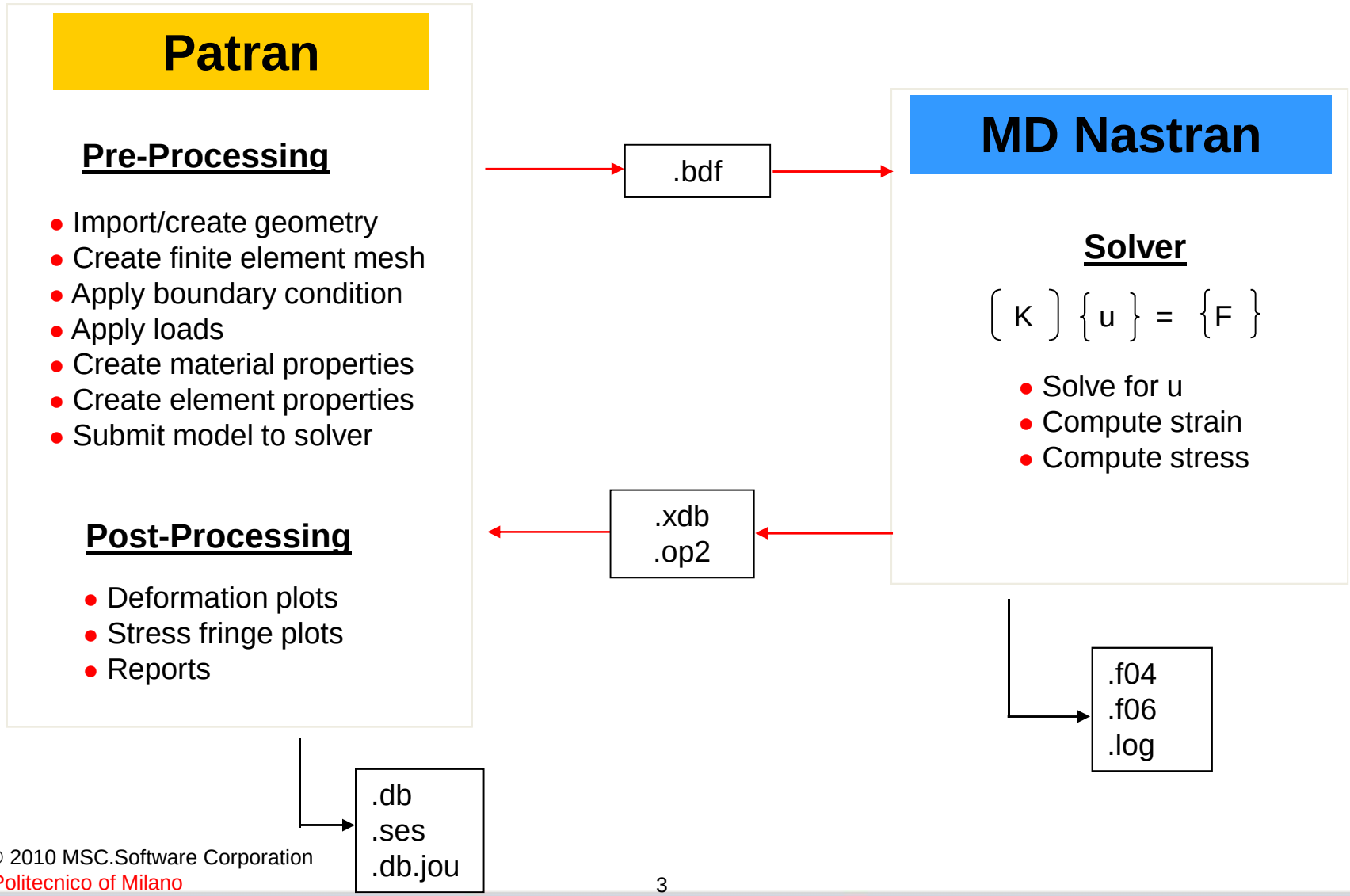
MD NASTRAN INPUT

PATRAN-NASTRAN WORKFLOW AND FILES



BASIC PATRAN FILES

File Extension	File Type	Comments
.db	Database	One per model
.ses	Session File	A Session File is opened at Patran start-up and it is closed when you quit Patran.
.db.jou	Journal File	One per model. Record of all PCL commands from database creation to present. Concatenated session files. EXTREMELY useful for rebuilding a database.

BASIC MD NASTRAN FILES

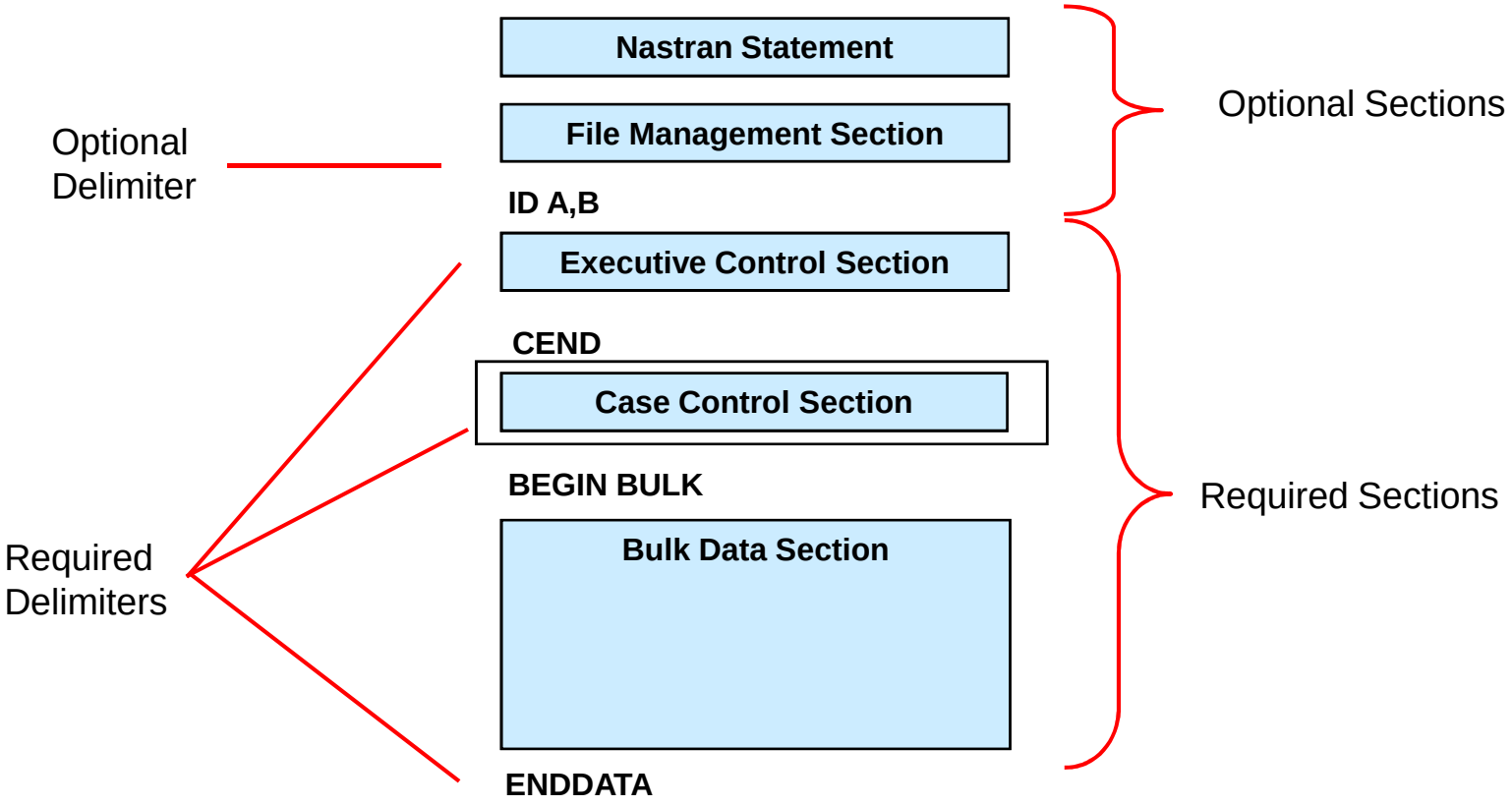
File Extension	File Type	Comments
.bdf	Input File	Contains model definition. Popular extensions are .bdf and .dat
.f06	Results File	This is the main Nastran output file. It contains the results of your analysis such as displacements and stresses. It is in ASCII format so it can be viewed in any text editor. It also contains warning messages, error messages, and diagnostic messages to help the user evaluate the quality of the analysis results.
.f04	Execution Summary File	Contains a time history of job execution.
.log	Operating System Log File	
.op2	Results File	Used by Patran for post processing.
.xdb	Results File	Used by Patran for post processing.

THE MD NASTRAN INPUT FILE

- The two files which contain the finite element model definition are
  - The Patran database file
  - The Nastran input file
- The Nastran input file is useful in a number of ways:
  - Can be viewed and edited in any text editor
  - Can include comments to document modeling assumptions and changes
  - Allows the user to add entries which are not supported in Patran
  - Useful in debugging a model

ORGANIZATION OF THE NASTRAN INPUT FILE

- The Nastran input file is arranged in five sections:



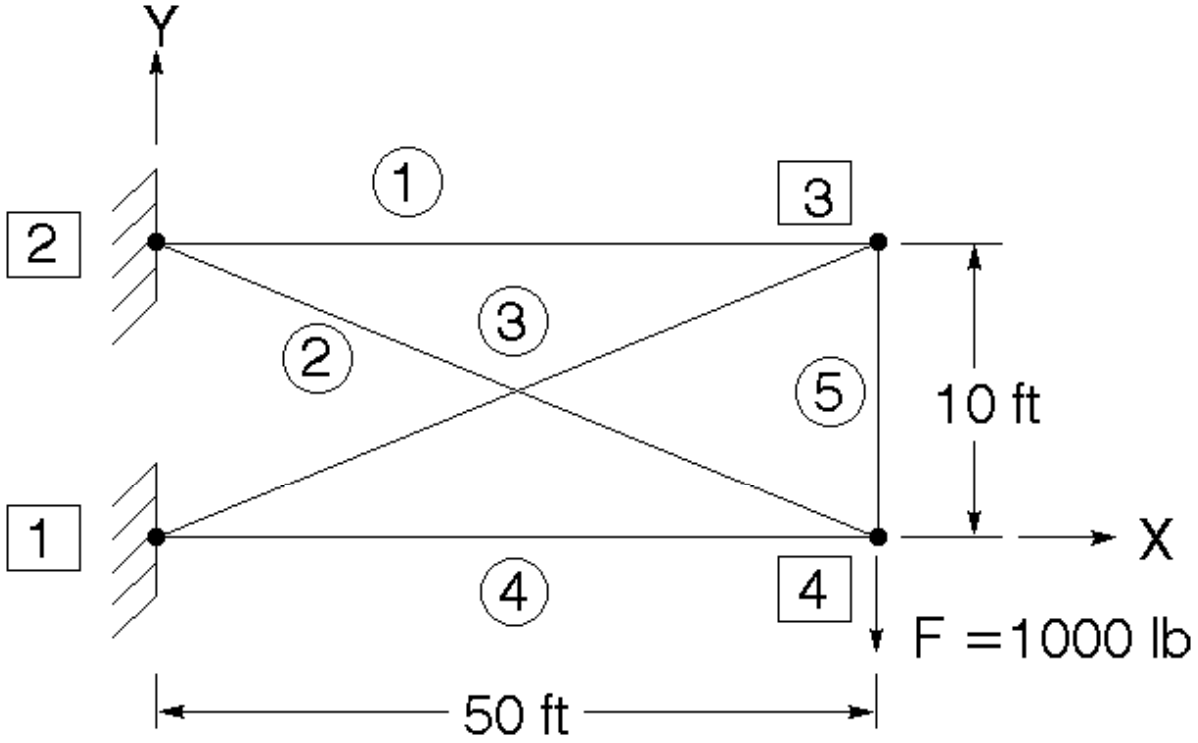
NASTRAN INPUT FILE SECTIONS

- Nastran Statement – Used to modify system defaults. Not needed in most runs.
- File Management Section – Allocates files, controls restarts and database operations
- Executive Control Section – Solution type, time allowed, program modifications, and system diagnostics
- Case Control Section – Requests Output and selects Bulk Data items such as loadings and constraints to be used
- Bulk Data Section – Model definition, loadings, and boundary conditions

NASTRAN INPUT FILE DELIMITERS

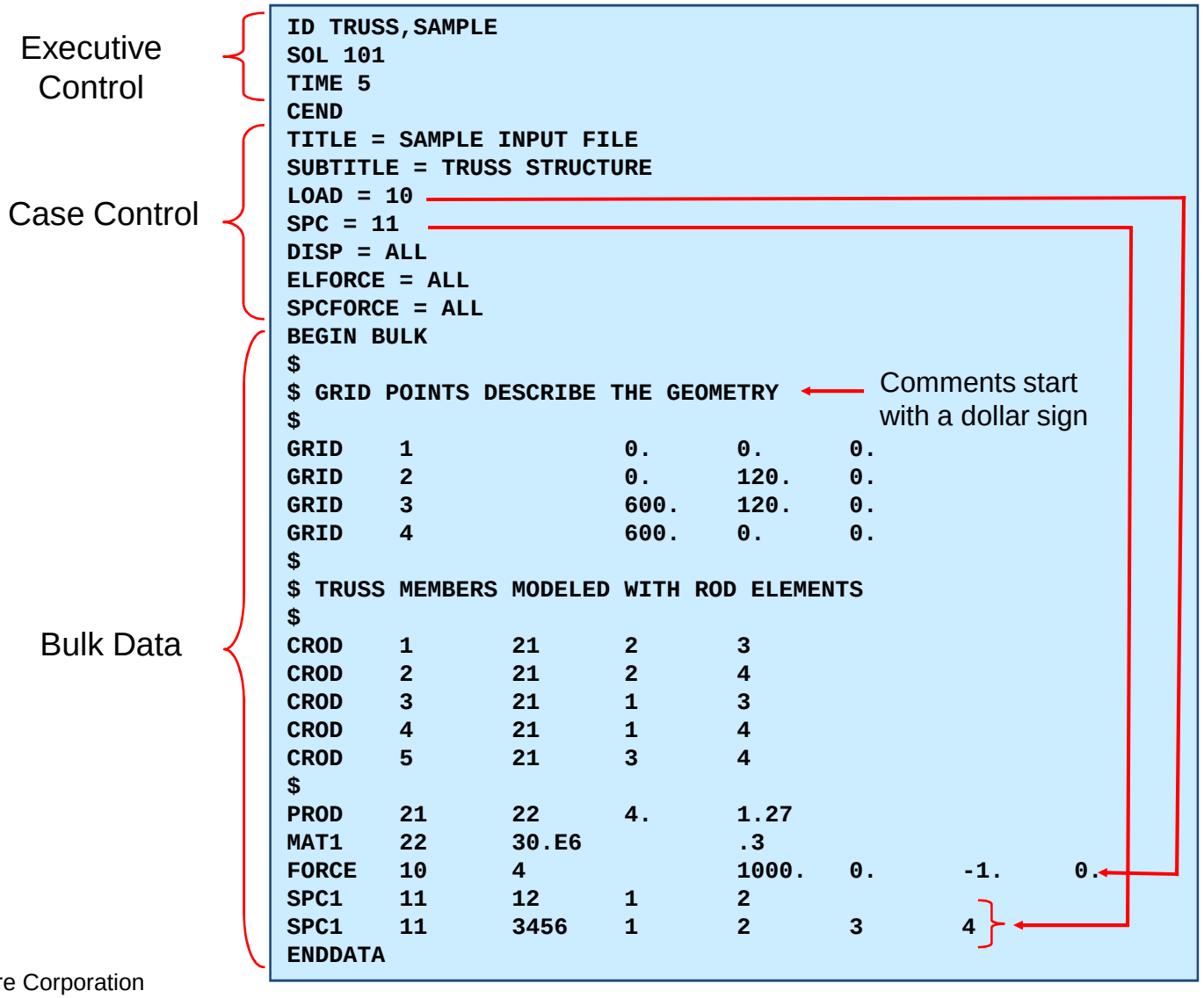
- The delimiters are
  - ID A,B — First statement in Executive Control Section
  - (optional)
  - CEND — End of Executive Control Section, beginning of Case Control Section
  - BEGIN BULK — End of Case Control Section, beginning of Bulk Data Section
  - ENDDATA — Last entry in the input file

SAMPLE MODEL



E = 30x10^6 psi ν = 0.3 A = 4.0 in^2 J = 1.27 in^4

NASTRAN INPUT FILE OF SAMPLE MODEL



THE BULK DATA SECTION

- The Bulk Data Section contains all data necessary for describing a structural model
- Each item described in the Bulk Data section is called an Entry
- The Bulk Data entries are not required to be input in any order

FORMAT OF BULK DATA ENTRIES

- Each Bulk Data entry has a specific pre-defined format and purpose (described in the MD Nastran Quick Reference Guide, Section 5)
- Shown below is the CROD entry description from the Quick Reference Guide:

CROD Rod Element Connection

Defines a tension-compression-torsion element.

Format:

1	2	3	4	5	6	7	8	9	10
CROD	EID	PID	G1	G2					

Example:

CROD	12	13	21	23					

Field	Contents
EID	Element identification number. (Integer > 0)
PID	Property identification number of a PROD entry. (Integer > 0; Default = EID)
G1, G2	Grid point identification numbers of connection points. (Integer > 0; G1 ≠ G2)

FORMAT OF BULK DATA ENTRIES (Cont.)

- Each line contains 80 columns
- A Bulk Data entry may span multiple lines
- There are three data formats
  - Integer
  - Real
  - Character String
- Each field in a particular entry has a required data format. See the Quick Reference Guide for the correct format.

FORMAT OF BULK DATA ENTRIES (Cont.)

- Following representations of the real number 123.4 are numerically equivalent and acceptable to MD Nastran:

123.4	1.234+2	1.234E2	12.34E+1
0.1234E3	.1234E3		

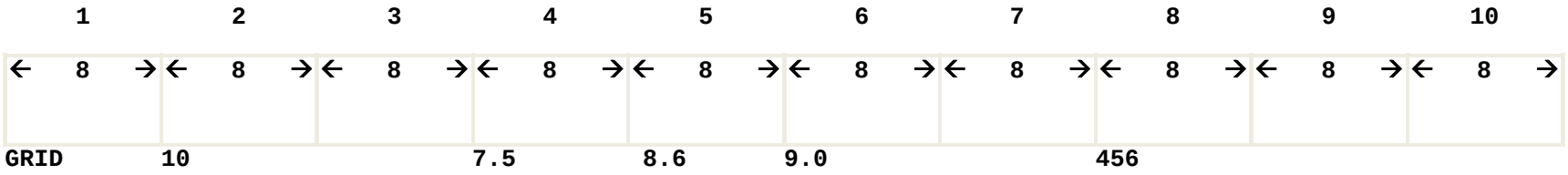
- Real numbers must be entered with a decimal point. Integers must be entered without a decimal point.

FIELD FORMAT

- Each Nastran input file line contains 80 columns. There are three field formats for entering data in these 80 columns:
  - Small Field Format
  - Large Field Format
  - Free Field Format

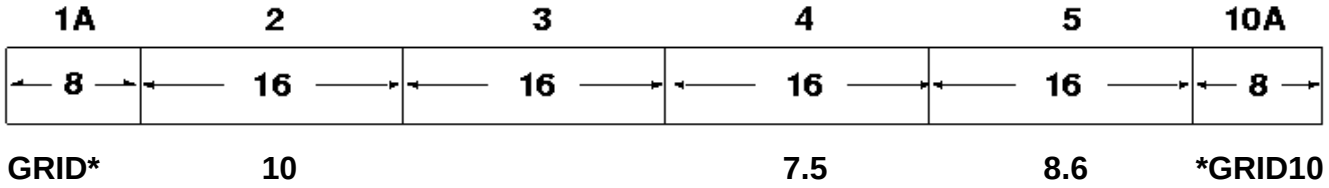
FIELD FORMAT (Cont.)

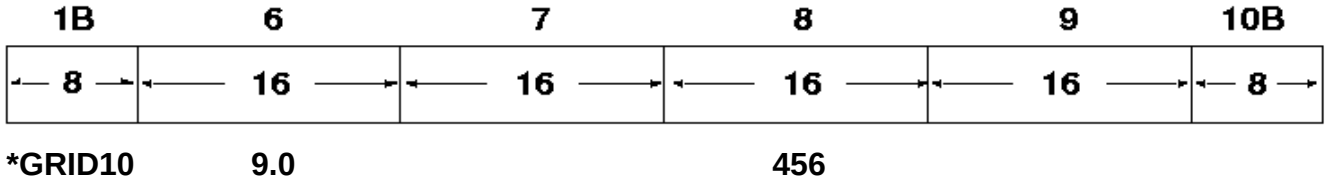
- Small Field Format
  - Each line is divided into 10 fields
  - Each field is 8 columns wide



FIELD FORMAT (Cont.)

- Large Field Format
  - A high degree of accuracy is required in some MD Nastran applications. The large field format is used when the small field format does not provide enough significant digits.
  - An asterisk after the keyword signifies large field format.





FIELD FORMAT (Cont.)

- Free Field Format
  - Fields are separated by commas or blanks (commas are strongly recommended)
  - To skip a field, use two commas in succession
  - Integer numbers or character strings with more than eight characters cause a fatal error
  - Real numbers with more than eight characters are rounded off and will lose some precision

    Example:

    GRID,10,,7.5,8.6,9.0,,456

CONTINUATION ENTRIES

- Many input entries require more than one line of input
- If this is the case, then “continuation” entries must be used.
- Continuation entries may be generated automatically when the entries are in sorted order. The parent entry may be blank in columns 74-80 (field 10), and the continuation entry may be blank in columns 2-8 (field 1). For small field entries, the first column of the continuation entry may be blank or contain a + symbol. For large field entries, the first column of the continuation entry must contain a * symbol.

CONTINUATION ENTRIES (Cont.)

- Input rules
  - Unless you use automatic generation, a (+) or (*) is required in column 1, field 1 of a continuation entry. The remaining contents in field 1 of a continuation entry must be identical to the entry in field 10 (columns 2 through 8) of the parent entry (or the preceding continuation entry).
  - Any entry in the first column of field 10 on the parent entry is ignored by the continuation entry
  - Small field and large field continuation entries may be used together in defining a single data item entry
- An example of the use of continuation is shown in the next slide

CONTINUATION ENTRIES (Cont.)

- Two methods of entering a MAT8 entry with continuation are shown below:

Method 1

MAT8	171	30.+6	1.+6	0.3	2.+6	3.+6	1.5+6	0.056	+M101
+M101	28.-6	1.5-6	155.0	1.+4	1.5+4	2.+2	8.+2	1.+3	+M102
+M102	1.-4		1.0						

Method 2

MAT8	171	30.+6	1.+6	0.3	2.+6	3.+6	1.5+6	0.056	
	28.-6	1.5-6	155.0	1.+4	1.5+4	2.+2	8.+2	1.+3	
	1.-4		1.0						

GENERAL INPUT FORMAT RULES

- Input data items in fields 1 and 10 must be left justified. Input data in fields 2 through 9 do not have to be left or right justified.
- Error results if data extends beyond its field into another field.
- Input data items must not have any embedded blanks.
- All real numbers, including zero, must contain a decimal point.
- Many fields have default values. If these fields are left blank, the default values will be used (See the Quick Reference Guide).