Passive Anti-Theft System (PATS) – Diagnostic Flowcharts

**Issue:**
This bulletin provides diagnostic information for the Passive Anti-Theft System.

**Action:**
Refer to the following information when diagnosing PATS on a 2002 MY-ON X-TYPE vehicle.

**DIAGNOSTIC FLOWCHARTS**
- P1260 - Security input (Page 2)
- Passive Anti-Theft System (To be used to interpret the type of failure) (Pages 3 and 4)

PATS Customer fault code flowcharts.
- B1681 - fault code 11 (Pages 5, 6, 7 and 8)
- B1600 - fault code 13 (Pages 9 and 10)
- B1602 - fault code 14 (Pages 11, 12, 13 and 14)
- B1601 - fault code 15 (Pages 15, 16 and 17)
- U2511/U1900 - fault code 16 (Page 18)

PATS Non-Customer fault code flowcharts.
- B1213 - fault code 21 (Pages 19 and 20)
- B2141 - fault code 22 (Pages 21 and 22)
- U2510 - fault code 23 (Pages 23 and 24)

**ADDITIONAL INFORMATION**
- Passive Anti-Theft System Overview (Page 25)
- Engine Control Module (ECM) PATS functionality (Page 26)
- Fault code reading (from PATS LED) (Page 27)
- DTC Descriptions (Page 28)
- Generic Connector Inspection (Page 29)
- Generic Harness Check (Page 30)
Use the Worldwide Diagnostic System (WDS) to interrogate the Engine Control Module (ECM) for Diagnostic Trouble Codes (DTC).

See Additional Information Fault Code Reading

If P1260 is logged, check that the Passive Anti-Theft System (PATS) prove-out is not reporting any faults via the Light Emitting Diode (LED).

Was a fault identified via PATS prove out?

GO TO THE ASSOCIATED FLOWCHART

Was a fault found and rectified?

END

Contact Technical Hotline for further assistance

Using WDS, Select Module Communications Network from the Content Model menu, then CAN Network. Check the Network Integrity
Passive Anti-Theft System

Faults with the Passive Anti-Theft System (PATS) are reported by the Instrument Cluster as Diagnostic Trouble Codes (DTCs) and Fault Codes via the Light Emitting Diode (LED)

If possible, ensure all customer keys are present, before proceeding

Switch the ignition ‘ON’

Refer to the Electrical Guide on JTIS

Check battery condition and power supplies/ignition circuits to Instrument Cluster

Was a fault found and rectified?

END

YES

Contact Dealer Technical Support for further assistance

NO

Is the Instrument Cluster Oil, Battery and Message Center Illuminated?

NO

YES

Did the PATS LED illuminate when the ignition was switched ‘ON’?

NO

YES

Use the WDS to investigate LED failure

A
Does the PATS LED flash when the ignition is switched 'ON'?

YES

Refer to the relevant flowchart

NO

Does the PATS LED extinguish after 3 seconds?

YES

See Additional Information. PATS Fault Code Reading

NO

Wait for 60 seconds then read the fault code

See Additional Information. PATS Fault Code Reading

PATS customer fault codes.
B1681 - fault code 11
B1600 - fault code 13
B1602 - fault code 14
B1601 - fault code 15
U2511/U1900 - fault code 16

NO

Wait for 60 seconds then read the fault code

PATS 'Non' customer fault codes
B1213 - fault code 21
B2141 - fault code 22
U2510 - fault code 23

Refer to the relevant flowchart

No faults indicated in prove out

Refer to the relevant flowchart
Diagnostic Trouble Code B1681
Fault Code 11

Visually inspect fitment of Passive Anti-Theft System (PATS) Transceiver and electrical connector

When inspecting the connector, pay particular attention to the wire clamp, ensuring it is clipped fully home. Also ensure the wires protruding through the connector are trimmed correctly and not shorting

Disconnect PATS Transceiver electrical connector FC052 and carry out a Generic Connector Inspection

Using a Digital Multi Meter (DMM) check for battery voltage at PATS Transceiver electrical connector FC052 pin 001

Check fuse 24 (5amp) in the Primary Junction Fusebox

Was the fuse blown?

YES

NO

Was battery voltage present?

YES

NO

See Additional Information Generic Connector Inspection

See Additional Information Generic Harness Check

Check fuse 24 (5amp) in the Primary Junction Fusebox

Was a fault found and rectified?

YES

NO

Contact Technical Hotline for further assistance

END

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Check battery voltage at fuse 12 (30amp) in the Rear Power Distribution Fusebox

Was battery voltage present?

YES: Investigate relay 2 in the Rear Power Distribution Fusebox

NO: Investigate battery supply to Rear Power Distribution Fusebox

YES: Refer to Electrical Guide within JTIS

NO: See Additional Information Generic Harness Check

Was a fault found and rectified?

YES: Carry out a Generic Harness Check between Rear Power Distribution Fusebox electrical connector CA061 pin 005 and Primary Junction Fusebox electrical connector CA002 pin 017 (Brown and white wire)

NO: Contact Technical Hotline for further assistance

END YES

END NO
Check for continuity between PATS Transceiver electrical connector FC052 pin 002 and Instrument Cluster electrical connector FC015 pin 004 (Black and green wire)

Was a fault found and rectified?

Contact Technical Hotline for further assistance

With the ignition 'ON' using a DMM check for a ground supply at PATS Transceiver electrical connector FC052 pin 002

Was the reading as expected?

Disconnect Instrument Cluster electrical connector FC015 and carry out a Generic Connector Inspection

See Additional Information Generic Connector Inspection

YES

NO

See Additional Information Generic Harness Check

See Additional Information Generic Harness Check

YES

END

NO
With the ignition 'ON' using a DMM check for battery voltage at PATS Transceiver electrical connector FC052 pin 003

Was battery voltage present?

Disconnect Instrument Cluster electrical connector FC015 and carry out a Generic Connector Inspection

Check for continuity between the PATS Transceiver electrical connector FC052 pin 003 and Instrument Cluster electrical connector FC015 pin 005 (white and red wire)

Was a fault found and rectified?

Contact Technical Hotline for further assistance

END
Was a fault found and rectified?

Connect Instrument Cluster electrical connector FC015 and carry out a Generic Connector Inspection

Check for continuity between the PATS Transceiver electrical connector FC052 pin 004 and Instrument Cluster electrical connector FC015 pin 006 (yellow and red wire)

Replace faulty PATS Transceiver

See Additional Information Generic Connector Inspection

See Additional Information Generic Harness Check

YES

END

NO
Diagnostic Trouble Code B1600
Fault Code 13

Note: Ensure more than one key is available

Switch the ignition ‘OFF’ and remove the key from ignition

Insert another key into ignition and switch the ignition ‘ON’

Is the Passive Anti-Theft System (PATS) LED flashing?

YES → A

NO

Replace the original ignition key

YES → Ensure all available ignition keys are clear of fault codes within the PATS prove-out, before the vehicle is returned to the customer

NO

Does the PATS LED extinguish after 3 seconds?

YES → LED on constantly for 60 seconds

NO

Read the ‘Non’ customer fault code and follow the relevant flowchart
Is fault code 13 still present?

Wait for 60 seconds

Replace faulty PATS Transceiver

Is fault code 13 still present?

Are any other fault codes present?

Ensure all available ignition keys are clear of fault codes within the PATS prove out, before the vehicle is returned to the customer

Follow the relevant flowchart

Replace the original ignition key
Diagnostic Trouble Code B1602
Fault Code 14

Are any non-Jaguar keys attached to the key ring?

NO → B

YES → Separate Jaguar keys from key ring

Switch the ignition 'ON'

Is the Passive Anti-Theft System (PATS) LED flashing?

YES → A

NO → Does the PATS LED extinguish after 3 seconds?

YES → Notify customer that attachments on key ring are interfering with key transponder

NO → LED on constantly for 60 seconds

Read the 'Non' customer fault code and follow the relevant flowchart

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Is the fault code 14 still present?

- If other fault codes are present, follow the relevant flowchart
- Insert another key into ignition, switch the ignition 'ON'
  - Wait for 60 seconds
  - Does the PATS LED extinguish after 3 seconds?
    - Yes
      - Does the PATS LED extinguish after 3 seconds?
        - Yes
          - Read the 'Non' customer fault code and follow the relevant flowchart
        - No
          - Replace original ignition key
      - No
        - Replace faulty PATS Transceiver
          - Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer
  - No
    - As the 2nd key has indicated another fault, rectify that fault first and then recheck original key
    - Replace faulty PATS Transceiver

Wait for 60 seconds

Is the fault code 14 still present?

- Yes
  - Read the 'Non' customer fault code and follow the relevant flowchart
- No
  - Wait for 60 seconds
  - Is the PATS LED flashing?
    - Yes
      - Does the PATS LED extinguish after 3 seconds?
        - Yes
          - Read the 'Non' customer fault code and follow the relevant flowchart
        - No
          - Replace original ignition key
    - No
      - Replace faulty PATS Transceiver
        - Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer
Insert another key into ignition, switch the ignition 'ON'

Is the PATS LED flashing?

YES

Replace original ignition key

NO

Does the PATS LED extinguish after 3 seconds?

YES

NO

LED on constantly for 60 seconds

Read the 'Non' customer fault code and follow the relevant flowchart
Is the fault code 14 still present?

Wait for 60 seconds

Replace faulty PATS Transceiver

Ensure all the available keys are free from fault codes within the PATS prove-out, before returning the vehicle to the customer

If other fault codes are present, follow the relevant flowchart
Diagnostic Trouble Code B1601
Fault Code 15

Have the key transponders been re-programmed to the vehicle?

NO

Switch the ignition ‘OFF’ and remove the key

Insert another key into ignition, and switch the ignition ‘ON’

Is the Passive Anti-Theft System (PATS) LED flashing?

NO

Does the PATS LED extinguish after 3 seconds?

YES

Replace the original ignition key

Ensure all available ignition keys are clear from fault codes within PATS prove-out, before returning the vehicle to the customer

YES

LED on constantly for 60 seconds

NO

Read the ‘Non’ customer fault code and follow the relevant flowchart

Note: Ensure more than one key is available
A

Using Worldwide Diagnostic System (WDS).
Select Vehicle Configuration tab, Set-up and Configuration, Security
then program new transponders

Re-program all available keys

Switch ignition 'ON'

B

YES

Is the PATS LED flashing?

NO

Does the PATS LED extinguish after 3 seconds?

YES

Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer

END

NO

LED on constantly for 60 seconds

YES

Read the 'Non' customer fault code and follow the relevant flowchart
Is the fault code 15 still present?

- YES: Contact Technical Hotline for further assistance
- NO: If other fault codes are present, follow the relevant flowchart

Ensure all available ignition keys are clear from fault codes within PATS prove out, before returning the vehicle to the customer.
Diagnostic Trouble Code U2511/U1900
Fault Code 16

V6/V8
Power - PI001 pin 022
PI001 pin 023
PI001 pin 024
Ground - PI001 pin 004
PI001 pin 005

Refer to the S-TYPE Electrical Guide

Investigate power and ground supplies to the Engine Control Module

Was a fault found and rectified?

YES

END

NO

Using the Worldwide Diagnostic System (WDS)
Select Module Communications Network from the Content Model menu, then the CAN network
Check the network integrity

Was a fault found and rectified?

YES

END

NO

Contact Technical Hotline for further assistance

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Diagnostic Trouble Code B1213
Fault Code 21

Ensure all keys programmed to the vehicle are available

Using the Worldwide Diagnostic System (WDS). Select Vehicle Configuration tab, Set-up and Configuration, Security then program new transponders

Re-program all keys available to the vehicle

Switch the ignition 'ON'

Wait for 60 seconds

Is the Passive Anti-Theft System (PATS) LED flashing?

YES

If other fault codes are present, follow the relevant flowchart

Ensure all available ignition keys are clear of fault codes within the PATS prove-out, before returning the vehicle to the customer

NO

Does the PATS LED extinguish after 3 seconds?

YES

END

NO

A

NO
Is the fault code 21 still present?

YES

Contact Technical Hotline for further assistance

NO

If other fault codes are present, follow the relevant flowchart

Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer
Diagnostic Trouble Code B2141
Fault Code 22

Diagnostic Trouble Code (DTC) B2141 will only occur following an Instrument Cluster replacement.

Using the Worldwide Diagnostic System (WDS), Select Vehicle Configuration, Set-up and Configuration then Immobilisation Set-up.

Run the application.

Switch the ignition 'ON'.

Is the Passive Anti-Theft System (PATS) LED flashing?

YES

Wait for 60 seconds

If other fault codes are present, follow the relevant flowchart.

Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer.

NO

Does the PATS LED extinguish after 3 seconds?

YES

END

NO

A

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LED on solid for 60 seconds

Is the fault code 22 still present?

If other fault codes are present, follow the relevant flowchart

Using the WDS. Select Module Communications Network, CAN Network then check Network Integrity

Was a fault found and rectified?

END

Contact Technical Hotline for further assistance
Diagnostic Trouble Code U2510
Fault Code 23

Diagnostic Trouble Code (DTC) U2510 will only occur following replacement of Engine Control Module (ECM)

Using the Worldwide Diagnostic System (WDS), Select Vehicle Configuration, Set-up and Configuration then Immobilisation Set-up

Run the application

Switch the ignition 'ON'

Is the Passive Anti-Theft System (PATS) LED flashing?

YES

Wait for 60 seconds

If other fault codes are present, follow the relevant flowchart

Ensure all available ignition keys are clear of fault codes within PATS prove-out, before returning the vehicle to the customer

YES

END

NO

Does the PATS LED extinguish after 3 seconds?

NO

A

YES
Is the fault code 23 still present?

NO

If other fault codes are present, follow the relevant flowchart

NO

Ensure all available ignition keys are clear from fault codes within the PATS prove-out, before returning the vehicle to the customer

YES

Using the WDS:
Select Module Communications Network, CAN Network then Check Network Integrity

YES

Was a fault found and rectified?

NO

Contact Technical Hotline for further assistance

END
The Passive Anti Theft System (PATS) function is split between the instrument cluster and the Engine Control Module (ECM). In order for the vehicle engine to crank and start the instrument cluster must have read a valid key and the correct information flow must have occurred between the instrument cluster and the ECM: (see Fig. 1)
ECM PATS Functionality

When a key is inserted in the ignition barrel, a hardwired input is supplied to the instrument cluster. This triggers the instrument cluster to read the PATS key code stored in the key and compare it with one that has been previously stored. If the ignition key is subsequently turned to the 'RUN/START' position the result of this comparison is transmitted to the ECM via the controller Area Network (CAN). Assuming the key status message received from the instrument cluster is OK, the ECM will respond with a challenge code. The instrument cluster will after encryption send a response code; if this response code matches one that the ECM has calculated the fuel injectors, ignition coils, fuel pump drive and starter will be enabled.

The ECM will disable the fuel injectors, ignition coils, fuel pump drive and starter if any of the following conditions apply:

1. A theft signal has been received from the instrument cluster, i.e. the key code has not been authenticated.
2. A challenge code has been transmitted to the instrument cluster but no response code has been received.
3. A challenge code has been transmitted to the instrument cluster and an incorrect response received.

The ECM will log DTC P1260 for any of the following reasons:

1. PATS Sequence Time Out. This means that the PATS exchange has started but the two second timer has expired prior to receiving the Enable / Disable Engine status.
2. Identification transfer challenge error. This occurs following an ID transfer (Part replacement), if the result of the challenge is incorrect.
3. Challenge response errors. This occurs if the result of the challenge is incorrect, the challenge is performed on every key 'ON' cycle.
4. Invalid key data received. This occurs if the ECM receives incorrect Key Status data.

System Diagnostics

The best method to confirm the correct operation of PATS is to check the light emitting diode (LED). The LED should illuminate constantly for 3 seconds when the key is turned to Ignition 'RUN/START' position and then extinguish. This validates all PATS functions (PATS Prove-out) i.e. the key transponder matches a key code stored, the challenge/response sequence between the instrument cluster and ECM was successful resulting in the ECM being enabled.

Engine cranks but will not start

If the engine is cranking it means that the ECM is enabled with respect to PATS. If PATS was disabled the ECM would not engage the starter.
This could be confirmed by verifying the PATS LED prove-out (illuminated solid for 3 seconds) or by reading Diagnostic Trouble Codes (DTCs) from the instrument cluster and ECM.
Fault Code Reading (from PATS LED)

When a PATS fault is apparent, the instrument cluster will store a DTC and indicate this to the customer by illuminating the LED in the following manner. The LED will be illuminated for 60 seconds (flashing for customer fault codes, continuous for non-customer fault codes); the LED will then be extinguished for 2.5 seconds. The first digit of the fault code will then be flashed. The total LED 'on/off' time per single flash will be one second, this being repeated for the relevant number of times to count the first digit. The LED is then off for a further 1.5 seconds before the second digit of the fault code is flashed, again the total 'on/off' time per single flash will be one second with the number of repeats being the second digit (see Fig. 2 below). The fault code flash routine will be repeated up to 10 times. The indication will stop immediately if the ignition is turned to 'OFF' at any time during the fault indication sequence. 

(Note: Only the highest priority fault code will be flashed).

Normal PATS operations are complete within 400 milliseconds of the ignition switch transition from 'OFF' to 'RUN/START'; worst case for ECM communication problems will be less than two seconds. If PATS is not complete during the two seconds, the ECM will terminate PATS and await the next ignition 'RUN/START' event.

• Example (see Fig. 2); fault code 21 (all times in seconds, from left hand side 2.5s, 1s, 1s, 1.5s, 1s, 2.5s, 1s, 1s, 1.5s and 1s)

![Diagram showing fault code reading](image-url)
DTC Descriptions

Customer codes

P1260 Security input malfunction.

B1681 Transceiver communications error.

B1600 Key transponder signal not received by the transceiver.

B1602 Key transponder communications error.

B1601 Key transponder code not stored in memory.

U2511/U1900 Instrument Cluster to engine control module (ECM) Controller Area Network (CAN) communication error.

Non-customer codes

B1213 Minimum key programming not achieved.

B2141 No ECM identification stored in the Instrument Cluster.

U2510 Mismatch with ECM identification stored in the Instrument Cluster and the ECM memory.
Generic Connector Inspection

Electrical failures can be caused by problems with the connectors and their pins. Below are a number of points that may aid in investigation.

Backed-out Pins

Inspection of the connector; look for signs that the pin has backed-out. If a seal is fitted to the pin it may be protruding further out the back of the connector. If a pin has backed-out of the cavity in the connector, there is a possibility that it has been forced out when the connector was mated. Make sure that the pins are in line when the two halves of the connector are mated.

Bent Pins

Disconnect the two halves of the connector and visually inspect the pins. If a pin is bent over there is a possibility of a short from pin to pin. Pins can easily be bent over when the connector is mated. Check to ensure the pins within the connector are not knocked out of alignment before the two halves of the connector are mated.

Water ingress/fluid ingress

Disconnect the connector and inspect for signs of water ingress, corrosion may have occurred. If water or any other fluid is visible this may cause a bad connection or even short circuit to the other pins within the connector. Examine the connector seals for any damage and to ensure that the seals are fitted correctly. Ensure that the two halves of the connector latch together securely.

Probing

Ensure when probing a pin that the correct probe is used and excessive force is not used as this may weaken the locating clip and allow the pin to work loose. Care must be taken when probing female pins as the pin can easily be splayed if probed with the incorrect adaptor or the wrong tool. This would then have the potential to cause a bad connection between the two mating halves. Always use the Worldwide Diagnostic System probe kit when probing pins within a connector. (Jaguar probe adaptor kit part number. 3548-1358-00.)

Insertion force

Insertion force is imperative to ensure a good connection is made between the two mating pins. If the female pin is splayed, the connection will be poor. To check the insertion force of the female connector, identify the correct male pin within WDS probe adaptor kit. Gently insert the adaptor into the female pin and then repeat with the other pins within the connector. If the pin in question feels loose in comparison replace both male and female pins.

Chafing

Inspect the harness when in close contact to other objects (i.e. sharp steel brackets). Engine vibration will cause the outer protection to quickly chafe through if the harness is not routed correctly. When performing a repair, ensure that heat resistant tape is used where relevant. Before repairing or replacing any harness, always refer to the electrical wiring harness repair guide, reference publication number JTP 586. When repairing a harness ensure the Jaguar harness repair kit is used. (Part number. 418-S065 and 418-S411.)

Always refer to the Technical hotline if problems are encountered.
Generic Harness Check

- When carrying out any of the tests in the generic harness check, it is imperative that any other sources that share the harness are taken into consideration when a measurement is taken.
- The S-TYPE electrical guide (publication part number – JJM 10 38 20/20) will show all other sources sharing that harness i.e. splices and sensors. This electrical guide is in JTIS.
- Always ensure the digital voltmeter is operating correctly before proceeding.
- Always use the WDS probe kit when probing pins within a connector.

**Note:** Do not insert the Digital Multi Meter (DMM) leads into the connector pins. (Probe adaptor kit part number: 3548-1358-00.)

**Continuity test**

Using a DMM, connect the DMM to the pins at both ends of the circuit that you are testing. Ensure you connect to the correct pin when a large number of pins are used in a connector. (Use WDS Probe adapter kit).

Set the DMM to the resistance test or the continuity beeper. The resistance should be between 0 – 10 ohms. If a high resistance or open circuit is found investigate harness for damage.

**Short circuit high fault**

The DMM can be connected to any ground source on the vehicle, but it is preferable to use the battery negative pole.

Set the DMM to Volts DC; connect the DMM red probe to the suspect pin of the circuit and the DMM black probe to the battery negative pole. No voltage should be seen, if 4 – 13 volts is seen suspect short circuit high and investigate harness for damage.

Always test the circuit with the ignition 'ON' and 'OFF' when trying to identify this fault condition.

**Short circuit low fault (to ground)**

The DMM can be connected to any ground source on the vehicle, but it is preferable to use the battery negative pole.

Set the DMM to the resistance test; connect the DMM to the suspect pin of the circuit and the battery negative pole, an infinity reading/open circuit (O/C) should be seen.

If a resistance is seen, suspect short circuit low and investigate harness for damage.

Always refer to the Technical hotline if problems are encountered.