

## **[1.4] Importing and exporting PC data with the TI-89 / TI-92 Plus**

It can be useful to move data between a PC and the calculator. For example, you might want to make better data plots with a PC graphing program, from calculated results. Or you might want to download a large data set to the calculator for processing.

These suggestions apply to Windows PCs. Some tips for Mac follow.

Unfortunately, transferring data from a PC to the calculator is quite limited. There are only two types of data you can transfer from the PC to the calculator: text variables, and numeric matrices.

This tip comes from this TI document: <http://www.ti.com/calc/docs/faq/graphlinkfaq011.htm>

### ***Sending text variables to the calculator***

1. Create the text in some application.
2. Use the standard Windows commands to copy the data to the clipboard. Even if the program Copy command does not explicitly mention the clipboard, the application most likely places a copy in the clipboard.
3. In GraphLink, choose File, New, and select the Data File type.
4. Use Edit, Paste to paste your text into the new text variable window.
5. Change the variable name from 'untitled' to your desired name.
6. Choose File, Save As, and save the text variable as a .9xt file.
7. Finally, select Link, Send, choose the text variable, select Add, then OK. The text variable will be sent to the calculator.

About all you can do with this text variable is view it in the text editor.

### ***Sending matrix variables to the calculator***

Note that this tip does not work with GraphLink 2.1. TI has unfortunately removed the Tools, Import, ASCII Data menu item. It is no longer possible to send a matrix variable to the calculator. Hopefully TI will restore this feature in the future.

The basic principle is to convert the matrix data to a text file, then use GraphLink to import the file. The steps are:

1. Create a text file (.txt) that contains your data. The individual elements can be separated by spaces, commas, semicolons or tabs. From a spreadsheet, you can select the data range, then choose File, Save As, and select the text file type. The actual procedure depends on which spreadsheet you are using. If the PC application does not support saving data as a text file, you can copy the data to the clipboard, then paste it into a text editor such as NotePad.
2. In GraphLink, select Tools, Import, ASCII data. Choose the .txt file and select OK.
3. GraphLink shows a Save As dialog box. Save the file as a .9xm file, with a name that you choose.
4. GraphLink opens a new data window showing the matrix. If it looks correct, you can send the matrix to the calculator with Link, Send.

The GraphLink Import function is smart enough to recognize that the E character means exponential notation. If the text file data rows don't have the same number of elements, the matrix is created by padding the short rows with '0' elements.

If you are sending variables to use the linear regression functions or other statistics functions, use *NewData* to convert the matrix to a data variable.

### **Creating a matrix variable program with a spreadsheet**

If you have a PC spreadsheet program such as Excel or Lotus 123, it can be used to create an ASCII text program which will create the matrix on the calculator. The data to be sent is arranged in the spreadsheet columns, and another column contains text strings and spreadsheet formulas which create the calculator matrix elements from the data in the spreadsheet cells.

The basic steps are:

1. Import the matrix data in the spreadsheet.
2. Enter the spreadsheet formulas which create an ASCII program in a spreadsheet column.
3. Cut and paste the ASCII program to a text editor, and save it as a text file.
4. Use GraphLink to import the ASCII program and send it to the calculator.
5. Run the program to create the matrix.

I will first describe the method for an Excel spreadsheet, then show how it is done with Lotus 123.

First, put the matrix data in the spreadsheet starting at column A, row 7. If your matrix has more than one column, put the remaining matrix columns in spreadsheet columns B, C and so on.

Enter the ASCII program in an empty column. I will use column E as an example. Spreadsheet column E will contain the matrix creating program, in text form. Start by entering these text strings:

cell E1:	\start92\ \comment= \name= <i>prgm_name</i> (replace <i>prgm_name</i> with the program name) \file= <i>prgm_name</i> .TXT ( Prgm
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Cell E7 is a spreadsheet formula that creates a TI-Basic instruction, which in turn creates the first matrix row. If the matrix has three columns, contents of cell E7 are

```
+="[&TEXT(A7,"###.#####")&","&TEXT(B7,"###.#####")&","&TEXT(C7,"###.#####")&"]"
&"/->/matrix_name"
```

The formula is entered as one line, not two as shown. Replace *matrix\_name* with the name of the matrix variable you want to create on the calculator. The three TEXT functions convert the contents of cells A7, B7 and C7 to text strings. The "###.#####" strings convert the cell contents to numeric strings, with six fixed decimal places. The string "/->/" is the ASCII TI-Basic equivalent for the *store* operator. For example, if *matrix\_name* is *mat1*, and the contents of cells A7, B7 and C7 are 10, 20 and 30, then this formula creates the string

```
[10.000000,20.000000,30.000000]/->/mat1
```

Cells E8 and subsequent cells (one for each matrix row) define a formula which augments each additional matrix row. For a three-column matrix, cell E8 is

```
+="augment(matrix_name;"
&"["&TEXT(A8,"###.#####")&","&TEXT(B8,"###.#####")&","&TEXT(C8,"###.#####")
&"]&")/->/matrix_name"
```

If A8, B8 and C8 are 40, 50 and 60, then this formula creates the string

```
augment(mat1:[40.000000,50.000000,60.000000])/->/mat1
```

which augments the row [40,50,60] to *mat1*.

In the two cells in column E following the last *augment()* expression, enter these two strings to create the program footer:

```
EndPrgm
\stop92\
```

This table shows the spreadsheet to create a 3x3 matrix. The TI-Basic program name will be *makemat()*, and the matrix will be called *mat1*.

	A	B	C	D	E
1					\start92\
2					\comment=
3					\NAME=makemat
4					\file=makemat.TXT
5					()
6					Prgm
7	10	20	30		[10.000000,20.000000,30.000000])/->/mat1
8	40	50	60		augment(mat1:[40.000000,50.000000,60.000000])/->/mat1
9	70	80	90		augment(mat1:[70.000000,80.000000,90.000000])/->/mat1
10					EndPrgm
11					\stop92\
12					

Now copy the program in column E (from the \start92\ to \stop92\ ) and paste it in a text editor, such as Windows NotePad. Save the text file as makemat.txt. In GraphLink, choose Tools, Import, ASCII Program, and open makemat.txt. Send the file to the calculator and run it. The program *makemat()* can be deleted after the matrix is created.

To create the matrix program in Lotus 123, different formulas are required in cells E7 and E8. The formula for cell E7 is

```
+ "["&@STRING(A7,6)&","&@STRING(B7,6)&","&@STRING(C7,6)&"]"&"\->\xyz"
```

and the formulas for cells E8 and below are

```
+ "augment(xyz;"&"["&@STRING(A8,6)&","&@STRING(B8,6)&","&@STRING(C8,6)&"]"&
"\->\xyz"
```

The @STRING() function replaces the Excel TEXT function, and the format code of '6' specifies six fixed decimal digits. Otherwise, the functions are the same.

While this method works, there are some limitations. Different formulas are required depending on the number of matrix columns. You cannot use exponential notation formatting in the spreadsheet formulas, because the calculator will interpret the 'E' as a variable, instead of the exponent prefix. This is a serious limitation, but you can use the text editor 'Replace' command to fix the exponents.

You can also use this method to transfer list data to the calculator.

*(Credit to Stuart Dawson)*

### ***Exporting data to PC applications from the calculator***

This is a simple matter of opening the variable in GraphLink, choosing Edit, Select All, then choosing Edit, Copy. This copies the variable contents to the clipboard. From there, they can be pasted into the PC application.

Or, in GraphLink, use Tools, Export, ASCII data to save the variable contents as a text file.

### ***Importing and exporting with a Macintosh***

George Dorner offers these tips, if you are using an Apple Macintosh.

Moving pictures or data to a Mac:

This works as one would expect with drag and drop and copy/paste technology, first using Graphlink to create the variables of the correct type.

1. Create the text, matrix data, or graphic in the appropriate Mac application. I used SimpleText, a scanned Dilbert comic, and Graphic Converter to experiment.
2. Copy the selected data (command C).
3. Open a new variable of the appropriate type with Graphlink at File->New (or command N). (Use .9xm,.9xl,.9xg,.9xs for matrices, lists, pictures, or strings.)
4. Paste the data to the screen which opens.
5. Save As <yourname>.9xt for a text file for example.
6. Drag and drop the new file to Graphlink. If you are in Auto mode, numbers will be taken as floating point. Change to Exact mode first if you want integers.
7. Use the variable as needed.

To size and crop a picture I use the shareware Graphic Converter from Thorsten Lemke.

Moving data from the calculator to your Mac application.

1. Open the variable in Graphlink.
2. Select and copy.
3. Paste to the appropriate Mac application.

*(Credit to George Dorner)*