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**LNT 505**

# **Operator's Manual**

Data subject to change without notice

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# 1 Legal notes

## 1.1 Trademarks.

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## 2 Lon Network Tool overview

### 2.1 About the Lon Network Tool version

This is the version 1.1.1 of the LNT 505, Lon Network Tool. Whenever a program version number should be indicated, the operator should specify this version information.

### 2.2 Getting help

The Lon Network Tool has a context-sensitive help utility: For most of the program windows pressing F1 key brings up a help page for that window. The Help utility can also be opened from the "Help" menu item on the program main menu.

### 2.3 Lon Network Tool features

- LonWorks network configuration:
  - LonWorks node installation.
  - Connection creation and maintenance.
- Configuration operations can be performed to a *project* (network of several nodes) or to a single LonWorks node.
- On-line and off-line configuration: Network configuration can be created without a physical network configuration and downloaded to the network later.
- Configuration creation and upload features: A Lon Network Tool configuration can be created by connecting to an existing network and uploading the structure of the network.
- Network diagnostics: Predefined diagnostic queries can be defined and saved/reloaded.
- Network documentation: Several reports each displaying information about the network configuration can be created, stored on a hard disk and printed.
- Internal Network database: Configuration information is stored on a database of the Lon Network Tool.
- Symbolic names for network nodes and connections.
- Data transfer by exporting and importing network configurations or configurations of a single LonWorks node.
- A 'Device type' concept allowing the creation of LonWorks nodes by using a predefined device type as a template.
- Separate communication utility (the Lon NETAgent).
- SNVT support for network variable connection creation and value display.
- LonTalk File Transfer support: Download, Upload, Directory Lookup.
- Easy drag-and-drop -operations for node creation, installation, upload and download.
- Graphical display of nodes with operator-selectable bitmaps.

- Special support for LON/SPA Gateway device (LON/SPA Gateway Configuration Tool, aka LSG CFG Tool).
- Context-sensitive help utility.
- A true Windows-application, developed following the Microsoft Windows Interface Guidelines.

## 2.4 Application

Lon Network Tool is a multi-purpose tool for LonWorks network configuration. All the functions required for setting up and configuring a LonWorks network are easily accessible on a single tool program.

Lon Network Tool provides an efficient way for connecting protective relays using LonWorks network.

## 2.5 General

The Lon Network Tool (LNT 505) is a program for installing and configuring different devices to the Echelon® LONWorks™ network. *Network Configurations*, also called *projects*, can be built using the Lon Network Tool. A network configuration includes several *devices* or *Lon nodes* connected to the same physical network. Each of these devices may have a configuration of its own. The Lon Network Tool also processes these device-dependent configurations for some special devices. The configurations can be created "off-line", without a physical network connection, and it can be transferred to another system that is "on-line", i.e. connected to the network.

The following tasks are the main functions of the Lon Network Tool:

## 2.6 Device type maintaining

Practically all the possible network structures involve at least two kind of different device types. Usually there are devices for collecting data and other devices for processing the collected data. The Lon Network Tool has a flexible device definition mechanism: Addition to the fixed system device types the operator can create new types using several different definition mechanisms. Device type definitions can be transferred from a Lon Network Tool system to another using any media suitable for data transfer (*export* and *import*). Device type data, like any data processed by the Lon Network Tool, could even be transferred by printing it and typing the information to the *Network Database* of the other Lon Network Tool system. However, this method is not recommended!

## 2.7 Network configuration (project) creation

Based on the device types created earlier a network configuration can be created by selecting the desired devices and specifying their LONWorks -specific parameters. Different connections can be created between the devices and/or the network objects within the devices.

When the configuration is created it will be saved to the network database, a storage system used by the Lon Network Tool. The configuration can anytime be reloaded

from the database and modified. An extension to this save/reload concept is the possibility to export and import the configuration information, as can be done with the device type information.

## 2.8 Network operations

A network configuration can be *downloaded* to the physical network to carry out its tasks. During the network operation the Lon Network Tool can be used to monitor the status of the devices on the network. The Lon Network Tool can also be connected to an unknown network and the structure of that network can be *uploaded* to the Lon Network Tool.

For most of the Lon Network Tool functions there exist several methods to perform the function. For example, if the operator wishes to change the Domain id of a node he has two alternative methods: If the node exists on a Lon Network Tool project, he can select the node for edit and modify the domain id. The change will be saved to the network database and it will take effect when the node is next time installed. The alternative method is to use a direct modification: The operator specifies the subnet/node address of the node and gets a dialog window displaying the current contents of the domain table. Now the operator can modify the entries and by pressing the OK button, the changes are immediately written to the node. No network database is used or modified. This allows the modification of an "arbitrary" node, without the need to create device types and device instances for the target node.

The third method available combines the methods described above. If the operator loads a network configuration and selects so-called on-line mode, the changes will be written to the network database and to the network node.



## 3 Using the Lon Network Tool

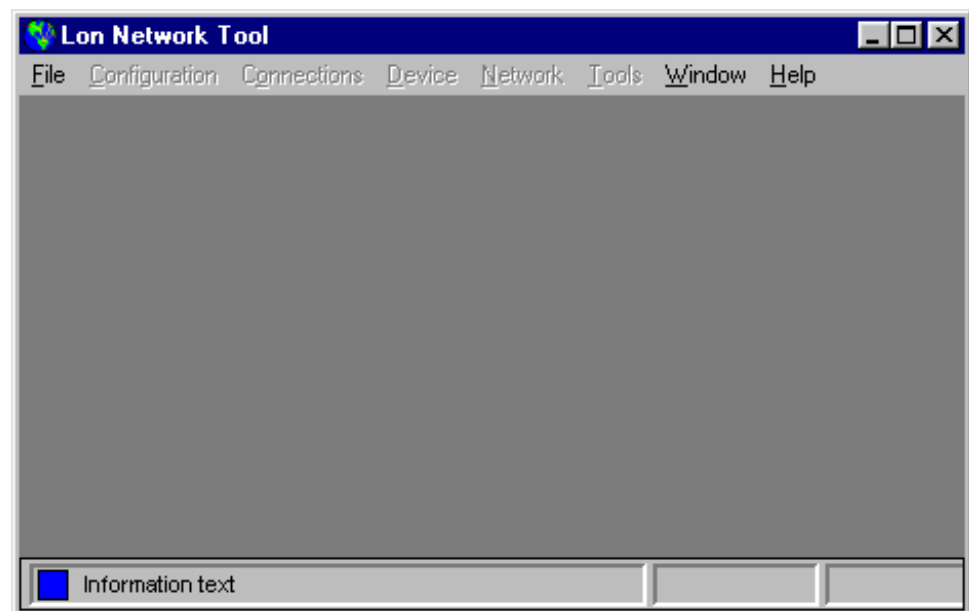
### 3.1 Start-up

The Lon Network Tool can be recognised from the following icon on the Shell Folder created by the LNT 505 installation program:



*Figure 1. Lon Network Tool icon*

The program can be started from this icon as any Windows program.



*Figure 2. Program Main window*

After the program has finished its initialisation operations it will display the program main window, as above. Since no network configuration is loaded, the program window is quite featureless. Figure 3 illustrates a more "active" program main window. Each of the windows displayed are described below.

From the top to the bottom the following items can be found on the main window:

#### **Caption**

The standard Windows program window caption, as illustrated in Figure 3, with text "Lon Network Tool"

## Menu

The program main menu containing the submenus. In addition to the standard File, Window and Help items there are several items for the Lon Network Tool functions as listed in Table 1:

Menu Item	Purpose
File	Contains functions for selecting and creating projects.
Configuration	Contains functions for processing the configurations on the Network Database.
Connections	Through this menu the operator can create/remove connections between the network objects.
Device	Contains functions for modifying individual devices and the device types.
Network	Here are listed the functions for physical network operations.
Tools	Miscellaneous reporting and debugging utilities.
Window	Contains functions for window management, as on any Windows application.
Help	Functions for browsing the Lon Network Tool help files.

Table 1. Lon Network Tool main menu items

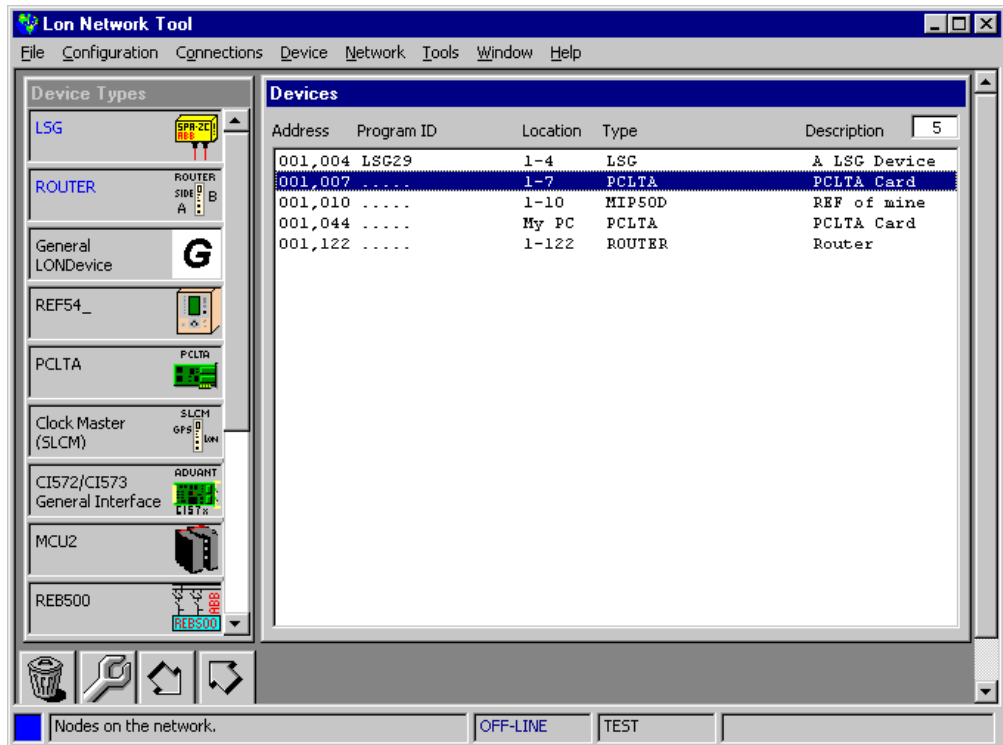


Figure 3. Active program main window

## Client area

The main window area displays different subwindows. As Figure 3 illustrates, the following subwindows are shown:

Sub Window / Icon	Purpose
Device Type Toolbox	A text/picture list of the available device types. For each type the type name and bitmap, if specified, are shown. This window serves as a "drag source" for drag-and-drop operations. Either the text label or the bitmap can be dragged. The possible drag targets are listed on the following two items.
Devices	The window displaying a list of the devices on the currently loaded network configuration. Each device is shown on a single row. The subnet/node address of the network management node can be seen as by keeping the mouse pointer over the "Address" field for a short time.
Remove Icon	An icon to be used as a drag source when removing (deleting) a device type or a device instance. Fixed device types (with blue names) can not be removed.
Install Icon	An icon to be used as a drag source when installing a device instance to the Lon network.
Download Icon	An icon to be used as a drag source for downloading the configuration of a single device.
Upload Icon	An icon to be used as a drag source for uploading the configuration of a single device.

*Table 2. Client area subwindows / icons*

## Status and Message area

Below the main menu exists five panels, the first being a square-shaped and the others filling the rest of the width of the window.

Panel	Purpose
Operation Target	The first panel displays a colour background when the program is executing a time-consuming function. The colour is <b>red</b> when the program is executing a network operation (usually more time-consuming) or <b>green</b> when internal database operations or initializations are executed. A <b>blue</b> colour indicates that the field next from the operation target panel displays information about the current program item pointed by mouse cursor.
Operation	The field next to the coloured square displays a textual information about the current operation. When processing large tables (such as Nv Configuration table) the currently used table index is displayed here. If the size of the table is known a display with format "1/25", for example, is used, indicating that the first entry of the 25 existing entries is processed.
Mode	The second panel displays the working mode of the program. On Figure 3 the blue text " <b>OFF-LINE</b> " specifies that the operator is working with the network database. Another alternative is a red " <b>ON-LINE</b> ", which indicates that a connection to the physical network has been created.
Project Name	The third panel displays the name of the currently loaded network configuration, which is "TESTNET" in Figure 3.
Project Description	The last panel displays the project description given by the operator when saving the project. Above the text "A Test Network" has been given.

Table 3. Status and message area panels

### Note

All these items are discussed in more detail later on this manual.

## 3.2

### Managing networks

When starting to use the Lon Network Tool the operator must select the network to work with. When the program is first started it creates the default network DEFPROJ. When experimenting the Lon Network Tool features this project can be used as a starting point. Other networks can be created by the operator as required.

The selection of the network is done through the menu selection **File|Open**. When the operator executes this selection the dialog in Figure 4 is displayed. Each of the networks existing on the Network Database have two identification attributes: Name and Description. The name is a 1-8 characters long symbol, which will be used when creating the directory structure for the network. The description can be up to 255 characters long and it is intended to give the reader more information about the contents of the network. In addition to this a 'Perform fast open' check box is shown. If the project is opened in "fast mode" the project is opened with all devices of the project but no device or nv connection related data is loaded in the run-time database. This information is loaded to the database on "on demand" basis whenever a device or connection is edited.



**Note**

The project can be opened in “fast mode” in order to speed up the opening of the project

When the dialog in Figure 4 is displayed the operator can select one of the existing networks and press the OK button. All the operations are now targeted to the newly selected network. Another menu selection, **File | New** allows the operator to create a new project.

The window used for project creation is quite similar to the window shown in Figure 4. It has some additional controls to allow the operator to specify name and description for the new project. The projects already on the database are also listed on that window to remind the operator of the existing projects.

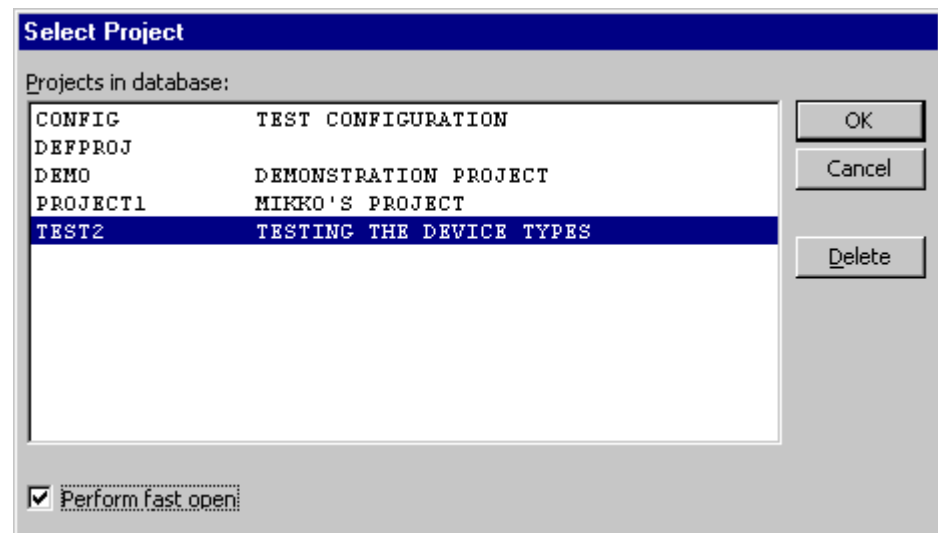


Figure 4. Opening a project

**3.3****Creating a configuration**

When the target network has been selected the operator can create a configuration for that network with the **File|New** command mentioned above. Or, if a configuration has already been created, it will be loaded to the program with **File|Open** menu selection. In either case the Lon Network Tool loads couple of windows required for the network creation operation. The following windows are involved:

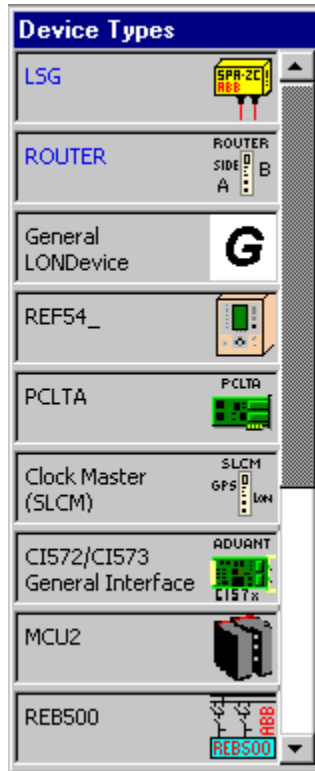


Figure 5. Device Types window

The Device Types window displays the different device types currently known by the Lon Network Tool. This window also serves as a toolbox: A device type can be picked up from the Device Types window and moved to the Devices window using standard Windows drag-and-drop procedure. New devices can be added to the network using this method. Naturally, also an alternative method for this operation exists, through the **Device** menu.

If the number of device types is greater than eight the Device Types window displays a scroll bar to allow the operator to browse the contents of the window.

When the Lon Network Tool is first started only the system device types, LSG and Router are displayed on the Device Types window. The chapter "Managing device types" below describes how to create new device types and how the existing types can be modified.

Devices				
Address	Program ID	Location	Type	Description
001,004	LSG29	1-4	LSG	A LSG Device
001,007	.....	1-7	PCLTA	PCLTA Card
001,010	.....	1-10	MIP50D	REF of mine
001,044	.....	My PC	PCLTA	PCLTA Card
001,122	.....	1-122	ROUTER	Router

Figure 6. Devices window

The Devices window displays the existing devices which currently belong to the network configuration. In Figure 6, the Devices window contains couple of devices. The exact format of the Devices window will be discussed below.

The operation of adding devices to a project is called *creating device instances*. As mentioned above, there exists a drag-and-drop -method for this function. The other way to perform this operation is to use the **Devices | Add** menu selection. The window shown in Figure 7 is used to specify the data for the new device:

Add Node	
Type:	REF54_ <input type="button" value="OK"/>
Node	<input type="button" value="Cancel"/>
Subnet:	1 <input type="button" value="Node: 8"/>
Location:	Office
Description:	A REF Device
	<input type="button" value="Interface..."/>
Neuron chip	<input type="button" value="Structures"/>
Neuron ID:	<input type="text"/>

Figure 7. Adding new device

The drop-down list labelled with "Type" lists all the available device types. The subnet/node address and the location string are specified here. "Description" is an information string the Lon Network Tool will display with the node identification data

on many situations. It is intended to be used to describe the device with more detail than the 6 character long location string allows.

When editing a device, which has been installed to the physical network the Neuron id will be shown on this window.

The button "Structures" allows the operator to specify information for the Neuron Chip data structures. The dialog window used for these settings is introduced later with the device installation procedure. The operator can review and modify these settings also during the installation process.

The button "Interface" will display a device type specific dialog for entering additional information about the device to be created. In Figure 8 is shown the window for a LON/SPA Gateway device. The structure of the device can be specified directly, or the desired device configuration can be imported with the "Import" button. The "LSG CFG Tool" button, disabled during the device add operation but enabled when the operator returns to edit this device using menu selection Device | Edit, can be used to start The LON/SPA Gateway Configuration Tool to edit the configuration of the device. When the operator presses the button, the LSG CFG Tool is started and the configuration of the edited device is loaded. The configuration can be changed using the standard LSG CFG Tool functions, and after the modified configuration has been saved and the LSG CFG Tool closed the edited configuration is loaded back to the Lon Network Tool. The address table and nv configuration table editing, however, is not allowed when the LSG CFG Tool is started from the Lon Network Tool, since these tables are maintained by the Lon Network Tool and changes to them would cause invalid configuration data to be generated.

The screenshot shows the "LSG Interface" dialog box. It features a title bar and several input fields and buttons. The "NV Count" field is a spin box with the value 52. The "Address table entries" field is a spin box with the value 4. The "LSG objects" section contains three spin boxes: "AI count" (16), "DI count" (16), and "DO count" (16). The "Version" section has three radio buttons: "2.x", "3.0" (selected), and "3.1 or above". The "Standard NV selectors" section has three text boxes: "nv\_warning" (2FFE), "nv\_clock" (2FFF), and "nv\_gw\_status" (7FCD). At the bottom, there are two buttons: "Import" and "LSG CFG Tool".

Figure 8. LSG additional data window

The current version of the Lon Network Tool allows the operator to specify the values for the last three Nv Configuration table entries of a LSG device. These network variables are the Clock warning message, the Clock message and LSG Gateway status. New versions of the Lon Network Tool also support version 3 of the Lon/SPA Gateway. The version of the LSG to be used should be specified with the option buttons on the "Version" group of the dialog.

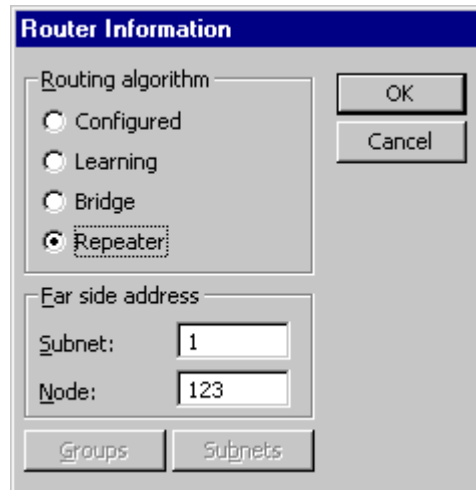


Figure 9. Router additional data window

Figure 9 displays the corresponding dialog for a Router device. When adding a router device the configuration PC is assumed to be connected to "this" side of the router, and the other devices are usually connected to the "far" side of the router. The routing algorithm "Configured" requires the specification of the routing tables. The default value is to not route any messages, i.e. all table entries are zero. In Figure 10 is shown the dialog used both for group tables and subnet tables, with the suitable titles for each of them. A check on a box indicates that the group/subnet should be forwarded.

For defining additional data to the operator-defined device types, the device type creation window, shown later in Figure 16, will be used. For those devices the operator can also select a different bitmap. The default device types have fixed bitmaps and they can not be changed. The Lon Network Tool creates a directory named BITMAPS under the working directory, where it stores the operator-defined bitmaps.

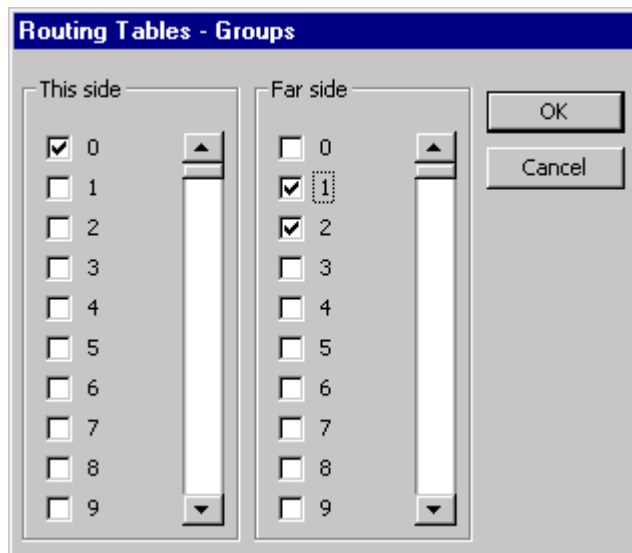


Figure 10. Router table edit window

When an instance of a device type is created the operator can modify the network variable structure of the instance. For example, the device type may only contain certain "system" network variables, which are known to be present of any device created from that type (this fact may also be used as a guideline when creating the device types). Depending on the purpose of the device instance the operator may add more network variables. He can also remove some of the system nv:s, or do both. These operations can be done through the "Additional data" button of the "Edit device" window.

The decision between creating a new device type and modifying an existing type can be made by the operator: If the operator wishes, he can create a separate device type for each of the nodes to be added to the project. This may, however, lead to problems with device types: Numerous device types are harder to manage. The experience of managing device types after using the Lon Network Tool for some time should be used as a guideline when deciding about the creation of a new device type.

As mentioned earlier, the Devices window will display information about the devices added to the network configuration. In Figure 11 (and also in Figure 6) is shown a Device window for a configuration with five devices: A LON/SPA Gateway, a Router and three other devices with operator-defined device types. The data displayed, from left to right, is:

### Subnet/Node address

A three-digit - comma - three-digit format has been adopted for the Lon Network Tool, mainly because filling the empty number positions with zeros makes it more readable when using a proportional display font. The subnet is displayed first, since it is assumed that the nodes will be grouped using the subnet value, which will cause the nodes of a group being displayed together.

### Program ID

A Neuron Chip program id is displayed next. When creating a new network this data is not known, and a row of dots is displayed instead.

### Location string

The next field is the location string the operator has specified when adding the device.

### Device type

The type of the device is displayed after the location string.

### Description

The description string given by the operator is displayed at the end of the window. Longer descriptions may not fit to the window, but enlarging the window will allow more of the description string to be seen.

Address	Program ID	Location	Type	Description
001,004	LSG29	1-4	LSG	A LSG Device
001,007	.....	1-7	PCLTA	PCLTA Card
001,010	.....	1-10	MIP50D	REF of mine
001,044	.....	My PC	PCLTA	PCLTA Card
001,122	.....	1-122	ROUTER	Router

Figure 11. Devices on the network configuration

Devices being added to the network configuration can be edited by selecting the device (as the REF device 001,010 in Figure 11) and using the menu selection **Device | Edit**. On the Device menu there also exists functions for removing a device (**Device | Delete**) and removing the configuration of the device (**Device | Unconfigure**).

## 3.4

### Configuring devices

The Lon Network Tool currently does not generally support changing the internal structure (for example, the number of the network variables or the node application-specific features) of a device existing on the network configuration. It is assumed that the structure of the devices is pre-defined and the information about this structure is brought to the Lon Network Tool. This is done during the device instance creation, by importing the configuration of the device, using one of the configuration importing methods described above.

An exception is the LON/SPA Gateway device. The LSG CFG Tool configuration program can be launched from the Lon Network Tool, allowing the configuration to be modified. Figure 8 shows the LSG additional data window which contains a push button for starting the LSG CFG Tool.

Detailed information on how to modify the configuration is provided starting from page 34.

### 3.5

## Creating connections

The program functions for connection creation can be found from the "Connections" menu. Two menu selections exist for connection creation, "Network variable connections" (or "NV Connections") and "LSG Event connections". The third menu selection, "View by Device" allows the operator to examine the existing connections by a selected device.

The screenshot shows the "NV Connections" dialog box. At the top, there is a "Name" field containing "A test connection" and "Rename" and "Close" buttons. Below this is a checked checkbox labeled "Hide unused network variables". The dialog is divided into two main sections: "Output selection" and "Input selection". Each section contains a table with columns for "Address", "Location", "Index", "Network variable", and "SNWT type". In the "Output selection" table, the values are "001,045", "1-45", "0021", "COMM\_OUT6", and "83". In the "Input selection" table, the values are "001,010", "1-10", and an empty field for "Index". To the right of these tables are "Add" buttons. Below the "Input selection" table is a "Selected network variables" table with columns "Direction", "Address", "Location", "Index", and "Name". It contains one row: "OUT", "001,045", "1-45", "0020", "COMM\_OUT5". At the bottom of the dialog, there is a "SNWT" field with the value "83 - SNWT\_state" and a "Delete" button. On the right side of the dialog, there are buttons for "New", "Done", "Remove", and "Delete All".

Figure 12. Creating a nv connection

In Figure 12 is shown the dialog for object connection creation. The button "New" is used to create new connections. The program prompts the operator for name to the new connection, and displays the given name on the combo box labelled "Name". Now the "Output selection" combo boxes can be used to select the output device and the output object within the selected device. Pressing "Add" moves the selection to the "Selected Nvs:" list box. In Figure 12 the object with nv index 0 from the device 002,001 is selected as the output.

The input selection works similar to the output selection. One or more inputs can be selected. Network variables can be removed by selecting a row of the list and pressing "Delete".

#### Note

The operator should note, that if the selected output or input is not added to the list with the "Add" button it is not included to the connection.



The button "Delete All" allows all the existing nv connections being removed with just one command. A double confirmation question is asked before actually removing all the connections.

The button "Additional Information" allows the operator to change the default values of the connection parameter. In Figure 13 is the same window after the operator has clicked the "Additional Information" button. Two combo boxes and three check boxes are displayed, allowing the operator to change the default values. This additional information remains visible to the user until "Hide Additional Information" button is pressed. The "Timer Values" button invokes a special dialog window which allows more advanced operators to define the address timer values for the connections. A set of general-purpose values is used by default. Appendix 2 provides information on these default values and how they can be changed.

Figure 13. Additional information of a nv connection

The Lon Network Tool maintains information about the selectors. If the operator tries to specify a selector which is already in use, the program will not accept the selector.

On some devices some network variables may have been marked as "unused". Such nv:s can be hidden by setting the "Hide unused network variables" check box on. All nv:s which have the word "unused" (case-insensitive) included on their name will not be displayed.

The connection will be added to the configuration when the "Save" button is pressed. When multiple connections exist, the operator can view them by opening the "Name" combo box and selecting the desired name.

When processing devices with large number of network variables (over 100), an additional control appears on the output and input selections: A combo box. It can be used to browse the network variables, a page of 100 nv:s can be shown at the time.

The control displays the index of the page to be displayed. This allows the operator to select any nv on the device and still keeps the size of the scroll list reasonable.

For LSG Event connections there exists another connection creation window. Figure 14 shows this window.

The "Senders" list box allows the operator to select one or more devices to be set send events. "Target 1" and "Target 2" lists are used to select the corresponding targets, one or more devices. The selections are not valid before the selected device is transferred to the list by pressing the corresponding "Add" button. In Figure 14 the operator have pressed the "Add" button of the group Target 1 and Target 2 in order to select 001,010 and 001,007 as target devices.

Figure 14. Creating LSG Event connection

### 3.6

#### Managing device types

In addition to the predefined fixed device types, LSG and Router, the Lon Network Tool can also process operator-defined device types. The list of the currently available device types can be obtained by using the menu selection **Devices | Types**. The window shown in Figure 15 will appear:

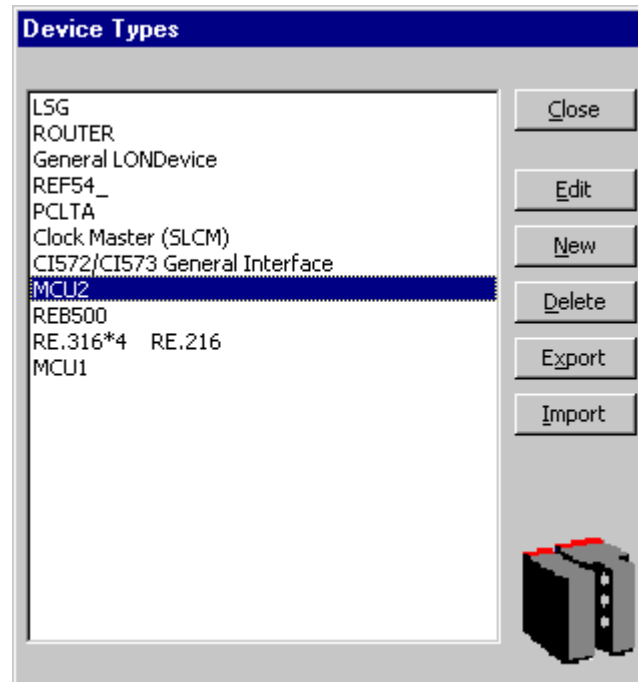


Figure 15. Listing the device types

When a device type is selected from the list its bitmap, if one defined, will be displayed on right, as in Figure 15. The "Export" and "Import" buttons execute the corresponding operations. The selected device types will be exported when pressing the "Export" button. The "Export" operation will produce a single file (with the filename specified by the operator) which will contain all the exported types. The "Import" function will read these files.

The "Edit" button allows the operator to modify the operator-defined device types. For fixed types their structure can be viewed but it can not be modified.

The editing of the device types, as well as the creation of the new device types, is done using the window shown in Figure 16. The button "New" on the device type list window brings up this window. The same window is used when creating an instance of a device type, but only some the settings shown here can be re-specified for a device instance.

This dialog includes controls for importing a device type definition of several formats. The "Copy" button allows another, already known device type, to be used as a template. The button "Import" reads the information from a file. The following file formats are supported:

File Extension	Purpose
*.CFG	Configuration or device type definition exported from the Lon Network Tool
*.SID	Node SI/SD information read from a network node to the file, by the Network Tool (using menu selection <b>Tools   Devices   SI/SD</b> ).
*.XIF	External interface file. The support for this file type has not been fully tested.

Table 4. Supported file formats by file extension

The "Read SI/SD" -button allows the operator to directly read the Self-Identification/Self-Documentation information of a network device. The result of this method is equal to the process which first involves reading the SI/SD -information to a .SID file and then importing the .SID file, as described above.

The option "Extended Address" allows the operator to specify if (and how) the device type supports extended address table processing. Unless stated otherwise by the device manufacturer the device type should be assumed to have "No" value, i.e. it does not support extended address table. Some special devices may support the "Yes" or "Only" options. Appendix 1 provides additional information on the subject.

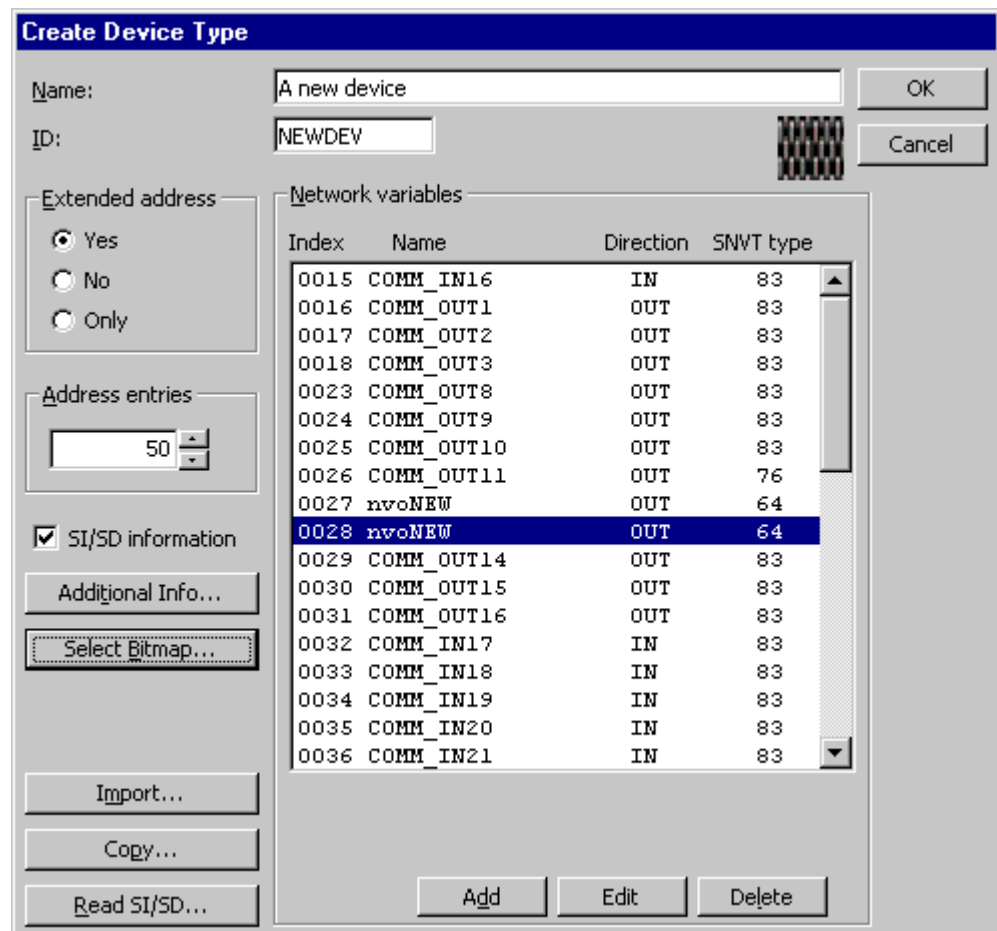


Figure 16. Creating a new device type

As mentioned above, the bitmap for the device type can be selected by the operator. The button "Select Bitmap" brings up a file dialog allowing the operator to select a

suitable bitmap file. If the selected bitmap does not yet exist on the BITMAPS directory under the LNT 505 installation directory, the bitmap is copied to that directory.

New objects can be added using the button "Add" (on the "NV structure" group), which brings up the dialog shown on .

This dialog is used to specify the attributes for an object. A special feature, Number of copies, allows the creation of a set of objects. By setting 1-3 "#" -marks to the name of the object and specifying a value larger than 1 to the Make Copies -field a set of objects can be created with the "#" -marks replaced by a copy count. For example, the settings used in will produce objects OBJ00000, OBJ00001, OBJ00002 and OBJ00003. When using "Number of copies" the "NV Index" field specifies the index of the first object. The following objects are assigned to consecutive nv indexes.

On the device type creation window (Figure 16) previously added objects can be removed by selecting the object to remove and pressing "Delete". Object definitions can also be edited: Selecting the object and pressing "Edit" will bring up the window shown in , allowing the values to be changed.

The Check control "SI/SD Information" provides no information to the program. The purpose of the control is to allow the operator to set this information for further reference.

If the SNVT type of the object(s) to be created is known, it can be selected from a separate list by pressing the button labelled with "..." on the "SNVT type" line.

Figure 17. Adding objects

Figure 18. Device type additional information

The control button "Additional Info" allows the operator to specify default address services for the device type. Two different values are specified: Default service for connecting a device object to a single object on another node, and for connecting an object to several object(s) on several other nodes.

Figure 18 shows the dialog window for this purpose:

The field "Number of message tags" allows the operator to specify the number of message tags declared on the device of this type. The Lon Network Tool honours this specification and does not use the address table entries reserved for the message tags. If the device type has been created from SI/SD information this value is automatically set.

If the device supports NV Poll only for certain area of network variable indexes those limits can be specified here. The "LSG events" defines the device's capability to send LSG events.

## 3.7

### Transferring configuration to the Network

When the network configuration has been created it should be transferred to the network. This is divided to two phases: Installing the devices to the network and downloading their configuration. The "Install" here means logical LonWorks installation, i.e. assigning an unique subnet/node address to the device. The physical installation of the device ("connecting the wires") should have been made earlier.

Since these operations require network activity, a working Lon NETAgent connection is required.

#### 3.7.1

### Installing nodes

The devices on the configuration currently loaded to the Lon Network Tool can be installed anytime during the Lon Network Tool session. The install process is started by using the menu selection **Configuration | Install Nodes**.

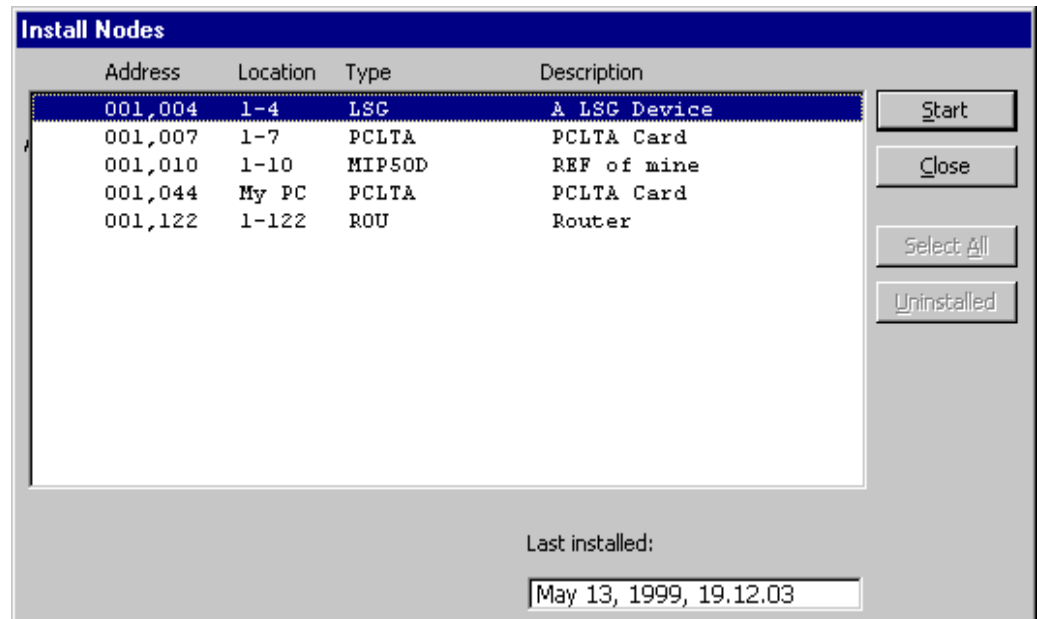


Figure 19. Installation selection window

This selection brings up the installation selection window shown above. The devices to be installed should be selected, like the LSG device 001,001 in Figure 19. Pressing "Start" starts the installation. For each of the devices selected, the installation will be confirmed by the program, i.e. the installation process is paused between the devices. This was designed to allow the operator for example to install multiple devices by connecting the devices one at the time to the network and installing the connected device.

The hash mark (#) at the beginning of the line indicates that the device has been installed with the Lon Network Tool. If it has not, no such mark appears at the beginning of the line. The "Last installed" field shows the date and time of the last installation of the first of the selected devices. If the device has not been installed earlier no data is shown. The button "Select Uninstalled" can be used for quickly determining the uninstalled devices. When the button "Select all" is pressed all the devices will be selected. At the same time the button caption is changed to "Unselect all" and a new button click will cause all the device to become unselected.

The default method for installation is the Service Pin message. However, if the Neuron Id of the device is known (given by the operator, or the device configuration has been uploaded from the same device), the Lon Network Tool asks the operator which installation method should be used: Service Pin message or the given Neuron ID.

As mentioned above, the operator can change the device Neuron Chip configuration structure settings and Neuron buffer settings during the installation operation. When the operator selects "Start" from the window shown in Figure 19, the following window appears:

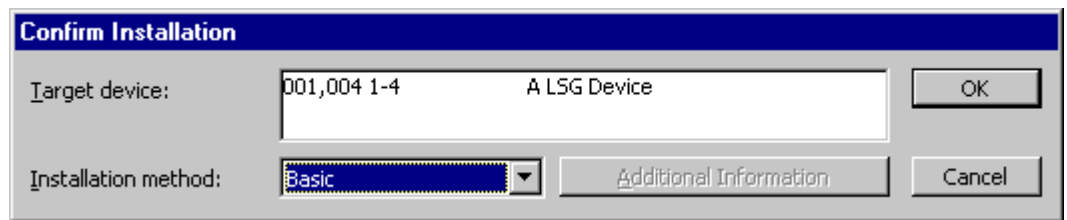


Figure 20. Confirm Installation window

Here the operator can select between two different installation methods: *Basic installation* and *Detailed Installation*, which will, in addition to updating the Neuron Chip domain table, also set the configuration structure settings as specified on the device structures.. The Detailed installation allows the operator also modify these values before installation: When the operator selects the Detailed installation the button "Additional Information" will be enabled and it can be used to enlarge the view, as shown in Figure 21.

As a sample of the subwindows associated with this view the subwindow for the Bit Rate function is shown.



**Confirm Installation**

Target device: 001,004 1-4 A LSG Device

Installation method: Detailed

channel\_id: 1

comm\_type: 1 Single-ended

comm\_pin\_dir: 0x0E Direct mode - single-ended

Raw transceiver parameters

preamble_length	5	xmit_interpacket	0
packet_cycle	4	recv_interpacket	0
Beta2_control	0		

node\_priority: 0

channel\_priorities: 20

non\_group\_timer: 5: 768 ms

nm\_auth: 0: No

preemption\_timeout: 5: 10 sec

direct\_parameter\_struct

collision_detect:	1: Yes
bit_sync_threshold:	0: 4 bits
filter:	0
hysteresis:	0
cd_to_end_packet:	1
cd_tail:	0: No
cd_preamble:	1: Yes

**Node Bit Rate**

Network values

comm_clock:	0
input_clock:	5
Bit rate:	1.250

Factory settings

comm_clock:	0
input_clock:	5
Bit rate:	1.250

Figure 21. Configuration structure settings

Here the operator can specify the configuration structure settings for the device, if those values have not been given earlier with **Device | Edit** command and the "Structures" -button from the Edit Node window (Figure 8). Currently a separate window, "Node Bit Rate", is used for specifying the bit rate settings. The factory speed setting for the device can be used if the configuration interface supports the changing of the speed of the network management node. For example, if the default configuration bit rate is 1.250 Mb/s and the device to be installed is known to have

625 Kb/s bit rate, the operator can specify the 626 Kb/s bit rate as the factory setting.. Now the Lon Network Tool will first change its own bit rate to 625 Kb/s, then it will install the device to have the bit rate of 1.250 Mb/s, and finally it will restore the configuration bit rate to the 1.250 Kb/s.

If the operator wishes to make no changes to the configuration structure and Neuron Chip buffers, the checkbox "Install without modifying Neuron structures" can be set. The reader should note that the Lon Network Tool can not know the memory structure of the Neuron Chip and it can not check if there is enough memory for the buffer setting specified the operator. Specifying too many of too large buffers may cause the physical device to become inoperable!!! However, a function helping the operator to avoid these situation has been implemented. Described in the menu selection **Network | Single Node | Upload Neuron Structures** later on this manual, page 61.

The Neuron Chip communication buffer sizes and counts can be specified with the dialog shown in Figure 22.

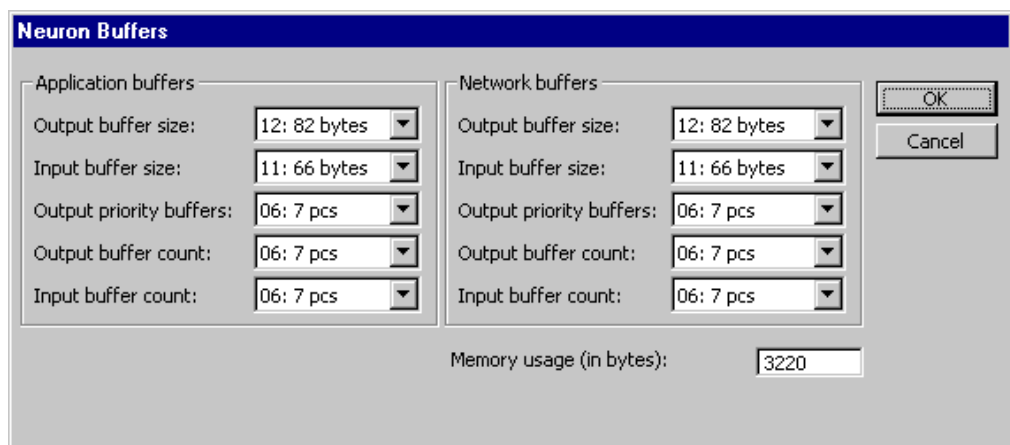


Figure 22. Neuron buffer settings

When the service pin method is used, the installation selection window changes its layout and informs the operator to generate the service pin message. Figure 23 shows this state of the window:



Figure 23. Waiting for a service pin message

When the service pin message is received, the installation process starts.

The Router devices are a special case: they should be installed and fully configured before other nodes can be installed or configured. For this reason the router devices selected for installation will always be installed first. However, if the operator does not select the required router devices, the installation process may fail.

### 3.7.2 Downloading a configuration

When the devices are installed to the network their configuration can be downloaded. The process is quite similar to the installation process, menu selection **Configuration | Download to Network** configuration brings up the same selection dialog which was used during the installation, with a bit different caption text, of course (Figure 23). The operator can select the devices to be downloaded, and "Start" begins the process. The downloading version of the device selection dialog allows the operator to select between Full download and Quick download. The quick download does not write unused entries of the configuration tables to the network device. This method may speed up the download operation considerably. However, if there may be wrong configuration values present on the device the full download should be done. It will clear the configuration entries which are not used by the connections known by the Lon Network Tool. The function of the field "Last Downloaded" and the hash marks at the beginning of the line are similar to those on the installation selection window.

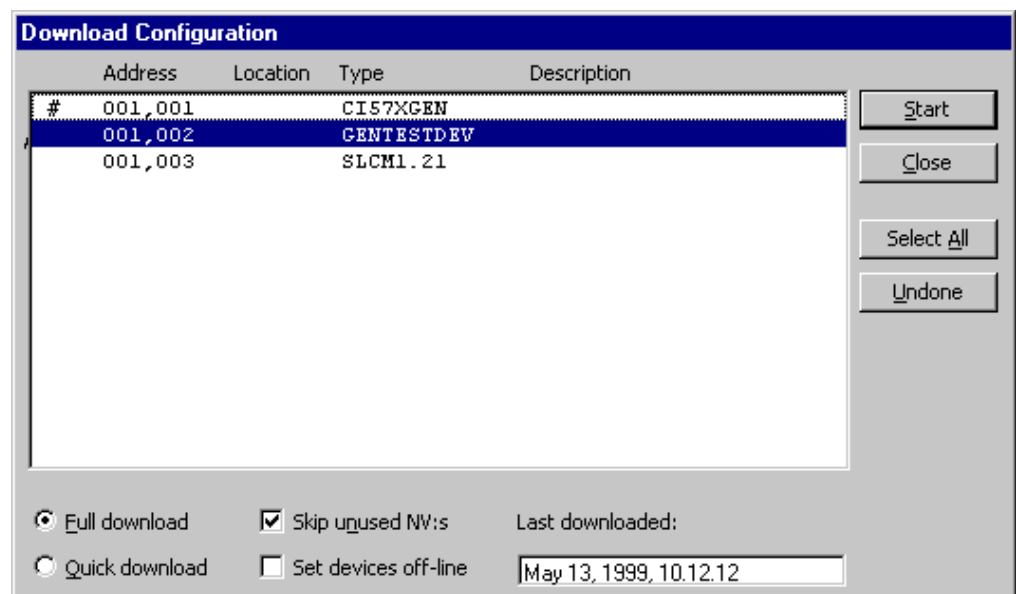


Figure 24. Download selection

On new versions of the Lon Network Tool the operator may also be able to select if the "unused" network variables of a device are updated. By checking the appropriate check box the operator can skip these network variables on download and upload operations. An "unused" network variable is a network variable which has the word UNUSED contained in its name. The nv name is transferred to uppercase letters before comparing. The Upload and Download icons found on the main window automatically skip unused nv:s.

### 3.8 Documentation

The Lon Network Tool includes a function allowing the operator to generate, view and print a set of reports about the contents of the network database. These reports are called operator documentation. The report generation dialog can be invoked using menu command **Tools | Documentation | Create** from the main menu. Figure 25 shows the dialog used for the report generation.

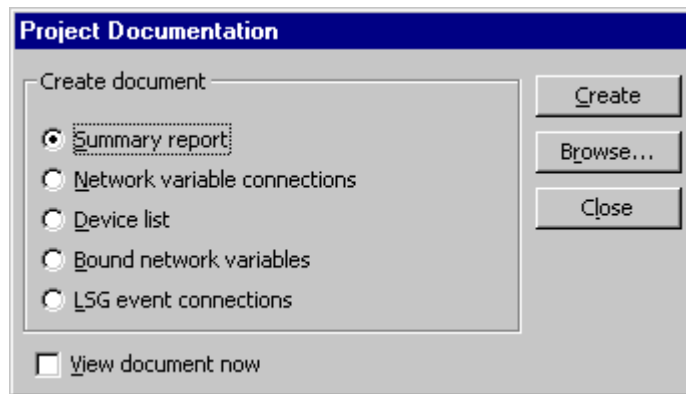


Figure 25. Documentation creation

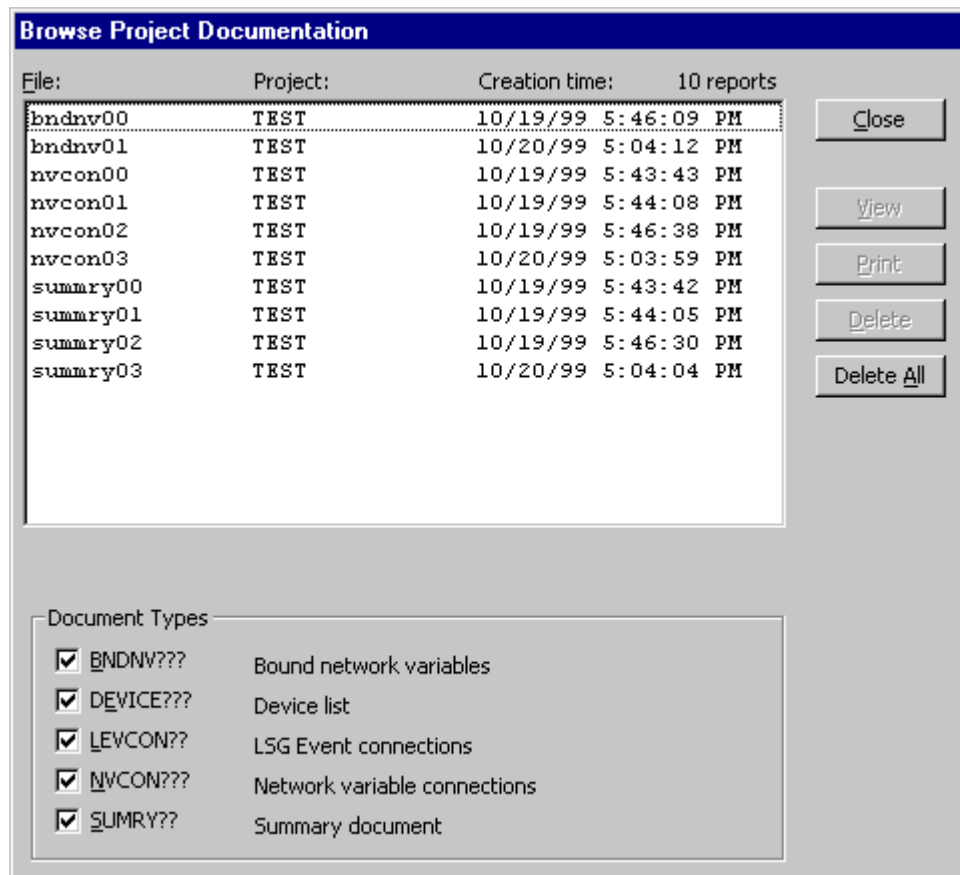


Figure 26. Documentation browse window

Currently there exists five kind of documentation, as the figure above indicates. Each of the documents are applied to the whole network configuration currently loaded. By checking the View document now -checkbox the operator can instruct the Lon Network Tool to display the document immediately. The Windows NOTEPAD.EXE text editor is used for the display, or, if it is not found, the Lon Network Tool internal log file display window is used. The use of the notepad.exe allows the report to be immediately printed, edited or saved to another file.

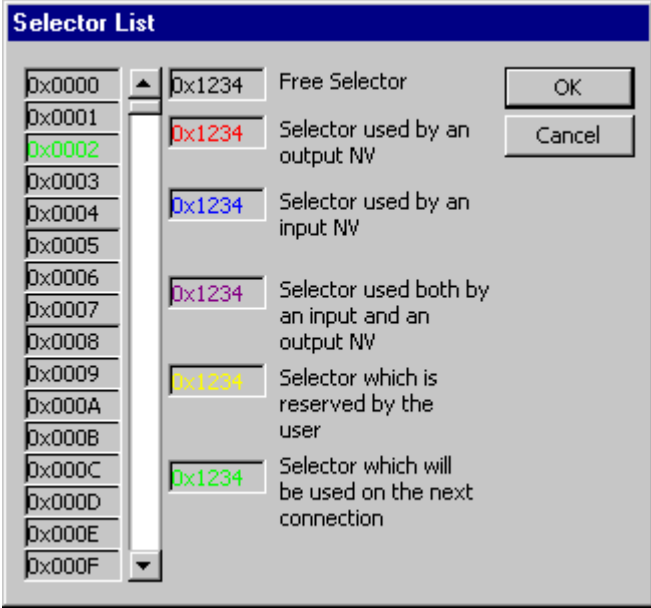
Figure 26 above shows the report browsing window, accessed with the menu command **Tools | Documentation | Browse**. This window allows the operator to manage the existing documentation files. The file extension .NTD (Lon Network Tool

Document) has been used for the files. The meaning of the different file names has been explained on the window. The ???'s are replaced with a counter when several files of the same type are created, as for the OBJCON??NTD above.

### 3.9

#### Utilities

There exists several utility functions on the Lon Network Tool, some of them were found useful during the program development, and some of them may even be included to the final product: This subject is also discussed further in the chapter describing The Tools menu on page 73.

Utility	Purpose
Network variable updates	A tool for defining and sending a set of network variable update messages was added. This may be very useful when testing the connections created to the network.
Bind by hand	A function to allow the network variable configuration table / address table to be modified directly by the operator. Extremely dangerous for not-yet-so-advanced operator, extremely useful for real-life advanced operator.
Selector utilities	<p>Any time during the program run a selector list can be displayed.</p> <p>The list has the following layout:</p>  <p><i>Figure 27. Selector list.</i></p> <p>The green colour indicates the selector to be used for the next connection. The operator can browse all the selectors from 0 to 12 287 (hex 2FFF) using the scroll bar displayed on the right side of the selectors. This list can be shown by using the menu selection <b>Tools   Selectors   List</b>. Another menu selection, <b>Tools   Selectors   Usage</b> displays a list of the selectors used by each device.</p> <p>In Figure 27, the different types of selector usage are indicated with colour. On a printed version of this document the reader may not be able to distinguish between the different types. However, on any graphical display where Windows can be run (at least 16 shades of grey) this is not a problem!</p> <p>The "reserved" selectors indicated by the yellow color are defined on a file called STARTUP.INI. By default some selectors at the end of the bindable selector area are reserved for LonTalk File Transfer use. Such selectors can not be used for connecting network variables.</p>

NETAgent menu	Using the menu <b>Tools   NETAgent</b> the Lon NETAgent can be started and closed. Also the configuration (subnet/node address, communication speed, file versions) can be viewed through this same menu.
Node menu	From the menu <b>Network   Node</b> a set of operations targeted to a physical network node can be found. These include Query Status, Wink, installation (for nodes not in the current project, for example), reset and displaying the read-only data structure and the Configuration structure.
Logfile display	As widely known, the programs created by the author tend to generate large amounts of log data when they're running. A menu selection <b>Help   Display log files</b> was added to allow these files to be displayed without closing the program.
Authentication key update	This function allows the operator to manually change the authentication key of a node. For the project nodes this function is available on the Node Edit, Neuron structures - command button. The authentication key increment is given as six hex-bytes, like 00 00 00 00 00 01 The increment appears to happen "per byte" -basis. For example, when the increment shown above is added to the existing authentication key of "FF FF FF FF FF FF", the result is "FF FF FF FF FF 00".

**Note**

There exist also other items on the program main menu. They will be described on the final version of this documentation.

**3.10****LNT Server**

Some of the program functions that do not need any knowledge about the Network Database have been moved to a separate application, *LNT Server*. This program is automatically started by the Lon Network Tool and it can be seen as an icon on the screen. This icon is shown in Figure 28.



Figure 28. *LNT Server application icon*

The server application is normally invisible to the operator, the operator may not know when a set of dialog windows is actually shown by the LNT Server. It can be also run as a separate application, by starting the program LNTSRV.EXE. It contains several menu selections for different LonWorks functions.

The only situation when the operator may get confused because of the LNT Server is the processing of the windows actually shown by the LNT Server. The Read Configuration Structure -window is one of such windows. When the operator has viewed the window and selects another menu selection from the Lon Network Tool application the configuration structure window may disappear behind the Lon

Network Tool or some other application. It is not closed and it can be reviewed by moving the other application windows.

## 3.11 LON/SPA Gateway Configuration Tool

### 3.11.1 Overview

LON/SPA Gateway Configuration Tool (aka LSG CFG Tool) is a Windows-based application for viewing and modifying the configuration of a LON/SPA Gateway device. This tool supports uploading, storing and modifying of multiple configurations using a program database. This tool also supports the viewing of Neuron Chip configuration information on any LON node connected to the network.

### 3.11.2 Installation

The LSG CFG Tool is currently delivered as a part of the Lon Network Tool. No special installation procedure for LSG CFG Tool exists.

### 3.11.3 Using the LSG CFG Tool

There exist two different modes for using the LSG CFG Tool:

- Integrated mode, where the LSG CFG Tool is invoked from Lon Network Tool's dialog for LSG configuration settings ("Edit Node" dialog, "Interface" button).
- Stand-alone mode, where the LSG CFG Tool is invoked via Lon Network Tool's Tool | Others -menu.

In the first case the LSG CFG Tool can only be used for processing the configuration of the selected LSG device. On the second case any LSG found on the network can be specified as the target. On the Stand-alone mode the LSG CFG Tool program supports the following main operations:

- Viewing the configuration of a (running) LON/SPA Gateway.
- Modifying the configuration loaded to the program database.

The program uses the same windows for data display and data editing. The layout of the windows differs slightly depending on the current working mode. The basic difference is, that in Stand-alone mode the operator may be able to immediately write modified values to the device. In Integrated mode the values should be saved to Lon Network Tool database and downloaded with Lon Network Tool.

The LSG CFG Tool supports both LSG version 3 and the earlier versions (2.x). The differences between these two appears mainly on the unit list processing. For version 3 LSG only one unit list entry can be specified. Also the SNVT\_alarm menu command (described below) is not available when configuring LSG 2.x.

The operator should consult LON/SPA Gateway documentation for more information on the meaning of the different configuration values.



## 3.11.4

## Starting the LSG CFG Tool



Figure 29. The icon entry for the LSG CFG Tool

When the LSG CFG Tool is started on the Integrated mode it will automatically load the configuration of the currently edited device. When started on Stand-alone mode it displays an empty program **main window**:

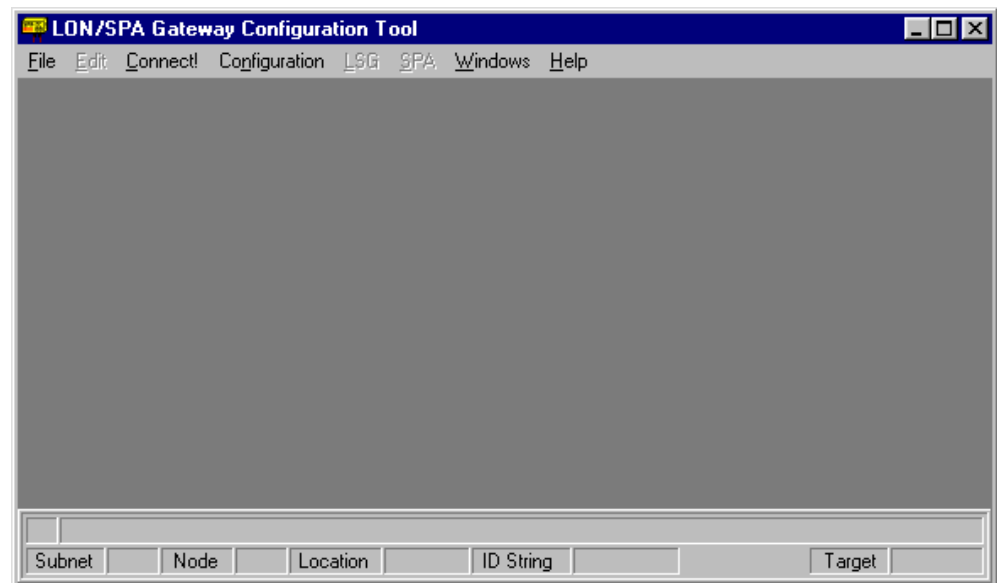


Figure 30. Program main window

The main window displays the following items (from top to bottom):

- Program title. The text "LON/SPA Gateway Configuration Tool" is displayed on the program title bar.
- Program main menu. The menu selections "**File**", "**Connect**", "**Configuration**", "**Windows**" and "**Help**" are available when the program has been started.
- Child window area: Here are displayed all the child windows of the application displaying different data. These child windows are described below.
- Message area: The grey area below the main menu displays messages to the operator. When the program communicates to the network a red square blinks on the leftmost column of the message area.

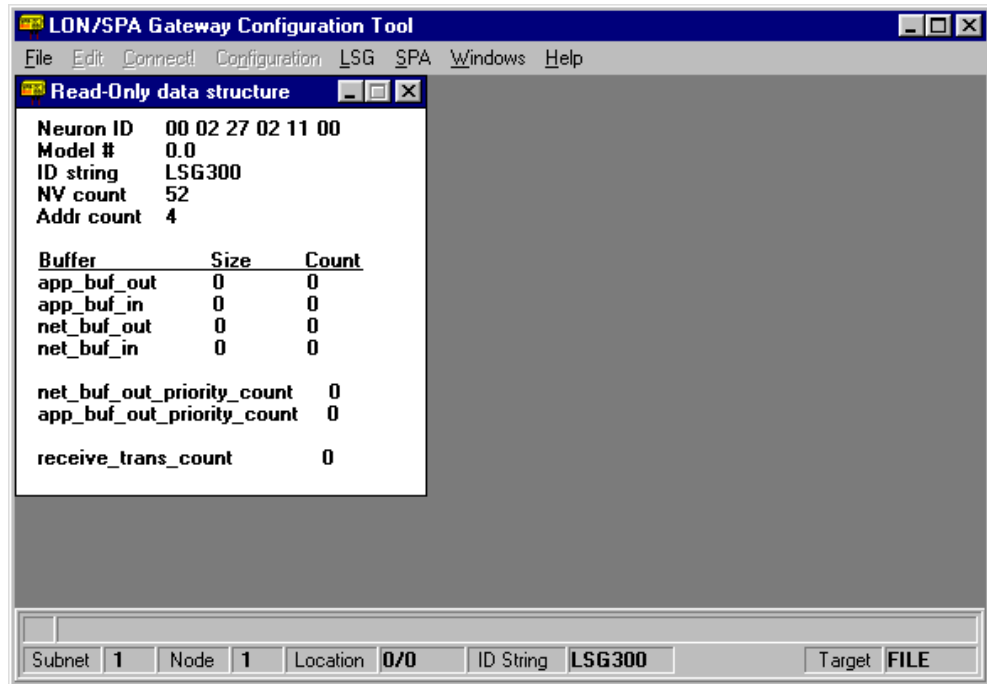


Figure 31. Integrated Mode Main Window

- Status bar: The grey area at the bottom of the window displays information about the current target node, if the program has been connected to a node.

When the program is started in Integrated mode the main window may look like on Figure 31.

### 3.11.5

#### Working on Stand-Alone Mode

To view the configuration of a LON/SPA Gateway on the network, the **Connect** menu should be used to establish a connection between the LSG and the program. Two different connection modes exist: “Read-Only” and “Edit On-Line”. The Read-Only mode allows the operator only to view configuration values. On the “Edit On-Line” mode the values can also be modified.

When one of the connect modes is selected the program shows a dialog window that asks the operator to specify the subnet and node address of the target device.

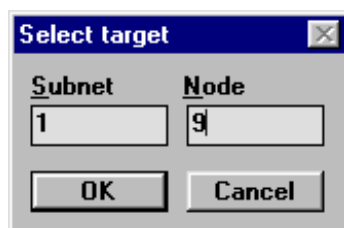


Figure 32. Target Selection Dialog

When the operator gives the subnet and node id:s and presses the OK button, the program first starts the Lon NETAgent program, if it is not running, and then establishes a connection to it. Messages about these processes appear on the message area.

After creating connection to the network the program starts interacting with the target LON/SPA Gateway. The program automatically reads the contents of the Read-Only data structure of the LSG Neuron chip. Figure 32 shows the program when it has been connected to a LSG.

Now the status bar contains information about the target device: Node and Subnet specify the target LON address. ID String and Location String are displayed. The configuration validity of the LSG is shown, "Valid" as in Figure 33, or "Invalid". The last item, "Target" shows to the operator the origin of the data displayed on the window. "LSG" as above indicates that the program is connected to a physical LSG device. The other alternatives are "FILE", which indicates that the operator has opened a configuration from the program database, and "NODE", which is displayed when the operator has connected to a device that is not a LON/SPA Gateway. The program can be used to display data from any Neuron Chip node. Naturally, the LON/SPA Gateway and SPA -specific functions are not available when the target is "NODE".

The menus "LSG" and "SPA" are now enabled. They contain the following commands for reading and displaying the LSG data structures:

#### **Menu "LSG":**

- Unit List
- Data Definitions
- SNVT\_alarm
- Address Table
- NV Config Table
- Node and LSG Status
- Configuration Structure
- Set Configuration Validity
- Clear Status

#### **Menu "SPA":**

- Send Spa Message
- Set SPA Bus Parameters
- Watch Messages

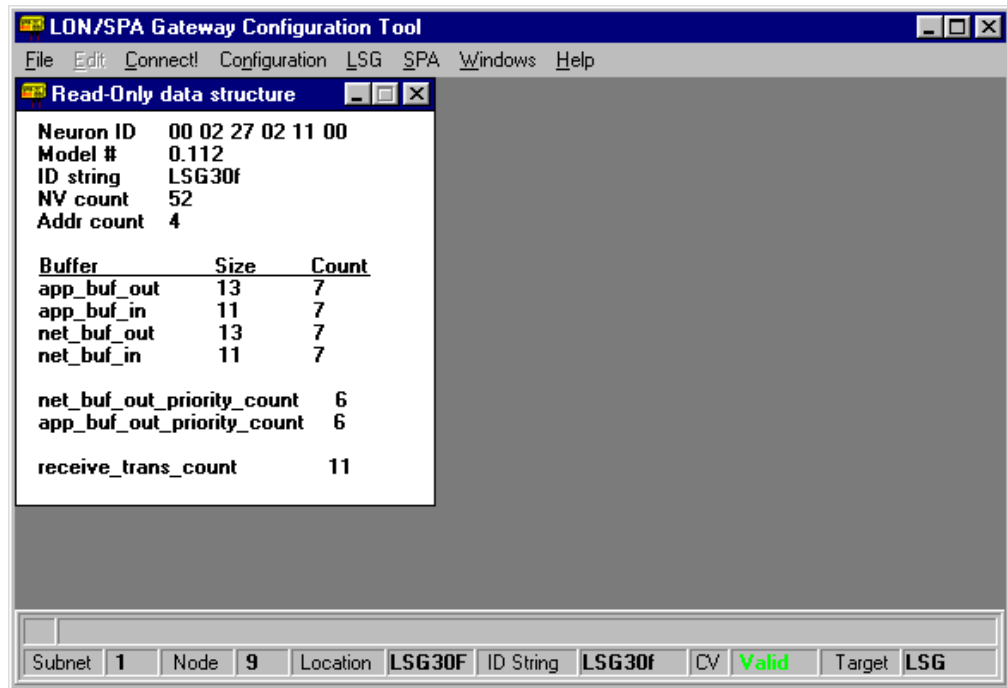


Figure 33. Main window and Read-Only data structure window

The functionality of the most of these selections is quite similar on both Stand-alone and Integrated mode, so below are given common instructions for both modes.

Some of the functions, such as “Clear Status” are available only in this Stand-alone mode.

On On-Line editing mode the LSG configuration validity can be changed by using the corresponding “LSG” menu item, but also clicking the text “Valid” or “Invalid” next to the “CV” label on the main window.

### 3.11.6

#### Working on Integrated Mode

As mentioned above, on integrated mode the LSG CFG Tool is invoked via Lon Network Tool. When editing a LSG device on Lon Network Tool the following window is opened when the operator presses button “Interface” on the Lon Network Tool’s “Edit Node” window:

The button “LSG CFG Tool” can be used to invoke the LSG CFG Tool. In this working mode all on-line operations are disabled. On “LSG” and “SPA” menus the following items are available:

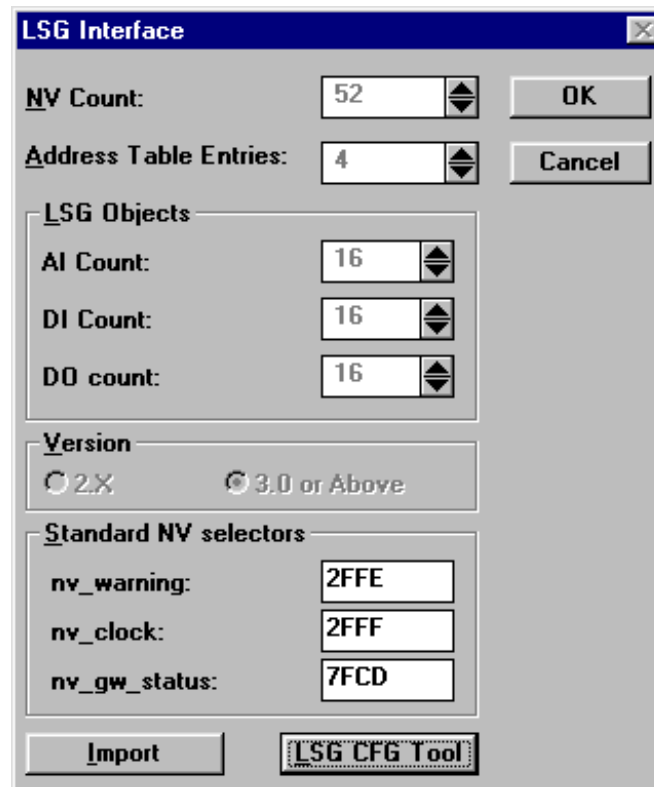


Figure 34. "LSG Interface" window on Lon Network Tool

### Menu "LSG":

- Unit List
- Data Definitions
- SNVT\_alarm

### Menu "SPA":

- Set SPA Bus Parameters

When the operator has made the desired changes the menu command "File | Save and Exit" should be used to return to Lon Network Tool. If the operator wishes not to save the changes the menu command "File | Exit" can be used.

How the configuration information is modified is described below with more detail.

## 3.11.7

### Configuration windows

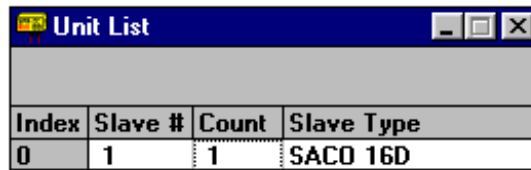
#### 3.11.7.1

#### Unit list

The menu command Unit List allows the operator to specify the contents of the Unit List of the LSG. On LSG versions 2.x this could be done by specifying 1-8 entries, each having separate Slave number and slave type. On LSG 3 the slave type is same for all slaves and the first slave number and the number of the slaves are specified.

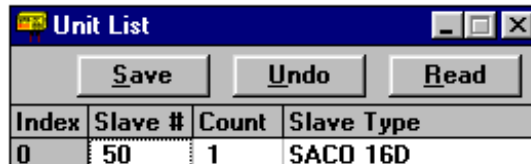
Below are shown the Integrated version (Figure 35) and the Stand-Alone version (Figure 36) of the Unit List window. These two figures illustrate the main difference

between these two versions. On Stand-alone version there exists buttons (“Save”, “Undo”, “Read”) for directly modifying the LSG data structures. On Integrated mode the download is done via Lon Network Tool’s Download function.



Index	Slave #	Count	Slave Type
0	1	1	SACO 16D

Figure 35. Unit List (Integrated)



Index	Slave #	Count	Slave Type
0	50	1	SACO 16D

Figure 36. Unit List (Stand-Alone)

As with all the LSG CFG Tool windows, the data can be modified by selecting the field to be modified (by clicking it with a mouse or moving the focus with <tab> key) and just typing in the new data. <Backspace> key can be used for erasing existing characters. For fields with only limited set of allowed values (“Slave Type” above) pressing any key toggles between the allowed values.

On integrated mode the operator does not need to explicitly “Save” the data, the current data is automatically read from the window and saved when the menu selection “File | Save and Exit” is selected. On Stand-alone mode the modifications can be written to the target with “Save”. “Undo” resets the display to the last read form. “Read” can be used for re-reading the data from the target. If, however, the operator has selected “Read-Only” connection in Stand-alone mode, the “Save” buttons can not be used.

The figures above display the LSG 3 version of the Unit List window. For LSG 2.x the window contains 8 rows (0-7), one for each possible Unit List entry. No “Count” column is displayed on that version of the window.

### 3.11.8

#### Data definitions

The menu command "Data Definition" displays the window shown in Figure 37. When the operator requests for the Data Definition window the program also loads and displays the address table window, since the addressing information is also needed for the Data Definition window.

On every line the following items are displayed:

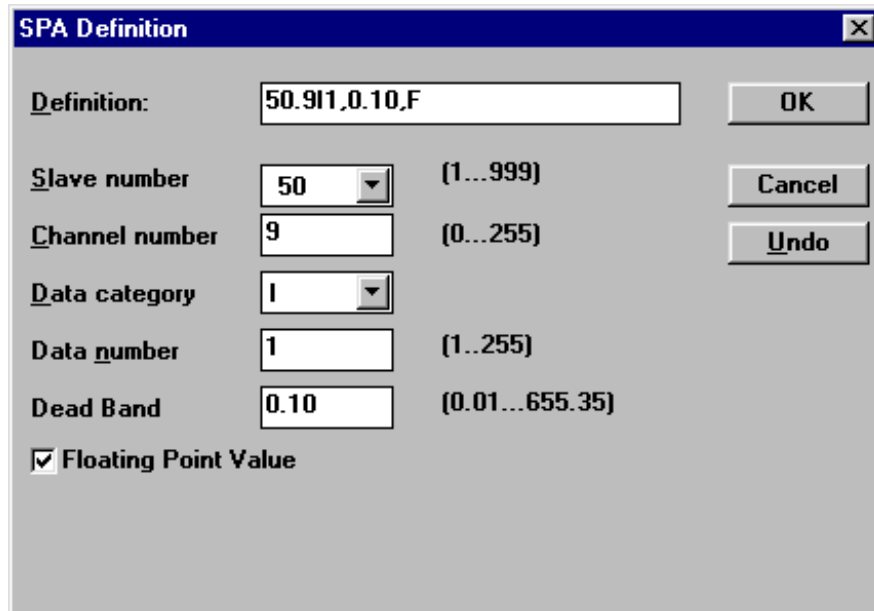
- **Idx:** Network variable index of the definitions
- **SPA Definition:** The SPA definition associated with the nv index. This column displays the DA AI, DA DI and DA DO definitions.
- **Direc:** The direction of the network variable, **IN** or **OUT**.

- **Selector:** The nv selector of the network variable, in hex format. Does not contain the direction bit.
- **Pri:** Priority bit of the network variable, **No** or **Yes**.
- **Service:** The service type associated with the network variable: **ACKD**, **UNACKD** or **UNACKD\_RPT**.
- **Address:** The address table data associated with the network variable. This field includes several sub fields. The fields Type, Subnet and Node are set by the program according to the **Entry** field.

Data Definitions									
<input type="button" value="Save"/> <input type="button" value="Read"/> <input type="button" value="SPA edit"/>									
Idx	SPA Definition	Selector	Pri	Service	Address	Entry	Type	Subnet	Node
* 0	DA AI,0=50.9I1.0.10,F	0001	No	UNACKD_RPT	2		BRO	0	0
* 1	DA AI,1=	3FFE	No	ACKD	<unused>				
* 2	DA AI,2=	3FFD	No	ACKD	<unused>				
* 3	DA AI,3=	3FFC	No	ACKD	<unused>				
* 4	DA AI,4=	3FFB	No	ACKD	<unused>				
* 5	DA AI,5=	3FFA	No	ACKD	<unused>				
* 6	DA AI,6=	3FF9	No	ACKD	<unused>				
* 7	DA AI,7=	3FF8	No	ACKD	<unused>				
* 8	DA AI,8=	3FF7	No	ACKD	<unused>				
* 9	DA AI,9=	3FF6	No	ACKD	<unused>				
* 10	DA AI,10=	3FF5	No	ACKD	<unused>				
* 11	DA AI,11=	3FF4	No	ACKD	<unused>				
* 12	DA AI,12=	3FF3	No	ACKD	<unused>				
* 13	DA AI,13=	3FF2	No	ACKD	<unused>				
* 14	DA AI,14=	3FF1	No	ACKD	<unused>				

Figure 37. Data Definition Window

The editing and saving mechanisms for the different modes are equal to the Unit List window. A more detailed view to the “SPA Definition” data can be obtained by double-clicking the definition column, or by selecting a row and pressing the “SPA Edit” button. The window shown in Figure 38 is displayed. The exact layout of this window depends on the SPA Definition type (AI, DI, DO) being edited.



The SPA Definition dialog box contains the following fields and controls:

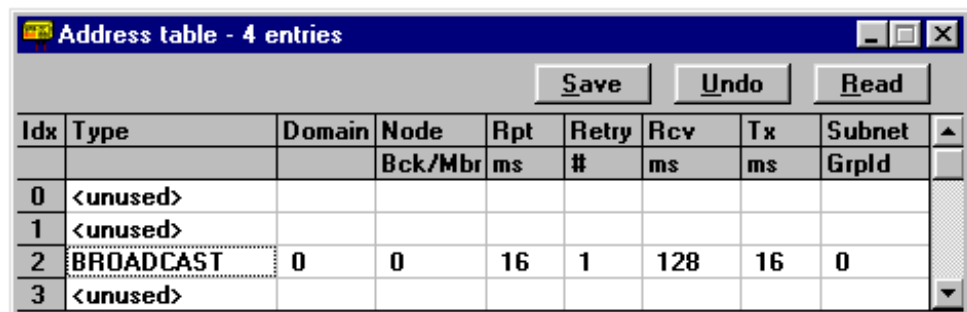
- Definition:** Text field containing "50.911.0.10.F" with an OK button to its right.
- Slave number:** Spin box set to "50" with a range of "(1...999)" and a Cancel button to its right.
- Channel number:** Text field containing "9" with a range of "(0...255)" and an Undo button to its right.
- Data category:** Spin box set to "1".
- Data number:** Text field containing "1" with a range of "(1..255)".
- Dead Band:** Text field containing "0.10" with a range of "(0.01...655.35)".
- Floating Point Value:** A checked checkbox.

Figure 38. SPA Definition edit window

### 3.11.9 Address table (Stand-Alone mode only)

The Address Table menu command displays the contents of the address table. This window can not be accessed from the Integrated version of the tool, since the addressing information is set by creating Lon Network Tool connections.

Due the different types of address there exist several captions for some of the columns of the table. On some cases the unit of the value is also given.



The Address table window displays a table with 4 entries. The table has columns for Idx, Type, Domain, Node, Rpt, Retry, Rcv, Tx, and Subnet. The Node column has sub-columns for Bck/Mbr and Grpld. The Rpt, Retry, Rcv, and Tx columns have units of ms. The Subnet column has a unit of Grpld.

Idx	Type	Domain	Node	Rpt	Retry	Rcv	Tx	Subnet
			Bck/Mbr	ms	#	ms	ms	Grpld
0	<unused>							
1	<unused>							
2	BROADCAST	0	0	16	1	128	16	0
3	<unused>							

Figure 39. Address Table window

Editing mechanisms on this window are analogous to the ones described above.

### 3.11.10 Network variable configuration table (Stand-Alone mode only)

Figure 40 shows the network variable table. This dialog displays all the fields present on a nv config table entry (the Data Definition window shows only some of them). To this window apply the same restrictions as to the address table window: Since NV config processing is made using Lon Network Tool, this window can not be displayed.



The screenshot shows the 'NV Config' window with a table of network variables and two operation fields.

Idx	Priority	Direction	Selector	Tmarnd	Service	Authent.	Addr Idx
0	No	OUT	0001	No	UNACKD_RPT	No	2
1	No	OUT	3FFE	No	ACKD	No	15
2	No	OUT	3FFD	No	ACKD	No	15
3	No	OUT	3FFC	No	ACKD	No	15
4	No	OUT	3FFB	No	ACKD	No	15
5	No	OUT	3FFA	No	ACKD	No	15
6	No	OUT	3FF9	No	ACKD	No	15
7	No	OUT	3FF8	No	ACKD	No	15
8	No	OUT	3FF7	No	ACKD	No	15
9	No	OUT	3FF6	No	ACKD	No	15
10	No	OUT	3FF5	No	ACKD	No	15
11	No	OUT	3FF4	No	ACKD	No	15

Below the table, there are two sections for operations:

**Fetch** section: Index: 0, Result: [Empty field]

**Update** section: Index: 0, Data: [Empty field]

Figure 40. NV Config window

On this Stand-alone version the **Fetch** function allows the value of a network variable to be fetched. The network variable index of the desired nv should be entered to the **Index** field. The result of the fetch operation is shown on the **Result** field. The **Update** function can be used to modify nv values. In Figure 40 the network variable with index 15 has been updated and fetched to check the result of the update.

### 3.11.11

#### Status display windows (Stand-Alone mode only)

As mentioned above, the Read-Only data structure -window is displayed during the Stand-alone mode Connect operation.

Two additional status display windows exist:

- Node/Gateway Status window
- Configuration Structure window

These windows can be retrieved through the corresponding menu selections on the **LSG** menu. The figures below illustrate the exact display format of the windows.

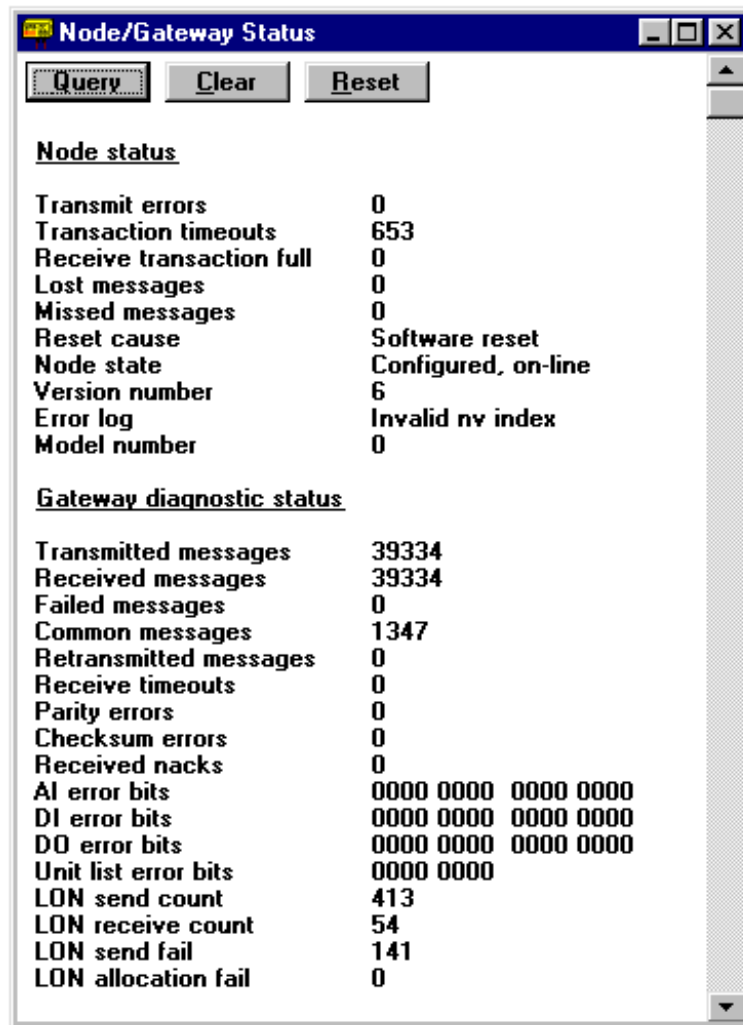


Figure 41. Node/Gateway Status window

The "AI error bits", "DI error bits" and "DO error bits" shown on the Node/Gateway Status window are shown correctly only if the data definitions have been read earlier. Otherwise a string of question marks ("????????????????") is displayed. Similarly the Unit list error bits require the Unit list to be read earlier.

Since the status values may change during the program run the Node/Gateway status can be updated from the LSG by double-clicking it with the mouse. If any of the display windows is corrupted it can be refreshed with a single click. The Query button at the top of the window allows the operator also to do this. The Clear button performs a clear status operation to the target device and the Reset button resets the target node.

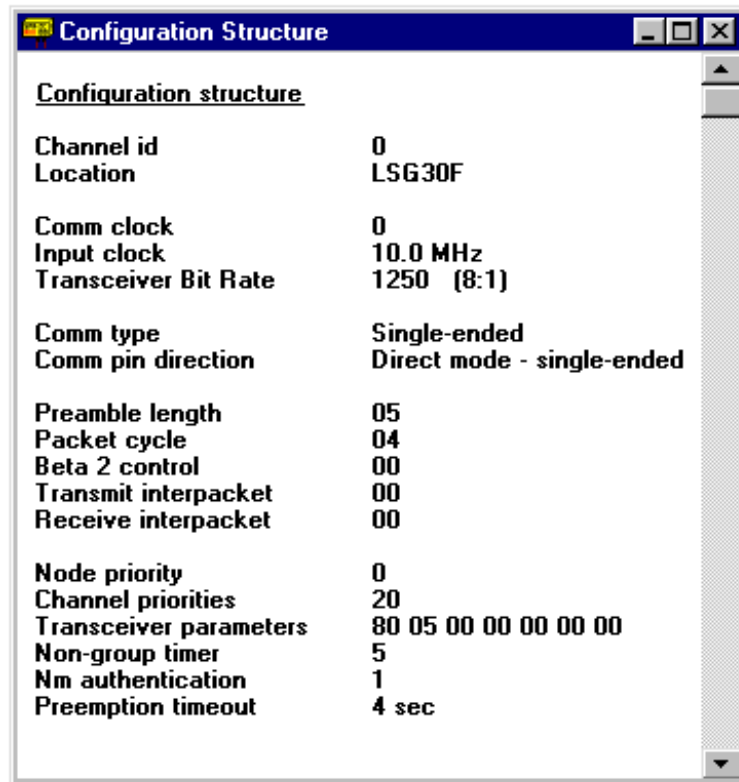


Figure 42. Configuration Structure

### 3.11.12 Uploading a configuration (Stand-Alone mode only)

#### 3.11.12.1 Uploading a single configuration

In order to modify a configuration the operator must first upload a configuration from a LON/SPA Gateway to the program database. The menu selection **Configuration|Upload from LSG** should be selected. The program uses an upload dialog (Figure 43) to ask a short specification for the configuration being uploaded. The operator should give a short text that helps to identify the configuration. There is no direct limit to the length of this text, but only up to 35 first characters of it are displayed when the uploaded configurations are listed. On a printed or exported configuration a longer string may be useful.

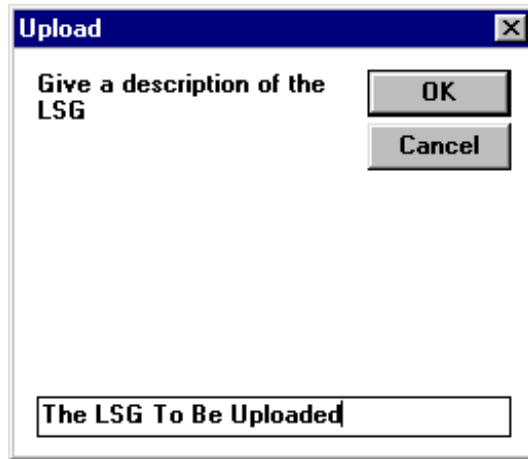


Figure 43. Description of a configuration

A configuration is always saved under a project. There can be several configurations under the same project. To specify which project is used the following dialog is used:

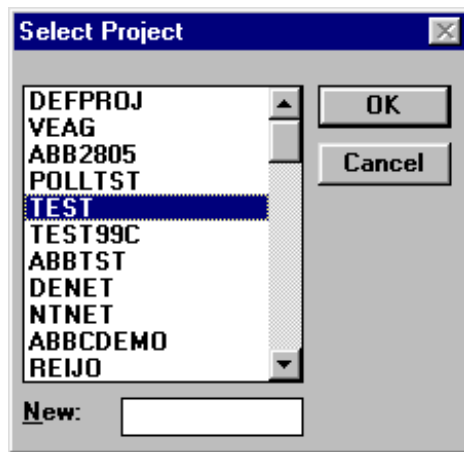


Figure 44. Select project dialog

The dialog lists the existing projects and allows the operator to specify a new project to be created. The project name will be used as a DOS directory name, so only the first eight characters are significant. Project names are converted to upper case letters.

When the project has been selected the program starts the upload operation. The message area on the main window displays the state of the upload operation.

### 3.11.12.2

## Uploading multiple configurations

The LSG CFG Tool supports the loading of multiple configurations to the program database by one selection. At the current version of the program this involves the use of the **Scan** function to get a list of the nodes currently installed to the network. From this list the operator can choose the nodes he wants to upload. See the section **Scan** on how this operation is done.

### 3.11.13 Modifying configuration (Stand-Alone mode only)

In order to modify a configuration of a LON/SPA Gateway the configuration must first be uploaded to the program database. The section "Uploading a configuration (Stand-Alone mode only)" provides information on how this subject.

When the configuration has been uploaded it should be opened by using the menu selection **File|Open**, supposed it is to be modified. A Project List dialog window (Figure 45) is displayed.

The list box on the left displays the projects currently on the program database. When the operator selects a project, by mouse or by using the space key, the other list is filled with the configurations saved to that project. The operator can select a configuration from the list box on the right and press the OK button to open it. Unnecessary configurations can also be deleted using the Delete button.

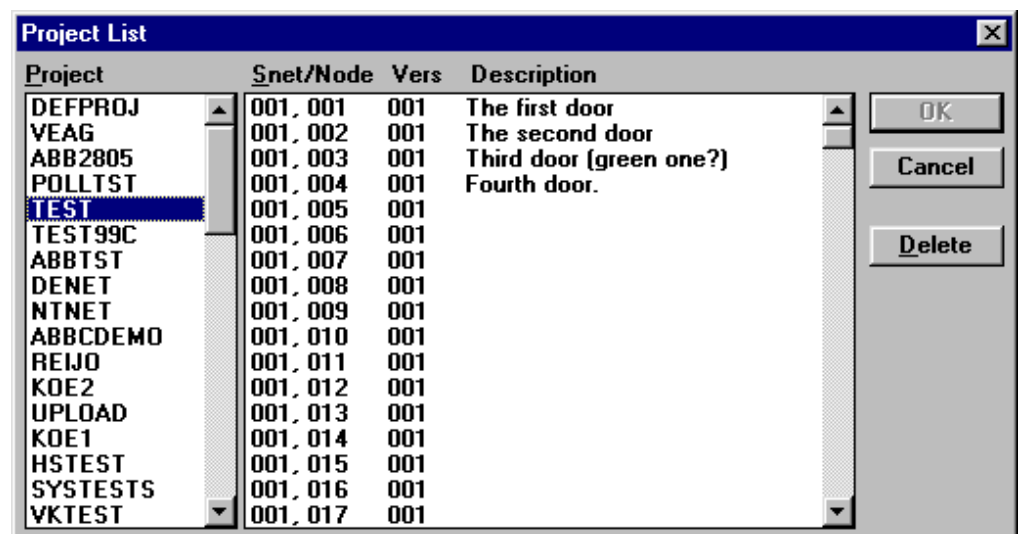


Figure 45. Project list window

When a configuration has been opened the program acts almost as if it was connected to a LSG, as described earlier. The operator can open the different display windows with the menu selections. Not all the menu selections, however, are available on this working mode.

The configuration can and should be saved after modifications by using the menu selection **File|Save**.

### 3.11.14 Downloading a configuration (Stand-Alone mode only)

To download a configuration from the program database to a LON/SPA Gateway requires that a configuration has been uploaded from a LON/SPA Gateway. Usually, also the uploaded configuration has been modified before the download operation. The sections "Uploading a configuration (Stand-Alone mode only)" and "Modifying configuration (Stand-Alone mode only)" provide information on how to perform these operations.

In order to download a configuration to a LON/SPA Gateway the operator should select the menu item **Configuration|Download to LSG**. The program displays the Project List window (Figure 47) asking the operator to select the configuration to transfer. After the operator's selection the program starts to transfer the configuration. The program uses the node information from the configuration file to determine the target node. However, the operator is asked to confirm the target. This allows a configuration to be downloaded to a LSG different from the device it was uploaded. During the download operation the main window message field displays information about the proceeding of the download operation.

### 3.11.15 **Creating and transferring configurations (Stand-Alone mode only)**

In addition to the **Upload from LSG** and **Download to LSG** menu selections described above there exist three other functions for configuration processing. A configuration can be created and it can be exported to a disk. The exported configuration can be imported from disk to the database.

The following menu commands exist:

#### **Configuration|Create New|Empty**

Creates a new LSG configuration, with no data. All the SPA definitions as well as address/nv configuration table entries are empty. The operator should edit the configuration before transferring it to a LSG, unless the purpose is to clear the configuration of the LSG.

#### **Configuration|Create New|Use Template**

Creates a new LSG configuration using an existing configuration as a template. The program asks the operator to select the template, and the contents of the new configuration will be initialized with the values from the template configuration.

#### **Configuration|Export**

Allows the operator to transfer one or several configurations from the database to a file, for example to a floppy disk. This function can be used to transfer configuration files between different databases (=different computers). Even if several configurations are exported, only one disk file is created.

#### **Configuration|Import**

Counterpart of the **Export** command. Allows the operator to read one or several configurations from a file to the database.

### 3.11.16 **SPA functions (Stand-Alone mode only)**

The program offers some SPA-bus -specific features on the **SPA** menu.

#### **Sending SPA messages**

A special dialog window can be used to send SPA messages to any LON/SPA Gateway known to exist on the network, i.e. the operator does not need to be connected to a particular LON/SPA Gateway in order to send SPA messages. In

Figure 46 is shown the window for SPA message sending. The **Subnet** and **Node** fields can be used to specify any node on the network. The default values for these fields are the values for the LSG currently connected.

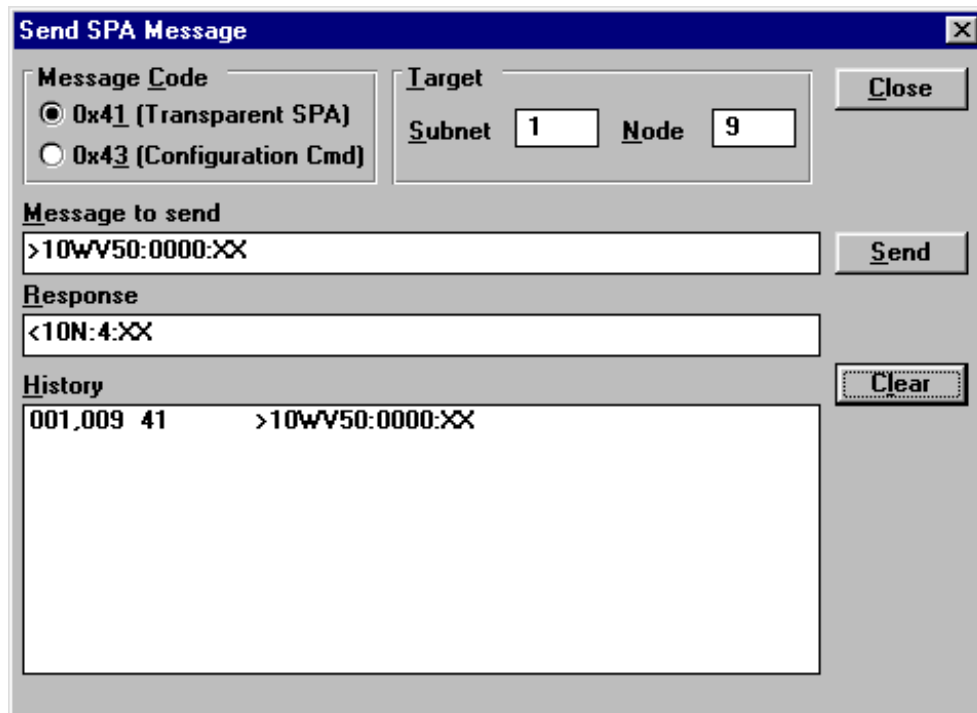


Figure 46. SPA message sending window

To the **Message to send** field the operator can write the SPA message to be send, in ASCII format, as in Figure 46. The response message is displayed on the **Response** control. The **History** list contains the messages sent earlier, along with the subnet/node addresses used.

### SPA Bus settings

A special dialog window for modifying the SPA bus settings can be retrieved through the **SPA|Set SPA Bus Parameters** menu selection. The window contain controls for specifying the event mode of the device (LSG 3 only) and the SPA Bus communication parameters. Pressing **Cancel** returns the operator back to the main window without changing the SPA bus parameters. Two seldom-used parameters can be displayed and modified by pressing the **Additional** button.

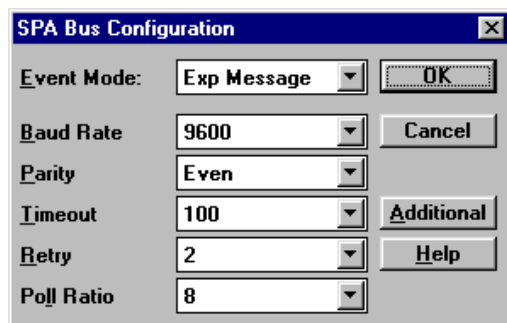


Figure 47. SPA bus configuration window

The SPA Bus Settings is the only data item that can be modified while the program is connected to a LON/SPA Gateway. And, when downloading a configuration to a LON/SPA Gateway, also the SPA Bus Settings found from the program database are downloaded.

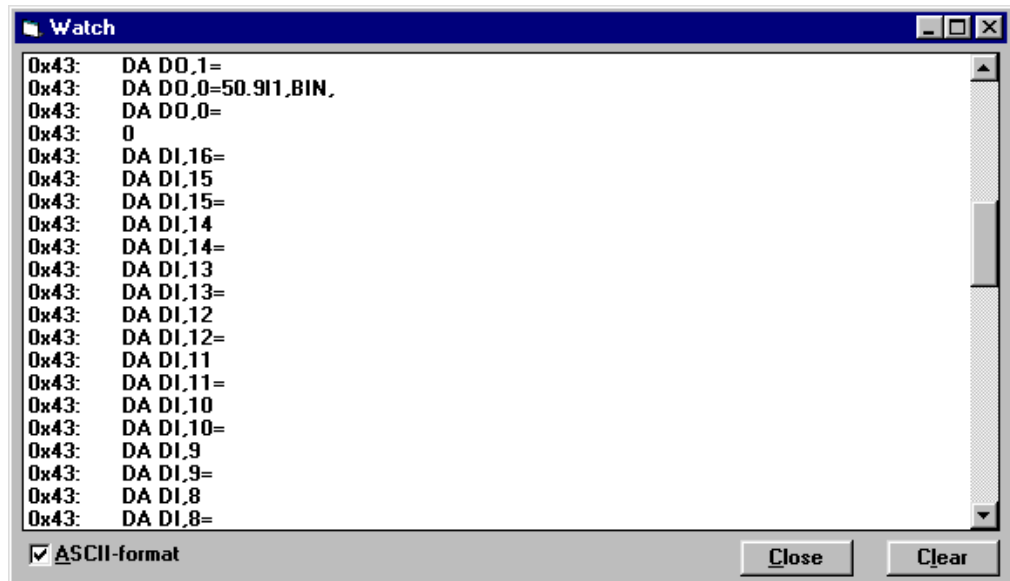


Figure 48. Watch window

## Watch messages

The **Watch messages** menu selection brings up a window which displays the incoming LON messages with message codes 0x40, 0x41 and 0x43 (SPA messages). The messages are listed to this window in addition to their normal processing, i.e. the Watch messages window does not have any effect on the program functionality. The newest message is always on the top of the window. The window has a check box allowing the data to be displayed in ASCII format. The default format is hex dump. The Figure 48 above, shows the watch message with some messages received. The first message (on the third line) has been received with the "ASCII format" checked, and the two other messages have been received with "ASCII format" off.

### 3.11.17

## Utilities (Stand-Alone mode only)

The following discusses the utility functions of the LSG CFG Tool.

### Scan

The **Scan** function found on the **File** menu executes a network scan, using a Scanner application (delivered as a part of the Lon Network Tool). The operation may take several minutes to complete, depending on the size of the network (=number of nodes). Rough approximation of the scanning speed is 12 nodes/minute.



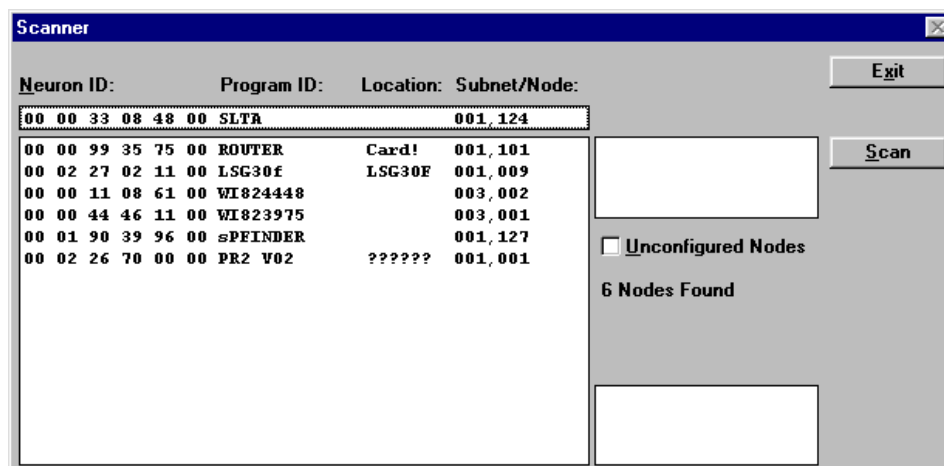


Figure 49. Scanner

## Install

The **File|Install** utility allows the operator to install a node to the network by invoking an Installer utility program. The installation involves modifying the subnet and node numbers and the location string of the node.

There are two methods to install a node:

- **By Service Pin message.** The program asks the operator for subnet and node id:s and the location string, and starts waiting for a service pin message from the network.
- **By Neuron ID.** The program asks the target node Neuron ID, too, and executes the installation immediately.

## Wink

The **File|Wink** menu command allows the operator to send a Wink message (LON message code 0x70) to a node. The program asks for the subnet/node address. This service can be very useful for identifying the target device, when there exist several nodes which look identical to the human eye, for example.

## Device

This menu contains three functions for maintaining LSG devices.

The first function, **Refresh**, allows the configuration of a LSG device to be refreshed with a single operation. LSG CFG Tool uploads the configuration of the target device, writes boot id to the node, re-installs the node and downloads the configuration back to the device

The second function, **Update**, is intended to be used on situations where the software of a LSG device should be updated. The functionality is quite similar to the Refresh described above, except that the tool pauses the operation (by displaying a message box) and allows the operator to go and change the EPROM of the device.

The third function, **Replace**, allows the whole LSG to be changed. On the above functions the Neuron Chip and hence the Neuron id of the target device has not been

changed. With the Replace functionality the operator may change the whole device. The new device is identified by pressing the service pin switch.

## History

The **File|History** function allows the operator to view the modification history of a configuration stored on the program database. When the operator is modifying a configuration (a configuration has been opened with **File|Open**) this menu selection displays a history window.

## Printing a configuration

The menu selection **File|Print** allows a configuration to be printed. What the **Print** command actually prints depend on the working mode of the program. If the operator is connected to a LON/SPA Gateway only the currently displayed parts of the configuration are printed. If the operator has read a configuration from the program database using the **File|Open** menu command, all the configuration data is printed.

Here is a sample of a printout of a configuration. Only part of the whole listing is shown.

```
[LSG]
DESCRIPTION=Unmodified, first configuration
ID_STRING=LSG28
NEURON_ID=00 00 18 76 26 00
SUBNET=01
NODE=01
SP =0,9600,E,100,2,8,0,S
```

```
[ADDRESS TABLE]
ENTRY0=01 72 63 06 01
ENTRY1=00 00 F0 0F 00
ENTRY2=00 00 F0 0F 00
ENTRY3=00 00 F0 0F 00
```

```
[UNIT LIST]
UN 0=50,0
UN 1=
UN 2=
UN 3=
UN 4=
UN 5=
UN 6=
UN 7=
```

```
[DATA DEFINITIONS]
DA AI,0=50.0V50,0.10;41 75 00
DA AI,1=;41 76 00
DA AI,2=;41 77 00
DA AI,3=;41 78 00
DA AI,4=;00 00 00
```

...

## 4 Lon Network Tool function reference

This section describes the Lon Network Tool functions in the order they appear on the program menu. This section is intended to a operator who finds a menu selection and wants to know more about it. Some of this information is also present on the description of the flow of operation of some basic functions above.

### 4.1 File menu

#### New

This item can be used for creating a new project. The following window is used for this purpose. The existing projects are also displayed.

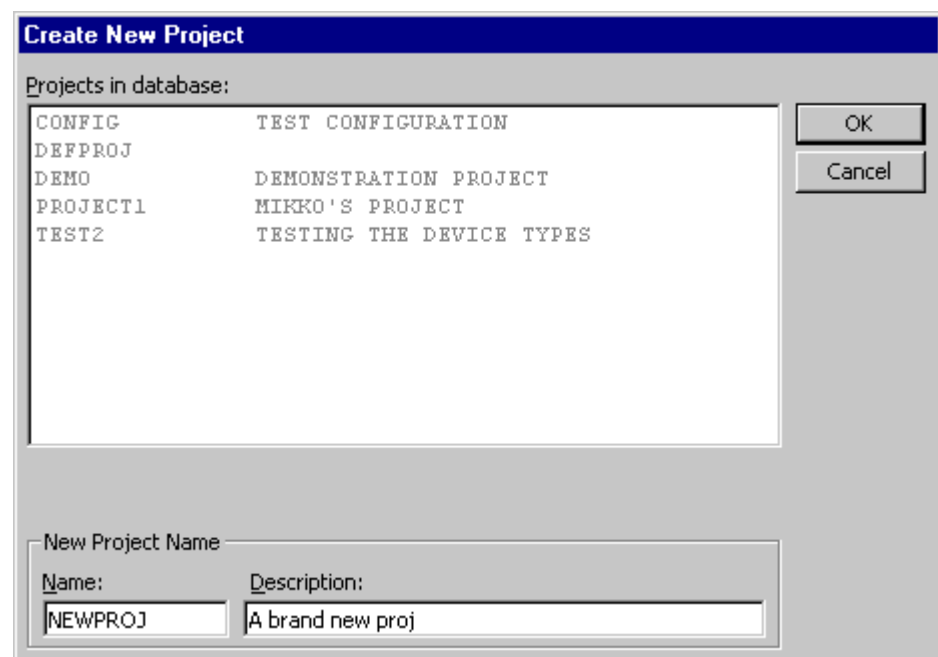


Figure 50. New project

#### Open

This function can be used for opening (loading) an existing project. The window used is similar to the one above, except that the Create New Project group is not displayed and the list is enabled allowing the operator to select one of the existing projects. There is also a "Perform fast open" check box. When this check box is checked, the device information and nv connection information is not loaded into run-time database when the project is opened. That information is loaded into run-time database "on demand" on device basis when the device is accessed for the first time. Figure 4 above shows the Open window.

#### Re-Open

This menu selection is used for reloading the current project from the database. This function can be considered as a kind of "Undo" feature: The operator can go back to

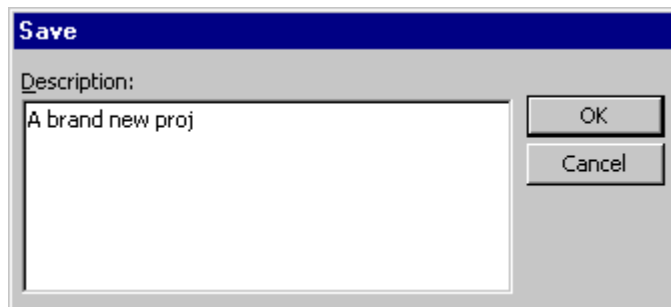
the configuration he started from and discard the changes made during the current session. If any changes have been made Lon Network Tool confirms the operation.

### Close

This menu selection allows the operator to close the configuration without ending the program. This function can be used if the operator wishes to operate without Lon Network Tool database functionality, to check the properties of the physical network, for example.

### Save

This menu item saves the currently loaded configuration. The following window will be displayed, allowing the operator to modify the description of the loaded configuration.



*Figure 51. Save*

### Save As

Saves the configuration to a new project. The same window as with the **File | New** project -function is used. Also, the Save window (Figure 51) is used after the operator has selected the project.

### Print Setup

This menu selection can be used to set up the printer. The dialog window used here and the number of options available depends on the particular system and what printers have been installed. The Figure 52 shows one example of such dialog window.

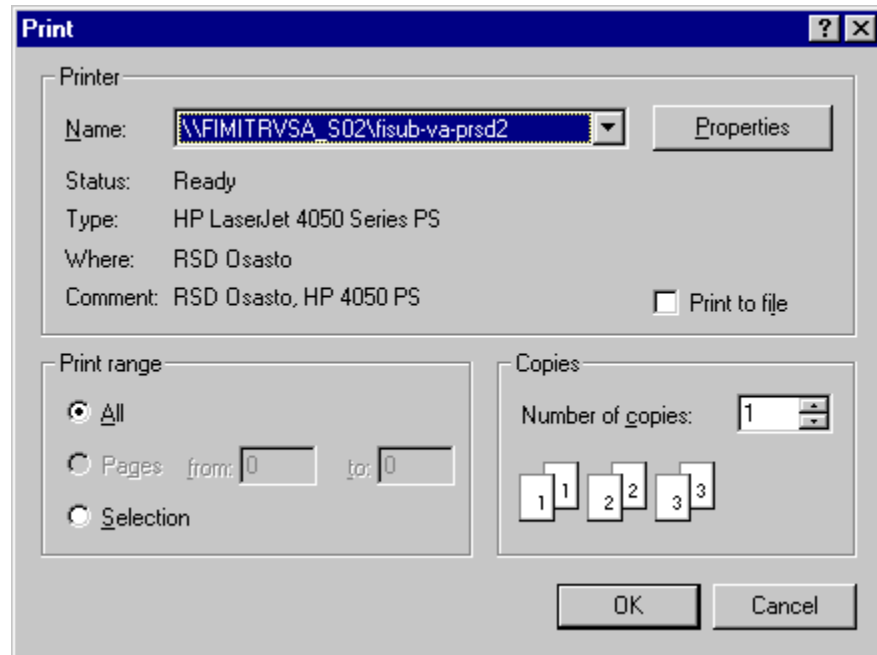


Figure 52. A sample Print setup

### Previously loaded projects

The three last and the current project are also displayed on the File menu. Any of these projects can be reloaded just by selecting the corresponding item.

### Import | Project

This allows an exported configuration (containing nodes and connections) to be imported to the database. The operator is asked to specify a directory from where the import will happen. This should be a directory to where the Export | Project -function (described below) has created a NETDB directory. The following window is used for the directory selections:

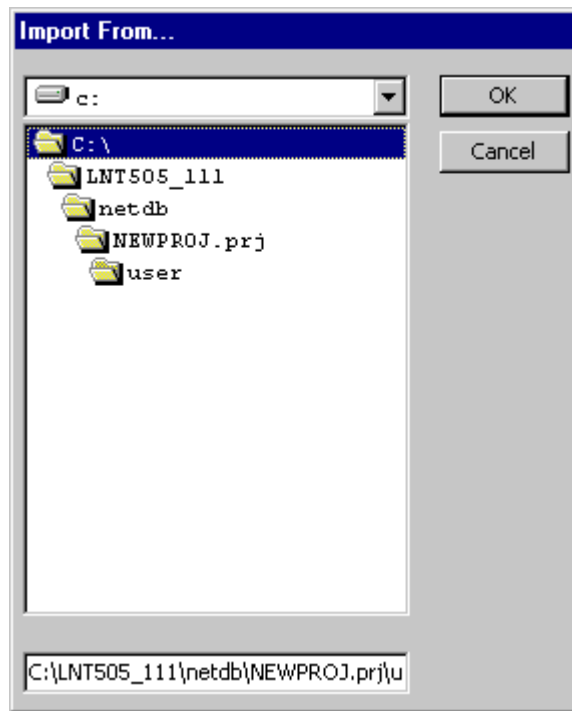


Figure 53. Import directory selection

### Import | Nodes

This allows the operator to import a (previously exported, see Export| Nodes below) configuration of a single node. The standard Windows file dialog is used here:

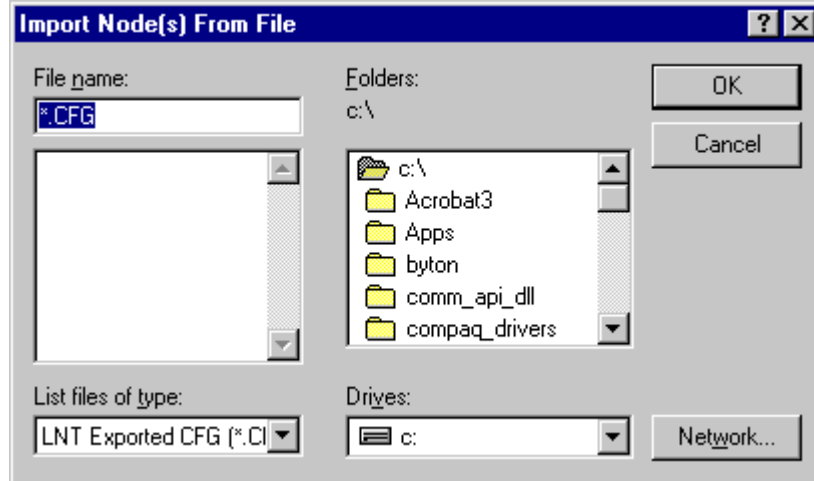


Figure 54. Import Nodes

### Export | Project

This selection allows the whole project configuration, including devices and connections, to be exported. The directory selection window (shown above on Import | Project) is used for selecting the target directory (and the target drive!). The project is exported to the NETDB directory under the selected directory. The function Import | Project described above can be used to import the exported project.

## Export | Nodes

One or more nodes (devices) on the configuration can be exported using this function. Each of the configurations is exported to a separate file, having the name of format `sssnnn.CFG`, where `sss` is the device subnet and `nnn` is the device node id. The operator is also asked for the directory where to export the files (using the directory selection dialog shown above). The selection of the exported devices is done with the window shown below:

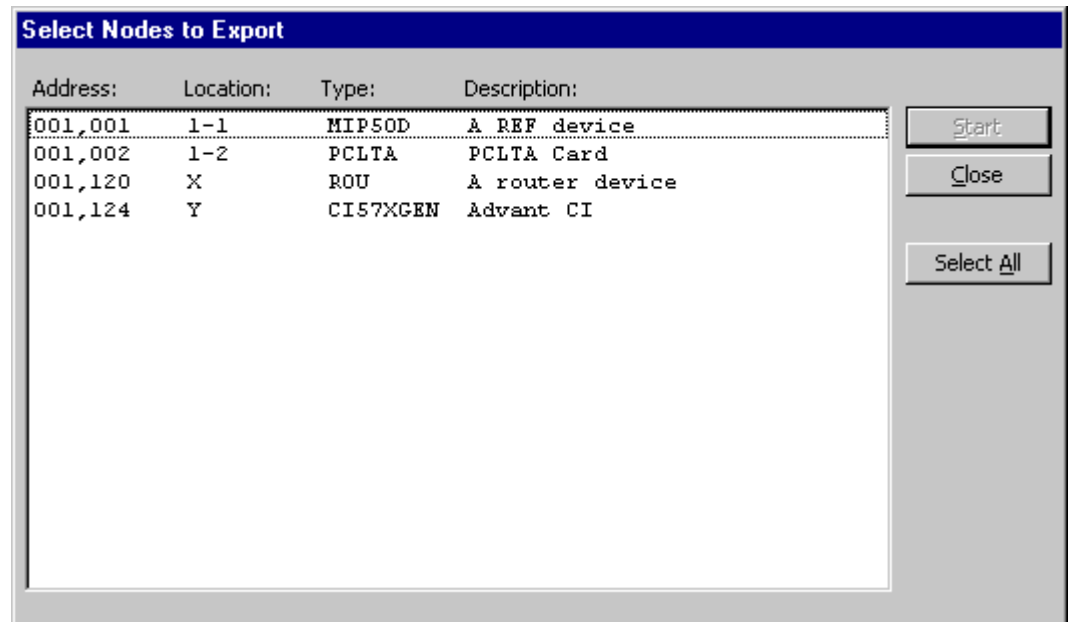


Figure 55. Export Nodes

## Exit

This menu selection is used to close the application. If a modified project is loaded the Lon Network Tool asks the operator if the configuration should be saved.

## 4.2

### Configuration menu

#### Clear

This function will destroy the contents of the current configuration but preserve the current project. The operator is asked if he wants to continue before destroying the configuration.

#### Upload from network

This function reads the configuration of the devices on the currently loaded project from the network. The existing connections are discarded and a new set of connections is created based on the selector and address values found. This function is also used when a new configuration is created from an existing physical network. Upload function also asks if the operator wants to verify the upload operation. This is discussed also in the Verify menu item paragraph below.

## Download to network

This function is used to transfer an off-line created configuration to the physical network, as shown in Figure 24 above. The Lon Network Tool writes configuration tables of the devices on the current project. The operator can select if he wishes to download all devices or just some of the devices. Also two different download methods are available: Full download rewrites all address/nv config table entries. Quick download writes only those entries which are non-empty (in Lon Network Tool's opinion). If the operator selects a single node the Last downloaded field displays the date and time of the last download of that device. After a download operation the program asks the operator if it should immediately execute a Verify operation (described below). The "Select All" button toggles selection of all nodes. The "Undone" button selects those devices which have not been downloaded earlier. Like the Upload function, the Download function includes the possibility to immediately verify the Download operation.

## Verify

This function verifies the configuration, i.e. checks that the configuration of the currently loaded configuration and the physical network are equal. This is done by reading all the configuration entries and comparing them to the corresponding database information. If differences are found a report is generated and the operator is informed. After a download or upload operation the operator is asked if he wants immediately execute this function.

## Install Nodes

This function allows the operator to install the nodes to the network. Installation in this case can be described as giving the Lon identity to a device. In practice this means assigning a subnet/node address to a device. A selection window quite similar to the Download selection window is used (there is no "Quick" and "Full" options and the "Last Installed" is shown instead of "Last Downloaded"). The installation is usually done using a service pin message. When the installation is started a window allowing the operator to modify the Neuron chip configuration structures is shown. That window is described later on the section describing device editing operations. After the operator has finished the structure settings (which he can simply pass if he wishes the structures not to be modified) the Lon Network Tool starts to wait for a service pin message. The installation selection window layout during the service pin wait is shown in Figure 23.

## 4.3

### Connections menu

#### NV Connections

This function brings up the window for network variable connection processing. The controls of this window are specified above on chapter 3.5, starting from page 18.

#### LSG Event connections

The LSG Event connection creation window can be invoked using this menu selection. The controls of this window are specified above on chapter 3.5, starting from page 18.



## View by device

This function allows the existing connections, both nv and LSG Event, to be viewed by device. The window used here (shown below) allows the operator to select one of the devices then displaying the connections the device belongs to. The operator can select which type of connections he wants to be shown. Also by selecting a connection and clicking the "View" -button the operator can go to the connection creation/edit windows shown above. Each line begins with a id which specifies the type of the connection. For the senders of the LSG Event connections the letter 'E' is displayed. For the receivers of the events, the letters 'E1' or 'E2' are displayed, depending on the target index of the receiver node.

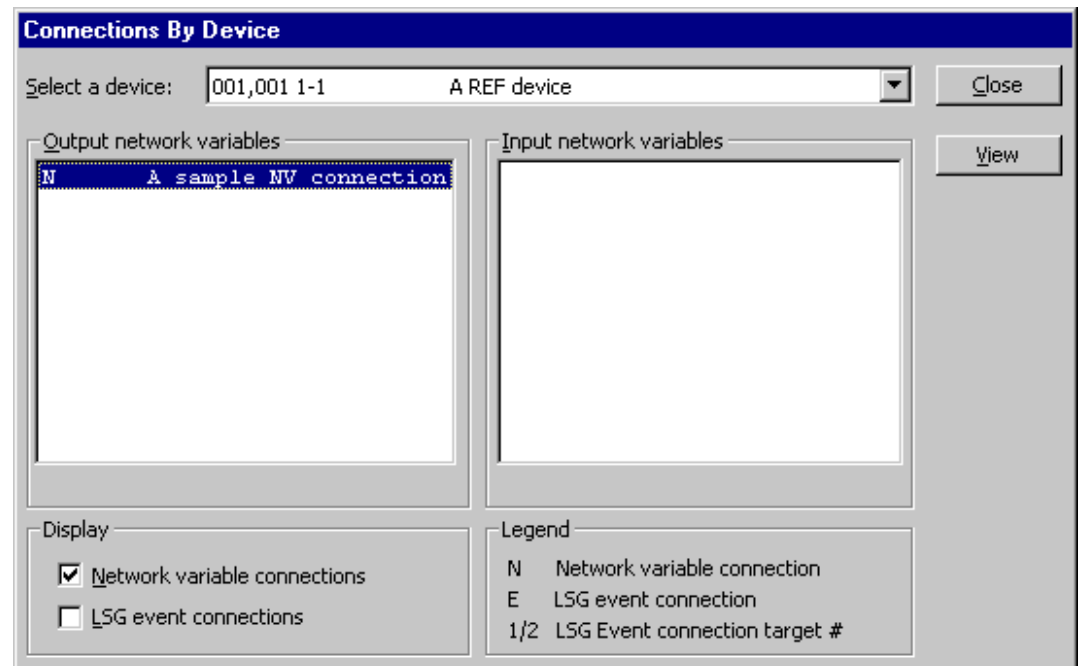


Figure 56. Connections by device

## Download to network

This menu selection allows one or several connections to be downloaded. This function may be considered to be the "Quickest download" function (when compared to the "Full" and "Quick" download (Figure 24), since it will write to the network only those nv config table / address table entries which are involved on the selected connection(s). The operator can select/deselect all connections or the desired connection type using the command buttons.

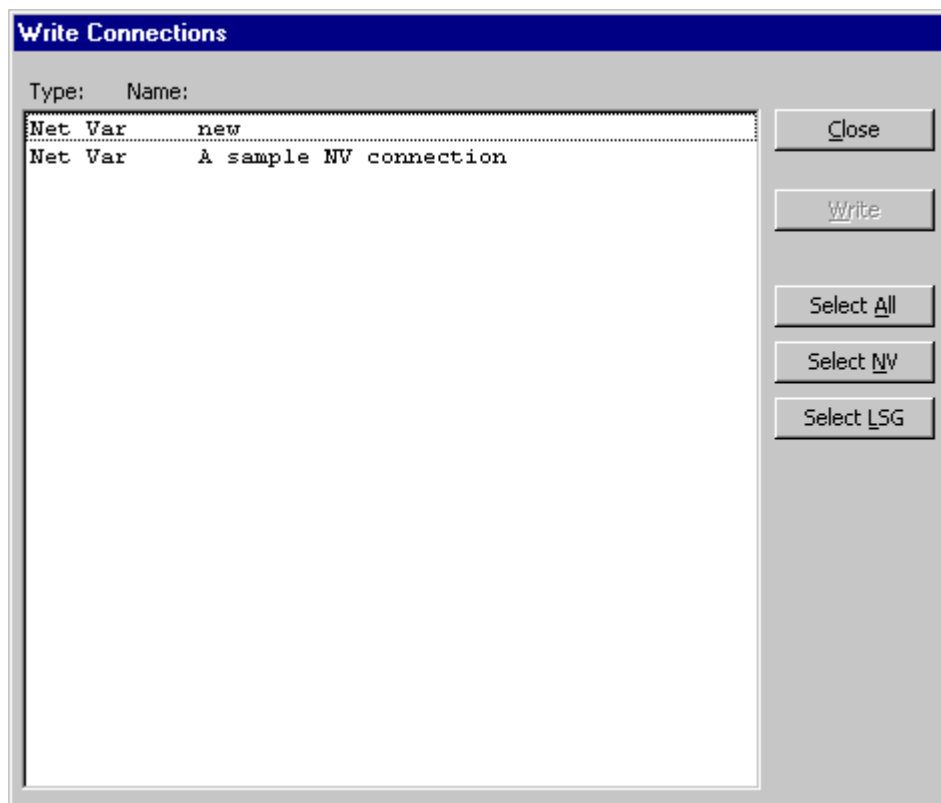


Figure 57. Download connections

## 4.4

### Devices menu

#### Add

This menu selection is the other of the two alternatives to add a new device to the configuration (the other being dragging a device type icon to the Devices -window). The windows used with this selection are described with the Add/Edit function, see Figure 7). The first window involved with this function allows the operator to specify device type, subnet/node address, location string and a description about the node. It also provides access to the node's network interface configuration and Neuron Chip structure settings.

#### Edit

This menu selection can be used to modify an existing device. There exists several windows associated with this function, which can be accessed by the same window used on the Add function above. The available edit windows depend on the device type of the selected device.

#### Unconfigure

This function "cleans" the configuration of the device, i.e. empties address table entries and modifies nv config table entries to have unbindable selectors. This function can be used to make a device "harmless" without removing it from the configuration: By unconfiguring a node and downloading the "unconfiguration" the physical node becomes inactive in the sense of its Lon interface.

## Delete

As the name indicates, this function permanently removes the device from the configuration. If the device belongs to any connections, it is removed from those connections.

## Types

This function, like the next one, does apply to the device types instead of individual devices (like the previous functions on this menu). It lists the existing device types, allowing the operator to remove, export and import these types. The export/import -function is quite similar to the one implemented with the individual nodes, except that all the exported device types are stored to a single file. The following window is used by the List types -function:

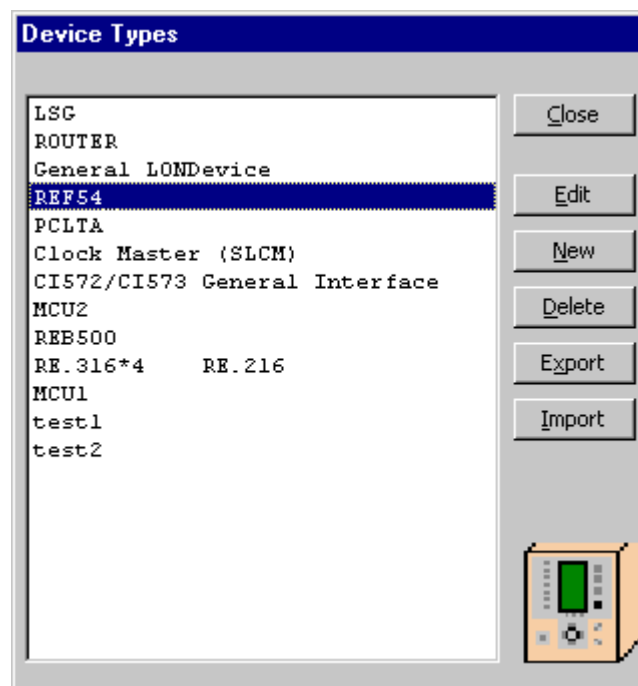


Figure 58. Device type processing window

The "New" button on the Device Types window deserves special attention, since it uses a window which is used also for device type editing and device instance creation and editing is used here as it is shown in Figure 16

## 4.5

### Network menu

This menu contains three different function groups. The first, Connect -group is used when connecting to a physical network. The Project Nodes -group contains functions which involve all the nodes on the currently loaded project. The last group, Single Node, contains functions which can be performed to a single network device, independently on any project currently loaded. Most of these Single Node -functions use the dialog window shown below to ask the operator for the address of the target node.

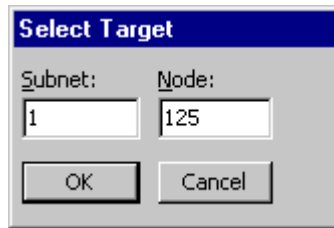


Figure 59. Target address

This window is also used by many other Lon Network Tool functions. The operator should note that the Single Node functions can very effectively mess up an existing network configuration, if not used with caution! However, the single node operations do not effect to the database of the Lon Network Tool, unless the configuration changed with these functions is uploaded to an existing project.

### Connect | On-line

This selection turns the program to on-line editing mode. This means that every operation made with the loaded project is immediately, without any operator action, downloaded to the physical network. The Lon Network Tool asks the operator to confirm this operation and verifies that all the devices can be reached. Where possible, the Lon Network Tool also checks the types of the devices. For some operator-defined types it may not be able to do this.

### Connect | Create

This function can be used for creating a project from an unknown physical network. This function first runs the Scanner application and then creates the device structure of the network based on the results. After that the program asks the operator if the configuration should be uploaded immediately. This upload is equal to the Configuration | Upload from Network menu selection. Below is shown the Scanner application:

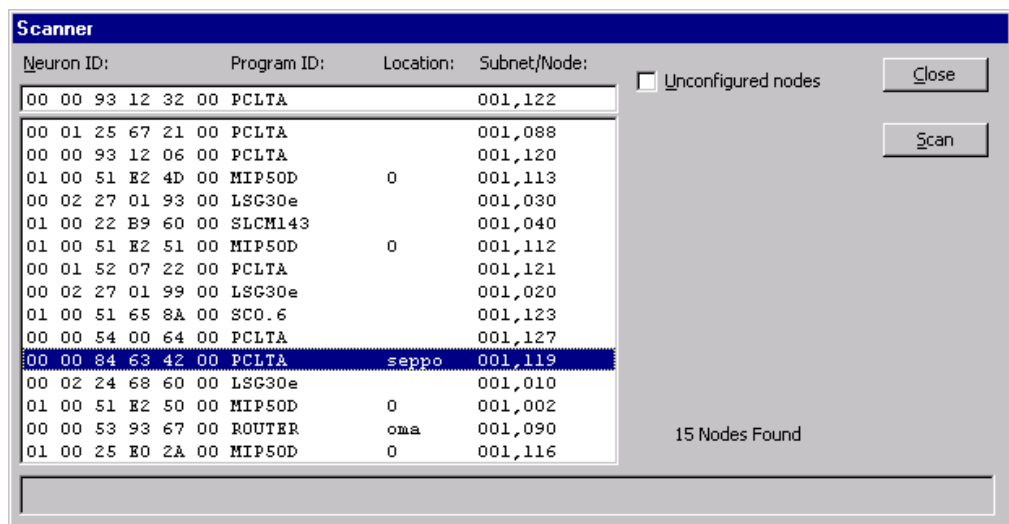


Figure 60. Scanner

## Network | Scan

This function starts the Scanner application. It can be used to verify the current network structure, for example.

## Project nodes | Ping All

This function executes a so-called Ping operation with all the nodes on the project. In practice this means sending Query Status to each of the nodes. If some of the nodes do not answer the operator is notified. This function is a quick way to check the overall status of the network. For more detailed information the Single Node | Query Status (described below) can be used.

## Project nodes | Reset

This function resets all the nodes on the currently loaded project. A selection dialog similar to the File | Export | Node -function is used.

## Project nodes | Clear Status

This function sends a Clear Status message to all nodes on the currently loaded project. A selection dialog is also used with this function.

## Project nodes | Set Priorities

This function can be used to set the Node priority and Channel priorities settings of the project nodes. The project devices with their `node_priority` value are listed on the window used for this function. The `node_priority` value of the selected node can be changed. A separate text field for `channel_priorities` value is also contained on the window.

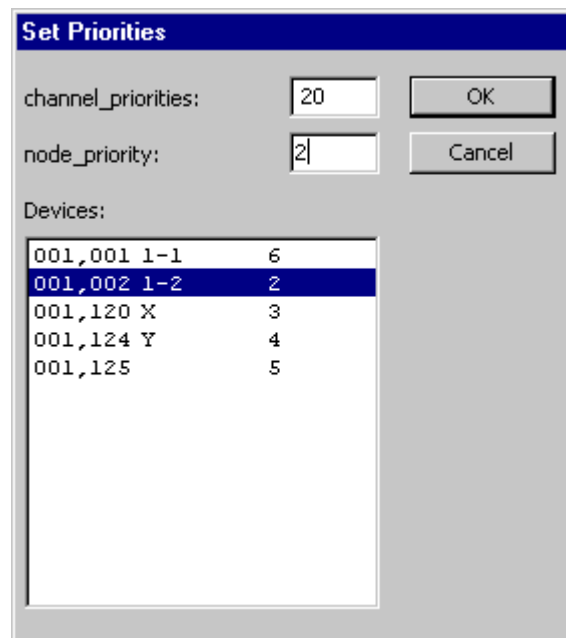


Figure 61. Project priority settings

## Project nodes | Increment authentication key

This function allows the authentication key of the project nodes to be incremented. The initial value of this key should be set separately using the device instance edit controls. A node should be selected for reference before this function can be executed. The authentication key of only the selected node will be displayed, but the increment operation will affect to all project nodes. The following window is used for this function:

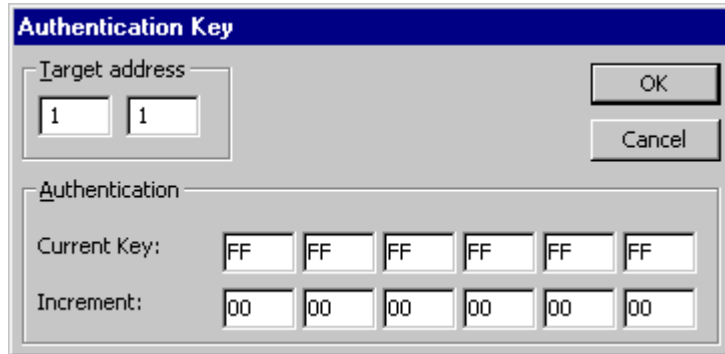


Figure 62. Authentication Key increment

## Single Node | Query Status

This function can be used to execute a Query Status to a single node. The following window is used to display the results. For an existing query status window the information can be updated (read again from the target) by double-clicking the window. Certain critical values are emphasized with red colour.

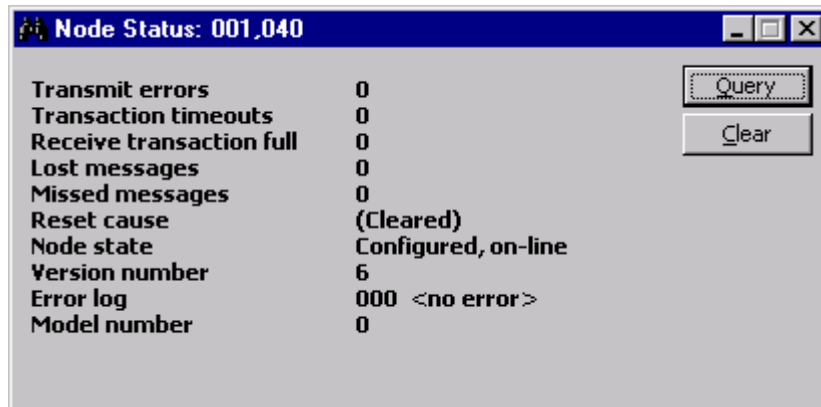


Figure 63. Query Status result

## Single Node | Wink

This function can be used to send a Wink message (simple format) to a network device. No special windows are associated with this function.

## Single Node | Ping

This function is designed for allowing the operator to monitor a single node by sending a query status message. Checking the "Monitor" check box causes the message to be sent cyclically. If the node responds, a green label is shown. If no

response is received the label is changed to red. Also, if the target node has transmit errors the text "XMIT" and the number of the errors is shown on the label, as on the rightmost picture below. When the "Monitor" function is active the number of succeeded and failed messages are displayed on the smaller green and red labels. If the "Beep" check is set the Lon Network Tool will give an audible indication for failed messages.

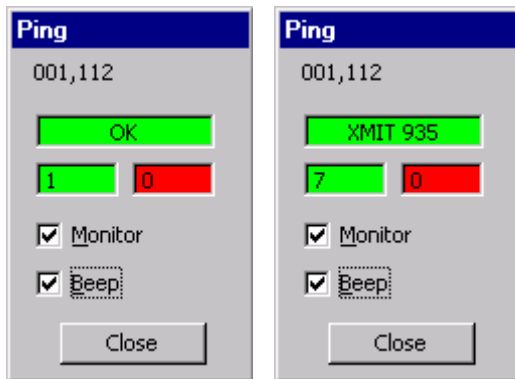


Figure 64. Sample Ping results

### Single Node | Domain Table

This function allows the Domain table of a single node to be modified. The subnet/node address can not be changed from this dialog, but the domain id and authentication key can be set using this function. The operator can select if he wishes to use two domain table entries, if the physical device does have two domain table entries. The domain id and authentication key can be viewed and entered using three different formats, hexadecimal, decimal or ASCII.

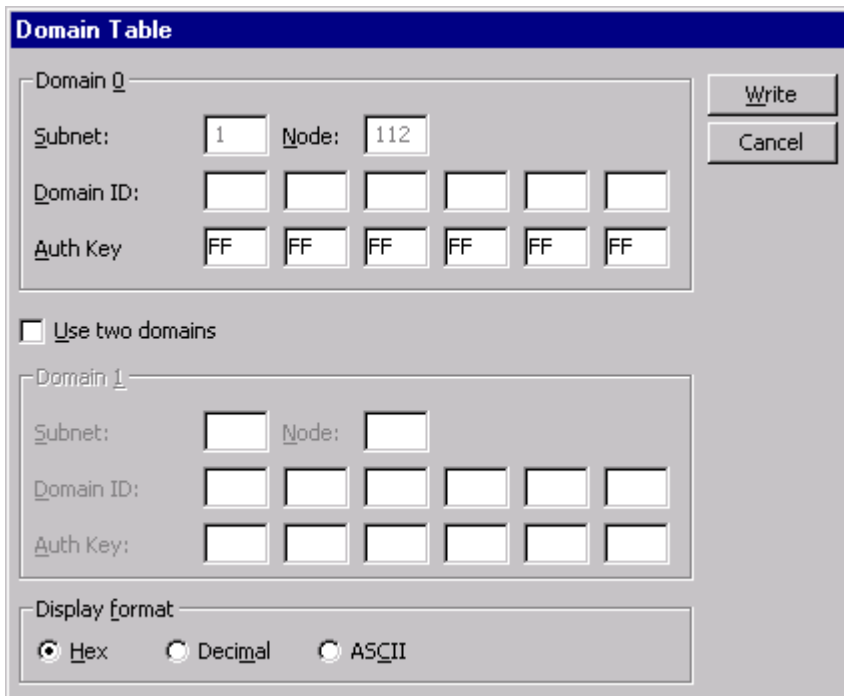


Figure 65. Domain table

The operator should note that if he uses this window to change the Domain settings of a network node the tool may not be able to communicate with the node any longer! The operator should refer to LonWorks documentation on how the domain settings affect to node's ability to communicate with another nodes.

### Single Node | NV Configuration Table

This function allows the Network Variable Configuration table to be modified. Initially, the window does not display any entries. It is assumed that the operator selects the index area to be viewed (either by entering the first and last index to read to the "From...to" -text fields, or by painting the rows with the appropriate indexes) and presses "Read".

The data can be edited by selecting a cell (or several cells on a single column) and typing the desired value. Backspace can be used to remove characters. For those values which have only limited set of allowed values (like "Yes" and "No") any key pressed toggles through these values. The mode "Standard" should be used for Lon devices which do not support extended address table processing. The options "Extended" and "Only Extended" can be used for read and write operations with devices which support extended address table. See Appendix 1 of this document for more information. The "Write" button writes the modifications to the device. Only one entry is written at the time, for example selecting multiple rows will only write the first one. A single row can be selected by double-clicking the row with the mouse. By selecting a single row and clicking the right mouse button the operator is able to view the data of the entry, as well as fetch or poll the nv value.

Idx	Priority	Direction	Selector	Trnarnd	Service	Authent.	Addr Idx
0	No	IN	3FFF	No	ACKD	No	<unused>
1	No	IN	3FFE	No	ACKD	No	<unused>
2	No	IN	0001	No	ACKD	No	1
3	No	IN	3FFC	No	ACKD	No	<unused>
4	No	IN	3FFB	No	ACKD	No	<unused>
5	No	IN	3FFA	No	ACKD	No	<unused>
6	No	IN	3FF9	No	ACKD	No	<unused>
7	No	IN	3FF8	No	ACKD	No	<unused>
8	No	IN	3FF7	No	ACKD	No	<unused>
9	No	IN	3FF6	No	ACKD	No	<unused>
10	No	IN	3FF5	No	ACKD	No	<unused>
11	No	IN	3FF4	No	ACKD	No	<unused>
12	No	IN	3FF3	No	ACKD	No	<unused>
13	No	IN	3FF2	No	ACKD	No	<unused>

Figure 66. NV Configuration table

### Single Node | Address Table

This function processes the address table quite similar way than the nv config table is processed above. The mode "Standard" should be used for Lon devices which do not support extended address table processing. The options "Extended" and "Only Extended" can be used for read and write operations with devices which support



extended address table. Appendix 1 of this manual provides more information on this subject.

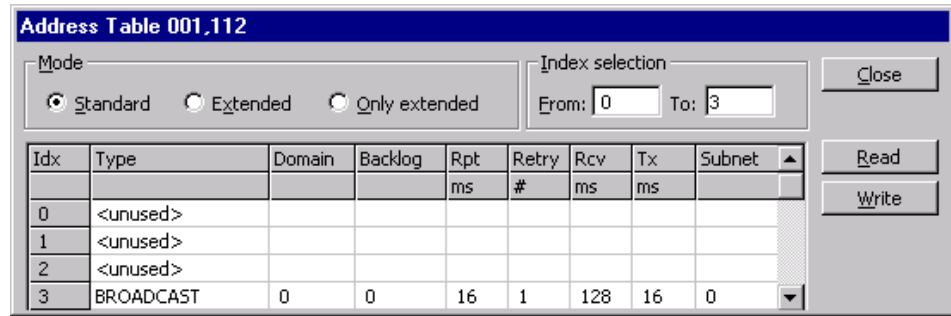


Figure 67. Address table

When clicking the right mouse button on the grid of the Address table the original format of the selected address entry (row) can be seen.

### Single Node | Neuron Buffers

This function allows the operator to specify the sizes and counts of the Neuron Chip communication buffers. Pressing the OK button causes immediate write memory message to the device, so the Checksum/Reset action can also be specified here.

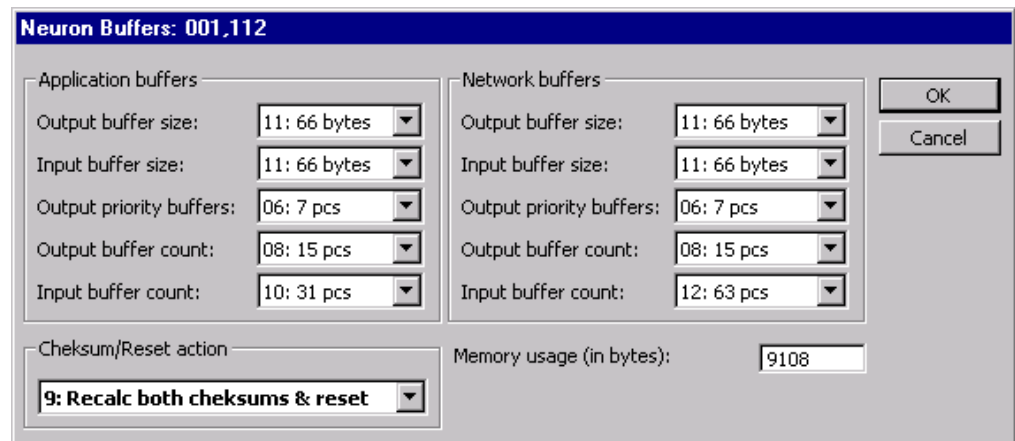
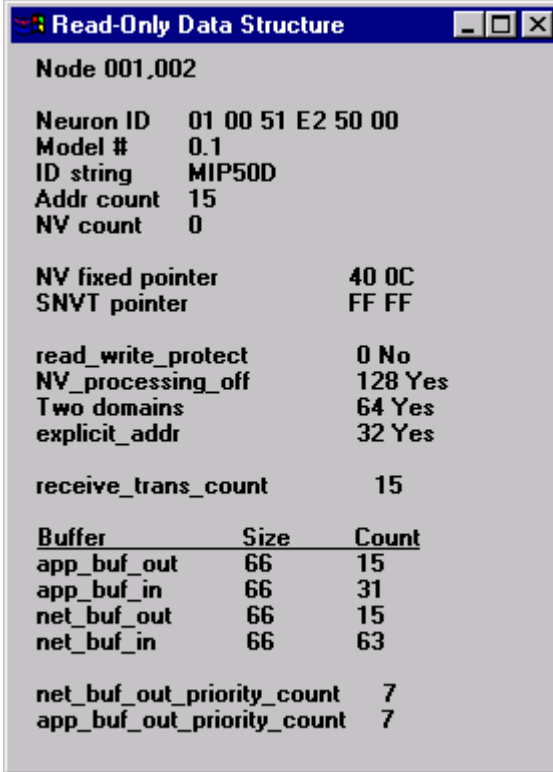


Figure 68. Neuron Chip communication buffers

### Single Node | Read-Only data structure

This function displays the Read-Only data structure of the selected device, using the following window:



Node 001,002

Neuron ID 01 00 51 E2 50 00  
 Model # 0.1  
 ID string MIP50D  
 Addr count 15  
 NV count 0

NV fixed pointer 40 0C  
 SNVT pointer FF FF

read\_write\_protect 0 No  
 NV\_processing\_off 128 Yes  
 Two domains 64 Yes  
 explicit\_addr 32 Yes

receive\_trans\_count 15

Buffer	Size	Count
app_buf_out	66	15
app_buf_in	66	31
net_buf_out	66	15
net_buf_in	66	63

net\_buf\_out\_priority\_count 7  
 app\_buf\_out\_priority\_count 7

Figure 69. Read-Only data structure

### Single Node | Configuration Structure

As the name indicates, this function displays the Configuration structure of the target device. For router devices the structure is displayed for both sides of the router.

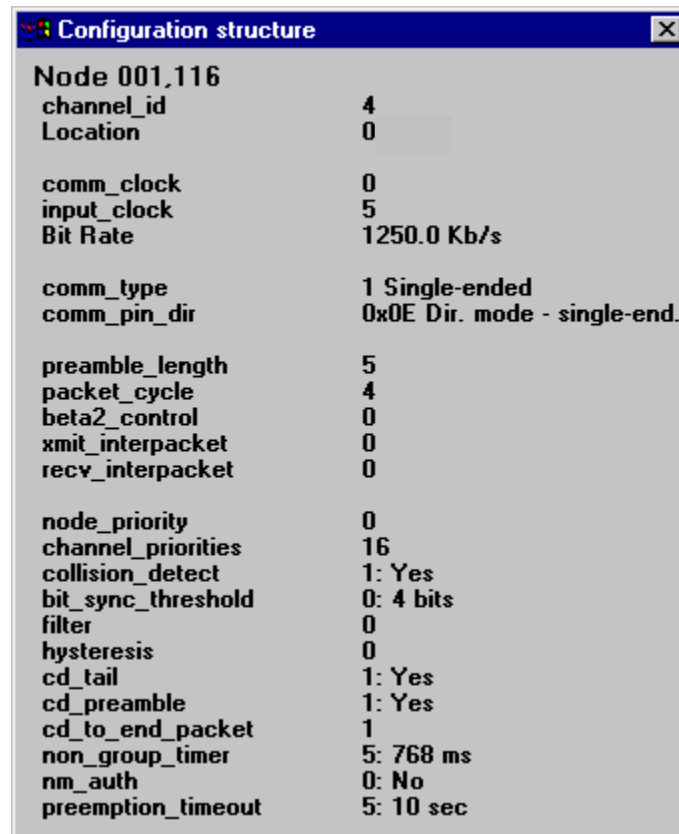


Figure 70. Configuration structure

### Single Node | Priority settings

This function basically uses the same window as the Project nodes priority settings, but the node list contains only one target node:

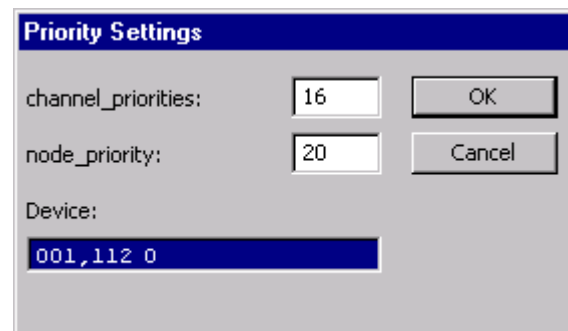


Figure 71. Single node priority settings

### Network | Single node| Fetch / Update Single NV

This function can be used for processing a single network variable. The value can be fetched (by nv index), manually or cyclically with given interval. Also the NV Poll (by selector) operation is supported. The Update function sends a NV update with the given selector and given data. The target device address can be changed without closing the window.

The screenshot shows a software window titled "Single Network Variable". At the top right, there is a "Target node:" field containing "001,112" and a "Close" button. Below this is a "Fetch" section with an "Index:" field containing "2", a "Result:" text area containing "34 02", and an "Interval (ms):" field containing "1000". There are "Manual" and "Stop!" buttons in this section. Below the "Fetch" section is a "Poll / Update" section with a "Selector:" field containing "0001", a "Data:" text area containing "34 02", and "Poll" and "Update" buttons. On the right side of the window, there is a "Target" button.

Figure 72. Single NV Fetch / Update

### Single node | Send NV Updates

This window can be used for sending network variable updates for multiple devices from multiple nv:s. First the operator should set the selector, update interval, data length and target address. Specifying zero node causes subnet broadcast to be used. Specifying also zero subnet causes domain broadcast to be used. True/False data causes zero data and data with all bits set to be sent after each other. After defining these settings the definition should be added to the "Active targets" list by using "Add" button.

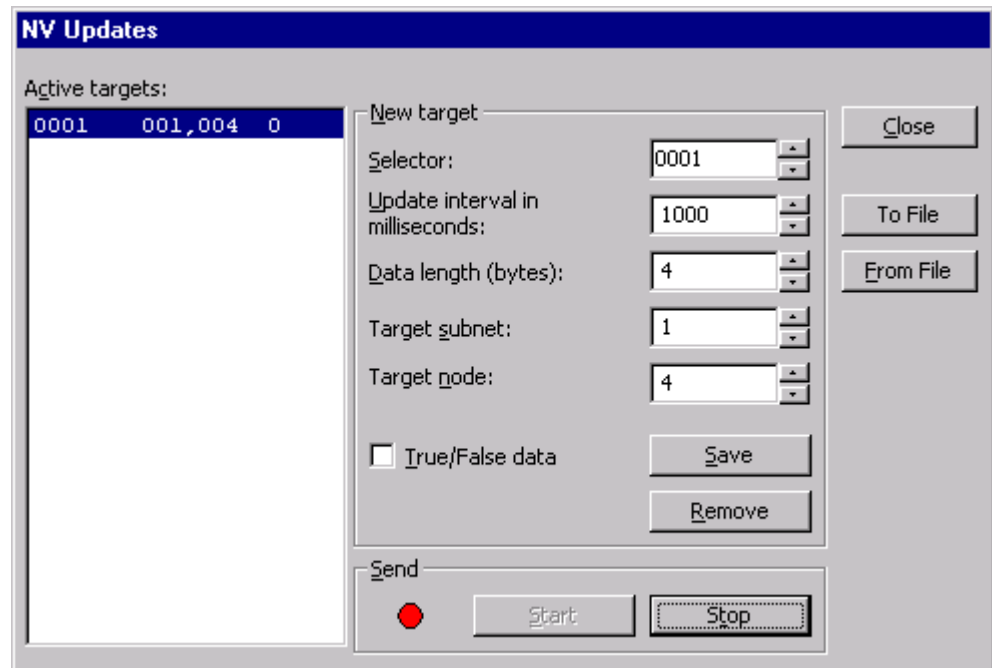


Figure 73. Send NV updates

Definitions can be saved to a file or loaded from a file. The "Start" button starts the processing. A circle left from the start button turns red whenever an update is being sent. The sending can be stopped just by moving the mouse pointer over the "Stop" button. Such feature was implemented since it sometimes was extremely hard to be able to press the button when the program was busy sending nv updates.

### Single node | Bind by Hand

This function is also called Manual Binding. It allows the operator to directly modify address table and nv configuration table of a device. The window shown in Figure 74 is used.

The operator is able to select the support for extended address table: A "Table mode" option group allows selection between the "No", "Yes" and "Only" options. The operator should refer to Address table and NV Configuration table windows above and Appendix 1 for more information.

The operator should specify the subnet and node of the target device and press connect. After that the Read Address table and Read NV Config table buttons can be used to read the tables. The read operations are targeted to the indexes given on the "From ... to" text fields. By selecting an item from the lists the item is displayed to the appropriate control group for editing. After the edit process the Update buttons can be used to write the modifications to the device.

Figure 74. Manual binding window

## Single Node | Install Node

This function starts an utility program called Quick Installer. With this program a node can be installed without creating a device instance and installing the instance from Install Project nodes -menu selection. The figure below displays the current layout of the installer. The Install menu provides functions for device installation, using Service Pin message and Neuron Id.

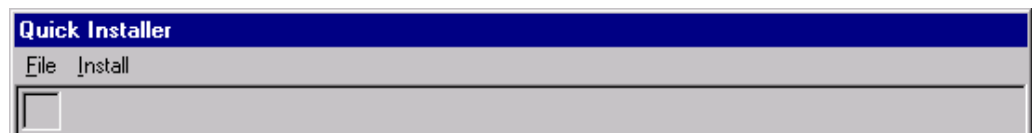


Figure 75. Installer application

## Single Node | Reset node

This function resets the selected node. No windows except the target selection window is associated with this function.

## Single Node | Clear Status

Executes the clear status operation. User interface similar to the Reset function. However, the Reset and Clear status function can be used together with Query Status function: Using Query Status a status window is opened. Now Reset or Clear status can be executed and the Query Status can be updated with a double-click.

## Single Node | Upload Neuron Structures

This function can be used to initialize the Read-Only structure and Configuration Structure of a device instance using an existing device as source. When creating device instances the operator may not know all the appropriate structure values. If a device of the same type can be reached through network this function can be used to retrieve suitable values.

### Note

It should be noted that the address on the target selection window defaults to the address of the currently selected device, but a different address can be specified if the source device has different address.

This function can be used to minimise the danger of damaging a device because of invalid installation information. Only the target selection window is used by this function, but the result of the Neuron structure upload can be viewed using the Structures command button on the Node Edit window.

## NM Authentication

This menu item can be used when an authenticated network management is required. When the operator checks this item all the network management messages (upload messages, download messages, etc...) are sent as authenticated.

## 4.6

### Tools menu

#### Documentation | Create

This function is used for creating project documentation, i.e. reports about the configuration. The window, in Figure 25, is used to select the type of the report to be generated:

The format and structure of the reports is described below. By checking the checkbox "View document now" the operator can immediately view the created document. The button "Go browse" allows direct transition to the Document browse function (described below).

#### Documentation | Browse

This allows the operator to view the previously generated reports. Reports are stored on 'per project' -basis, meaning that the operator can only view those reports that are created from the currently loaded project. The window, in Figure 26) is used.

For each existing report the file name and creation time are displayed. The check boxes below the list allow the operator to view only selected types of reports. They also provide a key to translate the filenames to report types. Reports can be viewed, printed and deleted. The report format is a standard ASCII file, so the files can be viewed with any text editor.

#### Device | SI/SD -Information

This function can be used to display the Self-Identification / Self-Documentation information of a device. A limited support for LonMark -formatted information is

included. The operator should refer to the Lon documentation for details on the subject. The following window is used for displaying the information:

Since the program does not know whether the target supports extended nv configuration table or not, the program asks the operator if only the extended query nv config table message is to be used. SI/SD information read using this method can be reported to an ASCII text file or it can be exported to a Lon Network Tool -specific file to be used for device type creation.

### Diagnostics | Define

This function allows the operator to create definitions for querying several status variables of network devices. The operator can select one or more devices (from the devices on the currently loaded configuration) and assign to this node group several statuses to be watched. The window, shown in Figure 76, is used for the purpose.

Here are listed the project nodes which can be added to the Selected devices -list. The operator can also specify a subnet/node address not belonging to the project. The combo box Available diagnostics contains three different selections, each displaying a set of different variables below the selection box. In addition to the Statistics counters shown on the figure above there exists a "Query Status" set containing the fields present on a status query response. There also exists "Derived statistics" -class, but it does not currently contain any variables. Once the operator has selected the desired devices and statistic counters, pressing the OK button moves to the diagnostics query window.

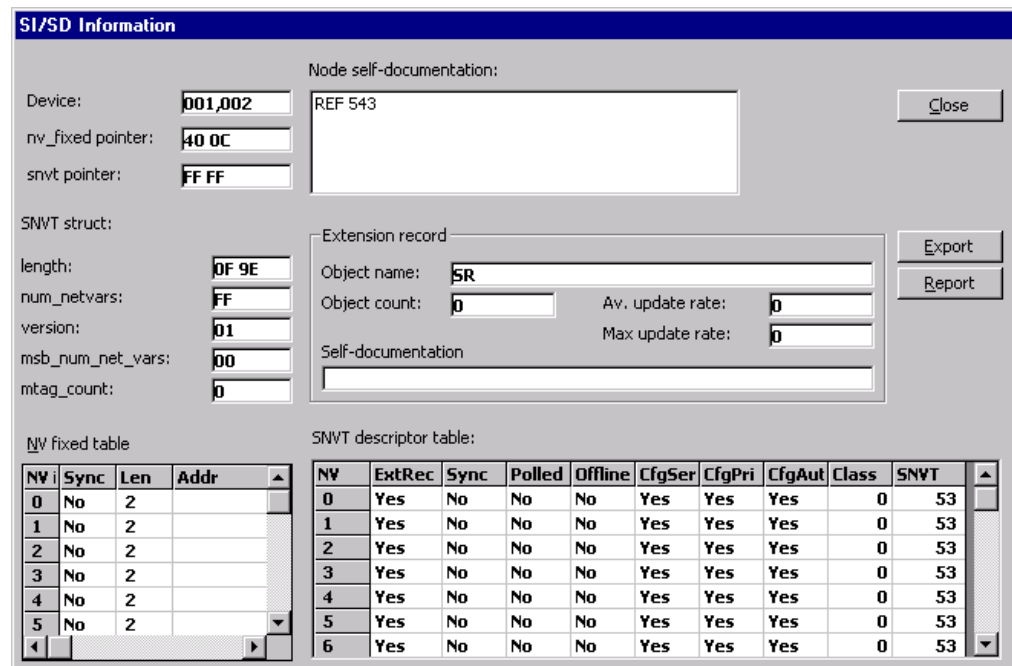


Figure 76. SI/SD Information

### Device | XIF file

This function allows the operator to view the information contained by a XIF (eXternal InterFace) file. The SI/SD Information window (Figure 76) is used for displaying the information.



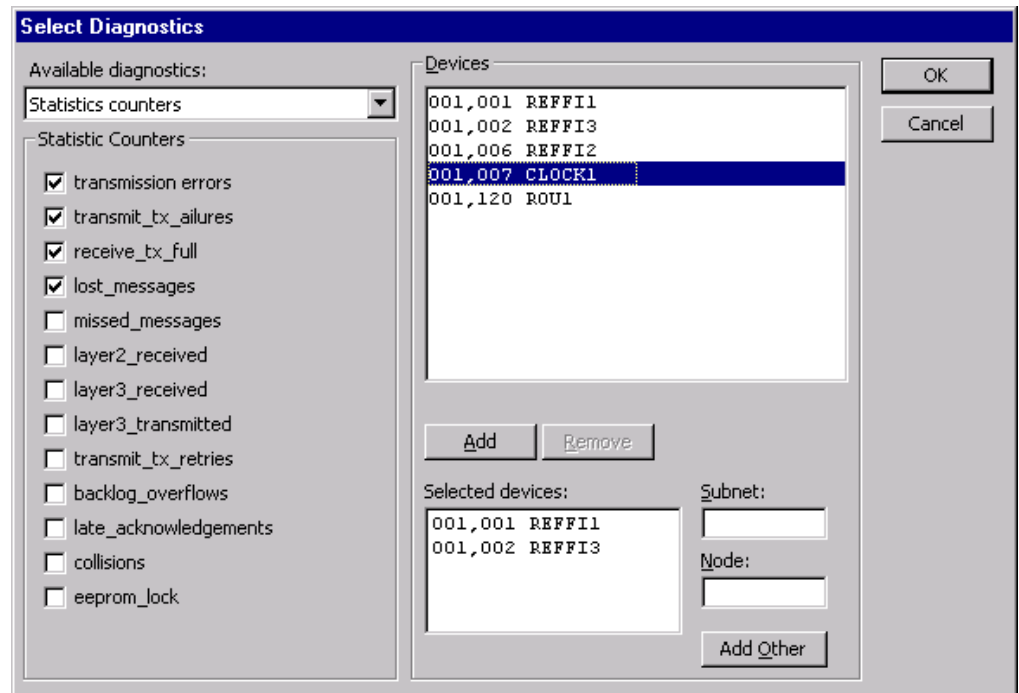


Figure 77. Diagnostics definition

## Diagnostics | Query

This menu selection allows the operator to use predefined diagnostic query information without having use the previous menu item first. From this window the operator can load and save query definitions.

The grid control displays the selected devices (columns) and the selected statistic counters (rows). For each device a separate query interval can be given. Also the query can be activated or deactivated for each device separately. On the figure above the texts "Off" on the toggle buttons indicate that the queries are not active. When pressed the button texts switch to "On" and the query is performed cyclically with given interval. The "Toggle all" button can be used to change the state of all the devices. The "DEAD" text indicates that the device has not answered. The "Save" and "Load" buttons can be used to save the current definition and load a previously saved query definition. The query results can be recorded to an ASCII file by using the Rec/Pause/Stop -buttons.

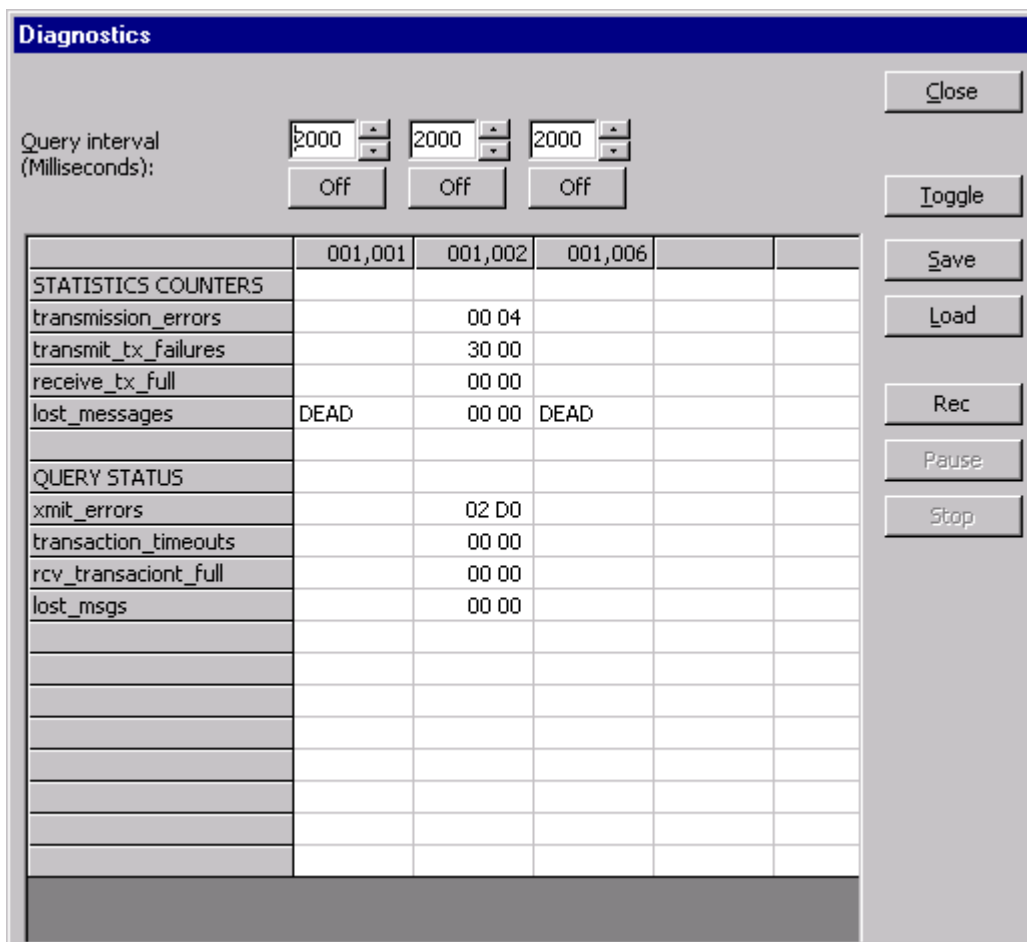


Figure 78. Diagnostics query

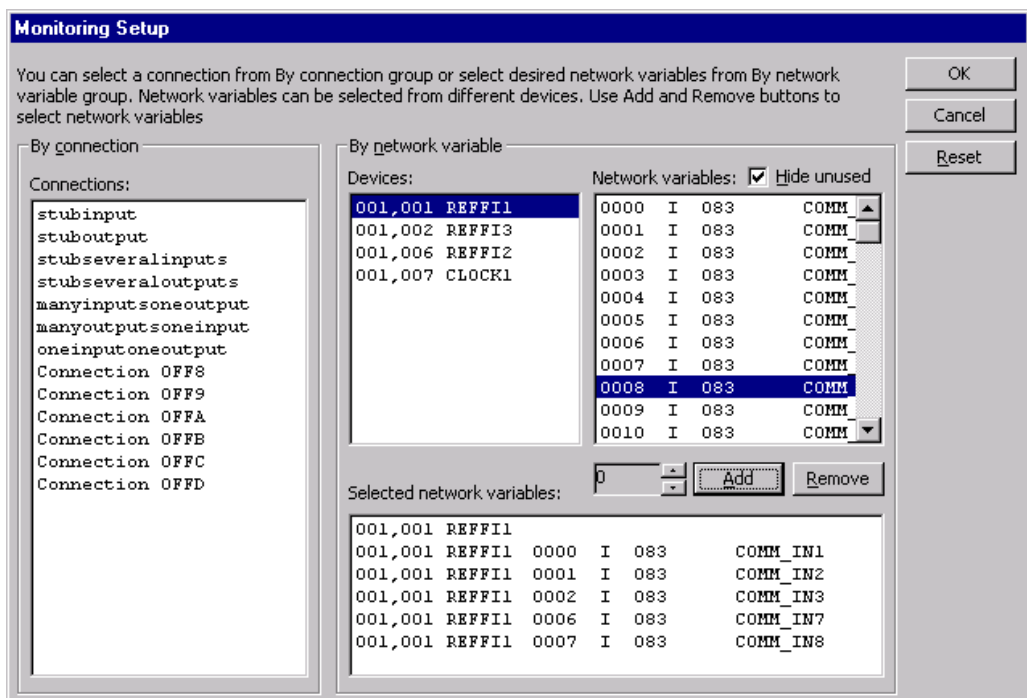
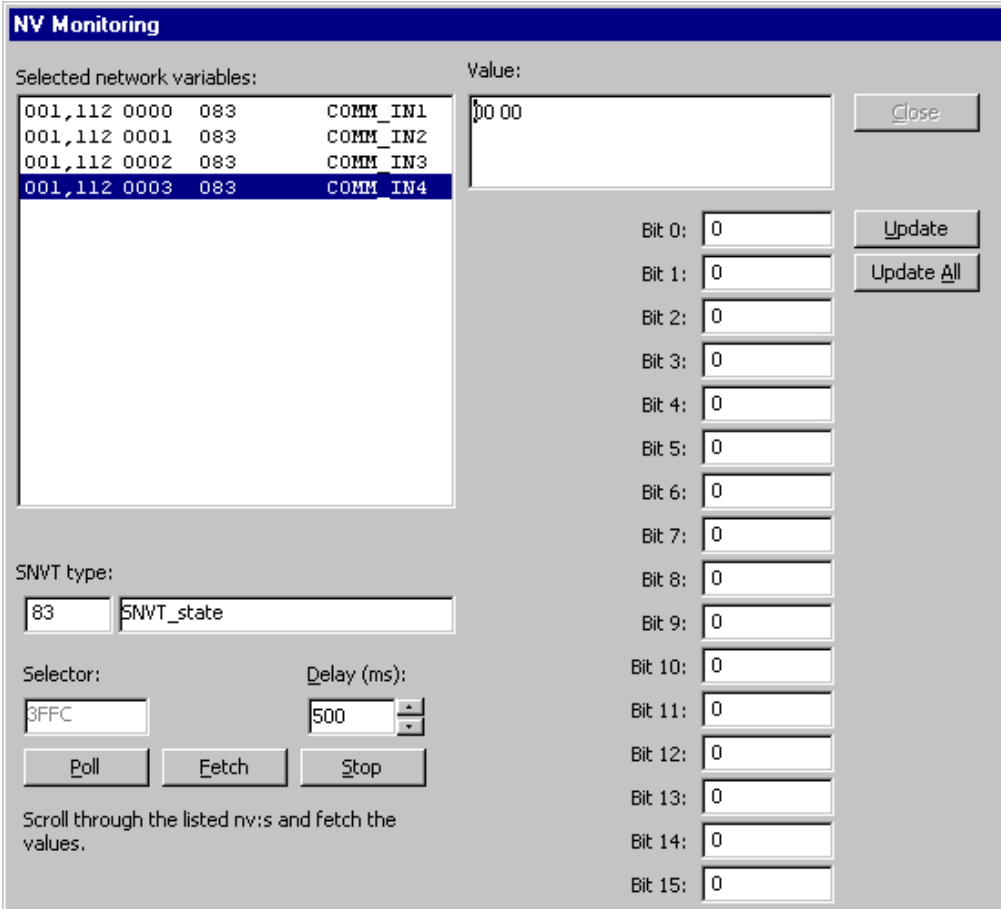


Figure 79. Monitoring Setup

## Monitoring | Network Variables

This menu selection provides access to the monitoring of the network variables. The monitoring can be based on two alternatives: The operator can select a set of individual nv:s from any project devices, or he can select an existing connection to be monitored. On the window operator should set one connection from the Connections list, or add one or more nv:s to the Selected NV:s -list. When a device is selected from the Devices list, all the device's nv's are listed to the NV:s list.

When the selections are made, pressing the OK button switches to the nv monitoring window. This window (below) contains tools for fetching, polling and updating a nv selected from the list, or cyclically poll all the listed nv:s. If the nv is known to have a SNVT type, the value is also shown in this SNVT format, like the SNVT\_alarm example below.



Selected network variables:			Value:
001,112 0000 083	COMM_IN1		00 00
001,112 0001 083	COMM_IN2		
001,112 0002 083	COMM_IN3		
001,112 0003 083	COMM_IN4		

SNVT type: 83 SNVT\_state

Selector: 3FFC Delay (ms): 500

Bit 0: 0  
Bit 1: 0  
Bit 2: 0  
Bit 3: 0  
Bit 4: 0  
Bit 5: 0  
Bit 6: 0  
Bit 7: 0  
Bit 8: 0  
Bit 9: 0  
Bit 10: 0  
Bit 11: 0  
Bit 12: 0  
Bit 13: 0  
Bit 14: 0  
Bit 15: 0

Scroll through the listed nv:s and fetch the values.

Figure 80. Monitoring nv:s

## Selectors | List

This function lists the selector values and displays how they are used. The window shown on Figure 27 is used.

## Selectors | Usage

This function creates a report listing those network variables of each device which contain a bindable selector value. The report is displayed immediately.

## File Operations

This menu selection starts the file transfer system. The file transfer window has a list containing the file id:s. The operator can add new id:s or remove existing id:s. The contents of the list is saved on exit and reloaded by the device subnet/node address.

The "Lookup" button can be used to view file id information. If no such file id exists, a FS\_LOOKUP\_ERROR line is displayed. Or, if no lookup response is received at all, the program notifies the operator that the target may not support File Transfer.

With the "New" and "Delete" buttons the operator can modify the listed file id:s. The "Selectors" group will allow the operator to change the file transfer selectors in the future versions of the program. Currently a set of fixed selector values are used.

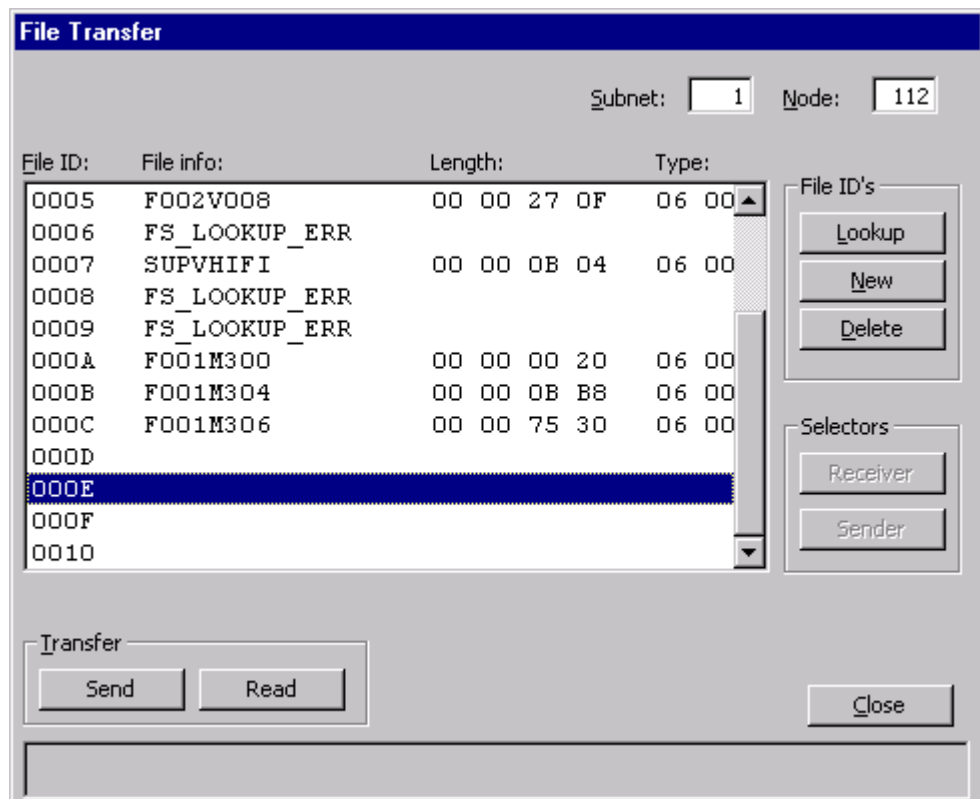


Figure 81. File transfer support

On the previous versions of LNT there were two methods for sending and receiving files: Fast and Standard. Currently only the "Standard" mode, which uses Lon NETAgent's file transfer capabilities, is supported. The "Fast" system is no longer present with the LNT.

The standard Windows file selection dialog is used for selecting outgoing and incoming file names. The system notifies the operator when an incoming file has arrived, but there is no direct method to detect the end of an outgoing transfer. The newest Lon NETAgent versions do make an audible signal ("Beep") when a file object is closed. On successful transfer it means that the transfer has finished.

## LNT Options | NM Timers

This menu item can be used to specify the LonTalk timers used by the Lon Network Tool network management messages. The window used for specifying the timers is the same window which is used when giving the timer values for NV Connection.

## LNT Options | Menu Structure

This menu item can be used to choose between Normal and Technical menu structures. The Technical menu structure contains all menu items available. In Normal menu structure some technical menu items are not visible to the user.

## NETAgent | Start

This function starts the Lon NETAgent communication interface. If the Lon NETAgent is already running this function has no effect.

## NETAgent | Close

This function closes the Lon NETAgent. If the Lon NETAgent is not running this function has no effect.

## NETAgent | Configure

This function displays the Lon NETAgent configuration window. With this window all the used Lon channels can be configured.

Figure 82. Lon NETAgent configuration

The "Channel" combo box is used for selecting the channel. For channel 0 the text CONFIGURATION CHANNEL is displayed indicating that channel 0 is the only channel fully supporting all the configuration messages (in practice this means that the File Transfer works only on channel 0). The Lon device, subnet/node address, domain id and communication speed for the channel can be specified. When the Lon NETAgent is started each of the channels will be installed with these values. The Lon NETAgent currently supports maximum of three channels.

In addition to these channel-specific values separate controls exist for settings values common to all channels, such as the Default speed, log control value and Lon NETAgent path.

The Lon NETAgent configuration information is stored on file NETTOOLS.INI found on the Windows directory. More detailed information on this file and these settings is provided in Appendix 4: LNT 505 INI file settings

### **NETAgent | Net Interface**

The Net Interface Tool is invoked through this menu item. For detailed information on the Net Interface Tool, the operator should refer to the LNT 505 Installation and Commissioning Manual.

### **Other | LSG CFG Tool**

This menu item is used for starting the LON/SPA Gateway Configuration Tool.

### **Other | Display Log files**

Displays a list of the different .LOG files generated by the Lon Network Tool system. Allows also the operator to view and print these files. A function mainly for debugging purposes.

## **4.7**

### **Window menu**

This menu contains the list of the windows currently open. Also the following menu selections are available:

#### **Graphical**

This menu selection displays the (primitive) graphical window showing the structure of the network. This window may be further developed in the near future. The operator can select a background bitmap for the display, and, when once moved to some location, the node icons "remember" their location. With suitable background this feature can be used to illustrate the physical structure of the network.

#### **Arrange Icons**

This function arranges the minimized child windows.

## **4.8**

### **Help menu**

#### **Contents**

Displays the contents of the Lon Network Tool help.

### **About Lon Network Tool**

Displays the program version and date. Also a kind of animation is provided, to bring some light to the ordinary day of the operator.





## 5

### Appendix 1: Extended address table

The number of address table entries (15) specified by LonWorks may prove to be insufficient for some large applications. Hence, a set of special messages allowing a host-based Lon device access a larger number of address table entries, usually up to 255, has been introduced by some Lon device manufacturers.

Depending on the structure of the device and the target environment, two alternatives for extended address table support exists currently: Devices which support the standard address table AND the extended address table. These devices are called extended address table support "Yes" -devices in the Lon Network Tool. Another class of devices support only the use of the extended address table. These are called extended address table support "Only" -devices in the Lon Network Tool.

For both of these device classes the manufacturer of the device indicates that it should be used with the corresponding Lon Network Tool value.

It should be noted that the term "extended address table" means that the network variable configuration table of the device has also been extended: To be able to store address indexes 15-255 a new method for storing nv configuration table has been introduced. The details of these operations, however, are not visible to the operator, Lon Network Tool is capable of processing each device appropriately, according to the Extended address table setting of the device type information.



## 6

**Appendix 2: Address table timers**

When creating an address table entry for a nv connection a set of timer values should be set. These timer values are:

- Repeat timer (rpt\_timer, default: 0 = 16 ms)
- Retry count (retry, default = 1)
- Receive timer (rcv\_timer, default: 0 = 128 ms)
- Transaction timer (tx\_timer, default: 0 = 16 ms)

These default values are stored on the file LNT.INI found on the directory Lon Network Tool was installed. On that file the following section should be found:

```
[LON]
DEF_TIMERS=01 00
```

(If it is not found the lines shown above can be added by the operator with any text editor.) Here the string "01 00" specifies these values, in hexadecimal. The first byte, "0", gives the repeat timer value, the second byte, "1", gives the retry count, etc. By editing this file the default values used by the program can be changed. The number values 0-F are interpreted as follows:

Value	rpt_timer	rcv_timer	tx_timer
0	16	128	16
1	24	192	24
2	32	256	32
3	48	384	48
4	64	512	64
5	96	768	96
6	128	1024	128
7	192	1536	192
8	256	2048	256
9	384	3072	384
A	512	4096	512
B	768	6144	768
C	1024	8192	1024
D	1536	12288	1536
E	2048	16384	2048
F	3072	24576	3072

Values are given in milliseconds. The retry timer is directly the number of the retries. For example if (for some reason) the timer values should be set as follows: rpt\_timer 512 milliseconds, retry count 3, receive timer 2048 milliseconds and transaction timer 768 milliseconds, the result would be:

```
[LON]
DEF_TIMERS=A3 8B
```

The operator is also able to define the timer values used by the network management messages sent by the Lon Network Tool using this same method.



## 7

### Appendix 3: Router configuration

To make Router configuration more user-friendly several additional features have been added to the Lon Network Tool. When setting the Neuron Chip structure values for a Router devices (Figure 21) a set of default values can be retrieved by changing the *comm\_type* value. Changing the *comm\_type* of the Router near side also affects to the far side parameters of the router.

When the Neuron Chip communication buffer sizes/counts for a Router device are changed, the far side settings are always automatically set equal to the near side. However, if far side buffer data is modified, the near side values are not changed.

When creating a configuration with one or more router devices, the user should note the limitations the LonTalk protocol sets. Basically, nodes belonging to the same subnet can not reside on different sides of a configured router. Violating this rule may cause the devices to be unable to communicate. The operator should refer to the LonWorks documentation for more information on this subject.



## 8 Appendix 4: LNT 505 INI file settings

### 8.1 Overview

The LNT 505 system utilizes several Windows .INI files for storing and retrieving different LonWorks settings. The following .INI files are most closely associated with the LNT 505 system. File keywords are shown below with their most common values respectively.

### 8.2 File NETTOOLS.INI

This file can be found on the Windows directory of the system. This file contains settings which specify how the Lon Network Tool node (which is equivalent to the Lon NETAgent communication interface's node) should communicate with the LonWorks network.

#### Note

In addition to the LNT 505 system, this file may be used by some other tool using the Lon NETAgent communication interface, for example CAP 505 Relay Product Engineering Tool Box.

#### 8.2.1 Section [CHANNEL0]

DEVICE=LONP0

Specifies the device name which should be used for Lon communication. An appropriate device driver should be loaded to create the device.

The naming convention for the device name is as shown in the Table 5:

Device Name	Device Driver	Installed Board	where
LONn	Echelon driver	PCLTA	n >= 0
LONPn	MiSCLONP driver	PCLTA	n >= 0

Table 5. Naming convention for the device name

SUBNET0=255

NODE0=127

These settings specify the subnet/node address for the Lon Network Tool node. Lon Network Tool network interface (Lon Network Tool node) appears as a LonWorks node to the other devices on the same network.

DOMAIN0=

This setting specifies the initial domain id where the Lon Network Tool node should go to when the Lon NETAgent communication interface is started. The domain id is given in hexdump string format, such as:

DOMAIN0=11 22 33 44 55 66

AUTH\_KEY=FF FF FF FF FF

This setting specifies the authentication key for the Lon Network Tool node. The default value recommended by Echelon is used here.

```
SPEED=0
FREQ=10 MHz
```

These settings specify the Lon Bit rate (communication speed) to be used. These values are equal to LonWorks *comm\_clock* (SPEED) and *input\_clock* (FREQ) values.

SPEED can have any value which is legal to *comm\_clock*.

FREQ can have any legal clock rate value. The “MHz” text is optional. The operator should check the appropriate *input\_clock* value from the LonWorks network interface documentation.

Table 6. lists the mapping of the *comm\_clock* to Lon Bit rate values with *input\_clock* value of 10 Mhz:

comm_clock	0	1	2	3	4	5	6	7
Lon Bit rate	1250	625	312.5	156.3	78.1	39.1	19.5	9.8

Table 6. Neuron Chip *comm\_clock* to Bit rate mapping with *input\_clock* value 10 Mhz

Table 7. lists the mapping of the *comm\_clock* to Lon Bit rate values with *input\_clock* value of 5 Mhz:

comm_clock	0	1	2	3	4	5	6	7
Lon Bit rate	625	312.5	156.3	78.1	39.1	19.5	9.8	4.9

Table 7. Neuron Chip *comm\_clock* to Bit rate mapping with *input\_clock* value 5 Mhz

For more information both on *comm\_clock* and *input\_clock* the operator should refer to the LonWorks documentation.

```
AUTH_INPUTS=-1
AUTH_TIME=0
```

These settings specify if the ML10 Terminal Unit network variables should be set authenticated. AUTH\_INPUTS sets the authentication state of input and configuration network variables. AUTH\_TIME sets the state of the real-time network variable. A zero value specifies that no authentication should be used. Any non-zero value causes the authentication to be used.

## 8.2.2

### Section [NETAGENT]

```
DIR=C:\LNT505\NAGNT
```

This setting specifies the Lon NETAgent communication interface home directory. Tool programs requesting for the Lon NETAgent search for it under this directory.

#### Note

This setting is set by the LNT 505 installation program and should not be modified by the operator.

```
VERSION=
```



This setting specifies the Lon NETAgent program version. It is not used by the application thus being only of informational value to the operator.

LOGCTRL=0

This setting specifies whether the Lon NETAgent should generate the log file SYSLOG.LOG during program run. Value 0 specifies that no logfile should be generated. Value 255 specifies that all incoming and outgoing messages should be logged to the file. This setting is usually set to nonzero value only during Lon NETAgent troubleshooting.

SLOW=YES

On some environments the Lon NETAgent startup may take quite a long time. If communication errors are found and they may be caused by losing messages which are sent before the Lon NETAgent is ready, this setting may be specified. It increases the Lon Network Tool delay before trying to perform Lon NETAgent communication. Usually this field may be left out or set to have empty value.

### 8.2.3

#### Section [TOOLS]

LNT=C:\LNT505

This setting specifies the LNT 505 installation directory. Lon Network Tool database is created under this directory.

#### **Note**

This setting is set by the LNT 505 installation program and should not be modified by the operator.

LNTVERS=

This setting specifies the Lon Network Tool version. It is not used by the application thus being only of informational value to the operator.

#### **Note**

This setting is set by the LNT 505 installation program and should not be modified by the operator.

### 8.2.4

#### Section [LON]

DEF\_TIMERS= 01 00

This setting specifies the default Lon timer values used by Lon Network Tool when creating network variable connections.

NM\_TIMERS=63 06

This setting specifies the default Lon timer values used by Lon Network Tool for network management messages.

FTR\_TIMERS=C3 0C

This setting specifies the default Lon timer values used for Lon File Transfer request messages.

## 8.3 File LNT.INI

### 8.3.1 Section [LAYOUT]

No settings currently exist on this section and it may not appear on all .INI files. Future versions of LNT 505 may use this for some purposes.

### 8.3.2 Section [PROJECTS]

```
LAST=  
LAST2=  
LAST3=
```

These settings specify the three last loaded projects. The names of the projects appear on the File menu of the program.

```
AUTOLOAD=-1
```

This setting specifies whether the last loaded project should automatically be re-loaded when the program is started. Nonzero value causes the project to be loaded, a zero value does not.

### 8.3.3 Section [TOOLS]

```
SCANNER=NETSCAN.EXE  
INSTALLER=NETINST.EXE
```

These items specify the names of the Scanner and Quick Installer utility applications. Currently they do not have meaning, but, if during program development special versions of these tools are created, these settings may be used to specify which version should be used in a particular LNT 505 installation.

### 8.3.4 Section [NETAGENT]

```
AUTOSTART=0
```

This item specifies whether the Lon NETAgent communication interface should be automatically started whenever the Lon Network Tool is started. A zero value (default) causes the Lon NETAgent being started only when it is needed.

### 8.3.5 Section [STATE]

```
LOCATION= 4815, 10440  
SIZE= 540, 540
```

These items specify the size and location of the Lon Network Tool window, in pixels.

## 8.4 Other .INI files

The Lon Network Tool system creates and updates also several other .INI files, which are not visible to the operator. These files include:

- SNVT.INI: This file contains information about the SNVT types known by the Lon Network Tool system

- **STARTUP.INI:** This file specifies LonWorks resource values which can not be used by the Lon Network Tool. For example, the LonWorks file transfer selectors are by default set here in order to not to allow Lon Network Tool to use them when creating network variable connections.



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**ABB Oy**

P.O. Box 699  
FIN-65101 VAASA  
Finland  
Tel. +358 10 224 000  
Fax. +358 10 224 1094  
[www.abb.com/substationautomation](http://www.abb.com/substationautomation)