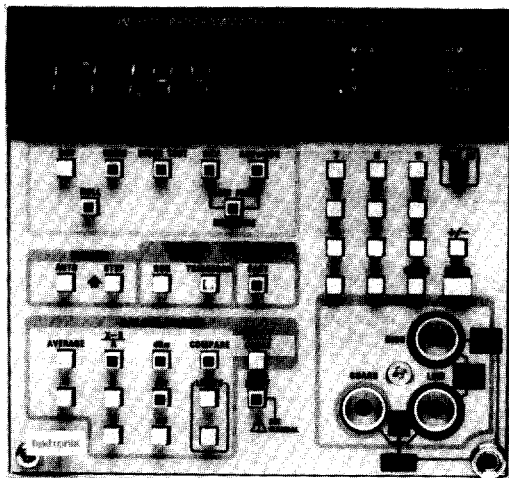


## DM 5010

GPIB



### Programmable Digital Multimeter

## DM 5010



The DM 5010 complies with IEEE Standard 488-1978, and with Tektronix Standard Codes and Formats.

4 1/2 Digit, Autoranging

Dc Volts, Ohms, True RMS (ac or ac + dc)

Diode Test

Comprehensive Math Functions:

dB Calculations; Averaging; Offset; Scaling; Hi/Low/Pass

The DM 5010 Programmable Digital Multimeter measures dc voltage, resistance, true RMS ac voltage, and true RMS ac + dc voltage. The internal math capability of the DM 5010 provides most of the calculations normally required for reducing raw measurements to decision-supporting information without controller assistance. These calculations include averaging (up to 19,999 measurements), offset and scaling, conversion to dBm or reference dB, and Hi/Low/Pass comparisons. User-selectable constants required for calculations may be supplied either through the front-panel keypad or via the GPIB.

The internal math capability of the DM 5010 permits such specialized measurements as: ac or dc current measurements, through the use of an external shunt resistor and a scaling factor equal to the ohmic value of the resistor; comparison against a percent tolerance (as opposed to an absolute value tolerance) through the combined use of the scaling and Hi/Low/Pass functions.

The low voltage (0.2 volt) ohms function allows in-circuit resistance measurements without turning on parallel diode and transistor junctions.

See DMM Selection Guide on page 363.

A Diode Test function is provided for forward and reverse testing of diode and transistor junctions.

The versatile TM 5000 rear interfacing capability allows signals to be applied to the DM 5010 via the rear interface connector as well as via the front panel input jacks. This front-rear selection capability allows the rapid comparison of two signals or voltage levels, such as the input and the output of a device, without the need for external switching of the signal. Selection of front or rear signal input may be made under bus control or by front-panel pushbutton.

The DM 5010 is fully guarded, with the Guard connector automatically connected to the Low input when there is no Guard signal lead inserted.

The Null function eliminates much of the requirement for four-wire ohms connections by allowing the operator, or the system, to null out lead resistance in resistance measurements. The Null function also allows the difference between two measurements to be displayed, either directly or as a dB difference.

A special Low Frequency Response function permits stable readouts of low frequency ac voltages.

Range selection is either automatic or manually incremented. Measurements and calculations may be triggered by internal circuitry, a front-panel pushbutton, a rear interface signal, or a GPIB command.

Calibration of the DM 5010 is greatly simplified through the use of internal microprocessor-computed nonvolatile calibration constants.

### CHARACTERISTICS

#### DC VOLTS

Ranges — 200 mV, 2 V, 20 V, 200 V, 1000 V.

Accuracy\*1

+18°C to +28°C		
Voltage Ranges	Normal Conversion Rate	Fast Conversion Rate
200 mV	±[0.015% of reading + 0.01% of full scale (2 counts)]	±[0.05% of reading + 0.05% of full scale (1 count)]
2 V through 200 V	±[0.015% of reading + 0.005% of full scale (1 count)]	±[0.05% of reading + 0.05% of full scale (1 count)]
1000 V	±[0.020% of reading + 0.010% of full scale (2 counts)]	±[0.05% of reading + 0.1% of full scale (2 counts)]
0°C to 18°C, +28°C to +50°C		
200 mV	±[0.06% of reading + 0.035% of full scale (7 counts)]	±[0.1% of reading + 0.1% of full scale (2 counts)]
2 V through 200 V	±[0.06% of reading + 0.03% of full scale (6 counts)]	±[0.1% of reading + 0.1% of full scale (2 counts)]
1000 V	±[0.065% of reading + 0.035% of full scale (7 counts)]	±[0.1% of reading + 0.15% of full scale (3 counts)]

\*1 Valid for six months or 1000 operating hours, whichever occurs first.

**Common-Mode Rejection Ratio (With 1 kΩ Imbalance)** — Unguarded: ≥130 dB at dc. ≥80 dB at 50 Hz to 60 Hz.

Guarded: ≥140 dB at dc. ≥100 dB at 50 Hz to 60 Hz.

**Normal-Mode Rejection Ratio** — ≥40 dB at 50 Hz or 60 Hz ±0.2 Hz.

**Maximum Resolution** — 10 μV.

**Step Response Time (To Rated Accuracy)**

**Run Mode** — Normal conversion rate is ≤0.53 s. Fast conversion rate is ≤0.08 s.

**Triggered Mode** — Normal conversion rate is ≤0.33 s. Fast conversion rate is ≤0.06 s.

**Input Resistance** — 200 mV to 20 V Range: >10<sup>9</sup> Ω.

200 V to 1000 V Range: 10 MΩ ±0.25%.

**Maximum Input Voltage** — 1000 V peak.

**TRUE RMS AC VOLTS (ACV AND AC + DC)**

**Input Signal** — Must be between 5% and 100% of full scale.

**Ranges** — 200 mV, 2 V, 20 V, 200 V, 700 V.

**Accuracy\*\*1**

Ac Volts and Ac Volts + Dc Volts			
+18°C to +28°C Normal and Fast Conversion			
Voltage Ranges	20 Hz to 100 Hz	100 Hz to 20 kHz	20 kHz to 100 kHz
200 mV through 200 V	±(0.8% of rdg + 0.2% of full scale)	±(0.2% of rdg + 0.2% of full scale)	±(1.0% of rdg + 0.5% of full scale)
700 V (15 kHz maximum)	±(0.8% of rdg + 0.6% of full scale)	±(0.2% of rdg + 0.6% of full scale)	
0°C to +18°C, +28°C to +50°C			
200 mV through 200 V	±(1.25% of rdg + 0.35% of full scale)	±(0.65% of rdg + 0.3% of full scale)	±(1.45% of rdg + 0.65% of full scale)
700 V (15 kHz maximum)	±(1.25% of rdg + 0.95% of full scale)	±(0.65% of rdg + 0.95% of full scale)	

#### Ac Volts + Dc Volts Only

+18°C to +28°C	
Voltage Ranges	Normal and Fast Conversion Rates 10 Hz to 20 Hz
200 mV through 200 V	±(0.8% of rdg + 0.3% of full scale)
700 V	±(0.8% of rdg + 0.9% of full scale)
0°C to +18°C, +28°C to +50°C	
200 mV through 200 V	±(1.25% of rdg + 0.45% of full scale)
700 V	±(1.25% of rdg + 1.25% of full scale)

\*\*1 Valid for six months or 1000 operating hours, whichever occurs first.

**Common-Mode Rejection Ratio** — Unguarded: Typically ≥80 dB from dc to 60 Hz. Guarded: Typically ≥100 dB from dc to 60 Hz.

**Maximum Resolution** — 10 μV.

**Response Time** — <1.2 s (except for Low Frequency Response mode).

**Input Impedance** — 2 MΩ ±0.1% paralleled by <150 pF.

**Maximum Input Voltage** — 1000 V peak ac, 500 V dc.

**Crest Factor** — Four (subject to maximum peak input voltage).

### DIODE TEST

**Operation** — A 1 mA current is generated and the resultant voltage is measured on the 2 V dc range. This produces a voltage sufficient to turn on diode and transistor junctions.

### RESISTANCE

**Ranges** — 200  $\Omega$ , 2 k $\Omega$ , 20 k $\Omega$ , 200 k $\Omega$ , 2 M $\Omega$ , 20 M $\Omega$ .

**Accuracy\***<sup>1</sup>

+18°C to +28°C		
Resistance Range	Normal Conversion Rate	Fast Conversion Rate
200 $\Omega$	$\pm$ [0.015% of reading + 0.015% of full scale (3 counts)] (using null)* <sup>2</sup>	$\pm$ [0.05% of reading + 0.05% of full scale (1 count)] (using null)* <sup>2</sup>
2 k $\Omega$ to 200 k $\Omega$	$\pm$ [0.015% of reading + 0.01% of full scale (2 counts)] (using null on 2 k $\Omega$ only)* <sup>2</sup>	$\pm$ [0.05% of reading + 0.05% of full scale (1 count)]
2 M $\Omega$	$\pm$ [0.10% of reading + 0.01% of full scale (2 counts)]	$\pm$ [0.10% of reading + 0.05% of full scale (1 count)]
20 M $\Omega$	$\pm$ [0.15% of reading + 0.005% of full scale (1 count)]	$\pm$ [1.0% of reading + 0.05% of full scale (1 count)]

**Accuracy\***<sup>1</sup>

0°C to +18°C, +28°C to +50°C		
Resistance Range	Normal Conversion Rate	Fast Conversion Rate
200 $\Omega$	$\pm$ [0.06% of reading + 0.06% of full scale (12 counts)] (using null)* <sup>2</sup>	$\pm$ [0.1% of reading + 0.1% of full scale (2 counts)] (using null)* <sup>2</sup>
2 k $\Omega$ to 200 k $\Omega$	$\pm$ [0.06% of reading + 0.035% of full scale (7 counts)] (using null on 2 k $\Omega$ only)* <sup>2</sup>	$\pm$ [0.1% of reading + 0.1% of full scale (2 counts)]
2 M $\Omega$	$\pm$ [0.54% of reading + 0.035% of full scale (7 counts)]	$\pm$ [0.55% of reading + 0.1% of full scale (2 counts)]
20 M $\Omega$	$\pm$ [0.9% of reading + 0.01% of full scale (2 counts)]	$\pm$ [1.6% of reading + 0.05% of full scale (1 count)]

\*<sup>1</sup> Valid for six months or 1000 operating hours, whichever occurs first.

\*<sup>2</sup> When the null function is not used add  $\pm 0.2 \Omega$  to all readings.

**Maximum Resolution** — 10 m $\Omega$ .

**Step Response Time (To Rated Accuracy)**

**Run Mode** — Normal conversion rate is  $\leq 1.24$  s. Fast conversion rate is  $\leq 0.33$  s.

**Triggered Mode** — Normal conversion rate is  $\leq 0.73$  s. Fast conversion rate is  $\leq 0.19$  s.

**Maximum Input Volts** — 400 V peak.

**Maximum Open Circuit Voltage Developed** —  $< 5$  V.

### OTHER CHARACTERISTICS

**Overrange Indication** — For Ohms and Diode Test, "OC" is displayed; for ACV, DCV, ACV+DCV, the display blinks.

**Measurement Rate** — ACV, DCV, ACV+DCV, Diode Test: 3/s at 4.5 digits; 26/s at 3.5 digits. Ohms: 1.6/s at 4.5 digits; 7.1/s at 3.5 digits.

**Power Consumption** —  $\approx 20$  VA.

**IEEE Standard 488-1978 Interface Function Subsets Implemented** — SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0

### ORDERING INFORMATION

**DM 5010 Programmable Digital Multimeter**

**\$2,260**

**Includes:** One set test leads (003-0120-00); instruction manual (070-2994-01); instrument interfacing guide (070-4603-00); reference guide (070-3542-00).

**Utility Software**

For TM 5000/4041. Order 062-6958-01

**\$150**

See page 297 for description and ordering information.

### OPTIONAL ACCESSORIES

**Test Lead** — Black, 4 ft.

Order 012-0425-00

**\$12**

**Test Lead** — Red, 4 ft.

Order 012-0426-00

**\$22**

**Test Lead** — Black, 4 ft.

Order 012-0426-01

**\$22**

**Test Lead Set** — Includes 012-0425-00, 012-0426-00, and 013-0107-05.

Order 012-0427-00

**\$29**

**High Voltage Probe** — To 40 kV (complete information page 366).

Order 010-0277-00

**\$165**

**P6420 RF Probe** — 2 m cable included (complete information page 441).

Order 010-6420-03

**\$145**

**Female BNC to Dual Banana Adapter** — Order 103-0090-00

**\$7.50**

## FG 5010

**GPB**  
IEEE-488

The FG 5010 complies with IEEE Standard 488-1978, and with Tektronix Standard Codes and Formats.

**0.002 Hz to 20 MHz**

**Up to 20 V p-p from 50 Ohms**

**Sine, Square, Triangle, Pulse, and Ramp Waveforms**

**10 ns Rise/Fall**

**10% to 90% Variable Symmetry in 1% Steps**

**Trigger, Gate, Counted Burst**

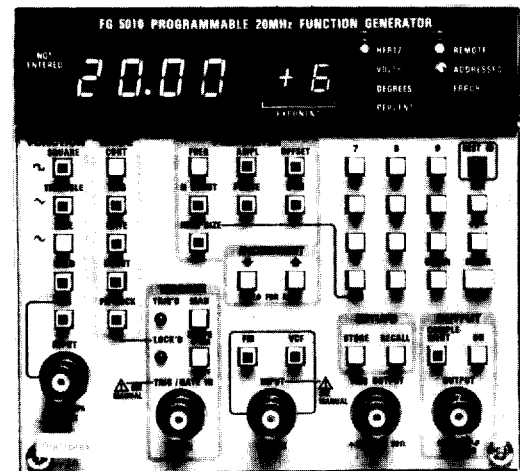
**Phase Lock, with Autoscan**

**AM, FM, VCF**

**Waveform Complement**

The FG 5010 Programmable 20 MHz Function Generator is a highly versatile GPIB programmable instrument and also extremely easy to operate in the manual mode as well. All functions are addressable via the lighted front-panel pushbuttons with nomenclature and functionality clearly designated. The ability to store ten complete front panel set-ups and recall them with only two key-strokes or by a single command over the GPIB reduces GPIB programming time and enhances stand-alone bench applications.

### FG 5010



### Programmable 20 MHz Function Generator

The FG 5010 provides the conventional sine, square, triangle, pulse, and ramp waveforms. Variable symmetry, which is usable throughout the entire frequency range, extends pulse and ramp capabilities beyond those of conventional generators. The FG 5010 also provides trigger, gate, counted burst, phase lock, AM, FM, and VCF modes. Variable phase enhances the trigger, gate, burst, and phase lock modes. The wide frequency range assures its usefulness in radio and other communication-oriented applications as well as in low frequency applications, such as biological, geophysical, and mechanical simulations.

The FG 5010 maintains frequency accuracy within 0.1% over its full 0.002 Hz to 20 MHz frequency range. Automatic phase lock to an external signal is possible from 20 Hz to 20 MHz. Waveform complement and  $\pm$  trigger slope allow interfacing to circuits with the proper waveform phase, especially important in pulse and digital applications. Waveform hold can freeze the output voltage of any 200 Hz or less waveform at its instantaneous value. With the output amplitude set to zero volts, the dc offset can be programmed to provide a dc voltage source of 0 volts to  $\pm 7.5$  volts in 10 mV steps.

### CHARACTERISTICS

**Waveform** — Sine, Square and Triangle with variable Symmetry providing Pulses and Ramps.

**Symmetry** — 10% to 90%, 1% steps,  $\pm 2\%$  accuracy. Range above 4 MHz is limited by 25 ns minimum triangle transition time (decreases to 50% at 20 MHz).

**Frequency** — Range: 0.002 Hz to 20 MHz. Accuracy: Continuous mode,  $\pm 0.1\%$ . Trigger, Gate, Burst Modes: Frequency  $\leq 200$  Hz,  $\pm 0.1\%$ ; frequency  $> 200$  Hz,  $\pm 5.0\%$ . Resolution: Continuous mode, 4 digits, Trigger, Gate, Burst modes. Frequency  $\leq 200$  Hz, 4 digits. Frequency  $> 200$  Hz, 3 digits.

**Amplitude** — Range: 20 mV to 20 V p-p from 50  $\Omega$  into open circuit.

To order, call your local Tektronix Sales Office, or call Tek's National Marketing Center, toll free: 1-800-426-2200, Ext 99. In Oregon call collect: (503) 627-9000, Ext. 99