

**Agilent N4971A**  
**Pattern Utility Software**

**User Guide**

## Notices

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## For Assistance and Support

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## Safety Notices

### CAUTION

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### NOTE

A **NOTE** provides important or special information.

# Safety Summary

## General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

## Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically. The Performance Tests give procedures for checking the operation of the instrument. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Agilent Technologies Sales/Service Office.

**WARNING** To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, etc.).

## General

This product is a Safety Class 1 product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside of the instrument, will make the instrument dangerous. Intentional interruption is prohibited.

## Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment per IEC 61010 Second Edition and 664 respectively. It is designed to operate within a temperature range of 10 to 40 °C at a maximum relative humidity of 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C at an altitude of 2000 meters.

This module can be stored or shipped at temperatures between -40°C and +70°C. Protect the module from temperature extremes that may cause condensation within it.

## Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.

## Ground the Instrument

Install the instrument so that the ON / OFF switch is readily identifiable and is easily reached by the operator. The ON / OFF switch is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. Or the detachable power cord can be removed from the electrical supply. Alternately, an externally installed switch or circuit breaker which is readily identifiable and is easily reached by the operator may be used as a disconnecting device.

## Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

## Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

## Symbols on Instruments



Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.



C-Tick Conformity Mark of the Australian ACA for EMC compliance.



The CSA mark is a registered trademark of the CSA International. This instrument complies with Canada: CSA 22.2 No. 61010-1 -04.



Indicates that protective earthing ground is incorporated in the power cord.



This symbol indicates that internal circuits can be damaged by electrostatic discharge (ESD), therefore, avoid applying static discharges to the panel input connectors.

ICES/NMB-001

This mark indicates compliance with the Canadian EMC regulations.

ISM 1-A

This text denotes the instrument is an Industrial Scientific and Medical Group 1 Class A product.



CE Marking to state compliance within the European Community: This product is in conformity with the relevant European Directives: EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.



China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001. This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.



Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Twenty five years is the expected useful life of the product.



The Korean Certification (KC) mark is required for products that are subject to legally compulsory certification.

The KC mark includes the marking's identifier code that has up to 26 digits and follows this format: KCC-VWX-YYY-ZZZZZZZZZZZZ.



This symbol indicates that the instrument requires alternating current (AC) input.

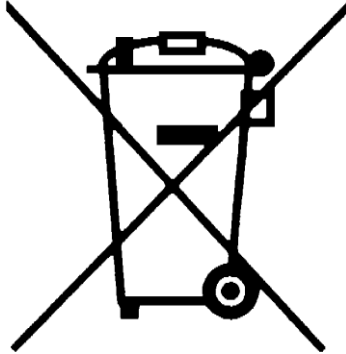


This symbol indicates that the power line switch is in the ON position.



This symbol indicates that the power line switch is in the OFF position.

## Environmental Information



This product complies with the WEEE Directive (2002/96/EC) marketing requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product category: With reference to the equipment types in the WEEE Directive Annexure I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office, or see

[www.agilent.com/environment/product/](http://www.agilent.com/environment/product/) for more information.



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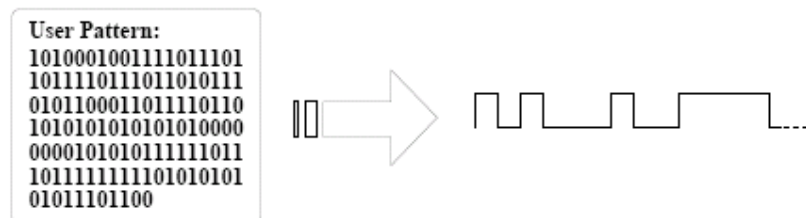




# 1 Introduction

## Introduction

The Agilent N4971A (PPG12500) Pattern Generator 13 Gb/s has 32 Mbits of programmable pattern memory. The N4971A includes many telecom and datacom preloaded RAM patterns, including CRPAT, CJPAT, K28-3, K28-5, K28-7, and PRBS 2N [N = 7, 10, 11, 13, 15, 23]. The N4971A Pattern Utility Software allows users to create and upload their own custom patterns onto the N4971A for playback.



**Figure 1. User pattern to high-speed data**

## Features

- Create custom patterns in binary or hexadecimal format
- Check syntax of custom patterns to ensure file integrity
- Save pattern files to PC disk drive
- Upload custom patterns to a N4971A
- Manage custom patterns on a N4971A





## 2 Installation

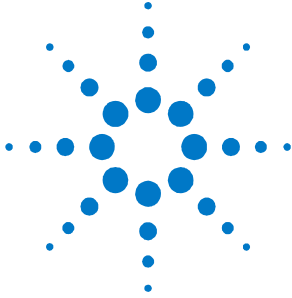
### Installation

1. Download the software from the Agilent Technologies web site.
2. Save the file to a temporary location (for example, C:/temp).
3. Double-click the following file from Windows Explorer:

```
C: /temp/setup.exe
```

4. Follow the on-screen installation instructions.
  5. If upgrading an already installed version of the software, it is recommended to first uninstall the original version, then install the new version.
-





## 3 Creating Patterns – The Editor Window

### 3.1 File Format

A pattern file can be made up of either binary or hexadecimal data, but not both. In binary pattern mode, only characters in the following set are allowed in the pattern data:

- 0-1

In hexadecimal pattern mode, only characters in the following sets are allowed in the pattern data:

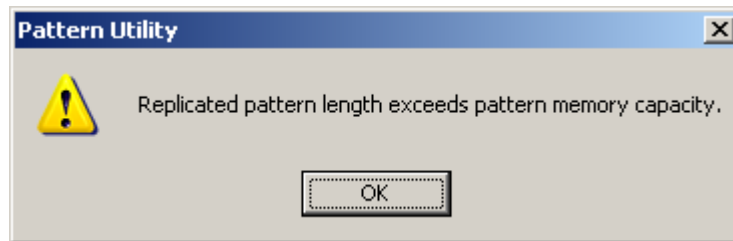
- 0-9
- a-f
- A-F

The pattern file extensions allowed are:

- For files in binary format = <filename>.bpt
- For files in hexadecimal format = <filename>.hpt

The most significant bit on the first line of the pattern file is the first bit generated in the serial pattern. The right most bit of the last line of the pattern file will be the final bit generated in the serial pattern.

The software can play back custom user patterns up to 32 Mbits long (i.e. 225 bits = 33,554,432 bits). The length of the pattern file that is ultimately stored in N4971A memory must be exactly divisible by 128 and be a minimum of 256 bits long. If the pattern length created in the software is not divisible by 128 and at least 256 bits long, then the pattern will be replicated until it meets these conditions. In some cases, the replicated pattern created may not fit in the available amount of N4971A memory. In such a case, an error message will be generated requesting that the pattern be modified to meet the pattern length requirements. Refer to Figure 2.



**Figure 2. Error message if replicated pattern exceeds memory size**

The N4971A requires filenames to be in a DOS 8.3 format, with .usr as the file extension e.g. testpatt.usr. Pattern files stored on a Windows PC with a .hpt or .bpt file extension do not need to conform to the 8.3 format.

---

### 3.2 Create/Edit File

The software user provides the interface to create custom user patterns for the N4971A. Figure 3 shows the text window used for entering pattern data.

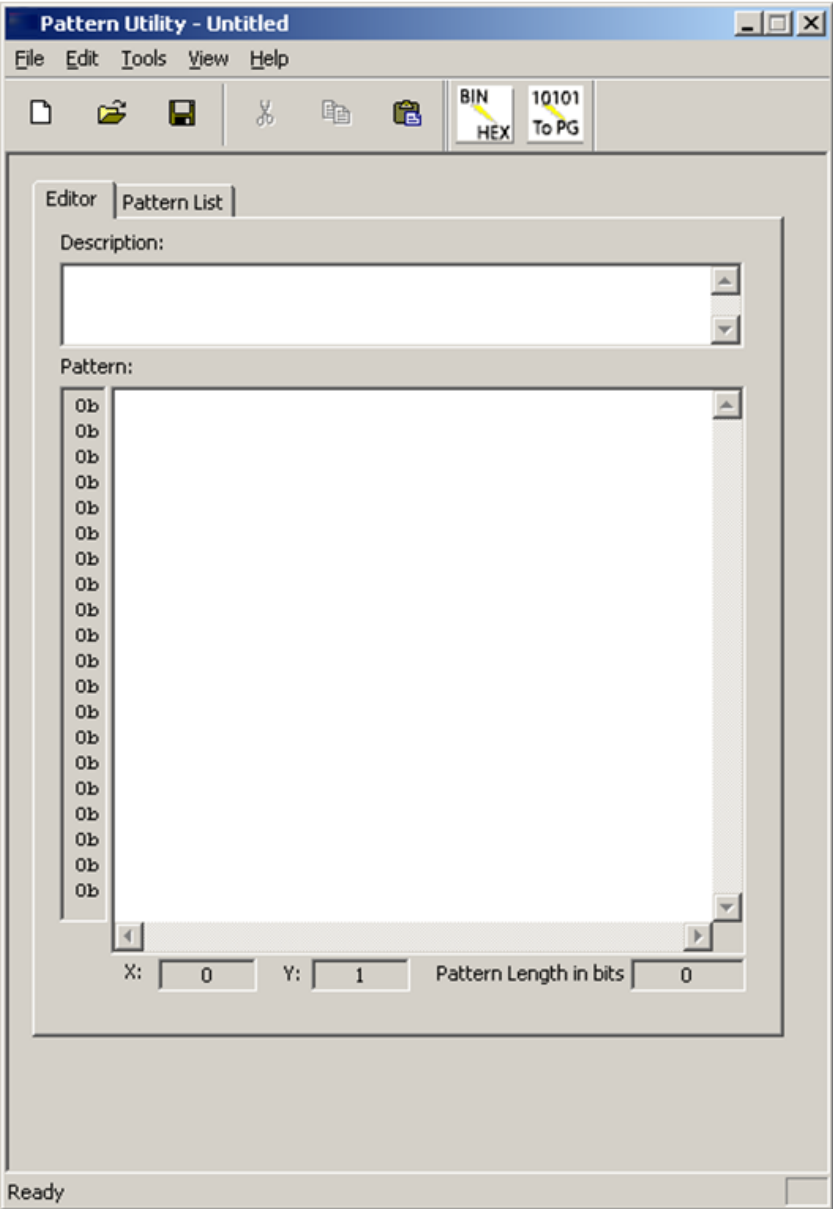
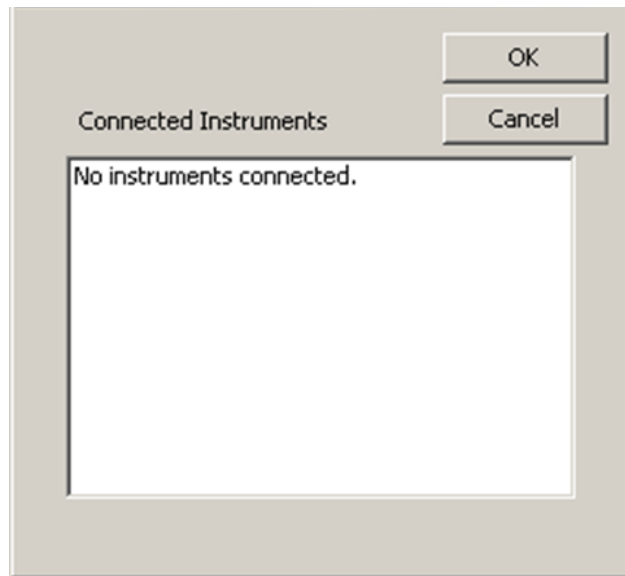


Figure 3. Pattern edit window

When the software is launched, it first scans the host PC's USB interfaces to detect N4971A instruments available for connection to the utility. If an N4971A is not detected then the window in Figure 4 is displayed. Pressing OK allows the user to continue and create/edit patterns without the N4971A being connected. These patterns can be stored to the PC for later uploading to a N4971A.



**Figure 4. No instruments connected**

If one or more N4971A (PPG12500) instruments are detected then a window similar to Figure 5 is displayed. Select the appropriate N4971A from the list available, and click OK to continue.



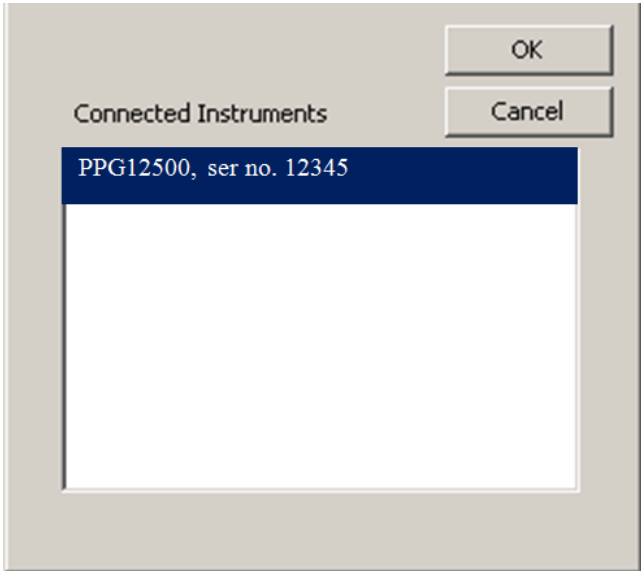


Figure 5. Connected instrument list

The software allows a description of up to 256 characters to be entered in the description window to describe the custom pattern. Comments are not allowed in the pattern edit window. Refer to Figure 6.

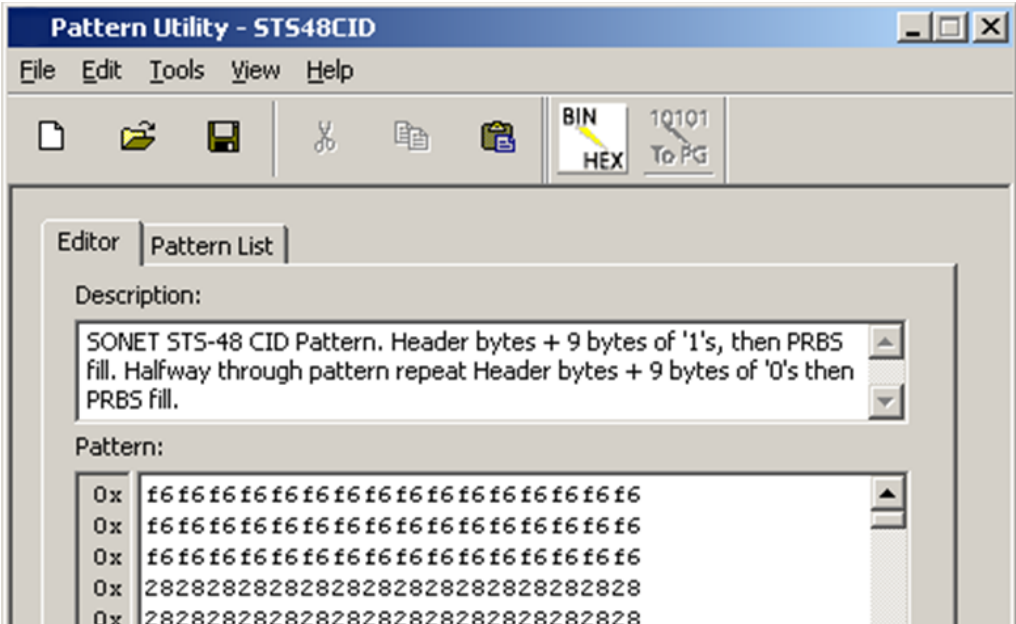

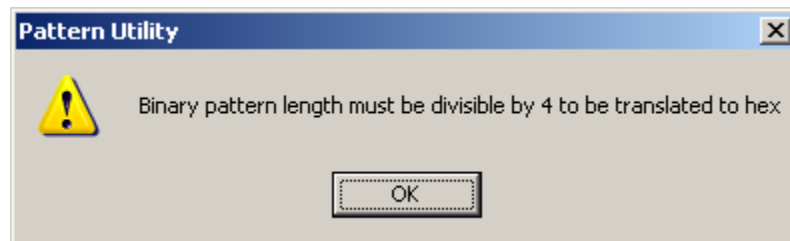


Figure 6. Pattern description field

Each line in the pattern edit window may contain up to 1000 characters. If the software detects more than 1000 characters per line during a file open command or cut and paste operation, the line will be wrapped to the next line in the pattern edit window.

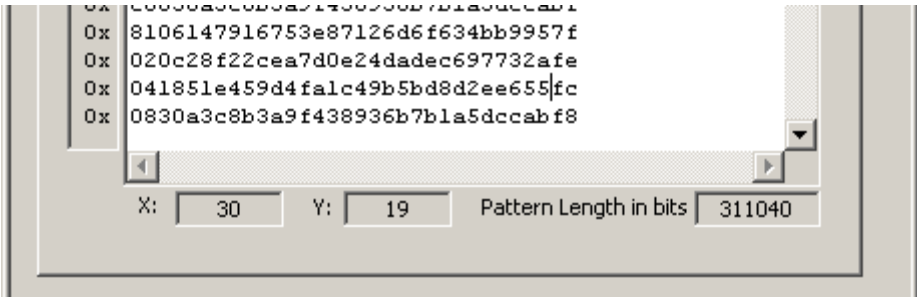
The software allows the numeric base of the pattern data to be toggled between hexadecimal and binary format by clicking on the icon or selecting 'Tools→Bin/Hex' . The default numeric base for the pattern data is binary. Clicking once toggles the numeric base from binary to hexadecimal. Clicking once more toggles back from hexadecimal to binary. This action will also reformat the display in the pattern edit window to be a maximum of 32 bits per line in binary mode, and a maximum of 8 characters per line in hexadecimal mode.

If a binary file does not contain a total number of bits that is divisible by 4 then it cannot be displayed in hexadecimal format and an error message will be generated. Refer to Figure 7.




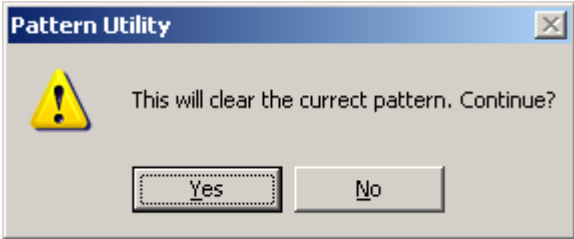
**Figure 7. Binary to hexadecimal conversion error**

Data can be directly typed into the pattern edit window in either binary or hexadecimal format, or data can be pasted into the window from another application. The total pattern length in bits is displayed at the bottom of the pattern edit window, together with the current x-y position of the cursor. Refer to Figure 8.



**Figure 8. Pattern length display**


To clear the current pattern from the editor and start a new pattern, select 'File → New' or click the  icon. A warning message as shown in Figure 9 will be displayed to help prevent accidentally clearing the current pattern. Click Yes to continue or No to cancel the operation.

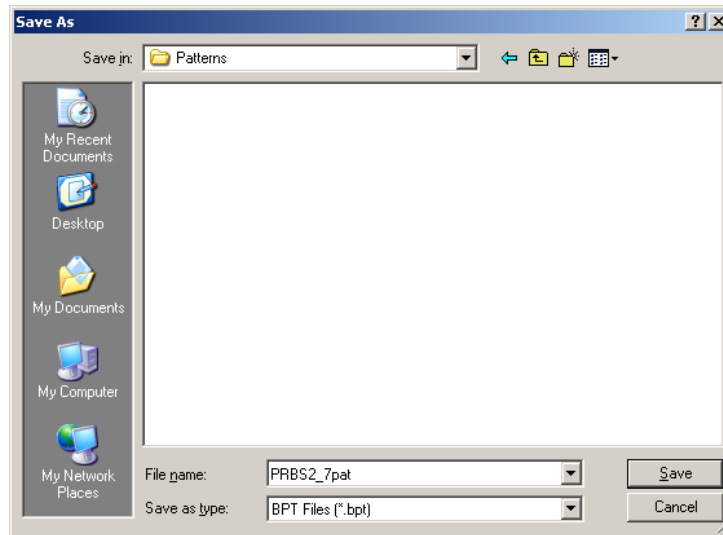


**Figure 9. Clear pattern confirmation**

### 3.3 Save Pattern File


The software can save custom user patterns in either binary or hexadecimal file format and will automatically assign a *.bpt* or *.hpt* file extension based on the current pattern mode.

To save a file select '**File** → **Save**' or '**File** → **Save As**' or click the  icon and navigate to the desired location. Refer to Figure 10.



**Figure 10. File Save window**

## 3.4 Open Pattern File

The software can open custom user patterns previously created by this utility or also patterns created in an external text editor. To open a file select **'File → Open'** or click the  icon. If the current pattern has not been saved then a warning message as shown in Figure 11 will be displayed. Click Yes to save the current pattern first, or No to continue with pattern open command.

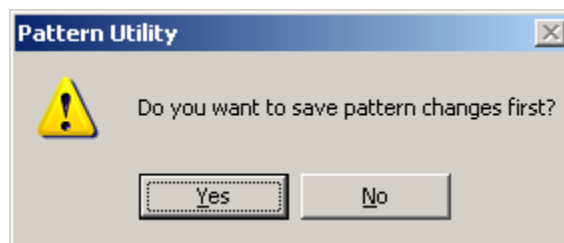

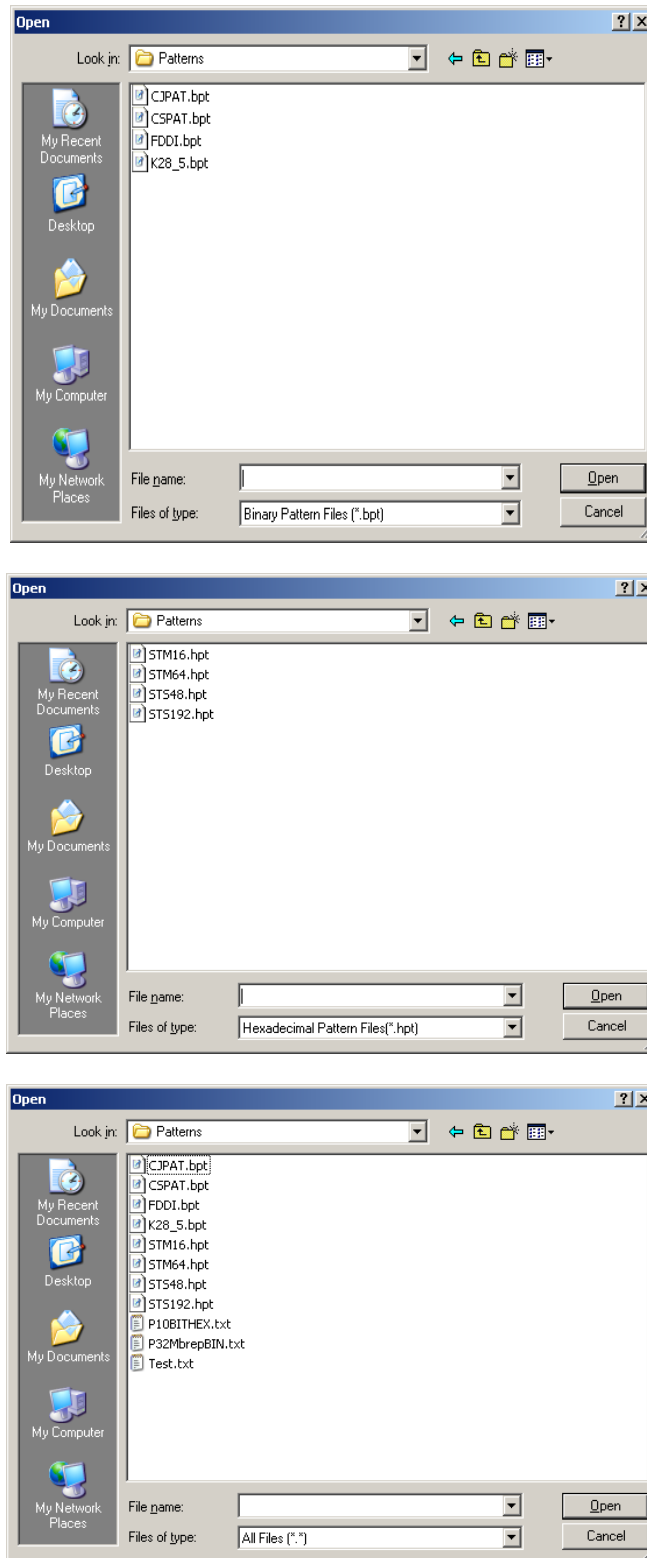


Figure 11. Save pattern warning

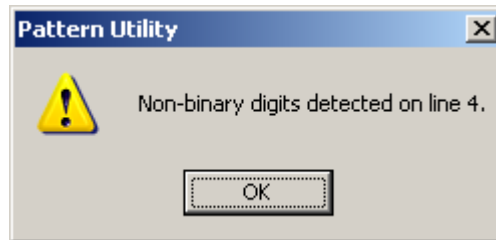
The **'File → Open'** or clicking on the  icon brings a window similar to that shown in Figure 12. Select "Binary Pattern Files (\*.bpt)", "Hexadecimal Patten Files (\*.hpt)", or "All Files (\*.\*)" as appropriate to display just the binary or hexadecimal patterns or all files in the current directory. Select the appropriate pattern to load and click Open.

## Creating Patterns – The Editor Window



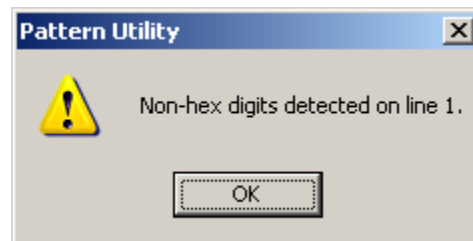
**Figure 12. File open windows**

A binary pattern file (\*.bpt) containing non-binary data will cause an error to occur upon opening. The error message displayed is shown in Figure 13.



**Figure 13. Binary pattern file open error message**

A hexadecimal pattern file (\*.hpt) containing non-hexadecimal data will cause an error to occur upon opening. The error message displayed is shown in Figure 14.




**Figure 14. Hexadecimal pattern file open error message**

The software will detect the numeric base of the pattern based on the file extension, and select the correct mode, binary or hexadecimal for the editor. If a pattern with a different file extension is loaded (e.g. .txt file) then the current edit mode will be retained.

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
## 3.5 Syntax Checking

Pattern structure and syntax must be checked before a pattern is uploaded to the N4971A. There are several ways to perform a syntax check of the created or imported pattern file.

1. A syntax check is performed when a custom user pattern is loaded into the software.
2. **Select 'Tools → Check Syntax'** to check the syntax of the pattern data in the edit window.
3. Selecting **'Tools → Upload Pattern'**, or click the  icon. A syntax check is performed before uploading a pattern to the N4971A.

## 3.6 Uploading Pattern File

Once the pattern data passes the syntax checking it is ready to be uploaded to a N4971A.

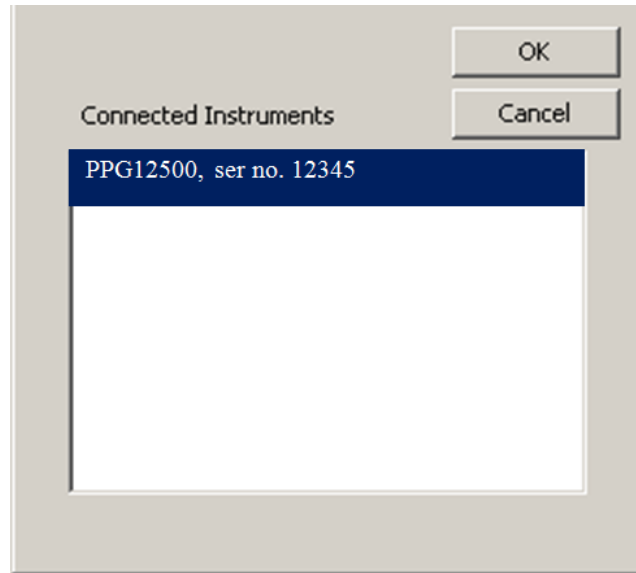
The software scans the host PC's USB interfaces to detect N4971A instruments available for connection to the utility. If an N4971A is not detected then pattern upload is not possible and the upload icon  and **'Tools → Upload Pattern'** items will be grayed out on the utility window. Refer to Figure 15.




**Figure 15. No instruments connected**

If the target N4971A is connected to the PC via the USB interface but not currently connected to the software, then connect the target N4971A by selecting **'Tools → Select Instrument'** and then selecting the N4971A from the list of available instruments in the instrument list window, by choosing the instrument with the serial number that matches the target N4971A. Refer to Figure 16.



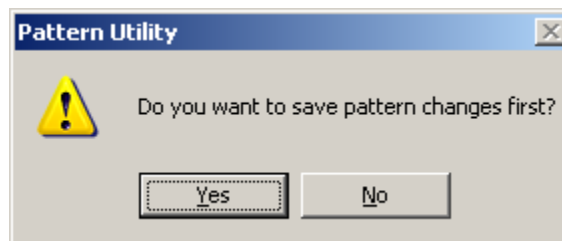


**Figure 16. Instrument list window**

Once the target N4971A is connected to the software, then select **'Tools → Upload Pattern'** or click the  icon to upload the current pattern to the N4971A.

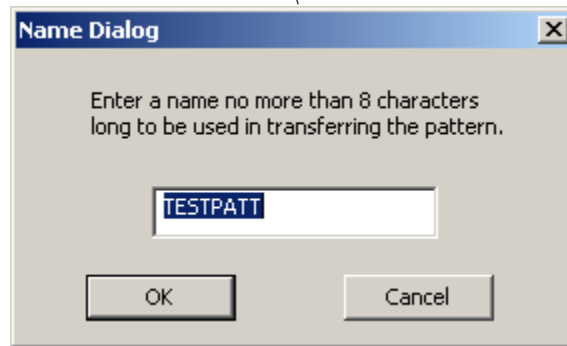
The software will first check to see if there is sufficient space on the target N4971A for the user pattern. If there is insufficient space an error message will be displayed and the upload cancelled.

If the current pattern has not been saved to the PC hard disk, the user will be prompted to save the file first before uploading to the N4971A. Refer to Figure 17.



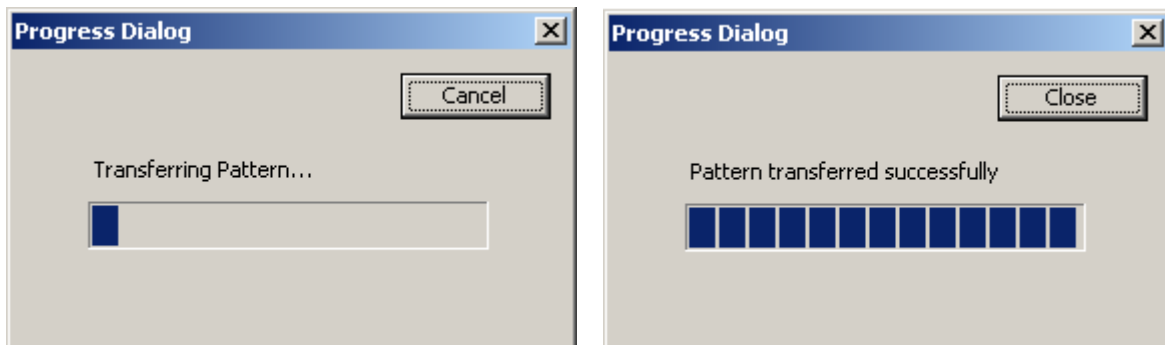
**Figure 17. Pattern save warning**

If the current pattern file has a filename longer than 8 characters, a dialog similar to Figure 18 will be displayed. The N4971A requires filenames in a DOS 8.3 format, e.g. TESTPATT.USR. The 3 character file extension need not be entered as all user patterns uploaded to the N4971A are assigned .usr file extension.



**Figure 18. Pattern name dialog window**

During the pattern upload, a progress bar will be displayed to track the time until completion. If the pattern file is uploaded successfully, a message will be displayed. Refer to Figure 19. Most patterns will load within a short time, however a pattern utilizing the entire 32 Mbit memory can take approx 30 minutes to transfer to the N4971A.



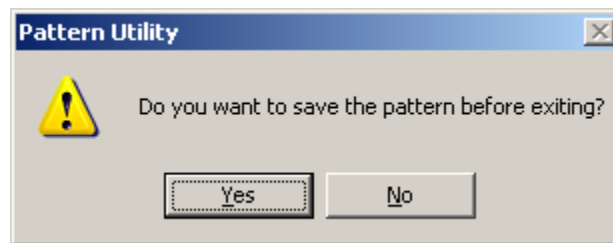
**Figure 19. Pattern upload in progress window**

Once a pattern has been successfully uploaded to the N4971A, use the Pattern Select menu on the N4971A to select the uploaded pattern as the active pattern on the N4971A.

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## 3.7 Exit Application

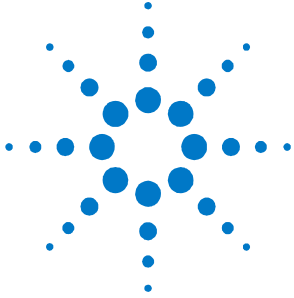
To exit the software, select '**File** → **Exit**'. If the current pattern has not been saved to the PC hard disk, the user will be prompted to save the file first before exiting the software. Refer to Figure 20.



**Figure 20. Pattern save warning on exit**

---

**Creating Patterns –  
The Editor Window**



## 4 Managing Patterns – The Pattern List Window

### 4.1 Pattern List

When the target N4971A is selected from the instrument list, then a list of all the patterns available on the target N4971A is displayed in the Pattern List window. Refer to Figure 21.

Patterns in this list with no 3-character file extension (e.g. PRBS2^31) are hardware generated patterns within the N4971A. Patterns in this list with a *.fpt* file extension (e.g. PN13\_1-8.FPT) are factory loaded RAM patterns within the N4971A. These patterns are listed for information purposes only.

Patterns in this list with a *.usr* file extension are user patterns that have been loaded into the N4971A using the software.

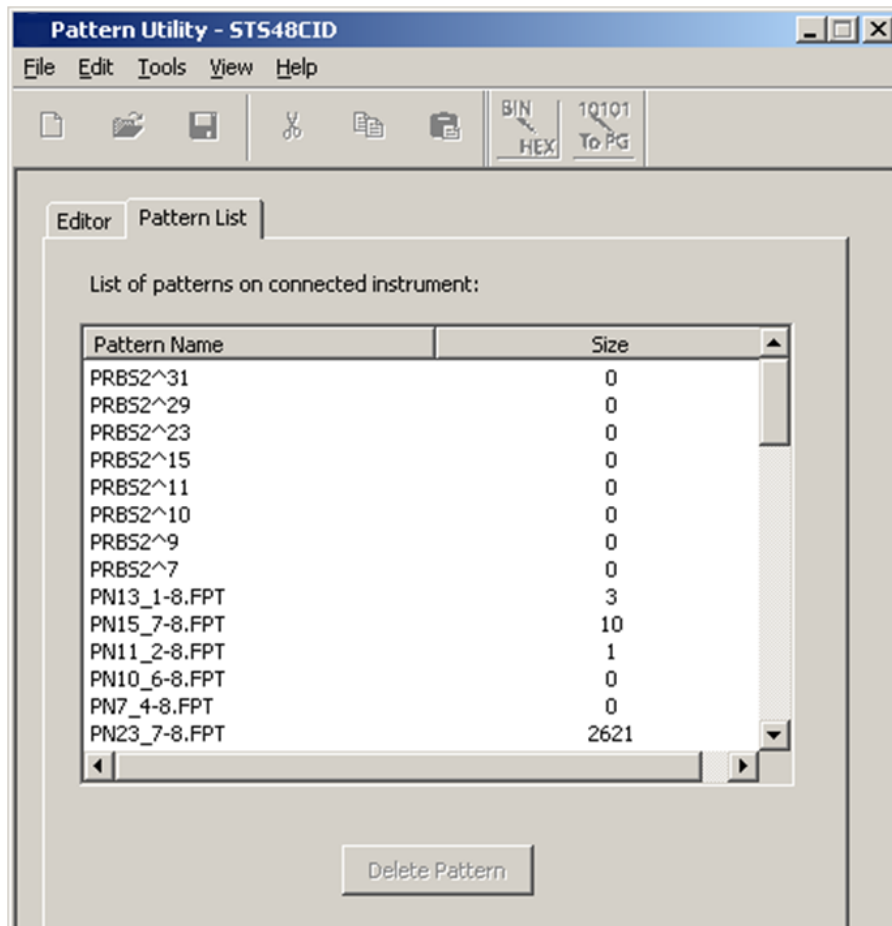
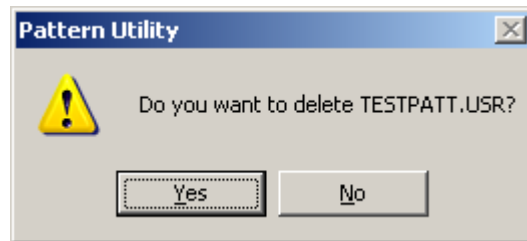


Figure 21. Pattern list window

## 4.2 Delete Pattern

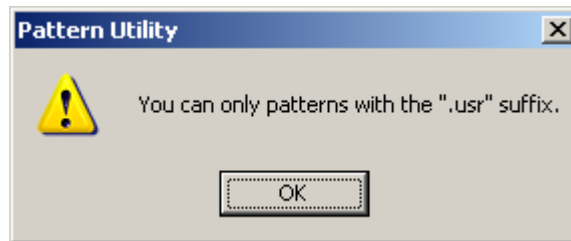
Only *.usr* user patterns can be deleted from the target N4971A. To delete a user pattern, select it from the list and click on the **Delete Pattern** button.

A confirmation message as shown in Figure 22 will be displayed. Click Yes to continue with the pattern delete or click No to cancel the operation.



**Figure 22. Delete pattern confirmation**

Attempts to delete factory patterns will generate an error message as shown in Figure 23.



**Figure 23. Pattern delete error message**

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