



**Nematron Software 5.50**

Paragon

OpenControl

HyperKERNEL

# Release Notes

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# 1. NEMATRON SOFTWARE 5.50

*Includes OpenControl, Paragon and HyperKERNEL on one CD-ROM*

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## 1.1 Introducing Version 5.50

### *New Ladder Logic Capability...*

The centerpiece of the Nematron Software version 5.50 is the enhancement of OpenControl with Ladder Logic capability. A new, fully integrated ladder logic editor and runtime debugger allows OpenControl users to implement control applications in the ladder language, in addition to flowcharts and the data flow diagrams of HKCS. While flowcharting generally makes application development and maintenance easier, there may be cases in which ladder is a better choice. Ladder may also ease the transition to PC-based control for some customers more comfortable working in that language. In either case, the addition of ladder logic allows you, the customer, to make the choice of application development language.

### *PCI BBSRAM support...*

In addition to ladder, version 5.50 includes software support for a new PCI version of the Nematron BBSRAM (part number 110A0460), providing retentive memory capability to the ICCE series of Nematron process control computers as well as newer 'white boxes' in which ISA slots are no longer provided.

### *And more...*

Version 5.50 includes other enhancements as well. HyperKERNEL has been updated to run in conjunction with both Windows NT Service Pack 6A and Windows 2000. Several new I/O drivers have been added to OpenControl and installation of OpenControl drivers has been made easier by removing password control from the driver installation process. Any OpenControl project, not just those compiled in 'demo mode', will now run for thirty minutes in the absence of the dongle or hardware protection key.

### *Continued attention to quality.*

As always, Nematron pays careful attention to reported defects (problems, bugs, etc). We document reported problems, isolate

responsible defects, then develop and field test corrections, and finally package clean corrections with each new release. The 5.50 release continues this commitment to quality. Corrections and minor enhancements made as part of the 5.50 release are summarized in a later section.

## 2. Installation

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### 2.1 General Installation Notes

The Nematron Software 5.50 CD contains installations for OpenControl, Paragon and HyperKERNEL for Windows NT, Windows 2000 and Windows 95 (Paragon only).

Installation procedures are largely unchanged since 5.40. Upgrading from 5.40 is straightforward – simply uninstall the 5.40 release, and install the 5.50 release. Note that HyperKERNEL must be uninstalled; it is not removed by the OpenControl uninstall process, even though HyperKERNEL is installed as part of the OpenControl installation. (While the OpenControl install will detect and upgrade HyperKERNEL when necessary should you not uninstall it first, uninstalling HyperKERNEL is recommended.) Please review the entire Installation section before starting to use the 5.50 CD.

**IMPORTANT NOTE:** Customers with versions of Paragon older than 5.30 must read the release notes for 5.30 before updating to 5.50. The 5.30 release notes contain important procedures, which must be followed before moving your application to 5.50. They are located on the 5.50 CD in /Doc/Para\_doc/rnote530.pdf.

#### 2.1.1 New with this Release

Installation of OpenControl drivers has been modified with this release; passwords are no longer required. This has been done primarily to support Nematron's new pricing structure, but has the added benefit of making the installation of OpenControl drivers easier. Optional software other than drivers is still password protected and required passwords should have been included with the shipment. If passwords are missing, make sure the order included the optional part and then call Customer Care at Nematron headquarters (1-800-Nematron).

In conjunction with the removal of password control on driver installation, installation of the OpenControl Professional Edition no longer installs drivers. Professional Edition customers can now install only the drivers needed for application development.

To support the new PCI SRAM card, a new Nematron driver is now included in the OpenControl installation process. The driver automatically detects and configures the SRAM card (when present), initially when the HyperKERNEL configuration wizard is executed (as part of the installation process), and subsequently at each power-up boot. A word of caution is needed here for those customers upgrading and using the PCI SRAM card; the self-configuring card may take the IRQ you have formerly assigned as the HyperKERNEL signaling interrupt. If this occurs and you do not choose another IRQ for the signaling interrupt, HyperKERNEL will not start. You will see the message 'Could not start HyperKERNEL driver' in the Console tab of the OCM and a popup will appear notifying you the system cannot start. As a precaution, when you configure HyperKERNEL as part of the OpenControl installation process, you should check the Windows NT IRQ assignments (use the Details button on the System Settings page, then select the Resources tab on the Windows NT Diagnostics dialog). When the IRQ you have previously used as the HyperKERNEL signaling interrupt is not available, select a free IRQ and assign it as the signaling interrupt.

### **2.1.2 Removed from this Release**

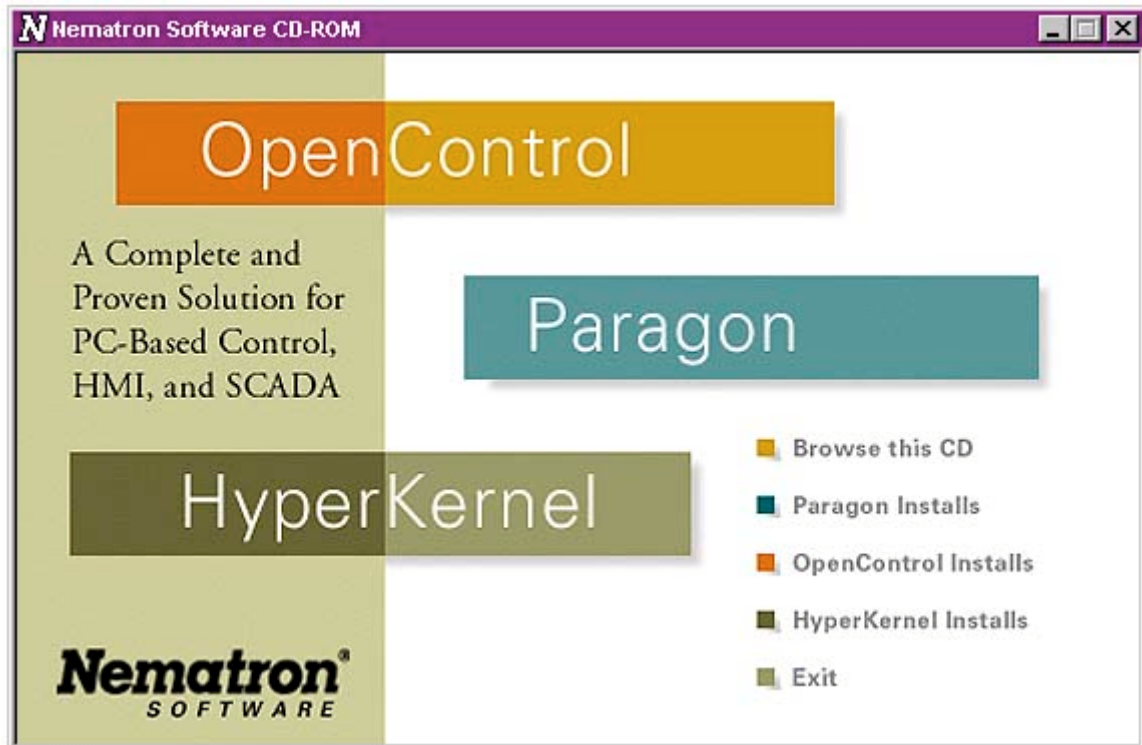
Due to lack of demand, an OS/2 version of Paragon is not included with this Nematron Software release and will not be included with future releases.

The Paragon PDK drivers, developed by third parties with the PIO Development Kit, are not included on this Nematron Software CD. The drivers are available for this release and can be obtained by contacting Software Support. Be advised these drivers are made available 'as is' and are not covered by any warranty. For more information on PDK drivers refer to the support web site: <http://support.nematron.com>.

## 2.2 Starting the Installation Utilities

### 2.2.1 Using Autorun

The Nematron Software 5.50 CD will start automatically when the CD ROM drawer is closed and the Nematron Autorun Screen should appear:



Installation options for installing Paragon, OpenControl and HyperKERNEL are selected from the lower right part of the screen. If the Autorun Screen does not appear, browse the CD and run “autorun.exe” manually.

### 2.2.2 Demo Modes

For demonstration or evaluation purposes, select the Paragon Test Drive option and OpenControl Standard Edition. This installs a fully featured version of Paragon with five hours allowed per session. OpenControl does not have a ‘test drive’ option. When run without a protection key, OpenControl defaults to demo mode, allowing 30 minutes of runtime per run. Note that HyperKERNEL is required for OpenControl operation and will also be installed as part of the OpenControl install procedure – be

advised a separate uninstall will be required to subsequently remove HyperKERNEL.

**IMPORTANT:** The applications built with the Paragon Test Drive can not be used with a purchased product or converted for use with standard product.

### 2.2.3 Paragon SI Packages

When installing Paragon for use with a Systems Integrator Key, go to the \Paragon\Tnt directory and run the LOADWIN file from the command line followed by the parameter SI. This will install the correct product configuration (.TEC) files for use with the SI keys. A product configuration diskette is not needed.

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## 2.3 New Installations

The Paragon Getting Started Manual and OpenControl User Manual (both available in PDF format on the Nematron Software CD) include detailed installation instructions for Paragon and OpenControl. The following sections give an overview for multiple product installations and 5.50 specific changes and recommendations.

### 2.3.1 Paragon

- Insert the Nematron Software CD in your PC's CD-ROM drive. From the Autorun Menu, click "Paragon Installs" and select any desired options, then reboot.
- If you need Paragon PDK drivers, see the section below.

### 2.3.2 Paragon PDK Drivers

- Obtain the driver from Software Support
- Copy the driver to the "paratnt\pio" directory. Note this assumes a default installation directory – adjust this accordingly when Paragon is not installed in the default installation directory.
- Open a command prompt window and move to the PIO subdirectory.
- Enter ".\tools\classedit manual" from the PIO subdirectory and select the desired drivers.
- Enable the drivers from the Application Manager menu bar. Select Settings, then Enablers..., then enable PIO Dev Kit – Driver 1 for one driver, Driver 1 and Driver 2 for two drivers and so on.

### 2.3.3 OpenControl

- Insert the Nematron Software CD in your PC's CD-ROM drive. From the Autorun Menu click "OpenControl Installs". Select Standard Edition or Professional Edition (requires a password). This will install first OpenControl and then HyperKERNEL.

When the HyperKERNEL installation completes, a configuration wizard will be activated to configure HyperKERNEL. Pay particular attention to the selection of the interrupt to be used by HyperKERNEL. Use the Windows NT Diagnostics, Resources Tab to locate an unused interrupt.

TIP: Normally it is best to select an interrupt in the range of 10-15.

- After HyperKERNEL is installed and configured, you will be instructed to reboot.
- After the reboot is complete, re-insert the Nematron Software CD and install any required OpenControl drivers.
- Once your system has restarted, access OpenControl from the Windows Start menu.

### 2.3.4 HyperKERNEL

- Insert the Nematron Software CD in your PC's CD-ROM drive. From the Autorun Menu, click "HyperKERNEL Installs" and select any desired options, then reboot.

NOTE: Installing HyperKERNEL is unnecessary if OpenControl is installed; the OpenControl installation automatically installs HyperKERNEL

### 2.3.5 Integrated Paragon And OpenControl Applications

- Insert the Nematron Software CD in your PC's CD-ROM drive. From the Autorun Menu, click "Paragon Installs" and select desired options. Choose to "reboot your system later".
- On the Autorun menu, click "OpenControl Installs". Select Standard Edition or Professional Edition (requires a password). This will install first OpenControl and then HyperKERNEL.

When the HyperKERNEL installation completes, a configuration wizard will be activated to configure HyperKERNEL. Pay particular attention to the selection of the interrupt to be used by HyperKERNEL. Use the Windows NT Diagnostics, Environment Tab to locate an unused interrupt.

TIP: Normally it is best to select an interrupt in the range of 10-15.

- After HyperKERNEL is installed and configured, you will be instructed to reboot.

- After the reboot is complete, re-insert the Nematron Software CD and install any required OpenControl drivers.
- Once your system has restarted, access Paragon from the Windows Start menu.

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## 2.4 Updating Existing Installations

Existing installations of Nematron Software Release 5.40, Paragon 5.32, Paragon 5.30, OpenControl 4.3, or HyperKERNEL 4.3 can easily upgrade to 5.50. Please be sure to read these release notes carefully for areas that may need attention during the upgrade. In general once an upgrade occurs, returning to an earlier release is possible **ONLY** when application files for the earlier release have been saved. When this is even a remote possibility, be sure backup versions of application files are saved.

**IMPORTANT NOTE:** Customers with versions of Paragon older than 5.30 must read the release notes for 5.30 before updating to 5.50. The 5.30 release notes contain important procedures, which must be followed before moving your application to 5.50. They are located on the Nematron Software CD in \DOC\PARA\_DOC\Rnotes530.PDF.

### 2.4.1 Paragon

- Backup existing applications and put them in a safe place.
- Using "Windows Start Button | Control Panel | Add/Remove Programs", uninstall Paragon.
- Use the previous procedure for a new installation of Paragon.

### 2.4.2 OpenControl

- Backup existing applications and store them in a safe place.
- Using "Windows Start Button | Control Panel | Add/Remove Programs", uninstall OpenControl. (NOTE: When you uninstall OpenControl 5.40 you must also uninstall HyperKERNEL.)
- Reboot (automatically triggered by the HyperKERNEL uninstall).
- Use the previous procedure for a new installation of OpenControl.

### 2.4.3 HyperKERNEL

- Backup existing applications and store them in a safe place.
- Using "Windows Start Button | Control Panel | Add/Remove Programs", uninstall HyperKERNEL
- Reboot (automatically triggered by the HyperKERNEL uninstall).
- Use the previous procedure for a new installation of HyperKERNEL.

## 2.4.4 Integrated Paragon and OpenControl Applications

- Backup existing applications and put them in a safe place.
- Using "Windows Start Button | Control Panel | Add/Remove Programs", uninstall Paragon.
- Uninstall OpenControl. (NOTE: When you uninstall OpenControl 5.40 you must also uninstall HyperKERNEL.)
- Reboot (automatically triggered by the HyperKERNEL uninstall).
- Use the procedure above for a new installation of both Paragon and OpenControl.

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## 2.5 Preserving the Sentinel SuperPRO driver

When OpenControl is uninstalled using the Add/Remove Programs selection in the Windows NT Control Panel, the Sentinel SuperPRO driver is also removed. Both OpenControl and Paragon use this driver to access the hardware protection key. When Paragon is not uninstalled following the OpenControl uninstall and OpenControl is not reinstalled, it will be necessary to reinstall the Sentinel driver. This is accomplished using the setupx86.exe install utility found on the Nematron Software CD in the \Paragon\Tnt\Win\Win\_nt directory. Run the utility to reinstall the driver.

## 3. Y2K Notes

Nematron Software Y2K issues were largely associated with replaying historical data and were all corrected before 1 January 2000 for the 5.40 release. For the most recent information on Y2K related issues and disclosure statements, please visit our web site (<http://support.nematron.com>).

# 4. Nematron Software 5.50 - Details

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## 4.1 Introduction

Nematron Software 5.50 is another positive step forward for PC-based control, with the addition of Ladder Logic as a language to OpenControl. A fully integrated editor and debugger now come as a standard part of the product, replacing a beta version of the ladder editor that was available in the previous 5.40 release. The following pages contain brief descriptions of this and other changes to OpenControl, HyperKERNEL and Paragon.

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## 4.2 Documentation

Nematron Software 5.50 introduces a new approach to OpenControl driver documentation. A new manual, titled “OpenControl Drivers User Guide” and containing documentation for all OpenControl drivers, replaces the individual manuals previously provided for each driver.

Drivers included in the manual are Honeywell SDS, Allen-Bradley Remote I/O, Interbus-S, Seriplex, Modicon RIO, DeviceNet, Genius and Softing ICT Profibus. There are also chapters explaining driver diagnostic functionality and the use of logical devices to map data points into OpenControl. Drivers that are new with this release are not yet included in the manual but documentation is available in the help file installed with the driver.

A user manual describing the Ladder Logic editor and runtime debugger has been included with this release.

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## 4.3 OpenControl Enhancements in 5.50

### 4.3.1 Ladder Logic

A new ladder logic editor and debugger is the focal point for the 5.50 release. This new capability adds the ladder logic language to OpenControl and integrates its runtime operation with the existing, field-proven execution engine utilized by OpenControl flowcharts. A full description of this new capability can be found at the end of these release notes.

There are a few known problems with this initial release of Ladder Logic:

- Problems with single-stepping through ladder execution using the ladder debugger have been encountered, particularly when stepping through a return from a subdiagram. By using the Enter Subdiagram and Exit Subdiagram tools and setting breakpoints both within the subdiagram and after the subdiagram call, problems can be worked around.

Corrections to these problems will be made available when the defects are corrected.

### 4.3.2 PCI SRAM Support

A PCI version of the BBSRAM card (part number 110A0460) developed primarily for Nematron's ICCe series of industrial computers but usable in any computer with a spare PCI slot, is supported in OpenControl 5.50. Support for the existing ISA version of the card is retained for compatibility with existing installations. This new card offers double the RAM (256 Kb v. 128 Kb) and faster read/write times. Applications making use of retentive memory should notice significant improvement in application cycle times with the PCI card as compared to the ISA card. No change in existing applications using retentive memory is necessary.

Configuration of retentive memory via the HyperKERNEL configuration dialogs has undergone minor change to support the PCI SRAM card. When the PCI card is installed and you enable Retentive Memory in the Memory Board Settings page of the configuration wizard, you are no longer required (or allowed) to enter the SRAM and I/O base addresses. These values for the PCI card are configured automatically, and text to that effect appears in the dialog when use of Retentive Memory is enabled. Additionally, when viewing the HyperKERNEL configuration, a new entry under Retentive Memory has been added to identify the enabled card type, ISA or PCI.

### 4.3.3 Keyless Operation

Prior versions of OpenControl allowed thirty minutes of runtime operation for projects compiled in 'demo mode' (without the hardware protection key). Non-demo projects (those compiled with the hardware protection key) would be allowed to start only when the protection key was present. Version 5.50 allows non-demo projects the same thirty minutes of runtime afforded to demo projects.

### 4.3.4 New Drivers

#### 4.3.4.1 *Siemens PCI Profibus*

A profibus driver for the Siemens CP5613/14 card has been included with this release. The driver handles discrete and complex discrete data types and has full diagnostic status support. The driver also allows the CP5613/14 to act as a slave device on the network.

#### 4.3.4.2 *Opto-22 Optomux*

The Opto-22 Optomux driver includes support for digital and analog devices. Analog support includes standard output modules, standard input modules, and various temperature sensor and thermocouple modules. Diagnostic support is included.

NOTE: Due to problems with the HyperKERNEL serial API when running under Windows 2000, the OptoMux driver will not function on a Windows 2000 platform.

#### 4.3.4.3 *Opto-22 Mystic-200*

The Opto-22 Mystic-200 driver includes support for digital, digital counter and analog devices. Digital Counter modules offer choices for Counter, Frequency or Quadrature. For Analog modules, various choices of input and output are available in the G4AD and G4DA groups. Diagnostic support is included.

NOTE: Due to problems with the HyperKERNEL serial API when running under Windows 2000, the Mystic-200 driver will not function on a Windows 2000 platform.

#### 4.3.4.4 *DataLogic EMS HS900*

The DataLogic EMS HS900 driver includes support for reading and writing RF tags using the HS900 PC-Bus Read/Write Controller. The EMS HS900 is an ISA expansion board that serves as the interface

between a PC and up to four HS-Series Antennas. The driver is capable of writing to, or reading from, various RF tag types in the HS200 series.

## **4.3.5 Enhanced Drivers**

### **4.3.5.1 SST DeviceNet**

The SST DeviceNet driver for the SST 5136-DN interface card has been enhanced to allow operation as a slave device. Each card in the system can act as either master or slave on the network. The driver startup time-out has also been lengthened to avoid intermittent startup failures for some devices. Additionally, an incomplete network reset generated through diagnostic control has been corrected.

### **4.3.5.2 ICT Profibus**

The Softing/ICT Profibus driver has been enhanced to support the PCI version of the Softing Profiboard in addition to the ISA version. Additionally, other enhancements to improve the diagnostic handling and message/data throughput have been made. The driver is now more stable and robust, handling very adverse network conditions without failing.

### **4.3.5.3 Seriplex**

A build error that was causing the Seriplex driver to fail on device initialization has been corrected. Additionally the installation of this driver was modified to place the configurator in the correct folder

### **4.3.5.4 Genius**

The Genius driver was corrected to start properly with off-line blocks and to clear inputs when a fault occurs.

### **4.3.5.5 ABRIO**

An installation problem, resulting in some missing Allen-Bradley RIO loader files, has been corrected. Additionally, BT devices can now be configured and scanned properly. Addressing errors with the previous version prohibited use of more than one BT device.

### **4.3.5.6 Interbus-S**

Message CR numbering and byte alignment has been corrected.

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## 4.4 Paragon Enhancements in 5.50

### 4.4.1 OPC Support

Paragon's OPC Server has become more robust and more efficient due to feedback from deployment and field tests of the server with a major automotive manufacturer. Consequently, you can be sure your OPC clients should have no problems accessing Paragon, OpenControl or HyperKERNEL data.

### 4.4.2 NT Service Desktop Switching

Modifications have been made to the NT Service capability of Paragon to make desktop switching easier. The switcher screen may now be operated solely with the keyboard on systems with no mouse available. Whenever the switcher window receives the focus, the cursor will move to the list of Desktops, allowing a desktop to be selected with the up and down arrow keys. Press F5 or Enter to switch to the selected Desktop. Also, F1 may be pressed to display Help, and F3 to display the switcher's About Box.

### 4.4.3 Modicon RTU Data Format

The Modicon RTU driver has been enhanced to allow the configuration of word ordering when dealing with double word (long, unsigned long and float) data types. Standard Modbus ordering in which the least significant word is assumed to be in the first of a two register pair is preserved as the default when upgrading prior configurations of the Modicon RTU driver.

Configuration of word ordering is done on a per-point basis; each multi-word data type will include the option 'StdWordOrder'. Setting this option to Y enables standard Modbus ordering for the multi-word data types. Setting this option to N enables the reverse, in which the most significant word is assumed to be in the first register of the two register pair.

### 4.4.4 BDK Alarming

Support for digital and fail alarms has been added to the Block Developer's Kit. Setting these alarms using the BDK support function setAlarm() will now generate alarm messages in the same fashion as the high and low alarming supported in prior releases. Additionally, the alarm status is for both digital (AlrmStat) and fail (FailAlrmStat) alarms are now connectable outputs from User blocks.

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## 4.5 HyperKERNEL Enhancements in 5.50

### 4.5.1 Windows 2000 Support

Version 5.50 now supports HyperKERNEL execution on systems with the Windows 2000 operating system. Service pack 1 for Windows 2000 is required.

There are several known limitations regarding HyperKERNEL execution on Windows 2000:

- During HyperKERNEL execution, an IDE CD-ROM drive on the secondary IDE controller, may be mistakenly reported 'removed' by Windows 2000 Plug-and-play support. Once this condition occurs, the CD-ROM drive is inoperative until Windows 2000 is rebooted. Fortunately, reboot is sufficient to restore the CD-ROM drive: there is no complex 'discovery' process or driver install process to restore access to the drive.
- On some systems, Nematron has observed problems with the HyperKERNEL Serial API transmitting data. It may be possible to correct this problem by modifying the serial port communication parameters.
- Due to the serial API problems when running HyperKERNEL on Windows 2000, the OptoMux and Mystic-200 drivers will not function properly.
- On computers with the Advanced Power Management (ACPI) HAL, an interrupt that appears to be free for use by HyperKERNEL may actually cause the system to blue screen at HK startup. This has been observed with IRQ5 and IRQ11 on various PC hardware platforms. If this problem is encountered, try a different 'free' interrupt.

Nematron will continue to investigate these issues and provide corrections or workarounds, as they become available.

### 4.5.2 NT Service Pack Support

Version 5.50 includes support for Microsoft Windows NT service packs 4, 5 and 6A. Service pack 6, withdrawn by Microsoft after numerous reported problems and no longer available, is not supported in this release.

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## 4.6 Undocumented Enhancements from Prior Releases

### 4.6.1 ICCFrame Actions

Values for the "Set Value" action can now be specified during runtime. Earlier releases required the value to be specified in advance when the

action was defined. Now, using a question mark (“?”) as the value for the “Set Value” action will allow operators to specify the value when the action executes. Additionally, any text that appears after the question mark will appear in the prompt for the operator. For example, when the value for “Set Value” action is configured as:

?Please enter flow rate

a dialog box will pop up when the action executes, requesting the operator to enter a value. A default prompt will be used when no text is provided following the question mark.

A "Login" action has also been added. When this action executes a dialog box will pop up prompting the operator to login as a different Paragon user. The operator must then type in a valid user name and password.

## 4.6.2 OI Momentary Function Keys

The function key ‘press’ event has been split into key ‘press’ and key ‘release’ events. This allows specification of separate actions so that a condition can be held as long as the key is held.

## 4.6.3 OI Function Key Broadcasting

Function key events (key ‘pressed’ and ‘released’) are now optionally broadcast to other open OI screens when sensed by the currently active OI screen. This allows all screens in a Paragon multi-window user interface to receive and process the key actions, not just the screen with the focus. When broadcasting is enabled on all displays, all Window Action function key events are passed to all OI screens.

Broadcasting is enabled with a checkbox on the OI Window Properties configuration screen in the OI builder. Note that this applies only to OI Window Actions. Function key events on OI objects do not participate in broadcasts.

**CAUTION:** Keys used by Windows (95, NT, or 2000) should not be used as Window Actions. For example:

Alt-F4 will close the current display

Alt-F6 will switch between windows

Ctrl-Esc will display the Start menu

Alt-Esc will cycle through programs in startup order

Alt-Space will display a program’s System menu

Attempting to use these or other standard Windows function keys for Paragon OI window actions will in general not be possible and should be avoided.

## 4.6.4 OPC Connectivity

OPC connectivity made its premiere in the previous Nematron Software release. As of that release, all Nematron Software servers act as OPC servers, making Nematron Software data available to OPC clients. This capability is fully described in the last chapter of this document.

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## 4.7 Using Microsoft Visual Studio 6.0

This section provides information that may prove helpful when creating custom software parts with the Nematron Software development kits.

### 4.7.1 HyperKERNEL Development

HyperKERNEL application development under Visual C++ 6.0 is essentially the same as under VC++ 5.0. When building applications that will run within HyperKERNEL, it is important to make sure the linker switch `"/fixed:no"` is appended to the Link settings of your project. Also remember to set the entry point to `"hkMain"`, and to use only `"Release"` builds. All of this is noted in the HyperKERNEL Reference Manual (regarding VC++ 5.0).

If you wish to open a project created in Visual C++ 4.2, with version 5.0 or 6.0 (including our samples), you will notice that the `"Open Workspace"` dialog does not immediately show the file to be opened. This is because version 5.0 and 6.0 are looking for Workspace files (`.dsw` or `.mdp` extension) which were not used by VC++ 4.2. To find the older project, use the `"Files of type"` combo box to choose the Makefiles (`.mak` extension) selection. When you open the Makefile, Visual Studio will warn you that it will convert the old project to the new format, and ask you to confirm the operation.

If you install HyperKERNEL to its default location, you will need to change your project settings for the new location of include and library files. They will be found in

`"C:\Program Files\NemaSoft\HyperKERNEL\Inc"`

and `"C:\Program Files\NemaSoft\HyperKERNEL\Lib"`

respectively. If you have created private copies of the include and library files for your projects, be sure to update them with the current versions.

There are no special considerations for the building of HyperSHARE applications with Visual C++ 6.0.

### 4.7.2 OpenControl Development Kits

For any executables that will operate within HyperKERNEL (scan programs, drivers, etc.) all the notes in the previous section apply. For executables that operate on the Windows NT side and use the OpenControl API, there are no known issues with VC++ 6.0. If you are

building a Configurator (a DLL that operates within the OpenControl Framework) please contact Nematron for the latest information.

### 4.7.3 Paragon Development Kits

There are no special considerations for using the Block Development Kit, User Draw Kit, or Client Objects with VC++ 6.0.

For the PIO Development Kit, the sample command files, LINKPDK.CMD and LINKMBUS.CMD, require modification. A section of each command file sets up the PATH, LIB and INCLUDE environment variables for Visual C++. These sample files are designed specifically for Visual C++ 5.0, and do not setup the environment properly for VC++ 6.0. Here are the lines in question:

```
set VS50DIR=c:\msdev50
set PATH=%VS50DIR%\sharedide\bin;%VS50DIR%\vc\bin;%PATH%
set LIB=%VS50DIR%\vc\lib;
set INCLUDE=%VS50DIR%\vc\include;
```

We recommend that you delete or comment out (place "REM" in front of) each of these lines. If you allowed Visual Studio to register environment variables during installation, you do not need to do anything else. If you did not allow Visual Studio to register environment variables, you must call the VCVARS32.BAT file provided by Visual Studio. We recommend that you call this file once per command session before using our sample command files. If you place a call to VCVARS32.BAT within our command files, each invocation will append more data to the environment variables, yielding undesirable results.

Because Microsoft has changed the file structure of Visual Studio for each of the past two releases, it is best to assume they will change it again in the future. If you are using only one compiler on your system, allowing the Visual Studio installation to setup the environment is the best way to go. If you require more than one version of the compiler, use the VCVARS32.BAT file to setup your command sessions as needed. The Visual Studio documentation should help you locate the VCVARS32.BAT file, or you can search your Visual Studio installation with Windows Explorer.

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## 4.8 Problems Corrected in 5.50

Brief descriptions of the problems corrected in 5.50 are listed below. If you require more detail or a better explanation please contact Nematron Software Technical Support.

Note: Several reports of driver startup failures (stack faults) were reported with the 5.40 release. This problem was traced to, and corrected in, HyperKERNEL (see the next section). Although seemingly a driver problem, no corrections to drivers were required.

Note: Reports of difficulty when implementing applications using Nematron Java Beans and deficiencies in the Beans themselves have been received. While Nematron has not as yet been able to remedy these problems, there are installations that have reported success when using Nematron Java Beans. If you encounter difficulty with your Java Beans applications, please contact Nematron Software Technical Support for assistance.

#### 4.8.1 HyperKERNEL Corrections

- Uninitialized global variables are now set to zero each time an executable running under HyperKERNEL loads. This problem was responsible for several reports of driver startup failures (stack faults).
- HyperKERNEL memory allocations (hkAlloc()) are now aligned on 4 byte boundaries, providing improved performance for some applications, and more predictable performance for others.

#### 4.8.2 OpenControl Corrections

- Projects containing port output commands (Output Byte, Output Word, and Output DWord) will now compile.
- Reordering commands within a process block will now mark the chart as modified, thus insuring a prompt is issued to save the chart when it is closed before it is resaved.
- The loss of sign occurring when OC byte and word sized variables are retrieved by ocDBReadType() and written by ocDBWrite() has been corrected.
- The truncation of any fractional part of floating point numbers expressed as strings when written to real (%MF) variables by ocDBWrite() has been corrected.
- OcDBRead() will now convert strings to any other OC simple data type
- Chart traces now show the correct block coordinates for large trace listings.
- Errors while loading the Motion database are now correctly reported as motion database errors rather than incorrectly reported as RMU database errors.

- The FindInProject function (Edit/FindInProject...) now provides a warning that all edits will be saved, and allows the option to cancel the save and hence the Find operation.
- A cosmetic problem in which deleting one branch of an IF statement would leave blocks in the remaining branch colored yellow has been corrected.
- Copying and pasting a chart with a 30-character name will no longer result in two files with the same name. A request for a unique file name is now made after a notification message is shown.
- Canceling an Open Project request from a 'Save changes to...' popup, issued when a project with unsaved edits is still open, is now honored. Selecting Cancel in prior releases would close the popup, but it would immediately reappear, forcing edits either to be saved (popup closed via the Yes pushbutton) or discarded (popup closed via the No pushbutton).
- Projects in which charts had been deleted after being placed in the chart list would complain about invalid charts in the chart list when the project was compiled. A visual inspection of the chart list would not show the chart names referenced in the compile error message. Deleted charts contained in the chart list are now marked with an asterisk after an informational popup identifies the problem. Saving the chart list automatically removes the 'phantom' charts and allows the project to build.
- Charts with comments that extend beyond the displayed portion of the chart will now print correctly.
- Charts performing serial port I/O will now compile.
- Charts passing an unsigned byte by reference to a subchart and using the passed reference in a Block Transfer command will again compile. (Charts that had compiled in 4.3 would not compile in 5.40)
- Find messages are no longer erroneously displayed in the output window in response to a request to view project statistics (Project/View Project Statistics).
- The block count in the project statistics window (Project/View Project Statistics) is now correct.
- Signal programs now correctly receive the long integer (dword) parameter specified in the calling chart

- Data sections within the runtime image of OpenControl projects are now aligned on 4 byte boundaries, providing improved performance for some applications, and more predictable performance for others.
- Projects with exactly 256 charts in the chart list would generate a build error indicating that no process logic had been defined. This has been corrected.

### 4.8.3 Paragon Corrections

#### 4.8.3.1 *ActiveX*

- A memory leak in the TNTAlarm control, which occurred when more than 50 alarms were present, has been corrected
- A crash in the TNTAnalogData control when used within VB has been corrected. The crash occurred in response to a ValueChanged event when there was associated code to process the event.

#### 4.8.3.2 *Application Manager*

- PIO is now enabled properly for the Level II product (256 PIO points). Manually re-enabling PIO each time Paragon starts is no longer required.

#### 4.8.3.3 *Application Wizard*

- OI files created using the wizard can now be opened and edited by the OI Builder.

#### 4.8.3.4 *Client Objects Interface (COI)*

- An error reported (missing javai.dll file) when using COI with Java 2 (Java 1.2) has been corrected.
- The VB example of the getAlarms() function using an incorrect value name to access data from an Alarm, resulting in IsTNTElement always set to FALSE, has been corrected
- The Delphi example of the getAlarms() function using an incorrect value name to access data from an Alarm, resulting in IsTNTElement always set to FALSE, has been corrected
- A one-byte memory overwrite in tntDescribe() which occurred when the string returned was larger than the provided buffer has been corrected
- Passing empty strings into client object methods via the Java binding would occasionally pass random garbage.

- Improper handling of empty alarm lists, which occasionally resulted in application crashes, has been corrected.
- The Java binding has been made thread-safe.

#### **4.8.3.5 Common Builder**

- A crash due to browsing long lists of OpenControl tags has been corrected.

#### **4.8.3.6 Continuous Strategy**

- A very long delay in the initial connection to remote CS values which occurred when the Remote Connections parameter of the CS Subsystem Parameters was set to a large (65535) value has been corrected.
- A startup crash caused when the Lookup Table Count in Subsystem Parameters is 0 and a strategy contains any string table (STBL, STBC, and STBI) blocks has been corrected.
- All connections from terminators to FANI blocks except for the first connection were erroneously being forced by the builder to the short integer type, instead of the type specified by the first connection. This prevented subsequent connections of the desired type from being configured by the builder, and has been corrected.
- A crash which occurred when a minus sign appeared as the first character in the Out parameter entry field of the EXPR block configuration dialog has been corrected.
- Incorrect data types and/or views sometimes returned when connections to CNVT inputs were queried has been corrected.

#### **4.8.3.7 DDE**

- A memory leak in the Conversation window (Show Conversation function) which occurred as new lines were added to the window has been corrected.

#### **4.8.3.8 Data Manager**

- Use of non-US code pages with Windows caused printed output and SQL commands sent to ODBC servers to be incorrect. Originally reported against the Latvian code-page, the problems have been corrected for all code-pages.

- A resource (memory handles) leak arising from Paragon clients making requests for Data Manager values before Data Manager is ready to process the requests has been corrected.

#### **4.8.3.9 ICCFrame**

- When using momentary buttons, a loss of focus (caused for example by an automatic logout popup) would disable any up key action associated with the button, and the button would not be released. This has been corrected by forcing up key actions on any loss of focus.

#### **4.8.3.10 Java Server**

- An error reported (missing javai.dll file) when using Java Server with Java 2 (Java 1.2) has been corrected.

#### **4.8.3.11 Java Beans**

- An error reported (missing javai.dll file) when using Java Beans with Java 2 (Java 1.2) has been corrected.
- The JavaBean Trend object will now display data from a DM DiskStream function
- Pen color and high and low scale values can now be accessed from the pen[] field of PlotPens

#### **4.8.3.12 OpenControl Server**

- A memory leak caused by Paragon clients when accessing OpenControl values through the OpenControl Server has been corrected.
- A resource (memory handles) leak arising from Paragon clients making requests for OpenControl values before OpenControl Server is ready to process the requests has been corrected.
- A memory leak caused when connections to invalid points are requested has been corrected.
- A user-specified maximum number characters is now honored when processing requests for strings. Formerly, one character less than the number requested was returned whenever the string contained the same or more characters as the number requested.

- OpenControl Server will now provide correct values for OpenControl timers to requesting clients.

#### **4.8.3.13 OI Builder**

- Adding digital connections to Text objects would cause a crash whenever the Text Field was left blank. The crash has been corrected.

#### **4.8.3.14 OI Runtime**

- A problem with the Alarm Control while displaying alarms from remote nodes has been corrected. Rapid state changes (once per second) in the remote alarms would cause the OI screen containing the Alarm Control to become non-responsive.
- A divide-by-0 error, which occasionally occurred when closing a child trend window, has been corrected.
- Opening the Login window with Interactive Trends configured to "float-on-top" prevented the Login window from being accessed. The Login window now appears in front of Interactive Trends.
- Quickly pressing buttons associated with display navigation actions (Load Sibling/Child, Replace, Replace All, Close) on faster computers would sometimes result in the buttons becoming disabled. The timing problem responsible for this behavior has been corrected.
- Opening the main display, followed by a sibling display, then opening and closing a trend display would freeze OI when the main display was subsequently closed. A reboot would then be required to restore OI functionality. The internal deadlock causing this behavior has been corrected.
- An "invalid bracketing" error when attempting an SQL import to Interactive Trends has been corrected.
- A problem with the Alarm Device that prevented viewing alarms from all but the first device in the dropdown list has been corrected.
- Prior releases exhibited problems when Set Value actions executed as part of a Close Display action for child displays. Popup messages stating that errors had occurred with the Set Value action would appear when a Replace All Displays action was triggered by the parent display. This has been corrected.
- A resource leak that occurred when closing grandchild displays, eventually leading to a crash, has been corrected.

- Random lockups in child displays, which occurred when closing other child/sibling displays, have been corrected.
- Lockups in displays with pushbuttons that have both the Replace Display and Set Value actions have been corrected.

#### **4.8.3.15 Paragon as NT Service**

- A timing problem causing random crashes during Paragon startup has been corrected.
- Starting specified applications when running Paragon as a service would be blocked until a valid Windows NT logon occurred. This unintentional blockage has been corrected.

#### **4.8.3.16 PIO**

##### **AB:**

- Problems combining transactions involving the Counters file for all AB drivers (KT, SLC, PLC5, INTERCHANGE) have been corrected.
- The WinRT configurator will now properly accept large addresses (such as FFFC0000) that may be required to configure access to PCI-based adapters such as the AB PKTX card.

##### **ADRTI:**

- The register offset for the ADRTI is now correct for 817.

##### **Applicom:**

- Memo, Input, and Output may now be addressed using the Siemens style of addressing digital data in the Applicom when using the S7 protocol
- DevErr32 generated when writing large groups of floats to the Applicom S7-300 has been corrected.

##### **Cyrano:**

- Message truncation resulting in bad data being received from the Cyrano Arcnet driver (Paragon 5.40 OS/2 Warp only) has been corrected
- Message truncation resulting in bad data being received from the Cyrano Serial driver (Paragon 5.40 OS/2 Warp only) has been corrected

##### **Eurotherm PDK:**

- A memory overwrite causing a crash with the Eurotherm PDK has been corrected.
- Protocol errors with the Eurotherm PDK have been corrected.

General:

- Writes to byte or unsigned byte data types are now handled correctly, and a bad data type error is no longer generated.

Mistic:

- Configuring analog watchdog timeout values would occasionally elicit a 'badly formed' driver message to which the Mistic hardware would respond with an error indicating 'not enough data'. The erroneous message generation has been corrected.
- A restriction that limited the analog watchdog timeout to integer values has been removed.

Modicon RTU:

- The incorrect combination of double precision and unsigned long data type registers, which caused the unsigned longs to be treated as double precision or the double-precision registers to be treated as unsigned longs, has been corrected.

# 5. OpenControl Ladder Logic

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## 5.1 How Ladder Fits in Nematron Software

Nematron Ladder Diagrams (LD) are a new element in the OpenControl Framework resource tree. Like flowcharts, ladder diagrams are also programs. Any (practical) number of ladder diagrams can be added with any number of rungs on each. Ladder diagrams, flowcharts, HKCS strategies or any combination can be used in one application. Elements of each, however, cannot be combined in a single diagram; for example, you cannot place ladder blocks in flowcharts, or HKCS blocks in ladder diagrams.

The LD editor contains a tool bar with icons representing more than 80 ladder logic instructions. These instructions access OpenControl variables (DRV, Alias, Wire Label) for inputs and outputs. Thus LD shares the variable database with flowcharts allowing ladder logic to interact with flowchart logic. This means that ladder applications use the same drivers as flowchart applications.

Ladder logic is made into an executable module using the same OpenControl validate, build, activate and start functions. When there are both ladders and flowcharts in the application, they are both compiled in the same operation.

Since ladder variables are the same as flowchart variables, the OCM works with ladder as-is, with the exception of the ability to launch the LD debugger. Runtime contains a new Ladder visual debugger that shows a dynamic version of a ladder and is activated from the OpenControl Monitor "charts" page.

All ladder variables are of course available to Nematron Software clients, OPC and DDE, meaning that LD can be added to existing applications without modifying HMI parts.

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## 5.2 Competitive Notes

Nematron's strategy is to take a proven concept, ladder logic, familiar to most of the control industry, to a new level of effectiveness based on the concepts and architecture of PC based control. Some reasons to use Nematron PC Based ladder include:

- Instruction set - There are a large number of ladder logic based products on the market. In the US, Allen-Bradley, Schneider Automation (Modicon), TI, etc. have very large ladder logic customer bases and each with different products. Then there is the "IEC 1131" standard that is also different from each of these. Technically it is not possible to make a functional superset of these products; however, the Nematron instruction set is very extensive. It is certainly not a "basic" set, but some vendor specific instructions and approaches are not provided. Nematron has not ignored proven algorithms but has built on standards like the IEC 1131 set and added others that have proven valuable.
- Modern Windows Editor - You get the familiar Windows editing techniques - cut, copy, paste, drag-and-drop to make you application building and maintenance more effective. This makes LD easier to learn and remember than competitive products.
- Field-proven execution engine - You build ladders visually and Nematron LD generates structured text and compiles it to use the field proven Nematron OpenControl runtime engine proven with flowcharts. This gives you reliability on the first release.
- Runtime Debugger - A strength of PC based control is the visual, color-coded, live debugger with high-speed watch windows (data view). Couple this with trace and high-speed data logging and you have the most effective application validation environment available.
- On-Line Changes - You can tune your ladder logic and replace ladders while the application is running to minimize the time needed to implement changes.
- Documentation of your application - Nematron LD documentation utilities not only handle your final documentation needs with ladder printouts but also improves your effectiveness during application development and testing with cross reference windows and reports.
- Integration With OpenControl - Ladders and flowcharts are built in the same easy to use environment, using the same data types and style and using the same drivers for concurrent ladder and flowchart control. Of course you can use Nematron Paragon HMI and SCADA software seamlessly with no separate database to build. Or simply use OPC with the Windows HMI client of your choice.
- Multiple I/O buses - All the existing (and future) OpenControl drivers can be used with Nematron LD. This provides Profibus, DeviceNet, Seriplex, GE Genius, Interbus-S, etc. and developer kits for any new ones you need.
- Extensibility - Extend OpenControl with your own HyperKERNEL applications that run concurrently with ladders and flowcharts ... one of the strengths of PC based control.

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## 5.3 Ladder Logic Functions

### 5.3.1 Ladder Editor

Ladders are added to the OpenControl Framework project tree at the same level as flowcharts. An application can contain any number of ladders and sub-ladders (which are callable from ladders). Ladders are executed from beginning to end each scan, in the order you place ladders in the "chart list". Ladders can be mixed with charts in the list in any order.

Double clicking on a ladder name in the project tree opens a visual ladder editor with tool bar at the top and an image of the ladder in the remainder of the window. The tool bar contains tools to select ladder elements, create new rungs, delete objects and perform other functions.

Nematron LD contains a complete set of powerful features:

- Use of the familiar "inputs on the left - output on the right" layout. Ladders are executed a rung at a time, in sequence so users do not have to worry about which column a block is positioned; some packages execute in columns creating the possibility of dangerous side effects to simple edits.
- Use of familiar Windows editing methods leading to intuitive operation: Cut, paste, drag and drop of rungs and parts of rungs enable users to quickly reach new level of productivity. You can even drag branches to change the structure of a rung.
- Convenient reordering of rungs by simply dragging them. It will even automatically scroll when you drag off the visible part of the LD window. Each rung is numbered for easy reference and is automatically re-numbered when rungs are inserted or deleted.
- Scrolling. Ladders scroll both horizontally and vertically to avoid those times when it is too confusing to break a rung into multiple rungs; the window size does not constrain you. There is no imposed limit to the size of an individual rung or ladder, but ladder applications should be implemented as multiple ladders both to ease maintenance and understanding at a future date.
- Zoom in and out. Ladders sometimes get pretty complex and the LD zoom feature can be very helpful in better visualizing your application.
- Toolbars. A convenient tool bar is provided for selecting from a full set of instruction and actions. Tool tips are included that help you deal with the large number of icons necessary for such a full set of instructions.
- Structured text window. As you edit, LD generates the equivalent structured text (ST) and makes it available in a split screen for your viewing. Sometimes this is helpful for validating your LD implementation.

- Consistency. LD was built from the ground up by Nematron and is not a glued on 3<sup>rd</sup> party component. All property editors for both instructions (blocks) and tag browsers are consistent with the equivalent OpenControl parts allowing you to easily move back and forth between LD and flowcharts. Remember ladders and charts operate on the same variables and I/O.
- Text substitution. Search and replace on tag names makes it easy to implement corrections and those inevitable project changes.
- Cross-referencing. Tag cross-reference lists for online use and cross-reference reports are available to help you understand where you have used variables in your application. The on-line cross-reference is provided in a convenient structured "tree" in the left part of a split window. Double clicking on an entry in the tree, takes you immediately to the associated location in your ladder.
- Error checking. Of course when you build your OpenControl project, ladders are validated and built along with your flowcharts, as you would expect. Validation results appear in the same output window used for flowchart and database validation errors.

### 5.3.2 Ladder Instructions

The LD instruction set was derived by an analysis of IEC1131 instructions and competitive offerings. The instructions are close to the 1131 set with enhancements to handle valuable improvements the industry has come to expect. The instruction set includes

- Basic logic - (actually part of ladder logic layout), transition detection, etc.
- Timer and counter operations.
- Math operations including trigonometric, logarithmic and exponential functions, comparison operations.
- Word oriented logical operations including AND, OR, XOR, NOT with rotate and shift operations.
- Signal selection operations.
- String (text operations).
- Number base conversion operations.
- Functions to call sub-ladders (no arguments are provided).

### 5.3.3 Building Runtime

Ladder diagrams are incorporated into OpenControl projects just like flowcharts, using the following sequence:

1. Create a ladder diagram using the LD editor.
2. Validate the ladder diagram and correct any detected errors
3. Add the ladder diagram to the "chart list".

4. (Re)build the project, to make the ladder diagram part of the runtime image.
5. Activate and start the project either simulated (no I/O) or with I/O.

Like flowcharts, ladders are first translated into structured text and then compiled into HyperKERNEL executable code. Once your ladders are running, you can use the LD debugger view to see how your application is running.

### 5.3.4 Running and Debugging Ladder Logic

OpenControl projects are started in any of three ways:

- From the OpenControl Framework (where editors are used) when Paragon is not installed.
- From the OpenControl Monitor (OCM) when Paragon is not installed.
- From the Paragon Application Manager when both OpenControl and Paragon are used in the same application.

In all cases, OCM is used to view OpenControl (and therefore LD) variables and ladder diagram status. From the OCM chart window, users can double click on a ladder and activate the LD debugger.

The LD debugger demonstrates one of the strengths of PC based control. On the same hardware, users can watch their ladders run and interact with them in real time to validate expected operation and troubleshoot any problems. The LD Debugger runtime view and validation capabilities include the following:

- The LD debugger looks like the LD editor (rungs, blocks, branches, comments, etc.) except that operations show runtime values.
- The elements can be color coded by enabling power-flow tracing to show "power flow" through the rung. This means when all the input conditions for rung elements are "true", causing the output to be "powered", the rung will be shown in a different color, allowing users to quickly see the state of their logic. For slow or blocked operations this allows users to view the state of control and where things are blocked.
- Nematron ladder logic processing is very fast and no display can keep up with the dynamics of many applications. Thus LD provides users the ability to stop LD processing for analysis at the stopped state. Multiple break points can be placed any place on any rung or block. Breakpoints are allowed only in simulation mode for safety reasons.
- When a break point is encountered, processing stops, showing power flow (when tracing is enabled) up to the breakpoint and waits for the user to restart processing. Processing may be resumed (Go), continued to the next block (SingleStep), or continued to the next selected block (RunToCursor).

- The LD debugger environment includes a watch window that shows all variables and their values for the selected block. Clicking on another block shows the variables and values for that block, allowing you to browse values and verify that they are as expected.
- Multiple debugger windows can be open for multiple ladders at the same time. Flowchart debugger windows can also be open at the same time.
- LD debugger provides high speed tracing of LD blocks. A trace window lists all blocks through which “power” flows. The trace information can be printed to document the state of a test or operation and saved to a file for easy electronic handling of information.

### 5.3.5 On Line Changes to Ladders

Nematron ladders can be edited while your application is running to effect quick changes and reduce test-and-correct times. The runtime (on-line change) editor, introduced with Nematron Software 5.40, has been enhanced to include runtime editing for ladder diagrams. Activated from OCM, it allows edits to executing charts and ladder diagrams. Once you are satisfied with changes, you can commit the changes immediately and see the results. Committed changes become part of the running, activated project but do not become permanent changes to the project. When you exit the runtime editor, you are given the option to permanently save the changes to the project.

# 6. OLE For Process Control (OPC)



All Nematron Software Servers are OPC servers.

## 6.1.1 OPC Introduction

OPC (OLE for Process Control) is a COM (Microsoft Windows) based technology. Specifically OPC is a defined, standard interface between COM clients and COM servers. The interface definition is under the control of the OPC Foundation, which can be found at "<http://www.opcfoundation.org/>". From the OPC web site you can download an overview of OPC and even the complete OPC specifications.

### 6.1.1.1 OPC Clients And Servers

When talking about *OPC products* it is important to understand whether the products are *OPC clients* or *OPC servers* - sometimes they are both. Many HMI vendors act as OPC clients to access data in I/O vendor and other servers. Clients should have the capability to:

- List available (installed) OPC servers and connect to them.
- Browse OPC server tags - so you do not have to type them. Note that tag browsing is an OPC option thus not all servers support this. (Nematron servers support full browsing.)
- Create OPCGroups in OPC servers and add OPCItems to groups for reading and writing. OPCItems correspond to a tag in OPC servers. OPC servers have a variety of tag implementations (flat, hierarchical, mixed) and the client must be able to handle all of them.
- Read and write data in various formats.
- Disconnect from servers when operations are complete.

Note that some clients connect once, when they are started, and keep all connections open until they shut down. This places a much heavier load on your system than clients that connect only when the data is needed.

The most common OPC server is a server that provides access to information in I/O equipment, eliminating the need for each HMI and SCADA vendor to write and maintain drivers. These servers must support the operations described above.

Other OPC servers, however, provide access to more extensive data. For example all Paragon data is accessible including PIO driver data, CS control block parameters, DM data (only as strings) and OpenControl variables. This allows a different HMI (or other client) to be used with Paragon drivers or control applications.

### **6.1.1.2 Using OPC with Visual Basic and VBA**

OPC servers provide a COM interface that is used directly by most OPC HMI clients. Microsoft Visual Basic and VBA do not use the direct COM interface. Instead they require an *Automation Interface* which was defined by the Microsoft Visual Basic development team.

The OPC foundation has defined an Automation Interface as a *Wrapper* (add on) to the OPC COM interface. This is not installed with 5.50 but is available on the 5.50 CD. If you want to use OPC with VB or VBA, see the section below on how to install it.

## **6.1.2 Nematron Software OPC Overview**

*All Nematron Servers are OPC Servers.*

Nematron Software Servers (OC, PIO, CS and DM) are OPC Data servers, allowing you to use any Nematron server with competitive HMI and other OPC client applications. Although Nematron Software does not currently contain OPC clients, the 5.50 CD does contain a time-limited trial version of an OPC bridge from Northern Dynamics, Inc. This OPC bridge can be installed by running the *setup.exe* utility found in the NDIBridge directory on the CD. Documentation for the bridge utility can be found in the same directory. Should you decide to use this OPC bridge after the trial period expires, you can purchase a license for the bridge directly from Northern Dynamics, Inc.

Note that although Nematron servers now function as OPC Data servers, this in no way impacts use of Nematron clients. You can still use Nematron clients (OI, Recipe, Quick Reports and others) with Nematron servers.

*Paragon has OPC built in. There is nothing to install and no enablers to turn on.*

The Nematron OPC support provided is slightly different depending on whether you install Paragon or not.

- When you install Paragon, OPC support is installed automatically – Paragon has OPC built in. In this case OpenControl tag names are limited to 12 characters (longer ones are ignored when browsing).
- When you do not install Paragon, you need to install OPC server support for OpenControl. (You cannot install this if Paragon has already been installed.). OpenControl OPC provides full tag name browsing.

If you intend to use Visual Basic or VBA as the client to Nematron OPC servers, you will need to install the OPC Automation Wrapper separately. The OPC Foundation defines Automation support separate from the OPC

COM interface and this can be installed from the 5.50 CD as described below.

This was done at the Paragon level and OpenControl by itself is not yet an OPC server. If you have an OPC Client, you will see "Nematron.OPCServer.1" when your client lists available servers for you, when you have properly installed Paragon. See the section below for more detail.

Several hardware vendors (ICT, SST, Siemens, OPTO-22, etc.) provide OPC servers that will allow OPC clients to configure and access their hardware. To use OPC Servers from hardware vendors you will need Nematron Software to act as an OPC Client. Nematron Software does not currently contain any OPC clients, however, the Northern Dynamic OPC bridge mentioned at the beginning of this section may help. Nematron OPC clients will be released in future products.

## 6.1.3 Nematron Software OPC Details

### 6.1.3.1 How Does OPC Help?

Although Nematron Servers are OPC now servers, existing Nematron Software applications will continue to work and existing Paragon clients (OI, Recipe, Itrends, ActiveX JavaBeans, etc.) will continue to operate. You do not have to use OPC or change anything you have been doing. Nematron OPC does offer you the potential for enhancing your Nematron applications with OPC clients as well as the potential for enhancing your non-Nematron applications with Nematron Software Servers.

Nematron Software's "designed in" true client server architecture makes it easy and efficient to use any Nematron Software server with any OPC based application. For example you might:

- Expand your Nematron Solution using OPC clients to add functionality. Advanced alarming or annunciation can easily access Nematron server data.
- Add a special OPC enabled recipe user interface client to an existing Nematron Software application.
- If you have standardized on a competitive operator interface product, add Nematron Software advanced distributed servers to enhance your non-Nematron Software application.
- Use just Paragon PIO server and one or more of the Paragon I/O drivers with your own custom application written in VB, C, C++.  
(Actually our ActiveX controls are still easier to use and faster but if you have already implemented OPC client code, Paragon will fit in.)
- Use OpenControl for high speed, deterministic sequential control with your existing OPC enabled user interface (especially when you discover that your existing control engine is not good enough).
- Use Paragon HKCS regulatory control with an existing OPC enabled user interface.

With Nematron Software you never have to throw away an entire application. That's what an open, client server architecture offers.

### **6.1.3.2 Nematron OPC Implementation**

Here are several points about Nematron implementation of OPC:

- Nematron Software conforms to the OPC Data Access 2.0 specification. Neither OPC Alarms (v1.0 specification) nor History (draft specification) are supported at this time.
- Nematron Software OPC modules do not take CPU or memory resources until used.
- Nematron Software OPC has been designed to have minimum impact on your existing applications. In fact, your existing application is useable in an OPC based application with no modifications.
- Nematron Software with OPC starts quickly and requires few additional resources beyond those required by the application itself.
- Nematron Software OPC provides access to all Nematron Software data and data types. DM's complex values (alarms and history) can only be accessed as strings at this time.
- Full browsing is supported. The presentation of the name hierarchy is controlled by the client, but typically uses a tree view. The client may assign the top level (Paragon, Nematron) a name like "root" or it may allow you to specify a name when it supports more than one server simultaneously. Under the top-level name, you will see the normal Nematron Software name structure: all of the normal Nematron Software server level names (AM, DM, PIO, CS, etc.), containing process level names, containing tag names, containing element names.
- Some clients let you choose the data type. When the "native" data type is available, choose it and the OPC Server will handle everything. If that does not work out, you can try specifying the format.
- Nematron Software OPC supports access to Paragon arrays a single element at a time. It does not support accessing multiple elements of an array in one transaction.
- All data is time stamped.
- Nematron Software Quality Flags are mapped to OPC flags where they make sense.

## **6.1.4 Installation of Nematron OPC**

### **6.1.4.1 Installing Paragon OPC**

There is nothing special to install to use Paragon Servers as OPC servers and there are no enablers to turn on. This support is part of the base Paragon product.

There is nothing to configure for OPC in your Paragon application.

Once you have installed Paragon, you can verify the installation of Paragon OPC with any OPC client that browses OPC servers:

- If you plan to use VB or VBA you must obtain and install the Automation Wrapper. One is available on the CD as described below.
- Start Paragon. As a minimum Application Manager must be running. Start an application to browse and access PIO, CS, DM or OC data.
- Run your OPC client and consult the documentation to learn how to connect to an OPC server. Typically a menu item is provided. When you attempt to connect, the client will present a list of OPC Servers available on you PC. You should see " Nematron.OPCServer.1" in the list. If this is there, you are on your way.
- If you do not see the entry listed above, then you either have not installed Paragon or your client requires some other action to retrieve a list of servers. If you are sure you installed Paragon, consult the clients documentation for the proper procedure.
- If none of this works, contact Nematron Software Technical Support providing the name of the client application and we will help you get started.

Usually " Nematron.OPCServer.1" will be listed and you can connect to Paragon servers. When you first run it, you may hear a few disk clicks as the OPC modules initialize. You should then be able to browse Paragon servers (AM, CS, PIO, DM, etc.) and drill down to server tags.

#### **6.1.4.2 Installing OpenControl OPC**

If you are not using Paragon then you need to install the OPC Server for OpenControl on the same station as OpenControl. Do this as follows:

- Browse the Nematron Software CD and locate the \Oc\Ocopc directory.
- Run (double click) Setup.exe

There are no configuration requirements for the OPC Server for OpenControl. You can set an environment variable to change the rate that the OpenControl database is scanned. The default value is 100 milliseconds (10 scans per second):

- Open the Windows NT Control Panel/System Settings.
- Add environment variable "NEMA\_OCS\_UPDATERATE".
- Set its value to a number larger than 100 (milliseconds) such as 1000 (scan once each second).

Once you have installed the OPC Server for OpenControl, you can verify the installation of Paragon OPC with any OPC client that browses OPC servers:

*WARNING! Do not install the OpenControl OPC Server with Paragon*

- If you plan to use VB or VBA you must obtain and install the Automation Wrapper. One is available on the CD as described below.
- Start OpenControl. An OpenControl application must be running to browse tags or access data.
- Run your OPC client and consult the documentation to learn how to connect to an OPC server. Typically a menu item is provided. When you attempt to connect, the client will present a list of OPC Servers available on your PC. You should see "Nematron.OPCServer.1" in the list. If this is there, you are on your way.
- If you do not see the entry listed above, then you either have not installed the OPC Server for OpenControl or your client requires some other action to retrieve a list of servers. Consult your client documentation for the proper procedure.
- If none of this works, contact Nematron Software Technical Support providing the name of the client application and we will help you get started.
- Usually "Nematron.OPCServer.1" will be listed and you can connect to the OPC Server for OpenControl. When you first run it, you may hear a few disk clicks as the OPC modules initialize. You should then be able to browse OpenControl and drill down to server tags.

#### **6.1.4.3 Installing The Automation Wrapper**

If you plan on using OPC with MS Visual Basic or VBA you must install the Automation wrapper on the same PC as Nematron Software. The installation is the same for all Nematron Software configurations.

On the server station:

- Install Paragon or OpenControl (or both)
- If Paragon is not installed, install OpenControl OPC.
- Browse the Nematron Software CD and locate the \Opc directory.
- Run (double click) Opcda20.exe to install the automation wrapper components.
- Remember that the OPC Automation documentation is a good source of information defining the automation interface.

#### **6.1.4.4 Remote OPC Using DCOM**

DCOM allows you to access Paragon or OpenControl data from a remote station without having Paragon installed on the remote station. (Note that some OPC clients will not let you connect over DCOM.) Here is the general procedure for setting this up.

On the server station:

- Install Paragon or OpenControl OPC.
- This installs the required "OPCProxy.DLL" for you.

- Using the Windows Start | Run menu, run the DCOM configuration tool "Dcomcnfg.exe" in "Windows/System32 directory.
- Select "Nematron OPC Server" from the list of applications and then click the "Properties" button.
- On the "Location" page, check the "Run application on this computer" box.
- The default permissions should work in many cases. Check with your network administrator if they do not.

On the client station:

- Go to the remote station and install your OPC client application.
- If the "OPCProxy.DLL" is not installed by the OPC client application, copy it from the Paragon station to the client station and register it on the client station using a command like:
 

```
regsvr32.exe opcproxy.dll
```
- Using the Windows Start | Run menu, run the DCOM configuration tool "Dcomcnfg.exe" in "Windows/System32 directory.
- On the "Location" page, check the "Run application on the following computer" box.
- From the network list, select the node name for the station that contains Paragon.

## 6.1.5 OPC Notes

### 6.1.5.1 OPC Issues

Please be aware of the following OPC related issues and monitor our software support web site for updates:

- Occasionally the Nematron OPC server name may not appear in the OPC server list during browsing. This has been traced to a Windows problem. Until a resolution is available you can enter the server name ("Nematron.OPCServer.1") manually.
- Note that some clients connect once when they are started and keep all connections open until they shut down. This places a much heavier load on your system than clients that connect only when the data is needed.
- Nematron does not offer OPC development kits. In fact our OPC development work is based on kits we have purchased from eMation, Inc. (formerly PC Soft, Inc.)

### 6.1.5.2 OPC and Paragon COI

OPC and Paragon's COI (Client Object Interface) are very similar in concept. The main differences are:

- OPC is Windows COM based which is useful from C++.

- OPC provides an Automation Interface (for VB and VBA). COI uses language specific bindings (VB, VBA, C, C++ and Java.).
- OPC is windows only. COI runs on non-Windows platforms.
- COI is optimized for Nematron servers and may be faster than the OPC interface.

COI provides access to DM alarms and history; our OPC does not support alarms and history access yet. (You can read an alarm or history record as a string).

The most important difference is that several other vendors of HMI and SCADA products support OPC allowing them to inter-operate with Nematron products.