


Digital Circuit Breaker Analyzer



CBT-8000

amperis

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The CBT-8000 is Vanguard's fifth generation, stand-alone, microprocessor-driven EHV circuit-breaker analyzer. This easy to use analyzer is available in models with either 3 (CBT-8000-3) or 6 (CBT-8000-6) dry-contact inputs. Both models feature three digital travel transducer input channels. The CBT-8000 can operate either in Time-Travel analyzer mode or in Quick-Shot mode (for on-line timing).

Quick-Shot Mode

In Quick-Shot mode, the CBT-8000 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-break-or-make as detected by an AC clamp-on current sensing probe.

With a simple connection, the Quick-Shot mode can detect a breaker's operating conditions with little or no down time. In Quick-Shot 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 Quick-Shot 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.

Conventional Time-Travel Analysis Mode

In Time-Travel mode, the CBT-8000 can fully analyze a circuit-breaker's performance by testing the contact time, stroke, velocity, over-travel, and contact wipe. Contact-motion analysis can be performed for all breaker contact operations (Open, Close, Open - Close, Close - Open, and Open - Close - Open). The CT-8000 S2's timing window is selectable between 1-second, 10-second, or 20-second periods. The 10-second and 20-second timing windows are ideal for timing long duration events such as circuit-switcher contact testing.

Contact Timing Inputs

Dry-contact input channels are used for timing breaker contacts. Each contact input channel can detect main contact and insertion-resistor contact times in milliseconds and cycles.



Linear Transducer

Voltage Monitoring Inputs

One analog voltage input channel, designated as V1, is dedicated to monitoring a circuit-breaker's DC power supply or coil voltage (0 – 255 volts, DC or peak AC). A second voltage input channel, designated as V2, is dedicated to detecting the voltage on/off status (presence or absence) of an A/B switch.

Trip/Close Current Monitoring

A built-in Hall-effect current sensor records the Trip/Close current level and duration. The breaker's operate-coil current waveform duration (effectively, a performance "fingerprint" or "current profile") can be used as a diagnostic tool for analyzing a breaker's performance.

Breaker Stroke and Velocity

Three digital travel transducer channels are available on the CBT-8000 for measuring circuit-breaker velocity, stroke, over-travel, and bounce-back. Unlike other transducer types, the digital transducer requires neither calibration nor setup. A breaker's contact velocity is calculated based on the contact's travel distance over a period of time. A special feature is also available to "slow-close" test a breaker and obtain a test result report.

Dynamic Contact Resistance

Using a 200-ampere, built-in, DC power supply, the CBT-8000 can also perform dynamic-resistance tests. One channel is available for performing a dynamic contact resistance test. The resistance measuring range is from 1 micro-ohm to 1,999 micro-ohms. Using this test, the contact resistance can be monitored during circuit-breaker operation. This important feature can help detect circuitbreaker contact erosion or other contact problems that cannot be detected in static-resistance tests. The CBT-8000 can also be used as a 200-ampere micro-ohmmeter to test circuit-breaker contact resistance and bus connections, or can be used for other applications where a low-resistance measurement is required.

Resistor Type Transducer Input

One resistor type input channel is also available on the CBT-8000. This input channel allows the unit to measure circuit-breaker motion by directly interfacing with resistive type transducers. The transducer resistance ranges from 200 ohms to 10K Ohms.

Breaker Initiate Features

A built-in solid-state initiate device is used to operate a breaker from the CBT-8000. The operational modes include Open, Close, Open – Close, Close – Open, and Open – Close – Open. Multiple operations, such as Open – Close and Open – Close – Open, can be initiated by using programmable delay time or by sensing a breaker's contact condition.



ABB AHMA-8 Mechanism Transducer

Internal Test Record Storage

The CBT-8000 can store up to 150 test records in Flash EEPROM. Test records can be retrieved and printed on the built-in thermal printer, or they can be transferred to a PC via the unit's RS-232C or USB interface.

Internal Breaker Test Plan Storage

The CBT-8000 can store up to 99 circuit-breaker test plans. Test plans are comprised of all circuit-breaker performance specifications (stroke, velocity, and contact time). A test plan can be used to immediately test a circuit-breaker. A pass/fail report is then generated by comparing actual performance with the specifications in the stored test plan. Test plans can also be generated on a PC and transferred to the CBT-8000 via the unit's RS-232C or USB interface.

Computer Interface

The CBT-8000 can be computer-controlled via its RS-232C or USB interface. A Windows® XP/Vista-based Breaker-Analysis software application is provided with each unit. Using this software, circuit-breakers can be timed from the PC. Test records can be retrieved from the CBT-8000 and then stored on the PC for future analysis and report generation. Circuit-breaker test plans can also be created on the PC and transferred to the CBT-8000. Additionally, test records can be exported in Microsoft® Excel format for further analysis.

User Interface

The CBT-8000 features a back-lit LCD screen (20 characters by 4 lines) that is viewable in both bright sunlight and low-light levels. A rugged, 16-key, membrane keypad is used to control the unit.

Built-in Thermal Printer

The CBT-8000's built-in 4.5-inch wide thermal printer can print the breaker contact analysis results in both tabular and graphic formats.

BREAKER TIMING RESULTS - 60 Hz

SHOT NUMBER: 0003
DATE: 06-02-00 TIME: 09:10:41

COMPANY: VANGUARD INSTRUMENT
STATION: DARTMOUTH
CIRCUIT:
HPR: ITE
MODEL: 14 4K6
S/N: R321003
OPERATOR: HAI NGUYEN

TEST: OPEN

CH	TIME	CYCLE	BOUNCE	WIRE
1	000.00	00.00	000.00	00.00
2	000.00	00.00	000.00	00.00
3	000.00	00.00	000.00	00.00

CT CHANNEL ANALYSIS

TIME	CYCLE
034.70	02.08

TRAVEL ANALYSIS T1

STROKE	IN	00.00
SPEED	F1.75	00.00
CURR-TRAVEL	IN	00.00
BOUNCE BACK	IN	00.00

SPEED ANALYSIS:

POINT 1 = 01.00 IN
POINT 2 = 05.00 IN

U1 HORIZONTAL VOLTAGE = 0 VOLTS
U1 HORIZONTAL VOLTAGE = 0 VOLTS
INITIATOR CURRENT = 04.7 ANPS

SHOT LENGTH: 1 SECOND
INSERTION RESISTOR: INTERNAL
TRIGGER:

EEPROM Stored Test Parameters

Graphic and Tabulated Printouts

TEST PLAN NUMBER 19

HPR: SP-72
TYPE: SISEM
COMMENT: TYPICAL TEST PLAN1

CONTACT TIME PARAMETERS

	OPEN	CLOSE
RAK (MS)	092.0	100.0
RIH (MS)	029.0	090.0
DELTA L1H (MS)	003.0	003.0

RESISTOR TIME PARAMETERS

	OPEN	CLOSE
DELTA L1H (MS)	000.0	000.0
DELTA L1H (MS)	000.0	000.0

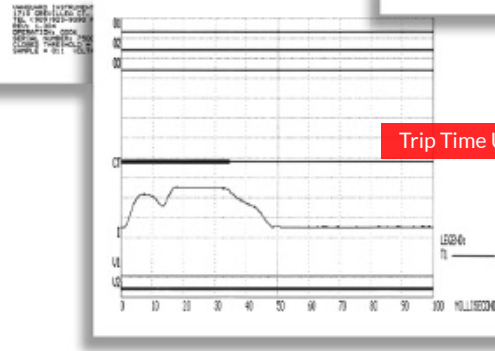
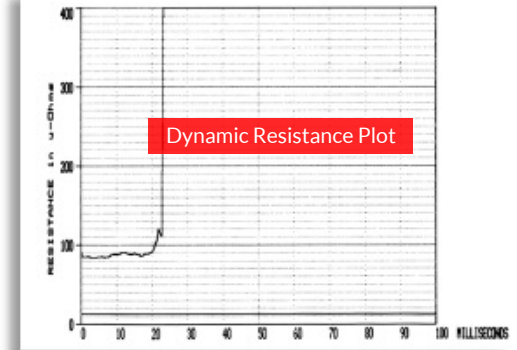
TRAVEL PARAMETERS

STAK	VEL	D-T
IN	F1.75	15

OPEN HI 04.99 16.20 00.
OPEN LOH 04.87 14.88 00.
CLOSE HI 04.99 09.00 00.
CLOSE LO 04.87 05.50 00.

ANALYSIS POINTS

OPEN AP1: 01.00 IN
OPEN SP2: 06.00 IN
CLOSE AP1: 00.80 IN
CLOSE AP2: 01.80 IN



BREAKER TIMING RESULTS

SHOT NUMBER: 0027
DATE: 02-21-99 TIME: 16:06:57

COMPANY: VANGUARD INSTRUMENT
STATION: DARTMOUTH
CIRCUIT:
HPR: ITE
MODEL: 14 4K600 30B
S/N: 62269 1108
OPERATOR: HAI NGUYEN

TEST: OPEN

CH	TIME	CYCLES	BOUNCE	WIRE
1	173.00	10.32	002.90	
2	170.00	10.30	001.40	
3	170.90	10.22	001.10	

CONTACT OPEN TIME

CH	TIME	CYCLES	BOUNCE	WIRE
1	184.70	11.60	000.10	
2	198.90	11.93	000.20	
3	199.60	11.98	000.20	

CONTACT LEAVE TIME

CH	TIME	CYCLES
1	024.70	01.48
2	028.90	01.73
3	029.30	01.76

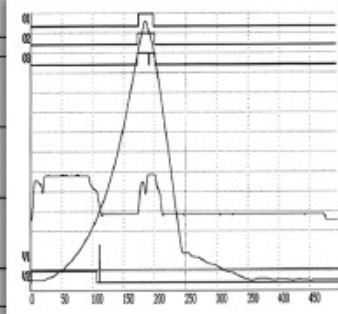
PEAK TO PEAK TRAVEL (IN)

T1

07.42

U1 HORIZONTAL VOLTAGE = 10 VOLTS
U1 HORIZONTAL VOLTAGE = 0 VOLTS
INITIATOR CURRENT = 04.6 ANPS

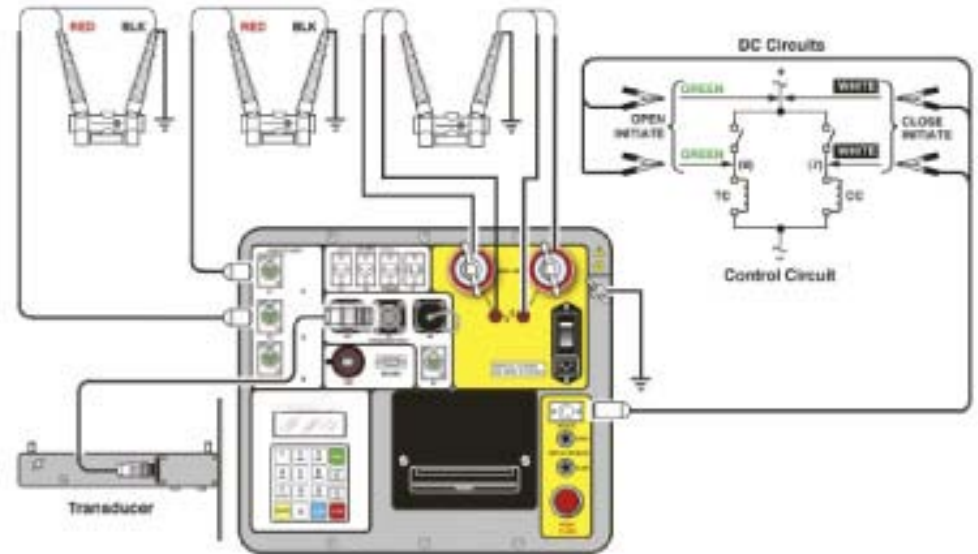
SHOT LENGTH: 1 SECOND
INSERTION RESISTOR: INTERNAL
TRIGGER: DELAY



SPECIFICATIONS

TYPE	Portable circuit-breaker analyzer
PHYSICAL SPECIFICATIONS	16"W x 11"H x 14"D (40.6 cm x 29.9 cm x 35.6 cm); Weight: 25 lbs (11.3 kg)
INPUT POWER	100 – 120 Vac or 200 – 240 Vac (selectable), 50/60Hz
DRY-CONTACT INPUT	3 or 6 dry-input channels (depending on model). Each channel detects main and insertion-resistor contacts
TIMING WINDOWS	1-second, 10-seconds, or 20-seconds
TIMING RESOLUTIONS	±50 micro-seconds @ 1-second duration, ±0.5 milli-seconds @ 10-second duration, ±1.00 milliseconds @ 20-second duration
TIMING ACCURACY	0.05% of reading ±50 micro-seconds @ 1-second duration
CONTACT DETECTION RANGE	Closed: less than 20 ohms; Open: greater than 5,000 ohms
RESISTOR DETECTION RANGE	50 – 5,000 Ohms
CT CURRENT SENSOR	One, non-contact, 0 – 100 Amperes
TRIGGER INPUT VOLTAGE	Open/Close: 30 – 300V, DC or peak AC
VOLTAGE SENSING INPUT RANGE	V1: analog input; 0 – 255V DC or peak AC; Sensitivity ±1V V2: voltage presence/absence detector input; 30 – 300V DC or peak AC
BREAKER OPERATIONS	Initiate Open, Close, Open – Close, Close – Open, Open – Close – Open
BREAKER INITIATE CAPACITY	25A, 250Vac/dc max (100A Inrush)
INITIATE CURRENT READING RANGE	One, non-contact, Hall-effect sensor, 0 – 20 amp range, dc to 5Khz
TRAVEL TRANSDUCER INPUTS	3 digital travel transducer channels; Linear range, 0.0 – 30.0 in (±0.01 in); Rotary range: 0 – 360 degrees (±0.36 degrees)
CONTACT TRAVEL POINT DIFFERENCE	Measures “slow-close” contact-point distances; results can be printed
DYNAMIC/STATIC RESISTANCE RANGE	0.1 – 1,999 micro-ohms; Accuracy: ±2% of reading, ±5 micro-ohms
RESISTANCE TEST CURRENT	200 Amperes typical
RESISTOR TYPE TRANSDUCER INPUT	200 Ohms – 10K Ohms
DISPLAY	Back-lit LCD Screen (20 characters by 4 lines); viewable in bright sunlight and low-light levels
PRINTER	Built-in 4.5-inch wide thermal printer can print both graphic contact travel waveforms and tabulated test results
INTERNAL TEST RECORD STORAGE	Stores up to 150 test records and 99 test plans
COMPUTER INTERFACES	One RS-232C port, One USB port
PC SOFTWARE	Windows® XP/Vista-based Breaker-Analysis software is included with purchase price
SAFETY	Designed to meet UL 6101A-1 and CAN/CSA C22.2 No 1010.1-92 standards
ENVIRONMENT	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
ALTITUDE	2,000m (6,562 ft) to full safety specifications
OPTIONS	Transportation case (available for the CBT-8000 and the 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.



- Quick-Shot mode for on-line timing; captures first trip time
- Static and dynamic resistance tests
- Prints breaker analysis results in both tabular and graphic formats
- Built-in 4.5-inch wide thermal printer
- Digital travel transducer requires no setup or calibration
- Supports resistance type transducers
- Detects main contact and insertion-resistor contact on the same input channel
- Stores up to 150 test records and 99 test plans
- RS-232C and USB computer interfaces

PARTS ORDERING INFORMATION for the CBT-8000 CIRCUIT BREAKER TIMER

All of the below listed replacement parts may be ordered from Vanguard Instruments Company, Inc. Linear transducer case Part No: LT-CASE

PC software and cables for CBT-8000, 3 contact channels	Part No: CBT-8000-3
PC software and cables for CBT-8000, 6 contact channels	Part No: CBT-8000-6
Carrying case for the CBT-8000	Part No: CBT-8000-CASE
Printer paper, thermally sensitive	Part No: Paper-TP4
CBT-8000 TRAVEL TRANSDUCERS	
10 inch linear transducer	Part No: LT-10
25 inch linear transducer	Part No: LT-25
30 inch linear transducer	Part No: LT-30
Rotary transducer	Part No: RT
15 inch universal transducer	Part No: UT-15
ABB AHMA-8 Transducer	Part No: ST-AHMA-8
ABB AHMB-8 Transducer	Part No: ST-AHMB-8
Westinghouse SF/SFA transducer	Part No: ST-SF/SFA
Linear transducer case	Part No: LT-CASE



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