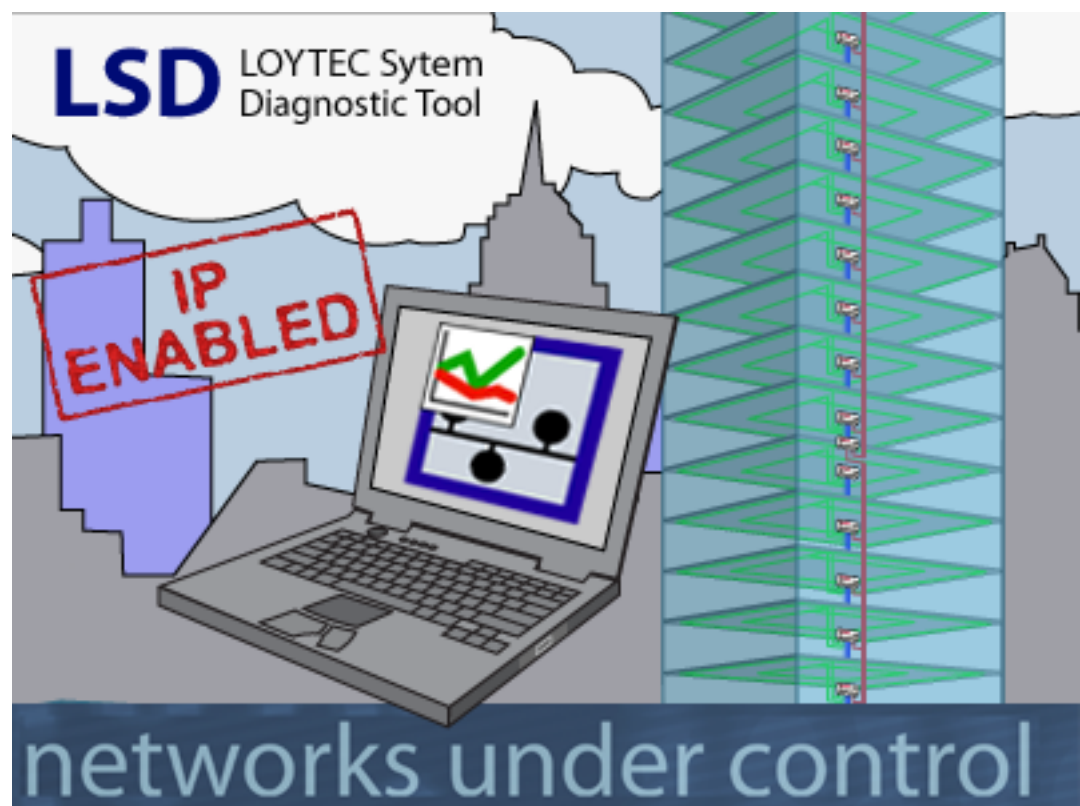


---

LSD Tool

# User Manual

LOYTEC electronics GmbH





## Contact

LOYTEC electronics GmbH  
Blumengasse 35  
A-1170 Vienna  
AUSTRIA/EUROPE  
[support@loytec.com](mailto:support@loytec.com)  
<http://www.loytec.com>

Version 3.4

Document No. 88067006

LOYTEC MAKES AND YOU RECEIVE NO WARRANTIES OR CONDITIONS, EXPRESS, IMPLIED, STATUTORY OR IN ANY COMMUNICATION WITH YOU, AND LOYTEC SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of LOYTEC.

L-Chip™, LC7093™ and L-CORE™ are trademarks of LOYTEC.

LonTalk®, LonWorks® and Neuron®, LonMaker and LNS are trademarks of Echelon Corporation registered in the United States and other countries.



# Contents

<b>Introduction</b>	<b>3</b>
Overview .....	3
Scope .....	3
Installing the LSD Tool.....	4
Starting the LSD Tool .....	4
<b>Using the LSD Tool</b>	<b>6</b>
The LSD Tool Main Window.....	6
Tree View Frame .....	6
Adding and Deleting Nodes in the Tree View .....	6
Device Info Frame .....	8
Information and Configuration Tabs .....	8
Status Log Frame.....	9
Loading and Saving a Project .....	9
Monitoring Nodes and Alarms .....	9
Advanced Topics .....	10
Multiple interface configurations.....	10
Segmentation Ratios.....	10
Recovering an LNS Database .....	11
<b>Trouble Shooting</b>	<b>12</b>
Empty Interface Selection Dialog .....	12
Network scan doesn't report all devices.....	12
<b>Reference</b>	<b>14</b>
Menus .....	14
File .....	14
View .....	14
Node .....	15
Network.....	15
Help.....	15
Speed Bar .....	16
Tree View Frame .....	17
Device Info Frame .....	18
General Node Info.....	18
Orion Node Info.....	19
Firmware Info .....	20
Monitoring.....	20
Switch Tables.....	22
Channel Statistics.....	24
L-Switch Setup .....	24
L-Proxy Setup.....	26
L-IP Setup / L-IP Rev B Setup.....	26
L-Switch Statistics .....	27
L-Switch Info.....	29
L-Switch Configuration.....	29
L-Switch Domain Table .....	31

L-Switch Subnet/Node Table.....	31
Group Tables .....	31
Status Log Frame.....	32
Configuration Dialog .....	34
Interface Selection Dialog .....	35
Network Scan Dialog .....	36
Multiplexed Network Interfaces (MNI Devices) .....	37
<b>Literature</b>	<b>38</b>
Table of Literature .....	38
<b>Revisions</b>	<b>39</b>
Revision Histroy .....	39
<b>Glossary of Terms</b>	<b>41</b>
<b>Index</b>	<b>43</b>

# Introduction

---

## Overview

The LSD System Diagnostic Tool (LSD Tool) is a MS Windows based software, which uses the diagnostic features of LOYTEC's network infrastructure devices to collect and display statistics data about the state of EIA-709 networks. Furthermore, it allows to configure the LOYTEC devices (L-Switch, L-IP, L-Proxy, ORION Stack based nodes,...) via the network and to update the firmware image of the different devices remotely. Since version 2.1 it is also possible to read the status information from generic EIA-709 nodes.

The LSD Tool runs on all LOYTEC network interface cards, including the NIC-852, which even allows to execute all operations over an IP connection.

The LSD Tool can be used to:

- find problems in single network segment by investigating the statistics information, which is stored in the LOYTEC network interface products,
- monitor different statistics parameters and the presence of a node and store the information to a file,
- configure the LOYTEC network interface products over any EIA-709 channel (including IP connections using the EIA-852 channel).

---

## Scope

This document covers the LSD Tool software starting with version 2.2.

---

## Installing the LSD Tool

Before the LSD Tool is installed, the NIC-709 or NIC-852 software has to be installed on the PC. The NIC-709/NIC-852 software package contains the drivers for your LOYTEC network interface card and the L-Config tool, which allows setting up the LOYTEC network interface and entering the registration code for the LSD Tool. For further information about the NIC-709 or NIC-852 software package, refer to the NIC User Manual [1].

*Please uninstall all previous versions of the LSD Tool from your PC before installing a new version of the LSD Tool..*

The LSD Tool comes with a self-extracting setup package. Start the setup program and follow the instructions during the setup process. When the setup program asks for the serial number, enter the LSD Tool serial number printed on the LSD Tool software package or the LOYTEC product CD. After the setup process has completed, start the L-Config Tool and check if your network interface (NIC) is installed and configured properly. Please refer to the NIC User Manual [1] for further information about how to enter a registration code.

This finishes the installation procedure for the LSD Tool. The program is now ready to be used.

---

## Starting the LSD Tool

The LSD Tool is started by selecting the corresponding entry from the Windows start menu. After the first startup, the LSD Tool displays the window shown in [Figure 1](#).

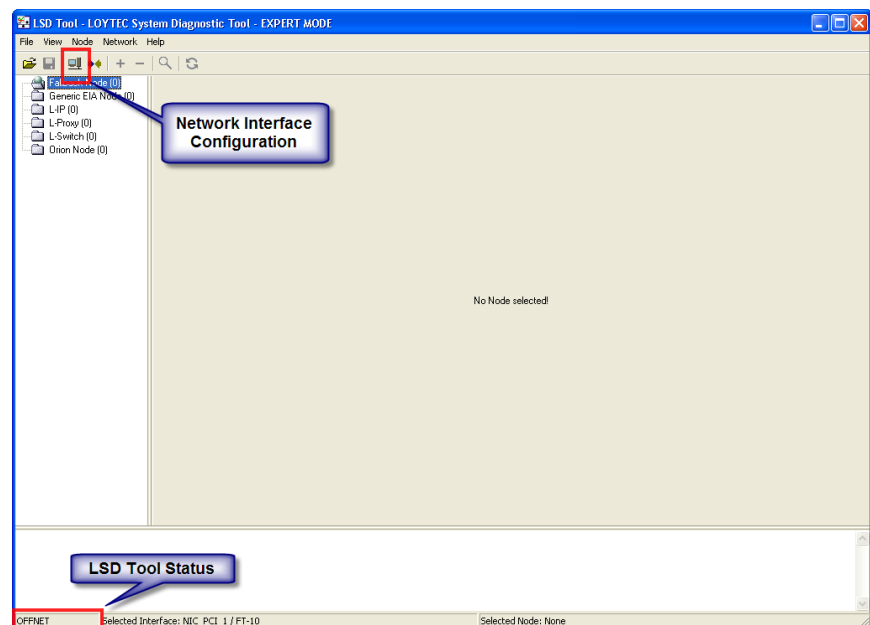


Figure 1: LSD Tool main window

The status bar shows that the tool is currently OFFNET (it has no connection to the network) and no network interface is selected. To access nodes on the network, the network interface of the LSD Tool has to be configured. This is done by opening the network interface configuration dialog via the File menu or



by clicking the corresponding button  in the speed bar. This opens the dialog shown in [Figure 2](#).

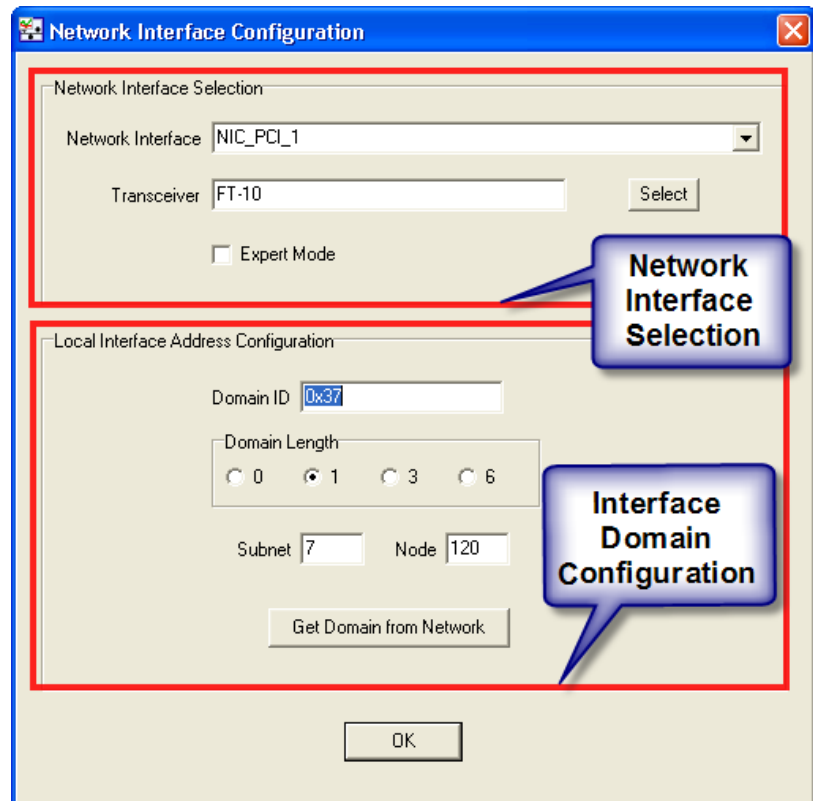



Figure 2: Network Interface Configuration Dialog.

Select the network interface, which connects to the network and for which the LSD Tool is registered. To communicate with devices, which have a configured domain table (devices that have been commissioned with a network management tool), like L-IP or L-Switch XP devices in router mode or L-Proxy devices, the LSD Tool has to reside in the same domain and subnet as the device itself.

The network address of the LSD Tool can be configured in the lower section of the Network Interface Selection dialog. If the network domain is unknown, the button „Get Domain from Network“ can be pressed. This connects the LSD Tool to the network and lets the LSD Tool wait for a service pin message of a node on the network. Now, press a service pin of a node, which is commissioned in the network and which resides on the network channel to which the LSD Tool is connected. When a service pin message is received, the LSD Tool reads the domain table of the node and enters the domain and subnet information into the Network Interface Configuration dialog. Mind, that only valid domain table entries can be used. L-Switch and L-IP devices in switching mode have no valid domain configuration set and therefore can not be used to configure the working domain for the LSD Tool.

Enter a Node number that is not in use and press the OK button to configure the domain table of the network interface and to put the LSD Tool in ONNET node.

For future use of the LSD Tool, the network interface configuration is stored in the Windows registry. The LSD Tool shows the selected network interface after the program start in the status bar. Select „Go Onnet“ from the File menu or

press the corresponding button  in the speed bar to set the LSD Tool ONNET.

# Using the LSD Tool

## The LSD Tool Main Window

The LSD Tool main window is divided into three sections, the Tree View Frame on the left side of the window, the Device Info Frame, which covers the main part of the window, and the Status Log Frame on the bottom of the window.

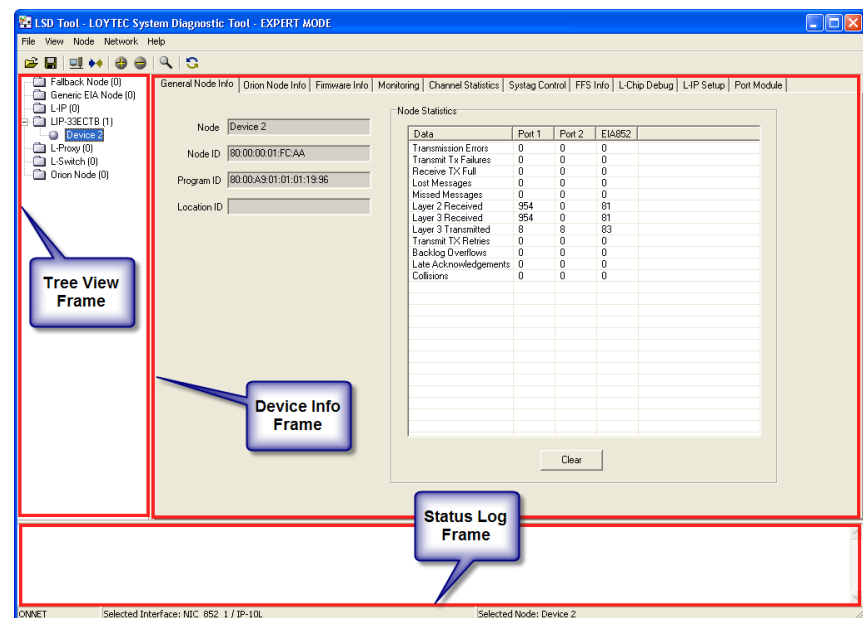


Figure 3: LSD Tool Frames

## Tree View Frame

The tree in the Tree View Frame shows all devices, which have been recognized by the LSD Tool and which have been registered in the internal database. Within this tree, single devices can be selected. Whenever a device is selected, detailed information about the device is shown in the Main Info Frame on the right side of the tree view.

## Adding and Deleting Nodes in the Tree View

Nodes can be added to the tree view in three different ways:

Press the service pin of a node. When the LSD Tool receives the service pin message, it checks the internal data base if the node is already registered. It checks if the program ID belongs to a supported device and adds the node to the internal database.

Manually adding a node. This can be done by selecting the „Add node“ menu



item from the Network menu, by pressing „Ctrl+A“ or by selecting the button from the speed bar. A dialog, which requests the Node ID of the new device appears. Optionally, also a name for the node can be entered. When the dialog is closed (OK button), the LSD Tool performs the device check as previously described and adds the node to the internal database.

Scanning the network. A network scan can be triggered by selecting the Scan



entry from the Network menu, by pressing „F3“ or by selecting the button from the speed bar. A dialog opens, which allows selecting the device types that should be scanned on the network. During the network scan, the LSD Tool searches for all selected device in the domain in which the LSD Tool is currently configured.

Whenever a device is added to the internal database, the device is also added to the device tree in the Tree View Frame. For easy identification of different devices, the label of the device in the tree view can be edited. The icon beside the device name shows the state of the device. If the button is blue, the device is in normal operation and no monitoring is in progress. If the button is green, the device is monitored and all monitored parameters are outside the warning level. If the button is red, the device is monitored and has exceeded one or more error levels, or the device could not be contacted. The device state icon stays red until the alarm is cleared. See Section [4.6](#) for more details about monitoring of devices.

A right click on a device opens a context menu. The context menu allows executing the following actions on the node:


- Delete: remove the device from the internal database and from the tree view.
- Reset: performs a hard reset of the node.
- Set Location ID: allows setting a location ID inside the device. The location ID is stored in the non-volatile memory of the device and is kept over a reset of the device.
- Wink: sends a wink message to the node, so that the node executes it's wink action.
- Lock: allows setting a password on a node. If the password is set, the configuration cannot be changed via the network. Nodes that are locked via a password show a key icon besides the state icon in the tree view.
- Unlock: allows unlocking the device. Unlocking the device removes the key icon from the node in the tree view.
- Reset to Factory Settings: allows resetting the node to its factory settings. On the L-IP node, the IP settings of the node are not reset, so that the node can still be reached over an IP channel after executing the reset to factory command.

---

## Device Info Frame

When a device is selected, the information of the device is shown on different tabs in the device info frame. Whenever a device is added to the internal database, the LSD Tool reads from the device, which information and configuration options are available, and displays the corresponding tabs in the Device Info Frame. The following section gives a short overview about what information tabs are available. A detailed description of the different items on the tab sheets can be found in the [Reference](#) section.

When a tab is selected in the Device Info Frame, the LSD Tool checks if the information for this tab is already present in the database. If the information was not yet retrieved from the node, the LSD Tool reads the information from the node, writes it into the database and displays the information. When the refresh

button  is pressed (F5), the information is re-read from the node and the database and the display are updated.

## Information and Configuration Tabs

- **General Node Info:** This tab is available on every node. It contains information about the node ID of the connected port, the name of the node, the program ID, the location ID and the general node error counters for all ports of the device.
- **Orion Node Info:** This tab shows the version of the ORION Stack in the node, the number of network ports, number of the currently connected port, the serial number, the uptime of the device since the last reset, the node IDs of all ports, the error log of the node, and the Orion Statistics for all ports.
- **Firmware Info:** This tab shows the current firmware image and allows downloading a new firmware image into the node. Before the image is downloaded, the LSD Tool tries to check if the firmware image belongs to the selected device. If the device does not provide the required information, a warning dialog appears and the user has to confirm the firmware download. If the firmware does not belong to the device, the LSD Tool refuses to download the firmware.
- **Monitoring:** This tab allows monitoring the life state, the CRC error counters, the missed preamble counters, and the bandwidth utilization. Depending on the device type some of the monitoring options might not be available.
- **Switch Table:** This tab shows the configuration of the Switch Domain Table, Blocked Domain Table, Subnet/Node Table and Group Tables. L-Switch devices, which are equipped with a 1.x firmware show the L-Switch Domain Table, L-Switch Subnet/Node Table, and Group Table tabs instead.
- **Switch Statistics:** This tab shows the Packet Forwarding, Packet Count, and Group Cleared statistics of the node. L-Switch firmware 1.x displays the L-Switch Statistics Tab instead.
- **Channel Statistics:** This tab shows the channel statistics information for all ports of the node. L-Switch firmware 1.x shows the L-Switch Statistics panel instead.
- **L-Switch Setup:** This tab shows the L-Switch configuration and allows to change the switch configuration like transceiver settings, port enabling/disabling, and management port configuration. For L-Switch RTR Devices it allows to change the routing mode of the L-Switch

RTR. L-Switch firmware 1.x uses the L-Switch Info and L-Switch Configuration panels instead.

- L-IP Setup: This tab allows viewing and changing the configuration of an L-IP device via the network. Configurable options are the IP settings (IP address settings, host name, ...), router mode configuration, control of the web server, and the transceiver configuration.
- L-Proxy Setup: This tab displays L-Proxy specific configuration like the transceiver equipment and the current temperature and voltage level.

---

## Status Log Frame

The frame on the bottom of the LSD Tool displays status and error log information. This frame can be hidden via the „View“ menu in the main menu bar. The log can be saved to a file by right-clicking on the frame and choosing the „Save“ option.

---

## Loading and Saving a Project

The whole project can be saved to a file and loaded later. This feature can be used to store all information for a later detailed review. To store the project, select the Save option from the File menu or press on the Save symbol in the speed bar. After the destination file name is selected, the LSD Tool opens a request box, which asks if all information should be downloaded from all nodes. If this option is selected, the LSD Tool reads all statistics and configuration information (except the subnet/node forwarding tables) from all nodes and writes it into the file. If the option is not selected, the LSD Tool only writes the current contents of the internal database into the file. Information, which has not yet been retrieved from the nodes, is not saved.

---

## Monitoring Nodes and Alarms

Depending of the node type, different parameters of a node can be monitored with the LSD Tool. The monitoring options are accessible via the „Monitoring“ tab in the Main Info Frame, shown in [Figure 4](#).

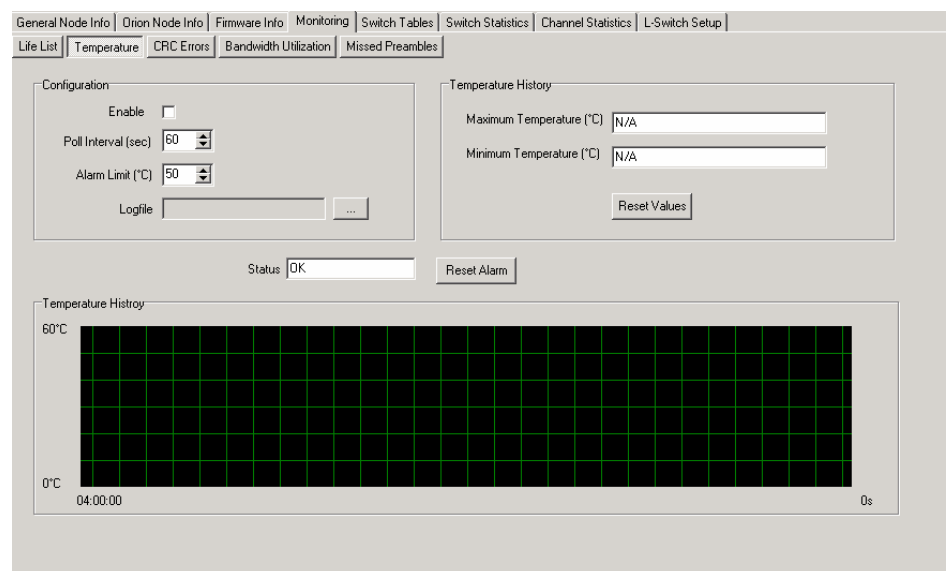


Figure 4: Device Monitoring Tab.

All monitoring options allow adjusting the poll interval, which controls how often the monitored value should be requested from the node. Optionally, a log file in which the status information of the node is stored can be specified. The monitored data is stored in a text file together with a time stamp. The different entries for a set of data (time stamp, value) are separated by the separation character, which can be adjusted in the File->Configuration menu. By default, a semicolon is used so that the log can be imported into spreadsheet programs like Microsoft Excel (CSV format).

For all devices there is the option to monitor the life state of a node. The LSD Tool frequently „pings“ the node and writes an error message into the Status View Frame if the node does not respond. Depending on the device type, the following parameters can be monitored:

- Channel bandwidth utilization
- CRC Errors per second
- Missed preambles per second
- Device temperature

The polled values are displayed in a graphical trend window. For the parameters, which are calculated for each port separately (e.g. CRC Errors, Channel Bandwidth, Missed Preambles), the values are plotted in different colors for each channel. Checkboxes allow to enable or disable the graph for each individual port. The slider on the left side of the trend log allows to change the scaling for the y-axis of the trend log. It is also possible to define alarm limits for the different monitored parameters. Whenever the monitored value exceeds the alarm limit, the node state icon in the Node Tree Frame turns red and an entry is written into the Status Log Frame. Each alarm can be cleared by clicking the „Reset Alarm“ button on the corresponding alarm monitoring tab or by selecting “Reset All Alarms” from the Network menu.

---

## Advanced Topics

### Multiple interface configurations

The LSD Tool allows storing different sets of configurations. A configuration set stores the used interface device together with the address configuration of the interface device and the communication parameters.

A new configuration can be created by specifying the *-c config* as a parameter on the command line when the LSD Tool is started, where *config* is the name for the requested configuration (e.g. *LSDTool.exe -c config1*). If the configuration is not yet present, a new configuration is created and the used values are stored under this configuration in the Windows registry. If the configuration is already present, the stored configuration parameters are used.

### Segmentation Ratios

The switch statistics tab in the Main Info Frame calculates two parameters, which can be used as an indicator for the quality of the network segmentation.

- Network Segmentation Ratio: The network segmentation ratio indicates how many packets of all processed packets were kept on the same port of the switching device. A ratio of 100% indicates that all packets are kept on the same port and that no packets are forwarded. 0% indicates that all received packets are forwarded to one or more destination ports.

- **Port Forwarding Factor:** The port-forwarding factor is the average value to how many ports a received packet is forwarded. A value of 0 would mean that the packet is not forwarded to any port (Network Segmentation Ratio of 100%), a value of 1 indicates that a packet is forwarded to exactly one port (like a learned subnet/node address of the L-Switch). A value >1 indicates broadcast addressing or group addressed messages where the group members are spread over multiple ports. Please keep in mind that the Port Forwarding Factor is influenced by the number of available ports on the device. A 5-Port L-Switch can have a Port Forwarding Factor between 0 and 4, whereas a 2-Port L-IP can have values between 0 and 1.

## Recovering an LNS Database

The LSD Tool must be closed when a LNS network recovery process is started. This is because the LSD Tool has a configured subnet/node address in the network domain but the channel id, which is used to help the LNS recover process to match discovered devices with the discovered network channels, is not properly configured. Therefore the LNS recover process might terminate if it finds the LSD Tool. The LSD Tool can be restarted after the recovery process.

# Trouble Shooting

---

## Empty Interface Selection Dialog

The interface selection dialog shows no interface in the drop-down box. What can be the reason for this?

The LSD Tool could not find LOYTEC network interfaces on the PC. Please check if the network interface drivers are installed properly and the L-Config tool was properly executed. For NIC-852 (CNIP) interfaces, please check if the USB dongle is plugged into the USB port of the PC.

---

## Network scan doesn't report all devices

The LSD Tool could not find a node on the network or not all nodes were found.

If the LSD Tool is not configured in the same domain like the devices, it cannot find the devices on the network when it performs a network scan. To find all nodes on the network, the correct domain and subnet must be adjusted in the network interface configuration dialog. Another option is to add the missing devices manually or to press the service pin on the missing devices so that the device is added to the LSD Tool database.

For devices, which have multiple network ports connected to the network like L-Proxy nodes, the LSD Tool registers the device in the internal database only once. This means, that also for these nodes there is only one entry in the device tree.





# Reference

---

## Menus

### File

- Load: Load a previously stored LSD Tool project into the internal database and displays the data. Files can also be loaded if the LSD Tool is currently in OFFNET mode. However, it is not possible to refresh the data of a device until ONNET mode is entered.
- Save: Save the current LSD Tool project to a file. The stored data can be loaded into the LSD Tool later for further processing and investigation of the stored data. After a destination file is selected, the LSD Tool asks if all data should be downloaded from the devices in the database or if only the currently available database contents are stored. Depending on the number of devices on the network and the network connection, the data download for all device can take a few minutes. Since the Switch subnet/node table is a very large table, the data for this table is not downloaded automatically even if the download option is selected. To store the data of the Switch subnet/node table, the data has to be downloaded manually before storing the LSD Tool project to a file.
- Configuration: Open the [Configuration Dialog](#) which allows to adjust network communication and data export parameters
- Interface Settings: Open the [Interface Selection Dialog](#) which allows to select the network interface and adjust the domain configuration of the network interface.
- Go Onnet: Put the LSD Tool into ONNET mode, using the currently selected network interface.
- Exit: Close the network interface and exits the application.

### View

- Refresh: Refresh the currently displayed device information of the selected node in the [Device Info Frame](#). This option can only be selected if a node is selected and if the LSD Tool is in ONNET mode.
- Show Log: This option allows to switch the display of the [Status Log Frame](#) on or off.

## Node

The Node menu lists all actions which can be executed on the currently selected device.

- **Reset:** This command sends a reset command to the selected device. After this command, the device performs a hard reset (even those LOYTEC device, which support the fast reset option like L-IP or L-Proxy).
- **Set Location ID:** Set the Location ID in the device. The Location is a string of up to 6 characters which is stored in the non volatile memory of the device. It should be used to store an identifier which represents the location of the device.
- **Wink:** This command sends a wink command to the selected device which causes the device to perform its Wink action.
- **Lock:** Set the configuration password of the selected node. If a node is locked with a password, the node configuration can not be changed until the node is unlocked. The node configuration lock disables changing of the device configuration settings, changing of the switching tables as well as the application firmware download.
- **Unlock:** Unlock a previously locked node with the specified password.
- **Reset to Factory Settings:** This command resets the configuration data of the node. Configuration data include the learned switching tables (if applicable on the selected device) as well as the device configuration. For devices which are connected to a CNIP channel, the IP configuration is not changed by this command.

## Network

This menu lists the commands, which act on the entire network.

- **Add Node:** This command opens a dialog window to add a new device to the internal database by manually entering the Unique Node ID of the port via which the LSD Tool is connected to the device. Optionally, also the device name which is used to display the device in the Device Tree can be entered.
- **Delete Node:** Delete the selected node from the internal LSD Tool database.
- **Scan Network:** This command opens the [Network Scan Dialog](#) which allows to scan the network for devices which are currently not stored in the LSD Tool database.
- **Reset All Alarms:** Reset all currently pending alarms on the monitored devices and puts all device into the “OK”- state.

## Help

- **About:** This menu item opens a panel, which gives version information about the LSD Tool. It also shows the serial number of the LSD Tool software.
- **Help:** This menu item opens the help file of the LSD Tool.

---

## Speed Bar

The speed bar on top of the LSD Tool window allows to execute actions which can also be selected in the main menu. Only the toolbar buttons are accessible which are currently executable. This means that e.g. in order to delete a node, a device in the [Tree View Frame](#) must be selected.

The different buttons of the toolbar are:



... load a stored LSD Tool project



... save the current LSD Tool project



... open the [Interface Selection Dialog](#) dialog



... put the LSD Tool into onnet mode



... open a dialog which allows to manually add a new device to the LSD Tool database



... delete the currently selected device from the internal LSD-Tool database



... open the [Network Scan Dialog](#)



... refresh the currently displayed information of the selected node

---

## Tree View Frame

The Tree View Frame on the left side the LSD Tool window shows a tree with all devices which are currently present in the LSD Tool database. A new device can be added to the database by pressing the status button of the device, manually adding the device by entering the Node ID of the port connected to the LSD Tool channel in the “Add Device” dialog or by scanning the network for new devices.

The Device Tree shows the different device types together with the number of present devices of this type. If the Device Tree is expanded, the tree shows all detected devices. The name of a device can be edited by clicking on the label of the device. This device label is not stored in the device. However, if the LSD Tool project is stored to a file, also the device label is saved to the file and can be loaded again later. If a location ID is stored in the node, the location ID string is appended to the device name, separated by a “@”.

On the left side of the label, a colour button shows the current device state. Possible device states are:




... The device is present in the database. The device is currently not monitored.



... The device is currently monitored and all monitored parameters are within the specified limits.



... The device is currently monitored and one ore more parameters have exceeded the specified limits.

In addition to those node state indicators, the symbol  is shown in the Device Tree if the node is currently locked.

If the right mouse button is clicked on a device in the Device Tree, a popup menu is shown.

The actions which can be executed via the popup menu are the same as those in the Node menu. The node can also be deleted from the internal database from within the popup menu.

---

## Device Info Frame

The Device Info Frame shows detailed information of the current state of the selected device and the network segments connected to the ports of the device. The device and network information is divided up into several different tab sheets. Depending on the device, different tab sheets are visible and can be selected. The information, which tab sheets are present, are stored in the devices and are read out by the LSD Tool when the device is added to the LSD Tool database.

## General Node Info

The General Node Info sheet is present for all devices.

It contains the following information:

- Node: Name of the node as it is displayed in the Device Tree.
- Node ID: Node ID of the port which is connected to channel via which the node is reached by the LSD Tool.
- Program ID: Program ID identifier of the node.
- Location ID: Currently stored location ID of the node.

The General Node Info sheet also contains a list of general Node Statistic data. If the device has multiple network ports (like L-IP or L-Switch or L-Proxy devices), the information is displayed for all ports.

The displayed data is:

- Transmission Errors: The number of CRC errors detected during packet reception.
- Transmit TX Failures: The number of times an outgoing transaction failed because the node did not receive acknowledgments or responses in time.
- Receive TX Full: Number of times a packet could not be received because there was no free entry in the incoming transaction database.
- Lost Messages: The Number of packets that could not be received because there was not application buffer available. Since the Orion Stack uses the network buffer up to the application, this value should always be 0.
- Missed Messages: Number of packets that could not be received because there was no incoming buffer available.
- Layer 2 Received: Number of packets, which were received by the Orion Stack on OSI Layer 2.
- Layer 3 Received: Number of packets, which were received by the Orion Stack on OSI Layer 3. In the L-Switch all packets are received and therefore the Layer 2 and Layer 3 receive counters always show the same values.
- Layer 3 Transmitted: Number packets sent by this device.
- Transmit TX Retries: The number of retries sent by this node (not including repeats in unacknowledged repeated service).

- Backlog Overflows: Number of times an overflow of the backlog counter was detected.
- Late Acknowledgments: Number of communication errors because the remote node sent the acknowledgment too late.
- Collisions: Number of detected packet collisions on the network.

## Orion Node Info

The Orion Node Info displays the data which is related with ORION Stack specific features.

The displayed data is:

- Orion Stack Version: Version number of the ORION Stack which is used in the device.
- Connected Port: If the device has more than one network ports, this is the port number of the port which is connect to the channel via which the LSD Tool is communicating with the device.
- Ports: Total number of network ports which are present in the device.
- Serial Number: Serial number of the device.
- Device Uptime: Time since the last reboot of the device.
- Node Ids: Unique Node Ids of all ports of the device.

The Error Log List shows a list of the log entries which are stored in the device. Each log entry consists of the following information:

- Timestamp: A timestamp which signals when the error log entry was written. If the device has a built-in real time clock, this is the absolute data and time of the log entry. If the device has no real time clock, this time stamp is the number of milliseconds since the last reboot of the device.
- Location: internal location of the device where the log entry was created (e.g. Application, ,,,) or \*\*\* Bootup \*\*\* if the log entry signals a power up reset of the device. For messages which are repeated several times, the location field contains a description how often the last error message was written to the error log.
- Type: Description of the error or error code.
- Category: Severity level of the error. Severity levels can be in a range from “Informative” to “Fatal Error Reset Node”.

The Orion Statistic List contains Orion Stack specific statistic information for all ports of the device. The displayed information is:

- Missed Preambles: Number of missed preamble messages, which were detected on the network segment connected to this port. A missed preamble message is detected if the signal on the network looks like a preamble but no valid packets can be detected after the preamble. High missed preamble values can be caused by noise on the network, bad cabling, or faulty termination.
- Long Packets: Number of times a packet larger than 255 bytes was received.

## Firmware Info

The Firmware Info Sheet shows information of the current device firmware and allows to update the firmware of the device.

The displayed firmware information is:

- Firmware: Type of the current device firmware.
- Version; Firmware version number.
- Build Timestamp: Date and Time of the firmware build process.
- Product Type: Device type of the product. This information is only available in the newer firmware versions of the devices. If the information is not present, the Product Type field shows “Unknown”.

To download a new firmware to the device, the image file of the new firmware image has to be selected using the button on the right side of the “Image File” field. Firmware files have a file extension of \*.dl (e.g. lswitch\_primary.dl). When a firmware file is selected, the firmware download can be started by clicking the “Start Download” button. The LSD Tool checks if the firmware image matches the device type of the selected device, using the “Product Type” of the device. If the product type can not be checked, the LSD Tool opens a confirmation dialog and asks the user to confirm that the firmware image matches the selected device. If the firmware does not match the device, the LSD Tool refuses to download the firmware.

Firmware images always have to match the target device type, otherwise the firmware will be detected as invalid by the device and the device will boot the fallback image. After this, a correct firmware image has to be loaded into the device to make the device operating again.

The Progress bar displays the progress of the firmware download. It is possible to selected different devices while a firmware download is in progress. Please be careful when downloading the firmware to different nodes concurrently because at the end of a firmware download the node is reset, which can lead to a firmware download failure if the reset device is a network infrastructure device on the network path between the LSD Tool and a different device to which a firmware is downloaded.

## Monitoring

The Monitoring sheet allows to monitor the presence and different network parameters of a device on the network. Depending on the device type, only some of the monitoring options might be present.

For all monitoring options, the following parameters are present:

- Enable: starts the selected monitoring option for the selected device.
- Poll interval: interval, how often the device is monitored.  
WARNING: shorter poll interval will cause the LSD Tool to generate more network traffic since the monitored data has to be requested from the node.
- Status: monitoring status of the device. If the device has exceeded the specified monitoring limit or could not be reached in life list monitoring, the state changes from “OK” to “Alarm”. This changes also the node state indicator in the Device Tree.
- Reset Alarm: Clears the alarm state of this monitored parameter. This changes the Status field to “OK”. The node state indicator in



the Device Tree turns only green if no other monitored parameters of this node are in alarm state.

### ***Life List Monitoring***

When life list monitoring is enabled, the LSD Tool contacts the node frequently. If the node does not respond the monitoring module Status field shows “Alarm” and an entry is written to the Status Log Frame.

### ***CRC Error Monitoring***

This module allows to monitor the number of CRC errors per second on different network segments. Beside the poll interval, the user can specify an alarm limit for CRC errors. If the number of CRC errors exceeds the specified limit, the module enters the alarm state and write a log entry to the Status Log Frame.

The Maximum CRC Errors field shows the maximum CRC value which was detected during the monitoring process.

When a log file is selected before monitoring is started, the monitored data is written to a CSV log file. The log file can be evaluated later with a spread sheet tool like MS Excel. The separator between the columns of the stored data (time stamp, node, data for different ports) can be specified in the Configuration Dialog.

The CRC History Graph shows a graphical representation of the monitored data. The data is displayed in a different colour for each network port. The single port graphs can be enabled or disabled using the check boxes below the graph. The slider on the left side of the graph allows to change the scaling of the data displayed in the graph.

### ***Bandwidth Utilization Monitoring***

This module allows to monitor the bandwidth utilization on different network segments. Beside the poll interval, the user can specify an alarm limit for the bandwidth utilization. If the bandwidth utilization exceeds the specified limit, the module enters the alarm state and writes a log entry to the Status Log Frame.

The Maximum Bandwidth Utilization field shows the maximum value which was detected during the monitoring process.

When a log file is selected before monitoring is started, the monitored data is written to a CSV log file. The log file can be evaluated later with a spread sheet tool like MS Excel. The separator between the columns of the stored data (time stamp, node, data for different ports) can be specified in the Configuration Dialog.

The Bandwidth Utilization History Graph shows a graphical representation of the monitored data. The data is displayed in a different colour for each network port. The single port graphs can be showed or hided using the check boxes below the graph. The slider on the left side of the graph allows to change the scaling of the data displayed in the graph.

### ***Missed Preambles Monitoring***

This module allows to monitor the number of missed preambles per second on different network segments. Beside the poll interval, the user can specify an alarm limit for the missed preambles value. If the missed preambles value exceeds the specified limit, the module enters the alarm state and writes a log entry to the Status Log Frame.

The Maximum Missed Preambles Value field shows the maximum value which was detected during the monitoring process.

When a log file is selected before monitoring is started, the monitored data is written to a CSV log file. The log file can be evaluated later with a spread sheet tool like MS Excel. The separator between the columns of the stored data (time stamp, node, data for different ports) can be specified in the Configuration Dialog.

The Missed Preambles History Graph shows a graphical representation of the monitored data. The data is displayed in a different colour for each network port. The single port graphs can be showed or hided using the check boxes below the graph. The slider on the left side of the graph allows to change the scaling of the data displayed in the graph.

### ***Temperature Monitoring***

This module allows to monitor the temperature in the selected device. Beside the poll interval, the user can specify an alarm limit for the maximum temperature value. If the temperature exceeds the specified limit, the module enters the alarm state and writes a log entry to the Status Log Frame.

The Minimum and Maximum Temperature Value field shows the maximum and minimum temperature value which was detected during the monitoring process.

When a log file is selected before monitoring is started, the monitored data is written to a CSV log file. The log file can be evaluated later with a spread sheet tool like MS Excel. The separator between the columns of the stored data (time stamp, node, data for different ports) can be specified in the Configuration Dialog.

The Temperature History Graph shows a graphical representation of the monitored data.

## **Switch Tables**

This sheet contains the different tables which have been learned by the switching algorithm and which are used to decide about forwarding of packets.

### ***Subnet/Node Table***

The Subnet/Node table sheet shows the subnet/node forwarding table of the device. Because downloading the table takes quite a long time, the table is only read from the device if the “Read” button is pressed.

The display selection drop down box is used to select the switch domain table entry for which the subnet/node table is displayed. The subnet/node table itself shows, to which port(s) a message with the specific subnet/node destination address is forwarded.

By double clicking on the table, the selected entry can be edited. The “Write” button updates the subnet/node table with the displayed values. The device does NOT need a reset to enable the changes.

### ***Group Table***

The group table shows, to which ports a message addressed to a specific group is be forwarded. The rows of the table define the groups in a domain, the columns define the index of the router domain table to which the group entries belong.

By double clicking an entry of the group forwarding table, this entry can be edited. Pressing the write button uploads the whole group table to the device. The device does NOT have to be reset to enable the changes.

## ***Domain Table***

The domain table panel shows the domain values, which currently have been learned by the device. The list shows the domain table index, domain ID, domain ID length and the protected flag of the entry. If the protected flag is set, the domain table entry cannot be relearned. For unused entries this means, that the entry is never used for learning domains. For used entries this means, that the entry is never deleted by the domain aging mechanism of the device.

By double-clicking an entry in the domain table, the entries can be edited manually. The write button writes the new entry to the device. Mind, that writing the entry can take quite a long time because beside the switch domain table, also the switch subnet/node table is updated. The device does NOT have to be reset in order to enable the changes.

Beside the domain table, this panel also shows the blocked domain table for devices which support the domain locking feature. This table shows all domains which are blocked by the device and are therefore excluded from being learned. All message which are received on one of the blocked domains are discarded and are not forwarded to any port. Domain entries for this table can be added and deleted. If a domain, which is already learned, is added to this table, the domain is removed from the domain table and all learned subnet/node and group addresses are cleared for this domain. When a domain is removed from this table, the device starts learning this domain.

## ***Switch Statistics***

This sheet shows statistic information which is collected by the switch module of the device.

## ***Packet Forwarding***

This table shows the number of packets, which were forwarded from a specific port to a specific port. The source port is defined in the rows of the table and the columns show the destination ports. For example, the field in the 3<sup>rd</sup> row (Port 3) and the 2<sup>nd</sup> column (Port 2) shows how many packets have been forwarded from port 3 to port 2 in the device. These numbers can be used to estimate how well the network is segmented in regards of network traffic.

The collected data is used to calculate two parameters which describe the segmentation state of the network:

**Network Segmentation Ratio:** This is the ratio between the number of packets which were not forwarded to a port (this is, which were kept local because the destination node of the packet was on the same port like the source node) and the total number of processed packets. A ratio of 100% would mean that all packets were kept local, where as a ratio of 0% means that all packets were forwarded.

**Port Forwarding Factor:** This is an average value to how many ports a received packet was forwarded. It can be taken as a measurement how efficient the device has learned the network topology. The factor has always a value between 0 and the (number of ports - 1).

## ***Packet Count***

The packet count table counts how many packets were processed on a port. The counter can be reset by clicking on the "Reset" button.

## ***Group Cleared***

The group cleared table counts the number of times a single group entry was relearned. Relearning happens whenever a communication problem (an alternate path packet) is detected in a specific group. If the counter of the group cleared

table increases quickly, there may be a communication problem with this specific group. Group relearning can also happen if there is a high packet load on the channels or if acknowledged service is used in groups with many group members.

If the group cleared counter increases quickly it is recommended to disable group learning via the DIP switch or the network.

## Channel Statistics

The channel statistic sheet contains the channel statistic data for all ports which are present on the device.

The displayed data are:

- Peak traffic packets: Peak value of packets on the channel measured in packets per second.
- Average traffic packets: Average value of packets on the channel in packets per second.
- Peak bandwidth utilization: Peak bandwidth utilization of the channel. The device calculates this value depending on different channel types and channel parameters.
- Average bandwidth utilization: Average bandwidth utilization of the channel. The device calculates this value depending on different channel types and channel parameters.
- Peak collisions: Peak collisions on the channel per second.
- Average collisions: Average collisions on the channel per second.
- Peak CRC errors: Peak CRC errors per second on the channel.
- Average CRC errors: Average CRC errors per second on the channel.
- Peak missed preambles: Peak number of missed preambles per second on the channel.
- Average missed preambles: Average number of missed preambles per second on the channel.
- Peak alternate path packets: Peak number of alternate path packets per second on the channel. A packet with the alternate path bit set (alternate path packet) is sent in the last two retries of an acknowledged or request/response message. This can be used as an indication for communication problems with single nodes or faulty bindings or addresses on the channel.
- Average alternate path packets: Average number of alternate path packets per second on the channel.
- Channel Overload Ration: Ratio how often the network port was in channel overload state (100% means that the channel is always in overload state).

## L-Switch Setup

This sheet displays the current configuration of the selected L-Switch device and allows to change the configuration over the network. When the configuration is change using the LSD Tool, the DIP switch settings on the device are overridden. The device has to be reset to factory settings to re-enable the DIP switch configuration of the device. The “Config” radio buttons show whether

the current configuration uses the DIP switch settings or are externally configured (this is, via the network or via the console menu of the device).

The switch learning algorithm can be adjusted with the settings:

- Group Learning Off/On: Enables/Disables learning of groups.
- Subnet/Node Learning Mode: Configures the learning of subnet/node addresses. Possible values are subnet/node learning, subnet learning (single subnets must not spread over multiple ports!) or switching off the learning algorithm.
- Block unknown domains: This feature allows to block all domains which are currently unknown (this is, which are currently not entered in the switch domain table). If this feature is enabled, messages on unknown domains are always dropped and never forwarded to any port. This feature should only be enabled if all desired domains have already been learned or if the desired domains are manually added to the switch domain table.

To enable the new settings after changes, press the “Write” button to download the settings to the L-Switch device and reset the device.

The Transceiver Settings section shows the transceiver equipment of the device. For transceiver type which allow a configuration change (like bit rate configuration for RS485 or backbone mode for TP/XF-1250 transceivers), the buttons on the left side of the transceiver label open a dialog which allow to change the configuration. The device has to be reset to apply the changes to the device.

The Enable/Disable Ports section allows to enable or disable single network ports on the L-Switch. This can be used to isolate faulty channels. The changes are written to the device when the “Write” button is clicked.

The configure management port panel allows to configure single ports of a device to forward all packets to a management port. It can be used to monitor the packets on a channel with a protocol analyser like LOYTEC’s LPA Protocol Analyzer. Selecting the “Enable Management” checkbox enables the management mode. The “Management Port” field selects the port, to which all messages of the selected channels should be forwarded. Per default, the management port is set to the port which is connected to the LSD Tool. Finally, the “Source Port” checkboxes allow to select, which Port(s) should forward the packets to the management port. The management mode has no influence on the learning algorithm of the device. This means, that, even if the management mode is selected and all packets of the selected ports are forwarded to the management port, the device still learns the subnet/node addresses and group addressed in the background and filters the packets if the management mode is disabled again.

NOTE: To monitor the packets on a remote channel, all channels between the monitored channel and the analyser tool have to be configured to operate in the management mode and thus forward all packets.

For L-Switch RTR Devices, the Router Mode can be adjusted at this panel.

The System Health panel shows the current device temperature and the supply voltage of the device.

## L-Proxy Setup

This sheet displays the current transceiver configuration of the selected L-Proxy device and allows to change the configuration over the network. When the configuration is change using the LSD Tool, the DIP switch settings on the device are overridden. The device has to be reset to factory settings to re-enable the DIP switch configuration of the device.

The Transceiver Settings section shows the transceiver equipment of the device. For transceiver type which allow a configuration change (like bit rate configuration for RS485 or backbone mode for TP/XF-1250 transceivers), the buttons on the left side of the transceiver label open a dialog which allow to change the configuration. The device has to be reset to apply the changes to the device.

The System Health panel shows the current device temperature and the supply voltage of the device.

## L-IP Setup / L-IP Rev B Setup

This sheet displays the current configuration of the selected L-IP device and allows to change the configuration over the network. When the configuration is changed using the LSD Tool, the DIP switch settings on the device are overwritten. The device has to be reset to factory settings to re-enable the DIP switch configuration of the device.

The L-IP configuration is split up in a sheet for the IP and time configuration and a sheet for the system configuration.

The following IP settings can be changed:

- IP Address: IP address of the device.
- IP Netmask: netmask of the device
- IP Gateway: IP address of the standard gateway
- Hostname: hostname of the device
- DNS Server 1: primary DNS server
- DNS Server 2: secondary DNS server
- DNS Server 3: third DNS server
- NAT Address: public address of the firewall if the L-IP resides behind a NAT firewall.

The changed configuration can be written to the device by pressing the “Write” button. The device needs to be reset to use the new settings.

The Ethernet Statistics list shows different statistic values which are collected by the Ethernet port of the L-IP device. The displayed values are:

- Rx total packets: total number of received Ethernet packets
- Tx total packets: total number of transmitted Ethernet packets
- Rx total bytes: total number of received bytes
- Tx total bytes: total number of transmitted bytes
- Rx TCP bytes: total number of received bytes in TCP service
- Tx TCP bytes: total number or transmitted bytes in TCP service
- Rx UDP bytes: total number of received bytes in UDP service
- Tx UDP bytes: total number of transmitted bytes in UDP service

In the System Configuration sheet, the following items are shown:

The “Config” radio buttons show whether the current configuration uses the DIP switch settings or are externally configured (this is, via the network, via the console menu of the device or via the web server).

The Device Date/Time shows the current configuration of the real time clock and allows to change the clock settings. The “Set to current Time” button reads the current system time, the “Write” button writes this setting to the device. Mind that setting the system time is only possible if the device does not use a SNTP server to synchronize it’s internal time.

The Transceiver Settings section shows the transceiver equipment of the device. For transceiver types which allow a configuration change (like bit rate configuration for RS485 or backbone mode for TP/XF-1250 transceivers), the buttons on the left side of the transceiver label open a dialog which allow to change the configuration. The device has to be reset to apply the changes to the device.

The device configuration section allows to change the router mode (Router/Switch) which is used by the L-IP device. If the switch mode is enabled, also the Group learning, Subnet/Node learning mode, and Unknown Domain Blocking configuration can be changed (see L-Switch Setup for further details on this options). Also the web server can be enabled or disabled.

The changes are written to the device when the “Write” button is clicked.

The System Health panel shows the current device temperature and the supply voltage of the device.

## L-Switch Statistics

The L-Switch Statistic tab is divided into two different sub-pages.

### **Statistics 1**

The Port Statistics list shows detailed statistical information in a per port manner on different characteristic channel values. All average values use a 2 second interval to calculate the average value. The Peak values report the peak value since the last reset or since the last time the table values have been cleared.

- Peak traffic packets: Peak value of packets on the channel measured in packets per second.
- Peak traffic bits: Peak value of bits on the channel measured in bits per second.
- Average traffic packets: Average value of packets on the channel in packets per second.
- Average traffic bits: Average value of bits on the channel measured in bits per second.
- Average bandwidth utilization: Average bandwidth utilization of the channel. The L-Switch calculates this value depending on different channel types and channel parameters.
- Peak collisions: Peak collisions on the channel per second.
- Average collisions: Average collisions on the channel per second.
- Peak CRC errors: Peak CRC errors per second on the channel.
- Average CRC errors: Average CRC errors per second on the channel.

- Peak missed preambles: Peak number of missed preambles per second on the channel.
- Average missed preambles: Average number of missed preambles per second on the channel.
- Peak alternate path packets: Peak number of alternate path packets per second on the channel. A packet with the alternate path bit set (alternate path packet) is sent in the last two retries of an acknowledged, unacknowledged repeated, or request/response message. This can be used as an indication for communication problems with single nodes or faulty bindings or addresses on the channel.
- Average alternate path packets: Average number of alternate path packets per second on the channel.

The Forwarded Packet Statistics list shows the number of packets which were forwarded from a specific source port to a specific destination port. The source port is defined in the rows of the table and the columns show the destination ports. For example, the field in the 3<sup>rd</sup> row (Port 3) and the 2<sup>nd</sup> column (Port 2) shows how many packets have been forwarded from port 3 to port 2 in the L-Switch. These numbers can be used to estimate how well the network is segmented in regards of network traffic.

The collected data is used to calculate two parameters which describe the segmentation state of the network:

- Network Segmentation Ratio: This is the ratio between the number of packets which were not forwarded to a port (this is, which were kept local because the destination node of the packet was on the same port like the source node) and the total number of processed packets. A ratio of 100% would mean that all packets were kept local, where as a ratio of 0% means that all packets were forwarded.
- Port Forwarding Factor: This is an average value to how many ports a received packet was forwarded. It can be taken as a measurement how efficient the device has learned the network topology. The factor has always a value between 0 and the (number of ports - 1).

## Statistics 2

This page displays statistic information of all ports on the node.

The displayed data is:

- Transmission Errors: The number of CRC errors detected during packet reception.
- Transmit TX Failures: The number of times an outgoing transaction failed because the node did not receive acknowledgments or responses in time.
- Receive TX Full: Number of times a packet could not be received because there was no free entry in the incoming transaction database.
- Lost Messages: The Number of packets that could not be received because there was not application buffer available. Since the Orion Stack uses the network buffer up to the application, this value should always be 0.



- Missed Messages: Number of packets that could not be received because there was no incoming buffer available.
- Layer 2 Received: Number of packets, which were received by the Orion Stack on OSI Layer 2.
- Layer 3 Received: Number of packets, which were received by the Orion Stack on OSI Layer 3. In the L-Switch all packets are received and therefore the Layer 2 and Layer 3 receive counters always show the same values.
- Layer 3 Transmitted: Number packets sent by this device.
- Transmit TX Retries: The number of retries sent by this node (not including repeats in unacknowledged repeated service).
- Backlog Overflows: Number of times an overflow of the backlog counter was detected.
- Late Acknowledgments: Number of communication errors because the remote node sent the acknowledgment too late.
- Collisions: Number of detected packet collisions on the network.
- Auth Failures: Number of times an authentication was executed and failed.
- Auth Attempts: Number of times an authentication was executed.
- Missed Preambles: Number of missed preamble messages, which were detected on the network segment connected to this port. A missed preamble message is detected if the signal on the network looks like a preamble but no valid packets can be detected after the preamble. High missed preamble values can be caused by noise on the network, bad cabling, or faulty termination.

## L-Switch Info

This sheet collects different information on the selected L-Switch Device:

- Serial Number: serial number of the device
- Firmware Information: firmware version string
- Image Type: type of firmware image currently used (primary/fallback)
- Orion Stack Version: version number of the used Orion Stack
- Temperature: current temperature inside of the device
- Connected to port: current port of the device via which the LSD Tool communicates with the device
- Supply Voltage: current supply voltage of the device
- Device Uptime: time since the last reboot of the device
- Node Id Port x: Node Ids of the different ports of the device

## L-Switch Configuration

The L-Switch Configuration sheet shows how the L-Switch is currently configured and also allows changing the L-Switch configuration remotely. The L-Switch configuration tab sheet consists of the panels:

- L-Switch Configuration Panel

- Transceiver Settings Panel
- Enable/Disable Ports Panel
- Learned Domains Panel

### ***L-Switch Configuration Panel***

The configuration panel shows the current configuration of the L-Switch DIP switch settings. It also allows changing the setting for the DIP Switches. The radio buttons below the DIP switch settings area shows, whether the configuration was adjusted via the DIP switches on the L-Switch device or via the network.

The following DIP switch settings can be adjusted:

- Group Learning Off/On
- Subnet/Node Learning Off/On
- Backbone Mode Off/On
- Adjust Backbone ID

To enable the new settings after changes, press the “Write” button to download the settings to the L-Switch device and reset the device.

In addition, it is possible to disable the subnet flooding functionality. If the checkbox “Subnet Broadcast Flooding” is disabled, the L-Switch assumes that subnets are not crossing multiple ports and thus does not forward subnet wide broadcast messages to all ports but it searches for the port on which the destination subnet is located and forwards the subnet broadcast message only to this port.

### ***Transceiver Settings Panel***

The transceiver settings panel displays the transceiver configuration for the L-Switch ports.

### ***Enable/Disable Ports Panel***

The enable/disable ports panel allows managing the different ports of the L-Switch. Disabling the checkbox of a port and pressing the Set button of the panel disables forwarding from or to the selected port. This feature can be used to isolate single network segments from the rest of the network.

### ***Configure Management Port***

This function allows to configure single ports of a L-Switch to forward all packets to a management port. It can be used to monitor the packets on a channel with a protocol analyser like LOYTEC’s LPA Protocol Analyzer. Selecting the “Enable Management” checkbox enables the management mode. The “Management Port” field selects the port, to which all messages of the selected channels should be forwarded. Per default, the management port is set to the port which is connected to the LSD Tool. Finally, the “Source Port” checkboxes allow to select, which Port(s) should forward the packets to the management port. The management mode has no influence on the learning algorithm of the L-Switch. This means, that even if the management mode is selected and all packets of the selected ports are forwarded to the management port, the L-Switch still learns the subnet/node addresses and group addressed in the background and filters the packets if the management mode is disabled.

NOTE: To monitor the packets on a remote channel, the all channels between the monitored channel and the analyser tool have to be configured to operate in the management mode and thus forward all packets.

## L-Switch Domain Table

The L-Switch domain panel shows the domain values, which currently have been learned by the L-Switch. The list shows the domain table index, domain ID, domain ID length and the protected flag of the entry. If the protected flag is set, the domain table entry cannot be relearned. For unused entries this means, that the entry is never used for learning domains. For used entries this means, that the entry is never deleted by the domain aging mechanism of the L-Switch.

By double-clicking an entry in the domain table, the entries can be edited manually. The write button writes the new entry to the device. Mind, that writing the entry can take quite a long time because besides the router domain table also the router subnet/node table is updated. The L-Switch does NOT have to be reset in order to enable the changes.

## L-Switch Subnet/Node Table

The Subnet/Node table sheet shows the subnet/node forwarding table of the L-Switch. Because downloading the table takes quite a long time, the table is only read from the L-Switch by pressing the “Read Table” button.

The display selection drop down box is used to select the router domain table entry for which the subnet/node table is displayed. The subnet/node table itself shows, to which port(s) a message with the specified subnet/node destination address should be forwarded.

By double clicking on the table, the selected entry can be edited. The Write Table button updates the subnet/node table with the displayed values. The L-Switch does NOT have to be reset to enable the changes.

## Group Tables

The Group Tables tab sheet consists of two tables:

Group Forwarding Table

Group Cleared Table

### ***Group Forwarding Table***

The group forwarding table shows, to which ports a message addressed to a specific group should be forwarded. The rows of the table define the groups in a domain, the columns define the index of the router domain to which the group entries belong.

By double clicking an entry of the group forwarding table, this entry can be edited. Pressing the write button uploads the whole group table to the L-Switch. The L-Switch does NOT have to be reset to enable the changes.

### ***Group Cleared Table***

The group cleared table counts the number of times a single group entry was relearned. Relearning happens whenever a communication problem (an alternate path packet) is detected in a specific group. If the counter of the group cleared table increases quickly, there may be a communication problem with this specific group. Group relearning can also happen if there is a high packet load on the channels or if acknowledged service is used in groups with many group members.

If the group cleared counter increases quickly it is recommended to disable group learning via the DIP switch or the network.

---

## Status Log Frame

The Status Log Frame displays status information of the LSD Tool during operation. An entry in the Status Log Frame always consists of a time stamp and a status message.

- Possible status entries are:
- Errors if the LSD Tool fails to read data from a device
- Alarms if monitored values exceed the alarm limit or if a monitored device can not be reached
- Status messages when a firmware download is started or finished

The node status log can be cleared and saved via the context menu of the Status Log Frame. The status log can be hidden in the view menu.

## Status Bar

The status bar on the bottom of the LSD Tool window displays status information of the LSD Tool:

- **ONNET/OFFNET mode.** The LSD Tool has to be in ONNET mode to communicate with devices on the network
- **Selected Interface:** The currently selected network interface and transceiver type which is used by the LSD Tool
- **Selected Node:** The name in the device tree of the currently selected node

---

# Configuration Dialog

The configuration dialog allows adjusting:

- **Maximum Packet Data Size:** The maximum data size used by the LSD Tool to read or write data on a device. The larger the packet size, the better the performance when reading or writing large tables or updating the firmware of a device. On the other hand, large packets may be dropped by EIA-709 routers, which have the network buffers configured to values so that the large packets do not fit into the buffer.
- **Retries:** This number defines how many retries are sent by the LSD Tool if a device is not responding or when sending messages in unacknowledged repeated service.
- **TxTimer:** This timer value is used for transmitting data in acknowledged service. It defines the time the LSD Tool waits for an acknowledgment message before sending a reminder message.
- **Repeat Timer:** This timer value is used by the LSD Tool for sending unacknowledged repeated messages. It defines the time between 2 succeeding repeats of a message.
- **Interpacket Delay:** This time value is the value the LSD Tool waits between follow-up packet when communicating large amounts of data. Currently this is when downloading a new firmware to a node or when up- or downloading the Switch Subnet/Node Table. The delay is used to avoid channel overload situations when performing the up- or download actions. Smaller delay values will result in faster network communication but also can cause a channel overload.

The “Intranet Optimised” button selects timing values for local network. It uses shorter values which allow faster access to the network in some operations like a network scan.

The “Internet Optimised” button selects timing values for non local IP networks. It uses longer timer value which reflect the higher packet delays which can occur if the packets are transferred via public IP networks.

The “Speed Optimised” button automatically selects values for large packets and thus higher throughput of productive data, which results in a higher speed when reading large tables like the Subnet/Node table or when downloading firmware images.

“LonMark Optimised” settings use a reduced packet data size to follow the suggested maximum packet size of the LonMark Interoperability Guidelines.

The “Column Separator Character” on the Data Export tab is used to separate columns when monitoring data is exported or when the status log is written to a file. When using a “,” character for German or a “;” character for the US version of MS Excel, the columns are automatically recognized when the data files are imported into MS Excel.

---

## Interface Selection Dialog

The Interface Selection Dialog allows to adjust the network interface which is used by the LSD Tool to access the network. The Network Interface Selection dropdown box shows all currently available LOYTEC network interface devices on the system. Choose a interface for which the LSD Tool is registered. Below the interface selection box, the checkbox “Expert Mode” allows to switch between two modes: in “Novice Mode” (Normal Mode), the LSD Tool automatically selects a unused MNI device which runs on the selected physical interface. In “Expert Mode”, the user can select the desired interface.

Beside the network interface, also the transceiver on the interface has to be chosen.

To access the network, the domain and subnet/node address of the network interface has to be configured. To access nodes which are commissioned in the network (like L-IP in router mode and L-Proxy nodes), the interface has to be configured in the same domain like these nodes in order to find the nodes during a network scan. If the configured domain and subnet is not known, it is possible to put the LSD Tool into a “listening mode” by pressing the “Get Domain From Network” button. This makes the LSD Tool listen for service pin messages. Press the service pin a commissioned device on the network (preferably a device which resides on the same network channel like the LSD Tool). The LSD Tool receives the service pin message, reads the domain configuration from the device and enters the configuration into the corresponding fields in the configuration dialog.

Please be careful that the node number to which the LSD Tool is configured in this dialog, is not used by another node on the network.

Pressing the “OK” button in this dialog closes the dialog, configures the interface and puts the LSD Tool into ONNET mode.

---

## Network Scan Dialog

The Network Scan Dialog can be used to scan the network for unknown devices. For each supported device class, a checkbox can be checked if devices of this class should be added if they are found. Currently supported device classes are:

- L-IP
- L-Proxy
- L-Switch
- Fallback Image (Node which have currently booted the fallback image)
- ORION Nodes (Nodes which base on the ORION Stack, e.g. L-Core Nodes or L-Vis nodes)
- Generic EIA-709 nodes

During the scan, the number of currently detected devices is updated in the lower part of the network scan dialog.



---

## Multiplexed Network Interfaces (MNI Devices)

The NIC709-PCI(P), NIC709-USB(P), and NIC852 network interfaces can be used in a 'Multiplexed Network Interface' mode. Each physical network interface is represented by 8 Multiplexed Network Interfaces (MNI devices). This means that you can start up to 8 different applications running on the same physical network interface at a time. These 'virtual interfaces' behave like nodes on a 'virtual channel' connected to the physical channel via the physical network interface. You could e.g. run the LPA software, the LSD tool, a custom ORION application, and an LNS<sup>TM</sup> (VNI) application at the same time using only one NIC709-PCI network interface. The MNI devices for the physical PCI1 device e.g. will appear as NIC\_PCI1\_000, NIC\_PCI1\_001, NIC\_PCI1\_002, etc. in the Network Interface selection dialog.

# Literature

---

## Table of Literature

[1] NIC User Manual for LOYTEC Network Interfaces,  
LOYTEC electronics GmbH

# Revisions

---

## Revision Histroy

Date	Version	Author	Description
11-08-04	2.3	NR	New document layout and structure
04-05-05	3.1	NR	Updated document number for release 3.1
04-04-07	3.3	NR	Updated LOYTEC contact information Updated document number for release 3.3



# Glossary of Terms

## **Multiplexed Network Interfaces (MNI Devices)**

The NIC709-PCI(P), NIC709-USB(P), and NIC852 network interfaces can be used in a 'Multiplexed Network Interface' mode. Each physical network interface is represented by 8 Multiplexed Network Interfaces (MNI devices). This means that you can start up to 8 different applications running on the same physical network interface at a time. These 'virtual interfaces' behave like nodes on a 'virtual channel' connected to the physical channel via the physical network interface. You could e.g. run the LPA software, the LSD tool, a custom ORION application, and an LNSTM (VNI) application at the same time using only one NIC709-PCI network interface. The MNI devices for the physical PCI1 device e.g. will appear as NIC\_PCI1\_000, NIC\_PCI1\_001, NIC\_PCI1\_002, etc. in the Network Interface selection dialog.



# Index

Fehler! Keine Indexeinträge gefunden.