R&E - Feature #955

EDC MV106 calibration

02/08/2014 06:12 PM - tin

Status:	Closed	**Start date:**	02/08/2014
Priority:	Normal	**Due date:**	
Assignee:	tin	**% Done:**	100%
Category:		**Estimated time:**	0.00 hour
Target version:			

Description

Using Keithley 2001 K7 unit
Room temp: 24.3°C (HEL-700 RTD set to 999.999 ohm on same Keithley unit)
20V Range : ±18ppm + 8 counts (Keithley 2001) + absolute ± 100ppm from Tektronix Cal lab.
10V : ±18ppm + 8 counts (Keithley 2001) + absolute ± 54ppm from Tektronix Cal lab.
2V Range : ±18ppm + 4 counts (Keithley 2001) + absolute ± 13ppm from Tektronix Cal lab.
200mV Range : ±25ppm + 12 counts (Keithley 2001) + absolute ± 2.1ppm from Tektronix Cal lab.

8/FEB/2014

Initial cal

1. Zener voltage 1557 - adjustment R1 to set zener voltage. Must be within 100uV

	Temperature	Zener voltage Vz	Zener current Iz	D ppm	Meas uncertainty
Label	23 to 25C	6.1698 V	7.5 mA ?		
Measured	24.3 C	6.169113 V	Not measured	-111.3	±18ppm + 8 counts & absolute ± 100ppm
Adjusted	24.3 C	6.169801 V	Not measured	0.16	±18ppm + 8 counts & absolute ± 100ppm

2. Adjust R2 for zero offset, all decades set to zero, DVM on output terminals (local sense)

Measured Vos	24.3 C	-0.01629 mV
Adjusted	24.3 C	-0.00203 mV

2A. Adjust R2a for sense "0" offset. Set all decades to zero, polarity to plus, range 10V.
Remove sense link from Black (LO) terminals and measure black terminals. Adjust to be less than 1 mV

Measured Vszo	24.3 C	0.81512 mV
Adjusted	24.3 C	-0.00101 mV

3. Adjust R3 to set feedback current accurately as required for accurate Vout

Dial 1V on second decade, using 10 position. DVM on output terminals, output read as 1.0000 +- 50uV

Measured Voi	24.3 C	0.9998574	-142.6 ppm
Adjusted	24.3 C	1.0000004 V	0.4 ppm

4. Linearity adjustment of 1st decade

Set setting same as step 3. Set 2nd decade to zero.

5. Set 2V on 1st decade. Adjust P2 pot to output. Set 1V on 1st decade, adjust P1 to 1V.
Vc - after initial cal settings done.

Measured 2V	24.3 C	1.9997686	-115,7 ppm
Measured 2Vc	24.5 C	2.0000546	27,3 ppm
Adjusted	24.5 C	1.9999995	0,3 ppm
Measured 1V	24.5 C	0.9998835	-116,5 ppm
Measured 1Vc	24.5 C	1.0000144	14,4 ppm
Adjusted	24.5 C	1.0000001	0,1 ppm

6. Set 4V on 1st decade to adjust P4. Set 3V to tweak P4.

Measured 4V	24.5 C	3.999532	-117 ppm
Measured 4Vc	24.5 C	4.000046	11,5 ppm
Adjusted	24.5 C	4.000003	0,75 ppm
Measured 3V	24.5 C	2.999645	-118.3 ppm
Measured 3Vc	24.5 C	3.000038	12.7 ppm
Adjusted	24.5 C	2.999994	-2 ppm

7. Set 6V on 1st decade to adjust P6. Set 5V to tweak P6.

Measured 6V	24.4 C	5.999280	-120 ppm
Measured 6Vc	24.5 C	6.000030	5 ppm
Adjusted	24.4 C	6.000007	1,2 ppm
Measured 5V	24.4 C	4.999398	-120 ppm
Measured 5Vc	24.5 C	5.000027	5,4 ppm
Adjusted	24.4 C	5.000003	0,6 ppm

8. Set 8V on 1st decade to adjust P8. Set 7V to tweak P8.

Measured 8V	24.4 C	7.999022	-122,3 ppm
Measured 8Vc	24.5 C	8.000021	2,6 ppm
Adjusted	24.4 C	8.000002	0,3 ppm
Measured 7V	24.4 C	6.999138	-123,1 ppm
Measured 7Vc	24.5 C	7.000018	2,5 ppm
Adjusted	24.4 C	7.000001	0,2 ppm

9. Set 10V on 1st decade to adjust P10. Set 9V to tweak P10.

Measured 10V	24.4 C	9.998775	-122,5 ppm
Measured 10Vc	24.6 C	10.000050	5 ppm
Adjusted	24.6 C	10.000002	0,2 ppm
Measured 9V	24.4 C	8.998888	-123,5 ppm
Measured 9Vc	24.6 C	9.000053	5,9 ppm
Adjusted	24.6 C	9.000001	0,1 ppm

Range set to 100mV

Set setting same as step 3. Set decades to zero.

5. Set 20mV on 1st decade. Adjust P4 pot to output.

Measured 20mV	24.4 C	19.99800	-100 ppm
Measured 20mVc	24.7 C	19.99994	-3 ppm
Adjusted	24.7 C	19.99998	-1 ppm

6. Set 40mV on 1st decade to check

Measured 40mV	24.4 C	39.99562
Adjusted	24.7 C	39.99952

7. Set 60mV on 1st decade to check

Measured 60mV	24.4 C	59.99295
Adjusted	24.7 C	59.99938

8. Set 80mV on 1st decade to check

Measured 80mV	24.4 C	79.99011
Adjusted	24.7 C	79.99916

9. Set 100mV on 1st decade to check

Measured 100mV	24.4 C	99.98775	-122,5 ppm
Adjusted	24.7 C	99.99878	-12,2 ppm

Range set to 10mV

5. Set 2mV on 1st decade.

Measured 2mV	24.4 C	1.99891	-545 ppm
Adjusted	24.7 C	1.99926	-370 ppm

6. Set 4mV on 1st decade to check

Measured 4mV	24.4 C	3.99777
Adjusted	24.7 C	3.99837

7. Set 6mV on 1st decade to check

Measured 6mV	24.4 C	5.99670
Adjusted	24.7 C	5.99758

8. Set 8mV on 1st decade to check

Measured 8mV	24.4 C	7.99581
Adjusted	24.7 C	7.99631

9. Set 10mV on 1st decade to check

Measured 10mV	24.4 C	9.99467	-533 ppm
Adjusted	24.7 C	9.99544	-456 ppm

Measured means before calibration
Adjusted - after calibration

History

#1 - 02/08/2014 06:14 PM - tin

- Description updated

#2 - 02/08/2014 07:34 PM - tin

- Description updated

#3 - 02/08/2014 07:35 PM - tin

- Description updated

#4 - 03/16/2014 02:23 PM - tin

- Description updated

#5 - 03/18/2014 11:36 PM - tin

- Description updated

#6 - 03/18/2014 11:49 PM - tin

Perf log, 4-wire connect

	KI2001 Cal, 8.FEB.14	KI2002 2TC, 21.2, 16.MAR14	KI2002,2TC,24.8,18.MAR14
10Vrng, 0V	-0.00203 mV 2030	0.000477 mV 477	0.000225 mV 225
10Vrng, 1V	1.0000001 V 0.1	1.00000936 V 9.36	1.00000333 V 3.33
10Vrng, 2V	1.9999995 V 0.3	2.00001817 V 9.1	2.00000408 V 2.04
10Vrng, 3V	2.999994 V -2	3.0000062 V 2	2.9999936 V -2.1
10Vrng, 4V	4.000003 V 0.75	4.0000161 V 4	3.9999956 V -1.1
10Vrng, 5V	5.000003 V 0.6	5.0000156 V 3.12	5.0000017 V 0.34
10Vrng, 6V	6.000007 V 1.2	6.0000224 V 3.73	6.0000054 V 0.9
10Vrng, 7V	7.000001 V 0.2	7.0000183 V 2.61	7.0000026 V 0.37
10Vrng, 8V	8.000002 V 0.3	8.0000277 V 3.46	8.0000032 V 0.4
10Vrng, 9V	9.000001 V 0.1	9.0000222 V 2.47	8.9999964 V -0.4
10Vrng,10V	10.000002 V 0.2	10.0000374 V 3.74	9.9999994 V 0.06

#7 - 12/05/2016 04:00 AM - tin

- Status changed from Resolved to Closed