

Instructions Manual

Tektronix

DCM910
Digital Clamp Meter

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DCM910 Digital Clamp Meter

The DCM910 Digital Clamp Meter measures DC current, AC current, and frequency. The meter uses a Hall-effect device to measure current without opening the circuit.

The meter automatically selects the correct measurement range and has a 4000 count resolution. (The maximum reading is 3999.)

The DCM910 meter provides true RMS readings for AC current.

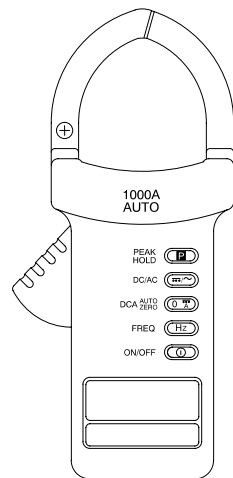


Figure 1: DCM910 Digital Clamp Meter

DCM910 Specifications

The characteristics listed in this section apply under the following conditions:

- The instrument operates in a 0° to 50° C (32° to 122° F) ambient environment unless otherwise noted.
- The instrument warms up for at least 20 minutes.

NOTE. All specifications are warranted unless marked “typical.” Typical characteristics are not guaranteed but are provided for the convenience of the user.

Table 1: Electrical characteristics

Characteristic	Description
Overload Protection	2000 A for one minute
Uninsulated Wire Voltage	600 V _{RMS} CAT II
Measuring Rate	2 times per second nominal
AC Current, Auto Ranging	
Ranges	400 A and 1000 A
Uninsulated Wire Voltage Rating	600 V _{RMS} CAT II
Resolution	
400 A Range	0.1 A
1000 A Range	1 A
Accuracy	
0 A to 400 A	±(1.9% of reading + 8 counts)
401 A to 1000 A	±(2.9% of reading + 5 counts)
Crest Factor	1.4 to 2.0, add 1.0% to accuracy 2.0 to 2.5, add 2.5% to accuracy
DC Current, Auto Ranging	
Ranges	400 A and 1000 A
Resolution	
400 A Range	0.1 A
1000 A Range	1 A

Table 1: Electrical characteristics (cont.)

Characteristic	Description
Accuracy	
0 A to 20 A	$\pm(1.9\% \text{ of reading} + 10 \text{ counts})$
20.1 A to 400 A	$\pm(1.9\% \text{ of reading} + 40 \text{ counts})$
401 A to 1000 A	$\pm(2.9\% \text{ of reading} + 5 \text{ counts})$
Frequency, Auto Ranging	
Ranges	4 kHz and 10 kHz
Sensitivity	$6 A_{RMS}$ ($10 A_{RMS}$, 1kHz to 10 kHz)
Resolution	
4 kHz Range	1 Hz
10 kHz Range	10 Hz
Accuracy	$\pm(0.5\% \text{ of reading} + 3 \text{ counts})$
Peak Hold	
Range	Low, High
Resolution	
Low	0.1 A
High	1.0 A
Accuracy	$\pm(3\% \text{ of reading} + 10 \text{ counts})$

Table 2: General specifications

Characteristic	Description
Auto Power Off	Approximately 30 minutes
Battery	9 V, ANSI/NEDA1604A, IEC 6F22
Battery Life	40 hours (alkaline)
Maximum Conductor Size	51 mm (2 inch) diameter or 24 × 60 mm (.95 × 2.36 inch) bus bar

Table 3: Certifications and compliances

Certifications	Canadian Standards Association certified to Standard CSA 1010.1, Standard UL3111-1 for Electrical and Electronic Measuring and Testing Equipment, and IEC1010-2-032 particular requirements for hand-held current clamps for electrical measurement and test.	
Overvoltage Category	Category:	Examples of Products in this Category:
	CAT III	Distribution-level mains, fixed installation
	CAT II	Local-level mains, appliances, portable equipment
	CAT I	Signal levels in special equipment or parts of equipment, telecommunications, electronics
Pollution Degree 2	Do not operate in environments where conductive pollutants may be present.	

Table 4: Environmental characteristics

Characteristic	Description
Temperature	
Operating	0° to 50° C (32° to 122° F), <75% relative humidity
Nonoperating	-20° C to +60° C (21° to 140° F), <80% relative humidity
Temperature Coefficient	0.2 × (specified accuracy) per °C at <18° C or >28° C
Maximum Altitude (Operating)	2,000 m (6,562 ft)

DCM910 Performance Verification

This section contains procedures to verify that the DCM910 Digital Clamp Meter performs as warranted. If an instrument fails any of the checks, it needs adjustment and or repair.

The performance verification procedures provide a valid confirmation of instrument electrical characteristics and function under the following conditions:

- The instrument operates in an 18° to 28° C (64° to 82° F) ambient environment with a relative humidity of less than 75%.
- The instrument warms up in the ambient environment for at least one hour.
- The instrument remains fully assembled (do not remove the bottom cover).

The DCM910 performance verification consists of the checks listed in Table 5.

Table 5: Performance verification checks

AC Current Check
DC Current Check
Frequency Check

The performance verification procedure should be performed annually or after every 2000 hours of operation if used infrequently.

Test Equipment

The performance verification procedures use external traceable test equipment to directly check warranted characteristics.

Alternative test equipment must meet or exceed the intended minimum requirements specified in Table 6. If you substitute equipment, you may need to modify the procedures.

NOTE. Before beginning the performance verification procedures, warm up the test equipment according to the manufacturer's recommendations.

Table 6: Test equipment

Description	Minimum requirements	Example product
AC/DC Current Calibrator	>0.5 % accuracy 0 to 400 A	Wavetek 9100 with Option 200 current multiplier coils
	>0.7 % accuracy 400 to 1000 A	

Set Up

To prepare for the performance verification checks, do the following.

1. Turn the DCM910 Digital Clamp Meter on.
2. Warm up the meter for 20 minutes.
3. Photocopy the test record on pages 11 and 12 to record your test results.

Verification Procedure

The following checks verify the performance of your DCM910 meter.



WARNING. The following procedures produce magnetic fields that may cause a malfunction in heart pacemakers or damage to sensitive equipment.

AC Current Check

To check the AC current accuracy, perform the following steps.

1. Set the meter function to **AC**.
2. Select the appropriate coils as necessary to multiply the AC current calibrator output to each of the test values in the AC current test record. For more information, refer to the user manual of your calibrator.
3. Position the clamp around the current loop of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
4. Verify that the display reads within the specified Display minimum and maximum limits.
5. Turn the calibrator output off.
6. Remove the clamp from the current loop.

DC Current Check

To check the DC current accuracy, perform the following steps.

1. Set the meter function to **DC**.
2. In the absence of any magnetic fields, press the **DCA AUTO ZERO** button to zero the meter.
3. Select the appropriate coil(s) as necessary to multiply the DC current calibrator output to each of the test values in the DC current test record. For more information, refer to the user manual of your calibrator.
4. Position the clamp around the current loop of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
5. Verify that the display reads within the specified Display minimum and maximum limits.
6. Before each measurement, set the calibrator output to off and press the **DCA AUTO ZERO** button to zero the meter.

***NOTE.** Any time a measurement appears to be out of tolerance, turn the calibrator output off, rezero the meter, and try again.*

7. Turn the calibrator output off.
8. Remove the clamp from the current loop.

Frequency Check

To check the frequency accuracy, perform the following steps.

1. Set the meter function to **Hz**.
2. Select the appropriate coil as necessary to multiply the AC current calibrator output to 20 A.
3. Position the clamp around the current loop of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
4. Verify that the display reads within the specified Display minimum and maximum limits for each of the frequencies listed in the Frequency test record.
5. Turn the calibrator output off.
6. Remove the clamp from the current loop.

DCM910 Test Record

Serial number	Procedure performed by	Date

DCM910 test record

Test input	Tolerance	Display minimum	Reading	Display maximum
AC current test				
0.0 A	±0.8 A	-00.8		00.8
10.0 A	50 Hz	±1.0 A	09.0	11.0
	400 Hz	±1.0 A	09.0	11.0
100.0 A	50 Hz	±2.7 A	97.3	102.7
	400 Hz	±2.7 A	97.3	102.7
300.0 A	50 Hz	±6.5 A	293.5	306.5
	60 Hz	±6.5 A	293.5	306.5
380.0 A	50 Hz	±8.0 A	372.0	388.0
	60 Hz	±8.0 A	372.0	388.0
600 A	50 Hz	±22 A	578	622
	60 Hz	±22 A	578	622
1000 A	50 Hz ¹	±34 A	966	1034
	60 Hz ¹	±34 A	966	1034

¹ At these frequencies, the inductance of the DCM910 may shut down the output of some calibrators. If this happens, decrease the calibrator output frequency until the output remains on for the duration of the test.

DCM910 test record (cont.)

Test input	Tolerance	Display minimum	Reading	Display maximum
DC current test				
0.0 A	±1.0 A	-01.0		01.0
10.0 A	±1.2 A	08.8		11.2
100.0 A	±5.9 A	94.1		105.9
300.0 A	±9.7 A	290.3		309.7
600 A	±22 A	578		622
1000 A	±34 A	966		1034
-10.0 A	±1.2 A	-11.2		-8.8
-100.0 A	±5.9 A	-105.9		-94.1
-300.0 A	±9.7 A	-309.7		-290.3
-600 A	±22 A	-622		-578
-1000 A	±34 A	-1034		-966

Frequency test

20 A	20 Hz	±3 Hz	0.017 kHz		0.023 kHz
20 A	50 Hz	±3 Hz	0.047 kHz		0.053 kHz
20 A	60 Hz	±3 Hz	0.057 kHz		0.063 kHz
20 A	100 Hz	±4 Hz	0.096 kHz		0.104 kHz
20 A	1 kHz	±8 Hz	0.992 kHz		1.008 kHz
20 A	3 kHz	±18 Hz	2.982 kHz		3.018 kHz
20 A	5 kHz	±60 Hz	4.94 kHz		5.06 kHz
20 A	7 kHz	±70 Hz	6.93 kHz		7.07 kHz
20 A	10 kHz	±80 Hz	9.92 kHz		10.08 kHz

DCM910 Adjustment Procedures

This section contains procedures to adjust the DCM910 Digital Clamp Meter. If your instrument fails a performance requirement, use these procedures to return it to factory specifications.

In this section you will find the following information:

- A list of adjustments
- A list of test equipment needed to make the adjustments
- Instructions on how to prepare the instrument for adjustment
- Step-by-step adjustment procedures

The procedures in this section do not verify performance. To confirm that your multimeter meets factory specifications, perform the procedures in the *DCM910 Performance Verification* section.

List of Adjustments

Use the adjustments listed in Table 7 to return the DCM910 clamp meter to factory calibration.

Table 7: DCM910 adjustments

Position Error
AC Current
DC Current
Peak Hold

Test Equipment

The test equipment listed in Table 6 on page 8 is a complete list of equipment needed for the adjustment procedures. These procedures assume that all test equipment is operating within tolerance. Detailed operating instructions for test equipment are not given in this procedure. If you need operating information, refer to the instruction manual of the test equipment.

Alternative test equipment must meet or exceed the intended minimum requirements specified in Table 6. If you substitute equipment, you may need to modify the procedures.

Preparation for Adjustment

The following guidelines apply to all DCM910 adjustments.

- Perform all adjustments in a 21° to 25° C ambient environment with a relative humidity of 75% or less.
- Before making any adjustment, warm up the current meter for at least 30 minutes.
- Do not alter any setting without reading the entire adjustment procedure first.
- Do not alter a setting unless a performance characteristic cannot be met at the current setting.
- Read the *Safety Summary* at the beginning of this manual.

Open the Meter Case

You must open the meter case to gain access to the internal adjustments.

1. Lay the meter face down on a flat work surface.
2. Remove the two screws from the case bottom with a Phillips-head screwdriver.
3. Gently lift the end of the case bottom until it unsnaps from the case top.
4. Remove the three screws that secure the circuit board assembly to the case top. Do not remove the screws that secure the circuit boards to each other.
5. To access the adjustments, lift the circuit board assembly far enough out of the top case to expose the adjustments. See Figure 2 and the procedure that follows.

To reassemble the meter following the adjustments, perform steps 2 through 4 above in reverse order.

Adjustment Procedure

To return your instrument to factory calibration, implement the following procedures.

Use a small flat-tipped screwdriver to make the adjustments. Refer to Figure 2 for adjustment locations.



WARNING. *Magnetic fields are produced that may cause a malfunction in heart pacemakers, or damage to sensitive equipment.*

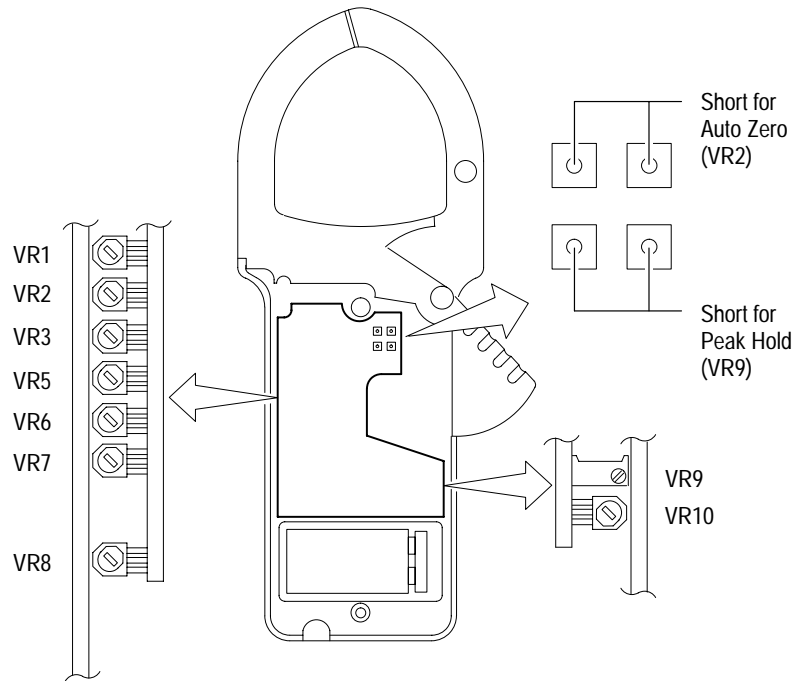


Figure 2: Adjustment locations

Position Error The adjust the position error calibration, perform the following steps.

1. Set the clamp meter to the **AC** position.
2. Select the appropriate coil to multiply the AC current calibrator output to 380 A at 50 Hz.
3. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
4. Adjust VR1 to maintain the measurement error to less than 1% total while positioning the coil in the clamp.
5. Turn the calibrator output off.
6. Remove the clamp from the coil.

DC Auto Zero To adjust the DC zero calibration, perform the following steps.

1. Set the clamp meter to the **DC** position.
2. Short the Auto Zero points indicated in Figure 2.

3. Adjust VR2 until the display reads 00.0 ± 5 counts.
4. Remove the short.
5. Press the clamp meter **DCA AUTO ZERO** button to zero the display.
6. Adjust VR3 until the display reads 00.0.

DC 400 A Range To adjust the DC 400 A range calibration, perform the following steps.

1. Set the clamp meter to the **DC** position.
2. Select the appropriate coil to multiply the DC current calibrator output to 200 A.
3. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
4. Position the clamp to the center of the coil.
5. Adjust VR5 until the display reads 201.5.
6. Turn the calibrator output off.
7. Remove the clamp from the coil.

DC 1000 A Range To adjust the DC 1000 A range calibration, perform the following steps.

1. Set the clamp meter to the **DC** position.
2. Select the appropriate coil to multiply the DC current calibrator output to 400 A.
3. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
4. Press the clamp meter **DCA AUTO ZERO** button to zero the display.
5. Position the clamp to the center of the coil.
6. Adjust VR6 until the display reads 400.
7. Turn the calibrator output off.
8. Remove the clamp from the coil.

- AC 400 A Range** To adjust the AC 400 A range calibration, perform the following steps.
1. Set the clamp meter to the **AC** position.
 2. Select the appropriate coil to multiply the AC current calibrator output to 390 A at 400 Hz.
 3. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
 4. Position the clamp to the center of the coil.
 5. Adjust VR8 until the display reads 396.0. To keep the meter on the lower range, it may be necessary to cycle the calibrator output off and on.
 6. Turn the calibrator output off.
 7. Remove the clamp from the coil.
- AC 1000 A Range** To adjust the AC 1000 A range calibration, perform the following steps.
1. Set the clamp meter to the **AC** position.
 2. Select the appropriate coil to multiply the AC current calibrator output to 400 A at 400 Hz.
 3. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
 4. Position the clamp to the center of the coil.
 5. Adjust VR7 until the display reads 400.
 6. Turn the calibrator output off.
 7. Remove the clamp from the coil.
- Peak Hold** To adjust the peak hold calibration, perform the following steps.
1. Set the clamp meter to the **AC** position.
 2. Short the Peak Hold points indicated in Figure 2.
 3. Press **PEAK HOLD** to activate the function.
 4. Adjust VR9 until the display reads 00.0.
 5. Remove the short.
 6. Press **PEAK HOLD** to cancel the function.
 7. Press **PEAK HOLD** again to verify that the display reads 00.0.

8. Press **PEAK HOLD** to cancel the function.
9. Repeat steps 2 through 8 above until the display reads 00.0.
10. Select the appropriate coil to multiply the AC current calibrator output to 200 A at 400 Hz.
11. Position the clamp around the coil of the current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.
12. Position the clamp to the center of the coil.
13. Adjust VR10 until the display reads 200.0.
14. Turn the calibrator output off.
15. Remove the clamp from the coil.
16. Reassemble the meter.

Table 8: Summary of adjustments

Adjustment name	Mode	Test value	Frequency	Circuit location	Tolerance	Display minimum	Display maximum
Position Error	AC	380 A	50 Hz	VR1	<5 counts	0 count	5 counts
DC Zero	DC			VR2 ¹	±0.5	-00.5	00.5
	DC			VR3	±0.1	-00.1	+00.1
DC 400 A Range	DC	200.0 A		VR5	±0.5	201.2	201.8
DC 1000 A Range	DC	400 A		VR6	±1	399	401
AC 400 A Range	AC	390.0 A	400 Hz	VR8	±0.1	395.5	396.5
AC 1000 A Range	AC	400 A	400 Hz	VR7	±1	399	401
Peak Hold	AC			VR9 ²		00.0	00.0
	AC	200.0 A	120 Hz	VR10 ²	±0.1	199.9	200.1

¹ Auto Zero points shorted.

² Peak Hold points shorted.