S E R V I C E   N O T E

SUPERSEDES: None

HP 44704A 16-bit High Speed Voltmeter

3852A Data Acquisition System

44704-90010 Service Manual

Change in test procedures for DCV offset, gain and linearity.

Situation:

The DCV test procedures for the HP 44704A voltmeter were developed to be consistent with the HP 44702A voltmeter. Because of the increased resolution and accuracy of the HP 44704A, versus the HP 44702, these procedures were found to be less than optimal, and properly functioning cards could consistently fail the DCV tests.

Solution/Action:

The following modifications have been made to the test procedures.

Changes to DCV Offset Test:

Modifications to program code: Change "TERM EXT" to "TERM ZERO". TERM ZERO places an internal short across the HI and LO terminals and eliminates possible noise problems with an external short.

Add the "DELAY 0,.001" and "AZERO ONCE" commands after "TERM ZERO".

"VREAD MIN" and "VREAD MAX" should be replaced with "VREAD MEAN" and "VREAD STDD".

Continued

DATE: 01 April 1992

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:		
INFORMATION ONLY		
AUTHOR:	ENTITY:	ADDITIONAL INFORMATION:
GWP	0900	

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You may also change the number of readings taken from 1000 to 100. One hundred readings is a sufficient sample size for this test. If you choose to do so, remember to also change the size of variable A from A(999) to A(99).

Modification to set-up:

As the internal short is now used across the HI and LO terminals, it is no longer necessary to short these terminals externally. A low thermal short should still be placed across the LO and CHASSIS terminals.

Modifications to Test Specs:

The minimum and maximum readings from the STAT command have been replaced by mean and standard deviation in the program code. The mean represents the "true" offset of the instrument while the standard deviation represents the noise measured.

The following specifications should be used for their respective ranges:

RANGE	PARAMETER	SPEC
.04 V	offset (mean)	+/- 10 E-6 V
.04	noise (std dev)	+ 10 E-6
.32	offset (mean)	+/- 18 E-6
.32	noise (std dev)	+ 32 E-6
2.56	offset (mean)	+/- 113 E-6
2.56	noise (std dev)	+ 227 E-6
10.24	offset (mean)	+/- 450 E-6
10.24	noise (std dev)	+ 900 E-6

Changes to both the DCV Gain and DCV Linearity Tests:

Modifications to test code:

Add the following commands after the "TERM EXT" command; "DELAY 0,.001" and "AZERO ONCE".

Replace "VREAD MIN" and "VREAD MAX" commands with "VREAD MEAN".

You may also change the number of readings taken from 1000 to 100. One hundred readings is a sufficient sample size for these tests. If you choose to do so, remember to also change the size of variable A from A(999) to A(99).

Modification to test specs:

The minimum, maximum and standard deviation readings from the STAT command should be ignored. The mean calculated for this test, from a sample of at least 100 readings, should be compared against the results of the test spec calculations shown below.

The specifications for the DCV gain and linearity tests are as follows:

90 Day Specs

40 mV range	.03% of rdg + 10 uV
320 mV range	.015% of rdg + 18 uV
2.56 V range	.015% of rdg + 113 uV
10.56 V range	.015% of rdg + 450 uV

Note: For 1 yr specs, add .005% of rdg.

Thus, the 1 year linearity specs would be:

$$5V \text{ in } 10.24 \text{ V range} \rightarrow 5V * (.00015 + .00005) + .000450$$
$$.001 \text{ V} + .000450 \text{ V} = +/- .001450 \text{ V}$$
$$= +/- 1450 \text{ E-6 V}$$

$$2.5 \text{ V in } 10.24 \text{ V range} \rightarrow 2.5V * (.0002) + .000450$$
$$.0005 \text{ V} + .000450 \text{ V} = +/- .000950 \text{ V}$$
$$= +/- 950 \text{ E-6 V}$$

$$1.25 \text{ V in } 10.24 \text{ V range} \rightarrow 1.25 (.0002) + .000450$$
$$.00025 \text{ V} + .000450 \text{ V} = +/- .000700 \text{ V}$$
$$= +/- 700 \text{ E-6 V}$$

The specs for the DCV gain tests should be calculated the same as above.

Examples:

$$36 \text{ mV in } 40 \text{ mV range (90 day specs)}$$
$$.036 \text{ V} * .0003 + .000010 \text{ V}$$
$$.000108 + .000010 = +/- .0000208 \text{ V}$$
$$= +/- 20.8 \text{ E-6 V}$$

$$2.5 \text{ V in } 2.56 \text{ V range (1 yr specs)}$$
$$2.5 \text{ V} * (.00015 + .00005) + .000113 \text{ V}$$
$$.0005 \text{ V} + .000113 \text{ V} = +/- .000613 \text{ V}$$
$$= +/- 613 \text{ E-6 V}$$

These modifications make the DCV gain and linearity tests comparable to the DCV offset test procedures provided earlier.

Attached to this service note are new performance test record forms with the new specifications.

Model			Report No.			Date		

Test No.	Test Input	HP 44704A Range	Low Limit	Measured Reading*	High Limit	Meas Uncert	Test Acc Ratio
4-1. DC Voltage Test (Values in Vdc)							
Offset Test (mean)							
	Short	.04 V	- 0.000010	_____	0.000010	N/A	N/A
	Short	.320 V	- 0.000018	_____	0.000018	N/A	N/A
	Short	2.56 V	- 0.000113	_____	0.000113	N/A	N/A
	Short	10.24 V	- 0.000450	_____	0.000450	N/A	N/A
Offset Test (standard deviation)							
	Short	.04 V		_____	0.000010	N/A	N/A
	Short	.320 V		_____	0.000032	N/A	N/A
	Short	2.56 V		_____	0.000227	N/A	N/A
	Short	10.24 V		_____	0.000900	N/A	N/A
Gain Test (mean)							
	+36 mV	40 mV	0.035979	_____	0.036021	6.52E-7	>10:1
	-36 mV	40 mV	- 0.036021	_____	- 0.035979	6.52E-7	>10:1
	+300 mV	320 mV	0.299937	_____	0.300063	2.00E-6	>10:1
	-300 mV	320 mV	- 0.300063	_____	- 0.299937	2.00E-6	>10:1
	+2.5 V	2.56 V	2.499512	_____	2.500488	9.25E-6	>10:1
	-2.5 V	2.56 V	- 2.500488	_____	- 2.499512	9.25E-6	>10:1
	+10 V	10.24 V	9.998050	_____	10.001950	2.80E-5	>10:1
	-10 V	10.24 V	- 10.001950	_____	- 9.998050	2.80E-5	>10:1
Linearity Test (mean)							
	+5 V	10.24 V	4.998800	_____	5.001200	1.55E-5	>10:1
	+ 2.5 V	10.24 V	2.499175	_____	2.500825	9.25E-6	>10:1
	+1.25 V	10.24 V	1.249363	_____	1.250638	6.13E-6	>10:1

Model _____　Report No. _____　Date_____

Test No.	Test Input	HP 44704A Range	Low Limit	Measured Reading*	High Limit	Meas Uncert	Test Acc Ratio
4-1 DC Voltage Test (Values in Vdc)							
Offset Test (mean)							
	Short	.04 V	- 0.000010	_____	0.000010	N/A	N/A
	Short	.320 V	- 0.000018	_____	0.000018	N/A	N/A
	Short	2.56 V	- 0.000113	_____	0.000113	N/A	N/A
	Short	10.24 V	- 0.000450	_____	0.000450	N/A	N/A
Offset Test (standard deviation)							
	Short	.04 V		_____	0.000010	N/A	N/A
	Short	.320 V		_____	0.000032	N/A	N/A
	Short	2.56 V		_____	0.000227	N/A	N/A
	Short	10.24 V		_____	0.000900	N/A	N/A
Gain Test (mean)							
	+36 mV	40 mV	0.035977	_____	0.036023	6.52E-7	>10:1
	- 36 mV	40 mV	- 0.036023	_____	- 0.035977	6.52E-7	>10:1
	+300 mV	320 mV	0.299922	_____	0.300078	2.00E-6	>10:1
	- 300 mV	320 mV	- 0.300078	_____	- 0.299922	2.00E-6	>10:1
	+2.5 V	2.56 V	2.499387	_____	2.500613	9.25E-6	>10:1
	-2.5 V	2.56 V	- 2.500613	_____	- 2.499387	9.25E-6	>10:1
	+10 V	10.24 V	9.997550	_____	10.002450	2.80E-5	>10:1
	-10 V	10.24 V	- 10.002450	_____	- 9.997550	2.80E-5	>10:1
Linearity Test (mean)							
	+5 V	10.24 V	4.998550	_____	5.001450	1.55E-5	>10:1
	+ 2.5 V	10.24 V	2.499050	_____	2.500950	9.25E-6	>10:1
	+1.25 V	10.24 V	1.249300	_____	1.250700	6.13E-6	>10:1