A/C-HEATER SYSTEM - AUTOMATIC

1988 Toyota Celica

1988 Automatic A/C-Heater Systems

Celica

* PLEASE READ THIS FIRST *

CAUTION: When discharging air conditioning system, use only approved refrigerant recovery/recycling equipment. Make every attempt to avoid discharging refrigerant into the atmosphere.

DESCRIPTION

The automatic temperature control system consists of electronically controlled A/C components that provided automatic temperature control of vehicle's interior.

OPERATION

AMBIENT TEMPERATURE SENSOR

Ambient sensor is a thermistor that determines temperature of surrounding outside air and sends appropriate signals to amplifier. This signal is compared against signals from in-car temperature sensor.

COOLANT TEMPERATURE SWITCH

Switch senses coolant temperature at heater core. Information is then sent to A/C amplifier to adjust amount of warm air that enters vehicle's interior.

SOLAR SENSOR

Solar sensor functions as a monitor of sunlight. It senses amount of sunlight entering vehicle interior, and then signals power servo to adjust air temperature according to preselected temperature.

TROUBLE SHOOTING

NO BLOWER OPERATION

Problem may be due to the following condition(s): blown fuses, faulty heater relay, faulty blower motor or resistor, faulty power transistor, faulty blower fan relay or blower switch, faulty A/C control assembly, faulty wiring, bad ground, air vent mode control servo, or system amplifier.

NO COOL AIR

Problem may be due to the following condition(s): blown fuses, incorrect refrigerant charge, incorrect A/C compressor belt tension, faulty magnetic clutch relay, faulty pressure switch or A/C compressor, faulty A/C control assembly, faulty/plugged receiver-drier, faulty/plugged condenser, faulty/plugged expansion valve or evaporator, faulty thermistor or A/C amplifier, faulty wiring or bad ground.

NO WARM AIR

Problem may be due to the following condition(s): A/C control cable out of adjustment, faulty heater valve, faulty air mix servomotor, faulty A/C amplifier or system amplifier (push-button type), faulty wiring or bad ground.

INTERMITTENT COOL AIR

Problem may be caused by the following condition(s): incorrect refrigerant charge, slipping A/C compressor belt, faulty magnetic clutch, or plugged/faulty expansion valve or evaporator.

COOL AIR ONLY AT HIGH SPEED

Problem may be caused by the following condition(s): incorrect refrigerant charge, slipping A/C compressor belt, faulty A/C compressor, plugged condenser, or faulty A/C fan motor or fan relay.

INSUFFICIENT COOLING

Problem may be caused by the following condition(s): incorrect refrigerant charge (including air or excessive oil in system), slipping A/C compressor belt, out-of-adjustment A/C control cable, clogged condenser, faulty A/C compressor, faulty A/C fan or relay, faulty expansion valve, faulty A/C control assembly, faulty air mix servomotor, faulty wire harness connections or wiring.

NO BLOWER CONTROL

Problem may be due to the following condition(s): power transistor faulty, blower resistor, heater main relay or blower fan relay faulty, faulty A/C control assembly,blown fuses, faulty wire harness connections or wiring.

INSUFFICIENT COOL AIR VELOCITY

Problem may be caused by the following condition(s): faulty blower motor, blocked air inlet, clogged/frosted evaporator, or air leakage from evaporator case or air duct.

TESTING

A/C AMPLIFIER

Disconnect amplifier. Check continuity or battery voltage on wiring harness connector following test conditions specified in A/C AMPLIFIER TEST chart. See Fig. 1. If circuit resistance/voltage readings are correct, replace A/C amplifier.

A/C AMPLIFIER TEST TABLE

Terminal Connection	(1) Test Condition	Specified Value
14-Ground	.....	Continuity
1-14	A/C Switch On	Battery Voltage
1-14	A/C Switch Off	No Voltage
6-14	A/C Switch On	Battery Voltage
6-14	A/C Switch Off	No Voltage

2-9	.....	.....	..... (2)
13-14	.....	Ignition On	..... Battery Voltage
13-14	.....	Ignition Off	..... No Voltage
4-14	.....	Ignition On	..... Battery Voltage
4-14	.....	Ignition Off	..... No Voltage
10-14	.....	Engine On	..... 10-14 Volts
10-14	.....	Engine Off	..... No Voltage
18-14	.....	Ignition On	..... Battery Voltage
18-14	.....	Ignition Off	..... No Voltage
7-14	.....	Ignition On	..... Battery Voltage
7-14	.....	Ignition Off	..... No Voltage
8-14	.....	Ignition On	..... Battery Voltage
8-14	.....	Ignition Off	..... No Voltage
5-14	.....	Ignition On	..... Battery Voltage
5-14	.....	Ignition Off	..... No Voltage
16-9	.....	.....	..... About 115 Ohms

(1) - Temperature to MAX COOL. "HI" blower speed.
(2) - About 1500 ohms at 77°F (25°C).

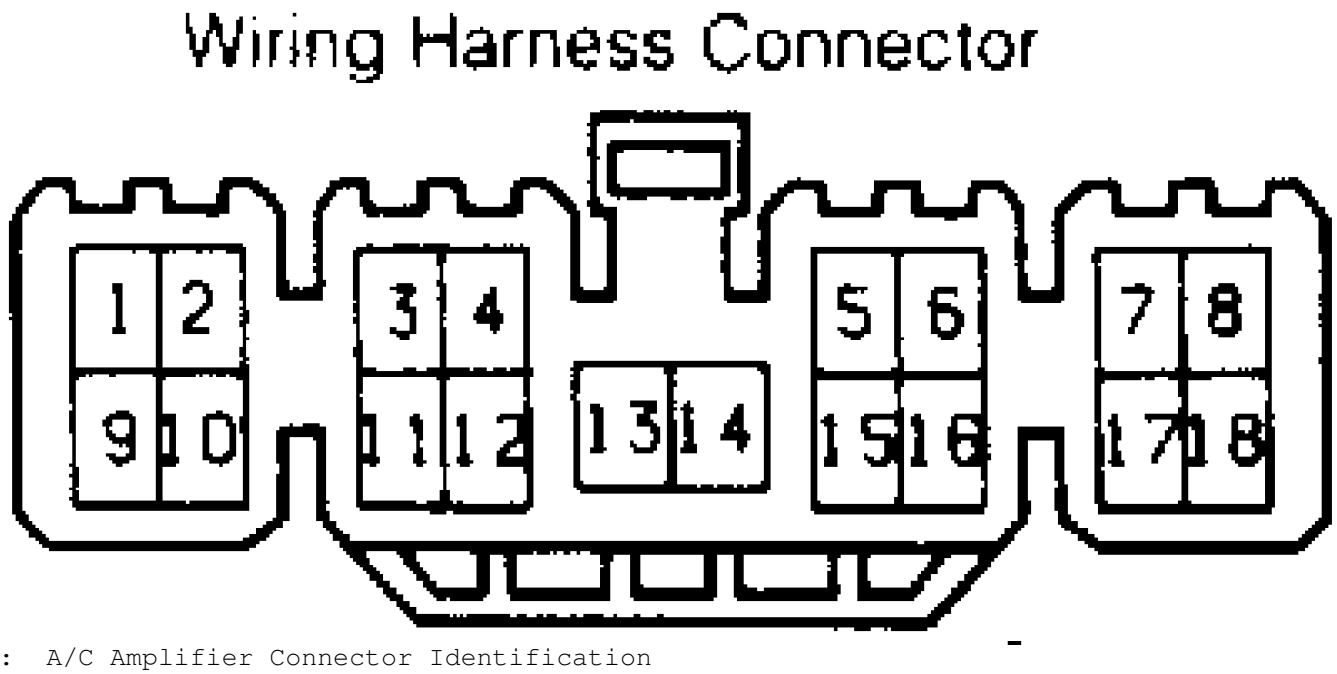


Fig. 1: A/C Amplifier Connector Identification
Courtesy of Toyota Motor Sales, U.S.A., Inc.

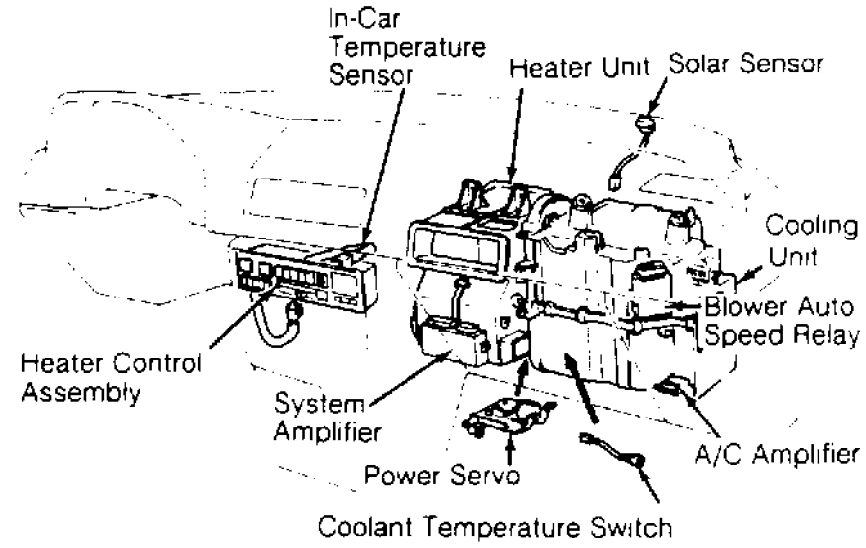
A/C COMPRESSOR

Clutch

Inspect pressure plate and rotor for signs of oil leaks. Check clutch bearings for noise and loss of lubricant. Using an ohmmeter, measure the resistance of stator coil between clutch lead wire and ground (A/C compressor body). Reading should be 3.4-3.8 ohms at 68°F (20°C). If reading is incorrect, replace A/C compressor clutch.

RPM Sensor

Using an ohmmeter, measure the resistance between connector terminals of RPM sensor lead. Reading should be 100-130 ohms at 68°F (20°C). If reading is incorrect, replace RPM sensor.



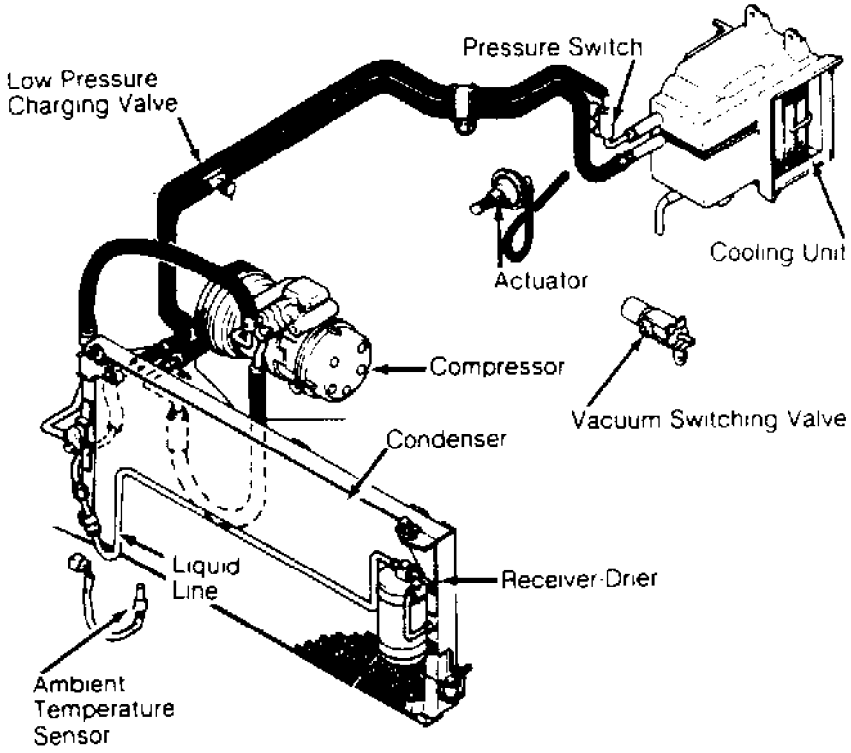


Fig. 2: Automatic A/C-Heater System Components
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C TEMPERATURE CONTROL SYSTEM

1) Remove glove compartment and reinforcement. Disconnect White single terminal connectors at the heater assembly. Connect Green/Black test connector to single White/Red male terminal connector.

2) Place temperature control lever at 77°F (25°C). Start and run engine at idle. Depress "AUTO" fan speed control switch. Verify that guide plate on servo motor is located at "O" mark. See Fig. 3.

3) If lower edge of guide plate is over "R", disconnect wiring harness from system amplifier. Install adjustment lead (terminal No. 10) into terminal No. 9 until position is correct. Put adjustment lead in terminal No. 10.

4) If lower edge of guide plate is over "W", disconnect wiring harness from system amplifier. Install adjustment lead (terminal No. 10) into terminal No. 2 until position is correct. Put adjustment lead in terminal No. 10.

5) Reconnect wiring harness to system amplifier. Unplug check connector from wiring harness. Plug in White/Red connector. Install reinforcement and glove compartment.

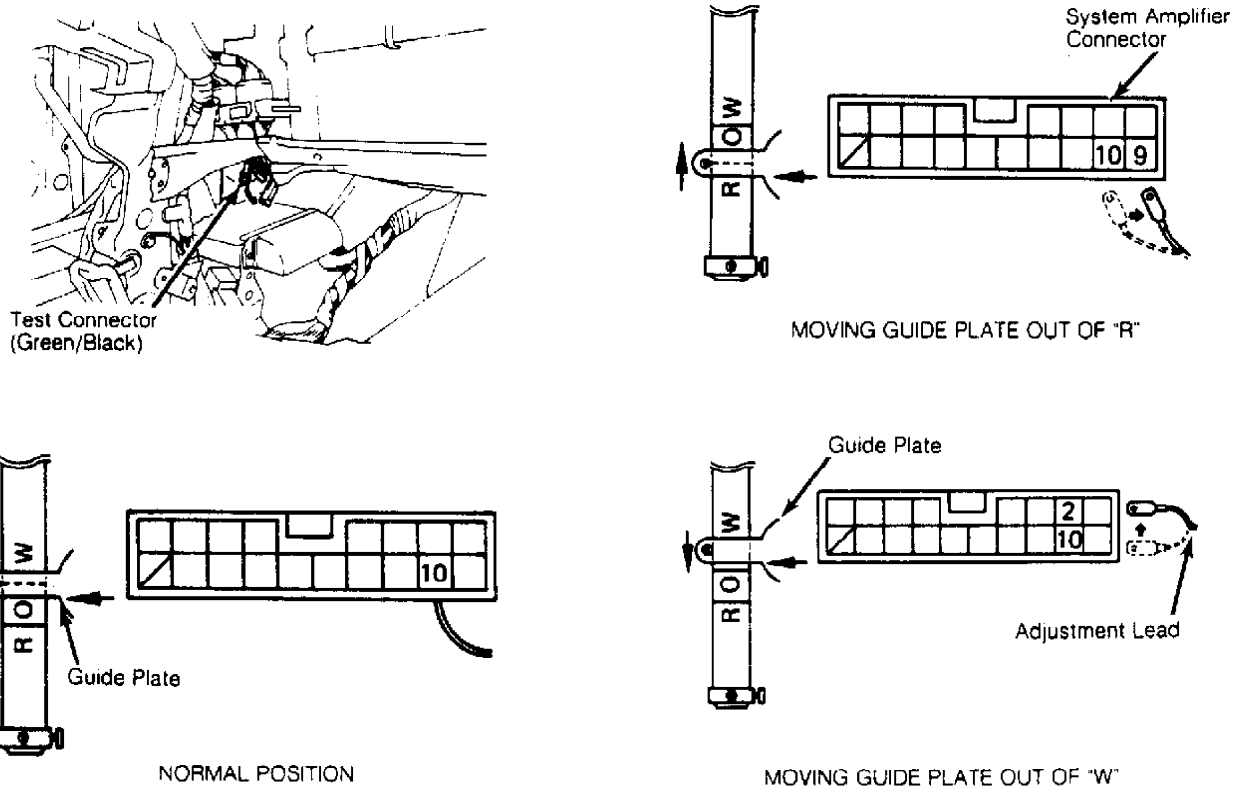


Fig. 3: A/C Temperature Control System Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AMBIENT TEMPERATURE SENSOR

Check ambient temperature sensor resistance. Sensor resistance may vary from 1700 ohms at 77°F (25°C) to 620 ohms at 122°F (50°C).

IN-CAR TEMPERATURE SENSOR

If an open exists in in-car temperature sensor circuit,

system will operate at maximum heating. If sensor circuit has a short, system will operate at maximum cooling. Sensor resistance may vary from 1700 ohms at 77°F (25°C) to 620 ohms at 122°F (50°C).

SOLAR SENSOR

Unplug solar sensor connector and check sensor continuity. If no continuity exists, replace solar sensor.

REFRIGERANT PRESSURE SWITCHES

Dual Pressure Switch

Check refrigerant pressure. Pressure must be more than 30 psi (2.1 kg/cm^2) when ambient temperature is more than 32°F (0°C). Charge A/C system if necessary. Using an ohmmeter, check continuity between terminals of dual pressure switch. Ohmmeter must indicate zero ohms. If continuity exist, replace switch.

High Pressure Switch

Disconnect high pressure switch lead from wiring harness. Using an ohmmeter, check continuity between terminals of high pressure switch. Ohmmeter reading must be zero ohms. If continuity exists, replace switch.

A/C COMPRESSOR CLUTCH RELAY

1) Remove A/C compressor clutch relay. Check that continuity exists between terminals No. 1 and 2. See Fig. 4. No continuity should exist between terminals No. 3 and 4, and terminals No. 1 and 4. If continuity is not as specified, replace relay.

2) If continuity is okay, apply battery voltage across terminals No. 1 and 2. With voltage across relay, continuity should exist between terminals No. 3 and 4. No continuity should exist between terminals No. 1 and 4. If relay operation is not as specified, replace relay.

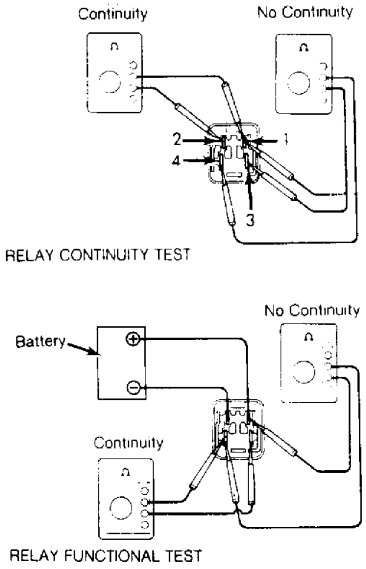


Fig. 4: A/C Compressor Clutch Relay Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CONDENSER FAN RELAYS

No. 1 Condenser Fan Relay

1) Remove relay. Check for battery voltage between body ground and terminals No. 2 and 6 at wiring connector. Check for ground connection between body ground and terminal No. 3 at wiring connector.

2) Check for continuity between relay terminals No. 2 and 6, and between terminals No. 1 and 3. No continuity should exist between terminals No. 1 and 4. See Fig. 5. If continuity is not as specified, replace relay.

3) If continuity is okay, apply battery voltage across terminals No. 2 and 6. With voltage across relay, continuity should exist between terminals No. 1 and 4. No continuity should exist between terminals No. 1 and 3. If relay operation is not as specified, replace relay.

No. 2 Condenser Fan Relay

1) Remove relay. Check for battery voltage between body ground and terminals No. 1 and 4 at wiring connector. Check for continuity between relay terminals No. 1 and 4. No continuity should exist between terminals No. 2 and 4. If continuity is not as specified, replace relay.

2) If continuity is okay, apply battery voltage across terminals No. 1 and 4. See Fig. 5. With voltage across relay, continuity should exist between terminals No. 2 and 3. If relay operation is not as specified, replace relay.

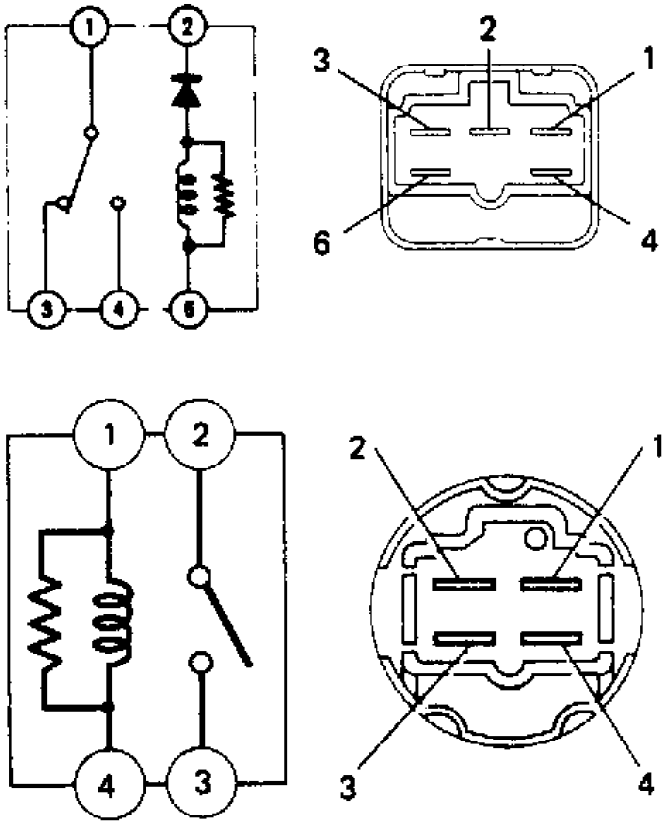


Fig. 5: Condenser Fan Relay Connector Identification
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CONDENSER FAN MOTOR

3S-GE Engine

1) Fan motor operates according to coolant temperature and A/C mode switch position. See 3S-GE ENGINE CONDENSER FAN MOTOR SPECIFICATIONS table.

2) Unplug condenser fan motor connector. Using ammeter and jumper wires, apply battery voltage to connector. Motor should operate smoothly and draw 6.0-7.4 amps. If not, replace condenser fan motor.

3S-GE ENGINE CONDENSER FAN MOTOR SPECIFICATIONS TABLE

A/C Switch Position	A/C Clutch	Coolant Temp. °F (°C)	Fan Motor Speed
Off	Off	194 (90) or Less	Off
On	Off	194 (90) or More	High
On	On	194 (90) or Less	Low
On	On (1)	194 (90) or More	High

(1) - With specified temperature or with refrigerant pressure at 220 psi (15.5 kg/cm²) or more.

3S-FE Engine

1) Fan motor operates according to coolant temperature and A/C mode switch position. See 3S-FE ENGINE CONDENSER FAN MOTOR SPECIFICATIONS table.

2) Unplug condenser fan motor connector. Using ammeter and jumper wires, apply battery voltage to connector. Motor should operate smoothly and draw 6.0-7.4 amps. If not, replace condenser fan motor.

3S-FE ENGINE CONDENSER FAN MOTOR SPECIFICATIONS TABLE

A/C Switch Position	A/C Clutch	Coolant Temp. °F (°C)	Fan Motor Speed
Off	Off	194 (90) or Less	Off
Off	Off	194 (90) or More	Off
On	Off	194 (90) or Less	Off
On	Off	194 (90) or More	High
On	On	194 (90) or Less	Low
On	On (1)	194 (90) or More	High

(1) - With specified temperature or with refrigerant pressure at 220 psi (15.5 kg/cm²) or more.

HEATER A/C CONTROLS

A/C Indicator Light

Disconnect electrical connector at control panel. Connect jumper lead from battery positive terminal to terminal No. B5. Connect jumper lead from battery negative terminal to terminal No. B2. With A/C control switch pushed in, check that indicator light is lit. See Fig. 6

A/C Switch

Disconnect electrical connector at control panel. Using an ohmmeter, check that continuity exists across terminals No. B5 and B6, and terminals No. B6 and B2 with A/C switch in the on position. There should be no continuity when A/C switch is off. See Fig. 6

Blower Switch

Detach multi-pin terminal from blower switch. Use ohmmeter to

check for continuity between terminals at different switch positions. If continuity is not as shown, replace blower switch. See BLOWER SWITCH CONTINUITY table. See Fig. 6.

BLOWER SWITCH CONTINUITY TABLE

Application/ Switch Position	Terminal Continuity
"OFF"	None
"LO"	A16-B23
"I"	A16-B23, A16-B24
"II"	A16-B23, B23-B20
"HI"	A16-B23, B23-B19

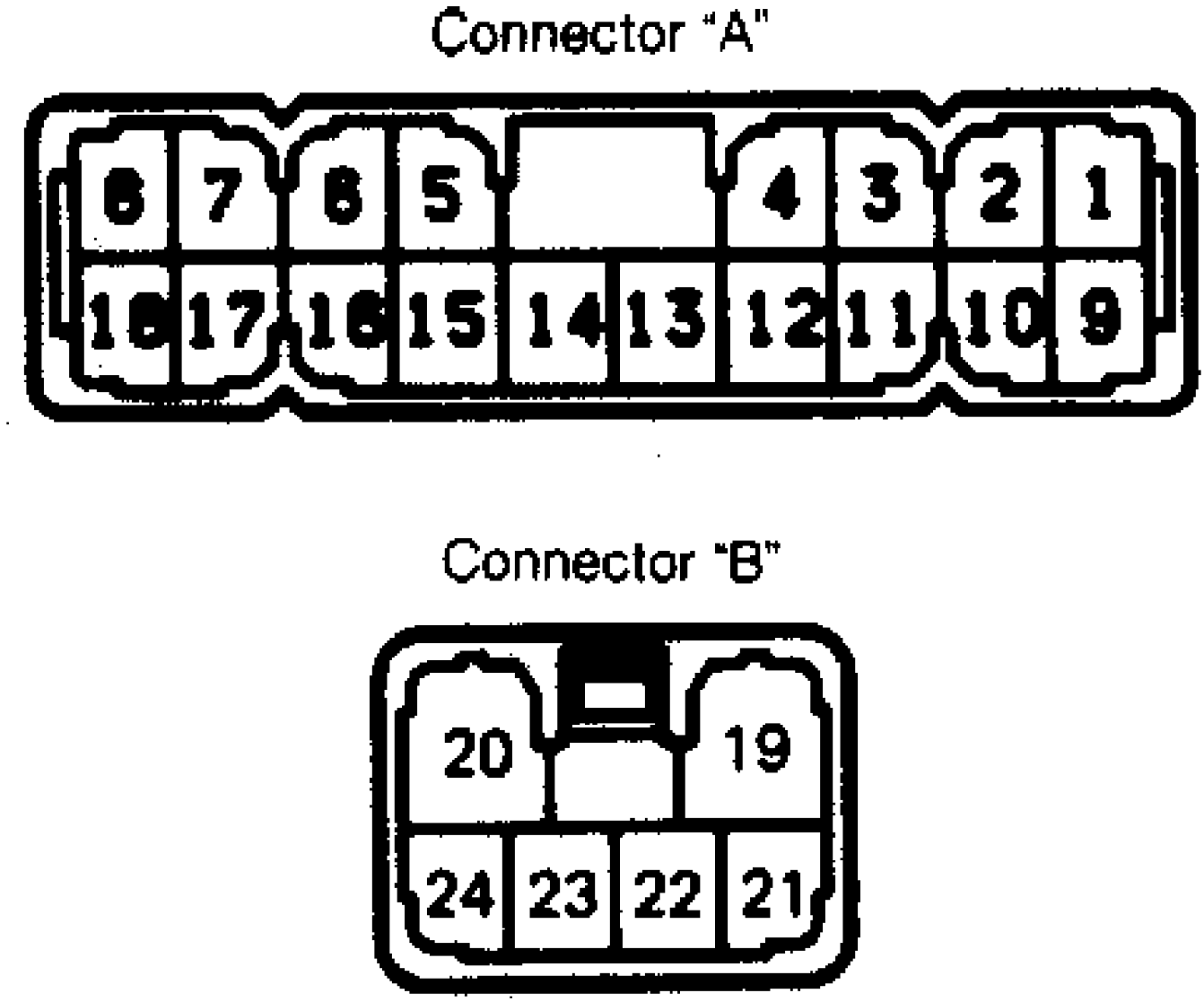


Fig. 6: Control Panel Connector Identification
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Thermister
Disconnect negative battery cable. Remove glove compartment

and under cover. Using an ohmmeter, measure resistance at thermistor connector. Resistance should be 1500 ohms at 77°F (25°C). If reading is not as indicated, replace thermister

Air Vent Control Switch

Disconnect electrical connector at control panel. Using an ohmmeter, check continuity across terminals at all switch positions. See AIR VENT CONTROL SWITCH CONTINUITY table. See Fig. 6

AIR VENT CONTROL SWITCH CONTINUITY TABLE

Switch Position	Terminal Continuity
"AUTO"	A16-A5
"FACE"	A16-A12
"BI-LEVEL"	A16-A17
"FOOT"	A16-A6
"FOOT/DEF"	A16-A13
"DEF"	A16-A11

Air-Mix Control Switch

1) Disconnect electrical connector at control panel. Using an ohmmeter, check resistance across terminals No. A1 and A10. See Fig. 6.

2) With temperature control lever at maximum cool position, ohmmeter should read infinity. With lever in center, ohmmeter should read 1.3-1.7 ohms. With lever in maximum warm position, ohmmeter should read zero ohm.

Recirc/Fresh Control Switch

1) Connect a battery positive jumper lead to terminal No. A2. Connect battery negative jumper lead to terminal No. A16. Recirc indicator light should come on. If light does not come on, replace switch. Remove battery jumper leads. See Fig. 6.

2) Set recirc/fresh switch to fresh position. Using an ohmmeter, check that continuity exists across terminals No. A15 and A16. Check that no continuity exists across terminals No. A14 and A16.

3) Set recirc/fresh switch to recirc position. Check that continuity exists across terminals No. A14 and A16. Check that no continuity exists across terminals No. A15 and A16. If recirc/fresh control switch operation is not as specified, replace switch.

Air Vent Servo Motor

Detach multi-pin terminal from air vent servo motor. Connect a battery positive jumper lead to terminal No. 1. Connect battery negative jumper lead to terminal No. 2. Use ohmmeter or circuit tester to check for continuity between terminals. If continuity is not as shown, replace air vent servo motor. See AIR VENT SERVO MOTOR CONTINUITY table. See Fig. 7.

AIR VENT SERVO MOTOR CONTINUITY TABLE

Switch Position	Terminal Continuity
"FACE"	None
"BI-LEVEL"	10-4, 4-5
"FOOT"	10-6, 6-5
"FOOT/DEF"	6-5, 10-9, 6-10
"DEF"	6-4, 4-3, 6-11, 11-9

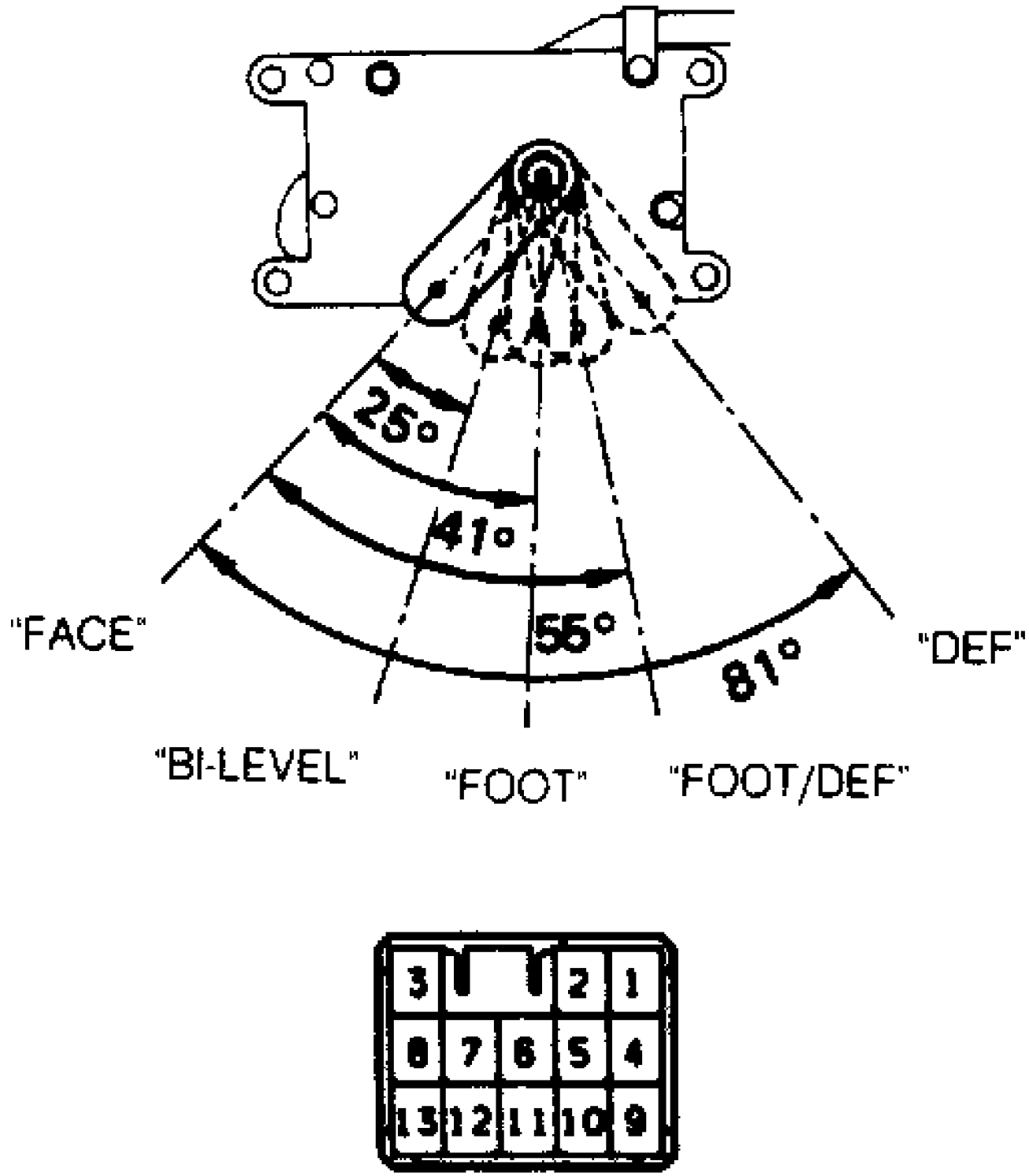


Fig. 7: Air Vent Servo Motor Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Air-Mix Servo Motor

1) Disconnect air-mix servo motor connector. Connect a battery positive jumper lead to terminal No. 2. Connect battery

negative jumper lead to terminal No. 8. Check that servo motor lever moves smoothly from warm to cool. Reverse battery jumper leads. Servo motor lever should move smoothly to warm position. See Fig. 8.

2) Connect an ohmmeter across terminals No. 13 and 15. While operating servo motor in step 1), check resistance. When servo motor is in cool position, ohmmeter should read 1800-2000 ohms. When in warm position, ohmmeter should read 150-250 ohms. If servo motor fails tests in either step, replace servo motor.

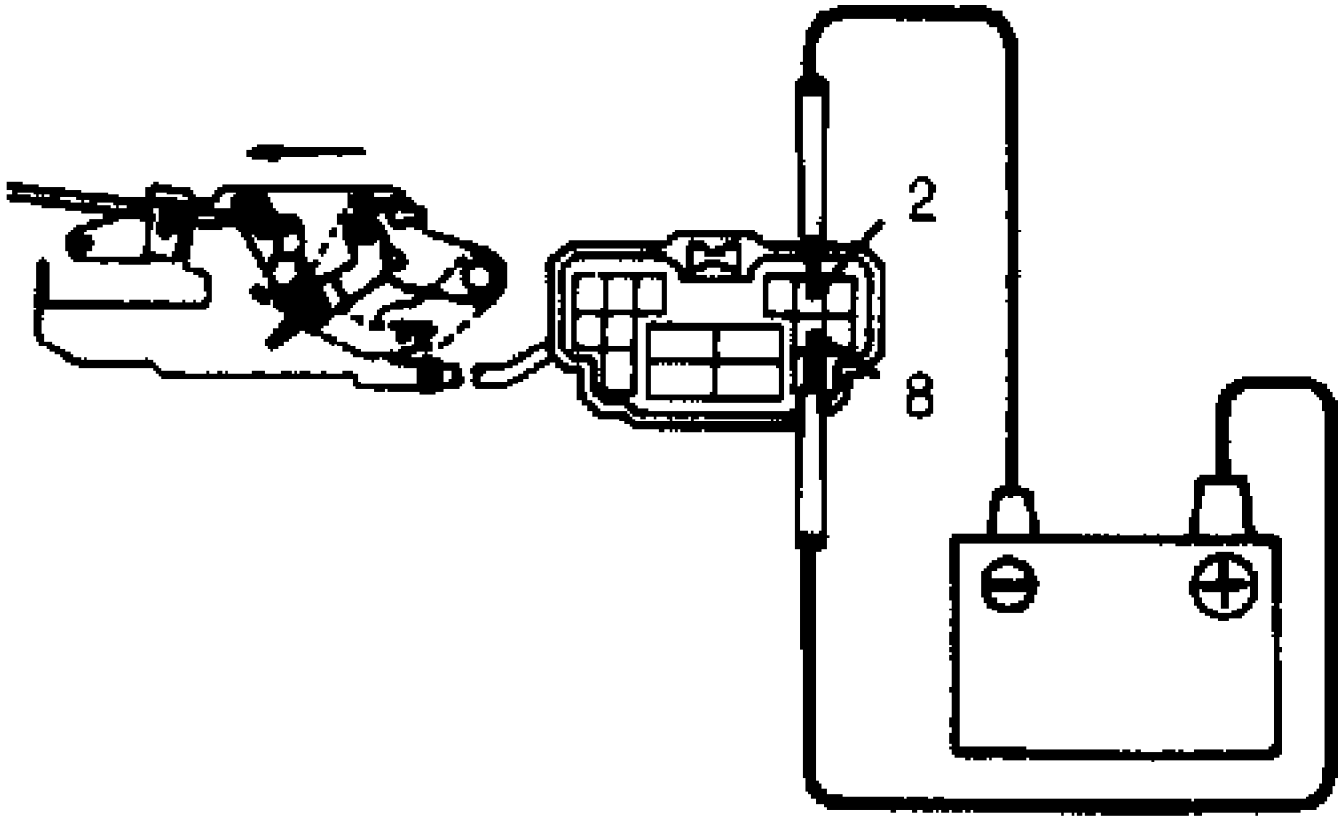


Fig. 8: Air-Mix Servo Motor Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Recirc/Fresh Servo Motor

1) Disconnect recirc/fresh servo motor connector. Connect a battery positive jumper lead to terminal No. 1. Connect battery negative jumper lead to terminal No. 2. Servo motor lever should move smoothly from fresh to recirc. See Fig. 9.

2) Move battery negative jumper lead to terminal No. 3. Servo motor lever should move smoothly from recirc to fresh. If servo motor operation is not as specified, replace servo motor.

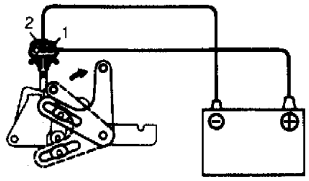


Fig. 9: Recirc/Fresh Servo Motor Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Blower Auto Speed (Relay A)

1) Using an ohmmeter, check that continuity exists across

terminals No. 5 and 7. Check that no continuity exists across terminals No. 3 and 4. See Fig. 10.

2) Using battery jumper leads, connect positive jumper lead to terminal No. 5 and negative jumper lead to terminal No. 7. Using an ohmmeter, check that continuity exists across terminals No. 3 and 4. If readings are not as specified, replace relay.

Blower Auto Speed (Relay B)

1) Using an ohmmeter, check that continuity exists across terminals No. 5 and 8. Check that no continuity exists across terminals No. 2 and 3. See Fig. 10.

2) Using battery jumper leads, connect positive jumper lead to terminal No. 5 and negative jumper lead to No. 8. Using an ohmmeter, check that continuity exists across terminals No. 2 and 3. If readings are not as specified, replace relay.

Blower Auto Speed (Relay C)

1) Using an ohmmeter, check that continuity exists across terminals No. 5 and 6. Check that no continuity exists across terminals No. 1 and 3. See Fig. 10.

2) Using battery jumper leads, connect positive jumper lead to terminal No. 5 and negative jumper lead to No. 6. Using an ohmmeter, check that continuity exists across terminals No. 1 and 3. If readings are not as specified, replace relay.

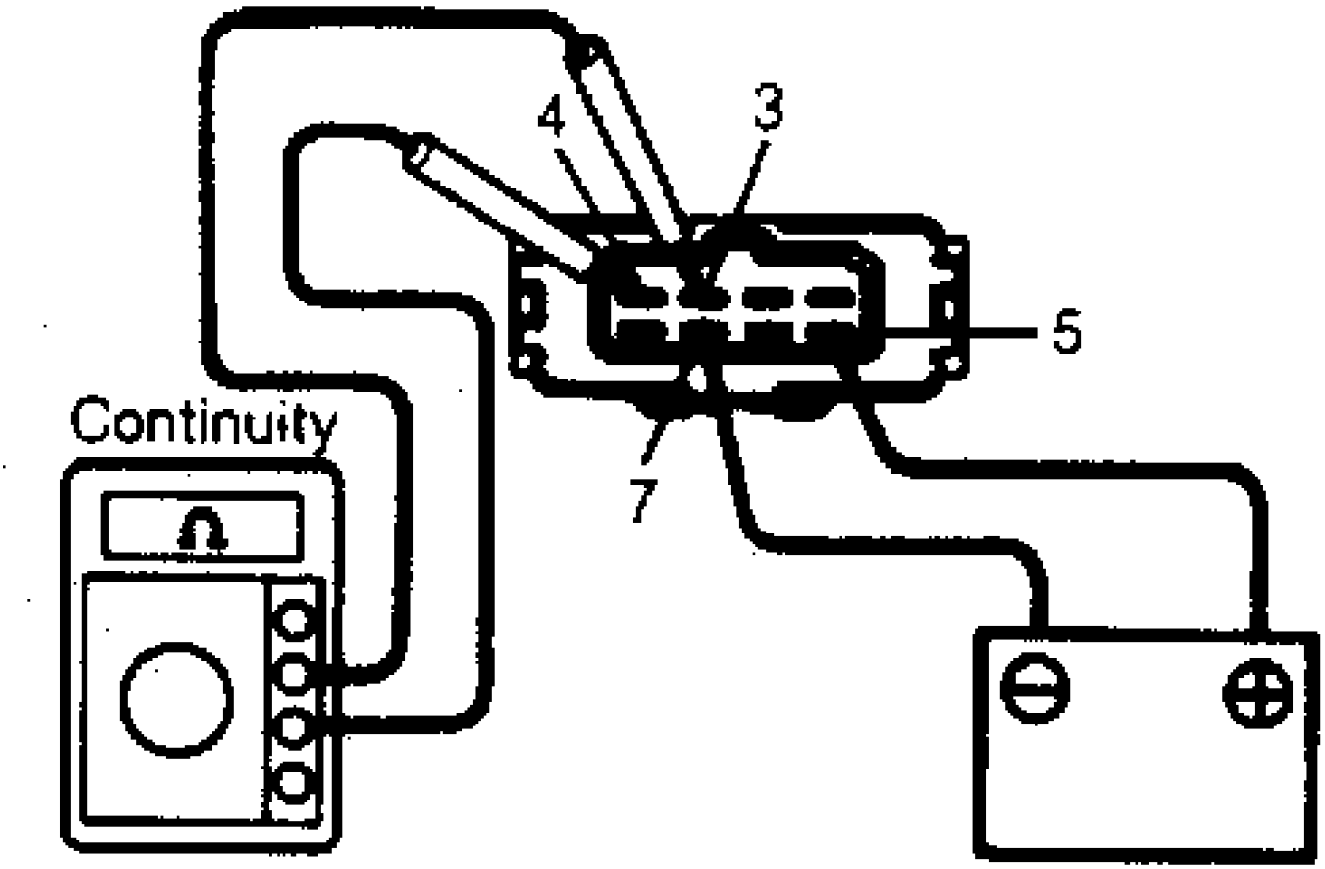


Fig. 10: Blower Speed Control Relay Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.

VACUUM SWITCHING VALVE

1) Remove Vacuum Switching Valve (VSV) from vacuum tank. Apply battery voltage to VSV terminals. See Fig. 11. Blow into pipe "A". Air should come out of pipe "B".

2) Disconnect battery. Blow into pipe "A". Air should come out of filter, and not out of pipe "B". If VSV operation is not as specified, replace valve. If operation is okay, go to next step.

3) Using an ohmmeter, check for continuity between each terminal of VSV and VSV mounting bracket (ground). No continuity should exist. If continuity exists, replace valve.

4) Using an ohmmeter, check for open circuit between VSV terminals. Resistance between terminals should be 38-43 ohms at 68°F (20°C). If resistance is not as specified, replace valve.

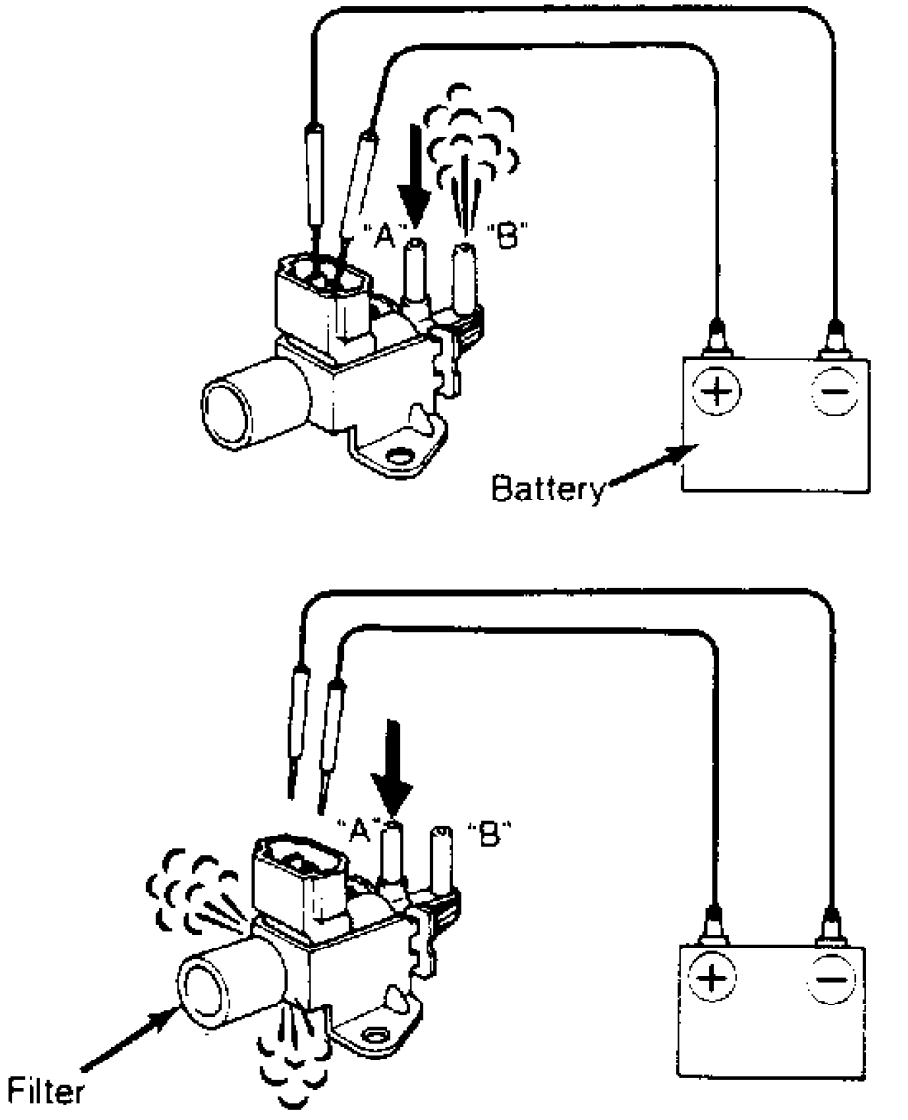


Fig. 11: Vacuum Switching Valve Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

COOLANT TEMPERATURE SWITCH

Remove coolant temperature switch from heater case. Unplug coolant temperature switch connector. Immerse switch in 59-77°F (15-25°C) water. Continuity should exist between terminals No. 1 and 3. Immerse switch in 95-113°F (35-45°C) water. Continuity should exist between terminals No. 2 and 4.

NOTE: Terminal No. 1 and 2 are near connector lock tab. Terminal No. 3 and 4 are opposite tab (flat portion of connector).

REMOVAL & INSTALLATION

COMPRESSOR

Removal & Installation

1) Start and run engine with A/C on for 10 minutes. Disconnect battery cables and remove battery. Disconnect A/C compressor leads from wiring harness. Discharge A/C system using approved refrigerant recovery/recycling equipment.

2) Disconnect hoses from compressor and cap all openings. Loosen drive belt, remove compressor mounting bolts and A/C compressor. To install, reverse removal procedure. Charge A/C system and check for leaks.

RECEIVER-DRIER

Removal & Installation

Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect lines from top of receiver-drier and cap all openings. Remove receiver-drier from holder. To install, reverse removal procedure. If receiver-drier is replaced, add .7 ounces of refrigerant oil to receiver-drier. Charge A/C system and check for leaks.

CONDENSER

Removal & Installation

1) Discharge A/C system using approved refrigerant recovery/recycling equipment. Remove grille and under cover. Remove center brace and horn. Disconnect discharge hose, suction hose, liquid line, and suction hose from condenser. Cap all openings. Remove condenser.

2) To install, reverse removal procedure. If receiver-drier is replaced, add 1.4-1.7 ounces of refrigerant oil to receiver-drier. Charge A/C system and check for leaks.

A/C AMPLIFIER, THERMISTOR, EXPANSION VALVE & EVAPORATOR

Removal

1) Disconnect negative battery cable. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect suction hose from outlet fitting. Disconnect liquid line from inlet fitting. Cap all openings.

2) Remove grommets from inlet and outlet fittings. Remove glove box and reinforcement. Unplug connector and remove evaporator housing. Remove connectors from lower evaporator case.

3) Remove 3 clips, 5 screws, upper case, thermistor holder, lower case, and A/C amplifier. See Fig. 12. Remove evaporator. Disconnect liquid line from inlet fitting of expansion valve. Remove packing and heat sensing tube from suction hose of evaporator. Remove expansion valve.

Installation

To install, reverse removal procedure. If evaporator is replaced, add 1.4-1.7 ounces of refrigerant oil to evaporator. Charge A/C system and check for leaks.

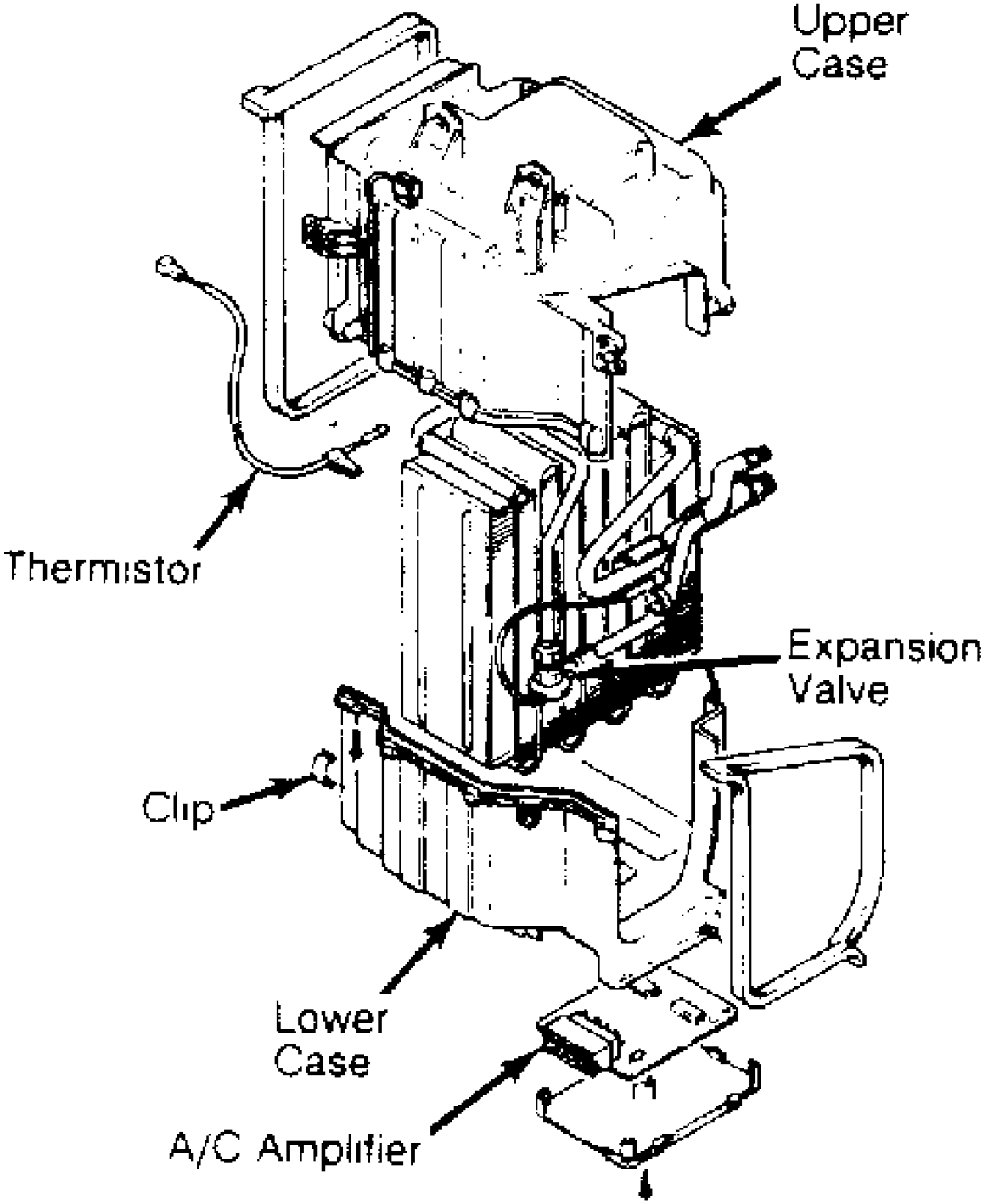


Fig. 12: Exploded View of Evaporator Assembly
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C SYSTEM SPECIFICATIONS

A/C SYSTEM SPECIFICATIONS TABLE

Application	Specification
System Type	Cycling Clutch
Compressor Type	Nippondenso 10-Cylinder
R-12 Capacity	21-27 oz.
Normal System Pressure	
Low Side	21-28 psi (1.5-2.0 kg/cm²)
High Side	206-213 psi (14.5-15.0 kg/cm²)
Drive Belt Deflection	(1)

(1) - Belt deflection is 165-175 lbs. using belt tension gauge. Belt deflection is 120-130 lbs. for used belt.

WIRING DIAGRAMS

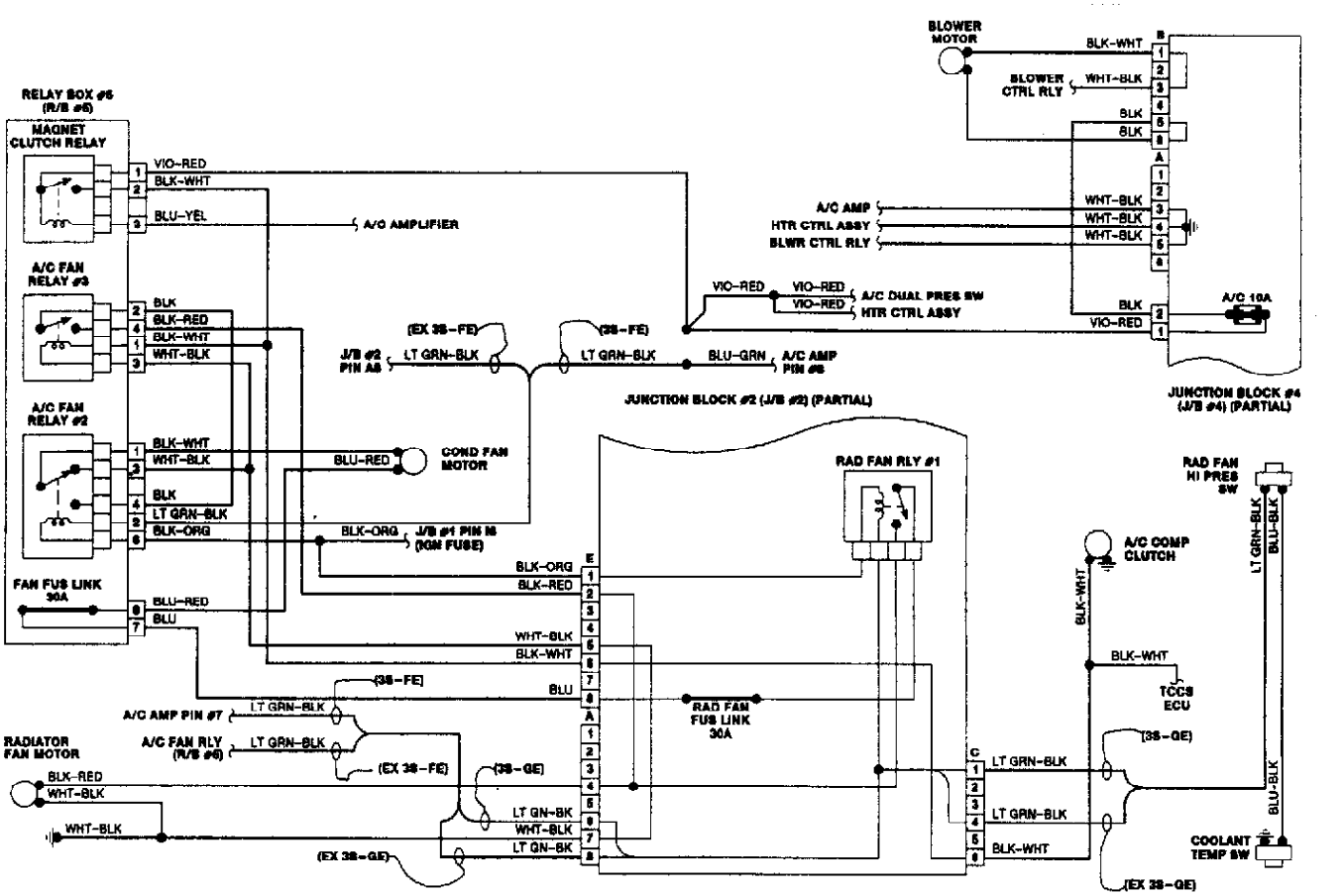


Fig. 13: Auto. A/C-Heater System Wiring Diagram (1 of 2)

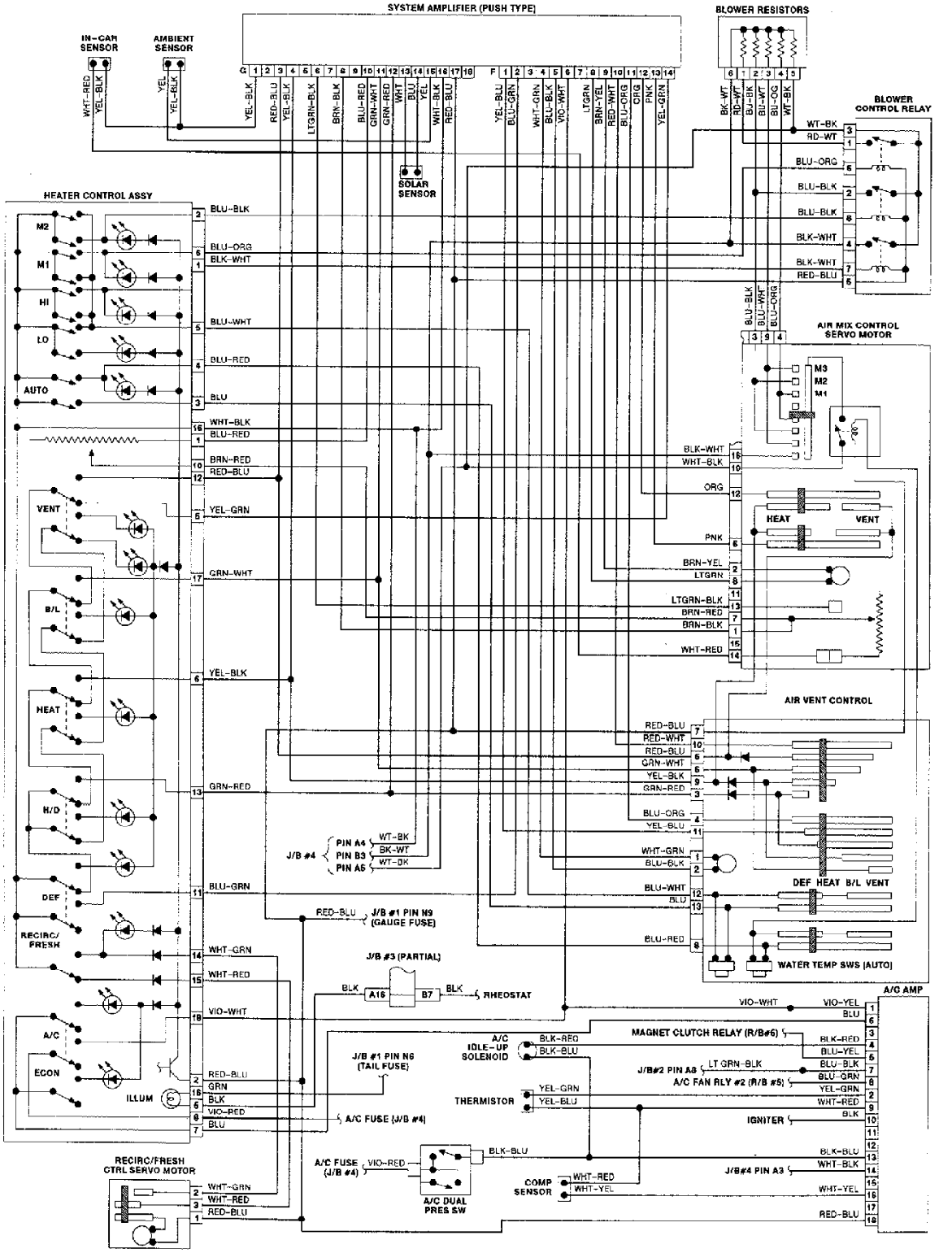


Fig. 14: Auto. A/C-Heater System Wiring Diagram (2 of 2)