

## Engineering Facilities Information Documentation and Management in Industries Using Autocad

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**Abstract:** Information technology is a must for every entrepreneur that wants to be relevant to global economic development. Present day developments in software industries have made it easy for non-programmers to integrate knowledge acquired in different software towards development of other software through Object Linking, Embedding (OLE) mechanism and Attribute Creation that will benefit their immediate environments. This paper gives an insight on how to use AutoCAD software to document facilities in both small and large scale industries with little knowledge of programming by linking drawing objects directly with Attribute definition (ATTDEF) relating to them within the drawing environment. A simple example was given just to illustrate the method.

**Key words:** Attribute definition (ATTDEF), Regenauto, Attribute redefinition (ATTREDEF), Attribute extraction (ATTEXT), Audit, Attribute edit (ATTEDIT), Recover and Attribute display (ATTDISP), User coordinate system (UCS)

### INTRODUCTION

Efficient information documentation is an essential prerequisite in any industrial organization. Developing countries worldwide are still at rudimentary stage of information technology, many people still believe that computers are meant for secretarial jobs. It is recently that cyber-cafes are springing up in urban areas where people can browse and send E-mails. Another area where computer awareness is being created is in Engineering and Architectural drawings. Presently, over 75% of the drawings in industries in Nigeria for example are produced by using AutoCAD (Oloketuyi, 2006). AutoCAD is not only software for drawing objects; it has other capabilities one of which is being investigated by this study.

Majority of industries in developing countries are still not exposed to efficient documentation of facilities information at reduced cost without buying costly foreign-based software. The few ones that can afford this software find it difficult to maintain it due to astronomical maintenance cost in areas of customization and training personnel abroad (Oloketuyi, 2001).

The main objective of this study is to solve this identified problem through the use of AutoCAD. The

success of this method of approach is based on the fact that drawings of various sections in any industry can be drawn with all the facilities adequately represented in them directly. These facilities are linked directly with attribute definition which can be queried for any useful information.

**Attribute creation formulation:** Better understanding of database formulation is essential from the point of view of construction data model identifying important entities and their attributes (Dowling, 1998). An entity is any thing of significance about which information need to be held. Entities may be real object such as machine, staff members, events, etc. attribute is any data items that can be used to identify, classify, quantify, qualify or describe the state of any entity (Alan, 2002). The relationships between the entities identified must be established. Each entity in the data model must contain an attribute, or combination of attributes that can be used to uniquely identify each instance of the entity. In industries, machines are given identification numbers to distinguish them from each other; likewise each staff is given staff identification numbers for the same purpose of unique identification.

In facility software development, data model should be concentrated on machines, equipment, staff, maintenance etc. the comprehensive drawings of various sections of the factory must be drawn with AutoCAD and all the facilities in them must be adequately represented with standard symbols along with their attribute definition, which can be made either visible or invisible (Terence, 1996).

### ATTRIBUTE DEFINITION WITH AUTOCAD

An attribute is informational text associated with a block while an attribute definition is a template for creating an attribute (Alan, 2002). Type (ATTDEF) to work from the command line and (DDATTDEF) to work from the attribute definition dialog box.

- At the command prompt, enter attdef.
- Current attribute modes: Invisible = N, Constant = N, Verify = N, Preset = N.
- Enter an option to change [Invisible/Constant/Verify/Preset] <done>: Return when done.
- Enter i, c, v, or p ←.

**Attribute modes:** Sets 4 optional modes. Entering i,c, v, or p toggles the modes. The AFLAGS system variable stores the current mode setting and can be used to set the default modes:

**Invisible:** Specifies that attribute values won't appear when you insert the block. ATTDISP overrides invisible mode.

**Constant:** Gives attribute a fixed value for block insertion.

**Verify:** Prompt for verification that the attribute value is correct when you insert the block.

**Preset:** Sets the attribute to its default value when you insert a block containing a preset attribute.

**Attribute tag:** Attribute tag represent the label of any items in a drawing just to identify each attribute (Ditch, 1996). Enter any characters except spaces or exclamation point that specifies the attribute tag, which identifies each occurrence of an attribute in the drawing. The tag can contain any characters except spaces. AutoCAD changes lowercase letter to uppercase.

**Attribute prompt:** Enter the text for the prompt line or press ←. Specifies the attribute prompt that appear when you insert a block containing this attribute definition. If

you press ←, AutoCAD uses the attribute tag as the prompt. If you turn on constant mode, this prompt does not appear.

**Attribute display:** Globally controls attribute visibility. From the options menu, choose display and then attribute display.

- At the command prompt, enter attdisp.
- Normal/On/Off <current> Enter an option or press ←.

**Normal:** Keeps the current visibility of each attribute. Visible attribute are displayed. Invisible attributes are not displayed.

- On: makes all attribute visible.
- Off: makes all attribute invisible.

### ATTRIBUTE EDIT WITH AUTOCAD

Changes attribute information independent of its block definition.

- At the command prompt, enter attedit←.
- Edit attributes one at a time <y>.
- Enter y or press ← to edit attribute one at a time or enter n to edit attribute globally.

Editing attribute globally limits you to replacing a single text string with another text string. Editing attribute one at a time allows you to edit any or all of the attributes.

**Editing attribute one at a time:** Attributes need to be visible to be edited one at a time. Attributes do not need to be visible globally.

- Block name specification <\*> Enter a name list or press←.
- Attribute tag specification <\*> Enter a name list or press←.
- Attribute value specification <\*> Enter a name list or press←.
- Select attributes: select only those attribute parallel to the current UCS.

**Editing attribute values global:** Globally editing of attribute values allows editing of visible and invisible attributes.

- Global edit of attribute values.
- Edit only attributes visible on the screen? <y>.
- Enter y or press ← to edit only visible attribute, or enter n to edit all attribute.

**All attribute:** Changes to attribute are not reflected immediately. AutoCAD regenerates the drawing at the end of the command unless REGENAUTO, which controls automatic regeneration, is off. Note, because null attribute are not visible and cannot be selected for editing, to select null attribute values, enter (\).

#### **ATTRIBUTE EXTRACT WITH AUTOCAD**

Extract attribute data. An attribute is informational text associated with a block, use ATTEXT to extract data on the command line and DDATTEXT to extract attribute data using the attribute extraction dialog box.

- At the command prompt, enter attext↵
- Cdf, sdf or dxf attribute extract (or Object)? <c>.

**Objects:** Select objects whose attribute you want to extract.

**Select object:** Use an object selection method.

**cdf (comma-delimited file):** Generates a file containing one record for each block reference in the drawing. Commas separate the field of each record. Single quotation marks enclose the character fields.

**sdf (space delimited file):** Generates a file containing one record for each block reference in the drawing. The fields of each record have a fixed width. Therefore, field separators or character string delimiters are not used.

**dxf (drawing interchange file):** Produces a subset of the AutoCAD drawing interchange file format containing only block reference, attribute and end-of-sequence objects.

The extract files extension is .txt for cdf or sdf format and dxx for dxf format.

#### **ATTRIBUTE REDEFINITION WITH AUTOCAD**

Redefines a block and updates associated attributes.

- At the command prompt, enter attredef ↵.
- Name of block you wish to redefine: enter a name.
- Select objects for new block...
- Select objects: use an object selection method.
- Insertion base point of new block: specify a point.

New attribute assigned to exiting block references are given their default values. Old attribute in the new block definition retain their old values. Old attribute not included in the new block definition are deleted from the old block reference.

#### **AUDITING WITH AUTOCAD**

Audit evaluates the integrity of a drawing. Audit is a diagnostic tool for examining the current drawing and identifying errors (AutoDesk, 1994). For every error detected, AutoCAD provides a description of the error and recommends corrective action. Errors are typically caused by data file storage malfunction such as lost cluster on a hard disk. When the AUDITCTL system variable is set to on, AUDIT create an ASCII file containing the description of problems and the action taken. This report file is placed in the same directory as the current drawing with the file type .adt. If a drawing contains errors that AUDIT can't fix, use the RECOVER command to retrieve the drawing and correct its errors.

#### **ILLUSTRATIVE EXAMPLE DONE WITH AUTOCAD**

The drawing Fig. 1 is the floor plan of a building which was drawn using AutoCAD. It contains some items such computers, chairs, telephones, tables, shelves etc.

**Step A:** To add a table and define attributes for it.

- From the standard toolbar, choose Zoom Window.

In this step, you will specify the points that are shown in Fig. 1 illustrated with dash line.

- At the command line, enter zoom window↵.
- All/Center/Dynamic/Extents/Previous/Scale(X/XP)/Window/<Realtime>: \_w.
- First corner: specify the point 1.
- Second corner: specify the point 2.

AutoCAD zooms in on the window you selected so that it fills the screen. The drawing look like Fig. 2.

Next you will draw a rectangle to represent the table.

- From the Draw toolbar, choose Rectangle.

By reading the coordinates display in the status bar, you can see which points to specify. In this step, you will specify the points that are shown in Fig. 2 illustrated with point 1 and 2.

- First corner: Specify the point (1) at coordinates 114,390.
- Other corner: Specify the point (2) at coordinates 174,360.
- The drawing looks like that shown in Fig. 3 with the rectangle as the table.

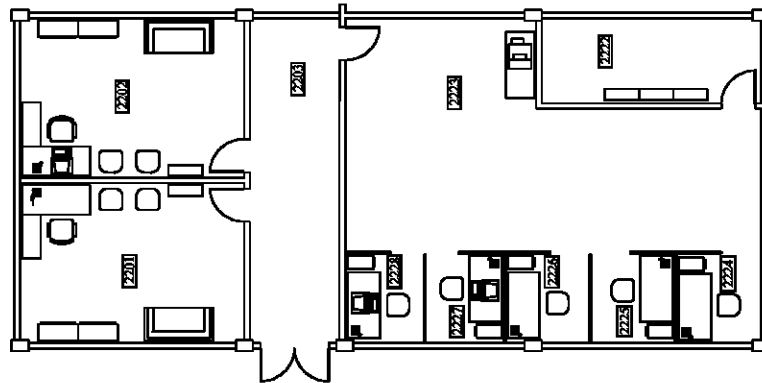


Fig. 1: Showing the floor plan of a building

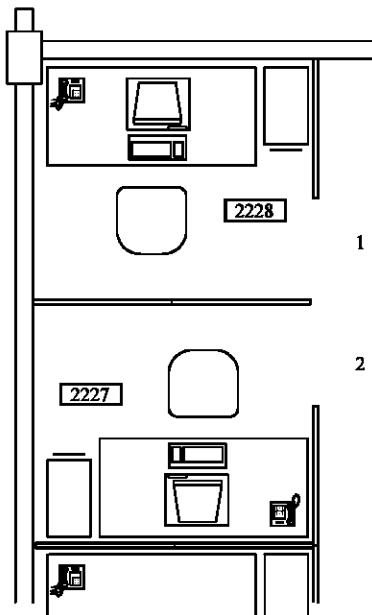


Fig. 2: Showing the zoom area

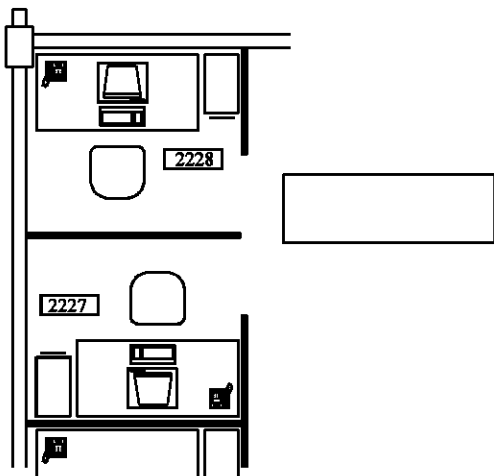


Fig. 3: Showing the table along with the drawing

- You will use a dialog box to define attributes for the table.
- On the command line, enter `ddattdef<cr>`.

If the Attributes Definition dialog box is not fully visible, move it by clicking the title bar and dragging the dialog box to a new position. The Attributes Definition dialog box looks like the one shown in Fig. 4.

- Under Mode, select Invisible.
- Choose Pick Point.

**Start point:** Specify a point just below the table at coordinates 114,348 for the attributes insertion point

- Enter the following Tag and Prompt attribute values:

Tag	Prompt
MANUF	Manufacturer

The tag is the label for the attribute. The prompt is the message that's displayed when you insert the block. In this case, the prompt requests the manufacturer's name.

**Choose OK:**

- AutoCAD displays the attribute below the table at the insertion point you specified. Your drawing should look like one in Fig. 5.

**Press ENTER to repeat the command:** Enter the following information for the Tag and Prompt values.

**Note:** Select the Align below Previous attribute in the Attribute Definition dialog box represented in Fig. 4. (This saves you from selecting the insertion point each time).

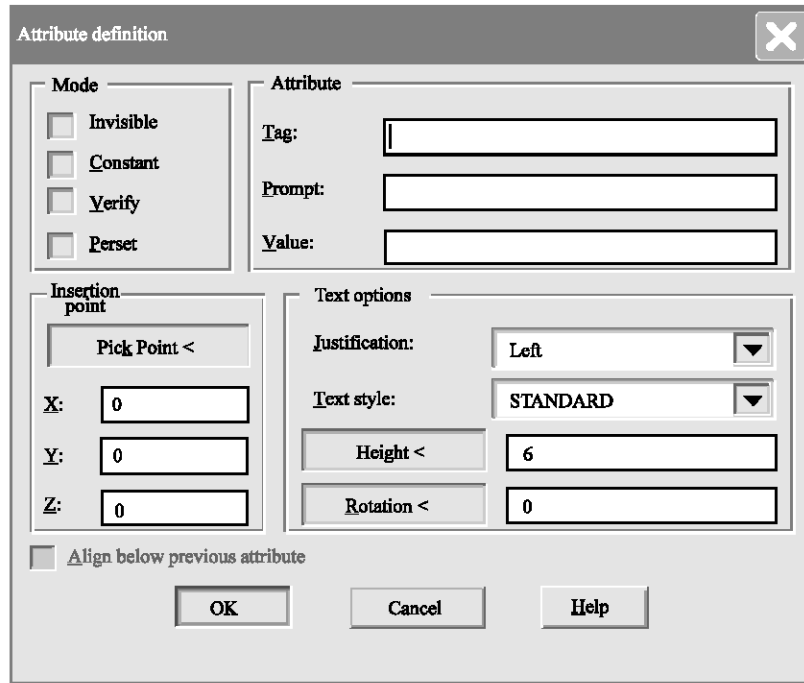


Fig. 4: Showing the attribute definition dialog box

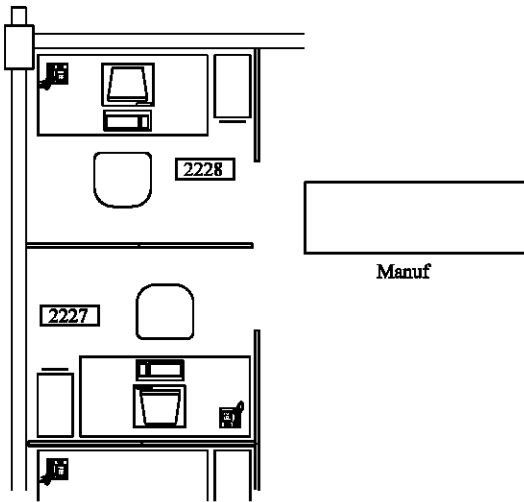


Fig. 5: Showing the attribute definition

Tag        Prompt  
MODEL    Model:

Choose OK. Repeat this process to add these last two strings.

Tag        Prompt  
COST       Cost:  
LOCATION    Location:

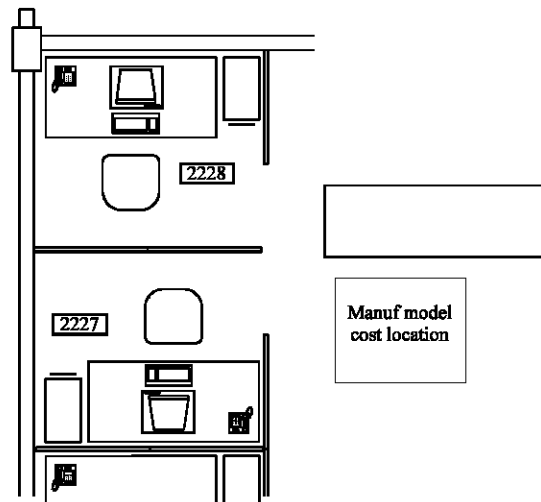


Fig. 6: Showing the attribute definition

Your drawing should look like the one in Fig. 6.

Now, you'll make the table and attributes into a block that you can insert easily in other places in the drawing.

**Step B:** To make the table into a block and insert it in the drawing

- On the command line, enter block↵.

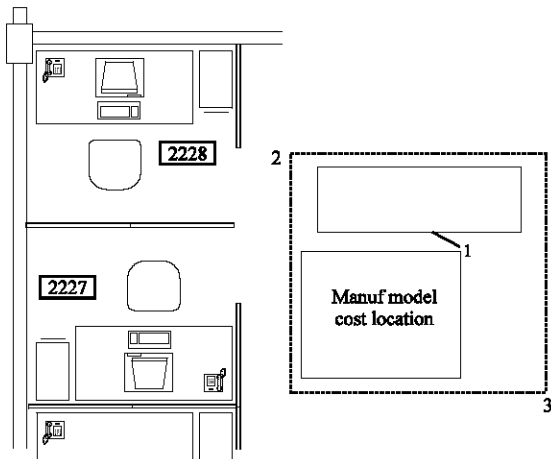


Fig. 7: Showing the attribute definition with the corresponding points

In this step, you will specify the points that are shown in the following illustration (Fig. 7).

- Block name (or ?): table.
- Insertion base point: from the Object Snap toolbar, choose Snap to Midpoint.
- `_MID` of Specify the point (1).
- Select objects: Specify the point (2).
- Other corner: Specify the point (3).
- Select objects: Press ENTER to end the command.

Although, the table is not displayed in the drawing, it is stored as a block in your drawing database. You'll insert it in the drawing now.

- On the command line, enter insert.
- Block name (or?): table.
- Insertion point: Place the table in the corner so that the insertion point is at coordinates 144,414.
- X scale factor <1> /Corner/XYZ: Press ENTER to keep the scale unchanged.
- Y scale factor (default=X): Press ENTER to keep the scale unchanged.
- Rotation angle <0>: Press ENTER.

You are prompted to enter actual values for the attributes as shown in Fig. 8. The Enter Attributes dialog box displays the prompts you defined earlier.

- Respond by entering the following values

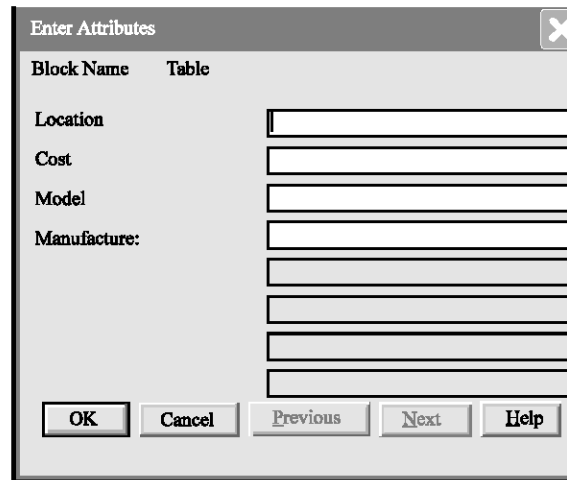


Fig. 8: Showing the Enter Attribute dialog box

**Note:** The prompts may not appear in exactly the order shown.

- Location: 2227.
- Model: Tressle.
- Manufacturer: Sierra Furniture.
- Cost: 126.00.
- Choose OK.

The table is inserted with all the information defined for it but you can't see the attributes at this point because they were made them invisible. You can override this by using the ATTDISP command. Your drawing should look like the one in Fig. 9.

**Note:** all the other items with their attributes were drawn and inserted as a block in the same way.

**Step C:** To edit the attributes

In this step, you will select the objects that are shown in the following illustration (Fig. 9).

- On the command line, enter ddatte .
  - Select block: Select the room tag (1)
  - AutoCAD display the Edit Attribute dialog box as illustrated in Fig. 10.
- In the Edit Attributes dialog box, enter the name Ehigiamusoe Noel for Employee and 2204 for location.
- Choose OK.
- Press ENTER to repeat the DDATE command.
  - Select block: Select the telephone (2)

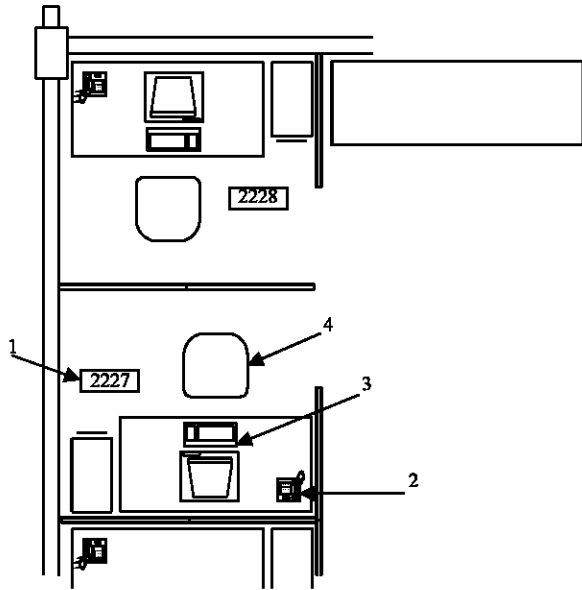


Fig. 9: Showing the inserted block table

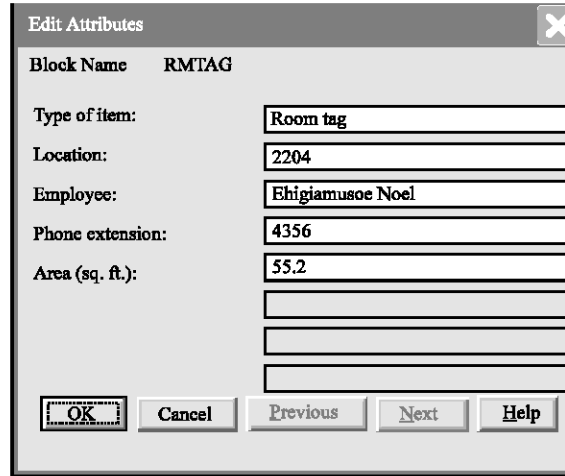


Fig. 11: Showing the values of the attribute after edit

### ENGINEERING FACILITY MANAGEMENT APPLICATION

The preceding sections described the fundamental concept of linking database with AutoCAD drawing objects. More detail information can be got from standard text on AutoCAD. In industries different sections can be represented with drawings showing facilities stationed in them. The facilities drawing objects can be linked with data which are essential for decision making. For example, a delivery of replacement file cabinets for some of the offices has just arrived in XYZ industry. How does the facility manager find the offices where the file cabinets are to be replaced? He can simply open the drawing in AutoCAD and query the database. The query could be "Which room numbers from the employee database file contains a type 26 file cabinet?" However, this is not the exact syntax to use. The query is requesting the database to indicate the room numbers of all rooms that contain a type 26 file cabinet. These rooms are automatically listed in a dialog box and can be highlighted on the AutoCAD drawing. The list office numbers can then be printed for delivery personnel for use.

### CONCLUSION

The concept discussed in this study has clearly shown how simple and flexible AutoCAD software can be use to document facilities information in an industry by linking drawing objects directly with attributes. It is essential to inform readers that computer skill in AutoCAD and Engineering skill in Engineering drawing are important prerequisites to achieved meaningful

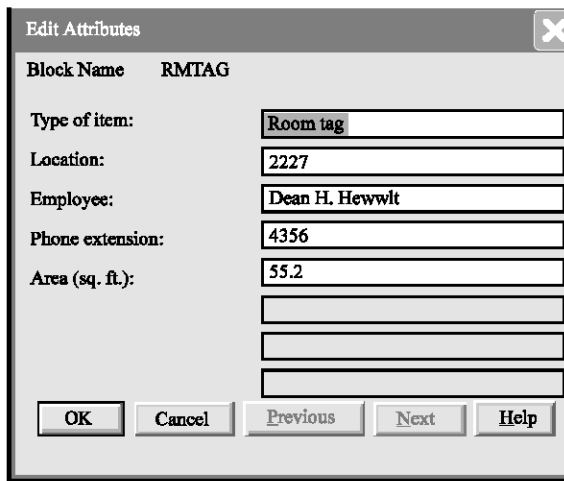


Fig. 10: Showing the default values of the attribute

- Enter Ehigiamusoe Noel for Employee and 2204 for location, choose OK.
- Press ENTER to repeat the DDATTE command.
  - Select block: Select the chair (4)
- Enter Ehigiamusoe Noel for Employee and 2204 for location, choose OK.
- Enter Ehigiamusoe Noel for Employee and 2204 for location, choose OK.
- Press ENTER to repeat the DDATTE command.
  - Select block: Select the computer (3).

progress based on this study concept. In entrepreneurship development, information documentation and management with appropriate technology are very essential. No business can strive well as of today without some levels of information technology.

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