Instructions Manual

Tektronix

DCM300 and DCM320
Digital Clamp Multimeters

070-9847-01

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DCM300 and DCM320 Digital Clamp Multimeters

The DCM300 and DCM320 Digital Clamp multimeters measure AC current, AC voltage, and resistance/continuity. The meters use a current transformer to measure current without opening the circuit.

The meters automatically select the correct measurement range and have a 4000 count resolution. (The maximum reading is 3999.)

The DCM320 meter provides true RMS readings for both AC volts and AC current.

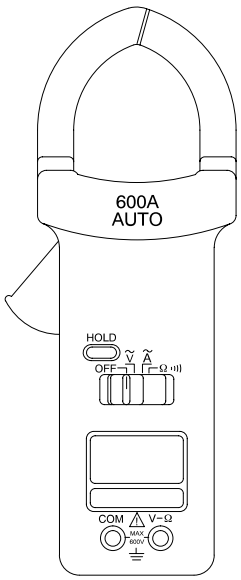

Figure 1: DCM300 Digital Clamp Multimeter

DCM300 and DCM320 Specifications

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

- The instrument operates in a 0° to 45° C 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
AC Voltage, Auto Ranging (nominal Input Impedance: 10 MΩ, <100 pF)	
Ranges	600 V and 400 V
Voltage Rating	600 V_{RMS} CAT II
Resolution	
400 V Range	0.1 V
600 V Range	1 V
Accuracy	40 to 500 Hz: ±(1.2% of reading + 5 digits)
Crest Factor (DCM 320 only)	1.4 to 2.0, add 0.6% to accuracy 2.0 to 2.5, add 2.0% to accuracy
AC Current, Auto Ranging	
Ranges	600 A and 400 A
Overload Protection	800 A
Uninsulated Wire Voltage Rating	600 V_{RMS} CAT II
Resolution	
400 A Range	0.1 A
600 A Range	1 A
Accuracy	50 to 60 Hz
400 A Range	±(1.9% of reading + 5 digits)
600 A Range	±(2.9% of reading + 5 digits)
Crest Factor (DCM 320 only)	1.4 to 2.0, add 1.0% to accuracy 2.0 to 2.5, add 2.5% to accuracy

Table 1: Electrical characteristics (cont.)

Characteristic	Description
Resistance, Auto ranging (meter beeps if resistance is <100 Ω.)	
Ranges	4 kΩ and 40 kΩ
Overload Protection	600 V_{RMS}
Resolution	
4 kΩ Range	1 Ω
40 kΩ Range	10 Ω
Accuracy	±(2.0% of reading + 9 digits)
Maximum Open Circuit Voltage	1 V

Table 2: General specifications

Characteristic	Description
Auto Power Off	Approximately 30 minutes
Battery	9 V, ANSI/NEDA1604A, IEC 6F22
Battery Life	200 hours (alkaline)
Maximum Conductor Size	40 mm

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 45° C (32° to 113° F), <75% relative humidity
Nonoperating	–20° to +60° C (–4° to 140° F), <80% relative humidity
Temperature Coefficient	0.2% (specified accuracy) per °C at <18° C (64° F) or >28° C (82° F)
Maximum Altitude (Operating)	2,200 m (7,218 ft.)

DCM300 and DCM320 Performance Verification

This section contains procedures to verify that the DCM300 and DCM320 Digital Clamp Multimeters perform 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 ambient environment with a relative humidity of less than 75%.
- The instrument warms up for 20 minutes.
- The instrument remains fully assembled (do not remove the bottom cover).

The DCM300 and DCM320 performance verification consists of the checks listed in Table 5.

Table 5: Performance verification checks

AC Current Check
AC Voltage Check
Resistance and Continuity 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 Current Calibrator	>0.5% accuracy, 0 to 400 A	Wavetek 9100 with option 200 current multiplier coils or Fluke 5500A with Wavetek X10 and X50 Current multiplier Coils
	>0.7% accuracy, 400 to 600 A	
AC Voltage Calibrator	>0.2% accuracy	
Resistance Calibrator	>0.3% accuracy	

Set Up

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

1. Turn the DCM300/DCM320 Digital Clamp Multimeter on by sliding the function switch to any position other than OFF.
2. Warm up the instrument 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 DCM300 or DCM320 multimeter.

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 multimeter function switch to the $\tilde{A}$ position.
2. Set up the AC current calibrator to output the values in the AC current test record.

NOTE*. Select the appropriate coils to multiply the AC Current calibrator output for each of the values listed in the AC current test record.*

3. For each of the conditions listed in the AC current test record, position the clamp around the current loop of the AC current calibrator and release the clamp trigger. Ensure that the clamp is entirely closed.

4. Verify that the multimeter display reads within the specified Display minimum and maximum limits for each of the specified conditions.
5. Turn the calibrator output off.
6. Remove the clamp from the current loop.

AC Voltage Check

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

WARNING. *To avoid electric shock, avoid touching the exposed connections on the multimeter circuit board.*

1. Set the multimeter function switch to the $\tilde{V}$ position.
2. Connect the AC voltage calibrator output to the multimeter **V–Ω** and **COM** input terminals.
3. Set the calibrator to each of the values listed in the AC voltage test record and verify that the multimeter display reads within the specified Display minimum and maximum limits.
4. Turn the calibrator output off.
5. Disconnect the calibrator.

Resistance and Continuity Check

To check the resistance accuracy and verify the continuity function, perform the following steps.

1. Set the multimeter function switch to the Ω))) position.
2. Connect the resistance calibrator output to the multimeter **V–Ω** and **COM** input terminals.
3. Set the calibrator to each of the values listed in the Resistance and continuity test record and verify that the display reads within the specified Display minimum and maximum limits.
4. Turn the calibrator output off.
5. Disconnect the calibrator.

DCM300 and DCM320 Test Record

Serial number	Procedure performed by	Date

DCM300 and DCM320 test record

Test input		Tolerance	Display minimum	Reading	Display maximum
AC current test					
0 A		±0.5 A	00.0		00.5
10.0 A	50 Hz	±0.7 A	09.3		10.7
	60 Hz	±0.7 A	09.3		10.7
100.0 A	50 Hz	±2.4 A	97.6		102.4
	60 Hz	±2.4 A	97.6		102.4
300.0 A	50 Hz	±6.2 A	293.8		306.2
	60 Hz	±6.2 A	293.8		306.2
380.0 A	50 Hz	±8 A	372.0		388.0
	60 Hz	±8 A	372.0		388.0
600 A	50 Hz	±22 A	578		622
	60 Hz	±22 A	578		622
AC voltage test					
0 V		±0.5 V	00.0		00.5
10.0 V	500 Hz	±0.6 V	09.4		10.6
100.0 V	500 Hz	±1.7 V	98.3		101.7
380.0 V	500 Hz	±5.1 V	374.9		385.1
600 V	50 Hz	±12 V	588		612
	500 Hz	±12 V	588		612

DCM300 and DCM320 test record (cont.)

Test input		Tolerance	Display minimum	Reading	Display maximum
Resistance and continuity test					
0 Ω		±9 Ω	000 Ω		009 Ω
			Buzzer must sound		
120 Ω		±11 Ω	109 Ω		131 Ω
			Buzzer must sound		
1.000 kΩ		±0.029 kΩ	971 Ω		1.029 kΩ
3.700 kΩ		±0.083 kΩ	3.617 kΩ		3.783 kΩ
39.00 kΩ		±0.87 kΩ	38.13 kΩ		39.87 kΩ

DCM300 and DCM320 Adjustment Procedures

This section contains procedures to adjust DCM300 and DCM320 Digital Clamp multimeters. 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, implement the procedures in the *DCM300 and DCM320 Performance Verification* section.

List of Adjustments

Use the adjustments listed in Table 7 to return DCM300 and DCM320 multimeters to factory calibration.

Table 7: DCM300 and DCM320 adjustments

AC Current
AC Voltage
Resistance
Continuity

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 DCM300 & DCM320 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 multimeter for 20 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 meter bottom with a Phillips-head screwdriver.
3. Gently lift the end of the bottom cover until it unsnaps from the top cover. Do not remove the circuit board mounting screws.

To reassemble the meter following the adjustments, perform steps 2 and 3 above in reverse order.

Adjustment Procedure

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

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

AC Current

To adjust the AC current calibration, perform the following steps.

1. Set the AC current calibrator to output 100 A at 50 Hz.
2. Set the multimeter function switch to the $\tilde{A}$ position.
3. Select the appropriate coil to multiply the AC current calibrator output to 100 A at 50 Hz.

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. Adjust VR2 with a small flat-tipped screwdriver; set the multimeter reading to 100.0.
6. Turn the calibrator output off.
7. Remove the clamp from the current loop.

AC Voltage

To adjust the AC voltage calibration, perform the following steps.

WARNING. *To avoid electrical shock, avoid touching the exposed connections on the multimeter circuit board.*

1. Set the multimeter function switch to the $\tilde{V}$ position.
2. Connect the AC voltage calibrator output to the multimeter **V–Ω** and **COM** input terminals.
3. Set the AC voltage calibrator to output 300 V at 500 Hz (DCM300) or 300 V at 50 Hz (DCM320).
4. Adjust VR1 with a small flat-tipped screwdriver; set the multimeter reading to 300.0.
5. Turn the calibrator output off.
6. Disconnect the calibrator from the multimeter.

Resistance

To adjust the resistance calibration, perform the following steps.

1. Set the multimeter function switch to the **Ω**))) position.
2. Connect the resistance calibrator output to the multimeter **V–Ω** and **COM** input terminals.
3. Set the resistance calibrator to simulate a 1 kΩ resistance load.
4. Adjust VR3 with a small flat-tipped screwdriver; set the multimeter reading to 1.000.
5. Turn the calibrator output off.
6. Disconnect the calibrator from the multimeter.

Continuity

To adjust the continuity calibration, perform the following steps.

1. Connect the resistance calibrator output to the multimeter **V–Ω** and **COM** input terminals.
2. Set the resistance calibrator to simulate a 150 Ω resistance load.
3. Place the bottom cover back on the meter and hold it in place. (The continuity buzzer will not sound during the following adjustments without the cover in place.)
4. If the buzzer does not sound, use a small flat-tipped screwdriver to adjust VR4 until the buzzer sounds. You will have to remove the bottom cover to make the adjustment and then replace the cover to make the test.
5. If the buzzer does sound, use a small flat-tipped screwdriver to adjust VR4 until the buzzer does not sound. After that, use the screwdriver to adjust VR4 until the buzzer sounds again. (Remove the cover to adjust; replace the cover to test.)
6. When you complete all adjustments, turn the multimeter off and replace the bottom cover. Do not pinch the battery leads between the case halves during reassembly.

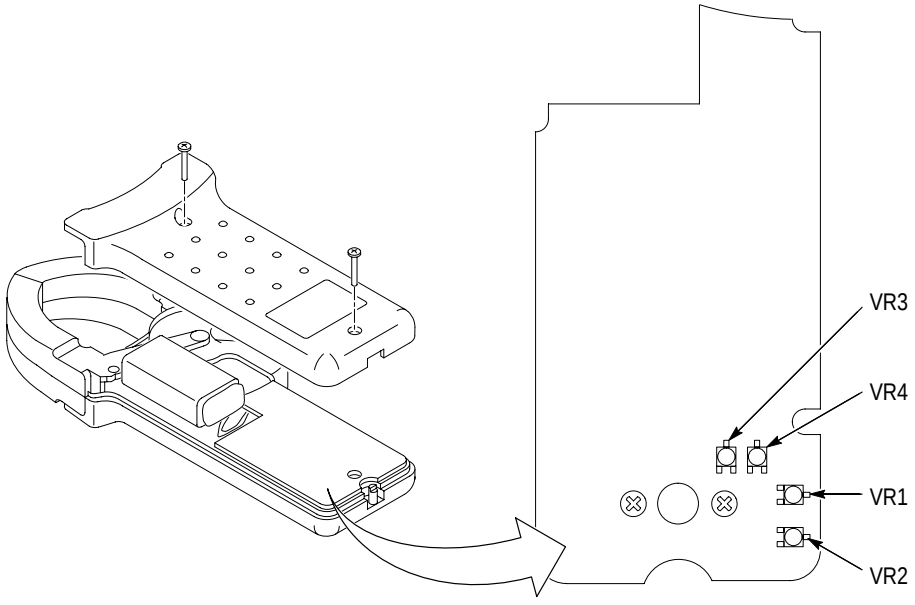

Figure 2: Adjustment locations

Table 8: Summary of adjustments

Adjustment name	Test value	Range setting	Circuit location	Tolerance	Display minimum	Display maximum
AC Current	100.0 A	50 Hz	VR2	±1.0 A	99.0	101.0
AC Volts	300.0 V	500 Hz (DCM300) 50 Hz (DCM320)	VR1	±0.3 V	299.7	300.3
Ohm	1.000 kΩ		VR3	±1 Ω	999 Ω	1.001 kΩ
	150 Ω		VR4	Adjust VR4 until the buzzer just sounds		