

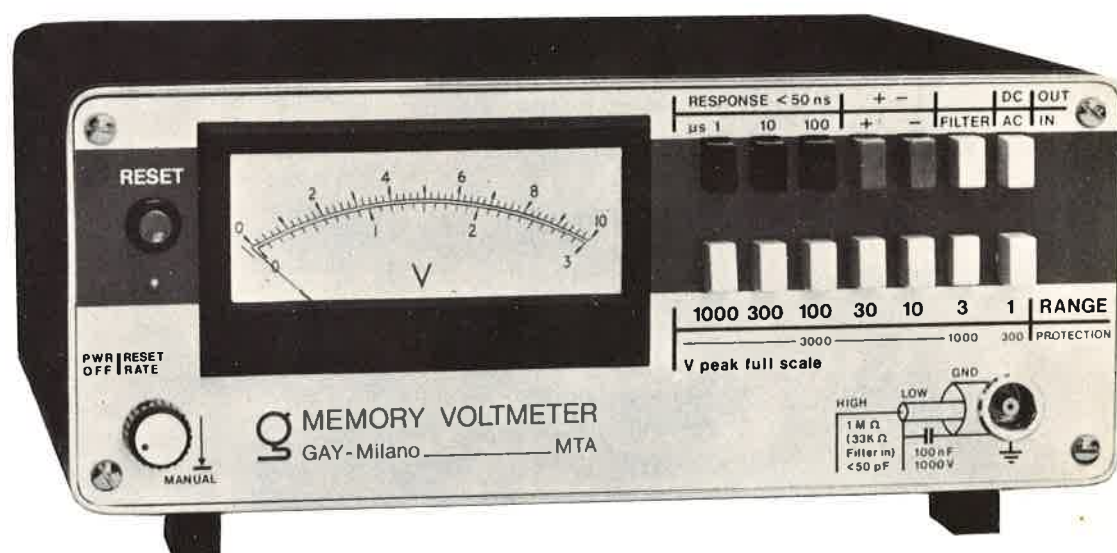


Ing. G. GAY - Milano

# MEMORY VOLTMETER (Patented)

MTA - 11/74

mod. MTA



- Peak voltage measurements of single or repetitive pulses down to 50 nanoseconds duration.
- Ideal for measurement and monitoring of fast transients, spikes, noise and interference.
- Wide range - 1V to 10,000V (full scale)
- Floating input, recorder output, remote control.
- Dual Faraday cage cabinet construction (box-in-a-box) for very high rejection of unwanted noise and mains line transients.
- Mains or self contained battery operation.
- Integrated circuit digital memory and optically coupled interface.

## INTRODUCTION

Disturbance of circuits by interference from power lines and catastrophic failures due to random transients are examples of phenomena of considerable significance in the context of equipments and system reliability. An instrument capable of measuring and storing indefinitely the **maximum peak value of a disturbing pulse** is an essential tool in the investigation of transients and the determination of their origin. An instrument having an **input range** covering both the **high voltages** produced by powerful « noise transmitters » and **low level peaks** on affected circuits acting as « noise receivers » is invaluable both in the design of protective circuits, limiters or filters, and in the measurement of their effectiveness. The MTA Memory Voltmeter has been designed especially for these needs, taking advantage of the experience gained over a considerable period with the earlier and widely-accepted model MT45.

Several additional features are provided to extend the field of application of the MTA. The **dual shielded cabinet** enables the instrument to operate correctly even in an ambient with a high level of radiated noise.

The **self-contained battery** power sup-

ply enables the instrument to operate during mains supply interruptions, and permits it to be operated free from ground, floating at high voltage using the automatic reset or the optically-coupled isolated reset and gate commands.

An input **high pass filter** attenuates the 50 Hz mains frequency and facilitates measurement of low voltage spikes on mains lines.

The **very fast inherent response** (less than 50 ns) can be slowed in three steps to enable pulses with duration longer than the preset response time to be measured, whilst attenuating shorter ones.

The **analogue output** together with the **automatic reset** facility makes the Memory Voltmeter ideal for continuous monitoring of supply or signal lines subject to transients, which can be recorded against time of occurrence or other correlated phenomena.

A **gate** circuit is also incorporated, with optically-coupled isolated external input. An external command signal can thus inhibit the instrument and enable it for only a short time; This is invaluable where spikes have different origins, assisting in correlation of each spike with its cause.

## APPLICATIONS

Measurements of overvoltages caused by fuse rupture and circuit breaker operation. Transients generated by solenoid valves, diodes thyristors and triacs.

Continuous monitoring of AC power lines, overhead lines and antennas subject to atmospheric discharges during storms or to other random high voltage disturbances.

Measurements on low level lines such as industrial instrumentation to check that transients do not exceed maxi-

mum allowable normal mode and common mode values.

Checking and testing the effectiveness of voltage suppressors, voltage dependent resistors, glow discharge tubes, etc.

Design and testing of protective circuits for large industrial systems, computers, communications equipment, telephone lines, etc.

Testing of breakdown voltage of semiconductors.

## PRINCIPLE OF OPERATION

An input amplifier is followed by a selectable half-wave positive, half-wave negative or full wave rectifier. A charge amplifier stores the input peak voltage on a capacitor. A high speed comparator senses if the output of a 224-step digital to analogue converter is lower than the voltage on the capacitor and triggers an oscillator which

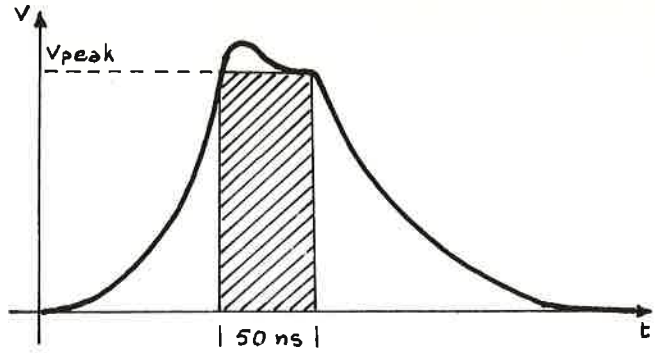
advances the binary count until the D/A converter output voltage is equal to that on the capacitor. The counter can only count forwards, being reset manually, automatically or remotely.

The output of the D/A converter energises the panel meter and also provides the analogue output signal.

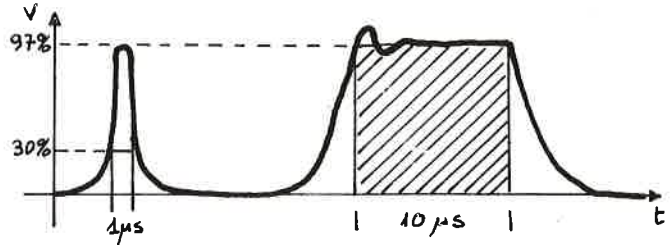
**FEATURES**

**Minimum pulse width**

MTA can measure and store within the specified accuracy a peak voltage having a duration of at least 50 nanoseconds (typically 30 ns) regardless of the pulse shape. In other words, it can measure any pulse containing within its envelope the rectangular minimum area: 50, ns width,  $V_{peak}$  height.

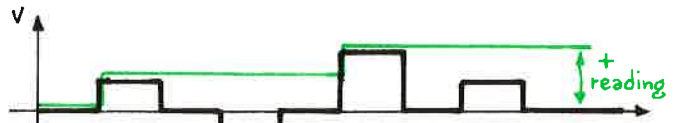


**Limiting the response time**, as an example to 10 microseconds, the first pulse of 1 microsecond will give an attenuated reading of 0.2-0.3 times its actual value. The second longer pulse will be stored at 97% of actual value.

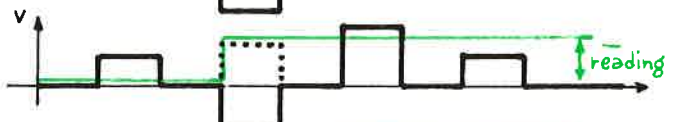


**Polarity selection**

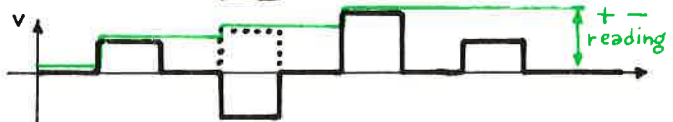
Positive



Negative

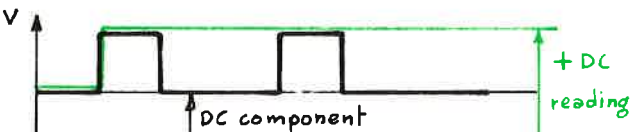


Positive and negative

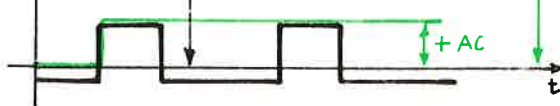


**DC/AC filter**

Out

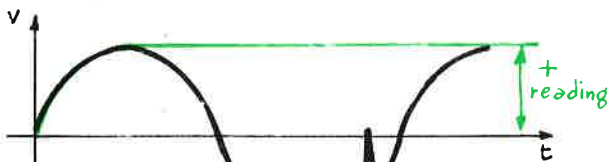


In

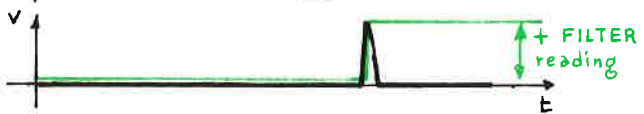


**High pass filter**

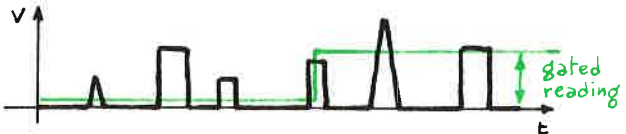
Out



In



**Gate**



## SPECIFICATIONS

**Input range:** 1V to 1000V full scale (1-3-10 sequence). 10kV with external attenuator.

**Input overload:**

Range	V <sub>peak</sub> (<50% duty cycle)
1V	300V
3V	1000V
10V - 1000V	3000V
10kV	15kV

**Input impedance:** Filter out: 1 Mohm <50 pF  
 Filter in: 33 kohms <50 pF  
 With 10 kV attenuator: 10 Mohms <20 pF

**Response time:** Selectable <50 ns, 1 μs, 10 μs, 100 μs.

**Accuracy:** ±3% of range (—10% at 20 ns typical), ±5% with external 10kV attenuator.

**Resolution:** 0.5% of full scale.

**Repeatability:** ±1% of range (max difference amongst successive readings of same input).

**Zero stability:** Better than ±1% of full scale for 10°C ambient variation.

**Ambient operating temperature:** 0-40°C.

**Maximum peak voltage:**

	1000V	1000V	1000V	2500V
between	input LOW	line	line	reset & gate (ext command)
and	GROUND	GROUND	input LOW	all other

**Polarity:** Selectable +, — or ± (absolute value).

**Reset:** Manual, automatic with adjustable rate 0.2-3 seconds or remote through optically-isolated input requiring external drive of 10 mA.

**Analogue output:** Not isolated from internal circuits. The external load must be isolated. Open circuit 1.2VEMF at full scale. Short circuit current 1.2 mA approx. The automatic reset is synchronized with the input and ensures that the stored value is present at the output for the set rate time.

**Gate:** Optically isolated. Enabled when disconnected or with no external drive current. Inhibited with external current 10 mA. All input requirements must be complied with during inhibition.

**High pass filter:** Attenuates 50 Hz by 45 dB. Pulses having durations shorter than 2 μs are attenuated less than 3%.

**Power supply:** 220V AC +20% —10%, 5VA approx. Internal battery is automatically connected when supply is off and recharges from line if instrument is switched on. Battery duration approx. 10 hours, recharge time 15 hours. The LED pilot light on front panel indicates the battery state: extinction of light indicates that 1 hour operation remain.

**Dimensions:** 95 x 215 panel x 210 mm depth (approx. 3¾" x 8½" x 8¼").

**Net Weight:** 3.9 kg (approx. 9 lb.).

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