

# High-impedance Buffer Amplifier System

## TCA-1MEG Datasheet



### Features & Benefits

- Bandwidth - DC to  $\geq 500$  MHz
- Input Impedance -  $1\text{ M}\Omega / 10\text{ pF}$
- Bandwidth Limiting - Full/100 MHz/20 MHz
- Input Coupling - DC/AC/GND
- Includes P6139A, 500 MHz, 10x Passive Probe
- TekConnect Interface Delivers Superior Signal Fidelity, Unparalleled Versatility, and Ease-of-use

### Applications

- Verification, Characterization, and Debug of Sophisticated Designs in Communications, Computer, and Semiconductor Electronic Environments
  - Jitter and Timing Analysis (Computer Systems)
  - Disk Drive Analysis
  - Investigation of Transient Phenomena
  - Spectral Analysis
  - Power Supplies/Inverters (Switching and Linear)
  - Semiconductor Devices (SCRs, IGBTs, FETs, CMOS)
  - Electronic Ballasts
  - Industrial/Consumer Electronics
  - Mobile Communications (Phone, Satellite, Relay Stations)
  - Motor Drives
  - Transportation Systems (Electronic Vehicles, Electric Trains, Locomotives, Avionics)

Tektronix award-winning TDS/CSA7000B DPO and TDS6000 Series oscilloscopes allow engineers to make high-speed measurements quickly and efficiently. In addition to these high-speed measurements, many of today's designers also face the challenges of measuring high-voltage, current, power, or even microvolt-level signals to gain a more complete understanding of their designs.

The TekConnect® family of amplifiers, probes, and adapters make it the ideal solution for such challenges, delivering a variety of acquisition capabilities through the use of existing compatible TekConnect and TEKPROBE™ measurement tools.

## TekConnect® TCA-1MEG Buffer Amplifier System Expands the Functionality of Tektronix High-performance Oscilloscopes

The TCA-1MEG high-impedance buffer amplifier system extends the capabilities of Tektronix high-performance oscilloscopes, making them ideal for a variety of general-purpose measurements. The TCA-1MEG amplifier system provides a 1 M $\Omega$  path that is easily removed and replaced with a wide array of TekConnect probes, amplifiers, and adapters.

This amplifier system delivers versatility to Tektronix high-performance oscilloscopes through the addition of input coupling (selectable), bandwidth limit (selectable), and a 1 M $\Omega$  input that provides access to a wide array of measurement solutions. These solutions include general-purpose passive probes, high-voltage probes (passive single-ended and active differential), microvolt differential probes, and current probes.

With this tool, Tektronix high-performance oscilloscopes may now perform measurements such as primary and secondary power supply voltage levels, currents, and elevated voltages, and assess the power requirements of the device-under-test.

For today's high-speed measurement solutions, having the 50  $\Omega$  and 1 M $\Omega$  terminations on the same input path compromises signal fidelity. By making the 1 M $\Omega$  path replaceable, the TCA-1MEG high-impedance buffer amplifier system eliminates a permanent degradation of the high-speed signal path. This also allows users to easily and quickly configure each channel for the input characteristics required for their measurements. By exchanging the TCA-1MEG for a high-performance 50  $\Omega$  path or other high-speed probing solution, maximum signal fidelity is maintained at the oscilloscope's input.

## TekConnect® Interface Delivers Superior Signal Fidelity, Unparalleled Versatility, and Ease-of-use

The TekConnect interface ensures superior signal fidelity with useful bandpass up to 18 GHz at the oscilloscope input, while offering unparalleled versatility with the world's widest array of accessory signal acquisition solutions for high-performance, real-time oscilloscopes. This interface delivers a more robust oscilloscope interface for next-generation products with multi-GHz analog bandwidths, overcoming many of the inherent bandwidth limitations of BNC-based interfaces. The TekConnect interface preserves a low-voltage standing wave ratio (VSWR) 50  $\Omega$  environment as well as a reliable electrical connection. A convenient, one-button release and locking mechanism provides quick, easy installation and removal of probes, amplifiers, and adapters.

## Characteristics

### Model Specifications

| Characteristic                                    | Description                                                                                                                                                 |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bandwidth (-3 dB)                                 | DC to $\geq 500$ MHz<br>(host instrument bandwidth $> 1.5$ GHz)                                                                                             |
| Probe Tip Bandwidth<br>(with P6139A at -3 dB)     | DC to $\geq 500$ MHz<br>(host instrument bandwidth $> 1.5$ GHz)                                                                                             |
| BW Limit                                          | Full, 100 MHz $\pm 25\%$ , 20 MHz $\pm 25\%$                                                                                                                |
| DC Gain Accuracy                                  | $\pm 3\%$ (TCA-1MEG with or without P6139A probe)*1                                                                                                         |
| Propagation Delay<br>(Input-to-Output)            | $< 2$ ns                                                                                                                                                    |
| Input Impedance                                   | 1 M $\Omega$ / 10 pF (at DC)                                                                                                                                |
| Maximum Input Voltage<br>(Derated with Frequency) | 150 V <sub>RMS</sub> CAT I<br>100 V <sub>RMS</sub> CAT II<br>Above 200 kHz derate at 20 dB per decade; limit to<br>13 V <sub>pk</sub> AC at 3 MHz and above |

\*1 Probe calibration required in TekConnect host instrument.

### Typical

| Characteristic                                                    | Description                                                                            |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Displayed System Input Offset                                     | $\pm 0.2$ div                                                                          |
| Rise Time (calculated small signal $t_r = 0.4/F_{-3\text{ dB}}$ ) | $\leq 0.8$ ns (minimum rise time)                                                      |
| Linear Dynamic Range                                              | The lesser of $\pm 5$ divisions or the dynamic range of the TekConnect host instrument |
| Linearity                                                         | $\pm 0.2\%$                                                                            |

### Nominal

Inputs – 1 (TEKPROBE™ BNC 1 M $\Omega$ ).

Input Coupling – DC, AC, or GND.

### Physical Characteristics

| Dimensions | mm     | in.   |
|------------|--------|-------|
| Length     | 180.08 | 4.255 |
| Width      | 31.5   | 1.240 |
| Height     | 46.1   | 1.815 |

**Safety Certifications U.S. NRTL Listing** – UL3111-1.  
UL3111-2-032.

**Canadian Certification** – CAN/CSA C22.2 No.1010.1.  
CAN/CSA C22.2 No.1010.2.032.

**European Union Compliance** – EN61010-1/A2.  
EN61010-2-032.

**Other** – IEC61010-1/A2.  
IEC61010-2-032.

**GPIO Programmable** – Through Host Instrument Commands.

**Power Requirements** – TekConnect.

**Adapter Model Compatibility** – Refer to TDS7000 Series TekConnect Adapters Compatibility Table.

**Warranty** – One year.

**TekConnect® Amplifier, Adapters, and Probes Compatibility\*2**

| Accessory Type                                     | Oscilloscope                                                          |                                                                                  |                                                         | TekConnect Amplifiers, Adapters, and Probes                               |                                                                          |                                                             |                              |                                     |
|----------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------|-------------------------------------|
|                                                    | TDS6000B TDS/CSA7000B TekConnect Series                               |                                                                                  |                                                         | TCA-1MEG<br>High-impedance<br>Buffer<br>Amplifier<br>(P6139A<br>Included) | TCA-BNC<br>Adapter<br>(Standard w/<br>TDS7154 /<br>TDS7254 /<br>CSA7154) | TCA-SMA<br>Adapter<br>(Standard w/<br>TDS7404 /<br>CSA7404) | TCA-N<br>Adapter             | TCA75<br>Adapter                    |
|                                                    | 6 GHz<br>8 GHz                                                        | 4 GHz                                                                            | 1.5 GHz<br>2.5 GHz                                      |                                                                           |                                                                          |                                                             |                              |                                     |
| Instrument Input Connection                        | TekConnect Interface                                                  |                                                                                  |                                                         | TEKPROBE<br>BNC 1 MΩ-to-<br>TekConnect<br>Interface                       | TEKPROBE<br>BNC 50 Ω-to-<br>TekConnect<br>Interface                      | SMA-to-<br>TekConnect<br>Interface                          | N-to-TekConnect<br>Interface | 75-to-50 Ω<br>TekConnect<br>Adapter |
| Instrument Input Impedance                         | TekConnect Interface Probes, Amplifier and Adapter Dependent          |                                                                                  |                                                         | 1 MΩ / 10 pF                                                              | 50 Ω                                                                     | 50 Ω                                                        | 50 Ω                         | 50 Ω                                |
| Passive Voltage Probes (1x)                        | P6101B w/ TCA-1MEG                                                    |                                                                                  |                                                         | P6101B                                                                    | N/A                                                                      | N/A                                                         | N/A                          | N/A                                 |
| Passive Voltage Probes (10x)                       | P6139A w/ TCA-1MEG                                                    |                                                                                  |                                                         | P6139A                                                                    | N/A                                                                      | N/A                                                         | N/A                          | N/A                                 |
| 50 Ω Divider Voltage Probes                        | P6150 w/ TCA-SMA<br>P6158 w/ TCA-BNC                                  |                                                                                  |                                                         | N/A                                                                       | P6158                                                                    | P6150                                                       | N/A                          | N/A                                 |
| Active Voltage Probes General                      | P6245 w/ TCA-BNC<br>P6243 w/ TCA-BNC                                  |                                                                                  |                                                         | N/A                                                                       | P6245<br>P6243                                                           | N/A                                                         | N/A                          | N/A                                 |
| Active Voltage Probes >2 GHz                       | P7260*3<br>P7240*3<br>P6249 w/ TCA-BNC<br>P6241 w/ TCA-BNC            |                                                                                  |                                                         | N/A                                                                       | P6249<br>P6241                                                           | N/A                                                         | N/A                          | N/A                                 |
| Differential Voltage Probes >2 GHz                 | P7380*3<br>P7380SMA*3<br>P7350*3<br>P7350SMA*3<br>P6330 w/<br>TCA-BNC | P7380*3<br>P7380SMA*3<br>P7350*3<br>P7350SMA*3<br>P7330*3<br>P6330 w/<br>TCA-BNC | P7350*3<br>P7350SMA*3<br>P7330*3<br>P6330 w/<br>TCA-BNC | N/A                                                                       | P6330                                                                    | N/A                                                         | N/A                          | N/A                                 |
| Differential Voltage Probes <1.8 GHz<br><8 V Logic | P6248 w/ TCA-BNC<br>P6247 w/ TCA-BNC<br>P6246 w/ TCA-BNC              |                                                                                  |                                                         | N/A                                                                       | P6248<br>P6247<br>P6246                                                  | N/A                                                         | N/A                          | N/A                                 |
| Differential Voltage Probes Microvolt              | ADA400A w/ TCA-1MEG                                                   |                                                                                  |                                                         | ADA400A                                                                   | N/A                                                                      | N/A                                                         | N/A                          | N/A                                 |
| High-voltage Probes Differential                   | P5205 w/ TCA-1MEG<br>P5210 w/ TCA-1MEG                                |                                                                                  |                                                         | P5205<br>P5210                                                            | N/A                                                                      | N/A                                                         | N/A                          | N/A                                 |
| High-voltage Probes Single-ended                   | P5100 w/ TCA-1MEG<br>P6015A w/ TCA-1MEG                               |                                                                                  |                                                         | P5100                                                                     | N/A                                                                      | N/A                                                         | N/A                          | N/A                                 |
| Current Probe AC/DC <15 A                          | TCP202 w/ TCA-BNC                                                     |                                                                                  |                                                         | N/A                                                                       | TCP202                                                                   | N/A                                                         | N/A                          | N/A                                 |
| Current Probe AC/DC 5 mA to 20 A                   | TCP300/TCP400/AM5030S w/ TCA-BNC or TCA-1MEG                          |                                                                                  |                                                         | TCP300 /<br>TCP400 /<br>AM5030S                                           | TCP300 /<br>TCP400 /<br>AM5030S                                          | N/A                                                         | N/A                          | N/A                                 |
| Current Probe AC High Frequency                    | CT6 w/ TCA-BNC<br>CT1 w/ TCA-BNC                                      |                                                                                  |                                                         | N/A                                                                       | CT6 CT1                                                                  | N/A                                                         | N/A                          |                                     |
| Current Probe AC Low Frequency                     | P6021 w/ TCA-1MEG<br>P6022 w/ TCA-1MEG                                |                                                                                  |                                                         | P6021<br>P6022                                                            | N/A                                                                      | N/A                                                         | N/A                          |                                     |
| O/E Converter Probes                               | P6701B w/ TCA-BNC<br>P6703B w/ TCA-BNC                                |                                                                                  |                                                         | N/A                                                                       | P6701B<br>P6703B                                                         | N/A                                                         | N/A                          |                                     |

\*2 Firmware version 2.1 or greater required for all referenced oscilloscopes.

\*3 P7225, P7240, P7260, P7330, P7350, P7350SMA, P7380, and P7380SMA are high-speed active and differential probing solutions for Tektronix oscilloscopes with TekConnect interface. These probes require no other adapters.

Please refer to TekConnect Adapters data sheet for more information about adapters.

## Ordering Information

### Service Options

Opt. C3 – Calibration Service 3 Years.

Opt. C5 – Calibration Service 5 Years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 Years (with Opt. C3).

Opt. D5 – Calibration Data Report 5 Years (with Opt. C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Opt. SILV600 – Standard Warranty Extended to 5 Years.

### Recommended Accessories

#### Passive Voltage Probes

P6101B – 15 MHz, 1x, Passive.

P6139A – 500 MHz, 10x, Passive.

#### High-voltage Probes

P5205 – 1.3 kV<sub>RMS</sub>, 100 MHz, Active Differential.

P5210 – 4.4 kV<sub>RMS</sub>, 50 MHz, Active Differential.

P6015A – 20 kV, 1000x, 75 MHz, Passive.

P5100 – 2.5 kV, 100x, 250 MHz, Passive.

#### Microvolt Differential Probe

ADA400A – 1 MHz, 100x/10x/1x/0.1x, Microvolt Differential Preamplifier.

#### Current Measurement Tools

AM503S – AC/DC, 5 mA to 700 A, Current Amplifier Measurement System.  
(Extended Current Capability by ordering additional Current Probes).

P6021 – AC, 60 MHz, Current Probe.

P6022 – AC, 120 MHz, Current Probe.

#### Cables and Terminations

012-0057-01 – 50 Ω BNC to BNC Coaxial Cable.

012-0482-00 – 50 Ω BNC to BNC Coaxial Cable, Precision 1%, Male-to-Male.

011-0049-02 – 50 Ω feed through termination.



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com)



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