



# **NodeUtil Node Utility User's Guide**



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## Welcome

The NodeUtil Node Utility is a test and diagnostic tool that can be used with Echelon's family of network interfaces (including the PCLTA-20, PCLTA-21, PCC-10, i.LON® 10, i.LON 100, i.LON 600, i.LON SmartServer, SLTA-10, U10, and U20 network interfaces). You can use the NodeUtil Node Utility to diagnose and configure LONWORKS® network interfaces, routers, and devices.

NodeUtil is not a network management tool: It allows you to view and modify the configuration of a single device, but does not manage a device's configuration in the context of the network containing the device. For network management, a large number of LNS® based network management, diagnostic, monitoring and control tools are available; see [www.echelon.com/lms](http://www.echelon.com/lms). A popular LNS based network engineering tool is the LonMaker® Integration Tool; see [www.echelon.com/lonmaker](http://www.echelon.com/lonmaker) for more information.

**Important:** Using NodeUtil, it is possible to make a device inoperable, so that it no longer communicates with other devices in its network. Certain operations, such as modifying communications parameters to incorrect values, can cause an unrecoverable device failure.

The NodeUtil Node Utility is provided as an UNSUPPORTED software tool.

This document describes the NodeUtil Node Utility, including how to install it and run it.

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## Audience

The NodeUtil Node Utility is intended for advanced LONWORKS device developers and integrators. Misuse of the utility can adversely affect LONWORKS devices or networks.

This document assumes that you understand LONWORKS device development and device integration. In addition, a thorough understanding of either the Series 3100 or Series 5000 Smart Transceiver architecture is required for making low-level changes to device configuration.

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## Related Documentation

The following manuals are available from the Echelon Web site ([www.echelon.com](http://www.echelon.com)) and provide additional information that can help you develop LONWORKS applications:

- *FT 3120 / FT 3150 Smart Transceiver Data Book* (005-0139-01D). This manual provides detailed technical specifications on the electrical interfaces, mechanical interfaces, and operating environment characteristics for the FT 3120® and FT 3150® Smart Transceivers.
- *Introduction to the LONWORKS Platform* (078-0183-01B). This manual provides an introduction to the ISO/IEC 14908-1 (ANSI/CEA-709.1 and EN14908) Control Network Protocol, and provides a high-level introduction to LONWORKS networks and the tools and components that are used for developing, installing, operating, and maintaining them.

- *LonMaker User's Guide* (078-0333-01A). This manual describes how to use the Turbo edition of the LonMaker Integration Tool to design, commission, monitor and control, maintain, and manage a network.
- *LonWorks Router User's Guide* (078-0018-01D). This manual provides specifications and user instructions for OEMs who plan to integrate RTR-10 core router modules into embedded or stand alone custom routers.
- *Mini FX User's Guide* (078-0398-01A). This manual describes how to use the Mini FX Evaluation Kit. You can use the Mini kit to develop a prototype or production control system that requires networking, or to evaluate the development of applications for such control networks using the LONWORKS platform.
- *NodeBuilder FX User's Guide* (078-0405-01A). This manual describes how to develop a LONWORKS device using the NodeBuilder FX Development Tool.
- *Neuron C Programmer's Guide* (078-0002-02H). This manual describes how to write programs using the Neuron C Version 2.2 programming language.
- *Neuron C Reference Guide* (078-0140-02F). This manual provides reference information for writing programs using the Neuron C Version 2.2 programming language.
- *OpenLDV Programmer's Guide* (078-0275-01C). This manual describes Echelon's OpenLDV™ Release 2.1 software. This document is intended for software developers creating OpenLDV applications for use with Echelon's family of LONWORKS network interface products.
- *OpenLDV Programmer's Guide, xDriver Supplement* (078-0277-01C). This manual describes how to install and configure xDriver, and how to create LNS applications for use with xDriver.
- *PL 3120 / PL 3150 / PL 3170 Power Line Smart Transceiver Data Book* (005-0193-01B). This manual provides detailed technical specifications on the electrical interfaces, mechanical interfaces, and operating environment characteristics for the PL 3120, PL 3150, and PL 3170™ Smart Transceivers.
- *Series 5000 Chip Data Book* (005-0199-01B). This manual provides detailed technical specifications on the electrical interfaces, mechanical interfaces, and operating environment characteristics for the FT 5000 Smart Transceiver and the Neuron 5000 Processor.

All of the Echelon documentation is available in Adobe® PDF format. To view the PDF files, you must have a current version of the Adobe Reader®, which you can download from Adobe at: [get.adobe.com/reader](http://get.adobe.com/reader).

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# 1

## Introduction

This chapter introduces the NodeUtil Node Utility. It also includes hardware and software requirements and installation instructions.

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## Introduction

The NodeUtil Node Utility is a console application for Microsoft® Windows® systems that can be used with Echelon's family of network interfaces (including the PCLTA-20, PCLTA-21, PCC-10, i.LON 10, i.LON 100, i.LON 600, i.LON SmartServer, SLTA-10, U10, and U20 network interfaces) to diagnose and configure LONWORKS® network interfaces, routers, and devices.

NodeUtil works with Echelon's OpenLDV network driver, which is included with several Echelon software tools, such as the LNS Turbo Edition and the LonMaker Integration Tool Turbo Edition. You can also download the OpenLDV network driver royalty-free from [www.echelon.com/openldv](http://www.echelon.com/openldv).

NodeUtil is a low-level test and diagnostic tool—it is not a network management tool. It allows you to view and modify the configuration of a single device, but does not manage a device's configuration in the context of the network containing the device.

**Important:** Using NodeUtil, it is possible to make a device inoperable, so that it no longer communicates with other devices in its network. Certain operations, such as modifying communications parameters to incorrect values, can cause an unrecoverable device failure.

For network management, a large number of LNS based network management, diagnostic, monitoring and control tools are available; see [www.echelon.com/lms](http://www.echelon.com/lms). A popular LNS based network engineering tool is the LonMaker Integration Tool; see [www.echelon.com/lonmaker](http://www.echelon.com/lonmaker) for more information.

The NodeUtil Node Utility is provided as an unsupported software tool intended for advanced LONWORKS device developers and integrators.

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## Requirements

This section describes the minimum hardware and software requirements for the NodeUtil Node Utility.

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### *PC Hardware Requirements*

The following are minimum requirements:

- Intel® Pentium® III 366 MHz processor
- 128 MB RAM
- 10 MB of available hard-disk space
- 800x600 screen resolution
- An Echelon LONWORKS network interface—the PCLTA-20, PCLTA-21, PCC-10, i.LON 10, i.LON 100, i.LON 600, i.LON SmartServer, SLTA-10, U10, or U20 network interfaces
- An Internet Protocol (TCP/IP) compatible network interface (if you are using an i.LON 10, i.LON 100, i.LON 600, or SmartServer network interface)

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## PC Software Requirements

The following are minimum requirements:

- Microsoft Windows XP or 32-bit version of Windows 7, Windows Vista®, or Windows Server 2008
- OpenLDV 3.3C or later
- Appropriate Echelon network interface driver (if you are using an SLTA-10 or LTS-20)
- Windows TCP/IP software (if you are using an i.LON 10, i.LON 100, i.LON 600, or SmartServer network interface)

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## Installing the NodeUtil Node Utility

Before you install the NodeUtil Node Utility, perform the following tasks:

1. Install version 3.3C or later of the OpenLDV network driver, if you do not already have it. You can download the latest OpenLDV network driver from [www.echelon.com/openldv](http://www.echelon.com/openldv).
2. If you are using an Echelon network interface that needs a driver in addition to the OpenLDV driver, verify that the appropriate driver is installed. The ReadMe file for the OpenLDV network driver lists the network interfaces that require separate drivers.
3. Configure your network interface driver, if required. See the documentation for your selected network interface for details.
4. Install the **StdXcvr.xml** file, if you do not already have it. This file is automatically installed by many Echelon applications, such as the LonMaker Integration Tool, the NodeBuilder® FX Development Tool, the NodeBuilder Resource Editor, the ShortStack FX Developer's Kit, and the FTXL™ Developer's Kit. The **StdXcvr.xml** file is installed to your LONWORKS Types folder (**C:\LonWorks\Types** or **C:\Program Files\LonWorks\Types** by default; you might have changed the location of your LONWORKS folder when you installed your first LONWORKS tool).

If you do not have a **StdXcvr.xml** file in your LONWORKS Types directory, you can download the file from the Design Guidelines page at [www.lonmark.org](http://www.lonmark.org).

You can download the NodeUtil Node Utility from Echelon's Downloads Web page: [www.echelon.com/downloads](http://www.echelon.com/downloads).

To install the NodeUtil Node Utility, perform the following tasks:

1. Download the **153-0222-01A\_NodeUtilxxx.zip** file, where **xxx** represents the current version of the utility, such as 221 for version 2.21.
2. Unzip the contents of the file to a folder on your PC. For example, you can create a **NodeUtil** folder in your LONWORKS folder, and unzip the NodeUtil Node Utility to this new folder. You run the **NodeUtil.exe** program from this folder. If you have installed other Echelon tools, you can unzip the NodeUtil Node Utility to your LONWORKS **Bin** folder. The installation programs for many Echelon tools add the LONWORKS **Bin**

folder to your Windows path, which makes it easy to run NodeUtil from any directory.

# 2

## Using NodeUtil

This chapter describes how to start the NodeUtil Node Utility, including the command-line parameters. It also describes the NodeUtil main menu and the NodeUtil device menu.

---

## Starting NodeUtil

To start the NodeUtil Node Utility, perform the following steps:

1. Open a Windows command prompt.

Windows 7: **Start** → **All Programs** → **Accessories** → **Command Prompt**

Windows XP: **Start** → **Programs** → **Accessories** → **Command Prompt**

2. If you installed NodeUtil in a directory that is not in your Windows path, use the **cd** (change directory) command set the current directory to the folder that contains the **NodeUtil.exe** file.
3. Enter **NodeUtil**, with appropriate command-line parameters (as described in the next section, *Command-Line Parameters*), to start the NodeUtil Node Utility.

Alternatively, you can use a Windows shortcut for the NodeUtil Node Utility; see *Creating a Shortcut to NodeUtil* on page 8.

When the NodeUtil Node Utility starts, it displays introductory text similar to the following text, followed by the NodeUtil main menu (see *The NodeUtil Main Menu* on page 9):

```
Echelon Node Utility Release 2.21
Received uplink local reset
Successfully installed TP/FT-10 network interface.
Welcome to the Echelon Node Utility application.
Activate the service pin on remote device to access it.
Enter one of the following commands by typing the indicated letter:
```

If NodeUtil cannot open the network driver, NodeUtil displays an error message similar to the following message, and exits.

```
Echelon Node Utility Release 2.21
Error initializing network interface (LON1): could not open network
driver
```

In this case, check that the network driver is loaded correctly, that you have OpenLDV 3.3C or later installed, and that your network interface hardware is correctly configured.

---

## Command-Line Parameters

The NodeUtil command has the following format:

```
nodeutil <command-line-parameters>
```

where *<command-line-parameters>* include the following: [-D*device*] [-A] [-B] [-H] [-I*inputfile*] [-J] [-M] [-O*outputfile*] [-S] [-V] [-?]. These parameters are described below:

**-D***<interface\_name>*

The **-D***<interface\_name>* parameter specifies the name of the network interface that you want to use. This parameter is required if your network interface is not named **LON1**, but is optional if you use **LON1**. If you specify an invalid network interface name, NodeUtil displays an error message. The network interface name is not case sensitive.

To specify an i.LON 10, i.LON 100, i.LON 600, or SmartServer, use the form **x**.*<Profile>*.*<i.LON\_or\_SmartServer\_name>*. For example, -

**Dx.Default.SmartServerAtHQ** specifies the **Default** xDriver profile, with the **SmartServerAtHQ** smart energy manager. See the *OpenLDV Programmer's Guide*, and the *OpenLDV Programmer's Guide, xDriver Supplement* for more information.

**-A**

The **-A** parameter specifies that NodeUtil should start in application mode. In this mode, NodeUtil does not configure the network interface, and does not accept service pin messages. That is, NodeUtil treats the network interface as an application device.

If you do not specify this parameter, NodeUtil assigns the network interface to a random subnet address in the zero-length domain with a node ID of 126, and sets the network interface to the configured state.

**-B**

The **-B** parameter specifies that NodeUtil to use only the OpenLDV network driver, and bypass the IP-852 network interface driver (formerly called VNI), if installed. In this mode, other host applications cannot share a single network interface.

This option need not be specified because **-B** is a default parameter.

**-H**

The **-H** parameter specifies that NodeUtil should not change the configuration of the network interface.

**-I***<input\_file>*

The **-I** parameter specifies that input to the NodeUtil Node Utility should be from an input text file rather than the keyboard. See *Using a Script File with NodeUtil* on page 25 for more information.

**-J**

The **-J** parameter prevents NodeUtil from querying SI data from a host-based device, such as a ShortStack Micro Server. By using this parameter, you can query a host-based device that does not have an attached host processor.

**-M**

The **-M** parameter specifies that a MIP or ShortStack device is being loaded (see *Y- Download Neuron Executable* on page 23). If you plan to load a MIP

or ShortStack device that is not currently attached to its host processor, use the **-J** parameter in addition to the **-M** parameter.

**-O**<*output\_file*>

The **-O** parameter specifies that output from the NodeUtil Node Utility be copied to the specified file. You can use this parameter to create a script file that you can use with the **-I** parameter. See *Using a Script File with NodeUtil* on page 25 for more information.

**-S**

The **-S** parameter specifies that NodeUtil should use slower transaction timers, which are suitable for use with PL-20 power line channels. By default, NodeUtil uses transaction timers that are suitable for TP/FT-10 channels.

**-V**

The **-V** parameter specifies that NodeUtil start up in verbose mode. In this mode, NodeUtil displays all network interface messages in detail.

**-?**

The **-?** parameter displays the command format, including a brief description of the command-line parameters, and exits.

---

## Creating a Shortcut to NodeUtil

Rather than entering the **nodeutil** command from a command prompt (as described in *Starting NodeUtil* on page 6), you can create a Windows shortcut to the command. You can then use the shortcut from your Windows Desktop or add the shortcut to your Windows Taskbar.

To create a shortcut:

1. Open Windows Explorer.

Windows 7: **Start** → **All Programs** → **Accessories** → **Windows Explorer**

Windows XP: **Start** → **Programs** → **Accessories** → **Windows Explorer**

2. Navigate to the folder in which you installed the NodeUtil Node Utility.
3. Right-click in the right-hand pane of the Windows Explorer window and select **New Shortcut** (or in Windows XP, you can alternatively select **File** → **New Shortcut**) to open the **Create Shortcut** wizard.
4. Enter the location of the **NodeUtil.exe** file (for example, **C:\LonWorks\Bin\NodeUtil.exe**), or click **Browse** to specify the location.
5. Click **Next** to continue.
6. Enter a name for the shortcut (for example, **NodeUtil LON1**).
7. Click **Finish** to create the shortcut.
8. Right-click the new shortcut, and select **Properties** to open the Properties dialog for the shortcut.
9. On the Shortcut tab, modify the text in the **Target** field to include the required command-line parameters for the NodeUtil Node Utility. For

example, add the `-D<interface name>` parameter to specify the network interface. The text in the **Target** field should look similar to the following command:

```
"C:\LonWorks\NodeUtil\NodeUtil.exe" -DLON2 -S
```

You should not need to make any other changes to the shortcut, so you can click **OK** to save your changes and close the dialog.

To add the shortcut to your Windows Desktop:

1. In Windows Explorer, navigate to the folder in which you created the shortcut to the NodeUtil Node Utility.
2. Click the shortcut and drag it to your Desktop.

To add the shortcut to your Taskbar in Windows XP:

1. In Windows Explorer, navigate to the folder in which you created the shortcut to the NodeUtil Node Utility.
2. Click the shortcut and drag it to your Taskbar.

To add the shortcut to your Taskbar in Windows 7:

1. In Windows Explorer, navigate to the folder in which you created the shortcut to the NodeUtil Node Utility.
2. Right-click the shortcut and select **Pin to Taskbar**.

---

## The NodeUtil Main Menu

When the NodeUtil Node Utility starts, it displays introductory text followed by the NodeUtil main menu, as shown below:

```
Welcome to the Echelon Node Utility application.
Activate the service pin on remote device to access it.
Enter one of the following commands by typing the indicated letter:

F1-- Show Banner.
A -- (A)dd device to list.
D -- Set the (D)omain of the network interface.
E -- (E)xit this application.
F -- (F)ind devices in the current domain.
l -- Find devices in all (l)-byte domains.
G -- (G)o to device menu....
H -- (H)elp with commands.
L -- Display device (L)ist.
M -- Change device (M)ode or state.
P -- Send a service (P)in message.
Q -- (Q)uickly add device to list.
R -- (R)eboot 3150 device.
S -- Report device (S)tatus and statistics.
T -- (T)ransceiver parameters.
V -- Control (V)erbose modes.
W -- (W)ink a device.
Z -- Shell out to command prompt.
< -- Redirect input from a file.
> -- Redirect output to a file.
NodeUtil>
```

Type the indicated letter (or function key) to run the corresponding command. You can stop any command by pressing the **ESC** key.

The **G**, **M**, **R**, **S**, and **W** commands prompt you to enter an ID for the device that you want to address with the command. NodeUtil maintains a list of devices that it knows about, indexed by ID number. This device list initially contains only the network interface itself, which has an ID of 0. For most of these commands, the default device is the last device in the list. You can use any of the following methods to add devices to the NodeUtil device list:

- Attach the device to the network and activate its service pin. When NodeUtil receives the service pin message, it adds the device to the device list and then displays the device ID and the program ID of the device. Subsequent service pin messages only display the device ID. If the service pin message is received from a router, two entries are made in the device list; the first entry will be for the router near side (the side closest to the network interface), and the second entry for the router far side.
- Enter either the **Find devices in all (1)-byte domains** or the **(F)ind devices in the current domain** command. All unconfigured devices, and devices configured in any 1-byte domain, or in the configured domain of the network interface, as appropriate to the command selected, are added to the device list.
- Enter the **(A)dd device to list** command. You are prompted to enter the 6-byte Neuron ID of the device you wish to add to the list. Enter the Neuron ID in hex (for example, **9000011E28061102**).

Use the **(G)o to device menu** command to display the device menu; see *The NodeUtil Device Menu* on page 15.

---

## *F1 – Show Banner*

Use this command to display the name and version of the NodeUtil Node Utility.

---

## *A – Add Device to List*

Use this command to add a device to the device list. The command prompts for the device's Neuron ID. Enter the Neuron ID as six hex values, optionally separated by spaces. For example, you can enter "**9000011E28061102**" or "**90 00 01 1E 28 06 11 02**". If NodeUtil can communicate with the device, it is added to the directory. If NodeUtil cannot communicate with the device, it displays the following error message: Query status: Could not communicate with the node.

---

## *D – Set the Domain of the Network Interface*

Use this command to display, and optionally set, the first domain table entry of the network interface. You can use this command to specify the domain before using the **(F)ind devices in the current domain** command (from the main menu).

When you enter the **D** command, you are prompted for the following parameters:

1. The domain ID length (0, 1, 3 or 6 bytes). Press the **ESC** key if you do not want to change the domain.

2. For domain ID length greater than zero, the domain ID values in hex, optionally separated by spaces. For example, enter “0011AB” or “00 11 AB” for a three-byte domain. The default domain ID is all zeroes.
3. The subnet ID for the network interface. The node ID in that subnet is fixed at 126 (decimal) or 7E (hexadecimal).
4. The authentication key to use for the primary domain table entry. Enter the key as hex bytes separated by spaces. The default key is 0xFF for all bytes.
5. Whether you are sure you want to make the domain change. If you reply **Y**, the new domain entry is written into the device; if you reply **N**, no change is made.

The second domain table entry of the network interface is always set to the zero-length domain for the purpose of receiving service pin messages.

Changing the authentication key is useful if you need to update network variables that have been configured as authenticated. An update to an authenticated network variable must be sent using a domain in which the target device is configured, using the correct authentication key.

---

## *E – Exit this Application*

Use this command to exit the NodeUtil Node Utility. The device list is not saved.

---

## *F – Find Devices in the Current Domain*

Use this command to find all devices in the current domain. The current domain is set by the **Set the (D)omain of the network interface** command. The **F** command sends a domain-wide Query ID broadcast to all devices, and then queries all responding devices for their identification. Each new device is added to the device list. This command is useful when the service pins and Neuron IDs of the remote devices are not accessible. It discovers unconfigured and application-less devices, as well as devices that are configured in the domain of the network interface.

To query for devices configured in a specific domain, use the **Set the (D)omain of the network interface** command before the **(F)ind devices in the current domain** command. The **(F)ind devices** command broadcasts on the domain that you assign to the network interface. Changing the domain and subnet to the configured domain for the network is especially useful if your network contains routers. Normally, routers are set to the configured routing mode because that mode is the most bandwidth efficient. In the configured routing mode, routers pass messages only for configured domains. However, if the routers are set to the repeater mode, it might not be necessary to modify the domain and subnet node address of the network interface in order to find devices on domains, because the routers configured as repeaters pass valid messages sent on any domain.

---

## *1 – Find Devices in All 1-Byte Domains*

Use this command to find all devices in all one-byte domains. This command sends a domain-wide Query ID broadcast in each of the one-byte domains, and then queries all responding devices for their identification. Each new device is

added to the device list. This command is useful when you do not know the domain of the devices in the network, and you are not able to physically access the devices in order to press the service pin. This command discovers unconfigured and applicationless devices, as well as devices that are configured in the domain of the network interface. This command uses the domain information stored in the network interface, and rewrites the domain information to the network interface when the command completes.

This command can take a long time to complete. You can interrupt the command by pressing any key on the keyboard. To query for devices configured in a specific domain, use the **Set the (D)omain of the network interface** command before the **(F)ind devices in the current domain** command.

---

## *G – Go to Device Menu*

Use this command to display the current device list, and allow you to switch to the device menu for a specific device. Enter the ID of the device (first column of the device list) that you want to address. After you enter the device ID, the prompt changes to **DEVICE:x>**, where *x* is the ID of the device. To return to the main menu, use the **(E)xit** command.

You can use the device menu to display and update various data structures within a device, and to interact with the device using network variables or application messages. For descriptions of the information displayed by the device menu commands, see the *FT 3120 / FT 3150 Smart Transceiver Data Book*, the *PL 3120 / PL 3150 / PL 3170 Power Line Smart Transceiver Data Book*, or the *Series 5000 Chip Data Book*.

See *The NodeUtil Device Menu* on page 15 for a description of the device menu and its commands.

---

## *H – Help with Commands*

Use this command to display the main menu. The main menu is also displayed if you enter an unrecognized command.

---

## *L – Display Device List*

Use this command to display the NodeUtil device list. You can add devices to the list using any of the methods described in *The NodeUtil Main Menu* on page 9. The list includes the network interface, devices, and routers that NodeUtil has discovered or that you have added. For each device (and for each side of a router), the NodeUtil device ID, Neuron ID, and program ID is displayed. The program ID is displayed in hexadecimal; it is also displayed in text if it is a text program ID.

---

## *M – Change Device Mode or State*

Use this command to change the device mode or state for one or all devices. If there is more than one device in the device list, you are prompted to enter a device ID, or to select all devices. The default is all devices, meaning that the mode or state that you select will be changed for all devices in the current domain. See *D – Set the Domain of the Network Interface* on page 10 for more information about setting the domain.

See the device menu Change Device Mode or State command, *M – Change Device Mode or State* on page 20, for more information.

---

## *P – Send a Service Pin Message*

Use this command to send a service pin message using the NodeUtil network interface.

---

## *Q – Quickly Add Device to List*

Use this command to add a device to the NodeUtil device list without attempting to communicate with the device.

Use this command in environments that have a large number of devices that you manage with NodeUtil scripts (see *Using a Script File with NodeUtil* on page 25). The script can add the devices in the same order (so that they have the same device ID for each run of the script, thus aiding network testing). Also, for power line channels, adding many devices without the extra communications can be useful.

---

## *R – Reboot 3150 Device*

Use this command to restore the contents of the on-chip EEPROM memory of an FT 3150 or PL 3150 Smart Transceiver to the state it had when the off-chip EEPROM was first installed.

This command restores the communications parameters, device state, buffer configuration, and on-chip EEPROM variables. It also re-initializes the domain, address, and network variable configuration tables. If the device was previously installed in a network, the reboot command removes it from the network.

This command does not operate on a FT 3120 or PL 3120 Smart Transceiver, an FTXL 3190 Transceiver, or a Series 5000 device.

You can use the **(R)ebboot 3150 device** command on the network interface used to run NodeUtil, if it uses a FT 3150 or PL 3150 Smart Transceiver. In this case, the network interface is reconfigured after the reboot completes, so that it can continue to be used.

---

## *S – Report Device Status and Statistics*

Use this command to send a message to query the status of a specific device, and display the results. When you run this command from the main menu, you are prompted to enter a device ID.

See the device menu Report Device Status and Statistics command, *S – Report Device Status and Statistics* on page 20, for more information.

---

## *T – Transceiver Parameters*

Use this command to display the transceiver ID of the network interface, and to set the transceiver ID for network interfaces that have software-configurable transceiver IDs. For all network interfaces, this command also allows you to change the transceiver parameters for the network interface.

See the device menu Transceiver Parameters command, *T – Transceiver Parameters* on page 21, for more information.

---

## V – Control Verbose Modes

Use this command to enable or disable two verbose modes: for network interface messages and for network traffic. These modes are useful for debugging network problems. By default, network interface message verbose mode is off, and network traffic verbose mode is on.

If you enable verbose mode for network interface messages, NodeUtil displays the contents of all application buffers going to and coming from the NodeUtil network interface.

If you enable verbose mode for network traffic, any incoming message addressed to the application processor on the network interface is displayed.

---

## W – Wink a Device

Use this command to send a wink message to a device or all devices. If the device has been programmed to respond to this message, it activates the wink task. You are prompted to enter a device ID for this command; if you accept the default (all devices), the wink message is sent as a broadcast to all devices configured in the current domain.

---

## Z – Shell Out to Command Prompt

Use this command to open a Windows command prompt without losing the device list. Type **exit** at the command prompt to return to the NodeUtil Node Utility.

---

## < – Redirect Input from a File

Use this command to run a command script. A command script is a text file that contains NodeUtil commands. A script file can use have any file extension, but a common extension is **“.scr”**.

Commands that do not require a carriage return must be on their own line. Input that requires a carriage return must be on its own line. Network variable data is displayed (and entered) in hexadecimal.

You can run a script repeatedly, as needed.

See *Using a Script File with NodeUtil* on page 25 for more information.

---

## > – Redirect Output to a File

Use this command to redirect all NodeUtil output to a file. You are prompted to specify the file name. The default file name extension is **.log**. If the file already exists, you are asked if you want to **(O)verwrite** the file from the beginning, or **(A)ppend** output to the end of the file.

To stop redirection, enter a null file name.

This command is useful for saving the output of any of the NodeUtil commands, and for creating script files. See *Using a Script File with NodeUtil* on page 25 for more information.

---

## The NodeUtil Device Menu

From the NodeUtil main menu, enter the **(G) o to device menu** command to display the current device list and switch to the device menu for a specific device. Enter the ID of the device (first column of the device list) that you want to address. After you enter the device ID, the prompt changes to **DEVICE:x>**, where *x* is the ID of the device. To return to the main menu, use the **(E) xit** command.

You can use the device menu to display and update various data structures within a device, and to interact with the device using network variables or application messages. For descriptions of the information displayed by the device menu commands, see the *FT 3120 / FT 3150 Smart Transceiver Data Book*, the *PL 3120 / PL 3150 / PL 3170 Power Line Smart Transceiver Data Book*, or the *Series 5000 Chip Data Book*.

The NodeUtil device menu is shown below:

```
Enter one of the following commands:
F1-- Show Banner.
A -- Device (A)ddress table.
B -- (B)uffer configuration.
C -- Application (C)onfiguration structures.
D -- Device (D)omain table.
E -- (E)xit this menu and return to main menu.
F -- Configuration (F)iles.
G -- (G)o to another device.
H -- (H)elp with device commands.
I -- Network variable al(I)as table.
J -- (J)am network variable type.
K -- Chec(K) Neuron executable.
L -- (L)ist network variables.
M -- Change device (M)ode or state.
N -- (N)etwork Variable configuration table.
P -- (P)oll network variable.
Q -- (Q)uickly send a message.
R -- (R)ead device memory.
S -- Report device (S)tatus and statistics.
T -- (T)ransceiver parameters.
U -- (U)pdate input network variable.
V -- Control (V)erbose modes.
W -- (W)rite device memory.
X -- Create device interface ((X)IF) file.
Y -- Download Neuron executable.
[ -- Performance test.
= -- Signal strength.
* -- Refresh memory.
< -- Redirect input from a file.
> -- Redirect output to a file.
DEVICE:1>
```

**Important:** The following commands are not available for the NodeUtil network interface or for routers: F, I, J, K, L, N, P, U, X, Y, =, or \*.

Type the indicated letter (or function key) to run the corresponding command. You can stop any command by pressing the **ESC** key. These commands operate on the selected device, which is displayed in the NodeUtil **DEVICE** prompt.

---

## *F1 – Show Banner*

Use this command to display the name and version of the NodeUtil Node Utility.

---

## *A – Node Address Table*

Use this command to display or update a specific address table entry or the entire address table for the selected device. The address table defines the network addresses to which the current device can send implicitly addressed messages and network variables. It also defines the groups to which the device belongs.

The columns of data displayed include:

- Index – Defines the index of the address table entry.
- Type – Defines the address type (for example, group address, broadcast, subnet/node, Neuron ID, or unbound).
- Domain – Defines the domain to which the device belongs.
- Mbr/Nod – Defines the member ID of the device within the group for group addresses. The member ID is used in acknowledgments to allow the sender of an acknowledged multicast message to keep track of which nodes have responded.
- Rpt tmr – Defines the time interval (in milliseconds) between repetitions of an outgoing message for the repeated service.
- Retries – Defines the number of retries (0 to 15) for acknowledged, request/response, or unacknowledged-repeated service. The maximum number of messages sent is one more than the displayed number.
- Rcv tmr – Defines the receive timer (in milliseconds) for multicast (group) messages. If a message with the same transaction ID is received before the receive timer expires, it is considered to be a retry of the previous message.
- Tx tmr – Defines the time interval (in milliseconds) between retries for the acknowledged or request/response service. The transaction retry timer is restarted when each attempt is made, and also when any acknowledgment or response (except for the last one) is received.
- Grp/Sbnt – Defines the ID (0 to 255) of the group within the domain for group addresses. For managed networks, the group ID is allocated by the network management server. For Neuron ID addressing, a value of 0 indicates that the message should pass through all routers in the domain. For subnet/node addressing, a value of 0 is not a valid subnet ID. For broadcast addressing, a value of 0 indicates that the message should be delivered to all nodes in the domain.

After the entry is displayed, you can change the entry, one value at a time. For each value, the default value is the current setting. If you enter a non-valid

value, the utility displays an error message (Value out of range) and displays the maximum allowable size, and you are prompted to enter a new value.

See the *ISO/IEC 14908-1 Control Network Protocol* standard for a description of the address table.

---

## B – Buffer Configuration

Use this command to display the buffer configuration of the selected device. The columns of data displayed include:

- Type – Defines the buffer type.
- Count – Defines the current buffer count for the specified buffer type.
- Size – Defines the size of the specified buffer type.
- Bytes – Defines the number of bytes required for the specified buffer type (count times size).

The display also includes the total number of bytes required for the specified buffer configuration.

After displaying the current buffer configuration, you can change the configuration, one value at a time. For each value, the default value is the current setting. If you enter a non-valid value, the utility displays an error message (Value out of range) and displays the maximum allowable size, and you are prompted to enter a new value.

After you update buffer values (or keep current values), the utility displays the new configuration, and you can accept or cancel the command before the new values are written to the device. If you configure the device to use more RAM than is actually available, the device will most likely crash:

- If the device is based on an FT 3120, PL 3120, or PL 3170 Smart Transceiver, it might not be recoverable.
- If it is based on an FT 3150 or PL 3150 Smart Transceiver, you might be able to recover it with the **(R)eboot** command. If the device is not recoverable with the reboot command, you can use the EEBLANK program (available from the Echelon Web site) to blank the EEPROM and reboot the default image.
- If it is based on an FT 5000 Smart Transceiver or Neuron 5000 Processor, you might be able to recover it by clearing the external non-volatile memory for the device. See the *Series 5000 Chip Data Book* for a description of how to clear the external non-volatile memory.

See the *Neuron C Programmer's Guide* for a description of the buffers.

---

## C – Application Configuration Structures

Use this command to display data from the read-only and configuration data structures of the selected device.

See the *ISO/IEC 14908-1 Control Network Protocol* standard for a description of the configuration data structures.

---

## *D – Device Domain Table*

Use this command to display a selected domain table entry or the entire domain table of the selected device. You can also update the domain. You can set the authentication key even if the domain is not used.

**Note:** When you update a device domain table, you are prompted whether (Y|N) to use Open Media Authentication (OMA), which allows you to send authentication keys securely over the network. The default is N because most devices do not use OMA.

---

## *E – Exit this Menu and Return to Main Menu*

Use this command to exit from the device menu and return to the main menu. The prompt changes to the **NodeUtil>** prompt.

---

## *F – Configuration Files*

Use this command to read the configuration file from the selected device and interpret the template. This command is supported only for devices that have a LonMark compliant Node Object functional block, which allows for direct memory read access to the configuration file. Enter the index of the **SNVT\_address** network variable which points to the file directory. The template is checked for syntax errors.

---

## *G – Go to Another Device*

Use this command to displays the current device list, and allow you to select another device for device menu operations. The prompt changes to **DEVICE:x>**, where *x* is the ID of the selected device.

---

## *H – Help with Device Commands*

Use this command to display the device menu. The device menu is also displayed if you enter an unrecognized command.

---

## *I – Network Variable Alias Table*

Use this command to display or update a selected network variable alias table entry or the entire network variable alias table of the selected device. The columns of data displayed include:

- Index – Defines the index of the network variable alias table entry.
- Selctr – Defines the 14-bit network variable selector in the range 0 to 0x3FFF. Selector values 0x3000 – 0x3FFF are reserved for unbound network variables, with the selector value equal to 0x3FFF minus the network variable index. Selector values 0 – 0x2FFF are available for bound network variables. The input network variables on any one device must all have different selectors. For managed networks, the network management server allocates the network variable selectors.
- Dir – Defines the direction of the network variable, input or output.

- Prio – Defines whether the network variable is a priority network variable. It is specified by `bind_info(priority | nonpriority)` in the Neuron C declaration of the network variable.
- Auth – Defines whether the network variable uses authentication. It is specified by `bind_info(authenticated | nonauthenticated)` in the Neuron C declaration of the network variable.
- AddrIdx – Defines the index into the address table for the network variable.
- Service – Defines the service used to deliver the network variable. It is specified by `bind_info(ackd | unackd_rpt | unackd)` in the Neuron C declaration of the network variable.
- TrnArnd – Defines whether the network variable is a turnaround network variable, that is, bound to another network variable on the same device.
- Primary – Defines the index into the network variable configuration table.

See the *ISO/IEC 14908-1 Control Network Protocol* standard for a description of the network variable alias table.

---

## *J – Jam Network Variable Type*

Use this command to display and optionally set a network variable type. To change a network variable type, enter the index of the network variable, and then enter the SNVT index of the new type. This command can only be used on devices with writeable self-identification data. For device applications developed in Neuron C, you must specify the `snvt_si_eecode` or `snvt_si_ramcode` Neuron C compiler directive.

---

## *K – Check Neuron Executable*

Use this command to compare the downloadable image file (`.nxe` or `.ndl` extension) contents on the computer with the application image loaded into the device. Any differences are displayed.

---

## *L – List Network Variables*

Use this command to display the self-documentation and other network variable information available on the selected device, in Neuron C source format. You can save the information to an output file; if you do not specify a file, the displayed data is not saved.

If the device is LONMARK certified or LONMARK compliant, the device and network variable self-documentation strings are interpreted and checked for errors.

---

## *M – Change Device Mode or State*

Use this command to change the selected device's mode or state. You can reset the device, change the application mode to online or offline, or change the device state to applicationless, unconfigured, configured, or hard offline.

If the device is a router, you can also set the router type to configured, learning, bridge, or repeater.

---

## *N – Network Variable Configuration Table*

Use this command to display or update a selected network variable configuration table entry or the entire network variable configuration table of the selected device. The columns displayed are the same as for the network variable alias table, except for the Primary column; see *I – Network Variable Alias Table* on page 18.

See the *ISO/IEC 14908-1 Control Network Protocol* standard for a description of the network variable configuration table.

---

## *P – Poll Network Variable*

Use this command to fetch the current value of a selected network variable, or of every network variable on the selected device. Enter the index of the network variable on the device, or press the ENTER key to fetch all network variables on the selected device. The network variable values are displayed in hexadecimal bytes, and can be further interpreted depending on length.

---

## *Q – Quickly Send a Message*

Use this command to send a LonTalk message to the selected device. You can specify the service type (acknowledged, unacknowledged, request/response, or repeated), whether to use authentication, the message code, and the data to send.

---

## *R – Read Device Memory*

Use this command to display the memory contents of the selected device. You can specify the starting address in hexadecimal format and the number of bytes to read in hexadecimal. The memory contents are displayed in hexadecimal bytes.

Use the **Redirect output to a file (>)** command before the **(R)ead device memory** command to save the output to a file.

---

## *S – Report Device Status and Statistics*

Use this command to query the status of the selected device, and display the results.

See the *ISO/IEC 14908-1 Control Network Protocol* standard for a description of the Query Status command.

If the selected device is a router, additional information is displayed including the router type. For a description of the meanings of these router-specific values, see the *LonWorks Router User's Guide*.

You are given an opportunity to clear the status of the device, which clears the error counters, the reset cause, and the last error logged. Clearing the status can be useful before running the **Performance test (I)** command; see [ – *Performance Test* on page 23.

---

## T – Transceiver Parameters

Use this command to display the transceiver (communications) parameters of the selected device. The information displayed depends on the transceiver type. For a description of these values, see the *FT 3120 / FT 3150 Smart Transceiver Data Book*, the *PL 3120 / PL 3150 / PL 3170 Power Line Smart Transceiver Data Book*, or the *Series 5000 Chip Data Book*.

If the selected device is a network interface that supports changing the input clock, you are prompted to change the input clock rate by selecting from a menu. The choices are 5, 10, and 20 MHz. You then have an opportunity to change the transceiver parameters by selecting from a menu. The choices depend on the input clock rate.

For Series 5000 devices, you are prompted to change the system clock rate along with the interface bit rate. The system clock can be set to 5, 10, 20, 40, or 80 MHz.

The NodeUtil Node Utility does not support changing the transceiver parameters for devices with input clocks less than 5 MHz.

If the device implements transceiver ID (XID) pins, you typically cannot change the interface bit rate or the transceiver type (differential, single-ended, or special-purpose mode). To change types of devices, you must first physically set the value read from the XID pins to 30 (decimal) or 1E (hexadecimal).

Selecting incorrect communications parameters could make it impossible to communicate with the device over the network:

- If the device is based on an FT 3120, PL 3120, or PL 3170 Smart Transceiver, it might not be recoverable.
- If it is based on an FT 3150 or PL 3150 Smart Transceiver, you might be able to recover it with the **(R)eboot** command. If the device is not recoverable with the reboot command, you can use the EEBLANK program (available from the Echelon Web site) to blank the EEPROM and reboot the default image.
- If it is based on an FT 5000 Smart Transceiver or Neuron 5000 Processor, you might be able to recover it by clearing the external non-volatile memory for the device. See the *Series 5000 Chip Data Book* for a description of how to clear the external non-volatile memory.

---

## U – Update Input Network Variable

Use this command to update an input network variable on the selected device. Enter the index of the network variable (use the **(L)ist network variables** command or the **(P)oll network variables** command to determine the network

variable index). The data from the last network variable update to the selected network variable is displayed.

At the prompt, enter the data to be sent to the network variable, in hexadecimal bytes. Separate each pair of hexadecimal digits with a space, and enter all the required data on one line. The data values for any bytes that you do not enter after the first character default to zero. For example, you can enter 01 00 00 or just enter 1 to set a **SNVT\_switch\_2** input network variable to the on state.

Press **ENTER** without any characters to cancel the update so that the input value is not changed.

You can use the **Set the (D)omain of the network interface** command to configure the NodeUtil network interface with a domain and authentication key to match those of the destination device if the network variable has been configured as authenticated.

---

## *V – Control Verbose Modes*

Use this command to enable or disable two verbose modes: for network interface messages and for network traffic. These modes are useful for debugging network problems. By default, network interface message verbose mode is off, and network traffic verbose mode is on.

If you enable verbose mode for network interface messages, NodeUtil displays the contents of all application buffers going to and coming from the NodeUtil network interface.

If you enable verbose mode for network traffic, any incoming message addressed to the application processor on the network interface is displayed.

---

## *W – Write Device Memory*

Use this command to write to the memory of the selected device. You can specify the starting address in hexadecimal format. The contents of the memory address that you specify are displayed in hexadecimal. Enter a new value for the location in hex and then press the ENTER key, or press the ENTER key with no data to leave the value unchanged. To stop entering data, enter any value that is not a hexadecimal character, such as a period (.), and press ENTER.

If you change any of the data in memory, you are given the opportunity to update both the application and configuration checksums, or just the configuration checksum.

**Important:** The device should be in the applicationless state before you change any of the application image memory, otherwise the device will report an application checksum error. Similarly, the device should be in the applicationless or unconfigured state before you change any of the network image memory, otherwise the device will report a configuration checksum error.

---

## *X – Create Device Interface (XIF) File*

Use this command to create a version 3 device interface file (**.xif** extension) for the selected device. You can enter a file name for the XIF file. If the device has an alphanumeric program ID, this ID is the default filename. You can use the

generated XIF file with any Echelon or third-party LNS tool, including the LonMaker Integration Tool.

If output redirection is in effect, the current output file is closed before creating the XIF file.

---

## Y – Download Neuron Executable

Use this command to download a Neuron application image file to the selected device. You can specify an application image file (**.ndl** or **.nxe** extension) that is generated by the NodeBuilder FX Development Tool or Mini FX application. If the device already contains an alphanumeric application ID, this name is the default for the application image file name.

**Recommendation:** Use a **.ndl** file for downloading the device application. A **.ndl** file contains the application code and initial values for configuration network variables, whereas a **.nxe** file contains the application code only.

If the download is successful, you are asked if you want to set the device configured, online. Answer “yes” to this question only if the device already contains a valid network configuration for this application. By default, the device will be set to the unconfigured state. After setting the state, NodeUtil reads the state of the device and displays any errors.

For **.nxe** files, the **Y** command does not check that the application image file that you are loading is compatible with the device hardware configuration. The **Y** command does perform compatibility checking for **.ndl** files. Thus, before loading an application to a device using a **.nxe** file, verify that the application image file was linked using the correct device model and firmware version for your target device. For FT 3150 or PL 3150 devices, also verify that the application image file was linked using the correct memory map for the device.

If an incompatible application image file is loaded to a device, the device generally performs continuous watchdog resets. You might be able to recover it by downloading a compatible application image file. However:

- If the device is based on an FT 3120, PL 3120, or PL 3170 Smart Transceiver, it might not be recoverable.
- If it is based on an FT 3150 or PL 3150 Smart Transceiver, you can use the EEBLANK program (available from the Echelon Web site) to blank the EEPROM and reboot the default image.
- If it is based on an FT 5000 Smart Transceiver or Neuron 5000 Processor, you might be able to recover it by clearing the external non-volatile memory for the device. See the *Series 5000 Chip Data Book* for a description of how to clear the external non-volatile memory.

If you attempt to set the device to the configured state after loading, but the device does not contain a valid network configuration for this application, then the Neuron firmware detects a configuration checksum error and sets the device to be unconfigured.

---

## [ – Performance Test

Use this command to test the performance of the channel and the device.

You are prompted to provide the following information:

- Number of iterations – How many times to repeat the performance test before displaying the collected data. The default is once. For an indefinite number of iterations, specify 0. You can press the [ key at any time to end the test.
- Delay between messages – How long, in milliseconds, to delay between sending messages to the device. The default is no delay.
- Acknowledged, Unacknowledged, Request, or Repeated – The type of message service to use for each message. The default is Acknowledged.
- Retry count – How many times to retry sending a message before marking it failed. The default for FT channels is three times; the default for power line channels is seven times.
- Use authentication – Whether (Yes) or not (No) to use authentication for the messages. The default is No.
- Message code – The message code to send to the device. The default is 0x0000.
- Up to 100 bytes of hex data – The data that you want to send to the device.

The result of the test is displayed at the conclusion of the test. For example, if the tests were successful, you receive `RESULT: No failures`. For an unsuccessful test, you receive a summary of the failures, such as `RESULT: 2 of 50 messages failed ( 4.00%)`.

You can also use the **Report device (S)tatus and statistics** command to see how the test affected the statistics collected by the device.

---

## = – *Signal Strength*

Use this command to perform a series of tests of the signal strength for a device attached to a power line channel. The tests include both the Primary (normal) and Secondary (alternate) LonTalk paths. The displayed output includes a summary of packet errors, margin, and signal strength.

This command is not valid for devices that are not attached to a power line channel.

---

## \* – *Refresh Memory*

Use this command to perform a series of Refresh Memory network management commands on the device. Use this command to refresh the local non-volatile memory (on-chip EEPROM or external EEPROM or flash memory).

---

## < – *Redirect Input from a File*

Use this command to run a command script. A command script is a text file that contains NodeUtil commands. A script file can use have any file extension, but a common extension is “.scr”.

Commands that do not require a carriage return must be on their own line. Input that requires a carriage return must be on its own line. Network variable data is displayed (and entered) in hexadecimal.

You can run a script repeatedly, as needed.

See *Using a Script File with NodeUtil* for more information.

---

## > – Redirect Output to a File

Use this command to redirect all NodeUtil output to a file. You are prompted to specify the file name. The default file name extension is **.log**. If the file already exists, you are asked if you want to **(O)verwrite** the file from the beginning, or **(A)ppend** output to the end of the file.

To stop redirection, enter a null file name.

This command is useful for saving the output of any of the NodeUtil commands, and for creating script files. See *Using a Script File with NodeUtil* for more information.

---

## Using a Script File with NodeUtil

You can create script files to automate command entry for the NodeUtil Node Utility. You can use script files for unit testing, for system testing, and for manufacturing testers. If you know the commands (and command responses) that your script requires, you can create the script using any text or programming editor that can produce standard ASCII files. You can also capture the output from running the NodeUtil Node Utility to a specified file by using the **-O** parameter (see *Command-Line Parameters* on page 6). You can then edit the output file (to remove text and output that are not commands) and use it with the **-I** parameter.

You can also use the **<** command to redirect input from a file for either main menu commands or device menu commands.

Commands that do not require a carriage return must be on their own line and input that requires a carriage return must be on its own line. Lines that start with a tab character are treated as comments by the NodeUtil Node Utility during scripting. Network variable and other data is entered in hexadecimal format.

---

### Example 1

The following script adds a device based on a Neuron ID, goes to that device, polls its first network variable, and updates its second network variable with a **SNVT\_switch** value of on 100%. Run this script from the main NodeUtil menu.

```
A
9000011E28061102
G
1
P
1
U
2
C8 00
```

---

## Example 2

The following script defines the domain and authentication key for a device that will be discovered and managed by a SmartServer. The script also places the device in the configured, online state and enables network management authentication. Run this script from the NodeUtil device menu for the device.

```
Step 1. Set domain 0 to unused with OMA
and set the first half of the 96-bit key.
d
0
Y
u
112233445566
Y
Y

Step 2. Set domain 1 to the discovery clone domain
and set the second half of the 96-bit key.
d
1
Y
6
7a3340f1bcd2
1
1
Y
665544332211
Y

Step 3. Set the channel ID to 0 so that the i.LON
SmartServer can discover this device.
q
q
Y
6e
02000002040000

Step 4. Set the device to the configured state
and online
m
s
c
m
n

Step 5. Turn on NM authentication.
q
q
Y
6e
0200180104E8

Step 6. Exit to force user to issue another
"q" command (to enter the key to talk to the device)
```

e

Note that this script uses the string “112233445566” as the first half of the 96-bit key and the string “665544332211” as second half of the 96-bit key. Using a key of “112233445566665544332211” is better than not using authentication, but it is considered a weak key.

---

## Example 3

The following script clears the non-volatile memory of the FT 5000 Smart Transceiver on the Echelon FT 5000 Evaluation Board. You use this script if you need to clear the onboard EEPROM non-volatile memory. The script assumes that the EEPROM device has been reset and that the FT 5000 Smart Transceiver is in the applicationless state (see the *Series 5000 Chip Data Book* for additional information about clearing non-volatile memory). Run this script from the NodeUtil main menu.

```
    Add the device
a
070000007CFE
    Go to it
g
1
    Write to memory location FDE8 to specify an I2C EEPROM
w
n
n
fde8
2
.
    Write a 0 to trigger device reinitialization
w
n
n
f037
0
.
    Exit NodeUtil
e
e
```



# A

## License Agreement

This appendix shows the software license agreement for the NodeUtil Node Utility software.

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# NodeUtil Software License Agreement

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