Cal Test
ELECTRONICS

CT4028
User Manual

Safety Summary

WARNING **CAUTION**

To avoid personal injury and/or product damage, review and comply with the following safety precautions. These precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this instrument.

Only qualified personnel should use this probe. This high voltage probe is designed to be used by personnel who are trained, experienced, or otherwise qualified to recognize hazardous situations and who are trained in the safety precautions necessary to avoid possible injury when using such a device.

This instrument is intended for usage within Measurement Category I (CAT I) only.

Do not exceed 60 seconds of contact between the probe and circuit-under-test when measuring voltages ≥30kV (DC + ACpk) or 20kV (ACrms). It is recommended to wait an interval of 5 minutes between such measurements.

Do not work alone when working with high voltages.

Do not apply to the input any potential that exceeds the maximum rating of the probe.

For your own safety, inspect the probes for cracks and frayed or broken leads before each use. If defects are noted, DO NOT USE the probe.

Hands, shoes, floor and work bench must be dry.

Avoid making measurements under humidity, dampness or other environmental conditions that might affect safety.

Turn the high voltage source off before connecting or disconnecting the probe whenever possible.

The probe body should be kept clean and free of any conductive contamination.

Do not remove the probe casing. Removal of the probe's casing may

expose you to electric shock.

Keep fingers behind the probe's finger guard during use.

Always properly ground the probe with the lead before contacting high voltage circuits with the probe tip. Always disconnect the probe tip from high voltage circuits before disconnecting the ground lead. Do not connect the probe ground lead to any point which is at a potential other than earth ground.

Use only on test instruments where the chassis or return lead is properly grounded.

Use only in office-type indoor setting

- The instrument is designed to be used in office-type indoor environments. Do not operate the instrument:
- In the presence of noxious, corrosive, or flammable fumes, gases, vapors, chemicals, or finely-divided particulates.
- In environments where there is a danger of any liquid being spilled on the instrument.
- In air temperatures exceeding the specified operating temperatures.
- In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.

Use in an indoor Pollution Degree 2 environment. Measurements made by this instrument may be outside specifications if the instrument is used in non-office-type environments. Such environments may include rapid temperature or humidity changes, sunlight, vibration and/or mechanical shocks, acoustic noise, electrical noise, strong electric fields, or strong magnetic fields.

Not for critical applications. This instrument is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Hazardous voltages may be present in unexpected locations in circuitry being tested when a fault condition in the circuit exists.

Do not substitute parts that are not approved by Cal Test Electronics or modify this instrument. Return the instrument to Cal Test Electronics

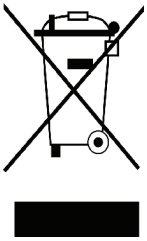
for service and repair to ensure that safety and performance features are maintained.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

Compliance Statements

Disposal of Old Electrical & Electronic Equipment



(Applicable in the European Union and other European countries with separate collection systems). This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

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1 Introduction

Overview

The Cal Test CT4028 is a 39 kV High Voltage divider probe for use with both digital and analog oscilloscopes.

Features

- Measures up to: 39 kV (DC + ACpk) or 27 kVrms AC
- DC to 220 MHz bandwidth
- Voltage dividing of 1000:1
- Frequency compensation

Probe Accessories

Figure 1: CT4028 Probe Accessories

1. Grounding Alligator Clip
2. High Voltage Isolation Head (for use with ≥25 kV)
3. Trimmer Tool
4. Grounding Lead Extension Cable
5. Frequency Compensation Trimmers
6. BNC Cable
7. Main Grounding Lead
8. Hands-Free Bolt-On Probe Tip
9. Standard Probe tip
10. Hands-Free Hook Probe Tip

2 Using the Probe

1. Connect the probe to the BNC input of the oscilloscope.
2. On the oscilloscope, select the desired volts/division range. Whenever available, set the probe attenuation ratio setting to 1000:1.
3. **WARNING** If possible, always turn the high voltage source off before connecting or disconnecting the probe.
4. **WARNING** Connect the probe grounding lead (via alligator clip) to a good earth ground or reliable chassis ground.
5. For the best frequency response, when measuring frequencies > 40 MHz use only the Main Grounding Lead plus the Grounding Alligator Clip. (Figure 1). For frequencies < 40 MHz the Grounding Lead Extension Cable may be used and will give you better reach with the probe.
6. **WARNING** Before turning on the high voltage source, be certain the operator is not touching any part of the device under

test.

7. Turn on the high voltage source.
8. You will now be able to analyze the voltage waveform on your oscilloscope.
9. **WARNING** Always attach the High-Voltage Isolation Head to the probe when working with voltages ≥25 kV. Gently turn the head clockwise to screw onto the tip of the probe. See Figure 2.

Figure 2: High Voltage Isolation Head

10. **CAUTION** Do not exceed 60 seconds of contact between the probe and circuit-under-test when measuring voltages ≥30 kV (DC + ACpk) or ≥20 kV (ACrms). It is recommended to wait an interval of 5 minutes between such measurements.

11. Turn off the high voltage source.

12. **WARNING** Disconnect the probe from the high voltage source BEFORE disconnecting the ground clip lead.

3 Frequency Compensation

Proper compensation of the probe is required to assure amplitude accuracy of the waveform being measured by matching the probe to the oscilloscope's input capacitance. Compensation should be adjusted whenever the probe is connected to, or transferred between, oscilloscopes.

The procedure is the same as for a x10 passive probe.

200 Hz Adjustment

1. Connect the probe to the oscilloscope.
2. Apply a 200 Hz square wave to the probe tip and adjust the oscilloscope controls to display a few cycles of the waveform.
3. Turn the 200 Hz Trimmer (Figure 3) using the Trimmer Tool, making a flat topped square wave (Figure 4).

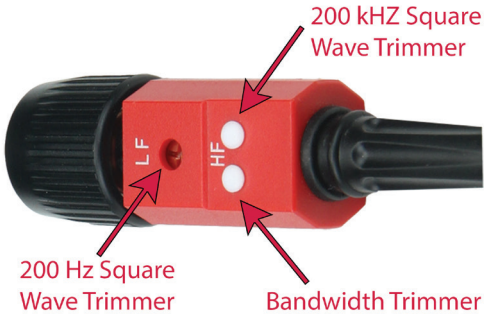

Figure 3: Frequency Compensation Trimmer

200 kHz and Bandwidth Adjustments

4. **CAUTION** 200 kHz and bandwidth adjustments should only be made by a qualified engineer. Remove the plastic cover to access these trimmers.
5. Change the square wave output to 200 kHz or to the frequency you will be using in your testing.
6. Turn the 200 kHz Trimmer for a flat topped square wave (Figures 3 & 5).
7. Turn the Bandwidth Trimmer for tuning the probe's bandwidth (Figure 3).

Figure 4 shows how over- and under-compensated pulse responses will look.

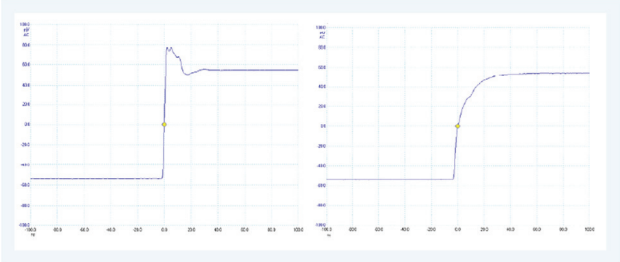

Figure 4: Over/Under Compensation

Figure 5 shows a perfectly compensated probe.

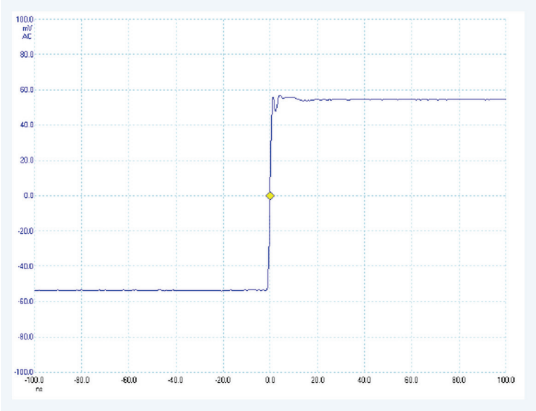

Figure 5: Good Compensation

4 Specifications

All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 25 °C ± 5 °C.

CT4026 Specifications	
Maximum Input Voltage (CAT I)	39 kV (DC + ACpk) 27 kVrms AC
Maximum Loading Current	45 µA
Division Ratio	1000:1
Bandwidth	DC to 220 MHz
Compensation Range	10 pF to 35 pF
Temperature Coefficient	≤200 ppm/ºC
Input Resistance	900 MΩ
Input Capacitance	2.0 pF
Rise Time	1.6 ns
Signal/Noise	>60 dB @ 1 KHz >50 dB @ 1 MHz
Accuracy: DC Volts	≤3% (0 to 35 kV)
Accuracy: AC Volts	≤3% at 1 kHz
Cable Length	6.6 ft (2 m)
Designed for Use in	Pollution Degree 2
Operating Environment	14ºF to 131ºF (-10ºC to 55ºC)
Storage Temperature	-4ºF to 158ºF (-20ºC to 70ºC)
Humidity	≤85% relative humidity at 95ºF (35ºC)
Dimensions	3.1 x 3.1 x 12.6 in (8 x 8 x 32 cm)
Weight	1.0 lbs (460 g)
Warranty	One-year warranty

Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current version from our website: caltestelectronics.com.

5 Voltage Derating Curve

WARNING

When measuring higher frequency signals, be sure to comply with the Voltage vs Frequency Derating Curve.

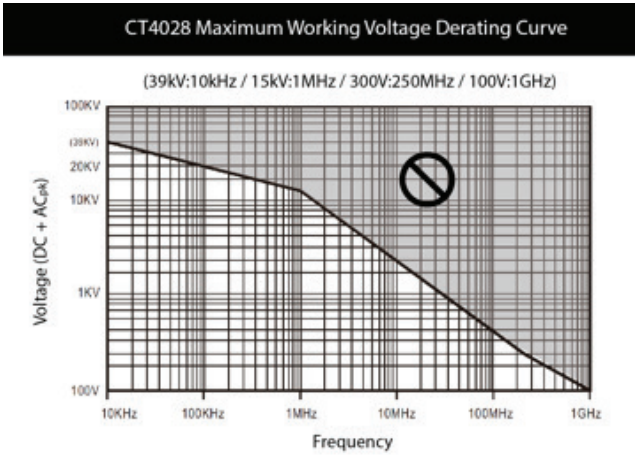

Figure 5: Voltage Derating Curve

6 Cleaning

Clean only the exterior probe body and cables. Use a soft cotton cloth lightly moistened with a mild solution of detergent and water. Do not allow any portion of the probe to be submerged at any time.

WARNING

Dry the probe thoroughly before attempting to make voltage measurements.

CAUTION Do not subject the probe to solvents or solvent fumes as these can cause deterioration of the probe body and cables.

7 Service & Warranty Information

Limited One-Year Warranty

Cal Test Electronics warrants this product to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Cal Test Electronics is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Cal Test Electronics that have been subject to abuse, misuse, damage, or accident, or have been connected, installed, or adjusted contrary to the instructions furnished by Cal Test Electronics, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Cal Test Electronics reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Cal Test Electronics is authorized to assume any other obligation in connection with the sale and purchase of this device.

Service

If you have a need for calibration or repair services, technical, or sales support, please contact us:

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