MCCB-500-2

MOLDED-CASE CIRCUIT BREAKER TESTER

USER'S MANUAL

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June 2021
Revision 1.1

SAFETY SUMMARY

FOLLOW EXACT OPERATING PROCEDURES

Any deviation from the procedures described in this user's manual may create one or more safety hazards, damage the MCCB-500-2, or cause errors in the test results. Vanguard Instruments Co., Inc. assumes no liability for unsafe or improper use of the MCCB-500-2. The following safety precautions must be observed during all phases of test setup, test hookups, testing, and test lead disconnection.

SAFETY WARNINGS AND CAUTIONS

The MCCB-500-2 shall be used only by trained operators. All circuit breakers under test shall be off-line and fully isolated.

SERVICE AND REPAIR

- Do not install substitute parts or perform any unauthorized modification to any MCCB-500-2 test unit.
- Repairs must be performed only by Vanguard Instruments Company factory personnel or by an authorized repair service provider. Unauthorized modifications can cause safety hazards and will void the manufacturer's warranty.

EQUIPMENT RATINGS

IP Rating: The enclosure for the MCCB-500-2 an IP rating of 21.

Pollution Degree: The MCCB-500-2 has a pollution rating of 2.

Operating Voltage: The MCCB-500-2 is rated for use with an operating voltage of 120V or 240V, auto-ranging ±10% of selected voltage.

Power Cord: The MCCB-500-2 is supplied with a 16 AWG, 16A power cord with an Amphenol MS3106 style plug. Replacement cable shall have the same or better rating and is available through the manufacturer.

VENTILATION REQUIREMENTS

The MCCB-500-2 must be operated with the enclosure lid open.

REPLACEMENT FUSES

The MCCB-500-2 uses two 250V/8A Fast Blow fuses (F8A 250V).

SAFETY SYMBOLS


Indicates that caution should be exercised


Indicates location of chassis ground terminal

CLEANING

To clean the MCCB-500-2:

- Disconnect all cables and turn the unit off.
- Use a soft, lint-free cloth to wipe all surfaces clean.
- Avoid getting moisture in openings and connectors.
- Don't use any cleaning products or compressed air.

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CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- A key, switch, input, or knob on the MCCB-500-2 is indicated as **[KEY], [SWITCH], [INPUT], [KNOB]**.
- Warning messages are indicated as:

WARNING Warning message

- Important notes are indicated as:

NOTE Note details

1.0 INTRODUCTION

1.1 General Description and Features

The Vanguard MCCB-500-2 is a microprocessor-based high current circuit breaker test set. This unit provides a variable high current source, control, metering, and timing circuitries for testing overload relays and thermal and magnetic circuit breakers.

Built-in Timer

The MCCB-500-2's built-in timer displays the test results in milliseconds and cycles. The cycle time (50 or 60 Hz) is selectable by the user. Timer reading range is from 0.1 ms to 2 hours. Timer resolution is 0.1 ms and the timer accuracy is ±0.1% of reading, ±0.1 ms.

NOTE

For timer reading range of 100s – 999s the resolution is 1 ms.
For timer reading range of 1000s – 7200s the resolution is 10 ms.

Timer Start Mode: Timer can be started when the current source is turned on.

Timer Stop Mode: Timer can be stopped with the removal of the test current or detection of a status change of dry contact or voltage input.

Current Source

The MCCB-500-2's current source has 3 outputs: 500A @ 4vac, 125A @ 14Vac, and 25A @ 70Vac. The current sources can output short-duration overload conditions. This feature is convenient for performing instantaneous trip tests of molded case circuit breakers, or testing the time delay characteristics of magnetic overload relays.

Test current is measured and displayed on a 128 x 64 pixel back-lit LCD screen that is clearly visible in direct sun light or low light levels. Control switches are used to turn the current source on and off, select the timer stop input type (current mode, dry contact, or wet contact), and control the LCD contrast.

A "momentary" mode can turn on the current source, capturing the current reading and displaying the value on the LCD. This feature can be used to set the test current and minimizes the possibility of overheating the device under test.

Test current is turned on at the zero crossing point using a solid state device for reliability and precision timing.

Built-in Current Meter

The MCCB-500-2 features a built-in current meter that displays the test current (100mA–3000A). Current reading accuracy is: ±1% of reading, ±2 digits. Test results (current reading and time) are retained after performing a test so that the test results can be reviewed. This is a convenient feature when used with the momentary mode to preset the test current to avoid overheating the circuit breaker.

Current Source Thermal Protection

Built in thermal sensor allows the microprocessor to monitor the transformer current source operating temperature.

1.2 Furnished Accessories

The MCCB-500-2 comes furnished with the following:

- Two 6-foot (1.8m) #4/0 current cables (**Part Number 8000-0183**)
- Two 6-foot (1.8m) #1/0 current cables (**Part Number 8000-0190**)
- Two 10-foot (3m) 8 AWG external timer input cables with alligator clips (**Part Number 8000-0184**)
- One Control Module to Current Module connection cable (**Part Number 8000-0210**)
- One ground cable (**Part Number 8000-0110**)
- One power cord (**Part Number 8000-0248**)
- Two 10-foot (3m) Timer+Sense Cables (**Part Number 8000-0185**)

1.3 MCCB-500-2 Technical Specifications

Table 1. MCCB-500-2 Technical Specifications

TYPE	500 Ampere current source
PHYSICAL SPECIFICATIONS	**Control Module** Dimensions: 11.2"W x 14.5"H x 8.13"D (28.4 cm x 36.8 cm x 20.7 cm); Weight: 31.4 lbs (14.2 kg) **Current Module** Dimensions: 11.2"W x 8.13"H x 14.5"D (28.4 cm x 20.7 cm x 36.8 cm); Weight: 61.3 lbs (27.8 kg)
INPUT VOLTAGE	100 – 120 Vac or 200 – 240 Vac (factory pre-set), 50/60 Hz
INTERNAL CURRENT METER	1A – 3,000A; accuracy: 1% of reading, ±2 digits
MEASUREMENT METHOD	Isolated CT
TIMER STOP INPUTS	Voltage input (20V – 300V, dc or peak ac), dry contact input, or removal of test current
TIMER READING RANGE	0.1ms – 2 hours (also displayed in cycles); accuracy: 0.1% of reading, ±0.1ms
OUTPUT CURRENTS	500A @ 4V, 125A @ 14V, 25A @ 70V
DISPLAY	back-lit LCD screen (128 x 64 pixels); viewable in bright sunlight and low-light levels
HUMIDITY	90% RH @ 40°C (104°F) non-condensing
SAFETY	designed to meet IEC61010 (1995), UL61010A-1, CSA-C22.2 standards
ENVIRONMENT	Operating: -10˚C to 50˚ C (15˚F to +122˚ F); Storage: -30˚ C to 70˚ C (-22˚F to +158˚ F)
ALTITUDE	2,000 m (6,562 ft) to full safety specifications
CABLES	• Two 6-foot (1.8m) #4/0 current cables (Part Number 8000-0183) • Two 6-foot (1.8m) #1/0 current cables (Part Number 8000-0190) • Two 10-foot (3m) 8 AWG external timer input cables with alligator clips (Part Number 8000-0184) • One Control Module to Current Module connection cable (Part Number 8000-0210) • One ground cable (Part Number 8000-0110) • One power cord (Part Number 8000-0248) • Two 10-foot (3m) Timer+Sense Cables (Part Number 8000-0185)
FURNISHED ACCESSORIES	shipping case
WARRANTY	one year on parts and labor

NOTE

The above specifications are valid at nominal operating voltage and at a temperature of 25°C (77°F). Specifications may change without prior notice.

1.4 Controls and Indicators

The MCCB-500-2's controls and indicators are shown in Figure 1 and Figure 2. The purpose of the controls and indicators may seem obvious, but users should become familiar with them before using the MCCB-500-2. Accidental misuse of the controls will usually cause no serious harm. Users should also be familiar with the safety summary found on the front page of this User's Manual.

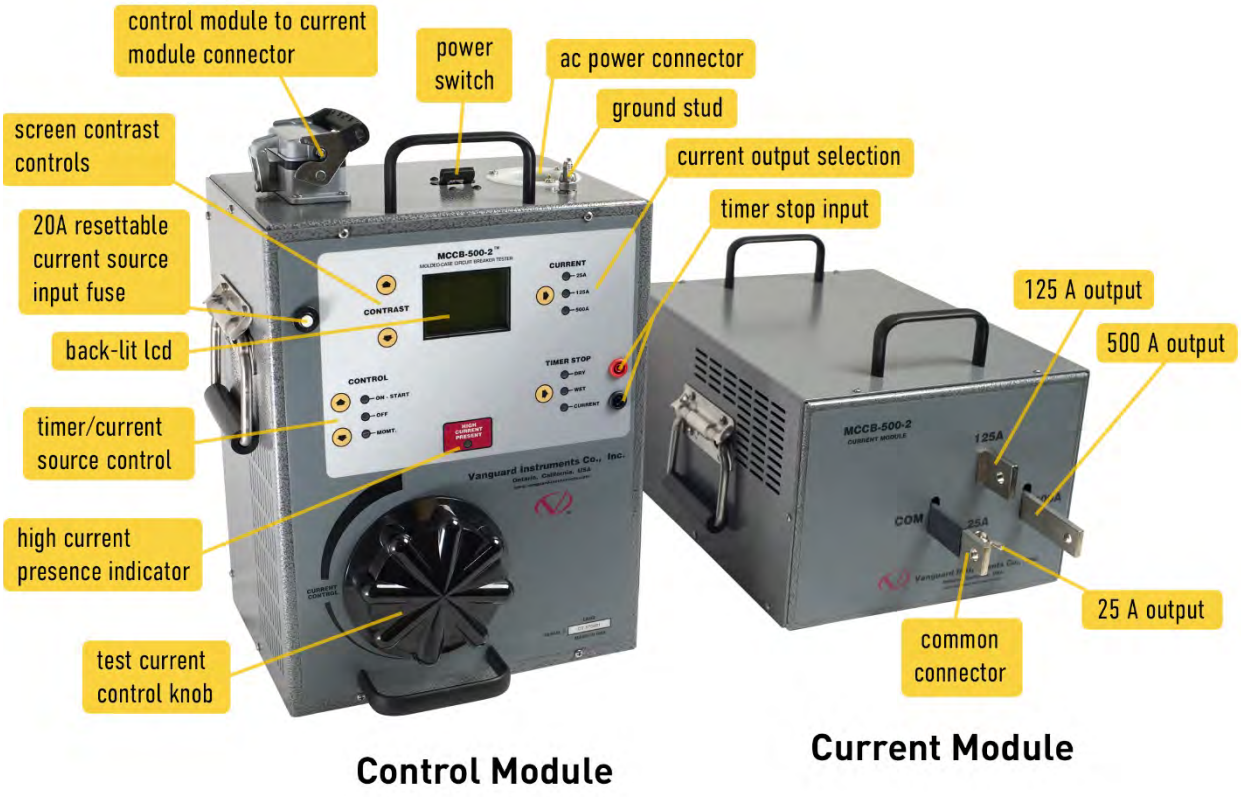
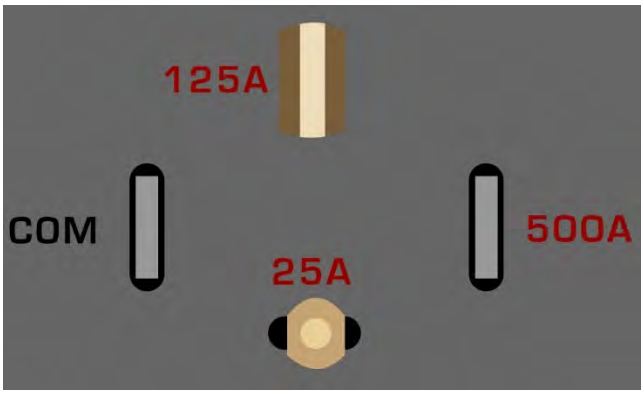


Figure 1. MCCB-500-2 Controls and Indicators

Figure 2. MCCB-500-2 Controls and Indicators (continued)

2.0 FUNCTIONAL DESCRIPTION

2.1 MCCB-500-2 AC Current Source



The MCCB-500-2 provides three AC current outputs. AC test current is set by the **[CURRENT CONTROL]** knob. This test current is measured and displayed on the LCD screen. The MCCB-500-2's output current ratings are shown in Table 2 and Table 3 below.

Table 2. MCCB-500-2 Current Output

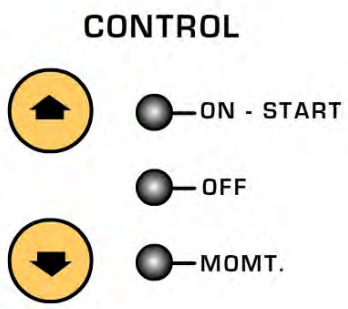
CURRENT OUTPUT
500A @ 4V
125A @ 14V
25A @ 70V

Table 3. MCCB-500-2 Overload Current Output

CURRENT	ON TIME	OFF TIME
40% (200A)	Continuous	Continuous
100% (500A)	30 minutes	30 minutes

NOTE: The MCCB-500-2 can deliver 2500A instantaneous current.

2.2 MCCB-500-2 Current Output Control



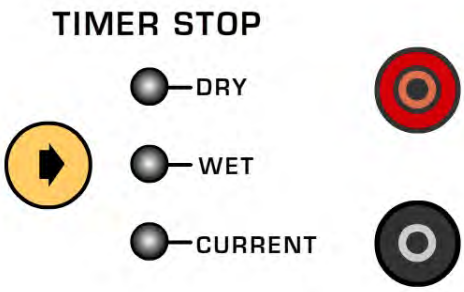
The MCCB-500-2 current source output is controlled by the **[🡅]** and **[🡇]** keys. Three control modes are available: ON-START, OFF, and MOMT.

The OFF mode indicates that both the current source output and timer are off.

The MOMT mode turns on the current source momentarily. To turn on the current source, press and hold the **[🡇]** key. The LED indicator next to the "MOMT" label will turn on indicating that the MCCB-500-2 current source is on. The output current will also be displayed on the LCD screen and the last current reading remains displayed on the screen. The MCCB-500-2 current output can now be set by turning the **[CURRENT CONTROL]** knob. Release the **[🡇]** key to turn off the current source.

The ON-START mode turns on the MCCB-500-2 current source and timer. This initiates a test and is stopped by using the **[TIMER STOP]** inputs. The test results will be displayed on the LCD screen. The test can also be terminated by pressing the **[🡇]** key.

2.3 Timer Stop Input and Control



After a test is started, the MCCB-500-2 timer can be stopped and the current source turned off using one of three modes: dry contact input, wet contact input, or interruption of the MCCB-500-2's current output. The **[➔]** key is used to select the desired mode.

When the DRY CONTACT mode is selected, the MCCB-500-2 will output a DC voltage to the **[TIMER STOP]** terminals to sense the state of the dry contacts. A change in this dry contact state will stop the timer and turn off the current source.

In WET CONTACT mode, the MCCB-500-2 will sense an AC or DC voltage applied to the **[TIMER STOP]** terminals. The OFF state is a voltage from 0 to 10 V ac/dc. The ON state is a voltage from 24 to 300 V ac/dc. A change in the voltage state will stop the timer and turn off the current source.

In CURRENT mode, an interruption of the MCCB-500-2's current source output (CB contact opened) will stop the timer and turn off the current source.

Both the DRY CONTACT and WET CONTACT modes require an external input to the MCCB-500-2 via the **[TIMER STOP]** terminals.

NOTE

The MCCB-500-2 defaults to CURRENT mode when it is first turned on.

2.4 MCCB-500-2 Timer

The MCCB-500-2's built-in time/cycle counter can be used to time events in milliseconds and cycles. The elapsed time is displayed on the LCD screen (in milliseconds and cycles) along with the test current after a test is completed. A typical test results screen is shown in Figure 3. The timer is turned on when the ON-START mode is selected.

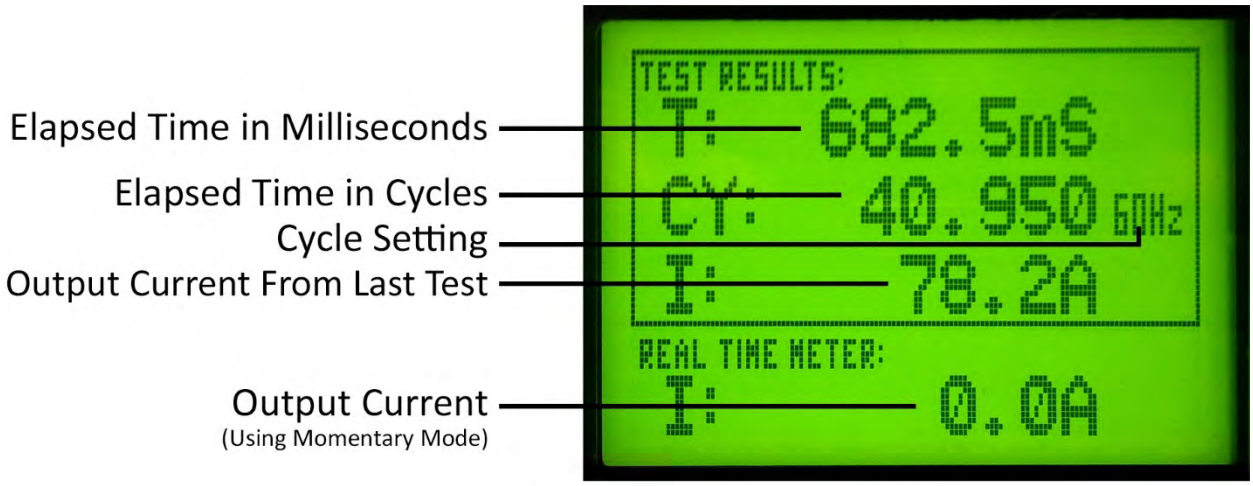
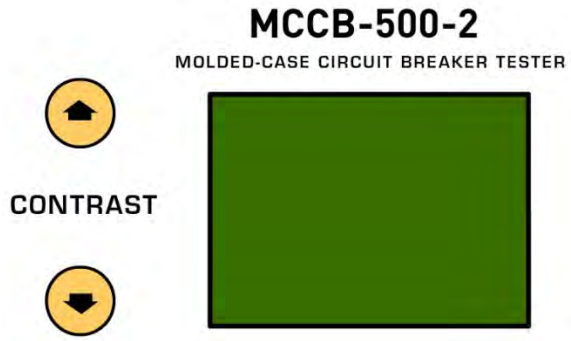


Figure 3. Typical MCCB-500-2 Test Results Screen

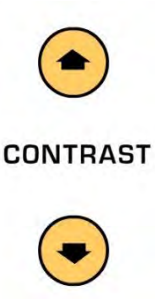
2.5 LCD Contrast Control



To adjust the LCD screen's contrast, press and hold the **[↑]** key next to the LCD screen to increase the contrast or the **[↓]** key to decrease the contrast. Release the key when the desired contrast level has been reached.

NOTE The MCCB-500-2 will store the current LCD setting in non-volatile memory.

2.6 50/60 Hz Cycle Time Selection



To toggle between the 50 and 60Hz cycle times, press and hold both the **[🡅]** and **[🡇]** keys to the left of the LCD screen. The message "50 Hz Set!" or "60 Hz Set!" will be displayed on the LCD screen. This value is also displayed on the test results screen.

3.0 OPERATING PROCEDURES

3.1 Testing the Time Delay of a Low Voltage Circuit Breaker

Figure 4 illustrates a typical connection of the MCCB-500-2 to a molded case circuit breaker to test its "Open Time Delay". The MCCB-500-2 injects a test current through a circuit breaker contact. This current is sensed by the circuit breaker control circuit. The time delay test starts by injecting a preset current to the circuit breaker contact and ends when the circuit breaker contact is opened and interrupts the test current.

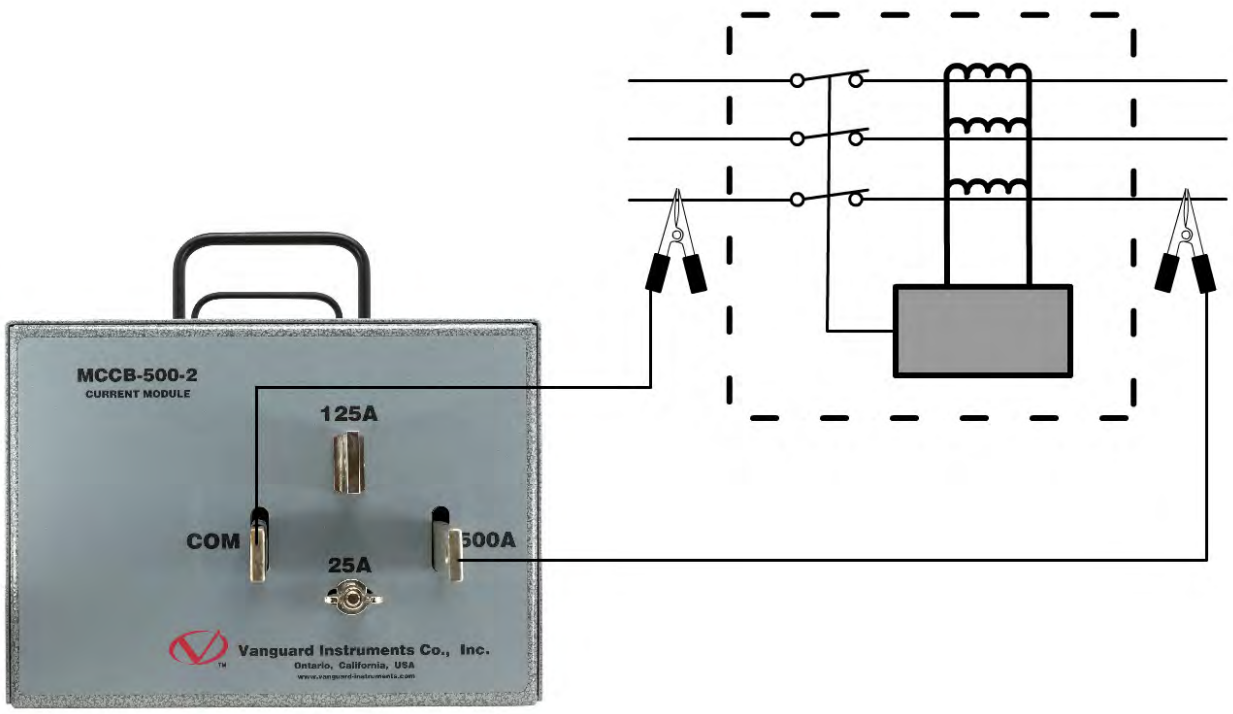


Figure 4. Typical MCCB-500-2 Application

Use the steps below to test the time delay of a protection relay:

a. Connect the Control Module to the Current module.
b. Connect the Safety Ground to the MCCB-500-2 Control Module's ground stud.
c. Connect the Safety Ground to the MCCB-500-2 Current Module's ground stud.
d. Connect the AC power cord to the Control Module.
e. Connect the Current Cables from the MCCB-500-2 to the bus as shown in Figure 4.
f. Turn the **[CURRENT CONTROL]** knob to zero.
g. Turn on the **[POWER SWITCH]** on the Control Module.
h. Hold the **[🡻]** key to momentarily turn on the current source.
i. Turn the **[CURRENT CONTROL]** knob to set the desired current.
j. Release the **[🡻]** key.
k. Press the **[🡹]** key to select the ON-START mode and start the test. The MCCB-500-2 will inject the preset current into the bus and turn on the timer. The timer will stop and the current source will be turned off when the circuit breaker is opened. A typical MCCB-500-2 time delay test results screen is shown below:

NOTE

In the above test, the timer will be stopped if the current source is interrupted (circuit breaker opened). The test results will be displayed and remain displayed on the screen. If the test is aborted by the operator, the last test results will be displayed and remain displayed on the screen.