

V⁺ - Visual Programming System User Manual

for V+ Development and Run-Time environments



SimPhonics Incorporated

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REVISION HISTORY

Version	Description	Date
1.1	Reformatted manual	March 2001
1.2	Added information concerning reinstalling V+; page 19	January 29, 2002
1.3	Added sections "Adding Worksheets (Designs) to Existing Projects" and "Editing Existing Worksheets (Designs)"; pages 26 & 28.	April 17, 2002
1.4	Added information on default paper size and operating system compatibilities; page 18, 19 & 30.	May 7, 2002
1.5	Changed "Reinstalling V+" section to "Upgrading to a newer version of V+." This section details how to upgrade V+ without reloading device drivers. Removed outdated "V+ Sample Designs" section.	January 23, 2003
1.6	Updated image in "choosing sound device" section	May 29, 2003
1.7	Added note on new "auto load" feature in SMx Audio System Software Version 2.0, Build 106 and later and V+ Version 1.0, Build 230 and later.	July 1, 2003
1.8	Removed all references to "renaming ports."	July 23, 2003
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1.14		July 30, 2007
1.15	Added a section describing the log files. Changed to the new V+ logo for the title page and header of subsequent pages.	October 19, 2009



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INTRODUCTION

Introducing V+

V+, pronounced "V - Plus", is a completely new way of programming systems that interact with real-world signals in real-time. V+ was created for system engineers and other computer professionals who need tools to transform their ideas into reality without the headaches of code. In fact, code is just that, code, something that is difficult to read and understand unless you are skilled in the art.

One of the paramount goals in the design of V+ was to create an extensible language. That is, a language that can be easily adapted and changed to match changing operating systems, and accommodate new hardware. If there is a universal constant in the computing world, it is change.

V+ is finding more and more uses in the simulation and training industry. From simple low fidelity systems, to full flight simulators, V+ is being used for I/O, audio, and DIS radio applications. Also, third parties are now beginning to develop objects and I/O devices that extend the V+ inventory of resources.

What is a Visual Programming Language?

A small but growing community of Visual Programming Language (VPL) people exists today. They have yet to accept a formal definition of a VPL. SimPhonics' own simplified contribution is a derivation of Webster's definition for the three words in VPL.

Webster Says:

Visual: Something (as a picture, chart, or film) that appeals to the sight and is used for illustration, demonstration, or promotion.

Programming: To work out a sequence of operations to be performed by a mechanism.

Language: The words, their pronunciation, and the methods of combining them used and understood by an considerable community.

Refine this and we have:

"Using Images for illustration of operations to be performed by a mechanism and the methods of combining them used and understood by a considerable community".

This is a highly simplified but practical definition. Execution is encapsulated in the sequence "of operations to be performed by a mechanism". The word "mechanism" is used instead of "computer" since the execution may be carried out by something other than a computer.

What is V+?

Traditionally, computers are programmed using text-based languages such as C, C++, Visual Basic, etc. Text based programming requires a working knowledge of a programming language. Writing the code for the simple mathematical equation "1+1=2" requires knowledge of a programming language. V+ uses graphic images to perform this same operation.

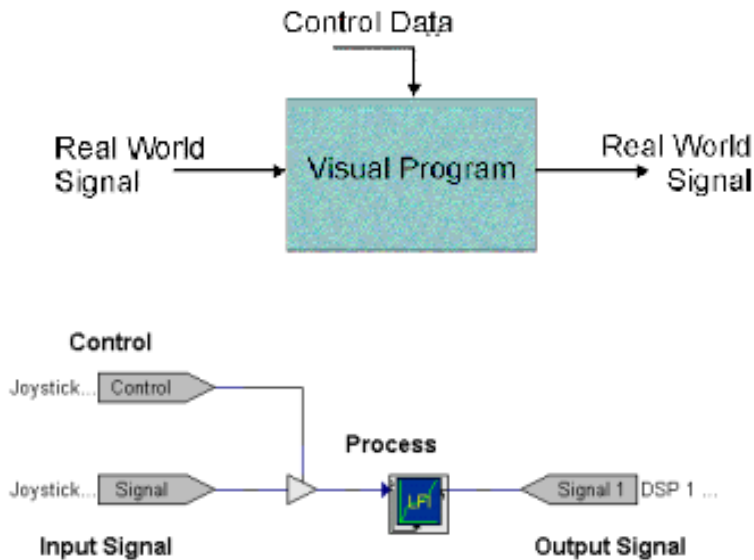


V+ is a Visual Programming System based on a Visual Programming Language (VPL), that replaces conventional textual programming languages such as C++, FORTRAN, PASCAL, etc. in some applications. Primarily, a VPL differs from a text-based language in that images replace the text, providing a more natural programming paradigm.

V+ is called a Visual Programming System since V+ is much more than just a VPL. Other features are provided automatically with V+ that would require several separate tools and steps in a text-based language, in order to arrive at the finished product.

Why use V+?

V+ is a natural choice for systems that input real-time data, process this data, and output the data in real-time under the control of a host computer. These systems are generally signal processing, or control systems, and are naturally conceived as a block diagram of processing elements. Of course, V+ is not restricted for use with real-time systems.



V+ applications can vary widely from Control Systems, Digital Audio Systems, Custom Interfaces, Educational, etc.



THE BASICS

The Basic Components

The V+ system is divided into two separate executables, a **development system** and a **Run-time system**. The development system is used to create and edit designs, while the platform shell is used to configure the system and to execute the designs created in the editor.

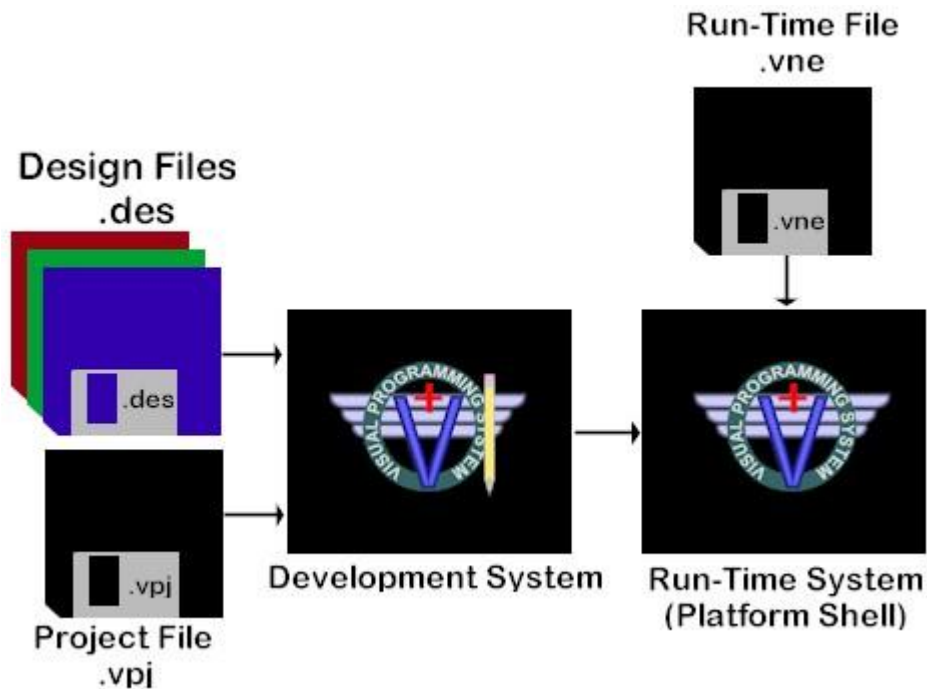


Figure 1 - V+ Development and Run-time Systems

Using the **Visual Editor**, a **design** is drawn on a **worksheet** by dragging objects from a list of available **objects** and dropping them in place. These objects are then connected via **nets** to other objects or **ports**. Ports are grouped into **I/O Devices** which are Input/Output objects connecting the design to real-world signals, such as RS-232, Ethernet, etc. Designs may consist of one or more worksheets that can be combined into a **project**. The design can then be executed on the **Run-Time System**.



V+ Designs

Simple Designs

Before getting into the details, let's look at some simple V+ designs. The simplest possible V+ design is a constant connected to a no-connection. While this does nothing for us, it shows how V+ is a data-flow syntax. An object on the left sends data to an object on the right.

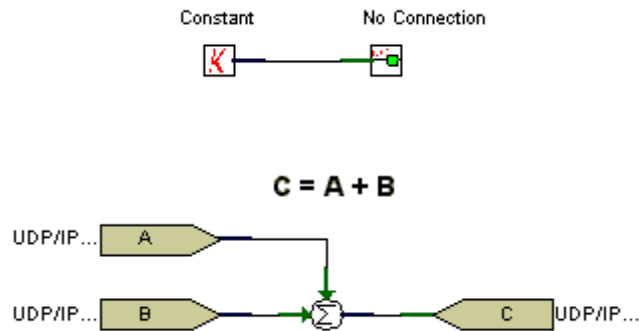


Figure 2 - Basic V+ Designs

Next, let's use an I/O Device and some simple math. Two input variables from a network are added together to produce another result that is then sent out over the network. A very expensive networked adding machine.

Next, a multiply, and a little more math.

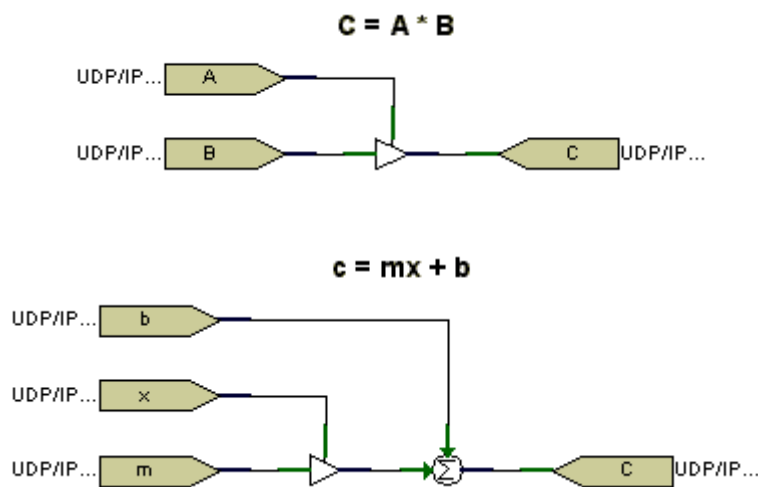


Figure 3 - Basic V+ Designs – Simple Math



Slightly More Advanced

One of the important features of V+ is feedback. As the design below illustrates, the data from the input is multiplied by itself and then applied to the output. The next figure shows the same design except with the data for the multiply being fed back to the input. The result is the same, except that the data coming back to the multiply is delayed by one processing frame. This concept is very useful for digital signal processing applications.

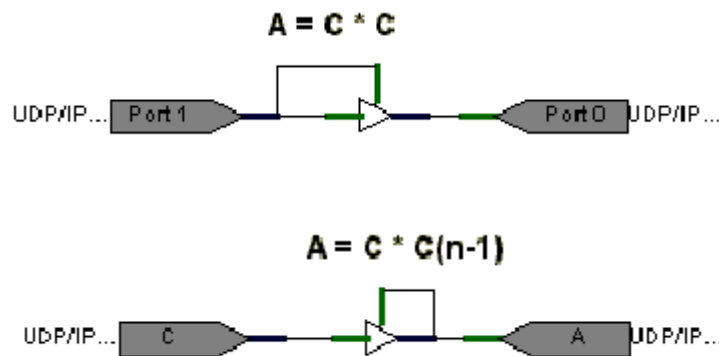


Figure 4 - Basic V+ Designs with Feedback

The next design is a simple first order filter. K1 and K2 are in the constants (k) shown. The delay element is f(n-1) feedback path through the multiply.

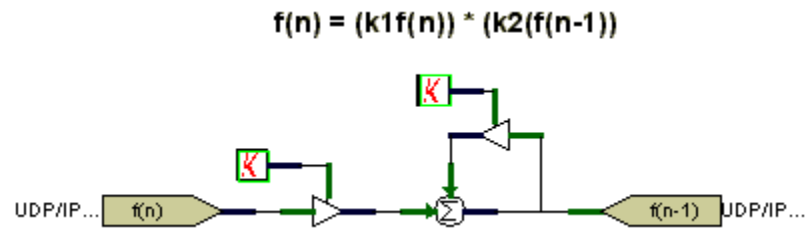


Figure 5 - Simple First Order Filter



A more complex design

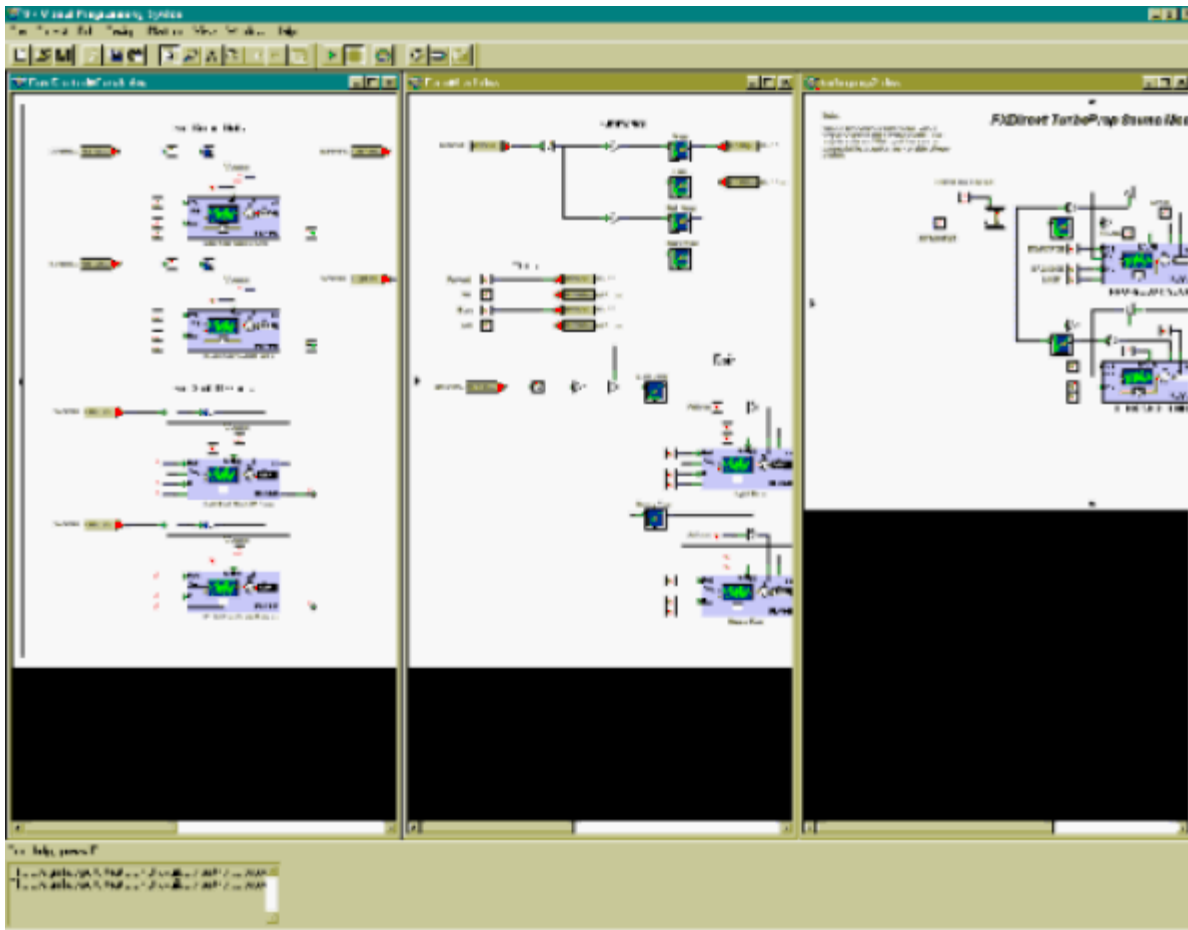


Figure 6 - Complex V+ Design



About Real-Time Frame Rate Processing

Real-time systems generally process data on an iterative basis. That is, the computer models the system in real-time by inputting data from a device, processing the data, and then outputting the data to another device periodically. This period is called a frame, and the rate at which this frame is processed is called the frame rate, or iteration rate. V+ defaults to use a frame rate of 30 Hz. V+ can be configured to operate at rates up to 600 hertz.

When a V+ design is executed, the objects and I/O devices are sorted according to input devices, objects, and output devices as shown below. The order of the objects can be manually adjusted by the user.

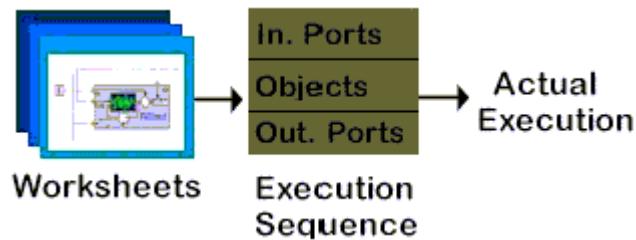


Figure 7 - Execution Sequence

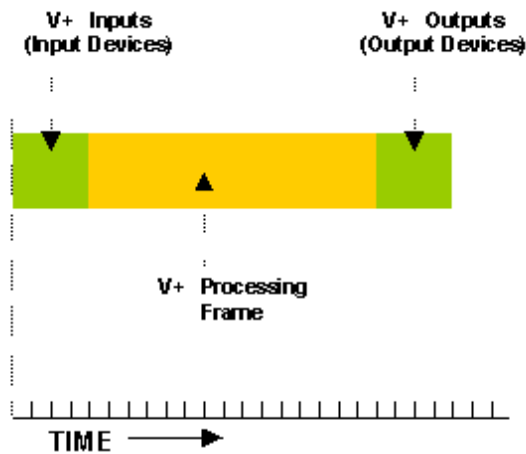


Figure 8 - Processing Load

V+ calculates the spare time per frame so that the user is aware of the processing load.



Navigating V+

V+ provides right-click menu support for doing the most common tasks. The menu options that are displayed are different in each component.

V+ Run Time System Toolbar

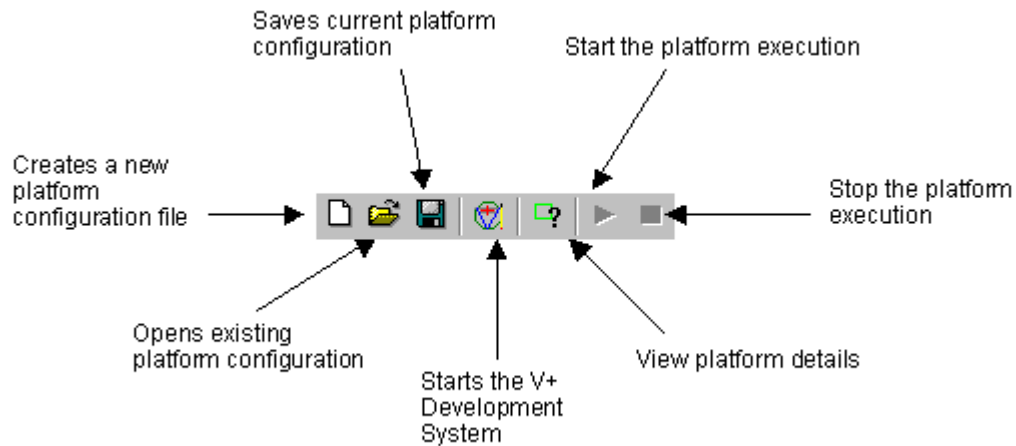


Figure 9 - V+ Run Time System Toolbar



Visual Programming System Toolbars

Below are the V+ toolbars with a description of the actions they initiate.

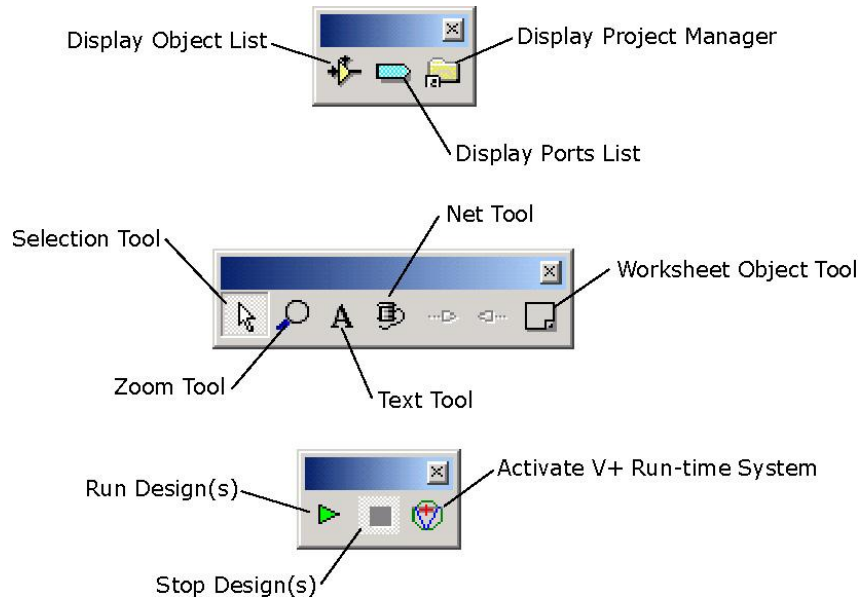


Figure 10 - V+ Development System Toolbars



Need Some Help?

There are two V+ Help Systems available for assistance:

- On-line V+ User Manual
- Object Help System

These help systems are intended to give users key information concerning the use and operation of V+.

On-line V+ User's Manual

The on-line user's manual contains information about how to operate V+.

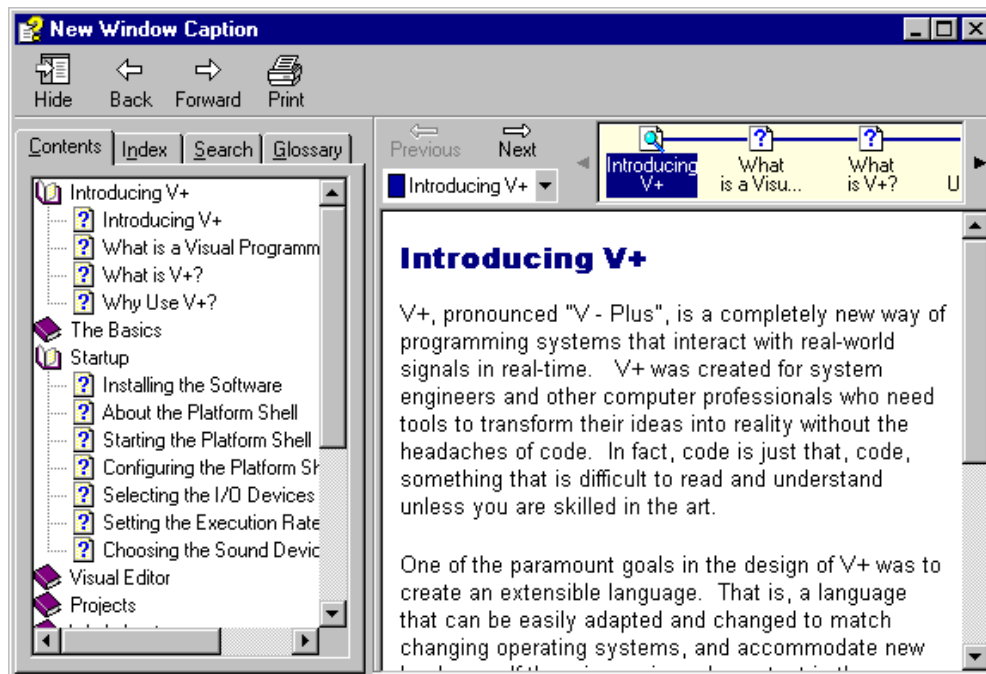


Figure 11 - V+ Online Help System

Use either of the following methods to access the online manual:

- Select **Help > User Manual**.
- Select the "F1" key.

Note: It is recommended that you view the User's Manual with your browser window expanded due to the size of some of the screen shots. In addition, if you are viewing this User's Manual on the internet, it is recommended that you use Internet Explorer 4.0 or greater.



Object Help System

This help system is used to familiarize users with the selection and use of V+ objects. This help system offers information on individual objects, the functions of the input and output pins and Static Data.

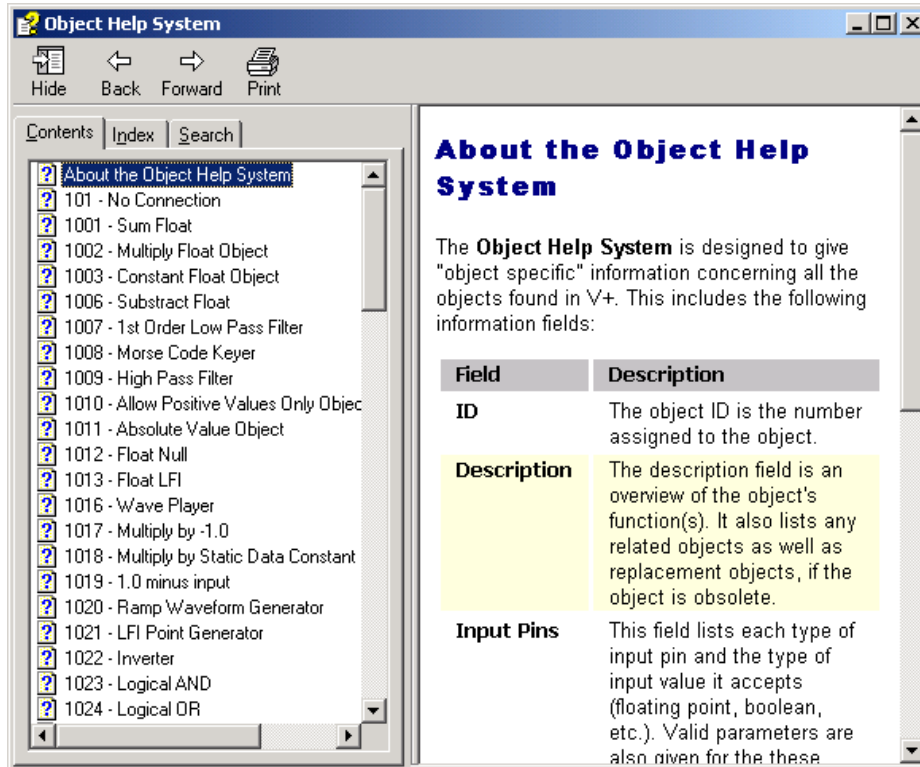


Figure 12 - Object Help System



STARTUP

System Requirements

Installing V+ is simple, and requires only a few steps. V+ is shipped CD-ROM or can be downloaded from the Internet.

Part Number	Description
VPLDEV-X86	V+ Development System for X86 Based Systems
VPLRTL-X86	V+ Run-Time System See I/O Device List for I/O Devices that are Included with the Run-Time System

Make sure your computer meets the following minimum system requirements:

To properly run the software you need:

Processor

Intel Pentium 4 Processor
512K L2 Advanced Transfer Cache
533MHz System Bus

Motherboard

ATX 533MHz-capable Socket 478 DDR Motherboard
Native USB Support
ACPI/WOL Compatible

Memory

512MB DDR (Double Data Rate) SDRAM
PC2100 266MHz or Faster

Hard Drive

Ultra ATA/100 7200RPM High Performance Hard Drive
10GB or Larger

Communication

One or more 10/100Mbps Ethernet Adapters
ACPI/WOL Compliant

Video

AGP 2X, 32MB or greater with OpenGL driver support

CD-ROM

48x or faster CD-ROM Drive

Floppy Drive

1.44MB 3.5" Floppy Drive

Power Supply

ATX 2.03(or above)-compliant Power Supply
300W or greater with 12V (Pentium 4) power connector

Operating System

Microsoft Windows 2000 or Windows^{XP} Professional



Note: For multichannel sounds cards, DirectX 7.0 may cause problems. Use Direct 6.0 until DirectX 8.0 or greater is available. You may need your original Windows operating system disk for the DirectX installation that follows the installation.



Operating System Compatibilities

Different V+ builds are compatible with different operating systems. Use the following instructions to determine which build is installed on your computer. See our website for a list of operating system compatibilities. <http://www.simphonics.com/products/software/compatibility.asp>

Determining Which V+ Version is Installed

To determine your V+ Version:

1. Select **Help > About V+** from the **V+ Visual Programming System**. This opens the **About VPLus** dialog box. Note: The last 3 numbers of the version number determine which V+ build is installed.

*Do not use the **V+ Run-time System** to determine which version you are using. The version number is displayed on your screen.*

Release Notes:

- For V+ Build 205 and later, Windows 95, Windows 98, Windows 98 Second Edition, and Windows NT are no longer supported as operating systems for new SimPhonics products. New products are now shipping with Windows 2000 or Windows XP. SimPhonics maintains older versions of all software. If you need an older version that may be compatible with an earlier operating system, [contact SimPhonics](#).
- If you are using Windows98SE or earlier and downloading **V+ Run-Time System** or **V+ Development System** you must install the latest version of DirectX. [DirectX is available for free from Microsoft](#).
- All V+ designs are completely portable across all platforms. If a V+ application was developed using windows 95 or 98, it will still work on Windows XP without modification.
- When using Windows NT with V+, ensure you are using service pack 4 or greater.
- Comprehensive release notes are available in the c:\program files\vplus\help folder.

***Warning:** You will lose any I/O devices if you uninstall V+ unless you follow the steps provided in the "Upgrading to a Newer Version of V+" section.*

Installing the Software

Before installation, login as the administrator on the system.

There are 2 ways to install V+ on your computer

- Install V+ from the CD
- Download V+ from SimPhonics' V+ Download Page.

To Install V+ from the CD:

1. Insert the media and execute the setup program on the disk.
2. The program's installer will walk you through the process of setting up the software. Follow the instructions and remove the CD when completed.

***Notes:** Be sure to use the default settings that the setup system requests to use.*



Upgrading V+

Always uninstall V+ before installing a new version.

Maintaining Registry Settings

When upgrading or installing a newer version of V+ the I/O device drivers will be removed also. To avoid the process of reloading the device drivers, there is simple procedure to save (i.e. Export) your registry settings and then recover (i.e. Import) them after your V+ upgrade.

This process takes only a few minutes and allows you to get back to your application or design efforts! The four steps of the process are detailed below.

Note: The following steps are only necessary if you want to keep your old settings and I/O devices.

- 1) **Export V+ Registry Settings**
 - a. Select **Run** from the **Start** menu.
 - b. Enter **regedit** to open the **Registry Editor** dialog box.
 - c. Browse to **HKEY_LOCAL_MACHINE\SOFTWARE**.
 - d. Highlight the SimPhonics folder.
 - e. Select **Export Registry File** from the **Registry** menu.
 - f. Save file as **vplusreg** on your desktop.
 - g. Close **Registry Editor** dialog box.
- 2) **Uninstall V+**
 - a. Select **Start > Settings > Control Panel**.
 - b. Uninstall old version of V+ via Add or Remove Programs selection.
- 3) **Reinstall V+**
 - a. Reinstall new version of V+ either via CD or Web download.
- 4) **Import Registry Settings**
 - a. Double click the **vplusreg** file on your desktop.
 - b. Select **Yes** to add the information to the registry.
 - c. Select **OK**.

About the V+ Run-time System

The V+ Run-time System is a configuration and execution tool for V+ designs. It is also the platform on which V+ designs are executed (ran). To understand how this system works, you must first understand the basics behind the V+ Development System. V+ takes related design files (filename.des) and incorporates them into a project file (projectname.vpj). Then, an executable **.vne** file is created allowing the visual program to be executed in the Run-time System. The Development System is used to develop V+ applications and is not needed to run or configure the design.

V+ must be fully configured when editing designs since all execution and resource aspects of V+ are contained in the Run-Time System. However, this system can function as a stand-alone platform during Run-Time.

The platform shell informs the editor of the object inventory. That is, the platform shell contains the actual objects that V+ can use.



Starting the Run-time System

The Run-time System must be started and configured (see [Configuring the Run-time System](#)) before a V+ design or project can be created.

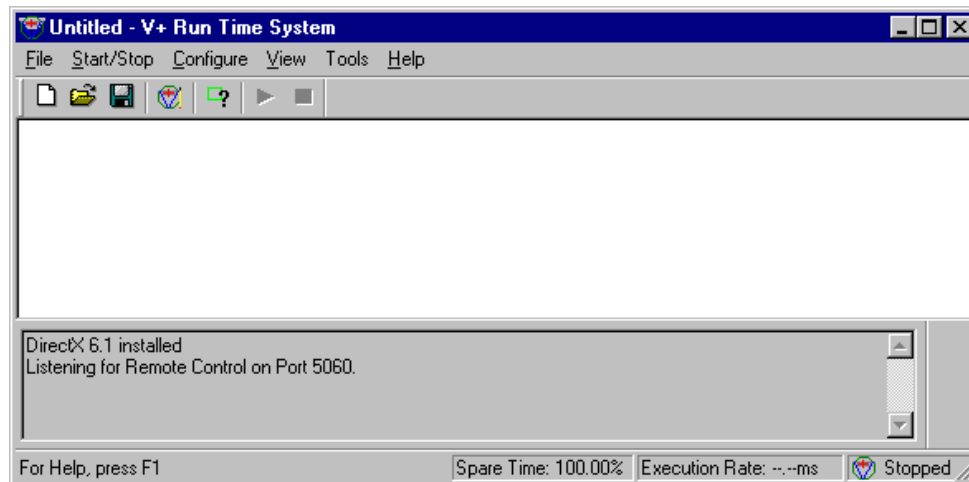


Figure 13 - Run-time System

Note: Before the Run-time System is launched, or when it is closed, the menus and toolbar buttons in the V+ Development System are disabled, not allowing V+ designs to be edited.

Use one of the following methods to launch the Run-time System:

- Select the executable file "vplptsh.exe" from the "VPLus" folder in your Windows Explorer.
- Select **Programs > VPLus > V+ Run-Time System** from the **Start Menu**.

Tip: The Platform Shell can also be launched by first starting the V+ Development System. The Platform Shell automatically loads in a separate window behind the Development System.

Configuration

Configuring the Run-time System

Once the V+ Run-time System is started, it must be configured for use. The Platform Configure dialog box is used to configure the following:

- I/O Devices
- Execution Speed
- Sound Card Configuration
- Third Party Devices

Tip: If you need help configuring an I/O Device, highlight the device and select the **Help** button to activate the I/O Device Help System.

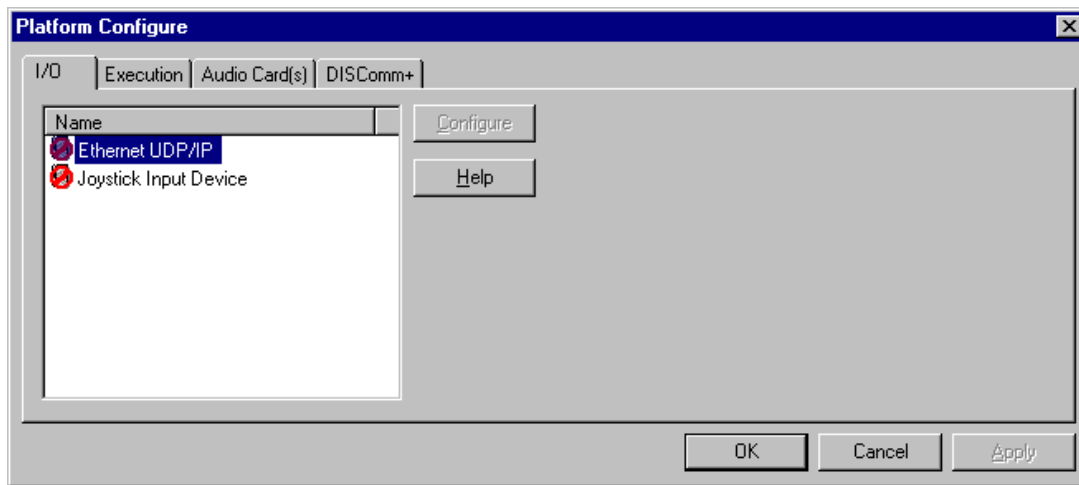


Figure 14 - Platform Configure Dialog Box

To open the Platform Configure dialog box:

1. Select **Configure** from the V+ Run Time System menu. This opens the **Platform Configure** dialog box.



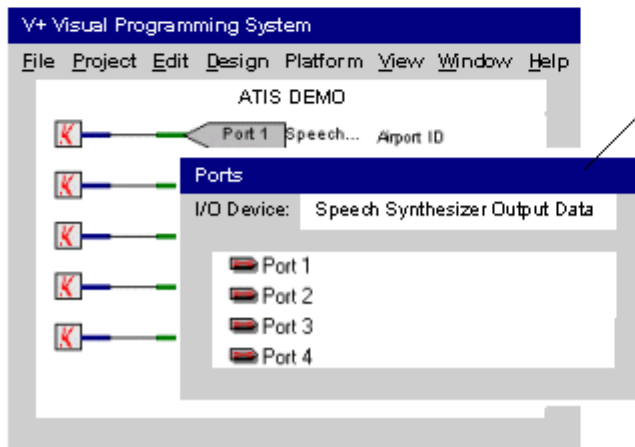
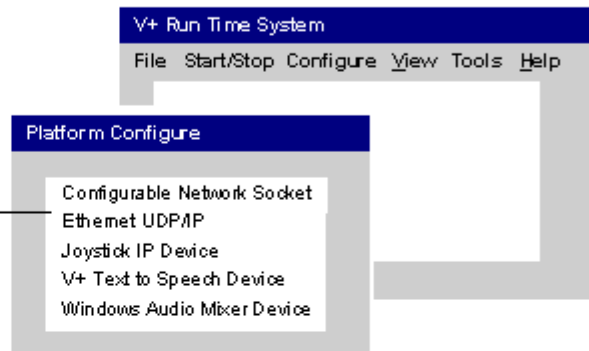
About IO Devices

I/O DEVICES

- Custom Socket
- UDP/IP
- Joystick
- Text-to-Speech
- Windows Audio Mixer
- FX-30
- ISED
- PROFIBUS
- SCRAMNET

IO devices are tools that provide V+ with input and output connections to the real-world. Each I/O device supplies one or more sets of ports. Ports are the elements of an I/O device that represent each byte, word, etc. SimPhonics provides a list of I/O devices as well as an I/O Device Development kit for users who wish to develop their own I/O device.

Once an I/O device is downloaded, it is accessed and configured through the **V+ Run Time System** configure menu.



After the I/O device is configured, the ports associated with the device are available through the **V+ Visual Programming System**. These ports are then placed in the design where they connect data between V+ and the real world.

Loading/Enabling I/O Devices

The I/O Drivers property page allows the user to load/enable the necessary I/O devices. If the device you want to configure is not found, it needs to be installed on your computer. Go to <http://www.simphonics.com/supp/downloads/default.asp> to download additional V+ I/O devices.


Auto Load Feature

Starting with V+ Build 230, I/O devices can auto load themselves if a certain registry key is present for the I/O device. This feature is currently available for the **SMx Audio System Software**.

When using V+ Version 1.0, Build 230 or later and **SMx Audio System Software** Version 2.0, Build 106 or later, the SMx driver is automatically loaded and enabled when the run-time system is started.



To enable/load I/O devices:

1. Select **Configure** from the V+ Run Time System menu. This opens the **Platform Configure** dialog box.
2. Select the I/O Drivers tab from the Platform Configure dialog box.
3. Double click the icon next to the desired I/O device. The device is enabled when there is no longer a  over the device.
4. Select **OK**.

*Note: If you need help configuring an I/O Device, highlight the device and select the **Help** button to activate the I/O Device Help System.*

Setting the Execution Rate

The **Execution** property page of the **Platform Configure** dialog box is used to set the execution rate for the selected platform. The execution rate is shown in milliseconds. For example, an execution rate of 25 means the platform will be executed every 25 milliseconds, or 40 times per second.

To set the execution rate:

1. Select **Configure** from the V+ Run Time System menu. This opens the **Platform Configure** dialog box.
2. Select the **Execution** tab from the Platform Configure dialog box.

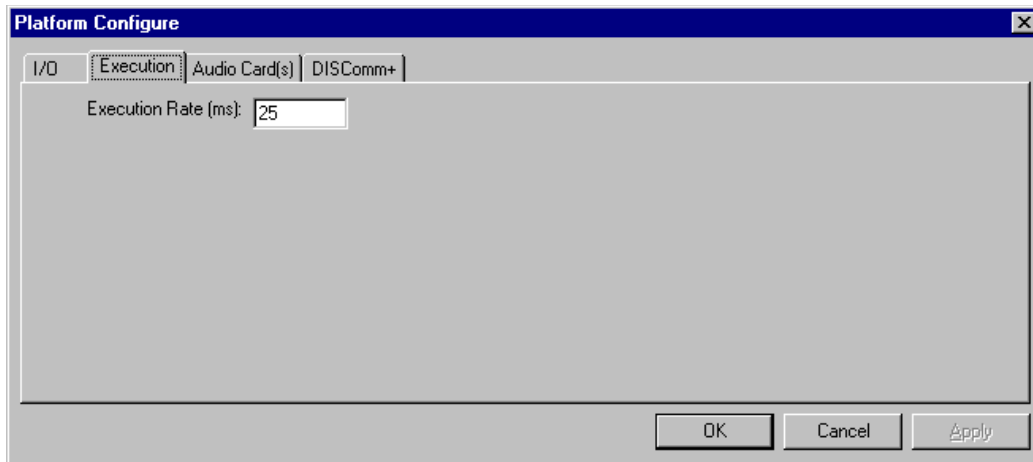


Figure 15 - Setting the Execution Rate

3. Enter the desired rate in the **Execution Rate** text box.
4. Select **Apply** to apply the rate.
5. Select **OK**.

Note: The default execution rate is 25ms.

Configuring Audio Cards

The Sound Device Configuration tab of the Platform Configure dialog box is used to choose input and output channels and to set the channel properties.



1. Select **Configure** from the V+ Run Time System menu. This opens the **Platform Configure** dialog box.
2. Use the **Up** and **Down** buttons to locate the correct output and input sound devices.
3. Select the correct devices. The choices are highlighted when the selection is made.

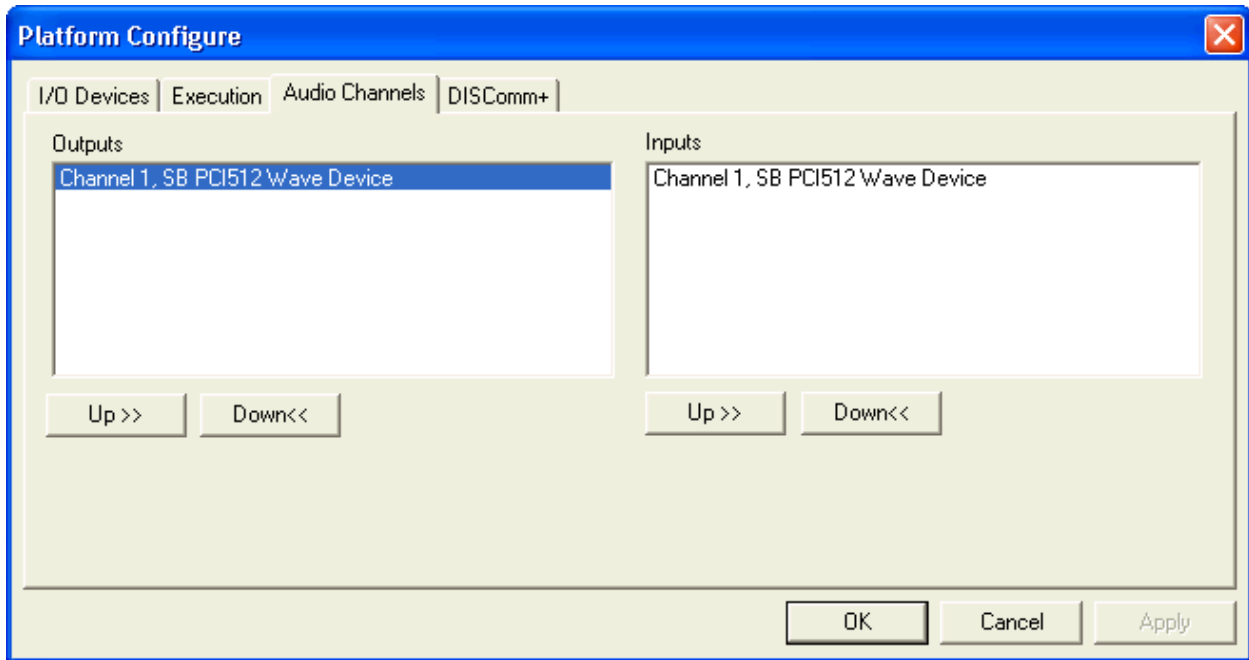


Figure 16 - Choosing the Sound Device

Configuring Channels for DIS/HLA Communications

Be sure to select 16 Bits/Sample when using a channel for DIS/HLA communications. The run-time system will not start when 8 Bits/Sample is selected, and the following text appears in the message box:

"Channel "n" bits/sample must be at least 16. Change the setting and restart."

Where "n" is the channel number.

V+ is not designed to run using 8 Bits/Sample because of unacceptably poor performance for communications systems while using this setting.

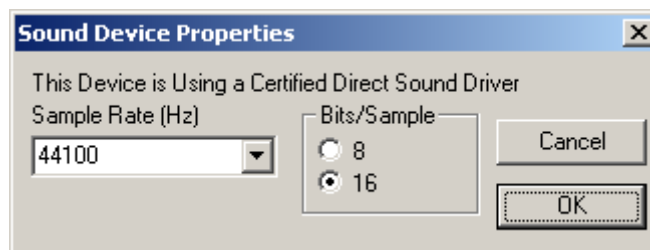


Figure 17 - Sound Device Properties




VISUAL EDITOR

About the Visual Editor

The Visual Editor is a development system. It is used to create and edit V+ designs.

Starting the Visual Editor

Use any of the following methods to launch V+ Development System:

- Select the  button from the V+ Run Time System toolbar.
- Select the executable file V+.exe from the Windows Explorer.
- Select **Programs > VPLus > V+ Editor** from the **Start** menu.

Note: Launching the visual editor (V+ Development System) opens the Platform Shell window. The Platform Shell must be configured before a design can be edited in the Development System. See [Configuring the Platform Shell](#) for help.



PROJECTS


About V+ Projects

Projects allow multiple worksheets to be contained in one design by encapsulating these related worksheets into a single project file (projectname.vpj). During run-time, all worksheets contained in a project execute simultaneously. This allows the user to create and test different portions of a design independently. Worksheets can be created as stand-alone designs or inserted into a project with other worksheets. See [About Design Execution](#) for more information concerning the execution of V+ projects.

Starting New Projects

In the past, V+ designs have simply been saved as design files (filename.des). Now, you can encapsulate multiple related design files into one Project File (projectname.vpj). This creates a manageable, hierarchical collection of designs, which can be displayed and viewed in the Project Manager Window. The Project Manager consists of a tree directory in which the project hierarchy is shown.

To start a new project:

1. Select **File > New > Project** from the V+ Visual Programming System menu. This activates the **Project Manager Window** button - .

Opening Projects

Existing project files (*.vpj files) are opened from the V+ Editor.

To open an existing project:


1. Select **Project > Open Project**.
2. Locate and open the project.

Note: Before opening and executing a project, make sure the correct Run Time System .vne file is open. To do this, go to the V+ Run Time System (Platform Shell) and select **File > Open**. Then browse for and open the .vne file.

Managing Projects

Projects are viewed and maintained in the **Project Manager** window. The worksheets contained in the project are displayed in a tree directory. See [Inserting Worksheets](#) for instructions on adding files to projects.

To display the project manager window:

1. Select the  button from the toolbar.
2. To access a file within a project, double-click the filename in the project list. An open design file is shown in the Project Manager with the V+ icon while a closed design file is shown as a closed folder.

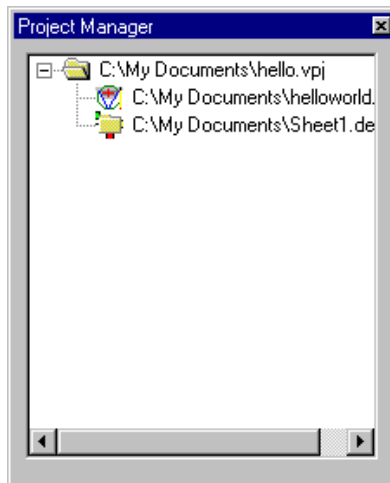



Figure 18 - Project Manager Dialog Box

Inserting Worksheets



Existing files, or worksheets, can be inserted in the Project Manager at any time.

To insert a file:


1. Open the project. See Opening Projects for instructions.
2. Select the  button to display the Project Manger window.
3. Right click inside the Project Manager window
4. Select Insert Files into Project from the pop-up menu.
5. Locate and open the desired file. This inserts the file in the project and displays it in the **Project Manager** window.

Adding Worksheets (Designs) to Existing Projects

V+ is divided into a development environment, **V+ Visual Programming System**, and run-time environment, **V+ Run Time System**. Using the development environment, related design files (filename.des) are incorporated into a project file (projectname.vpj). Then, an executable .vne file is created allowing the visual program to be executed in the run-time environment. When a new worksheet is added to a project, there are a few steps you must follow to successfully make this change part of the run-time system and executable file.

1. Using the **V+ Visual Programming System**, open the **V+** project (projectname.vpj).
2. Stop the **V+ Run Time System**, if it's running.
3. Using the **V+ Visual Programming System**, create a new worksheet, or insert an existing worksheet into your project.
4. Select **Start** from the **Platform** menu (or select  from the shortcut bar) to execute your project.
5. After verifying the project is successfully running, select  from the shortcut bar to stop the project.




6. Save your project. *Note: Once your project has been successfully executed and saved, you must also save the new executable/platform configuration file.*
7. Go to the **V+ Run Time System** window.
8. Select **Save** from the **File** menu (or select  from the shortcut menu) to save the current platform configuration (.vne file).

Removing Worksheets

Files, or worksheets, can be removed from a project using the Project Manager.

To remove a file:

1. Open the project. See [Opening Projects](#) for help.
2. Select the  button to display the **Project Manger** window.
3. Right click the mouse on the file you wish to remove.
4. Select Remove From Project.

Saving Projects

To save a project:

1. Select Project > Save Project.

Tip: You can also save the project by clicking "Save Project As" under the V+ Project menu. Save the project in a directory of your choice.

Closing Projects

To close a project:

1. Select **Project > Save Project** from the Visual Programming System window.
2. Select **Yes** to save and close the project.



WORKSHEETS

About Worksheets

A design file in V+ is called a worksheet. Worksheets can be large complete designs or more compact designs which are part of a project. Worksheets are individual, working designs independent of other worksheets and stored in a project file. They are saved with a .des extension.




Creating New Worksheets

Use one of the following methods to start a new worksheet:

- Select **New > File**.
- Select the  button from the toolbar.

Editing Existing Worksheets (Designs)

V+ is divided into a development environment, **V+ Visual Programming System**, and run-time environment, **V+ Run Time System**. Using the development environment, related design files (filename.des) are incorporated into a project file (projectname.vpj). Then, an executable .vne file is created allowing the visual program to be executed in the run-time environment. When a worksheet is edited in an existing project, there are a few steps you must follow to successfully make this change part of the run-time system and executable file.

1. Using the **V+ Visual Programming System**, open the **V+** project (projectname.vpj) containing the worksheet.
2. Stop the **V+ Run Time System**, if it's running.
3. Using the **V+ Visual Programming System**, make the necessary changes to your worksheet.
4. Select **Start** from the **Platform** menu (or select  from the shortcut bar) to execute your project.
5. After verifying the project is successfully running, select  from the shortcut bar to stop the project.
6. Save your project and worksheet. *Note: Once your project has been successfully executed and saved, you must also save the updated executable/platform configuration file.*
7. Go to the **V+ Run Time System** window.
8. Select **Save** from the **File** menu (or select  from the shortcut menu) to save the current platform configuration (.vne file).


A Comment on Comments

You can add text anywhere on a worksheet to make it more readable. Everyone will appreciate your comments when they are using your designs.



Adding Comments

To add comments:

1. Select the  button from the toolbar.
2. Place the cursor anywhere on the worksheet and double click the mouse. This opens the **Edit Text** dialog box.
3. Enter your comments in the dialog box and select the **OK** button.

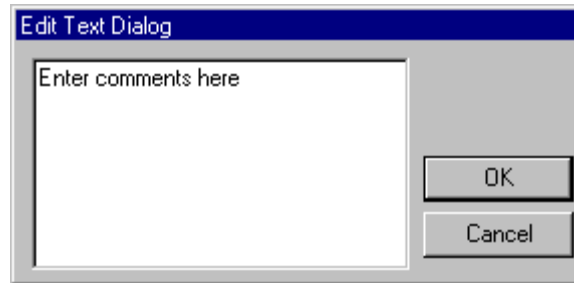


Figure 19 - Edit Text Dialog Box

Editing Comments

Comment text, font and background properties can be changed at any time.

To edit text:

1. Right click on the text.
2. Select **Edit** from the pop-up menu to open the **Edit Text** dialog box.
3. Edit your text.
4. When finished, select the **OK** button.

To change the font:

1. Right click on the text.
2. Select **Font** from the popup menu to open the **Font** dialog box.
3. Select the desired font and font properties.
4. When finished, select the **OK** button.

To change the background properties:

1. Right click on the text.
2. Select **Background** from the popup menu to open the **Worksheet Text Properties** dialog box.
3. Select the desired background properties.
4. When finished, select the **OK** button.

Moving Comments

Comments can be moved anywhere on the worksheet.




To move comments:

1. Press the left mouse button on the comment box and drag the comments to the desired location on the worksheet.

Removing Comments

To remove the comment box:

1. Left click the comment to select it.
2. Select the  to remove the comment box from the worksheet.

About Customizing Worksheets

V+ offers the tools to customize worksheets to suit your needs and match your preferences. The following worksheet properties are changed using the Page Layout dialog box.

- Paper Size
- Grid
- Background color

Setting Page Properties

The Page Layout dialog box is used to customize the worksheet. The page size and paper color are determined and the layout grid is enabled from the Page Layout dialog box.

To open the Page Layout dialog box:

1. Click **Design > Page Properties** or right-click on the worksheet and choose **Properties**. This opens the Page Layout dialog box.

Choosing Paper Size

The default page layout is "B" size, or 11" X 17."

To change the paper size:

1. Select the applicable radio button. Your selection is displayed in the edit boxes.
2. Select **OK**.

Tip: Use the Custom radio button to enter paper sizes not listed in the dialog box.

Enabling the Background Grid

To enable the background grid:

1. Select the **Enable Grid** check box.
2. Select **OK**.



Changing the Background Color

To select a background color:

1. Select the **Paper Color** button. This opens the **Color** dialog box.
2. Select the background color.
3. Select **OK**.

TIP: If the color you desire is not listed, click the **Define Custom Colors** button on the Color dialog box. Using the point and click capability of the mouse, select the desired color. Click Add to Custom Colors then OK to apply this color to your background.

Zooming In and Out

The default worksheet zoom level is set to 100%, or actual size. The zoom is limited from 25% to 225%, with 25% increments. There are a couple of ways to zoom in and out. The first is from the main menu; the second is with the zoom tool, found in the worksheet toolbar (see image below).

Using the Main Menu	Using the Zoom Tool
<p>To zoom in using the main menu:</p> <ol style="list-style-type: none">1. From the main menu, select View > Zoom > Zoom In. <p>To zoom out using the zoom tool:</p> <ol style="list-style-type: none">1. From the main menu, select View > Zoom > Zoom Out.	<p>To zoom in using the zoom tool:</p> <ol style="list-style-type: none">1. Select the zoom tool from the toolbar.2. Click on the worksheet to zoom in 25%. Repeat Step 2. until desired view is reached. <p>To zoom out using the zoom tool:</p> <ol style="list-style-type: none">1. Select the zoom tool from the toolbar.2. Right-click on the worksheet to zoom out 25%. Repeat Step 2. until desired view is reached.

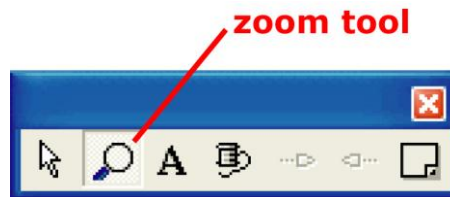


Figure 20 - Zoom Tool



OBJECTS

About Objects

Objects are the primitives, or the essential programming tools, of the V+ Programming System. Objects represent an executable set of instructions which, when connected to other objects or ports, act on incoming or preset data.

When an I/O Device is chosen and configured in the Platform Shell, a list of objects associated with that device is made available in the V+ Object View dialog box. The list of objects is constantly growing. Ensure that you have the latest release of V+.

Obsolete Objects


Object names beginning with (Obsolete) will be removed from the object list, although the objects will still load from disk and otherwise operate the same as before. SimPhonics uses this obsolescence mechanism to ensure that these objects are not used for new designs, but still load and may function properly. Be sure to check your objects to ensure that the names do not contain (Obsolete) in the title.

A warning message will be generated in the development system message window during execution if any objects in your design are obsolete. Warnings do not stop the system from executing, so the system will continue to run. However, the obsolete object may not function properly. The format of the message is: **“Warning, obsolete object on (worksheet name): x, y”** Where x and y are the worksheet locations. This error will be displayed in the development system message window when the design is started. A message will be printed for each object that is found to be obsolete.

Opening the Objects List

A list of all available objects is found in the Objects dialog box.

To open the Objects dialog box:

1. Select the  from the project toolbar or select **View > Toolbars > Objects**.

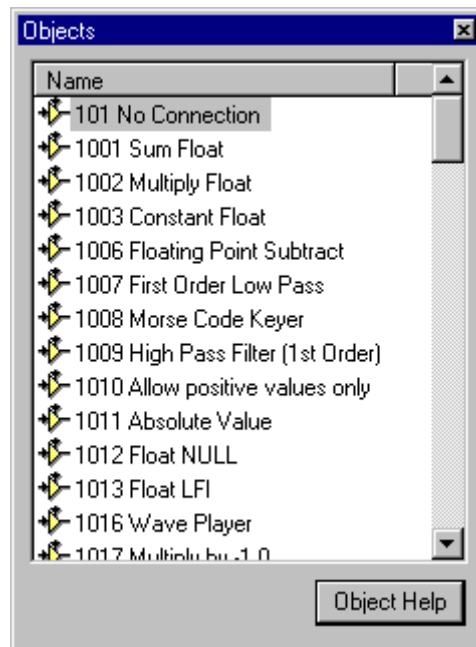



Figure 21 - Objects Dialog Box

Placing Objects on Worksheets

To place an object:

1. Select the  button or select **View > Toolbars > Objects**.
2. Double-click the object you want to place on the worksheet.
3. Place the cursor on the worksheet and click the mouse. The object is now displayed on the worksheet with the input and output pins shown.

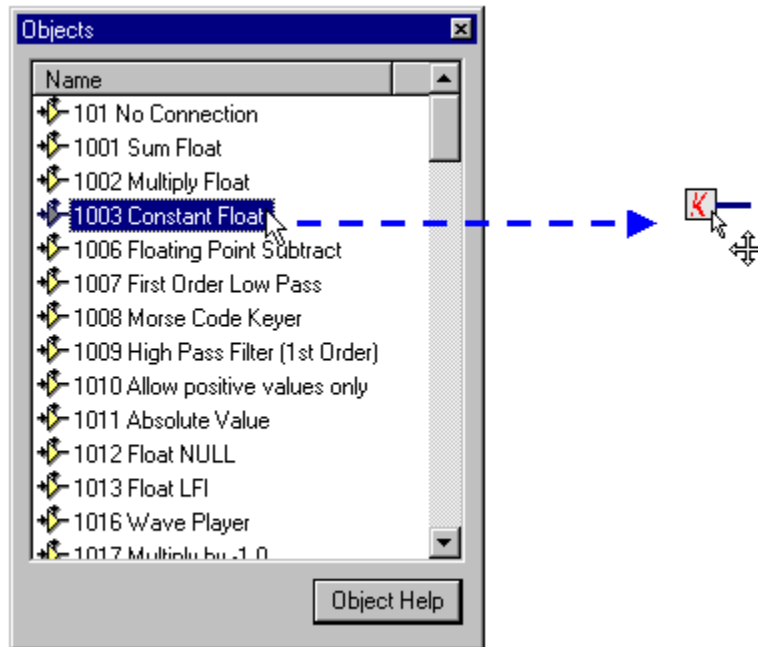


Figure 22 - Placing Objects on Worksheets

Note: The color of the input/output pins is determined by your system colors.


Rearranging Objects

Since V+ is a visual language, it is in your best interest to keep the design as simple as possible. Direct routes between objects make the design flow easier to visualize. As you add elements to your design, it may be helpful to reorganize the objects or restructure the design. This is easily accomplished using the following methods:

- dragging
- rotating
- flipping
- mirroring

Dragging Objects

To drag an object:

1. Select the  from the design toolbar.
2. Position the arrow over the object. The arrow is properly positioned when a 4 headed arrow appears (see below).
3. Use the left mouse button and drag the object to its new location. As you drag, a dashed rectangle appears around the object.

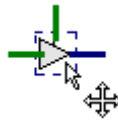



Figure 23 - Dragging Objects

Note: Moving an object does not affect its connections to other objects or ports. See [About Nets](#) for help with connections.

Rotating Objects

Objects can be rotated counter clockwise in 90 degree increments.

To rotate an object:

1. Select the  from the design toolbar.
2. Right click on the object. This opens the object menu box.
3. Select **Rotate**. This rotates the object 90 degrees counter clockwise as shown below. Repeat the process to continue rotating the object.

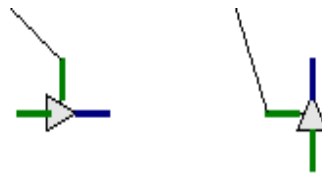



Figure 24 - Rotating Objects

Note: Rotating an object does not affect its connections to other objects or ports. See [About Nets](#) for help with connections.

Flipping Objects

Objects can be flipped upside down.

To flip an object:

1. Select the  from the design toolbar.
2. Right click on the object. This opens the object menu box.
3. Select **Flip**. This flips the object upside down, as shown below. Repeat the process to flip the object back to its original position.

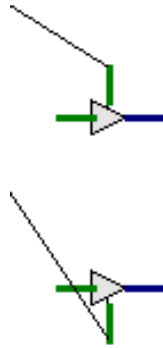


Figure 25 - Flipping Objects

Note: Flipping an object does not affect its connections to other objects or ports. See [About Nets](#) for help with connections.

Mirroring Objects

When an object is mirrored, it is flipped horizontally.

To mirror an object:


1. Select the  from the design toolbar.
2. Right click on the object. This opens the object menu box.
3. Select **Mirror**. This flips the object horizontally, as shown below. Repeat the process to flip the object back to its original position.





Figure 26 - Mirroring Objects

Note: Mirroring an object does not affect its connections to other objects or ports. See [About Nets](#) for help with connections.

Deleting Objects

To delete an object:

1. Select the  button from the design toolbar.
2. Click on the object you want to delete.
3. Select the  button from the design toolbar or press **Delete** on the keyboard.




Note: When an object is deleted, all its connections are also deleted.

Getting Help for Objects

Help is available for each object. See [Object Help System](#) for additional information.

To access Object help:

1. Select the  from the project toolbar or select **View > Toolbars > Objects**.
2. Select the object you wish to view help for.
3. Select the **Object Help** button.

Tip: Help is also available for objects already placed on the worksheet. Right mouse click over the object in question. Choose Description. This opens the help window.



STATIC DATA

About Static Data

Static Data is data which cannot be altered in any way by the operation performed by the V+ object. This data is set in the object itself and can include such information as filenames, channel designations, etc. One unique feature of V+ is this data can be changed at any point during run-time by a simple click of the mouse without having to reboot the system. This allows the programmer/designer to "tweak" the design during the run-time process and, by using monitors, watch how the change affects the outputs.

Some V+ objects, such as simple mathematical expressions, have no Static Data mechanism since they perform operations based only on incoming data.

TIP: The **Object Help System** describes static data settings for each object. See [Object Help System](#) to access this help system.

Types of Static Data

The table below gives a list of static data types and a brief description. Use the Object Help System for a detailed description of an object's static data settings.

Type	Description
Single precision float	A constant. This control defaults to a min of 0 and a max of 1.0
Null terminated text string	Anything that needs a string of text in an object to be in static data will use this control. A .wav file is an example of this type of static data
LFI (Linear Function Interpolator) Point Generator	

Accessing Static Data

To access static data values:

1. Right-click the mouse on the object and select Static Data or double click on the object.
2. If there is only one type of static data, the data dialog box opens, skip steps 3-4 and go to Setting Static Data. If there is more than one type of static data, the dialog box opens.
3. Select the type of static data you wish to access.
4. Select **OK**. Use the appropriate instructions below to set the data.





SETTING STATIC DATA

- Constants
- Files
- LFI Points

Single precision float - Constant

The control defaults to a min of 0 and a max of 1.0

To set static data values:

1. Click the  button on the left side of the Constant dialog box and set the value in the Maximum edit box to any number greater than one.
2. Select **OK**.
3. Once the Min/Max Extents have been set, the actual initial value of the Constant Float object can be set. Select the  button.
4. Enter the initial value of the Constant Float.
5. Select **OK**.

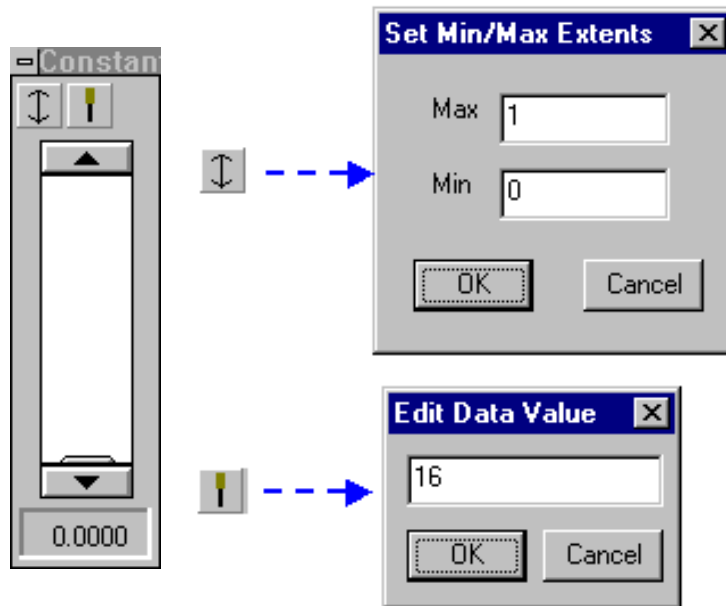


Figure 27 - Setting Static Data

Note: When working with constants, the Minimum/Maximum Extents have to be set before the actual value of the Constant Float object is set. The Min/Max Extents dialog box determines that the actual value will fall between the values entered enabling the slider control you see in the Static Data for the Constant Float object



Null terminated text string

To set static data for null terminated text strings


1. Select the  button.
2. Browse for and select the appropriate file.
3. Select the green Lock button to select the file. The Filename Box is shown below.



Figure 28 - null terminated text string Static Data

LFI (Linear Function Interpolator) Point Generator

To set x, y points on the LFI table:

1. Select **Add Point**
2. Use the mouse to drag the point to the desired location on the table.

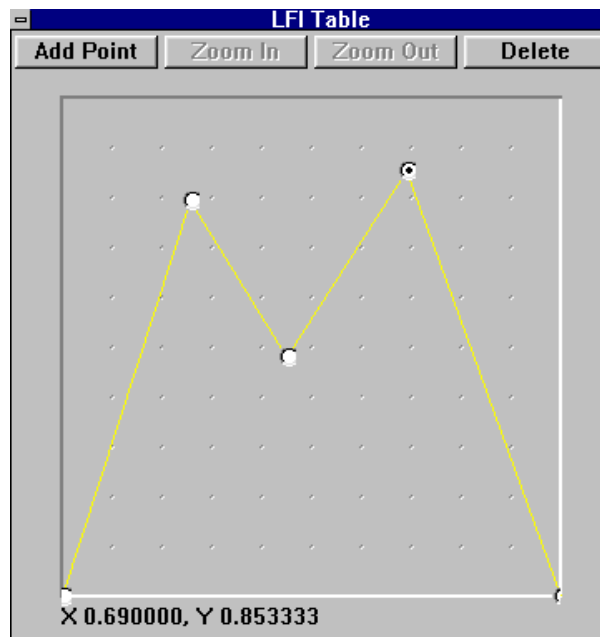


Figure 29 - LFI Point Generator

To delete a point:

1. Highlight the point and select the **Delete** button.

Note: Points must be placed at unique x locations.



Changing Static Data

The steps involved in changing static data are the same as setting the data. See [Setting Static Data](#) for help.



NETS

About Nets

In V+ terminology, a net is a connection device which links the output pin of an object or port to an input pin of another object or port. A net must be started on an output pin and continue to an input pin. A net can be routed anywhere on the active worksheet. This is useful for routing nets around objects and other obstacles.

Visually, a net is a small line connecting two pins. Below is an example of a net connecting 2 objects.

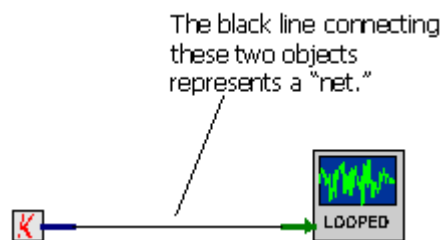



Figure 30 - Net

Connecting Objects with Nets

Visual objects and ports are connected via "nets". A net connects an object's output pin to one or more inputs to another object or port. Nets are drawn, manually on the worksheet using the mouse. Nets must start on an output pin and continue to one or more inputs. Nets may be routed around corners, "anchors", and do not have to go directly to the destination. Junctions may be added to existing nets in order to add another input to the net.

To link objects:


1. Select the  from the design toolbar or select **Design > Tools > Net**.
2. Click on the output pin of the object you are connecting from.
3. Click on the input pin that you want to connect to. The two objects are now linked.

Tip: Nets can be routed around objects by clicking the left mouse button where the net should change direction and continuing to the input pin.

Moving Nets

Nets can be routed anywhere on the worksheet. This is useful for routing nets around objects or other obstacles.

To move the net:

1. Select  from the design toolbar or select **Design > Tools > Net**.
2. Click on and drag the net. A dashed line appears around the angle that is being moved.

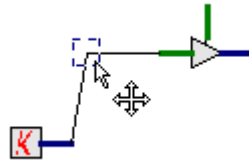


Figure 31 - Moving Nets

Deleting Nets

There are two ways to delete nets:

- before they are connected to input pins
- after they are connected to input pins

To cancel a net before it is connected to an input pin:

1. Right click the mouse.
2. Select **Cancel Net**.

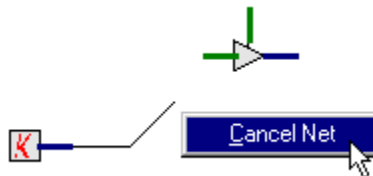



Figure 32 - Canceling Nets

To delete a net after it is connected to an input pin:

1. Select  from the design toolbar.
2. Click on the net you want to delete. The net changes to a dashed line.

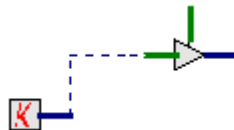


Figure 33 - Deleting Nets

3. Select  from the design toolbar or press **Delete** on the keyboard.



PORTS

About Ports

In V+, Ports are the primitive elements of I/O Devices. They connect data from an external device to V+ worksheets. After the I/O device has been selected in the Platform Shell, the ports associated with that I/O device are loaded into the Port List in the V+ Development System and made available to the user. Before an I/O Device is selected and configured, the Port List dialog box remains empty. All ports names can be changed from the default name to any name up to 255 characters. Below is a graphical representation of V+ ports.

Normal Input Port	Non Available Input Port	Non Unique Input Port
	 An input port which is not available due to the I/O device not being configured or not physically connected. A message box will also appear indicating this.	 An input port that is not unique. That is, a port that is already in use on that worksheet or on other worksheets. A message box will also appear indicating this. A red port icon in the Port List dialog box will also indicate this with an "X" in the "in use" column.

Placing Ports on Worksheets

Ports are placed on worksheets and serve as input and output data mechanisms. To select a port, the desired I/O device must first be selected and configured. See [Selecting the I/O Device](#) for more information concerning configuring I/O devices. Once the Platform Shell is configured, a list of available ports is loaded into the Port List.

To place a port:

1. Select or select **View > Toolbars > Ports**.
2. Select either the input or the output option from the drop box.
3. Double-click the port and drag it to the desired location on the active worksheet and click the port again. The port is now displayed on the worksheet.

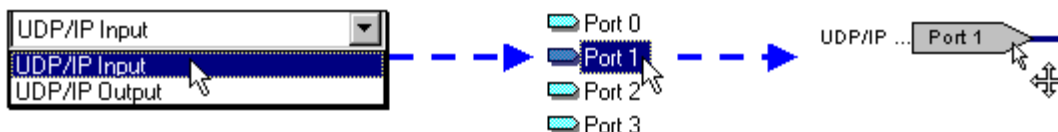


Figure 34 - Placing Ports



Using Connections With Ports

To use connections, or nets, with input or output ports, follow the same process as you would with any other object.

See [Connecting with Nets](#) for more information.

Moving Ports

Since V+ is a visual language, it is in your best interest to keep the design as simple as possible. Direct routes between objects and ports make the design flow easier to visualize. As you add elements to your design, it may be helpful to move ports. This is easily accomplished using the following methods:

To drag a port:

1. Select the arrow tool from the design toolbar.
2. Position the arrow over the port. The arrow is properly positioned when a 4 headed arrow appears (see below).
3. Use the left mouse button and drag the object to its new location. As you drag, a dashed rectangle appears around the object (see below).

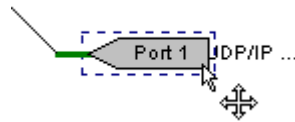


Figure 35 - Dragging Ports

Note: Moving a port does not affect its connections to objects. See [About Nets](#) for help with connections.



EXECUTION

About Design Execution

In V+, the initial order that objects are executed is the default order in which they were created. Multiple worksheets are executed in the order in which they appear in the Project Manager window.

Below is a graphic displaying the execution process involved in the V+ Programming System. The input ports are extracted from the worksheet(s) and executed first, then the actual objects on the worksheet(s) followed by the output ports.

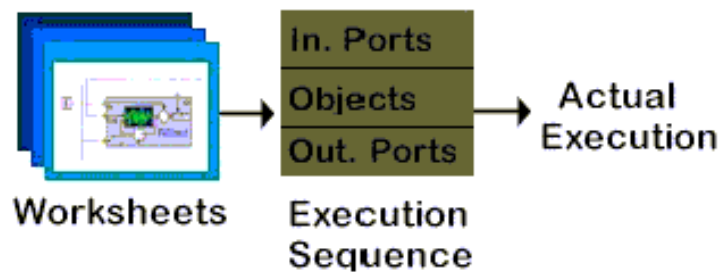


Figure 36 - Execution Sequence

Tip: V+ programs can be executed from the **Visual Editor** or the **Run-time System**. Developers should run designs from the **Visual Editor** while building their program. This makes it easier to monitor data and adjust settings. However, once designs are complete, they should be ran from the **Run-time system**.


Note: The "GUID" (Globally Unique Identifier) number is used for debugging and programming purposes only.

Executing your V+ Design

V+ programs can be executed from the **Visual Editor** or the **Run-time System**. Developers should run designs from the **Visual Editor** while building programs. This makes it easier to monitor data and adjust settings. However, once designs are complete, they should be ran from the **Run-time system**.

The Messages Area at the bottom left corner of the **Run-time System** reflects information regarding the status of the design during build and run-time.

Use either of the following methods to run a design from the V+ Editor:

- Select  from the platform toolbar
- Select Platform > Start.



Note: Once a design is executing, the Messages Area informs you that your design is running and a green light appears on the V+ Status Bar. Also, a green dashed line appears around all executing objects. This is important since during execution of individual designs, only the top-level design will execute. However, during execution of a project, all involved designs execute simultaneously. Below are graphics showing an object executing and one that is not executing.

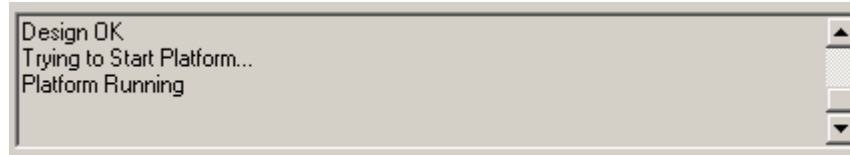


Figure 37 - Message Box

Executing...



Not executing...



Tip: While the design is running, you may at any time place a monitor on the output pins of any object or port to determine the status of data at that point of the design. The data can be manipulated with the Static Data controls and the value of the data on the output pins will reflect in real-time through a monitor placed on that pin. See [Monitoring Real-Time Data](#) for help.

Changing the Execution Order

The execution order of objects on a given worksheet is changed using the Execution Order dialog box. In the simple example below, the Multiply object was created before the Constant Float object that feeds data to both of its inputs. This sets the inputs on the Multiply object to zero on the first execution iteration. This can cause serious problems especially in the design of digital filters.

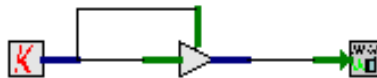


Figure 38 - Multiply and Constant Float Objects

To set the execution order:

1. Select **Edit > Execution Order**. This opens the **Execution Order** dialog box.
2. Select the object number (see below).
3. Use the **Up** and **Down** buttons to change the object order.
4. Select the **OK** button.



Figure 39 - Changing Object Execution Order



TROUBLESHOOTING

Editor and Run-time Errors

When the platform is started from the development system, there are two phases of error checking. The development system checks editor errors, such as unconnected pins, invalid ports, etc. Once the design checks OK, the run-time system is notified that it can begin the run-time startup error checking process. This is the runtime error checking phase,

Run-time Errors

If a run-time error stops the system, then the message, "*Run-time error. See run-time message window*" appears, in the development system message window. To review error details, go to the Run-time system message window.

Note: If the user stops the system, the message, "User stopped system." Appears in both the run-time and development system windows.

Editor Errors

If an object/port is causing an error, message provides the worksheet name, object name and X-Y coordinates. This feature is useful when working on large projects with multiple worksheets.

Log Files

The V+ Development System and V+ Run-time System can both generate text based ASCII log files collect information as the software is running. Logging is a feature that is available in V+ Build 362 and greater. The run-time system is where most of the log information would be useful since that is where V+ executes designs, user configuration occurs, etc. The Development and runtime log filenames are fixed with the following names:

Development System: **V+DevLog.txt**
Run time System: **V+RuntimeLog.txt**

The logging activity can be turned on or off via keys in the system registry. The locations are as follows. If the key is set to nonzero then logging will occur, otherwise it will be turned off.

Development system:
**HKEY_LOCAL_MACHINE\SOFTWARE\SimPhonics\VPLus\
DWORD "enableLogFile"**

Runtime system:
**HKEY_LOCAL_MACHINE\SOFTWARE\SimPhonics\VPLus\Platforms\Native Platform\
DWORD "enableLogFile"**

The files will be located in the folder where V+ lives. This is normally **C:\Program Files\VPLus\.** The file format for these log files are divided into two areas. The first area is initial information about the hardware and software of the computer and is the first section of the log file. The second area following the first is the actual log messages that are collected over time. Each message is numbered and time



stamped with an accurate time based on the CPU clock time. For example a typical log entry for the run time system is shown below. The font and font color has been changed for easy readability.

1 [2009-10-14] 14:11:17.490: Output Device 1 Found: -- IDT Audio1

The color coded text is defined as follows:

Black	Line Number
Red	Date: Year, Month, Day
Green	Time Stamp in 24 hour format: Hour, Minute, Second, millisecond
Blue	Actual message

All files start at the second character position and continue to the end of the line without any line breaks. There are no extra lines between message lines. Each log file will continue to gather messages until the software is closed regardless of the status of the run/stopped state. The files are not buffered and as soon as a message is generated, it goes directly to the disk and bypasses any buffering that the operating system may provide.

All information is flushed to the log file when V+ is started and stopped.



Ethernet Connections to/from V+

The following Ethernet configuration data is presented to help choose ports for various Ethernet interfaces in V+.

Interface	Port(s)	Protocol
V+ Remote Control	5067 – Transmit Port 5068 – Listen Port Controlled via registry variables at: HKEY_LOCAL_MACHINE\SimPhonics\Software\VPLus\ RemoteControlListenPort RemoteControlTransmitPort	TCP/IP
Custom Socket I/O Device	5050 – Listen Port Auto – Transmit Port User Programmable via GUI	UDP/IP
UDP/IP I/O Device	5070 – Transmit Port 5071 – Listen Port User Programmable via GUI	UDP/IP
Flash I/O Device	4345 – Listen Port Auto – Transmit Port This is currently hard coded.	TCP/IP
VComm DIS	3000 – Transmit Port User Programmable via GUI	UDP/IP

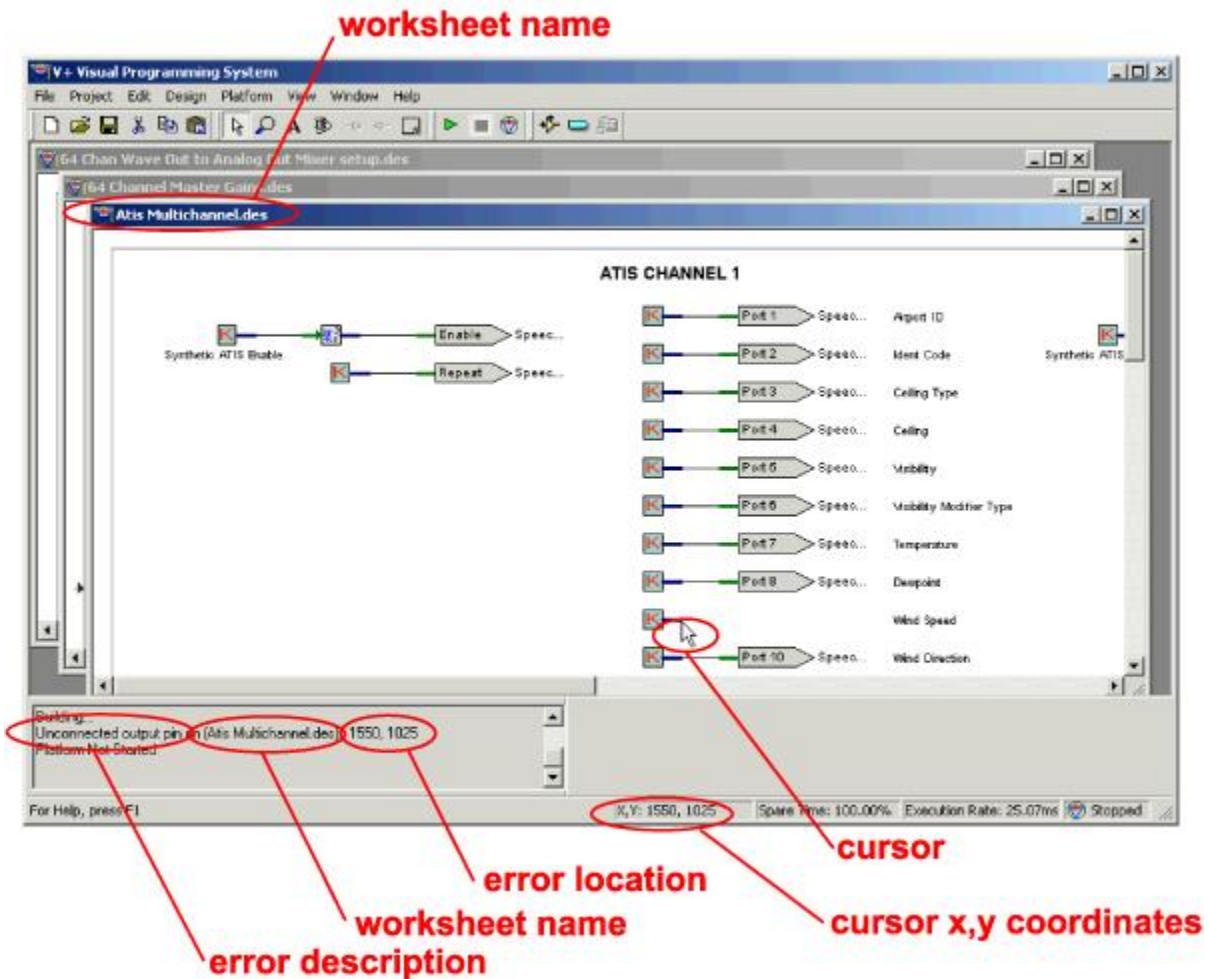


Figure 40 - Locating Errors

System Crashes

Possible Cause	Solution
Obsolete Object	Inspect your worksheet, and verify that the title of any of your objects do not start with the word "(obsolete)."



REAL-TIME DATA

About Real-Time Data

Any data that changes meaningfully with respect to time is referred to as time-based media, or real-time data. Real-time in operating systems is the ability of the operating system to provide a required level of data in a bounded response time. Audio clips are common forms of time-based media. Such media data can be obtained from a variety of sources, such as local or network files.

Monitoring Real-Time Data

Monitors allow the user to see the value of data within a V+ design during run-time. This gives V+ a distinct advantage over text-based programming languages in that the user can "tune" the design during real-time without having to change a line of code. A monitor is a box showing the data value of a particular pin at a given time during the execution of a design.

To monitor data:

1. Right click on the output pin of any object or port during run-time.
2. Select **Monitor**. A gray box appears showing the value of the data at that point (see below). Below is an example of a monitor placed on the output pin of the square root object with an input value of "16."

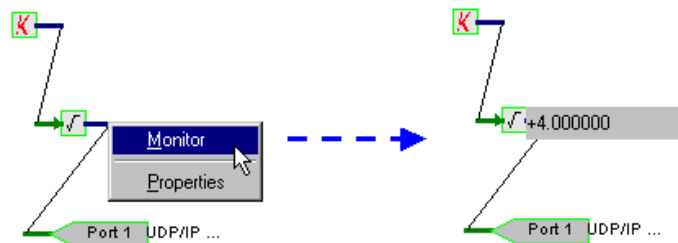


Figure 41 - Monitoring Real-time Data

Tip: To change the value of the data, adjust the Static Data control that inputs data to that pin. See [Changing Static Data](#) for help.

To close the monitor box:

1. Right click on the monitor box.
2. Select **Close** to close the monitor box.

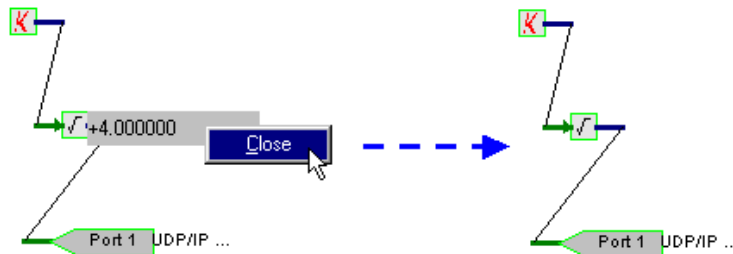


Figure 42 - Closing the Monitor Box



APPENDIX A - GLOSSARY

connections

In V+, these are called Nets, and they link output pins of an object to one or more input pins of another object or port. Nets appear as a line between two pins and can be routed around obstacles at the user's discretion.

design

A worksheet drawing(s) created in the V+ Development System. Designs are visual programs analogous to programs designed in a text-based programming system. A design may consist of one or more worksheets.

development system

Used to create and edit designs. Also called a visual editor.

I/O devices

Input and output mechanisms used to transfer real-world data into or out of a V+ design. I/O devices contain one or more ports that represent each element of an I/O device.

monitor

A box showing the data value of a particular pin at a given time during design execution.

nets

Connections that link output pins of an object to one or more input pins of another object or port. Nets appear as a line between two pins and can be routed around obstacles at the user's discretion.

non-native platforms

A non-native platform is a platform that is not the same as the development platform. All non-native platforms are external to the development machine. The ability to interface with external platforms is one of the most important features of the V+ Visual Programming System.

objects

Visual primitives, or the essential programming tools, in V+. They represent an executable set of instructions which, when connected to other objects or ports, act on incoming or preset data.

pins

Input or output connections on objects. They are shown visually on the worksheet as small lines extending from objects. Pins allow objects to be interconnected via nets, and represent data that is either flowing into or out of an object.

platform

The execution environment for V+ designs. Platforms communicate via I/O devices allowing the user to visually generate multi-processing applications.

platform shell

Also called the run-time system. Used to configure the system and execute the designs created in the editor.

ports

The fundamental input and output data mechanism of V+, representing primitive data types such as a single bit, byte, word, float, etc.

Project

In V+, a project is a collection of files, or designs, which together make up a complete visual design.

project manager

Used to view and maintain files contained in a project.

real-time data



Any data that changes meaningfully with respect to time is referred to as time-based media, or real-time data. Real-time in operating systems is the ability of the operating system to provide a required level of data in a bounded response time. Audio clips are common forms of time-based media. Such media data can be obtained from a variety of sources, such as local or network files.

run-time system

Used to configure the system and to execute designs created in the editor. Also called the platform shell

spare time

Designs take a finite amount of time each frame. The spare time is the amount of time left in each period (frame). So, for example if the V+ design required 12.5ms to execute, and the user had selected a 25ms frame rate the spare time should be 50%.

static data

Data which cannot be altered in any way by the operation performed by the V+ object. This data is set in the object itself and can include such information as filenames, channel designations, etc.

V+ editor

The visual editor. See "development system."

visual editor

The development system, used to create and edit designs.

worksheet

In V+, a worksheet is a file, represented by a single window, that contains the user design. One or more worksheets together form the complete user design.



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