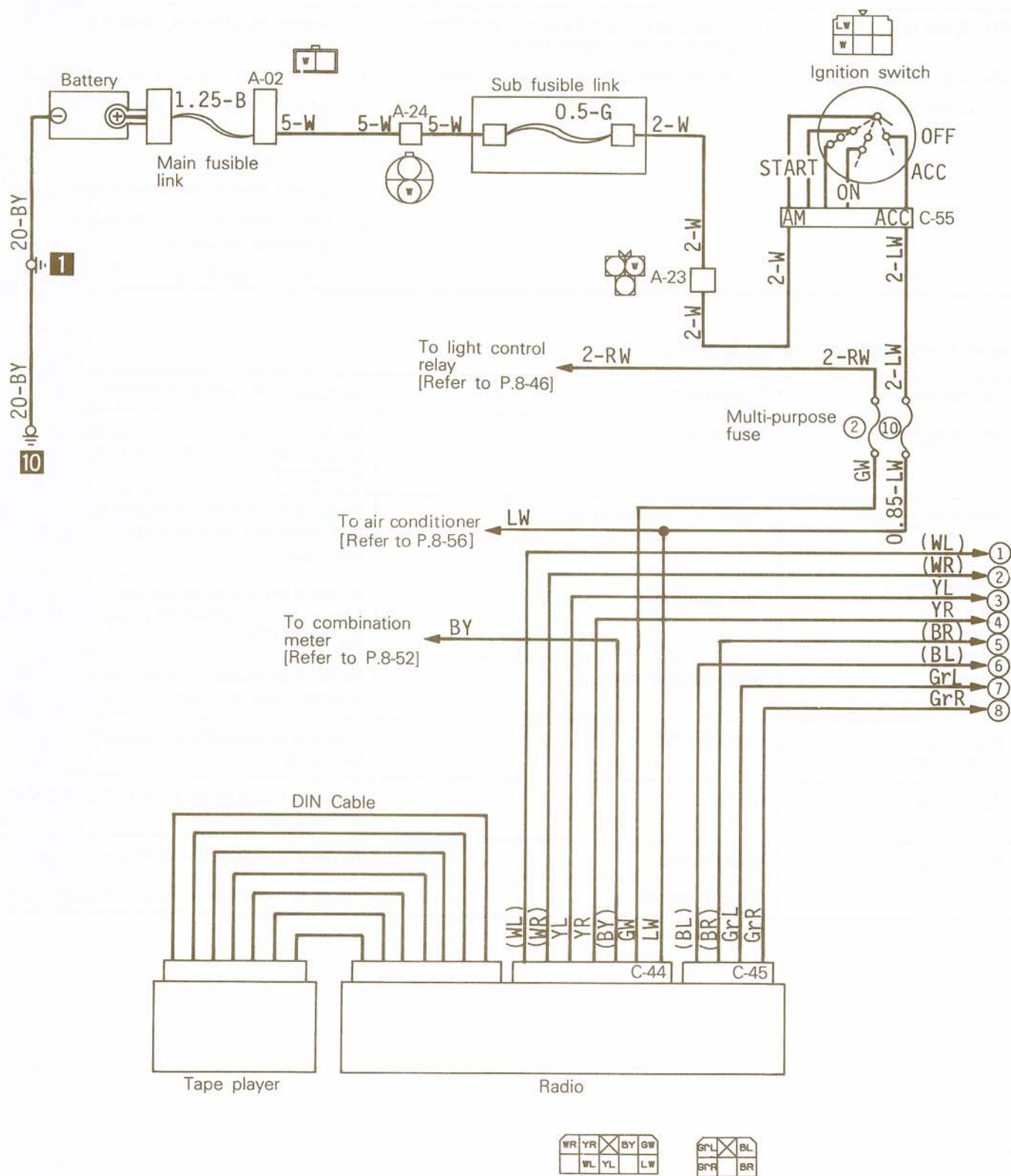
**Noise Source of Vehicle Equipment**

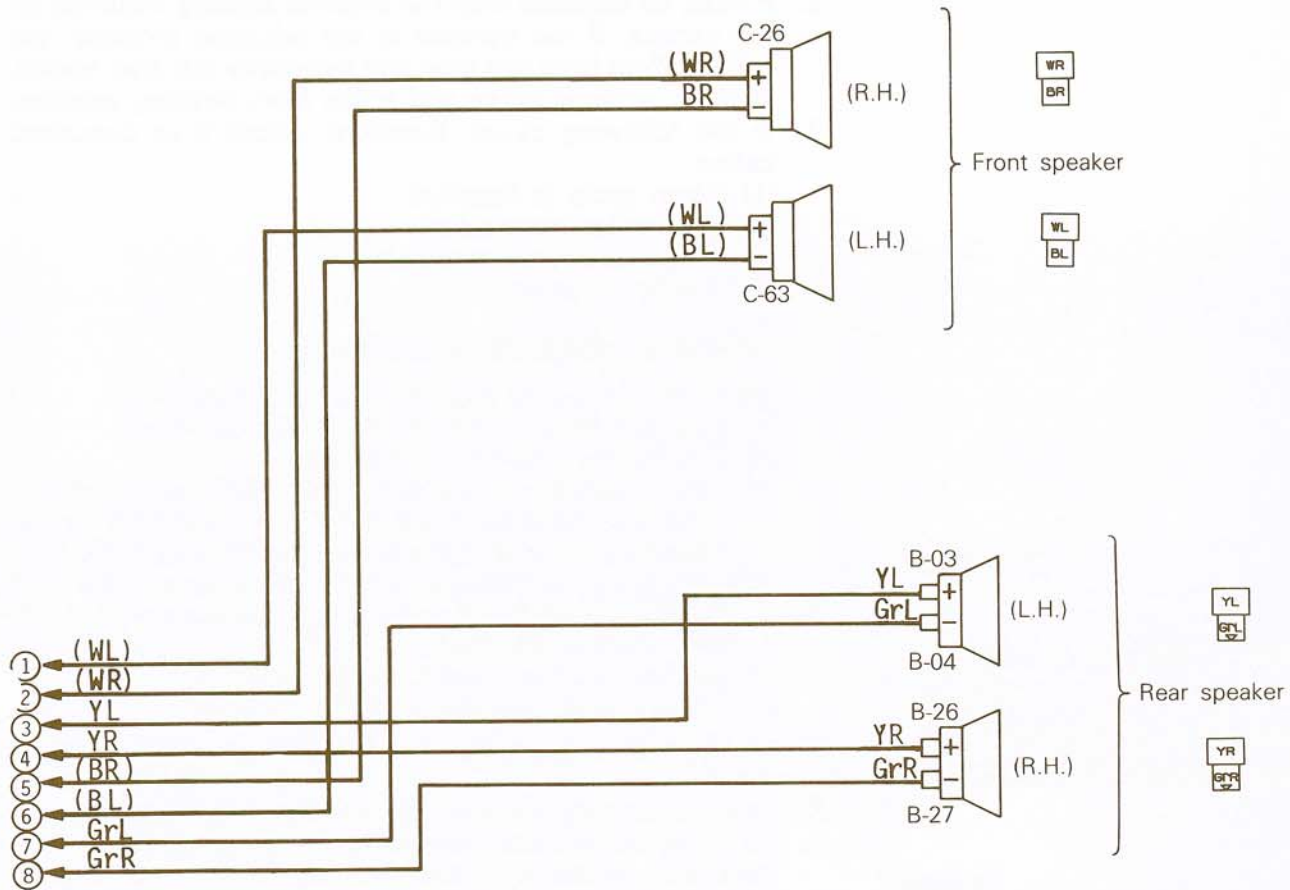
Kind of noise	Equipment	Symptom of noise generation
Whistling sound	Alternator	Noise increases when accelerator pedal is depressed and it subsides soon after engine is stopped.
Scratching sound	Water temperature gauge unit	Noise is produced while engine is running and it persists for a while after engine shutdown.
	Fuel gauge unit	Noise is produced at sudden acceleration, driving on rough road or when ignition key is placed to ON.
Jarring	Oil pressure switch	Noise is produced with engine operation and no noise is made when engine is idling.
Wish-wash, wish-wash	Flasher relay	Noise is produced with operation of turn signal light
Buzz, click	Horn	Noise is made when horn button is pressed or released.
Whinnying	Wiper motor	Noise is generated with the wiper speed.
	Washer motor	Noise is made when washer is operated.



# CIRCUIT DIAGRAM

## RADIO/CASSETTE DECK CIRCUIT





37W618

## Remarks

- (1) For information concerning the ground points (example: **1**), refer to P.8-7.
- (2) The symbols ①, ②, etc. indicate that the wiring is connected (using the same numerical symbol) to the facing page.  
(In other words, ① on the right page is connected to ① on the left page.)

## Wiring color code

B: Black	Br: Brown	G: Green	Gr: Gray	L: Blue	Lg: Light green
LI: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White



## SERVICE ADJUSTMENT PROCEDURES

### ANTENNA TRIMMER

N08NIA'

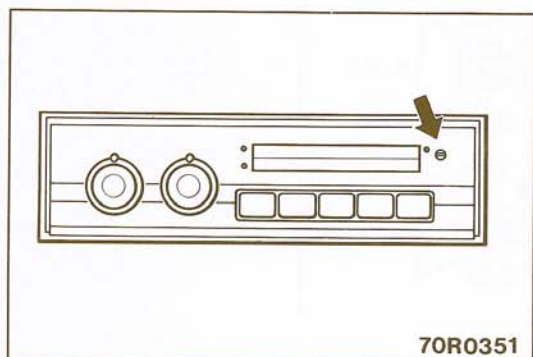
1. The antenna trimmer is essential for matching the antenna with the radio in order to obtain the maximum sensitivity of the radio.
2. It must be adjusted with the antenna actually mounted on the vehicle. If the trimmer is not adjusted properly, the radio suffers from not only low sensitivity but also noises, such as external noise and noise from passing vehicles.
3. In the following cases, therefore, adjust it as described below.
  - (1) When radio is installed.
  - (2) If antenna is replaced.
  - (3) If radio has low sensitivity.
  - (4) If radio is noisy.

### ANTENNA TRIMMER ADJUSTMENT

1. Make the following preparations for adjustment:
  - (1) Turn the ignition key to the "ACC" position.
  - (2) Extend the antenna all the way.
  - (3) Tune accurately to a station near 1,400 kHz in order to receive a broadcast in as weak an electric field as can be barely received. If there is no station near 1,400 kHz, tune to any high-frequency station (above 1,000 kHz) available. If there are two or more stations near 1,400 kHz, choose the louder one.
  - (4) Set the volume control to the proper volume.
  - (5) Set the tone control to treble position.
2. Be sure that preparations 1 through 5 have been correctly made.
3. Insert a screwdriver into the trimmer adjusting hole.
4. Turn the screwdriver clockwise or counterclockwise for maximum sensitivity (maximum broadcast wave sound).
5. If the optimum sensitivity point cannot be found, check for an antenna malfunction or a broken wire.

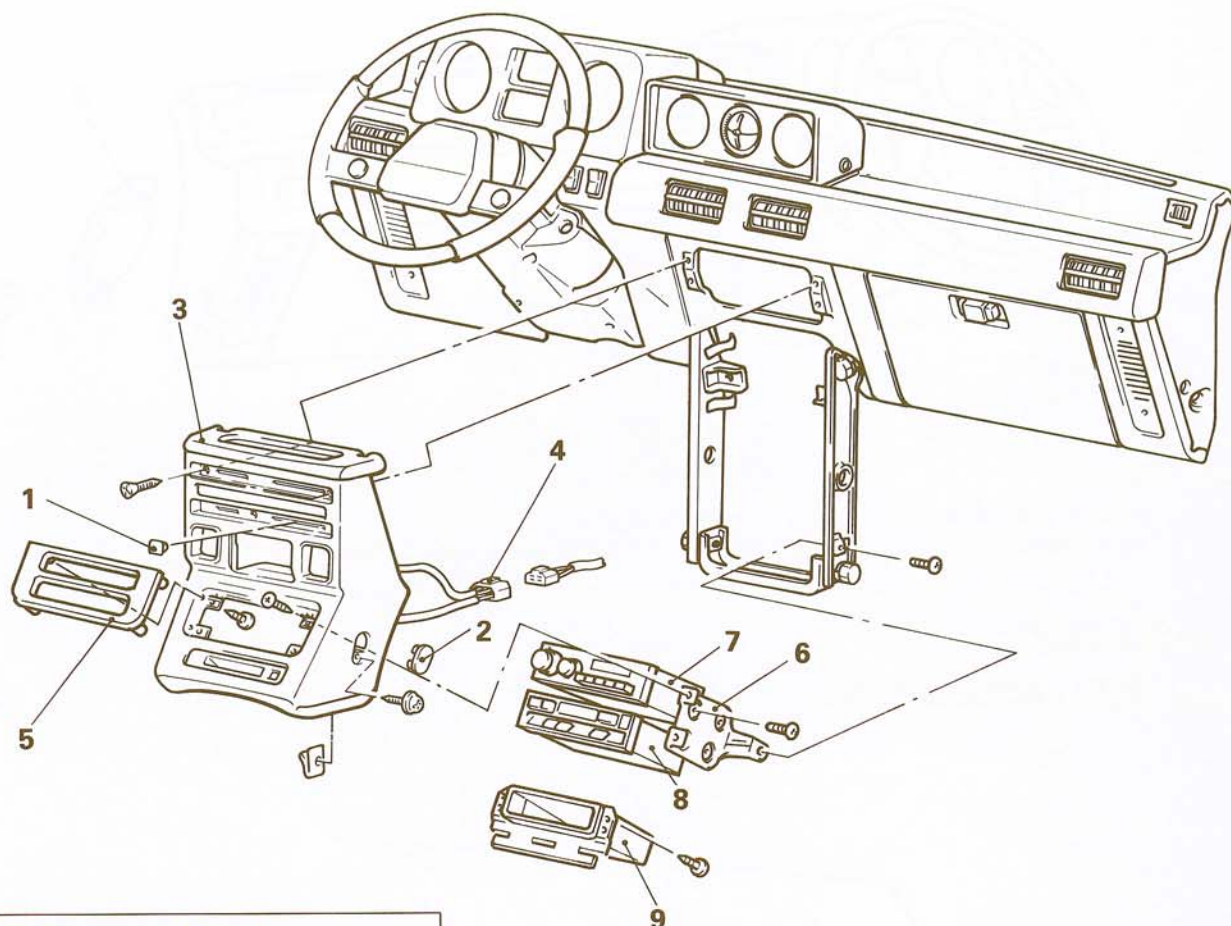
#### NOTE

The antenna trimmer of an electronic tuning radio does not require adjustment.



## RADIO AND TAPE PLAYER REMOVAL AND INSTALLATION

N08NJAF



### Post-installation Operation

- Adjustment of Antenna Trimmer  
(Refer to P.8-196.)

16W1519

### Removal steps

- |  |                                       |
|--|---------------------------------------|
| 1. Knob  | 7. Radio                              |
| 2. Plug  | 8. Tape player                        |
| 3. Center console  | 9. Box (Vehicles without tape player) |
| 4. Connection of center panel wiring harness to front wiring harness connector |                                       |
| 5. Radio panel   |                                       |
| 6. Radio bracket   |                                       |

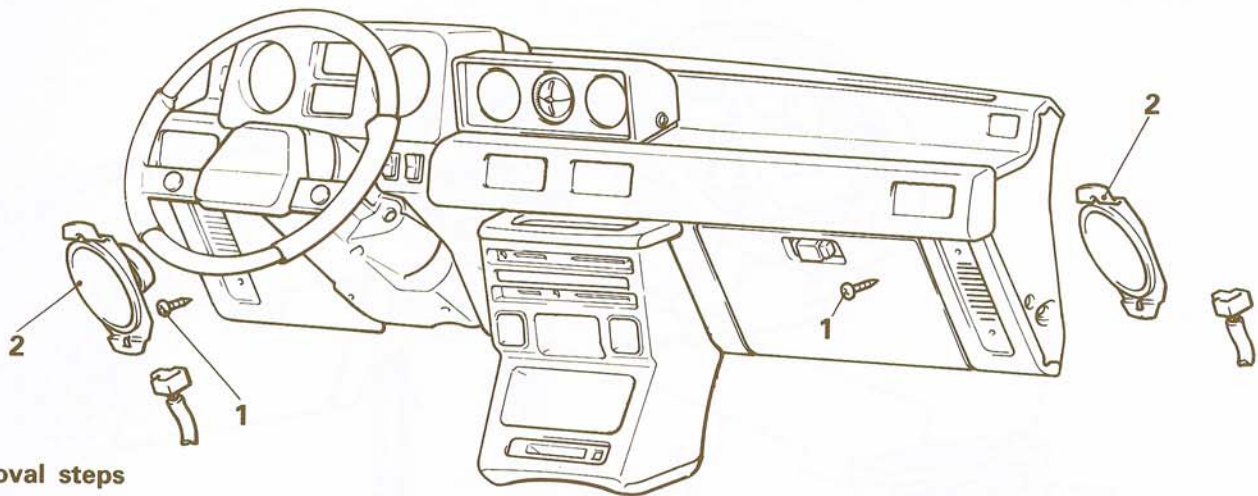
### NOTE

Reverse the removal procedures to reinstall.



**FRONT SPEAKER****REMOVAL AND INSTALLATION**

N08NMAF

**Removal steps**

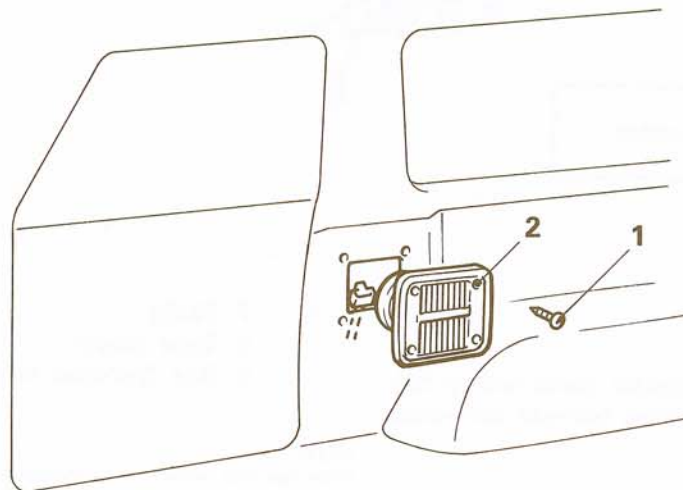
1. Mounting screws
2. Front speaker

**NOTE**  
Reverse the removal procedures to reinstall.

16W1520

**REAR SPEAKER****REMOVAL AND INSTALLATION**

N08NOAD

**Removal steps**

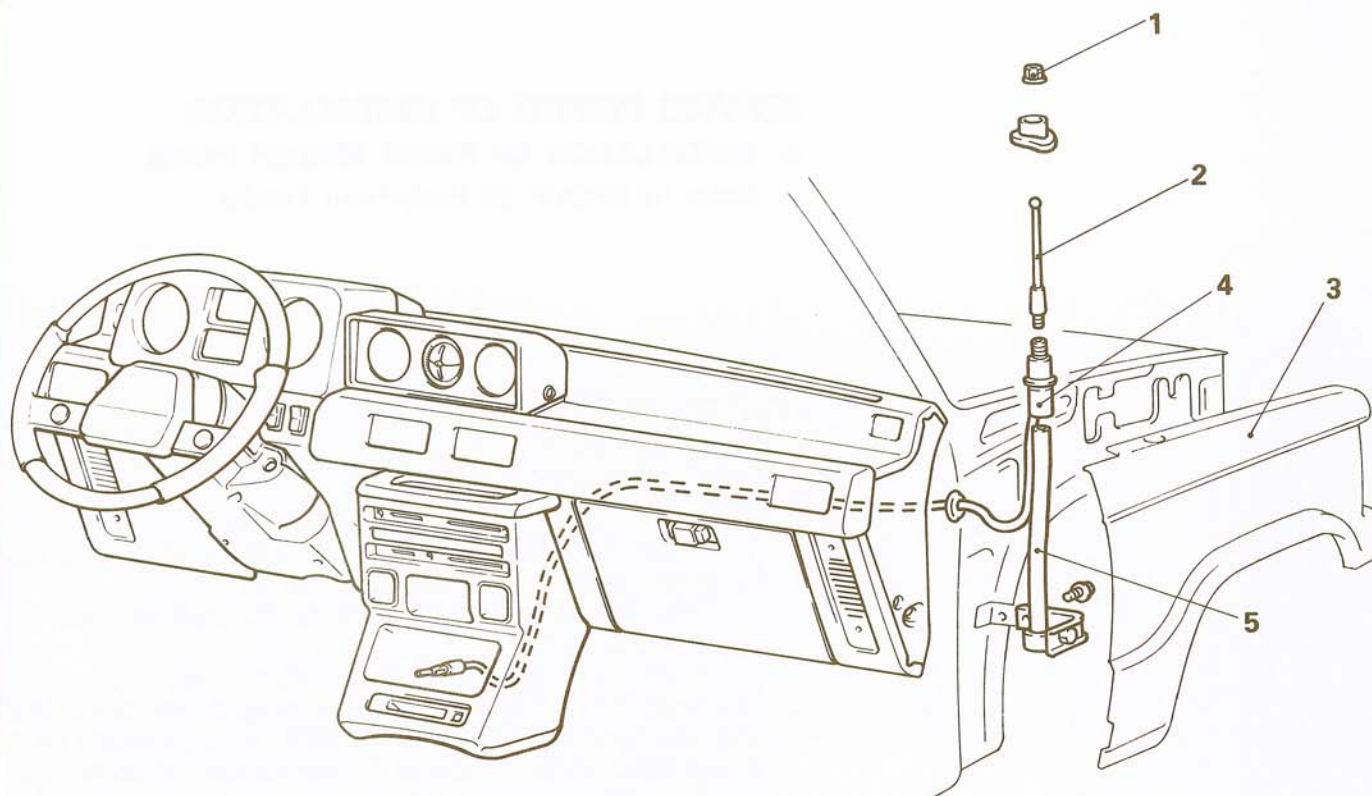
1. Mounting screws
2. Rear speaker

**NOTE**  
Reverse the removal procedures to reinstall

16W1578

## ANTENNA REMOVAL AND INSTALLATION

N08NPAC



### Post-installation Operation

- Adjustment of Antenna Trimmer  
(Refer to P.8-196.)

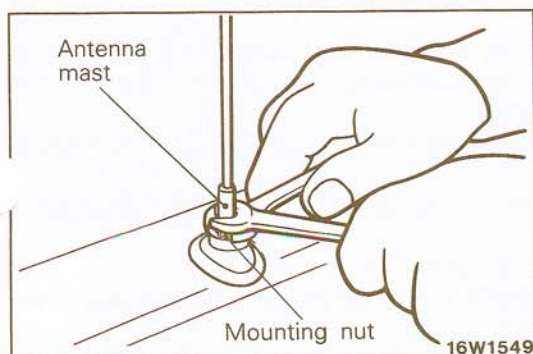
16W1579

### Removal steps

- ◆◆ 1. Mounting nut
- 2. Antenna mast
- ◆◆ ◆◆ 3. Front fender panel
- 4. Ground base
- 5. Antenna base

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆ ◆◆ : Refer to "Service Points of Installation".



16W1549

## SERVICE POINTS OF REMOVAL

### 1. REMOVAL OF MOUNTING NUT

Hold the antenna mast, and then remove the mounting nut.



**3. REMOVAL OF FRONT FENDER PANEL**

Refer to GROUP 23 Body-Front Fender

**SERVICE POINTS OF INSTALLATION****3. INSTALLATION OF FRONT FENDER PANEL**

Refer to GROUP 23 Body-Front Fender.

**NOISE SUPPRESSION**

N08NQAA

1. Noise interfering with radio reception may be roughly classified as follows:
  - (1) Noise produced by the vehicle itself  
Noise from the ignition circuit, alternator circuit, etc.
  - (2) Noise generated in the radio itself  
Thermal noise from transistors, IC, resistor, etc.
  - (3) Atmospheric noise  
Noise from other cars, neon signs, etc.
2. The radio has devices to suppress noise of the radio itself and atmospheric noise, but it is difficult to eliminate them completely. Noise produced by the vehicle includes whirring from the alternator system, and a strong, impulsive, fast popping noise from the ignition system.
3. Before performing any checking or adjustments, first confirm the following points.
  - Adjust the antenna trimmer completely.
  - Set the push buttons (tuning) properly.
  - Extend the antenna all the way.

**PREVENTION OF IGNITION CIRCUIT NOISE**

A resistance-equipped cable is used for the high-tension cable in order to prevent noise; however, if any noise from the ignition circuit does occur, check the tightness and ground connection of the positive (+) terminal of the noise filter, and, if necessary, check the noise filter.

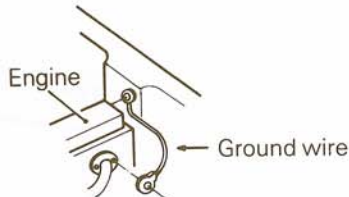
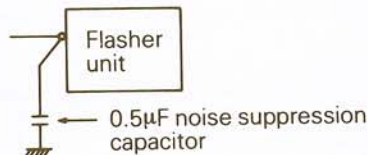
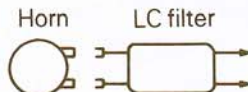
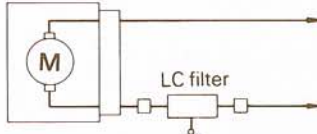
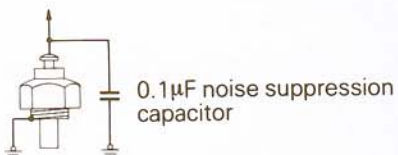
**Caution**

**Be careful not to connect the noise filter to the hightension cable; doing so could damage the noise filter.**

**PREVENTION OF OTHER CIRCUIT NOISE**

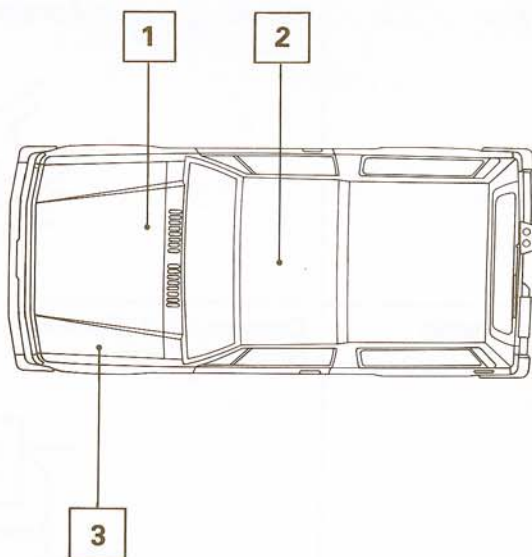
1. For other noises, take necessary corrective actions in accordance with the following items and the NOISE SUPPRESSION CHART.
2. Polish the grounding cable terminal, and connect it properly.
3. Polish the pillar antenna ground terminal, and connect it properly.
4. Ground electric parts completely.
5. Keep the antenna cable and speaker lead wire away from other electric wiring.

## NOISE SUPPRESSION CHART

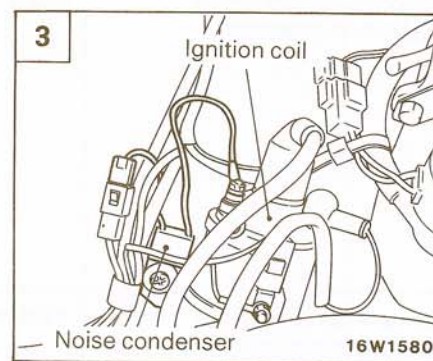
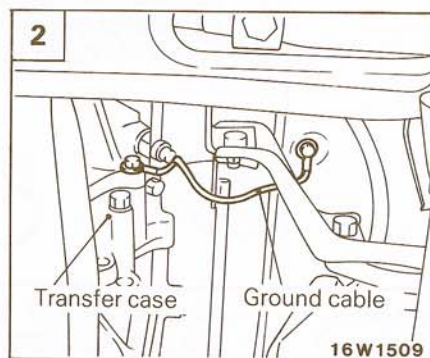
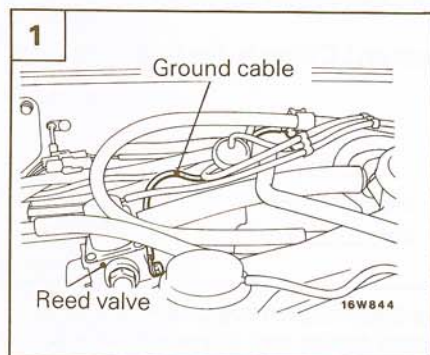
Symptom	Noise source	Remedy
Unusual noise related to engine speed.	Engine	Securely ground the engine, frame and/or body and engine hood.  <b>16E710</b>
"Clatter" noise related to the flashing of turn signal lights	Turn signals	Connect a 0.5 $\mu$ F noise-suppression capacitor to the B terminal of the flasher unit.  <b>16E712</b>
Abnormal noise when the horn is operated.	Horn	1. Connect a 0.5 $\mu$ F noise-suppression capacitor to the + B terminal of the horn. 2. For an FM radio, connect an LC filter to the horn terminals.  <b>16E713</b>
Noise when the windshield washer operates.	Washer motor	1. Connect a 0.5 $\mu$ F noise-suppression capacitor between the terminal of the washer motor and the power source wire. 2. For an FM radio, connect an LC filter between the terminal of the washer motor and the power source wire.  <b>16F671</b>
Unusual noise when the engine is started.	Water temperature gauge unit	Connect a 0.1 $\mu$ F noise-suppression capacitor to the terminal of the water temperature gauge unit.  <b>16F672</b>



## NOISE SUPPRESSOR LOCATION



16W722



# BACK DOOR WINDOW DEFOGGER

## SPECIFICATIONS


### GENERAL SPECIFICATIONS

N08PB-A

Items	L042GT (Vehicles with rear window defogger)	L042GV
Back door window defogger switch		
Type	Seesaw type	Seesaw type (automatic reset)
Rated current	20A	20A
Back door window defogger timer		
Timer	–	7–13 min.
Back door window glass with defogger		
No. of printed heater lines	11	11
Power consumption [20°C (68°F)]	112–148 W	145–196 W

## SPECIAL TOOLS

N08PG-A

Tool (Number and name)	Use
C-4755 Trim stick	Removal of back door window defogger switch
	



## TROUBLESHOOTING

N08PH-A

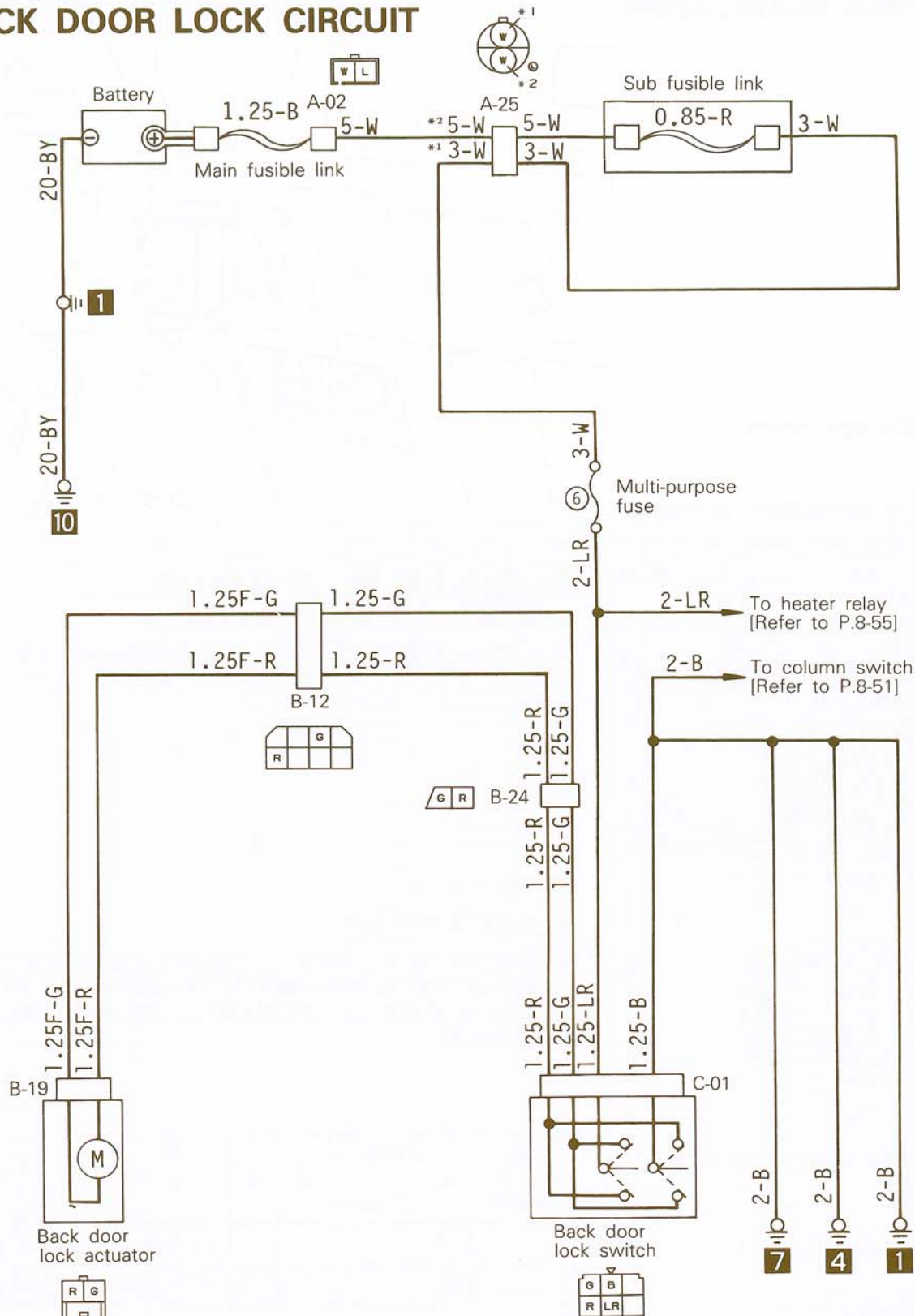
Symptom	Inspection items						
	Fuse No. 5	Sub fusible link* (only for defogger)	Defogger switch	Defogger timer*	Printed heater line	Wiring harness and connector connection	Ground
Neither the back door window defogger nor the indicator function.	①		②	③		④	⑤
The indicator functions, but the back door window defogger does not function.		①			②	③	④
The back door window defogger timer does not function.				①		②	

## NOTE

(1) Number in circle indicates inspection sequence.

(2) \* Vehicles for L042GV

# CIRCUIT DIAGRAM BACK DOOR LOCK CIRCUIT



Remark

For information concerning the ground points (example: **1**) refer to P.8-7.

37W602

## Wiring color code

B: Black	Br: Brown	G: Green	.Gr: Gray	L: Blue	Lg: Light green
Li: Light blue	O: Orange	P: Pink	R: Red	Y: Yellow	W: White



## DEFOGGER SWITCH

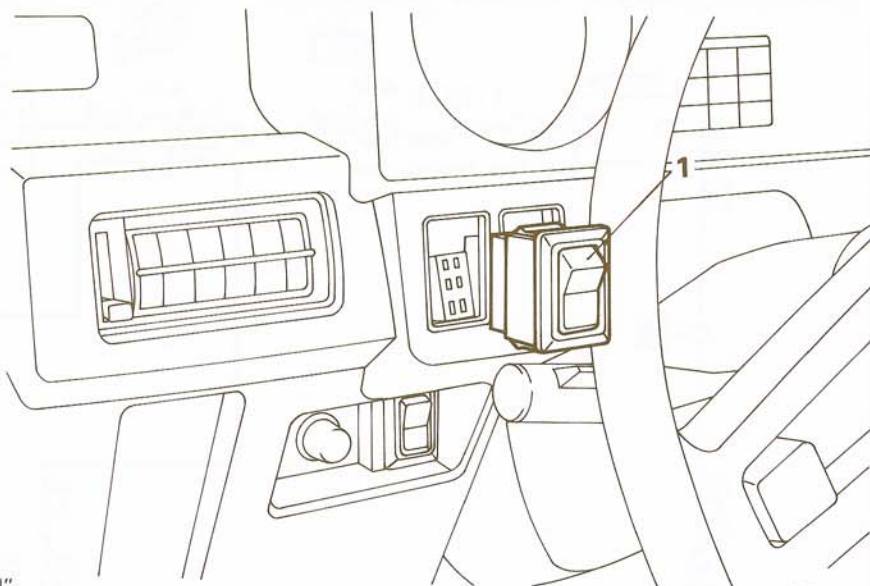
## REMOVAL AND INSTALLATION

N08PJB\*

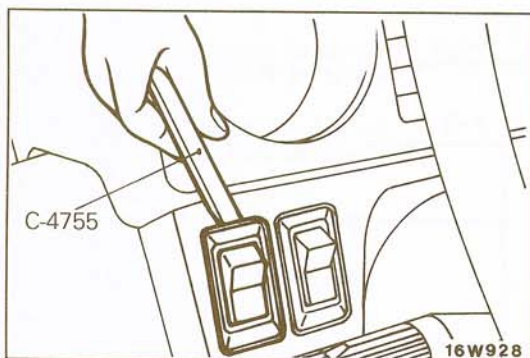
↔ 1. Defogger switch

## NOTE

↔ : Refer to "Service Points of Removal".



16W932

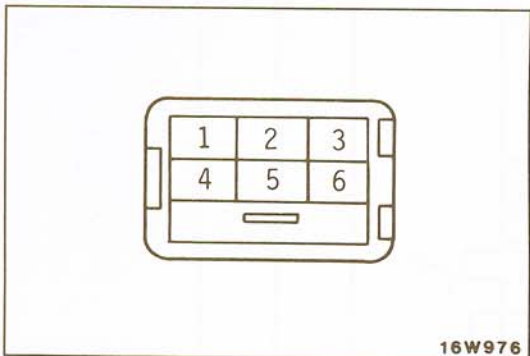


16W928

## SERVICE POINTS OF REMOVAL

## 1. REMOVAL OF DEFOGGER SWITCH

Insert the special tool into the switch and pry the switch to remove it from the instrument panel.



16W976

## INSPECTION

## DEFOGGER SWITCH

- (1) Remove the defogger switch from the instrument panel and connect an ohmmeter to the switch side connector.
- (2) Operate the switch and check the continuity between the terminals.

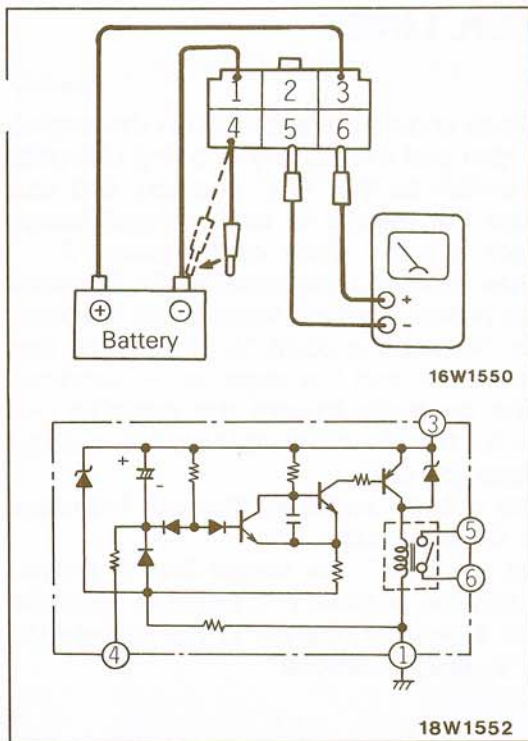
\* : Indicator light

\*\* : Illumination light

Switch position \ Terminal	2	5	1	*	4	3	**	6
OFF			○—○	⊗	○	○	⊗	○
ON	○—○		○	⊗	○	○	⊗	○

## NOTE

○—○ indicates that there is continuity between the terminals.

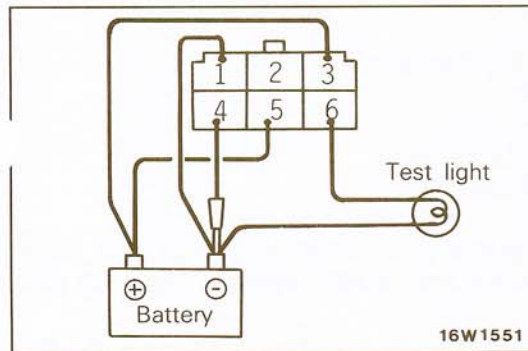


## DEFOGGER TIMER

Remove the defogger timer from the cowl side at the passenger seat side.

### CONTINUITY CHECK

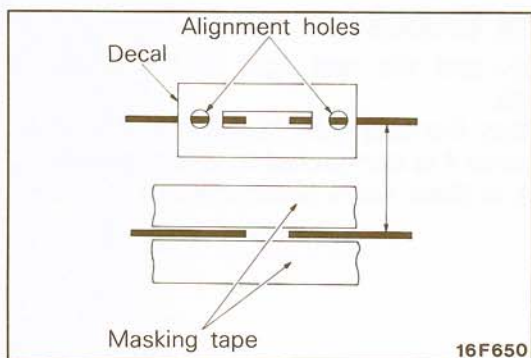
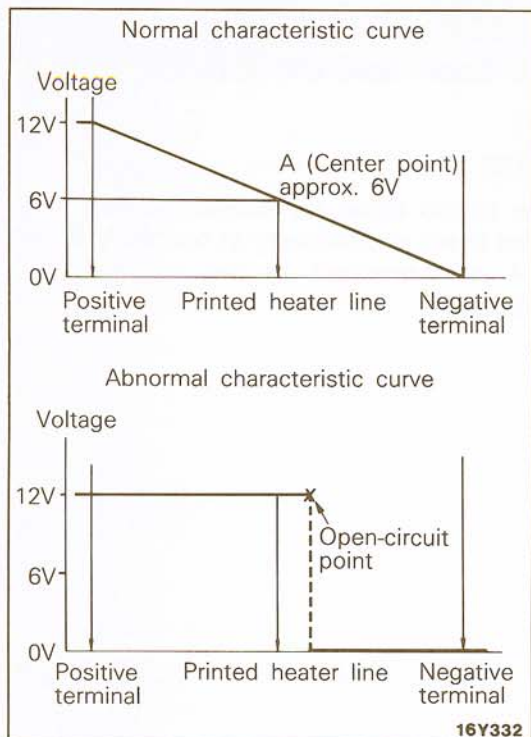
- (1) Connect the battery to the timer, as shown in the figure.
- (2) Check to be sure that there is continuity at terminals 5 and 6 when terminal 4 is connected to the negative (–) terminal of the battery.



### TIMER OPERATION CHECK

- (1) Connect the battery and the test light to the timer, as shown in the figure.
- (2) Check to be sure that the test light flashes for about ten minutes when terminal 4 is connected to the negative (–) of the battery and is then soon disconnected.





## PRINTED HEATER LINES

### INSPECTION

N08PKA7

1. The printed heater lines should be tested while the engine is running at 2,000 rpm and the battery is being charged.
2. Turn the defogger switch to the "ON" position, and use voltmeter to measure the voltage of each printed heater line at the back door window glass center point "A".
3. If all of the heater lines indicate approximately 6V, the back door window printed heater lines are functioning properly.
4. If a voltage of 12V is indicated at point "A", the heater line is broken between point "A" and the negative (–) terminal. Move the test probe gradually toward the negative (–) terminal, and search for the place where there is a sudden change in the voltage (to 0 V).
5. This place where the voltage suddenly changes indicates the location of the broken heater line.
6. If 0V is indicated at point "A", the heater line is broken between point "A" and the positive (+) terminal. Find the point where there is a sudden change in the voltage (to 12V), as described in step 4. above.

### REPAIR

1. Prepare the following items:
  - Conductive paint
  - Paint thinner
  - Masking tape, decal, etc.
  - Unleaded gasoline
  - Thin brush

Wipe the glass adjacent to the broken heater line, clean with unleaded gasoline, and bond a decal or masking tape as shown.

2. Shake the electroconductive paint container well, and remove the amount of paint needed. Dilute it with a small quantity of paint thinner, and apply three coats with the brush at intervals of about 15 minutes.
3. Remove the tape or decal and leave the repaired defogger unused for a while before supplying power.
4. For a better finish, scrape away excess deposits with a knife after drying is complete (one day later).

#### Caution

**After repair, clean the glass with a soft dry shop towel or wipe along the printed heater line with a slightly moistened shop towel.**

N08RAAA

## GENERAL INFORMATION

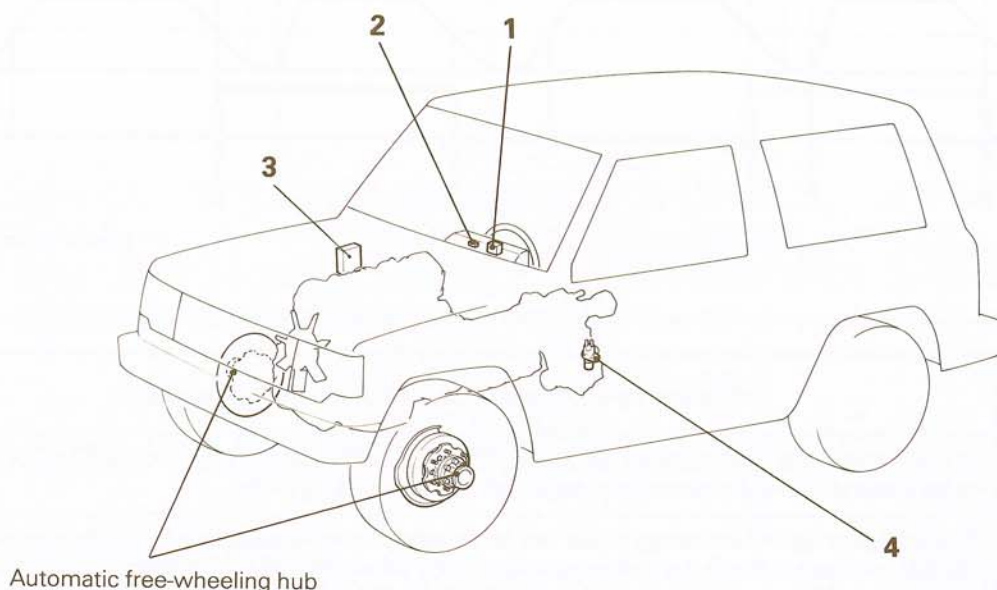
This system is composed of the automatic free-wheeling hub indicator light, the vehicle-speed sensor (reed type switch), the automatic free-wheeling hub indicator control unit, and the pulse generator.

The pulse generator is located at the rear part of the front output shaft of the transfer; the vehicle-speed sensor is incorporated within the combination meter.

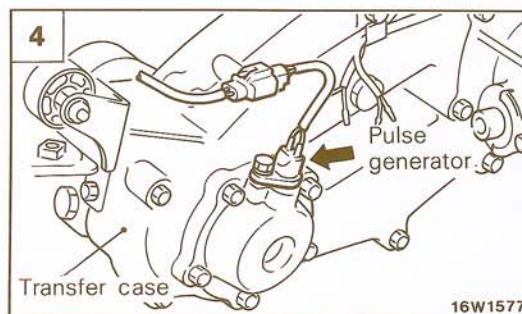
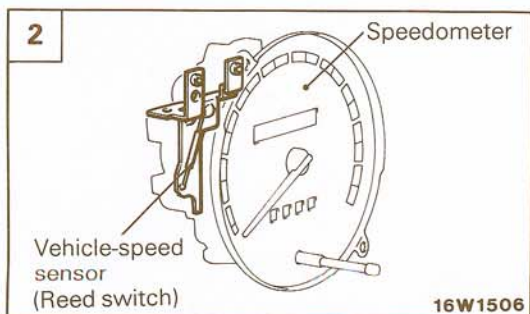
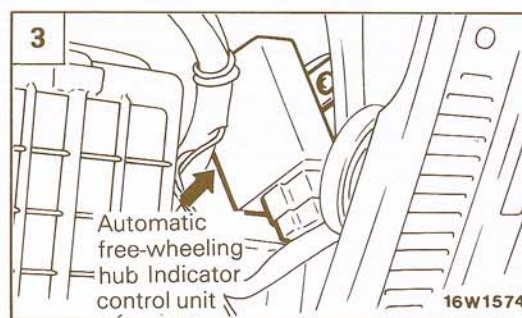
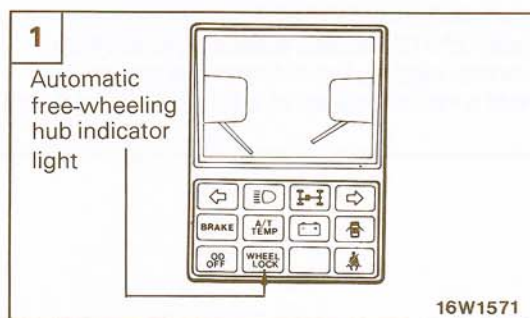
Based upon the output signals from the pulse generator and from the vehicle-speed sensor (reed type switch), the automatic free-wheeling hub indicator control unit judges whether the automatic free-wheeling hub is in the locked condition or the free condition.

When it is in the locked condition, the indicator light illuminates; when it is in the free condition, the indicator light does not illuminate.

This is, therefore, a system which makes it easy to see, from the driver's seat, whether the automatic free-wheeling hub is in the locked condition or the free condition.

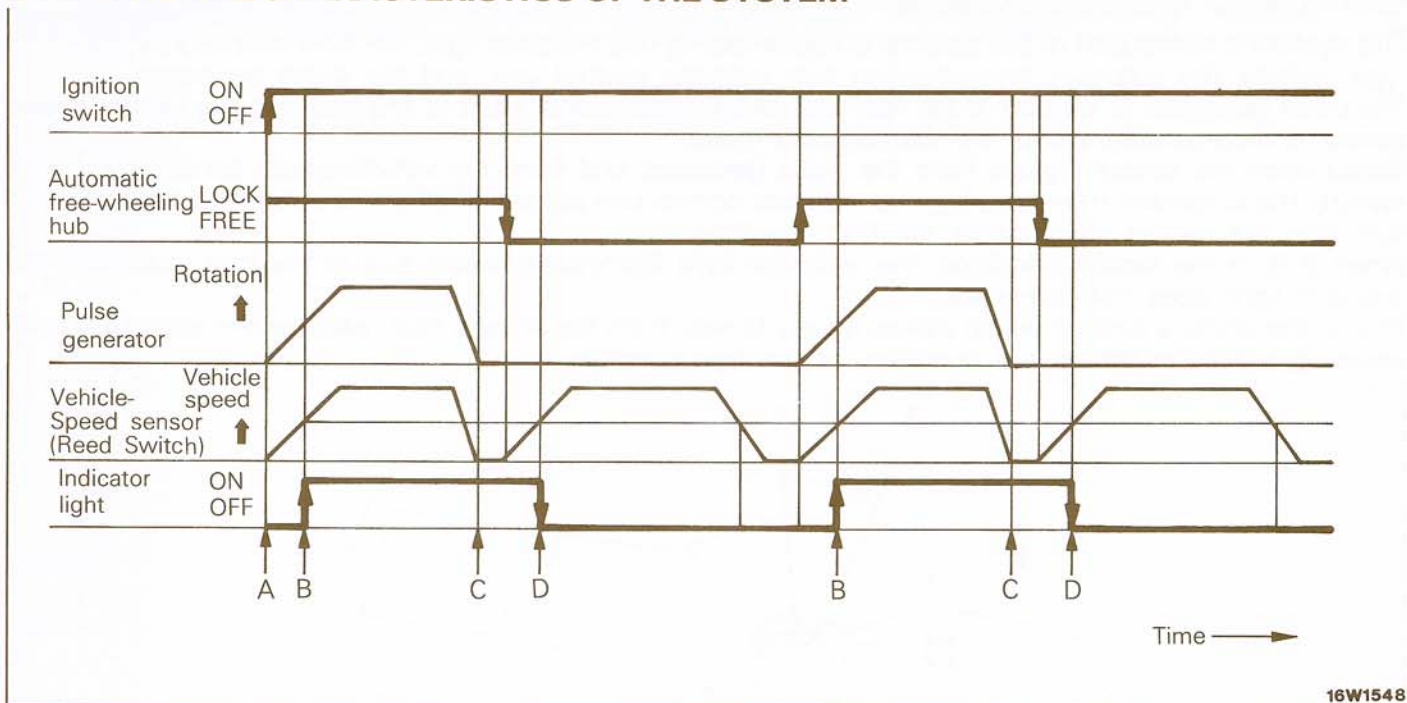


16W1567





# OPERATIONAL CHARACTERISTICS OF THE SYSTEM



16W1548

Symbols used in above diagram	Indication by automatic free-wheeling hub indicator light
A	No illumination of the indicator light when the ignition key is turned from OFF to ON, regardless of the condition of the automatic free-wheeling hub.
B	The indicator light illuminates when the automatic free-wheeling hub is locked and pulse signals are output from the pulse generator, and when, in addition, the vehicle-speed sensor detects a vehicle speed of approximately 2.5 mph (4 km/h) or higher.
C	The locked condition is entered in the memory even if the vehicle is stopped (with ignition key still at ON) while the automatic free-wheeling hub is in the locked condition, and the indicator light illumination continues.
D	After the automatic free-wheeling hub is changed from the locked condition to the free condition (the pulse signals from the pulse generator cease), the indicator light remains illuminated until the vehicle-speed sensor detects a vehicle speed of approximately 2.5 mph (4 km/h) or higher.

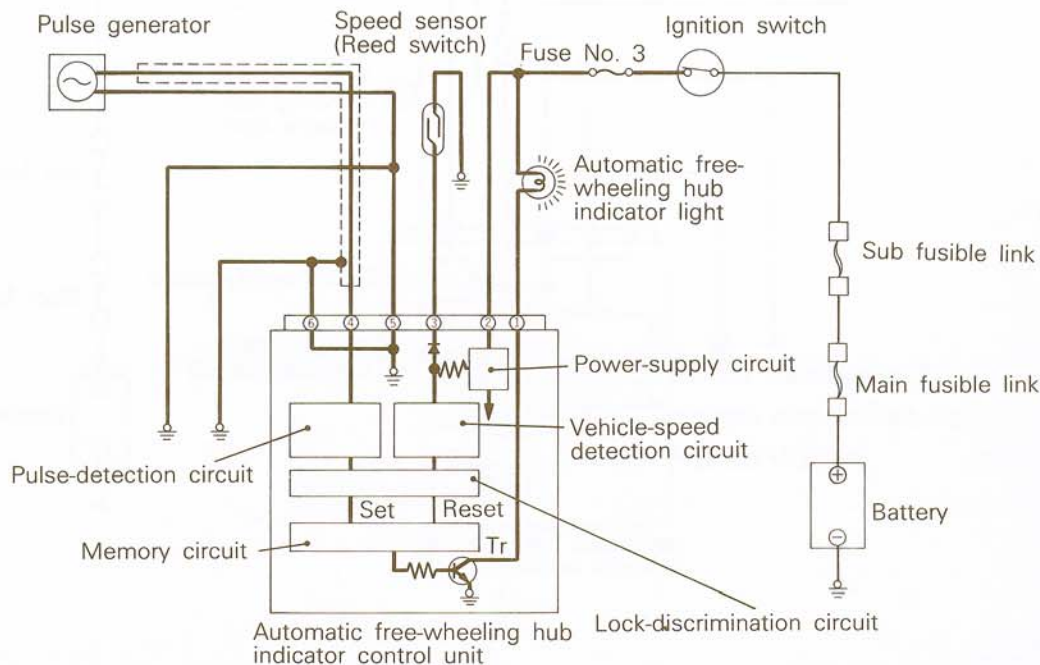
## EXPLANATION OF INDICATOR OPERATION

### 1. Automatic free-wheeling hub in locked condition

The output of the pulse generator is input to terminal 4 of the control unit, and the output signals from the vehicle-speed sensor are input to terminal 3 of the control unit.

Only when there are pulse signals from the pulse generator, and when, moreover, the vehicle-speed signals indicate a vehicle speed of approximately 2.5 mph (4 km/h) or higher does the control unit judge that the automatic free-wheeling hub is the locked condition at the lock-discrimination circuit of the control unit, and therefore the set signal (locked condition) is output.

This signal is entered into the memory circuit, thus causing the indicator light to illuminate.

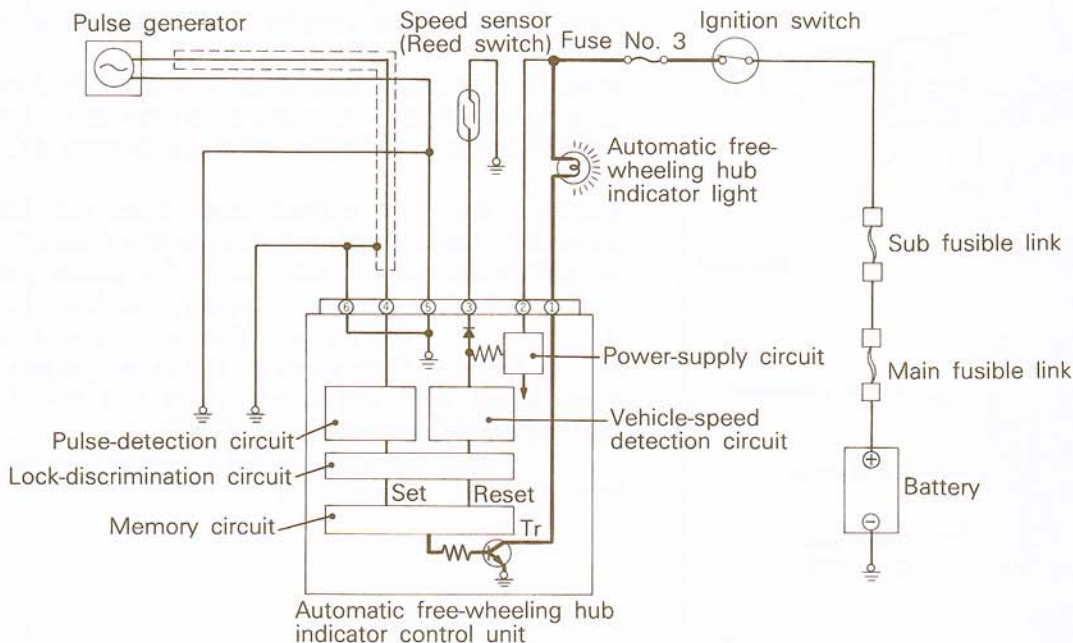


16W1536

### 2. When vehicle is stopped (with ignition key still at ON) with automatic free-wheeling hub locked

Signals are not output from the pulse generator and the vehicle-speed sensor when the vehicle is stopped.

However, because the set signal (locked condition) is entered into the memory circuit, the indicator light shows the condition in effect when the vehicle was traveling.

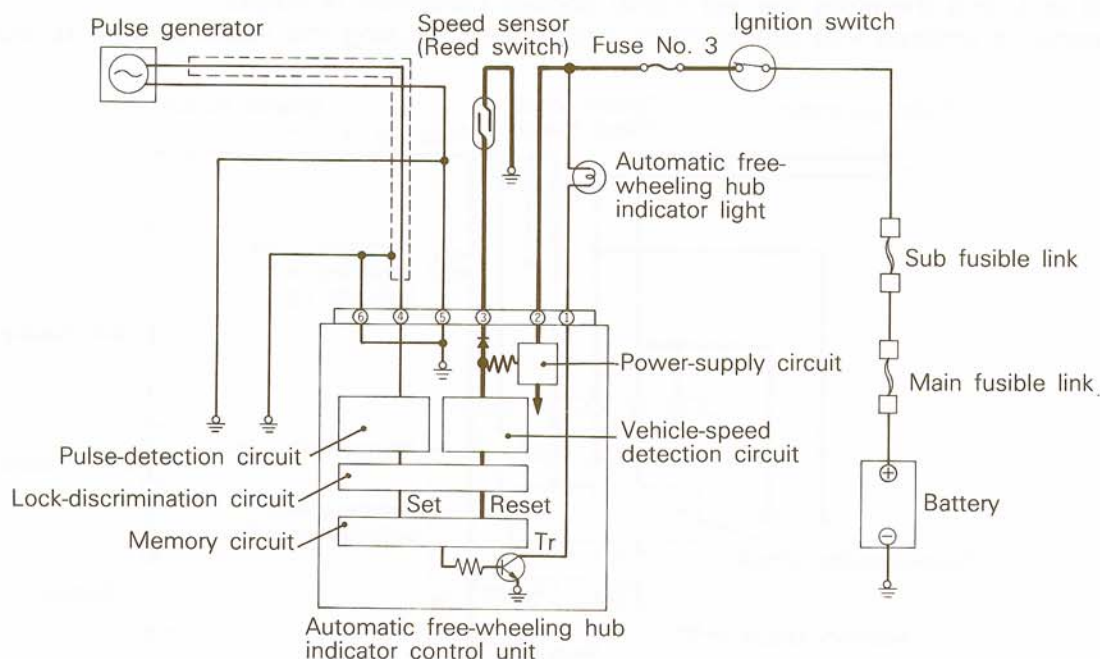


16W1535



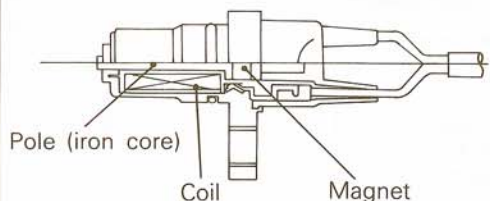
### 3. Automatic free-wheeling hub in free condition

For the free condition, although there are (when the vehicle is traveling) output signals from the vehicle-speed sensor, there are no signals from the pulse generator, with the result that the memory circuit is erased (because reset signals are output from the lock-discrimination circuit), and so the indicator light does not illuminate.

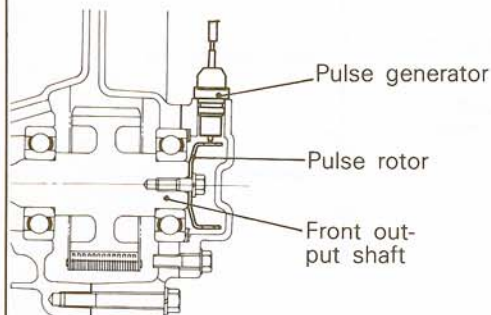


16W1534

### Pulse generator cross-sectional view



16W1547



16W1546

## PULSE GENERATOR

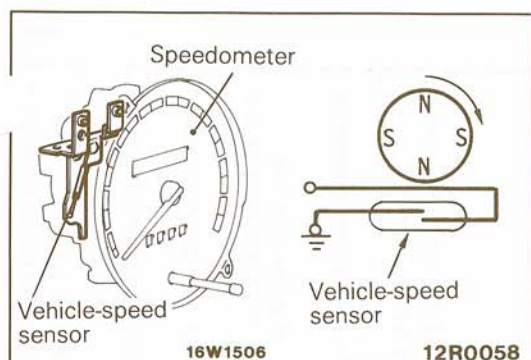
The pulse generator is located at the rear part of the front output shaft of the transfer, and is composed of the magnet, the coil and the pole (iron core).

When a magnetic material (iron, nickel, etc.) is brought close to and moved away from the pole (iron core), the magnetic flux within the pole changes, thus generating AC voltage in the coil.

Because the front output shaft does not rotate when the automatic free-wheeling hub is in the free condition, there is no generation of AC voltage in the pulse generator.

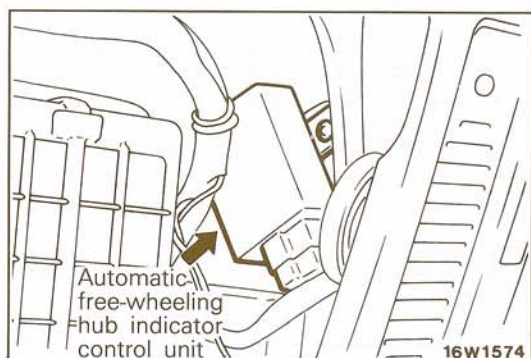
In the locked condition, however, the front output shaft and the pulse rotor rotate, with the result that the magnetic flux (within the pole (iron core) of the pulse generator) changes in accordance with the rotations of the pulse rotor, thereby generating AC voltage in the coil.

This AC voltage is transmitted to the automatic free-wheeling hub indicator control unit.



## VEHICLE-SPEED SENSOR (REED-TYPE SWITCH)

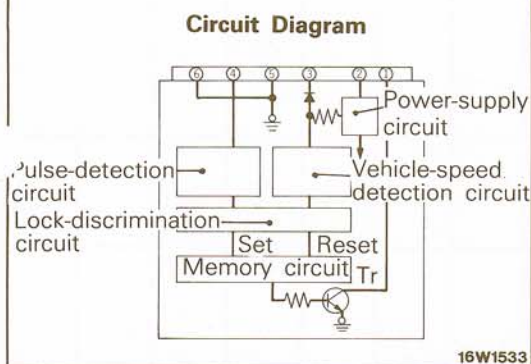
The vehicle-speed sensor functions to substitute pulse signals for the rotations (vehicle speed) of the transmission's output gear; it is located within the speedometer. Pulse signals are generated when the speedometer cable rotates.



## AUTOMATIC FREE-WHEELING HUB INDICATOR CONTROL UNIT

The control unit is located at the upper part of the right cowl side.

The control unit is composed of the pulse-detection circuit (which receives the input signals from the pulse generator), the vehicle-speed-detection circuit (which receives the input signals from the vehicle-speed sensor), the lock-discrimination circuit (which, based on both of these input signals, judges the condition of the automatic free-wheeling hub and then transmits indicator output signals to the memory circuit), and the memory circuit (which "memorizes" the indicator output signals from the lock-discrimination circuit).



## SPECIFICATIONS

### GENERAL SPECIFICATIONS

N08RB--

Items	Specifications
Automatic free-wheeling hub indicator light	W (SAE trade number)
Pulse generator	1.4 (74)
Type	Magnet coil type
Vehicle-speed sensor	
Type	Reed switch type
Pulse generation	4 pulses/ rotation

### SERVICE SPECIFICATIONS

N08RC--

Items	Specifications
Standard values	
Pulse generator resistance $\Omega$	215–275
Vehicle-speed sensor output voltage V	When OFF 4 or more When ON 0



## TROUBLESHOOTING

N08RH--

Symptom	Inspection items											
	Burnt-out fuse No. 3	Break in wiring harness	Poor ground connection	Poor connector connection	Break in print circuit board	Break in bulb	Malfunction of the vehicle-speed sensor (reed type switch)	Malfunction of the pulse generator	Malfunction of automatic free-wheeling hub indicator control unit	Malfunction of the speedometer	Improperly installed speedometer cable	Improper clearance between the pulse rotor and the pulse generator
Reference page	8-68	-	-	-	-	-	8-217	8-216	-	8-128	8-133	-
The indicator light does not illuminate although the automatic free-wheeling hub is in the locked condition and the vehicle speed is approximately 2.5 mph (4 km/h) or higher.	①	⑫	②	③	⑪	⑨	⑥	④	⑨	⑧	⑦	⑤
The indicator light does not illuminate when the vehicle is stopped (with the ignition key at ON) after traveling, even though the automatic free-wheeling hub is in the locked condition.									①			
The indicator light remains illuminated when the ignition key is turned from OFF to ON.		③			②				①			
The indicator light remains illuminated when (after traveling with the automatic free-wheeling hub in the locked condition) the vehicle is stopped, the automatic free-wheeling hub is changed to the free condition, and the vehicle is then driven at a speed of approximately 2.5 mph (4 km/h) or higher.		⑥			⑤		①		④	③	②	

## NOTE

Number in circle indicates inspection sequence.

The diagram illustrates the electrical wiring for a vehicle, focusing on the ignition and indicator systems. Key components and their connections include:

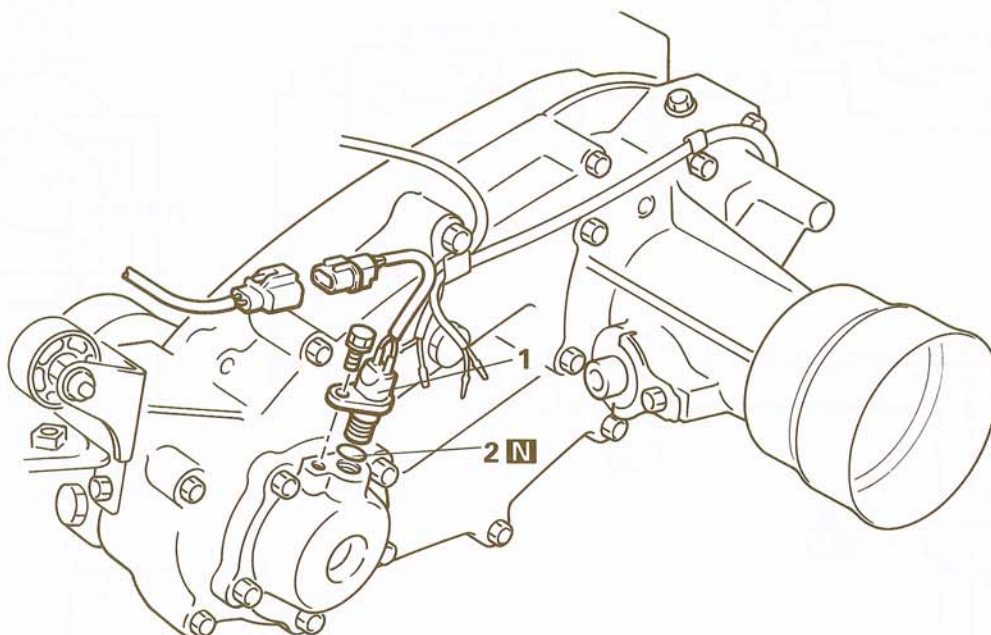
- Battery:** Connected to the main fusible link (1.25-B).
- Main fusible link:** Labeled 1.25-B, it connects the battery to the rest of the system.
- Sub fusible link:** Labeled 0.5-G, it connects the main fusible link to the ignition switch.
- Ignition switch:** Controls the starter motor (A-24) and the ignition coil (A-25).
- Starter motor (A-24):** Labeled 2-W, it is connected to the sub fusible link.
- Ignition coil (A-25):** Labeled 5-W, it is connected to the sub fusible link.
- Multi-purpose fuse:** Labeled 0.85-RL, it protects the indicator circuit.
- Indicator circuit:** Includes a combination meter (C-05) with four indicator lamps (B, Y, L, RL) and a pulse generator (A-11).
- Memory circuit (C-28):** Controls the indicator system, including a pulse detector, vehicle speed detector, locking check circuit, and a memory circuit.
- Wiring:** Various wire colors and gauges are specified throughout the diagram, such as 20-BY, 20-B, 2-W, 5-W, 0.5-G, 1.25-B, 0.85-RL, and 2-B.

B: Black      Br: Brown      G: Green      Gr: Gray      L: Blue      Lg: Light green  
 Ll: Light blue      O: Orange      P: Pink      R: Red      Y: Yellow      W: White



## PULSE GENERATOR REMOVAL AND INSTALLATION

N08RJF



### Removal steps

1. Pulse generator
2. O-ring

16W087

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) **N** : Non-reusable parts

## INSPECTION

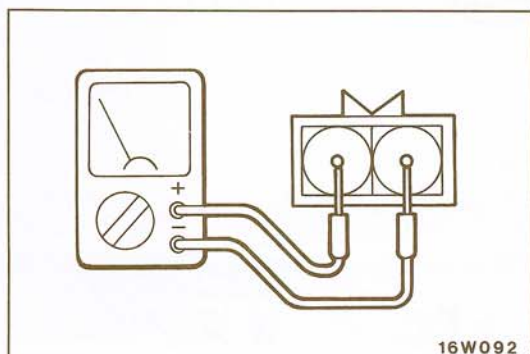
- Check whether or not metal particles are adhered to the pole (iron core) of the pulse generator.
- Check whether or not the installation bolts of the pulse rotor or the pulse generator are loose.  
(For detailed information concerning the pulse rotor, refer to GROUP 21 TRANSMISSION – Transfer.)

## CHECKING PULSE GENERATOR RESISTANCE

Check whether or not the resistance between the terminals shown in the figure is within the standard value range.

**Standard value : 215 – 275  $\Omega$**

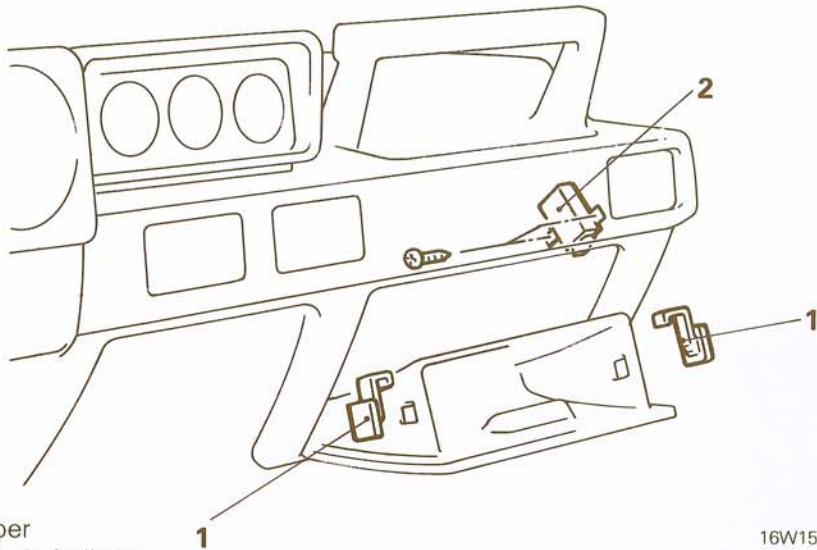
If the resistance is not within the standard value range, replace the pulse generator.



16W092

## **AUTOMATIC FREE-WHEELING HUB INDICATOR CONTROL UNIT REMOVAL AND INSTALLATION**

N08RKAA

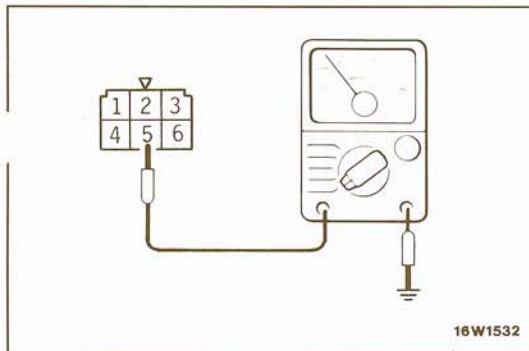


### **Removal steps**

1. Glove compartment stopper
2. Automatic free-wheeling hub indicator control unit

**NOTE**  
Reverse the removal procedures to reinstall.

16W1568



16W1532

### **CHECKING OUTPUT VOLTAGE OF THE VEHICLE-SPEED SENSOR (REED TYPE SWITCH)**

1. Turn the ignition key to ON.
2. Insert a test probe from the rear side of the connector of the automatic free-wheeling hub indicator control unit.
3. Measure the output voltage of the vehicle-speed sensor when the vehicle is moved a distance of about 0.5 m (1.6 ft.).

#### **Standard values :**

**Vehicle-speed sensor OFF : 4V or higher**

**Vehicle-speed sensor ON : 0V**

If there is a malfunction of the vehicle-speed sensor, replace it by replacing the speedometer assembly.





Figure 1. Schematic diagram of the circuit. The circuit consists of a 1000 ohm resistor in series with a parallel combination of two 100 ohm resistors. The total resistance is 1200 ohms.

The circuit is shown in Figure 1. The circuit consists of a 1000 ohm resistor in series with a parallel combination of two 100 ohm resistors. The total resistance is 1200 ohms.



The circuit is shown in Figure 1. The circuit consists of a 1000 ohm resistor in series with a parallel combination of two 100 ohm resistors. The total resistance is 1200 ohms.

# HEATERS AND AIR-CONDITIONING

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N24AA--

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Air is Emitted but Is Not Cool  
Cool Air Flow Is Intermittent  
Insufficient Air Flow  
Insufficient Cooling

### HEATERS

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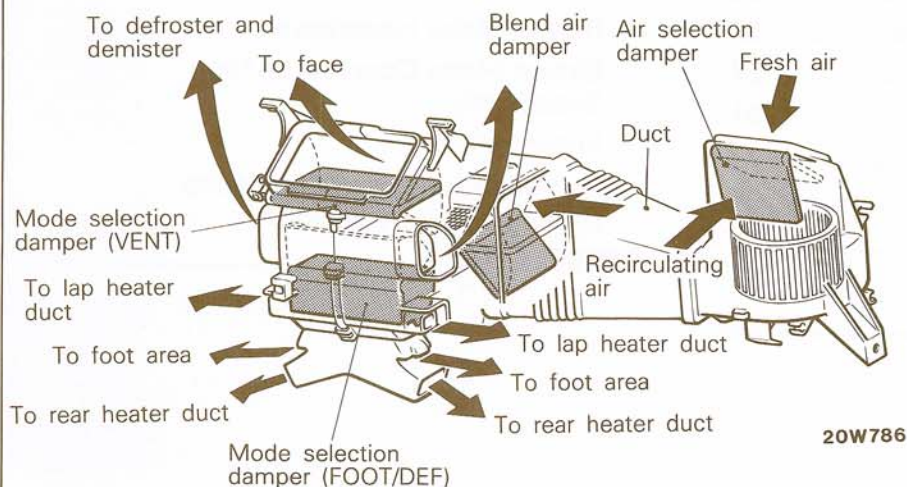
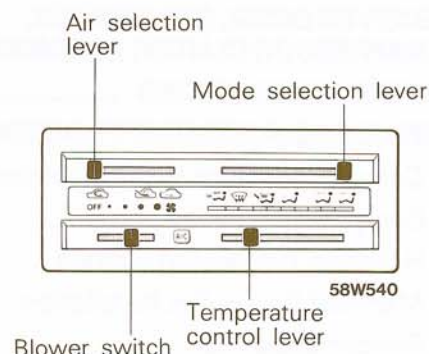
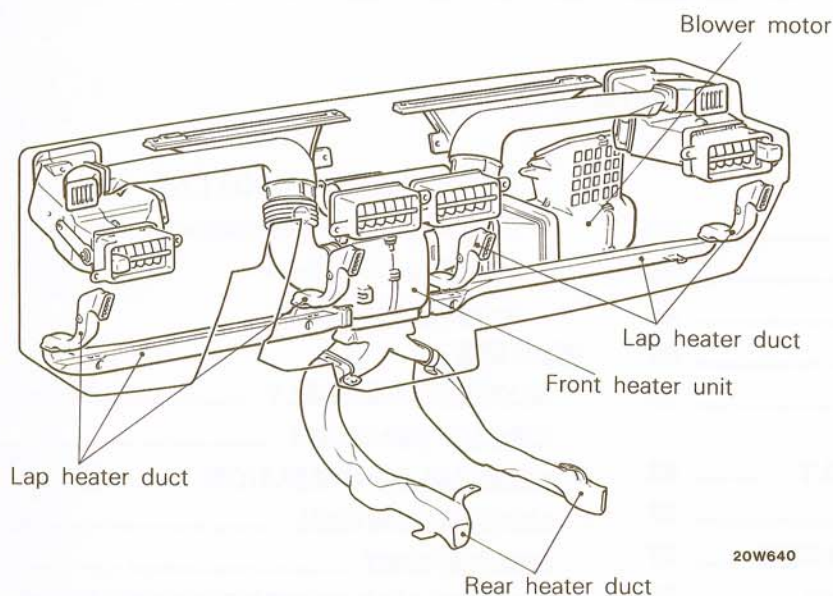
## GENERAL INFORMATION

The heater unit and the blower motor are the separate type.

For temperature control of the heater, the blend air system is used for excellent response and easy temperature adjustment.

Because the damper in the blend air system controls the warm air, which passes through the heater core, and fresh (cool) air, which does not pass through the core, minor adjustments of the temperature are therefore possible, and the temperature can be set to the optimum level.

The lap heater ducts (which provide warm air to the knee area for the front seats) and the rear heater ducts (which provide warm air to the foot area for the rear seats) from the heater unit, plus the warm-water-type rear heater, assure heating comfort throughout.



## TROUBLESHOOTING

N24EAAC

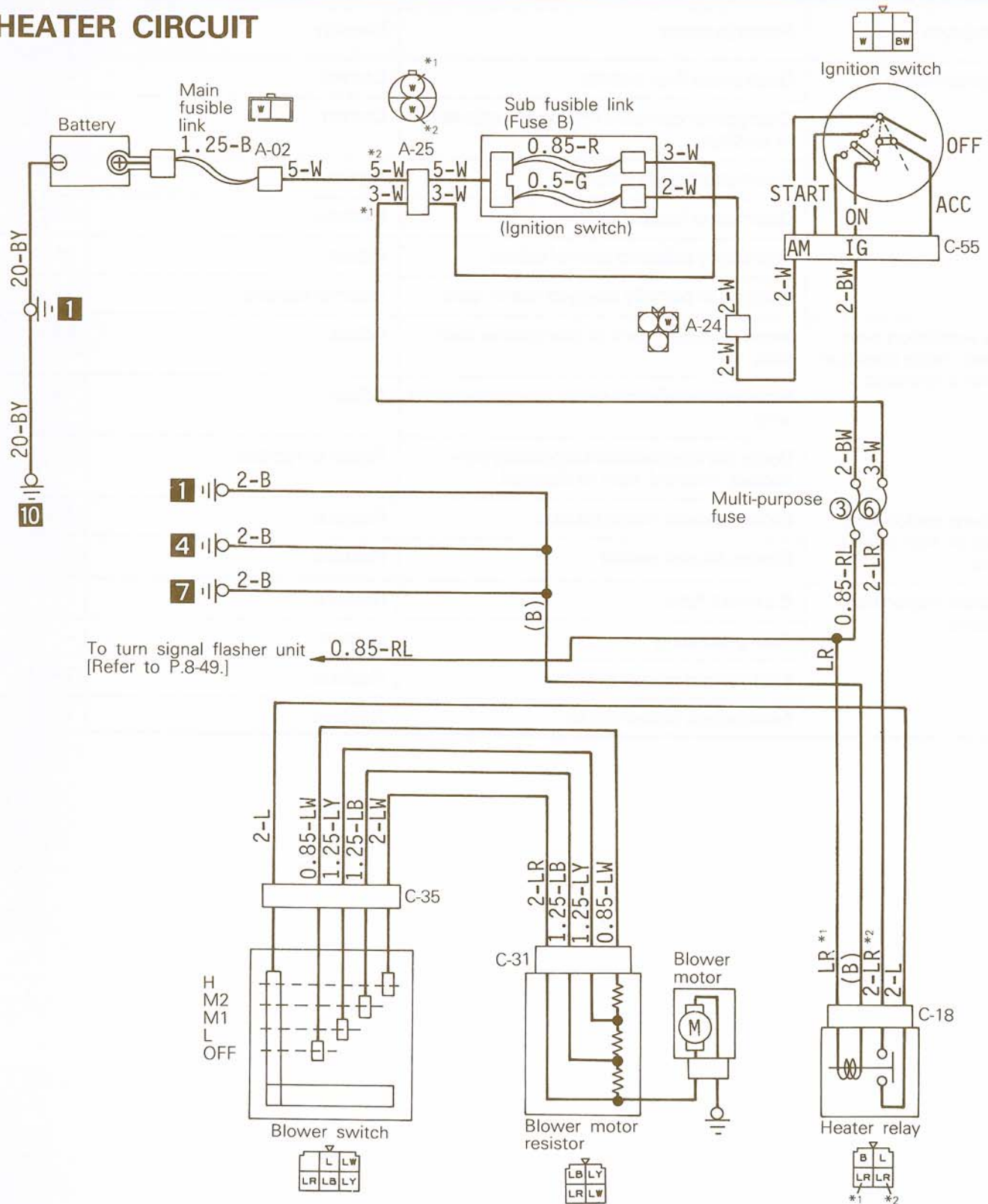
Symptom	Probable cause	Remedy	Reference page
Improper heat	Obstructed floor outlets	Correct	–
	Changeover dampers improperly adjusted or binding	Correct	24-5
	Thermostat malfunction	Replace	–
	Obstructed heater hoses	Replace	24-12
	Improperly adjusted control cables	Adjust	24-5
	Plugged or partially plugged heater core	Clean or replace	24-13
No ventilation even when mode selection lever is operated	Incorrect adjustment of changeover dampers	Adjust	24-5
	Incorrect installation mode selection control wire	Adjust	24-5
	Ducts are incorrectly/incompletely connected, crushed, bent or clogged.	Repair or replace	–
Blower motor operates on high speed only	Broken blower motor resistor	Replace	24-15
	Broken blower switch	Replace	24-10
Blower motor inoperative	Burnt-out fuse	Replace	–
	Poor grounding	Correct	–
	Malfunction blower switch	Replace	24-10
	Malfunction blower motor	Replace	24-14



## CIRCUIT DIAGRAM

N24AZ--

## HEATER CIRCUIT



## Remark

For information concerning the ground points (example: **1**), refer to P.8-7.

## Wiring color code

B: Black

Br: Brown

G: Green

Gr: Gray

L: Blue

Lg: Light green

LI: Light blue

O: Orange

P: Pink

R: Red

Y: Yellow

W: White

37W614

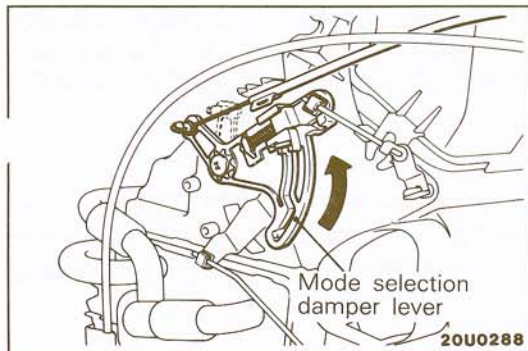
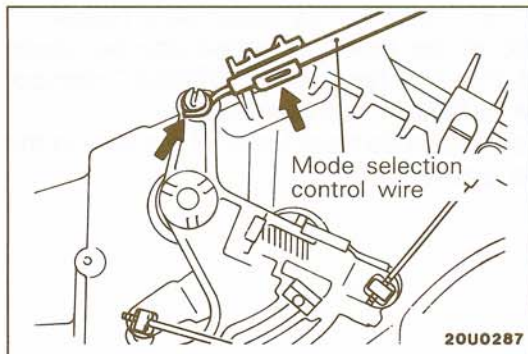
## SERVICE ADJUSTMENT PROCEDURES

### TEMPERATURE CONTROL SYSTEM ADJUSTMENT

N24FAAD

#### MODE SELECTION LEVER

1. Move the mode selection lever to each position and check the air flow with the blower operating.
2. If the air flow is not correct for any position of the mode selection lever, adjust the mode selection control wire. If this adjustment does not help, adjust the damper.



#### Adjustment of the Mode Selection Control Wire

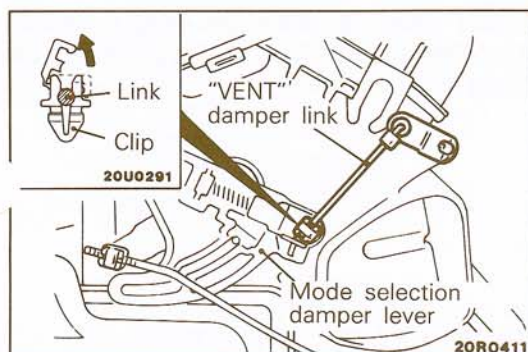
1. Disconnect the defroster duct and the lap heater duct (B) at the driver's seat side from the heater unit.
2. Disconnect the mode selection control wire from the mode selection damper lever and the heater unit's clip.

3. Set the mode selection lever of temperature control to the "VENT" position.
4. Turn the mode selection damper lever all the way in the direction of the arrow.
5. Connect the mode selection control wire to the mode selection damper lever, and to the clip part of the heater unit.

#### Caution

**Be careful that the lever does not move when clipping.**

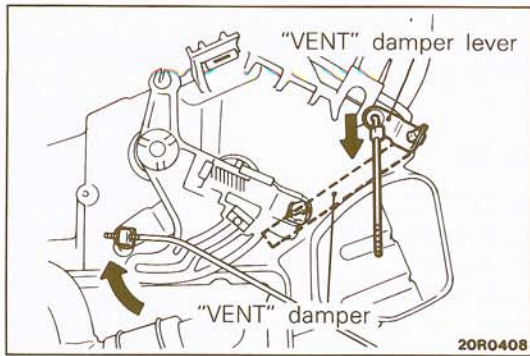
6. Check to be sure that the mode selection lever moves smoothly to each position and that the air flow is correct for each position.
7. If the air flow is not correct for any position of the mode selection lever even after the mode selection control wire has been adjusted, adjust the "VENT" damper and the "FOOT/DEF" damper.
8. Connect the driver's side defroster duct and lap heater duct (B) to the heater unit.



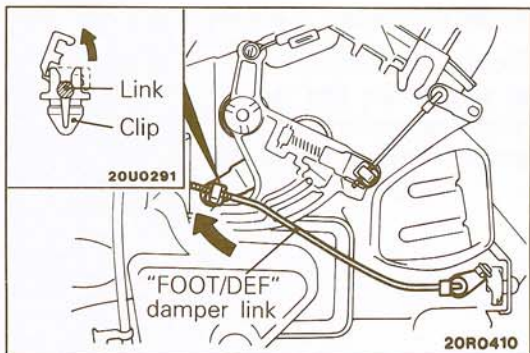
#### Adjustment of the Damper

1. Disconnect the mode selection control wire from the mode selection damper lever and the heater unit's clip.
2. Adjust the "VENT" damper as described below:
  - (1) Unfasten the clip of the mode selection damper lever, and disconnect the link for the "VENT" damper from the mode selection damper lever.

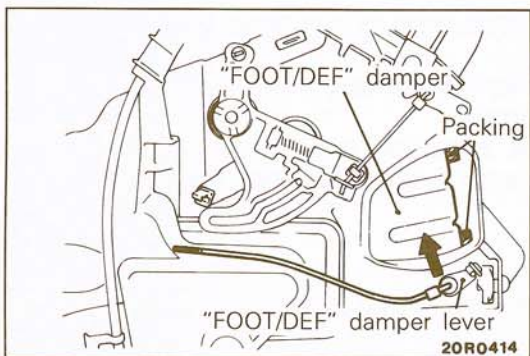




- (2) Turn the mode selection damper lever all the way in the direction of the arrow.
- (3) Pull the "VENT" damper lever completely downward and move the "VENT" damper to the position (not visible) shown in the figure.
- (4) Attach the end of the link for the "VENT" damper to the mode selection damper lever.



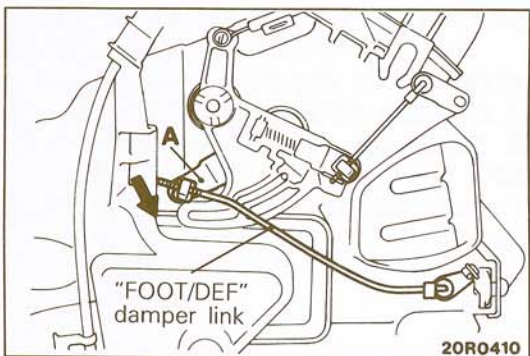
3. Adjust the "FOOT/DEF" damper as described below.
  - (1) Unfasten the clip of the mode selection damper lever, and disconnect the link for the "FOOT/DEF" damper from the mode selection damper lever.
  - (2) Turn the mode selection damper lever all the way in the direction of the arrow.



- (3) Pull the "FOOT/DEF" damper lever completely upward and move the "FOOT/DEF" damper to the position shown in the figure. (The packing should contact the case.)

#### NOTE

Confirmation can be made that the "FOOT/DEF" damper is raised upward through the defroster blower outlet of the heater unit (with defroster duct disconnected).



- (4) Attach the end of the link for the "FOOT/DEF" damper to the mode selection damper lever.

#### NOTE

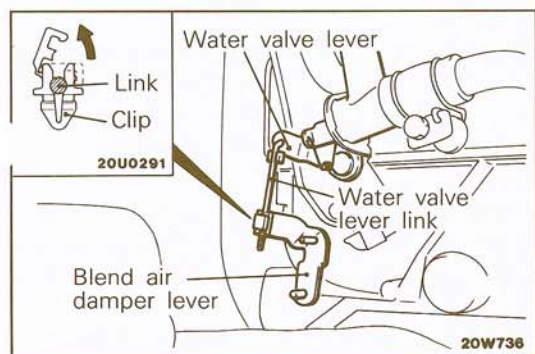
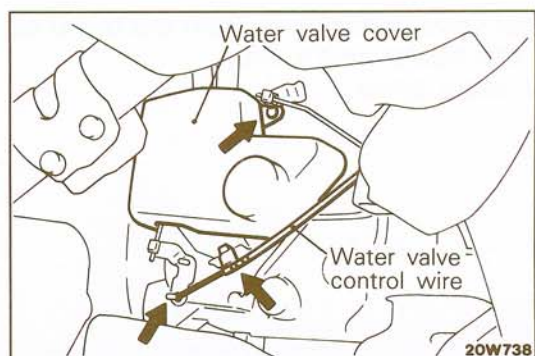
When attaching it, pull the lever end (A in the figure) in the direction of the arrow.

4. Referring to the section which explains the adjustment of the mode selection control wire, connect the control wire to the mode selection damper lever.



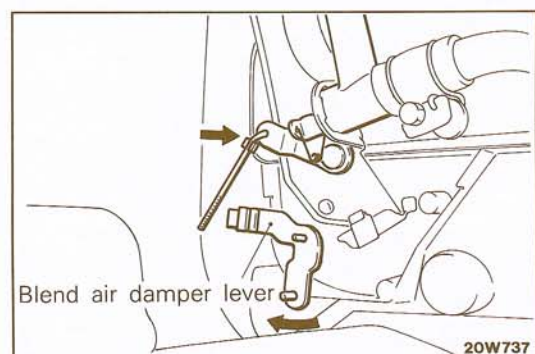
**TEMPERATURE CONTROL LEVER**

1. Move the temperature control lever from its extreme left position to its extreme right position and check to be sure that it moves correctly and smoothly to each position.
2. Then move the temperature control lever to the extreme left position, and check to be sure that warm air does not come out when the blower is operated.
3. If the air flow is not correct in the above step, adjust the temperature control wire.

**Adjustment of the Blend Air Damper**

1. Move the warm water flow control lever to the extreme left position.
2. Disconnect the water valve control wire from the blend air damper lever and the heater unit's clip.
3. Remove the water valve cover.

4. Unfasten the clip of the blend air damper lever, and disconnect the link for water valve lever from the blend air damper lever.



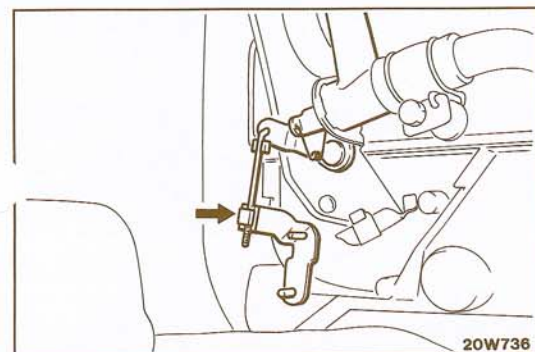
5. Push the water valve lever all the way inward so that the water valve is at the closed position.
6. Turn the blend air damper lever all the way in the direction of the arrow so that the blend air damper is completely closed at the lower most position.

7. Attach the end of the link for the water valve lever to the blend air damper lever.
8. Install the water valve cover.
9. After connecting the water valve control wire to the blend air damper lever, connect to the clip part of the heater unit.

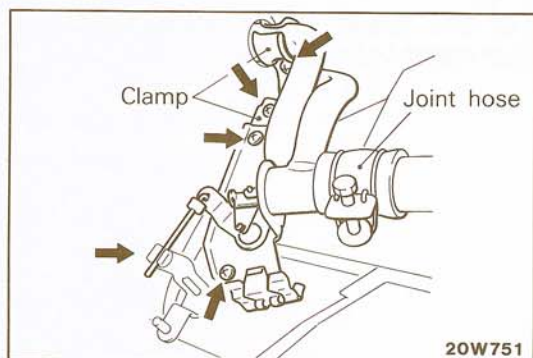
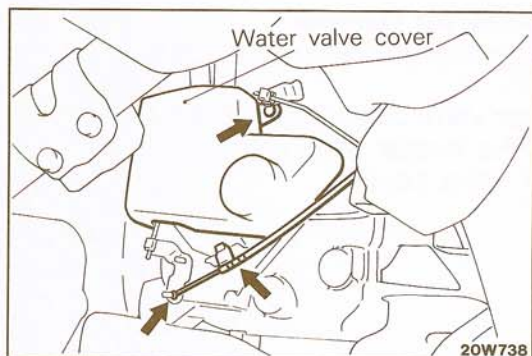
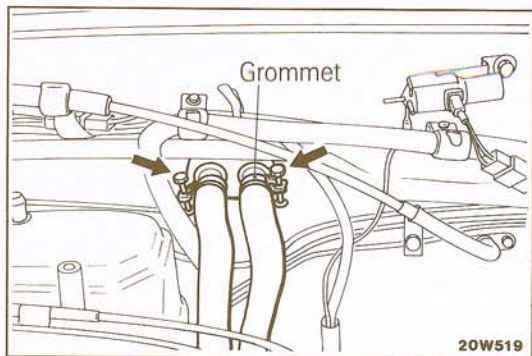
**Caution**

**Be careful that the lever does not move when clipping.**

10. Check to be sure that the temperature control lever operates smoothly at each position. Also check to be sure that the blend air damper is completely closed when the temperature control lever is moved to the extreme left position and the extreme right position.







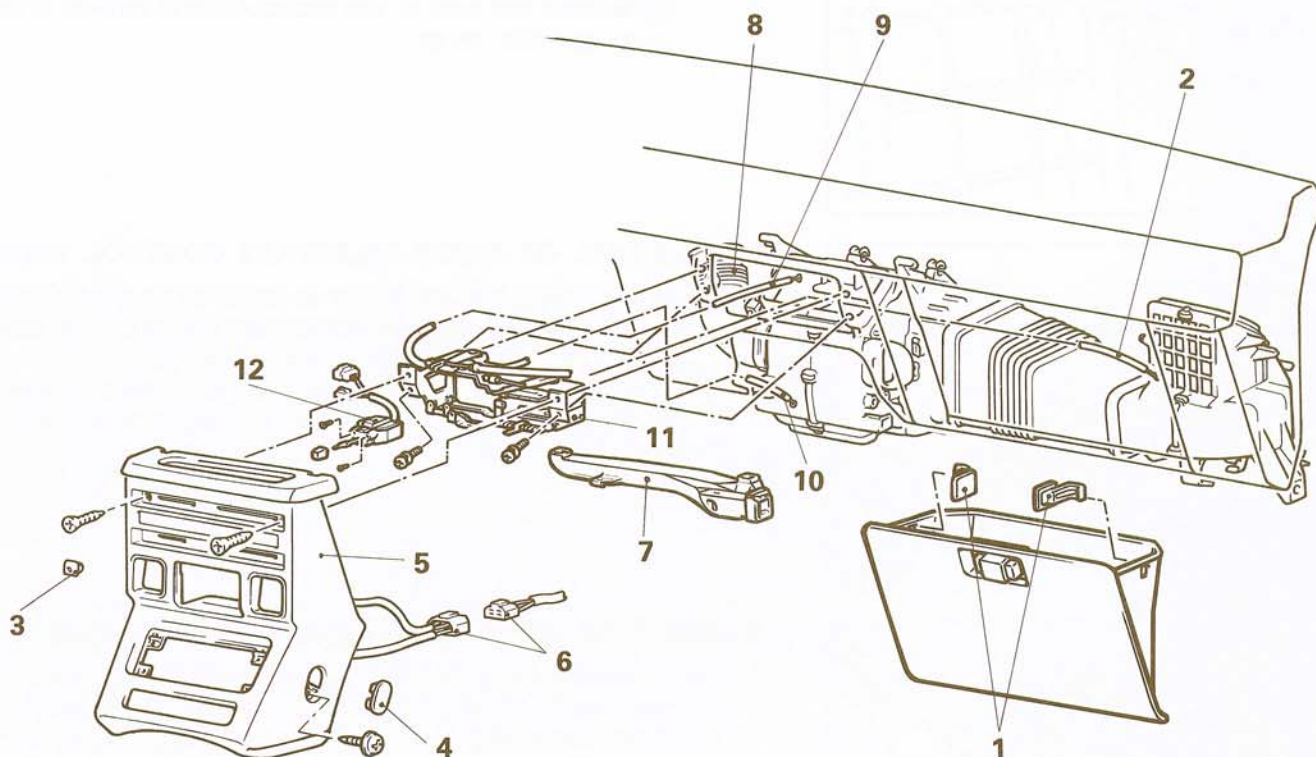
## WATER VALVE REPLACEMENT

N24FBAC

1. Set the temperature control lever to the extreme right position.
2. Remove the radiator drain plug, and then drain the engine coolant.
3. Remove the air filter
4. Remove the heater hose clamp to disconnect the heater hose.
5. Disconnect the water valve control wire from the blend air damper lever and the heater unit's clip.
6. Remove the water valve cover.
7. Remove the piping clamp.
8. Unfasten the clip of blend air damper lever, and disconnect the link for the water valve lever from the blend air damper lever.
9. Remove the joint hose clamp.
10. Cut the joint hose.
11. Remove the water valve from the heater core.
12. Apply a coating of soapy water to the inside surface of the new joint hoses, and then connect them to the pipe part of the water valve and the heater core.
13. Connect the link, and then install the heater cover.

# HEATER CONTROL REMOVAL AND INSTALLATION

N24GA--



20W824

## Removal steps

- ◆◆ 1. Glove box stoppers
- ◆◆ ◆◆ 2. Air selection control wire
- 3. Knobs
- 4. Plugs
- 5. Center panel
- 6. Connection of center panel wiring harness to front wiring harness connector
- 7. Lap heater duct (B)
- 8. Defroster duct
- ◆◆ ◆◆ 9. Mode selection control wire
- ◆◆ ◆◆ 10. Water valve control wire
- ◆◆ 11. Heater control assembly
- 12. Blower switch

## NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal".
- (3) ◆◆◆ : Refer to "Service Points of Installation".



20W760

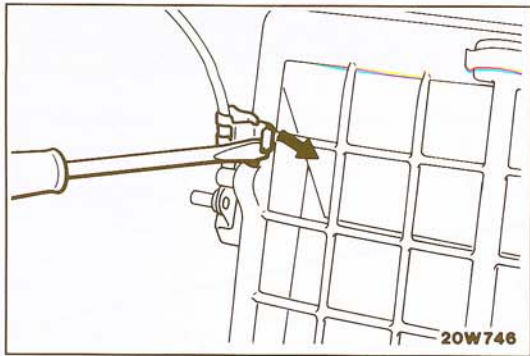
## SERVICE POINTS OF REMOVAL

N24GBAE

### 1. REMOVAL OF GLOVE BOX STOPPERS

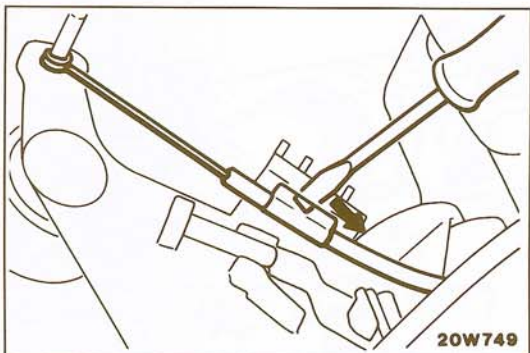
- (1) Open the glove box lid.
- (2) Remove the glove box stopper.
- (3) Pull the glove box outward.





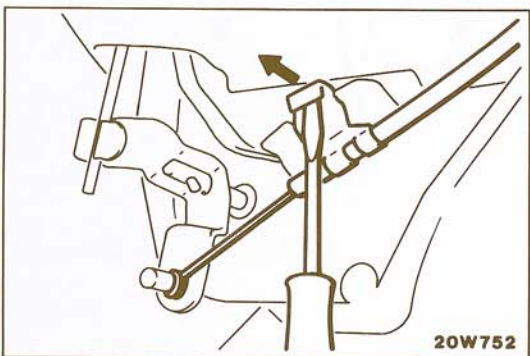
## 2. REMOVAL OF AIR SELECTION CONTROL WIRE

- (1) Use a screwdriver to pry and remove the clip that holds the outer cable of the air selection control wire.
- (2) Disconnect the inner cable of the air selection control wire from the end of the recirculation/fresh-air change-over damper lever.



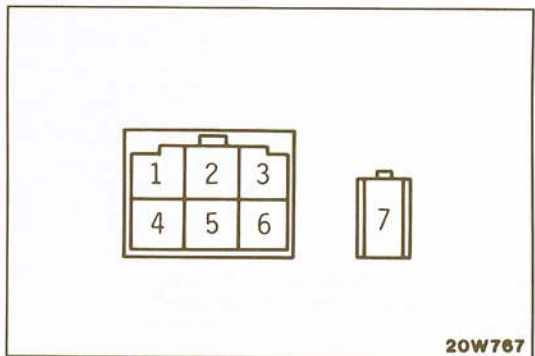
## 9. REMOVAL OF MODE SELECTION CONTROL WIRE

- (1) While using a screwdriver to pry the clip that holds the outer cable of the mode selection control wire, pull the outer cable to remove it from the clip.
- (2) Disconnect the inner cable of the mode selection control wire from the end of the mode selection damper lever.



## 10. REMOVAL OF WATER VALVE CONTROL WIRE

- (1) Use a screwdriver to pry and remove the clip that holds the outer cable of the water valve control wire.
- (2) Disconnect the inner cable of the water valve control wire from the end of the water valve control lever.



## INSPECTION

### BLOWER SWITCH

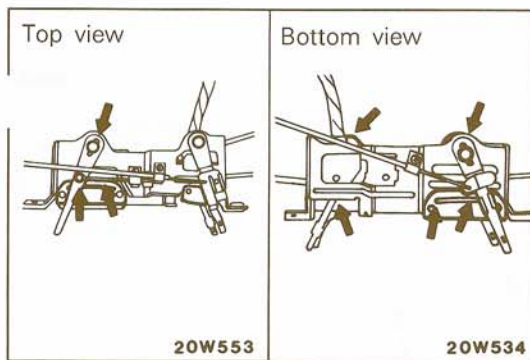
N24GCAC

Operate the switch, and check the continuity between the terminals.

Terminal	2	1	4	5	6	7
Switch position						
OFF						
•	○	○				○
•	○		○			○
•	○			○		○
•	○				○	○

#### NOTE

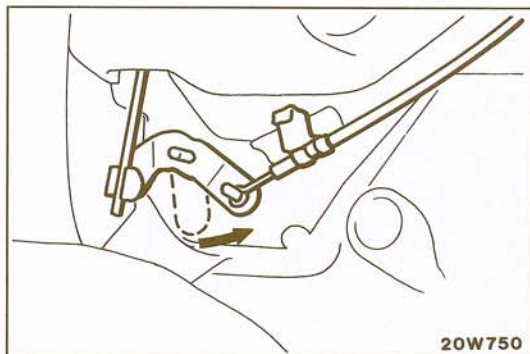
○—○ indicates that there is continuity between the terminals.

**SERVICE POINTS OF INSTALLATION**

N24GDAD

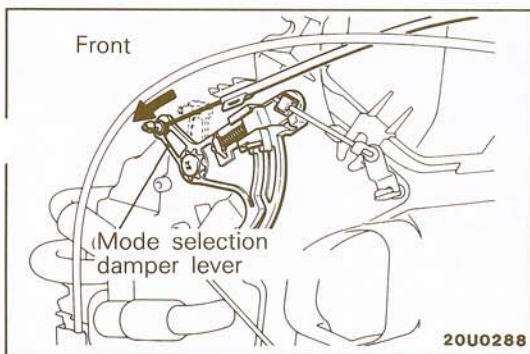
**11. APPLICATION OF GREASE TO HEATER CONTROL ASSEMBLY**

Apply the chassis grease to all the moving parts of the heater control assembly.


**10. INSTALLATION OF WATER VALVE CONTROL WIRE**

Connect the water valve control wire to the water valve control lever by following the steps below.

- (1) Move the temperature control lever to the extreme left position
- (2) With the water-valve control lever pressed inward in the direction indicated by the arrow, connect the inner cable of the water-valve control wire to the end of the water-valve control lever, and then secure the outer cable by using a clip.


**9. INSTALLATION OF MODE SELECTION CONTROL WIRE**

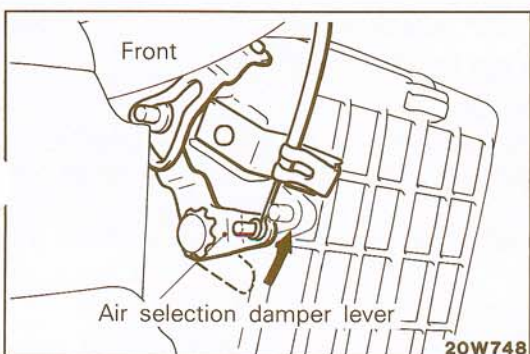
Connect the mode selection control wire to the mode selection damper lever by following the steps below.

- (1) Move the mode selection lever to the  position.
- (2) With the mode selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the mode selection control wire to the end of the mode selection lever, and then secure the outer cable by using a clip.

**2. INSTALLATION OF AIR SELECTION CONTROL WIRE**

Connect the air selection control wire to the air selection damper lever by following the steps below.

- (1) Move the air selection control lever to the  position.



- (2) With the air selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the air selection control wire to the end of the air selection lever, and then secure the outer cable by using a clip.



## HEATER UNIT

## REMOVAL AND INSTALLATION

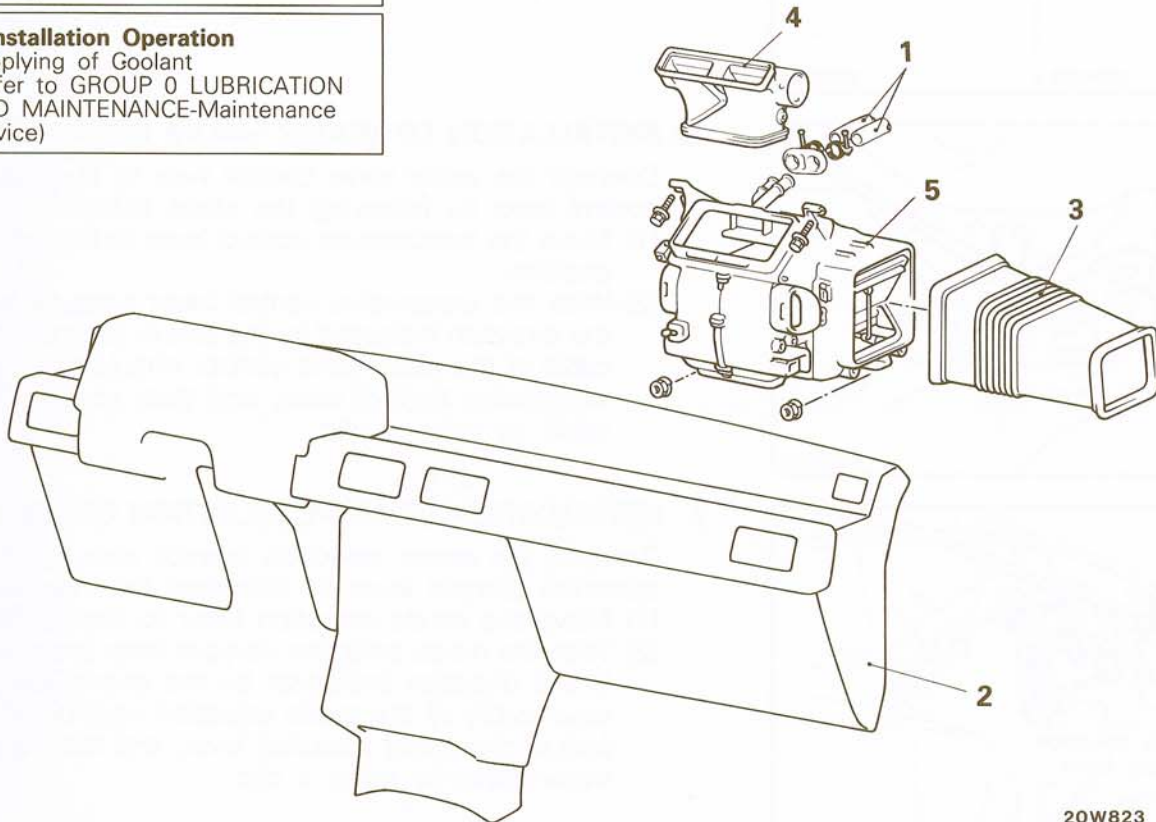
N241A-

**Pre-removal Operation**

- Draining of Coolant  
(Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

**Post-installation Operation**

- Supplying of Goolant  
(Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)



20W823

**Removal steps**

- ◆◆ 1. Heater hose connection
- ◆◆ ◆◆ 2. Instrument panel
- 3. Duct
- 4. Center ventilator duct
- 5. Heater unit

**NOTE**

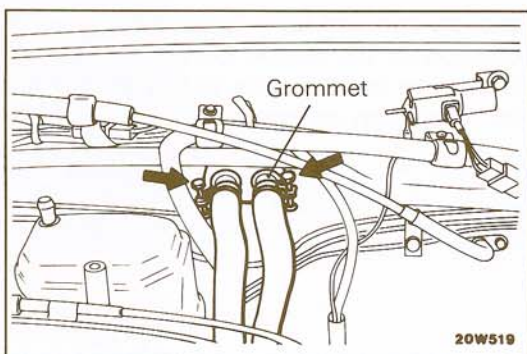
- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Removal"
- (3) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N241BAE

**1. DISCONNECTION OF HEATER HOSES**

- (1) Remove the air filter.
- (2) Set the temperature lever to the far right position.
- (3) Remove the radiator drain plug and then drain the engine coolant.
- (4) Remove the heater hose clamp, and disconnect the heater hose.



20W519

**2. REMOVAL OF INSTRUMENT PANEL**

Refer to GROUP 23 BODY-Instrument Panel.

**INSPECTION**

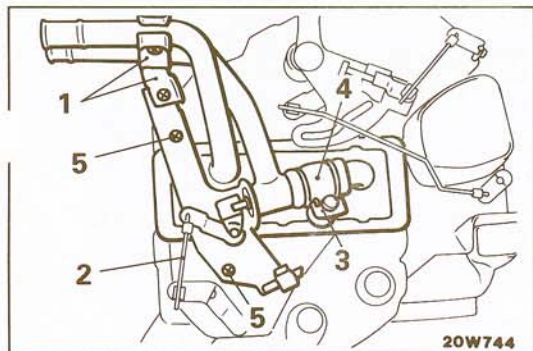
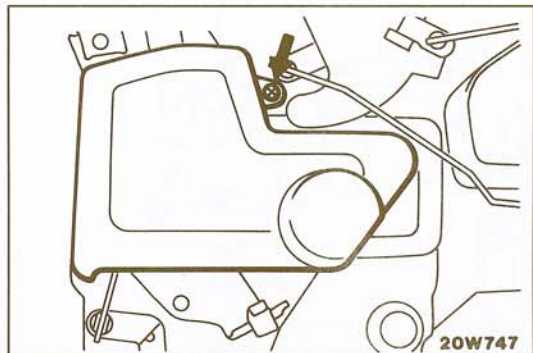
N24ICAA

- Check the damper and link mechanism for operation.
- Check the heater core for clogging or water leakage.
- Check the water valve for operation and clogging.

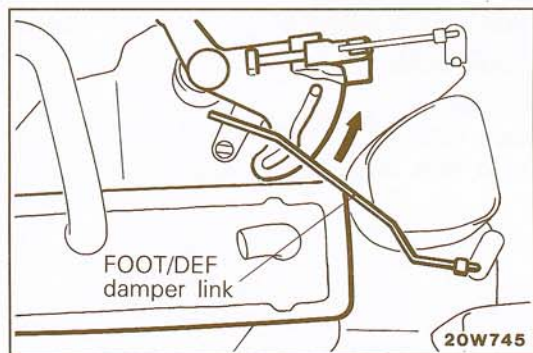
**HEATER CORE REPLACEMENT**

N24IDAD

1. Remove the water valve cover.



2. Remove the following parts to remove the water valve.
  - (1) Piping clamp
  - (2) Water valve link
  - (3) Joint hose clamp
  - (4) Joint hose
  - (5) Screw



3. Remove the FOOT/DEF damper link from the mode selection damper lever.
4. Move the damper lever to the position at which the mode selection damper lever does not protrude very much to the heater core side.
5. Remove the heater core. If at this time the damper lever and heater core are in contact, making removal difficult, remove the damper lever.

**Caution**

**To prevent interference between the heater core and case, use care not to peel the heater core felt away when the heater core is removed.**

6. After installing the heater core and water valve, install the link for each damper after referring to the "Service adjustment procedures" section.

**SERVICE POINTS OF INSTALLATION**

N24IEAD

**2. INSTALLATION OF INSTRUMENT PANEL**

Refer to GROUP 23 BODY-Instrument Panel.

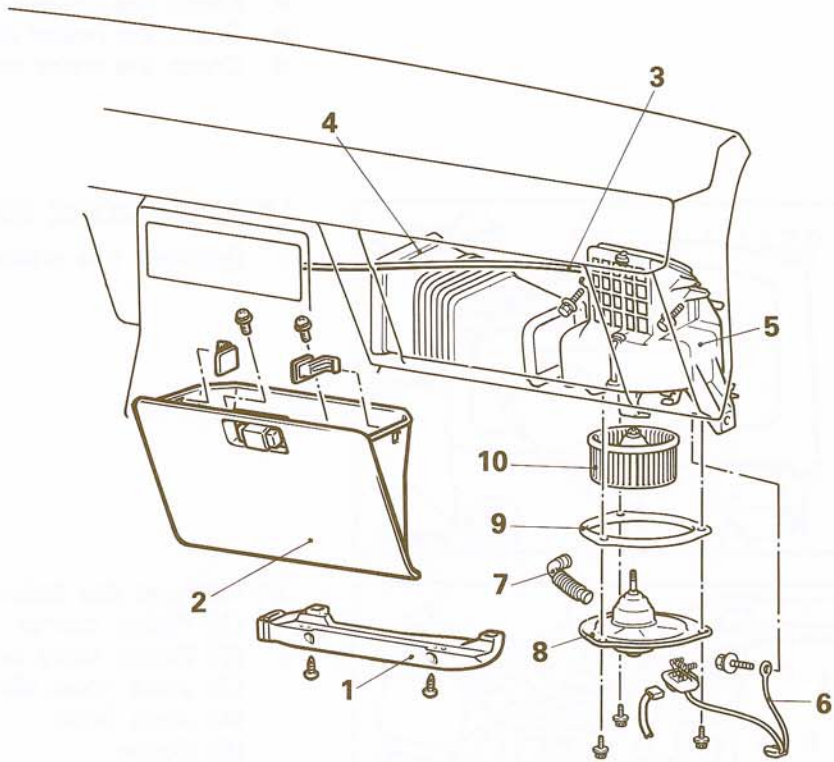


**BLOWER ASSEMBLY****REMOVAL AND INSTALLATION**

N24K

**Removal steps**

- 1. Lap heater duct (C)
- ↔ 2. Glove box
- ↔ ↔ 3. Air selection control wire
- ↔ 4. Duct
- ↔ 5. Blower assembly
- 6. Resistor
- 7. Hose
- 8. Blower motor
- 9. Packing
- 10. Fan



20W806

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ↔ ↔ : Refer to "Service Points of Installation".



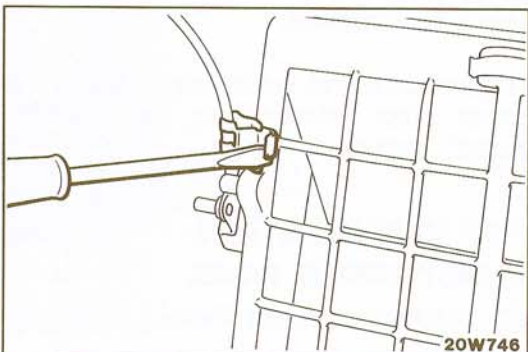
20W760

**SERVICE POINTS OF REMOVAL**

N24KBAE

**2. REMOVAL OF GLOVE BOX**

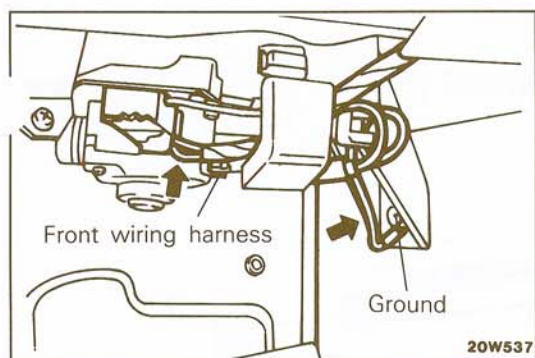
- (1) Open the glove box lid.
- (2) Remove the glove box stopper.
- (3) Remove the glove box from the hinge.



20W746

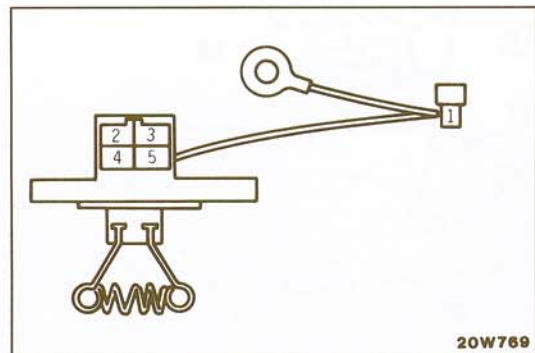
**3. REMOVAL OF AIR SELECTION CONTROL WIRE**

- (1) Use a screwdriver to pry and remove the clip that holds the outer cable of the air selection control wire.
- (2) Disconnect the inner cable of the air selection control wire from the end of the air selection damper lever



### 5. REMOVAL OF BLOWER ASSEMBLY

- (1) Disconnect the connector of the front wiring harness (connected to the resistor).
- (2) Remove the ground installation bolt. (Tightened together with the blower assembly.)
- (3) Remove the blower assembly installation bolt.



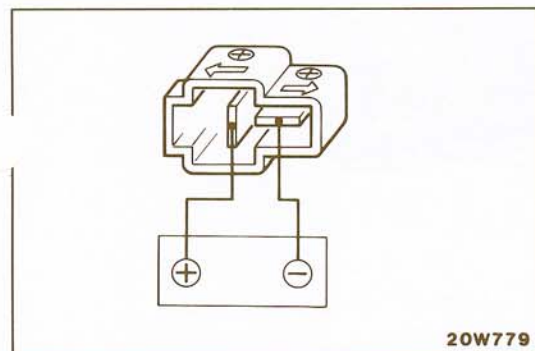
### INSPECTION

N24KCAD

#### RESISTOR

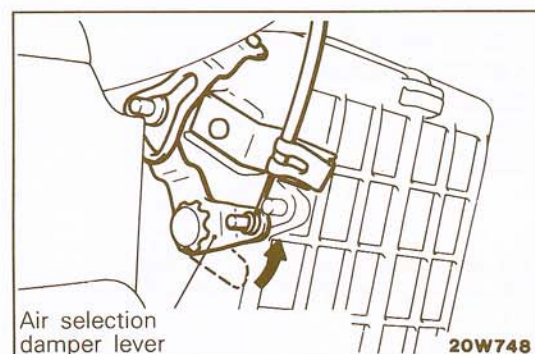
Connect an ohmmeter to each terminal of the resistor and measure the resistance.

Terminal connections	Resistance
1 – 2 ( $M_1$ )	Approx. $1.22\Omega$
1 – 3 ( $M_2$ )	Approx. $0.41\Omega$
1 – 4 (Low)	Approx. $2.25\Omega$
1 – 5 (High)	Approx. $0\Omega$



#### BLOWER MOTOR

- (1) Connect the blower motor terminals directly to the battery and check that the blower motor operates smoothly.
- (2) Next, reverse the polarity and check that the blower motor operates smoothly in the reverse direction.




### SERVICE POINTS OF INSTALLATION

N24KDAC

#### 3. INSTALLATION OF AIR SELECTION CONTROL WIRE

Connect the air selection control wire to the air selection damper lever by following the steps below.

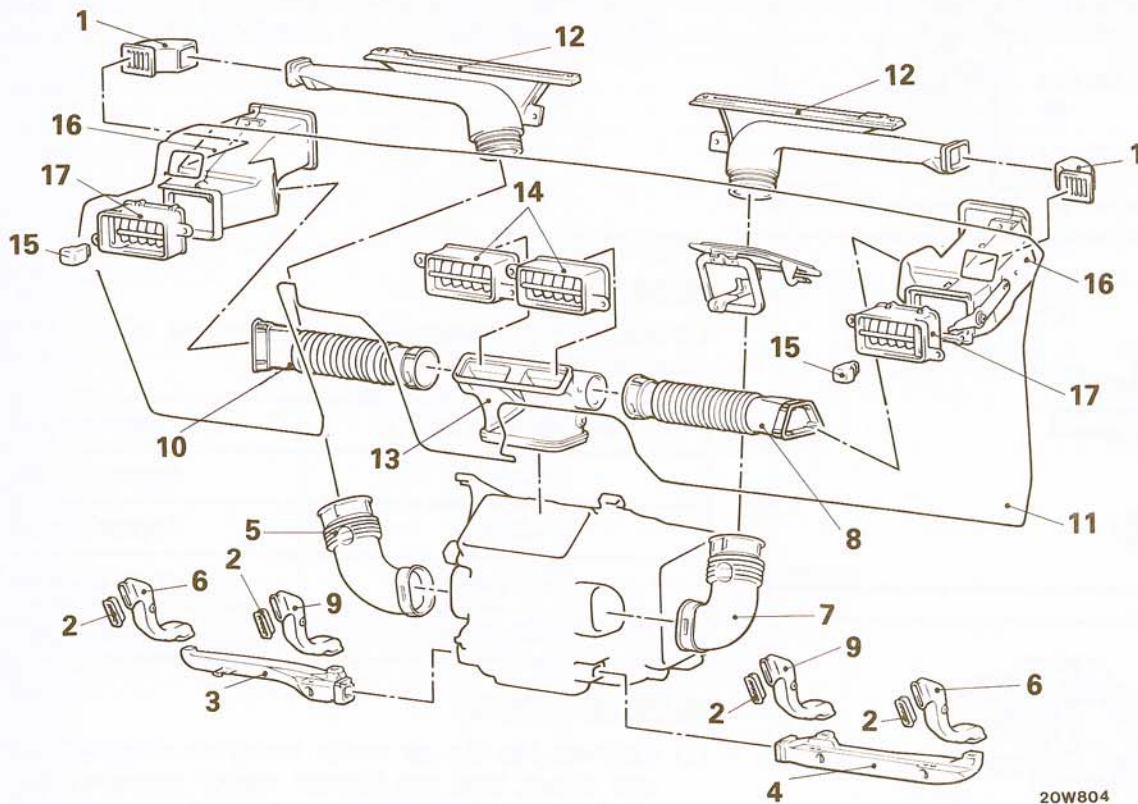
- (1) Move the air selection control lever to the  position.
- (2) With the air selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the air selection control wire to the end of the air selection damper lever, and then secure the outer cable by using a clip.



## VENTILATORS

### REMOVAL AND INSTALLATION (Ventilators of instrument panel)

N24MA

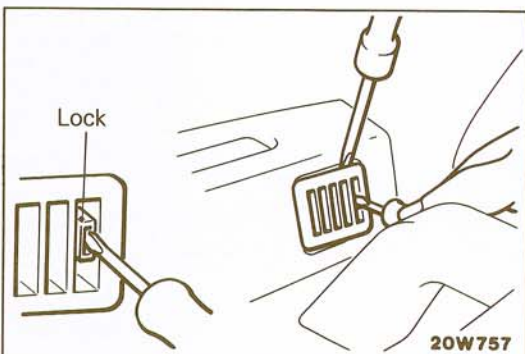


#### Removal steps

- |    |  |    |                            |
|----|--|----|----------------------------|
| ◆◆ | 1. Demister grill  | ◆◆ | 11. Instrument panel       |
| ◆◆ | 2. Lap heater garnish                                    | ◆◆ | 12. Defroster duct         |
|    | 3. Lap heater duct (B)                                   |    | 13. Center ventilator duct |
|    | 4. Lap heater duct (C)                                   |    | 14. Center air outlet      |
|    | 5. Defroster duct (L.H.)                                 |    | 15. Knob                   |
| ◆◆ | 6. Lap heater duct (A)                                   |    | 16. Air duct               |
| ◆◆ | 7. Defroster duct (R.H.)                                 |    | 17. Side air outlet        |
| ◆◆ | 8. Air duct (R.H.) (Only vehicles with air conditioner)  |    |                            |
| ◆◆ | 9. Lap heater duct (A)                                   |    |                            |
| ◆◆ | 10. Air duct (L.H.) (Only vehicles with air conditioner) |    |                            |

#### NOTE

- (1) Reverse the removal procedures to reinstall.  
 (2) ◆◆ : Refer to "Service Points of Removal".

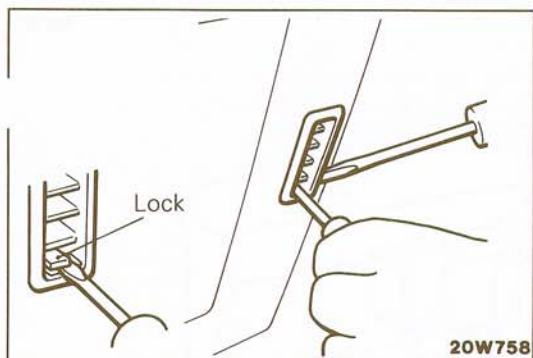


### SERVICE POINTS OF REMOVAL

N24MBAG

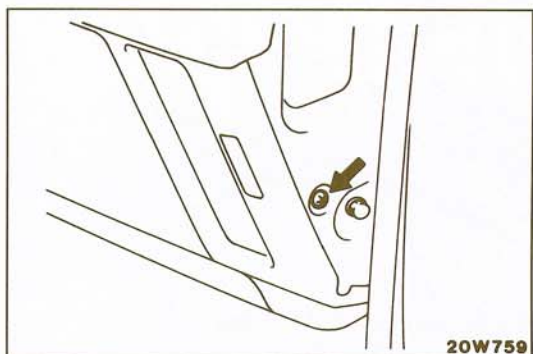
#### 1. REMOVAL OF DEMISTER GRILL

While using a screwdriver to pry the lock of the demister grill, use another screwdriver to pry the end of the demister grill to remove it.



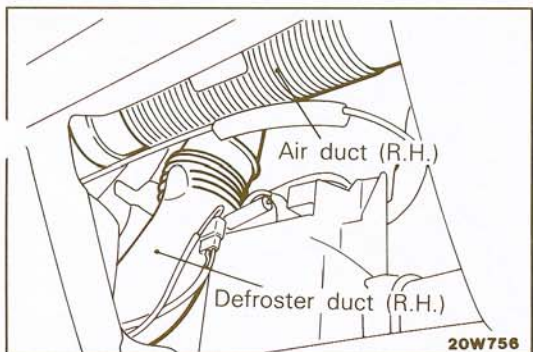
## 2. REMOVAL OF LAP HEATER GARNISH

While using a screwdriver to pry the lock of the lap heater garnish, use another screwdriver to pry the end of the lap heater garnish to remove it.



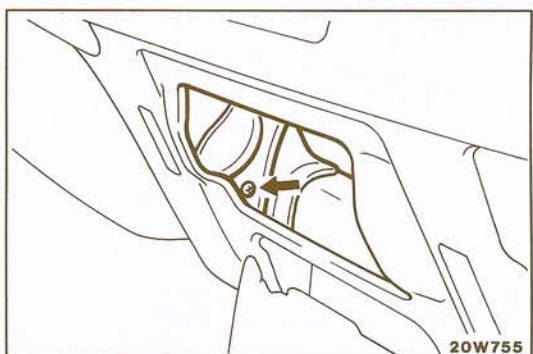
## 6. REMOVAL OF LAP HEATER DUCT (A)

Remove the screw at the side of the instrument panel, and then remove the lap heater duct (A).



## 7. REMOVAL OF DEFROSTER DUCT (R.H.)/8. AIR DUCT (R.H.)

- (1) Open the glove box lid.
- (2) Remove the glove box stopper.
- (3) Pull the glove box outward.
- (4) Remove the defroster duct (R.H.)
- (5) Remove the air duct (R.H.)



## 9. REMOVAL OF LAP HEATER DUCT (A)

- (1) Remove the center panel. (Refer to GROUP 23 BODY – Floor console)
- (2) Remove the heater control assembly. (Refer to P.24-9)
- (3) Insert a hand through the heater control assembly installation hole in the instrument panel, and remove the installation screw of the lap heater duct (A).



## 10. REMOVAL OF AIR DUCT (L.H.)

- (1) Remove the combination meter. (Refer to GROUP 8 HI ELECTRICAL-Meters and Gauges)
- (2) Remove the air duct (L.H.).

## 11. REMOVAL OF INSTRUMENT PANEL

Refer to GROUP 23 BODY-Instrument Panel.

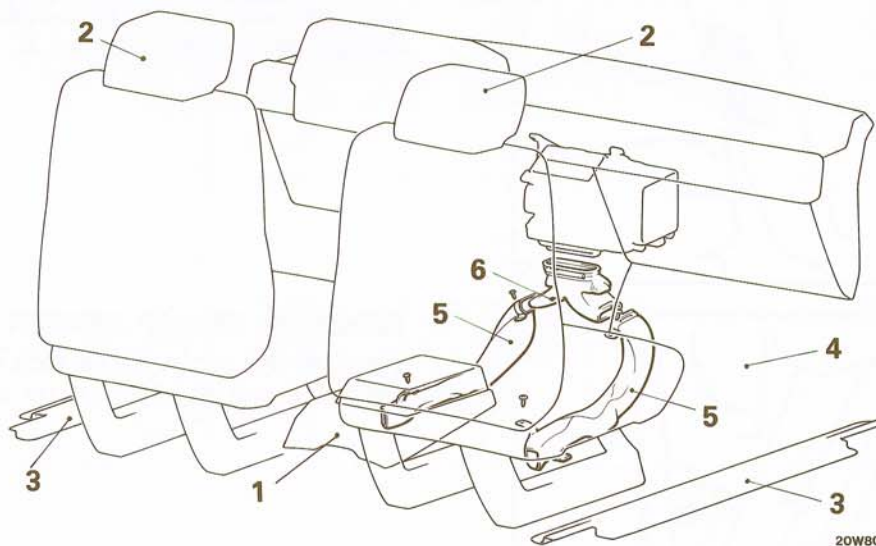


## REMOVAL AND INSTALLATION (Rear heater ducts)

N24MA--

## Removal steps

1. Floor console
2. Front seat
3. Rail cover
4. Carpet
5. Rear heater duct (B)
6. Rear heater duct (A)



NOTE  
Reverse the removal procedures to reinstall.

## REMOVAL AND INSTALLATION (Rear ventilator duct)

N24MA--

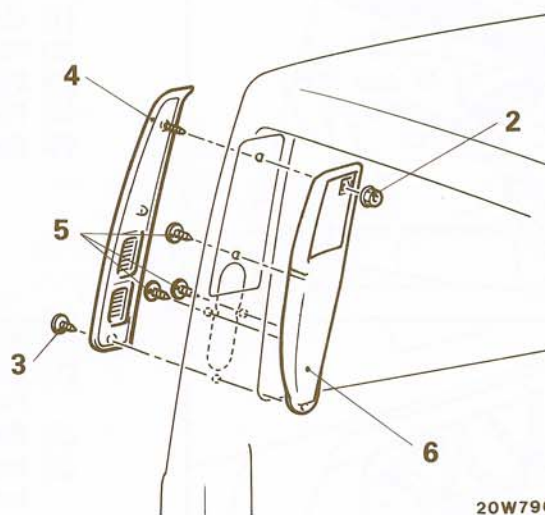


18W826

## Removal steps



1. Upper quarter trim
2. Nut
3. Screw
4. Air outlet garnish
5. Screw
6. Rear ventilator duct



20W796

NOTE  
(1) Reverse the removal procedures to reinstall.  
(2) : Refer to "Service Points of Removal".

## SERVICE POINTS OF REMOVAL

N24MBAH


## 1. REMOVAL OF UPPER QUARTER TRIM



Refer to GROUP 23 BODY-Trims

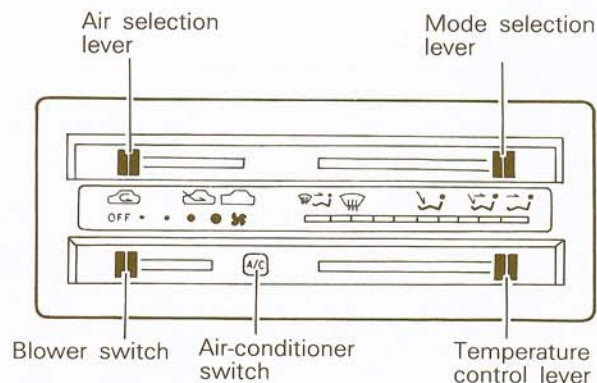
## GENERAL INFORMATION

N24BBAC

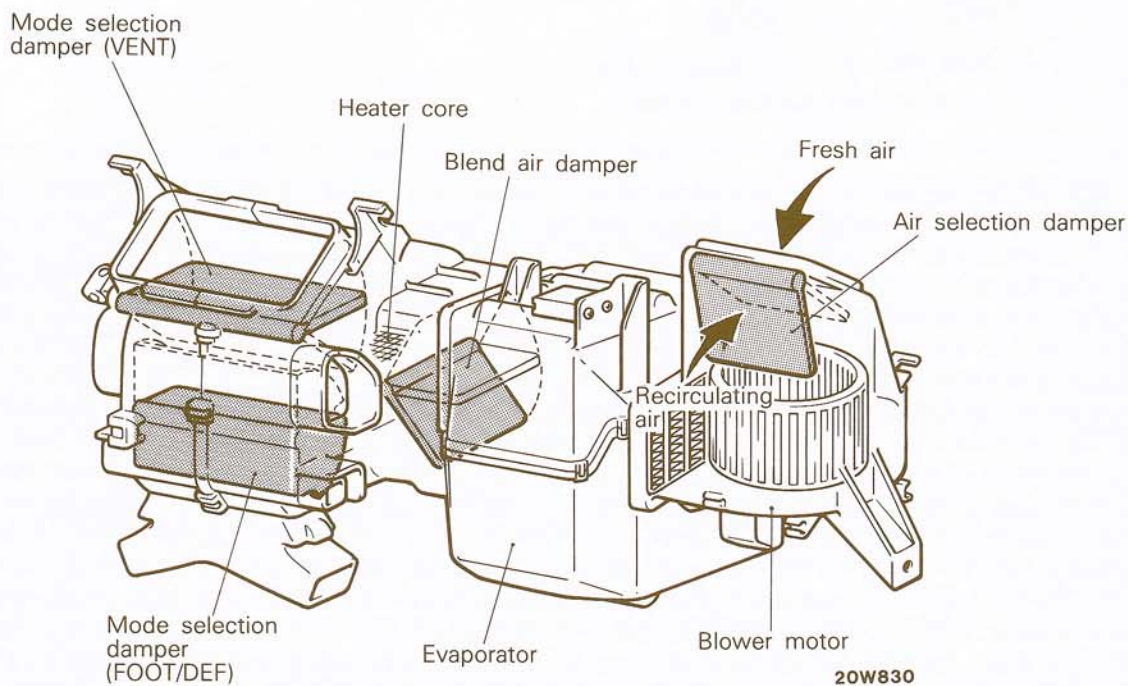
The air conditioner blows out cooled air by driving the compressor when the air conditioner switch installed in the heater control panel is pressed ON and the position of the blower switch is out of OFF position. The temperature in the cabin is adjusted by the position of the temperature control lever which determines the opening of the blend air damper and adjusts the mixing ratio of the cooled air and warm air.

The blowout made is , and the cooled air is blown out from four directions, and the blowout can be adjusted by the blower switch changes the blowout in four stages by the cabin condition.

The air selector is set on  during cooling, and can be changed to  according to the offensive smell and pollution.



58W539

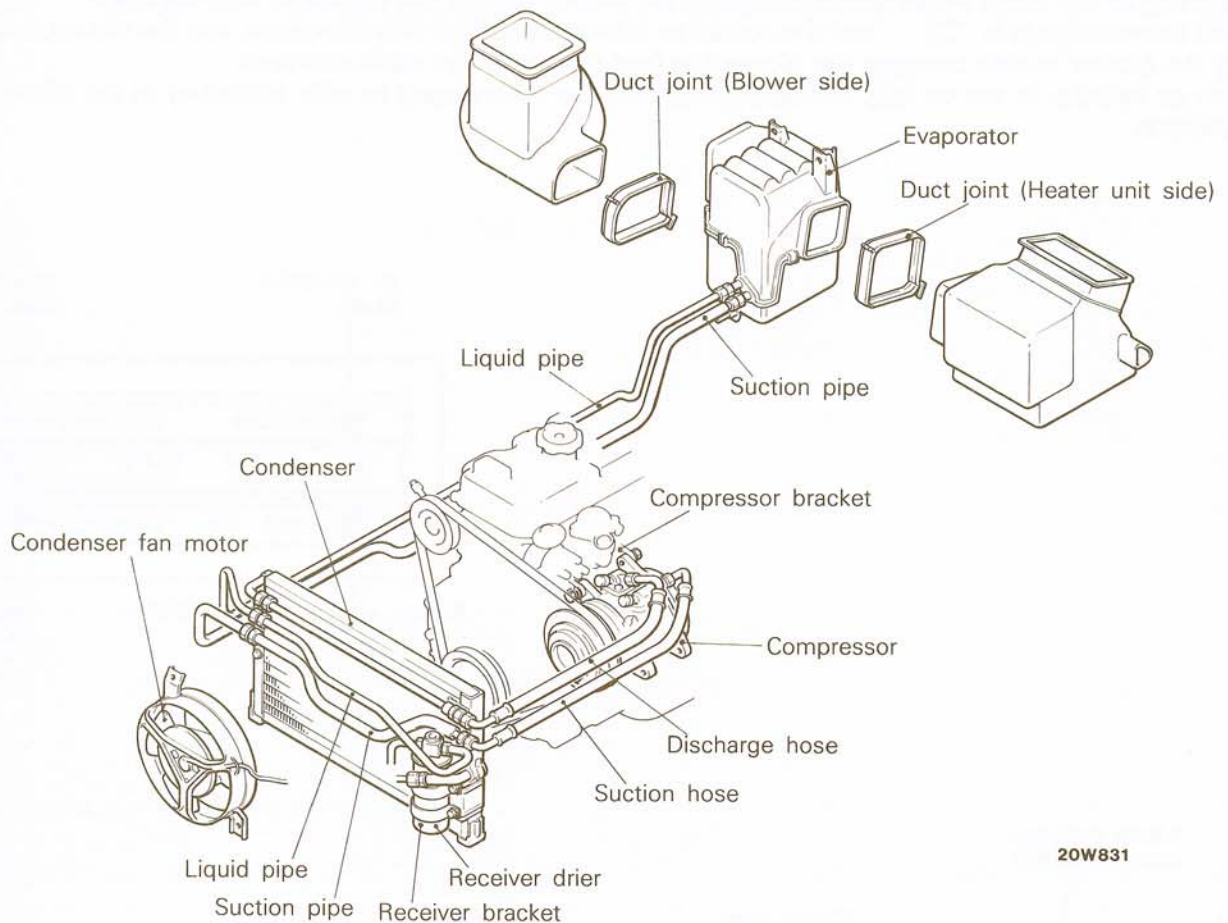


20W830



## AIR-CONDITIONING SYSTEM COMPONENTS

N248B88



20W831

**COMPRESSOR** – The prime purpose of the compressor is to compress the low pressure refrigerant vapor from the evaporator into a high pressure, high temperature vapor. The 6 cylinder 6P148 compressor is used. **MAGNETIC CLUTCH** is mounted on the compressor providing a convenient way to drive and disengage compressor in accordance to the cooling needs. **CONDENSER** is located in front of the radiator. Its function is to cool the hot, high pressure refrigerant gas causing it to condense into high pressure liquid refrigerant. **RECEIVER DRIER** is used to remove any traces of moisture from the refrigerant system. This component incorporates the sight glass and fusible plug. **SIGHT GLASS** at the top of the receiver drier is provided as a diagnostic tool to observe refrigerant flow and observe refrigerant level. **THE FUSIBLE PLUG** is located on the receiver drier. Its function is to prevent damage to the air conditioning system in the event that excessive pressure develops due to condenser air flow being restricted by, for example, leaves, newspaper, an overcharge of refrigerant, or air in the system. **LOW PRESSURE SWITCH** prevents damage to the compressor in case of system loss of refrigerant charge. **EXPANSION VALVE** – The expansion valve is used for all applications. Its function is to meter refrigerant into the evaporator in accordance with cooling requirements. **EVAPORATOR COIL** is located in the unit and its function is to cool and dehumidify the air before it enters the vehicle. **FREEZE UP CONTROL FIN THERMOSTAT SENSOR** is installed at the heater side of evaporator. The main function of a freeze control is to keep condensate water on the face of the evaporator coil from freezing and restricting air flow. **WATER TEMPERATURE SWITCH** – When the temperature of the radiator coolant became high, this switch functions to stop the compressor and prevent engine overheating. **SERVICE VALVE** at the compressor and the discharge line. The valves are used to test and service the refrigerant system. **REFRIGERANT R-12** is used maximum amount 907 g (32 oz.) R-12. **COMPRESSOR OIL** is used **DENSO oil 6** maximum amount 110 cc (3.7 U.S.fl.oz., 3.9 Imp.fl.oz.).

## SPECIFICATIONS

## GENERAL SPECIFICATIONS

N24CA--

Items	Specifications
Compressor	
Model	6P148Inclined-plate type
No. of cylinders and displacement c.c. (U.S.fl. oz., Imp.fl.oz.)	6 cylinders 6,148 (208, 216)
Refrigeration unit lubricant c.c. (U.S.fl. oz., Imp.fl.oz.)	DENSO oil 6 110 (3.7, 3.9)
Protective equipment	OFF:1.0 (22) ON:4.5 (39)
Cycling clutch switch °C(°F)	OFF:210 (30) ON:230 (33)
Low pressure switch kPa (psi)	OFF:113 (235) ON:106 (222)
Water temperature switch °C (°F)	Air temperature thermostat
Freezor prevention °C (°F)	OFF:3 (37.4) ON:5 (41)
	Burn out temperature 106 (222)
Fusible plug °C (°F)	R-12 600–900 (1.3–2.0)
Refrigerant and quantity g (lbs.)	

## SERVICE SPECIFICATIONS

N24CB--

Items	Specifications
Standard value	
Drive belt deflection mm (in.)	17.20 (.7-.8)
Pressure plate to rotor clearance mm (in.)	0.4-0.7 (.02-.03)

## TORQUE SPECIFICATIONS

N24CC--

Items	Nm	ft.lbs.
Suction hose to cooling unit	30–35	22–25
Liquid pipe to cooling unit	12–15	9–11
Liquid pipe to receiver drier	12–15	9–11
Suction hose to suction hose	30–35	22–25
Liquid pipe to liquid pipe	12–15	9–11
Liquid pipe to condenser	20–25	15–18
Suction hose to compressor	30–35	22–25
Discharge hose to compressor	20–25	15–18
Discharge hose to liquid pipe	20–25	15–18
Compressor shaft nut	15–17	11–13
Through bolt	25–26	18–20



## TROUBLESHOOTING

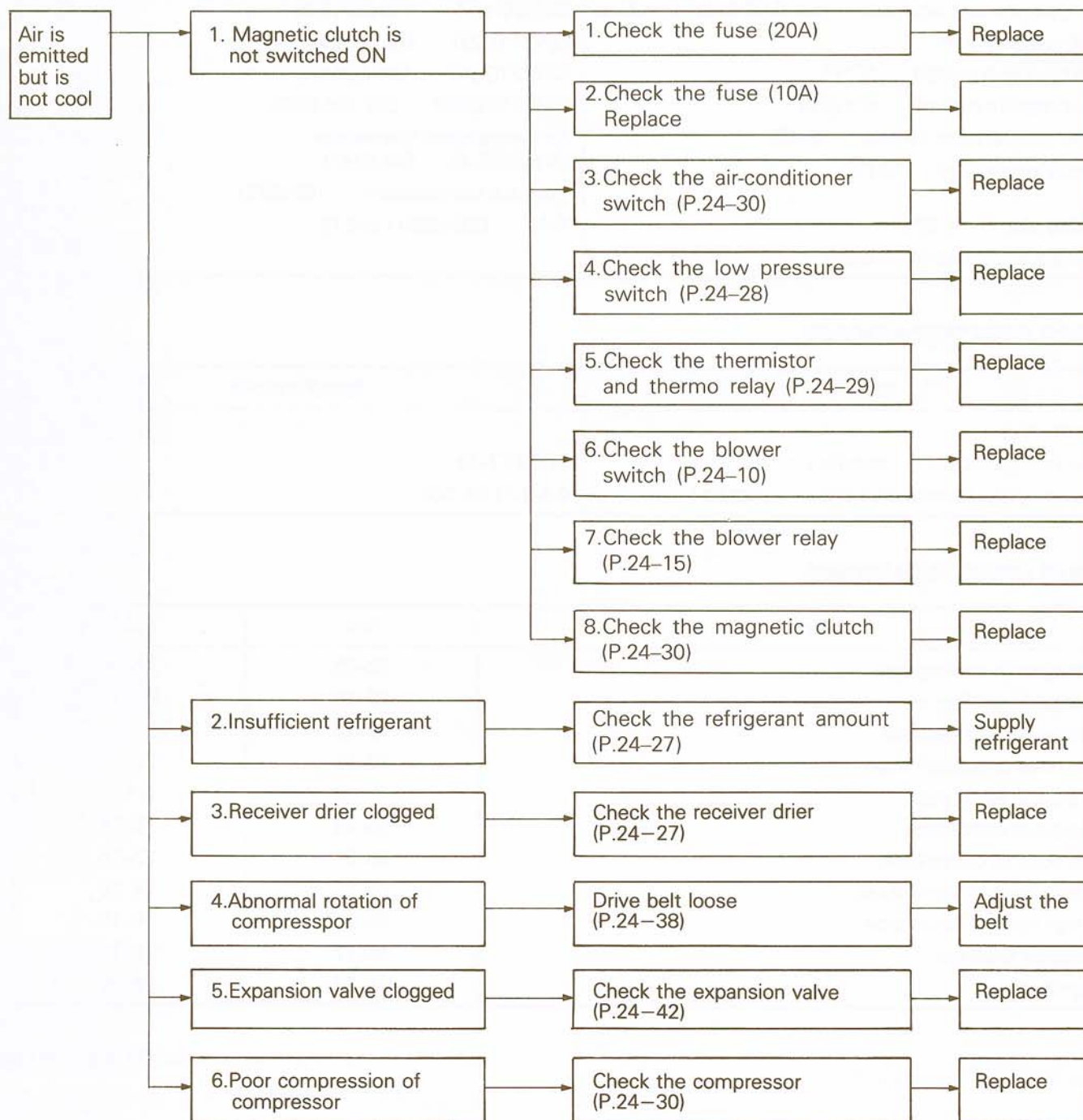
N24EBAE

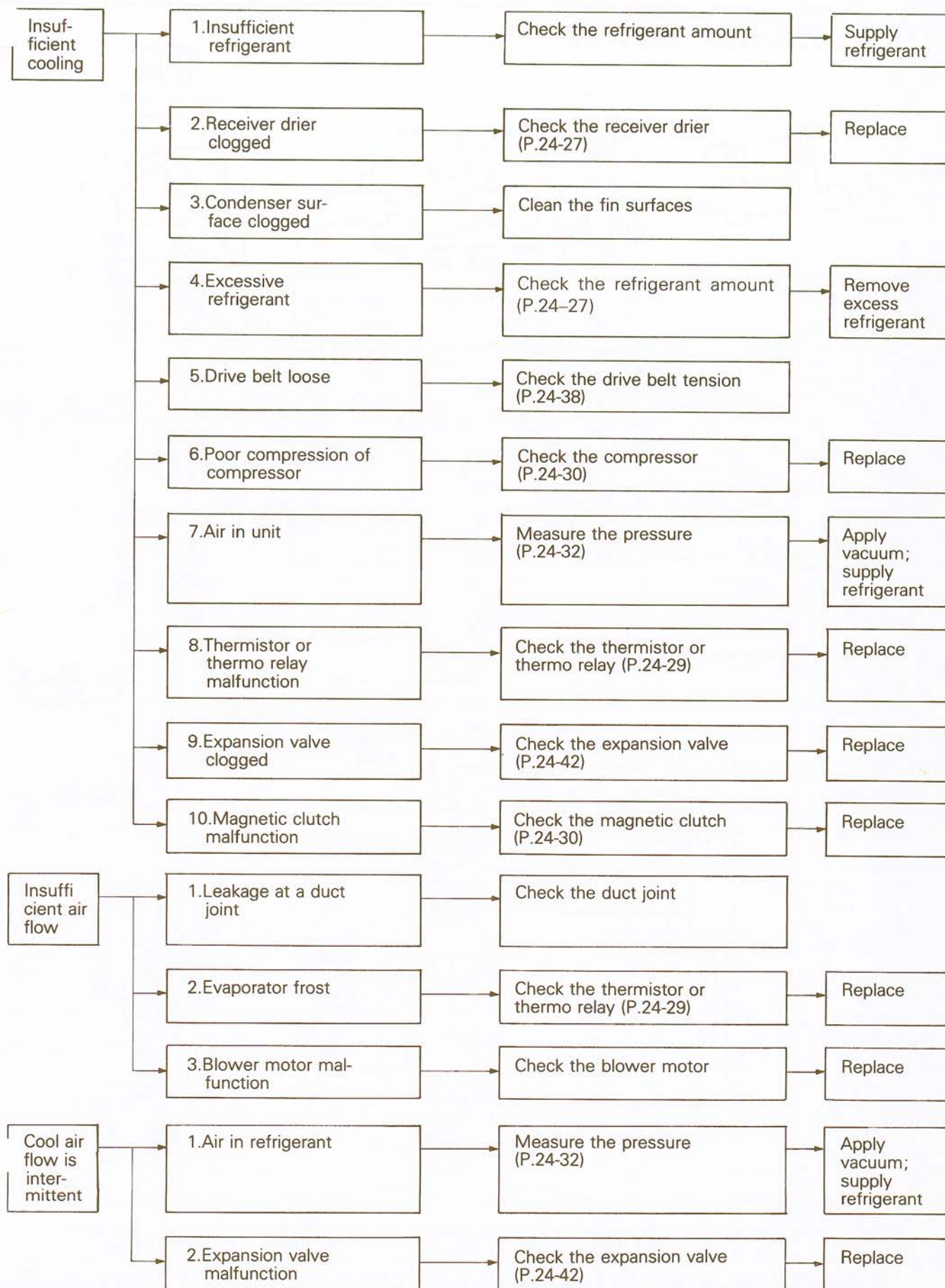
Before replacing or repairing air conditioning components, first determine if the malfunction is; due to refrigerant charge, air flow, or compressor related.

The following diagnostic charts have been developed as a "quick reference" aid in determining the cause of malfunction. If these charts do not satisfactorily describe the problem, refer to appropriate section for detailed explanation.

After correcting the malfunction, check out the complete system to assure satisfactory performance.

## MALFUNCTION CAUSES AND REMEDIES (Numbers indicate checking/inspection order.)



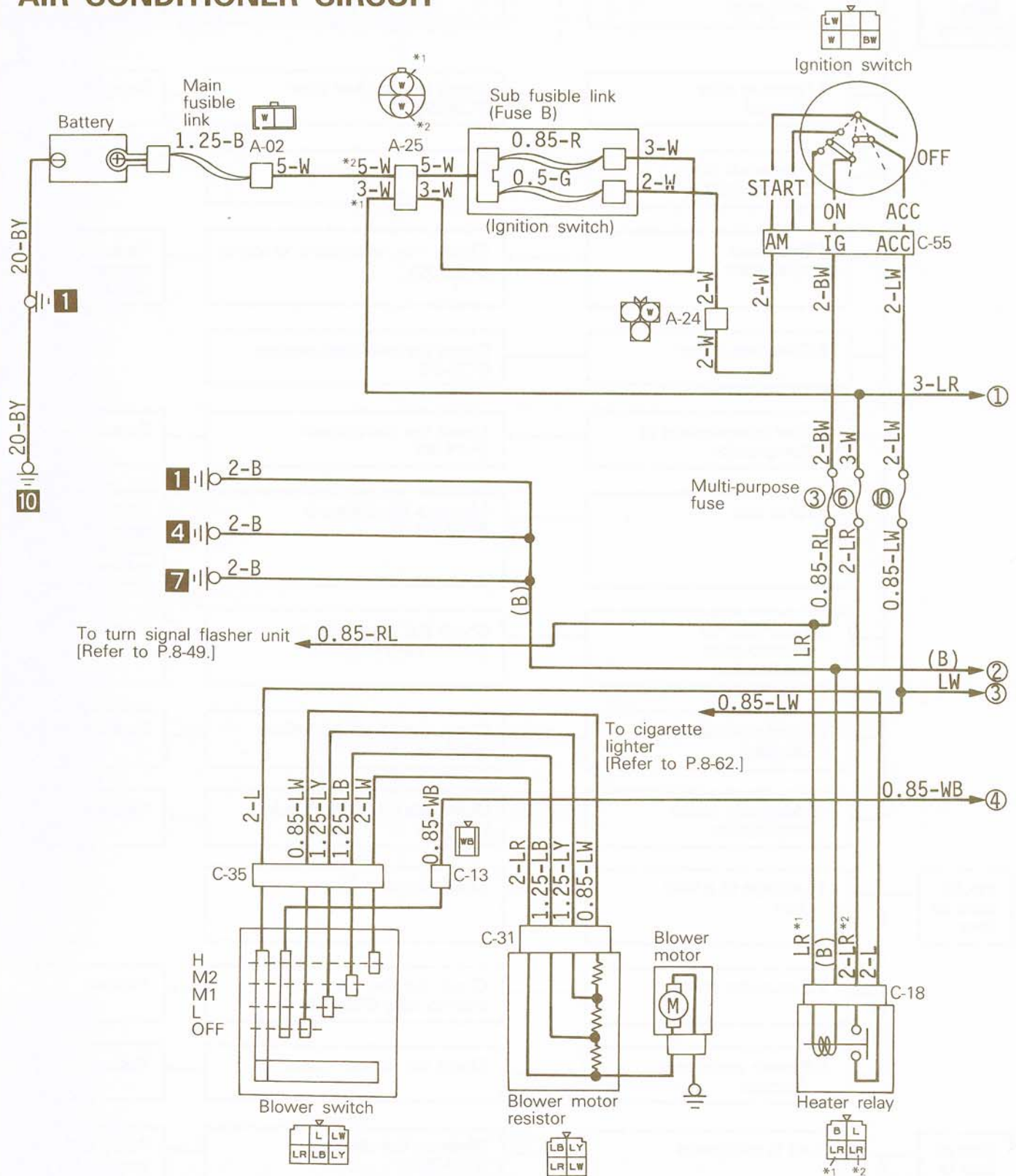




## CIRCUIT DIAGRAM

N24ZB--

## AIR CONDITIONER CIRCUIT



## Wiring color code

B: Black

Br: Brown

G: Green

Gr: Gray

L: Blue

Lg: Light green

Li: Light blue

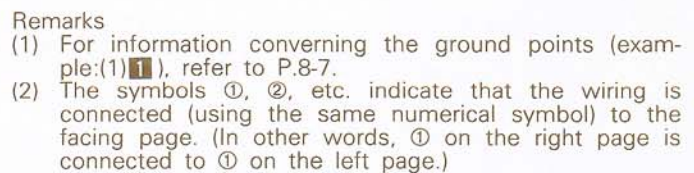
O: Orange

P: Pink

R: Red

Y: Yellow

W: White





## SAFETY PRECAUTIONS

### SAFETY PRECAUTIONS

The refrigerant used in all air-conditioning installations is R-12. It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of  $-29.8^{\circ}\text{C}$  ( $-21.7^{\circ}\text{F}$ ), at atmospheric pressure, it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, non-flammable, and nonexplosive. It is nonpoisonous except when it is in direct contact with open flame. It is noncorrosive except when combined with water. The following precautions must be observed when handling R-12.

#### Caution

**Wear safety goggles when servicing the refrigeration system.**

R-12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

Always wear safety goggles when servicing the refrigeration part of the air-conditioning system. Keep a bottle of sterile mineral oil handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. R-12 is rapidly absorbed by the oil. Next, splash the eyes with plenty of cold water. Call your doctor immediately even though irritation has ceased after treatment.

#### Caution

**Do not heat R-12 above  $52^{\circ}\text{C}$  ( $125^{\circ}\text{F}$ ).**

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over  $52^{\circ}\text{C}$  ( $125^{\circ}\text{F}$ ) is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

#### Caution

**Keep R-12 containers upright when charging the system.**

When metering R-12 into the refrigeration system, keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

#### Caution

**Always work in a well-ventilated room.**

Good ventilation is vital in the working area. Always discharge the refrigerant into the service bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.

Although R-12 vapor is normally nonpoisonous, contact with an open flame can cause the vapor to become very poisonous. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the flame-type leak detector. Avoid inhaling the fumes from the leak detector.

#### Caution

**Do not allow liquid refrigerant to touch bright metal.**

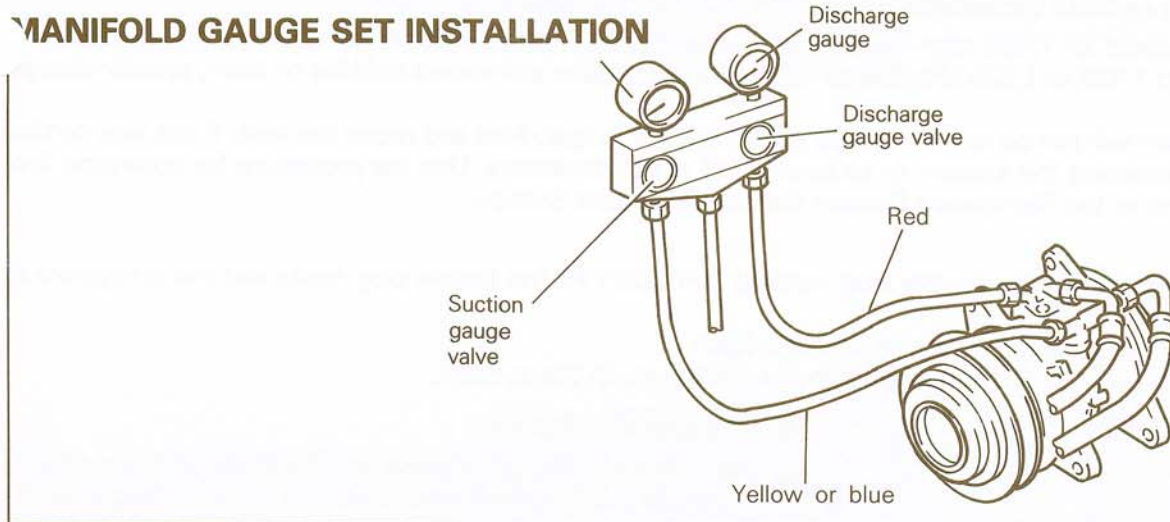
Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.



## SERVICE ADJUSTMENT PROCEDURES

N24FDAD

### MANIFOLD GAUGE SET INSTALLATION



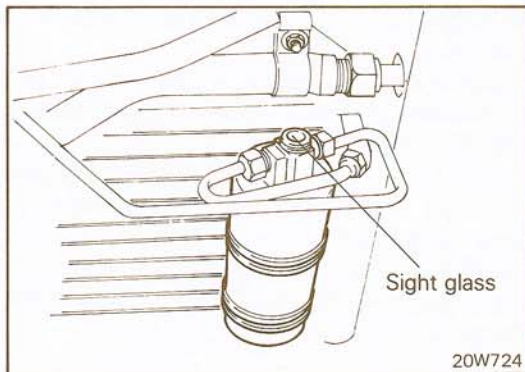
Manifold Gauge Valves should be closed when connecting the manifold gauge set to the service port of the compressor and the discharge hose. The suction gauge valve at the left is opened to provide a passage between the suction gauge and the center manifold outlet. The discharge gauge valve at the right is opened to provide a passage between the discharge pressure gauge and the center manifold outlet.

Detailed instructions for proper use of the gauge set manifold are contained in the text covering each test and service operation employing these gauges.

**Suction Gauge;** the left side of the manifold set is calibrated to register 0 to -100 kPa (0 to 30 in. of vacuum) and 0 to 1000 kPa (0 to 150 psi). This gauge is connected to the suction port of the compressor.

**Discharge Gauge;** the right of the manifold set is calibrated to register 0 to 2100 kPa (0 to 300 psi). For all tests this gauge is connected to the discharge port of the system.

**Center Manifold Outlet** provides the necessary connection for a long service hose used when discharging the system, using a vacuum pump to "pull a vacuum" before charging the system, and for connecting the supply of refrigerant when charging the system.



20W724

## TEST PROCEDURES

N24FEAE

### RECEIVER DRIER

The receiver drier assembly consists of; Drier reservoir, Refrigerant level sight glass and Fusible plug.

#### To Test the Receiver Drier

- (1) Operate the unit and check the piping temperature by touching the receiver drier outlet and inlet.
- (2) If there is a difference in the temperatures, the receiver drier is restricted. Replace the receiver drier.

### SIGHT GLASS REFRIGERANT LEVEL TEST

The sight glass is a refrigerant level indicator. To check the refrigerant level, clean the sight glass and start the vehicle engine. Push the air conditioner button to operate the compressor, place the blower switch to high and move the temperature lever to extreme left.

After operating for a few minutes in this manner, check the sight glass.

- (1) If the sight glass is clear, the magnetic clutch is engaged, the compressor discharge line is warm and the compressor inlet line is cool; the system has a full charge.
- (2) If the sight glass is clear, the magnetic clutch is engaged and there is no significant temperature difference between compressor inlet and discharge lines; the system has lost some refrigerant.
- (3) If the sight glass is clear and the magnetic clutch is disengaged; the clutch is faulty or, the system is out of refrigerant. Perform low pressure switch test to determine condition. Check low pressure switch and clutch coil for electrical continuity.



- (4) If the sight glass shows foam or bubbles, the system could be low on charge. Occasional foam or bubbles are normal when the ambient temperature is above 43°C(110°F) or below 21°C(70°F).

Adjust the engine speed to 1,500 rpm. Block the airflow through the condenser to increase the compressor discharge pressure to 1,422 to 1,520 kPa (206 to 220 psi). If sight glass still shows bubbles or foam, system charge level is low.

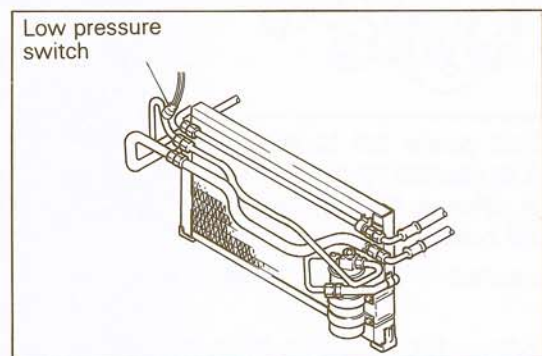
The refrigerant system will not be low on charge unless there is a leak. Find and repair the leak. If the leak can be repaired without discharging the system an oil level check is not necessary. Use the procedure for correcting low refrigerant level found in the Refrigerant System Service Procedure Section.

### FUSIBLE PLUG

When ambient temperature of the fusible plug reaches 105°C(221°F), the fusible plug melts and the refrigerant in the system is released.

Once the fusible plug is operated, it cannot be used again.

So, it is necessary to install new one and charge the refrigerant in the system.



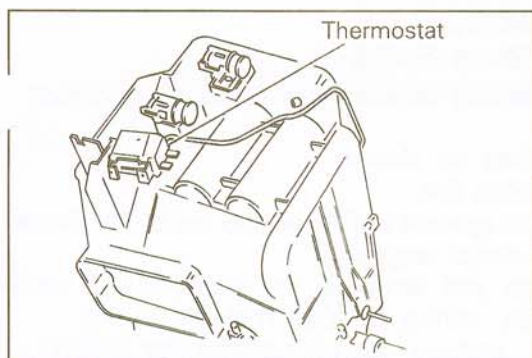
### LOW PRESSURE SWITCH

The Low Pressure Switch, located on the liquid line, is wired in series with the magnetic clutch. It cuts off the electrical power supply to the clutch when refrigerant pressure drops below the control point of the switch. Whenever the system is inactivated by the low pressure switch due to refrigerant loss, the refrigerant oil may have been lost. Therefore, to prevent damage to the compressor due to operation without sufficient lubrication, the leak must be repaired and the compressor oil level checked before final charge of the system. The switch is a sealed, factory calibrated unit. No attempt should be made to adjust or otherwise repair it. If it is found to be faulty it must be replaced.

### To Test the Low Pressure Switch (Engine Off)

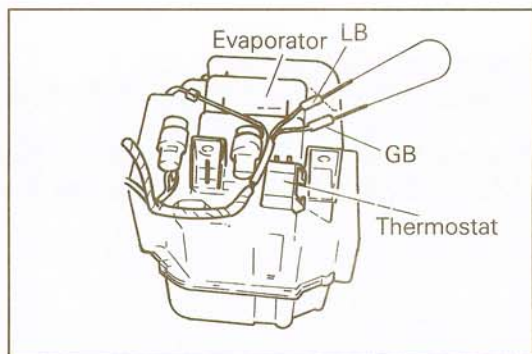
- (1) Jump the wire leads.
- (2) Press the air conditioner switch and blower switch on.
- (3) Momentarily turn the ignition switch on (do not crank the engine), listen for the compressor clutch engaging.
- (4) If the clutch does not engage, the fin thermostat, water temperature switch or fuse may be faulty.
- (5) If clutch engages, connect the manifold gauge set and read pressure. At pressure of 210 kPa (30 psi) or above, switch must actuate the clutch.  
If the pressure is below 210 kPa (30 psi), the refrigerant system is low in charge. For corrective action refer to refrigerant leak repair procedure.
- (6) Reconnect boot on switch and perform step number 3.  
If the clutch does not engage, discharge the system, replace the switch, and recharge the system.





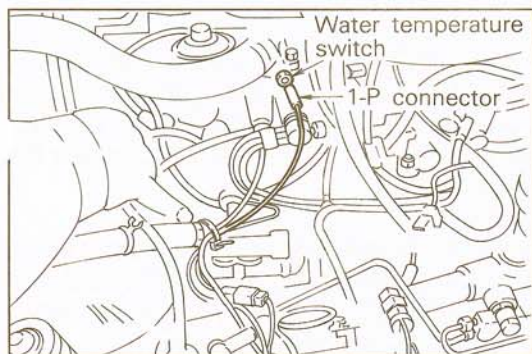
### FREEZE UP CONTROL

Evaporator freeze up is controlled by a thermistor attached to the evaporator fins. The control is an electronic type and consists of two parts (thermo relay and thermistor.) It is connected to the magnetic clutch of the compressor in series. When the temperature of the evaporator drops below 3°C (37.4°F), the compressor is turned OFF.



### To Test the Thermistor

- (1) Jump the wire lead (LB to GB) of the connector portion.
- (2) Press the air conditioner switch and blower switch on.
- (3) Momentarily turn the ignition switch on (do not crank the engine), listen for the clutch engaging.
- (4) If the clutch does not engage, the low pressure switch, water temperature switch wiring or fuse may be faulty.
- (5) If the clutch operates, replace the thermostat.



### WATER TEMPERATURE SWITCH

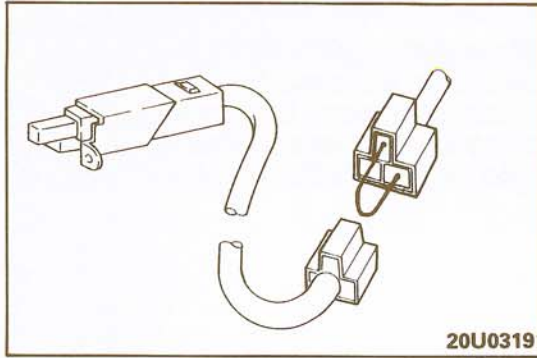
The water temperature switch is located on the thermostat housing. The water temperature switch is connected to the clutch in series. When the coolant temperature in the radiator reaches above 113°C (235°F), it turns the compressor OFF. This is to prevent engine overheating.

When the water temperature switch is activated and the clutch is OFF, check the surface of the condenser and radiator, the belt tension, and the coolant volume in the radiator, and return to the normal condition.

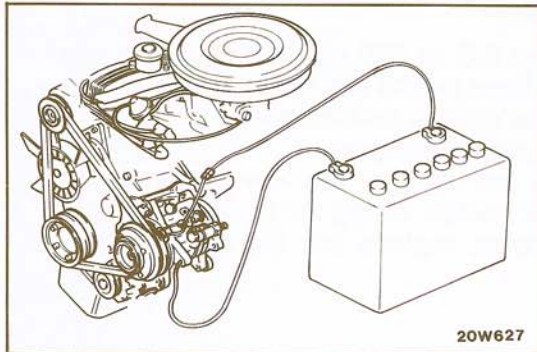
### To Test the Water Temperature Switch

- (1) Remove wire from water temperature switch and jump lead wires.
- (2) Press the air conditioner switch and blower switch on.
- (3) Momentarily turn the ignition switch on (do not crank the engine), listen for the clutch engaging.
- (4) If the clutch does not engage, the fin thermistor, low pressure switch, wiring or fuse may be faulty.
- (5) If clutch engages, replace the switch.

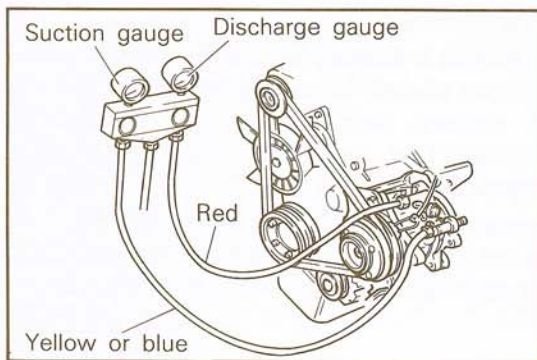


**AIR CONDITIONER SWITCH****To Test the Air Conditioner Switch**

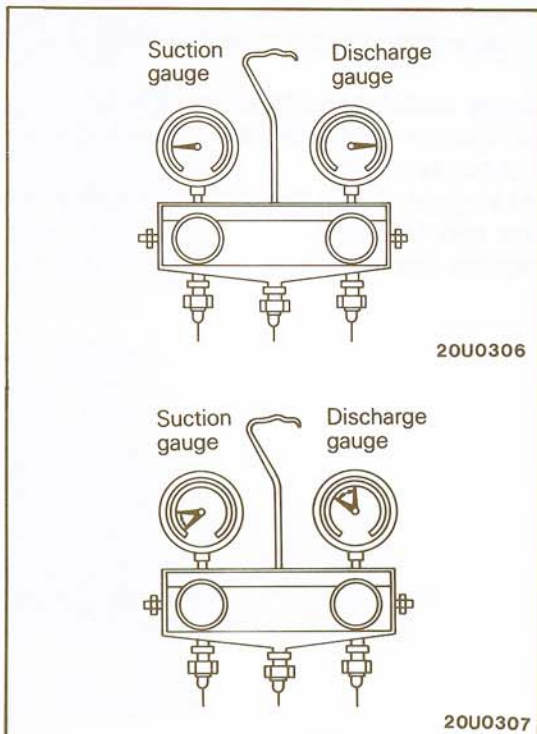
- (1) Disconnect the harness connector for the air condition switch.
- (2) Jump the lead wires as shown.
- (3) Turn the blower switch ON.
- (4) Momentarily turn the ignition switch on (do not crank the engine), listen for the clutch engaging.
- (5) If the clutch does not engage, fin thermostat, water temperature switch, wiring or fuse may be faulty.
- (6) If clutch engages, replace the air conditioner switch.

**MAGNETIC CLUTCH**

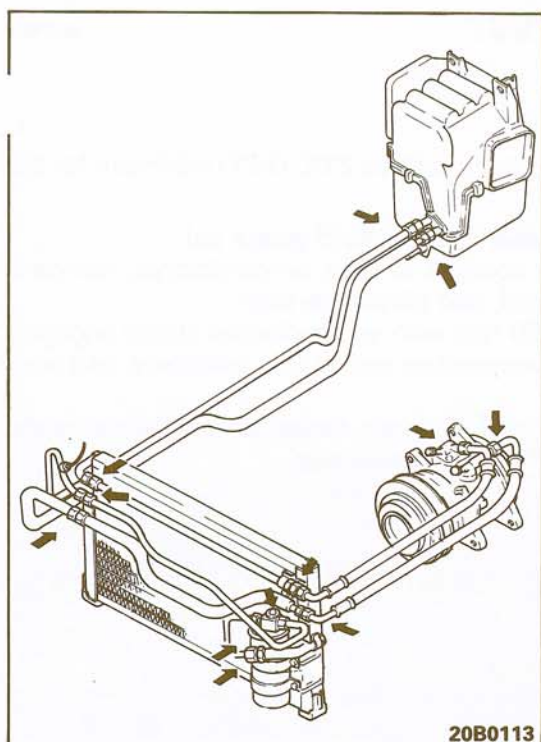
- (1) Disconnect the wiring to the magnetic clutch.
- (2) Connect battery (+) voltage directly to the wiring for the magnetic clutch.
- (3) If the magnetic clutch is normal, there will be a "click". If the pulley and armature do not make contact ("click"), there is a malfunction.

**COMPRESSOR**

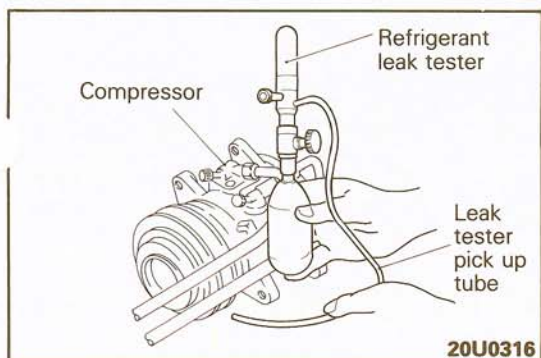
- (1) Install the manifold gauge set, and run the air conditioner.
- (2) If a pressure of approx. 490 kPa (71 psi) is indicated on the suction gauge side and a pressure of approx. 883 kPa (128 psi) is indicated on the discharge gauge side, the compressor has abnormal compression. Replace the compressor.
- (3) If a pressure of 294 to 392 kPa (43 to 59 psi) is indicated on the suction gauge side and a pressure of approx. 1961 kPa (284 psi) is indicated on the discharge gauge side, it is suspected that air is present in the air conditioning system. Discharge the system, evacuate and recharge with specified amount of refrigerant.
- (4) During operation of the air conditioner, cold air may stop flowing after the elapse of time and this state is maintained before cold air flows out again. If cold air stops flowing out with negative pressure indicated on the suction gauge side and a pressure of 588 to 980 kPa (85 to 142 psi) indicated on the discharge gauge side, it is suspected that water is present in the air conditioning system. Discharge the system. Replace receiver drier. Evacuate and check for leaks, and recharge with specified amount of refrigerant.







20B0113



20U0316

## TESTING SYSTEM FOR LEAKS

N24FFAB

A leak is likely to occur where two components are connected together. See illustration for possible locations.

The Leak Detector Torch is a butane gas-burning torch used to locate a leak in any part of the refrigeration system. Refrigerant gas drawn into the sampling or "sniffer" hose will cause the flame to change color in proportion to the size of the leak. A very small leak will produce a flame varying from yellowish-green to bright green. A large leak will produce a brilliant blue flame.

### Caution

**Do not use the lighted detector in any place where explosive gases, dust or vapors are present. Do not breathe the fumes that are produced by the burning of refrigerant gas. Large concentrations of refrigerant in the presence of a live flame become dangerously toxic.**

If the flame remains bright yellow when the tester is removed from a possible leak point, insufficient air is being drawn in through the sampling tube, or the copper reaction wire is dirty.

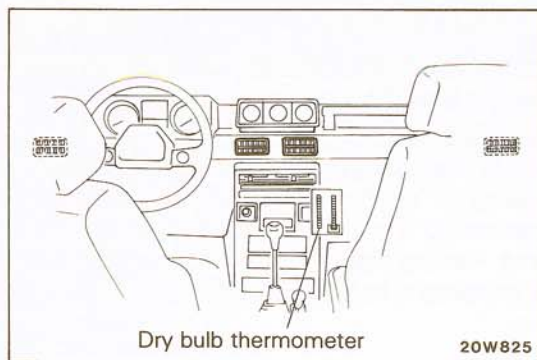
- (1) Assemble leak detector as shown be sure detector is seated tightly over torch gasket.
- (2) Holding torch upright screw-in butane charger (clockwise) until punctured. (Do not use force).
- (3) Screw-out butane charge (counterclockwise) about 1/4 turn.
- (4) Point torch away from body—then light escaping gas with match. Always keep torch in upright position.
- (5) Adjust flame by turning cartridge in or out as required.
- (6) Allow 30 seconds to heat copper reaction wire.

### Caution

**Never remove butane charger while torch is lighted or in the presence of any open flame.**

- (7) Examine all tube connectors and other possible lead points by moving the end of the sampling hose from point to point. Always keep torch in upright position. Since R-12 is heavier than air, it is good practice to place the open end of sampling hose directly below point being tested. Be careful not to pinch sampling tube since this will shut off air supply to flame and cause a color change.
- (8) Watch for a change in the color of the flame. Small leaks will produce a green color and large leaks a bright blue color. If leaks are observed at tube fittings, tighten the connection, using the proper flare wrenches, and retest.





## PERFORMANCE TEST

N24FWAB

### TEST

#### NOTE

Air temperature in test room must be 21°C (70°F) minimum for this test.

- (1) Connect a tachometer and manifold gauge set.
- (2) Set air conditioner controls to Max air conditioner, temperature lever on full cool, and blower on high.
- (3) Turn engine on 1000 rpm with air conditioner clutch engaged.
- (4) Engine should be warmed up with doors, windows, and hood open.
- (5) Insert a thermometer in the left center air conditioner outlet and operate the engine for 5 minutes.
- (6) Note the discharge air temperature.

#### NOTE

If the clutch cycles, take the reading before the clutch disengages.

### Performance Temperature Chart

Garage ambient temperature	21 °C (70 °F)	26.5 °C (80 °F)	32 °C (90 °F)	37.5 °C (100 °F)	40.6 °C (105 °F)
Discharge air temperature	1.7–4.4 °C (35–40 °F)	1.7–5.0 °C (35–41 °F)	1.7–5.6 °C (35–42 °F)	1.7–6.1 °C (35–43 °F)	1.7–6.7 °C (35–44 °F)
Compressor discharge pressure	928–1,322 kPa (132–188 psi)	1,069–1,547 kPa (152–220 psi)	1,209–1,772 kPa (172–252 psi)	1,336–1,969 kPa (190–280 psi)	1,406–2,109 kPa (200–300 psi)
Evaporator suction pressure	127–148 kPa (18–21 psi)	131–162 kPa (18.6–23 psi)	134–176 kPa (19–25 psi)	135–188 kPa (19.2–26.8 psi)	136–194 kPa (19.4–27.6 psi)

## REFRIGERANT LEAK REPAIR PROCEDURE

N24FHAB

### LOST CHARGE

If the system has lost all charge due to a leak:

- (1) Evacuate the system. (See the procedure).
- (2) Charge the system with approximately one pound of refrigerant.
- (3) Check for leaks.
- (4) Discharge the system.
- (5) Repair leaks.
- (6) Replace receiver drier.

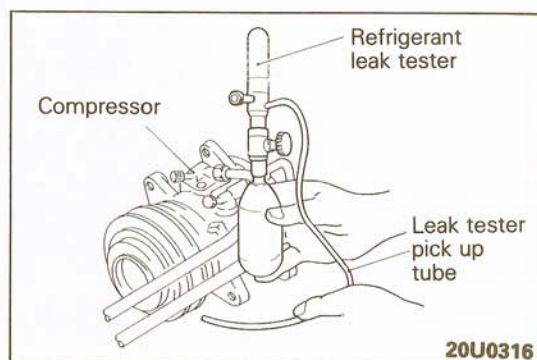
#### Caution

**Replacement filter-drier units must be sealed while in storage. The drier used in these units will saturate water quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.**

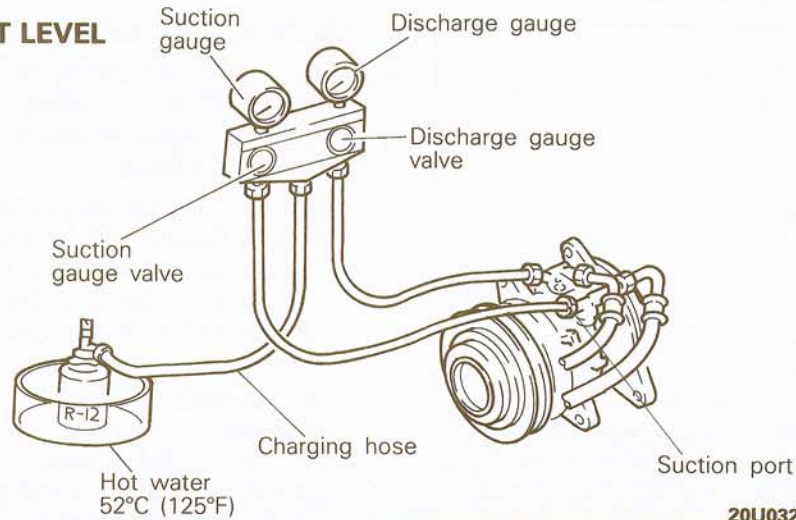
- (7) Evacuate and charge the system.

### LOW CHARGE

If the system has not lost all of its refrigerant charge; locate and repair all leaks. If it is necessary to increase the system pressure to find the leak (because of an especially low charge) add refrigerant. If it is possible to repair the leak without discharging the refrigerant system, use the procedure for correcting low refrigerant level.





**CORRECTING LOW REFRIGERANT LEVEL**

20U0325

Since the refrigeration system is completely sealed, refrigerant level will not be low unless there is a leak in the system.

Before adding refrigerant when the cause of low level is not known, the system should be tested for leaks. Assuming that leaks have been corrected without discharging the system, proceed with partial charge.

Install and connect manifold gauge set.

- (1) Close both gauge set manifold valves.
- (2) Connect the suction gauge test hose to the suction port of the compressor. Connect the discharge gauge test hose to the discharge port.
- (3) Connect one end of long test hose to center manifold outlet, other end to refrigerant dispensing manifold.
- (4) Close two dispensing manifold valves and open remaining dispensing manifold valve. Remove protective cap from opened valve.
- (5) Screw a can of R-12 to the opened manifold valve. Be sure gasket is in place and in good condition. Tighten refrigerant can and manifold locking nut to insure a good seal. Do not overtighten. 8 to 11 Nm (6 to 8 ft.lbs.) is sufficient if gasket is in good condition.
- (6) Turn manifold valve (above the refrigerant can) completely clockwise to puncture the can. This closes the valve and seals the refrigerant in the can.

**Caution**

**Never heat small cans of refrigerant over 52°C (125°F) as they may explode.**

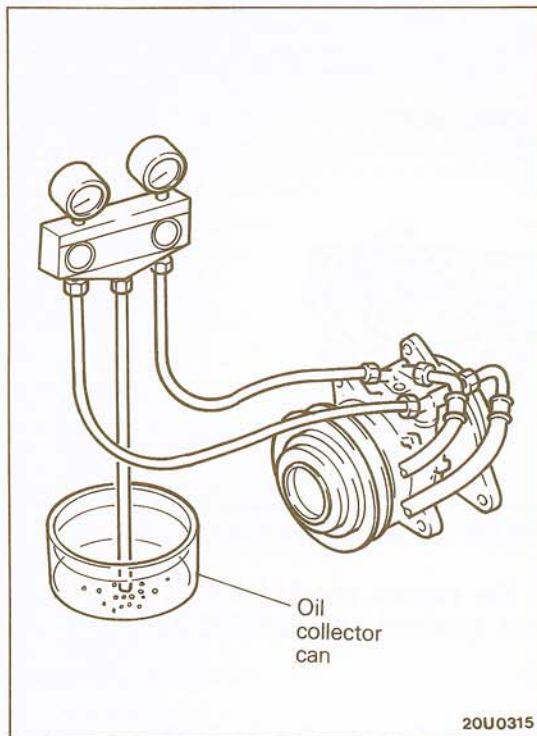
- (7) Place the refrigerant in a large pan of water heated to 52°C (125°F). Place pan of water containing the refrigerant can on an accurate scale so the amount of refrigerant added can be weighed. Open the refrigerant manifold valve.
- (8) **Purge all air from test hoses.** Air in the system will be trapped in the condenser causing abnormally high discharge pressures and interfering with condensing of the refrigerant.
- (9) Slightly loosen both test hoses at the gauge set manifold. Tighten the hoses as soon as the air is purged.
- (10) Slightly loosen charging hose connection at gauge set manifold. This will purge air from the charging hose. Tighten connection as soon as air is purged.
- (11) With vehicle windows open and hood up, operate engine at 1,500 rpm and jump the switch terminals located on so the clutch will remain engaged.
- (12) Place air conditioner control on air conditioner and place the blower switch on high.
- (13) If necessary, block the condenser to maintain a discharge pressure of 1,422 to 1,520 kPa (206 to 220 psi.). System must be charged through the evaporator suction service ports as follows:
  - (a) Slowly open the **suction service gauge valve**. Meter flow of refrigerant by adjusting the suction service gauge valve so that pressure registered at the suction service gauge does not exceed 345 kPa (50 psi). **Keep refrigerant container upright.**
  - (b) Add refrigerant gas until there is no foam visible at the sight glass.
  - (c) Close the suction gauge valve.

**Caution**

**Too much refrigerant in the system can cause abnormally high discharge pressures. Care must be used so that the exact recommended amount of refrigerant is added after foam clears in the sight glass.**

- (d) Close dispensing manifold valve. Remove test hoses and adapters from the service ports of compressor, install protective caps at service ports and reconnect wiring.





### DISCHARGING THE SYSTEM

Since the air conditioning refrigerant system is pressurized, it will be necessary to completely discharge the system (in a well ventilated area) before replacing any refrigerant component. The procedure is as follows:

- (1) Install manifold gauge set. Make sure the gauge set valves are closed before attaching the hoses to the refrigerant system.
- (2) Install a long hose to the manifold gauge set connector. Run this hose to the oil collector can near a shop exhaust system. A good oil collector can may be made from a large empty coffee can with a plastic top. Slit the plastic top in the form of a Y to make an entrance for the refrigerant hose and an exit for the gas.
- (3) Open the compressor discharge and suction line pressure valves and blow the refrigerant into the oil collect can. Watch to make sure the hose does not blow out of the collector can.
- (4) When the system has been completely discharged, measure the amount of oil collected in the can. The amount of oil measured should be added to the refrigerant system before it is re-charged. Add new oil—discard the used oil.

### Caution

**It is important to have the correct amount of oil in the refrigerant system.**

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

When a 6P148 compressor is installed at the factory, it contains 110 c.c. (3.7 U.S.fl.oz., 3.9 Imp.fl.oz.) of refrigerant oil. While the air conditioning system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.

When the following system components are changed, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor – 40cc (1.4 U.S.fl.oz., 1.4 Imp.fl.oz.)

Condenser – 30 cc (1.0 U.S.fl.oz., 1.1 Imp.fl.oz.)

Evaporator – 60 cc (2.0 U.S.fl.oz., 2.1 Imp.fl.oz.)

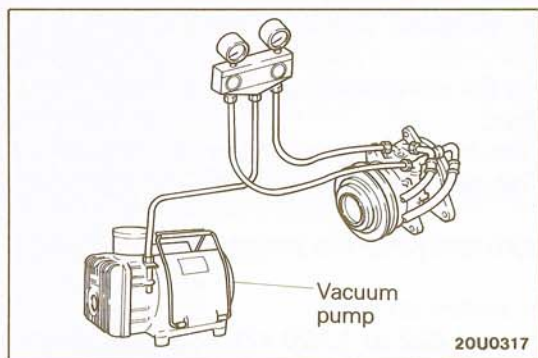
Piping – 10 cc (.3 U.S.fl.oz., .4 Imp.fl.oz.)

Receiver drier – 0 cc (0 U.S.fl.oz., 0 Imp.fl.oz.)

### EVACUATING THE SYSTEM

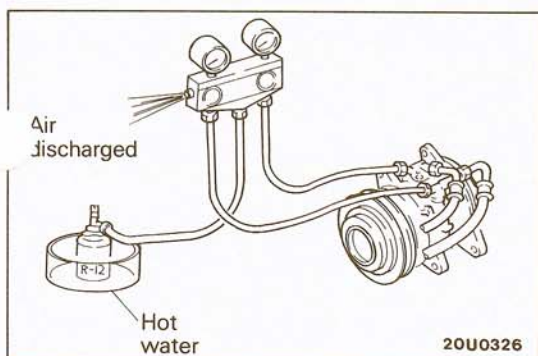
Whenever the system has been opened to the atmosphere, it is absolutely essential that the system be evacuated or “vacuumed” to remove all the air and moisture. Air in the refrigerant system causes high compressor discharge pressures, a loss in system performance, and oxidation of the compressor oil into gum and varnish. Moisture in the refrigerant system can cause the expansion valve to malfunction. Under certain conditions, water can react with the refrigerant to form destructive acids. It is necessary to adhere to the following procedure to keep air and moisture out of the system.

- (1) Install manifold gauge set. Make sure the gauge set valves are closed before attaching the hoses to the refrigerant system.
- (2) Discharge the system if the manifold gauge set indicates pressure in the system.
- (3) Connect a long test hoses from gauge set manifold center connection to vacuum pump.
- (4) Open both manifold gauge set valves.





- (5) Start the vacuum pump and operate until the evaporator suction gauge registers at least  $-101$  kPa (29.9 in. of vacuum). If at least  $-101$  kPa (29.9 in. of vacuum) cannot be obtained, either the system has a leak or the vacuum pump is defective. Check the vacuum pump. If the pump proves to be functioning properly, the system has a leak. Charge the system with one pound of refrigerant. Locate and repair all leaks. Discharge the refrigerant and evacuate the system.
- (6) Continue to operate the pump for at least five minutes.
- (7) Close manifold valves. Turn off the vacuum pump and observe evaporator suction gauge for two minutes. The vacuum level should remain constant. If the vacuum level falls off, the system has a leak. Charge the system with one pound of refrigerant. Locate and repair all leaks. Discharge the system and repeat evacuation procedure.



### CHARGING THE SYSTEM

The refrigerant system must have been evacuated using the previous procedure before charging. Charge using only R-12 refrigerant. R-12 is available in bulk tanks or small cans. Follow the safety precautions for handling R-12 as listed in the beginning of this group.

#### Charging with Small Cans

When using disposable cans of this type, follow carefully the can manufactures instructions.

#### Caution

**Never use these cans to charge into the high pressure side of the system (compressor discharge port) or into a system that is at high temperature, because the high system pressures could be transferred into the charging can causing it to explode.**

Keep the refrigerant manifold valves capped when not in use. Keep a supply of extra refrigerant-can-to-refrigerant-manifold gaskets on hand so that gaskets can be replaced periodically. This will insure a good seal without excessive tightening of the can or the manifold nuts.

- (1) Attach center hose from manifold gauge set to refrigerant dispensing manifold. Turn refrigerant manifold valves completely counterclockwise so they are fully open. Remove protective caps from refrigerant manifold.
- (2) Screw refrigerant cans into manifold. Be sure manifold-to-can gasket is in place and in good condition. Tighten can and manifold nuts to 8 to 11 Nm (6 to 8 ft.lbs.)
- (3) Turn refrigerant manifold valves completely clockwise to puncture the cans and close the manifold valves.



- (4) Purge the air from the charging line by loosening the charging hose at the gauge set manifold and turning one of the refrigerant valves counterclockwise to release refrigerant. When the refrigerant gas starts escaping from the loose connection, re-tighten the hoses.

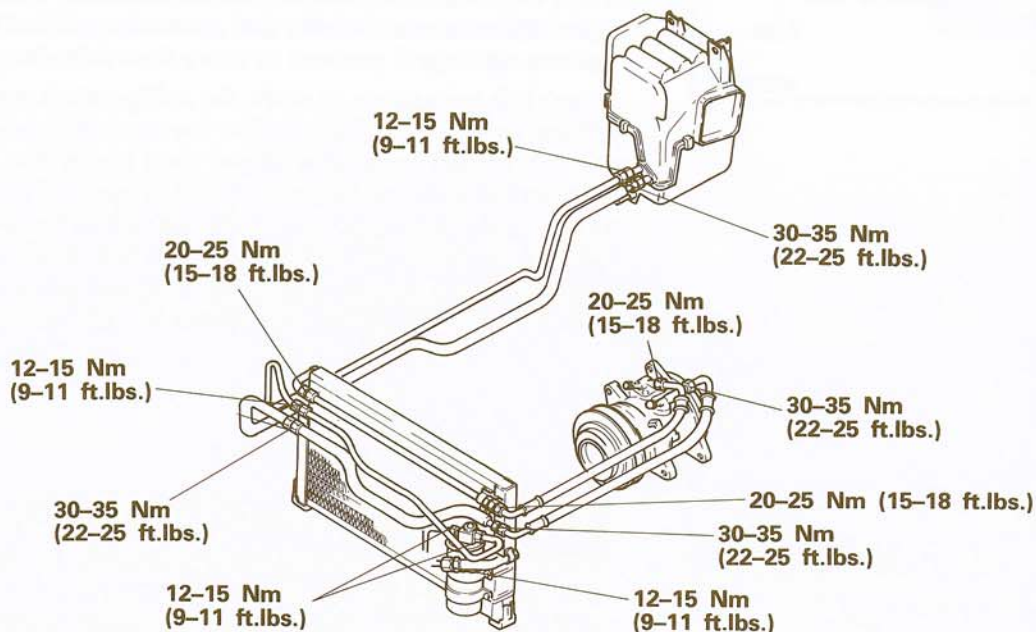
**Caution**

**Never heat small refrigerant cans over 52°C (125°F) as they may explode.**

- (5) Fully open all refrigerant manifold valves being used and place the cans of refrigerant into a pan containing 52°C (125°F) water. The water will warm the charging can and aid in the transfer of the charge into the system. Place the water pan and refrigerant cans on a scale and note the weight.
- (6) Jump the low pressure switch terminals located on the receiver drier so the clutch will remain engaged.
- (7) Start the engine and move the controls to air conditioner switch on and low blower position.  
The low pressure switch will prevent the clutch from engaging until refrigerant is added to the system. If the clutch does engage, replace the switch before proceeding any further.
- (8) Charge through the suction side of the system by slowly opening the suction manifold valve. Adjust the valve as necessary so charging pressure does not exceed 345 kPa (50 psi). Maintain the temperature of the water in the pan by adding warm water as necessary. Note the weight of water added, to ensure accuracy when determining amount of refrigerant added to system.
- (9) Adjust the engine speed to a fast idle of approximately 1500 rpm.
- (10) When specified refrigerant charge 730 (1.6 lbs.) has entered the system, close the gauge set manifold valves, refrigerant manifold valves, and reconnect wiring. Each can contains 397 g (14 oz.) of R-12. Use 2 1/2 cans.

## HANDLING TUBING AND FITTINGS

N24FIAA



20B0122

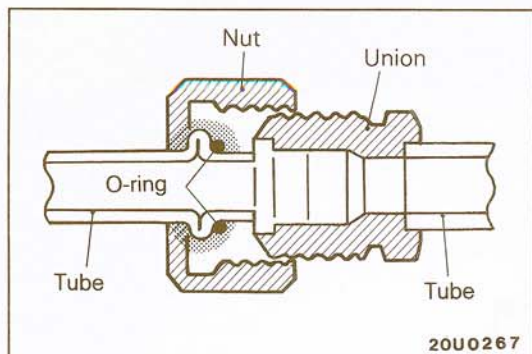
Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed.

The system must be completely discharge before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly. **Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing.**

A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose. Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm (3 in.) from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.

Unified plumbing connections with O-rings. These O-rings are not reusable.





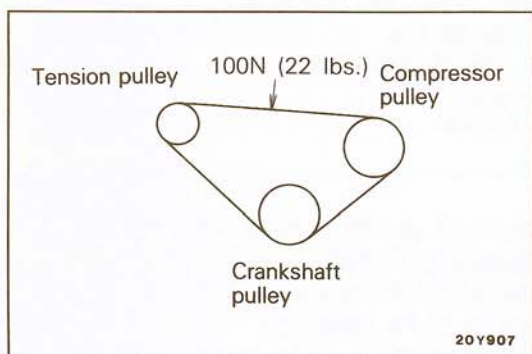
### O-RING INSTALLATION

- (1) Clean sealing surface.
- (2) Make sure O-ring does not have any scratches.
- (3) Connect fitting, install fastener, and torque to amount shown in illustration.

The internal part of the refrigeration system will remain in a state of chemical stability as long as pure-moisture-free R-12 and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause operational troubles or even serious damage if present in more than minute quantities.

When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are ready to be used.

All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses should be kept clean and dry.



### COMPRESSOR DRIVE BELT ADJUSTMENT

N24FJAB

Satisfactory performance of the air-conditioning system is dependent upon drive belt condition and tension. If the proper tensions are not maintained, belt slippage will greatly reduce air-conditioning performance and drive belt life. To avoid such adverse effect the following service procedure should be followed:

- (1) Any belt that has operated for a minimum of one half-hour is considered to be a "used" belt. Adjust air-conditioning drive belt at the time of new-car preparation.
- (2) Check drive belt tension at regular service intervals and adjust as needed.

**Standard value : 17–20 mm (.67–.78 in.)**

## COMPRESSOR NOISE

N24FLAA

When investigating an air conditioning related noise, you must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.

Noises that develop during air-conditioning operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering, alternator or air pump). Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.

Drive belts are speed sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

### Adjustment Procedures

- (1) Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise.

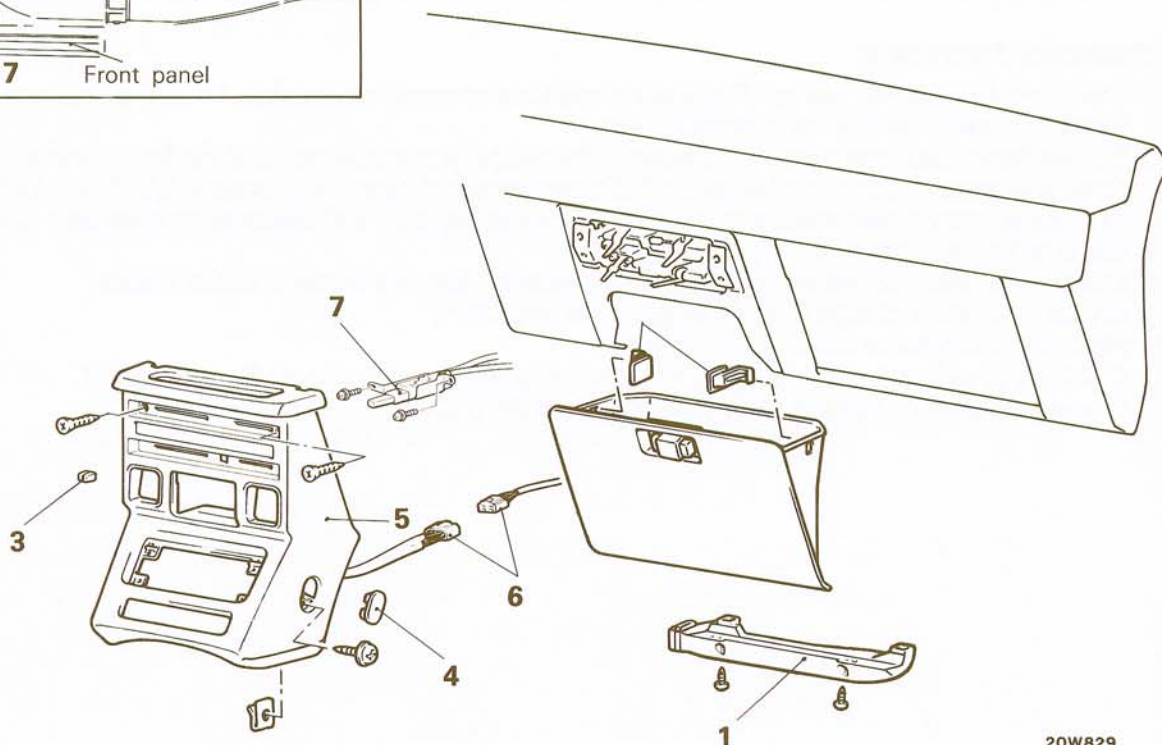
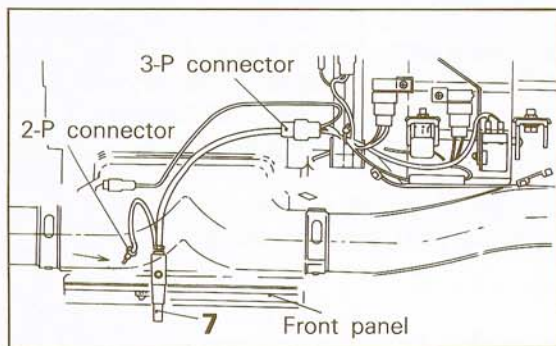
**To duplicate high ambient conditions (high head pressure), restrict air-flow through condenser. Install manifold gauge set to make sure discharge pressure does not exceed 2,070 kPa (300 psi).**

- (2) Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
- (3) Check refrigerant hoses for rubbing or interference that can cause unusual noises.
- (4) Check refrigerant charge (See "Charging the System").
- (5) Recheck compressor noise as in Step 1.
- (6) If noise still exists, loosen compressor mounting bolts and retorque. Repeat Step 1.
- (7) If noise continues, replace compressor and repeat Step 1.



## AIR CONDITIONER SWITCH REMOVAL AND INSTALLATION

N24QA



20W829

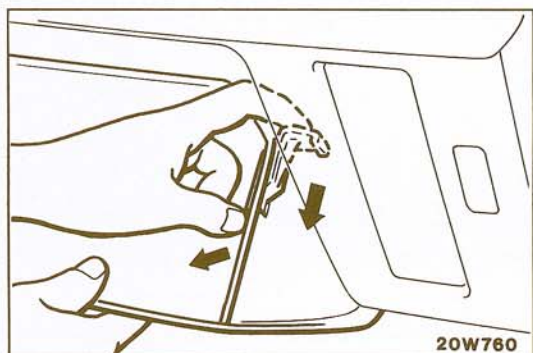
### Removal steps



1. Lap heater duct (C)
2. Glove box stoppers
3. Knobs
4. Plugs
5. Center panel
6. Connection of center panel wiring harness to front wiring harness connector
7. Air conditioner switch

### NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) : Refer to "Service Points of Removal".



20W780

## SERVICE POINTS OF REMOVAL

N24GBAE

### 1. REMOVAL OF GLOVE BOX STOPPERS

- (1) Open the glove box lid.
- (2) Remove the glove box stopper.
- (3) Pull the glove box outward.

## EVAPORATOR

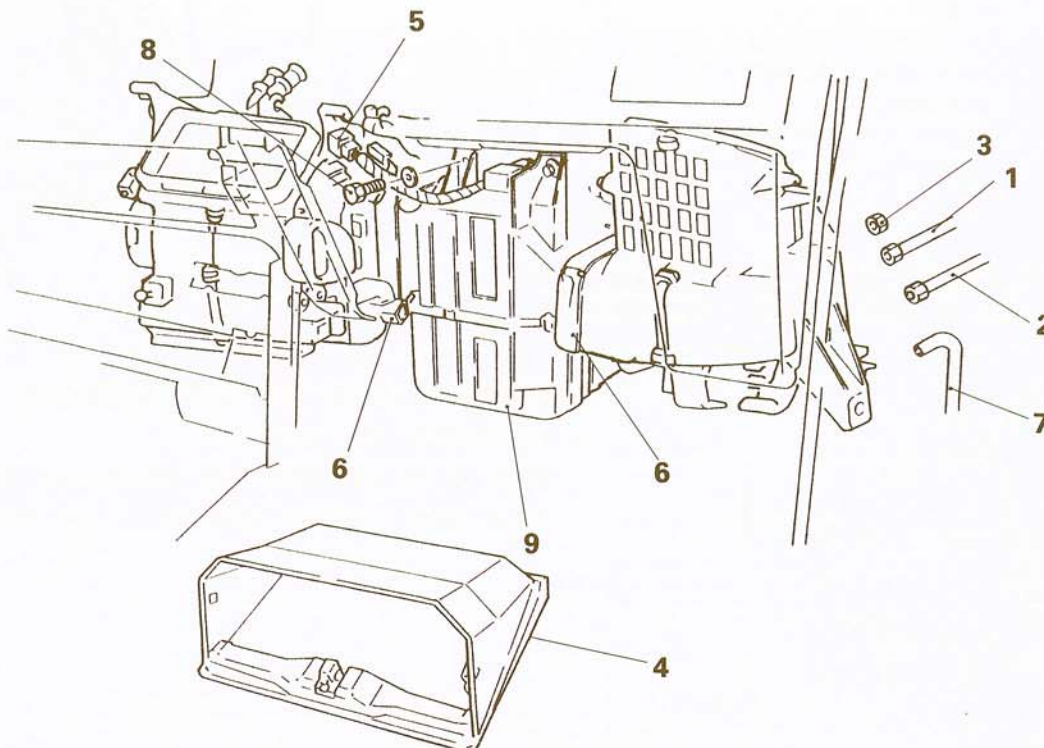
## REMOVAL AND INSTALLATION

**Pre-removal Operation**

- Discharge the refrigerant. (Refer to P.24-34)

**Post-installation Operation**

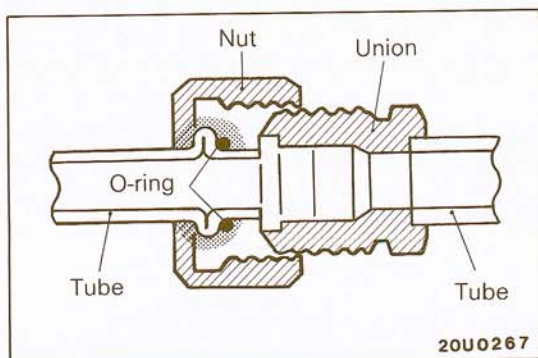
- Charge the refrigerant. (Refer to P.24-35)

**Removal steps**

- ◆◆ 1. Liquid pipe connection
- ◆◆ 2. Suction hose connection
- 3. Nut
- 4. Glove box
- 5. Main harness connector connection
- 6. Duct joint
- 7. Drain hose connection
- 8. Bolt
- 9. Evaporator

**NOTE**

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ : Refer to "Service Points of Installation".

**SERVICE POINTS OF REMOVAL**

N24RBAC

**Caution**

If the hoses or pipes are disconnected, cap the hoses or pipes with a blank plug to prevent entry of dust, dirt, and water.

**SERVICE POINTS OF INSTALLATION**

N24RDAE

**2. APPLICATION OF COMPRESSOR OIL TO SUCTION HOSE/1. LIQUID PIPE**

Apply specified compressor oil to portions indicated before installing the liquid pipe (C) and suction flexible hose.

**Specified oil : DENSO oil 6**



## DISASSEMBLY AND REASSEMBLY

N24RE--

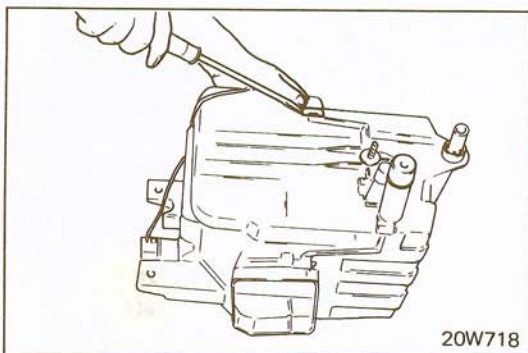
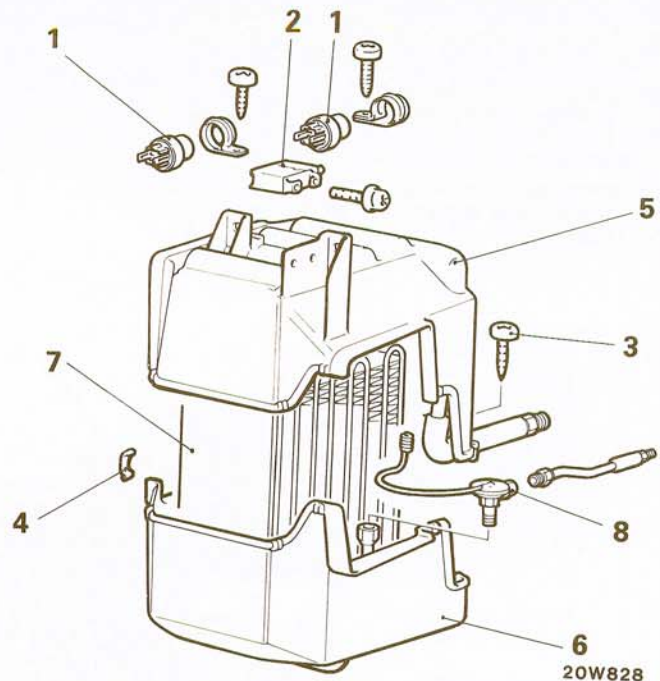
## Disassembly steps

1. Air conditioner relay
2. Thermostat
3. Screw
4. Clip
5. Evaporator case (upper)
6. Evaporator case (lower)
7. Evaporator assembly
8. Expansion valve



## NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2)  : Refer to "Service Points of Disassembly".
- (3)  : Refer to "Service Points of Reassembly".

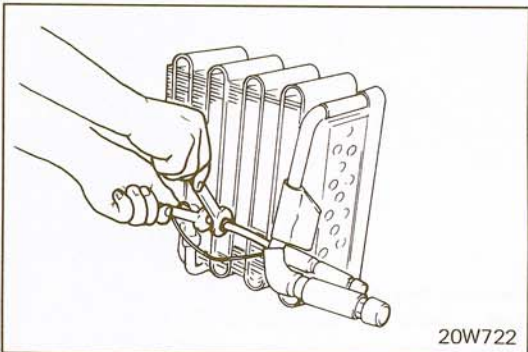


## SERVICE POINTS OF DISASSEMBLY

N24RFAB

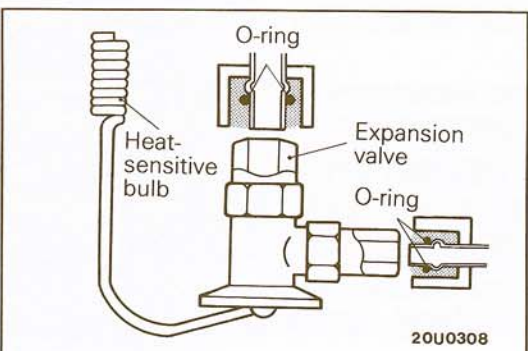
## 4. REMOVAL OF CLIP

Remove the clips with a flat-blade screwdriver covered with a shop towel to prevent damage to case surfaces.



## 8. REMOVAL OF EXPANSION VALVE

Use two wrenches to loosen the flare nut on the pipe connection (for both the inlet and outlet).



## SERVICE POINTS OF REASSEMBLY

N24RHAE

## 8. APPLICATION OF COMPRESSOR OIL TO EXPANSION VALVE

Apply specified compressor oil to the O-rings and install the expansion valve to the evaporator assembly.

**Specified oil : DENSO oil 6**

# RECEIVER DRIER, CONDESER, COMPRESSOR CLUTCH ASSEMBLY REMOVAL AND INSTALLATION

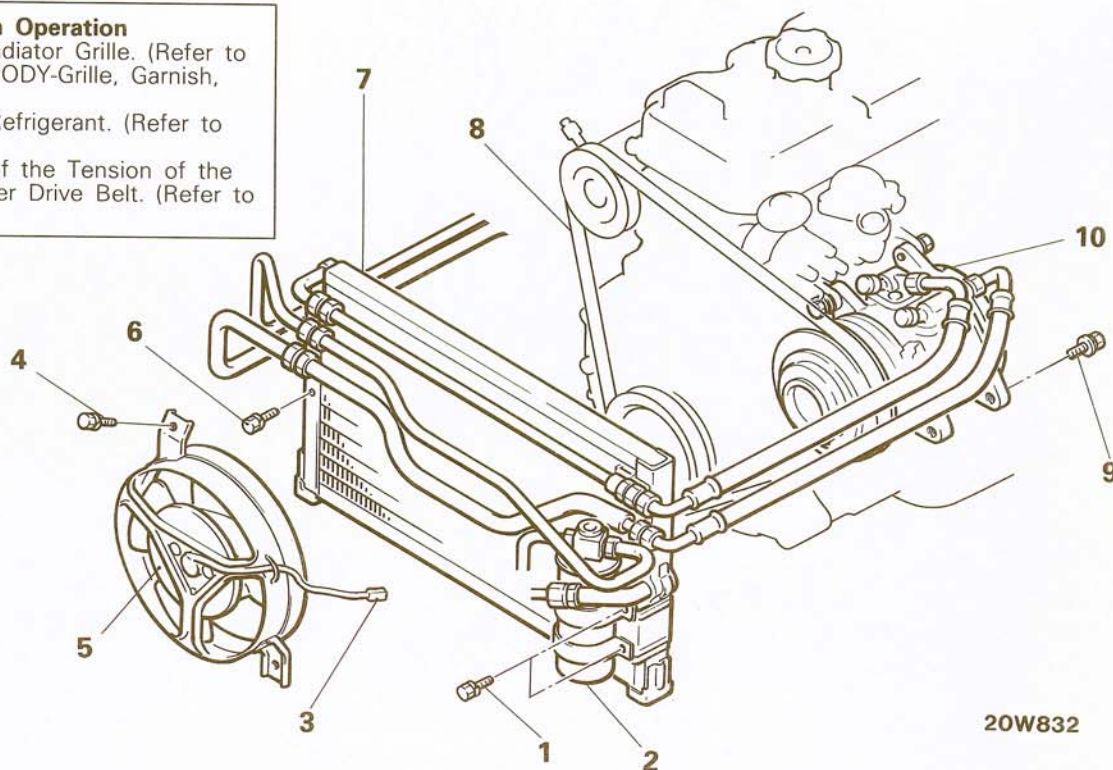
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## Pre-removal Operation

- Discharge the Refrigerant. (Refer to P.24-34)
- Remove the Radiator Grille. (Refer to GROUP 23 BODY-Grille, Garnish, Moulding)
- Disconnect the Liquid Pipes and Hoses.

## Post-installation Operation

- Install the Radiator Grille. (Refer to GROUP 23 BODY-Grille, Garnish, Moulding)
- Charge the Refrigerant. (Refer to P.24-35)
- Adjustment of the Tension of the Air Conditioner Drive Belt. (Refer to P.24-38)



## Receiver drier removal steps

1. Receiver drier mounting bolt
2. Receiver drier

## Condenser removal steps

3. Blower motor connector
4. Blower motor mounting bolt
5. Blower motor
6. Condenser mounting bolt
7. Condenser

## Compressor clutch assembly removal steps

8. Drive belt
9. Compressor clutch assembly mounting bolt
10. Compressor clutch assembly

## NOTE

Reverse the removal procedures to reinstall.

## SERVICE POINTS OF REMOVAL

N24TBAB

## Caution

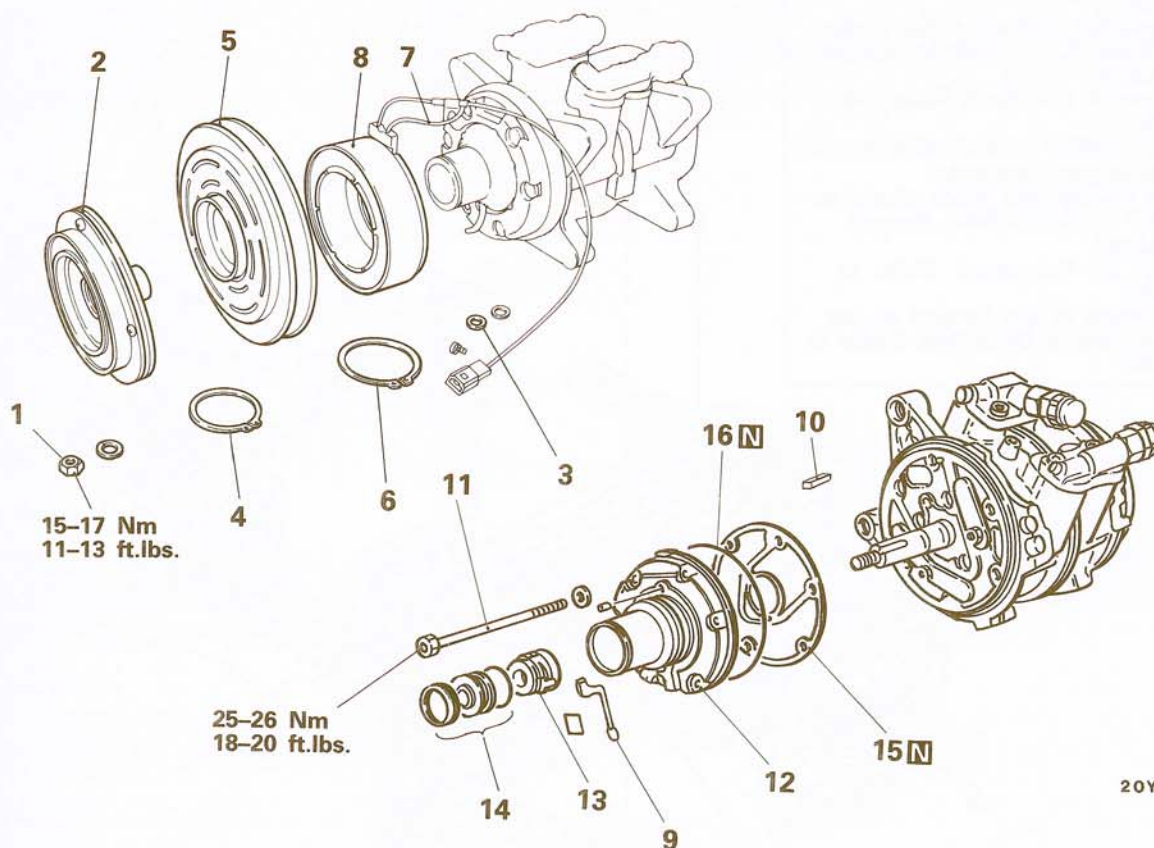
If the hoses or pipes are disconnected, cap the hoses or pipes with a blank plug to prevent entry of dust, dirt, and water.



## COMPRESSOR

## DISASSEMBLY AND REASSEMBLY

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## Magnetic clutch disassembly steps

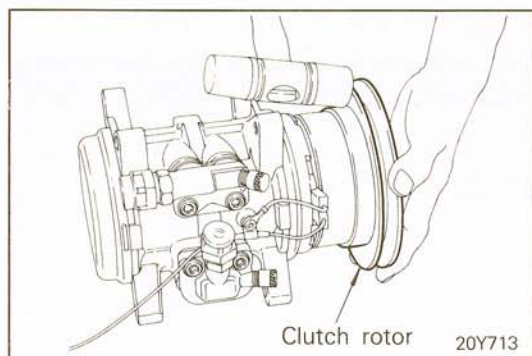
1. Nut
- ◆◆ Adjustment of clutch clearance
2. Clutch hub
3. Shims
4. Snap ring
- ◆◆ 5. Rotor assembly
6. Snap ring
7. Ground terminal
- ◆◆ 8. Clutch coil

## Compressor front housing and service valve disassembly steps

9. Oil drain guide
10. Woodruff key
11. Through bolt
- ◆◆ Refilling of compressor oil
12. Front housing
- ◆◆ 13. Shaft seal
- ◆◆ 14. Shaft plate
15. Gasket
16. O-ring

## NOTE

- (1) Reverse the disassembly procedures to reassemble.
- (2) ◆◆ : Refer to "Service Points of Disassembly".
- (3) ◆◆ : Refer to "Service Points of Reassembly".
- (4) N : Non-reusable parts

**SERVICE POINTS OF DISASSEMBLY**

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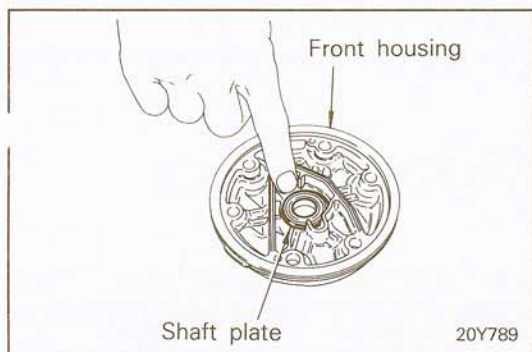
**5. REMOVAL OF ROTOR ASSEMBLY**

It may be necessary to lightly tap the rotor with a plastic hammer.

**INSPECTION**

N24TGAC

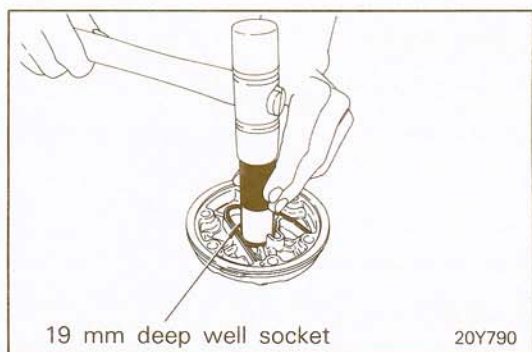
- Check the surface of the clutch hub for scoring or bluing.
- Check the surface of the rotor for scoring or bluing.
- Check the sealing surfaces for cracks, scratches and deformation.
- Check the front housing for cracks or scoring on the sealing surfaces.
- Check the compressor shaft for scoring.

**SERVICE POINTS OF REASSEMBLY**

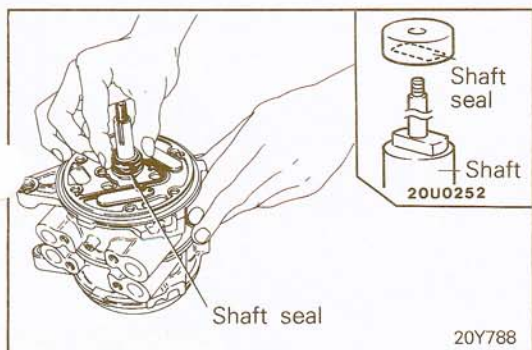
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**14. INSTALLATION OF SHAFT PLATE**

- (1) Lubricate the shaft plate and a new O-ring with compressor oil. Push the shaft plate and O-ring into the front housing.



- (2) Install the seal plate into the front housing with 19 mm deep well socket.

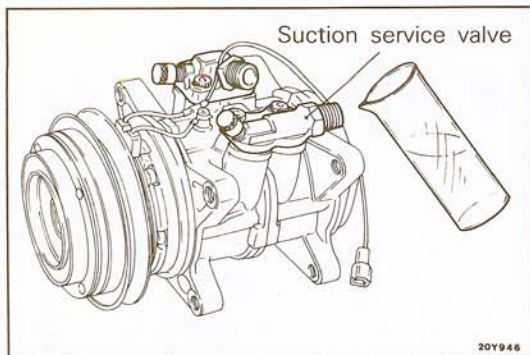
**13. INSTALLATION OF SHAFT SEAL**

Lubricate the shaft seal with compressor oil. Install the shaft seal on the shaft.

**NOTE**

Rotate the shaft seal lightly by hand to check that it is fitted into the notch on the compressor shaft.

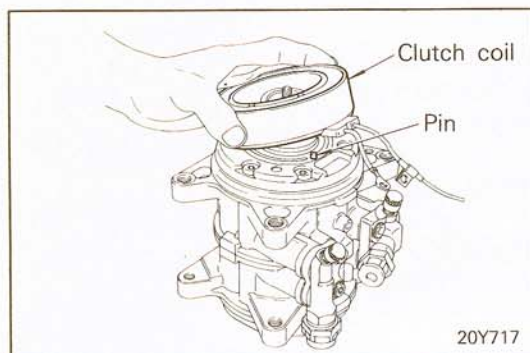




### ● REFILL OF COMPRESSOR OIL

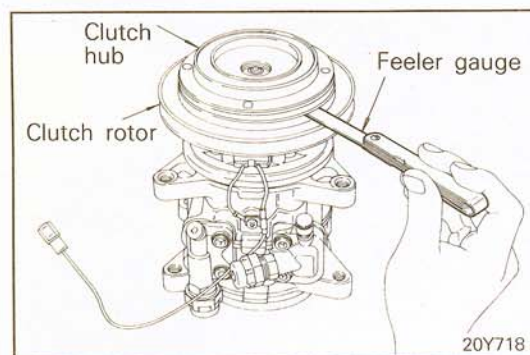
Fill 110 c.c. (3.7 U.S. fl.oz., 3,9 Imp.fl.oz.) specified compressor oil from the suction hole side and install the flange fitting assembly.

**Specified oil : DENSO oil 6**



### 8. INSTALLATION OF CLUTCH COIL

The clutch coil must be aligned with the pin in the compression housing.



### ● ADJUSTMENT OF CLUTCH CLEARANCE

- (1) Check the pressure plate to rotor clearance as illustrated.

**Pressure plate to rotor clearance :**  
**0.4–0.7 mm (.016–.028 in.)**

#### NOTE

Remove clearance adjusting shims to decrease clutch clearance. Add shims selected from the following table to increase clutch clearance.

#### Clearance Adjustment Shims

Part No.	Thickness
RS13023A	0.1 mm (.004 in.)
RS13023B	0.2 mm (.008 in.)
RS13024	0.5 mm (.020 in.)

- (2) Turn the rotor by hand to confirm that it rotates freely.



## UNITED STATES



The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source are available through the following outlet.

Miller Special Tools, Division of Utica Tool Company, Inc., 32615 Park Lane, Garden City, Michigan 48135, U.S.A.

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## CANADA



The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source are available through the following outlet.

C & D Riley Enterprises, Ltd., P.O. Box 243, Amherstburg, Ontario N9V 2Z4.

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## INTERNATIONAL



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Miller Special Tools, Division of Utica Tool Company, Inc., 32615 Park Lane, Garden City, Michigan 48135, U.S.A.



