

# TekConnect™ High-impedance Buffer Amplifier System

## ► TCA-1MEG



Tektronix award-winning TDS7000, CSA7000 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 micro-volt 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), micro-volt differential probes and current probes.

### ► Features & Benefits

Bandwidth – DC to  $\geq 500$  MHz

Input Impedance –  
1 M $\Omega$ /10 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)

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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 Ω and 1 MΩ terminations on the same input path compromises signal fidelity. By making the 1 MΩ 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 Ω 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 Ω 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

|  |   |
|--|---|
| Bandwidth (-3 dB)                              | DC to ≥500 MHz<br>(in a host instrument with bandwidth > 1.5 GHz)   |
| Probe Tip Bandwidth (with P6139A at -3 dB)     | DC to ≥500 MHz (host instrument bandwidth > 1.5 GHz)  |
| BW Limit                                       | Full, 100 MHz ± 25%, 20 MHz ± 25%   |
| DC Gain Accuracy                               | ± 3% (TCA-1MEG with or without P6139A probe)* <sup>1</sup>  |
| Propagation Delay (Input-to-Output)            | < 2 ns  |
| Input Impedance                                | 1 MΩ/10 pF (at DC)  |
| Maximum Input Voltage (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;<br>limit to 13 V <sub>pk</sub> AC at 3 MHz and above |

\*<sup>1</sup> Probe calibration required in TekConnect host instrument.

### ▶ Typical

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

### ▶ Nominal

|   |   |       |
|---|---|-------|
| Inputs                                  | 1 (TEKPROBE™ BNC 1 MΩ)  |       |
| Input Coupling                          | DC, AC or GND   |       |
| Safety Certifications U.S. NRTL Listing | UL3111-1<br>UL3111-2-032  |       |
| Canadian Certification                  | CAN/CSA C22.2 No.1010.1<br>CAN/CSA C22.2 No.1010.2.032          |       |
| European Union Compliance               | EN61010-1/A2<br>EN61010-2-032                                   |       |
| Other                                   | IEC61010-1/A2<br>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  |       |
| Dimensions                              | m m   | in.   |
| Length                                  | 180.08  | 4.255 |
| Width                                   | 31.5  | 1.240 |
| Height                                  | 46.1  | 1.815 |

## ▶ TekConnect™ Amplifier, Adapters and Probes Compatibility\*1

|   | Oscilloscope   |  |  | TekConnect Amplifiers, Adapters and Probes                             |  |  |                     |
|---|--|--|--|--|--|--|---------------------|
| Accessory Type                                | TDS6604<br>6 GHz   | TDS7154 /<br>CSA7154 /<br>TDS7254<br>1.5 GHz /<br>1.5 GHz /<br>2.5 GHz | TDS7404 /<br>CSA7404<br>4 GHz /<br>4 GHz                 | TCA-1MEG<br>High Impedance<br>Buffer Amplifier<br>(P6139A<br>Included) | TCA-BNC<br>Adapter<br>(Standard w/<br>TDS7154 /<br>TDS7254 /<br>CSA7154) | TCA-SMA<br>Adapter<br>(Standard<br>w/TDS7404 /<br>CSA7404) | TCA-N<br>Adapter    |
| Instrument Input<br>Connection                | TekConnect   | TekConnect   | TekConnect   | TEKPROBE BNC<br>1 MΩ-to-TekConnect                                     | TEKPROBE BNC<br>50 Ω-to-<br>TekConnect                                   | SMA-to-<br>TekConnect                                      | N-to-<br>TekConnect |
| Instrument Input<br>Impedance                 | TekConnect<br>Probes, Amplifier and<br>Adapter Dependent | TekConnect<br>Probes, Amplifier and<br>Adapter Dependent               | TekConnect<br>Probes, Amplifier and<br>Adapter Dependent | 1 MΩ/10 pF   | 50 Ω   | 50 Ω   | 50 Ω                |
| Passive Voltage<br>Probes (1X)                | P6101B<br>w/TCA-1MEG                                     | P6101B<br>w/TCA-1MEG   | P6101B<br>w/TCA-1MEG                                     | P6101B   | N/A  | N/A  | N/A                 |
| Passive Voltage<br>Probes (10X)               | P6139A<br>w/TCA-1MEG                                     | P6139A<br>w/TCA-1MEG   | P6139A<br>w/TCA-1MEG                                     | P6139A   | N/A  | N/A  | N/A                 |
| 50 Ω Divider<br>Voltage Probes                | P6150 w/TCA-SMA<br>P6158 w/TCA-BNC                       | P6150 w/TCA-SMA<br>P6158 w/TCA-BNC                                     | P6150 w/TCA-SMA<br>P6158 w/TCA-BNC                       | N/A  | P6158  | P6150  | N/A                 |
| Active Voltage<br>Probes General              | P6245 w/TCA-BNC<br>P6243 w/TCA-BNC                       | P6245 w/TCA-BNC<br>P6243 w/TCA-BNC                                     | P6245 w/TCA-BNC<br>P6243 w/TCA-BNC                       | N/A  | P6245<br>P6243   | N/A  | N/A                 |
| Active Voltage Probes<br>< 3.3 V Logic        | P7260*2<br>P7240*2<br>P6249 w/TCA-BNC                    | P7260*2<br>P7240*2<br>P6249 w/TCA-BNC                                  | P7260*2<br>P7240*2<br>P6249 w/TCA-BNC                    | N/A  | P6249  | N/A  | N/A                 |
| Differential Voltage<br>Probes < 3.3 V Logic  | P7330<br>P6330 w/ TCA-BNC                                | P7330<br>P6330 w/ TCA-BNC  | P7330<br>P6330 w/ TCA-BNC                                | N/A  | P6330  | N/A  | N/A                 |
| Differential<br>Voltage Probes<br>< 8 V Logic | P6248 w/TCA-BNC<br>P6247 w/TCA-BNC<br>P6246 w/TCA-BNC    | P6248 w/TCA-BNC<br>P6247 w/TCA-BNC<br>P6246 w/TCA-BNC                  | 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                 |
| Differential<br>Voltage Probes<br>Micro-volt  | ADA400A<br>w/TCA-1MEG                                    | ADA400A<br>w/TCA-1MEG  | ADA400A<br>w/TCA-1MEG                                    | ADA400A  | N/A  | N/A  | N/A                 |
| High Voltage<br>Probes Differential           | P5205 w/ TCA-1MEG<br>P5210 w/TCA-1MEG                    | P5205 w/ TCA-1MEG<br>P5210 w/TCA-1MEG                                  | P5205 w/ TCA-1MEG<br>P5210 w/TCA-1MEG                    | P5205<br>P5210   | N/A  | N/A  | N/A                 |
| High Voltage Probes<br>Single-ended           | P5100 w/TCA-1MEG<br>P6015A w/TCA-1MEG                    | P5100 w/TCA-1MEG<br>P6015A w/TCA-1MEG                                  | P5100 w/TCA-1MEG<br>P6015A w/TCA-1MEG                    | P5100<br>P6015A  | N/A  | N/A  | N/A                 |
| Current Probe<br>AC/DC < 15 A                 | TCP202 w/TCA-BNC   | TCP202 w/TCA-BNC   | TCP202 w/TCA-BNC   | N/A  | TCP202   | N/A  | N/A                 |
| Current Probe<br>AC/DC 5 mA to 20 A           | AM503S w/<br>TCA-BNC or<br>TCA-1MEG                      | AM503S w/<br>TCA-BNC or<br>TCA-1MEG                                    | AM503S w/<br>TCA-BNC or<br>TCA-1MEG                      | AM503S   | AM503S   | N/A  | N/A                 |
| Current Probe<br>AC High Frequency            | CT6 w/TCA-BNC<br>CT1 w/TCA-1MEG                          | CT6 w/TCA-BNC<br>CT1 w/TCA-1MEG  | CT6 w/TCA-BNC<br>CT1 w/TCA-1MEG                          | N/A  | CT6<br>CT1   | N/A  | N/A                 |
| Current Probe<br>AC Low Frequency             | P6021 w/TCA-1MEG<br>P6022 w/TCA-1MEG                     | P6021 w/TCA-1MEG<br>P6022 w/TCA-1MEG                                   | P6021 w/TCA-1MEG<br>P6022 w/TCA-1MEG                     | P6021<br>P6022   | N/A  | N/A  | N/A                 |
| O/E Converter<br>Probes                       | P6701B w/TCA-BNC<br>P6703B w/TCA-BNC                     | P6701B w/TCA-BNC<br>P6703B w/TCA-BNC                                   | P6701B w/TCA-BNC<br>P6703B w/TCA-BNC                     | N/A  | P6701B<br>P6703B   | N/A  | N/A                 |

\*1 Firmware version 2.1 or greater required for all referenced oscilloscopes.

\*2 P7240, P7260 and P7330 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.

# TekConnect™ High-impedance Buffer Amplifier System

▶ TCA-1MEG

## ▶ Ordering Information

TCA-1MEG – TekConnect-to-1MEG High-impedance Buffer Amplifier.

Includes: Buffer Amplifier; Instruction/Service Manual; 1 – P6139A; Certificate of Traceable Calibration; TDS6000, TDS7000 and CSA7000 Series product software upgrade CD(s).

## Service Options

C3 – Three years of Calibration Services (initial certification + 2 calibrations).

C5 – Five years of Calibration Services (initial certification + 4 calibrations).

D1 – Test data on delivery and with further calibrations; Must order with C3.

D3 – Test data on delivery and with further calibrations; Must order with C3.

D5 – Test data on delivery and with further calibrations; Must order with C5.

R3 – Repair warranty extended to cover three years.

R5 – Repair warranty extended to cover five 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.

### Micro-volt Differential Probe

ADA400A – 1 MHz, 100X/10X/1X/0.1X, Micro-volt Differential Preamplifier.

### Current Measurement Tools

AM503S – AC/DC, 5 mA to 700 Amp, 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.

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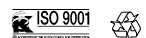
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