



XK8

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501-11

SERVICE

TECHNICAL BULLETIN

Convertible Top Electrical System – Component Descriptions & Diagnosis

MODEL 1997 MY-ON
XK8 Convertible
VIN 001001-ON

Remove and destroy Bulletin 501-11, dated 9/98.
Replace with this Bulletin.
A description of the convertible top system
opening and closing sequence has been added.

Issue:

This Technical Bulletin provides information which should enable the diagnosis and repair of possible malfunctions within the electrical components of the power convertible top system. Mechanical failures are **not** covered in this Technical Bulletin.

Action:

Refer to section below for component descriptions. Refer to page 5 for fault diagnosis. Refer to Fig. 15.2 of the XK8 Electrical Guide for an electrical schematic of the convertible top system.

COMPONENT DESCRIPTIONS

Hydraulic Pump

Located in the right side of the luggage compartment. The pump can be operated in two directions depending on the required direction of the convertible top (push direction - pistons extend, pull direction - pistons retract). There is a separate fluid outlet for each direction since the fluid returns through the other outlet which then functions as an inlet.

Convertible Top Hydraulic Cylinders

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

Latch Mechanism Hydraulic Cylinder

Located above the windshield in the latch plate assembly, the cylinder controls the convertible top latching mechanism which basically comprises a claw and two locking pins. The cylinder, either locks or releases the latching mechanism. At the end of the convertible top closing cycle, the claw engages the convertible top and pulls it into the latch position, where the locking pins secure the convertible top in place. On receiving a request for the convertible top to be opened, the cylinder retracts the two locking pins and opens the claw, releasing the convertible top, allowing the convertible top cylinders to take over the convertible top opening cycle.

Hydraulic Pump Control Relays

The relays are located in the luggage compartment fuse box.

When the Top Up Relay is energized, the hydraulic pump is in convertible top raising mode (push direction - pistons extend).

When the Top Down Relay is energized, the hydraulic pump is in convertible top lowering mode (pull direction - pistons retract).

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

Hydraulic Control Solenoid Valves (Latch Control Valve and Main Control Valve)

Located on top of the convertible top's hydraulic pump, the solenoids are identified by colored dots: Latch Control Valve = Blue, Main Control Valve = Orange.

Both solenoids are controlled by the Security and Locking Control Module (SLCM) 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 energized, the Latch Control Valve allows fluid to be pumped into the base of the latch mechanism cylinder to extend the piston. When de-energized, the Latch Control Valve allows fluid to exit the base of the latch mechanism cylinder to allow the piston to retract.

When energized, the Main Control Valve allows fluid to be pumped into the base of the convertible top cylinders to extend the pistons. When de-energized, the Main Control Valve allows fluid to exit the base of the convertible top cylinders to allow the pistons to retract.

Convertible Top Switch

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

When the switch is pressed it signals to the Body Processor Module (BPM) to either open or close the convertible top. The BPM communicates the request via the SCP - BUS to the SLCM for as long as the switch is held in the respective position.

There are five microswitches in total which inform the SLCM of the convertible top's position: The "Top Ready To Latch" Switch, "Top Latch Closed" Switch, and "Top Closed" Switch are located in the latch mechanism, and are connected to the BPM which is located behind the glove compartment.

The "Top Down" Switch is located on the bottom of the right side convertible top cylinder and is connected to the SLCM.

The "Top Raised" Switch is located on top of the right side convertible top cylinder and is wired in series with the "Top Ready To Latch" Switch.

The BPM notifies the SLCM of any change to the "Top Ready To Latch" Switch, the "Top Latch Closed" Switch, or the "Top Closed" Switch via the vehicle SCP - BUS.

The functions of the microswitches are given in more detail in the section Operation of Microswitches.

OPERATION OF MICROSWITCHES

Overview

“Top Ready to Latch” Switch and “Top Raised” Switch

When both of these switches are closed, the system signals that the convertible top is over center, and that the top has contacted the latch claw.

“Top Closed” Switch

When this switch is closed, the system signals that the top has been successfully grabbed by the latch claw.

“Top Latch Closed” Switch

When this switch is closed, the system signals that the latch has retracted successfully, and that the locking pins are extended.

“Top Down” Switch

When this switch is closed, the system signals that the top is completely open.

Description

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

“Top Ready To Latch” Switch: Latch Claw.

- When the claw is fully raised (open) the “Top Ready To Latch” Switch is ‘open circuit’.
- When the claw is in the lowered position (closed) the “Top Ready To Latch” Switch is ‘closed circuit’.
- On a convertible top closing cycle, the SLCM waits until the “Top Ready To Latch” Switch and the “Top Raised” Switch are ‘closed circuit’ before it triggers the latch pins to close.
- On a convertible top opening cycle, the SLCM is informed that the convertible top has left the claw when the “Top Ready To Latch” Switch switches to ‘open circuit’.

<p>Note: The “Top Ready To Latch” Switch is wired in series with the “Top Raised” Switch therefore, both switches must be closed before the BPM input is grounded.</p>

“Top Closed” Switch: Latch Claw.

- The “Top Closed” Switch informs the SLCM of the position of the convertible top.
- Before the claw lowers the convertible top into latch position, the “Top Closed” Switch is ‘open circuit’.
- When the claw has lowered the convertible top into latch position, the “Top Closed” Switch switches to ‘closed circuit’.
- On a convertible top opening cycle, the SLCM begins to power the convertible top cylinders when the “Top Closed” Switch switches to ‘open circuit’.

- When the “Top Closed” Switch switches to ‘open circuit’ the hydraulic pump reverses direction to open the convertible top.

“Top Latch Closed” Switch: Latch Locking Pins.

- When the latch claw has pulled the convertible top into latch position and the locking pins are fully engaged, the “Top Latch Closed” Switch switches to ‘closed circuit’. In all other conditions the “Top Latch Closed” Switch is ‘open circuit’.
- On a convertible top closing cycle, the SLCM waits for the “Top Latch Closed” Switch to switch to ‘closed circuit’ confirming that the convertible top is closed, before raising any glass at easy open, and sounding the chime alarm.
- The switching of the “Top Latch Closed” Switch to ‘closed circuit’ indicates that the convertible top 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 “Convertible top Latch Fail”.

“Top Down” Switch: Convertible top Hydraulic Cylinders.

- When the convertible top cylinders are fully retracted (convertible top lowered) the “Top Down” Switch switches to ‘closed circuit’, in all other conditions the “Top Down” Switch is ‘open circuit’.
- When the convertible top cylinders are fully retracted, the switching of the “Top Down” Switch to ‘closed circuit’ retracts the latch claw.

“Top Raised” Switch: Convertible top Hydraulic Cylinders.

- When the convertible top cylinders are fully extended (convertible top over-center in raised position) the “Top Raised” Switch is ‘closed circuit’.
- In all other conditions the “Top Raised” Switch is ‘open circuit’.
- The “Top Raised” Switch when ‘closed circuit’ informs the SLCM that the convertible top is over center and in a safe condition for the latch claw to pull the convertible top closed.

Note: The “Top Raised” Switch is wired in series with the “Top Ready To Latch” Switch, therefore both switches must be closed before the BPM input is grounded.

CONVERTIBLE TOP OPENING SEQUENCE

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

The following is a step-by-step description of the convertible top opening sequence. It can be used for fault finding to determine at what stage the convertible top 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 (on = closed, off = open) of the switches, solenoids and relays as the convertible top goes through the opening cycle. The numbers in the top row of the table refer to the following description steps.

1. When the convertible top opening sequence begins the relays and solenoids will be in the off position, 'Convertible top down switch' will be the only switch in the 'open circuit' condition.
2. Pressing the convertible top switch will signal the Body Processor Module (BPM) to send a 'Open Convertible top' signal to the Security and Locking Module (SLCM). The SLCM will open both rear quarter windows, and sound the chime alarm to warn that the convertible top is about to open. (Note: the rear quarter windows will be powered for a maximum of 3 seconds).
3. If the front windows are closed they will be opened slightly. The SLCM will switch on relay 'Top up relay' and the 'latch control valve', the latch claw will start to raise.
4. As the latch raises 'Convertible latch closed switch' followed by the 'convertible top closed switch' will switch to 'open circuit'.
5. When 'Convertible top closed switch' switches to 'open circuit' the SLCM will switch off relay 'Top up relay' and switch on relay 'Top down relay'. This will change the hydraulic pump from push to pull mode to start the opening of the convertible top. When the convertible top leaves the latch claw 'Convertible top ready-to-latch switch' and 'Convertible top raised switch' will be switched to 'open circuit'.
6. When the convertible top has fully opened 'Convertible top down switch' will switch to 'closed circuit'. The SLCM will sound the chime alarm, raise any windows which it had lowered except the rear quarter windows, and switch off the 'latch control valve' causing the latch mechanism to close.
7. When 'Convertible top latch closed switch' is switched to 'closed circuit' in response to the latch closing, the SLCM will switch off the hydraulic pump.

	1 & 2	3	4	4	5	5	5	6	6	7	7
Main control valve	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Latch control valve	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF
Top up relay	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Top down relay	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF
Convertible top ready-to-latch switch & Convertible top raised switch.	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Convertible top closed switch	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Convertible top latch closed switch	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
Convertible top down switch	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON

CONVERTIBLE TOP CLOSING SEQUENCE

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

The following is a step-by-step description of the convertible top closing sequence. It can be used for fault finding to determine at what stage the convertible top 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 (on = closed, off = open) of the switches, solenoids and relays as the convertible top goes through the closing cycle. The numbers in the top row of the table refer to the following description steps.

1. When the convertible top closing sequence begins the solenoids and relays will all be switched 'off'. The 'Convertible top latch closed switch' and 'Convertible top down switch' will be the only switches that are 'closed circuit'.
2. Pressing the convertible top switch will signal the Body Processor Module (BPM) to send a 'Close Convertible top' signal to the Security and Locking Control Module (SLCM). The SLCM will sound the chime alarm to warn that the convertible top is about to close.
3. If the front windows are closed they will be opened slightly. The SLCM will turn on the 'top up relay' and the 'latch control valve', the latch claw will start to raise.
4. As the latch claw raises 'Convertible top latch closed switch' will go 'open circuit'.
5. When 'Convertible top latch closed switch' goes 'open circuit' the SLCM switches on solenoid 'main control valve'; the convertible top will start to raise.
6. When the convertible top has fully raised it will touch the latch claw which will switch 'Convertible top ready-to-latch switch' to 'closed circuit', and the end of the convertible top cylinder travel will switch 'Convertible top raised switch' to closed circuit enabling a signal to be sent. The SLCM switches off the 'Latch Control Valve'; and the claw pulls the convertible top in to the latch position allowing the locking pins to engage, securing the convertible top in place.
7. When the latch has closed 'Convertible top closed switch' and 'Convertible top latch closed switch' will be switched to 'closed circuit', the SLCM will turn off the hydraulic pump, sound the alarm chime, and raise the front windows.
8. Further pressure on the convertible top switch will raise the rear quarter windows.

	1 & 2	3	4	5	6	6	7	7	7
Main control valve	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF
Latch control valve	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
Top up relay	OFF	ON	ON	ON	ON	ON	ON	ON	OFF
Top down relay	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Convertible top ready-to-latch switch & Convertible top raised switch	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
Convertible top closed switch	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
Convertible top latch closed switch	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
Convertible top down switch	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF

FAULT DIAGNOSIS

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

Fault diagnosis is split into three sections, the most common top failures are listed under the section Preliminary Checks. 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 top failures and their possible causes. Refer to Fig. 15.2 of the XK8 Electrical Guide for an electrical schematic of the convertible top system.

Preliminary Checks

Listed below are the most common top failures:

- Is the battery fully charged?
- Is the top pump switched to automatic? - check that the manual operation valve on the side of the pump is turned fully clockwise.
- Are all the relays correctly seated in the luggage compartment fuse box?
- Check for blown 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 top 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 top's position, it is possible that the system's logic has become confused. The problem can be corrected 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 top malfunction. Once found, check that the description in the opposite box relates to the malfunction when the top 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 top malfunctions assume that the top 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 top opening or closing to complete its cycle.

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

Problem While Top is Opening	Problem While Top is Closing	Possible Cause
'Top Latch Fail' displayed on instrument pack when ignition is activated. Rear quarter glass will lower, but latch and top will not function.	Top raises and latches but chime alarm does not sound. Rear quarter glass will not raise. 'Top Latch Fail' displayed on instrument pack after operation.	Open circuit in "Top latch closed" switch.
'Top Latch Fail' displayed on instrument pack when ignition is activated. Top will lower and latch claw will retract when top is down, however, on releasing main control switch the latch claw will raise and remain raised.	'Top Latch Fail' displayed on instrument pack when the ignition is activated. Top raises and latches but chime alarm does not sound. Rear quarter glass will not raise.	Open circuit in "Top closed" switch.
Top will lower but there will be a delay before the latch claw 'rapidly' retracts, due to a logic time-out. 'Top Latch fail' will NOT be displayed on instrument pack after operation.	Top will function normally. (Top down' switch is not functional during Top raise operation).	Open circuit in "Top down" switch.
Top will function normally.	Top will raise and engage in latch claw, followed by a delay before the latch claw 'rapidly' retracts. Rear quarter glass will not raise. 'Top Latch Fail' will display on instrument pack after operation	Open circuit in "Top raised" switch.
Rear quarter glass 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 top back into the latch. 'Top Latch Fail' will display on instrument pack after operation.	'Top Latch Fail' displayed on instrument pack when ignition is activated. Top and latch do not function.	Short circuit in "Top latch closed" switch.
Rear quarter glass will lower and top 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 top back into the latch. 'Top Latch Fail' will NOT be displayed on instrument pack after operation.	Latch claw will raise but top will not move. Latch claw retracts after 5 seconds of switch operation. 'Top Latch Fail' will NOT be displayed on instrument pack after operation.	Short circuit in "Top closed" switch.
'Top Latch Fail' displayed on instrument pack when the ignition is activated. Rear quarter glass will lower but top and latch do not function.	Top will raise and engage in latch claw followed by a delay before the claw 'rapidly' retracts. Rear quarter glass will not raise. 'Top Latch Fail' displayed on instrument pack after operation.	Short circuit in "Top down" switch.
Top and rear quarter glass will operate normally, but 'Top Latch Fail' will be displayed on instrument pack after operation.	'Top Latch Fail' displayed on instrument pack when ignition is activated. Top and rear quarter glass do not function.	Short circuit in "Top raised" switch.

Fault	Detection	Possible Causes
Top Will Not Raise	Pressing the top control switch has no effect on the top system or rear quarter glass.	<p>Low battery voltage. Blown fuse. Ignition is off or faulty. "Top raised" switch is short circuit. Top control switch faulty. BPM not receiving signal from top switch. "Top ready-to-latch"/"Top raised" switch input to BPM is shorted to ground. Instrument pack is indicating wrong vehicle speed. BPM not sending open/close message. SCP failure</p>
Top Will Not Lower	Pressing the top control switch has no effect on the top system or rear quarter glass.	<p>Low battery voltage. Blown fuse. Ignition is off or faulty. "Top down" switch is short circuit."Top latch closed" switch is open circuit. Top control switch faulty. BPM not receiving signal from top switch. BPM not sending open/close message. SCP failure.</p>
Top Will Not Unlatch	Quarter glass lowers when top control switch is pressed but top does not unlatch.	<p>Low battery voltage. Blown fuse. Pump is on manual setting. Pump/solenoids are disconnected/faulty. Relay is dislodged/damaged faulty. "Top latch closed" switch is short circuited. "Top closed" switch is open circuit. Instrument pack is indicating wrong vehicle speed.</p>
Top Will Not Latch	Top raises but does not latch when it reaches the claw.	<p>"Top ready-to-latch"/"Top raised" switch input to BPM is open circuit. "Top ready-to-latch" switch is open circuit-Inst. pack shows 'Top Latch Fail'. "Top raised" switch is open circuit - Inst. pack shows 'Top Latch Fail'. "Top closed" switch is short circuit - Inst. pack shows 'Top Latch Fail'. "Top latch closed" switch is short circuit."Top down" switch is short circuit. Latch Control Valve solenoid is stuck active. Instrument pack is indicating wrong vehicle speed.</p>