

# TM 500 / 5000

MODULAR TEST INSTRUMENTS

- 4-1/2 Digit Autoranging
- Fast (3-1/2 Digit) Mode
- AC/DC Voltage, AC/DC Current, Resistance and (optional) Temperature Measurement
- AC dBm and dBV Calculations
- True RMS AC Functions
- Null and Hold Modes
- Hi/Lo/Pass Limit Testing and Compare Mode with Beeper
- 50 Hz or 60 Hz Mode Selection
- Standard IEEE-488 Interface (DM 5110 only)
- Front and Rear Interfacing

## Low-cost plug-in DMM offers price/performance advantage.

The new DM 5110/511 offers exceptional functionality and the highest performance available in a low-cost single-width plug-in module.

The DM 5110 is fully programmable over the IEEE-488 interface, while the DM 511 is designed for manual operation only. The units are otherwise identical. The DM 5110 occupies one slot in any TM 5000 mainframe, and the DM 511 can be operated in either a TM 500 or TM 5000 mainframe.

## A full range of functions.

Both units give you a choice of either autoranging or manual operation for all standard functions—voltage, current or resistance measurements. Also included are true RMS AC measurements and dB calculations, plus features not normally found in a low cost DMM.

The normal resolution mode of 4-1/2 digits, together with a minimum range of 200 mV, allows voltages as small as 50  $\mu$ V

# DM 5110 / 511 Autoranging Digital Multimeter

to be resolved; a 3-1/2-digit mode provides for faster test throughput. Basic accuracy  $\pm 0.05\%$ . And 50 Hz or 60 Hz mode selection provides normal mode rejection ratio improvement.

## Front-panel convenience.

Operation of the DM 5110/511 is via twelve front-panel “soft keys” which are used for selection of function and range. When programming the DM 5110, they are also used to set the GPIB address and termination.

In addition to 7-segment readout and function/range annunciators, front-panel LEDs are included with both units. NULL, HOLD and AUTO mode indicators

The DM 5110 offers LEDs for two additional modes: REM (indicating remote operation) and ADDR (indicating that the instrument is being addressed to talk or listen). The DM 5110 also includes a front-panel ID button to request a display of a GPIB address and termination, and to generate an SRQ under certain circumstances. A manually-operated front-panel switch is used to select front or rear connection to volts and Ohms measurement modes. The switch is also operable over the GPIB, but its status can be queried and monitored remotely. (Caution—maximum input voltage on the rear connection pins is 60 V dc  $\pm$  pk ac.)



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**NULL mode** operates with all functions which enables the unit to add or subtract an offset to make relative measurements.

**HOLD mode** stops the instrument from measuring and displays the last measurement made. The HOLD key toggles the instrument between HOLD and RUN modes.

**The TRIG key** lets you make a single measurement and then automatically return to HOLD.

**COMPARE mode** makes it possible to compare measurements against user-defined HI and LO limits. A beeper indicates when a measurement is out of limits.

**Temperature measurements** are made using a platinum resistance probe. DM 5110/511 will measure temperatures from -62° to 240°C.

### Electrical Characteristics

#### DC Volts

**Accuracy** (4-1/2 digits, auto or manual ranging, front or rear input):

Range	+18° to +28°C	0° to +18°C, +28° to +50°C
200 mV	±(0.05% of reading + 0.015% of full scale)	±(0.15% of reading + 0.04% of full scale)
2V	±(0.05% of reading + 0.01% of full scale)	±(0.1% of reading + 0.02% of full scale)
20V	±(0.05% of reading + 0.015% of full scale)	±(0.15% of reading + 0.025% of full scale)
200V	±(0.05% of reading + 0.01% of full scale)	±(0.1% of reading + 0.02% of full scale)
1000V	±(0.05% of reading + 0.02% of full scale)	±(0.1% of reading + 0.02% of full scale)

**CMRR (with 1 kΩ unbalance)** — ≥100 dB @ dc, ≥80 dB @ 50/60 Hz.

**NMRR** — ≥50 dB @ 50/60 Hz (±0.2 Hz).

**Max. Resolution** — 10 μV.

**Step Response Time** — <50 msec to 0.05% of step.

**Input Resistance** — 10 mΩ ±0.5%.

**Max. Input Voltage** — Front panel, LOW to GND and V/Ω/Temp to LOW or GND: 1000 V pk; Rear connector, HI to LO and HI or LO to Chassis: 60 V dc + pk ac.

#### True RMS AC Volts

**Accuracy** (4-1/2 digits, auto or manual ranging, front or rear input, 200 mV to 500 V range):

Input Frequency	+18° to +28°C	0° to +18°C, +28° to +50°C
20 Hz to 100 Hz (see note 1)	±(0.8% of reading + 0.05% of full scale)	±(1.1% of reading + 0.075% of full scale)
100 Hz to 10 kHz (see note 1)	±(0.3% of reading + 0.05% of full scale)	±(0.6% of reading + 0.075% of full scale)
10 kHz to 20 kHz (see note 2)	±(0.6% of reading + 0.05% of full scale)	±(0.9% of reading + 0.05% of full scale)
20 kHz to 50 kHz (see note 3)	±(1.0% of reading + 0.05% of full scale)	±(1.3% of reading + 0.075% of full scale)

**Notes:**

1. For inputs > 200 counts, 200 mV to 200 V ranges, > 50 counts, 500 V range.
2. For inputs > 500 counts, 200 mV to 200 V ranges, > 250 counts, 500 V range.
3. For inputs > 2000 counts, 200 mV to 200 V ranges, > 500 counts, 500 V range.

**CMRR (with 1 kΩ unbalance)** — ≥60 dB @ 50/60 Hz.

**Max. Resolution** — 10 μV.

**Response Time** — <0.3 sec to 1% of step.

**Input Impedance** — 2 MΩ ±0.1%, paralleled by <50 pF.

**Max. Input Voltage** — Front panel, V/Ω/Temp to LOW: 500 V rms or 600 V dc; Front panel, V/Ω/Temp or LOW to GND: 1000 V pk; Rear connector, HI to LO and HI or LO to Chassis: 60 V dc + pk ac.

**Crest Factor** — 3:1 for 0.1% additional error.

## dB (True RMS AC Voltage)

**Accuracy** (4-1/2 digits, auto or manual ranging, front or rear input):

Range, dBV	Range, dBm	+18° to +28°C	0° to +18°C +28° to +50°C	Frequency
-34 to +54	-32 to +56	±0.3 dB	±0.4 dB	20 Hz-20 kHz
-54 to -34	-52 to -32	±0.6 dB	±0.8 dB	20 Hz-10 kHz
-60 to -54	-58 to -52	±1.0 dB	±1.5 dB	20 Hz-10 kHz

**Max. Resolution** — 0.01 dB.

**Response Time** — <0.3 sec to 1% of step.

**Input Impedance** — 2 M $\Omega$  ±0.1%, paralleled by <50 pF; Front panel, V/ $\Omega$ /Temp to LOW:

500 V rms or 600 V dc; Front panel, V/ $\Omega$ /Temp or LOW to GND: 1000 V pk; Rear connector, HI to LO and HI or LO to Chassis: 60 V dc + pk ac.

## Ohms

**Accuracy** (4-1/2 digits, auto or manual ranging, front or rear input):

Range	+18° to +28°C	0° to +18°C, +28° to +50°C	Source Current	V <sub>ax</sub>
200 $\Omega$	±(0.05% of reading + 0.02% of full scale)	±(0.25% of reading + 0.04% of full scale)	1.0 mA	0.2 V
2 k $\Omega$	±(0.05% of reading + 0.01% of full scale)	±(0.25% of reading + 0.03% of full scale)	1.0 mA	2.0 V
20 k $\Omega$	±(0.05% of reading + 0.02% of full scale)	±(0.25% of reading + 0.04% of full scale)	10 $\mu$ A	0.2 V
200 k $\Omega$	±(0.05% of reading + 0.01% of full scale)	±(0.25% of reading + 0.03% of full scale)	10 $\mu$ A	2.0 V
2 M $\Omega$	±(0.1% of reading + 0.02% of full scale)	±(1.0% of reading + 0.04% of full scale)	0.1 $\mu$ A	0.2 V
20 M $\Omega$	±(0.1% of reading + 0.01% of full scale)	±(1.0% of reading + 0.03% of full scale)	0.1 $\mu$ A	2.0 V

**Response Time** — <0.2 sec, 200  $\Omega$  to 2 M $\Omega$  ranges; <2 sec 20 M $\Omega$  range.

**Max. Input Voltage, All Ranges** — Front Panel: 300 V pk; Rear Connector: 60 V pk.

**Max. Resolution** — 10 m $\Omega$ .

**Max. Open-Circuit Voltage** — <11V.

## DC Amps

**Accuracy** (4-1/2 digits, auto or manual ranging, front panel only):

Range	+18° to +28°C	0° to +18°C, +28° to +50°C
200 $\mu$ A, 2 mA, 20 mA	±(0.1% of reading + 0.01% of full scale)	± (0.3% of reading + 0.025% of full scale)

**Response Time** — <50 msec to 0.05% of step.

**Input Resistance** —

Range	≈ Resistance
200 $\mu$ A	1.0 k $\Omega$
2 mA	100 $\Omega$
20 mA	10.2 $\Omega$
200 mA	1.2 $\Omega$
2000 mA	.26 $\Omega$

**Max Open-Circuit Input Voltage**

(mA to LOW) — 250 V pk.

**Max Input Current** — 2 A any range.

**Max Floating Voltage** — 1000 V pk, mA or LOW to GND.

**Max Resolution**—10 nA.



# TM 500 / 5000

## MODULAR TEST INSTRUMENTS

### AC Amps

Accuracy (4-1/2 digits, auto or manual ranging, front panel only, all ranges):

Frequency	+18° to +28°C	0° to +18°C, +28° to +50°C
20 Hz to 100 Hz (input > 200 counts)	±(0.8% of reading + 0.05% of full scale)	±(1.1% of reading + 0.075% of full scale)
100 Hz to 10 kHz (input > 200 counts)	±(0.3% of reading + 0.05% of full scale)	±(0.6% of reading + 0.075% of full scale)

**Crest Factor** — 3:1 for 0.1% additional error.

**Response Time** — <0.3 sec to 1% of step.

**Input Resistance** —

Range	≈ Resistance
200 μA	1.0 kΩ
2 mA	100 Ω
20 mA	10.2 Ω
200 mA	1.2 Ω
2000 mA	.4 Ω

**Max Open-Circuit Input Voltage (mA to LOW)** — 250 V pk.

**Max Input Current** — 2 A any range.

**Max Floating Voltage** — 1000 V pk, mA or LOW to GND.

**Max Resolution** — 10 nA.

### Temperature

Accuracy (4-1/2 digits, front panel, input only):

Measurement Range	+18° to +28°C	0° to +18°C, +28° to +50°C	Probe Status
-62° to +150°C	±0.6°C	±1.5°C	Instrument calibrated to probe
+150° to +240°C	±1.6°C	±2.5°C	
-62° to +150°C	±3.5°C	±4.5°C	Any probe
+150° to +240°C	±6.0°C	±7.0°C	

### Miscellaneous

**Reading Rate** — 4.5 Digits (NORMAL): >3/sec; 3.5 Digits (FAST): >25/sec.

**Power Consumption** — <10 W.

**Over-range Indication** — Flashing display.

**Warm-up Time** — 30 minutes (60 minutes after storage in high humidity environment).

### Environmental Specifications

**Temperature** — Operating: 0° to +50°C; Non-Operating: -55° to +75°C.

**Humidity** — <95%, 0° to +30°C; <75%, +30° to +40°C; <45%, above +40°C.

**Altitude** — Operating: 4.6 km (15,000 ft); Non-Operating: 15 km (50,000 ft).

### Physical Characteristics

**Net weight** — DM 5110: 1.1 kg (2.45 lb); DM 511: 1.0 kg (2.2 lb).

**Dimensions** — Single TM 5000/500 compartment; ≈ 67 mm (2.63 in) W x 285 mm (11.24 in) D x 126 mm (4.96 in) H.

TM 5006A	6 Wide Power Module Mainframe, GPIB
TM 5006A/R	TM 5006A w/Rack Mount
TM 5006A/RI	TM 5006A w/Rear Interface
TM 5006A/R/RI	TM 5006A w/Rack Mt & Rear Interface
TM 5006A/EMC	TM 5006A w/EMC Shielding

### Mainframe Power Plug Options

Standard	120V North American
UE220	220V Universal Euro & Switzerland
UK240	240V United Kingdom
A240	240V Australian
NA240	240V North American
S220	220V Switzerland

### Warranty

One year on materials and workmanship.

### Calibration Documentation

Contact TEGAM for OPTION Z540 NIST Traceable Compliance Certificate and Test Data.

### Calibration & Technical Services

For warranty and remedial repair, calibration services and spare parts, or for additional information on TEGAM sales and service offices around the world, contact us at 440-466-6100 (ph) or 440-466-6110 (fx).

### Ordering Information

DM 5110 Prgm. Autoranging Digital Multimeter

DM 511 Autoranging Digital Multimeter

Both Include:

Instruction Manual (070-7478-00),  
Instrument Interfacing Guide (070-7560-00),  
Reference Guide (070-7559-00),  
Meter Leads, Set (196-3212-00)

TM 502A	2 Wide Power Module Mainframe
TM 502A/TB	TM 502A w/Tool Box Plug-In
TM 503B	3 Wide Power Module Mainframe
TM 5003	3 Wide Power Module Mainframe, GPIB
TM 5003/RI	TM 5003 w/Rear Interface



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