

Trig-Tek™
41P
Portable Calibrator
User Manual

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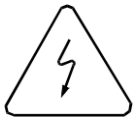
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FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.
2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

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DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
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Chapter 1

Introduction

The Trig-Tek 41P Portable Calibrator is a hand held signal generator with accurate frequency and level of mV and pC (millivolts and picocoulomb outputs). Primarily used in Environmental Test Laboratories and Engine Test cells, the 41P is ideal as a sensor simulator for remote calibration of monitoring instrumentation.



Figure 1-1, 41P Portable Calibrator

A crystal controlled oscillator provides five stable selectable frequencies: 100 and 1000 Hz, 61.4 Hz, 140 Hz and 318 Hz. Since the 41P has both mV and pC outputs it is possible to calibrate piezoelectric or charge mode amplifiers.

A four-digit thumb switch combined with an X10 switch allows level selection from 0.1 to 10000 mV and PC, available in DC, Peak, Pk-Pk, and RMS units. An offset feature allows 0 to +12 Volts DC to be added to the AC signals. The rechargeable battery provides 8 hours of continuous service and has a low battery indicator on the front panel.

Features

Features include:

- Millivolts and picocoulomb outputs
- 0.1% frequency stability
- AC or DC output
- DC, Pk, Pk-Pk, RMS
- 0.1 to 10000 mV-pC
- High Accuracy
- DC Offset

Specifications

Outputs (mV and pC)

Impedance	mV output < 50 Ohms
Level Accuracy	0.5% of reading $\pm 0.1\%$ of fullscale ± 3 LSD at 25°C ($\pm 0.015\%$ / °C)
Frequencies	61.4, 140, 318, 100 and 1000 Hz
Frequency Accuracy	0.5% @ 25°C, 0.015% / °C
Units	DC, RMS, Pk, and Pk-Pk

Controls

Frequency, Power	Selects desired frequency or power ON/OFF
Amplitude Selector	Four-digit thumb switch allows level selection of 0.1 to 999.9
Units	Selects DC, Peak, RMS, or Pk-Pk
DC Offset	Variable from 1 to 12 VDC (positive or negative depending on position of UNITS switch)
X1-X10 Switch	In X10 position, output level is multiplied by 10

Indicators

CHRG ON

LED illuminates when charging.

BATT LOW

LED illuminates when low battery condition exists.

Power

110 VAC with supplied charger

6 VDC rechargeable batteries

Dimensions

2.5" high x 6" wide x 7" long

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Chapter 2

Operations

The Trig-Tek 41P Portable Calibrator is contained in a high impact plastic case. It is lightweight and very durable. It provides settings of 000.1 to 999.9 mV or pC output levels with an X10 to provide 0001 to 9999 mV or pC at the two separate output jacks. The internal battery will provide more than 8 hours of operation before recharge.

FREQUENCY HZ POWER Switch

This switch has six positions, OFF, 61.4 Hz, 100 Hz, 140 Hz, 318 Hz, and 1000 Hz. The 100 Hz and 1000 Hz are frequencies widely used for checking various equipment. The other three frequencies are unique: 61.4 Hz is where Acceleration Peak is equal to Velocity Peak; 140 Hz is where Acceleration Peak is equal to Displacement Pk-Pk; and 318 Hz is where Velocity Peak is equal to Displacement Pk-Pk. The OFF position de-energizes the circuitry.

UNITS mV–pC Switch

This switch has five positions.

The first is DC. When the switch is in this position, only DC voltages appear at the mV (millivolt) output. The output level of the DC is determined by the AMPLITUDE switch, and can provide outputs of 000.1 to 999.9 millivolts or 0001 to 9999 millivolts DC in two ranges by placing the X1-X10 Switch to X10.

The next position of the switch is PEAK. When in this position the AMPLITUDE is calibrated for millivolts peak at the mV output. The output at the BNC connector labeled pC (picocoulomb) is a charge output equivalent to the applied voltage through a precision capacitor. The precision 0.3% capacitor is 1000 pF. Hence, if 100 mV PEAK is set on the front panel switch, a voltage of 100 mV is applied through the 1000 pF capacitor providing an equivalent charge of 100 pC PK at the BNC PC output.

The third position of the switch is PK-PK– (minus). In this position the mV and pC outputs are calibrated in PK-PK units. While in the PK-PK– (minus) position, the mV output can be offset 0 to -12 VDC adjustable by the DC OFFSET control to the right of the UNITS mV-pC switch.

Note: When no DC offset is needed, be sure the DC OFFSET control is turned completely counterclockwise to “0”.

The fourth position of the switch is PK-PK+ (plus). In this position the mV and pC outputs are calibrated in PK-PK units. While in the PK-PK+ position, the mV output

can be offset using the DC SET control for the 0 to +12 VDC.

The last switch position is RMS+ (plus). In this position the mV and pC outputs are calibrated in RMS units and the output can be offset 0 to +12 VDC using the OFFSET control.

AMPLITUDE and X1-X10 Switches

The AMPLITUDE four-digit thumbwheel switch providing settings from 000.0 to 999.9 mV or pC amplitude for the units selected by the UNITS mV-pC switch.

The 000.1 to 999.9 amplitude setting can be multiplied by the X1-X10 switch above the AMPLITUDE switch. When switched to X1 the amplitude is 000.0 to 999.9 mV and pC. In the X10 position, the amplitudes of 0000 to 9999 mV and pC can be set.

Rechargeable Battery

The 41P Portable Calibrator uses a six-volt rechargeable battery pack. The battery supplies power to the 41P for up to 8 hours when fully charged.

In order to recharge the battery, it is necessary to plug the charge adapter into 115 VAC power and then connect it to the 41P. To extend the life of the battery, the calibrator should be completely discharged before recharging. The battery requires ten hours to fully charge.

The 41P provides circuitry such that the charger may be left plugged-in indefinitely without damaging the battery. When the low battery (BATT LOW) LED illuminates, it does not necessarily mean the battery is fully discharged but that the battery's voltage has dropped below what is required to maintain the specifications for the 41P. The 41P will probably continue to operate, but the output voltages may not be within specifications.

The unit can be operated with the charger plugged-in.

Chapter 3

Performance Test

The following performance test procedure is a method of testing the 41P Portable Calibrator unit to verify that it is performing within the manufacturer's specifications. The unit uses integrated circuits and very stable parts, so should not require calibration more often than every twelve months. In the event that a reading is out of tolerance, refer to Chapter 4 of this manual.

Test Equipment

Note: Equivalent equipment can be used.

- | | |
|-----------------------------|----------------------|
| 1. AC-DC Digital Multimeter | Keithley Model 191 |
| 2. Frequency Counter | Leader Model LDC-822 |

Switch Settings

Set the FREQUENCY switch to 318 Hz, the AMPLITUDE switch to indicate 9999, and the UNITS switch to DC. Set the X1-X10 switch for X10. Turn the OFFSET knob to the full counterclockwise position ("0").

Performance Test

1. Connect the Digital Multimeter to the mV OUTPUT (BNC) jack.
2. Observe an indication of 9999 ± 60 mVDC on the multimeter.
3. Set the X1-X10 switch to X1.
4. Set the AMPLITUDE switch to 0000.
5. Observe an indication of 0 ± 5.0 mVDC.
6. Set the AMPLITUDE switch to 100.0.
7. Observe an indication of 100 ± 10.5 mVDC.
8. Set the AMPLITUDE Switch to 010.0.
9. Observe an indication of 10.0 ± 1.5 mVDC.
10. Set the AMPLITUDE switch to 900.0, and the UNITS switch to RMS+.
11. Observe an indication of 900 ± 14.5 mVAC RMS.
12. Set the UNITS switch to PEAK.

13. Observe an indication of 636 ± 3.2 mVAC RMS.
14. Set the UNITS switch to PK-PK+.
15. Observe an indication of 318 ± 1.6 mVAC RMS.
16. Set the FREQUENCY switch to 61.4 Hz.
17. Connect the Frequency Counter to the mV OUTPUT (BNC) jack.
18. Observe an indication of 61.44 ± 0.31 Hz on the Frequency Counter.
19. Set the FREQUENCY switch to 140 Hz.
20. Observe an indication of 139.9 ± 0.696 Hz.
21. Set the FREQUENCY switch to 318 Hz.
22. Observe an indication of 318 ± 1.59 Hz.
23. Set the FREQUENCY switch to 100.0 Hz.
24. Observe an indication of 100.0 ± 0.5 Hz.
25. Set the FREQ switch to 1000 Hz.
26. Observe an indication of 1000 ± 5 Hz.

Chapter 4

Calibration Procedure

The unit has been carefully calibrated using frequency counters and multimeter that are traceable to the National Bureau of Standards. **Do not make any adjustments unless properly calibrated equipment is available.** Make sure the battery is fully charged.

Test Equipment

Note: Equivalent equipment can be used.

- | | |
|-----------------------------|----------------------|
| 1. AC-DC Digital Multimeter | Keithley Model 191 |
| 2. Frequency Counter | Leader Model LDC-822 |

Adjustments

There are four separate adjustments inside the 41P Portable Calibrator. Refer to **Figure 4-1** for potentiometer locations on the circuit board inside the case.

1. Remove the back cover of the 41P by taking off the six screws found on the back of the calibrator.
2. Pull the cover back off. Place the unit in front of you with the front panel down.
3. Looking down into the calibrator circuit board, you will see the four potentiometers which provide the following adjustments:
 - R1 RMS Level
 - R2 PEAK Level
 - R3 DC Zero
 - R4 DC Level

Calibration Procedures

1. Connect a digital multimeter to the mV (BNC) OUTPUT jack.
2. Set FREQUENCY switch to 318 Hz.
3. Place the UNITS switch to DC. Set the DC OFFSET Control completely counterclockwise to "0".
4. Set the AMPLITUDE switch to 0000.

5. Adjust the DC ZERO Adjustment R3 for a 0 ± 1.0 mVDC indication on the multimeter.
6. Set the AMPLITUDE switch to 900. Set X1-X10 switch to X1.
7. Set the DC LEVEL Adjustment R4 for a 900 ± 1.0 mV indication on the multimeter.
8. Place the UNITS switch to RMS. Make sure the DC OFFSET Control is in the full counterclockwise ("0") position.
9. Turn the FREQ Switch to 318 Hz.
10. Set the RMS Level Adjustment R1 for an indication of 900 ± 1.0 mV RMS on the multimeter.
11. Place the UNITS switch to PEAK.
12. Set the PEAK Level Adjustment R2 for a $636.3 \text{ k} \pm 1.0$ mV RMS indication on the multimeter.

Note: A high grade 0.3% precision 1000 pF capacitor is in series with the BNC output connector. The above calibrations have automatically adjusted the pC (picocoulomb) output, as these calibrated voltages are used via the capacitor to the pC (picocoulomb) output.

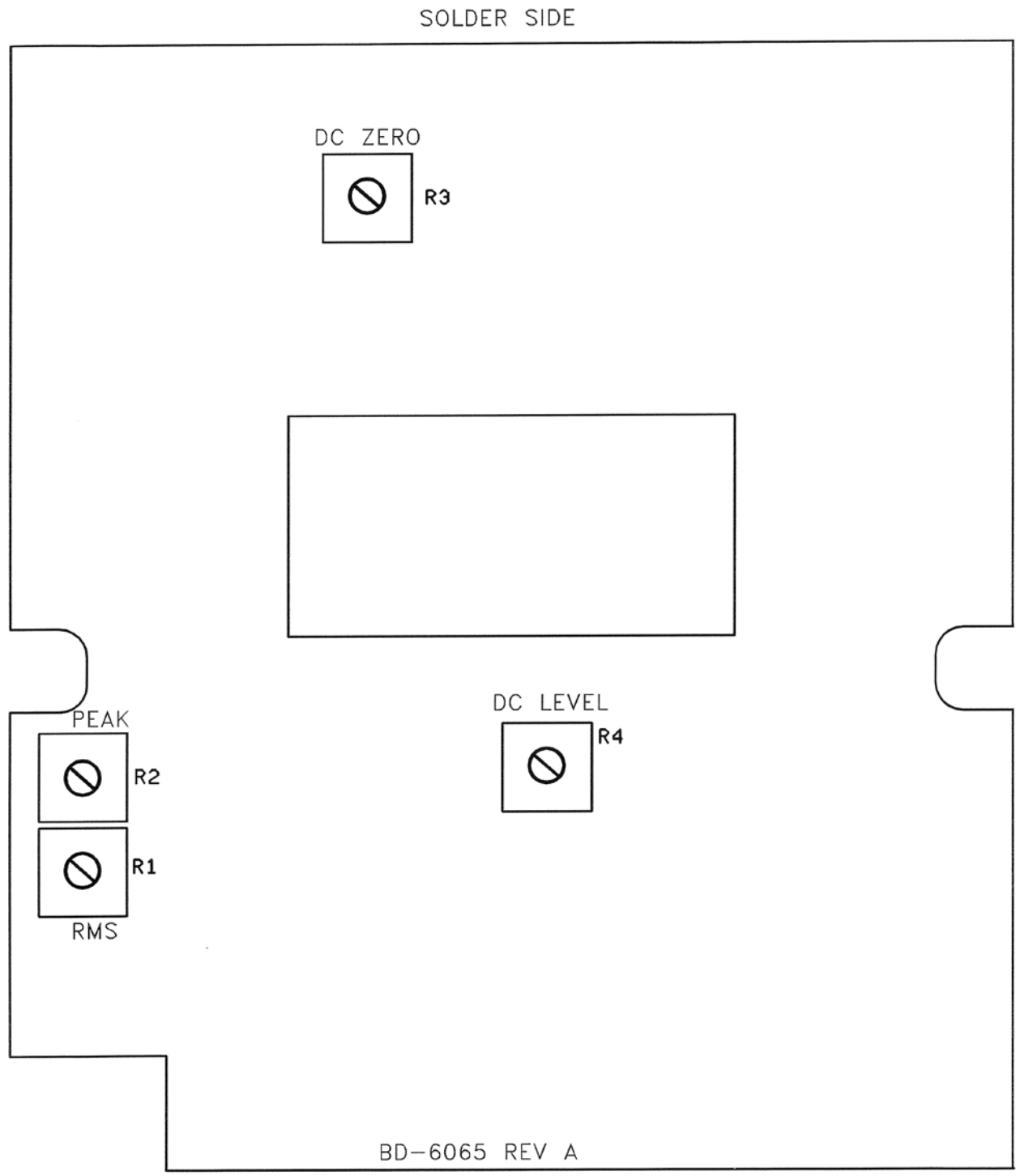


Figure 4-1: Potentiometer Adjustment Location Diagram

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