Tektronix

Service Procedure

Product: DM2510 / DM2510G

Title: Performance Check Procedure

Issue Date: May 18, 1994 **Revision Level A**

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File Location: T&M Service Support, Beaverton, Del. Sta. 19-083

REVISION LEVEL SUMMARY:

Revision Level A is the origination Level for this Procedure.

Revision #	Date	Initiator	Level Change From: To:	Description

Contents

PERFORMANCE CHECK PROCEDURE

Introduction

This procedure verifies that the DM2510G or DM2510 is operating within the limits of the performance requirements as listed in the Specification section of the DM2510G/2510 Instruction manual (Part No. 070-8479-00). To ensure instrument accuracy, check the performance every 1000 hours of operation or at a minimum of every six months if used infrequently.

This procedure may also be used to determine acceptability of performance in an incoming inspection facility; it may also be used whenever there is a question of instrument accuracy, following repair or internal adjustment. If the instrument fails to meet these performance checks, or adjustment is considered to be needed, a qualified service person should perform the adjustment procedure and repeat the Performance Check Procedure. If readjustment does not correct discrepancy, circuit troubleshooting is needed.

Environmental Conditions

All performance checks should be made at 18 - 28oC (65 - 82oF) and at less than 75% relative humidity.

The DM2510G/DM2510 must be turned on and allowed to warm up for at least 30 minutes before beginning the performance checks.

After exposure to or storage in high humidity (condensing) environment one hour warm-up time is required.

Recommended Test Equipment

The test equipment listed in Table 1, or equivalent is suggested to make the performance checks.

NOTE

The performance limits in this procedure do not include test equipment test equipment tolerance.

Table 1
Test Equipment Required

Description	Performance Specifications	Used for	Example
Calibration Generator	DC Voltage: Range, 0 to 1000V, accuracy: ± 0.005% . AC Voltage: Range 0 to 1000V, accuracy: ± 0.1%, 20 Hz-20kHZ AC Current: Range 0 to 2A, accuracy: ± 0.1%, 20Hz-10kHz DC Current: Range 0 to 2A, accuracy: ± 0.01% Resistance: 0 to 20 MΩ, accuracy: ± 0.01%	DC Volts	Fluke Model 5700A Fluke Model 5100B
AC Power Amplifier		AC Volts	Fluke 5215A
Shorting plug			Tektronix P/N 134-0012-00
Temperature Bath	Temperature bath: 0 ° C ± 0.1° C, 100 ° C ± 0.1 ° C	Temperature probe	RTE 4 Neslab

Preparation

1. Check that the line selector (on the rear panel) is set to the correct voltage.

2. Turn on the power.

3. Allow the instrument to warm up for at least 30 minutes before continuing with the performance checks. (See Environmental Conditions above.)

4. Check to see that the DMM is set at the proper line-frequency (50 or 60 Hz).

NOTE

In the following procedure, the DM2510G and DM2510 instruments are referred to as DMM.

The following steps are for verifying the accuracy specifications of the DM2510G or DM2510 at 4 1/2 digit resolution, for each of the six measuring functions: DC voltage, TRMS AC voltage, resistance, TRMS AC current, DC current and Temperature. These procedures are intended for use by qualified personnel using accurate and reliable test equipment.

WARNING

To prevent a shock hazard, do not exceed 1000V peak between input low and chassis ground. some of the procedures in this section may expose the user to dangerous votages. Use standard safety precautions when such dangerous voltage are encountered.

All following measurement procedures need to be performed with the following settings:

Resolution: 4.5 digit	(right hand digit ON)
NULL - mode: OFF	(NULL - led OFF)
Autoranging: OFF	(AUTO - led OFF)
In RUN mode	(HOLD - led OFF)

NOTE:

The dBm and dBV function are recalculated AC Voltage ranges. Checking AC Voltage will suffice.

1. Check DC Volts

Test Equipment Required:

DC Voltage Calibrator
Standard Test Leads
Shorting plug

CAUTION:

Do not exceed 1000V peak between the input V/Ω/TEMP and LOW terminals or instrument damage may occur.

a. Set the DMM to DCV measurement function by pressing the key and selecting DC Volts (AC symbol off).

b. Short the LOW and V/Ω/TEMP jacks together with a shorting plug.

c. Use the RANGING ⇓ key to select the 200 mV range (mV symbol ON).

d. CHECK- DMM display reads 0.00mV ± 3 counts.

e. Select the 2 V range.

f. CHECK- DMM display reads .0000V ± 2 counts.

g. Repeat steps e and f in 20, 200 and 1000 V ranges.

Range	Reading		Range	Reading
200 mV	0.00 mV ± 3 counts		200 V	0.00 V ± 2 counts
2 V	0.0000 V ± 2 counts		1000 V	0.0 V ± 4 counts
20 V	0.000 V ± 3 counts			

h. Remove the shorting plug and connect the DMM to the DC voltage calibrator.

i. Select autoranging.

j. Check the 200mV, 2V, 20V, 200V and 1000V ranges by applying the respective DC voltage levels listed in Table 2.

k. Repeat step j while applying negative voltages.

Table 2
Limits for DC Volts check

DMM: DCV Range	Applied DC Voltage	Reading Limits
200 mV	190.000 mV	189.91 to 190.09 mV
2 V	1.90000 V	1.8992 to 1.9008 V
20 V	19.0000 V	18.991 to 19.009 V
200 V	190.000 V	189.92 to 190.08 V
1000 V	1000.00 V	999.5 to 1000.5 V

2. Check TRMS AC Volts

Test Equipment Required:

AC Voltage Calibrator
AC Power Amplifier
Standard Test Leads

CAUTION:

Do not exceed 1000V peak or RMS 500V between the input V/Ω/TEMP and LOW terminals or instrument damage may occur.

a. Set the DMM to ACV measurement function by pressing the V and AC/DC keys.

b. Connect the DMM to the AC voltage calibrator and the power amplifier.

c. Press DOWN and UP of Autoranging keys to select autoranging function.

d. Set the calibrator to output 190mV at a frequency of 50/60Hz.

e. CHECK- the reading is within the limits listed in Table 3.

f. Repeat the 190mV measurement at the other frequencies specified in Table 3.

g. Repeat the procedure for the 2V, 20V, 200V and 500V ranges by applying the respective AC voltages and frequencies listed in Table 3.

h. CHECK- the reading for each range should be within the limits listed in Table 3:

Table 3

Limits for TRMS AC VOLTS Check

DMM: ACV Range	Applied AC Voltage		Reading	-------	Limits	
		50/60Hz	100Hz	1kHz	20kHz	50kHz
200 mV	190.000 mV	188.38 to 191.62	189.33 to 190.67	189.33 to 190.67	188.76 to 191.24	188.0 to 192.0
2 V	1.90000 V	1.8838 to 1.9162	1.8933 to 1.9067	1.8933 to 1.9067	1.8876 to 1.9124	1.8800 to 1.9200
20 V	19.0000 V	18.838 to 19.162	18.933 to 19.067	18.933 to 19.067	18.876 to 19.124	18.800 to 19.200
200 V	190.000 V	188.38 to 191.62	189.33 to 190.67	189.33 to 190.67	188.76 to 191.24	188.00 to 192.00
500 V	500.000 V	495.7 to 504.3	498.2 to 501.8	498.2 to 501.8	496.7 to 503.3	494.7 to 505.3

3. Check Ohms

Test Equipment Required:

Resistance Calibrator
Standard Test Leads
Shorting plug

CAUTION:

Do not exceed 300V peak between the input V/Ω/TEMP and LOW terminals during Ohms measurement, or instrument damage may occur.

a. Set the DMM to Ohms measurement function by pressing the Ω key.

b. Short the LOW and V/Ω/TEMP jacks together with a shorting plug.

c. Use the RANGING ⇓ key to select the 200 Ω range (Ω symbol displayed).

d. CHECK- DMM display reads between 0.00 Ω and 0.04 Ω (Table 4)

e. Select the 2 kΩ range by pressing the RANGING ⇑ key once.

f. CHECK- DMM display reads between 0.0000 Ω and 0.0002 Ω (Table 4).

g. Repeat steps e and f in 20 kΩ, 200 kΩ, 2 MΩ and 20 MΩ ranges. (See table 4).

h. Remove the shorting plug and connect the DMM to the Resistance Calibrator.

i. Press DOWN and UP of Autoranging keys to select autoranging function.

j. Check the 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ and 20 MΩ ranges by applying the respective resistance listed in Table 4.

Table 4
Limits for Ohms Check

DMM: Ohms Range	Applied Resistance	Reading Limits
200 Ω	Short	0.00 to 0.04
2 kΩ	Short	.0000 to 0.0002
20 kΩ	Short	0.000 to 0.004
200 kΩ	Short	0.00 to 0.02
2 MΩ	Short	.0000 to 0.0004
20 MΩ	Short	0.000 to 0.002
200 Ω	100.000 Ω	99.91 to 100.09 Ω
2 kΩ	1.00000 kΩ	.9993 to 1.0007 kΩ
20 kΩ	10.0000 kΩ	9.991 to 10.009 kΩ
200 kΩ	100.000 kΩ	99.93 to 100.07 kΩ
2 MΩ	1.00000 MΩ	.9986 to 1.0014MΩ
20 MΩ	10.0000 MΩ	9.988 to 10.012MΩ

4. Check DC Current

Test Equipment Required:

Current Calibrator
DC Voltage Calibrator
Standard Test Leads

CAUTION
Do not exceed 2A to the mA and LOW input terminals or the internal current fuse will blow. Do not exceed 10A to the A and LOW input terminals.

a. Set the DMM to DC Current measurement function by pressing the mA and AC/DC keys.

b. Use the DMM with open jacks.

c. Use the RANGING ⇓ key to set the 200 µA range ("µA" displayed).

d. CHECK - DMM display reads 0.00 µA ± 2 counts.

e. Repeat steps c and d in 2, 20, 200, 2000mA and 10A ranges. Set the DMM to 10A by pressing "A" key.

Range	Reading (± 2 counts)	Range	Reading (± 2 counts)
20 mA	0.000	2000 mA	0.0
200 mA	0.00	10 A	0.000

f. Connect the DMM to the DC current calibrator.

g. Select autoranging.

h. Check the 200μA, 2mA, 20mA, 200mA and 2000mA ranges by applying the respective DC currents listed in Table 5.

i. For 10A, make sure that the DC current calibrator is connected to the LOW and A input jacks. Set the DMM to 10A by pressing A key.

j. Repeat step h while applying negative currents.

Table 5
Limits DC current Check

DMM: DCA Range	Applied DC Current	Reading Limits
200 mA	190.000 mA	189.86 to 190.14 mA
2 mA	1.90000 mA	1.8986 to 1.9014 mA
20 mA	19.0000 mA	18.986 to 19.014 mA
200 mA	190.000 mA	189.86 to 190.14 mA
2000mA	1900.00 mA	1898.6 to 1901.4 mA
10 A	10.0000 A	9.965 to 10.035 A

5. Check TRMS AC Current

Test Equipment Required:

Current Calibrator
AC Voltage Calibrator
Standard Test Leads

CAUTION:

Do not exceed 2A to the mA and LOW input terminals or the internal current fuse will blow. Do not exceed 10A to the A and LOW input terminals.

a. Set the DMM to AC Current measurement function by pressing mA and AC/DC keys.

b. Connect the DMM to the AC current calibrator and set the calibrator to output 190mA at a frequency of 50 or 60Hz

c. Select autoranging.

d. CHECK - the reading is within the limits listed in Table 6.

e. Repeat the 190mA measurement at the other frequencies specified in Table 6.

f. Repeat the procedure for the 2, 20, 200, 2000mA and 10A ranges by applying the respective AC currents and frequencies in Table 6.

g. CHECK - the reading for each range should be within the limits listed in Table 6.

h. For 10A, ensure that the AC current calibrator is connected to the LOW & A input jacks. Set the DMM to 10A by pressing the A key.

Table 6
Limits for TRMS AC Current check

DMM: ACA Range	Applied AC Current	Reading 50/60Hz	Reading 100Hz	Limits 1kHz	Limits 10kHz
200 µA	190.000 µA	188.38 to 191.62	189.33 to 190.67	189.33 to 190.67	189.33 to 190.67
2 mA	1.90000 mA	1.8838 to 1.9162	1.8933 to 1.9067	1.8933 to 1.9067	1.8933 to 1.9067
20 mA	19.0000 mA	18.838 to 19.162	18.933 to 19.067	18.933 to 19.067	18.933 to 19.067
200 mA	190.000 mA	188.38 to 191.62	189.33 to 190.67	189.33 to 190.67	189.33 to 190.67
2000 mA	1900.00 mA	1883.8 to 1916.2	1893.3 to 1906.7	1893.3 to 1906.7	1893.3 to 1906.7
10 A	10.0000 A	9.915 to 10.085	9.915 to 10.085	9.915 to 10.085	9.915 to 10.085

6. Check Temperature

Test Equipment Required:

Temp.bath 0 ° C ± 0.1 ° C
Temp.bath 100 ° C ± 0.1 ° C

a. Set the DMM to Temperature measurement function by pressing the PROG and TEMP key.

b. Connect the P6602 Probe to which the DMM is calibrated to the LOW and V/Ω/TEMP jacks.

c. Put the tip of the temperature probe about 1 inch into the temperature bath of 0 ° C (± 0.1 ° C).

d. Wait for the measurement stabilize.

e. CHECK - DMM display reads between -0.6 ° C and +0.6 ° C.

f. Put the tip of the temperature probe about 1 inch into the temperature bath of 100 ° C ± 0.1 ° C.

g. Wait for the measurement to stabilize.

h. CHECK - DMM display reads between +99.4 ° C and +100.6 ° C.

This completes the Performance check procedure. Disconnect all test equipment from the DMM.