# Excel Tables – How to Make Screen Readers Announce Column and Row Headers in Excel Spreadsheets

## Introduction

**NOTICE: These instructions assume you are using a recent version of standalone Excel, not a web-based version. Many features that are described below do not work at all in the web versions. Also assumed is the default reference style “A1” (column letter(s) followed by row number optionally with $ absolute designations) rather than the “R1C1” reference style which was not tested.**

Excel spreadsheets are a very popular and effective way of organizing data. They offer a variety of options for sighted users to follow along in lengthy sets of data, such as freezing regions of the spreadsheet—called frozen panes—like column and row headers. Excel spreadsheets also allow protecting some cells to prevent accidental changes. This is a good way to prepare your spreadsheet if it has areas that shouldn’t be changed e.g.: headers, reference information, intermediate computation cells, etc. Using the Tab key (and Shift-Tab) will move the current cell focus only to unprotected cells making it much easier for screen reader users to know which cells they should be editing. This document will discuss how to tell if these features are being used, both visually and in a screen reader, and how to use them with tables within an Excel spreadsheet to make it accessible to all.

This document uses - (hyphen) to indicate when two or more keys should be simultaneously pressed and spaces between key names/characters to indicate keypresses in succession. This construction does not show up as a spelling error as using the + symbol as a simultaneous indicator would. E.g., Alt-j indicates hold the Alt key down and press the J key then release both. Alt j indicates press the Alt key and release it then press the J key.

Other document conventions to be aware of are that “workbook” always means an Excel .xlsx file whether it has one or many sheets. Sheet means only a single sheet in a workbook. Spreadsheet can mean either an entire workbook or only a single sheet. Non-symbol Key names, such as Tab or Enter or Up Arrow are capitalized and may or may not be followed explicitly by the word “key.” Menu, tab, and other control names are in quotes and follow the capitalization of their visual version in the Excel program. A visual mouse sequence of clicks has its control steps separated by the greater than symbol (>). A … (dot dot dot or ellipsis) indicates that the preceding key should be repeated as many times as needed as is often true for the Tab key (e.g., Tab, …).

These instructions somewhat give preference to screen reader user actions which will nearly always work for visual/mouse users too.

## What are frozen panes?

Frozen panes are regions of your spreadsheet which you want to be visible no matter where a user has scrolled to. Unlike the rest of the spreadsheet, these regions stay visible onscreen when scrolling. Commonly frozen regions are column and row headers with information that users might want to continuously reference when viewing your data.

To check if you have frozen panes in your spreadsheet, press Control-Home (or Command-Home on a Mac). If your spreadsheet has frozen panes, the cursor will jump to the top left corner of the scrollable region regardless of locked or protection status. If you don’t have frozen panes in your workbook, then Control-Home will take you to cell A1. While it is good for you to preset frozen panes in a way that makes good visual sense as you develop a spreadsheet it is also important that you be aware that users are still free to unset your frozen pane settings and set their own so that any instructions you write should not assume your frozen panes without explicitly identifying them.

NOTICE: You can freeze panes so that some columns and rows are completely out of sight to the left and above the visible sheet content area (but they can still be accessed via Arrow keys). Visual users can simply Down and Right Arrow to move the columns and rows out of sight before following the below steps. Screen reader users can do the same thing but need to understand how to use the [=INFO(“origin”) formula](https://support.microsoft.com/en-us/office/info-function-725f259a-0e4b-49b3-8b52-58815c69acae) to understand what has been moved out of sight.

### How to freeze and unfreeze panes:

1. Place your cursor in the cell immediately below the lowest row and immediately to the right of the rightmost column you want to be frozen. (I.e., make the current selected cell, but without being in cell edit mode, the top left cell of the area you want to scroll.) If you want to freeze only columns the focused cell should be in the first row (1) and likewise if you want to freeze only rows the focused cell should be in the first column (A).
2. Go to the “View” tab (Alt-w), then find (Tab key, …) and click (Enter key) “Freeze Panes” in the “Window” group.
3. Click (Enter) “Freeze Panes.” \*If panes are already frozen, you will have to click “Unfreeze Panes” then do the previous step again and this step again to freeze the new panes.\*
4. Press Control-Home and verify you’re in the top left unfrozen cell instead of cell A1. If you did it correctly, visually you should be able to see column headers no matter how far down you scroll, and the row headers no matter how far you scroll to the right.

Unfortunately, the very useful effect frozen panes provides doesn’t work for screen reader users but frozen panes don’t interfere with screen reader use either. Although the frozen regions stay onscreen, they’re not read to a screen reader user unless the user moves the current cell focus into the panes. There are ways to emulate the freeze panes row and column headings effect for screen reader users that will be fleshed out in a minute.

## What is Protection and Locking?

By default Excel spreadsheet cells are locked but also by default protection is turned off so that the “locking” does not take effect. When a user switches the sheet or workbook to “Protected” (with or without a password) all the locked cells cannot be changed in any way, not even spell checked. While protection has exactly the same effect in and outside frozen pane areas the same is not true for table development (the next topic). Protection must be off for table and most other spreadsheet development and generally it is critical that it be off when doing additional development work in spreadsheets that you are receiving from others. To prepare a spreadsheet for protection or any additional development it is first necessary to know what state the spreadsheet is in and, when not protected, to individually (or as selected blocks/regions) unlock cells then turn “Protection” on. Unlocking cells (or regions) then turning on “Protection” is an essential for robust, accessible, spreadsheets that keep non-data entry areas safe from accidental changes.

### How to tell whether your spreadsheet is protected:

1. Go to the “Review” tab (Alt-r) on the ribbon, then find (Tab, …) the “Protection” group.
2. You will have one of two options: “Protect Sheet” or “Unprotect Sheet.” When “Protect Sheet” is the available option the spreadsheet is already unprotected and this is the state you need it to be in for following the example instructions below.
3. If “Unprotect Sheet” is the available option you will want to click it (Enter key) to unprotect your spreadsheet so it will allow unlocking cells. You may need to enter a password. (Generally use of a password is **not** recommended.)
4. Once you’ve edited the contents of what will be your protected cells and followed the unlocking procedure (described later) for data entry cells you will need to do Alt-r p s or steps 1 and 2 above then click (Enter key) “Protect Sheet.”

## What are Tables?

Workbook sheets in and of themselves are tabular in nature with rows and columns but within Excel sheets it is also possible to designate specific areas as “Format as Table” areas complete with a header row and/or a header column. Tables with designated headers are essential for accessible screen reader use. Multiple designated table areas can be placed on a single sheet. However, creating an effective and accessible workbook as a whole is an extremely complex topic when you get past a sheet or two with one or two tables and other content areas each. A sheet with instructions and an index of other sheets and specific locations may be appropriate as complexity increases. For our purposes here we are only going to consider a single sheet with 2 tables to illustrate the basics of building and designating tables, headers, and protection in ways that make accessibility reasonably universal.

### How to tell if you are in a table (and what it’s about):

1. For whatever cell has the current focus press Alt-j and you will either hear bling tones, which means you are not in a table, or, an announcement with “Table Design tab selected” somewhere in it. You are in the “Table Design” tab because you are in a “table” more completely known as a range “formatted as a table.” (Visually when the current cell is in a table a “Table Design” tab will be on the ribbon.)
2. If you are now on the “Table Design” tab from the prior step then press the A key which (when Protection is off) should land you in the “Table Name” of the “Properties” and read the table name which should, if proper naming conventions have been followed, begin “Table” followed by a meaningful table name. If the name has been left as a “default” it will likely read something like “Table three” (and display as “Table3”).
3. Press the Escape key (often labeled “Esc”) once (or twice if Protection is on) to return to your current cell then, to find the table’s column headings, press Alt-a (which will select the table content area) and listen for the address of the first cell. Up Arrow to the row above the first content row.
4. Use the Left Arrow and Right Arrow to read the heading row. If what is read is Column1, Column2, ColumnX where X is any number then you know your table simply has meaningless Excel assigned column headings.
5. Properly laid out tables, if there are more than one on a sheet, should be separated by a single blank row (with optionally a visual heading row and a blank row above and/or below it) or column or both to make it easier for screen reader users to know (or correctly surmise), when using the arrow keys, that they need go no farther. But don’t count on that, rummage around with the arrow keys and recheck to see what table (if any) you are in to understand the structure. Everything does not have to be in tables and often a lot of information and intermediate calculation cells are not in tables. It may be easiest to do Ctrl-End to find the “Last Used Cell” in a spreadsheet and rummage backwards and up.

## Building a Sheet with Tables, Headings, and Protection

The following subsections will take you step-by-step through the process of adding “Tables” with headings and proper protection to your sheet. Additionally there will be a few pros and cons for various alternatives. There is no one perfect answer for everyone because different objectives necessarily will result in different choices. Also, there are alternative ways to achieve the same result but they will not be explored. A suggested starting point for documentation on screen reader use of Excel is the Microsoft [Basic tasks using a screen reader with Excel](https://support.microsoft.com/en-us/office/basic-tasks-using-a-screen-reader-with-excel-6b275296-a377-4608-af7b-1571e2924a7c) page.

Be very aware that layout matters and the order you do the layout in (or at least the cell naming or “Format as Table”) seems to matter (why is unknown). If you want more than one table on a page it is strongly recommended that you add tables to the right, or down, or to the right and down (diagonally), never above. When down, never horizontally overlapping except when the lower table is less than or equal to the width of the above table and completely (or perfectly) under it. And always one column and/or one row between (or blank row, visual table heading, optional blank row for vertical layout). If you have a column of aligned down repeating tables that are identical plan on naming the column header and row header row intersection only once at the top of the top table.

### First Build the Sheet

* 1. Good practice is to enter a brief description of the sheet in cell A1.
	2. Particularly when the sheet will have more than one table a meaningful name for the first table can go in A2 or A3.
	3. On the next row after any visual table name or the row after that enter the text names for the column headings without skipping columns. The heading cell for the first column should not be left empty but should identify what the column contains, e.g., Category, Student. The first column should be for a value that will uniquely identify what the row content is about, it can be a static value or a formula such as one that will combine subsequent Last Name and First Name columns into a student name. Column names must be meaningful but yet be reasonably short because, once the step that designates them as headers is completed, a screen reader will read them every time the user moves into that column below the header.
	4. If the table has a fixed set of row headings that are known in advance they can all be entered also down the first column of what will be the table. It’s not that the list cannot be expanded later it’s that for new rows (or rarely columns) to be added requires “Protection” be off.
	5. Repeat the above for each of your table structures for the sheet keeping the above “Be very aware…” cautions in mind.

### Second Define a Unique Name for Each Cell Where Column and Row Headers Intersect[[1]](#footnote-2)

1. CAUTION: this process of defining the names for the top left corner of each table area (or the top one of a column of identical tables) should be done before designating tables.
2. Place your cursor on the cell where the header column and header row intersect.
3. Navigate to the formulas tab (Alt-m), then find (Tab, …) and click (Enter) “Define Name”.
4. In the “Name” field of the “New Name” popup box, you will want to type the following: Title\_[unique\_name]. The “Title\_” part (“Title” followed immediately by an underscore) is required. You can choose anything to replace, including the brackets, the “[unique\_name]” after the “Title\_” piece using underscores instead of spaces. (Simply naming it “Title” is sufficient if it’s the only intersection of heading row/columns but Excel requires unique names). Make the unique name part meaningful and, if the table is a static size and location some people suggest ending the name, for easy understanding, with the cell range using underscore as the separator. Screen readers only require that the first 5 characters of the name be “title” with no case distinction and will, usually for any cell farther down and to the right (but only 1 column past the last column), read the title column or row value as a header. Thus positioning of tables is important if there are more than one on a sheet otherwise header values farther above (and sometimes farther left of) a table may be read when not in a table.
5. Set the “Scope” to just the sheet you’re working with (The default sheet name in a new workbook is “Sheet1” but in an already created spreadsheet it can be anything.) In NVDA to find what sheet tab you are on press the F6 key until (probably the one just after the ribbon) you are back in the contents of the sheet. The sheet name, (and for unexplained reasons) the word “table,” then the cell and its address (or whatever) that has the focus will be read. Often, but not always, a Shift-F6 followed by an F6 will read the sheet name. In theory simply pressing the F6 key should announce the tab name when you arrive on the sheet tabs but in NVDA it currently does not. If it makes sense you can also pick “Workbook” for “Scope.”
Alternatively Control-PgUp and Control-PgDn are supposed to cycle through the tabs and read their names but unfortunately they don’t work usefully when there is only one sheet. Also when default sheet names exist they may be read as “Undefined” or be silent but no effort when writing these instructions was put into figuring out what conditions gave those results.
6. You can also enter “Comments” in their respective field in the Name popup box but Tab past the “Refers to” field, which should already contain the address of the cell you are adding the title to, and click “OK”. Notice: If you are adding a cell name after having established a table you may find the “Refers to” field contains something like “=Table1[[#Headers],[Column1]]” which won’t work [in NVDA at least], you MUST fix the “Refers to” field value to =[SheetName]![$[x]$[y] where you replace “[SheetName]” (including brackets) with the correct sheet name properly capitalized, followed by ! and $ sign, then replace “[x]” (including brackets) with the column identification letters, $, and “[y]” with the row number.
7. Working down, or right, or down and right, but **never** working above an already done cell name, repeat for each table in your sheet except for a column of identical tables where the “Define Name” **must** be done only once for the top table in the stack (or for a matching header row even above it if that will work appropriately).
8. WARNING: arrow key around immediately to be sure that when appropriate column headings are read when you change columns and row headings are read when you change rows. If that does not happen, or seems to stop at any time when working in a sheet, try Alt-j f a (Table Design > Refresh > Refresh All). If that doesn’t fix it, save the workbook and reopen and if that doesn’t fix it recheck your layout per the “Be very aware” cautions and make sure you’ve not inadvertently created a “Title” Defined Name somewhere you didn’t intend to. Breaking the workbook into more sheets with fewer tables on each may also be necessary.
9. If appropriate you can also name specific cells and regions that are not intended for tables or row or column headings. Such names should be meaningful and should **not** begin with either “Title” or “Table” because those have special meaning for screen readers. Generally special named cells should be identified and explained in your instructions for using the spreadsheet.

### Third Establish the Table(s)

1. Select all the cells in your first table including the header row (even if it is the only row at this point) and all the content cells (if any) to the lower right corner of the table.
2. Then Control-t, or from the “Insert” ribbon tab (Alt-n), then find (Tab, …) and click (Enter key) “Table.” In the “Create Table” dialog Tab key out of the “Where is the data for your table?” to the My table has headers” checkbox and check it if it isn’t already checked then move (Tab key) to the “OK” button and click it. (Having the “My table has headers” checked prevents Excel from automatically adding headers above your columns and labeling them “Column1”, “Column2”, etc., it does not set headers). The preceding creates a table with a default style in which the background color of the heading line will need to be darkened to meet contrast requirements. It is not necessary that the “green bar” alternate row backgrounds (whatever their actual color) be adjusted.
Alternatively one could visit the “Home” ribbon (Alt-h) then find the “Format as Table” option and click it then select a specific styling before getting to the “Create Table” dialog. The following list identifies the 17 specific available styles that are (currently) accessible **in the default set of 60 styles**:
* White, Light 1, 1 of 60
* Light Blue, Light 6, 6 of 60
* White, Light 8, 8 of 60
* Blue, Light 13, 13 of 60
* White, Light 15, 15 of 60
* Light Blue, Light 16, 16 of 60
* Light Orange, Light 17, 17 of 60
* White, Light 18, 18 of 60
* Light Yellow, Light 19, 19 of 60
* Light Blue, Light 20, 20 of 60
* Light Green, Light 21, 21 of 60
* White, Medium 1, 22 of 60
* Blue, Medium 6, 27 of 60
* Light Gray, Medium 8, 29 of 60
* Blue, Medium 13, 34 of 60
* Dark Gray, Dark 1, 50 of 60
* Dark Blue, Dark 6, 55 of 60

Use the Arrow keys to find the style you want then the Enter key to accept it and pop up the “Create Table” dialog. Other styling options are available particularly using the “First Column”, “Last Column” and “Banded Columns” options in the “Table Style Options” group of the “Table Design” tab on the ribbon. Choosing styling options has no accessibility benefit but causes no accessibility harm and may be useful to visual users.

 Optionally, but very strongly recommended, at this point you can give the table a meaningful “Table Name” which will allow screen reader users to easily find it. You should also give the table a visual name that reasonably matches (except for spaces vs underscores) the “Table Name” property of the table. Visual names are best if in the same column as the left column of the table and on the row immediately above the table or the row above that with another blank line above that if there is a table above it also. It is OK, and often best, to merge (and center) the cell the visual name has been put in with cells above the table and to the right on the row you put the visual name in.

1. From the above steps the current cell should still be within the table or the whole table selected, if not, select any cell in the table.
2. Alt-j a then type in a “Table Name” beginning with “Table” then underscore then an appropriate meaningful name perhaps shortened but still recognizable as matching the visual name using underscores instead of spaces between words. The property “Table Name” and the visual name need to match so visual users and screen reader users of the table can talk about the table and know they are talking about the same table.
3. With the table now having a “Table Name” property it can easily be found in the “Go to” dialog box:
	1. Control-g, Tab to the “Go to” list and Down Arrow to the desired table name then the Enter key (note: the first Down Arrow may not read a name but another Down Arrow or Up Arrow will work fine).
	2. The entire table content area will be selected so Right Arrow Left Arrow will select only the first cell as the current cell.

### Fourth Add Protection

 The main premise is to only unlock the data regions you want to be editable then protect the entire spreadsheet. A locked protected column essentially functions like the border of a table and restricts tab navigation to the unlocked area. In a Protected sheet where there is only one unlocked range the Tab key will only navigate within the unlocked range including wrapping last cell to first cell or first cell to last cell for Shift-Tab. If there are multiple ranges *and no tables* Tab key on the last column will go to the first cell in that row of the next unprotected range if there is one to the right on the row or, if not, it will wrap back to the first unprotected cell on the next or subsequent row but if there are tables, when in a table the table boundaries will be honored.

* 1. By default each sheet in a new spreadsheet has all cells flagged as “Locked” but they are not actually locked until “Protect Sheet” or “Protect Workbook” is turned on.
	2. To make just designated cells in tables editable you will want to set their “Format” > “Protection” to “Unlocked” in the next step. Generally you will want to leave header rows and cells with formulas “Locked”.
	3. In a table select a range of cells that you want users to be able to change then Alt-h o e and Left/Right Arrow key to the “Protection” tab, Tab key to “Locked” and uncheck (spacebar) it leaving it unchecked. Click the “OK” button to finish. Repeat for all single cells or ranges you want editable whether in a table or not.
	For tables for which you only entered the column headers Excel should have automatically set the cells one row below the headers as the table content area. Enter any formulas needed then unlock the non-formula cells on the row and leave all the cells below the row locked. When you want to enter new rows in a table that is not a fixed size you will need to have “Protection” off and press the Tab key to leave the last (lower right) cell in the table so that Excel automatically creates the next row of cells, including copying formulas and formatting, and pushing all cells below them down one row. (Caution: where you lay out tables matters. If you have a table that is only partially underneath the table you intend to be extended that will block the automatic creation of the next row.)
	4. Protect (Alt-r p s) the sheet leaving (as a best practice) no password and setting the checkboxes in the “Allow all users of this worksheet to” as suit your needs ([protection options help](https://support.microsoft.com/en-us/office/protect-a-worksheet-3179efdb-1285-4d49-a9c3-f4ca36276de6?ns=excel&version=90&syslcid=1033&uilcid=1033&appver=zxl900&helpid=21290&ui=en-us&rs=en-us&ad=us)). If your tables all contain a fixed number of rows you should not have to unprotect the sheet (also Alt-r p s but you will not be asked for anything unless the sheet is password protected).

Don’t worry, even if your column and row headers are protected, they will still be announced as users tab through the sheet.

## Pros and Cons from a Screen Reader User Perspective

### Pros of the table format:

* The built-in formatting automatically restricts Tab key navigation to within the table in a “Protected” sheet, so users can stay focused on the data region. The tab key (or Shift-Tab to go backwards) in a “Protected” sheet will cycle through only the table columns—not any columns before or after—and wrap back to the start of the table when it reaches the last cell. In an unprotected sheet the Tab key from the lower right corner of the table will create a new table line below the last one and move the focus to the first column of the table in the new row. Pressing Shift-Tab, from the first changeable cell in a table, in either a “Protected” or unprotected sheet will wrap backwards to the last cell in the table. Users can still navigate to any part of the spreadsheet using the arrow keys.
* Tab key navigation in tables is super helpful because it makes it easy to tab within the important information and prevents users from tabbing over into empty cells.

### Cons of the table format:

* There is not a keyboard command to easily jump between tables but, in a “Protected” spreadsheet, if you down arrow once from the last row of the table then Tab key again the focus will go to the next unprotected cell. Likewise from a table in a “Protected” sheet if you Up Arrow once from the heading row (or Left Arrow once from the row header) then Shift-Tab will go to the previous unprotected cell.
Alternatively, when your heading “title…” cells are meaningfully named, Ctrl-g will pop up the “Go To” dialog, Tab key to the “Go to” list, and Down Arrow to the name of the first data cell in the table you want then Enter key or, when Protection is on, Tab key to the first editable cell in the table. It is possible to name tables meaningfully also and “Go To” them then Right Arrow, Left Arrow to clear the table selection and be in the first cell.
* For tables to which new records will be added Protection must be turned off to allow the addition of new rows. Protection, of course, can be turned back on when it is not necessary to be adding rows.

### Pros of protection:

* Prevents accidental editing of static cells.
* Allows for more control over formatting rather than being confined to the table.
* Allows tab navigation to all editable regions without the user needing to use their arrow keys unless there are tables in which case arrow keys are necessary to leave the table boundaries.

### Cons of protection:

* You have to manually select and unlock all the cells you want users to be able to tab to.
* If an entire sheet is protected, the Tab key only navigates down one column in JAWS but goes nowhere in NVDA—so the Tab key becomes virtually useless.
* You must unprotect the sheet if you want to make any edits aside from entering data into the unlocked cells then remember to re-Protect the sheet.
* The Tab key skips over locked regions, so it doesn’t stay confined to a data region (unless there is only one) like the table allows for. This also means that the screen reader won’t announce information in any of the locked cells unless it is a header, or the user uses the arrow keys (or Tab and Shift-Tab) to navigate to it.

## Spreadsheet Example

Many of the features described above can be found in the MSU Evaluation Protocol for WCAG 2.0 AA Recording Spreadsheet linked to on the [Webaccess Evaluation & Validation page](https://webaccess.msu.edu/Help_and_Resources/evaluation-validation.html). Pretty much the whole left side of that spreadsheet is a series of identical tables (starting with two originally but allowing more to be added). Each table is automatically named via macros “Table\_” followed by the essence of the Page Name/Description cell just above each table so they can easily be found by using the Control-g (Go To) feature. The column headers are provided a defined name (Title\_ColRowHeads..BZ20000) via only the column header row in the topmost table so they are applied all the way down the spreadsheet even though there will be some rows (such as page identification information) they don’t apply to. Protection is turned on except for the unlocked cells that are the content area of each table and a few other “user cells”. A macro automatically reapplies protection when exiting the spreadsheet. And there are a couple of small “Summary Scoring” tables toward the bottom of the spreadsheet that are named in parallel with the merged and centered table heading above them. There are also a few named cells that are explicitly referenced in the general “Instructions” document available for describing the use of the spreadsheet. Those instructions are also linked to on the [Webaccess Evaluation & Validation page](https://webaccess.msu.edu/Help_and_Resources/evaluation-validation.html).

1. WARNING: NVDA and JAWS at least honor [reader key]-Shift-c and [reader key]-Shift-r (or equivalent) for setting column and row headers and they likely do it well in an unprotected sheet with no “Format as Table” set however at least NVDA fails nearly completely when in Protected mode or on a “Format as Table’s” Defined Name headers. While NVDA correctly creates the cell name even in Protected mode it fails to honor it due apparently to Microsoft’s creation of a non-A1 cell reference formula in existing tables. Microsoft’s Narrator currently (12/9/21) can read column headings but not row headings. [↑](#footnote-ref-2)