

Imagination to Realization

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**Panelization Process
Instruction Manual**

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Introduction

Scenario Design Inc. has developed a proprietary software package that has the capability to panelize any model in real time. The “Panelization Process” is the process in which digital full scale models are “panelized” to create actual data for the fabrication of a rebar infrastructure.

About this Manual

This manual provides detailed information of WireWorks 3D, which is a proprietary software developed by Scenario Design Inc. As an add on package, WireWorks 3D uses two fundamental design platforms to perform its specific functions. This manual provides a step by step procedure on how to get from conceptual 3D modules to wire framed structures.

About the Company

Scenario Design Inc. is a dynamic turnkey production company. We specialize in design development and specialty fabrication for one-of-a-kind structures and environments.

To take a leading position in our field we are using digital 3D modeling in our design department directly linked to digital machining. Our technology and process provides a precise, scalable means of developing and articulating individual designs quickly and cost-effectively.

Our Core strengths are our ability to transform ambitious designs into successful high-quality reality, the resources to deliver outstanding results on time and within budget expectations, and the passion and drive to meet and exceed expectations for performance and results.

We have the resources and experience to handle simultaneous multi-million dollar projects as well as the focus and care to produce on a much smaller scale.

Our goal is to extend the imagination of our clients by providing 21st century tools to realize their most ambitious design challenges.

Through the use of Building Integrated Management [SDI^{BIM}] and Integrated Product Delivery System [IPDS], Scenario Design Inc. has developed technologies to increase productivity and feasibility.

3D Studio Max / Solidworks / Wire Works 3D

Autodesk 3D Studio Max is a full-featured 3D modeling, animation, rendering, and effects solution that has produced top-selling games and award-winning film and video content.

Solidworks is a mechanical design CAD solution, providing the product design team with all the mechanical CAD, data management, and design validation tools that is needed in one package.

WireWorks 3D is a revolutionary plug-in that provides specific tools for the Rockwork Process. Through Panelization Technology, developed by Scenario Design Inc, this software package has surpassed the methodology of traditional Rockwork. WW3D has dramatically increased time, accuracy, and flexibility light years ahead of any process. WireWorks 3D is not just a tool, but it is the solution to any scale Rockwork project.

Intended Users

Wireworks 3D is a proprietary development add on to Autodesk 3D Studio Max and Solidworks. It is a new program that is easy to operate, but it assumes that you have basic skills for Windows, 3D Studio Max and Solidworks.

In this book you are introduced to automated 3D Panelizaion. You are given step by step procedures on how to panelize, generate bending data and Assembly drawings from a model.

System / Software Requirements

- Dual Quad Core Xeon Processor X5450 3.0 GHz or better
- 8GB DDR2 ECC SDRAM 667MHz or better
- nVidia Quadro FX 4600 768MB dual DVI
- 1GB available hard-disk space
- CD-ROM or DVD Drive
- 1024 x 768 or higher resolution monitor
- USB 2.0 for Software Key
- Windows XP x64 SP1 or Higher
- Autodesk 3D Studio Max 2009
- Solidworks 2008 SP4.0

WireWorks 3D

WireWorks 3D is a plug-in software platform that has been developed specifically for Autodesk 3D Studio Max and Solidworks. The base platform software(s) must be installed prior to installing the custom module.

WireWorks 3D Custom Module for 3D Studio Max & Solidworks (Module – *SDI Proprietary Software*)

This manual provides detailed information of WireWorks 3D, which is a proprietary software developed by Scenario Design Inc. As an add on package, WireWorks 3D uses two fundamental design platforms to perform its specific functions. This manual provides a step by step procedure on how to get from conceptual 3D modules to wire framed structures.

Installation

Use installation CD to load WireWorks 3D custom module for both applications. All files shall be installed into specific folders in which each base platform will reference from. Once all files have been installed, the add-on icons shall automatically be added to Autodesk 3D Studio Max & Solidworks 2008.

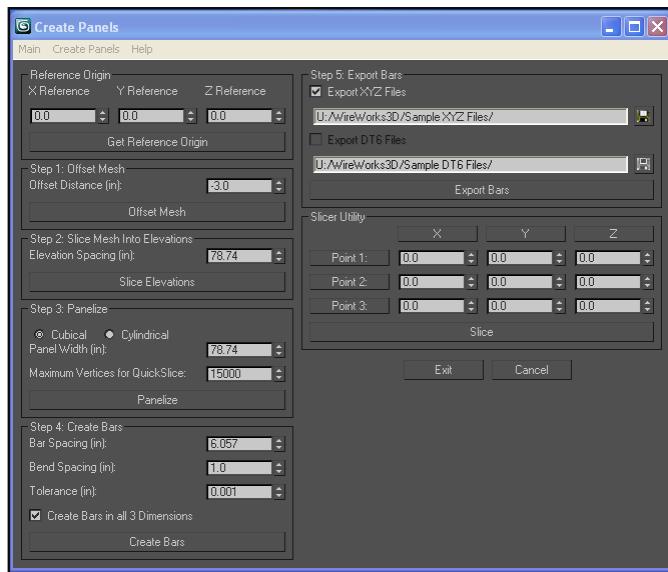
During operation, the WireWorks Icon  shall be added to the user interface of both platforms.

3D Studio Max – WireWorks 3D Module User Interface

Autodesk 3D Studio Max is the main platform used for the processing of a digital model. Many of the main operations in handling and manipulating data are done using this base platform. The WireWorks 3D Module that was developed for this platform has been seamlessly integrated. Providing dynamic functions that have the capability to take large file size models and automatically breaking the model down into the key components needed for fabrication.

Module Operation in 3DS Max

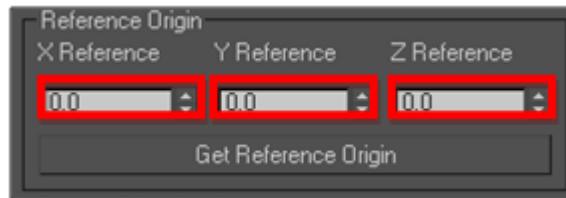
1. Double click Autodesk 3D Studio Max and wait until program has completely loaded.
2. Activate WireWorks 3D by opening MAXScript or selecting the WireWorks 3D icon .
3. MAXScript>MAXScript Listener
4. In MAXScript Listener - File>Open Script (locate Library.ms)
5. In the Library - Go to Tools>Evaluate All or hit Ctrl+E
6. On the Listener enter WW () – this command will run Wireworks and open the main user interface, click Create panels to see the commands that will be used.
7. The user interface contains the necessary functions from referencing to an origin to exporting the XYZ data needed. The user interface will pop up and the following menu will be displayed.



8. The WireWorks 3D interface is straight forward. The UI itself is setup in a step by step format to guide the user to produce the desired panels. The following topics shall explain each window thoroughly.

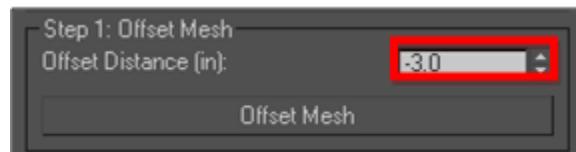
Referencing the Origin

Reference origin lets you input x, y, and z locations manually or you can pick it directly on the screen by using the “get reference origin” button. The Referencing function is used in order to set the Origin of the 3D module. The image below displays the section in which this function can be accessed.



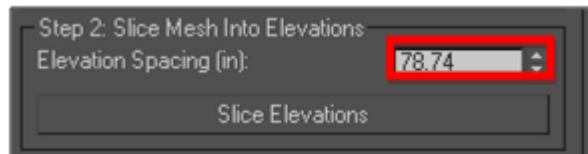
Offsetting Mesh

Offset Mesh is a 3D offsetting command that gives you the freedom to generate a gap from your original model. The user can set the distance that the generated bars will have from the original surface. This function is useful in order to accommodate for material that will be added to the rebar structure later during fabrication.



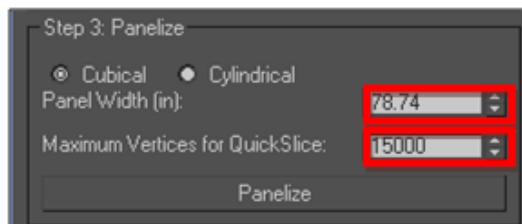
Slicing Elevations

The Slice Elevations command splits the model by elevations. The user can change the spacing of elevations by entering a value in this section, as seen below. Elevations are created as a standard for Scenario Design Inc., but this can be easily modified by application.



Panelizing

Panelizing is a term used & coined by Scenario Design Inc. Panelizing describes the process in which rebar/pencil rod cages are created. This command allows you to create panels from an elevation or from a model. This feature gives you the option to panelize your model either cubical or cylindrical. You can change the size of your panel by inputting the desired value on the dialog box. The maximum vertices for Quick Slice is an option to set the maximum vertices that you will let 3d max run through, the default is 15000 vertices. If it is more than 15000 wireworks 3d will use the hard drive to process the command.



Creating Bars

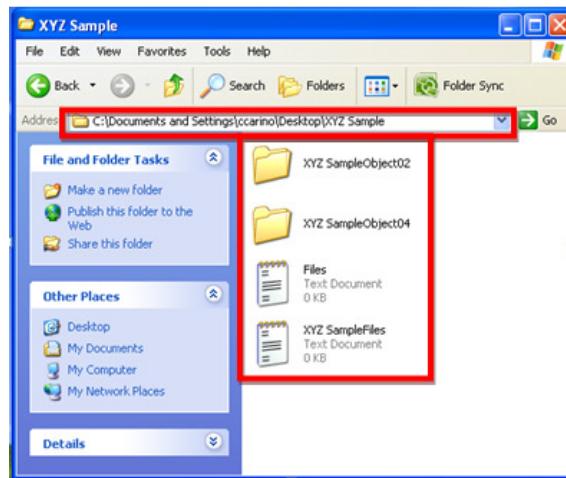
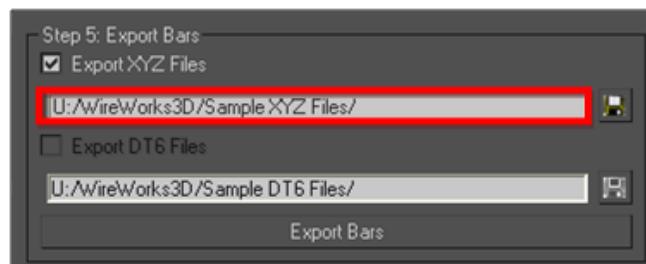
This command creates the bars from the model using the panel's XYZ coordinates. The bar spacing is the distance between bars within a single panel. The bar spacing will dictate the distance between bars as well as how many bars are contained in a single panel.

Bend spacing dictates the distance between bends.



Exporting Bar Data (XYZ)

This command lets you specify to which folder you want to export the XYZ data from the bars that you created.

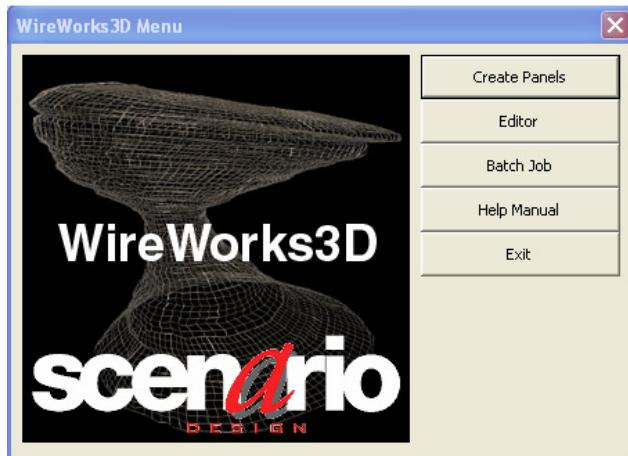


Solidworks – WireWorks 3D Module User Interface

Solidworks is the standard engineering tool used to perform support functions for the fabrication & build process. The WireWorks 3D Module works hand in hand with Solidworks as well. The integration of the WireWorks 3D Module to Solidworks is critical in order to perform the engineering functions required. Along with its engineering capabilities, it has the same capability of taking a solidworks model and panelizing it accordingly as 3D Studio Max. Historically, most models are made in the format that MAX is capable of using. Through our development and integration, any model can be used and panelized.

Module Operation in Solidworks

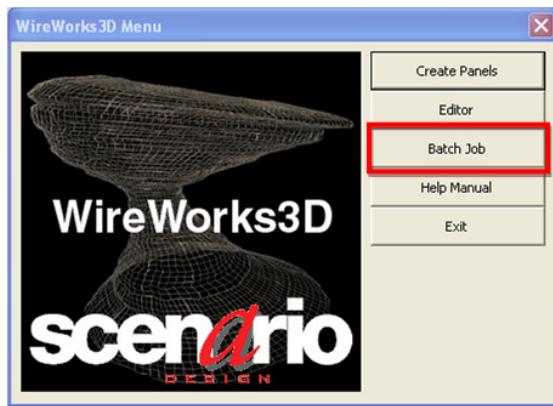
1. Double click the Solidworks icon and wait until the program is full loaded.
2. Wireworks 3D on SolidWorks
3. Wireworks is also used with Solidworks to generate individual and master models as well as Assembly Drawings. This is a good way to QC the bars on measurements and visualize how the bars will be oriented.
4. To run wireworks on Solidworks-
5. Go to Tools>Macro>Run
6. Locate the Wireworks3D.swp file and open it. This will run the WireWorks 3D Menu for Solidworks. As seen below.



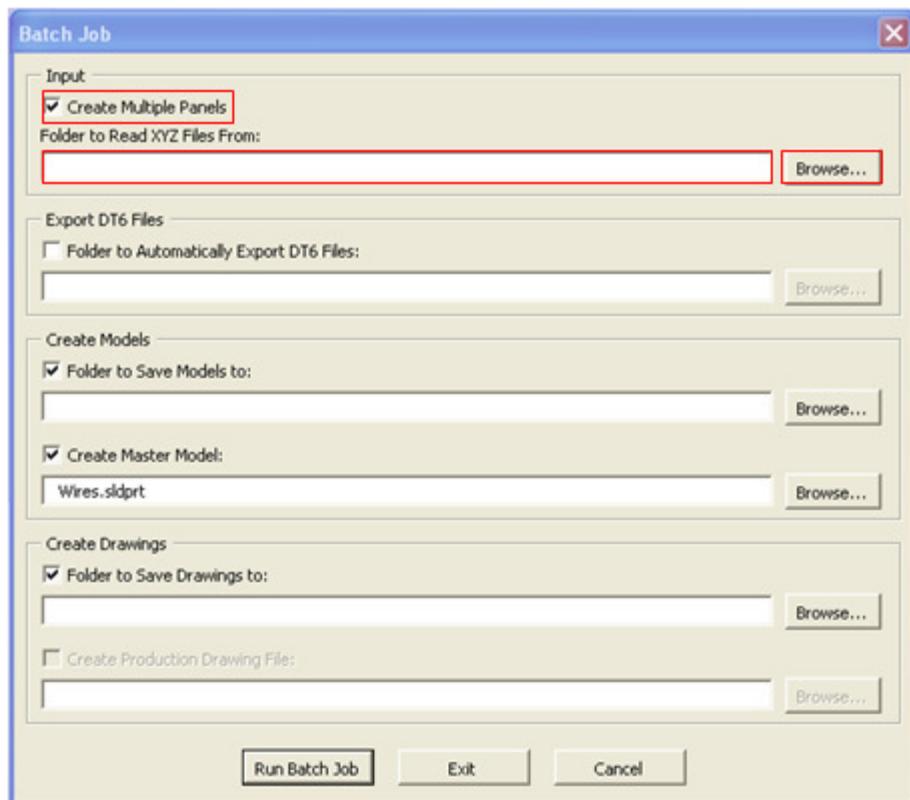
7. Menu Buttons:
 - Create Panels – Function used to panelize a Solidworks model
 - Editor – Function used to import data and recreate models
 - Batch Job – Function used to generate models, master models, & drawings
 - Help Manual – Help manual
 - Exit – To exit WireWorks 3D menu
8. The Batch Job button is the main function used to create models, master models, & drawings.

Create Models

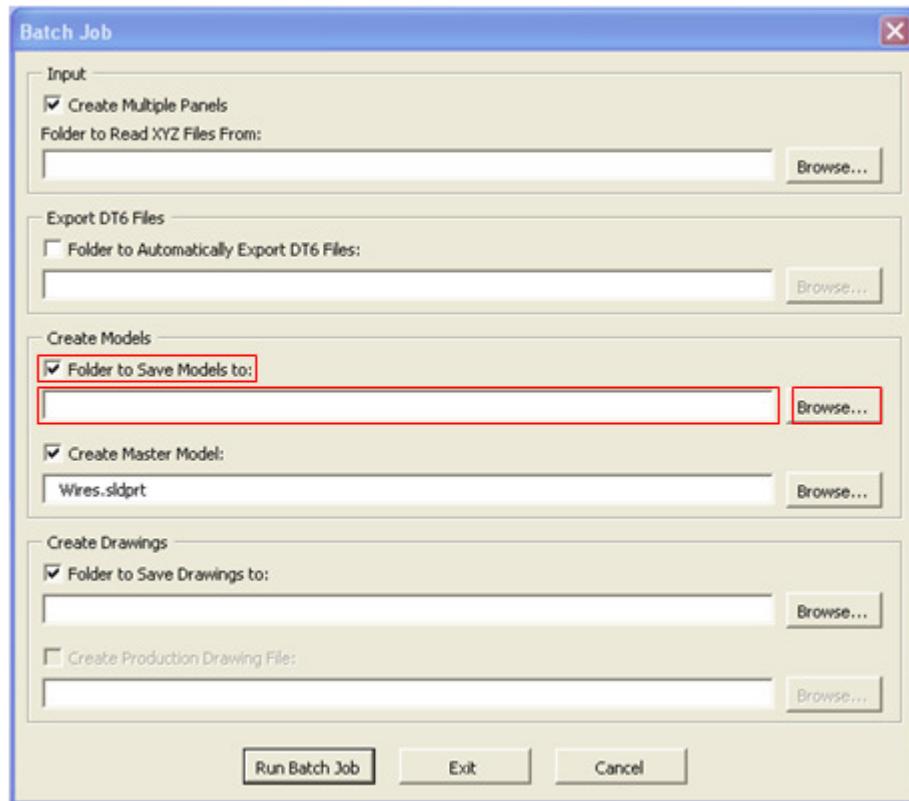
When ready, click the batch job button on the main menu and another menu will pop up for the specific functions.



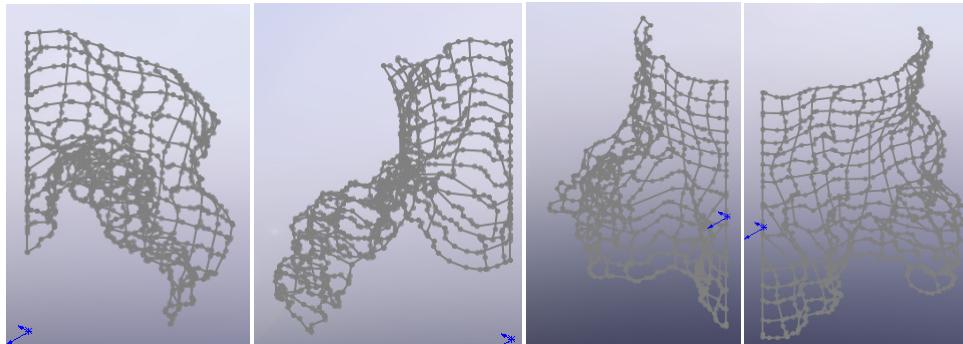
The very first function that must be set is the Input function, as seen below. This input is the data in which WireWorks 3D will reference. These are the files/data that were created in the 3D Studio Max portion.



Mark this checkbox to create model/models out of the files from the input. Provide the desired location where the model files are to be saved.

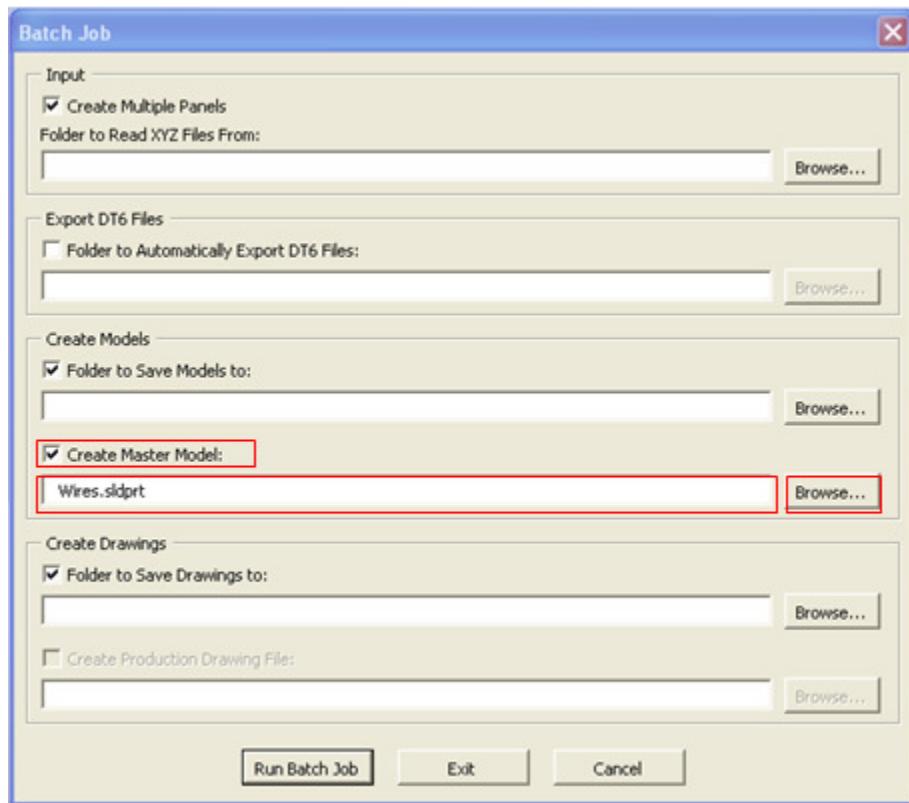


The images below are the 3D models that will be created in Solidworks in a sldprt format.

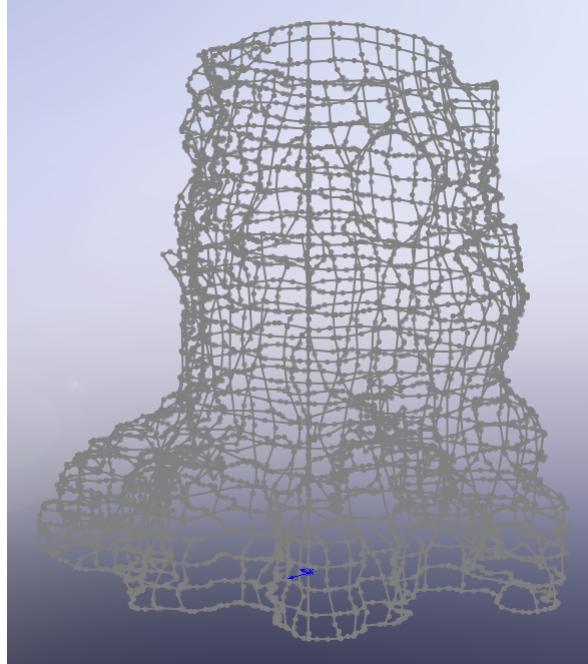


Creating Master Modules

This option will create and save a Master Model out of all the panels that was in the specified folder in the Input. A master model is an assembly model of all the parts reconstructed together.

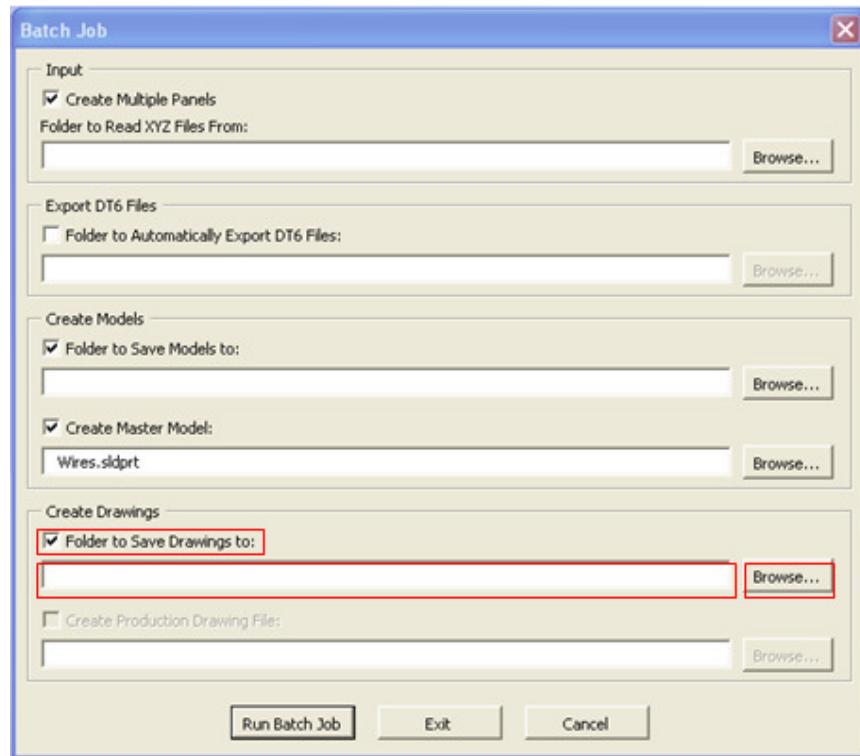


The image below displays the overall assembly, referred to as the master model.

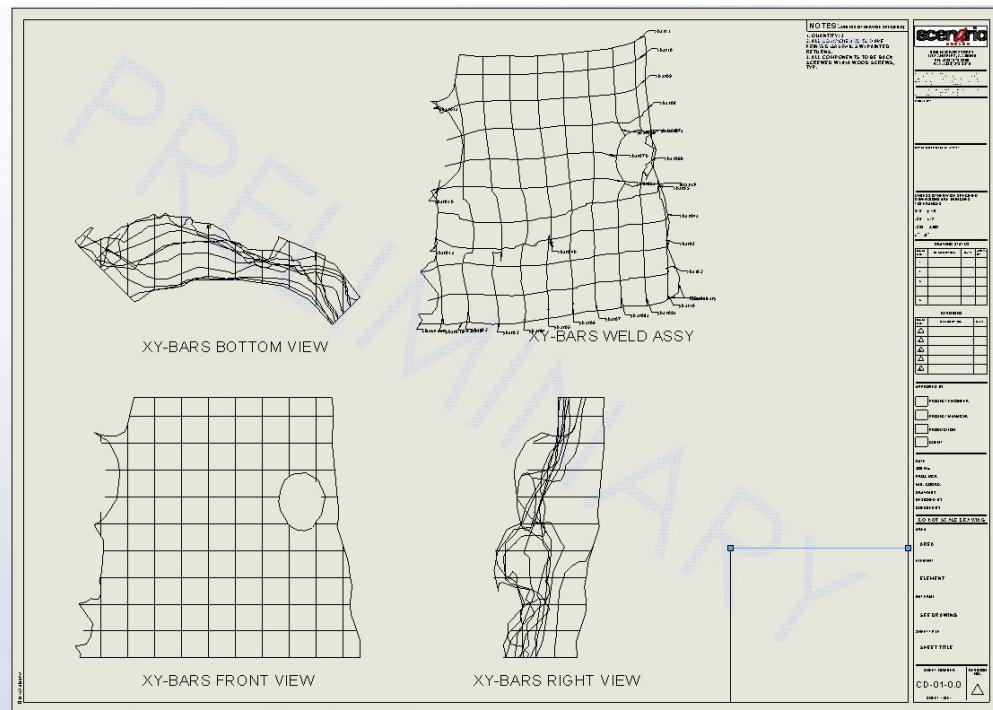


Generating Drawings

This Option will generate the drawing files from the XYZ data that was created. As seen below, once this option is checked there is another option in which to save these files into.



The image below is an example of the output that this function will generate [slldraw format].



Wire Bending

Machine Introduction

The 3 Dimensional Accuform Wire Bender is capable of bending round and shaped wire into complex three dimensional forms via Smart Editor. The High Speed Z axis arm rotates around the wire to bend at any third dimensional point.

Programming is done on an acoustic wave touch screen panel. The panel contains an industrial glass, eliminating wearing out the screen or tearing it from the repeated usage.

With its turret head design, the machine is capable of multiple radii on one tool, closed eye loops, removable pins, 2 bending pins to handle hard bends and generating radius.

Machine Components



Turtable / Material Payload

The turntable platform holds the material and dispenses accordingly. Unit is automatically controlled from main controller through umbilical.

Material Payload: 4mm – 12mm diameter wire coiled 4 Ton Max.



Two Plane Wire Straightener

Wire Straightener used to remove memory from coiled wire. In order to have memory free, straight wire feed into the bending process.



Feeder Roller and Encoder

The Feeder and Encoder Roll is the main apparatus that determines the lengths of wire used to bend as well as being able to pull from payload to bending turret.



Computer Control Console

PC Based Controller used to manual program different bends as well as the interface used to download data from our WireWorks 3D Module.



Bending Arm & Table

The Bending Arm is the output end of the machine that does the fabrication of bends. The Table is attached to the arm that can rotate 360+ degrees in order to create 3D and 2D parts.

In the use of 2D parts, the table is critical in supporting the weight and force as each bend is fabricated.



Torsion Control Unit & Cutting Tool

The Torsion Unit controls the twist of the wire so as the wire is being bent, the wire remains straight.

The cutting tool is made of stainless steel – heat treated material, and is located before the turret.



Turret and Bending Pin

The turret is the middle unit that provides the different radius' of bending.

The Bending Pin, which is located on the perimeter of the turret, has two pins used for hard pin bending and the other for rolling.

Smart Editor

Smart Editor is a program integrated within the wire bender to assist in programming, organizing and simulating programs of wire forms. In, addition the software has a suite of options to assist the user in many areas.

For wireworks smart editor is used to import and generate the bars, but the user can also manually input values to generate bends.

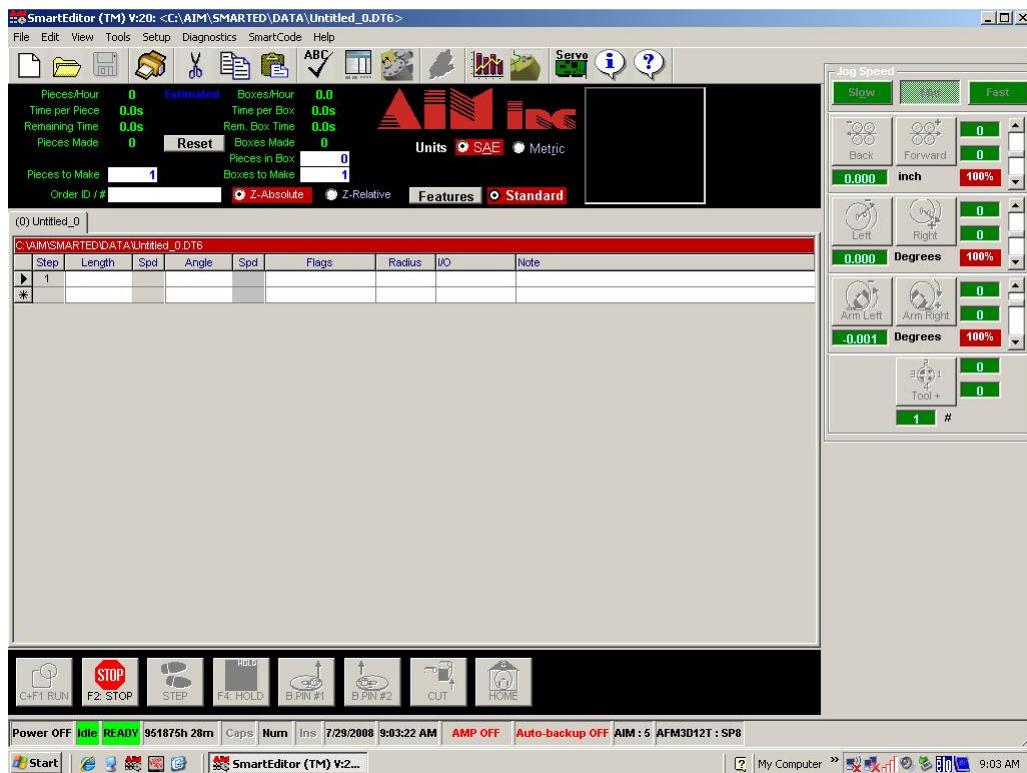
Length Column is the amount of material you want the machine to feed forward or backwards.

The 1st speed column is for the Feeder Speed. Measured in percentage for how fast it feeds the wire, it will run 100% at default.

Angle Column inputs the certain angle desired for the bend.

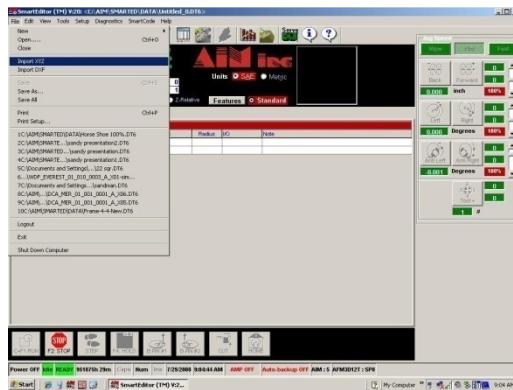
The 2nd speed column is for the Bend speed, this is for the speed of the bend to the angle. This is also measured in percentage and will run in 100% at default.

Flags Columns are for commands that can be pulled down on manually inputted by the keyboard. This includes the Pin to be uses, the tool to be used, whether you want to back up at the end of the process and to cut the bars.



Importing Bending Data

Importing Bending data is the process of transferring the XYZ data generated by wireworks 3d to the Smart Editor software for the Bender.



After starting the AIM Smart editor software, you can import the files by going to file>Import XYZ. The following window shall pop up.



An import window pops up, go to file>open



After selecting open, a browser pops up. Locate the file that you would like to import. You can only import one bar at a time.

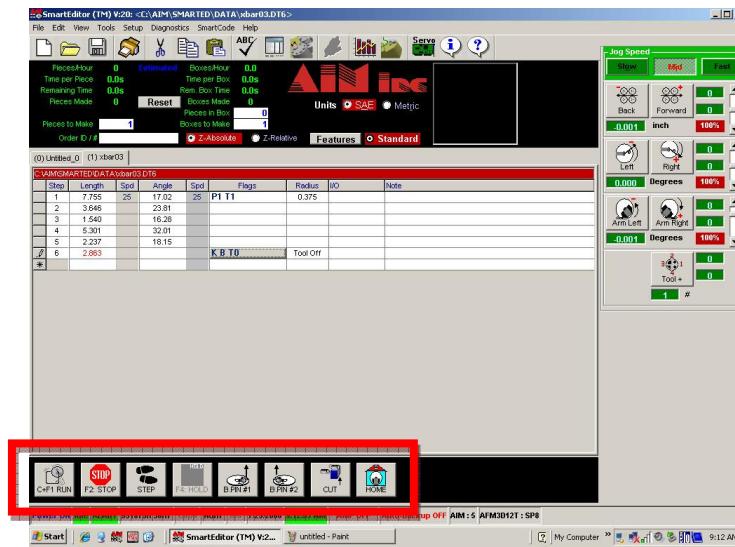


After selecting the bar that you want to bend, click on the convert button, this should convert the XYZ file to the data which the bender will use to bend the bar. Now manual manipulations can be entered.



Operation

In the AIM menu, there are 8 distinct buttons located on the bottom right. In order to run the machine, hold down the CTRL key and press the F1 button.

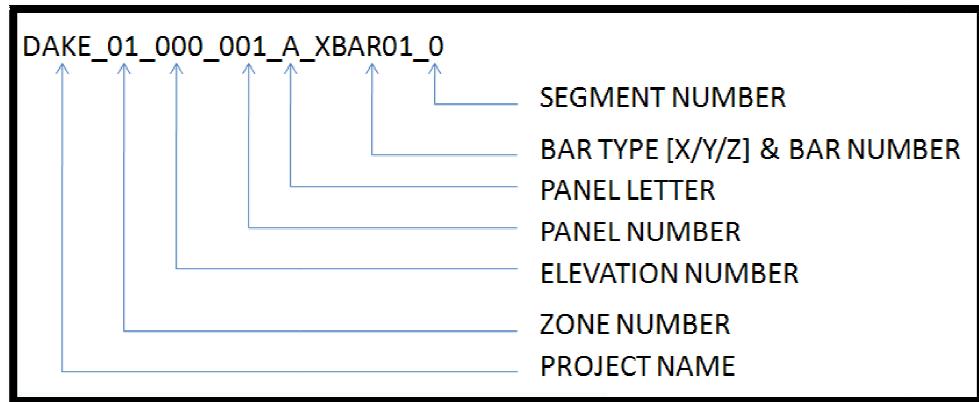


When the data is converted we can now set the commands to be used to bend the bar such as bend speed and tool to be used. When everything is set, click run to start bending the bar.



Naming Convention & Bar Identification

The naming convention used is provided below. Each bar will have the associated information printed on labels that will automatically be attached during bar fabrication. A barcode will also be placed on the label that will associate the bar information with the drawing, model, and master model.



Below is an example of an actual bar identification tag. These tags will also be placed on drawings to provide referencing of information.

DAKE 01 000 001 A XBAR01 0



The following images display how the bars will be tagged. In order to increase fabrication, techniques have been developed in the software to orient the bars in specific way. During fabrication, the panel is created using the following order:

Border bars – Usual consisting of 2 Xbars and 2 Ybars, but can consist of Zbars as well.

Ybars – Vertical bars [Fabricated from left to right]

Xbars – Horizontal bars [Fabricated from bottom to top]

In doing so, the WireWorks3D module creates the data in such a manner that when a bar is fabricated the lead edge will always be marked with the identification tag as seen in the pictures below. Now if the bar that was fabricated was a Ybar, we know that the leading edge will be on the right side of the panel. If the bar is an Xbar, we know that leading edge will be oriented to the bottom of the panel as seen in the other picture below.

