A R I S T O M A T   S e r i e

Machseta.exe

ARISTO Plotbridge Driver Setup Program

Version 4.09

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Machseta.exe - ARISTO Plotbridge Driver Setup Program

Overview

This document discusses how to use the Plotbridge Driver Setup program, **Machseta.exe**, to build a new Machine Driver File for use with **ARISTO Plotbridge**.

To successfully build a driver using this program, you will need a thorough understanding of the commands and command structure required by the machine that you wish to control from Plotbridge. Plotbridge's driver structure is very flexible and, correctly setup, will allow it to control a wide variety of different machines that accept ASCII commands via an RS232 Serial port.

About the Files Used

There are three files used by both the Machseta and Plotbridge programs. They are all in Windows.INI format and can be viewed using a simple text editor such as NotePad. It is recommended that you do not do any changes directly to the files but rather use the Plotbridge and Machseta programs to do so. This will ensure that the correct syntax and values are used in the files. The files are:

DXPLOT.INI

Located in the Windows directory on drive C. This file contains general information about the last use of Plotbridge such as Window size and position, screen colours etc. It also contains the name of the Setup file (see below) and the ID number for the last used Setup.

DXPLOTSU.INI

Located in the Setups directory which should be in the same directory as the Plotbridge and Machseta programs. This file can contain up to 50 different setups. Each setup contains the currently set "preferences" for the **Plotbridge** program including File Conversion settings, Plotting & Cutting Settings, Speeds and Machine Variables (see later section) and the Machine Driver File used by this setup.

Thus it is possible to change to another machine driver by simply changing the setup within **Plotbridge**. This is useful if you have a multi-function machine that can run in a number of different modes. Each mode can have its own Machine Driver file which can be automatically loaded by changing the current setup from within **Plotbridge**.

New setups can be added to this file from within **Plotbridge** by choosing Save the current Setup from the Setup Menu.

New setups can also be added to this file from the **Machseta** program, however they will only contain setup data related to the Machine Driver file. When one of these setups is loaded into **Plotbridge** all other parameters will be set to their default values.

DRIVER.PLD (*.PLD)

Each Machine Driver file should be located in the Drivers directory which should be in the same directory as the **Plotbridge** and **Machseta** programs. This file contains the options and commands that will be sent to the machine at various stages of a plotting/cutting job.

Driver file commands can contain a number of variables and expressions which are substituted and evaluated at plot time before commands are sent to the machine. See later sections for more details on the use of variables in the driver files.

If no Drivers are found in this directory the program will automatically create a simple default driver called **HPGL.PLD**.

Driver Variables

There are two types of Driver Variables: Built-in Variables and Machine Variables. All variables can have alphanumeric names up to ten characters in length.

Built-In Variables

Built-in Variables are those used by Plotbridge to pass information to the Machine Driver such as the coordinates of the next point, the required speed etc. These are pre-defined within the software. As of version 4.0, the following Built-in Variables have been defined.

XC   Output scale for the X Axis

YC   Output scale for the Y Axis

XL   X position of the last move point

YL   Y position of the last move point

X   X position of the next move point

Y   Y position of the next move point

XF   X value of any offset applied to the drawing

YF   Y value of any offset applied to the drawing

T   Current tool number starting from 0

PI   Pi = 3.14159

V   Desired velocity of current tool

XR   X position of the centre of the next Arc or Circle

YR   Y position of the centre of the next Arc or Circle

R   Radius of the next Arc or Circle

SA   Sweep angle of the next Arc or Circle

Note that the values of XL,YL,X,Y,XF,XY,XR,YR, and R are in milli-metres **already multiplied** by the output scaling factors (XC and YC) set in Plotbridge and stored in the driver file.

Machine Variables

Up to 30 Machine Variables can be defined in a Machine Driver file using the **Machseta** program. These variables are available to the user inside Plotbridge (under the Setup Speeds/Variables Menu) and allow the user to "fine tune" the machine for different types of plotting or cutting jobs.

Each Machine Variable has a default value that is defined in the **Machseta** Program. It <u>also</u> has a current value that is used when plotting. The current values of each machine variable are saved with each saved Setup in Plotbridge. Therefore the user can use these variables to define and save different "tunings" for each type of plotting or cutting job. For example, the machine's acceleration rate may be set to a slower value when cutting heavy duty materials or certain types of drop-in tools.

Obviously if you define a Machine Variable with the same name as a Built-in Variable you will not get the results that you expect!

Using Variables and Functions

Variables and functions can be embedded into Machine Driver Commands by enclosing then between angle brackets < >. At run time, Plotbridge evaluates the expression between the brackets and substitutes the result as numeric text string.

For example, if the next plotted point on the machine is to be X=100.5 and Y=50.25 then the command "PA<X>,<Y>;" will be evaluated as "PA100.5,50.25;". ARISTOMAT machines are able to read real values.

By default all variable numbers are real so if your machine requires integer only numbers then you can use the **INT** function to truncate the value to the integer only part.

Repeating the above example, the command "PA<INT(X)>,<INT(Y)>;" will be evaluated as "PA100,50;"

Other examples are:

"VS<V/200>;" with V (current tool velocity) = 1000 evaluates as "VS5;"

In this case the user has entered the required velocity in meters/ minute but the machine expects the value in mm/sec.

The following is the list of currently supported functions that can be included in a command expression.

TAN(A)	Tangent
SIN(A)	Sine
COS(A)	Cosine
ARCTAN(A)	Arc Tangent
EXP(A)	Exponent
LN(A)	Natural Log
LOG10(A)	Log to base 10
LOG2(A)	Log to base 2
SQR(A)	Square
SQRT(A)	Square Root
ABS(A)	Absolute Value
INT(A)	Truncates a Real number to an Integer
ROUND(A)	Rounds a Real Number to the closest Integer
SIGN(A)	Returns -1 if A<0, 0 if A=0, 1 if A>0
ZERO(A)	Returns 0 if A+0, else returns 1
MAX(A,B)	Returns the Maximum of two arguments
MIN(A,B)	Returns the Minimum of two arguments
HEAV(A,B)	Returns 0 if A<0 else returns 1
LEN(X,Y)	Length of a vector with X & Y components
ANG(X,Y)	Angle of a vector with X & Y components

The Program in Detail

Program Overview

Machseta.exe should be located in the same directory (or folder) as the Plotbridge program. It assumes that the Setups and Drivers directories are also located in this directory.
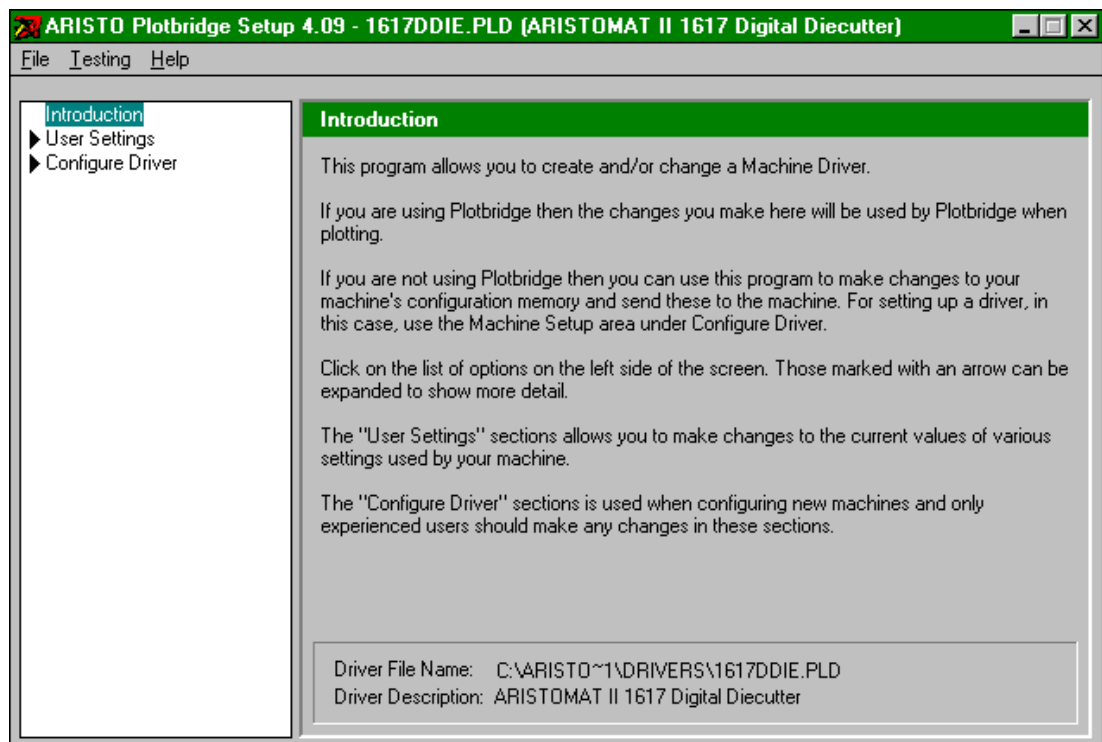
CAUTION: Machseta should not be run at the same time as the Plotbridge program. Exit one program before running the other

Machseta uses the current setup ID number read from the DXPLOT.INI file to determine the currently selected Setup. This is loaded from the DXPLOTSU.INI file (in the Setups directory) to find the currently selected Machine Driver file (which should be in the Drivers directory). The Driver File is then loaded. The file name and description of the loaded Driver File are displayed in the Title bar and at the bottom of the Introduction page.

You can load another driver using the File, Load Driver... Menu. A new driver can be created from an existing one by using the File, Save Driver As.. Menu. A new simple HPGL driver can be created using the File, New HPGL Driver... Menu.

The left side of the Window features an expanding/collapsing menu.
With two main parts: User Settings and Configure Driver. Clicking
on an item with an arrow will expand or collapse that item. Clicking
on an item without an arrow will show the page for that item. The
fully expanded view has the following structure:

Introduction

User Settings

    General

    Machine Variables

Configure Driver

    General

    Machine Variable

    Commands

        Operational

            Machine Setup

            First Tool Only

            Using All Tools

            Move Head Line

            Move Head Arc

            Next Frame

            End of Job

        Tools

            Tool 1

            Tool 2

            Tool 3

            (.... up to 10 tools)

        User Buttons

            User Button 1

            User Button 2

            User Button 3

            User Button 4

        User Commands

            User Option 1
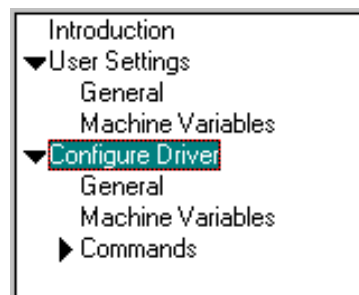
The following sections cover each of the sections in detail..

User Setting - General

Both this page and the next (Machine Variables) replicate functions found in the Plotbridge program. They allow the changing of general parameters associated with the machine. You should refer to the Plotbridge User Manual for more information on these.

User Setting - Machine Variables

This section lists the current Setup's values for any Machine Variables that have been created for this driver. The combobox item at the top of the page contains all Setups (from DXPLOTSU.INI) <u>that use the currently loaded driver file</u>.
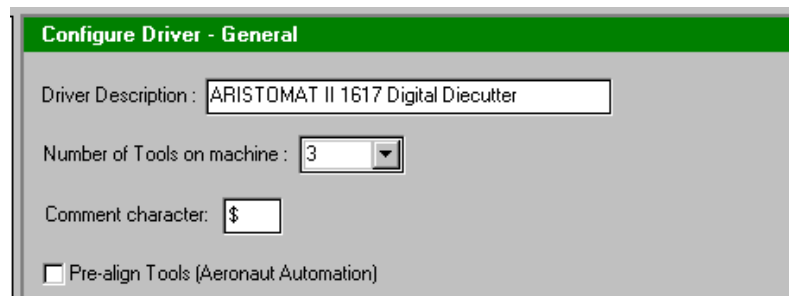

NOTE: This is different from the list of Setups that appear in Plotbridge. In the latter case the list will include all setups from the setup file which may refer to other driver files.

You can change, select a different setup, create another setup, delete a setup and set all the values to their default settings. If you change the values for a selected setup this will be also changed in the Setups file and the changes will appear in Plotbridge when it is run.

Every Driver must have at least one Setup that refers to it, so you cannot delete the last Setup in the list.

Configure Driver - General

This page allows you to :

Change the Driver Description that appears in the list of Drivers in Plotbridge if the user selects to change to another driver.

Set the maximum number of tools that the machine carries (up to 10). In certain cases you may want to have two or more virtual tools that are mapped to the same physical tool. In Plotbridge, all drawings are plotted in tool order starting from tool 1 through to tool 10. You can specify the cutting order of a drawing by assigning certain drawing lines to different tools which are then cut with the same physical tool on the machine.

Set the comment character. Any text included in the commands from this character onwards are removed before the command is sent to the machine. You can add comments to a whole line or at the end of a command line. Empty command lines are not sent to the machine. The default comment character is a "$".

Set the Pre-align Tool option to on or off. When set on, the head will move to an extra point slightly before (about 0.5 mm) and in-line with the next line to be plotted when the tool is in the up position only. This will ensure that tangential cutting tools are pre-aligned with the next line when the tool is lowered.

Configure Driver - Machine Variables

This page is used to setup new Machine Variables for this driver. The list at the top shows any currently setup variables, their description and default values. Click on a line then edit the values in the boxes at the bottom.

You can add and delete variables using the buttons at the bottom of the page. You can also change the order that the variables appear in the list using the Shift Up and Shift Down buttons. Use this last option to put the more commonly changed variables at the top of the list for ease of access by the user.

Remember, the default values set here are stored in the Driver file. The actual values used are store with the saved setup in the DXPLOTSU.INI file.

If you delete a Machine Variable, any Setup values for that variable will be lost.

Configure Driver - Commands
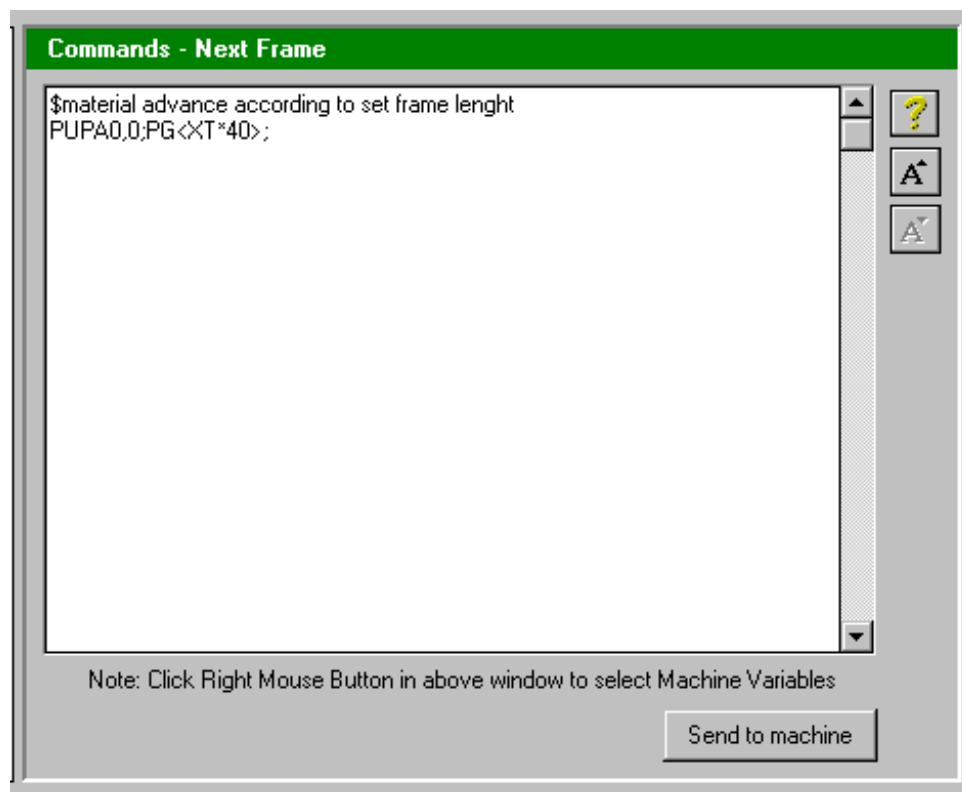
```
Commands - Next Frame

$material advance according to set frame lenght
PUPA0,0;PG<XT*40>;
```

```
Note: Click Right Mouse Button in above window to select Machine Variables

                                    Send to machine
```

These pages are used to enter the commands that will be sent to the machine at various stages of a plotting/cutting job. Each command set can contain one or more lines of commands, comments, variables and expressions.

Simply enter the commands into the window area. You can Cut, Copy and Paste using the standard Windows keyboard commands.

To enter control characters such as ESC, place a "^" symbol before the equivalent character. This will be converted to a control character before being sent to the machine. Some commonly used control characters are:

ESC use	^[	SUB use	^Z
TAB use	^I	FF use	^L

You can increase/decrease the size of the text in the windows using the font size buttons on the right side of the page. The Help button displays a list of Built-In Variables and available functions.

If you click on the right mouse button with the mouse pointer over the window, a pop-up menu will appear showing the currently setup Machine Variables. Selecting one will place the variable name at the current cursor position in the window.

Commands are sent to the machine in the following sequence:

Machine Setup	Sent at the start of each plot. Use for initialization
First Tools Only	If the user has checked the use First Tool for all tools option in Plotbridge's Plot dialog box. Can be used to turn off any tools that are not being used.
Use All Tools	If the user has not checked the use First Tool for all tools option in Plotbridge's Plot dialog box. Use to turn on or initialise any tools.
Move Head Line	Sent for each move head for drawing a straight line from drawing.
Move Head Arc	Sent for each move head in an arc for drawing arc and circles from the drawing (see below for more notes on this).
Next Frame	Sent after completing a frame. Can be used to send a command to load the next frame of material onto the machine.
End of Job	Sent at the end of the job. Use to turn things off!

Each Command page has a **Send** button which will evaluate the current variables and send the resulting command to the machine via the configured RS232 port. You can use this to test the function of various command sets.

For testing purposes, it is also possible to send the output commands to a text file instead of the machine. To do this make sure that the Testing, Send Commands to File menu item is checked. With this set, clicking on the **Send** button will send the commands to a file called COMMANDS.TXT in the same directory as the program. This file will be erased and replaced on each send operation.

Move Head Line Commands

This command set needs to be set up to issue a command to the machine to do a move. You would generally use the X and Y built-in variables for this function. For example on a HPGL compatible machine the command would be

PA<INT(X)>,<INT(Y)>;   # This sends the Integer part of X and Y to the machine.

PA<(X)>,<(Y)>;   # Best for ARISTOMAT Plotters

As previously noted, the values of X and Y are in millimetres **already multiplied** by the output scaling factors (XC and YC). For a standard HPGL machine you would set the output scaling factor to 40 units/mm, and in this case a move to the X axis position of 10 mm would result in the number 400 in the X variable.

Move Head Arc Commands

This command set can be optionally set up if you want to use the machine to plot arcs and circles directly. If your machine doesn't support this feature, Plotbridge will automatically plot these as a series of line segments. The number of segments along a curve is determined by the **Curve Smoothness** setting under Setup, Plotting/Cutting menu in Plotbridge.

Once you have entered some commands in this section, you should then select the **Use Arc Commands** option on the User Settings, General page of Machseta.exe or the Setup, Plotting/Cutting Menu in Plotbridge. You can also specify a maximum radius for using the machines Arc Commands. Any Arcs or circles with a radius greater than the set value will be converted to line segments and plotted using the Move Head Line commands.

The Built-in Variables that you would normally use are

XR,YR   the absolute position of the centre of the arc.
R   the radius of the arc.
SA   the angular sweep of the arc in degrees.

As previously noted, the values of XR,YR and R are in millimetres **already multiplied** by the output scaling factors (XC and YC).

For example on a HPGL compatible machine the command would be

AA<INT(XR)>,<INT(YR),<SA>; # Sends Arc command to the machine.

AA<(XR)>,<(YR),<SA>;   # Best for ARISTOMAT Plotters

Controlling Small Arcs

Some machines have poor arc speed control when plotting very small arcs, so it is possible to force a speed setting for arcs less than a set size using the **Send Before** commands and then restore the machine's speed to the set speed for the current tool using the **Send After** commands. These commands can be found on the bottom of the Move Head Arc Command page.

To do this simply enter a value other than zero for specifying a small arc size and the commands to send before and after the arc command set as shown in the example below for a HPGL controlled machine.

Send the following commands with all Arcs with a radius less than | 10 | mm

Before Small Arcs   **After Small Arcs**

VS1;   VS<V*XC;

Note: Click Right Mouse Button in above window to select Machine Variables

Send to machine

In this example, the machine is forced to slow to a speed of 1 for all arcs with a radius less than 10 mm. After the arc is drawn, the speed is returned to the current tool speed.

Configure Driver - Tools

```
Configure Commands - Tool 1 (Crease)

┌─Tool Parameters─────────┐    Tool Select :          [ Send ]
│ Name:  [Crease       ]  │   ┌─────────────────────────────┐
│                         │   │SP1;                       ▲│
│ Default Speed: [1,000.0]│   │VS <V/200>;                 │
│                         │   │                            │
│                         │   │                            │
│ Safety Border:  [  0.0] │   │                           ▼│
└─────────────────────────┘   └─────────────────────────────┘

┌─Position Offset:────────┐    Tool On:               [ Send ]
│  X Offset:    [   0.0]  │   ┌─────────────────────────────┐
│  Y Offset:    [   0.0]  │   │PD;                        ▲│
│                         │   │                            │
│                         │   │                           ▼│
└─────────────────────────┘   └─────────────────────────────┘

                               Tool Off:               [ Send ]
 ☐ Use Maximum Line Length     ┌─────────────────────────────┐
                               │PU;                        ▲│
                               │                            │
                               │                           ▼│
                               └─────────────────────────────┘

  Note: Click Right Mouse Button in above windows to select Machine Variables
```

These pages are used to enter the commands that will be sent to the machine to select and actuate the tools on the machine. There is one command set for each tool. Machseta.exe provides a mechanism for copying the same commands from the previous tool to save some typing. Simply click the Same as Previous Tool checkbox to copy the commands. Note: this short cut just occurs in the Machseta program. The commands are replicated when written out to the driver file.

These pages also allow the setting of each tool's name, its default speed, safety border and offset position (in millimetres).

Tool Speeds

The default speed for the tool is stored in the driver file. The actual speed used for each tool is stored in the current setup file and provided to the Driver via the Built-in Variable "V".

Tool Safety Border

Each tool can have a safety border applied to the top and bottom edges of the cutting table (the minimum and maximum Y axis positions). If set to other than zero the drawing will be clipped for the set distance in from the edge for that tool, so the centre of that tool will not move closer than the safety border from the edge of the machine. This can be used to prevent wide tools from hitting the edge limits or stopping tools from cutting over the edge of the material.

Tool Offset Position

These adjustments are not necessary for ARISTOMAT tool heads. In Plotbridge, the first Tool is considered to be the reference tool and all other positions are set relative to this tool. Positive values mean the tool position is above and to the right of the first Tool's position. These values are also accessible by the user from the **Adjust Tool Offsets** Button in the **Calibrate** Dialog in **Plotbridge** (under the Setup, Machine Menu) and in **Machseta** (User Settings, General Page).
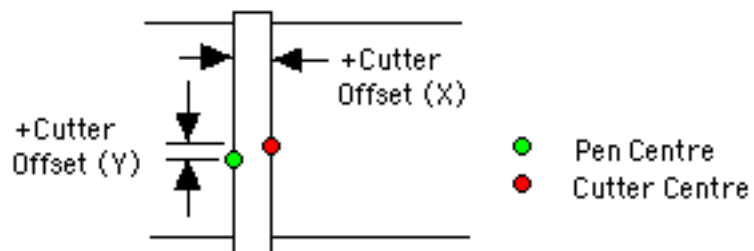

Tool - Use Maximum Line Length Option

If this item is checked for a tool then any long lines (but not arcs plotted using the Move Arc commands) will be broken up into a number of short segments with Tool Off and Tool On Commands being sent to the machine at the end of each segment. This can be used for tools that need to clear swarth periodically. The maximum length of a line (applicable for all Tools with this item checked) is set in Plotbridge's Setup, Plotting/Cutting Dialog.
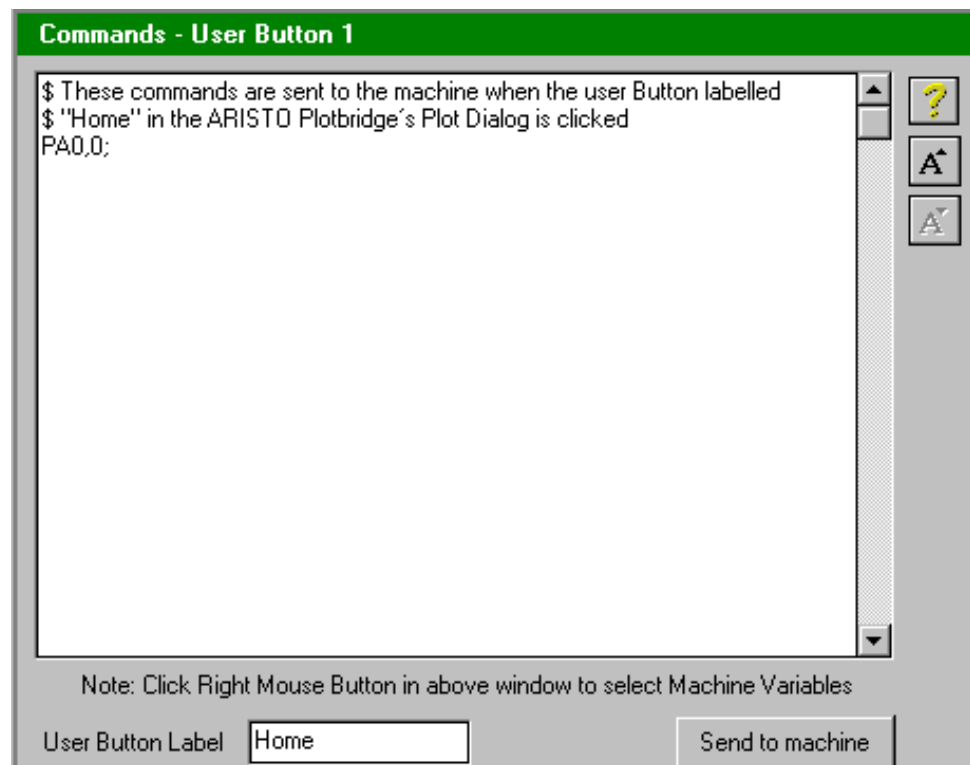
User Buttons

Up to four User Buttons can be defined and will appear in Plotbridge's Plot dialog. When a User button is pressed the commands defined for that User Button are sent to the machine.
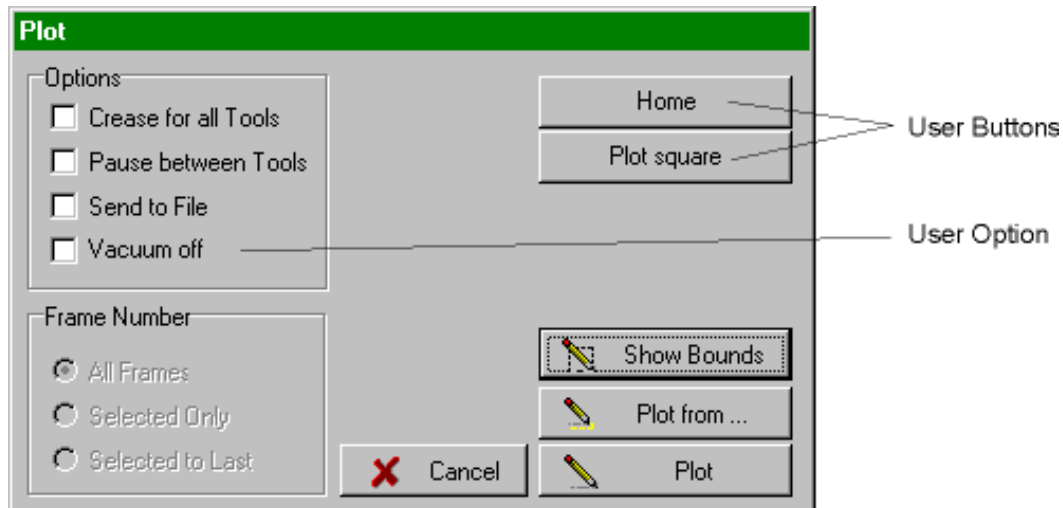
Typical uses for User Buttons include turning a vacuum pump on or off or move the machine to a specific location to allow access for material loading or unloading. Use your imagination and make life a little easier for the user!

Enter the name that will appear on the User button at the bottom of the page.

User buttons will only appear in the Plotbridge Plot dialog if there is at least one line of commands entered in the Driver File for that Button.

Commands - User Button 1

```
$ These commands are sent to the machine when the user Button labelled
$ "Home" in the ARISTO Plotbridge's Plot Dialog is clicked
PA0,0;
```

Note: Click Right Mouse Button in above window to select Machine Variables

User Button Label   Home   Send to machine

User Options

Currently only one User Option is available. This appears in Plotbridge's Plot dialog as a checkbox item that the user can select or not. When selected, the contents of the User Option Command set will be sent to the machine before each frame is plotted. The status of the User Button (check or unchecked) is save in Plotbridge's current setup file.

Creating a New Driver

If you have read all of the above sections you should have a fair idea on how to design your own Plotbridge Machine Driver file using Machseta.exe. However, perhaps you are not sure where to start. Below is a suggested order for setting up a new machine driver:

1. Use File, New HPGL Driver.. Menu to create a basic and mainly empty Driver. You will be prompted to enter a file name such as HPGL.PLD. Select one that hasn't been used and make sure that it's saved in the Drivers directory.

2. You will then be prompted to name a **Setup** that will use this driver. If you are not in a very creative mood just click OK!

3. Go to the Configure Driver, General Page and change the number of tools for your new driver to the number that you will have mounted on the machine. You will find that it is already set to five tools.

4. While you are there, you can enter a Driver Description for the machine and check that the default comment character is not used in any of your machine's commands. If it is, change it to one that is not!

5. If you plan on using some Machine Variables, go to the Configure Driver, Machine Variables and add as many as you want. It's a good idea to set a variable name that resembles the use of the variable. e.g. <PENDLY> for Pen Delay Time. Enter a description for the variable that the user will be able to understand and finally enter the default value for each variable. Remember you can change the order of the variables so the most commonly altered ones will be at the top of the list.

   If you are not sure of what you want now, you can always come back and add more variables at any time in the future.

6. If you have entered some Machine Variables, go to the User Settings, Machine Variables page and click on the **Set to Default Values.** This will make sure that the current setup is using reasonable values for each of the variables.

7. Pop over to the User Setting, General page and enter the Machine's **Length** and **Width** values (actually these aren't used yet, but may be on future versions of Plotbridge). If you plan to send **Arc Commands** to the machine, check the **Use Arc Commands** box and set a value for the **Maximum Radius**. If you always want to use the Arc Command regardless of the radius, then set the **Maximum Radius** value to a very big number such as 100,000 mm.

8. If you know the approximate (or exact) **Output Scale** used by your machine enter these values in the X and Y Axis boxes.

9. Select the serial port on your computer that the machine is connected to and setup the other values by clicking on the **Port Settings...** Button. If your machine is not plugged in yet, now is a good time to do it so you can test send your commands to it.

10. If the machine will be loading its own frames of material (on receipt of Next Frame Commands) then check **Automatic Frame Moves**.

11. Now go through and add your machine's commands to each of the Commands pages. If your machine is mostly pre-configured then you may not need to enter anything in the Machine Setup, First Tool Only, Using All Tools, Next Frame and End of Job pages. You <u>will</u> need to make sure that the **Head Move Line** Command is correct for your machine.

    Remember you can use the **Send** button to send the commands to the machine to check if it works correctly. When you do this all the Machine Variables will use the values in the current setup. Built-in variables will set to a value of zero. If you are not sure what's happening you can send the commands to a file by having the Testing, Send Commands to File Menu ticked.

12. Now for each tool, set the tool's name, offset values and default speed. The speed units that you use are arbitrary as the final value ends up in the "V" variable which you can scale by using an expression in the command line before sending to the machine.

    Remember, drawings are plotted in tool order so setup the driver such that the tools that you want to use first are listed first. For example, if you usually draw with a Pen before you cut - the Pen Tool would come before a cutting tool.

    Now enter the commands for selecting the tool, the commands for turning it on (lowering, or engaging) and the commands for turning it off (raising or disengaging). Again you can test these using the **Send** Buttons.

13. Add any User Button and User Options commands if required.

14. Use the File, Save Driver.. Menu to save the driver. You can now Exit the program and use the Driver in Plotbridge.

Support

If you have any questions, problems, requests or idea regarding Plotbridge or Machseta, please email the ARISTO Support Team at sup@aristo.de

While Plotbridge has been designed to be configurable to a wide range of machines it may not fit all configurations. If you find a problem in this regard, please let us know the details. We are always looking for ways to improve the functionality and flexibility of the program.

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