



Toshiba GRD140 Instruction Manual

Directional overcurrent protection relay

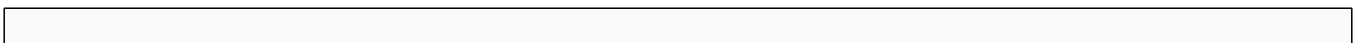
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16
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INSTRUCTION MANUAL

DIRECTIONAL OVERCURRENT PROTECTION RELAY

GRD140

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(Ver.0.7)

[Next Page](#)

1
2
3
4
5

[Page 9](#) The GRD140 series provides the following functions for all models. • Metering • Fault recording • Event recording • Disturbance recording (available via communications ports) Table 1.1.1 shows the members of the GRD140 series and identifies the functions to be provided by each member. □ □...

[Page 10](#) 6 F 2 S 0 7 5 8 Table 1.1.1 Series Members and Functions Model Number GRD140 - Directional Phase Fault O/C OC1 - OC4 (67/50P, 67/51P) Directional Earth Fault O/C EF1 - EF4 (67/50N, 67/51N) Directional Sensitive Earth Fault SEF1 - SEF4(67/50N, 67/51N)

[Page 11](#) 2.1.1 Non-directional Overcurrent Protection GRD140 provides distribution network protection with four-stage phase fault and earth fault overcurrent elements OC1 to OC4, EF1 to EF4, sensitive earth fault elements SEF1 to SEF4, and two-stage negative sequence overcurrent elements NOC1 and NOC2 which can be enabled or disabled by scheme switch setting.

[Page 12](#) Note: kr, b are used to define the reset characteristic. Refer to equation (2). In addition to above nine curve types, GRD140 can provide a user configurable IDMT curve. If required, set the scheme switch [M***C] to "CON" and set the curve defining constants k, a, c.

[Page 13](#) 6 F 2 S 0 7 5 8 The following table shows the setting ranges of the curve defining constants. Curve defining constants Range Step 0.000 - 30.000 0.001 0.00 - 5.00 0.01 0.000 - 5.000 0.001 0.000 - 30.000 0.001 0.00 -...

[Page 14](#) 6 F 2 S 0 7 5 8 Definite time reset The definite time resetting characteristic is applied to the IEC/IEEE/US operating characteristics. If definite time resetting is selected, and the delay period is set to instantaneous, then no intentional delay is added. As soon as the energising current falls below the reset threshold, the element returns to its reset condition.

[Page 15](#) 6 F 2 S 0 7 5 8 IEEE Reset Curves (Time Multiplier = 1) 1000.00 100.00 10.00 1.00 Current (Multiple of Setting) Figure 2.1.4 Dependent Time Reset Characteristics 2.1.1.2 Definite Time Overcurrent Protection In a system in which the fault current does not vary a great deal in relation to the position of the fault, that is, the impedance between the relay and the power source is large, the advantages of the IDMT characteristics are not fully utilised.

[Page 16](#) 6 F 2 S 0 7 5 8 2.1.1.3 Instantaneous Overcurrent Protection In conjunction with inverse time overcurrent protection, additional overcurrent elements provide instantaneous or definite time overcurrent protection. OC1 to OC4 and EF1 to EF4 are phase fault and earth fault protection elements, respectively. Each element is programmable for instantaneous or definite time delayed operation.

[Page 17](#) 6 F 2 S 0 7 5 8 Fuse GRD140 Figure 2.1.7 Feeder Protection Coordinated with Fuses Configuring the inverse time element OC1 (and EF1) and time graded elements OC2 and OC3 (or EF2 and EF3) as shown in Figure 2.1.8, the characteristic of overcurrent protection can be improved to coordinate with the fuse characteristic.

[Page 18](#) In such a case, directional control should be added to overcurrent elements. GRD140 provides directional control for phase fault and earth fault overcurrent elements OC1 to OC4, EF1 to EF4, SEF1 to SEF4, NOC1 and NOC2 which can be enabled or disabled by scheme switch setting.

[Page 19](#) 6 F 2 S 0 7 5 8 0.1s 1.0s 0.4s 0.7s GRD140 1.3s Non-directional GRD140 1.3s 0.1s Non-directional 1.0s 0.4s 0.7s Figure 2.1.10 Protection of a Ring Main Circuit Power Systems with Sources at both Line Terminals In power systems with sources at both line terminals as shown in Figure 2.1.11, the fault current flows in from both terminals.

[Page 20](#) 6 F 2 S 0 7 5 8 2.1.2.2 Directional Characteristics Figure 2.1.12 illustrates the directional characteristic, with the forward operate zone shaded. The reverse zone is simply a mirror image of the forward zone. The forward operate zone or reverse operate zone is selectable by the scheme switch [OC-DIR], [EF-DIR], [SE-DIR] and [NC-DIR].