Router+ 2-Port

User Manual

This manual refers to the Easylon Router+
with one LON/IP-852 and one LON/TP port.
with order codes P.I3x116 or P.I4x11x

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Gesytec

This Manual …

...describes set-up of and working with the Gesytec Easylon Router+ with 2 ports. Thereby the focus is set to an application oriented description of practical procedures which are complemented, wherever possible, by notices related to success indicators. This manual does not go into details related to theoretical backgrounds of the related technologies. Please inquire the corresponding literature for further information. Backgrounds about LONWORKS® can be found on the website www.echelon.com. Details describing the functionality of the router as RNI interface can be found in the manual for the Gesytec Remote Network Interface that can be fetched from the website www.gesytec.com.

This manual is structured as follows:
Chapter 1 introduces the product.
Chapter 2 describes the connection of the router and the basic settings.
Chapter 3 describes the settings of the integrated Configuration Server.
In **chapters 4 and 5** you learn how to use the individual functions of the device.
Miscellaneous service procedures are explained in **chapter 6**.
Chapter 7 shows how to localize and to resolve specific problems. Further information is finally included in **chapter 8**.

Naming
This documentation describes different version of the Easylon Router+. All devices are fitted with one LON/IP ort. The other port may be either TP/FT-10 or TP/XF-1250. These two are generally referred to as “LON/TP” in this documentation.

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1 About Easylon Router+

1.1 Functions

Easylon Router+ with 2 ports[1] flexibly provides different functionalities within the LONWORKS environment:

- As **router** it connects a TP/FT10 or a TP/XF-1250 LON network (LONWORKS, ISO/IEC 14908-2) and one LON/IP-852 (ISO/IEC 14908-4) compatible network to each other.
- As **TCP/IP Remote Network Interface** the device is suitable for VNI and Layer-5 applications for remote access to LONWORKS networks.
- An integrated **time server** (NTP) can bet activated for the connected networks in order to synchronize the available devices to each other.

Configuration and diagnosis of the device are realized via an integrated Web Interface. LEDs at the front side of the housing indicate the current statuses of the router interfaces. By means of buttons different service functions can be released while a bus termination for the connected LON/TP segment can be set via DIL switches.

Figure 1-1: Easylon Router+ with 2 Ports

[1] Information on other versions of the Easylon Router+ with a different number of TP/FT-10 or TP/XF-1250 ports is available from our web site under Easylon.

1.2 Variants

The Easylon Router+ with 2 ports is available in different models with respect to the LON/TP port (LON 1). Every model features 1 LON/IP-852 port.
A further difference is the power supply of the devices.

Order code	LON 1	Supply
P.I30116	TP/FT-10	24 V DC
P.I40112	TP/XF-1250	24V AC/DC
P.I40116	TP/FT-10	24V AC/DC

Table 1-1: Router variants

1.3 Logical Configuration of Easylon Router+ with 2 Ports

Physically the router consists of one port for LON/TP network connection (ISO/IEC 14908-2) and one Ethernet interface for connection to a LON/IP-852 network (ISO/IEC 14908-4).

The Easylon Router+ with 2 ports operates as any LONWORKS router. It can be commissioned with any LNS based network management tools e.g. the LonMaker by Echelon.

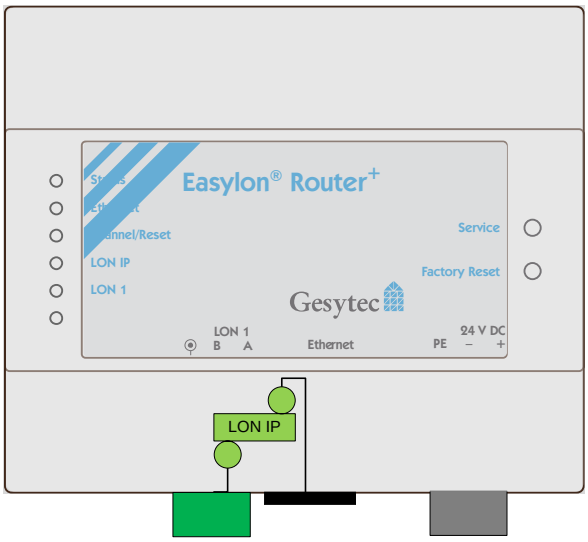


Figure 1-2: Router Logic

1.4 Remote Network Interface

Using the Gesytec RNI technology a standard LONWORKS interface to access each channel of the Easylon Router+ can be created, meaning that for the 2-port router an access to the LON/IP channel and the LON/TP channel can be realized.

As a Remote Network Interface is available for each channel of the router, a transparent access to the individual channels –such as for the common diagnosis tools or the Easylon Analyzer software– can be used independent from the LON/IP technology. The RNI driver by Gesytec provides an Echelon compatible driver interface.

The access is available in both modes, VNI and MIP. Details related to address generation of the specific Node IDs are included in chapter 8.1 “Survey of Node IDs“. Chapter 4.3 informs about the RNI configuration to use the various connections.

Please use an RNI driver for a MIP interface for normal LONWORKS applications. A VNI interface may only be used for applications explicitly supporting the VNI technology, such as LNS.

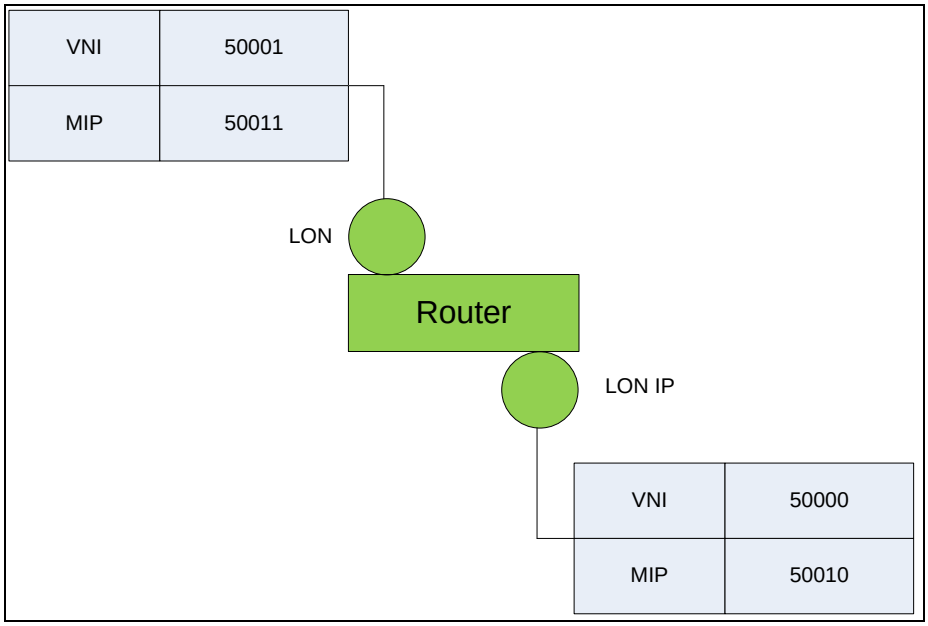


Figure 1-3: Assignment of the IP-Ports to the Router Channels

1.5 LEDs, Buttons and DIL Switches

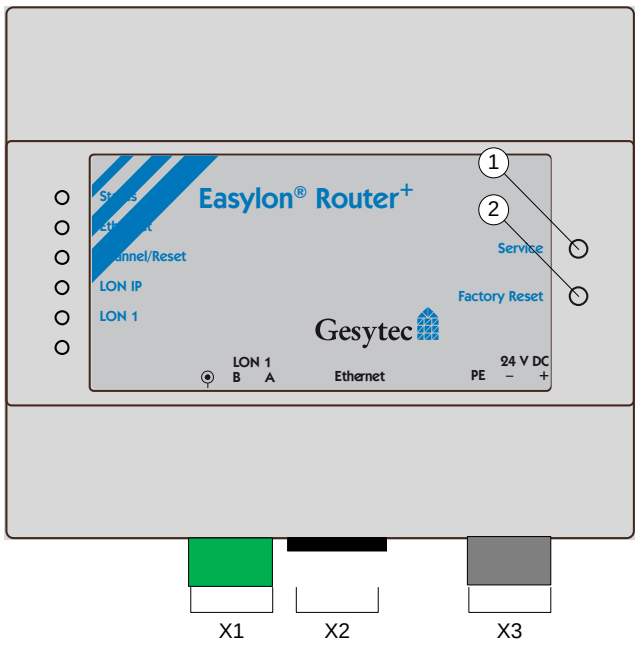


Figure 1-4: Control Elements and Connections[2]

X1	LON/TP connection, TP/FT-10 or TP/XF-1250 (ISO/IEC 14908-2)
X2	Ethernet connection, LON/IP-852 (ISO/IEC 14908-4)
X3	Connection to power supply
①	LON service button
②	Factory reset button

LEDs

The following LEDs are available at the front side of the housing and at the lateral RJ45 connector:

- **Status**: After activation this LED initially glows red. As soon as the router is ready for operation it changes to green. If the device has discovered an error, the LED constantly glows red. An overload situation on one of the two channels will be visualized by a permanently red status LED and activation of the respective channel LED for one second.
  If the device has no IP address[3] the LED is flashing periodically red (or green, if its base state is already red due to another condition).

2 For details of different device models, please have a look at Table 1-1, “Router variants”.

3 This may be caused by missing Ethernet connection or a duplicate IP address may have been assigned.

- **Ethernet**: As soon as a connection between a LON/IP network has been established, the LED is glowing yellow. While transmitting data packets, the LED flickers green.

- **Channel / Reset**: While initializing a Factory Reset the LED gives different signals, cf. chap. 6.5.
  When the router is running, this LED also shows the connection state to the Configuration Server: LED green = connected to Configuration Server.

- **LON** 1 and **LON/IP**: During the router's initial phase those LEDs remain disabled. The LEDs flicker during operation if data are transmitted via the respective channel. In case of overload of a channel the appropriate LED glows red for one second while the status LED is continuously showing red.

Buttons

Furthermore the device is provided with two buttons:

- **Service**: By pushing this button, service pin messages are sent out on both LON interfaces and the LON 1 and LON/IP LEDs give a are short signal.
- **Factory Reset**: This button sets the device back to the factory settings, as described in chapter 6.5.

1.6 Important Notes

The designated use of the Easylon Router+ is the transmission of LON data packets between a *LON/TP* network and a *LON/IP* network, the function as *Remote Network Interface* and the specification of a reference time (*Time Server*).

Only use mains adapters for the power supply of the Router+ that are provided with a SELV identification and a connecting cable with a maximum length of 1.5 m.

By default, the router is supplied with the ***preset, constant IP-Address*** `192.168.100.100`*. In order to avoid collisions, make sure that this IP-Address has not already been assigned to another device in your network.*

To allow for access to the setting options of the router via the Web Interface, a user with name „gesytec" and password "admin" is defined upon delivery. Please immediately change the password after initial commissioning.

2 Setting-Up the Device

2.1 Connecting Cables

Concerning the connection of the device see **Fehler! Verweisquelle konnte nicht gefunden werden.** on page 4**Fehler! Textmarke nicht definiert.**.

2.1.1 Power Supply

Fix the Easylon Router+ to the top hat rail and connect the device (Figure 1-4, X3) to a power supply following the installation instruction (cf. 8.2, "Technical Specifications"). When completed, the *Status*-LED on the top side of the device glows.

Only use mains adapters for the power supply of Router+ that are provided with a SELV identification and a connecting cable with a maximum length of 1.5m.

2.1.2 Grounding Connections

The router is provided with a ground connection PE at the power connector (Figure 1-4, X3). Connect it to ground potential in order to enable discharge of over-voltage.

CAUTION:
*The protective earth must **NEVER** be connected to the bus shield (⏚) **and** to the supply voltage (e.g. 0 V DC)!*

2.1.3 LON/TP Interface

The Easylon Router+ is provided with a LON/TP port[4] for connection with, depending on the device model, a TP/FT-10 or a TP/XF-1250 network according to ISO/IEC 14908-2 (Figure 1-4, X1). Connect the respective cables to the screw terminals. Once a connection has been successfully established, the LON LED on the top side of the device flickers as soon as data are transmitted.

It is also necessary to establish the connection to the shield ⏚ at the third pin of each of the LON screw terminal. This pin is connected to ground by a 100 nF capacitor.

4 For details of different device models, please have a look at Table 1-1, "Router variants".

2.1.4 LON/IP-852 Interface

The router is connected to a LON-over-IP network (ISO/IEC 14908-4) via the RJ45 plug (Figure 1-4, X3). Use a common Ethernet patch cable for connection. The port is provided with an auto sense and auto speed function automatically determining if an Ethernet connection is available and which speed (up to max. 100 MBit/s) is used. As soon as a connection has been established, the LED glows green or yellow (during data transmission).

2.2 Installing Software

The data carrier supplied includes the Easylon Router+ documentation, a program to search for the device via Ethernet (DeviceFinder), the Gesytec Device Management Center (GDMC) program and the software to use the device as Remote Network Interface (RNI).

Only if you want to use the GDMC or connect to the Easylon Router+ through *Remote Network Interface* (RNI) software has to be installed. Apart from that, all other settings can be performed via the router's Web Interface.

Concerning installation and operation of the GDMC please read the respective separate documentation.

You will find further information on RNI in chapter 5, where the appropriate functionality is described.

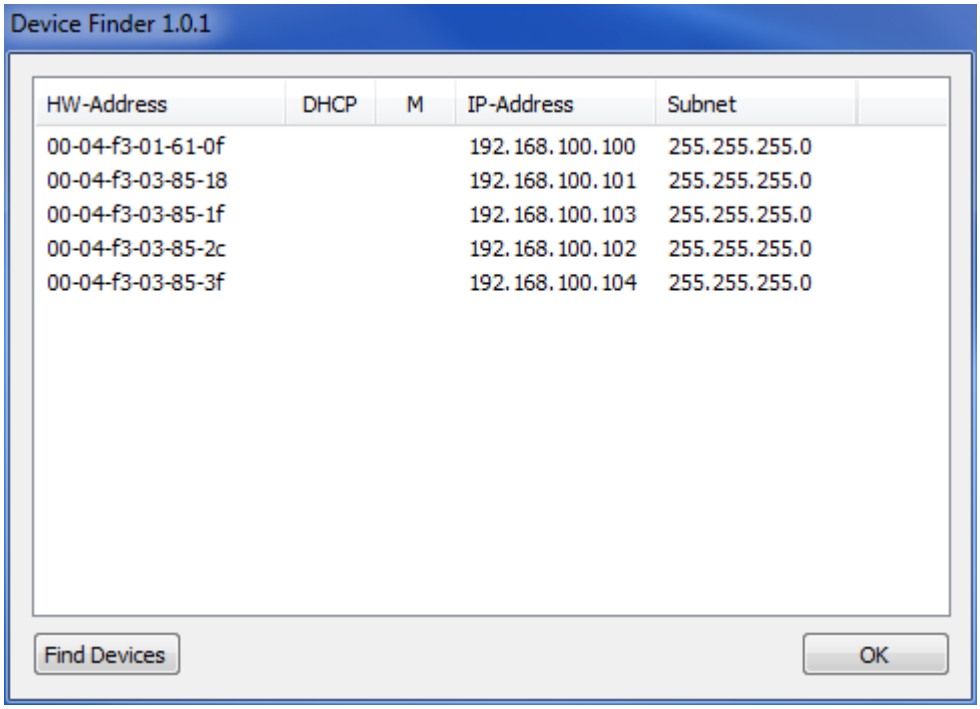
2.3 Connecting to the Web Interface

Status information can be queried and further settings can be performed through the Web Interface of the Easylon Router+. The Web Interface can be accessed by entering the router's IP address in the web browser of a computer connected to the router. By default Easylon Router+ is delivered with the preset IP address `192.168.100.100` and the subnet mask `255.255.255.0`.

If the IP address of the device is unknown, launch the DeviceFinder program from the provided data carrier.

When starting the program, it has to be approved by the Windows Firewall.

After activation of the Find Devices button, the program searches the connected network for Gesytec devices and displays them in a list.



The DeviceFinder displays the MAC address (HW-Address), the IP address and the subnet mask. The sorting is performed according to the MAC address. The column DHCP indicates if the IP address has been assigned by a DHCP Server.

In order to avoid collisions, make sure that the default IP-Address of the router in your network has not already been assigned to another device in your network, as this could interfere the communication.

Is your PC located in a different subnet, you can access the router under Microsoft Windows XP, 7, 8 or 10 using the following commands, without the need to set a permanent new IP address in the network settings first. However, this example will only work with devices in delivery status or after a factory reset:

To perform the following commands, administrator rights or an UAC authorization are required.

For Windows XP

1. Open the Command Prompt (under *All Programs* > *Accessories*),
2. Enter the command `route add 192.168.100.0 mask 255.255.255.0 %COMPUTERNAME%`[5].

3. For Windows 7 and later

1. Open the Command Prompt by right-click the Start menu with the mouse and select the option "*Run as Administrator*"[6],
2. Enter the command `ipconfig` in order to query the current IP address of your computer,
3. Enter the command `route add 192.168.100.100 mask 255.255.255.255 xxx.xxx.xxx.xxx` (where `xxx.xxx.xxx.xxx` corresponds to the current IP address of your computer). [7]

Now enter the IP address `192.168.100.100` in the address bar of your web browsers in order to access the Web Interface for configuration of the router.

[5] You can use the command described for 7/… as well. But the %COMPUTERNAME% part will not work under 7/….

[6] Alternatively you can click the Windows Start button, type "cmd" into the search area and hit the shift+ctrl+enter keys.

[7] `route add 192.168.100.0 mask 255.255.255.0 xxx.xxx.xxx.xxx` can be used as well.

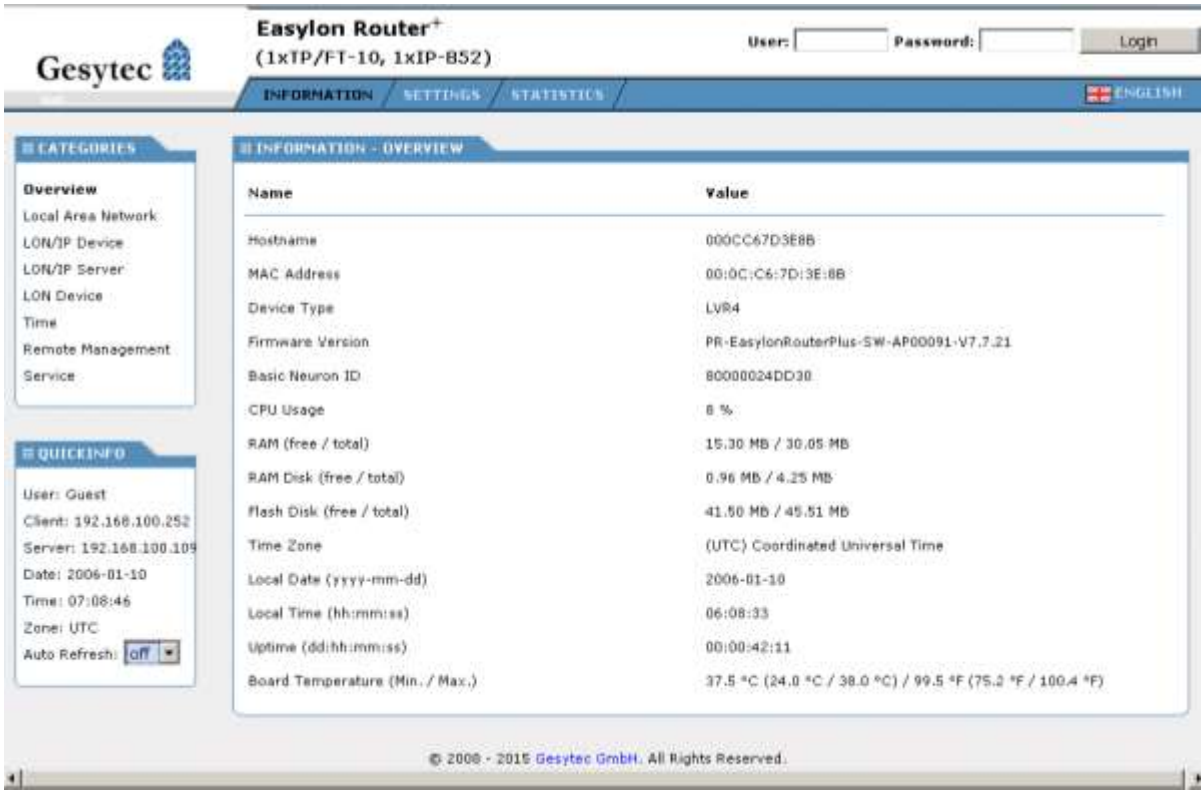


Figure 2-1: The Easylon Router+ Web Interface

See chapter 3 for further advices related to status query and device configuration.

2.4 Specifying the IP Address

Open the *SETTINGS* tab and select *Local Area Network* from the *CATEGORIES* on the left to change the IP settings.

*To access the setting options of the router via the Web Interface, a user with name "**gesytec**" and password "**admin**" is set upon delivery. Please immediately change the password after initial commissioning.*

The desired values can now be entered into the fields *IP Address, Subnet Mask, Gateway, DNS*[8] and TTL[9]. Alternatively you may specify the use of dynamic IP address data via the *DHCP* checkbox. The settings will only be applied after clicking the *Save* button.

For static IP settings, the fields related to gateway and DNS server may also remain empty. They will be required, however, if external NTP servers shall be used or a remote maintenance is intended.

8 More than one DNS server address can be entered by using comma for separation.

9 TTL, time to live, determines the lifespan of data in an IP network. Value is in seconds, the maximum is 255.

Keep in mind that upon modification of the router's IP address the current connection to the Web Interface will be lost, meaning it has to be newly established afterwards. If DHCis used, the new IP address of the router has to be identified first (for instance via the IP router, GDMC or the DeviceFinder).

We discourage from the use of dynamic IP addresses for the router, as the routing will be interrupted for some time upon each change of address. This can be avoided by setting the DHCP server to always assign the same DHCP lease with the same IP address to Easylon Router+.

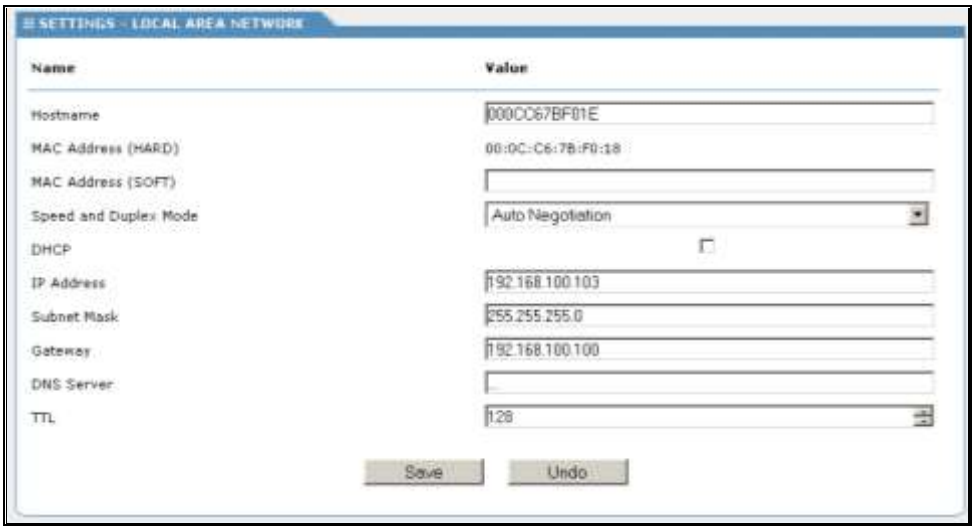


Figure 2-2: IP Settings

Use the Software MAC Address (SOFT) carefully. *If specified it will replace the original Hardware* MAC Address (HARD) *of the device. Identical MAC addresses on different devices can cause severe problems in a network.*

2.5 Adapting the Time Settings

For a LON-over-IP network, the relevant standard recommends synchronization of the routers in order to allow for detection of outdated messages. For this purpose synchronization via the NTP protocol is recommended.

The Easylon Router+ integrates both, an NTP client and an NTP server, meaning the device can retrieve current time information from one or several NTP servers within the local network or from the Internet, but also act as time server within the local network. A simultaneous operation is possible, meaning the router can for example retrieve the exact time form a specific NTP server in the Internet and make it simultaneously available to locally connected clients. If the option *NTP Client* is switched-off, the router uses the integrated real-time clock as reference.

Open the *SETTINGS* tab and select *Time* from the *CATEGORIES* on the left to perform settings.

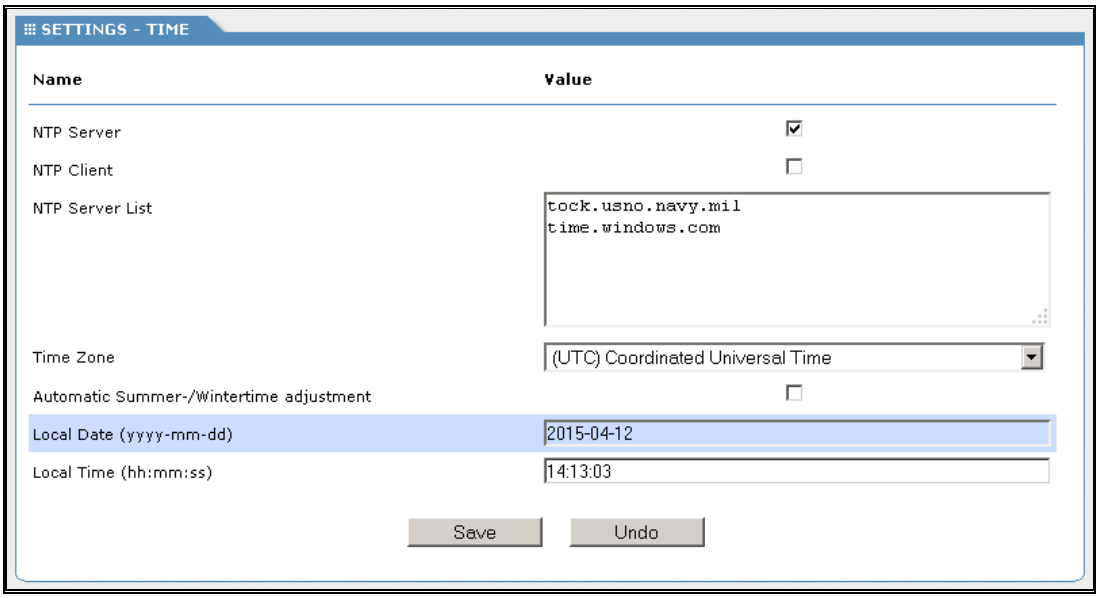


Figure 2-3: Time Settings

You should make sure that all devices connected to the Easylon Router+ and the router itself get time synchronized.

The integrated real-time clock is provided with a buffering of at least 6 days. If the router remains without power longer, the time has to be set once, either manually or via NTP.

The particular operation is enabled or disabled by clicking on the checkbox *NTP Server* or *NTP Client*. Multiple time servers can be entered in the field *NTP Server List*. Use an individual row for each server address.

Keep in mind to enter the details related to Gateway and DNS servers in the IP Settings (see above) when using external time servers.

Under *Local Date* or *Local Time* you can as well enter the desired time or the desired date manually. In this case the operation as *NTP Client* must not be selected as the time will be overwritten by NTP synchronization otherwise.

The time settings made here are overwritten, if the Configuration Server is set as NTP server as well.

The settings shown in Figure 2-3 mean:

- The router is NTP server for other devices
- No automatic summer/winter time switching
- The time manually entered is used
- The servers listed under *NTP Server List* are not used as *NTP Client* is not activated.

Click on the *Save* button to store the settings.

2.6 Changing the Password, Managing Users

Upon the first login, please change the password of the default user “gesytec”. Select *User* in the *SETTINGS* tab under the *CATEGORIES* on the left. Click on *Edit* and enter the desired new password twice in the following dialog.
In addition, you can also create new users with their own name and password or delete existing ones. The last user in the list cannot be deleted.

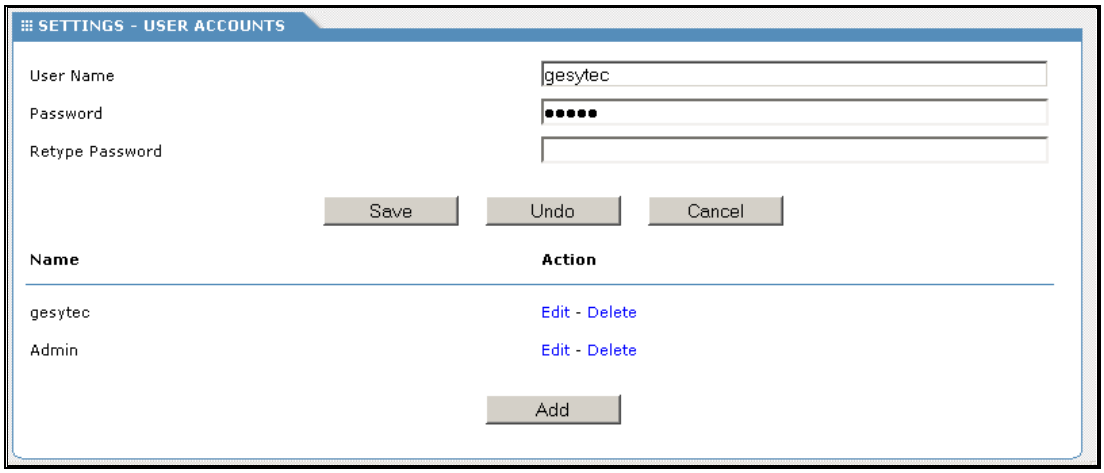


Figure 2-4: Changing the Password

3 Configuration Server

The Easylon Router+ comes with an integrated Configuration Server which administers information on all ISO/IEC 14908-4 compatible devices in the network. This refers to routers, LON/IP network nodes or PCs running ISO/IEC 14908-4 compatible software.

3.1 Setting up the Configuration Server

Activating the Configuration Server of an Easylon Router+ is done using its Web Interface. Enter the IP address of the specific router in the address bar of a web browser on a PC that is connected to the router. Select the *SETTINGS* tab and then *LON/IP Server* from the *CATEGORIES*.

There must only be a single Configuration Server in one LON/IP channel.

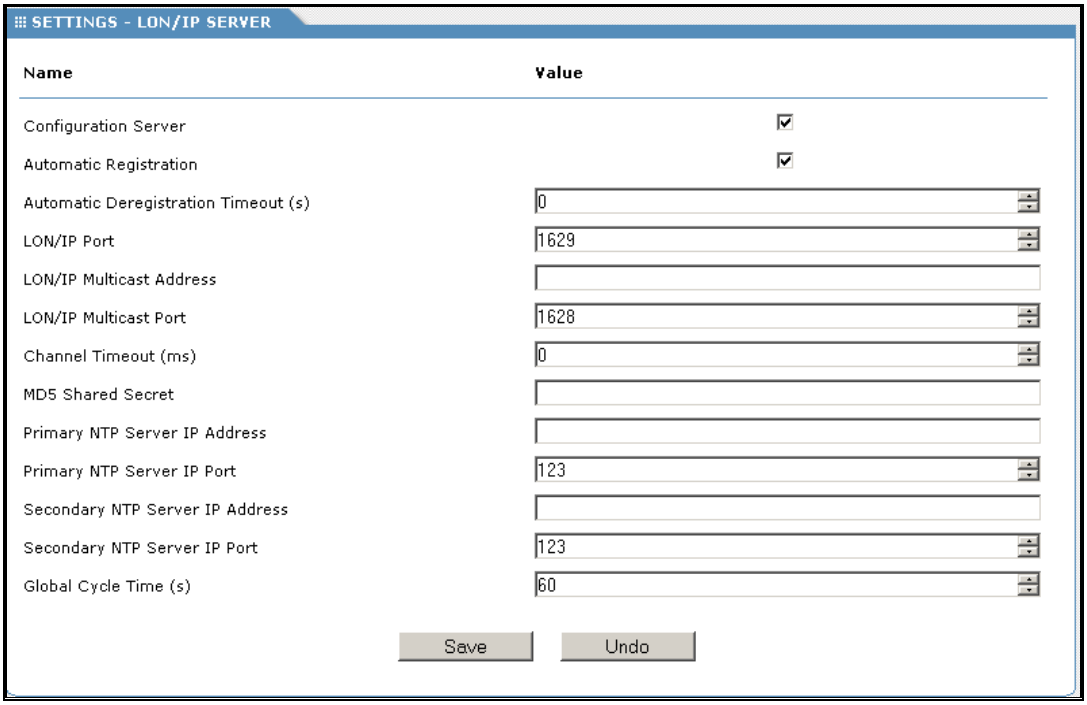


Figure 3-1: Configuration Server Settings

Activate the Configuration Server by checking the respective check box.

Automatic Registration: Selecting this mode will cause any connected LON/IP device to be automatically added to the LON/IP channel. These devices, however, will be removed again if no message

from them is received within the *Automatic Deregistration Timeout.* This interval is set in seconds. (default = 300 s)

LON/IP Port: This is the port by which the Configuration Server is accessed (default = 1629, according to ISO/IEC 14908-4 standard[10]).

If this value is be modified it has to be set identical to the same value for all devices on the LON/IP channel.

If LON/IP Port and LON/IP Multicast addresses are set on the Configuration Server local device settings are overwritten.

LON/IP Multicast Address and Port: By means of IP Multicast addressing, LON packets can be sent in parallel to multiple recipients of the LON/IP channel. This considerably contributes to the reduction of the network load. Multicast addressing is especially recommended if channel routing is not possible.

All participants of a LON/IP channel should use the same Multicast address and the same port number.

Channel Timeout: This parameter serves to detect delayed IP packages. If this value is used all devices in the network have to be synchronized in time. The value to be entered is in milliseconds from 1 to 1500.
The default setting of "0" turns this method off.

If Channel Timeout is used, a synchronization by an NTP server from the Configuration Server is strongly recommended. The real-time clock in the device does not provide a sufficient accuracy.

MD5 Shared Secret: If MD5 authentication[11] is used this field provides the key. An empty field means that no authentication is used. Using authentication requires all devices to support this.

NTP Server: Time consistency is mandatory for network operation. Therefore usage of an NTP server is recommended. The Easylon Router+ can be used for it (cf. section 0). We recommend to use the device running the Configuration Server as NTP server as well. This will ensure time synchronization without having each device to access an internet time server.
If NTP servers shall be used their IP addresses have to be entered

[10] The corresponding client port is 1628.

[11] A hexadecimal value of 16 bytes (32 characters) is required

here, even if the internal NTP server of the same device shall be used. The NTP standard port is 123.

Global Cycle Time: The interval in seconds at which the LON/IP devices are polled for availability (default = 60). Entering 0 will turn this off.

3.2 Manage Routers via the Configuration Server

If an Easylon Router+ is used as Configuration Server its clients can be accessed from it, provided that these are Easylon Router+or devices offering a Web Interface. Commands are available from *SETTINGS > CATEGORIES > LON/IP Channel List.*

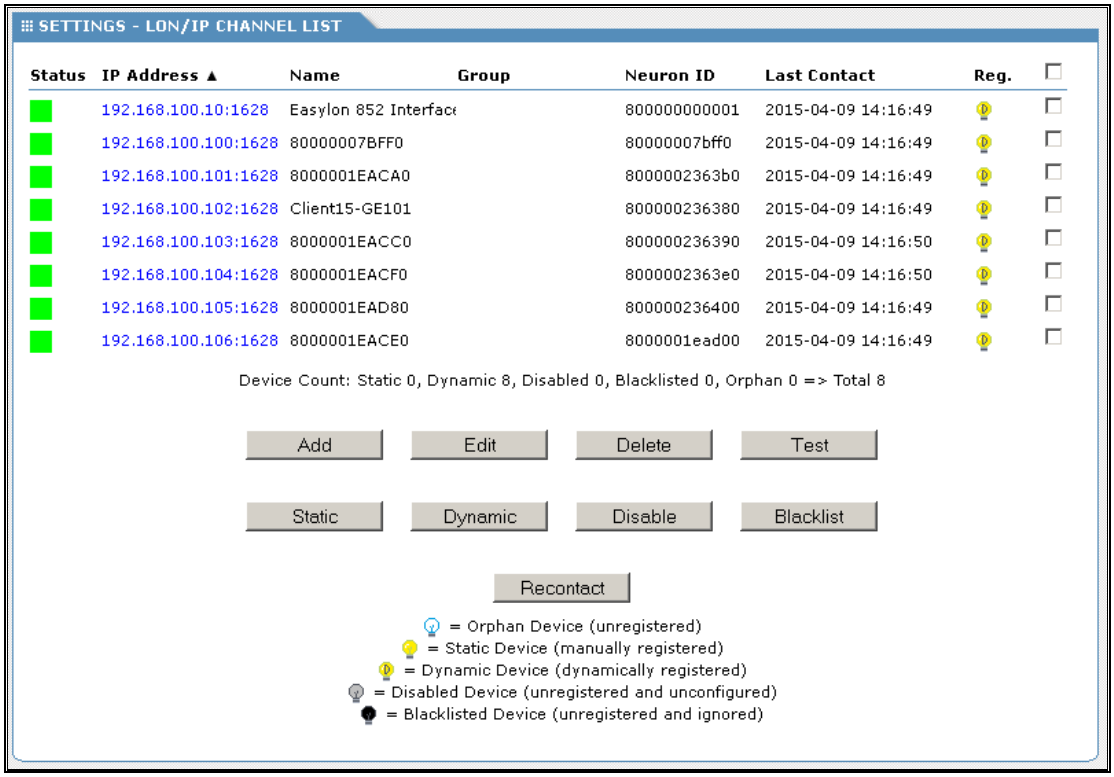


Figure 3-2: LON/IP Channel List

The INFORMATION tab displays the same list without the commands.

The list can be sorted by clicking on the column headers.

Device status is signaled by colors as follows:

Green	registered client
Yellow	in process, e.g. is just registered
Red	registered, but does not respond
Grey	unregistered

Click on the IP address of a device to open its Web Interface (if available). The settings on this device can then be modified.

By default the *Name* column gives the basic node ID[12] of the device. A more telling name can be used, but it must be unique.

The *Group* column provides an additional classification criterion. It makes it easier to manage devices in long lists. For operation of the Configuration Server this parameter is not needed.

Symbols in the *Flag* column quickly signal the current device status with respect to the Configuration Server.

Orphan Device: Device detected in the network, however not registered yet.

Static Device: Device which was manually registered to be permanent.

Dynamic Device: Device, which registered itself at the Configuration Server and may again be deregistered (cf. Automatic Registration in chapter 0).

Disabled Device: Temporarily deactivated device, i.e. this device will not receive messages through the LON/IP channel.

Blacklisted Device: Device which was manually excluded from network operation. Automatic registration will not be accepted and no information on other devices will be sent to it.

The command buttons beneath the list affect selected devices as follows:

Add	A new router device can be added to the list.
Edit:	IP address, port. name and group can be edited
Delete	The device is removed from the list, i.e. it will receive no information on other devices and will no longer take part in the communication.
Test	The device status is tested and the result is displayed above the list
Static	Selected devices will be set as Static Devices. This is helpful with devices showing up during network commissioning through *Au-*

[12] Easylon Router+ have several node IDs. For more information cf. 8.1

tomatic Registration. Making them permanent, so that the deregistration timeout will not apply, is just a few clicks.

Dynamic	The device status becomes that of a device registered under Automatic Registration, i.e. it will be removed if no messages are received within the defined *Automatic Deregistration Timeout*.
Disable	The LON/IP channel communication of the device is temporarily disabled. The device is still registered and will show that it is communicating with the Configuration Server. The *Static* and *Dynamic* commands are used to activate it again.
Blacklist	Registrations from a device with this IP address will no longer be accepted.
Recontact	The Configuration Server will discard all existing data on the devices and rebuild the list of registered devices including all data.

3.3 Tips for Configuration Server Settings

Channel Timeout, possible data loss

Channel Timeout should be turned off (= 0). If a too short time is set, data packets may be lost. Time synchronization between the Routers is important here: If, e.g., the Channel Timeout is smaller than the possible time difference between some devices data will surely be lost.

If Channel Timeout is used, a synchronization by an NTP server from the Configuration Server is strongly recommended. The real-time clock in the device does not provide a sufficient accuracy.

Multicast addressing, reducing the bus load

Having many devices on the network, Multicast addressing is the preferred method, as the bus load will go down.
Another way to reduce the load is to use the Time To Live, or more precisely the IP TTL, which can be set under *LON/IP Device*. This value limits the number of Router hops a message is allowed. Suitable values result from the network structure (contact network administrator) or have to be assessed empirically.

Automatic Registration for fast commissioning

The easiest way to get all devices on the LON/IP network ist o use *Automatic Registration*. Using the commands available under *LON/IP Channel List*, the device status can then be set to *Static* or devices can be excluded using the *Disable*

or *Blacklist* commands. Afterwards Automatic Registration can be turned off for normal operation.

Automatic Registration for normal operation

In case a remote LNS server is part of the network operation *Automatic Registration* should be used as normal operation mode. Other LON/IP devices then have to be set to *Static* or excluded from communication by the *Blacklist* command.

Disable* or *Blacklist

In *Automatic Registration* mode communication from *Blacklisted* devices will be ignored. *Disabled* devices will not receive information, however, they are further registered and the *Automatic Deregistration Timeout* will apply to them.
The *Blacklist* command can be used to exclude devices from the system. The *Disable* command can be used, e. g. for testing, to temporarily turn off the IP channel of the device from the system communication.

4 Using the Router Functionality

4.1 Configuring the LON/IP-852 Interface

The configuration of the LON/IP-852 interface is realized via the Web Interface of the Easylon Router+. Enter the IP address of the Router in the address bar of a web browser on a PC that is connected to it. Select the *SETTINGS* tab and *LON/IP Device* from the *CATEGORIES*.

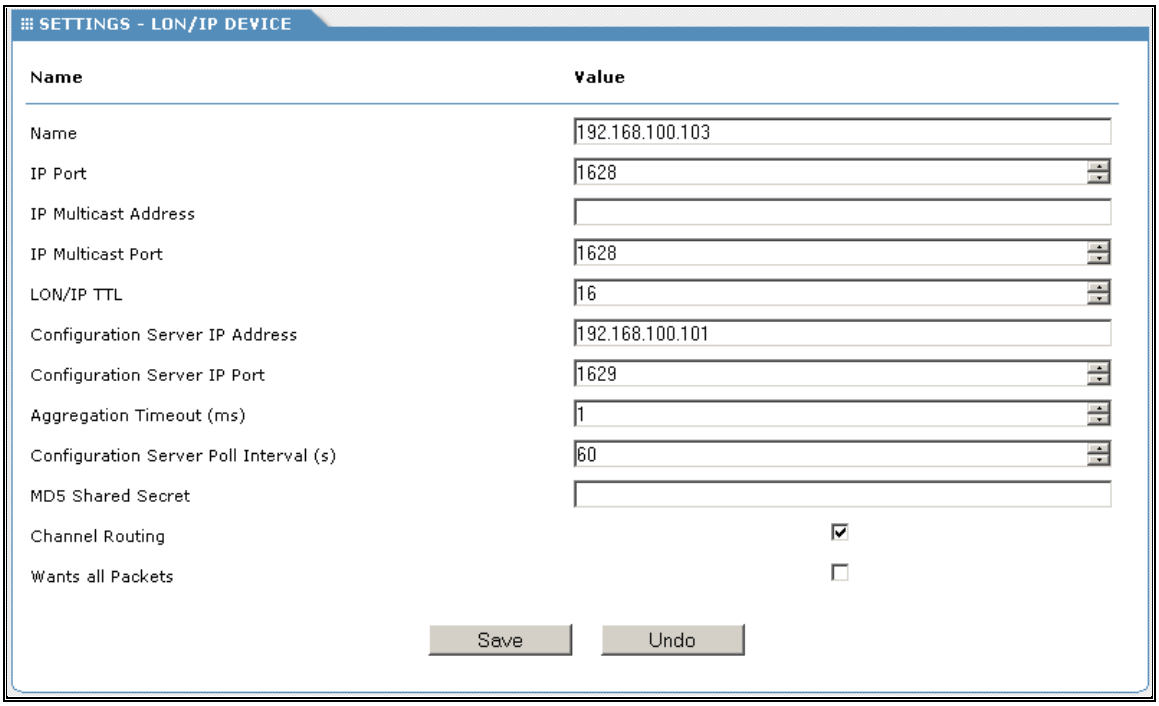


Figure 4-1: LON/IP Settings

If the Easylon Router+ device is simultaneously used as Configuration Server certain device settings (e.g. NTP Server, Multicast addresses) are not available here, as they are determined by the respective server settings.

Name

First assign a unique name for the device under *Name*. By default the basic node ID of the device is used (cf. 8.1). With this name, the router registers at the Configuration Server and identifies itself to other participants of the LON/IP channel.

The name of the device has to be unique in the LON/IP network.

IP Port

If you want to assign a different port than the standard (port 1628) for the exchange of LON packets through the LON/IP interface, enter it under the option *IP Unicast Port*.

If Unicast and Multicast addresses are set on the Configuration Server device settings are overwritten.

IP Multicast Address and Port

By means of IP Multicast addressing, LON packets can be sent in parallel to multiple recipients of the LON/IP channel. This considerably contributes to the reduction of the network load. Enter the values specified by the administrator under *IP Multicast Address* and *IP Multicast Port.*

All participants of a LON/IP channel should use the same Multicast address and the same port number.

LON/IP TTL

The Time To Live entered here is the number of router hops a LON/IP packet is allowed in the network before being discarded. This can be used to limit the propagation of messages, which reduces the overall bus load. Maximum value is 255 (default = 16).

The value set here only applies to LON/IP messages. The IP TTL for general communication of the router, e.g. access to the web interface, follows the general router settings[13].

Configuration Server

Usually a LON/IP channel is managed by a Configuration Server. Such is provided by the Easylon Router+. It is activated through the tab *SETTINGS* > *CATEGORIES* > *LON/IP Server* (cf. chapter 3).[14]

Enter the address of the Easylon Router+running the Configuration Server together with the port (1629 according to CEA-852 standard). If the Configuration Server is running on the same device no entry can be made here.

By means of the following steps you can check if the Configuration Server assignment has been successful:

[13] A general TTL can be entered in the Local Area Network settings.

[14] Information concerning operation with the Echelon *i.LON configuration server (ILCS)* you will find in the Annex .

1. The *Channel/Reset* LED is showing green.
2. In the router's Web Interface under *STATISTICS* > *LON/IP* Device > *Packets* it can be observed that data and configuration packets are transmitted.
3. *Members on the Channel* shows the number of the other participants. A survey can be retrieved via the link *Get Device Channel List*.
4. Other devices can be accessed in the LON/IP network.

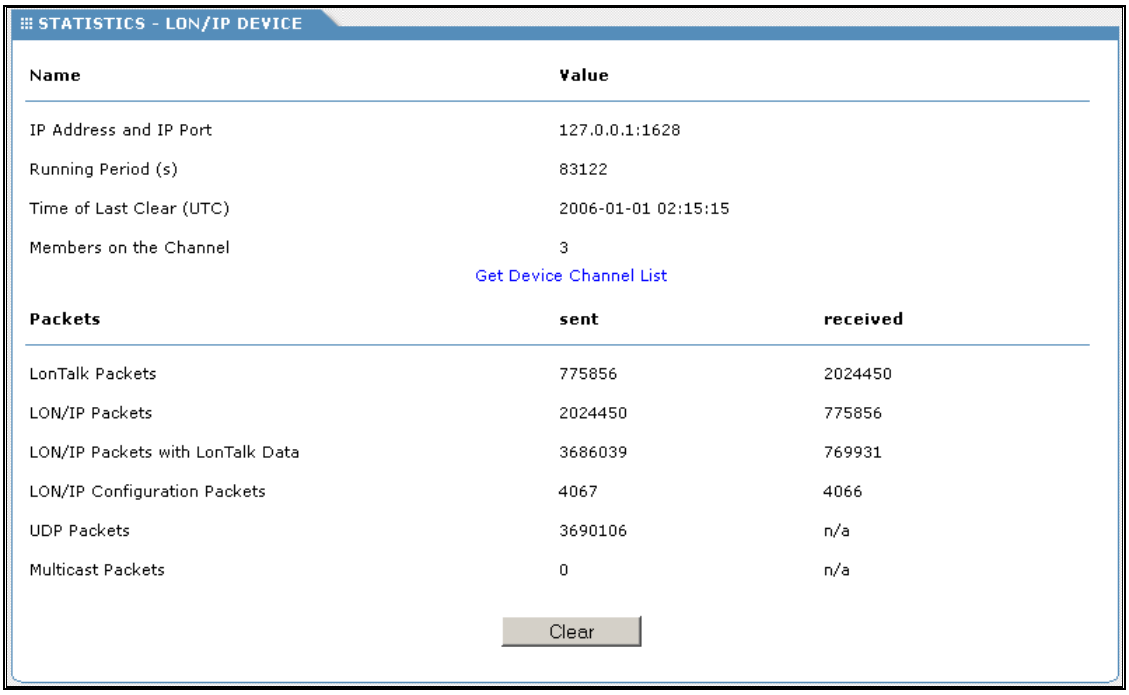


Figure 4-2: Statistical Data related to the LON/IP Interface

Aggregation Timeout

Usually LonWorks packets are short compared to the maximum length of an Ethernet packet. Therefore LON/IP devices can collect LonWorks packets for a short time to transmit them in a single Ethernet packet. The ISO/IEC 14908-4 standard calls this "Aggregation". The *Aggregation Timeout* parameter sets the time for which the Easylon Router+ collects LonWorks messages before they are transmitted in an Ethernet packet. However, if the maximum length of an Ethernet packet is reached prior to that time limit the packet is sent immediately.

LonMark defines a value of 16 ms for the *Aggregation Timeout*. The value 0 will turn this mechanism off. The parameter does not have to be the same on all devices. As the Aggregation Timeout will reduce Ethernet network load usage of this feature is recommended.

In low traffic situations request/response cycles are increased by the Aggregation Timeout.

Configuration Server Poll Interval

The router will query the Configuration Server in the interval set here and use the responses to ascertain the connection status.

MD5 Shared Secret

If MD5 authentication[15] is used this field provides the key. An empty field means that no authentication is used. Using authentication requires all devices on the channel to support this.

Channel Routing

"Channel Routing" refers to a procedure described in the ISO/IEC 14908-4 standard by which LON/IP devices determine from the LonWorks addresses of a packet to which other LON/IP devices the message has to be transmitted via Ethernet. For this purpose the LON/IP devices provide lists containing the LonWorks addresses of the devices connected on the LON/IP channel, i.e. domain, subnet IDs, node IDs, group IDs and Neuron IDs. Using subnet/node addressing the message will only refer to one device, with group or broadcast addressing several ones.

Channel Routing is another means to reduce network load. LON/IP devices will only receive Ethernet packets they really have to process.

Therefore the Channel Routing is on by default. For diagnosis purposes it can be switched off here.

Wants all Packets

A device on the LON/IP channel can tell other devices that it wants all messages, regardless of any addressing or routing. This can be important in case of an Analyzer device. Check the *Wants all Packets* option to enable this mode for a device.

[15] A hexadecimal value of 16 bytes (32 characters) is required

4.2 Setting-up the 2 Port Router (LonMaker)

Using the example of the Echelon LonMaker the following section describes step-by-step how to set-up and use the Easylon Router+ with two ports. This example uses a TP/FT-10 interface. It has to be applied according to the specifications of the device concerned.

Prior to any further steps, first make sure that the LonMaker actually can access the LON/IP channel.

4.2.1 Preparation

1. Open your LonMaker project or create a new one.

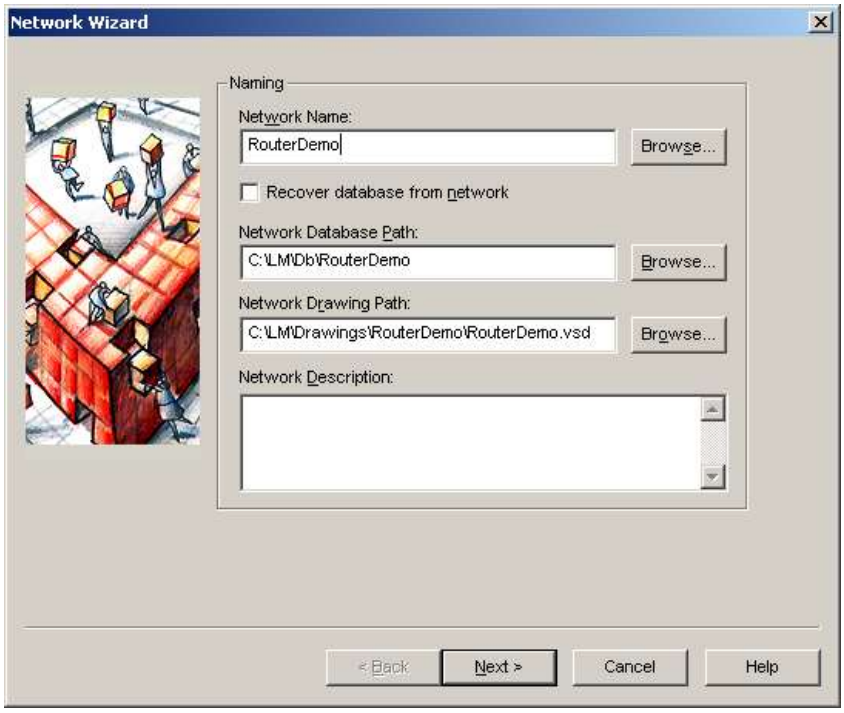


Figure 4-3: Creating a New LonMaker Project

2. Create a type IP-10L channel where the LON/IP interface should be located.

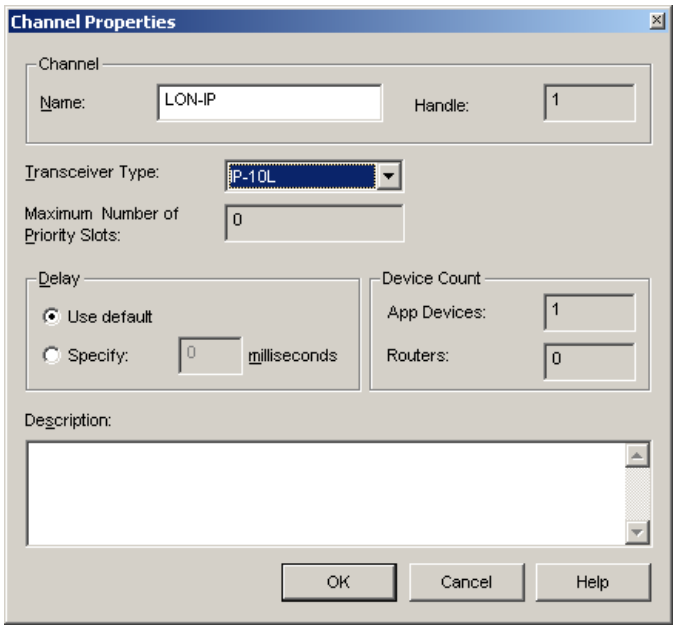


Figure 4-4: Creating a Channel for the LON/IP Interface

3. Create another channel of FTT-10 type for the physical LONWORKS port LON/TP.

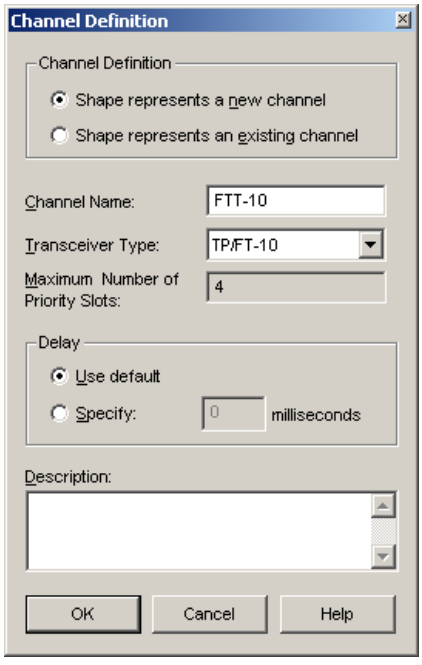


Figure 4-5: Channel for the LON/TP Interface

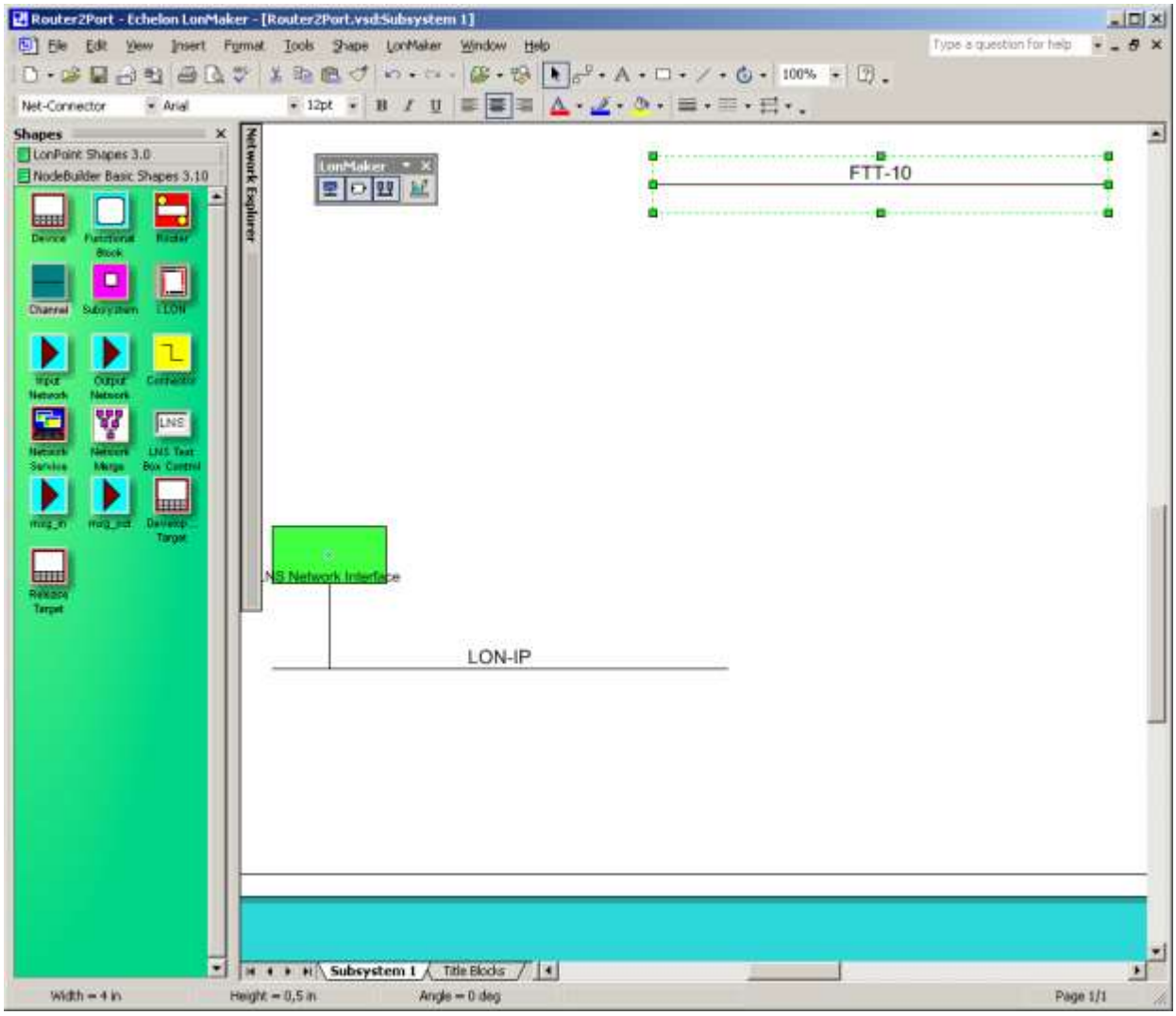


Figure 4-6: The two Channels in LonMaker

4. Now create a router shape for the channels LON/FT and LON/IP.

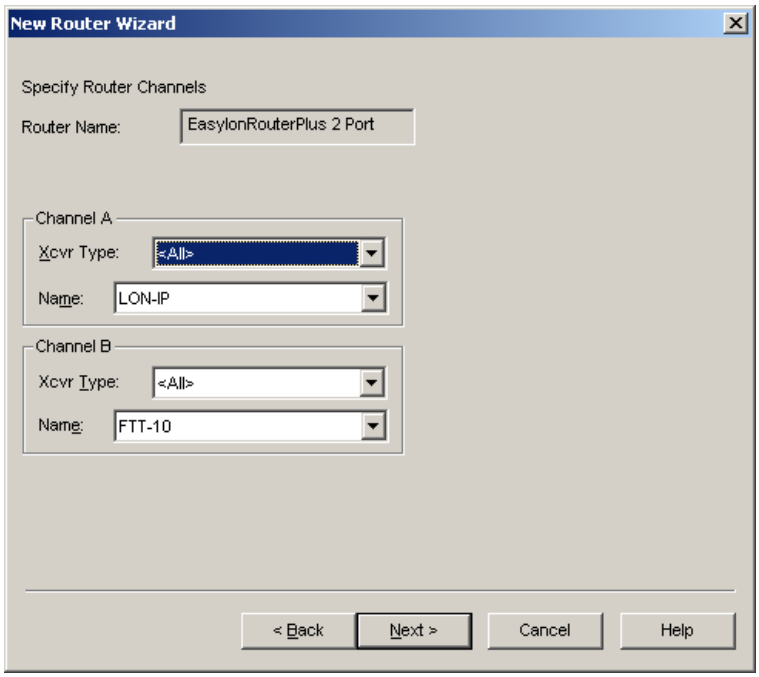


Figure 4-7: Creating the Router Shape

5. Connect one of the router shape to the existing LON/IP channel and the LON/FT channel.

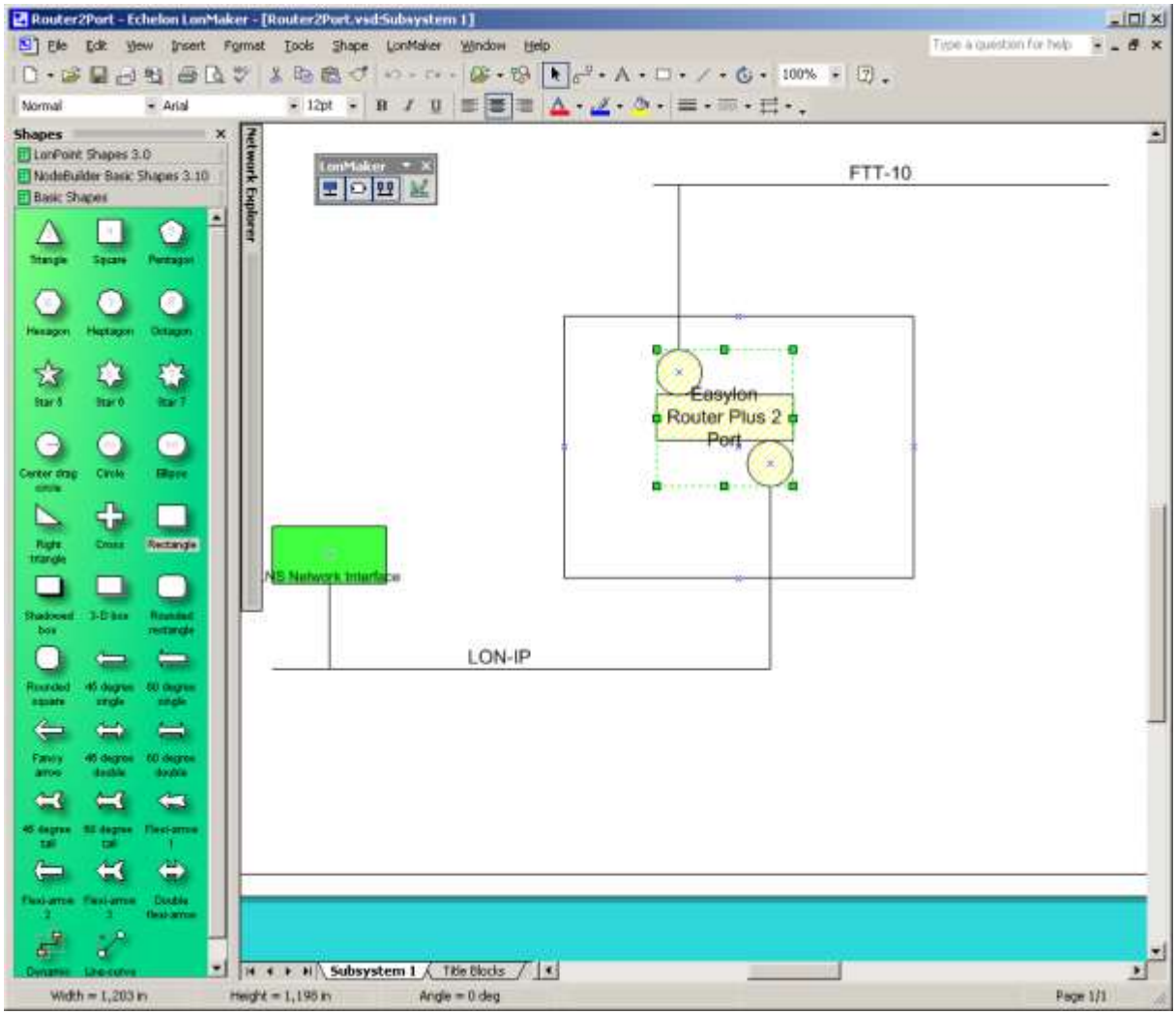


Figure 4-8: Completed Presentation of the Easylon Router+ in LonMaker

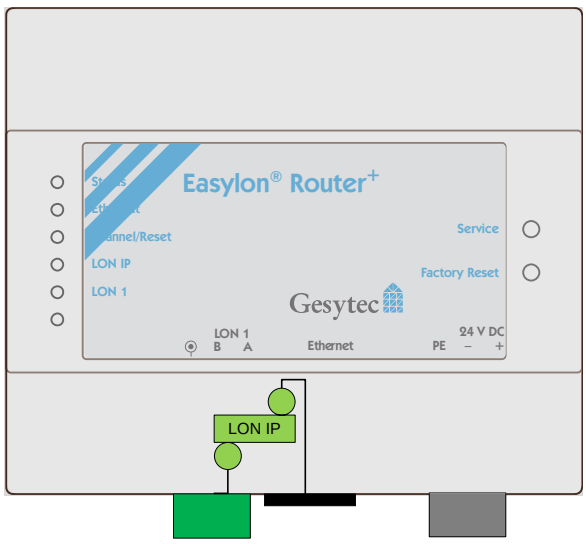


Figure 4-9: Schematic and Real Router

Thus the configuration of the router in the LonMaker is completed. The rectangle in the figure above is merely designated to hint at the boundary of the physical device; otherwise it has no function.

4.2.2 Commissioning

Now the shape created in LonMaker still has to be commissioned. This is realized by sending the service pin message.

On one hand you must be connected to the LONWORKS network in order to perform the commissioning in the LonMaker. On the other hand, to access the router's Web Interface, an Ethernet connection to the Easylon Router+ is required.

First right-click on the router shape created in LonMaker. Select the command *Commission* in the dialog, performing this process in the *Service Pin* mode. Simultaneously open the Web Interface of the Easylon Router+ in a web browser. Select *CATEGORIES* > *Service* from the *INFORMATION* tab, where a button to release the service pin message is available without the need to log in.

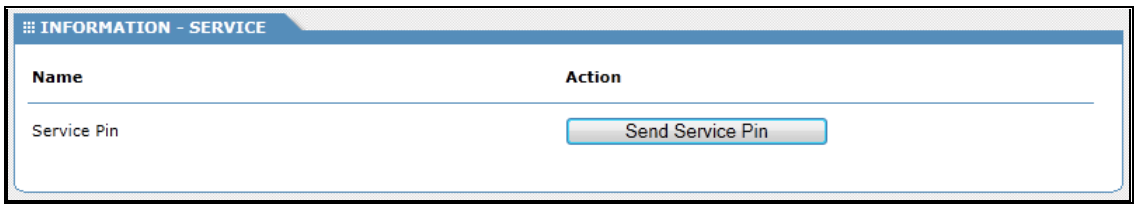


Figure 4-10: Triggering the Service Pin Message

Alternatively to activate the service pin via the Web Interface, you can also use the "service" button on the top side of the Easylon Router+ for commissioning if the router is located nearby.

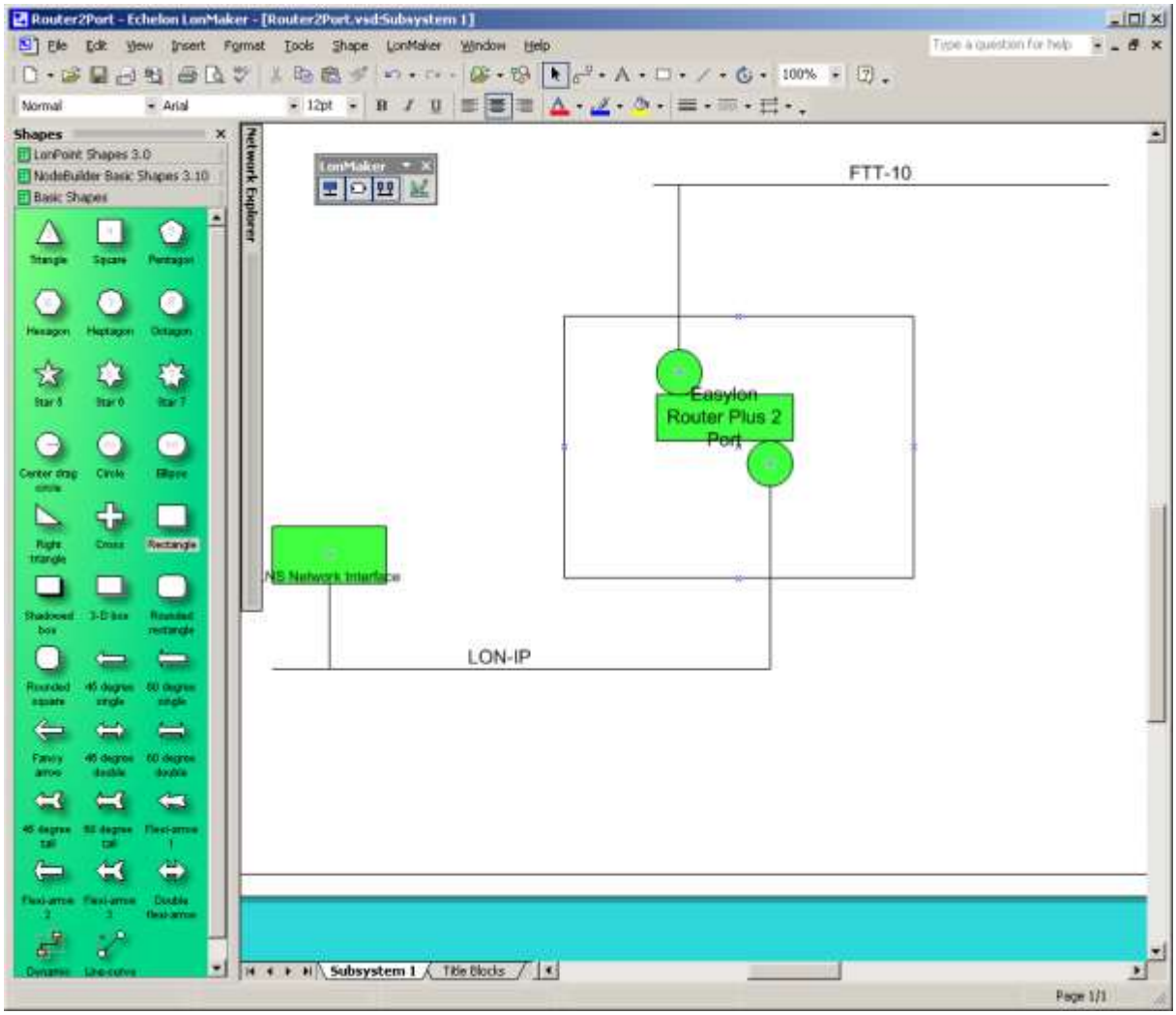


Figure 4-11: LonMaker Representation of Commissioned Router

You can check via the Web Interface of the Easylon Router+ if the installation is OK. Go to the *STATISTICS* tab and select the *LON device* in the *CATEGORIES* to the left. If transmitted packets appear in the right column under *LON 1 (refresh browser window repeatedly[16])*, the installations has been successful.

[16] *Auto Refresh* in the *QUICKINFO* of the Easylon Router+ can be used here.

4.3 Configuring the LON/TP Interface

Using a network management tool as the LonMaker will set the router operation mode. This setting can be modified here.

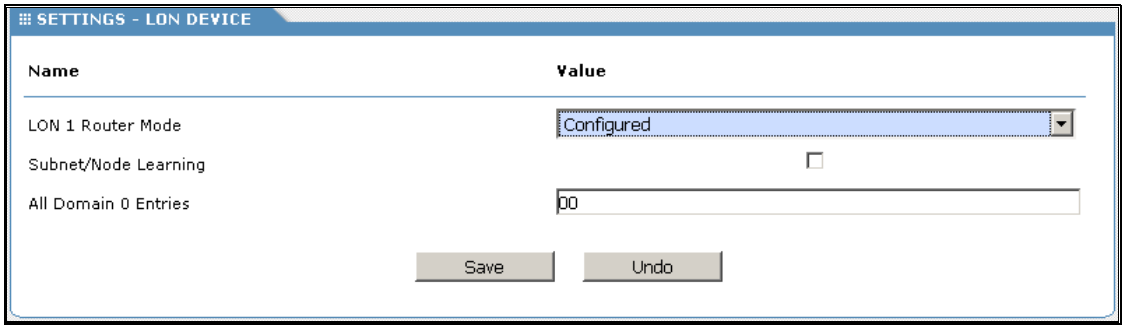


Figure 4-12: Settings for LON/TP Channel

The *Subnet/node Learning* can be applied if the *Router Mode* is set to *Learning*. In addition to the subnet information the node information will then be used for a more efficient routing. (default = OFF)

5 Using the RNI Functionality

As already described in chapter 1.1 the Easylon Router+ provides a *Remote Network Interface* (RNI) for each of the channels (LON/TP, LON/IP), used with MIP and VNI meaning in total four simultaneously usable RNI. Thus different LONWORKS tools (such as *nodeutil* via MIP or *Easylon Analyzer* via VNI) can directly communicate via TCP/IP with one of the channels. The virtual interfaces can directly be accessed via their IP ports.

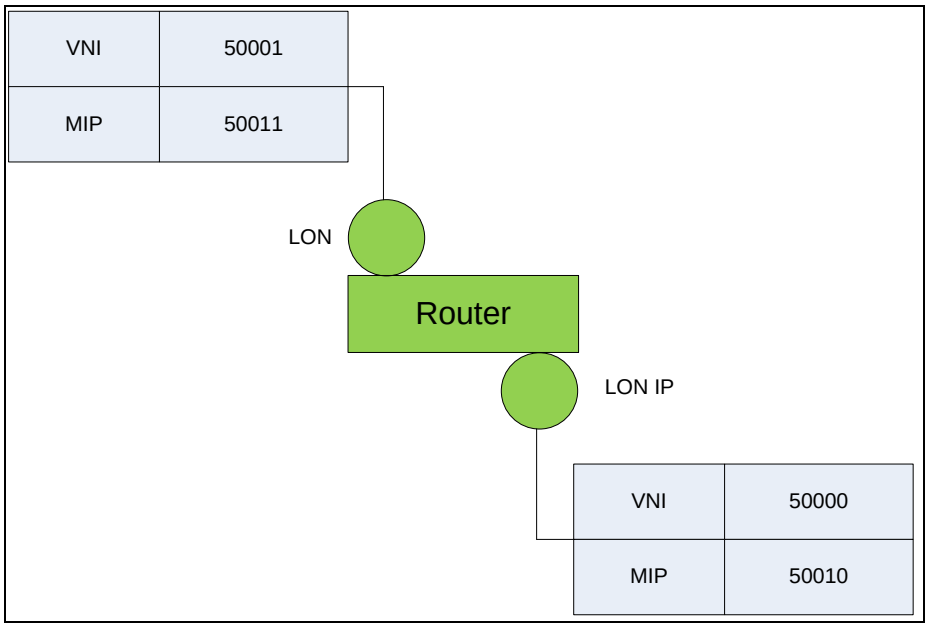


Figure 5-1: Assignment of Channels to the IP Port

Software Installation

1. First unpack the RNI drivers by double-clicking on the EXE file in the directory *RNISetup* on the enclosed data carrier;

2. Copy the unpacked drivers to *c:\Easylon\Install\RniLonCl*;

3. Launch the application *FastInst.exe* and follow the software directions to perform the installation. After successful installation an Easylon logo appears in the task bar of the system tray.

4. Right-click on the Easylon logo in the system tray. Select the entry *Settings* from the context menu and enter the IP address of the Easylon Router+ and the IP port of the router's desired RNI (see Figure 5-1);

5. Click the button *Test Connection* to verify the connection.

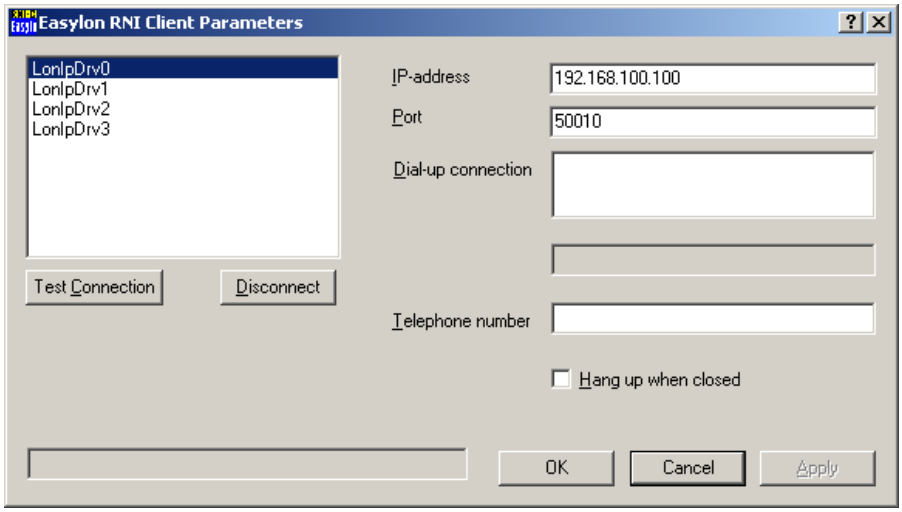


Figure 5-2: RNI Client Parameter

You can also use the Easylon Interface Checker (EasyCheck) to verify the correct functionality of the software installed. Launch the software via the entry *Easylon > LPX* in the menu Windows S*tart*. A survey of all interfaces found is displayed. As the RNI drivers are provided in the system the same way as physically installed interface devices, the appropriate entries can easily be selected in EasyCheck in order to perform further status queries and tests.

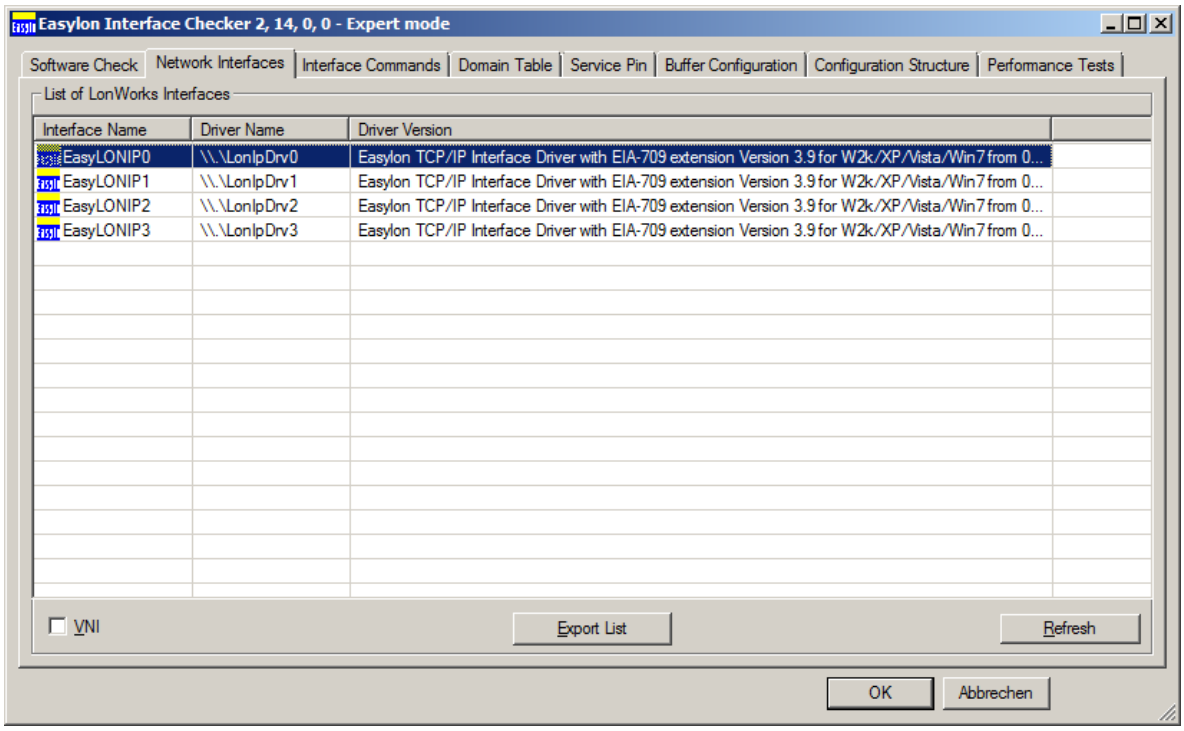


Figure 5-3: RNI Driver under EasyCheck

Assign valid values for domain, subnet and node ID to each RNI. All channels connected to the router must be in the same Domain. The subnet ID must match

with the connected channel of the interface. The combination of all three values has to be unique over the entire network.

Further Information about RNI Functionality

Further details related to backgrounds and operation of a Remote Network Interface can be found in the appropriate manual included on the data carrier.

6 Performing Service Procedures

This section describes some routine operations that may be required while operating a router.

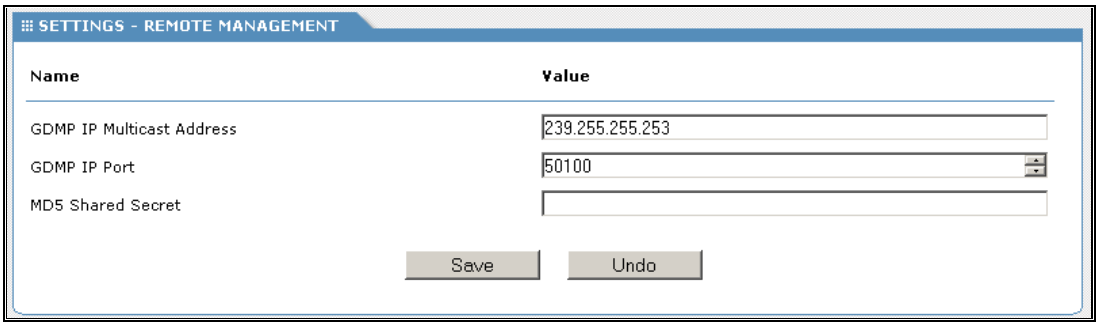
The procedures described in the following are always started from a specific router device. The Gesytec Device Management Center (GDMC) offers advantageous methods making commissioning and maintenance of many Easylon LON/IP routers over the network easy and effective. Among these are backup and restore of device configurations or a firmware update through the network. Operations can even be applied to selected groups of routers.

The GDMC is available from the data carrier delivered with the Easylon Router+ or from the download pages of www.gesytec.com.

6.1 Prepare Router for GDMC Usage

The Easylon Router+ can be used with the GDMC with its default settings. Modifications have only to be made if the device (and all other Easylon routers in the network) shall use others than the standard communication parameters.

Go to SETTINGS > CATEGORIES > *Router Management* and enter the values defined in the GDMC.



6.2 Restart Router

In order to restart the Easylon Router+, open its Web Interface by entering its IP address in the web browser of a PC connected to the router. Go to the *SETTINGS* tab, enter name and password of an authorized user, then select *Service* from the *CATEGORIES* on the left side. After clicking on the button *Reboot Now* and acknowledgement of a security query the router will restart. During the booting process, the Status LED changes its color from green to red.

After modification of certain parameters and after deployment of a new firmware the router has to be restarted to apply the modifications.

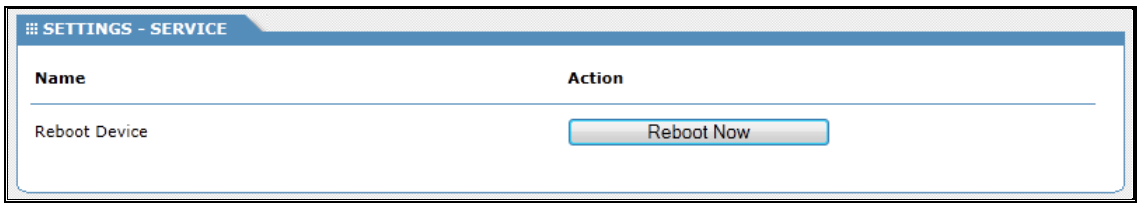


Figure 6-1: Restart Router

6.3 Save and Load Configuration

The most current settings of the router can be locally saved as gsf file in order to be uploaded into the device later again. This file contains the router specific configuration data in an XML format.

For this purpose go to the *SETTINGS* tab in the Web Interface and then in the *CATEGORIES* to *Backup*. Clicking the *Backup* button next to *Device Backup* will save a .gsf file on the PC. Its file name is composed from the Node ID and a time stamp.

NOTE:
Loading a manually edited configuration file may result in a malfunctioning Router device.

In order to upload an existing router settings file to the router, click on the button *Browse…* next to *Select a "Gesytec Settings File" to upload (*.gsf)* and then select the file from your local storage medium. Launch the transmission procedure by clicking *Restore*.

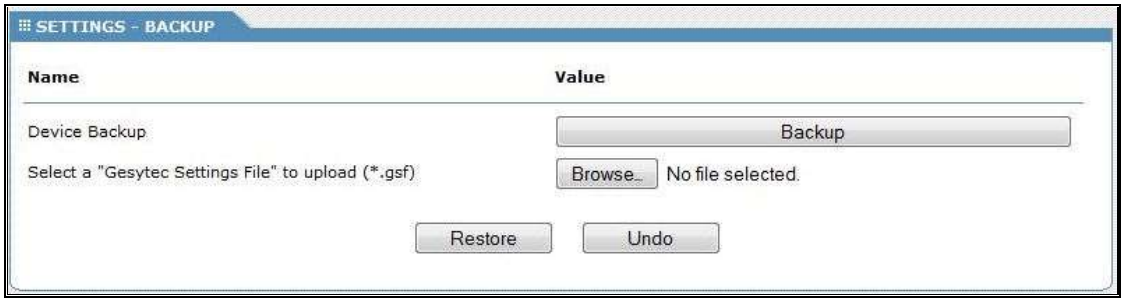


Figure 6-2: Saving/Uploading Configuration

6.4 Firmware Update

Gesytec provides updates of the router's firmware in form of specific guf files you can retrieve, for example, from the Web site www.gesytec.com.

The files are specific to the router model. Please make sure by verifying the router order code P.Ixxxxx that the update file is suited for your device.

In order to deploy new firmware to the device, go to the *SETTINGS* tab in the Web Interface and choose *Firmware* from the *CATEGORIES* to the left. The current firmware version is shown.

Next to *Select a "Gesytec Update File" to upload (*.guf)* click on *Browse…* and select the desired file from your local storage medium. Upload and subsequent firmware update are launched clicking the *Update* button. During installation of the new firmware the *Status* LED changes to red. After completion of the procedure the router must be restarted to apply the update.

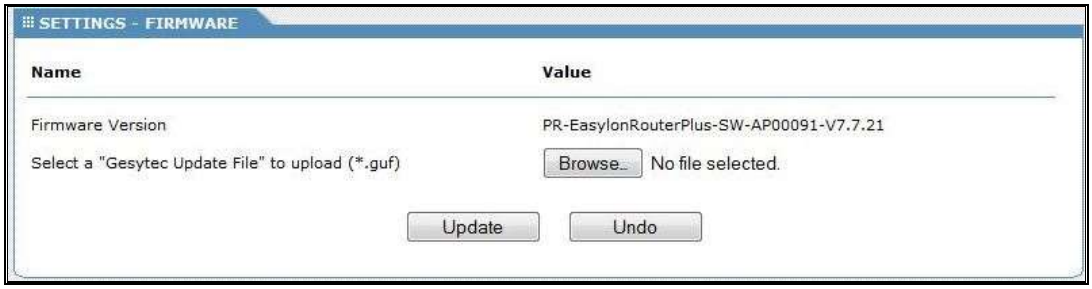


Figure 6-3: Firmware Update

6.5 Reset Router to Factory Defaults

Proceed according to the following steps in order to reset the Easylon Router+ to its factory settings:

Proceed according to the following steps in order to reset the Easylon Router+ to its factory settings:

1. Remove the power supply plug.
2. Reconnect the power supply and immediately push the *Factory Reset* button (see Figure 1-4, ②) on the top side of the housing until the *Channel / Reset* LED starts to flash in red (will take approximately 20 seconds).
3. Release *Factory Reset* button and press it again for a second. It will then flicker fast and even faster later. Finally it will be constantly on. The reset process has started.
4. After about a minute the *Channel / Reset* LED will turn off for a first time followed by a short flash. Then it will turn on again for a minute. After it has turned off a second time, the device is restarted and the factory reset has finished.

The settings of the route rare now reset to the factory defaults.

Returning to factory defaults sets the IP address back to `192.168.100.100`*. Refer to chapter "2.3" to re-establish communication with the device. Furthermore all defined users will be deleted and the default user "Gesytec" will be reestablished.*

7 Solving Problems

This section deals with typical problem situations and provides suggestions for remedy.

7.1 Web Interface of the Router does not Open

Symptoms

Browser signals a timeout while opening the site.

Possible Causes

- Device is not switched-on.
- No Ethernet connection established.
- Problems with IP addresses.

Solution Suggestions

1. Verify if the router is connected to the power supply and if that is functioning.

2. Does the *Status* LED glow green?
   If the *Status* LED is not showing green latest 3 minutes after switching-on, please contact Gesytec service via support@gesytec.de.

3. Is the *Status* LED blinking red or red/green?
   In that case there is a IP address problem. Perhaps there is an address conflict with another device in the network using the same address. Perhaps, if DHCP is active, the router has not been assigned an IP address. Ask the system administrator for a valid address.

4. Check the Ethernet LED of the Easylon Router+. The LED must show yellow (LINK signal) and flicker green with the TRAFFIC.

   Also verify on the PC if an Ethernet connection is established.

5. Using the DeviceFinder, verify if the Easylon Router+ is detected and has its correct IP address.
   While using DHCP in the router or on the PC it may occur that the devices are not located in the same subnet and therefore no connection can be established. Configure the IP settings the way to enable a communication with the Easylon Router+.

6. You are just configuring multiple devices one after the another and resetting the default IP address 192.168.100.100 of the Easylon Router+ to the address desired in the installation?
   In this case it may occur that PC still remembers the MAC address of the previous device with the IP address 192.168.100.100. Thus a new device cannot be addressed under 192.168.100.100, as the PC is expecting it under the old MAC address. Enter the command "arp -d" in the command line and the PC will delete the obsolete assignment.

7.2 LON LEDs Don't Flicker

Symptoms

The LON LEDs remain dark.

Possible Causes

- Faulty connection at LON/TP channel
- Faulty bus termination
- Faulty configuration of the LON/IP interface

Solution Suggestions

1. First verify the wiring of the LON/TP interface, especially if the cable shield has been grounded. Could it be that earth has been connected on a wrong pin?

2. Make sure that the terminator settings are correct.
   Is there maybe already a terminator in the network? If so, switch-off the termination at the Easylon Router+.

3. Check the data traffic of both LON interfaces by means of the statistics function of the Web Interface. For this purpose select the *STATISTICS* tab and *LON Device* from *CATEGORIES* .

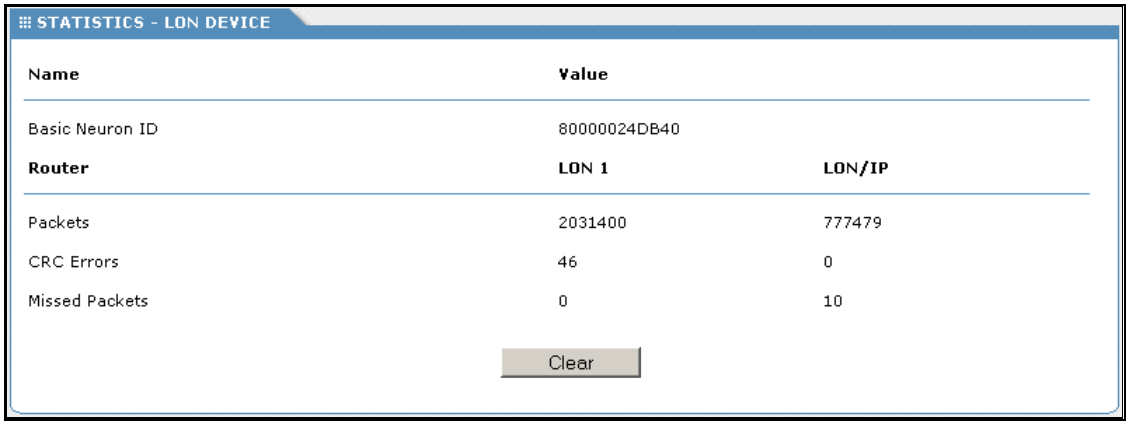
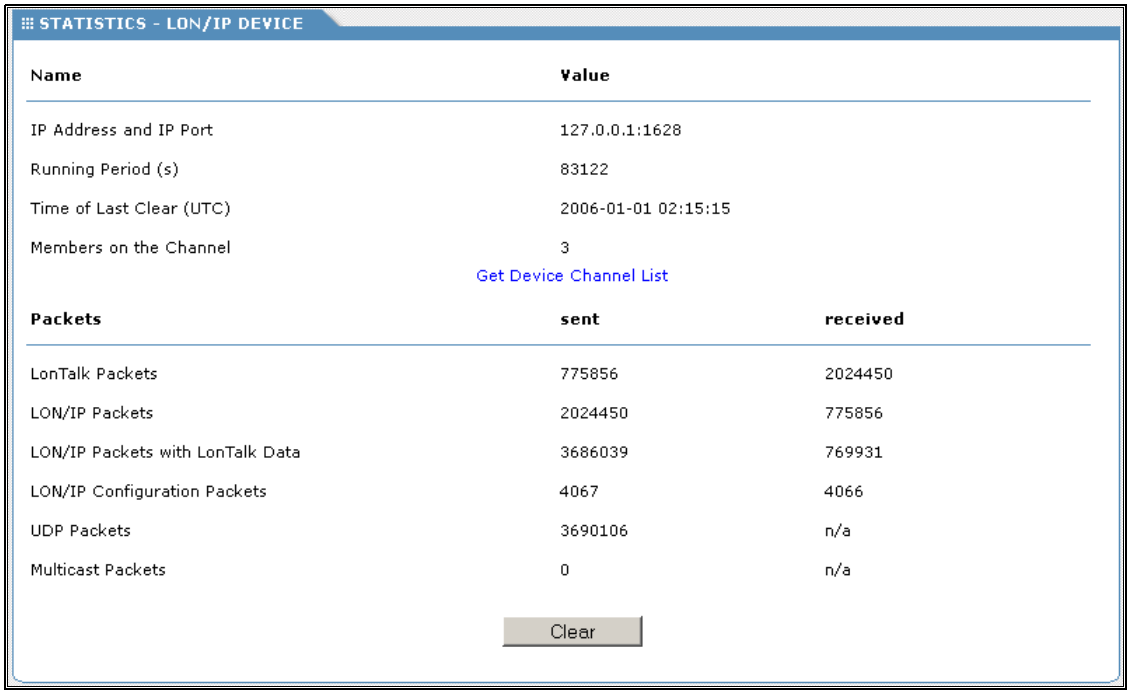


Figure 7-1: Statistics of the LON/TP Interface

You should see increasing values for *Packets* for LON 1. For this purpose you have to refresh the page repeatedly. The value for *CRC Errors* has to be low, otherwise there may be a wiring problem.

Should the *Packets* counter of the LON/IP interface show 0, the LON/IP configuration is faulty. First verify if the Easylon Router+ is correctly registered at the Configuration Server. Verify as well the counters for the individual packet types in *CATEGORIES* > *LON/IP* Device.


STATISTICS - LON/IP DEVICE

Name	Value
IP Address and IP Port	127.0.0.1:1628
Running Period (s)	83122
Time of Last Clear (UTC)	2006-01-01 02:15:15
Members on the Channel	3

Get Device Channel List

Packets	sent	received
LonTalk Packets	775856	2024450
LON/IP Packets	2024450	775856
LON/IP Packets with LonTalk Data	3686039	769931
LON/IP Configuration Packets	4067	4066
UDP Packets	3690106	n/a
Multicast Packets	0	n/a

Clear

Figure 7-2: Statistics of the LON/IP Interface

It is important for the communication with the Configuration server that you see values in the column *Received*. The values for *UDP Packets* and *Multicast Packets* indicate the values for the LON/IP data traffic. Verify if the multicast address is configured identically on all devices.

7.3 Communication Problems at the LON/IP Channel

Symptoms

Data are not exchanged with all devices.

Possible Causes

- No communication with the Configuration Server.

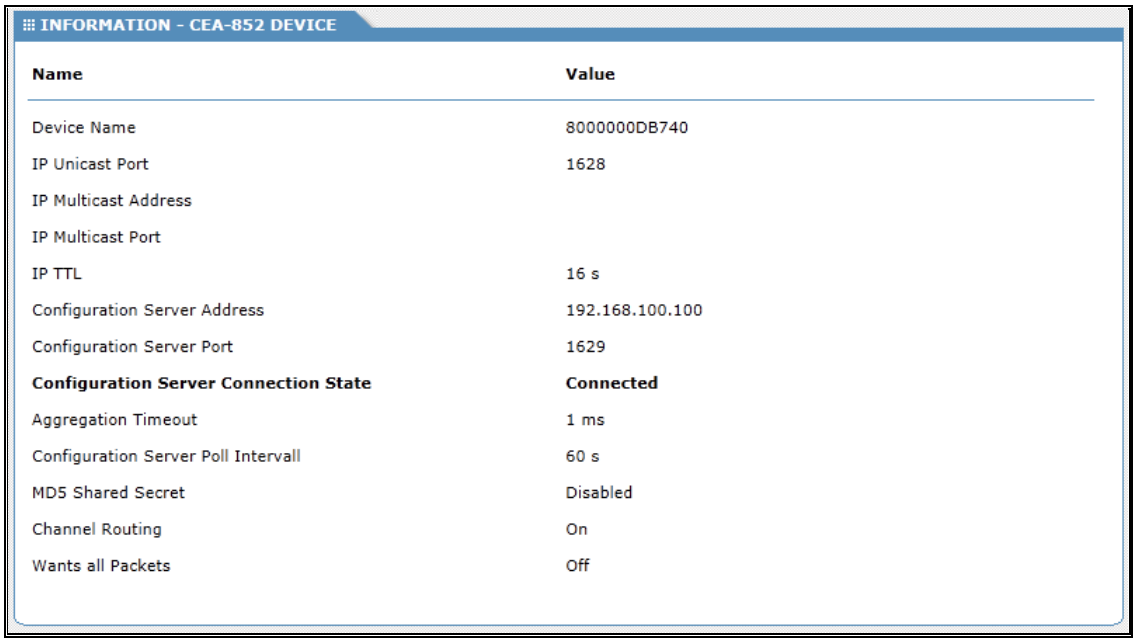
- Not all devices are connected to the network.
- Clocks are not synchronized.

Solution Options

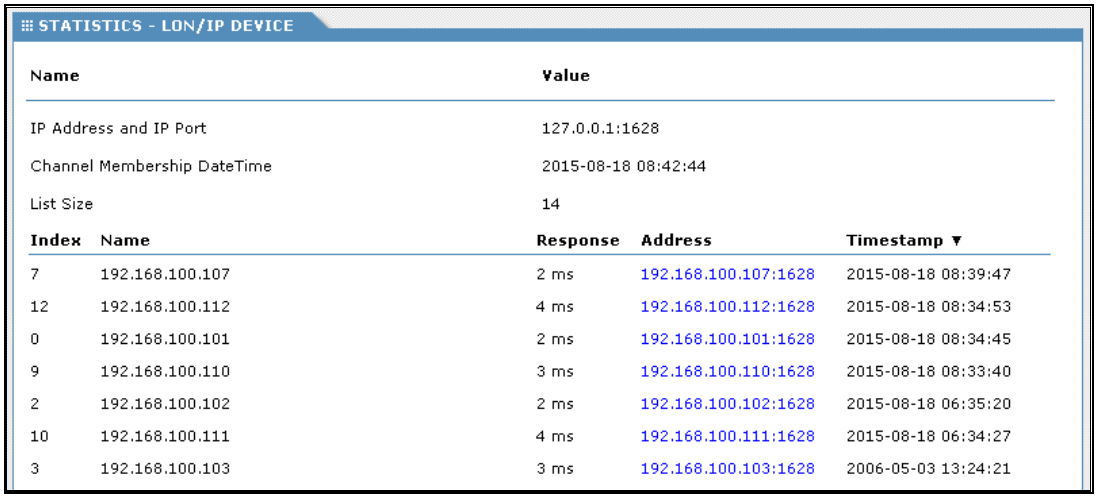
Check the *Channel List* in the Configuration Server if it is complete and for devices showing status Red. Give these devices a more thorough inspection.

Check if the *Channel / Reset* LED of the router is showing green. If the LED is off, the router has not been registered by the Configuration Server. In that case check the IP address settings for the Configuration Server in the router and the settings in the Configuration Server for consistency.

You can as well check the Configuration Server communication in the Web Interface. Have a look at *INFORMATION > LON/IP Device*.



You can perform a communication test with the other devices at the LON/IP channel via the *STATISTICS* tab of the Web Interface. For this purpose open *LON/IP Device* from *CATEGORIES*. Activate the link *Get Device Channel List* you can see on the right side (cf. Figure 7-2). The router now tries to exchange data with the known devices on the LON/IP channel will display the response times.



STATISTICS - LON/IP DEVICE

Name	Value
IP Address and IP Port	127.0.0.1:1628
Channel Membership DateTime	2015-08-18 08:42:44
List Size	14

Index	Name	Response	Address	Timestamp ▼
7	192.168.100.107	2 ms	192.168.100.107:1628	2015-08-18 08:39:47
12	192.168.100.112	4 ms	192.168.100.112:1628	2015-08-18 08:34:53
0	192.168.100.101	2 ms	192.168.100.101:1628	2015-08-18 08:34:45
9	192.168.100.110	3 ms	192.168.100.110:1628	2015-08-18 08:33:40
2	192.168.100.102	2 ms	192.168.100.102:1628	2015-08-18 06:35:20
10	192.168.100.111	4 ms	192.168.100.111:1628	2015-08-18 06:34:27
3	192.168.100.103	3 ms	192.168.100.103:1628	2006-05-03 13:24:21

Figure 7-3: Checking the LON/IP Channel

Make sure that all devices are included in the list and that data can be exchanged with those devices.

Verify if the time settings are correct on the devices of the LON/IP channel. If necessary, use an Easylon Router+ as NTP server.

7.4 Status and LON LEDs Momentarily Glow

Symptom

Short glowing of LON LED together with *Status* LED for approximately 1 s.

Possible Causes

Overload

Solution Suggestions

The LEDs display per channel that the router is overloaded. Lower the data rate within the respective channel.

7.5 No Routing

Symptom

Not data exchange in direction of a channel is performed.

Possible Causes

- The router is not configured.
- The router is “self-learning“ and has discovered a topology error.

Solution Suggestions

Use the LonMaker in order to verify the router. If necessary, re-commission the router. In case of a topology error in the router state you can reset the router using the LonMaker.

7.6 The LonMaker Does not Receive the Service Pin Messages

Symptom

Service pin messages are not displayed in the LonMaker.

Possible Causes

- Faulty LON/IP configuration

Solution Suggestions

First check the LON/IP parameterization as described above.

During commissioning of the router you have to make sure that you first commission the virtual router of three included in the Easylon Router+ that addresses the LonMaker. Typically this is the router located at the LON/IP interface before you may commission the other two.

8 Annex

8.1 Survey of Node IDs

In total, the Easylon Router+ with two ports covers a range of 16 Node IDs[17]; 6 of them are assigned to the router and the Remote Network Interfaces. Each connection of the two interfaces can be identified by a discrete Node ID, realized by adding a hexadecimal number to the basis Node ID of the router. The following table gives the appropriate offset related to the individual connection options and the modes of the Easylon Router+.

Example:

For a *Basic Node ID* of `80 00 00 01 AA 80` the extended Node ID `80 00 00 01 AA 8B` describes the external connection of the LON interface in MIP mode.

Router	Interface	Mode	IP Port	Offset Node ID
LON/IP (external)				+0
LON 1 (external)				+5
	LON/IP	VNI	50000	+8
	LON/IP	MIP	50010	+9
	LON/TP	VNI	50001	+A
	LON/TP	MIP	50011	+B

Table 8-1:Node IDs of the Router Connections

[17] This number is due to compatibility reasons with other Easylon Router+ devices offering more ports.

8.2 Technical Specifications

Power Supply

Device	Supply voltage	consumption
P.I3xxxx	24 V DC (10–30 V)	typ.: <2.5 W, max = 3.6 W
P.I4xxxx	24V AC ±33%, 50-60Hz or 24V DC ±33%	typ.: <3.1 W, max = 3.6 W typ.: <2 W, max = 3.6 W

P.I3xxxx — The 24V DC supply is not galvanically separated. The negative pole is directly connected to mass and to the shield of the Ethernet line. The protective earth connector is connected to the negative pole of the supply voltage.

P.I4xxxx — The 24V AC/DC supply is galvanically separated. There is a protective earth connector which is directly connected to mass and to the shield of the Ethernet line.

Connection — Plug-in screw terminals, 0.5 – 2.5mm²

Ambient Conditions

Temperature
- Operation: 0 – +55 °C, at free convection
- Storage: 0 – +55 °C

Humidity — Class F (DIN 40 040), 5 – 93 % not condensing

EMC

Emission — EN 55022 B

Sensitivity — EN 61 000-4-2/3/4/6

Functions and Features

Real-time clock — Gold Cap buffered, > 6 days

Watchdog

Voltage Monitoring

Temperature Sensor — Display in Web Interface

Displays and Operation

LEDs	- Status - Ethernet - Channel / Reset - LON IP - LON 1 (TP/XF-1250) - LON 2 (TP/FT-10)
Further Buttons	- LON Service - Factory Reset

Interfaces

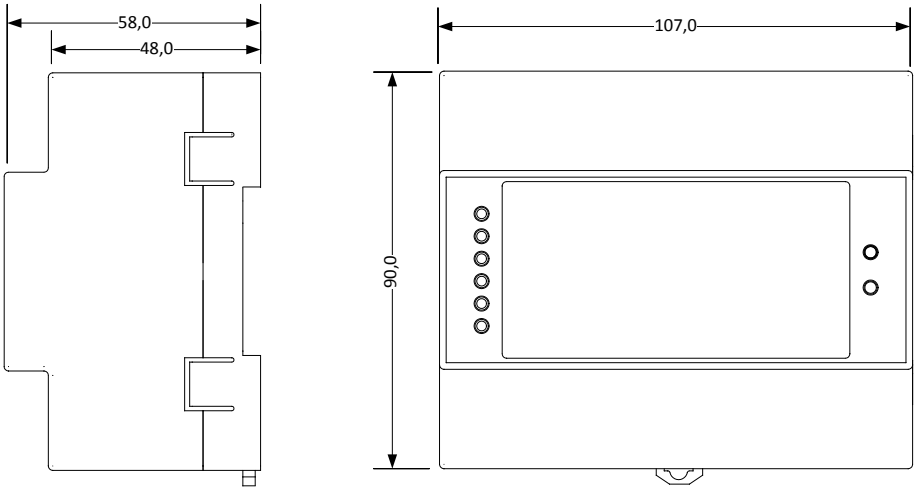
LON

Order code	LON 1	LON/IP
P.I30116	TP/FT-10	LON/IP-852
P.I40112	TP/XF-1250	LON/IP-852
P.I40116	TP/FT-10	LON/IP-852

Connection	3-pin plug-in screw terminals 0.5 – 2.5 mm²
Ethernet	10/100 MBit/s
Connection	RJ45

Housing

Dimensions	107 x 90 x 58 [mm], 6 units acc. to DIN 43880
Mounting	Top hat rail (EN 60715-35*7.5/35*15)
Material	ABS
Color	Gray
Protection Class	IP 20
Inflammability	UL94-V0, self-extinguishing



8.3 Echelon Configuration Server

If there is already an *i.LON Configuration Server (ILCS)* from Echelon running the following steps show you how to configure the Easylon Router+ to interact successfully with an ILCS:

1. Make sure that the Configuration Server can be accessed by the Easylon Router+ in the network.
2. Enter IP address and port (by default 1629) of the Configuration Server in the router's settings. The Easylon Router+ should now sign-in with the Configuration Server, where it initially will be administrated in the group *Orphans*.
3. Open the configuration dialog of the Configuration Server, where the known devices will be shown above the *Orphans* group. Drag the entry for the Easylon Router+ to the desired channel in order to launch the automatic configuration of the LON/IP channel via the server. After successful assignment, the router icon should be appear in green.

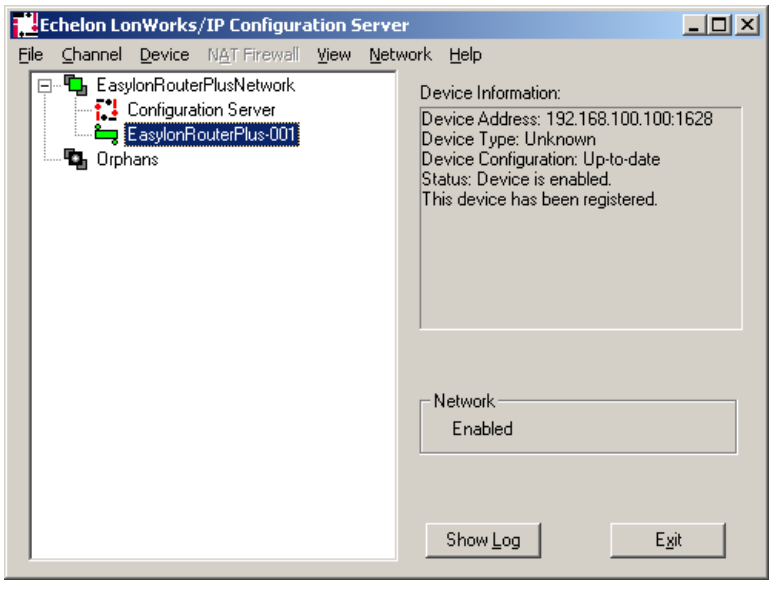


Figure 8-1: Easylon Router+ in the Configuration Server

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