

Title	Demonstrate knowledge of power protection and control networks		
Level	5	Credits	15

Purpose	<p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> • demonstrate understanding of power protection and control networking fundamentals in the electricity supply industry • demonstrate understanding of Ethernet and serial fieldbus fundamentals utilised by power protection equipment in the electricity supply industry • apply a router or switch to an Ethernet LAN network for use with power protection and control systems in the electricity supply industry. <p>This standard provides electricity supply industry power technicians with the fundamental knowledge of power protection and control network theory, and hardware.</p>
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Classification	Electricity Supply > Electricity Supply - Power System Maintenance
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Available grade	Achieved
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Guidance Information

- 1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with applicable legislative and industry requirements.
- 2 Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to:
 - Electricity Act 1992
 - Health and Safety at Work Act 2015
 - Electricity supply industry codes of practice and documented enterprise procedures, including *Safety Manual – Electricity Industry (SM-EI)* and relevant EEA guides available from www.eea.co.nz.
 and any subsequent amendments and replacements

3 Definitions

Cable – coaxial, copper, optical fibre.

Coaxial cable – includes 10Mbps baseband coaxial cable (Thinnet) (10Base-2) and 10Mbps baseband coaxial cable (Thicknet) (10Base-5).

DNP – distributed network protocol.

Ethernet – a computer network using Carrier Sense, Multiple Access, Collision Detection (CSMA/CD), which has data collision detection, it is used to pass data across a physical media.

Gbps – gigabits per second.

IPv – internet protocol version.

LAN – local area network.

MAC – media access control.

Mbps – megabits per second.

Network media – cable, wireless.

OSI – open systems interconnect model.

RS – recommended standard

TCP – transmission control protocol

TCP/IP – transmission control protocol/internet protocol

UTP – unshielded twisted pair.

URL – uniform resource locator.

WAN – wide area network.

Outcomes and performance criteria

Outcome 1

Demonstrate understanding of power protection and control networking fundamentals in the electricity supply industry.

Performance criteria

- 1.1 Terminology used in industrial protection and control networks is explained.
- Range may include – connection, packet, network interface, protocol, port, firewall, layers, addresses, URL, router, switches, gateway; evidence of eight explanations is required.
- 1.2 Networking services used to support communication in data networks are explained.
- Range may include – topology, protocols, LANs, WANs, intranets, extranets; evidence of two network services is required.
- 1.3 The characteristics of network media are explained.
- Range may include – copper, coaxial, UTP, optical fibres, wireless; evidence of three media types is required.

Outcome 2

Demonstrate understanding of Ethernet and serial fieldbus fundamentals utilised by power protection equipment in the electricity supply industry.

Performance criteria

- 2.1 The structure of network models and protocol layers is explained.
Range includes but is not limited to – OSI, TCP and/or IP.
- 2.2 Function of physical layer protocols are explained.
Range includes but is not limited to – RS232, RS485.
- 2.3 Characteristics of common industrial fieldbus protocols are explained.
Range includes but is not limited to – Modbus, DNP3.
- 2.4 Fundamental Ethernet media access control is explained.
Range includes but is not limited to – MAC, timing, CSMA/CD, error handling, link establishment.
- 2.5 The types of Ethernet technologies are explained.
Range includes but is not limited to – 10 Mbps, 100 Mbps, 1000 Mbps, 10 Gbps.
- 2.6 TCP/IP and IP addressing in networks are explained.
Range IPv4, IPv6.
- 2.7 The purpose of TCP/IP transport and application layers is explained.
- 2.8 The function of gateways and firewalls as applied to protection systems is explained.

Outcome 3

Apply a router or a switch to an Ethernet LAN network for use with power protection or control systems in the electricity supply industry.

Performance criteria

- 3.1 A network design for one router or one switch in a protection or control network is planned.
- 3.2 Network design is implemented using cabling or wireless links and network hardware.
- 3.3 Configuring software is used to program a router or a switch.

3.4 Tests are carried out to confirm network operation.

Planned review date	31 December 2025
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	20 July 2017	N/A
Rollover and Revision	2	2 March 2023	N/A

Consent and Moderation Requirements (CMR) reference	0120
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Waihanga Ara Rau Construction and Infrastructure Workforce Development Council qualifications@WaihangaAraRau.nz if you wish to suggest changes to the content of this unit standard.