How to Use a Multimeter to Identify the Row and Column Pins of an LED Matrix

1. Orient the LED matrix in such a way that you can use the same frame of reference every time you look at it. See Figure 1 for an example. There is usually one pin marked on the underside as a reference pin (it may be marked with a “1”). There may also be a label located on one side of the matrix. It’s best to use the marked reference pin if possible, since the label (if there is one) may not always be located in the same place consistently on all matrices. If there is no marked reference pin and no label, place a mark of your own near one of the pins using a pen or marker.

*Once you have oriented the matrix, make sure you keep the matrix oriented throughout the rest of this procedure.*

![Figure 1. Orienting the LED matrix so that the marked reference pin is located in the upper right corner as you are facing the matrix.](image)

2. Number the rows and columns of the matrix for reference, as shown in Figure 2. You don't know at this point which are rows and which are columns, but you need this numbering later.

3. Turn the multimeter to the diode setting, which is typically marked with a symbol.

4. Hold the positive (red) lead of the multimeter on the marked reference pin.

5. Systematically begin touching the other pins with the negative (black) lead of the multimeter. Observe the LED matrix as you touch each pin. When you see one of the LED's light up, you know that the negative lead of the multimeter is touching a pin that controls a column, although you don’t know yet which column. At this point, stop touching pins with the negative lead of the multimeter and go to Step 6.

If none of the LED’s light up after touching all the other pins with the negative lead of the multimeter, go back to
Step 4 and move the positive lead of the multimeter to a different pin, then continue with Step 5.

![Figure 2. LED matrix with reference numbering to identify row and column numbers.](image)

6. At this point, you have both the positive and negative leads of the multimeter touching pins, and one LED in the matrix is lit. An example is shown in Figure 3. We will refer to this example in later steps.

![Figure 3. The first LED that is observed to light up following Steps 4-5.](image)
Note that at this point we don’t know whether the pin connected to the negative lead of the multimeter controls column 4 or column 3, since the matrix could be physically oriented such that the columns are oriented horizontally instead of vertically. Figure 4 shows both possible orientations. It is necessary to find another column to distinguish between the two possible orientations.

![Figure 4](image)

**Figure 4.** The first LED that is observed to light up could be in column 4 (left panel) or column 3 (right panel), depending on how the matrix is physically oriented.

7. To distinguish between the two possible orientations shown in Figure 4, remember the location of the first LED that lit up and continue moving the negative lead of the multimeter to different pins until a different, second, LED lights up. This second LED will either be located above or below where the first LED was lit, or to the right or left of where the first LED was lit. See Figure 5 for an example.

Using the example shown in Figure 5, if the second LED lights up as shown in the left panel of the figure, you can conclude the following:

a. The pin touched by the negative lead of the multimeter that caused the first LED to light up controls column 4.

b. The pin touched by the negative lead of the multimeter that caused the second LED to light up controls column 6.

c. The pin currently being touched by the positive lead of the multimeter controls row 3.

If the second LED lights up as shown in the right panel of Figure 5, you can conclude the following:

a. The pin touched by the negative lead of the multimeter that caused the first LED to light up controls column 3.

b. The pin touched by the negative lead of the multimeter that caused the second LED to light up controls column 5.

c. The pin currently being touched by the positive lead of the multimeter controls row 4.
At this point you should begin recording your results on a diagram like the ones shown in the figures here, to keep track of which pins you have identified. Use any notation that is understandable to you. As an example, you could label the pin that controls column 4 on the diagram, “C4”.

Figure 5. Distinguishing which direction the columns are oriented. The faint red LED represents the first LED that was observed to light up; the dark red LED represents the second LED observed to light up by following Step 7. If the second LED lights up to the left or right of the first LED, the columns flow horizontally. If the second LED lights up above or below the first LED, the columns flow vertically; i.e., the matrix is turned 90 degrees.

8. Now that you have established the orientation of the rows and columns, as you are looking at the matrix, keep the positive lead of the multimeter in place while you continue moving the negative lead to other pins to identify the remaining columns.

9. At this point, you have identified which pins control the columns, and you know that the pin currently contacting the positive lead of the multimeter controls a row, and you know which row that is. You now need to identify which pins control the other rows. To do this, make sure that you have the positive and negative leads of the multimeter connected to the matrix such that one LED is lit up (it doesn’t matter which one). Now, instead of holding the positive lead stationary, and moving the negative lead to different pins, do the opposite: hold the negative lead stationary, and move the positive lead to the other pins, one at a time. Each time an LED lights up, you will have identified a pin that controls a row. If you have kept a careful record of which pins control the columns, you can skip over these pins as you’re moving the positive lead around.

10. If, after completing Step 9, you have a diagram where each pin has a label, and no labels are duplicated (e.g., you have two pins labeled as controlling column 4), you are done. If you have an unlabeled pin, or a duplicate label, you will need to go back to Step 4 or Step 9, as needed.

Note: For this exercise, please use a matrix labeled TOM-1088BMR-B. The lights should all be red. There may be a couple of green red 8X8 LED matrices floating around. These directions apply, but the particular columns and pins may differ.

After testing, you should have come up with the following configuration.
From left to right where the top right is labeled with a small one on the back and not all LED matrices have these.

TOP
R6  R3  C5  R1  C3  C2  R2  R4 (little tiny 1 is next to this pin)

BOTTOM
R8  C4  C6  R5  C1  R7  C7  C8

In some ways the data sheet is not helpful in that the labels show on the sheet with respect to pin number and column/row can be confusing.

Please use your numbering of columns and rows in conjunction with the values in Table 7-1 on page 131 to correctly connect your LED display. Remember too, that there may be a mistake in one line of the code downloaded off the internet and you want to compare the version in the book (correct) with the downloaded. The design will not display correctly without the adjustment to the code.