CREATOR PRO IV

Program **Instruction** and **Setup Manual**

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Chapter 1

Introduction

ÖSTLING Creator Pro IV, is an application program for the graphic creation of two dimensional objects for engraving with ÖSTLING laser

NOTE:
For management of external signals, controlling and entering engraving data using Creator Pro IV, **it is necessary** to install and configure the DSP interface board. See the DSP Installation Guide.

System requirements for Creator Pro IV

- For Microsoft Windows™: 300 MHz Intel Pentium ® processor or equivalent (433 MHz recommended) with Windows NT4, Windows 2000, or Windows XP), 64 MB RAM (128 MB recommended), 40 MB space available on hard disk, color monitor which supports 800 x 600 resolution and CD-ROM drive.

NOTE:
Creator Pro IV can also be installed on Windows 98 but its functionality is limited to **emulating** and **not engraving**.

- If laser engraving is to be performed, a ÖSTLING DSP board with proper driver must be installed.

Creator Pro IV Installation

The Creator Pro IV program must be installed on a PC with 800 x 600 or higher resolution color monitor.

Follow this procedure to install Creator Pro IV on your Windows computer:

- Insert the Creator Pro IV CD in the computer CD-ROM drive
- Carry out one of the described operations:
- In Windows,
  Wait for the CD auto run if it is active
  select Start > Run. Click on Browse and select the Setup.exe file on the Creator Pro IV CD. Click on OK in the Run window to start the installation.
- Follow the prompts on the screen.
- If necessary, reboot the computer.

Selecting the language

The guided installation program installs Creator Pro IV and related applications. One of these applications is called LOCALIZE, and allows users to choose the language for Creator Pro IV and Laser Control.

Select (Windows) Start > Programs > Lasonall Creator IV > Localize

Or select directory ..\Lasonall Creator IV\bin and open the executable: LaserLocalize.exe

The program is configured to detect the language of the operating system and adapt as necessary. To set a specific language, select it using the Localize program. The following window will appear when the program is started:

Creator Pro IV Innovations

Creator Pro IV is the development of previous versions of Creator.

The new features in Creator Pro IV offer advanced functions for creating engraving projects, while simplification of the work flow makes it possible to create single projects able to be integrated with vectorial graphics or bitmaps, and to assign mechanical axis control or engraving sequences to them.

Creator Pro IV also includes expanded functions for the creation of actions with Script in Visual Basic, integrating the Active Script technology.

Please see the “VB Script” chapter in this manual.

Engraving project

The work flow of Creator Pro IV has been greatly streamlined thanks to the introduction of a "project" concept.
In addition to the already known modes present in the previous Creator including Vectorial Work and Ring Work (which have been maintained) a new mode has been introduced: the engraving project.
The engraving project is able to group: vectorial objects, Bitmaps, and engraving on rotating axes; in addition mechanical axe movements and activation from external signals can be associated to each object. Input and output signal logic control makes it possible for a flexible and versatile organization of the project which can be compared to elementary PLC functions.

NOTE:
Creator Pro IV maintains complete compatibility with previous versions of Creator. The files generated with the previous versions can be used by Creator Pro IV. Files generated with Creator Pro IV cannot used with the previous versions of Creator.

VB Script

Creator Pro IV makes it possible to enter particular functions associated to individual project elements. The entire group of some function examples are included in the standard version of Creator Pro IV and make it possible for example to

- Manage work shifts
- Manage special characters to be associated to the current date
- Manage serial communication
- Etc.

The functions are activated in the properties window. Existing scripts may be selected or new ones may be created. Setting new functions requires experience with Visual Basic programming.

Simulation

A graphic project to be used for engraving can be simulated. Thus there is a command which displays the format that the laser will execute in the engraving area.

Grid

The grid is a new instrument which simplifies the placement of objects on Creator Pro's graphic area, making placement of objects on the drawing faster and more precise.

Clone

The clone tool makes it possible to create rectangular series of objects. The main object can be reproduced with a matrix on lines and columns with spacing set by the operator. Editing of the source object is reproduced on all cloned objects.

Connected objects (LDC format)

Files generated in LDC mode are defined as "connected" objects. They are generated by Creator Pro IV and can be imported inside the graphic area of a project.
LDC's unique feature is that it is possible to import the files inside the project and dynamically update them.
See the related chapters for additional information.

Main differences between Creator Pro IV and the previous release

Features	Creator	Creator Pro IV
ISA Systems compatibility using DSP1 board	Ö	Ö
PCI Systems compatibility using DSP2 board		Ö
Windows 98/Me compatibility	Ö	
Windows NT4 compatibility	Ö	Ö
Windows 2000 compatibility		Ö
Windows XP compatibility		Ö
Backward compatibility (old version compatibility)		Ö
Far east language support		Ö
True Type font compatibility	Ö	Ö
Extended True Type font (CJK)		Ö
Sequence work handling	Ö	Ö
Grid with snap		Ö
Flexible document origin		Ö
Vectorial + Bitmaps in the same file		Ö
Monochrome Bitmaps	Ö	Ö
Gray-tones Bitmaps		Ö
PLT files	Ö	Ö
DXF files	Ö ½	Ö
BMP files	Ö	Ö
JPEG files		Ö
GIF files		Ö
LDC linked files		Ö
Wobble feature		Ö
Graphics sectorizations on ring divider		Ö
Position of arc text in degrees		Ö
Rectangular objects array		Ö
Flexible barcode creation		Ö
Digital I/O support for simple PLC functions		Ö
RS232 data exchange protocol	Ö	
String customization using VBScript		Ö
Flexible date format		Ö
Program customizatin using VBScript		Ö
Question window to fill up text objects		Ö
File selection using digital inputs, RS232 port, etc		Ö
Flexible data import from different sources		Ö
Direct I/O support for complex PLC functions		Ö
Visual Basic integration		Ö

Chapter 2

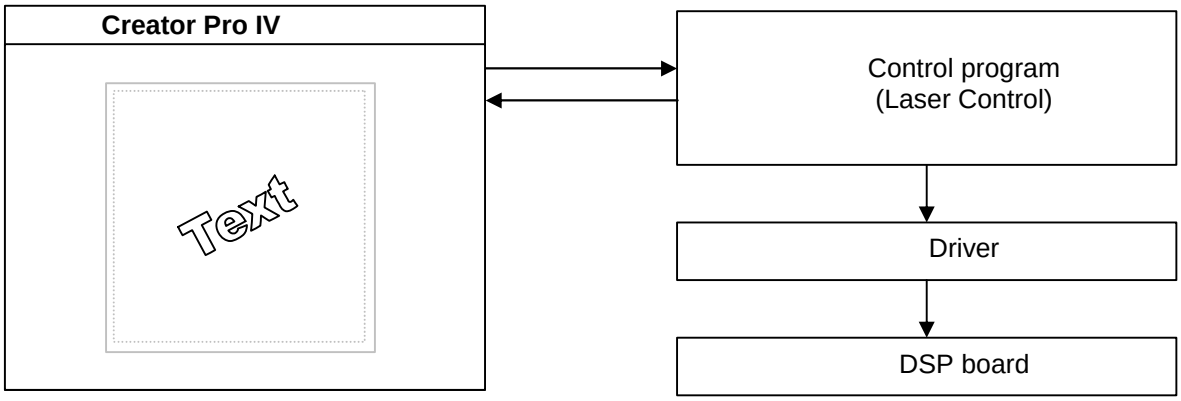
Basic Concepts

Overview

The Creator Pro IV program makes it possible to generate graphic files and translate them into paths for laser engraving. The laser engraving system consists of:

1) DSP board to be connected to a standard or industrial PC slot
2) DSP board driver.
3) DSP control program for tuning engraving parameters.
4) Graphic editor for drawing models to be sent to the engraver..

The complete system components hierarchy is illustrated in the following chart



The engraving file is graphically created by **Creator Pro IV**, a program for creating bitmap models, photographic marking and vectorial models, consisting of:

- Text strings.
- Customized date and time.
- Counter.
- Barcodes.
- Data matrix.
- Vectorial Drawings (VCT, PLT, DXF).
- Bitmap Drawings (BMP, JPG, GIF)

The DSP board program manages up to three linear mechanical axes and one rotating mechanical axe.

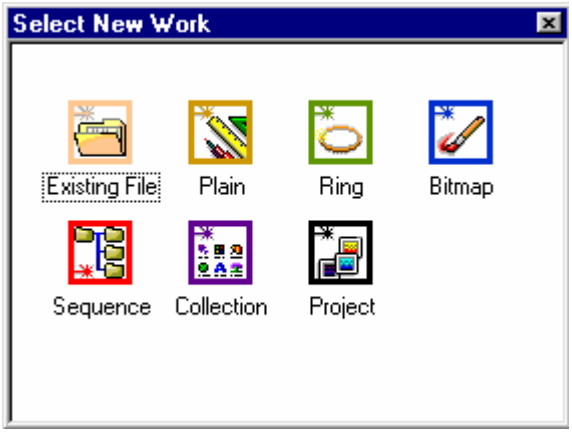
Creator Pro IV can be used to create graphic models for laser engraving with ÖSTLING DSP engraving systems. The program has two separate operating modes:

- **Work mode.** This mode is for working only. In other words, the loaded model cannot be edited in any way. In this mode, the program automatically updates the "active" components (for example the date or the counter) at each engraving job beginning and end..
  The work mode can be blocked by a password.

- **Edit mode**. This mode is used for creating/editing vectorial graph models (text strings, bar codes, data matrix, CAD files, etc.) and bitmap models (Windows BMP) and either sending the models to the engraver or saving them on the disk.

Creating a new project

When creating a new work, with Creator Pro IV the type of work to be effected is set from a selection window.
To create a new work select File> New.



After selecting the command, specify the type of work using the related icon.

Existing file
Use this command to open an existing file

Plain
Use this command for creating a new engraving file for flat surfaces

Ring
Use this command to create a new engraving file on a rotating axis

Bitmap
Use this command to create a new bitmap engraving file

Sequence
Use this command to generate a series of graphics to be engraved in sequence

Collection
Use this command to generate a series of graphics to be engraved by remote command

Project
Use this command to generate an engraving project. The engraving project is able to group vectorial, Bitmap, and rotating axe engraving, in addition for each object it is possible to associate movements of mechanical axes and activation from remote signals, Input and output logic signal control.

Creating a new project for plane engraving

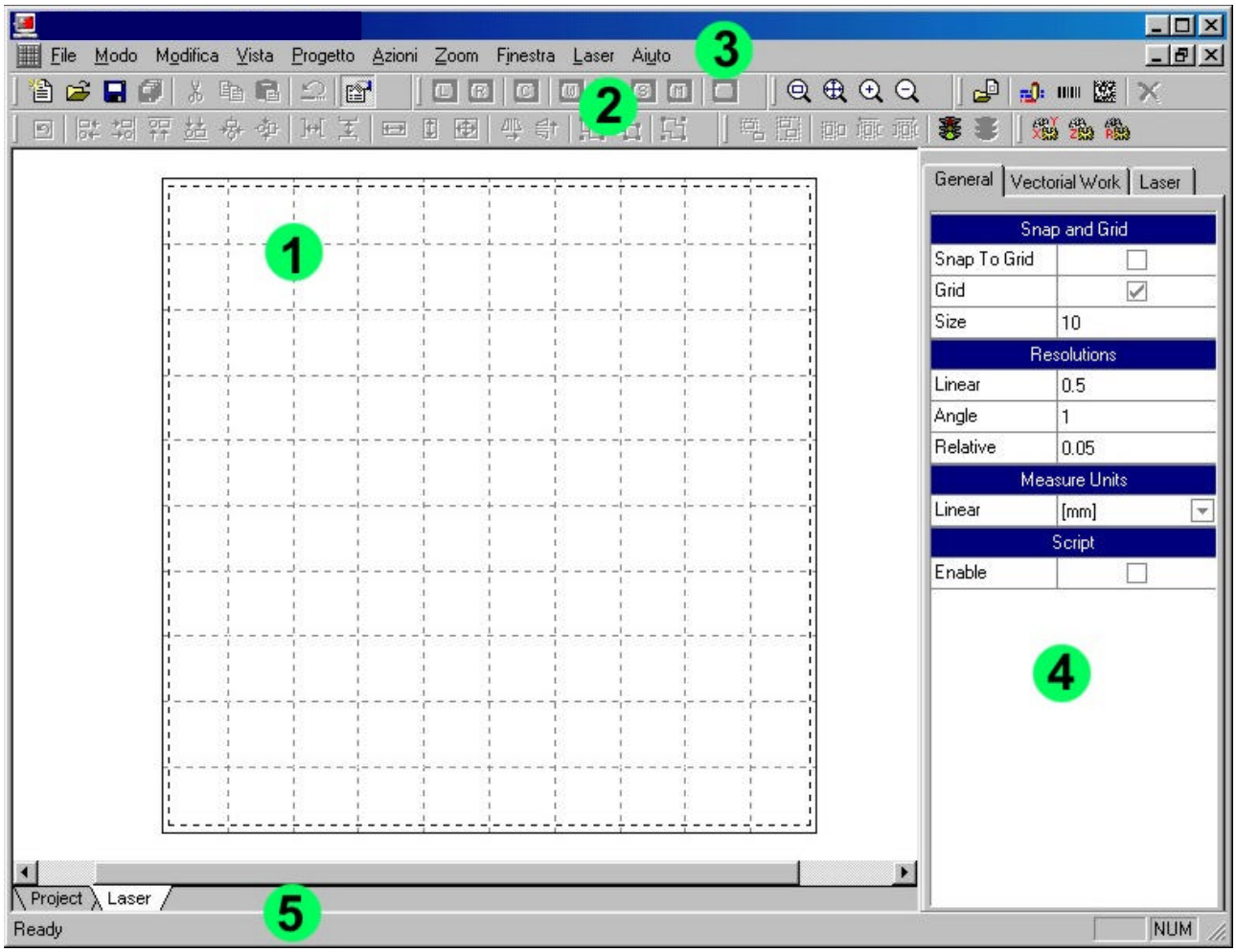
When working with Creator Pro IV, a project is created composed of new graphic forms for engraving and organized with any elementary functions for completing the activity required by the application. Creating or editing a project is only from:

- Mode > work mode

To create a new project to use for engraving a flat surface:

- Select File > New
- Select Plain from the window
- A new window "1" will open corresponding to the laser engraving model

In work window 1 it is possible to draw the graphic to be engraved or import a drawing if the extension is compatible with Creator Pro IV (DXF, PLT, BMP), see the chapter on exporting files for additional information.

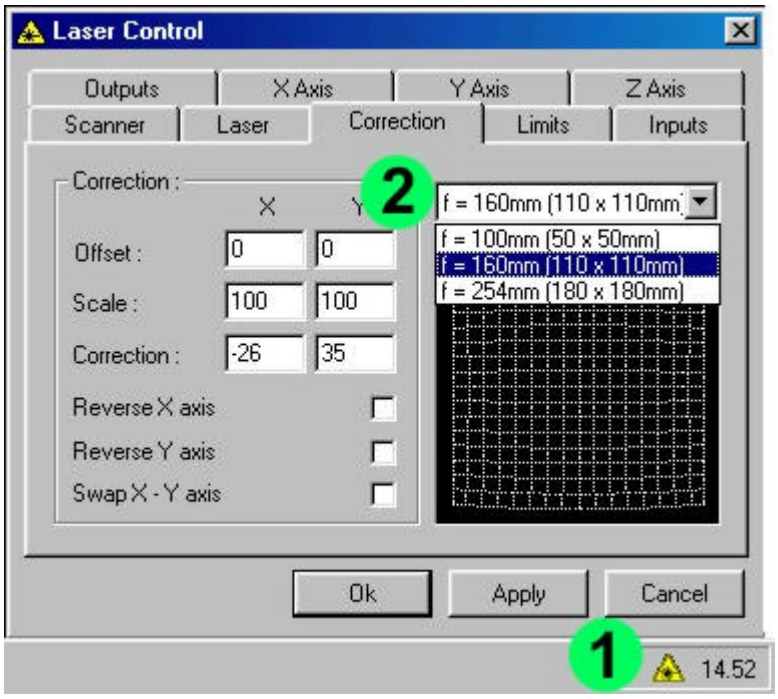


1 Work area.
2 Tool bar with tools for drawing and managing the project.
3 Menu with all Creator Pro IV commands.
4 Property window. This changes depending on the type of operation required.
5 Project pages. See relative chapter.

NOTE:
The size of the work area is a fundamental parameter. The maximum size that can be used is based on the focus height installed on the engraving laser.

Focus length

The maximum width of the work area is defined by the focus length set in Laser Control.



- Open the Laser Control application by clicking twice on icon 1 in the Tray area
- Select the Correction page
- Open Combo Box 2 and set the focus length used by the engraving laser

NOTE:
it is important that the selected focus length actually corresponds to the one installed on the engraving laser

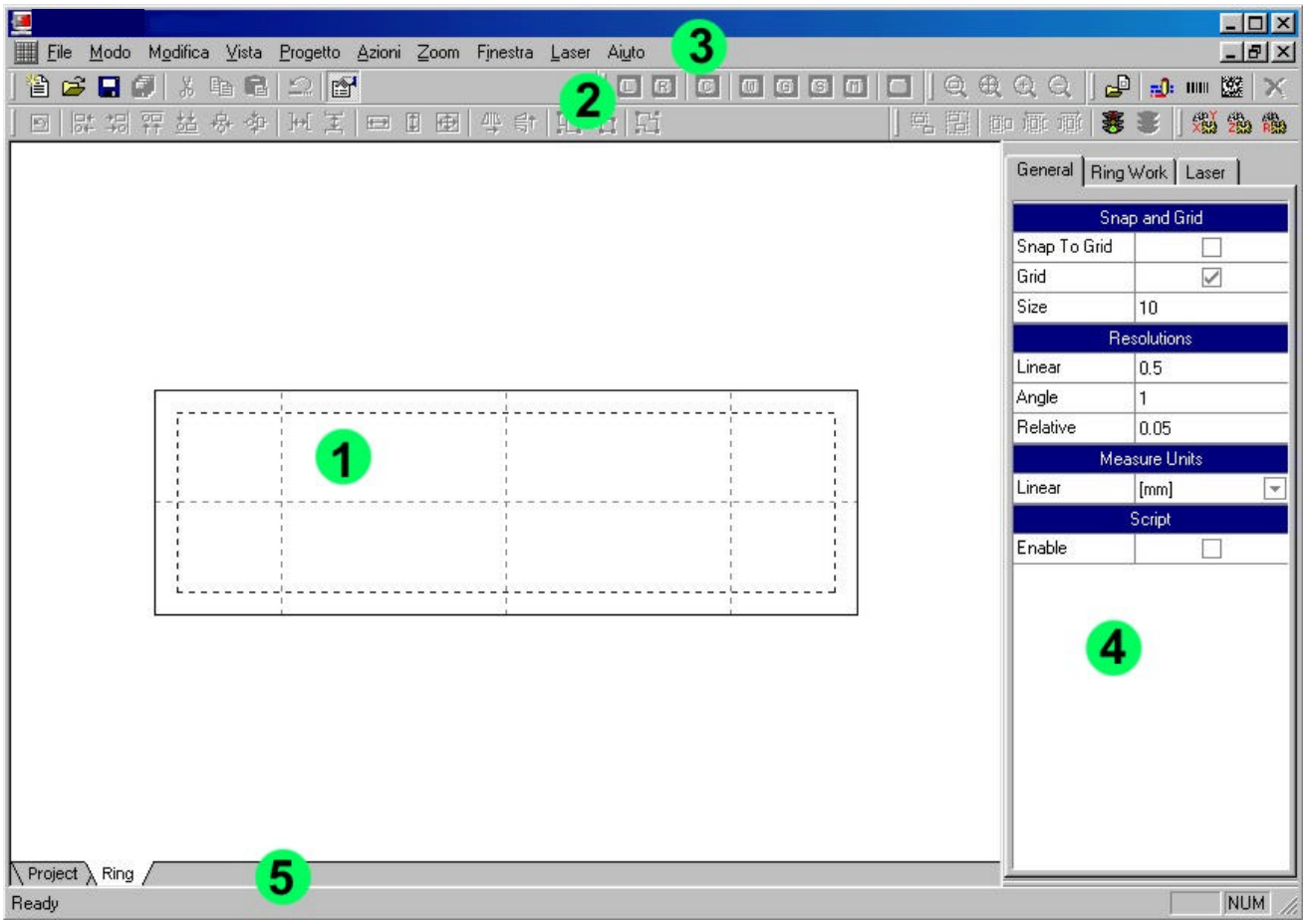
Creating a new project for ring work engraving

As previously described for plane surface engraving, when working with Creator Pro IV a project is created composed of new graphic forms for engraving and organized with any elementary functions for completing the activity required by the application. Creating and editing a project is only from:

- Mode > edit mode

To create a new project for rotary axis engraving
- Select File > New
- Select Ring from the window
- A new window "1" will open corresponding to the laser engraving model

In work window 1 it is possible to draw the graphic to be engraved or import a drawing if the extension is compatible with Creator Pro IV (DXF, PLT, BMP), see the chapter on exporting files for additional information.



1. Model with preset size based on the linear development of the surface to engrave.
2. Tool bar with tools for drawing and managing the project.
3. Menu with all Creator Pro IV commands.
4. Property window. This changes depending on the type of operation required.
5. Project page, TAB. See relative chapter.

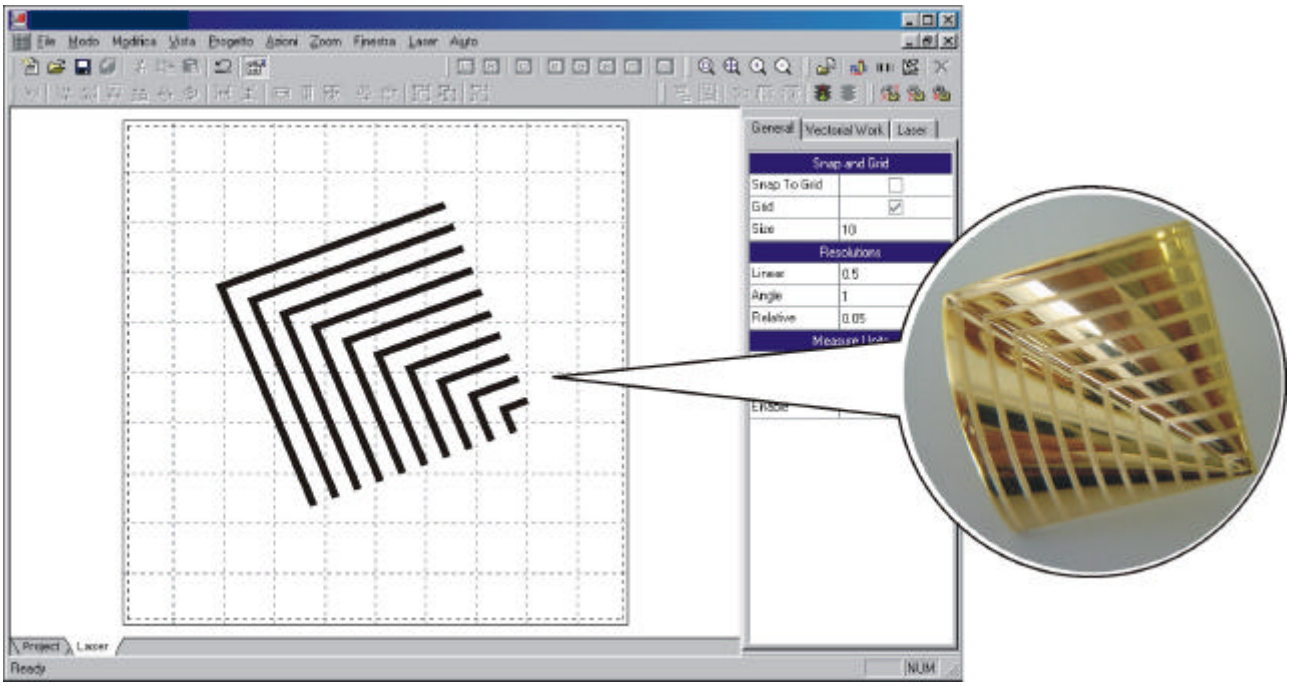
NOTE:
The height and diameter of the work area is a fundamental parameter. The displayed work area is the development of the surface to be engraved.

Drawing with Creator Pro IV

Two dimensional graphics generated by other programs (Autocad, Corel, Macromedia, Adobe…) can be imported in the Creator model.
The following are Creator Pro IV importation files:

- **DXF:** is a two dimensional vectorial graphic exchange format primarily used by CAD applications, but available for most vectorial graphic applications on the market.
- **PLT:** is a vectorial format used as an exchange file for plotters. The filters that are equipped with vectorial graphic programs can be used to generate it, or by installing HP model 7475A plotter in the operating system and printing the graphic created with the application on the file.
- **BMP:** is the standard format for bitmap graphics. It can be generated with any graphic application, from digital cameras or scanners.
- **DIB: Device Independent Bitmap,** is a format similar to BMP. It can be generated with any graphic application, from digital cameras or scanners.
- **JPG:** is one of the most common compressed bitmap formats. A BMP image converted into JPG has a much smaller (in bytes) dimension, it is generally used in continuous tone images.
- **GIF:** is a format similar to BMP. It can be generated with any graphic application, from digital cameras or scanners.
- **VCT:** engraving graphics generated by Creator (2.11 or lower)

The imported graphic can be located in the model and moved, re-dimensioned, rotated and transformed so that it is compatible with the object to be engraved.



The example in the figure shows a drawing imported into a Creator Pro IV model and then re-dimensioned and rotated to adapt it to the object to be engraved.

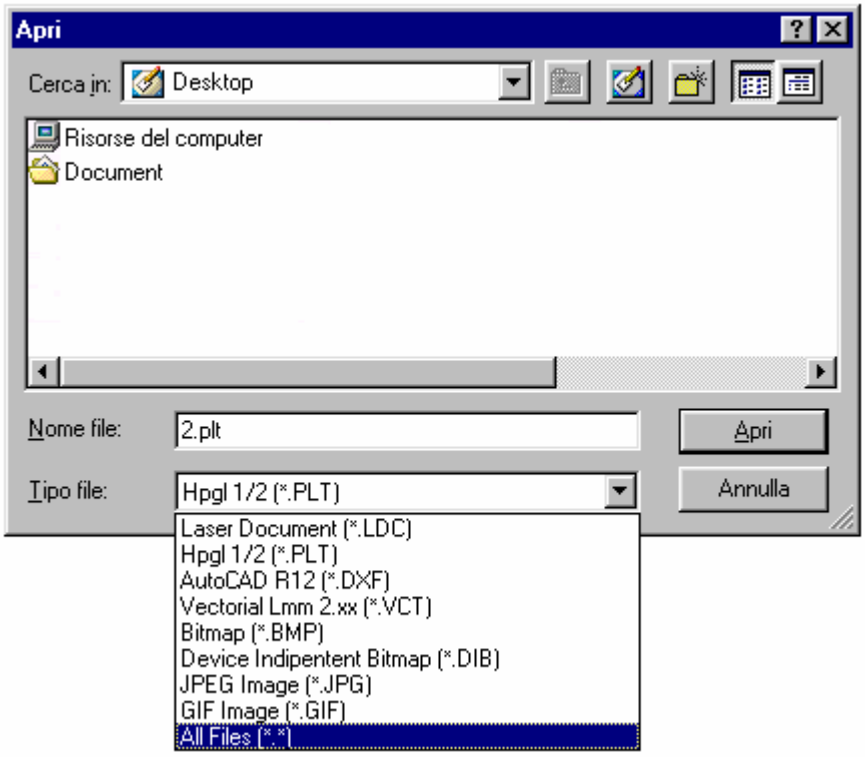
Importing graphics with Creator Pro IV

After having created a new project as described in the previous chapters, it is possible to import a drawing as follows:

- Select: Actions > Add > Import File

The following window will be displayed

- Select the importation filter from the "File type" combo box.
- Specify the path of the file to be imported from the “search” combo box
- Select the file.



After having positioned the file inside the work area, elementary operations can be effected, for example:

- positioning the object on established coordinates
- changing the height and width of the object
- filling the object with filler lines (only if the lines of the imported object are closed)

The drawing can be completed by adding other imported graphics or with Creator Pro IV entities, for example:

- Text strings
- Bar codes
- Data matrix
- Connected objects (LDC)

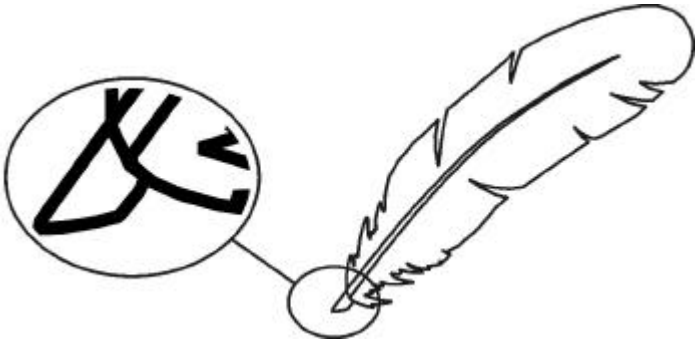
NOTE:
The use of LDC connected objects is described in the following chapters.

Information on bitmap and vectorial graphics

Computers display vectorial or bitmap graphic formats. Understanding the difference between the two can be helpful for working more efficiently.
Creator Pro IV is able to generate and import two dimensional vectorial graphics and also import and edit bitmap graphics created in other applications.

Vectorial graphics

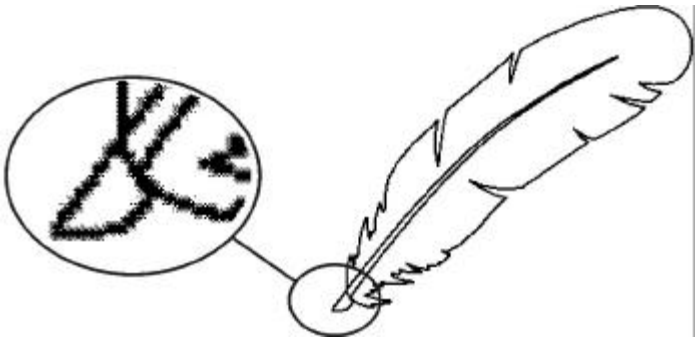
Vectorial graphics describe the images using lines and curves, called vectors, which all include properties related to color and position. For example the image of a feather is described by points through which lines pass, creating the form of the outline of a leaf. The color of the leaf is determined by the color of the outline and the color enclosed within the outline. In the example described below a black and white feather is represented because the laser engraving is monochromatic. When vectorial graphics are edited, all the properties of the lines and curves which describe the form are also edited. It is possible to move, re-dimension, remodel and change the color of vectorial graphics without changing their quality. Vectorial graphics are not resolution dependent, this means they can be displayed on output devices with different resolutions with no change in quality.



In laser engraving a vectorial graphic is faster in engraving and more defined in terms of outline lines and filling. A vectorial graphic cannot be used for engraving digital photographs.

Bitmap graphics

Bitmap graphics describe images using colored dots, called Pixels, located within a grid. For example, the image of a feather is described by the specific position and color of every pixel in the grid, the creation process is very similar to that of a mosaic.
In the example described below a black and white feather is represented because the laser engraving is monochromatic
When bitmap graphics are edited the pixels are edited instead of the lines and curves. The bitmap graphics change with resolution, as the data which describes the image is fixed in a grid with specific dimensions. Editing bitmap graphics can change their quality. In particular, re-dimensioning bitmap graphics may make the edges of the image irregular since the pixels within the grid are redistributed. In addition, displaying bitmap graphics on an output device with a lower resolution in relation to the image reduces the display quality.



In laser engraving, a bitmap graphic is slower in engraving and less defined in terms of outline lines and filling. A bitmap graphic can be used, with opportune conversions, for engraving digital photographs.

Creator Pro IV work environment

During the creation and editing of projects for engraving, normally the following key functions are used

- The graphic work area where the drawing is represented
- The project work area where any sequences and functions are displayed within the individual project
- Property window, where the engraving parameters and properties for the single graphic objects are set
- Simulation for displaying a new window with the outline of what the laser is going to effect in the engraving area
- The toolbar for editing the various project and drawing elements..

Zooming reducing

By changing the zoom, it is possible to display the whole graphic area on the screen or a greatly enlarged detail of a particular part. The maximum zoom depends on the screen resolution and the dimensions of the graphic area.
The zoom or reduce use the following techniques:

- To zoom a certain element, select the Zoom tool and click on the element.

- To zoom a specific area in the drawing, use the zoom to trace a rectangular window around the perimeter. Creator Pro IV sets the zoom level so that the specific rectangle fills the window..
- Or select Zoom > Window

- To zoom or reduce the entire window, select Zoom > In or Zoom > Out.

Property window

Project property

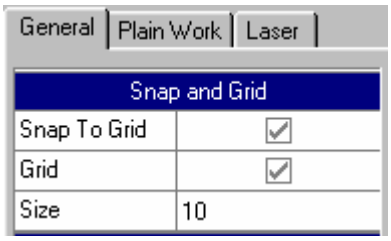
The parameters which characterize the various elements or the functions which make them up are set in the project property window. Each project component will be described in **Chapter 6: Framework of a Project**

Engraving document property

The property window changes based on the type of engraving document selected. The engraving document can be "flat" for vectorial or bitmap graphic engraving on flat surfaces, or "rotor" for vectorial or bitmap graphic engraving on rotating axes.

General

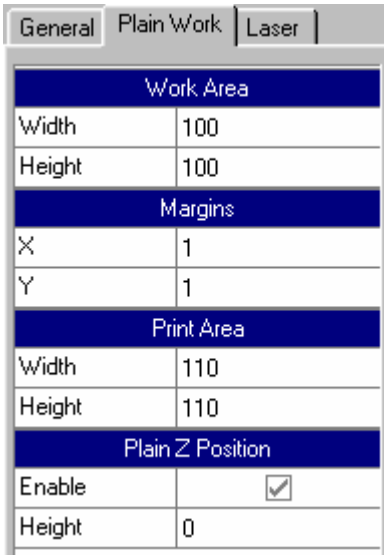
The grid characteristics are set on the "General" page



Snap to grid:	Enables the snap to the objects in the grid
Grid:	Enables grid display
Size:	Sets grid spacing

Flat

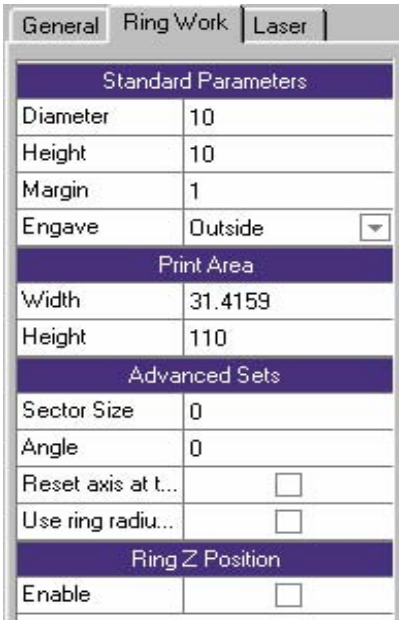
The characteristics for objects engraved on flat surfaces are set on the "Plain Work" page.



Work area	Width/Height:	Sets the dimension of the work area
Margins	X Y	Sets the width of the margins in the work area
Print Area	Width/Height	Sets the maximum width of the work area, it is related to the lens mounted on the engraving laser
Plain Z position		
Height		Shows the Z axe value set in the laser parameters, it can be editing by enabling "Enable" and entering a new value in the "Height" field

Ring

The characteristics for graphic objects to be engraved on rotating axes are set on the "Ring Work" page.

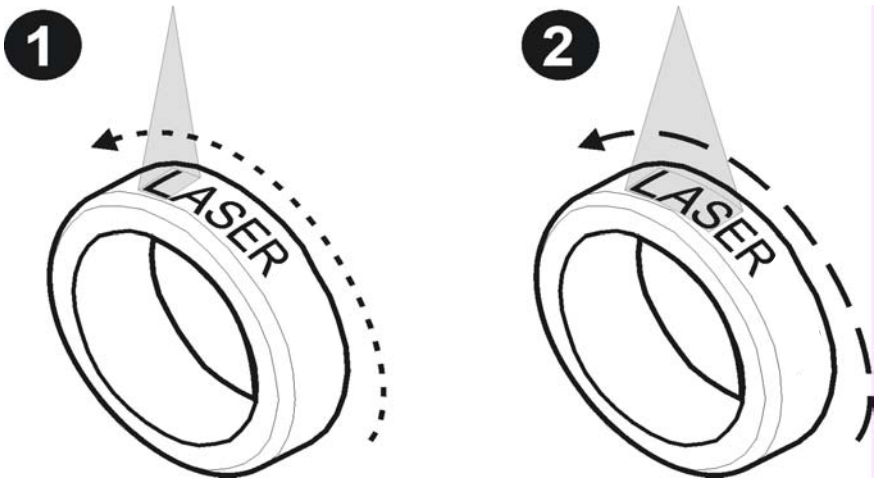


Standard Parameters

Diameter: The size of the external or internal diameter, expressed in millimeters.
Height: The height of the ring or cylinder, expressed in millimeters
Margins: Sets the width of the margins in the work area
Engrave : Sets engraving inside or outside the ring

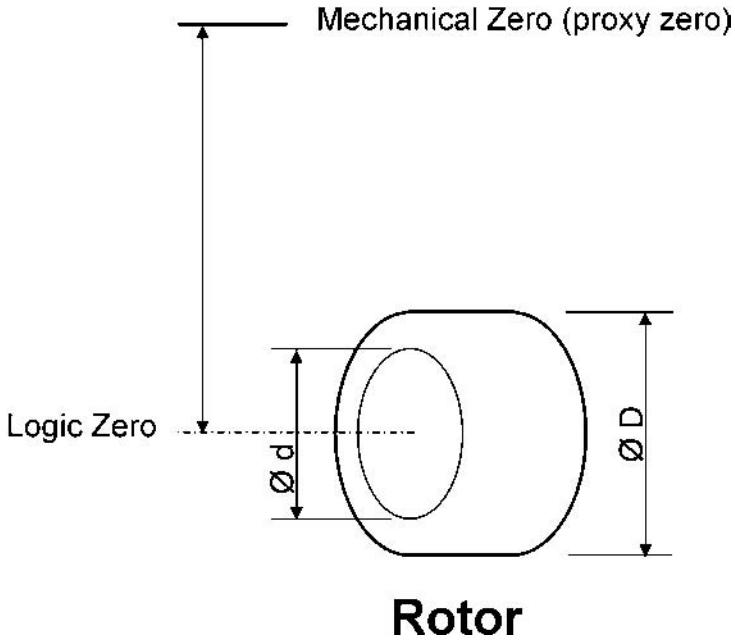
Advanced Sets

Sector Size: Defines the width of the sector in millimeters, The sector represents a graphic portion to be engraved. When sector is 0, each element is engraved individually, and after each element, the motor of the separator advances. If the sector value is greater than 0 (set acording to the size of the part), engraving will be organized by sectors. This will reduce the number of motor movements.



NOTE:
the sector Size value is self-controlled by Creator Pro IV program to prevent distortions in the engraving caused by curving of the ring.

Angle	The slant angle of the work-piece on the separator, expressed in degrees
Reset axes at engraving end	If enabled, it brings the rotor to its initial position at the end of engraving
Use radius as Z position:	Creator Pro IV can be used to automatically focus the ring to be engraved by enabling the term "**Use radius as Z position".** When this function is enabled Creator Pro IV will compute the optimum focus position according to the diameter (internal or external) entered in the respective box. For correct operation of this option, set the logic zero of axis Z in the revolution center. Logic zero is the focus position on the item to be engraved.



Position Z	Enable/Height	The R axe value. It can be edited using "Enable", set the new value in "Height"

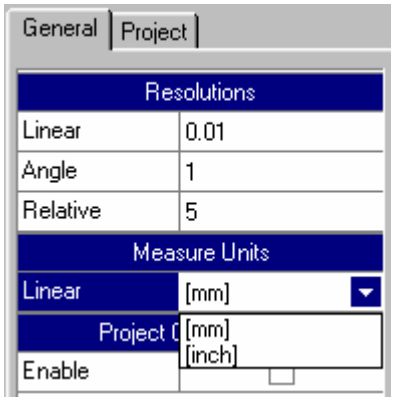
Graphic object property

Each object that makes up the model can be edited using the mouse, toolbar or "property window" which displays all the characteristic parameters including: sizes, origins, filling, laser parameters etc. It is important to note that also the document itself is an object which properties can be accessed when no other object is selected. Each graphic object uses by default the laser parameters of the document. You can set different laser parameters for each object, in this case, the parameters will appear blue.

Object properties depend on the selected object, this is discussed in the paragraphs related to individual graphics (text, bar codes and data matrix).

Setting the measurement unit

Creator Pro IV makes it possible to set the linear measurement unit which characterizes part of the configurations. You can use the "General" page located in the project property window and set the measurement unit in millimeters or inches from the "Measurement unit" menu.



Resolution

Linear Represents the approximation for linear quotes. Each entered measurement unit will be approximated to the value set in this box

Angle Represents the approximation for angle quotes. Each entered measurement unit in degrees will be approximated to the value set in this box

Relative Represents the approximation for relatives, that is expressed in percentages. Each entered percentage value will be approximated to the value set in this box.

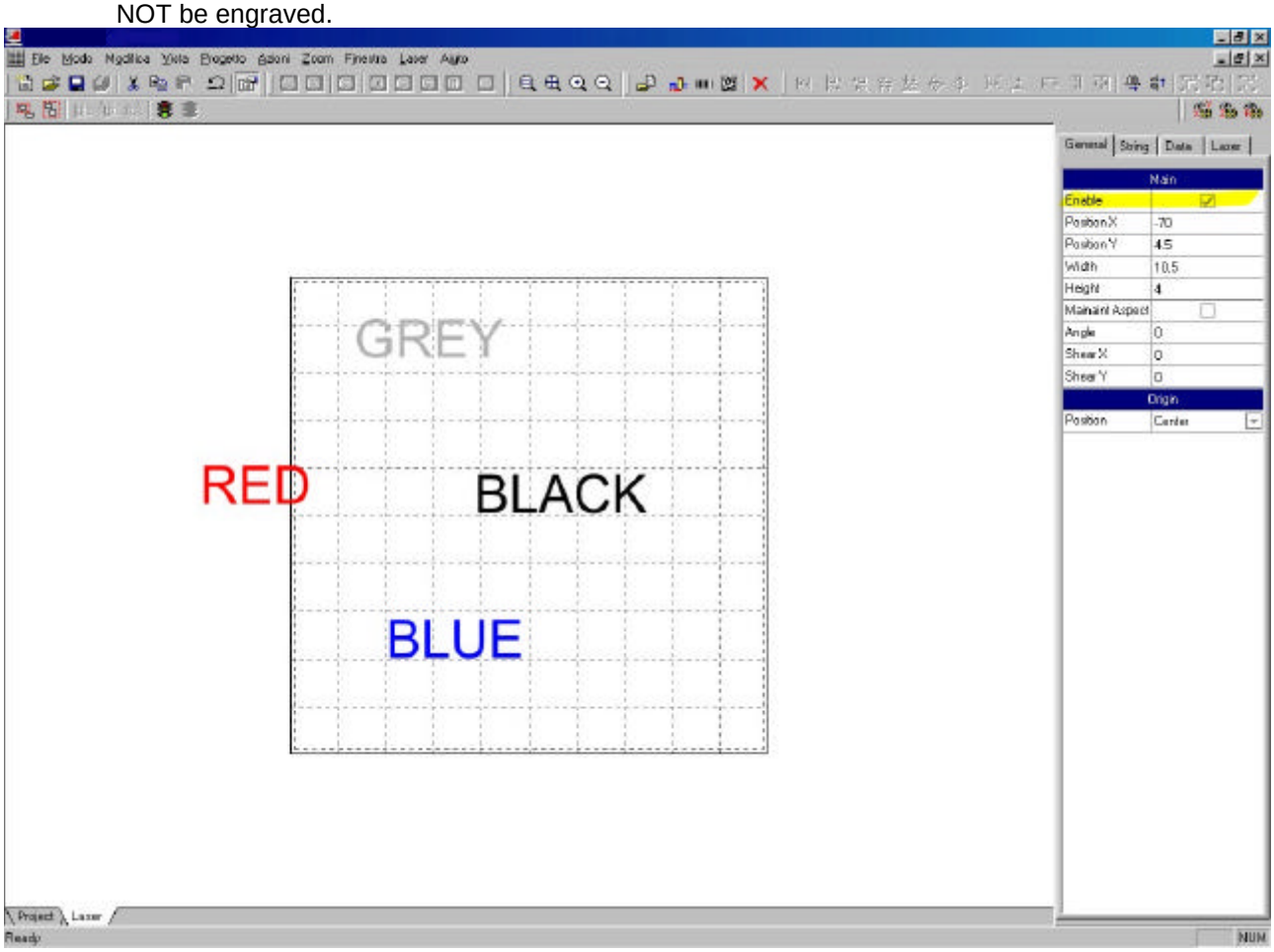
Coloring of graphic objects

The objects in the graphic area may be different colors.

- **Black:**
  Black indicates that the object is correctly placed within the graphic area and is enabled for engraving. Its engraving parameters are the standard ones of the document..
- **Blue:**
  Blue indicates that the graphic object is correctly placed within the graphic area and is enabled for engraving. Its engraving parameters are NOT the standard ones of the document, special laser engraving parameters have been set which are only relative to the blue colored object.

NOTE:
There can be various blue colored objects within the graphic area. Each object had laser parameters which are different than the standard document ones. The blue colored objects may have laser parameters which are different from each other.

- **Red:**
  Red indicates that the graphic object is NOT correctly placed within the graphic area. A red colored object will NOT be engraved.
- **Grey:**
  Grey indicates that the graphic object is correctly placed within the graphic area but is NOT enabled for engraving (see the area highlighted in the property window). A grey colored object will NOT be engraved.



Chapter 3

Creating Graphics

Creator Pro IV drawing tools

Creator Pro IV drawing tools can be divided into two different types:

- Imported graphics
- LDC connected objects
- Creator Pro IV objects

Imported graphics

For a description and the use of imported graphics see the description contained in the previous chapter.

LDC connected objects

For a description and the use of LDC connected objects see the description contained in the previous chapter.

Creator Pro IV objects

Some elementary forms able to complete the engraving can be introduced into the graphic area.

- Text
- Bar Code
- Data Matrix

Using the text tool

When text is used in Creator Pro IV it is possible to set dimensions, printing character, style, spacing, shear and filling. The text can also be transformed as if it were an object, by rotating it, shearing it and mirroring it, and it is still possible to edit the characters.

It is possible to insert text boxes in the projects destined for user input or dynamically displaying updated texts, by associating an identification to a string.
It is also possible to place the text inside or outside of a circumference arc.

In Creator Pro IV it is possible to import any kind of true type font, including Asian origin ideogram fonts. To for importing fonts see the paragraph in the chapter: Customizing Creator Pro IV.

To add a text string in Creator Pro IV:

from the menu select: **“Actions” → “Add” → “Text”**, or use the mouse to click on the “**Add string**” icon on the tool bar.
Then set the text parameters:

- Font style
- Character height
- Compression percentage
- Spacing percentage
- Character angle
- Character shear
- Circle arrangement arc radius
- String ID

Special character sequences

The text string can contain any alphanumeric character and one or more of the following special character sequences:

%a, %A : Day of the week, abbreviated (a) or full (A)
%b, %B : Month of the year abbreviated (b) or full (B).
%c : Date and time according to current location
%d : Day of the month, decimal number (01 –31)
%H : Time 24 hour clock format (00 – 23)
%I : Time 12 hour clock format (01 – 12)
%j : Day of the year, decimal number (001 – 366)
%m : Month of the year, decimal number (01 – 12)
%M : Minutes, decimal number (00 – 59)
%p : A.M. / P.M. indicator
%S : Seconds, decimal number (00 – 59)
%U : Week of the year, decimal number (00 – 51, Sunday is the first day of the week).
%w : Day of the week, decimal number (0 – 6, Sunday = 0)
%W : Week of the year, decimal number (00 – 51, Monday is the first day of the week).
%x : Date according to current location
%X : Time according to current location
%y : Year, two digit decimal number (00 – 99)
%Y : Year, four digit decimal number
%z, %Z : Time zone, name (Z) or abbreviation (z).
%n : Counter, decimal format
%o : Counter, octave format.
%e, %E : Counter, hexadecimal format, lower case (e) or upper case (E)
%s : Data from serial RS232-C.
%% : Percentage sign%
%ID : (Percentage sign followed by an ID number) ID number string copy

[1] The string ID is a number which identifies the string uniquely inside the file.

Example of date in dd/mm/yyyy format

Proceed as follows to make a text string with the format: day (two digits), month (two digits), year (four digits) separated by '/':

- Create a text string.
- Select the required parameters (font, character height etc.)
- Enter the string "%d/%m/%Y" in the text box and press enter

Example of date in dd/mm/yy format

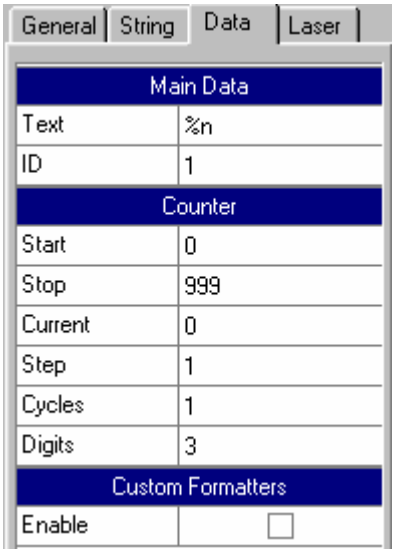
Proceed as follows to make a text string with the format: day (two digits), month (two digits), year (two digits) separated by '/':

- Create a text string.
- Select the required parameters (font, character height etc.)
- Enter the string "%d/%m/%y" in the text box and press enter

Example of counter

Proceed as follows to make a text string including a decimal format counter:

- Create a text string.
- Select the required parameters (font, character height etc.)
- Select the required counter parameters (see below).
- Enter the string “%n” in the text box and press enter.



The counter parameters can be accessed from the "Properties" window on the string "Data" page> The parameters are:

- Start, the minimum value of the counter.
- Stop, the maximum value of the counter
- Cycles, the number of engraving jobs required to increase

the counter.

- Increment, increment value (positive or negative).
- Digits, minimum number of digits to be displayed.

For example, with the following parameters:

Current	= 9
Start	= 1
Stop	= 10
Cycles	= 2
Increment	= 2
Digits	= 3

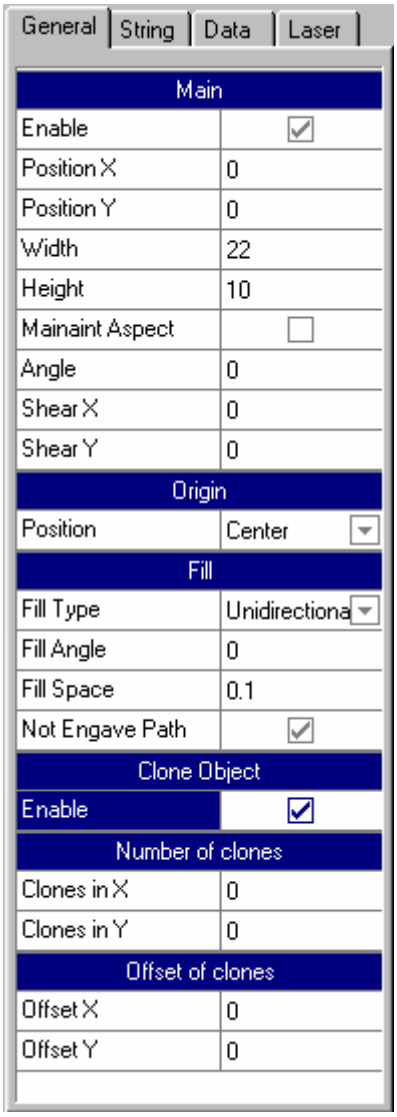
The following would appear: “001”
to become: “003”…”005”…”007”…”009”…”002”…”004”…”006”…”008”…”010”…”001”…

In this example an increment would occur every two engraving jobs.

Selecting text properties

The property window displays the text parameters only when the text in the graphic area is selected. Typical text parameters are shown on the various pages in the figure.

General:



Main:

Enable: Enables engraving of the selected text (if not enabled the text is gray)

Position XY Sets the text coordinates in relation to the origin of the engraving area (0,0 is the center of the area)

Width, Height: Sets the text width, height

Maintain Aspect: If enabled, keeps the proportions between width and height

Angle Sets the rotation angle (in degrees) of the string on the engraving area

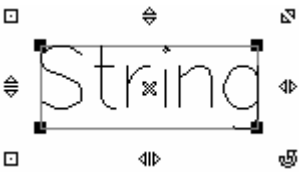
Shear X Sets a shear on axis X. The shear in the figure on the right is 50.

Shear Y Sets a shear on axis Y. The shear in the figure on the right is 50.

.

Origin:

Position This is used to move the reference origin of the string. The origin is identified by an X placed in the center, this can be moved to one of the four corners of the selected object.



Filling:

Fill tipe… Use to fill a text string. Filling is effected with parallel lines.

Fill angle… Represents the fill angle

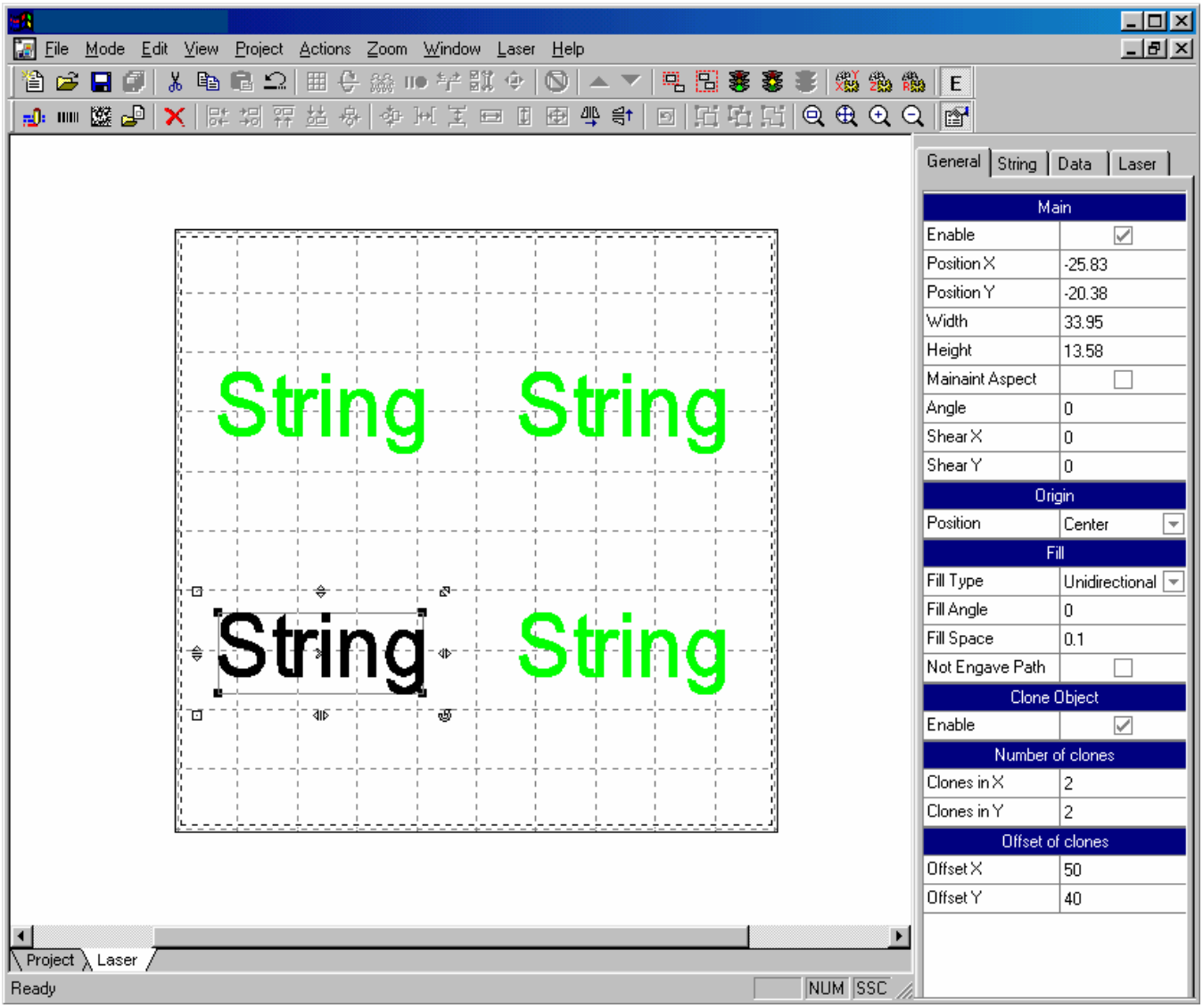
Fill space… Represents the fill line space

Not engrave path: If this option is selected, only filling lines will be engraved.

String String

Clone Object

Enable	This is enabled in order to generate clones of the selected object. Clones are objects which are identical to the original one, placed on a rectangular matrix. Editing of the original object parameters (in black) is reflected on its clones (in green)
Clone in X	Represents the number of clones on the horizontal axis (X)
Clone in Y	Represents the number of clones on the vertical axis (Y)
Offset X	Represents the offset of the clones on the X axis in relation to the original
Offset Y	Represents the offset of the clones on the Y axis in relation to the original



Text

Data:

Text: Enter the string to be engraved in the TEXT field; or the value of the variable which represents it

ID: Represents the numeric value which univocally identifies the string or variable

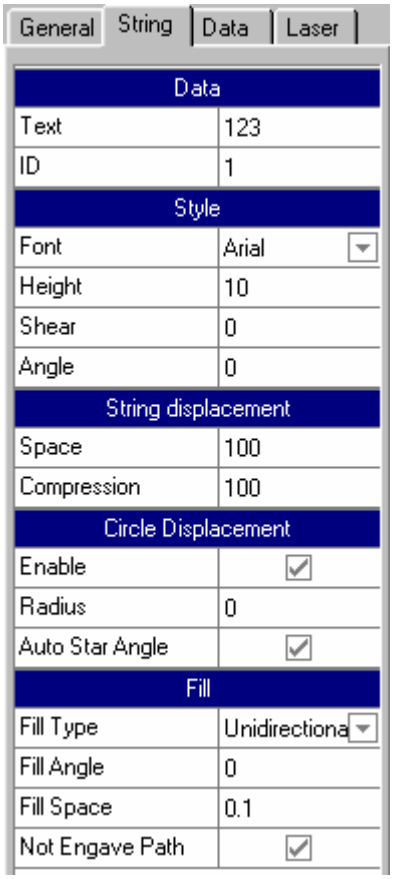
Style

Font: Represents the converted True Type font that the text must use

Height: Represents the character height

Shear: Represents the shear of the selected character on the X axis

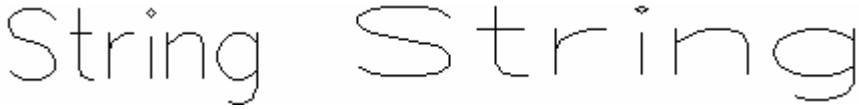
Angle Represents the angle of rotation that a single letter uses in relation to its origin. The example shows a string with a character angle of 45 degrees.



String Displacement

Space Represents the spacing between the letters of the string (default value is 100).
The example below shows a string with a spacing value of 200.

Compression Represents the compression of each character of the string (default value is 100). The example below shows a string with a Compression value of 200.

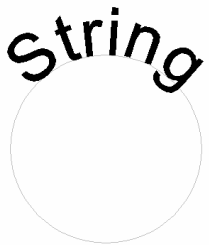


Circle Displacement

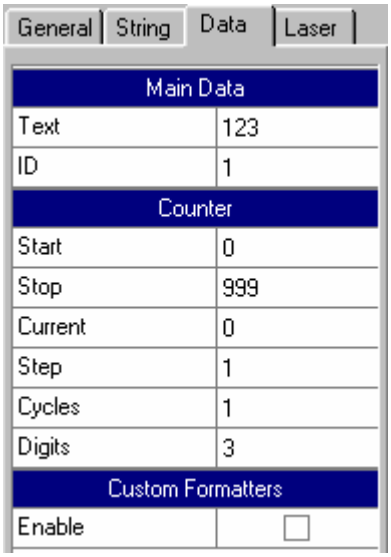
Enable Enables placing the text on the circumference arc

Radius Represents a hypothetical circumference arc to align the string on. The example below shows a string with an arc of 20 mm.

Auto start angle If enables, this is used to set the start point of the string on the arc. The start point is set in degrees in the "Start Angle" field. The figure shows an automatic start angle.



Data:



Main data

Text: Enter the string to be engraved in the TEXT field; or the value of the variable which represents it

ID: Represents the numeric value which univocally identifies the object in the document

Counter

Start: minimum value of the counter.
Stop: maximum value of the counter.
Step: value of the increment (positive or negative)..
Cycles: number of engraving jobs required to increase the counter.
Digits: minimum number of digits to be displayed.

NOTE:
The counter is only enabled if the sequence **%n** appears at least once in the TEXT box

Customized formatting

Enable: Enables management of VB script (see relative chapter)

Adding a bar code

A bar code can be defined as a symbol or alphabet for coding information in a format so that it can be automatically acquired.

Terminology

Bar code	A succession of alternating dark elements (bars) and blank elements (spaces) Code may also mean the type of coding.
Element	Name of a space or a bar
Bar	Dark element of a code
Space	Blank element between two bars
Bar code symbol	A complete bar code, made of a blank area before the code, a start character, one or more characters containing the information, a stop character and a final blank area.
Discrete code	Bar code in which all elements are not significant. Some act as separators, relatively broad tolerances are allowed for their thickness.
Continual code	The bars and spaces which contain information.
Inter-character space	A space which separates two adjacent characters, in some codes (code 39, bar code) the spaces inside a character contain information, inter-character spaces do not.
Module	The smallest thickness in a code element. It constitutes the measurement unit of the thickness of wide elements.
Character	Succession of bars and spaces which code a single decimal digit or a special alphabet character.
Start/Stop Character	Each symbol starts with a start character and stops with a stop character. They are used to identify the type of code and indicate the reading direction
Quiet Zone	The blank spaces immediately preceding the start character and following the stop character.
Print ratio	In two thickness codes, it is the ratio between the thickness of the wide element and that of the narrow one

When a bar code is used in Creator Pro IV it is possible to set the dimensions, the type of standard, a checksum, the shear and filling.

The following bar codes are available:

- 2/5 Standard
- 2/5 Industrial
- 2/5 Interleaved
- 3/9 Standard
- 3/9 Full
- Code 128
- EAN 13 digit
- EAN 8 digit
- UPC-A
- UPC-E

The bar code is treated by Creator Pro IV in the same way as a text string, therefore it is possible to associate the functions of special character sequences described in the previous paragraphs.

Bar code engraving can be done in reverse by enabling the relative tag.

NOTE:
Reverse bar code engraving can only be done on those materials which react "backwards". The bar code standard does not include reverse coding.

Classifications

Two thickness codes
The code elements (bars and spaces) can only assume two thickness, in a ratio between 2 and 3. The following codes belong to this group:

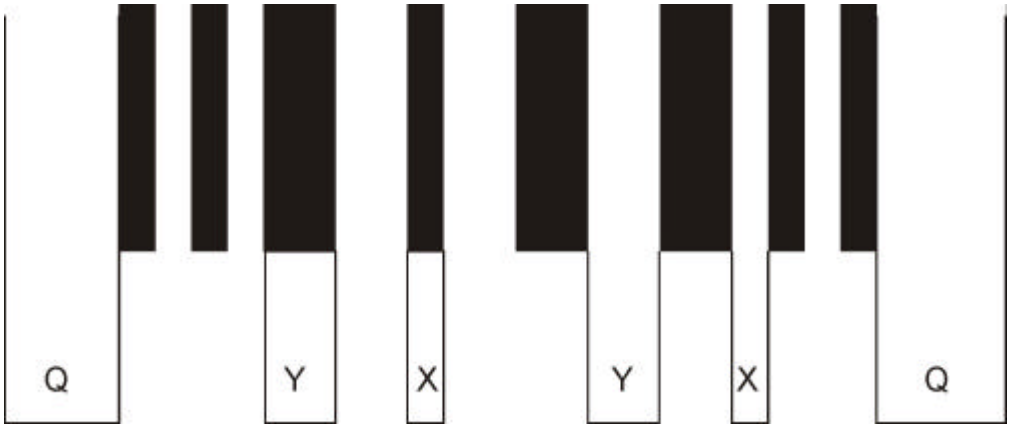
- 2/5 Standard
- 2/5 Industrial
- 2/5 Interleved
- 3/9 Standard
- 3/9 Full
- Code 128

Codes with multiple thicknesses
The code elements can assume more than two different thickness. Generally this requires better printing quality. The following codes belong to this category:

- EAN 13 digit
- EAN 8 digit
- UPC-A
- UPC-E

Structure of a bar code symbol

A bar code symbol is made up of a series of bars and spaces which contain information and check elements.

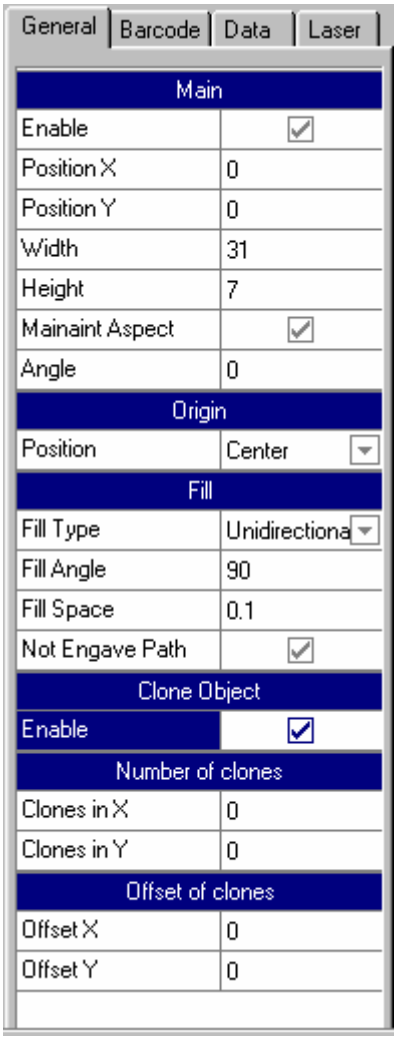


Y: Thickness of the wide element
X: Thickness of the narrow element
Q: Thickness of the blank overflow zones at the end of the label (quite zones)

The type of code is characterized by:

- Ratio between the thickness of the wide elements and that of the narrow ones
- Thickness of the narrow element. This is often called "module thickness", it is used as the measurement unit of the wide element thicknesses.
- Sequence of bars and spaces for coding the characters which can be represented. The single characters are codes with 4,5,7,8 or 9 elements..
- Characters which can be represented. All codes can represent digits, some can also code letters and/or special characters.
- Number of characters which can be represented with a label. Some codes represent a fixed number of characters.
- Sequence of bars and spaces for coding the start/stop characters. They are used for identifying the type of code and for establishing the reading direction. Some codes use the same sequence for both others have separate sequences..
- Tolerances for the single elements. Tolerances can range from a few hundredths to a few tenths of a millimeter.
- Check digit. To increase the security of the code a check digit may be added to the useable characters.

Selecting bar code properties



General:

Main:

Enable: Enables engraving of the selected text (if not enabled the text is gray)

Position XY: Sets the bar code coordinates in relation to the origin of the engraving area (0,0 is the center of the area)

Width, Height: Sets the code width, height

Maintain Aspect: If enabled, keeps the proportions between width and height

Angle: Sets the orientation angle (in degrees) of the bar code on the engraving area

Origin:

Position: This is used to move the reference origin of the bar coda. The origin is identified by an X placed in the center, this can be moved to one of the four corners of the selected object.

Fill:

Type Represents the filling method used for engraving a bar code, it can be single or bi- directional

Angle Represents the angle of the fill lines

Space Represents the space between fill lines

Not Engrave Path Disables engraving of the code outlines

Clone object

Enable By enabling this it is possible to generate clones of the selected object. Clones are objects which are identical to the original one, placed on a rectangular matrix. Editing of the original object parameters (in black) is reflected on its clones (in green)

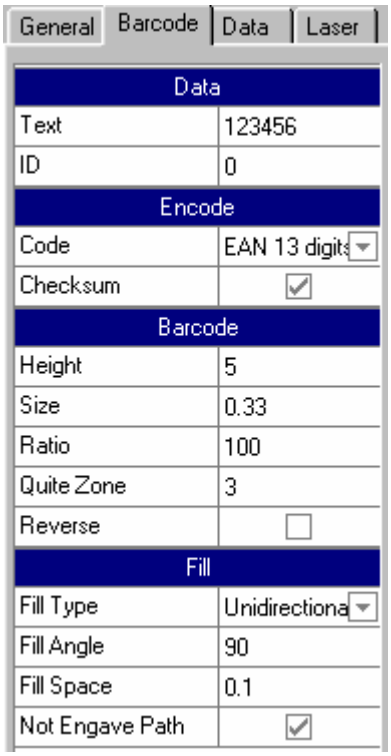
Clone in X Represents the number of clones on the horizontal axis (X)

Clone in Y Represents the number of clones on the vertical axis (Y)

Offset X Represents the offset of the clones on the X axis in relation to the original

Offset Y Represents the offset of the clones on the Y axis in relation to the original

Barcode



Data:

Text: Enter the string to be engraved in the TEXT field, or the value which represents it.

ID: Represents the numeric value which univocally identifies the string or variable.

Coding

Code: Represents the coding type of the bar code

Checksum: Enables a checksum calculation on the bar code string (if installed)

Bar code

Height: Represents the bar code height

Size: Represents the width of the unit bar

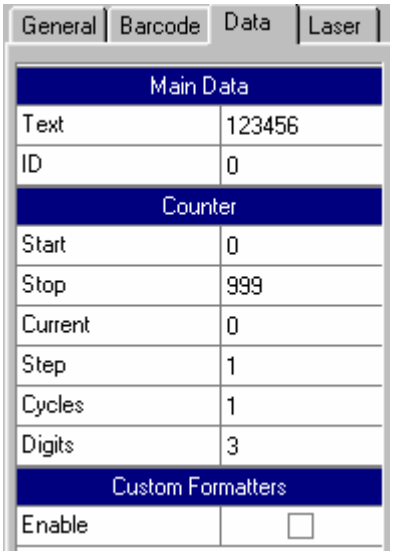
Ratio Represents the engraving offset due to the dimension of the spot laser. This parameter is used to balance and make the engraved square dimensions identical to the empty ones.

Quite zone: Represents the extra space to the left and right of the bar code when it is inverted

Reverse: Bar code engraving can be effected in reverse by enabling the tag

NOTE:
Reverse bar code engraving can only be done on those materials which react "backwards". The bar code standard does not include reverse coding.

Data



Main data

Text: Enter the string to be engraved in the TEXT field, or the value which represents it.

ID: Represents the numeric value which univocally identifies the string or variable that represents the bar code.

Counter

Start: minimum value of the counter.
Stop: maximum value of the counter.
Step: value of the increment (positive or negative)..
Cycles: number of engraving jobs required to increase the counter.
Digits: minimum number of digits to be displayed.

NOTE:
The counter is only enabled if the sequence **%n** appears at least once in the TEXT box

Customized formatting

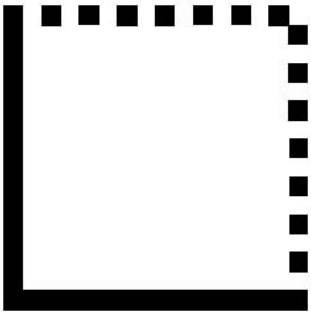
Enable: Enables management of VB script (see relative chapter)

Creating a Data Matrix

Data Matrix is a symbol represented by a two dimensional matrix composed of square modules included in a perimeter defined by a pattern.
A Data Matrix can be represented as a dark drawing on a light surface or vice versa.

Terminology

Pattern Perimeter that marks off the code, composed of continuous vertical and horizontal lines and a mirrored dotted line. The dotted line is composed of single modules alternating with single spaces.



Code Represents the code of the string which is placed inside the pattern
Module It is a single cell, it represents a bit in the code representation. It is represented by a square
Protocol Represents the type of encoding used by Data Matrix. Creator Pro IV uses the ECC 200 standard protocol (Reed Solomon Error Correction)

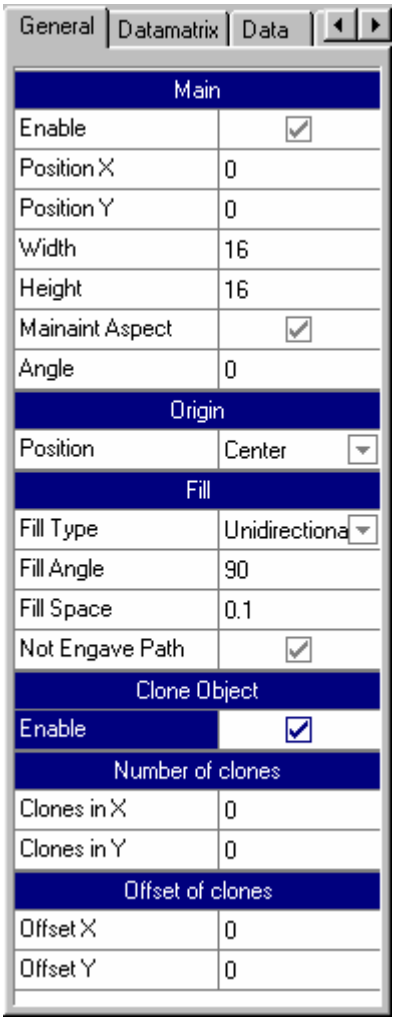
When using Data Matrix with Creator Pro IV it is possible to set the dimensions, the type of standard and any parameter modifications for optimizing engraving.

The following Data Matrix codes are available:

- C40
- TEXT
- ASCII
- X12
- EDIFACT
- BASE 256

The Data Matrix is treated by Creator Pro IV in the same way as a text string, therefore it is possible to associate the functions of special character Sequences described in the previous paragraphs.
The Data Matrix can be square or rectangular. The matrix dimensions can be automatic (based on the length of the string) or set by the user.
For square Data Matrix, the matrix ranges from a minimum of 10x10 to a maximum of 48x48. For rectangular Data Matrix the matrix ranges from a minimum of 18x8 to a maximum of 48x16.

Selecting Data Matrix properties



General

Main:

Enable: Enables engraving of the selected text (if not enabled the text is gray)

Position XY: Sets the text coordinates in relation to the origin of the engraving area (0,0 is the center area)

Width, Height: Sets the data matrix width, height

Maintain Aspect: If enabled, keeps the proportions between width and height

Angle: Sets the rotation angle (in degrees) of the data matrix on the engraving area

Origin:

Position: This is used to move the reference origin of the data matrix. The origin is identified by an X placed in the center, this can be moved to one of the four corners of the selected object.

Fill

Fill type Represents the filling method to use for engraving the data matrix it can be single or bi-directional

Fill angle Represents the angle of the fill lines

Fill space Represents the space between fill lines

Not Engrave Path: Disables engraving of code outlines

Object clone

Enable This is enabled in order to generate clones of the selected object. Clones are objects which are identical to the original placed on a rectangular matrix. Editing of the original object parameters (in black) is reflected on its clones (green)

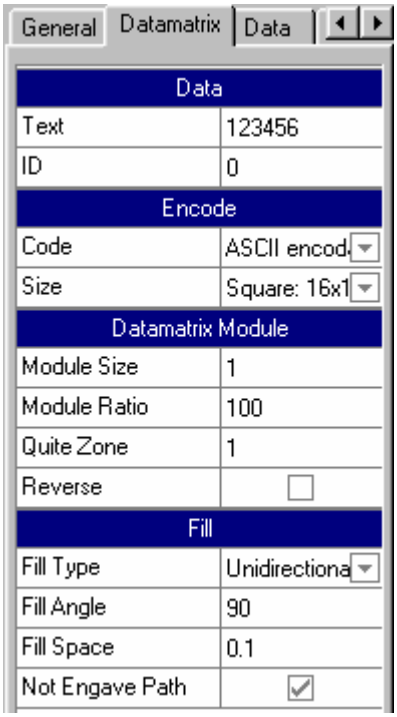
Clone in X Represents the number of clones on the horizontal axis (X)

Clone in Y Represents the number of clones on the vertical axis (Y)

Offset X Represents the offset of the clones on the X axis in relation to the original

Offset Y Represents the offset of the clones on the Y axis in relation to the original

Datamatrix



Data:

Text: Enter the string to be engraved in the TEXT field, or the value which represents it.

ID: Represents the numeric value which univocally identifies the string or variable that represents the bar code.

Encode

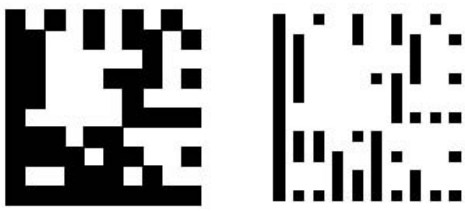
Code: Represents the type of data matrix encoding

Size: Sets the data matrix. For square Data Matrix, the matrix ranges from a minimum of 10x10 to a maximum of 48x48. For rectangular Data Matrix the matrix ranges from a minimum of 18x8 to a maximum of 48x16

Datamatrix Module

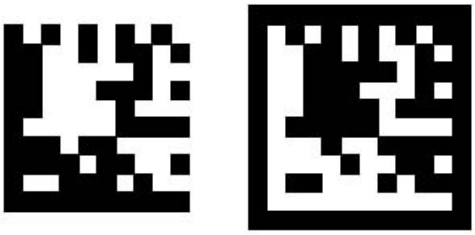
Module Size : Represents the dimension of the Data Matrix pixel in the engraving area.

Module Ratio: Represents the engraving offset due to the dimension of the spot laser. This parameter is used for balancing and for making the dimensions of the engraved squares identical to the empty ones and is particularly useful for engraving very small Data Matrix. Module ratio is expressed in percentage, the figure below shows a Data Matrix with a module ratio of 100% (left) and the same Data Matrix with a module ratio equal to 50% (right). The lesser dimension of the engraving area (black) is used to compensate the dimension of the spot laser.

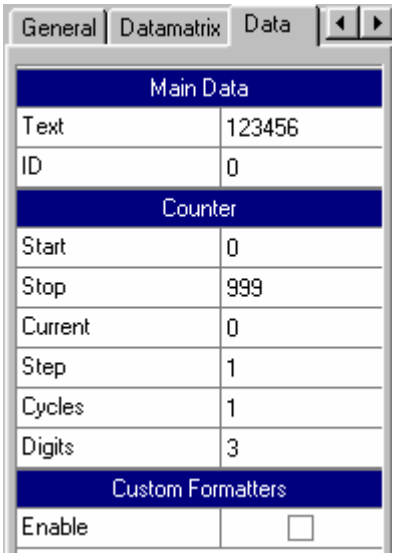


Quite Zone: Represents the extra space around the Data Matrix when it is inverted

Reverse: Data Matrix engraving can be reversed by enabling the relative tag (reverse). The figure below shows a normal Data Matrix (left) and a reversed Data Matrix (right).



Data



Main

Text: Enter the data matrix text to be engraved in the TEXT field, or the value of the variable which represents it.

ID: Represents the numeric value which uniquely identifies the string or variable that represents the data matrix.

Counter

Start: minimum value of the counter.
Stop: maximum value of the counter.
Step: value of the increment (positive or negative)..
Cycles: number of engraving jobs required to increase the counter.
Digits: minimum number of digits to be displayed.

NOTE:
The counter is only enabled if the sequence **n** is set in the TEXT box with the % symbol before it.

Customized formatting

Enable: Enables management of VB script (see relative chapter)

Deleting

To delete an object from the engraving area select it and press the button on the tool bar.
Or select the Eliminate command from the Actions menu.

Chapter 4

Importing images

Adding images to CREATOR PRO IV

Bi-dimensional graphics generated by other programs (Autocad, Corel, Macromedia, Adobe…) can be imported into the Creator Pro IV work area. They can be composed of vectorial graphics or Bitmap.

Importing vectorial graphics

The following vectorial graphics can be imported in Creator Pro IV:

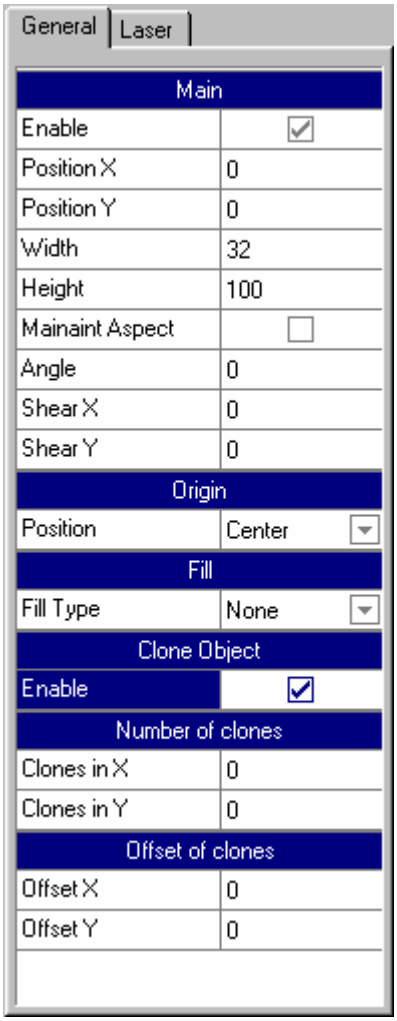
- **DXF:** is a two dimensional vectorial graphic exchange format primarily used by CAD applications, but available for most vectorial graphic applications on the market.
- **PLT:** is a vectorial format used as an exchange file for plotters. The filters that are equipped with vectorial graphic programs can be used to generate it, or by installing HP model 7475A plotter in the operating system and printing the graphic created with the application on the file.
- **VCT:** engraving graphics generated by Creator (2.11 or lower)

To import a vectorial graphic into the work area:

- Select Actions > Add > Import
- Select the importation filter from the “File type” combo box.
- Specify the file path to be imported in the “search in” combo box
- Select the file.

After positioning the file in the work area, the object parameters can be set.

Setting vectorial image parameters



Main:

Enable: Enables engraving of the selected text (if not enabled the text is gray)

Position XY: Sets the text coordinates in relation to the origin of the engraving area (0,0 is the center area)

Width, Height: Sets the object width, height

Maintain Aspect : If enabled, keeps the proportions between width and height

Angle: Sets the rotation angle (in degrees) of the object on the engraving area

Origin:

Position: This is used to move the reference origin of the object. The origin is identified by an X placed in the center, this can be moved to one of the four corners of the selected object.

Fill

Filling type Represents the filling method to use for engraving the object it can be single or bi-directional

Fill angle Represents the angle of the fill lines

Fill space Represents the space between fill lines

Not Engrave Path: Disables engraving of graphic outlines

Object clone

Enable This is enabled in order to generate clones of the selected object. Clones are objects which are identical to the original placed on a rectangular matrix. Editing of the original object parameters (in black) is reflected on its clones (green)

Clone in X Represents the number of clones on the horizontal axis (X)

Clone in Y Represents the number of clones on the vertical axis (Y)

Offset X Represents the offset of the clones on the X axis in relation to the original

Offset Y Represents the offset of the clones on the Y axis in relation to the original

Importing Bitmap graphics

The following Bitmap graphics can be imported in Creator Pro IV:

- **BMP:** is the standard format for bitmap graphics. It can be generated with any graphic application, from digital cameras or scanners
- **DIB: Device Independent Bitmap,** is a format similar to BMP. It can be generated with any graphic application, from digital cameras or scanners.
- **JPG:** is one of the most common compressed bitmap formats. A BMP image converted into JPG has a much smaller (in bytes) dimension, it is generally used in continuous tone images
- **GIF:** is a format similar to BMP. It can be generated with any graphic application, from digital cameras or scanners

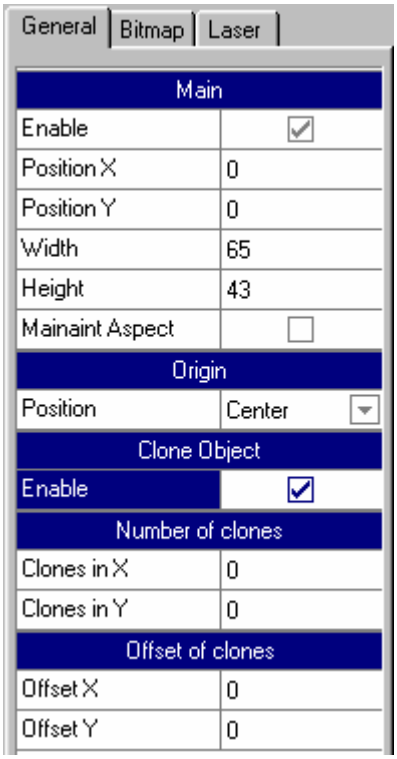
To import a Bitmap graphic into the work area:

- Select Actions > Add > Import
- Select the importation filter from the “File type” combo box.
- Specify the file path to be imported in the “search in” combo box
- Select the file.

After positioning the file in the work area, the object parameters can be set.

Setting Bitmap image parameters

General



Main:

Enable: Enables engraving of the selected text (if not enabled the text is gray)

Position XY: Sets the text coordinates in relation to the origin of the engraving area (0,0 is the center area)

Width, Height: Sets the object width, height

Mantein Aspect: If enabled, keeps the proportions between width and height

Origin:

Position: This is used to move the reference origin of the object. The origin is identified by an X placed in the center, this can be moved to one of the four corners of the selected object.

Object clone

Enable: This is enabled in order to generate clones of the selected object. Clones are objects which are identical to the original placed on a rectangular matrix. Editing of the original object parameters (in black) is reflected on its clones (green)

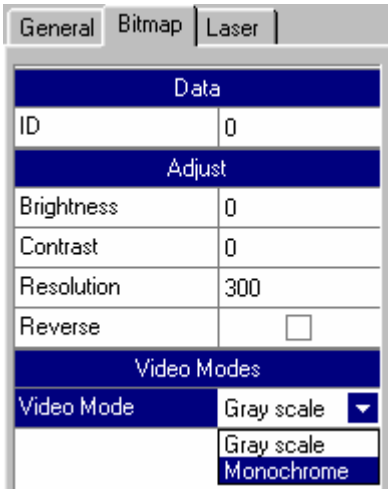
Clone in X: Represents the number of clones on the horizontal axis (X)

Clone in Y: Represents the number of clones on the vertical axis (Y)

Offset X: Represents the offset of the clones on the X axis in relation to the original

Offset Y: Represents the offset of the clones on the Y axis in relation to the original

Bitmap



Adjust

Brightness: Used to adjust the brightness of an imported bitmap image
Contrast: Used to adjust the contrast of an imported bitmap image
Resolution: Used to change the resolution, expressed in dots per inch
Reverse: Engraving of the imported bitmap can be done in reverse by enabling the relative tag (reverse).

Video Modes

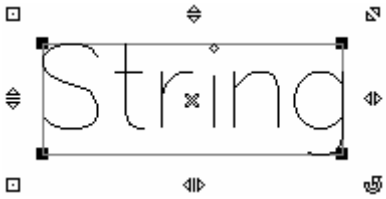
Monochrome: Converts the image to monochromatic
Gray scale: Converts the image in dithering to gray tones

Chapter 5

Operations with objects

Selecting objects

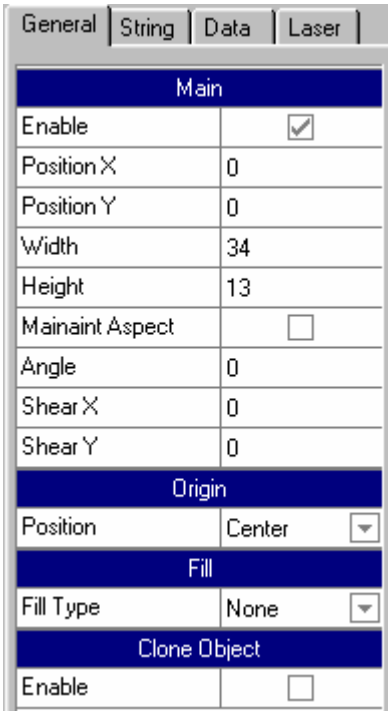
Selection of graphic objects is done by direct selection using the mouse cursor our by drawing a window which contains them. By drawing a window it is possible to select one or more objects, to select more than one object by direct selection, it is necessary to hold down the SHIFT key. The selected object is highlighted by a square , tools for changing the selected object are on the edges of the object. A small "x" marks the center of the selection perimeter.



To deselect an object, click on a blank area of the drawing window.

Enabling/disabling an object

Each object in the graphic area can be disabled using the relative TAG, located in the properties window.



General	String	Data	Laser

Main	
Enable	☑
Position X	0
Position Y	0
Width	34
Height	13
Mainaint Aspect	☐
Angle	0
Shear X	0
Shear Y	0
Origin	
Position	Center
Fill	
Fill Type	None
Clone Object	
Enable	☐

The "Enable" TAG disables the selected object. A disabled object is displayed in gray in the graphic area but will **NOT** be engraved.

Group objects

The objects located in the graphic area can be batched so as to form a single object.
The functions Batch Separate and Intersect of objects are used to create unusual and irregular shapes. They can be used on all objects. However it is not possible to batch or intersect bitmap pictures.
Batch, Separate and Intersect operations involve source objects and objective objects. For example to create a star cut-out on a square object, the star becomes the source object because it is used to cut the square. The square becomes the objective object because it is the one to be cut.

Group
This command Group one or more objects in the work area. The single objects keep their structure, but the transformation and movement operations involve all of the batched objects. Groups containing strings can be used to change the text without prior separation.

Ungroup
This is used to separate the objects combined with the batch function. The separated objects can then again be configured and transformed individually.

Merge
is used to obtain an object with a single outline. It is possible to independently weld the objects even if they are overlaid. If objects are welded which are not overlaid, it is possible to form a welding group which acts as a single object. In both cases, the welded object assumes the filling and outline attributes of the objective object.

When single objects are welded with intersecting lines, the object is divided onto various sub-formats, while the aspect remains the same.
The cut-out creates new irregular shapes by removing the areas overlaying other objects. The objective object maintains the filling and outline attributes. For example, if a text is cut overlaying a circle the text area is removed, thus creating the effect of a reverse text.

Before cutting out the objects it is necessary to establish which object is going to be cut (objective object) and which objects to use in the cut-out. The objects used for the cut-out must be overlaying or be overlaid by the objective object.
The intersection creates a new object from an area where two or more objects overlay. The shape of this new object can be simple or complex, depending on the intersected shapes. The filling and outline attributes of the new object are based on the object set as the objective object.

In complex graphics, the merge command can be applied on single imported object.

In the example below are represented three figure. The figure number one represent the vectorial imported graphics. The figure number 2 represent the same graphics but with filling lines. The figure number 3 represent again the same graphics, with filled lines but with merge functions enabled.

As shown, merge function applied on a single object allow the engraving of complex vectorial graphics.

Moving/re-dimensioning objects

It is possible to position the objects by dragging them to a new location, using a shift operation, or by specifying the horizontal and vertical position.
The set values
To specify the position of an object, the horizontal and vertical coordinates to a central anchorage point of the object can be indicated or to another anchorage point. A small "x" marks the anchorage point.
For a per-set setting, the origin point (0,0) corresponds to the central point of the work area.

Alignment of objects

Creator Pro IV can be used to align and distribute objects in the drawing. Alignment can be used to precisely align any series of objects. For example, it is possible, to align a series of objects horizontally or vertically.

 Alignment of selected objects to the left

 Alignment of selected objects to the right

 Alignment of selected objects at the top

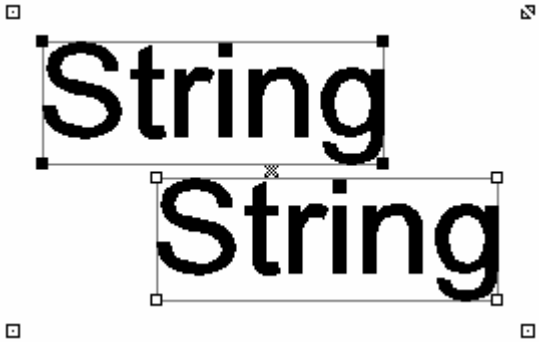
 Alignment of selected objects at the bottom

 Alignment of selected objects along the y axis

 Alignment of selected objects along the x axis

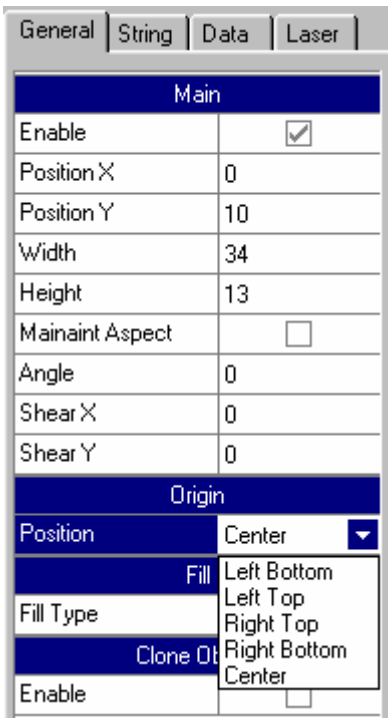
Reference object

Alignment operations for objects are characterized by a reference object. The reference object is the central point of the alignment and the selected objects move as a consequence.
The reference object can be identified by the black square apices. In the example below the reference object is the upper string. To change the reference object push the Control (CTRL) key and select a new on in the work area.



Rotating and Mirroring Objects

Creator Pro IV can be used to rotate the objects and create mirror images. It is possible to rotate an object by specifying the angle "Angle" on the "General" page of the object properties.
It is also possible to change the rotation center "Position" in the same way, this is identified with a small "x" from the related menu in the property window.



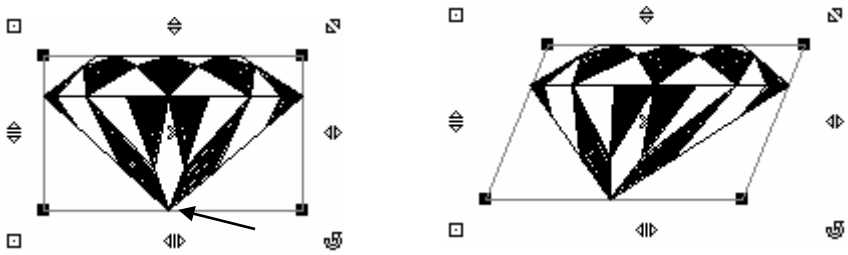
Mirroring of the object is done by selecting Actions > Mirror > horizontal (or vertical), or by using the keys on the tool bar.

 Mirror object along vertical axis

 Mirror objects along horizontal axis

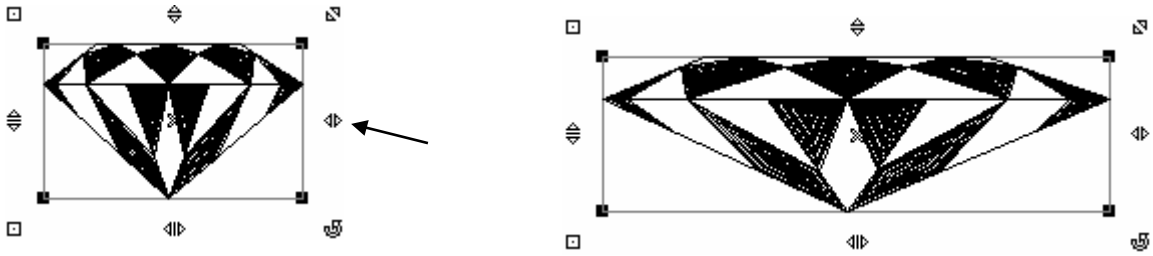
Shearing and lengthening objects

In Creator Pro IV it is possible to shear and lengthen objects. To shear an object it is necessary to specify the value in degrees of required shear by specifying on the "general" page of the object properties the shear for axis X (shear X) and axis Y (shear Y). The same result can be obtained by dragging the relative apices after selecting the object.



The example in the figure shows shearing along axis X obtained by dragging the lower central apex.

To lengthen an object it is necessary to change the dimension value (Height and Width) on the "general" page of the object properties. The same result can can be obtained by dragging the relative apices after selecting the object.



The example in the figure shows lengthening along axis X obtained by dragging the lower right apex.

Using the grid

The grid is a series of traced lines which intersect. They can be used to precisely align and position objects in the drawing window.

The distance between lines in the grid can be set by specifying the spacing in the document property window:

General > Snap to grid > Size

The "Size" spacing refers to the exact distance between each line, lower spacing values can be used to align and position objects with greater precision.

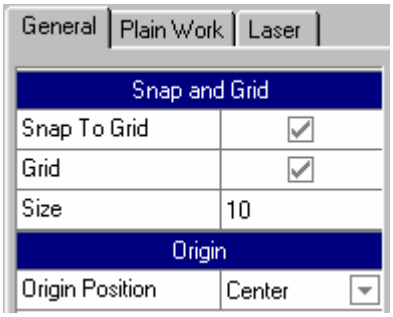
To display the grid in the drawing window the following tag needs to be enabled:

General > Snap to grid > Grid

To snap to grid objects the following tag needs to be enabled:

General > Snap to grid

Snap to is used to move objects and align them to the closest grid line.



NOTE:
To display the document property window deselect each object in the drawing area.

Chapter 6

Project structure

Project Structure

The project is a container which houses single graphic works and related functions.
The following items may be located inside the project:

Plain

This is a graphic work for plain engraving. By selecting Project > Add plain (or using the related icon) a work for plain engraving is added to the project, defined by the word PLAIN. Select the related pain to access the graphic area where it is possible to draw or import objects for plain engraving.

Ring

This is a graphic work for ring engraving. By selecting Project > Add ring (or using the related icon), a work for ring engraving is added to the project, defined by the word RING. Select the related pain to access the graphic are where it is possible to draw or import. objects for engraving on the separator.

Clone

This is a copy of a previously set Plain or Ring. The Clone function is related to the identification number of the original graphic work. Therefore the Plain or Ring to be cloned must have an ID number.

Wait Start

This command interrupts execution of the project. Engraving is stopped at the end of the Plain or Ring prior to the Start wait. This period ends with a Start Engraving signal.

Get and Go

This command is used to jump inside a project sequence. The conditions for effecting this function come from a reading of the signals on the Input ports. If the set condition occurs, the project will resume from the Plain or Ring defined by the corresponding ID. It is also possible to effect an unconditioned jump in the sequence.

Set Out

This command is used to Set or Reset the output bits on the interface board.

Move axis

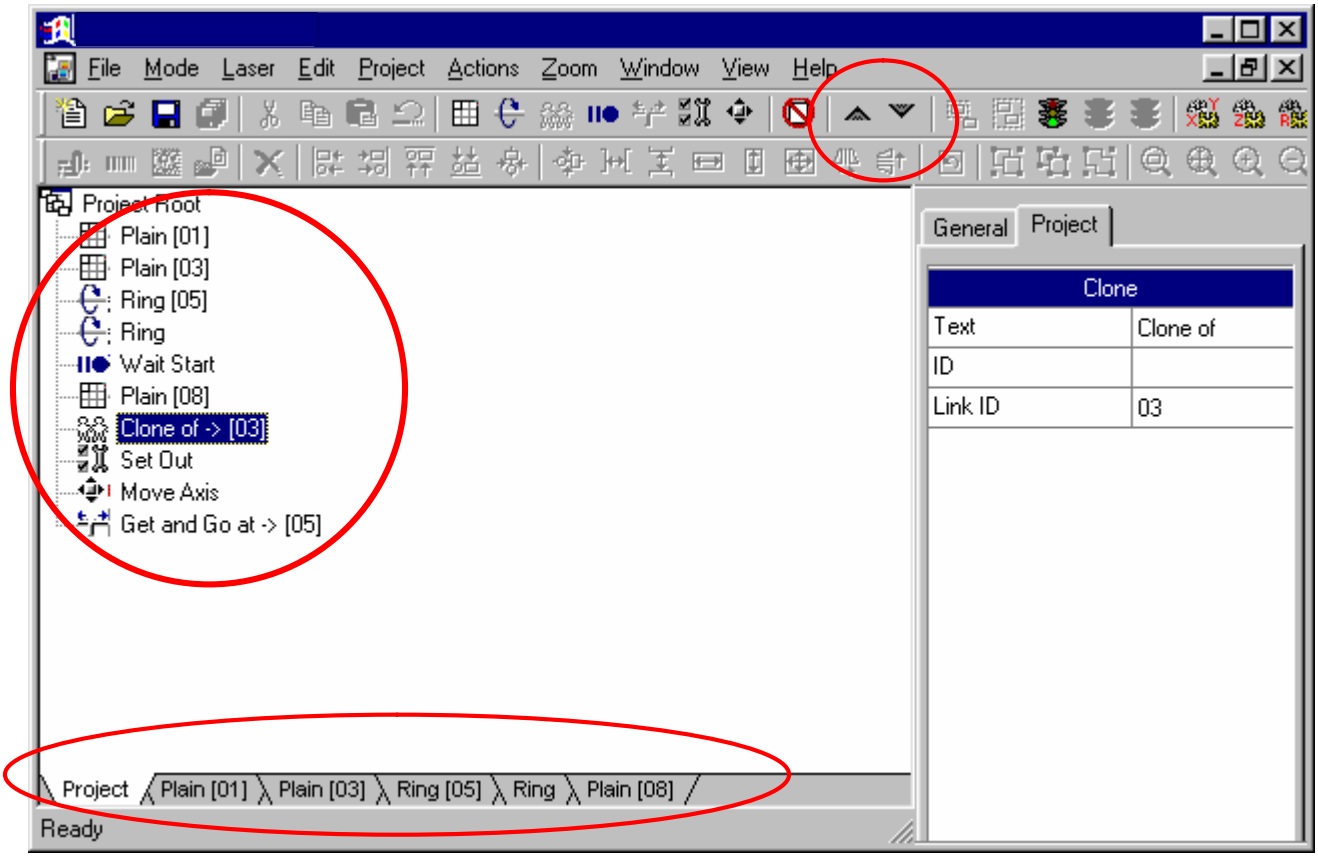
This command is used to move the three mechanical axes (X, Y, Z) to the required position.

Delete

Deletes the selected element.

The project is identified and represented by a series of works and correlated functions. When engraving starts, each project item is processed in the sequence set by the structure.
The figure below shoes the structure of a hypothetical project. The various engraving jobs and related functions are carried out from top to bottom.

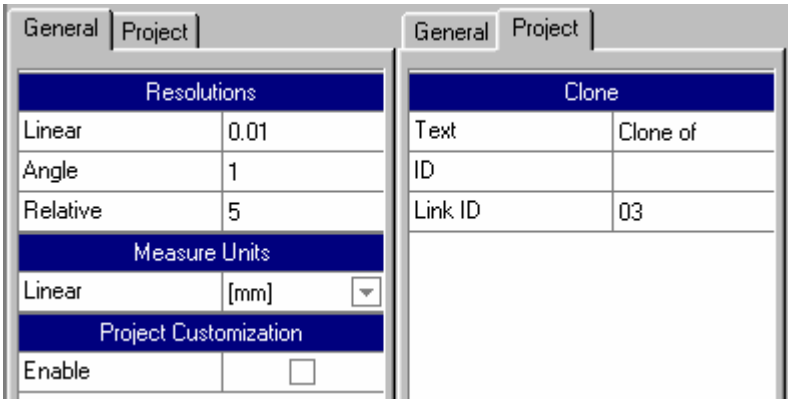
The item order can be modified using the arrows on the toolbar.



The pages shown on the lower part are used to access single graphic works to make additions or edit.

Project properties

When a new project is created some general parameters need to be specified. These parameters are located in the property window and are displayed by selecting the project that has just been created.



The following parameters are set from the General Page:

Resolution

Linear Represents the approximation order for linear quotes. Every measurement unit that is entered will be approximated to the value set in this box

Angle Represents the approximation order for angle quotes. Every measurement unit that is entered will be approximated to the value set in this box

Relative Represents the approximation order for relative, thus expressed in percentages.. Every percentage value that is entered will be approximated to the value set in this box

Measurement unit

Linear Sets the measurement unit used in the project

Project Customization

Enables the use of VB script in the current project (see the related chapter)

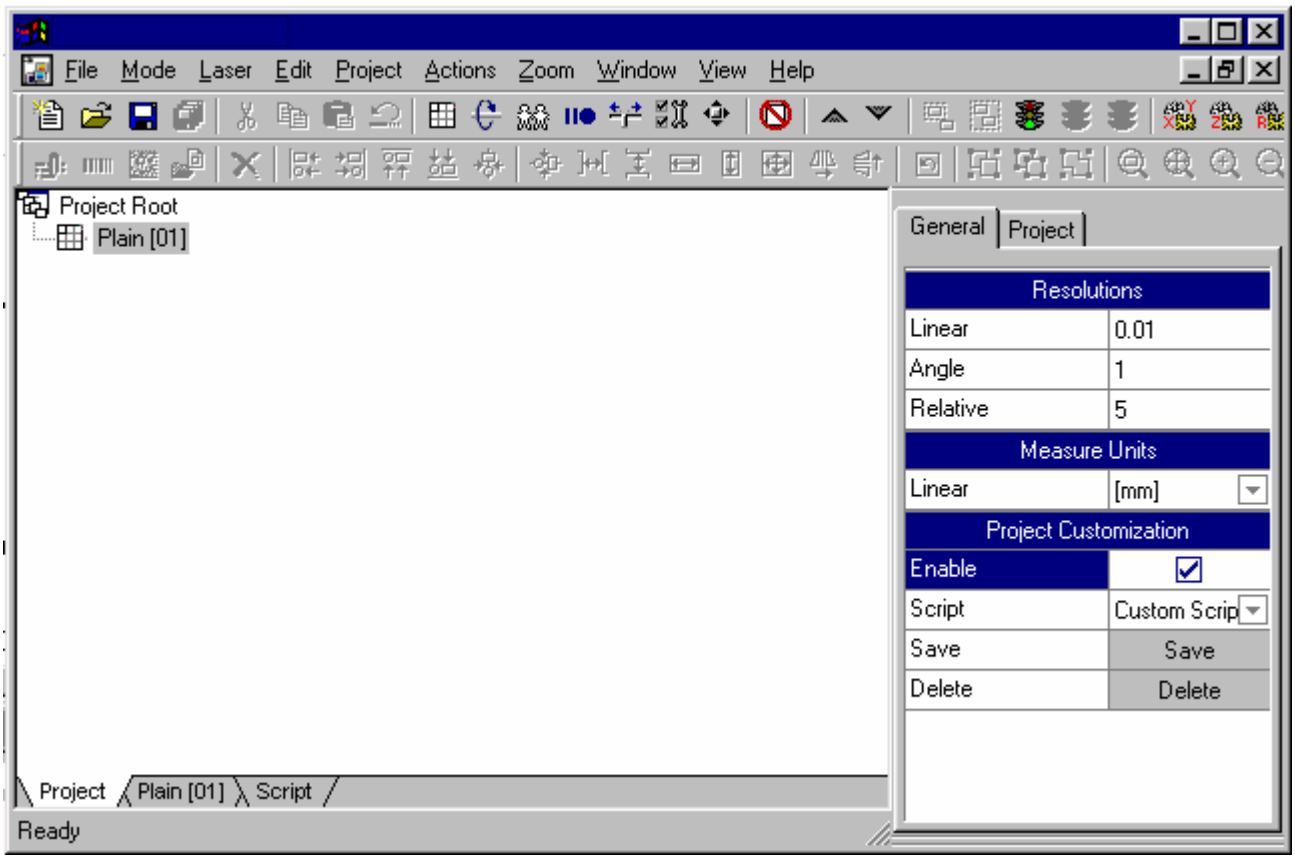
The following parameters are set on the Project Page:

Project

Text The name of the project can be set in this box

Plain

This is a graphic work for plain engraving. By selecting Project > Add plain (or using the related icon) a work for plain engraving is added to the project, defined by the word PLAIN. Select the related pain to access the graphic area where it is possible to draw or import objects for plain engraving.

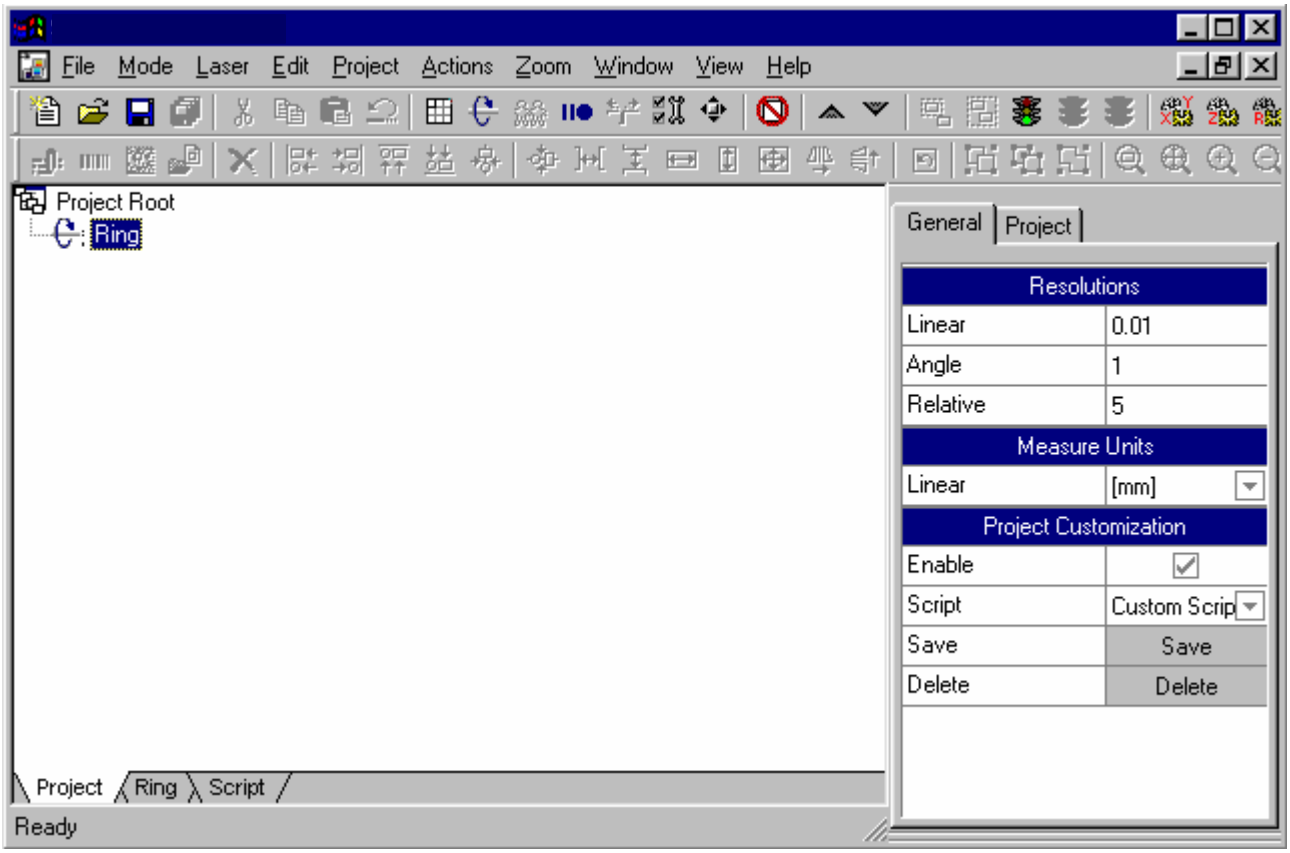


The following parameters are set on the Project Page:

Document

Text	The name of a plain engraving work can be set in this box
ID	Sets an identification for a plain engraving work. Setting an ID is indispensable for enabling the Clone, Get and Go functions

Ring



This is a graphic work for ring engraving. By selecting Project > Add ring (or using the related icon), a work for ring engraving is added to the project, defined by the word RING. Select the related pain to access the graphic are where it is possible to draw or import. objects for engraving on the separator.

The following parameters are set on the Project Page:

Document

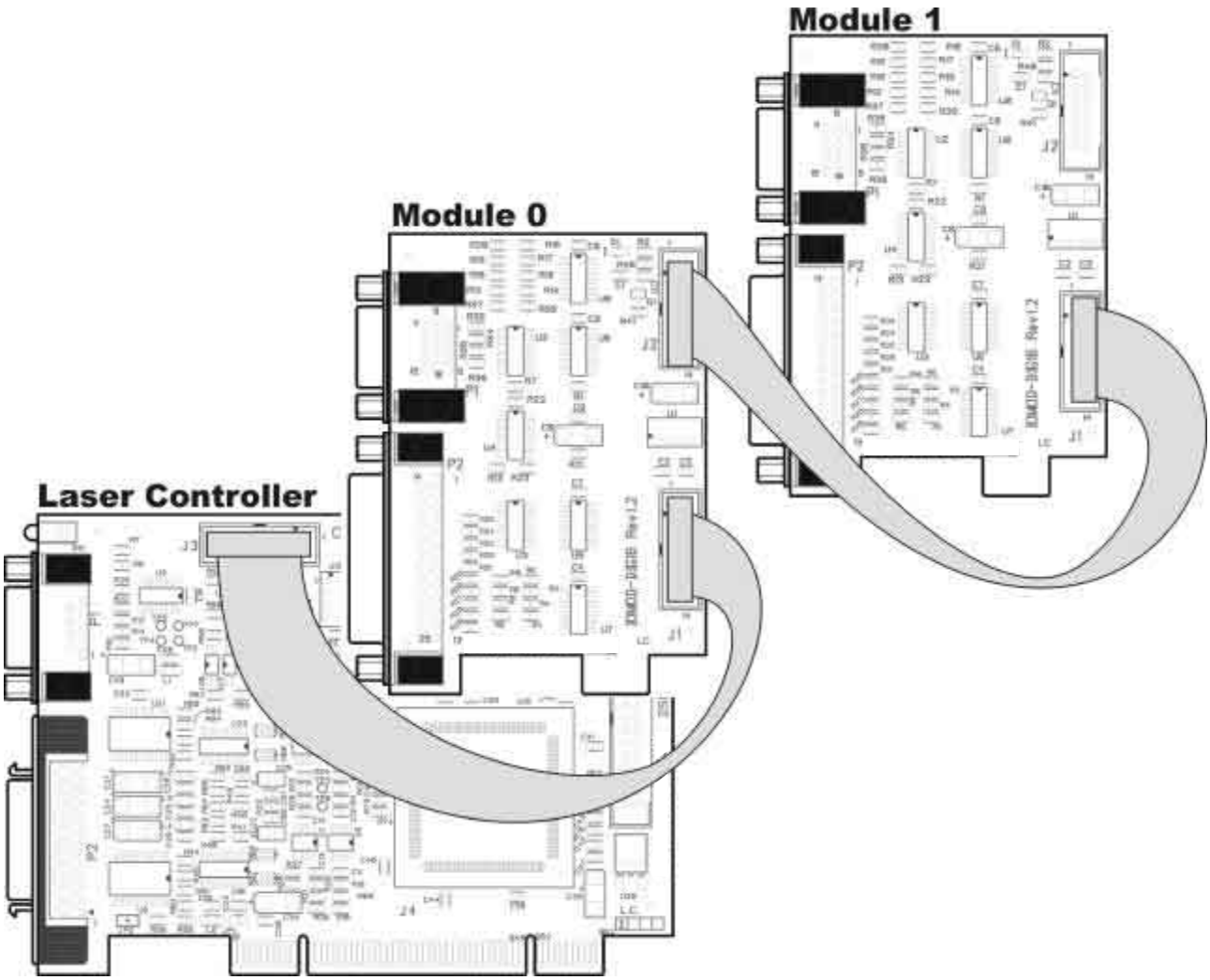
Text	The name of a ring engraving work can be set in this box
ID	Sets an identification for a ring engraving work. Setting an ID is indispensable for enabling the Clone, Get and Go functions

I/O Management

Some of the functions introduced to Creator Pro IV can be used to pilot I/O signals located on the Laser control board. This possibility is particularly useful if the laser system is installed in complex systems or long assembly lines. In these cases the control board can manage inputs and outputs in order to optimize system integration.

Laser control board

The electronics which control the laser system and the related I/O signals is composed of a board with DSP controller (laser controller) which is inserted in a PCI slot of a standard PC. Up to four expansion boards can be connected to this board to control I/O signals. The following figure represents a connection. Module 0 is always present, in addition to the I/O/ signals set by the application, it also controls the mechanical axes; the subsequent modules are optional and control the I/O signals set by the application.



Control board I/O signals

I/O signals are located on the control board expansion boards. The connectors are described below. It is possible to increase the number of expansion boards and thus increase the number of available I/O.

NOTE:
The connectors 1 and 2 mounted on the Laser controller are reserved for the scanner head (connector 1) and for laser source signals (connector 2)

I/O signals available on module 0

DB 25 pin male - Axis motor connection. The DSP board is able to generate the signals used to operate the three independent axes driven by step motors. All signals are of the open-collector type, i.e. are active in conduction (GND output) and not active with high impedance. All inputs are opto-isolated and require a voltage from 10 to 30 V to be activated.

Pin out		Pin out	
1:	+12V 500mA	14:	+5V 500mA.
2:	Reserved	15:	Reserved
3:	Reserved	16:	Reserved
4:	Reserved	17:	Reserved
5:	Reserved	18:	Reserved
6:	Reserved	19:	Input 9.
7:	Reserved	20:	Input 8.
8:	Reserved	21:	Input 7.
9:	Reserved	22:	Input 6.
10:	Reserved	23:	N.C.
11:	Reserved	24:	N.C.
12:	Reserved	25:	GND.
13:	GND.		

NOTE:
"Reserved" signals are use for axis control. For additional information see the DSP board manual. For this reason, some I/O addresses set on port 0 (module 0) will not be accepted by the program.

DB 15 pin male – Laser controls/status. The output signals of this connector are of the open-collector type, being active when conducting (output to GND) and not active when cut-off (high impedance). All inputs are opto-isolated and require a voltage from 10 to 30 V to be activated.

Pin out

1:	Out – Laser End. Active at end of engraving.
2:	Out – Laser Busy. Active during engraving.
3:	Out – Laser Ready. Active when system is ready.
4:	In – External Start. Starts engraving when activated.
5:	In – External Stop. Stops engraving in progress when activated.
6:	Input 13
7:	Input 15.
8:	Output 15
9:	12V.
10:	DSP Ready
11:	N.C.
12:	GND
13:	Input 12
14:	Input 14
15:	Output 14

Available I/O signals on Module 1 - 2 - 3

DB 25 pin male. Manages I/O signals set by the application. The signals are of the open-collector type for outputs, i.e. are active in conduction (GND output) and not active when cut-off (high impedance). The inputs are opto-isolated and require a voltage from 10 to 30V to be activated.

Pin out		**Pin out**	
1:	+12V 500mA	14:	N.U.
2:	Output 0	15:	Output 1
3:	Output 2	16:	Output 3
4:	Output 4	17:	Output 5
5:	Output 6	18:	Output 7
6:	Output 8	19:	Input 9.
7:	Input 0	20:	Input 8.
8:	Input 1	21:	Input 7.
9:	Input 2	22:	Input 6.
10:	Input 3	23:	Output 9
11:	Input 4	24:	N.U.
12:	Input 5	25:	GND.
13:	GND.		

DB 15 pin male. - Manages I/O signals set by the application. The signals are of the open-collector type for outputs, i.e. are active in conduction (GND output) and not active when cut-off (high impedance). The inputs are opto-isolated and require a voltage from 10 to 30V to be activated.

Pin out	
1:	Output 10
2:	Output 11
3:	Output 13
4:	Input 10
5:	Input 11
6:	Input 13
7:	Input 15.
8:	Output 15
9:	12V.
10:	Output 12
11:	N.C.
12:	GND
13:	Input 12
14:	Input 14
15:	Output 14

Setting a mask for managing I/O signals

The single inputs and outputs can be set by means of project functions (e.g. get/go, configure out) The reference mask is expressed in hexadecimal value. The table below shows an example of setting the mask. The hexadecimal value can be used to set the status of the 16 inputs or 16 outputs located on the expansion modules. The various modules are specified by the ***PORT*** parameter. Port 0 corresponds to module 0, port 1 to module 1 and so on.

Bits 15-12				Bits 11-8				Bits 7 - 4				Bits 3 - 0					Hexadecimal Value
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0001
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		0002
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1		0003
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		0004
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1		0005
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0		0006
																	…….
1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1		FFF9
1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0		FFFA
1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1		FFFB
1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0		FFFC
1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1		FFFD
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0		FFFE
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		FFFF

Wait Start

The command interrupts execution of the project. Engraving stops at the end of the Plain or Ring prior to the Start Delay. The project resumes with a Start Engraving signal.

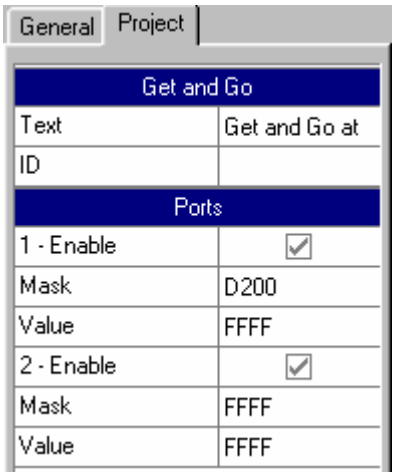
Get and Go

This command is used to jump inside a project sequence. The conditions for effecting this function come from a reading of the signals on the Input ports. If the set condition occurs, the project will resume from the Plain or Ring defined by the corresponding ID. It is also possible to effect an unconditioned jump in the sequence.

This condition is defined as true when an AND condition between the port inputs and set mask are the same as the Value.

The parameters which set the Get and Go conditions are:

Enable Enables the corresponding port (displayed based on the Installed Hardware)
Mask Sets the bits to be compared with the state of the inputs
Value Sets the value that establishes the true condition

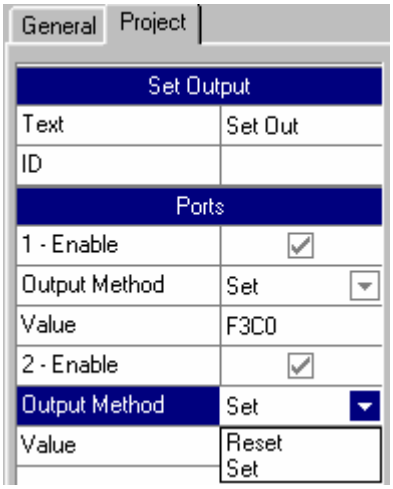


Set Out

This command is used to Set or Reset the output bits on the interface board.

The parameters which set the Configure Out condition are:

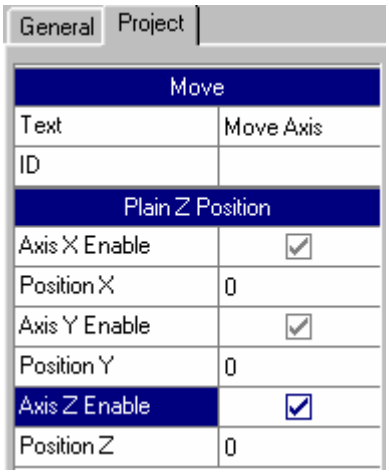
Enable	Enables the corresponding port (displayed based on the Installed Hardware)
Output method	Sets the end of the function that can set the bits to 0 (reset) or to 1 (set)
Value	Sets the bit mask which the function will affect



Move Axis

This command is used to move the three mechanical axes (X, Y, Z) to the required position.

The parameters which set the Axis Shift condition are:



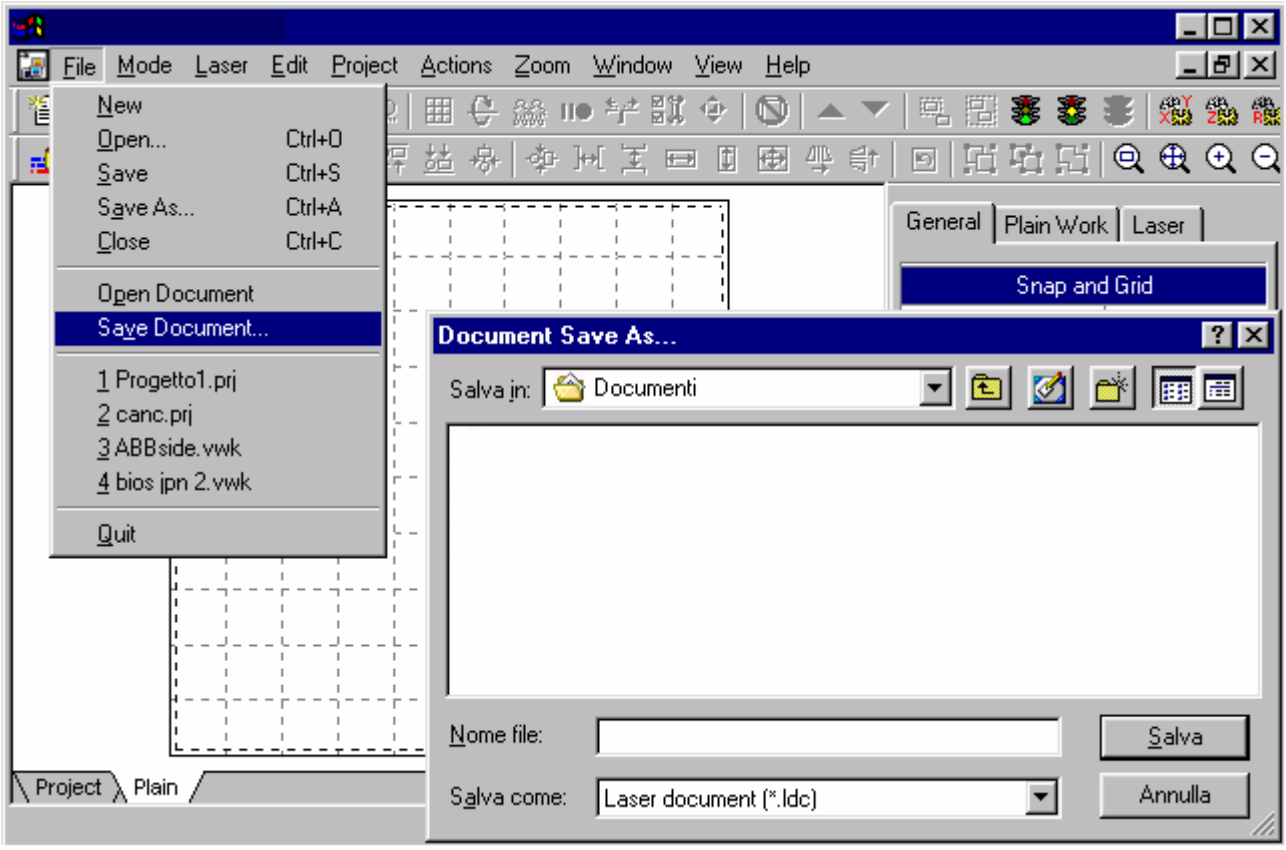
Enable Axis	Enables the corresponding mechanical axis (set based on the Installed Hardware)
Position	Coordinates positioning of the relative axis

LDC Files

Files generated in LDC mode are set as "connected" objects. They are generated by Creator Pro IV and can be imported in a graphic area or project.
The special feature of LDC files allows them to be imported in a project and dynamically updated.
When an LDC file is edited, its picture imported in the project is also edited. This possibility is very useful when graphic files need to be updated remotely, or at work stations which are not necessary those of the engraving laser.

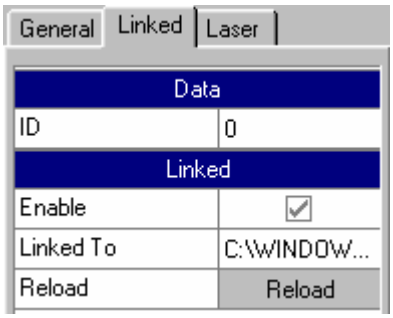
Creating LDC files

To create a LDC "connected" file apply the normal procedures for creating engraving projects described in the previous chapters. Creation of the graphic part is completely the same as that preciously described, to generate the LDC format the processed item needs to be saved using the command
File > Save Document.
Creator Pro IV will propose saving the document with LDC extension.



Importing an LDC file

An LDC file needs to be imported in an existing project. To import and LDC file and thus generate a connection, select the command Actions > Add > Import File, select the Type of LDC file and confirm. The "Linked" page will appear in the property window.



The Id of the imported object will appear on the "Data" page, and the following will appear on the "Linked" page

Enable	Enables a link with the LDC origin file, used to set the dynamic object
Linked to	Sets the path and position of the original LDC file
Reload	Press this button to update the link, any modifications made to the original LDC file will be replicated in the imported object

NOTE:
If the LDC object is not enabled (using the relative tag), the object itself will be treated as a normal imported file.

Chapter 7

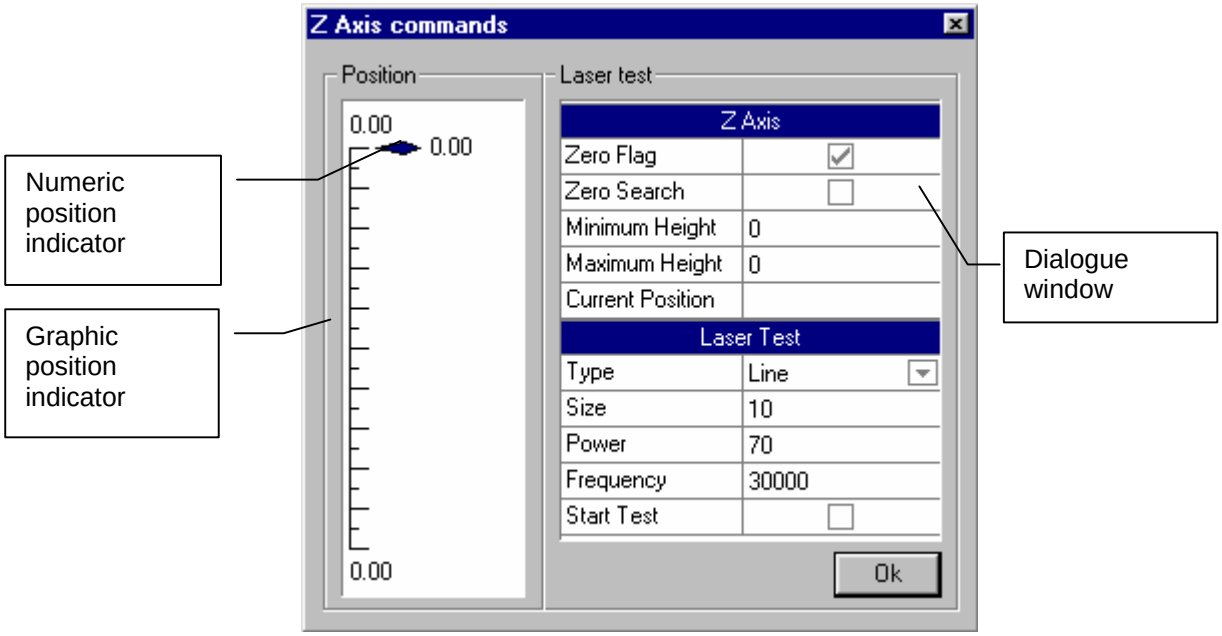
Laser

Axis commands

Creator Pro IV is able to manage up to three linear axes driven by a step motor.

Axis Z

The program can be used for the integrated management of the Z axis (mechanical axis) for focusing on different levels. Either select Laser > Z axis or click "Z axis" on the toolbar to access the control window.



Axis Z

Zero flag	Detects the position of the mechanical axis (the Z axis is on the sensor)
Zero search	Enables a zero search along the Z axis, the zero position is related to a proximity
Minimum height	Sets the minimum height axis Z can reach
Maximum height	Sets the maximum height axis Z can reach
Current position	Indicates the current position reached by axis Z, may be an operator entered quote

Laser Test

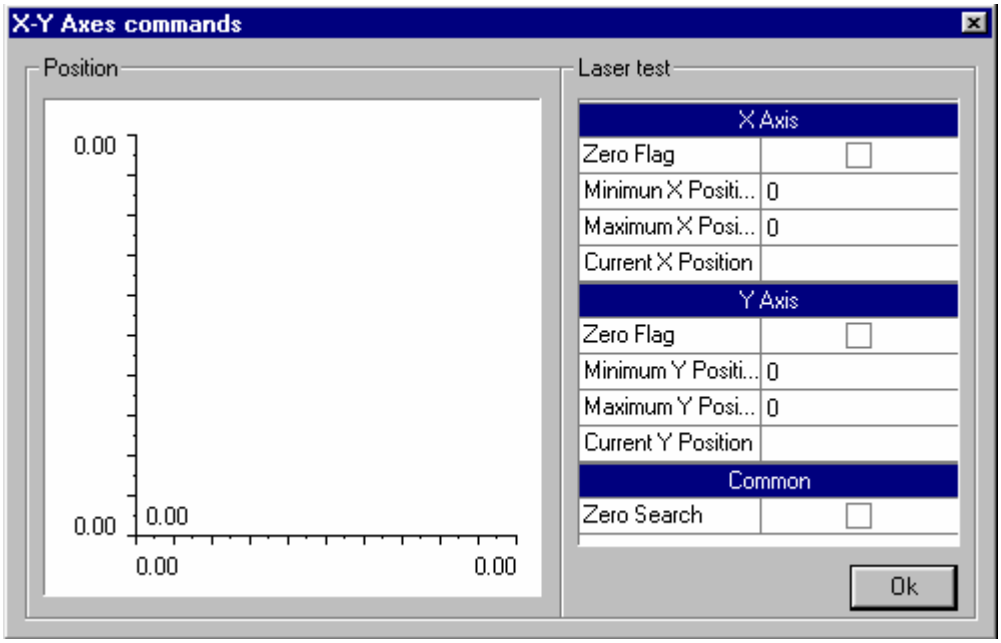
These parameters are usually used during the focusing phase before engraving. See the related chapter for more information.

The axis control window is used to display the current position by means of a numeric indicator showing the current position in millimeters and a colored bar which graphically represents the axis position total offset. The axis can be positioned from the window by entering the new position in the specific box or by means of the "Up" and "Down" scroll buttons on the keyboard. In the latter case, press the button to start the movement and hold it pressed. The movement will be automatically stopped when the button is released.
The axis control function can also be used to reset, i.e. to automatically seek the mechanical reference position. Select "Reset". The axis will start searching. The search operation will stop when the mechanical zero sensor is reached.

NOTE:
Press the ESC key on the keyboard to stop any action (movement or reset).

Axis XY

The program allows integrated management of the linear XY axes. These are mechanical axes used to position objects under the laser via step motor control. The axis control window can be accessed by selecting "Laser" → "Axis XY" from the menu or by pressing the "Axis XY" button on the toolbar.



Axis X

Zero flag	Detects the position of the mechanical axis (the axe is on the sensor)
Minimum height axis X	Sets the minimum height axis X can reach
Maximum height axis X	Sets the maximum height axis X can reach
Current position axis X	Indicates the current position reached by axis X, may be an operator entered quote

Axis Y

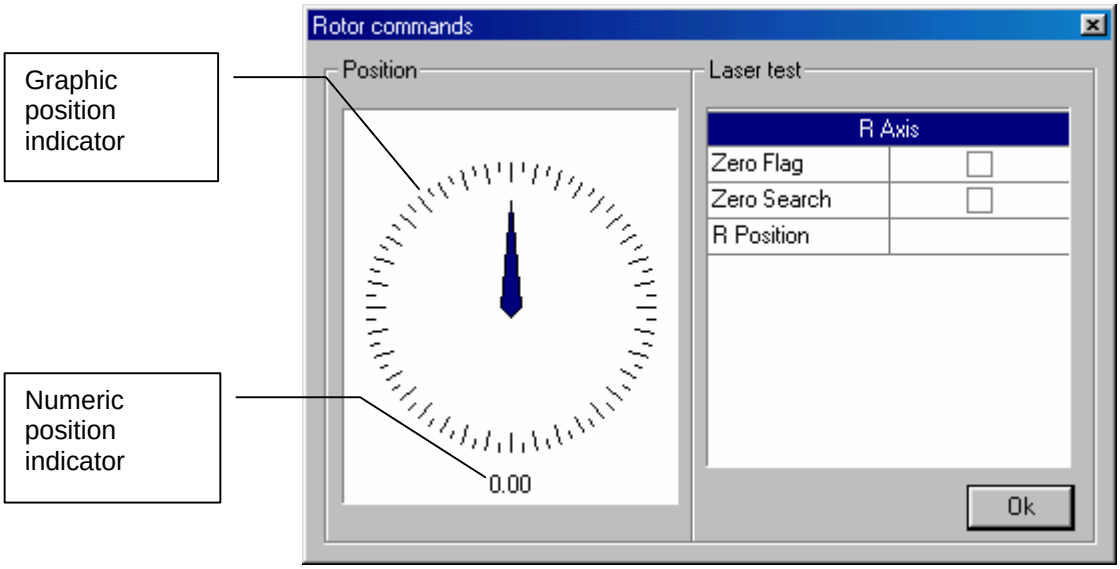
Zero flag	Detects the position of the mechanical axis
Minimum height axis Y	Sets the minimum height axis Y can reach
Maximum height axis Y	Sets the maximum height axis Y can reach
Current position axis Y	Indicates the current position reached by axis Y, may be an operator entered quote

Common

Search for zero	Enables a search for zero along axis X and Y, the zero position is related to a proximity fixed on both axes.

Ring Work Commands

The program allows integrated management of the ring separator, indispensable for ring work engraving. The ring work control window is accessed by selecting “Laser” → “Ring work commands” from the menu or by pressing "ring work commands" button on the toolbar.



Axis R

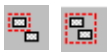
Zero Flag	Detects the position of the mechanical axis (the rotor is on the sensor)
Zero search	Enables a zero search along ring R, the zero position is related to a proximity
Position axis R	Represents the indicator of the current position reached by axis R, it is expressed in degrees and can be entered by the operator

The ring control window is used to display the current position by means of a numeric indicator which displays the current position, and via a circular dial which graphically represents the position of the axis in relation to the total stroke. The ring can be positioned from this window by entering the new position in degrees.
The ring control function can be used to reset, i.e. to automatically seek the mechanical reference position. Select "Reset". The axis will start searching. The search operation will stop when the mechanical zero sensor is reached.

NOTE:
Press the "ESC" button on the keyboard to stop any action (movement or reset).

Limits

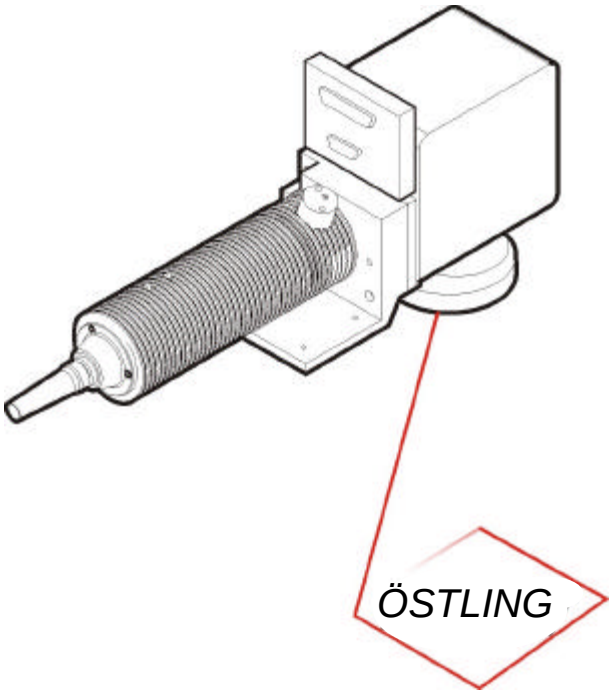
The term limits refers to displaying the margins of the drawing on the work plain. Margins are displayed using a red laser pointer (650 mm).

Limits in the plain engraved area 

Either select "Laser"→"Show selection limits" or click on the "Selection limits" button on the toolbar to display the engraving limits. In this way, you can see the pointer limits of the currently selected objects.
Either select “Laser”→“limits” or click on the "Limits" button on the toolbar to display the graphic object limits for the graphic area. In this way, you can see the pointer limits of the currently selected objects.

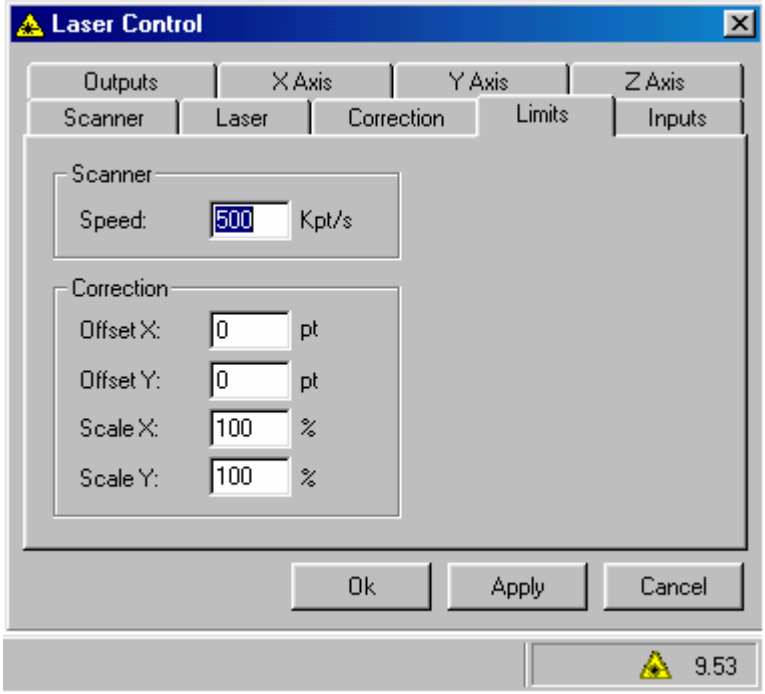
During limit display the area involved in engraving is shown and NOT the profile of the object to be engraved. The limits always describe an orthogonal area.

The example below shows how the limits for a sheared word (ÖSTLING) would appear.



Setting limit parameters

The laser pointing parameters that are used to display engraving limits are listed in the "limits" window in Laser Control. To access the Laser Control window double click on the yellow triangular icon in the Tray Area.



The parameters that can be configured are:

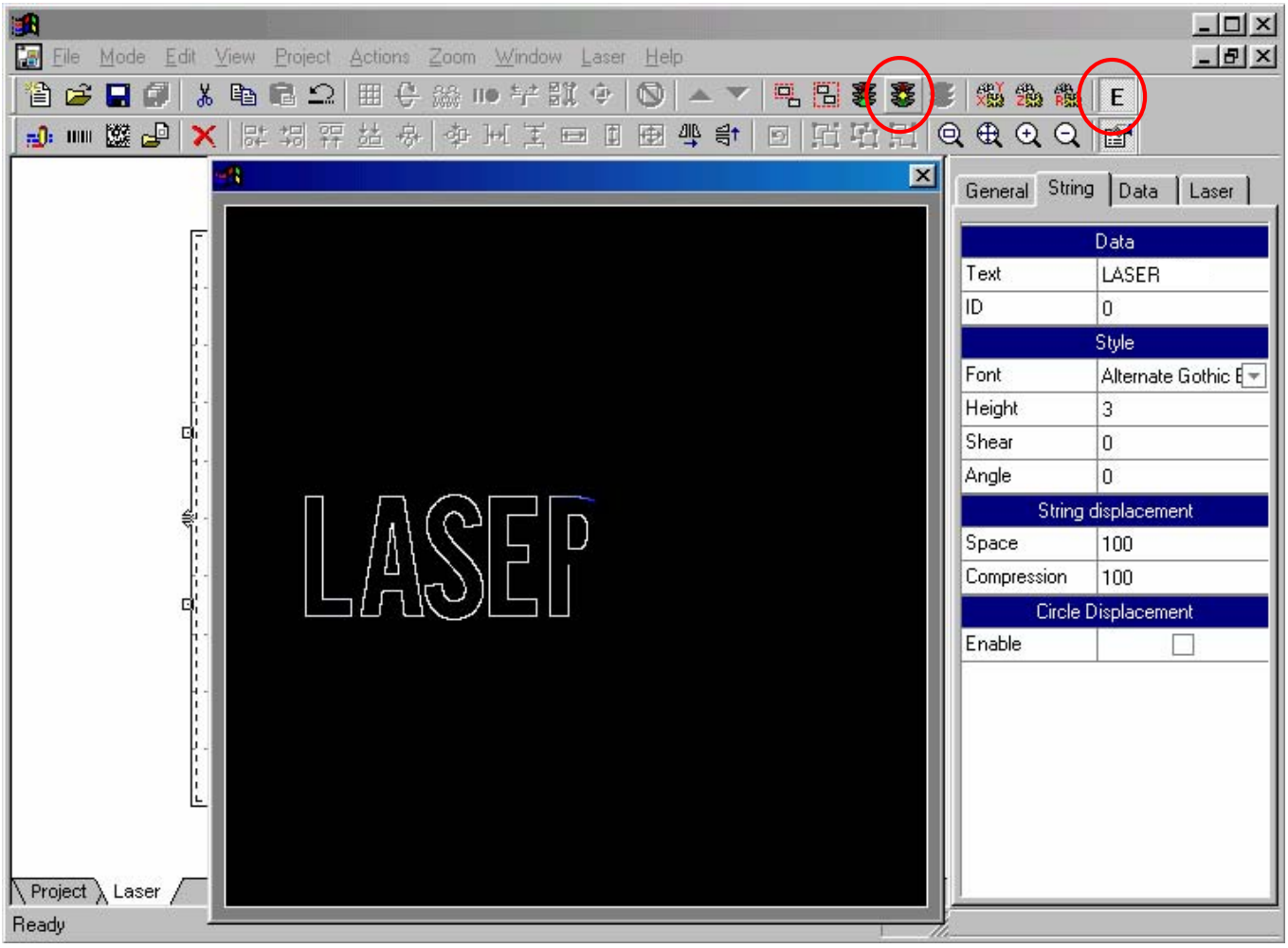
Scanner
Speed: Speed of pointing limits expressed in Kpoints/s

Correction
OffsetX: Alignment offset expressed in points on axis X
OffsetY: Alignment offset expressed in points on axis Y
ScaleX: Scaling of limits in relation to engraving expressed in % on axis X
ScaleY: Scaling of limits in relation to engraving expressed in % on axis Y

NOTE:
This page is used to correct pointer limits in relation to engraving. In this way perfect overlaying is achieved even if the power laser and pointer laser wavelengths are different.

Project test

Creator Pro IV can be used to simulate an engraving result. It is possible to enable an Emulation mode using the button **E** located on the toolbar.
In this way, by pressing the icon represented by a yellow signal, which normally starts engraving, a new window opens in which engraving is simulated. The simulation maintains all the speed, filling, wobble etc. parameters set in the document.



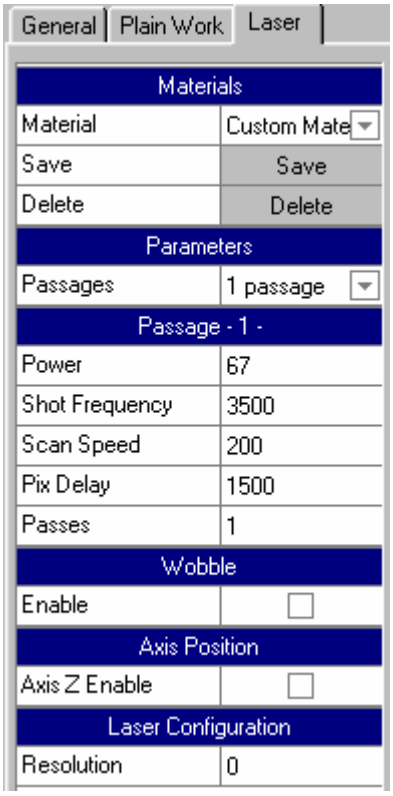
NOTE:
Simulation is automatically enabled if the DSP board and relative driver are not installed correctly.

Setting laser engraving parameters

The engraving parameters must be set before engraving the generated file. Correct engraving parameters are essential to ensure engraving quality. The parameters depend on the laser source used by the material and the required process. Engraving parameters can be the same for all the graphic objects. It is important to notice that the document itself is also an object, its properties can be accessed when no other object is selected. Each graphic object uses the laser parameters properties of the document by default. You can set different laser parameters for each object. In this case the parameters will appear blue.

Document laser parameters

To configure identical laser parameters for all objects in a document, simply click any point of the work area so that **no object** is selected. The engraving properties for the entire document will appear on the Laser page.



Select "document property, "laser" to set the engraving parameters for all the objects in the work area. The following parameters can be set:

- **Passages**
  This indicates the possibility of configuring more runs (up to 3) with differentiated laser parameters
- **Power**
  This indicates the laser output power. The value is a percentage according to the maximum power of the laser used.
- **Shot Frequency**
  This parameter is used to adjust the laser output frequency by directly operating on the Q-switch. The Q-switch is an electro-optical system which controls the opacity of a lens making it possible to change the laser beam frequency. A lower frequency will generate "spotted" engraving while a higher frequency will allow "line" engraving. Frequency is inversely proportional the laser beam power, i.e. if the frequency is too high, the power may not be sufficient for the engraving process. The Q-switch may be compared to a sluice shutter which closes and deflects the laser beam.
- **Scan Speed**
  This indicates the engraving speed. The value is expressed in millimeters per second.

NOTE:
a slower speed implies engraving a deeper engraving. Set a very slow speed (50-100 mm/sec.) for special processes (burnishing or deep engraving).

- **Pix delay**
  Duration of pixels for bitmap engraving

- **Passes**
  This indicates the number of runs required by the laser for engraving the imported objects. Increasing the number of passes will increase depth of engraving, consequently affecting the cycle time.

Engraving using different runs and laser parameters

Various passages can be made, also with different engraving parameters.
Select the combo box in the ***passages*** box in the window in the figure to an enable an engraving sequence with parameters which can be completely different. This option may be particularly useful to make several light engraving runs to clean the workpiece after a more incisive engraving process.

Parameters	
Passages	3 passages
Passage - 1 -	
Power	67
Shot Frequency	3500
Scan Speed	200
Pix Delay	1500
Passes	1
Passage - 2 -	
Power	80
Shot Frequency	3500
Scan Speed	200
Pix Delay	1500
Passes	1
Passage - 3 -	
Power	80
Shot Frequency	3500
Scan Speed	200
Pix Delay	1500
Passes	1

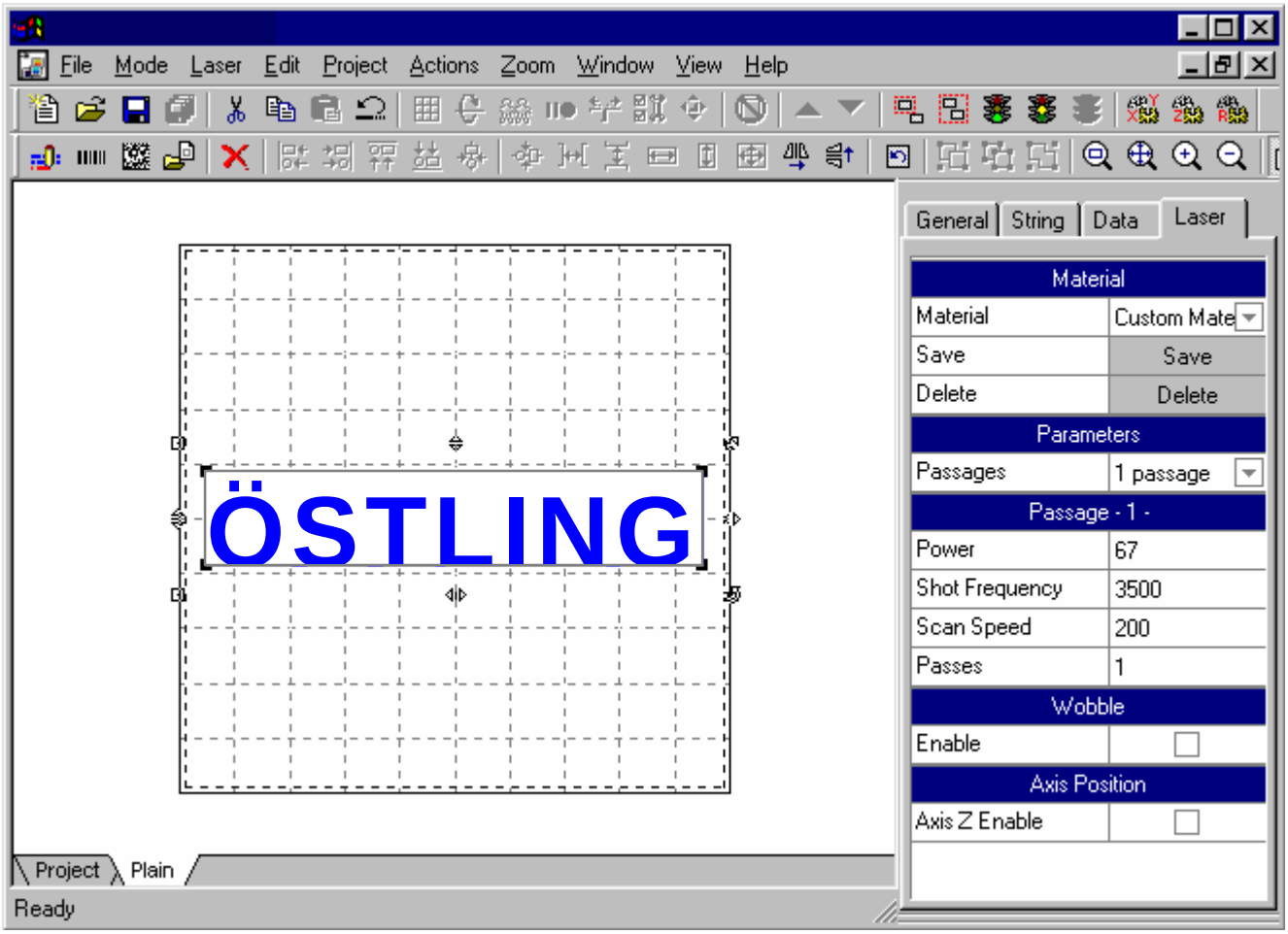
In this example, the first engraving process was very incisive (three runs at 100% power).
Sessions 2 and 3, on the other hand, are lighter for trimming and cleaning the engraving.

NOTE:
These data are only examples. The values are not significant for real engraving tests. Select the best parameters according to the material used and the required processing type.

WARNING:
To carry out a good cleaning run, it is important that the speed is the same as an engraving run.

Object laser parameters

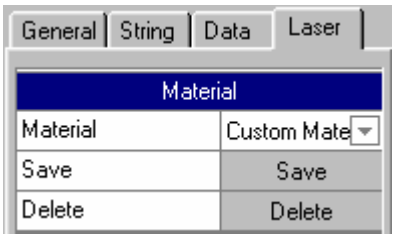
The parameters set for the object can be different from those set for the entire document. Select the object and the Laser page to set the required parameters.



The edited object will appear blue.

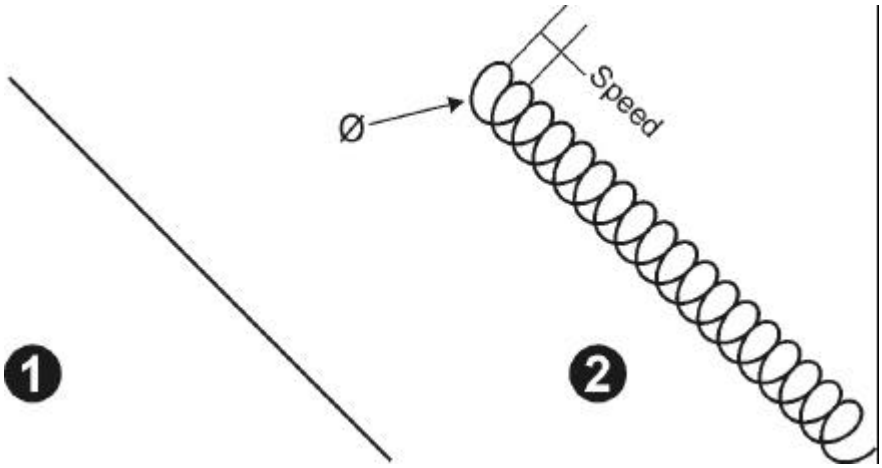
Engraving on different materials

Laser Creator Pro IV can be used to save different laser parameters in a Materials library. When engraving on different materials, the parameters can be saved by entering the material name in the box where the word ***Materials*** appears and pressing the **Save** button to save the parameters in the list.



Wobble

Wobble is a new function integrated in the Creator Pro IV engraving software. The purpose of this application is to engrave the single lines of vectorial graphics, either True Type characters or imported figures, with thicker lines. The line thickness if normally equal to the dimension of the laser spot. However, for some applications this thickness may not be sufficient, the wobble function solves this problem.
The figure below represents the functioning principle of the wobble. Figure 1 shows the result of a vector engraving with the wobble disabled. Figure 2 shows the same vector but with the wobble enabled. The conversion of the vector into a dense spiral provides greater thickness of the engraved line. The same function can be applied to any vectorial graphic that is going to undergo plain or ring engraving.

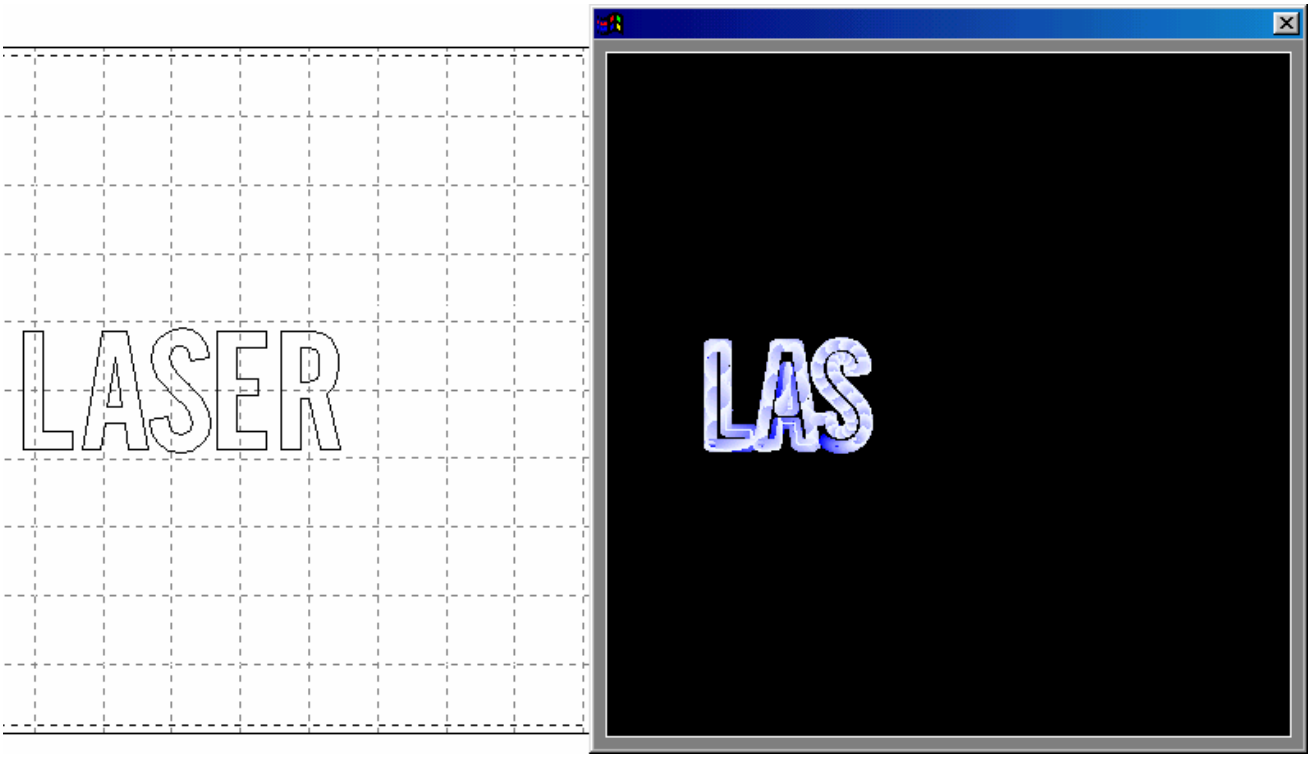


Wobble function configuration parameters are:

Ø Diameter: Represents the diameter of the spiral curve
Speed: Represents the frequency of spiral repetition

NOTE:
The wobble function configuration parameters must be tested and checked in order to obtain the desired effect. Engraving times with the Wobble function are longer, only use the Wobble function when absolutely necessary.

In the project simulation it is possible to verify the result of the Wobble function. As seen in the figure below, the single line character has a much thicker outline. The same result would be obtained with real engraving.



Work mode

Either press the button depicting a green signal or select the command Mode > Work Mode to access the "work mode". This mode is for working only, graphic editing operations and any editing of the engraving project is disabled, i.e. the loaded model cannot be edited in any way. In this operating mode, the program automatically updates the "active" components (such as the date or the counter) at the end of each engraving job.

This mode is particularly useful in work environments where the operator assigned to engraving is not authorized to edit the engraving project.

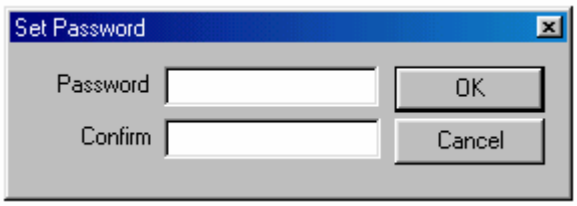
To exit the work mode, press the green signal again or select the Mode > Edit Mode command.

Exiting from the work mode may be subject to a password.

Password

To prevent unauthorized individuals from accessing engraving project editing, it is possible to set a password to the edit mode, so that the operator can continue to engrave but all project editing is disabled.

To set a password select the Mode > Set Password command.
In the following dialogue box set the password and confirm.



Chapter 8

Engraving with Creator Pro IV

Focusing

Engraving in the conditions illustrated in the previous chapters implies that the laser head (see Lens) is at the correct focus distance from the item to be engraved.
The Z axis control window can be used to carry out "engraving tests" for focusing. The program sends a test to the laser which will continuously engrave a geometric shape with predefined parameters and position the axis at the same time. A greater interaction of the laser with the material under examination indicates that the optimal focus has been obtained.

NOTE:
The correct position can be identified as the engraving point in which the laser generated noise and luminosity are at the maximum.

To start the test, select the required geometrical shape (line, square or circle), set the dimensions in mm, set the laser parameters and enable the “Start Test” tag.

Carrying out the engraving

To start engraving of the generated graphic file press the relative icon (yellow signal) or select the Laser > Start command.

The process can be stopped at any time during engraving by selecting “Laser” > “Stop” on the menu or by pressing the "Stop" button (red signal) on the toolbar.

Setting waits

As previously illustrated, the engraving process is achieved by means of a laser beam deflection device controlled by two retroactive electrical drives (PID) which angular position is proportional to the control voltage provided. Due to the very nature of the system, the reaction time (phase) of the drives is not negligible. Consequently, the system generating the control signals (usually a PC) will need to wait for the positioning operation in progress to end before starting the next process.

Calculating waits

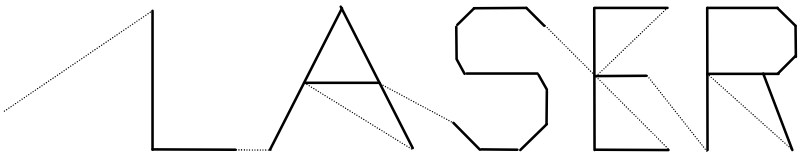
The waiting times required for high quality engraving are illustrated below. Some waiting times are linear functions (linear phase) of the engraving speed and for this reason are parameterized by two variables, namely K: proportional coefficient for speed and C constant. The system computes the waiting time according to these two parameters with the following formula:

$$T = C + K \cdot \frac{speed}{\max speed}$$

The speeds indicated in the formula are expressed in thousands of coordinates per second and the maximum reference speed mentioned in the formula is equal to 1000 [Kcoord/s], which corresponds to the following speeds expressed in [mm/s] according to the lens:

- f100 = 1133.3 mm/s
- f160 = 1822.2 mm/s
- f254 = 2900.2 mm/s

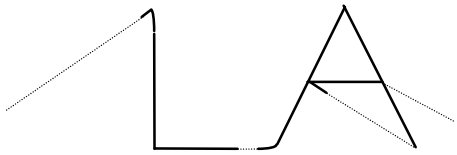
The following example shows how to engrave the word "LASER":



these examples will better illustrate how incorrect technical waiting time setting effect the result.

Tfirst

Waiting time for the scanner to actually reach the required position before switching the laser on.

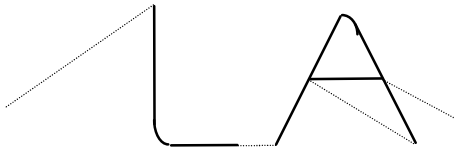


If the delay is **lower** than the optimal value, notice how the first vector of each polygon is distorted and longer than the correct length..

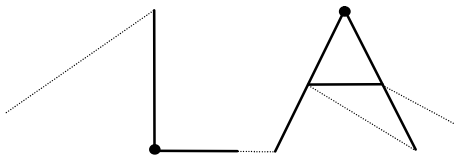
If the delay is **higher** than the optimal value, the engraving process will be slower but no effects will be visible.

Tnext

Waiting time for the scanner to reach the correct position before tracing the vector after the first with the exception of the last. This waiting time is according to the engraving speed and depends on the angle between the two consecutive vectors. If the angle is equal to 180°, the waiting time will be equal to zero, while the waiting time will increase as the angle decreases, the time being maximum when the angle is equal to zero degrees.



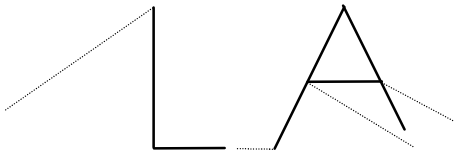
If the delay is **lower** than the optimal value notice how the polygon vectors are rounded and not sharp



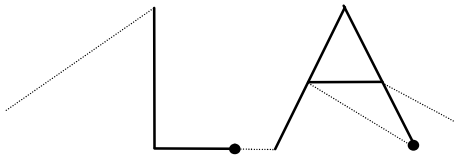
If the delay is **higher** than the optimal value, notice how the polygon vectors are more marked and deeper than they should be.

Tlast

Waiting time for the scanner to reach the correct position before switching the laser off (scanning the last vector of a polygon).



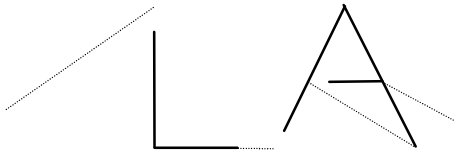
If the delay is **lower** than the optimal value, notice how the last polygon vectors are shorter and incomplete..



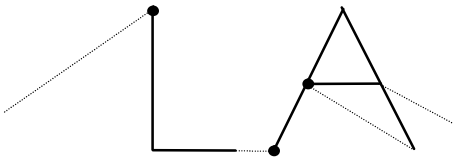
If the delay is **higher** than the optimal value, notice how the vector end points are more marked.

Tdraw (Diode Laser)

Waiting time to allow actual laser emission before starting to scan the vector.



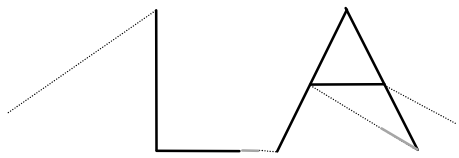
If the delay is **lower** than the optimal value, notice how the first vector of each polygon is shorter.



If the delay is **higher** than the optimal value, notice how the initial vector points are deeper.

Tjump (Diode Laser)

Waiting time to allow the laser beam to actually go out before making a jump (scanning with laser off).



If the delay is **lower** than the optimal value, notice the blurring between the polygons.

If the delay is **higher** than the optimal value, the engraving process will be slower but no effects will be visible.

Tramp / Ttresh (Diode Laser)

Waiting time (Tramp) for allowing the laser beam to stabilize before actually starting to engrave without holding the laser in the same position., i.e. without engraving the material which may be exposed to the undesired radiation. This wait is only carried out if the laser is off for a time which is higher than the threshold time (Ttresh).

Bitmap - Toff

Waiting time for the scanners to reach a certain position before switching on the laser during bitmap picture engraving.

Bitmap – Ton

Waiting time for adjusting the depth of each pixel during bitmap engraving. Essentially, this is the minimum firing time for each pixel.

Chapter 9

VBScript

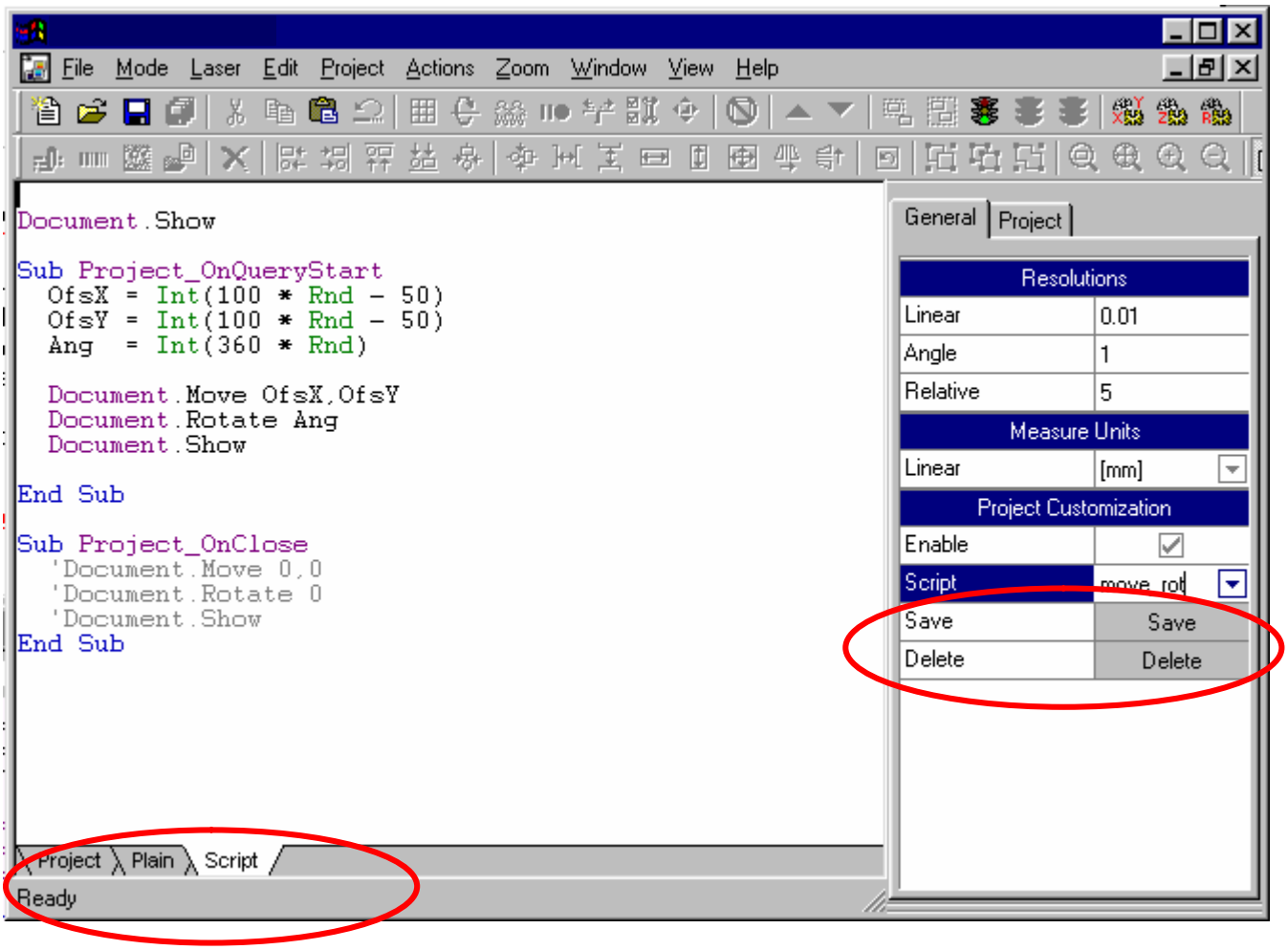
Information on VBScript

VBScript is a scripting language derived from Visual Basic, it is used to add customized functions to Creator Pro IV. VBScript is a object-oriented programming language. In object-oriented scripting the information is organized into groups called classes. It is possible to create more than one item in a class, called objects, to be used in the scripts. It is possible to use classes pre-set by VBScript or create customized ones.
When you create a class all the properties (characteristics) and all methods (behaviors) are set for each created object, just like setting objects in the real world. For example, a person is characterized by properties like sex, height, hair color and methods like how they talk, walk and throw. In this example, "person" is a class and each individual is an object or an item of the class.

NOTE:
The following paragraphs contain introductory information on the use of VBScript but it cannot be considered a complete guide. For further information, see the official programming manual.

Generating VBScript in Creator Pro IV

To add VBScript to a project, the ***Project Customization*** tag must be enabled. An additional page labeled SCRIPT will appear to the side of the project pages.
A pre-set script can be entered using the SCRIPT combo box located in the properties window or a new one can be written.
The highlighting syntax us used to quickly display the basic elements that make up the script.
Any errors during execution of the script will be indicated by messages on the page.



Basic tools

Variables

VBScript is derived from Visual Basic, and the variables behave in almost the same way.
The instruction Dim is used to state them. For example:

```
Dim variable1
Dim variable2
```

etc.
Or

```
Dim variable1, variable2, etc.
```

Those who are used to other languages know that when a variable is stated the type also needs to be set, i.e. if it contains a number, a string, a date etc.
This distinction does not exist in VBScript: the variables do not have type. Management of a number or a string is entrusted to the VBScript interpreter. This makes it very easy to program, but you must be careful, as the following example shows:

```
dim a,b,c
a=inputbox("First Number:")
b=inputbox("Second Number:")
c=a+b
MsgBox“Result “&c
```

In the example, I assign the values to variables a and b via InputBox, i.e. the dialogue box which asks the user to enter a value. If I assign the value 3 the first time and the value 5 the second time, one would expect the line "MsgBox c" to print the value 8 and instead it displays 35. This is because a and b are interpreted as strings and the + sign instead of adding, chains the 2 strings.
To solve the problem the variables must be converted from string to numeric using Eval (..).

Warning: types do not exist, but subtypes which characterize the variables do, they are:

Boolean:	Can contain True or False.
Byte :	Contains an integer between 0 and 255.
Integer:	Contains an integer between -32,768 and 32,767.
Currency:	Value between -922,337,203,685,477.5808 and 922,337,203,685,477.5807.
Long:	Contains an integer between -2,147,483,648 and 2,147,483,647.
Single:	Contains a floating point number with single precision between –3.402823E38 and 3.402823E38
Double:	Contains a floating point number with double precision between –1.79769313486232E308 and 1.79769313486232E308
Date:	Contains a number representing a date between 1 January 100 and 31 December 9999.
String:	Contains a string with a variable length composed of a maximum of around 2 billion characters.
Object:	Contains an object.

The conversion of types is managed by VBScript when it is clear. In the previous example if subtraction was used the result would be correct:

```
dim a,b,c
a=inputbox("First Number:")
b=inputbox("Second Number:")
c=a-b
MsgBox“Result “&c
```

In the first example there is the + sign which is used for adding and for chaining. Thus a and b are not converted into a numeric type, but are left in string type. To set this conversion the Cint function is used:

```
dim a,b,c
a=inputbox("First Number:")
b=inputbox("Second Number:")
c=Cint(a)+Cint(b)
MsgBox“Result “&c
```

The dim instruction is used to state a variable, but this statement is not mandatory: the program works even without the "dim a,b,c" line. This makes programming even faster because it is not necessary to state the variables, they only need to be set.
When creating a complicated program it is advisable to use the "Option Explicit" command at the beginning of the program.
This command requires stating the variables and is useful if you make a mistake in writing the name of a variable. If I make a mistake with the name, the variable does not exist and a error is generated.

```
Option Explicit
dim a,b,c
a=inputbox("First Number:")
b=inputbox("Second Number:")
c=Cint(a)+Cint(b)
MsgBox“Result “&c
```

In choosing the name of a variable the following rules need to be taken into account:
It needs to start with a letter of the alphabet.
It cannot include periods and spaces.
It must not be composed of more than 255 characters.
There is no difference between upper and lower case letters.
There is also a non-mandatory rule: to give a non-logic name to a variable and thus a variable that must contain a date of birth could be called dtDate_Of_Birth, where dt indicates that it is a date type. This is used to make programs easier to read.

Operators

VBScript operators can be divided into types:
Arithmetic Operators

		a=5 b=2	**Result**
+	Add	c=a+b	7
-	Subtract	c=a-b	3
*	Multiply	c=a*b	10
/	Divide	c=a/b	2,5
\	Whole Division	c=a\b	2
Mod	Module	c=a Mod b	1
^	Increase exponent	c=a^b	25
&	String chaining	c=a & b	52

For complex formulas, addition and subtraction from left to right have precedence.
Comparison operators

=	Equal
>=	Greater than or equal to
<=	Less than or equal to
<>	Different
<	Less than
>	Greater than

Comparison between two variables gives True or False

Logical Operators

Not	Negation
And	Logical Conjunction
Or	Logical Disjunction

These are used for operations with Boolean variables. They will be greatly used in the next chapter which examines conditional instructions.

The following program is used to check arithmetic operators:

```
Option Explicit
dim a,b,c
a=5
b=2
MsgBox "c=a + b ---->" & a + b
MsgBox "c=a - b ---->" & a - b
MsgBox "c=a * b ---->" & a * b
MsgBox "c=a / b ---->" & a / b
MsgBox "c=a \ b ---->" & a \ b
MsgBox "c=a Mod b ---->" & a Mod b
MsgBox "c=a ^ b ---->" & a ^b
MsgBox "c=a & b ---->" & a & b
```

In the previous chapter the operator + was used to combine two strings, here the & sign is used. The two operators are equivalent but it is advisable to always use the & sign to better distinguish an addition operation.

Conditional Structures

Let's try to some alternatives in the program.
To carry out operations under certain conditions the main command is IF. The syntax is as follows:

```
IF <condition> Then
<operations if the condition is true>
Else
<operations if the condition is false>
End If
```

The following example uses the function Month(), which gives the month in a numeric form, and Now(), which gives the current date and time:

```
if month(Now())=6 then
MsgBox "It is June"
end if
```

If the month is June, it will print "it is June".
To make the program more complete:

```
if month(Now())=6 then
MsgBox“It is June"
else
MsgBox“It is not June"
end if
```

It is also possible to create structures inside other structures, i.e. nested structures:

```
if month(Now())<=6 then
MsgBox "We are in the first half of the year <br>"
if month(Now())<=3 then
MsgBox "it is the first quarter."
else
MsgBox "it is the second quarter."
end if
else
MsgBox "We are in the second half of the year <br>"
if month(Now())<=9 then
MsgBox "it is the third quarter."
else
MsgBox "it is the fourth quarter."
end if
end if
```

Notice the importance of an indent formatting when using structures that are this complex.
Another use of the IF instruction is the give as many conditions as possible:

```
if month(Now())<=3 then
MsgBox "We are in the first quarter."
elseif month(Now())<=6 then
MsgBox "We are in the second quarter."
elseif month(Now())<=9 then
MsgBox "We are in the third quarter."
else
MsgBox "We are in the fourth quarter."
end if
```

You can see that in this type of structure only one operation is carried out. Starting from the top and moving towards the bottom, at the first condition the corresponding operations is effected and the structure is left. If it was January all the conditions would have been true but only the first sentence would have been printed.
The logical operations NOT, AND and OR can be use to combine multiple conditions. When using structures with many choices based on the value of a parameter, you can use a structure with SELECT.
This is the same program as above but with a SELECT structure:

```
Select case month(Now())
case 1,2,3
MsgBox "We are in the first quarter."
case 4,5,6
MsgBox "We are in the second quarter."
case 7,8,9
```

```
MsgBox "We are in the third quarter."
case else
MsgBox "We are in the fourth quarter."
end select
```

In this structure the variable to check is set with the instruction "Select case Variable"., and then a list of possible values that the variable can assume with the instruction" case *value1, value2, value3*"; the operations to be carried out follow this instruction. In the example the variable is numeric, in the case of string variables the values are placed between quotation marks: case *"value1", "value2", "value3".*

Structures for cycles

A cycle is used to repeat operations for a certain number of times or until a certain condition occurs.
The FOR - NEXT cycle increments by a variable at each cycle. When the variable reaches an established value the cycle finishes.

```
Option Explicit
Dim i
For i=4 to 20
MsgBox i & "<br>"
next
```

The program prints the values from 4 to 20 in a column.
Using the STEP parameter, I can count backwards and use different steps.

```
Option Explicit
Dim i
For i=20 to 4 step -2
MsgBox i & "<br>"
next
```

This program will display the numbers 20, 18, 16, 14, 12, 10, 8, 6, 4
The FOR - EACH cycle is similar. This cycle is based on a set of objects and is repeated for each element of the set.
In this example a vector is used. After being stated and filled, the following is displayed through a For Each cycle:

```
Option Explicit
Dim vector(5),element
vector(0)="Html"
vector(1)="Asp"
vector(2)="Php"
vector(3)="JavaScript"
vector(4)="VBScript"
for each vector element
MsgBox element & "<br>"
next
```

The DO LOOP cycle is repeated until a condition becomes false. The following code will be repeated until a second has passed from when it starts. The variable counted increments with each cycle. This is a way of appreciating your own computer!

```
Option Explicit
dim StartTime, EndTime, count
count=0
StartTime=now()
EndTime=now()+1/(100000)
do While now()<=EndTime
count=count+1
loop
MsgBox "The cycle is repeated " & count & " times"
MsgBox " in 1 second"
```

If the condition never occurs, the cycle is not carried out even once. By moving the condition to the bottom, the test is carried out and then the condition is checked. In the following example the words "Test Until" are displayed even if the condition is false.

```
Option Explicit
dim a
a=10
do
MsgBox "Test Until"
loop While a < 0
```

The cycles can also be nested. In the following code the contents of a matrix is displayed.

```
Option Explicit
dim cLines, Columns, Matrix(3,2)
matrix (1,1)=1
matrix (2,1)=2
matrix (3,1)=3
matrix (1,2)=4
matrix (2,2)=5
matrix (3,2)=6
for cLines=1 to 3
for cColumns=1 to 2
MsgBox mstrix(cLines,cColumns) & " "
next
MsgBox "<br>"
next
```

Objects

Like in Visual Basic, in VBScript w also find the concept of object. An object is an entity which has properties, actions (methods) and generates events.
An item needs to be created to use an object, i.e. it needs to be stated and associated to a name.
To do this the CreateObject command is used. The syntax for creating an object is as follows:
Set object name= CreateObject("type of object")

The objects (Active Objects) available in Creator Pro IV are listed below:.

Creator Pro IV Active Objects

Type: Global
Name: Project

Description:
This object exports global function to modify the project

Properties

ActiveItem	Sets/Gets active item indices

Methods

ShowWindow	Displays the laser window if it is not visible
LoadProject(path)	Loads a new project and gives a TRUE value if successful.
ItemCount	Gives a number of project items
SelectActiveItem(id)	Activates the item set by the specified ID, gives the item index if successful, otherwise gives the value of -1
ShowActiveItem	Displays the page associated with the active item, gives TRUE if successful
ProcessActiveItem	Processes the active item (sends the data to the laser and launches engraving). Gives TRUE if successful.
GetActiveDocument	Gives the document associated with the active item.
UpdateViews	Updates the views

Events

OnQueryStart	External start request (or software)
OnItemStart	Start Item is launched
OnItemStop	Start Item is stopped by the software or external stop.
OnItemEnd	Start Item ended
OnClose	Selects work mode for modify mode or closes the active project

Type: Global and Local
Name: Document

Description: This object is a global shortcut to the first project document where the script is being executed. The Document object is particularly useful when it is necessary to customize a single document. It is possible to obtain a local document using the GetActiveDocument function for the project objects

Properties None

Methods

Load(path) Loads a document from the disk giving true if successful.

Save(path) Saves a document from the disk giving true if successful.

Show Shows a page associated with the document

GetObject(id) Gives the document identified by the specified ID

Events None

Type: Local
Name: String

Description: Strings are not global objects, but they can be obtained from the document using the GetObject function and specifying the ID of an existing string.
.

Properties

Text Sets/Gets the text object

Compression Sets/Gets string compression

Spacing Sets/Gets sting spacing

CharHeight Sets/Gets character height

CharAngle Sets/Gets character angle

CharShear Sets/Gets character shear

Radius Sets/Gets string radius on the circumference

Angle Sets/Gets start angle of the string on the circumference

Methods

Update Updates the object while the modifications have effect

Length Gives the number if string characters

Events

Type: Local
Name: Barcode

Description: Bar codes are not global objects but they can be obtained by the document using the GetObject function and specifying an ID of an existing Bar code.

Properties

Text Sets/Gets the object text

Methods

Update Updates the object while the modifications have effect

Length Give the number of bar code characters

Events

Type: Local
Name: Datamatrix

Description: Data matrix are not global objects but they can be obtained by the document using the GetObject function and specifying an ID of an existing data matrix..

Properties

Text Sets/Gets the object text

Methods

Update Updates the object while the modifications have effect

Length Gives the number of data matrix characters

Events

Type: Global
Name: Axis

Description: The axis object id used to manage the mechanical axes
To select axis X use index 0
To select axis Y use index 1
To select axis Z use index 2

Properties

Position(index) Sets/Gets the position of the selected mechanical axis

Methods

IsEnabled(index) Gives TRUE if the selected axis is active

IsOnZero(index) Gives TRUE if the selected mechanical axis is in the Zero position

Reset(index) Starts a search for zero on the selected mechanical axis. Gives TRUE if successful.

Move(index,position) Moves the selected mechanical axis to the specified position, gives TRUE if the command is correctly carried out

Break(index) Stops the movement of the selected mechanical axis, gives TRUE if the command is correctly carried out

Events

OnReachZero(index) Zero position of the selected mechanical axis reached

OnReachPosition(index) Requested position of the selected mechanical axis reached

Type: Global
Name: IoPort

Description: The IoPort object is used to pilot output signals and read input signals
Properties

Methods

PortsCount Gives the number of I/O modules and related available ports
Each port has 16 output bits and 16 input bits

SetPort(port,mask) Configures the output of all bits via the selected port mask

ResetPort(port,mask) Resets all output bits via the selected port mask

GetPort(port) Gets the input bit mask of the selected port

CheckPort(port) Checks the inputs of the selected port

UncheckPort(port) Stops the input test of the selected port

Events

OnInputChange(port) Checks the change of at least one bit on the monitored port

Type: Global
Name: ComPort

Description: The ComPort object is used to configure on of the serial ports installed on the system

Properties

Methods

Open(parameters) Opens the port selected with specific parameters. The parameters are represented by a string with the following syntaxes:
Port,speed,data bits, stop bits, Equality (i.e.: "COM1,9600,8,1,NONE").
The function gives TRUE if successful

Close Closes the port

Write(string) Sends the character string to the port, gives TRUE if successful

Read Reads the port. The function gives the received character string

SetFlag Configures the flag character (end transmission character)

Flush Resets the port flush

DTR	Configures/Resets DTR signal (data terminal ready), gives TRUE if successful
RTS	Configures/Resets RTS signal (request to send), gives TRUE if successful

Events

OnTxComplete	Transmission complete
OnRxChar	A character has been received
OnRxFlag	Flag Received (end transmission character received).
OnError	Error on line
OnBreak	Input interruption
OnRing	Ring indicator
OnRSLD	RSLD signal (receive line signal detect) has changed logic state
OnCTS	CTS signal (clear to send) has changed logic state
OnDSR	DSR signal (data set ready) has changed logic state

Examples of VBScript

Example 1

The following VBScript randomly rotates the object in the engraving area

```
Document.Show

Sub Project_OnQueryStart
 OfsX = Int(100 * Rnd - 50)
 OfsY = Int(100 * Rnd - 50)
 Ang  = Int(360 * Rnd)

 Document.Move OfsX,OfsY
 Document.Rotate Ang
 Document.Show

End Sub

Sub Project_OnClose
 'Document.Move 0,0
 'Document.Rotate 0
 'Document.Show
End Sub
```

Example 2

This VBScript puts a pre-set string (“Creator Pro IV ÖSTLING) in the work area on a circumference with pre-set characteristics.

```
Document.Show

On Error Resume Next

Set MyString = Document.CreateString(1)
If Err.Number = 424 Then
 MsgBox "Impossible to create string ID: 1"
Else
 MyString.Text = "Creator Pro IV ÖSTLING"
 MyString.Radius = 30
 MyString.Angle = 90
 MyString.Update
End If

Project.UpdateViews
```

Chapter 10

Customizing Creator Pro IV

Origin of the work area

The coordinates set in an engraving job, either plain or ring, have an origin as a reference. The origin is the point of coordinate 0.0 that the objects in the engraving area refer to. The point of origin is invisible but its position is indicated on the General page of the selected job.
By default, Creator Pro IV sets the center of the work area as the point of origin.

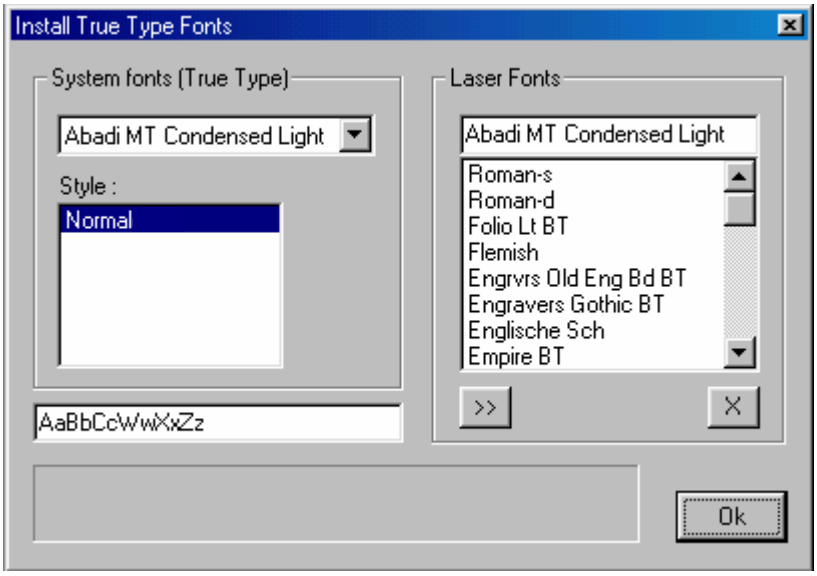
Moving the origin of a work area

To modify the origin position, open the combo box related to the origin position and set the new position.
If you set the CUSTOM position, it is necessary to enter new X,Y coordinates which will set the new origin of the work area.

NOTE:
If a Custom origin is set, i.e. with coordinates set by the user, the grid will automatically be positioned in relation to the new origin.

Installing new fonts

The engraving program uses specifically made fonts to optimize the number of vectors forming the various letters for engraving applications. In addition, the program can convert True Type fonts installed in the system into its own format. If you want to install a particular type of True Type font for engraving, close all the open models and select “File” → “Fonts…” to open the font installation window.



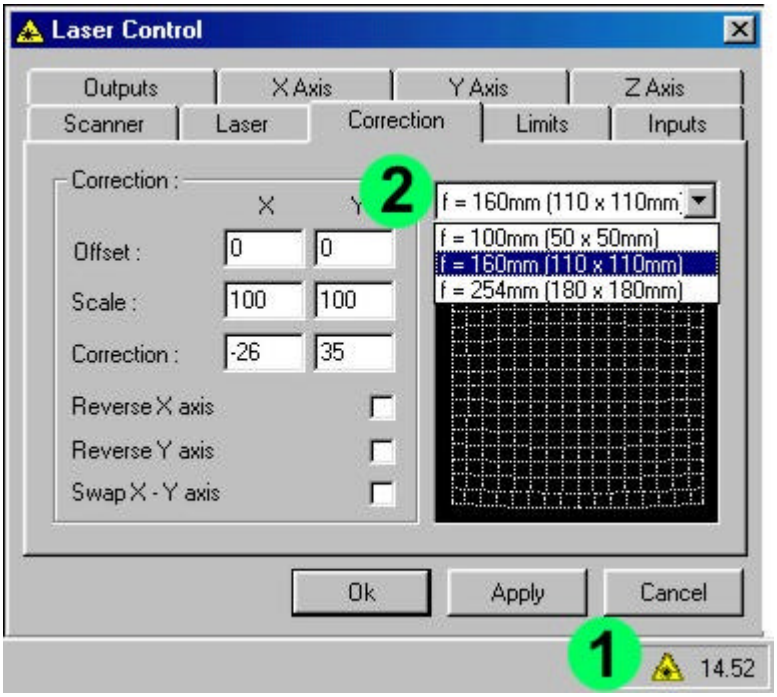
You can select a standard font installed in the system, see a preview and add it to the laser font list by pressing the “>>” button. Press the "X" button to delete a font.

NOTE:
The font menu can only be accessed if all engraving jobs are **CLOSED**

Setting the focus

To set the type of focus currently used by the engraver select Laser Control. This window contains a list of available lenses, by selecting a lens its parameters are displayed.

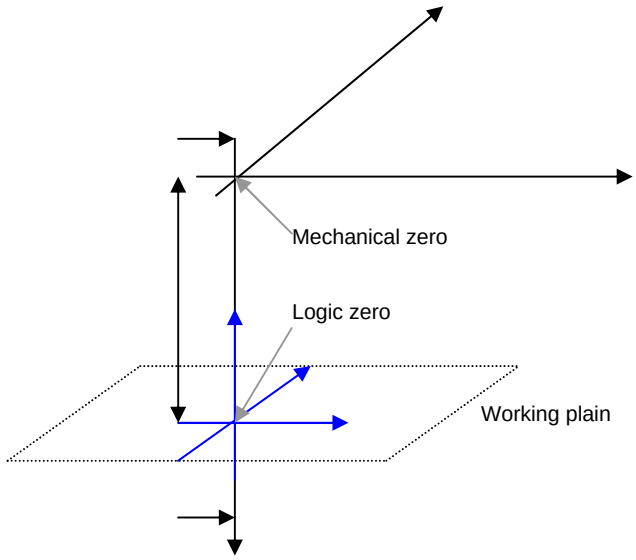
The width of the work are is set by the focus length set in Laser Control.



- Open the Laser Control application by clicking twice on icon 1 in the Tray area
- Select the Correction page
- Open Combo Box 2 and set the focus used by the engraving laser

Mechanical Axis Management

The engraver can manage three mechanical axes, namely X, Y and Z. The following figure shows how the axes are positioned (in black):



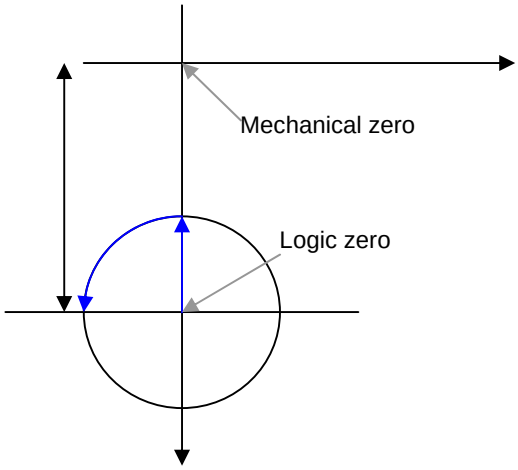
The program can define a minimum height (Min), a maximum height (Max) and a zero height (Zero) for each axis. Each axis can be reversed.

Linear axes

The Z axis in the figure has a zero height which is different from null and is reversed. The X and Y axes (mechanical) coincide with the x and y axes (logic).
In this example, the logic height z + 0 mm coincides with the focus height from the working plain. A height z > 0 mm would mean that the focus position is over the working plain.

Rotary axis

Axis management is completely independent from the axis itself. This is because the engraving program can be configured to manage an angular axis simply by setting the Z axis to "zero" at the center of the ring and configuring the rotary axis conversion factor in order to correctly convert the angular positions (e.g. "steps per revolution"/ 360 = sexagesimal degrees). In the following example, axis x is a rotary axis.

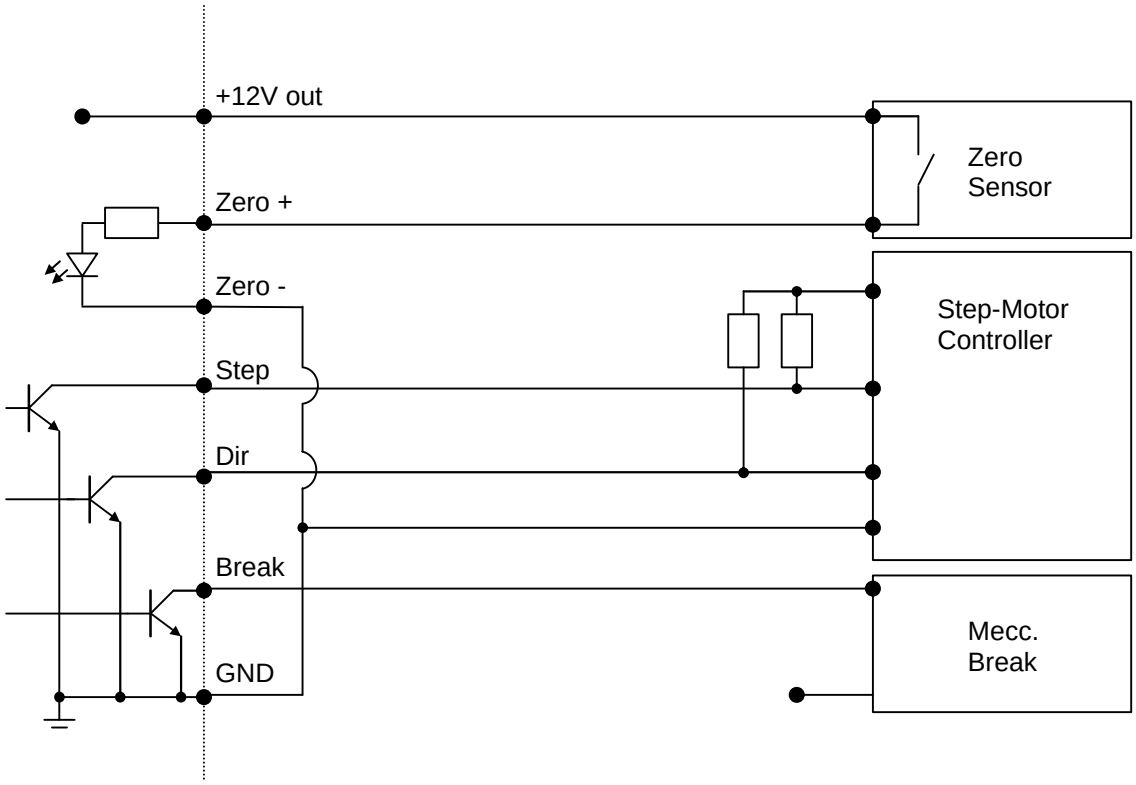


Connecting an axis (Step Controller)

The DSP board is able to drive up to the independent step type axes. The board uses the following signals to control each axis:

Step: Open collector output, generates the steps for the step motor controller. The generated frequency is based on the set movement speed, the duty-cycle is equal to 50%.
Dir: Open collector output, direction signal.
Break Open collector output, brake unlock signal
Zero: Opto-isolated input, mechanical zero detection input.

The following diagram shows how to connect an axis driven by a step controller to the DSP board.

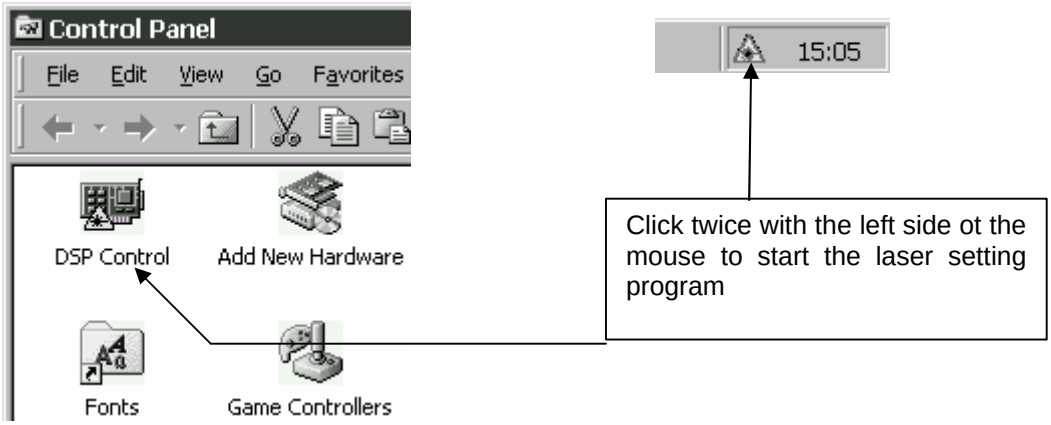


Chapter 11

DSP board management

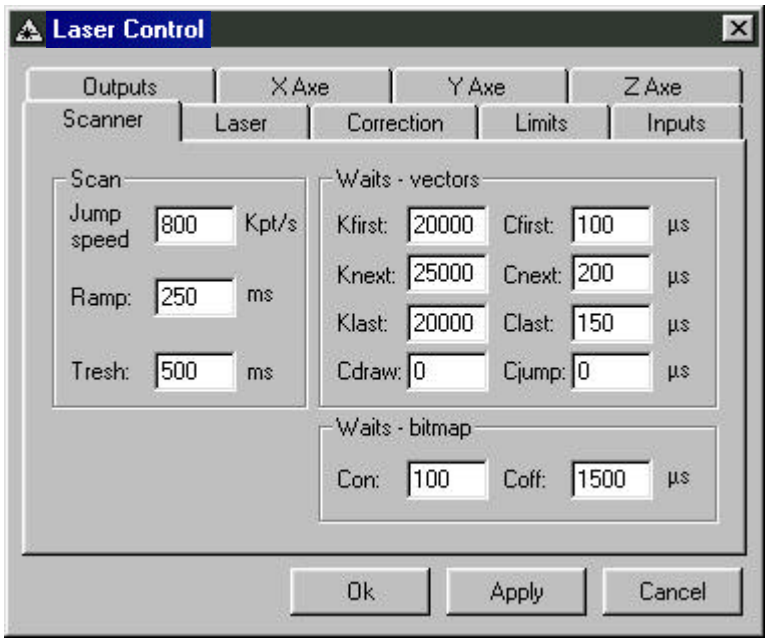
Laser Control

The "DSP" control program is used to set laser engraving parameters for the various applications. Each set of parameters is logically grouped on a page to facilitate access. The program can be accessed from the "Control Panel" via the "DSP Control" icon or from the yellow icon depicting laser emission present in the "Tray Area"(the area in the lower right on the Windows bar) of the Windows shell as shown in the figure below.



Installation of the program takes place automatically when the **Creator Pro IV** graphic editor is installed as described below.

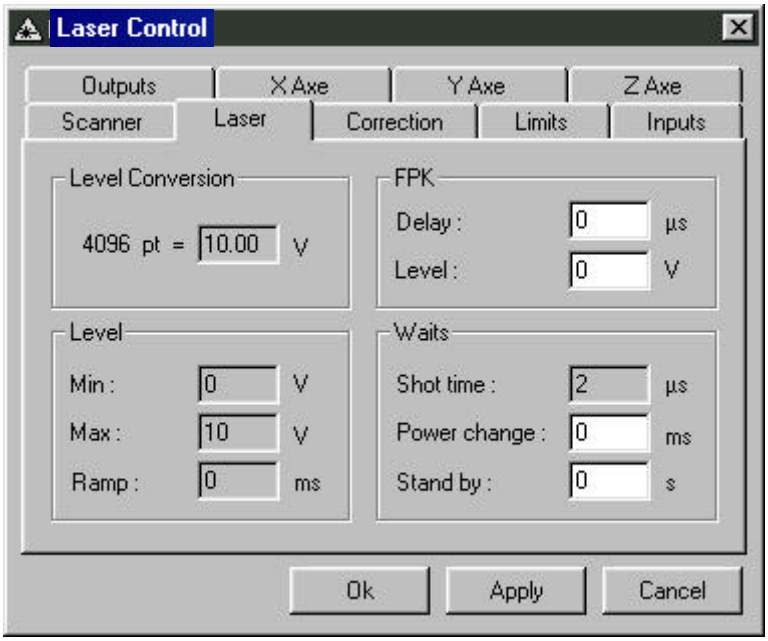
“Scanner” parameters



This page is used to set the scanner speed when the laser is off (*Jump Speed*) and the waiting times for adjusting the engraving quality with respect to running times.

NOTE:
See **Setting Waits** for the correct wait settings.

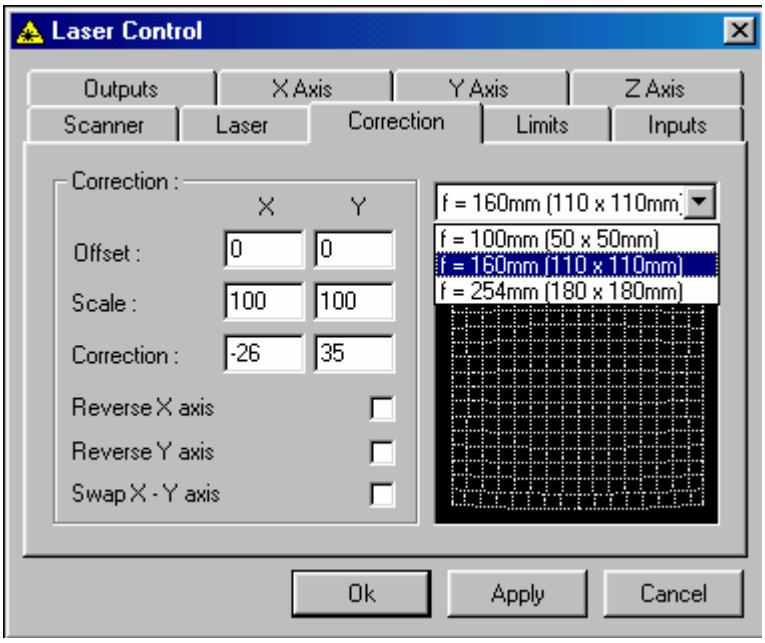
“Laser” parameters



This page is used to set the following parameters

- ***Level – Min:***
  Minimum current level expressed in V. Corresponding to 0% power.
- ***Level – Max:***
  Maximum current level expressed in V. Corresponding to 100% power.
- ***Level - Ramp:***
  Time expressed in ms required to complete the ramp from minimum to maximum level.
- ***FPK – Delay:***
  First pulse delay expressed in us.
- ***FPK – Level:***
  First pulse level expressed in V.
- ***Waits – Shot time:***
  Last pulse shpt time expressed in us.
- ***Waits – Power change:***
  Warm up time, expressed in ms, i.e. the waiting time between the end of the level ramp and start of engraving. The waiting time allows the laser to stabilize before the process.
- ***Waits – Stand by:***
  Stand-by time, expressed in s, i.e. the waiting time between the end of engraving and the level ramp resetting the minimum value (stand-by value). This waiting time allows the laser to remain stable between two close engraving processes, consequently saving process time.

“Correction” parameters



This page is used to set the optical correction required to recover the distortion of mirrors and lens. The parameters are:

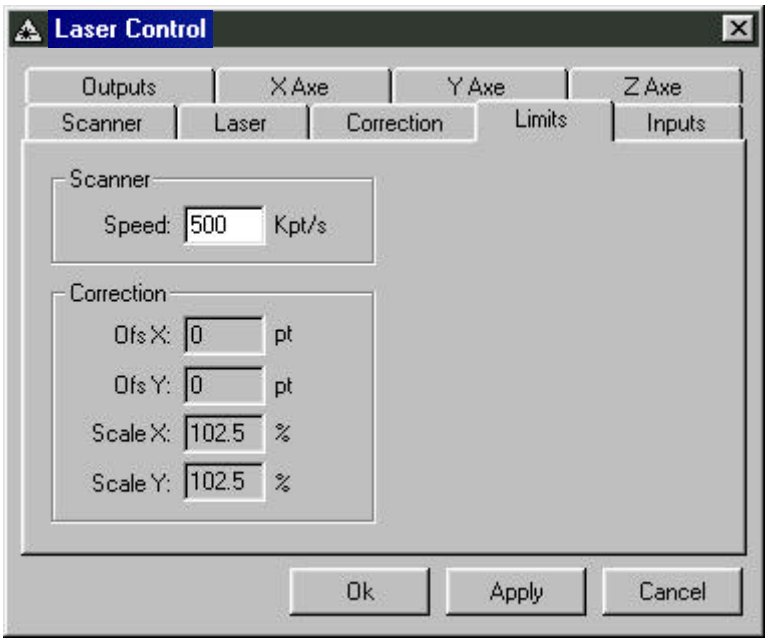
- ***X/Y:***
  Value, expressed in degrees, indicating the curvature to be applied to each axis.
- ***Scale X/Y:***
  Scale, expressed in %, to be applied to each axis.
- ***Reverse X/Y axe:***
  To reverse the relative axis.
- ***Swap X-Y axes:***
  To swap X axis and Y axis

The three axis reverse parameters are used to direct the engraving field in the four angular positions:: 0°, 90°, 180° and 270° as described below:

- *0° rotation* : None.
- *90° rotation* : Reverse X + Swap X-Y.
- *180° rotation* : Reverse X + Reverse Y.
- *270° rotation* : Reverse Y + Swap X-Y.

NOTE:
See **Foundations on engraving and optical correction** for a better understanding of optical correction.

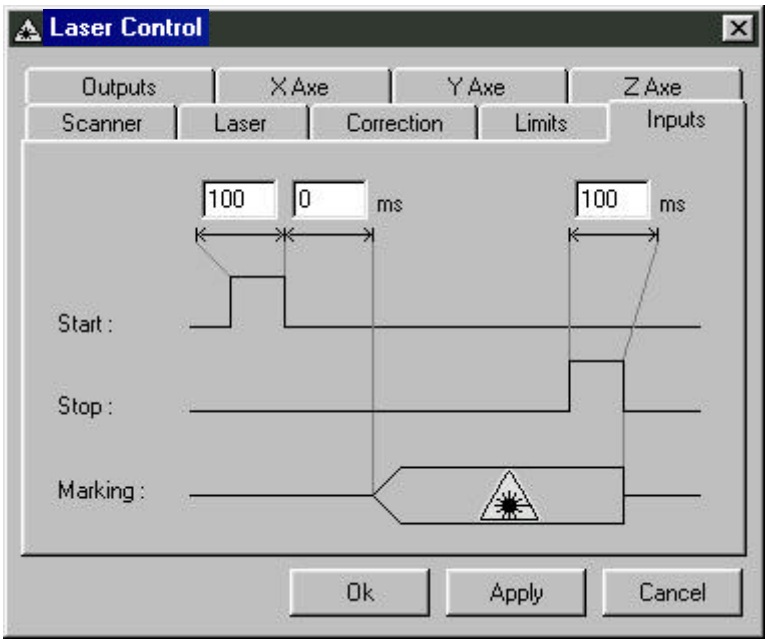
“Limits” parameters



This page is used to correct the pointer limits in relation to engraving. This allows perfect overlaying, even when the power laser and the pointer laser wavelengths are different. The following parameters can be set:

- ***Speed:***
  Pointer limit processing speed, expressed in Kspots/s.
- **OfsX/Y:**
  Alignment offset, expressed in points per respective axis.
- **ScaleX/Y:**
  Limit scaling in relation to engraving, expressed in % on the respective axes.

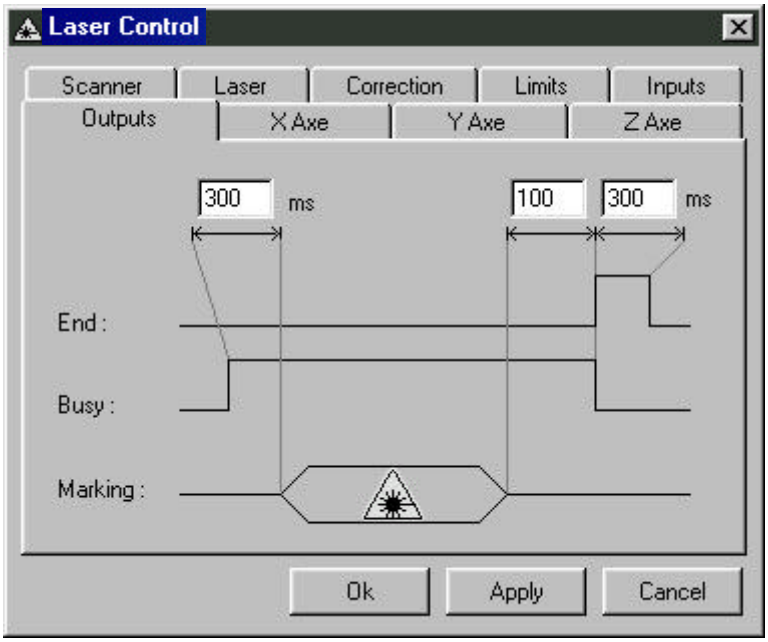
“Inputs" parameters



These two pages are used to set laser input signal time and delay in relation to engraving. The parameters are:

- ***Inputs – Start Time:***
  To set the minimum start engraving signal duration, expressed in ms.
- ***Inputs – Start Delay:***
  To set the delay (in ms) between start engraving signal acceptance and start of engraving process.
- ***Inputs – Stop Time:***
  To set the minimum stop engraving signal duration, expressed in ms.

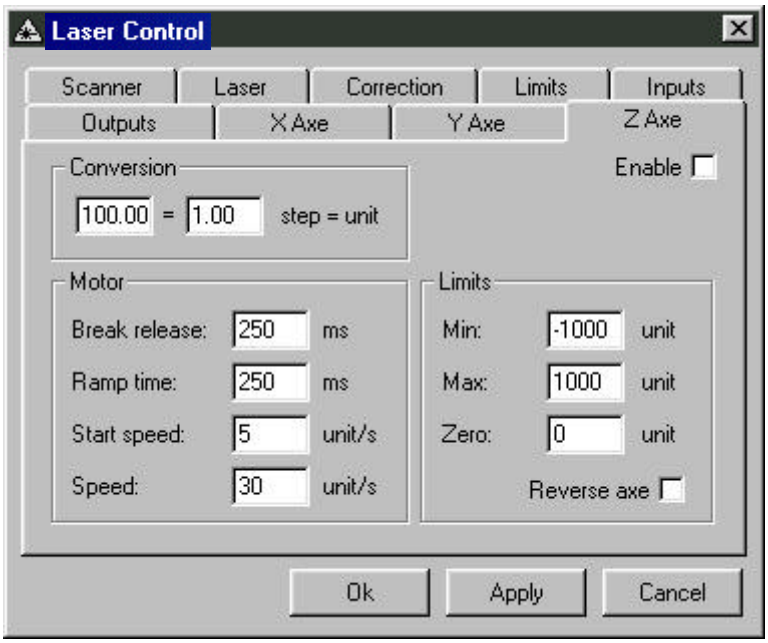
"Outputs" parameters



These two pages are used to set laser output signal time and delay in relation to engraving. The parameters are:

- ***Outputs – Busy Advance:***
  Advance, expressed in ms, of the busy signal (engraving in progress) in relation to the start of process. This parameter can be useful when the signal is used to open an electromechanical shutter.
- ***Outputs – Busy Delay:***
  Delay, expressed in ms, of the busy signal in relation to the end of the process.
- ***Outputs – End Delay:***
  Duration of the end of engraving signal.

“X/Y/Z Axe” parameters



This page is used to set the parameters related to the three mechanical axes controlled by step motors. The parameters are:

- ***Enable***:
  To allow axis use.
- ***Conversion:***
  These two parameters establish the correspondence between motor steps and millimeters of shift.
- ***Motor – Break release***:
  Electromechanical brake release time, expressed in ms. This is the time which passes between brake release signal activation and mechanical movement start.
- ***Motor – Ramp Time:***
  This is the time, expressed in ms, employed by the acceleration ramp to go from minimum speed (Start speed) to working speed (Speed).
- ***Motor – Start speed:***
  Minimum motor revolution speed, expressed in mm/s.
- ***Motor – Speed:***
  Motor revolution speed at the end of acceleration, expressed in mm/s.
- ***Limits – Min:***
  Minimum motor position limit, expressed in mm.
- ***Limits – Max:***
  Maximum motor position limit, expressed in mm.
- ***Limits – Zero:***
  Position (in mm) of the axis logic zero in relation to the mechanical zero. Each movement of the axis is considered in relation to the logic zero. Conversely, axis resetting locates the mechanical zero.
- ***Limits – Reverse Axe:***
  To reverse axis logic.

NOTE:
See **Mechanical Axis Management** for additional information on axis use and parameter settings.

Chapter 12

Engraving and optical correction

Foundations of engraving and optical correction

The scanning head used for laser engraving employs two electrical drives to set the angular position of the two mirrors and deflect the beam along the two directions X and Y. A simplified diagram is shown below (**Fig. 1**):

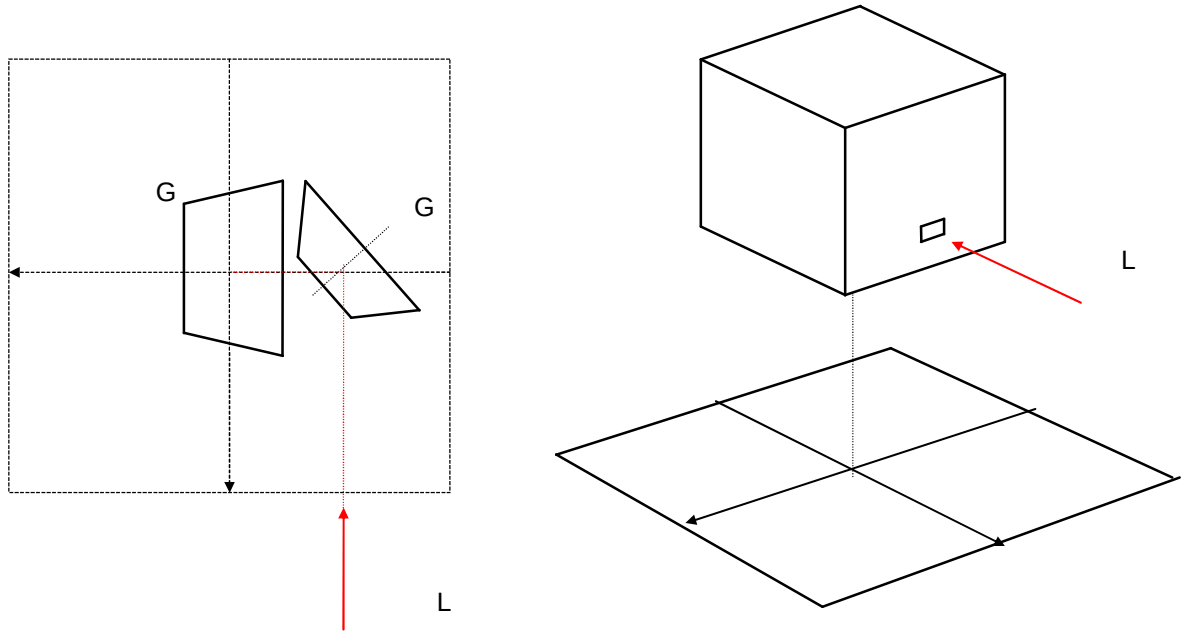


Figure 1: Scanning head

Distortion

The picture projected on the engraving surface by the two mirrors is deformed due to the different length of the optical paths for the different angles. Observe **Fig. 2**. The point on the plain does not follow a straight line parallel to the x axis as angle J_x varies, instead it follows a trajectory which is similar to a parabola distancing the hypothetical line according to the two angles J_x and J_y.

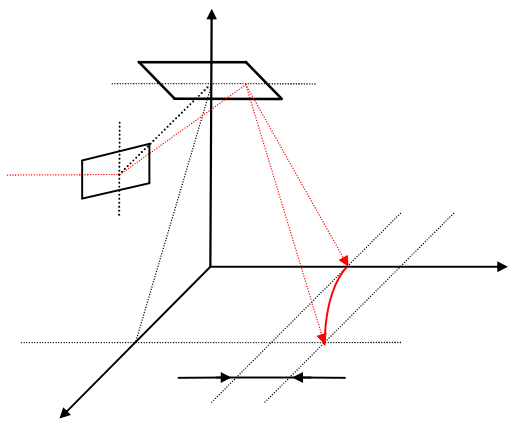


Figure 2: Projection on plain

The coordinates of the projected point can be computed with the following formula:

$$\begin{cases} x = f \cdot \tan(J_x) \\ y = (d+h) \cdot \tan(J_y) = \left[d + f \cdot \sqrt{1+\tan^2(J_x)}\right] \cdot \tan(J_y) = \left(d + \dfrac{f}{\cos(J_x)}\right) \cdot \tan(J_y) \cong f \cdot \dfrac{\tan(J_y)}{\cos(J_x)} \end{cases}$$

The error - i.e. the discrepancy between the real y and the ideal value according to the variation of J_x is:

$$\Delta y = f \cdot \frac{\tan(J_y)}{\cos(J_x)} - f \cdot \tan(J_y) = f \cdot \tan(J_y) \cdot \left(\frac{1}{\cos(J_x)} - 1\right)$$

as a result the angular correction to be applied to J_y to compensate this distortion is:

$$\Delta J_y = \tan^{-1}\left(\frac{\Delta y}{f}\right) = \tan^{-1}\left[\tan(J_y) \cdot \left(\frac{1}{\cos(J_x)} - 1\right)\right]$$

Barrel distortion

The lenses used for scanner heads (e.g. RODENSTOCK f-theta objective), in addition to focusing on the work plain, apply a deformation ,called barrel distortion, to eliminate the dependency from the tangent.

$$y = h \cdot J_y$$

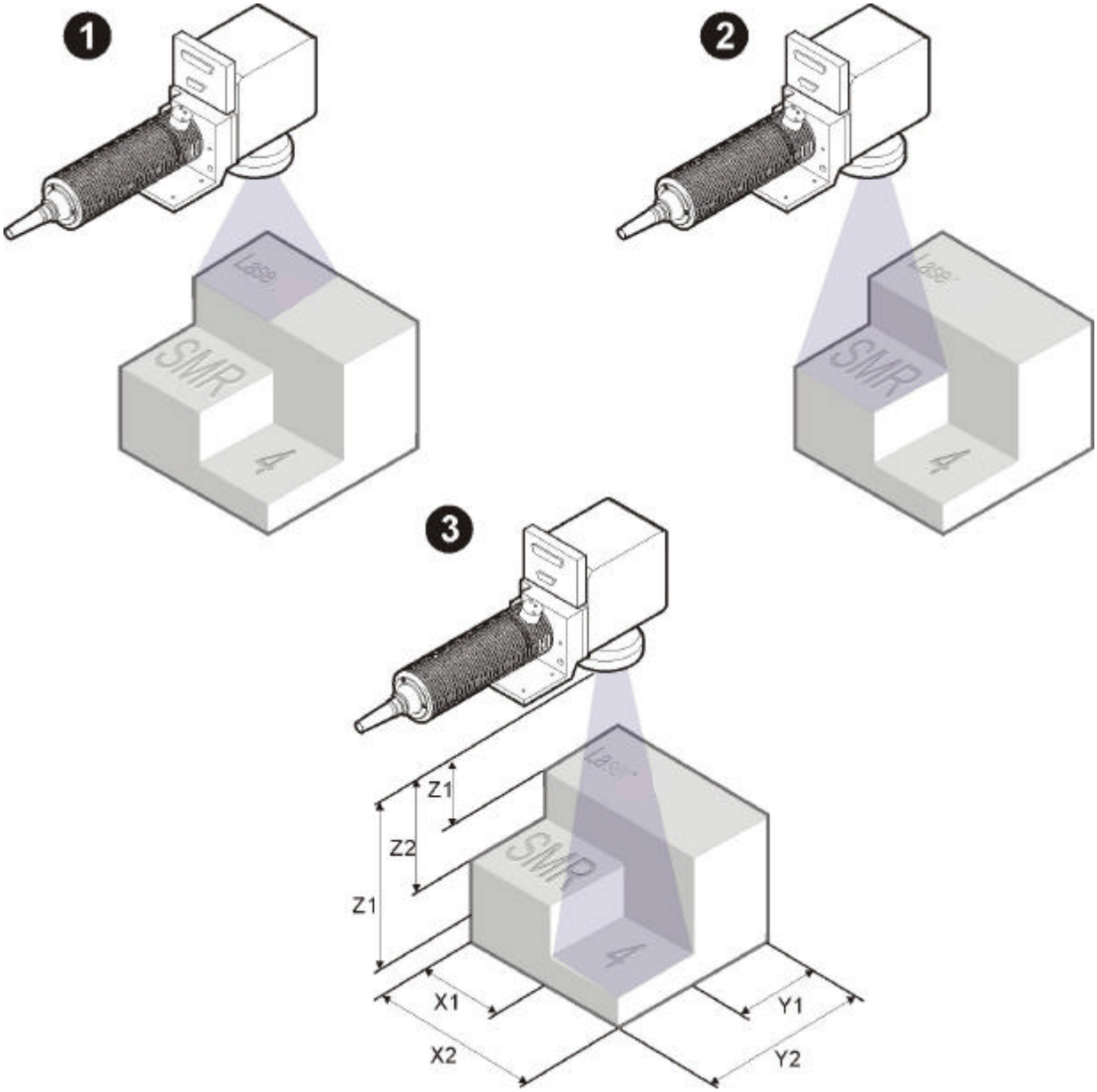
The use of these lenses could simplify the task of the software by eliminating tangent distortions.

Chapter 13

Practice exercises

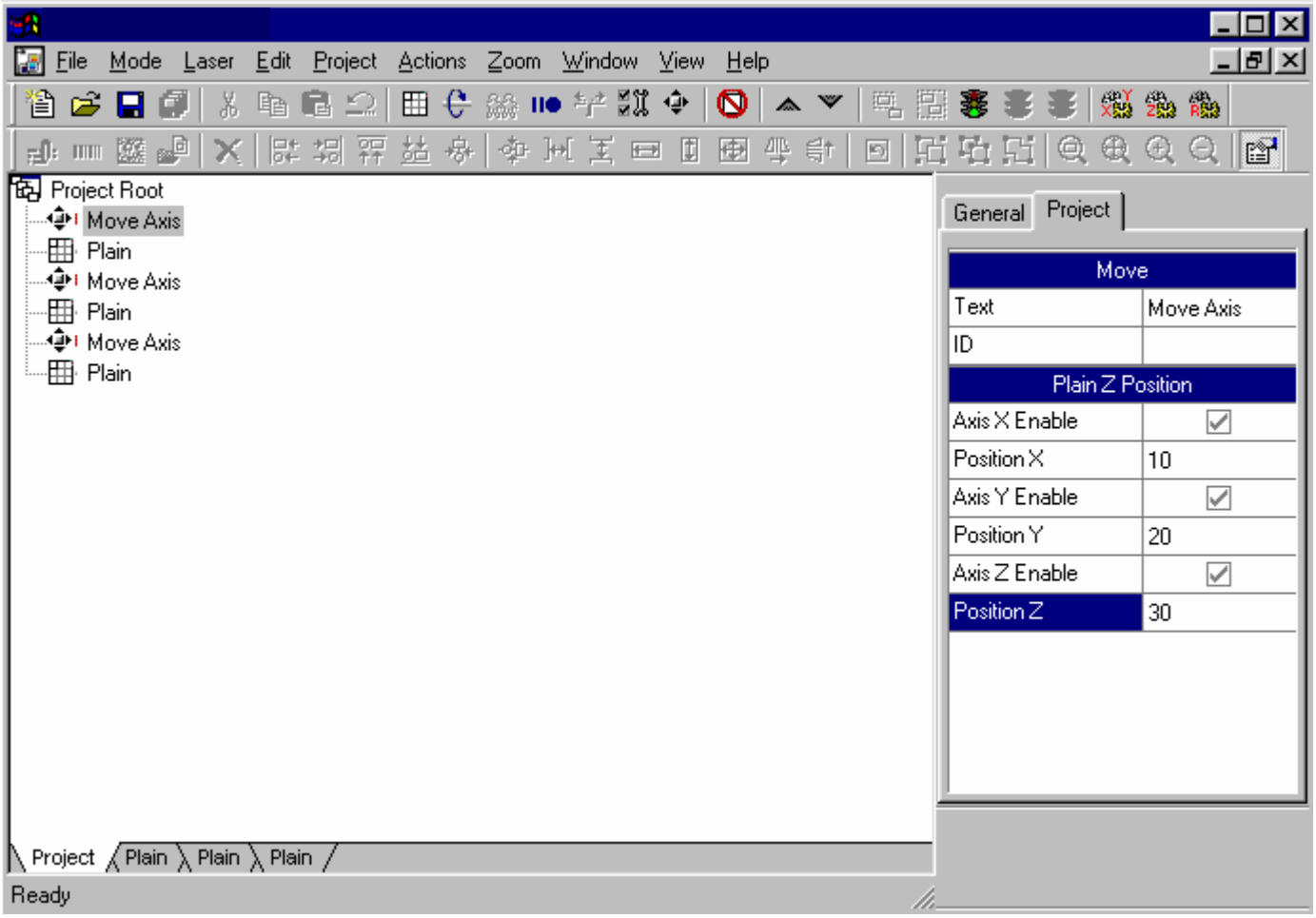
Exercise 1 -Project for engraving on different levels

The figure below shows a job which entails movement of the three mechanical axes for engraving the piece in three different positions.



The proposed exercise involves creating a project with a sequence of three different engraving items on the plain (laser) separated by the axis movement function.

- Creation of a new Project File > New > Project
- Addition of three jobs for plain engraving Project> Add Plain
- Position three functions for axis movement Project > Shift axes
- Position three axis Shift function as shown in the figure using the arrow keys ▲ ▼



Set the shift value along axes X, Y, Z for each “Axis Shift” function in the project sequence.

Chapter 14

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