

## EAS 199B

## A Note on File Types

Word processors and spreadsheets store much more information in documents than what you directly enter by typing. Data about font selection, text formatting, spreadsheet formulas, etc. are also stored in the file that you create with the “Save” command. This information is invisible when you open the document or print it, although the *effect* of some of that invisible information, such as font selection or size is evident in the appearance of the document.

MATLAB m-files and Arduino programs are stored as *plain text*, meaning that the file only contains the text (characters) that you see when you look at the program. MATLAB and the Arduino IDE do not use formatting instructions or any information other than the text of the program. Therefore, when working with MATLAB m-files or Arduino programs, it is important to keep the files in plain text format. Do not open and then save Arduino programs or m-files with Word, or other word-processors.

Data files used by MATLAB and Arduino IDE must also be plain text files. The software engineers at Microsoft have actually made it intentionally confusing to save plain text data from Excel. First, you must use the “Save As...” command (there is no “export” option), and then you must work to uncover the options for two types of files that can be read by other applications: tab-delimited text files and CSV or Comma Separated Value files.

### Tab-delimited text files

A tab-delimited text file is appropriate for storing tables of numbers. Each row in the table should have the same number of columns. The columns are separated by an invisible tab character ('\t'). When the data is read by MATLAB, the tab signifies a new column.

As an example, the following table is an excerpt of an Excel spreadsheet of data from a pump curve measurement sav

h (cm)	m (g)	dt (s)	Vmotor (V)	Imotor (A)
35.6	145	15	11.98	0.370
71.1	92	15	11.98	0.380
20.3	167	15	11.98	0.385

If the data in the preceding table is stored in an Excel spreadsheet and then exported to a CSV file, the contents of the CSV file would contain the following text

```
h (cm) m (g) dt (s) Vmotor (V) Imotor (A)
35.6 145 15 11.98 0.370
71.1 92 15 11.98 0.380
20.3 167 15 11.98 0.385
```

The misalignment between the header row and the data is an artifact of the location of the tab stops in the word-processor. Regardless of the appearance, values in all adjacent columns are separated by one tab character.

## CSV files

A Comma Separated Value file (CSV file) is useful for storing tables of information with mixed text and numbers. For example, the following table lists part numbers. The table could appear in a Word-processing document or a spreadsheet.

Part Description	Part Number	Length (cm)	Shipping Weight (g)	Material
3mm Socket head cap screw, 2cm long	11002-03-200	2	0.2	steel
3mm Socket head cap screw, 3cm long	11002-03-300	3	0.26	steel
1cm stand-off	22003-01	1	0.11	aluminum

If the data in the preceding table is stored in an Excel spreadsheet and then exported to a CSV file, the contents of the CSV file would contain the following text

```
Part Description,Part Number,Length (cm),Shipping Weight (g),Material
"3mm Socket head cap screw, 2cm long",11002-03-200,2,0.2,steel
"3mm Socket head cap screw, 3cm long",11002-03-300,3,0.26,steel
1cm stand-off,22003-01,1,0.11,aluminum
```

Notice that in the second and third row, the part description is surrounded by quotation marks. The quotation marks are necessary because there is a comma in the part description. Throughout the document (which is in CSV format, after all), commas are used to separate contents of columns. Whenever a column value contains a comma, the entire value in the column is enclosed in quotes. When the column value does not contain a comma, no quotes are necessary.