Automating Schedules:
Let AutoCAD® Create and Maintain Your Schedules

William Work – Robert A.M. Stern Architects, LLP

AC3966 - In this class you will learn to use AutoCAD alone to create and maintain schedules. You will learn to take full advantage of AutoCAD's ability to associate textual data with blocks and subsequently extract and format that data using tables. This class will take you step-by-step through the entire process using real-world examples. You will improve your productivity and accuracy. Consider this class if you sometimes need to organize the data represented by items in your drawings.

Learning Objectives

At the end of this class, you will be able to:

- Create attribute blocks to tag drawn objects
- Format purpose-specific table styles
- Create and maintain schedules from data placed in drawings
- Output your schedule to Microsoft® Excel®

About the Speaker

William Work is a practicing architect with a firm of more than 200 hundred professional staff working on projects spanning a wide range of project types. On a daily basis, he works closely with the staff providing impromptu one-on-one Q&A style AutoCAD® support and tutorials, and on a regular basis he develops and delivers structured classes. He has also worked directly with resellers providing a variety of consulting services throughout the United States. These services have included AutoCAD deployment and customization, on-site training, and CAD standards development and documentation.
Contents

Introduction .................................................................................................................................................. 1

Example 1 – Door Schedule .......................................................................................................................... 2
  Creating the Table Style............................................................................................................................. 2
  Creating the Attribute Block .................................................................................................................... 4
  Extracting the Data .................................................................................................................................... 6
  Maintaining the Table ............................................................................................................................... 7

Example 2 – Equipment Quantity Takeoff .................................................................................................... 8
  Creating the Excel File ............................................................................................................................... 8
  Creating the Table Style ............................................................................................................................ 9
  Creating the Attribute Block .................................................................................................................... 9
  Creating the Multileader Style .................................................................................................................. 10
  Linking the External Data ........................................................................................................................ 10
  Maintaining the Data ............................................................................................................................... 15

Example 3 – Area Calculations .................................................................................................................. 16
  Preparing the Drawing ............................................................................................................................... 16
  Creating the Table Style ............................................................................................................................ 16
  Creating the Attribute Block .................................................................................................................... 16
  Inserting the Attribute Block ................................................................................................................ 17
  Extracting the Data ................................................................................................................................. 19

Conclusion .................................................................................................................................................. 23

Appendix .................................................................................................................................................... 24
  Related Command and System Variable Reference .................................................................................. 24
Introduction

Exploring AutoCAD’s table functionality using AutoCAD 2012 we find that there are capabilities that are not necessarily apparent at first glance. In particular, we will look at the ability to create purpose-built table styles with complex formatting. These table styles are designed to suite specific schedule types as we will see.

You should already be aware that:

- A table is an object that contains data in rows and columns;
- Empty tables can be placed in drawings and edited;
- A table can be linked to data in drawings as well as in Microsoft Excel files; and
- You should be somewhat familiar with blocks, attributes and fields.

By way of a quick refresher, the Tables ribbon panel is located on the Annotate ribbon tab. There you will find the command to create an empty table object as well as commands to work with table data. You can also access the Table Style dialog box from this ribbon panel.

![Figure 1 - Tables Ribbon Panel](image)

Just as the appearance of text and dimensions are based on named styles, so are tables. Through the Table Style Dialog box you gain access to Cell Styles where you establish cell properties such as Alignment, Text style, and Boarders, for the built-in cell types which are Title, Header, and Data. Much as you would in Microsoft Excel or even Microsoft Word, after placing a schedule in your drawing you can simply enter data. You can also add elements such as formulas and fields, manipulate cell boarders and, because AutoCAD is ultimately a graphics application, you can include blocks.

Used is this fashion tables can be quite useful but here we would like to take tables a step or two further.

Three examples follow; each example showcases a different application scenario. All of the scenarios have in common the need for a purpose-built table style.
Automating Schedules: Let AutoCAD Create and Maintain Your Schedules

Example 1 – Door Schedule

In this example we will create a schedule of unique items found in a drawing or set of drawings. Specifically we will create a door schedule with the help of the Data Extraction wizard.

In order to generate a schedule that looks the way you want, you will need to create a purpose-built table style. You will also need a block with attached attributes to serve as an item tag.

Once your preparatory work is complete, you will have the tools you need to automate your door schedule. Using this example as a guide you should be able to generate other schedules of unique items.

Creating the Table Style

The table styles that you can make straight from the Table Style dialog box do not provide sufficient control to satisfy all of the formatting requirements of our door schedule. Looking at the proposed layout for the door schedule shown below, you will see that the columns have varying widths, some of the header columns are gathered under a single group heading, and some, but not all of the header text, is rotated 90 degrees.

![Figure 2 - Door Schedule Proposed Layout](image)

To define a table style with this more complex and controlled formatting, draft a proposed schedule layout and place an empty table on top of the proposed layout. Using the table editing grips on the empty table, massage it into the format that is needed. Use the PROPERTIES (PR) command to rotate the text. In this case, the Standard table style was inserted with ten columns and three rows. The figure below shows the purpose-built table that we want. This process can be a little tedious but it is well worth it.

![Figure 3 - Door Schedule Table Style Prototype](image)
Automating Schedules: Let AutoCAD Create and Maintain Your Schedules

**Tip:** Set up the table based on the size it should be when plotted and place it in the paper space of your layout.

Having carefully prepared your prototype table, use the Table Style configuration dialog box (TABLESTYLE) shown below to establish the prototype table as the starting table for your new Door Schedule style.

![Create New Table Style](image)

**Figure 4 - Create a New Table Style**

The New Table Style dialog box allows you to select a table to use as the starting table.
Once you have established the starting table, go through the Cell styles formatting for all of the cell styles to coordinate them with your Title and Headers.

Creating the Attribute Block
Attributes are one or more alphanumeric data objects included in a block definition. Their values can be predefined or specified when the block is inserted. They are useful here because their values can be extracted and output to a table or an Excel file.

The idea in using an attribute block to track the doors is that the graphic representation of the door can be independent of the tag. If the attributes were part of the door itself, you would need to coordinate the attributes in all of the various graphic representations for doors, e.g., swinging door, sliding door, folding door and so on.

The attribute block consists of the graphics of the tag plus a group of attributes representing each of the columns in the schedule. In this case the door number attribute is defined as visible while the others are defined as invisible.

Use the Block Editor button \( \text{
\includegraphics[width=1cm]{block_editor_icon}} \) (BEDIT), found on the Block panel of the Home tab of the ribbon to create the block named Dr_Iden.
In the block editor, use the Properties pallet to set the block properties to annotative. Although not critical to the task at hand, making the tag block annotative gives you the flexibility to use the completed tag at whatever scale might be appropriate for the drawing at hand.

![Dr_Iden Block as it Appears in the Block Editor](image)

Use the Define Attribute button (ATTDEF), found on the Attributes panel of the Insert tab of the ribbon, to define the attributes using the Attribute Definition palette. The worksheet below shows the properties for the attributes used in the example.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Prompt</th>
<th>Default</th>
<th>Justification</th>
<th>Text Style</th>
<th>Annotative</th>
<th>Text Height</th>
<th>Rotation</th>
<th>Modes</th>
<th>Insertion Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR_NUM</td>
<td>Enter door number:</td>
<td>INT</td>
<td>Middle Center</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>0.0</td>
</tr>
<tr>
<td>INT/EXT</td>
<td>Enter INT or EXT:</td>
<td>INT</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Lock position</td>
<td>By eye</td>
</tr>
<tr>
<td>NO</td>
<td>Enter number of doors:</td>
<td>1</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
</tr>
<tr>
<td>DR_TYP</td>
<td>Enter door type:</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>DR_WD</td>
<td>Enter door width:</td>
<td>3'-0&quot;</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>DR_HT</td>
<td>Enter door Height:</td>
<td>7'-0&quot;</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>DR_THK</td>
<td>Enter door thickness:</td>
<td>1 ¾&quot;</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>DR_MATL</td>
<td>Enter door material:</td>
<td>HM</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>Invisible, Lock position</td>
<td>By eye</td>
<td></td>
</tr>
<tr>
<td>SILL</td>
<td>Enter sill detail number:</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>HDW</td>
<td>Enter hardware set number:</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>CLASS</td>
<td>Enter fire rating class:</td>
<td>-</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>Invisible, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
<tr>
<td>RMK</td>
<td>Enter remarks</td>
<td>Left</td>
<td>Attribute</td>
<td>No</td>
<td>1/32</td>
<td>0.00</td>
<td>Invisible, Multiple lines, Lock position</td>
<td>Align below …</td>
<td></td>
</tr>
</tbody>
</table>

![Attribute Definitions for Door Tag Block](image)
Let AutoCAD Create and Maintain Your Schedules

Automating Schedules:

Tip: The ATTDISP command can be used to control the display of invisible attributes in the drawing.

The figure below shows the completed door tag attribute block as it appears when plotted.

Figure 8 - Door Tag Block as it Appears when Plotted

Tip: When making annotative blocks, establish the size of objects based on the size that they should appear on the printed page. The current scale of the block editor should be set to 1:1.

Having created the door tag, insert a door tag adjacent to each door. Be sure to assign a unique DR_NUM attribute value to each door.

Extracting the Data
By using the Data Extraction wizard and by utilizing your purpose-built table style, extracting the data to create your door schedule becomes very straightforward. The data can be extracted from one or more drawings at once and the resulting schedule can be placed in any drawing or even output to an Excel file.

Begin by launching the Data Extraction wizard.

Figure 9 - Launch Data Extraction

For those completely unfamiliar with the process, the AutoCAD help facility provides very comprehensive documentation of the data extraction process under the Quick Reference for the DATAEXTRACTION command. Here is a summary of the eight steps involved in extracting the data to populate the door schedule based on the page numbers in the wizard.

1. Select, Create a new data extraction. Click Next to name the data extraction and choose where to save it. The data extraction saves a .DXE file which is a template that can be used for generating subsequent data extractions that follow the same pattern. Generally you’ll want to save it with your project to ensure that it is always available. The file that
Automating Schedules:
Let AutoCAD Create and Maintain Your Schedules

the schedule is placed in will contain a reference to the data extraction template that you can see in the External References palette. Detaching the data extraction template file breaks the link with the schedule and precludes any further updates.

2. Select your data source which may or may not include the current drawing. You may also add other drawings or entire folders. Note that these drawings do not need to be open in order you to extract data from them. Click Yes if you encounter any message regarding Unit Mismatch.

3. Select the objects to extract data from. In this example choose the Dr_Iden block.

4. Select the properties to be extracted. In this example choose only attributes. Click OK if you encounter any message regarding Non-Uniformly Scaled Blocks.

5. On page 5 of the wizard you will be presented with a preview of the schedule. Hide the Count and Name columns. Notice that the columns are in alphabetical order. You will need to drag them into order to match the schedule style. Sort the schedule based on the DR_NUM property.

6. For Output options, choose Insert data extraction into drawing.

7. Select the Door Schedule table style. Click Use table in table style for label rows. Uncheck Use property names as additional column headers.

8. Click Finish and place your door schedule in your drawing. Note that at this point you have the option to extract the data to Microsoft Excel.

Maintaining the Table
The table that you now have in your drawing has two areas. The title and the column headers are one area and the data is another. Click on the outside boarder of the table to select it and hover over the data area. At the cursor, notice that a lock icon and a link icon appear. If you hover a little longer a small text box will also appear showing pertinent information regarding the table.

Figure 10 - Cursor Information for Table
The data is locked to prevent you from inadvertently editing the data cells. If you unlock a cell and overwrite the data, it will no longer update. To make changes to the schedule, add, delete or edit one or more of your attribute blocks in the source drawing(s) and save.

**Tip:** Use the FIND command to find and replace values in multiple insertions of the attribute block.

The DXEVAL system variable controls when data extraction tables are updated. Consider adding bitcode 32 to the initial value of 12 for this variable giving a value of 44. This will ensure that your schedule is updated each time you save the file. Note that this value is saved in the drawing.

To force the table to update, highlight the table and right-click, from the cursor menu that appears, select Update Table Data Links.

**Tip:** If you do not see the cursor menus referenced throughout this document set the system variable SHORTCUTMENU back to its initial value of 11.

**Example 2 – Equipment Quantity Takeoff**

In this example you will create a schedule of items that may occur numerous times in a drawing. Specifically we will be creating a schedule of office equipment using the Data Extraction wizard together with the Data Link Manager. The drawing itself will give us the quantity of each item and associate that number with the item code that we assign. A separate Excel file will give us specification and pricing information for each type of office equipment. Additionally the table will include a formula that will multiply the quantity of each item found in the drawing by the cost found in the Excel file. Finally the Equipment Schedule will show us the total cost of the equipment. As in the previous example, the graphics representing the objects being scheduled do not contain the data; this makes it possible to quickly represent new items without creating a complex block.

In order to generate the schedule you will need an Excel file containing the data to be linked, a prototype table style, an attribute block as the item tag, and a multileader style to place the block in the drawing with a leader.

Once your preparatory work is complete, you will have the tools you need to automate your schedule whether it is an office equipment takeoff, a furniture estimate, or some other schedule of items in your drawings

**Creating the Excel File**

The Excel file you create is the source of the external data that you want to appear in your schedule. Looking at the Equipment Schedule Table prototype shown above, the Excel file will contain:
Automating Schedules:
Let AutoCAD Create and Maintain Your Schedules

supply the data for columns B through J. As long as the table style and the Excel file are coordinated, the data collected is entirely a function of your needs. We are only collecting the data from the Excel file so the headers do not need to match our desired output exactly. Note that the values in the Unit Cost ($) column are formatted without a currency symbol or thousands separators. They would cause the values to be interpreted as text by AutoCAD’s data extraction tool. We will do the formatting for the dollar values in AutoCAD during the data extraction process. When creating the Excel file, it is helpful set up a named cell range of cells that you want to link to AutoCAD via the Data Link manager.

Figure 11 - Equipment List Excel File

Creating the Table Style
Similarly to the first example, create a proposed layout for the schedule and insert an empty table into the drawing over top of the layout then massage it into the format that is needed. In this case the empty table was inserted with 11 columns and two rows.

Figure 12 - Equipment Schedule Table Style Prototype

Following the same procedure as described in Example 1, use the TABLESTYLE command to establish the newly created prototype as the starting table for the Equipment Schedule style.

Creating the Attribute Block
In the block editor, build the attribute block consisting of a single attribute centered in a rectangle that is converted to construction geometry (BCONSTRUCTION). The attribute will be an item code; its value will come from item codes established in the Excel file containing the item data. The rectangle will prevent the multileader from encroaching on the attribute.
Tip: Construction geometry is not displayed in the drawing but in the Block Editor it appears as a gray dashed line

Creating the Multileader Style
Multileaders give us the ability to place the equipment tag in the drawing together with a leader. To accomplish this, create a new multileader style. Consider defining this style as annotative so that it will be sized correctly in drawings at any scale. On the content tab set the Multileader type to Block and set the Source block to the attribute block you are using.

![Multileader Equipment Tag Definition](image)

Use this multileader style to identify each instance of the equipment items on your plan. The figure below shows the completed door tag attribute block as it appears when plotted.

![Multileader Equipment Tag](image)

Linking the External Data
Launch the Data Link Manager from the Data Link button found on the Tables ribbon panel.
In the Data Link Manager click Figure 16 - Launch Data Link Manager

Create a New Excel Data Link and give the new link a name. Next, browse for the Excel file you are linking. At this point you will see a dialog box showing a preview of the data to be linked. Note that, in this example, under Link options the sheet is named Office Equipment and the named range is Equipment_List.
Automating Schedules:  
Let AutoCAD Create and Maintain Your Schedules

Figure 17 - Establish Data Link

Extracting the Data
Now that the link has been established with the external data, this step will crate the association between the external data and the tagged items in your drawing and produce the formatted schedule.

To begin the data extraction process, select Extract Data from the Tables panel on the Annotate tab of the Ribbon. The numbered steps below coincide with pages in the Data Extraction wizard.

1. Select, Create a new data extraction. Click Next to name the data extraction and choose where to it save it. The data extraction saves a .dxe file which is a template that can be
used for generating subsequent data extractions that follow the same pattern. Generally you’ll want to save it with your project to ensure that it is always available. The file that the table is placed in will contain a reference to the data extraction template that you can see in the External References palette.

2. Select your data source which may or may not include the current drawing. You may also add other drawings or entire folders. Note that these drawings do not need to be open in order you to extract data from them. Click Yes if you encounter any message regarding Unit Mismatch.

3. Select the objects to extract data from. Select the multileader object. In this example the block containing the attribute that you need is imbedded in a multileader.

4. Select the properties to be extracted. In this example choose the attribute listed as CODE. Click OK if you encounter any message regarding Non-Uniformly Scaled Blocks.

5. On page 5 of the wizard you will be presented with a preview of the schedule.
   a. Hide the Name column.
   b. Sort the schedule based on the CODE property.
   c. Click the Link External Data … button to launch the Link External Data dialog box.
      i. Choose the previously created external data link;
      ii. Select the columns to match up between the drawing and the data link
      iii. Verify that the columns to include are correct.
Automating Schedules: Let AutoCAD Create and Maintain Your Schedules

Figure 18 - Link External Data Dialog Box

Back at the Data Extraction dialog box you should see a preview of your schedule. Looking back at the Equipment Schedule Prototype Table Style you will see that Column K, Total Cost, is still unaccounted for.

e. To add the Total Cost column, right-click on the schedule preview and select Insert Formula Column … from the cursor menu.

f. In the Insert Formula Column dialog box, name the new column Total Cost, and create the formula <Count> * <Unit Cost ($)}. Click OK when complete. You may need to drag the new column to the correct position.

g. To add a grand total to the Total Cost column, right-click on the column and select Insert Totals Footer … → Sum.

h. To add currency formatting to the Unit Cost and Total Cost columns, right-click on the Unit Cost column and select Set Column Data Format … In the Set Cell Format dialog box, choose the Currency data type. Repeat for the Total Cost column. After completing this step, your preview should resemble the figure below.
Automating Schedules: Let AutoCAD Create and Maintain Your Schedules

For Output options, choose Insert data extraction into drawing. You can also choose at this point to output the data to an external file.

Select the Equipment Schedule table style. Click Use table in table style for label rows. Uncheck Use property names as additional column headers.

Click Finish and place your Equipment Schedule in your drawing.

Maintaining the Data

The table that you now have in your drawing has two areas. The title and the column headers are one area and the data is another. Click on the outside border of the table to select it and hover over the data area. At the cursor, notice that a lock icon and a link icon appear. If you hover a little longer a small text box will also appear showing pertinent information regarding the table. The data is locked to prevent you for inadvertently editing the data cells. If you unlock a cell and overwrite the data, it will no longer update.

Add or delete equipment tags in the drawing as needed. You can also edit the Excel file by changing the equipment specifications or by adding equipment items. If you add equipment items verify that your named cell range is also updated.

To force the table to update, highlight the table and right-click, from the cursor menu that appears, select Update Table Data Links. Note that the data extraction template file is referenced in the External References manager. Detaching the data extraction file breaks the link with the schedule thus precluding any further updates.
Example 3 – Area Calculations

In this example we take advantage of AutoCAD’s ability to read the properties of objects using fields. Specifically we will link attribute blocks to hatch objects in the drawing and generate an area takeoff as a table that will give us various totals. As in the previous two examples we will create a purpose-built table style, and an attribute block. Once your preparatory work is complete, you will have the tools you need to automate your area calculations based on whatever area calculation standard you are accustomed to using.

Preparing the Drawing

Using the hatch command, generate hatch patterns delineating the areas you want to measure. One of the properties of the hatch command is area so it is a natural object to use for this application. An advantage that the hatch object has over the polyline, which is the other likely object that might be used, is that a single hatch object can include more than one discrete area. As an example, all of the service spaces could be hatched with a single hatch object making it possible to account for all of the service areas with a single area calculation.

Creating the Table Style

Similarly to the previous examples, create a proposed layout for the schedule and insert an empty table into the drawing over top of the layout then massage it into the format that is needed. In this case the empty table was inserted with five columns and three rows.

![Figure 20 - Area Calculation Table Style Prototype](image)

Following the same procedure as described in Example 1, use the TABLESTYLE command to establish the newly created prototype as the starting table for the Area Calculations Table style.

Creating the Attribute Block

In this example, the attribute block consists entirely of attribute objects. They identify the space, the units (square feet in this case) and the four categories of space shown above in the prototype area calculation table style.

Use the Block Editor (BEDIT) to create the block named Space_Tag. In the Block Editor, use the Properties pallet to set the block properties to annotative. Although not critical to the task at hand, making the tag block annotative gives you the flexibility to use the completed tag at whatever scale might be appropriate for your drawing.
Use the Define Attribute button (ATTDEF), found on the Attributes panel of the Insert tab of the ribbon, to define the attributes using the Attribute Definition dialog box. The worksheet below shows the properties for the attributes used in the example. Note that the four attributes associated with the areas are placed directly on top of one another. This works because each space can belong to only one space type. Also note that the UNITS attribute is set to preset, this means that you will not be asked to supply the units each time the block is inserted. The default value will be used.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Prompt</th>
<th>Default</th>
<th>Justification</th>
<th>Text Style</th>
<th>Annotative</th>
<th>Text Height</th>
<th>Rotation</th>
<th>Modes</th>
<th>Insertion Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACE</td>
<td>Enter space name:</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>0,0</td>
<td></td>
</tr>
<tr>
<td>UNITS</td>
<td>AREA SF</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Preset, Lock position</td>
<td>Align below ...</td>
<td></td>
</tr>
<tr>
<td>OCCP</td>
<td>Edit OCCP:</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>Align below ...</td>
<td></td>
</tr>
<tr>
<td>COMM</td>
<td>Edit COMM:</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>Same as previous</td>
<td></td>
</tr>
<tr>
<td>CIRC</td>
<td>Edit CIRC:</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>Same as previous</td>
<td></td>
</tr>
<tr>
<td>BLDG</td>
<td>Edit BLDG:</td>
<td>Top Left</td>
<td>Attribute</td>
<td>No</td>
<td>3/32</td>
<td>0.00</td>
<td>Lock position</td>
<td>Same as previous</td>
<td></td>
</tr>
</tbody>
</table>

Figure 21 - Attribute Definitions for Space Tag Block

Inserting the Attribute Block

A textual item that updates as conditions change is called a field. In our tag we will insert fields that are linked to the hatches as the area attributes. If the area of the hatch changes the value of the field will update.

To begin tagging spaces and linking them to the tags:

1. Insert the Space_Tag attribute block;
2. In the Edit Attributes dialog box, enter the name of the space or area you are tagging;
3. Right-click on the input box for the space type and choose Insert Field… from the cursor menu that appears;
4. In the Field dialog box that appears:
   a. For Field category, choose Objects;
   b. For Field names choose Object;
   c. Click the Select objects button and select the hatch object representing the space you are tagging;
   d. For Property select Area;
   e. For Format select Decimal;
   f. From the Precision drop-down menu, choose 0;
   g. Click the Additional Format button;
      i. For Conversion factor type 1/144 to convert the result from square inches to square feet.
5. Click OK in each of the open dialog boxes to return to the drawing.

6. Repeat these steps as many times as necessary.
   Alternatively, you can copy a tag that you have already inserted and link it using the Enhanced Attribute Editor (ETTEDIT). Select the attribute to edit and right-click on the Value. From the cursor menu, click Edit Field and follow the steps above.

Extracting the Data
To begin the data extraction process, select Extract Data from the Tables panel on the Annotate tab of the Ribbon. The numbered steps below coincide with pages in the Data Extraction wizard.

1. Select, Create a new data extraction. Click Next to name the data extraction and choose where to save it. The data extraction saves a .dxe file which is a template that can be used for generating subsequent data extractions that follow the same pattern. Generally
you’ll want to save it with your project to ensure that it is always available. The file that
the table is placed in will contain a reference to the data extraction template that you can
see in the External References palette.

2. Select your data source which may or may not include the current drawing. You may
also add other drawings or entire folders. Note that these drawings do not need to be
open in order you to extract data from them. Click Yes if you encounter any message
regarding Unit Mismatch.

3. Select the objects to extract data from. In this example choose the Space_Tag block.

4. Select the properties to be extracted. In this example choose only attributes. The UNITS
attribute won't be needed so leave it unchecked. Click OK if you encounter any
message regarding Non-Uniformly Scaled Blocks.

5. On page 5 of the wizard you will be presented with a preview of the schedule.
   a. Hide the Name column. Hide the Count column. Sort the schedule on the Space
column. Drag the columns in the positions established in the Area Calculation
table style.
   b. Adjacent to each of the area columns, using the right-click menu choose Insert
   Formula Column. The formula is simply the name of the adjacent column. Right-
click on the new column, choose Set Column Data Format and set the Precision
to 0 and under Additional Format, add the suffix S.F. and choose the comma as
the thousands separator. Again from the right-click menu, choose Insert Totals
Footer → Sum.

At this point your preview of the schedule should resemble the figure below.
c. Using the right-click menu, hide the columns indicated on the figure above. The figure below shows the final preview of the Area Calculations. Do not be concerned with the # signs, they will not appear on the drawing.
Automating Schedules:
Let AutoCAD Create and Maintain Your Schedules

6. Under Output options, select Insert data extraction table into drawing.

7. Under Table style select the Area Calculation table style. Under Formatting and structure, choose Use table in table style for label rows. Clear the Use property names as additional column headers checkbox.

8. Click Finish to complete the extraction and place the Area Calculations in the drawing.

Figure 24 - Final Preview of Area Calculations
Automating Schedules:  
Let AutoCAD Create and Maintain Your Schedules

Figure 25 - Area Calculations Schedule as Placed in Drawing

To verify your successful link, change the area of one your hatch objects and use the UPDATEFIELD command or regenerate the drawing to update the tags. To update your schedule, select the table and right-click. From the cursor menu that appears, select Update Table Data Links. Notice that the associated area updates.

Conclusion

Using AutoCAD commands alone you can generate and maintain schedules in your drawings that are designed to suite a broad spectrum of scenarios. Experiment and explore the possibilities.
Appendix

Related Command and System Variable Reference

**ATTDEF Command**
Creates an attribute definition for storing data in a block.

**ATTDISP Command**
Controls the visibility overrides for all block attributes in a drawing.

**ATTSYNC Command**
Updates block references with new and changed attributes from a specified block definition.

**BATTORDER Command**
Specifies the order of attributes for a block. You can only use the BATTORDER command in the block editor.

**BCLOSE Command**
Closes the Block Editor.

**BCONSTRUTION Command**
Converts geometry into non-printing construction geometry. You can only use the BCONSTRUCTION command in the block editor.

**BEDIT Command**
Opens the block definition in the Block Editor.

**DATALINK Command**
Displays the Data Link Manager dialog box.

**DATAEXTRACTION Command**
Extracts drawing data and merges data from an external source to a data extraction table or external file.

**DATALINKNOTIFY System Variable**
Controls the notification for updated or missing data links. Initial value is 2. Saved in registry.

**DATALINKUPDATE Command**
Updates data to or from an established external data link.

**DXEVAL System Variable**
Controls when data extraction tables are compared against the data source, and if the data is not current, displays an update notification. Initial value is 12. Saved in drawing.
**FIELDVAL System Variable**
Controls how fields are updated. Initial value is 31. Saved in drawing.

**FIELDDISPLAY System Variable**
Controls whether fields are displayed with a gray background. Initial value is 1 (on). Saved in registry.

**FIND Command**
Finds the text that you specify, and can optionally replace it with other text.

**SHORTCUTMENU System Variable**
Controls whether Default, Edit, and Command mode shortcut menus are available in the drawing area. Initial value is 11. Saved in registry.

**TABLE Command**
Creates an empty table object.

**UPDATE FIELD Command**
Manually updates fields in selected objects in the drawing.