Hathaway

CBT-400

CIRCUIT BREAKER TEST SYSTEM

From the world leader in breaker testing and monitoring

COMPANY OVERVIEW

With design and manufacturing facilities both in the USA and Europe, Hathaway Power Instrumentation produce a comprehensive and cost-effective range of fault recorders and circuit breaker test products designed exclusively for the Power Industry. The European division based in Belfast has been accredited to ISO 9001 which underlines the company's commitment to produce quality products for a global market. Hathaway's expertise, gained from many years of experience in servicing this international market, allied to close working relationships with our customers, allows us to introduce a high degree of systems flexibility. Such experience and versatility has resulted in the development of the CBT-400 Circuit Breaker Test System.

The CBT-400 - a cost effective test system providing accurate information for factory and field testing of circuit breakers.

Windows™ is a trademark of the Microsoft Corporation.
Replay™ is a trademark of Hathaway Systems Limited.

CBT-400 CIRCUIT BREAKER TEST SYSTEM

- **Simple to Operate**
- **Internal Storage of Records**
- **Intelligent Results Analysis**
- **Test Sequencing and Cycling**
- **Multiple Test Configurations**
- **Powerful Replay™ Software**

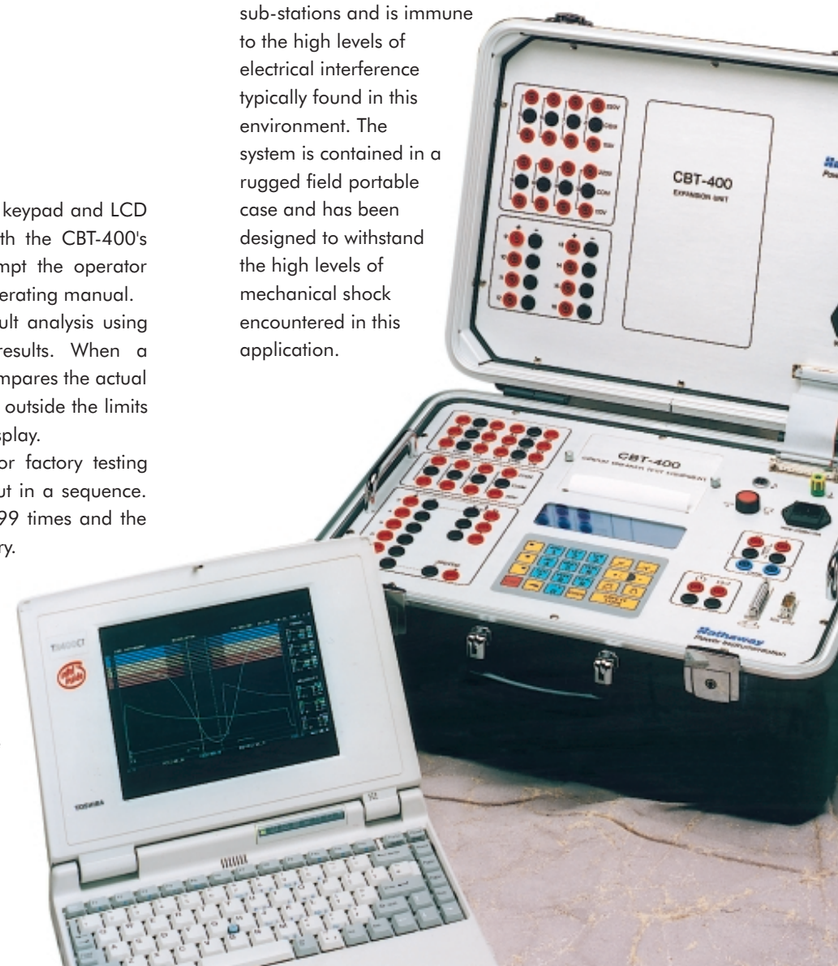
TECHNICAL SUMMARY

The new CBT-400 is the latest microprocessor based Circuit Breaker Test System for the timing and testing of medium and high voltage circuit breakers. In response to ever growing needs for field and factory testing of circuit breakers, Hathaway has developed a succesor to the CBT-4, which has a ten year history of successful circuit breaker testing worldwide.
The CBT-400 can acquire the following information:

- Contact Opening / Closing timings.
- Open / Close coil currents.
- Mechanism Travel and Velocity.
- Station battery voltage.
- Dynamic contact resistance.

The system is controlled using an integral keypad and LCD display. Simple operation is obtained with the CBT-400's menu driven software, designed to prompt the operator and requiring minimal reference to the operating manual.
The CBT-400 can perform automatic result analysis using pre-programmed limits for expected results. When a breaker test is carried out the CBT-400 compares the actual results with those expected. Any variances outside the limits are indicated on the print-out and LCD display.
An additional feature of the CBT-400 for factory testing allows a number of tests to be carried out in a sequence. This sequence can then be cycled up to 99 times and the results of each test can be saved to memory.
16 different test configurations can also be stored within the memory, any of which can be accessed on site. All results can be stored within the CBT-400's internal memory and retrieved at a later date via direct computer link or modem, eliminating the requirement for a PC to be carried on site.

Results can also be downloaded from the CBT-400 to a Windows™ Replay™ package where they can be analyzed and archived. Also featured in this package is a Remote Configuration program to allow modification of test parameters via a PC. Results may also be transferred to any "off the shelf" Windows™ database package for easy generation and customising of reports.
The CBT-400 has been designed for use in high voltage sub-stations and is immune to the high levels of electrical interference typically found in this environment. The system is contained in a rugged field portable case and has been designed to withstand the high levels of mechanical shock encountered in this application.



A powerful test system that is easy to use . . . with results anyone can understand

SPECIFICATION

INPUTS

Contact Inputs:

Up to four breaks per phase, each break can consist of one Main and one Resistor break in parallel. It is not necessary to disconnect Resistor or Main contacts.

Resistor contact range:

29ohms - 10kohms

Timing Accuracy:

100μs

Analog Inputs:

2 channels dedicated for Open and Close coil currents. 4 or 6 user configurable channels for measuring mechanism travel and velocity, station battery voltage, contact resistance, etc.

Expandable to have a further 8 user configurable channels that can be incorporated into the case lid.

Analog Accuracy:

Better than 1%.

Analog Resolution:

12 bits.

Event Inputs:

4 channels user selectable for 110V or 220Vdc nominal. Expandable to have a further 8 user selectable channels that can be incorporated into the case lid.

RECORDING

Sample Rates:

10kHz, 1kHz or 100Hz, user selectable.

OUTPUTS

Coil Initiation:

Voltage free contactors 250Vdc, 25A.

Alarm Output:

Rating 110Vdc, 0.5A.

Remote Start:

For use with hand-held trigger switch.

Printer Port

For connection to an external Epson® compatible parallel printer.

RS232:

For communications to a PC or modem.

Expansion Unit:

For connecting an additional 8 analog channels (AC or DC input) and 8 event inputs.

Whilst every effort is made to ensure information is correct, the specification may change due to continuous product development.

MEMORY

Sizes:

256kbytes, 1Mbyte or 4Mbytes Static RAM.

(The use of data compression allows approximately 10s of recorded data to be stored per 1Mbyte of memory, at a sample rate of 10kHz).

Max Record Lengths:

256kbytes:- 10kHz - 500ms
1kHz - 5s
100Hz - 50s

1 or 4Mbytes:- 10kHz - 2s
1kHz - 20s
100Hz - 200s

TRIGGERING

Start Trigger:

Internal contactor, Open coil current, Close coil current, change in any event status, change in analog status.

ISOLATION

Analog and event inputs, coil initiation outputs:

2.5kVac channel to channel and channel to earth.

ELECTRICAL INTERFERENCE

High voltage impulse:

IEC 255.4 withstand.

Surge withstand:

IEC 255.4, 2.5kV 1MHz.

POWER SUPPLY

85 - 264Vac, 120 - 370Vdc

PRINTER

Internal:

Thermal 112mm - 8 dots per mm.

External:

Epson® compatible parallel printer.

CONNECTIONS

All breaker connections are terminated to 4mm safety sockets.

LANGUAGES

Menu selectable from:

English, French, German, Spanish or Italian.

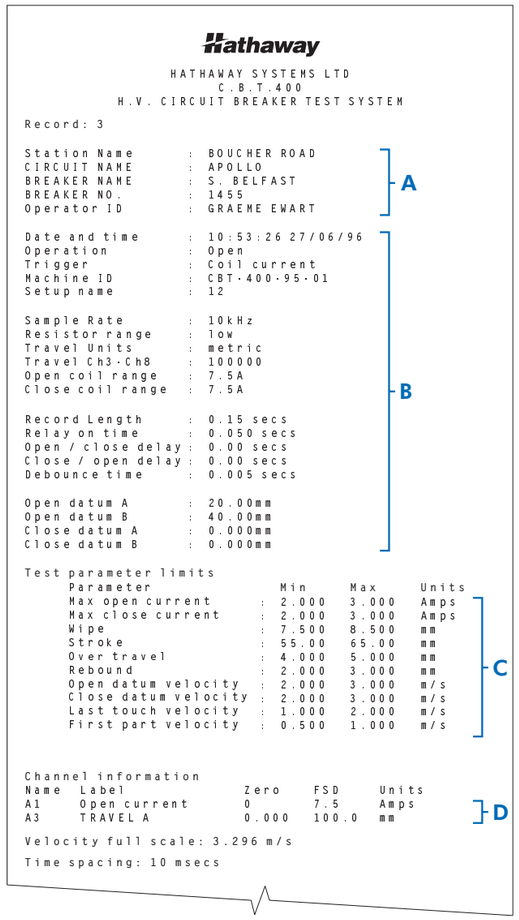
PHYSICAL DIMENSIONS

461mm (W) x 347mm (D) x 209mm (H).

Weight:

15kg.

SAMPLE PRINTOUT



Hathaway

HATHAWAY SYSTEMS LTD
C.B.T.400
H.V. CIRCUIT BREAKER TEST SYSTEM

Record: 3

A
Station Name : BOUCHER ROAD
CIRCUIT NAME : APOLLO
BREAKER NAME : S. BELFAST
BREAKER NO. : 1455
Operator ID : GRAEME EWART

B
Date and time : 10:53:26 27/06/96
Operation : Open
Trigger : Coil current
Machine ID : CBT-400-95-01
Setup name : 12

Sample Rate : 10kHz
Resistor range : low
Travel Units : metric
Travel Ch3-Ch8 : 100000
Open coil range : 7.5A
Close coil range : 7.5A

Record Length : 0.15 secs
Relay on time : 0.050 secs
Open / close delay : 0.00 secs
Close / open delay : 0.00 secs
Debounce time : 0.005 secs

Open datum A : 20.00mm
Open datum B : 40.00mm
Close datum A : 0.000mm
Close datum B : 0.000mm

C
Test parameter limits

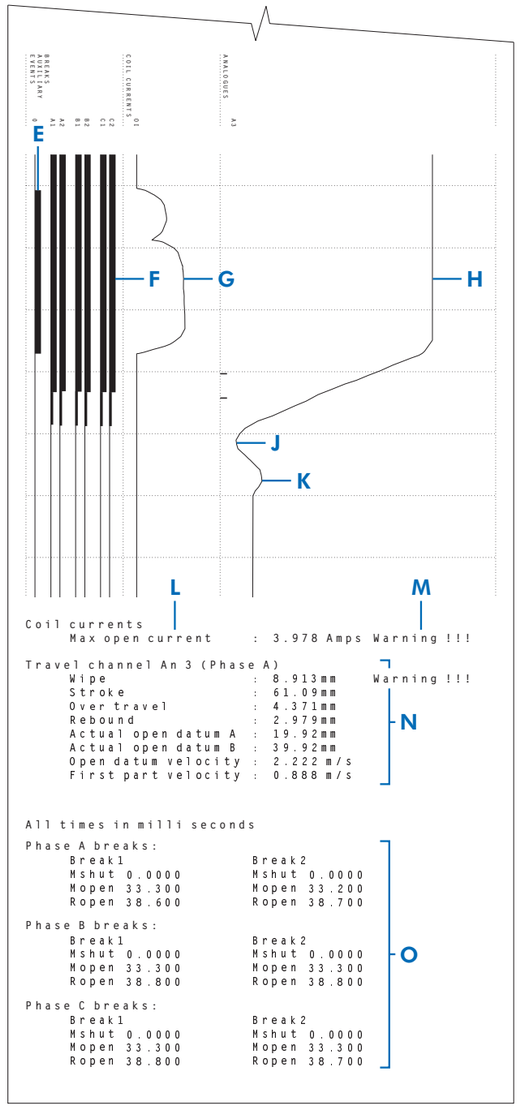
Parameter		Min	Max	Units
Max open current	:	2.000	3.000	Amps
Max close current	:	2.000	3.000	Amps
Wipe	:	7.500	8.500	mm
Stroke	:	55.00	65.00	mm
Over travel	:	4.000	5.000	mm
Rebound	:	2.000	3.000	mm
Open datum velocity	:	2.000	3.000	m/s
Close datum velocity	:	2.000	3.000	m/s
Last touch velocity	:	1.000	2.000	m/s
First part velocity	:	0.500	1.000	m/s

D
Channel information

Name	Label	Zero	FSD	Units
A1	Open current	0	7.5	Amps
A3	TRAVEL A	0.000	100.0	mm

Velocity full scale: 3.296 m/s

Time spacing: 10 msecs



L Maximum coil currents recorded.

M A "Warning !" will appear beside any test result that is outside the test limits set in the "Test parameter limits".

N Measurements taken from the mechanism travel curve.

Coil currents
Max open current : 3.978 Amps Warning !!!

Travel channel An 3 (Phase A)
Wipe : 8.913mm Warning !!!
Stroke : 61.09mm
Over travel : 4.371mm
Rebound : 2.979mm
Actual open datum A : 19.92mm
Actual open datum B : 39.92mm
Open datum velocity : 2.222 m/s
First part velocity : 0.888 m/s

N

All times in milli seconds

O
Phase A breaks:

Break1	Break2
Mshut 0.0000	Mshut 0.0000
Mopen 33.300	Mopen 33.200
Ropen 38.600	Ropen 38.700

Phase B breaks:

Break1	Break2
Mshut 0.0000	Mshut 0.0000
Mopen 33.300	Mopen 33.300
Ropen 38.800	Ropen 38.800

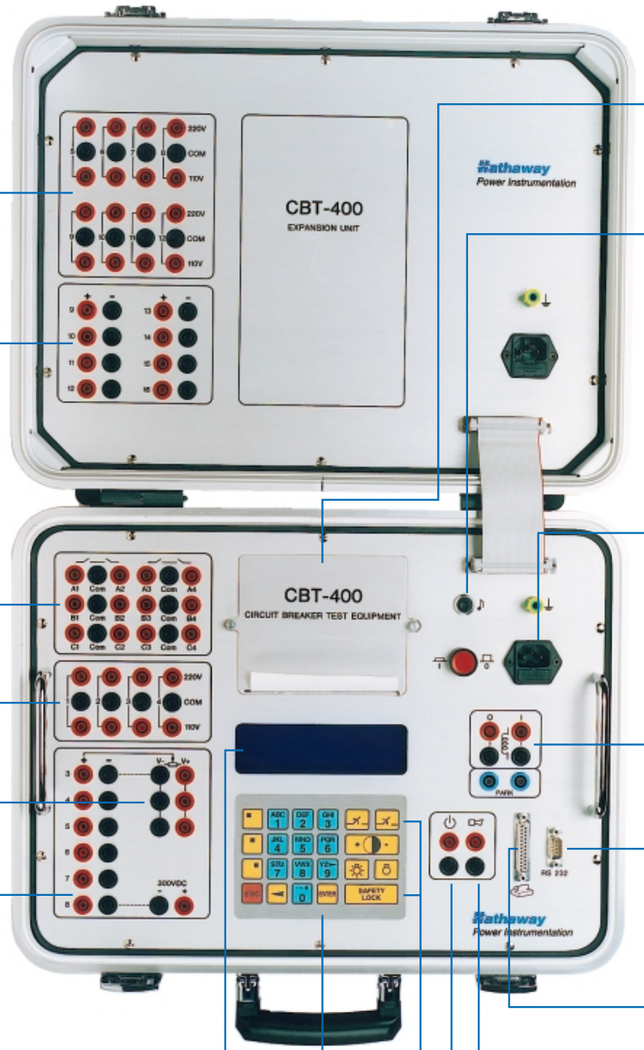
Phase C breaks:

Break1	Break2
Mshut 0.0000	Mshut 0.0000
Mopen 33.300	Mopen 33.300
Ropen 38.800	Ropen 38.700

A Test identification data.
B Test configuration data.
C Selected test limits.
D Analog channel labels.
E Event contacts.
F Breaker contacts.
G Coil current profile.
H Analog channel representing the mechanism travel curve.
J Mechanism overtravel.
K Mechanism rebound.

The CBT-400, easily satisfying the needs of maintenance and testing programmes

PANEL LAYOUT



Additional 8 event inputs (optional).

Additional 8 analog inputs (optional).

Test lead outputs to circuit breaker contact heads. Two cables per phase each allowing 4 breaks per phase to be monitored.

Event inputs for monitoring energized contacts, e.g., breaker auxiliary contacts. Selectable 110V or 220Vdc nominal.

Power outputs for resistive travel transducer. 2.5Vdc.

Analog inputs, 2.5Vdc sensitivity. Typically used for mechanism travel and velocity, contact resistance or battery voltage measurements.

Integral printer and paper roll. Printer uses a fixed thermal head to give high reliability.

Buzzer giving audible warning of breaker test.

Power input, 85 - 264Vac, 120 - 370Vdc.

Open and Close initiation outputs to breaker under test. Dry contacts rated for 250V, 25A controlled from integral keypad. Parking sockets provided for prevention of unintended breaker operation.

RS232 serial output port to download recorded test data to a computer system for storage and off-line analysis.

External printer output for an Epson® compatible printer.

External horn output.

Test initiation input for remote handheld switch.

Liquid crystal display with contrast control and backlight.

System control keypad with alpha-numerical capabilities.

Manual breaker operation with safety lock.

ACCESSORIES

A protective carrying case and cable carrying roll is available for the safe transportation of the CBT-400.

Protective Case and Cable Carrying Roll

Travel Transducer

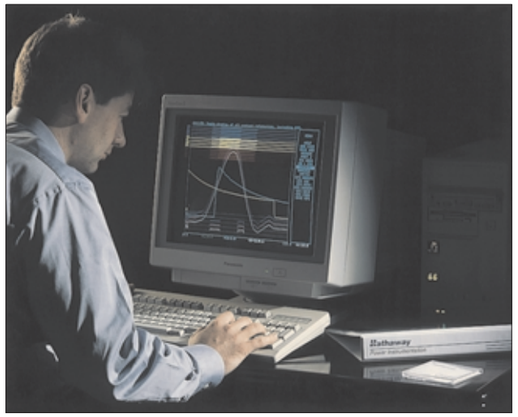
A comprehensive range of linear and rotary travel transducers are available for measuring circuit breaker mechanism travel and velocity.

The Micro-Ohm Interface allows a "dynamic" resistance profile of the circuit breaker to be recorded. This can be analysed using the Windows™ based Replay™ software package and measurements of both main and arcing contacts can be made by injecting a high dc current, typically 1000A, from an external battery. The Micro-Ohm Interface calculates the resistance of the contacts throughout a Close-Open sequence and generates an output for the CBT-400 where a resistance trace is recorded. The Micro-Ohm Interface has an added safety feature which will break the current flow in the event of the circuit breaker failing to open.

Micro-Ohm Interface

REPLAY™ SOFTWARE AND DATABASE

A Windows™ based Replay™ software package is available for the Hathaway range of Circuit Breaker test and monitoring products. This package allows test records and results to be analyzed in detail and archived on a PC. Records can be transferred to the CBT-400 via a modem or a direct RS232 connection.
The Replay™ software allows single records to be viewed, or multiple records may be overlayed to show variances in results. Cursors can be moved to any position on a record, where measurements can be obtained.
Also included in this package is a Remote Configuration program that enables the set up parameters and test limits to be stored and transferred to the CBT-400.



Replay™ Station

The program can also export test results to a database that enables the sorting and searching of records, generation of customised reports and generation of works orders for preparing breaker maintenance schedules. The database package used in this application is commercially available and highly flexible. It can be easily customised to provide information in any customer required format.

Other Hathaway products that can be used with the above software packages are:

- **CBT-2** Off line breaker tester.
- **CBT-4** Off line breaker tester.
- **CBT-200** Off line breaker tester.
- **RTR-84** Periodic On line breaker tester.
- **BCM** Permanent On line breaker condition monitor.

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