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SERVICE

TECHNICAL BULLETIN

**HOOD SYSTEM ELECTRICAL HARDWARE
DIAGNOSIS OF ELECTRICAL DEFECTS**

MODEL **XK8**
YEAR **1997 MY ON**
VIN **001246 ON**

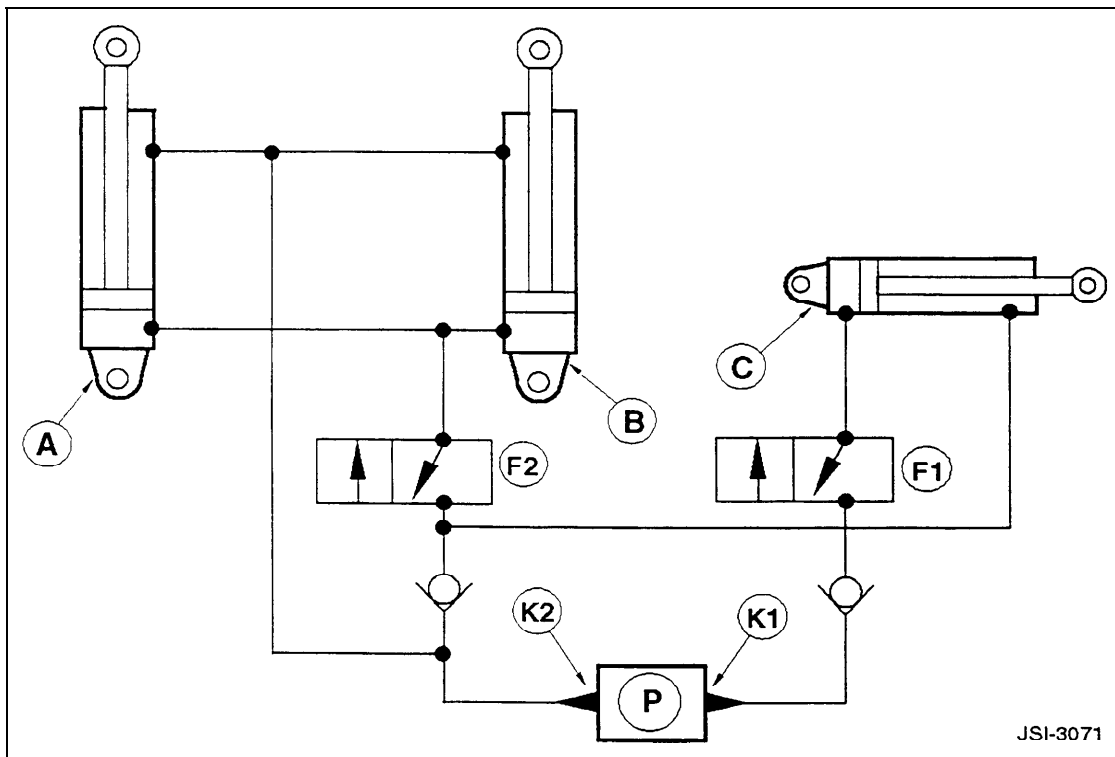
ISSUE:

This Technical Bulletin provides information which should enable the rapid **diagnosis and** rectification of potential malfunctions within the electrical components of the power hood system. For convenience, a description of the method operation of the hood and its electrical control logic is provided, followed by diagnosis charts.

Mechanical failures are NOT covered in this Technical Bulletin.

SYSTEM DESCRIPTION

The diagram below shows the main components of the hood system. (The cylinders are shown in the hood fully open position).



- Hydraulic Pump ('P')
- Hood Hydraulic Cylinders ('A' and 'B')
- Latch Mechanism Hydraulic Cylinder ('C')
- Two Relays ('K1' and 'K2'), control pump direction
- Two Solenoid Valves ('F1' and 'F2'), control hydraulic fluid flow

Hydraulic pump

Located in the right hand side of the luggage compartment. The pump can be operated in one of two directions depending on the required direction of the hood. There is a separate fluid outlet for each direction

Hood Hydraulic Cylinders

Located one each side of the rear seat, they are attached between the body and the hood. When hydraulic fluid is pumped into the base of the cylinders the rams extend, raising the hood. Fluid directed to the top of the cylinders cause the rams to retract, lowering the hood.

Latch Mechanism Hydraulic Cylinder

Located above the windscreen in the latch plate assembly, the cylinder controls the hood latching mechanism which basically comprises a claw and two locking pins. The cylinder, working in conjunction with the position of the hood hydraulic cylinders, either locks or releases the latching mechanism. At the end of the hood closing cycle the claw engages the hood and pulls it into the latch position, where the locking pins secure the hood in place. On receiving a request for the hood to be opened, the cylinder disengages the two locking pins and releases the claw from the hood, allowing the hood cylinders to take over the hood opening cycle.

Hydraulic Pump Control Relays

Relays are located in the luggage compartment fuse box

When relay 'K1' is energised, the hydraulic pump is in hood raising mode (push direction).

When relay 'K2' is energised, the hydraulic pump is in hood lowering mode (pull direction).

The two relays are controlled directly by the Security and Locking Module (SLM) located below the fuse box in the luggage compartment.

Hydraulic Control Solenoid Valves ('F1' and 'F2')

Located on top of the hood's hydraulic pump, the solenoids are identified by their coloured connectors: 'F1' = Blue, 'F2' = Orange.

Both solenoids are controlled by the Security and Locking Module (SLM) which is located below the luggage compartment fuse box. The solenoids control the flow of fluid 'to and from' the base of the hydraulic cylinders:

When energised 'F1' allows fluid to be pumped into the base of the latch mechanism cylinder.

When energised 'F2' allows fluid to be pumped into the base of the hood cylinders.

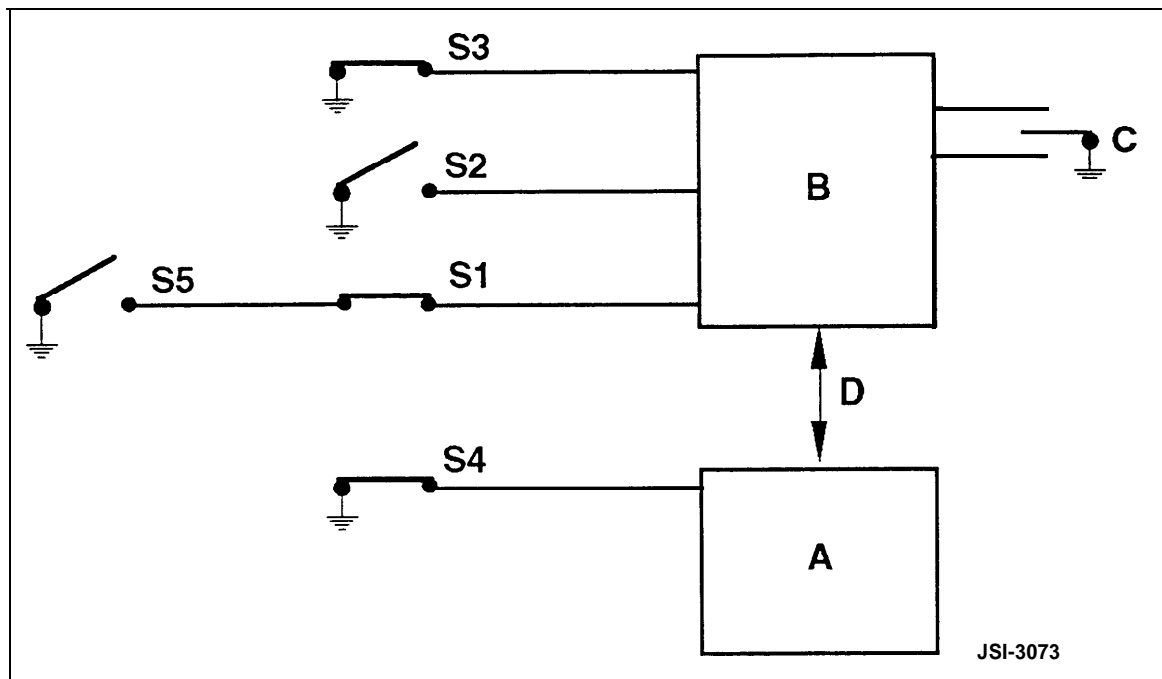
Main Control Switch

The switch is located in the centre console in front of the radio.

When the switch is pressed it signals to the BPM to either 'open' or 'close' the hood, the BPM communicates the request via SCP BUS to the SLM for as long as the switch is held in the respective position.

System Electronics

The diagram below shows the main electronic components of the hood system. (The switch positions are shown in the hood down position).



A - Security and Locking Module (SLM)

B - Body Processor Module (BPM)

C - Main Control Switch

D - SCP - BUS

'S1' to 'S5' - Microswitches

There are five microswitches in total which inform the SLM of the hood's position:

'S1' 'S2' and 'S3' are located in the latch mechanism, and are connected to the BPM which is located behind the glovebox.

'S4' is located on the bottom of the right hand, hood cylinder and is connected to the SLM.

'S5' is located on top of the right hand, hood cylinder and is wired in series with 'S1'.

The BPM notifies the SLM of any change to 'S1' 'S2' or 'S3' via the vehicle SCP - BUS.

The functions of the microswitches are given in more detail in the section 'Microswitch Functionality'.

MICROSWITCH FUNCTIONALITY

When the Security and Locking Module (SLM) receives a hood action request from the main control switch, the SLM monitors each mechanical movement via the microswitches as the hood cycles through its open or close operation. The microswitches signal when the cylinders and latch mechanisms have completed each of their designated operations.

Switch 1 ('S1'): Latch Claw.

- When the claw is fully raised (open) 'S1' is 'open circuit'.
- When the claw is in the lowered position (closed) 'S1' is 'closed circuit'.
- On a hood closing cycle, the **SLM** waits until 'S1' and 'S5' are 'closed circuit' before it triggers the latch pins to close.
- On a hood opening cycle, the SLM is informed that the hood has left the claw when 'S1' switches to 'open circuit'.

Note: 'S1' is wired in series with 'S5' therefore, both switches must **be closed before** the BPM input is grounded.

Switch 2 ('S2'): Latch Claw.

- 'S2' informs the SLM of the position of the hood.
- Before the claw lowers the hood into latch position, 'S2' is 'open circuit'.
- When the claw has lowered the hood into latch position, 'S2' switches to 'closed circuit'.
- On a hood opening cycle, the SLM begins to power the hood cylinders when 'S2' switches to 'open circuit'.
- When 'S2' switches to 'open circuit' the hydraulic pump reverses direction to **open the hood**.

Switch 3 ('S3'): Latch Locking Pins.

- When the latch claw has pulled the hood into latch position and the locking pins **are fully** engaged, 'S3' switches to 'closed circuit', in all other conditions 'S3' is 'open circuit'.
- On a hood closing cycle, the SLM waits for 'S3' to switch to 'closed circuit' confirming that the hood is closed, before raising any glass at easy open, and sounding the chime alarm.
- The switching of 'S3' to 'closed circuit' indicates that the **hood opening or closing cycle** has finished, therefore allowing the hydraulic pump to be switched off.

Note: The switches in the latch mechanism are monitored; if there is a switch failure the instrument cluster will display 'Hood Latch Fail'.

Switch 4 ('S4'): Hood Hydraulic Cylinders.

- When the hood cylinders are fully retracted (hood lowered) 'S4' switches to 'closed circuit', in all other conditions 'S4' is 'open circuit',
- When the hood cylinders are fully retracted, the switching of 'S4' to 'closed circuit' retracts the latch claw.

Switch 5 ('S5'): Hood Hydraulic Cylinders.

- When the hood cylinders are fully extended (hood over-centre **in raised position**) 'S5' is 'closed circuit'.
- **In all** other conditions 'S5' is 'open circuit'.
- 'S5' when 'closed circuit' informs the SLM **that the hood is over centre and in a safe** condition for the latch claw to pull the hood closed.

Note: 'S5' is wired in series with 'S1', therefore both switches must be closed before **the** BPM input is grounded.

HOOD OPENING SEQUENCE

Note: When operating the hood, the engine should be running to maintain maximum battery voltage.

The following is a step-by-step description of the hood opening sequence. It can be used in a fault finding capacity to determine at what stage the hood opening sequence was interrupted, therefore giving an indication of which component is malfunctioning.

The table at the end of the description shows the varying conditions of the switches, solenoids and relays as the hood goes through the opening cycle. The numbers in the top row of the table refer to the following description steps.

1. When the hood opening sequence begins the relays and solenoids will be in the off position, 'S4' will be the only switch in the 'open circuit' condition.
2. Pressing the hood control switch will signal the Body Processor Module (BPM) to send a 'Open Hood' signal to the Security and Locking Module (SLM). The SLM will open both rear quarter lights, and sound the chime alarm to warn that the hood is about to open. (Note: the rear quarter lights will be powered for a maximum of 3 seconds).
3. If the front windows are closed they will be opened slightly. The SLM will switch on relay 'K1' and solenoid 'F1', the latch claw will start to raise.
4. As the latch raises 'S3' followed by 'S2' will switch to 'open circuit'.
5. When 'S2' switches to 'open circuit' the SLM will switch off relay 'K1' and switch on relay 'K2'. This will change the hydraulic pump from push to pull mode to start the opening of the hood. When the hood leaves the latch claw 'S1' and 'S5' will be switched to 'open circuit'.
6. When the hood has fully opened 'S4' will switch to 'closed circuit'. The SLM will sound the chime alarm, raise any windows which it had lowered except rear quarter glass, and switch off solenoid 'F1' causing the latch mechanism to close.
7. When 'S3' is switched to 'closed circuit' in response to the latch **closing**, the SLM will switch off the hydraulic pump.

	1 & 2	3	4	4	5	5	5	6	6	7	7
F2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
F1	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF
K1	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
K2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF
S1 & 5	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
S2	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
s3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON

HOOD CLOSING SEQUENCE

Note: When operating the hood, the engine should be running to maintain maximum battery voltage.

The following is a step-by-step description of the hood closing sequence. It can be used in a fault finding capacity to determine at what stage the hood closing sequence was interrupted, therefore giving an indication of which component is malfunctioning.

The table at the end of the description shows the varying conditions of the switches, solenoids and relays as the hood goes through the closing cycle. The numbers in the top row of the table refer to the following description steps.

1. When the hood closing sequence begins the solenoids and relays will all be switched 'off'. 'S3' and 'S4' will be the only switches that are 'closed circuit'.
2. Pressing the hood control switch will signal the Body Processor Module (BPM) to send a 'Close Hood' signal to the Security and Locking Module (SLM). The SLM will sound the chime alarm to warn that the hood is about to close.
3. If the front windows are closed they will be opened slightly. The SLM will turn on relay 'K 1' and solenoid 'F1', the latch claw will start to raise.
4. As the latch claw raises 'S3' will go 'open circuit'.
5. When 'S3' goes 'open circuit' the SLM switches on solenoid 'F2'; the hood will start to raise.
6. When the hood has fully raised it will touch the latch claw which will switch 'S1' to 'closed circuit', and the end of the hood cylinder travel will switch 'S5' to closed circuit enabling a signal to be sent. The SLM switches off solenoid 'F1'; and the claw pulls the hood in to the latch position allowing the locking pins to engage, securing the hood in place.
7. When the latch has closed 'S2' and 'S3' will be switched to 'closed circuit', the SLM will turn off the hydraulic pump, sound the alarm chime, and raise the front windows.
8. Further pressure on the hood control switch will raise the rear quarter light glass.

	1 & 2	3	4	5	6	6	7	7	7
F2	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF
F1	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
K1	OFF	ON	ON	ON	ON	ON	ON	ON	OFF
K2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S1 & .5	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
s2	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
S3	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
s4	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF

FAULT DIAGNOSIS

Note: When operating the hood, the engine should be running to maintain maximum battery voltage.

Fault diagnosis is split into three sections, the most common hood failures are listed under the heading 'First Actions'. The vehicle should be checked using this list before consulting the following sections. The second section 'Diagnosing Switch Faults' deals **with faults** which occur when one of the microswitches malfunctions. The third **section is a list of** hood failures and their possible causes.

First Actions

Listed below are the most common hood failures:

- Is the battery fully charged?
- Is the hood pump switched to automatic - check that the 'T' piece on the side of the pump is turned fully clockwise.
- Are all the relays correctly seated in the luggage compartment fuse box.
- Check for ruptured fuses in the luggage compartment fuse box.
- Are all the connectors including the orange and blue solenoid connectors secure and correctly fitted to the hydraulic pump.
- If the hood has been manually operated ensure it has been returned to the automatic condition.
- If the mechanism claw is in the wrong position in comparison to the hood's position, it is possible that the system's logic has become confused. The problem can be rectified by manually repositioning the claw, e.g. if the claw is in the raised position move it into the lowered position.

Diagnosing Switch Faults

To use the table on the next page, read down the **relevant column until a box is found** that describes the hood malfunction. Once found, check that the description in the opposite box relates to the malfunction when the hood is operated in the opposite direction. If both descriptions agree, then the problem is being **caused- by the listed switch or the harness/connectors** linked to it.

The described hood malfunctions assume that **the hood operation is starting from either the fully raised and latched position or the fully lowered and latch retracted position. It is important that to successfully diagnose some failures that the main control switch is depressed for up to 35 to 40 seconds. This allows the program logic to achieve 'time out' i.e. maximum time allowed for hood opening or closing to complete its cycle.**

Note: Some switches have similar symptoms when the hood is operated in one direction, but no two switches have the same failure problems in both directions.

Problem Occurring When Hood is Opening	Problem Occurring When Hood is Closing	Fault
'Hood Latch Fail' displayed on IC when ignition is activated. Rear quarter lights will lower, but latch and hood will not function.	Hood raises and latches but chime alarm does not sound. Rear quarter lights will not raise. 'Hood Latch Fail' displayed on IC after operation.	'S2' open circuit
'Hood Latch Fail' displayed on IC when ignition is activated. Hood will lower and latch claw will retract when hood is down, however, on releasing main control switch the latch claw will raise and remain raised.	'Hood Latch Fail' displayed on IC when the ignition is activated. Hood raises and latches but chime alarm does not sound. Rear quarter lights will not raise.	'S3' open circuit
Hood will lower but there will be a delay before the latch claw 'rapidly' retracts, owing to a logic time-out. 'Hood Latch fail' will NOT be displayed on IC after operation.	Hood will function normally. ('S4' is not functional during hood raise operation).	'S4' open circuit
Hood will function normally.	Hood will raise and engage in latch claw, followed by a delay before the latch claw 'rapidly' retracts. Rear quarter lights will not raise. 'Hood Latch Fail' will display on IC after operation	'S5' open circuit
Rear quarter lights will lower and hood will start to unlatch but will only lift slightly and remain in the latch claw. After 5 seconds approx., latch claw will 'rapidly' retract pulling hood back into the latch. 'Hood Latch Fail' will display on IC after operation.	'Hood Latch Fail' displayed on IC when ignition is activated. Hood and latch do not function.	'S2' short circuit
Rear quarter lights will lower and hood will start to unlatch but will only lift slightly and remain in the latch claw. After 5 seconds approx., latch claw will 'rapidly' retract pulling hood back into the latch. 'Hood Latch Fail' will NOT be displayed on IC after operation.	Latch claw will raise but hood will not move. Latch claw retracts after 5 seconds of switch operation. 'Hood Latch Fail' will NOT be displayed on IC after operation.	'S3' short circuit
'Hood Latch Fail' displayed on IC when the ignition is activated. Rear quarter lights will lower but hood and latch do not function.	Hood will raise and engage in latch claw followed by a delay before the claw 'rapidly' retracts. Rear quarter lights will not raise. 'Hood Latch Fail' displayed on IC after operation.	'S4' short circuit
Hood and rear quarter lights will operate normally, but 'Hood Latch Fail' will be displayed on IC after operation.	'Hood Latch Fail' displayed on IC when ignition is activated. Hood and rear quarter lights do not function.	'S5' short circuit

IC = instrument cluster

Hood Fault Finder

Fault	Detection.	Possible Causes
Hood Will Not Raise	Pressing the hood control switch has no effect on the hood system or rear quarter lights.	Low battery voltage. Ruptured fuse. Ignition is off or faulty. 'S5' is short circuit. Hood control switch faulty. BPM not receiving signal from hood switch. 'S1'/'S5' input to BPM is shorting to ground. IC is indicating wrong vehicle speed. BPM not sending open/close message. SCP failure.
Hood Will Not Lower	Pressing the hood control switch has no effect on the hood system or rear quarter lights.	Low battery voltage Ruptured fuse Ignition is off or faulty. 'S4' is short circuit. 'S3' is 'open circuit'. Hood control switch faulty BPM not receiving signal from hood switch. BPM not sending open/close message. SCP failure.
Hood Will Not Unlatch	Quarter lights lower when hood control switch is pressed but hood does not unlatch.	Low battery voltage. Ruptured fuse. Pump is on manual setting. Pump/solenoids are disconnected/faulty. Relay is dislodged/damaged faulty. 'S3' is short circuit. 'S2' is open circuit. IC is indicating wrong vehicle speed.
Hood Will Not Latch	Hood raises but does not latch when it reaches the claw.	'S1/S5' input to BPM is open circuit. 'S1' is open circuit - IC shows 'Hood Latch Fail'. 'S5' is open circuit - IC shows 'Hood Latch Fail'. 'S2' is short circuit - IC shows 'Hood Latch Fail'. 'S3' is short circuit. 'S4' is short circuit. Solenoid 'F1' is stuck active. IC is indicating wrong vehicle speed.
Quarter Light Does Not Raise	Quarter light does not raise or does not raise correctly.	Hood is open. Ruptured fuse. 'S3' is open circuit - IC shows 'Hood Latch Fail'. 'S2' is open circuit - qtrs. rise after 3rd press. 'S4' is short circuit. Fault with quarter light mechanism. Quarter lights are iced up / stuck to seal. Ignition is off or faulty. Hood control switch is faulty. BPM not receiving signal from control switch. BPM not sending open/close hood signal .
Quarter Glass Does Not Lower.	Hood lowers but quarter lights do not.	Ruptured fuse. Fault with quarter light mechanism. Quarter lights are iced up / stuck to seal . Quarter light, raise relays are stuck active.
Front Windows Do Not Drop/Raise Correctly	The front windows do not drop to easy open, or raise from easy open during hood operation, or do not drop/raise far enough.	The windows require programming. Ruptured fuse. Electronic fault between SCP and door modules. Door modules incorrectly programmed. Problems with glass/door seals.