

CUSTOMER SUPPORT NOTE

Extracting Stiffness, Mass and Damping Matrices

Note Number:	CSN/LUSAS/1020
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This support note is issued as a guideline only.

The logo for LUSAS, featuring the word "LUSAS" in a bold, white, sans-serif font with a slight shadow effect, set against a blue gradient background.

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1. Introduction

This support notes provides information on extracting stiffness, mass and damping matrices from LUSAS Solver.

2. Description

Follow the steps below to extract the stiffness, mass and damping matrices for a model.

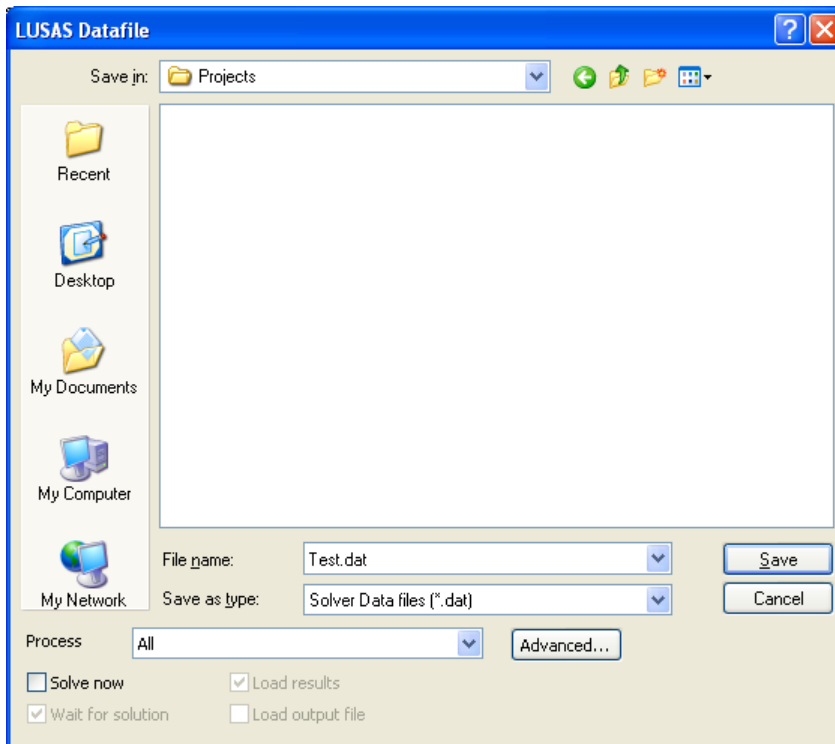
1. Set the analysis control to Eigenvalue

This will force the mass matrix to be computed. One loadcase and one eigenvalue should be sufficient in the analysis.

2. Tabulate a data file for the model

Select menu item File > LUSAS Datafile and ensure 'Solve now' is unticked. Click Save.

A file will be created with the extension .dat.



3. Open the data file created in (2) in a text editor

The data file is in text format and can be opened in any text editor, such as Notepad.

4. Add `SYSTEM` and `DEBUG` commands to the data file

Add the lines in bold to the beginning of the data file.

```

C LUSAS solver datafile
C Created by LUSAS 14.6-3 - Modeller Version 14.6.1650.13141
C Created at 12:39 on Wednesday, December 07 2011
C (C) Finite Element Analysis Ltd 2011

```

```

SYSTEM
  SOLVER = 2
EXIT

```

```

DEBUG
  ASMMAT 4
EXIT

```

```

PROBLEM TITLE No title set
UNITS N m kg s C

```

5. Save and close the data file
6. Create a shortcut to the Solver batch file

Create a shortcut to the file C:\LUSAS14x\Programs\Lusas_S.bat on the desktop.

7. Open a DOS command window
8. Set the number of OMP threads to 1

In the DOS window, type the following line and press the return key.

```
SET OMP_NUM_THREADS=1
```

9. Drag and drop the shortcut created in (6) onto the DOS window, followed by a space
10. Drag and drop the edited data file onto the DOS window and press the return key
11. The data file will be solved by Lusas Solver and three new files will be generated in the working folder.

```

*_stmat.dat    – contains the stiffness matrix
*_mamat.dat    – contains the mass matrix
*_damat.dat    – contains the damping matrix

```

Note that mass and damping matrices are only output if they exist.

Sample output for the stiffness matrix is as follows.

GLOBAL STIFFNESS MATRIX FOR XXXX IN COMPRESSED COLUMN STORAGE FORMAT.
ENTRIES ARE SHOWN AS COLUMN : ROW : VALUE.
SYMMETRIC MATRIX - ONLY THE LOWER HALF IS STORED (AND SHOWN).
RESTRAINED EQUATIONS REMOVED FROM MATRIX (ROW AND COLUMN NUMBERS ALTERED
ACCORDINGLY).

	6	14	
1	1		106.9683333333
1	2		-43.89666666667
1	3		-54.4683333333
1	4		13.89666666667
1	5		1.00000000000
2	2		139.70666666667
2	3		8.896666666667
2	4		10.2933333333
3	3		71.9683333333
3	4		21.1033333333
3	6		1.00000000000
4	4		39.70666666667
5	5		0.000000000000E+00
6	6		0.000000000000E+00