

SUBJECT **Closed Circuit Current Measurement****MODEL** All**SITUATION** Increased closed-circuit currents may occur permanently or intermittently, and cause the battery to discharge prematurely. The increase in closed circuit current may be caused by a faulty control unit, or by the installation of a non-approved accessory.

In a situation where a vehicle has broken down due to a discharged battery, for diagnostic purposes it is important not to disconnect the battery. This is because a control unit will be reset if the battery is disconnected. Following a reset, the faulty control unit may start functioning correctly again, making accurate diagnosis impossible.

To correctly measure closed-circuit current, measurement adapter 61 2 300 (P/N 90 88 6 612 300) should be used. This tool provides a bridge to ground, before the negative battery terminal is disconnected, and this prevents the control units from being reset. The additional use of MoDiC adapter 61 2 310 (P/N 90 88 6 612 310) provides a method for current measurements over an extended period of time.

PROCEDURE

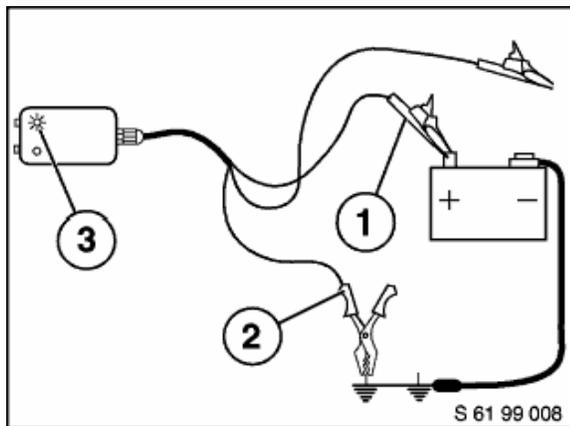
1. Check battery voltage is a minimum of 12 volts. If necessary, recharge the battery.
2. Switch off all other electrical consumers, paying particular attention to the telephone and any retrofitted special equipment.
3. If the battery is installed in the trunk, open the trunk and turn the lock to the locked position using a screwdriver or similar (simulates the trunk lid being closed). The hood must be closed.

If the battery is installed in the engine compartment, open the hood and pull the front lid contact switch fully up and lock in this position (workshop position, simulates the front lid being closed). The trunk must be closed.

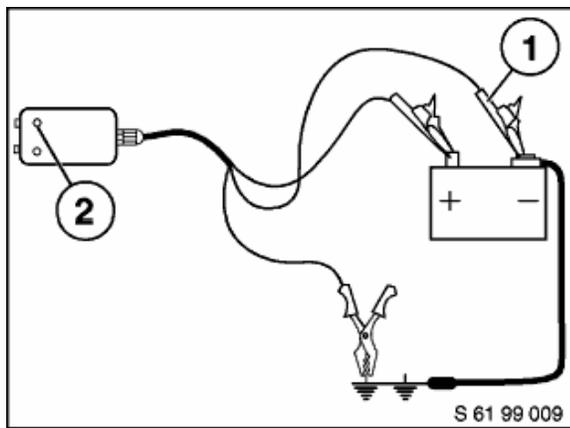
4. With the exception of the trunk / hood above, all other doors / lids must be closed.
5. In order to simulate normal closed circuit conditions:
 - Open the driver's door and close it again (simulates somebody getting in).
 - Switch the ignition "on" for at least 5 seconds and then switch it "off" again (simulates driving).
 - Open and close the driver's door again (simulates somebody getting out).
 - Lock the car, arming DWA if this is installed.
6. Wait 16 minutes for consumer cut-off. (On automatic transmission vehicles, consumer cut-off is visually indicated when the amber shifter LED goes out). Closed circuit current can now be measured.

In general, closed circuit current consistently over 50 mA must be investigated. Depending on the vehicle's equipment, closed-circuit current by vehicle model is approximately as follows:

- E31 50 milliamps
- E32 50 milliamps
- E34 40 milliamps
- E36 30 milliamps
- E38 50 milliamps
- E39 40 milliamps
- E46 40 milliamps
- E53 40 milliamps
- Z3 30 milliamps
- Z8 50 milliamps

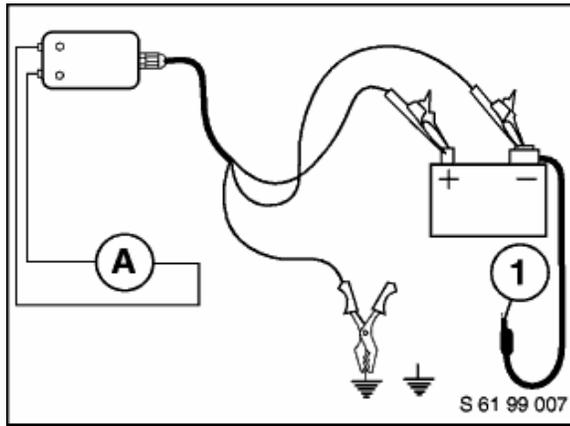


7. Using the closed-circuit current measurement adapter 61 2 300:
 - Connect the red clamp (marked "BATT +") (1) to the battery positive terminal.
 - Connect the black clamp (marked "CHASSIS") (2) to a the ground support point on the body (or other suitable ground).
 - The green LED (3) illuminates to indicate correct installation.



8.
 - Connect the black clamp (marked "BATT -") (1) to the negative battery terminal.
 - The green LED (2) goes out.
 - Note: Any electrical overloading will be indicated by the red LED illuminating. In such cases, the adapter connection should be checked and corrected as necessary.

9. Closed-circuit current measurement with a multimeter:



10.

- Set the multimeter to the 10 amps measuring range.
- Connect the multimeter to the adapter.
- Disconnect the battery ground (1) from the body.
- Measure the closed-circuit current on the multimeter.
- After measuring the closed-circuit current, reconnect the battery ground cable (1) before removing the clamps. Then switch the ignition "on" for at least 5 seconds and then "off" again to prevent faults due to non-initialized control units.

11. Interpretation of Measurements taken with a Multimeter

BMW recommends the use of Fluke Models 83 and 88. Most multimeters have a "powersave" feature which shuts down the meter after a certain period of time. With the Fluke Models 83 and 88, this "powersave" feature is automatically disabled when using "MIN MAX" or "AVG". Operating characteristics of other makes and models may vary - consult the operating instructions for details.

With the Fluke meter set in regular mode, and if systems are functioning normally, the closed circuit current will be seen to maintain a reasonably constant level, with momentary excursions to higher currents as system modules perform occasional update duties. These occasional fluctuations should be ignored.

With the Fluke meter set on "MIN MAX", these occasional fluctuations (sometimes over 100 mA), will be recorded. As a result, care should be taken when interpreting the results when the meter is used with this setting. In general, the use of "MIN MAX" is not recommended for this reason.

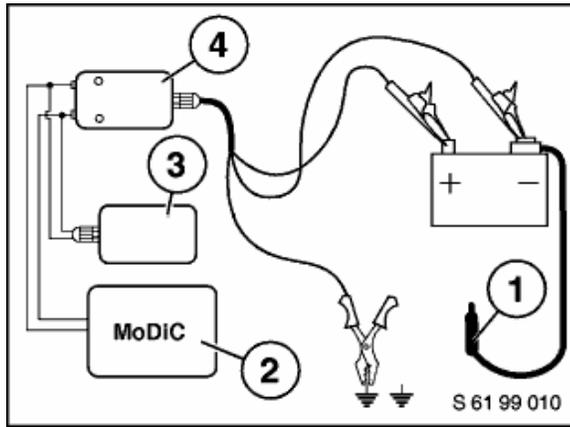
With the Fluke meter set on "AVG" (Average), the momentary fluctuations are averaged out. **This is the recommended setting to use.**

If the average closed circuit current measured after an overnight test is within the value for the vehicle model (step 6), the system is performing satisfactorily.

If the average closed circuit current measured after an overnight test results in a higher than expected current, further investigation is required. In such cases, the use of the MoDiC is recommended (see step 12)

12. Closed-circuit current measurement with a MoDiC:

Note: This technique with a MoDiC, is particularly suitable for extended measurements, and provides a graphical readout of recorded measurements over time. It is recommended for the situations where the use of a multimeter provided insufficient information for problem diagnosis.



13.

- Connect the MoDiC adapter 61 2 310 (3) in parallel to the adapter 61 2 300 (4)
- Connect the MoDiC (2) with measuring cable MFK1 to the two adapters.
- Disconnect the battery ground (1) from the body.
- Set up and operate the MoDiC as described in test steps 11 - 14.
- Measure the closed-circuit current on the MoDiC.
- After measuring the closed-circuit current, reconnect the battery ground cable (1) before removing the clamps. Then switch the ignition "on" for at least 5 seconds and then "off" again to prevent faults due to non-initialized control units.

14. MoDiC set up

- The MoDiC must be installed in its charging station for all measurements. The oscilloscope function will not operate if the MoDiC is not in the charging station
- Select "Measurement system"
- Select "Oscilloscope setting"

15. Notes on oscilloscope settings:

- a. Measuring range - When using the oscilloscope function in conjunction with adapter 61 2 310, 1 Volt = 1 ampere. In other words, a closed-circuit current of 50 mA is shown as 50 mV. When measuring closed circuit current, an initial "Measuring range" setting of 1V is recommended as an initial setting, changing to a lower range once an approximate level has been established.
- b. Frequency range - The frequency range determines how frequently and for how long a

measured value is recorded. The larger the frequency range, the more frequently a measured value is recorded, and the shorter the maximum stored recording duration.

Examples:

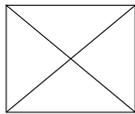
<u>Set "Frequency range"</u>	<u>Number of Measurements</u>	<u>Maximum duration of recording</u>
2 mHz	1 per second	83 minutes
1 mHz	1 every 2 seconds	2.7 hours
0.4 mHz	1 every 5 seconds	5.5 hours
0.2 mHz	1 every 20 seconds	27.7 hours

16. Oscilloscope Settings (see illustration below):

- Test Connection - MFK1 (1)
- Type of measurement - DC (2)
- Measuring range - 1V, or less (3) (see step 12)
- Frequency range
 - Select "Writer mode" (4)
 - Select between 0.1 mHz and 2 mHz (5) (see step 12)

Select "Oscilloscope display" on the Oscilloscope settings screen, to start recording measurements.

Note: Pressing the "Oscilloscope settings" button will delete any recorded measurements.



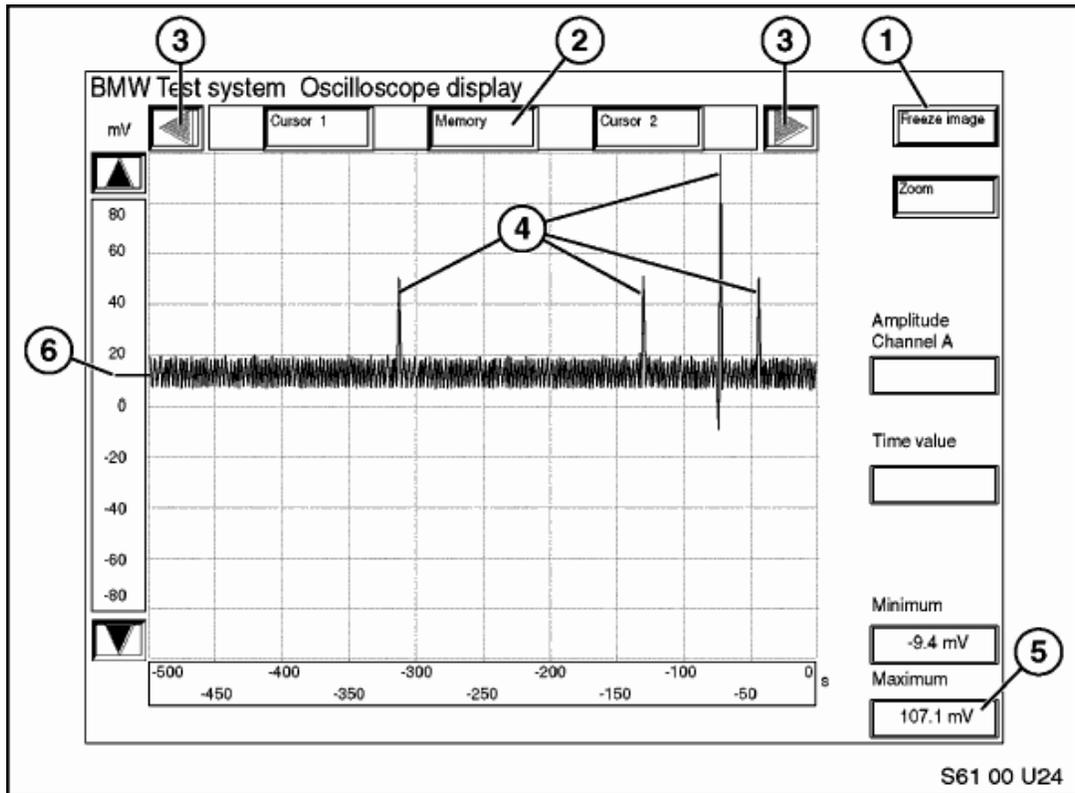
17. Displaying and Understanding Measurements (see illustration below):

- Stop recording measurements by pressing the "Freeze image" button (1). Note: If the "Freeze image" button is pressed again, the recorded measurements will immediately be deleted and new measurements started.
- Recorded data can be called up by pressing the screen button "Memory" (2) and paged through with the aid of the "arrow keys" (3) on the upper corners of the screen. When the maximum recording duration has been used, measured values can be called up for a total of 10 screens.
- Momentary current fluctuations (4) are normal and should be ignored. "Maximum" display (5) captures these momentary fluctuations, and also should be ignored.
- For the example shown, the "Measuring range" was set at +/- 100mV and the "Frequency range" set at 2 mHz. The measured closed circuit current is the mid point

of the trace (6). In this case, the closed circuit current is approximately 10 mA (converted from 10 mV on the left hand scale).

- An increased closed-circuit current will also be intermittently measured for a few seconds due to the use of remote-control keys of other vehicles, or other radio transmitters in the frequency range 315 MHz. In these cases, the General Module wakes up for key identification, then goes back to sleep when its own key is not recognized. This is normal operation.

If necessary a record of high closed circuit current can be printed by pressing the "Print screen" button.



WARRANTY INFORMATION

Information only