

Instructions for Field Installing Ground Fault Alarm/Power Supply Modules into Digitrip 520M Equipped Eaton Magnum and Magnum DS Circuit Breakers



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Note: The recommendations and information contained herein are based on experience and judgement, but should not be considered to be all inclusive or to cover every application or circumstance which may arise. If you have any questions or need further information or instructions, please contact your local representative or the Customer Support Center at 1-800-356-1234.

1.0 General Description (of the Ground Alarm / Power Supply Module)

The Ground Alarm / Power Supply Module (see Figure 1) is an optional accessory for the Digitrip 520M trip unit. It mounts underneath the metal trip unit mounting plate in the Magnum breaker. When wired (see Figure 2), it will provide an auxiliary power supply for the Digitrip 520M's LCD meter display, when the circuit breaker is lightly loaded. (On non-ground fault style trip units, this will be its ONLY function.)

A second function of the module is to provide Ground Trip or Ground Alarm Only contact closure via the relay supplied in the module. This is assuming the Digitrip 520M is already equipped with ground trip or ground alarm functionality. The following input voltage ratings of the module it self are covered: 120 Vac, 230 Vac and 24/48 Vdc.



Figure 1. Ground Alarm / Power Supply Modules Style #7802C83G01 Shown.

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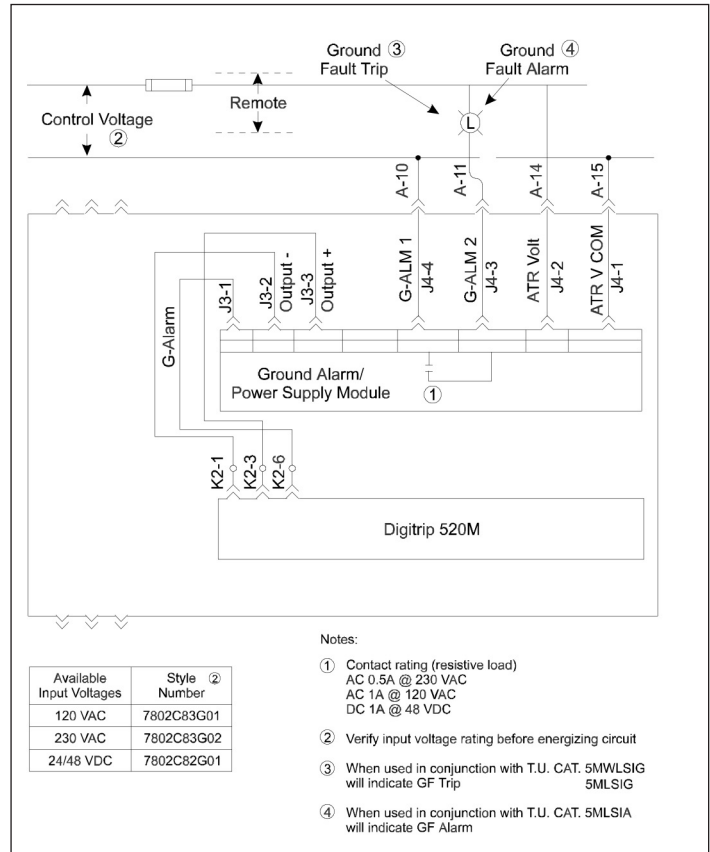


Figure 2. Wiring Diagram for 520M Models and Ground Alarm / Power Supply Modules.

1.1 Auxiliary Power & Ground Alarm

When the module is wired (as shown in Figure 2), it will provide an auxiliary power supply so that the 520M/520Mi liquid crystal display (LCD) will be functional even when the circuit breaker has no load. A Digitrip 520M unit **without** auxiliary power will not display data until load current reaches approximately 25% 1 phase or 10% 3 phase of the (I/n) rating.

A second function of the module is to provide either a ground trip or ground alarm only output contact via the relay supplied in the module. On Digitrip 520M models with ground fault protection, an LED on the front of the unit also provides an indication of ground fault trip.

1.2 Ground Fault Trip

When the Ground Alarm/Power Supply module is used with the 5MLSIG model, this unit will provide ground fault trip contacts when the circuit breaker trips on a ground fault. You must then push the Reset button on the Digitrip in order to reset the contacts (see Figure 2, Note 3).

1.3 Ground Fault Alarm

A ground fault alarm alerts a User to a ground fault condition without tripping the circuit breaker. (This is applicable when using the 5MLSIA model.) A red Alarm Only LED on the front of the trip unit will indicate the presence of a ground fault condition that exceeds the programmed setting.

The ground fault alarm relay is energized when the ground current continuously exceeds the ground fault pickup setting for a time in excess of a 0.1 second delay. The alarm relay will reset automatically if the ground current is less than the ground fault pickup (see Figure 2, Note 4).

2.0 Choosing the Proper Upgrade Kit

Choose the Field Installation Kit Style, for Ground Alarm /Power Supply Module, in accordance with the control voltage input rating you desire. (for Magnum DS circuit breakers equipped with a Digitrip 520M)

- 120 Vac Style # 70C1081G01
- 230 Vac Style # 70C1081G02
- 24/48 Vdc Style # 70C1081G03

3.0 Hardware / Items Supplied with Upgrade Kit

Each Eaton Field Installable Kit Style for Ground Alarm / Power Supply module (in Digitrip 520M equipped, Magnum DS Breaker) comes with the following:

- This Instruction Leaflet (#70C1080H02)
- Ground Alarm/Power Supply Module (#7802C83G01, G02 or #7802C82G01)
- A completed, four conductor wiring harness (#2C12797G05)
- Two #8 x 0.5" long, high load Phillips screws (#70010LXG5V)
- Tie wraps (#765A029H01)
- Accessory Kit labels sheet (#2A10163H01)

4.0 Tools Required (Not Supplied)

Installation of the module requires:

- 10 mm socket & ratchet (1/4" drive)
- 1/8" (3 mm) flat bladed screwdriver
- # 2 Phillips screwdriver
- Wire cutters (for tie wraps)
- AMP[®] pin extraction tool (not always required)
305183-R (see note on Page 5)
AMP is a Registered Trademark of TYCO International, LTD.

5.0 Installation Preparation

5.1 Remove Breaker from Line

Ascertain that the breaker is completely powered down during the Ground Alarm / Power Supply module installation. If you are unsure as to whether or not the unit is isolated, contact a certified electrician.

⚠ WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING. ALWAYS FOLLOW SAFETY PROCEDURES. EATON IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

5.2 Manually Tripping the Breaker

Before installing the Ground Alarm / Power Supply module, manually force the isolated breaker to trip via the push buttons on the front panel.

6.0 Installation Procedure

6.1 Removing the Front Cover

Using a 10 mm socket or driver tool, loosen the four bolts which affix the front cover to the breaker frame. These are located at the four corners of the cover. Then pull down the charging handle and lift off cover (see Figure 3).



Figure 3. Pulling Down the Charging Handle to Remove Cover.

6.2 Loosening the Rating Plug

To loosen the rating plug from the trip unit, spring the rating plug door where it is marked "open" with a small, flat bladed screwdriver. Using a 0.125" (3.2 mm) wide screwdriver, fully loosen the M4 screw (see Figure 4).

The rating plug can now be removed by itself or is free to come out along with the trip unit when it is lifted from the breaker.



Figure 4. Loosening the Rating Plug Retaining Screw.

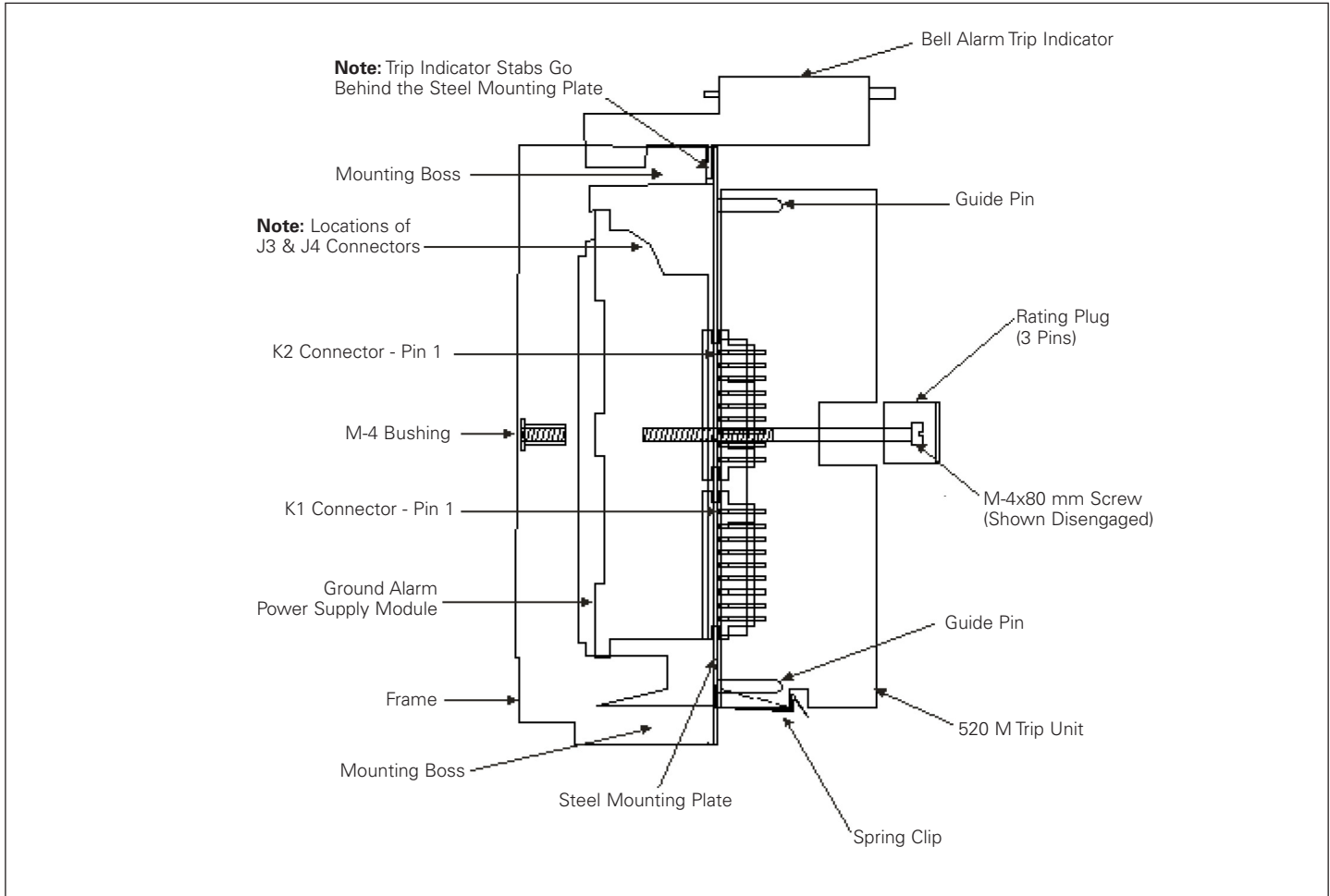


Figure 5. Components of the Trip Deck and Installation of the Digitrip Unit into a Magnum Breaker (Side View).

6.3 Removing the Trip Unit

To remove the trip unit from the circuit breaker, deflect the spring clip underneath the trip unit with a screwdriver. When unlocked, you will be able to pull the trip unit straight out and, by doing so, will disengage the trip unit's printed circuit board connectors K1 & K2 from the circuit breaker. This action should be firm, but not forced (see Figure 5).

6.4 Removing the Trip Deck Mounting Plate

Using the # 2 Phillips screwdriver, remove the two top screws that anchor the steel trip deck plate into the mounting boss. Be careful not to damage the Trip Indicator Assembly (and Over Current Trip Switch / Bell Alarm if your breaker contains this option).

Note: Observe how the Trip Indicator Assembly (Figures 5 & 6) tabs are located BEHIND the steel mounting plate. Upon reassembly, the unit must be reattached in an identical manner.

Next, loosen the two screws at the bottom of the steel mounting plate. Lift the plate upward then swing it to the left to expose the cavity where the Ground Alarm / Power Supply Module will be mounted.



Figure 6. The Trip Indicator Assembly.

7.0 Mounting the Module

Carefully remove any wire ties and move existing wiring to the left. The module mounts directly under the steel plate so that the hole in the module aligns with the 4 mm threaded insert. Hold the module against the mounting surface to confirm correct positioning. Take one of the supplied self tapping screws and partially screw it into the bottom retaining boss for the module. The screw anchoring tabs for the module are slotted.

Slide the bottom tab of the module behind the partially inserted screw. Take the second screw and place it in the other slotted notch on the top of the module and anchor the unit in place in the breaker. Now go back and tighten the bottom retaining screw and ascertain that the Ground Alarm / Power Supply Module is firmly seated in the Magnum frame.

8.0 Wiring Harnesses

Two wiring harnesses must be attached to the Ground Alarm / Power Supply Module. The first, a three conductor connector, is already pre-wired into the breaker at the factory. The second is supplied with the field installable upgrade kit. It comes ready to install with a four conductor connector on one side and male pins on the other which are inserted into the Secondary Block "A" which is a black connector on the top left side of the breaker

8.1 Preparing the Harness

Using several of the supplied tie wraps, secure the four conductor harness into a common bundle. Cleanly trim the excess tails from the tie wraps.

⚠ CAUTION

IT IS IMPORTANT THAT THE TIE WRAPS ARE TRIMMED AND THAT THE NEW HARNESSES AND EXISTING WIRING BE TUCKED NEATLY BACK INTO THE BREAKER FRAME. LOOSE OR STRAY WIRES MIGHT INTERFERE WITH PROPER FIT AND ALIGNMENT OF THE TRIP UNIT. ADDITIONALLY, THIS SAME SITUATION MIGHT INHIBIT MOVEMENT OR OPERATION OF CERTAIN MECHANICAL COMPONENTS WITHIN THE BREAKER.

8.2 Attaching Harnesses to the Module

Take the pre-wired, three conductor connector with the locking edge facing up and push firmly into place on the three conductor pin set (J3) on the left side of the top of the module. Confirm that the connector is locked in place.

Next, take the four conductor connector and similarly attach it to the four conductor pin set (J4) on the right side of the top of the module. Confirm that it is secure.

8.3 Running the Harness

Rout the end of the four conductor harness with the four pins from the Ground Alarm Power Supply Module between the bosses up to the Secondary Block "A." Be sure that the wires do not interfere with any moving parts.

8.4 Wiring the Secondary Block "A"

The ends of the four conductor harness are to be connected to the Secondary Block "A" on the top, left side of the breaker (see Figure 7). The wires are marked A-10, A-11, A-14, and A15. According to the label on the block, insert them into the proper terminal slots. This is done simply by pushing them in until they lock. After the audible "click," confirm that they are secure by slightly pulling on each wire.

Tuck away and tie wrap all wiring neatly so that it will not interfere with any mechanical operation or prevent improper fit of reassembled components.



Figure 7. Wiring Secondary Block "A".

Note: The AMP™ extraction tool is not actually required for the installation of the Ground Alarm / Power Supply Module. It is needed only if the pins are accidentally inserted into the wrong locations in Secondary Block "A" and have to be removed and reinserted.

9.0 Reassembly

9.1 Replacing the Trip Deck (Mounting Plate)

Swing the steel trip unit mounting plate down onto the two lower partially loosened attachment screws. Tuck all wiring bundles neatly behind it so as not to capture wires between the module and the steel deck. Position the mounting tabs of the Trip Indicator Assembly (also the Overcurrent Trip Switch / Bell Alarm if this option is attached) behind the steel Trip Unit Mounting Plate (see Figure 8).

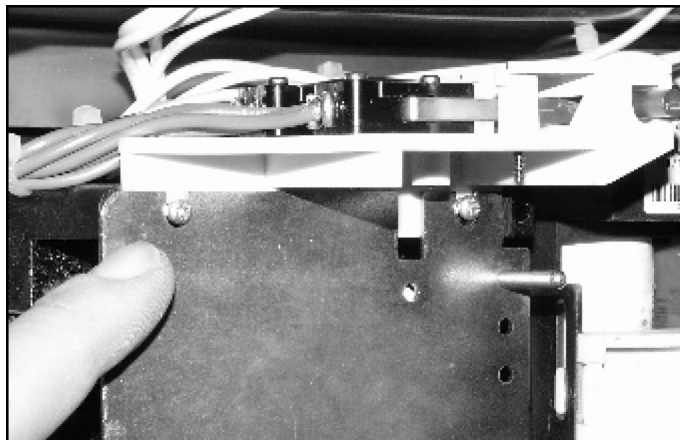


Figure 8. Proper Seating of Trip Indicator Assembly Behind the Steel Trip Unit Mounting Deck.

Confirm that the steel wireform for the Trip Indicator Assembly is not bound nor its operation interfered with (see Figure 9). Replace the two top screws that hold the steel Trip Unit Mounting Plate in place. Tighten all four appropriately and confirm that the trip deck plate is firmly seated.

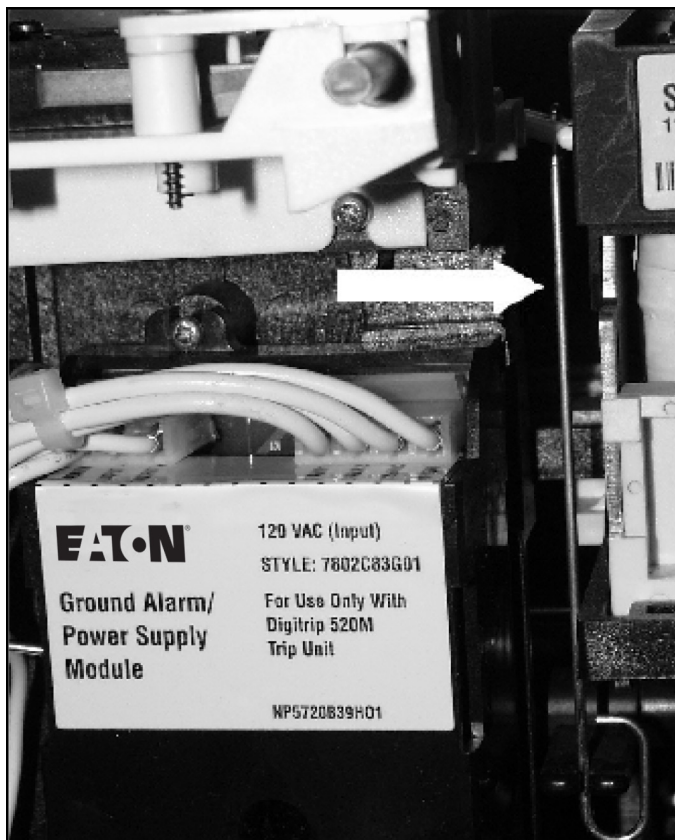


Figure 9. The Steel Wireform of the Trip Indicator Assembly.

9.2 Reinstalling the Trip Unit

Align the Digitrip unit with the two guide pins on the plate and spring clip of the Magnum Circuit Breaker (see previous Figure 5). Press the unit into the breaker until the pins engage into the connectors and the lower spring clip engages over the Digitrip's housing.

⚠ WARNING

DO NOT ENERGIZE THE MAGNUM BREAKER WITH THE DIGITRIP REMOVED OR DISCONNECTED FROM ITS CONNECTOR. DAMAGE TO INTERNAL CURRENT TRANSFORMERS MAY OCCUR DUE TO AN OPEN CIRCUIT CONDITION.

9.3 Reinserting and Securing the Rating Plug

If the rating plug was removed from the trip unit, carefully, insert it back into the cavity on the right-hand side of the trip unit. Align the three pins on the plug with the sockets in the cavity. The plug should fit with a slight insertion force.

Now (or If the rating plug was left inside the trip unit), use a 0.125" (3.2 mm) wide screwdriver to tighten the M4 screw until the screw head contacts the rating plug with 1 in.-lb (1.36 N·m) of torque. This will secure the plug and the trip unit into the circuit breaker (as removed in previous Figure 4).

Close the rating plug door.

⚠ CAUTION

DO NOT FORCE THE RATING PLUG INTO THE CAVITY. FURTHERMORE, THE M4 SCREW SHOULD BE TIGHTENED ONLY UNTIL IT IS SNUG. DO NOT USE A LARGE SCREWDRIVER. A 1/8" (3 MM) WIDE SCREWDRIVER BLADE IS ADEQUATE.

⚠ CAUTION

BE SURE TO CHECK THAT THE SENSOR RATING MATCHES THAT PRINTED ON THE RATING PLUG DOOR. INSTALLING A RATING PLUG THAT DOES NOT MATCH THE SENSOR RATING CAN PRODUCE SERIOUS MISCOORDINATION AND/OR FAILURE OF THE PROTECTION SYSTEM.

IF A RATING PLUG IS NOT INSTALLED IN THE TRIP UNIT, THE UNIT WILL INITIATE A TRIP WHEN IT IS ENERGIZED BY CONTROL POWER OR BY LINE CURRENT.

9.4 Final Internal Visual Inspection

Before proceeding any further, do a visual inspection to insure that none of the breaker's internal wiring might hamper any mechanical operation or compromise proper fit of any component. Use any remaining tie wraps to secure any wires which might be loose.

9.5 Replacing the Front Cover

Partially pull down the charging handle on the front of the breaker. Slide the breaker cover over the handle and into place on the breaker frame. Using the 10mm ratchet or driver, tighten all four retaining bolts in each corner of the cover to 25 to 35 in.-lb (33.90 - 47.45 N·m) of torque. Latch the breaker and reset the red flag on the Trip Indicator Assembly which protrudes from the front cover above the Trip Unit. Proceed with the test sequence.

Note: At this time, it is highly recommended that the proper accessory label be placed in the "Accessories" area of the front cover. Chose the sticker that matches the Trip Unit Power voltage of the style installed:

24-48 Vdc (#70C1081G01), 120 Vac (#70C1081G02) or 240 Vac (#70C1081G03).

10.0 Post Installation Testing

10.1 When to Test

Testing prior to start-up can best be accomplished with the breaker out of its cell or in the Test, Disconnected, or Withdrawn (or Removed) cell positions.

⚠ CAUTION

TESTING A CIRCUIT BREAKER WHILE IT IS IN SERVICE AND CARRYING LOAD CURRENT IS NOT RECOMMENDED.

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

⚠ CAUTION

ANY TRIPPING OPERATION WILL CAUSE DISRUPTION OF SERVICE AND POSSIBLE PERSONAL INJURY, RESULTING IN THE UNNECESSARY SWITCHING OF CONNECTED EQUIPMENT.

10.2 Code Requirements

The NEC, under Article 230-95-C, requires that any ground fault protection system be performance tested when first installed. Conduct tests in accordance with the approved instructions provided with the equipment. Make a written record of this test and make the results available to the authority having inspection jurisdiction.

10.3 Standard Requirements

As a follow-up to the basic performance requirements stipulated by the NEC, UL Standard No. 1053 requires that certain minimum instructions must accompany each ground fault protection system. These statements (Section 5.4.3), detailed testing information, plus a copy of the record forms can be found in the Instructional Leaflet which came with your breaker. (I.L. 70C1037)

10.4 Test Methods - (Refer to Figure 2)

10.4.1 Power Up Check

Upon energizing the trip unit with the correct auxiliary power control voltage onto secondary contacts A-14 and A-15, confirm that the status LED and LCD display are functioning.

If the Digitrip does not have a ground element and the module was installed just for the powering of the LED display, then perform an overload test at 200% to verify tripping (secondary injection test with a test kit). This would complete the verification sequence. If a ground element is involved, continue with the following tests.

10.4.2 Secondary Injection Test

An AC current of 1 Amp input can be injected onto the breaker secondary contacts B-4 and B-5. This will trigger the Ground Alarm indicator to function and close contacts A-10 and A-11.

10.4.3 Primary Injection Test

A primary current higher than the Ground Current Pickup setting, when applied to a pole of the circuit breaker, will trigger the Ground Alarm indicator to function.

10.4.4 General Test Instructions For Secondary and Primary Injection Methods

The interconnected system must be evaluated only by qualified personnel and in accordance with the equipment assembler's detailed instructions.

To avoid improper operations following apparently correct simulated test operations, the polarity of the neutral sensor connections (if used) must agree with the equipment assembler's detailed instructions. Where a question exists, consult the specifying engineer and/or equipment assembler.

⚠ WARNING

DO NOT ATTEMPT TO INSTALL, TEST, OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT.

DE-ENERGIZE THE CIRCUIT AND DISCONNECT THE CIRCUIT BREAKER BEFORE PERFORMING MAINTENANCE OR TESTS.

⚠ WARNING

PERSONAL INJURY CAN OCCUR WHEN WORKING ON POWER SYSTEMS. ALWAYS TURN OFF POWER SUPPLYING BREAKER BEFORE CONDUCTING TESTS. TEST OUT OF THE CELL, IF POSSIBLE. THERE IS A HAZARD OF ELECTRICAL SHOCK OR BURN WHENEVER WORKING IN OR AROUND ELECTRICAL EQUIPMENT.

Verify the grounding points of the system using high voltage testers and resistance bridges to ensure that ground paths do not exist that could bypass the sensors.

Use a low-voltage (0 to 24 volt), high-current, AC source to apply a test current of 125% of the Digitrip unit ground fault pickup setting through one phase of the circuit breaker. This should cause the breaker to trip (on LSIG style trip units) in less than 1 second and operate the alarm indicator. Reset the breaker and the alarm indicator. Repeat the test on the other two phases (see Figure 10).

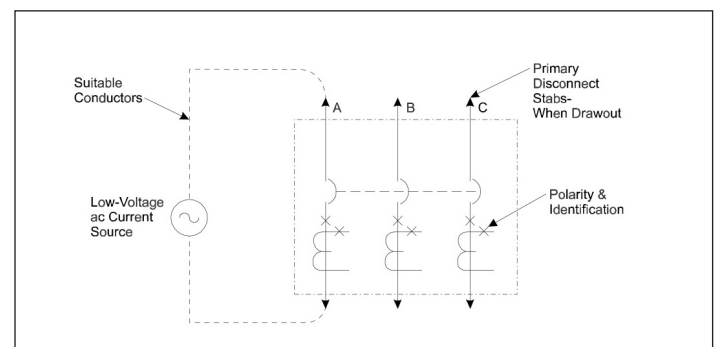


Figure 10. Connection Details for Conducting Single Pole, Single Phase Current Tests with the Breaker Removed from the Cell.

Apply the same current as described above through one phase of the breaker, returning through the neutral sensor if so equipped. The breaker should not trip and the alarm indicator should not operate. Repeat the test on the other two phases.

Apply the same current as described above through any two phases of the breaker. The breaker should not trip, and the alarm indicator, if one is supplied, should not operate. Repeat the test using the other two combinations of breaker phases (see Figure 11).

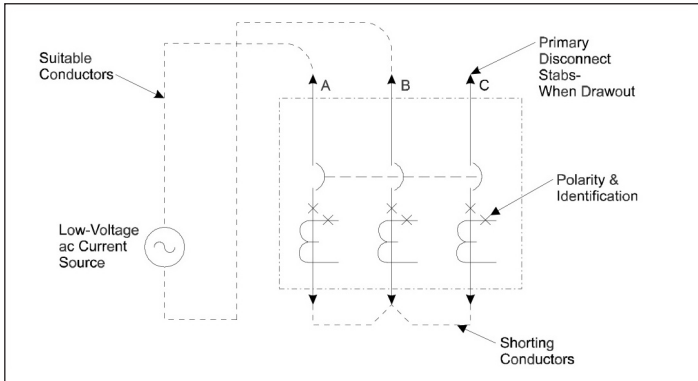


Figure 11. Connection Details for Conducting Single Phase Current Tests with the Breaker Removed from the Cell.

⚠ CAUTION

RESTORE ALL TEMPORARY CONNECTIONS MADE FOR THE PURPOSE OF CONDUCTING TESTS TO PROPER OPERATING CONDITIONS BEFORE RETURNING THE BREAKER TO SERVICE.

10.4.5 Eaton Test Kit Check

The functions of your newly installed Ground Alarm / Power Supply module can also be confirmed with an optional, test kit authorized by Eaton. This device can provide secondary injection currents to the ground protection element of the trip unit that simulates currents from the current transformers.

Follow the detailed instructions of the particular test kit to initiate a ground trip and verify the alarm, contact closure and breaker trip action.

The test port is located on the front left-hand corner of the Trip Unit. To access the port, remove the plexiglass cover from the front of the circuit breaker. Using a small screwdriver, gently pry up on the test port cover to remove this item.

Model	Test Kit
Digitrip DT20 family	Test Kit (140D481G02R, 140D481G02RR, 140D481G03, or G04) with Test Kit Adapter 8779C02G04

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⚠ CAUTION

BEFORE PLUGGING A TEST KIT INTO THE TEST PORT, PLACE THE LTM JUMPER IN THE INACTIVE POSITION. AFTER TESTING, RETURN THE LTM JUMPER TO ITS ORIGINAL POSITION.

⚠ CAUTION

PERFORMING TESTS WITHOUT THE EATON- APPROVED TEST KIT MAY DAMAGE THE DIGITRIP UNIT

⚠ WARNING

OBSERVE ALL RECOMMENDATIONS, NOTES, CAUTIONS, AND WARNINGS RELATING TO THE SAFETY OF PERSONNEL AND EQUIPMENT. OBSERVE AND COMPLY WITH ALL GENERAL AND LOCAL HEALTH AND SAFETY LAWS, CODES, AND PROCEDURES. .

11.0 Standards

The Eaton Digitrip Trip Units are listed by the Underwriters Laboratories, Inc.® (UL), UL File E52096, for use in Magnum Circuit Breakers. These same units are also listed by the Canadian Standards Association (CSA) under file LR 43556.

All Digitrip units have also passed the IEC 947-2 test program which includes radiated and conducted emission testing. As a result, all units carry the CE mark.

Notes:

The instructions for installation, testing, maintenance, or repair herein are provided for the use of the product in general commercial applications and may not be appropriate for use in nuclear applications. Additional instructions may be available upon specific request to replace, amend, or supplement these instructions to qualify them for use with the product in safety-related applications in a nuclear facility.

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