# DigiTMR S2

*digital circuit breaker analyzer*



**Vanguard Instruments Company, Inc.**

www.vanguard-instruments.com

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## Product Overview

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 back-lit LCD screen and can also be printed on the built-in 4½" wide thermal printer.

### ordering information

| Part No. | Description |
|---|---|
| 9005-UC | DIGITMR S2, cables, and PC software |
| 9005-SC | DIGITMR S2 shipping case |
| 9005-OT | On-line timing option |
| 9005-BT | Bluetooth option |
| TP4-CS | TP4 thermal printer paper (24 rolls) |

## "On-line" Timing Mode

In addition to the conventional off-line timing mode, the DIGITMR S2 also offers an optional "on-line" timing mode. In this mode, the DIGITMR S2 captures the breaker's trip or close time, the trip/close coil current "fingerprint," and the battery supply voltage while the breaker is still in service. The trip/close time is derived from the time of trip, or close coil initiation, to the breaker's bushing current breaker-make as detected by an AC clamp-on current sensing probe.

The "on-line" timing mode can detect a breaker's operating conditions with little or no down time. In this mode, the first trip operation time of the breaker is captured. If a breaker has been in service for a long period of time and sitting in close position, the first trip time of the breaker may be slow possibly due to a sticky mechanism. The "on-line" mode is very useful in such cases because traditional breaker timing may not detect this condition since several operations may have occurred before the first timing test is conducted.

## Diagnostic Capabilities

The DIGITMR S2 can perform diagnostics on its internal electronics. Diagnostics can be performed to verify contact cable connections and to test the travel transducer's electronics.

## Open/Close Coil Current Monitoring

A built-in Hall-Effect current sensor records the circuit breaker's operating coil current amplitude and duration. The circuit breakers' operating-coil waveforms (effectively, a performance "fingerprint" or "current profile") can be used as a diagnostic tool for analyzing a circuit breaker's performance.

## Voltage Monitoring Input

One analog input channel, designated as (V1), is dedicated to monitoring the substation DC supply or coil voltage (0-255 Volts, DC or peak AC). A second voltage input channel, designated as V2, is dedicated to detecting voltage On/Off status (presence or absence). This input can be used to monitor the status of an A/B switch.

## Internal Test Record and Test Plan Storage

The DIGITMR S2 can store up to 200 test records and 100 circuit breaker test plans in Flash EEPROM. A test plan comprises of all circuit breaker performance specifications (Stroke, Velocity, and Contact Time). When a test plan is used, the DIGITMR S2 compares the test results for the circuit breaker against its performance to generate a "Pass/Fail" report.

Test plans are generated using the included Windows®-based Circuit Breaker Analysis application. Test plans can be transferred to the DIGITMR S2 via the USB or optional Bluetooth interface, or by using an external USB Flash drive. Up to 999 test records and 999 test plans can be stored on an external USB Flash drive.

## Contact Timing Inputs

Dry-contact input channels are used for timing circuit-breaker contacts. Each contact input channel can detect main contact and insertion-resistor contact times in milli-seconds and cycles. Three contact timing channels are available on the DIGITMR S2.

## Breaker Stroke and Velocity

One digital transducer input channel is available to measure circuit breaker contact stroke, velocity, over-travel, and bounce-back. With the use of a Vanguard digital travel transducer, no set-up calibration is required before testing. A special feature is also available to "Slow-Close" test a circuit breaker and obtain test results. An optional Resistor Transducer Adapter Device can be used to interface with any resistor transducer.

## CT Input

One non-contact AC current sensor is used to monitor circuit breaker on-line current for the "on-line" timing mode.

## Circuit Breaker Initiate Feature

A built-in solid-state initiate device is used to operate the circuit breaker from the DIGITMR S2. Operational modes include Open, Close, Open-Close, Close-Open, and Open-Close-Open. Multiple operations such as Open-Close, Close-Open, and Open-Close-Open can be initiated using a programmable delay or by sensing the circuit breaker's contact condition. The circuit breaker coil current amplitudes and waveforms are recorded and can be printed on the thermal printer.

# DIGITMR S2 Features



- voltage input channels
- external trigger input connector
- digital transducer connector
- AC clamp-on current probe
- bluetooth indicator
- USB flash drive interface
- contact timing input
- 5" back-lit LCD screen (240 x 128 pixels)
- USB PC interface
- breaker initiate output
- breaker initiate arm switch
- rugged "QWERTY" membrane keypad
- 4½" wide thermal printer

## Computer Interface

One USB interface port and one optional Bluetooth interface is available for computer-control. Vanguard's Windows®- based Circuit Breaker Analyzer application is included with each DIGITMR S2. The software can be used to control the unit, review test records, and create circuit breaker test plans. Test records can be exported to PDF, Excel, and XML format. All future software updates can be downloaded from the Vanguard web site at no additional charge.

## User Interface

The DIGITMR features a back-lit (256 x 128 pixels) graphic LCD screen to display menus and test results. A convenient, rugged, 44-key QWERTY-style keypad is used to control the unit and enter data.

## Built-in Thermal Printer

The DIGITMR S2 features a built-in 4½" wide thermal printer that can print test results in both tabulated and graphic format.
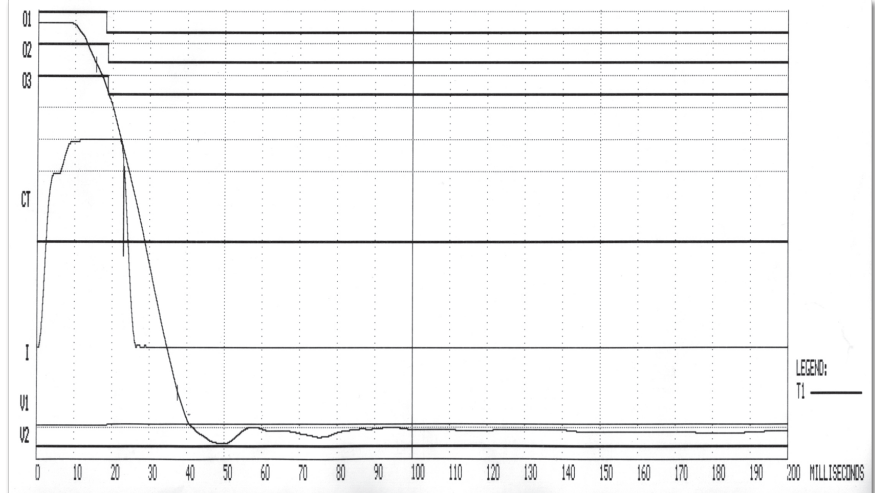
## DIGITMR S2 connections
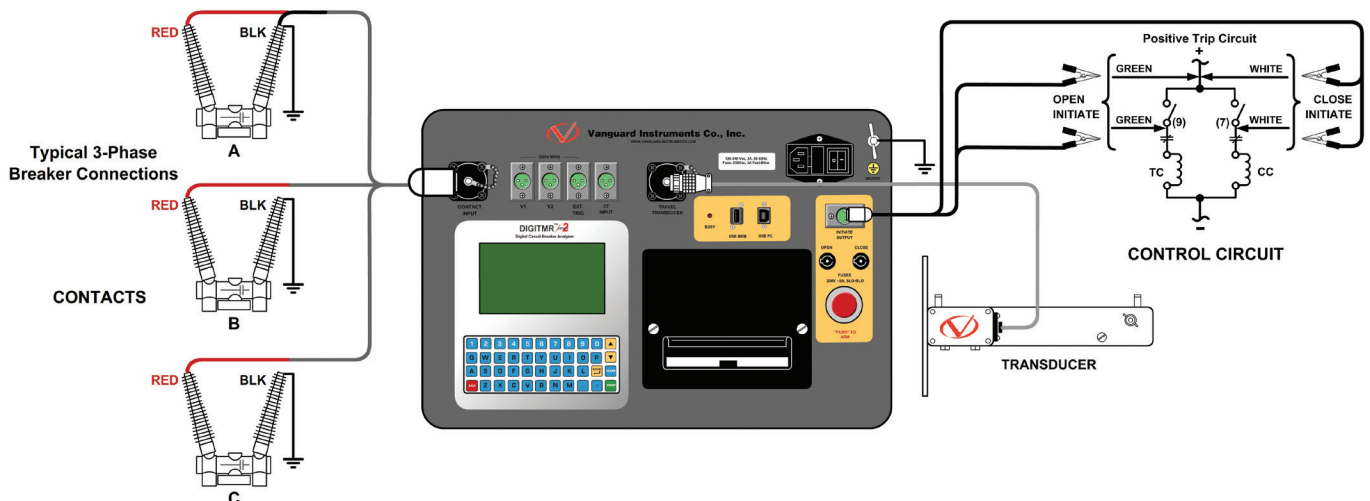
# DIGITMR S2 thermal printer output



Thermal printout of tabulated test results



Thermal printout of graphic test results

# DIGITMR S2 desktop printer output



Desktop printout of tabulated test results from VCBA S2 software
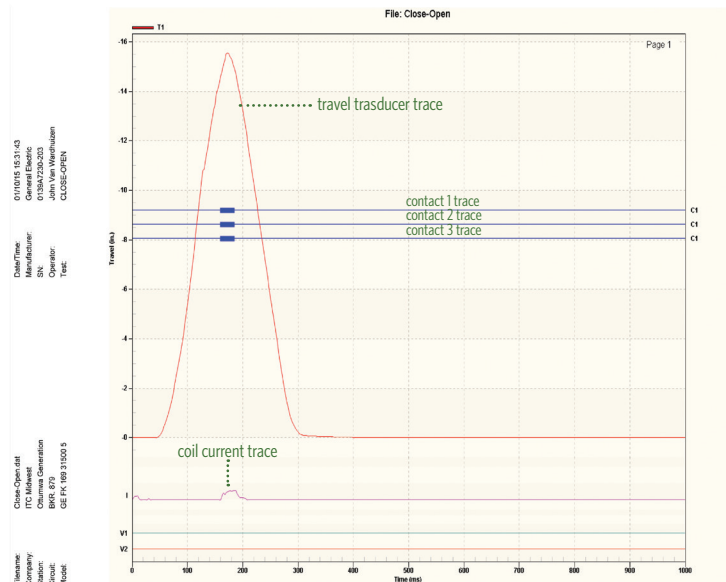


Desktop printout of graphic test results from VCBA S2 software

# VCBA S2 Software

The DIGITMR S2 comes with the Vanguard Circuit Breaker Analysis Series 2 (VCBA S2) PC software. The VCBA S2 software can be used to retrieve timing records from the DIGITMR S2, analyze retrieved records, view test results in graphic format, generate timing reports, create breaker test plans, transfer breaker test plans to the DIGITMR S2, and control the unit from the PC to perform timing tests. The software can also be used to print test results to a desktop printer.

The latest version of the VCBA S2 software can always be downloaded free from the Vanguard web site at **www.vanguard-instruments.com**. Please note that you will need to create a free account on our site in order to download software or firmware.
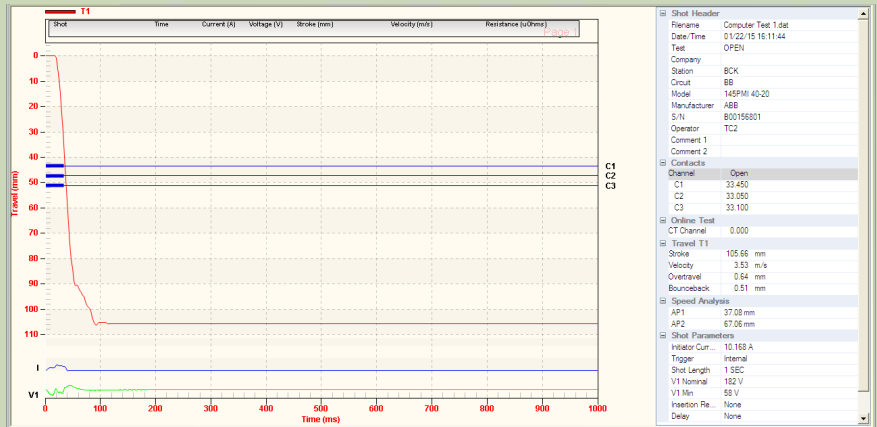
# DIGITMR S2 *technical specifications*

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|---|---|---|---|---|---|
| **physical specifications** | **Dimensions:** 18½"W x 14"H x 7" D (47 cm x 35.7 cm x 17.6 cm) **Weight:** 20 lbs. (9.1 Kg) | | **input power** | 3 A, 100 – 240 Vac, 50/60 Hz | |
| **dry-contact inputs** | 3 dry-contact channels; each channel detects main contact and insertion resistor contact | | **timing windows** | 1 second, 10 seconds, or 20 seconds | |
| **timing resolutions** | ±50 micro-seconds @ 1 sec. duration, ±500 micro-seconds @ 10 sec. duration, ±1.0 milliseconds @ 20 sec. duration | | | | |
| **timing accuracy** | 0.05% of reading ±0.1 milliseconds @ 1 second duration | | **dry-contact detection range** | **closed:** less than 20 ohms; **open:** greater than 5,000 ohms | |
| **resistor detection range** | 50 – 5,000 ohms | | **trigger input voltage** | open/close: 30 – 300 V, dc or peak ac | |
| **voltage sensing input range** | V1: analog input; 0 – 255 V dc or peak ac; sensitivity ±1 V V2: voltage presence/absense detector input: 30 – 300 V dc or peak ac | | **breaker operations** | initiate open, close, open-close, close-open, open-close-open | |
| **breaker initiate capacity** | 30 A, 250 V ac/dc max | | **CT current sensor** | one, non-contact, 0 – 100A | |
| **digital travel transducer input** | 1 digital travel transducer channel; linear range: 0.0 – 60.0 in (±0.005 in); rotary range: 0 – 360 degrees (±0.006 degrees) | | | | |
| **initiate current reading range** | one, non-contact, Hall-effect sensor, 0 – 20 amp range, dc to 5 Khz ac | | **contact travel point difference** | measures "slow-close" contact-point distances; results can be printed | |
| **display** | 5" back-lit LCD screen (240 x 128 pixels); viewable in bright sunlight and low light levels | | **internal test record storage** | stores up to 200 test records and 100 test plans | |
| **printer** | built-in 4½" wide thermal printer that can print both graphic contact travel waveforms and tabulated test results | | **computer interfaces** | one USB port, optional Bluetooth interface | |
| **pc software** | Windows®-based Circuit Breaker Analysis software (VCBA S2) included with purchase price. Software updates available at no additional charge | | **safety** | designed to meet UL/IEC 61010 and CAN/CSA C22.2 No. 1010.1-92 standards | |
| **temperature** | **Operating:** -10°C to +50°C (+15°F to +122°F) **Storage:** -30°C to +70°C (-22°F to +158°F) | | **humidity** | 90% RH @ 40°C (104°F) non-condensing | |
| **cables** | furnished with full set of test leads, including 20-foot (6.10m) contact leads and 30-foot (9.14m) contact lead extensions | | **altitude** | 2,000 m (6,562 ft) to full safety specifications | |
| **options** | shipping case available for the DIGITMR S2 PC and travel transducers | | **warranty** | one year on parts and labor | |

**NOTE :** the above specifications are valid at nominal voltage and ambient temperature of +25°C (+77°F). Specifications are subject to change without notice.

**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 circuit breaker analyzer, which was a resounding success. It became the forerunner of an entire series of circuit breaker 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.

VIC's performance-oriented products are well suited for the utility industry. They are rugged, reliable, accurate, user friendly, and most are computer controlled. Computer control, with innovative programming, provides many automated testing functions. VIC's instruments eliminate tedious and time-consuming operations, while providing fast, complex, test-result calculations. Errors are reduced and the need to memorize long sequences of procedural steps is eliminated. Every VIC instrument is competitively priced and is covered by a liberal warranty.

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