VisSim/DSP

Version 3

Visual Solutions

INCORPORATED

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Contents

Preface

This manual describes how to use VisSim/DSP for designing, simulating, and validating digital signal processing (DSP) algorithms and embedded control applications. You can use all of the features of VisSim to create and test your DSPs and embedded controllers.

Registering your software

Before you begin using VisSim, please fill out the enclosed registration card and mail it to us. As a registered user, you will receive a free subscription to The flexWire, along with discount promotions and VisSim workshop schedules.

Conventions used in this book

This manual assumes that you are already familiar with the VisSim graphical user interface. If you need to review the interface, consult your *VisSim User's Guide*.

The following typographical conventions are used to make this manual:

Visual convention	Where it's used
Shortcut key combinations	Shortcut key combinations are joined with a plus sign (+). For example, the command CTRL+C means hold down the CTRL key while you press the C key.
Hot keys	Hot keys are the underlined keys in VisSim's menus, commands, and dialog boxes. To use a hot key, press ALT and then the key for the underlined character. For instance, to execute the File menu's New command, hold down the ALT key while you press the F key, then release both keys and press the N key.
SMALL CAPS	To indicate the names of keys on the keyboard.
ALL CAPS	To indicate directory names, file names, and acronyms.

Visual convention	Where it's used
Initial Caps	To indicate menu names and command names.
`Lucida console`	To indicate block names.

In addition, unless specifically stated otherwise, when you read "click the mouse..." or "click on...," it means to click the left mouse button.

Getting help

To help you get the most out of VisSim, the following online information is available:

- **Online help** The online help contains step-by-step instructions for using VisSim features.
- **Online release notes** A file named READDSP.TXT is installed in your main VisSim directory. This file contains last minute information and changes that were discovered after this manual went to print. For your convenience, you should read this file immediately and print a copy of it to keep with this manual.

Online help

VisSim's Help program provides online instructions for using VisSim.

▶ **To open help**

- Do one of the following:

To	Do this
Access the top level of help	Select Help from the menu bar or press ALT+H.
Access help on the selected block	Click on the Help button in the dialog box for the block.

▶ **To close help**

- In the Help window, choose File > Exit, or press ALT+F4.

Technical support service

When you need assistance with a Visual Solutions product, first look in the manual and read the online READDSP.TXT file. If you cannot find the answer, contact the Technical Support group via a toll call between 9:00 am and 6:00 pm Eastern Standard Time, Monday through Friday, excluding holidays. The phone number is **978-392-0100.**

When you call in, please have the following information at hand:

- The version of VisSim and the version of the software operating environment that you're using
- The type of hardware that you're using
- All screen messages
- What you were doing when the problem happened
- How you tried to solve the problem

Visual Solutions also has the following fax and e-mail addresses:

Address/Number	What it's for
978-692-3102	Fax number
bugs@vissol.com	Bug report
doc@vissol.com	Documentation errors and suggestions
sales@vissol.com	Sales, pricing, and general information
suggest@vissol.com	Product suggestions
tech@vissol.com	Technical support

Chapter 1
Introduction

VisSim/DSP is an interactive and visual environment that extends VisSim for use in designing, simulating, and testing digital signal processing (DSP) algorithms and embedded control applications.

The DSP configuration supported by VisSim/DSP consists of PC bus cards with RAM and CPU and real-time I/O ports. The cards support up to four 16-bit analog A/D and four 16-bit D/A channels. There are two possible targets for DSP:

- A completely stand-alone DSP with its own power supply, serial port connection, and program in EPROM
- A PC bus card that uses the host PC for initialization and booting

Programs compiled to run on the DSP card have a .OUT suffix. The download program supplied with VisSim/DSP lets you download the .OUT files to the DSP card and then start running them.

VisSim/DSP offers the following features:

Automatic compiling: VisSim generates a single .C file that does not need any modification. In the Code Generation Setup dialog box, the Compile button generates C code, then compiles and links the code into a downloadable executable. A compilation progress report is provided on screen.

Automatic commenting: Comments can be automatically inserted into the generated code that describe the location in the VisSim block hierarchy from which the code originated.

Variable name coherency: Variable names used in VisSim are maintained in the generated code.

Interrupt driven timing: A timer on the DSP is used to generate an interrupt at a user-specified interval. The control loop is executed on the occurrence of this

interrupt. This execution rate can be changed without recompiling the code through the setup dialog box for the DSP Interface block.

Analog and digital I/O: Access to the analog and digital I/O channels is provided directly from VisSim, both with and without compilation. This allows you to test various connections and control loops in standard interactive VisSim before compiling and downloading the algorithm to the target DSP.

Interface to VisSim: All inputs and outputs to the compound block compiled to the DSP are maintained. Consequently, when compound block is replaced with a `DSP Interface` block, the connections are the same.

Chapter 2

Installing VisSim/DSP

This chapter describes how to install VisSim/DSP on your computer.

Installation prerequisites

Before you install VisSim/DSP on your computer, make sure you have the following components:

- Professional VisSim
- VisSim/C-Code
- DSP hardware kit

These components may be part of your VisSim/DSP package or you may have ordered them separately. If you are missing any of them, call Visual Solutions immediately.

Note that VisSim/RT is not required for real-time I/O with the DSP card.

In addition, your computer must meet the following minimum configuration:

- Intel 80386+ processor
- Windows 95 or Windows NT
- 4 MB RAM
- 400 KB free hard disk space
- 3½" floppy drive
- EGA+ monitor

Installation procedure

The installation procedure is divided into four parts:

- Installing Professional VisSim and VisSim/C-Code
- Installing the DSP peripheral libraries, drivers, and hardware
- Installing the C compiler
- Installing the VisSim/DSP software

Installing Professional VisSim and VisSim/C-Code

To begin, install Professional VisSim and VisSim/C-Code on your computer if they are not already there. The installation instructions can be found in the *VisSim User's Guide* and *VisSim/C-Code User's Guide*, respectively. Note that you must install Professional VisSim before you install VisSim/C-Code.

Installing the DSP peripheral libraries, drivers, and hardware

Only after you have installed Professional VisSim and VisSim/C-Code on your computer can you install the DSP peripheral libraries, drivers, and hardware. The installation procedures for these components can be found in Appendix A, "Installing DSP Peripheral Libraries, Drivers, and Hardware." Because VisSim/DSP is continually adding new board support, the installation procedures for your DSP components may be included on separate sheets of paper that accompany your VisSim/DSP kit.

Installing the C compiler

Now you can install the C compiler meant to go with the chips on your DSP card. To install the C compiler, refer to the installation instructions supplied with the compiler. Do not install the C compiler until after the DSP peripheral libraries, drivers, and DSP card have been successfully installed.

Installing the VisSim/DSP software

The VisSim/DSP software consists of:

- DSP support libraries
- An enhanced DSP code generator
- Three new VisSim blocks for communicating with the DSP and performing analog and digital I/O with the analog and digital ports on the DSP card

▶ **To install the VisSim/DSP software**

1. Start Windows 95 or Windows NT.
2. Insert the VisSim/DSP disk into the floppy drive.
3. Click on Start and choose the Run command.
4. In the text box, type a:\install.
5. Follow the installation instructions.

When the installation is complete, VisSim adds the menu item VisSim/DSP to the menu bar. Click on this menu to access the DSP blocks.

Chapter 3

Using VisSim/DSP

The following information is covered in this chapter:

- DSP basics
- Creating a DSP algorithm
- Running a DSP algorithm
- Performing hardware-in-the-loop simulations

DSP basics

There are three basics steps in the development of a DSP algorithm:

1. Create the system you want to execute on the target DSP.
2. Generate the C source code from the system.
3. Compile and link the C source code to produce an executable file.

Although steps 2 and 3 are automatically performed by VisSim/DSP, it is important to understand how the executable file is generated and the restrictions that apply to your system.

Creating the system

You create the system that will eventually execute on the target DSP in VisSim. Follow these guidelines when creating your system:

- A small subset of VisSim blocks are unsupported in VisSim/DSP and should therefore be avoided. Unsupported blocks are listed on page 8.
- In order to create a DSP algorithm, the system must be entirely encapsulated in a compound block. Creating compound blocks is described on page 9.

Generating C code

During C code generation, the following actions occur:

- Blocks are translated either directly into C operators or into one or more calls to the C support library. Blocks that call the C support library are listed on page 9.

  A small set of blocks are unsupported in VisSim and are translated into function calls that either produce ASCII data streams or EMPTY returns. These blocks are listed below.

- The integration algorithm is re-set to Runge Kutta 2nd order if it was previously set to an algorithm other than Runge Kutta 2nd order or Euler.

Unsupported blocks

The table below lists the blocks that produce ASCII data streams or call the EMPTY function.

Block	ASCII data stream	Call to EMPTY function
animate		✓
bezel		✓
case		✓
constraint		✓
cost		✓
DDE, DDEreceive, DDEsend		✓
display	✓	
export		
globalConstraints		✓
histogram		✓
import		
index		✓
light	✓	
lineDraw		✓
meter	✓	
neuralNet		✓
parameterUnknown		✓
plot	✓	
stop	✓	

Block	ASCII data stream	Call to EMPTY function
stripChart	✓	
unknown		✓

Compiling and linking C source code

During compilation and linking of the .C file, VisSim/DSP invokes the C compiler included with the corresponding hardware kit to compile and link the .C file, support libraries, and header files to create an .OUT file. For example, if you purchased the PC32 hardware kit, VisSim/DSP uses the Texas Instruments C compiler to generate the .OUT file.

There can be only one .OUT file per VisSim diagram.

Support library

The support library supplied with VisSim/DSP is a collection of object files that contain compiled instructions to support blocks for which there is no direct translation into C source code. These blocks include:

- crossDetect
- integrator
- limitedIntegrator
- pulseTrain
- resetIntegrator
- stateSpace
- timeDelay
- transferFunction
- unitDelay

Creating a DSP algorithm

Because a target DSP has no file system, you cannot use import or export blocks with VisSim/DSP. You can, however, use map blocks; VisSim/DSP provides the option of embedding the maps inline in the generated C code.

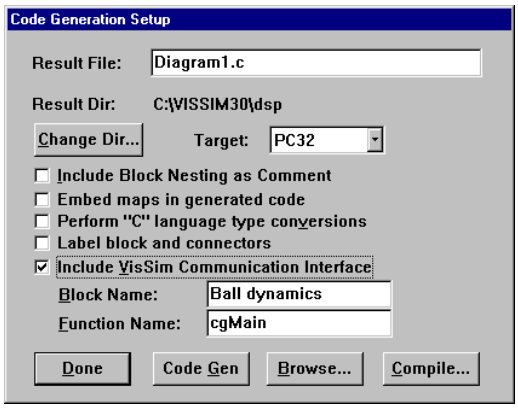
▶ **To create a DSP algorithm**

1. Load the VisSim diagram that contains the system you want to execute on the target DSP.
2. Encapsulate the system in a single compound block, if it has not been encapsulated already.

> ***Encapsulating blocks***
>
> Select all the blocks to be encapsulated, then choose the Edit > Create Compound Block compound. In the Compound Properties dialog box, enter a name for the compound block and click on the OK button. For more information on compound blocks, see the *VisSim User's Guide*.

3. Select the compound block.
4. Choose Simulate > Code Gen.

   The Code Generation Setup dialog box appears:



5. Click on the down arrow on the Target category for the list of installed board libraries. Choose the DSP platform that the generated code will run on.
6. Activate the Include VisSim Communication Interface option.
7. Choose the other options you want. (For more information on these options, see the descriptions below.)
8. Click on the Compile button. This button performs three functions:
   - Generates a .C file from the selected compound block.
   - Invokes the C compiler included with the corresponding hardware kit for VisSim/DSP to compile and link the .C file, support libraries, and header files to create an .OUT file.
   - Opens an MS/DOS window in which to view the code generation, compilation and linking phases.
9. Click on the Done button.

Using the Code Generation Setup dialog box

The options for the Code Generation Setup dialog box are described below.

Result File: Indicates the result file name. By default, VisSim displays the block diagram name with a .C extension in this box. You can change the name, but not the extension. When you press the Compile button, VisSim/DSP creates an .OUT file. You can alternatively press the Code Gen button, which causes VisSim/DSP to create a .C file. You can open and browse the .C file by clicking on the Browse button.

Result Dir: Displays where the result file will reside. If you want to change the directory, click on the Change Dir button.

Embed Maps in Generated Code: Builds the data files from any map blocks in the generated code. Because DSPs do not have a file system, this option should be turned on. If the DSP has a file system and you want to change the map file, turn this option off.

Target: Indicates the DSP platform that the generated code will run on. Only the installed board libraries will appear in this drop-down list box.

Include Block Nesting as Comment: Includes comments with the generated code that indicate the source compound block in the VisSim diagram from which the generated code came.

Perform "C" Language Type Conversions: Allows the generated code to use the data type specified in VisSim instead of the default double floating point data type.

Label Blocks and Connectors: Includes block and connector names with the generated code that indicate the source compound block in the VisSim diagram from which the generated code came.

Include VisSim Communication Interface: Allows the generated code to include calls to use the dual-ported memory to send data to and receive data from VisSim. This option is dimmed when no compound block is selected.

Function Name: Indicates the name of the main VisSim time step function. This option can be ignored.

Block Name: Indicates the name of the block of the compound block from which the code is generated. This option can be ignored.

Validating a DSP algorithm

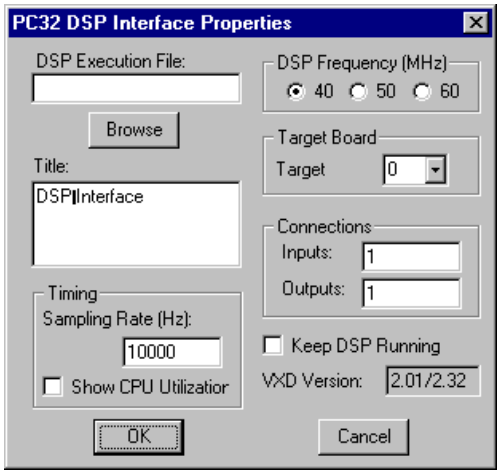
An easy way to test your DSP algorithm is replace the compound block from which the DSP algorithm was generated with a `DSP Interface` block. When you simulate the diagram, the `DSP Interface` block automatically downloads the .OUT file to the target DSP and starts running it. While the .OUT file runs, you can communicate with the DSP via the inputs and outputs to the `DSP Interface` block.

Note that the DSP always runs in real-time, so you should run in real-time mode when communicating with the DSP.

▶ To validate a DSP algorithm

1. In VisSim, open the block diagram used to generate the .OUT file.
2. Select the compound block from which the DSP algorithm was generated and delete it.
3. From the VisSim/DSP menu, drag a `DSP Interface` block into the work area to where the compound block was located.
4. Wire the `DSP Interface` block into the diagram as necessary.
5. Choose File > Save As and save the diagram under a new name.
6. Choose Edit > Block Properties command.
7. Click on the `DSP Interface` block.

   The DSP Interface Setup dialog box appears.



8. Choose the options you want. (For more information on the options, see the descriptions below.)
9. Click on the OK button, or press ENTER.
10. Choose Simulate > Go.

Using the DSP Interface Setup dialog box

The options for the DSP Interface Setup dialog box are described below.

DSP Execution File: Indicates the complete pathname of the .OUT file previously generated. If your are not sure of the pathname, click on the Browse button to locate the .OUT file.

Title: Indicates an optional name that appears on the `DSP Interface` block.

DSP Frequency (MHz): Indicates the speed of your CPU. VisSim/DSP needs to know the speed in order for the timing to be accurate.

Target Board: Specifies the target DSP card. VisSim/DSP supports up to four simultaneous cards. Board numbers are 0 through 3.

Connections: Specifies the number of inputs and outputs on the compound block from which the code was generated.

Keep DSP Running: Allows the DSP program to continue running even after you quit VisSim.

VXD Version: Indicates the version number of the driver board in use.

Sample Rate: Specifies the sample rate at which the DSP algorithm should run. The default is 10kHz.

Show CPU Utilization: Creates an extra output that displays the CPU utilization on the DSP while your .OUT file runs.

Performing hardware-in-the-loop simulations

To control a plant from VisSim, you use the `Input Port` and `Output Port` blocks. When you run a simulation on the diagram, the real-time DSP analog I/O values appear on their associated blocks. In this mode, the sampling rate is limited by the compute rate of your PC; however, the environment is flexible enough for initial system testing.

▶ **To perform hardware-in-loop simulations**

1. From the VisSim/DSP menu, drag an `Input Port` block into the work area for each DSP analog input channel that you need.
2. From the VisSim/DSP menu, drag a `Output Port` block into the work area for each DSP analog output channel that you need.
3. For each `Input Port` and `Output Port` block, call up its Setup dialog box and specify the following information:
   - Channel title
   - Channel number

- Whether the channel is analog or digital
- The target board on which the channel resides

4. Connect the blocks to your VisSim controller.
5. Connect your plant input and outputs to the terminal card, as described in your hardware manual. Note that the analog outputs, while very accurate, provide only small amounts of current and will require a power amplifier to drive significant loads.
6. Choose Simulate > Go.

Once the controller system with real-time I/O runs correctly, you can collect it into a single compound block and compile it into an .OUT file, as described earlier on page 9. The code generator automatically generates code for each real-time I/O in the block, as well as all the other blocks. Thus the .OUT file contains all the code required to read DSP real-time inputs, calculate the control values, and write the real-time analog outputs.

To run the generated .OUT file, replace the compound block with the `DSP Interface` block and set it up with the generated .OUT file, as described on page 12.

DSP resources managed by VisSim/DSP

VisSim/DSP allows you to access most of the resources available on the DSP. Managed resources include dual port RAM, counter 0, Analog and Digital I/O ports and mailbox “0.”

VisSim/DSP installs a counter 0 interrupt handler that executes the basic core time step routine of the VisSim simulation engine. At VisSim simulation start-up, the counter 0 interrupt rate you set through the `DSP Interface` block is transmitted to DSP via a read/write mailbox command. This allows rapid changing of the base sampling rate of the DSP algorithm. Analog and digital I/Os are sampled at the occurrence of the counter 0 interrupt.

Analog and digital ports on the DSP board can be accessed by simply dragging the `I/O Port` block off the Blocks menu. The blocks can access their corresponding ports immediately without DSP code generation, and will also access the ports when compiled as part of a DSP system downloaded to execute on the DSP. For the PC32 board, there is no muxing logic for analog I/O channels, and thus interrupts are enabled across analog I/O ports accessed by VisSim. Boards such as PC3,1 which required mux selection logic, will have interrupts disabled across mux selection and analog I/O pairs to prevent spurious readings caused by user code accessing the analog mux.

Mailbox 0 is used only at DSP start-up time to initialize communication between the host PC and the DSP.

Dual port RAM is used continuously during a simulation run to send data from the PC to the DSP and send DSP data back to the DSP. This data movement between PC and DSP is handled during the DSP idle time between timer interrupt processing. As the timer interrupt rate increases, less time is available to the idle process to update the PC, and the PC will see less frequent updates. However, since priority is given to the timer interrupt task, the algorithm running on the DSP will handle analog and digital I/O with no interruption.

Frequently asked questions

How do I establish or confirm the time step on the code running on the DSP?

The code runs at a timing interval established by an interrupt generated by an onboard clock. Therefore, VisSim/DSP runs at a hardware-generated clock rate. You can change this rate in the Setup dialog box for the `DSP Interface` block.

How do I merge my own custom code with VisSim generated code?

Write a custom block in VisSim using the VisSim add-on API. This lets you run pure simulations on the PC side. When DSP code generation is requested, a call to the user function is emitted in the generated code; VisSim also sends a message to the user DLL at code generation time requesting a code generation string if the standard call is not sufficient. The code generation string may contain %n references that will be expanded by the code generator to the expressions that represent the values flowing into the n^{th} connector.

To take advantage of the automated Compile and Link button in VisSim, add the custom function object file to the LNK30 command line in *xxxx*CL.BAT file, where *xxxx* is the name of the board. For example, PC32CL.BAT is the file name for the PC32 board.

How do I merge my own device driver code with VisSim generated code?

Write an interrupt handler to read or write the serial or digital I/O and make it available as a global to the VisSim algorithm. To do so:

1. Reference a VisSim global `variable` from inside the compound block from which C code was generated and define the `variable` outside the compound block. This causes an external reference from the VisSim-generated C code.
2. Use the same variable name for the result value from your I/O handler and link the I/O handler with the generated C code in the *xxxx*CL.BAT file, where *xxxx* is the name of the board. In other words, add an I/O .OBJ argument to the LNK30 command line in the *xxxx*CL.BAT file.
3. To install your interrupt handler, create a function called userStartup(). This function is called by VisSim if linked in with the standard VisSim DSP library. In this function, you can install your interrupt handler and perform any other initialization task.

Appendix A

Installing DSP Peripheral Libraries, Drivers, and Hardware

This appendix describes how to install the PC31, PC32, and SPC31 peripheral libraries and corresponding driver software. Other peripheral library installations are on separate sheets of paper accompanying your VisSim/DSP kit.

Installing the PC31 peripheral libraries and driver software

The DSP package consists of a DSP card and corresponding PC31 peripheral libraries and driver software. Do not install these components until after you have installed Professional VisSim and VisSim/C-Code.

PC31 peripheral libraries installation procedure

Before you begin the installation, close any applications that are currently open and check that no previous environment variable settings from previous installations are in AUTOEXEC.BAT. These settings would start with SET c_dir =, SET d_dir=, SET c_src=, and SET d_src=. If such settings exist, delete them or comment them out. Next, make sure that the DSP card is not already installed. If it is, shut down the system and remove the card. Finally, reboot the system.

▶ **To install the PC31 peripheral libraries**

1. Insert the VisSim/DSP PC31 Peripheral Libraries disk 1 into drive a.
2. Select Start and choose the Run command.
3. Type A:\SETUP and click on the OK button.
4. Follow the on-screen directions. When prompted for an installation directory, use the default directory \PC31CC\, unless disk space is a problem on the current drive.

5. An Explorer window may open as a result of this installation. Close Explorer now as it may block your view of subsequent installation messages.
6. When prompted to restart the system, select No.

At this point, the PC31 peripheral libraries have been installed. To install the PC31 driver software, proceed to "PC31 driver software installation procedure."

PC31 driver software installation procedure

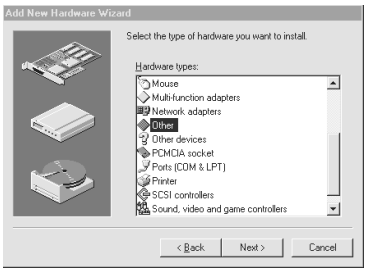
The following two procedures step you through the process of installing the PC31 driver software on the Windows 95 and Windows NT platforms. Note that you must install the PC31 peripheral libraries before installing the PC31 driver software.

▶ **To install the PC31 drivers on a Windows 95 system**

1. Insert the PC31 Drivers disk into drive a.
2. Click on Start and choose Settings; Control Panel.
3. Double-click on the Add New Hardware icon.
4. In the Add New Hardware Wizard window, click on the Next button to begin installing your hardware.
5. The Add New Hardware Wizard window asks if you want Windows to search for your new hardware.

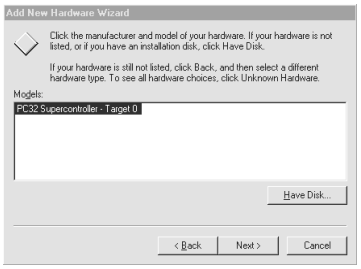
Select No to prevent Windows from searching for installed hardware. Then click on the Next button.

6. The Add New Hardware Wizard window displays the hardware types.



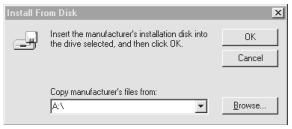
   Select Other and click on the Next button.

7. The Add New Hardware Wizard window asks about the manufacturer and model of your hardware.



   Click on Have Disk.

8. The Install From Disk window is displayed.



9. Click on the Browse button.

10. The Open dialog box is displayed.

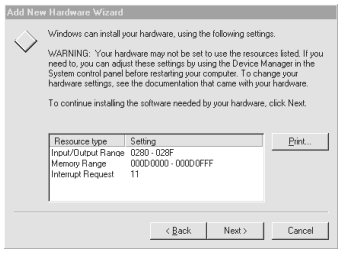
    Do the following:

    - In the Drives box, select a:.
    - In the Files box, select PC31BD0.INF (for board 0) or PC31BD1.INF (for board 1, if there already is a board at the 0 position).
    - Click on the OK button.
    - In the Install From Disk window, click on the OK button.

11. The Add New Hardware Wizard window displays the manufacturers and models of your hardware.

Make sure the item “PC31 SuperController” is highlighted. Then click on the Next button.

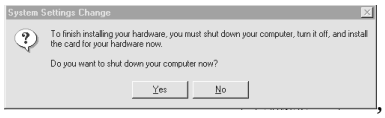
12. The Add New Hardware Wizard window displays a list of resource types and corresponding settings.



Do the following:

- Jot down the information in this dialog box; you’ll need it when you configure the DSP card, as described under “PC31 Hardware Installation.”
- **Notes:** 1. The setting values displayed above are for the example and do not necessarily reflect the settings you’ll see. 2. For confirmation, this information can be re-displayed at any time by opening the Control Panel, double-clicking on System, selecting the Device Manager tab, double-clicking on Other, double-clicking the appropriate DSP board name, and viewing its resources.
- Click on the Next button.

13. In the Add New Hardware Wizard window, click on the Finish button.
14. The System Settings Change window is displayed.



Click on the Yes button to shut down the system.

At this point, the PC31 drivers have been installed on Windows 95. To install the PC31 hardware, proceed to “PC31 Hardware Installation Procedure.”

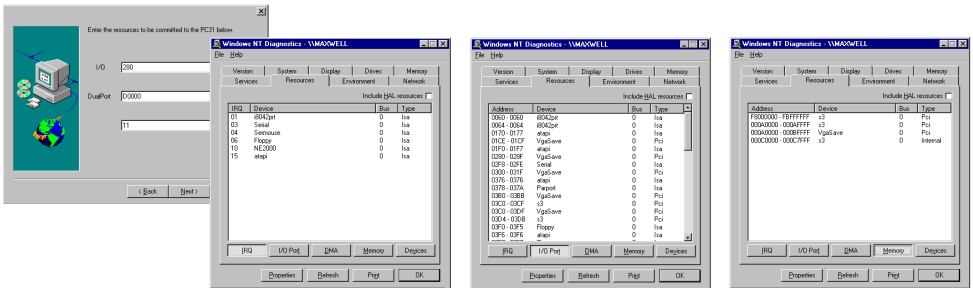
▶ To install the PC31 drivers on a Windows NT system

1. Insert the PC31 Drivers disk into drive a.
2. Click on Start and choose Run.
3. In the Open box, type A:\SETUP and click on the OK button.

4. Follow the on-screen directions. When prompted for installation directories, use the default directories.

5. When the installation comes to the point of launching NT Diagnostics, select the Resources tab; then move the NT Diagnostics window aside in order to view the settings selected by the installation software.

6. Click on the appropriate resource type buttons to review the resources already allocated. If the resources selected conflict with those for other applications, type in new (available) resources accordingly.



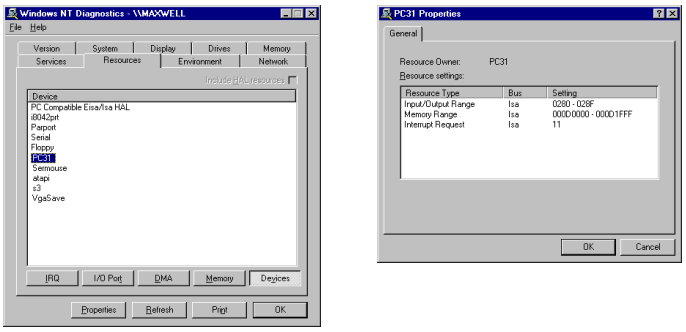
Note: The leading 0 is omitted from the I/O value displayed in the PC31 Board Settings dialog box. The leading three 0s are omitted from the Dual Port value.

7. Jot down the final resource settings for board configuration; you'll need it when you configure the DSP card, as described under "PC31 Hardware Installation."

8. Click on Next in the PC31 Board Settings dialog box and choose No when asked to restart your computer.

9. Close Windows NT Diagnostics.

Notes: 1. For confirmation, the resources assigned to the PC31 card can be quickly accessed at any time by launching NT Diagnostics, selecting the Resources tab, clicking on the Devices button, selecting PC31, and clicking the Properties button. 2. The setting values displayed below are for the example and do not necessarily reflect the settings you'll see.



10. Start up the PC31 NT drivers by doing the following:
    - Click on Start and choose Settings; Control Panel.
    - Double-click on the Devices icon.
    - Locate and select PC31; then click on the Start button. To start up this driver automatically upon boot-up, click on the Startup button and activate the Automatic option; then click on the OK button.
    - Close the Devices dialog box and the Control Panel window.

At this point, the PC31 drivers have been installed on Windows NT. To install the PC31 hardware, proceed to "PC31 hardware installation procedure."

PC31 hardware installation procedure

Install the PC31 hardware after you have installed the PC31 driver software.

▶ **To install the PC31 hardware**

1. Power down your computer.
2. Set the hardware switches (S1 and S2) and jumper (JP22) on the DSP card to reflect the actual addresses assigned by Windows.
    - **On Windows 95**: Use the information from step 12 of "PC31 driver installation Ppocedure" (Windows 95) to configure the DSP card.
    - **On Windows NT**: Use the information from step 7 of "PC31 driver installation procedure" (Windows NT) to configure the DSP card.

    For information on DIP switch settings, see "PC31 DIP switch settings."
3. Insert the configured DSP card into an available slot on the sytem bus.
4. Boot up your system to Windows 95 or Windows NT.

At this point, the PC31 hardware has been installed. To install the C compiler that goes with the chips on your DSP card and VisSim/DSP, refer to their respective documentation.

PC31 DIP switch settings

This section contains the I/O address assignments and memory range address assignments. Refer to the PC31CC hardware manual for possible conflicts.

I/O address assignments

Format

		Bank 1	Bank 2	
I/O address	0	_____	_____	0
S1 switches used	N/A	7, 6, 5	4, 3, 2, 1	N/A

Bank 1

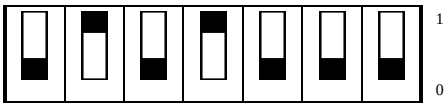
Value assigned	Switch 7	Switch 6	Switch 5
1	0	0	1
2	0	1	0
3	0	1	1

Bank 2

Value assigned	Switch 4	Switch 3	Switch 2	Switch 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Example

I/O address	Switch number	7	6	5	4	3	2	1
0 2 8 0	Setting	0	1	0	1	0	0	0



S1 switch

Dual port RAM configuration

Memory range address assignments (HEX)

Format

				Bank 3	Bank 4			
Starting address	0	0	0	_____	_____	0	0	0
S2 switches used	N/A	N/A	N/A	7, 6, 5, 4	3, 2, 1	N/A	N/A	N/A

Bank 3

Value assigned	Switch 7	Switch 6	Switch 5	Switch 4
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Bank 4

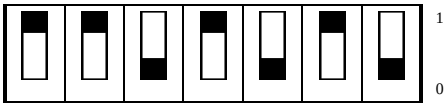
Value assigned	Switch 3	Switch 2	Switch 1
0	0	0	0
2	0	0	1
4	0	1	0
6	0	1	1
8	1	0	0
A	1	0	1
C	1	1	0
E	1	1	1

Example

Dual port memory range address
0 0 0 D 4 0 0 0

Switch number / Setting

7	6	5	4	3	2	1
1	1	0	1	0	1	0



S2 switch

Installing the PC32 peripheral libraries and driver software

The DSP package consists of a DSP card and corresponding PC32 peripheral libraries and driver software. Do not install these components until after you have installed Professional VisSim and VisSim/C-Code.

PC32 peripheral libraries installation procedure

Before you begin the installation, close any applications that are currently open and check that no previous environment variable settings from previous installations are in AUTOEXEC.BAT. These settings would start with SET c_dir =, SET d_dir=, SET c_src=, and SET d_src=. If such settings exist, delete them or comment them out. Next, make sure that the DSP card is not already installed. If it is, shut down the system and remove the card. Finally, reboot the system.

▶ **To install the PC32 peripheral libraries**

1. Insert the VisSim/DSP PC32 Peripheral Libraries disk 1 into drive a.
2. Select Start and choose the Run command.
3. Type A:\SETUP and click on the OK button.
4. Follow the on-screen directions. When prompted for an installation directory, use the default directory \PC32CC\, unless disk space is a problem on the current drive.
5. An Explorer window may open as a result of this installation. Close the Explorer window now as it may block your view of subsequent installation messages.
6. When prompted to restart the system, select No.

At this point, the PC32 peripheral libraries have been installed. To install the PC32 driver software, proceed to “PC32 driver software installation procedure.”

PC32 driver software installation procedure

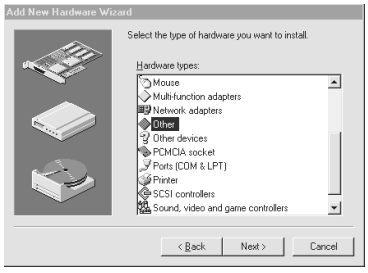
The following two procedures step you through the process of installing the PC32 driver software on the Windows 95 and Windows NT platforms. Note that you must install the PC32 peripheral libraries before installing the PC32 driver software.

▶ To install the PC32 drivers on a Windows 95 system

1. Insert the PC32 Drivers disk into drive a.
2. Click on Start and choose Settings; Control Panel.
3. Double-click on the Add New Hardware icon.
4. In the Add New Hardware Wizard window, click on the Next button to begin installing your hardware.
5. The Add New Hardware Wizard window asks if you want Windows to search for your new hardware.

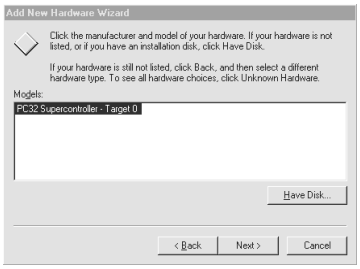
   Select No to prevent Windows from searching for installed hardware. Then click on the Next button.

6. The Add New Hardware Wizard window displays the hardware types.



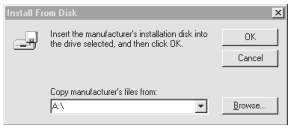
   Select Other and click on the Next button.

7. The Add New Hardware Wizard window asks about the manufacturer and model of your hardware.



Click on Have Disk.

8. The Install From Disk window is displayed.



9. Click on the Browse button.
10. The Open dialog box is displayed.

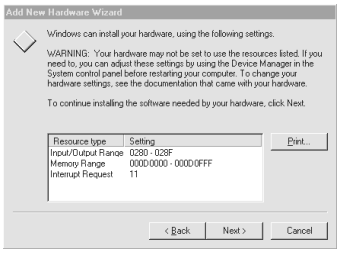
    Do the following:

    - In the Drives box, select a:.
    - In the Folders box, select WIN95.
    - In the Files box, select PC32BD.INF (unidriver).
    - Click on the OK button.
    - In the Install From Disk window, click on the OK button.

11. The Add New Hardware Wizard window displays the manufacturers and models of your hardware.

    Make sure the item “PC32 SuperController” is highlighted. Then click on the Next button.

12. The Add New Hardware Wizard window displays a list of resource types and corresponding settings.



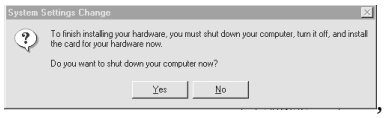
Do the following:

- Jot down the information in this dialog box; you'll need it when you configure the DSP card, as described under "PC32 Hardware Installation."

  Notes: 1. The setting values displayed above are for the example and do not necessarily reflect the settings you'll see. 2. For confirmation, this information can be re-displayed at any time by opening the Control Panel, double-clicking on System, selecting the Device Manager tab, double-clicking on Other, double-clicking the appropriate DSP board name, and viewing its resources.

- Click on the Next button.

13. In the Add New Hardware Wizard window, click on the Finish button.
14. The System Settings Change window is displayed.

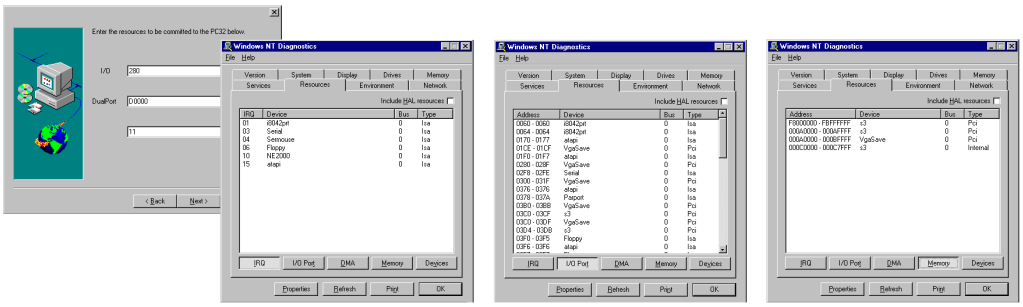


Click on the Yes button to shut down the system.

At this point, the PC32 drivers have been installed on Windows 95. To install the PC32 hardware, proceed to "PC32 hardware installation procedure."

▶ To install the PC32 drivers on a Windows NT system

1. Insert the PC32 Drivers disk into drive a.
2. Click on Start and choose Run.
3. In the Open box, type A:\WINNT\SETUP and click on the OK button.
4. Follow the on-screen directions. When prompted for installation directories, use the default directories.
5. When the installation comes to the point of launching NT Diagnostics, select the Resources tab; then move the NT Diagnostics window aside in order to view the settings selected by the installation software.
6. Click on the appropriate resource type buttons to review the resources already allocated. If the resources selected conflict with those for other applications, type in new (available) resources accordingly.



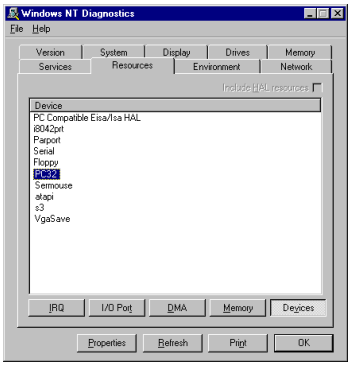
Note: The leading 0 is omitted from the I/O value displayed in the PC32 Board Settings dialog box. The leading three 0s are omitted from the Dual Port value.

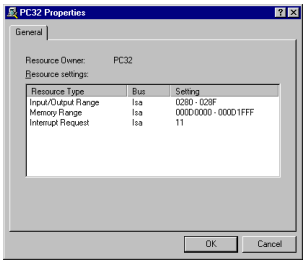
7. Jot down the final resource settings for board configuration; you'll need it when you configure the DSP card, as described under "PC32 Hardware Installation."

8. Click on Next in the PC32 Board Settings dialog box and choose No when asked to restart your computer.

9. Close Windows NT Diagnostics.

   Notes: 1. For confirmation, the resources assigned to the PC32 card can be quickly accessed at any time by launching NT Diagnostics, selecting the Resources tab, clicking on the Devices button, selecting PC32, and clicking the Properties button. 2. The setting values displayed below are for the example and do not necessarily reflect the settings you'll see.





10. Start up the PC32 NT drivers by doing the following:

    - Click on Start and choose Settings; Control Panel.
    - Double-click on the Devices icon.

- Locate and select PC32; then click on the Start button. To start up this driver automatically upon boot-up, click on the Startup button and activate the Automatic option; then click on the OK button.
- Close the Devices dialog box and the Control Panel window.

At this point, the PC32 drivers have been installed on Windows NT. To install the PC32 hardware, proceed to "PC32 hardware installation procedure."

PC32 hardware installation procedure

Install the PC32 hardware after you have installed the PC32 driver software.

▶ **To install the PC32 hardware**

1. Ensure the JP14 is jumpered (readback enabled). Note that the defaults for the digital direction are jumpered for all channels as digital out. These can be unjumpered as digital in in banks of 8 channels. Consult the PC32 hardware manual for more information.
2. Power down your computer.
3. Set the hardware switches (S1 and S2) and jumper (JP7) on the DSP card to reflect the actual addresses assigned by Windows.
   - **On Windows 95**: Use the information from step 12 of "PC32 Driver Installation Procedure" (Windows 95) to configure the DSP card.
   - **On Windows NT**: Use the information from step 7 of "PC32 Driver Installation Procedure" (Windows NT) to configure the DSP card.

   For information on DIP switch settings, see "PC32 DIP switch settings."
4. Insert the configured DSP card into an available slot on the system bus.
5. Boot up your system to Windows 95 or Windows NT.

At this point, the PC32 hardware has been installed. To install the C compiler that goes with the chips on the DSP card and VisSim/DSP, refer to their respective documentation.

PC32 DIP switch settings

This section contains the I/O address assignments and memory range address assignments. Refer to the PC32CC hardware manual for possible conflicts.

I/O address assignments

0 = ON 1 = OFF

Format

		Bank 1	Bank 2	
I/O address	0	_____	_____	0
S1 switches used	N/A	6, 5	4, 3, 2, 1	N/A

Bank 1

Value assigned	Switch 6	Switch 5
1	0	1
2	1	0
3	1	1

Bank 2

Value assigned	Switch 4	Switch 3	Switch 2	Switch 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0

Bank 2 (*continued*)

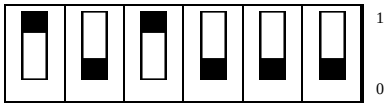
Value assigned	Switch 4	Switch 3	Switch 2	Switch 1
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Example

I/O address 0 2 8 0

Switch number / Setting

6	5	4	3	2	1
1	0	1	0	0	0



S1 switch

Dual port RAM configuration

Memory range address assignments (HEX)

Format

				Bank 3	Bank 4			
Starting address	0	0	0	_____	_____	0	0	0
S2 switches used	N/A	N/A	N/A	8, 7, 6, 5	4, 3, 2, 1	N/A	N/A	N/A

Bank 3

Value assigned	Switch 8	Switch 7	Switch 6	Switch 5
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Bank 4

Value assigned	Switch 4	Switch 3	Switch 2	Switch 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

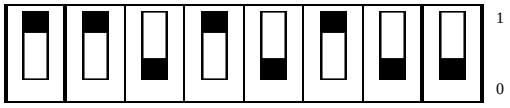
Example

Dual port memory range address

0 0 0 D 4 0 0 0

Switch number / Setting

8	**7**	**6**	**5**	**4**	**3**	**2**	**1**
1	1	0	1	0	1	0	0



S2 switch

Installing the SBC31 peripheral libraries and hardware

The DSP package consists of a DSP card and corresponding SBC31 peripheral libraries. Do not install these components until after you have installed Professional VisSim and VisSim/C-Code.

SBC31 peripheral libraries installation procedure

Before you begin the installation, close any applications that are currently open and check that no previous environment variable settings from previous installations are in AUTOEXEC.BAT. These settings would start with SET c_dir =, SET d_dir=, SET c_src=, and SET d_src=. If such settings exist, delete them or comment them out. Next, make sure that the DSP card is not already installed. If it is, shut down the system and remove the card. Finally, reboot the system.

▶ **To install the SBC31 peripheral libraries**

1. Insert the VisSim/DSP SBC31 Peripheral Libraries disk 1 into drive a.
2. Select Start and choose the Run command.
3. Type a:\setup and click on the OK button.
4. Follow the on-screen directions. When prompted for an installation directory, use the default directory \SBC31CC\, unless disk space is a problem on the current drive.
5. An Explorer window may open as a result of this installation. Close Explorer now as it may block your view of subsequent installation messages.
6. When prompted to restart the system, select No.

At this point, the SBC31 peripheral libraries have been installed. Since the SBC31 card communicates with the PC via the serial communications port, it uses the standard serial port drivers installed with Windows. No special driver installation is implemented.

To install the SBC31 hardware, proceed to “SBC31 hardware installation procedure.”

SBC31 hardware installation procedure

Install the SBC31 hardware after you have installed the SBC31 peripheral libraries.

▶ **To install the SBC31 hardware**

1. Power down your computer.
2. Attach the serial connection from the JP2 connector on the DSP card to the selected COM port.
3. Boot up your system to Windows 95 or Windows NT.

At this point, the SBC31 hardware has been installed. To install the C compiler and VisSim/DSP, refer to their respective documentation.

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