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# 1. FUSION PRO Hardware and System Requirements

## 1.1 Hardware Requirements

Computer:	Pentium PC (Pentium III recommended)
Memory:	Minimum of 64 MB RAM (128 MB recommended)
Disk Drive:	CD-ROM Drive
Hard Disk Space:	40 MB for installation. 200 MB free disk space available for file swapping.
Pointing Device:	Microsoft mouse or compatible pointing device.
Monitor:	VGA or higher resolution monitor compatible with Microsoft Windows.

## 1.2 Supported Operating Systems

- Microsoft Windows 98 Second Edition
- Microsoft Windows 2000, Service Pack 2 or later
- Microsoft Windows NT 4, Service Pack 6 or later

## 1.3 Operating System Component Requirements

- Microsoft Internet Explorer 4.01 SP2 or later (Installer is on the FUSION PRO software CD)
- Microsoft® Data Access Components (MDAC), version 2.5 (Installer is on the FUSION PRO software CD and the software will be install automatically as needed.)

## 2. New Features

New features in the software are categorized to indicate whether the feature is FUSION PRO specific (PRO) or takes effect in both FUSION PRO and FUSION ONE (BOTH).

### 2.1 FUSION 7.3.12

**BOTH Historical Data Archiving** – previously enabled just for the method of steepest ascent (MSA), this feature allows you to keep a historical record of every cycle of experimentation associated with a single project. Whenever you generate a next-cycle experiment, whether or not you are in the MSA mode, the program will ask if you want to archive the current design and associated response data prior to generating the new design. If you answer yes the program will automatically move the current design and associated response data to the Historical data grid within Activity 1 of Module 2 prior to clearing the file and generating the new experiment design.

### 2.2 FUSION 7.2.2

**BOTH Method of Steepest Ascent (MSA)** – Powerful integration of Design of Experiments (DoE) and sequential experimentation methods for rapid product development and optimization. This unique capability lets you (1) generate a quick screening study to identify a “direction” of presumed improvement, (2) create and carry out a Step design ( a series of experiment runs along the direction of presumed improvement) until no further improvement is achieved, then (3) run a new screening study.

If the new screening study indicates that more work is needed, you can create and carry out a new Step design along a new direction of presumed improvement. If the new screening study indicates that the system can be optimized within the new study ranges of the variables, then you can efficiently convert the screening study into an optimization study.

**BOTH Dispersion Effects Analysis** - Most D.o.E. analyses focus on isolating and quantifying experiment variable mean effects. Software programs use regression or ANOVA analysis, coupled with the appropriate hypothesis tests, to identify important variables in terms of their mean effect on the response. However, these analyses do not estimate the effects of the variable on product stability or quality variation. These effects are called dispersion effects.

A variable identified as not having a significant mean effect from a standard regression or ANOVA analysis may still be an important effector in terms of dispersion effects. Without this information, the experimenter may prematurely dismiss a variable that has important effects on product stability or quality. This capability enables the experimenter to estimate the effects of experiment variables on product stability and quality variation in replicated and unreplicated two-level factorial designs.

**BOTH OLE Automation - Microsoft® Word and Excel** – The OLE automation links Fusion Pro directly with Word and Excel. It enables you to embed a Word document and an Excel workbook within a FUSION PRO file. For OLE automation to work properly, you must have the native application (Word or Excel) installed on your computer.

The embedded document and workbook are fully functional. You can directly enter and edit text, data, images, formulas, graphs, etc. within the document or workbook. You can also open other Word documents and Excel workbooks and copy and paste the contents into the embedded document or workbook.

## 2.3 FUSION 7.0.1

- BOTH **Lab Notebook Interface** – elegant, streamlined interface that tremendously simplifies the experiment design process. The LN provides direct entry and editing of study variable data, better organization of reports and tools, and simplified software operation.
- BOTH **Optimization Overlay Graphs** – 2D process contour or mixture ternary overlay graphs are now produced for all design types. Graph options include Color, Grayscale, and Black & White. These graphs visualize the variable level setting combinations that simultaneously meet or exceed all response optimization goals.
- BOTH **Split-plot Experiments** - fully automated design and analysis of split-plot experiments for process designs and combined mixture-process designs. This experiment design type enables the experimenter to correctly address variables that have a restriction on randomization. They provide accurate estimates of variable effects while avoiding Type 1 and Type 2 errors associated with effects estimation that can otherwise arise.
- BOTH **Plackett-Burman Designs** – highly fractionated 2-level designs used for screening and method validation.

## 2.4 FUSION 6.7.0

- PRO **Mixture Trace Plots** – this graph type is now produced for response surface graphics. These are 2D line graphs that present a slice, or trace, of the mixture ternary surface along each of the three mixture variable axes. Each trace is a line running from the baseline to the apex of a mixture variable axis that passes through the geometric center of the ternary surface graph.
- BOTH **Normal and Half-normal Probability Plots** – plots are now produced that display the experiment variable effects against a normal or half-normal probability line. The plotted probability line has drag-and-drop mobility. The plots are updated each time the analysis model is updated and the data are re-analyzed.
- BOTH **Response Data Transformation Graph** - a graph is now produced along with the table of the nonlinear data test results. The graph displays the relative improvement in the model prediction error obtained when the response data are transformed prior to analysis for each available transformation.
- PRO **Mixture Ternary Response Surface Graphs** – this graph type is now produced for both design quality graphics and response surface graphics. These 3D response surface graphs can be rotated on the X, Y, and Z axes, and also contain a projection of the 2D ternary contour graph on the X-Y plane.
- BOTH **Single Response Series Graphics** – the trellis graphs are now normalized to a common Z-axis (response axis) scale. The lowest and highest predicted response values obtained for all level setting combinations of the graphed and trellis (conditioning) variables correspond to the lower and upper bounds, respectively, on the normalized Z-axis scale.
- BOTH **Design and Response Graph Edits** – changes made to design matrix quality and response graphs using the 2D or 3D Chart Control Properties dialog, including rotation of the 3D view, are now automatically communicated to the “thumbnail” display graphics. These updates are also saved when you save the file.
- BOTH **Optimizer Wizard** – the Response Variable Goals dialog now lets you select one, two, three, or four sigma confidence limits as the limits reported along with each predicted mean response.

### 3. Known Issues

Known issues in the software are designated as FUSION PRO specific (PRO) or common to both FUSION PRO and FUSION ONE (BOTH). Known issues are identified with a control number used to track the problem in S-Matrix's development control system. [The control numbers of resolved issues are shown in Blue text. Resolution information is also presented in Blue text and identifies the first version that contains the fix.](#)

#### 3.1 FUSION 7.3.12

#1293 BOTH Data Entry Mining Activity - Matrix Master: the variable bounds and level settings text boxes within the Independent Variable Settings dialog box will accept entries that are greater than double precision (number boxes) or greater than 32 characters (alphanumerics).

#### 3.2 FUSION 7.2.2

#898 BOTH Create a Design Activity - Lab Notebook: the variable bounds and level settings text boxes will accept numbers that are too large or too small (e.g. -1.2E-14 and 1.2E14 or -1.4E-16 and 1.4E16).

#952 PRO Data Entry Mining Activity - Matrix Master: editing any design (X) variable data deletes all multi-component constraints without notifying the user.

#1005 BOTH Create a Design Activity - Lab Notebook: the Tab key and the tab behavior of the Enter key can cease to function when the user toggles between active Windows applications. However, the Enter key will still function to input data.

#1176 BOTH Create a Design Activity - Lab Notebook: the text box settings do not copy to the Windows clipboard using the Cntrl+C keyboard Copy function. However, a right-mouse click when a text box has the focus brings up the Copy, Cut, Paste functions.

### 3.3 FUSION 7.0.1

- #730 PRO Design Graphics Activity - certain mixture designs containing a Mixture-within-Mixture multi-component constraint raise a “Division by Zero” error message during graph generation. [Fixed in version 7.2.](#)
  
- #778 PRO Create a Design Activity - a “Division by Zero” error message occurs during design generation for certain model-robust mixture-process designs when the design model is edited to remove all interaction effects and an inverse term is added to the design model. [Fixed in version 7.2.](#)
  
- #990 BOTH Data Entry Mining Activity - Matrix Master: editing any design (X) variable data removes the formatting for all X variable columns. After Matrix Master is run, the formatting is re-applied for each X column based on the number in the column with the most decimal places. [Fixed in version 7.2.](#)
  
- #1129 BOTH Overlay Graphics Activity - graphed variable names in the selection list boxes do not include the coded variable designators (e.g., A, B, C, ...). [Fixed in version 7.2.](#)
  
- #1131 BOTH Data Analysis Activity - the analysis reports for a given response will not update if Matrix Master is run, the user goes immediately to the Automated Optimizer activity and performs an on-demand analysis of the response as part of optimization, then returns to the Data Analysis activity. [Fixed in version 7.2.](#)
  
- #1137 PRO Create a Design Activity - Lab Notebook: adding a multi-component constraint and then canceling the design wizard does not delete the multi-component constraint. [Fixed in version 7.2.](#)
  
- #1154 BOTH Data Entry Mining Activity - the Format Column dialog will add numeric formatting to categorical columns when certain formatting is applied (e.g. selecting the Bold text formatting option). [Fixed in version 7.2.](#)
  
- #1160 BOTH Data Analysis Activity - Split-plot analysis: if a given response is analyzed and the analysis model is then updated in the Custom Model Builder, re-analyzing the data launches the Analysis Type dialog with two options: Split-plot Regression and Standard Regression. The pointer remains in the hourglass mode while this dialog is displayed even though the pointer is active. [Fixed in version 7.2.](#)

### 3.4 FUSION 6.7.0

- #762 BOTH Newly added responses were not being made available for inclusion in Module 3 – Activity 2, Multiple Response Series, and in Module 4, Optimization. [Fixed in version 7.0.](#)
- #790 BOTH Deleting the row label column (the first column) in the Design Matrix (Module 2 – Activity 1) was not causing the matrix to become unreconciled. [Fixed in version 7.0.](#)
- #792 BOTH Deleting two variables from the Design Matrix and then running Matrix Master caused all reduced response data to be deleted from the data reduction columns. [Fixed in version 7.0.](#)
- #799 BOTH The Pareto Chart in Data Analysis (Module 2 – Activity 2) now plots variables by their relative rank. [Fixed in version 7.0.](#)
- #800 BOTH Program crash at startup if “schema.dat” file exists in Windows Temp folder. [Fixed in version 7.0.](#)
- #804 BOTH Deleting an entire row of data in the Response Data Entry Dialog (Module 2 – Activity 1) corrupted the reduced data set for that response. [Fixed in version 7.0.](#)
- #814 BOTH When loading a file with third-order/f(x) terms, term states were sometimes being restored improperly. [Fixed in version 7.0.](#)
- #819 BOTH Inserting and designating columns in the Design Matrix (Module 2 – Activity 1) caused Matrix Master to produce errors. [Fixed in version 7.0.](#)
- #820 BOTH When run numbers were associated with specific rows in the Design Matrix, those run numbers were permanently associated with those rows. Run numbers can now be assigned in any way the user chooses and the row order will not be affected. [Fixed in version 7.0.](#)
- #824 BOTH The Non-linear Data Statistics Report in Data Analysis (Module 2 – Activity 2) was not printing completely under certain circumstances. [Fixed in version 7.0.](#)
- #826 BOTH When loading a previously saved file in which the rows in the Design Matrix had been randomized, the Row Labels and Observed Responses for Experimental Error Statistics and Residual Tables were mismatched. [Fixed in version 7.0.](#)
- #833 BOTH Rotating a 3-dimensional Design Graph in the Chart Editor caused a rapid reduction in system resources. [Fixed in version 7.0.](#)
- #846 BOTH When data in the Design Matrix were in Scientific Notation, Matrix Master produced the following error: “Error 9 - Subscript out of range”. [Fixed in version 7.0.](#)

### 3.5 FUSION 6.6.0

- #463 PRO Model Robust design generation was not using the correct number of center points when a block variable was present. [Fixed in version 6.7.0.](#)
- #625 PRO Mixture ternary charts do not include constraint lines . [Fixed in version 6.7.0.](#)
- #658 BOTH User is now prevented from saving the active file over an existing file that is also open.
- #664 BOTH User could turn off all model terms within the Design and Analysis model editors, raising “Error 9 - Subscript out of range”. User is now not allowed to turn off all the terms. [Fixed in version 6.7.0.](#)
- #695 PRO The center points were missing and the model was incorrect when internal blocking was selected for a model-robust mixture design. [Fixed in version 6.7.0.](#)
- #710 BOTH If a constant variable was defined, “Error 11 – Division by zero” occurred when invoking the Graphics Wizard or the Optimization Wizard. [Fixed in version 6.7.0.](#)
- #729 PRO Matrix Master is now verifying that each run has allowable levels within any defined multiple constraint. [Fixed in version 6.7.0.](#)
- #733 BOTH If all rows were deleted when running Matrix Master, the Independent Variable Settings Wizard, or the Multiple Component Constraints Wizard, “Error 9 - Subscript out of range” was being generated. Currently, the software prevents the deletion of all rows. [Fixed in version 6.7.0.](#)
- #735 BOTH Canceling an analysis when a Custom Model has been initialized sometimes caused Custom Model to become inaccessible. [Fixed in version 6.7.0.](#)
- #736 BOTH Deleting a response was not clearing the Optimization Report. [Fixed in version 6.7.0.](#)
- #737 PRO In Single Response Series, when producing multiple Mixture Ternary charts, an error was being generated at the end of the Graphics Wizard for each chart after the first one. This error was “Error 457 – This key is already associated with an element of this collection Variables.Add”. This error was occurring during validation of the mixture graph settings and had no effect on the generation of the charts, unless the graph variable settings were invalid. [Fixed in version 6.7.0.](#)
- #738 PRO The Optimizer Wizard would not optimize, given the starting point level settings, if the design contained mixture variables and at least one of the mixture variables was constant. [Fixed in version 6.7.0.](#)
- #739 PRO Generating new graphics in an old file (from FUSION ONE file or the example files) containing graphics raised an “Error 5 – Invalid procedure call or argument”. [Fixed in version 6.7.0.](#)
- #740 PRO Generating a Repair design for a two variable model-robust process screening design sometimes raised “Error 11 - Division by zero”. [Fixed in version 6.7.0.](#)
- #745 PRO Unable to save a chart to file using the Chart Editor Print function. [Fixed in version 6.7.0.](#)
- #749 BOTH Running Matrix Master for designs containing 10 variables sometimes raised an “Element not part of control array” error. [Fixed in version 6.7.0.](#)

- #752 PRO Loading a file that has a saved ternary graph in Design Graphics Quality sometimes raised “Error 5 – Invalid procedure call or argument”. [Fixed in version 6.7.0.](#)
- Incorrect contour level values in the legend in Design Graphics charts. [Fixed in version 6.7.0.](#)
- Loading a file that has saved ternary graphs in Single Response Series and/or Multiple Response Series sometimes displays graphs with no data. The cause was traced to analyses not being saved when automated analyses were being performed during the operation of the Graphic Wizard. [Fixed in version 6.7.0.](#)
- #758 PRO Clicking “Back” at the Graph Variable Settings dialog and then clicking “Next” at the Series Response Variables dialog raised “Error 380 – Invalid property value” during the operation of the Graphic Wizard for ternary graph generation. [Fixed in version 6.7.0.](#)
- #761 BOTH Performing automated analyses in Multiple Response Series directly after clearing all analyses (as in running Matrix Master) produced “Error 91 - Object variable or With block variable not set “. [Fixed in version 6.7.0.](#)

## **4. Installation**

### **4.1 Running Setup**

To start the FUSION PRO Setup program, follow the steps below.

1. Close all other applications.
2. Insert the FUSION PRO CD-ROM disk in your CD drive.

If you have the AutoPlay option enabled, FUSION PRO Setup will start automatically. Follow the Setup instructions on the screen.

If the AutoPlay option is disabled, continue with Steps 3-5 below.

3. Click the Start button on the Windows Taskbar. Select the Run ... menu option.
4. Type “d:\setup.exe” into the textbox within the Run dialog box (this assumes your CD-ROM drive is the D drive).
5. Follow the Setup instructions on the screen.

### Armadillo Software Protection System – FUSION PRO 7.3 and beyond

Starting with version 7.3 of FUSION PRO Professional, every installation of the product is a fully operational demonstration version of the software with a 45 evaluation window. Customers can register the software with S-Matrix using the Technical Support information listed below and receive a registration key that will permanently unlock the software. This information is also provided in the reminder dialog that appears upon startup of the software (note: the reminder dialog will not appear once the product is permanently unlocked.).

### **4.2 Internet Explorer Installation**

The FUSION PRO software requires Microsoft® Internet Explorer (IE), version 4.01 SP2 or later. Version 5.01 of IE is located in the **IE501** folder on the FUSION PRO software Installation CD. During FUSION PRO installation, if the program detects that you either do not have IE installed, or if your version of IE is below 4.01 SP2, it will inform you that installation will be discontinued and instruct you to run the IE installation from the CD, reboot your computer, then again run the FUSION PRO Installation program.

### **4.3 MDAC Installation**

The FUSION PRO software requires Microsoft® Data Access Components (MDAC), version 2.5. If setup detects that MDAC version 2.5 or later is already present on your system, no changes will be made. Otherwise, MDAC version 2.5 will automatically be installed on your machine. You may be prompted to reboot and in that case the FUSION PRO setup will continue.

### **4.4 What Setup Does**

FUSION PRO Setup installs the files necessary to run FUSION PRO, along with tutorial example files and the help system. It prompts you for a folder in which to install the software, providing a default folder (typically, “C:\Program Files\S-Matrix\Fusion Pro”). You may accept the default folder or install to any folder accessible to you. The selected installation folder will be created if it does not already exist. Several subfolders will be created under the selected installation folder: “WS”, “Data”, and “Doc”. **THESE FOLDERS MUST NOT BE MOVED OR RENAMED, OR THE SOFTWARE WILL NOT OPERATE PROPERLY.**

Setup will create a program folder and place it on your Start menu. You may rename the program folder if you wish.

Setup will display a summary of your installation selections before copying the software to your hard drive.

After copying the software and documentation to your system, setup will add entries to the Windows registry and perform other updates to your system. You may be prompted to reboot your machine a final time after installation is complete. You **MUST** do so before running the software.

## **4.5 Contacting Technical Support**

If you encounter problems during installation and are not able to resolve them, telephone customer support is available between the hours of 8:00 a.m. and 5:00 p.m., Pacific Standard Time. The technical support number is (707) 441-0406. When calling, you should be at your computer with your FUSION PRO CD available. You should also have the following information ready:

1. Your name.
2. Your company name, address, and telephone number with extension.
3. The FUSION PRO product registration information.
4. The version of Microsoft Windows you are running and whether or not you are attached to a network.
5. The exact wording of any messages displayed on the screen.
6. A clear statement of what you were doing and what happened. If possible, the statement should include the exact sequence of operations that caused the problem.

You may also contact technical support via email at the following address:

`support@s-matrix-corp.com`

## **4.6. Uninstalling FUSION PRO**

To uninstall FUSION PRO, use the Add/Remove Programs feature accessed from the Windows Control Panel. To access the Windows Control Panel, click the Start button on the Windows taskbar and select the Settings option.

## 5. Getting Data Into FUSION PRO

Data are entered into FUSION PRO by one of three paths, depending on the nature of the data. These three paths are described below.

### Matrix Master Path

Use this path for **pasting in multiple columns of data from the Windows clipboard**. Also use this path when you are **importing a data table from a database file** using the Import Database File feature.

The Matrix Master wizard is located in the *Data Entry/Mining* activity grid within the Data Mining/Analysis module. Use this wizard to initialize historical matrices containing experiment variables and only a single column of test result data for each response. Matrix Master has the following content requirements for historical matrices:

1. For experiment variables, input only X matrix columns corresponding to main effects (linear effects) terms. Do not put in columns corresponding to computed effects such as quadratic effects. FUSION PRO will automatically compute these columns and append them onto the analysis-ready X matrix.
2. For categorical (non-numeric) variables, put in only one column for each variable with alphanumeric level settings for each level. Do not put in columns corresponding to the dummy variable conversion of the categorical variable. FUSION PRO will automatically convert the categorical variable into a dummy variable and add the dummy columns onto the analysis-ready X matrix.
3. One column of test result data for each response.

### Column Designator Path

You can enter **single columns of design or response data** at any time by pasting the column directly into the *Data Entry/Mining* activity grid within the Data Mining/Analysis module. Once the column is entered, use the Column Designator dialog box to designate the column as a Response (Y) data column. The Column Designator dialog box is accessed from the popup menu in the *Data Entry/Mining* activity grid.

### Response Reductions Path

You enter **response data that contain multiple test repeat columns** into the *Data Entry/Mining* activity grid using the Response Data Entry Setup dialog box. This dialog box is launched from the main toolbar using the Response Reductions command button. The Response Data Entry Setup dialog box lets you easily enter multiple columns of repeat measurements and automatically create computed response columns for analysis, including the mean, variance, standard deviation, and relative standard deviation.

## 6. Restoring FUSION PRO Files After Program Malfunction

During normal operation FUSION PRO creates a temporary database file for each open file. The temporary files are named “~tmp####.smxf”, where #### will equal 0001 (~tmp0001.smxf) for the first opened file, 0002 for the second opened file, and so on. The ~tmp0001.smxf temporary file is created by default each time the program is launched. They reside in a folder created in the Windows temporary folder.

The Windows temp folder can be found on any computer by launching the MSDOS PROMPT and typing the SET command. The SET command displays the Windows environment parameters of the operating system. Look for the statement “TEMP = <path>”, where <path> will be the actual directory path of the Windows temp folder (e.g. C:\WINDOWS\TEMP for Windows 95, 98, or C:\TEMP in Windows NT 3.5 or later).

For each invocation of FUSION PRO, a folder with a unique name will be created in the Windows temp folder to hold temporary files for that session. The temporary folders are named “SMX##.TMP” where ## will equal 1 for the first temp folder, 2 for the second, etc. When the program is terminated normally (i.e., when you exit), that session’s temp folder and all its’ contents will be removed.

If the program malfunctions (crashes), that session’s temp folder will not be removed. You can therefore recover from a crash by renaming the temporary file and copy it to your data folder or other location. Remember to maintain the .SMXF file extension. You should be able to open the renamed file after re-launching the program, unless the file is corrupted.

FUSION temp folders in the Windows temp folder that are older than two weeks will be detected and removed at system launch.

## 7. Component Version Checking

At startup, it is possible for FUSION Pro to perform a comparison of the versions of the dependency files it expects to find (i.e., the ones with which it was distributed) and the versions it actually finds. If any conflicts are encountered, a dialog box is presented detailing the differences. This version checking is currently suppressed via the addition of the parameter /v- to the command line for executing FUSION, as illustrated in the following command:

```
“C:\Program Files\S-Matrix\FusionPro\FusionPro.exe” /v-
```

You can modify the shortcuts used to launch the application to enable version checking by removing the “/v-“ from the command line of the shortcut. Navigating to the FusionPro directory in Windows Explorer and double clicking the Fusion Pro icon will also run the product with version checking enabled. This may be of use when attempting to diagnose runtime problems with FusionPro.