

COMMUNICATIONS FOR TELEPROTECTION

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PURPOSE AND SCOPE

This specification is a station function specification within the substation information, control and protection suite of technical specifications.

This Specification describes the functional and performance requirements for communication services used to convey teleprotection information. This includes communication requirements for unit protection, direct transfer trip systems, permissive under-reach, blocked over-reach and DAR control signalling.

The Specification primarily covers inter-substation communication and the interface presented to the relevant S/S applications but also defines some aspects of communication networks for teleprotection within a S/S.

The Specification defines the teleprotection requirements for the following types of channel:

- Digitally presented channels.
- Four wire, voice frequency presented channels (non power- line carrier) in exceptional cases for legacy applications.

The overall context of this specification in relation to the complete documentation suite is explained in TS 3.24.3. Additionally it should be noted that this specification is to be read in conjunction with TP133 and TGN138.

PART 1 – PROCEDURAL

1 INTERFACE PRESENTATION AND ISOLATION

- 1.1.1 The preferred service delivery medium for external connections to the substation shall be 9-10/125 micro-metre single mode optical fibre as per specification provided in the link below.

Informative: Fibre Build Specifications are available online through NG – Livelink-Public Library-Communications Infrastructure Info.

1.2 Voice Frequency Channels

- 1.2.1 The channel shall be four-wire and capable of full duplex transmission. The nominal characteristic impedance shall be 600 Ohms (balanced).

1.3 Digital Channels

- 1.3.1 The interface equipment shall be capable of providing one or more of the following types of channel:-

- a) 64Kbit/s digital service to IEC 62843/IEEE C37.94 with 62.5µm multimode cabling. (Note: The interface presentation uses a SC connector.) – This is the preferred type.
- b) 64 Kbits/s digital service to ITU-T X21.
- c) 64 Kbits/s four-wire, co-directional duplex transmission to ITU-T G703. (Legacy applications only)

Informative: Note that the C37.94 receiver threshold needs to be set to allow up to 10% of logic 1 to be recognised as logic 0 to achieve interoperability with other compliant devices as per section 7.1 in IEC62843.

1.4 Directly Connected Fibre Optic Channel

- 1.4.1 For external connections to the substation, the preferred type of fibre is 9-10/125 micro-metre single mode. The choice of fibre and type of connector utilised will depend on the optical interface presented by the teleprotection equipment and the link length.

- 1.4.2 The link shall consist of NG type registered components.

2 SERVICE PARAMETERS AND CHARACTERISTICS

2.1 Signalling Speed

- 2.1.1 Digitally presented communication channels shall operate at 64 kbits/s and be capable of full duplex operation.

2.2 Power Supplies

- 2.2.1 Any electronic equipment supplied by the Operational Service Provider (OSP) and installed within the substation which comprises part of the communication link shall be designed to operate from a nominal 48V D.C. battery as specified in TS 3.12.4. (Note: At sites where only 110VDC supplies are available the 48VDC supply can be provided by use of a suitable converter).

- 2.2.2 The equipment shall be provided with two separate battery supplies to provide redundancy.

Informative: This requirement removes the risk of a complete protection depletion on any one primary circuit due to a single battery failure. The 48V DC battery positive is normally earthed. The 110V DC battery is centre tapped earthed.

- 2.2.3 The equipment shall provide isolation between the incoming D.C. supply and the substation battery, its internally derived voltage rails, and also earth. Isolation shall also be provided between the two incoming DC supplies. The level of isolation is defined in TS 3.24.15.

- 2.2.4 The complete link must be powered such that its correct operation does not rely on power supplies derived from any part of the Electricity Supply Network remaining within the supplier's specification, whether such supplies be provided by a Generator or Electricity Supplier. In the event of complete failure of mains electricity the link shall continue to operate normally for at least 48 Hours without manual intervention, and thereafter ad-infinitum with manual intervention..

Informative: The link must not be affected by any disturbance on, or black-outs of, the mains electricity supply. For blackouts exceeding 48 hours duration, manual intervention is permitted to maintain the link e.g. in order to replenish the fuel supplies of back-up generators

2.3 Earthing

- 2.3.1 The equipment zero volt line and the equipment protective earth shall be segregated. The OSP terminal/multiplexing equipment shall, therefore, be provided with separate zero volt and earth terminals. If segregation cannot be achieved, the OSP shall state the recommended earthing practice.

- 2.3.2 The protective earth terminal shall be connected to the local earthing system, whereas the zero volt terminal shall be connected to the station earthing point via a screened cable.

Informative: a single point earthing policy can therefore be maintained.

- 2.3.3 Where the interface presented to the teleprotection equipment carries a non isolated zero volt line, the teleprotection equipment zero volt line shall be segregated from earth at the teleprotection end.

- 2.3.4 Where segregation of protective earth and zero volts cannot be achieved for a particular connection, suitable isolation precautions may need to be taken, if it is deemed that the performance of the communication system may be adversely affected.

2.4 Service Type

- 2.4.1 The service shall be synchronous and provide a point-to-point connection.

2.5 Propagation Delay

- 2.5.1 Routing of the communications channel through a digital network shall be performed such that the propagation delay time incurred is as small as possible.

- 2.5.2 Propagation delay shall remain stable during normal operation of the channel and shall only change during path re-routing under failure conditions.

- 2.5.3 The maximum allowable communication channel 'end to end' delay is 6 ms.

Informative: Delays above this level can impact on target fault clearance times for teleprotection and therefore degrade protection system dependability. Communication service providers shall deliver services compliant to clause 2.5.3. Where this is not achieved on the worker or protection path details shall be provided and approval on a case by case basis is required. Communication service users shall ensure that the relevant applications