

3458A-18A

S E R V I C E N O T E

Supersedes:
3458A-18

3458A Multimeter

Serial Numbers: US28031400 / US28032927

Some recently produced 3458As may be “out of DCV specifications” due to time drift issues. One issue is long-term drift of the internal reference that may cause the instrument to be out of DCV specification in time intervals less than 1 year. The second issue is short-term drift that may cause some instruments to be out of specifications within 24 hours following an ACAL.

To Be Performed By: Either qualified customers or Agilent Service Personnel

Parts Required:

P/N	Description	Qty.
03458-69503	PCA A/D & Inguard Logic (rebuilt A3 assembly)	1

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:			
MODIFICATION RECOMMENDED			
ACTION CATEGORY:	<input type="checkbox"/> IMMEDIATELY <input checked="" type="checkbox"/> ON SPECIFIED FAILURE <input type="checkbox"/> AGREEABLE TIME	STANDARDS:	LABOR: 3.0 Hours
LOCATION CATEGORY:	<input checked="" type="checkbox"/> CUSTOMER INSTALLABLE <input type="checkbox"/> ON-SITE <input checked="" type="checkbox"/> SERVICE CENTER	SERVICE INVENTORY:	<input type="checkbox"/> RETURN <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> SEE TEXT
AVAILABILITY:	PRODUCT'S SUPPORT LIFE	USED PARTS:	<input type="checkbox"/> RETURN <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> SEE TEXT
AUTHOR: DLL	PRODUCT LINE: 9E		
AGILENT RESPONSIBLE UNTIL: March 31, 2006			
ADDITIONAL INFORMATION:			

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Situation:

Long-term drift: ACAL DCV utilizes the internal reference assembly to adjust the DCV calibration constants. If the voltage reference changes values with time then the accuracy of the DCV ranges will shift with the changes in the value of the voltage reference.

The internal reference assembly used in the 3458A are aged (stabilized under a powered-up state) and monitored for appropriate DCV time drift for use in the 3458A. Initially, virtually all references drift at rates too high for use in the 3458A. However, the rate of drift decreases with time and the future drift performance of the reference assembly can be accurately predicted with a high level of certainty.

If the reference assemblies are powered down for an extended period of time (such as being stored in a stock bin) the references revert back toward their “pre-aged state”. As a result the initial drift rate for the DCV reference may be high enough that the DCV function may be “out of specification” prior to the first calibration/adjustment interval (90 days or 1 year).

Some of our references used in recent production have been stored in a stock bin long enough to exhibit this drift problem. The error associated with this long-term drift issue will cause a gain error for all voltage, resistance and current measurements. This error is expected to be less than 15 ppm of the reading.

Operation of the 3458A for six weeks is sufficient for these references to stabilize under a powered-up state. Adjustment/calibration of the instrument after this initial six week operating period will eliminate this issue and the reference will be sufficiently stable to remain within specification until the next regular scheduled adjustment/calibration event.

Short-term drift: The performance of some 3458A Multimeters may change enough following the previous ACAL that instruments will be operating outside of specifications for the DCV function in a time period less than 24 hours. This means that toward the end of the 24-hour period following the ACAL some measurements will be outside the 3458A accuracy specifications.

NOTE: The 3458A accuracy specifications require that an ACAL has been done sometime during the prior 24 hours.

ACAL uses the internal references (internal DCV reference and the internal Ohms reference) to adjust the instrument calibration constants to conform to the values of the internal references. This means that an ACAL readjusts the instrument to compensate for any short-term drift of the 3458A measurement circuits.

A temporary procedure to compensate for this excess short-term drift of some of the 3458A Multimeters is to utilize more frequent ACALs. ACALs every 8 or 12 hours may be required to assure that all measurements are within product specifications. If the cause of this excess short-term drift is not corrected, then ACAL may not have sufficient range to correct for this drift. If this occurs then an error message indicates a hardware failure.

The error associated with this short-term drift issue will cause a gain error for all voltage, resistance and current measurements. This error will vary in value following an ACAL from no additional error to the error accumulated by applying the 1-day drift rate for the 24-hour period (1-day period). Determining the 1-day drift rate is covered later in this service note.

Solution/Action:

Long Term Drift: Having the 3458A “powered on” nearly continuously for six weeks stabilizes the drift performance of the DCV internal reference assembly. However, the drift performance of the internal reference during the first weeks of instrument operation may have shifted the performance of the 3458A to an “out of tolerance condition” or enough that performance is marginal.

An adjustment of the “DC Gain Adjustment” will correct an “out of tolerance condition” or a marginal situation. The internal reference will now be stable so that you can be assured that the instrument will be able to operate within the specified accuracy limits until the next normal calibration/adjustment interval.

NOTE: If your 3458A has been adjusted/calibrated after an initial operating period of at least six weeks then this issue has been corrected for your instrument. **No additional action is required to correct for this drift issue.**

Testing for an “out of tolerance condition” or a marginal situation can be done on a 3458A by using an accurate 10 VDC Voltage Standard (Fluke 732A/B or equivalent) or by using a stable DCV source and a second 3458A. Refer to the “DC Gain Adjustment” in the 3458A Calibration Manual (03458-90017) for the detailed adjustment procedure.

A web address where the 3458A Calibration Manual can be accessed is:

<http://cp.literature.agilent.com/litweb/pdf/03458-90017.pdf>

Short term drift: The average daily drift rate for calibration constant 72 will be computed. If this rate is above the expected value then the A3 assembly needs to be replaced.

*Complete an ACAL just prior to obtaining the present value of Calibration Constant 72. Refer to the last part of this Service Note entitled “Obtaining Calibration Constant 72 from the 3458A Keyboard” for instructions in reading the value of Calibration Constant 72.

Use the **Computation of the drift rate of calibration constant 72** at the end of this note.

Test Results/Action:

If the drift rate is **equal to or less than 0.43 pmm (parts per million) per day:**

The short-term drift rate of the 3458A is acceptable and the instrument can be returned to its application and you can be confident that the 3458A will continue to operate within specification.

If the drift rate is **greater than 0.43 ppm per day:**

Then the A3 assembly needs to be replaced. You may be able to continue using your 3458A until a repair can be scheduled. However, the performance of the instrument will be degraded. We recommend that the instrument be repaired as soon as possible. Two repair options are being offered (the first will minimize instrument down time):

- 1) Order a replacement A3 assembly (03458-69503 PCA A/D & Inguard Logic - rebuilt A3 assembly.) Running ACAL ALL after a 4-hour warm-up period will restore instrument functionality (the instrument will align itself to the internal references). A complete calibration/adjustment **may be required** to satisfy your specific calibration/repair requirements. This calibration will be the responsibility of the user. This repair takes about 30 minutes and will help minimize the instrument downtime required to correct this drift issue. Customer replacement of the A3 assembly will not void the normal 3458A product warranty.
- 2) The other option is to return the 3458A to the factory where appropriate repairs will be made, the instrument calibrated.

You may want to continue to use the 3458A until a repair can be scheduled. Instrument specifications will need to be degraded by the amount of drift that has occurred since the last ACAL. For example:

If the daily drift rate is 6 ppm per day and ACAL ALL is done once every 24 hours. Then all specifications will be degraded by 6 ppm of reading.

However, in this example if ACAL is done every 8 hours or for measurements made within 8 hours of the last ACAL then all specifications will be degraded by 2 ppm of reading (8 hours is 1/3 of the one day period for which the drift rate was computed).

****Computation of the drift rate of calibration constant 72 (will take 1 week to complete):**

$$C = [(A - B) * 1000000] / [A * D] \text{ ppm per day}$$

A = the value of the calibration constant 72 (following an ACAL on day 1 of the test)

B = the value of calibration constant 72 (following an ACAL on the last day of the test)

C = the drift rate of calibration constant 72 in ppm per day

D = the number of test days where the instrument was powered on during the test interval

(See Note # 1)

If the absolute value of C is > 0.43 ppm per day, then the A3 assembly in your instrument needs to be replaced.

Note # 1: The test interval needs to be at least 7 days long to provide accurate results. The best results can be obtained by using:

--the factory value of the calibration constant for A (obtain this from the web site previously listed)

--for D use the "number of instrument operating days since the 3458A was first received at your site".

Obtaining Calibration Constant 72 from the 3458A Keyboard:

Press the "blue" key (shift)

Press the "Menu" key

Press the "down arrow" so that "MENU FULL" appears on the display

Press "Enter"

Press the "blue" key (shift)

Press the "C" key

Press the "down arrow" so that "CAL?" appears on the display

Press "7"

Press "2" (now "CAL?72" should be displayed)

Press "Enter" (the calibration constant 72 is now displayed)