

EMTP/EMTPWorks input output files

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EMTPWorks and EMTP require a number of files for accomplishing various data handling tasks. There are temporary or scratch files, intermediate data files and main files. This document presents the list of main files and related usage. The provided information can be useful in some specific tasks accomplished by the user for maintaining data, comparing simulations or more advanced manipulations.

1 Input and Output files

The main file names are based on a root naming system and project directory.

The top level file is the design file: *mydesign.ecf*. It can have any name, but must have the extension **ecf**. This file contains all the information on a given design and links to other data files optionally used by some devices.

The design file name constitutes the root name on which all generated file names are based.

The following table provides information on files automatically generated by the simulation process.

Name	Function	Location
<i>mydesign.net</i>	The Netlist file. Created at simulation startup by EMTPWorks and used by EMTP as an input file.	Design file directory.
<i>mydesign_pj</i>	Project directory. Created automatically the first time the Netlist file is generated.	Design file directory.
<i>mydesign.out</i>	Output log file. Various information, error and warning messages. Recreated at each simulation.	Project directory.
<i>mydesign.html</i>	The output HTML. Various information on the simulation. Top access to other HTML files: top HTML file. Overwritten at each simulation.	Project directory.
<i>mydesignss.html</i>	Steady-state solution HTML file. Referenced from the top HTML file. Created when a steady-state solution exists. Not deleted when the steady-state solution is cancelled in a subsequent simulation of the same case.	Project directory.
<i>Mydesingss.xml</i>	Steady-state solution XML file. Referenced from scripts for access to steady-state solution.	
<i>mydesign_machines.html</i>	Contains calculated data for machines. Referenced from the top HTML file. Created only when a design contains electrical machines.	Project directory.

<i>mydesignm.m</i>	ASCII plot file for standard simulation waveforms (scopes) or base case in statistical analysis: Main Plot file. Provides content information on the related binary file. This file must be selected by the plot package to show waveforms. Overwritten at each simulation with scope requests.	Project directory.
<i>mydesign.mda</i>	Binary file associated to <i>mydesignm.m</i> . Contains simulation waveform (scope) data in binary format.	Project directory.
<i>mydesignms.m</i>	ASCII plot file for statistical analysis cases: Statistical Plot file. Provides content information on the related binary file. Overwritten at each simulation with statistical analysis options.	
<i>mydesigns.mda</i>	Binary file associated to <i>mydesignms.m</i> . Contains statistical simulation data (min and max scopes) in binary format.	Project directory.
<i>mydesignX.m</i>	ASCII plot file for simulation number X . These files are created for an option requesting to save all simulation waveforms during a statistical analysis.	Project directory.
<i>mydesignX.mda</i>	Binary file associated to <i>mydesignX.m</i> .	Project directory.
<i>mydesign_lf.html</i>	Load-Flow solution HTML file. Referenced from “Show Load-Flow” device in “options” library. Created when a Load-Flow solution exists. Not deleted when the Load-Flow solution is cancelled in a subsequent simulation of the same case.	Project directory.
<i>mydesignlf.xml</i>	Load-Flow solution XML file. Referenced from scripts for access to Load-Flow solution.	
<i>mydesign_lf.dat</i>	“Load-Flow solution data file” for Load-Flow devices. This is an ASCII file. Needed by EMTP when the “Start from Load-Flow solution” option is selected. Also used to load data into data forms in EMTPWorks.	Project directory.
<i>mydesign_dev_lf.dat</i>	Load-Flow solution data file (“Device Load-Flow data file”) for some non-Load-Flow devices that must perform computations at the completion of the Load-Flow solution.	Project directory.

2 File tag and the Copy option

The “I/O FILES” device, which is also accessible from the menu “Simulate>Advanced>View Output Files...”, provides a list of the most important files and makes them accessible through hyperlinks. It also provides a “Copy” option to allow preserving the Main Plot file and the Statistical Plot file. The “Copy” option is based on tagging. The user must enter a tag name which is used by EMTPWorks for making a copy of the tagged file. The tag is concatenated to the root name for creating the copied file name. The associated binary file is copied automatically and named in the new ASCII plot file.

The tag can be used in some devices, such as MPLOT, for referring to the tagged file. The tag “_new”, for example, refers to the file *mydesign_new.m*.

3 Main Plot file format

The plot file is the file that contains the waveforms for the selected scopes. It is available for frequency scan and time-domain simulations. It is made of two files. The first file is an ASCII file, it is the Main Plot ASCII file. It contains a reference to the binary file where scopes are saved and provides information on the contents of that file.

3.1 ASCII format

The format of the Main Plot file can be explained by showing an example. The file resulting from the simulation of the design “syst.ecf” is named “systm.m” and has the contents:

```
filn='syst.mda';
t=1;
precision='float64';
t_max=0.30000000000E-01;
n_scopes=15;
n_time_scopes=1;
Ntime='time';
time=1:1:1;
n_vn_scopes=1;
Nvn='BUS1';
vn=2:1:2;
n_ivs_scopes=1;
Nivs='AC1';
ivs=3:1:3;
n_vb_scopes=6;
Nvb='AC1';
Nvb=strvcat(Nvb,'R1');
Nvb=strvcat(Nvb,'SW2Sub/SW2');
Nvb=strvcat(Nvb,'SW1');
Nvb=strvcat(Nvb,'SW3');
Nvb=strvcat(Nvb,'ZnO1');
vb=4:1:9;
n_ib_scopes=2;
Nib='RLC3';
Nib=strvcat(Nib,'ZnO1');
ib=10:1:11;
n_p_scopes=2;
Np='AC1';
Np=strvcat(Np,'ZnO1');
p=12:1:13;
n_control_scopes=2;
Ncontrol='zenergy';
Ncontrol=strvcat(Ncontrol,'zpower');
control=14:1:15;
```

- ❑ The syntax is compatible with MATLAB and that is why this file has the extension “m”. It is called the MCAT file format.
- ❑ The first line is the reference to the attached binary file: “syst.mda”. The variable “filn” is a string.
- ❑ The second line is a variable for indicating the type of simulation. In this case, “t=1;” means that the plot file contains time-domain waveforms (scopes). The x-axis is time.
- ❑ The following line presents the precision of the real numbers used in the binary file. The default is double-precision (8 bytes per real number). The double-precision flag is ‘float64’.
- ❑ The “t_max” variable gives the maximum simulation time selected for this design.
- ❑ The variable “n_scopes” is equal to the total number of scopes available in the binary file. It is the number of columns of data in the binary file. It also signals the start of the scope groups for identifying the scopes.

- The following lines provide the scope groups, names and locations in the binary file.

The method used for identifying the scopes is based on grouping the scopes according to scopes types. The generic template is:

“N_typename_scopes=” gives the number of scopes of this type (in this group).

“Ntypename=” provides the scope names in this group. It is a column vector of strings created using one or more lines. The keyword “strvcat” means vertical concatenation.

“typename=” provides the column numbers for locating the scope column vectors in the binary file.

For scopes of type “control”, it is apparent in the above file that the selected scope names or the “control” scopes are: ‘zenergy’ and ‘zpower’. The scope ‘zenergy’ is located at the column 14 in the binary file. The scope ‘zpower’ is located at the column 15 of the binary file.

The currently available scope types are listed in the MPlot device MATLAB code file “plottype.m”.

The Statistical Plot file contains extra information related to statistical analysis. The following file “systms.m” is created for “syst.ecf” for the statistical analysis option. Partial listing of “systms.m”:

```

filn='systs.mda';
precision='float64';
statistical=1;
t_max=0.30000000000E-01;
n_simulations=200;
n_scopes=35;
n_simulation_scopes=1;
Nsimulation='simulation';
simulation=1:1:1;
n_t_stat_scopes=3;
Nt_stat='SW2Sub/SW2';
Nt_stat=strvcat(Nt_stat,'SW1');
Nt_stat=strvcat(Nt_stat,'SW3');
t_stat=2:1:4;
n_t_stat_real_scopes=3;
Nt_stat_real='SW2Sub/SW2';
Nt_stat_real=strvcat(Nt_stat_real,'SW1');
Nt_stat_real=strvcat(Nt_stat_real,'SW3');
t_stat_real=5:1:7;
...

```

- The field “statistical” indicates a statistical case. The first column of the associated binary file contains the simulation numbers.
- The field “n_simulations” provides the total number of simulations performed in this case.
- The rest is identical to the Main Plot file, but different variable groups are used.

The frequency domain file format is slightly different since it must provide magnitude and phase for each scope. A partial listing of the frequency domain file “testscanm.m” is given below.

```

filn='testscan.mda';
f=1;
precision='float64';
n_scopes=33;
n_frequency_scopes=1;
Nfrequency='frequency';
frequency=1:1:1;
n_vn_scopes=3;
Nvn='BUS13L';
Nvn=strvcat(Nvn,'M2');
Nvn=strvcat(Nvn,'M3');
vnmag=2:1:4;

```

```
vnang=5:1:7;
n_is_scopes=2;
Nis='SW1';
Nis=strvcat(Nis,'SW2');
ismag=8:1:9;
isang=10:1:11;
...
```

- ❑ The variable “f” signals a frequency domain plot file. The first column of the associated binary file holds frequency.
- ❑ The scope groups provide the scope names, but instead of only one column pointer variable, there are two column pointer variables. The first one locates magnitudes (“mag”) and the second one locates angles (“ang”).

3.2 Binary format

The binary file is created using the Fortran-95 write method. It has as many columns as scopes. Data rows are written at each simulation time-point, frequency or simulation number. The Fortran-95 write method precedes and ends each row of data by 4 bytes.