

Nodal Construction User Guide and Menu Reference

CADD5i Release 14

DOC38223-005

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GB2366639B 13-October-2004	GB2353376 05-November-2003	5,140,321 18-August-1992
GB2363208 25-August-2004	GB2354686 15-October-2003	5,423,023 05-June-1990
(EP/DE/GB)0812447 26-May-2004	6,545,671 B1 08-April-2003	4,310,615 21-December-1998
GB2365567 10-March-2004	GB2354685B 18-June-2003	4,310,614 30-April-1996

(GB)2388003B 21-January-2004	GB2354683B 04-June-2003	4,310,614 22-April-1999
6,665,569 B1 16-December-2003	6,608,623 B1 19-August-2003	5,297,053 22-March-1994
GB2353115 10-December-2003	6,473,673 B1 29-October-2002	5,513,316 30-April-1996
6,625,607 B1 23-September-2003	GB2354683B 04-June-2003	5,689,711 18-November-1997
6,580,428 B1 17-June-2003	6,447,223 B1 10-September-2002	5,506,950 09-April-1996
GB2354684B 02-July-2003	6,308,144 23-October-2001	5,428,772 27-June-1995
GB2384125 15-October-2003	5,680,523 21-October-1997	5,850,535 15-December-1998
GB2354096 12-November-2003	5,838,331 17-November-1998	5,557,176 09-November-1996
GB2354924 24-September-2003	4,956,771 11-September-1990	5,561,747 01-October-1996
6,608,623 B1 19-August-2003	5,058,000 15-October-1991	(EP)0240557 02-October-1986

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Preface

Nodal Construction User Guide and Menu Reference provides instructions for all persons who are using the system to create figures and using strings and nodal entities.

The property sheets shown throughout this User Guide and Menu Reference depict the defaults when you activate a new part with a drawing and access the STRING/NODAL task set.

Related Documents

The following documents may be helpful as you use *Nodal Construction User Guide and Menu Reference*:

- *Explicit Modeling User Guide and Menu Reference*
- *Explicit Solid Modeling User Guide*

Book Conventions

The following table illustrates and explains conventions used in writing about CADDs applications.

Convention	Example	Explanation
Menu selections and options	List Section option, Specify Layer field	Indicates a selection you must make from a menu or property sheet or a text field that you must fill in.
User-selected graphic location	X, d ₁ or P1	Marks a location or entity selection in graphic examples.
User input in CADDs text fields and on any command line	cvaec.hd.data.param tar -xvf /dev/rst0	Enter the text in a CADDs text field or on any command line.
System output	Binary transfer complete.	Indicates system responses in the CADDs text window or on any command line.
Variable in user input	tar -cvf /dev/rst0 filename	Replace the variable with an appropriate substitute; for example, replace filename with an actual file name.
Variable in text	tagname	Indicates a variable that requires an appropriate substitute when used in a real operation; for example, replace tagname with an actual tag name.
CADDs commands and modifiers	INSERT LINE TANTO	Shows CADDs commands and modifiers as they appear in the command line interface.
Text string	"SRFGROUPA" or 'SRFGROUPA'	Shows text strings. You must enclose text string with single or double quotation marks.
Integer	n	Supply an integer for the <i>n</i> .
Real number	x	Supply a real number for the <i>x</i> .
#	# mkdir /cdrom	Indicates the root (superuser) prompt on command lines.
%	% rlogin remote_system_name -l root	Indicates the C shell prompt on command lines.
\$	\$ rlogin remote_system_name -l root	Indicates the Bourne shell prompt on command lines.

Window Managers and the User Interface

According to the window manager that you use, the look and feel of the user interface in CADDSS can change. Refer to the following table:

Look and Feel of User Interface Elements

User Interface Element	Common Desktop Environment (CDE) on Solaris, HP, and IBM	Window Manager Other Than CDE on Solaris, HP, IBM, and Windows
Option button	ON — Round, filled in the center OFF — Round, empty	ON — Diamond, filled OFF — Diamond, empty
Toggle key	ON — Square with a check mark OFF — Square, empty	ON — Square, filled OFF — Square, empty

Online User Documentation

Online documentation for each book is provided in HTML if the documentation CD-ROM is installed. You can view the online documentation in the following ways:

- From an HTML browser
- From the Information Access button on the CADDSS desktop or the Local Data Manager (LDM)

Please note: The LDM is valid only for standalone CADDSS.

You can also view the online documentation directly from the CD-ROM without installing it.

From an HTML Browser:

1. Navigate to the directory where the documents are installed. For example,
 - `/usr/apl/caddss/data/html/htmldoc/` (UNIX)
 - `Drive:\usr\apl\caddss\data\html\htmldoc\` (Windows)
2. Click `mainmenu.html`. A list of available CADDSS documentation appears.
3. Click the book title you want to view.

From the Information Access Button on the CADDSS Desktop or LDM:

1. Start CADDSS.
2. Choose Information Access, the *i* button, in the top-left corner of the CADDSS desktop or the LDM.
3. Choose DOCUMENTATION. A list of available CADDSS documentation appears.
4. Click the book title you want to view.

From the Documentation CD-ROM:

1. Mount the documentation CD-ROM.
2. Point your browser to:
CDROM_mount_point/html/doc/mainmenu.html (UNIX)
CDROM_Drive:\html\doc\mainmenu.html (Windows)

Online Command Help

You can view the online command help directly from the CADDs desktop in the following ways:

- From the Information Access button on the CADDs desktop or the LDM
- From the command line

From the Information Access Button on the CADDs Desktop or LDM:

1. Start CADDs.
2. Choose Information Access, the *i* button, in the top-left corner of the CADDs desktop or the LDM.
3. Choose COMMAND HELP. The Command Help property sheet opens displaying a list of verb-noun combinations of commands.

From the Command Line: Type the exclamation mark (!) to display online documentation before typing the verb-noun combination as follows:

```
#01#!INSERT LINE
```

Printing Documentation

A PDF (Portable Document Format) file is included on the CD-ROM for each online book. See the first page of each online book for the document number referenced in the PDF file name. Check with your system administrator if you need more information.

You must have Acrobat Reader installed to view and print PDF files.

The default documentation directories are:

- /usr/apl/cadds/data/html/pdf/doc_number.pdf (UNIX)
- CDROM_Drive:\usr\apl\cadds\data\html\pdf\doc_number.pdf (Windows)

Resources and Services

For resources and services to help you with PTC (Parametric Technology Corporation) software products, see the *PTC Customer Service Guide*. It includes instructions for using the World Wide Web or fax transmissions for customer support.

Documentation Comments

PTC welcomes your suggestions and comments. You can send feedback electronically to doc-webhelp@ptc.com.

Introduction

This chapter defines the five types of nodal entities and describes how to access them through the `STRING/NODAL` task set.

- Overview of Nodal Entities and Attributes
- Getting Started

Overview of Nodal Entities and Attributes

Nodal entities allow you to define connectivity between different portions of your model. Nodal entities are very useful for product design applications such as the creation of assembly models and drawings or the routing of pipes and cables. Nodal figures allow you to include graphic and nongraphic information in other parts or assemblies efficiently, and without unnecessary duplication of geometry.

Types of Nodal Entities

There are five types of nodal entities:

- Nodal lines
- Connect nodes
- Figures
- Text nodes
- Nodal text

Each nodal entity type is briefly described below.

Nodal Lines (Nlines)

A nodal line is a string entity often used to represent pipes and wires. A nodal line must begin and end on a connect node. Nodal lines retain a direction of flow. Nodal text, usually a name, can be associated with a nodal line. Properties associated to nodal lines can be accessed for reporting.

Nodal lines are explained and the interface is described in Chapter 2, “Strings and Nodal Lines.”

Connect Nodes (Cnodes)

A connect node is a connection or terminal point to which Nlines can be attached. The connect node symbol (a diamond) maintains a uniform size regardless of scale. Text nodes can be attached to a connect node.

Connect nodes are explained and the interface is described in Chapter 3, “Connect Nodes.”

Figures

A figure is a graphic representation of a part or drawing. There are four types of figures: part figures, subfigures, nodal figures, and extended nodal figures. Figures are explained and the interface is described in Chapter 4, “Figures.” Annotating figures is not covered in this user guide. For information, see *Design and Drafting User Guide and Menu Reference*.

Text Nodes (Tnodes)

The text node is a placeholder for text. It allows you to associate variable text with a symbol or titleblock. A text node may stand alone or you can attach it to a connect node. A text node symbol (a triangle) maintains a uniform size regardless of scale.

A connect node can have any number of text nodes associated to it.

You can join multiple text nodes and their corresponding nodal text into one text node with a single multiline text string; the original text nodes and nodal text are then deleted.

Text nodes have default sequence numbers associated to them which you use for annotating; you can override the assigned sequence numbers.

You can renumber the sequence numbers of text nodes starting at one and incrementing by units of one. The next sequence number available now has the lowest value.

You can request that tags belonging to the text nodes be updated to match the new sequence number if they did so before renumbering. Alternatively, you can tag every text node with its new sequence number or blank out the tags entirely.

Text nodes are not covered in this user guide. For information about inserting, changing, renumbering, and annotating text nodes, see *Design and Drafting User Guide and Menu Reference*.

Nodal Text (Ntext)

Use nodal text to annotate nodal figures, text nodes, and nodal lines, with any alphanumeric characters you desire. Nodal text can be extracted from parts or drawings in order to generate reports, or to control text insertion, appearance, and modification in a manner similar to standard text.

You insert text for text nodes by:

- Selecting the desired nodes
- Specifying their starting sequence number
- Specifying the layer number to discriminate the text nodes

Alternatively, you can bulk annotate all the text nodes on your drawing, identified by their sequence numbers, with a text file you have previously created containing all the annotated strings. Any existing text is deleted and replaced by the annotation process.

To perform a large number of annotations for properties assigned to text nodes contained in library symbols or other specially prepared nodal figures, use an interactive method. Nodal figures are processed in the order you entered them in your schematic drawing or in the order you select them.

For each property name assigned to a text node of the nodal figure, enter its corresponding value (null, integer, real, or text) or accept the previously assigned value.

Because only alphanumeric input is involved, you can annotate nodal figures on a standard alphanumeric terminal.

You can insert up to 10 lines of text and a total of 200 characters at each text node; however, there is a limit of 60 characters per line.

Nodal text is not covered in this user guide. For information about inserting, changing, editing, joining, relating, and unrelating nodal text, see *Design and Drafting User Guide and Menu Reference*.

Please note: You can also view Nlines, Cnodes and Tnodes in the Parametric environment.

Using Attributes

Attributes (also known as properties) are used as labels to associate specific values and characteristics with their related entities or parts.

Attributes can be assigned to:

- A part
- A nodal entity

These attributes can also be edited and deleted.

Part properties are discussed here, but they are not used when you have inserted properties on a nodal entity. If you have a part that has been converted into a figure, any part properties assigned to the original part disappear when that figure is inserted into another part. The part properties are those of the new part if any have been assigned.

The attributes discussed here are those found in the CADDs database. The software provides two sets of property sheets for assigning attributes. If you have the EDMInformation license, then you should be referring to the *EDMInformation User Guide and Menu Reference* for how to use attributes. If you do not have the EDMInformation license, then refer to Chapter 5, “Attributes” for an explanation of the interface and its use.

Getting Started

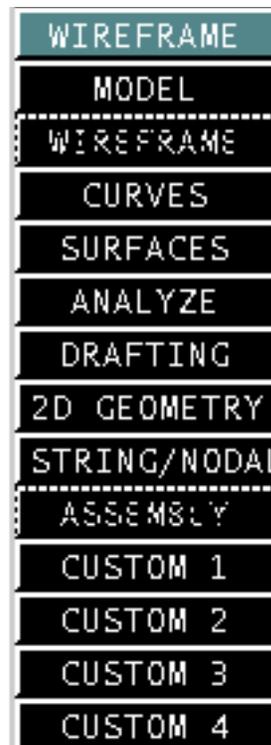
You are ready to define connectivity between different portions of your model.

Accessing the String/Nodal Task Set

At the top left of the CADDs main menu, there is a bar that identifies where you are. If you enter CADDs in the Parametric area, the bar is labeled PARAMETRIC. If you find that the bar says EXPLICIT, you are in the Explicit area of the product. From this bar, independent of what it is labeled, you can access any of the other areas of the software.

Assume that when you look at the top left side of the menu the word EXPLICIT appears. The following steps can be used from any of the areas to get into the STRING/NODAL menu.

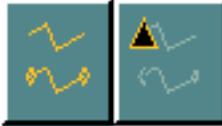
1. Move the cursor to the word WIREFRAME and select it. The following appears.



2. Slide the cursor down the list of choices and select the word STRING/NODAL.

Once you have selected STRING/NODAL from the list of options, the STRING/NODAL task set appears.

Figure 1-1 The STRING/NODAL task set

STRING/NODAL		
Selects String and Nline parameters		Lists String and Nline parameters
Creates Strings and Nlines		Changes Strings and Nlines
Displays relationships between Ntext and Nlines		Changes relationships of Nlines with text and Ntext
Selects Cnode parameters		Lists Cnode parameters
Creates Cnodes		Changes Cnodes
Displays relationships between figures and CNodes		Changes relationships of Cnodes with Nfigures
Reports the status of the instances of an Nfigure in a part		
Selects Figure parameters		Lists Figure parameters
Creates Figures		Changes Figures
Displays relationships between Tnodes and Nfigures		Changes relationships of Nfigures with other Nfigures and Tnodes
		Ungroups Figure entities

The STRING/NODAL task set provides access to icons, menus, and property sheets that provide options for using the Nodal Construction software. The task set is broken up into three distinct areas. The top six icons deal with nodal lines and string, the middle six icons deal with connect nodes, and the bottom seven icons deal with nodal figures.

Accessing the Attributes Task Set

In the pulldown under UTILITY on the right side of the top bar, you can find the heading ATTRIBUTE MANAGEMENT. Select the heading and the following appears.



Use the options on the Attribute Management task set for the following:



Access and Security Functions



Attribute Functions



Display Functions



Query Functions



Utility Functions



Administration Functions

Strings and Nodal Lines

This chapter defines Strings and nodal lines (Nlines) and mainly describes how to create them and change them.

- Overview of Strings and Nlines
- String and Nline Parameters
- String and Nline Creation
- Inserting Strings
- Inserting Nlines
- Changing Strings to Nlines
- Creating Strings from Existing Entities
- Listing String and Nline Parameters
- Modification of Strings and Nlines
- Changes to Strings and Nlines
- Dividing Strings and Nlines
- Joining Strings and Nlines by Adjusting Ends
- Joining Strings with a New Segment
- Closing Strings
- Reversing the Flow of Strings and Nlines
- Smoothing Strings and Nlines
- Changes to Vertices of Strings and Nlines
- Adding Vertices to Strings and Nlines
- Moving Vertices of Strings and Nlines
- Deleting Vertices of Strings and Nlines
- Changing the Ending Cnode of Nlines

- Changes to Segments of Strings and Nlines
- Adding Segments to Strings and Nlines
- Adding a 45 Degree Segment to Strings and Nlines
- Moving Segments of Nlines
- Deleting Segments of Strings
- Changing Nline Relationships
- Displaying Nline Relationships

Overview of Strings and Nlines

A String is an ordered collection of line segments that is considered a single entity in the database.

An Nline is a String that begins and ends at a Cnode.

Strings can be changed into Nlines. Vertices can be added, deleted or moved on Strings and Nlines. Because they are closely interrelated, they are both included in Nodal Construction.

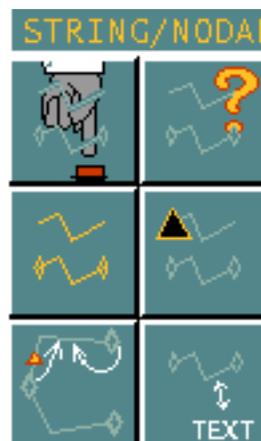
Because Nlines are direction sensitive, and can have intelligent properties associated to them, they are ideal for many applications. These applications include the generation of piping and electrical schematics and the design of wire harnesses.

You can route an Nline to begin or end at any location on another Nline instead of its Cnodes by using the auto-junction feature. The original Nline is broken and a Cnode, or bullet, is inserted.

You generate smooth nodal curves or round existing Nlines by specifying a smoothness ratio.

You can revise an Nline between its Cnodes, reverse its direction, or select different Cnodes for its end points.

All the information needed to work with Strings and Nlines can be found in the top six icons on the STRING/NODAL task set.



String and Nline Parameters



String and Nline parameters define characteristics such as Smoothness ratio, nongraphic properties, automatic junctions, and bullets.

Selecting the String/Nline Parameter icon allows you to select default parameters for Strings and Nlines. Any Strings or Nlines created after the parameters are selected will have the specified parameters assigned to them.

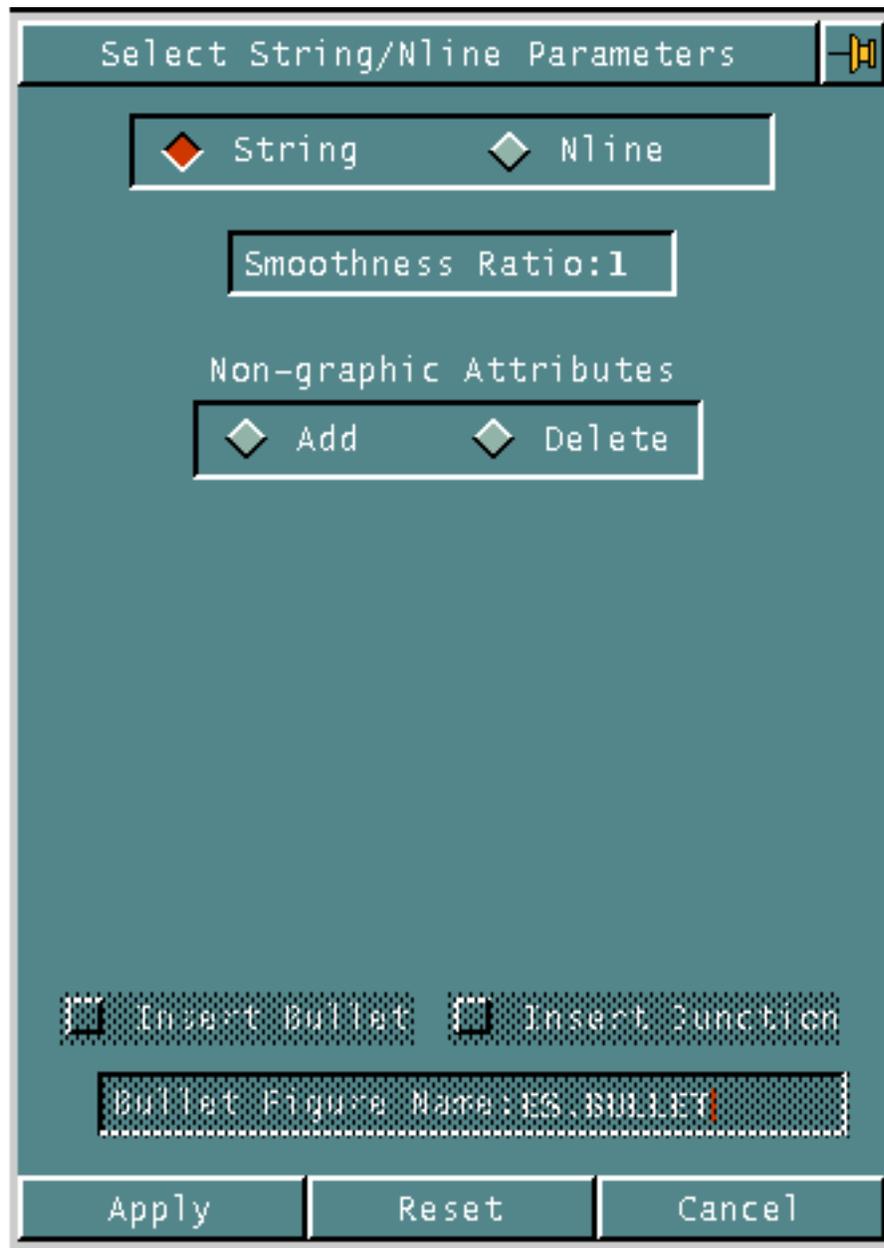
Strings can have the following parameters assigned:

- Smoothness ratio
- Nongraphic properties

Nlines can have the above parameters assigned, and in addition, they can have:

- Automatic junctions
- Bullets

The Select String/Nline Parameters property sheet contains the default parameters and characteristics defined by the system.



1. Choose String or Nline to select parameters for Strings or Nlines. String is the default. When String is chosen, the three options at the bottom of the property sheet are not available for selection. When Nline is chosen, the Insert Bullet and Insert Junction options become available.
2. Enter the Smoothness Ratio. The default value is 1. The default value gives you straight-line segments between input locations. The range of smoothness is 1-99. The higher the smoothness ratio, the greater the smoothness of curves drawn through the input locations.

When you select this option on the property sheet, the scientific calculator appears allowing you to enter the value from the calculator. The value entered into the smoothness ration field is the number before the decimal point on the calculator.

- 3. The Non-graphic Attributes allow you to add or delete nongraphic properties. Properties are labels that associate specific values and characteristics with their related entities. Properties serve the following functions: describe entities or attributes of an entity, link entities to files with other nongraphic information, and influence insertion, tracing, and reporting operations. Adding and deleting nongraphic properties applies to subsequently inserted Strings and Nlines.

Choose one of the following options:

- Choose Add to add property names and values to the String or Nline. The property name must be found in the property name file, and the property value must correspond to the type required by the name. The system file can be found under `/usr/apl/cadds/data/_bcd/prop`. Using the `LIST PROPERTY ALL` command displays a list of all the properties found in the system file.

Property	Value

- Choose Delete to delete property names and values from the set to be added to future Strings or Nlines. You can select the properties for deletion from the list of properties already assigned in the part.



4. If you have chosen Nline on the property sheet, you can choose Insert Bullet. This allows you to insert a bullet at the junction of two Nlines.
5. If you have chosen Nline on the property sheet, you can choose Insert Junction. This allows an Nline to begin and end on an Nline. The Nline is broken at the junction, and a Cnode (default) or a bullet is inserted. If the input location is close to a vertex, the junction is placed at the vertex. If the input location is close to an existing Cnode, the new Nline starts or ends at the Cnode. (A new Cnode is not inserted and the old Nline is not broken.)
6. Enter Bullet Figure Name to enter the name of the bullet, an existing Nfigure of your choice. The default is ES.BULLET.

Example 1

To set up default parameters for Strings,

1. Select the String/Nline Parameters icon from the String/Nodal task set.
2. Choose Add under Non-graphics Attributes on the Select String/Nline property sheet.

3. Enter the property names and value that you want to assign to the String.

Property	Value
ELEMNAME	"R1" "R2" "R3"
SIGNAL	

4. Choose Apply. All subsequently created Strings have the property ELEMNAME with the values "R1" "R2" "R3" and the property SIGNAL with no value assigned.

Example 2

To change the smoothness ratio for Nlines,

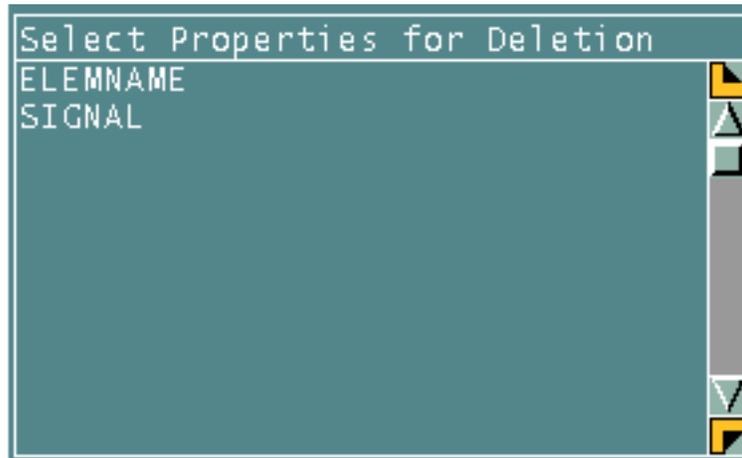
1. Select the String/Nline Parameters icon from the String/Nodal task set.
2. Choose Nline at the top of the property sheet.
3. Choose Smoothness Ratio on the property sheet. Using the calculator, enter the new smoothness ratio that you want. In this case, enter 25.
4. Choose Apply.

Example 3

To change the parameters set up for Strings,

1. Select the String/Nline Parameters icon from the String/Nodal task set.
2. Choose Delete under Non-graphics Attributes.

3. Select the nongraphic properties that you want to delete from subsequently created Strings. In this case, select ELEMNAME.



4. Choose Apply. The next time that you want to delete a nongraphic property from a String while in the part, you will find that SIGNAL is the only property listed.

Example 4

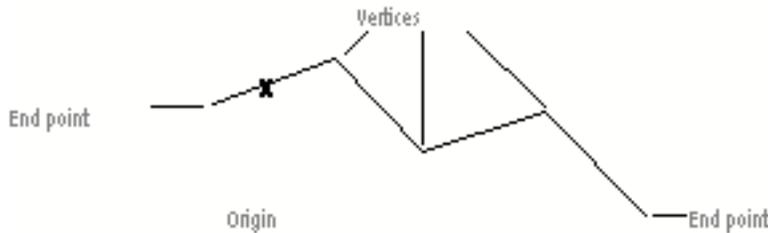
To turn on automatic junction and insert the default named bullet at each junction for subsequently inserted Nlines,

1. Select the String/Nline Parameters icon from the String/Nodal task set.
2. Choose Nline at the top of the property sheet.
3. Choose Insert Junction from the bottom of the property sheet.
4. Choose Apply.

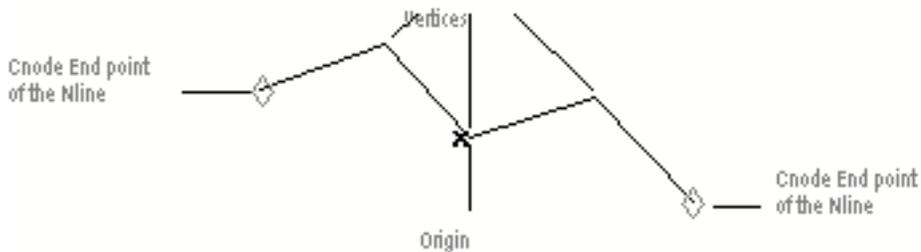
String and Nline Creation



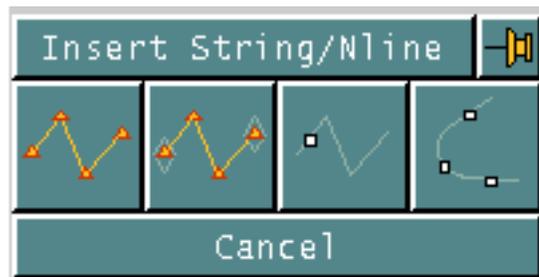
Although a String appears as a series of segments, it is considered a single entity in the database. The origin of a String is the midpoint of the first segment, that is, the midpoint between the first two locations selected.



Although an Nline appears as a String that begins and ends at a Cnode, it too is considered a single entity in the database. The origin of the Nline is the midpoint of the Nline.



There is more than one way to create a String or an Nline. When you select the Insert String/Nline icon on the String/Nodal task set, the following appears. The first three icons allow you to create a String or an Nline, or convert a String to an Nline by selecting locations or entities. The last icon (converts entities to Strings) calls up a property sheet.



Inserting Strings



You can create a String between locations that you select. If the same location is selected twice, both locations appear in the database.

The String is created on the active layer. To create the String on a different layer, choose the Tag/Layer option.

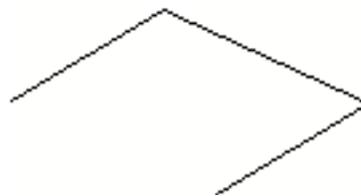
Example 1

To create a String,

1. Select the String icon from the Insert String/Nline menu.
2. Select the locations to create the String.



3. Choose Done from the Utilities menu.

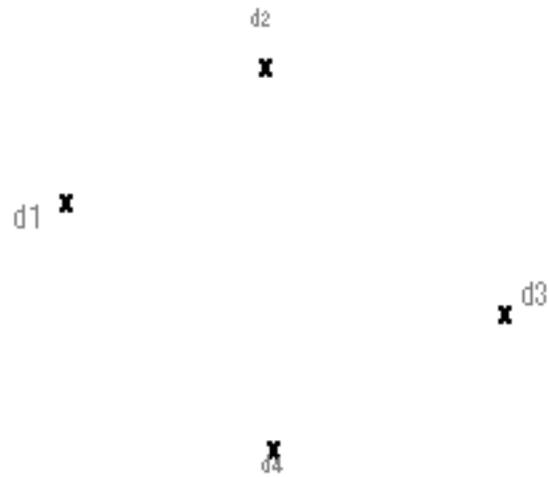


Example 2

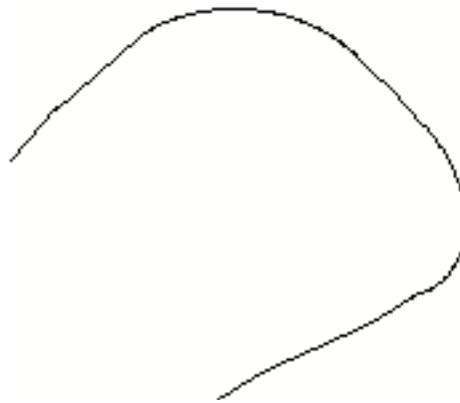
To create a String with a Smoothness ratio,

1. Select the String/Nline Parameters icon from the String/Nodal task set.
2. Choose Smoothness ratio on the property sheet and enter the value 25 into the calculator.
3. Choose Apply.
4. Select the Insert String/Nline icon from the task set.
5. Select the String icon from the Insert String/Nline task set.

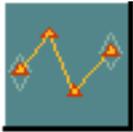
6. Select the locations to create the String.



7. Choose Done from the Utilities menu.



Inserting Nlines



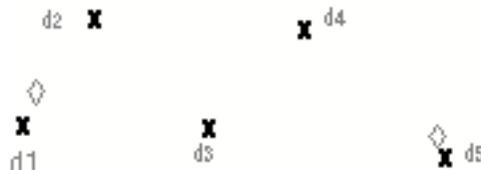
You can create an Nline between locations that you select freehand or specify with coordinates.

The Nline is created on the active layer. To create the Nline on a different layer, choose the Tag/Layer option.

Example 1

Cnodes have already been created in the part. To create an Nline,

1. Select the Nline icon from the Insert String/Nline task set.
2. Select the locations to create the Nline. The Nline must begin and end at a Cnode.



3. Choose Done from the Utilities menu.

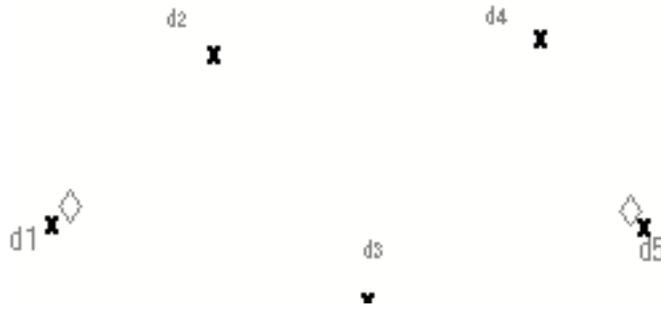


Example 2

Cnodes have already been created in the part. To create an Nline with a smoothness ratio of 25,

1. Select the Parameters icon from the String/Nodal task set.
2. Choose the Nline option.
3. Choose Smoothness ratio on the property sheet and enter the value 25 into the calculator. Choose the entry field to accept the value.
4. Choose Apply.
5. Select the Insert String/Nline icon from the task set.

6. Select the Nline icon from the Insert String/Nline menu.
7. Select the locations to create the Nline.



8. Choose Done from the Utilities menu.



Example 3

Cnodes have already been created in the part. Set all the Nline parameters back to the default. (Smoothness ratio = 1). To create multiple Nlines,

1. Select the Insert String/Nline icon from the task set.
2. Select the Nline icon from the Insert String/Nline task set.

3. Select two locations to create the Nline.



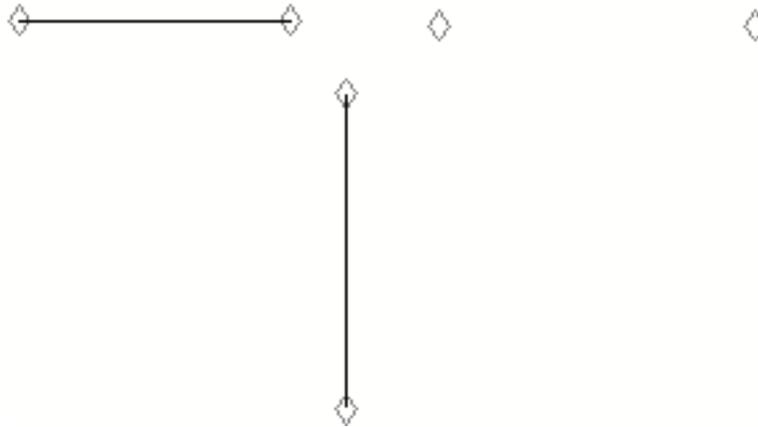
4. Choose Again from the Utilities menu.



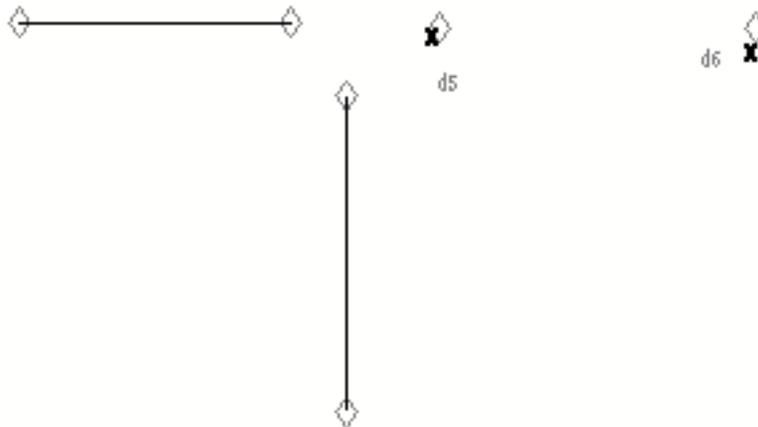
5. Select two more locations to create the Nline.



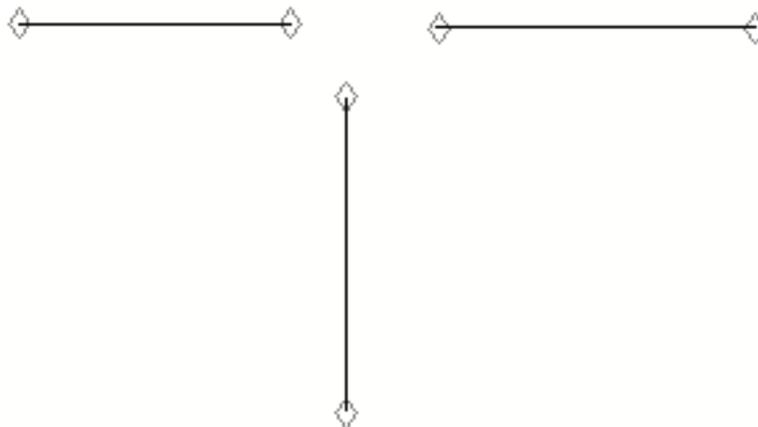
6. Choose Again from the Utilities menu.



7. Select two more locations to create the Nline.



8. Choose Done from the Utilities menu.



Changing Strings to Nlines



Strings can be changed to Nlines. A Cnode is inserted at each end point, unless an existing Cnode can be used. An existing Cnode can be found only when it is visible.

When changing Strings to Nlines, you must be aware of the following:

- Two Strings at a T-junction are converted to three Nlines sharing one Cnode. Strings are resolved with existing Cnodes before testing for T-joins. A T-join will only be recognized if it is within the existing trap size.
- Up to 1,000 Strings can be converted at one time.

The Nline is created on the active layer. To create the Nline on a different layer, turn on the Tag/Layer Toggle.

The Strings being changed must be on visible layers to be converted. The layer toggle does not convert Strings on unechoed layers. Strings that have coincident start and end points should be selected explicitly. You must insert one Cnode at the end point to guarantee correct results. Only one Cnode is created at any given point.

Example

To change a String to an Nline,

1. Select the Convert String icon from the Insert String/Nline menu.
2. Select the String that you want to change to an Nline.



3. Choose Done from the Utilities menu.



An existing Cnode is used and another Cnode is added at the other end of the Nline.

The following information is displayed in the text window.

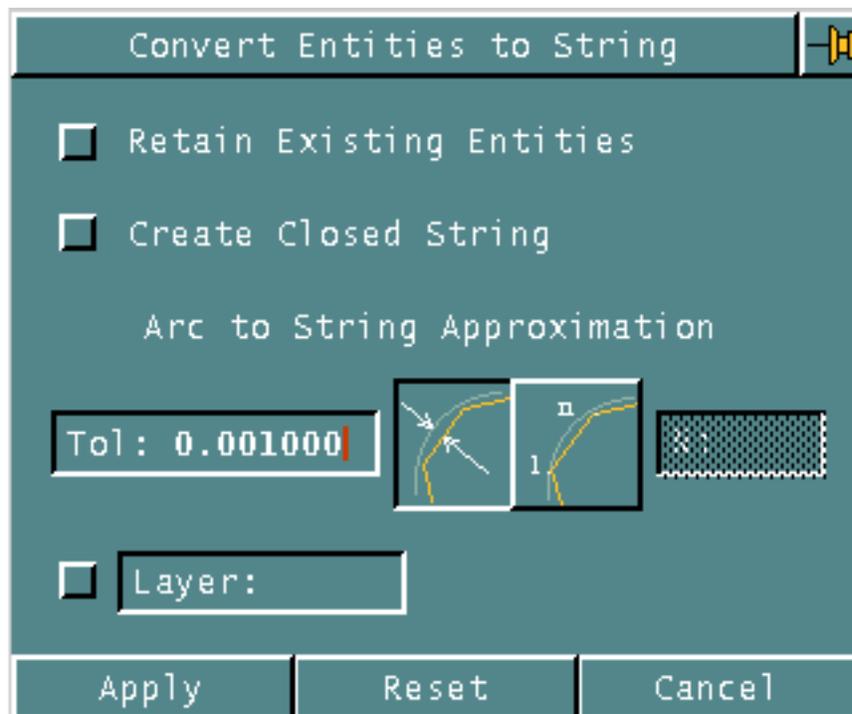
```
1 STRINGS FOUND  
COORD. FILE COMPLETE  
PROCESSING      2 COORDS  
AFTER 1 PASS,   0 NLINS RESOLVED  
1 STRINGS BEING PROCESSED
```

Creating Strings from Existing Entities



You can create a single String from a series of up to 2,000 lines, arcs, circles, and Strings.

When you select the Convert Entities to String icon from the Insert String/Nline task set, the following appears.



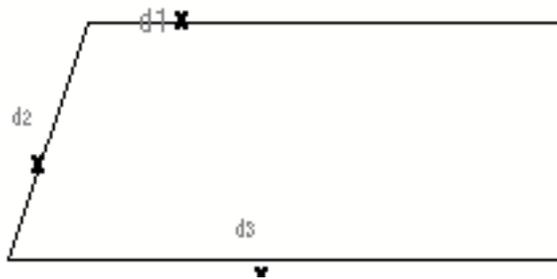
1. Choose Retain Existing Entities to retain the existing entities.
2. Choose Create Closed String to create a closed String by joining the end points of the generated String.
3. Specify tolerance (accuracy of the linear approximation) or the number of points used when an arc is turned into a String. Icons for Tolerance or N must be selected to switch back and forth.
 - Choose Tol : to change the default value. The scientific calculator appears allowing you to enter the value from the calculator. The value entered determines how closely the new String matches the curvature of the original arc. The smaller the value, the closer the match.
 - Choose N and specify the number of points used when turning an arc into a String. If you do not select this option, the default of Tolerance is used.

4. Choose Layer and enter the layer number(s) of existing entity(s) to be processed using the layer keypad.

Example 1

To create a String from existing line entities,

1. Select the Convert Entities to String icon from the Insert String/Nline menu.
2. Choose Create Closed String from the property sheet.
3. Choose Apply.
4. Select the lines from which you want to create a String.



5. Choose Done from the Utilities menu.

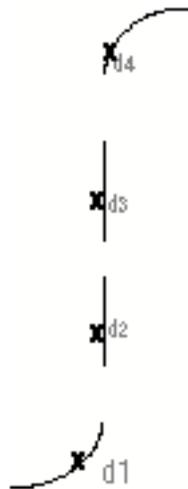


Example 2

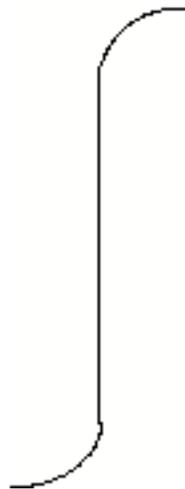
To create a String from two curved entities and two lines,

1. Select the Convert Entities to String icon from the Insert String/Nline menu.
2. Choose Retain Existing Entities on the property sheet.
3. Choose Apply.

4. Identify the curves and lines from which you want to create a String.



5. Choose Done from the Utilities menu.



To verify that the original entities were retained, use the Query icon on the top bar.

Listing String and Nline Parameters



The following series of procedures will show you the results of selecting different parameters for both Strings and Nlines.

These parameters come from the Select String/Nline parameters property sheet, and from using SELECT LOCK (Premium Engineering Package).

To find out the nongraphic properties that have been assigned to created Strings and Nlines, you must enter LIST PROPERTY and select the String or Nline.

Example 1

To list the parameters for the String entity,

1. Select the List icon from the String/Nodal task set. The following menu appears directly below the List icon.



2. Choose String from the list of choices.

The following information is displayed in the text window.

```
*** Default parameters ***  
STRING/NLINE Parameters  
  INTRP RATIO           = 25  
  GENERAL LOCKING       = OFF  
  LOCKING FOR COMMAND  
  EDIT STRING/NLINE = OFF  
  BASIS ANGLE           = 90.0  
  NO. OF DIRECTIONS     = 4
```

Example 2

To list the parameters for the Nline entity,

1. Select the List icon from the String/Nodal task set. The following menu appears directly below the List icon.



2. Choose Nline from the list of choices.

The following information is displayed in the text window.

```

*** DEFAULT PARAMETERS ***
STRING/NLINE PARAMETERS
  INTRP RATIO           = 25
  AUTOMATIC JUNCTION   = OFF
  BULLET OPTION        = OFF
  BULLET NAME          = ES.BULLET
  GENERAL LOCKING      = OFF
  LOCKING FOR COMMAND
  EDIT STRING/NLINE    = OFF
  BASIS ANGLE          = 90.0
  NO. OF DIRECTIONS   = 4
  
```

Example 3

To view the nongraphic properties (attributes) associated with the Nline,

1. Choose Attribute Management from the Utility menu.
2. Select the Query Function icon from the menu.



3. Select the Nline for which you want to have the properties listed.
4. Choose Done from the Utilities menu.

The system displays the following in the text window.

```
## LISt PROPErty :MODEL ent
```

```
PROPERTIES ATTACHED TO ENTITY ARE:  
SIGNAL
```

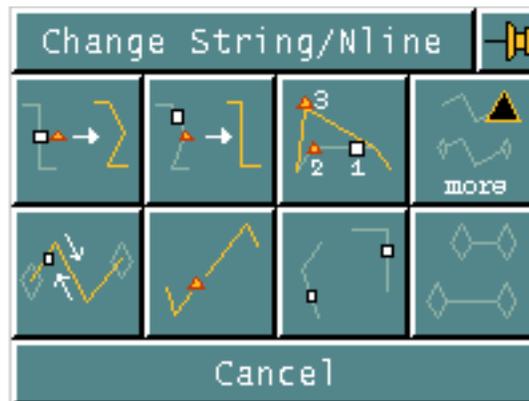
Modification of Strings and Nlines



Strings or Nlines can be modified in the following ways:

- Vertices can be added, cut, deleted, joined, or moved.
- Strings or Nlines can be broken into multiple (two or more) Strings or Nlines.
- Smoothness ratio can be changed.
- Segments can be removed from one or more Strings.
- Graphic changes can be made to Strings or Nlines.
- Direction of String or Nline can be reversed.
- Multiple Strings or Nlines located close together can be joined.
- Segments of an Nline can be stretched.

The Change String/Nline menu appears when you select the Change icon from the String/Nodal task set.



The property sheet is discussed first. All the other options on this menu can also be done from the property sheet. When the option is available from both places, it will be noted with an example.

Changes can be made to existing Strings and Nlines.

When you select the More icon from the Change String/Nline menu, the following property sheet appears. String is selected by default.



There are three different types of actions that can be achieved using this property sheet. Each of these types of actions will be explained separately.



Selecting this icon allows you to make changes to Strings and Nlines.



Selecting this icon allows you to make changes to vertices of Strings and Nlines. The property sheet changes.



Selecting this icon allows you to make changes to segments of Strings and Nlines. The property sheet changes.

Changes to Strings and Nlines



When the default selections on the property sheet are used (top icon with the String option), you can do the following things:

- Divide a String into two or more Strings
- Join two close Strings by adjusting their end points.
- Unite two Strings by adding a segment between end points.
- Close a String.
- Reverse the direction of flow of Strings.
- Change the smoothness of Strings.

When you select Nline from the two options at the top of the property sheet, you can do the following things:

- Divide an Nline into two or more Nlines, inserting a Cnode at the break location.
- Join two close Nlines by adjusting their end points and making three or more Nlines come together at the same point without ceasing to be individual entities.
- Unite two Nlines by adding a segment between end points deleting the Cnodes in the middle of the new Nline.
- Closes an Nline by creating a segment between existing end points.
- Reverse the direction of flow of Nlines.
- Change the smoothness of Nlines.

Changes to Vertices of Strings and Nlines



Selecting the middle icon and using the default String option, you can do the following things:

- Add a vertex to a String.
- Move a vertex in a String.
- Delete a vertex from a String.

When you select Nline from the two options at the top of the property sheet, you can do the following things:

- Add a vertex to an Nline.
- Move a vertex in an Nline.
- Delete a vertex from an Nline.
- Change the termination of an Nline to a different Cnode.

Changes to Segments of Strings and Nlines



Selecting the bottom icon and using the default String option, you can do the following things:

- Add a segment to a String.
- Create a new String segment at a 45-degree angle between two existing String segments.
- Delete a segment of a String.

When you select Nline from the two options at the top of the property sheet, you can do the following things:

- Add a segment to an Nline.
- Create a new Nline segment at a 45-degree angle between two existing Nline segments.
- Move a segment of an Nline.

Changes to Strings and Nlines



The following procedures are all done using the options shown below. When a command can also be done from the Change String/Nline menu, it is so noted by giving an example.



Dividing Strings and Nlines

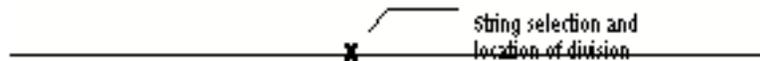


Dividing a String or Nline into two or more Strings or Nlines is not apparent after the division takes place. In order to verify that the division actually took place, you should use the Query icon.

Example 1

To divide a String at one location,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon on the Change String/Nline task set.
3. Choose the Divide option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the String that you want to divide into two Strings at the location you want the division to occur.



6. Choose Done from the Utilities menu.

There is no visual change to the graphics; however, if you select the Query icon from the top bar, you will now get information on two Strings.

Example 2



To get the same results by using the Divide String icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Divide String icon from the Change String/Nline menu.
3. Select the String that you want to divide into two Strings at the location you want the division to occur.
4. Choose Done from the Utilities menu.

There is no visual change to the graphics; however, if you select the Query icon from the top bar, you will now get information on two Strings.

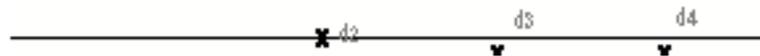
Example 3

To divide a String into multiple Strings,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the String/Nodal task set.
3. Choose the Divide option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the String that you want to divide, at the location of the division on each string.



6. Choose Next from the Utilities menu.
7. Select the additional locations where you want the String divided.



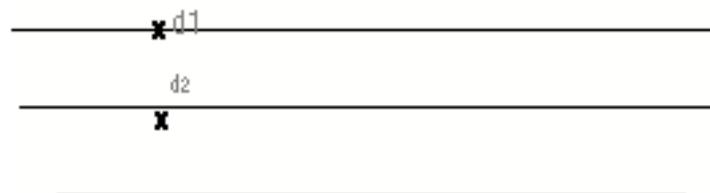
8. Choose Done from the Utilities menu.

There is no visual change to the graphics; however, if you select the Query icon from the top bar, you will now get information on four Strings.

Example 4

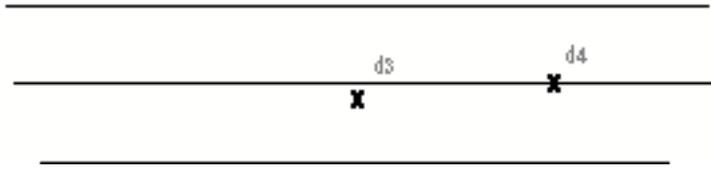
To divide multiple Strings,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the String/Nodal task set.
3. Choose the Divide option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the Strings that you want to divide at the location on each String of the division.



6. Choose Next from the Utilities menu.

7. Select the locations on the last String identified where additional divisions are to occur.



8. Choose Done from the Utilities menu.
The top String is divided into two, the middle String is divided into four, and the bottom String remains as one.

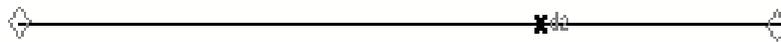
Example 5

To divide an Nline at two locations,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the String/Nodal task set.
3. Choose the Nline and Divide options from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the Nline that you want to divide into more than two Nlines at the location of the first division.



6. Choose Next from the Utilities menu.
7. Select the additional location where you want the Nline divided.



8. Choose Done from the Utilities menu.



Example 6

To divide multiple Nlines,

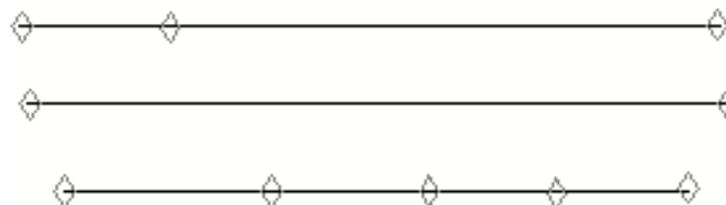
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the String/Nodal task set.
3. Choose the Nline and Divide options from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the Nlines that you want to divide at the location of the division.



6. Choose Next from the Utilities menu.
7. Select the locations on the last Nline identified where additional divisions are to occur.



8. Choose Done from the Utilities menu.



Joining Strings and Nlines by Adjusting Ends



Two Strings or Nlines can be joined into one continuous entity, or three or more Strings or Nlines can come together at the same point, without ceasing to be individual entities.

You can give the location where the Strings or Nlines must be joined. (Nlines must be joined at a common Cnode.) If you do not give a location, the default location is the average of the x- and y-coordinates of the end points nearest the input locations selecting the Strings or Nlines. The end point nearest the input location is transferred, and vertices of the String or Nline are moved, modifying its shape to suit the transfer of its end point.

Two Nlines that share a Cnode can be selected to become one Nline by automatic deletion of their shared Cnode. Opposite directions of the Nlines do not prevent their union (except in mapping applications).

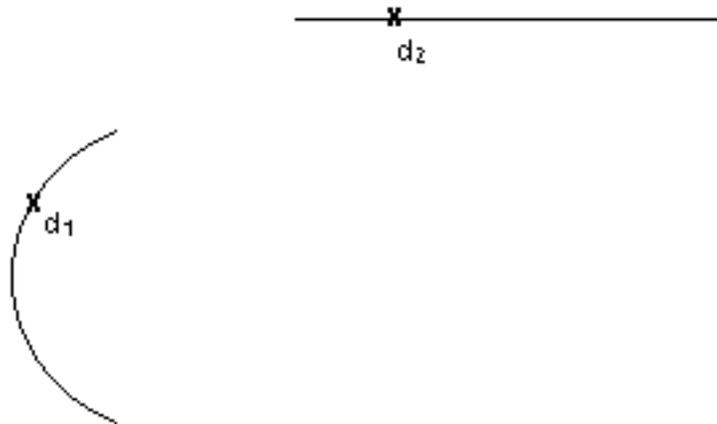
A Cnode may be deleted when a join is made. If Ntext is attached to the Cnode or the Cnode belongs to a figure, the join is not made.

Example 1

To join two close Strings,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline task set.
3. Choose the Join by Adjusting Ends option from the Change String/Nline property sheet.
4. Choose Apply.

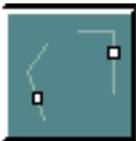
5. Select the two Strings that you want to join.



6. Choose Done from the Utilities menu.



Example 2



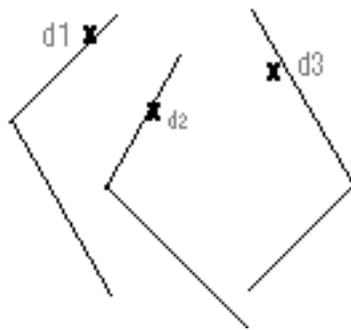
To get the same results by using the Join String icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Join String icon from the Change String/Nline menu.
3. Select the two Strings that you want to join.
4. Choose Done from the Utilities menu.

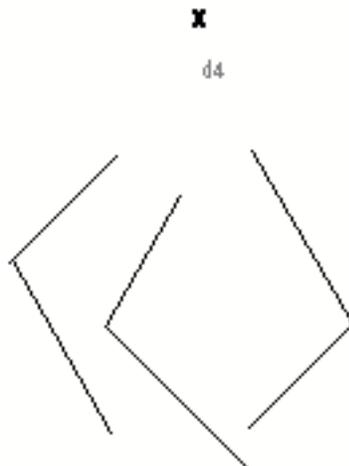
Example 3

To join three Strings at a common point,

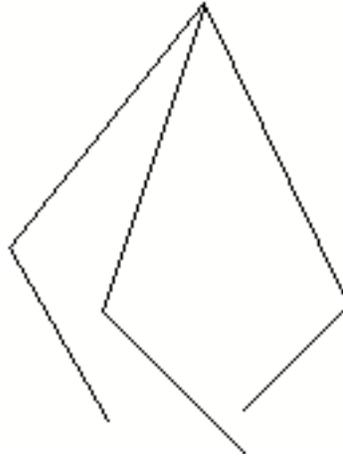
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Join by Adjusting Ends option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the three Strings that you want to join at a common point.



6. Choose Next from the Utilities menu.
7. Select the location for the common point of the three Strings.



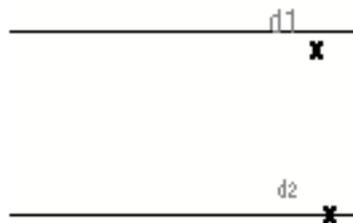
8. Choose Done from the Utilities menu.



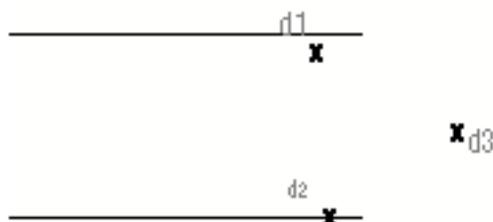
Example 4

To join two Strings by giving a location where the Strings must be joined,

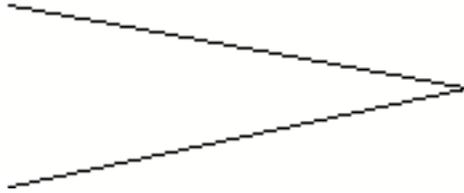
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Select the Join by Adjusting Ends option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the two Strings that you want to join.



6. Choose Next from the Utilities menu.
7. Select the location through which the Strings are to be joined.



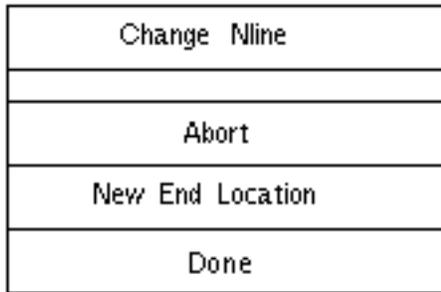
8. Choose Done from the Utilities menu.



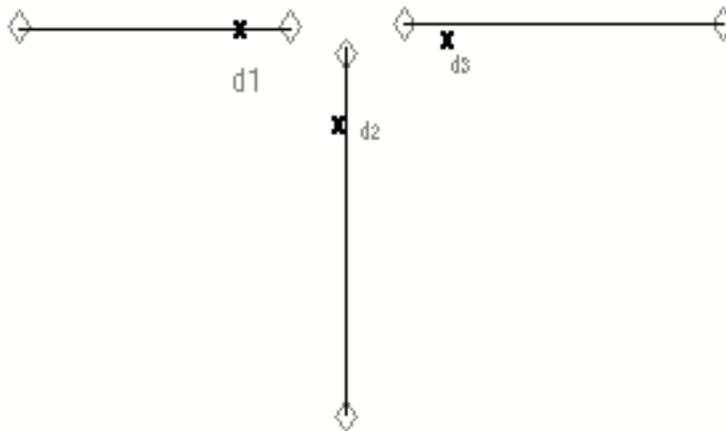
Example 5

To join three Nlines at calculated default location,

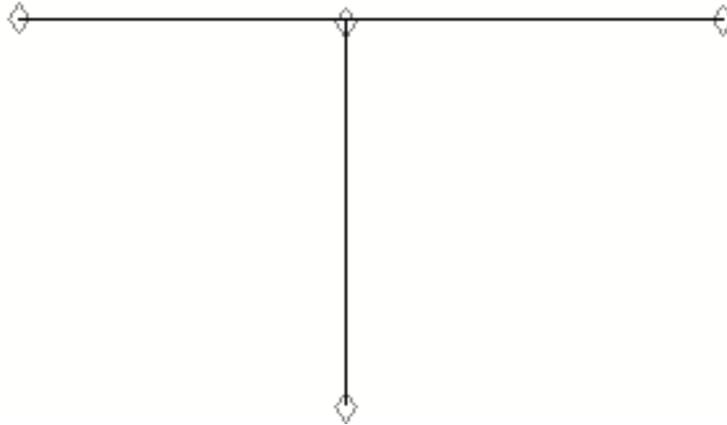
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Nline and Join by Adjusting Ends options from the Change String/Nline property sheet.
4. Choose Apply. The following appears below the Apply box.



5. Select the three Nlines that you want to join.



6. Choose Done from the Change Nline menu.



Example 6



To get the same results by using the Join Nline icon from the Change String/Nline menu,

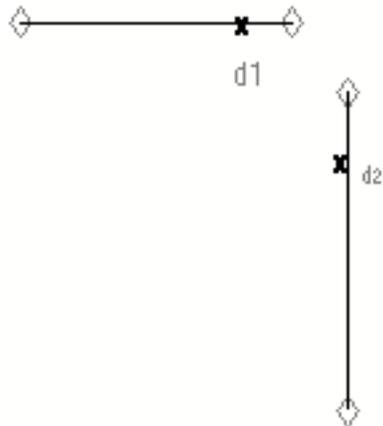
1. Select the Change icon from the String/Nodal task set.
2. Select the Join Nline icon from the Change String/Nline menu.
3. Select the three Strings that you want to join.
4. Choose Done from the Utilities menu.

Example 7

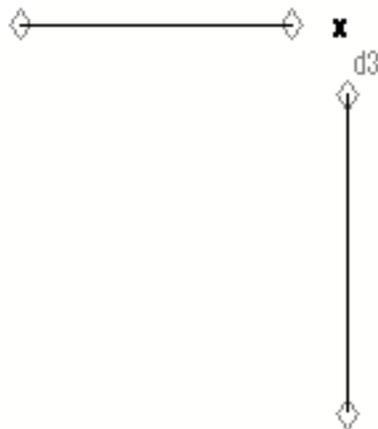
To join two Nlines at a new location creating one Nline,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Nline and Join by Adjusting Ends options from the Change String/Nline property sheet.
4. Choose Apply.

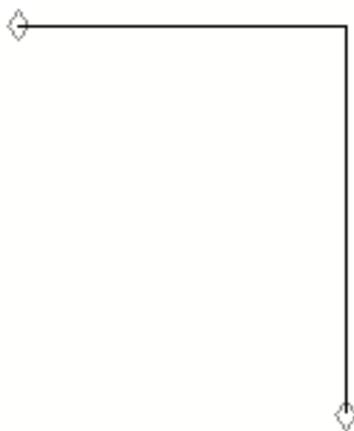
5. Select the two Nlines that you want to join.



6. Choose New End Location from the Change Nline menu.



7. Choose Done from the Change Nline menu.



Joining Strings with a New Segment



Two Strings can be joined to create one String by creating a segment between an end point of the first String and an end point of the second String.

This option is not available for Nlines.

Example

To join two Strings by creating a segment between their end points,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Join with New Segment option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the two Strings at the end points that you want to join.



6. Choose Done from the Utilities menu.



Closing Strings



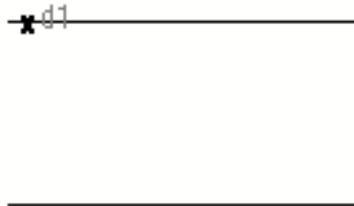
Strings that are not closed can be closed by creating a segment between two end points of the existing String.

This option is not available for Nlines.

Example

To close an existing String,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Close option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the String that you want to close.



6. Choose Done from the Utilities menu.



Reversing the Flow of Strings and Nlines

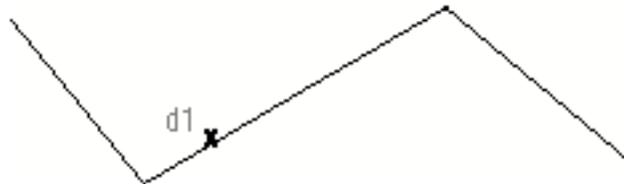


The direction of flow of a String or Nline can be changed or reversed.

Example 1

To reverse the direction of a String,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Reverse option from the Change String/Nline property sheet.
4. Choose Apply.
5. Select the String which will have its direction reversed.



6. Choose Done from the Utilities menu.

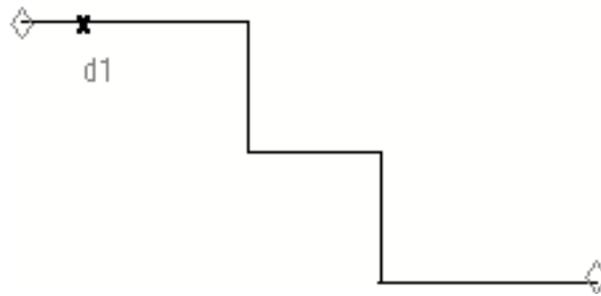
There is no visual change to the graphics.

Example 2

To reverse the direction of an Nline,

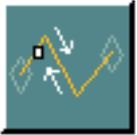
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Nline and Reverse options from the Change String/Nline property sheet.
4. Choose Apply.

5. Select the Nline which will have its direction reversed.



6. Choose Done from the Utilities menu.
There is no visual change to the graphics.

Example 3



To get the same results by using the Reverse Nline Direction icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Reverse Nline Direction icon from the Change String/Nline menu.
3. Select the Nline which will have its direction reversed.
4. Choose Done from the Utilities menu.
There is no visual change to the graphics.

Smoothing Strings and Nlines



The Smoothness Ratio can be changed for existing Strings and Nlines.

The default smoothness of 1 produces a series of straight line segments when Strings and Nlines are created. This Smoothness Ratio is selected before the String or Nline is created. The value set for the Smoothness Ratio on the Select String/Nline property sheet determines the smoothness of the segments of created Strings or Nlines. The range of values allowed is 1 to 99.

Example 1

To change the Smoothness Ratio of all existing Strings in the part,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Smoothness Ratio option from the Change String/Nline property sheet. Using the calculator, enter the new Smoothness Ratio that you want. In this case, enter 90.

The Select Graphically and Select All options now become available.

4. Choose Select All.
5. Choose Apply.
6. All the Strings in the part will have their Smoothness Ratio changed to a value of 90.



Smoothness Ratio :1



Smoothness Ratio :90

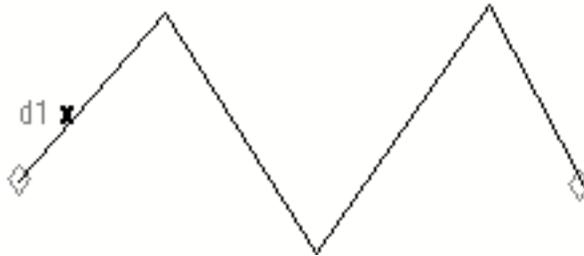
Example 2

To change the Smoothness Ratio of an existing Nline,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Nline and Smoothness Ratio options from the Change String/Nline property sheet. Using the calculator, enter the new smoothness ratio that you want. In this case, enter 76.

The Select Graphically and Select All options now become available.

4. Choose Select Graphically.
5. Choose Apply.
6. Select the Nline that you want to change.

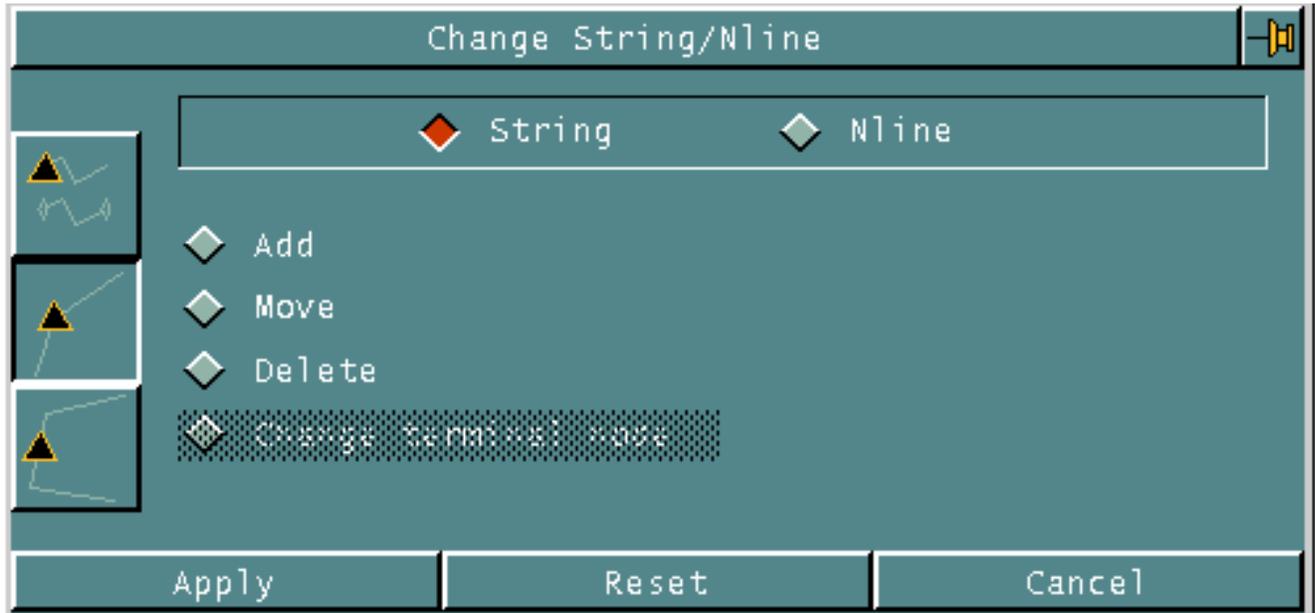


7. Choose Done from the Utilities menu.



Changes to Vertices of Strings and Nlines

The following procedures are all done using the options shown below. When a command can also be done from the Change String/Nline menu, it is so noted by giving an example.



Adding Vertices to Strings and Nlines



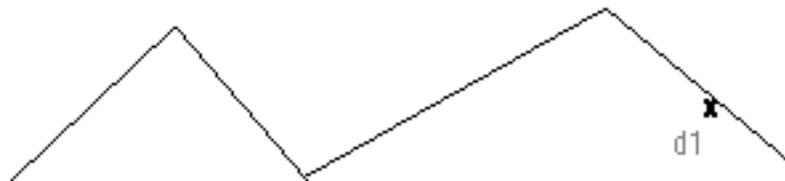
You can add an additional vertex to an existing String or Nline. The new vertex can be used to reshape any String or Nline by replacing any segment with two segments joined at the new vertex.

You can also extend any String defined by three or more vertices by adding a segment from the vertex at either end of the String to the new vertex.

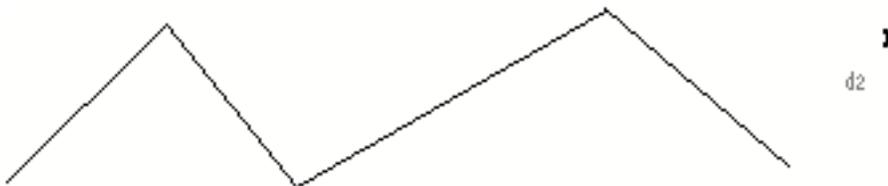
Example 1

To extend an existing String by adding a segment at the end of the String,

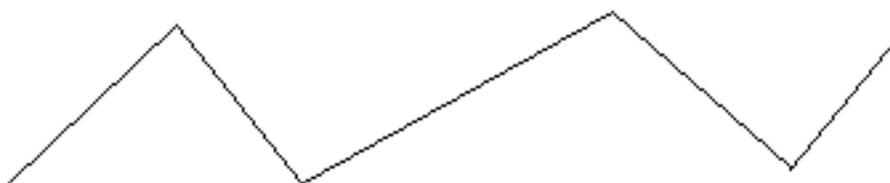
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Changes to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Add option from the property sheet.
5. Choose Apply.
6. Select the String which will have a segment added to its end.



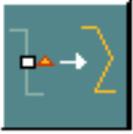
7. Select the location of the end point of the extension.



8. Choose Done from the Utilities menu.



Example 2



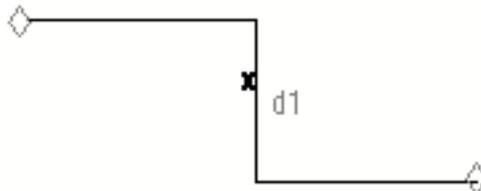
To get the same results by using the Add Vertex icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Add Vertex icon from the Change String/Nline menu.
3. Select the String which will have a segment added to its end.
4. Select the location of the end point of the extension.
5. Choose Done from the Utilities menu.

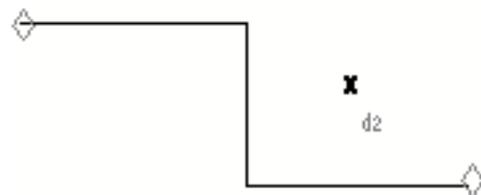
Example 3

To add a vertex to an Nline,

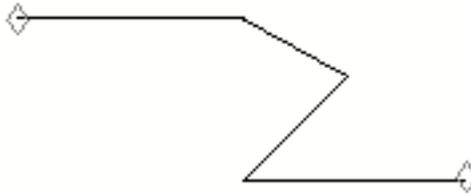
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Changes to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Add options from the property sheet.
5. Choose Apply.
6. Select the Nline close to where the vertex is to be added.



7. Select the location where you want the new vertex.



8. Choose Done from the Utilities menu.



Example 4



To get the same results by using the Add Vertex icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Add Vertex icon from the Change String/Nline menu.
3. Select the Nline close to where the vertex is to be added.
4. Select the location where you want the new vertex.
5. Choose Done from the Utilities menu.

Moving Vertices of Strings and Nlines



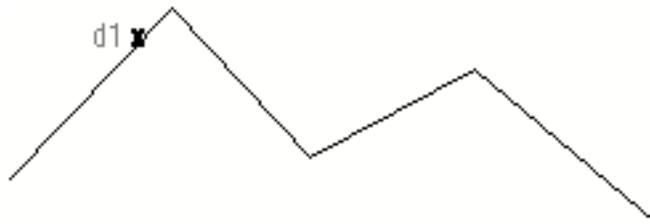
You can move one vertex of an Nline, but the vertex cannot be an end point of an Nline. You will eliminate the vertex between adjacent colinear horizontal or vertical segments in the entire Nline. These adjacent segments are then replaced by single segments.

If you move a vertex or node onto an adjacent vertex or node, one of the coincident points is removed, unless these coincident points are the only points in the entity. In this case, a zero length String containing the two coincident vertices remains.

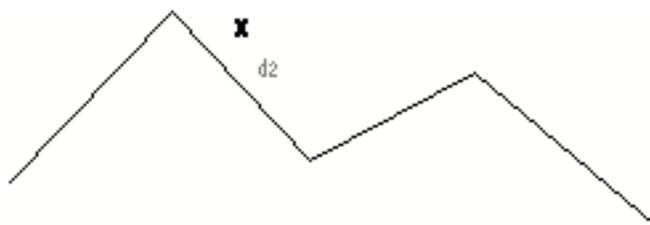
Example 1

To move a vertex on a String,

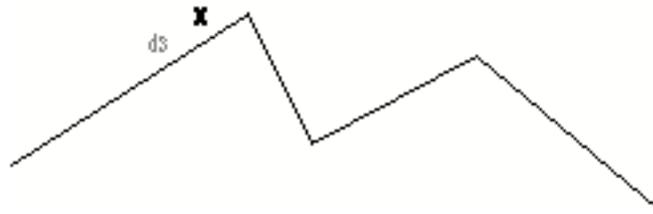
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Changes to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Move option from the property sheet.
5. Choose Apply.
6. Select the String on which the vertex is to be moved. The location of this first selection determines which vertex is to be moved.



7. Select the location to which you want the vertex to move.



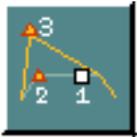
The vertex immediately moves to the new location. You can keep selecting a new location for the vertex until you have located it exactly where you want it.



8. Choose Done from the Utilities menu to end the selection of new locations for the vertex.



Example 2



To get the same results by using the Move Vertex icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Move Vertex icon from the Change String/Nline menu.
3. Select the String on which the vertex is to be moved. The location of this first selection determines which vertex is to be moved.
4. Select the location to which you want the vertex to move.

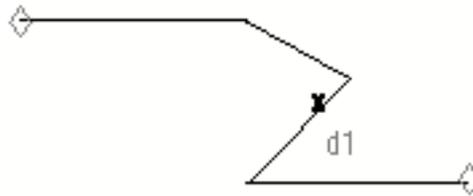
The vertex immediately moves to the new location. You can keep selecting a new location for the vertex until you have located it exactly where you want it.

5. Choose Done from the Utilities menu to end the selection of new locations for the vertex.

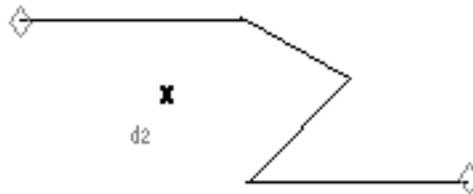
Example 3

To move a vertex on an Nline,

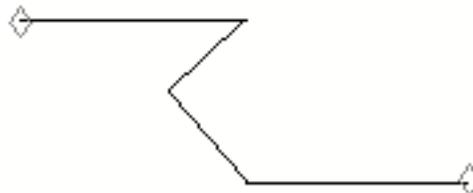
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Changes to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Move options from the property sheet.
5. Choose Apply.
6. Select the Nline on which the vertex is to be moved. The location of this first selection determines which vertex is to be moved.



7. Select the location to which you want the vertex to move.

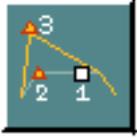


The vertex immediately moves to the new location. You can keep selecting a new location for the vertex until you have located it exactly where you want it.



8. Choose Done from the Utilities menu to end the selection of new locations for the vertex.

Example 4



To get the same results by using the Move Vertex icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Move Vertex icon from the Change String/Nline menu.
3. Select the Nline on which the vertex is to be moved. The location of this first selection determines which vertex is to be moved.
4. Select the location to which you want the vertex to move.

The vertex immediately moves to the new location. You can keep selecting a new location for the vertex until you have located it exactly where you want it.

5. Choose Done from the Utilities menu to end the selection of new locations for the vertex.

Deleting Vertices of Strings and Nlines

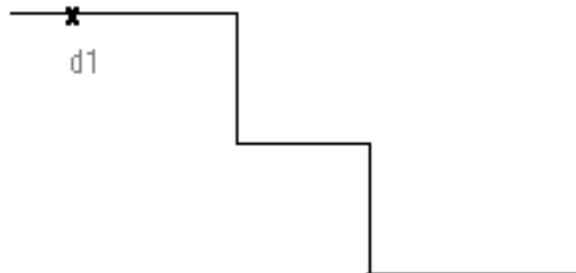


You can delete up to 100 vertices from a String if deletion does not leave fewer than two vertices.

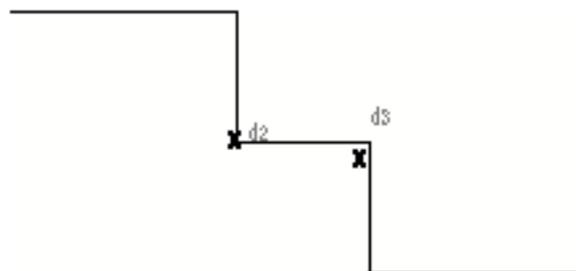
Example 1

To delete a vertex on a String,

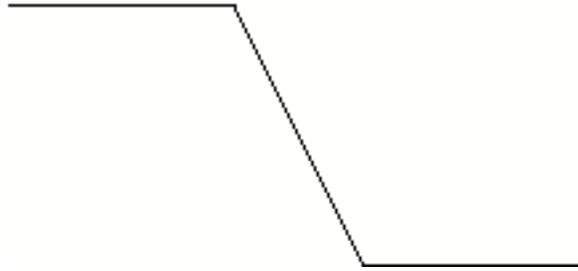
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Changes to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Delete option from the property sheet.
5. Choose Apply.
6. Select the String on which the vertex is to be deleted. The location of this first selection determines which vertex is to be moved.



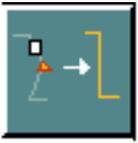
7. Select the vertices that you want to delete.



8. Choose Done from the Utilities menu.



Example 2



To get the same results by using the Delete Vertex icon from the Change String/Nline menu,

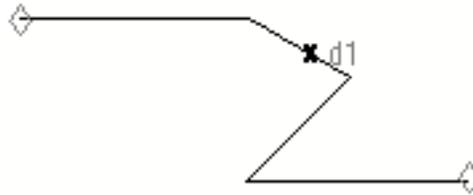
1. Select the Change icon from the String/Nodal task set.
2. Select the Delete Vertex icon from the Change String/Nline menu.
3. Select the String on which the vertex is to be deleted. The location of this first selection determines which vertex is to be moved.
4. Select the vertices that you want to delete.
5. Choose Done from the Utilities menu.

Example 3

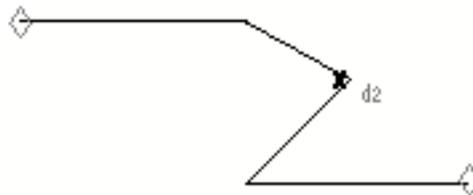
To delete a vertex on an Nline,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Nline and Changes to Vertices options on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Delete option from the property sheet.
5. Choose Apply.

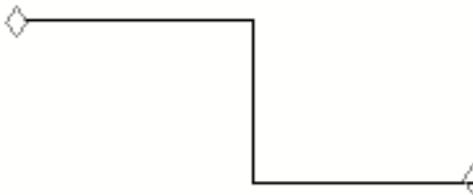
6. Select the Nline on which the vertex is to be deleted. The location of this first selection determines which vertex is to be moved.



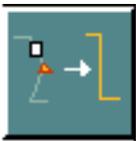
7. Select the vertex that you want to delete.



8. Choose Done from the Utilities menu.



Example 4



To get the same results by using the Delete Vertex icon from the Change String/Nline menu,

1. Select the Change icon from the String/Nodal task set.
2. Select the Delete Vertex icon from the Change String/Nline menu.
3. Select the Nline on which the vertex is to be deleted. The location of this first selection determines which vertex is to be moved.
4. Select the vertex that you want to delete.
5. Choose Done from the Utilities menu.

Changing the Ending Cnode of Nlines



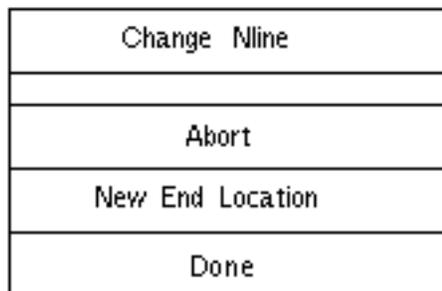
You can change the termination of an Nline to a different Cnode. Any associated text, assigned properties, or relationships remain unchanged.

If only one Cnode is selected, all Nlines end there. If two or more Cnodes are selected, they must number as many as the Nlines.

Example 1

To redirect Nlines to a single Cnode,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Change terminal node options from the property sheet.
5. Choose Apply. The following appears below the Apply box.

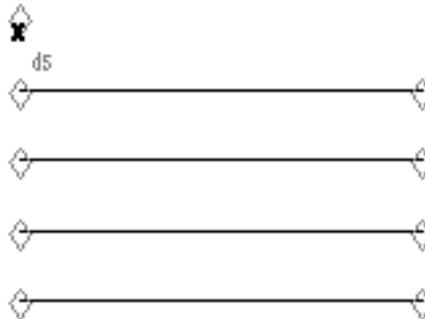


6. Select the Nlines to be moved.

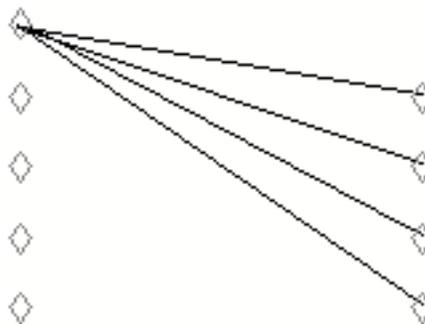


7. Choose New End Location from the Change Nline menu.

8. Select the Cnode at which the Nlines are to terminate.



9. Choose Done from the Change Nline menu.

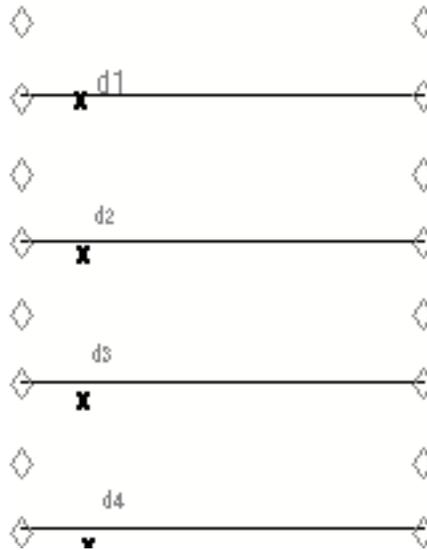


Example 2

To redirect Nlines to Cnodes,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Vertices option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Change terminal node options from the property sheet.
5. Choose Apply.

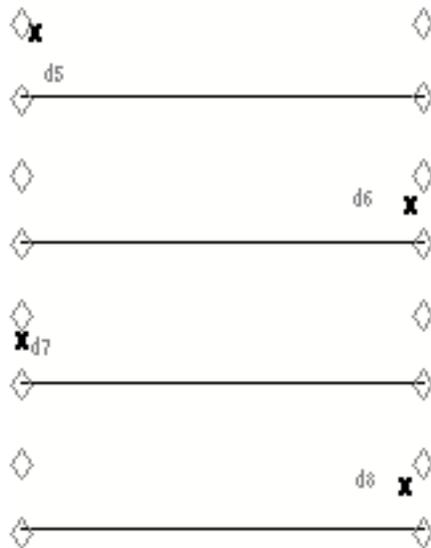
6. Select the Nlines to be moved.



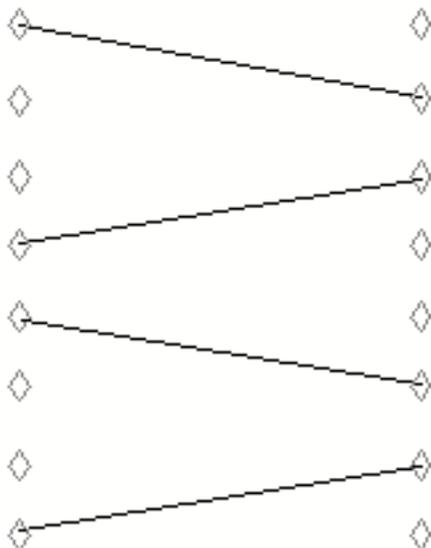
7. Choose New End Location from the Change Nline menu.

8. Select the Cnodes at which the Nlines are to terminate.

If more than one Cnode is selected, the number must equal the number of Nlines selected.



9. Choose Done from the Change Nline menu.



Changes to Segments of Strings and Nlines

The following procedures are all done using the options shown below. None of the options shown can be done from the Change String/Nline menu.



Adding Segments to Strings and Nlines



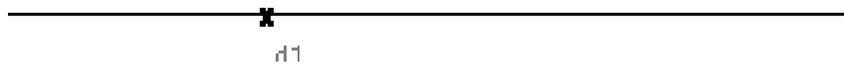
You can add segments to Strings and Nlines. This is a convenient way to revise an existing String or Nline.

The revision must begin and end on the String or Nline.

Example 1

To add a segment to a String,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Add option from the property sheet.
5. Choose Apply.
6. Select the String that you want to revise.



7. Select two or more locations between which you want to construct a revision of the String.



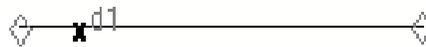
8. Choose Done from the Utilities menu.



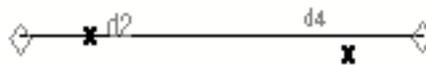
Example 2

To revise a segment of an Nline,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Select the Nline and Add options from the property sheet.
5. Choose Apply.
6. Select the Nline to be revised.



7. Select two or more locations between which you want to construct a revision or the Nline.



x d3

8. Choose Done from the Utilities menu.



Adding a 45 Degree Segment to Strings and Nlines



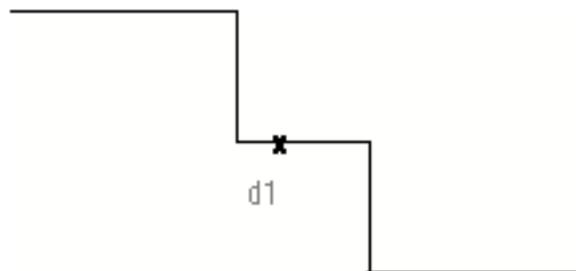
You can create a new segment, at a 45-degree angle from the horizontal, between two existing segments of a String or Nline.

The 45-degree segment ends at the segment nearest the second location selected, as long as the 45-degree segment intersects that old segment, and does not intersect any other segments between its origin and the old segment. If the new segment intersects other segments before intersecting the segment nearest the location selected, it terminates on the first such intersection.

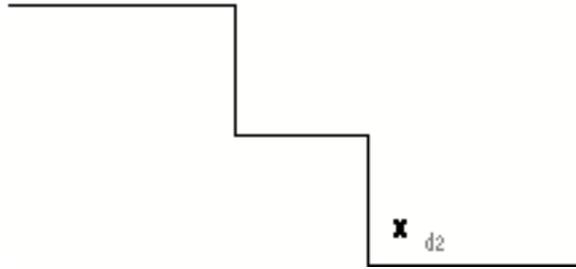
Example 1

To create a new segment of a String at a 45-degree angle from the horizontal,

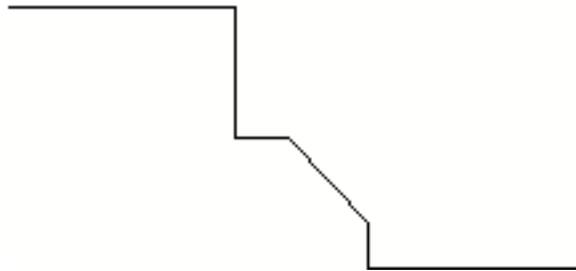
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Add 45 degree option from the property sheet.
5. Choose Apply.
6. Select the String on which you want to add a 45-degree segment. This location also indicates where you want the segment to start.



7. Select the direction in which the segment is to be created.



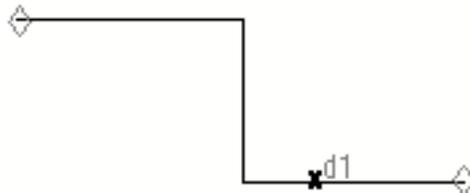
8. Choose Done from the Utilities menu.



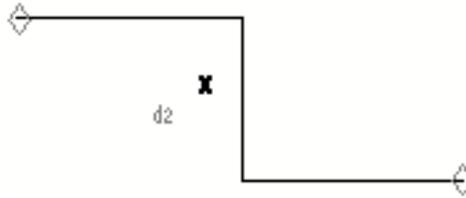
Example 2

To create a new segment of an Nline at a 45-degree angle from the horizontal,

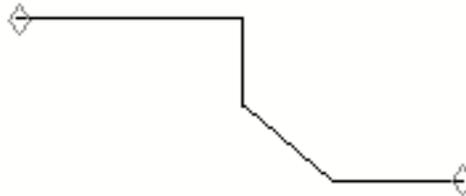
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Add 45 degree options from the property sheet.
5. Choose Apply.
6. Select the Nline on which you want to add a 45-degree segment. This location also indicates where you want the segment to start.



7. Select the direction in which the segment is to be created.



8. Choose Done from the Utilities menu.



Moving Segments of Nlines



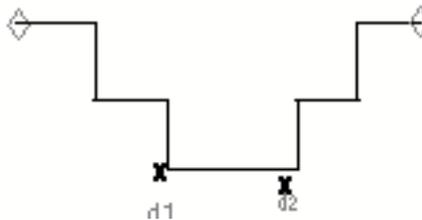
You can move segments of Nlines. When only one end point or vertex is moved, the one or two segments it pertains to are changed in length and direction as necessary. When an extent delimited by two end points or vertices is moved, only the one or two segments attached to it are changed in length and direction as necessary.

When the end points of an Nline are moved, the Cnodes are not moved with them, but remain related to them.

Example 1

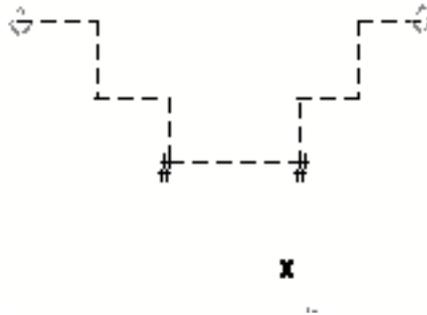
To move two vertices and translate three segments of an Nline,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Move options from the property sheet.
5. Choose Apply.
6. Select the Nline near the desired end points or vertices that are to be moved.

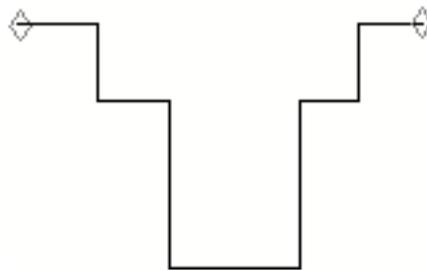


The Nline immediately becomes highlighted and a pound sign (#) appears at the selected vertices to be moved.

7. Select the location to which the move should be made.



8. Choose Done from the Utilities menu.



Example 2

To move one vertex and translate the two segments of an Nline,

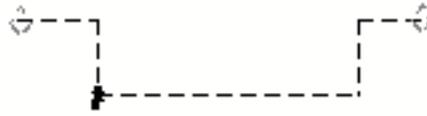
1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose the Nline and Move options from the property sheet.
5. Choose Apply.
6. Select the Nline near the preferred end point or vertex that is to be moved.



The Nline immediately becomes highlighted and a pound sign (#) appears at the selected vertex to be moved.

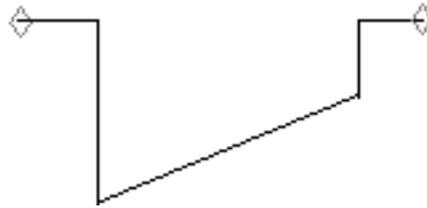
7. Choose Next from the Utilities menu. The prompt that appears immediately after your first selection requests an optional second vertex (see Example 1).

8. Select the location to which the move should be made.



X

9. Choose Done from the Utilities menu.



Deleting Segments of Strings



You can delete segments from one or more Strings. The segments are selected by enclosure in a rectangular window, a polygon window, or a closed String.

Example 1

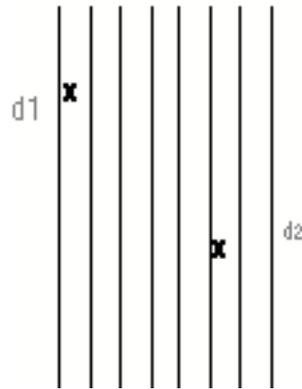
To delete segments from Strings using a rectangular window,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose Delete from the property sheet. The Layer and Boundary fields become available to you.
5. Choose Boundary. The following three additional choices appear: Window, Pwindow, Entity.
6. Choose Window; win appears in the Boundary field, and the three choices go away.

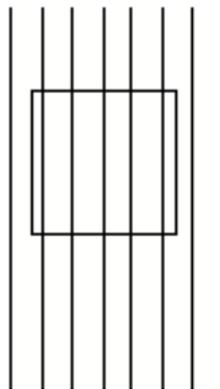
Layer :
Boundary : win
Window
Pwindow
Entity

7. Choose Apply.

8. Select two locations for the diagonally opposite corners of the window.

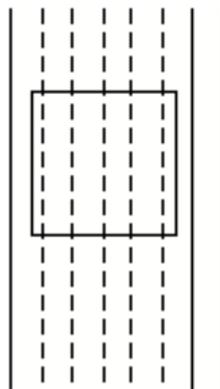


A rectangular box appears using the two locations as corners of the box.



9. Choose Done from the Utilities menu.

The Strings within the window that you have defined are highlighted.

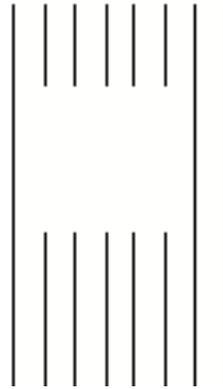


The following message appears in the text window.

TYPE "OK" TO CUT STRINGS

10. Enter OK or ok from the keyboard.

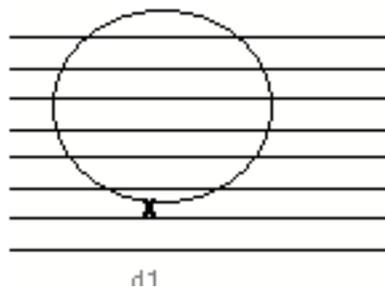
11. Choose Done from the utilities menu.



Example 2

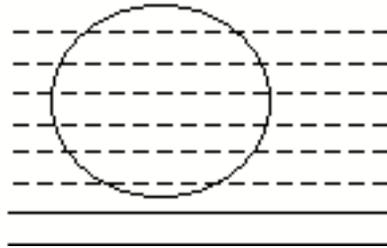
To delete segments from Strings using an existing entity,

1. Select the Change icon from the String/Nodal task set.
2. Select the More icon from the Change String/Nline menu.
3. Choose the Change to Segments option on the Change String/Nline property sheet. The information on the property sheet changes.
4. Choose Delete from the property sheet. The Layer and Boundary_fields become available to you.
5. Choose Boundary. The following three additional choices appear: Window, Pwindow, Entity.
6. Choose Entity; ent appears in the Boundary field, and the three choices go away.
7. Choose Apply.
8. Select the closed String entity.



9. Choose Done from the Utilities menu.

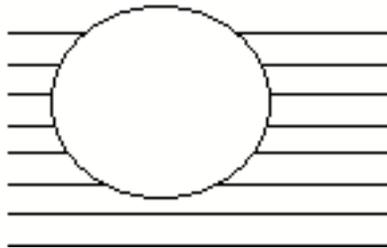
The Strings within the closed String are highlighted.



The following message appears in the text window.

TYPE "OK" TO CUT STRINGS

10. Enter OK or ok from the keyboard.
11. Choose Done from the utilities menu.

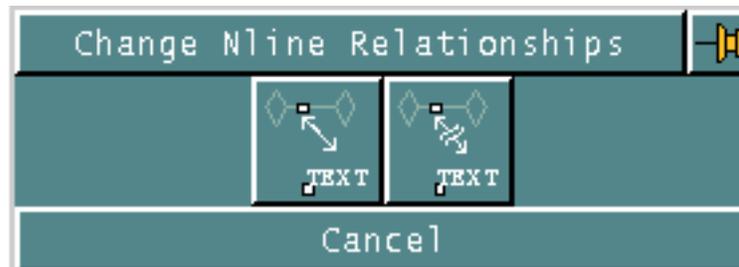


Changing Nline Relationships



You can relate Nlines to standard text or you can unrelate Nlines from Ntext and, in this case, the Ntext becomes standard text.

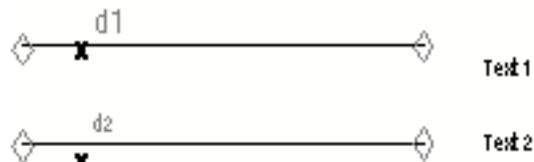
When you select the Change Nline Relationships icon from the String/Nodal task set, the following Change Nline Relationships menu appears.



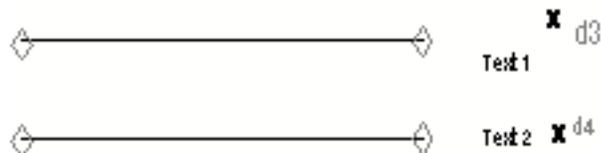
Example 1

To relate an Nline to standard text,

1. Select the Change Nline Relationships icon from the String/Nodal task set.
2. Select the Relate Nlines icon from the Change Nline Relationships menu.
3. Select one or more Nlines.



4. Choose Next from the Utilities menu.
5. Select one or more standard text entities. If multiple text entities are selected, they must be as many as the Nlines.



6. Choose Done from the Utilities menu.

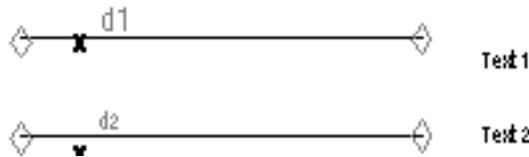


The standard text is now Ntext. The text Nline 1 is related to the top Nline, while Nline2 is related to the bottom Nline.

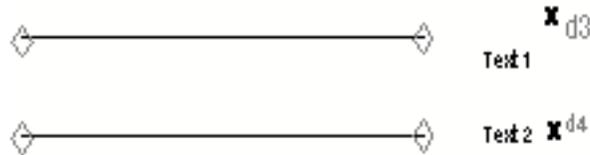
Example 2

To unrelate an Nline from Ntext,

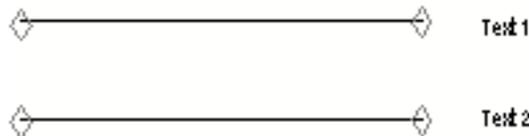
1. Select the Change Nline Relationships icon from the String/Nodal task set.
2. Select the Unrelate Nlines icon from the Change Nline Relationships menu.
3. Select one or more Nlines.



4. Choose Next from the Utilities menu.
5. Select one or more Ntext entities. If multiple Ntext entities are selected, you must select as many Ntext entities as the Nlines.



6. Choose Done from the Utilities menu.



The Ntext is now standard text.

Displaying Nline Relationships



You can display the relationship between Ntext and Nlines. You must select the Ntext to show the relationship to the Nline.

Example

To display the relationship between the Nline and the associated Ntext,

1. Select the Display Relationship Nline icon from the Drafting task set.
2. Select the Ntext for which you want to see the related Nline.



The selected Ntext is blanked from the screen. A line connecting the origin of the text with the circled origin of the related Nline is displayed in the graphics window as a temporary graphic.



The following is displayed in the text window verifying the relationship.

```

MAIN ENTITY
-----
NTXT  X=-2.841716 Y=5.909763 Z=0.0

RELATED ENTITIES
-----
NLIN  X=-7.846154 Y=5.83432   Z=0.0
       X=-3.747041 Y=5.859468 Z=0.0

MODEL  ent
    
```

3. Choose Done from the Utilities menu.

The graphic returns to what it was before you selected the Display Relationship Nline icon.



Connect Nodes

This chapter defines connect nodes (Cnodes) and mainly describes how to create them and change them.

- Overview of Connect Nodes
- Cnode Parameters
- Cnode Creation
- Listing Cnode Parameters
- Changes to Cnodes
- Changing Cnode Relationships
- Displaying Cnode Relationships

Overview of Connect Nodes

A Cnode describes a coordinate location in space that is used as a predefined attachment point for Nlines, symbols, figures, and text. It is associated with all Nlines and figures you select.

You can insert or change a Cnode with the following features:

- The preferred and invalid connection directions
- Input/output modes
- Radius
- Orientation angle
- Tag name
- Layer of each selected connect node or all the nodes in your part

When you set a radius value, nodal lines terminate at that distance from the Cnode.

You can use Cnodes in Nfigures to create intelligent schematics for electronics and piping applications.

When you insert a Cnode for electronic applications you can attach predesigned pad graphics to it. You can assign special pin text to the connect node that has a padcode.

An incremental text feature is available if you are inserting multiple Cnodes.

All the information needed to work with Cnodes can be found in the middle six icons on the STRING/NODAL task set.



Moving Cnodes

You can move a Cnode along a vector specified by two locations.

When you move Cnodes, it is important to understand the following operations that occur:

- All the unshared Tnodes associated with the Cnode and all Ntext associated with these Tnodes are moved.
- Any Nlines attached to the Cnode are examined. If the other end of the Nline is attached to any of the following, then the Nline is also moved:
 - Another Cnode in this Nfigure.
 - A Cnode in an Nfigure that is also being moved concurrently.

If the other end of the Nline is not attached to any of the above, the end of the Nline is stretched to the new location of the Cnode and the Cnode is moved.

Cnode Parameters

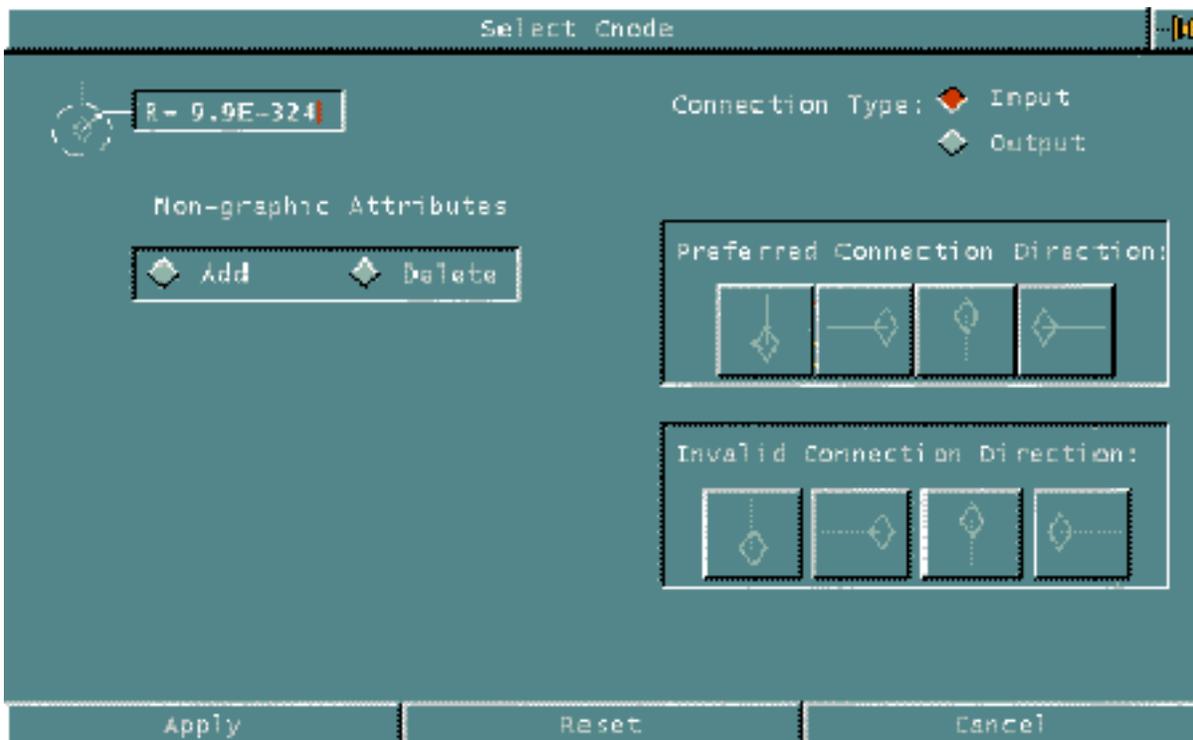


Selecting the top left icon of the Cnode group allows you to select default parameters for Cnodes. Any Cnodes created after the parameters are selected will have the specified parameters assigned to them.

Cnodes can have the following parameters assigned:

- Radius
- Preferred connection direction
- Invalid connection directions
- Input/output mode
- Automatic association of a property and its value

The Select Cnode property sheet shown below contains the default parameters and characteristics defined by the system.



1. Enter the radius in the model unit of measure in the R field. When a Cnode has a radius, Nlines terminate at that distance from the Cnode.

When you select this option on the property sheet, the scientific calculator appears allowing you to enter the value from the calculator.

2. Non-graphic Attributes allow you to add or delete nongraphic properties. Properties are labels that associate specific values and characteristics with their related entities. Properties serve the following functions: describe entities or attributes of an entity, link entities to files with other nongraphic information, and influence insertion, tracing, and reporting operations. Choose one of the following options:
 - Choose Add to add property names and values to the Cnode. The property name must be found in the property name file, and the property value must

correspond to the type required by the name. The system file can be found under `/usr/apl/cadds/data/_bcd/prop`.

Property	Value

Enter `LIST PROPERTY ALL` in the text window to display a list of all the properties found in the system file.

- Choose Delete to delete property names and values assigned to the Cnode. You can select the properties for deletion from the list of properties already assigned in the part.



3. Connection Type allows you to select the connection type (Input or Output) for each Cnode. Input is the default.
4. Preferred Connection Direction allows you to select the preferred connection direction. Only one preferred connection direction is valid for any one Cnode.
5. Invalid Connection Direction allows you to select the invalid connection directions. No more than three invalid directions may be specified at one time. Preferred and invalid directions must be consistent.

Example 1

To change the default radius parameters for Cnodes,

1. Select the Cnode Parameters icon from the String/Nodal task set.
2. Choose R on the Select Cnode property sheet. Using the calculator, enter **1.0** as the new radius for the Cnode.
3. Choose Apply. All subsequently inserted Cnodes will have a radius of 1.0.

Example 2

Select the Cnode Parameters icon from the String/Nodal task set.

4. Choose Add under Non-graphics Attributes.
5. Enter the property name and value that you want to assign to the string.

Property	Value
TERMDESC	

6. Choose Apply. All subsequently created Cnodes will have the property TERMDESC with an area for assigned text.

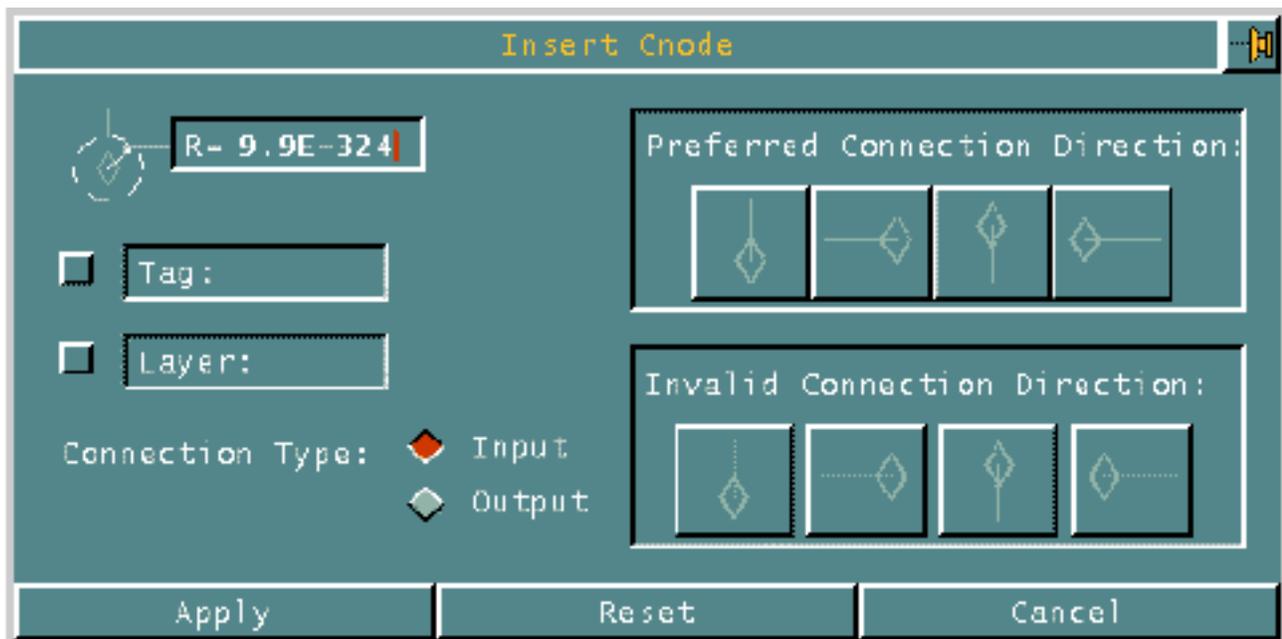
Cnode Creation



A Cnode describes a coordinate location in space that is used as a predefined attachment point for Nlines, symbols, figures, and text. It is associated with all Nlines and figures you select.

You can create Cnodes with the same parameters that you have set up by using the Select Cnode property sheet. You also have the choice to create Cnodes and define the parameters as they are being inserted by using the Insert Cnode property sheet.

When you select the Cnode icon on the String/Nodal task set, the following appears.



The options that also appear on the Select Cnode property sheet are explained in “Cnode Parameters” on page 3-4.

The two additional options that appear on the Insert Cnode property sheet that are not on the Select Cnode property sheet are:

- Choose Tag to enter the tag name, using the Alphanumeric keypad, for the created Cnode.
- Choose Layer to enter the layer, using the Layer keypad, on which the created Cnode will be placed.

Example 1

To insert Cnodes with a radius of 1.0 (as in Procedure 1 using the Select Cnode property sheet),

1. Select the Cnode icon from the String/Nodal task set.
2. Use the default settings on the Insert Cnode property sheet.

If you have reset the radius back to 0.000000 on the Select Cnode property sheet, select the R field on the Insert Cnode property sheet and enter the value of 1.0.

3. Choose Apply.
4. Select the locations for the Cnodes.

X d1
X d2
X d3
X d4

5. Choose Done from the Utilities menu.



Example 2

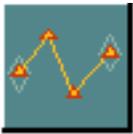
To insert Cnodes with a radius of 0, then insert Nlines between these Cnodes, and existing Cnodes, with a radius of 1.0,

1. Select the Cnode icon from the String/Nodal task set.
2. Choose R on the Insert Cnode property sheet. Using the calculator, change the default radius for the Cnode. (It was set to 1.0 on the Select Cnode property sheet.) Change the value to 0.0.
3. Choose Apply.

4. Select the locations for the Cnodes.



5. Choose Done from the Utilities menu.



6. Select the Insert String/Nline icon from the String/Nodal task set.

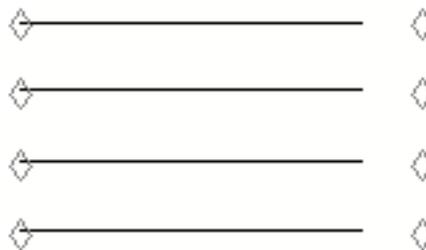
7. Select the Nline icon from the Insert String/Nline menu.

8. Select locations to create the Nlines. Remember that the Nline must begin and end at a Cnode.

Select Next from the Utilities menu after each even-numbered location to insert separate Nlines (not one continuous Nline).



9. Choose Done from the Utilities menu.



The Nlines are inserted at the Cnode on the left side of the above procedure because the Cnodes were inserted with a radius of 0.0. The Nlines terminate at a distance of 1.0 from the Cnode because the Cnodes were inserted with a radius of 1.0.

Listing Cnode Parameters



Cnode parameters come from the Select Cnode property sheet, and the Insert Cnode property sheet.

Example

To list the default parameters set up with the Select Cnode property sheet, select the List Cnode icon from the String/Nodal task set.

The following information is displayed in the text window.

```
*** Default Parameters ***  
Cnode Parameters  
  CNODE RADIUS      = 1.0  
  PREFERRED DIRECTION = N  
  INVALID DIRECTION = N,N,N  
  IN/OUT            = IN  
  
NO PADCODE SPECIFICATION FILE SELECTED.  
  
PADSTACK GRAPHICS WILL NOT BE GENERATED (PADOFF) .  
  
PINTEXT WILL NOT BE GENERATED (PINOFF) .
```

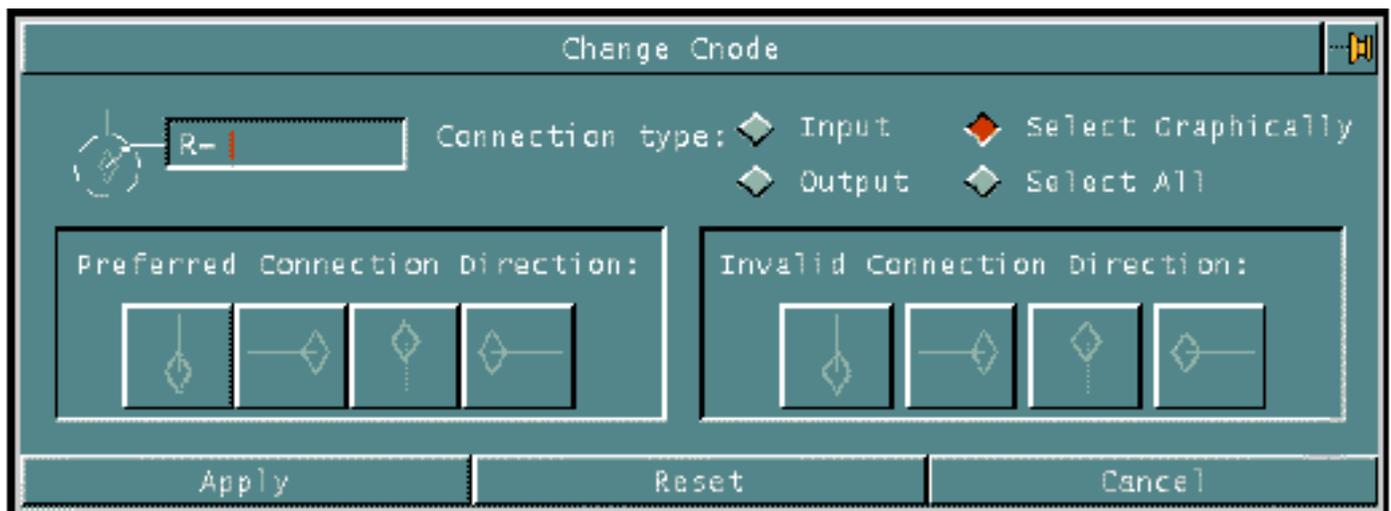
The N is used to signify that a connection direction has not been selected.

Changes to Cnodes



You can change the parameters that you have previously selected when you used the Select Cnode or Insert Cnode property sheets.

When you select the Change Cnode icon from the String/Nodal task set, the following appears.



All the options that appear on the Select Cnode property sheet also appear on the Change Cnode property sheet.

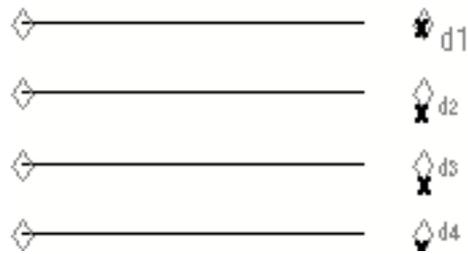
In addition to these options, you can choose between changing all the Cnodes in the part or only those that you select graphically.

Example

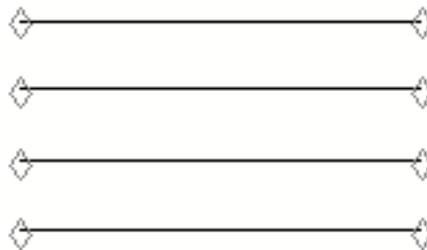
To change Cnodes, using the results of inserting Nlines between Cnodes with different radii (Example 2 of Cnode Creation),

1. Select the Change Cnode icon from the String/Nodal task set.
2. Choose R on the Change Cnode property sheet. Using the calculator, enter the new radius for the Cnodes that you select. (It was set to 1.0 on the Select Cnode property sheet.) Change the value to 0.0.
Choose the Select Graphically default.
3. Choose Apply.

4. Select the Cnodes for which the radius is to be changed.



5. Choose Done from the Utilities menu.

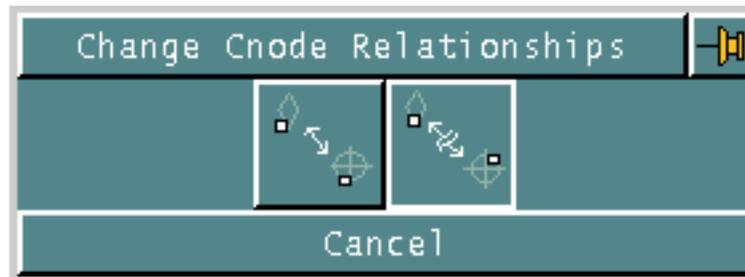


Changing Cnode Relationships



You can relate Cnodes to Nfigures or you can unrelate Cnodes from Nfigures.

When you select the Change Cnode Relationships icon from the String/Nodal task set, the following Change Cnode Relationships menu appears.

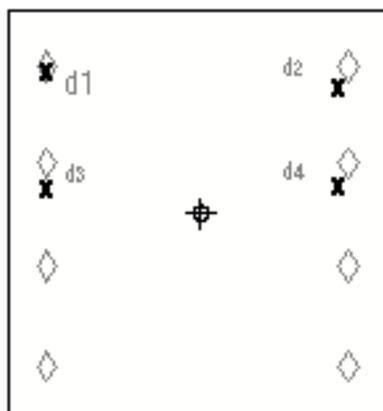


When you relate Cnodes to Nfigures, the Cnodes are selected before the Nfigures. If more than one Nfigure is selected, there must be as many Cnodes selected as Nfigures (see Example 2).

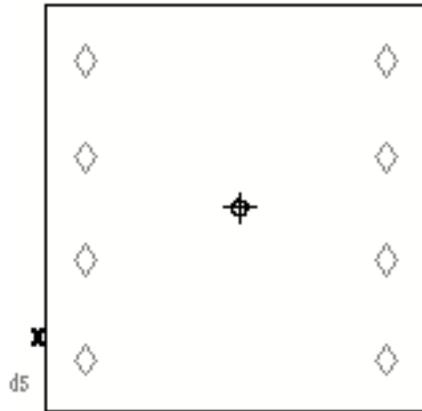
Example 1

In this procedure, after you insert the Nfigure into the active part, you insert the Cnodes. To relate the selected Cnodes to the Nfigure,

1. Select the Change Cnode Relationships icon from the String/Nodal task set.
2. Select the Relate Cnode icon from the Change Cnode Relationships menu.
3. Select one or more Cnodes.



4. Choose Next from the Utilities menu.
5. Select the Nfigure to which the Cnodes are to be related.

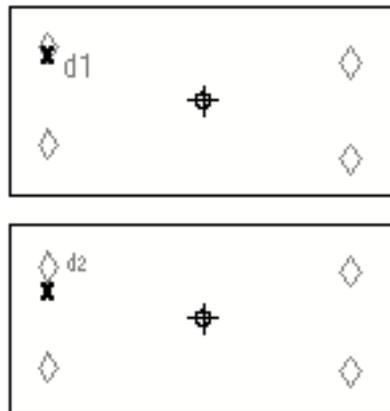


6. Choose Done from the Utilities menu. There is no change in the graphics.

Example 2

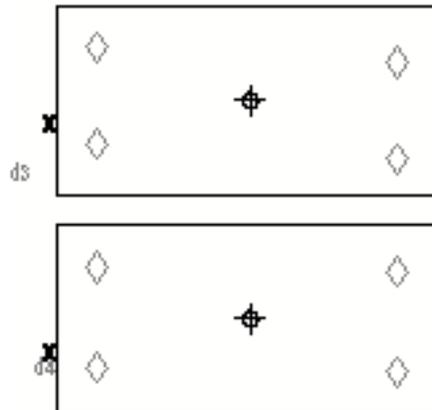
To relate Cnodes to multiple Nfigures,

1. Select the Change Cnode Relationships icon from the String/Nodal task set.
2. Select the Relate Cnode icon from the Change Cnode Relationships menu.
3. Select one or more Cnodes.



4. Choose Next from the Utilities menu.

5. Select the Nfigures to which the Cnodes are to be related.



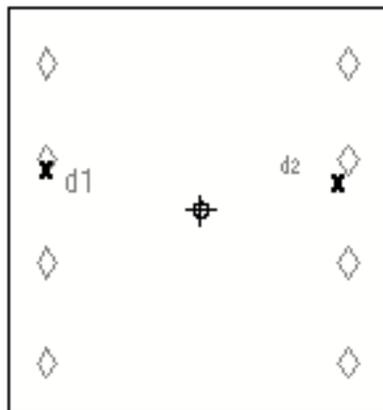
The Cnode selected first (d1) is related to the Nfigure selected first (d3), and the Cnode selected second (d2) is related to the Nfigure selected second (d4).

6. Choose Done from the Utilities menu. There is no change in the graphics.

Example 3

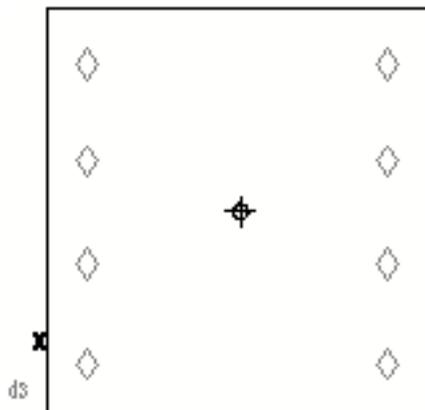
To unrelate two of the related Cnodes from the Nfigure,

1. Select the Change Cnode Relationships icon from the String/Nodal task set.
2. Select the Unrelate Cnode icon from the Change Cnode Relationships menu.
3. Select one or more Cnodes.



4. Choose Next from the Utilities menu.

5. Select the Nfigure to which the Cnodes are to be related.



6. Choose Done from the Utilities menu. There is no change in the graphics.

Displaying Cnode Relationships

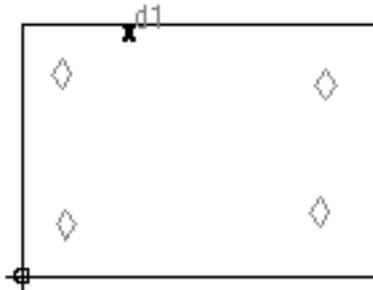


You can display the relationship between Nfigures and Cnodes. You must select the Nfigure to show the relationship to the Cnode.

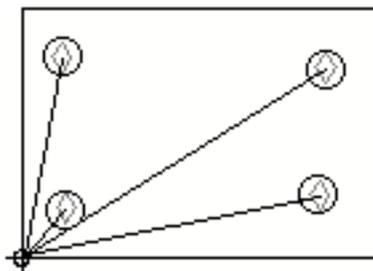
Example

To display the relationship between the Cnode and the associated Nfigure,

1. Select the Display Relationship Cnode icon from the String/Nodal task set.
2. Select the Nfigure for which you want to see the related Cnodes.



Lines connecting the Nfigure origin with the origin of each of the related Cnodes and circles around the related Cnodes are displayed in the graphics window as temporary graphics.



The following is displayed in the text window verifying the relationship.

MAIN ENTITY

NSI X=-2.841716 Y=5.909763 Z=0.0
SUBFIGURE NAME:
LOCAL

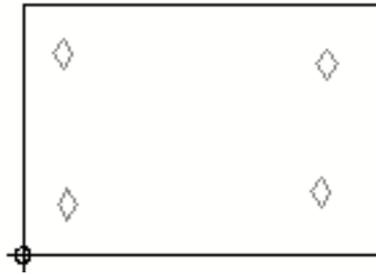
RELATED ENTITIES

CNOD X=0.402367 Y=1.45858 Z=0.0
CNOD X=2.539941 Y=1.433432 Z=0.0
CNOD X=0.427515 Y=0.42367 Z=0.0
CNOD X=2.514793 Y=0.477811 Z=0.0

MODEL ent

3. Choose Done from the Utilities menu.

The graphic returns to what it was before you selected the Display Relationship Cnode icon.



This chapter defines figures and describes how to create them and change them.

- Overview of Figures
- Types of Figures
- Choosing the Correct Figure Type
- Moving Nfigures
- Creating Figures
- Updating Nfigures
- Getting Started
- Figure Parameters
- Figure Creation
- Inserting Nfigures
- Inserting Sfigures
- Inserting Pfigures
- Inserting Figures
- Constructing Local Figures
- Constructing Figures
- Listing Figure Parameters
- Changing Figures
- Changing Figure Relationships
- Displaying Nfigure Relationships
- Ungrouping Figure Entities

Overview of Figures

A figure is a graphic representation of a part or drawing.

A figure is a copy of an existing part that you can use to duplicate and standardize information in other parts. You make figures of parts that you use repeatedly and place them in a library directory for access by all designers and drafters. You can also create figures and place them in your own file system directory for your own use.

Using figures is an effective way to include company standard graphic and nongraphic data in your parts. You can update all your parts which contain library figures by updating the figures themselves; this feature allows you to create intelligent assemblies and assembly drawings with full associativity to their original source components. Figures reduce the size of your part because they do not duplicate geometry unnecessarily.

You may need important information taken from a designed part (such as its geometry, a bill of materials, part properties, etc.) in the design of other parts. You can place such information in a figure library.

Figures also allow you to standardize subsets of information between parts. Once a figure has been prepared and exists independently from other parts, it is called a library figure. Library figures can be displayed in multiple views just like any other entity.

Types of Figures

There are five types of figures you can create depending on your application and your need to modify them:

- Part figures (Pfigures)
- Subfigures (Sfigures)
- Nodal figures (Nfigures)
- Extended nodal figures (Extended Nfigures)
- Local nodal figures (Local Nfigures)

Subfigures, nodal figures, and extended nodal figures contain an instance symbol in the shape of a cross in a circle at their origins. All entities within the figure are associated to the instance allowing you to move the figure in its entirety. You can control the visibility of instance symbols for plotting and other applications.

Each type of figure is as described.

Part Figures (Pfigures)

Inserting a Pfigure is similar to inserting preconstructed parts into your active part, but it is more efficient. You can manipulate all entities in the inserted Pfigure individually since they exist in the database. You cannot update Pfigures in a part if changes are made to the original library figure.

The Pfigure is a part that remains a part. Once inserted, the entities become part of the active part's database as if they had been inserted in the normal interactive way.

Pfigures take up more disk space than either Sfigures or Nfigures. An advantage of inserting a Pfigure, as opposed to inserting the actual part from which the Pfigure was made, is that the Pfigure inserts faster. This is because the Pfigure does not have to be reconstructed by the system at each insertion point.

Subfigures (Sfigures)

The entities of an Sfigure are contained in a figure file of associated graphics and not in the part database, saving disk space for your part. All graphics, text, and other entities of the figure are related to the figure instance symbol for manipulation, deletion, and other operations. You cannot access or affect the individual entities that make up the Sfigure.

You can update Sfigures in a part if changes are made to the original library figure.

Sfigures by their very nature, do not recognize nodal entities. If you want to create a figure that contains both nodal and nonnodal entities, the type of figure you create is a nodal figure.

Sfigures are the fastest type of figure to insert into the active part. Sfigure graphics appear in the active part through the Sfigure instance (SI). The Sfigure instance is a pointer back to the original part.

Nodal Figures (Nfigures)

Nfigures are similar to Sfigures. You can include both nodal and nonnodal entities when you create an Nfigure, but you can only manipulate nodal entities in the active part individually. You can, however, manipulate the entire nodal figure as a unit using the Nfigure instance (NSI).

Nfigures also save you disk space. However, because you have both nodal and nonnodal entities in the Nfigure, your figure file takes up more disk space than an Sfigure file. The Nfigure is generally slower than an Sfigure when you insert it into the active part.

Extended Nodal Figures (Extended Nfigures)

An extended Nfigure differs from an Nfigure in that both the nodal and nonnodal entities can be individually manipulated. They can also be manipulated as a single entity.

Extended Nfigures take up considerable disk space. This is because the entities are copied into the database of your active part.

You can view Extended Nfigures in the parametric environment.

Local Nodal Figures (Local Nfigures)

A local Nfigure is a type of extended Nfigure. It is available only in the part/drawing in which it was constructed. Because they exist only in the part that they were constructed in, local Nfigures do not take up any room in the part database.

Local Nfigures can be nested and are considerably faster than any other type of figure. When nesting local Nfigures, you must be aware of the fact that the

outermost Nfigure, when deleted, will also delete all of the nested local Nfigures. The limit of local Nfigures allowed in a part should not exceed the same number allowed in parts (i. e., 10,000).

Choosing the Correct Figure Type

Each type has advantages and disadvantages in different situations. Choose the one that best suits your needs.

Each type of figure is structured differently within your database. For example, a part containing the following 19 entities is stored on your system:

- 13 lines
- 4 Tnodes
- 1 text string
- 1 Cnode

You then create a Pfigure, Sfigure, Nfigure, and extended Nfigure from the original part.

Pfigure

The Pfigure contains 19 entities and all 19 are stored in the library figure file database. You can manipulate all the entities individually; there is no relationship among them.

Sfigure

The Sfigure contains one entity and one entity is stored in the library figure file database. You cannot manipulate the entities individually. You can only manipulate the Sfigure as a whole.

Nfigure

The Nfigure contains six entities:

- 1 for all other (13 lines and 1 text string are treated as one entity)
- 4 Tnodes
- 1 Cnode

The six entities are stored in the library figure file database. You can individually manipulate each of the six entities. The 4 Tnodes can be individually manipulated, the Cnode can be manipulated, and the 13 lines and one text string can be manipulated as one entity.

Extended Nfigure

The extended Nfigure contains 20 entities and all 20 are stored in the library figure file database. In addition to the original 19 entities, the NSI is also maintained.

The following table shows several common situations. Acceptable figure selections for each situation are indicated.

Situation	Part Figures	Sub-Figures	Nodal Figures	Extended Nodal Figures
The entities within the figures are to merge with the host part database and do not need to be associated with the figures library after insertion.	Yes			
Part A will not be updated with changes that are to be passed on to the figure inserted in part B.	Yes			
The entities in the figure are to be manipulated in an assembly as a unit.		Yes	Yes	Yes
Updates made to part A and carried to the figure in the parts library are to be passed on to parts having the figure inserts.		Yes	Yes	Yes
Nodal information is to be carried with the figure. Such information may include a bill of materials, part properties, nodal text, etc.			Yes	Yes
After insertion in an assembly, individual entities in the figure are to be changed within the assembled part.				Yes
The entities in the inserted figure are to be used as a part of a study to measure clearances or angles in an assembly.				Yes
The entities in the inserted figure are to be used as part of a section view or for hidden line removal, etc.				Yes

Moving Nfigures

You can move an Nfigure along a vector specified by two locations.

When you move Nfigures, it is important to understand the operations that occur.

When you move an Nfigure, the system will

- Move the Nfigure and any nested Nfigure associated with it, and any nested within them, etc. Note that an Nfigure nested within another Nfigure may be moved independently of its parent Nfigure.
- Move all Cnodes associated with any of the Nfigures being moved.
- Move Nlines for which both associated Cnodes are being moved.
- Stretch any Nlines for which only one associated Cnode is being moved.
- Move all unshared Tnodes associated with any of the Nfigures or Cnodes being moved.
- Move all shared Tnodes for which associated Cnodes are being moved.
- Translate all shared Tnodes for which all associated Cnodes are being moved.
- Translate all Ntext associated with any Tnode or Nline being moved.

Creating Figures

Figures can be created in a number of different ways without selecting an icon from the String/Nodal task set.

Figure files are mode dependent. If you create a figure in Model mode, it must be inserted in Model mode. If you create a figure in Draw mode, it must be inserted in Draw mode.

A Model mode figure contains only Model mode graphics and text.

A Draw mode figure contains all the entities in the part or all those selected to make up the figure. Any Model mode entities in the part from which the figure is created are converted into Draw mode entities as they appear in the view and are included in the specified drawing.

Figures can be created as single precision and then inserted into Explicit environment single or double precision parts. They are not valid for creation or use in the Parametric environment.

Understanding Part File Structure

In order to understand the relationship between a CADD5 4X part, Design parts, and figures, you must first understand the files that are created when using the different types of parts.

- Design part

The default type of part that is always created from the LDM is a double precision Design part. One of the permanent data files associated with a Design part stored on disk in the Create directory looks like this; `createdirectory/partname/_fd`. The `_fd` is the extension distinguishing the part as a double precision Design part.

- CADD5 4X part

If you enter the Explicit environment by entering ENTER EXPLICIT from the keyboard, you have the option to create either a single- or double-precision CADD5 4X part. One of the permanent data files associated with either a single or double precision CADD5 4X part stored on disk in the Create directory looks like this: `createdirectory/partname/_pd`. The `_pd` is the extension distinguishing the part as either a single or double precision CADD5 4X part.

Only parts with the `_pd` extension can be used to create figures.

If you have no part active, you can prepare a figure from any existing nonactive part. This part can be a single-precision (`_pd`), double-precision (`_pd`), or C5 (`_fd` Design part). How you prepare a figure depends on the format of the part that is to become a figure.

Creating Figures from Design Parts

Figures cannot be prepared from a Design (C5) part. You can however extract from the Design part the information that you need to create a CADD5 4X part, and then create a figure from the CADD5 4X part.

If you forget to select single precision before you activate a part for the first time, when you try to file the part as a figure, or exit and file as a figure, the system gives the following message:

```
<part name> is a DESIGN part
DESIGN parts cannot be prepared into figures directly.
If you must prepare a figure for this geometry, please
use the Extract Part command first, then prepare the
figure from the C4XPART part it creates.
```

At this point, to create a figure from a Design part,

1. In the text window enter EXIT PART FILE. You can enter a new name for the filed part if you wish. The default is the existing part name. Either use the RETURN key from the keyboard, or choose Done from the Utilities menu.

2. While still in the text window, enter

```
EXTRACT PART FROM <CADD5partname> TO <CADD54X partname>
```

Then, either use the Return key from the keyboard, or choose Done from the Utilities menu.

3. Decide which type of figure you want to create and enter one of the following commands in the text window.

```
PREPARE PFIGURE <CADD54X partname>
```

```
PREPARE SFIGURE <CADD54X partname>
```

```
PREPARE NFIGURE <CADD54X partname>
```

After you have entered the part name, you can

- Enter valid modifiers
- Use the Return key from the keyboard
- Choose Done from the Utilities menu

If you do not use any modifiers after the part name, a Model mode figure is prepared by default.

The figure that you have prepared using one of the above commands can then be inserted into a different part.

Once a figure is created, it is not valid for use in the Parametric environment, although the part can still be used.

Creating Figures from a CADDS 4X Part

When you know that the part that you plan to construct will later become the basis for a figure, you must first make sure that the part starts as a CADDS4X part.

The CADDS 5 default part is a Design part because it is automatically opened as a double precision (C5) part. In order to change this, you should enter the command `SELECT PFORMAT SINGLE` before you activate the new part. This process will allow you to then create a figure while working in your active part, or as you are filing and exiting the part.

1. From the LDM menu, enter the command `ENTER EXPLICIT` at the command line at the bottom of the screen. After entering the command, use the `Return` key.
2. When the Explicit environment comes up in the text window, enter the command `SELECT PFORMAT SINGLE` before you activate the new part. Again, after entering the command, use the `Return` key.
3. Since the default is set up so that you activate a part from the LDM using the interface, at this point you must enter the command `ACTIVATE PART <new name>` from the keyboard. This will activate a single precision part.

From this point on, you can use the interface to activate a drawing, define a view, and create the model that you will then turn into a figure.

You can create a figure while working in your active part by filing the part. When you exit the part, you can also create a figure.

If you have no part active, and are still in the Explicit environment, you can prepare a figure from any existing nonactive part (`_pd`).

Creating Figures Inside a Part

You can create a figure file from an active single precision part:

- At any time while the part is open
- When you are ready to save and close the part's database

Figure file options include preparing:

- Nodal figures (regular or extended)
- Subfigures
- Part figures

When creating the figure file, you can save any of the following options related to the active part:

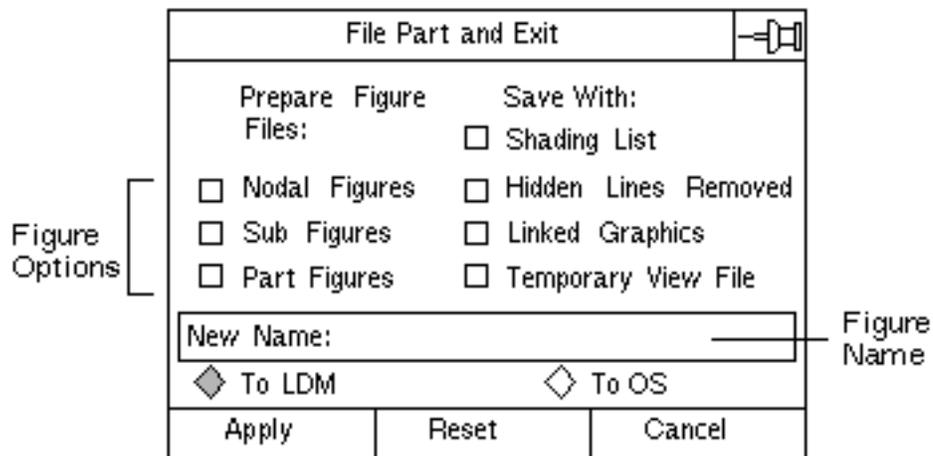
- Shading List
- Hidden Lines Removed
- Linked Graphics
- Temporary View File (TVF)

The system prepares the figure, creates the file, and stores it with the part database.

Creating Figure Files When Saving Work

To create a figure file when saving your work,

1. Choose FILE from the top bar.
2. Choose FILE PART W/OPTIONS from the File menu.
3. When the property sheet appears, choose the type(s) of figure you want to create from the active part.
4. If you want the figure to include the TVF, linked graphics, shading list, or keep hidden lines removed, select the appropriate options.
5. Enter the name of the figure in the New Name field.



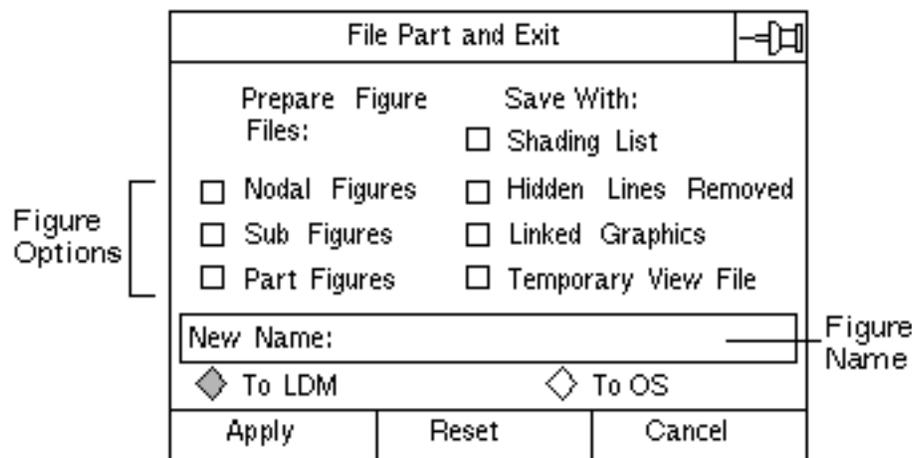
6. Choose Apply.

The system creates the figure file and stores it with the part from which it was created. The active part remains open.

Creating Figure Files When Closing the Part

To create a figure file when closing the active part,

1. Choose FILE from the top bar.
2. Choose FILE & EXIT W/OPTIONS from the File menu.
3. When the property sheet appears, choose the type(s) of figure you want to create from the active part.
4. If you want the figure to include the TVF, linked graphics, shading list, or keep hidden lines removed, select the appropriate options.
5. Enter the name of the figure in the New Name field.
6. Decide whether you want to return to the Local Data Manager (LDM) menu and continue working or to exit CADD5 and return to the operating system (OS) level. Returning to the LDM menu is the default selection.



7. Choose Apply.

The system creates the figure file, stores it with the part from which it was created, and saves and closes the active part.

Updating Nfigures

You can replace the graphics and nodal information of current Nfigures with updated standalone or library figures that have already been prepared and stored at system level.

Before you replace an Nfigure you can determine the status of current instances in your drawing to determine their last update. Unless you specify otherwise, replacement will not occur unless the library figure is different from the existing Nfigure in your drawing. All Nfigures replaced are highlighted on the drawing. Local Nfigures do not apply since they exist only as an instance in the current part.

You can preserve Ntext in the current instance so that it is not overwritten by coincident text or text with the same property name in the library symbol. You can retain properties, attributes, and padcode graphics associated to current instances.

All Nlines attached to an Nfigure but not part of the Nfigure are deleted from the database. Usually, attached means beginning and ending within the Nfigure but not contained within it. Before updating the Nfigure, break all attached Nlines.

For applications such as the design of mechanical assemblies, entity fonting and associative entities attached to extended Nfigures are preserved during the update process.

Getting Started

Once you have created figures, you are ready to use these figures in another part.

The information needed to work with figures can be found in the bottom third of the STRING/NODAL task set.



Report Nfigure



You can use the Report Nfigure option to report the status of the instances of an Nfigure in a part.

The report displays the following information about the Nfigure instances:

- the type (local, external or nested)
- the miptr
- the status (OUT-OF-DATE or UP-TO-DATE)

Please note:

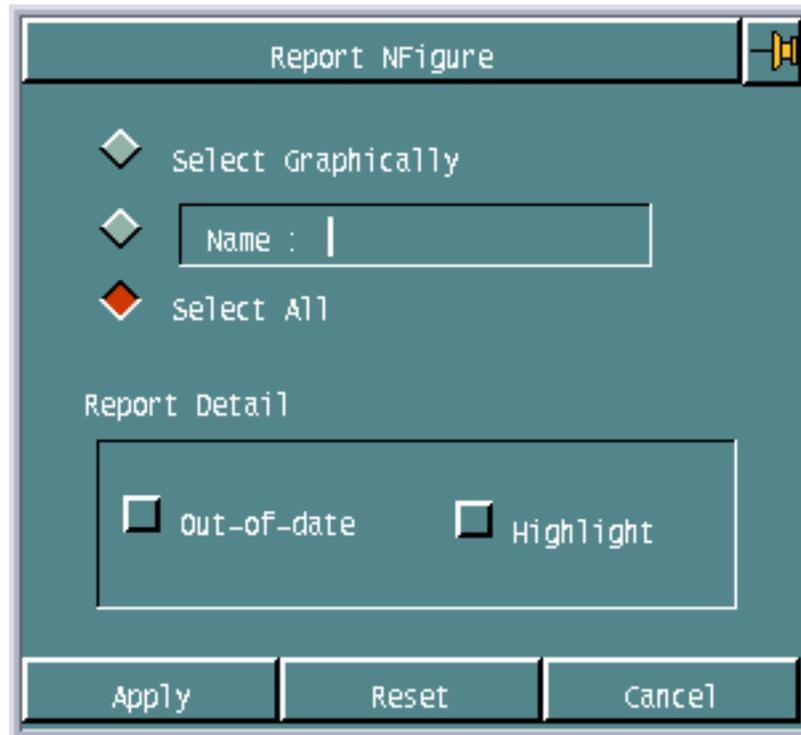
1. Whenever you modify an Nfigure in its library version, or when you prepare the Nfigure again, you need to update the Nfigure instance. Otherwise its status is out-of-date.
2. The status field is applicable only for external Nfigure instances.

The check for OUT-OF-DATE is based upon:

- The currency, for Nfigure instances created prior to CADDs Rev 14. These are represented by the symbol *.
- The currency and the timestamp, for Nfigure instances created on CADDs Rev 14 or later. These are represented by the symbol **.

When you select the Report Nfigure icon from the String/Nodal task set, the following property sheet appears.

Figure 4-1 Report Nfigure Property Sheet



- **Select Graphically**
Allows you to graphically select individual Nfigures whose instances should be reported.
- **Name**
Allows you to specify the name of the Nfigure whose instances should be reported.
- **Select All**
Allows you to make the change to all Nfigures in the part.
- **Out-of-date**
Allows you to report only the out-of-date instances of the Nfigure.
- **Highlight**
Allows you to highlight the reported Nfigure instances in red color.

Example 1

To report the complete status of all the Nfigure instances in the part, follow the procedure below:

1. Select the Report Nfigure icon from the String/Nodal task set.
2. The Report Nfigure property sheet appears.
3. Choose the Select All option.
4. Click Apply.

The complete status of all the Nfigure instances in the part are reported as shown below:

NAME	TYPE	MIPTR	STATUS
Nfig1	EXTERNAL	20	UP-TO-DATE**
Nfig2	EXTERNAL	40	OUT-OF-DATE**
Nfig3	EXTERNAL	45	NO-FILE-ON-DISK
Nfig4	LOCAL	25	-----
Nfig5	EXTERNAL-NESTED	30	-----
Nfig6	LOCAL-NESTED	35	-----

Note:

- * indicates that the status check is based on currency check alone.
- ** indicates that the status check is based on currency and timestamp check.
(Applies to figure instances created on revision 14 or later)

Figure Parameters



Selecting the top left icon of the Figure group allows you to select default association properties for Nfigures and Sfigures. Any figures created after the properties are selected will have the specified properties assigned to them.

The Select Figure Parameters property sheet shown contains the default parameters and characteristics defined by the system.



1. Choose Nfigure or Sfigure to select parameters for Nfigures or Sfigures. Nfigure is the default.
2. Non-graphic Attributes allows you to add or delete nongraphic properties. Properties are labels that associate specific values and characteristics with their related entities. Properties serve the following functions: describe entities or attributes of an entity, link entities to files with other nongraphic information, and influence insertion, tracing, and reporting operations. Choose one of the two following options.

- Choose Add to add property names and values to the string or Nline. The property name must be found in the property name file, and the property value must correspond to the type required by the name. The system file can be found under `/usr/apl/cadds/data/_bcd/prop`.

Property	Value

Enter `LIST PROPERTY ALL` in the text window to display a list of all the properties found in the system file.

- Choose Delete to delete property names and values from the string or Nline. You can select the properties for deletion from the list of properties already assigned in the part.



Example 1

To set up default parameters for Nfigures,

1. Select the Figure Parameters icon from the String/Nodal task set.
2. Choose Add under Non-graphics Attributes on the Select Figure Parameters property sheet.

3. Enter in the property names and value that you want to assign to the Nfigure.

Property	Value
XMAPINC	1.5
DRAWFORM	

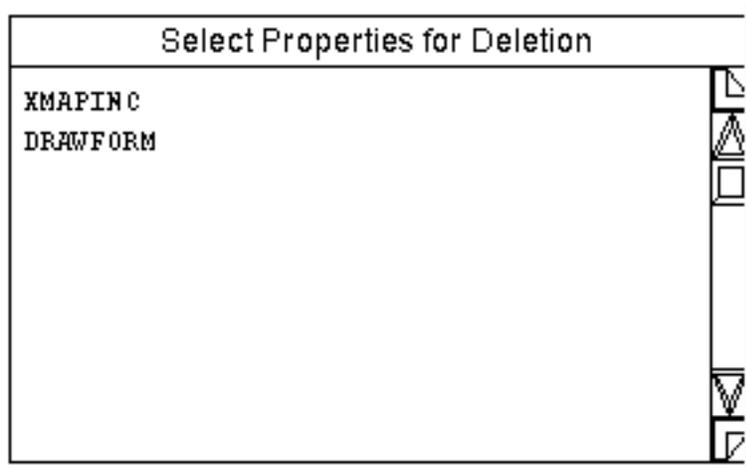
4. Choose Apply. All subsequently created Nfigures will have the property XMAPINC with the value 1.5 assigned.

Example 2

To delete the parameters set up for Sfigures,

1. Select the Figure Parameters icon from the String/Nodal task set.
2. Choose Sfigure at the top of the Select Figure Parameters property sheet.
3. Choose Delete under Non-graphics Attributes on the property sheet.

4. Select the nongraphic properties that you want to delete from subsequently created Sfigures. In this case, select DRAWFORM.



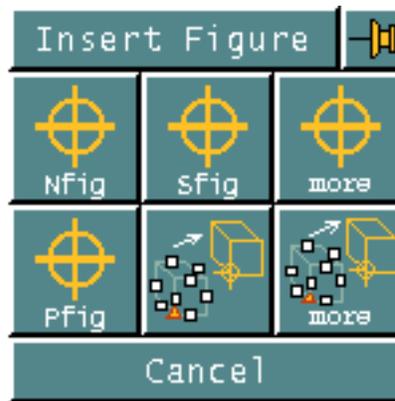
5. Choose Apply. The next time that you want to delete a nongraphic property from an Sfigure while in the part, you will find that XMAPINC is the only property listed.

Figure Creation



A figure is a copy of an existing part that you can use to duplicate and standardize information in other parts.

The Insert Figure menu appears when you select the Insert Figure Icon from the String/Nodal task set.



The first two icons in the first row and the first icon in the second row allow you to insert a figure by entering the name in the field that appears.



Enter the name of the figure you want to insert. The type of figure selected must match the name and type of figure that was previously prepared.

The following figures are used throughout this chapter.

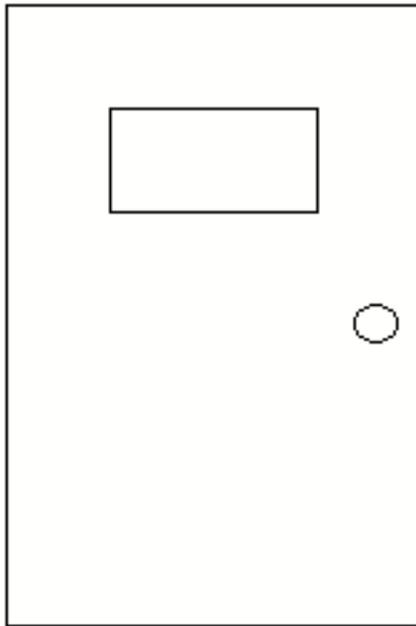


Figure named DOOR

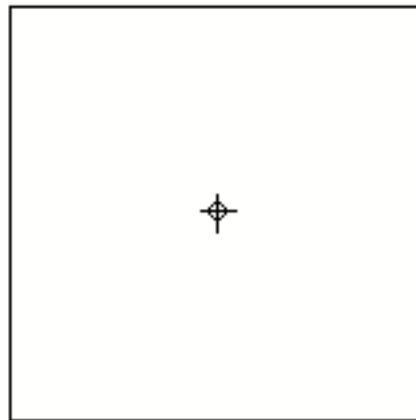


Figure named BOX

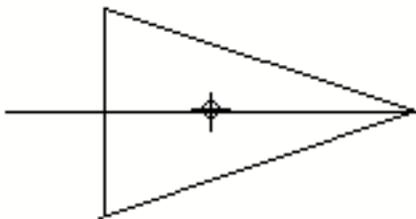
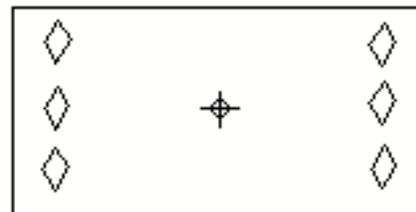


Figure named ARROW



Extended Figure named BOARD

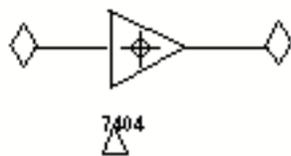


Figure named AX.7404

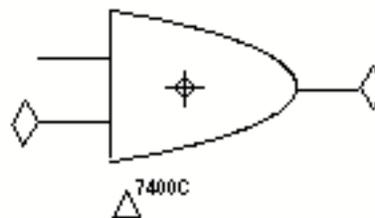


Figure named AX.7400C

Inserting Nfigures



You can insert a previously prepared Nfigure into an active part. The part specified is accessed and all entities in that part are copied into the active part.

Tnodes, Cnodes, Ntext, and Nlines are inserted into the database while all other entities in the Nfigure become base graphics.

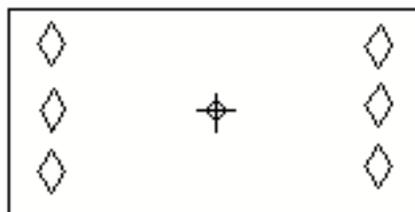
Example

To insert a previously prepared Nfigure named BOARD,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Nfig icon from the Insert Figure menu.
3. Enter the name BOARD in the Figure Name field.
4. From the keyboard, use the Return key. If you slide off the Figure Name field, the system interprets that as a mistake and does not send any information to the text window.
5. After entering Return, select the location for the origin of the Nfigure BOARD.



6. Choose Done from the Utilities menu. The extended Nfigure BOARD is inserted into the part with the figure origin at the selected location.



Inserting Sfigures



You can insert a previously prepared Sfigure into an active part. The part specified is accessed and only base graphics in that part are copied into the active part through the SI (Subfigure Instance).

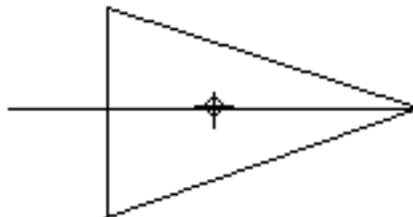
Example

To insert a previously prepared Sfigure named ARROW,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Sfig icon from the Insert Figure menu.
3. Enter the name ARROW in the Figure Name field.
4. From the keyboard, use the Return key. If you slide off the Figure Name field, the system interprets that as a mistake and does not send any information to the text window.
5. After entering Return, select the location for the origin of the Sfigure ARROW.



6. Choose Done from the Utilities menu. The Sfigure ARROW is inserted into the part with the figure origin at the selected location.



Inserting Pfigures



You can insert a previously prepared Pfigure into an active part. The part specified is accessed and all entities in that part are copied into the active part. There is no relationship back to the original part.

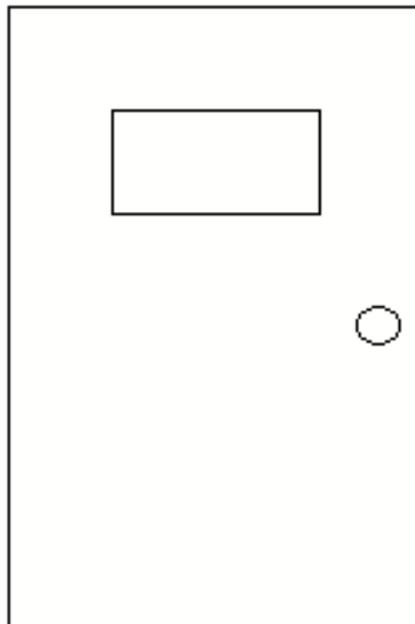
Example

To insert a previously prepared Pfigure named DOOR,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Pfig icon from the Insert Figure menu.
3. Enter the name DOOR in the Figure Name field.
4. From the keyboard, use the Return key. If you slide off the Figure Name field, the system interprets that as a mistake and does not send any information to the text window.
5. After entering Return, select the location for the origin of the Pfigure DOOR.



6. Choose Done from the Utilities menu. The Pfigure DOOR is inserted into the part at the selected location.



Inserting Figures



You can also insert figures into an active part and specify additional parameters for the figure at the time of insertion.

When you select the Insert Figure More icon from the Insert Figure menu, the following appears.

Insert Figure

Nfigure Sfigure Pfigure

Name: |

Uniform Scale: 1.000000

Scale by Axis: Xscale: 1.000000
Yscale: 1.000000
Zscale: 1.000000

Graphics on Layer:

Instance on Layer:

Specify Orientation

Apply Reset Cancel

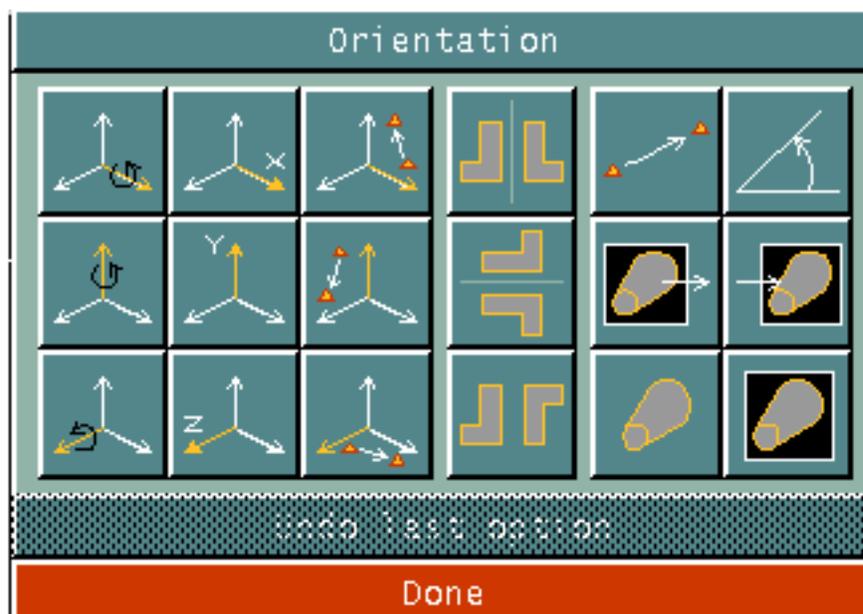
1. Choose Nfigure or Sfigure or Pfigure to select the type of figure that you want to insert. The default is Nfigure.
2. Enter the name of the figure to insert in the Name field.
3. Choose Uniform Scale to change the default uniform scale for the inserted figure. The calculator appears and you can enter the new scale value.

4. Choose Scale by Axis to use a different scale factor for each axis. After selecting the Scale by Axis option, you can change any or all of the default values to the right. This is not available for Pfigures or extended Nfigures.
5. Choose Graphics on Layer to specify the absolute layer that all nodal entities will be inserted on. This is not available for Sfigures and Pfigures.
6. Choose Instance on Layer to specify the layer for inserting the figure.

Please note: Steps 3, 4, 5, and 6 are mutually exclusive.

7. Choose Specify Orientation. The Orientation property sheet appears as explained below.

When you select the Specify Orientation option on the property sheet and then select Apply, the following property sheet appears. The Apply turns to Abort to allow you to exit from the action without doing anything.



Each of these orientation options is explained on the following pages. They are grouped by similar function.

When using these orientation options, the order in which they are selected determines what the final outcome of the graphic change will be.

Undo last option erases the last selected option.

Done ends the selection of the Orientation options.



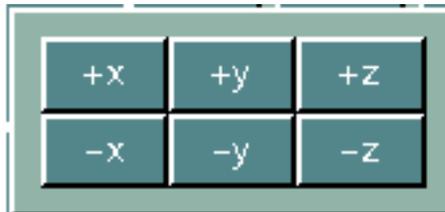
Rotates the instance the given number of degrees about the specified axis. Rotation is clockwise with respect to the positive direction of the axis. By default, they refer to the axis in model space (TOP Cplane). All rotation is done about the origin of the instance. If AX, AY, or AZ are not used, the default is 0 degrees rotation.

When one of these is selected, the scientific calculator appears so that you can enter the degrees of rotation. If you want a negative value, enter the angle, then select the +/- on the keypad.



Points the selected axis in the direction of the axis selected on the direction menu (PX, PY, PZ).

When one of these is selected, the direction menu appears. Then you can choose the direction that the selected axis is to be pointed.



Turns the x-, y-, or z-axis in the direction of a selected line or vector (TX, TY, TZ).

If you select one of these, you need to select two locations in the graphics window to define the direction for the axis. After you have done this, the system allows you

to continue selecting from the Orientation property sheet, or continue the process by selecting Done

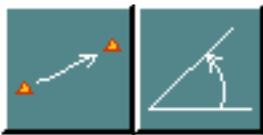


Mirrors image about the y-axis.

Mirrors image about the x-axis.

Mirrors image about both the x- and y-axis.

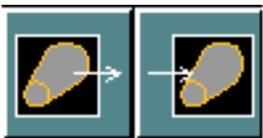
You can select only one of these at a time.



The Vector icon allows you to select the axis (through two location selections) around which the rotation of a specified number of degrees is to be performed. It can be used with the Angle icon on the right. (VEC).

The Angle icon rotates the image the given number of degrees about the z-axis, the normal rotation (similar to AZ). To rotate about another axis, use the Axis icon. (ANG).

When the Angle icon is selected, the scientific calculator appears so that you can enter the degrees of rotation. If you want a negative value, enter the angle, then select the +/- on the keypad.



These two icons must be used together. You can rotate the appearance of the view from the first view selected to the appearance of the second view selected.

After selecting the From icon, select the first view. This selection becomes the X0Y0Z0 coordinates of the second view. Then select the To icon, and select the second view.



Used with AX, AY, AZ and TX, TY, TZ on this property sheet.

The Model icon specifies that you want the rotation done about the model space (TOP Cplane) axis.

The View icon specifies that you want the rotation done about the view space axis.

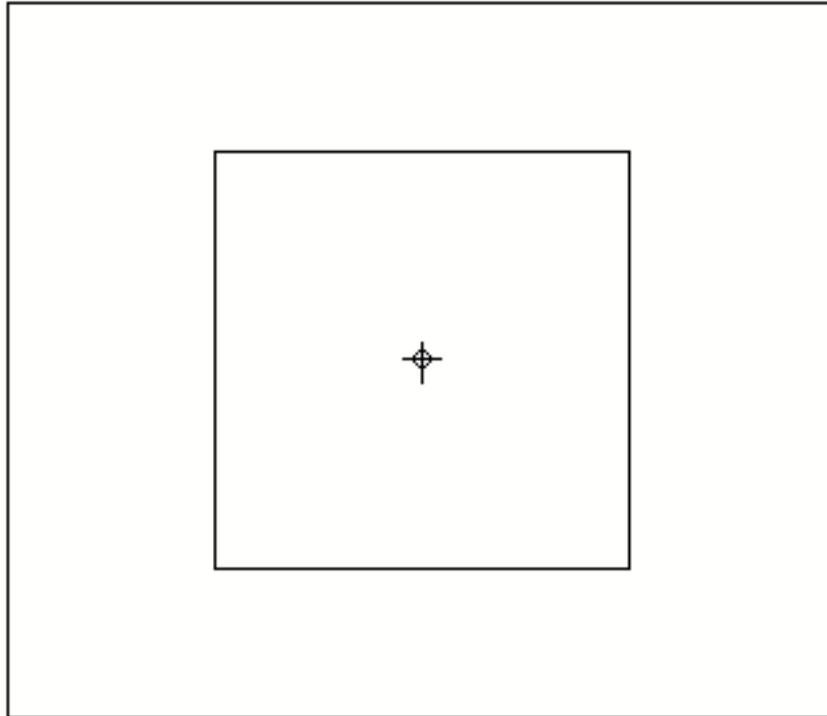
Example 1

To insert an Nfigure at a nonuniform scale,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Insert Figure More icon from the Insert Figure menu.
3. Use the default Nfigure as the choice of the type of figure.
4. Enter the name of the Pfigure that has previously been prepared (BOX) in the Name field.
5. Choose the Scale by Axis option. Then select Xscale. Using the calculator, enter 2 as the scale for the x-axis. Choose Yscale. Using the calculator, enter 1.5 as the scale for the y-axis.
6. Choose Apply.
7. Select the location for the origin of the Nfigure.



8. Choose Done from the Utilities menu. The Nfigure that is dashed, is the original Nfigure named BOX is shown here in dashed lines so that you can see the changes in the x-axis and y-axis scale.



Extended Nfigures cannot be inserted at a nonuniform scale.

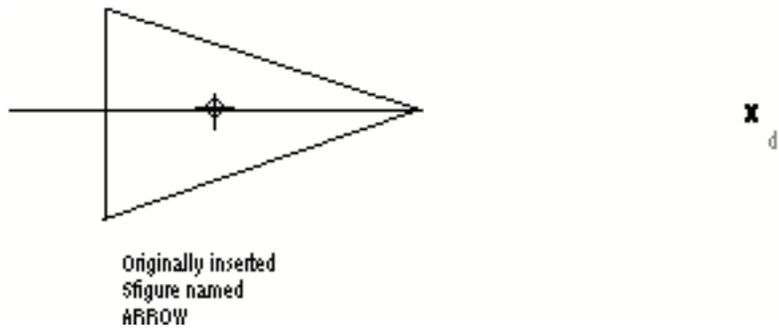
Example 2

To insert an Sfigure and mirror it about the x-axis,

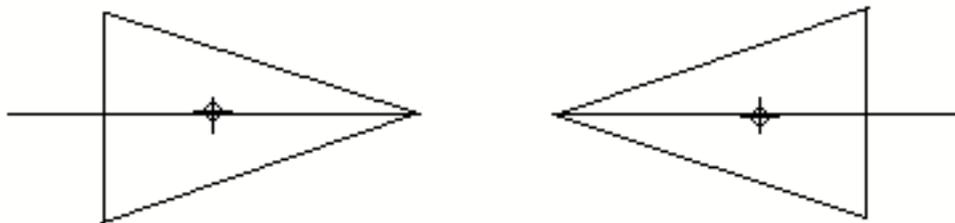
1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Insert Figure More icon from the Insert Figure menu.
3. Choose Sfigure as the choice of the type of figure.
4. Enter the name of the Sfigure that has previously been prepared (ARROW) in the Name field.
5. Choose Specify Orientation.
6. Choose Apply.

The Orientation property sheet appears below the Insert Figure property sheet.
7. Choose the Mirror y-axis (top mirror) icon on the property sheet.
8. Choose Done at the bottom of the Orientation property sheet.

9. Select the location for the origin of the Sfigure.



10. Choose Done from the Utilities menu. The Sfigure ARROW is inserted mirrored about the y-axis.



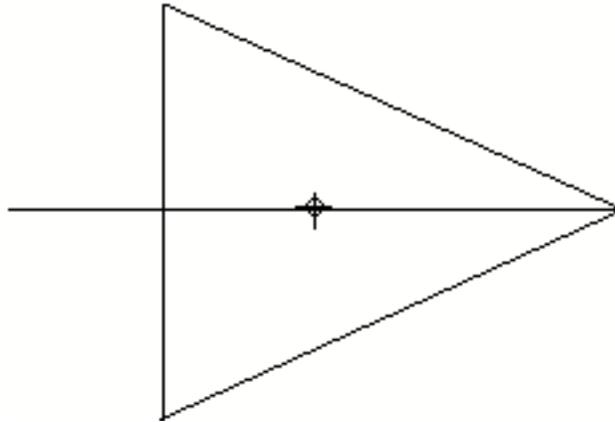
Example 3

To insert the same Sfigure at a nonuniform scale,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Insert Figure More icon from the Insert Figure menu.
3. Choose Sfigure as the choice of the type of figure.
4. Enter the name of the Sfigure that has previously been prepared (ARROW) in the Name field.
5. Choose the Scale by Axis option. Then select Xscale. Using the calculator, enter 1.5 as the scale for the x-axis. Choose Yscale. Using the calculator, enter 2.0 as the scale for the y-axis.
6. Choose Apply.
7. Select the location for the origin of the Sfigure.

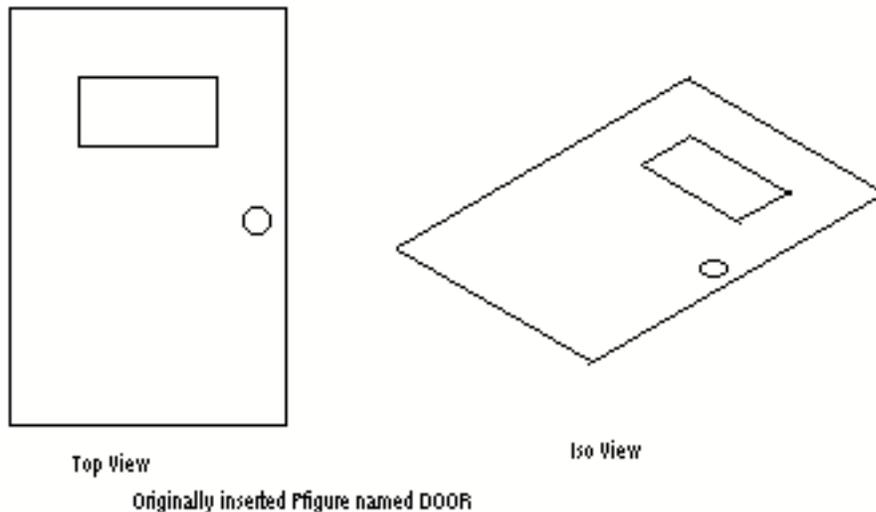


8. Choose Done from the Utilities menu. The Sfigure ARROW is inserted with a scale of 1.5 along the x-axis and 2.0 along the y-axis.



Example 4

This procedure uses the Top and Iso views to show you what happens when a Pfigure is inserted at 45 degrees rotation about the y-axis.



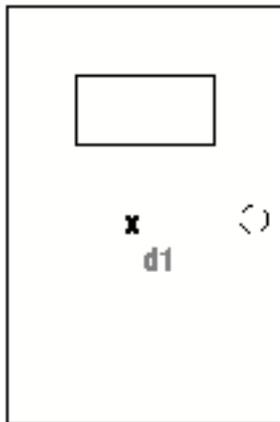
To insert a Pfigure with a rotation about the y-axis,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Insert Figure More icon from the Insert Figure menu.
3. Choose Pfigure as the choice of the type of figure.
4. Enter the name of the Pfigure that has previously been prepared (DOOR) in the Name field.
5. Choose Specify Orientation.

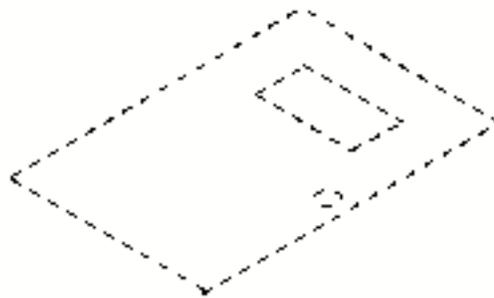
6. Choose Apply.

The Orientation property sheet appears below the Insert Figure property sheet.

7. Choose the AY option. Using the calculator enter the value 45. This will rotate the Pfigure DOOR 45 degrees about the y-axis. The origin of the Pfigure is the origin of the part, and the door was constructed with X0Y0 in the approximate center of the door.
8. Choose Done at the bottom of the Orientation property sheet.
9. Select the location for the origin of the Pfigure.

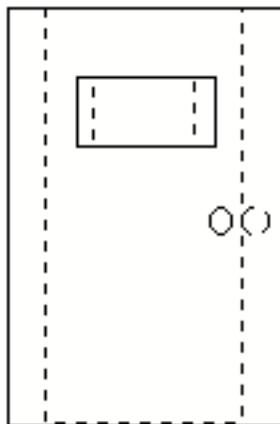


Top View

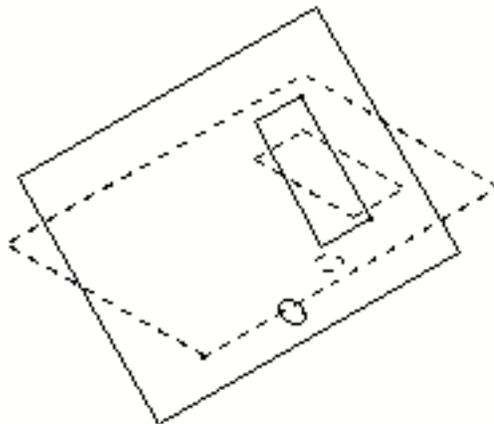


Iso View

10. Choose Done from the Utilities menu.



Top View



Iso View

To show exactly what happens when the door is rotated 45 degrees about the y-axis, the original Pfigure is shown in dashed lines.

Constructing Local Figures



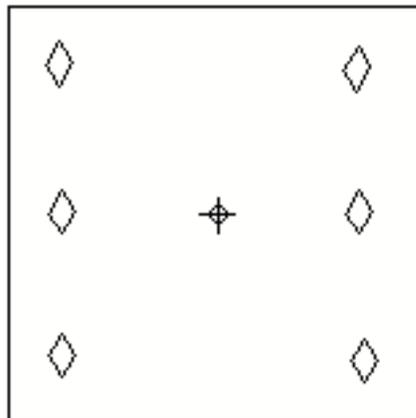
You can construct a local Nfigure by selecting a subset of the entities within the active part. This type of Nfigure is not stored in the database, but is resident only in the active part and drawing in which it is constructed.

Entities in the newly constructed Nfigure are no longer independent. They are related through the figure instance in that the operations on the instance affect all entities.

The Nfigure BOX is inserted into the active part.

Six Cnodes are inserted with a radius of 0.

The resulting Nfigure with Cnodes looks like this:

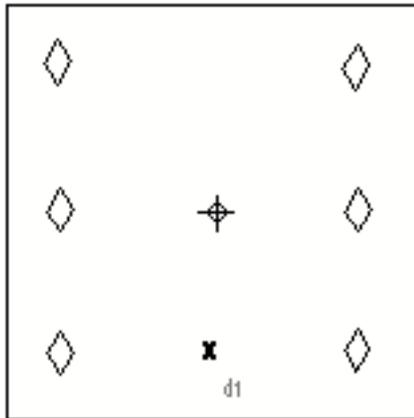


Example

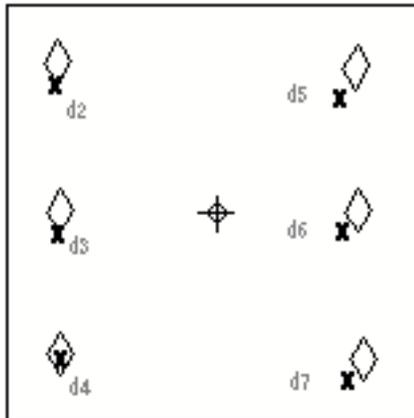
To construct a local Nfigure of just the Cnodes,

1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Construct Local icon from the Insert Figure menu.
3. Enter the name CNODES in the Figure Name field.
4. From the keyboard, use the Return key. If you slide off the Figure Name field, the system interprets that as a mistake and does not send any information to the text window.

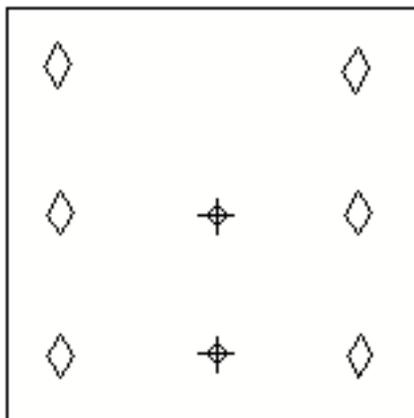
5. After entering Return, select the location for the origin of the Nfigure CNODES.



6. Select the Cnodes that you want to make up the local Nfigure.



7. Choose Done from the Utilities menu.



The Nfigure BOX now contains a local Nfigure CNODES.

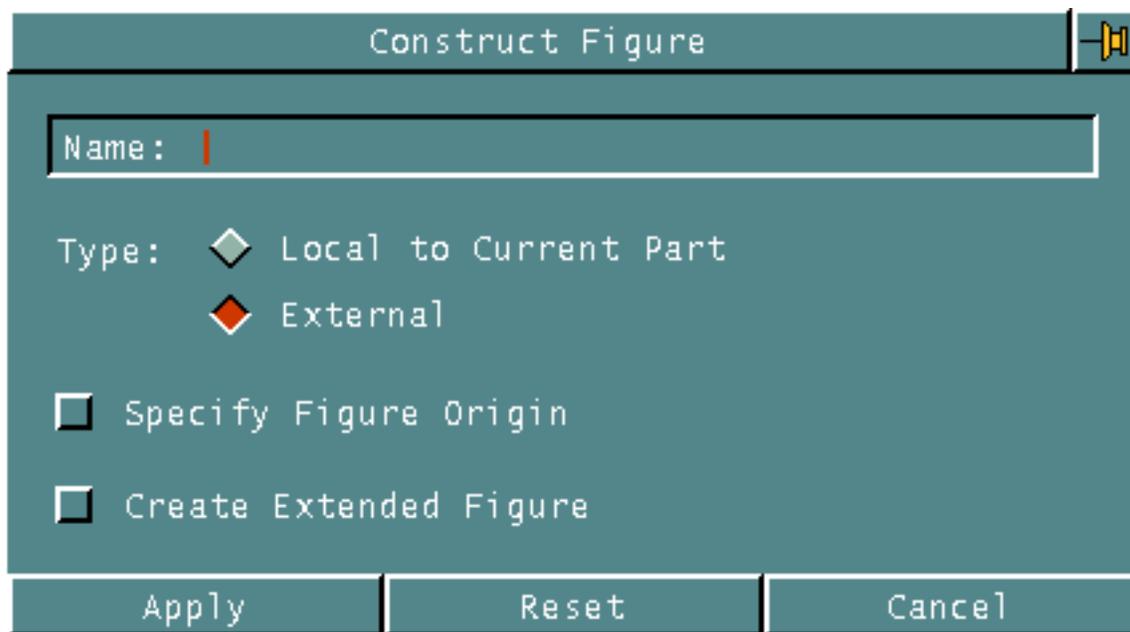
Constructing Figures



You can construct an Nfigure by selecting a subset of the entities within the active part.

This process is most useful in cases where you are creating a part and would like to treat a subset of the entities inserted in the part as an Nfigure.

When you select the Construct Figure More icon from the Insert Figure menu, the following appears.



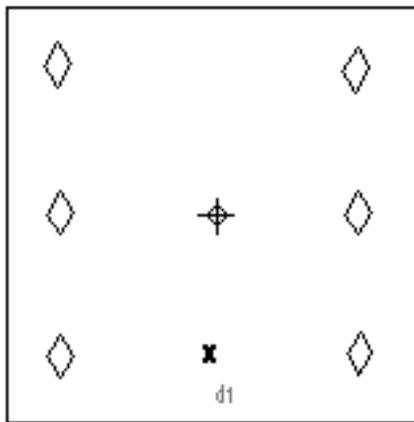
When constructing an Nfigure, you can choose to:

- Specify the name of the Nfigure. If the name used is the same as an existing Nfigure file, and you decide to overwrite it, all the Nfigure instance in your part contained in that file are deleted.
- Create the Nfigure local to the current part
- Create an Nfigure from an external part
- Select an origin for the Nfigure other than the default origin of the original part
- Create an extended Nfigure from the entities

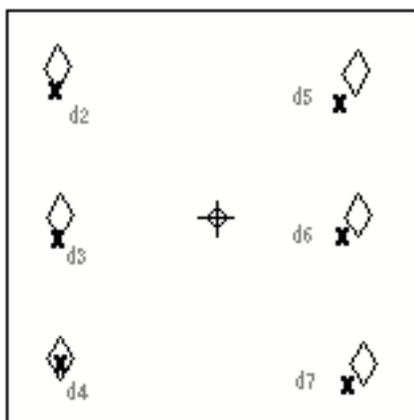
Example

To construct an extended Nfigure that is stored in the database, from the Cnodes in the part,

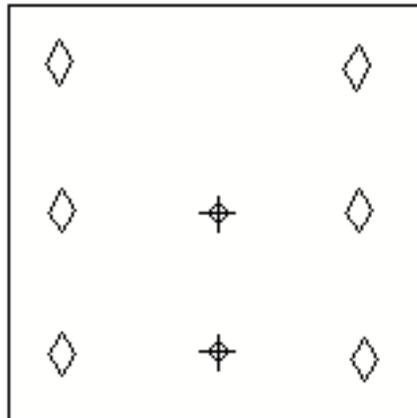
1. Select the Insert Figure icon from the String/Nodal task set.
2. Select the Construct Figure More icon from the Insert Figure menu.
3. Choose the Name field and enter CNODE6.
4. Make sure that External is selected, and then select Specify Figure Origin and Create Extended Figure.
5. Choose Apply.
6. Select the location for the origin of the extended Nfigure.



7. Select the Cnodes that you want to make up the Nfigure.



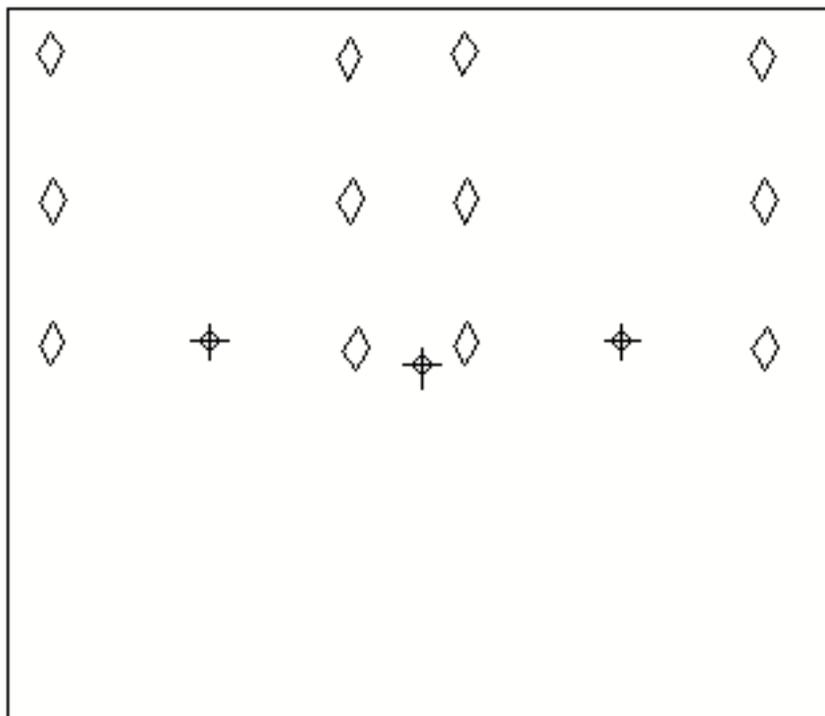
8. Choose Done from the Utilities menu.



The only difference between the Nfigure constructed using the Construct Figure More icon, and the Nfigure using the Construct Local icon is that this Nfigure is stored in the database and can be inserted into other parts. The Construct Local icon constructs an Nfigure that is only available in the active part.

If you were to exit the active part, and activate another part, you could insert the Nfigure that was constructed. The part contains the Nfigure BOX inserted at a scale of 2 along the x-axis and a scale of 1.5 along the y-axis.

The result of inserting Nfigure CNODE6 twice would look like this.



Listing Figure Parameters



The origin echo flag and the current default figure insertion scale for all inserted figures are printed out in the text window.

To find out the nongraphic properties that have been assigned to created figures, you must use the command `LIST PROPERTY` and select the figures.

Example

To list the parameters for the Nfigure,

1. Select the List icon from the String/Nodal task set. The following menu appears directly below the List icon.



2. Choose Nfigure from the list of choices.

The following information is displayed in the text window.

```
SFIGURE/NFIGURE PARAMETERS
FIGURE ORIGIN ECHO      = ON
DEFAULT SCALE           = 1.000
```

Changing Figures



Once Nfigures have been inserted into an active part, you may have occasion to change them. You can make graphic or nongraphic changes to them, update changed figures, and you can replace specifically named figures with other named figures.

When you select the Change Figure icon from the String/Nodal task set, the following property sheet appears.

- Select Graphically
Allows you to graphically select individual Nfigures to change.
- Name
Allows you to make changes to the named Nfigure
- Select All
Allows you to make the change to all Nfigures in the part.
- Non-graphic Change
Allows you to choose to retain properties and/or attributes, and/or update only changed figures.
- Graphic Changes

Allows you to change the scale and or orientation of an Nfigure. Scaling should be done before mirroring or rotating.

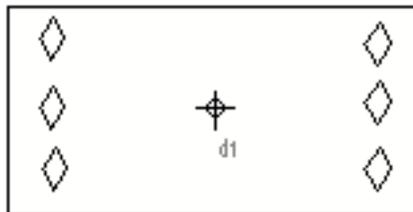
- Replace and with

Allows you to replace specifically named figures with other named figures (i.e., replaces BOX with BOX1).

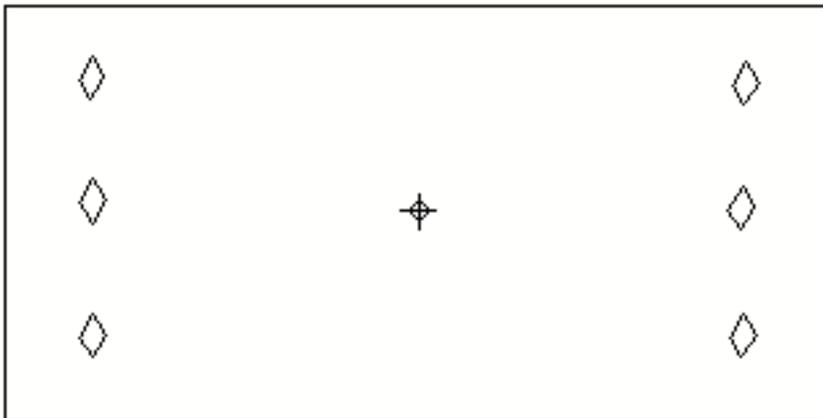
Example 1

To change the scale of the Nfigure BOARD,

1. Select the Change Figure icon from the String/Nodal task set.
2. Use the default Select Graphically. Choose Graphic Changes and Change Scale to. Enter the new scale of 2.
3. Choose Apply.
4. Select the Nfigure that you want to change.



5. Choose Done from the Utilities menu.



Example 2

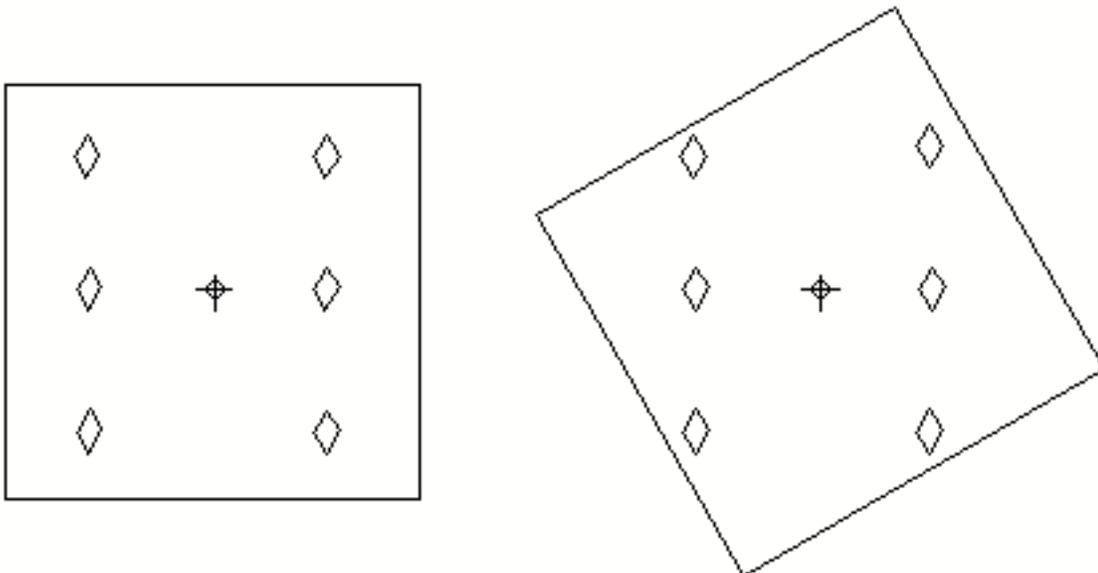
To rotate an Nfigure 30 degrees about the z-axis,

1. Select the Change Figure icon from the String/Nodal task set.
2. Choose the Name option. Enter the name BOX.
3. Choose Graphic Changes and Change Orientation.
4. Choose Apply.

The Orientation property sheet appears below the Insert Figure property sheet.

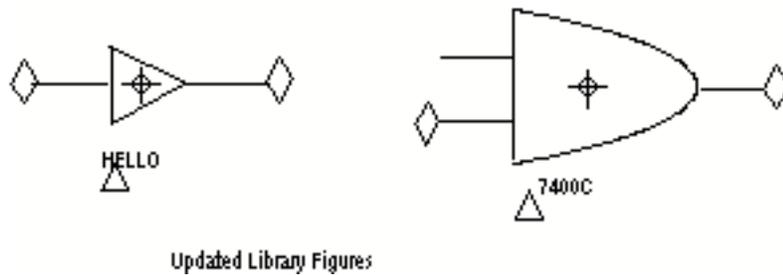
5. Select the Angle icon. Using the calculator enter the value 30. This will rotate the Nfigure BOX 30 degrees about the z-axis.
6. Choose Done at the bottom of the Orientation property sheet.

Since the Nfigure was named on the property sheet, you do not have to select it graphically. The Nfigure BOX contained only the rectangular outline, and therefore, it was all that was rotated.

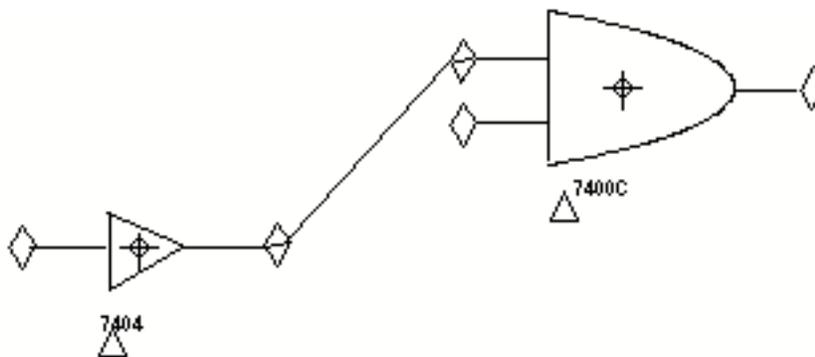


Example 3

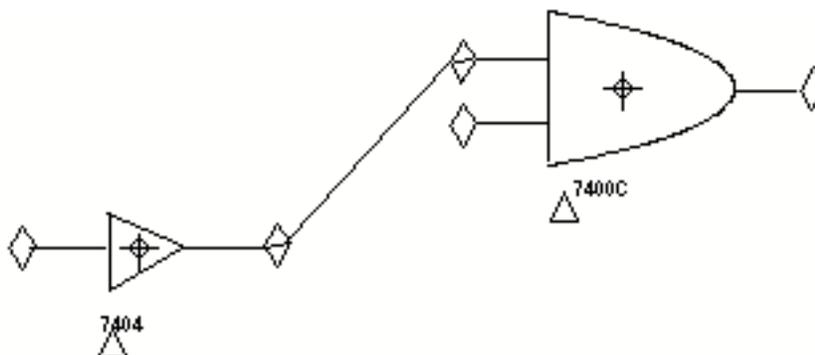
The Ntext in the Nfigure on the left was changed from 7404 to HELLO. A Cnode was removed from the Nfigure on the right.



To replace the current Nfigure instances with updated library figures that have been prepared and filed on disk, start off with the following part containing earlier versions of the two Nfigures.



1. Select the Change Figure icon from the String/Nodal task set.
2. Choose the Select All option.
3. Choose Only Update Changed Figures and Retain Attributes.
4. Choose Apply.



The library figures replace the Nfigures that are in the part. The exception is that a standalone Cnode is generated to support the Nline, and Ntext 7404 is preserved.

The following information is displayed in the text window.

NAME	DATE	QUANTITY
AX.7404	mm-dd-yy	1
AX.7400C	mm-dd-yy	1

Updating Complete

2 Updated

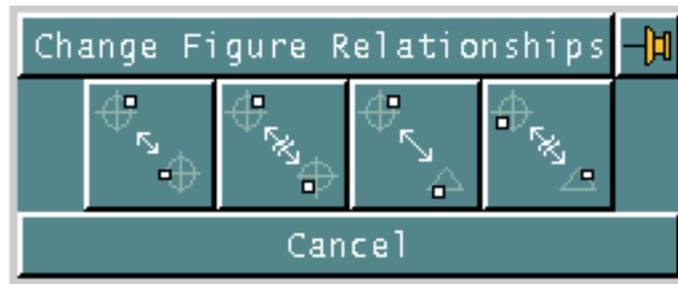
2 TOTAL

Changing Figure Relationships



You can relate or associate Nfigures with other Nfigures or with Tnodes, and you can unrelate Nfigures from other Nfigures or Tnodes.

When you select the Change Figure Relationships icon from the String/Nodal task set, the following Change Figure Relationships menu appears.



Example 1

To relate an Nfigure with another Nfigure,

1. Select the Change Nfigure Relationships icon from the String/Nodal task set.
2. Select the Relate Nfigure icon from the Change Figure Relationships menu.
3. Select one or more Nfigures.
4. Choose Next from the Utilities menu.
5. Select one or more Nfigures. If multiple Nfigures are selected, they must be as many as the first set of selected Nfigures.
6. Choose Done from the Utilities menu.

Example 2

To unrelate an Nfigure from one or more Tnodes,

1. Select the Change Nfigure Relationships icon from the String/Nodal task set.
2. Select the Unrelate Nfigure Tnode icon from the Change Figure Relationships menu.
3. Select one or more Nfigures.
4. Choose Next from the Utilities menu.

5. Select one or more Tnodes. If multiple Tnodes are selected, you must select the same number of Nfigures.
6. Choose Done from the Utilities menu.

Displaying Nfigure Relationships

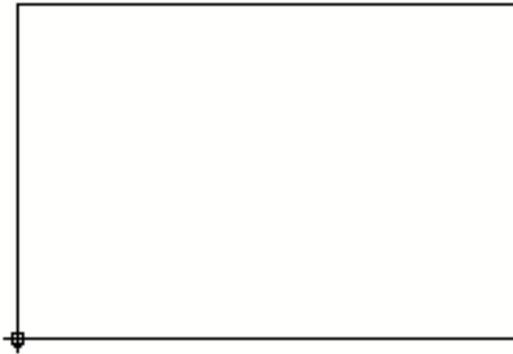


You can display the relationship between Tnodes and Nfigures. You must select the Tnode to show the relationship to the Nfigure.

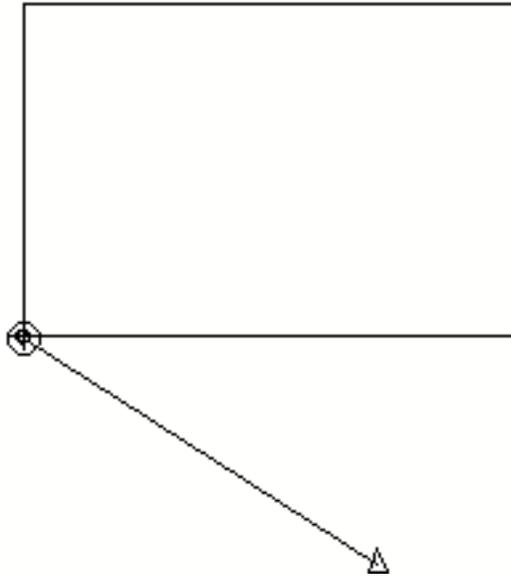
Example

To display the relationship between the Nfigure and the associated Tnode,

1. Select the Display Relationship Nfigure icon from the String/Nodal task set.
2. Select the Tnode for which you want to see the related Nfigure.



A line connecting the Tnode with the origin of the related Nfigure and a circle around the NSI of the related Nfigure are displayed in the graphics window as temporary graphics.



The following is displayed in the text window verifying the relationship.

```

MAIN ENTITY
-----

  TNOD      X=1.860947 Y=1.056213 Z=0.0
SEQUENCE NUMBER 7
PIN NUMBER      0

RELATED ENTITIES
-----

  NSI  X=0.0 Y=0.0   Z=0.0
SUBFIGURE NAME:
LOCAL

MODEL ent
    
```

3. Choose Done from the Utilities menu.

The graphic returns to what it was before you selected the Display Relationship Cnode icon.

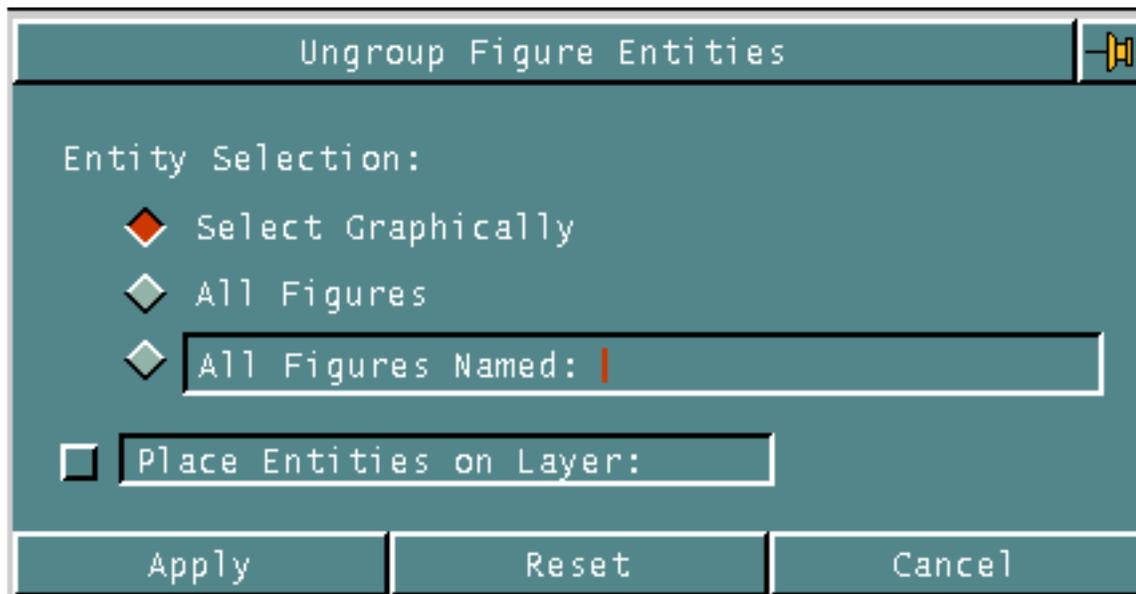


Ungrouping Figure Entities



You can ungroup or dissociate each entity in an extended Nfigure to an unassociated entity in the database. The instance is deleted from the database.

If you have extended Nfigures in your part's database, but you no longer need the restrictions and grouping functions they provide, you can ungroup them and they become standalone entities.



When ungrouping an extended Nfigure, you can choose to:

- Select the extended Nfigure graphically.
- Select all the extended Nfigures in the part.
- Select the extended Nfigures by name.
- Specify the layer on which to place the entities.

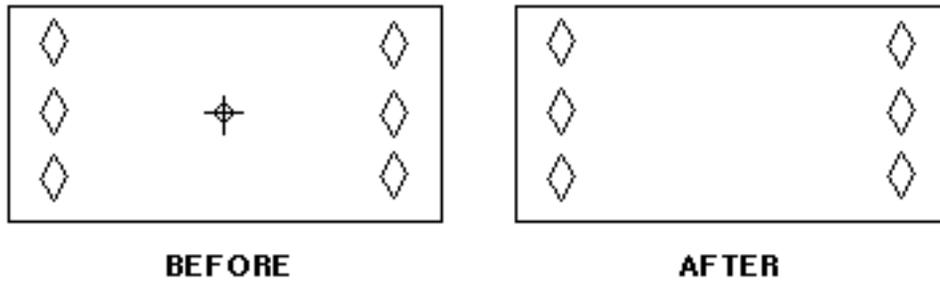
Example

To ungroup the entities within an extended Nfigure,

1. Select the Ungroup Figure Entities icon from the String/Nodal task set.
2. Choose the All Figures Named option. Enter BOARD as the name of the extended Nfigure that you want to ungroup. All the extended Nfigures named BOARD in the active part will be ungrouped.

3. Choose Apply.

The only visible change to the graphics is that the NSI is removed. If you use the Query icon off the top bar, you will find that you have to select each entity separately to get any information. There is no longer a relationship between the lines and Cnodes.



Attributes

This chapter defines attributes (also known as properties) and describes how to assign, edit or delete them from a part or a nodal entity.

- Overview of Attributes
- Assigning Attributes
- Listing Attributes
- Editing Attributes
- Deleting Attributes
- Annotating Entities from Attribute Data

Overview of Attributes

Attributes are used as labels to associate specific values and characteristics with their related entities or parts.

Attributes can be assigned to a

- Part.
- Nodal entity.

Attributes serve the following functions:

- They describe entities.
- They describe attributes of an entity.
- They link entities to files with other nongraphic information.
- They influence insertion, tracing, and reporting operations.

Attributes consist of a name and a value. The name must be selected from the file `/usr/apl/cadds/data/_bcd/prop` to be recognized by the system. You can define additional attributes and add them to this file.

The value of the property is the actual information you attach to the entity or part. The value can be one of four types:

- **NULL**
Does not have a value assigned to it.
- **INTEGER**
Stores numeric values which are positive or negative whole numbers.
- **REAL**
Stores numeric values which are not necessarily whole numbers.
- **TEXT**
Stores alphanumeric text.

The following is an example of different attribute names from the file /usr/apl/cadds/data/_bcd/prop and the type of value required. An example is also given.

Attribute Name	Attribute Type	Sample Value
HOLE	Null	
DIVISION	Integer	8
INSULATION	Real	0.6
SYSTEM	Text	FURNITURE
VALUEA	Text	\$42.00

The table uses the following value-type code.

- 0 = NULL
- 1 = INTEGER
- 2 = REAL
- 3 = TEXT

Text values are delimited with special characters, the opening and closing character must be the same. Acceptable characters are: single (' ') and double (" ") quotes, pound sign (#), dollar sign (\$), percent sign (%), asterisk (*), ampersand (&), and slash (/).

Once attributes have been assigned, they can also be edited and/or deleted.

The property sheets shown in this chapter can be found only if you *do not* have and are not configured to run the EDMInformation license on your workstation.

All the information needed to work with attributes can be found by selecting Attribute Management from the menu that appears when you select Utility from the top bar. The Attribute icon is the second one from the left on the Attribute Management menu.



When the Attributes icon is selected, the following menu appears.



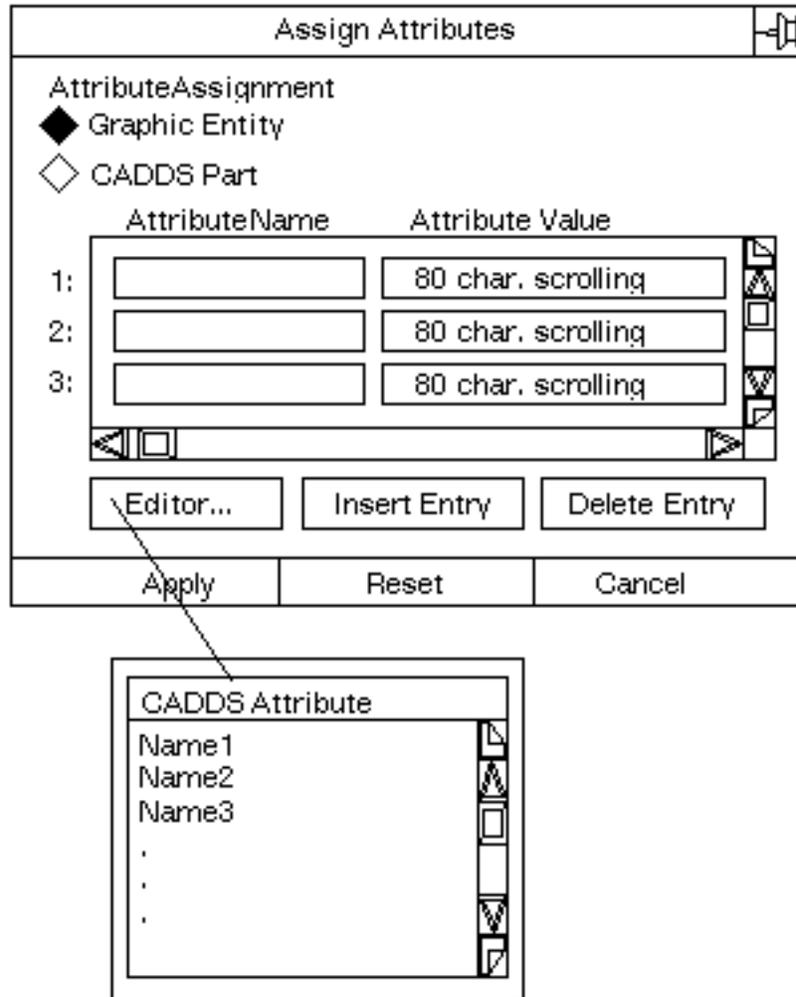
When the Display menu is selected, the following menu appears.



Annotate Entities from Attribute Data is the only one discussed in this chapter.

Assigning Attributes

When you select Assign Attributes on the menu, the following property sheet appears.



The default setting on this property sheet is to assign an attribute to a graphic entity. You also have the option to assign attributes globally on a part.

Example 1

To assign attributes to a graphic entity within a part,

1. Choose Attribute Management from the Utility menu.
2. Select the Attribute Functions icon from the menu.



3. Choose Assign Attributes from the menu that appears.
4. When the property sheet for Assign Attributes appears, make sure that the default Graphic Entity is selected.
5. Choose any Attribute Name field, then select the Editor option to display the CADDs Attribute Editor. Choose attribute names from the list, then type the values for the attributes into the Attribute Value field opposite the attribute name. This area scrolls, allowing up to 80 characters to be entered.
6. After each attribute name-value pair is correctly entered, select Insert Entry on the property sheet.
7. When you have selected and entered all the attribute name-value pairs for the graphic entity within the part, select Apply.
8. Select the entity or entities within the part to which you want to assign attributes.
9. Choose Done from the Utilities menu.

Example 2

To assign attributes to a part,

10. Choose Attribute Management from the Utility menu.
11. Select the Attribute Functions icon from the menu.



12. Choose Assign Attributes from the menu that appears.
13. When the property sheet for Assign Attributes appears, select CADDs part option.

- 14.** Choose any Attribute Name field, then select the Editor option to display the CADDs Attribute Editor. Choose attribute names from the list, then type the values for the attributes into the Attribute Value field opposite the attribute name. This area scrolls, allowing up to 80 characters to be entered.
- 15.** After each attribute name-value pair is correctly entered, select Insert Entry on the property sheet.
- 16.** When you have selected and entered all the attribute name-value pairs for the part, select Apply.

Listing Attributes

You can list the assigned attributes for a graphic entity at any time while working in your part.

1. Choose Attribute Management from the Utility menu.
2. Select the Query Function icon from the menu.



3. Select the entity for which you want attributes listed.
4. Choose Done from the Utilities menu.

The system displays the following in the text window.

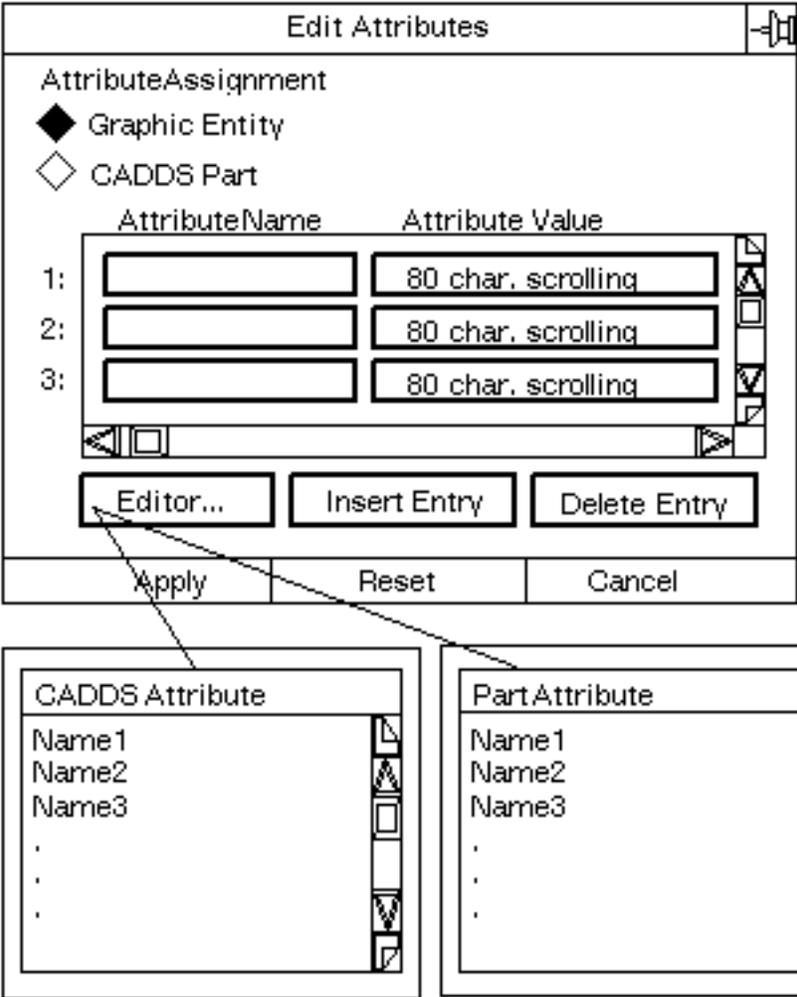
```
## LIST Property :MODEL ent
```

```
PROPERTIES ATTACHED TO ENTITY ARE
UNIT          " IN"
HOLE
LATREF        2.000000
              -2.000000
WDTHOBJ       36.00000*
REGION        "  "
SYSTEM        " DOOR"
DIVISION      8
SUBDIVDE      " INTERIOR"
TYPE          " WOOD"
SUBTYPE       " 34X84"
PHAME         " CVAEC.GBD.OBJ.DOOR.INTERIOR.WOOD.34X84"
HGTOBJ        85.00000*
```

Editing Attributes

Existing attribute values can be changed on graphic entities or on a part.

When you select Edit Attributes on the Attribute Management menu, the following property sheet appears.



The default setting on this property sheet is to edit the attribute assigned to a graphic entity. You also have the option to edit attributes globally on a part.

Example 1

To edit attributes assigned to a graphic entity within a part,

1. Choose Attribute Management from the Utility menu.
2. Select the Attribute Functions icon from the menu.



3. Choose Edit Attributes from the menu that appears.
4. When the property sheet for Edit Attributes appears, make sure that the default Graphic Entity is selected.
5. Choose any Attribute Name field, then select the Editor option to display the CADD Attribute Editor. Choose an attribute name from the list, then type the value for the attribute into the Attribute Value field opposite the attribute name. This area scrolls, allowing up to 80 characters to be entered.

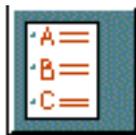
If you have selected an attribute that does not exist in an entity, the attribute and value are added.

6. After each attribute name-value pair is correctly entered, select Insert Entry on the property sheet.
7. When you have selected and entered all the attribute name-value pairs for the graphic entity within the part, select Apply.
8. Select the entity or entities within the part to which you want to edit their attributes.
9. Choose Done from the Utilities menu.

Example 2

To edit attributes already assigned to a part,

1. Choose Attribute Management from the Utility menu.
2. Select the Attribute Functions icon from the menu.



3. Choose Edit Attributes from the menu that appears.

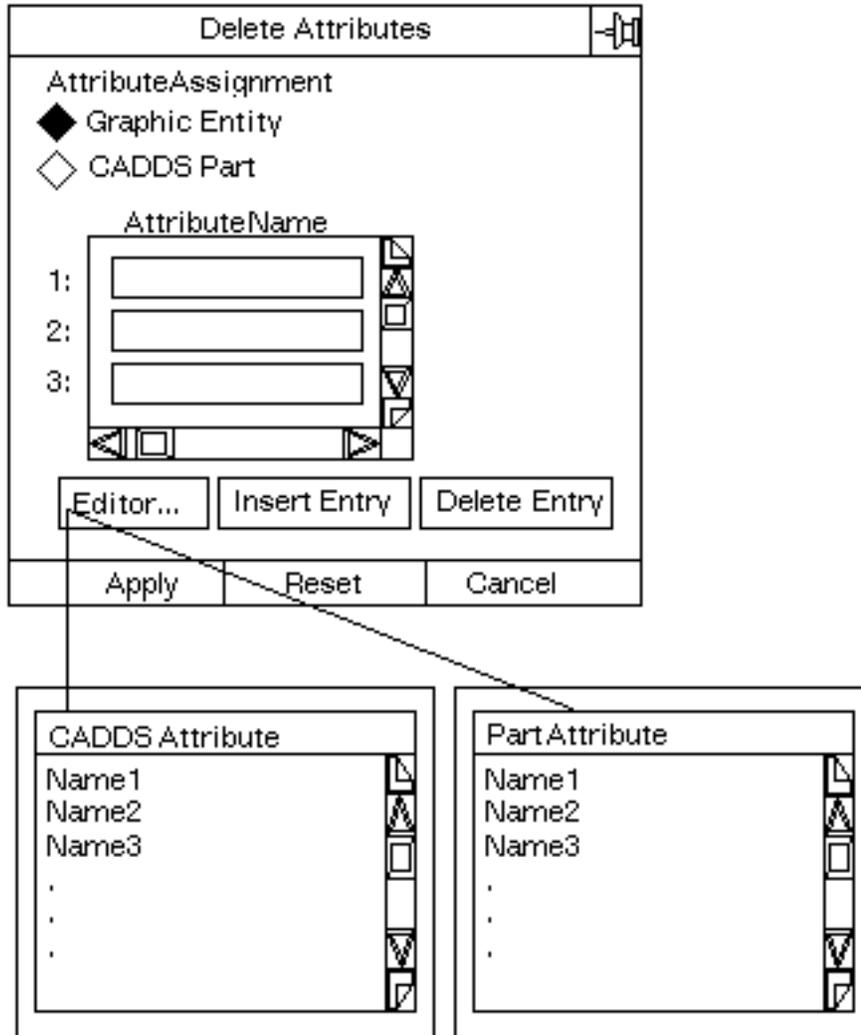
4. When the property sheet for Edit Attributes appears, select the CADDs Part option.
5. Choose any Attribute Name field, then select the Editor option to display the Parts Attribute Editor. Choose an attribute name from the list, then type the value for the attribute into the Attribute Value field opposite the attribute name. This area scrolls, allowing up to 80 characters to be entered.

If you have selected an attribute that does not exist in the part, the attribute and value are added.
6. After each attribute name-value pair is correctly entered, select Insert Entry on the property sheet.
7. When you have selected and entered all the attribute name-value pairs for the part, select Apply.

Deleting Attributes

Existing attributes can be removed from graphic entities or from a part.

When you select Delete Attributes on the Attribute Management menu, the following property sheet appears.



The default setting on this property sheet is to delete the attribute assigned to a graphic entity. You also have the option to delete attributes globally from a part.

Example 1

To delete attributes assigned to a graphic entity within a part,

1. Choose Attribute Management from the Utility menu.
2. Select the Attribute Functions icon from the menu.



3. Choose Delete Attributes from the menu that appears.
4. When the property sheet for Delete Attributes appears, make sure that the default Graphic Entity is selected.
5. Choose any Attribute Name field, then select the Editor option to display the CADDs Attribute Editor. Choose an attribute name from the list.
6. After each attribute name is correctly entered, select Insert Entry on the property sheet.
7. When you have selected and entered all the attribute names that you want to delete for the graphic entity within the part, select Apply.
8. Select the entity or entities within the part to which you want to delete the named attributes.
9. Choose Done from the Utilities menu.

Example 2

To delete attributes already assigned to a part,

1. Choose Attribute Management from the Utility menu.
2. Select the Attribute Functions icon from the menu.



3. Choose Delete Attributes from the menu that appears.
4. When the property sheet for Delete Attributes appears, select the CADDs Part option.
5. Choose any Attribute Name field, then select the Editor option to display the Parts Attribute Editor. Choose an attribute name from the list.

- 6.** After each attribute name is correctly entered, select Insert Entry on the property sheet.
- 7.** When you have selected and entered all the attribute names for the part that you want to delete, select Apply.

Annotating Entities from Attribute Data

You can generate text that annotates entities with attached attributes. This text is known as Property Text (Ptext). Ptext is standard text except that it can be created only in Model mode. Note that you cannot generate text for attributes attached to a part.

Ptext is created using the current text parameters that you selected for the active part.

You can change an entity's attributes and values after you have generated Ptext; you must delete and re-create the Ptext.

A Ptext string cannot exceed 200 characters. This includes the attribute name + attribute value + optional text. The text may be created before or after the attribute name and attribute value.

Annotate Entities from Attribute Data Property Sheet

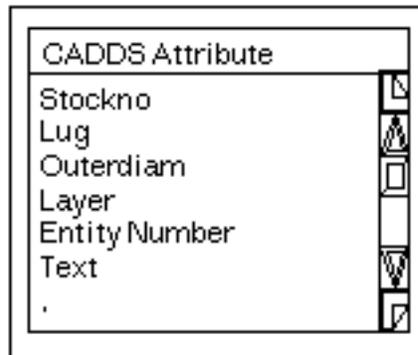
When you select the Annotate Entities option found under the Display Function icon on the Attribute Management menu, the following property sheet appears:

The screenshot shows a dialog box titled "Annotate Entities from Attribute Data". It is organized into several sections:

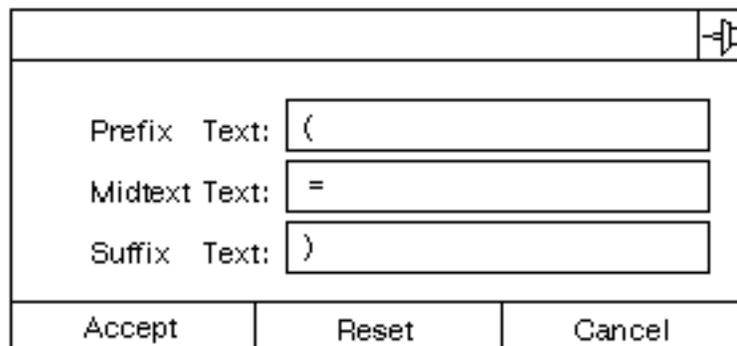
- Entity Selection:** Contains two radio buttons: "Select Graphically" (selected) and "Select All".
- Attribute Selection:** Contains two radio buttons: "Include All Attributes" (selected) and "Specify AttributeNames". Below this is a list of three "AttributeName" entries, each with an input field and a set of icons. Below the list are buttons for "Editor...", "Insert Entry", and "Delete Entry".
- Text Display:** Contains three radio buttons: "Attribute Name and Value" (selected), "Attribute Name Only", and "Attribute Value Only".
- Layer:** Contains three radio buttons: "Active Layer" (selected), "Specify Layer" (with a "Number:" field), and "Relative Layer" (with a "Number:" field).
- Other Options:** A group of checkboxes: "Offset" (with a "Distance:" field), "Hide Portion of String under Text", "Rotate Label Angle by 180 Degrees", "Text Parallel to Selected String", and "Additional Text" (with an "Options..." button).
- Buttons:** "Apply", "Reset", and "Cancel" buttons at the bottom.

1. Entity selection allows you to annotate all entities with text, or only those that you select graphically, with attributes.
2. Attribute selection allows you to include all attributes in the text, or specify individual attributes.

3. After you select the Attribute Name field, select the Editor option, and the following CADDs Attributes file appears. Choose the attribute to insert into the Attribute Name field.



4. The check-boxes allow you to specify the following:
 - Specify an offset distance for the Ptext either above or below the selected entity. The distance is a percentage of the text height. A positive value places the text below and a negative value places the text above the selected entity.
 - Hide those portions of the string that the Ptext intersects when it is created.
 - Guarantee that the Ptext is not inserted upside down.
 - Create Ptext parallel to a selected string at the selected location.
 - Create additional text with the attribute and value.
5. After you select the Additional Text option, select the Options next to the field, and the following property sheet appears.



Prefix Text includes the specified text string as a prefix to the Ptext. Midtext Text includes the specified text string between the attribute name and the attribute value. To include spaces between the three elements of the Ptext, include spaces at the beginning and/or end of this text string. Suffix Text includes the specified text string as a suffix to the Ptext. Each of these selections can have no more than 20 characters for the string.

6. Text Display allows you to specify the type of attribute information you want included in the Ptext. Attribute name and value, attribute name only, or attribute value only. You can choose only one of these options at a time.
7. Layer allows you to specify the layer on which the Ptext is to be created. You can select the active layer, specify the layer number, or specify a layer number relative to the layer number of the associated entity (i. e., if the entity is on layer 5, and a value of 3 is given, the Ptext is created on layer 8).

Example

To generate text from entities with attached attributes,

1. Choose Attribute Management from the Utility menu.
2. Select the Display Function icon from the menu.



3. The Annotate Entities from Attribute Data property sheet appears.
4. Make your selections on the property sheet, leave the entity selection at Select Graphically.
5. Choose Apply.
6. Select the entity or entities for which you want to generate text.
7. Choose Done from the Utilities menu.

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