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National Grid

National Grid Technical Specification

NGTS 3.24.36
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Teleprotection (Command Based)

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TELEPROTECTION (COMMAND BASED)

FOREWORD

This specification is a functional specification within the Substation Information, Control and Protection suite of technical specifications. It shall be called up and applied by the appropriate bay level specifications

This Specification defines National Grid Company plc's (National Grid's) technical requirements for Teleprotection systems to be used for command transfer.

1 SCOPE

This Specification describes the functional and performance requirements for command based Teleprotection systems associated with 400, 275 and 132 kV feeder circuits.

It covers direct transfer trip, permissive underreach, blocked overreach and specific control signalling functions.

2 REFERENCES

This Specification makes reference to the following documents:

NGTS 3.24.20	- Communications for Teleprotection
NGTS 3.24.7	- Feeder bay functions
NGTS 3.24.4	- Hardware Platform
NGTS 2.24	- Substation Information, Control, Protection and Metering
NGTS 3.24.19	- PLC coupling equipment
NGTS 3.2.8	- Line Traps for use on 275 kV and 400 kV systems
NGTS 3.24.15	- Environmental and Test Requirements for Electronic Equipment
IEC 60834-1	- Teleprotection equipment of power systems – Performance and Testing – Part 1: Command systems
IEC 60050(448)	- International Electrotechnical Vocabulary – Chapter 448: Power System Protection

3 DEFINITIONS

Teleprotection Equipment - equipment specially designed to be used in conjunction with a protection system. The teleprotection equipment, which is connected to a telecommunication link between both ends of the protected circuit, transforms the information given by the protection equipment into a form suitable for transmission.

Teleprotection System: - System composed of teleprotection equipment and an associated telecommunication system between the ends of the protected circuit.

Informative: - Only command transfer systems are considered in this NGTS, and henceforth the term Teleprotection refers only to these systems.

Below are the definitions for the teleprotection functions covered by this specification.

Direct Transfer Tripping (DTT): - the tripping of circuit breaker(s) by signals initiated from protection at a remote location independent of the state of the local protection. (IEV 448-15-08).

Informative: - DTT is otherwise known as 'Intertripping' within the Electricity Supply Industry in the UK.

Protection Signalling - the transmission and reception of advisory signals initiated by the operation of a non-unit protection function, over a communications medium, to modify the operation of the remote non-unit protection.

Informative: - The two most common protection signalling system schemes used by National Grid are 'Permissive Underreach' and 'Blocked Overreach'. These are defined below.

Permissive Under Reach (PUR): - Operating mode of a non unit protection scheme where the signal received from the remote end of the circuit contains information that the fault is in the protected zone. The received information is used to allow a forward over-reaching zone to trip almost immediately for a fault in the protected zone. The received signal is derived from a forward under reaching zone at the remote end.

Informative: - PUR is otherwise known as 'Acceleration' within the Electricity Supply Industry in the UK.

Blocked Over Reach (BOR): - Operating mode for non unit protection where the received signal carries information from protection at the remote end of the circuit which indicates that the fault is not in the protected zone. A receiving end forward over-reaching element will give a trip output after a co-ordination time if no signal is received from a reverse reaching zone at it's remote end.

Informative: BOR is otherwise known as 'Blocking' within the Electricity Supply Industry in the UK.

Control Signalling (CS): - the transmission and reception of critical control signals

Informative: the control signals considered in the scope of this specification are those associated with the DAR conditioning function (see NGTS 3.24.7)

4 FUNCTIONAL REQUIREMENTS

Informative: - A typical arrangement of the interconnections of the DTT and protection signalling systems with associated plant, equipment and other protection systems within the substation is given in NGTS 3.24.7.

Direct Transfer Trip (DTT) – Transmit Functions

- 4.1 The DTT function shall convert the send DTT input(s) into a trip command which is suitable for transmission over a telecommunication service.
- 4.2 The signal conversion shall utilise a communications protocol or analogue signal modulation mechanism consistent with meeting the security and dependability requirements contained in Section 5.
- 4.3 For DTT functions which use frequency shift keying (FSK) for signalling, two tones with diverging frequency shifts shall be used.
- 4.4 An interface diagram of the DTT function is shown in Figure 1.

Direct Transfer Trip (DTT) – Receive Functions

- 4.5 The DTT shall be capable of receiving the trip command and generating the required DTT received signal.
- 4.6 Received signals shall inhibit resetting of the DTT received outputs.
- 4.7 For DTTs which utilise a dual tone frequency shift system, a period of guard tone shall be detected before a trip command can be issued. A subsequent trip tone shall be regarded as valid if it occurs within 600 ms of the loss of guard.
- 4.8 The received signal shall be continuously monitored.
- 4.9 The time period of a received command shall be capable of being extended by an additional period of between 0-100 ms.