USER INSTRUCTION GUIDE
SECTION 01

Introduction
Introduction

- BEND SAFETY
- WHAT’S IN THE BOX
- GETTING TO KNOW THE D.I.WIRE PLUS
- WIREWARE MODES OVERVIEW
**Bend Safety**

The D.I.Wire Plus has moving parts that should be treated with care. While the wheels and bend pin may move slowly, the D.I.Wire is powerful and can cause injury.

**NEVER TOUCH**
**MOVING PARTS!**

### Moving Parts

NEVER touch the Bend Pins or Feed Wheels during bending. Allow the D.I.Wire to finish bending before touching the top plate.

### Attention

Do not leave the D.I.Wire unattended during operation.

### Eye + Hand Protection

Cut wire can be sharp. Be careful of the cut ends. As with any tool, wear safety equipment. Eye protection and gloves are important.

### Work Surface

Clear the work surface and give the machine plenty of room to work.

**To Stop Machine**

- Hit the Power Button
- Unplug Machine
- Hit the computer Spacebar
- Press STOP or PAUSE in WireWare

**Power Off**

Power off when not in use

**Adult Supervision Required**

Not a toy and intended for use by or under supervision of adults

**Avoid Water**

Do not use near or place in water
What’s in the Box

**POWER CORD**
AC Wall Adaptor
24 Volts/ 2.5 Amps

**USB CORD**
USB allows DIWire to communicate with the computer

**PRE-CALIBRATED WIRE**
Sample of our favorite wire to use with the tutorials. Visit [www.Pensolabs.com/materials](http://www.Pensolabs.com/materials) to learn more!

**DIWIRE PLUS**

**BEND HEAD + FEED WHEELS**
DIWire is assembled with either 1/8” or 1/16” Bend Head and Feed Wheels.
If the Starter Kit was purchased then the 1/16” versions are provided in the little black pouch. Keep these somewhere safe!

**T15 TORX SCREWDRIVER + 5/32 HEX CREWDRIER**
Used to change Bend Head and Feed Wheels and Clamp Adjust
Getting to know the D.I.Wire Plus

Take a few minutes to get oriented to the D.I.Wire Plus.

**TOP VIEW**

- **BEND PINS**: Bends wire against the Bend Head
- **BEND HEAD**: Holds wire in place as it is bent. Interchangeable to accommodate two material diameters
- **RESET BUTTON**: Button to reset DIWire Plus
- **FEED WHEELS**: Moves material through
- **WIRE GUIDES**: Guides to feed material through

**BACK VIEW**

- **POWER SWITCH**
- **USB-B PORT**
- **POWER JACK**
WireWare Modes

WireWare is comprised of three sections, Path Mode, Script Mode and the Material Profile Mode. Path Mode and Script Mode are used to edit and create input for bending. The Material Profile Mode contains a library of Material Profiles for each wire type that compensate for the spring back of the wire during a bend.

PATH MODE
Create or manipulate curves visually or numerically within the workspace.

FEATURES
- Create bend path or import SVG files from other programs
- Manipulate bend angles and segment lengths on the workspace
- Reference saved Material Profiles for best accuracy
- Save files as paths or G-Code

SCRIPT MODE
Use WireWare Scripts and G-Code to precisely control bend actions.

FEATURES
- High level of control over your output
- Use WireWare scripts or basic G-Code
- Create complex, smooth curves
- Access advanced features like roll bending

MATERIAL PROFILES
Save Material Profiles for all wire types.

FEATURES
- Create and save new calibrated Material Profiles for any wire.
- The Material Profile works with Path Mode and WireWare Script to compensate for material springback.
SECTION 02

Getting Set Up
Getting Set Up

- Download Wireware
- Set up Hardware
- Loading Wire
Download WireWare

Download WireWare software to run the D.I.Wire Plus. WireWare prepares your files for bending on the DIWire.

1 INSTALL WIREWARE

After receiving WireWare, download to the computer. Reference the materials that come with the software.

WINDOWS / MAC

Choose either Windows or Mac version of WireWare to install on the computer.

2 CONTACT US

For any questions or problems with download or installation contact Pensalabs.

EMAIL support@pensalabs.com

PHONE 844-434-9473, ext. 2
Choose a work area for the D.I.Wire Plus. Consider the area needed for wire entering the feed wheels and exiting the bend head.

**WHAT'S NEEDED**
- D.I.Wire Plus
- USB Cord
- Power Cord

**ADDITIONAL ELEMENTS**
- Computer

**1 PREPARE WORK AREA**

**2 PLUG-IN**

Choose a work area and plug in the D.I.Wire.
There is an indent at the front of the bend head at the Start Point. The wire can be marked with a Sharpie in this indent.

Commands the D.I.Wire to locate and rest at Home (machine position zero).

Loading the wire past the Start Point will cause the Bend Pins to hit the wire during the homing sequence.

Before bending, the D.I.Wire needs to go through the homing sequence to ensure the bend pin is in the proper position.

The machine must be homed when turning on the machine or restarting or if it has lost its location.

Loading wire into the D.I.Wire is a simple process.

1 LOAD WIRE
Load the wire through the Wire Guides (1), the Feed Wheels (2) and into the Bend Head (3).

2 START POINT
Load the wire up to the Start Point.

3 HOMING SEQUENCE
Before bending, the D.I.Wire needs to go through the homing sequence to ensure the bend pin is in the proper position.
SECTION 04

Path Mode
Path Mode

Import .SVG files, or create a bend path in Path Mode. It is an interactive workspace to view and edit paths and prepare them for bending. It has been designed to provide basic manipulation and adjustments to bend points and line segments and to manage multiple paths on the work area.

- OVERVIEW
- GETTING STARTED
- PATH & WORKSPACE INFO
- TOOLBAR
- MATERIAL PROFILE SELECTION
- ACTION LIST
- CONTROL & JOG BAR
- ARROW KEY CONTROLS
- OTHER FEATURES
04 | PATH MODE

Screen Overview
Getting Started

Import a curve as an .SVG format or create a path.

**IMPORT A FILE**

Go to File, Open a saved SVG file from your computer.

CTRL + O  Quick key to open a file

**CREATE A SHAPE**

Add Bend (B) and Feed (F) points to the Action List to start creating a new part.

The Plus icon adds feed and bend points to the list. Clicking the Plus will add a bend and feed after the last segment of a shape.

After adding several Feed/Bend Actions, zoom out to view and manipulate the new set of segments and bend points.

**WORKSPACE**

The path is a series of bend angles and line segments.

These bend angles and line segments can be manipulated using the tools on the following pages.
Path & Workspace Info

The Path Info section displays properties of the shape and Grid Tools provide Grid Size units and Snap behavior control.

PATH INFO

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Width</td>
<td>105.70 mm</td>
</tr>
<tr>
<td>Overall Height</td>
<td>99.78 mm</td>
</tr>
<tr>
<td>Bend Points</td>
<td>5</td>
</tr>
<tr>
<td>Scale</td>
<td>5</td>
</tr>
</tbody>
</table>

GRID TOOLS

- **Grid Size**: Size of the grid on the workspace and the units in use.
- **Change the units by going to the Edit Tab and selecting Change Units.**
- **Snap to Grid**: Bend points and line segments will snap to the grid as they are moved around on the workspace.
- **Snap to Original Path**: Bend points and line segments will snap to the ghosted imported path as they are moved around on the workspace.

**PATH**

The estimated total wire length needed for the part.

**SEGMENT LENGTH**

Shows the minimum distance between bend points on a path. Enter a small segment length value to get a smoother curve with many bend points.

**8.25” (209mm) of extra wire is needed so that the feed wheels are always engaged.**
04 | PATH MODE

Toolbar

The Zoom, Select and Undo tools allow for flexible navigation of the workspace and control of the path.

**Zoom**

Zoom tools help you to navigate around your workspace.

- **Fit to Screen**: Resize the view of the workspace to show the entire active part.
- **Zoom In**: Zoom into desired details of the workspace.
- **Zoom Out**: Zoom out to view more of the workspace.
- **Pan**: Move around the viewable area of the workspace by clicking and dragging.

**Select**

Select Tool allows you to click on line segments and bend points and move them.

- **Select Vertices**: Click on line segments and bend points to move them around on the workspace.
- **Add a Vertex**: Add new bend points on the active path.
- **Remove a Vertex**: Remove bend points from the active path.
- **Add a Pause Point**: Select a Bend Point where the machine will pause before the bending at that location.
- **Change Starting Point**: Choose which end of the path to start bending.

**Undo Tool**

Undo changes made to the Path.

- **Undo Tool**: Click on the Undo Tool to undo changes made on the path.
- **Ctrl + U**: Undo previous action on the Workspace.
- **Ctrl + Shift + U**: Redo previous action on the Workspace.
Material Profile Selection

Selecting the Material Profile that matches the wire in use ensures accurate bending of the Path. A Material Profile is needed to bend from Path Mode or Run WireWare Script commands in Script Mode.

The Material Profile data is used to compensate for the spring back of the wire. Any wire used by the D.I.Wire needs a Material Profile.

Displays the associated Wire Material, Wire Thickness, Feed Wheels and Bend Head.

In order to modify or create new material profiles go to Material Profile Mode.
Action List

The Action List shows an editable sequential list of all of the actions that the machine will make while bending the Path.

**BEND (B) & FEEDS (F)**

If a file is imported into the Path Mode workspace, WireWare breaks the shape up into Feed and Bend actions.

**BEND (B) & FEED (F) FIELDS**

A sequential list of feed (F) and bend (B) actions and their values.

**SELECTION**

Click on a Bend Point or line segment to see its corresponding Action, or click on the Action to see the corresponding Bend Point/line in the Path. Change values to adjust Path.

**ACTION LIST ADJUSTMENTS**

Action List values can be changed on the list and the Path will update on the workspace.

**ADJUSTMENT FIELDS**

Allows for corrections to discrepancies on the bent wire part.

For example, if a 10° Action results in a 9° bend output simply put a 1° in the adjustment field for a correction.

**ADDING TO A SHAPE**

Add Bend (B) and Feed (F) points to the Action List to add to the end of a Path.

The Plus icon adds Feed and Bend Points to the list. Clicking the Plus will add a bend and feed after the last segment of a shape.

After adding several Feed/Bend Actions, zoom out to view and manipulate the new set of segments and bend points.
Control & Jog Bar

The Control Bar and Jog Bar at the bottom of the workspace can be found in every mode. These controls Home the bend pin, Bend the path or Run the script and Stop the D.I.Wire. The Jog bar shows the location and controls to move the bend pin and feed wheels.

**HOME, BEND & STOP**

- **HOME**: Commands the D.I.Wire to locate and rest at Home (machine position zero)
  - The machine must be homed when turning on the machine or restarting or if it has lost its location
- **BEND**: Starts bending the active path
- **STOP**: Immediately stops moving the machine axes
  - The spacebar will also immediately stop the machine

**JOG**

Jog controls the machine with simple movements set in the numerical fields for each moving part of the machine

- This may be helpful for loading wire

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPEED %</strong></td>
<td>Shows the speed the machine is running as a percent of the maximum speed determined by machine settings</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Controls position of the bend pin, measured in degrees</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>Controls the feed of the wire, measured in the units in use (inches or mm)</td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td>Controls the up/down position of the pin</td>
</tr>
<tr>
<td><strong>ZERO</strong></td>
<td>Sets the current position of the specified axis to 0</td>
</tr>
<tr>
<td><strong>GO TO</strong></td>
<td>Go to the position entered in the jog bar</td>
</tr>
</tbody>
</table>
Arrow Key Controls

Hold control and press arrow keys to manually move the bend pin or feed the wire. This is helpful loading new wire.

1. FEED WIRE
   - UP ARROW + CMD/CTRL Feeds the material forward
   - DOWN ARROW + CMD/CTRL Feeds the material back

2. MOVE BEND PIN
   - LEFT ARROW + CMD/CTRL Moves the bend pin (counter-clockwise)
   - RIGHT ARROW + CMD/CTRL Moves the bend pin (clockwise)
## Other Path Features

These are other Path Mode tools that are helpful for Path selection, imported file clean up and quick undo/redo of actions on the Workspace.

### PATH SELECTION

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT</td>
<td>Selects the “Select bend points” Tool</td>
</tr>
<tr>
<td>ESC KEY</td>
<td></td>
</tr>
<tr>
<td>NEXT PATH</td>
<td>Selects the next Path in order of creation</td>
</tr>
<tr>
<td>CTRL + N</td>
<td></td>
</tr>
<tr>
<td>PREVIOUS</td>
<td>Selects the Path that was previously selected</td>
</tr>
<tr>
<td>CTRL + P</td>
<td></td>
</tr>
<tr>
<td>HIDE</td>
<td>Hides / Shows the ghosted silhouette of the imported path</td>
</tr>
<tr>
<td>ORIGINAL FILE</td>
<td></td>
</tr>
</tbody>
</table>

### PATH CLEAN UP

Use these tools to modify the imported Path. Paths must be modified to accommodate Bend Head geometry and minimum segment lengths.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPLIT SELECTED VERTICES</td>
<td>Divides a selected Bend Point into two equal angle Bend Points.</td>
</tr>
<tr>
<td>CTRL + J</td>
<td>e.g. a 160 ° bend angle into two 80 ° Bend Points. This allows easier manipulation of larger angles.</td>
</tr>
<tr>
<td>DELETE SELECTED VERTICES</td>
<td>Deletes selected Bend Point.</td>
</tr>
<tr>
<td>BACKSPACE</td>
<td></td>
</tr>
</tbody>
</table>

### PATH CLEAN UP

Simplifies complex Paths by deleting segments smaller than a threshold relative to the path size.
SECTION 05

Script Mode
Script Mode

Create precise shapes using written WireWare script commands or G-Code commands to control the D.I.Wire. These allow for a higher level of control over the output.

- OVERVIEW
- GETTING STARTED
- MATERIAL PROFILE SELECTION
- CONTROL & JOG BAR
- ARROW KEY CONTROLS
05 | SCRIPT MODE

Screen Overview
Getting Started

Start a new Script in the Script Window using WireWare Script or G-Code commands.

- **SCRIPT WINDOW**: Click into the Script Window to copy and paste text or type in commands.

  - **WireWare Script** + G-Code: Create shapes using the WireWare script commands or G-Code.
  
  - The Script Window is active when it has a blue outline. Click anywhere outside of the Script Window to be able to use the keys for manually driving the machine.

- **IMPORT A FILE**: Use the file menu to open a saved file from your computer.

  - **CTRL + O**: Open a file from your keyboard
  
  - Paths can be saved as G-Code from Path Mode and opened in Script Mode.

- **SCRIPT MODE GLOSSARY**: This is a glossary of WireWare Script and G-Code commands.
Material Profile Selection

When using the WireWare script select a material profile to compensate for the wire spring back.

Material Profile Selection

When you select a Material Profile you will also be able to view its associated information.

- **DROPDOWN MENU** Drop down menu lets you select among saved Material Profiles
- **G-Code will not use Material Profile information.**
- In order to modify or create new material profiles go to **Material Profile Mode.**
Control & Jog Bar

The Control Bar and Jog Bar at the bottom of the workspace can be found in every mode. These controls Home the bend pin, Bend the path or Run the script and Stop the D.I.Wire. The Jog bar shows the location and controls to move the bend pin and feed wheels.

1. HOME, BEND & STOP

HOME
Commands the D.I.Wire to locate and rest at Home (machine position zero)

The machine must be homed when turning on the machine or restarting or if it has lost its location.

BEND
Starts bending the active path

STOP
Immediately stops moving the machine axes

The spacebar will also immediately stop the machine.

2. JOG

Jog controls the machine with simple movements set in the numerical fields for each moving part of the machine.

This may be helpful for loading wire

SPEED %
Shows the speed the machine is running as a percent of the maximum speed determined by machine settings

A
Controls position of the bend pin, measured in degrees

X
Controls the feed of the wire, measured in the units in use (inches or mm)

ZERO
Sets the current position of the specified axis to 0

GO TO
Go to the position entered in the jog bar
05 | SCRIPT MODE

**Arrow Key Controls**

Hold the Control key (or Command on a Mac) and tap or hold arrow keys to manually move the bend pin or feed the wire. This is helpful loading new wire.

### FEED WIRE

<table>
<thead>
<tr>
<th>Key</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP ARROW</td>
<td>Feeds the material forward</td>
</tr>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>CTRL / CMD</td>
<td></td>
</tr>
<tr>
<td>DOWN ARROW</td>
<td>Feeds the material back</td>
</tr>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>CTRL / CMD</td>
<td></td>
</tr>
</tbody>
</table>

### MOVE BEND PIN

<table>
<thead>
<tr>
<th>Key</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT ARROW</td>
<td>Moves the bend pin (counter-clockwise)</td>
</tr>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>CTRL / CMD</td>
<td></td>
</tr>
<tr>
<td>RIGHT ARROW</td>
<td>Moves the bend pin (clockwise)</td>
</tr>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>CTRL / CMD</td>
<td></td>
</tr>
</tbody>
</table>
Material Profile Mode
A Material Profile can be created for any wire used in the D.I.Wire. Material Profile data is used to compensate for wire spring back during a bend.

A Material Profile is needed to bend from Path Mode or Run WireWare Script commands in Script Mode.

WireWare comes pre-loaded with Material Profiles for wire sold on Pensalabs.com

- WHAT IS A MATERIAL PROFILE?
- LIBRARY OVERVIEW
- CREATE NEW MATERIAL PROFILE
- EDIT A MATERIAL PROFILE
What is a Material Profile?

When creating a Material Profile the D.I.Wire learns how much to compensate for wire spring back. Material Profiles consist of hardware Definition information and Dataset measurements.

HARDWARE DEFINITION

The Material Profile Definition is information about the wire material, and Bend Head and Feed Wheel setup of the D.I.Wire. This information needs to be entered every time a new Material Profile is created.

DATASET MEASUREMENTS

A dataset consists of bending discrete angles, measuring each using a protractor and inputting the results into a table. It is necessary to complete all three Datasets.
Library Overview

The Material Profile Library is a collection of wire materials that have been calibrated for the D.I.Wire.
Creating a Material Profile

1 PREPARATION

Prepare the following to create a NEW Material Profile.

MATERIALS NEEDED
- D.I.Wire, at least ~20 feet (610cm) of wire, cutting tool and protractor
- A digital protractor is recommended

TIME NEEDED
- 1-2hrs total

2 CREATE NEW PROFILE

Select the NEW button from the Material Profile Library Screen.

3 PROFILE DEFINITION

Fill in the information about the wire and the D.I.Wire hardware setup and click BEGIN when ready to move on.

- Red* fields are required, others are optional
- To determine the Bend and Feed Velocities for the wire being used, refer to Pensolabs.com for a reference guide.
Before bending, the D.I.Wire needs to go through the homing sequence to ensure the bend pin is in the proper position.

**HOME BEND PIN**

Load the wire through the Wire Guides, the Feed Wheels and into the Bend Head.

**LOAD WIRE**

Click BEND to bend your first datapoint. Use the cutting tool to remove the bent wire from the D.I.Wire.

**BEND**

The machine must be homed when booted or if it has lost its location.
MEASURE ANGLE

Measure the angle of the bent wire using a protractor.

INPUT

Type measurement into the dataset fields, press the ENTER key to move down to the next datapoint.

REPEAT & SAVE

Repeat these steps for every datapoint in the Dataset.

SAVE & EXIT

Click the Save & Exit button to save a completed or in-progress Material Profile. The file will not show up in the Material Profile drop down lists until all three datasets are complete.

CANCEL

Click the Cancel button to exit without saving the file.
06 | MATERIAL PROFILE MODE

Editing a Material Profile

1 EDIT PROFILE

In the Material Profile Library, select the Material Profile to be edited and click the EDIT button.

The blue box will appear around the Material Profile when it is selected.

2 EDIT DEFINITION

Make any needed changes to the Material Profile Definition and click BEGIN.

Note that the Bend Head and Feed Wheel types and velocities cannot be changed as the datapoints are linked to this information.

3 INITIATE EDITING

Click the EDIT icon next to the datapoint that needs to be edited.
**EDIT DATAPoint**

Click BEND to rebend this value and/or input measured angle.

After new numerical value is entered, press the ENTER key to move down.

**SAVE & EXIT**

Save and Exit the Material Profile at anytime if needed. However, this file will not appear in a Material Profile drop down list until all 3 Datasets are complete.
SECTION 07

Maintenance
Maintenance

- SWITCHING BEND HEAD & FEED
- CLAMP ADJUST
Switching Bend Head + Feed Wheels

D.I.Wire Bend Head and Feed Wheels must be changed to accommodate different wire dimensions.

1 PREPARATIONS

WHAT’S NEEDED:

- Bend Head and Feed Wheels (1/8” or 1/16”)
- T15 Torx Screwdriver

The Bend Head and Feed Wheels need to be changed to ensure the wire remains centered while bending. As the wire diameter gets larger, the groove in the Bend Head gets larger and the Feed Wheels get smaller.

2 SWITCH BEND HEAD + FEED WHEELS

Unscrew assembled Bend Head and two Feed Wheels from the D.I.Wire PLUS machine with the T15 Torx Screwdriver.

Screw the new Bend Head and Feed Wheels onto the D.I.Wire.
If the Feed Wheels are slipping, meaning they are not effectively pulling wire through, the Clamp Adjust needs to be modified.

**PREPARATIONS**

**WHAT'S NEEDED**

5/32 Hex Screwdriver

**CLAMP ADJUSTMENT**

Turn the Clamp Adjust on the D.I.Wire with the 5/32 Hex Screwdriver. Going against convention, turn left to tighten and turn right to loose.

*Overtime, it is possible to get a feel for the variation in how tightly the bearings pull towards the Feed Wheels*