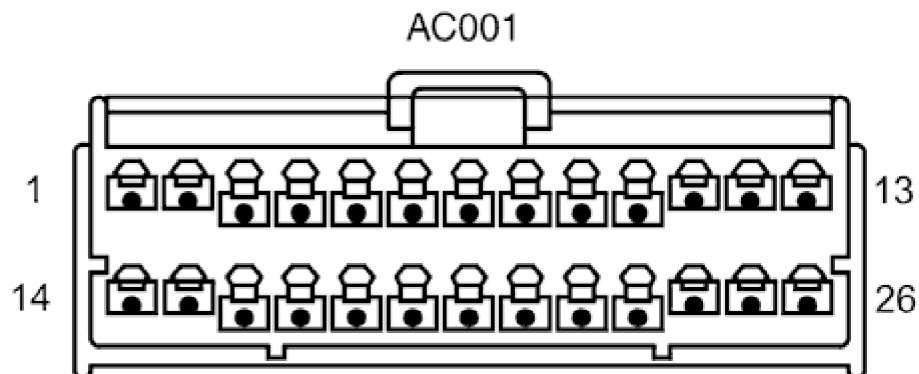


1998 XK RANGE - Control Components - 412-04

Control Components

Connector Pins Identification

Connector Pin Identity Chart for AC001



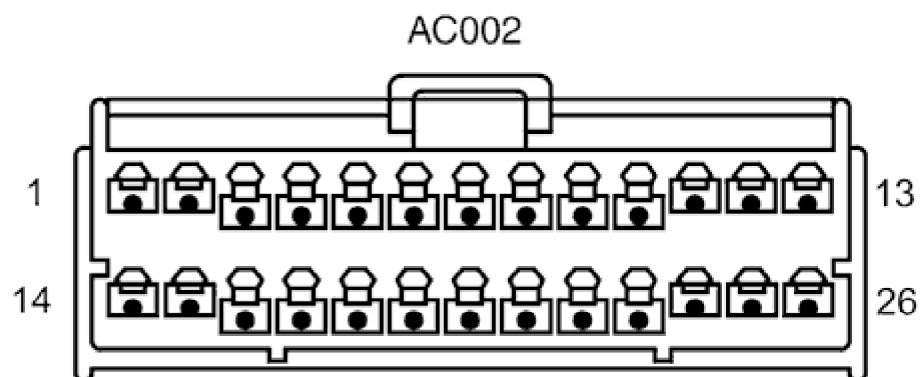
E34303

| Pin Number | Circuit | Circuit Function |
|------------|---------|---|
| 001 | | Compressor ON signal |
| 002 | | Coolant valve |
| 003 | | RH Blower motor relay |
| 004 | | Heated windshield relays (where fitted) |
| 005 | | Heated door mirror relay |
| 006 | | Defrost servomotor (positive) |
| 007 | | Center vent servomotor (positive) |
| 008 | | LH air intake servomotor fresh / recirculation (positive) |
| 009 | | RH air intake servomotor fresh / recirculation (positive) |
| 010 | | Not used |
| 011 | | Not used |
| 012 | | Foot servomotor (positive) |
| 013 | | Cool air bypass servomotor (positive) |
| 014 | | Not used |
| 015 | | Not used |
| 016 | | LH Blower motor relay |
| 017 | | Coolant pump motor relay |
| 018 | | Heated backlight relay |
| 019 | | Defrost servomotor (negative) |

1998 XK RANGE - Control Components - 412-04

| | | |
|-----|--|---|
| 020 | | Center vent servomotor (negative) |
| 021 | | LH air intake servomotor fresh / recirculation (negative) |
| 022 | | RH air intake servomotor fresh / recirculation (negative) |
| 023 | | Not used |
| 024 | | Not used |
| 025 | | Foot servomotor (negative) |
| 026 | | Cool air bypass servomotor (negative) |

Connector Pin Identity Chart for AC002

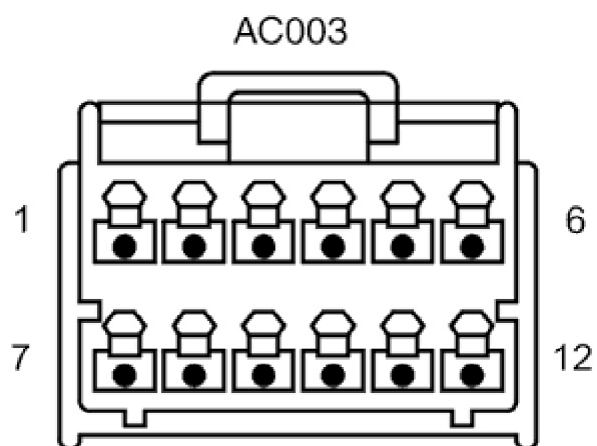


E34304

1998 XK RANGE - Control Components - 412-04

| Pin Number | Circuit | Circuit Function |
|------------|---------|---|
| 001 | | Solar sensor |
| 002 | | Center vent servomotor feedback potentiometer |
| 003 | | RH air intake servomotor feedback potentiometer fresh / recirculation |
| 004 | | Not used |
| 005 | | Cool air bypass servomotor feedback potentiometer |
| 006 | | Coolant temperature signal |
| 007 | | RH blower motor voltage feedback |
| 008 | | RH blower motor drive signal |
| 009 | | Differential potentiometer |
| 010 | | Defrost servomotor feedback potentiometer |
| 011 | | LH air intake servomotor feedback potentiometer fresh / recirculation |
| 012 | | Not used |
| 013 | | Foot servomotor feedback potentiometer |
| 014 | | Not used |
| 015 | | LH blower motor voltage feedback |
| 016 | | LH blower motor drive signal |

Connector Pin Identity Chart for AC003

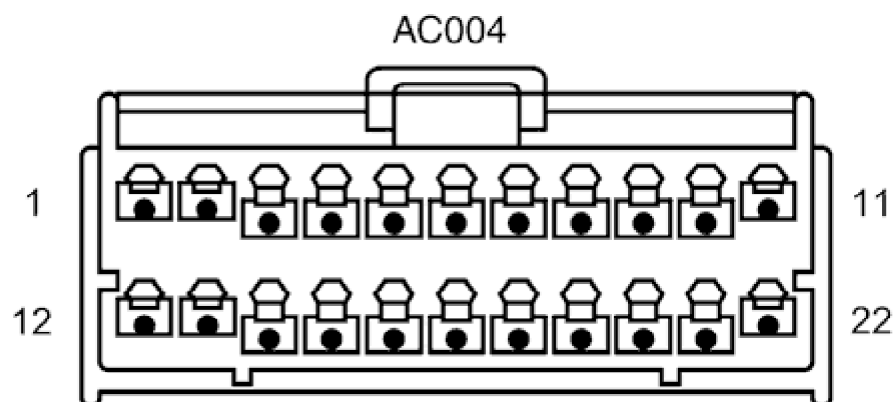


E34305

1998 XK RANGE - Control Components - 412-04

| Pin Number | Circuit | Circuit Function |
|------------|---------|-----------------------------------|
| 001 | | Screen request to ECM |
| 002 | | CLOCK signal to control panel |
| 003 | | DATA OUT signal to control panel |
| 004 | | Compressor lock signal |
| 005 | | Exterior air temperature sensor |
| 006 | | Heater matrix temperature sensor |
| 007 | | DATA IN signal from control panel |
| 008 | | START signal to control panel |
| 009 | | Not used |
| 010 | | Compressor lock select |
| 011 | | In-car temperature sensor |
| 012 | | Evaporator temperature sensor |

Connector Pin Identity Chart for AC004

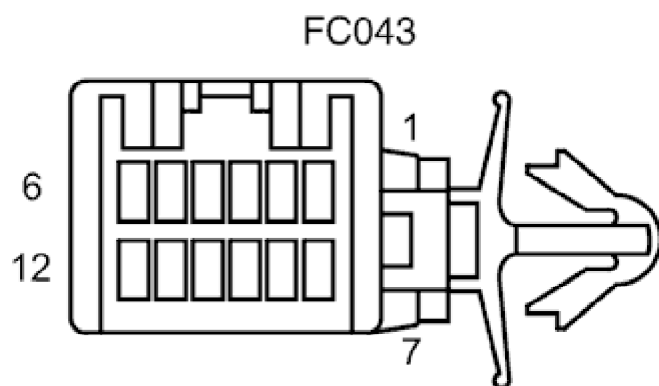


E34306

1998 XK RANGE - Control Components - 412-04

| Pin Number | Circuit | Circuit Function |
|------------|---------|--------------------------------------|
| 001 | | Ignition positive supply |
| 002 | | Battery isolate supply |
| 003 | | Auxiliary ground |
| 004 | | Auxiliary ground to control panel |
| 005 | | Battery supply |
| 006 | | Engine speed input |
| 007 | | Electrical load drive inhibit |
| 008 | | +5V sensors |
| 009 | | Clutch request to ECM |
| 010 | | Diagnostic L-line |
| 011 | | Not used |
| 012 | | Ignition (positive) to control panel |
| 013 | | System ground |
| 014 | | Ground to control panel |
| 015 | | Air conditioning isolation relay |
| 016 | | Vehicle speed |
| 017 | | Pressure switch |
| 018 | | Aspirator motor (In-car sensor) |
| 019 | | Sensor ground |
| 020 | | Logic ground for diagnostic lines |
| 021 | | Diagnostic K-line |
| 022 | | Not used |

Connector Pin Identity Chart for FC043



E34307

1998 XK RANGE - Control Components - 412-04

| Pin Number | Circuit | Circuit Function |
|------------|---------|----------------------------|
| 1 | | Input CLOCK |
| 2 | | Input START |
| 3 | | Input DATA IN |
| 4 | | Output DATA OUT |
| 5 | | Input ignition (positive) |
| 6 | | Input auxiliary (negative) |
| 7 | | Ground |
| 8 | | Dimmer |
| 9 | | Dimmer override |
| 10 | | Not used |
| 11 | | Not used |
| 12 | | Not used |

Control Panel Communication

The control panel provides operator interface with the climate control system.

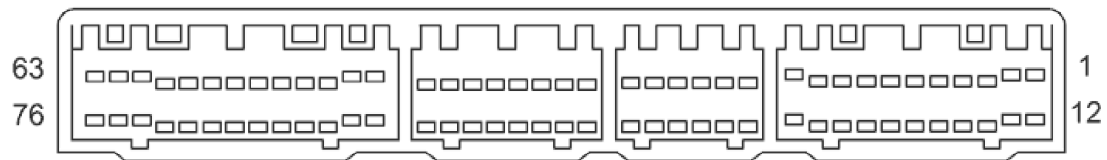
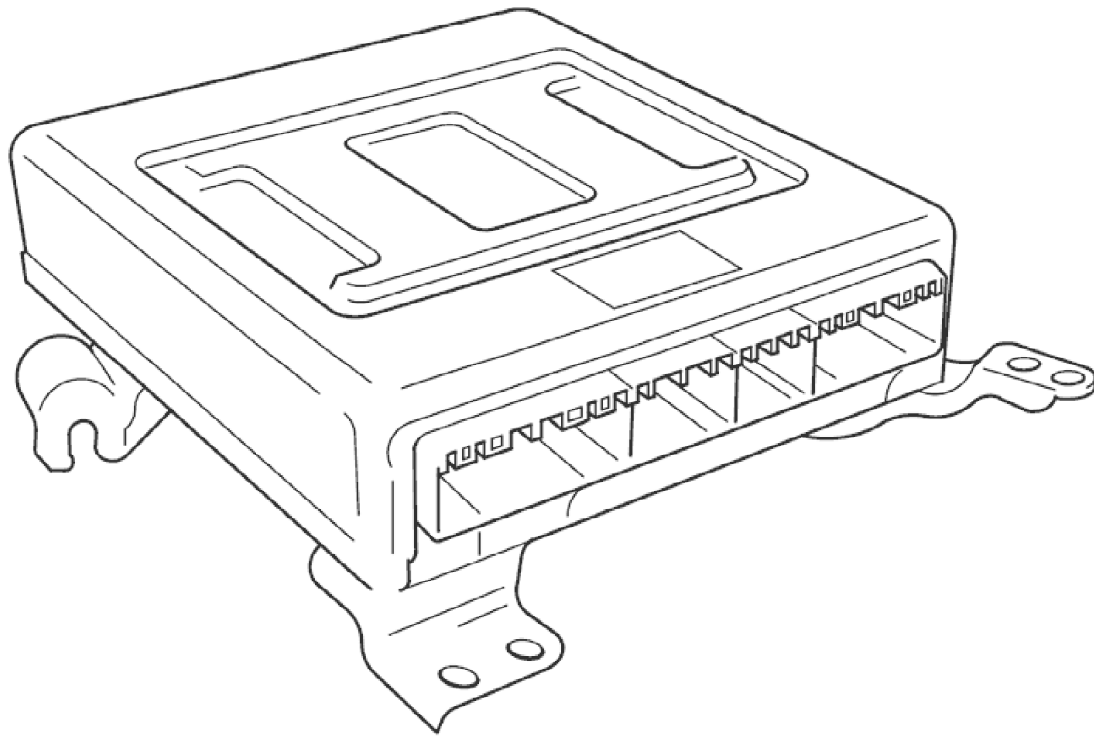
Control panel operation is described in detail in the D section.

Control Panel Inputs / Outputs

| Pin # | Description | Cable color |
|-------|---------------------------|----------------|
| 1 | Output clock | Slate |
| 2 | Output start | Slate / Red |
| 3 | Input data in | Slate / Yellow |
| 4 | Output data out | Slate / Green |
| 5 | Output ignition positive | White / Red |
| 6 | Output auxiliary positive | White / Blue |
| 7 | Output ground | Black |
| 8 | Dimmer | Red |
| 9 | Dimmer override | Red / Green |
| 10 | Not used | n/a |
| 11 | Not used | n/a |
| 12 | Not used | n/a |

A/CCM Connections

1998 XK RANGE - Control Components - 412-04



E34298

1998 XK RANGE - Control Components - 412-04

| Pin # | Input / Output | Function | Specification |
|-------------|----------------|--|--|
| 1 (22-way) | Input | Ignition positive supply | With ign ON |
| 2 (22-way) | Input | Battery isolate supply | Activated when IGN ON and for 30 seconds after IGN OFF |
| 3 (22-way) | Input | Auxiliary ground | Auxiliary switch closed to ground |
| 4 (22-way) | Output | Auxiliary ground | Direct line to pin #3 |
| 5 (22-way) | Input | B+ | |
| 6 (22-way) | Input | Engine speed input | Open collector, 3 pulses per rev. |
| 7 (22-way) | Input | Electrical load drive inhibit | Active low signal from EMS |
| 8 (22-way) | Output | Sensor +5V | |
| 9 (22-way) | Output | Clutch request | Open collector R = 1KOHM, connected to IGN, activated high |
| 10 (22-way) | Input | Diagnostic L line | |
| 11 (22-way) | n/a | Not used | n/a |
| 12 (22-way) | Output | Ignition (+VE) to control panel | |
| 13 (22-way) | | System ground | |
| 14 (22-way) | Output | Ground to control panel | |
| 15 (22-way) | Output | Isolation relay | Activated when IGN ON and for 30 seconds after IGN OFF |
| 16 (22-way) | Input | Vehicle speed input | |
| 17 (22-way) | Input | Pressure switch | Ground for normal pressure. IGN+ for abnormal pressure |
| 18 (22-way) | Output | Aspirator motor (Motorized In-car Aspirator) | 0.05A at 12V, activated high during ON mode only |
| 19 (22-way) | Input | Sensor ground | |
| 20 (22-way) | | Logic ground for diagnostic lines | |
| 21 (22-way) | Output | Diagnostic K line | |
| 22 (22-way) | Output | Water pump ground | Sensing cct current signal |
| 23 (12-way) | Output | Screen request to ECM | Open collector R = 57OHM, connected to IGN, activated low |
| 24 (12-way) | Output | CLOCK signal to control panel | Open collector R = 1KOHM, connected to IGN, activated high |
| 25 (12-way) | Output | DATA OUT signal to control panel | Open collector R = 1KOHM, connected to IGN, activated high |
| 26 (12-way) | Input | Compressor lock signal | |

1998 XK RANGE - Control Components - 412-04

| | | | |
|----------------|----------|--|---|
| 27 (12-way) | Input | Ambient air temperature sensor | Voltage / temperature values |
| 28 (12-way) | Input | Heater matrix temperature sensor | Voltage / temperature values |
| 29 (12-way) | Input | DATA IN signal from control panel | |
| 30 (12-way) | Output | START signal to control panel | Open collector R = 1KOHM, connected to IGN, activated high |
| 31 (12-way) | Not used | | |
| 32 (12-way) | Input | Compressor lock select | Ign. voltage |
| 33 (12-way) | Input | In-car temperature sensor (Motorized In-car Aspirator) | Voltage / temperature values |
| 34 (12-way) | Input | Evaporator temperature sensor | Voltage / temperature values |
| 35 (16-way) | Input | Solar sensor | Voltage / temperature values |
| 36 (16-way) | Input | Centre vent servo motor feedback potentiometer | Resistance 6KOHM +/-10% 0% closed - 1V, 100% open - 4V |
| 37 (16-way) | Input | RH air intake servo motor feedback potentiometer | Resistance 6KOHM +/-10% 0% closed - 1V, 100% open - 4V |
| 38 (16-way) | Not used | | |
| 39 (16-way) | Input | Cool air bypass servo motor feedback potentiometer | Resistance 6KOHM +/-10% 0% closed - 1V, 100% open - 4V |
| 40 (16-way) | Input | Coolant temperature signal | PWM signal |
| 41 (16-way) | Input | RH blower motor voltage feedback | |
| 42 (16-way) | Output | RH blower motor drive signal | 0V to 3V max. |
| 43 (16-way) | Input | Differential potentiometer | Resistance 10KOHM +/-10%. Min. 1V, Max. 4V |
| 44 (16-way) | Input | Defrost servo motor feedback potentiometer | Resistance 6KOHM. +/-10%. 0% closed - 1V, 100% open - 4V |
| 45 (16-way) | Input | LH air intake servo motor feedback potentiometer | Resistance 6KOHM +/-10%. 0% closed - 1V, 100% open - 4V |
| 46 (16-way) | Not used | | |
| 47 (16-way) | Input | Foot servo motor feedback potentiometer | Resistance 6KOHM +/-10%. 0% closed - 1V, 100% open - 4V |

1998 XK RANGE - Control Components - 412-04

| | | | |
|----------------|----------|-----------------------------------|---------------------------------------|
| 48 (16-way) | Not used | | |
| 49 (16-way) | Input | LH blower motor voltage feedback | |
| 50 (16-way) | Output | LH blower motor drive signal | 0V to 3V max. |
| 51 (26-way) | Input | Compressor ON signal | B+ @ compressor ON |
| 52 (26-way) | Output | Water valve | 1amp at 12 volts |
| 53 (26-way) | Output | RH Blower motor relay | Load 105OHM at 12V IGN, activated low |
| 54 (26-way) | Output | Heated windshield relays | Load 36OHM at 12V IGN, activated low |
| 55 (26-way) | Output | Heated door mirror relay | Load 105OHM at 12V IGN, activated low |
| 56 (26-way) | Output | Defrost servo motor (+VE) | B+ when operated |
| 57 (26-way) | Output | Centre vent servo motor (+VE) | B+ when operated |
| 58 (26-way) | Output | LH air intake servo motor (+VE) | B+ when operated |
| 59 (26-way) | Output | RH air intake servo motor (+VE) | B+ when operated |
| 60 (26-way) | Not used | | |
| 61 (26-way) | Not used | | |
| 62 (26-way) | Output | Foot servo motor (+VE) | B+ when operated |
| 63 (26-way) | Output | Cool air bypass servo motor (+VE) | B+ when operated |
| 64 (26-way) | Output | RH High speed relay | Load 105OHM at 12V IGN, activated low |
| 65 (26-way) | Output | LH High speed relay | Load 105OHM at 12V IGN, activated low |
| 66 (26-way) | Output | LH Blower motor relay | Load 105OHM at 12V IGN, activated low |
| 67 (26-way) | Output | Water pump motor relay | Load 105OHM at 12V IGN, activated low |
| 68 (26-way) | Output | Heated backlight relay | Load 72OHM at 12V IGN, activated low |
| 69 (26-way) | Output | Defrost servo motor (-VE) | B+ when operated |

1998 XK RANGE - Control Components - 412-04

| | | | |
|----------------|----------|-----------------------------------|------------------|
| 70 (26-way) | Output | Centre vent servo motor (-VE) | B+ when operated |
| 71 (26-way) | Output | LH air intake servo motor (-VE) | B+ when operated |
| 72 (26-way) | Output | RH air intake servo motor (-VE) | B+ when operated |
| 73 (26-way) | Not used | | |
| 74 (26-way) | Not used | | |
| 75 (26-way) | Output | Foot servo motor (-VE) | B+ when operated |
| 76 (26-way) | Output | Cool air bypass servo motor (-VE) | B+ when operated |

System Self-test

Control Panel Interrogation Procedure

The control panel has a self-diagnosis feature, and is capable of displaying and clearing stored fault codes.

Climate control is an integrated system, therefore it is recommended that the PDU is used for fault diagnosis. The fault codes displayed with the control panel self-diagnosis feature are not as comprehensive as those of the PDU. The PDU will display the relevant fault code, fault code description and information of the system peripherals at the time the fault occurred.

Fault Code Extraction and Deletion Procedure

Error information is stored in the A/CCM up to a maximum of 5 faults. Should a sensor fault occur there will be an audible beep and the message Er will be displayed on the control panel display for 5 seconds after ignition on. Please note that this will happen only once in any ignition switch cycle. The error source may be accessed by the following procedure

This procedure must be completed through one complete cycle, 1 through 6

| Step | Result |
|--|--|
| #1 Simultaneously hold AUTO and RECIRC - Switch ignition to ON | Display element check |
| #2 Press AUTO | Display of stored fault (NUMERIC) code. If ZERO appears, there are no stored codes |
| #3 Press FACE | Scroll through stored faults (maximum of 5) |
| #4 Simultaneously press FACE and R | Clear stored fault codes (may need to be repeated for each fault) |
| #5 Press RECIRC (Press FAN to skip actuator check) | Initiate actuator check (Actuator codes 20 through 27 *) |
| #6 Press FAN | Exit error check mode |

NOTE:

1998 XK RANGE - Control Components - 412-04

* Actuator codes do NOT equate to system fault codes.

NOTE:

Only codes 11, 15 and 21 (see Fault Code Listing) will cause audible beep and 'Er' display.

NOTE:

If '0' is displayed, there are no stored fault codes, wait 30 seconds to allow system self-test.

- The control panel display will flash repeatedly indicating a list of two digit numbers (see table for code analysis).
- Should a code be displayed accompanied by an audible beep, the fault is current and therefore still present within the system. A code displayed without an accompanying 'beep' indicates a fault had previously occurred but is not present within the system.

NOTE:

It is advisable to check all areas indicated with cleared fault codes. Such faults may re-occur if intermittent problems are present in the system.

- To delete stored and cleared fault codes press 'R' and 'FACE' buttons simultaneously.
- After investigating and correcting all stored faults, press the 'Push Off' button to restore normal operation with default panel settings, ie AUTO at 24°C.

Control Panel Fault Code Listing

Condition(s):NOTE:

Reference fault code #23*: In ambient temperatures below 0°C, this code may be logged because the low ambient causes a temporary low gas pressure.

NOTE:

Where the ambient temperature rises above 40°C, with the engine close to overheating, electrical feed to the compressor clutch may be cut and code #23 registered.

0 Normal operation no fault codes present

Possible Source(s):

- None

Action(s) to take:

- Wait 30 seconds for system self-check.

11 Motorized in-car aspirator malfunction

Possible Source(s):

- Harness / connector fault
- Sensor open / short circuit

Action(s) to take:

- Panel fault codes are not stored for motorized in-car aspirator motor failure.

12 Ambient temperature sensor malfunction

Possible Source(s):

- Harness / connector fault
- Sensor open / short circuit

1998 XK RANGE - Control Components - 412-04

Action(s) to take:

- After rectification, disconnect the vehicle battery for 10 seconds to reset the system.

13 Evaporator temperature sensor malfunction

Possible Source(s):

- Harness / connector fault
- Sensor open / short circuit

Action(s) to take:

- Refer to PDU

14 Water temperature input malfunction

Possible Source(s):

- Instrument cluster output

Action(s) to take:

- Refer to PDU

15 Heater matrix temperature sensor malfunction

Possible Source(s):

- Harness / connector fault
- Sensor open / short circuit

Action(s) to take:

- Refer to PDU

21 Solar sensor

Possible Source(s):

- Sensor open /short circuit

Action(s) to take:

- Refer to PDU

22 Compressor lock signal fault

Possible Source(s):

- Low refrigerant charge, low compressor oil level, loose drive belt
- Harness / connector fault

Action(s) to take:

- Adjust items as required

23 Refrigerant pressure switch malfunction

Possible Source(s):

- Harness / connector fault
- Switch open / short circuit

Action(s) to take:

1998 XK RANGE - Control Components - 412-04

- Refer to PDU

23 Refrigerant pressure low refrigerant charge *

Possible Source(s):

- Leak from damaged pipe or joint

Action(s) to take:

- Rectify as required and recharge system

24 Face vent demand potentiometer fault

Possible Source(s):

- Potentiometer open / short circuit
- Harness / connector fault

Action(s) to take:

- Refer to PDU

31 LH fresh / recirc. potentiometer fault

Possible Source(s):

- Harness / connector fault
- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

32 RH fresh / recirc. potentiometer fault

Possible Source(s):

- Harness / connector fault
- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

33 Cool air by-pass potentiometer fault

Possible Source(s):

- Harness / connector fault
- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

34 Defrost vent potentiometer fault

Possible Source(s):

- Harness / connector fault

1998 XK RANGE - Control Components - 412-04

- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

35 Centre vent potentiometer fault

Possible Source(s):

- Harness / connector fault
- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

36 Foot vent potentiometer fault

Possible Source(s):

- Harness / connector fault
- In certain circumstances the servo motor may over-travel and cause further logged faults. This may be cured, following fault rectification, by cycling the ignition ON-OFF-ON 3 times

Action(s) to take:

- Refer to PDU

41 LH fresh / recirc. motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

42 RH fresh / recirc. motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

43 Cool air by-pass motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking

1998 XK RANGE - Control Components - 412-04

- Flap seized or sticking

Action(s) to take:

- Refer to PDU

43 Cool Air by-pass motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

44 Defrost vent motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

45 Centre vent motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

46 Foot vent motor fault

Possible Source(s):

- Harness / connector fault
- Servo motor seized or sticking
- Flap seized or sticking

Action(s) to take:

- Refer to PDU

Associated Faults

Other conditions which may exist but will NOT log fault codes:

1998 XK RANGE - Control Components - 412-04

Condition(s):

No heat

Possible Source(s):

- Airlock in system.

Action(s) to take:

- Refer section 303-03 for fill / bleed procedure

Possible Source(s):

- Heater water pump inoperative
- Coolant flow valve stuck closed

Action(s) to take:

- Check operation and circuit

Possible Source(s):

- Faulty engine coolant thermostat

Action(s) to take:

- Renew as required

One vent failing to open / close

Possible Source(s):

- Broken linkage.

Action(s) to take:

- Renew as required

Poor airflow

Possible Source(s):

- Blower motors - incorrect operation

Action(s) to take:

- Check operation and circuit

Panel Communication Check

The panel communication check verifies the inputs and outputs from the control panel to the A/CCM.

| Step | Result |
|---|--|
| #1 Simultaneously hold FACE and FAN - Switch ignition to ON | Panel communication with FACE, Bi-LEVEL, FOOT, DEMIST, DEFROST and RECIRC lines checked - State lamps will illuminate if all is OK. Unlit state lamp indicates a continuity fault for that specific link |
| #2 Press ON | Exit check mode |

1998 XK RANGE - Control Components - 412-04

| Item | Check LED | Condition |
|-----------------|---------------|--|
| Ignition | Defrost | IGN input at 12V, check LED is illuminated |
| Auxiliary | Face | AUX input at 12V, check LED is illuminated |
| Clock | Feet / face | Clock input normal, check LED is illuminated |
| Start input | Foot | Start input normal, check LED is illuminated |
| Data out | Screen / foot | Data out input normal, check LED is illuminated |
| Dimmer override | Recirc. | Dimmer override input ON, check LED is illuminated |

Actuator Check Procedure

The system self test procedure drives all the actuator motors, to check their operation. If an actuator is operating incorrectly or operating outside of its limits then a fault code will be present.

Before commencing with the actuator check procedure, ensure the car is operating under normal conditions.

1. Switch ignition OFF.
2. Press and hold the RECIRC and AUTO buttons simultaneously, switch ignition ON and run the engine.
3. All the control panel LEDs and all LCD segments will flash on and off. Any function LED indicator which does not flash on / off suggests a fault condition within that area of the panel or, with the LED.
 - Any LCD element which fails to flash on / off indicates a fault within the display element or panel.
4. Press AUTO
5. Press RECIRC button to instigate actuator check mode.
6. Press FACE to cycle through the actuator mode conditions 20 to 27.
7. Press the FAN button to restore normal operation with default panel settings, ie AUTO @ 24°C.

Actuator Fault Codes

NOTE:

* The water valve operates on a 6 second pulse, ie 3 seconds ON, 3 seconds OFF.

1998 XK RANGE - Control Components - 412-04

| | | Outlet | | | | | | |
|------|--------------|---------------|-----------|-----------|------------------|-----------------|------------|-------------|
| Code | Blower Level | Centre vent | Foot | Defrost | Cool air by-pass | Fresh / Recirc. | Compressor | Water valve |
| 20 | 0 | open | closed | closed | closed | fresh | OFF | closed |
| 21 | 1 | open | closed | closed | closed | fresh | OFF | closed |
| 22 | 10 | open | closed | closed | open | half open | A/C ON | closed |
| 23 | 17 | bleed | half open | closed | half open | half open | A/C ON | 6s pulse * |
| 24 | 17 | bleed | half open | closed | closed | recirc. | A/C ON | 6s pulse * |
| 25 | 23 | closed | open | bleed | closed | recirc. | A/C ON | open |
| 26 | 23 | closed | half open | half open | closed | recirc. | A/C ON | open |
| 27 | 31 | closed | closed | open | closed | open | A/C ON | open |