QUIESCENT CURRENT DRAIN

… what is it?
… why is it important?
… and how do we measure it?

The Problem ...

Owners may arrive at this issue as a result of unexplained and ongoing discharge of their vehicle's battery, despite continual re-charging. Logically, they wish to diagnose whether some on-board electrical or electronic equipment or fault is causing an unexpected current drain, despite the car being locked away for the night and thus, asleep.

One might expect that when the car is locked and undisturbed, electrical activity ceases and current drain from the battery drops to zero. Not so! While the locked car may appear to be totally inert, it is actually in an active standby mode called “shut-down” or “sleep” with a small, quiescent current flowing to maintain required on-board data (system and control module settings, time, memory settings etc) and to monitor its PATS inputs to either unlock or flag intrusion. The flashing dash-top light alerts us that the vehicle is still drawing power.

Jaguar defines this quiescent current drain in JTIS (the digital workshop manuals), as follows …

JAGUAR UPDATE - September 2011

QUIESCENT CURRENT DRAIN - TYPICAL VALUES

• NOTE: The quiescent drain after the initial shutdown period should not exceed the value shown in the table.

	MODEL SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
XJS 3.2	60	<30
Sovereign 3.2	60	<37.3
XJ6 4.0	60	<38.6
XJS	60	<43.9
XJ6 (X300) (1995MY)	60	<43
XJ8 (X300)	60	<30
XK8 (X100)	60	<30
S-Type (X200)	60	<30
X-Type (X400)	30	<30
XJ6 (X350)	40	<30
XJ8 (X350)	40	<30
XK (X150)	3 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
XF (X250)	3 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
XJ (X351)	3 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30

• NOTES:

1. The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)
2. Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.

notes by “cat_as_trophy” for JF in April/June '14

Measuring this quiescent current drain is not easy ...

For most models, Jaguar dictates that the entire car will consume a maximum of less than 30mA when at “shut-down”, but that this only occurs at least 30 to 60 minutes after being locked (depending on model), and only if it remains undisturbed during that entire time-out period. If disturbed, the time-out period will reset to a new countdown before “shut-down” condition is achieved. Firstly, do not be deceived by the fact that lights have extinguished. Secondly, if the car isn't locked properly, not only is it not armed, it can't reach shut-down!

How then do you measure this battery drain because, as many have found, any action that inhibits “sleep” or "wakes" the correctly shut-down car, will immediately draw an increase in current from the battery … which will produce a false reading of quiescent current drain … and thus, a totally false diagnosis. Also, ignore added current from flash of dash alarm.

Here's what we recommend …

1. read the JTIS Electrical section for your model year and/or VIN .. also, see the intro pages to Wiring Diagrams, noting significant changes with S-Type 2002.5 “facelift”;

2. it is critical for the following tests that all electrical items are manually turned off; all windows and moon-roof are closed fully, and that the ignition is turned off; the key removed, but kept close at hand (see 3);

3. the test process will require the car battery to be temporarily disconnected, so first determine what car memories will be lost; need for radio access code; reset of memory settings for seats/steering/mirrors; and be aware the car will self arm when battery is reconnected at end of tests … hence the need to keep key/fob close by;

4. as we cannot leave either bonnet/hood nor boot/trunk open during tests (the car will never sleep!), arrange sufficiently long leads from car battery area to read the meter from outside locked car … the boot dust seal is supple enough to prevent damage;

5. from here onward, it is vital that no current draw devices be turned on, nor attempt to start the engine … as the latter will almost certainly destroy the test multimeter;

6. now disconnect the battery negative/ground/earth cable and interpose a multimeter between the negative battery post and cable terminal … pre-set the meter to its maximum DC Amps setting … 10A is OK to handle the car locking currents.

Test #1 – establishing the baseline ...

1. lock the car … then immediately record the battery current drain at “lock-down”;

2. wait for time period to expire … then record quiescent current drain at “shut-down” … it is this latter, lower (?) reading that is to be compared with the JTIS reference.

Analysis – Is the quiescent current drain below the 30mA threshold?

Yes? … tests complete; remove meter; replace battery cable; disarm and reset.
No? …. continue with test sequence.

notes by “cat_as_trophy” for JF in April/June '14

Test Sequence #2 – finding the circuit causing excess quiescent current drain …

Using the S-Type as example, Fuse #25 (<2002.5) or Fuse #1 (2002.5>) feeds power to the PJB/Cabin Fuse Box (obvious source for all devices fitted inside cabin). Test may need to be repeated; first for all circuits in total then if indicated, separate circuits one at a time.

1. unlock car; remove Fuse #25 (or #1); relock car; wait for shut-down; record drain.

Analysis – Is the quiescent current drain below the 30mA threshold?

Yes? … then at least one of the circuits fed from this 40A fuse is causing excess drain, but all other areas of the car are fine, so proceed with this Test Sequence #2;
No? …. replace Fuse #25 (or #1) and move to Test Sequence #3.

Having identified and listed all fuses and circuit names in PJB fed by Fuse #25 (or #1) …

2. unlock car; replace Fuse #25 (or #1); then remove first fuse in PJB that is fed by Fuse #25 (or #1); relock car; wait for shut-down period and record drain.

Analysis – Is the quiescent current drain below the 30mA threshold?

Yes? … we have found the culprit … this fused circuit is the one that is drawing excess current drain; record this fuse; tests complete; remove meter; replace battery cable; disarm and reset; then investigate/rectify circuit before replacing fuse.
No? …. this fused circuit is not the culprit … replace this fuse and continue Test Sequence #2.

On each successive occasion ...

3. unlock car; replace fuse for tested good circuit and remove next in sequence that is fed from Fuse #25 (or #1); relock car; wait for shut-down period and record drain. Conduct same analysis at each new sub-test until the offending circuit is identified.

Test Sequence #3 – If Fuse #25 (or #1) circuits are all OK ...?

Use the model specific Wiring Diagrams to identify next major power distribution fuse (eg feeding Front & Rear Power Distribution Fuse Boxes) and follow test process outlined in Test Sequence #2 for the S-Type's Fuse #25 (or #1) and PJB fused sub-circuits. This is a slow process, with the shut-down time delay proving slow and tiresome … however it is an orderly and logical sequence that will identify any culprit with absolute certainty.

What to do about the culprit ...?

That will depend on the nature of fault. If the excess drain is caused by a faulty component or module, this will need to be replaced. If a wiring connector fault, this will need to be removed and cleaned and then reconnected securely.

Remember to remove test meter and replace battery cable and disarm with key/fob before operating any major power circuits. Start car; reset or calibrate as necessary.

notes by “cat_as_trophy” for JF in April/June '14

Case Study – Learning from past threads on Jaguar Forums …

Here I have provided a link to a specific case from a JF member, that set out just such a battery drain problem, his frustration in trying to identify the cause, and the solution finally achieved, despite a number of errors along the way (mostly mine in trusting memory rather than checking my updates). **NB: Vehicle is 2001 S-Type so focus is on 40A Fuse #25.**

Cartridge Fuse #25 causing battery drain - now what do I do? - Jaguar Forums

In this case, withdrawing the radio fuse identified the culprit quickly. My point in referencing this thread is that, with initial help to identify and locate major components, and with some understanding of the sleep process into “shut-down” and how easily it is interrupted, the OP [moranir] achieved an accurate diagnosis and lasting solution.

Case Study – MY05 S-Type with quiescent current drain of about 2A ...

The most frustrating case I have wrestled with was a friend's S-Type with unusually high battery drain, and was referred to in one of my posts in the thread quoted above. The anxious owner had already purchased a new battery but, despite being fully charged on several occasions, this was discharging at an alarming rate.

On test, the quiescent current never fell below 2A ... about 70 times the Jaguar defined maximum limit ... and the reason for constant and ongoing battery discharge. Despite using (and refining) the processes outlined here, the “usual suspects” of audio and climate control components all proved OK. Nor could we find any dodgy wiring mods. Finally, we identified both the offending circuitry and the nature of the fault …

- the PATS system was both sinking current by driving the GEM control module flat out in an effort to constantly monitor and control it … and … it was refusing to allow the car its shut-down sleep mode despite locking the car;

- the fault was traced to a shorted PATS sensor which, once replaced, resolved the fault … as verified by the final check test of quiescent current drain at some 24mA.

This realisation that the car, locked and with lights out but dashboard alarm warning light flashing, “appeared to be asleep” when in fact it was not in “shut-down”, was sobering.

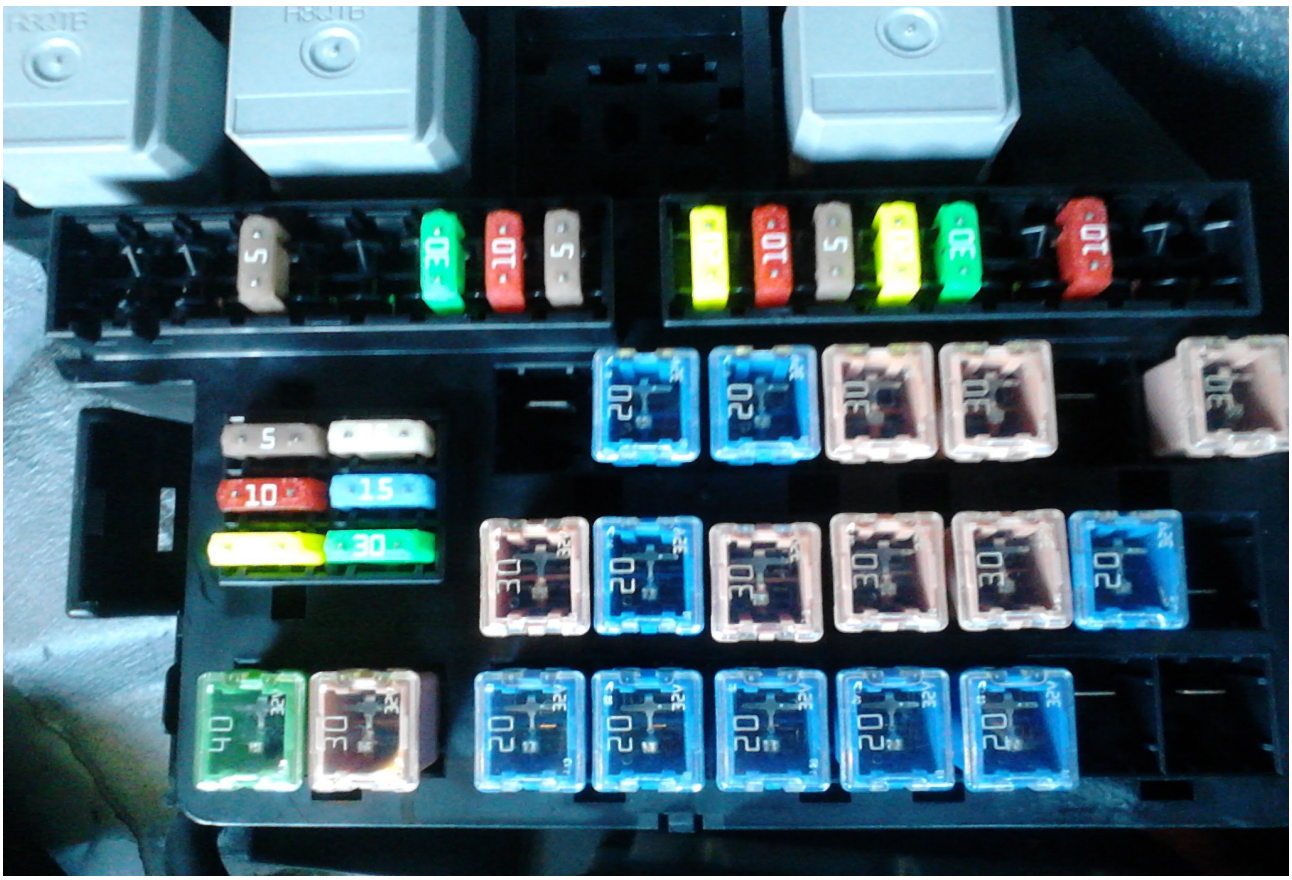
I do hope these clarifications help other forum members better understand the shut-down sleep process defined by Jaguar; the maximum limit of quiescent battery current drain; and the time period that the car must be undisturbed for it to reach shut-down.

Accordingly, we have learned a new mantra … the difference between when the vehicle “appears to be asleep", and when it has indeed reached “shut-down”, can be expressed as

If quiescent current drain exceeds 30mA, then either it is not shut-down as defined in JTIS or a fault exists, and we must test all circuits or after-market devices to identify and rectify.

In that light, we offer this diagnostic process as an accurate, even if time consuming strategy to identify these faults and their impact on excessive battery discharge.

notes by “cat_as_trophy” for JF in April/June '14



Rear Power Distribution Fuse Box in 2007 S-Type with 40A Fuse #1 at lower left corner.

Boot/trunk lid closed to allow shut-down … soft dust seal prevents damage to car or leads.

notes by “cat_as_trophy” for JF in April/June '14