Robbie's Guide ForBattery&QuiescentDrainTesting

1. Always start from a known good point with a charged battery. Please note that batteries can fail and self-discharge internally o
should be pushed down the tapered terminal before tightening to ensure a good connection. All aftermarket electrical systems shou
aftermarket kit was 'ok before so therefore it should be ok now'. No exceptions, disconnect it.

a. Good battery voltage:

Click image to enlarge

2. The vehicle has to be asleep before testing, so open the bonnet, short the bonnet sensor undo the RHS latch and either lock the vehicle or mechanically latch the doors open so that the vehicle thinks they are closed. If you are fooling the locks don't set the internal alarm. Even when asleep the alarm LED flashes, which is detectable, and the EAS and potentially the EPB can occasionally draw power.

a. Bonnet latch connector with paperclip:

Click image to enlarge

b. Depending on vehicle, Model Year and specification it can take a while for the vehicle to sleep:

QUIESCENT DRAIN - TYPICAL VALUES

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

Land Rover Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
Range Rover (LM) - Up to 2009MY	30	16.0 - 18.0
Range Rover (LM) - From 2010MY	20 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
Range Rover Sport (LS) - Up to 2007MY	20	<22
Range Rover Sport (LS) - From 2007MY to 2010MY	30	<25
Range Rover Sport (LS) - From 2010MY	3 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
Range Rover Evoque (LV) - From 2012MY	20 (after lock and arm condition)	<20
Discovery 3/LR3 (LA) - Up to 2007MY	20	<22
Discovery 3/LR3 (LA) - From 2007MY to 2010MY	30	<25
Discovery 4/LR4 (LA) - From 2010MY	3 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
Freelander 2/LR2 (LF) - From 2007MY	35 (single locked or unlocked)	<23.6
	12 (double locked)	<23.6
Freelander (LN) - Up to 2007MY	10	24-25 - without Becker Navigation system
	10	27-28 - with Becker Navigation system
Defender (LD) - 1998MY to 2007MY	30	<21
Defender (LD) - from 2007MY	<30	<30
Discovery Series 2 (LT)	30	<30

• NOTE:

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.

Click image to enlarge

3. The preferred method is to use a DC capable current clamp that has a milliamp range with a 1mA resolution. This can be clamped on individual circuits or groups of circuits. It is easier to start with large groups (such as the BJB) before delving into individual circuits. It is not possible to remove fuses as part of the diagnostics as this may wake systems or stop others from sleeping which will make nonsense of the diagnostics. Equally, if the drain is caused by an energised relay you may reset it by pulling the fuse and lose the very thing you are looking for.

a. Current clamp for attaching to DMM:

Click image to enlarge

4. At the +ve terminal the load paths split into 2 directions; one towards the starter/alternator and the other to the battery junction box (BJB). These should be tested individually. Start with the alternator cable; there should be no current running down this lead in this state. Be aware that some alternator failures that can leak current only do so when either cold or hot, so even if you have zero current flow you may have to come back to this if no other faults are found.

5. The main positive lead from the battery to the BJB can be gently manoeuvred upwards to allow for an amp clamp. You should detect a current less than the value shown in the previous table. As an example an older D3 with no TMPS and no tracker fitted should be below 22mA. My own MY13 D4 should be below 30mA, as shown below:

Click image to enlarge

a. Due to the alarm etc the figure can move around a bit, up to 26mA in my case, but this is still below the 30mA maximum:

Click image to enlarge

6. If you do have a drain beyond the table limit you have to move systematically through all the various circuits to find out which are drawing more than they should. To save time you can quickly trace down all the fuses with a test light or digital multimeter (DMM) to see which circuits have zero power on them. This allows you to focus on the circuits that have some power on them.

7. You have a few options for testing individual circuits. The workshop method is to release the BJB and clamp the wires from below. This does work but the looms on some later vehicles can be a bit tight. A method I like is to use is via the test points on the back of the blade fuses and

effectively treat the fuse as a resister of known value (as that is what they are) and Ohms law to deduce the current flow by measuring the voltage drop in mV and using a calculator or a look-up table to find the actual current flow.

a. The tables are in my gallery and look like this:

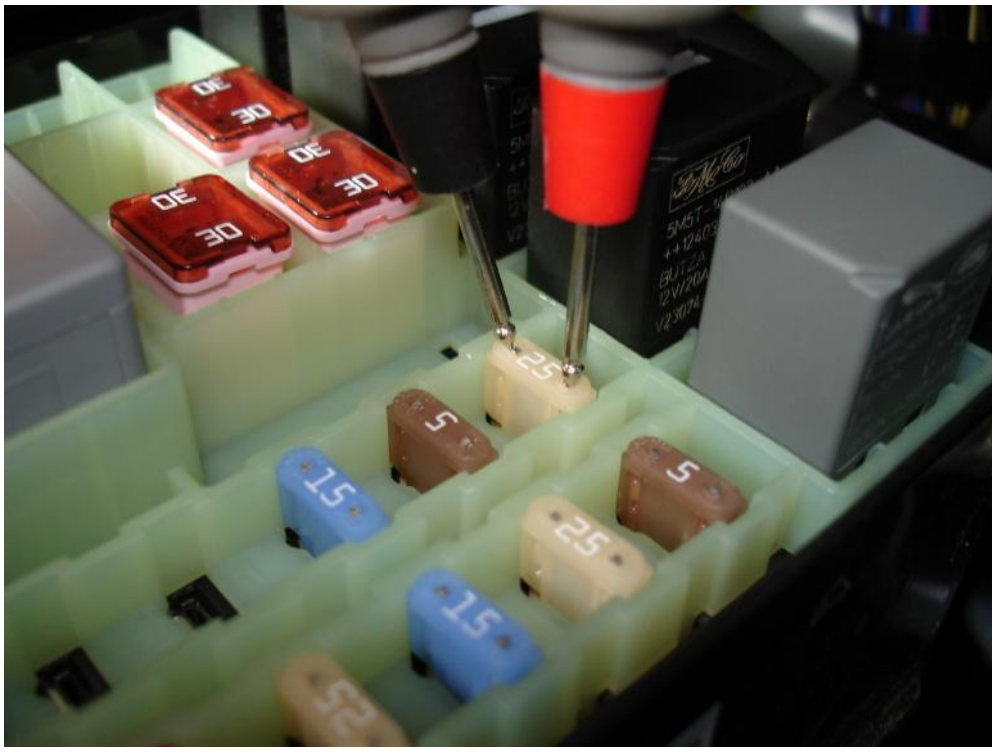
Fuse Voltage Drop Chart - Mini Fuse

Circuit Current Across Fuse (milliAmps)

Fuse Color	Grey	Violet	Pink	Tan	Brown	Red	Blue	Yellow	Clear	Green
Measurement mV	Mini 2 Amp	Mini 3 Amp	Mini 4 Amp	Mini 5 Amp	Mini 7.5 Amp	Mini 10 Amp	Mini 15 Amp	Mini 20 Amp	Mini 25 Amp	Mini 30 Amp
0.1	2	3	4	6	9	13	22	31	42	54
0.2	4	6	9	11	18	27	44	62	85	108
0.3	5	9	13	17	28	40	66	93	127	162
0.4	7	12	17	23	37	54	87	125	169	216
0.5	9	15	21	28	46	67	109	156	212	270
0.6	11	18	26	34	55	81	131	187	254	324
0.7	13	21	30	39	65	94	153	218	297	378
0.8	14	24	34	45	74	108	175	249	339	432
0.9	16	27	38	51	83	121	197	280	381	486
1	18	30	43	56	92	135	218	312	424	541
1.1	20	33	47	62	101	148	240	343	466	595
1.2	22	36	51	68	111	162	262	374	508	649
1.3	23	39	55	73	120	175	284	405	551	703
1.4	25	41	60	79	129	189	306	436	593	757
1.5	27	44	64	85	138	202	328	467	636	811
1.6	29	47	68	90	147	216	349	498	678	865
1.7	31	50	72	96	157	229	371	530	720	919

Click image to enlarge

b. The fuse test points if you have never really noticed them before look like this and can be tested thus:



Click image to enlarge

c. For those that like maths rather than the table the current calculation on this circuit (fuel pump) was:

25 Amp Fuse = 2.36 mOhm or 0.00236 Ohms
Measured @ 0.0235 V or 23.5 mV
= 9.95763 Amps

8. If you do not fancy using a clamp from below or using the voltage drop method you can use a fuse buddy or a home made fly lead to form a wire loop that can be either inserted directly into a DMM (if the circuit is below the fuse limit of the DMM) or to clamp with a DC clamp. There are bespoke kits on the market for those that like to spend money but you can make your own fly lead with spade crimps or get one of these and link it together with a female to female banana plug:

a. Same circuit again from the example above, producing very similar results to the voltage drop method:

9. The method above is also useful for very low power circuits as you can wind the wire around the clamp a few times for extra accuracy and divide the number displayed by the number of times you have wound the wire through the jaws of the amp clamp.

10. Current can be measured anywhere on the circuit so in practice you can clamp anywhere with access. This can be helpful when you are down at the component level but a great deal of diagnostics can be done at the BJB or CJB.

11. It is not a complicated thing to do and definitely something you would want to do DIY as it takes time and patience. Even if you have no idea how to fix the problem circuit (although the forum is pretty good) it will save a bundle of cash if you have done the time consuming diagnostics to narrow it down to a particular circuit. Before you know it your workbench or kitchen table looks like this and at least gives the illusion that you know what you are doing: