



INSTRUCTIONS

DFP300 RELAY

DFP3*****

DFP200 WITH SENSITIVE GROUND DIRECTIONAL FUNCTION AND ZERO SEQUENCE OVER VOLTAGE FUNCTION.

Introduction

These instructions, GEK-106224 together with GEK 105559, constitute the complete instructions for the DFP300 relay (DFP3*****). The DFP300 is similar to the DFP200, except it is specifically designed to operate in ungrounded systems.

Description

This relay has the following differences from the standard relay described in GEK 105559:

Removed:

- Negative Sequence Ground Directional Function, 67N.
- Zero Sequence Ground Directional Function, 67G.
- Ground IOC/TOC Functions, 50N, 51N

Added:

- Sensitive Ground Directional Function, 67NU
 - Sensitive Ground Directional Function Low Set, 67NUL
 - Sensitive Ground Directional Function High Set, 67NUH
- Zero Sequence Over Voltage, 59N

These instructions do not purport to cover all details or variations in equipment nor provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company. To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

Product Description

Sensitive Ground Directional Function, 67NU

This very sensitive function is designed to detect the capacitive zero sequence current generated in single phase to ground faults in ungrounded systems. Testing has shown that this function will operate for faults with impedances up to 20 times the zero sequence capacitive reactance of the substation.

Although very sensitive, the 67NU function is also very secure. This function will not operate for phase to phase faults, transformer inrush, normal energizing, or existing unbalances due to insulation failures or PT errors. This security is the result of digital filtering of the fundamental frequency and flexible settings of the $|3V0|$ and $|3I0|$ plane.

A single phase to ground fault in one feeder will generate zero sequence voltage and zero sequence current in other feeders on the same bus. A security measure to prevent mis-operation during this time is the directionality required for the 67NU function to operate.

To provide for continuity of service, the 67NU function will work with the standard recloser function of the DFP to clear temporary faults on the system. Also, the 67NUL function takes advantage of the Down-Conductor Logic of the HiZ function for the DFP300. This logic provides that the 67NUL function will only be enabled within 30 seconds of the loss-of-load or 2 cycle overcurrent flag being set true.

The 67NU function has a high set and a low set for both voltage $|3V0|$ and current $|3I0|$. Both the high set, 67NUH and the low set, 67NUL contain four set points as seen in Figure 1.

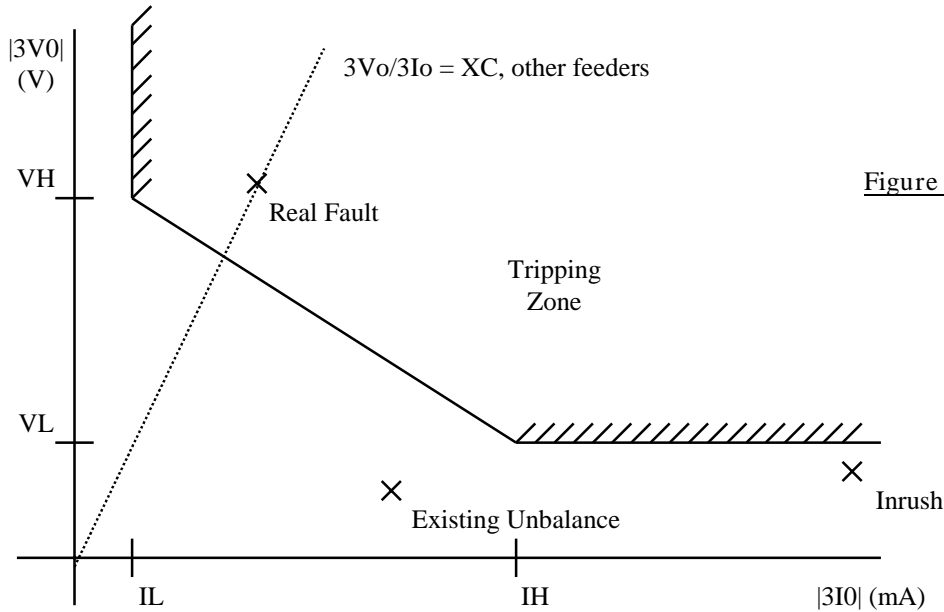
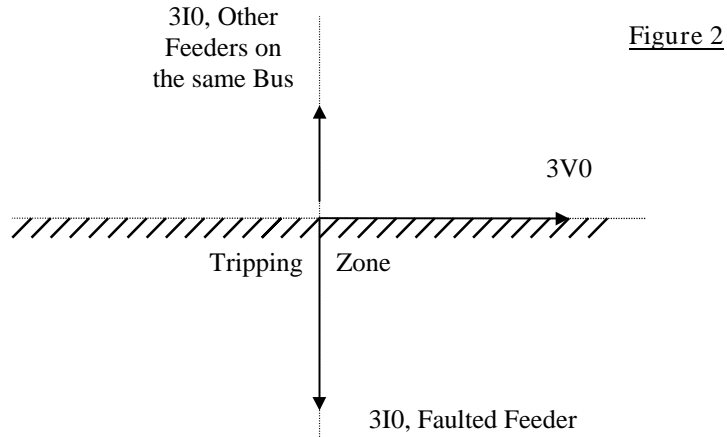


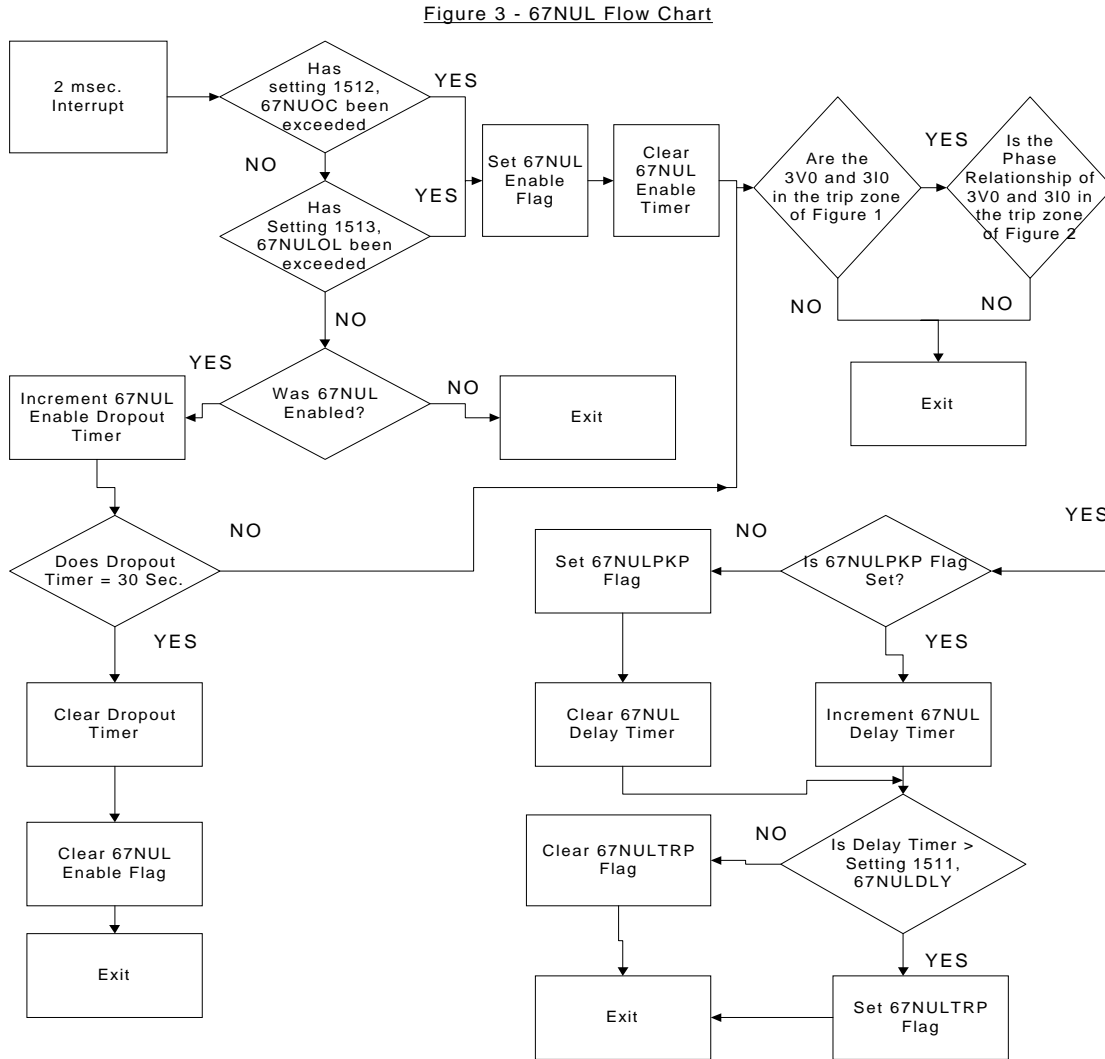
Figure 1

Once the relay has determined that the $|3V0|$ and $|3I0|$ quantities fall within the trip zone, the DFP300 will then check the phase relationship of the $|3V0|$ and $|3I0|$ quantities.

During a single phase to ground fault the DFP300 will see the $3I0$ quantity lag the $3V0$ by 90° . Other feeders on the same bus will see the $3I0$ quantity lead the $3V0$ by 90° as seen in Figure 2.

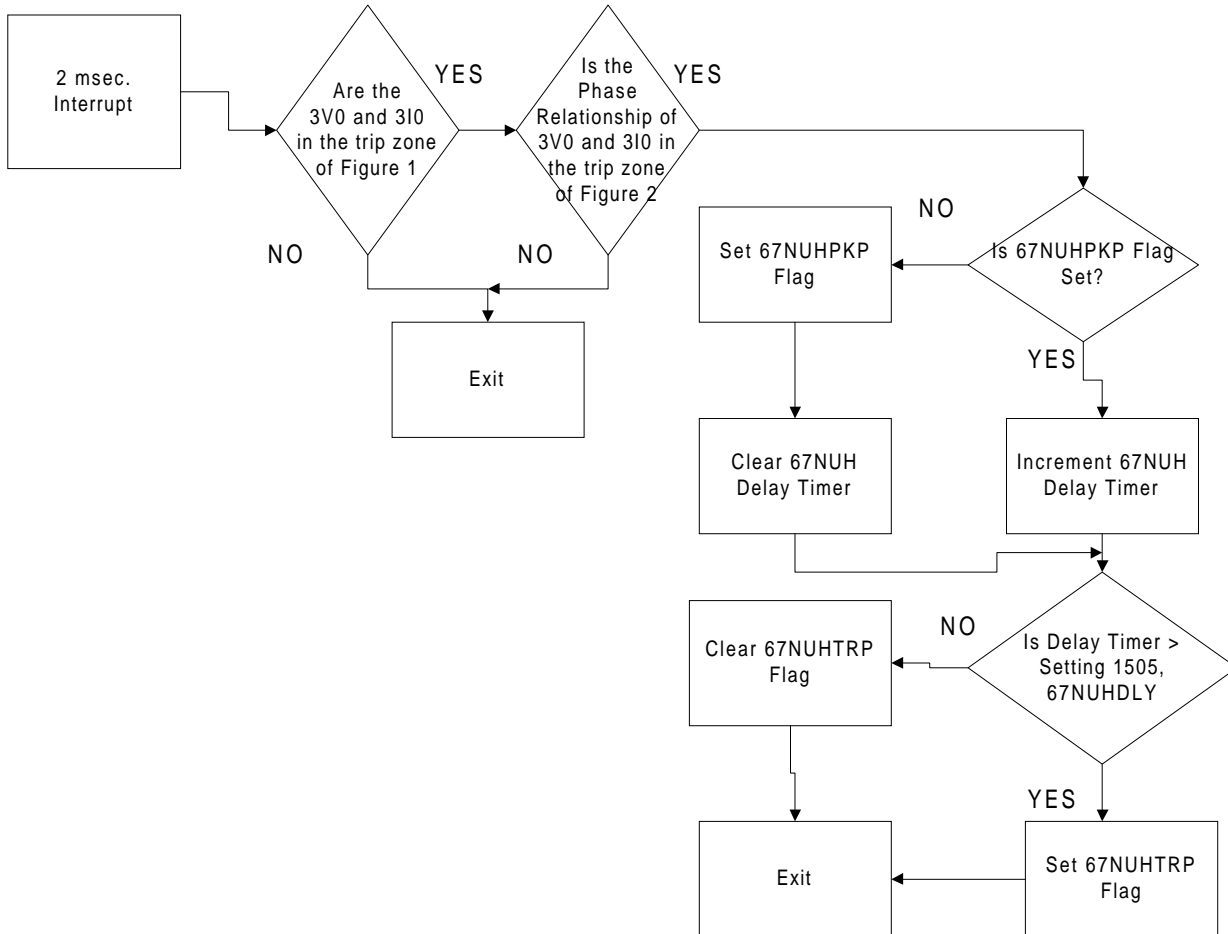


The output of Figure 1 and Figure 2 are ANDed together and if both tests show that the feeder is in the trip zone the appropriate 67NUHPKP or 67NULPKP flag will be set true. The flow chart of Figure 3 shows the complete operation of the 67NUL function.



The operation of the 67NUH function is similar to the 67NUL function, except the 67NUH function is free-running. It does not require the Loss of load flag or the Over Current flag to be set prior to processing any data. The flow chart of Figure 4 shows the complete operation of the 67NUH function.

Figure 4 - 67NUH Flow Chart



The PT wiring for correct operation of the 67NU function require three PTs, wye-wye connected with a grounded neutral. No special broken delta connections are required.

The CT wiring for correct operation of the 67NU function can either have 3 phase CTs or 2 phase CTs. The quantity, 3I0 is measured by a sensitive CT input at terminals AA13 (+) and AA14 (-) on the DFP300. The signal for this input is created by using an external toroidal CT which encircles the three phase CT secondaries.

Zero Sequence Over Voltage, 59N

This function calculates the 3V0 quantity from your wye-wye connected PTs. This function can also be used to detect single phase faults in ungrounded systems. However, due to a lack of phase determination it is only intended to be used as an alarm or as backup to the 67NU function.

The algorithm for the 59N function is strait-forward. If the 3V0 amplitude exceeds setting 1601, 59NPU the 59NPKP flag will be set. If this flag is set for a period of time equal to setting 1602, 59NDLY the 59NTRP flag will be set.

Calculations of Settings

67NU

1. **High Set IL Pickup, ILHPU** - Setting 1501 sets the IL point for the 67NUH function. The range is 0.5 - 100.0 mA.
2. **High Set IH Pickup, IHHPU** - Setting 1502 sets the IH point for the 67NUH function. The range is 0.5 - 100.0 mA. It should be set greater than or equal to ILHPU.
3. **High Set VL Pickup, VLHPU** - Setting 1503 sets the VL point for the 67NUH function. The range is 1.0 - 170.0 V.
4. **High Set VH Pickup, VHHPU** - Setting 1504 sets the VH point for the 67NUH function. The range is 1.0 - 170.0 V. It should be set greater than or equal to VLHPU.
5. **High Set Trip Delay, 67NUHDLY** - Setting 1505 sets the delay for the 67NUH function. The range is 0.10 - 10.00 s.
6. **High Set Enable, 67NUH** - Setting 1506 enables the 67NUH function. The ON/OFF setting enables or disables the function.
7. **Low Set IL Pickup, ILLPU** - Setting 1507 sets the IL point for the 67NUL function. The range is 0.5 - 100.0 mA.
8. **Low Set IH Pickup, ILHPU** - Setting 1508 sets the IH point for the 67NUL function. The range is 0.5 - 100.0 mA. It should be set greater than or equal to ILLPU.
9. **Low Set VL Pickup, VLLPU** - Setting 1509 sets the VL point for the 67NUL function. The range is 1.0 - 170.0 V.
10. **Low Set VH Pickup, VLHPU** - Setting 1510 sets the VH point for the 67NUL function. The range is 1.0 - 170.0 V. It should be set greater than or equal to VLLPU.
11. **Low Set Trip Delay, 67NULDLY** - Setting 1511 sets the delay for the 67NUL function. The range is 1 - 1000 ms.
12. **Phase Overcurrent Pickup, 67NUOC** - Setting 1512 sets the pickup level for the overcurrent flag in the 67NUL function.
13. **Loss of Load Threshold, 67NULOL** - Setting 1513 sets the pickup level for the loss of load flag in the 67NUL function.
14. **Low Set Enable, 67NUL** - Setting 1514 enables the 67NUL function. The ON/OFF setting enables or disables the function.
15. **Reclose on 67NUH, REL67NUH** - Setting 1515 affects the reclose function of the DFP300. If this setting is Reclose on All Functions, the recloser will operate according to the settings contained in Category 11. If this setting is Reclose Only on 67NUH, the recloser will operate only if the 67NUH function trips the breaker.

59N

1. **59N Pickup, 59NPU** - Setting 1601 sets the pickup level for the 59N function. The range is 1.0 - 170.0 V.
2. **59N Trip Delay, 59NDLY** - Setting 1602 sets the delay for the 59N function. The range is 0.00 - 10.00 s.
3. **59N Enable, 59NPROT** - Setting 1603 enables the 59N function. The ON/OFF setting enables or disables the function.



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