

# EasyLon® Network Components

From Repeater to Terminator

## Repeater

Compact or multi-port

## Router

Structuring networks,  
combining FT and IP

## Link Power Supply

Supply and fieldbus on the same line

## Host Controller

Embedded PC for LONWORKS

## Terminator

Bus terminator for LONWORKS



## Easylon® Repeater

### Compact LONWORKS® Repeater

- Increase of the communication distance
- Regeneration of network signals
- AC and DC power supply
- Separation of Link Power segments
- Communication of data packets of any length
- No configuration required



Compact repeater for TP/FT and TP/LP LONWORKS networks, increasing the allowable communication distances by regeneration of the signals. A greater number of nodes within a physical network segment are also possible. The rules for repeater usage have to be observed.

In Link Power networks the Easylon Repeater realizes the connection between two segments.

By its compact size of just 45 mm width it perfectly suits into cabinets or in cable ducts. The power supply of the DIN rail module can either be AC or DC.

#### NETWORK INTERFACE

Transceiver	FTT-10A
Connectors	2 pairs of screw terminals on each side

#### POWER SUPPLY

Voltage	24 V AC $\pm$ 20%, 1 W or
	12 – 28 V DC, 1 W
Connector	screw terminals

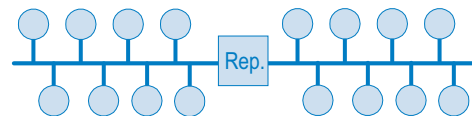
#### DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS

Housing	type F, cf. p. 26	
Dimensions	95 x 45 x 38 [mm], 2.5 units accord. to DIN 43880	
Mounting	DIN rail (EN 60715: 35x15, 35x7.5)	
Temperature	operating	0 – +60 °C
	storage	-20 – +85 °C
Humidity	class F, accord. DIN 40040, 5 – 93 %, no condensation	
Protection class	IP 20	
EMC	emission	EN 55022 A/B
	immunity	EN 61000-6-2
Flammability	UL94-Vo, self-extinguishing	

#### EASYLON REPEATER

with transceiver FTT-10A

P.R10003



**NETWORK INTERFACE**

Transceiver	4 x FTT-10A or 3 x FTT-10A and 1x LPT-10
Connectors	3 pin screw-plug terminals, Phoenix 3.81 mm
Termination	bus / free topology selectable per channel

**POWER SUPPLY**

Voltage <sup>1</sup>	Type A	24 V AC +- 20%, or 12 – 28 V DC
	Type B	230 V AC, 50 Hz
	Type C	120 V AC, 60 Hz
	Type D	Link Power over LONWORKS network

Power consumption: < 2.5 W

**DISPLAY & OPERATION**

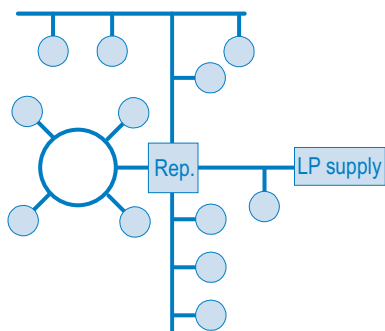
LEDs	power (green)
	traffic (yellow)
DIL switches	2 per channel: bus termination on/off and topology

**DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS**

Housing	type A or B, cf. p. 26		
Dimensions	Repeater type A, B, C	105 x 58 x 68 [mm], 6 units accord. DIN 43880	
	type D	70 x 58 x 86 [mm], 4 units accord. DIN 43880	
Mounting	DIN rail (EN 60715: 35x15, 35x7.5)		
Temperature	operation	0 – +55 °C	
	storage	-20 – +85 °C	
	ext. temp. range	operation	-40 – +85 °C
		storage	-40 – +85 °C
Humidity	class F accord. DIN 40040 F, 5 – 93 %, no condensation		
Protection class	IP20		
EMC	emission	EN 55 022 A/B	
	immunity	EN 61000-6-2	
Flammability	UL94-Vo, self-extinguishing		

**EASYLON MULTIPORT REPEATER**

24 V supply (Type A)	P.R10103
230 V supply (Type B)	P.R10113
120 V supply (Type C)	P.R10123
Link power supply (Type D)	P.R10133



## Easylon® Multiport Repeater

### LONWORKS® Repeater with 4 Channels

- Integrated bus termination
- Variants for 24 V, 120 V, 230 V or Link Power
- Version for extended temperature range



LONWORKS Repeater with 4 channels in variants for free topology and Link Power. By regenerating the signals it increases the allowable communication distance. Even a greater number of nodes within a physical network segment are also possible within the limits of a tolerable network load.

With up to 4 network connections the Easylon Multiport Repeater allows for a flexible network structure. Of course this repeater is also compatible to Link Power networks. For each channel a termination can be set by switches to bus or free topology network structure. The device status is displayed by a power and a traffic LED.

There are variants for power supply with 24 V AC/DC, 120 V AC or 230 V AC available. A fourth variant of the repeater is supplied by Link Power. This device with a width of only 70 mm does not require external power supply.

## Easylon® Router<sup>+</sup>

### LON/IP Router for ISO/IEC 14908 Compatible Networks

- Router in TP/FT-10 and to LON/IP-852 networks
- Channel routing, subnet-/node routing
- Integrated configuration server
- Remote network interface for VNI and MIP applications
- Usable as NTP server
- Multi-language browser interface for setup and diagnosis



The Easylon Router<sup>+</sup> connects ISO/IEC 14908-2 compatible network segments, as well as TP/FT-10 and LON/IP-852 networks, according to the ISO/IEC 14908-4 standard. Furthermore the device operates as configuration server in LON/IP networks.

Fitted with Ethernet interface and 2 LON TP/FT-10 interfaces the 3-port version of the device can be used in versatile manner: As router between two segments of a TP/FT network or to a LON/IP network. The latter allows implementation of fast backbone structures. The device is also available as a 2-port variant with only one TP/FT interface.

Parameterization of the Easylon Router<sup>+</sup> is easily achieved via its multi-lingual web interface, by which extensive diagnosis information can as well be called from the device.

PC based applications, such as a network management tool, accessing the TCP/IP channel will additionally need the Easylon IP Interface software.

### Configuration Server

The Easylon Router<sup>+</sup> provides an integrated Configuration Server. Using the web interface all settings are easily handled including access to the settings of other LON/IP devices.

### Network Interface for Remote Access

Installed at the LONWORKS network and connected to it and via Ethernet into the Internet, the device can as well serve as a TCP/IP network interface. Using the Easylon RNI software this is a cost effective and reliable solution for remote network access for VNI or MIP based PC applications, compared to a special PC at the network.

### INTERFACES

#### Network Interfaces

Transceiver	1 or 2 x TP/FT-10, depending on variant
Connector	3 pin screw-plug terminals (0.5–2.5 mm <sup>2</sup> )
Ethernet Interface	LON/IP-852 according to ISO/IEC 14908-4
Transmission rate	10/100 Mbps
Connector	RJ45

### POWER SUPPLY

Voltage	24 V DC (10–30 V)
Consumption	typically: <2,5 W, max = 3,6 W
Connector	3 pin screw-plug terminals (0.5–2.5 mm <sup>2</sup> )

### DISPLAY & OPERATION

LEDs	- Status - Ethernet - Channel / Reset - LON IP - LON 1 - LON 2
Taster	- Service Pin - Factory Reset

### FEATURES

Real-time clock	Gold Cap buffered, >6 d
Watchdog	
Voltage Monitoring	
Temperature Sensor	displayed in Web Interface

### DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS

Dimensions	107 x 90 x 58 [mm], 6 units acc. to DIN 43880	
Mounting	DIN rail (EN 60715: 35 x 15, 35 x 7.5)	
Temperature	operating	0 – +55 °C
	storage	0 – +55 °C
Humidity	class F, accord. DIN 40040,	
	5 – 93 %, no condensation	
Protection class	IP 20	
EMC	emission	EN 55 022 B
	immunity	EN 61000-6-2/3/4/5
Flammability	UL94-Vo, self-extinguishing	

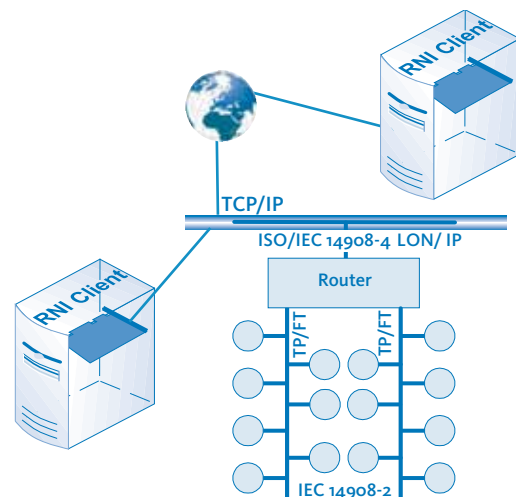
### EASYLON ROUTER<sup>+</sup>

2 x TP/FT-10, 1 x LON/IP-852

P.130106

1 x TP/FT-10, 1 x LON/IP-852

P.130116



**POWER SUPPLY**

Rated input voltage	230 V AC (195 – 264 V) or 120 V AC (96 – 144 V)
Rated frequency	50 Hz (47 – 63 Hz) or 60 Hz (57 – 63 Hz)
Mains failure buffering	> 20 ms at nominal input voltage
Rated input current	0.7 A / 1,4 A
Inrush current	< 20 A
Efficiency	> 75%, at nominal input voltage

**OUTPUT TO BUS**

Output voltage	41.5 V +/-2.2%
Residual ripple	< 80 mV at 10 kHz (200 mV at f>200 kHz)
Output current	2 A at nominal input voltage
Overload protection	typical at 2.3 A; permanent short-circuit proof with pulsing try of restart

**DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS**

Housing	type D, cf. p. 26
Dimensions	126 x 58 x 90 [mm], 7 units accord. DIN 43880
Mounting	DIN rail (EN 60715: 35x15, 35x7.5)
Connectors	screw terminal 0.5 – 2.5 mm <sup>2</sup>
Temperature	operating                    0 – +40 °C convection storage                        -40 – +70 °C
Relative humidity	5 – 95 %, no condensation
Protection class	IP 20 (EN 60529) VDE0106 T1 I (with PE) (EN61140)
EMC	emission EN 61000-6-3, class B, EN 50090-2-2 immunity EN 61000-4-2/3/4/5/6, class A
Bus termination	bus or free topology, settable by switch

**EASYLON LINK POWER SUPPLY**

230 V input voltage	P.110002
120 V input voltage	P.110012

## Easylon® Link Power Supply

### Supply and Fieldbus on the Same Line

- Low residual ripple of the output voltage
- Short circuit and over current monitoring
- Type of bus termination externally selectable
- Output current limitation
- Thermal monitoring
- Variants for 120 V and 230 V supply



Power supply for LONWORKS networks in Link Power technology. The Easylon Link Power Supply is designed for the use in networks with free and bus topology. It satisfies with both, its compact design and its excellent technical features: Overload protection at 2.3 A, residual ripple of the output voltage below 80 mV, galvanic isolation of input and output voltage, internal no load, overload and short-circuit protection.

The high efficiency of the power pack of more than 75% reduces heating of switching cabinets. The EMC classification makes the module the perfect choice for industrial as well as building and home automation networks.

Automatic restart of the Easylon Link Power Supply at failures increases the usability of the device. The possibility to set the type of bus termination by a switch is comfortable.

**Info****LINK POWER NETWORKS**

In Link Power Networks the twisted pair line not only transmits messages but also supplies the devices. One link power supply can energize a bus length of up to 320 m. For the network nodes a supply of 100 mA at 5 V is available. Several link power segments can be connected. Concerning their structure link power networks have to follow the rules for free topology networks. Mixed networks with link power (TP/LP) and free topology (TP/FT) transceivers can be realized.

## DELTA 1000

### Host Controller with Remote Access

- Remote Network Interface for VNI and MIP Applications
- Host Controller at LONWORKS Control network
- Data server for remote capturing and monitoring
- Web server for parameterization and diagnosis



DELTA 1000 is an embedded device providing many features for data communication. In addition to an Ethernet connection a modem can be plugged in optionally. Furthermore it provides two interfaces to CEA-709.1 compatible networks (LONWORKS TP/FT), making the device suitable as host controller.

Depending on project requirements socket modems (analog, ISDN or GSM) can also be used for a remote connection. Thus the DELTA 1000 is perfectly suitable for the use in data capturing and monitoring systems with remote access, running user provided software. The device software includes an SQL data base, a web server and an CEA-852 compliant LON/IP interface.

With the DELTA 1000 the following solutions can be realized in a LONWORKS environment:

- Data capturing and communication with remote systems
- Ethernet interface to the control network
- Analyzer node (using the optionally available Analyzer software from a networked PC)

A browser interface is available for parameterization which can also be used for diagnosis purposes.

### INTERFACES

#### LONWORKS

Transceiver	2 x FTT-10A
Connector	3 pin screw-plug terminals, Phoenix 5.08 mm
Serial Interface	EIA-232, not optically isolated
Connector	9 pin D-type
Ethernet Interface	according to CEA-852
Transmission rate	100 Mbps
Connector	RJ45
USB Host	acc. full speed USB standard 2.0
Connector	USB type B
Modem	optional PSTN, ISDN or GSM modem

### POWER SUPPLY

Voltage	24 V DC ( $\pm 20\%$ ),
Consumption	< 2.5 W w/o external USB devices < 8 W under GSM operation

### DISPLAY & OPERATION

LEDs	- Status - LON 1 - LON 2 - LON IP - USB active
Push button	- service pin - stop USB
DIL switches	- bus termination, free or bus topology - watchdog - boot mode

### DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS

Housing	type C, cf. p. 26	
Dimensions	157 x 86 x 58 [mm], 9 units accord. to DIN 43880	
Mounting	DIN rail (EN 60715; 35 x 15, 35 x 7.5)	
Temperature	operating	0 – +55 °C
	storage	-20 – +70 °C
Humidity	class F, accord. DIN 40040, 5 – 93 %, no condensation	
Protection class	IP 20	
EMC	emission	EN 55 022 A/B
	immunity	EN 61000-6-2
Flammability	UL94-Vo, self-extinguishing	

### DELTA 1000

Hardware configurations:

- 2x FTT-10, CEA-852
- 2x FTT-10, CEA-852, PSTN Modem
- 2x FTT-10, CEA-852, ISDN Modem
- 2x FTT-10, CEA-852, GSM Modem

Please contact us for available software.

**NETWORK INTERFACE**Connector screw terminal 0.5 – 2.5 mm<sup>2</sup>**DIMENSIONS & ENVIRONMENTAL CHARACTERISTICS**

Housing type F, cf. p. 26  
 Dimensions 75 x 55 x 10 [mm]  
 Mounting DIN rail (EN 50 022, 35x15)  
 Temperature operating - 0 – +60 °C  
 storage -20 – +70 °C  
 Humidity class F, accord. DIN 40 040,  
 5 – 93 %, no condensation  
 Protection class IP 20  
 Flammability UL94-Vo, self-extinguishing

**EASYLON BUS-TERMINATOR**

FTT-10/LPT-10 for	- free topology	P.Z10013
	- bus topology	P.Z10023
TP/XF-1250, -78	- bus topology	P.Z10001

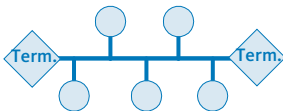
**Easylon® Bus-Terminator**

Bus Terminator for LONWORKS®

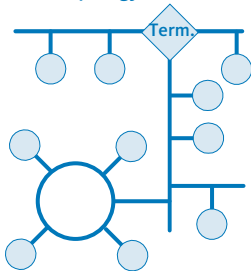
- For FTT-10, LPT-10 and TP/XF networks
- Variants for free and bus topology
- Top hat rail installation



Bus (line)



Free Topology



A bus terminator is required for correct operation of a LONWORKS network. The type of the bus terminator depends on the used transmission technology and the network topology. Easylon Terminators for TP/FT-networks are available for bus or free topology. These are as well suited for LPT-10 (link power) networks. A separate variant is available for TP/XF networks.

**Info****USING TERMINATORS****TP/FT and TP/LP networks**

Free topology: One terminator per segment is required, which can be connected at any place.

Bus topology: Two terminators are required, which must be placed at both ends.

**TP/XF networks**

Bus topology: Two terminators are required, which must be placed at both ends.

The Easylon Link Power Supply, Multiport Repeater and Router<sup>+</sup> have integrated bus terminators.

## Housings

### HOUSING TYPE A

Multiport Repeater

Material

Top: Lexan 940

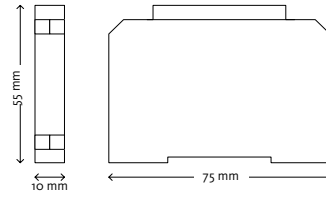
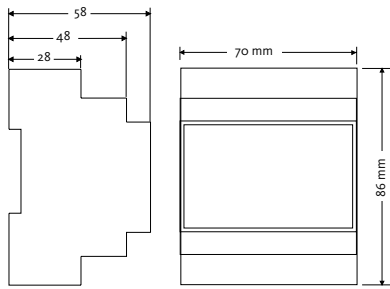
Base: Noryl VO 1550

Flammability: UL94-Vo

Color

Top: RAL 7035 (grey)

Base: RAL 7021 (black)



### HOUSING TYPE B

Multiport Repeater

Material

Top: Lexan 940

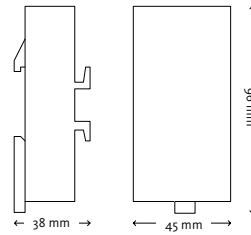
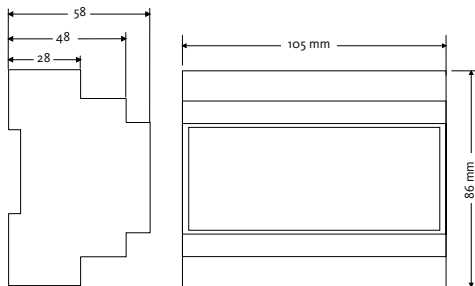
Base: Noryl VO 1550

Flammability: UL94-Vo

Color

Top: RAL 7035 (grey)

Base: RAL 7021 (black)



### HOUSING TYPE C

Router<sup>+</sup>, DELTA 1000

Material

Top: Lexan 940

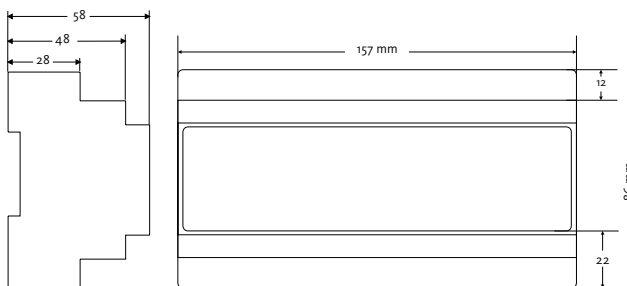
Base: Noryl VO 1550

Flammability: UL94-Vo

Color

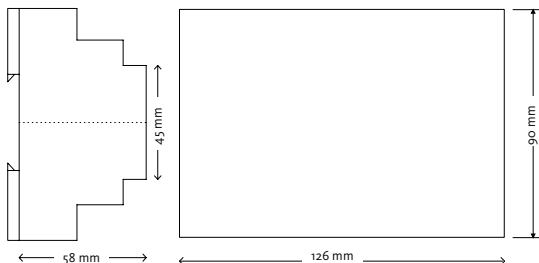
Top: RAL 7035 (grey)

Base: RAL 7021 (black)



### HOUSING TYPE D

Link Power Supply



### HOUSING TYPE E

Terminator

Material: Polycarbonate

Flammability: UL94-Vo

Color: green

### HOUSING TYPE F

Repeater

Material: Makrolon 9425

Flammability: UL94-Vo

Color: grey



## Some Information About LONWORKS®

LONWORKS is a control network for universal use developed by Echelon Corporation, USA. It is a distributed automation system where free programmable intelligent nodes communicate using the standardized LonTalk® protocol (CEA-709.1). The nodes exchange status and control messages in any topology and via various media realizing the desired control applications by interacting. Thereby the entire system remains modular and flexible. Furthermore the software of a node remains slight and manageable.

Interoperability, meaning the seamless integration of products from several manufacturers, is a major subject of LONWORKS technology. This was reached by using a single microprocessor –the NEURON Chip®– not only providing a standardized communication interface but also realizing the basic communication. Disclosure of the communication protocol in the ANSI/CEA-709.1 standard and continuative standards defined an open standardized system, for which components are available from manufacturers all over the world.

### What Makes the Difference?

The difference in comparison with other field bus systems becomes obvious in the technological approach: Distributing the control task by using rules partly realized in hardware is a general approach not emerging from the solution for a single area of application. This results in a universal usability for a general and very broad range of requirements. For extreme requirements and special challenges LONWORKS often is inappropriate. There specific solutions are unbeatable, however rarely transposable.

In building automation this becomes apparent. LONWORKS crosses the traditional barriers between different building sections (heating, lighting, ...) to the advantage of a cross-functional building automation. LONWORKS devices complete the control tasks in their application section but, at the same time, make available information to devices dedicated to other application sections, thus increasing the effectiveness of the whole automation system. The important thing in this is not being open for information transfer but the integrated operation of the networked system. Without any change in technology all tasks can be solved using products from different manufacturers. The message from the access control at the gate is just a data point, which next to granting access can as well be used by the room heating resulting in a comfortable office temperature as soon as the staff member reaches the office. Separate presence detection is not required. Initial costs of such integrated solutions may be higher than those for traditional ones, total cost of ownership will soon make up for it.

### LONWORKS CHARACTERISTICS

- Standardized and already implemented communication
- Manageable software by distribution of the control task
- Easy modification and scalability
- Free choice of topology
- Safe local operation by independence from a central instance
- Variety of transmission media
- Communication distance
- Flexible addressing
- Interoperability

## The Elements of LONWORKS

### NETWORK NODES

The NEURON Chip is the core of the node intelligence, where arbitrary applications can be loaded. If required, external memory can be added. Each NEURON and herewith each network node can be identified by its unique, 48 bit NEURON-ID. In addition the NEURON ensures communication handling by the implemented LonTalk protocol.

Following the disclosure of the LonTalk protocol in the CEA-709.1 standard it is possible to develop devices for this network technology using different processors. Normally an FPGA or ASIC is used on the device to access the network; the higher protocol layers are then realized in PC software. This allows, further to higher performance, to overcome other resource restrictions. PC-network interfaces, routers and nodes with special performance requirements are typical fields of application. The EasyLon<sup>+</sup> products, for instance, make use of these possibilities.



### TRANSCIVER

A transceiver couples the node to the network. As large as the variety of the media is which LONWORKS can use (the technology is by definition not restricted to certain media) as large is the number of different transceivers. Very common is the FTT-10A transceiver, as twisted pair lines in free topology are frequently used (TP/FT networks).

### LONTALK PROTOCOL

This is the LONWORKS “language”. It is used with all nodes and is already implemented in the NEURON Chip.

#### Info

#### STANDARDS AND NAMES

CEA-709	Communication protocol standard (ANSI/EIA), LONWORKS compatible; corresponding European standard: EN 14908
CEA-852	Standard for an Ethernet based communication protocol equivalent to LONWORKS (EIA/CEA) corresponding European standard: EN14908 part 4
DIN EN 14908	"Open data communication in building automation, controls and building management"; European standard for LONWORKS equivalent communication protocol;

## TOOLS FOR OPERATION AND DEVELOPMENT

A network management tool is required to design and maintain a LONWORKS network. Almost all current tools are based on the LNS (LONWORKS Network Services) platform by Echelon. A network management tool serves for planning the network and establishing the logical connections between the nodes – the binding. Furthermore it allows network diagnosis and provides information visualization systems can use.

For the development of the nodes themselves Echelon provides the “NodeBuilder” software. This program allows application writing using the NEURON-C programming language. Similar to C this language contains special extensions with respect to the LONWORKS communication protocol and enables a quick implementation of control applications.

## INTEROPERABILITY

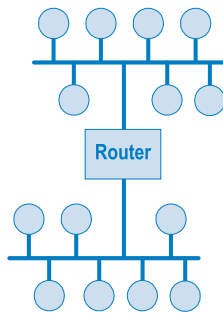
The standardized protocol in itself is not sufficient. Standard network variable type tables (SNVT) are part of the LONWORKS technology. With respect to applications, LonMark International coordinates the definition of functional profiles existing for many areas of application.

## The Network Structure

The LONWORKS network can be structured in domain, subnet and node. A domain can comprise up to 255 subnets, a subnet a maximum of 127 nodes. In total this makes up to 32 385 nodes in one domain. Several domains can be connected. However, in principle only nodes within the same domain can directly communicate. Each node in the network has a distinct logical address consisting of the three hierarchical levels domain-id, subnet-id and node-id.

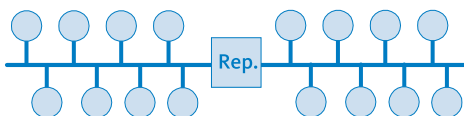
A LONWORKS network uses infrastructure components such as routers, bridges and repeaters.

**Routers** are devices offering two or more network connections. They are used to connect different subnets. Messages received from the network on one side will usually be transmitted to the other side and vice versa. Additionally the router can filter messages, distribute messages or find and route into the correct subnet.



**Bridges** connect different domains. They transmit data from one domain to another and vice versa.

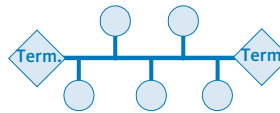
**Repeaters** just are physical signal amplifiers regardless of the message contents. They are used to realize long communication distances or if the maximum permissible number of 64 nodes per 2-wire-segment (FTT-10 transceiver) is exceeded.



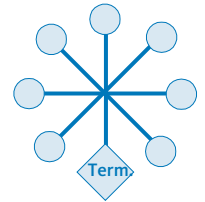
## Network Topology and Media

LONWORKS allows for various network topologies and free selection between bus, star, ring or tree structure. In practice free topologies often are realized, oriented to the existing structures in buildings or installations. For segmentation of such free topologies routers can be used to control the data transfer.

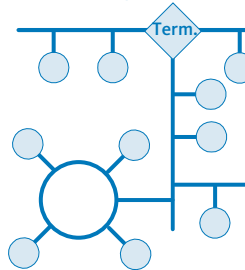
Bus (line)



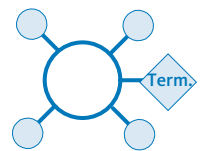
Star



Free Topology



Ring



LONWORKS is specially flexible with respect to the transmission media:

- Twisted pair
- Radio
- Infra-red
- Fiber optic cable
- COAX cable
- Power supply system
- IP-networks

Even larger distances can be connected. Networks (in bus topology) can be extended up to more than 2000 m using twisted pair lines. By using physical star couplers for instance, the length of the individual branch lines is 1.3 km maximum. By using repeaters, routers or gateways the structures of the network can be extended to an almost unlimited length.

Further to those transmission media the LonTalk protocol can also use the IP-protocol for transmission. Thus the LonTalk protocol becomes Intranet and Internet enabled.

Transceiver	TP/XF 78	TP/XF-1250	TP/FTT-10	TP/LP-10
Medium	Twisted Pair	Twisted Pair	Twisted Pair	Twisted Pair
Number nodes	64	64	64	127
Topology	line	line	line	free
Network length	1 400 m	130 m	2 700 m	500 m

## Who is Addressing Whom?

Further to the mere physical connection the control task requires a logical connection. Data exchange in LONWORKS networks takes place between network variables (NV). A special group among these is the SNVTs (Standard Network Variable Type). Defined by LonMark International every developer can use them to maintain interoperability. Network variables are of special importance:

- Information from one node to another is exclusively “transmitted” by NVs.
- NVs are the logical interface from one node to every other node.
- Binding the NVs of the network nodes is the main task of the system integrator while commissioning the network.
- NVs are, along with configuration parameters, the essential information, which can be seen of a node.

A network management tool is used to define the control logic of the network. The following definitions are made:

- Who communicates with whom?
- Which information is exchanged?
- In which way is the information exchanged?

## The Network is the Control

A LONWORKS network consists of up to 32 385 intelligent network nodes communicating via LonTalk. Time-critical messages can be prioritized; a safe transmission is granted, amongst others, by end-to-end control and acknowledgements.

Wherever input and output signals (I/O) are required, distributed and intelligent sensor or actor devices can be placed. Those application specific nodes control and manage themselves and mutually. They only need status or modification messages from other network nodes to take action, which they receive via the LONWORKS network. Transmission speeds up to 1.25 Mbps can be reached.

Standardized data types, so-called SNVTs and functional profiles are the basis for the interoperability of the network nodes. The interoperability between modules from different vendors provides the user with freedom of choice and considerably facilitates a cross-functional building automation.

By distributing the intelligence or, respectively, the application LONWORKS networks can be operated at low cost without host computer or PLC (for central capturing and processing). No host computer is required for control and monitoring tasks. For visualization purposes and further processing of LONWORKS data in other systems usually PCs are used.

LONWORKS offers a flexible field bus system provided with distributed intelligence that can cover large distances using most different media on a high level of reliability and safety. The modular structure allows for modification and extension of the network; at any time and without large effort.





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