

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



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.

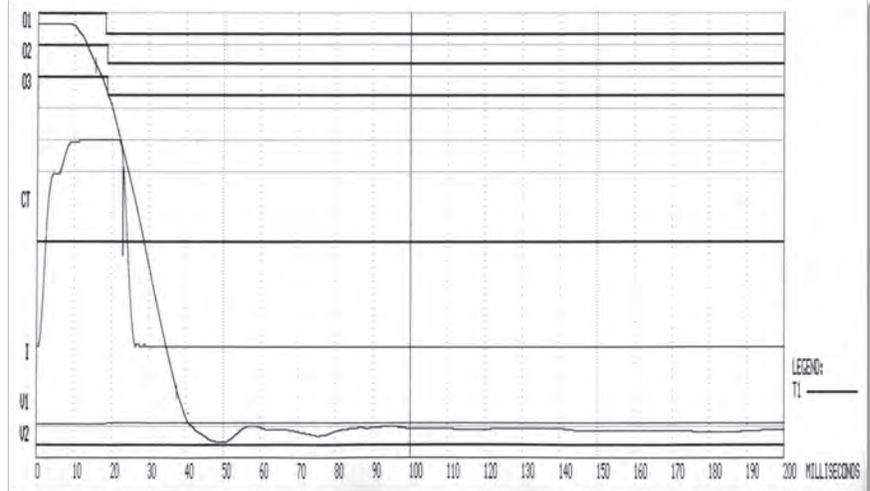
DIGITMR S2 connections



DIGITMR S2 thermal printer output

BREAKER TIMING RESULTS - 60 Hz			
SHOT NUMBER: 1			
DATE: 01/09/15 TIME: 09:24:29			
COMPANY: VANGUARD INSTRUMENTS			
STATION: NERA			
CIRCUIT: 220KV			
MFR: MITSUBISHI			
MODEL: 200 SFMT 63P			
S/N: OPERATOR: SPK			
TEST: OPEN			
CONTACT TIME			
CH	TIME	CYCLE	BOUNCE HIPE
	<ms>	<ms>	<ms>
1	18.05	1.09	0.10 30.4
2	18.35	1.11	0.05 33.0
3	18.35	1.11	0.05 33.0
DELTA TIME <ms>: 0.50			
CT CHANNEL ANALYSIS			
TIME CYCLE			
<ms> 0.00 0.00			
TRAVEL ANALYSIS T1			
STROKE mm 198.0			
SPEED M/S 7.21			
OVER-TRAVEL mm 5.2			
BOUNCE BACK mm 2.9			
SPEED ANALYSIS:			
POINT 1 = 10%			
POINT 2 = 90%			
UI NOMINAL VOLTAGE = 1 VOLTS			
UI MINIMUM VOLTAGE = 0 VOLTS			
INITIATOR CURRENT = 14.2 AMPS			
SHOT LENGTH: 1 SECOND			
INSERTION RESISTOR: NO			
TRIGGER: INTERNAL			

Thermal printout of tabulated test results



Thermal printout of graphic test results

DIGITMR S2 desktop printer output

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Filename: Close-Open.dat Date/Time: 01/10/15 15:31:43
 Company: Manufacturer:
 Station: S/N:
 Circuit: Operator:
 Model: Test: CLOSE-OPEN

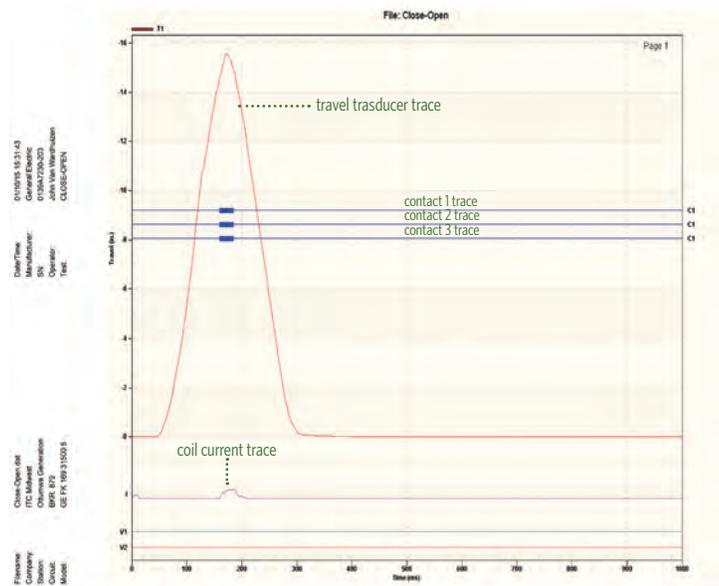
CONTACT (CLOSE)			CONTACT (OPEN)				
CHA	P/F Time(ms)	Cycle	Bounce(ms)	CHA	P/F Time(ms)	Cycle	Bounce(ms)
1	158.750	9.52	2.70	1	185.150	11.11	1.05
2	161.950	9.72	2.20	2	185.500	11.13	0.25
3	163.050	9.78	2.45	3	186.450	11.19	0.10
4	0.000	0.00	0.00	4	0.000	0.00	0.00
5	0.000	0.00	0.00	5	0.000	0.00	0.00
6	0.000	0.00	0.00	6	0.000	0.00	0.00

Delta Time(ms): 4.300 Delta Time(ms): 1.300

Travel Analysis	T1	T2	T3
Peak To Peak (n.)	15.965	0.600	0.000

Initiator Current: 11.644 A V1 Nominal: 1V V1 Min: 0V
 Shot Length: 1 SEC
 Insertion Resistor: None
 Delay: CONTACT #1
 Trigger: Internal

Desktop printout of tabulated test results from VCBA S2 software

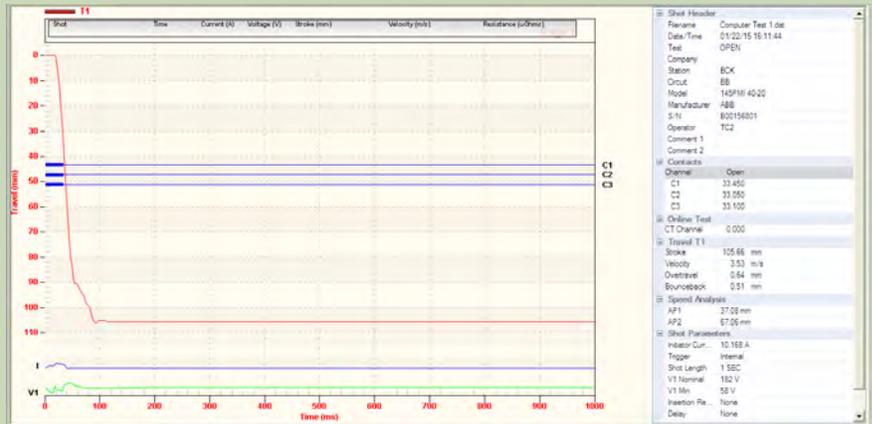


Desktop printout of graphic test results from VCBA S2 software

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

 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/absence 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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