

# 2017

## **SUBSTATION TEST EQUIPMENT GUIDEBOOK**

*condensed edition*



**Vanguard Instruments**  
A DOBLE COMPANY



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# ATRT-01 S3 *single phase transformer turns ratio tester*

part number **9023-UC**



RS-232C  
PC interface

USB Flash  
drive interface

## DESCRIPTION

The ATRT-01 S3 is Vanguard's fourth generation, micro-processor based, single phase, automatic transformer turns-ratio tester.

The ATRT-01 S3 uses the IEEE C57.12.90 measuring method to determine the transformer turns-ratio. The ATRT-01 S3's measuring circuitry self adjusts before each measurement to ensure turns-ratio accuracy. Two selectable test voltages, 4Vac and 40Vac, offer flexibility in testing different types of transformers.

The ATRT-01 S3 can store up to 4,000 readings in its internal memory.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 12"W x 10"H x 8" D (30.4 cm x 25.4 cm x 20.3 cm) <b>Weight:</b> 8 lbs. (3.6 Kg)
<b>operating voltage</b>	120 or 240 Vac (Selectable), 50/60Hz
<b>measuring method</b>	ANSI/IEEE C57.12.90
<b>typical turns-ratio accuracy</b>	<b>4 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) <b>40 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%)
<b>test voltages</b>	4Vac @ 1.0A, 40Vac @ 0.6A
<b>current reading range</b>	0–2 A, Accuracy: 2% of reading (±1 mA)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>computer interface</b>	RS-232C, USB Flash drive port
<b>internal data storage</b>	128 records of 33 readings
<b>external data storage</b>	up to 999 test records on external USB flash drive
<b>safety</b>	<b>IEC/EN 61010-1, EN 61326-1, EN 61000-3, and EN 61000-4 certified.</b> Designed to meet UL 61010A-1 and CSA-C22.2 standards
<b>pc software</b>	Windows-based software is included with purchase price

TRANSFORMER TURNS RATIO TESTERS

# ATRT-01B S3 *single phase transformer turns ratio tester*

part number **9036-UC**



RS-232C  
PC interface

USB Flash  
drive interface

## DESCRIPTION

The ATRT-01B S3 is a single-phase, automatic, transformer turns ratio tester with all the features of the ATRT-01 S3 above.

It is powered by a 6-Volt, 7 Ampere-hour, lead-acid battery. The high capacity battery, coupled with the ATRT-01B S3's low power consuming circuitry, allows the unit to be used continuously for up to 4 hours between re-charges. A built-in charger lets the unit be used while the battery is being charged.

The ATRT-01B S3 can store up to 4,000 readings in its internal memory.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 12"W x 10"H x 8" D (30.4 cm x 25.4 cm x 20.3 cm) <b>Weight:</b> 9 lbs. (4.3 Kg)
<b>operating voltage</b>	90 – 240Vac, 50/60 Hz; SLA battery delivers up to 4 hours operation
<b>measuring method</b>	ANSI/IEEE C57.12.90
<b>typical turns-ratio accuracy</b>	<b>4 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) <b>40 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%)
<b>test voltages</b>	4Vac @ 300mA, 40Vac @ 70mA
<b>current reading range</b>	0–2 A, Accuracy: 2% of reading (±1 mA)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>computer interface</b>	RS-232C, USB Flash drive port
<b>internal data storage</b>	128 records of 33 readings
<b>external data storage</b>	up to 999 test records on external USB flash drive
<b>safety</b>	<b>IEC/EN 61010-1, EN 61326-1, EN 61000-3, and EN 61000-4 certified.</b> Designed to meet UL 61010A-1 and CSA-C22.2 standards
<b>pc software</b>	Windows-based software is included with purchase price

# CVT-765 *capacitor voltage transformer tester*

part number **9025-UC**



RS-232C  
PC interface

USB Flash  
drive interface

## DESCRIPTION

The Vanguard CVT-765 is a microprocessor-based, single phase, automatic, transformer turns-ratio tester. This portable test unit is specifically designed to measure the turns-ratios of Capacitor Voltage Transformers (CVT's).

The CVT-765 determines the transformer turns-ratio using the IEEE C57.12.90 measuring method. It uses a 7440Vac excitation voltage source to accurately measure the turns-ratio of Capacitor Voltage Transformers with a rating of up to 765KV. The transformer turns-ratio is determined by precisely measuring the voltages across the unloaded transformer windings.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 19.5"W x 12"H x 17" D (49.5 cm x 30.5 cm x 43.2 cm) <b>Weight:</b> 65 lbs. (29.5 Kg)
<b>input power</b>	100 – 120 Vac or 220 – 240 Vac (selectable), 50/60 Hz
<b>measurement method</b>	ANSI/IEEE C57.12.90
<b>typical turns-ratio accuracy</b>	<b>75–5,000 (±0.25%),</b> <b>5,001–10,000 (±0.35%),</b> <b>10,001–15,000 (±0.5%)</b>
<b>test voltage</b>	7440Vac @ 50mA
<b>phase angle reading</b>	0 – 360 degrees (±0.2 degree accuracy)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>computer interface</b>	RS-232C, USB Flash drive port
<b>internal data storage</b>	128 records of 33 readings
<b>external data storage</b>	up to 999 test records on external USB flash drive
<b>pc software</b>	Windows-based software is included with purchase price

# ATRT-03 S2 *automatic, 3-phase transformer turns ratio tester*

part number **9003-UC**

TRANSFORMER TURNS RATIO TESTERS



 **RS-232C**  
PC interface

 **USB**  
PC interface

 **USB Flash**  
drive interface

## DESCRIPTION

The ATRT-03 S2 is Vanguard's third generation, microprocessor-based, automatic, three-phase, transformer turns ratio tester.

The ATRT-03 S2 is capable of measuring turns ratio from 0.8 to 15,000. The 3-phase excitation current, phase angle readings, along with the turns ratios are displayed on the back-lit LCD screen. The ATRT-03 S2 also features a built-in LTC controller.

The optional 4.5-inch wide thermal printer can be used to print test results in the field.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 18"W x 7"H x 15" D (45.7 cm x 17.8 cm x 38.1 cm) <b>Weight:</b> 20 lbs. (9.0 Kg)
<b>operating voltage</b>	100 – 240 Vac, 50/60 Hz
<b>measurement method</b>	ANSI/IEEE C57.12.90
<b>turns-ratio accuracy</b>	<b>typical</b> 8 Vac: 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) 40 Vac: 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%) 100 Vac: 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%)
<b>test voltages</b>	8 Vac @ 1.0 A, 40 Vac @ 0.2 A, 100 Vac @ 0.1 A
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	optional built-in 4½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB, USB Flash drive port
<b>pc software</b>	Windows-based transformer turns-ratio analysis software is included
<b>data storage capacity</b>	stores 112 transformer test records and 128 transformer test plans. up to 999 transformer test records can be stored on a USB Flash Drive.
<b>ltc controller</b>	built-in load tap changer controller
<b>safety</b>	designed to meet IEC 61010 (1995), UL 61010A-1, and CSA-C22.2 standards

# Tri-Phase *true 3-phase transformer turns ratio tester*

part number **9008-UC**



 **RS-232C**  
PC interface

 **USB**  
PC interface

 **USB Flash**  
drive interface

## DESCRIPTION

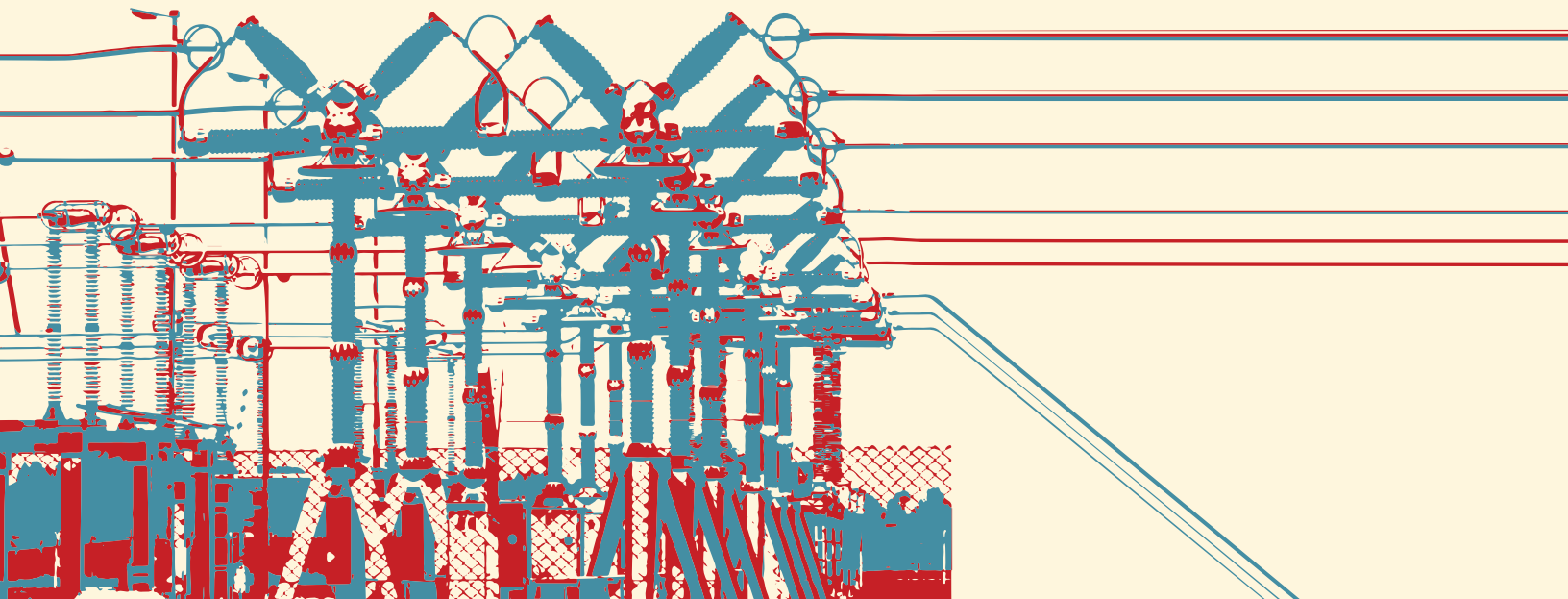
The Tri-Phase is a true three-phase transformer turns ratio tester. It is capable of measuring turns ratios from 0.8 to 15,000.

The Tri-Phase outputs a three-phase excitation test voltage to the three transformer primary windings. The induced 3-phase secondary voltages are sensed and the turns ratio is calculated.

The unit's built-in 4½" wide thermal printer can be used to print test results in the field. The Tri-Phase also features a built-in LTC controller.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21"W x 9"H x 17" D (53 cm x 24 cm x 43 cm) <b>Weight:</b> 35 lbs. (15.8 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz, 3 amps
<b>measurement method</b>	ANSI/IEEE C57.12.90
<b>turns-ratio accuracy</b>	<b>typical</b> 8 Vac: 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) 40 Vac: 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%) 100 Vac: 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%)
<b>test voltages</b>	three-phase, 8 Vac @ 1 Amp, 40 Vac @ 0.2 Amp, 100 Vac @ 0.1 Amp
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 4½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB, USB Flash drive port
<b>pc software</b>	Windows-based transformer turns-ratio analysis software is included
<b>data storage capacity</b>	stores 112 transformer test records and 128 transformer test plans. up to 999 transformer test records can be stored on a USB Flash Drive.
<b>ltc controller</b>	built-in load tap changer controller



# TRF-100 *automatic, 3-phase transformer turns ratio finder*

part number **9117-UC**



USB  
PC interface

## DESCRIPTION

The TRF-100 is Vanguard's fourth generation, microprocessor-based, automatic, three phase, transformer turns-ratio tester. This lightweight, portable unit is designed for testing transformers at utility power substations.

The TRF-100 determines the transformer turns-ratio using the IEEE C5712.90 measurement method. The transformer turns-ratio (ranging from 0.8 to 50,000) is determined by precisely measuring the voltages across the unloaded transformer windings. The TRF-100's turns-ratio measurement accuracy is 0.1% or better.

Up to 99,000 readings can be stored in the TRF-100's internal memory.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 7"H x 13" D (43.2 cm x 17.8 cm x 33.0 cm) <b>Weight:</b> 14 lbs. (6.4 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz, 3 Amps
<b>measuring method</b>	ANSI/IEEE C5712.90
<b>typical turns-ratio accuracy</b>	<b>4 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) <b>40 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%) <b>100 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%)
<b>test voltages</b>	4 Vac @ 1.0A, 40 Vac @ 0.6A, 100 Vac @ 0.1A
<b>current reading range</b>	0 – 2 A, resolution: ±1mA, accuracy: ±2% of reading (±1 digit)
<b>display</b>	back-lit LCD (20 characters by 4 lines), viewable in bright sunlight and low-light levels
<b>computer interface</b>	USB
<b>printer</b>	optional built-in 4½" wide thermal printer
<b>internal data storage</b>	stores 1,000 transformer test records and 128 transformer test plans
<b>safety</b>	designed to meet IEC 61010 (1995), UL 61010A-1, and CSA-C22.2 standards
<b>pc software</b>	Windows-based transformer turns-ratio analysis software is included

# TRF-250 *automatic, 3-phase transformer ratio finder*

part number **9105-UC**



USB  
PC interface



Bluetooth  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The TRF-250 is Vanguard's fourth generation transformer turns ratio tester. This latest design provides a higher excitation voltage of 250Vac, a wireless Bluetooth PC interface, and features a 44-key "QWERTY"-style membrane keyboard. All these features greatly improve the accuracy of the turns ratio readings, ease of operation, and reliability.

The TRF-250 determines the turns ratio of the transformer under test using the IEEE C5712.90 measurement method. The turns-ratio range is from 0.8 to 50,000 to 1. Transformer turns ratio, excitation current, and winding polarity are displayed on the built-in 128x64 pixels graphic LCD screen. The TRF-250 can be used as a standalone unit or can be computer-controlled.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 18"W x 5"H x 12" D (45.7 cm x 12.7 cm x 30.5 cm) <b>Weight:</b> 20 lbs. (9.1 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>measuring method</b>	ANSI/IEEE C5712.90
<b>typical turns-ratio accuracy</b>	<b>4 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) <b>40 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%) <b>100 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%) <b>250 Vac:</b> 0.8–1,000 (±0.03%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%)
<b>test voltages</b>	4 Vac @ 1 A, 40 Vac @ 200 mA, 100 Vac @ 100 mA, 250 Vac @ 50 mA
<b>current reading range</b>	0 – 2 Amperes, accuracy: ±0.1mA, ±2% of reading (±1 mA)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>computer interfaces</b>	Bluetooth, USB, USB Flash drive port
<b>internal data storage</b>	112 test records and 128 test plans
<b>printer</b>	optional built-in 4½" wide thermal printer

# TRF-250A *automatic, 3-phase transformer ratio finder*

part number **9106-UC**



USB  
PC interface



Bluetooth  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The TRF-250A is the battery-operated version of the TRF-250 above. Its battery offers approximately 3 hours of continuous use. The TRF-250A features a built-in charger that allows the unit to be used while charging.

Like the TRF-250, the TRF-250A also features a built-in 4½" wide thermal printer and an LTC controller.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 18"W x 5"H x 12" D (45.7 cm x 12.7 cm x 30.5 cm) <b>Weight:</b> 20 lbs. (9.1 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz or 12 Vdc
<b>measuring method</b>	ANSI/IEEE C5712.90
<b>typical turns-ratio accuracy</b>	<b>4 Vac:</b> 0.8–1,000 (±0.08%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%) <b>40 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%) <b>100 Vac:</b> 0.8–1,000 (±0.05%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.25%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%) <b>250 Vac:</b> 0.8–1,000 (±0.03%), 1,001–4,000 (±0.1%), 4,001–15,000 (±0.2%), 15,001–20,000 (±0.4%), 20,001–50,000 (±0.5%)
<b>test voltages</b>	4 Vac @ 120 mA, 40 Vac @ 50 mA, 100 Vac @ 20 mA, 250 Vac @ 10 mA
<b>current reading range</b>	0 – 1 Ampere, accuracy: ±0.1mA, ±2% of reading (±1 mA)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>computer interfaces</b>	Bluetooth, USB, USB Flash drive port
<b>internal data storage</b>	112 test records and 128 test plans
<b>printer</b>	built-in 4½" wide thermal printer

# ATRT Check Box *turns ratio verification device*

part number **9129-UC**

TRANSFORMER TURNS RATIO TESTERS



## DESCRIPTION

The ATRT Check Box is designed to verify the field performance of all Electronic Transformer Turns Ratio Testers. It can also be used for trouble-shooting and servicing Electronic Turns Ratio Testers.

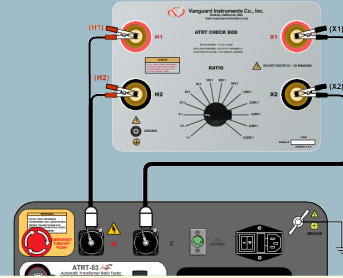
The ATRT Check Box uses a toroidal auto-transformer with different taps to give the precise turns-ratio. The design uses a nickel-iron superalloy core to minimize excitation current in order to achieve very accurate turns ratios.

Up to 250 Vac excitation voltage can be applied to the ATRT Check Box, allowing it to be used with virtually all turns ratio testers on the market.

The ATRT Check Box offers the following turns ratios: 1:1, 2:1, 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1,000:1, 2,000:1, 3,000:1, 6,000:1, and 12,000:1.

## SPECIFICATIONS

- physical specs** **Dimensions:** 14½"W x 7½"H x 12" D (36 cm x 19 cm x 30.5 cm)  
**Weight:** 9.1 lbs. (4.13 Kg)
- max excitation voltage** 250 Vac, 50/60 Hz
- turns-ratio selection** 1:1, 2:1, 5:1, 10:1, 50:1, 100:1, 200:1, 500:1, 1,000:1, 2,000:1, 3,000:1, 6,000:1, 12,000:1
- turns-ratio accuracy** 1–3,000 to 1: ±0.05% of settings; 6,000–12,000 to 1: ±0.15% of setting. Test data is included with each device.



# Turns Ratio Calibration Standard

part number **9130-UC**



## DESCRIPTION

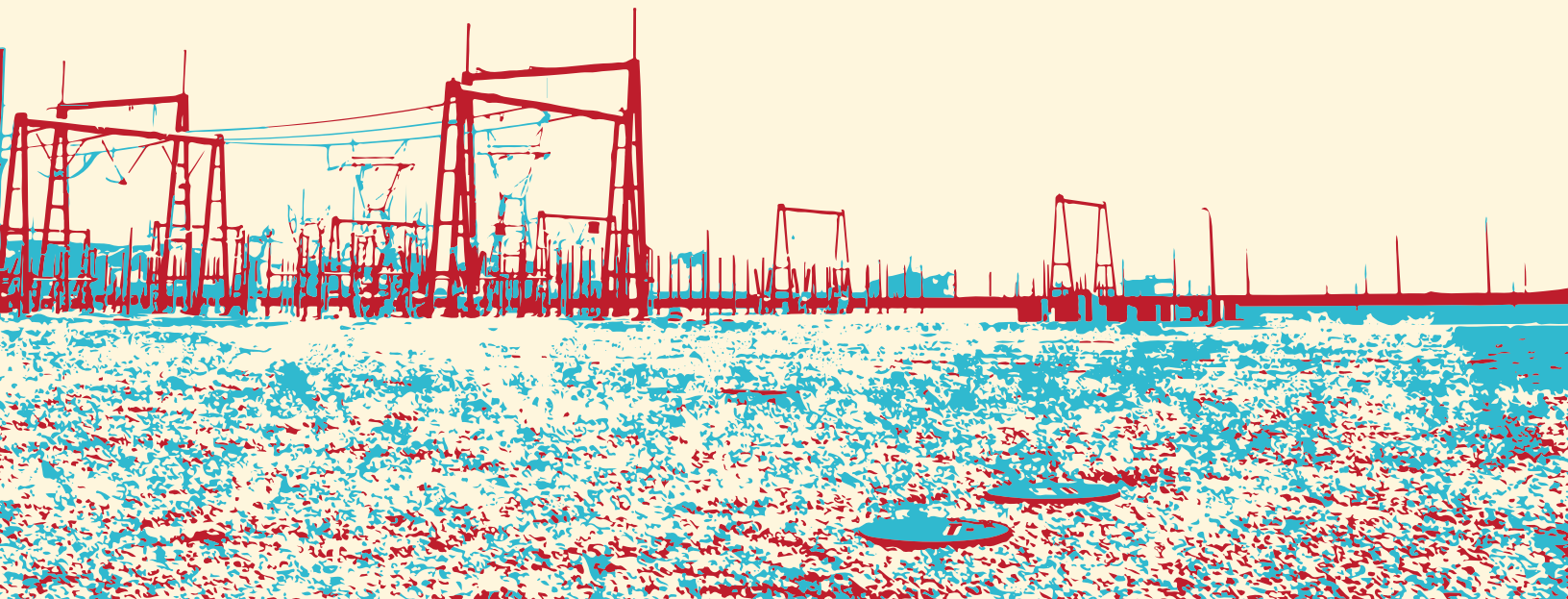
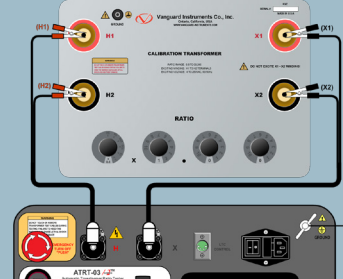
The Turns Ratio Calibration Standard can calibrate all Vanguard Turns Ratio Testers. It offers selectable turns ratios from 0.8 to 33,000 to 1 with accuracy of ±0.05% of the set value guaranteed for turns ratios from 0.8 to 5,000.

The Turns Ratio Calibration Standard features three decade rotary switches (unit, 10th, and 100th) for selecting the turns ratio. A multiplier switch provides 1, 10, 100, 200, 1000, and 3000 multiplier values.

The unit uses a nickel-iron super-alloy core toroidal transformer to ensure a very low excitation in order to achieve high turns ratio accuracy. Up to 250Vac test voltage can be used with the Vanguard Turns Ratio Calibration Standard. The high excitation test voltage allows the unit to be used with virtually all turns ratio testers on the market.

## SPECIFICATIONS

- physical specs** **Dimensions:** 16"W x 7"H x 13½" D (40.6 cm x 17.8 cm x 34.3 cm)  
**Weight:** 22 lbs. (9.98 Kg)
- max excitation voltage** 250 Vac, 50/60 Hz
- turns-ratio resolution** 0.01 step for turns ratios from 0.8 to 111, 0.1 step for turns ratios from 111 to 1111, 1.0 for turns ratios from 1111 to 11110
- turns-ratio range** 0.8 to 33,000
- turns-ratio accuracy** 0.8 to 5,000: ±0.05% of setting, 5,001 to 10,000: ±0.1% of setting, 10,001 to 20,000: ±0.20% of setting, 20,001 to 33,000: ±0.35% of setting



## EZCT-10 *current transformer test set*

part number **9045-UC** [110V], **9046-UC** [220V]



 **RS-232C  
PC interface**

 **USB  
PC interface**

### DESCRIPTION

The EZCT-10 is a microprocessor-based, current-transformer test set. It performs excitation, turns ratio, and winding polarity on single- and multi-ratio current transformers. Current transformers can be tested in their field-mounted configuration, eliminating the need to remove them from the host equipment.

The unit's built-in 4.5-inch wide thermal printer can be used to print test results in the field. The EZCT-10 supports stand-alone mode or can be computer-controlled.

The EZCT-10 is capable of outputting up to 10 A excitation current on the 50 Vac and 200 Vac range.


### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 12" D (42.7 cm x 32 cm x 26.9 cm) <b>Weight:</b> 55 lbs. (25 Kg)
<b>measuring method</b>	ANSI/IEEE C57.12.90, IEC 60044-1 and ANSI/IEEE C57.131
<b>current ratio range</b>	0.8 – 99; ±0.5%, 100 – 999; ±1.0%, 1,000 – 5,000; ±2%
<b>output test voltages</b>	<b>0 – 50 Vac</b> @ 10A max; <b>0 – 200 Vac</b> @ 10A max; <b>0 – 1,200 Vac</b> @ 1.5A max
<b>voltage reading range</b>	0 – 1,250 Vac, accuracy: ±1.0% of reading, ±0.5 volt
<b>current reading range</b>	0 – 10A, accuracy: ±1.0% of reading, ±0.02 A
<b>phase angle measurement</b>	0 – 360 degrees, accuracy: ±1.0 degree
<b>display</b>	back-lit LCD Screen (4 lines by 20 characters), viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 4½" wide thermal printer
<b>computer interfaces</b>	RS-232C and USB
<b>pc software</b>	Windows-based software is included with purchase price
<b>data storage capacity</b>	stores 128 test records and 10 test header records

## EZCT S2A *current transformer test set*

part number **9047-UC** [110V], **9048-UC** [220V]



 **RS-232C  
PC interface**

 **USB  
PC interface**

 **USB Flash  
drive interface**

### DESCRIPTION

The EZCT S2A is Vanguard's third-generation, microprocessor-based, current transformer test set. The EZCT S2A can perform the current transformer (CT) excitation, CT current-ratio, and winding polarity tests automatically.

The EZCT S2A automatically raises and lowers the excitation test voltage without any operator intervention. With up to 1500 Vac excitation test voltage available, the EZCT S2A can easily perform excitation tests on very large CT's.

The EZCT S2A supports stand-alone mode or can be computer-controlled.

### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 12" D (42.7 cm x 32 cm x 26.9 cm) <b>Weight:</b> 48 lbs. (21 Kg)
<b>measuring method</b>	ANSI/IEEE C57.12.90, IEC 60044-1 and ANSI/IEEE C57.131
<b>current ratio range</b>	0.8 – 999; ±0.1%, 1000 – 1999; ±0.3%, 2,000 – 5,000; ±1%
<b>output test voltages</b>	<b>0 – 50 Vac</b> @ 10A max; <b>0 – 250 Vac</b> @ 10A max; <b>0 – 500 Vac</b> @ 5A max; <b>0 – 1,500 Vac</b> @ 1.2A max
<b>voltage reading range</b>	0 – 2,200 Vac, accuracy: ± 1.0% of reading, ± 1 volt
<b>current reading range</b>	0 – 10A, accuracy: ± 1.0% of reading, ± 0.02A
<b>phase angle measurement</b>	0 – 360 degrees, accuracy: ±1.0 degree
<b>display</b>	240 x 128 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 4½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB port, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price
<b>data storage capacity</b>	stores 140 test records and 128 test plans.

## EZCT-2KA *current transformer test set*

part number **9118-UC** [110V], **9119-UC** [220V]



 **USB  
PC interface**

 **Bluetooth  
PC interface**

 **USB Flash  
drive interface**

### DESCRIPTION

The EZCT-2KA is Vanguard's third-generation microprocessor-based current transformer test set. The EZCT-2KA can perform the current transformer (CT) excitation test, measure the CT winding resistance and CT current-ratio automatically.

All of the EZCT-2KA's test leads can be connected to the CT output terminals (X1, X2, X3, X4 and X5), eliminating the need for lead switching during testing. Test voltage output is automatically raised and lowered by the EZCT-2KA without any operator intervention. With up to 2000 Vac excitation test voltage available, the EZCT-2KA can easily perform excitation tests on very large CT's.

The EZCT-2KA supports stand-alone mode or can be computer-controlled.

### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 12" D (42.7 cm x 32 cm x 26.9 cm) <b>Weight:</b> 48 lbs. (21 Kg)
<b>measuring method</b>	ANSI/IEEE C57.12.90 and ANSI/IEEE C57.131 standards
<b>current ratio range</b>	0.8 – 999; ±0.1%, 1000 – 1999; ±0.3%, 2,000 – 4,999; ±1%, 5,000 – 10,000; ±1.5%
<b>output voltages</b>	<b>0 – 50 Vac</b> @ 10A max; <b>0 – 300 Vac</b> @ 8A max; <b>0 – 500 Vac</b> @ 5A max; <b>0 – 1,200 Vac</b> @ 2A max <b>0 – 2,000 Vac</b> @ 1.2A max
<b>voltage reading range</b>	0 – 2,200 Vac, accuracy: ±1.0% of reading, ±1 volt
<b>current reading range</b>	0 – 10 A, accuracy: ±1.0% of reading, ±0.02A
<b>phase angle measurement</b>	0 – 360 degrees, accuracy: ±1.0 degree
<b>resistance measurement</b>	range: 100 μΩ to 20 Ω; <b>resolution:</b> 1 μΩ <b>accuracy:</b> 100 μΩ – 1.99 Ω (2% of reading ±10 μΩ), 2 Ω – 20 Ω (1.5% of reading ±2 mΩ)
<b>display</b>	240 x 128 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 4½" wide thermal printer
<b>computer interfaces</b>	USB, bluetooth, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price
<b>data storage capacity</b>	stores 1,000 test records and 128 test plans

# EZCT-2000C *current transformer test set*

part number **9101-UC** [110V], **9102-UC** [220V]

CURRENT TRANSFORMER TESTERS



USB  
PC interface



Bluetooth  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The EZCT-2000C is Vanguard's third-generation microprocessor-based current transformer test set. Designed specifically for CT testing, the EZCT-2000C has the following outstanding features that can greatly increase productivity and save time during the commissioning stage:

- Performs CT excitation, current-ratio, polarity, and phase angle tests
- Measures insulation resistance and winding resistance of the CT secondary windings
- Measures the CT's load burden
- Standalone or computer-controlled via USB or Bluetooth wireless interface

The EZCT-2000C's test leads can be connected to all the CT output terminals, and the complete CT test can be performed automatically without any operator intervention.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 19"W x 13"H x 16" D (48.3 cm x 33 cm x 40.1 cm) <b>Weight:</b> 73 lbs. (33.1 Kg)
<b>measuring method</b>	ANSI/IEEE C5712.90 and ANSI/IEEE C5713.1 standards
<b>current ratio range</b>	0.8 – 999; ±0.1%, 1000 – 1999; ±0.3%, 2,000 – 4,999; ±1%, 5,000 – 10,000; ±1.5%
<b>output test voltages</b>	<b>0 – 50 Vac</b> @ 10A max; <b>0 – 300 Vac</b> @ 10A max; <b>0 – 500 Vac</b> @ 5A max; <b>0 – 1,200 Vac</b> @ 2A max; <b>0 – 2,000 Vac</b> @ 1A max
<b>voltage reading range</b>	0 – 2,200 Vac, accuracy: ±1.0% of reading, ±1 volt
<b>current reading range</b>	0 – 10 A, accuracy: ±1.0% of reading, ±0.02A
<b>phase angle measurement</b>	0 – 360 degrees, accuracy: ±1.0 degree
<b>resistance measurement</b>	100 micro-ohms – 30 ohms; accuracy: 2% of reading ±1 count, ±10 micro-ohms
<b>reading range insulation</b>	2 M-ohms – 500 M-ohms; accuracy: 3% of reading; 500 – 1,000 Vdc test voltage
<b>resistance test display</b>	240 x 128 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 4½" wide thermal printer
<b>computer interfaces</b>	USB, bluetooth, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price
<b>data storage capacity</b>	stores 140 test records and 128 test plans

# Auto-Ohm-10 *low resistance micro-ohmmeter*

part number **9131-UC**

MICRO-OHMMETERS



## DESCRIPTION

The Vanguard Auto-Ohm 10 is a 10-ampere battery powered micro-ohmmeter designed for low-resistance-measuring applications such as the measurement of resistance in circuit breaker contacts, bushing contact joints, and welding joints.

The Auto-Ohm 10 offers a transformer resistance mode that can measure transformer winding resistance. The unit's built-in discharge circuit ensures that the transformer's stored energy is depleted at the end of each test.

The unit is powered by four 3400mAh, 3.7Vdc Li-Ion rechargeable batteries. With these high capacity batteries, up to 2,900 tests per charge (10A/2 second duration) can be performed in the field. A built-in charger can simultaneously charge the batteries and provide power to the unit for continuous operation.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 8"H x 12" D (36 cm x 19.4 cm x 30.4 cm) <b>Weight:</b> 7.8 lbs. (3.54 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>test currents</b>	1mA, 10mA, 100mA, 1A, 5A, 10A (selectable)
<b>resistance reading range</b>	1µΩ - 5,000 Ω accuracy: ± 0.2% (please refer to detailed product datasheet for full specs)
<b>batteries</b>	Rechargeable Li-Ion, 3.7Vdc, 3400 mAh, protected (Qty=4)
<b>charge time:</b>	4 hours
<b>testing capacity:</b>	perform up to 2,900 tests per charge (10A/2 sec duration)
<b>auto power down</b>	<b>Programmable:</b> 30 sec, 1 min, 3 min
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in direct sunlight and low-light levels

# Auto-Ohm 200 S3 *true dc micro-ohmmeter*

part number **9051-UC**



RS-232C  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The Auto-Ohm-200 S3 is Vanguard's fourth generation, microprocessor-based, true DC micro-ohmmeter. It is designed for testing EHV circuit-breaker contact resistances, bushing contact joints, welding joints, or for any low-resistance measuring application. This high current and very lightweight (16.8 lbs/ 7.6 Kg) micro-ohmmeter is designed to meet the IEEE C57.09-1999 (5.15) requirement for testing circuit breaker contact resistance.

The Auto-Ohm-200 S3 can accurately measure resistance values from 1 micro-ohm to 5 ohms. A 0.1 micro-ohm resolution is possible with current greater than 5A. The Auto-Ohm-200 S3 applies a selectable true DC test current from 1A to 200A to the resistance load to be tested.

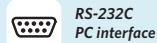
## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 7"H x 13" D (43.2 cm x 17.8 cm x 33.0 cm) <b>Weight:</b> 16.8 lbs. (7.6 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>resistance reading range</b>	1 µΩ to 5 Ω (max 10 mΩ @ 200A and 5 Ω @ 1A)
<b>typical accuracy</b>	±(0.15% of reading + 0.15% FS) at test current of 10-200A
<b>test current range</b>	1 A – 200 A (selectable in 1A steps)
<b>resolution</b>	<b>1.0 µΩ – 999.9 µΩ:</b> 0.1µΩ, <b>1,000 mΩ – 9,999 mΩ:</b> 1µΩ, <b>10,00 mΩ – 99,99 mΩ:</b> 10µΩ, <b>100.0 mΩ – 999.9 mΩ:</b> 0.1mΩ, <b>1 Ω – 5 Ω:</b> 0.01Ω
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in direct sunlight and low-light levels
<b>keypad</b>	rugged, 44-key "QWERTY" style membrane keypad
<b>internal data storage</b>	128 test records; each record can contain up to 64 readings.
<b>external data storage</b>	up to 999 test records on external USB Flash drive
<b>computer interfaces</b>	RS-232C, USB Flash drive
<b>pc software</b>	Windows-based software is included
<b>safety</b>	IEC/EN 61010-1, EN 61326-1, EN 61000-3, and EN 61000-4 certified.

# DMOM-200 S3 *true dc micro-ohmmeter*

part number **9052-UC**

MICRO-OHMMETERS



RS-232C  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The DMOM-200 S3 has all of the features of the Auto-Ohm 200 S3 above. It also comes with a built-in 2½" wide thermal printer that can be used to print test reports in the field.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 18"W x 7"H x 15" D (45.7 cm x 17.8 cm x 38.1 cm) <b>Weight:</b> 19.8 lbs. (8.9 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>resistance reading range</b>	1 µΩ to 5 Ω (max 10 mΩ @ 200A and 5 Ω @ 1A)
<b>typical accuracy</b>	±(0.15% of reading + 0.15% FS) at test current of 10-200A
<b>test current range</b>	1 A – 200 A (selectable in 1A steps)
<b>resolution</b>	<b>1.0 µΩ – 999.9 µΩ:</b> 0.1µΩ, <b>1.000 mΩ – 9.999 mΩ:</b> 1µΩ, <b>10.00 mΩ – 99.99 mΩ:</b> 10µΩ, <b>100.0 mΩ – 999.9 mΩ:</b> 0.1mΩ
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in direct sunlight and low-light levels
<b>keypad</b>	rugged, 44-key "QWERTY" style membrane keypad
<b>internal data storage</b>	128 test records. Each record can contain up to 64 readings.
<b>external data storage</b>	up to 999 test records on external USB Flash drive
<b>printer</b>	Built-in 2½" wide thermal printer
<b>computer interface</b>	RS-232C, USB Flash drive port
<b>pc software</b>	Windows-based software is included
<b>safety</b>	IEC/EN 61010-1, EN 61326-1, EN 61000-3, and EN 61000-4 certified.

# DMOM-600 *true dc micro-ohmmeter*

part number **9053-UC**



RS-232C  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The DMOM-600 is specifically designed for testing EHV circuit-breaker contact resistances, bushing contact joints, welding joints, or for any low-resistance measuring application. This high current and lightweight micro-ohmmeter is designed to meet the IEEE C57.09-1999 (5.15) requirement for testing circuit breaker contact resistance. The DMOM-600 can accurately measure resistance values from 1 micro-ohm to 450 milliohms. The DC test current is selectable from 10A to 600A.

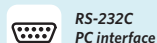
The DMOM-600 also features a built-in 2½" wide thermal printer that can be used to print test reports in the field.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 16¾"W x 12½"H x 12" D (42.7 cm x 32 cm x 30.5 cm) <b>Weight:</b> 33 lbs. (15 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>resistance reading range</b>	1 µΩ to 450 mΩ (max 1.5 mΩ @ 600A and 450 mΩ @ 10A)
<b>typical accuracy</b>	±(0.15% of reading + 0.15% FS) at test current of 10-600A
<b>resolution</b>	<b>0.1 µΩ – 999.9 µΩ:</b> 0.1µΩ, <b>1.000 mΩ – 9.999 mΩ:</b> 1µΩ, <b>10.00 mΩ – 99.99 mΩ:</b> 10µΩ, <b>100.0 mΩ – 999.9 mΩ:</b> 0.1mΩ
<b>test current range</b>	10 A – 600 A (selectable in 1A steps)
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in direct sunlight and low-light levels
<b>keypad</b>	rugged, 44-key "QWERTY" style membrane keypad
<b>internal data storage</b>	128 test records; each record can contain up to 64 readings
<b>external data storage</b>	Up to 999 test records on external USB Flash drive
<b>printer</b>	built-in 2½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price

# SGT-200 *safety ground tester*

part number **9133-UC**



RS-232C  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The Vanguard SGT-200 Safety Ground Tester is a 200A DC micro-ohmmeter designed specifically to measure the resistance of protective in-service grounding and jumper cable assemblies. The SGT-200 can measure the resistance of the grounding cables, clamps and ferrules. The measured resistance values can be compared against the calculated values (using the ASTM 2249-03 standard) and a Pass/Fail result can be printed along with the measured resistance values. Since the SGT-200 uses a DC current, **there is no need to uncoil the cable under test.** It can be conveniently tested in its coiled state in a much smaller testing environment.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21"W x 8"H x 14" D (53.3 cm x 20.3 cm x 35.6 cm) <b>Weight:</b> 31 lbs. (14.1 Kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>resistance reading range</b>	1 µΩ to 1000 mΩ (max 1.5 mΩ @ 200A, 450 mΩ @ 10A, 1000 mΩ @ 1A)
<b>test current range</b>	10A – 200A (selectable in 1A steps);
<b>accuracy</b>	<b>10A – 49.9A:</b> 1% ±2 micro-ohms, <b>50A – 200A:</b> 1% ±1 micro-ohm
<b>test voltage</b>	5 Vdc
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in direct sunlight and low-light levels
<b>keypad</b>	rugged, 44-key "QWERTY" style membrane keypad
<b>internal data storage</b>	100 test records
<b>external data storage</b>	Up to 999 test records on external USB Flash drive
<b>printer</b>	built-in 2½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price

# WRM-10P S2 *lightweight winding resistance meter*

part number **9137-UC** [110V], **9138-UC** [220V]

WINDING RESISTANCE METERS



USB  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The WRM-10P S2 is Vanguard's second generation lightweight winding resistance meter designed to accurately measure the winding resistance of highly inductive power transformers. The unit's dual resistance-reading input channels can measure two winding resistances simultaneously, and four-wire (Kelvin) connections provide high accuracy and require no lead compensation.

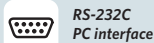
The WRM-10P S2 provides stable resistance readings of very large transformers by utilizing a 36Vdc power supply capable of outputting up to 10 Amperes. The resistance reading of a 100MVA transformer can be achieved in 5 minutes or less. The unit's power supply is cooled by heavy-duty fans designed for continuous operation. For greater flexibility in the field, the WRM-10P S2 comes with a built-in 2½-inch wide thermal printer used for printing test reports.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17½"W x 11¾"H x 12½"D (44.5 cm x 29.8 cm x 31.8 cm) <b>Weight:</b> 27 lbs (12.2 kg)
<b>resistance reading range</b>	1 micro-ohm – 2,000 ohms
<b>accuracy</b>	<b>1 – 19,999 micro-ohms:</b> ±0.5% reading, ±1 count <b>20 – 999 milliohms:</b> ±1% reading, ±1 count <b>1 – 2,000 ohms:</b> ±1.5% reading, ±1 count
<b>test voltage</b>	36 Vdc max
<b>test current range</b>	auto range, 10 A max
<b>display</b>	5" back-lit LCD screen (240 x 128 pixels) viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 2½" wide thermal printer
<b>internal data storage</b>	stores 100 test records of 64 readings each
<b>computer interface</b>	USB, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price
<b>cables</b>	three 50-foot (15.24m) test cables, one ground cable, one power cord, one USB cable and cable carrying bag

# TRM-20/40 *transformer resistance meters*

part number **9007-UC** [TRM-20], **9061-UC** [TRM-40]



RS-232C  
PC interface



USB  
PC interface



Bluetooth  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The TRM-20 and TRM-40 are Vanguard's third generation transformer winding resistance meters. The TRM line is designed to measure DC resistance values of transformer windings, rotating machine windings, or any dc resistance of an inductive device.

The TRM line features dual resistance-reading input channels that can measure two winding resistances simultaneously (primary and secondary windings of a transformer).

Both the TRM-20 and TRM-40 can provide a fast and stable reading of very large transformers by utilizing a 60Vdc power supply. The TRM-20 is capable of outputting a selectable test current from 1A to 20A while the TRM-40's test current is selectable from 1A to 40A. Both models can automatically demagnetize the transformer after performing a test.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21"W x 17"H x 9" D (53 cm x 43 cm x 24 cm) <b>weight:</b> 33 lbs (15.4 kg)
<b>operating voltage</b>	100 – 240 Vac, 50/60 Hz
<b>resistance channels</b>	two static resistance reading channels
<b>resistance reading range</b>	<b>TRM-20:</b> 1 micro-ohm – 2,000 Ohms <b>TRM-40:</b> 1 micro-ohm – 500 Ohms
<b>accuracy</b>	<b>1 – 19,999 micro-ohms:</b> ±0.5% reading, ±1 count <b>20 – 999 milliohms:</b> ±1% reading, ±1 count <b>1 – 2,000 ohms:</b> ±1.5% reading, ±1 count
<b>test voltage</b>	60 Vdc charging, 18 Vdc max during measurement
<b>test currents</b>	<b>TRM-20:</b> 1 – 25 A in 1A increments, <b>TRM-40:</b> 1 – 40 A in 1A increments
<b>computer interfaces</b>	RS-232C, USB, Bluetooth, USB Flash drive
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 2½" wide thermal printer
<b>cables</b>	50' (15.24m) current cable set, two 50' (15.24m) sense cable sets, LTC control cable, ground cable, power cord, RS-232C cable, USB cable



# TRM-203/403 transformer resistance meters

part number **9060-UC** [TRM-203], **9006-UC** [TRM-403]

WINDING RESISTANCE METERS



**RS-232C**  
PC interface

**USB**  
PC interface

**Bluetooth**  
PC interface

**USB Flash**  
drive interface

## DESCRIPTION

The TRM-203 and TRM-403 are three phase transformer winding resistance meters that allow the user to connect all test cables to the transformer bushings. The unit will then measure the transformer resistance value for each of the phases without the need to disconnect and reconnect cables for each phase.

The TRM-203 and TRM-403 can provide a fast and stable reading of very large transformers by utilizing a 60Vdc power supply. The TRM-203 is capable of outputting a selectable test current from 1A to 20A while the TRM-403's test current is selectable from 1A to 40A.

Both models automatically dissipate the energy stored in the transformer at the end of each test.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21"W x 17"H x 9" D (53 cm x 43 cm x 24 cm) <b>Weight:</b> 35 lbs (15.8 kg)
<b>operating voltage</b>	100 – 240 Vac, 50/60 Hz
<b>resistance reading range</b>	<b>TRM-203:</b> 1 micro-ohm – 2,000 ohms <b>TRM-403:</b> 1 micro-ohm – 500 ohms
<b>accuracy</b>	<b>1 – 19,999 micro-ohms:</b> ±(0.2% reading + 0.1% F.S.) <b>20 – 999 milliohms:</b> ±(0.3% reading + 0.1% F.S.) <b>1 – 2,000 ohms:</b> ±(0.5% reading + 0.1% F.S.)
<b>test currents</b>	<b>TRM-203:</b> 1A – 25A in 1A increments <b>TRM-403:</b> 1A – 40A in 1A increments
<b>test voltage</b>	60 Vdc charging, 18 Vdc max during measurement
<b>input channels</b>	4 input channels for measuring resistance
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low-light levels
<b>printer</b>	built-in 2½" wide thermal printer
<b>computer interfaces</b>	RS-232C, USB, Bluetooth, USB Flash drive
<b>internal data storage</b>	256 static test records (each can contain up to 111 readings) and 120 dynamic test records
<b>external data storage</b>	up to 999 test records on external USB Flash drive

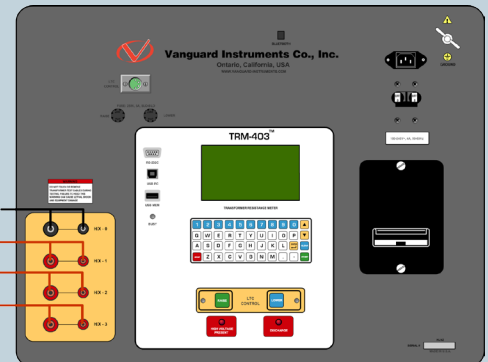
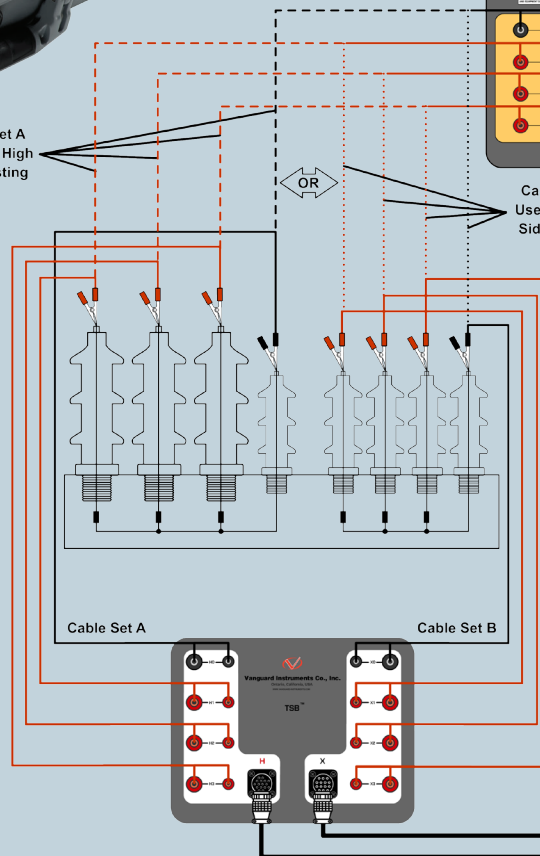
# TSB trip saver box

part number **9062-UC**

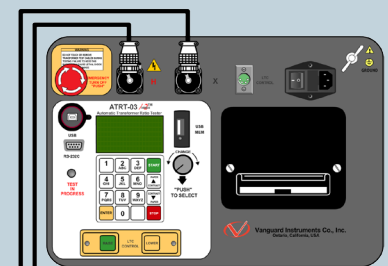


Cable Set A  
Used for High  
Side Testing

Cable Set B  
Used for Low  
Side Testing



The Vanguard TSB can be used with a Vanguard ATRT-03 series turns ratio tester to perform transformer turns ratio tests using the same cable set provided with the TRM-203/403. Using the TSB, there is no need to connect and reconnect cables from the transformer after the initial connections are made. The user can conveniently perform resistance tests using the TRM-203/403 and turns ratio tests using an ATRT-03 without having to make trips to the transformer to connect and disconnect cables.



# MCCB-250 *molded case circuit breaker tester*

part number **9066-UC** [110V], **9067-UC** [220V]



## DESCRIPTION

The MCCB-250 is a programmable, high-current source designed specifically for testing molded-case circuit breakers, thermal magnetic and solid-state overload motor-protection relays. The MCCB-250's built-in digital timer displays test results in milliseconds and cycles (with 1 ms resolution). The digital current meter displays test current. External current input allows the user a quick way to verify CT turns ratio.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 10½" D (42.6 cm x 32 cm x 27 cm) <b>Weight:</b> 46 lbs (21 kg)
<b>input power</b>	100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz
<b>output currents</b>	0 – 5 A @ 120 Vac max; 0 – 25 A @ 24 Vac max; 0 – 120 A @ 6 Vac max; 0 – 250 A @ 3 Vac max
<b>instantaneous current</b>	700 A
<b>internal current meter</b>	100 mA – 1,000 A; accuracy: 1% of reading ±20 mA
<b>external meter range</b>	10 mA – 10 A; accuracy: 1% of reading, ±20 mA
<b>timer reading range</b>	1ms – 2 hours; accuracy: 0.1% of reading ±1ms
<b>timer stop inputs</b>	voltage input (24V – 300V, dc or peak ac), dry contact input, or removal of primary current
<b>display</b>	back-lit LCD Screen (20 characters by 4 lines) viewable in bright sunlight and low-light levels
<b>cables</b>	power cord, ground cable, 10-foot (3.0m) #4 AWG current cable set, 10-foot (3.0m) #10 AWG current cable set

# CT-3500 S2 *digital circuit breaker analyzer*

part number **9002-UC**



 **USB PC interface**

 **USB Flash drive interface**

## DESCRIPTION

The CT-3500 S2 is Vanguard's second generation, stand-alone, digital, microprocessor-controlled, circuit-breaker timer. It measures the elapsed time from the instant a breaker coil is energized to the instant of opening or closing of a circuit-breaker's dry contacts. In addition to timing a breaker's contact response time, the CT-3500 S2 can also time relays or other switching functions that use an initiating trigger voltage (30-300 Volts DC or AC).

The CT-3500 can fully analyze the timing of all circuit breaker operations (Open, Close, Open - Close, and Close - Open). Timing results are displayed in milliseconds and cycles on the unit's back-lit LCD screen and can be printed on the built-in 2½" wide thermal printer.




## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 16"W x 7"H x 13" D (40.6 cm x 17.4 cm x 33 cm) <b>Weight:</b> 14 lbs (6.4 kg)
<b>input power</b>	100 – 240 Vac, 50/60 Hz
<b>dry-contact inputs</b>	3 channels
<b>trigger input voltage</b>	open/close: 30 – 300 V, DC or peak AC
<b>breaker operations</b>	open, close, open-close, close-open
<b>timing resolution</b>	±0.1 milliseconds; accuracy: 0.05% of reading ±0.1 ms
<b>display</b>	128 x 64 pixels back-lit LCD, viewable in bright sunlight and low light levels
<b>keypad</b>	rugged, 44-key "QWERTY"-style membrane keypad
<b>printer</b>	built-in 2½" wide thermal printer
<b>internal data storage</b>	stores up to 128 timing records
<b>computer interfaces</b>	USB, USB Flash drive
<b>pc software</b>	Windows-based software is included with purchase price
<b>cables</b>	furnished with full set of test leads (including 20-foot (6.10m) contact leads and 30-foot (9.14m) contact lead extensions)

# DIGITMR S2 *digital circuit breaker analyzer*

part number **9005-UC**



-  **USB PC interface**
-  **Bluetooth PC interface (optional)**
-  **USB Flash drive interface**

## DESCRIPTION

The Vanguard DIGITMR S2 is an inexpensive, easy to use digital circuit breaker analyzer. The DIGITMR S2 can be operated stand-alone or can be computer-controlled. It can fully analyze a circuit-breaker's performance by testing the contact time, stroke, velocity, over-travel, and contact wipe. Contact and motion analysis can be performed for all breaker contact operations (Open, Close, Open - Close, Close - Open, and Open - Close - Open). Timing results are recorded and displayed on the 240 x 128 pixels backlit LCD screen and can also be printed on the built-in 4½" wide thermal printer.




## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 18½"W x 14"H x 7" D (47 cm x 35.7 cm x 17.6 cm) <b>Weight:</b> 20 lbs (9.1 kg)
<b>input power</b>	3 A, 100 - 240 Vac, 50/60 Hz
<b>dry-contact inputs</b>	3 dry-contact channels; each channel detects main contact and insertion resistor contact
<b>timing windows</b>	1 second, 10 seconds, or 20 seconds
<b>timing resolutions</b>	±50 micro-seconds @ 1 sec. duration, ±500 micro-seconds @ 10 sec. duration, ±1.0 milliseconds @ 20 sec. duration
<b>timing accuracy</b>	0.05% of reading ±0.1 milliseconds @ 1 second duration
<b>resistor detection range</b>	50 - 5,000 ohms
<b>breaker initiate capacity</b>	30 A, 250 Vac/dc max
<b>voltage sensing input range</b>	<b>V1:</b> analog input; 0 - 255 V dc or peak ac; sensitivity: ±1 V <b>V2:</b> voltage presence/absence detector input; 30 - 300 V dc or peak ac
<b>breaker operations</b>	initiate open, close, open-close, close-open, open-close-open
<b>digital travel transducer input</b>	1 digital travel transducer channel; linear range: 0.0 - 60.0 in (±0.005 in) rotary range: 0 - 360 degrees (±0.006 degrees)
<b>printer</b>	built-in 4½" wide thermal printer that can print both graphic contact travel waveforms and tabulated test results
<b>computer interfaces</b>	USB port, USB Flash drive, bluetooth (optional)

# CT-7000 S3 *digital circuit breaker analyzer*

part number **9021-UC** [3 channels], **9100-UC** [6 channels]



-  **USB PC interface**
-  **Bluetooth PC interface (optional)**
-  **USB Flash drive interface**

## DESCRIPTION

The CT-7000 S3 is Vanguard's fourth generation EHV circuit breaker analyzer. The CT-7000 S3 is available with 3 (part number 9021-UC) or 6 contact timing channels (part number 9100-UC). The CT-7000 S3 can fully analyze a circuit breaker's performance by measuring the main contact and resistor contact time, stroke, velocity, over-travel, bounce back and contact wipes. Both contact and motion analysis can be performed on all circuit breaker operations (OPEN, CLOSE, OPEN-CLOSE, CLOSE-OPEN, and OPEN-CLOSE-OPEN). The CT-7000 S3's timing window is selectable between 1 second, 10 seconds, and 20 seconds.




## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21½"W x 8"H x 14" D (53 cm x 20 cm x 35 cm) <b>Weight:</b> 15 lbs (6.8 kg)
<b>dry-contact inputs</b>	3 channels (9021-UC) or 6 channels (9100-UC). Each channel can detect the main contact and resistor contact time.
<b>timing windows</b>	1 second, 10 seconds, or 20 seconds
<b>timing accuracy</b>	0.05% of reading ±0.05 ms @ 1 second duration
<b>voltage sensing input range</b>	<b>V1:</b> analog input; 0-250 V dc or peak ac; sensitivity: ±1 V <b>V2 and V3:</b> voltage presence/absence detector input; 24 - 255 V dc or peak ac
<b>breaker operations</b>	initiate open, close, open-close, close-open, open-close-open
<b>breaker initiate capacity</b>	30 A, 250V ac/dc max
<b>initiate current reading range</b>	one, non-contact, Hall-effect sensor, 0 - 20 A range, dc to 5 KHz ac
<b>travel transducer inputs</b>	3 digital travel transducer channels; 3 resistor-type transducer channels
<b>computer interfaces</b>	USBt, USB Flash drive, bluetooth (optional)
<b>pc software</b>	Windows-based software is included with purchase price
<b>printer</b>	built-in 4½" wide thermal printer
<b>internal data storage</b>	stores up to 200 test records and 100 test plans
<b>optional features</b>	bluetooth, 3-phase on-line timing mode, dual-ground timing mode

# CT-8000 S3 *circuit breaker analyzer*

part number **9103-UC** [3 channels], **9104-UC** [6 channels]



-  **USB PC interface**
-  **Bluetooth PC interface (optional)**
-  **USB Flash drive interface**

## DESCRIPTION

The CT-8000 S3 is Vanguard's fourth generation, stand-alone, microprocessor-driven EHV circuit-breaker analyzer. It is available in models with either 3 (9103-UC) or 6 (9104-UC) dry-contact inputs. The CT-8000 S3 can fully analyze a circuit breaker's performance by measuring the main contact and resistor contact time, stroke, velocity, over-travel, bounce back and contact wipes. Also, an outstanding feature of the CT-8000 S3 is the ability to perform dynamic resistance tests on circuit breaker contacts.

The unit's built-in 4½" wide thermal printer can print test results in the field.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 16"W x 11"H x 14"D (40.6 cm x 29.9 cm x 35.6 cm) <b>Weight:</b> 22 lbs (9.98 kg)
<b>dry-contact inputs</b>	3 channels (9103-UC) or 6 channels (9104-UC). Each channel can detect the main contact and resistor contact time.
<b>timing windows</b>	1 second, 10 seconds, or 20 seconds
<b>timing accuracy</b>	0.05% of reading ±0.05 ms @ 1 second duration
<b>resistor detection range</b>	50 - 5,000 ohms
<b>voltage sensing input range</b>	<b>V1:</b> analog input; 0-250 V dc or peak ac; sensitivity: ±1 V <b>V2 and V3:</b> voltage presence/absence detector input; 24 - 255 V dc or peak ac
<b>breaker operations</b>	initiate open, close, open-close, close-open, open-close-open
<b>breaker initiate capacity</b>	30A, 250 V ac/dc max
<b>initiate current reading range</b>	one, non-contact, Hall-effect sensor, 0 - 20 A range, dc to 5KHz
<b>travel transducer inputs</b>	3 digital travel transducer channels; 3 resistor transducer inputs
<b>computer interfaces</b>	USB, USB Flash drive, bluetooth (optional)
<b>pc software</b>	Windows-based software is included with purchase price
<b>internal data storage</b>	stores up to 200 test records and 100 test plans
<b>optional features</b>	bluetooth, 3-phase on-line timing mode, dual-ground timing mode

# CT-7000 S3/CT-8000 S3 Options



## ON-LINE TIMING PROBES

for CT-7000 S3 part no  
**9021-OT**

for CT-8000 S3 part no  
**9103-OT**



## DUAL GROUND PROBES (3 probes)

for CT-7000 S3 part no  
**9021-DG**

for CT-8000 S3 part no  
**9103-DG**

# CB Analyzer Test Box

part number **9126-UC**

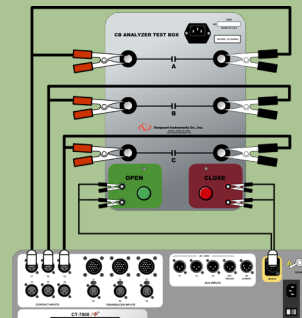


## DESCRIPTION

The CB Analyzer Test Box is designed as a field training/demo tool for the CT-7000 S3, CT-8000 S3, and DigiTMR S2. It can be used to verify the CT-7000/CT-8000/DigiTMR's timing function. The CB Analyzer Test Box provides 3 independent dry-contact channels to simulate the 3 phases of a circuit breaker. A built-in 12Vdc power supply is used to open or close the contacts. An OPEN or CLOSE command can be sent by using the front panel switches or the OPEN and CLOSE terminals. The contact status is indicated by LED's on the front panel. The CB Analyzer Test box can simulate the following CB operations: OPEN, CLOSE, O-C, C-O, O-C-O.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 14½"W x 7½"H x 12"D (36.8cm x 19cm x 30.5cm) <b>Weight:</b> 8.2 lbs (3.72 kg)
<b>input power</b>	1 A, 90 – 240 Vac, 50/60 Hz
<b>dry contact outputs</b>	3 dry-contact channels, 250 V ac/10A
<b>open/close coil control</b>	built-in front panel switch and contact inputs
<b>control status indicators</b>	built-in LED's



# CBS *circuit breaker simulator*

part number **9122-UC** [120V], **9123-UC** [240V]



## DESCRIPTION

The Vanguard Circuit Breaker Simulator (CBS) is designed to verify the performance of a Vanguard circuit breaker analyzer by simulating a circuit breaker with precise pre-defined parameters. The CBS generates precise timing, travel, voltage, and initiate current values to verify the circuit breaker analyzer functions and timing accuracy of Vanguard's CT-3500, DIGITMR, CT-6500, CT-7000, CT-7500, and CT-8000 product lines. The CBS is an essential tool for any calibration lab.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 19"W x 7"H x 15"D (48cm x 17cm x 38cm) <b>Weight:</b> 17 lbs (7.71 kg)
<b>input voltage</b>	100 – 120 Vac or 200 – 240 Vac (factory-pre-set), 50/60 Hz
<b>display</b>	back-lit LCD (20 characters by 4 lines)
<b>contact timing channels</b>	six contact timing channels; accuracy: ±0.01 ms
<b>CT timing channel</b>	one CT timing channel, 100mA; accuracy: ±0.5 ms
<b>digital transducer channels</b>	three digital transducer channels; accuracy: ±0.01"
<b>V1 voltage channel</b>	one, full-wave rectified AC, 25V peak
<b>V2 voltage channel</b>	one, 30Vdc
<b>initiate channel</b>	one, 3.6A load, ±0.3A
<b>external trigger channel</b>	one, 30 Vdc, ±2Vdc
<b>safety</b>	designed to meet UL 61010A, CAN/CSA C22.2 No 1010.1-92 standards
<b>cables</b>	one CT-7000 S2 contact cable, one CT-7000 S3 contact cable, one CT-3500/Digitmr contact cable, three transducer cables, one initiate cable, two voltage cables, one CT channel cable, one power cord

# Resistor Transducer Adapter

part number **9095-UC**



## DESCRIPTION

The Vanguard Resistor Transducer Adapter (RTA) can be used to connect any resistor type transducer to the digital transducer channel of a Vanguard circuit breaker analyzer. The RTA also features a 3-pin SwitchCraft connector that can directly interface with ABB resistor transducers.



Connected to an ABB AHMB resistor-type transducer

# Doble Transducer Adapter

part number **9084-UC**



## DESCRIPTION

The Doble Transducer Adapter can be used to interface any Doble travel transducer to a Vanguard circuit breaker analyzer.



Connected to a Doble rotary transducer

# Linear Digital Transducers

part number **9087-UC** [10"], **9088-UC** [25"]



## DESCRIPTION

Vanguard Digital Linear transducers are designed to precisely measure circuit breaker contact linear motion. Using an optical encoder, the linear transducer can measure distances up to 25" with a 0.01" resolution. Our robust design measures velocity up to 41ft/sec (12.5m/sec). Neither calibration nor setup is required when this transducer is used with a compatible Vanguard Time Travel Analyzer (DigitMR/CT-7000/CT-8000 CB analyzer family)

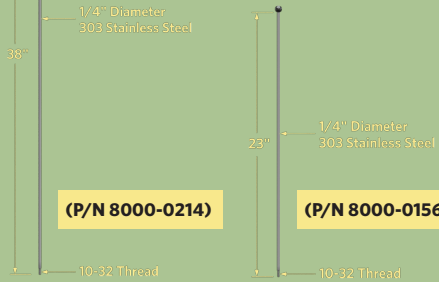
## SPECIFICATIONS

	<b>10" linear transducer</b>	<b>25" linear transducer</b>
<b>physical specs</b>	17" (43.2 cm) L with 10.5" (26.7 cm) x 4.5" (11.4 cm) mounting base	31.5" (80 cm) L with 10.5" (26.7 cm) x 4.5" (11.4 cm) mounting base
<b>physical travel</b>	0 – 10 inches max (0 – 25.4 cm max)	0 – 25 inches max (0 – 63.5 cm max)
<b>accuracy</b>	0.1% of reading $\pm 0.1"$ (2.54 mm)	0.1% of reading $\pm 0.1"$ (2.54 mm)
<b>resolution</b>	$\pm 0.01"$ ( $\pm 0.25$ mm)	$\pm 0.01"$ ( $\pm 0.25$ mm)
<b>velocity</b>	41 ft/sec (12.5 m/sec)	41 ft/sec (12.5 m/sec)

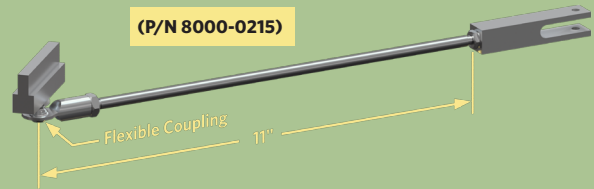
# Linear Transducer Timing Rods

part number **8000-0156** [23"], **8000-0214** [38"]  
part number **8000-0215** [ABB 72PM]

Vanguard Instruments offers two timing rods for use with our linear transducers. The Long Linear Transducer Timing Rod (**P/N 8000-0214**) is compatible with the Vanguard 25" Digital Linear Transducer (P/N 9088-UC), and the Short Linear Transducer Timing Rod (**P/N 8000-0156**) is compatible with the Vanguard 10" Digital Linear Transducer (P/N 9087-UC). Both timing rods are constructed of 303 stainless steel and feature 10-32 threaded ends.



The ABB 72PM Timing Rod with Flexible Coupling (**P/N 8000-0215**) can be connected to a Vanguard Digital Linear Transducer and is used for timing an ABB 72PM circuit breaker.



BREAKER ANALYZER ACCESSORIES

# Rotary Digital Transducers

part number **9125-UC** [type 1], **9090-UC** [type 2], **9091-UC** [type 3]

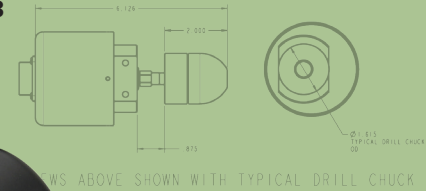
## DESCRIPTION

Rotary transducers translate the rotary motion of a circuit breaker's linkage shaft to the linear motion of the circuit breaker's main contact. Vanguard rotary transducers employ optical encoders that can detect rotary position with a maximum velocity of 100 revolutions per second. Vanguard offers three rotary transducers, each of which is furnished with a drill chuck adapter and two adapter shafts with 8mm and 10mm threading, respectively. The included accessories can be used to connect the transducers to a wide range of circuit breakers in the field.

## SPECIFICATIONS

### rotary transducer type 1, 2, and 3

- physical travel** 0 – 1,800 degrees
- accuracy** 0.1% of reading  $\pm 0.36$  degree
- resolution**  $\pm 0.36$  degree
- velocity** 100 rev/sec max



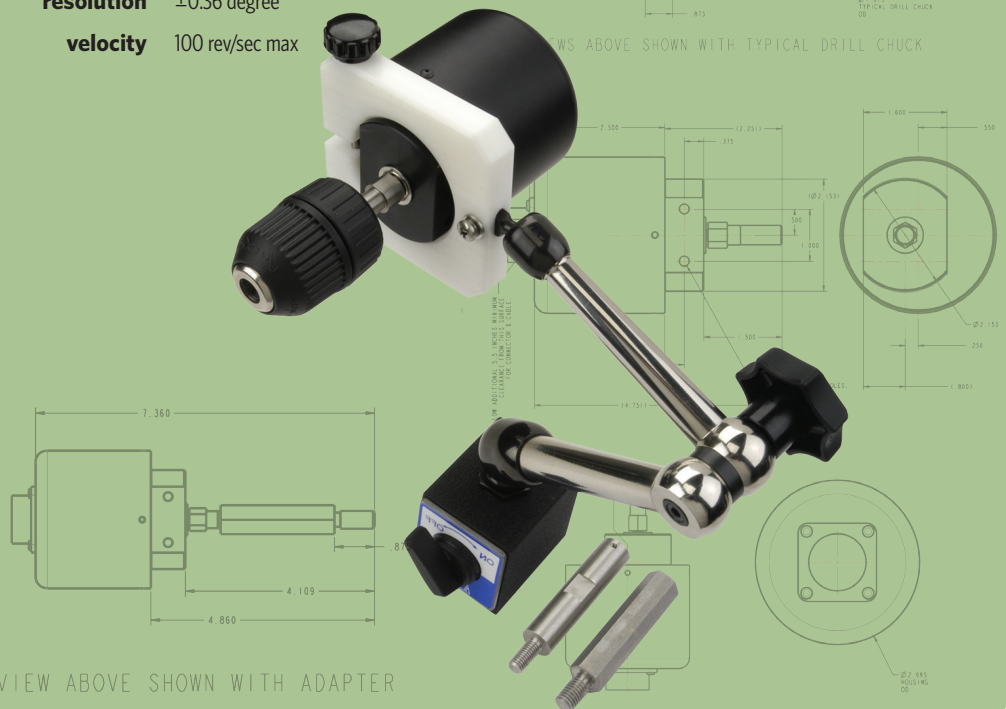
VIEWS ABOVE SHOWN WITH TYPICAL DRILL CHUCK



Type 2 rotary transducer  
Part no 9090-UC



Type 3 rotary transducer  
Part no 9091-UC



VIEWS ABOVE SHOWN WITH ADAPTER

# Linear Resistor Transducer

part number **9093-UC**



## DESCRIPTION

The linear resistor transducer (part no 9093-UC) is designed for measuring small displacements. A typical application for this transducer is to measure circuit breaker vacuum bottle displacement (0.25" - 0.50"). This resistor transducer can interface directly to the Vanguard CT-7000 S3 and CT-8000 S3 via the resistor transducer input channels.

## SPECIFICATIONS

<b>physical travel</b>	0 – 2 inches (0 – 5 cm)
<b>resistance range</b>	0 – 5KΩ
<b>accuracy</b>	0.1% of reading ±0.1" (2.54 mm)
<b>resolution</b>	±0.01" (±0.25 mm)
<b>velocity</b>	25 ft/sec (7.6 m/sec)



Resistor Transducer on a Vacuum Circuit Breaker

BREAKER ANALYZER ACCESSORIES

# UPS S2 portable ac/dc power supply

part number **9002-UC**



## DESCRIPTION

The Vanguard Universal Power Supply S2 (UPS S2) is designed to meet a utility company's substation needs for an independent AC/DC power source for operating circuit breakers. The UPS S2's AC and DC voltage sources can each supply up to 10 amperes during circuit breaker coil energization and circuit breaker charging motor operation.

The variable DC power supply (10 – 300 Vdc) is ideal for use as a substitute primary power source when substation batteries are not available. The UPS S2 is best suited for operating circuit-breakers, powering substation relays, or for un-regulated charging of substation batteries. The AC power supply is a variable isolated power source (10 – 240 Vac) that can be used to power other equipment in the substation.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 21"W x 17"H x 9"D (53 cm x 43cm x 24 cm) <b>Weight:</b> 55 lbs (25 kg)
<b>input power</b>	100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz
<b>DC output voltage</b>	10 – 300 Vdc @ 10 amperes (1 minute)
<b>AC output voltage</b>	10 – 240 Vac @ 10 amperes (1 minute)
<b>safety</b>	designed to meet UL 61010A-1 and CAN/CSA C22.2 No. 10101-92 standards
<b>environment</b>	Operating: -10°C to +50°C (+15°F to +122°F); Storage: -30°C to +70°C (-22°F to +158°F)
<b>humidity</b>	90% RH @ 40°C (104°F) non-condensing
<b>altitude</b>	2,000 m (6,562 ft) to full safety specifications
<b>cables</b>	power cord, ground cable, 10-foot test leads
<b>options</b>	transportation case

CIRCUIT BREAKER POWER SUPPLIES

# UPS S3 portable ac/dc power supply

part number **9140-UC**



## DESCRIPTION

The UPS S3 is an AC/DC adjustable output power supply designed to operate substation circuit breakers. The UPS S3's AC and DC voltage sources can supply up to 10 Amperes during the circuit breaker coil energization and circuit breaker charging motor operation.

Powered by a single phase 90-120 Vac voltage source, the UPS S3 provides an isolated adjustable AC/DC voltage source. Output voltages are variable via the front panel control knob.

The unit's variable AC voltage source (10-140 Vac) is rated at 140 Vac @ 9A continuous. It is also full-wave rectified and filtered to provide an isolated DC voltage source. The DC voltage source (10-200 Vdc) is rated at 180 Vdc@9A (2 seconds) or 180 Vdc @ 2A continuous. Both AC/DC voltage source outputs are protected by a circuit breaker.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17½"W x 11¾"H x 12½" D (44.5 cm x 30 cm x 31.8 cm) <b>Weight:</b> 45 lbs (20.5 kg)
<b>input voltage</b>	100 – 120 Vac, 50/60 Hz
<b>DC output voltage</b>	10 – 200 Vdc
<b>AC output voltage</b>	10 – 140 Vac
<b>output current</b>	9A max @ 140 Vac (20 min on, 30 min off) 9A max @ 140 Vdc (2 sec), 2A (continuous)
<b>safety</b>	designed to meet UL 61010A-1 and CAN/CSA C22.2 No. 10101-92 standards
<b>cables</b>	power cord, ground cable, 10' (3.05m) test leads

# CB PWS *circuit breaker power supply*

part number **9120-UC** [120Vdc], **9121-UC** [240Vdc]



## DESCRIPTION

The CB PWS is a standalone DC power supply designed for operating circuit breakers. This compact and lightweight DC power supply can power the circuit breaker control circuit (trip and close coils, and charging motor) in situations where the substation DC supply is not available.

The CB PWS is powered by a wide AC voltage source (120 -240Vac) and available with factory preset 120Vdc or 240Vdc output.

The CB PWS offers several outstanding features:

- very lightweight (14 lbs / 6.4 kg)
- thermal and short-circuit protected output
- output DC voltage source is isolated from the power input
- wide AC voltage input range (120 Vac to 240 Vac)

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 7"H x 13"D (43.0 cm x 17.8 cm x 33.0 cm) <b>Weight:</b> 14 lbs (6.4 kg)
<b>input voltage</b>	100 – 130 Vac, 50/60 Hz or 200 – 240 Vac, 50/60 Hz
<b>output voltage (120 Vac input voltage)</b>	<b>120 Vdc model:</b> 120 Vdc @ 15A, 10 second duration max (5% regulation) or 120 Vdc @ 4A continuous (3% regulation) <b>240 Vdc model:</b> 240 Vdc @ 7.5A, 10 second duration max (5% regulation) or 240 Vdc @ 2A continuous (3% regulation)
<b>output voltage (240 Vac input voltage)</b>	<b>120 Vdc model:</b> 120 Vdc @ 20A, 10 second duration max (5% regulation) or 120 Vdc @ 4A continuous (3% regulation) <b>240 Vdc model:</b> 240 Vdc @ 10A, 10 second duration max (5% regulation) or 240 Vdc @ 2A continuous (3% regulation)
<b>led indicators</b>	power available, output available, and output fault
<b>safety</b>	designed to meet UL 61010A-1 and CAN/CSA C22.2 No 10101-92 standards
<b>cables</b>	power cord, safety ground, 10ft DC power supply test leads

# CBCT *programmable dc power supply*

part number **9063-UC**



## DESCRIPTION

The Vanguard Circuit Breaker Coil Tester (CBCT) is a variable voltage DC power supply designed specifically to test substation circuit-breaker Open and Close coils. The CBCT uses the substation's DC power supply to electronically generate a programmable output voltage from 5% to 95% of the source voltage.

The CBCT can maintain up to an 80A test current while maintaining 2% or better voltage regulation during the circuit breaker coil operation. The CBCT provides a safe and convenient method for testing minimum operating voltages of Open and Close coils. The CBCT provides a single channel timer that can be used to quickly verify the circuit breaker operation.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 19"W x 7"H x 15" D (48 cm x 17 cm x 38 cm) <b>Weight:</b> 25 lbs (11.3 kg)
<b>input voltage</b>	20 – 300 Vdc, 20A fuse
<b>output voltages</b>	5% – 95% of input voltage with 2% regulation at max current (up to 80A)
<b>output voltage protection</b>	shutdown if current exceeds 80A or if current drawing time exceeds 500 ms @ 80A
<b>output voltage channels</b>	one continuous and one pulse dc output
<b>volt meter range</b>	input/output meters, 0 – 300 Vdc; accuracy: 1% of reading, ±0.2V
<b>timer start input</b>	internal (coil initiation), wet-contact input (20 – 240 Vac/dc) or dry-contact input (1 – 200 ohms)
<b>timer stop input</b>	wet-contact (20 – 240 Vac/dc) or dry-contact (1 – 200 ohms)
<b>timer display range</b>	0.0000 – 999.999 seconds; accuracy: 0.1 ms, ±1 digit
<b>display</b>	back-lit lcd screen (20 characters by 4 lines) viewable in bright sunlight
<b>cables</b>	two 6-foot (1.83m) #8 AWG DC cable sets, two 10-foot (3.05m) cable sets, one ground cable, one cable bag

# VBT-75 S2 *vacuum bottle tester*

part number **9134-UC**



## DESCRIPTION

The VBT-75 S2 is Vanguard's second generation microprocessor-based, portable, 75kV dc vacuum bottle tester. This lightweight, portable tester is designed for testing circuit-breaker vacuum bottles in the field and at the shop.

Test voltages can be selected from 10 kV dc to 75 kV dc in 5 kV steps. The high-voltage test time can be set from 5 seconds to 2 minutes. The test voltage is raised to the selected voltage and held for the test time duration. After the test time duration has elapsed and the leakage current did not pass the pre-set value of 100 µA, 200 µA, or 300 µA, the test voltage is returned to zero and a "Pass" message is displayed. If a flash-over condition occurs, the test voltage is immediately turned off, a "Failure" message is displayed on the LCD screen, and the "TEST FAIL" LED light on the unit is also illuminated.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 10½"H x 6½" D (42.7 cm x 26.9 cm x 16.5 cm) <b>Weight:</b> 10 lbs (4.53 kg)
<b>input power</b>	90 – 240 Vac, 2A, 50/60 Hz
<b>output voltage</b>	10kV – 75 kV dc in 5 kV steps; accuracy: 1.5%
<b>output ripple voltage</b>	3% max
<b>discharge time</b>	maximum discharge time for internal high voltage is 3 seconds
<b>display</b>	back-lit LCD (16 characters x 2 lines); viewable in bright sunlight and low-light levels
<b>failure indicator</b>	failure indicator LED illuminates when test current exceeds 100 µA, 200 µA, 300 µA (programmable)
<b>control</b>	single turn-and-press knob
<b>firmware updates</b>	firmware can be updated in the field via the unit's built-in USB Flash drive interface
<b>cables</b>	one 10-foot (3.05m) high-voltage cable, one 10-foot (3.05m) high voltage return cable, one ground cable, one power cord

## VBT-75P S2 *vacuum bottle tester*

part number **9135-UC**



 **USB Flash drive interface**

### DESCRIPTION

The VBT-75P S2 offers all of the features of the VBT-75 S2 above and also includes a built-in 2½" wide thermal printer along with a rugged membrane keypad for easier data entry.

### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 10½"H x 6½" D (42.7 cm x 26.9 cm x 16.5 cm) <b>Weight:</b> 12 lbs (5.44 kg)
<b>input power</b>	90 – 240 Vac, 2A, 50/60 Hz
<b>output voltage</b>	10kV – 75 kV dc in 5 kV steps; accuracy: 1.5%
<b>output ripple voltage</b>	3% max
<b>discharge time</b>	maximum discharge time for internal high voltage is 3 seconds
<b>display</b>	back-lit LCD (20 characters x 4 lines); viewable in bright sunlight and low-light levels
<b>failure indicator</b>	failure indicator LED illuminates when test current exceeds 100 µA, 200 µA, 300 µA (programmable)
<b>computer interface</b>	USB Flash drive port for test record storage and firmware updates
<b>control</b>	rugged membrane keypad
<b>printer</b>	built-in 2½" wide thermal printer
<b>cables</b>	one 10-foot (3.05m) high-voltage cable, one 10-foot (3.05m) high voltage return cable, one ground cable, one power cord

VACUUM BOTTLE TESTERS

## RFD-200 S3 *portable relay test set*

part number **9032-UC** [110V], **9082-UC** [220V]



### DESCRIPTION

The RFD-200 S3 is a portable relay test set that delivers performance verification testing of electromechanical, electronic, and microprocessor-based protective relays in their operating installations. The RFD-200 S3 is a rugged test set suitable for testing a variety of protection relays operated in both indoor and outdoor environments. The unit's ergonomic design and intuitive control panel layout make it ideal for first-time users who have little or no training.

### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 12"D, (42.7 cm x 32.0 cm x 30.5 cm); <b>Weight:</b> 35 lbs (15.9 kg)
<b>input power</b>	100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz
<b>ampere meter input ranges</b>	<b>internal input range:</b> 0 – 250 A; Accuracy: 2% of reading ±10 mA <b>external AC input range:</b> 0 – 6A; Accuracy: 1% of reading ±10mA <b>external DC input range:</b> 0 – 6A; Accuracy: 0.5% of reading ±1 count <b>measurement method:</b> true RMS for AC
<b>volt meter input range</b>	0 – 600.0V AC accuracy: 1% of reading ±1 count DC accuracy 0.5% of reading ±1 count measurement method: true RMS for AC
<b>power resistors</b>	5 Ω/50 W, 1 Ω/50 W, 25 Ω/50 W, 100 Ω/50 W, 500 Ω/50 W
<b>dry contact output</b>	3A, 240 Vac or 120 Vdc
<b>auxiliary power supplies</b>	24 Vdc @ 1A, 48 Vdc @ 0.25 A, 124 Vdc @ 0.125 A

RELAY TEST EQUIPMENT

## RFD-200F *portable relay test set*

part number **9098-UC**



 **USB PC interface**

 **USB Flash drive interface**

### DESCRIPTION

The RFD-200F is a digitally-controlled single phase relay tester. It can serve as a primary AC current source (250A), AC voltage source (250 Vac), or a DC voltage source (300 Vdc). It also provides an independent secondary AC or DC current source (20A) as well as a secondary independent AC or DC voltage source (140V).

The RFD-200F features an auxiliary DC programmable power supply (20 – 240 Vdc) that can power the relay under test. It uses a digital timer with two event input channels for relay testing. The RFD-200F features one external volt meter and one external ammeter.

Test results can be printed on the unit's built-in 2.5" wide thermal printer. Up to 100 test records and test plans can be stored internally and can be transferred to a PC using the unit's USB Flash drive interface. The RFD-200F supports stand-alone mode or can be computer-controlled.

### SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 19"W x 13"H x 16"D (48.3 cm x 33.0 cm x 40.6 cm) <b>Weight:</b> 45 lbs (20.4 kg)
<b>outputs</b>	<b>I1:</b> 0-250 A/0.1 A step, 40-100 Hz/0.01Hz step <b>V1ac:</b> 0-250 Vac/1 V step, 40-100 Hz/0.01 Hz step <b>V1dc:</b> 0-300 V/1 V step <b>I2ac:</b> 0-20 A/0.01 A step, 15-500 Hz/0.01 Hz step <b>I2dc:</b> 0-20 A, 0.01 A step <b>V2ac:</b> 0-140 Vac/0.1V step, 15-500 Hz/0.01 Hz step <b>V2dc:</b> 0-140 Vdc/0.1 V step <b>Aux DC:</b> 20-240 Vdc/1 V step
<b>timer</b>	0 – 99999.9 seconds; 0 – 500,000 cycles
<b>external volt meter</b>	0 – 600 Vrms, Accuracy: 0.5% ±0.5 V
<b>external ammeter</b>	0 – 6 Arms, Accuracy: 0.5% ±0.1A
<b>event input channels</b>	channels A and B: wet input (0 – 300V) or dry input
<b>display</b>	back-lit LCD screen (240 x 128 pixels)
<b>pc software</b>	Windows-based software included with purchase price
<b>internal data storage</b>	up to 100 test records and 100 test plans
<b>printer</b>	built-in 2½" wide thermal printer

# RFD-200L *portable relay test set*

part number **9136-UC**

RELAY TEST EQUIPMENT



USB  
PC interface



USB Flash  
drive interface

## DESCRIPTION

The Vanguard RFD-200L is a digitally-controlled single phase relay tester. It features multiple functions that make relay testing simple and efficient. Relay testing can be automated using test plans created on the PC that specify relay test parameters. The RFD-200L's high output current and voltage sources can be used to test electromechanical and digital relays in their operating environment.

Test results can be viewed on the unit's back-lit LCD screen (240 x 128 pixels). Both test records and test plans can be stored internally and transferred to a PC via the USB Flash drive or USB PC interface.

The RFD-200F can be operated in standalone mode or can be PC-controlled. The user interface features a back-lit LCD screen (240x128 pixels), a 16-key rugged membrane keypad, and a control knob.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 15"W x 12½"H x 13"D (38.1 cm x 31.8 cm x 33.0 cm) <b>Weight:</b> 43 lbs (19.5 kg)
<b>outputs</b>	<b>I1:</b> 0-250 A/0.1 A step, 40-100 Hz/0.01Hz step <b>V1ac:</b> 0-250 Vac/1 V step, 40-100 Hz/0.01 Hz step <b>V1dc:</b> 0-300 V/1 V step <b>I2ac:</b> 0-20 A/0.01 A step, 15-500 Hz/0.01 Hz step <b>I2dc:</b> 0-20 A, 0.01 A step <b>V2ac:</b> 0-140 Vac/0.1V step, 15-500 Hz/0.01 Hz step <b>V2dc:</b> 0-140 Vdc/0.1 V step <b>Aux DC:</b> 20-240 Vdc/1 V step
<b>timer</b>	0 – 99999.9 seconds; 0 – 500,000 cycles
<b>external volt meter</b>	0 – 600 Vrms, Accuracy: 0.5% ±0.5 V
<b>external ammeter</b>	0 – 6 Arms, Accuracy: 0.5% ±0.1A
<b>event input channels</b>	channels A and B: wet input (0 – 300V) or dry input
<b>display</b>	back-lit LCD screen (240 x 128 pixels)
<b>pc software</b>	Windows-based software included with purchase price
<b>internal data storage</b>	up to 100 test records and 100 test plans

# PCI-600 *portable relay test set*

part number **9029-UC** [110V], **9058-UC** [220V]



## DESCRIPTION

The PCI-600 is a programmable AC high-current source designed specifically for utility-substation applications. The PCI-600 injects a current on a substation bus to verify the relay settings and CT output.

This versatile device can also be used for testing thermal, magnetic, and solid-state motor-protection relays and molded-case circuit-breakers, as well as any application that requires a high-current source.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12.5"H x 10.5"D, (42.6 cm x 32 cm x 27 cm) <b>Weight:</b> 46 lbs (21 kg)
<b>input power</b>	100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz
<b>output current</b>	10 – 600 A
<b>internal current meter</b>	100 mA – 1000 A; accuracy: 1% of reading, ±20 mA
<b>external meter range</b>	10 mA – 10 A; accuracy: 1% of reading, ±2 mA
<b>timer reading range</b>	1 ms – 2 hours; accuracy: 0.1% of reading ±1ms
<b>timer stop input</b>	voltage input (24 – 300 V, DC or peak AC), dry-contact input, or removal of primary current
<b>cables</b>	10-foot (3.05m) #1/0 AWG test leads, power cord, ground cable

# IRM-5000P *insulation resistance meter*

part number **9049-UC** [110V], **9050-UC** [220V]

INSULATION RESISTANCE METER



RS-232C  
PC interface

## DESCRIPTION

The IRM-5000P is a microprocessor-based, high-voltage, insulation-test ohmmeter. The rugged and portable IRM-5000P is ideal for use in electric utility substations and for industrial applications.

The IRM-5000P can perform Resistance, Polarization Index, Step Voltage, and Dielectric Discharge tests automatically. It can also store up to 100 records in Flash EEPROM, and records can be downloaded to a PC.

The unit's built-in 2.5-inch wide thermal printer can print test results in the field.

## SPECIFICATIONS

<b>physical specs</b>	<b>Dimensions:</b> 17"W x 12½"H x 12"D, (42.7 cm x 32.0 cm x 30.5 cm); <b>Weight:</b> 35 lbs (15.9 kg)
<b>input power</b>	100 – 120 Vac or 220 – 240 Vac (selectable), 50/60Hz
<b>resistance reading range (0°C to +30°C)</b>	100 K-ohms – 1 M-ohm ±20%, 1 M-ohm – 1 T-ohm ±5%, 1 T-ohm – 5 T-ohm ±20%, 5kV; 100 K-ohms – 1 M-ohm ±20%, 1 M-ohm – 100 G-ohms ±5%, 100 G-ohms – 500 G-ohms ±5%, 500 V; 1 M-ohm – 10 G-ohms ±5%, 50 V
<b>test voltage</b>	selectable from 50Vdc – 5 Kvdc, in 2 Vdc steps
<b>output voltage accuracy</b>	±2% ±1v of selected voltage with load resistance > 100 M-ohm
<b>short circuit current</b>	2 mA max
<b>current reading range</b>	0.03 mA – 2 mA; Accuracy: ±5% ±0.2 mA
<b>capacitance reading range</b>	0.01 µF – 10.0 µF (Test voltage >100V), Accuracy ±5% ±0.03 µF (0°C to +30°C)
<b>voltage reading range</b>	50 – 1250 Vac (rms) or dc; Accuracy: ±5%, ±1V
<b>capacitor discharge</b>	less than 2 Sec/µF, automatic at the end of test
<b>hum rejection</b>	1mA per 1kv of fast voltage, 2mA rms maximum
<b>computer interface</b>	RS-232C
<b>cables</b>	one 6-foot (1.83m) cable set, one 15-foot (4.57m) cable set, ground cable, power cord, cable bag

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**FAX:** 909.923.9391  
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1520 S Hellman Avenue  
Ontario, CA 91761, US

## Canada

### Accutech

**Web:** [www.accutech.ca](http://www.accutech.ca)  
**Phone:** 780.434.0501  
**Contact:** Luc Claeys (LClaeys@accutech.ca)  
**Mailing Address:**  
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Canada

## Malaysia

### Labmetrik Electrical Sdn Bhd

**Web:** [www.labmetrik.com](http://www.labmetrik.com)  
**Phone:** +60 3927 440 11 / 33 / 77  
**Contact:** Eric Oh (eric@labmetrik.com)  
**Mailing Address:**  
19, Jalan Pandan Perdana 10/12  
Taman Pandan Perdana  
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Malaysia

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### Dynamics Circuit

**Web:** [www.dynamicscircuit.com](http://www.dynamicscircuit.com)  
**Phone:** +65 6554 7024  
**Contact:** Mr. Kannan (kannan@dynamicscircuit.com)  
**Mailing Address:**  
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Singapore, 787494

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### TestOne Teknoloji Cozumleri

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**Contact:** Bedriye Doner (bedriyed@testone.com.tr)  
**Mailing Address:**  
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## Vietnam

### Ha Long Inspection and Technical Service J.S.C. (HAINTEC)

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**Phone:** +84 4 35378919  
**Contact:** Mr. Pham Dinh Duc (pdduc@haintec.com)  
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## Instruments designed and developed by the hearts and minds of utility electricians around the world

Vanguard Instruments Company, (VIC), was founded in 1991. Currently, our 28,000 square-foot facility houses Administration, Design & Engineering, and Manufacturing operations. From its inception, VIC's vision was, and is to develop and manufacture innovative test equipment for use in testing substation EHV circuit breakers and other electrical apparatus.

The first VIC product was a computerized circuitbreaker analyzer, which was a resounding success. It became the forerunner of an entire series of circuitbreaker test equipment. Since its beginning, VIC's product line has expanded to include microcomputer-based, precision micro-ohmmeters, single and three phase transformer winding turns-ratio testers, transformer winding-resistance meters, mega-ohm resistance meters, and a variety of other electrical utility maintenance support products.

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