Special Notes:

The following pages are an assemblage of information, data and tables I have collected over a period of several years. It has been collected for my own use and to assist me with diagnostics of Jaguar vehicles. The information is from numerous sources, documents, emails and word of mouth, and is not to be construed as complete or free of error. I have re-written some portions for my own clarity.

As it is a collection of notes, tid-bits, etc.; its continuity may be somewhat lacking.

Some references to appendices for illustration were/are not present and should be ignored.

Some references to ECM software levels should also be ignored as the listing is an engineering designation, and is found nowhere when using the Jaguar diagnostic equipment in the field.

Some data files are stated to be saved by the equipment as .txt files, using WDS that is correct; when using later IDS equipment they are saved as .edr files.

Using this information is not for the faint of heart.....
It can make you cross-eyed in rather short order! sp

Code P1582 -- Flight Recorder

If code P1582 [Flight Recorder] is flagged then data will be stored within the ECM. The Flight Recorder has 2 areas for data storage dependent upon the trigger mode that has occurred, areas A and B. This code does not indicate a failure of a component or system; it is for assisting in determination of the root cause of an engine cutout or stall event.

Manual vehicles are more likely to have this code flagged, due to the fact that it is very easy to cause the engine speed to drop below 400 RPM during pull away.

Area A contains data that has been triggered only by Mode 1
Area B contains data that has been triggered by Mode 2, 4 or 5
The trigger mode is always stored in the relevant area.

Currently [Z67 software], if data is stored in either area then the following will occur:

Area A	Stored data will be over-written if a subsequent trigger [Mode 1] occurs.
Area B	Data will be over-written if a trigger of higher priority occurs [Mode 2 is lowest, Mode 5 is highest]. It will not be over-written if a trigger of equal priority occurs. Software level Z69 onwards is supposed to rectify this, i.e. a trigger event of equal priority will cause data to be overwritten. WDS disk 10 is due to be released August 2001, this will include ECM software level Z69.

The flight recorder contains 10 seconds of data, 8 seconds of which is pre-trigger and 2 seconds post trigger. It contains 38 frames; therefore each frame has a resolution of 270ms. It also stores the last 5 DTC's that occurred before the trigger event, see Appendix A. DTC 0 is the most recent code.

Vehicle mileage [km] is stored in both areas at the point where the trigger event occurs. If the trigger event occurs in less than 12 seconds since ignition on, the stored km value will be incorrect [it will use the default value 1677721], this is because the ECM has not had sufficient time to communicate with the IP.

Due to the current production process, it is very likely that DTC's are stored in either or both areas of the Flight Recorder. These codes should be treated with extreme caution, it may be that they can be disregarded e.g. in the case of EVAP codes [for non FED systems]
So that the supplier can check the full functionality of the ECM it is originally flashed as a FED spec, therefore at the 1st ignition on [pre VCATS], the system will detect open circuit conditions on the components that are not fitted e.g. CCV and FTPS, this is correct. Unfortunately the area of the memory within the ECM which stores flight recorder data does not get cleared during the production process [DTC clear does NOT clear Flight Recorder data], this is to be rectified at a later date.

Trigger Modes

Mode 1	Stall
Mode 2	Fail to start or start and stumble
Mode 3	does not exist for X400
Mode 4	Throttle fault
Mode 5	Inertia switch operation

Trigger Modes Defined

Mode 1 This is triggered if the engine has been running for at least 10 seconds, the ignition key is still in the “run” position and the engine speed drops to zero RPM.

Mode 2 This trigger will occur if after a preset period of cranking, the engine speed has not exceeded 400 RPM [for the current software levels up to Z69, this period is 30 seconds, this is likely to be reduced at some future point]

or Is triggered by the engine speed rising above 1000rpm and subsequently dropping below 300rpm within 2 seconds.

Mode 4 If a throttle limp home fault is detected this mode will be triggered

Mode 5 If the inertia switch has been activated, this mode will be triggered

**Note: It is possible that under certain circumstances an engine stall event may be interpreted as a stumble, therefore area B would be triggered, not A.

Additional Info

Currently on disk 9, the WDS gives misleading information for P1582. When highlighting P1582 the right hand portion of the screen displays a description/summary of the code, this description states Inertia Switch Inactive (or something similar), this is misleading. A more accurate statement would be Flight Recorder Data is Stored. This has been communicated to the relevant engineer at Whitley, it is likely to be changed at some future WDS disk release.

To access Flight Recorder Data using WDS

Within “Vehicle Setup and Configuration” (car with spanner)
Select “Special Applications”
Select “ECM Data Recorder”
Select area A or B as required (WDS will indicate which area(s) contain data)

Clearing Flight Recorder data using WDS

This can only be achieved if a P1582 is actually present within the ECM, therefore the flight recorder data MUST be cleared before clearing DTC’s.
To clear Flight Recorder Data:
Within “Vehicle Setup and Configuration” (car with spanner)
Select “Special Applications”
Select “ECM Data Recorder”
Exit Flight Recorder.

At this point you will have an option to delete Flight Recorder data. Note this will only clear Flight Recorder areas A and B, NOT the Start Time data recorder.

If a vehicle has P1582 data stored, this data must be cleared before the vehicle is returned to the customer. This will avoid confusion if a further fault develops, and in the case of data being stored in area B, the data would not be overwritten if a trigger event occurs that is a lower priority than the previous trigger.

To obtain and view Flight Recorder Data

Copy data from relevant area(s) onto a floppy disk, and then attach them to an email. They are in .txt format; therefore they can be automatically read using Notepad. So that the date can be read more easily, [i.e. that the data appears in aligned columns] it is better to read this data using Excel, as follows:

Launch Excel
Select ‘File Open’
Ensure that ‘Files of type’ is set to All Files (*.*)
Highlight and Open relevant .txt file
Ensure that ‘Delimited’ is selected
Ensure that only the ‘Comma’ box is selected
Click Finish

Interpreting Flight Recorder data

See Page 5

Start Time data recorder

This recorder stores a total of 50 start times separated into 3 temperature bands as set out below:

Low	<15 degC	maximum of 25 starts
Middle	15 to 70 degC	maximum of 10 starts
High	>70 degC	maximum of 15 starts

The data is accessed by using WDS; it does not rely on the fact that a P Code is stored. If a P1582 has not been flagged, then when entering the ECM Data Recorder, the WDS will state “No Data Stored” or something similar, do you wish to continue. At this point select YES.
Start Time data cannot be cleared using WDS, it will only be cleared if the vehicle battery is disconnected or he ECM is reflashed.

To access Start Time Data Recorder using WDS

Within “Vehicle Setup and Configuration” (car with spanner)
Select “Special Applications”
Select “ECM Data Recorder”
Select “Start Time Data Recorder”

To obtain and view Flight Recorder Data

Copy data from relevant area(s) onto a floppy disk, and then attach them to an email. They are in .txt format; therefore they can be automatically read using Notepad. So that the date can be read more easily, [i.e. that the data appears in aligned columns] it is better to read this data using Excel, as follows:

Launch Excel
Select ‘File Open’
Ensure that ‘Files of type’ is set to All Files (*.*)
Highlight and Open relevant .txt file
Ensure that ‘Delimited’ is selected
Ensure that only the ‘Comma’ box is selected
Click Finish

See Appendix B for example of data.

This recorder also stores the following:

The total number of starts
The average start time
The statistical deviation start time. To get an idea of the spread of starts/maximum start, take the square root of this value.

Flight Data Recorder -- Data Interpretation

The following guide is intended to assist with the interpretation of data from the Flight Recorder; appendix A contains typical data from a fully warm vehicle that stalled during idle. From this data you can see typical values for all parameters.

In addition, some of the data cannot be directly interpreted, it requires some further analysis:

Engine Condition:

This is displayed as a decimal value and is determined by the following table

Bit 3	Bit 2	Bit 1	Bit 0
Inertia Switch operated	Throttle Failure Flag	Brake Pedal Switch Operated	Ignition Switch On
8	4	2	1

e.g.
Engine condition 3 – This means that Ignition is On and the brake switch is operated
Engine condition 9 – This means that Ignition is On and the Inertia switch has operated

This data should be treated with caution; there have been instances where this data is invalid, in particular with respect to the inertia switch being operated and the engine not being cut. If you see a value of 8 for the engine condition, beware. It is not thought possible to get a value of 8, it must be 9 or 11. (for the inertia switch to trip, the ignition must be in the on position)

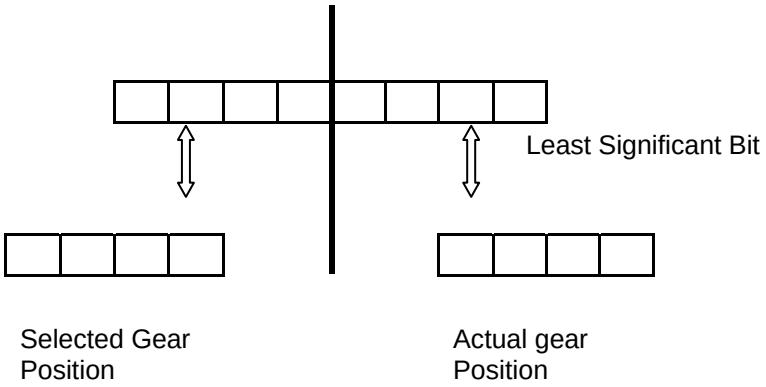
***Note: The X400 has no physical Inertia Switch

PATS Status

Info not yet available

Gear Position:

This code is displayed in decimal format, to determine its meaning it must be first converted into a binary number, and then be split into two groups as shown below. Each group can then be compared to its respective table and its precise meaning determined.



Group 1	Selected Gear Position
0000	Park
0001	Reverse
0010	Neutral
0011	Drive
0100	4th
0101	3rd
0110	2nd
0111	(Reserved)
1000	Gear Selector between positions
Other	Invalid

Group 2	Actual Gear Position
0000	Neutral
0001	1st
0010	2nd
0011	3rd
0100	4th
0101	5th
1100	Reverse
1111	Gear Shift in Progress
Other	Invalid

Example:

For a decimal value of 49:
Converting this to a binary value using a scientific calculator = 110001
Add sufficient zeros to convert to an 8 bit byte = 00110001
From the table, the 1st 4 bits (0011) indicate that the selected gear position is Drive
The 2nd 4 bits (0001) indicate the actual gear position is 1st

For a decimal value of 28:
Converting this to a binary value using a scientific calculator = 11100
Add sufficient zeros to convert to an 8 bit byte = 00011100
From the table, the 1st 4 bits (0001) indicate that the selected gear position is Reverse
The 2nd 4 bits (1100) indicate the actual gear position is Reverse

Throttle Condition:

This is displayed as a decimal value. It is determined by converting to a binary number using the scientific calculator, then adding sufficient leading zeros to convert to eight bits (one byte), it is then split into groups as shown in the following table.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Limp Home Mode	Cruise Control Mode			Fuel Intervention			

To decode each group, use the following relevant tables:

Limp Home Status

Bit 7	Limp Home Mode
0	Limp Home **NOT** Active
1	Limp Home Active

Cruise Control Status

Bits 4,5,6	Cruise Control Status
000	C/C not active -- fundamental condition for C/C hasn't been satisfied
001	C/C not active -- set speed not in memory
010	C/C not active -- set speed in memory
011	C/C active -- operating under feedback conditions
100	C/C active, but the accelerator pedal is being pressed by the driver
Other	Invalid

Fuel Intervention Status

Bits 0 to 3	Fuel Intervention
0000	Fuel Intervention not operation
0001	Fuel Intervention on cylinder 1
0010	Fuel Intervention on cylinder 2
0011	Fuel Intervention on cylinder 3
0100	Fuel Intervention on cylinder 4
0101	Fuel Intervention on cylinder 5
0110	Fuel Intervention on all cylinders -- engine shut down
Other	Invalid

See next page for “Throttle Condition” examples

Examples for Throttle Condition Status:

Stored decimal value = 128
Binary = 10000000
Throttle is in Limp Home mode

Stored decimal value = 132
Binary = 10000100
Throttle is in Limp Home + Fuel Intervention on cylinder 4

Stored decimal value = 64
Binary = 01000000
Cruise control is active and the driver is operating the accelerator pedal

Stored decimal value = 37
Binary = 00100101
Cruise control not active with a speed set in memory + Fuel Intervention on cylinder number 5

Additional Info:

Battery voltage: The system utilizes a 2-stage charge strategy; in the majority of conditions, high charge for the 1st 5 minutes after start, then normal charge rate (high = approx. 15 volts)

Fuel Pressure: Normally 380 Kpa (55psi)
Under extremely high under bonnet temperatures it is boosted to 420 Kpa (61psi)

Appendix A:
This data was taken from a 3.0L auto with the engine fully warm and at idle (no throttle pedal input is being applied), the stall was deliberately induced. It can also be seen that for the initial part of the data the vehicle was in Park, the pedal was then depressed and the selector moved to the neutral position. The recorder was triggered due to the engine speed dropping below 400RPM; at this point the ECM has attempted to prevent the engine stall by advancing the ignition and opening the throttle.

Flight Recorder [ECM Data Recorder] Supporting Info

ECM Data Recorder
The flight data recorder captures vehicle data in the event of an incident in the field. This data may be used for problem diagnosis and displayed using WDS.

The ECM will utilize an area of its RAM to provide a 10 second rolling buffer for a number of parameters defined by Jaguar. The data in the rolling RAM buffer will be refreshed every 256 milliseconds by the ECM CPU and will be transferred to an area of EEPROM once a trigger condition has been met.

The data storage area in EEPROM is divided into two areas (Area A and Area B) and the data transferred into these areas from RAM will depend on the trigger condition that has been detected. The data in these areas will represent events over a calibrated time prior to the trigger event followed by the remaining portion of the 10-second buffer after the trigger event.

Area A will only store data associated with the Area A trigger condition and likewise Area B will only store data associated with the Area B trigger conditions. The Data stored in area A will be overwritten with new data every time a trigger condition occurs. The data stored in area B will be overwritten depending on the priority of the triggered data. The trigger priorities are as follows:

Highest priority
A fuel pump cut off by the inertia switch being tripped will trigger data rated as the highest priority. This data will overwrite all other data and can only be cleared using WDS.

Medium priority
A throttle default will trigger data rated at a medium priority. This data will overwrite any lower priority data. It will not overwrite medium or highest priority data.

Lowest priority
An engine that fails to start or an engine that starts and stumbles will trigger data rated as the lowest priority. It will not overwrite high or medium priority data.

Whenever data is captured in EEPROM memory, the odometer reading and stored DTCs are also written to the EEPROM. DTC P1582 (Flight Recorder Information Available) will be logged whenever data is stored in either Area A or Area B.

To access the recorded information you can choose to read DTCs from the vehicle, and select the DTC (P1582) that indicates that ECM recorded data is available. The user may choose to investigate the DTC by pressing the DTC pinpoint button. This causes the application sub-tab to appear within DTC Monitor. This is consistent with existing methods of DTC investigation. The existing functionality of DTC Monitor will allow user help and the required DTC clearing operations to be performed as with any other DTC. Or, the user can select Vehicle Configuration, then Special Applications, then select the ECM Data Recorder application from the Special Applications menu.

Trigger Conditions for Data Storage

Condition	Trigger	Storage Area	Trigger Mode
Engine Stalls	Engine speed held above a calibrated threshold for more than a calibrated period of time, and then dropping below a calibrated threshold.	A	1
Engine fails to start	Engine speed remaining below a calibrated threshold for longer than a calibrated period of time while the engine is being cranked	B	2
Engine starts and stumbles	Engine speed exceeding a calibrated threshold and then dropping below a calibrated threshold without meeting the conditions for "Engine Stall"	B	2
Throttle default	Entry into throttle default mode	B	4
Fuel pump cutoff by inertias switch	Inertia switch going open circuit	B	5

ECM Data Recorder Parameters

- Throttle position
- Driver demand
- Engine speed
- Vehicle speed
- Fuel pulse width
- Ignition
- MAF volts
- Coolant temperature
- Air temperature
- PATS status
- CAN traction status
- Gear position selected
- Gear position actual
- Brake switch status
- Cruise control mode
- Fuel intervention
- Throttle failure flag
- Ignition angle
- Fuel pressure
- Battery voltage

Start Time Monitor

The start time monitor is another feature within the data recorder function. This will display the length of time taken to start the vehicle in milliseconds for each of the last 50 engine starts. The ECM considers the engine to have started when the engine speed exceeds 700 RPM. The display will also indicate the engine temperature for each of the 50 starts as either low, medium or high. The following parameters are used:

- Low: < 15 degrees centigrade (25 starts)
- Medium: 15 – 70 degrees centigrade (10 starts)
- High: > 70 degrees centigrade (15 starts)

WDS will also display the total number of times the engine has been started and the average length of time taken. This data will be reset if the vehicle battery is disconnected.

Full Authority Throttle Control

System Requirements

- Engine starting: Allow sufficient air into the engine during cranking
- Idle speed control: Keep the engine speed stable
- Driver demand control: Respond to accelerator pedal movement
- Cruise control: Keep vehicle speed at a set speed
- Traction and stability control: Throttle is controlled to a request from the ABS to reduce engine torque
- Power limitation: Limit the maximum allowed open position of the throttle blade when engine, transmission or vehicle conditions require it.

Fault Accommodation

When a throttle system fault condition is detected a fail-safe mode is entered. As a summary of electronic throttle in fail-safe, it behaves as follows:

There is no response from accelerator pedal
The engine will be able to start in all conditions except when the throttle is stuck in the open position
Once the engine is started it will idle such that:
– It will not stall under normal loads
(e.g. air conditioning, power steering, neutral-to-drive gear change)
– Under normal conditions on a level road, the vehicle will creep up to 15 m.p.h. when the brakes are released

A warning is issued to the driver via the instrument panel in the form of a warning lamp (MIL, Red or Amber) and a warning message; a fault code will be stored when a warning is issued. Data will be captured in the data recorder.

Throttle Failure Modes

Cruise inhibit mode (6) – No cruise activation is available.

Safety redundancy mode (5) – This mode is available when there is a redundancy in a failed component such that fail-safe operation can still be maintained. Reverse throttle progression is implemented in forward gears. This reduces vehicle performance and inhibited kickdown requests. A maximum speed of 75 mph (120 km/h) is imposed, and cruise control is inhibited.

High-idle mode (3) – This mode is invoked when a pedal position sensor failure is detected. The throttle angle allows an engine speed of 1500 rpm. Cruise control is inhibited and there is no throttle pedal response.

Limp-home mode (2) – The throttle is deactivated and the limp-home spring moves the throttle to the limp-home lever position. Fuel intervention is used to achieve an engine idle speed of 1400-1800 rpm when the limp-home lever is at its stop position. Cruise control is inhibited – Perceived pedal response.

Engine shutdown mode (1) – Fueling is inhibited to all cylinders and the engine stops. The vehicle will not restart.

#	Fail-safe Mode	Fail-safe Action	Warning	Failure
1	Engine shutdown mode	Fuel cut to all cylinders	Red lamp, Amber lamp and MIL lamp	Throttle valve stuck open; Limp-home and unavailable mode
2	Limp-home mode	DC motor power off; fuel intervention; no CC	Red lamp, Amber lamp and MIL lamp	Throttle motor, throttle sensor, Motor relay off, Relay driver off, Main CPU
3	High-idle mode	Throttle valve fixed angle, no CC	Red lamp, MIL lamp	Demand sensor
4	Limp-home unavailable mode	Power limitation (20% throttle); no CC	Red lamp	Limp-home spring, return spring
5	Safety redundancy mode	Power limitation; no CC	Red lamp	Motor relay always on, relay driver always on, W/D circuit
6	Cruise control inhibit mode	CC Inhibit	Amber lamp	Cruise control switches, Clutch or brake switches
7	Redundancy mode	4 times amp; inhibit (TPS)	Amber lamp	Throttle position sensor

NOTE: CC = Cruise Control
W/D = watch dog circuit that monitors CPU operation;
amp = amplifier.

For low specification instrument clusters, the red powertrain malfunction and the MIL will illuminate for failures 1, 2 and 3. For failures 4, 5, 6 and 7 only the red powertrain malfunction light will illuminate.