ECHELON®

i.LON™ 100 *e2* Internet Server User's Guide:

Configuring the *i*.LON 100 Applications Using the i.LON 100 Configuration Plug-in

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Preface

This document describes how to configure the *i*.LON 100 Internet Server using the *i*.LON 100 Configuration Plug-in.

Welcome

The *i*.LON 100 Configuration Plug-in provides configuration for the *i*.LON 100 Internet Server applications. Using the plug-in, you can configure the *i*.LON 100 to perform alarming, scheduling, analog function processing, digital input and output, pulse counting, and type translation.

Purpose

The *i.LON 100 User's Guide: Configuring the i.LON 100 Applications Using the i.LON 100 Configuration Plug-in* describes how to use the *i*.LON 100 Configuration Plug-in to configure the *i*.LON 100 applications.

Related Documentation

The i.LON 100 documentation is provided as online Adobe Acrobat PDF files and Windows Help files. The i.LON 100 documentation consists of the following manuals:

- *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100* — Describes how to connect the *i*.LON 100 Internet Server hardware and configure it to communicate by TCP/IP, LONWORKS messaging, email, and POP.
- *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points* — Describes how to configure the *i*.LON 100 application using the *i*.LON 100 Web pages and how to design Web pages that can be used to monitor and control *i*.LON 100 Data Points.

The following additional documentation is useful if you are using the applicable features of the i.LON 100:

- *LNS For Windows Programmer's Guide, xDriver Extension* — Describes how the xDriver software can be used by an LNS application to manage communications with multiple LONWORKS networks that communicate over a TCP/IP network. The xDriver software is used to communicate with the *i*.LON 100 when the *i*.LON 100 is functioning as a Remote Network Interface (RNI).
- *LNS Programmer's Guide* — Describes how to write LNS applications that can take advantage of the communication provided by the *i*.LON 100 Web server.
- *LonMaker User's Guide* — Describes how to use the LonMaker tool, which can be used to install the i.LON 100 in a LONWORKS network.

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Introduction

This chapter provides an overview of the i.LON 100 Configuration Plug-in. It also describes how to start the plug-in, how to resynchronize the plug-in to the LNS network, how to upgrade the *i*.LON 100 firmware using the plug-in, and how to set plug-in options.

Overview of the *i*.LON 100 Plug-in

The *i*.LON 100 Configuration Plug-in is an LNS plug-in designed to create and configure data points on the *i*.LON 100 and to configure the *i*.LON 100 scheduling, alarming, data logging, digital input and output, pulse counting, type translation, and analog function processing applications. You do not need to use the plug-in if you are only using the i.LON 100 as a remote network interface. You can start the plug-in from any LNS application that supports LNS plug-ins, such as the LonMaker Integration Tool.

The *i*.LON 100 plug-in is used to create, view, and configure *data points* on the *i*.LON 100. Each data point represents an I/O point that an *i*.LON functional block can get or set. Each network variable on the *i*.LON 100 device has a corresponding data point. In addition, the *i*.LON 100 can create data points that correspond to network variables on other devices in the LONWORKS network, constant values, or data values on other field busses, such as an MBus data points (see *Data Points* in Chapter 2 for more information).

Each functional block on the *i*.LON 100 is associated with an instance of an *i*.LON application. To create and configure an *i*.LON functional block using the *i*.LON 100 Configuration Plug-in, you create an instance of the functional block in your LONWORKS network using an LNS installation tool such as the LonMaker tool. For example, using the LonMaker tool you can create a functional block by dragging the appropriate functional block shape to the LonMaker drawing, then right-clicking the functional block and then clicking **Configure** on the shortcut menu to use the plug-in to configure its behavior. The *i*.LON 100 contains the following applications:

Calendar — Configures a calendar that consists of *exception schedules*. An exception schedule can be a range of dates or a recurring interval (i.e. "Every other Sunday"). The *i*.LON 100 supports one **Calendar** functional block.

Scheduler — Configures daily and weekly schedules. The *i*.LON 100 supports up to 40 **Scheduler** functional blocks.

Alarm Generator — Monitors data point values or status and generates an alarm when a specified condition is met. The *i*.LON 100 supports up to 40 **Alarm Generator** functional blocks.

Alarm Notifier —Responds to alarms by updating data points and/or sending emails; it also defines how an alarm condition can be cleared. The *i*.LON 100 supports up to 40 **Alarm Notifier** functional blocks.

Analog Function Block — Performs analog function processing such as mathematical operations and comparisons. The *i*.LON 100 supports up to 20 **Analog Function Block** functional blocks.

Data Logger — Logs data point values. These data logs can be read from the *i*.LON 100 Web pages or extracted to a CSV text file. The *i*.LON 100 supports up to 10 **Data Logger** functional blocks.

Type Translator — Converts data from one type to another. This can be a simple scalar conversion or a complex conversion of multi-field data points. The *i*.LON 100 supports up to 40 **Type Translator** functional blocks.

Digital Input — Determines how data from one of the *i*.LON 100 device's two hardware digital inputs is processed. The *i*.LON 100 supports two **Digital Input** functional blocks—one for each physical input.

Digital Output —Determines how data is sent to the *i*.LON 100 device's two hardware digital outputs. The *i*.LON 100 supports two **Digital Output** functional blocks (one for each physical output).

Pulse Counter — Determines how data from one of the *i*.LON 100 device's two pulse count inputs is processed. The *i*.LON 100 supports two **Pulse Counter** functional blocks (one for each pulse count input).

Using the i.LON 100 Plug-in With LNS Tools Other Than the LonMaker Tool

The *i*.LON 100 Configuration Plug-in is designed to work with any LNS tool that supports plug-ins. When the plug-in is used with the LonMaker tool, it is aware of what functional block shapes have been added to the LonMaker network and will automatically add them when a resynchronization is performed (see *Resynchronizing the i.LON 100 Plug-in With a LONWORKS Network).*

When the *i*.LON 100 Configuration Plug-in used with a non-LonMaker tool, the plug-in is unaware of functional blocks added to the network and these functional blocks must be created in the plug-in manually as described in *The Applications Pane*, later in this chapter.

If you use both the LonMaker tool and a non-LonMaker tool to configure your network, the plug-in will be aware of all functional block shapes in the LonMaker drawing, but it will not be aware of functional blocks created in another tool. One of the resynchronization options is **Delete Application Instances Not Defined in LonMaker**. If this option is set and a resynchronization is performed, all *i*.LON 100 functional blocks that do not have an associated functional block shape in the LonMaker network drawing will be deleted during the resynchronization, and their configuration will be lost. This option is not set by default.

The i.LON 100 Plug-in vs. the i.LON 100 Web Pages

Many of the capabilities of the *i*.LON 100 Configuration Plug-in are also provided by the *i*.LON 100 Web pages.

This capability is provided to allow you to maintain and update your *i*.LON 100 from any computer using a Web browser. The *i*.LON 100 Web pages have the following limitations compared to the plug-in:

The *i*.LON 100 Web pages cannot be used to configure the **Analog Functional Block** application, the **Type Translator** functional block, or the **Type Translator** functional block rules.

- The *i*.LON 100 Web pages cannot be used to create data points.

See the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Functional Blocks and to Monitor and Control Data Points* for more information on configuring *i*.LON 100 data points and functional blocks using the *i*.LON 100 Web pages.

The i.LON 100 Plug-in vs. the i.LON 100 SOAP/XML Interface

The *i*.LON 100 SOAP/XML interface allows you to do anything that you can do using the *i*.LON 100 Configuration Plug-in or the *i*.LON 100 Web pages and also

provides additional functionality. However, configuring the *i*.LON 100 using this method requires knowledge of XML structure and SOAP messages, or requires third-party i.LON 100 applications or Web pages.

See the *i.LON 100 Programmer's Guide* for more information on using the SOAP/XML interface.

i.LON 100 Plug-in Limitations

The *i*.LON 100 Configuration Plug-in has the following limitations:

- *Web binding*. The *i*.LON 100 Configuration Plug-in cannot be used to perform Web binding (i.e. binding to a data point on another *i*.LON 100 or Web service). Select **i.LON 100 Web Binder** from the **Tools** menu to open the Web page interface for Web binding. See the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points* for more information on Web binding.
- *Mbus data points*. The *i*.LON 100 Configuration Plug-in cannot be used to add Mbus data points. For more information on Mbus data points, see the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points*.
- *Browsing data point values*. The *i*.LON 100 Configuration Plug-in cannot be used to browse data point values. To browse NVL values, you can use a network variable browser such as the LonMaker browser to browse the values of the corresponding network variables. To browse the values of all data points on the *i*.LON 100, use **View Data Points** Web page as described in the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points*.

The following *i*.LON 100 functional blocks cannot be configured using the *i*.LON 100 Configuration Plug-in:

- *Node Object* — The **Node Object** functional block is used by installation tools such as the LonMaker tool to manage the other functional blocks on the i.LON 100. You typically do not need to configure or bind the **Node Object** functional block. For more information on the uses of the **Node Object** functional block, see the Node Object functional profile, available from the LONMARK Web site (www.lonmark.org).
- *Real Time Clock* — The **Real Time Clock** functional block sends the current time as kept by the *i*.LON 100 server. This capability is described in Chapter 3. Right-click the **Real Time Clock** functional block and select **Configure** to open the **Time** configuration Web page. See the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points* for more information. You typically do not need to configure this functional block.
- *Web Server* — The **Web Server** functional block is used to create local data points that are bound to other devices. You can use these data points to monitor and control a LONWORKS network via a Web page. Right-click the **Web Server** functional block and select **Configure** to open the **Web Binder** configuration Web page. See the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points* for more information.

Getting Started With the *i*.LON 100 Plug-in

To begin using the *i*.LON 100 Configuration Plug-in, follow these steps:

1. Use an LNS installation tool such as the LonMaker tool to add an *i*.LON 100 device to a LONWORKS network and commission it. If you are using the LonMaker tool, see *Adding an i.LON 100 Shape to a LonMaker Drawing* below, for more information. If you are using another LNS tool, see the documentation for the tool.
2. Optionally create one or more *i*.LON 100 functional blocks using the LNS installation tool. Typically, you add functional blocks corresponding to the i.LON 100 applications you want to use. If you are using the LonMaker tool, see Adding i.LON 100 Functional Blocks to a LonMaker Drawing, below, for more information. If you are using another LNS tool, see the documentation for the tool.
3. Configure the *i*.LON 100 device or the *i*.LON 100 functional blocks. For example, to configure an i.LON 100 functional block using the LonMaker tool, right-click the functional block in the LonMaker drawing and then click **Configure** on the shortcut menu. If you are using another LNS tool, see the documentation for the tool. See *Starting the i.LON 100 Plug-in* for more information.

The i.LON 100 Shapes Stencil

The ***i*.LON 100 Shapes** Visio stencil is installed with the *i*.LON 100 software. This stencil contains LonMaker shapes for the *i*.LON 100 device and the *i*.LON 100 functional blocks. This stencil should open automatically when a LonMaker network is opened. If this stencil does not open, follow these steps to open it:

1. In Visio, select the **File** menu, hover your mouse cursor over **Stencils**, and then select **Open Stencil** from the drop-down menu. The **Open Stencil** dialog opens.
2. Browse to LonWorks\LonMaker\Visio.
3. Select the iLON100.vss stencil.

If you are using the LonMaker tool, the new version 1.1 stencil will overwrite the old stencil. You cannot use the version 1.1 *i*.LON 100 shape to create and commission a version 1.0 *i*.LON 100; attempting to do so will result in an error.

Adding an i.*LON 100 Shape to a LonMaker Drawing*

You can add an *i*.LON 100 server to a LonMaker drawing. This allows you to place the *i*.LON 100 functional blocks in the drawing and connect the input and output network variables on those functional blocks to other devices in the LONWORKS network. This in turn allows you to use the data logging, scheduling, and alarming applications on the *i*.LON 100 server to monitor and control the network. See the *LonMaker User's Guide* for more information about the LonMaker tool.

To add an *i*.LON 100 shape to a LonMaker drawing, follow these steps:

1. Start the LonMaker tool.
2. Open or create a LonMaker network.
3. If this is the first time that you are opening the LonMaker network since installing the *i*.LON 100 software, register the **Echelon *i*.LON 100**

Configuration Plug-in and the **Echelon i.LON 100 Web Server Plug-in** in the **Plug-in Registration** window (see the *LonMaker User's Guide*).

4. Drag the ***i*.LON 100 FTT** shape (for the free topology model) or ***i*.LON 100 PL** shape (for the power line model) from the *i*.LON 100 Shapes stencil to the LonMaker drawing. The New Device Wizard appears.
5. Step through the **New Device Wizard**. If your *i*.LON 100 server is connected to the network, you can commission it just like any other LONWORKS device. If you create any new network variables on any of the i.LON 100 functional blocks, you must commission the *i*.LON 100 device to add the new network variables to the *i*.LON 100 hardware.

NOTE: If you have trouble commissioning the device on a power line channel due to inability to communicate with the device, you should increase the LonMaker **Transmit Timer** to at least 512 ms; to do this, open the **LonMaker** menu, click **Network Properties**, select the **Timing** tab, and then set this property.

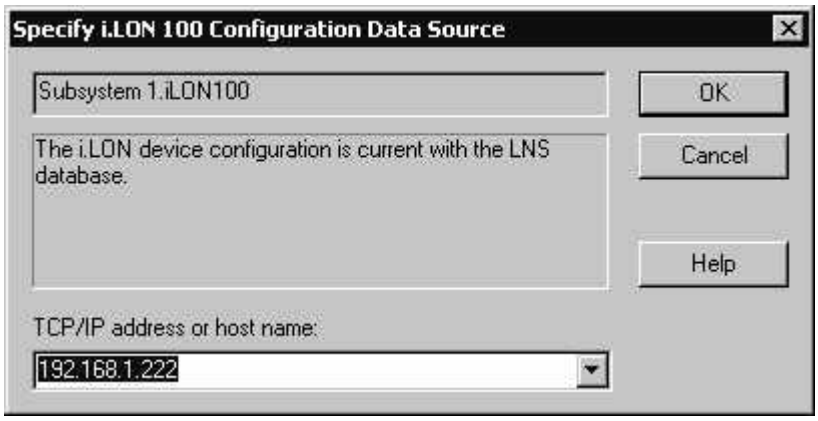
Adding i.LON 100 Functional Blocks to a LonMaker Drawing

Once you have added the *i*.LON 100 shape to the LonMaker drawing, as described above, you can add *i*.LON 100 functional blocks. The functional blocks supported by the *i*.LON 100 server are contained in the *i*.LON 100 Shapes stencil (see Chapters 3 through 9 for more information on these shapes). Drag an *i*.LON 100 functional block shape to the LonMaker drawing in order to add it to the network design. See the *LonMaker User's Guide* for more information on adding functional blocks and creating network variable shapes.

Starting the i.*LON 100 Plug-in*

To start the *i*.LON 100 configuration plug-in,, follow these steps:

1. Select an i.LON 100 device or functional block as required by your LNS installation tool and then start the plug-in. For example, if you are using the LonMaker tool, select an i.LON 100 device or functional block shape and then click **Configure** on the shortcut menu. The **Specify *i*.LON 100 Configuration Data Source** dialog appears, as shown in the following figure:



2. Enter the IP address of the *i*.LON 100 server in **TCP/IP Address**. If you have configured the *i*.LON 100 to use a port other than 80, you must also specify the port (*i.e.* **192.168.1.222:8080**).
3. Click **OK**.

Note: You must be in both TCP/IP and LONWORKS network communication with the *i*.LON 100 server in order to configure it using the *i*.LON 100 Configuration Plug-in. The *i*.LON 100 should always be in sync with the LONWORKS application that opens it (*i.e.* in the LonMaker tool, you should be connected and OnNet).

Note: The *i*.LON 100 device must be commissioned and online and the LonMaker tool must be attached to the network with the *i*.LON 100 in order to use the *i*.LON 100 Configuration Plug-in.

Organization of the *i*.LON 100 Plug-in

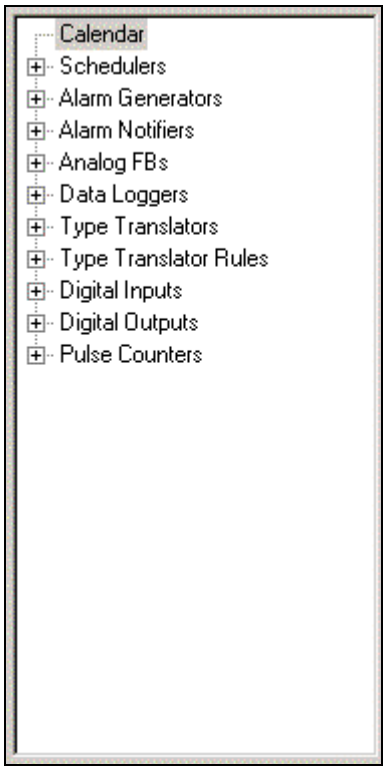
The *i*.LON 100 Configuration Plug-in is organized into two main tabs, the **Data Points** tab and the **Applications** tab.

You can use the **Data Points** tab to create and configure local, external, and constant data points. See Chapter 2 for more information.

You can use the **Applications** pane to create and configure *i*.LON 100 functional blocks. See, *The Applications Pane*, below, for more general information about the **Applications** pane, and chapters 3 through 9 for more information on specific applications.

The Applications Pane

The **Applications** tab of the *i*.LON 100 Configuration Plug-in contains the **Functional Blocks** list, as shown in the following figure:



Click a '+' button to show a list of all instances of a specified application. Select an application to configure it as described in Chapters 3 through 9.

The applications pane will display all functional blocks that have been added to the *i*.LON 100. In addition, if the *i*.LON 100 Configuration Plug-in in was started via a request to configure a functional block, this functional block will be shown in the applications pane. If you are using the LonMaker tool, you can perform a resynchronization (see *Resynchronizing the i.LON 100 Plug-in With a LonWorks NETWORK*, later in this chapter), to have all functional blocks in the LonMaker drawing added to this pane.

You can add a functional block to the list by right clicking the application and then clicking **Add** on the shortcut menu. Copy a functional block (and its configuration) by right-clicking the instance and selecting **Duplicate** from the short-cut menu. Remove a functional block by right clicking the instance and selecting **Delete** from the short-cut menu.

Resynchronizing the *i*.LON 100 Plug-in With a LONWORKS Network

When you add or remove an i.LON 100 functional block using an LNS installation tool, the changes will not be seen by the *i*.LON 100 server until it is resynchronized. Resynchronizing has the following effects:

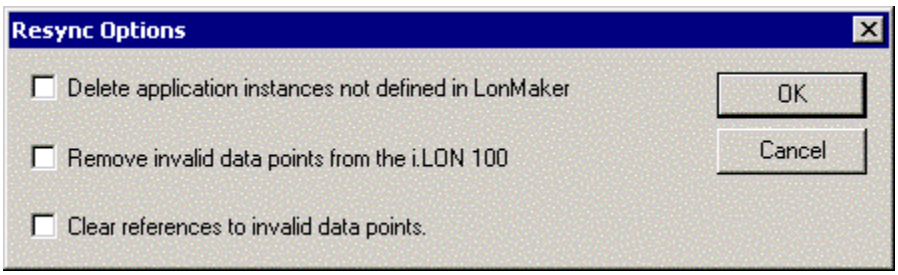
- Adds and removes functional blocks to make the *i*.LON 100 **Functional Blocks** list consistent with the functional block shapes in the LonMaker drawing. This step will not be performed if the network was configured with an LNS tool other than the LonMaker tool.
- Updates the type of all local and external data points to be consistent with the LONWORKS network. It will not update data points if only the format is

different. If the type of a data point changes, all preset information, including the default value, will be lost (see *Data Point Presets* in Chapter 2).

- Adds data point references to the functional blocks; *e.g.* if you add input network variables to the **Data Logger** functional block, the corresponding data points will be added to the **Data Logger** configuration page of the *i*.LON 100 Configuration Plug-in. This step will not be performed if the network was configured with an LNS tool other than the LonMaker tool.
- If you removed any network variables from the i.LON 100, they will optionally be reported. You can remove the associated data points from the *i*.LON 100 using the **Delete** button on the **Data Points: Properties** tab.
- If any functional blocks refer to data points that are no longer defined (*i.e.* the corresponding network variable has been removed), they will be reported. To have these data points automatically removed, set **Remove Invalid Data Points From the i.LON 100** as described below.

To resynchronize the *i*.LON 100 server with a LonMaker drawing, follow these steps:

1. Click the **Tools** menu and then select **Resync**. Note that in version 1.0 of the *i*.LON software, the resynchronization feature was accessible through a button on the lower part of the dialog.
2. Optionally click **Options** to open the following dialog:



Set the following options:

Delete Application Instances Not Defined in LonMaker	If you are using the *i*.LON 100 Configuration Plug-in with the LonMaker tool, set this option to have the resynchronization delete all functional blocks that do not have corresponding functional block shapes in the LonMaker network. If there are *i*.LON 100 functional blocks that do not have corresponding LonMaker functional block shapes, resynchronizing with this option set will cause those functional blocks to be removed, along with all configuration. This option is set by default.
Remove Invalid Data Points From the *i*.LON 100	Set this option to have any invalid data points (i.e. data points that can no longer access their associated network variable) removed as part of the resynchronization. This option is not set by default.
Clear References to Invalid Data Points	Set this option to have any references to invalid data points removed as part of the resynchronization. This option is not set by

default.

3. Click **Go** to begin the resynchronization. The dialog lists the changes that will be made to the *i*.LON 100 server's configuration data. Review the changes.
4. Click **Apply** to accept the changes and update the *i*.LON 100 server and the *i*.LON 100 Configuration Plug-in.

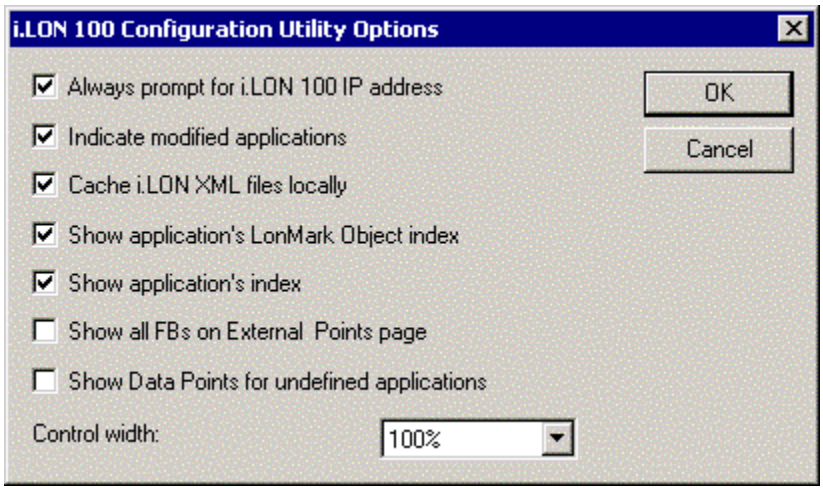
   Click **Continue** to accept the changes and update the Configuration Plug-in, but not the *i*.LON 100 server; the *i*.LON 100 server will be updated when you click the **OK** or **Apply** button in the *i*.LON 100 Configuration Plug-in.

   Click **Cancel** to reject the changes.

NOTE: If, after performing a resynchronization using the *i*.LON 100 Configuration Plug-in, you subsequently delete the network using a tool other than the LonMaker tool, you must manually delete the network folder and all subfolders. The resynchronization process creates a folder (**iLonXml**) below the network folder and a resynchronization log that are not removed when the network is deleted (this folder is also created by the backup and upgrade procedures described later in this chapter). The LonMaker tool will ask you whether you want to remove these folders as part of the network deletion process. If you do not remove these files, you will not be able to create a new network of the same name as the deleted one.

Setting *i*.LON 100 Plug-in Options

To set *i*.LON 100 Configuration Plug-in options, open the **Tools** menu and select **Options**. The following dialog opens:



Set the following options:

Always Prompt for i.LON 100 IP Address — Set this option to always have the **Specify i.LON 100 Configuration Data Source** dialog appear when you start the i.LON 100 Configuration Plug-in. If the i.LON 100 is not commissioned or you are not OnNet, this dialog will appear irrespective of how this option is set.

Indicate Modified Applications — Set this option to have an asterisk appear next to applications in the **Applications** list when they have been modified but the changes have not been

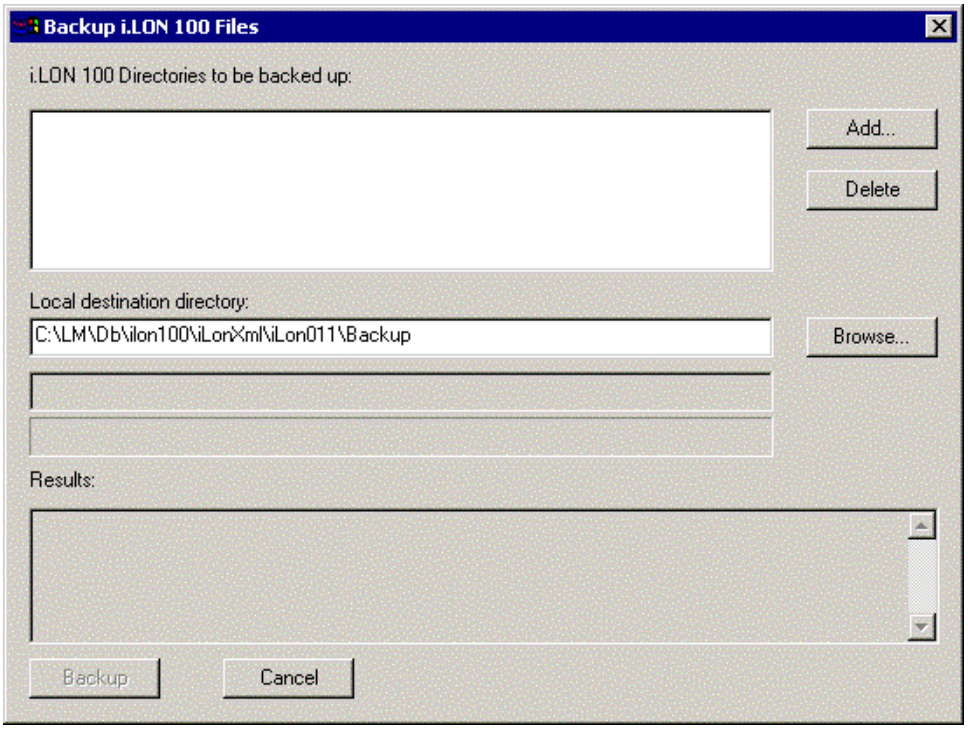
	applied (i.e. you have not clicked the **Apply** or **OK** buttons).
Cache i.LON 100 XML Files Locally	Check this option to have i.LON 100 XML files cached locally. These files will be stored in the iLON100Xml folder in the LonWorks database folder for the LonWorks database that contains the i.LON 100.
Show Application's LonMark Index	Set this option to have the functional block numbers appear for each functional block in the **Applications** list.
Show Application's Index	Set this option to have the application indices for each functional block appear in the **Applications** list.
Show All FBs on External Points Page	Set this option to see all functional blocks on all devices when creating an external data point when starting the *i*.LON 100 Configuration Plug-in from the LonMaker tool. If this option is cleared, only the functional blocks that have been added to the LonMaker drawing will be shown. If the *i*.LON 100 Configuration Plug-in is started from another LNS application, you will always see all functional blocks on all devices when creating an external data point. This option is cleared by default.
Show Data Points For Undefined Applications	Set this option to have the **Data Points:Properties** tab show all NVL data points, regardless of whether the associated functional block has been created on the *i*.LON 100.
Control Width	Resizes the i.LON 100 Configuration Plug-in window. Any change to this option will not take effect until the i.LON 100 Configuration Plug-in is closed and restarted.

Backing Up the *i*.LON 100 Server

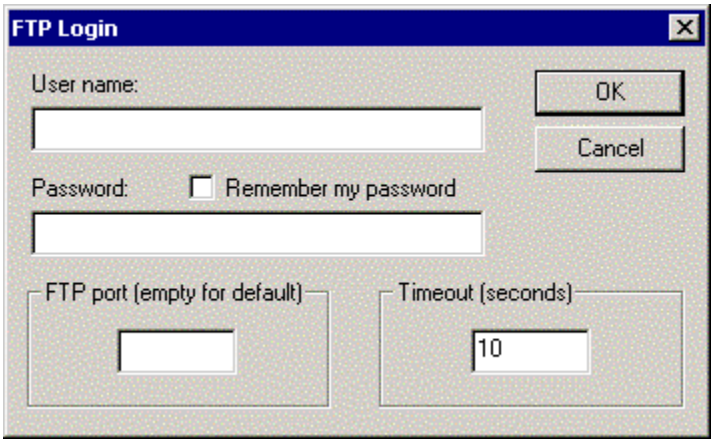
You can backup the configuration of an *i*.LON 100 device using the i.LON 100 Configuration Plug-in or using FTP as described in the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100.*

To backup the *i*.LON 100 using the plug-in, follow these steps:

1. Click the **Tools** menu and select **Backup i.LON 100**. The following window opens:



2. Click **Browse** to select a location on your computer to which the files will be backed up. By default, files are backed up in `<LNS Database path>\iLonXml\iLon011\Backup`.
3. Click **Add** to select which files on the *i*.LON 100 will be backed up. If this is the first time the *i*.LON 100 Configuration Plug-in has attempted to access the *i*.LON 100 via FTP, the following dialog opens:



Set the following options:

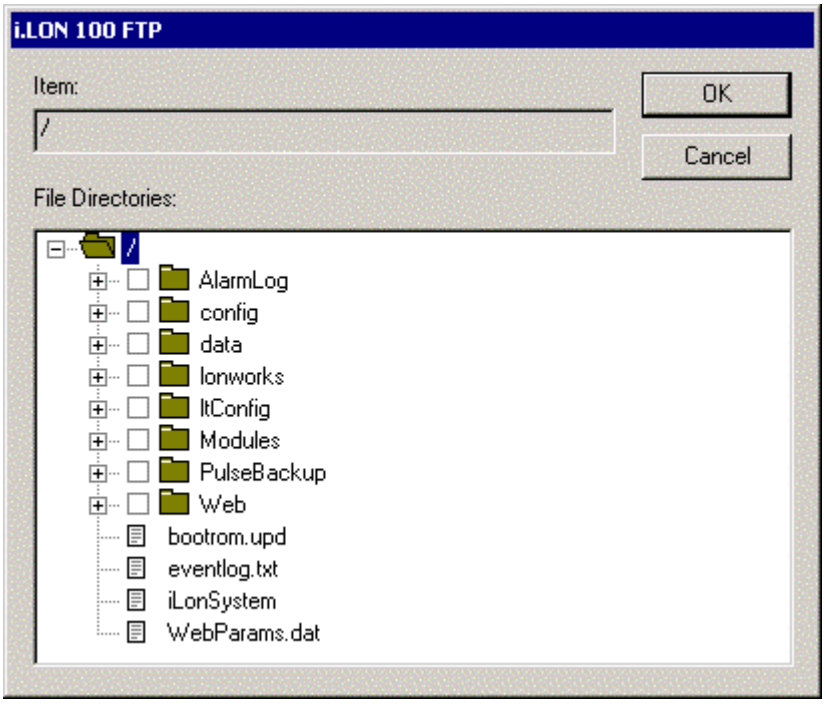
User Name	Your *i*.LON 100 user name. By default, this is 'ilon'.
Password	Your *i*.LON 100 password. By default, this is 'ilon'.
Remember My Password	Set this option to have your password automatically filled in each time this dialog is opened.
FTP Port	The port used to FTP files to and from the

i.LON 100. Leave this field blank to use the default FTP port.

Timeout — The time, in seconds, after which the *i*.LON 100 Configuration Plug-in will stop trying to gain FTP access to the *i*.LON if no connection has been established.

Once you have provided this information, click **OK**.

4. The following dialog opens:



Use this dialog to select the directories that will be backed up. Once you have finished selecting files and directories to backup, click **OK**.

To not back up a directory that you chose from the FTP list, select it from the **i.LON 100 Directories to be Backed Up** list and click **Delete**.

5. Click **Backup**. The *i*.LON 100 will FTP the files to the selected location on your computer. The status of the backup procedure will be displayed in **Results**. Click **Cancel** to cancel the backup procedure.

Using the *i*.LON 100 Configuration Plug-in With Version 1.0 of the *i*.LON 100 Firmware

You can use the i.LON 100 version 1.1 *i*.LON 100 Configuration Plug-in to access i.LON 100 servers running either version 1.0 or 1.1 firmware. Using the version 1.0 firmware with the version 1.1 Configuration Plug-in has the following capabilities and restrictions:

- You can add, remove, and configure version 1.0 functional blocks using the version 1.1 software. You can use the *i*.LON 100 Upgrade Wizard (described below) to automatically upgrade your version 1.0 firmware to version 1.1 with minimal disturbance to your configuration. Note that when you add a new Node Object functional block to a version 1.0 *i*.LON 100, you must use the

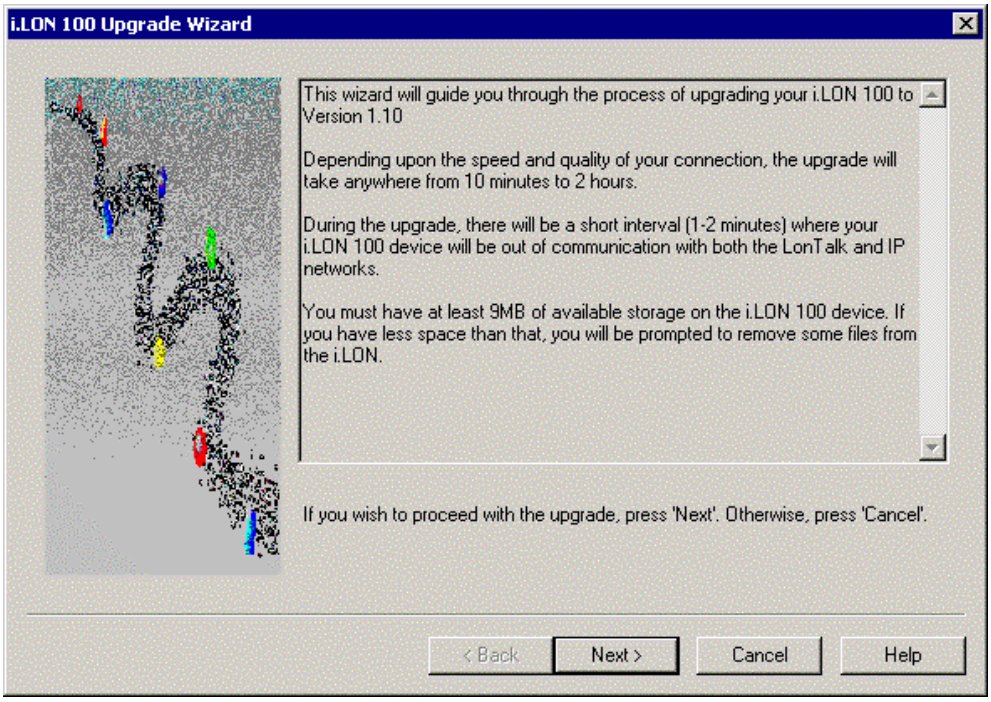
generic Functional Block shape from LonMaker instead of the Node Object shape from the i.LON 100 Shapes 1.1 stencil.

- If you are using the LonMaker tool, the new version 1.1 *i*.LON 100 stencil will overwrite the old *i*.LON 100 stencil. You cannot add a new version 1.0 *i*.LON 100 device to a network using the version 1.1 stencil (though you may continue using an existing version 1.0 *i*.LON 100 as described above).
- If you have an existing network with version 1.0 *i*.LON 100 devices, you can create new version 1.0 *i*.LON 100 device shapes by copying existing version 1.0 device shapes. The version 1.1 functional block shapes in the stencil will work with the 1.0 device shape and the version 1.1 *i*.LON 100 Configuration Plug-in will be used to configure all *i*.LON 100 device shapes.
- When using a version 1.0 i.LON 100, if you configure a **Web Server** functional block, the LonMaker Browser will launch. In version 1.1, the **Web Binder** configuration Web page opens.
- If using the LonMaker tool, you can upgrade a version 1.0 *i*.LON 100 device shape by right-clicking it and selecting **Upgrade** from the short-cut menu. All functional blocks will be preserved, but any connections to the **nvoDeviceAlarm** output network variable on the **Node Object** functional block will be deleted and must be recreated.
- Before upgrading the *i*.LON 100 from version 1.0 to 1.1 you should back up all Data Logs and Alarm Logs via FTP. All logs will be deleted when the *i*.LON 100 boots for the first time using version 1.1.
- Data Logs and Alarm Logs, which use the CSV extension (text format), now use a comma ' , ' to separate data instead of a semi-colon ' ; '. If you have built a tool to read these logs via FTP, please make a note of this change and modify your tool to accommodate this new format when upgrading to version 1.1.

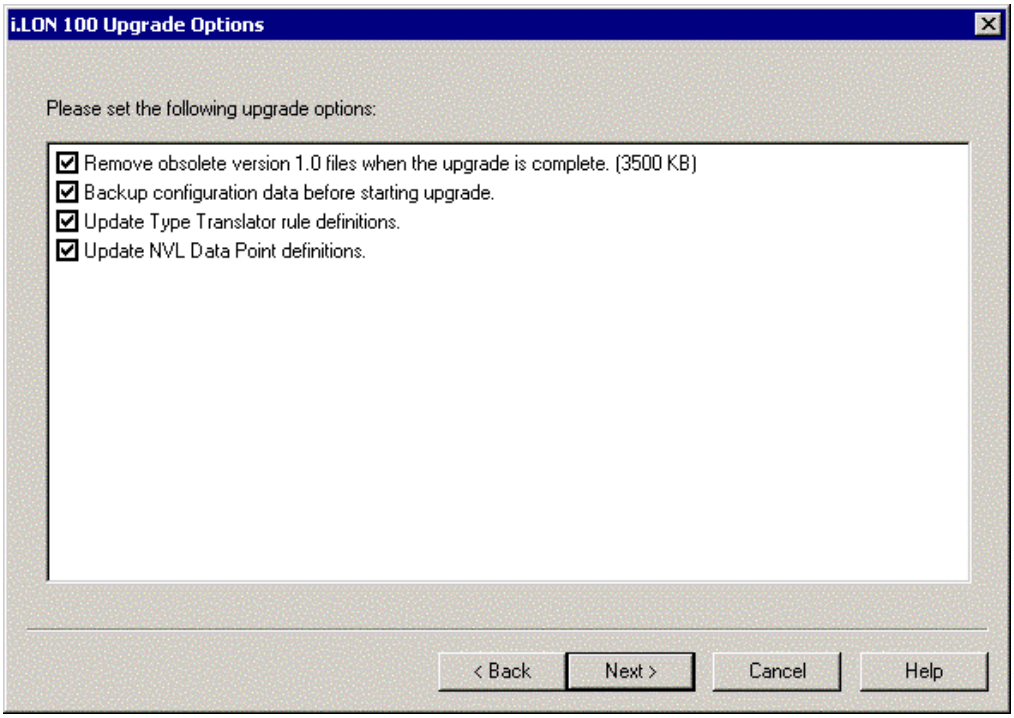
Upgrading the i.LON 100 Firmware Using the i.LON 100 Upgrade Wizard

To upgrade your *i*.LON 100 firmware from version 1.0 to version 1.1, follow these steps:

1. In the i.LON 100 Configuration Plug-in, open the **Tools** menu and select **Upgrade *i*.LON 100**. The **i.LON 100 Upgrade Wizard** opens, as shown in the following figure:



2. Click **Next**. The **i.LON 100 Upgrade Options** window opens, as shown in the following figure:



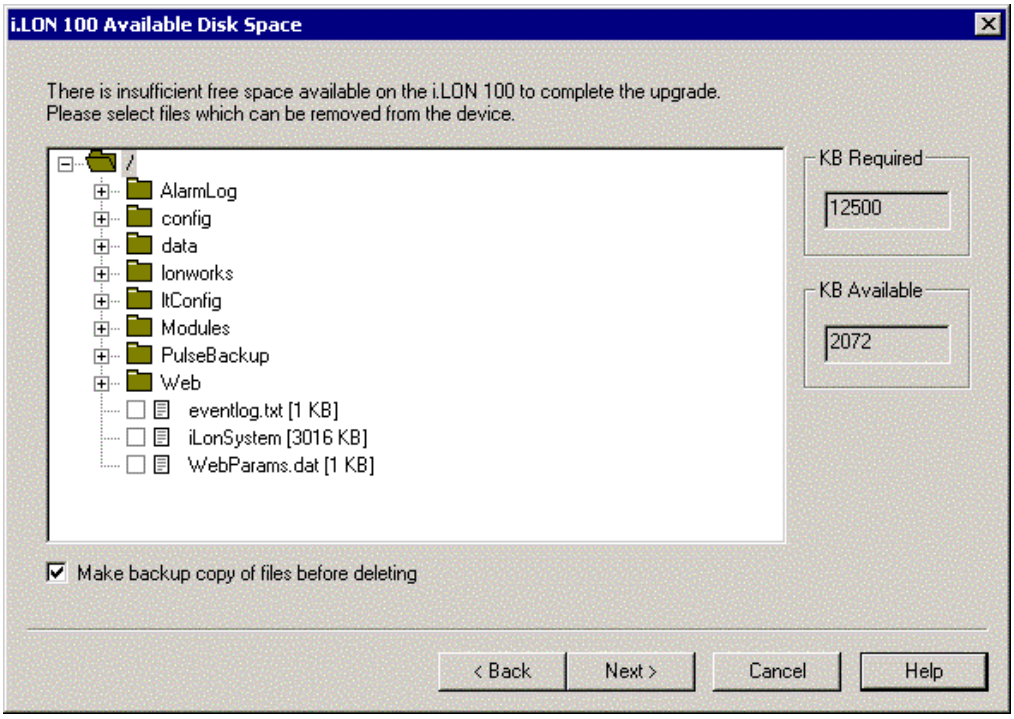
Set the following options:

Remove Obsolete Version 1.0 Files When the Upgrade is Complete

Set this option to have files which are not used in the version 1.1 *i*.LON 100 software removed once the upgrade has completed. Clearing this option will require an additional 3.5MB of disk space on the *i*.LON 100. This option should

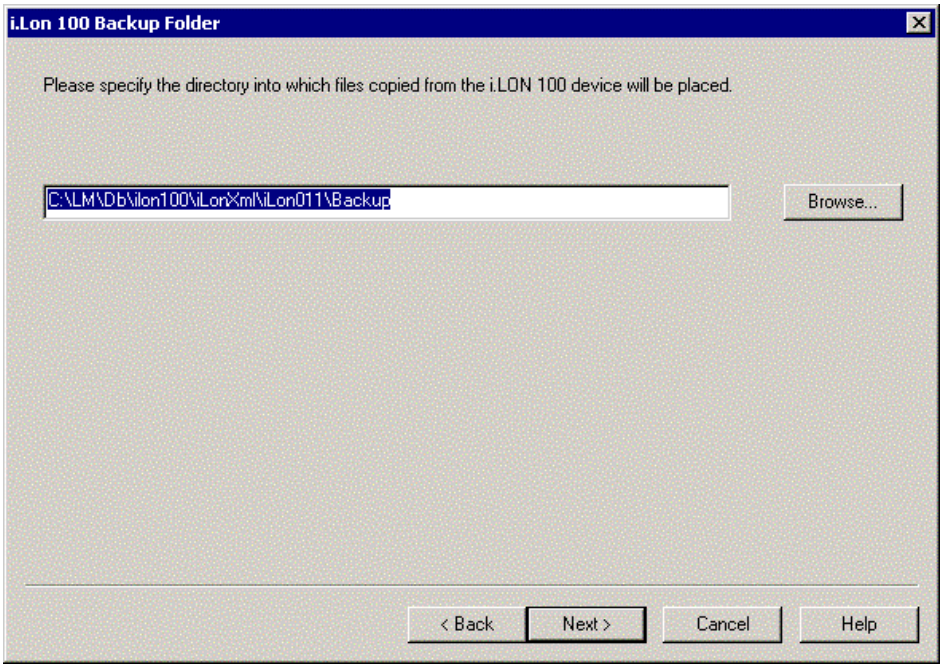
	only be cleared if you intend to revert to firmware version 1.0 after the upgrade (this is not supported by the upgrade utility and you must perform the reversion manually using an FTP client). This option is set by default.
Backup Configuration Data Before Starting Upgrade	Set this option to have the *config* and *ltConfig* directories backed up to your computer before the upgrade procedure begins. This allows you to recover your configuration if the upgrade fails. The files will be backed up to the folder selected in the **i.LON 100 Backup Folder** window of the upgrade wizard. This option is set by default.
Update Type Translator Rule Definitions	Set this option to have the predefined **Type Translator** rules updated. If you made changes to the version 1.0 **Type Translator** rules using the SOAP interface, clear this option to preserve those changes after the upgrade. Any new rules you may have written will be unaffected by the upgrade. This option is set by default.
Update NVL Data Point Definitions	Set this option to have existing NVL data point definitions updated. This will update the NVL data point location strings to be compatible with the current Web pages. Setting this option will delete any preset values you have created for NVL data points. This option is set by default.

3. Click **Next**. If your i.LON 100 has insufficient disk spade to complete the upgrade, the following window opens (otherwise, skip to the next step):



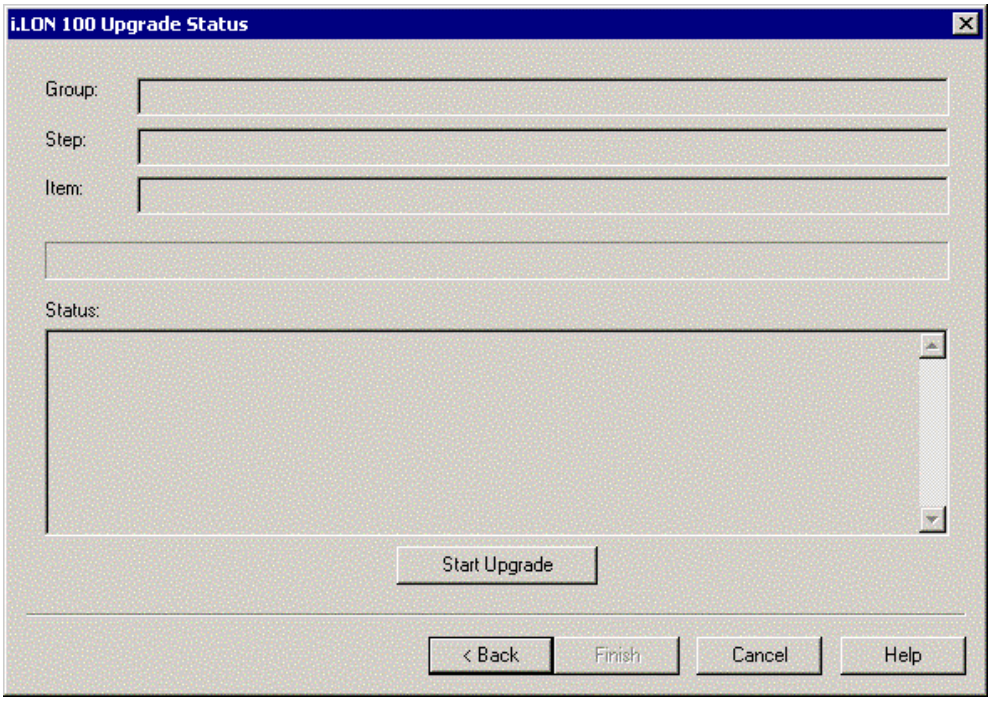
This window displays a tree view of the *i*.LON 100 directory structure. **KB Required** shows how much memory must be free, and **KB Available** shows how much memory is currently available. Browse the *i*.LON 100 directory structure and select files to be deleted until **KB Available** is greater than **KB Required**. If you have cleared the **Remove Obsolete Version 1.0 Files When the Upgrade is Complete** in the previous step, setting it will free up about 3.5MB of disk space.

4. Click **Next**. If you set the **Backup Configuration Data Before Starting Upgrade** option in the **Upgrade Options** window or selected files to be backed up in the **Available Disk Space** window, the **i.LON 100 Backup Folder** window opens as shown in the following figure (otherwise, skip to the next step):

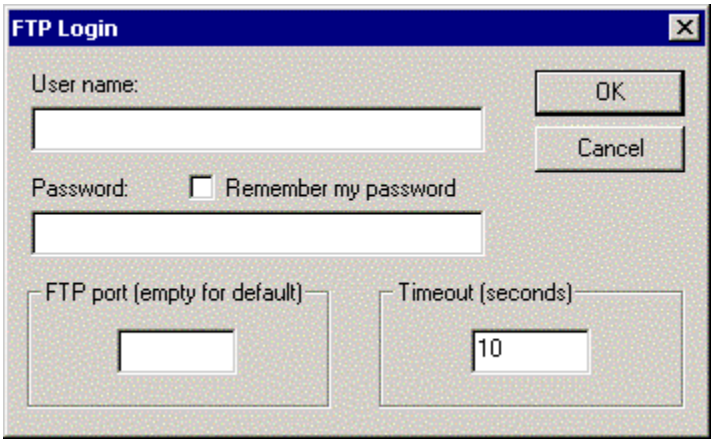


Set the path where the *i*.LON 100 data will be backed up before the upgrade procedure begins. By default, this path is **<LNS Database path>\iLonXml\iLon011\Backup**.

5. Click **Next**. The **i.LON 100 Upgrade Status** window opens, as shown in the following figure:



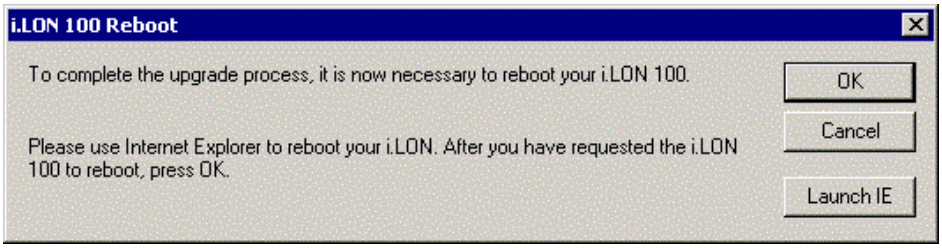
6. Click **Start Upgrade** to begin the upgrade. The following dialog opens:



Set the following options:

User Name	Your *i*.LON 100 user name. By default, this is 'ilon'.
Password	Your *i*.LON 100 password. By default, this is 'ilon'.
Remember My Password	Set this option to have your password automatically filled in each time this dialog is opened.
FTP Port	The port used to FTP files to and from the *i*.LON 100. Leave this field blank to use the default FTP port.
Timeout	The time, in seconds, after which the *i*.LON 100 Configuration Plug-in will stop trying to gain FTP access to the *i*.LON 100 if no connection has been established.

7. Click **OK**. The **i.LON 100 Upgrade Status** window will show the status of the upgrade. If an error occurs during the upgrade, repeat the upgrade procedure; when prompted, indicate that you wish to **Resume** (as opposed to **Restart**) the upgrade.
8. Once the upgrade has finished, the following dialog opens:



Click **Launch IE** to open Internet Explorer with the **Reboot** Web page selected. Once you have rebooted the *i*.LON 100, click **OK**.

9. Click **Finish** to close the wizard.

Upgrading the *i*.LON 100 Device

Once you have finished upgrading the i.LON 100 firmware, you must upgrade the *i*.LON 100 device in the LNS database. See the documentation for your LNS tool for more information. If you are using the LonMaker tool, follow these steps:

1. In the LonMaker tool, right-click the i.LON 100 device shape and select **Replace** from the short-cut menu.
2. When prompted for the device template, select the **v12** version of the *i*.LON 100 template (FTT or PL)
3. When prompted for the Neuron ID, select **Manual Entry**. **T**he default Neuron ID will be the current value and does not need to be changed.
4. Once the upgrade procedure is completed, the LonMaker tool upgrades the *i*.LON 100 device in the LNS database. If you had any connections to the **nvoDeviceAlarm NV** on the **Node Object,** those connections will be removed and have to be recreated.

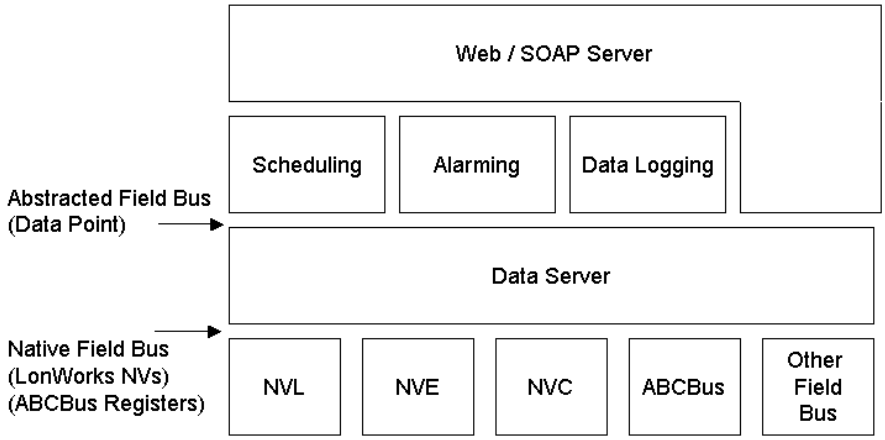
2

Data Points

This chapter describes how to add, remove, and view data points on the *i*.LON 100 Internet Server. Each data point represents a network variable value on the network that an *i*.LON functional block can get or set.

Data Points

The *i*.LON 100 server's functional blocks and supporting applications are structured as diagrammed in the following figure:



Those familiar with other LONWORKS products are accustomed to thinking in terms of network variables. The *i*.LON 100 works with network variables, and also works with data elements from other field busses. For example, an *i*.LON 100 **Scheduler** functional block can schedule an ABCBus register just as easily as it can schedule a LonWorks network variable.

This flexibility uniquely positions the *i*.LON 100 to integrate legacy devices from other field busses. Release 1.1 of the *i*.LON 100 applications includes NVL, NVE, NVC, and MBus drivers. Please contact Echelon support (lonsupport@echelon.com) directly for information on other third-party field bus drivers.

The integration of other field busses with a LONWORKS network is accomplished by the *i*.LON 100's data server. The data server is a software component that ***abstracts*** any data element of any bus into a ***data point***. The *i*.LON 100's functional blocks (**Scheduler**, **Data Logger**, **Alarm Generator**, etc.) operate on data points—not just network variables. When you use the i.LON 100 with LONWORKS devices, you can consider a data point to be the same thing as a network variable because a network variable ***is*** a LONWORKS data point.

The *i*.LON 100 server can support up to 800 data points.

Data Point Types

The *i*.LON 100 firmware supports the following data points types: *local data points* (also called NVL data points), *external data points* (also called NVE data points), *constant data points* (also called NVC data points), and *Meter Bus data points* (also called MBus data points):

Local data points correspond to network variables that are defined locally on the *i*.LON 100 server. This includes any default network variables on an *i*.LON 100 functional block, and any network variables you might add to an *i*.LON 100 functional block. Local data points must be bound to one or more network variables on other devices in order to send or receive information on the LONWORKS network.

External data points correspond to network variables on other LONWORKS devices. These data points are not implemented as network variables on the i.LON 100, instead the i.LON 100 polls or explicitly updates these network variables.

The *i*.LON 100 server's NVE driver keeps an XML file that contains all the information required to read and write external data points. This XML file is updated when you create NVE points using the *i*.LON 100 Configuration Plug-in. You can also write to this XML file manually; see the *i.LON 100 Programmer's Reference* for more information.

Because NVE points are explicitly polled or updated they consume no network variable resources on the referenced devices but often at the expense of increased network traffic.

Constant data points are not associated with a network variable and are used to hold constant values. Constants are useful when making comparisons (for example, testing for alarm conditions) and when you need to supply a static value to some other device on your network.

Meter Bus data points are used to communicate with Meter Bus (MBus) devices using the MBus protocol (EN 1434-3). MBus devices are connected to the i.LON 100 via the Serial Port. For more information on creating MBus data points, see the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points*.

Creating and Viewing Data Points

You can create and view local data points, external data points, constant data points, and MBus data points.

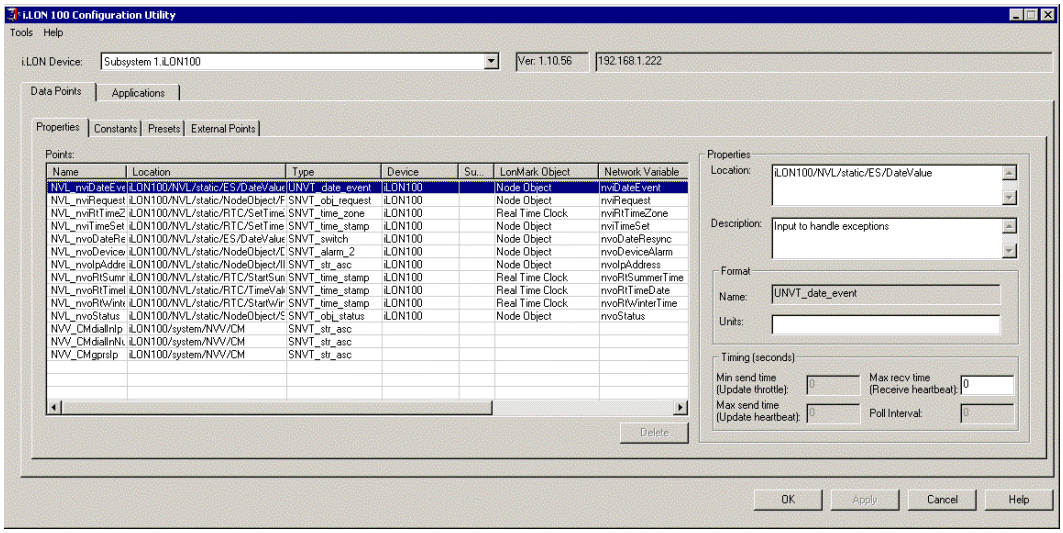
Creating and Viewing Local Data Points (NVLs)

You can create a local data point on an i.LON 100. These include all network variables included with the *i*.LON 100 and all network variables that you add. You can use any LNS installation tool that provides the capability to add dynamic network variables. For example, you can use the LonMaker tool to add dynamic network variables. See the *LonMaker User's Guide* for more information on creating dynamic network variables.

Note: The LonMaker tool maintains private information in the Description property of dynamic network variables. It is recommended that this property not be modified by any tools other than the LonMaker tool or the LonMaker browser.

You can manage all local data points on functional blocks that have been defined on an *i*.LON 100 server using the *i*.LON 100 Configuration Plug-in. To view local data points (NVLs), follow these steps:

Start the *i*.LON 100 plug-in as described in *Starting the i.LON 100 Plug-in* in Chapter 1. The following dialog appears:



This tab displays all of the data points that exist on defined functional blocks on the selected *i*.LON 100 server. Local data points are created for all network variables on *i*.LON 100 functional blocks in the LONWORKS network, as well as all network variables on the **Real Time Clock** and **Node Object** functional blocks, which cannot be configured using the *i*.LON 100 Configuration Plug-in. If a dynamic data point is created on an *i*.LON 100 functional block while the *i*.LON 100 Configuration Plug-in is running, an associated NVL data point will be created once a resynchronization is performed (see *Resynchronizing the i.LON* 100 Plug-in With *a LonWorks NETWORK*, in Chapter 1).

The **Delete** button can be used to remove NVL data points that no longer have an associated network variable. This can happen if you remove a network variable from the LonWorks network and then resynchronize the *i*.LON 100 Configuration Plug-in

The name of a local data point is **NVL_<network variable programmatic name>**. Using the LonMaker tool, you can find the programmatic name of a network variable by right-clicking the network variable shape, selecting **Properties** from the shortcut menu to open the **Network Variable Properties** dialog, and reading the **Programmatic Name** field of the **Description** tab. The programmatic name may not be the same as the network variable name. See *Network Variable Programmatic Names*, below, for more information.

You can sort the data points on this tab by clicking any of the column headings, just as you would in Windows Explorer. You can resize any of the columns by dragging the edges of the column header.

Network Variable Programmatic Names

The network variable programmatic name is used to determine the name of the associated local data point. All programmatic network variable names on a device must be unique. For the network variables that are included with the i.LON 100, as well as any network variables that you create on an i.LON 100 using the LonMaker tool, the following rules are used to make the names unique:

- For a static network variable (*i.e.* a network variable included with the i.LON 100) on arrays of functional blocks, the programmatic network variable name is:

  <NV name>[<FB array index>]

<NV name> is the name of the network variable as it appears on the functional block. **<FB array index>** is the index of the functional block within the array.

For example, the **nviAnEnable** network variable on the **Alarm Notifier[4]** functional block has a programmatic name of **nviAnEnable[4]**; the associated local data point is **NVL_nviAnEnable[4]**.

- For a dynamic network variable (i.e. a network variable that you create), the programmatic network variable name is:

  NVname_FBindex

  NVname is the name of the network variable as it appears on the functional block. ***FBindex*** is the 3-digit functional block index of the functional block on which the network variable appears. Each functional block on a device has a unique functional block index.

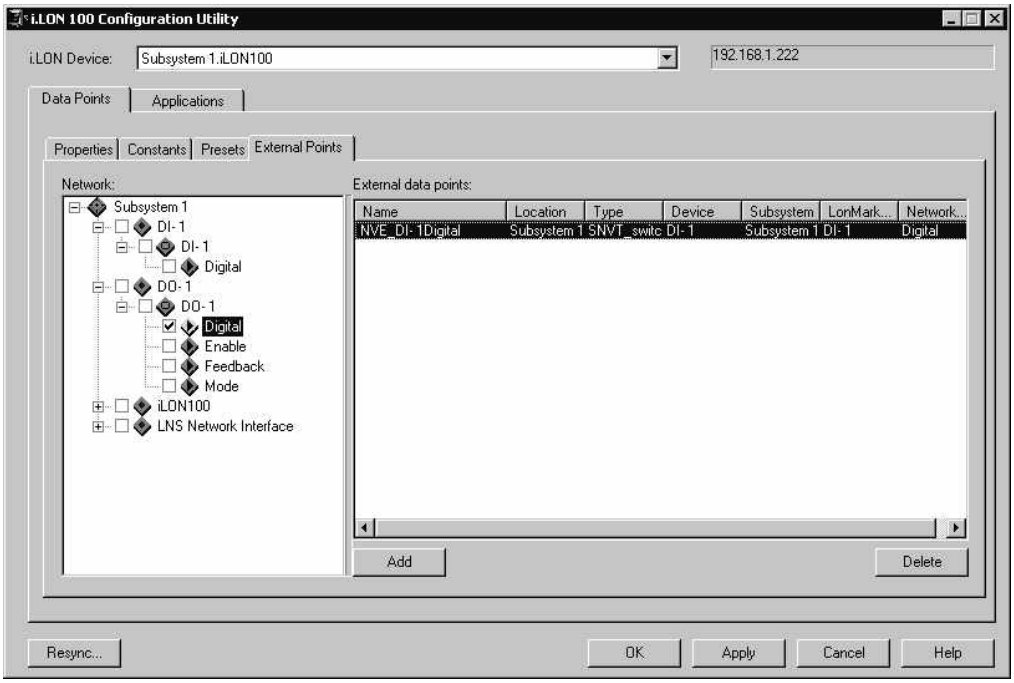
  For example, if you drag an **Alarm Notifier** shape to your LonMaker drawing and associate it with **Alarm Notifier[1]**, an **nviAnAlarm** network variable is dynamically created. This network variable will have a programmatic name of **nviAnAlarm_097**. 097 is the functional block index of **Alarm Notifier[1]** on the *i*.LON 100 device. The associated local data point is **NVL_nviAnAlarm_097**.

Do not change the programmatic names of the *i*.LON 100 network variables.

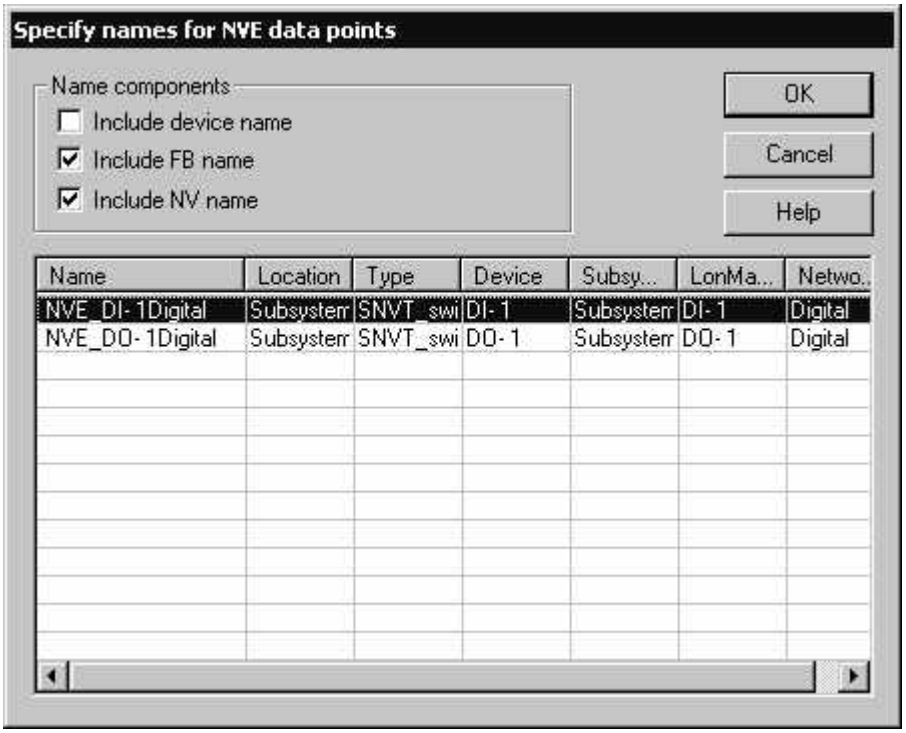
Creating and Viewing External Data Points (NVEs)

You can create an external data point using the *i*.LON 100 Configuration Plug-in. An external data point is a data point associated with a network variable on another device. To create an external data point, follow these steps:

1. Start the *i*.LON 100 Configuration Plug-in as described in *Starting the i.LON 100 Plug-in* in Chapter 1.
2. Select the **Data Points** tab and then the **External Points** tab. The **External Points** tab appears as shown in the following figure:



3. Using the **Network** pane of this tab, set the check box to the left of one or more network variables to create external data points for them. If you set the check box next to a device or functional block, external data points will be created for each network variable on the device or functional block.
4. Click **Add**. The **Specify Names for NVE Data Points** dialog opens, as shown in the following figure:



5. Specify how the name(s) for the new data point(s) will be determined. You can choose to use any or all of the following options:

Include Device Name	Set this option to include the device name in the data point name.
Include FB Name	Set this option to include the functional block name in the data point name.
Include NV Name	Set this option to include the network variable name in the data point name.

As you set and clear these options, you will see the results in the **Name** column. The format of the name is:

NVE_[*deviceName*][*fBlockName*][*nvName*][*index*]

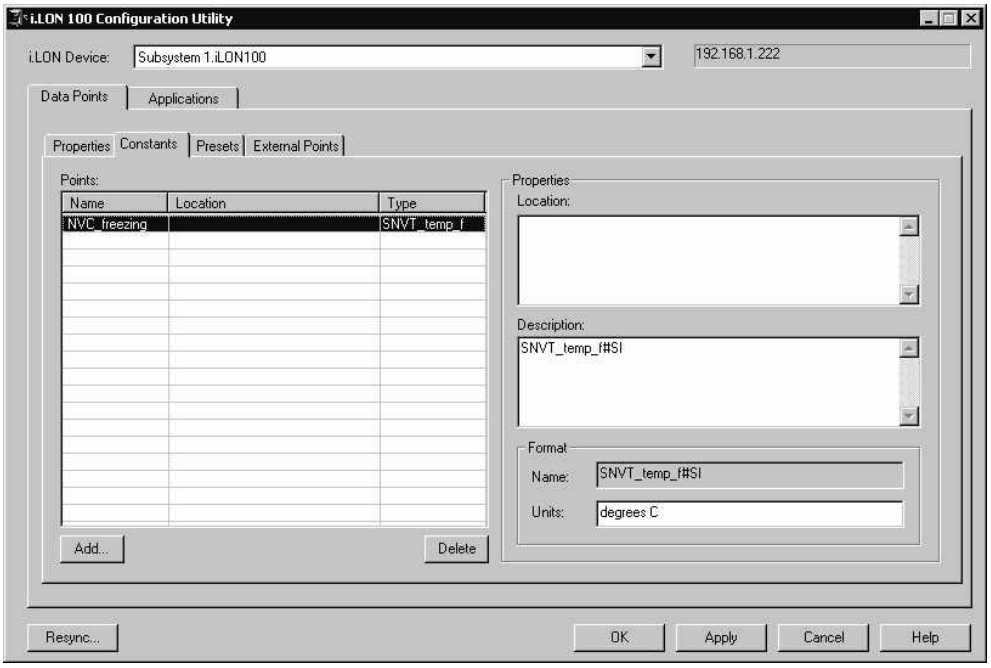
An **index** will only be created if the options that you set are not sufficient to create a unique name for the new external data point; *i.e.* if you only set **Include NV Name** and you create external data points for two or more identically named network variables on different functional blocks. The name can have a maximum of 25 characters; if it is longer, it will be truncated. You can manually change the name of a data point by double-clicking the name. The name you specify must be unique and start with **NVE_**, any spaces and bracket characters ('[' ']') in the name will be removed, and any hyphens ('-') will be changed to underscores ('_').

6. Click **OK** to create the new external data point(s). These data points will appear in **External Data Points**. They will all appear in the **Properties** tab.

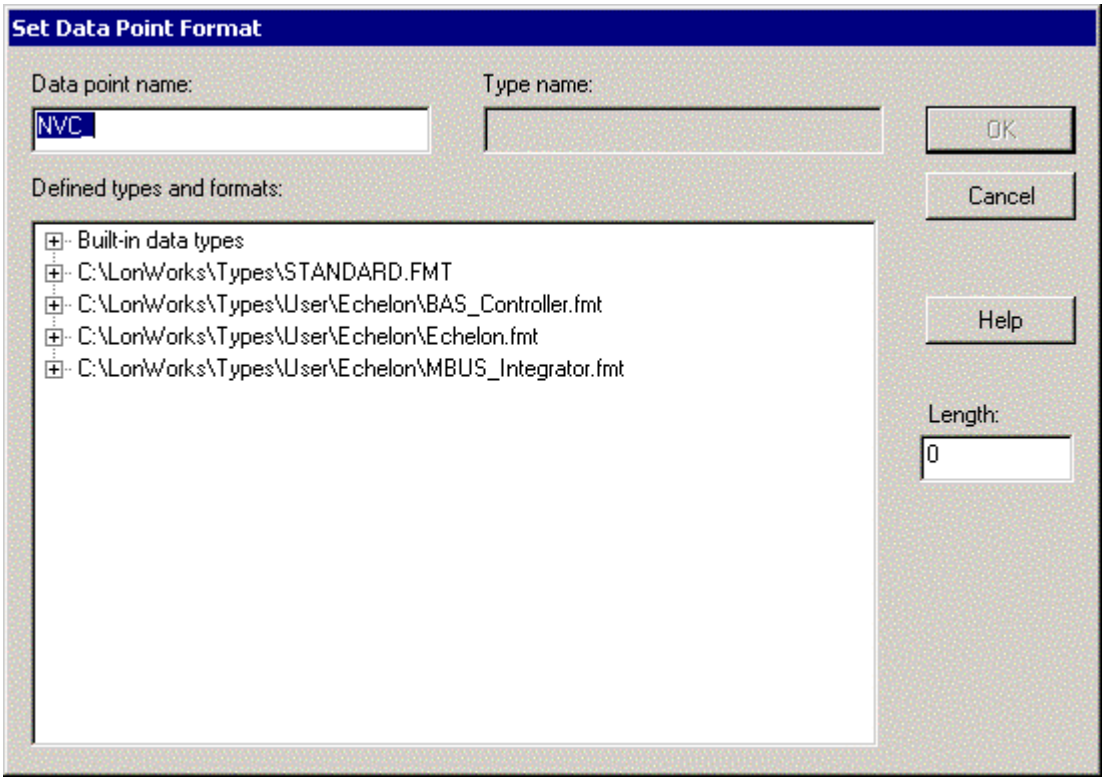
Creating and Viewing Constant Data Points (NVCs)

You can create a constant data point using the *i*.LON 100 Configuration Plug-in. A constant data point is useful when making comparisons—for example, testing for alarm conditions. A constant data point is also useful when you need to supply a static value to some other device on your network. To create a constant data point, follow these steps:

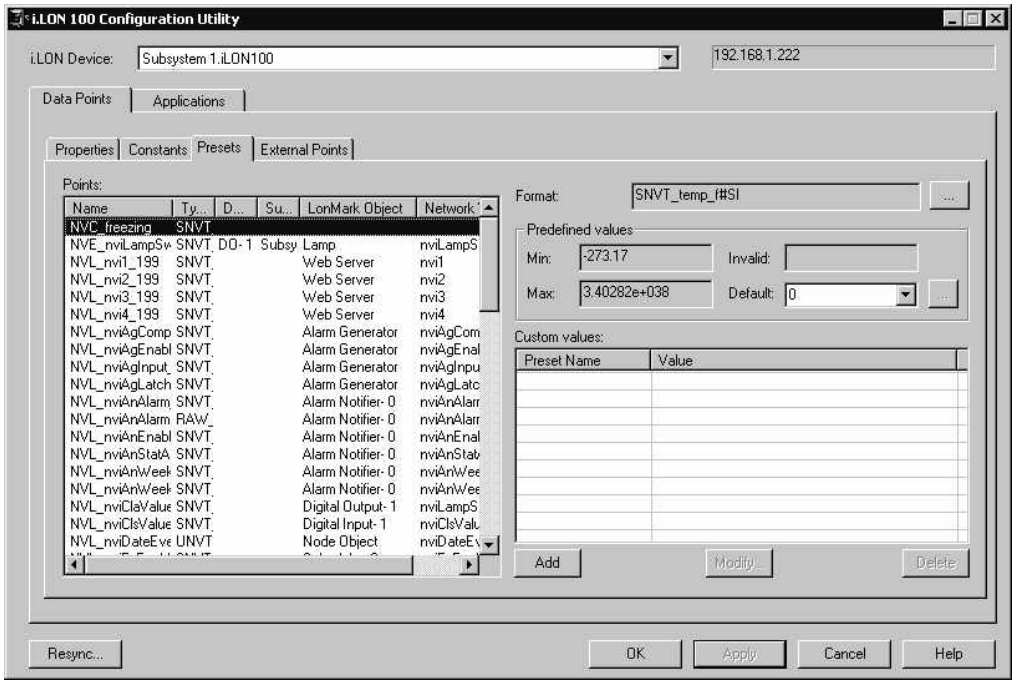
1. Start the *i*.LON 100 Configuration Plug-in as described in *Starting the i.LON 100 Plug-in* in Chapter 1.
2. Select the **Data Points** tab and then the **Constants** tab. The **Constants** tab appears as shown in the following figure:



3. Click **Add**. The **Set Data Point Format** dialog appears as shown in the following figure:



4. Enter a name for the data point in **Data Point Name**. This field contains **NVC_** by default.
5. Select a network variable type and format for this constant. You can choose from any data type that is available in the resource catalog. All available resources are displayed in a tree view. The top level of the tree shows all available resource files plus the built in data types. Expand the tree to view the resources within a resource file set. The selected resource files must be available on both the computer and on the *i*.LON 100. Resource files on the computer are maintained by the resource catalog. Resource files on the *i*.LON 100 are kept in **/root/lonworks/types**.
6. Click **OK**. The constant data point will be added to the **Points** list on the left side of the **Constants** tab.
7. Use the **Data Point Presets** tab to set the default value of this constant, as shown in the following figure:



See *Data Point Presets* for more information.

Data Point Presets

The *i*.LON 100 server allows you to define presets for each data point. For example you might define a preset named **ON** for an **NVE_lampSw** data point (which is defined as a SNVT_switch) as 100.0 1. You might also define a preset named **ON** for an **NVL_heat_setpoint** data point (which is of type **SNVT_temp_f**) to be 22.

In both cases what you are saying is that you want to turn something ***on*** (lights or the heater), but the underlying data type needs to use 100.0 1 for lights and a floating point value of 22° C for the HVAC system. The data server in the *i*.LON 100 server allows you to abstract the idiosyncrasies of the data types and use a mnemonic (ON) that makes sense to a human. This makes it much easier to work with the point later on. Whenever you want to drive an output network variable to a pre-defined value you set the data point to a pre-defined preset. For example, to turn the lights on at 8:00AM a scheduler block sets the data point **NVL_lampSw** to the ON preset, and the data server automatically translates ON to 100.0 1 as it updates the output network variable.

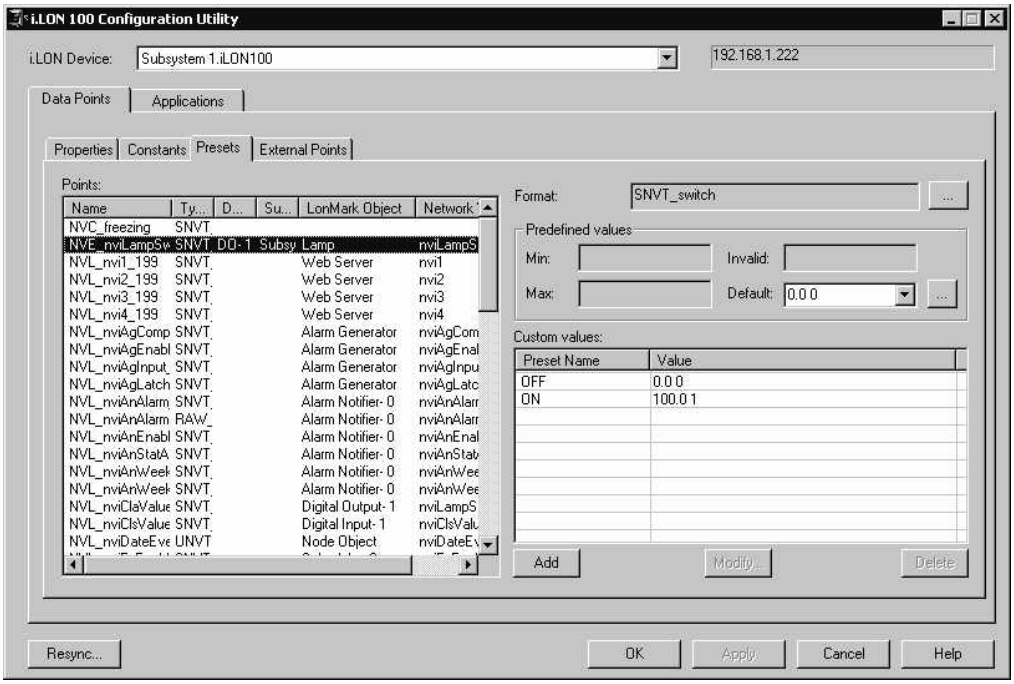
Another advantage of presets is that you can drive multiple outputs of different type simultaneously. For example, a scheduler can turn a group of points "ON" at 8:00AM, and if you included both the data points discussed above in the scheduled group the *i*.LON 100 server would send the value 22 on **NVE_heat_setpoint** at 8:00AM and 100.0 1 on **NVL_lampSw** at 8:00AM. This is an extremely powerful feature that allows the *i*.LON 100 server's built-in applications to work with any kind of data type and field bus. This provides a layer of abstraction in the user interface so the end user does not need to know about the underlying data structures of the various data points.

The *i*.LON 100 contains predefined presets for a number of data points. These presets can be viewed, modified, or removed using this tab just like any other presets.

Creating Data Point Presets

You can create predefined values for local, external, and constant data points. To create presets, follow these steps:

1. Start the *i*.LON 100 Configuration Plug-in as described in *Starting the i.LON 100 Plug-in* in Chapter 1.
2. Select the **Data Points** tab and then the **Presets** sub. The **Presets** tab appears as shown in the following figure:



3. Select a data point from the **Points** list. If the selected data point is of a type that has a predefined minimum, maximum, or invalid value, these values will appear in the **Min**, **Max**, and **Invalid** fields (see the resource file documentation for the data point type for more information—for standard LONMARK resource files, this information is available at types.lonmark.org; for user resource files, this information is provided by the resource file manufacturer.

   You can sort the data points on this tab by clicking any of the column headings, just as you would in Windows Explorer. You can resize any of the columns by dragging the edges of the column header.

4. If multiple formats are available for the data point type, set the format for the point. Click the ... button next to **Format** to open a dialog that allows you to select a format from all available resource files. Changing the type of a data point automatically changes the type of the corresponding network variable.

5. Optionally set a **Default** value. If this is a structure type data point, click the ... button to set each field separately. The **Default** value is used to set the data point value after a reboot or when the *i*.LON 100 server is put into override using a network tool; it cannot be referenced by the other *i*.LON 100 functional blocks like the custom values described below.

   Note: If an output data point has no default value (i.e. **Default** is **<none>**), it cannot send a heartbeat.

6. To create additional presets for this data point, click **Add**. The **Specify New Preset Name** dialog appears, as shown in the following figure:

Enter the name of the new preset and click **OK**. The new preset name appears in the **Custom Values** list. Alternatively, you can double-click a **Custom Values** list entry and type preset names and values directly into the list.

7. Select the new preset name. If this data point is a structure-type data point, you can click **Modify** to set each field of the structure separately. Otherwise, click the **Value** column next to the preset name to enter a value that will correspond to the preset name.

3

Managing Alarms

This chapter describes how to use the *i*.LON 100 Internet Server to define alarm conditions, how to trigger alarms, and how to clear alarms.

Alarming Overview

The *i*.LON 100 Internet Server contains two types of functional blocks that control alarming—the **Alarm Generator** and the **Alarm Notifier** functional blocks. The alarm generator monitors one or more data point values and triggers alarms by setting a data point value when specified conditions are met. The alarm notifier monitors data points; it can be configured to respond to an alarm by modifying one or more data points, sending email, and/or logging the alarm. The *i*.LON 100 includes 40 of each type of alarm functional block. You can create, modify, and delete **Alarm Generator** and **Alarm Notifier** functional blocks using the *i*.LON 100 Configuration Plug-in or the i.LON 100 Web pages. These functional blocks are described in the following sections.

The Alarm Generator Functional Block

The *i*.LON 100 includes 40 **Alarm Generator** functional blocks. An alarm generator generates alarms based on the values of any of the *i*.LON 100 data points. The alarm generator compares the values of an *input data point* with a *compare data point* each time either one is updated. You will select the function the alarm generator will use to make the comparison. If the result of the comparison is true, an alarm will be generated, and the status of the input data point will be updated to an alarm condition.

For example, you could select a Greater Than comparison function. The alarm generator generates an alarm when either data point is updated and the value of the input data point is greater than the value of the compare data point. The alarm generator includes the following *binary* comparison functions: Less Than, Less Than or Equal, Greater Than or Equal, Equal, and Not Equal.

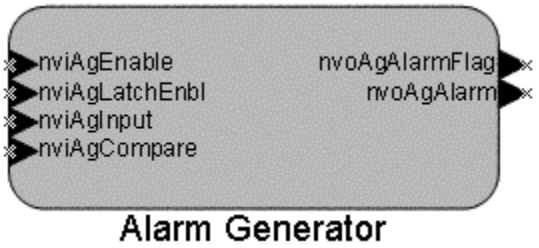
The alarm generator also includes an *analog* comparison function. When you select this comparison function, you will specify four offset limits for the alarm generator. The four offset limits allow you to generate alarms based on how much the value of the input data point exceeds, or is exceeded by, the value of the compare data point. The alarm generator generates an alarm when either data point is updated and the difference between their values exceeds any of the offset limits.

You will define a hysteresis level for each alarm-offset limit when you use the analog comparison function. After an alarm has been generated based on an offset limit, the value of the input data point must return to the hysteresis level defined for that offset limit before the alarm clears, and before another alarm can be generated based on that offset limit. As a result, the alarm generator will not generate an additional alarm each time the input data point is updated after it reaches an alarm condition, but before it has returned to a normal condition.

All of the comparison functions have additional features that will allow you to throttle alarm generation. You can specify an interval that must elapse between alarm generations for a data point. You can also define an interval that must elapse after an alarm has returned to normal status before that alarm will be cleared. These features prevent the alarm generator from triggering multiple alarms each time the input data point reaches an alarm condition.

You can optionally select up to two *alarm data points* for each alarm generator, one **SNVT_alarm** data point and one **SNVT_alarm_2** data point. The status of these data points will be updated to an alarm condition each time the alarm generator state changes (i.e. passive to active *or* active to passive).

The **Alarm Generator** functional block includes the following input and output network variables:



nviAgEnable — This **SNVT_switch** static input network variable enables and disables the alarm generator. If this network variable is set to **Off** (**0.0 0**), the alarm generator will not generate alarms. The default value for this network variable is **On** (**100.0 1)**, so if this network variable is left unbound, the alarm generator will function normally.

nviAgLatchEnbl — This **SNVT_switch** static input network variable can be used to latch an alarm. When this network variable is set to **On** (**100.0 1**) and an alarm is generated, the **nvoAgAlarmFlag** output will continue to send an **On** (**100.0 1**) value even when the conditions that caused the alarm no longer exist. When this network variable is set to **Off** (**0.0 0**), the **nvoAgAlarmFlag** network variable will be set to **Off** (0.0 0) when the alarm condition ends. See *Latching, Acknowledging, and Clearing Alarms*, later in this chapter, for more information.

nviAgInput — This changeable-type input network variable provides an input value to the alarm generator. Typically, the alarm generator compares this value to the **nviAgCompare** network variable value to determine if an alarm should be generated. The comparison function can be configured as described in *Configuring the Alarm Generator Functional Block*, below.

nviAgCompare — This dynamic changeable-type input network variable provides a value to be compared to the **nviAgInput** network variable value. This network variable must have the same type as the **nviAgInput** network variable.

nvoAgAlarmFlag — This **SNVT_switch** static output network variable is set to Off (**0.0 0**) when no alarm is being generated and to On (**100.0 1**) when an alarm is generated.

nvoAgAlarm — This **SNVT_alarm** dynamic output network variable sends alarms generated by the alarm generator. The **SNVT_alarm** network variable type is described in the standard resource file

documentation available from the LONMARK Web site at types.lonmark.org.

The Alarm Notifier Functional Block

The *i*.LON 100 includes 40 **Alarm Notifier** functional blocks. An alarm notifier logs alarm conditions and generates email messages and data point updates each time an alarm condition occurs. You can use an alarm notifier to provide notification of alarms generated by any device that produces a SNVT_alarm or SNVT_alarm_2 output, including the *i*.LON 100 device itself. For example, you can use an alarm notifier to provide alarm notification of alarms produced by alarm generators on the *i*.LON 100 device. You can also use the alarm notifier to provide notification of any i.LON 100 data point going offline.

You will specify a group of input data points for each alarm notifier. The alarm notifier reads the status of these data points each time they are updated to determine if the alarm condition for the point has been changed to a value other than **AL_NO_CONDITION** (you can limit this further using the **Alarms** tab, as described below). If the data point has such a condition, the alarm is classified as an *active alarm* and an alarm notification is generated. Each time an input data point is updated and the alarm condition is set to **AL_NO_CONDITION**, the alarm is classified as a *passive alarm*.

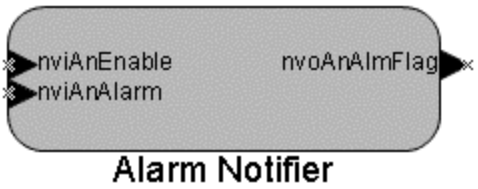
You can specify one or more output data points for each alarm notifier. These data points will be updated each time an alarm notification occurs. You can also specify an email profile for each alarm notifier. An email message will be sent to the addresses specified for that email profile each time an alarm notification occurs. You can specify the message text, subject heading, and attachment to be included with each email notification. Email profiles allow you to notify different people when different alarms occur. This is useful if different groups of people need to receive notifications about the various alarm conditions that can occur on your network. See the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100* for information on configuring the *i*.LON 100 to communicate with an email server.

Each alarm notifier generates a log file. It will add an entry to this log file each time it causes an alarm notification. You can find these log files in the /root/AlarmLog directory of the *i*.LON 100 device. These files are named histlogX, where X represents the index number assigned to the alarm notifier when it was created. An alarm notifier will not generate a log file until it has generated an alarm notification.

The *i*.LON 100 device does not limit how much alarm data can be logged. However, you should maintain at least 1024KB of free disk space. You can view the amount of free disk space using the System Info Web page.

In addition, the alarm notifier generates a summary log that summarizes the log entries made by all alarm notifiers that were classified as active alarms. This file is called sumlog0, and can also be found in the /root/AlarmLog directory of your *i*.LON 100 device.

The **Alarm Notifier** functional block includes the following input and output network variables:



nviAnEnable	A **SNVT_switch** type static input network variable. This input network variable is used to enable and disable the **Email** and **Outputs** tabs (*Configuring the Alarm Notifier Functional Blocks).* Using the Configuration Plug-in, you can configure the alarm notifier to use other network variables as enable inputs.
nviAnAlarm	This **SNVT_alarm** dynamic input network variable is used to receive **SNVT_alarm** type messages. How the **Alarm Notifier** functional block responds to these messages is configured using the **Alarm Notifier** tab of the *i*.LON 100 Configuration Plug-in, as described blow.
nvoAnAlmFlag	This **SNVT_switch** dynamic output network variable is set to On (100.0 1) whenever an alarm notifier is responding to an alarm. When no alarm has been detected, this network variable is set to Off (0.0 0).

Configuring an Alarm Generator

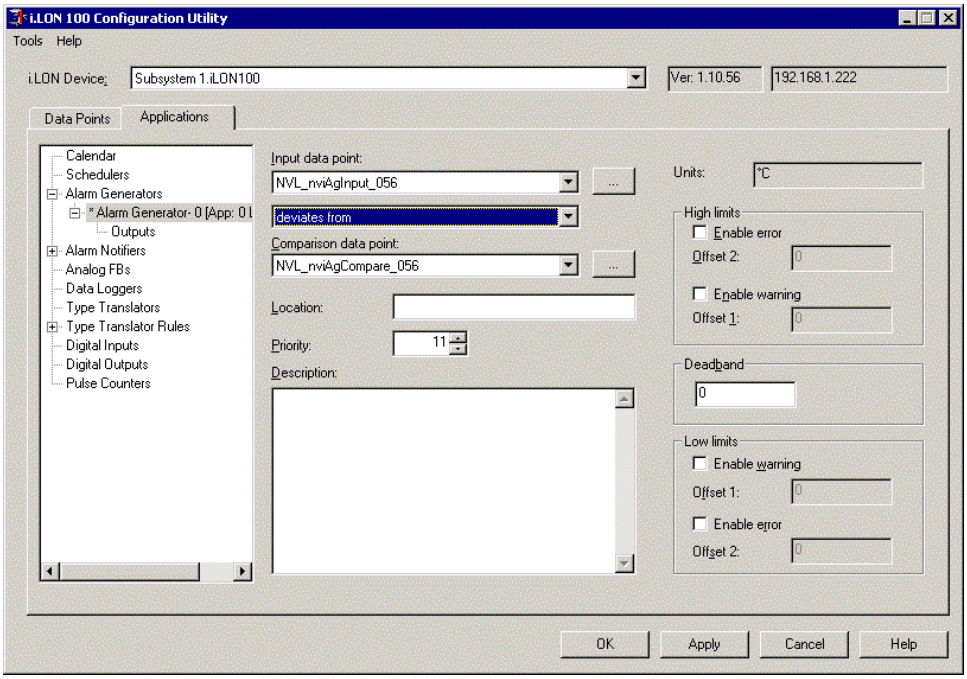
You can configure an **Alarm Generator** functional block to generate an alarm update in response to input conditions that you define. An alarm update from an alarm generator does not result in an alarm notification. To provide notifications of an alarm update, connect the alarm output of an alarm generator, or any other functional block with an alarm output, to one or more alarm notifiers (see *Configuring the Alarm Notifier Functional Blocks*, later in this chapter).

You can configure an Alarm Generator functional block using either the *i*.LON 100 Configuration Plug-in or the **Alarm Generator Configuration** Web page.

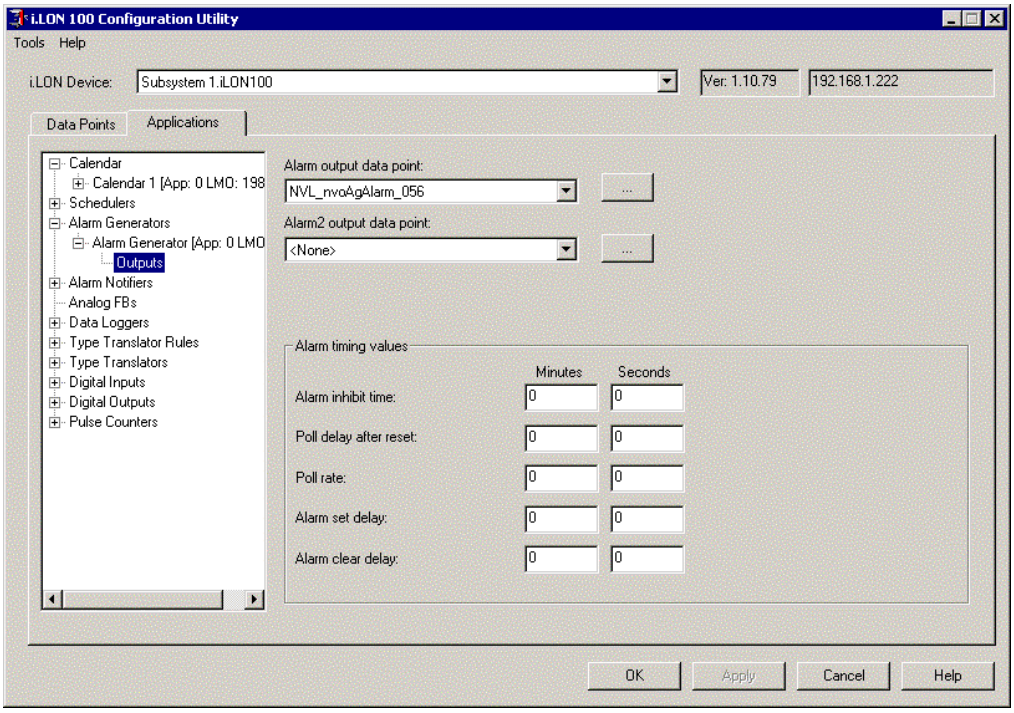
To configure an alarm generator to generate alarms using the *i*.LON 100 Configuration Plug-in, follow these steps:

1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Define a data point to be monitored as described in Chapter 2. This is the *input data point*.
4. Define a data point to use as a comparison value as described in Chapter 2. This is the *comparison data point*. For example, you may define a constant data point to compare the input data point against.
5. Associate the **Alarm Generator** functional block shape with any of the available **Alarm Generator** functional blocks on the *i*.LON 100 device, and then click **Next**.

6. Enter a name for the **Alarm Generator** functional block, and then click **Finish**.
7. Right-click the **Alarm Generator** functional block, and then select **Configure** from the shortcut menu. Enter the IP address or fully qualified host name of the *i*.LON 100 server when prompted. The following tab appears:



8. Select the input and comparison data points from the **Input Data Point** and **Comparison Data Point** lists.
9. Select a comparison function from the **Comparison** list between the input and comparison data points. The available comparison functions include the following:
   - Input value deviates from comparison value.
   - Input value is equal to comparison value.
   - Input value is greater than comparison value.
   - Input value is greater than or equal to comparison value.
   - Input value is less than comparison value.
   - Input value is less than or equal to comparison value.
   - Input value is not equal to comparison value.
10. If you selected the **Deviates From** comparison function, enter **High Limit**, **Deadband**, and **Low Limit** values on the right side of the tab. Click **Help** for a description of these values.
11. Set **Priority** to a value from 0 to 11, with 0 being the highest priority and 11 being the lowest priority. This value will be sent in the priority field of the SNVT_alarm or SNVT_alarm_2 output.
12. Enter a description of the criteria in **Description**. This allows other network integrators to easily understand the purpose of this **Alarm Generator** functional block.
13. Select **Output** from below the Alarm Generator from **Applications** list. The following dialog appears:



14. Select one or two output data points in **Alarm Output Data Point** and **Alarm2 Output Data Point**. Use **Alarm Output Data Point** to select a SNVT_alarm output; use **Alarm2 Output Data Point** to select a SNVT_alarm_2 output.
15. You can optionally specify alarm timing in **Alarm Timing Values**. Set **Poll Rate** to a positive value if you have specified an external data point for either the input value or the comparison value. Click **Help** for a description of these values.
16. Click **OK** to configure the *i*.LON 100 device and close the plug-in, or click **Apply** to configure the *i*.LON 100 device without closing the plug-in.

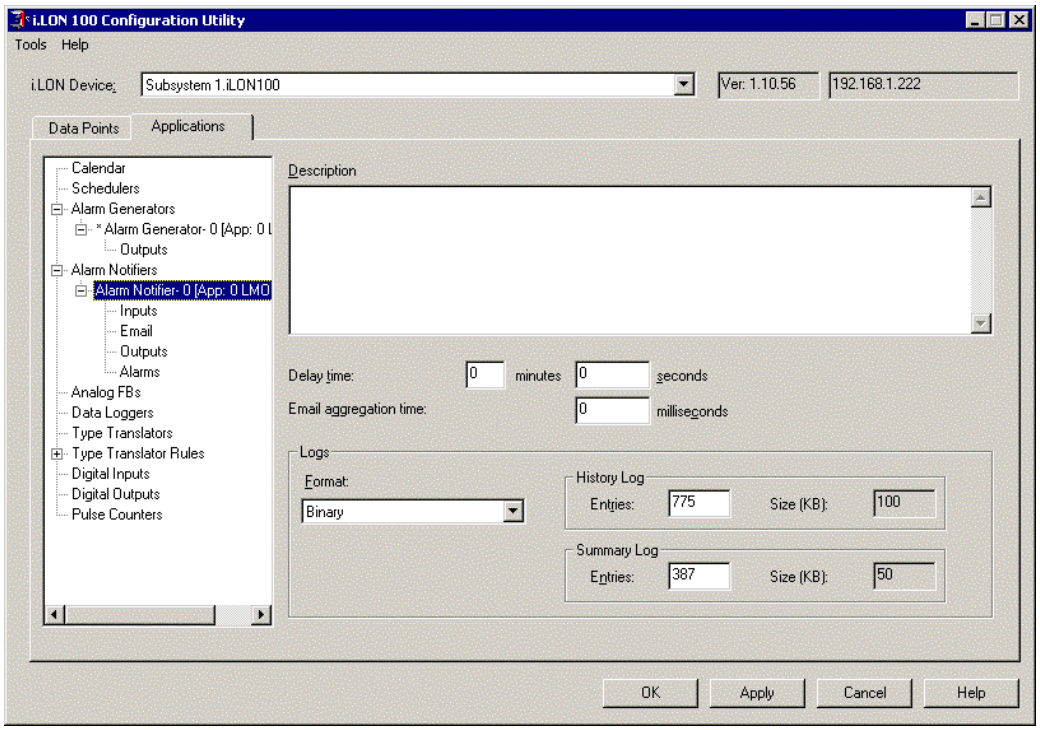
Providing an Alarm Notification

You can configure an **Alarm Notifier** functional block to provide a network or email notification of an alarm condition. The alarm condition may be generated by an **Alarm Generator** functional block, it may be generated by another LONWORKS device that produces SNVT_alarm or SNVT_alarm_2 alarm outputs, or it may be generated in response to any data point going offline. To configure an alarm notifier to provide alarm notifications, follow these steps:

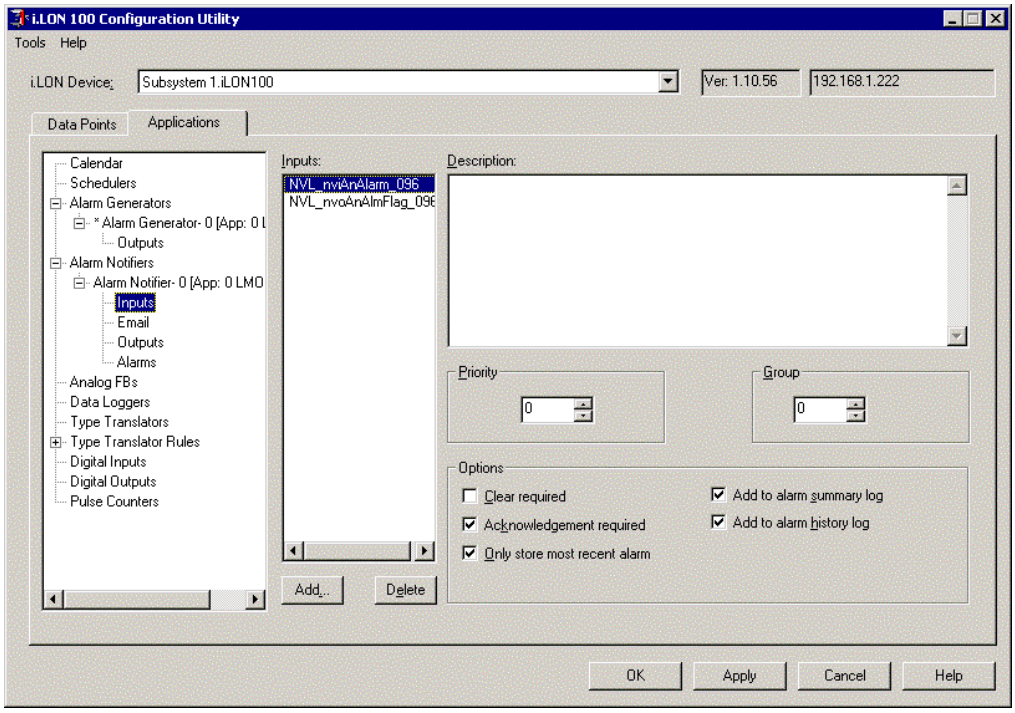
1. Use an LNS installation tool such as the LonMaker tool to open an existing network or create a new network as described in your installation tool documentation.
2. Use an existing *i*.LON 100 device in your network, or create and commission a new *i*.LON 100 device.
3. To provide email notifications, configure the *i*.LON 100 device to send email as described in the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100*.
4. Add an **Alarm Notifier** functional block to your network. For example, using the LonMaker tool drag an **Alarm Notifier** functional block shape

from the *i*.LON 100 Shapes stencil to the drawing. The New Functional Block wizard appears (the next 3 steps assume you are using the LonMaker tool).

5. Associate the **Alarm Notifier** functional block shape with any of the available **Alarm Notifier** functional blocks on the *i*.LON 100 device, and then click **Next**.
6. Enter a name for the **Alarm Notifier** functional block, and then click **Finish**.
7. Right-click the **Alarm Notifier** functional block and then select **Configure** from the shortcut menu. Enter the IP address or fully qualified host name of the *i*.LON 100 server when prompted. The following window appears:



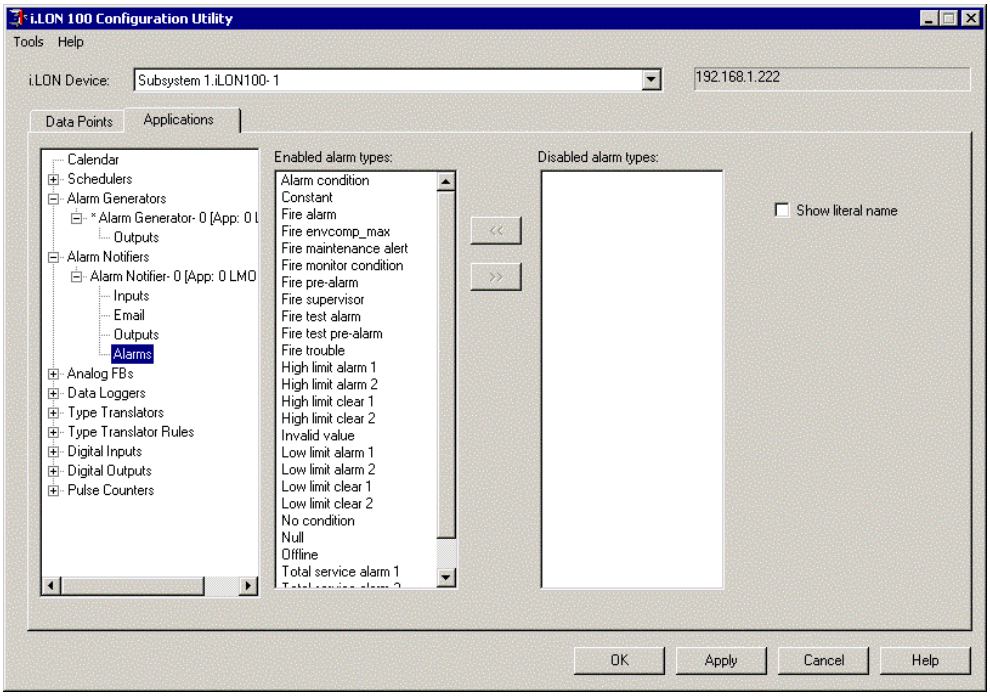
8. Enter a description of the alarm notifier in **Description**. This allows other network integrators to easily understand the purpose of this **Alarm Notifier** functional block.
9. Optionally set global options for this alarm notifier. Click **Help** for a description of the available options.
10. Click **Inputs** under the selected **Alarm Notifier** in the Applications list. The following tab appears:



11. Select the data points to be monitored by the alarm notifier in the **Inputs** list. The alarm notifier will generate notifications for these data points as defined on the **Email** and **Outputs** tabs. You can select any type of data point. If a data point is a SNVT_alarm or SNVT_alarm_2 type, the alarm notifier generates an alarm notification based on the value of the data point. If the data point is of any other type, the alarm notifier generates an alarm notification if the data point status changes to OFFLINE. This typically happens when the time between two data point inputs is greater than the **Max Recv Time** set in the Data Points Properties tab..
12. Set **Priority** to the priority of the alarm generated by this alarm notifier. This value can be from 0 (highest priority) to 255 (lowest priority). If alarm conditions are received on more than one input, the alarm with the highest priority will take precedence.
13. Set **Group** to an alarm group number. This value can be from 1 to 127. A value of 0 indicates the alarm has no group. You can use groups to classify alarms into installation-specific categories. You can assign any meaning to each of the group numbers. The group numbers have no effect on the function of the alarm notifier, but you can include the group number in email messages sent by the alarm notifier.
14. Optionally set input options for this alarm notifier. Click **Help** for a description of the available options.
15. To send email notifications, click **Email** under the selected **Alarm Notifier** in the Applications list. Select SNVT_switch data points to be used to trigger email notifications, and define an email message to be sent for each of these data points. When an alarm changes state (*i.e.* when it becomes active or when it becomes passive), the alarm notifier sends email messages that are associated with all data points in the **Enable Data Points** list that are set to On. You can define the text for each email message, including substitution strings that specify details about the alarm such as alarm value, alarm limit, and alarm time. See the *i.LON 100 User's Guide: Installing, Connecting, and*

Configuring the i.LON 100 for information on configuring the *i*.LON 100 to communicate with an email server. Click **Help** for more details on how to define email notifications.

16. To provide alarm notifications via data point outputs from the alarm notifier, select **Outputs** under the selected **Alarm Notifier** in the Applications list. Select SNVT_switch data points to be used to enable outputs from the alarm notifier. You can define output data points to be set for each enable data point with an On value. Each output data point has an *active value* and a *passive value*. When an alarm condition is received, the enabled output data points are set to the active value. When an alarm is cleared, the enabled output data points are set to the passive value. Click **Help** for more details on how to define output notifications.
17. To enable or disable specific alarm conditions for an alarm notifier, select **Alarms** under the selected **Alarm Notifier** in the Application list. This tab appears as shown in the following figure:



Normally, an alarm is triggered whenever an alarm condition other than **No Condition** or **Null** is received (alarm conditions are received on **SNVT_alarm** or **SNVT_alarm_2** network variables—these are sent by the alarm generator or any other functional block with a **SNVT_alarm** or **SNVT_alarm_2** output).

To disable one or more alarm types, select them from the **Enabled Alarm Types** list and click the ">>" button. to move them to the **Disabled Alarm Types** list.

To see the enumerated names for alarm types used by **SNVT_alarm** and **SNVT_alarm_2**, set the **Show Literal Name** check box.

18. Click **OK** to configure the *i*.LON 100 device and close the plug-in, or click **Apply** to configure the *i*.LON 100 device without closing the plug-in.

Scenario - Configuring an Alarm System

The following example demonstrates how to design and configure a simple alarming application using the *i*.LON 100 Configuration Plug-in. The example is specific to a particular scenario, but the concepts can be used for any alarming application. If you need more information about a particular tab of the alarming configuration dialogs, click the **Help** button in the *i*.LON 100 Configuration Plug-in.

Description

A water-piping system for a building in New York City uses an **Alarm Generator** functional block connected to a temperature sensor functional block on another device. The alarm generator compares the data point value from the temperature sensor with a constant data point value set to a temperature near freezing. This constant value represents the low-limit 2 value for the temperature. When the temperature falls below four degrees above the *low-limit 2 value*, the generator updates a SNVT_alarm data point. This is the *low-limit 1* value. An **Alarm Notifier** functional block monitors this data point and when an alarm condition is set, it automatically turns on the heating mechanism to keep the pipes from freezing and sends an email to the building staff informing them of the alarm and the response. The alarm is logged in the *i*.LON 100's internal alarm log. When the temperature returns to a safe level, the alarm is cancelled automatically.

If the temperature continues to drop below the low-limit 2 value, the alarm generator functional block triggers a different, more serious alarm condition. A separate alarm notifier functional block then sends a more urgent email message reports this second alarm condition. This alarm notifier is configured so the alarm is not automatically cleared. It must be manually cleared using a Web page hosted by the *i*.LON 100.

Designing the LonMaker Network Drawing

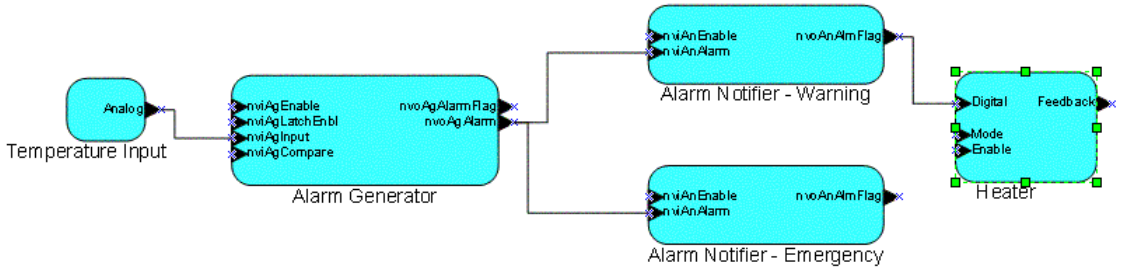
To use the LonMaker tool to create the example network described above, follow these steps:

1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Configure the *i*.LON 100 device to send email as described in the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100*.
4. Drag an **AI-10** LonPoint device shape from the LonPoint Shapes stencil to the drawing. This LonPoint device will be physically attached to a temperature sensor. See the *LonPoint Hardware Guide* and *LonPoint User's Guide* for more information.
5. Drag an **Analog Input** functional block shape from the LonPoints Shapes stencil to the drawing. Associate it with one of the Analog Sensor functional blocks on the AI-10 device. Name this shape **Temperature Input**.
6. Drag a **DO-10** LonPoint shape from the LonPoint Shapes stencil to the drawing. This LonPoint will be physically attached to a heater control relay near the water pipes.

7. Drag a **Digital Output** shape from the LonPoint Shapes stencil to the drawing. Associate it with one of the **Digital Output** functional blocks on the DO-10 device. Name this shape **Heater**.
8. Drag an **Alarm Generator** functional block shape from the *i*.LON 100 Shapes stencil to the drawing. Associate it with any of the available **Alarm Generator** functional blocks on the *i*.LON 100 device. Name this shape **Alarm Generator**.
9. Drag two **Alarm Notifier** functional block shapes from the *i*.LON 100 Shapes stencil. Associate them with two **Alarm Notifier** functional blocks on the *i*.LON 100 server. Name these shapes **Alarm Notifier – Warning** and **Alarm Notifier – Emergency**.
10. Make the following network variable connections:

- Connect the **Analog** output network variable on the **Temperature Input** functional block to the **nviAgInput** input network variable on the **Alarm Generator** functional block.
- Connect the **nvoAgAlarm** output network variable on the **Alarm Generator** functional block to the **nviAnAlarm input** network variables on both the **Alarm Notifier – Warning**, and **Alarm Notifier – Emergency** functional blocks.
- Connect the **nvoAnAlarmFlag** output network variable on the **Alarm Notifier – Warning** functional block to the **Digital** input network variable on the **Heater** functional block,

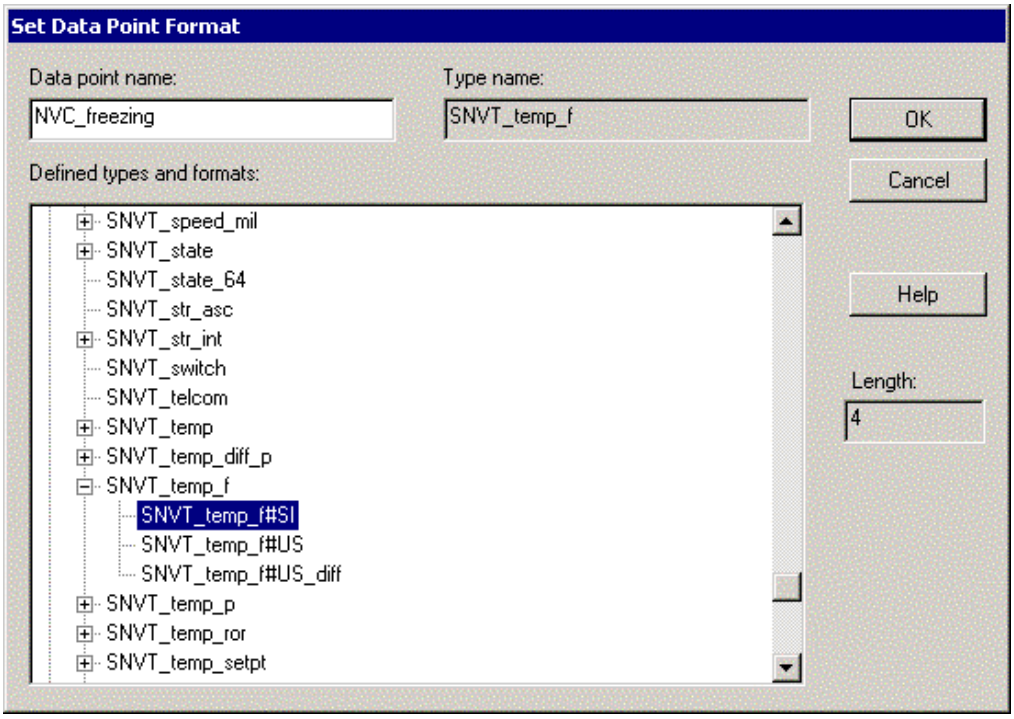
When you are done, your LonMaker drawing should look something like the following figure:



Creating a Constant Data Point

In the scenario described above, we want to compare the value of the **nviAgInput** network variable to freezing to determine whether to generate an alarm. In order to do this, we will create a constant data point that contains the value for freezing as a value in degrees Celsius. To do this, follow these steps:

1. Right-click the *i*.LON 100 device shape and select **Configure** from the shortcut menu. Enter the IP address or fully qualified host name of the *i*.LON 100 server when prompted. The *i*.LON 100 Configuration Plug-in opens.
2. Select the **Data Points** tab and the **Constants** sub-tab.
3. Click **Add** to create a new constant data point. The **Set Data Point Type** dialog opens.
4. Choose **STANDARD.FMT** from the **Type Files** list, select **SNVT_temp_f#SI** from the **Type List**, and set **Data Point Name** to **NVC_freezing**, as shown in the following figure:



5. Click **OK**. The **NVC_freezing** data point appears in the **Points** list.
6. Select the **Presets** tab.
7. Select the **NVC_freezing** data point from the **Points** list.
8. Click the **Default** field and enter **0**. Click **Apply**.

Configuring the Alarm Generator Functional Block

To configure the **Alarm Generator** functional block, follow these steps:

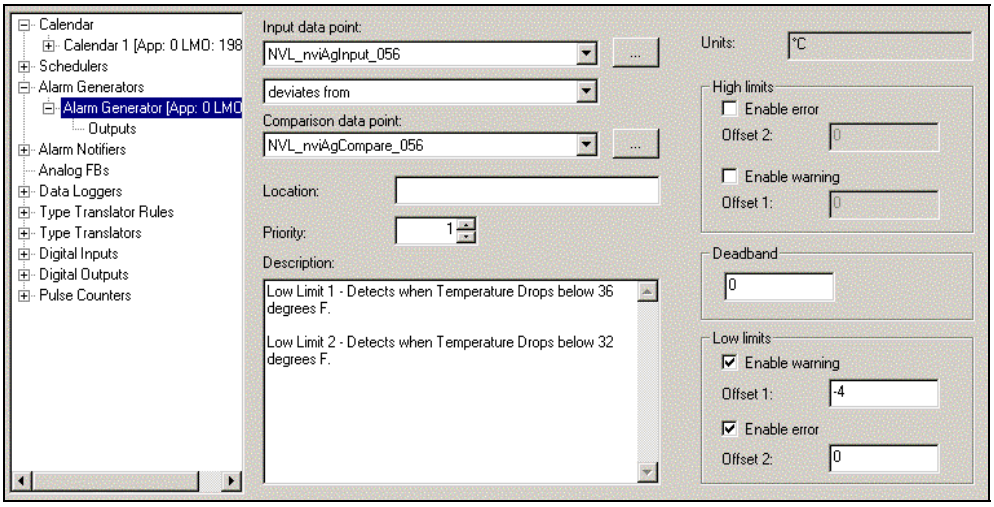
1. Right-click the **Alarm Generator** functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens with the **Alarm Generator** configuration dialog selected.
2. Select the **Alarm Generator** window.
3. Select **NVL_nviAgInput** from **Input Data Point** list, **Deviates From** from the second list, and **NVC_freezing** from the **Comparison** list. This causes the **High Limits**, **Deadband**, and **Low Limits** frames on the right side of the tab to become active.

> **Note:** Be sure that the **NVL_nviAgInput** data point is associated with the **nviAgInput** network variable on the **Alarm Generator** functional block. You can verify this using the **Input Data Point** list. The data points that are on the selected **Alarm Generator** functional block are listed first under **Local Data Points**.

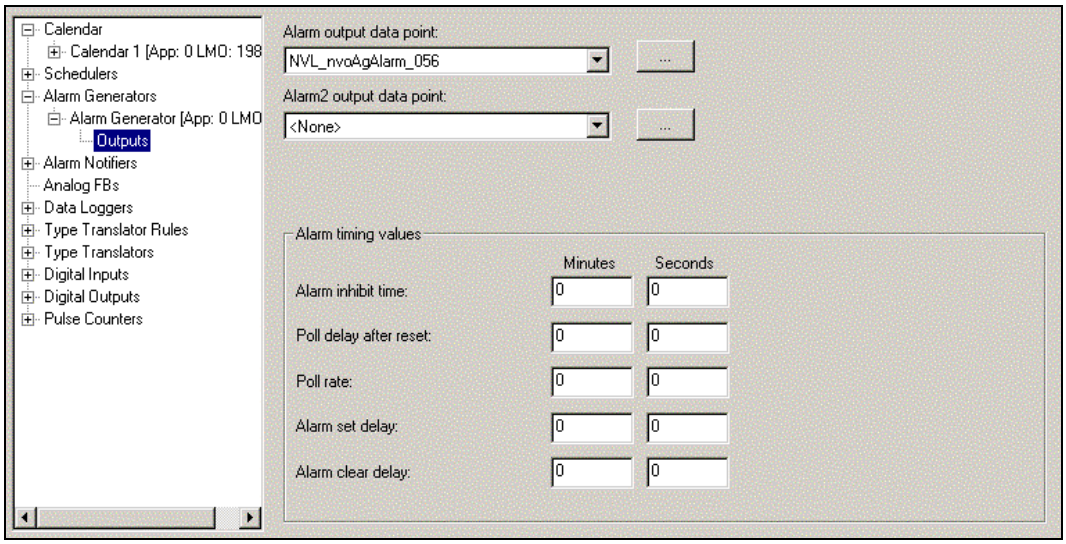
4. Set the **Enable Warning** and **Enable Error** check boxes in **Low Limits**. This causes an alarm to be generated when the value of the **Input Data Point** passes below a certain point.
5. Set **Offset 1** to **–4**. This causes an **AL_LOW_LMT_ALM_1** alarm to be generated when the **Input Data Point** (*i.e.* the temperature) passes below 4 degrees. The value in this field is subtracted from the **Comparison data point** to determine when the alarm is generated; **0 – (-4) = 4**.

6. Set **Offset 2** to 0. This causes an **AL_LOW_LMT_ALM_2** alarm to be generated when the **Input data point** passes below 0 degrees F (-18 degrees C).
7. Set the **Deadband** to 2. If one of the low limits is passed, the alarm condition will stay active until the **Input Data Point** is 2 degrees above the threshold. This prevents the heater from rapidly switching on and off as the temperature hovers around 4 degrees.
8. Set the **Priority** to 1.
9. Enter a description of the criteria in **Description**.

   When you are finished, the **Alarm Generator** window appears as shown in the following figure:



10. Select the **Output** window from below the **Alarm Generator**.
11. Set **Alarm Output Data Point** to **NVL_nvoAgAlarm**. This data point is associated with the **nvoAgAlarm** network variable on the **Alarm Generator** functional block (you should verify this as described in the note in step 3). The **Output** tab appears as shown in the following figure.

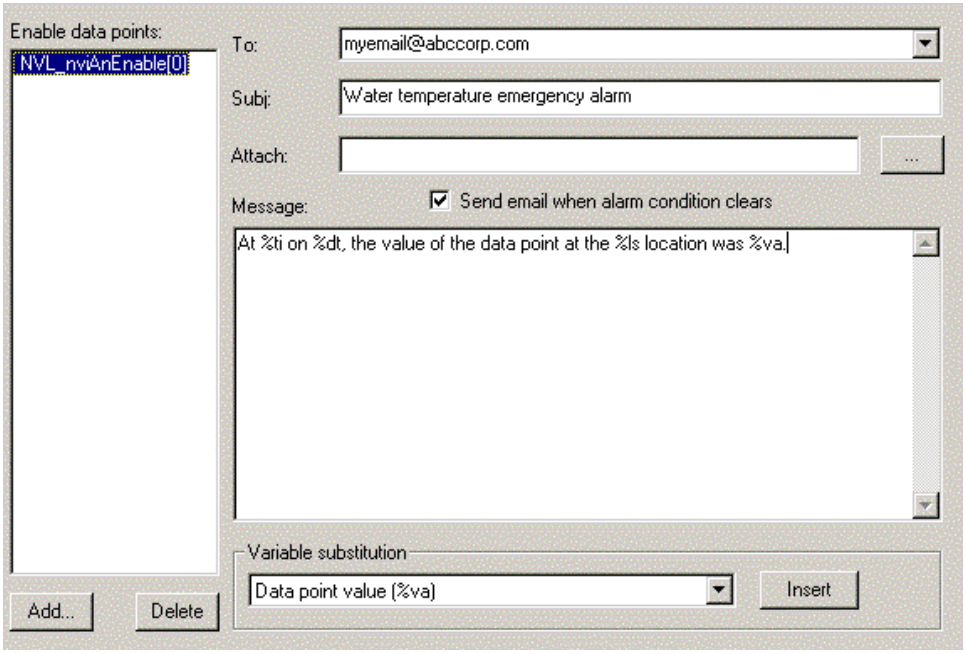


Use this tab to set the output data points for the alarm generator and to set timing properties. Set **Poll Rate** to a positive value. Click **Help** for a description of this tab.

Configuring the Alarm Notifier Functional Blocks

To configure the **Alarm Notifier – Warning** and **Alarm Notifier – Emergency** functional blocks, follow these steps:

1. Expand **Alarm Notifiers** on the Applications tab, and then select the **Alarm Notifier – Warning** functional block. The Alarm Notifier configuration dialog opens.
2. Select the **Global** tab.
3. Enter a **Description** of the **Alarm Notifier – Warning** functional block.
4. Select the **Inputs** tab.
5. Delete all data points other than the data point associated with the **nviAnAlarm** network variable from the **Inputs** list. The remaining data point will have the name **NVL_nviAnAlarm_xxx**, where xxx is the functional block index of the **Alarm Notifier** functional block.
6. Select the NVL_nviAnAlarm_xxx data point from the **Inputs** list and clear the **Acknowledgement Required** and **Clear Required** check boxes.
7. Select the **Email** tab.
8. The **Enable Data Points** field displays the **SNVT_switch** data points defined on the selected functional block.
9. Select the **NVL_nviAnEnable** data point and set the **To**, **Subj**, and **Message** fields as shown in the following figure:



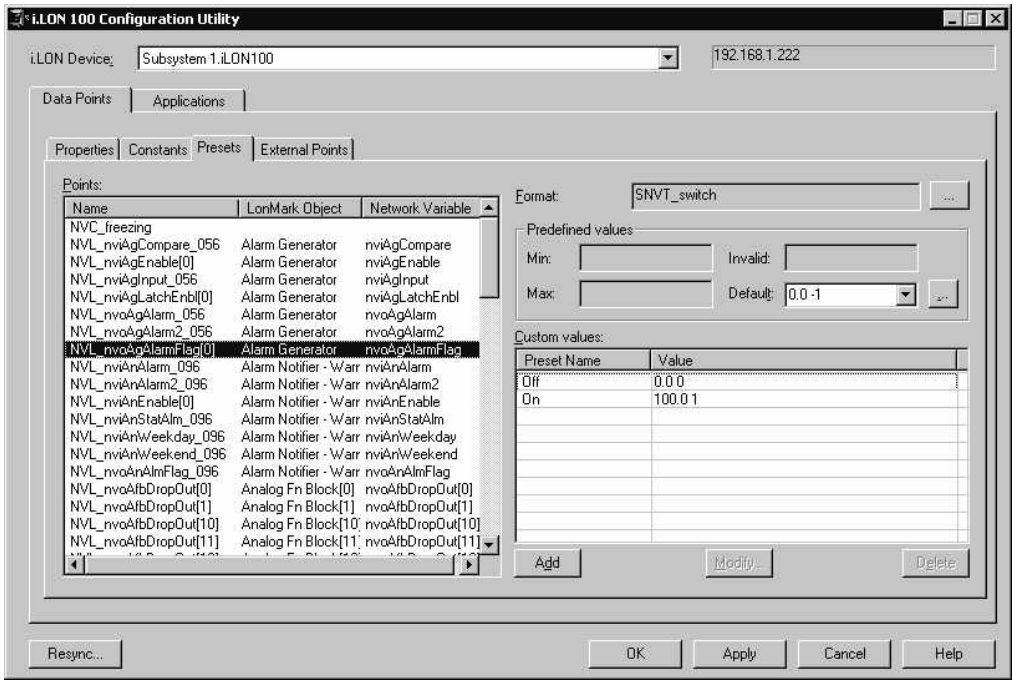
10. Enter your own email address in the **To** box. To send this email to multiple recipients, use a semi-colon as an address separator.

    This example email message uses variable substitution to send specific information about the time and location of the alarm. You can insert selected

substitutions from the **Variable Substitution** list when entering data into the **Message** field. Click **Help** for a complete list of substitutions.

When an alarm changes state (*i.e.* when it becomes active or when it becomes passive), the Alarm Notifier will send the emails that are associated with all data points in the **Enable Data Points** list that are set to On (**100.0 1**). The default value of the **nviAnEnable** input network variable is **100.0 1**, so if no other input is received on this network variable, the email shown above will be sent when the alarm is activated.

11. Select the **Outputs** tab.
12. The **Enable Data Points** list displays all the **SNVT_switch** data points on the selected functional block.
13. Click the **Add** button below the **Output Data Points** list to add output data points. The Add Data Point dialog opens. Select the data point associated with the **nvoAnAlarmFlag[n]** output network variable on the **Alarm Notifier – Warning** functional block and then click **OK**.
14. Select the **Data Points** tab and the **Presets** sub-tab.
15. Select the data point associated with the nvoAnAlarmFlag network variable and define two presets, **On** and **Off**. Set **On** to a value of **100.0 1** and **Off** to a value of **0.0 0**, as shown in the following figure:

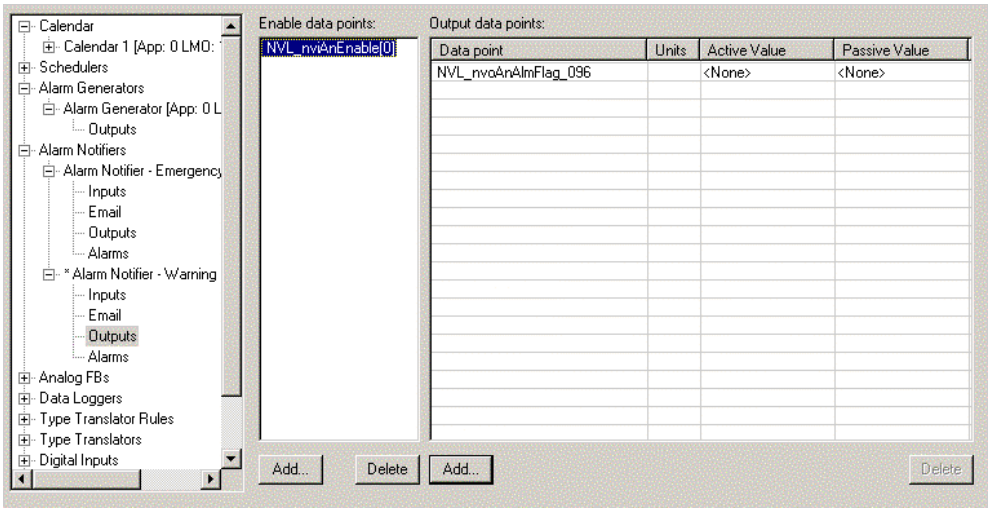


These presets are used to send output values from the alarm generator. See *Data Point Presets* in Chapter 2 for more information on creating presets.

16. Select the **Applications** tab to return to configure the **Alarm Notifier – Warning** functional block.
17. In the **Outputs** tab, double-click the **Active Value** column next to the data point added in step 11 (**NVL_nvoAnAlarmFlag_xxx**) and select **On** from the shortcut menu. The **Active Value** is the value to which the data point will be set when there is an active alarm. You can also enter the data value in this column directly (*i.e.* **100.0 1**).

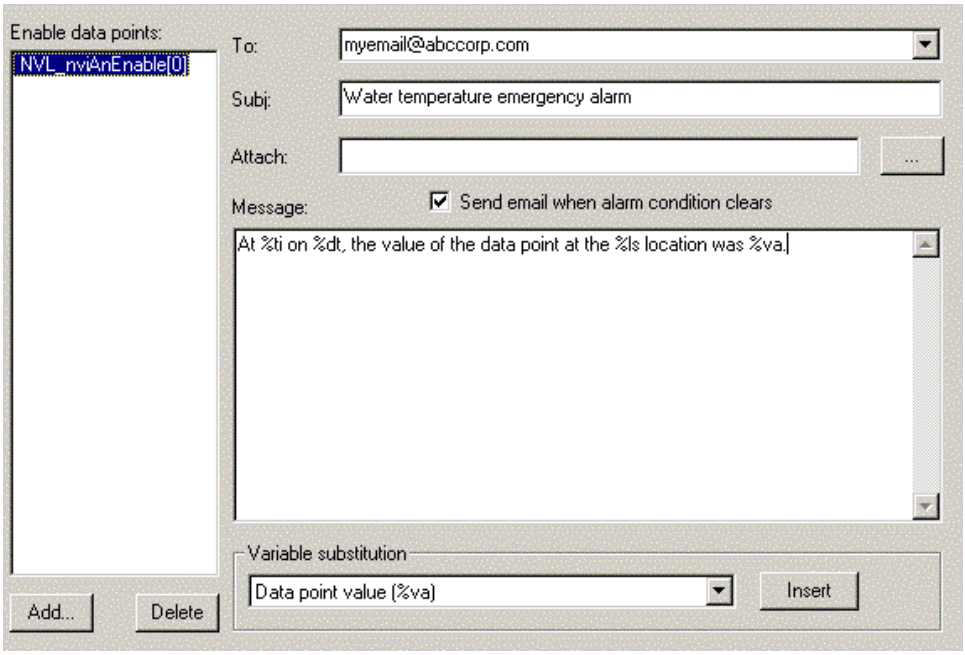
18. Double-click the **Passive Value** column and select **Off** from the shortcut menu. The **Passive Value** is the value to which the data point will be set when there is no alarm.

    The **Output** tab should now appear as shown in the following figure:



    When an alarm is activated, the **NVL_nvoAnAlarmFlag_xxx** data point will be set to On (**100.0 1**). When the alarm is cleared, the data point will be set to Off (**0.0 0**).

19. Expand **Alarm Notifiers** on the Applications tab, and then select the **Alarm Notifier – Emergency** functional block.
20. Select the **Global** tab.
21. Enter a **Description** of the **Alarm Notifier – Emergency** functional block.
22. Select the **Inputs** tab.
23. Clear the **Acknowledgement Required** check box. The **Clear Required** check box should be set.
24. Select the **Email** tab.
25. Remove all data points from the **Enable Data Points** list other than **NVL_nviAnEnable[n]**.
26. Select the **NVL_nviAnEnable** data point and set the **To**, **Subj**, and **Message** boxes as shown in the following figure:



27. Enter your own email address in the **To** box.
28. Select the **Alarms** tab.
29. Select the **AL_LOW_LMT_ALM_1** alarm type and clear the **Enable Alarm** check box. This prevents the **Alarm Notifier – Emergency** functional block from registering an alarm when the first low limit is passed.
30. Click **Apply**.

Simulating an Alarm

To simulate an alarm, follow these steps:

1. Right-click the **Alarm Generator** functional block and select **Browse** from the shortcut menu. The LonMaker browser opens.
2. Click the **Monitor All** button on the toolbar. The browser starts monitoring all points in the browser window, allowing you to see network variable value updates as they happen.
3. To simulate a warning level alarm, select the **nviAgInput** network variable, enter a value of 3, and then click the Set Value button (). The *i*.LON 100 device updates the **nvoAgAlarm** output network variable to a condition of **AL_LOW_LMT_ALM_1**. Be sure that the browser is displaying the value of **nviAgInput** in SI units (*i.e.* Celsius).
4. Open a Web browser (Internet Explorer 6 or better) and point it to the IP address of your *i*.LON 100 server.
5. Click **View** under the **Alarming** heading.
6. Select **Alarm Notifier – Warning** from the **Alarm Log** list. The following alarm appears at the bottom of the page:

ACK	CLR	Alarm time	Location	Point	Pri	Grp	Src	Value	Unit	Description	Comment
☑	☐	2002/08/23 07:30:23	iLON100	NVL_nviAnSNVTalarm1	0		1.3	35		Low limit alarm 1	

7. To simulate an emergency alarm, return to the LonMaker browser and set the **nviAgInput** value to -2. The *i*.LON 100 device updates the **nvoAgAlarm** output network variable to a condition of **AL_LOW_LMT_ALM_2**.
8. To simulate no alarm condition, set the **nviAgInput** value to 40.
9. Return to the Web browser and then click **Clear** on the left side of the Web page.
10. Select **Alarm Notifier – Emergency** from the **Alarm Log** list. A new alarm appears in the list at the bottom of the page.
11. Set the CLR check box and click **Update Log** to clear the alarm.

Detecting Heartbeat Failures

You can use the **Alarm Notifier** functional block to detect heartbeat failures. To do this, follow these steps:

1. Drag an **Alarm Notifier** functional block shape from the *i*.LON 100 stencil to the LonMaker drawing.
2. Determine what network variable will be monitored for heartbeat failure. If the selected network variable has an associated external data point on the *i*.LON 100 device skip to step 4.
3. Connect the network variable to be monitored to the **nviAnStatAlm** input network variable on the **Alarm Notifier** functional block. You may need to change the type of the **nviAnStatAlm** network variable to do this.
4. Right-click the **Alarm Notifier** functional block created in step 1 and select **Configure** from the shortcut menu. Enter the IP address or fully qualified host name of the *i*.LON 100 server when prompted. The *i*.LON 100 Configuration Plug-in opens.
5. Select the **Inputs** tab.
6. Remove all input data points from the **Inputs** tab by selecting them and clicking **Delete**.
7. Click **Add** and add the data point to be monitored for heartbeat failure. This is either the external data point identified in step 2 or the NVL_nviAnStatAlm_xxx data point on the **Alarm Notifier** functional block.
8. When there is a heartbeat failure, the **Alarm Notifier** will register an AL_NUL alarm condition. Configure the **Email** and **Output** tabs to respond as desired.

Latching, Acknowledging, and Clearing Alarms

In some situations, you may want an alarm to stay active even when the condition that caused the alarm has been returned to normal. One example of this is shown above, with the **Alarm Notifier – Emergency** alarm requiring a manual clear via the Web page.

If a piece of hardware fails, causing an alarm that causes a backup piece of hardware to be activated, the alarm should stay active until manually cleared.

The *i*.LON 100 server provides three ways of implementing this behavior:

- *Set the **Clear Required** check box on the **Inputs** tab of the **Alarm Notifier** configuration dialog* tab. This method is demonstrated in the example above.

Setting this check box causes the **Alarm Notifier** to maintain the alarm state until the alarm is cleared using the **Alarm Summary** Web page (see the help for these Web pages for more information). The condition that caused the alarm should be removed or the alarm will just immediately be regenerated. To clear the alarm, a user must have access to the **Alarm Summary** Web page. You can grant this access as described in the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points*.

- *Set the **Acknowledgement Required** check box on the **Inputs** tab of the **Alarm Notifier** configuration dialog tab*. Setting this check box causes the Alarm Notifier to maintain the alarm state until the alarm has been Acknowledged using the **Alarm Summary** Web page. An alarm can be acknowledged even while the alarm condition is still true; however, the Alarm Notifier will not terminate the alarm until the condition has been removed.
- *Use the **nviAgLatchEnable** network variable on the Alarm Generator Functional Block*. When this **SNVT_switch** network variable is set to On (100.0 1), the **Alarm Generator**'s **nvoAgAlarmFlag** network variable will remain set to On (100.0 1) even after the alarm condition has ended. Set this network variable to Off (0.0 0) to have the **nvoAgAlarmFlag** network variable reflect the state of the alarm.

4

Logging Data

This chapter describes how to use the *i*.LON 100 Internet Server to save network data in data logs and how to view the data logs.

Data Logging Overview

The *i*.LON 100 Internet Server contains 10 **Data Logger** functional blocks. To create a data log, create a Data Logger functional block in an LNS installation tool such as the LonMaker tool. To create a Data Logger functional block using the LonMaker tool, drag one of the Data Logger functional blocks to a LonMaker drawing. Then you use the *i*.LON 100 Configuration Plug-in to associate one or more data points with the Data Logger shape.

You can use a data logger to record updates to a group of user-specified data points into a *log file*. The log files for each data logger are stored in the /root/Data directory of the *i*.LON 100 with the file name logX, where X represents the index number assigned to the data logger.

You can create two kinds of data loggers: *historical data loggers*, and *circular data loggers*. A historical data logger stops recording data point updates when its log file becomes full. A circular data logger removes the records for older updates when its log file is full, and new updates occur. A data logger can save either type of log file in an ASCII-text (.csv file extension) or binary (.dat file extension) format.

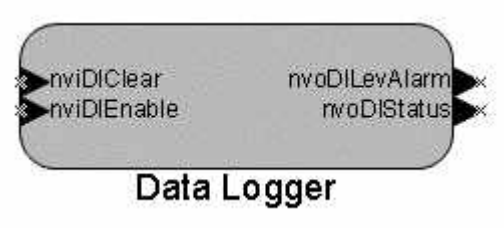
You will specify the minimum amount of time that must elapse, and the minimum change in value required, between log entries for each data point your data logger is monitoring. When an update to a data point is logged, a subsequent update for that data point will not be logged until the minimum time period specified for the data point has elapsed, and the minimum value change specified for the data point has been met. If any of the input data points are updated before the minimum time period and value change have elapsed, the older values will be discarded. The data logger records the most recent update when the minimum time period and value change elapse. This allows you to throttle the data entries into a log.

You can also define a threshold level for each data logger. The threshold level represents a percentage. When the data logger's log file consumes this percentage of the memory space allocated to it, the data logger provides notification that it is time to upload the log and clear out some of the data. The data logger makes this notification by updating the data logger's alarm data point (called NVL_nvoDlAlarm[X], where X represents the index number assigned to the data logger) to the status AL_ALM_CONDITION. This feature is useful when working with historical data loggers, which are disabled when they become full.

You can access the data in a log file by viewing it in the data logging Web page, by manually opening the log file, or by using a SOAP function. You can clear data from a log by sending an update to the data point NVL_nviDlClear[X], where X represents the index number of the Data Logger to be affected, or by using a SOAP function.

Each log can be up to 1024 KB, and the *i*.LON 100 can log up to 10 MB of data. You can view the amount of free disk space using the **System Info** Web page.

The **Data Logger** functional block includes the following input and output network variables:



nviDlClear — This **SNVT_switch** input network variable clears the data log when set to On (100.0 1). Once the data log is clear, reset this network variable to Off (0.0 0) to begin logging again. You can also clear a percentage of the total log by setting the **Value** field to a non-zero value (*e.g.* setting this network variable to 60.0 1 deletes all entries up to 60% of the total log — oldest entries first; if the log is less than 60% full, setting this value to 60.0 1 will delete the entire log).

nviDlEnable — This **SNVT_switch** input network variable enables and disables the Data Logger functional block. Set this network variable to **Off** (0.0 0) to disable data logging. You can clear the data log even when logging is disabled.

nvoDlLevAlarm — This **SNVT_alarm** output network variable sends an alarm when the data log reaches a configurable percentage of its capacity. You can configure the percentage as described in *Typically, you will create one or* more dynamic input network variables to be bound to output network variables on other devices whose values are to be logged. You can also log external data points.

Creating and Configuring a Data Logger, below.

nvoDlStatus — This **SNVT_switch** output network variable indicates the current status of the data log. The State field is set to 1 if the data log is active. The Value field indicates the level (how full) of the data log, from 0 to 100%

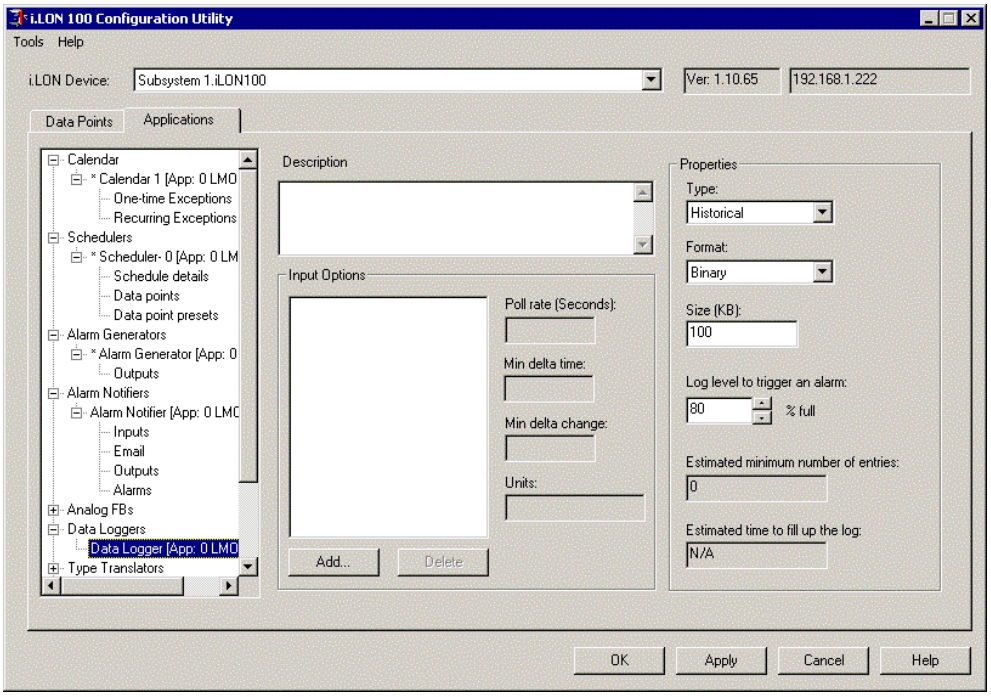
Typically, you will create one or more dynamic input network variables to be bound to output network variables on other devices whose values are to be logged. You can also log external data points.

Creating and Configuring a Data Logger

You can create a data logger to record updates to a group of data points that you specify. The data logger stores these updates in a *log file*. You can create a data logger using the *i*.LON 100 Configuration Plug-in or the *i*.LON 100 Web pages. To create a data logger, follow these steps:

1. Open an existing LNS network or create a new network. See the *LonMaker User's Guide* for information on how to do this using the LonMaker tool.
2. Use an existing *i*.LON 100 device in the network, or create and commission a new *i*.LON 100 device.

3. Create a **Data Logger** functional block. In the LonMaker tool, this is done by dragging a **Data Logger** shape from the *i*.LON 100 Shapes stencil to the LonMaker drawing.
4. To log data using local data points, create one or more dynamic input network variables on the **Data Logger** functional block as described in *Creating and Viewing Local Data Points (NVLs)* in Chapter 2. Otherwise, define the external data points to be logged as described in *Creating and Viewing Local Data Points (NVLs)* in Chapter 2.
5. Start the *i*.LON 100 Configuration Utility. To do this using the LonMaker tool, right-click the Data Logger functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in appears with the **Data Logger** tab selected, as shown in the following figure:



6. Set the following options:

Input Options — This list shows all the data points that will be logged by this data logger. By default, this list includes all input network variables on the Data Logger functional block. To add additional data points, click **Add** and select points from the **Add Data Point** dialog. To remove data points, select the point or points to be removed, and then click **Delete** (this will not delete the associated network variable).

Poll Rate — Determines how often the data point will be logged. Set the **Poll Rate** to 0 to turn off polling.

Min Delta Change — Determines how big of a change needs to be made from the previous logging in order for the point to be logged again. Set **Min Delta Change** to 0 disables logging on value change. For structure type data points, set

	the **Min Delta Change** to any non-zero value to cause any change in value to be logged.
Min Delta Time	Determines the minimum amount of time that must pass for a point to be logged again. The data point will not be logged again within this time even if the **Min Delta Change** threshold is passed.

This dialog also allows you to set the following properties for the **Data Logger** functional block as a whole:

Type	The type of the data log maintained by this **Data Logger** functional block. Data logs can be one of two types: *Historical* – When the data log fills up, data ceases to be logged. *Circular* – When the data log fills up, new data overwrites the oldest existing data.
Format	The format of the data logs. Available formats are **Binary** and **Comma Separated Value**. Data logs can be found on the *i*.LON 100 in the root\data directory. The name of the log file is `log<n>.dat` (for binary log files) or `log<n>.csv` (for comma separated value log files), where `<n>` is the index number of the **Data Logger** functional block. Changing the log file format deletes any existing log file.
Size	The size of the data log. Each log can be up to 1024 KB, and the *i*.LON 100 can log up to 10 MB of data. You can view the amount of free disk space using the **System Info** Web page.
Log Level to Trigger an Alarm	When the data log reaches the specified percent capacity, the **nvoDlLevAlarm** output network variable will be set to the `AL_ALM_CONDITION` status.
Estimated Minimum Number of Entries	The minimum number of entries it will take to fill the data log based on the log size and the size of the data points to be logged.
Estimated Time to Fill Up the Log	The estimated amount of time it will take to fill the log based on the log size, the size of the data points to be logged, and the poll rate.

Click **Help** for a description of other options on this page.

7. The **Input Options** list shows all the data points that will be logged by this data logger. By default, this list includes all input network variables on the Data Logger functional block. To add additional data points, click **Add** and select points from the **Add Data Point** dialog. To remove data points, select the point or points to be removed, and then click **Delete** (this will not delete the associated network variable).

Extracting Data Logs

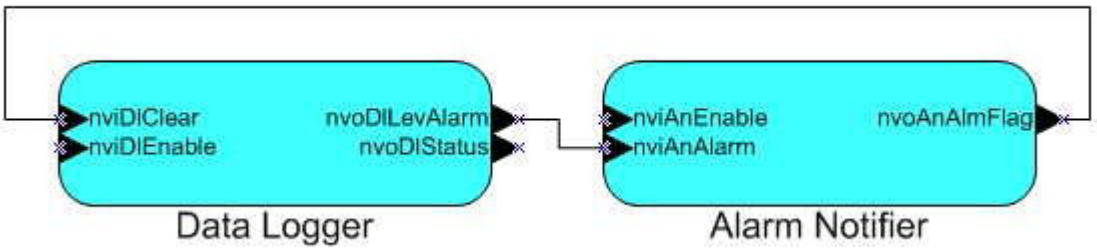
You can extract the data logs from the *i*.LON 100 server via FTP, SOAP requests, or by having them emailed by the alarm notifier. See the *i.LON 100 Internet Server Programmer's Reference* for information on using SOAP requests. To extract a data log using FTP, follow these steps:

1. Open an FTP client such as Internet Explorer 6.
2. Point the FTP client to the IP address of the *i*.LON 100 server (note, FTP access must be enabled on the Security Web page as described in the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100*). You will see the *i*.LON 100 server directory structure.
3. Open the **data** folder. You will see a log file for each data logger that you have created. The log files are named **log<n>.dat** (binary file) or **log<n>.csv** (comma separated value file) <n> is the index of the functional block to which the log applies. The file type (binary or CSV) is determined by the **Format** property on the **Data Logging** tab of the *i*.LON 100 Configuration Plug-in.
4. Copy this log file to your computer using any method available to your FTP client.

Emailing and Clearing Data Logs

You can use an alarm notifier to automatically email a data log when it reaches a specified capacity and clear the data log. Typically, you will send the data log as a comma separated value (.csv file extension), which can be read by spreadsheet and database applications. To do this, follow these steps:

1. Create a **Data Logger** functional block and an **Alarm Notifier** functional block.
2. Connect the **nvoDlLevAlarm** output network variable of the **Data Logger** functional block to the **nviAnAlarm** input network variable of the **Alarm Notifier** functional block.
3. Connect the **nvoAnAlarmFlag** output network variable of the **Alarm Notifier** functional block to the **nviDlClear** network variable of the **Data Logger** functional block. If you are using the LonMaker tool, your LonMaker drawing should now appear as shown in the following figure:



4. Right-click the **Data Logger** functional block and select **Configure** from the shortcut menu. The Data Logger configuration dialog opens.
5. Set **Log Level to Trigger an Alarm** to the percentage at which you want the data log to be emailed and cleared.

6. Set **Format** to **CSV Text**.
7. Expand **Alarm Notifiers** on the **Applications** tab, and then select the **Alarm Notifier** functional block. The **Alarm Notifier** configuration dialog opens.
8. Select the **Inputs** tab; verify that the **NVL_nviAnAlarm[n]** data point is listed as an input.
9. Select the **Email** tab. In the **To** box enter the email address to whom the log should be sent. In the **Attach** box, enter **/data/log/<*n*>.csv**, where <*n*> is the index of the **Data Logger** functional block. Clear the **Send Email When Alarm Condition Clears** checkbox so that the **Alarm Notifier** does not send two emails with the attached data log.
10. Select the **Outputs** tab. Add the **NVL_nvoAnAlarmFlag[n]** data point to the **Output Data Points** list. Make sure that this is the only data point in the list. Set the **Active Value** to the same percentage as was set for the **Data Logger** in step 5, in the proper format for SNVT_switch. For example if you set the percentage to 75.0%, in the **Data Logger**, you should format this value in the **Alarm Notifier** as "75.0 1". Set the **Passive Value** to **Off** (0.0 0). You can set these values directly or define them as presets as described in the Data Point Presets section in Chapter 2.

When the **Data Logger** functional block reaches the specified percentage of its capacity, the **nvoDlLevAlarm** network variable will send an alarm condition. The **Alarm Notifier** functional block will attempt to email the data log to the specified address. Once the email has been sent successfully, the **Alarm Notifier** will set the **nviDlClear** network variable on the **Data Logger** functional block to the specified percentage, clearing the data log by the amount that was sent. If new data is received between the time that the **Data Logger** set its **nvoDlLevAlarm** network variable, the next attachment will include these duplicate entries.

5

Scheduling

This chapter describes how to use the *i*.LON 100 Internet Server to create, view, and manage schedules.

Scheduling Overview

The *i*.LON 100 contains three types of functional blocks used for scheduling applications—the **Scheduler**, **Calendar**, and **Real Time Clock** functional blocks. The **Scheduler** functional block allows you to define *daily schedules* that each specify the *schedule events* for a 24 hour day. Each daily schedule is either a *daily* schedule or an *exception* schedule.

Daily schedules occur every week on a specified day; each scheduler can contain up to seven daily schedules (*i.e.* one for each day of the week); you can assign a single daily schedule to multiple days of the week (*i.e.* you could define one daily schedule for all weekdays and one for weekends). You can create a *weekly schedule* by assigning a daily schedule to each day of the week.

Exception schedules occur on a set of dates defined by an *exception*; each scheduler can contain up to two exception schedules. Exceptions are ranges of dates defined on the **Calendar** functional block; these can be ranges like "January 12th to February 2nd" or "Every other Monday" or "the third Monday of every month." The exceptions defined on the calendar can be used by any number of schedulers.

The **Real Time Clock** functional block maintains the current date and time that is used by the **Scheduler** and **Calendar** functional blocks, and can also provide date and time data to other devices. The *i*.LON 100 includes one **Real Time Clock** and one **Calendar** functional block and 40 **Scheduler** functional blocks. These functional blocks are described in the following sections.

The Scheduler Functional Block

The *i*.LON 100 includes 40 **Scheduler** functional blocks. You can use a scheduler to generate time-based updates to the data points in your network. You will select a data point or group of data points for each scheduler you create.

You will define daily and exception daily schedules on each scheduler. You can create up to seven daily and two exception schedules on a single scheduler. Each schedule is identified by a unique name. For example, you may define two daily schedules, one named "Weekday" (to occur every weekday) and one named "Weekend" (to occur every weekend day) and two exception schedules, "Holiday" (to occur on specified holiday dates) and "Inventory" (to occur on a specified regular interval). The dates for the "Holiday" and "Inventory" schedules are derived from exceptions defined in the **Calendar** functional block.

A schedule event specifies a time and a value. At the specified time, the value is sent to all of the scheduler's output data points (defined on the **Outputs** tab); if the scheduler drives output data points of different types, you will need to define presets for each of the data points (see *Data Point Presets* in Chapter 2). For example, you can create a scheduler that sets two data points – one SNVT_switch data point and one SNVT_temp_f – to a MorningWarmup preset at 6:00 on weekdays, a DayTime preset at 8:00 on weekdays, and a NightWeekend preset at 18:00 on weekdays; on weekends, the data points are left set to the NightWeekend preset on weekends. Using the **Presets** tab, you would define the presets for these data points as shown in the following table:

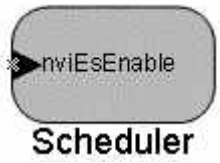
	MorningWarmup	DayTime	NightWeekend
SNVT_switch	100.0 1	100.0 1	0.0 0
SNVT_temp_f	25	22	18

You can create exception schedules that become active based on *exceptions* that you define using the **Calendar** functional block. You can use exceptions to select exception schedules that become active on specific dates that require a unique schedule, such as holidays or special events, and assign them a unique schedule within your scheduler. You can set up a separate daily schedule for each exception. This allows you to specify what value you want your data points to use on each exception date at any given time.

When using exceptions, multiple schedule events may become active at the same time. You will assign a *schedule priority* to each schedule event. This value can be from 0 (highest priority) to 255 (lowest priority). If two schedules conflict—for example a daily schedule and an exception schedule —the one with the higher priority takes precedence.

You can create one or more outputs from a scheduler by adding dynamic network variable outputs to the Scheduler functional block. You can connect these outputs to any input network variables that require activation on a scheduled interval.

Each **Scheduler** functional block contains a single **nviEsEnable** network variable input as shown in the following figure:



The **nviEsEnable** input is a **SNVT_switch** network variable that disables the **Scheduler** functional block. To disable a Scheduler functional block (*i.e.* to not update the points as specified in the *i*.LON 100 Configuration Plug-in), set this network variable to Off (**0.0 0)**. In the absence of any input, this network variable defaults to On (**100.0 1)**, so the **Scheduler** functional block will be enabled unless explicitly disabled.

To generate outputs from a scheduler, use an LNS installation tool such as the LonMaker tool to add one or more output dynamic network variable outputs to it as described in *Creating and Viewing Local Data Points (NVLs)* in Chapter 2. Define preset values for these outputs as defined in *Data Point Presets* in Chapter 2. Configure the schedules for these outputs as described in this chapter.

The Calendar Functional Block

The *i*.LON 100 includes 1 **Calendar** functional block. You can use this functional block to create up to 256 exception exceptions to be used by your Scheduler functional blocks. Each exception that you create represents a date, or a group of dates. When you reference an exception in a scheduler, you will be able to assign an exception schedule to each exception. You can use exceptions to assign alternate daily schedules to use on particular dates such as holidays or special events.

The **Calendar** functional block contains a single **nviEcDateResync** network variable input and a single **nvoEcDateEvent** output as shown in the following figure:

nvoEcDateEvent This output network variable reports the status of each exception that you define as described in *Creating Exception*. This output is internally connected to the *i*.LON 100 Node Object functional block and all the *i*.LON 100 **Scheduler** functional blocks. Every day at 12:00pm (noon) it resynchronized by sending all **Scheduler** functional blocks updates informing them of the exception status and time to the next date event. When the clock is set manually before 12:00pm on a particular day, the **Calendar** will resynchronize immediately. After this irregular resyncronization, the daily resyncronization will be cancelled for that day, and it will resume at noon on the following day.

Use this network variable to synchronize schedules on multiple *i*.LON 100 devices, as described in *Using the Same Exception Schedule on Multiple i.LON 100 Devices*, later in this chapter.

nviEcDateResync This **SNVT_switch** input network variable requests an update on the status of all defined exceptions. When the state of this input changes from Off to On, the Calendar functional block sends a series of updates on the nvoEcDateEvent output, one for each defined exception. The input is On when the state value is one (1) and the level value is greater than zero (0). This input is internally connected to the *i*.LON 100 Node Object functional block and all the *i*.LON 100 Scheduler functional blocks.

Use this network variable to synchronize schedules on multiple *i*.LON 100 devices, as described in *Using the Same Exception Schedule on Multiple i.LON 100 Devices*, later in this chapter.

Using the Same Exception Schedule on Multiple *i*.LON 100 Devices

If you have multiple *i*.LON 100 devices in the same LonWorks network that use the same exception schedule (holidays, maintenance days, etc.), you can bind the

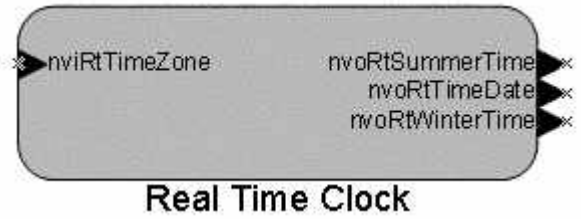
Calendar functional block of the source *i*.LON 100 to the **Node Object** functional block of the destination *i*.LON 100. To do this, follow these steps:

1. Connect the **nvoEcDateEvent** output network variable on the source *i*.LON 100 device's **Calendar** functional block to the **nviDateEvent** input network variable on the destination *i*.LON 100 device's **Node Object** functional block.
2. Connect the **nvoDateResync** output network variable on the destination *i*.LON 100 device's **Node Object** functional block to the **nviEcDateResync** input network variable on the source *i*.LON 100 device's **Calendar** functional block.

In addition, the configuration of the **Calendar** functional block is stored in the **/root/config/software/EventCalendar.xml** file. If you want to copy schedule information to an *i*.LON 100 that is not in the same LONWORKS network, you can configure the **Calendar** on one *i*.LON 100 device (*i.e.* define all exceptions) and FTP this file to the same location on all other *i*.LON 100 devices that should share the same schedule.

The Real Time Clock Functional Block Shape

The *i*.LON 100 includes 1 **Real Time Clock** functional block. It maintains the current date and time. It includes the following input and output network variables:



nviRtTimeZone — This **SNVT_time_zone** input network variable sets the time zone. You can also set the time zone on the TCP/IP Web page as described in the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points.*

nvoRtTimeDate — This **SNVT_time_stamp** output network variable reports the current date and time. You can set the current date and time (configure the *i*.LON 100 to obtain this information from an SNTP server) on the TCP/IP Web page as described in the *i.LON 100 User's Guide: Using the i.LON 100 Web Pages to Configure Applications and to Monitor and Control Data Points.*

nvoRtSummerTime — This **SNVT_time_stamp** output network variable reports the date of the beginning of daylight savings time.

nvoRtWinterTime — This **SNVT_time_stamp** output network variable reports the date of the end of daylight savings time.

Creating a Schedule

A typical schedule consists of a weekly schedule that defines the daily schedule to be used for each day of the week, and up to two exception schedules that allow alternate daily schedules to become active on specified dates. Before creating a schedule, you should already have created a LonWorks network that controls the functions you wish to schedule. To create a schedule, follow these steps:

1. *Plan Out Your Schedule* – Write out your desired schedule. For example, "On weekday mornings at 06:00 the heating system should be started and the thermostat set to 65 degrees F (18 degrees C). At 08:00, the thermostat should be set to 70 degrees F (21 degrees C)." etc. See *Planning Out Your Schedule* for more information.
2. *Add a Scheduler Functional Block to the LonWorks Network* – Use an LNS installation tool such as the LonMaker tool to add a Scheduler functional block to the network drawing. See *Adding a Scheduler Functional Block to a LonWorks Network* for more information.
3. *Define Outputs* – Using the schedule written in step one, decide what data points in your network need to be written by the scheduler. Optionally add dynamic output network variables to the **Scheduler** functional block and then add the appropriate data points to the **Scheduler** functional block's **Data Points** window. Connect these output network variables to the corresponding input network variables. See *Defining Outputs* for more information.
4. *Define Presets* – Use the **Data Point Presets** window of the **Scheduler** functional block *to* define presets for each of the data points defined on the **Data Points** window. See *Defining Presets* for more information.
5. *Create Daily Schedules* – Use the **Scheduler** functional block to define a schedule for each day of the week. Each daily schedule consists of zero or more *events*. An *event* consists of a time and a preset value (i.e. 06:00:Warmup). When an event occurs, the data points specified on the **Data Points** window will be set to the values associated with the preset on the **Data Points Presets** window. Each day of the week can have a different schedule. See *Creating Daily Schedules* for more information.
6. *Create Exceptions* – Use the **Calendar** functional block to define exceptions: date ranges during which the weekly schedule will be overridden. These *exceptions* can be specific ranges of dates (i.e. "March 27th-April 6th, 2002") or dates in a certain pattern (i.e. "The second Tuesday of every month" or "Every other Saturday"). For each of these exception schedules, use the **Scheduler** functional block to define the schedule that will be used on that day. See *Creating Exception Schedules* for more information.
7. *Optionally Create One-time Overrides* – You can optionally use the **Scheduler** functional block to create a daily schedule that will override the schedule for a specified range of dates. See *Creating a One-time Override Schedule* for more information.

Planning Out Your Schedule

Before implementing a schedule using the **Scheduler** and **Calendar** functional blocks, you should write out the schedule so you have a full understanding of all the schedules and events you will need to create.

Example of Planning Out a Schedule

The following is an example of a simple schedule that might be created to schedule HVAC and lighting controls in a retail store:

On weekdays, the heat should be set to 60 degrees F (16 degrees C) at 07:00 (Warmup), 70 degrees at 09:00 (Open), and turned off at 19:00 (Closed).

On weekdays, the lighting should be turned on at 09:00 (Open) and turned off at 19:00 (Closed).

On weekends, the heating and lighting should remain off.

On the first Sunday of each month, for inventory, the heat should be set to 65 degrees F (18 degrees C) at 09:00 (OpenInventory) and turned off at 18:00 (Closed).

On the first Sunday of each month, for inventory, the lighting should be turned on at 09:00 (OpenInventory) and turned off at 18:00 (Closed).

Every year you will have a winter vacation. In 2003-2004, you would like it to last from December 23rd to January 3rd, but you would like to be able to change the dates of the vacation every year.

Adding a Scheduler Functional Block to a LonWorks Network

To add a **Scheduler** functional block to a LONWORKS network, follow these steps:

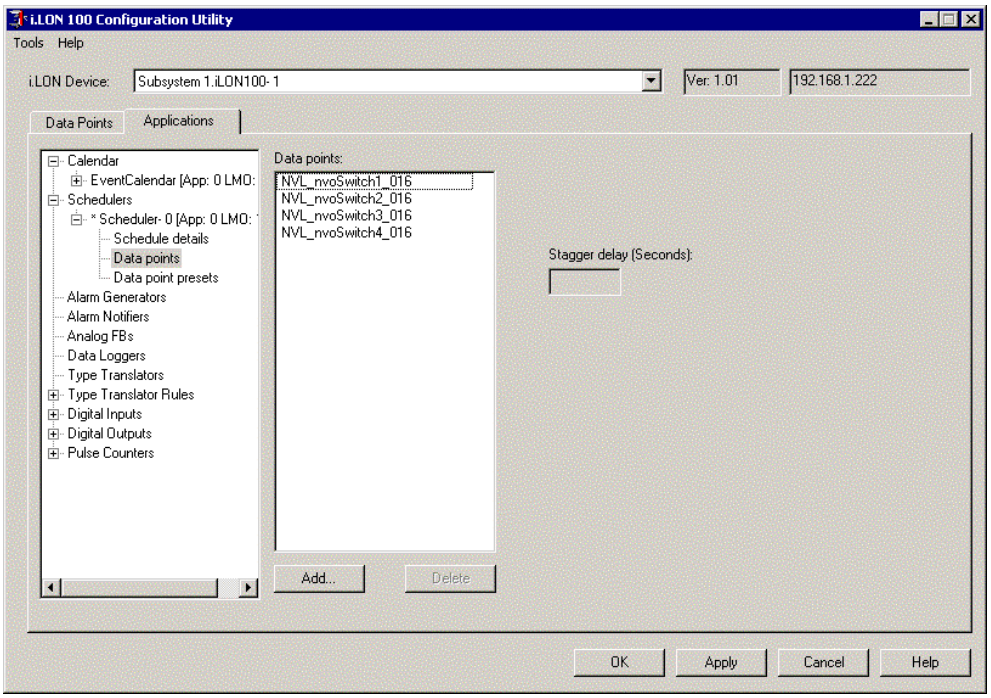
1. Open the network that controls the functions you want to schedule in an LNS installation tool such as the LonMaker tool.
2. Use an existing *i*.LON 100 device in the network, or create and commission a new *i*.LON 100 device.
3. Add a **Scheduler** functional block. For example, using the LonMaker tool, drag a Scheduler functional block shape from the *i*.LON 100 Shapes stencil to the LonMaker drawing. The LonMaker New Functional Block wizard appears.
4. Associate the **Scheduler** functional block shape with one of the **Scheduler** functional blocks on the *i*.LON 100 device. See the installation tool documentation for more information.

Defining Outputs

To define outputs, follow these steps:

1. Determine which data points should be modified by the scheduler.
2. If these data point represent input network variables on a LonWorks network, you can optionally create complimentary dynamic output network variables on the **Scheduler** functional block. You may want to create a single output network variable to connect to multiple input network variables (for example, if you want to send a temperature setpoint to multiple heating controllers on the network). See the installation tool documentation for more information on creating dynamic network variables.
3. Start the *i*.LON 100 Configuration Plug-in as described in *Starting the i.LON 100 Plug-in* in Chapter 1.

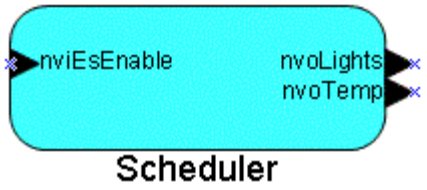
4. In the **Applications** pane on the left side of the *i*.LON 100 Configuration Plug-in, select **Data Points** beneath the **Scheduler** functional block you created in the previous step. The **Data Points** window appears, as shown in the following figure:



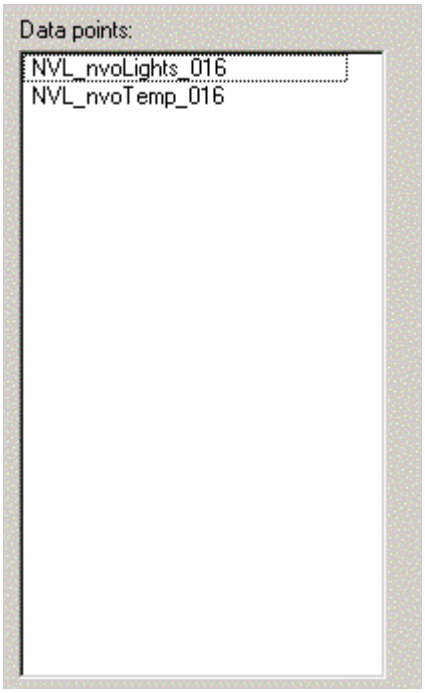
5. Click **Add** The **Add Data Point** dialog opens. This dialog shows all data points on the *i*.LON 100.
6. Press and hold the CTRL key and then select each of the data points associated with the network variables you created in step 2. You can click on the column headings in the **Add Data Point** dialog to sort the data points according to different criteria—this may make it easier to find the correct data points.
7. Optionally set a **Stagger Delay** for each data point. This is the amount of time that the Scheduler will wait before updating the specified data point. This allows you to gradually bring up or bring down a system. For example, imagine a schedule that controls the power for 100 stores in a mall. The schedule indicates that power should be turned on at 8:00. However, turning on power for 100 stores at once can cause a power surge. To avoid this, use varying **Stagger Delays** for the different points to bring power up 1 or 2 stores at a time.
8. Click **OK**. The data points will be added to the **Data Points** list.

Example of Defining Outputs

In the sample schedule described above, two outputs are needed, one to control the setpoint on the HVAC controller, and one to turn the lights on and off. Two output network variables are dropped on the **Scheduler** functional block, one of the network variable type used by the HVAC controller on the network (**nvoTemp**) and one of the network variable type used by the light controller on the network (**nvoLights**). If you are using the LonMaker tool, the **Scheduler** functional block now appears as shown in the following figure:



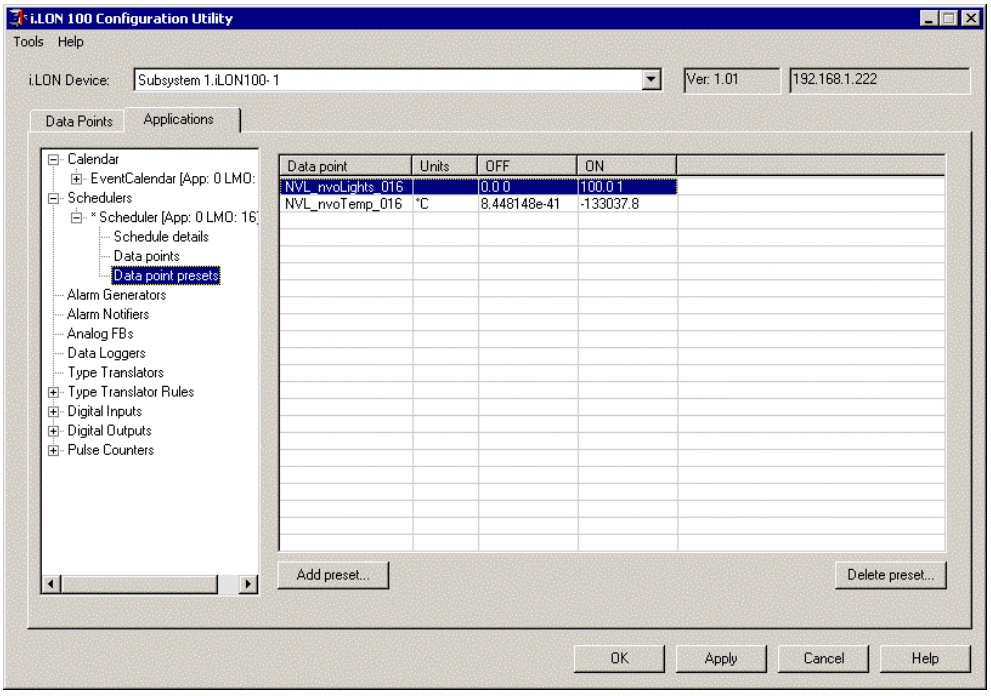
When you add the two data points associated with the output network variables to the **Data Points** pane, the list appears as shown in the following figure:



Defining Presets

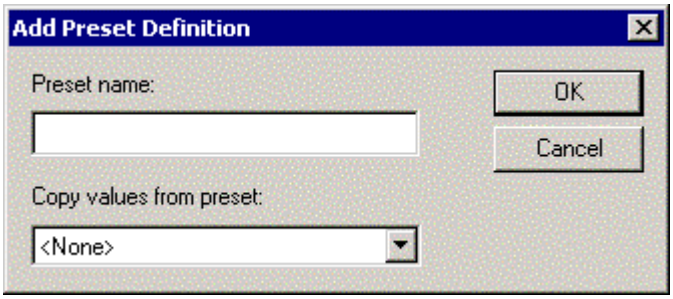
To define presets for the outputs configured on the **Data Points** page, follow these steps:

1. Define each event that will be triggered by any schedules. In the *Example of Planning Out a Schedule* procedure a name was given to each of the events. Use your written out schedule to determine what events will occur and what state the outputs should be set to for each event.
2. Under the appropriate **Scheduler** in the applications tab, select **Data Point Presets**. The **Data Point Presets** window opens, as shown in the following figure:



All data points added to the **Data Points** list in the previous step will be listed. Some presets may already have been defined on the **Data Points** tab of the *i*.LON 100 Configuration Plug-in (see *Creating Data Point Presets* in Chapter 2).

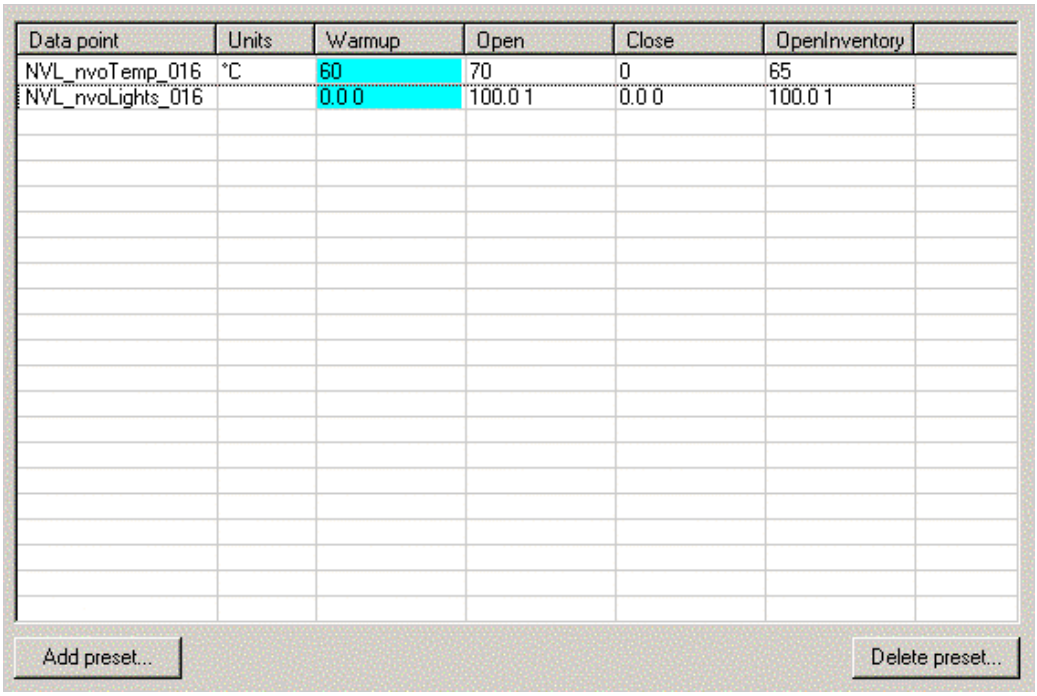
3. Click **Add Preset**. The **Add Preset** dialog appears, as shown in the following figure:



4. Enter the name of the preset in **Preset Name**. Leave **Copy Values from Preset** set to **<None>**.
5. Repeat steps 3 and 4 for each preset you defined in step 1. When you are done, each preset name will be listed across the top of the **Presets** spreadsheet.
6. For each preset, set the value to which each data point should be set.

Example of Defining Presets

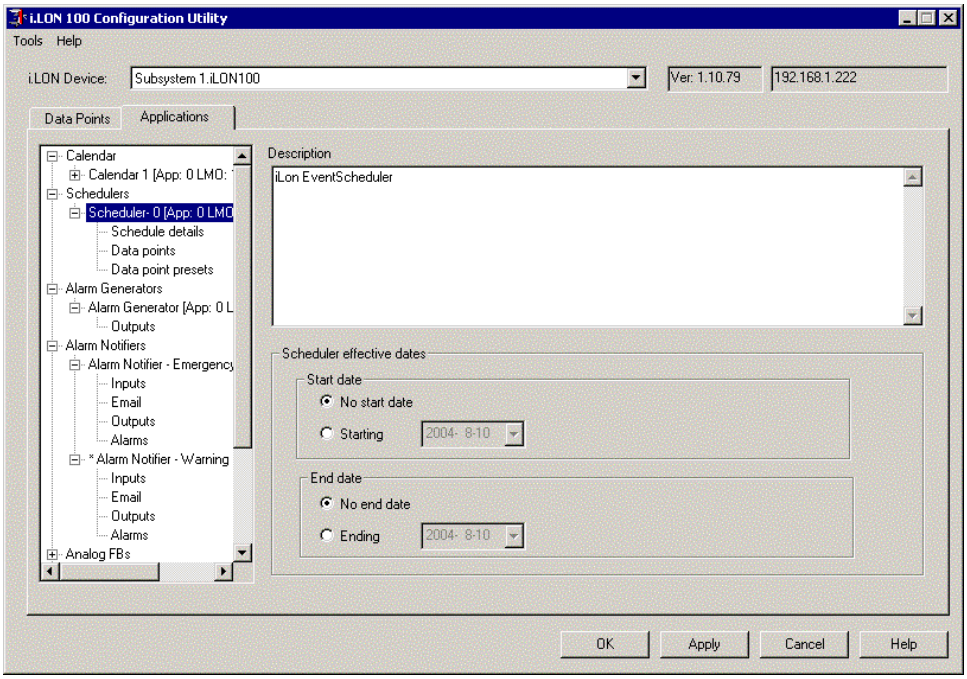
In the example described above, four presets are needed, Warmup, Open, Closed, and OpenInventory. Once added and configured, the presets table should appear as shown in the following figure:



Creating Daily Schedules

Define a daily schedule of each day of the week. To define a daily schedule, follow these steps:

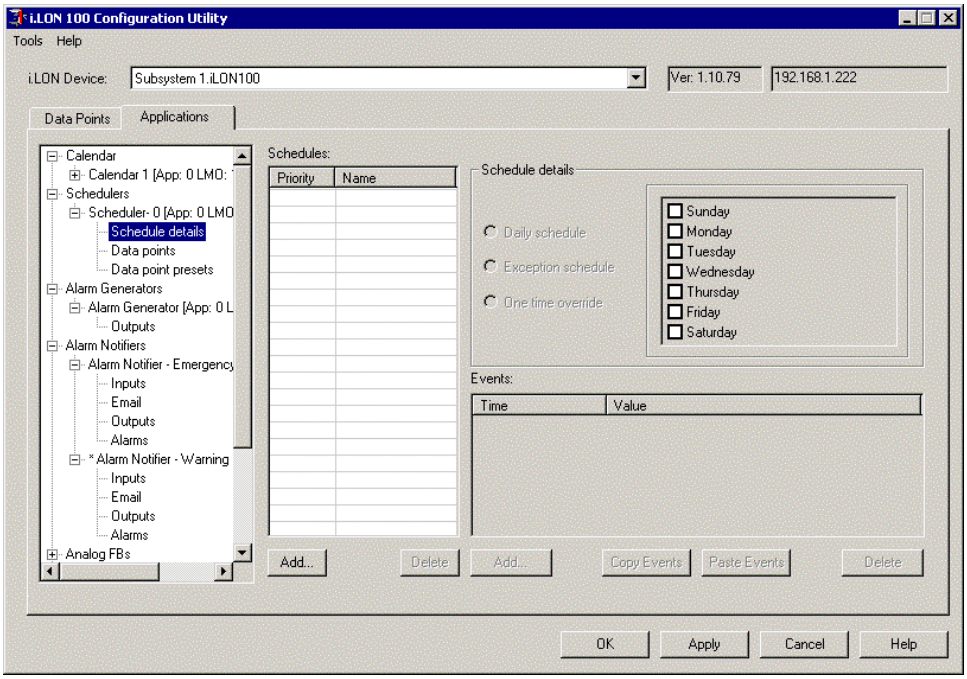
1. Right-click the Scheduler functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens with the **Scheduler** selected, as shown in the following figure:



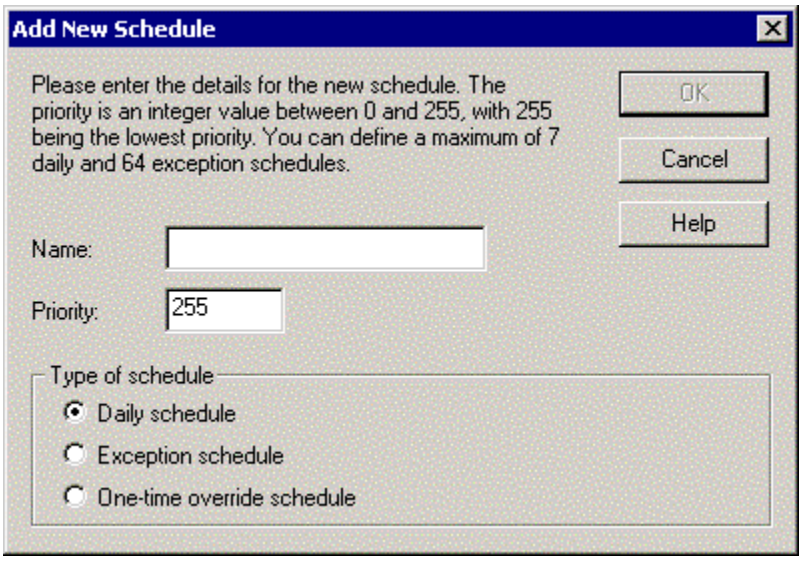
   Click **Help** for a complete description of this window.

2. Select the **Start Date** and **End Date** for this schedule.

3. Click **Schedule Details** under the selected Scheduler in the Applications list. The **Schedule Details** dialog opens, as shown in the following figure:



4. Click **Add** under the **Schedules** list to open the **Add New Schedule** dialog, shown in the following figure:

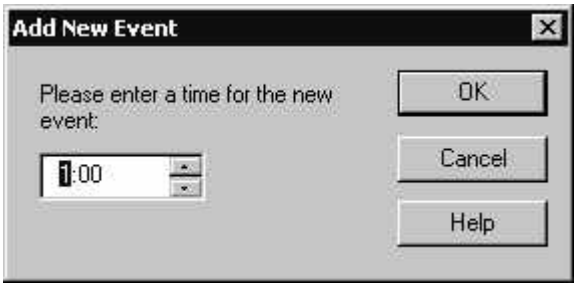


5. Enter the following information to add a new daily schedule:

Name	The name of the new daily schedule. This can be up to 228 characters.
Priority	The priority of the new daily schedule. This value can be from 0 (highest priority) to 255 (lowest priority). If two daily schedules conflict — for example a daily schedule and an exception — the one with the higher priority value takes precedence.

Type of Schedule	When creating a daily schedule, select **Daily Schedule**.

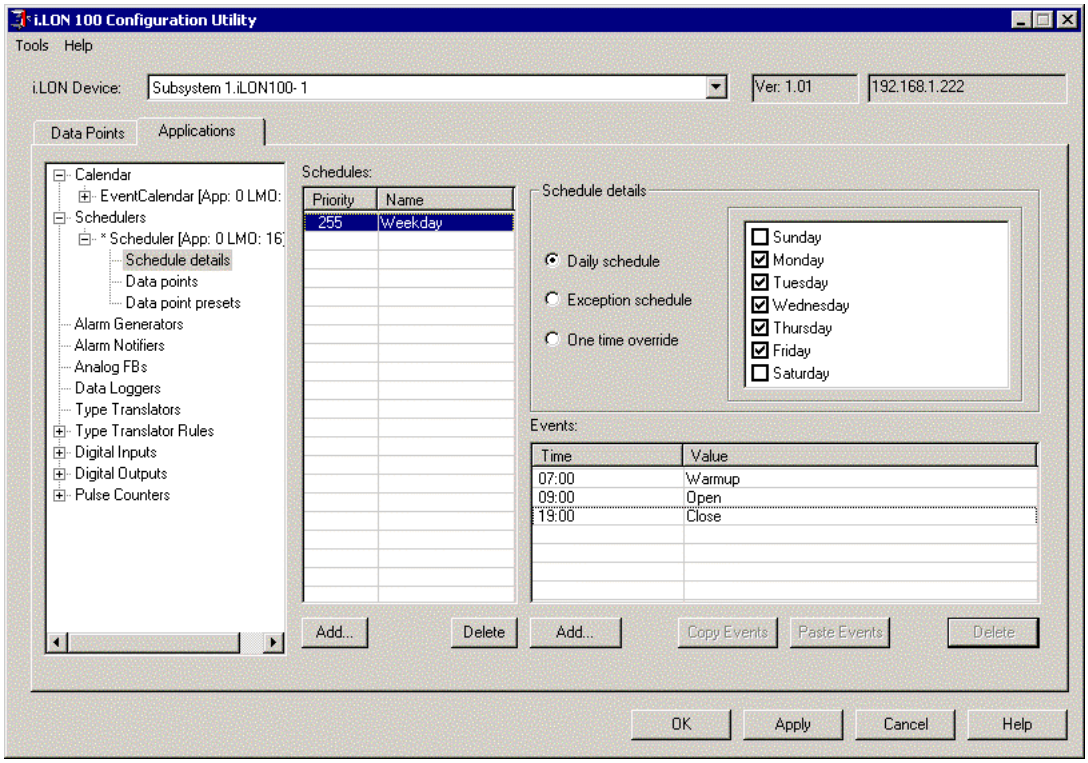
6. Click **OK** to create the new daily schedule. The new daily schedule appears in the **Schedules** list.
7. Select the days of the week to which this schedule will apply using **Days**. Set the check box for all days that this daily schedule should be active.
8. Add one or more events to the schedule. To add an event, click **Add** under the **Events** list or double-click the first column of the first empty row in the **Events** list. The **Add New Event** dialog opens, as shown in the following figure:



9. Set the time for the new event and then click **OK**. A new event appears in the **Events** list. The **Time** will be the time you selected, and the **Value** will be empty.
10. Select a preset value for the new event. This should be one of the presets created in the previous step.
11. Create additional daily schedules. For example, you can create one schedule for Monday through Thursday, one schedule for Friday, and one schedule for the weekend. You can create up to 7 daily schedules in a single Scheduler functional block.
12. Click **OK** or **Apply** to save the changes to the *i*.LON 100 device.

Example of Creating a Daily Schedule

The following figure shows the weekday schedule created to match the example described above:



Creating Exception Schedules

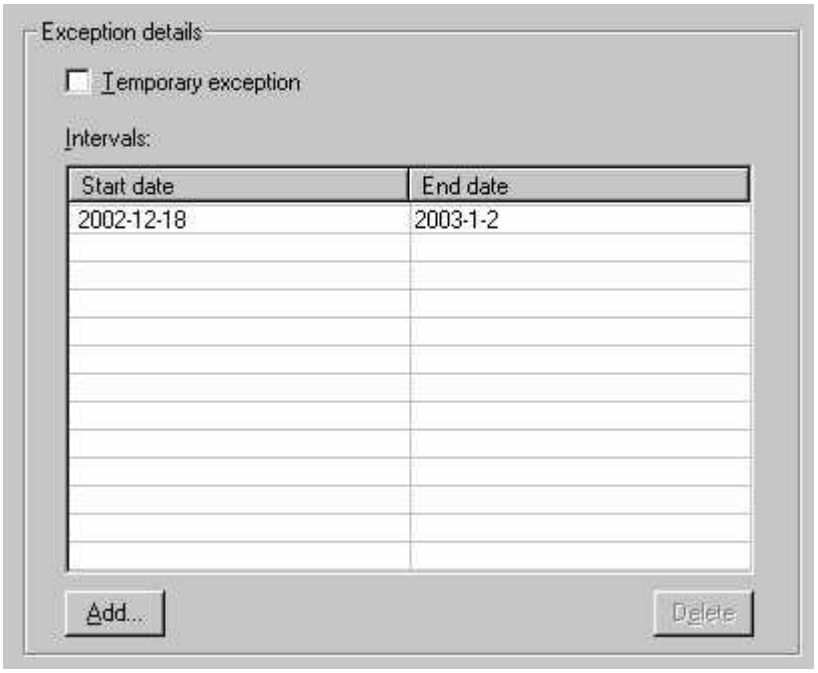
Once you have created daily schedules for each day of the week, you can add exceptions to the schedule. You can create an exception using the **Calendar** functional block, and then add it as an exception schedule to one or more **Scheduler** functional blocks. You do not have to add a **Calendar** functional block shape to the LonMaker drawing in order to be access the **Calendar** funcatinal block from the *i*.LON 100 Configuration Plug-in.

You can create two kinds of exceptions: *one-time exceptions*, and *recurring exceptions*. One-time exceptions specify a single range of dates. For example, if a building were being shut down for two weeks for maintenance, you could create a one-time exception for those dates. Recurring exceptions occur at regular intervals. For example, you can create a recurring exception for a yearly holiday or for an inventory procedure that takes place on the second Monday of every month.

To create an exception, follow these steps:

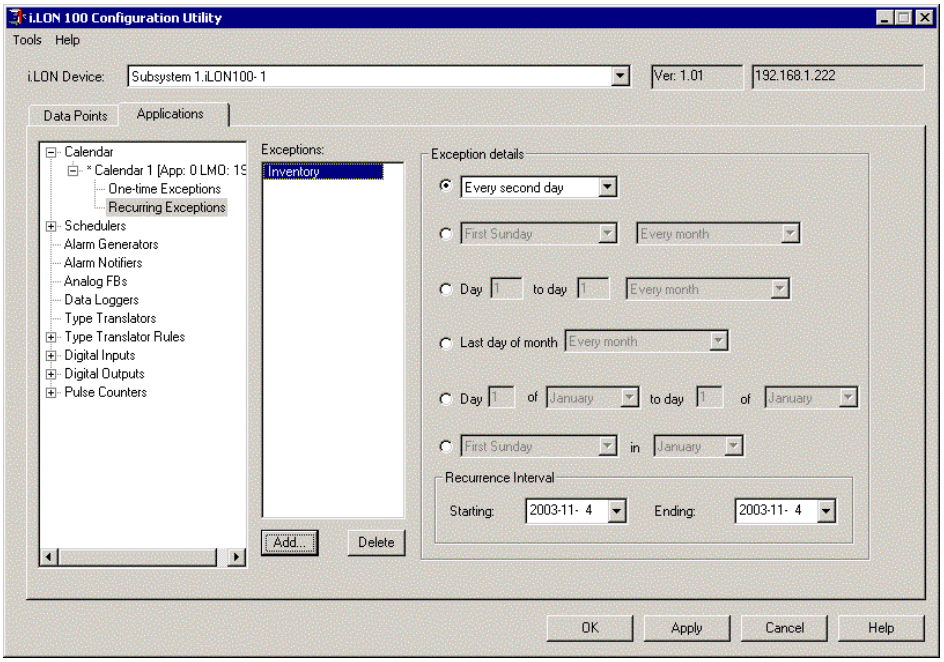
1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Right-click the *i*.LON 100 device shape and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens.
4. Select the **Applications** tab and then select **One-time Exceptions** or **Recurring Exceptions** from beneath the **Calendar** application on the applications pane on the left side of the *i*.LON 100 Configuration Plug in.
5. On either tab, click **Add** to open the **New Exception** dialog, as shown in the following figure:

6. Enter the name of the new exception and then click **OK**. The new exception will be added to the **Exceptions** list.
7. Select the new exception from the **Exceptions** list. The fields in **Exception Details** will highlight.
8. If you are in the **One-time Exceptions** tab, **Exception Details** appears as shown in the following figure:



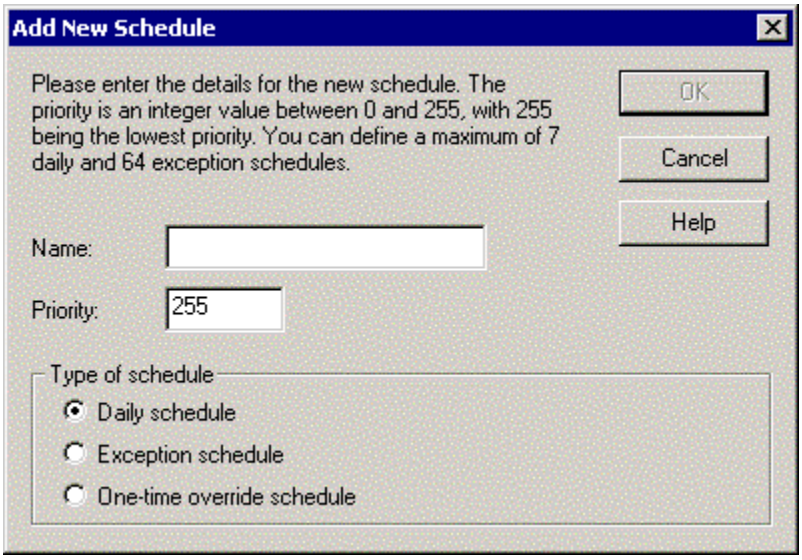
9. Use the **Start Date** and **End Date** columns to select the start and end dates for the exception. Each exception can have up to 16 date ranges. Select the **Temporary Exception** check box to have the exception removed once the last date specified in the **End Date** column has passed. If this check box is cleared, the exception will remain and the dates can be updated (*i.e.* if you have an exception schedule that will be used at irregular intervals).

   If you are in the **Recurring Exceptions** window, **Exception Details** appears as shown in the following figure:



These fields allow you to set how often the exception occurs. Click **Help** for more information.

10. Once you have defined one or more exceptions, click the **Scheduler** tab and the **Schedule Details** tab. The exceptions you created are listed in **Exceptions**.
11. Click **Add** below the **Schedules** list to open the **New Schedule** dialog, shown in the following figure:

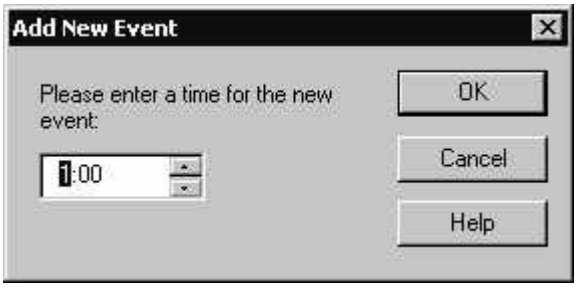


12. Enter the following information to define a new daily schedule:

Name	The name of the new schedule. This field can be up to 228 characters.
Priority	The priority of the new schedule. This number can be from 0 (highest priority) to 255 (lowest priority). If two schedules conflict—for example a daily schedule and an exception

	schedule—the one with the higher priority value takes precedence. When creating an exception schedule, set the **Priority** higher than the priority used for the daily schedule.
Type of Schedule	When creating an exception schedule, select **Exception Schedule**.

13. Click **OK** to create the new exception schedule. The new schedule will appear in the **Schedules** list.
14. Select the new schedule from the **Schedules** list. Since you have created an exception schedule, the **Days** field is grayed out, while the **Exceptions** field is highlighted.
15. Select the exceptions to which the new schedule will apply. Each schedule can apply to multiple exceptions. For example, if you created recurring exceptions for Christmas, the Fourth of July, Presidents Day, and New Years, you can create a holiday schedule that would apply to those dates.
16. Optionally add one or more events to the schedule (you can leave a schedule empty to indicate that the scheduler should remain dormant on that day). To add an event, click **Add** under the **Events** list or double-click the first column of the first empty row in the **Events** list. The **Add New Event** dialog opens, as shown in the following figure:

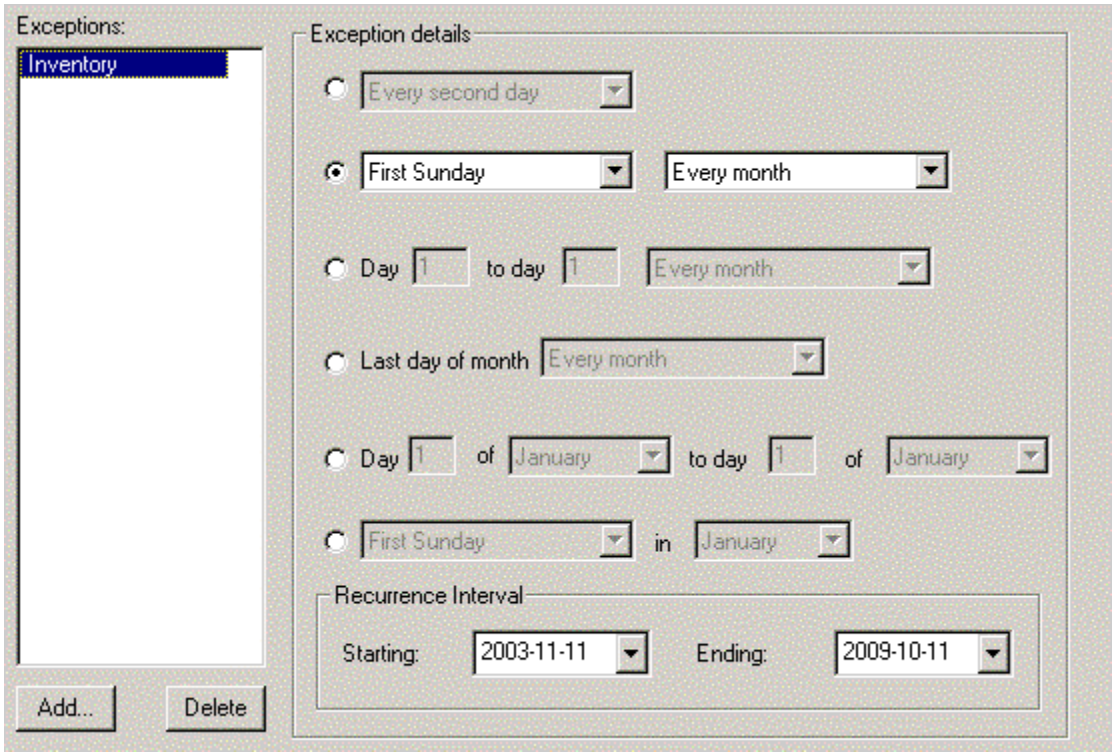


17. Use this dialog to set the time for the new event and click **OK**. An event will appear in the **Events** list. The **Time** will be the time you selected, and the **Value** will be **Default**. This indicates that at the specified time, all the data points specified in the **Data Points** tab will be set to their **Default** value, as specified in the **Presets** tab (see *Data Point Presets* in Chapter 2 for more information on data point presets).
18. To change the value to which the data points will be set, click the value to open a shortcut menu that allows you to set any of the preset values available in the **Presets** tab for the collection of data points in the **Inputs** tab. You can set the value for multiple data point of the different types as long as the preset value you specify is defined for each data point (see *Data Point Presets* in Chapter 2 for more information on data point presets). You can also enter a value manually, but you must ensure that it is a valid value for all data points in the **Inputs** tab (the Configuration Plug-in will not validate it).
19. Create additional exception schedules as described above. You can create up to three exception schedules in a single Scheduler functional block.

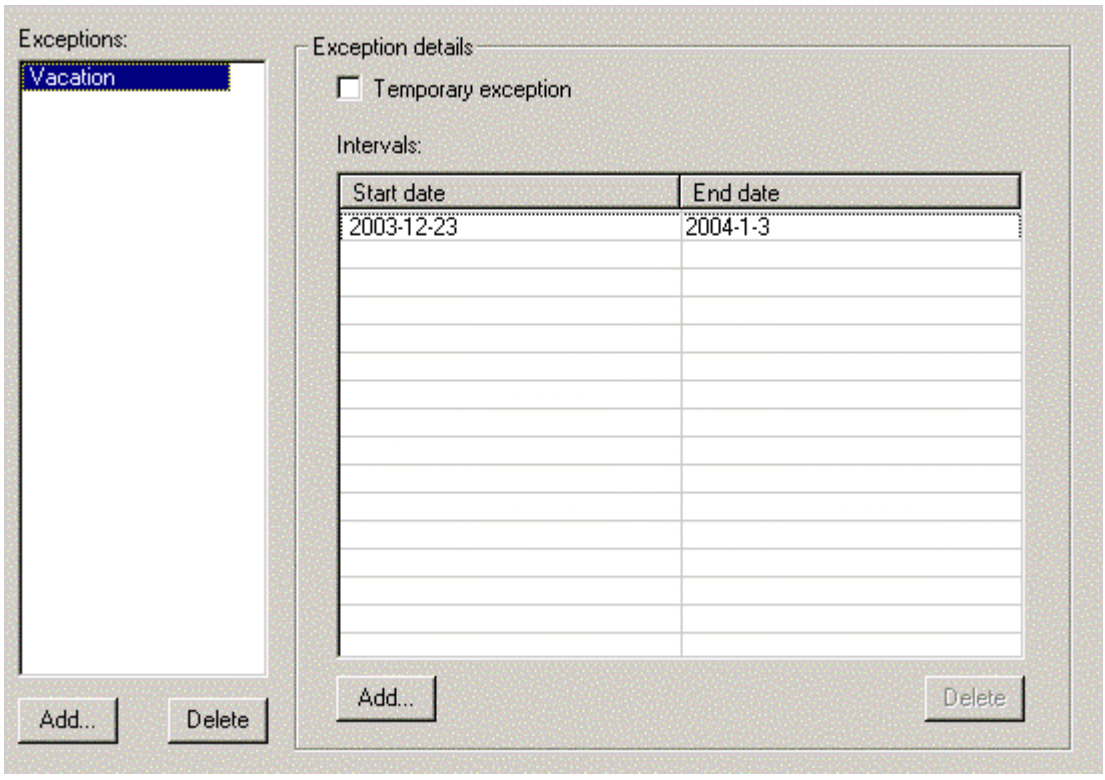
Example of Creating Exception Schedules

In the example described above, two exception schedules are created, one recurring exception (Inventory, on the first Sunday of each month) and one one-time exception (Vacation, dates to be set manually every year).

The **Recurring Exceptions** window for the Inventory schedule appears as shown:



The **One-time Exceptions** window for the Vacation schedule appears as shown:



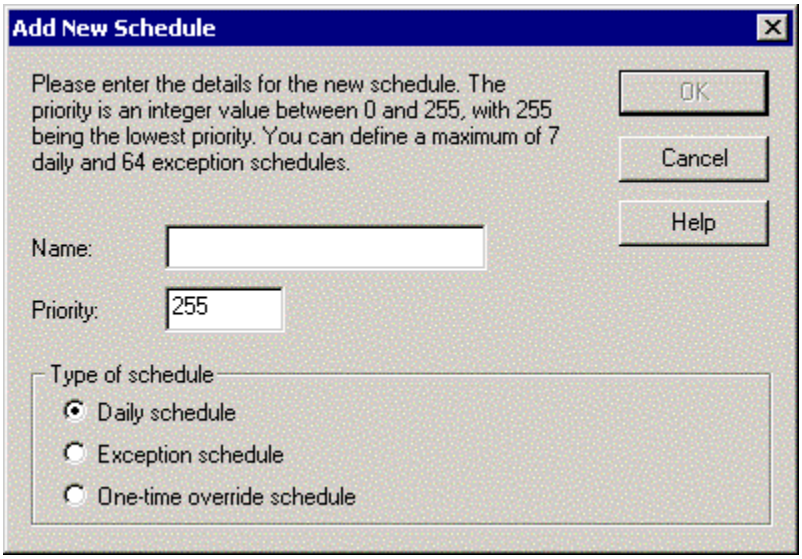
Deleting Exception Schedules

You can delete one-time or recurring exceptions in the **Calendar** functional block by selecting the exception from the **Exceptions** list and clicking **Delete**. If you delete an exception, you should assure that you remove the reference to the exception from all **Scheduler** functional blocks on the i.LON 100; if a **Scheduler** references a non-existent exception, the **Scheduler** may be rendered unoperational.

Creating a One-time Override Schedule

You can create a one-time override schedule to implement a temporary exception schedule for a single range of dates. A one-time override schedule is never recurring. One-time override schedules count against the total of two exception schedules (*i.e.* exception schedules) that can exist on a scheduler, so you cannot create one if the scheduler already has two exception schedules defined. To create a one-time override schedule, follow these steps:

1. Right-click the **Scheduler** functional block that you want to override and select **Configure** from the shortcut menu. The *i*.LON Configuration Utility opens with the **Scheduler** tab selected.
2. Select the **Schedule Details** tab.
3. Verify that the correct Scheduler functional block is selected in the **Schedulers** folder in the **Functional Blocks** list and then click **Add**. The **New Schedule** dialog opens as shown in the following figure:



4. Enter the following information to define a new daily schedule:

Name	The name of the new schedule. Creating a one-time override schedule creates a temporary exception of the same name in the Calendar functional block, so the override schedule name must not match an existing exception name.
Priority	The priority of the new schedule. This number can be from 0 (highest priority) to 255 (lowest priority). If two schedules conflict—for

	example a daily schedule and a one-time override schedule—the one with the higher priority takes precedence. When creating a one-time override schedule, set the **Priority** higher than the priority used for the current day's daily schedule.
Type of Schedule	When creating a one-time override schedule, select **One-time Override Schedule**.

5. Click **OK** to create the one-time override schedule. The new schedule appears in the **Schedules** list with an asterisk next to it to indicate it is a one-time override schedule.
6. Select the new schedule from the **Schedules** list. Enter the start and end dates for the override schedule under **One-time Exception Details**.
7. Optionally add one or more events to the schedule (you can leave a one-time override schedule empty to indicate that the Scheduler should remain dormant on that day). To add an event, click **Add** under the **Events** list or double-click on the first column of the first empty row in the **Events** list. The **Add New Event** dialog opens, as shown in the following figure:

8. Set the time for the new event and click **OK**. An event will appear in the **Events** list. The **Time** will be the time you selected, and the **Value** will be **Default**. This indicates that at the specified time, all the data points specified in the **Data Points** tab will be set to their **Default** value, as specified in the **Presets** tab (see *Data Point Presets* in Chapter 2 for more information on data point presets).
9. To change the value to which the data points will be set, click the value to open a shortcut menu that allows you to set any of the preset values available in the **Presets** tab for the collection of data points in the **Inputs** tab. You can set the value for multiple data point of the different types as long as the preset value you specify is defined for each data point (see *Data Point Presets* in Chapter 2 for more information on data point presets). You can also enter a value manually, but you must ensure that it is a valid value for all data points in the **Inputs** tab (the Configuration Plug-in will not validate it).
10. Once you have finished entering events for the one-time override schedule, click **OK**. Once the dates of the one-time override schedule have passed, it will be removed automatically.

Recovering from a Power Outage

If the *i*.LON 100 device loses power and power is later restored, it will attempt to set the appropriate outputs given the current date and time. To do this, it will look at the schedule in use for that day and the most recent event for that schedule.

For example, the *i*.LON 100 was executing a weekday schedule with the following events:

06:00	Warmup
08:00	Daytime
18:00	Cooldown
19:00	Nighttime

At 04:30 there was a power outage, and power was restored at 09:00. Since the most recent event was the 08:00 Daytime event, the *i*.LON 100 would set its output data points to the values specified by the Daytime preset.

Any events that should have happened in the ensuing time (in this case, the Warmup event) will not be processed.

6

Using Digital Inputs and Digital Outputs

This chapter describes how to use the *i*.LON 100 Internet Server's two digital inputs and two digital outputs.

Digital Input Overview

The *i*.LON 100 device includes two digital inputs. These can be used to connect the *i*.LON 100 device to a digital device that does not include a LONWORKS interface such as a switch or pushbutton. The *i*.LON 100 device contains two Digital Input functional blocks. The Digital Input functional blocks include the following input and output network variables:

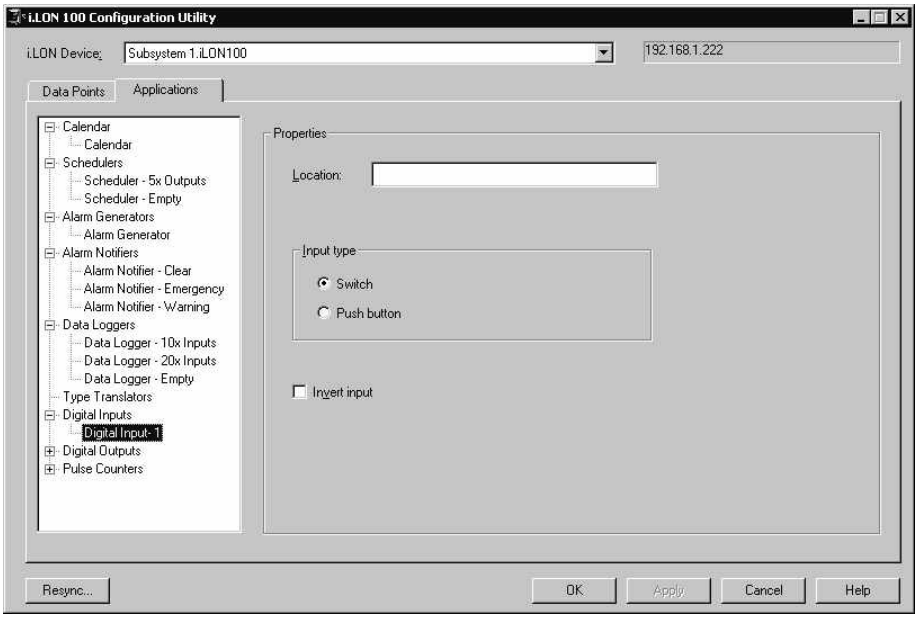
nvoClsValue	This **SNVT_switch** output network variable sends the state of the digital input (*i.e.* **100.0 1** for On, **0.0 0** for Off). This value is derived from the raw digital input value according to the settings of the *i*.LON 100 Configuration Software, as described below.
nvoClsSetting	This **SNVT_setting** output network variable sends the state of the digital input (*i.e.* **ST_ON 0 0.0** for On and **ST_OFF 0 0.0** for Off; only the **function** field is used). It is provided for compatibility with systems that use **SNVT_setting**, such as occupancy controllers and constant light controllers.
nviClsValueFb	This **SNVT_switch** input network variable is used to synchronize a group of switches. See the *LONMARK Closed-Loop Sensor Functional Profile* for more information. This network variable only works when bound.

Using a Digital Input

To use digital input, follow these steps:

1. Choose one of the two digital inputs. Connect one side of the input to ground and one side to a 12V current source (such as the one provided by +12V < 20mA output – see the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100*) that runs through a switch or dry-contact relay. When no current is received (*i.e.* the relay is open), there is no voltage difference, so the digital input will register **On**; when current is received, there will be a 12V difference and the digital input will register **Off**.
2. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
3. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device as.
4. Drag a Digital Input functional block shape from the *i*.LON 100 stencil to the LonMaker drawing. The LonMaker New Functional Block wizard appears.

5. Select **Digital Input 1** or **Digital Input 2** in **Functional Block – Name**. These correspond to hardware digital inputs 1 and 2. Select the appropriate functional block. Click **OK**. The Digital Input functional block shape appears.
6. Right-click the new Digital Input functional block and then select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens and prompts you for the IP address of the *i*.LON 100 server.
7. Enter the IP address of the *i*.LON 100 server and then click **OK**. The Digital Input tab opens, as shown in the following figure:



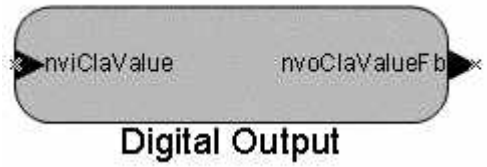
8. Enter the following information:

Location	A description of the location of the physical input associated with this **Digital Input** functional block. The location can be up to 30 characters. This information will not affect the operation of the functional block.
Input Type	Select **Switch** or **Push Button**. If you select **Switch**, the **nvoClsValue** network variable reflects the state of the hardware input (*i.e.* when the digital input is **On**, the **nvoClsValue** network variable sends **100.0 1**). If you select **Push Button**, the **nvoClsValue** network variable will change state every time the hardware input transitions from a low to high value.
Invert Input	Set this check box to invert the input from the **Value** network variable. This is typically only used in conjunction with the **Switch Input Type**.

9. Click **OK** or **Apply** to save the settings.

Digital Output Overview

The *i*.LON 100 device includes two dry-contact relay outputs. You can use these outputs to connect the *i*.LON 100 device to a digital device that does not include a LONWORKS interface such as a drive contactor or alarm bell. The *i*.LON 100 device contains two Digital Output functional blocks. The Digital Output functional blocks include the following input and output network variables:

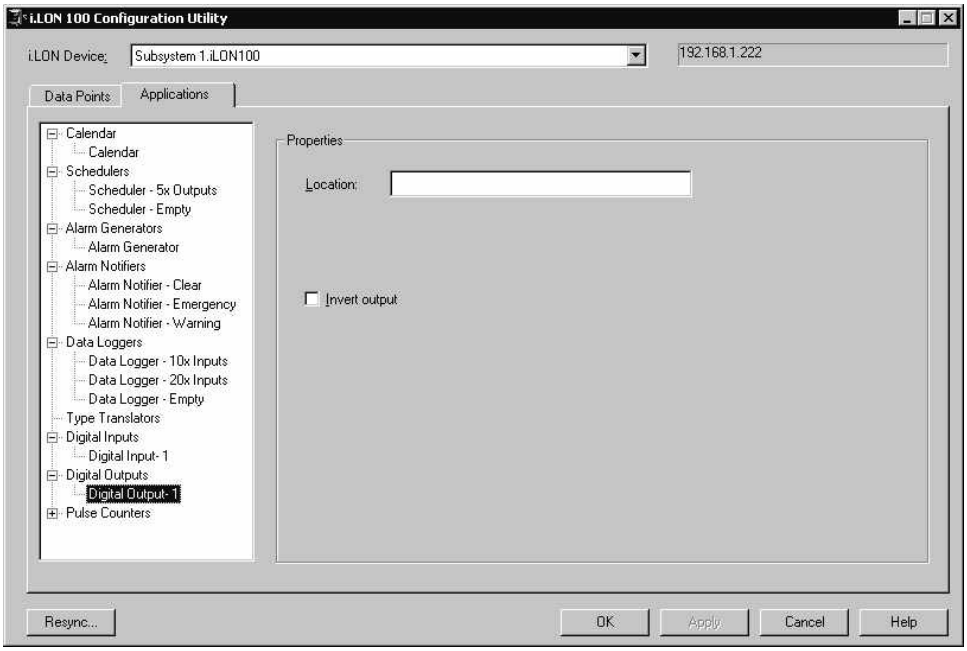


nviClaValue	This **SNVT_switch** input network variable accepts an On (**100.0 1**) or Off (**0.0 0**) value. This value drives the digital output's hardware relay according to the settings of the *i*.LON 100 Configuration Plug-in, as described below.
nviClaValueFb	This SNVT_switch output network variable reflects the last value sent to the **nviClsValue** network variable. This is used to synchronize a group of outputs. See the *LONMARK Closed-Loop Sensor Functional Profile* for more information.

Using a Digital Output

To use a digital output, follow these steps:

1. Connect the one of the two relay outputs to a digital input.
2. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
3. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
4. Drag a Digital Output functional block shape from the *i*.LON 100 stencil to the LonMaker drawing. The LonMaker New Functional Block wizard appears.
5. Select **Digital Output 1** or **Digital Output 2** in **Functional Block – Name**. These correspond to relay outputs 1 and 2. Select the appropriate functional block.
6. Click **OK**. The Digital Output functional block shape appears.
7. Right-click the new Digital Output functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens and prompts you for the IP address of the *i*.LON 100 server.
8. Enter the IP address of the *i*.LON 100 server and then click **OK**. The Digital Output tab opens, as shown in the following figure:



9. Enter the following information:

Location	A description of the location of the physical output associated with this Digital Output functional block. The location can be up to 30 characters. This information will not affect the operation of the functional block.
Invert Output	Set this check box to invert the output sent to the hardware. If this check box is cleared, the Digital Output functional block will close the relay when **nviClaValue** is set to **On (100.0 1**), and will open the relay when the **nviClaValue** is set to **Off** (**0.0 0**). If this check box is set, the **Digital Output** functional block will open the relay when the **nviClaValue** network variable is set to **On**, and close the relay when **nviClaValue** is set to Off.

10. Click **OK** or **Apply** to save the settings.

7

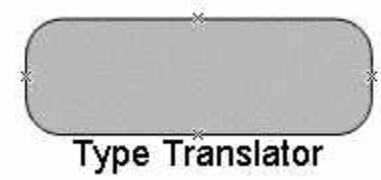
Using the Type Translator

This chapter describes how to use the *i*.LON 100 Internet Server's Type Translator functional block to translate data from one network variable type to another.

Type Translator Overview

The *i*.LON 100 includes 40 Type Translator functional blocks. A type translator allows you to translate data from one network variable type to another. You can use *scalar-based translation* and *rule-based translation*. Scalar-based translation allows you to translate one floating point or integer network variable to another floating point or integer network variable. Rule-based translation uses one of the Type Translators rules to translate from one network variable type to another. The Type Translator ships with a number of pre-defined rules and you can create custom rules using the i.LON 100 Configuration Plug-in as described in *Creating a Custom Type Translator Rule*, later in this chapter. Rule-based translation can involve translating a single input into many outputs or vice versa.

The Type Translator functional block initially has no network variables, as shown in the following figure:

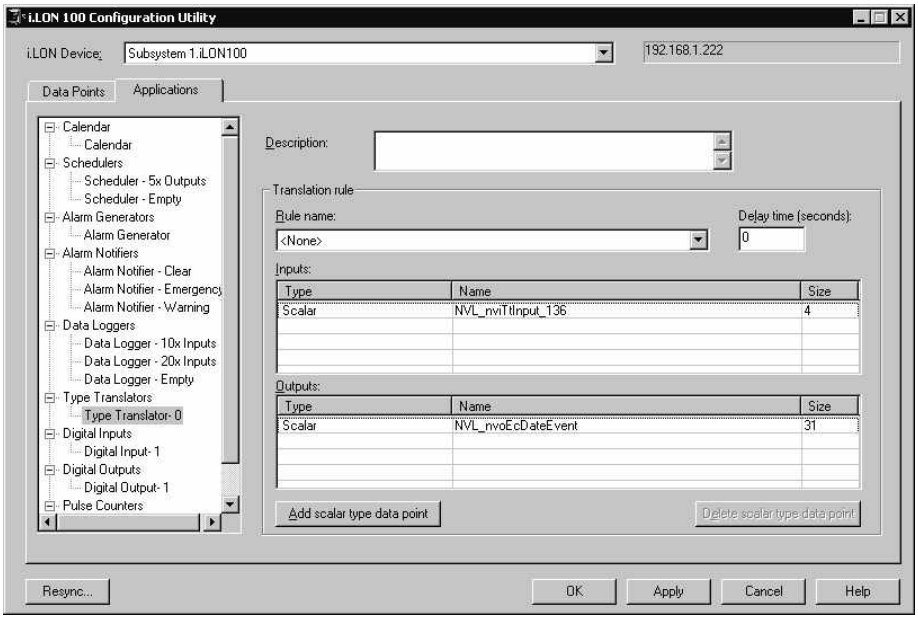


You will dynamically add input and output network variables of the appropriate types for the translation you want to implement.

Using the Type Translator Functional Block

To use a type translator, follow these steps:

1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Drag a Type Translator functional block shape from the *i*.LON 100 stencil to the LonMaker drawing.
4. Use the LonMaker New Functional Block wizard to associate the Type Translator functional block shape with any of the available Type Translator functional blocks on the *i*.LON 100.
5. Optionally add dynamic network variables to the Type Translator functional block as described in *Creating and Viewing Local Data Points (NVLs)* in Chapter 2. These network variables can be used as local data points.
6. Right-click the Type Translator functional block and select **Configure** from the short-cut menu. The *i*.LON 100 Configuration Plug-in opens and prompts you for the IP address of the *i*.LON 100 hardware.
7. Enter the IP address of the *i*.LON 100 and then click **OK**. The *i*.LON 100 Configuration Plug-in options with the **Type Translator** tab selected, as shown in the following figure:



Click **Help** for a description of all the fields in this tab.

8. To create a scalar-based translation, select **<None>** from **Rule Name**, and then click **Add Scalar Type Data Point** to add a scalar point to the **Input** and **Output** lists. You can add as many input/output pairs as required. In each case, the input is translated to the corresponding output.

   To create a rule-based translation, select the translation rule you want to use from **Rule Name**. The **Input** and **Output** lists will be filled in according to the rule you select. For example, if you select the **16xSNVT_switch_TO_SNVT_state** rule, the **Input** list will display 16 **SNVT_switch** type inputs, and the **Output** list will display one **SNVT_state** type output. Click **Help** for a complete list and description of all rules provided with the *i*.LON 100 Configuration Software. For information on creating a custom rule, see *Creating a Custom Type Translator Rule*, later in this chapter.

9. Select a data point of the appropriate type for each entry in the **Input** and **Output** lists. To do this, double-click the **Name** column next to the entry to see a shortcut menu of all data points of the appropriate type.

10. Click **OK** or **Apply** to save changes.

Creating a Custom Type Translator Rule

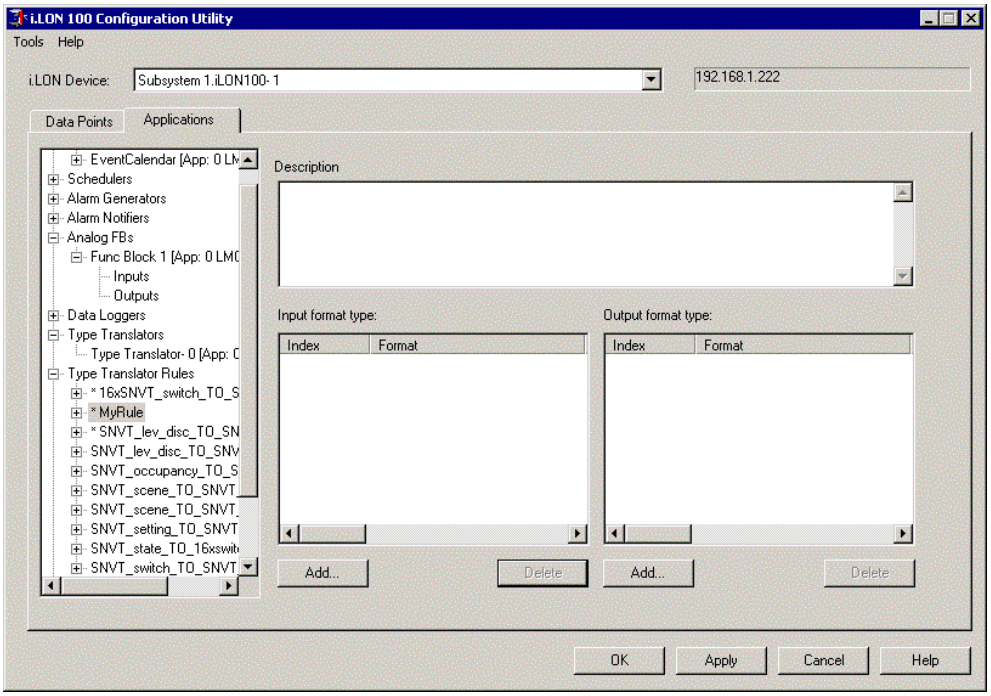
You can use the *i*.LON 100 Configuration Software to create custom type translator rules. You can use custom rules to translate data from any number of input network variables to any number of output network variables. To create a custom rule you will define the inputs and outputs of the rule, and create one or more cases that define how the rule will behave with various inputs. To create a custom rule, follow these steps:

1. In the **Applications** tab of the *i*.LON 100 Configuration Software, select **Type Translator Rules** from the Applications list.

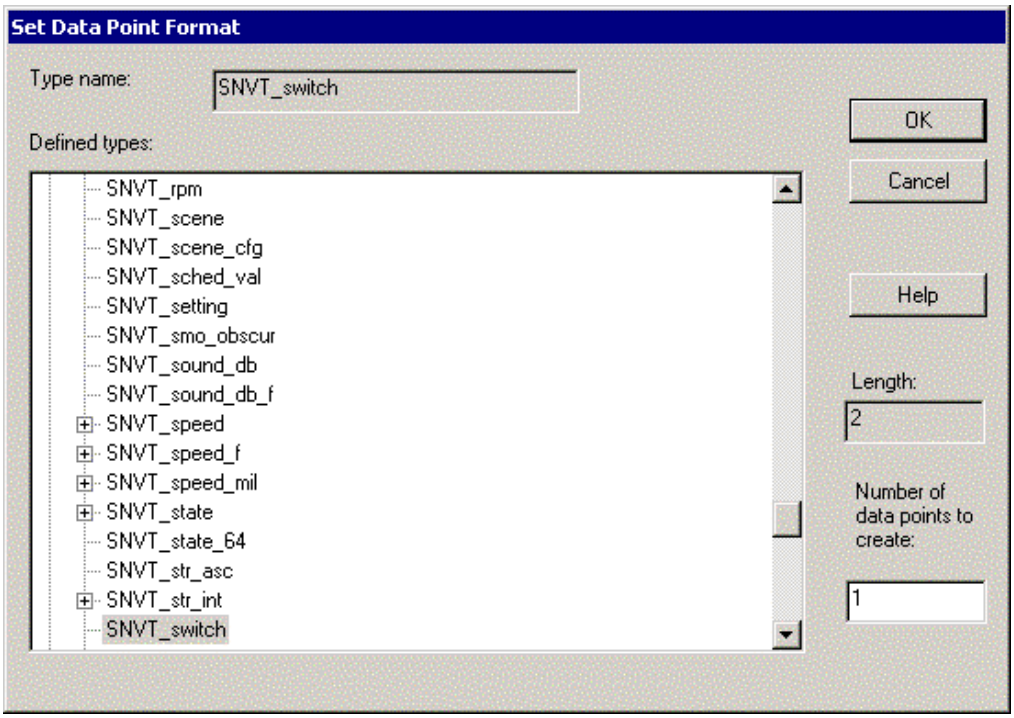
2. Right click **Type Translator Rules** in the Applications list and select **Add** from the shortcut menu. The **Add Application** dialog appears. Enter the

name of the new rule in **Application Name** and click **OK**. The new rule appears on the Applications list.

3. Select the new application. The following dialog appears:

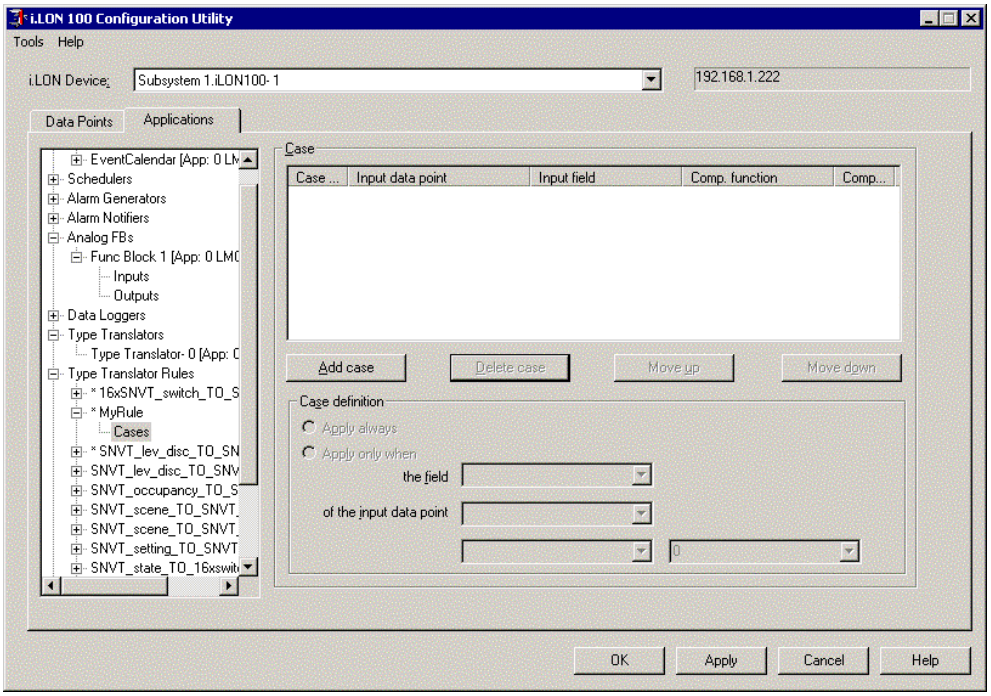


4. Click the **Add** button under **Input Format Type**. The **Set Data Point Format** dialog appears, as shown in the following figure:

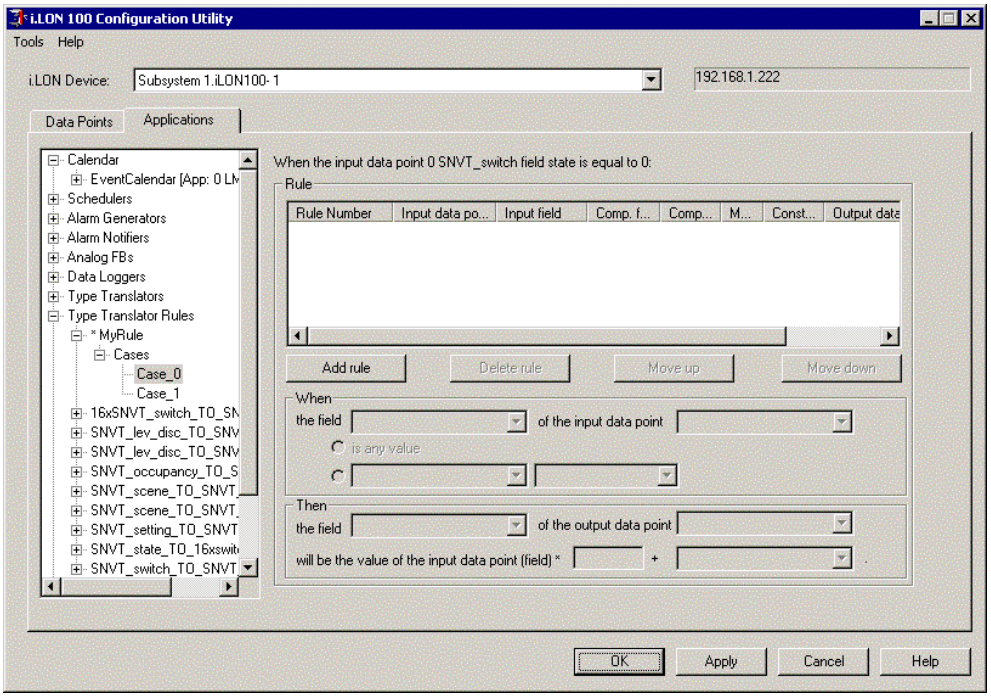


Select a data type that will be used as an input for this rule. If this rule will accept multiple inputs of this type, set **Number of Data Points to Create** appropriately.

5. Click **OK**. The data point or data points specified will appear in the **Input Format Type** list.
6. To add more input data points, click **Add** and repeat step 4.
7. Add one or more output data points using the **Add** button under the **Output Format Type** list, using the same method described in steps 4-6 for input data points.
8. Once you have defined all the inputs and outputs, expand the new rule the Applications list and then click **Cases**. The **Cases** dialog appears, as shown in the following figure:



9. Expand the **Cases** item under your translation rule in the Applications list. Select one of the cases you created. The **Rules** dialog opens:



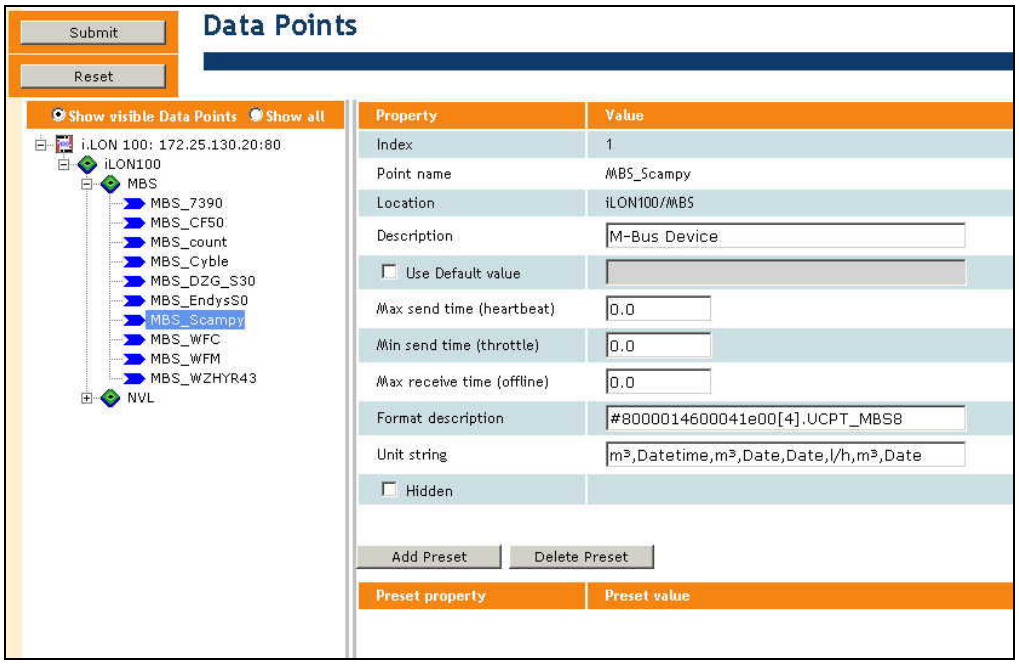
10. Click the **Add Rule** button to create a new rule for this case. Click **Help** for more information on defining rules.
11. Define rules for all defined cases. The i.LON 100 Configuration Software does not do any verification of your cases and rules; you must make sure what you have defined makes sense. Once you are finished, click **Apply**. The new rule will now appear in **Rule Name** in the **Type Translator** dialog.

Tutorial: Integrating M-Bus Devices in a LonWorks Network Using the Type Translator Functional Block

This tutorial describes how to expose the data from a generic M-Bus device as a network variable on a LonWorks network. The techniques covered in this tutorial may be applied to any M-Bus device that you want to integrate with your *i*.LON 100. Before starting this tutorial, you should already have installed an M-Bus device using the M-Bus driver Web page (see above). You should also create a LonMaker drawing that includes the *i*.LON 100 which contains the M-Bus data point. If you would like more information about the specific device used in this tutorial, you may download the data sheet of the Scampy water meter from the Hydrometer GmbH web site.

Step 1: View the Data Point properties

Once you have added an M-Bus data point to the *i*.LON 100 using the built-in M-Bus Web page, you can examine the properties of the data point using the **Configure Data Points** Web page. On the left side of the page, you will see a hierarchical tree view of your data points. To find the new M-Bus data point, expand the *i*.LON 100 location by clicking on the plus symbol, and then expand the MBS location, as shown in the following figure.



All MBS data points are listed under the **MBS** location. The *i*.LON 100 M-Bus driver represents each device using a single data point that exposes all data from the device as an array. In this example you can see that the **Format Description** of the data point is UCPT_MBS8. This means that the data point is an array with 8 elements. The **Unit String** property tells you the unit for each of these values in order. In this example, the first element in the array is a measurement of volume with the unit **m³**, the second element is a time stamp, and so on. The M-Bus driver discovers the type and unit information when the M-Bus device is configured with the M-Bus Web page. The unit and type information will not be set if the *i*.LON 100 cannot communicate with the M-Bus device.

The formats used by the M-Bus driver are described in the MBUS_Integrator resource file set which is installed by the i.LON 100 Software CD. These files may be viewed with the LonMark Resource Editor, also included on the *i*.LON 100 Software CD.

Step 2: Evaluating the device specification

Though the type and unit information can be easily read from the device, many M-Bus devices could have complex data structures. It is often the case that you will have to read the device specification to determine how each piece of data should be interpreted.

In the device specification for an M-Bus device there is usually a section on the M-Bus protocol. Find the description of the data being returned by the device on the REQ_UD2 M-BUS command. This command could also be called the *standard telegram* or the *response RSP_UP*. Once you have found this section in the documentation, you can map the entries in the **Unit String** one by one to the values in the vendor specification.

This example shows a structure with the following elements:

value[0] m³: This value reflects the current meter reading (total amount of water)

value[1] Datetime: The current date and time stored in the M-Bus device

value[2] m³: The meter reading at the last reference day. *Reference days* are configured by the installation tool for the device and define a fixed date or recurring pattern when data will be recorded.

value[3] Date: The last reference day. *Reference days* are configured by the installation tool for the device and define a fixed date or recurring pattern when data will be recorded.

value[4] Date: The next reference day

value[5] l/h: The current flow of water

value[6] m³: The meter reading at the end of the month

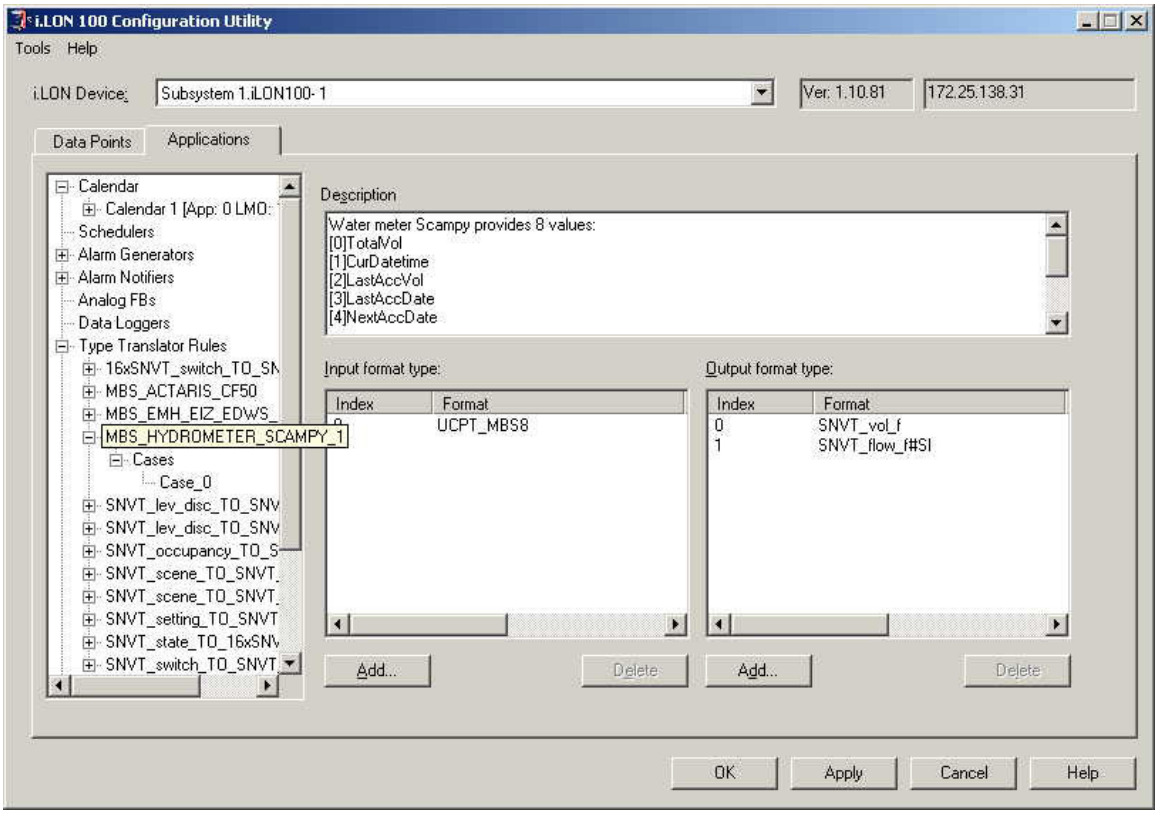
value[7] Date: The date of last months reading

Step 3: Modifying the M-Bus Type Translator rules

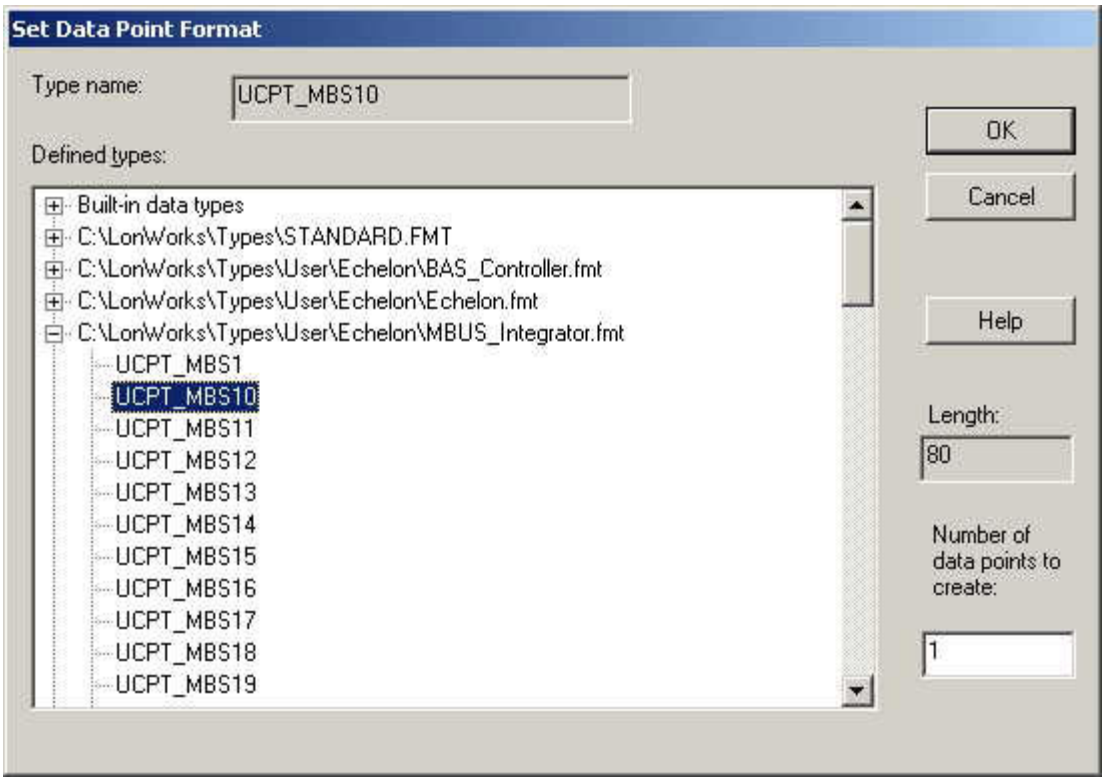
Once you have read the data sheet for your device and determined what each element in your M-Bus data point structure means, you can use an i.LON 100 **Type Translator** functional block to extract each item and map it to a network variable on the LonWorks network.

The i.LON 100 ships with three generic Type Translator Rules for water, power, and thermal measurement which can be used as a starting point when integrating your own M-Bus devices. These rules are named **MBS_HYDROMETER_SCAMPY_1**, **MBS_EMH_EIZ_EDWS_7390** and **MBS_ACTARIS_CF50** respectively. The names of these rules are composed of the manufacturer and model number of actual devices for which these were designed. Other rule examples can be found on the *i*.LON 100 V1.1 CD in the **Unsupported** folder.

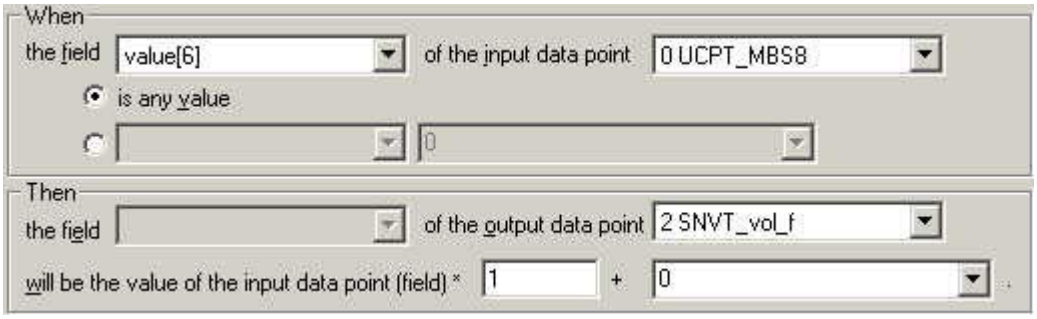
You can view these built-in rules by opening the *i*.LON 100 Configuration Plug-in for an existing i.LON 100 and browsing to **Type Translator Rules** in the Applications pane as shown in the following figure.



To integrate your device, you will either create a new Type Translator rule or duplicate one of the existing M-Bus rules. In the **MBS_HYDROMETER_SCAMPY_1** rule, there is one input and two outputs. If the input data point for your device is not **UCPT_MBUS8**, add an input with the correct type to match your device. The M-Bus type definitions are stored in the MBUS_Integrator resource file set which by default is installed to $LonWorks$\Types\User\Echelon\MBUS_Integrator.fmt as shown below.

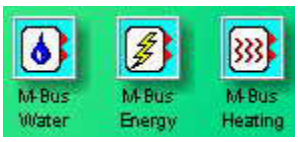


This rule maps **value[0**] to an output network variable with the type **SNVT_vol_f** and **value[5]** to an output network variable with the type **SNVT_flow_f#SI**. You can use the *i*.LON 100 Configuration Plug-in to add more outputs to the rule if you would like to expose other data from the M-Bus device. For each output, add a rule that maps a data field from the M-Bus device to a SNVT. For example, to add a new output to expose the monthly reading from the M-Bus device sent on field 6, create the rule as shown in the following figure:



Step 4: Using the M-Bus Type Translator shapes in LonMaker

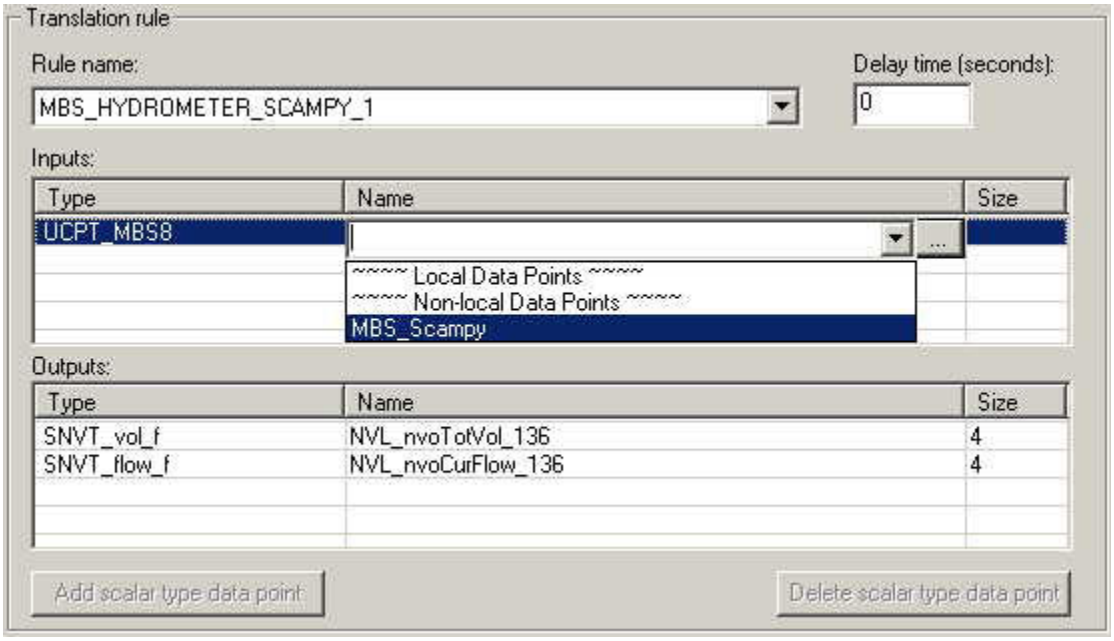
There are predefined master **Type Translator** shapes in the i.LON 100 Stencil for three types of M-Bus devices: Water, Energy and Heating.



These shapes contain an output network variable for each output defined in the **Type Translator** rules. Add the appropriate shape to your LonMaker drawing,

right-click on it, and then select **Configure** from the short-cut menu to open the *i*.LON 100 Configuration Plug-in with the **Type Translator** configuration window selected.

To use your new rule, choose it from the list. The two predefined outputs will be selected by default. To select the input data points, click **Name** under the **Inputs** list and select the data point from the drop down list that appears as shown in the following figure.



The **Name** drop down list shows only data points of the appropriate type. If the *i*.LON 100 cannot communicate with the M-Bus device, it may not have set the data point type; in this case, your data point will not show up in this list.

To add new output network variables to the M-Bus functional block using the LonMaker tool, drag an **Output Network Variable** shape from the *i*.LON 100 Shapes 1.1 stencil to the functional block (see the LonMaker documentation for more information. When creating network variables in LonMaker, you must have another network variable with the same type to act as a template. In the example above, the new output had the same type as the first output. In most cases, this process is simplified if you install the LonWorks devices that will be integrated before creating the output network variables.

Note: The M-Bus driver represents all scalar values as double precision floating-point numbers (8 bytes). The use of 4 byte floating-point types such as **SNVT_vol_f** may exhibit a loss of precision when values become very large. The **Pulse Counter** output network variable **nvoPcValue_1** is 8 bytes and may be used as a template to create output network variables with double precision floating point types, such as those found in the **BAS_Controller** resource file set of the *i*.LON 100 (**UNVT_double_float**, **UNVT_elec_kwh_lf**, and **UNVT_power_lf**).

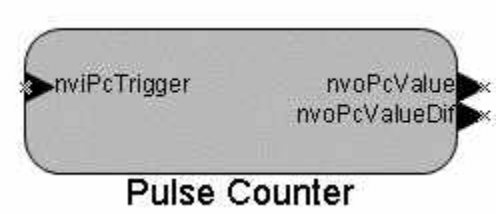
8

Using Pulse Counter Inputs

This chapter describes how to use the *i*.LON 100 server's Pulse Counter to measure electrical energy, volume, rate or flow, or power.

Pulse Counter Overview

The *i*.LON 100 device includes two pulse counter inputs. You can use these inputs to connect the *i*.LON 100 to a power meter or other device with a pulse output that does not include a LONWORKS interface. The *i*.LON 100 device contains 2 Pulse Counter functional blocks. The Pulse Counter functional blocks include the following input and output network variables:



nvoPcValue — This changeable type output network variable sends the cumulative pulse count data (*i.e.* the total number of pulse counts received in this time interval). This value will be calculated every time a pulse is received, but the value will not be sent to the network until the **Time Interval** (see below) expires or the **state** field of the **nviPcTrigger** network variable changes from **Off** (0) to **On** (1); polling this network variable at any time will return the most current value. The type of this network variable is set by the *i*.LON Configuration Software as described below.

nvoPcValueDif — This changeable type output network variable sends the pulse rate. The type of this network variable is set by the *i*.LON Configuration Software as described below.

nviPcTrigger — This SNVT_switch input network variable is used to synchronize the **nvoPcValueDif** network variable. When the **state** field of this network variable changes from Off (0) to On (**1**), the **nvoPcValue** and **nvoPcValueDif** values will be calculated and sent to the network and a new time interval is started.

Using the Pulse Counter

To use pulse counter, follow these steps:

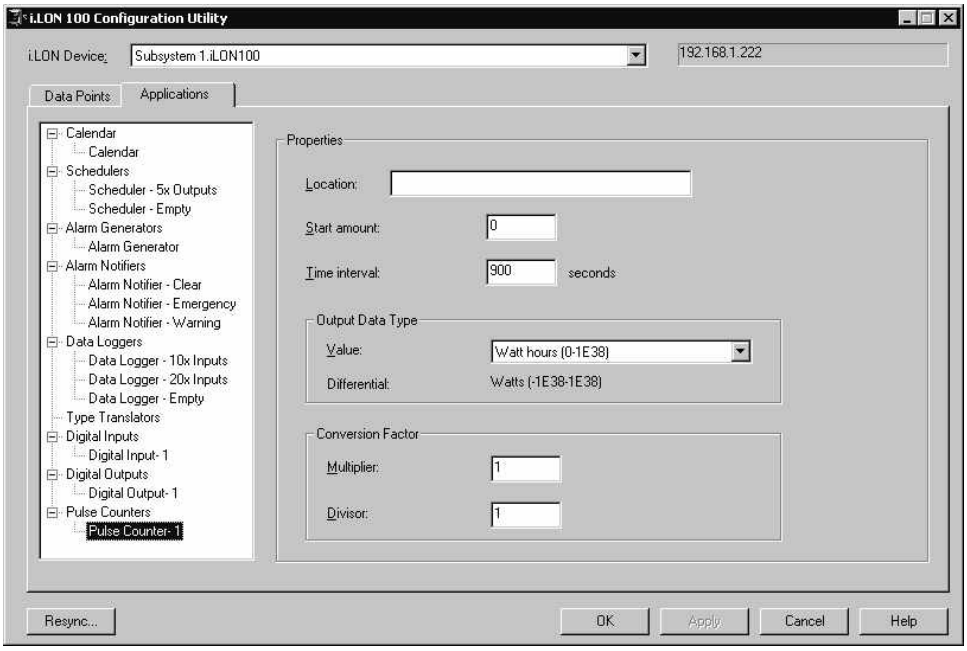
1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Drag a Pulse Counter functional block shape from the *i*.LON 100 stencil to the LonMaker drawing. The LonMaker New Functional Block wizard appears.

4. Select **Pulse Counter 1** or **Pulse Counter 2** in **Functional Block – Name**. These correspond to hardware Meter Inputs 1 and 2. Select the appropriate functional block.

   Click **OK**. The Pulse Counter functional block shape appears.

5. Right-click the new Pulse Counter functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens and prompts you for the IP address of the *i*.LON 100 server.

6. Enter the IP address of the *i*.LON 100 server and then click **OK**. The Pulse Counter tab opens, as shown in the following figure:



7. Enter the following information:

Location — A description of the location of the physical input associated with this Pulse Counter functional block. The location can be up to 30 characters. This information will not affect the operation of the functional block.

Start Amount — Specifies the start amount of the **Value** network variable. This value will be added to the number of counted pulses.

Time Interval — Specifies the time interval, in seconds, that will be used to calculate the pulse rate sent on the **Differential** network variable.

Output Data Type — Select the type of the output data point. This selection updates the types of the **nvoPcValue** and **nvoPcValueDif** network variables. Select one of the following options:

Watt hours (0-6553.5) – The **Value** network variable will be set to a type of **SNVT_elec_whr** and send total watt-hours as an integer. The **Differential** network

variable will be set to a type of **SNVT_power** and send power information as an integer.

Watt hours (0-1E38) – The **Value** network variable will be set to a type of **SNVT_elec_whr_f** and send total watt-hours as a floating point number. The **Differential** network variable will be set to a type of **SNVT_power_f** and send wattage information as a floating point number.

Kilowatt hours (0-65535) – The **Value** network variable will be set to a type of **SNVT_elec_kwhr** and send total kilowatt-hours as an integer. The **Differential** network variable will be set to a type of **SNVT_power_kilo** and send power information as an integer.

Liters (0-6553.5) – The **Value** network variable will be set to a type of **SNVT_vol** and send total volume as an integer. The **Differential** network variable will be set to a type of **SNVT_flow** and send flow rate information as an integer.

Liters (0-1E38) – The **Value** network variable will be set to a type of **SNVT_vol_f** and send total volume as a floating point number. The **Differential** network variable will be set to a type of **SNVT_flow_f** and send flow rate information as a floating point number.

When the output network variable reaches the limit defined in parentheses, it will wrap back to zero.

Multiplier/Divisor — Defines an input multiplier and divisor to convert the units per pulse of the attached meter to correspond to the output data point type. For example, if the output data type is *Watt hours (0-6553.5)* and the attached meter sends 1 pulse per 10 Watt Hours, you would set the **Multiplier** to 10 and the **Divisor** to 1. This setting would produce a 10 Watt-hour increase in the value on the **nvoPcValue** network value for every pulse of the electric meter.

8. Click **OK** or **Apply** to save the settings. The *i*.LON 100 server will retain the values of the pulse counters when reset, but it will not count any pulses during a reset (a period of up to 2 minutes).

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Using the Analog Function Block

This chapter describes how to use the *i*.LON 100 server's Analog Function Block application to perform statistical, arithmetic, or logical operations on input values and send output values.

Analog Function Block Overview

The *i*.LON 100 device includes twenty analog function blocks. You can use these functional blocks to perform statistical, arithmetic, or logical operations on data points. The *i*.LON 100 device contains 20 Analog Function Block functional blocks. The Analog Function Blocks include the following input and output network variables:

nvoAfbDropOut — This SNVT_count type output network variable provides a count of data points that are currently offline.

nvoAfbOutput — This dynamic, changeable type output network variable is used to send the output of the Analog Function Block. By default, the type is set to SNVT_temp_f. The type must be set to a scalar type or to SNVT_switch.

nviAfbInputA/B — These changeable-type input network variables provide input values to the analog function block. The analog function block can be configured to operate on these values or to compare one of them to the **nviAfbCompare** network variable value. The comparison function can be configured as described in *Comparing Data Points*, below.

nviAfbCompare — This dynamic changeable-type input network variable provides a value to be compared to the **nviAfbInput** network variable value. This network variable must have the same type as the **nviAfbInput** network variable. The input and compare functional blocks must be scalar types.

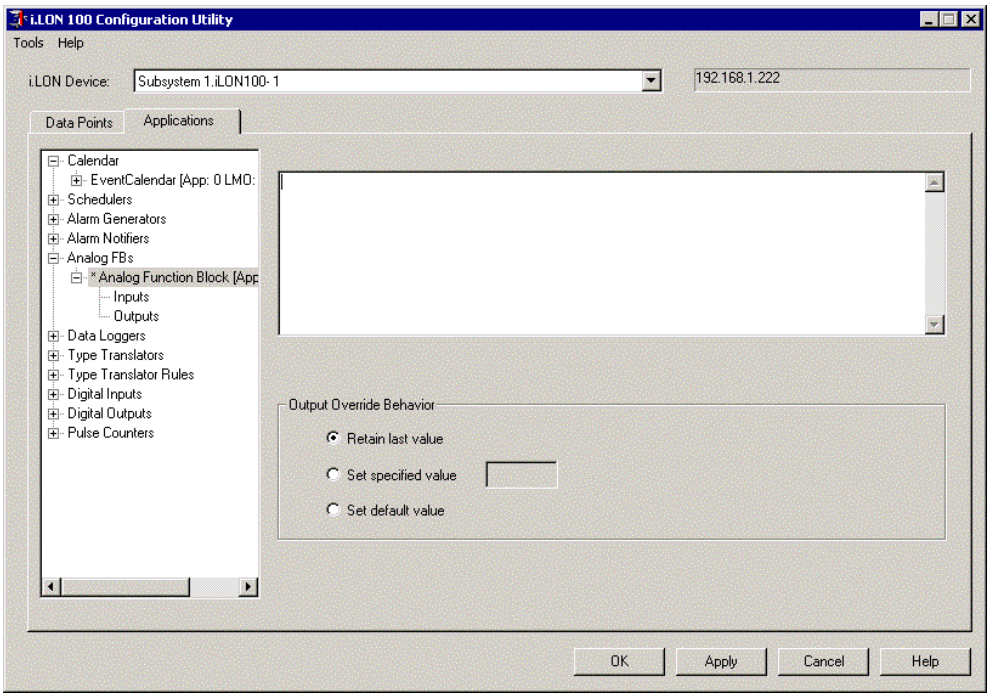
Using the Analog Function Block

To use the analog function block, follow these steps:

1. Open an existing LonMaker network or create a new LonMaker network as described in the *LonMaker User's Guide*.
2. Use an existing *i*.LON 100 device in the LonMaker network, or create and commission a new *i*.LON 100 device.
3. Drag an Analog Function Block functional block shape from the *i*.LON 100 stencil to the LonMaker drawing. The LonMaker New Functional Block wizard appears.
4. Select one of the 20 available Analog Function Blocks in **Functional Block – Name**.

Click **OK**. The Analog Function Block functional block shape appears.

5. Right-click the new Analog Function Block functional block and select **Configure** from the shortcut menu. The *i*.LON 100 Configuration Plug-in opens and prompts you for the IP address of the *i*.LON 100 server.
6. Enter the IP address of the *i*.LON 100 server and then click **OK**. The Analog Function Block dialog opens, as shown in the following figure:



7. Enter the following information:

Description — Enter a description of the analog function block.

Output Override Behavior — Determine the behavior of output data points on the analog function block functional block when it is put into override. Available options are:

Retain Last Value – The output data points continue to send their most recent value before the functional block was put into override.

Set Specified Value – The output data points send the specified value when the functional block is in override. You must ensure that the given value is valid.

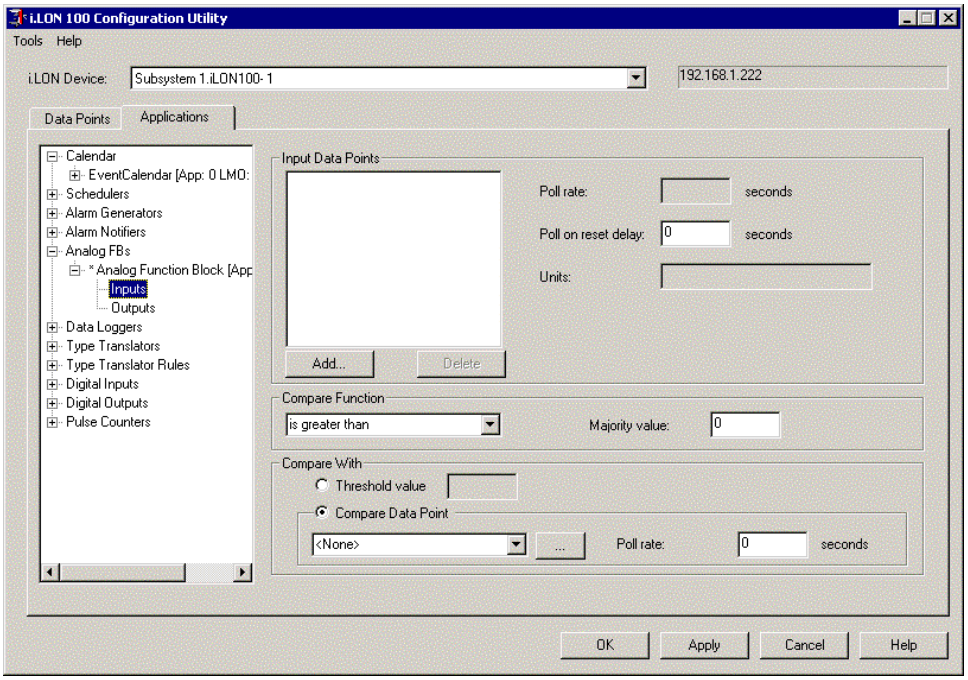
Set Default Value – The output data points send their default values.

8. See one of the following sections corresponding to what function you want the analog function block to perform (click **Help** for more information about any options that are not discussed below):

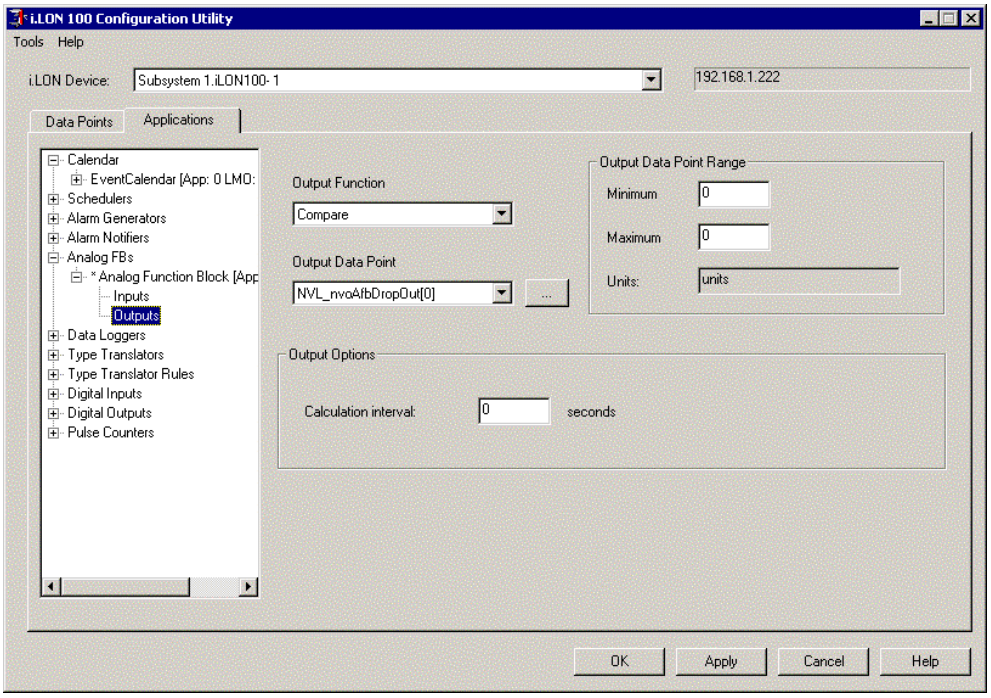
Adding, Averaging, or Selecting the Minimum or Maximum of Two or More Values

To perform a arithmetic or statistical operation on two or more values using the analog function block, follow these steps:

1. Click **Inputs** under the analog function block on the Applications list. The **Inputs** dialog opens, as shown in the following figure:



2. By default, the **nviAfbInputA** and **nviAfbInputB** data points will appear in the **Input Data Points** list. Click **Add** to add additional data points to the list using the **Add Data Points** dialog. All data points must be scalar types (although data points of different types may yield unpredictable results due to differing scaling factors).
3. Click **Outputs** under the analog function block on the Applications list. The **Outputs** dialog opens, as shown in the following figure:



4. Set the **Output Data Point** to the data point to be used to output the selected function of the input data points. This data point must be of the same type as all the input data points.
5. Set **Output Function** to one of the following values:

Sum	The data point specified in **Output Data Point** will send the sum of all **Input Data Points** specified in the **Inputs** dialog.
Average	The data point specified in **Output Data Point** will send the average of all **Input Data Points** specified in the **Inputs** dialog (i.e. the sum divided by the number of points).
Minimum	The data point specified in **Output Data Point** will send the smallest of all **Input Data Points** specified in the **Inputs** dialog.
Maximum	The data point specified in **Output Data Point** will send the largest of all **Input Data Points** specified in the **Inputs** dialog.

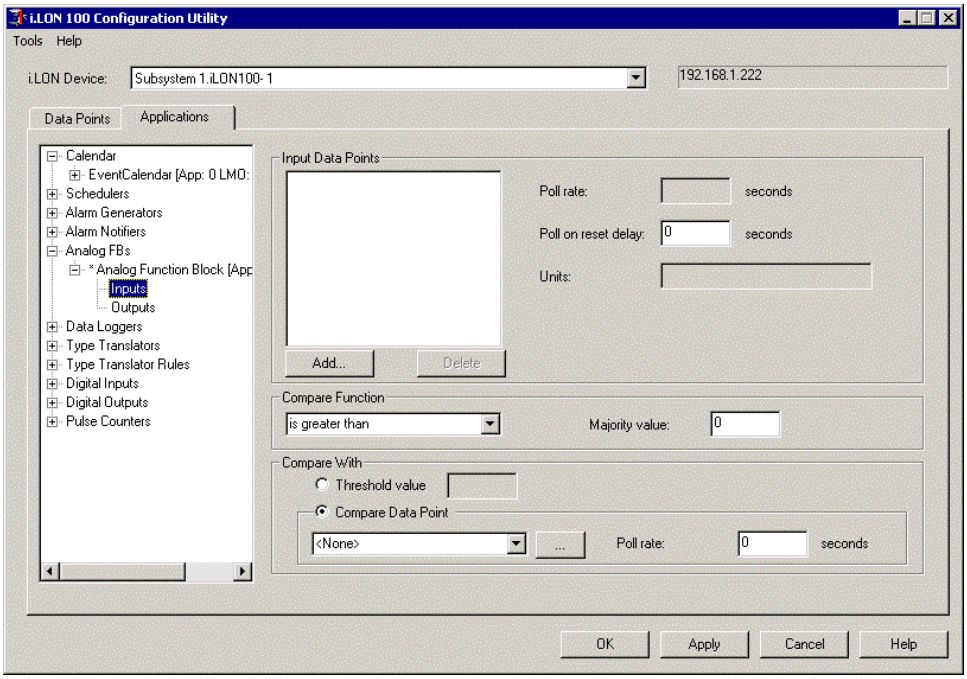
6. Set the **Minimum** and **Maximum** values to limit the range of values that can be sent on the **Output Data Point**. If the value exceeds one of these values, the minimum or maximum will be sent instead.
7. Click **OK** or **Apply**.

Comparing Data Points

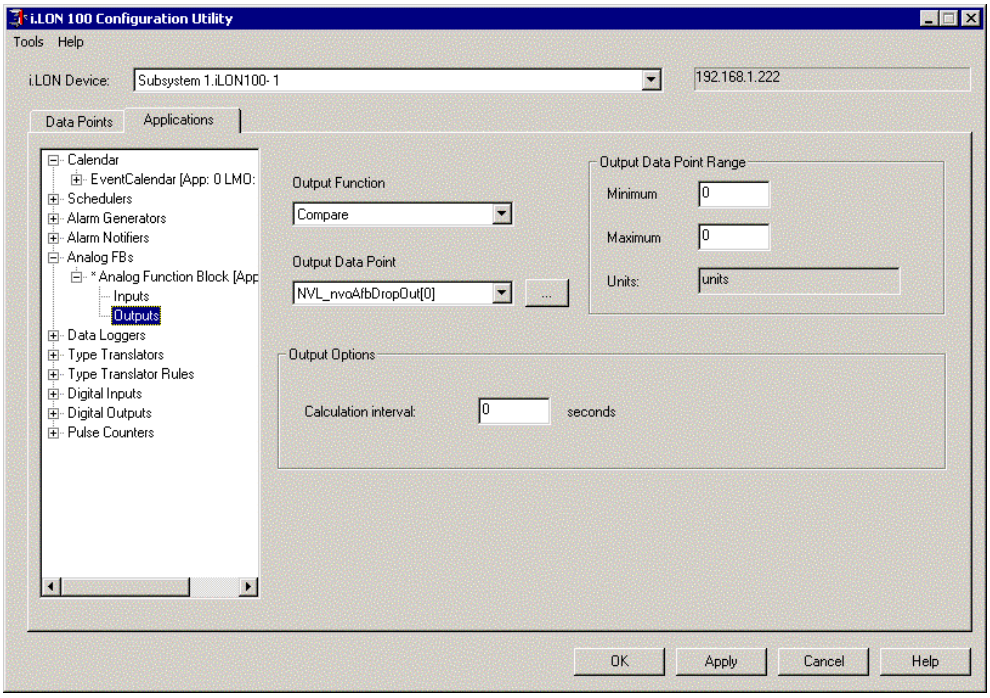
The analog function block can be used to compare an input data point to either another data point or a static value and send a true or false result depending on the results of the comparison. If you use multiple input data points, you can specify a percentage of them that must satisfy the comparison in order for the

analog function block or output a TRUE value. To compare data points, follow these steps:

1. Click **Inputs** under the analog function block on the Applications list. The **Inputs** dialog opens, as shown in the following figure:



2. By default, the **nviAfbInput** data point will appear in the **Input Data Points** list. Click **Add** to add additional data points to the list using the **Add Data Points** dialog.
3. Set **Compare Function** to determine how the input data points will be compared to the compare data point or the threshold value. Click **Help** for a description of the comparison functions.
4. Set **Compare With** to determine what value will be compared against the input data points. Select **Threshold Value** to enter a static value to be used for comparison. Select **Compare Data Point** to compare the input data points to another data point value. By default, this is set to the **nviAfbCompare** data point, but you can select any data point that matches the type of the input data points.
5. If you are comparing multiple data points, set **Majority Value** to the percentage of data points that must satisfy the comparison in order for the analog function block to output a TRUE value.
6. Click **Outputs** under the analog function block on the Applications list. The **Outputs** dialog opens, as shown in the following figure:



7. Set **Output Function** to one of the following values:

Compare	The data point specified in **Output Data Point** will send a true value if the comparison specified in the **Inputs** tab evaluates as true. For multiple data points, **Majority Value** is used to determine what percentage of input data points must satisfy the condition for the **Output Data Point** to send a true value.
AND	If all data points specified in **Input Data Points** in the **Inputs** dialog evaluate as true, the **Output Data Point** will send a true value.
OR	If any data points specified in **Input Data Points** in the **Inputs** dialog evaluate as true, the **Output Data Point** will send a true value.

8. Set **Output Data Point** to the data point to be used to output the TRUE or FALSE value. This data point must be of the SNVT_Switch type.

Appendix A

Troubleshooting

This appendix can be used to diagnose common problems that occur with the *i*.LON 100 device.

When I run the *i*.LON 100 Configuration Plug-in I get an error stating that I could not communicate with the *i*.LON 100

- Verify that the WSDL file is not password protected. Protection is defined in the **webparams.dat** file located at the root of the *i*.LON 100's flash disk.
- Verify that the IP communication path to the *i*.LON 100 is intact. (Try pinging the *i*.LON 100)

I have created NVE style points and although I can see them in the plug-in and reference them using the SOAP/XML interface I can not reference them within my Web pages.

- The *i*.LON 100 Web server does not allow NVE tag names with spaces. Be sure your tag names do not have spaces. The SOAP/XML server and the plug-in do allow spaces under some conditions, but the best practice is never to include spaces in NVE names.

I can't make my *i*.LON 100 send an email message. What am I doing wrong?

- Emails are sent as a result of alarm conditions. Verify that the alarm condition actually triggers and that the email *should* be sent.

After changing the type of a data point using Configuration Plug-in or the LonMaker browser, the data point starts showing incorrect data.

- The LNS Data Server may be using old format data. Close and restart all LNS applications.

The *i*.LON 100 exhibits problems due to a low-memory condition. This could be indicated by one or more of the following: "out-of-memory" messages, slow network access, application performance problems, or even an unexpected reboot.

- Reduce the number of Alarm Notifiers and/or the size limit of the alarm Summary Logs (which are kept in RAM).
- Reduce the number of Web clients that are simultaneously accessing the *i*.LON 100.
- If you are making calls to the SOAP interface on the *i*.LON 100, refer to the *i*.LON 100 Programmer's Guide for specific recommendations on limiting SOAP messages.

I am having trouble getting the upgrade procedure to work.

If you are having trouble using the *i*.LON 100 upgrade tool, you can manually upgrade a configured *i*.LON 100 device to a later version without losing your configuration, by following these steps:

1. On your computer, install the new version of the *i*.LON 100 software from the version *i*.LON 100 CD.
2. Using an FTP client, back up the entire contents of your *i*.LON 100 device to your computer.
3. Using an FTP client, delete all files from the **/Modules** directory on the *i*.LON 100 device.
4. Using an FTP client, overwrite the files on the *i*.LON 100 device with the *i*.LON 100 image installed on your computer in step 1. By default, this image is located at **C:\LonWorks\iLON100\Images\iLON100 x.xx** (where x.xx is the latest version number).
5. Using an FTP client, restore the following backed up files to their old locations on the *i*.LON 100:

/config/Software/Dataserver/DP_NVL.xml

/config/Software/rni.xml

6. Reboot the *i*.LON 100.
7. If the new version of the software includes a new bootrom, update the bootrom as described in Appendix A of the *i.LON 100 User's Guide: Installing, Connecting, and Configuring the i.LON 100*.