Chapter 16

Understanding External References

Learning Objectives

After completing this chapter, you will be able to:

- *Understand external references and their applications.*
- *Understand dependent symbols.*
- *Use the **XREF** command and its options.*
- *Use the **Attach**, **Unload**, **Reload**, **Detach**, and **Bind** options.*
- *Edit the path of an xref.*
- *Understand the difference between the **Overlay** and **Attachment** options and use the **XATTACH** command.*
- *Use the **XBIND** command to add dependent symbols.*
- *Understand demand loading.*
- *Use the **DESIGNCENTER** to attach a drawing as an xref.*

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EXTERNAL REFERENCES

The external reference feature allows you to reference an external drawing without making that drawing a permanent part of the existing drawing. For example, assume that we have an assembly drawing ASSEM1 that consists of two parts, SHAFT and BEARING. The SHAFT and BEARING are separate drawings created by two CAD operators or provided by two different vendors. We want to create an assembly drawing from these two parts. One way to create an assembly drawing is to insert these two drawings as blocks by using the **INSERT** command. Now assume that the design of BEARING has changed due to customer or product requirements. To update the assembly drawing, you have to make sure that you insert the BEARING drawing after the changes have been made. If you forget to update the assembly drawing, then the assembly drawing will not reflect the changes made in the piece part drawing. In a production environment, this could have serious consequences.

You can solve this problem by using the **external reference** facility, which lets you link the piece part drawings with the assembly drawing. If the xref drawings (piece part) get updated, the changes are automatically reflected in the assembly drawing. This way, the assembly drawing stays updated, no matter when the changes were made in the piece part drawings. There is no limit to the number of drawings that you can reference. You can also have **nested references**. For example, the piece part drawing BEARING could be referenced in the SHAFT drawing, then the SHAFT drawing could be referenced in the assembly drawing ASSEM1. When you open or plot the assembly drawing, AutoCAD LT automatically loads the referenced drawing SHAFT and the nested drawing BEARING. When using external references, several people working on the same project can reference the same drawing and all the changes made are displayed everywhere the particular drawing is being used.

If you use the **INSERT** command to insert the piece parts, the piece parts become a permanent part of the drawing, and therefore, the drawing has a certain size. However, if you use the external reference feature to link the drawings, the piece part drawings are not saved with the assembly drawing. AutoCAD LT only saves the reference information with the assembly drawing; therefore, the size of the drawing is minimized. Like blocks, the xref drawings can be scaled, rotated, or positioned at any desired location, but they cannot be exploded. You can also use only a part of the Xref by making clipped boundary of Xrefs.

Tip

External Referenced drawings are useful for creating parts or subassemblies and then putting them together in one drawing to create the main assembly. You can also use it for laying out the contents of a drawing with multiple views before plotting.

DEPENDENT SYMBOLS

If you use the **INSERT** command to insert a drawing, the information about the named objects is lost if the names are duplicated. If they are unique, it is imported. The **named objects** are entries such as blocks, layers, text styles, and layers. For example, if the assembly drawing has a layer Hidden with green color and HIDDEN linetype, and the piece part Bearing has a layer Hidden with blue color and HIDDEN2 linetype, then when you insert the Bearing drawing in the assembly drawing, the values set in the assembly drawing will override the values of the

inserted drawing (Figure 16-1). Therefore, in the assembly drawing, the layer Hidden will retain green color and HIDDEN linetype, ignoring the layer settings of the inserted drawing. Only those layers that have the same names are affected. The remaining layers that have different layer names are added to the current drawing.

Figure 16-1 *Partial view of the layer settings of the current drawing in the* ***Layer Properties Manager*** *dialog box*

In the xref drawings, the information about named objects is not lost because AutoCAD LT will create additional named objects such as the specified layer settings, as shown in Figure 16-2. For xref drawings, these named objects become dependent symbols (features such as layers, linetypes, object color, text style, and so on).

Figure 16-2 *Xref creates additional layers*

The layer Hidden of the xref drawing (BEARING) is appended with the name of the xref drawing Bearing, and the two are separated by the vertical bar symbol (|). The name of these layers appear in light gray color in the **Layer Control** drop-down list of the **Layers** toolbar. These layers can neither be selected nor be made current. The layer name Hidden changes to Bearing|Hidden. Similarly, Center is renamed Bearing|Center and Object is renamed Bearing|Object (Figure 16-2). The information added to the current drawing is not permanent. It is added only when the xref drawing is loaded. If you detach the xref drawing, the dependent symbols are automatically erased from the current drawing.

When you xref a drawing, AutoCAD LT does not let you reference the symbols directly. For example, you cannot make the dependent layer, Bearing|Hidden, current. Therefore, you cannot add any objects to that layer. However, you can change the color, linetype, lineweight, plotstyle,

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or visibility (on/off, freeze/thaw) of the layer in the current drawing. If the **Retain changes to Xref layers** check box in the **External References (Xrefs)** area of the **Open and Save** tab of the **Options** dialog box is cleared, which also implies that the system variable **VISRETAIN** is set to 0, the settings are retained only for the current drawing session. This means that when you save and exit the drawing, the changes are discarded and the layer settings return to their default status. If this check box is selected (default), which also implies that the **VISRETAIN** variable is set to 1, layer settings such as color, linetype, on/off, and freeze/thaw are retained, and they are saved with the drawing and used when you open the drawing the next time. Whenever you open or plot a drawing, AutoCAD LT reloads each Xref in the drawing and as a result, the latest updated version of the drawing is loaded automatically.

Note

*You cannot make the xref-dependent layers current in a drawing. Only when the xref drawing is bounded to the current drawing using the **XBIND** command you can make the xref-dependent layers a permanent part of the current drawing and use them. The **XBIND** command will be discussed later in this chapter.*

MANAGING EXTERNAL REFERENCES IN A DRAWING

Toolbar:	Insert > X Ref Manager
	Reference > X Ref Manager
Menu:	Insert > Xref Manager
Command:	XREF

Figure 16-3 *The **Insert** toolbar*

When you invoke the **XREF** command (Figure 16-3), AutoCAD LT displays the **Xref Manager** dialog box (Figure 16-4). The **Xref Manager** dialog box displays the status of each Xref in the current drawing and the relation between the various Xrefs. It allows you to attach a new xref, detach, unload, load an existing one, change an attachment to an overlay, or an overlay to an attachment. It also allows you to edit an xref's path and bind the xref definition to the drawing.

Apart from the methods mentioned in the command box, you can also invoke the **Xref Manager** dialog box by selecting an Xref in the current drawing and then right-clicking in the drawing area to display a shortcut menu. Now, choosing **Xref Manager** from the shortcut menu, the **Xref Manager** dialog box is displayed.

The upper left corner of the dialog box has two buttons: **List View** and **Tree View**.

List View

Choosing the **List View** button displays the xrefs present in the drawing in alphabetical order. This is the default view. The list view displays information about xrefs in the current drawing under the following headings.

Reference Name

This column lists the name of all existing references in the current drawing.

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Figure 16-4 *The* ***Xref Manager*** *dialog box*

Status

This column lists the current status of each xref in the drawing. It lists whether an xref is loaded, unloaded, unreferenced, not found, orphaned, unresolved, or marked to be reloaded. A loaded xref implies that the xref is attached to the current drawing. You can then unload it and then reload it using the options in the dialog box (this will be discussed later). An xref selected to be unloaded or reloaded displays **Unload** and **Reload**, respectively, under the **Status** column. If the xref has nested references that cannot be found, the status is **Unreferenced**, and if the parent of the nested reference gets unloaded, or cannot be found, its status is described as **Orphaned**. An unreferenced xref will not be displayed. If the xref is not found in the search paths defined, its status is **Not Found**. A missing xref or one that cannot be found is **Unresolved**.

Size

The file size of each xref is listed here.

Type

This column lists whether the xref is an attachment or overlay.

Date

This column lists the date on which the xref drawing was last saved.

Saved Path

This column lists the path of the xref, that is, the route taken to locate the particular referenced drawing.

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Choosing any of these headings, sorts and lists the Xrefs in the current drawing according to that particular title. For example, choosing **Reference Name**, sorts and lists the xrefs as per name. The column widths can be increased or decreased as per requirements. When you place your cursor at the edge of a column title button, the cursor changes to a horizontal resizing cursor. Now, press the pick button of your mouse and drag the column edge to increase or decrease its width. After you increase the column widths, it is possible that the width of the columns extend beyond the list box width. In such a case, a horizontal scroll bar appears at the bottom of the list box. You can use the scroll bar to view the columns that extend beyond the width of the list box.

Choosing the **Tree View** button, displays the xrefs in the drawing in a hierarchical tree view. It displays information on nested xrefs and their relationship with one another. Xrefs are indicated by an icon of a paper with a paper clip. This icon appears faded when the xref has been unloaded, and if there is a missing xref, a question mark appears. Similarly, an upward arrow indicates that the xref was reloaded and an arrow pointing downward indicates that the xref is unloaded. You can also choose **List View** and **Tree View** by pressing the F3 and F4 keys, respectively.

Attaching an Xref Drawing (Attach Option)

The **Attach** button of the **Xref Manager** dialog box is used to attach an xref drawing to the current drawing. This option can be invoked by choosing the **Attach** button in the **Xref Manager** dialog box. The following examples illustrate the process of attaching an xref to the current drawing. In this example, it is assumed that there are two drawings, SHAFT and BEARING. SHAFT is the current drawing that is loaded on the screen (Figure 16-5) and the BEARING drawing is saved on the disk. We want to xref the BEARING drawing in the SHAFT drawing.

Figure 16-5 *Current drawing, SHAFT*

1. The first step is to make sure that the SHAFT drawing is on the screen (draw the shaft drawing with assumed dimensions).

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Tip

One of the drawings need not be on the screen. You could attach both drawings, BEARING and SHAFT, to an existing drawing, even if it is a blank drawing.

2. Invoke the **XREF** command to display the **Xref Manager** dialog box. In this dialog box, choose the **Attach** button. You can also choose **External Reference** from the **Insert** menu. The **Select Reference File** dialog box is displayed.

   Select the drawing that you want to attach (BEARING), and then choose the **Open** button. The **External Reference** dialog box is displayed on the screen (Figure 16-6). In the **External Reference** dialog box (Figure 16-6), the name of the file you have selected to be attached to the current drawing as an xref is displayed in the **Name** edit box. You can also select a name of the file to attach from the **Name** drop-down list. The path of the file is displayed adjacent to **Found in**, located below the **Name** edit box. Also, the saved path of the file is displayed adjacent to **Saved Path**.

Figure 16-6 *The* ***External Reference*** *dialog box*

Note

AutoCAD LT also searches for the xref file in the paths defined in the ***Project Files Search Path*** *folder in the* ***Files*** *tab of the* ***Options*** *dialog box. This folder does not have any paths defined in it and displays* ***Empty*** *when the tree view is expanded. To define a search path, highlight* ***Empty*** *and choose the* ***Add*** *button in the dialog box. You can enter a project name here, if you want. Now, expand the tree view again and select* ***Empty*** *again and choose the* ***Browse*** *button. The* ***Browse for Folder*** *window is displayed. Select the folder that is to be searched for the file and choose OK. Then choose* ***Apply*** *and* ***OK*** *in the* ***Options*** *dialog box to exit it.*

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In the **Reference Type** area, select the **Attachment** radio button if it is not already selected (default option). The **Overlay** option is discussed later in this chapter. The **Path type** drop-down list is used to specify whether you want to attach the drawing with Full path, Relative path, or No path. If you select the Full path option, the precise location of the xreffed drawing is saved. If you select the relative path, the position of the xreffed drawing with reference to the host drawing is saved. If you select the No path option, AutoCAD LT will search for the xreffed drawing in only that folder in which the host drawing is saved. You can either specify the insertion point, scale factors, and rotation angle in the respective **X**, **Y**, **Z** and **Angle** edit boxes or select the **Specify On-screen** check boxes to use the pointing device to specify them on the screen. By default, the X, Y, and Z scale factors are 1 and the rotation angle is 0. The **Block Unit** area provides the information regarding the units of the inserted block. The **Units** edit box displays the unit of the block. The **Factor** edit box displays the scale factor, depending on the unit of the block and that of the current drawing. Accept the default values and choose the **OK** button in the **External Reference** dialog box. Specify the insertion point on the screen. After attaching the BEARING drawing as an xref, save the current drawing with the file name SHAFT (Figure 16-7).

Figure 16-7 *Attaching xref drawing BEARING*

Note

You can also use the ***-XREF*** *command to attach a drawing from the pointer input. All the options available in the dialog box are available through the dynamic preview too.*

3. Load the drawing BEARING and make the changes shown in Figure 16-8 (draw polylines on the sides). Now, save the drawing with the file name BEARING.

4. Load the drawing SHAFT (Figure 16-9) on the screen. You will notice that the xref drawing BEARING is automatically updated. This is the most useful feature of the **XREF** command. You could also have inserted the BEARING drawing as a block, but if you had updated the BEARING drawing, the drawing in which it was inserted would not have been updated automatically.

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When you attach an xref drawing, AutoCAD LT remembers the name of the attached drawing. If you xref the drawing again, AutoCAD LT displays a message to that effect as given next.

Xref "BEARING" has already been defined.
Using existing definition.
Specify insertion point or [Scale/X/Y/Z/Rotate/PScale/PX/PY/PZ/PRotate]: *Specify where to place another copy of the xref.*

Figure 16-8 *Modifying the xref drawing BEARING*

Figure 16-9 *After loading the drawing SHAFT, BEARING is automatically updated*

Note

If the xref drawing you want to attach is currently being edited, AutoCAD LT will attach the drawing that was last saved through the ***SAVE****,* ***WBLOCK****, or* ***QUIT*** *command.*

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Points to Remember about Xref

1. When you enter the name of the xref drawing, AutoCAD LT checks for block names and xref names. If a block exists with the same name as the name of the xref drawing in the current drawing, the **XREF** command is terminated and an error message is displayed.

2. When you xref a drawing, the objects that are in the model space are attached. Any objects that are in the paper space are not attached to the current drawing.

3. The layer 0, DEFPOINTS, and the linetype CONTINUOUS are treated differently. The current drawing layers 0, DEFPOINTS, and linetype CONTINUOUS will override the layers and linetypes of the xref drawing. For example, if the layer 0 of the current drawing is white and the layer 0 of the xref drawing is red, the white color will override the red.

4. The xref drawings can be nested. For example, if the BEARING drawing contains the reference INRACE and you xref the BEARING drawing to the current drawing, the INRACE drawing is automatically attached to the current drawing. If you detach the BEARING drawing, the INRACE drawing gets detached automatically.

5. You can rename an xref under the **Reference** column name in the list box of the **Xref Manager** dialog box by highlighting the xref and then clicking on it again. You can now enter a new name. An AutoCAD LT warning is displayed: **Caution! "XXXX" is an externally referenced block. Renaming it will also rename its dependent symbols**.

6. When you xref a drawing, AutoCAD LT stores the name and path of the drawing by default. If the name of the xref drawing or the path where the drawing was originally stored has changed or you cannot find it in the path specified in the **Options** dialog box, AutoCAD LT cannot load the drawing, plot it, or use the **Reload** option of the **XREF** command.

Detaching an Xref Drawing (Detach Option)

The **Detach** option can be used to detach or remove the xref drawings. If there are any nested xref drawings defined with the xref drawings, they are also detached. Once a drawing is detached, it is erased from the screen. To detach an xref drawing, select the file name in the **Xref Manager** dialog box list box to highlight it and then choose the **Detach** button. When you choose **OK** in the dialog box, the xref is completely removed from the current drawing. If you do not want to remove the specified xref from the current drawing, but have already selected the xref in the list box and chosen the **Detach** button, you can simply choose the **Cancel** button to cancel the detach operation.

You can also use the **-XREF** command to detach the xref drawings. When AutoCAD LT prompts for an xref file name to be detached, you can enter the name of one xref drawing or the name of several drawings separated by commas. You can also enter * (asterisk), in which case all referenced drawings, including the nested drawings, will be detached.

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Updating an Xref Drawing (Reload Option)

When you load a drawing, AutoCAD LT automatically loads the referenced drawings. The **Reload** option of the **XREF** command lets you update the xref drawings and nested xref drawings at any time. You do not need to exit the drawing editor and then reload the drawing. To reload the xref drawings, invoke the **Xref Manager**, select the drawings in the list box, and then choose the **Reload** button. AutoCAD LT will scan for the referenced drawings and the nested xref drawings and load the most recently saved version of the drawing.

The **Reload** option is generally used when the xref drawings are currently being edited and you want to load the updated drawings. The xref drawings are updated based on what is saved on the disk. Therefore, before reloading an xref drawing, you should make sure that the xref drawings that are being edited have been saved. If AutoCAD LT encounters an error while loading the referenced drawings, the **XREF** command is terminated, and the entire reload operation is canceled.

You can also reload the xref drawings by using the **-XREF** command. When you enter the **-XREF** command, AutoCAD LT will prompt you to enter the name of the xref drawing. You can enter the name of one xref drawing or the names of several drawings separated by commas. If you enter * (asterisk), AutoCAD LT will reload all xref and nested xref drawings.

Unloading an Xref Drawing (Unload Option)

The **Unload** option allows you to temporarily remove the definition of an xref drawing from the current drawing. However, AutoCAD LT retains the pointer to the xref drawings. When you unload the xref drawings, the drawings are not displayed on the screen. You can reload the xref drawings by using the **Reload** option.

Tip

It is recommended that you unload the referenced drawings if they are not being used. After unloading the xref drawings, the drawings load much faster and need less memory.

Adding an Xref Drawing (Bind Option)

The **Bind** option lets you convert the xref drawings to blocks in the current drawing. The bound drawings, including the nested xref drawings (that are no longer xrefs), become a permanent part of the current drawing. The bound drawing cannot be detached or reloaded. You can use this option when you want to send a copy of your drawing to a customer for review. Because the xref drawings are a part of the existing drawing, you do not need to include the xref drawings or the path information. You can also use this option to safeguard the master drawing from accidental editing of the piece parts. To bind the xref drawings, select the file names in the **Xref Manager** dialog box list box and then choose the **Bind** button. The **Bind Xrefs** dialog box (Figure 16-10) is displayed. AutoCAD LT provides two methods to bind the xref drawing in the **Bind Type** area of the dialog box. These methods are discussed next.

Figure 16-10 *The* ***Bind Xrefs*** *dialog box*

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Bind

When you use the **Bind** option, AutoCAD LT binds the selected xref definition to the current drawing. All the xrefs are converted to blocks and the named objects are renamed. For example, if you xref the drawing BEARING with a layer named OBJECT, a new layer BEARING|OBJECT is created in the current drawing. When you bind this drawing, the xref dependent layer BEARING|OBJECT will become a locally defined layer BEARING0OBJECT (Figure16-11). If the BEARING0OBJECT layer already exits, AutoCAD LT will automatically increment the number, and the layer name becomes BEARING1OBJECT.

Insert

When you use the **Insert** option, AutoCAD LT inserts the xref drawing. The xrefs get converted into blocks. For example, if you xref the drawing SHAFT with a layer named OBJECT, a new layer SHAFT|OBJECT is created in the current drawing. If you use the **Insert** option to bind the xref drawing, the layer name SHAFT|OBJECT is renamed as OBJECT (Figure 16-11). If the object layer already exists, then the values set in the current drawing override the values of the inserted drawing.

Figure 16-11 *The* ***Layer Properties Manager*** *dialog box*

Note

It is possible to bind only an individual or several xref-dependent named objects instead of the entire drawing into a current drawing. This will be discussed later in this chapter.

You can also use the ***-XREF*** *command to bind the xref drawings. Prompts are displayed on the command line.*

Editing an XREF's Path

By default, AutoCAD LT saves the path of the referenced drawing and displays it in the **Saved Path** column in the **Xref Manager** dialog box. As mentioned earlier, when AutoCAD LT loads the drawing containing a referenced file, and if it is not able to find the file at the location specified in the **Saved Path** column of the **Xref Manager** dialog box, it searches for the file in the current

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directory, and in the **Support File Search Path** locations specified in the **Files** tab of the **Options** dialog box. If a file with the same name is found here, it is loaded. Now, when you invoke the **Xref Manager** dialog box, you will notice that when you select an xref name in the list box to highlight it, the path displayed in the **Saved Path** column for the xref file is different from the one displayed in the **Xref Found At** edit box. To update the path of the xref file, choose the **Save Path** button. The new path is saved and displayed in the **Saved Path** column.

If AutoCAD LT cannot locate the specified file even in the directories specified in the **Files** tab of the **Options** dialog box, it will display an error message saying that it cannot find the specified file. The path of the file is displayed as a marker text in the current drawing. Now, when you invoke the **Xref Manager** dialog box, the status of the drawing is shown as **Not Found**. To specify a new path for the xref file, select the xref file name in the list box of the dialog box and choose the **Browse** button. The **Select new path** dialog box is displayed where you can locate the drawing to be used as xref. Once you have found the file, choose the **Open** button to return to the **Xref Manager** dialog box. The new path is displayed in the **Saved Path** column and the **Xref Found At** edit box. The specified xref file is reloaded and replaces the marker text in the drawing when you choose the **OK** button in the **Xref Manager** dialog box. If you remember the new location of the xref file, you can also enter it in the **Xref Found At** edit box. For example, if a drawing, which was originally in the C:\CAD\Proj1 subdirectory, has been moved to A:\Parts directory, the path must be edited so that AutoCAD LT is able to load the xref drawing.

You can also use the **-XREF** command to change the path using the prompts on the command line. When AutoCAD LT prompts you to enter the name of the xref whose path you want to edit, you can enter the name of one xref drawing or the names of several drawings separated by commas. You can also enter * (asterisk), in which case AutoCAD LT will prompt you for the path name of each xref drawing. The path name stays unchanged if you press ENTER when AutoCAD LT prompts for a new path name.

THE OVERLAY OPTION

As discussed earlier, when you are attaching an xref to a drawing, the **External Reference** dialog box is displayed. The **Reference Type** area of this dialog box has two radio buttons. They are **Attachment** and **Overlay**. The **Attachment** option is the default option. You can use any of these options to xref a drawing. The advantage of using the **Overlay** option is that you can access the desired drawing instead of the drawing along with its xreffed attachments. For example, consider three people working on three different drawings that are a part of the same project. The first designer is working on the layout of walls of a room, the second designer is working on the furniture layout of the room, and the third on the electrical layout of that room. The names of the drawings are WALLS, FURNITURE, and ELECTRICAL, respectively. Assume that the designer working on the walls layout uses the **Attachment** option to xref the FURNITURE drawing so that he or she can check the furniture layout according to the wall structure. After insertion, the WALLS drawing will comprise the wall structure (current drawing) along with the furniture layout (xreffed drawing). Now, if the designer working on the electrical layout xrefs the WALLS drawing to check the location of electrical fittings with respect to the walls, he/she will get the drawing that has the furniture layout as well as the wall layout. This is because the FURNITURE drawing was xreffed in the WALLS drawing using the **Attachment** option.

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In the above example, the designer working on the ELECTRICAL drawing may not require the FURNITURE drawing. This is because at this stage, he/she is more interested in checking the electrical fittings with respect to the wall structure. So the furniture layout that is xreffed with the wall structure needs to be avoided. This can be done using the **Overlay** option while xreffing the FURNITURE drawing in the WALLS drawing. This means that the designer working on the wall structure needs to xref the furniture layout using the **Overlay** option. Now, if the wall structure is xreffed in some other drawing, the furniture layout will not appear.

One of the problems with the **Attachment** option is that you cannot have a circular reference. For example, assume you are designing the plant layout of a manufacturing unit. One person is working on the floor plan (see Figure 16-12), and the second person is working on the furniture layout in the offices (Figure 16-13). The names of the drawings are FLOORPLN and OFFICES, respectively. The person working on the office layout uses the **Attachment** option to insert the FLOORPLN drawing so that he or she has the latest floor plan drawing. The person who is working on the floor plan wants to reference the OFFICES drawing.

Figure 16-12 *Drawing files hierarchy*

Figure 16-13 *Sample plant layout drawing*

Now, if the **Attachment** option is used to reference the drawings, AutoCAD LT displays an error message because by attaching the OFFICES drawing a circular reference is created (Figure 16-14). The AutoCAD LT message displayed is "**Circular references detected. Continue?**" If you choose the **No** button, the **XREF** command is canceled and no drawing is referenced. But, if

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you choose the **Yes** button, the following message is displayed **Breaking circular reference from "offices" to "current drawing"** and the particular file you wanted to reference is referenced.

Figure 16-14 *The* ***AutoCAD LT Alert*** *message box*

However, to overcome this problem of circular reference, you can use the **Overlay** option to overlay the OFFICES drawing. This is a very useful option because the **Overlay** option lets different operators avoid circular reference and share the drawing data without affecting the drawing. Overlaying allows you to view a referenced drawing without having to attach it to the current drawing. This option can be invoked by selecting the **Overlay** radio button in the **External Reference** dialog box, which is displayed after you have selected a drawing to reference. Also, when a drawing that has a nested overlay is overlaid, the nested overlay is not visible in the current drawing. This is another difference between attaching an xref and overlaying an xref to a drawing. This feature is especially useful when you want to reference a drawing that another user who is referencing your drawing does not need. Although the attachment will reference the nested reference too, the **overlay** option ignores nested references.

You can also use the **-XREF** command to display prompts on the command line and enter the **Overlay** option. Selecting the **Overlay** option, displays the **Enter Name of file to overlay** dialog box, where you can select the file you want to overlay.

Example 1 *Architectural*

In this example, you will use the **Attachment** and **Overlay** options to attach and reference the drawings. Two drawings, PLAN and PLANFORG, are given. The PLAN drawing (Figure 16-15) consists of the floor plan layout, and the PLANFORG drawing (Figure 16-16) has the details of the forging section only. The CAD operator who is working on the PLANFORG drawing wants to xref the PLAN drawing for reference. Also, the CAD operator working on the PLAN drawing should be able to xref the PLANFORG drawing to complete the project. The following steps illustrate how to accomplish the defined task without creating a circular reference.

Figure 16-15 *PLAN drawing*

Figure 16-16 *PLANFORG drawing*

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How circular reference is caused.

1. Load the drawing PLANFORG, invoke the **XREF** command, and choose the **Attach** button in the **Xref Manager** dialog box. Select the PLAN drawing in the list box of the **Select Reference File** dialog box and choose the **Open** button. The **External Reference** dialog box is displayed. The name of the PLAN drawing is displayed in the **Name** edit box and the **Attachment** radio button is selected by default in the **Reference Type** area of the dialog box. Choose **OK** to exit the dialog box and specify an insertion point on the screen. Now the drawing consists of PLANFORG and PLAN. Save the drawing.

2. Open the drawing file PLAN, and invoke the **XREF** command and attach the PLANFORG drawing using the same steps described in Step 1. AutoCAD LT will display the message that the circular reference has been detected and will ask you if you want to continue. If you choose to continue by choosing **Yes** in the AutoCAD LT message box, the circular reference is broken and you are allowed to reference the specific drawing.

   Another possible solution is for the operator working on the PLANFORG drawing to detach the PLAN drawing. This way, the PLANFORG drawing does not contain any reference to the PLAN drawing and would not cause any circular reference. The other solution is to use the **Overlay** option, as follows.

How to prevent circular reference:

3. Open the drawing PLANFORG (Figure 16-17) and select the **Overlay** radio button in the **External reference** dialog box, which is displayed after you have selected the PLAN drawing to reference. The PLAN drawing is overlaid on the PLANFORG drawing (Figure 16-18).

Figure 16-17 *The PLANFORG drawing*

Figure 16-18 *The PLANFORG drawing after overlaying the PLAN drawing*

4. Open the drawing file PLAN (Figure 16-19), and select the **Attachment** radio button in the **External References** dialog box, which is displayed when you have selected the PLANFORG drawing in the **Select Reference** dialog box to attach as an xref to the PLAN drawing. You will notice that only the PLANFORG drawing is attached (Figure 16-20). The drawing that

Figure 16-19 *The PLAN drawing*

Figure 16-20 *The PLAN drawing after attaching the PLANFORG drawing*

was overlaid in the PLANFORG drawing (PLAN) does not appear in the current drawing. This way, the CAD operator working on the PLANFORG drawing can overlay the PLAN drawing, and the CAD operator working on the PLAN drawing can attach the PLANFORG drawing, without causing a circular reference.

WORKING WITH THE XATTACH COMMAND

Toolbar:	Reference > External Reference
Menu:	Insert > External Reference
Command:	XATTACH

Figure 16-21 *The **Reference** toolbar*

If you want to attach a drawing without invoking the **Xref Manager** dialog box, you can use the **XATTACH** command (Figure 16-21). When you invoke this command, AutoCAD LT displays the **Select Reference File** dialog box. This command makes it easier to attach a drawing, since most of the xref operations involve simply attaching a drawing file. After you have selected the drawing file to attach, choose the **Open** button. The **External Reference** dialog box is displayed. Select the **Attachment** radio button under the **Reference Type** area. You can specify the insertion point, scale, and rotation angle on screen or in the respective edit boxes.

Tip

*When you attach or reference a drawing that has a drawing order created by using the **DRAWORDER** command, the drawing order is not maintained in the xref. To correct the drawing order, first open the xref drawing and specify the drawing order in it. Now, use the **WBLOCK** command to convert it into a drawing file and the **XATTACH** command to attach the newly created drawing file to the current drawing. This way the drawing order will be maintained.*

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Note

AutoCAD LT maintains a log file (.xlg) for xref drawings if the ***XREFCTL*** *system variable is set to 1. This file lists information about the date and time of loading and other xref operations to be completed. This .xlg file is saved with the current drawing with the same name as the current drawing and is updated each time the drawing is loaded or any xref operations are carried out.*

Using the DESIGNCENTER to Attach a Drawing as Xref

The **DESIGNCENTER** can also be used to attach an xref to a drawing. Choose the **DesignCenter** button in the **Standard** toolbar to display the **DESIGNCENTER** window (Figure 16-22). In the **DESIGNCENTER** toolbar, choose the **Tree View Toggle** button, if not chosen already, to display the **tree pane**. Expand the **Tree view** and double-click the folder whose contents you want to view. The contents of the selected folder are displayed in the palette on the right side. From the list of drawings displayed in the palette, right-click on the drawing you wish to attach as an xref. A shortcut menu is displayed. Choose **Attach as Xref**; the **External Reference** dialog box is displayed. You can also use the right button of your mouse to drag and drop the drawing into the current drawing. A shortcut menu is displayed again. Choose **Attach as Xref** and the **External Reference** dialog box is displayed.

Figure 16-22 *The* ***DESIGNCENTER*** *window*

The **Name** edit box displays the name of the selected file to be inserted as an xref and **Found in** displays the path of the file. Select the **Attachment** radio button in the **Reference type** area, if not already selected. Specify the **Insertion point**, **Scale**, and **Rotation** in the respective edit boxes or select the **Specify On-screen** check boxes to specify this information on the screen. Choose **OK** to exit the dialog box.

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ADDING DEPENDENT SYMBOLS TO A DRAWING

Toolbar:	Reference > Bind
Menu:	Modify > Object > External Reference > Bind
Command:	XBIND

Figure 16-23 *The* ***Reference*** *toolbar*

You can use the **XBIND** command to add the selected dependent symbols of the xref drawing to the current drawing. The following example describes how to use the **XBIND** command (Figure 16-23).

1. Load the drawing Bearing that was created earlier when the **Attach** option of the **XREF** command was discussed. Make sure the drawing has the following layer setup. Otherwise, create the following layers, using the **Layer Properties Manager** dialog box.

Layer Name	**Color**	**Linetype**
0	White	Continuous
Object	Red	Continuous
Hidden	Blue	Hidden2
Center	White	Center2
Hatch	Green	Continuous

2. Draw a circle and use the **BLOCK** command to create a block of it. The name of the block is SIDE. Save the drawing as BEARING.

3. Start a new drawing with the following layer setup.

Layer Name	**Color**	**Linetype**
0	White	Continuous
Object	Red	Continuous
Hidden	Green	Hidden

4. Use the **XATTACH** command or the **Attach** option of the **XREF** command and attach the Bearing drawing to the current drawing. When you xref the drawing, the layers will be added to the current drawing, as discussed earlier in this chapter.

5. Now, invoke the **XBIND** command. The **Xbind** dialog box is displayed on the screen. This dialog box has two areas with list boxes. They are **Xrefs** and **Definitions to Bind**. If you want to bind the blocks defined in the xref drawing Bearing, first click on the plus sign adjacent to the xref Bearing. Icons for named objects in the drawing are displayed in a tree view (Figure 16-24). Click on the plus sign next to the Block icon. AutoCAD LT lists the blocks defined in the xref drawing (Bearing). Select the block Bearing|SIDE and then choose the **Add** button. The block name will be added to the **Definitions to Bind** area list box. Choose **OK** to exit the dialog box. AutoCAD LT will bind the block with the current drawing and a message at the command line is displayed: **1 Block(s) bound**. The name of the block will change to Bearing0SIDE. You can invoke the **Block Definition** dialog box

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using the **BLOCK** command and check the **Name** drop-down list to see if the block with the name Bearing0SIDE has been added to the drawing. If you want to insert the block, you must enter the new block name (Bearing0SIDE). You can also rename the block to another name that is easier to use.
If the block contains a reference to another xref drawing, AutoCAD LT binds that xref drawing and all its dependent symbols to the current drawing also. Once you **XBIND** the dependent symbols, AutoCAD LT does not delete them, not even when the xref drawing is detached. For example, the block Bearing0SIDE will not be deleted even when you detach the xref drawing or end the drawing session.

You can also use the **-XBIND** command to bind the selected dependent symbols of the xref drawing, using the command line.

Figure 16-24 *The* ***Xbind*** *dialog box*

6. Similarly, you can bind the dependent symbols, Bearing|STANDARD (textstyle), Bearing|Hidden, and Bearing|Object layers of the xref drawing. Click on the plus signs adjacent to the respective icons to display the contents and then select the layer or textstyle you want to bind and choose the **Add** button. The selected named objects are displayed in the **Definitions to Bind** area list box. If you have selected a named object that you do not want to bind, select it in the **Definitions to Bind** area list box and choose the **Remove** button. Once you have finished selecting the named objects that you want to bind to the current drawing, choose **OK**. A message indicating the number of named objects that are bound to the current drawing is displayed at the command line.

   Once bound, the layer names will change to Bearing0Hidden and Bearing0Object. If the layer name Bearing0Hidden was already there, the layer will be named Bearing1Hidden. These two layers become a permanent part of the current drawing. Even if the xref drawing is detached or the current drawing session is closed, the layers are not discarded.

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DEMAND LOADING

The demand loading feature loads only that part of the referenced drawing that is required in the existing drawing. For example, demand loading provides a mechanism by which objects on frozen layers are not loaded. Also, only the clipped portion of the referenced drawing can be loaded. This makes the xref operation more efficient since less disk space is used, especially when the drawing is reopened.

Demand loading is enabled by default. You can modify its settings in the **External References (XRefs)** area of the **Open and Save** tab of the **Options** dialog box (Figure 16-25). You can select any of the three settings available in the **Demand load Xrefs** drop-down list in this dialog box. They are **Disabled**, **Enabled**, and **Enabled with copy**. These options correspond to a value of **0**, **1**, and **2** of the **XLOADCTL** system variable, respectively, and are discussed next.

Setting	Value of XLOADCTL	Features
Disabled	0	1. Turns off demand loading. 2. Loads entire xref drawing file. 3. The file is available on the server and other users can edit the xref drawing.
Enabled	1	1. Turns on demand loading. 2. The referenced file is kept open. 3. Makes the referenced file read-only for other users.
Enabled with copy	2	1. Turns on demand loading with the copy option. 2. A copy of a referenced drawing is opened. 3. Other users can access and edit the original referenced drawing file.

Figure 16-25 *Setting* ***XLOADCTL*** *using the* ***Options*** *dialog box*

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You can also set the value of **XLOADCTL** at the command line. When you are using the **Enabled with copy** option of demand loading, the temporary copies of the xref are saved in the AutoCAD LT temporary files directory (defined in the **Temporary File Location** folder in the **Files** tab of the **Options** dialog box) or in a user-specified directory. The **XLOADPATH** system variable creates a temporary path to store demand loaded Xrefs.

Spatial and Layer Indexes

As mentioned earlier, the demand loading improves performance when the drawing contains referenced files. To make it work effectively and to take full advantage of demand loading, you must store a drawing with Layer and Spatial indexes. The layer index maintains a list of objects in different layers and the spatial index contains lists of objects based on their location in 3D space.

Layer and spatial indexes are created using the **Save Drawing As** dialog box. Choose the **Tools** button available on the upper right corner of the dialog box to display a shortcut menu. Choose the **Options** option from the shortcut menu to display the **Saveas Options** dialog box. Choose the **DWG Options** tab if it is not already chosen and select the type of index you want to save the file with from the **Index type** drop-down list. **None** is the default option, that is, no indexes are created. The other options available are: **Layer**, **Spatial**, and **Layer & Spatial**. Once you have selected the type of index to create, choose the **OK** button to exit the dialog box and choose the **Save** button in the **Save Drawing As** dialog box to save the drawing with the indexes. The **INDEXCTL** variable also controls the creation of layer index and spatial index and its value can be set using the command line. The following are the settings of the **INDEXCTL** system variable, and they correspond to the **Index Type** options available in the **DWG Options** tab of the **Saveas Options** dialog box.

Setting	Features	Index Type option
0	No index created.	None
1	Layer index created.	Layer
2	Spatial index created.	Spatial
3	Layer and spatial index created.	Layer and Spatial

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Self-Evaluation Test

Answer the following questions and then compare your answers to those given at the end of this chapter.

1. If the assembly drawing has been created by inserting a drawing, the drawing will be updated automatically, if a change is made in the drawing that was inserted. (T/F)

2. The external reference facility helps you keep the drawing updated no matter when the changes were made in the piece part drawings. (T/F)

3. Objects can be added to a dependent layer. (T/F)

4. While using the **Attachment** option during referencing a drawing, the drawing will reference the nested references too, while the **Overlay** option ignores nested references. (T/F)

5. The _____ are entries such as blocks, layers, and text styles.

6. If you use the **INSERT** command to insert a drawing, the information about the named objects is lost if the names are _____ and if the names are _____, the drawing is imported.

7. The _____ button of the **Xref Manager** dialog box is used to attach an xref drawing to the current drawing.

8. The _____ feature loads only that part of the referenced drawing that is required in the existing drawing.

9. The _____ option can be used to overcome the problem of circular reference.

10. If the **Retain changes to Xref layers** is _____, in the **External References (Xrefs)** area of the **Open and Save** tab of the **Options** dialog box, the layer settings such as color, linetype, on/off, and freeze/thaw are retained. The settings are saved with the drawing and are used when you xref the drawing the next time.

Review Questions

Answer the following questions.

1. If the xref drawings get updated, the changes are not automatically reflected in the assembly drawing when you open the assembly drawing. (T/F)

2. There is a limit to the number of drawings you can reference. (T/F)

3. It is not possible to have nested references. (T/F)

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4. Like blocks, the xref drawings can be scaled, rotated, or positioned at any desired location. (T/F)

5. You can change the color, linetype, or visibility (on/off, freeze/thaw) of the dependent layer. (T/F)

6. Which of the following features lets you reference an external drawing without making this drawing a permanent part of the existing drawing?

   (a) demand loading (b) external reference
   (c) external clipping (d) insert drawing

7. If the xref has nested references that cannot be found, which of the following will be displayed under the status heading of the **List View** button in the **Xref Manager** dialog box?

   (a) Orphaned (b) Not found
   (c) Unreferenced (d) Unresolved

8. Which of the following commands can be used from the command line to attach a drawing?

   (a) **-XBIND** (b) **-XREF**
   (c) **XCLIP** (d) None of the above

9. Which of the following system variables, when set to 1, will allow AutoCAD LT to maintain a log file (*.xlg*) for xref drawings?

   (a) **XLOADCTL** (b) **XLOADPATH**
   (c) **XREFCTL** (d) **INDEXCTL**

10. Which of the following system variables when set to 0, will make sure that there are no indexes created?

    (a) **XCLIPFRAME** (b) **XLOADCTL**
    (c) **INDEXCTL** (d) **XREFCTL**

11. In the _____ drawings, the information regarding dependent symbols is not lost.

12. What is the function of the **XCLIPFRAME** system variable? Explain. _____ _____.

13. AutoCAD LT maintains a log file for xref drawings if the _____ variable is set to 1.

14. If the value of **INDEXCTL** is set to _____, the layer and spatial indexes are created.

15. You can use the _____ command to add selected dependent symbols from the xref

drawing to the current drawing.

In this exercise, you will start a new drawing and xref the drawings Part-1 and Part-2. You will

Exercises

Exercise 1 *Mechanical*

also edit one of the piece parts to correct the size and use the **XBIND** command to bind some of the dependent symbols to the current drawing. The following are detailed instructions for completing this exercise.

1. Start a new drawing, Part-1, and set up the following layers.

Layer Name	Color	Linetype
0	White	Continuous
Object	Red	Continuous
Hidden	Blue	Hidden2
Center	White	Center2
Dim-Part1	Green	Continuous

2. Draw Part-1 with dimensions as shown in Figure 16-26. Save the drawing as Part-1.
3. Start a new drawing, Part-2, and set up the following layers.

Figure 16-26 *Drawing of Part-1*

Layer Name	Color	Linetype
0	White	Continuous
Object	Red	Continuous
Hidden	Blue	Hidden

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Center	White	Center
Dim-Part2	Green	Continuous
Hatch	Magenta	Continuous

4. Draw Part-2 with dimensions as shown in the Figure 16-27. Save the drawing as Part-2.
5. Start a new drawing, ASSEM1, and set up the following layers.

Figure 16-27 *Drawing of Part-2*

Layer Name	**Color**	**Linetype**
0	White	Continuous
Object	Blue	Continuous
Hidden	Yellow	Hidden

6. Xref the two drawings Part-1 and Part-2 so that the centers of the two drilled holes coincide. Notice the overlap as shown in Figure 16-28. Save the assembly drawing as ASSEM1.

7. Open the drawing Part-1 and correct the mistake so that there is no overlap. You can do it by editing the line (1.175 dimension) so that the dimension is 1.160.

8. Open the assembly drawing ASSEM1 and notice the change in the overlap. The assembly drawing gets updated automatically.

9. Study the layers and notice how AutoCAD LT renames the layers and the linetypes assigned to each layer. Check to see if you can make the layers, belonging to Part-1 or Part-2, current.

10. Use the **XBIND** command to bind the Object and Hidden layers that belong to the drawing Part-1. Check again to see if you can make one of these layers current.

11. Use the **Detach** option to detach the xref drawing Part-1. Study the layer again, and notice

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Figure 16-28 *Assembly drawing after attaching Part-1 and Part-2*

that the layers that were edited with the **XBIND** command have not been erased. Other layers belonging to Part-1 are erased.

12. Use the **Bind** option of the **XREF** command to bind the xref drawing Part-2 with the assembly drawing ASSEM1. Open the xref drawing Part-1 and add a border or make any changes in the drawing. Now, open the assembly drawing ASSEM1 and check to see if the drawing is updated.

Answers to Self-Evaluation Test

1 - F, **2** - T, **3** - F, **4** - T, **5** - named objects, **6** - duplicated, unique, **7** - **Attach**, **8** - demand loading, **9** - **Overlay**, **10** - selected

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