GE
Digital Energy

GPM Series

Firmware Version 1.02 Release Notes

GE Publication Number: GER-4472

Overview

Summary

Release 1.02 of the GPM series introduces improvements to protection functions. The following feature was modified for this release:

- GPM-F
    - Measuring of Field Ground resistance enhanced to ensure:
        - Fast and secure fault resistance measurement if the field voltage is stable
        - Improved and secure resistance measurement if the field voltage is in an allowable transient state
        - Frozen resistance measurement if the field voltage is in a large transient state, to ensure secure operation of the field ground fault module

Upgrading from a previous version of the GPM firmware to the new version 1.02 firmware can be done using the EnerVista Launchpad application or downloaded directly from the following GE Digital Energy website at www.GEDigitalEnergy.com\multilin\software\GPM.htm

Please contact your local Multilin sales representative or GE Digital Energy Technical Support for any questions regarding this upgrade.

Products Affected

The firmware release applies to the following product:

- GPM Field Ground Fault Protection Module (GPM-F)

It does not apply to the GPM Stator Ground Fault Protection Module (GPM-S).

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FW 1.02 Release Details

In the following descriptions, a revision category letter is placed to the left of the description. See the Appendix at the end of this document for a description of the categories displayed.

E   **Enhanced Field Ground Resistance Measurement**

102-1

Applicable: GPM-F-L and GPM-F-H

The GPM-F algorithm was reported as generating unreliable Field Ground resistance readings in situations when the field voltage changed rapidly. A large change in field voltage can occur during a large change in generator excitation, however this is normally temporary. The issue caused undesired Field Ground fault alarms or tripping. Through analyzing the source code and data obtained from field, testing and simulations, the reasons were concluded as:

- In the algorithm, the field voltage transient was considered. However, the cut-off rate of Field voltage change threshold was too loose, causing the calculation of Field Ground resistance to have a large error even if the fluctuating field voltage was still in the allowable range.

- In the calculation of Field Ground resistance, there may have been negative values in the presence of a large rate of change of field voltage. There were three reasons for this phenomenon: 1) the field voltage was in a large transient state; 2) a Field ground fault was just occurring and 3) the Field Ground resistance was very small, close to 0. In the algorithm, the negative fault resistance was forcedly set to zero.

The enhanced Field Ground resistance algorithm (Rev 1.02) considers the following aspects:

- When the field voltage is stable (no rapid change in voltage), the Field Ground resistance is output with few security checks, similarly as was done by the previous version of the algorithm. This guarantees the speed and sensitivity of the module.

- When the field voltage is in an allowable transient state, more security checks and calculations are processed to improve the accuracy and security of the module.

- When the field voltage is in a large transient state, the calculated fault resistance is frozen to the previous valid value to guarantee the security of the module.

The figure shows this modification.
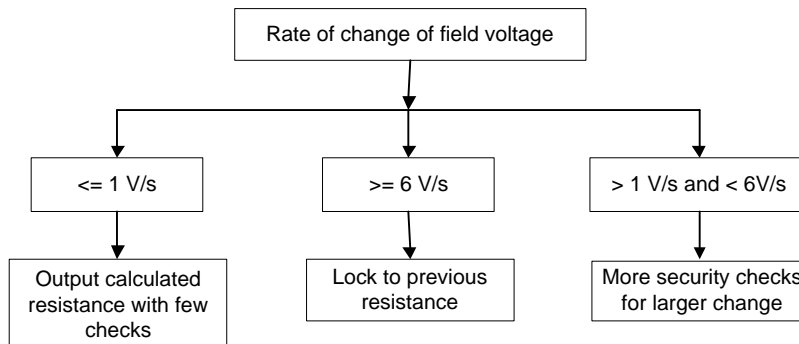
The effects of the enhanced algorithm can be summarized as

- The Field Ground resistance output is more accurate, especially when the field voltage is in the allowable transient state

- Unreliable Field Ground resistance output is filtered out

- In order to guarantee accuracy, the response time can become longer in the situation when the rate of change of field voltage is larger than 1V/s

If the generator field voltage can have a step-response of 6V/s or more, consider upgrading the firmware.

Upgrade Paths

Upgrade the GPM-F firmware using the EnerVista Launchpad application or downloaded directly from our website at www.GEDigitalEnergy.com\multilin\software\GPM.htm

To obtain the firmware using EnerVista Launchpad:

1. Open EnerVista Launchpad.
2. Click **IED Setup**.
3. Click **Check Updates** and specify the web option, for example. The check is done for all devices shown.
4. Select the GPM version 1.02 upgrade for download.

To upgrade the firmware of the GPM-F module:

1. Start the EnerVista UR Setup software.
2. Open the G60 device so that it appears in the online window.
3. Navigate to **Maintenance > Update GPM Firmware**.
4. Select the appropriate firmware file.
5. Click **Open** to start the firmware upgrade process. This process also works for a serial port device, taking longer to complete (approximately five minutes).

Appendix

Change Categories

This document uses the following categories to classify changes.

Table 1: Revision categories

Code	Category	Comments
N	New feature	A separate feature added to the relay. Changes to existing features even if they significantly expand the functionality are not in this category
G	Change	A neutral change that does not bring any new value and is not correcting any known problem
E	Enhancement	Modification of an existing feature bringing extra value to the application
D	Changed, incomplete, or false faceplate indications	Changes to, or problems with text messages, LEDs, and user pushbuttons
R	Changed, incomplete ,or false relay records	Changes to, or problems with relay records (oscillography, demand, fault reports, and so on)
C	Protocols and communications	Changes to, or problems with protocols or communication features
M	Metering	Metering out of specification or other metering problems
P	Protection out of specification	Protection operates correctly but does not meet published specifications (example: delayed trip)
U	Unavailability of protection	Protection not available in a self-demonstrating way so that corrective actions can be taken immediately
H	Hidden failure to trip	Protection does not operate when appropriate
F	False trip	Protection operates when it is not appropriate
B	Unexpected restart	Relay restarts unexpectedly

GE Technical Support

GE contact information for product support is as follows:

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