



Body Electrical System

General Information

W ELECTRICAL WIRING SCHEMATIC

Legend:
--- CURRENT FROM BATTERY
--- CURRENT FROM IG1
--- CURRENT FROM ACC
--- OTHERS

SYSTEM CIRCUIT

SEC-TION	SYSTEM CIRCUIT
A	STARTING SYSTEM
M	SUN ROOF SYSTEM
I-1a	ROOM LAMP
F-1	TURN & HAZARD FLASHER UNIT
K-2	POWER DOOR LOCK SYSTEM
I-1a I-1b	ETWIS
F-2	HORN
G	HEATER & AIR CONDITIONER SYSTEM
E-4	REAR FOG LAMP HLLD
I-1a	ACC SOCKET CIGAR LIGHTER
F-2	BACK-UP LIGHT
L	POWER MIRROR SYSTEM
J	RADIO SYSTEM
C-1a C-1b C-1c	INSTRUMENT CLUSTER & WARNING LAMPS
H-1a H-1b	EACT CONTROL SYSTEM
C-1a	SPEED SENSOR
S	AIR BAG SYSTEM
E-3	DAYTIME RUNNING LIGHT (DRL)

SYSTEM CIRCUIT

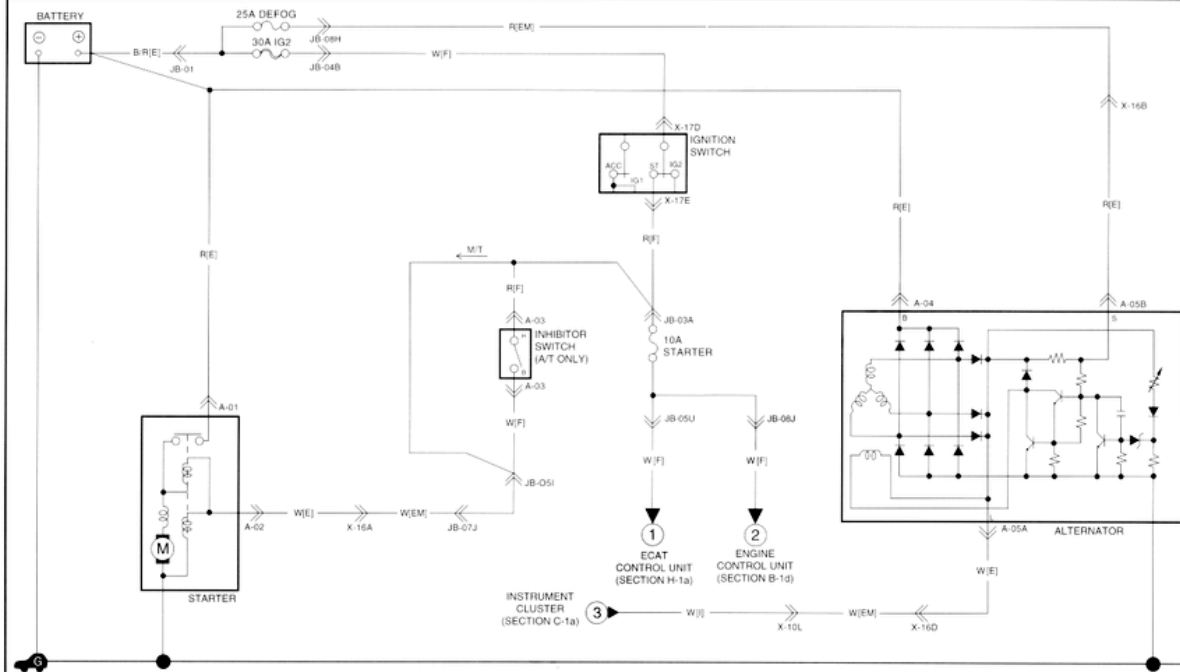
SYSTEM CIRCUIT	SEC-TION
STARTING SYSTEM	A
CHARGING SYSTEM	A
ENGINE CONTROL SYSTEM	B-1a B-1b B-1c B-1d B-1e
HEAD LIGHTS	E-1a E-1b
FRONT FOG LAMPS	E-2
LICENSE LIGHTS	E-2
POSITION LAMPS	E-2
TAIL LAMPS	E-2
ILLUMINATION LAMPS	I-2
POWER WINDOW SYSTEM	K-1
STOP LIGHTS	F-2
REAR DEFROSTER	I-1b
DIAGNOSIS CONNECTOR	U
FRONT WIPER & WASHER	D
REAR WIPER & WASHER	D
ANTI-LOCK BRAKE SYSTEM	O
IMMOBILIZER SYSTEM	T

GROUND POINT



A

STARTING & CHARGING SYSTEM



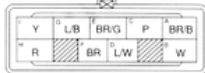
A-01 STARTER [E]



A-02 STARTER [E]



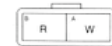
A-03 INHIBITOR SWITCH [F]GY



A-04 ALTERNATOR [E]

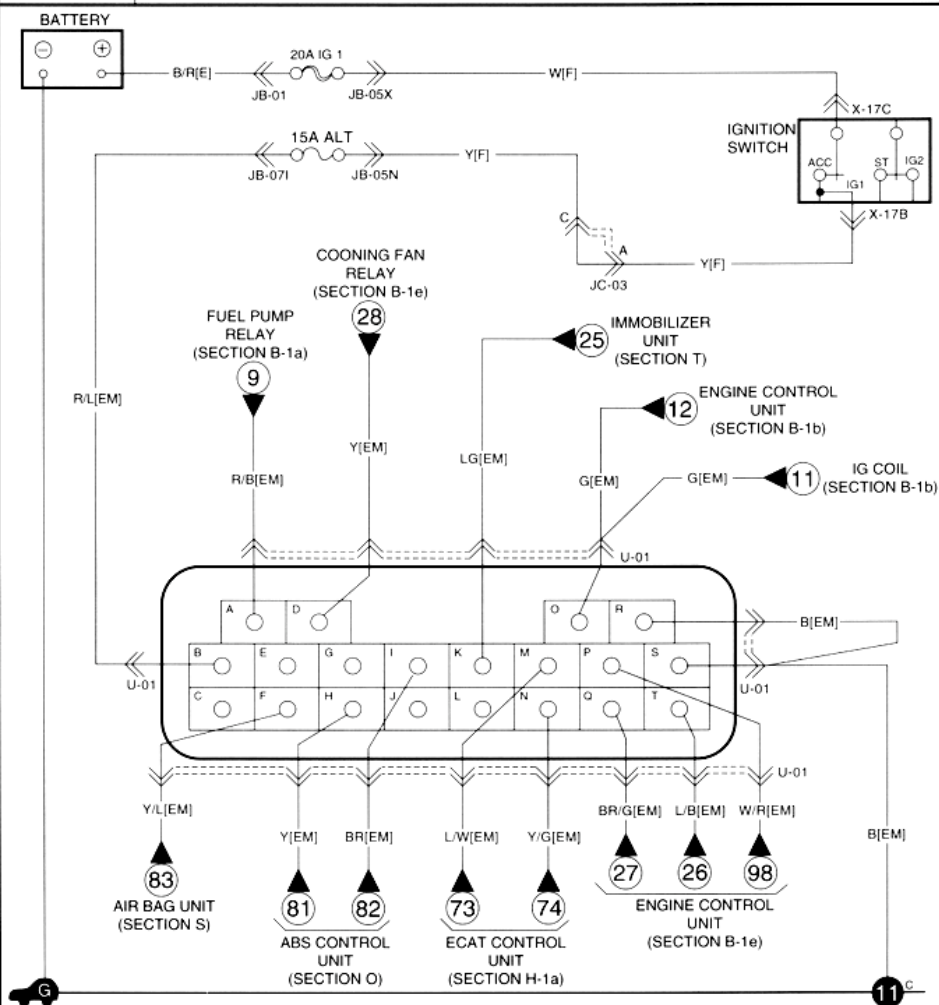


A-05 ALTERNATOR [E]GY



Diagnosis connector

DIAGNOSIS CONNECTOR



U-01 DIAGNOSIS CONNECTOR [EM]

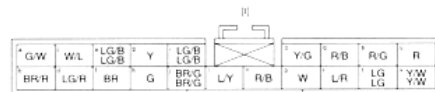
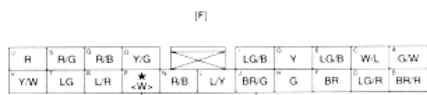
A diagram of a 3x3 grid. The top row contains a large 'A' and a large 'Y'. The middle row contains 'R/L', 'E', 'G', 'I', 'BR', 'LG', 'L/W', 'V', 'W/R', 'S', 'B'. The bottom row contains 'C', 'F', 'Y/L', 'H', 'J', 'L', 'N', 'Y/G', 'O', 'BR/G', 'T', 'L/B'. There are also some smaller symbols like a star and a cross.

A			Y									
B	R/L	E	*	G	I	BR	LG	L/W	V	W/R	S	B
C	*	F	Y/L	H	J	*	L	N	Y/G	O	BR/G	T

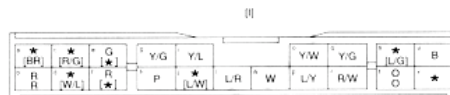
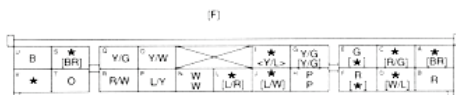
Common connector

X-1a COMMON CONNECTOR

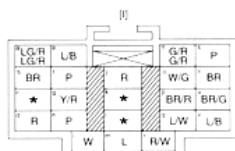
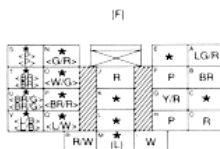
X-01 FRONT [F] - INSTRUMENT PANEL HARNESS [I]



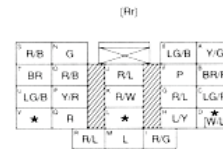
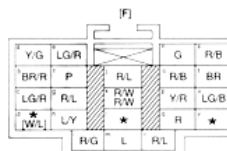
X-02 FRONT [F] - INSTRUMENT PANEL HARNESS [I]



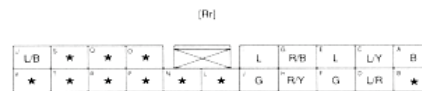
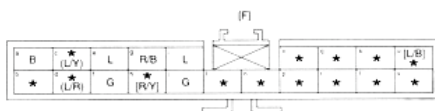
X-03 FRONT [F] - INSTRUMENT PANEL HARNESS [I]



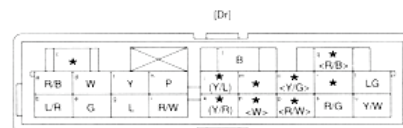
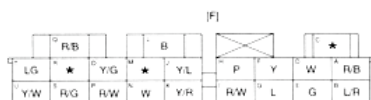
X-04 FRONT [F] - REAR HARNESS [R]



X-05 FRONT [F] - REAR HARNESS [R]



X-06 FRONT [F] - FRONT DOOR LEFT HARNESS [D]



< >

< > AIR BAG
| : EUROPE

< > A/T
() ABS

() EURO1

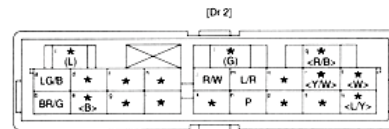
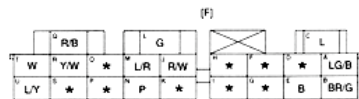
() ABS
| : EUROPE

< > POWER MIRROR
() DOOR LOCK

X-1b

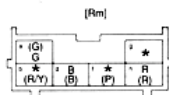
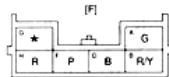
COMMON CONNECTOR

X-07 FRONT [F] - FRONT DOOR RIGHT HARNESS (Dr)



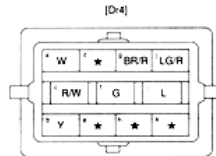
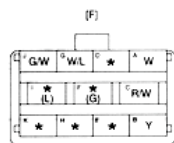
< > : POWER MIRROR
() : DOOR LOCK

X-08 FRONT [F] - ROOM HARNESS [Rm]



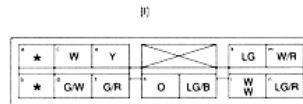
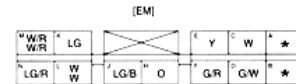
() : SUN ROOF

X-09 FRONT (F) - REAR DOOR RIGHT HARNESS [D+4]

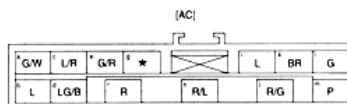
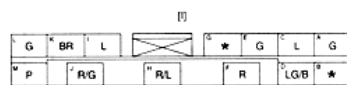


() : DOOR LOCK

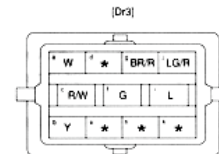
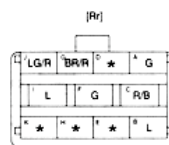
() : DOOR LOCK	X-10 EMISSION (EM) - INSTRUMENT PANEL HARNESS (I)
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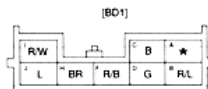
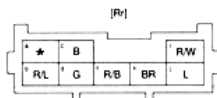
X-11 INSTRUMENT PANEL (I) - A/C HARNESS (AC)



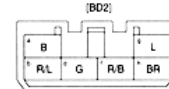
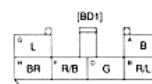
X.12 REAR [Rr] - REAR DOOR LEFT HARNESS [Dr4]



X-13 REAR [Rr] - BACK DOOR No.1 HARNESS [BD1]

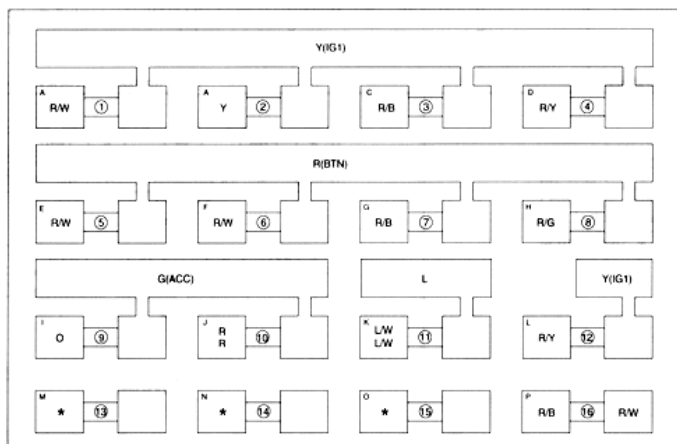


X-14 BACK DOOR No.2 [BD1] - BACK DOOR No.2 HARNESS [BD2]



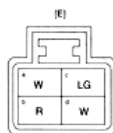
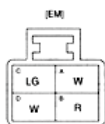
X-1c COMMON CONNECTOR

X-15 FUSE BOX [F]

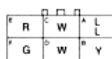


- ① 10A TURN LAMP
- ② 10A METER
- ③ 10A AIR BAG
- ④ 10A ABS
- ⑤ 20A S/WARMER
- ⑥ 15A STOP
- ⑦ 10A ECU
- ⑧ 15A POWER SOCKET
- ⑨ 10A AUDIO
- ⑩ 15A CIGAR LIGHTER
- ⑪ 15A FRONT WIPER
- ⑫ 10A EGI
- ⑬ *
- ⑭ *
- ⑮ *
- ⑯ 10A MIRROR HEATER

X-16 EMISSION [EM] - ENGINE HARNESS [E]



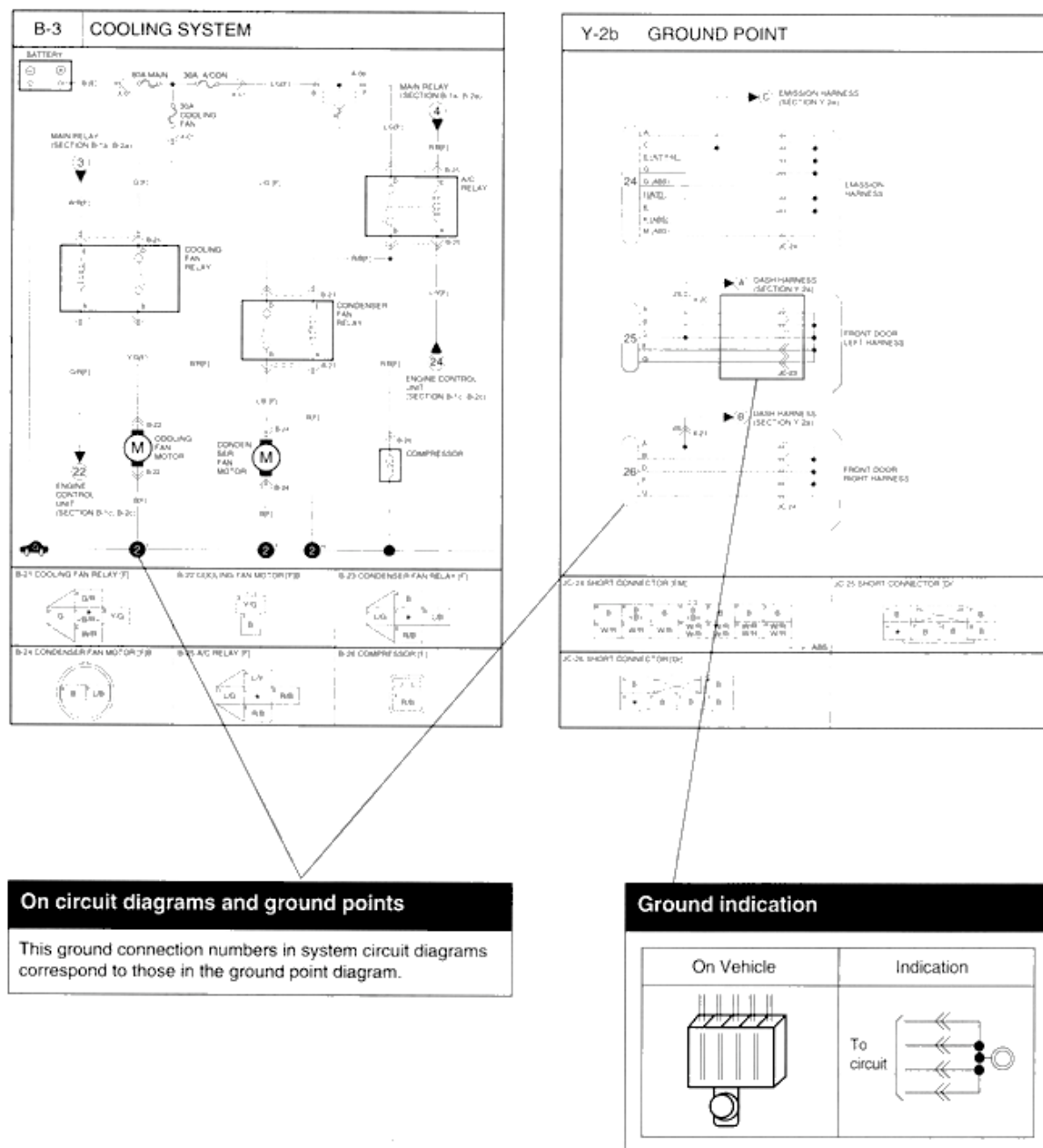
X-17 IGNITION SWITCH [F]





Ground points

- This shows ground points of the harness.



System circuit diagram/connector diagram

- These diagrams show the circuits for each system, from the power supply to the ground. The power supply side is on the upper part of the page, the ground side on the lower part. The diagrams describe circuits with the ignition switch off. Below is an explanation of the various points in the diagram.

F-2 HORNS, STOP LIGHTS, BACK-UP LIGHT

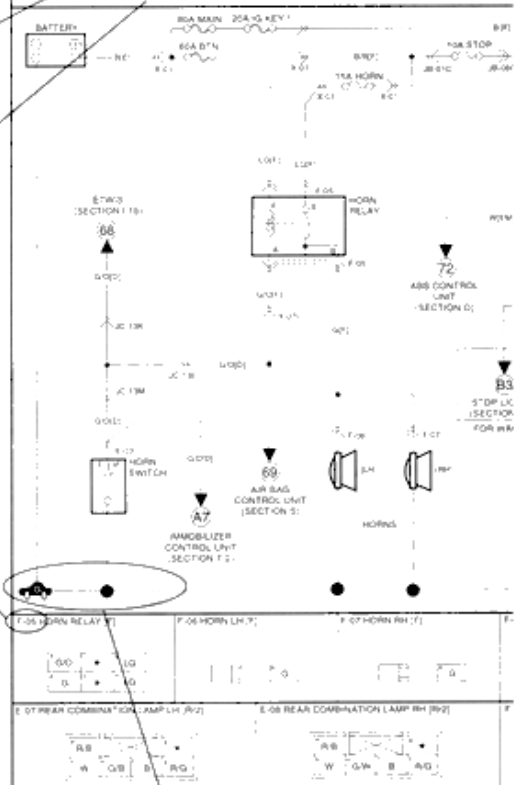
System code

System name

Connector code

The prefix letter indicates the system in which the connector is used.

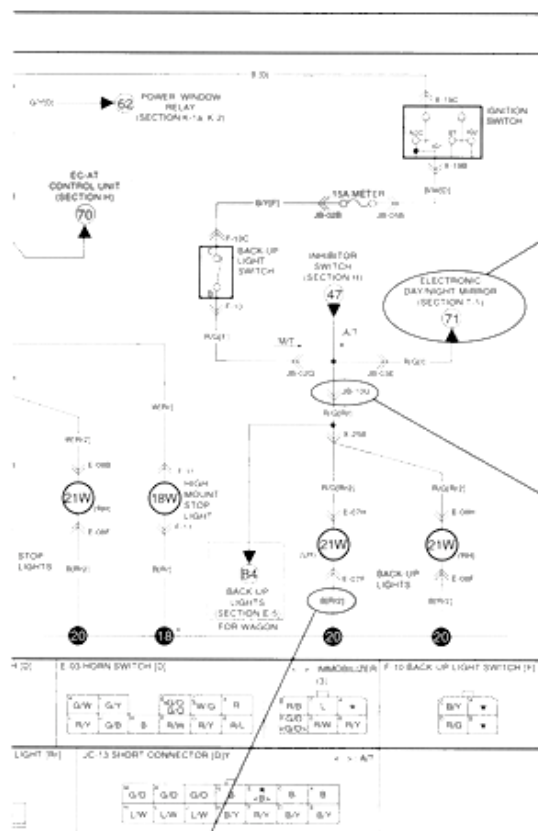
- JB : Joint box connections
- X : Common connectors
- A : Charging system/starting system connectors
- B : Engine control system connectors
- C : Gauge control system connectors
- D : Wiper system connectors
- E : Lighting system connectors
- F : Signal system connectors
- G : Air-conditioning system connectors
- H : Transmission Control system connectors
- I : Interior lamp system connectors
- J : Audio/radio connectors
- K : Power window/power door lock system connectors
- L : Remote control mirror system connectors
- M : Sliding sunroof system connectors
- N : Power steering/4-wheel steering system connectors
- O : Anti-lock brake system connectors.
- P : Power seat/seat heater system connectors
- Q : Auto cruise control system connectors
- R : Auto adjusting suspension system connectors
- S : Passive shoulder belt control/Airbag system connectors
- T : Others
- Y : Ground connector



Ground numbers

A harness ground is represented differently than a unit ground

Types of grounds	Symbol
Harness 	
Unit 	



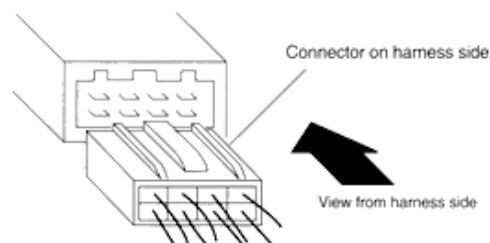
The number indicates that the circuit continues to the related system diagram.

Connector symbols

- Male and female connectors are represented as follows in the circuit and connector diagrams.

		Circuit diagram symbol	Connector diagram symbol
Male			
Female			

- Like connectors are linked by dashed lines between the connector symbols.
- Connector diagrams show connectors on the harness side. The terminal indicates the view from the harness side. (Example)

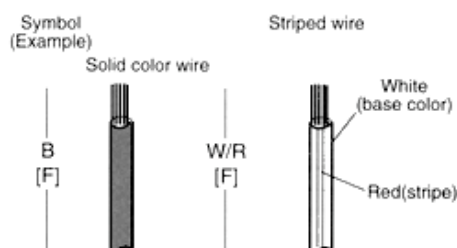


- Colors for connectors except milk-white are given in locations.
- Unused terminals are indicated by *.
- Connector No. X-21D ; The letter "D" indicates the location of connector pin.

Wire color code (harness symbol)

- Two-color wires are indicated by a two-letter symbol. The first indicates the base color of the wire, the second the color of the stripe. For example:

W/R is a white wire with red stripe
BR/Y is brown wire with a yellow stripe.



Routing diagram

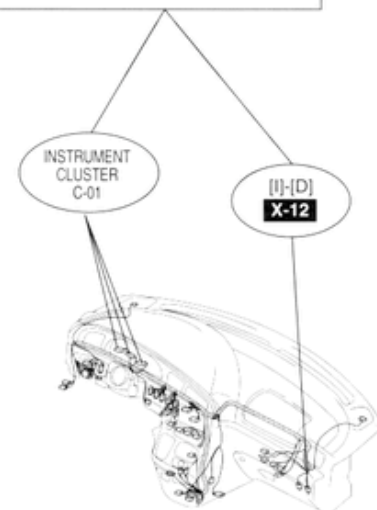
- The routing diagram shows where electrical components are on the system circuit diagram by call outline and connector symbols.
- Specified values are listed beside the routing diagram or on the following page.

Connector symbol

Shows the system that uses the connector.

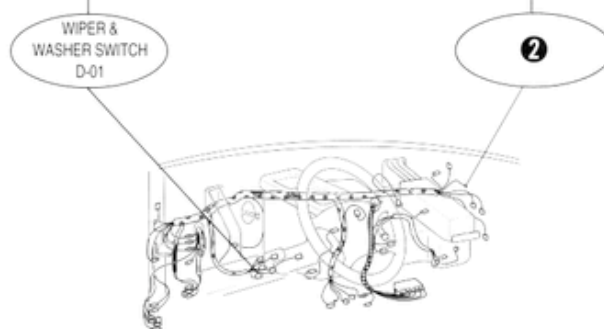
(Example)

Connector	Symbol
Common connectors	X-17
System connectors	C-01



Component name

Shows the names of components in routing diagrams



Ground symbol

Shows the ground in system diagrams

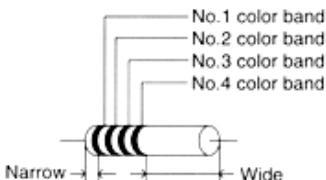
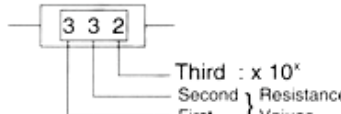
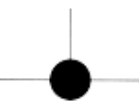
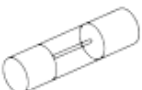
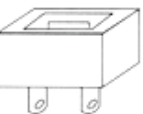
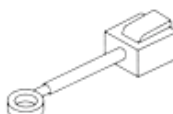
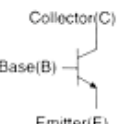
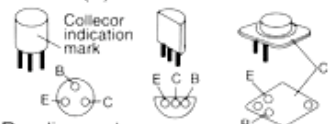
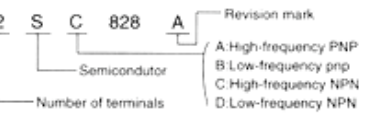
Engine control unit terminal(unit side)

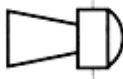
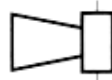
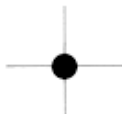
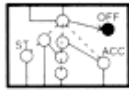
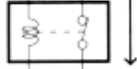
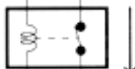
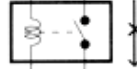
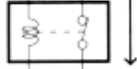
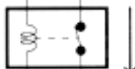
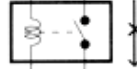
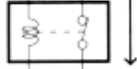
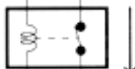
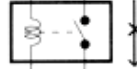
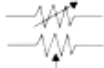
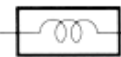
Terminals	Input	Output	Connection to	Test condition	Correct voltage	Remark
1A			Battery	Constant	V _B	For backup
1B	O		Main relay (FUEL RELAY)	Ignition switch OFF	Approx. 0V	
1C	O		Ignition switch (START)	Ignition switch ON	Approx. 10V	
1D	O		Diagnosis connector (ENG. MON. terminal)	First 3 seconds after ignition switch OFF → ON	Approx. 5V	While Performing switch monitor function
				After 3 seconds	V _B	
				Any monitored switch in ON position	Approx. 5V	
				Any monitored switch in OFF position	V _B	
1F	O		Diagnosis connector (ENG. FAIL terminal)	First 3 seconds after ignition switch OFF → ON	Below 2.5V	
				After 3 seconds	V _B	
1G	O		Igniter	Ignition switch ON	Approx. 0V	
1H				Idle	Approx. 0.2V	
1I						
1J	O		A/C relay	Ignition switch ON	V _B	
				A/C switch ON at idle	Below 2.5V	
				A/C switch OFF at idle	V _B	
1K	O		Diagnosis connector (ENG. TEST terminal)	ENG. TEST terminal open	V _B	
				ENG. TEST terminal grounded	Below 1.0V	
1L	O		DRL relay	Parking brake pulled with ignition switch ON (DRL OFF)	V _B	
				Idle (DRL ON)	Below 2.5V	

Specified values

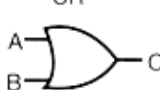
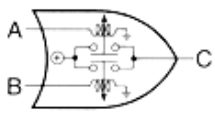
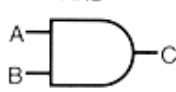
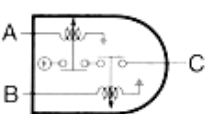
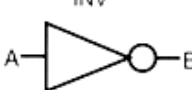
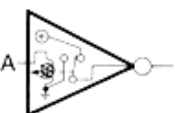
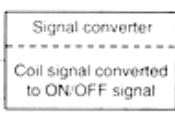
Shows values for determining whether an electrical component is good.

Symbols

Symbol	Meaning	Symbol	Meaning																																																																						
Battery 	- Generates electricity through chemical reaction. - Supplies direct current to circuits.	Resistance	- A resistor with a constant value. - Mainly used to protect electrical components in circuits by maintaining rated voltage. - Reading resistance values. <Colored>  <table border="1" data-bbox="960 575 1351 1032"><thead><tr><th>Color</th><th>No.1 Resistance values</th><th>No.2 Multiplier</th><th>No.3 Multiplier</th><th>No.4 Tolerance</th></tr></thead><tbody><tr><td>Black</td><td>0</td><td>0</td><td>$\times 10^0$</td><td></td></tr><tr><td>Brown</td><td>1</td><td>1</td><td>$\times 10^1$</td><td></td></tr><tr><td>Red</td><td>2</td><td>2</td><td>$\times 10^2$</td><td></td></tr><tr><td>Orange</td><td>3</td><td>3</td><td>$\times 10^3$</td><td></td></tr><tr><td>Yellow</td><td>4</td><td>4</td><td>$\times 10^4$</td><td></td></tr><tr><td>Green</td><td>5</td><td>5</td><td>$\times 10^5$</td><td></td></tr><tr><td>Blue</td><td>6</td><td>6</td><td>$\times 10^6$</td><td></td></tr><tr><td>Purple</td><td>7</td><td>7</td><td>$\times 10^7$</td><td></td></tr><tr><td>Grey</td><td>8</td><td>8</td><td>$\times 10^8$</td><td></td></tr><tr><td>White</td><td>9</td><td>9</td><td>$\times 10^9$</td><td></td></tr><tr><td>Gold</td><td></td><td></td><td>$\times 10^{-1}$</td><td>$\pm 5\%$</td></tr><tr><td>Silver</td><td></td><td></td><td>$\times 10^{-2}$</td><td>$\pm 10\%$</td></tr><tr><td>-</td><td></td><td></td><td></td><td>$\pm 20\%$</td></tr></tbody></table> <Numerical> 	Color	No.1 Resistance values	No.2 Multiplier	No.3 Multiplier	No.4 Tolerance	Black	0	0	$\times 10^0$		Brown	1	1	$\times 10^1$		Red	2	2	$\times 10^2$		Orange	3	3	$\times 10^3$		Yellow	4	4	$\times 10^4$		Green	5	5	$\times 10^5$		Blue	6	6	$\times 10^6$		Purple	7	7	$\times 10^7$		Grey	8	8	$\times 10^8$		White	9	9	$\times 10^9$		Gold			$\times 10^{-1}$	$\pm 5\%$	Silver			$\times 10^{-2}$	$\pm 10\%$	-				$\pm 20\%$
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Ground(1) 	- Connecting point to vehicle body or other ground wire where current flows from positive to negative terminal of battery. - Ground(1) indicates a ground point to body through wire harness.																																																																								
Ground(2) 	- Ground(2) indicates point where component is grounded directly to body. Remarks - Current will not flow through a circuit if ground is faulty.																																																																								
Fuse(1)  (box)	- Melts when current flow exceeds that specified for circuit, interrupts current flow. Precautions - Do not replace with fuses exceeding specified capacity.																																																																								
Fuse(2)  (Cartridge)	<Blade type> <Tube type>  																																																																								
Main fuse/ Fuse link 	<Cartridge type> <Fusible link>  																																																																								
Transistor(1) 	- Electrical switching component. - Turns on when voltage is applied to the base(B). 	Motor 	Converts electrical energy into mechanical energy.																																																																						
Transistor(2) 	Reading code 	Pump 	Pulls in and discharges gases and liquids.																																																																						
Lamp 	Emits light and generates heat when current flows through filament.	Cigarette lighter 	Electrical coil that generates heat.																																																																						

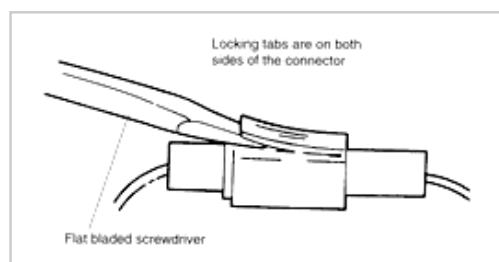
Symbol	Meaning	Symbol	Meaning									
Horn 	Generates sound when current flows.	Switch(1)  Normally open(NO)	Allows or breaks current flow by opening and closing circuits.									
Speaker 		Switch(2)  Normally closed(NC)										
Heater 	Generates heat when current flows.	Harness  (Not connected)	Unconnected intersecting harness.									
Speed sensor 	Movement of magnet in speedometer turns contact within sensor on and off.	 (Connected)	Connected intersecting harness.									
Ignition switch 	Turning ignition key switches circuit to operate various component.											
Relay(1)  Normally open(NO)	Current flowing through coil produces electromagnetic force causing contact to open or close.	<table><tr><th></th><th>No current to coil</th><th>Current to coil</th></tr><tr><td>Normally open relay(NO)</td><td> No flow</td><td> Flow</td></tr><tr><td>Normally closed relay(NC)</td><td> Flow</td><td> No flow</td></tr></table>			No current to coil	Current to coil	Normally open relay(NO)	 No flow	 Flow	Normally closed relay(NC)	 Flow	 No flow
	No current to coil	Current to coil										
Normally open relay(NO)	 No flow	 Flow										
Normally closed relay(NC)	 Flow	 No flow										
Relay(2)  Normally closed(NC)												
Sensor (Variable) 	Resistance changes with other components operation.	Diode 	Known as a semiconductor rectifier, the diode allows current flow in one direction only. Cathode(K)  Anode(A) ← Flow of electric current K-  A K-  A									
Sensor (Thermistor) 	Resistance Changes with temperature.	Light-emitting diode (LED) 	- A diode that lights when current flows. - Unlike ordinary bulbs, the diode does not generate heat when lit. Cathode(K)  Anode(A)  Cathode(K) Anode(A) ← Flow of current									
Capacitor 	Component that temporarily stores electrical charge.											
Solenoid 	Current flowing through coil generates electromagnetic force to operate plungers.	Reference diode (Zener diode) 	Allows current to flow in one direction up to a certain voltage; allows current to flow in the other direction once that voltage is exceeded.									

Logic symbols

Type of logic symbols	Operation	Expressing output	Simple relay circuits
OR 	Input to A or B will produce output at C.	Low electrical potential (L) at A and B → no output (L) at C High electrical potential (H) at A or B → output (H) at C	
AND 	Input to A and B will produce output at C.	High electrical potential (H) at A and B → output (H) at C Low electrical potential (L) at A and B → output (L) at C	
INV 	No input to A will produce an output at B An input to will not produce an output at B.	Low electrical potential (L) at A → no ground (H) B High electrical potential (H) at A → grounds (L) B	
PROCESS 	Simplified representation of complex functions within circuit describes main function. 1. Signal detector for engine control unit, cooling unit, and tachometer. 2. Signal converter for turn and hazard flasher unit and igniter unit.		(Examples) Igniters 

In-line connectors

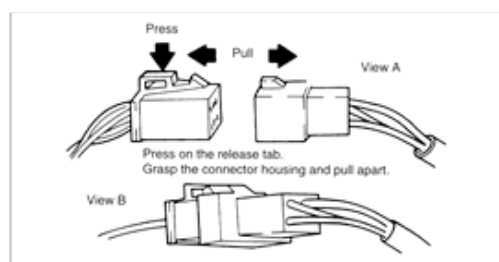
- The following illustrations show typical electrical connectors and their disengagements.



A. Insert a flat blade screwdriver in the locking tab and twist.

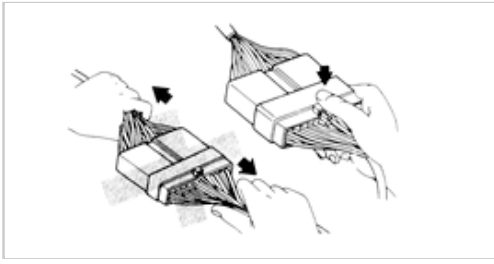
B. Grasp the connector housing and pull until the locking tab is on the ramp.

Turn the connector over and repeat the procedure on the opposite side of the connector.
Grasp the connector housing and pull apart.



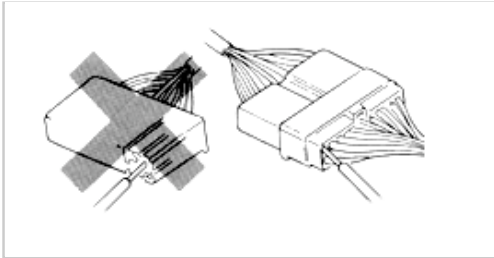
Disconnecting the connector

- The connector can be disconnected by pressing the lock lever. Do not pull on the wires when disconnecting the connector. Be careful to hold the connector itself when disconnecting it.



Inspection

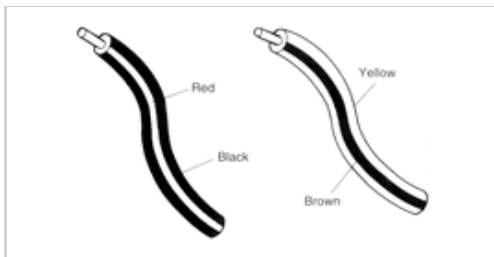
1. When a tester is used to check the continuity or to check the voltage, insert the tester probe from the wire harness side.



Wiring color codes

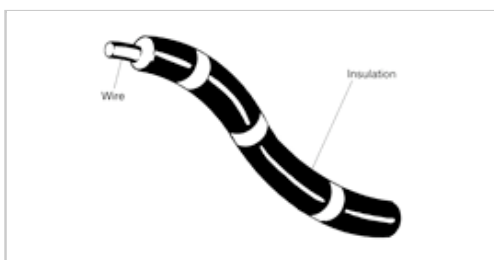
1. Two-color wires are indicated by a two-color code symbol. The first color code indicates the base color of the wire and the second indicates the color of the stripe.

Code	Color	Code	Color
B	Black	Lg	Light green
Br	Brown	O	Orange
G	Green	R	Red
L	Blue	Y	Yellow
P	Pink	W	White
Lb	Light Blue	V	Violet



Thin Insulation wire

1. To reduce the weight of the wiring harness, a thin coating of a high resistance insulation material is used.

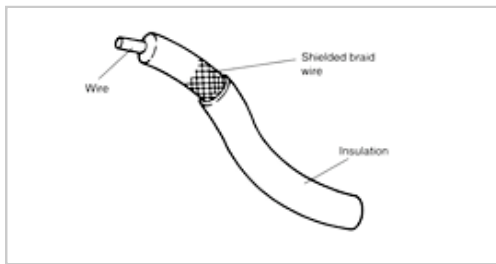


Shielded braid wire

1. The shielded braid wire is used to prevent malfunctions in those circuits that are important and susceptible to outside

signals or interference. For example:

- A. Ignition coil signal
- B. Heated Oxygen sensor(HO2S) signal.



Replacement of terminals

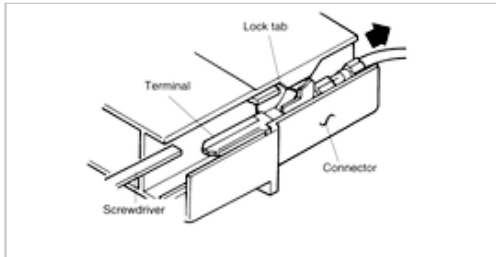
Use the appropriate tools to remove the terminal, as shown in the illustrations.

NOTICE

When installing a terminal, be sure to press it in until it locks securely.

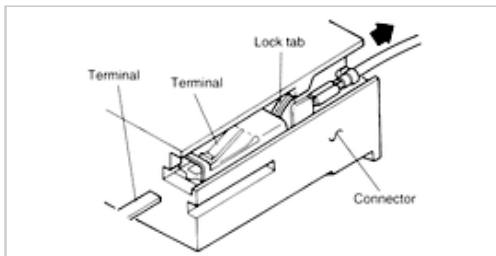
Female type

1. Insert a push-tool, or thin piece of metal such as a small screwdriver, from the terminal side of the connector, and then, with the locking tabs pressed down, pull the terminal out from the rear side of the connector.



Male type

1. Refer to female type procedure.





Diagnostics

Exterior lights

Refer to 1999 CARENS Wiring Diagram Manual.

Windshield wiper/washer

Refer to 1999 CARENS Wiring Diagram Manual.

Horn

Refer to 1999 CARENS Wiring Diagram Manual.

Problem	Possible cause	Action
Horn does not operate	Fuse "HORN" has opened	Replace fuse
	Horn relay failed	Replace relay
	No ground at horn installation	Establish ground connection
	Horn failed	Replace horn
Horn operates continuously	Horn button stuck	Pull horn button up; repair or replace
	Relay stuck (contacts stuck closed)	Replace relay

Instrument cluster assembly

In vehicle use, if an instrument does not run smoothly or indicate correctly, remove instrument and test it in shop to determine fault cause. Remove a failed bulb by removing instrument cluster. Other problems and their possible causes are listed below.

Problem	Possible cause	Action
Speedometer does not work or shows indicator error	Defective speedometer	Replace
	Defective speedometer sensor	Replace
	Defective wire between speedometer and speedometer sensor	Replace
	Defective printed circuit	Replace
Coolant temperature gauge does not work	Defective printed circuit	Replace
	Coolant temperature gauge	Replace
	Coolant temperature sensor unit	Replace
Fuel gauge does not work	Defective printed circuit	Replace
	Fuel gauge sensor unit (fuel tank)	Replace
	Fuel gauge	Replace
Instrument cluster lamp does not test correctly or operate	Defective bulb	Replace
	Defective bulb holder	Replace
	Defective printed circuit	Replace
Instrument cluster trim switch does not light	Defective bulb	Replace

Power door

If power door does not operate, refer to 1999 CARENS Wiring Diagram Manual.

Power mirror

If power mirror does not operate, refer to 1999 CARENS Wiring Diagram Manual.

Power window

If power window does not operate, refer to 1999 CARENS Wiring Diagram Manual.

Radio

Problem	Possible cause	Action
Radio does not work	Radio unit	Replace fuse
Radio has static or drift	Antenna	Replace
Radio has weak reception	Antenna cable Antenna Radio	Replace Replace Replace
One area of vehicle does not get radio reception	Radio speaker	Replace area speaker
Radio has no reception	Antenna cable (shorted)	Repair or replace unit
Antenna mast damaged or broken	Antenna mast	Replace

Rear defroster window

Refer to 1999 CARENS Wiring Diagram Manual. for supporting electrical system problem diagnosis.

Five-step troubleshooting

1. Verify the problem

Turn on all the components in the problem circuit to check the accuracy of the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.

2. Analyze the circuit schematic

Look up the schematic for the problem circuit.

Determine how the circuit is supposed to work by tracing the current paths from the power source through the circuit components to ground. Also, trace circuits that share wiring with the problem circuit. The names of circuits or components that share the same fuse, ground, or switch, and so on, are referred to in each circuit schematic. Try to operate any shared circuits you didn't check in step 1. If the shared circuits work, the shared wiring is OK, and the cause must be in the wiring used only by the problem circuit. If several circuits fail at the same time, the fuse or ground is a likely cause.

Based on the symptoms and your understanding of the circuit's operation, identify one or more possible causes.

3. Find the cause

Make circuit tests to check the diagnosis you made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting. Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.

4. Repair the problem

Once the specific problem is identified, make the repair.

Be sure to use proper tools and safe procedures.

5. Check the repair

Turn on all components in the repaired circuit in all modes to make sure you've fixed the entire problem. If the problem was an open fuse, be sure to test all of the circuits on that fuse.

Make sure on new problem turn up and the original problem does not recur.

Test equipment

NOTICE

Most circuits include solid-state devices. Test the voltages in these circuits only with a 10-megaohm or higher impedance digital multimeter.

Never use a test light or analog meter on circuit that contain solid-state devices. Damage to the devices may result.

Test light and DVOM

On circuits without solid-state devices, use a test light to check for voltage. A test light is made up of a 12-volt bulb with a pair of leads attached.

After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. The bulb will go on if there is voltage at the point being tested.

If you need to know how much voltage is present, use a digital volt/ohmmeter (DVOM).

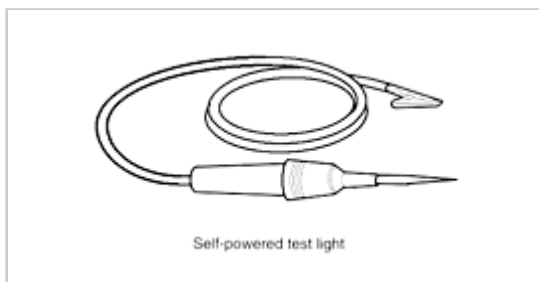
Self-powered test light and DVOM

1. Use a self- powered test light to check for continuity.

This tool is made up of a light bulb, battery, and two leads. To test it, touch the leads together, the light should go on.

Use a self-powered test light only on an unpowered circuit. First, disconnect the battery, or remove the fuse that feeds the circuit between which you want to check continuity.

Connect one lead of the self-powered test light to each point. If there is continuity, the test light's circuit will be completed, and the light will go on.



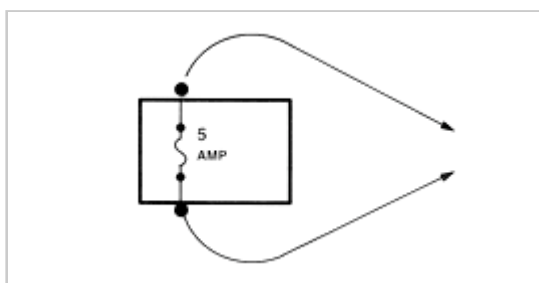
Fused jumper wire

Use a jumper wire to bypass an open circuit. A jumper wire is made up of an in-line fuse holder connected to a set of test leads. It should have a five ampere fuse.

Never use a jumper wire across any load. This direct battery short will blow the fuse.

Short finder

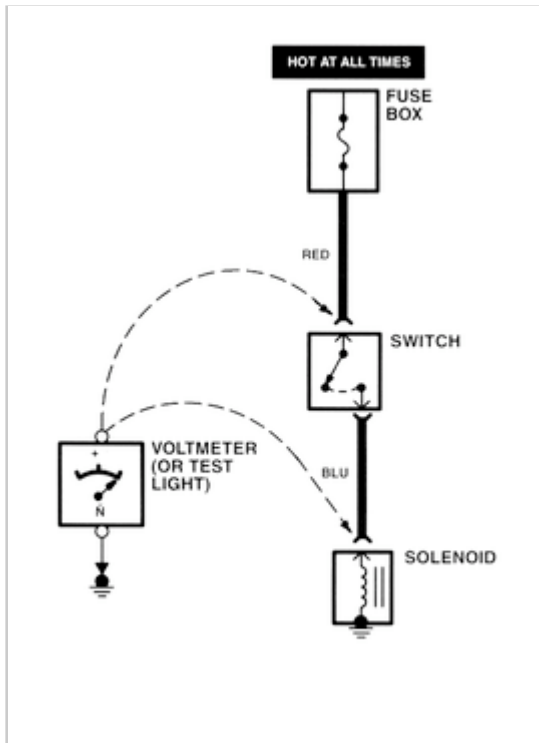
1. Short finder are available to locate shorts to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through interior trim. Its use is explained in the following troubleshooting tests.



Testing for voltage

This test measures voltage in a circuit. When testing for voltage at a connector, you may not have to separate the two halves of the connector. Instead, probe the connector from the back. Always check both sides of the connector because dirt and corrosion between its contact surfaces can cause electrical problems.

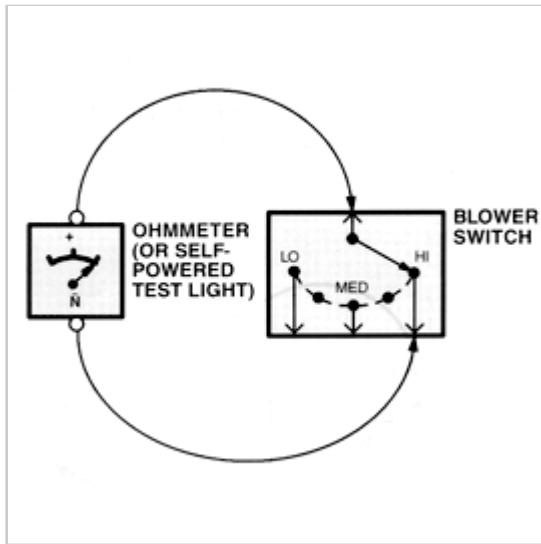
1. Connect one lead of a test light to a known good ground, or if you are using a voltmeter, be sure you connect its negative lead to ground.
2. Connect the other lead of the test light or voltmeter to the point you want to check.
3. If the test light glows, there is voltage present. If you are using a voltmeter, note the voltage reading. It should be within one volt of measured battery voltage. A loss of more than one volt indicates a problem.



Testing for continuity

This test checks for continuity within a circuit. When testing for continuity at a connector, you may not have to separate the two halves of the connector. Instead, probe the connector from the back. Always check both sides of the connector because dirt and corrosion between contact surface can cause electrical problems.

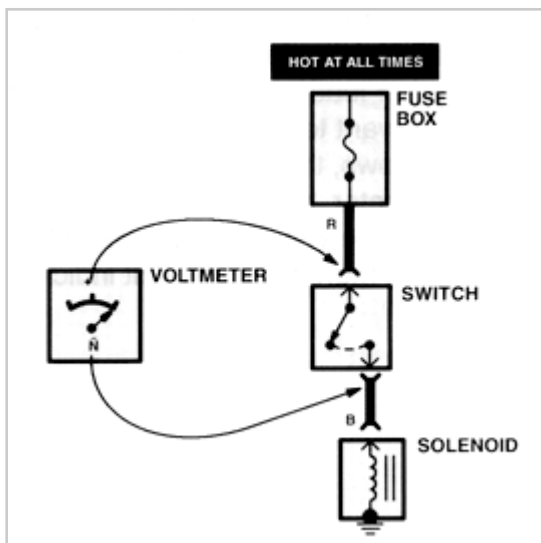
1. Disconnect the negative cable from the vehicle battery.
2. If you are using an ohmmeter, hold the leads together and adjust the ohmmeter to read zero ohms.
3. Connect one lead of a self-powered test light or ohmmeter to one end of the circuit you wish to test.
4. Connect the other lead to the other end.
5. If the self-powered test light glows, there is continuity. If you are using an ohmmeter, low or no resistance means good continuity.



Testing for voltage drop

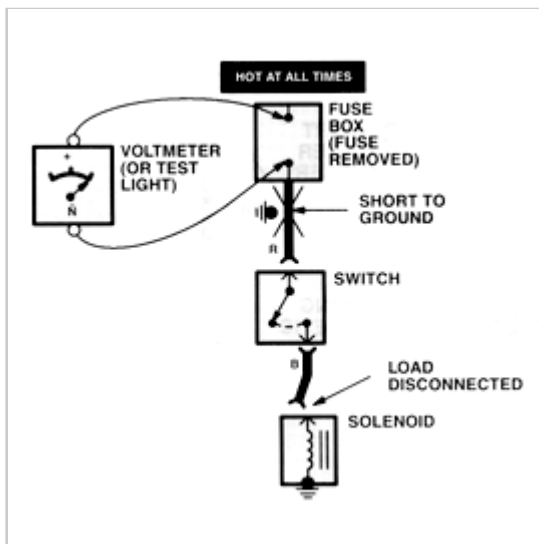
This test checks for voltage drop along a wire, or through a connection or switch.

1. Connect the positive lead of a voltmeter to the end of the wire (or to the side of the connector or switch) closest to the battery.
2. Connect test negative lead to the other end of the wire (or the other side of the connector or switch).
3. Operate the circuit.
4. The voltmeter will show the difference in voltage between the two points. A difference, or drop of more than 0.5 volts, may indicate a problem.



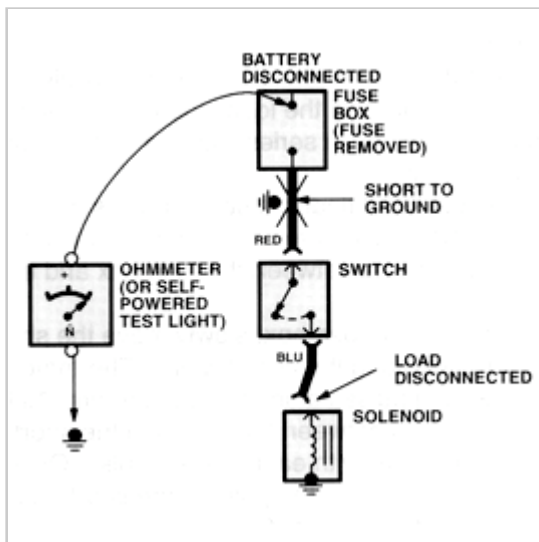
Testing for a short to ground with a test light or voltmeter

1. Remove the open fuse and disconnect the load.
2. Connect a test light or voltmeter across the fuse terminals. Make sure voltage is being applied to the battery side fuse terminal. Check the schematic to see if the ignition switch needs to be in the "ON" position.
3. Beginning near the fuse box, wiggle the harness. Continue this process at convenient points about six inches apart while watching the test light or voltmeter.
4. When the test light blinks or the voltmeter needle moves, there is a short to ground in the wiring near that point.



Testing for a short to ground with a self-powered test light or ohmmeter

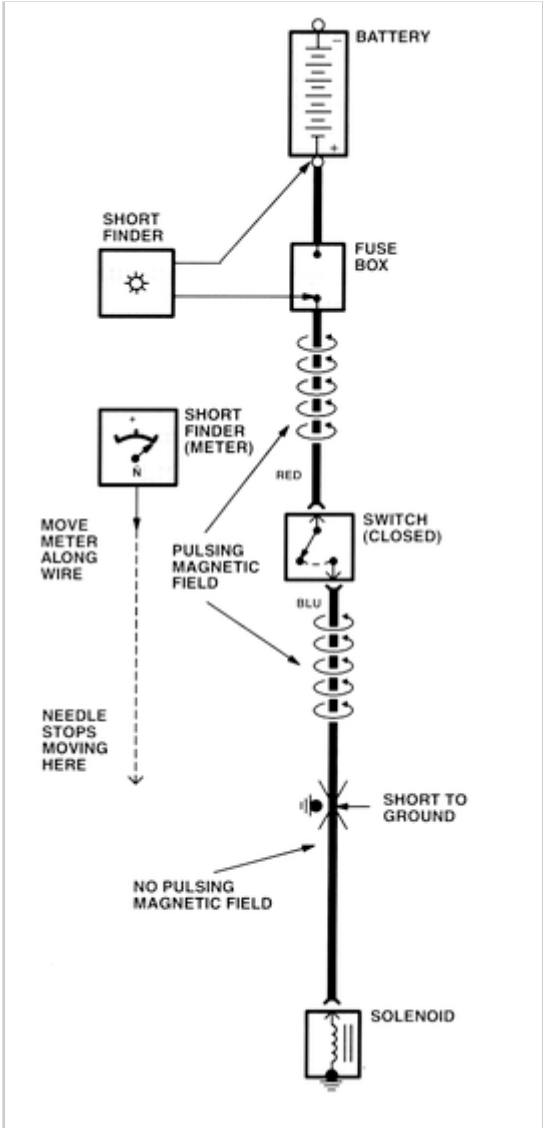
1. Remove the open fuse and disconnect the battery and load.
2. Connect one lead of a self-powered test light or ohmmeter to the fuse terminal load side.
3. Connect the other lead to a known good ground.
4. Beginning near the fuse box, wiggle the harness.
Continue this process at convention points about six inches apart while watching the test light or ohmmeter.
5. If the self-powered test light blinks or the ohmmeter needle moves, there is a short to ground in the wiring near that point.



Testing for a short to ground with a short finder

1. Remove the open fuse. Leave the battery connected.
2. Connect the short finder between the positive battery terminal and the load side fuse terminal.
3. Close all switch in series with the wire you are troubleshooting.
4. Turn on the short finder. It sends pulses of current to the short. This creates a pulsing magnetic field around the wiring between the fuse box and the short.
5. Beginning at the fuse box, slowly move the short finder meter along the circuit wiring. The meter will show current pulses along the interior trim. As long as the meter is between the fuse and the short, the needle will move with each current pulse. Once you move the meter past the point of the short, the needle will stop.

moving. Check around this area to locate the cause of the short circuit.



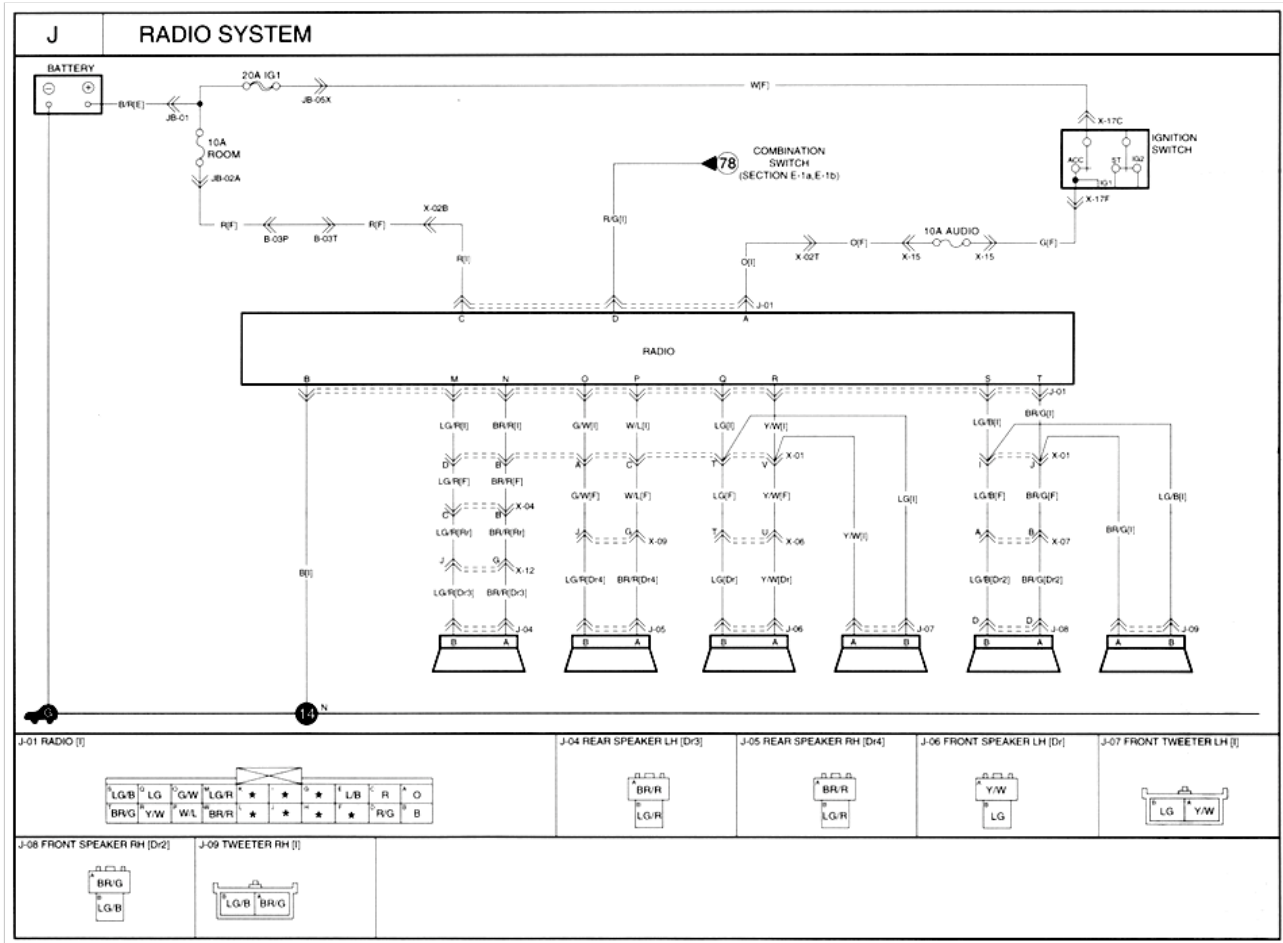


Body Electrical System

Audio



Audio





Circuit operation

Battery voltage is always applied to the terminal C(R) of AUDIO through "ROOM (10A)" fuse. With the ignition switch in "ACC" or "ON", battery voltage is applied to the terminal A(O) of AUDIO through the "AUDIO (10A)" fuse. Battery voltage is always applied to the terminal C(R) of AUDIO through "ROOM (10A)" fuse of the memory related functions, which retains the station presets when the AUDIO is turned OFF. The AUDIO has amplifier and supplies the signal directly to the speakers. The AUDIO is grounded permanently at terminal B(B).



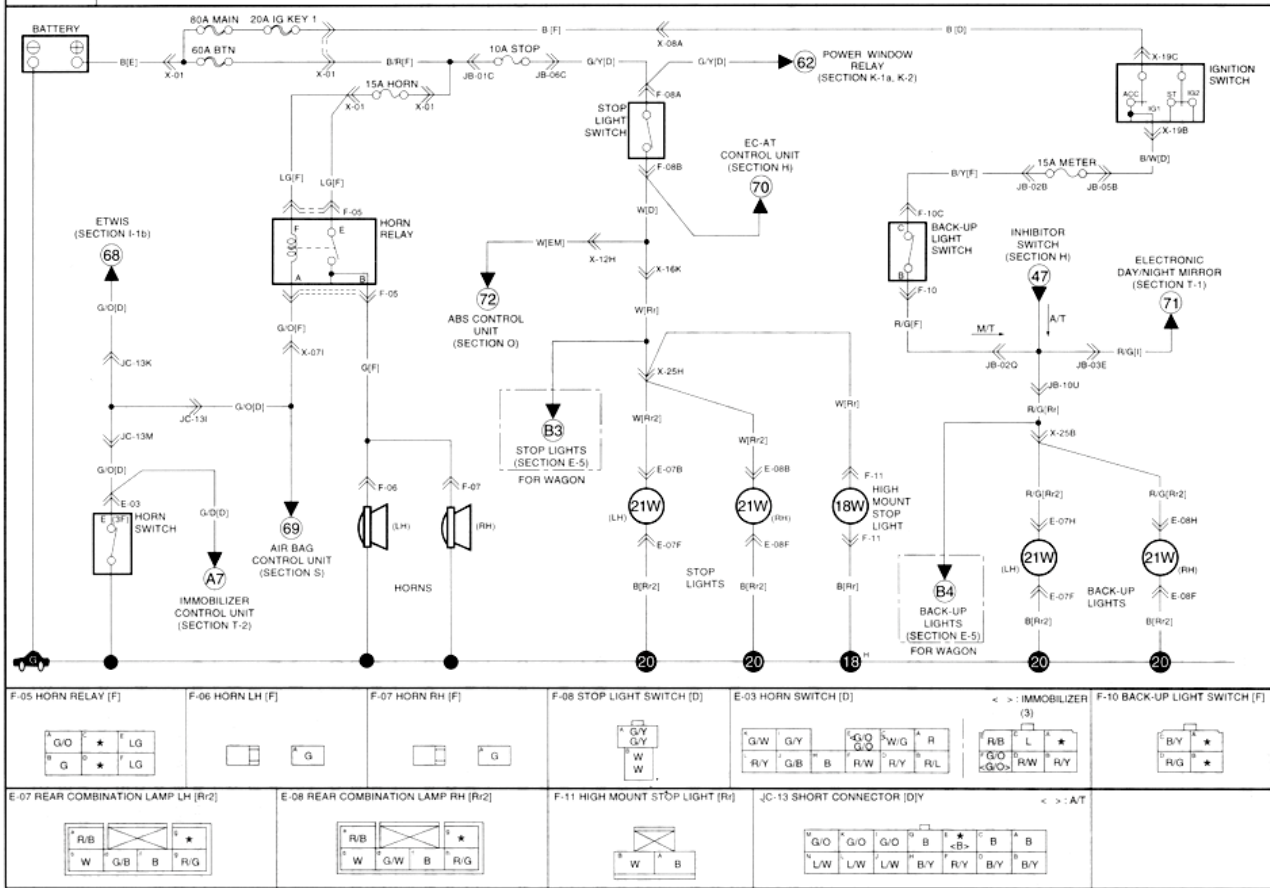
Body Electrical System

Horn



Horn, stop and back-up lights

F-2 HORNS, STOP LIGHTS, BACK-UP LIGHTS





DESCRIPTION AND OPERATION

The vehicle is equipped with one horn mounted behind front bumper near the center. Operation of horn is controlled by a switch (horn button) located on steering wheel. Electrical power from positive side of battery is applied to a horn relay located in the engine compartment fuse box. When horn button is pressed, horn relay is energized, and electrical power is directed through the switch in the horn relay to the horn. The circuit is completed by grounding the horn, and the horn sounds. When the horn button is released, springs force button upward to open horn switch. This is also known as a momentary switch. When this occurs, the relay is de-energized and horn operation stops.

Circuit operation

Battery voltage is always applied to one side of the horn relay coil through the "HORN (15A)" fuse. With the horn switch pressed, the other side of the horn coil is grounded through the W/G wire, and horn switch. When the relay is energized, the normally open contacts of the horn relay close, allowing battery voltage to be applied to the horn through the "HORN (15A)" fuse, horn relay and L wire. The horn sounds for pressing the horn switch.



Troubleshooting

Horn does not operate

Preliminary check:

Check "HORN (15A)" fuse and horn relay. If open, check for short to ground though wire, replace fuse or relay and check that all system electrical connectors mated correctly.

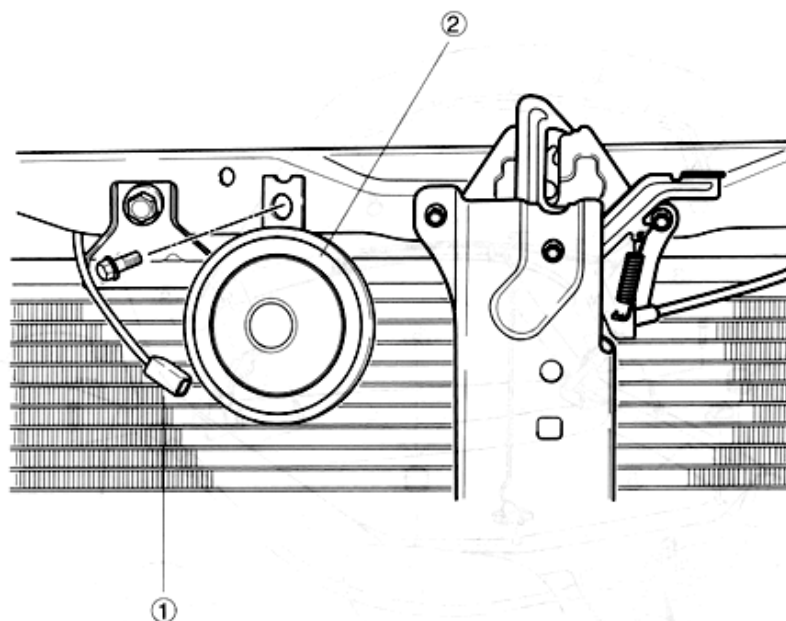
Step	Inspection		Action
1	Connect for voltage at terminal F (W/G) of horn switch connector E-01. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "W/G" or replace.
2	Check for continuity between terminal F (W/G) of horn switch connector E-01 and ground while pressing horn switch. Is continuity preseent?	Yes	Go to next step
		No	Check for a poor connection at horn switch. If OK, replace the horn switch.
3	Use jumper wire to bypass between terminal F (W/G) of horn switch connector E-01. Check for voltage at terminal A (L) of horn connector F-04. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "L" or replace.
4	Connect for voltage between terminal A(L) and terminal B (B) of horn connector F-04. Is abattery voltage present?	Yes	Check for a poor connection at horn connector. If OK, replace horn.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



Removal

Horn relay

1. Disconnect negative battery cable.
2. Disconnect horn relay from fuse box in engine compartment

**Component**

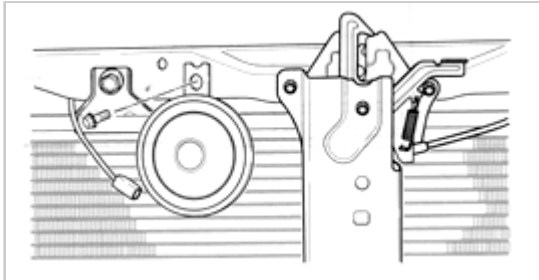
- (1) Horn wire harness
(2) Horn

Vehicle is equipped with one horn mounted behind front bumper on center side. Operation of horn is controlled by a switch (horn button) located on steering wheel. Electrical power from positive side of battery is applied to a horn relay located in fuse box of engine compartment. When horn button is pressed, horn relay is energized, and electrical power is directed to horn. Circuit is completed by case-ground of horn, and horn sounds. When force is removed from horn button, springs force button to open horn switch. Relay is de-energized and horn operation stops.



Removal

1. Disconnect negative battery cable.
2. Remove one bolt and remove horn.



Installation

Horn is electrically grounded through mounting. Be sure that metal-to-metal contact is established before installing attaching bolt.

1. Disconnect negative battery cable.
2. Position horn on chassis and install one bolt.

Tightening torque : 70~95 lb-in (8-11 N-m, 80~110 kg-cm)

3. Connect one wire to horn.
4. Connect negative battery cable.

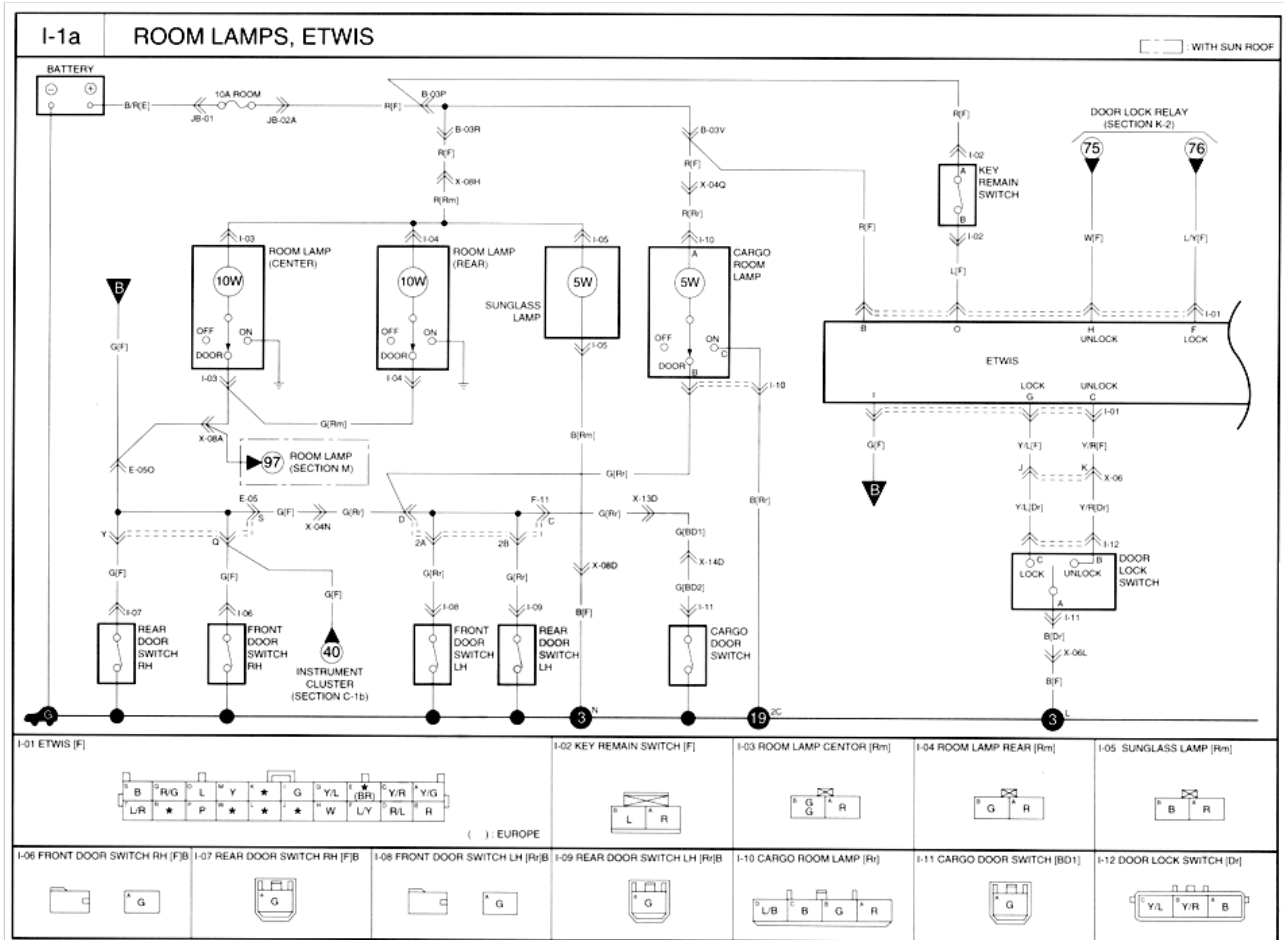


Body Electrical System

ETACS

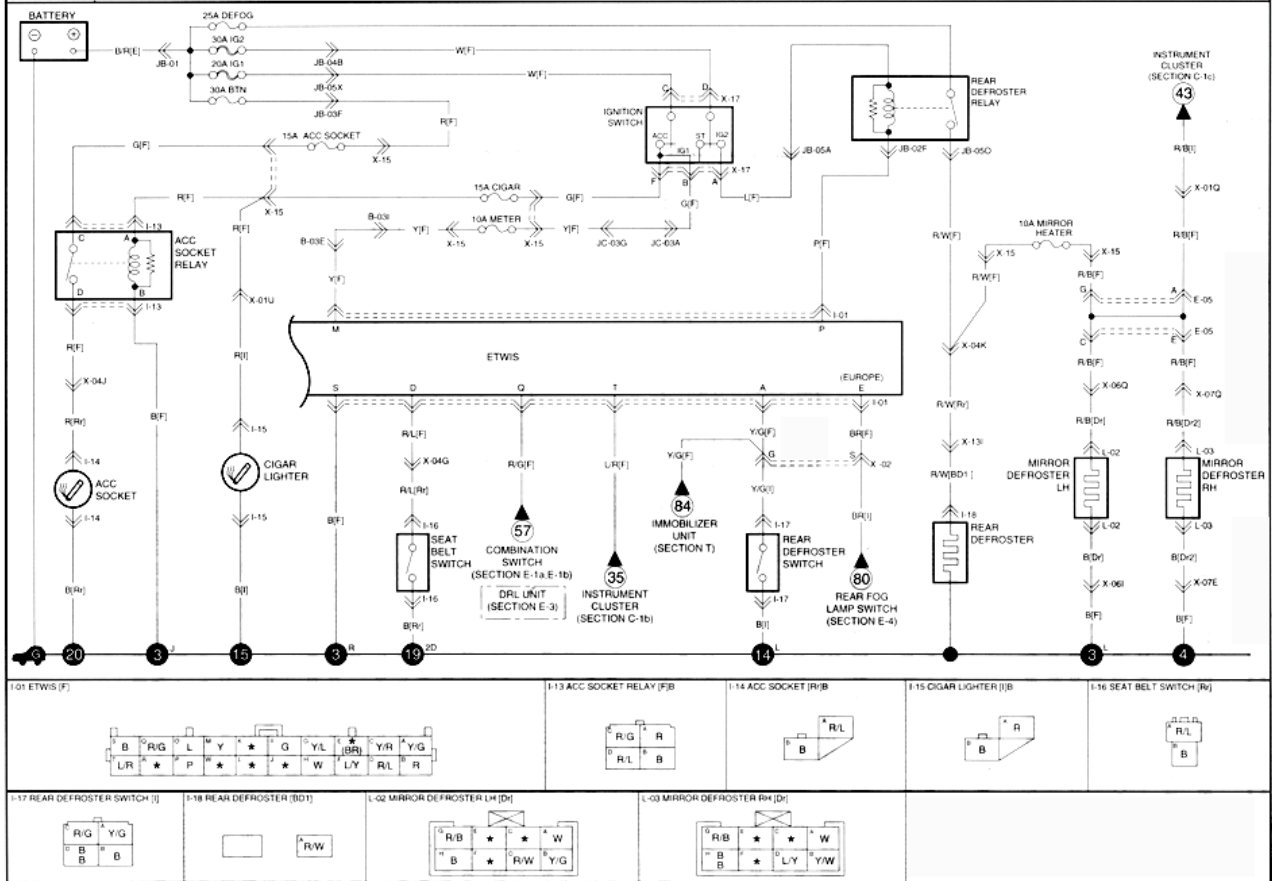


ETWIS, door courtesy lamp, room lamp



I-1b

ETWIS, REAR DEFROSTER, CIGAR LIGHTER, ACC SOCKER





Circuit operation

Electronic time & warning indication system (ETWIS)

The electronic time and alarm control module operates the chime and controls the timing functions for the chime, seat belts indicator, rear defroster, and power door locks.

Battery voltage is always applied from the "ROOM (10A)" fuse to the electronic time and alarm control module through R wire, which is grounded permanently through terminal S(B). With the ignition switch "ON", battery voltage is applied from "METER(10A)" fuse to terminal M(Y) of ETWIS through Y wire. For details and usage of the various input and outputs, refer to the system indicated in the schematic.



Troubleshooting

ETWIS does not operate.

Check for rear "ROOM (10A)" and "METER (10A)" fuse. If open, check for short to ground through the R or Y wire and replace fuse. In addition, check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Check for voltage at terminal B(R) of ETWIS connector I-01. Is battery voltage present.	Yes	Go to next step
		No	Repair open or short in the wire "R" or replace.
2	Turn the ignition switch to ON position. Check for voltage at terminal M(Y) of ETWIS connector I-01. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "B" or replace.
3	Check for continuity at terminal S(B) of ETWIS connector I-01 to ground. Is continuity present?	Yes	Inspect ETWIS.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.

Circuit testing (Electronic time and warning indication system module)

Check for voltage or continuity with connector connected. Repair or replace as necessary.

Terminal	Function	Test Condition	Specification
A	Rear defroster switch	Defroster switch ON	0V
		Defroster switch OFF	5V
B	Battery voltage input	Constant	12V
C	Door unlock switch GND signal input	Switch ON (UNLOCK)	0V
		Switch OFF	5V
D	Seat belt switch GND signal input	Fasten seat belt	5V
		Not fasten seat belt	0V
E	Rear fog lamp switch input	Switch ON	0V
		Switch OFF	5V
F	Door lock control (LOCK)	Door lock (within 0.3 second)	0V
		Door lock (after 0.3 second)	12V
G	Door lock switch GND signal input	Switch ON (LOCK)	0V
		Switch OFF	5V
H	Door unlock control (UNLOCK)	Door unlock (within 0.3 second)	0V
		Door unlock (after 0.3 second)	12V
I	Door switch GND signal input	Door open (switch ON)	0V
		Door open (switch OFF)	5V
M	Ignition switch ON input	Ignition switch ON	12V
		Ignition switch OFF	0V
O	Keyless switch ON input	Key in ignition	12V

		Key not in ignition	0V
P	Defroster control	Defroster operation (15±3 minutes)	0V
		No defroster operation	12V
Q	Light switch ON input	Light switch ON	12V
		Light switch OFF	0V
S	Battery	Constant	12V
T	Belt indicator control	Ignition switch ON (within 6 second)	0V
		Ignition switch ON (after 6 second)	12V



Body Electrical System

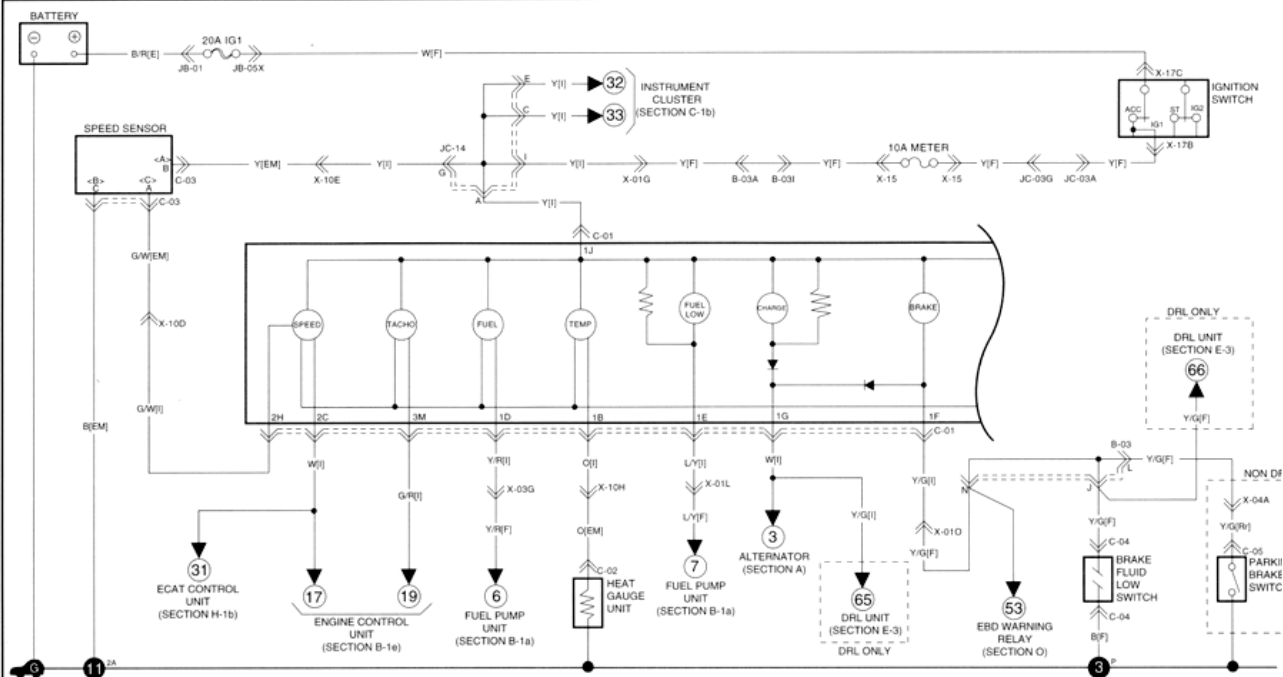
Indicators And Gauges - Instrument Cluster



Instrument cluster & warning lamps

C-1a INSTRUMENT CLUSTER & WARNING LAMPS

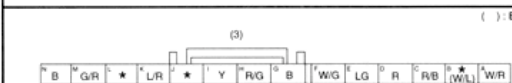
< > A/T



C-01 INSTRUMENT CLUSTER [I]

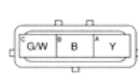


C-02 HEAT GAUGE UNIT [EM/B]

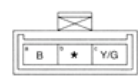


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C-03 SPEED SENSOR [EM/B]

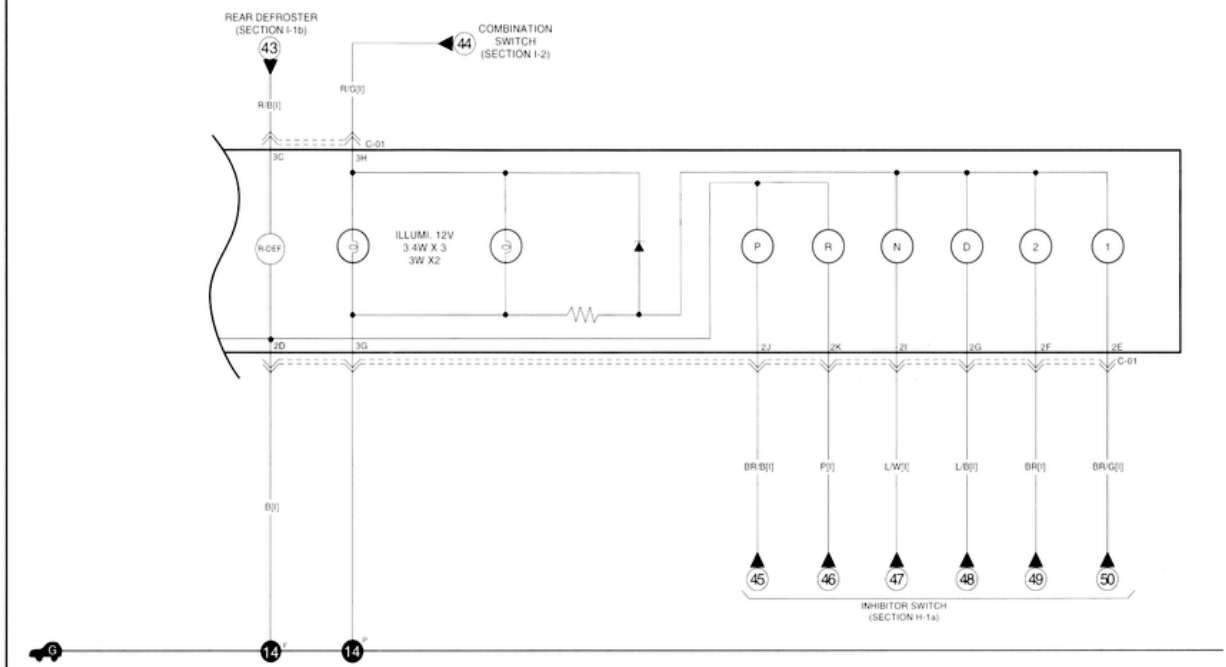


C-04 BRAKE FLUID LOW SWITCH [F]



C-05 PARKING BRAKE SWITCH [Y/G]





C-01 INSTRUMENT CLUSTER (1)



() : EUROPE





Description

Instrument cluster

Instrument cluster assembly houses driver-operated switches and controls. An analog electric speedometer, stepper motor-driven odometer, trip meter analog fuel gauge, temperature gauge, and information/warning center are located in cluster. Center information/warnings include:

- 1) Engine oil pressure warning
- 2) ABS warning
- 3) Check engine warning
- 4) Rear window defroster indicator
- 5) Brake warning
- 6) Charge warning
- 7) Seat belt warning
- 8) High beam indicator
- 9) Door open warning
- 10) Parking brake indicator
- 11) Air bag warning
- 12) Accessory (ACC) indicator
- 13) Low fuel warning
- 14) Hazard warning
- 15) Turn signal indicators

Instrument cluster electrical connectors are located at rear of assembly. When assembly is removed, instrument panel electrical harness connectors are disconnected. A printed circuit is mounted on back of instrument cluster. It transfers electrical power to cluster. Bulb holders are removed at rear of instrument cluster. Instruments are removed from cluster after cluster has been removed and bezel/lens has been removed from cluster case. Instrument cluster trim electrical connectors are located at rear of trim switches and are disconnected when cluster trim is removed. When ignition is in "ON" position, instrument and switch lights are checked. If any light is inoperative, a replacement of failed bulb should be made.

Meters and gauges

- Engine coolant temperature gauge
Engine coolant temperature gauge in instrument cluster indicates temperature of engine coolant with ignition switch in "ON" position. A sending unit in engine changes resistance with temperature.
- Fuel gauge
Electrical fuel gauge system consists of an electrical panel gauge and a fuel tank sender device. Fuel gauge indicates quantity of fuel in fuel tank only when ignition is turned to "ON" position. When ignition switch is turned to "ACC" or "LOCK" positions, pointer does not point to correct fuel level.
- Speedometer/Odometer/Trip meter
This instrument cluster assembly includes a speedometer, an odometer and a trip meter. Speedometer indicates speed. Odometer records total road mileage. Trip meter records trip mileage. Indicator needle is electrically driven by a precision DC motor circuit. Speed information source is a speed sensor on transmission. Odometer and trip meters consist of numbered wheels that are electrically driven by a DC stepper motor.
- Tachometer
Tachometer indicates engine speed in rpm (revolutions per minute) with engine running. A wire to "TACH" connector on ignition module measures ignition pulses of module. An electronic circuit on tachometer converts these pulses to rpm data.

CAUTION

When removing or installing any electrical units, disconnect negative battery cable to prevent possible

short circuits which could lead to personal injury and/or property damage.

When replacing odometer assembly, law requires odometer reading of replacement unit to be set to same mileage as prior odometer. If mileage cannot be set, law requires that replacement odometer be set at zero and a label be installed on driver's door frame to show previous odometer reading and date of replacement.

Switches

- Defroster
Defroster switch turns on window defroster and indicates defrosting is in operation.
- Hazard warning
Hazard warning switch turns on hazard warning flashers. Both turn signal indicators blink at same time when hazard condition switch is turned "ON".
- Outside rearview mirror
Power mirror switch allows powered movement of outside rearview mirror position in horizontal and vertical direction. "R/L" switch selects mirror to be moved. Mirror movement switch allows four-way movement of selected mirror.
- Wipers
Wiper switch controls operation of windshield wipers.

Warning and indicator lamps

- Accessory ("ACC") indicator
Accessory "ACC" indicator illuminates when radio or other accessory is being operated and ignition switch is in "ACC" position.
- Anti-lock brake system (ABS) warning
ABS warning lamp lights up when ABS control unit detects a malfunction of anti-lock brake system.
- Brake warning
"BRAKE" warning lamp comes on when brake fluid drops below a safe level with ignition switch in "ON" position as a bulb check. Brake fluid warning switch is located at master cylinder tank. Float grounds lamp circuit when brake fluid goes below central position, causing lamp to illuminate.
- Charge warning
"CHARGE" warning lamp is a red lamp in instrument cluster. "CHARGE" warning lamp lights up when generator does not charge battery enough.
- Check engine warning
"CHECK ENGINE" lamp in instrument cluster warning center illuminates during engine starting. It may stay on a short time after engine starts. If warning illuminates while driving, ECM has detected a fault in the engine management system.
- Door open warning
"DOOR" warning lamp indicates a door is open when ignition is turned "ON".
- Engine oil pressure warning
"OIL" warning lamp lights up whenever oil pressure is low with engine on. A sending unit in engine block changes resistance with oil pressure. Lamp lights up for several seconds after starting engine and goes off when normal oil pressure is reached.
- High beam indicator
High beam indicator lamp comes on when engine is on and driver switches headlights to high beam position or uses "Flash-to-pass" control. Lamp goes off when headlights are switched from high beam.
- Low fuel warning
Low fuel warning lamp indicates a fuel tank low fuel condition.
- Parking brake indicator
Parking brake indicator lights up when parking brake is in upward-locked position and ignition switch is turned "ON".
- Rear defroster ("R-DEF") indicator
Rear defroster "R-DEF" indicator lamp indicates rear window defroster is on.
- Safety belt warning

"BELTS" warning lamp comes on and an audio warning is given when ignition switch is in "ON" position with either front door open and/or driver's safety belt not fastened. Warning lamp goes out when driver's safety belt is fastened.

- Turn signal indicators

Turn signal indicators illuminate when right or left turn signal controls are operated.

Instrument panel

Instrument panel houses instrument cluster, center panel and a number of special switches and controls. Instrument panel electrical system is discussed in 1999 CARENS Wiring Diagram Manual. Ducts installed in instrument panel are discussed in this section.

Radio and antenna cable

When a radio is installed in vehicle, user instructions are supplied. Radio is located in instrument panel. Antenna and electrical connections are located at rear of unit. Antenna cable connects to radio. It is routed behind instrument panel and connects to antenna. Radio receives signals through antenna cable from antenna. It is necessary to remove radio when instrument panel is removed.

Ventilation control panel

Ventilation control panel provides control of heating and air conditioning and is mounted in instrument panel. There are control cables from ventilation control panel that attach to heater assembly. Part of instrument panel must be removed for access to where cables attach to heater or air conditioner units.

Circuit operation (Low oil pressure indicator)

With the ignition switch in "ON", battery voltage is applied to the low oil pressure indicator in the instrument cluster through the "METER" fuse and G/W wire. The indicator is grounded through the oil pressure switch whenever the oil pressure is below 0.7~2.6 kg/cm² at 1000rpm. The bulb illuminates to warn the driver.

Fuel gauge

The magnetic coils inside the instrument cluster control the pointer of the fuel gauge whose circuit is grounded permanently. Ground also is provided to the fuel gauge sender, which acts as a variable resistor. When the fuel in the tank is full, the resistance is low, and the pointer indicates full. When the fuel in the tank is low, the resistance is high, and the pointer indicates empty.

Fuel gauge sender

A float attached to a variable resistor is mounted in the fuel tank. With a full tank, the float arm sits at the top of the tank and the variable resistance value is high. As the float drops, so does the resistance value. The sender operates the fuel gauge.

Engine coolant temperature gauge

The coolant temperature gauge pointer is moved by the magnetic field of two coils at right angles to each other. Battery voltage is applied to the "C" coil from the "METER" fuse. The circuit then divides into two. One path continues through the H coil and the to ground.

The other path goes through the variable resistance engine coolant temperature sender and the to ground. When the coolant temperature is high, the resistance of the engine coolant temperature sender is low and less current flows through the "H" coil, pushing the pointer toward "H". When the coolant temperature is low, the resistance of the engine coolant temperature sender is high and more current flows through the "H" coil pushing the pointer toward "C". With two coils operating the pointer, the gauge is not affected by changes in the voltage.

Engine coolant temperature sender

The engine coolant temperature sender is thermistor, in which resistance decreases as engine coolant temperature increases.

Tachometer

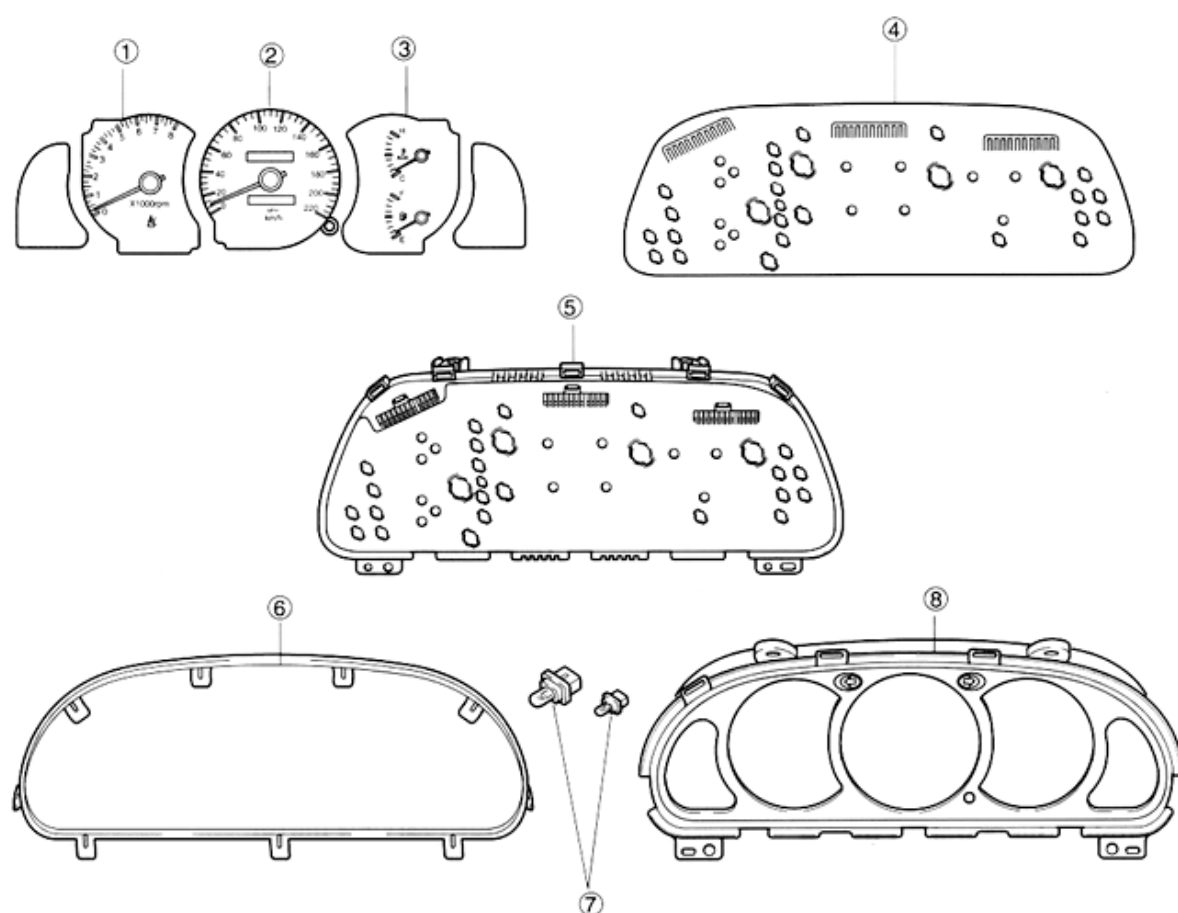
A solid state circuit controls tachometer. With the engine running, ignition coil pulses proportional to engine speed are read into the solid state circuits, which output the engine speed in RPM through the tachometer.

Speedometer

A solid state circuit controls the speedometer. As the wheels are turned, an electrical signal is sent from the vehicle speed sensor to the speedometer to the speedometer assembly. The speedometer registers the speed of the vehicle.



Component



- (1) Tachometer
- (2) Speedometer/Odometer/Trip meter
- (3) Fuel gauge/Temperature gauge
- (4) Printed circuit

- (5) Instrument cluster case
- (6) Bezel/Lens
- (7) Bulb
- (8) Instrument cluster trim



Circuit testing

Tachometer

1. Check if the indication of tachometer is within the allowance range by use of tachometer tester.

Standard (RPM)	Allowance range (RPM)
1000	850-1090
2000	1940-2180
3000	2910-3270
4000	3880-4360
5000	4850-5450
6000	5820-6540
7000	6790-7630
8000	7760-8720

Inspection point: 1000, 3000, 6000 rpm (at -20-60°C, 10-15V)

2. If beyond the range, replace the tachometer.

Speedometer

1. Check if the indicator of speedometer is within the allowance range by use of speedometer tester.

Standard (km/h)	Allowance range (km/h)
40	40~43
80	80~84
120	120~126

2. If beyond the range, replace the speedometer.

Engine coolant temperature gauge

1. Check if the indicator of engine coolant temperature gauge is within the allowance range by use of variable resistance.

Temperature (°C)	(C)50	85	105	(H) 125
Indicator (°)	-30	-5	+5	+30
Allowance (°)	-	+2, -5	+2, -5	-
Resistance (Ω)	180.5	48.7	27.4	15.9

2. If beyond the range, replace the engine coolant temperature gauge.

Fuel gauge

1. Check if the indication of the fuel gauge is within allowance range by use of variable resistance.

Indicator	E	1/4	1/2	3/4	F
Resistance (Ω)	95	51	32.5	18.5	6.5
Error (°)	± 2.4	-	± 5	-	± 2.4

Engine coolant temperature sensor

1. Check if the resistance of engine coolant temperature sensor is within the below specification in certain temperature.

Coolant temperature (°C)	50	125
Resistance (Ω)	180.5~198.5	14.4~15.9

2. If beyond the specifications, replace the engine coolant temperature sensor.



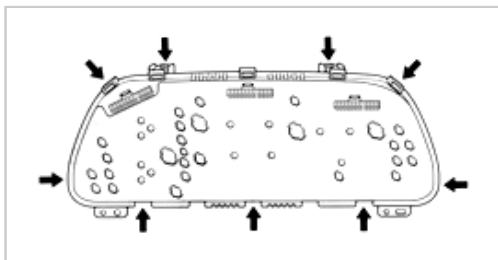
Removal

Bezel/Lens

NOTICE

- 1) Do not touch face of a gauge or back of lens with fingers. It will leave a permanent fingerprint.
- 2) Use care in removing instruments from instrument cluster case. Make sure instruments are face-up when separating bezel/lens from cluster case.

1. With instrument cluster bezel/lens downward on a soft, clean shop cloth, press on each of bezel tabs going out around unit while using pressure between bezel/lens and cluster.
Do not remove bezel/lens. Make sure each tab is not in a locked position in its mating slot.

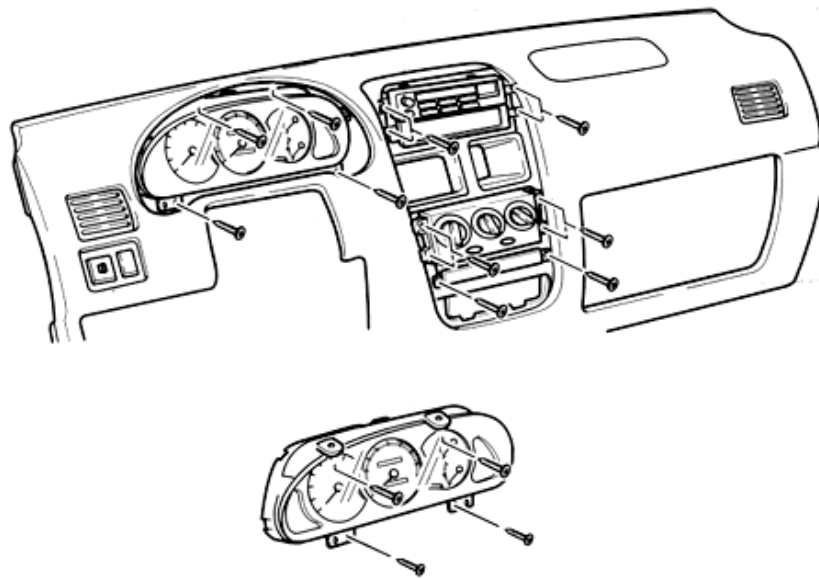


2. Place instrument cluster case on its back, bezel/ lens facing up, and carefully pull bezel/lens away from cluster case.

REMOVAL

INSTRUMENT CLUSTER

1. Remove one mounting screw.
2. Remove instrument cluster hood.
3. Remove four mounting screws.
4. Pull cluster from instrument panel.
5. Disconnect three connectors.
6. Remove instrument cluster.



Installation

Bezel/Lens

1. Install in reverse order of removal.

INSTALLATION

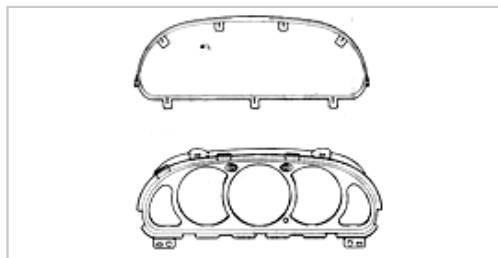
INSTRUMENT CLUSTER

1. Place cluster in instrument panel.
2. Connect three connectors.
3. Push cluster into instrument panel.
4. Install four cluster mounting screws.
5. Install instrument cluster hood.
6. Install one cluster mounting screw.

Inspection

Bezel/Lens

1. Inspect bezel/lens for sign of any damage. Repair or replace bezel or lens as necessary.



Instrument cluster

Inspect cluster for signs of any damage and replace damaged part as necessary.



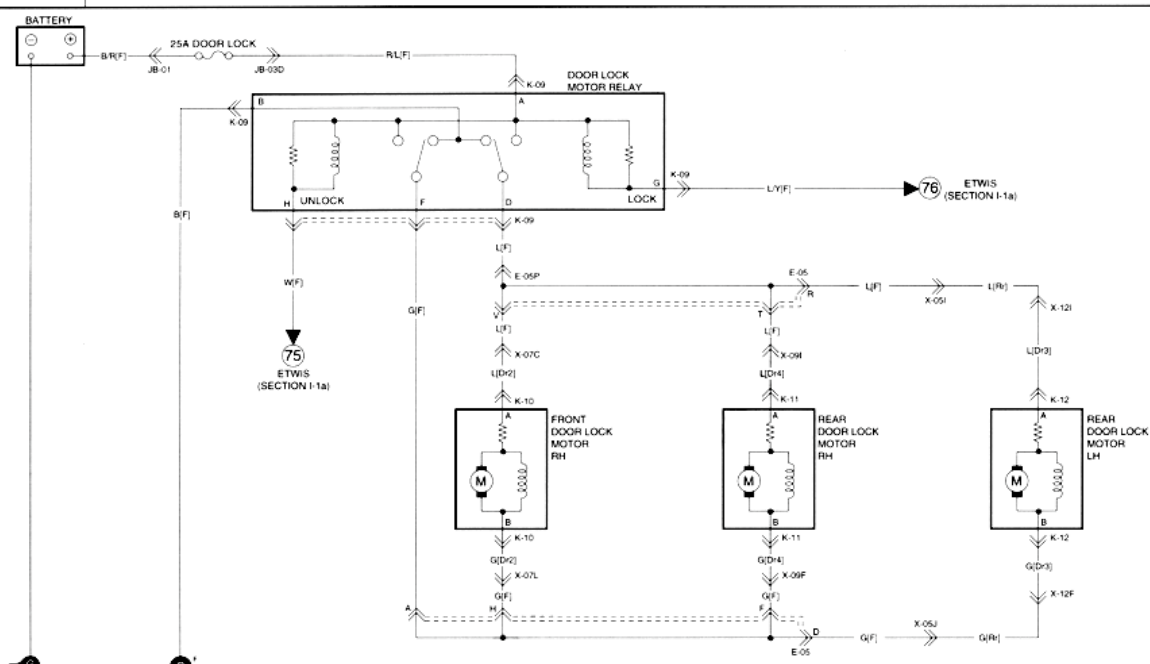
Body Electrical System

Power Door Locks



Door lock system

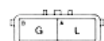
K-2 DOOR LOCK SYSTEM



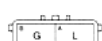
K-09 DOOR LOCK MOTOR RELAY [F]



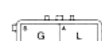
K-10 FRONT DOOR LOCK MOTOR RH [Dv2]



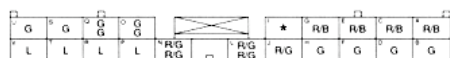
K-11 REAR DOOR LOCK MOTOR RH [Dv4]



K-12 REAR DOOR LOCK MOTOR LH [Dv3]



E-05 SHORT CONNECTOR [F]





Circuit operation

The door lock system can be controlled manually by the door lock switch, which is located in the driver door. Battery voltage is always applied from "DOOR LOCK" fuse to the one side of door lock relay coils through R/L wire. The other side is connected to ETWIS, which controls door lock relay contacts according to door lock/unlock switch signal.

With the door lock switch locked, a ground signal is sent to the ETWIS module, allowing door lock relay to be energized. When the relay is activated, battery voltage is applied from the door lock relay to terminal B(G) of door lock motor and the terminal A(L) of the door lock motor is grounded through the door lock relay. The doors operate for approximately 0.2~0.4 second (i.e.) while the relay is activated). All doors are locked.

When the door lock switch is unlocked, battery voltage is applied to the door lock motors in opposite side and the other side to be grounded. The motors operate in opposite direction and all doors are unlocked.



Troubleshooting

Power door lock does not operate.

Check "DOOR LOCK (25A)" fuse and door lock relay. If open, check for short to ground through R/L wire, replace fuse or relay. In addition, check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Check for voltage at terminal B(R) of the ETWIS connector I-01. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "R" or replace.
2	Check for voltage between terminal B(R) and terminal of ETWIS connector I-01. Is Continuity present?	Yes	Go to next step.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect door lock switch connector. Check for voltage at terminal G(Y/L) and C(Y/G) of ETWIS connector I-01. Is the voltage approximately 5V?	Yes	Go to next step.
		No	Check for a poor connection at ETWIS. If OK, check ETWIS
4	Check for voltage at terminal C(Y/L) of door lock switch connector I-11. Is the voltage approximately 5V?	Yes	Go to next step.
		No	Repair open or short in the wire "Y/L" or replace.
5	Check for voltage at terminal B (Y/R) of door lock switch connector I-11. Is the voltage approximately 5V?	Yes	Go to next step.
		No	Check open or short in the wire "Y/R" or replace.
6	Check for continuity between terminal A(B) of door lock switch connector I-11 and ground. Is continuity present?	Yes	Go to next step.
		No	Repair open in the wire "B" to ground or replace.
7	Check for door lock switch. Is the door lock switch normal?	Yes	Go to next step.
		No	Replace the door lock switch.
8	Connect door lock switch. Check for voltage at terminal H(W) of ETWIS connector I-01. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "W" or replace.
9	Check for voltage at terminal F(L/Y) of ETWIS connector I-01. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "L/Y" or replace.
10	When lock switch is unlocked, check for voltage at terminal H(W) of ETWIS connector I-01. Is the voltage approximately 0V for 0.2~0.4 second?	Yes	Check
		No	Check for a poor connection at ETWIS. If OK, check for ETWIS module.
11	When lock switch is unlocked, check for voltage at terminal F(L/Y) of ETWIS connector I-01. Is the voltage approximately 0V for 0.2~0.4 second?	Yes	Go to next step.
		No	Check a poor connection at ETWIS. If OK, check for ETWIS module.

12	Check for continuity between terminal B(B) of door lock relay and ground. Is continuity present?	Yes	Go to next step.
		No	Check for a poor connection to ground. If OK, repair open in the wire "B" or replace.
13	Check for continuity between terminal D(G) and F(L) of door lock relay and ground. Is continuity present?	Yes	Go to next step.
		No	Repair a poor connection to door lock relay.
14	When door lock switch is unlocked, check for voltage at terminal B(G) of each motor. Is batter voltage present for approximately 0.2~0.4 second?	Yes	Go to next step.
		No	Repair open or short in the wire "G" or replace.
15	When door lock switch is locked, check for voltage at terminal A(L) of each motor. Is battery voltage present for approximately 0.2~0.4 second?	Yes	Check for a poor connection to door lock motor. If OK, replace power door lock motor.
		No	Repair open or short in the wire "L" or replace.



Body Electrical System

Power Door Locks - Power Door Lock

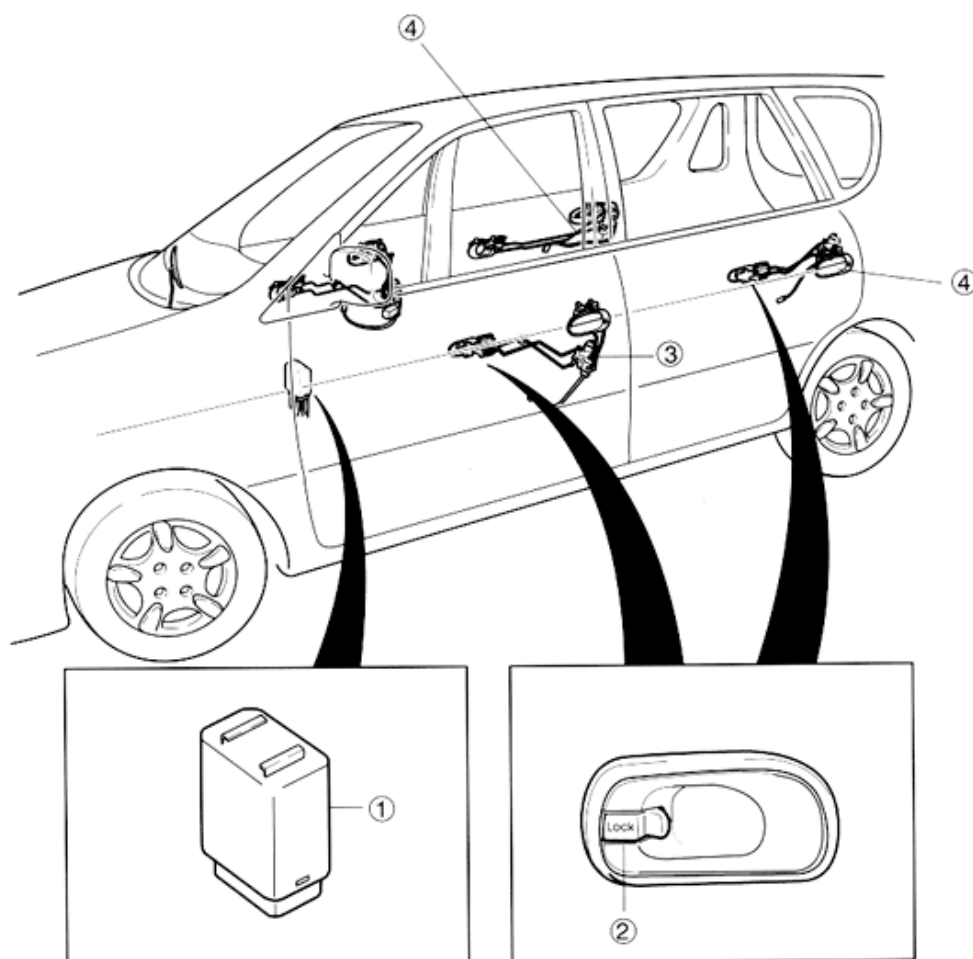


Description

Power door lock system is comprised of door lock assembly, inside door handle, outside door handle, door lock cylinder, and door lock switch. This system is installed on all doors of vehicle. System is activated by driver's side door which has a manual door lock system and a door lock switch. Switch is connected to door lock relay which is located leftside of instrument panel. Door lock assembly has four remote control rods. One is attached to inside door handle (inside door lock rod). Second is attached to inside door handle (inside door handle rod). Third is attached to outside door handle (outside door handle rod). Fourth rod is attached to lock cylinder of outside door handle (lock cylinder rod). Depressing door lock switch in inside door handle locks and unlocks remaining three doors of vehicle. Depressing driver's side switch and closing door while holding outside handle locks all four doors. Opening this door with a key automatically unlocks all four doors. When door lock switch of front passenger door is depressed, and this door is closed, all doors lock. Two rear doors are locked by depressing door lock switch and closing doors. These doors also have child safety locks which, when activated, prohibit opening doors from inside vehicle.



Component



- (1) Door lock motor relay
(2) Door lock switch

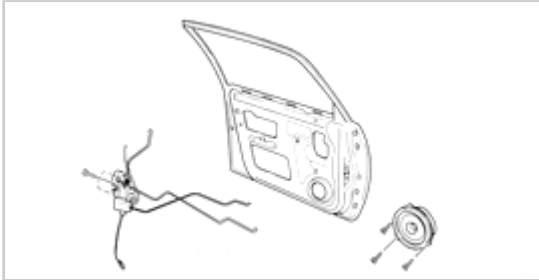
- (3) Front door lock assembly
(4) Rear door lock assembly



Removal

Power door lock assembly

1. Disconnect negative battery cable.
2. Remove door trim. Refer to "Trim" in this section.
3. Remove one screw on pull handle bracket.
4. Remove pull handle bracket.
5. Remove speaker.
 - A. Remove three screws on door speaker.

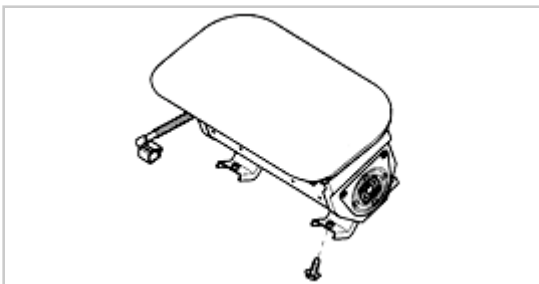


- B. Unfasten harness connector from door frame.
 - C. Pull out speaker and disconnect connector.
6. Remove inside door handle assembly.
 - A. Remove three screws from inside door handle.
 - B. Disconnect door lock control rods.
 - C. Remove inside door handle.

NOTICE

Peel plastic moisture barrier off carefully so that it can be reused.

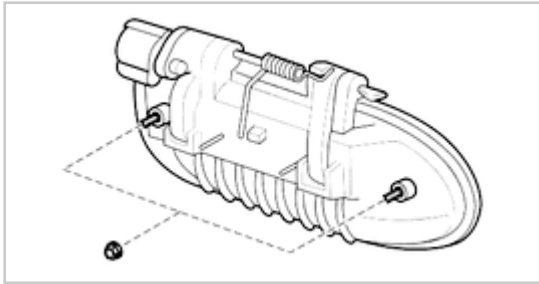
7. Peel off plastic moisture barrier carefully by pulling it away gradually from door frame.
8. Remove door lock assembly.
 - A. Disconnect two remote control rods from outside door handle assembly.



- B. Remove three screws from door lock assembly and remove assembly from access hole.
 - C. Remove two mounting nuts from outside door handle.



D. Remove outside door handle.



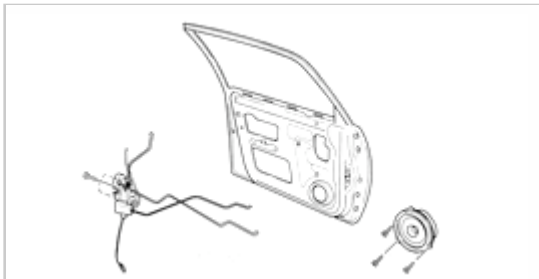
Removal

Power door lock cylinder

1. Disconnect negative battery cable.
2. Remove door trim. Refer to "Trim" in this section.
3. Remove one screw on pull handle bracket.



4. Remove pull handle bracket.
5. Remove speaker.
 - A. Remove three screws on door speaker.

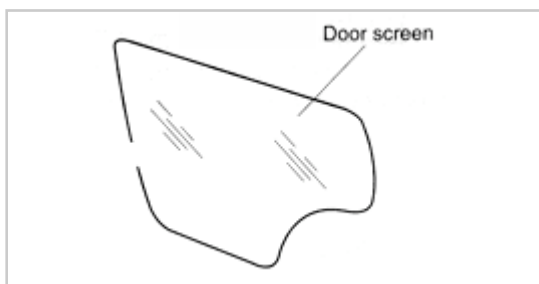


- B. Unfasten harness connector from door frame.
- C. Pull out speaker and disconnect connectors

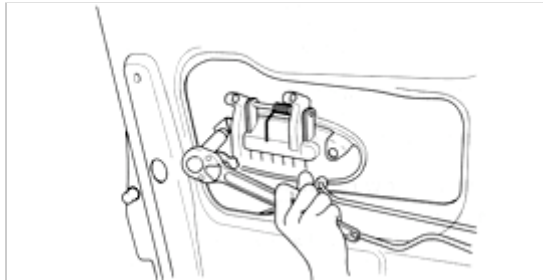
NOTICE

Peel plastic door screen off carefully so that it can be reused.

6. Peel off plastic door screen carefully by pulling it away gradually from door frame.



7. Disconnect outside door handle rod of door lock assembly from outside door handle.
8. Disconnect lock cylinder rod of door lock assembly from door lock cylinder of door handle.
9. Remove two mounting bolts on outside door handle.
10. Remove outside door handle.
11. Remove lock cylinder from outside door handle.



Installation

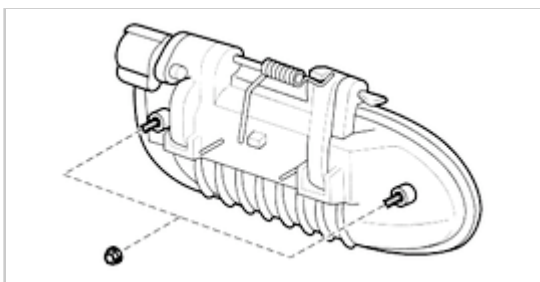
Power door lock assembly

1. Install door lock assembly.
 - A. Position it as originally positioned through access hole.
 - B. Install three mounting screws.

Tightening torque : 35~52 lb-in (4~6 N-m, 40~60 kg-cm)

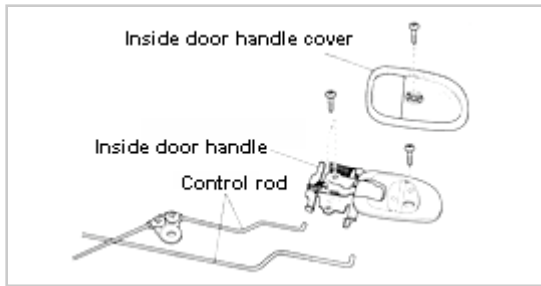


2. Install outside door handle.
 - A. Connect two control rods of door lock assembly.
 - B. Install two mounting nuts.



3. Install plastic door screen.
 - A. Fasten plastic door screen.
 - B. Pull out electrical harness connector from plastic door screen.
 - C. Pull out control rod for inside door handle from plastic door screen.
 4. Install inside door handle.
 - A. Connect two control rods or door lock assembly.
 - B. Install three mounting screws.
-

Tightening torque : 26~34 lb-in (2~4 N-m, 30~40 kg-cm)



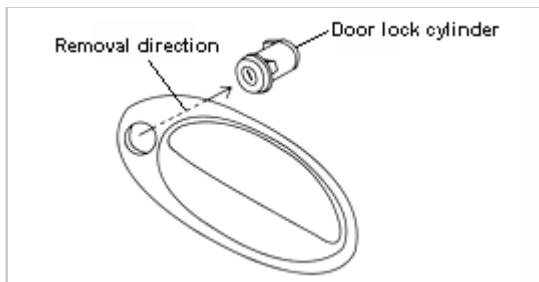
5. Install door speaker with three mounting screws.
6. Install pull handle bracket with one mounting screw.
7. Install door trim.
8. Install inside door handle cover with one mounting screw.
9. Fasten door trim. Refer to "Trim" in this section.
10. Install inner weatherstrip.
11. Connect negative battery cable.

Installation

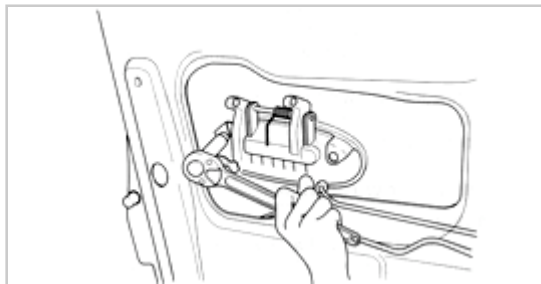
Power door lock cylinder

1. Install lock cylinder in outside door handle.
2. Install lock cylinder retainer on outside door handle.
3. Position outside door handle as originally positioned.
4. Install two mounting nuts.

Tightening torque : 61~86 lb-in (7~10 N-m, 70~100 kg-cm)

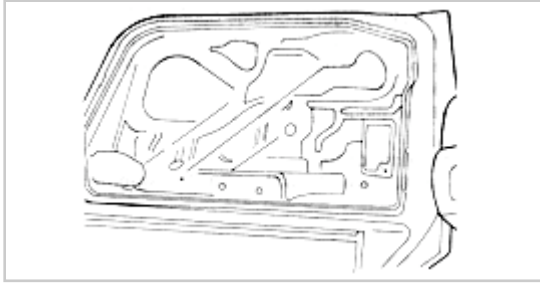


5. Connect lock cylinder rod of door lock assembly to door lock cylinder of door handle.
6. Connect outside door handle rod of door lock assembly to outside door handle.

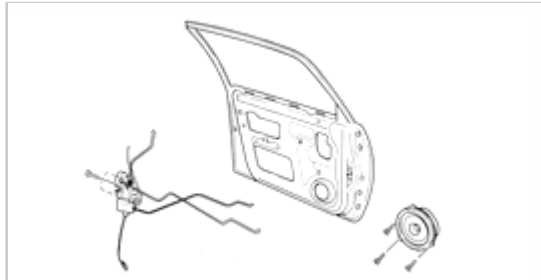


7. Install plastic door screen.
 - A. Fasten plastic door screen.
 - B. Route electrical harness connector from plastic door screen.

C. Pull out remote control rod for inside door plastic door screen.



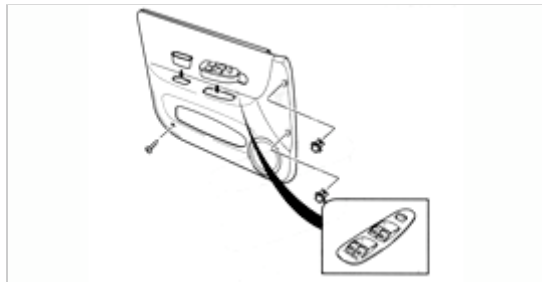
8. Install speaker with three mounting screws.



9. Install door pull handle bracket with one mounting screw.

10. Install door trim. Refer to "Trim" in this section.

11. Connect negative battery cable.





Body Electrical System

Power Door Mirrors

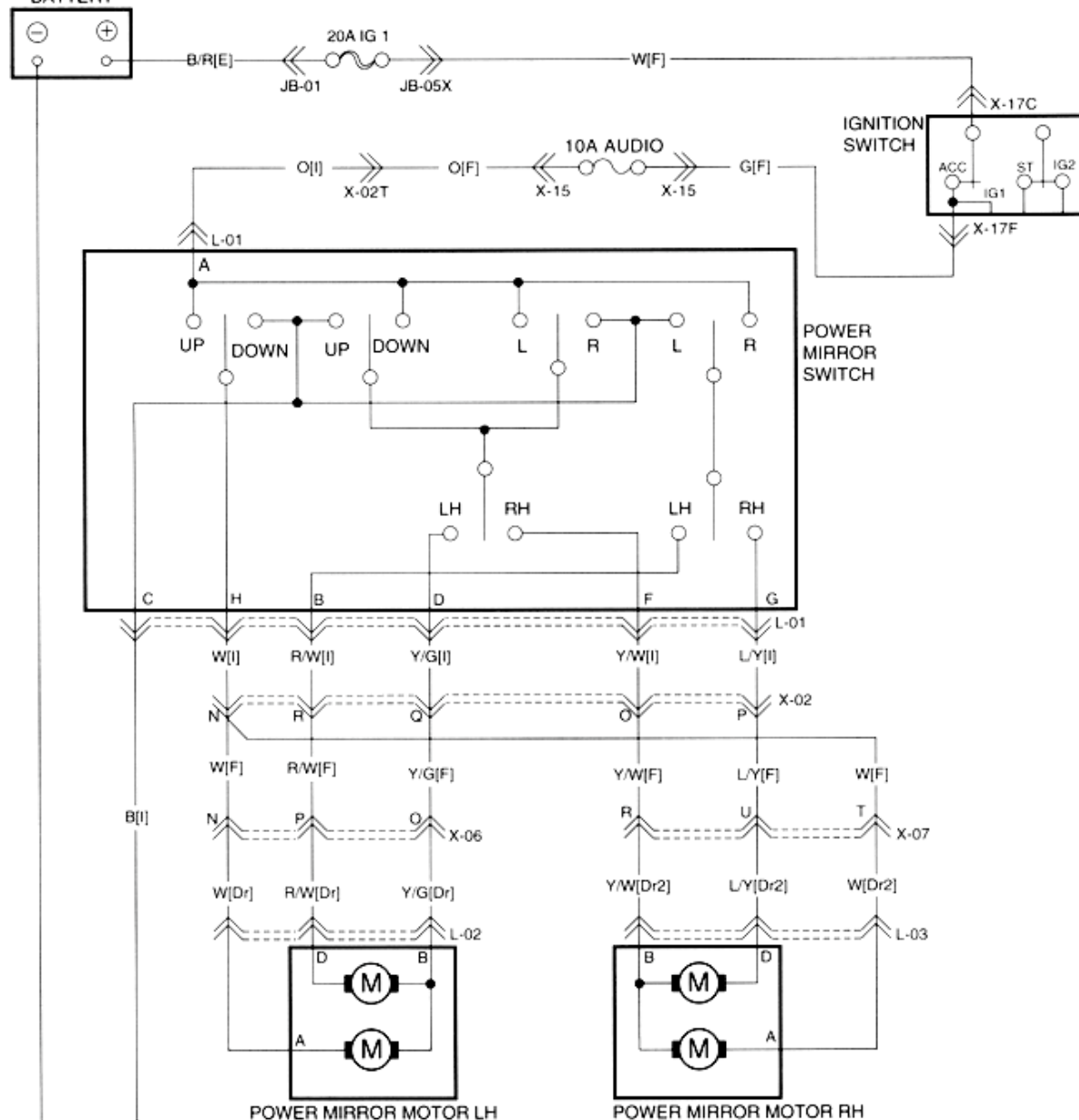


Power mirror system

L

POWER MIRROR SYSTEM

BATTERY



L-01 POWER MIRROR SWITCH [I]

G	L/Y	C	B	A	O
H	W	F	Y/W	D	Y/G
				B	R/W

L-02 POWER MIRROR MOTOT LH [Dr]

G	R/W	E	*	C	*	A	W
H	B	F	*	D	R/W	B	Y/G

L-02 POWER MIRROR MOTOT RH [Dr2]

G	R/W	E	*	C	*	A	W
H	B	F	*	D	L/Y	B	Y/W



Circuit operation

Each outside mirror has two reversible motors. One motor adjust the power mirror up and down, and the other motor adjusts the mirror right and left. The power mirror switch controls these motors by changing the polarity of the voltage to the motors. The power mirror switch also contains a mirror select switch, which directs the voltage to the LH or RH power mirror.

With the ignition switch in "ACC" or "ON" position, battery voltage is applied from "AUDIO (10A)" fuse to the power mirror switch through the O wire. The power mirror switch is permanently grounded through the B wire. When the mirror select switch is in "LH" position, the mirror position switch will control the two motors in the LH outside mirror.

When the up switch is pressed, battery voltage is applied to the terminal A(W) of UP/DOWN motor of the LH power mirror by the UP switch of power mirror switch. Ground is provided the terminal B(Y/G) of UP/DOWN motor of LH power mirror through the UP switch of the power mirror switch. The UP/DOWN motor in the LH power mirror will run and turn the LH power mirror up.

When the DOWN switch is pressed, battery voltage is applied to the terminal B (Y/G) of UP/DOWN motor of the LH power mirror through the DOWN switch of power mirror switch. Ground is provided the terminal A(W) of UP/DOWN motor in LH power mirror through the DOWN switch of power mirror switch.

Changing the polarity of voltage to the motor will cause the UP/DOWN motor to operate in the opposite direction and turn the LH power mirror down.

The LEFT/RIGHT motor of the LH power mirror operates in a similar way. When the mirror select switch in "RH" position, the RH power mirror is adjusted in same way according to the position



Troubleshooting

Preliminary check

Check "AUDIO (10A)" fuse. If open, check for short to ground through wire, replace fuse. In addition, check that all system electrical connectors mated correctly.

Power mirrors do not operate.

Step	Inspection		Action
1	Turn the ignition switch to "ON" position. Check for voltage at terminal A(O) of power mirror switch connector L-01. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "Y" or replace.
2	Check for continuity at terminal C(B) of power mirror switch connector L-01 to ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect power mirror switch. Check for continuity between terminals of power mirror switch by pressing switch. Is power mirror switch good?	Yes	Go to next step
		No	Replace power mirror switch.
4	Check for the wires between power mirror switch and power mirror motors. Is continuity present?	Yes	Check for a poor connection at power mirror motor. If OK, replace power mirror motor.
		No	Repair open or short in the wires between power mirror switch and power mirror or replace.

Circuit testing (Power window main switch)

1. Disconnect the power mirror switch.
2. Check for continuity between terminal as indicated.

Terminal		A	B	C	D	F	G	H
Position								
LH	UP	O		O	O			O
	DOWN	O		O	O			O
	LEFT	O	O	O	O			
	RIGHT	O	O	O	O			
RH	UP		O		O		O	O
	DOWN	O	O	O				O
	LEFT	O		O		O	O	
	RIGHT	O	O	O			O	

O—O: indicates continuity

3. If not as specified, replace the power window main switch assembly.



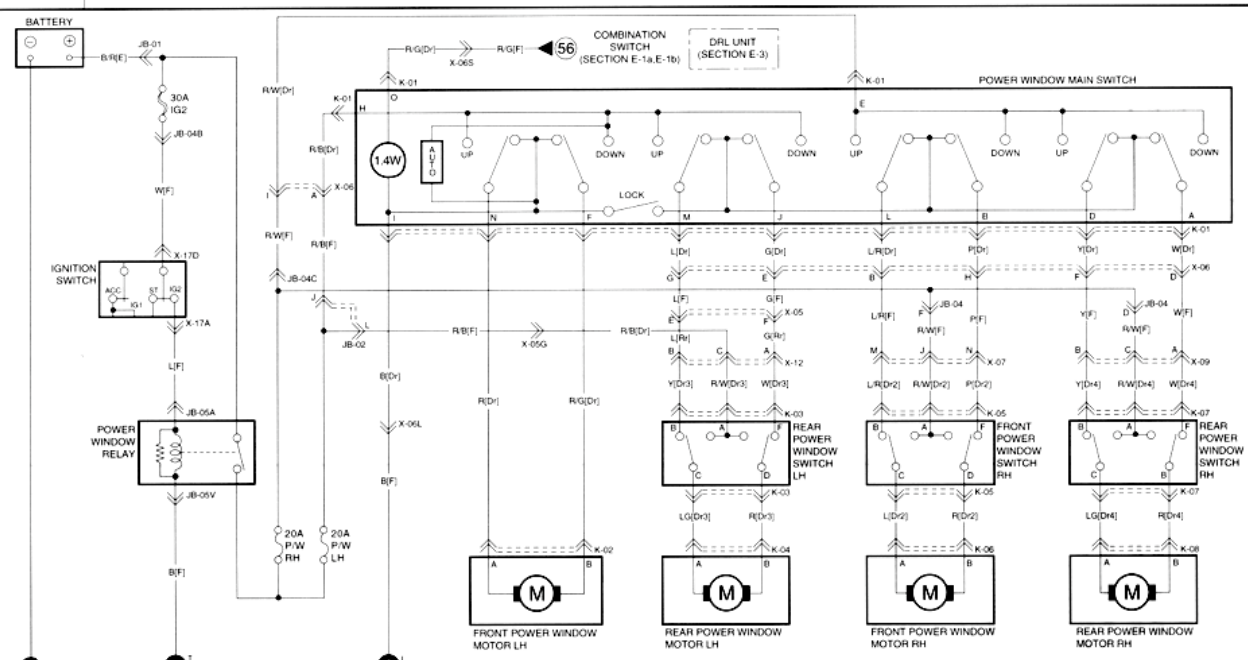
Body Electrical System

Power Windows

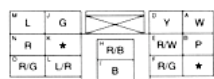


Power window system

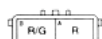
K-1 POWER WINDOW SYSTEM



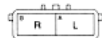
K-01 POWER WINDOW MAIN SWITCH [D:1]



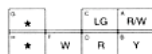
K-02 FRONT POWER WINDOW MOTOR LH [D:1]



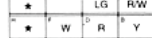
K-06 FRONT POWER WINDOW MOTOR RH [D:2]



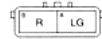
K-03 REAR POWER WINDOW SWITCH LH [D:3]



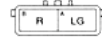
K-07 REAR POWER WINDOW SWITCH RH [D:4]



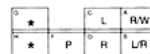
K-04 REAR POWER WINDOW MOTOR LH [D:3]



K-08 REAR POWER WINDOW MOTOR RH [D:4]



K-05 FRONT POWER WINDOW SWITCH RH [D:2]





Description

Power window system allows front and rear side door windows to be operated electrically. Each window is raised or lowered using a bi-directional electric motor attached by continuous cable to window regulator. Window motors are controlled by switches mounted on front and rear side doors. Driver's door contains main power window switch assembly that controls each of other three doors.

Circuit operation

With the ignition switch turned to "ON" or "START", battery voltage is applied from the ignition switch to the one side of the power window relay coil through L wire (the other side of the relay coil is grounded), allowing the relay to be energized. When energized, battery voltage is applied to the power window main switch, front RH power window switch, rear LH and RH power window switch through power window relay and the "P/W RH (20A)" or "P/W LH (20A)" fuse.

The power window main switch is grounded through the terminal I(B) of main switch connector K-01. On the other hand, other switch and motors are grounded through power window main switch according to each switch operation. All the power windows are operated directly from the power window main switch. The front main switch or the front RH power window switch. The reversible, permanent magnet motors drive the power windows. Each motor is controlled with an "UP" and a "DOWN" switch, which are normally closed to ground. On the front LH power window, when the front LH switch of window main switch assembly is moved to the "UP" position, the "UP" switch will provide battery voltage to front LH window motor through R/B wire, "UP" switch, and R wire. The front LH window motor will receive ground through the R/G wire, "DOWN" switch will connect the R/G wire to battery voltage. Ground will be provided to the R wire through the "UP" switch of the power window main switch. The polarity across the motor will be reversed, causing the front LH motor to rotate in the opposite direction and lower the front LH window.

On the front RH power window, when the front RH switch of window main switch assembly is moved to the "UP" position, the "UP" switch will provide battery voltage to the front RH window motor through R/W wire, "UP" switch, front RH power window switch, and L wire. The front RH window motor will receive ground through the R wire, the front RH power window switch, P wire, "DOWN" switch of the front RH switch B wire. The switch will drive the front RH window up.

To lower the front RH window, the "DOWN" switch will connect the R wire to battery voltage. Ground will be provided to the L wire through the front RH power window switch, the "UP" switch of the power window main switch. The polarity across the motor will be reversed, causing the front RH motor to rotate in the opposite direction and lower the front RH window.

When the front RH window switch (passenger side) is moved to the "UP" position independently, the "UP" switch will provide battery voltage to the front RH window motor through L wire. The front RH window motor will receive ground through the R wire and "DOWN" switch and drive the front RH window up.

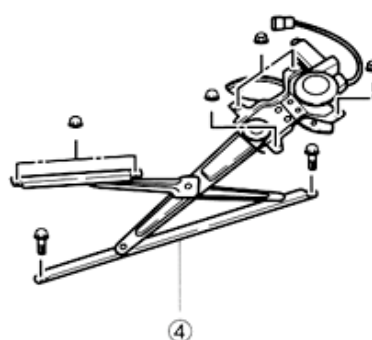
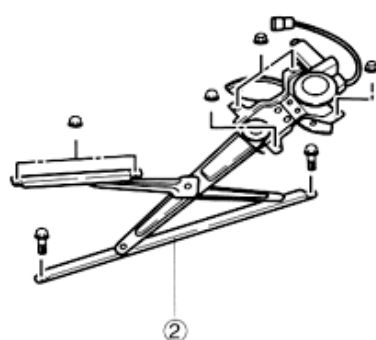
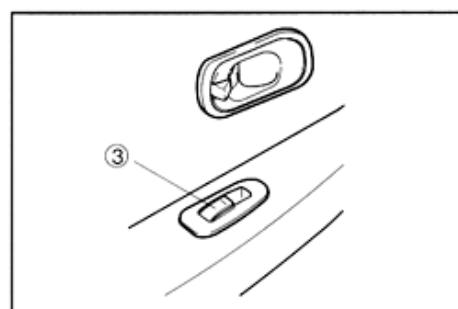
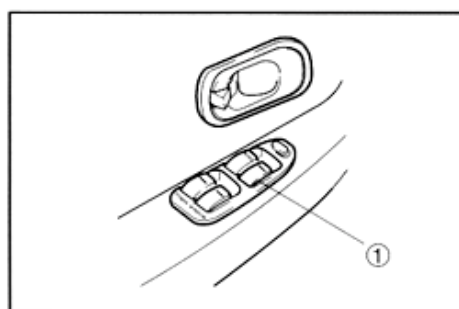
To lower the front RH window, the "DOWN" switch will connect the R wire through "DOWN" switch to battery voltage. Ground will be provided to the L wire through the "UP" switch. The motor rotates in the opposite direction and lowers the front RH window.

If the lock switch of the power window main switch is locked (opened), the other window switches (passenger side) can not operate the other windows.

The rear LH (or RH) window operates as the same method with power window main switch and rear LH (or RH) power window switch independently.



Component



- (1) Power window operating switch (Driver's side)
- (2) Power window regulator assembly (Front)
- (3) Power window operating switch (Passenger & Rear side)
- (4) Power window regulator assembly (Rear)



Troubleshooting

Preliminary check:

Check power window relay and "P/W LH (20A)" and "P/W RH (20A)" fuse. If open, check for short to ground though R/W or R/B wire, replace fuse. In addition, check that all system electrical connectors mated correctly.

Front LH power window does not operate.

Step	Inspection		Action
1	Turn the ignition switch ON position. Check for voltage at terminal H(R/B) of connector K-01 of power window main switch. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "Y" or replace.
2	Check for voltage between terminal H(R/B) and terminal I(B) of power window main switch connector K-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	While pulling the UP position on main switch, check for voltage at terminal N(R) of window main switch connector K-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
4	While pulling UP position on main switch, check for voltage at terminal A(R) of front LH motor connector K-021. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "L" or replace.
5	Check for continuity between terminal F(R/G) and I(B) of power window main switch connector K-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
6	Check for continuity between terminal B(R/G) of front LH motor connector K-02. Is battery voltage present?	Yes	Check for a poor connection at front LH motor. If OK, replace front LH motor.
		No	Repair open in the wire "R/G" or replace.
7	While pressing DOWN position on power window main switch, check for voltage at terminal F (R/G) of power window main switch connector K-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
8	While pressing DOWN position on power window main switch, check for voltage at terminal B(R/G) of front LH motor connector K-03. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.
9	Check for continuity between terminal N(R) and I(B) of power window main switch K-01. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
10	Check for continuity between terminal A(R) of front LH motor connector K-03 and ground. Is continuity present?	Yes	Check for a poor connection at front LH motor, If OK, replace front LH motor.
		No	Repair open in the wire "L" or replace.

Front RH power window do not operated by main switch.

Step	Inspection		Action
1	Turn the ignition switch ON position.	Yes	Go to next step.

	Check for voltage at terminal E(R/W) of connector K-01 of power window main switch. Is battery voltage present?	No	Repair open or short in the wire "R/W" or replace.
2	Check for voltage between terminal E(R/W) and terminal I(B) of connector K-01 of power window main switch. Is battery voltage present?	Yes	Go to next step.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	While pulling UP position on power window main switch, check for voltage at terminal L(L/R) of main switch connector K-01. Is battery voltage present?	Yes	Go to next step.
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
4	While pulling UP position on power window main switch, check for voltage at terminal B(R/Y) of front RH power window switch connector K-05. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "L/R" or replace.
5	While pulling UP position on power window main switch, check for voltage at terminal C(L) of front RH switch connector K-05. Is battery voltage present?	Yes	Go to next step.
		No	Check for a poor connection at front RH switch. If OK, replace front RH power window switch.
6	While pulling UP position on power window main switch, check for voltage at terminal A(L) of front RH motor connector K-06. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "L" or replace.
7	Check for continuity between terminal B(P) and I(B) of power window main switch K-01. Is continuity present?	Yes	Go to next step.
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
8	Check for continuity between terminal F(P) of connector K-05 of front RH power window switch and ground. Is continuity present?	Yes	Go to next step.
		No	Repair open or short in the wire "P" or replace.
9	Check for continuity between terminal D(R) of front RH switch connector K-04. Is continuity present?	Yes	Go to next step.
		No	Check for poor connection at front RH window switch. If OK, replace front RH power window switch.
10	Check for continuity between terminal B(R) of front RH motor connector K-06 and ground. Is continuity present?	Yes	Check for poor connection at front LH motor. If OK, replace front RH motor.
		No	Repair open in the wire "R" or replace as necessary.
11	While depressing DOWN position on power window main switch, check for voltage at terminal B(P) of power window main switch K-01. Is battery voltage present?	Yes	Go to next step.
		No	Check for a poor connection at power window main switch. If OK, replace power window main switch.
12	While depressing DOWN position on main switch, check for voltage at terminal F(P) of front RH power window switch K-05. Is battery voltage present?	Yes	Go to next step.
		No	Repair open or short in the wire "P" or replace.
13	While depressing DOWN position on power window main switch, check for voltage at terminal D(R) of front RH power window switch connector K-05. Is battery voltage present?	Yes	Go to next step.
		No	Check for a poor connection at front RH power window switch. If OK, replace front RH power window switch.
14	While depressing DOWN position on power	Yes	Go to next step.

	window main switch, check for voltage at terminal B(R) of front RH motor connector K-06. Is battery voltage present?	No	Repair open or short in the wire "R" or replace.
15	Check for continuity between terminal M(L) and I(B) of power window main switch K-01. Is continuity present?	Yes	Go to next step.
		No	Check for a poor connection at power window main switch. If OK, replace for power window main switch.
16	Check for continuity between terminal B(L/R) of connector K-05 of front RH power window switch and ground. Is continuity present?	Yes	Go to next step.
		No	Repair open in the wire "R/Y" or replace.
17	Check for continuity between terminal C(L/D) of front RH switch connector K-05. Is continuity present?	Yes	Go to next step.
		No	Check for a poor connection at front RH window switch. If OK, replace front RH Power window switch.
18	Check for continuity between terminal A(L) of front LH motor connector K-06 and ground. Is continuity present?	Yes	Check for a poor connection at front RH motor. If OK, replace front RH motor.
		No	Repair open in the wire "L" or replace.

Front RH power window does not operate by front RH power window switch.

Step	Inspection		Action
1	With released LOCK switch, check for continuity between terminal B(L/R) of front RH power window switch K-05 and ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, repair open in the wire "L/R" or replace.
2	Check for continuity between terminal B(L/R) of front RH power window switch K-05 and ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at power window main switch. If OK, repair open in the wire "P" or replace.
3	Turn the ignition switch to ON position. Check for voltage at terminal A(R/W) of front RH power window switch K-05. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "R/W" or replace.
4	While pulling UP position on front RH power window switch, check for voltage at terminal C(L) of front RH power window switch K-05. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at front RH power window switch. If OK, replace for front RH power window switch.
5	While pulling UP position on front RH power window switch, check for voltage at terminal A(L) of front RH power window switch K-06. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "L" or replace.
6	While pressing DOWN position on front RH power window switch, check for voltage at terminal D(R) of front RH power window switch K-05. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at front RH power window switch. If OK, replace front RH power window switch.
7	While pressing DOWN position on front RH power window switch, check for voltage at terminal B(R) of front RH power window switch K-06. Is battery voltage present?	Yes	Replace front RH power window motor.
		No	Repair open or short in the wire "R" or replace.

Circuit testing (Power window main switch)

1. Disconnect the power window main switch.
2. Check for continuity between terminal as indicated.

Position \ Terminal		A	B	D	E	F	H	I	J	K	L	M	N	O
OFF		O—O		O—		O—		O—	O—		O—	O—	O—	O—
FRONT	UP	O—O		O—		O—	O—	O—	O—		O—	O—	O—	O—
LH	DOWN	O—O		O—		O—	O—	O—	O—		O—	O—	O—	O—
FRONT	UP	O—O		O—	O—	O—		O—	O—		O—	O—	O—	O—
RH	DOWN	O—	O—	O—	O—	O—		O—	O—		O—	O—	O—	O—
REAR	UP	O—O		O—		O—	O—	O—	O—		O—	O—	O—	O—
LH	DOWN	O—O		O—		O—	O—	O—	O—		O—	O—	O—	O—
REAR	UP	O—O		O—	O—	O—		O—	O—		O—	O—	O—	O—
RH	DOWN	O—O		O—	O—	O—		O—	O—		O—	O—	O—	O—

O—O: indicates continuity

3. If not as specified, replace the power window main switch assembly.

Front RH, rear LH and RH power window switch

1. Disconnect the RH power window switch.
2. Check for continuity between terminals as indicated.

Position \ Terminal		A	B	C	D	F
OFF			O—	O—	O—	O—
UP		O—		O—	O—	O—
DOWN		O—	O—	O—	O—	

O—O: indicates continuity

3. If not as specified, replace the RH power window switch assembly.



Body Electrical System

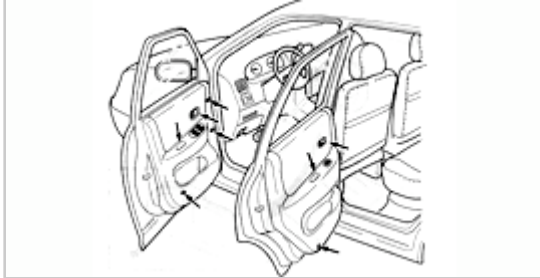
Power Windows - Power Windows Motor



Removal

Power window regulator

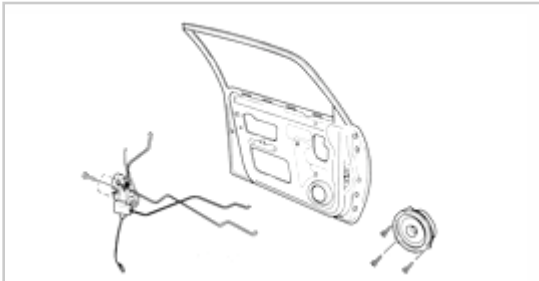
1. Disconnect negative battery cable.
2. Remove door trim. Refer to "Trim" in this section.



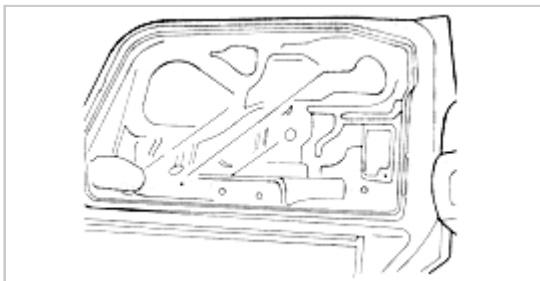
3. Remove one screw on pull handle bracket.



4. Remove pull handle bracket.
5. Remove speaker.
 - A. Remove three screws on door speaker.

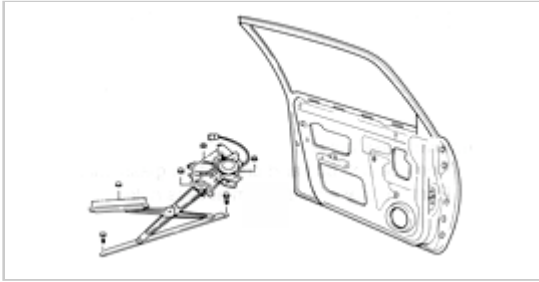


- B. Unfasten harness connector from door frame.
 - C. Pull out speaker and disconnect connectors.
6. Peel off plastic door screen carefully by pulling it away gradually from door frame.



7. Remove window glass.
 - A. Reconnect window operating switch.
 - B. Reconnect negative battery cable.
 - C. Turn on ignition and position window glass to speaker access hole.

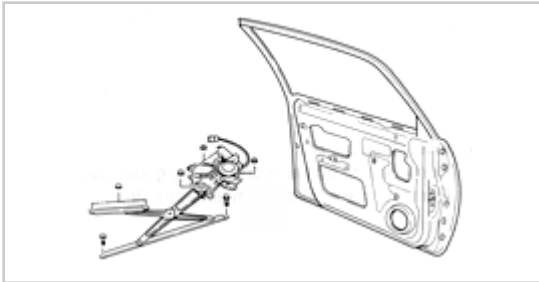
- D. Turn off ignition.
- E. Disconnect negative battery cable.
- F. Remove two glass mounting bolts from power window regulator.



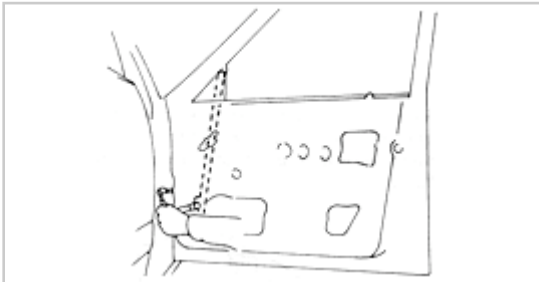
- G. Remove glass carefully. Hold glass from both its inner and outer surfaces while tilting it toward hinge side of door, pull it out from outside door frame.



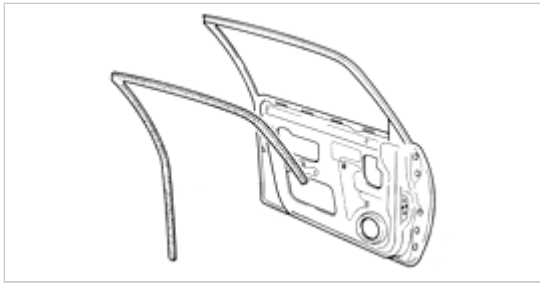
- 8. Remove power window regulator assembly.
 - A. Disconnect electrical connector for power window motor.
 - B. Remove six nuts on door frame.
 - C. Remove power window regulator assembly from out of access hole.



- 9. Remove glass guide.
 - A. Remove one bolt and one nut on glass guide.
 - B. Remove glass guide from access hole.



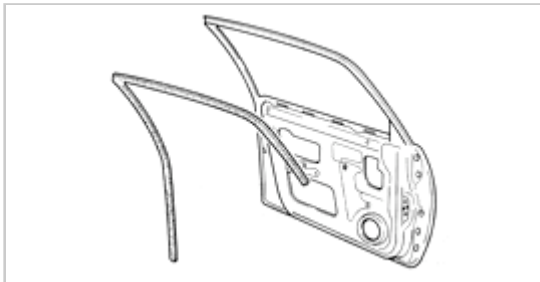
- 10. Remove run channel.



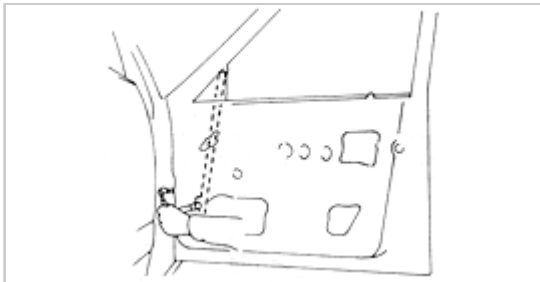
Installation

Power window regulator

1. Install run channel.

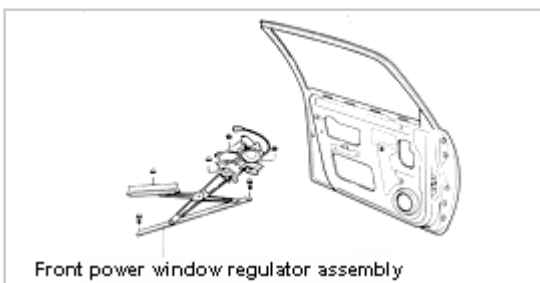


2. Install glass guide.
 - A. Position glass guide as originally installed through access hole.
 - B. Install one bolt and one nut loosely.



3. Install power window regulator assembly.
 - A. Position power window regulator assembly as originally installed through access hole.
 - B. Install six mounting nuts.

Tightening torque : 61~86 lb-in (7~10 N-m, 70~100 kg-cm)



- C. Connect electrical connector for power window motor.
4. Install window glass
 - A. Position glass carefully. Hold glass from both its inner and outer surfaces, and while tilting it towards hinge side of door, place it on small bracket on window regulator assembly.
 - B. Install two glass mounting bolts on power window regulator assembly loosely.

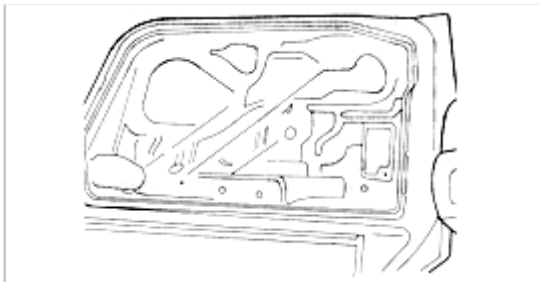
- C. Reconnect window operating switch.
- D. Connect negative battery cable.
- E. Turn on ignition and move glass up and down to ensure proper function.
- F. Make adjustments as necessary.



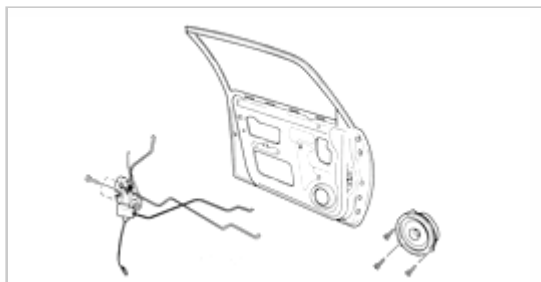
- G. Turn off ignition.
- H. Disconnect negative battery cable.
- I. Tighten two glass mounting bolts on power window regulator assembly.
- J. Tighten one bolt on glass guide.

Tightening torque : 60~86 lb-in (7~10 N-m, 70~100 kg-cm)

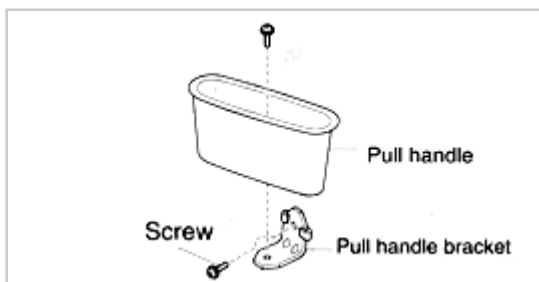
- 5. Install plastic door screen.
 - A. Fasten plastic door screen as originally installed.
 - B. Pull out electrical harness connector from plastic door screen.
 - C. Pull out two control rods for inside door handle from plastic door screen.



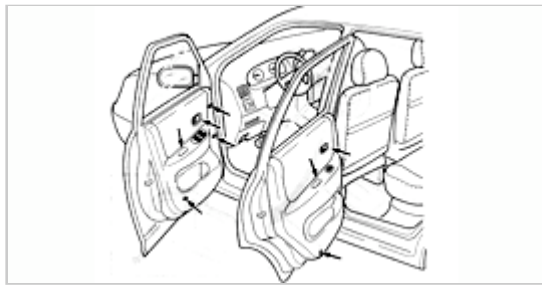
- 6. Install speaker with three mounting screws.



- 7. Install pull handle bracket with two mounting screws.



- 8. Install door trim. Refer to "Trim" in this section.





Body Electrical System

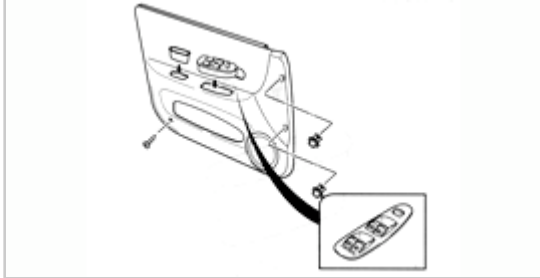
Power Windows - Power Window Switch



Removal

Operating switches

1. Disconnect negative battery cable.
2. Remove power window operating switch and disconnect power window harness connector.



Installation

Operating switches

1. Install power window switch on door trim.
 - A. Set power window operating switch into armrest cavity and snap switch assembly into place.
2. Connect power window harness connector to power window operating switch.
3. Connect negative battery cable.



Body Electrical System

Rear Window Defogger



Description

Rear window is equipped with heating elements that clear condensation, frost and light show. Baked inside surface, heating elements, or grid lines, are connected to vertical buss bar lines that comprise an electrical circuit.

When dash-mounted switch is pressed, electric current is supplied through defrost relay in fuse box of engine compartment. Should rear glass not be cleared, switch must be pressed again for another 15 minutes heating cycle.

Circuit operation

Battery voltage is always applied from "DEFOG (20A)" to one side of the rear defroster relay and the other side of the relay is connected to the rear window defroster, mirror defroster and defroster indicator. The indicator and defrosters is grounded permanently.

With the ignition switch "ON" position, battery voltage is applied to one side of the rear defroster relay coil and the other side of rear defroster relay coil is connected to terminal P(P) of the ETWIS.

When the rear defroster switch is pressed, the ETWIS module senses the ground signal through terminal A(Y/G), the rear defroster switch, and B wire, which grounds one side of the relay coil by activating the internal solid state of ETWIS. The rear defroster relay energizes and applies battery voltage to the indicator and defrosters until the ETWIS is deactivated.



Troubleshooting

Rear defroster Does Not Operate.

Preliminary Check:

Check for rear defroster relay and "DEFOG (20A)" and "MIRROR DEF (10A)" fuse. If open, check for short to ground through the wire and replace fuse and relay. In addition, check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Connect for voltage at terminal B(R) of ETWIS connector I-01. Is battery voltage present.	Yes	Go to next step
		No	Repair open or short in the wire "R" or replace as necessary.
2	Turn the ignition switch to ON position. Check for voltage at terminal M(Y) of ETWIS connector I-01. Is battery voltage present.	Yes	Go to next step
		No	Repair open or short in the wire "Y" or replace as necessary.
3	Check for continuity at terminal S(B) of ETWIS connector I-01 to ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair or replace B wire.
4	Check for continuity between terminal B(B) of rear defroster switch connector I-17 and ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
5	With pressed rear defroster switch, check for continuity between terminal A(Y/G) of rear defroster connector I-17 and ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at rear defroster switch. If OK, replace the rear defroster switch.
6	With pressed rear defroster switch, check for continuity between terminal A(Y/G) of ETWIS I-01 and ground. Is continuity present?	Yes	Go to next step
		No	Repair open or short in the wire "Y/G" or replace.
7	Press rear defroster switch once. Check for continuity between terminal P(P) of ETWIS I-01 and ground. Is continuity present?	Yes	Go to next step
		No	Check for a poor connection at ETWIS. If OK, repair open in the wire "P" or replace.
8	Check for voltage at following terminals. Is battery voltage present respectively?	Yes	Inspection rear defroster grid and go to next step.
		No	Repair open or short in the wire "R/W" or/and "R/B" or replace.
9	Check for continuity between following terminals and ground.	Yes	Inspect mirrror defroster.

Is continuity present?

Item	Connector	Terminal	Value
LH mirror defroster	L-02	H (B)	0 Ω
RH mirror defroster	L-03	H (B)	0 Ω

No

Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



Body Electrical System

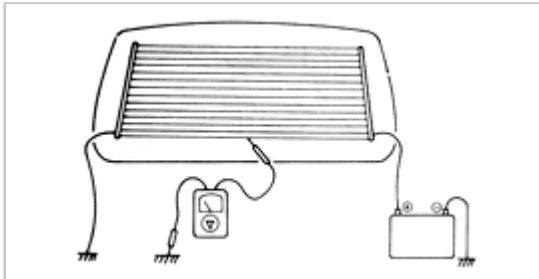
Rear Window Defogger - Rear Window Defogger
Printed Heater



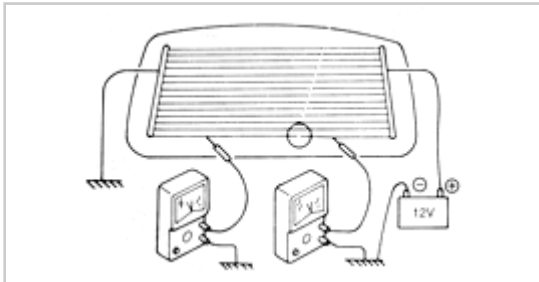
Inspection

Grid electrical system

1. With engine running, push defroster switch "ON".
2. Connect negative (-) terminal of a voltmeter to vehicle ground.
3. Using voltmeter positive (+) probe, test center of each grid line for about 6 volts.



4. If voltmeter reading is more than 6 volts, grid line is broken between center and grounded (GND) end.
5. If voltmeter reading is less than 6 volts, or 0 volts, grid line is broken between center and battery feed wire end.

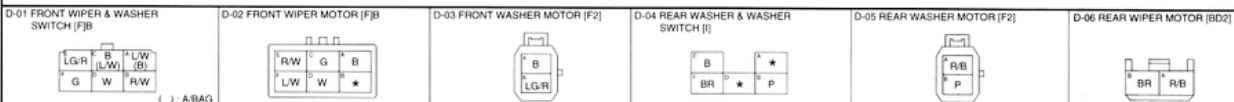




Body Electrical System

Windshield Wiper/Washer

() : AIR BAG





Description

Washer system

CARENS is equipped with a variable speed (intermittent), modular wiper/washer system. Wiper system consists of a wiper motor, a wiper link assembly, and two wiper arms with blades. Washer assembly consists of a washer tank, a washer motor, two washer nozzles, and connecting hoses. Both systems are then connected to a wiper lever and a timer unit in steering column combination switch.

- Hoses
Washer hoses are neoprene lines that carry washer fluid to washer nozzles. There are three hose pieces, a three-port hose joint, and a two-port hose joint. Hoses can be replaced individually. Washer hose system also has three replaceable hold-down clips.
- Lever assembly
Wiper assembly is located in combination switch on steering column. For switch-related electrical problems, refer to 1999 CARENS Wiring Diagram Manual. For removal procedures, refer to Group ST, Steering System.
- Motor
Washer motor pumps washer fluid to washer nozzles. It is a single speed 12V DC motor to a pump mechanism. It is a replaceable item.
- Nozzles
Washer nozzles deliver washer fluid directly to windshield. Nozzles are replaceable as an individual item.
- Tank assembly
Washer tank assembly stores washer fluid used by washer system. It is a plastic assembly with a fill port and a connection port to washer motor. It is a replaceable item.
- Timer unit
Timer unit controls intermittent operation of wiper system. It is part of wiper unit assembly in steering column combination switch. For unit-related electrical problems, refer to 1999 CARENS Wiring Diagram Manual. For removal procedures, refer to Group ST, Steering System.

Wiper system

- Arm
Wiper arms are metal arms which pull wiper blades across windshield. They are spring-loaded to firmly hold blades onto windshield during operation of wiper system. They are individual units consisting of a driver's side and a passenger side arm.
- Blades
Wiper blades are metal frames with rubber inserts. They are available as a unit, or inserts can be replaced separately.
- Link assembly
Wiper link assembly connects wiper motor to wiper arms. It consists of two connecting rods and two pivot units. When in operation, assembly converts wiper motor's rotational motion into proper left/right movement needed by wiper arms. If faulty, it can be disassembled, but replacement of full assembly is recommended.
- Motor and bracket
Motor is a 12V DC, two-speed unit which provides power to wiper system. It is connected to a transmission (gear box) in mounting bracket which reduces motor rpm and increases torque. This low rpm, high torque motion is then transmitted to wiper link assembly. Motor and bracket are a single, replaceable item.

Circuit operation

Front wiper & washer operation (Low and high positions)

When the ignition switch is turned to "ON" or "START" position battery voltage is applied to front wiper & washer switch terminal A (L) of D-01 and front wiper motor terminal F (L/W) of D-02. In the 'HI' position of the wiper & washer switch, battery voltage is applied to the wiper motor terminal E (R/W) of D-02. In the 'LO' position wiper & washer switch C (G) of D-02. The wiper motor has separate brushes and windings for low and high speed operation. When the wiper & washer switch is in "LO" or "HI" position, one of the brushes is

connected to ground through the wiper motor. Wiper motor operates in "LO" or "HI" speed.

Park position

When the wiper & washer switch is turned to "OFF" position from any positions, the wipers will complete "PARK" position. In the "OFF" position of the wiper & washer switch, battery voltage is applied to the wiper motor terminal C(G) of D-02 through G wire, INT relay, and W wire. The wiper motor continues to run until the "PARK" position, in which battery voltage is closed through open between wiper motor terminal D(W) and F(L/W) of D-02. The wiper motor stops in "PARK" position.

INT position

With the wiper & washer switch in "INT" position, battery voltage is applied to INT relay through the L wire. This triggers the timer circuit and shortly energizes the relay. The INT relay routes GND through the wiper & washer switch terminal C(B) of D-01 and battery voltage is applied to the wiper motor terminal C(G) of D-02 long enough to pull the wiper motor out of the "PARK" position. Battery voltage also is applied to the wiper motor terminal C of D-02 through L and L/W wires, INT relay, and G wire. The wiper motor stops when the wipers return to their "PARK" position. When the timer circuit times out, it again energizes the momentarily, repeating the wiper cycle. Rotating the wiper & washer switch can vary the timer circuit's period.

Front washer operation

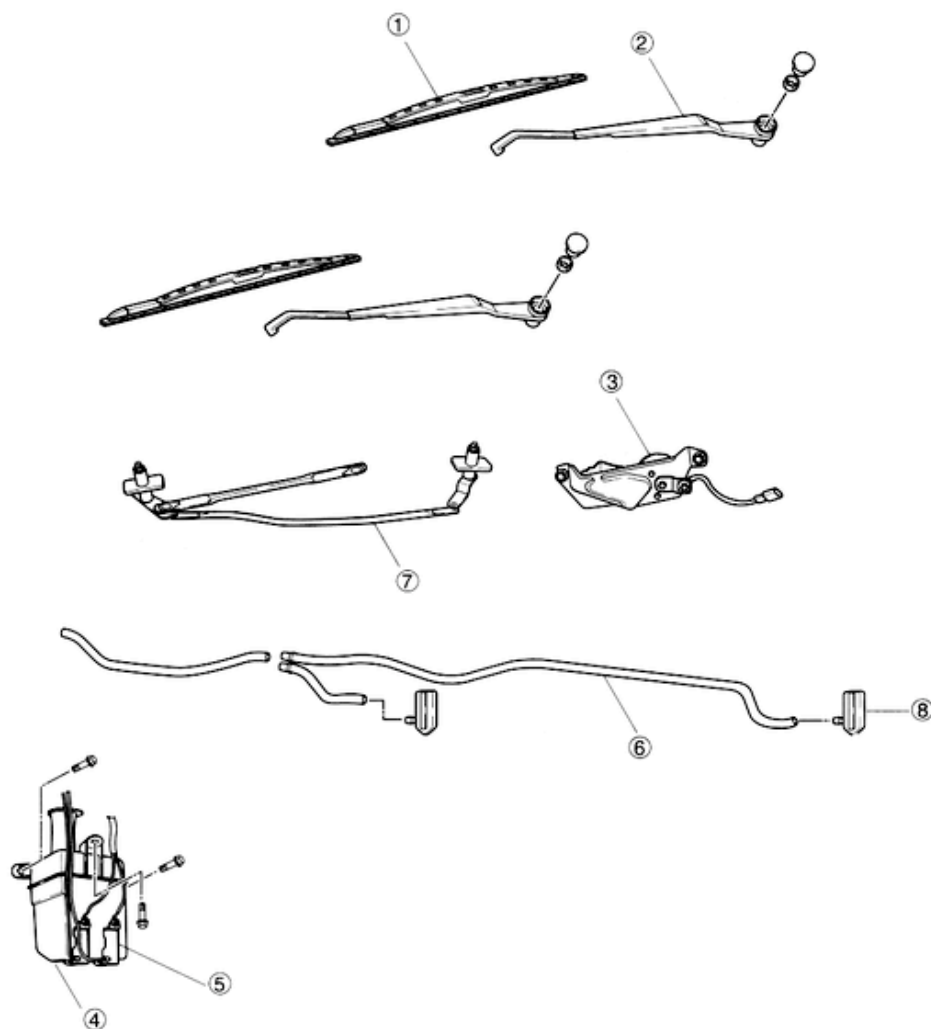
When the washer switch is pulled towards the driver, battery voltage is applied to the washer motor terminal B(LG/R) of D-03 through washer switch and LG/R wire, which runs washer motor. The washer switch also applies battery voltage to the wiper motor terminal C of D-02 through G wire. The wiper and washer motors run until the washer switch released.

Rear wiper & washer operation

When the ignition switch is turned to "ON" or "START" position, battery voltage is applied to Rear wiper motor and rear washer motor. When the rear wiper & washer switch is pressed the other side of rear wiper motor and rear washer motor is grounded through P and BR wires, rear wiper & washer switch, and B wire. The rear wiper and washer motors run until the rear wiper & washer switch is released. When the rear wiper switch is pressed, wiper motor operates.



Component



- (1) Wiper blade
- (2) Wiper arm
- (3) Wiper motor
- (4) Washer tank

- (5) Washer motor
- (6) Washer hose
- (7) Wiper link assembly
- (8) Washer nozzle



Troubleshooting

Front wiper and washer system

Preliminary check:

Check "FRONT WIPER" (15A) fuse. If open, check for short to ground through the L/W wire and overload, and check that all system electrical connectors mated correctly. If washer does not operate, check that washer reservoir is filled and hoses are correctly attached.

Wipers do not operate in "HI" or "LO" Position

Step	Inspection		Action
1	Turn the ignition switch to "ON" position. Connect test light between wiper & washer switch terminal A(L) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection to wiper & washer switch. If OK, repair open in the wire "L" to wiper & washer switch or replace.
2	Turn the wiper & washer switch to "LO" or "HI" position. Connect test light between wiper & washer switch terminal B(R/W;HI) or F(G;LO) of D-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check a poor connection at terminal B(R/W;HI) or F(G;LO) of D-01. If OK, replace wiper & washer switch assembly.
3	Connect test light between wiper motor terminal E(R/W;HI) or C(G;LO) of D-02 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/W" or "G", or replace as necessary.
4	Connect test light between wiper motor terminal E(R/W;HI) or C(G;LO) of D-02 and terminal B(B) of D-02. Is test light ON?	Yes	Check a poor connection at wiper motor terminal B(B) of D-02. If OK, replace wiper motor assembly.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.

Wiper motor does not operate correctly in "INT" position

Step	Inspection		Action
1	Turn the ignition switch to "ON" position. Connect test light between the terminal A(L) of wiper & washer switch and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "L" to wiper & washer switch assembly or replace.
2	Connect test light between wiper motor terminal F(L/W) of D-02 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "L/W" to wiper motor assembly or replace.
3	Connect test light between wiper motor terminal F(L/W) of D-02 and B(B) of D-02. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "B" to wiper motor assembly or replace.
4	Connect test light from wiper & washer switch terminal F(G) of D-01 to ground. Is test light ON when turning the wiper & washer switch to "INT" position?	Yes	Go to next step
		No	Check a poor connection at wiper & washer switch terminal F(G) of D-01. If OK, replace wiper & washer switch assembly.
5	Turn the wiper & washer switch to "INT" position. Connect test light between wiper motor terminal D(W) of D-02 and ground. Does test light blink periodically?	Yes	Go to next step
		No	Check a poor connection at wiper motor assembly. If OK, replace wiper motor assembly.
6	Connect test light between wiper & washer switch terminal D(W) of D-01 and ground. Does test light blink periodically?	Yes	Go to next step
		No	Repair open or short in the wire "W" between wiper motor and wiper & washer switch or replace.

7	Connect test light between wiper & washer switch terminal F(G) of D-01 and ground. Does test light blink periodically?	Yes	Go to next step
		No	Check for a poor connection at wiper & washer switch assembly. If OK, replace wiper & washer switch assembly.
8	Connect test light between wiper motor terminal C(G) of D-02 and ground. Does test light blink periodically?	Yes	Go to next step
		No	Repair open or short in the wire "G" between wiper & washer switch and wiper motor or replace.
9	Connect test light between wiper motor terminal C(G) of D-02 and B(B) of D-02. Does test light blink periodically?	Yes	Check wiper motor assembly.
		No	Check for a poor connection at wiper motor assembly. If OK, repair open in the wire "B" or replace.

Wipers run when switch is in "OFF" position

Step	Inspection		Action
1	Turn ignition switch to "ON" position and wiper & washer switch to "OFF" position. Does wiper motor keep running when disconnecting wiper & washer switch connector D-01?	Tes	Go to next step
		No	Check for short wires to wiper & washer switch assembly. If OK, replace wiper & washer switch assembly.
2	Does wiper motor keep running when disconnecting wiper motor connector D-02?	Yes	Go to next step
		No	Check for short wires to wiper motor. If OK, replace wiper motor assembly.

Wipers stop randomly and do not park when switch is turned "OFF" position

Step	Inspection		Action
1	Turn ignition switch to ON position. Connect test light between the wiper motor terminal F(L/W) of D-02 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the "L/W" between fuse and wiper motor.
2	Connect test light between the wiper motor terminal D(W) of D-02 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at the wiper motor assembly. If OK, replace wiper motor assembly.
3	Connect test light between the terminal D(W) of wiper & washer switch D-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "W" between wiper motor and wiper & washer switch.
4	Connect test light between the wiper & washer switch terminal F(G) of D-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at the wiper & washer switch. If OK, replace wiper & washer switch assembly
5	Connect test light between the wiper motor terminal C(G) of D-02 and ground. Is test light ON?	Yes	Check for a poor connection at the wiper motor assembly. If OK, replace wiper motor assembly.
		No	Checkf or a poor connection at the wiper a washer switch assembly. If OK, repair open or short in the wire "G" or replace.

Front washer does not operate

Step	Inspection		Action
1	Turn ignition switch to ON position.	Tes	Go to next step

	Connect test light from the terminal A(L) of wiper & washer switch D-01 and ground. Is test light ON?	No	Repair open or short in the wire "L" to wiper & washer switch assembly or replace.
2	With pulled washer switch toward the driver, connect test light between wiper & washer switch terminal E(LG/R) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at terminal E(LG/R) of D-01. If OK, replace wiper & washer switch assembly.
3	Connect test light between washer motor terminal B(B/W) of D-03 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "B/W" or replace.
4	Connect test light between washer motor terminal B(B/W) of D-03 and terminal A(B) of D-03. Is test light ON?	Yes	Check for a poor connection at washer motor. If OK, replace washer motor assembly.
		No	Check .Repair open in the wire "B" to ground or replace.

Rear wiper & washer system

Preliminary check :

Check "RR WIPER (15A)" fuse. If open, check for short to ground though the R/B wire and overload, and check that all system electrical connectors mated correctly. If washer does not operate, check that washer reservoir is filled and hoses are correctly attached.

Wiper does not operate.

Step	Inspection		Action
1	Turn ignition switch to ON position. Connect test light from the terminal A(R/B) of D-06 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R/B" to rear wiper motor or replace.
2	Connect test light between washer motor terminal B(R/B) of D-06 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at rear wiper motor. If OK, replace rear wiper motor assembly.
3	Connect test light between washer motor terminal F(BR) of D-04 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "BR" or replace.
4	Connect test light between washer motor terminal F(BR) of D-04 and E(B) of D-04. Is test light ON?	Yes	Replace rear wiper switch assembly. Repair open in the wire "B" to ground or replace.
		No	Check for a poor connection at rear wiper switch. If OK, repair open in the wire "B" or replace.

Washer does not operate

Step	Inspection		Action
1	Turn the ignition switch to "ON" position. Connect test light between rear washer motor terminal A(R/B) of D-05 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R/B" or replace.
2	Connect test light between rear washer motor terminal B(P) of D-05 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at rear washer motor. If OK, replace rear washer motor.
3	Connect test light between rear wiper & washer switch terminal B(P) of D-04 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "P" or replace.
4	Connect test light between rear wiper & washer	Yes	Replace rear wiper & washer switch..

	switch terminal B(P) and E(B) of D-04. Is test light ON?	No	Check for a poor connection at rear wiper & washer switch. If OK, repair open in the wire "B" or replace.
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Circuit testing (Front wiper & washer switch)

1. Disconnect the front wiper & washer switch.
2. Check for continuity between terminal as indicated.

Terminal		C	A	D	E	F	B
Position	OFF			O		O	
	ON		O			O	
INT		O	O	O		O	
LO			O			O	
HI			O				O

O—O : indicates continuity

3. If not as specified, replace the wiper/washer switch assembly.

Front wiper motor

1. Disconnect wiper motor.
2. Check for continuity between terminals as indicated.

Terminal		B	C	E	F	D
Position	Park	O	O	O		
	Except park	O	O	O	O	O

O—O : indicates continuity

3. If not as specified, replace wiper motor assembly.

Rear wiper & washer switch

1. Disconnect the rear wiper & washer switch.
2. Check for continuity between terminal as indicated.

Terminal		B	E	F
Position	OFF			
	WIPER		O	O
WIPER & WASHER		O	O	O

O—O : indicates continuity

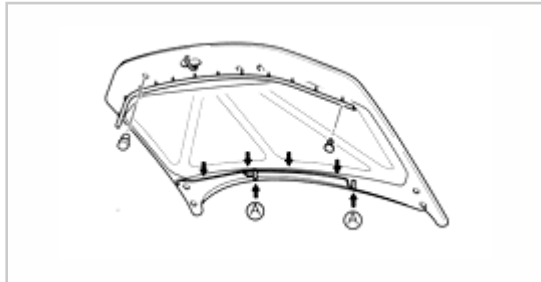
3. If not as specified, replace the wiper/washer switch assembly.



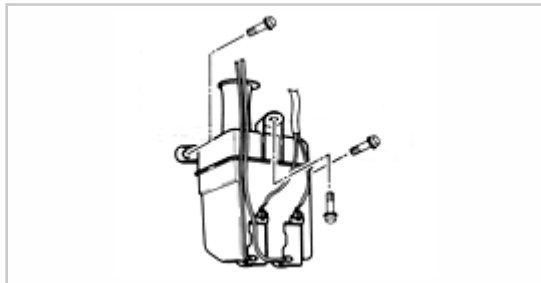
Removal

Washer hose

1. Disconnect washer nozzles (A).



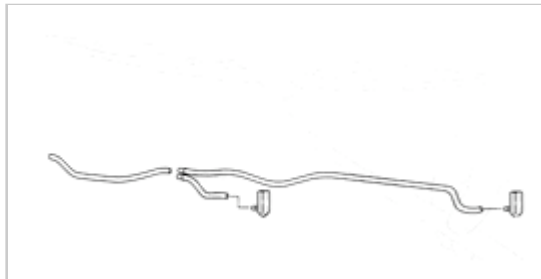
2. Inclip hoses from four hose clips.
3. Disconnect hose clips on side panel.
4. Disconnect hose from washer motor.



Removal

Washer nozzle

1. Release holding clip by inserting a thin screwdriver between nozzle and bushing.
2. Remove nozzle from hood and then disconnect nozzle from neoprene hose.



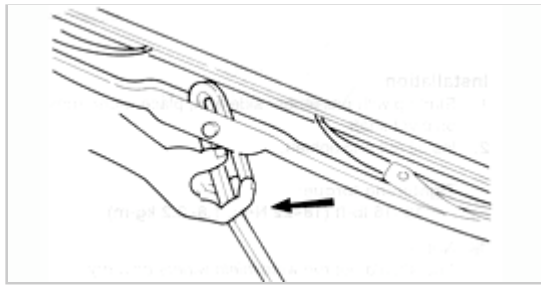
Removal

Windshield wiper blade

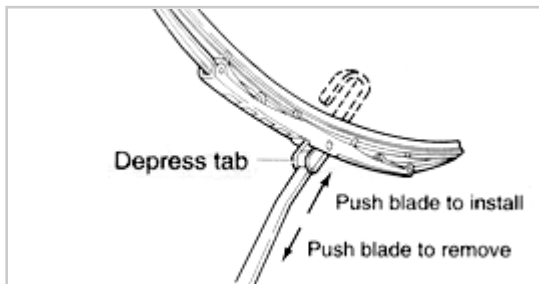
1. Raise wiper arm off windshield into upright locked position.



2. Pivot blade until locking tab is exposed and then press in.



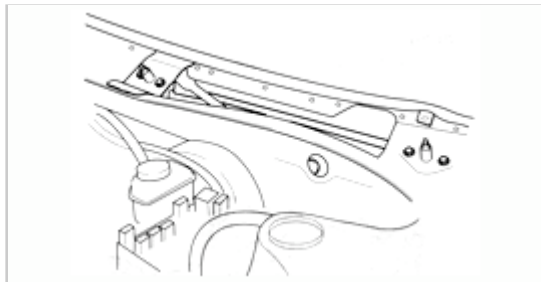
3. Push wiper blade down arm until hook has separated from blade.
4. Slide blade up arm until it clears hook.



Removal

Link assembly

1. Remove wiper arms and blades. Refer to "Windshield Wiper/Washer System" in this section.
2. Remove eight clips and four fasteners from cowl grille.
3. Remove cowl grille.
4. Remove wiper motor. Refer to "Windshield Wiper/Washer System" in this section.
5. Remove four nuts from pivot shafts.
6. Slide link assembly out of driver's side access hole.



Installation

Washer hose

Reverse removal procedures.

Installation

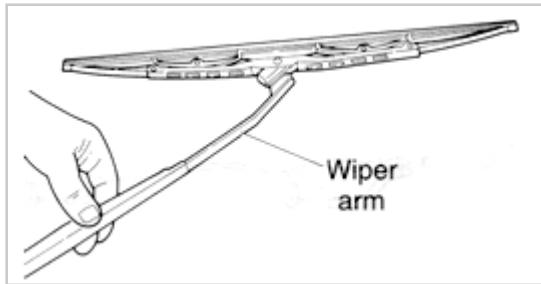
Washer nozzle

1. Connect nozzle to neoprene hose
2. Face nozzle exit towards windshield and push in place on hood.

Installation

Windshield wiper blade

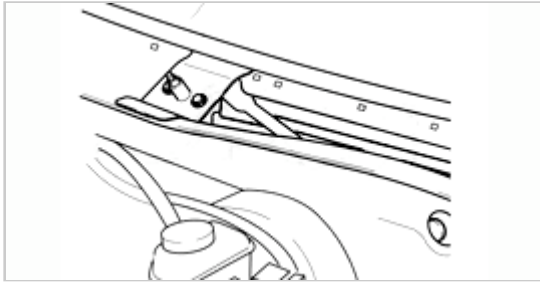
1. Place new blade on wiper arm, taking care that open side of hook is facing connection point.
2. Move blade (left or right) until connection point is at opening of hook.
3. Push blade into hook until lock tab sets.
4. Lower wiper arm to windshield.



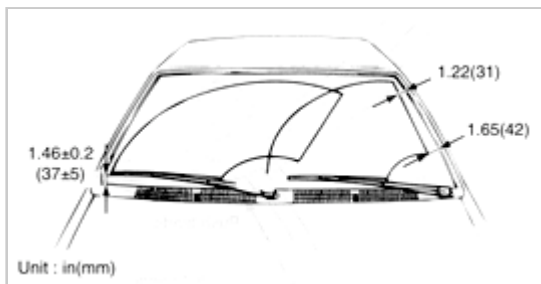
Installation

Link assembly

1. Slide link assembly into position through driver's side access hole.
2. Position pivot shafts in their holes and install mounting nut and bolts.
3. Extend link assembly fully and connect link slot to wiper motor ball joint.



4. Install wiper motor. Refer to "Windshield Wiper/ Washer System" in this section.
5. Place cowl vent in position and install screws and fasteners.
6. Install wiper arms and blades. Refer to "Windshield Wiper/Washer System" in this section.
7. Check system movement.



Adjustment

Washer nozzle

1. Spray should center on driver and passenger sides of front windshield. If off-line, adjust by slightly turning the nozzle.
2. If clogged or restricted, use a needle or wire to clear nozzle exit.



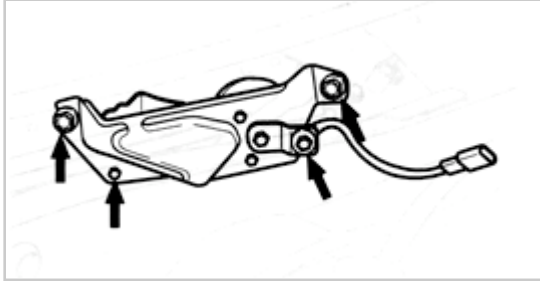
Body Electrical System

Windshield Wiper/Washer - Front Wiper Motor

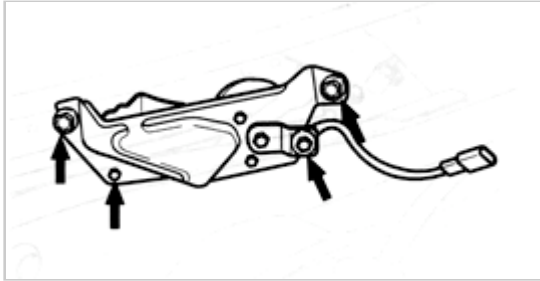


Removal

1. Disconnect negative battery cable.
2. Disconnect wiper motor harness connector.
3. Remove four wiper motor mounting bolts.



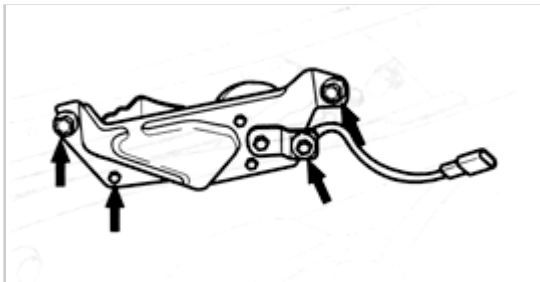
4. Separate motor assembly from wiper link assembly using a screwdriver.
5. Remove wiper motor from engine compartment.



Installation

1. Attach wiper motor ball joint to wiper link assembly.
2. Install and tighten four wiper motor mounting bolts.

Tighten mounting bolts to 61~87 lb-in (7~10 N-m, 70~100 kg-cm)



3. Connect wiper motor harness connector.
4. Connect negative battery cable.



Body Electrical System

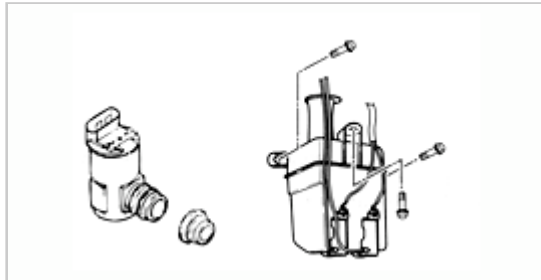
Windshield Wiper/Washer - Front Washer Motor



Removal

Washer motor

1. Disconnect negative battery cable.
2. Remove fasteners and bolt from mud guard and gently pull mud guard down ward fully.
3. Remove three bolts on washer tank.
4. Disconnect washer motor harness connector.
5. Remove hose connector at washer motor.
6. Remove washer motor and washer tank.
7. Drain washer tank and then separate washer motor from washer tank.



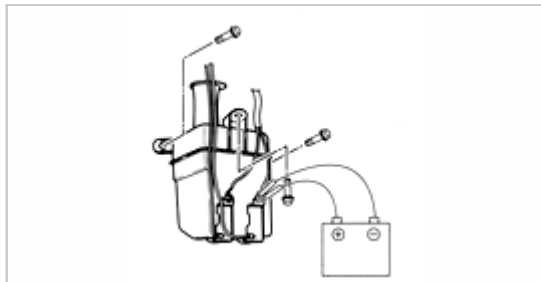
Installation

Washer motor

1. Reverse removal procedure.

Inspection

1. Check for continuity between positive terminal and negative terminal using an ohmmeter.
2. Check motor function by connecting it to a 12V DC source.



3. Visually inspect washer tank for cracks or damage.



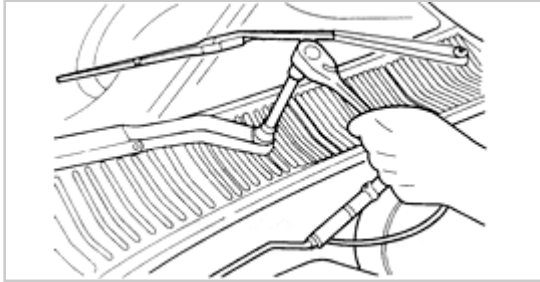
Body Electrical System

Windshield Wiper/Washer - Wiper Arm



Removal

1. Before removal check that wiper has stopped at its off position.
2. Remove nut cover and then wiper arm nut.
3. Check that arms are marked "DS" (Driver Side) and "PS" (Passenger Side). If not, mark them before removal.
4. Remove wiper arms.



Installation

1. Starting with passenger side arm, place wiper arms on pivot shaft.
2. Install nut and tighten.

Tightening torque : 13~16 lb-ft (18~22 N-m, 1.8~2.2 kg-m)

NOTICE

You should not run windshield wipers on a dry windshield.

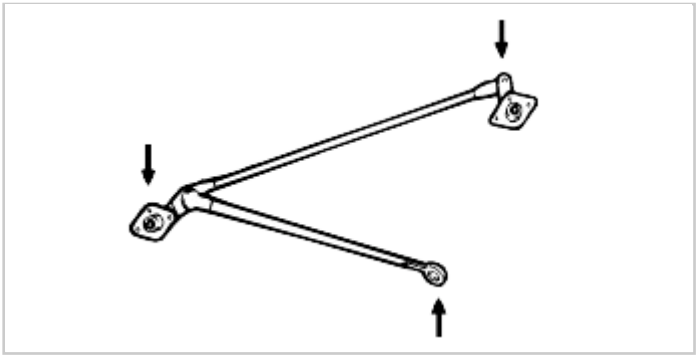
3. Install nut cover and check arm movement across windshield.



INSPECTION

LINK ASSEMBLY

1. Check for any resistance by moving each part of link assembly by hand.
2. If any resistance is found, remove linkage and apply grease to indicated joints.





Body Electrical System

Rear Wiper/Washer



Description

Windshield wiper/Washer system (Rear)

The CARENS equipped with a single-speed, modular, wiper/washer system. The wiper system consists of a wiper motor and transmission assembly, a wiper arm and a blade. The washer assembly consists of a washer tank, a washer motor, a washer nozzle and a multi-piece connecting hose. The control switches for these units in the instrument panel.

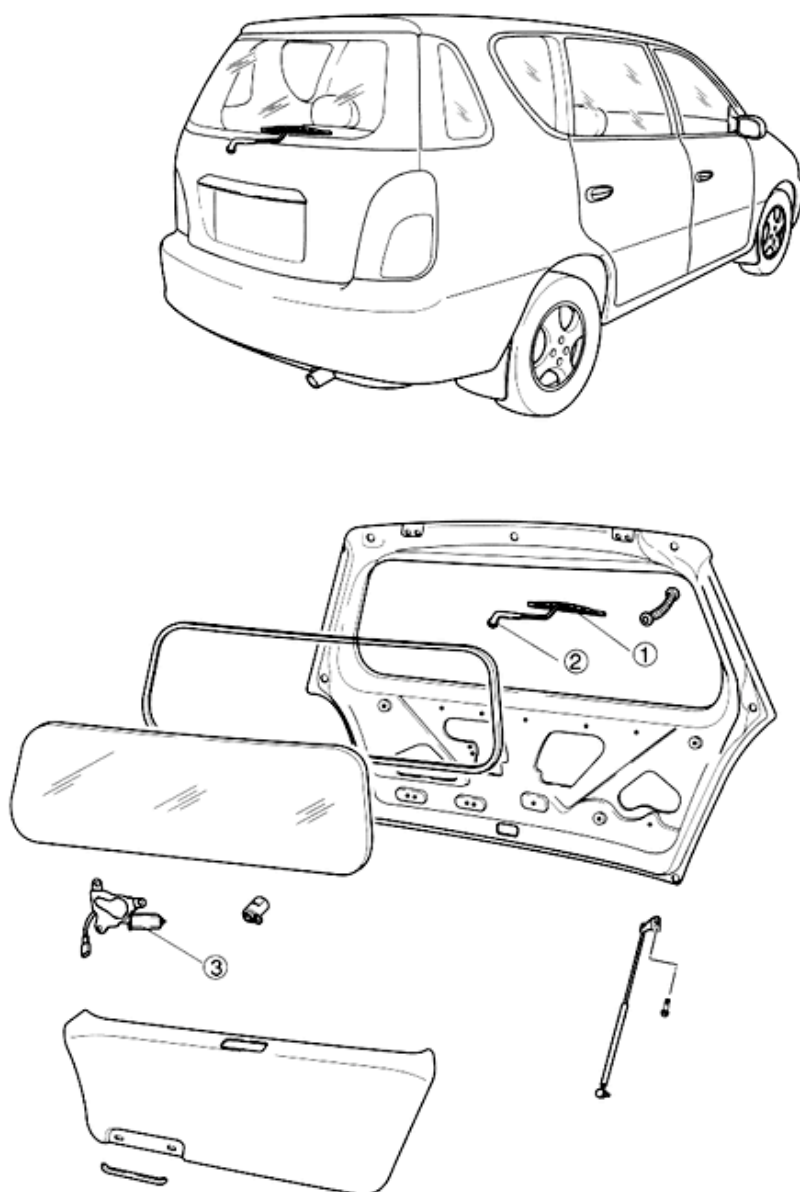
- Washer hose
The washer hose carries the washer fluid to the washer nozzle. It is a single-speed 12V DC motor connected to a pump mechanism. It is replaceable item.
- Washer motor
The washer motor pumps washer fluid to the washer nozzles. It is a single-speed 12V DC motor connected to a pump mechanism. It is a replaceable item.
- Washer nozzle
The washer nozzle delivers washer fluid directly to the windshield. The nozzle is both adjustable and replaceable.
- Rear wiper/washer switch
The rear wiper/washer switch is used to clean the rear hatch window. To solve an electrical problem with this switch, see the 1999 CARENS Wiring Diagram Manual. For removal procedures, see "Instrument Panel" in this section
- Rear wiper switch
This rear wiper switch provides continuous operation of the rear wiper. To solve an electrical problem with this switch, see 1999 CARENS Wiring Diagram Manual. For removal procedures, see "Instrument Panel" in this section

Wiper system (Rear)

- Wiper arm
The wiper arm is a spring-loaded metal unit which pulls the wiper blade across the windshield. It is a replaceable item.
- Washer motor/wiper blade
The wiper blade is a metal frame with a rubber insert. It is available as a unit, or the insert can be replaced separately.
- Wiper motor and bracket
The motor is a 12V DC single-speed unit which provides power to the wiper system. It is connected to a transmission (gear box) in the bracket which reduces rpm and increases torque. This low rpm, high torque motion is then transmitted to the wiper arm. The motor and brackets are a single, replaceable item.



Component



- (1) Wiper blade
- (2) Wiper arm
- (3) Rear wiper motor

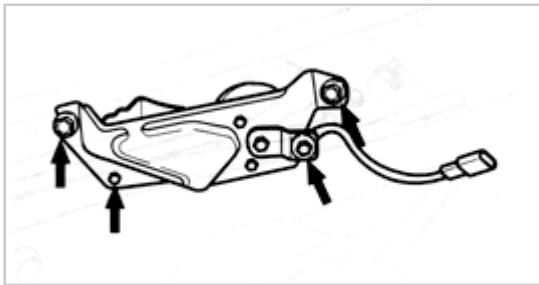


Removal

1. Disconnect negative battery cable.
2. Remove rear hatch trim. Refer to "trim" in this section.
3. Remove wiper blade.
4. Remove wiper arm mounting nut cover.
5. Remove one nut from wiper arm.
6. Remove wiper arm.
7. Remove four bolts from wiper motor.

Installation

1. Reverse removal procedure.





Body Electrical System

Lighting System



Description and operation

Exterior lights

Exterior lights consist of six lighting systems: headlights, turn-signal lights, position lights, hazard lights, brake lights, and license plate lights (rear only). Six systems include left and right headlight and combination light assemblies, left and right rear combination light assemblies, a rear high-mounted brake light assembly, and two license plate light assemblies (for rear license only). All lights are powered by 12-volt electrical system.

Combination light assembly (Rear)

Rear combination light assembly is aerodynamically shaped to follow body contours. Lens is three-colored: amber (hazard/turn signal), translucent (backup) and red (tail/brake). Rear combination light assembly contains three bulbs. Two bulbs are single-filament and are used in hazard/turn signal and backup light circuits. Third bulb is a dual filament bulb; one filament functions as brake light and other as tail light. A plastic bulb holder mounts three lamps and associated wiring.

Headlight and positionlight/Turn signal light assembly

Headlight/combination light assembly is aerodynamically shaped to match contours of body.

High-mounted brake light assembly

High-mounted brake light assembly is mounted on package tray assembly. Lens is red and is visible through rear window. Assembly has one bulb. Two screws attach a cover. Cover is removed for access to bulb. Light is turned on/off by a brake light switch mounted near brake pedal and actuated by movement of brake pedal.

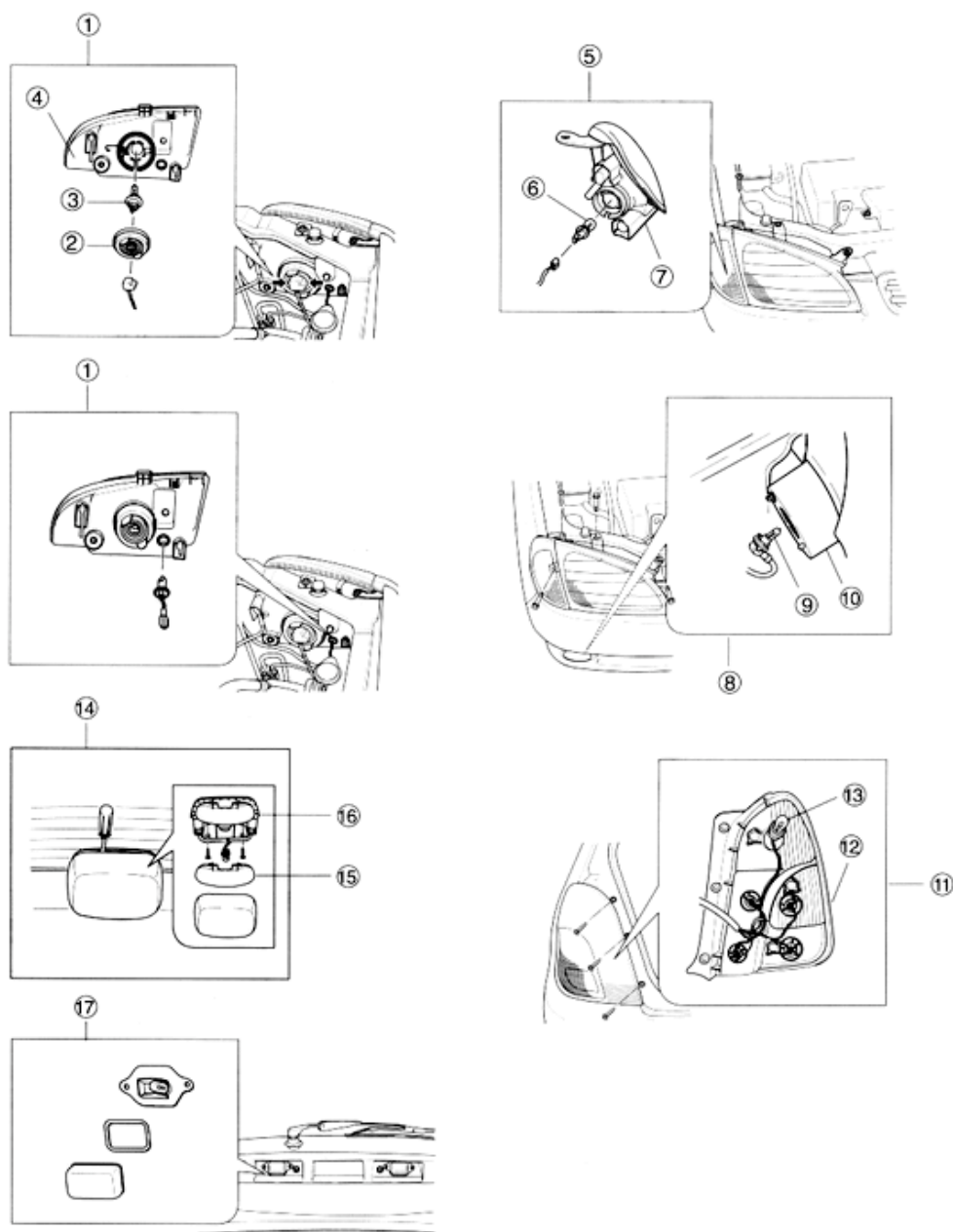
License plate light assembly

Two license plate light assemblies are installed in rear bumper above license plate mount. Each light assembly has one bulb. Both bulbs are turned on when headlights and position lights (parking lights) are on. Each bulb is protected by a translucent plastic lens attached with two screws. Bulb can be removed/installed by removing two screws and plastic lens.



Component

Exterior Lights



- (1) Headlight and position light assembly
- (2) Dust cover
- (3) Bulb
- (4) Light housing
- (5) Front turn signal light assembly
- (6) Bulb
- (7) Light housing
- (8) Front fog light
- (9) Socket & bulb

- (10) Light housing
- (11) Rear combination light
- (12) Light housing
- (13) Socket & bulb
- (14) High-mounted brake light assembly
- (15) Lens
- (16) Light housing
- (17) License plate light assembly

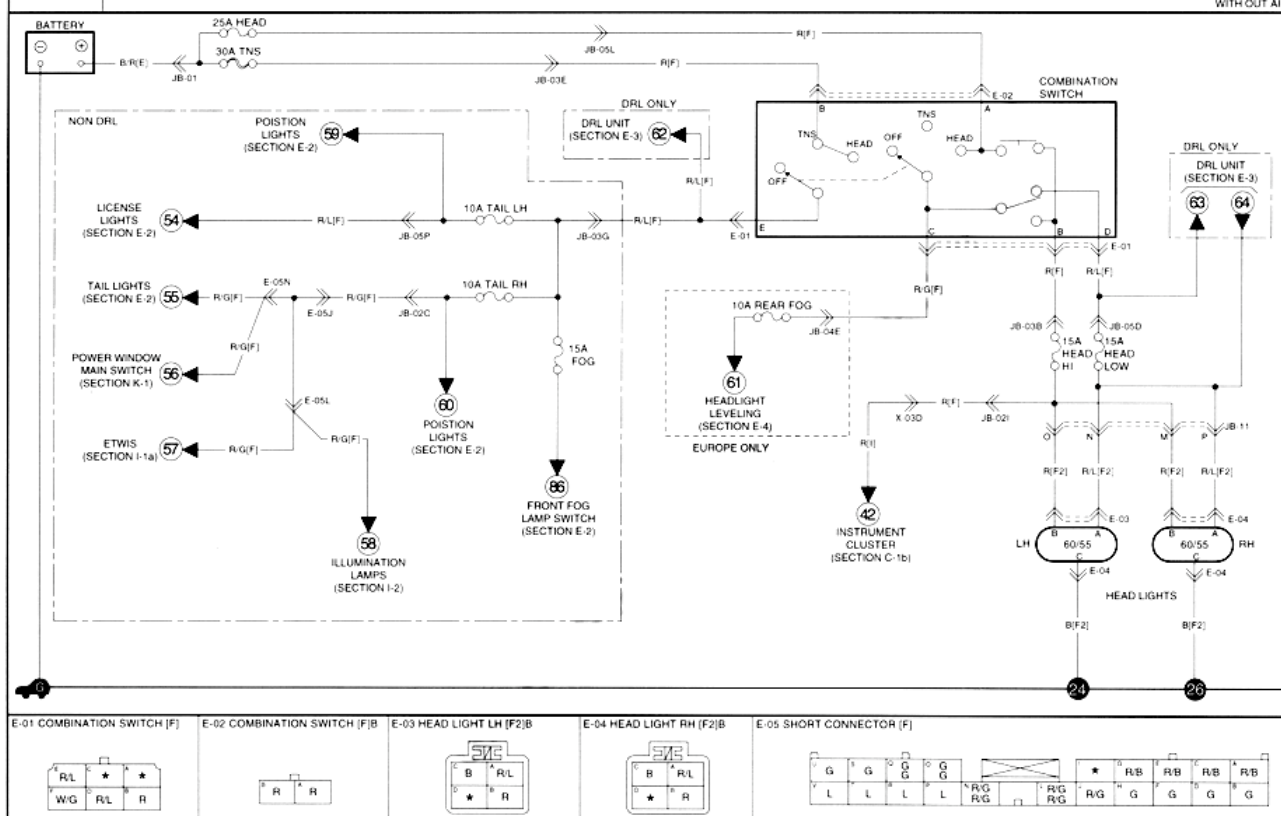


Body Electrical System

Lighting System - Head Lamps

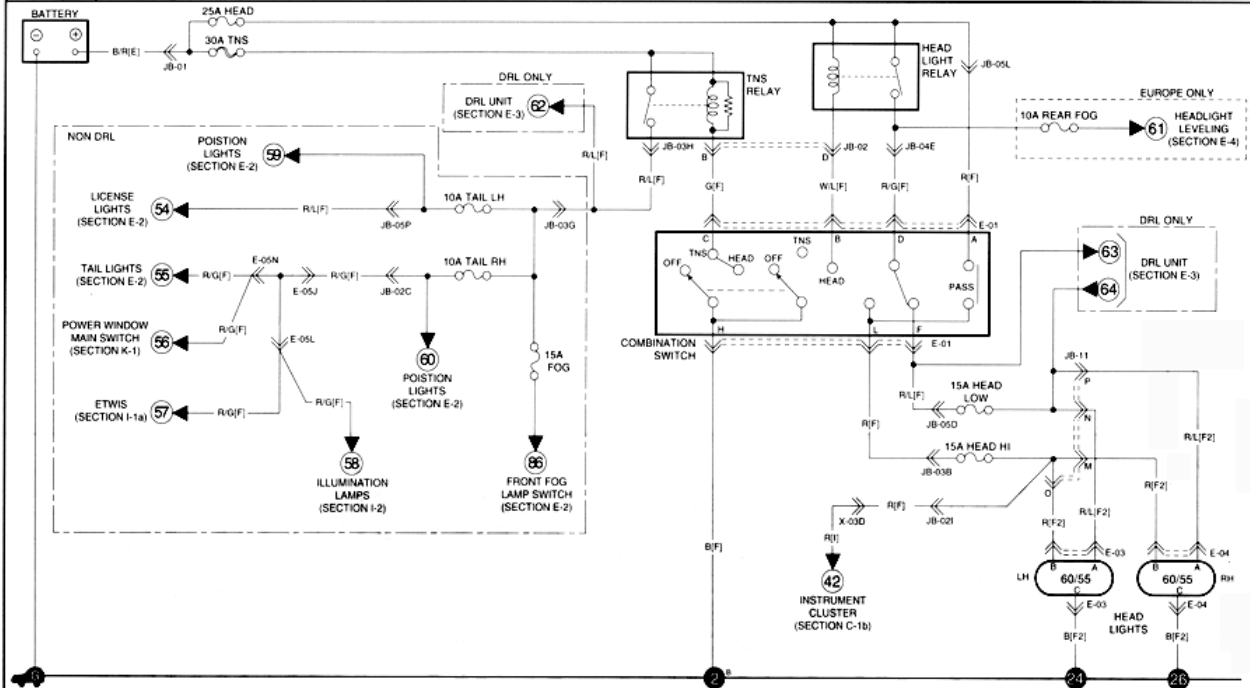
WITH OUT AIR

WITH OUT AIR



E-1b HEADLIGHTS

WITH AIRBAG



E-01 COMBINATION SWITCH [F]

LGB	P	E	C	G	A	R
R	LG/R	B	R/L	R/G	B	W/L

E-03 HEAD LIGHT LH [F2]B

B	R/L
*	R

E-04 HEAD LIGHT RH [F2]B

B	R/L
*	R

E-05 SHORT CONNECTOR [F]

G	G	G	G	R/B	R/B	R/B	R/B	R/B
L	L	L	L	R/G	R/G	G	G	G



Circuit operation

Headlights (with airbag)

Battery voltage is applied to the light switch through "HEAD" fuse, R wire and HEADLIGHT relay. In the "HEAD" position of the light switch and the "HL" position of the dimmer switch, The relay routes GND through the light switch terminal B(W/L) of E-01 through headlight switch and B wire and is energized. Battery voltage also is applied to the LO beam filaments of the right and left headlight through the light switch, "HEAD LOW" fuse and R/L wire. The headlight LO beams illuminate.

With the dimmer switch in the "HU" position, Battery voltage also is applied to the beam indicator and the HI beam filaments of the right and left headlight through the light switch, "HEAD (HI)" fuse and R wire. The headlight HI beams and HI beam indicators illuminate. When the flash-to-pass switch is activated, battery voltage is applied to the beam indicators and the HI beam filaments of the right and left headlight through the "HEAD" fuse, R wire, flash-to-pass switch, R wire and "HEAD HI" fuse. The headlight HI beams and HI beam indicators illuminate. The beam indicators illuminate when the dimmer switch is in "HIGH" position or the flash-to-pass switch is activated.

Headlights (Without airbag)

Battery voltage is applied to the light switch through "HEAD" fuse, and R wire. In the "HAED" position of the light switch and the "HL" position of the dimmer switch, Battery voltage also is applied to the LO beam filaments of the right and left headlight through the light switch, "HEAD LOW" fuse and R/L wire. The headlight LO beams illuminate.

With the dimmer switch in the "HU" position, Battery voltage also is applied to the beam indicator and the HI beam filaments of the right and left headlight through the light switch, "HEAD HI" fuse and R wire. The headlight HI beams and HI beam indicators illuminate.

When the flash-to-pass switch is activated, battery voltage is applied to the HI beam indicators and the HI beam filaments of the right and left headlight through the "HEAD" fuse, R wire, flash-to-pass switch, R wire and "HEAD HI" fuse. The headlight HI beams and HI beam indicators illuminate. The HI beam indicators illuminate when the dimmer switch is in "HIGH" position or the flash-to-pass switch is activated.



Troubleshooting

Headlights (With airbag)

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If headlight bulb is damaged, check connection of the bulb and replace bulb. Also, check "HEAD(25A)", "HEAD LOW(15A)" and "HEAD HI(15A)" fuse and HEADLIGHT relay. If open, check for short and overload, replace fuses or relay and check that all system electrical connectors mated correctly.

Low beam headlights do not operate.

Step	Inspection		Action
1	Connect test light between headlight switch terminal B(W/L) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "W/L" to headlight switch or replace.
2	Connect test light between headlight switch terminal B(W/L) of E-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair or replace headlight switch.
3	Ground headlight switch terminal B(W/L) of E-01. Connect test light between headlight switch terminal D(R/G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.
4	Turn headlight switch to "HEAD" position. Connect test light between headlight switch terminal D(R/G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair or replace headlight switch.
5	Make sure the dimmer switch is in "HL" position. Connect test light between headlight switch terminal F(R/L) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair or replace headlight switch.
6	Connect test light between headlights terminal A(R/L) of E-03(LH) or/and E-04(RH) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open or short in the wire "R/L" or replace.
7	Connect test light between headlights terminal A (R/L) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH) Is test light ON?	Yes	Check for a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check for a poor connection at wiper & washer switch assembly. If OK, replace open in the wire "B" or replace.

High beam headlights do not operate.

Step	Inspection		Action
1	Connect test light between headlight switch terminal B(W/L) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "W/L" to headlight switch or replace.
2	Connect test light between headlight switch terminal B(W/L) of E-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open in the wire "B" or replace.
3	Ground headlight switch terminal B(W/L) of E-01. Connect test light between headlight switch terminal D(R/G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.

4	Turn headlight switch to "HEAD" position. Connect test light between headlight switch terminal D(R/G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair or replace headlight switch.
5	Make sure the dimmer switch is in "HU" position. Connect test light between headlight switch terminal L(R) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair or replace headlight switch.
6	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open or short circuits in the wire "R" or replace.
7	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH) Is test light ON?	Yes	Check for a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check for a poor connection at wiper & washer switch assembly. If OK, repair open in the wire "B" or replace.

High beam headlights do not operate by flash-to-pass switch

Step	Inspection		Action
1	Connect test light between headlight switch terminal A(R) of E-01 and ground. Is test light OK?	Tes	Go to next step
		No	Repair open or short in the wire "R" to headlight switch or replace.
2	With pulled the flash-to-pass switch toward driver, connect test light between headlight switch terminal L(R) of E-01 and ground. Is test light OK?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair headlight switch.
3	Connect jumper wire between headlight switch terminal A(R) and L(R) of E-01, connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and ground. Is test light OK?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open or short in the wire "R" or replace.
4	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH). Is test light OK?	Yes	Check a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.

Headlights (Without airbag)

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. if headlight bulb is damaged, check connection of the bulb and replace bulb. Also, check "HEAD(25A)", "HEAD LOW(15A)" and "HEAD HI(15A)" fuse. If open, check for short and overload, replace fuses and check that all system electrical connectors mated correctly.

Low beam headlights do not operate

Step	Inspection		Action
1	Connect test light between headlight switch terminal A(R) of E-02 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R" to headlight switch or replace.
2	Turn headlight switch to "HEAD" position. Make sure the dimmer switch is in "HL" position. Connect test light between headlight switch terminal D(R/L) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair headlight switch.
3	Connect test light between headlights terminal	Yes	Go to next step

	A(R/L) of E-03(LH) or/and E-04(RH) and ground. Is test light ON?	No	Check for a poor connection at headlight switch. If OK, repair open or short in the wire "R/L" or replace.
4	Connect test light between headlights terminal A(R/L) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH). Is test light ON?	Yes	Check a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.

High beam headlights do not operate.

Step	Inspection		Action
1	Connect test light between headlight switch terminal A(R) of E-02 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R" to headlight switch or replace.
2	Turn headlight switch to "HEAD" position. Make sure the dimmer switch is in "HU" position. Connect test light between headlight switch terminal B(R) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair headlight switch.
3	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open or short in the wire "R" or replace.
4	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH). Is test light ON?	Yes	Check a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.

High beam headlights do not operate by flash-to-pass switch

Step	Inspection		Action
1	Connect test light between headlight switch terminal A(R) of E-02 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R" to headlight switch or replace.
2	With pulled the flash-to pass switch toward driver, connect test light between headlight switch terminal B(R) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair headlight switch.
3	Connect Jumper wire between headlight switch terminal A(R) and L(R) of E-01. Connect test light between headlights switch terminal B(R) of E-03(LH) or/and E-04 (RH) and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at headlight switch. If OK, repair open or short in the wire "R" or replace.
4	Connect test light between headlights terminal B(R) of E-03(LH) or/and E-04(RH) and terminal C(B) of E-03(LH) or/and E-04(RH). Is test light ON?	Yes	Check a poor connection at headlights. If OK, replace the headlight bulbs.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.

Combination switch (Headlight switch) (With airbag)

1. Disconnect the headlight switch.
2. Check for continuity between terminal as indicated.

Terminal		A	B	C	D	F	H	L
DIMM	HL				O — O			
	HU				O — O			O
PARK				O — O	O — O		O	
HEAD			O — O	O — O			O	
FLASH-TO-PASS		O — O						O

O — O: indicates continuity

3. If not as specified, replace the headlight switch assembly.

Combination switch (Headlight switch) (Without airbag)

1. Disconnect the headlight switch.
2. Check for continuity between terminal as indicated.

Item \ Terminal		E-01				E-02	
		B	C	D	E	A	B
DIMM	HL		O — O				
	HU	O — O					
PARK					O — O		O
HEAD			O — O		O — O	O — O	O
FLASH-TO-PASS		O — O			O — O		

O — O: indicates continuity

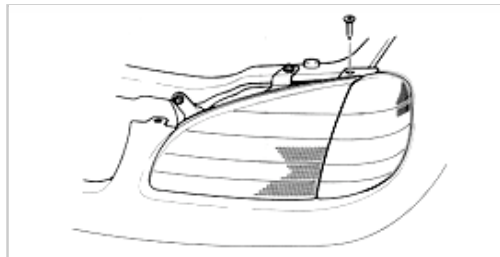
3. If not as specified, replace the headlight switch assembly.



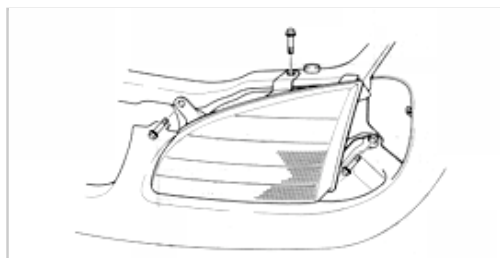
Removal

Headlight/turn signal light assembly

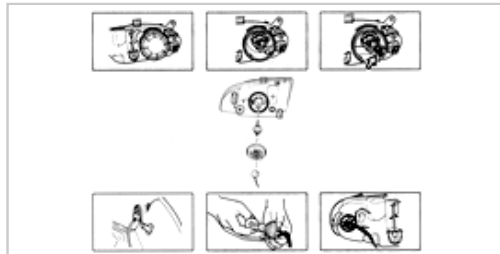
1. Open hood. Disconnect negative battery cable.
2. Remove one screw attaching turn signal light assembly to vehicle.
3. Pull turn signal light assembly forward clear of vehicle.



4. Remove two bolts attaching headlight assembly to vehicle.
5. Pull turn signal light assembly forward clear of vehicle.



6. Rotate back cover counterclockwise to disengage from light assembly.
7. Pull socket with bulb straight out of headlight and combination light assembly.



Installation

Headlight/turn signal light assembly

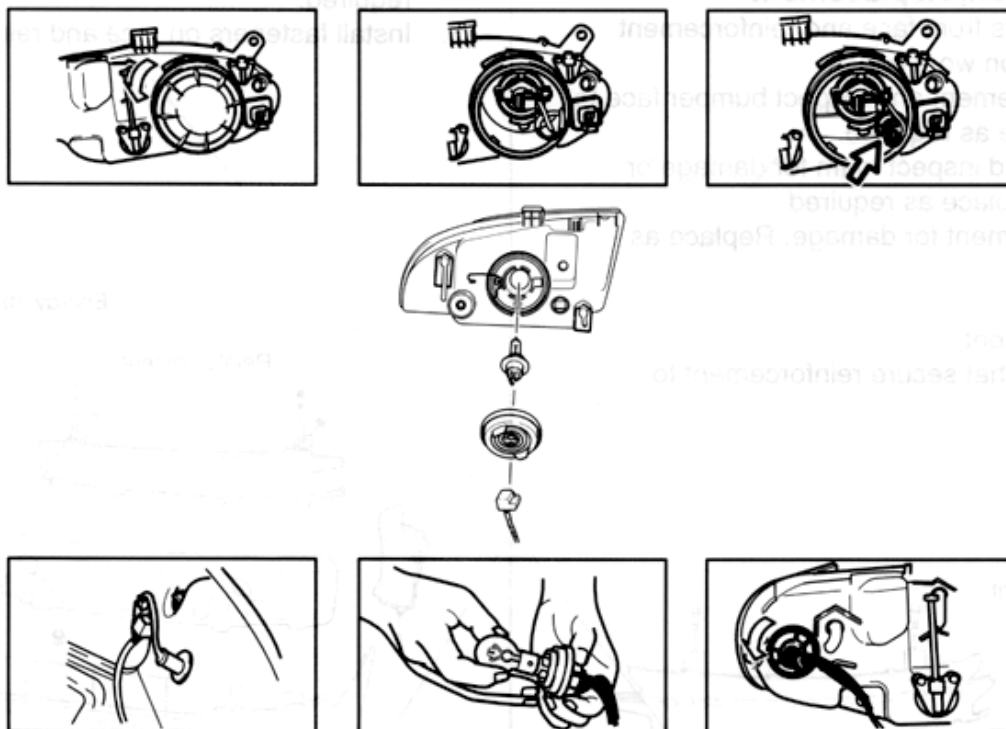
1. With bulb installed in socket, align grooves of socket with bosses on headlight and combination light assembly and insert socket into headlight and combination light assembly.
2. Align back cover with headlight and combination light assembly and install, turning clockwise until properly engaged.
3. Position headlight and combination light assembly on vehicle and install two bolts.

Tightening torque : 61~86 lb-in (7~10 N-m, 70~100 kg-cm)

4. Connect electrical connector to headlight and combination light assembly.
5. Connect negative battery cable.

Replacement

Headlight and position light bulb



1. Disconnect negative battery cable.
2. Remove electrical connector from headlight and combination light assembly.
3. Remove back cover by pushing in on cover, then rotating cover counterclockwise to disengage from headlight and combination light assembly.

CAUTION

The headlight bulb is filled with a gas which is under pressure. Damage to glass part of bulb can cause bulb to explode causing possible personal injury.

NOTICE

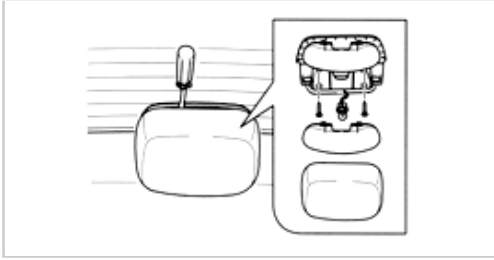
Use care when handling halogen headlight bulb. Do not touch glass part of bulb with bare hands. Oil from skin can cause bulb to fail.

4. Pull socket with bulb straight back and remove it from headlight and combination light assembly.
5. If bulb has failed, place it in new bulb carton and dispose of properly.
6. Hold replacement bulb by base, or use clean cloth or paper to avoid touching glass, and install bulb in socket.
7. Align slots on bulb and corresponding bosses on headlight assembly. Insert bulb into headlight and combination assembly.
8. Install back cover to hold bulb in place.
9. Connect electrical connector.
10. Connect negative battery cable.

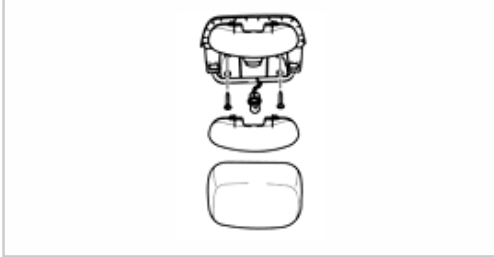
High-mounted brake light assembly bulb

1. Disconnect negative battery cable.
2. Remove cover.

3. Remove two screws from light assembly.



4. Remove bulb from socket.



5. Install replacement bulb in socket.

6. Install cover.

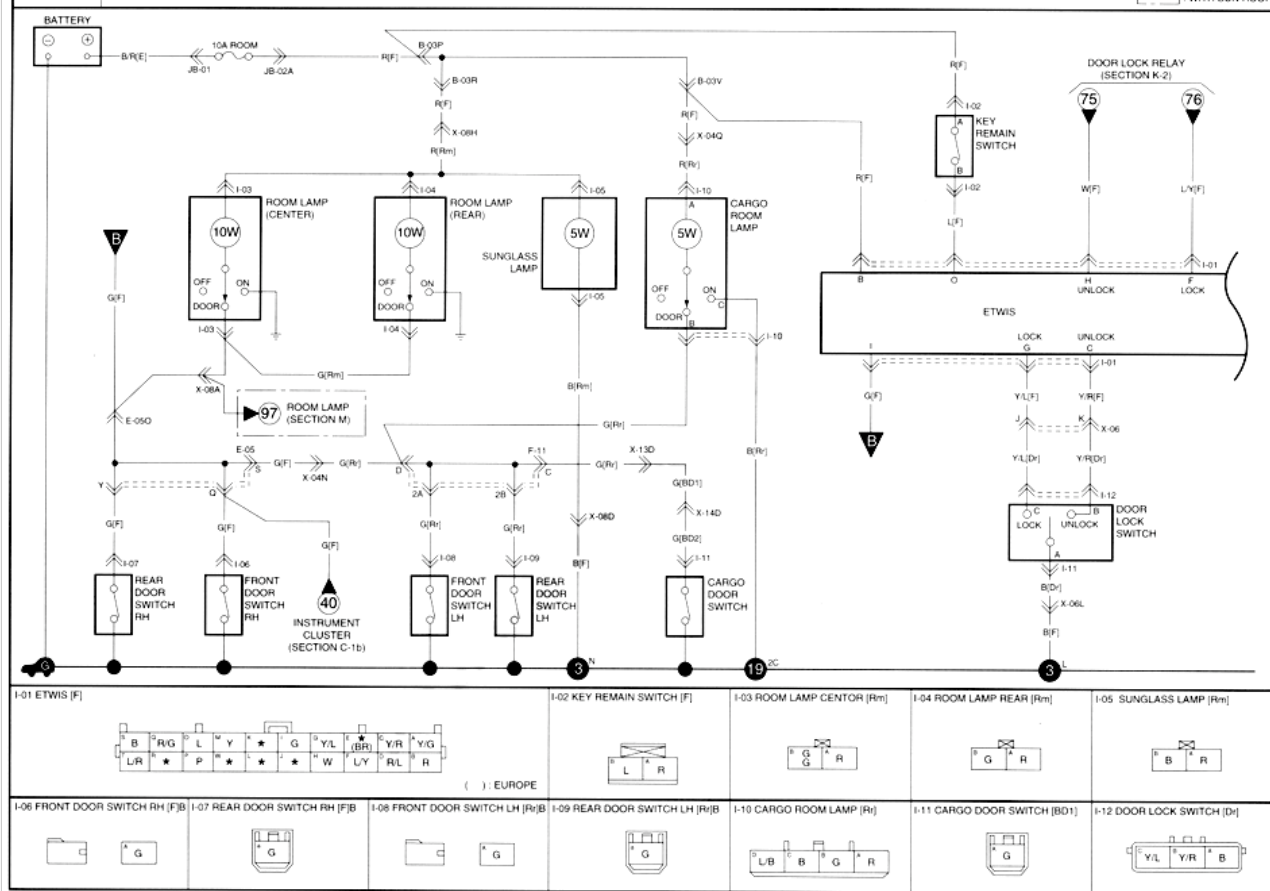
7. Connect negative battery cable.



Body Electrical System

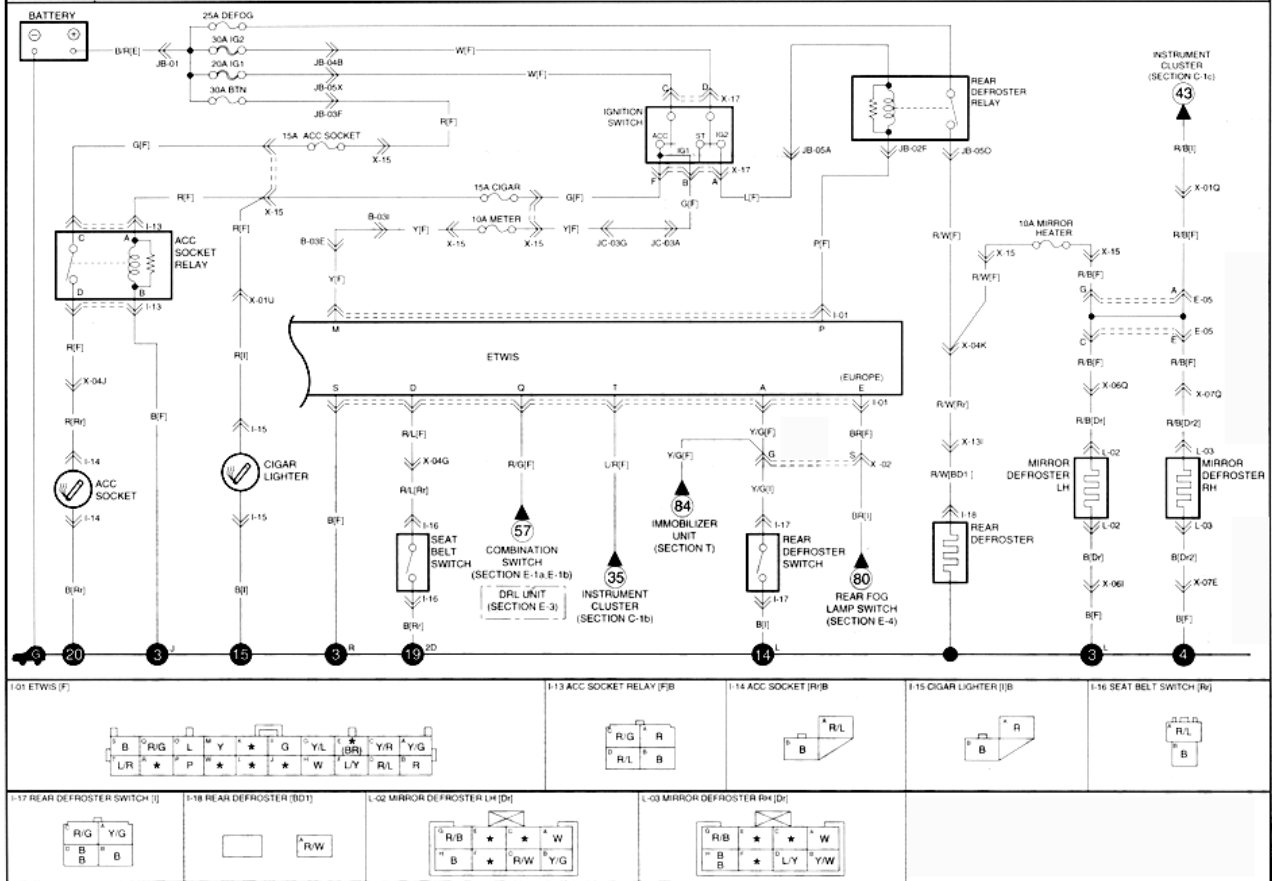
Lighting System - Room Lamp

☐ : WITH SUN ROOF



I-1b

ETWIS, REAR DEFROSTER, CIGAR LIGHTER, ACC SOCKER





Circuit operation

Front, rear room lamp and cargo room lamp

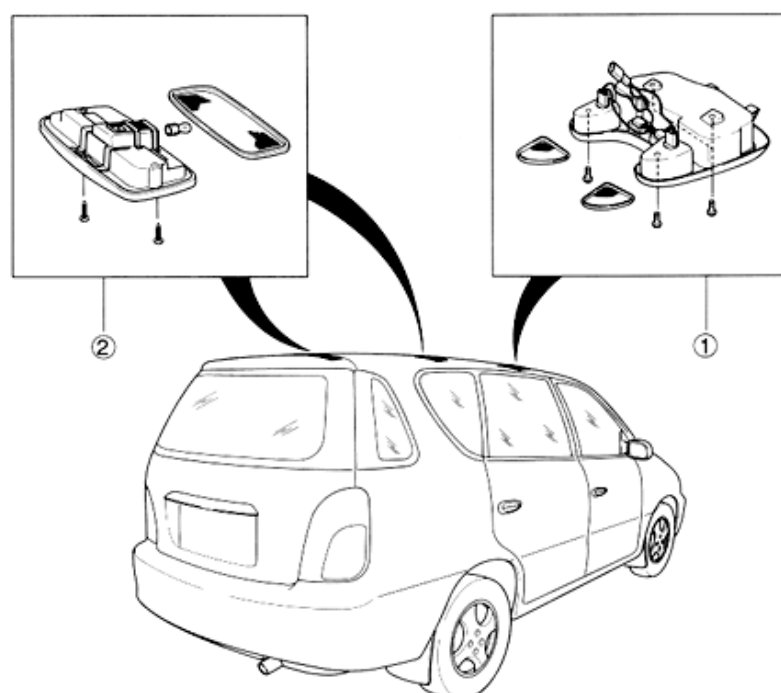
Battery voltage is always applied to the room lamps through the "ROOM (10A)" fuse and R wire. In case that each room lamp switches is in DOOR position, when one or more door is opened the lamps will illuminate. The room lamps illuminate independently and respectively by turning lamp switch.

Sunglasses lamp

Battery voltage is applied from "ROOM (10A)" fuse to sunglasses lamp through the R wire. The other side of sunglasses lamp is grounded permanently.



Component



- (1) Room light
- (2) Front room light / Corgo room light

Interior light provides light for entering exiting of passenger compartment (doors open). It can also be used to provide light when doors are closed. It is positioned at center of headliner, it is both serviceable and replaceable.



Troubleshooting

Room lamps do not operate in ON position.

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "ROOM (10A)" fuse. If open, check for short to ground through the wire, replace fuse and check that all system electrical connectors mated correctly. With all doors closed, perform this procedure.

Step	Inspection		Action																
1	Check for voltage at following terminals. Is battery voltage present respectively?	Tes	Check for room lamp.																
		No	Repair open or short in the wire "R" or replace.																
	<table border="1"> <thead> <tr> <th>Item</th><th>connector</th><th>terminal</th><th>Value</th></tr> </thead> <tbody> <tr> <td>Front room lamp</td><td>I-03</td><td>A</td><td>12V</td></tr> <tr> <td>Rear room lamp</td><td>I-04</td><td>A</td><td>12V</td></tr> <tr> <td>Cargo room lamp</td><td>I-10</td><td>A</td><td>12V</td></tr> </tbody> </table>	Item	connector	terminal	Value	Front room lamp	I-03	A	12V	Rear room lamp	I-04	A	12V	Cargo room lamp	I-10	A	12V		
Item	connector	terminal	Value																
Front room lamp	I-03	A	12V																
Rear room lamp	I-04	A	12V																
Cargo room lamp	I-10	A	12V																

Room lamps do not operate in DOOR position.

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "ROOM (10A)" fuse. If open, check for short to ground through the wire, replace fuse and check that all system electrical connectors mated correctly. With all doors closed, perform this procedure.

Step	Inspection		Action
1	Connect for voltage at following terminals. Is battery voltage present respectively?	Tes	Go to next step
		No	Repair open or short in R wire or replace as necessary.
2	Check for continuity between following terminal and ground by opening the relevant door. Is continuity present	Yes	Go to next step
		No	Check for a poor connection at door switch. If OK, repair or replace damaged door switch.
3	Check for continuity between following terminal and ground by opening doors one after another. Is continuity present?	Yes	Check for a poor connection at room lamp. If OK, repair or replace damaged room lamp.

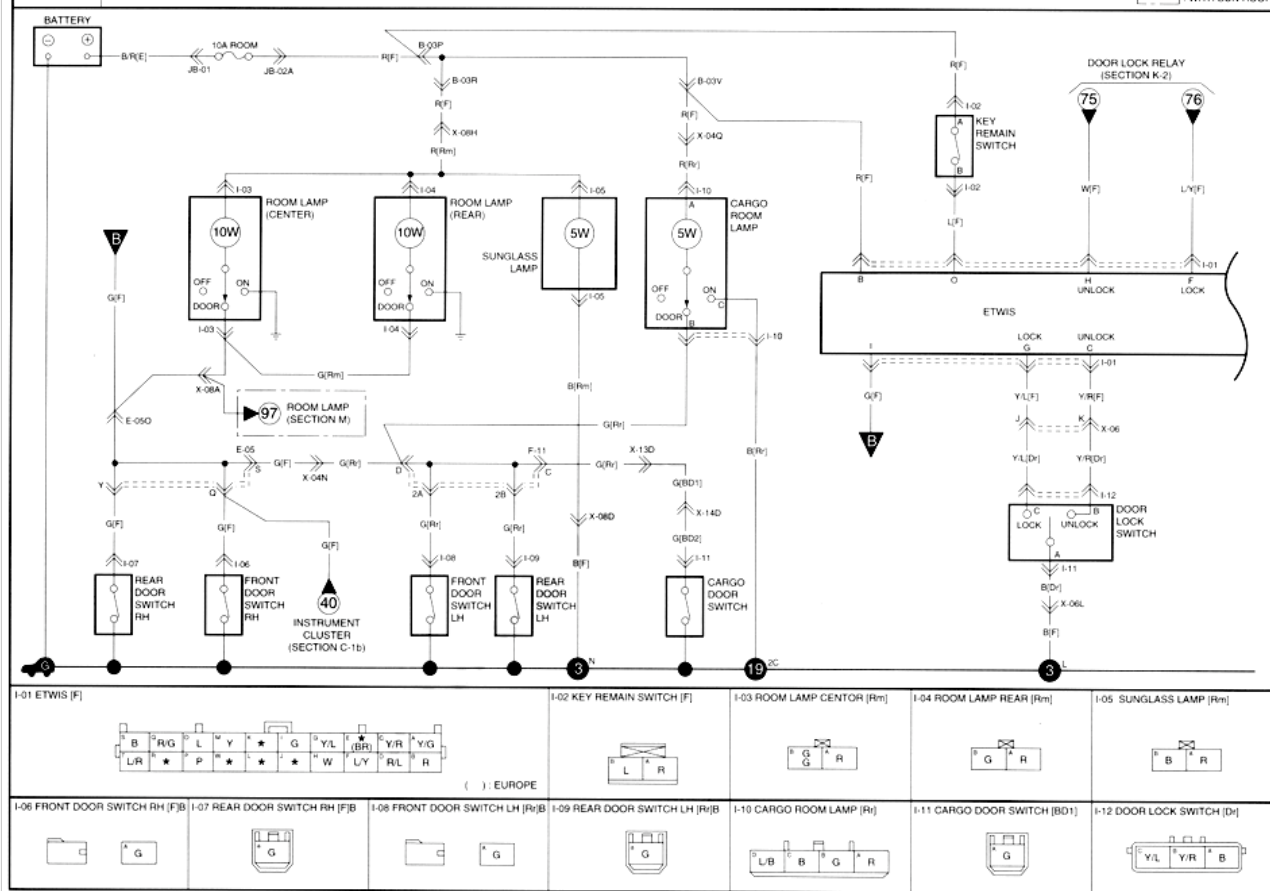
	<table> <tr> <th>Item</th><th>Connector</th><th>Terminal</th><th>Value</th></tr> <tr> <td>Front room lamp</td><td>I-03</td><td>B (G)</td><td>0 Ω</td></tr> <tr> <td>Rear room lamp</td><td>I-04</td><td>B (G)</td><td>0 Ω</td></tr> <tr> <td>Cargo room lamp</td><td>I-10</td><td>B (G)</td><td>0 Ω</td></tr> </table>	Item	Connector	Terminal	Value	Front room lamp	I-03	B (G)	0 Ω	Rear room lamp	I-04	B (G)	0 Ω	Cargo room lamp	I-10	B (G)	0 Ω	No	Repair open or short in the wire "G" or replace.
Item	Connector	Terminal	Value																
Front room lamp	I-03	B (G)	0 Ω																
Rear room lamp	I-04	B (G)	0 Ω																
Cargo room lamp	I-10	B (G)	0 Ω																



Body Electrical System

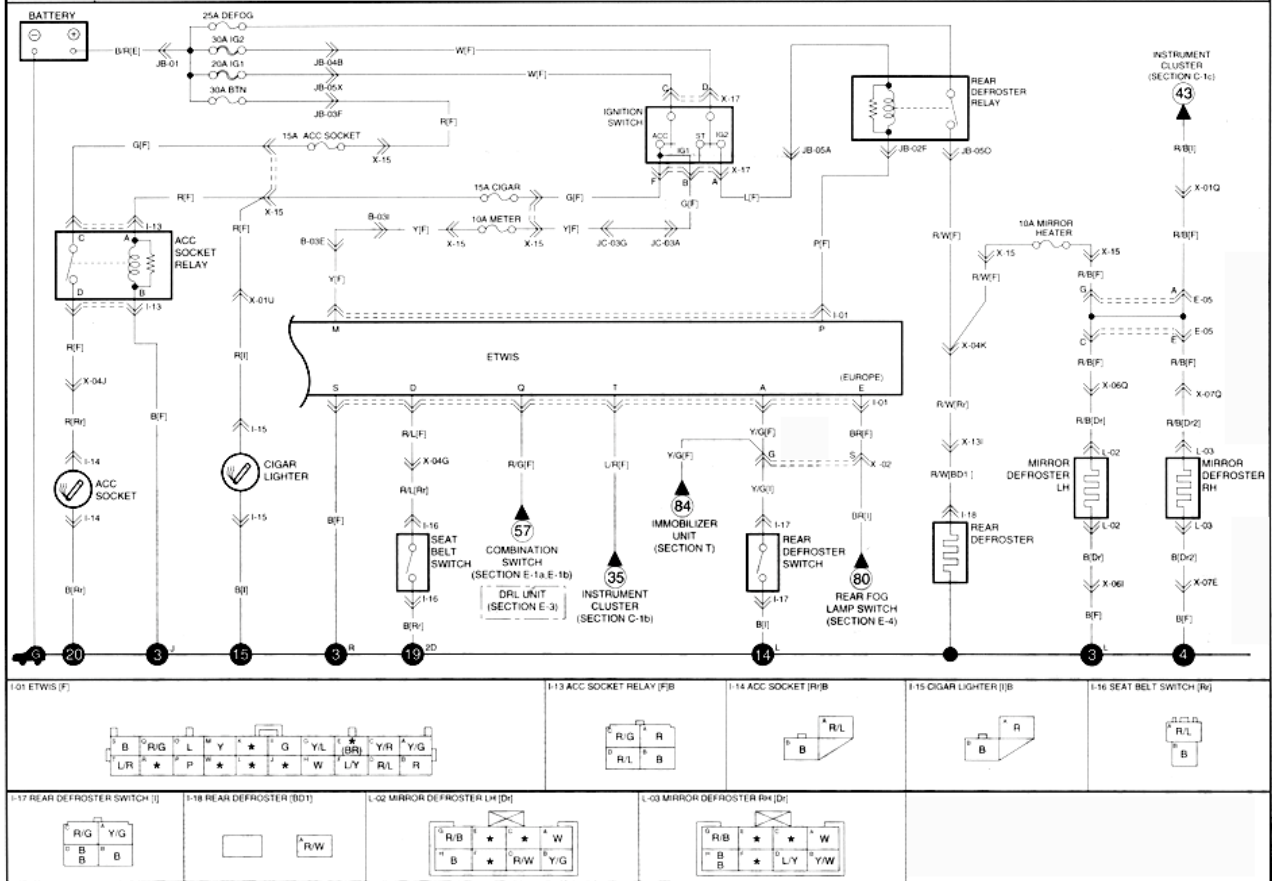
Lighting System - Door Courtesy Lamp

☐ : WITH SUN ROOF



I-1b

ETWIS, REAR DEFROSTER, CIGAR LIGHTER, ACC SOCKER





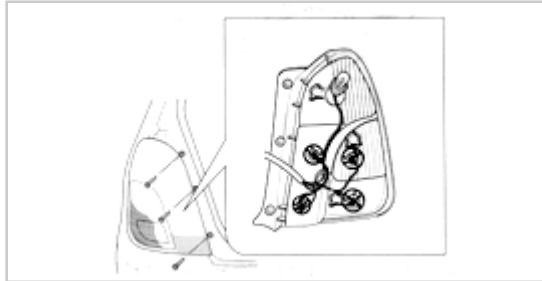
Body Electrical System

Lighting System - Combination Lamp



Removal

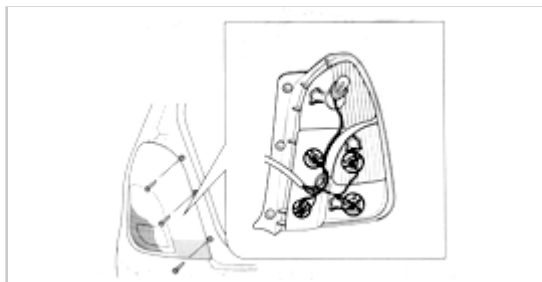
1. Disconnect negative battery cable.
2. Remove three screws attaching rear combination light assembly to vehicle.
3. Disconnect electrical connector.



4. From outside of vehicle, grasp combination light assembly push combination light assembly outside and pull from vehicle using care not to damage gasket.

Installation

1. Install gasket on light assembly with pins through appropriate holes of gasket.
2. Position light assembly on vehicle with studs through mounting holes on vehicle.

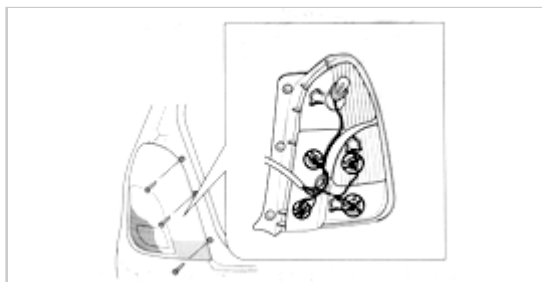


3. Install three screws on rear combination light.
4. Connect electrical connector.
5. Connect negative battery cable.

Replacement

Rear combination light assembly bulb

1. Disconnect negative battery cable.
2. Disconnect electrical connector from light assembly.
3. From outside of vehicle, grasp combination light assembly, push combination light assembly outside and pull from vehicle using care not to damage gasket and combination light assembly.



4. With bulb holder disengaged, pull bulb holder carefully forward relative to vehicle, and remove from light assembly.

5. Remove bulb as required from bulb holder.
6. Install new bulb of proper type, as shown on bulb holder.
7. Position bulb holder on light assembly and press to engage with light assembly.
8. Install two mounting screws and one nut.
9. Connect negative battery cable.

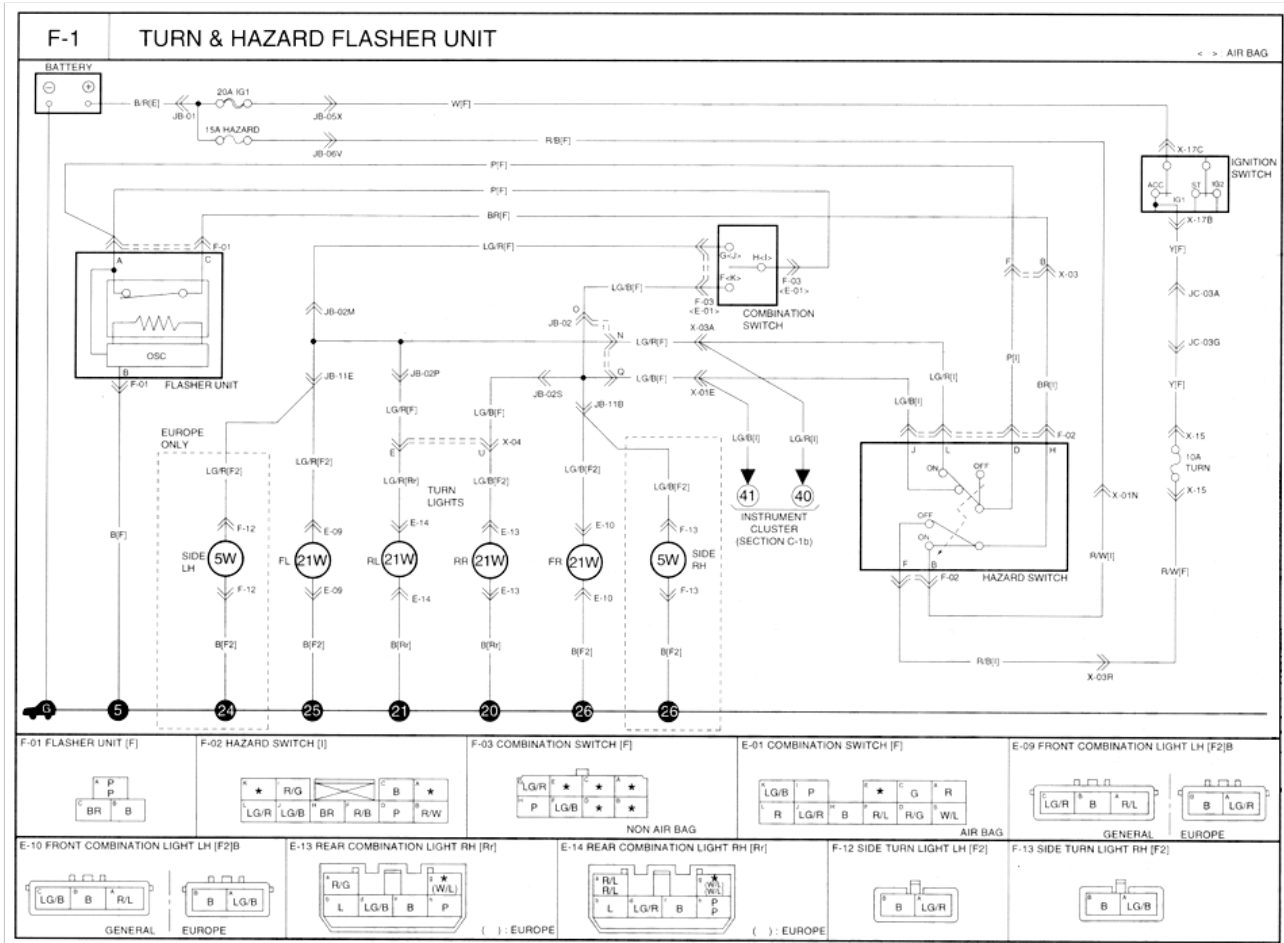


Body Electrical System

Lighting System - Hazard Lamp Switch



Turn and hazard flasher unit





Circuit operation

Turn lights

With the ignition switch in "ON" or "START", battery voltage is applied from "TURN(10A)" fuse to the flasher unit through the hazard switch (Hazard switch is OFF). When the turn signal switch is turned to "LH" or "RH" position, the flasher unit alternately opens and closes a solid state switch, which send pulses of battery voltage to the "LH" or "RH" turn lights, side lights and indicator through turn switch. The appropriate lights and indicator flash.

Harzard lights

Battery voltage is always applied from "HAZARD" fuse to the flasher unit through the R/W wire. The flasher unit is grounded through B wire permanently. When the hazard switch is pressed battery voltage is applied to the flasher unit through the hazard switch. The flasher until alternately opens and closes to a soild state switch which sends pulses of battery voltage is applied to the turn lights, side lights and indicators through the hazard switch. The lights and both indicators flash "ON" and "OFF" until the hazard switch open.



Troubleshooting

Turn signal lights do not operate.

Preliminary check :

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "TURN (10A)" fuse. If open, check for short to ground through the R/B wire, replace fuse and check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Turn the ignition switch to "ON" position and disconnect the hazard switch. Check for voltage at terminal F(R/B) of hazard switch harness connector F-02. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "R/B" or replace.
2	Connect the hazard switch, which is OFF. Check for voltage at terminal H(BR) of the hazard switch connector F-02. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at hazard switch. If OK, replace the hazard switch.
3	Check for voltage at terminal C(BR) of flasher unit connector F-01. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "BR" or replace.
4	Check for voltage between terminal C(BR) and terminal B(B) or the flasher unit connector F-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at the flasher unit. If OK, repair open in the wire "B" to the flasher unit or replace.
5	Check for voltage at terminal A(P) of flasher unit connector F-01. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a poor connection at the flasher unit connector. If OK, replace the flasher unit.
6	Check for voltage at terminal H(P) of combination switch connector F-03. Is battery voltage present periodically?	Yes	Go to next step
		No	Repair open or short in the wire "P" or replace.
7	Turn the turn switch to LH position. Check for voltage at terminal G(LG/R) of combination switch connector F-03. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a poor connection at combination switch connector. If OK, inspect combination switch.
8	Turn the turn signal switch to RH position. Check for voltage at terminal F(LG/R) of combination switch connector F-03. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a poor connection at combination connector. If OK, inspect combination switch.
9	Turn the turn signal switch to LH position. Check for voltage at each below terminal of LH turn lights. Is battery voltage present periodically? -LH front turn : C(LG/R) of E-09 -LH side : A(LG/R) of F-12, -LH rear turn : D(LG/R) of E-14.	Yes	Go to next step
		No	Repair open or short in the wire "LG/R" or replace.

10	Check for continuity between following each terminal of -LH lights and ground. Is continuity present? -LH front turn : B(B) of E-09 -LH side :B(B) of F-12, -LH rear turn : F(B) of E-14,	Yes	Check for a poor connection at the lights. If OK, replace damaged lights.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
11	Turn the turn signal switch to RH position. Perform diagnosis of RH side in the same way from step 9 to step 10.		

Hazard function hazard does not operate.

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "HAZARD(15A)" fuse. If open, check for short to ground through the wire, replace fuse and check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Disconnect the hazard switch connector. Check for voltage at terminal B(R/B) of hazard switch harness connector F-02. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "R/B" or replace.
2	Connect the hazard switch connector and switch the hazard to ON position. Check for voltage at terminal H(BR) of the hazard switch connector F-02. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at hazard switch. If OK, replace the hazard switch.
3	Check for voltage at terminal C(BR) of flasher unit connector F-01. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "BR" or replace.
4	Check for voltage between terminal C(BR) and terminal B(B) or the flasher unit connector F-01. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at the flasher unit. If OK, repair open in the wire "B" to the flasher unit or replace.
5	Check for voltage at terminal A(P) of flasher unit connector F-01. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a poor connection at the flasher unit connector. If OK, replace the flasher unit.
6	Check for voltage at terminal D(P) of hazard switch connector F-02. Is battery voltage present periodically?	Yes	Go to next step
		No	Repair open or short in the wire "P" or replace.
7	Check for voltage at terminal L(LG/R) of hazard switch connector F-03. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a poor connection at hazard switch. If OK, inspect hazard switch.
8	Check for voltage at terminal J(LG/B) of hazard switch connector F-03. Is battery voltage present periodically?	Yes	Go to next step
		No	Check for a .for a poor connection at hazard switch connector. If OK, inspect hazard switch.

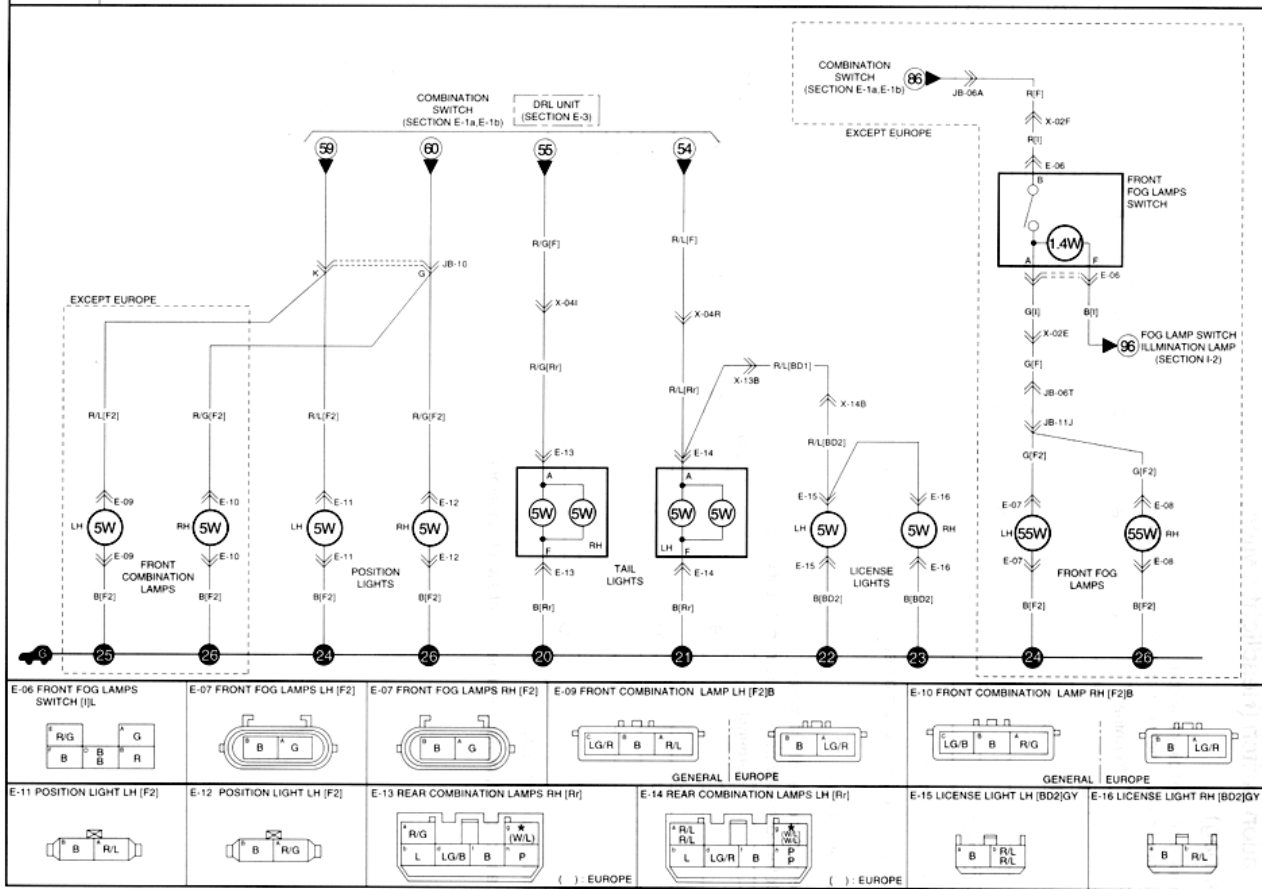
9	Check for voltage at each terminal of the following lights. Is battery voltage present periodically? -LH front turn : C(LG/R) of E-09 -LH side : A(LG/R) of F-12 -LH rear turn : D(LG/R) of E-14 -RH front turn : C(LG/B) of E-10 -RH side : A(LG/B) of F-13 -RH rear turn : D(LG/B) of E-13	Yes	Go to next step
		No	Repair open or short in the wire "LG/R" or/and "LG/B" or replace.
10	Check for continuity between each terminal of the following lights and ground. Is continuity present? -LH front turn : B(B) of E-09 -LH side : B(B) of F-12 -LH rear turn : F(B) of E-14 -RH front turn : B(B) of E-10 -RH side : B(B) of F-13 -RH rear turn : F(B) of E-13	Yes	Check for a poor connection at the lights. If OK, replace damaged lights.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



Body Electrical System

Lighting System - Front Fog Lamps

POSITION LIGHTS, TAIL LIGHTS, LICENSE LIGHTS, FRONT FOG LAMPS





Circuit operation

Front fog lamps (With airbag)

With the light switch in "PARK" or "HEAD" position, one side of "TNS" relay coil is grounded through the light switch, energizing the relay (the other side of the coil is powered through "TNS(30A)" fuse).

When energized, the normally open contacts of the front fog lamp switch through the "FOG(15A)" fuse, and G wire. The front lamps illuminate when front fog lamp switch is pressed.

Front fog lamps (Without airbag)

With the light switch in "PARK" or "HEAD" position, battery voltage to be applied to the front fog lamp switch through the "FOG(15A)" fuse, and G wire. The front lamps and fog switch illumination lamp illuminate when front fog lamp switch is pressed.



Front fog lights (With airbag)

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "FOG(15A)" fuse and TNS relay. If open, check for short to ground through the R wire and overload, replace fuse or relay and check that all system electrical connectors mated correctly.

Front fog lights do not operate.

Step	Inspection		Action
1	Connect test light between the combination switch terminal C(G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "G" to combination switch or replace.
2	Connect test light between the combination switch terminal C(G) of E-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect combination switch connector. Check for continuity between terminals of combination switch by turning the switch. Is combination switch normal?	Yes	Go to next step
		No	Replace combination switch assembly.
4	Connect combination switch connector and turn the combination switch to "PARK" position. Connect test light between terminal B(R) of front fog lamp switch E-06 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R" or replace.
5	Turn the combination switch to "OFF" position and disconnect front fog lamp switch. Check for continuity between terminals of front fog lamp switch by pressing the switch. Is continuity present ON?	Yes	Go to next step
		No	Replace front fog lamp switch.
6	Connect front fog lamp switch and turn the combination switch to "PARK" position. Connect test light between terminal A(G) of LH front fog lamp E-07 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at front fog lamp switch. If OK, repair open or short in the wire "G" between front fog lamp switch and LH front fog lamp or replace.
7	Connect test light between terminal A(G) and terminal B(B) of LH front fog lamp E-07 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
8	Connect test light between terminal A(G) of RH front fog lamp E-08 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "G" between front fog lamp switch and LH front fog lamp or replace.
9	Connect test light between terminal A(G)	Yes	Go to next step

and terminal B(B) of RH front fog lamp E-08 and ground. Is test light ON?	No	Check for poor connection at ground. If OK, repair open in the wire "B" or replace.
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Body Electrical System

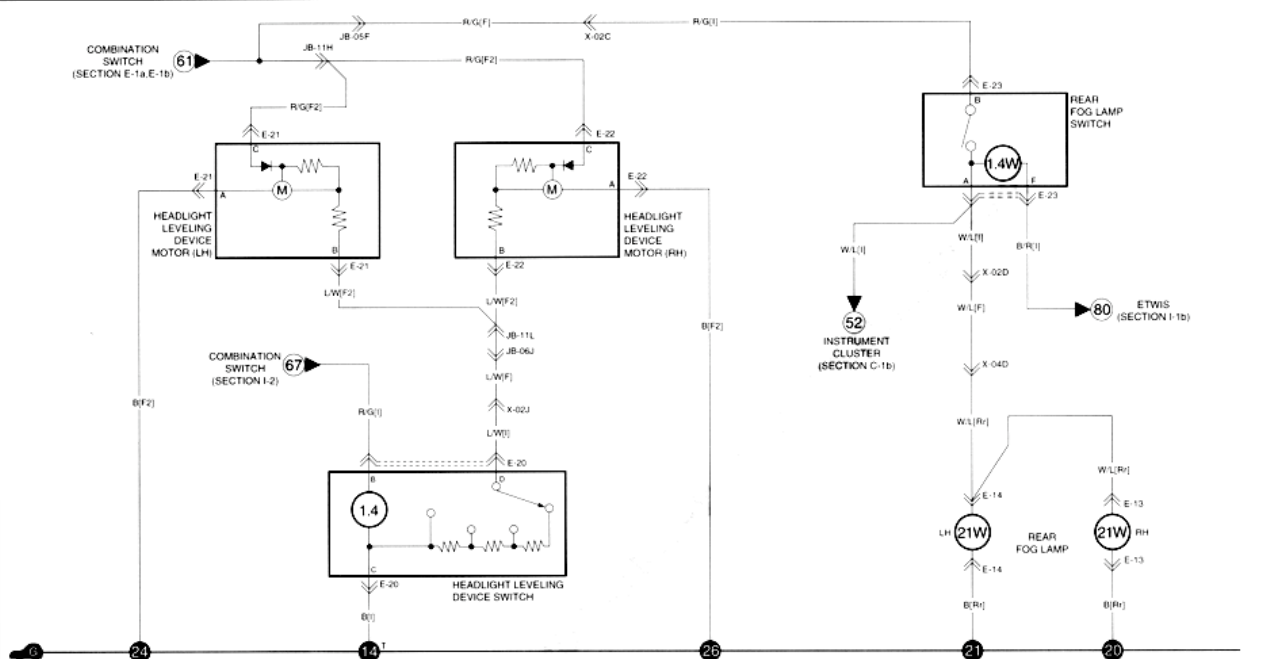
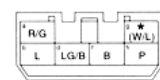
Lighting System - Rear Fog Lamps



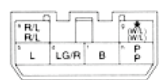
Headlights leveling device, rear fog lamps

E-4 HEADLIGHT LEVELING DEVICE(HLLD), REAR FOG LAMPS

EUROPE ONLY

E-13 REAR COMBINATION LAMPS RH (R_h)

() EUROPE

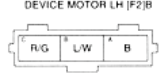
E-14 REAR COMBINATION LAMPS LH (R_h)

() EUROPE

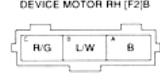
E-20 HEADLIGHT LEVELING DEVICE SWITCH (I)



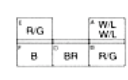
E-21 HEADLIGHT LEVELING DEVICE MOTOR LH (F2)B



E-22 HEADLIGHT LEVELING DEVICE MOTOR RH (F2)B



E-23 REAR FOG LAMPS SWITCH (I)





Circuit operation

Rear fog lights (With airbag)

In case that airbag system is equipped on vehicle, When the headlight switch is turned to "HEAD" position the one side coil of the HEADLIGHT relay is grounded through light switch (the other side is powered through "HEAD" fuse).

When the relay is energized, the normally open contacts of the HEADLIGHT relay close, allowing battery voltage to be applied to the one side of the rear fog lamp switch through "HEAD (25A)" fuse, HEADLIGHT relay, "RR FOG (10A)" fuse, and R/L wire.

With closed the rear fog lamp switch, battery voltage is applied to the RH and LH rear fog lamp through the switch and W/L wire. The lamps illuminate.

When the headlight switch is turned to the "OFF" position, ground is removed to one side if the HEADLIGHT relay coil, de-energizing the relay and turning off the rear fog lamps.

In case that airbag system is not equipped on vehicle, when the headlight switch is turned to "HEAD" position battery voltage is directly applied from the headlight switch to RH and LH rear fog lamp through "RR FOG(10A)" fuse and R/G wire.

Rear fog lights (Without airbag)

When the headlight switch is turned to "HEAD" position, battery voltage is directly applied from the headlight switch to RH and LH rear fog lamp through "RR FOG (10A)" fuse and R/G wire.



Troubleshooting

Rear fog lamps (With air-bag)

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check for "RR FOG(10A)" fuse and headlight relay. If open, check for short to ground through the R/G wire, overload. Replace the fuse and relay. Check that all system electrical connectors mated correctly.

Rear fog lamps do not operate.

Step	Inspection		Action
1	Connect test light between the combination switch terminal B(W/L) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "W/L" to combination switch or replace.
2	Connect test light between the combination switch terminal B(W/L) of E-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect combination switch connector. Check for continuity between terminals of combination switch by turning the switch. Is combination switch normal?	Yes	Go to next step
		No	Replace combination switch assembly.
4	Connect combination switch connector and turn the combination switch to "HEAD" position. Connect test light between terminal B(R/G) of rear fog lamp switch E-23 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.
5	Turn the combination switch to "OFF" position and disconnect rear fog lamp switch. Check for continuity between terminals of rear fog lamp switch by pressing the switch. Is continuity present ON?	Yes	Go to next step
		No	Replace rear fog lamp switch.
6	Connect rear fog lamp switch and turn the combination switch to "HEAD" position. Connect test light between terminal A(G) of LH rear fog lamp E-14 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at rear fog lamp switch. If OK, repair open or short in the wire "G" between rear fog lamp switch and LH rear fog lamp or replace.
7	Connect test light between terminal A(G) and terminal B(B) of LH rear fog lamp E-14 and ground. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
8	Connect test light between terminal A(G) or RH rear fog lamp E-13 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "G" between rear fog lamp switch and LH rear fog lamp or replace.

9	Connect test light between terminal A(G) and Terminal B(B) of RH rear fog lamp E-13 and ground. Is test light ON?	Yes	Check for a poor connection at the rear fog lamp. If OK, replace the rear fog lamp.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



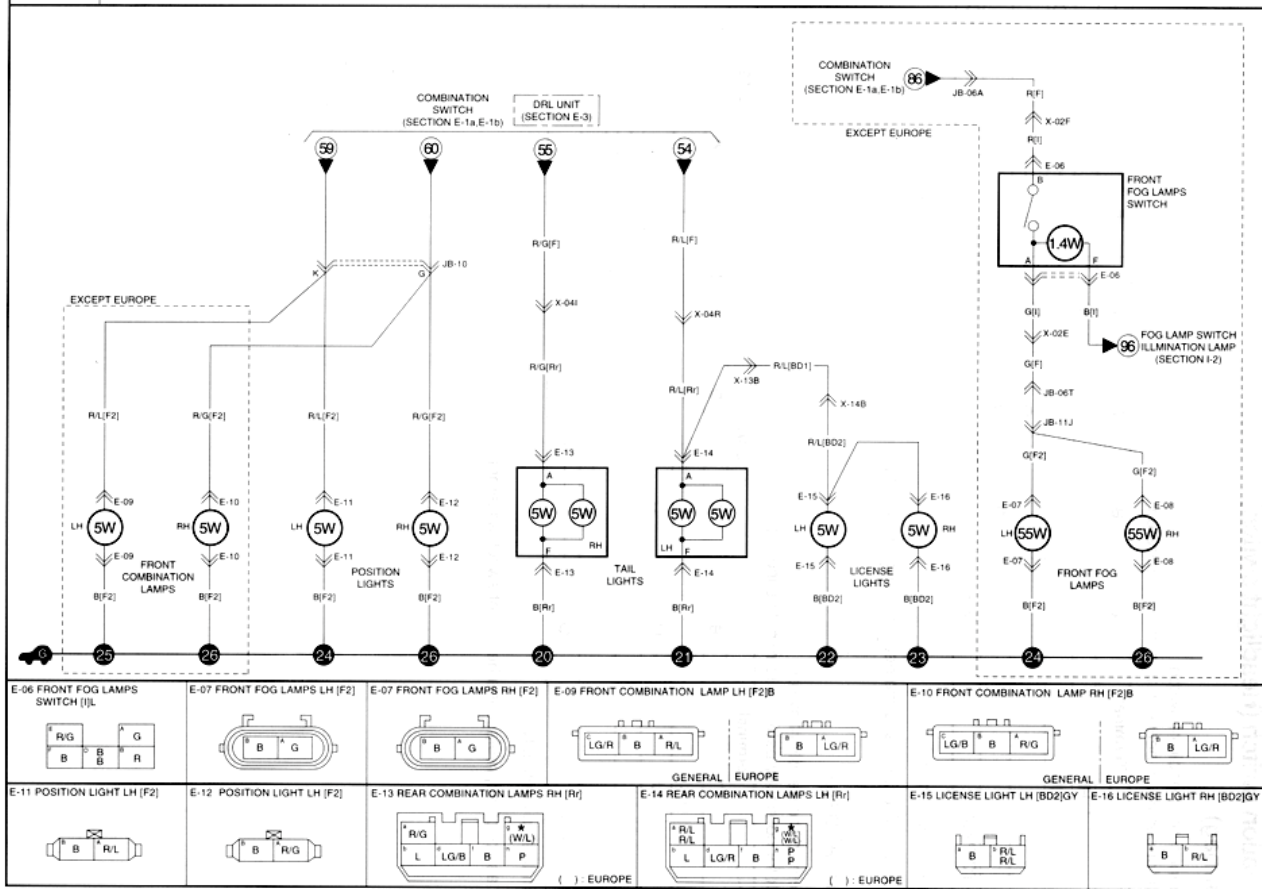
Body Electrical System

Lighting System - License Lamps



E-2

POSITION LIGHTS, TAIL LIGHTS, LICENSE LIGHTS, FRONT FOG LAMPS





Circuit operation

Position, license and taillights (With airbag)

With the light switch in "PARK" or "HEAD" position, one side of "TNS" relay coil is grounded through the light switch, energizing the relay (the other side of the coil is powered through "TNS(30A)" fuse.

When energized, the normally open contacts of the TNS relay close, allowing battery voltage to be applied to the position, taillights, license lights through the "TAIL(10A) LH" and "TAIL(10A) RH" fuses, and G wire. The mentioned lights illuminate.

Position, license and taillights (Without airbag)

With the light switch in "PARK" or "HEAD" position, battery voltage to be applied to the position, taillights, license lights through the "TAIL(10A) LH" and "TAIL(10A) RH" fuse, and G wire. The mentioned lights illuminate.



Troubleshooting

Position, license and taillights(With airbag)

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "TAIL(15A)LH" and "TAIL(15A)RH" fuses and TNS relay. If open, check for short to ground though the R/G and R/L wire and overload, replace fuse or relay and check that all system electrical connectors mated correctly.

Position lights do not operate.

Step	Inspection		Action
1	Connect test between the combination switch terminal C(G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "G" to combination switch or replace.
2	Connect test light between the combination switch terminal C(G) of D-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect combination switch connector. Check for continuity between terminals of combination switch by turning the switch. Is combination switch normal?	Yes	Go to next step
		No	Replace combination switch assembly.
4	Connect combination switch connector and turn the combination switch to "PARK" position. Connect test light between terminal A(R/L) of LH position light E-11 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/L" or replace.
5	Connect test light between terminal A(R/L) and terminal B(B) or LH position lights E-11. Is test light ON?	Yes	Check for a poor connection at LH position light. If OK, replace the LH position light bulb.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.
6	Connect test light between terminal A(R/G) of RH position light E-12 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.
7	Connect test light between terminal A(R/G) and terminal B(B) of RH position lights E-12. Is test light ON?	Yes	Check for a poor connection at RH position light. If OK, replace the RH position light bulb.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.

Taillights do not operate

Step	Inspection		Action
1	Connect test between the combination	Yes	Go to next step

	switch terminal C(G) of E-01 and ground. Is test light ON?	No	Repair open or short in the wire "G" to combination switch or replace.
2	Connect test light between the combination switch terminal C(G) of D-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect combination switch connector. Check for continuity between terminals of combination switch by turning the switch. Is combination switch normal?	Yes	Go to next step
		No	Replace combination switch assembly.
4	Connect combination switch connector and turn the combination switch to "PARK" position. Connect test light between terminal A(R/L) of LH position light E-14 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/L" or replace.
5	Connect test light between terminal A(R/L) and terminal F(B) or LH position lights E-14. Is test light ON?	Yes	Check for a poor connection at LH position light. If OK, replace the LH position light bulb.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.
6	Connect test light between terminal A (R/G) of RH position light E-14 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/G" or replace.
7	Connect test light between terminal A(R/G) and terminal F(B) of RH position lights E-14. Is test light ON?	Yes	Check for a poor connection at RH position light. If OK, replace the RH position light bulb.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.

License lights do not operate

Step	Inspection		Action
1	Connect test between the combination switch terminal C(G) of E-01 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "G" to combination switch or replace.
2	Connect test light between the combination switch terminal C(G) of D-01 and terminal H(B) of E-01. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.
3	Disconnect combination switch connector. Check for continuity between terminals of combination switch by turning the switch. Is combination switch normal?	Yes	Go to next step
		No	Replace combination switch assembly.
4	Connect combination switch connector and	Yes	Go to next step

	turn the combination switch to "PARK" position. Connect test light between terminal B(R/L) of LH license E-15 and ground. Is test light ON?	No	Repair open or short in the wire "R/L" or replace.
5	Connect test light between terminal B(R/L) and terminal A(B) or license LH E-15. Is test light ON?	Yes	Check for a poor connection at LH position light. If OK, replace the LH license light bulb.
		No	Check a poor connection at ground. If OK, repair open in the wire "B" or replace.
6	Connect test light between terminal B (R/L) of RH license light E-16 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/L" or replace.
7	Connect test light between terminal B(R/L) and terminal A(B) of license light RH E-16. Is test light ON?	Yes	Check for a poor connection at RH license light. If OK, replace the RH license light bulb.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



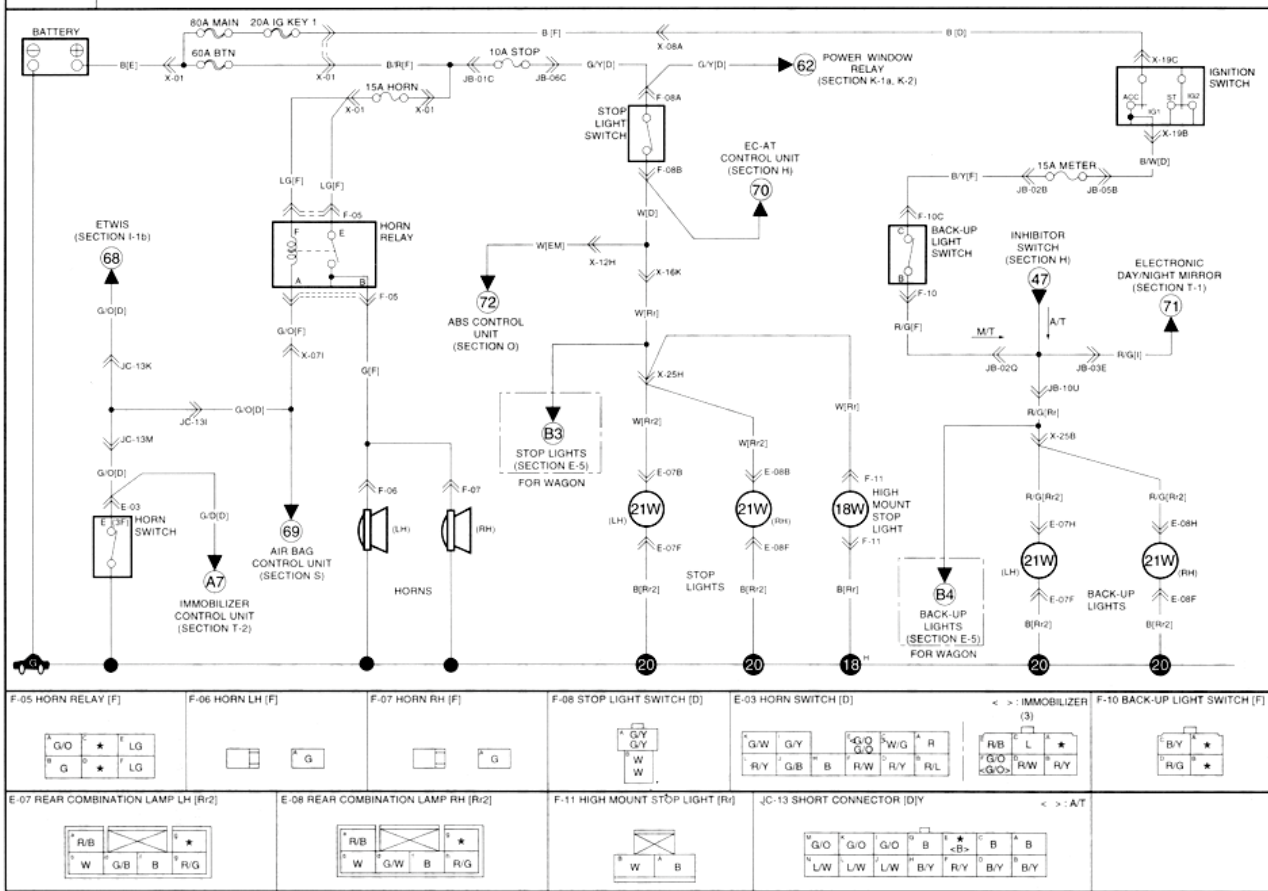
Body Electrical System

Lighting System - Back-up Lamps



Horn, stop and back-up lights

F-2 HORNS, STOP LIGHTS, BACK-UP LIGHTS





Circuit operation

With the ignition switch in "ON" or "START", battery voltage is applied to one side of the backup light switch(MT, inhibitor switch for AT) through the "METER (10A)" fuse and Y wire. When the shift lever is in reverse position, battery voltage is applied to the backup lights through P wire. The lights illuminate.



Troubleshooting

Backup lights do not operate.

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "METER (10A)" fuse. If open, check for short to ground though the wire, replace fuse and check that all system electrical connectors mated correctly.

Step	Inspection		Action
1	Turn the ignition switch to ON. Check for voltage at terminal A(Y) of backup lights switch connector F-07. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "G/W" or replace.
2	Set shift lever to REVERSE position. Check for voltage at terminal B(P) of backup light switch connector F-07. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at backup light switch connector. If OK, replace backup light switch.
3	Connect for voltage at each terminal H(P) of backup light connector E-13 and E-14. Is battery voltage present respectively?	Yes	Go to next step
		No	Check for a poor connection at backup light switch. if OK, repair open in the wire "P" or replace.
4	Connect for continuity between each terminal F(B) of backup light connector E-13 and E-14 and ground. Is battery voltage present?	Yes	Check for a poor connection at backup lights. If OK, replace backup light bulb.
		No	Check for poor connection at ground. If OK, repair open in the wire "B".



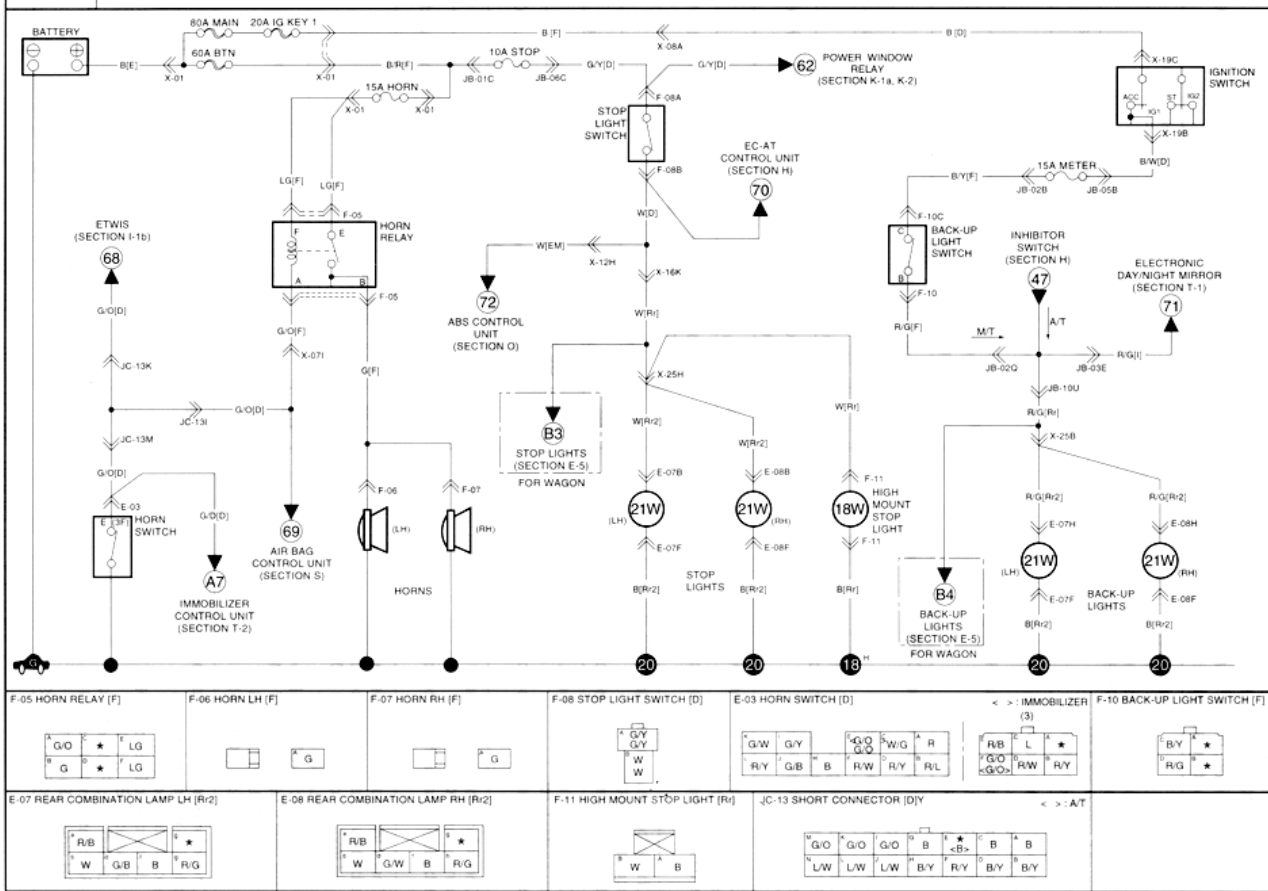
Body Electrical System

Lighting System - High Mounted Stop Lamp



Horn, stop and back-up lights

F-2 HORNS, STOP LIGHTS, BACK-UP LIGHTS





Circuit operation

Battery voltage is always applied from "STOP (15A)" fuse to the stop light switch through the R/W wire. When the brake pedal is depressed, the stop switch closes and voltage is applied to the high mounted stop light and both stop lights through the stop light switch and L wire. The lights illuminate for depressing the brake pedal.



Troubleshooting

Stop lights do not operate

Preliminary check:

Check an open lamp filament before proceeding with diagnosis. If bulb is damaged, check connection of the bulb and replace bulb. In addition, check "STOP (15A)" fuse. If open, check for short to ground through the wire, replace fuse and check that all system electrical connectors mated correctly.

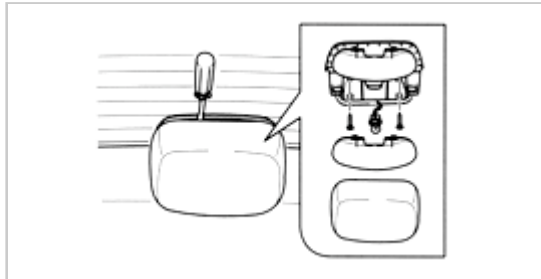
Step	Inspection		Action
1	Connect for voltage at terminal A(R/W) of stop switch connector F-05. Is battery voltage present?	Yes	Go to next step
		No	Repair open or short in the wire "R" or replace.
2	Check for voltage at terminal B(L) of stop switch while depressing brake pedal. Is battery voltage present?	Yes	Go to next step
		No	Check for a poor connection at stop light switch. If OK, adjust or replace the stop switch.
3	Use a jump wire to bypass between terminal A(R/W) and B(L) of stop switch connector F-08. Check for voltage at terminal B(L) of RH stop light connector E-13, terminal B(L) of LH stop light connector E-14, and terminal B(L) of high mounted stop light connector F-06. Is battery voltage present respectively?	Yes	Go to next step
		No	Repair open or short in the wire "W" or replace.
4	Remove a jumper wire. Check for continuity between ground and terminal F(B) of RH stop light connector E-13, terminal F(B) of LH stop light connector E-14, and terminal A(B) of high mounted stop light connector F-06. Is continuity present respectively?	Yes	Check for a poor connection at stop lights. If OK, replace light bulbs.
		No	Check for a poor connection at ground. If OK, repair open in the wire "B" or replace.



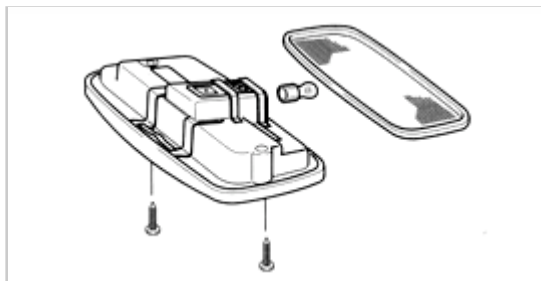
Removal

High-mounted brake lights

1. Disconnect negative battery cable.
2. Open rear hatch.
3. Remove cover.



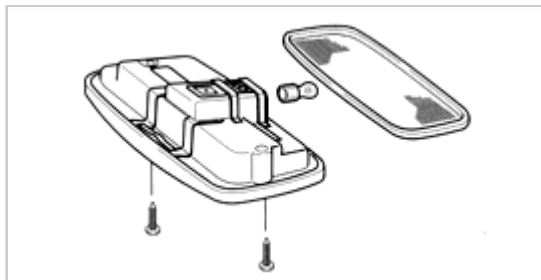
4. Remove two screws that attach lens to lights assembly.
5. Disconnect electrical connector from light assembly; remove light assembly.



Installation

High-mounted brake lights

1. Remove cover from light assembly.
2. Position light assembly on rear hatch.



3. Install two bolts attaching light to vehicle.
4. Install two screws attaching lens to light assembly.
5. Connect negative battery cable.



Body Electrical System

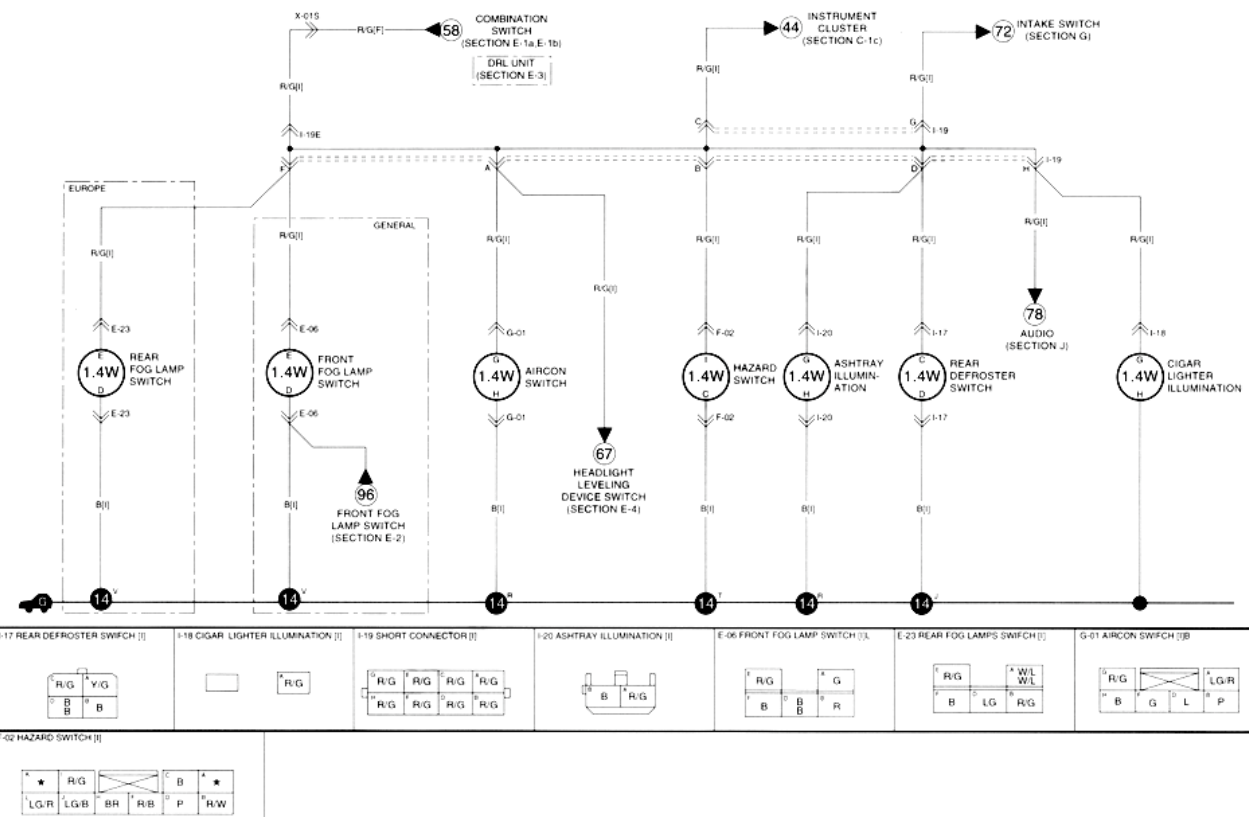
Lighting System - Other Component



Illumination lamp

I-2

ILLUMINATION LAMPS





Circuit operation

When the light switch is turned to ON position battery voltage is applied from TNS relay to the illumination lamps, which is grounded permanently. The illuminations illuminate.



Body Electrical System

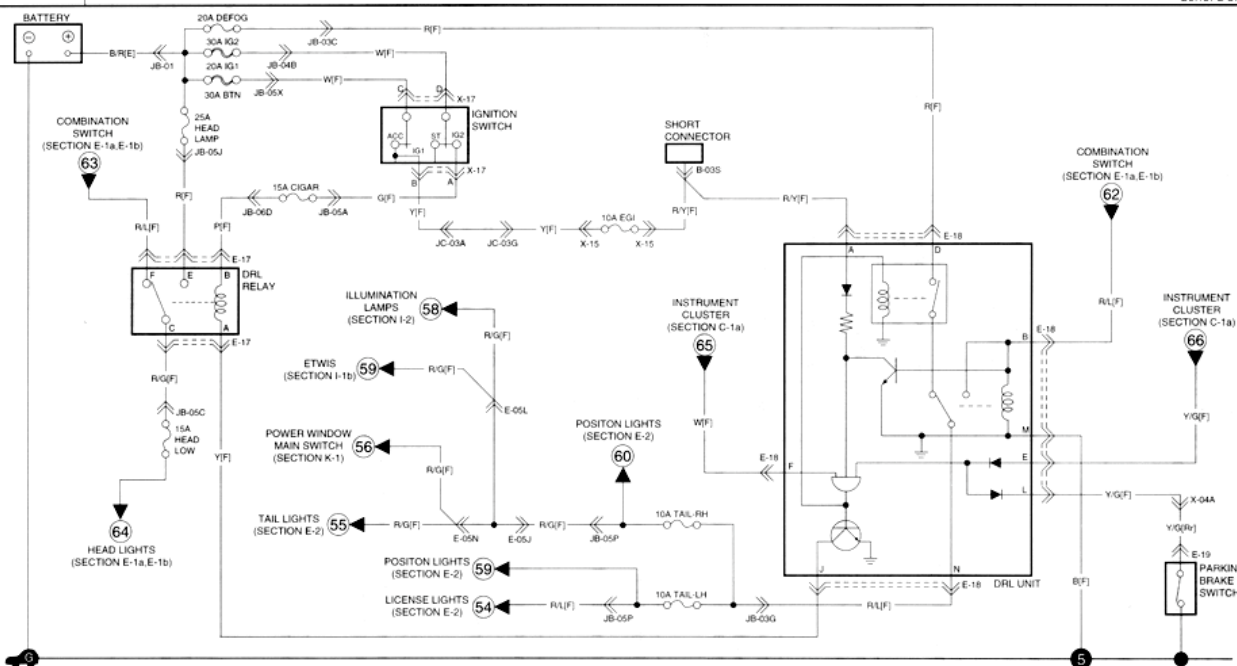
Lighting System - Daytime Running Lights



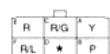
Daytime running light (DRL) system

E-3 DAYTIME RUNNING LIGHT(DRL) SYSTEM

EUROPE ONLY



E-17 DRL RELAY [F]



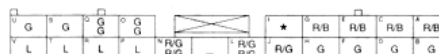
E-18 DRL UNIT [F]



E-19 PARKING BRAKE SWITCH [R]



E-05 SHORT CONNECTOR [F]





Circuit operation

Daytime running lights(DRL) (With airbag)

The daytime running lamp system consists of the DRL module and DRL relay. Battery voltage is always applied to the terminal D(R) of the DRL through the "TEFOG (20A)" fuse and R wire, and with the ignition switch in ON, voltage also is applied to the terminal A(R/Y) of the DRL module through "IG1" fuse and R/Y wire. The terminal M(B) of the DRL module is always grounded through B wire. The DRL module detects alternator operation at the terminal F(W) of the DRL module.



Troubleshooting

Daytime running lights(DRL)

Preliminary check:

Check if headlights and tail, position and license lights operate with the headlight switch. If not OK, at first, repair these light systems and recheck DRL system. If OK, perform the following procedures. Check "HEAD LAMP(15A)", "CIGAR(15A) and "EGI(10A)" fuse and DRL relay. If open, check for short to ground through the G,Y, and G/W wire and overload, replace fuse or relay and check that all system electrical connectors mated correctly.

Headlight does not operate by DRL system

(Tail, position and license lights operate by DRL system normally)

Step	Inspection		Action
1	Connect test light between the terminal E(W) of DRL relay E-17 and ground. Is test light ON?	Tes	Go to next step
		No	Repair open or short in the wire "R" to the DRL relay or replace.
2	Turn the ignition switch "ON" position, connect test light between the terminal B(P) of DRL relay E-17 and ground. Is test light ON	Yes	Go to next step
		No	Repair open or short in the wire "R" to the DRL relay or replace.
3	Disconnect the DRL connector. Connect test light between the terminal J(Y) of DRL module harness E-18 and ground. Is test light ON?	Yes	Connect DRL connector. Check DRL module.
		No	Repair open or short in the wire "Y" to the DRL relay.

Tail, position and license lights do not operate by DRL system

(Headlights operate by DRL system normally)

Step	Inspection		Action
1	Connect test light between the terminal D(R) of DRL relay E-18 and ground. Is test light ON?	Tes	Check for DRL module.
		No	Repair open or short in the wire "R" or replace.

Headlight tail, position and license lights do not operate by DRL system

Step	Inspection		Action
1	Disconnect DRL module connector and turn the ignition switch to "ON" position. Connect test light between the terminal A(R/Y) of the DRL harness E-18 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/Y" or replace.
2	Connect test light between the terminal A(R/Y) and terminal M(B) of the DRL harness E-18. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection in the wire "B" to ground. If OK, repair or replace the wire "B".
3	Turn the light switch to "PARK" position. Connect test light between the terminal B(R/L) of the DRL harness and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "R/L" or replace.
4	Turn the headlights switch to "OFF" position. Connect test light between the terminal E(Y/G) of the DRL harness E-18 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "Y/G" or replace.
5	Release the parking brake. Connect test light between the terminal L(Y/G) of the DRL harness E-18 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "Y/G" or replace.

6	Connect test light between the terminal E(Y/G) of the DRL harness E-18 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "Y/G" or replace.
7	Lock the parking brake and set the shift lever in "N " position. Start engine. Connect test light between the terminal F(W) of the DRL harness E-18 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open or short in the wire "W" or replace.
8	Turn the ignition to OFF and connect the DRL module. Check for continuity between the terminal J(Y) and ground when 1) the engine operates (alternator operates normally), 2) the ignition switch is ON, 3) the parking brake release, and 4) the headlight switch is OFF. Is battery voltage present?	Yes	Go to next step
		No	Inspect DRL module.
9	Connect for continuity between the terminal N(R/L) and ground when 1) the engine operates (alternator operates normally), 2) the ignition switch is ON, 3) the parking brake release, and 4) the headlight switch is OFF. Is battery voltage present?	Yes	Check for a poor connection at DRL module.
		No	Inspect DRL module.

Circuit testing (DRL module)

Check for voltage or continuity with connected. Repair or replace as necessary.

Terminal	Function	Test condition	Specification
A	Ignition switch input.	Ignition switch ON	12V
		Ignition switch OFF	0V
B	Light switch input.	Headlight switch OFF	0V
		Headlight switch PARK or HEAD	12V
D	Battery voltage.	Constant	12V
E	Brake fluid LOW input.	Below LOW	0V
		Above LOW	12V
F	Charging system input.	Abnormal operation	0V
		Normal operation	12V
J	DRL relay control.	DRL condition	0V
		Ignition switch ON	12V
L	Parking brake input.	Parking brake is unlocked	0V
		Parking brake is locked	12V
M	Ground	Constant	GND
N	Tail, position, and license light control.	DRL condition	12V
		None DRL condition	0V

DRL relay

1. Disconnect the DRL relay.

2. Check for continuity between terminal as indicated.

Power		Terminals				
12V	GND	A	B	C	E	F
-	-	O	O	O		O
B	A			O	O	

O—O : indicates continuity

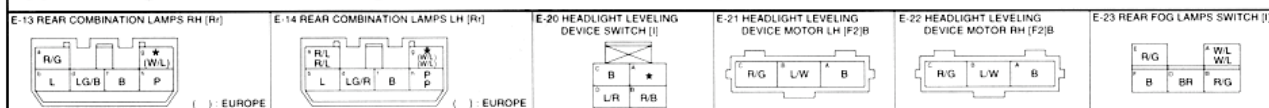
3. If not as specified, replace the DRL module.



Body Electrical System

Lighting System - Head Lamp Leveling Device

EUROPE ONLY





Circuit operation

Headlight leveling device (With airbag)

In case that airbag system is equipped on vehicle, when the headlight switch is turned to "HEAD" position the one side coil of the HEADLIGHT relay is grounded through light switch (the other side is powered through "HEAD" fuse).

When the relay is energized, the normally open contacts of the HEADLIGHT relay close, allowing battery voltage to be applied to the right and left headlight leveling device motor through "RR FOG(10A)" fuse, and R/G wire. Each terminal A(B) of the headlight leveling device motors is grounded through B wire.

When changing the position of the headlight leveling device switch, the inter resistance of headlight leveling device switch varies according to its position. The headlight leveling device motors operate and stop in specified position.

In case that airbag system is not equipped on vehicle, when the headlight switch is turned to "HEAD" position battery voltage is applied to the right and left headlight leveling device motors through the headlight switch, "RR FOG (10A)" fuse, and R/G wire.

Headlight leveling device (Without airbag)

When the headlight switch is turned to "HEAD" position, battery voltage is applied to the right and left headlight leveling device motor through "RR FOG(10A)" fuse, and R/G wire. Each terminal A(B) of the headlight leveling device motors is grounded through B wire.

When changing the position of the headlight leveling device switch, the inter resistance of headlight leveling device switch varies according to its position. The headlight leveling device motors operate and stop in specified position.

In case that airbag system is not equipped on vehicle, when the headlight switch is turned to "HEAD" position battery voltage is applied to the right and left headlight leveling device motors through the headlight switch, "RR FOG(10A)" fuse, and R/G wire.



Trubleshooting

Headlight leveling device (With air-bag)

Preliminary check:

Check "RR FOG (10A)". If open, check for short to ground though the R/G wire and overload, replace fuse and check for a poor connection of all relevant connectors.

Headlight leveling device does not operate.

Step	Inspection		Action
1	Turn the headlight to "HEAD" position. Connect test light between LH headlight leveling device terminal C(R/G) of E-21 (RH:E-22) and ground. Is test light ON?	Yes	Go to next step
		No	Repair open and short circuits in the wire "R/G" or replace R/G wire.
2	Connect test light between LH headlight leveling device terminal C(R/G) of E-21 (RH:E-22) and A(B) of E-21(RH:E-22). Is test light ON?	Yes	Go to next step
		No	Check a poor connection in the wire "B" at ground. If OK, repair open circuits in B wire or replace B wire.
3	Ground test light between LH headlight leveling device witch terminal B(R/G) of E-20 and ground. Is test light ON?	Yes	Go to next step
		No	Repair open and short circuits in the wire "R/G" or replace R/G wire.
4	Connect test light between LH headlight leveling device witch terminal B(R/G) of E-20b and terminal C(B) of E-20. Is test light ON?	Yes	Go to next step
		No	Check for a poor connection in the wire "B" at ground. If OK, repair open circuits in B wire or replace B wire.
5	Disconnect the headlight-leveling switch. Check if there is a change of resistance between terminal D and C(or between D and B) by adjusting the switch.	Yes	Go to next step
		No	Replace the headlight-leveling device switch.
6	Connect the headlight-leveling device switch. Connect test light from the LH headlight leveling device switch terminal B(L/W) of E-21 (RH:E-22) and ground.Is test light ON	Yes	Go to next step
		No	Check for a poor connection at the LH headlight level device. If OK, replace the LH headlight leveling device.
7	Connect test light from the headlight leveling device switch terminal D(L/W) of E-20 and ground. Is test light ON?	Yes	Check for a poor connection at the headlight leveling device switch. If OK, check headlight leveling device switch.
		No	Repair open and short circuits in the wire "L/W" or replace L/W wire.



Body Electrical System

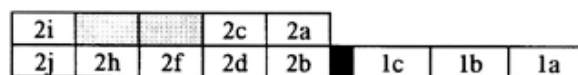
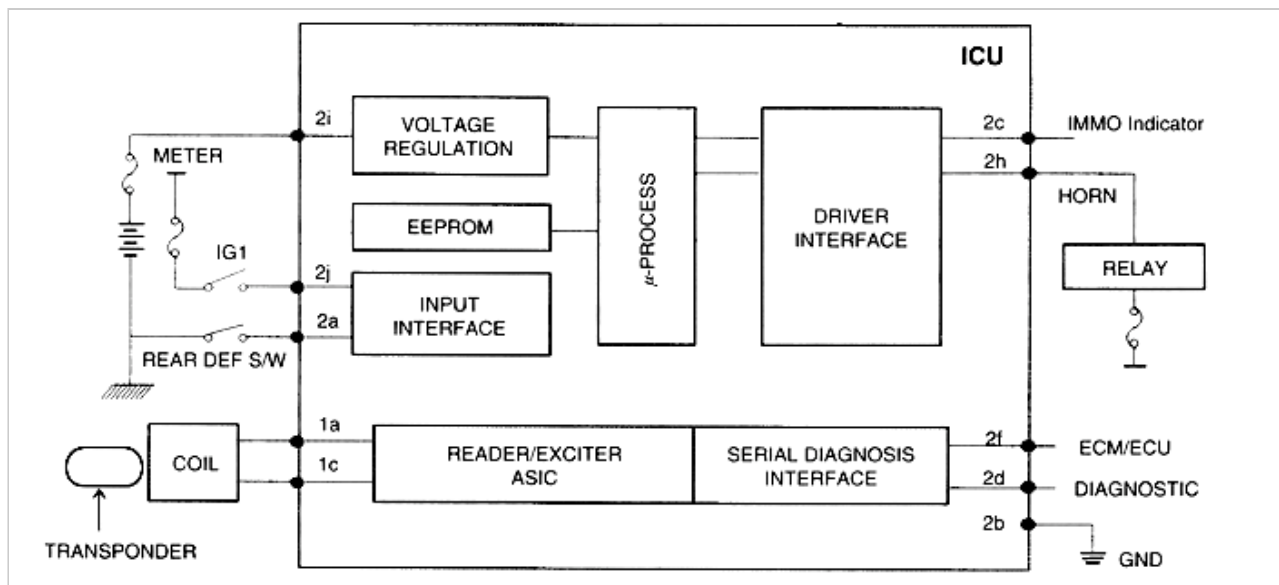
Immobilizer System



IMMOBILIZER



I R/B			C L/R	A Y/G
J R/Y	H W/G	F LG	D L/G L/G	B B



PIN	Description	PIN	Description
2a	REAR DEF S/W	1a	Coil (+)
2b	GND	1b	NC (Not connected)
2c	IMMO indicator	1c	Coil (-)
2d	Serial communication(diagnosis)		
2f	ECM ECU		
2h	Horn		
2l	B (+)		
2j	(+) IG1		

NOTICE

- 1) While performing a coding procedure, the period of ON and OFF must maintain approximately two seconds in order to confirmed communication time between ICU and ECU.
- 2) After completing to perform a coding procedure, if engine does not start in spite that "IMMO" indicator is normal, disconnect the antenna coil connector from the ICU and then perform a limphome procedure. In case of observing that "IMMO" indicator is normal, the ICU is normal. So, check for ECU including the starting system.
- 3) After a neutralization or replacement of ICU, must perform "Normal Coding" procedure with the original correct PIN.
- 4) When performing a "Key Only Matching" procedure, must code key one by one.
- 5) With the ignition switch ON, perform a limphome procedure through a "IMMO" indicator by RR. DEF switch. If succeed, "IMMO" indicator blinks from 2Hz to 0.5Hz. If not, "IMMO" indicator goes out.
- 6) If a limphome procedure is succeed, must turn the ignition switch to OFF and then start engine within 20 seconds.
- 7) After performing neutralization, must turn the ignition switch OFF and ON.
- 8) In case of virgin ICU, the Key Only Matching service is not allowed.



Diagnostic function

The diagnostic communication is initiated by an external diagnostic tool (Hi-Scan Pro). Its purpose is to:

- Perform an end-of-line test at the car assembly plant consisting of:
- Programming the PIN
- Matching the ECM to the ICU
- Matching the transponder keys
- doing a complete check of the system
- Program a replacement ECM or ICU (neutralization)
- Program replacement keys

Diagnostic service

Refer to Hi-Scan Pro Tool Manual.

- Normal coding
- Neutralization
- Code change
- key only matching
- VIM check
- ECM check

Passcode (or PIN) request

This service is used to enter the PIN.

Test sequence request

This frame is sent immediately after the Passcode frame and starts a test sequence either with or without transponder key matching. If the test sequence request is not received before the end of the time-out, the ICU sends a response frame containing \$ FF FF as status.

NOTICE

This service can be allowed only when the ICU status is not learnt by setting an EEPROM in case of learnt status, the sequence is not processed and the PIN is not changed.

Consider a virgin ICU. By performing a full test sequence:

- either without key matching,
- or with key matching,

the ICU becomes learnt, and unlocked. The ICU will remain unlocked while the ignition ON. However, if a full test sequence is performed with key matching (and two keys are matched : the sequence was successful), then the ICU is learnt and unlocked, but a passive arming is armed. In that case, once the passive arming is elapsed, or if ignition is ON with an unknown key, the ICU is locked.

Key management

In case of key matching (from a full test sequence or a key matching only).

- no key is learnt : the previous keys are kept
- at least 1key is learnt : the previous keys are erased, and replaced by the new ones.

Case of virgin ICU

In virgin status the key matching service is not allowed.

DIAGNOSTIC SEQUENCE

1. The operation inserts a transponder key.
2. The test tool sends the PIN with option full test (program PIN) and a diagnostic request to the ICU.
3. The PIN is programmed and the ICU status changes to learnt
4. The ICU activates the horn for 50ms (Parameter 1)
5. The operator turns the key to IG ON position
6. The ICU communicates with the ECM and unlocks it.
7. The operator turns the key to IG OFF position.

8. The operator depresses the RR DEF SE for 500ms minimum.
9. The horn sounds for 50ms.
10. The operator turns the key to IG ON position
11. The first transponder key is learned.
12. If the programming was OK, The lamp is ON for 250ms.
13. The operator starts the engine.
14. The operator turns the key to IG OFF position and replaces it by the second key in less than 10 seconds
15. The operator turns the key to IG ON position.
16. The second transponder key is learned
17. If the programming was OK, the lamp is ON for 250ms and the horn is activated for 50ms (Parameter 1)
18. The operator starts the engine.
19. The operator turns the key to IG OFF position.
20. The status of the ICU is sent to the test tool (Hi-Scan Pro Tool).

Transponder key matching only

Transponder matching sequence : this procedure corresponds to matching keys procedure

1. The operator inserts a transponder key
2. The test tool sends the PIN to the ICU with option transponder matching and the number of keys to be programmed.
3. The ICU activates the horn for 50ms.
4. The operator turns the key to IG ON position
5. The first transponder key is learnt.
6. The lamp lights
7. The operator turns the key to IG OFF position and replaces it by the next key
8. The operator turns the key to IG ON position
9. The second transponder key is learned
10. The lamp lights
11. Step 7 to 10 are repeated depending on the number of keys to be programmed
12. The status of the ICU is sent to the test tool.

Also, during the ignition test, the VIM detects the ECM type connected to it and stores the type in EEPROM.

ECM (or ECU) communication

The ECM communication is initiated by the ECM. The ICU decrypts this request to get three bytes of fix code; it compares this fix code with ICU's MIN. If they are different or if the ICU is in the locked condition, ICU answers ECM with dummy data. Otherwise, the answer is got from encrypted different code according the ICU status.

The ECM type is extracted from the ECM request and stored in EEPROM of ICU.

Relay communication

This function allows the communication between tester and ECM by shorting W-line and K-line together.

The ICU controls a relay, which permits to connect the K (Diagnostic)-line with the W (ECM serial data)-line and disconnect the internal W-line pull-up, to allow communication between the ECM and an external tester.

If the ICU recognizes a falling edge on the K-line, with a low level lasting more than 10ms, it will close the relay and then disable the pull-up.

If the request is a 5 bauds wake-up addressed to the ICU, or if the K-line is seen idle for 10 seconds or a falling edge ON ignition input appears, the pull-up is re-enabled and then the relay is released.

In key immobilizer

The product described in these specifications is a transponder-based immobilizer for vehicle. This product called ICU (Inkey Control Unit) communicates with the engine management system in order to allow or not the engine start depending on the recognition or not of the transponder inserted in the key. This product complies with European directives applicable in anti-theft systems for vehicles. The transponder inserted in the key; two keys are associated to vehicle. The identification of a transponder by the ICU is done by reading by magnetic coupling the identifier code engraved on the transponder identifier puts the ICU in an unlocked state until a falling edge in ignition input; otherwise, it is in the locked

state. The unlocked state allows engine start. The ICU communicates also with a Power Scan Tool in order to:

- Proceed with key (transponder) matching at the end of vehicle manufacturing line.
- Initialize the engine management system.
- Proceed with auto-test of the product (check of antenna connections and W line output).

In case of a transponder failure, the immobilizer can be unlocked with a procedure called Limp Home Procedure by entering PIN (i.e. passcode) with the RR DEF SW.

ICU

- Transponder reader/exciter interface
- 5V power supply regulation
- Serial communication interface
- Lamp relay drivers
- Micro controller and software

Transponder reader/exciter

The communication with the transponder is done by an integrated circuit (ASIC) which integrates in addition to the transponder reader/exciter:

- 5V voltage regulator for internal use and micro controller power supply.
- Watch dog circuit
- W line driver used for the communication with the ECM

Electrical characteristics of the ASIC:

- DC operational supply voltage: 6V~16V
- 5V voltage regulator output: 4.8V~5.2V

Transponder

The transponder used is the read only type in glass tube package. The transponder is inserted in the key by over molding procedure at the steering column lock factory.

Antenna

The antenna is composed of:

- Coil
- Plastic holder for the coil and envelop
- 1 meter of 1 pair of twisted wires cable
- AMP 3 position connector

Functions

Abbreviations

ECU	Electronic Control Unit or Engine Control Unit
EMS	Engine Management System
ECM	Engine Control Module (Same as ECU)
VIM	Vehicle Immobilizer
ICU	Inkey Control Unit
MIN	Model Identification Number
PIN	personal Identification Number (i.e. Passcode)
VIN	Vehicle Identification Number

Function list

Transponder communication : reads the transponder code and decide (in normal mode) the immobilizer condition "Locked" or "Unlocked"

ECM communication: answer the requests from engine management system.

Diagnostic communication: answers the requests from diagnostic tool (Hi-Scan Pro Tool).

Limp home function: manages the ignition and RR DEF SW input and handles the override procedure for the Limp home and key learning sequence.

ICU condition and status

The ICU has two possible conditions: "Locked" or "Unlocked".

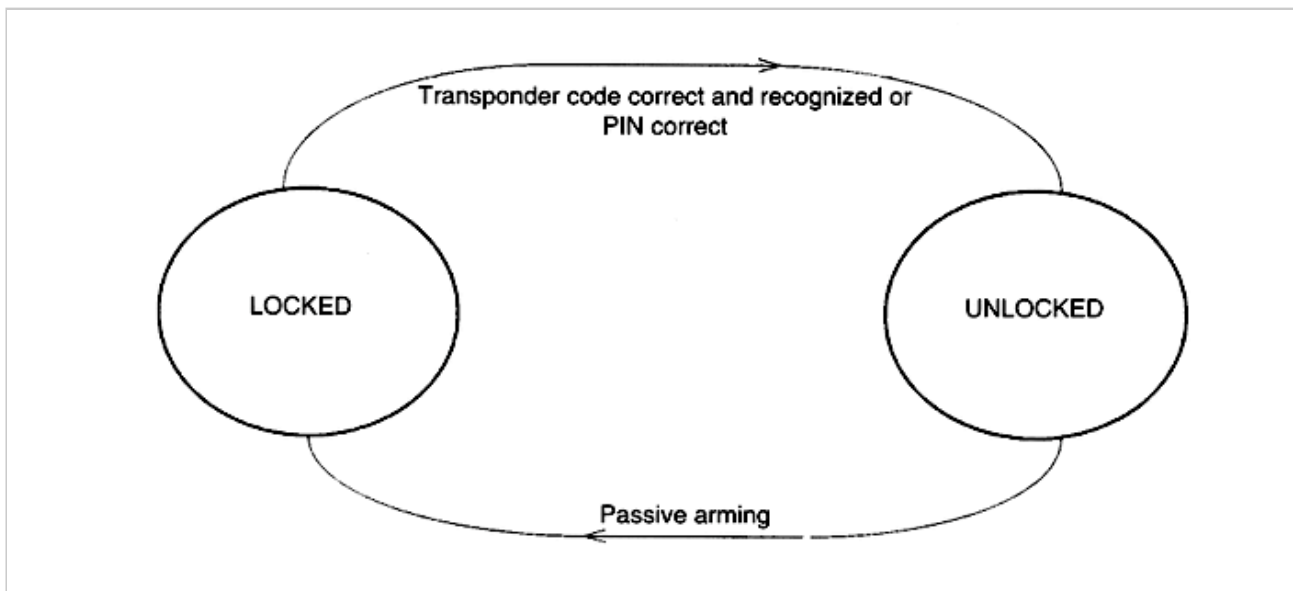
In addition, three possible statuses: "Virgin", "Learnt" and "Neutralized".

Locked condition

The ICU will stay in the locked condition as long as no valid transponder code has been received. The ICU will automatically go to lock condition a regular time after key OFF. As long as the ICU is in the locked condition, engine start is impossible, since the ICU answers any ECM request with dummy data. Exceptions to this rule are made if either the ECM or the ICU is in virgin state.

Unlocked condition

Only if the ICU is in the unlocked condition, engine start is allowed.



Virgin status

This status represents the delivery condition of the ICU. The MIN has been programmed at the factory in EEPROM. The VIN has not been programmed yet; it will be programmed at the car manufacturer's end-of-line test. In this status, if the ECM is also in virgin state and the MIN of the ICU are the same, engine start is allowed.

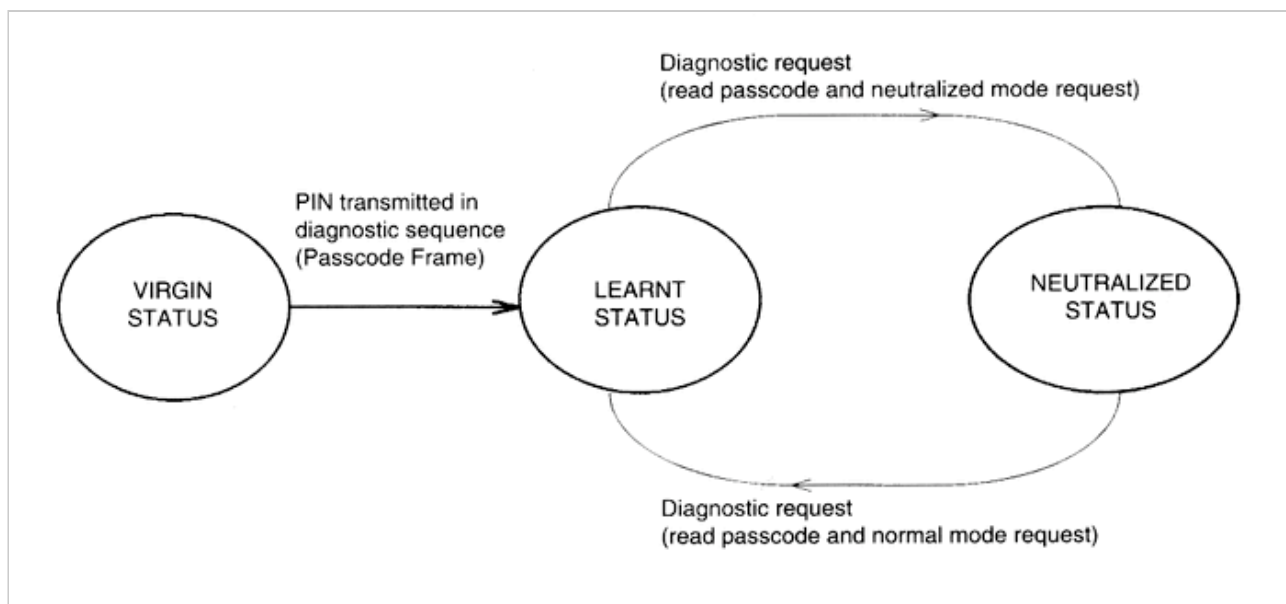
Learnt status

This represents the normal operation of the ICU, where the VIN has been learned. When the ECM sends a request containing the same MIN, then if the ICU is unlocked, the response to the ECM will contain a code based on the VIN. If the ICU is locked, the response will contain dummy data.

Neutralized status

To replace a part of the system (ICU, ECM), the ICU and the ECM have to be set to neutralized state by a '<<read passcode >>' request from the diagnostic tool. In this status, engine start is never possible.

Following flow diagram shows the possible transitions between statuses:

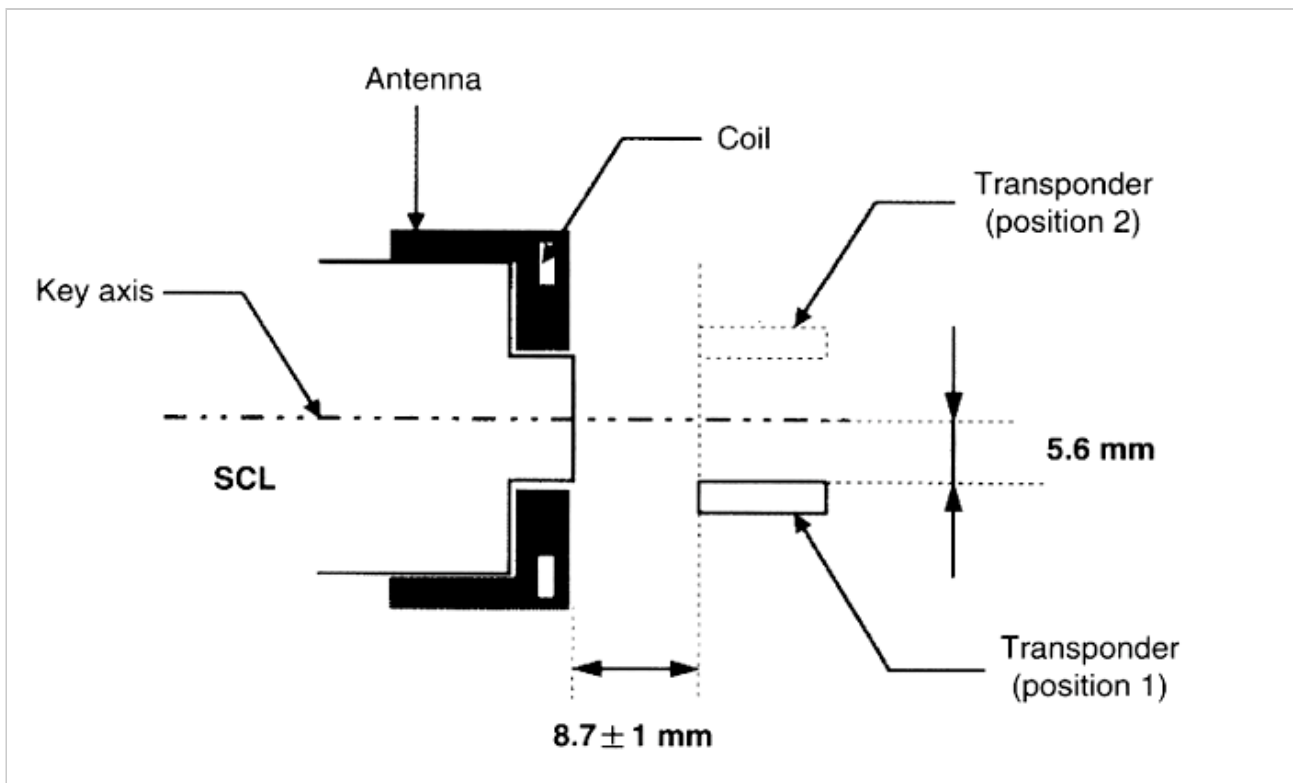


Status VS condition

The following table shows the possible conditions according the different possible status of the ICU :

Stetus	Condition	Condition for locked.unlocked	Remark
Virgin	Unlocked	Always	Enfine start is allowed provided the ECU is virgin.
Neutralized	Locked	Ignition ON with an unknown key	
	Unlocked	Ignition ON with a unknown or override procedure	ICU may neutralize an ECU provided they both have similar MIN and VIN.
Learnt	Locked	Ignition ON with an unknown key	
	Unlocked	Ignition ON with a unknown or override procedure	Engine start allowed provided ICU and ECU have similar MIN and VIN

Normal environment of coil/transponder



The transponder (inserted in the Key) has two stable positions (position 1 and position 2 on the above figure). Reading the transponder in these conditions should be possible at 100% rate:

- in the temperature range
- in case if extreme values intervening in the coupling between transponder and coil, which are:
 - carrier frequency
 - tuning frequency of the antenna resonant circuit
 - tuning frequency of the transponder coil
 - minimum magnetic field of transponder good operation
 - mechanical tolerances of positioning (transponder in the key and coil on the SCL)
- When the system is submitted to an electromagnetic field

Functional description

The trading transponder procedure is initiated by a rising edge in the Ignition input.

The transponder reading should be completed during a delay of 200ms after + ignition rising edge. This time includes two possible tentative of transponder reading.

During this delay, all other requests are ignored.

Four transponders in total can be programmed in the EEPROM.

The ICU is unlocked if the transponder code read is known and belongs to the list in the EEPROM and if the transponder has been authenticated successfully. ICU switches to the locked state after approximately one second after the + ignition falling edge (Passive arming). The ICU is locked if the transponder is absent or the code read is unknown.



Diagnostic Trouble Codes and Associated Procedures

Immobilizer

1. Turn ignition switch to ON.
2. The MIL should illuminate.
3. Turn the ignition switch to LOCK.
4. Locate the data link connector (DLC) in the engine compartment and install the Hi-Scan Pro Tool.
5. Turn the ignition switch to ON and record any Diagnostic Trouble Codes displayed by Hi-Scan Pro Tool.
6. Refer to Diagnostic Trouble Code Chart, for fault description and actions.

Diagnostic Trouble Code (DTC) Chart

Diagnostic Trouble Code	Fault Description	MIL	Remark
P1611	Communication error(ECU-VIM)	ON	BOSCH T8D
P1612	Checksum message wrong		
P1613	Implausible bytes from ICU		
P1614	ECU status error		

Diagnostic service

Refer to Hi-Scan Pro Tool Manual.

NOTICE

- 1) Refer to Emission Control System, Hi-Scan Pro Tool Manual.
- 2) If a detected fault remains for the first time for a time, it is stored as "not confirmed fault". If the fault is detected again when it is stored as "confirmed fault". It is stored as confirmed fault and MIL is ON after two driving cycles.
- 3) The driving cycle is counted up ten seconds passed after ignition ON or "erased code" of Kia Power Scan Tool.
- 4) Not confirmed fault : If a detected fault remains for the first time for a time, it is stored as a temporary failure that is "not confirmed fault".
- 5) Confirmed fault : If the fault is detected again at status which is stored as "not confirmed fault", it is stored as "confirmed fault"
- 6) Before replacing ICU or ECU, perform "Before Servicing and "Normal Coding" procedure and recheck inkey immobilizer system.

Diagnostic Trouble Code Troubleshooting

DTC	Fault Description	Possible cause	Action
P1611	No receiving any answer on K-line after elasing timeout of communication or no receiving correct answer for communication time.	Harness or connection failure. Unmatched between ICU and ECU. ICU failure. ECU failure.	Repair or replace Perform Normal Coding Replace Replace
P1612	Checksum message from ICU is wrong.	Harness or connection failure. ICU failure. ECU failure	Repair or replace Replace Replace
P1613	Answer from ICU includes implausible bytes.	Harness or connection failure. ICU failure.	Repair or replace Replace
P1614	ECU staus byte at EEPROM does not correspond to virgin, learnt or neutralized staus.	Harness or connection failure. ECU failure.	Repair or replace Replace

General Diagnostics and Test

System check

Step	Action	Normal results
1	- Observe "IMMO" indicator. - Turn the ignition switch to ON.	"IMMO" indicator illuminates for approximately two seconds and goes out.
2	Turn the ignition switch to START.	Engine starts.
3	- Turn the ignition switch to OFF. - Diagnostic antenna coil connector from ICU. - Turn the ignition switch to ON. - Observe "IMMO" indicator.	"IMMO" indicator blinks continuously (2Hz).
4	Perform limphome with original correct PIN.	"IMMO" indicator blinks from 2Hz to 0.5Hz.
5	Turn the ignition switch to START.	Engine starts.

ICU status by "IMMO indicator

Action	Part number	Virgin	Neutralized/Learnt
- Disconnect antenna coil connector. - Turn the ignition switch to ON.	0K2AC 67 7R0/7R0A	"IMMO" indicator illuminates for approximately two seconds and goes out.	"IMMO" indicator blinks continuously (2Hz).
	0K2AC 67 7R0B	"IMMO" indicator blinks at three times for approximately one second.	

ICU type

Type			Read only type	Encrypt type
Part number				
Part number			0K2AC 67 7R0/7R0A	0K2AC 67 7R0B
Label color of ICU			White	Yellow
Antenna coil			Common	
Key knob color			Black	Deep blue
"IMMO" indicator	Before coding		"IMMO" indicator illuminates for approximately two seconds and goes out.	"IMMO" indicator blinks at three times for approximately one second.
	After coding	OK	"IMMO" indicator illuminates for approximately two seconds and goes out.	"IMMO" indicator illuminates for approximately two seconds and goes out.
		NO	"IMMO" indicator blinks continuously (2Hz).	"IMMO" indicator blinks continuously (2Hz).

WARNING

FOR 0K2AC 67 7R0 ONLY, MUST WAIT FOR 10 SECONDS AFTER PERFORMING "ECM CHECK" WITH KIA POWER SCAN TOOL, BECAUSE THE RELAY OF ICU IS RETURNED IN ORIGINAL POSITION AFTER APPROXIMATELY 10 SECONDS. IF YOU START ENGINE WITHIN 10 SECONDS, THERE IS THE POSSIBILITY OF NOT STARTING ENGINE OR OCCURRING ECU FAULT CODE.

Before serving

Step	Inspection	Yes	No
1	- Turn the ignition switch to ON. - Check if "IMMO" indicator illuminates or blinks.	Go to step 7	Go to step 2
2	Disconnect the immobilizer harness connector from the ICU.	Go to step 3	Repair or replace

	Check if battery voltage is applied to the terminal 2I of the harness connector.		
3	Check if the terminal 2B of the harness connector is ground.	Go to step4	Repair or replace
4	- Check if battery voltage is applied to the terminal 2H of the harness connector. - Turn the ignition switch to ON.	Go to step5	Repair or replace
5	Check the battery voltage is applied to the terminal 2J and 2C of the harness connector.	Go to step6	Repair or replace
6	- Turn the ignition switch to OFF and connect the immobilizer harness connector to the ICU. - Turn the ignition switch to ON.		
7	Check if "IMMO" indicator illuminates for approximately two seconds and then goes out.	Go to step8	Go to "Symptom table"
8	The ICU is normal. Check if engine starts.	System is OK	Go to "Symptom table"

Symptom table

Fault	Possible symptom	Action
- Defective Ket transponder - No Key matching - Defective Antenna coils - Defective Harness between ICU and antenna coils - The rest of system is OK.	- Engine does not start. "IMMO" indicator blinks continuously at 2Hz. - When disconnecting antenna coil and then performing limphome with original correct PIN, "IMMO" indicator blinks from 2Hz to 0.5Hz. - When turning the ignition switch to OFF and START after limphome, engine starts.	Refer to procedure 1
- ICU virgin (0K2AC 67 7R0/7R0A) - Defective Antenna coils - Defective Harness between antenna coils and ICU. - The rest of system is OK.	- Engine does not start. "IMMO" indicator illuminates for approximately two seconds and then goes out. - When disconnecting antenna coil connector and turning the ignition switch to ON, "IMMO" indicator illuminates for approximately two seconds and then goes out (for 0K2AC 67 7R0/7R0A).	Refer to procedure 2
- ICU virgin (0K2AC 67 7R0B) - The rest of system is OK.	- Engine does not start. "IMMO" indicator illuminates for approximately two seconds and then goes out. - When disconnecting antenna coil connector and turning the ignition switch to ON, "IMMO" indicator illuminates for approximately two seconds and then goes out (for 0K2AC 67 7R0B).	Perform "Normal Coding" procedures with original correct PIN.
- Defective ECU - harness between ICU and ECU - Starting system - The rest of system is OK	- Engine does not start. "IMMO" indicator illuminates for approximately two seconds and then goes out. - When disconnecting antenna coil connector and turning the ignition switch to ON, "IMMO" indicator blinks at 2Hz continuously.	Refer to procedure 3
- Defective ICU - Defective ECU - Defective harness between ICU and ECU. - The rest of system is OK.	- Engine does not start. - When disconnecting antenna coil and then performing limphome with original correct PIN, "IMMO" indicator does not blink from 2 Hz to 0.5 Hz (The PIN entry is correct). - MIL indicator illuminates (there are any Diagnostic Trouble Codes related to Inkey Immobilizer System.).	Refer to procedure 4

Procedure 1

Step	Inspection	Action
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1	- Perform "Key Only Matching" with the original correct PIN. - Is key matching results OK?	Yes	Turn the ignition switch to START. If engine starts, system is OK.
		No	Go to step 2.
2	- Turn the ignition switch to OFF. - Check if connection and wire harness between antenna coils and ICU are normal.	Yes	Go to step 3.
		No	Repair or replace wire harness.
3	Check if antenna coils are normal.	Yes	Go to step 4
		No	Replace antenna coils.
4	- Perform "Key Only Matching" with the original correct. - Is key matching results OK?	Yes	Go to step 5.
		No	Recheck system.
5	- Turn the ignition switch to OFF and ON. - Check if "IMMO" indicator illuminates for approximately two seconds and goes out.	Yes	Go to step 6.
		No	Recheck system.
6	- Turn the ignition switch to START. - Check if engine starts.	Yes	System is OK.
		No	Refer to "Symptom table."

Procedure 2

Step	Inspection		Action
1	- Perform "VIM CHECK" with Kia Power Scan Tool - Check if ICU status is "VIRGIN".	Yes	Perform "Normal Coding" procedure with original correct PIN.
		No	Go to step 2.
2	Check if the antenna coils are normal.	Yes	Go to step 3.
		No	Replace antenna coils.
3	Check if connection and wire harness between ICU and antenna coils are normal.	Yes	Go to step 4.
		No	Repair or replace wire harness.
4	- Turn the ignition switch to ON. - Observe if "IMMO" indicator illuminates for approximately two seconds and goes out.	Yes	Start engine. If not, recheck system.
		No	Go to step 5.
5	- Turn the ignition switch to OFF and disconnect antenna coils connector from ICU. - Perform limphome procedure with original correct PIN. - Observe if "IMMO" indicator blinks from 2Hz to 0.5Hz.	Yes	Go to step 6.
		No	Perform "Normal Coding" procedures with original correct PIN.
6	Turn the ignition switch to START. Does engine start?	Yes	Go to step 7.
		No	Recheck system.
7	- Turn the ignition switch to OFF. Connect antenna coils connector and perform "Key Only Matching" procedures with original correct PIN. - Turn the ignition switch to START - Does engine start?	Yes	System is OK.
		No	Recheck system.

Procedure 3

Step	Inspection		Action
1	Perform "VIM CHECK" with original correct	Yes	ICU is normal.

	PIN. ● Check if ICU's status and condition are "Learnt" and "Unlocked".	No	Go to step 2.
2	● Check if connection and wire harness between ICU and ECU is normal.	Yes	Go to step 3.
		No	Repair or replace wire harness.
3	● Perform "Normal Coding" with original correct PIN. ● Turn the ignition switch to OFF and ON. ● Check if "IMMO" indicator illuminates for approximately two seconds and goes out.	Yes	Go to step 4.
		No	Recheck system or check if PIN entry is correct.
4	● Perform "ECM CHECK" with original correct PIN. ● Check if ECU condition is "Unlocked"	Yes	Check Starting System.
		No	Go to step 5.
5	● Recheck if connection and wire harness between ICU and ECU are normal.	Yes	Go to step 6.
		No	Repair or replace wire harness.
6	● Perform "Neutralization" and Normal Coding" with original correct PIN. ● Turn the ignition switch to START. ● Check if engine starts.	Yes	System is OK.
		No	Go to step 7.
7	● Before replacing ECU, must remember and recorded the original correct PIN. ● Perform "Neutralization" with the original correct PIN and turn the ignition switch to OFF. ● Remove ECU and store the ECU with the tag recorded serial inspection. ● Install new virgin or neutralized ECU. ● Perform "Normal Coding" with the original correct PIN. ● Turn the ignition switch to START. ● Check if engine starts.	Yes	System is OK.
		No	Perform "Neutralization" with the original correct PIN, remove new ECU, and install original ECU. Perform "Normal coding" with the original correct PIN. Recheck system.

Procedure 4

Perform "ECM CHECK" and "VIM CHECK" with Kia Power Scan Tool. The ECU and ICU installed in vehicle must be in Learnt Status because they were first encoded by Kis Motor.

Step	Inspection		Action
1	● Perform "Neutralization" and "Normal Coding" with the original correct PIN. ● Turn the ignition switch to START. ● Check if engine starts.	Yes	System is OK
		No	Go to step 2.
2	● Turn the ignition switch to OFF and disconnect antenna coils connector from ICU. ● Turn the ignition switch to ON and perform "Limphone" with the original correct PIN through RR DEF SW. ● Observe if "IMMO" indicator blinks from 2Hz to 0.5Hz.	Yes	Go to step 3.
		No	Go to step 6.
3	● Turn the ignition switch to START. ● Check if engine starts.	Yes	System is OK
		No	Go to step 4.
4	● Check if connection and wire harness between ICU and ECU is normal.	Yes	Go to step 5.
		No	Repair or replace wire harness.

5	• Before replacing ECU, must remember and recorded the original correct PIN. • Perform "Neutralization" with the original correct PIN and turn the ignition switch to OFF. • Remove ECU and store the ECU with the tag recorded serial inspection. • Install new virgin or neutralized ECU. • Perform "Normal Coding" with the original correct PIN. • Perform "Limphone" with the original correct PIN and turn the ignition switch to START. - Check if engine starts.	Yes	System is OK
		No	Go to step 6.
6	• Before replacing ICU, must remember and recorded the original correct PIN. • Perform "Neutralization" with the original correct PIN and turn the ignition switch to OFF. • Removal ICU and store the ICU with the tag recorded a serial inspection. • Install new virgin or neutralized ICU. • Perform "Normal Coding" with the original correct PIN. • Perform "Limphone" and turn the ignition switch to START. • Check if engine starts.	Yes	System is OK
		No	Go to step 7.
7	• Check if connection and wire harness between ICU and ECU is normal.	Yes	Go to step 8.
		No	Repair or replace wire harness.
8	• Perform "VIM CHECK" and "ECM CHECK" with the original correct PIN. • Check if ICU and ECU status is "Unlocked"	Yes	Check starting system.
		No	Perform "Neutralization" with the original correct PIN, remove new ECU and ICU, and install original ECU and ICU. Perform "Normal coding" with the original correct PIN. Recheck system.

Limphone (override) procedure

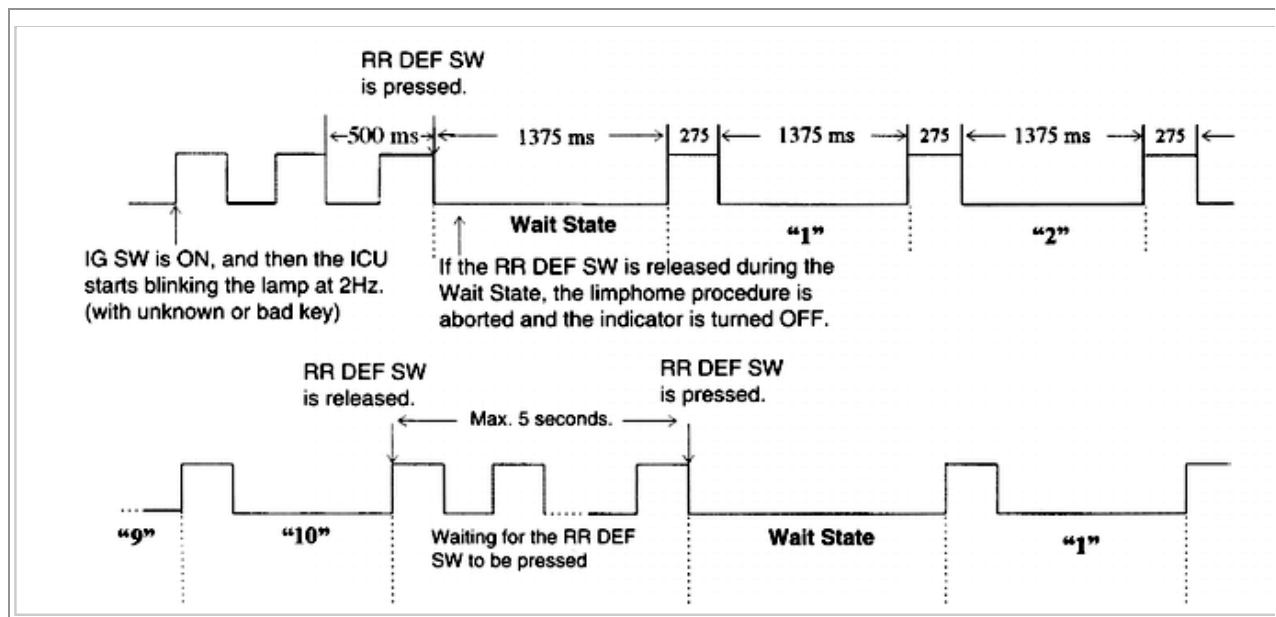
This procedure allows the unlocking of the ICU by entering the PIN via the RR DEF SW, in case the transponder code cannot be read or is unknown. 200ms after ignition-ON, a valid transponder code must have been received, otherwise the ICU will remain "Locked" and the lamp will start blinking at 2Hz. This can happen through a malfunction of the transponder, the reading device or an unknown transponder code.

The following grid indicates weather the passage into override procedure is possible according to the status of the ICU:

ICU Status	Is override procedure possible?
Learnt	Yes
Neutralized	Yes
Virgin	No

The PIN has to be entered using the following procedure:

1. Turn the ignition switch to ON. The "IMMO" indicator will blink at 2Hz (duty cycle ON/OFF=1).
2. Press the RR DEF SW and keep the switch pressed. Then, the "IMMO" indicator will blink at 0.6Hz (duty cycle ON/OFF=0.2) after approximately 1.5 seconds.
3. Release RR DEF SW when the "IMMO" indicator blinks the same times as the number of PIN's (so-called passcode) first digit. The following figure shows signal of IMMO indicator.



A. If the RR DEF SW is released in the following position;

"1" : the digit entered is one,

"2" : the digit entered is two,

...

"9" : the digit entered is nine,

"10" : the digit entered is zero.

B. If the RR DEF SW is not released after tenth flash the indicator goes OFF and exit limphome procedure.

4. Press the RR DEF SW within approximately five seconds.

Then, the "IMMO" indicator will blink at 0.6Hz (duty cycle ON/OFF=0.2) after approximately 1.5 seconds. If the RR DEF SW is not pressed within this time-out, the limphome procedure is aborted and the lamp is turned OFF.

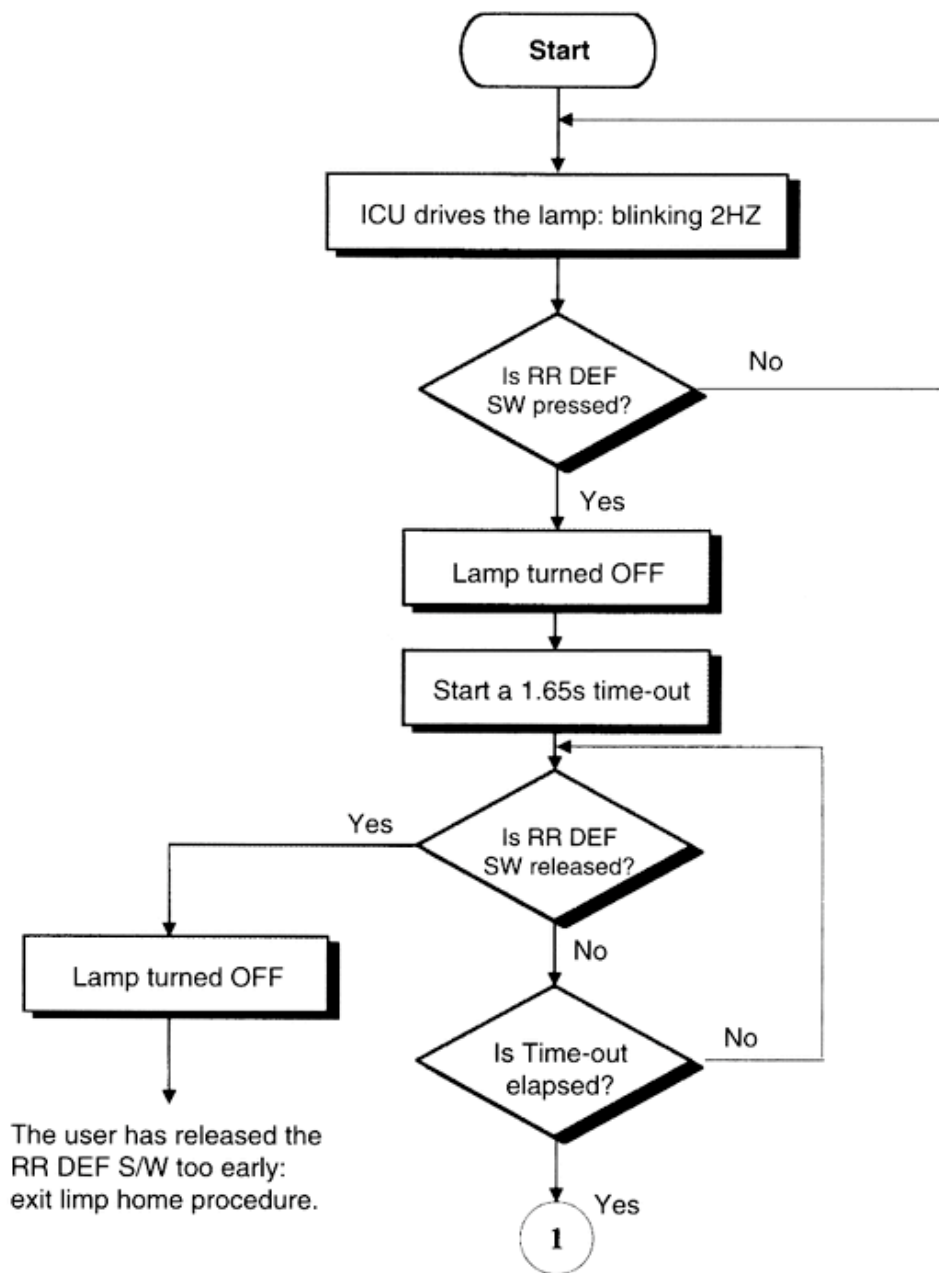
5. Repeat step and step 4 for entering the rest of the PIN's digits.

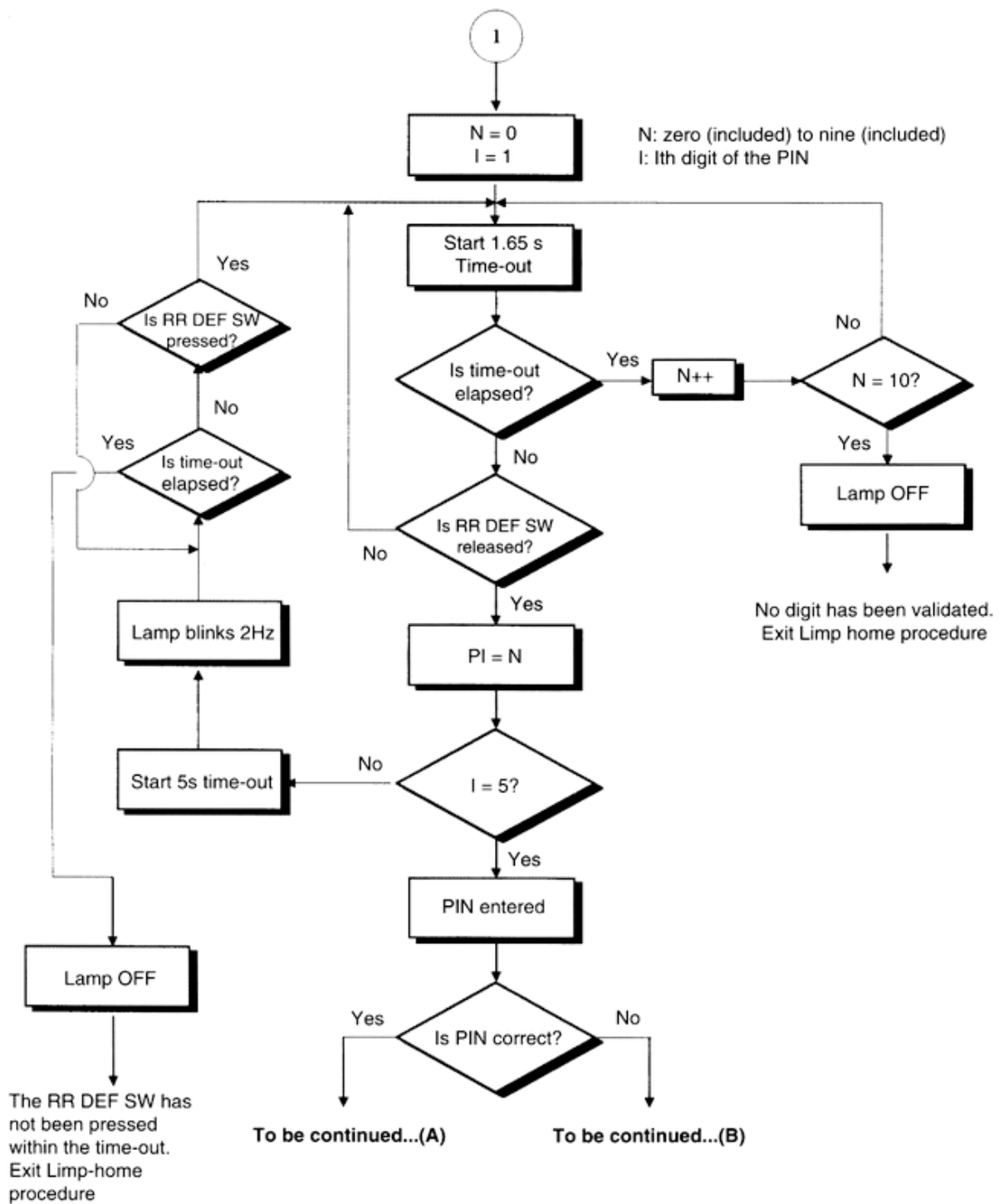
A. If the PIN entered correspond to the PIN of ICU, the "IMMO" indicator starts blinking at 0.5Hz (duty cycle ON/OFF=7) and ICU is unlocked and starting is allowed during approximately 20 seconds.

B. If the PIN entry is incorrect, the "IMMO" indicator is turned OFF and starting is not allowed. Repeat limphome procedure.

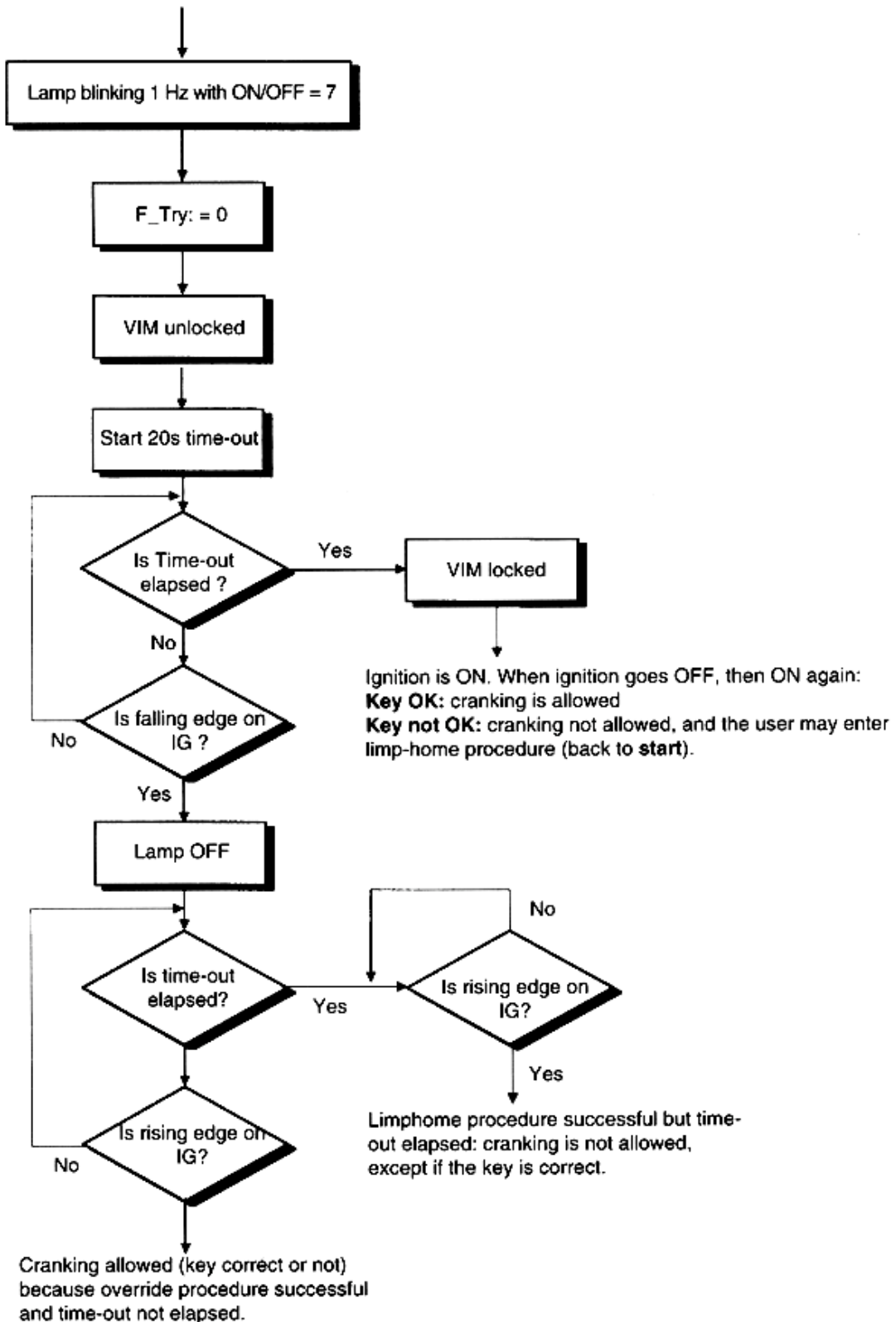
6. Start the engine.

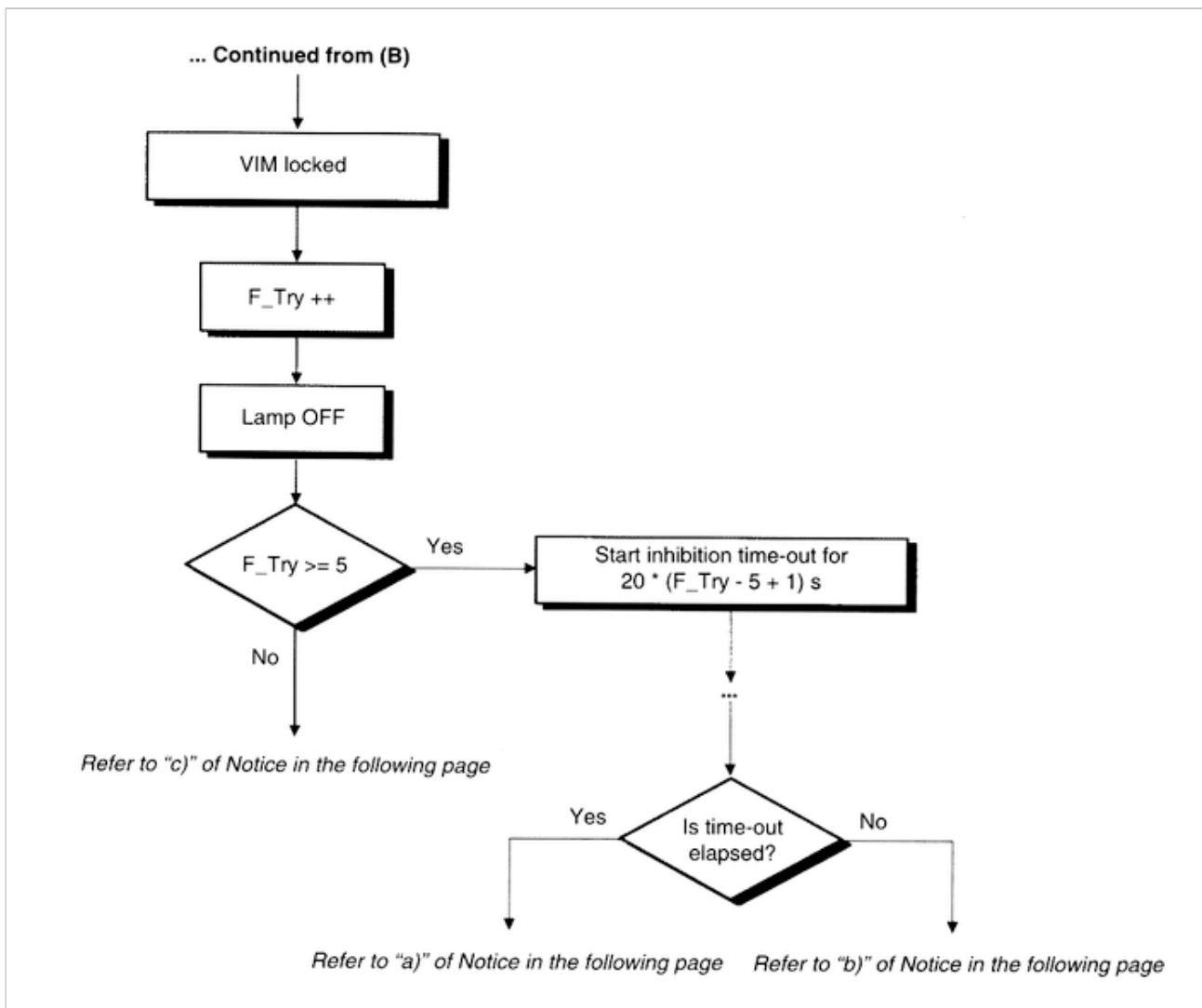
Use the following procedure for only detail reference.





... Continued from (A)





- F_Try : The counter counting wrong PIN is entered.

Influence of the ignition on the PIN entry

From label "Start" to "PIN entered" action, any falling edge on the ignition will turn the lamp OFF and will exit the limp-home procedure.

Exit limp-home procedure

"Exit limp-home procedure" means that, when a rising edge on the ignition occurs:

- The key can be read and is known : F_Try is reset, and engine start is allowed.
- The key can not be read or is unknown : the "IMMO" indicator starts blinking at 2Hz (duty cycle ON/OFF=1)

Inhibition

If a wrong PIN has been entered 5 times in a row, the horn is activated at a 2.5Hz rate for 30 seconds and the system is inhibited for 20 seconds. Inhibition means that engine start is not allowed (ie. the ICU is locked), and that the PIN can not be entered. Each further incorrect try will increase the inhibit time by 20 seconds. The maximum inhibition time is limited to 60 seconds. The inhibition is turned OFF:

- When the time-out is elapsed. In that case, the ICU remains locked, but the user may enter the PIN again.
- When the user turns the ignition ON with a correct key. In that case, the ICU is unlocked.

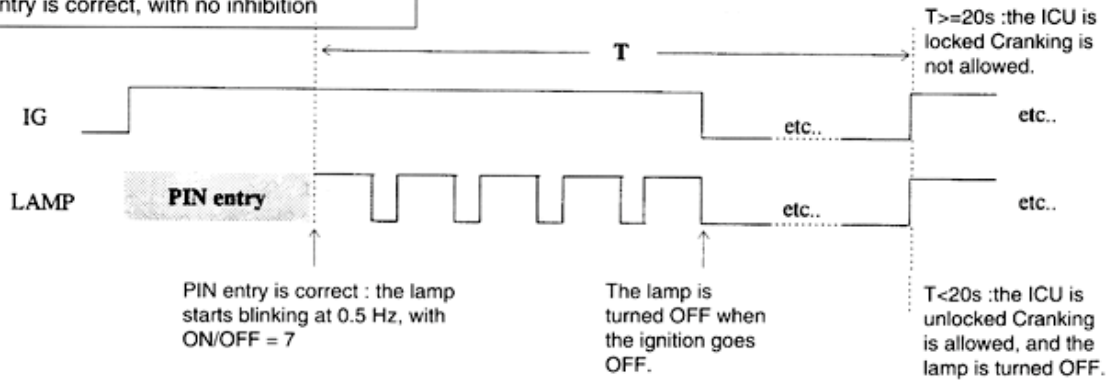
Correct PIN entered

If the entered PIN corresponds to the stored PIN, the ICU is unlocked and the passive arming delay is set to a calibration value (i.e. 20 seconds) specific to the limp-home procedure. The lamp blinks to indicate to the user to switch the ignition OFF and ON again, so that the ICU and the ECM can communicate and "Unlock" the engine. While the PIN is being entered, the ICU is locked. Therefore, the ECM may continuously send ECM's request to the ICU. When the user enters the correct PIN, the ICU becomes unlocked and answers the ECM request with unlock status. "IMMO" indicator goes out. If the ignition is switch off for more than the passive arming delay (i.e. 20 seconds), the ICU is locked again.

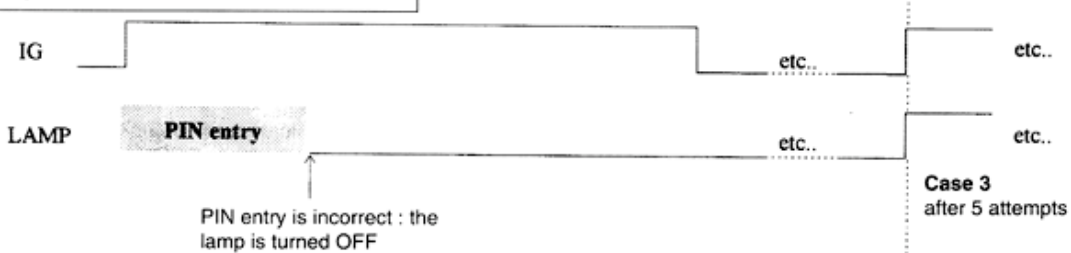
NOTICE

- 1) The inhibition time-out is elapsed.
 - If the ignition had remained ON : the lamp starts blinking at 2Hz, in order to let the user know he may again try to enter the PIN.
 - If the ignition is OFF : a rising edge on the ignition, with a correct key, will allow the engine cranking. If the key can not be read, or is unknown, the inhibition time-out is reinitialized and the lamp is off.
- 2) The inhibition is still active with the ignition ON :
 - the user turn the IGN OFF/ON with a key that can be read and is known : The inhibition is deactivated, and number of PIN wrong entries is reset. Engine cranking is allowed.
 - the key can not be read or is unknown : the inhibition time-out is re-initialized, and engine cranking not allowed. By leaving the ignition ON long enough to let the time-out elapse, we are sent back to "a)" of Notice.
- 3) When the number of wrong PIN entries is less than 5, there is no inhibition.
Therefore, when the user turns the ignition ON :
 - the key can be read and is known : the counter of wrong PIN entries is reset, and engine cranking is allowed.
 - the key can not be read or is unknown : the lamp flashes at 2Hz, duty cycle=0.5..
- 4) While the PIN is being entered, the ICU is locked. Therefore, the ECM may continuously send its request to the ICU : in that case, when the user enters the correct PIN, the ICU becomes unlocked and answers the ECM request with unlocked status, and turns the lamp off : the lamp blinking will not be visible!

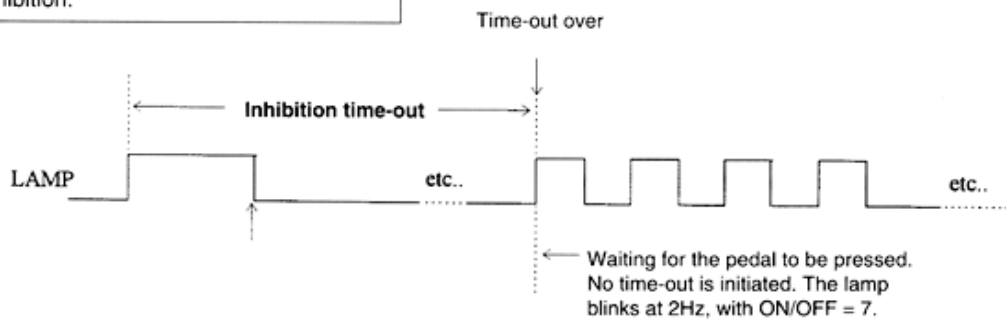
Case 1: the transponder can not be read. The PIN entry is correct, with no inhibition



Case 2: the transponder can not be read. The PIN entry is incorrect, with no inhibition.

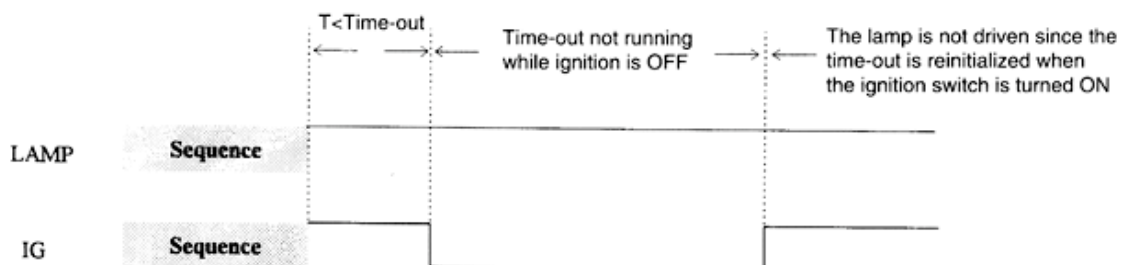


Case 3: the transponder can not be read, with inhibition.



The lamp starts blinking 2 Hz provided the ignition is left ON.

The ignition time-out does not run when the ignition is OFF. The following shows the effect of the ignition on the time-out after a PIN-entry sequence (5th attempt):



Signal modes by the lamp

The following table shows the behavior of the lamp depending on the current mode of operation:

Mode	Lamp	Frequency	Duty-cycle ON/OFF	Duration
ICU locked IG OFF	OFF	-	-	Permanent
ICU unlocked IG OFF	OFF	-	-	Permanent

ICU locked IG OFF	Blinking	2 Hz	1	Until RR DEF SW is pressed or ignition is turned to ON
ICU unlocked IG OFF	ON	-	-	2 seconds
Limphome procedure : digit entry	Blinking	0.6 Hz	0.2	RR DEF SW is released, ignition is turned OFF, or 10 blinks.
After PIN entry (correct code)	Blinking	0.5 Hz	7	Max. 20 seconds or ignition is turned OFF.
After PIN entry (incorrect code)	OFF	-1.25 Hz	-	Permanent
ICU virgin IG ON	Blinking		1	3 blinks (2.4 seconds)
	ON	-	-	2 seconds



General specifications

Power supply

Battery voltage for normal operation is 7V to 16V.

Current consumption

The maximum stand by current is 2.0 mA.

The maximum current through (+) battery pin is 100 mA.

Temperature range

-40°C~85°C : Operational

-40°C ~90°C : Storage

Electrical characteristics of the ASIC

DC operational supply voltage : 6V~16V

5V voltage regulator output : 4.8V~5.2V