

A/C-HEATER SYSTEM - MANUAL

1995 Toyota 4Runner

1995-96 Manual A/C-Heater System

4Runner

* PLEASE READ THIS FIRST *

WARNING: To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.

CAUTION: When battery is disconnected, radio will go into anti-theft protection mode. Obtain radio anti-theft protection code from owner prior to servicing vehicle.

A/C SYSTEM SPECIFICATIONS

SPECIFICATIONS

| Application | Specification |
|-------------------------------------|---|
| Compressor Type | Nippondenso 10-Cyl. |
| Compressor Belt Tension (1) | |
| New Belt (2) | 100-150 lbs. (45.4-68.1 kg) |
| Used Belt | 60-100 lbs. (27.2-25.4 kg) |
| System Oil Capacity (3) | 4.1 ozs. |
| Refrigerant (R-134a) Capacity | 23.2-26.7 ozs. |
| System Operating Pressures (4) | |
| Low Side | 21-36 psi (1.5-2.5 kg/cm ²) |
| High Side | 199-228 psi (14-16 kg/cm ²) |

- (1) - Using a belt tension gauge, measure at longest run of belt.
- (2) - A new belt is one that has been used less than 5 minutes.
- (3) - Use ND-Oil 8 refrigerant oil (Part No. 38885-09109).
- (4) - When ambient temperature is 86-95°F (30-35°C).

DESCRIPTION

Slight variations exist among the various manual A/C-heater systems used. Nippondenso 10-cylinder compressors are used. Compressors only operate in normal operating temperatures and pressures set for each model. An electric condenser fan operates at 2 speeds, depending on system pressure and A/C switch position. An A/C cut-off relay used on 4Runner. Relay is controlled by an engine coolant temperature switch.

System components used vary depending on model. Most systems consist of a fan switch, A/C amplifier, evaporator, thermistor, dual-pressure (high and low) switch, single pressure switch, engine coolant temperature switch, compressor, condenser, receiver-drier and all the necessary pipes and hoses. Air door operation is controlled through cable connections. Compressor operation and associated A/C modes are electrically controlled.

OPERATION

SYSTEM CONTROLS

A/C functions are controlled by sliding levers and A/C on-off switch.

A/C controls operate air supply selection (fresh or recirculating air), mode and temperature selection, and blower speeds. Temperature control lever operates blend air door in A/C-heater unit, to mix both cooled and heated air so desired air temperature can be obtained.

System will provide cooled air when A/C switch is in the ON position and blower motor is in any position except OFF. Temperature control lever should be in the far left (maximum cooling) side of temperature selection scale when maximum A/C operation is desired.

SYSTEM COMPONENTS

NOTE: A/C systems may not use all system components listed.

A/C Cut Relay

An A/C cut relay is used on 3.0L A/T 4WD 4Runner. Relay coil is wired in series with A/C engine coolant temperature switch. A/C operation will be canceled when engine coolant is greater than or less than specified values.

A/C Switch

When A/C switch is pushed, A/C will operate if blower motor control lever or push button is in any position except OFF. When activated, A/C switch allows compressor clutch to engage, operating compressor. On some models, a light will illuminate on the A/C push button when switch is activated.

Dual-Pressure Switch

Dual-pressure switch allows a voltage signal to A/C amplifier indicating that system pressures are within specification. A/C amplifier can then energize compressor clutch if other confirming signals are present. Dual-pressure switch cuts voltage signal to A/C amplifier when refrigerant pressures are greater than or less than control point of the switch. When pressures return to normal operating ranges, power is supplied to compressor clutch to resume operation.

Thermistor

Thermistor is a thermocouple mounted in front of the evaporator (air outlet side) to monitor airflow temperature. A/C amplifier will de-energize compressor clutch when thermistor signal indicates low evaporator output temperature. Evaporator thermistor is used to prevent evaporator from freezing up. A/C amplifier uses information received from thermistor for proper on-off cycling of compressor clutch.

Triple-Pressure Switch

Triple-pressure switch is located below expansion valve. Triple-pressure switch signals A/C amplifier when to operate compressor clutch and condenser cooling fan. Triple-pressure switch high/low pressure cuts voltage signal to A/C amplifier when refrigerant pressures are greater than or less than control point of the switch. When refrigerant pressures return to normal operating ranges, power is supplied to compressor clutch to resume operation. Medium-pressure switch controls A/C condenser fan operation. When refrigerant pressures are within specification, A/C condenser fan will operate.

Vacuum Switching Valve (VSV)

Solenoid valve is used to assist smooth engine operation during compressor's on cycle. The VSV holds throttle slightly above

idle (spring-loaded to this position) when A/C system is operating. When system is off, vacuum is directed to VSV diaphragm to allow throttle to return to normal idle position.

ADJUSTMENTS

NOTE: For control cable adjustments, see HEATER SYSTEM article in the AIR CONDITIONING & HEAT section.

TROUBLE SHOOTING

COOL AIR ONLY AT HIGH SPEED

Check for incorrect refrigerant charge and for loose or broken A/C drive belt. Check for bent or dented refrigerant lines, expansion valve, evaporator, thermistor, and wiring harness, grounds and connectors. Check for clogged condenser.

BLOWER MOTOR DOES NOT OPERATE

Check for blown fuse/fusible link, circuit breaker, blower resistor or blower speed relay. Check for faulty A/C controls, blower switch or faulty blower motor. Check for faulty wiring harness, grounds and connectors.

INSUFFICIENT COOL AIR VELOCITY

Check for faulty blower motor. Check for blocked air inlet. Check for clogged or frosted evaporator. Check for air leakage from evaporator case or air duct. Check for faulty A/C amplifier.

INSUFFICIENT COOLING

Check for incorrect refrigerant charge and incorrect system pressures. Check for slipping A/C drive belt. Check for clogged condenser. Check for plugged receiver-drier.

NO COMPRESSOR OPERATION

Check for incorrect refrigerant charge and for a loose or broken A/C drive belt. Check for A/C fuse, compressor clutch, compressor, pressure switch, heater main relay, A/C switch, blower switch, A/C amplifier, thermistor, and wiring harnesses, grounds and connectors.

TESTING

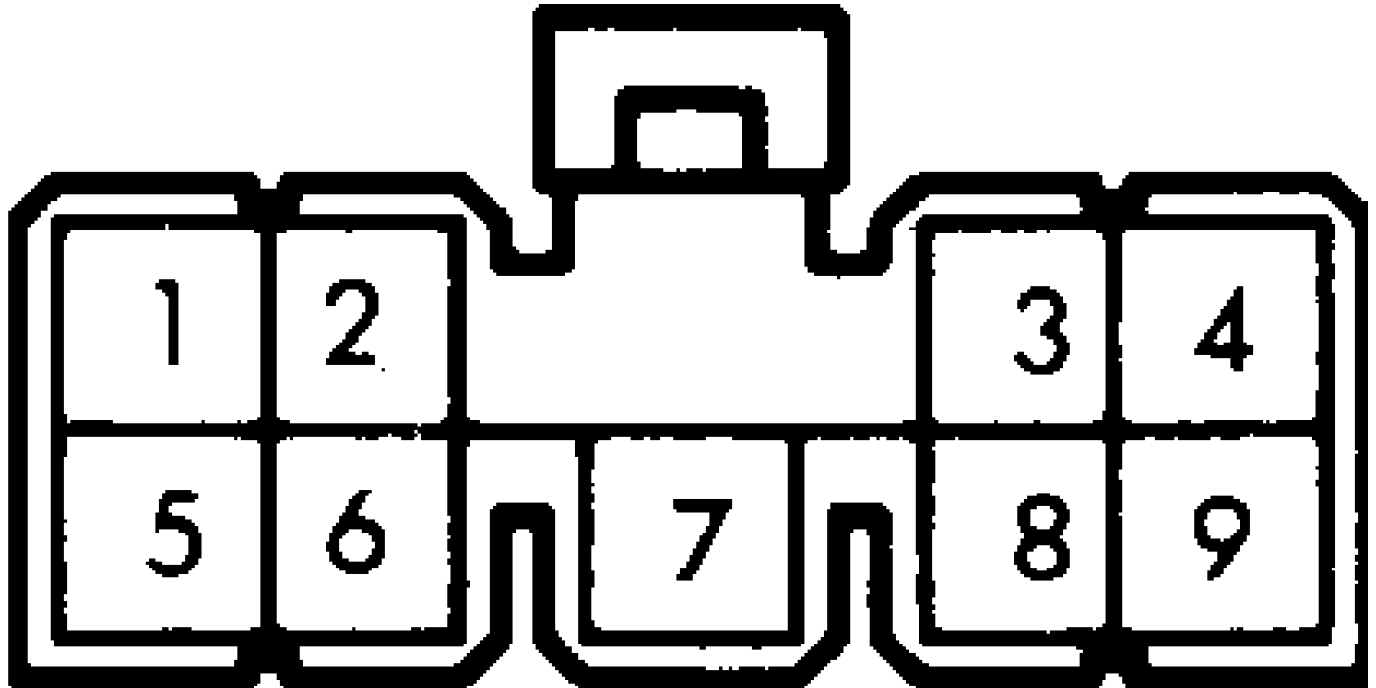
A/C SYSTEM PERFORMANCE

1) Park vehicle out of direct sunlight. Install manifold gauge set and turn A/C controls to recirculated air position, with inlet air temperature at 86-95°F (30-35°C). Start engine and allow it to run at 1500 RPM.

2) Set blower/fan on high speed and temperature control switch set to maximum cooling. Verify high side and low side pressures are within specification. See SPECIFICATIONS table at beginning of article.

A/C AMPLIFIER

Disconnect negative battery cable and wait at least 90 seconds. Disconnect A/C amplifier connector. A/C amplifier is located either on top or front of A/C cooling unit (evaporator housing) behind glove box. Test wire harness side of connector. See Fig. 1. Ensure circuit tests as specified in A/C AMPLIFIER CIRCUIT TEST table. If circuits DO NOT test as specified, repair as necessary.



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Fig. 1: Identifying A/C Amplifier Connector Harness Side Terminals
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C AMPLIFIER CIRCUIT TEST TABLE

| Terminal No. & Test Condition (1) | Specification |
|-----------------------------------|-------------------|
| 7 & 8 | Continuity |
| 8 & Ground | Continuity |
| 3 & 8 | |
| A/C Switch ON | Battery Voltage |
| A/C Switch OFF | Battery Voltage |
| 4 & 8 | |
| A/C Switch ON | Battery Voltage |
| A/C Switch OFF | No Voltage |
| 6 & 8 | |
| Start Engine | About 10-14 Volts |
| Stop Engine | No Voltage |
| 8 & 9 | |
| A/C Switch ON | Battery Voltage |
| A/C Switch OFF | Battery Voltage |
| 2 & 5 | |
| Temp. At Maximum Cooling | Zero Ohms |
| Temp. At Minimum Cooling | About 3 Ohms |

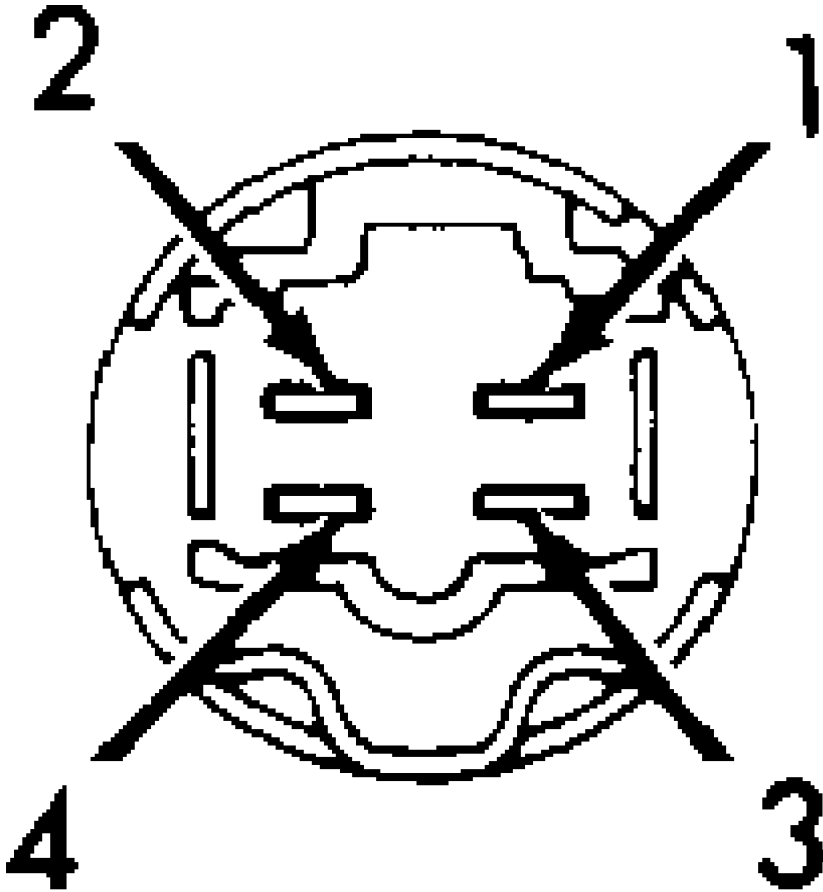
5 & 8 (2) About 1500 Ohms

- (1) - Ensure ignition switch is on, temperature control lever is at the maximum cool position, and blower switch is on HI position.
 - (2) - Test with air temperature at 77°F (25°C).
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A/C CUT RELAY

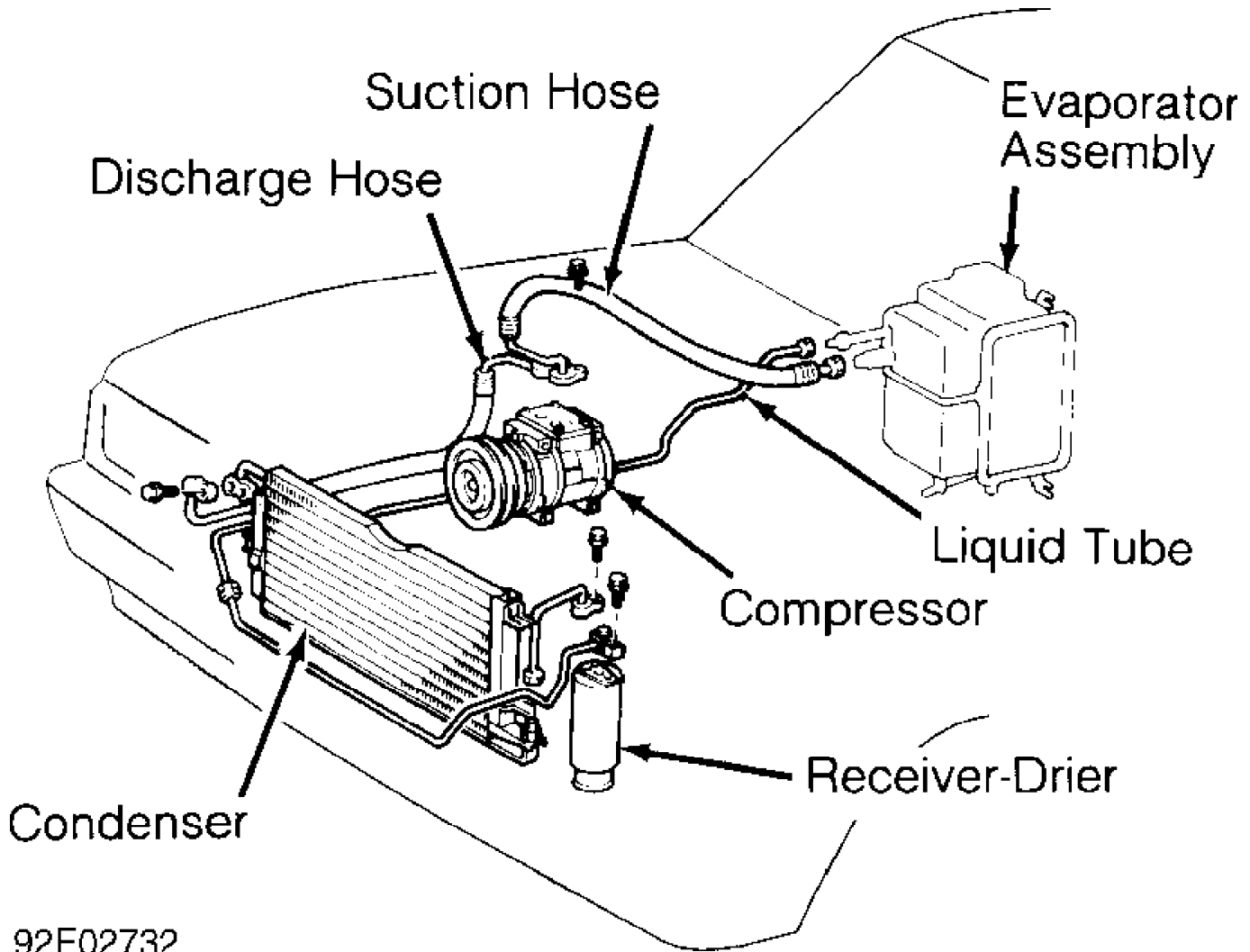
4WD 3.0L With A/T

Remove A/C cut relay. Relay is located on right side of A/C cooling unit. Check continuity between terminals No. 1 and No. 3. See Figs. 2-4. If continuity does not exist, replace relay. Apply battery voltage between terminals No. 1 and No. 3. Check continuity between terminals No. 2 and No. 4. Ensure continuity exists. If continuity does not exist, replace relay.



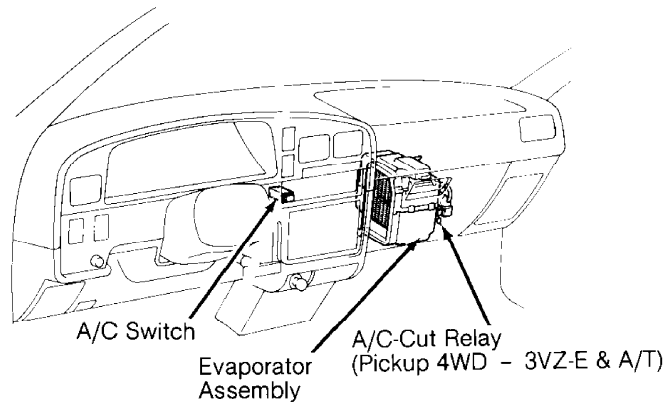
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Fig. 2: A/C-Cut Relay Terminal ID (4Runner)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 3: A/C Component ID - 1 Of 2 (4Runner)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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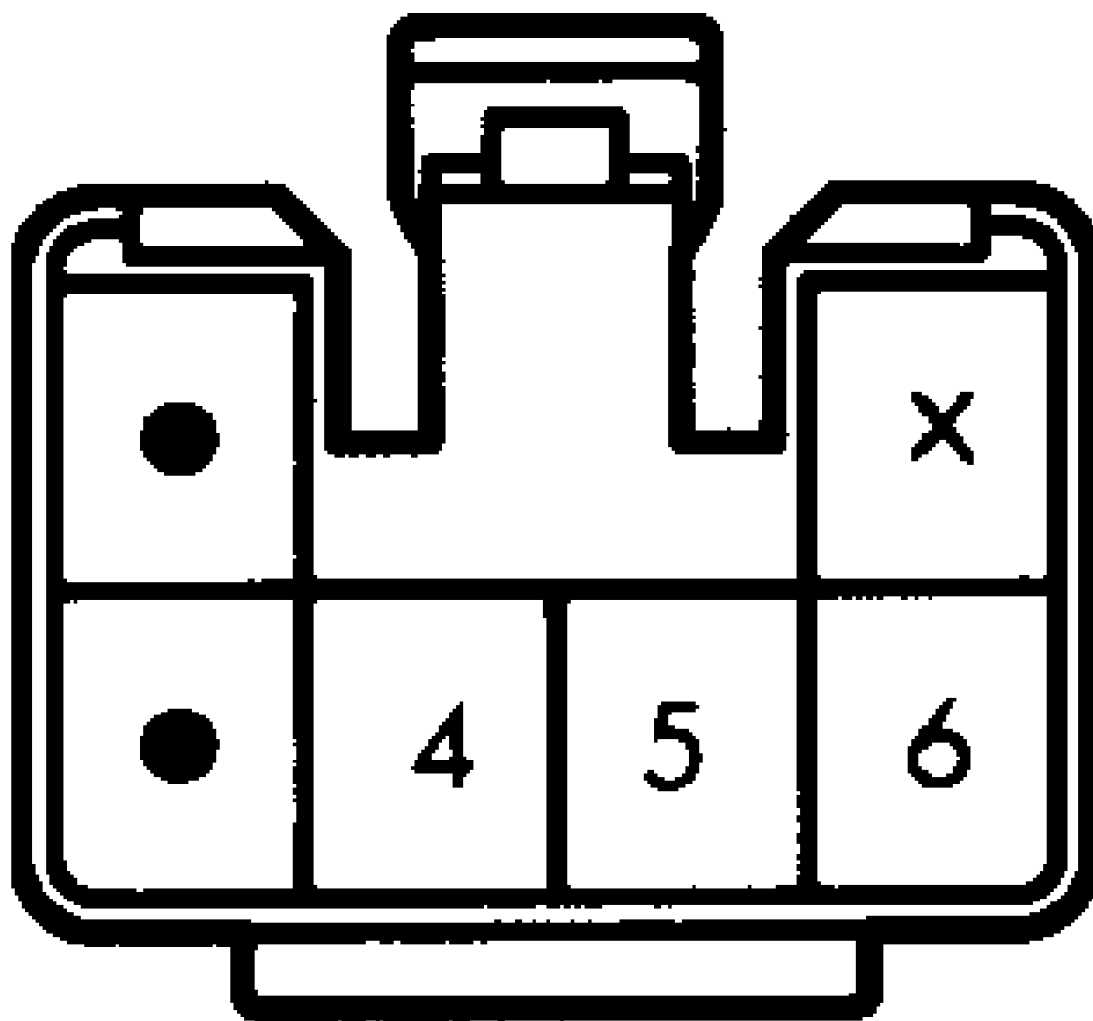
Fig. 4: A/C Component ID - 2 Of 2 (4Runner)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C SWITCH

Disconnect negative battery cable and wait at least 90 seconds. Remove glove box, A/C switch, and disconnect wire harness connector. Check continuity at specified terminals. See A/C SWITCH CONTINUITY table. See Fig. 5. Because A/C switch has a one-way diode, check continuity in both directions before replacing switch.

A/C SWITCH CONTINUITY TABLE

| Switch Position | Between Terminal No. | Result |
|-----------------|----------------------|---------------|
| OFF | | No Continuity |
| ON | 4 & 5 | Continuity |
| ON | 4 & 6 | Continuity |



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Fig. 5: A/C Switch Connector Terminal ID (4Runner)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

CONDENSER FAN MOTOR & SPEED CONTROL RESISTOR

1) Disconnect fan motor 2-pin connector. Apply battery voltage to fan motor side of connector. Fan motor should rotate smoothly and current draw should be 7.3-8.7 amps. If operation is not as specified, replace condenser fan motor.

2) Remove front grille. Locate condenser fan motor speed control resistor next to receiver-drier. Measure resistance between resistor terminals. Resistance should be .54-.66 ohms at 68°F (20°C). If resistance is not as specified, replace resistor.

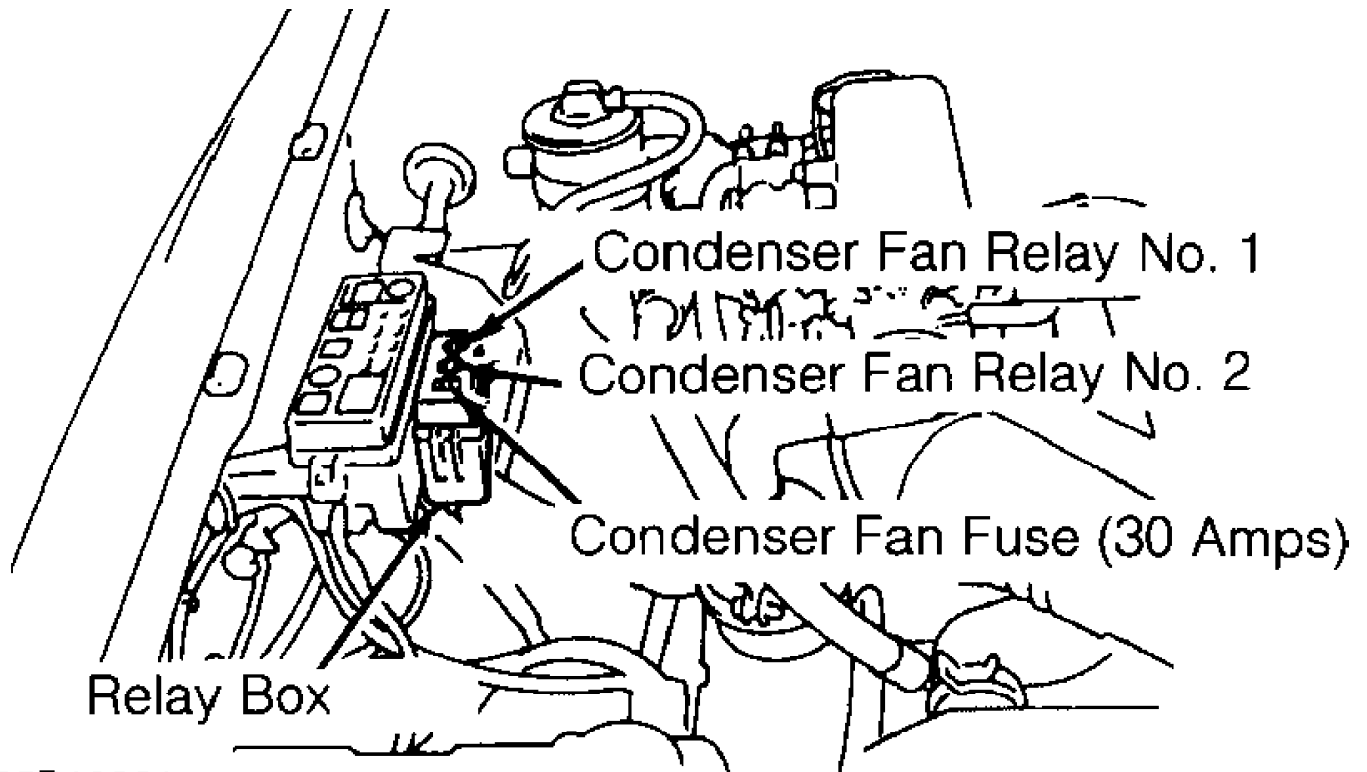
CONDENSER FAN RELAY

Condenser Fan Relay No. 1

Disconnect negative battery cable. Remove relay. Using ohmmeter, check continuity between terminals No. 1 and No. 2, and between terminals No. 3 and No. 4. See Figs. 6 and 7. Ensure continuity exists. If continuity does not exist, replace relay. Apply battery voltage between terminals No. 1 and No. 2. Check continuity between terminals No. 3 and No. 4. Continuity should not exist. If continuity exists, replace relay.

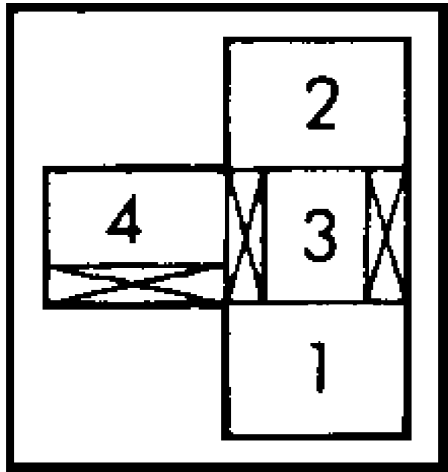
Condenser Fan Relay No. 2

Remove relay. Using ohmmeter, check continuity between terminals No. 1 and No. 2. See Figs. 6 and 8. Continuity should exist. If continuity does not exist, replace relay. Apply battery voltage between terminals No. 1 and No. 2. Check continuity between terminals No. 2 and No. 5. If continuity exists, relay is okay. If continuity does not exist, replace relay.



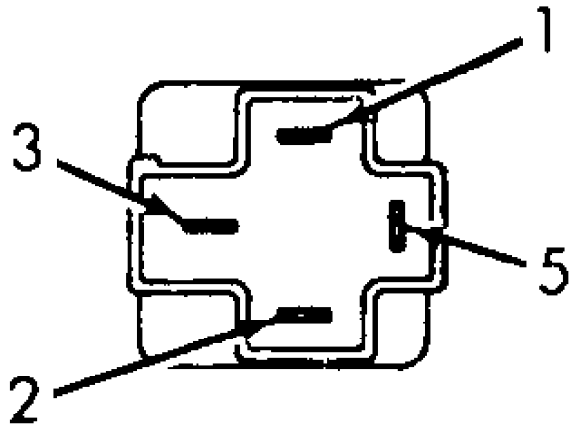
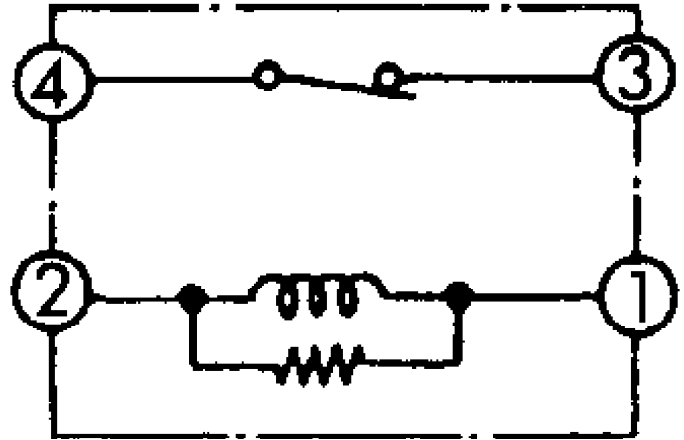
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Fig. 6: Locating Condenser Fan Relays (4Runner)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



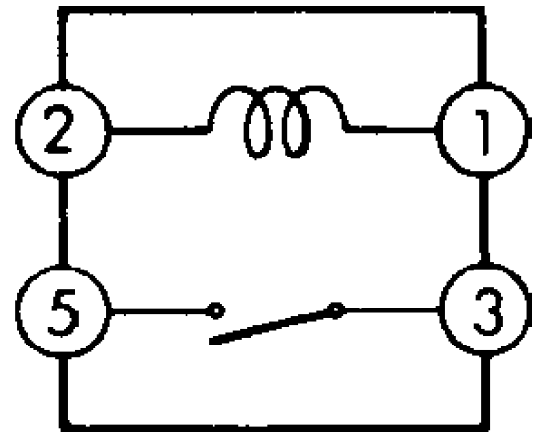
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Fig. 7: Identifying Condenser Fan Relay No. 1 Terminals (4Runner)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 8: Identifying Condenser Fan Relay No. 2 Terminals (4Runner)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



COMPRESSOR CLUTCH

Inspect pressure plate and rotor for signs of oil contamination. Check clutch bearing for noisy operation and grease leakage. Using an ohmmeter, measure resistance of clutch coil between clutch and ground. Resistance should be 3.4-3.8 ohms at 68°F (20°C). If reading is not within specification, replace clutch coil. Apply battery voltage to compressor clutch connector terminal. Ensure compressor clutch is energized. If compressor clutch is not energized, replace clutch coil.

REAR HEATER BLOWER MOTOR

Disconnect rear heater blower motor connector. Using jumper wires, connect battery voltage to terminal No. 1 (Blue/White wire) and connect terminal No. 2 (Blue/Red wire) to ground. Ensure rear heater blower motor operates smoothly. Replace blower motor if operation is not as specified.

REAR HEATER BLOWER MOTOR RESISTOR

Disconnect negative battery cable and wait at least 90 seconds. Remove console box and disconnect rear blower resistor 2-pin connector. Measure resistance between resistor terminals. At 68°F (20°C), resistance should be 3.2 ohms. If resistance is not as specified, replace resistor.

REAR HEATER BLOWER SWITCH

Locate rear heater blower switch in center console. When switch is in LO position, continuity should exist between terminals No. 1 (Blue/Black wire) and No. 4 (White/Black wire). When switch is in HI position, continuity should exist between terminals No. 1 (Blue/Black wire), No. 2 (Blue/Red wire) and No. 4 (White/Black wire). When switch is in off position, continuity should not exist between any terminals. If continuity is not as specified, replace rear heater blower switch.

THERMISTOR

1) Disconnect negative battery cable and wait at least 90 seconds. Remove lower trim panel and glove box. locate 6-pin connector. Using an ohmmeter, measure resistance of thermistor while it is installed.

2) Measure resistance between 6-pin connector terminals No. 1 (Yellow/Green wire) and No. 3 (White/Black wire).

3) Resistance should be 1500 ohms at 77°F (25°C) ambient temperature. If resistance is not within specification, replace thermistor. If resistance is as specified, go to next step.

4) Remove evaporator case. See EVAPORATOR ASSEMBLY under REMOVAL & INSTALLATION. Disassemble evaporator case, and remove thermistor. Check thermistor operation. Submerge thermistor at least 3.94" deep in cold water. See Fig. 9.

5) Place thermometer in water and measure resistance of thermistor at various temperatures. Use ice or hot water to vary water temperature. If readings are not within specification, replace thermistor. See THERMISTOR RESISTANCE VALUES table.

THERMISTOR RESISTANCE VALUES TABLE

| Water Temperature °F (°C) | Ohms |
|---------------------------|-----------|
| 77 (25) | 1300-1700 |
| 68 (20) | 1700-2100 |
| 59 (15) | 2200-2600 |
| 50 (10) | 2900-3300 |
| 41 (5) | 3700-4200 |
| 32 (0) | 4600-5100 |

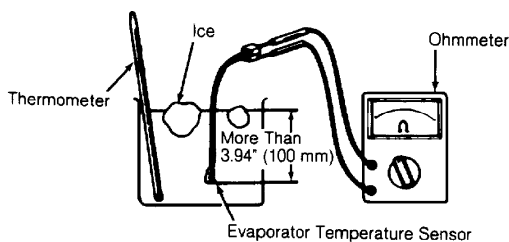


Fig. 9: Testing Thermistor
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

TRIPLE-PRESSURE SWITCH

HIGH/LOW PRESSURE SWITCH SPECIFICATIONS TABLE

| Pressure psi (kg/cm ²) | System Operation | Continuity |
|------------------------------------|------------------|------------|
| Increasing To 33 (2.3) | Off | No |
| Decreasing To 28 (2.0) | On | Yes |
| Decreasing To 370 (26.0) | Off | No |
| Increasing To 455 (32.0) | On | Yes |

MEDIUM-PRESSURE SWITCH SPECIFICATIONS TABLE

| Pressure psi (kg/cm ²) | System Operation | Continuity |
|------------------------------------|------------------|------------|
| Increasing To 220 (15.5) | On | Yes |
| Decreasing To 178 (12.5) | Off | No |

Compressor Clutch Control

1) Disconnect negative battery cable and wait at least 90 seconds. Install manifold gauge set. Remove glove box. Locate pressure switch 6-pin connector at top of evaporator assembly. Disconnect pressure switch 6-pin connector. Turn A/C switch off.

2) Check that continuity exists between switch terminals No. 2 (Blue/White wire) and No. 6 (Red/Green wire) when system pressure is 28-455 psi (2-32 kg/cm²). Continuity should not exist when system pressure is less than 28 psi (2 kg/cm²) or greater than 455 psi (32 kg/cm²).

Condenser Fan High Speed Control

1) Disconnect negative battery cable and wait at least 90 seconds. Install manifold gauge set. Remove glove box. Locate pressure switch 6-pin connector at top of evaporator assembly. Disconnect pressure switch 6-pin connector. Turn A/C switch off.

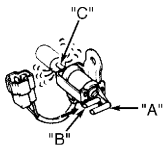
2) Check that continuity exists between switch terminals No. 4 (Black/White wire) and No. 5 (Green/White wire) when system pressure is less than 178 psi (12.5 kg/cm²). Continuity should not exist when system pressure is greater than 220 psi (15.5 kg/cm²).

VACUUM SWITCHING VALVE (VSV)

1) Remove VSV. Connect battery voltage to VSV terminals. Blow into fitting "A". See Fig. 10. Ensure air comes out of fitting "B" but does not come out of fitting "C".

2) Disconnect battery from VSV. Blow into fitting "B". Ensure air comes out of fitting "C" and does not come out of fitting "A".

3) Using an ohmmeter, ensure continuity does not exist between each terminal and VSV body. Measure resistance at both terminals. Resistance should be 37-42 ohms at 68°F (20°C).



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Fig. 10: Testing Vacuum Switching Valve (4Runner)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REMOVAL & INSTALLATION

NOTE: For removal and installation procedures of heater components, see HEATER SYSTEM article in the AIR CONDITIONING & HEAT section.

COMPRESSOR

Removal

1) If possible, run A/C system for 10 minutes. Disconnect negative battery cable and wait at least 90 seconds. On 4Runner equipped with 3.0L engine, remove power steering pump. On all models, disconnect compressor clutch electrical connector, and temperature switch (if equipped).

2) Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect compressor hoses and cap hose ends to keep moisture out of system. Remove fan shroud and loosen compressor drive belt.

3) Remove compressor mounting bolts. Remove compressor.

Installation

To install, reverse removal procedure. Tighten mounting bolts and compressor hoses to specified torque. See TORQUE SPECIFICATIONS. Evacuate, recharge and leak test system.

CONDENSER

Removal

1) Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect negative battery cable and wait at least 90 seconds. Remove clearance lights, front grille, and hood lock brace.

2) Disconnect A/C lines from condenser. Plug all openings. Remove condenser fan motor. Remove mounting bolts and condenser.

Installation

To install, reverse removal procedure. Tighten mounting bolts and condenser hoses to specified torque. See TORQUE SPECIFICATIONS. If installing a new condenser, add 1.4-1.7 ounces of refrigerant oil to compressor. Evacuate, recharge and leak test system.

EVAPORATOR ASSEMBLY

Removal

1) Disconnect negative battery cable and wait at least 90 seconds. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect inlet lines, outlet lines and grommets from evaporator. Plug openings.

2) Disconnect electrical leads from evaporator. Remove glove box and lower trim panel. Remove evaporator assembly.

Disassembly

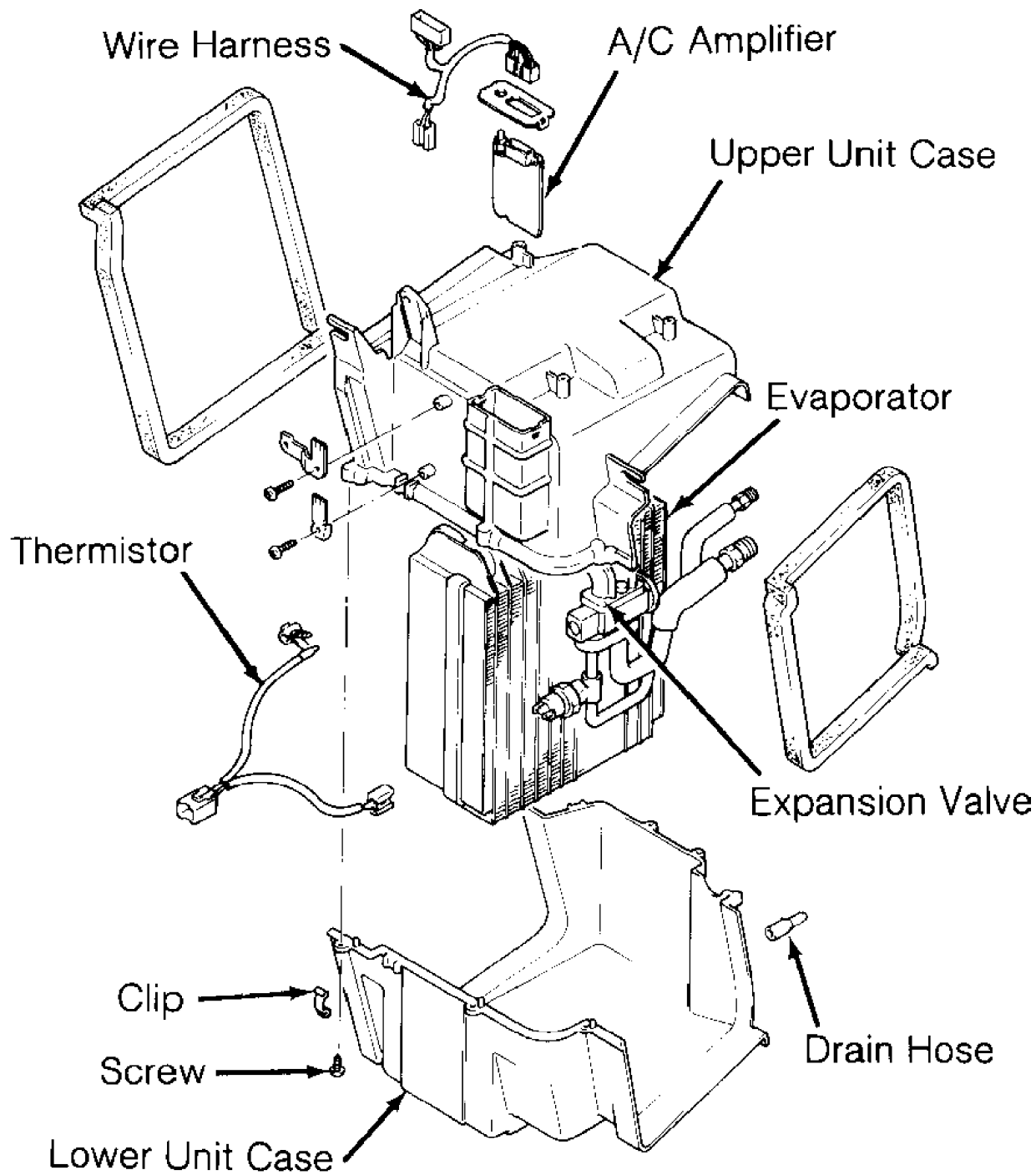
1) Release spring clips holding covers together. Remove any screws at case joints. Separate upper and lower cases from evaporator core. Remove thermistor together with holder. See Fig. 11.

2) Remove heat insulator from outlet tube. Remove high-side (inlet) line from expansion valve, and remove expansion valve. Remove pressure switch (if equipped).

Reassembly & Installation

To reassemble and install evaporator assembly, reverse disassembly and removal procedures. If installing a new evaporator

core, add 1.4-1.7 ounces of refrigerant oil to core before installing. Evacuate, recharge and leak test system.



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Fig. 11: Exploded View Of Evaporator Assembly (4Runner)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EXPANSION VALVE

Removal & Installation

Evaporator must be removed in order to remove expansion valve. See EVAPORATOR ASSEMBLY under REMOVAL & INSTALLATION.

RECEIVER-DRIER

Removal

Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect negative battery cable and wait at least 90 seconds. Remove clearance lights and front grille. On all models, remove A/C lines from receiver-drier. Plug all openings. Remove mounting bolts and receiver-drier.

Installation

To install, reverse removal procedure. If installing a new receiver-drier, add 0.7 ounce of refrigerant oil to compressor. Evacuate, recharge and leak test system.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

| Application | Ft. Lbs. (N.m) |
|--|----------------|
| Compressor & Bracket-To-Engine Bolts | 18 (24) |
| Compressor Bracket-To-Engine Bolts | 27 (37) |
| Drive Belt Idler Pulley Bolt | 29 (39) |
| Lower Compressor Bracket (A/T) | 34 (46) |
| Refrigerant Hoses/Lines | |
| Compressor | 18 (24) |
| Expansion Valve | 17 (23) |
| Evaporator (Suction) | 24 (33) |
| Evaporator (Liquid) | 10 (14) |

- (1) - Torque specification is 48 INCH lbs. (5.4 N.m).
 - (2) - Torque specification is 84 INCH lbs. (9.5 N.m).
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WIRING DIAGRAMS

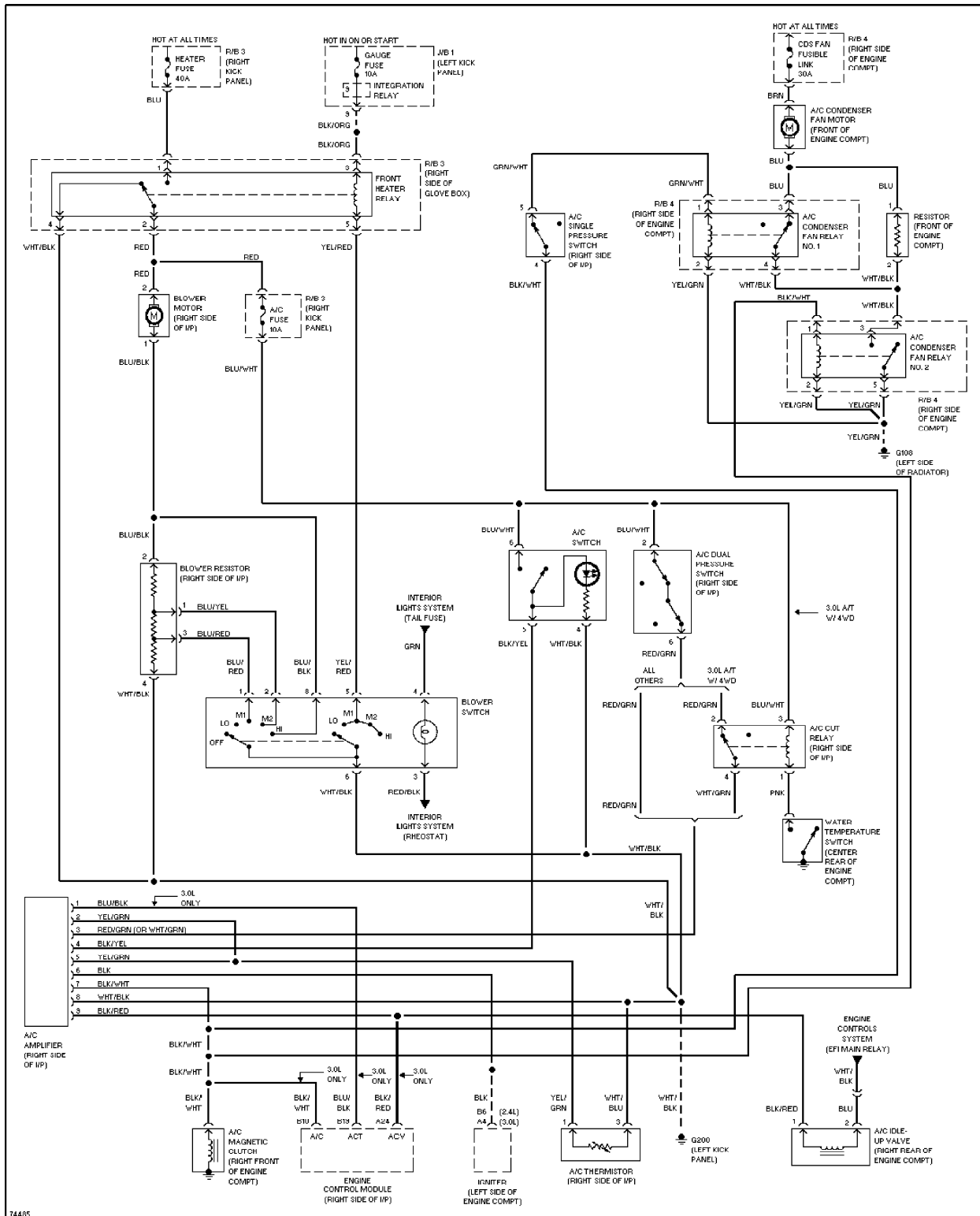


Fig. 12: Manual A/C-Heater System Wiring Diagram