



BUSTA (A)

Istituto Nazionale di Fisica Nucleare  
Sezione di Milano

Milano, 19 luglio 2022

ACC. n. 4

**CONCORSO BANDO N. MI/ C6/ 23746**

CONCORSO PER TITOLI ED ESAMI PER UN POSTO CON IL PROFILO PROFESSIONALE DI COLLABORATORE  
TECNICO E.R. DI VI LIVELLO PROFESSIONALE CON CONTRATTO DI LAVORO A TEMPO DETERMINATO,  
PRESSO LA SEZIONE DI MILANO DELL'INFN

Prova Orale – Elettronica generale

- 1) Discussione sul Datasheet allegato
- 2) In un circuito in cui sono presenti induttori quali effetti occorre considerare in caso di interruzione della corrente mediante un transistor?
- 3) Sensori di temperatura: tipologie, metodi di alimentazione/lettura, conversione.

Handwritten signatures in blue ink.

2000

## 6½-Digit Multimeter



- 13 built-in measurement functions
- 2000 readings/second at 4½ digits
- Optional scanner cards for multipoint measurements
- GPIB and RS-232 interfaces
- Fluke 8840/42 command set

## Ordering Information

2000 6½-Digit DMM  
 2000/2000-SCAN  
 6½-Digit DMM/  
 Scanner Combination

## Accessories Supplied

Instruction Manual and Model  
 1751 Safety Test Leads

## ACCESSORIES AVAILABLE

2000-SCAN	10-channel, General-Purpose Scanner Card
2001-SCAN	10-channel Scanner Card with two high-speed channels
2001-TCSCAN	9-channel, Thermocouple Scanner Card with built-in cold junction

## CABLES/ADAPTERS

7007-1	Shielded IEEE-488 Cable, 1m (3.3 ft)
7007-2	Shielded IEEE-488 Cable, 2m (6.6 ft)
7009-5	RS-232 Cable

## RACK MOUNT KITS

4288-1	Single Fixed Rack Mount Kit
4288-2	Dual Fixed Rack Mount Kit

## GPIB INTERFACES

KPCI-488LPA	IEEE-488 Interface/Controller for the PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter

## SERVICES AVAILABLE

2000-SCAN-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2000-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2001-TCSCAN-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
C/2000-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase for Models 2000, 2000-SCAN*
C/2001-3Y-ISO	3 (ISO-17025 accredited) calibrations within 3 years of purchase for Model 2001-TCSCAN*

\*Not available in all countries

The Model 2000 6½-Digit Multimeter is part of Keithley's family of high performance DMMs. Based on the same high speed, low noise A/D converter technology as the Model 2001 and 2002, the 2000 is a fast, accurate, and highly stable instrument that's as easy to operate as it is to afford. It combines broad measurement ranges with superior accuracy specifications — DC voltage from 100nV to 1kV (with 0.002% 90-day basic accuracy) and DC resistance from 100μΩ to 100MΩ (with 0.008% 90-day basic accuracy). Optional switch cards enable multiplexing up to 20 different input signals for multipoint measurement applications.

## High Throughput

The 2000 offers exceptional measurement speed at any resolution. At 6½ digits, it delivers 50 triggered rdgs/s over the IEEE-488 bus. At 4½ digits, it can read up to 2000 rdgs/s into its internal 1024 reading buffer, making it an excellent choice for applications where throughput is critical.

For benchtop or stand-alone applications, the 2000 has a front panel design that's simple to understand and easy to use. The 2000 has 13 built-in measurement functions, including DCV, ACV, DCI, ACI, 2ΩΩ, 4ΩΩ, temperature, frequency, period, dB, dBm, continuity measurement, and diode testing. A built-in RS-232 interface connects to a notebook or full-sized PC's serial port to take, store, process, and display measurements automatically.

1.888.KEITHLEY (U.S. only)

www.keithley.com

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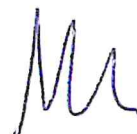
A Greater Measure of Confidence

A Tektronix Company

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- 1) Discussione sul Datasheet allegato
- 2) Dovendo connettere una sorgente di segnale analogico del valore alcune decine di mV ad un sistema di acquisizione posto ad una decina di metri, quali metodi devono essere presi in considerazione per ridurre al minimo l'influenza del rumore.
- 3) In un sistema di acquisizione di segnali analogici/digitali descrivere le possibili tipologie delle connessioni in ingresso e le metodologie per effettuare un disaccoppiamento di massa sia a livello analogico, sia digitale.







# Precision, Low Cost, High Speed, BiFET Op Amp

## AD711

### FEATURES

Enhanced Replacement for LF411 and TL081

### AC PERFORMANCE

- Settles to  $\pm 0.01\%$  in  $1.0 \mu\text{s}$
- 16 V/ $\mu\text{s}$  min Slew Rate (AD711J)
- 3 MHz min Unity Gain Bandwidth (AD711J)

### DC PERFORMANCE

- 0.25 mV max Offset Voltage: (AD711C)
- 3  $\mu\text{V}/^\circ\text{C}$  max Drift: (AD711C)
- 200 V/mV min Open-Loop Gain (AD711K)
- 4  $\mu\text{V}$  p-p max Noise, 0.1 Hz to 10 Hz (AD711C)
- Available in Plastic Mini-DIP, Plastic SOIC, Hermetic Cerdip, and Hermetic Metal Can Packages

### MIL-STD-883B Parts Available

- Available in Tape and Reel in Accordance with EIA-481A Standard
- Surface Mount (SOIC)
- Dual Version: AD712

### PRODUCT DESCRIPTION

The AD711 is a high speed, precision monolithic operational amplifier offering high performance at very modest prices. Its very low offset voltage and offset voltage drift are the results of advanced laser wafer trimming technology. These performance benefits allow the user to easily upgrade existing designs that use older precision BiFETs and, in many cases, bipolar op amps.

The superior ac and dc performance of this op amp makes it suitable for active filter applications. With a slew rate of 16 V/ $\mu\text{s}$  and a settling time of  $1 \mu\text{s}$  to  $\pm 0.01\%$ , the AD711 is ideal as a buffer for 12-bit D/A and A/D Converters and as a high-speed integrator. The settling time is unmatched by any similar IC amplifier.

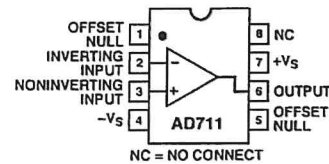
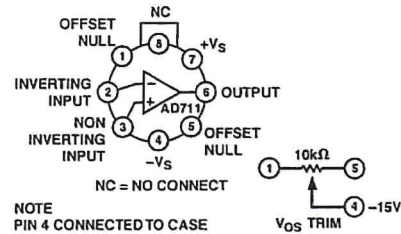
The combination of excellent noise performance and low input current also make the AD711 useful for photo diode preamps. Common-mode rejection of 88 dB and open loop gain of 400 V/mV ensure 12-bit performance even in high-speed unity gain buffer circuits.

The AD711 is pinned out in a standard op amp configuration and is available in seven performance grades. The AD711J and AD711K are rated over the commercial temperature range of  $0^\circ\text{C}$  to  $70^\circ\text{C}$ . The AD711A, AD711B and AD711C are rated over the industrial temperature range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ . The AD711S and AD711T are rated over the military temperature range of  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$  and are available processed to MIL-STD-883B, REV. E.

### REV. E

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### CONNECTION DIAGRAMS



Extended reliability PLUS screening is available, specified over the commercial and industrial temperature ranges. PLUS screening includes 168 hour burn-in, as well as other environmental and physical tests.

The AD711 is available in an 8-pin plastic mini-DIP, small outline, cerdip, TO-99 metal can, or in chip form.

### PRODUCT HIGHLIGHTS

- The AD711 offers excellent overall performance at very competitive prices.
- Analog Devices' advanced processing technology and 100% testing guarantee a low input offset voltage (0.25 mV max, C grade, 2 mV max, J grade). Input offset voltage is specified in the warmed-up condition. Analog Devices' laser wafer drift trimming process reduces input offset voltage drifts to  $3 \mu\text{V}/^\circ\text{C}$  max on the AD711C.
- Along with precision dc performance, the AD711 offers excellent dynamic response. It settles to  $\pm 0.01\%$  in  $1 \mu\text{s}$  and has a 100% tested minimum slew rate of 16 V/ $\mu\text{s}$ . Thus this device is ideal for applications such as DAC and ADC buffers which require a combination of superior ac and dc performance.
- The AD711 has a guaranteed and tested maximum voltage noise of  $4 \mu\text{V}$  p-p, 0.1 to 10 Hz (AD711C).
- Analog Devices' well-matched, ion-implanted JFETs ensure a guaranteed input bias current (at either input) of 25 pA max (AD711C) and an input offset current of 10 pA max (AD711C). Both input bias current and input offset current are guaranteed in the warmed-up condition.

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1) Discussione sul Datasheet allegato

2) Leggendo un segnale sinusoidale con un oscilloscopio un ciclo del segnale è compreso in 5 quadretti della griglia dello schermo. Avendo impostato una base dei tempi di 10msec. Che valore ha la frequenza del segnale?

3) Si definisca risoluzione di uno strumento di misura anche tramite un esempio.

for M ~~D~~

# Mixed Domain Oscilloscopes

## MDO3000 Series Datasheet



Today's integrated designs need an oscilloscope that is just as integrated - such as the MDO3000 Mixed Domain Oscilloscope (MDO) Series. It is the ultimate 6-in-1 integrated oscilloscope that includes an integrated spectrum analyzer, arbitrary function generator, logic analyzer, protocol analyzer, and digital voltmeter/counter. The MDO3000 is completely customizable and fully upgradeable. Add the instruments and performance you need now - or later.

### Key performance specifications

- Oscilloscope
  - 2 and 4 analog channel models
  - 1 GHz, 500 MHz, 350 MHz, 200 MHz, 100 MHz bandwidth models
  - Bandwidth is upgradable (up to 1 GHz)
  - Up to 5 GS/s sample rate
  - 10 M record length on all channels
  - >280,000 wfms maximum waveform capture rate
  - Standard passive voltage probes with 3.9 pF capacitive loading and 1 GHz, 500 MHz, or 250 MHz analog bandwidth
- Spectrum Analyzer
  - Frequency range
    - Standard: 9 kHz - oscilloscope bandwidth
    - Optional: 9 kHz - 3 GHz
  - Ultra-wide capture bandwidth up to 3 GHz
- Arbitrary Function Generator (Optional)
  - 13 predefined waveform types
  - 50 MHz waveform generation
  - 128 k arbitrary generator record length
  - 250 MS/s arbitrary generator sample rate

- Logic Analyzer (Optional)
  - 16 digital channels
  - 10 M record length on all channels
  - 121.2 ps timing resolution
- Protocol Analyzer (Optional)
  - Serial bus support for I<sup>2</sup>C, SPI, RS-232/422/485/UART, USB 2.0, CAN, LIN, FlexRay, MIL-STD-1553, and Audio standards
- Digital Voltmeter (Free with product registration)
  - 4-digit AC RMS, DC, and AC+DC RMS voltage measurements
  - 5-digit frequency measurements

### Key features

- FastAcq™ high-speed waveform capture rate finds elusive signal anomalies quickly
- Wave Inspector® Controls provide easy navigation and automated search of waveform data
- 33 automated measurements and waveform histograms for simplified waveform analysis
- TekVPI® probe interface directly supports active, differential, and current probes for automatic scaling and units
- 9 in. (229 mm) WVGA widescreen color display
- Small footprint and lightweight – Only 5.8 in. (147 mm) deep and 9.2 lb. (4.2 kg)
- Spectral Analysis
  - Dedicated front-panel controls for commonly performed tasks
  - Automated peak markers identify frequency and amplitude of spectrum peaks
  - Manual markers enable non-peak measurements
  - Trace types include: Normal, Average, Max Hold, and Min Hold
  - Spectrogram display enables easy observation and insight into slowly changing RF phenomena
  - Automated measurements include: Channel Power, Adjacent Channel Power Ratio (ACPR), and Occupied Bandwidth (OBW)
- Arbitrary Function Generation
  - Generate predefined signals to quickly simulate missing devices in designs
  - Capture signals on analog or digital inputs, transfer to the arbitrary edit memory, and replicate out from the AFG
  - Add noise to any signal to easily perform margin testing



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**PROVA ORALE DI INFORMATICA:**

- 1) DARE UN ESEMPIO DI SISTEMA OPERATIVO PER COMPUTER.
- 2) DARE UN ESEMPIO DI LINGUAGGIO O PROGRAMMAZIONE INFORMATICO.
- 3) ELENCCARE ALCUNE APPLICAZIONI DI MICROSOFT OFFICE E SPIEGARNE I TIPICI CAMPI DI IMPIEGO.

**PROVA ORALE DI INGLESE:**

LEGGERE E TRADURRE IL DATASHEET ALLEGATO



## Datasheet

- Mixed signal design and analysis
  - Automated triggering, decode, and search on parallel buses
  - Multichannel setup and hold triggering
  - MagniVu™ high-speed acquisition provides 121.2 ps fine timing resolution on digital channels
- Protocol Analysis
  - Trigger, decode and automatically search on packet-level content on most common embedded design serial bus standards.
  - Export protocol decode tables for use in documenting results
- Digital Voltmeter and Frequency Counter
  - Quickly validate voltage or frequency measurements at a glance
  - Graphical readout provides information on stability of the measurement
- Fully upgradeable
  - Add functionality, increase bandwidth or spectrum analyzer frequency range over time as your needs change or budget allows

### Optional application support

- Power analysis
- Limit and mask testing

### Need more performance?

Need more input frequency range on the spectrum analyzer?

Need to analyze analog, digital, and RF simultaneously?

Need more record length or a larger display?

Consider the MDO4000B Series oscilloscopes [www.tektronix.com/MDO4000](http://www.tektronix.com/MDO4000)



- ▶ 3 GHz and 6 GHz integrated spectrum analyzers
- ▶ Simultaneous acquisition of analog, digital and RF
- ▶ 20 M record length
- ▶ 10.4 inch XGA display

## Oscilloscope

At the core of the MDO3000 Series is a world-class oscilloscope, offering comprehensive tools that speed each stage of debug – from quickly discovering anomalies and capturing them, to searching your waveform record for events of interest and analyzing their characteristics and your device's behavior.

### Digital phosphor technology with FastAcq™ high-speed waveform capture

To debug a design problem, first you must know it exists. Every design engineer spends time looking for problems in their design, a time-consuming and frustrating task without the right debug tools.

Digital phosphor technology provides you with fast insight into the real operation of your device. Its fast waveform capture rate – greater than 280,000 wfms with FastAcq – gives you a high probability of quickly seeing the infrequent problems common in digital systems: runt pulses, glitches, timing issues, and more.

To further enhance the visibility of rarely occurring events, intensity grading is used to indicate how often rare transients are occurring relative to normal signal characteristics. There are four waveform palettes available in FastAcq acquisition mode.

- The *Temperature palette* uses color-grading to indicate frequency of occurrence with hot colors like red/yellow indicating frequently occurring events and colder colors like blue/green indicating rarely occurring events.
- The *Spectral palette* uses color-grading to indicate frequency of occurrence with colder colors like blue indicating frequently occurring events and hot colors like red indicating rarely occurring events.
- The *Normal palette* uses the default channel color (like yellow for channel one) along with gray-scale to indicate frequency of occurrence where frequently occurring events are bright.
- The *Inverted palette* uses the default channel color along with gray-scale to indicate frequency of occurrence where rarely occurring events are bright.

These color palettes quickly highlight the events that over time occur more often or, in the case of infrequent anomalies, occur less often.

Infinite or variable persistence choices determine how long waveforms stay on the display, helping you to determine how often an anomaly is occurring.