

Instructions for using Functional Test Kit on Digitrip 520 and 1150 family of Power Circuit Breaker Trip Units and Series G and FD MCCB Trip Units

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Long Time Trip, Instantaneous Trip, Short Delay Trip, and Ground (Earth) Fault Trip. These test selections are chosen via the switch labeled “Select Test” on the Test Kit. (See Figure 1.1).

Description	Style #
Functional Test Kit included 120VAC Aux. Power Module	70C1056G52
Functional Test Kit included 230VAC Aux. Power Module	70C1056G53

1.1 Test Procedure: Digitrip 520 family for Power Circuit Breakers

1.1.0 When to Test

Power circuit breakers (*Magnum*) and Medium Voltage (*Type VCP-T, VCP-TR, T-VAC and T-VACR*) circuit breakers can be tested prior to start-up or with the circuit breaker out of its cell or in the Test, Disconnected, or Withdrawn (*or Removed*) cell positions.

NOTE: Since time-current settings are based on desired system coordination and protection schemes, the protection settings selected and preset should be reset to their as-found conditions if altered during any routine test sequence.

1.0 Description of Functional Test Kit

The Functional Test Kit (See Figure 1.0 and 1.1) is a handheld battery powered tester capable of testing trip elements for Digitrip family of power circuit breaker trip units.

The Digitrip 520 family includes the Digitrip 220+, 520, 520*i*, 520M, 520M*i*, 520MC and 520MC*i*. In addition it can test the Digitrip1150 family consisting of the Digitrip 1150, 1150*i* and Digitrip 1150V and 1150V*i* by overlaying a nameplate on the tester.

An Auxiliary Power Module is included to provide trip unit power to illuminate the trip units having display LEDs.

The molded case Series G and FD circuit breakers can also be tested with the addition of the Series G and FD overlay and a different test cable assembly supplied in the kit. The type test that can be done are trip unit Power Up,



CAUTION

TESTING A CIRCUIT BREAKER WHILE IN-SERVICE AND CARRYING LOAD CURRENT IS NOT RECOMMENDED FOR POWER AND MEDIUM VOLTAGE CIRCUIT BREAKERS.

TESTING OF A CIRCUIT BREAKER THAT RESULTS IN THE TRIPPING OF THE CIRCUIT BREAKER SHOULD BE DONE ONLY WITH THE CIRCUIT BREAKER IN A DEENERGIZED SYSTEM OR IN THE TEST OR DISCONNECTED CELL POSITIONS OR WHILE THE CIRCUIT BREAKER IS ON A TEST BENCH.

PERFORMING TESTS WITHOUT THE CUTLER-HAMMER-APPROVED TEST KIT MAY DAMAGE THE DIGITRIP UNIT.



Figure 1.0 Functional Test Kit - Complete

The figure displays three overlapping technical labels for the EATON Cutler-Hammer Functional Test Kit. The central label is the main 'Functional Test Kit' label, flanked by two 'Overlay' labels for 'Digitrip 1150' and 'Series G and FD'. Each label contains detailed test procedures, diagrams of the test kit's control panel, and safety instructions.

Digitrip 1150 Test Kit Overlay (Left): This overlay is for Digitrip 1150V, 1150V, 1150V, 1150V, 1150V, 1150V. It includes a diagram of the control panel with 'SELECT TEST' (POWER UP, TEST, LONG, GROUND, SHORT) and 'BATTERY VOLTAGE' (A, B) settings. The test procedure includes steps like 'Connect cables from Test Kit to Digitrip', 'Push Test Button LED's A, B light', and 'Release Test Button'.

Functional Test Kit (Center): This is the main label for Digitrip 520, 520V, 520M, 520M, 520MC, 520MC, 520V, 220V. It includes a diagram of the control panel with 'SELECT TEST' (POWER UP, TEST, LONG, GROUND, SHORT) and 'BATTERY VOLTAGE' (A, B) settings. The test procedure includes steps like 'Note the Digitrip setting of this time', 'Adjust LTR jumper for horizontal position', and 'Push Test Button LED's A, B light'.

Series G and FD Test Kit Overlay (Right): This overlay is for Series G and FD (79C1056). It includes a diagram of the control panel with 'SELECT TEST' (POWER UP, TEST, LONG, GROUND, SHORT) and 'BATTERY VOLTAGE' (A, B) settings. The test procedure includes steps like 'Note the Series JLS LED settings of this time', 'Connect cables from Test Kit to Series G, L8 Nonconnect', and 'Push Test Button LED's A, B light'.

Figure 1.1 Tester Label (center) with 1150 Overlay (left) and Series G and FD Overlay (right)

1.1.1 Setup Digitrip 520 family

Before testing, write down all settings in use so that they may be restored after test are completed. Remove the circuit breaker's plexiglass cover and the additional cover over the Digitrip "Test Kit" port pins. This is done by applying a screwdriver under the lip to pop off the cover. If necessary, reposition the Thermal Memory jumper temporarily to a "bridging" position in order to defeat memory for these tests. (See Figure 1.2).



CAUTION

BEFORE PLUGGING A TEST KIT INTO THE TEST PORT, VERIFY THAT THE LTM JUMPER IS IN THE INACTIVE POSITION (See Figure 1.2). AFTER TESTING, RETURN THE LTM JUMPER TO ITS ORIGINAL POSITION.

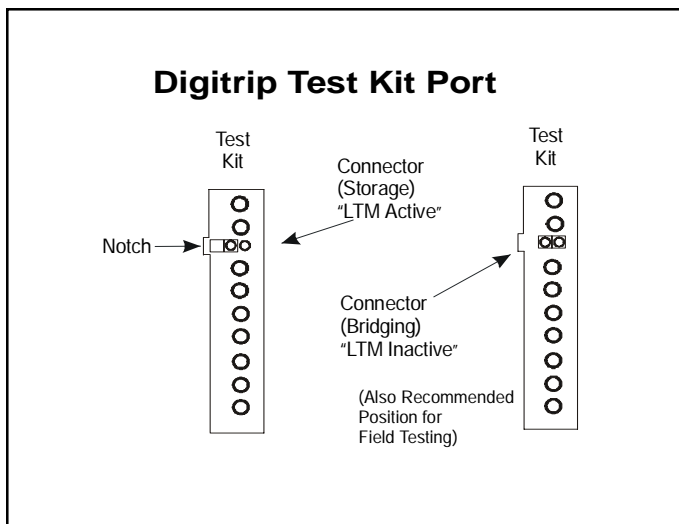


Figure 1.2 Long Time Memory (LTM) Jumper

To begin testing, connect the Test Kit cable (style 5720B57) from the left side of the Functional Test Kit to the "Test Kit" port pins located on the front panel of the Digitrip unit.

The trip unit end of the cable is designed in such a way that it will only fit over the "Test Kit" pins correctly.

1.1.1 Power Up

Set the Select Test switch on the Test Kit to the "POWER UP" position. Push the Test pushbutton on the Test Kit to verify battery voltages are available from both power sources. Both Battery Voltage LED's A and B should light.

NOTE: The cable has an interlock feature and must be connected to the tester to enable battery power. In the event that either LED does not light, refer to Section 1.7. Observe Digitrip status. Unit Status LED should flash at a rate of about one second on / one second off. Release Test pushbutton.

On Digitrip 520M/520MC units, a current value can be observed by pressing the Step pushbutton to select the PHase 2 readout. The readout value should be approximately 30% of the Plug rating.

1.1.3 Instantaneous Trip

Set Select Test switch to "INST" position. Set Instantaneous Pickup of Digitrip to 2x and Short Delay Setting to 10x. Close the circuit breaker. Push the Test pushbutton and release immediately after the circuit breaker trips or the Digitrip indicates Trip condition. Check that the Instantaneous Trip LED on the Digitrip is flashing at a 4 or 5 second repetition rate. Reclose the circuit breaker and reset the trip unit by depressing the Reset pushbutton.

1.1.4 Short Delay Trip (not applicable on Digitrip 220)

The Select Test switch should be on "SHORT" position at this time. Position the Digitrip Instantaneous setting to 4x or higher and Short Pickup to 2x. Push the Test pushbutton and hold for a maximum of one second. Release immediately after trip. The Short Delay Trip LED should flash after trip. Reset the circuit breaker and the trip unit. Reposition the Digitrip Short Pickup setting to 4x or higher.

1.1.5 Long Delay Pickup and Trip

Set the Select Test to "LONG" position. Position the Digitrip Short Pickup setting to 4x or higher. Set Long Pickup to 0.4x and Long Delay to 2 seconds. Push Test and hold. Status indicator LED on the Digitrip should flash quickly indicating an overload condition in progress. Long Delay Trip should occur in 5 - 8 seconds accompanied by flashing Long Delay Trip LED. Release Test after Trip and reclose the circuit breaker and reset the trip unit.

NOTE: After a circuit breaker trip has occurred, release the “Push to Test” pushbutton immediately. If held in too long after a trip, the Digitrip unit will re-enter its protection algorithm to start timing out for a second trip. In this process the previous expected trip LED indication may get cleared.

1.1.6 Ground Fault Trip (if applicable)

Set Select Test to the “GROUND” position. Plug in the Ground Fault Test Connector supplied with the kit to the circuit breaker’s “B” secondary contact block. This provides a temporary jumper from terminals B-6 to B-7 of the circuit breaker. (See Figure 1.4)

NOTE: The circuit breaker will have to be in its Disconnected Position to plug in this connector. This jumper connection could be accomplished by other means.) No setting changes are required for this test. Hold Test pushbutton until circuit breaker trips and/or Digitrip Ground (Earth) Fault indicator flashes.

When testing is completed, **remove the Ground Fault Connector jumper with the yellow tag** and disconnect cable from both trip unit and Test Kit. Test Kit components should be stored together in case.

NOTE: On the Digitrip 520M and 520MC product before removing the test cable set the Select Test back to the “Power Up” position. Depress the “Push to Test” pushbutton and then on the Digitrip depress the Reset pushbutton. This action will provide a complete reset of the Digitrip’s cause of trip memory and eliminate relighting of previous test trip LED when the circuit breaker is put back into service.

NOTE: After completion of testing, always disconnect cable from Test Kit to prevent accidental operation and battery drainage. Reset all Digitrip settings to their original condition, including LTM jumper. Install the small cover on the Digitrip and install the circuit breaker’s plexiglass cover.

NOTE: On the left side of Figure 1.2, a relief notch is shown next to the jumper to accommodate a non connected “storage” position. Some Digitrip units may not have this notch. LTM is made active in this case by placing the jumper over the outer pin and letting it hang down.

1.1.7 Digitrip 220

The original Digitrip 220 (*not the 220+*) can be tested using the Test Kit. This Digitrip 220 has an adjustable Instantaneous setting but uses a fixed Long Delay set at 1.0x and a fixed Long Time set at 10 seconds at 6x. The Instantaneous can be tested as indicated in section 1.1.3.

However the Long Time test requires the hand held tester be set at the SHORT setting (200mA or 200%). Hold “Push to Test” button in and view the Status LED flashing rapidly. The circuit breaker/Digitrip should trip in 60 to 90 seconds.

1.2 Test Procedure: Digitrip 1150 family

The Digitrip 1150 family consists of the Digitrip 1150, 1150i (*Magnum Breaker*) and the Digitrip 1150V, Vi (*Medium Voltage type VCP-T, VCP-TR and T-VAC, T-VACR*)

1.2.1 Setup

Before testing, apply the overlay onto the handheld tester for the Digitrip 1150 to aid in the test sequence. Remove the circuit breaker’s plexiglass cover. At this time also apply the Aux power to the Digitrip right corner connector if the Digitrip is not already powered up. Note the Digitrip trip setting “as found” so that they can be restored after testing is completed. This can be accomplished by entering the VIEW SETTINGS menu and recording each of the settings.

Enter the Program Setting menu and temporarily enter test settings by depressing the Reset pushbutton and selecting ProGraM SETTINGS (in the middle display) using the down arrow VIEW pushbutton. Then Select CURRENT and then LSIG (curve). Make the following test settings:

LONG SLOPE =I2T, LONG Pickup = 0.4x , LONG TIME =2 SHORT PU =4x, INST = 2.5x, GROUND = 0.24x or 0.4x Push SAVE to transfer Test settings into memory.



Figure 1.3 Testing Digitrip 1150 with Magnum Breaker in Disconnected Cell position

Also the VOLTAGE Settings (if applicable) will need DISABLED at this time while performing these current injection type tests.

Remove cover over Digitrip "Test Kit" port pins by applying screwdriver under lip to pop off cover.

To begin testing, connect the Test Kit cable (style 5720B57) from the left side of the Functional Test Kit to the "Test Kit" port pins located on the front panel of the Digitrip unit. The trip unit end of the cable is designed in such a way that it will only fit over the "Test Kit" pins the correct way.

1.2.2 Power Up

Set Select Test switch on the Test Kit to the "POWER UP" position. Push the Test pushbutton on the Test Kit to verify battery voltages are available from both power sources. Both Battery Voltage LED's A and B should light. In the event that either LED does not light, refer to Section 1.7. Observe Digitrip status. Unit Status LED should flash at a rate of one second on / one second off. Release Test pushbutton.

1.2.3 Instantaneous Trip

Set Select Test switch to "INST" position. Close the circuit breaker. Push Test pushbutton and release immediately after breaker trips. Reset Digitrip and the red trip flag. Recharge and reclose the circuit breaker.

1.2.4 Short Delay Trip

The Select Test switch should be on "SHORT" position at this time. Push the Test pushbutton and hold for a maximum of one second. Release immediately after trip. The Short Delay Trip LED should flash after trip. Reset the Digitrip and red trip flag on the circuit breaker.

1.2.5 Long Delay Pickup and Trip

Set Select Test to "LONG" position. Push Test and hold. Status indicator LED on Digitrip should flash quickly indicating an, Long Pickup, overload condition in progress. Long Delay Trip of circuit breaker should occur in 5 - 8 seconds accompanied by flashing Long Delay trip LED. Release test pushbutton immediately after trip.

NOTE: After a circuit breaker trip has occurred, release the "Push to Test" pushbutton immediately. If held in too long after a breaker trip, the Digitrip unit will re-enter its protection algorithm to start timing out for a second trip. In this process the expected trip LED indication may get cleared and a "CHECK AUX SWITCH" alarm message may appear on the display. This message would be as expected if the test pushbutton is held in too long.

1.2.6 Ground Fault Trip (if applicable)

Set Select Test to the "GROUND" position. Plug in the Ground Fault Test Connector supplied with the kit to the circuit breaker's "B" secondary contact block. (See Figure 1.4.)

NOTE: The circuit breaker will have to be in its Disconnected Position to plug in this connector. This connection could be accomplished by other means. No setting changes are required for this test. Hold Test pushbutton until breaker trips and/or Digitrip Ground (Earth) Fault indicator flashes.

NOTE: After completion of testing, always disconnect cable from Test Kit to prevent accidental operation and battery drainage. Reset all Digitrip settings to their original condition. Install the small cover on the Digitrip and install the circuit breaker's plexiglass cover.

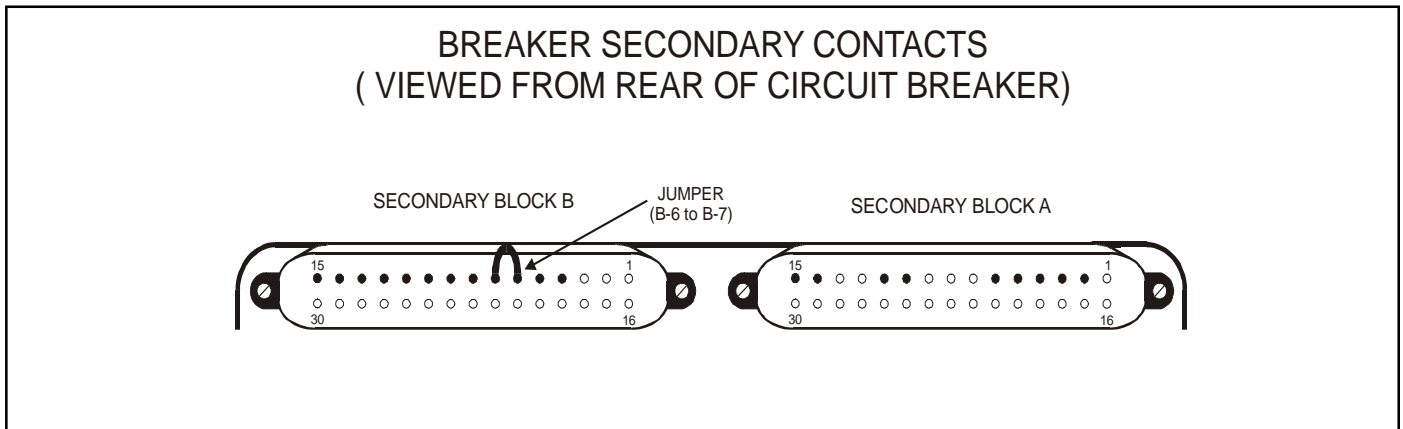


Figure 1.4 Breaker Secondary Contact Jumper for Ground Fault Test (Magnum or Medium Voltage Breaker)

When testing process is completed, **remove the Ground Fault Connector jumper** and disconnect cable from both trip unit and Test Kit. Test Kit components should be stored together in case.

1.3 Test Procedure: Series G and FD Circuit Breakers

1.3.1 Setup

Before testing, write down all settings in use so that they may be restored after tests are completed. To begin testing connect the G/FD cable assembly (style 5721B14) into the side connector of the handheld unit. Plug the other end of the cable into the test port. Position Trip/No Trip switch on cable assembly to the Trip position and set the Ground Fault switch to the "Off" position. On the circuit breaker set the (I_r) switch and SDPU (I_{SD}) switch to maximum.

1.3.2 Power Up

Set the Select Test switch on the Test Kit to the "POWER UP" position. Push the Test pushbutton on the Test Kit to verify battery voltages are available from both power sources. Both Battery Voltage LEDs A and B should light.

Note: The cable has an interlock feature and must be connected to the tester to enable battery power. In the event that either LED does not light, refer to Section 1.7. Batteries Status LED should flash at a rate of one second on / one second off. The circuit breaker/trip unit should not trip. Release Test pushbutton.

1.3.3 Short Delay Trip

The Select Test switch should be on "INST" position at this time. Position the circuit breaker Short Delay (I_{SD}) setting to 2x. Push the Test pushbutton and hold for a maximum of one second. Release immediately after circuit breaker trip. Relatch and reclose the circuit breaker.

1.3.4 Long Delay Pickup and Trip

On the cable assembly depress Memory Reset pushbutton for 5 seconds to discharge the thermal memory capacitor. On the Test Kit, set the Select Test to "LONG" position. On the circuit breaker, set the Short Delay setting to 4x or higher. Set (I_r) setting to its maximum ampere setting and set Long Delay Time (t_{LD}) to 2 seconds. Push Test and hold. Status indicator LED on the trip unit should flash. Long Delay Trip should occur in a nominal 18 seconds. Release Test after Trip and relatch and reclose the circuit breaker.

1.3.5 No Trip Testing

Set the Select Test to "INST" position. Position the Trip / No Trip switch on the cable assembly to "No Trip" position and Ground Fault switch to "Off" position. On the breaker set Short Delay to 2. Push Test and hold for 1 second. Release Test button. The yellow TEST / ALARM LED on the circuit breaker should light and the circuit breaker should not trip. Unplugging the test connector will reset the TEST LED.

NOTE: Long Delay and GF Test can also be done in the "No Trip" position.

1.3.6 Ground Fault Trip (if applicable)

Set the Select Test to "GROUND". Position the Ground Fault switch on the cable assembly to "On". On the circuit breaker set Ground Fault Pickup ($GND I_G$) to 0.6 or less. Push Test button and hold for 1 second or release immediately after circuit breaker trips. Relatch and reclose the circuit breaker.



CAUTION

IF CIRCUIT BREAKER IS ON LINE, TEST KIT MUST BE IN NO-TRIP SWITCH POSITION OR CIRCUIT BREAKER COULD TRIP.

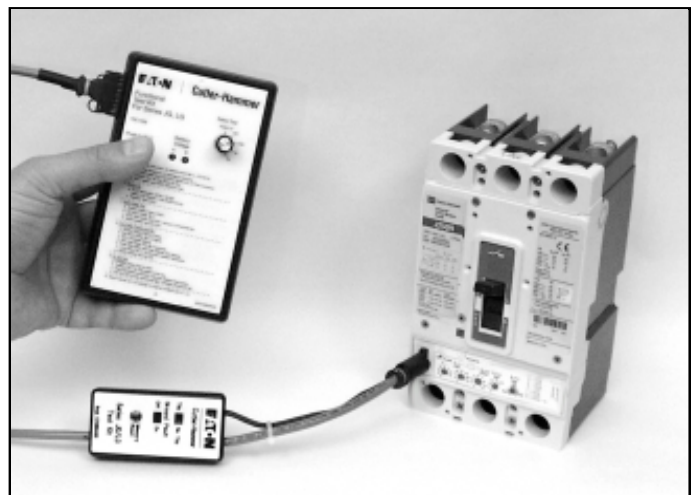


Figure 1.5 Testing a Circuit Breaker

1.4 Currents

Each test selected by the Select Test switch on the Test Kit supplies a fixed milliampere dc current value. The current levels are 30, 300, 120 and 200 mA. For the various trip units the Long Delay Setting will affect the per unit (Ir) current value and the overall time-current characteristic curve for Long and Short Time.

1.5 Batteries

The Functional Test Kit contains a total of seven 9-Volt batteries located under the back cover by removing the four screws. A single Lithium Ion cell is the preferred battery type for BAT A and is attached to the main pc board of the Test Kit. This battery has a much longer life span to accurately perform the selected tests. The remaining six batteries, BAT B, are located on a separate board in the Test Kit and serve to power up the trip unit.

LED's A and B function to represent sufficient battery voltage. If either LED does not light or lights only dimly, replace the appropriate battery or batteries. To do this, open the back of the case using a screwdriver and remove the battery or batteries from their respective locations.

For best results, replace Lithium battery (Battery A) with ULTRALIFE® U9VL Battery.

When replacing battery six-pack (Battery B), replace all batteries at the same time using standard 9V alkaline batteries.

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