SACE® Emax 2 and Tmax® XT
LSIA protection: Ground fault alarm with ABB circuit breakers

Ground fault alarm with ABB circuit breakers

Abstract
In some cases, users want to know when a ground fault exists but need the equipment to continue operating without shutting down. This is commonly the case in continuous process industries or in situations where an abrupt shutdown of equipment would be more hazardous than an orderly and systematic shutdown. If desired, ABB circuit breakers with Ekip Touch or Ekip Hi-Touch electronic trip units have the capability to give the user an "alarm only" function for ground fault, without tripping. Circuit breakers setup for LSIA functionality will alert the user to a ground fault condition by local and remote indication without tripping the circuit breaker. Threshold settings available for ground fault alarm are the same as for ground fault trip, adjustable from 10 to 100 percent of the rating plug value, up to a maximum of 1200 amps as allowed by the product standards for UL circuit breakers. Once a ground fault alarm occurs, both local and remote signal indication is available.

Introduction
In applications allowed by the NEC, the ABB circuit breaker with LSIG protection functions and Ekip Touch or Hi-Touch trip units can be set up to provide LSIA protection. This transition from ground fault trip to ground fault alarm only without tripping the circuit breaker is a quick and simple change easily made by the user. This is accomplished by going into the programming menus and disabling the opening command for the ground fault function. In this way, the circuit breaker detects the ground fault condition but only displays a local alarm indication. Furthermore, by adding an Ekip Signaling 2K-3 module the alarm can be made available remotely by using one of the two available programmable output contacts. This Ekip Signaling 2K-3 module functionality can also be combined with an energy-reducing maintenance switch with local status indicator, sometimes referred to as RELT (reduced energy let-through).

Ground fault protection (trip or alarm only)
An adjustable ground fault set point is provided on Ekip Touch and Hi-Touch trip units with LSIG functions. The ground fault function can be set to trip the circuit breaker once the GF threshold and time delay settings are exceeded, see Figures 1 and 2, or to give an alarm only and NOT trip the circuit breaker when the settings are exceeded. When setup for ground fault alarm only, the circuit breaker will not trip when a ground fault is detected, instead an alarm indication will be displayed locally on the trip unit. If the circuit breaker is equipped with an optional Ekip Signaling 2K-3 module, a programmable set of output contacts can be programmed to change state allowing the alarm signal to be annunciated remotely via an external device. The ground fault trip/ alarm value is calculated by multiplying the ground fault current threshold setting value times the circuit breaker's rating plug value "In". The available range of ground fault trip/alarm values is from 0.100 to 1.000 times "In" with increments of 0.001 with a maximum value of 1200 amps as determined by applicable product standards for UL circuit breakers. Time delay values range from 0.1 to 0.4 seconds in increments of 0.05 seconds. The curve can be set to fixed time (t=k) or inverse time (t=k/I2).
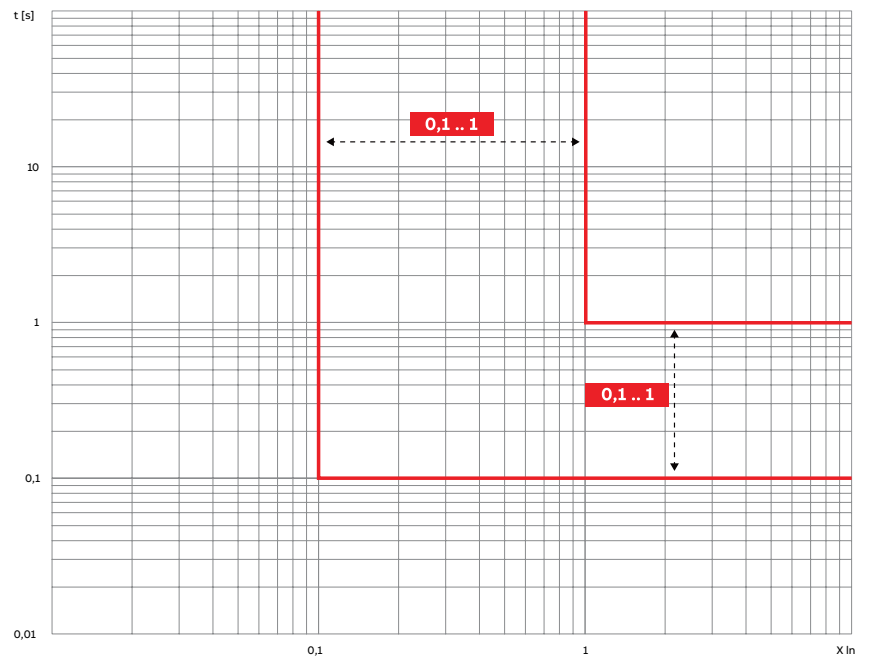
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Ground fault trip curves

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01
Ground fault protection
with inverse time [a]

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02
Ground fault protection
with fixed time [a]
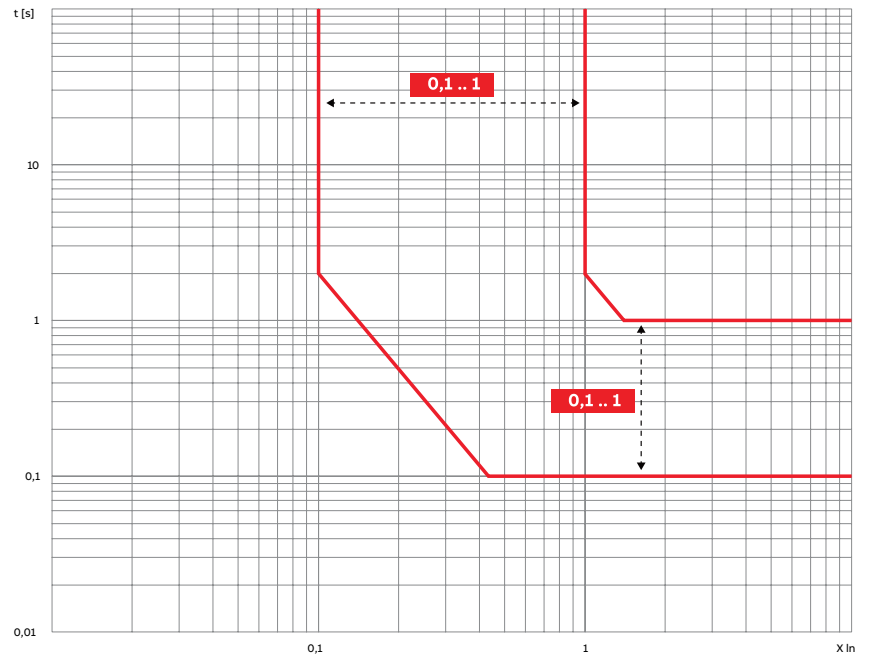

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01

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02

Programmable Output Contacts

—
03
Ekip signaling 2K module

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04
Wiring diagrams for Ekip
signaling 2K module and
Ekip supply module [b]

The Ekip Signaling 2K module comes with two programmable output contacts and two digital inputs, see Figures 3 and 4. With the Ekip signaling 2K-3 module one of the two programmable output contacts is used to signal the activation of a second instantaneous protection for RELT or "maintenance mode". Simultaneously, the second programmable output contact of the Ekip Signaling 2K-3 module can be programmed to change state when a ground fault that exceeds the programmed threshold value and time delay is detected by the trip unit, thereby giving you a ground fault alarm output contact.

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03
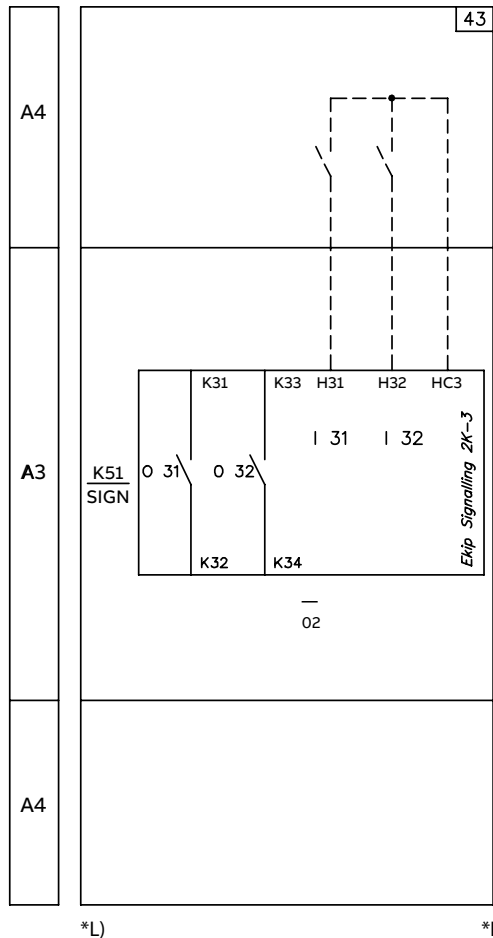
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04
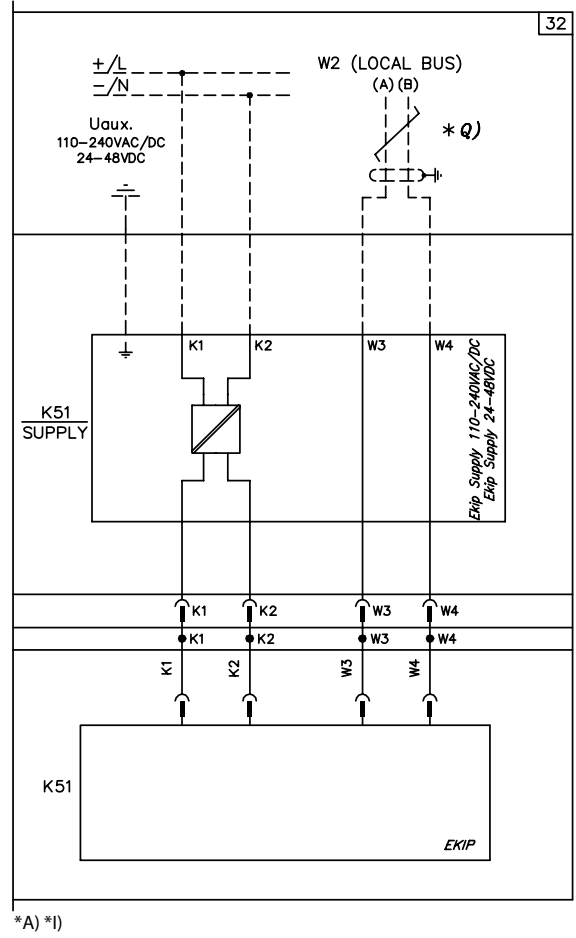
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Wiring

Since the first digital input (terminals HC3 and H31) is used for RELT, we will use the second digital input (terminals HC3 and H32) for a manual reset pushbutton to reset the ground fault alarm which will come on and stay on once a ground fault condition is detected. Connect a normally open pushbutton contact between the Ekip Signaling 2K-3 terminals HC3 and H32 for the manual reset function. It should also be noted that an Ekip Supply module is required which will

provide the power for the signaling module digital inputs. Output O 32 (terminals K33 and K34) will be used for the ground fault alarm output contact and can be wired to any external alarm either visual, audible or both that the user wants, provided the load does not exceed the ratings of the output contact.

The following table lists the electrical characteristics of the modules [b]:

Component	Characteristics
	Maximum switching voltage[1]; 150 V DC / 250 V AC
	Breaking capacity[1]; 2 A @ 30 V DC, 0.8 A @ 50 V DC, 0.2 A @ 150 V DC, 4A @ 250 V AC.
	Dielectric strength between open contracts: 1000 V AC (1 minute @ 50 Hz).
Output Contracts	Dielectric strength between each contracts: 1000 V AC (1 minute @ 50 Hz).

[1] Data relating to a resistive load.

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Programming

Set all the protection thresholds and time delays for the ground fault function as you normally would and then follow these programming steps to disable the circuit breaker from tripping and setup the GF alarm reset.

> **Note**
> Trip unit programming was performed using Ekip Connect 3 software, all illustrations are screenshots from software versions 3.3.2.0.

1. Launch the free Ekip Connect software on the customer supplied laptop [c]

2. Connect your laptop computer to the circuit breaker trip unit using the Ekip T&P cable. Connect one side of the micro USB cable to the Ekip T&P module and the other side to the Ekip Touch or Hi-Touch trip unit. Connect the USB connection on the Ekip T&P module to the customer supplied laptop [d]. You can confirm the proper connection is made when the green power led is on. Active communication will be indicated via the orange transmission indicator blinking on the Ekip T&P module.

Note: It may be necessary to scan for the trip unit via the ABB Key before the device will appear in the Ekip Connect software

3. Select "Scan" next to T&P

3
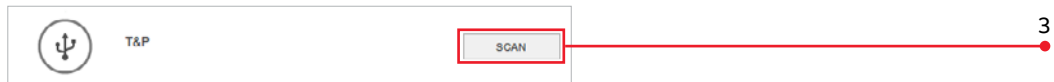
4. Select "Configuration"
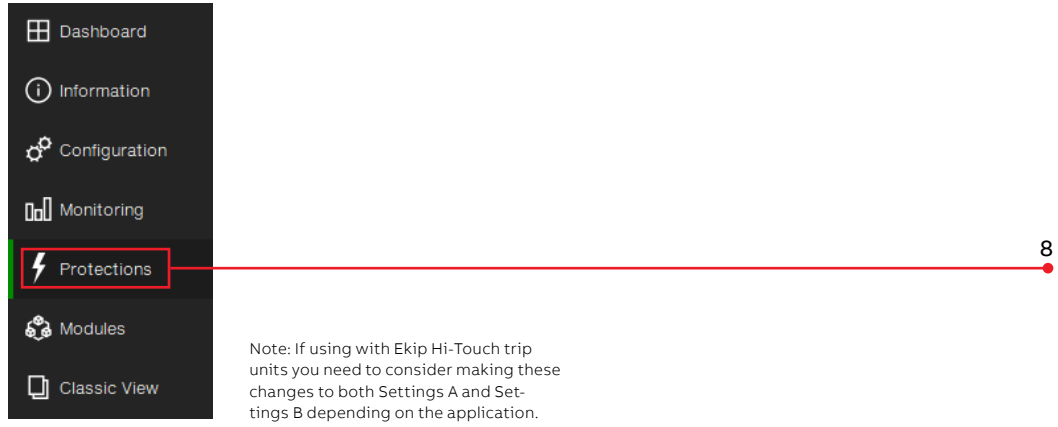

4
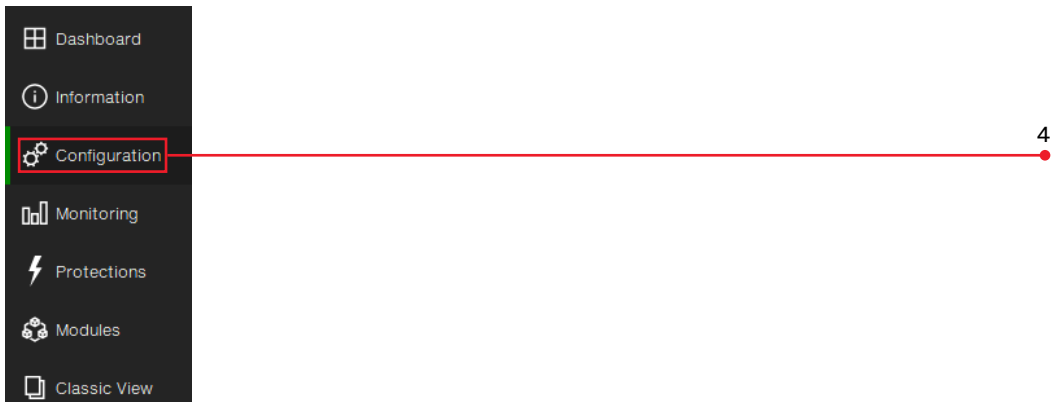
5. Select "Unit main parameters"

5

6. Enable Local Bus to see Ekip Signaling module 2K-3
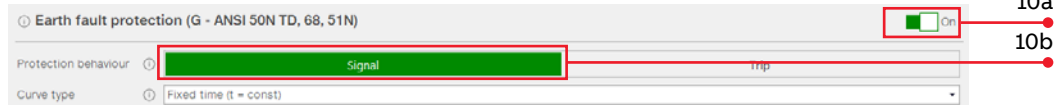

6

7. Select "Apply" to submit the changes

7

8. Select "Protections"

8

Note: If using with Ekip Hi-Touch trip units you need to consider making these changes to both Settings A and Settings B depending on the application.

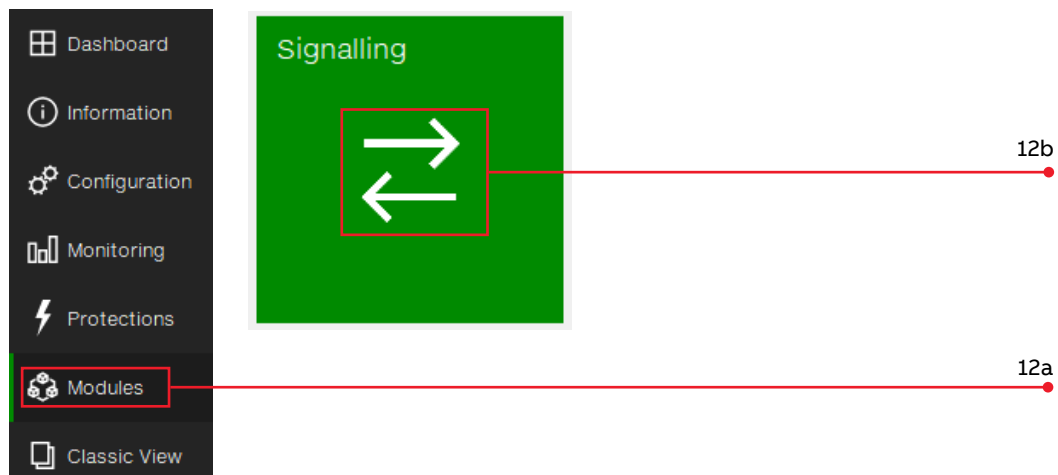9. Select "G 50" for "Earth Fault Protection"

9

10. Enable the G 50 protection by selecting "On" and then "Signal" for alarm only

10a
10b
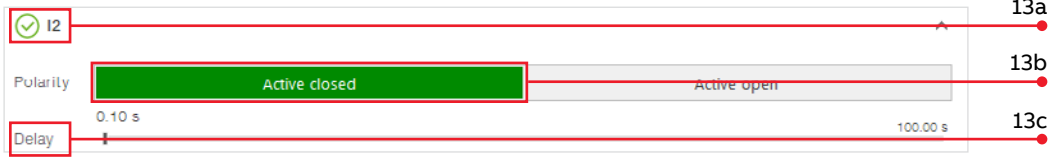
11. Select "Apply" to submit the changes

11

**12.** Select "Modules" and then "Signaling" to access the Ekip Signaling 2k-3

12b

12a

13. Select "I32 2K-3" and make sure the "INPUT I32" is set to "Active Closed" and "Delay" is set to 0.10 s, which are the factory default settings.

13a
13b
13c

14. Under "OUTPUT O32" set "Contact Type" to "Normally Open" and "Self-latching" to "ON". This will cause the output contact to stay on once a ground fault condition is detected until it is manually reset using the reset pushbutton that is wired to the "INPUT I32".
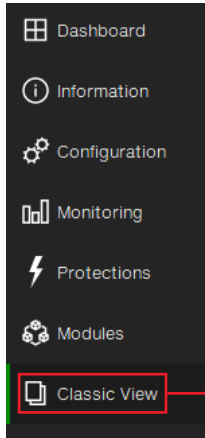

14a
14b
14c
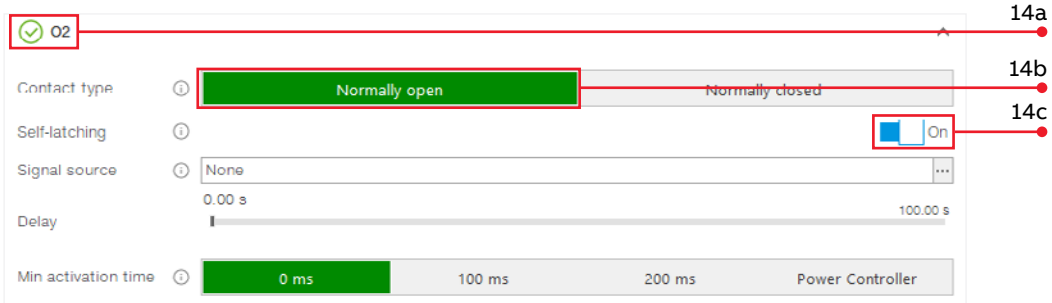
15. Under "OUTPUT O32" click on the "…" button for "Signal Source" and choose "Custom…" from the "Trigger type:", then select "Alarm/Warning 1 H" from the "Events group:", then select "G alarm (Blocked Trip)" from "Events:" and change from "X" to "1". Click "OK"

15a
15b

15c

15d

15e
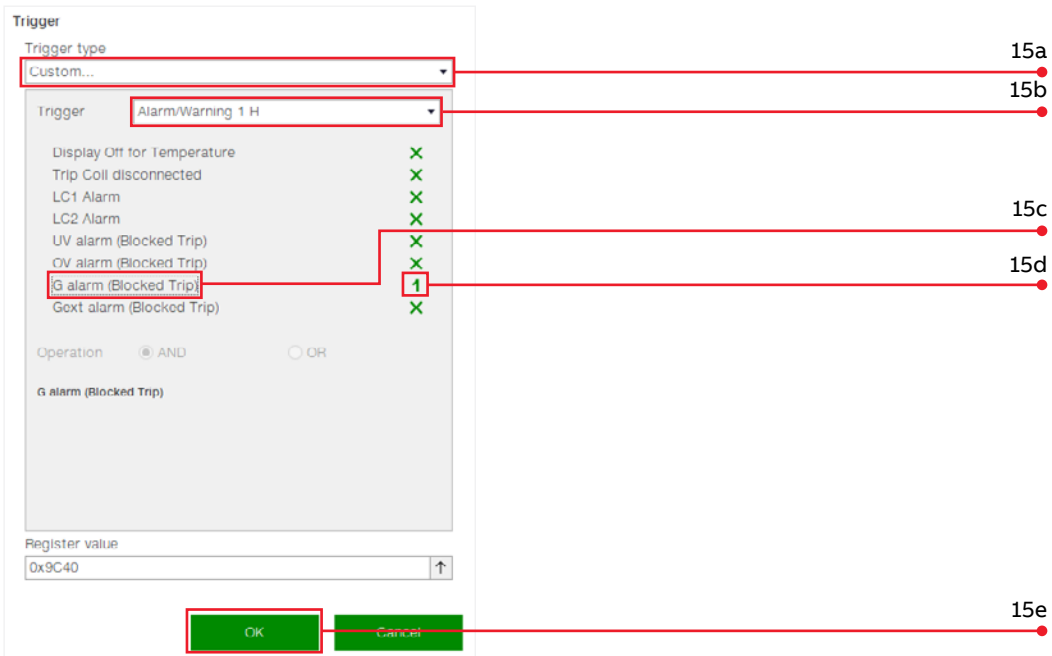
16. Click on "Apply", "OK" and "Apply" (you should see this):
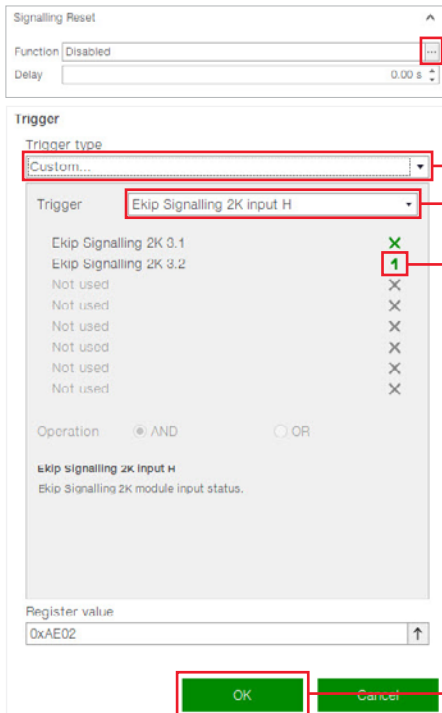

16

17. Select: "Classic View"

17

18. Select "Functions"
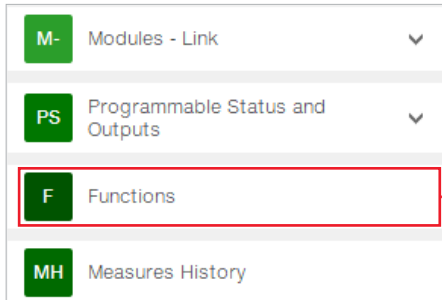
18

19. Under "Signalling Reset" click the "…" button for "Function". For "Trigger type" select "Custom." In the Trigger drop down, select "Ekip Signaling 2K input H." Change the X to 1 under Ekip Signaling 2k 3.2. Click "OK."
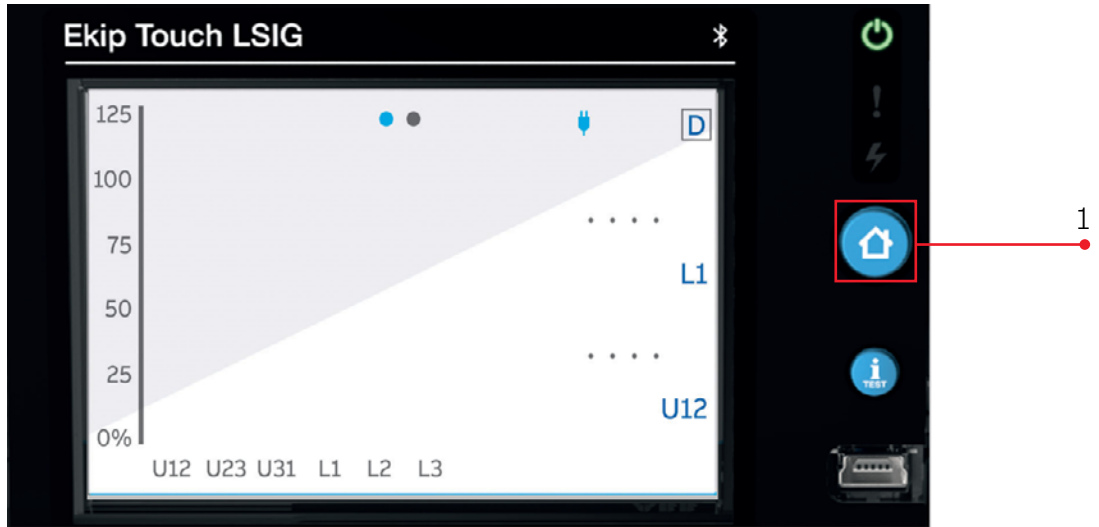

19a

19b

19c

19d

19e

20. Click on the "Up Arrow" located in the upper right corner to submit changes
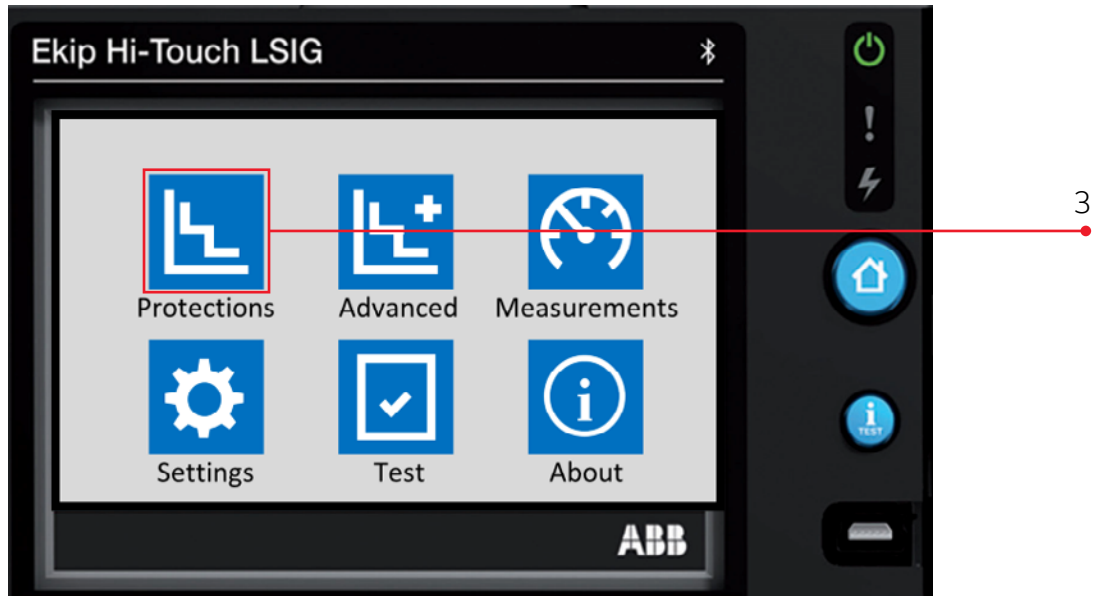

20

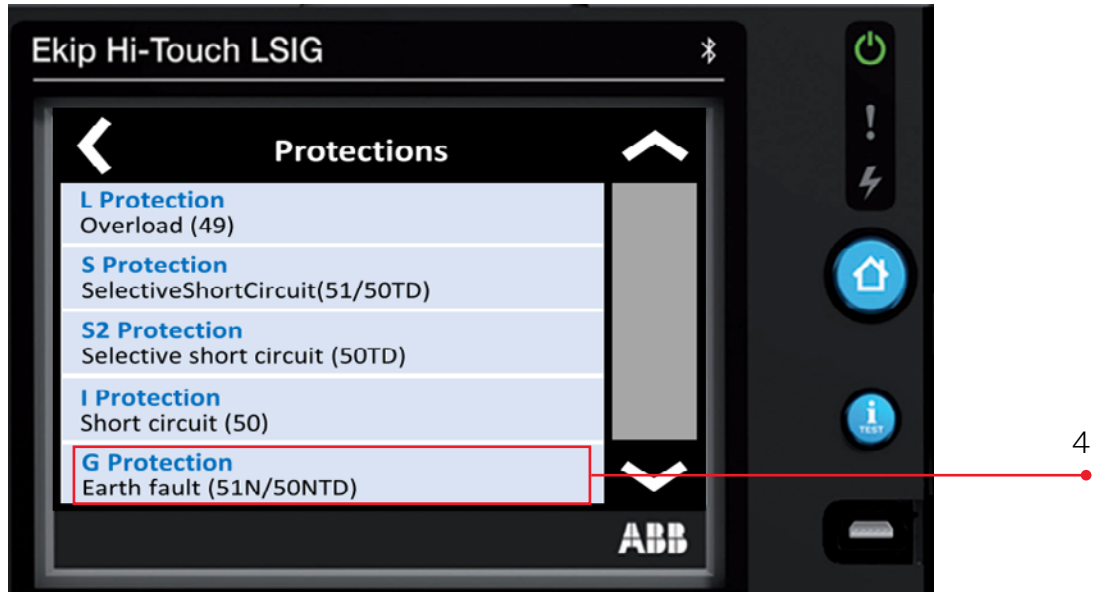# Enabling Ground Fault Alarm using trip unit HMI

Step 1. Press "Home" button

Step 2. Select "Settings"

Step 3. Select "Protections"
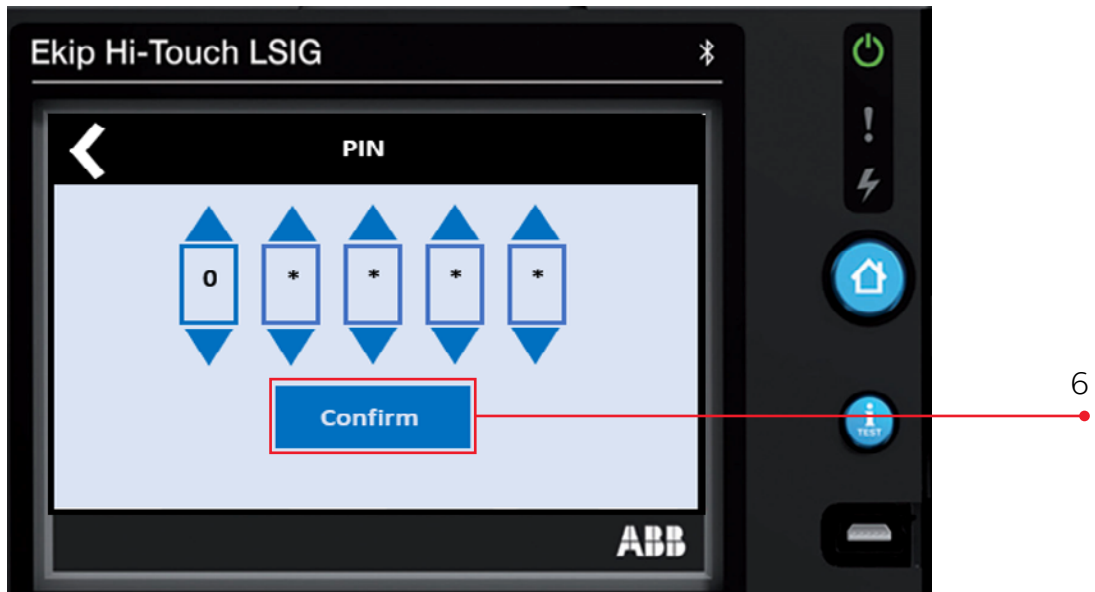

Step 4. Select "G Protection"

Step 5. Select "Enable"
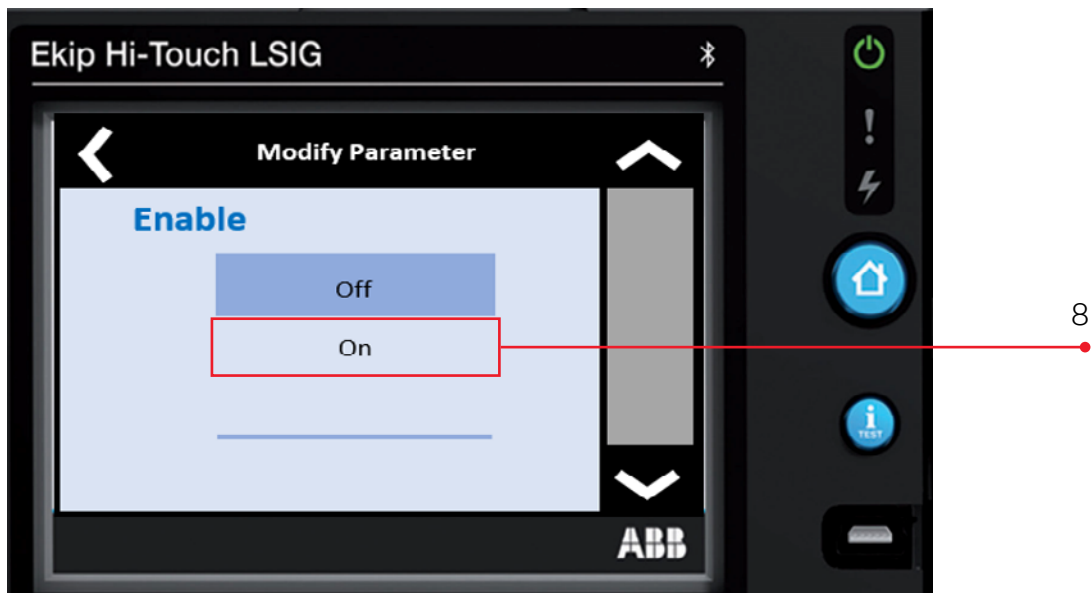

5

Step 6. Zero appears in the first PIN box.
- Press Confirm to accept zero
- Repeat for the next three PIN boxes
- On the 5th PIN box change from zero to one (press the up triangle), then press Confirm
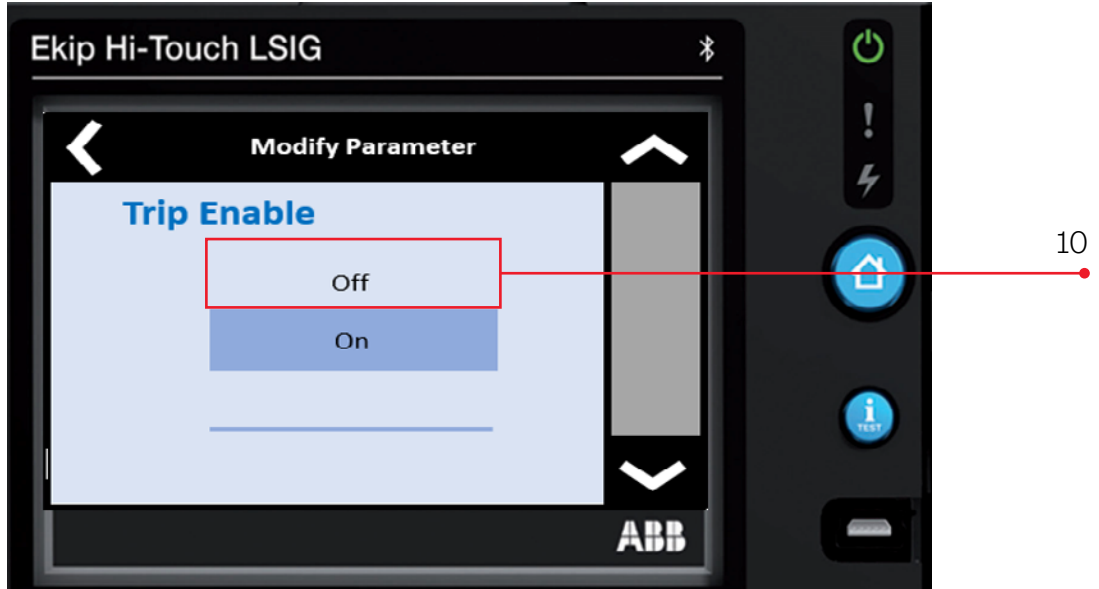

6

Step 7. Select "Enable"

7

Step 8. Select "On"

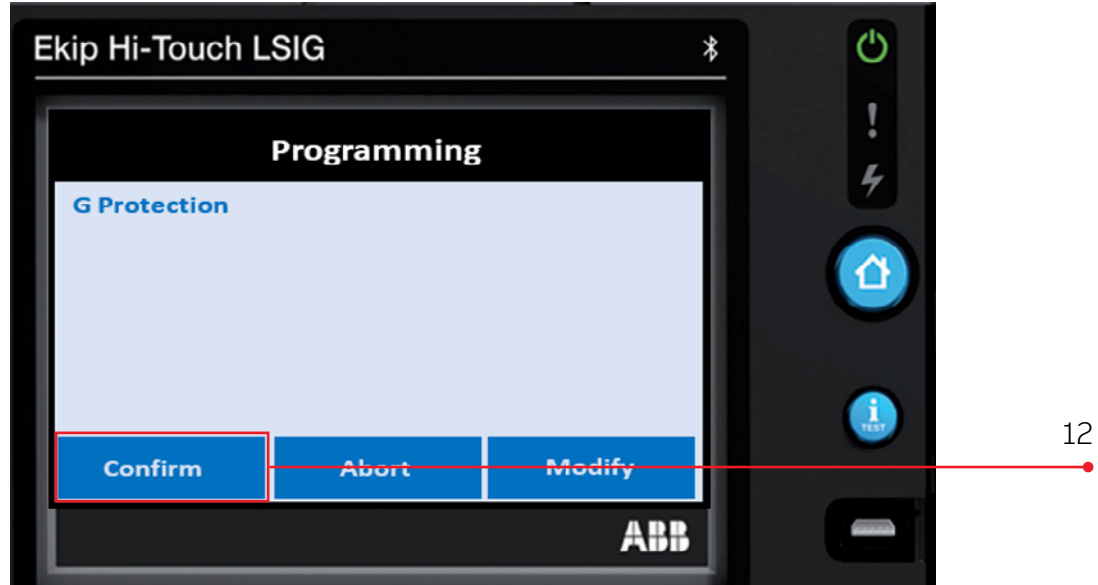8

Step 9. Select "Trip Enable"

9

Step 10. Select "Off"

10

Step 11. Press the "Home" button

Step 12. Select "Confirm"

This completes the setting of the Ground Fault Alarm using trip unit HMI

Conclusion

There are several electrical installations where ground fault protection (tripping) is not required or desirable, but ground fault sensing, or alarm, may be beneficial to the equipment user or even required by the National Electrical Code. ABB circuit breakers provide a way to meet the requirements of these specialized ground fault alarm applications with only a few simple and quick programming changes when using the advanced features of the Ekip Touch or Hi-Touch trip units.

References

[a] ABB SACE Emax 2 Operating instructions for the design engineer, 1SDH001330R1002 - ECN000134959 - Rev. A page 221
SACE Emax 2 - Operating instructions for the design engineer (Black platform) (abb.com)

[b] SACE Emax 2 Low voltage power circuit breakers ANSI C37 / UL 1066 / CSA standards Technical Catalog 1SXU200040C0201 - 2022.03
SACE Emax 2 UL Catalog (abb.com)

[c] ABB Ekip Connect 3 Software Download
ABB Library - 1SDC20011X3000

[d] ABB Ekip T&P Instruction Sheet, Emax 2, 1SDH001000R0517
Ekip T&P - XT2 - XT4 - XT7 - XT7M - E1.2 - E2.2 - E4.2 - E6.2 (abb.com)

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