Resistance Grounded Power Systems:

Guideline on NGRM Relay Testing

Application Note

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Introduction

Testing the NGRM500 and NGRM700 is mentioned in the manuals for each product. They describe using the internal self-test feature to test that all output relays are switching. Each relay output can be independently enabled as detailed below:

Test Cycle

Since the ouput relays are not monitored in the hardware or software, they must be tested at regular intervals to verify proper functioning. The frequency of the test cycle is subject to the safety requirements of the operator but it should be carried out at least once every six months.

NOTE: During the test it must be ensured that the relays can actually switch off!

Ground-fault relay	menu 6.6.1.2 relay test “on”
NGR relay	menu 6.6.2.2 relay test “on”
Trip relay	menu 6.6.3.2 relay test “on”

Starting the test

Start the test by pressing the TEST button, via menu 10.3 or the input I3.

Functional Ground-Fault Test

Primary current injection can be used to perform a functional test of Ground-fault protection and CT operation and accuracy. A current source can be used to inject current through the CT window. Two methods are described below.

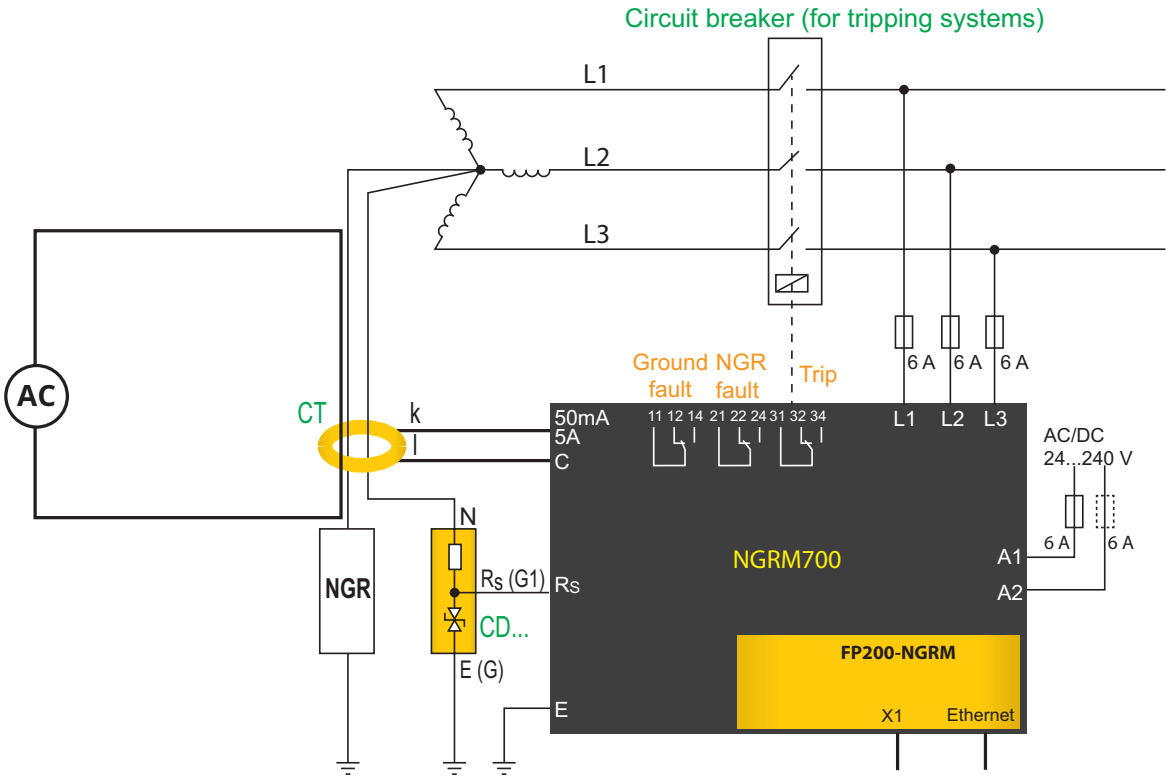

Figure 1:

Ground-Fault Test Method 1
Inject current with a value greater than I NGR trip through the CT. This will cause a ground-fault alarm (Ground Fault LED lights and Ground Fault relay output operates) and, if the current persists beyond the t(GFtrip) ground-fault delay time, will cause the Trip relay output to change state (if configured to do so in the Response Values menu). The NGRM may also show an R-NGR resistor-fault alarm. This is expected and normal operation because the NGRM compares neutral current and neutral voltage and will determine a resistor failure when current is measured without also measuring voltage across NGR (measured at the Coupling Device). During operation, this condition can only happen when a ground fault occurs when the NGR is shorted.

Note the Ground fault and NGR fault contacts operate with no delay when a fault condition is detected. Trip contact operation is time delayed based on time-delay settings for each protection mode. Injecting current for a short duration (less than the greater of 7 s, or the t(NGRtrip) setting) will prevent the Trip and NGR fault contacts from changing state during the test.

Ground-Fault Test Method 2
Inject less than 15% of nominal current (I NGR nom) through the CT, to ensure the NGRM will stay in the active measurement mode. Compare the injected current value to the value measured by the NGRM to verify accuracy.

NGRM Continuity Monitoring Function Test
While the NGRM relay is programmed for auto method of operation (Menu 6.3.1) , and it is measuring less than 15% of nominal current, it injects a dc signal into the Rs output (active mode). To verify the continuity monitoring is functional on a de-energized system, with control power applied to the NGRM, disconnect the Rs connection between the NGRM and Coupling Device. The unit should trip on >Rngr resistor fault. NGRM short detection may be tested by shorting the connection between the NGRM and Coupling Device. The unit should trip on <Rngr. In both simulated failure modes, the NGR Fault LED will light and the NGR fault and Trip contacts will operate. Reconnect and reset the unit after testing.

NGRM Test Record
In addition to recording the test data below it is recommended to upgrade to the latest firmware and to record the settings of the relay using the export function of the webserver connection.

Date	NGRM Serial number	Ground-Fault Trip Setting	Injected Current	Measured Value	Ground- Fault Trip test pass/ fail	>Rngr Test (open) pass/fail	<Rngr Test (short) pass/fail

NGRM Firmware _____

Facility _____

Testing Technician _____

Date _____

Signature _____