ARTICLE BEGINNING

1989 Automatic A/C-Heater Systems

Supra

*** 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

Automatic temperature control system contains electronically controlled components to provide automatic control of interior car temperature.

OPERATION

TEMPERATURE SENSORS

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

In-Car Temperature Sensor
This thermistor functions like ambient temperature sensor. It senses in-car temperature and sends appropriate electrical signal to amplifier.

Solar Sensor
Solar sensor senses amount of sunlight entering vehicle interior to adjust air temperature.

OPERATION

A/C AMPLIFIER

The A/C amplifier is an electronic device which receives signals from temperature sensors and potentiometer (selected setting). It increases signal strength enough to operate vacuum valves.
As temperature inside vehicle drops, resistance in signal from sensors and potentiometer increases. Amplifier input voltage signal increases. If temperature lever is moved to higher setting, resistance also increases.
When temperature becomes higher than selectdd temperature or if lever is moved to lower temperature, amplifier input voltage is

decreased.

NOTE: Operational description of other system components not available from manufacturer.

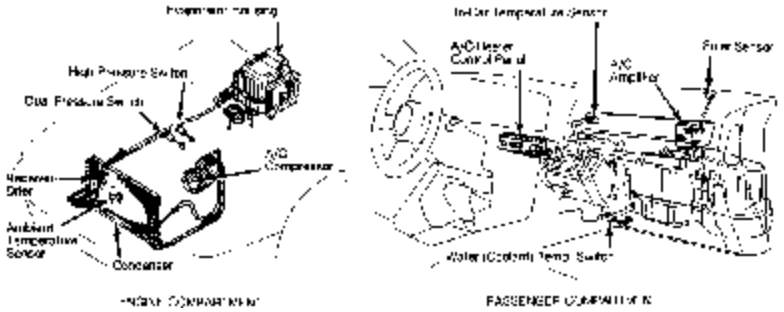

Fig. 1: Automatic A/C-Heater System Components
Courtesy of Toyota Motor Sales, U.S.A., Inc.

TESTING

A/C AMPLIFIER

Disconnect A/C amplifier. See Fig. 1. Turn ignition switch on. Set temperature control to maximum cooling and blower switch to high. Check continuity, battery voltage or resistance on wiring harness connector following test conditions specified in A/C AMPLIFIER TEST chart. See Fig. 2. If A/C amplifier circuit resistance/voltage readings are correct, replace A/C amplifier.

A/C AMPLIFIER TEST TABLE

Connect Between Terminals	Test Condition	Specified Value
10-Ground	n/a	Continuity
2-10	A/C Switch On	Battery Voltage
2-10	A/C Switch Off	No Voltage
6-9	n/a	(1) Approx. 1500 Ohms

(1) - At 77øF (25øC).

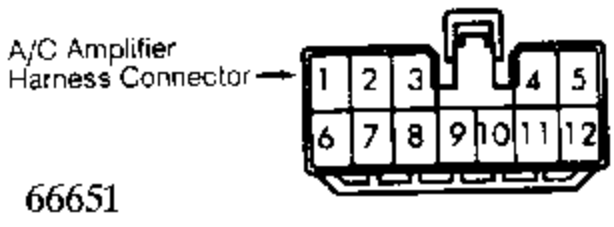

Fig. 2: A/C Amplifier Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C COMPRESSOR CLUTCH

Inspect pressure plate and rotor for signs of oil leaks. Check clutch bearings for noise and loss of lubricant. With ignition off use ohmmeter to measure the resistance of stator coil between clutch lead wire and ground (A/C compressor body). Reading should be 2.7-3.1 ohms at 68øF (20øC). If reading is incorrect, replace compressor clutch.

A/C TEMPERATURE CONTROL PANEL

1) Remove A/C control panel. See A/C CONTROL PANEL under REMOVAL & INSTALLATION in this article. Connect jumper lead from battery positive terminal to terminals No. 1 and 2. See Fig. 3. Connect jumper lead from battery negative terminal to terminal No. 10.

2) Connect voltmeter negative lead to terminal No. 10. With automatic A/C system control buttons in position specified, check voltage output at terminal "A" with voltmeter positive lead. See Fig. 3. Ensure indicator lights are lit with button pushed in. Compare voltage readings with chart in Fig. 3. If voltage readings are incorrect, replace A/C control panel.

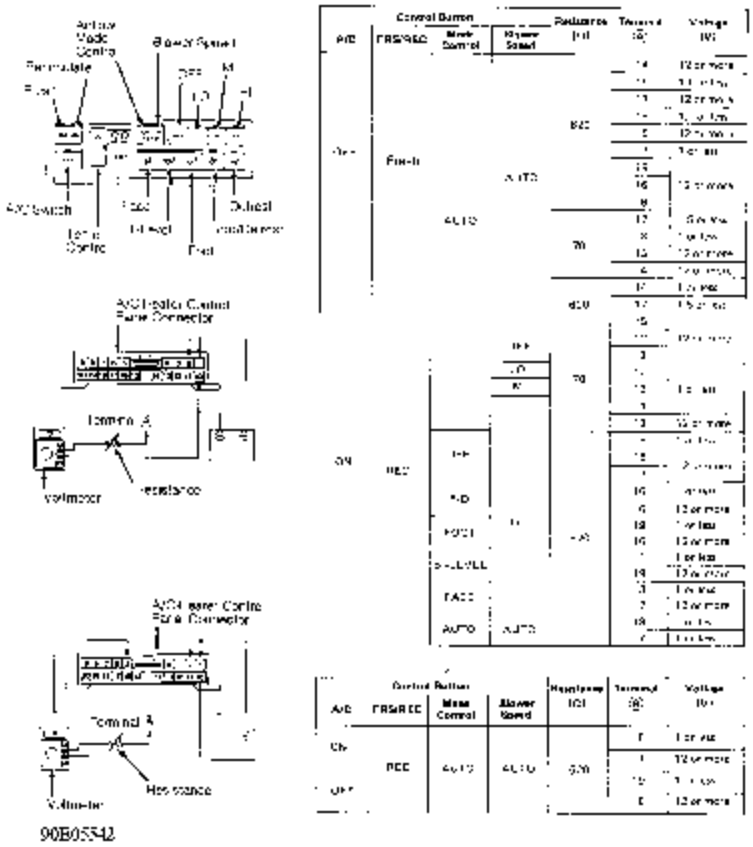

Fig. 3: A/C-Heater Control Panel Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C TEMPERATURE CONTROL SYSTEM

1) Unplug test connector. See Fig. 4. Insert a jumper wire between terminals No. 1 and 3. Set temperature control to 77øF (25øC). Start and run engine at idle.

2) Depress "AUTO" fan speed control button. Verify guide plate on servo motor is positioned between "R" and "W" marks. See Fig. 4. If correct, reconnect test connector.

3) If guide plate is over "W", connect Red/Green wire and Black/White wire until position is correct. Reconnect test connector. If guide plate is over "R", connect Red/Green wire and Brown/Yellow wire until position is correct. Reconnect test connector.

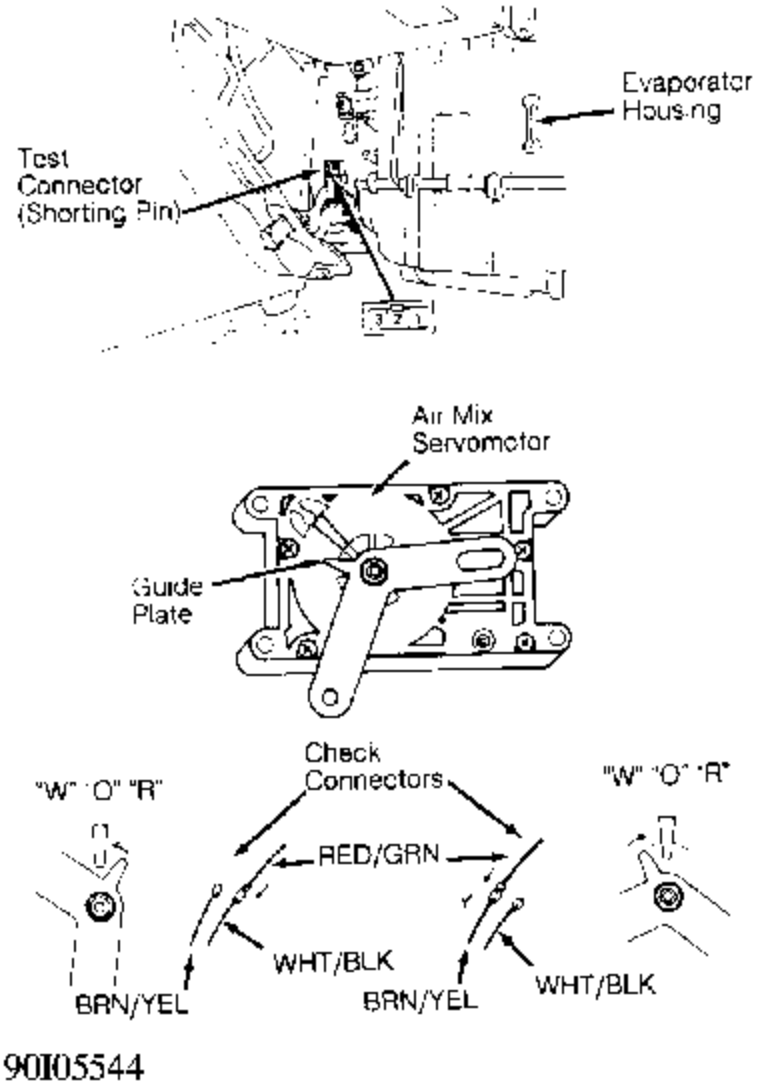

Fig. 4: A/C Temperature Control System Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AMBIENT TEMPERATURE & IN-CAR TEMPERATURE SENSORS

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. Resistance on both sensors may vary from 620-1700 ohms @ 77-122øF (25-50øC).

SOLAR SENSOR

Disconnect solar sensor connector and check sensor continuity. If there is no continuity, replace pressure switch.

HEATER RELAY

1) Check continuity between terminals No. 1 and 3, between terminals No. 2 and 4, and then between terminals No. 4 and 5. See Fig. 5. If continuity is not as specified, replace relay.
2) If continuity is okay, apply battery voltage to terminals No. 1 and 3. Ensure continuity exists between terminals No. 4 and 5. No continuity should exist between terminals No. 2 and 4.

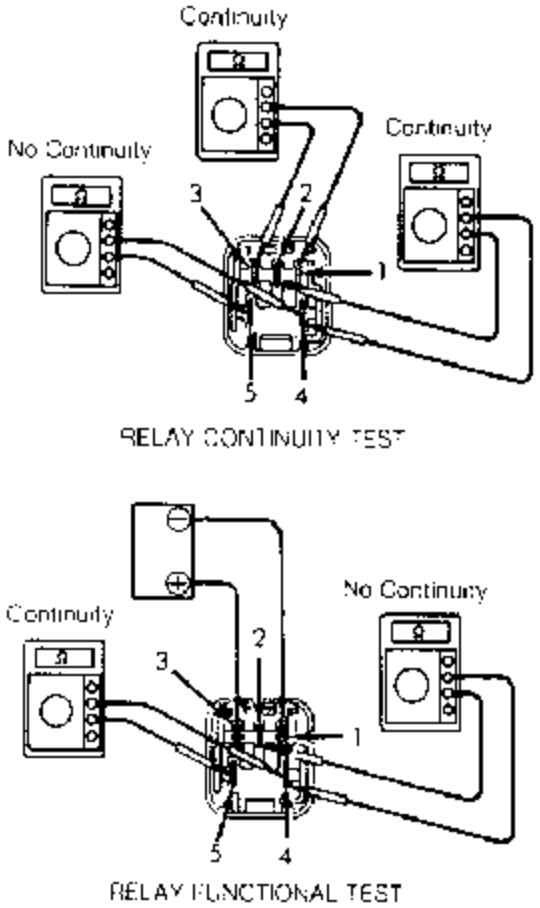

Fig. 5: Heater Relay Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

HEATER BLOWER RESISTOR

Check blower resistor continuity between terminals No. 4 and 6. If no continuity, replace heater blower resistor. See Fig. 6.

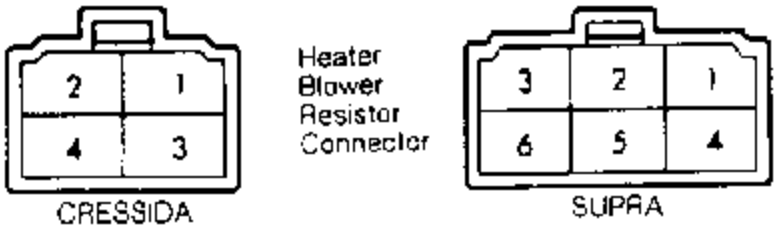

Fig. 6: Heater Blower Resistor Tests
Courtesy of Toyota Motor Sales, U.S.A., Inc.

COOLANT TEMPERATURE SWITCH

Remove coolant temperature switch. Switch is located on bottom of heater core. Immerse switch in 77øF (25øC) water. Continuity should exist between terminals No. 1 and 4. Immerse switch in 113øF (45øC) water. Continuity should exist between terminals No. 1 and 4 and terminals No. 2 and 3.

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

AIR-MIX SERVO MOTOR

1) Connect jumper lead from battery positive terminal to terminal No. 10, and a negative jumper lead to terminal No. 11 of servo motor connector. See Fig. 7.
2) Ensure servo motor lever moves smoothly from warm to cool position. Reverse jumper leads on servo motor connector, and ensure motor lever moves smoothly from cool to warm position.
3) While operating servo motor in step 1) or 2), measure resistance between terminals No. 5 and 6. Resistance values will gradually decrease from cool to warm position. If motor does not operate as specified, replace servo motor.

AIR-MIX SERVO MOTOR RESISTANCE SPECIFICATIONS TABLE

Position	Ohms
Cool	1700-2000
Warm	150-250

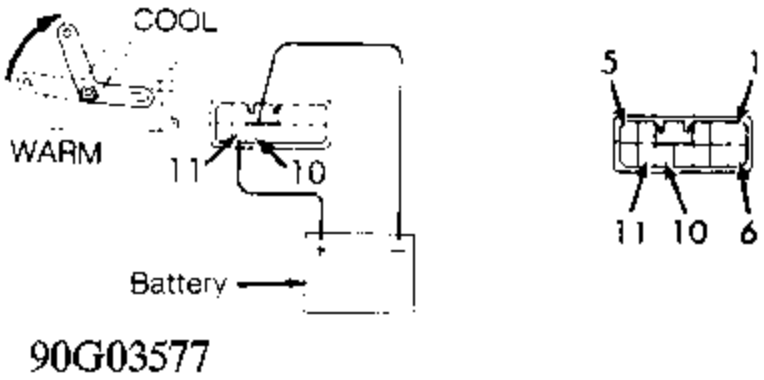

Fig. 7: Air Mix Servo Motor Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

RECIRCULATED/FRESH AIR SERVO MOTOR

1) Connect jumper lead from battery positive terminal to terminal No. 1, and a negative jumper lead to terminal No. 2 of servo motor connector. See Fig. 8. Ensure servo motor arm moves smoothly. Continuity should exist between terminals No. 3 and 4.

2) Reverse jumper leads on servo motor connector. Ensure servo motor arm moves smoothly. Continuity should exist between terminals No. 5 and 6. If motor does not operate as specified, replace servo motor.

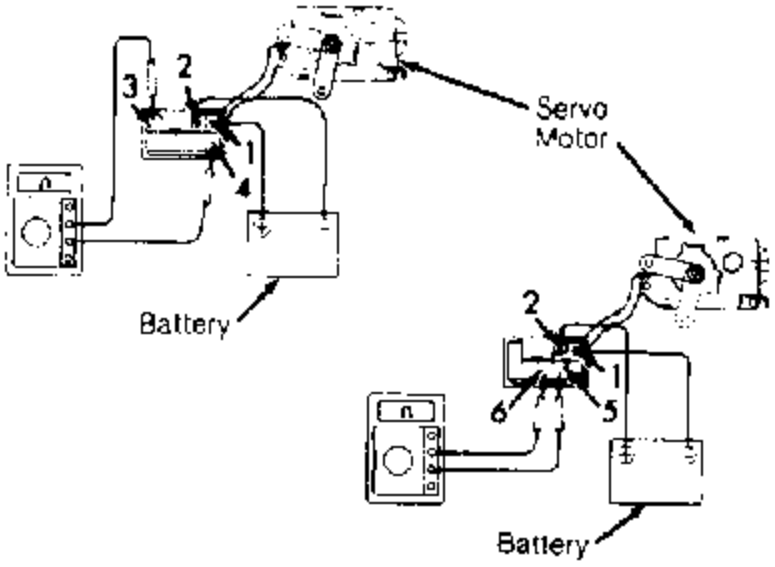

Fig. 8: Recirculated/Fresh Air Servo Motor Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AIR VENT SERVO MOTOR

1) Connect jumper lead from battery positive terminal to terminal No. 1, and a negative jumper lead to terminal No. 4 of servo motor connector. Ensure servo motor arm moves smoothly.

2) Reverse jumper leads on servo motor connector. Ensure servo motor arm moves smoothly. Continuity should exist between terminals as shown. See Fig. 9. If motor does not operate as specified, replace servo motor.

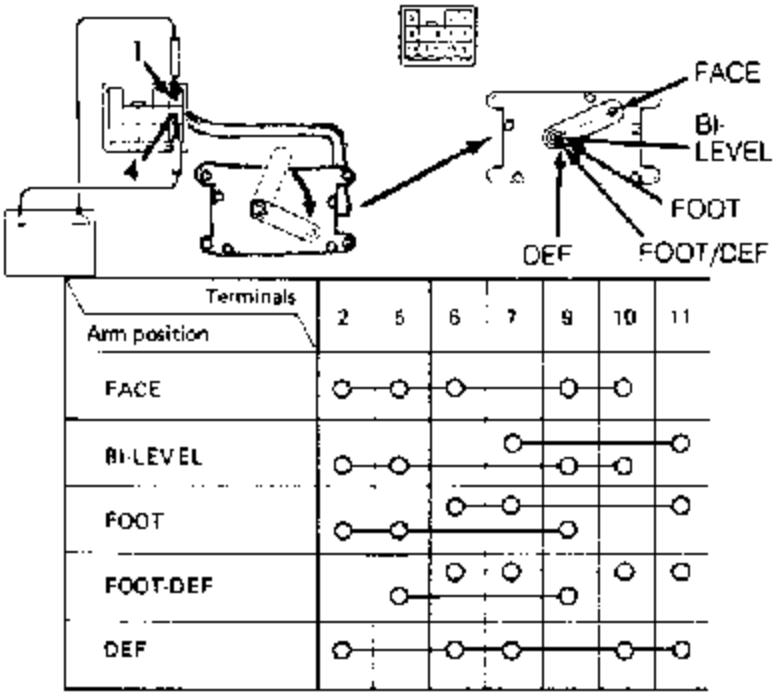

Fig. 9: Air Vent Servo Motor Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ST CUT & BLOWER DELAY RELAY

1) Remove relay(s). Check for continuity between terminals No. 2 and No. 4. See Fig. 10. No continuity should exist between terminals No. 1 and No. 3, and between terminals No. 1 and No. 2. If continuity is not as specified, replace relay(s).

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

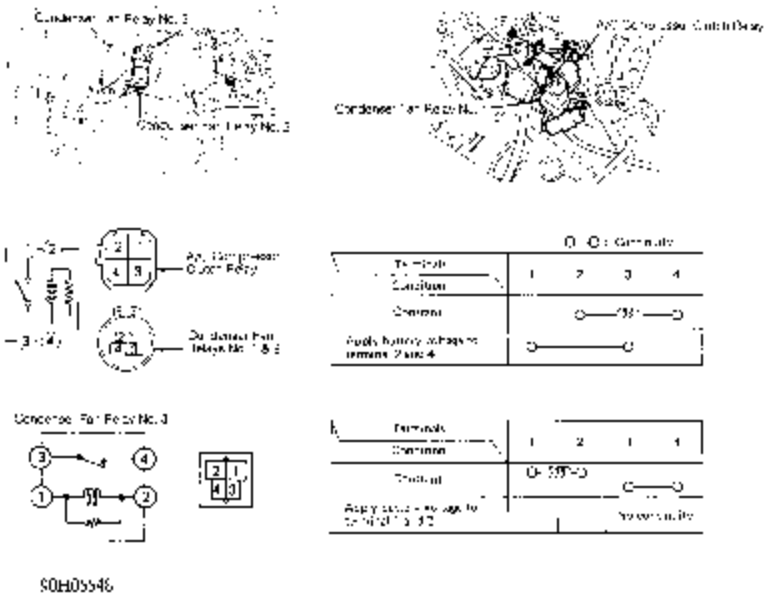

Fig. 10: A/C Compressor Clutch Relay & Condenser Fan Relay Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REFRIGERANT PRESSURE SWITCHES

Dual Pressure Switch

Check refrigerant pressure. Pressure must be more than 30 psi (2.1 kg/cmý) when ambient temperature is more than 32øF (0øC). Charge A/C system if necessary. Using an ohmmeter, check continuity between terminals of dual pressure switch. Ohmmeter must indicate zero ohms. If no continuity exists, replace switch.

High Pressure Switch

Using an ohmmeter, check continuity between terminals of high pressure switch. No continuity should exist between terminals when pressure is less than 178 psi (12.5 kg/cmý). If continuity exists, replace switch.

THERMISTOR

Disconnect negative battery cable. Remove glove box and instrument panel undercover. Using an ohmmeter, measure resistance at thermistor connector. Resistance should be 1500 ohms at 77øF (25øC).

EXPANSION VALVE

Check quantity of refrigerant during refrigeration cycle. Install manifold gauge set. Start and run engine at 2000 RPM for at least 5 minutes. If expansion valve is clogged, the low pressure reading will drop to zero psi (0 kg/cmý). If not, expansion valve is okay.

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 clutch lead 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 mount 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 compressor. Charge A/C system and check for leaks.

CONDENSER

Removal

Discharge A/C system using approved refrigerant recovery/ recycling equipment. Remove hood lock brace, center brace and horn, windshield washer tank and bracket. On turbo models, remove engine under cover, intercooler, oil cooler and condenser fan. Disconnect discharge hose, suction hose, liquid tube, and suction tube from condenser. Cap all openings. Remove condenser.

Installation

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

THERMISTOR, EXPANSION VALVE & EVAPORATOR

Removal

1) Disconnect negative battery cable. Discharge A/C system using approved refrigerant recovery/recycling equipment. Remove charcoal canister with bracket. Disconnect suction tube from outlet fitting. Disconnect liquid tube from inlet fitting. Cap all openings.

2) Remove grommets from inlet and outlet fittings. Remove glove box and under cover. Remove glove box cover and reinforcement. Remove electronic fuel injection and anti-lock brake system computers. Unplug connector and remove evaporator housing.

3) Remove thermistor connector from upper evaporator case. Remove 3 clips, 4 screws, and upper case. Remove thermistor with thermistor holder. Remove lower evaporator case.

4) Remove evaporator. Disconnect liquid tube from inlet fitting of expansion valve. Remove packing and heat sensing tube from suction tube of evaporator. Remove expansion valve. See Fig. 11.

Installation

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

A/C CONTROL PANEL

Removal & Installation

Remove ash tray. Remove 2 screws and ashtray retainer from center panel. Remove 3 screws, wire connectors and remove center panel. Remove 3 screws, disconnect wire connectors and slide A/C control panel out. To install, reverse removal procedure.

Showcase	Entire Article 1989 Toyota Supra

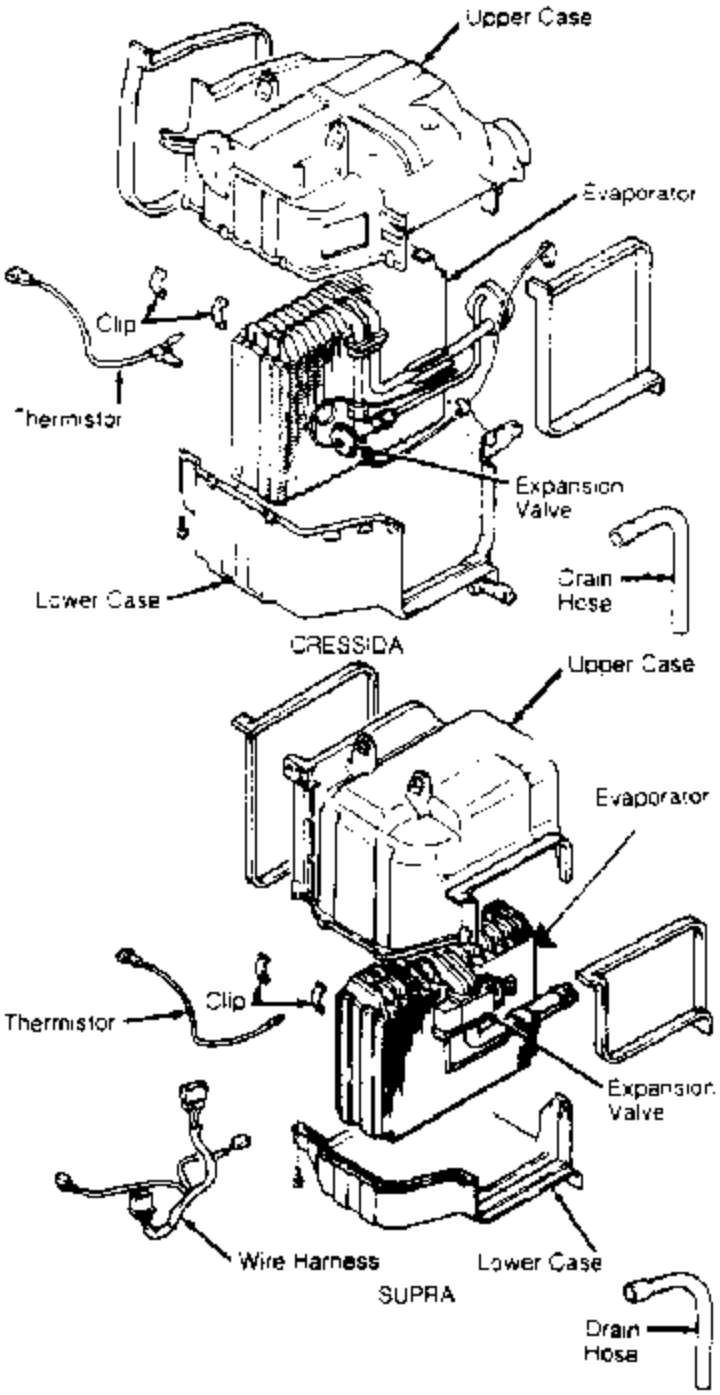

Fig. 11: Exploded View of Evaporator Assemblies
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C SYSTEM SPECIFICATIONS

A/C SYSTEM SPECIFICATIONS TABLE

Application	Specification
Compressor Type	Nippondenso 10-Cyl.
Compressor Oil Capacity	2.7 oz.
Compressor Belt Tension	(1)
Refrigerant (R-12) Capacity	27-30 oz.
System Operating Pressures	
High	206-213 psi (14.4-15.0 kg/cmý)
Low	21-28 psi (1.5-2.0 kg/cmý)

(1) - Belt tension is 140-180 lbs. for a new belt. Belt tension is 95-115 lbs. for a used belt.

WIRING DIAGRAMS

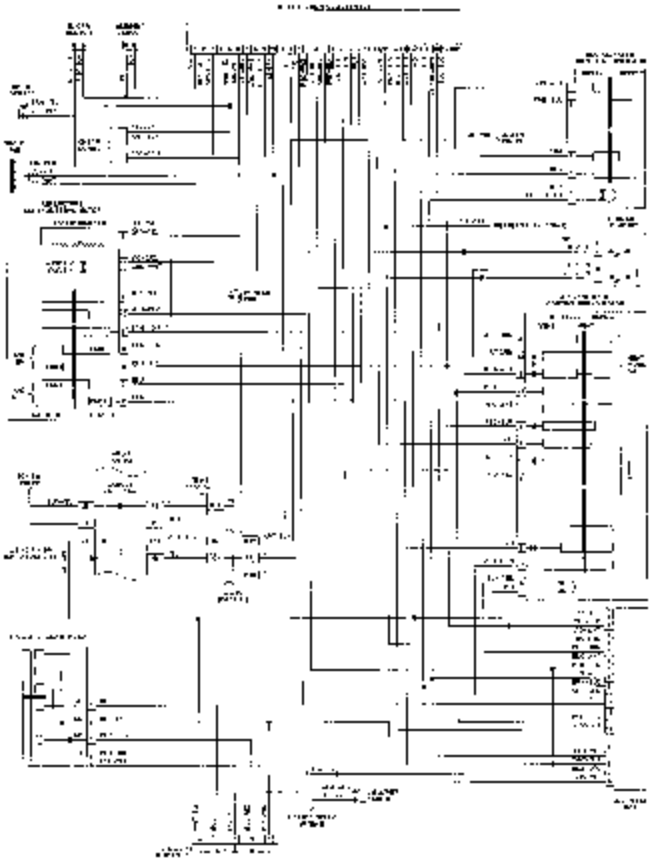

Fig. 12: Auto A/C-Heater System Wiring Diagram (1 of 2)

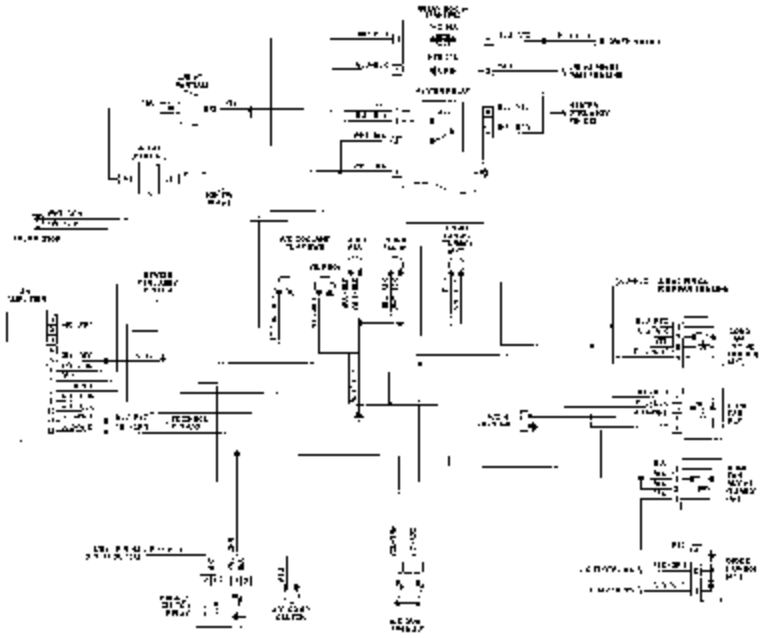

Fig. 13: Auto A/C-Heater System Wiring Diagram (2 of 2)

END OF ARTICLE

