
MATISSE

Version 2.0

Demonstrative Example

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INTRODUCTION

The aim of this demonstration is to show the sequence of steps by which the drawing in Picture 1 may be introduced in the computer with CAD MATISSE.

Before data input two phases of work are necessary:

- Arrangement of data input system, that means verifying supplies, connections, hardware and software presettings.

- Picture analysis, that means identifying both types of elements in a geometrical drawing: absolute and relative coordinates, connection radius, tangents and so on, and the elements of fancy of free-hand drawings

The data input for the two kinds of drawing is a bit different.

During the different phases of work, the operations on the two kinds of elements are just the same, and the final composition turns out homogeneous.

Data input of geometrical drawing must be exhaustive, data shouldn't be redundant at risk of binding situations, neither insufficient allowing doubtful situations.

The coordinates of construction lines must be introduced through keyboard; the other input device, mouse or plotter, allows, during CAD process, selecting these lines and obtaining the final figure according to input data.

The profile of a fancy drawing must be clear and plain, so that the significant points of the picture can be easily identified and digitizing turns out simple and accurate.

Also the coordinates of fancy drawing must be introduced carefully, for a reliable reproduction of the picture.

It is necessary to assign the scale with which the real object is reproduced by drawing; a single point should be identified and its coordinates defined, as reference for all other points (it may be external to profile); finally as the physical input device (digitizer, tablet or drawing table) has its own reference system, an alignment axis must be defined in order to make it compatible with the axis of the drawing.

In Picture 1 the outlines may be identified as geometric drawing, the flower as fancy drawing.

In order to follow a structured working method, we suggest to divide the entire picture in its two main components: flower (Picture 2) and outlines (Picture 5).

The flower in Picture 2 is by itself a complex drawing. It is suggestable (even if not necessary) to subdivide it in simple parts that will be aggregated later.

The final composition will be successful not only according to digitizing accuracy, but mainly to a correct identification of reference axis.

All parts must be in exact scale and correctly positioned each with respect to the other. The concept of scale can be usefully employed when an enlarged copy of a detail is available (Corolla in picture 4).

The larger is the scale of the drawing, the better accuracy is obtainable.

Three groups of details may be identified in the flower: the four leaves, the stem and the corolla. Each group should be separately drawn in a structured working technique.

FANCY DRAWING

Creating file "stem".

Flower's Stem may be subdivided in stalk and leaves. Stalk requires construction of eight separate lines. Each line is characterised by an Initial Point, a Final Point and a sequence of intermediate Points.

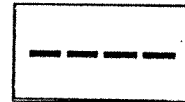
Such lines will be hereafter called routes. The routes sequence must be carefully chosen, particularly in case that no optimizing elaboration is provided later, because the first introduced route will be executed first.

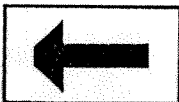
It's suggestable before digitizing, to point out with a pencil on the drawing the positions of points that later will be introduced.

The constructed route will pass through the points and will be subject to tangency conditions according to their type (Angular, Normal, Stand Alone).

Stem lines are very similar among them. They can be described, in a simple way, as a sequence of arcs of circle with a bending changing with continuity.

A technique useful to describe these lines is **Alternating Digitizing**, so called because it alternates a Normal Point with an Angular Point. A normal point is constructed with continuity of tangent. The Angular Point doesn't impose constraints, except for passage. Consequently the sequence Angular-Normal-Angular points describes univocally an arc of a circle. The continuity between following arcs is assured by cleverly choosing points. In particular, notice the disposition of points A, B, C in picture 3. Angular points are set where bending is changing.





CAD process (accessible after the introduction of a Final Point) provides a command called **Shift on Circle** which exasperates continuity between points modifying the position of the Normal Point in order to obtain on the previous Angular Point, the same tangent on both sides. With this technique all the lines of the stem can be drawn.

The top of the stem has a segmented shape. It can be efficiently drawn with a sequence of Angular Points. Between two Angular Points a segment is always present. Indicate now all points using the technique described above.

In case of unitary scale, draft on the paper sheet a segment of approximately 100.0 mm, possibly parallel to the sheet border.

Put the sheet on the tablet, in such a way that all the drawing lays within the active area of the input device.

As the system asks for **Reference Axis**, put the end of the tablet pen on the initial point of the segment just defined, and push the pen until its contact switches. Repeat the same sequence for the final point.

Introduce 227.0 mm as axis length, being all coordinates expressed in millimeters, and $X=0.0$, $Y=0.0$ as origin.

The first point to be introduced will be automatically qualified as **Initial**; the following are at operator's choice. It's very important to acquire a good manual skill in operation with the tablet pen, in order to avoid useless or double commands.

Some sequences of points are not allowed: **Final - Final**, **Tangent - Tangent** etc. They cause generation of an error message and inhibit storage.

An error on the last point can be eliminated by command **Delete**.

But as any point may be modified in CAD for all its specifications, it's suggested to postpone all small corrections to once entered this phase of work.

Once the last Final Point is introduced, it's suggested to save data making use of command **Storage**.

All data introduced can be controlled using command **Cad**.

Small details may be evaluated with **Zoom** command, and little defects corrected.

Selecting **Digitizing** it's possible to come back to the preceding phase.

All references remain unchanged, unless command **Display** has been selected, as this command modifies scale in order to optimize video display, this way changing all correspondences with input device.

The lines which constitute leaves (Picture 3) are similar to those composing stem, but they create closed routes.

In order to assign a Final Point perfectly coincident with Initial Point, activate command **Final Point** followed by command **Initial Point**.

Remark also the position of Angular Point I in Picture 3, located on a flex point of route HL, where the two arcs invert their spin.

A **Tangent Point** has been introduced in position N, because tangency between a straight segment and an arc is requested.

Once all points corresponding to leaves have been introduced, the whole profile must be saved with a new **STORAGE**.

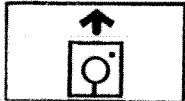
Creating file "corolla"

The flower's Corolla (Picture 4) has been drawn with a larger scale with respect to the remaining drawing; this is not a problem, if length (477.0) and origin (0.0, 0.0) of the reference axis are exactly introduced.

The origin is used in the final composition as connection point with the rest of the drawing. Therefore it's convenient to define it in correspondence with a significant point (A).

Routes constituting petals are very tortuous. They require tangent continuity. A sequence of Normal point is best suited.





Creating file "flower"

In order to create the whole drawing of flower, (picture 2) we suggest to copy file "Stem" onto a new basic file called "Flower".

When the already existing file "Flower" is recalled, CAD operation is proposed by system.

In order to add other parts, activate command **Insert Profile**, that opens a window for positioning options.

Because of its specific reference axis, the coordinates for corolla are the ones of point P in picture 3.

It's suggested to insert the new profile on a level which is not the current one, in order to make it easily identifiable and allow partial storage.

When all elements have been inserted, activate Storage.

Geometric Drawing

Creating file "base"

File "Base" (picture 5) includes all the construction lines of the profile contained in the file "Contour", which represents the profile of the door of picture 1.

All the lines can be realized with the procedures of Geometric CAD.

In order to activate **Geometric Cad** it is necessary to work on a profile already existing or to introduce two separate points on a new profile, or at least a Final Point.

The choice of construction sequence of the geometric elements is arbitrary. Here after you can see an example, that we suggest to follow.

External Rectangle:

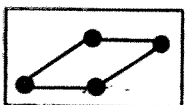
The operation of Geometric Cad allows the definition of rectangle, two of its opposed vertices being given, selecting the icon **Geometric Polygon** and after that the item "Rectangle".

The coordinates to be used are:

First point X=0.0; Y=0.0; Z=0.0

Second point X=450.0; Y=660.0; Z=0.0

They can be assigned according to the procedures of "Absolute Position".



Circumference

There are different possibilities for the construction of a circle, according to the data that are available, within command **Geometric Circle**.

The available data are the radius and the tangency position of circle in the medium point of the small superior side of rectangle.

From these data it is possible to desume the abscissa and the ordinate of the centre, $x_c=225.0$ $y_c=570.0$, that, together with radius value (90.0) and rotation direction, allows use of option "Center, Sense and Radius".

Parallel segment:

By activating command **Geometric Segment**, one selects the option "Two Points" that defines the segment passing through the two points in sequence.

The coordinates are chosen by means of absolute position and are:

First point $x=0.0$; $y=540$; $z=0.0$

Second point $x=450$; $y=540$; $z=0.0$

Connection Arc:

In this case radius and the tangency condition to the segment and to circumference introduced are known.

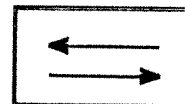
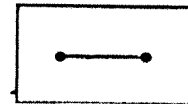
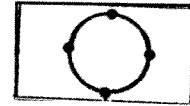
The option "Tang str. Line and Arc with Rad." started by command **Geometric Arc**, allows its construction.

First of all the initial point of the new arc is individuated on the first chosen line, while the Final Point is set in correspondence of the second chosen line.

Rotation direction is congruent to rotation direction of chosen lines, the arc moves continuously from the first to the second route.

In order to easily verify the possibility of inserting the arc, display the rotation direction of single lines, through command **Display**, and set the field "Direction Display" in "y" position.

In case of routes with incongruent directions, it is necessary to modify them with command **Inversion**.





That's the case of segment.

In order to obtain arc AB (picture 5), first select the segment, and after the arch CD. The given radius is 150.0.

Repeat the operation to obtain arc EF, but inverting the order in the selection of lines.

Construction of file "edge"

It is possible to obtain the exact contour from the construction lines, through the command **Geometric Composition**, available within Geometric Cad operations (Picture 6).

Before starting command, some conditions should be verified. Rotation directions of routes should be congruent among them; Initial or Final Points shouldn't be present along the lines constituting the new route, because they interrupt the continuity of the line.

After verifying all the conditions, activate the command.

The user can see the list of progressive order of points and lines that should be introduced following program request. Nevertheless it is possible to choose the lines by sight.

Here is the list.

Initial point	0
Final point	5
Segment 0	11
Segment 1	13
Segment 2	7
Segment 3	16
Segment 4	11
Segment 5	4

Route can be closed by interrupting the selection of segment 6, (press key ESCAPE) and then confirm the choice (press key ENTER).

The route obtained in this way, results completely superimposed to the preceding one.

In order to distinguish the new route, assign a different level of work, for example level 2. It is evident in this way that all the construction figures belong to level 1, while the final contour belongs to the level 2.

Level change is obtained, within route menu, selecting window **Level**.

The new route is stressed by a different colour.

Construction profile is no more necessary. It is possible to save it in a temporary file with command **Level memory**, inside the **Profile Menu**.

Set the level value chosen, that is Level = 1 and confirm **Storage**.

You can get an internal route activating a left contour on external route.

In order that the contour route can be omogeneous to the base one, it is necessary that the Initial and the Final point, besides coinciding, have the same tangent. Before starting contour function, the source of the route should be placed in correspondence with Angular Point N.7. Set the cursor on this point, enter the route menu and start the command **Change Origin**.

The route is joined in correspondence of Initial and Final points and broken in correspondence of Angular point.

Now it is possible to start the command **Contour** with radius = +15.0.

In order to obtain arcs in correspondence of inferior vertices of internal route, use the command **Connection** inside the menu **Geometric Arc**.

First came back to Geometric Cad operations, Start the menu of Geometric Arc and the command **Connection**.

Then when requested, introduce the progressive of the point, indicate point A and assign the value radius = 15.0.; repeat the command indicating point B.

The last operation consists in storing the profile. Select the window **Storage**, assign the level to memorize, in this case 2, and confirm the command.

Final Composition

Copy "Contour" file on "Final" file.

Enter in modification of file "Final" and recall by command **Profile Insert**, the file "Fiore", set coordinate $x = 180.0$ and $y = 90.0$.

If there are no errors, go on with final storage.



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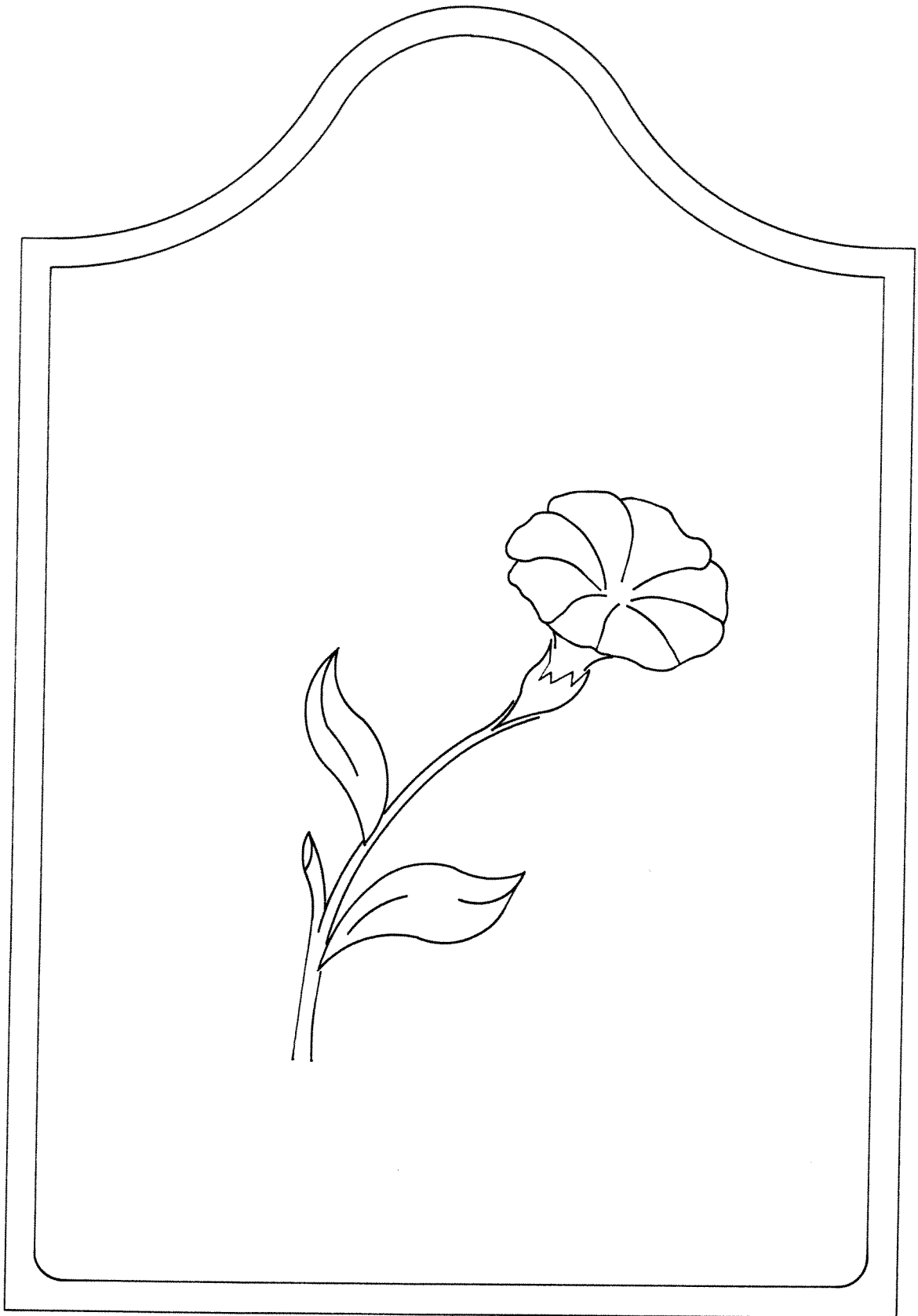
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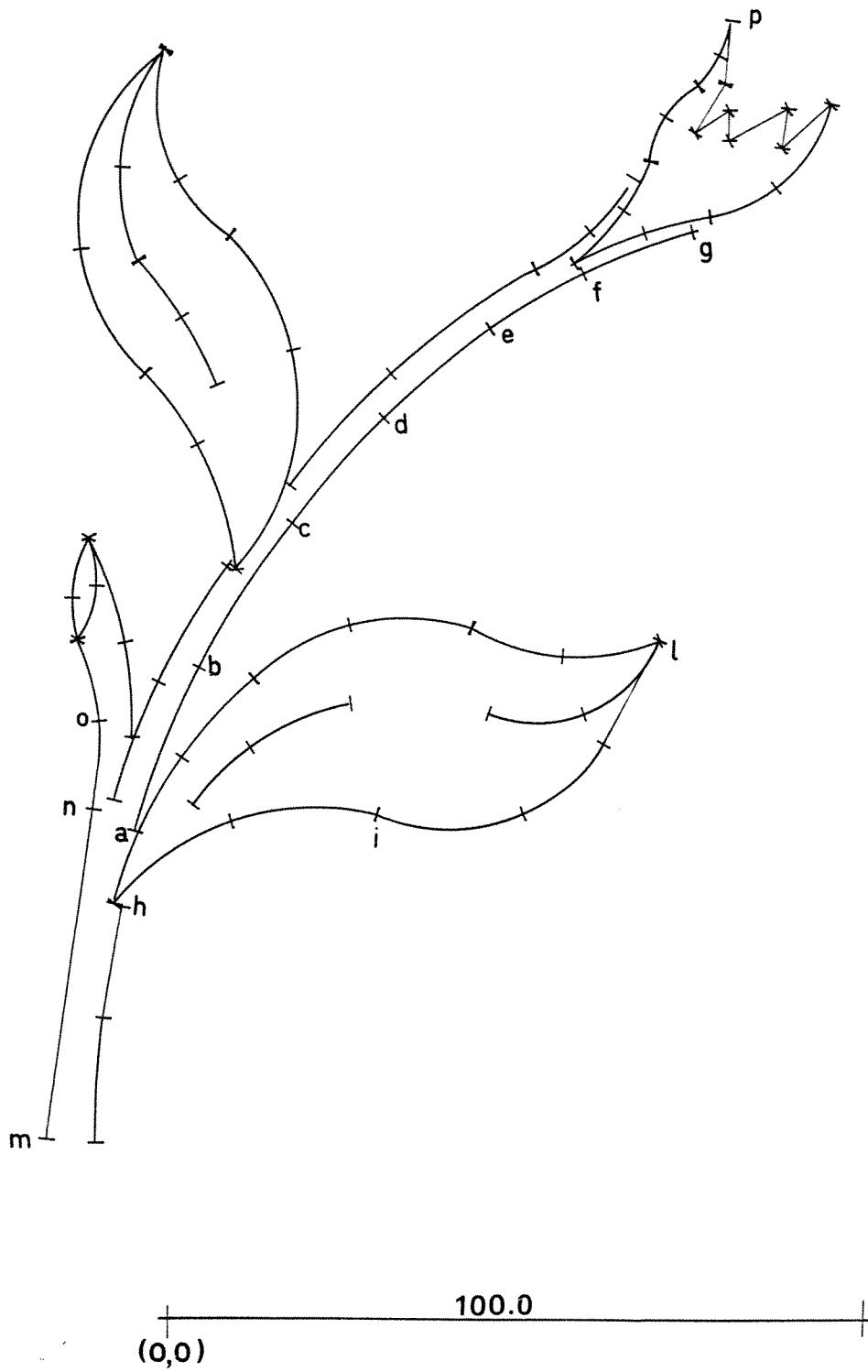
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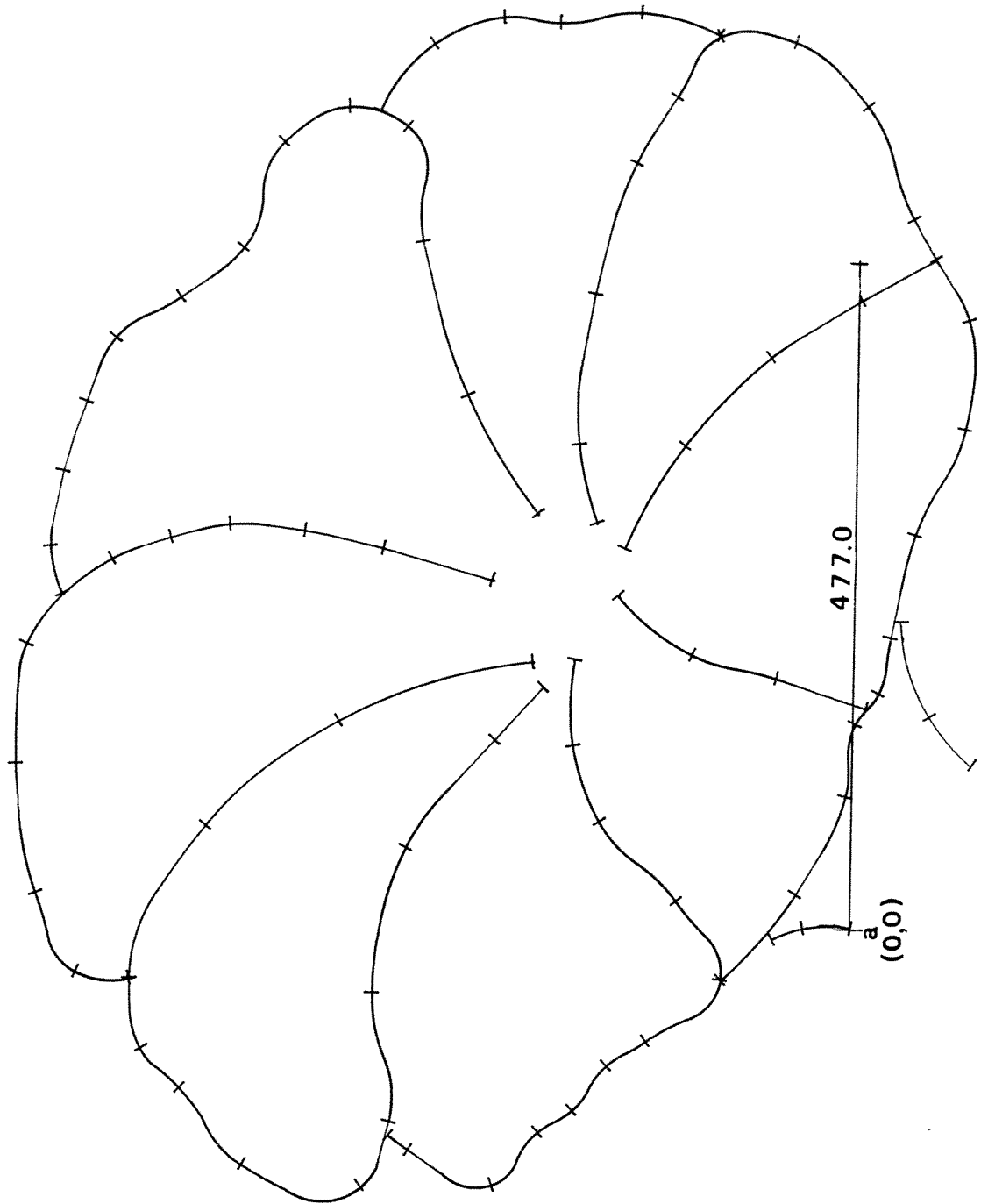
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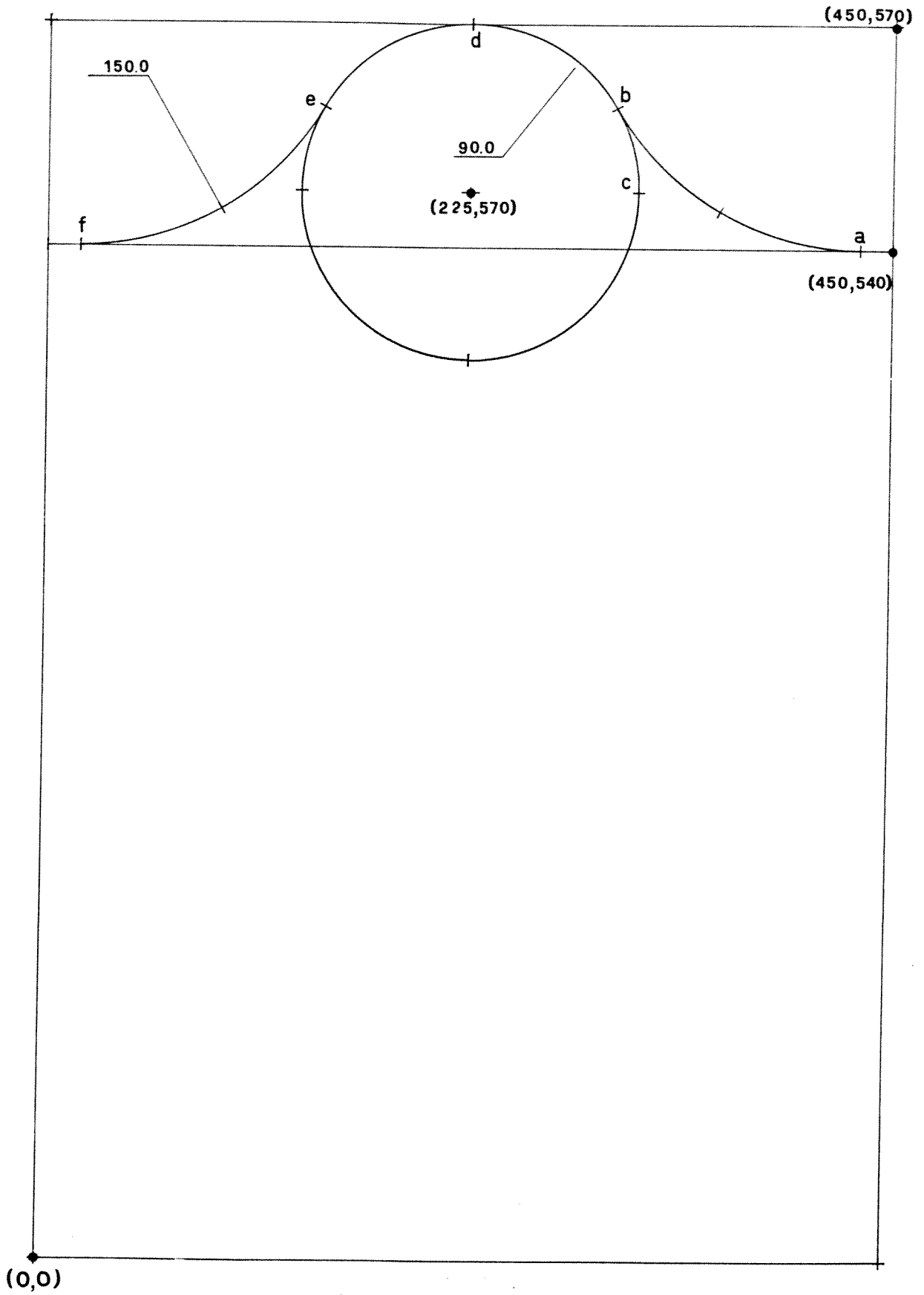
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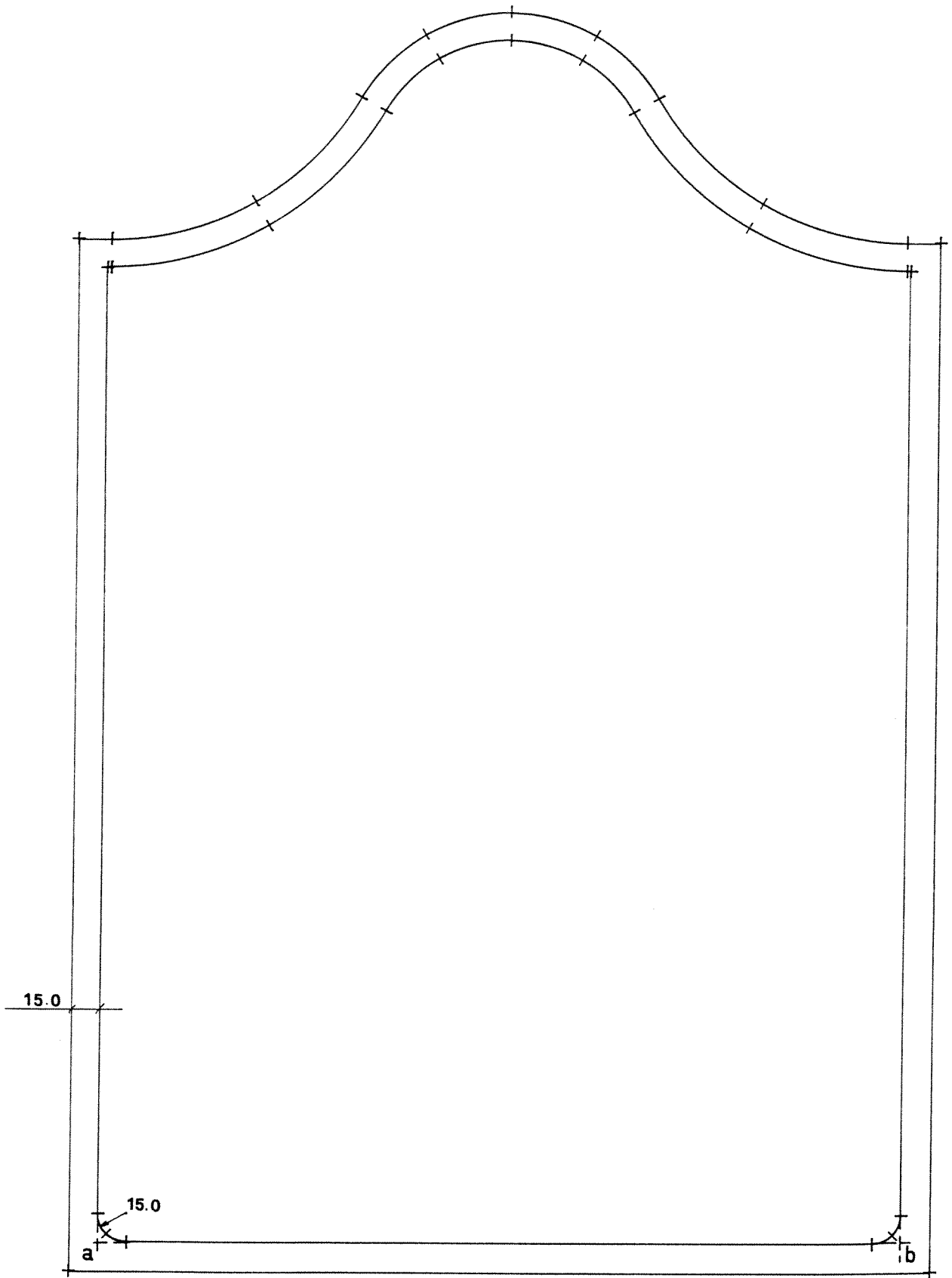
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General Manual

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INTRODUCTION

MATISSE is a **CAD/CAM** system. Its use is advised for all those machines which carry out contouring operations such as milling machines, honing machines and copying machines.

The system helps the operator simply and automatically, from the design phase of the product to the drawing up of programs, complete with all geometrical and technological data required for operating machines.

Drawings are alternatively input into the computer by means of a digitizer, or a digital drawing table, or a tablet, and a mouse.

The operation consists of marking the significant points along the drawing by means of a cursor or a stylus according to a sequence easy to understand. Geometrical and technological characteristics are associated to each point.

A powerful calculation program connects the input points according to their characteristics obtaining curves made up of linked arcs and lines. These are immediately displayed on the video.

It is also possible to digitize enlarged details of the drawing. Details already digitized can be recalled and they can be re-used in a new drawing. After inputting the drawing, it can be modified or corrected at will.

The access to the operating phases is simplified by the menu displayed on the video set by a logic near to the traditional methods of work.

It is possible to move, copy, rotate, translate, do symmetries, enlarge details, carry out distortions or contourings, calculate measurements and display geometrical sizes, storage changes, recall graphic elements, etc.

Modifications are carried out by means of the tablet or the mouse.

It is sufficient to select a Point of the geometrical element on which you want to operate and activate the desired command, available on the video menu.

CHAPTER 1**SYSTEM SOFTWARE CONFIGURATION**

In order to operate correctly, Matisse needs configuration and customization files in the work directory. Be sure these files with their correct configuration are present before starting the program.

SYSTEM HARDWARE CONFIGURATION

The basic configuration for a correct operation of the program is represented by a Personal Computer with MS-DOS operating system, high resolution colour video with relative graphic card. As input device it is possible to use a tablet, a mouse, or a digital drawing table associated to a mouse, or a digitalizer associated to a mouse.

CHAPTER 2

DISPLAYING DATA ON VIDEO

Heading and data area

The upper part of the screen specifies in order, by means of a graphic representation, the name of the company which drew up the program, the identification of the running operation and the last command selected.

In the lower part of the screen is shown:

- geometrical data on the selected Point: sequence number, working plan, type, position, input tangent and output tangent, radius, direction (+=clockwise, -=counterclockwise)
- technological data
- guidelines for inputting data and warning messages in case of error
- profile name
- current position of the graphic cursor

Graphic representation area

It corresponds with the digitizing area of the tablet or digitizer on which the drawing is set, be sure all the Points are present.

Command area

It is on the left side of the screen, it consists of a series of icons each showing an easily interpretable command.

CHAPTER 3

PROGRAM DESCRIPTION

The program allows you to know, save and manipulate geometrical and technological data concerning a Profile.

All this is developed in two phases:

DIGITIZING and CAD

The first phase allows the creation of a new profile by entering the points by means of a peripheral unit (tablet or digitizer). The second phase includes all the modification operations of a pre-existing profile.

The word **Profile** means all the Routes drawn.

A **Route** consists of **Points** linked by segments or by circumference arcs. Its first point is an INITIAL point, the last one is a FINAL point.

Also an STANDALONE Point is considered a Route.

ACTIVATION

The program can be activated by an external menu or directly by DOS. In the first case the name of the file containing the profile is defined in the Menu, while in the second case the profile name (that is the associated file) is requested as the first input datum.

In case of a pre-existing profile, CAD operation is enabled otherwise DIGITIZING operation is enabled.

DIGITIZING OPERATION

The DIGITIZING phase consists of a series of compulsory and optional operations (and commands) to be activated on the basis of a logic criterion of priority.

In DIGITIZING phase, points are input and characterized by creating Routes and then the Profile.

The input of a Point is carried out by pressing the stylus on the tablet in correspondence with the selected position.

The Point to be input is associated to data which define quality, speed, functions by means of an initial assignment or the propagation of preceding assignments. To modify, the assignment must be carried out before inputting the Point.

Values can be assigned directly through keyboard, by selecting the key "X" to assign x value of the Point, the key "Y" for y values and the key "Z" for z values. The confirmation of these values is obtained by pressing END key from the keyboard or by pressing the confirmation key of the peripheral unit positioning the cursor inside the graphic area.

If you make a mistake, the correction can be carried out by repeating correctly the assignment.

The type of Point to be input can be selected from the video menu, or keyboard. The detailed description of types is shown in the following pages.

The assignment order of these data is not important.

CAD OPERATION

The word CAD (Computer Aided Design) means the operation of a profile modification which is carried out by the tablet or the mouse.

Initial representation scale

The recalled profile is first represented in a special scale, calculated by the program so the workpiece is completely represented on the screen.

Point and Route selection

To select a Point, you must bring the graphic cursor near the selected Point and press the stylus on the tablet or the left key of the mouse.

The program carries out a sequence search starting from Point n.0: the first Point selected and marked with the big white symbol "+" is assumed. Then, it is possible that if two points are very close, the first point in order of numbering will always be marked.

To avoid this, it is possible to use commands such as FOLLOWING POINT, PRECEDING POINT, enlarge through ZOOM command and repeat the selection, or use POINT SELECTION command.

If the program does not find any Point around the cursor position it emits an acoustic signal.

Data concerning the selected Point are displayed in the area dedicated to data on the Point, just near the graphic area.

Select a Point means select also the Route to which it belongs.

Segment selection

To select a segment, bring the graphic cursor onto the selected segment and press the stylus on the tablet or the left key of the mouse. The segment is highlighted after being identified.

If segments are very close one another, it is possible to enlarge through ZOOM command and select the better identified segment.

The program checks the type of the segment selected, if it does not correspond with the input type required, the program waits for a further selection.

CHAPTER 4**DATA ASSOCIATED TO THE POINT**

Geometrical and technological data are associated to each Point.

The following commands can be activated on a Point:

ERASE, DISTANCE, STRAIGHT DISTANCE, FUNCTION R, UPWARD INSERTION, DOWNWARD INSERTION, MODIFY, PRECEDING POINT, FOLLOWING POINT, POINT SELECTION, SHIFT ON CIRCLE, TRANSLATION, DRILLING SPEED, TANGENT SPEED.

Point quality

A Point can be:

- INITIAL:** Origin Point of the Route.
- FINAL:** Final Point of the Route. A Route is called CLOSE if the Final Point coincides with the Initial Point.
- ANGULAR:** Point which does NOT require the continuity of tangent to the Route. Generally, the Route has a corner on the Angular Point
- NORMAL:** Point which requires the continuity of tangent to the Route. Arcs of circle end and start on the normal Point.
- TANGENT:** Point which requires the Route to follow continuity of tangent between a line and an arc of circle. A tangent Point must be included between an Angular Point and a Normal Point.
- STANDANLONE:**Particular Point. It makes up a separate Route.
- SMOOTH:** Point inserted by the digitizing algorithm. It allows the Route to Keep the continuity of tangent on the adjacent points which require it.

The points are shown on the video by specific marker such as:

INITIAL	light blue square
FINAL	red square
ANGULAR	red cross
NORMAL	green cross
TANGENT	violet cross
STANDALONE	yellow cross, inserted inside a circle with different colour according to the value assigned to L Function
SMOOTH	light blue cross

The conjunction lines are drawn with a colour selected by the operator. The standard colour is light blue with grey background.

Point Position

The position of the Point is expressed by X, Y, Z values in the reference system (left-handed Cartesian system), the origin and the measurement unit are defined by the user. The values can be entered through a stylus or in case of a digitized drawing also through keyboard.

If the Point is joined to the next one by an arc, also the position of centre, radius and the rotation direction relative to the joined arc calculated by the program, are associated to the Point itself.

Parameters

In a Point of the Route the tangential speed of the working head starting from the Point itself and the drilling speed that is the Z axis speed can be defined.

The speed values propagate, that is are assigned to all the following points by the program until a new assignment occurs.

The measurement units to express speed values (decimal number) are not set by the program but are chosen by the user.

CHAPTER 5**DATA ASSOCIATED TO THE ROUTE**

The Route is a geometrical entity such as a sequence of points, starting from an Initial Point to a Final Point.

A particular Route consists of a single Isolated Point.

The points are linked, according to their type, by arcs and segments.

Parameters with constant values can be assigned to the points of the Route. These parameters can characterize the Route such as workability from the operating machine or in case of L Function parameter such as characterization for some CAD operations.

The following commands can be activated:

ERASE, CONTOURING, COPY, DISTORSION, FRACTURE, F FUNCTION, L FUNCTION, T FUNCTION, JUNCTION, INVERSION, MILL RADIUS, ROTATION, INITIAL-FINAL SYMMETRY, HORIZONTAL SYMMETRY, VERTICAL SYMMETRY, S FUNCTION, TRANSLATION.

Parameters

S Function, T Function, F Function, L Function are global functions of Route.

The speed values are assigned to all points of Route and the following Routes by the program until a new assignment occurs.

The measurement units to express the speed values are not set by the program, but are chosen by the user.

The functions associated to a Route are named T, F, L.,U

Functions T and L are expressed in integer values interpreted as "mask". In particular L Function identifies the Level on which the Route is found.

The Level can be considered an instrument to identify a set of Routes subset of the Profile.

To each Level can be assigned a colour selectable through the EDIT PROFILE command in order to identify it from the others.

It can be temporarily filed by means of the LEVELS STORAGE command, and then recalled by means of the RECALL LEVELS command. It is possible to omit the display by using the option present in the DISPLAY command.

The presence of Levels is important in case you want to operate with a reference drawing on which you insert modifications and updatings.

CHAPTER 6

DATA ASSOCIATED TO THE PROFILE

The Profile is a geometrical entity and consists of a set of Routes.

The following commands can be activated: FILE, ERASE, CONTOURING, COPY, DISTORSION, EDIT PROFILE, INSERTION, PROFILE RADIUS, MILL RADIUS, RESET, ROTATION, HORIZONTAL SYMMETRY, VERTICAL SYMMETRY, TRANSLATION, OUTPUT, DISPLAY, ZOOM, ZOOM OFF.

Procedure for a Profile creation

Below you can find the procedures for the correct creation of a Profile.

The drawing must be positioned so as to be completely included in the active area of the input device, without occupying the command area.

A REFERENCE axis must be precisely indicated on the drawing, it is indispensable for the definition of the Profile representation scale (REFERENCE AXIS command).

There are commands (DISPLAY) which change the scale and the references, so that the video and the input peripheral unit no longer correspond. This correspondence can be restored only by means of resetting the original values of the REFERENCE axis and then activating the ZOOM OFF command.

The REFERENCE AXIS and ZOOM OFF commands can be used for digitizing enlarged details.

The user is offered this possibility to minimize the imprecision of digitizing which can have unacceptable consequences on small movements. To use this performance the drawing of enlarged details must be located on the plotter.

To go from the base drawing to the detail you must follow the procedure below:

- definition of the REFERENCE axis in order to assign the orientation, the scale and the position of the enlarged drawing. Then, it is necessary to know the position of the first point of the new drawing and the length of the axis (real).
- digitizing the detail until the last point, according to the usual modalities.
- activation of the ZOOM OFF command to restore the original representation.

CHAPTER 7

DATA INSERTION PROCEDURE

Data can be inserted by a keyboard or by tablet and mouse setting the graphic cursor on the field to be selected and in the first case pressing the stylus until the point contact is closed, in the second case pressing the left key.

If you use a digitizer or a drawing machine, some data or commands can usually be inserted by a small alpha-numeric keyboard.

Insertion of numeric values

Some commands require a numeric value which can be entered selecting numbers from the menu keyboard and then pressing ENTER command or typing from the keyboard.

To correct a number, during the insertion of a value, use the command '<-' on the video menu or press BACKSPACE key from the keyboard.

To quit the command at any time, without saving the value, press ESCAPE key from the keyboard or the lateral key of the pen or the right key of the mouse.

Command suspending

The commands which require a series of data before executing them can be suspended by pressing the lateral key of the pen or the right key of the mouse or ESCAPE key from the keyboard.

If the command is already confirmed, it is not possible to suspend it.

Geometric entity positioning

There are six possible types of positioning:

- approximate positioning:

the new entity is positioned on the Point selected through the data input peripheral unit.

- Point positioning:

the new entity is positioned on the coordinates of the Point of the Profile closest to the Point indicated by the peripheral unit (Y) or on the Point of which the progressive number is indicated.

- absolute Cartesian positioning:

the absolute values are required on which the entity selected will be repositioned.

- relative Cartesian positioning:

the displacement value is required.

- absolute polar positioning:

the module, that is the distance of the point from the origin, the value of the angle formed by the segment joining the point with the origin and the X axis and the Z value are required.

- relative polar positioning:

the module, that is the distance of the new point from the current point, the angle between this vector and X axis, and the Z coordinate of the entity selected are required.

The selection is carried out in a window which shows the various options in the same order as written. To select the most correct positioning modality, position the luminous bar with the cursor keys or position the graphic cursor close to it or press the confirmation key of the peripheral unit or ENTER key from the keyboard.

In case of approximate positioning, the program waits until an Angular Point is picked.

In case of a Point positioning, the progressive value which identifies the Point is required through a following selection or selecting the approximate Point; the program waits for the selection of the Point through the peripheral unit. Then the Point closest to the picked point will be searched for and marked with the symbol '+'.

By activating the remaining positionings, a new window for inserting the values which are referred to the Point marked with the symbol '+' will be opened.

The confirmation of entered values is carried out by pressing FINE or END key from the keyboard or positioning the graphic cursor on the menu symbol and pressing the left key of the mouse or the pen until the point contact is closed.

Pressing ESCAPE key from the keyboard, or the right key of the mouse or the lateral push-button of the plotter, the main window is shown again only in case of relative and absolute positioning.

Command confirmation

There are main commands which must be confirmed. A window with two possible selections is shown on the video.

To confirm the command you must type the letter "Y" or alternatively, you must position the cursor close to the word "YES" and press the confirmation key of the input peripheral unit.

To cancel the command you must type the letter "N" or alternatively, you must position the cursor close to the word "NO" and press the confirmation key of the input peripheral unit.

Option activation in the Window

Commands such as DISPLAY, EDIT PROFILE propose a window of activable options.

To select them you must highlight the field by moving with the cursor keys or with the graphic cursor.

The activation requires the insertion of a numeric value for some options, for other ones the selection of the letter "Y". In this case by pressing ENTER key or the confirmation key of the input peripheral unit you can change the value of the field from "N" to "Y" or vice versa.

To confirm the modifications, press END or FINE key from the keyboard, or position the graphic cursor around the menu icon and press the confirmation key of the peripheral unit.

CHAPTER 8

Operating commands

Commands description, using modes and relative options



ALTERNATE

Description

Command accessible in DIGITAZING mode

Used to modify default point inserction sequence, to force Angular-Normal-Angular-Normal point sequence

Functionality:

It is enabled/disabled by selection of the same icon.

Warning

This points introduction mode is indicated overall when digitized Route has slow change in bending radius.

Using this mode it is not started tangence continuity on points.

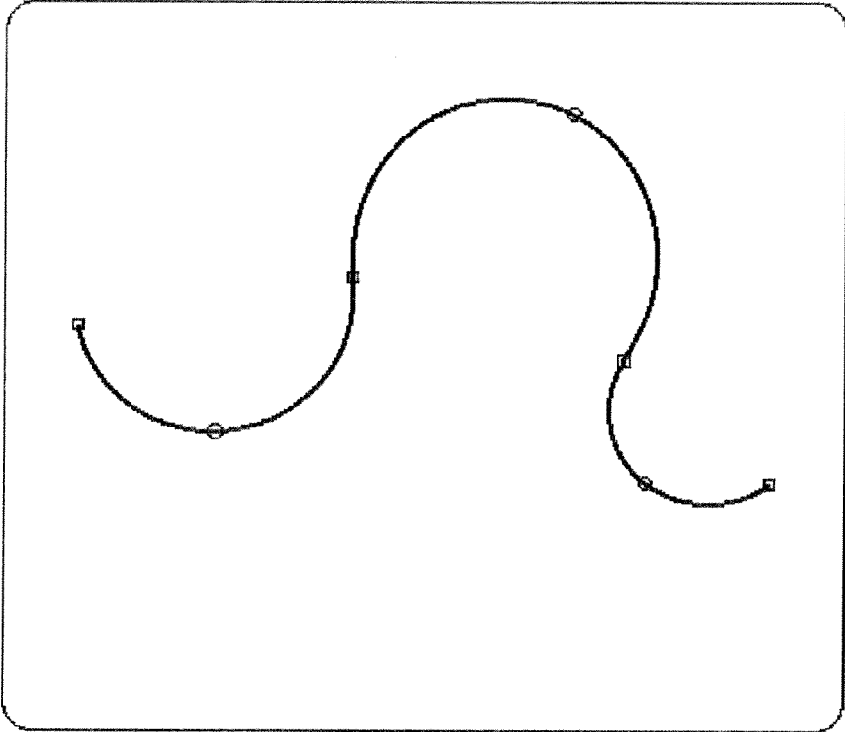
See also

NORMAL

ANGULAR



Examples





ANGULAR POINT

Description

Command accessible in DIGITIZING and in CAD mode, working on Point.

Insert an Angular Point.

Functionality:

In CAD mode it is possible to force Angular typology on current point acting on corresponding icon.

If this command cause incorrect points sequence, the error message: "Sequence Points not allowed" will be displayed.

Warning

Angular point doesn't force tangence continuity to Route.

In DIGITIZING mode this point type may be selected also pressing "A" key on the keyboard.

The following point will be Angular, by default.

If the ALTERNATE command is enabled, the following point is Normal.

See also

INITIAL NORMAL TANGENT FINAL STAND ALONE
ALTERNATE

Appendix A contains a description of allowed sequences of points.



Examples



BREAK

Description

Command allowed in CAD, working on the Route.

It breaks the Route in the position defined by the selected Angular point.

Functionality:

The current point must be compulsory Angular otherwise the message:

"Command not enabled Press ENTER to Continue"

will be displayed.

When command is activated Route is doubled and crossing an Angular point: it originates a Final point for upper route, Initial for the other.

Warning

See also

JUNCTION



Examples



CAD

Description

This operation mode allows to modify all geometric elements introduced by DIGITIZING mode

Functionality:

The access to this command is activated only if last inserted point of profile is Final or Stand Alone (i.e. the Profile is completed by all the values).

If only Stand Alone points are present, their number must be equal or more than two.

Warning

The user can enter in CAD mode selecting CAD icon and also pressing TAB on keyboard.

See also

DIGITIZING



Examples



CONTOURING

Description

Command accessible in CAD mode working on Profile or on Route

It generates a new Profile or Route parallel to the original, at a specified distance

Functionality:

The "sign" ("+", "-") of the distance and his value must be introduced

The contouring is made at the right, if "-" is pressed, at the left if "+" is pressed, moving from Initial to Final point of the Profile

If some errors occurs during contouring execution, the message : "ERROR p.n (x,y)", will be displayed ; p.n. is the identification number of the point and x,y the relative coordinates.

Warning

Arcs centers of parallel Route are the same as original one.

See also

ROUTER RADIUS



Examples



COPY

Description

Command accessible in CAD mode working on Profile or on Route

It may be used to generate a new copy of the Profile or the Route placed in a user stated position.

Functionality:

This command actives positioning window.

The reference point for the copy is the point marked by the cursor.

Warning

See also



Examples



DIGITIZING

Description

Command activable from CAD mode, through Profile Menu.

It allows to enter in DIGITIZING operation mode.

Functionality:

Warning

It is possible enter in Digitizing operation mode pressing TAB key, only working into Profile Menu

See also

CAD



Examples



DISPLAY

Description

Accessible in CAD, by operating on Profile.

It activates a series of display options.

Functionality:

Command activation gives access to display window. All options proposed are described hereafter.

Warning

Option Scale Modify, when coming from Digitizing mode, causes lost of references with the display scale defined by means of REFERENCE AXIS.

See Also

REFERENCE AXIS, L FUNCTION, R FUNCTION



DISPLAY

Options

Scale Modify:

recalculates display scale, in order to show entire Profile. In case of activation, a confirm is requested when Profile or a part of it has just been digitized, because this operation causes lost of correspondence between tablet and video screen.

Display Points:

Profile is displayed without indication of points.

Works Display:

Mill Route is displayed This field can be activated only if a value different from 0.0. is assigned to R Function .

Y Axis Symmetry:

allows display, together with basic Profile, of its symmetric with respect to Y axis.

Direction Display:

displays direction of rotation of every line of Profile.

LEVEL:

displays only Routes characterized by the specified levels. Possible level values are between 1 and 8.



Examples





DISTANCE

Description

Command available in CAD, if working on the Point menu.

With this command it is possible to compute the distance of a segment of a Route between two points of the same route.

Functionality:

When this command is selected, a straight line is drawn, changing its length according to cursor movement. The line starts from a first selected point - marked by a cross '+'.
.

The second point selection may be done with the following modalities:

- progressive number of the point selection

- straight line positioning in the selected point proximity and pressing the confirm key of the input device

The selected points must be placed on the same Route, otherwise the second point will not be accepted.

The effective distance between these points is displayed on the lower left corner of the screen.

Warning



See also

STRAIGHT DISTANCE

Examples



DOWNWORD INSERTION

Description

Command available in CAD, working on the Point.

Used to insert a point after a selected point.

Functionality:

Before any operation it is compulsory to select the point before which the new Point must be inserted.

This command enables a Point Menu to select a new point typology.

The new point will be placed through the options displayed in the window.

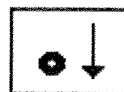
These types of errors may occur:

- insertion of a point after a Final point, with the following error message:

"Command not enabled Press Enter to Continue"

- insert of a point causing incorrect point sequence, with the error message:

"Sequence Not Allowed Preee Enter to Continue"



Warning

See also

UPWORD INSERTION



DOWNWARD INSERTION Options

Options

Line medium point :

inserts a point in the middle of a line.

Offset Point on Line:

inserts a point with stated distance, starting from the first point of selected line.

The number displayed in the field of distance insertion indicates line length.

X Quote point on line:

inserts a point defined by intersection between the straight line with Y constant and the selected segment.

Y Quote point on line:

inserts a point defined by intersection between the straight line with Y constant and the selected segment.

Point in Quote:

inserts a point within a graphic area.

Point of First Intersection:

inserts a point at the quotes of first intersection encountered between two selected segments.

Point of Second Intersection:

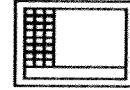
inserts a point at quotes stated by second intersection encountered between two selected segments.

Point at arc center:

inserts a point at center quotes of a selected arc.



Examples



EDIT PROFILE

Description

Available in DIGITAIZING and in CAD mode, working on the profile.

It allows to assign some parameters of general interest to profile.

Functionality:

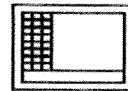
When this icon is selected an optional menu is displayed.

After confirmation of selected values, activated options are displayed in sequence.

Warning

See also

Examples



EDIT PROFILE

Options

Speedy:

activates a speedy positioning procedure. User is not requested to assign any kind of positioning. Program waits for a second point selection according to a roughly positioning..

Inferior Radius :

if radius value is different from 0.0 a control procedure on radius value of every inseted arc is activated. If this value exceeds the limit, the message "Inferior Radius in n point", is displayed, n is point progressive.

Iterations Number:

in countouring and/or mill radius computing, an authomatic procedure of critical points shift is inserted to allow Route working. Shift value is the same as iterations number multiplied by a Delta factor, equal to 0.004 per cent of the value of selected mill radius

Colours:

Bottom colour of screen (bottom), area (area), and levels (Profile) can be changed. At the same time color list is displayed, with overprinted the number correspondent to colour..

Remark:

allows the insertion of a comment string to Profile.



EXIT

Description

Command accessible in both CAD and Digitizing mode.

It terminates the program.

Functionality:

Once the icon is selected, a confirm window is displayed and afterwards a window for assigned configuration saving. The list of all parameters saved in configuration file is in Appendix D.

Program exit is also possible pressing the ESCAPE key on the keyboard when waiting for a command, or the corresponding key of the peripheral in use.

Warning

In case Profile has not been saved, EXIT causes lost of all data introduced during the work session.

See Also



Examples



F FUNCTION

Description

Command accessible in DIGITIZING and CAD mode working on Route.

It allows to assign a numerical parameter to the Route , defining for every point an integer value, with a customizable significance.

Functionality:

In DIGITIZING mode F Function value must be assigned before point introduction. This value is propagated to all previous and following points, until a new inserted value.

In CAD the programmed value is assigned to all points of the selected route.

If Stand Alone points are present, the new value is spread to all points of this type having the same F value as the selected point, until to first Initial point or Stand Alone point with a different F Function value.

Warning

F value range is 0 to 255.

See also

T FUNCTION, L FUNCTION, S FUNCTION U FUNCTION



Examples



FINAL POINT

Description

Accessible in DIGITIZING mode.

This command introduces a Final point.

Functionality:

If point type is inconsistent with Route geometry, the error message: "Sequence of Points not Allowed¹" will be displayed.

Warning

It is Final point of a Route.

This point may be selected also pressing "F" key trough keyboard.

It may be assigned only if a Route Initial point is present.

The following point is qualified as Initial Point. It's also possible to introduce Stand Alone Points after a Final Point.

A closed Route may be defined by selecting the icon corresponding to Final Point and, immediately after, the icon corresponding to Initial Point.

This way the coordinates of Final Point and of Initial Point will be the same.

Before completing Route, operator is asked if a tangency condition is requested between the two points. Press ENTER in case of positive answer.

¹Appendix A contains a description of allowed sequences of points.



See Also

STAND ALONE INITIAL NORMAL ANGULAR TANGENT

Examples



FOLLOWING POINT

Description

Accessible in CAD, operating on Point.

It selects point following the current one.

Functionality:

This command displaces symbol '+' on the following point and updates all data.

It is activated by operating on Point

Warning

Same effect may be obtained pressing right arrow key.

Press END key for direct selection of the last point in Route, after activation of Route menu, or of the last point in Profile, while working in the Profile menu.

See Also

PRECEDING POINT



Examples

**FREEZE****Description**

Command accessible in CAD mode working at Profile or Route level.

It modify the Profile or Route erasing all Tangent and Smooth points.

Functionality:

It is sufficient to select the Route and to active the command.

Warning

Route geometric characteristics do not change.

See also

GEOMETRIC COMPOSITION



Examples



GEOMETRIC ARC

Description

Command accessible in DIGITIZING and in CAD.

This command is used to generate an arc based on geometric conditions defined in the different possible options.

Functionality

This command activates a Pup-up menu with the options hereafter described.

In function of the selected options, user must insert points and segments according to operation modes described in the first chapters of the handbook.

Warning

In DIGITIZING operation mode this command may be selected only if last inserted point is Final, that is to say that the Profile is completed by all the geometrical data. Besides the last inserted point is considered the first arc point, at command executed, will become Angular.

See also

GEOMETRIC SEGMENT GEOMETRIC POLYGON
GEOMETRIC POINT GEOMETRIC CIRCLE
GEOMETRIC COMPOSITION



GEOMETRIC ARC

Options

In DIGITIZING and in CAD mode

Three Points:

inserts an arc connecting the three stated points [a)]

Two Points,Cen Asc, Sense:

inserts an arc defined by two points, arc center abscissa and sense of rotation. [b)]

Two Pts, Cen. Ord. and Sense:

inserts an arc defined by two points, center ordinate and sense of rotation [c)]

Two Pts, Radius and Sense <:

inserts the minimum length arc, defined by two points, radius and sense of rotation [d)]

Two Pts, Radius and Sense >:

inserts the maximum length circular arc, defined by two points, radius and sense of rotation [e)]

Two Pts, Tang, Sense:

inserts an arc connecting the two points, with stated sense of rotation. and tangent to the straight line crossing the first point [f)]

Point,Tang,Rad,Sense:

inserts an arc crossing the point, tangent to the line with stated radius and sense. The point must be out to the straight line.[g)]

**In CAD mode****Tang two str. Line with Radius**

inserts an arc tangent to two straight lines with stated radius [a)]

Arc initial point is on the first selected line; rotation sense derives by arc movement from the first str.line to the second one in direction of final point.

Tang str. Line and Arc with Rad:

inserts an arc tangent to a str.line and to an arc, with stated radius. [b)]

Arc initial point is on the first selected segment. Rotation sense is congruent to the two segments sense. In case that the first selected segment is a straight line, the arc is inserted on the right or on the left of str.line according to user answer.

Tang two Arcs with Radius:

inserts an arc with stated radius, tangent to two defined arcs. [c)]

Arc initial point is on the first selected segment. Sense of rotation is the same as first arc if Concordant option is chosen by the user..

Input - Output:

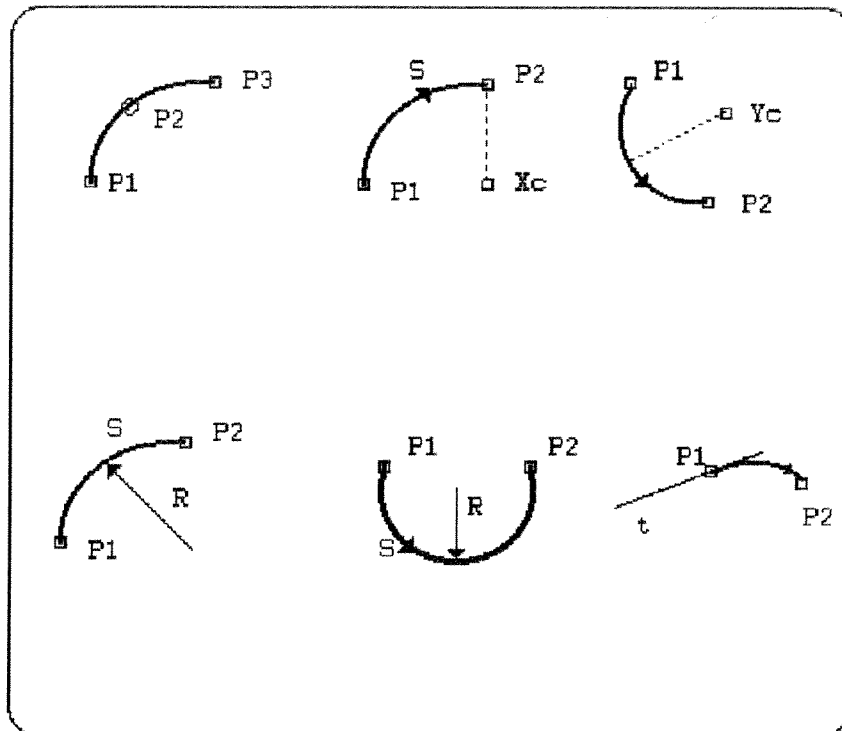
inserts an arc connecting the selected Initial or final point with a second point selected by the user. Arc has a continuity of tangence with the segment starting from an initial or final point. [d)]

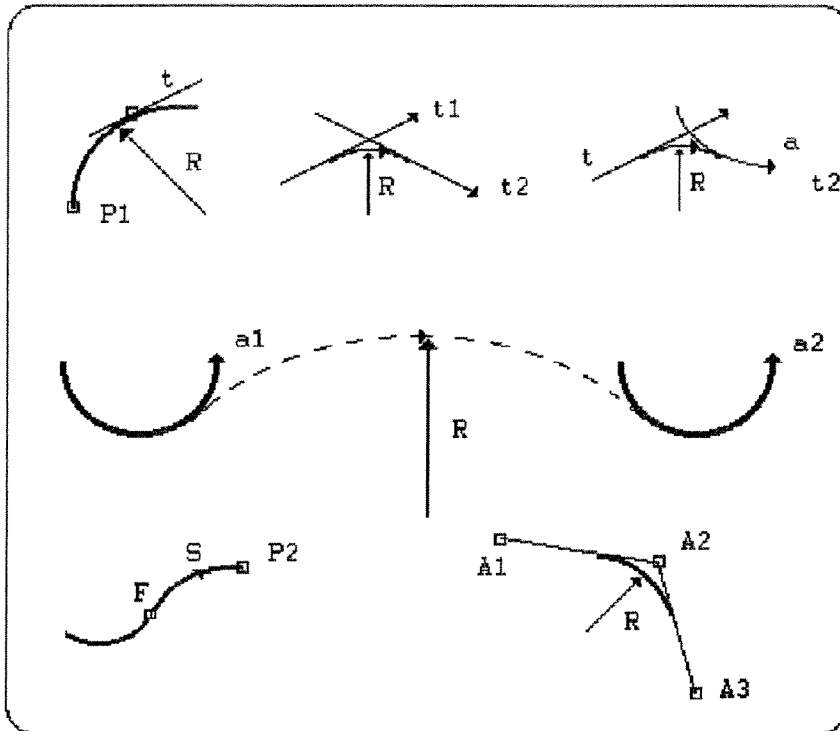
Connection Arc

inserts an connection arc , with stated radius, on selected Angular point.). [e)]



Examples









GEOMETRIC CIRCLE

Description

Command accessible in DIGITIZING and CAD MODE.

This command allows the inserction of a circle based on geometric conditions selected in Options.

Functionality:

When this command is selected, a Pop-up Menu with different available options (see later) is displayed.

According to selected option, different geometric elements (Points and lines) must be specificated to define the circle according to operation modes described above.

Warning

This command is available in DIGITIZING mode only if the last point is Final or Stand Alone, that is the profile is defined by all geometrical values..

See also

GEOMETRIC POINT GEOMETRIC POLIGON GEOMETRIC SEGMENT
GEOMETRIC ARC GEOMETRIC COMPOSITION



GEOMETRIC CIRCLE

Options

Three P.ts

inserts a circle with three stated points [a]]

Point,Center,Sense:

inserts a circle with stated point, Center coordinates and Sense of Rotation. [b]]

Center, Sense, Radius:

inserts a circle with stated Center coordinates,Radius value and Sense of Rotation. [c]]

Two Pts, Radius, Sense <:

inserts a circle crossing two points, with stated radius and Sense of rotation, choosing the minimum length. [d]]

Two Pts, Radius, Sense >:

the same, but choosing the maximum length. [e]]

Center, Tang Line , Sense:

inserts a circle tangent to a selected segment with stated Center and Sense of rotation [f]]

Tang Two Segm., Radius:

inserts a circle with stated radius and tangent to two selected segments.

Tang Three Segm.:

inserts a circle tangent to three selected segments.[g]]

Tang Two Arcs , Radius:

inserts a circle with stated radius and tangent to two selected arcs. [h]]

Ellipse:

inserts an ellipse with stated center, axis length and inferior arc radius.[i]]



Example





GEOMETRIC COMPOSITION

Description

Command accessible in CAD mode.

It allows to generate a new Route linking together any number of crossing outlines.

Functionality:

The new route is defined by the stated crossing lines.

This command begins selecting the first line and ends pressing ENTER or END key . Last stated intersection will be the final point of new Route.

Next level (colour) in comparison to first selected line, is set up automatically.

When selecting a not specific line it is important to take care of cursor position. The position is stored and utilized to compute new Route direction, because it will cross the point , projection of cursor value on selected line.

Warning

The selected Routes must be composed only by Initial, Normal, Angular, Final points.

See also

GEOMETRIC POINT, GEOMETRIC POLYGON

GEOMETRIC SEGMENT, GEOMETRIC CIRCLE

FREEZE



Examples



GEOMETRIC POINT

Description

Command accessible in DIGITIZING and in CAD mode.

It generate a Point with the Options stated conditions.

Functionality:

When this command is actived, a Pop-up menu is displayed with the different available options.

Based on selected option, Points and Outlines must be inserted with the modalities above explained.

Warning

In DIGITIZING mode this command may be directly selected only if the last inserted point is Final or Stand Alone, i.e. the corresponding profile is geometrically stated.

Points are inserted only on Routes placed on XY plane.

See also

GEOMETRIC SEGMENT, GEOMETRIC POLYGON,

GEOMETRIC CIRCLE, GEOMETRIC ARC, GEOMETRIC COMPOSITION



GEOMETRIC POINT

Options

- Segm. Medium Point:
inserts the medium Point of stated segment.[a)]
- Outline Offset Point:
inserts the Point on the selected outline at the stated distance from the Initial point : the distance is computed along the curvilinear coordinate. [b)]
- Outline X Quote Point:
inserts a new Point on the selected outline with the stated X quote. [c)]
- Outline Y Quote Point:
inserts a new Point on the selected outline with the stated Y quote. [d)]
- Pnt at Quote:
inserts a Point at stated X and Y quotes. [e)]
- First intersection P.nt:
inserts the first Point placed on the two stated outlines intersection.[f)]
- Second intersection point
inserts the second Point placed on the two stated outlines intersection
- Center of arc Point:
inserts a Point placing in the center of the stated arc.[g)]
- Matrix of Pts:
inserts a Stand Alone points matrix at stated X and Y distance, within a ficticiuos rectangle.[h)]
- Outline Fitting:
inserts a Stand Alone Points sequence, at stated interaxe, starting from the first point of the outline in the direction of the his last point.[i)]
- St.one Point Erase:
Erases all Stand Alone points, provided that the profile is not composed only by these points.
- St.one Point Save:
Erases all Routes of the Profile saving only Stand Alone Points: otherwise,if this typology of points are not present,the Profile will not be changed.



Examples





GEOMETRIC POLYGON

Description

Command accessible in DIGITIZING and CAD mode.

It allow to generate a Polygon based on Option specifications.

Functionality:

The command actives a Pop-up menu, displaying the different available Options.

Warning

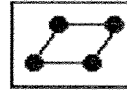
In DIGITIZING mode, this command may be directly selected if the last inserted point is Final type, that is the Profile is geometrically stated..

See also

GEOMETRIC POINT, GEOMETRIC SEGMENT

GEOMETRIC ARC, GEOMETRIC CIRCLE, GEOMETRIC COMPOSITION,

DEPTH CHANGE



GEOMETRIC POLYGON

Options

Rectangle:

inserts a Rectangle with stated vertices. [a)]

Parallelogram:

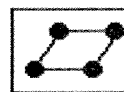
inserts a parallelogram with two opposite stated vertices and inclination angle of a side [b)]

Inscribed Polygon :

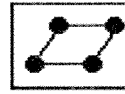
inserts a polygon with stated sides inscribed in a circle with stated center and radius. [c)]

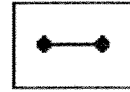
Circumscribed Polyigon:

inserts a polygon with stated sides circumscribed to a circle with stated center and radius. [d)]



Examples





GEOMETRIC SEGMENT

Description

Accessible in DIGITIZING and in CAD.

This command defines a segment with the geometric attributes specified by options.

Functionality:

Command gives access to a pop-up menu, proposing the options hereafter described.

According to the option chosen, Points and Lines shall be selected, following the functionality described above.

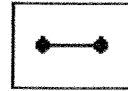
Warning

In DIGITIZING mode, this command may be directly selected if the last point introduced is a Final Point. The last digitized point is automatically considered as first point, and becomes Angular point after command execution.

See Also

GEOMETRIC POINT GEOMETRIC POLYGON GEOMETRIC ARC

GEOMETRIC CIRCLE GEOMETRIC COMPOSITION



GEOMETRIC SEGMENT

Options

In Digitizing and in CAD

Two Points:

introduces a segment between two selected points.[a)]

Point, Length, Ang.:

introduces a segment of specified length, passing through the specified point and having a specified slope with respect to X axis [b)]

Point, Length, Rel Ang:

introduces a segment of specified length, passing through the specified point and having a specified slope with respect to a specified segment. [c)]

Point, Tangent Curve:

introduces a segment, passing through the specified point and tangent to the specified arc. The straight line with concordant direction to curve is chosen, among the two possible ones.[d)]

Point, Final Absc, Angle:

introduces a segment, passing through the specified point and through a second point of given absciss, having a specified slope with respect to the plane.[e)]

Pto, Fin. Ord., Angle:

introduces a segment, passing through the specified point and through a second point of given ordinate, having a specified slope with respect to the plane.[f)]

In CAD

Tangent to two Arcs:

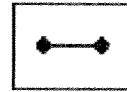
introduces a segment tangent to two specified arcs. The straight line with concordant direction to curve is chosen, among the four possible ones.[a)]

Bisector two straight lines:

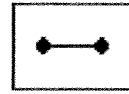
introduces a segment of specified length, bisector of two specified straight lines. The angle value is oriented from the first to the second straight line selected.[b)]

Bevel:

introduces a segment, at a specified distance from a selected Angular point, connecting the two segments that converge in the selected point.[c)]



Examples





INITIAL POINT

Description

Accessible in DIGITIZING.

This command introduces an Initial Point.

Functionality:

If this command cause incorrect points sequence, the error message: "Sequence of Points not Allowed" will be displayed

Warning

It is the Initial point of the Route.

This point type may be selected also pressing the key "I" trough keyboard.

It is assigned by default at the beginning

It may be assigned only if preceeding point is FINAL or STAND ALONE.

See Also

STAND ALONE FINAL NORMAL ANGULAR TANGENT

Appendix contains a description of allowes sequences of points.



Examples



INVERSION

Description

Command accessible in CAD, working on the Route.

It reverse the progressive inserction order of the Route Point, that is the movement sense of the Route

Route reversing is executed exchanging Initial end Final points.

Functionality:

This command may be actived only after a previous Route selection.

Warning

See also



Examples



JUNCTION

Description

Command accessible in CAD when working on a Route.

Used to link two different Routes: the first is translated to be joined to the second.

Functionality:

If this command is activated, the Route is displayed, and user is requested to select the Initial or Final point of second Route.

The first Route remains before the other if the point selected on the second Route is Initial or next to an Initial one, it follows if the selected point is Final or next to Final one.

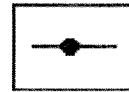
Warning

The junction point between the two Routes is always Angular.

All parameters of the second Route are modified to be equal to the first Route parameters.

See also

BREAK



Examples



L FUNCTION

Description

Command accessible in DIGITIZING and CAD mode working on the Route

It assigns a level number to the selected Route

Functionality:

Level is a Route particularity

In DIGITIZING mode Level value for a Route must be assigned after that Initial point of the Route was digitized

Otherwise the Level value is ascribed to all previous and following points until to next Initial Point.

In CAD mode the Level value is ascribed to the selected Route.

If Stand Alone points are present, the new value is spread to all points of this type having the same L number as the selected point, until the first Initial point or a Stand Alone point with a different L Function.

Warning

A different colour is assigned to each level, so that Routes with different levels are clearly stressed from a graphique point of view.

Routes with the same level may be temporarily stored, facilitating complexe profiles management.

Routes can have a maximum of eight different levels.

See also

VISULIZE, EDIT PROFILE, DISPLAYING



Examples



LEVEL

Description

Command accessible in CAD mode.

Moving Normal points of selected figure, it eliminates, where possible, tangence discontinuity on previous Angular points.

Functionality:

Normal points coordinates are modified when these sequences occur:

Point A	Point B	Point C
Angular	Normal	Final
	or	
Angular	Normal	Angular

B point is translated in direction of circonference point crossing C and A points and having the same tangent as arc or segment ending in A.

This procedure works in sequence from Initial to Final point with Profiles Routes.

Warning

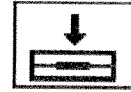
Translation value is function of two parameters which can be modified in configuration. The first is the angle (difference between input and output tangence on A point). Under this value the function is enabled to start. The second is maximum shift value.



See also

CIRCUMFERENCE DEPLACEMENT

Examples



LEVELS STORAGE

Description

Command accessible in CAD, working on the Profile

It activates a partial profile storage, saving only the routes with the same level value.

Functionality:

After selecting this icon, user is requested to introduce Routes level to be temporary stored.

The command will be aborted with error message if the selected profile is composed only by routes within the same level.

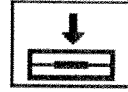
Warning

Routes with selected level are stored in a temporary file. If these Routes are no more recalled in the operative session, the corresponding informations will not be saved by STORE command.

See also

LEVELS RECALL, L FUNCTION

Examples





MILL RADIUS

Description

Accessible in CAD by operating on Route or on Profile.

This command generates the construction of a Profile (or Route) following the movement of a virtual mill working on the basic Profile (or Route).

Functionality:

The computer asks for mill position ("+", "-") with respect to Route and radius value.

Following Route from Initial Point towards Final Point, milling operation is executed on the right side if '-' is selected, on the left side in the opposite case.

In case of impossibility of correct operation for the algorithm of mill radius, operator is warned by message:

" ERROR p.n (x,y) ", where n indicates the point on which the error was generated, and x,y are the coordinates of this point.

Warning

MILL RADIUS command is active only when Route, or Profile, lay on XY plane.

See Also

CONTOURING



Examples



NORMAL POINT

Description

Accessible in DIGITIZING and in CAD by operating on Point.

Introduces a Normal Point.

Functionality:

In CAD it's possible to modify the quality of the current Point, directly selecting the command.

If point type is inconsistent with Route geometry, the error message: "Sequence of Points not Allowed¹" will be displayed

Warning

This point force continuity of tangence among the arcs beginning and ending from the same.

Assigned by default in Digitizing, after Initial Point. The type of point to be introduced may also be selected through keyboard pushing key 'N'.

In both functionalities it can be introduced after another Normal Point, an Angular, a Tangent and an Initial Point.

Following point is qualified as Normal, if command ALTERNATE is not enabled.

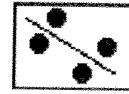
See Also

INITIAL FINAL STAND ALONE TANGENT ALTERNATE
ANGULAR

¹Appendix contains a description of allowed sequences of points.



Examples



NOT SPECIFIED AXIS SIMMETRY

Description

Accessible in CAD mode. operating on Profil and Route.

Stated a Route or a base Profile, it generates a Route or a Profile symmetric to the same with respect to a not specified axis.

Functionality:

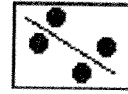
This command displays a video window which allows to select one of the following options: horizontal symmetry, vertical symmetry, and not specified axis symmetry.

In the first case operator is requested to assign a value to X axis; in the second case Y axis value is requested.

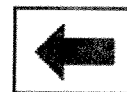
The last possibility requires the specification of two points belonging to symmetry axis.

Warning

See also



Esempi



OBJECT ERASE

Description

Available in DIGITIZING and CAD mode on Point and Route menu.

In DIGITIZING mode this command deletes the last introduced point.

In CAD it deletes the geometrical object selected.

Functionality:

Used in CAD mode, if this command is activated by Route menu it deletes selected route. If activated by Point menu it deletes the current point.

In this case the command is activated also pressing BACK SPACE key.

Warning

This command is not executed if the point deletion causes an incorrect point sequence; the message:

"Command not enabled . Press Enter to continue" is displayed.

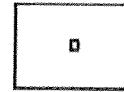
In CAD mode the point must be selected before this command is activated.

See also

RESET



Examples

**POINT****Description**

Command accessible in CAD mode, working on Profile and Route.

It activates Point operations.

Functionality:**Warning****See also**

ROUTE,PROFILE



Examples



PRECEDING POINT

Description

Accessible in CAD mode, operating on Point.

It selects point preceding the current one.

Functionality:

This command displaces symbol '+' on the preceding point and updates all data.

Warning

Same effect may be obtained pressing left arrow key.

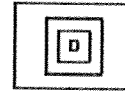
Press HOME key for direct selection of the first point in Route, after activation of Route menu, or of the first point in Profile, while working in the Profile menu.

See Also

FOLLOWING POINT



Examples



PROFILE

Description

Command accessible in CAD mode, working on Route and level.

It activates the following Profile operations.

Functionality:

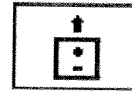
Warning

See also

POINT, ROUTE



Examples



PROFILE INSERTION

Description

Command accessible in CAD mode, working on Profile.

Used to insert a profile already stored.

Functionality:

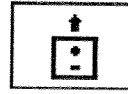
If this command is activated, a window is displayed with Profiles list stored in the directory of current Profile.

After selecting the Profile, user is requested to define F Function and its position within the new profile.

Profile origine. ($x=0.0$; $y=0.0$) is considered the reference point.

Warning

See also



Examples



RECALL LEVELS

Description

Accessible in CAD, in Profile operations.

This command offers the possibility to recall Routes that were present in levels saved in temporary memory buffers during the work session.

Functionality:

Command gives access to a window on the screen, displaying a list of all levels currently saved.

Levels may be selected by means of arrow keys.

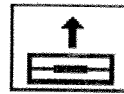
No window is displayed if no temporary files have been saved yet.

Warning

Routes recalled are automatically drawn in the same position they had before being saved.

See Also

SAVE LEVELS L FUNCTION



Examples



REFERENCE AXIS

Description

Command accessible in the DIGITIZING operation mode.

It defines the reference system of drawing and the representation scale.

Functionality:

The reference axis is defined introducing, in sequence, two points, the length of this segment and the coordinates of the first point.

The length is used to compute the representation scale of the drawing.

The first point defines the origine of the coordinates system, chosen by the user..

In this manner user reference system is stated exactly. If a quoted drawing is placed on the tablet, the detected quotes of all other points will be automatically related to the real quotes of the drawing, without any other operations..

Warning

If this command is skipped (using ESC key), the X axis and origin of the drawing get the default values of the input device.

In ZOOM operation mode , the REFERENCE AXIS command is disabled

See also



Examples



RESET

Description

Accessible in CAD and in DIGITIZING.

It deletes all digitized points.

Functionality:

After command selection, confirm window is displayed.

It resets all digitized points. If activated, internally to Quote Menu, it resets all the value in the Profile.

Warning

This command causes lost of all data not yet saved.

See Also



Examples



ROTATION

Description

Accessible in CAD by operating on Route and on Profile.

It rotates Route or entire Profile, around an axis that can be selected by operator.

Functionality:

After activation of this command, a window is displayed where rotation center coordinates and rotation value (in degrees) must be assigned. Rotation is clockwise in case of negative value, counter-clockwise in the opposite case.

Warning

See Also



Examples



ROUTE

Description

Command accessible in CAD, working on Profile or Point level.

It activates Route operations.

Functionality:

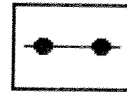
Warning

See also

POINT, PROFILE



Examples



ROUTE - PROFILE CONNECTION

Description

Available in CAD mode working on Route and Profile.

Within Route menu, this command connects two Routes, if they have the same 'U' Function, by inserting a sequence of lines with tangency continuity. The final Route is only one.

Original Routes position is not changed.

Profile menu connects a variable number of Routes, having the same 'U' Function.

Functionality:

In Route menu, first Route must be selected before activating the command, while Initial or Final point progression must be state for second Route, belonging to the same.

Profile menu is immediately activated.

In both case radius value is requested to compute intermediate lines sequence to Routes having the same 'U' Function.

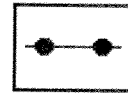
If there is any connection possibility, user is warned by error message.

Warning

Command is enabled when control on "Inversion" is assigned in Configuration file and 'U' Function inserction is enabled.

Second Route parameters are changed and the same of first one.

See also



Examples



SHIFT ON CIRCLE

Description

Accessible in CAD by operating on Point.

It shifts selected point (NORMAL or ANGULAR) on a circle which can be determined by geometric conditions imposed by nearest points.

Functionality:

This command is activated when definition of a circle is allowed by the geometric context..

Case: Angular NORMAL Tangent

Normal Point is selected and then displaced along the circle passing through the Angular Point and the Tangent Point, and tangent in the latter to the straight line passing through it.

Case: Angular NORMAL Angular.

Normal Point is selected and then displaced along the circle passing through the two Angular Points, and tangent in the first one to the straight line which is tangent to the preceding segment.

Case: Angular NORMAL Angular.

Angular Point is selected and then displaced, together with Normal Point, along a circle with stated radius which passes through the first Angular Point, and it is tangent in this point to the straight line which is tangent to the preceding segment.

Warning

This command is used when continuity of tangency is desired on Angular Points.

See Also



Examples



STAND ALONE POINT

Description

Accessible in DIGITIZING and in CAD mode when operating on Point.

It introduces a Stand Alone Point.

Functionality:

If point type is inconsistent with Route geometry, the error message: "Sequence of Points not Allowed¹" will be displayed.

Warning

Stand Alone point is treated as an autonomous Routet.

In Digitizing it can be assigned at the beginning, after a Final Point, or after another Stand Alone Point, the type of point to be introduced may also be selected through keyboard pressing 'O' key.

Following point is qualified as Stand Alone.

In Cad it may be introduced after a Final Point or a Stand Alone Point, before an Initial Point or a Stand Alone Point.

See Also

INITIAL FINAL NORMAL ANGULAR TANGENT

¹Appendix contains a description of allowed sequences of points.



Examples



STORAGE

Description

Command accessible in CAD and DIGITIZING mode.

Used to store all informations associated to the Profile into output file.

Functionality

It is possible to store an intere profile or a part according to the used levels.

User must specify storing levels and selected route level is proposed as default.

After confirmation, weather the proposed value is accepted or modified routes to be stored are visualized.

If no errors occurs, the message

"Storage completed.Press ENTER to continue" is displayed

Warning

This command is enabled only if the last inserted point has Final or Initial typology.

If some errors are detected, the storage is aborted with error message display.

In this case information are not stored.



See also

L FUNCTION.

Examples



STRAIGHT DISTANCE

Description

Command available in CAD mode working on the Point menu.

It is used to compute the straight distance between two points.

Functionality:

When this command is selected a line may be drawn, changing its length according to the movement of graphic cursor. This line starts from a point, marked by a + ', which is taken as the first.

To select the second point, from which to compute the distance, position the second extreme of the line in the proximity and press the key to confirm.

In addition to distance value, X- and Y- coordinates and the angle of str.line inclination congruent to two points are displayed.

Warning

See also

DISTANCE



Examples



TANGENT POINT

Description

Accessible in DIGITIZING and in CAD mode by operating on Point.

It introduces a Tangent Point.

Functionality:

In CAD it's possible to modify the quality of the current Point, directly selecting the command.

The type of point to be introduced may also be selected through keyboard pushing key 'T'.

If point type is inconsistent with Route geometry, the error message: "Sequence of Points not Allowed¹" will be displayed.

Warning

This point forces continuity of tangent between str.line and arc.

It may be assigned after another Tangent Point, a Normal Point or an Angular Point.

Following point is automatically qualified as Angular or Normal.

Another Tangent Point may follow a Tangent Point, or a Connection Point if an Angular point will follow.

¹Appendix contains a description of allowed sequences of points.



See Also

INITIAL FINAL STAND ALONE ANGULAR NORMAL

Examples



TRANSLATION

Description

Accessible in CAD by operating on Route, on Profile and on Point.

It shifts the geometric entity selected.

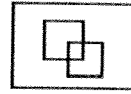
Functionality:

Command activation gives access to translation window.

Warning

Reference point for translation is the point identified by the position marker.

See Also



Examples



U FUNCTION

Description

Command accessible in DIGITIZING and in CAD mode, working on the Route.

It allows to assign a parameter to the Route, defining an integer number for each point, with a different significance according to application.

Functionality:

In DIGITIZING mode U Function value must be assigned before point introduction. This value is propagated to all points until a new value is inserted.

In CAD the programmed value is assigned to all points of the selected Route.

If Stand Alone points are present, the new value is spread to all points of this type having the same U Function as the selected point, until first Initial point or Stand Alone point with a different U Function.

Warning

U Function value is a string of different characters, such as 1234567890ABCDEF.

Digitizing string 11234 is the same as 1234.

If no value is assigned to U Function, 1 is default value.



See also

Examples



UPWORD INSERTION

Description

Command accessible in CAD mode, working on the Point.

Used to insert a point before the selected point.

Functionality:

Before any operation, it is compulsory to select the point as regards to which the new point must be inserted

This command activates the Point Menu to select the new point typology.

The new point will be placed though the options displayed in the window.

These types of errors may occurs:

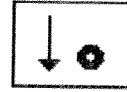
- point inserction before an Initial point, with the following error message:

"Command not enabled Press Enter to Continue"

- point inserction causing incorrect points sequence.

The error message is:

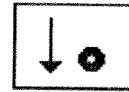
"Sequence Not Allowed Press Enter to Continue"



Warning

See also

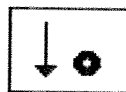
DOWNWORD INSERTION



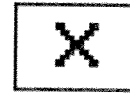
UPWORD INSERTION Options

Options

- Line medium point :
inserts a point in the middle of a line.
- Offset Point on Line:
inserts a point with stated distance, starting from the first point of selected line.
The number displayed in the field of distance insertion indicates line length.
- X Quote point on line:
inserts a point defined by intersection between the straight line with Y constant and the selected segment.
- Y Quote point on line:
inserts a point defined by intersection between the straight line with X constant and the selected segment.
- Point in Quote:
inserts a point within a graphic area.
- Point of First Intersection:
inserts a point at the quotes of first intersection encountered between two selected segments.
- Point of Second Intersection:
inserts a point at quotes stated by second intersection encountered between two selected segments.
- Point at arc center:
inserts a point at center quotes of a selected arc.



Examples



X COORDINATE

Description

Accessible in DIGITIZING.

It assigns X coordinate to next Point to introduce.

Functionality:

Once activated the command, X coordinate is asked by the computer, and an exact value can be introduced.

Warning

Command X COORDINATE may also be selected by pressing 'X' key on the keyboard.

In DIGITIZING, with stated values, point introduction may be effected pressing confirm key on the peripheral, internally to graphic area, or pressing END key on keyboard.

Coordinate assigned to X cannot exceed 10000.0 in absolute value.

See Also

Z COORDINATE, Y COORDINATE



Examples



Y COORDINATE

Description

Accessible in DIGITIZING.

It assigns Y coordinate to next Point to introduce.

Functionality:

Once activated the command, Y coordinate is asked by the computer, and an exact value can be introduced.

Point introduction may be effected by picking a point on the tablet, and the inserted values will be assigned to the point, or by pressing END on the keyboard.

Warning

Command Y COORDINATE may also be selected by pushing 'Y' key on the keyboard.

In digitizing, with stated values, point introduction may be effected pressing confirm key on peripheral, internally to graphic area, or pressing End key on keyboard.

Coordinate assigned to Y cannot exceed 10000.0 in absolute value.

See Also

Z COORDINATE, X COORDINATE



Examples



ZOOM

Description

Active in DIGITIZING and in CAD.

A part of Profile, selected by user, is displayed on the whole screen.

Functionality:

The computer asks for the corner points of the rectangle defining the Profile area to be enlarged..

If the rectangle corners are too near, an error condition is generated. In this case second ZOOM point is asked again.

Warning

ZOOM command may be activated many times in sequence.

It doesn't affect any CAD and DIGITIZING operation.

The only exception is constituted by command REFERENCE AXIS, that is deactivated.

See Also

ZOOM OFF



Examples



ZOOM OFF

Description

Accessible in DIGITIZING and in CAD.

It restores the representation existing before ZOOM command or series of commands.

Functionality:

After selection of icon, the figure is redrawn in its original size.

Warning

This command is very useful when a refresh of the display is desired after a series of delete and translation operations of superimposed geometric entities.

See Also

ZOOM



Examples

APPENDIX 1**Hardware configuration**

The Hardware configuration expects the existence of a central processing unit, an input peripheral and an output peripheral.

The definition of their features is contained in *configuration* file DIGI.SET, that may be modified by means of program DIGISET.

Elaborator

- Personal Computer class 286 or 386
- RAM Memory 1 MB
- Hard disk of at least 20 MB
- Minifloppy 3.5" with 1.44 MB capacity
- VGA Colour monitor, 14", 640x480 pixels, 16 colours. In alternative, colour monitor SUPERVGA, 16", 1024x768, 16 colours.
- Hardware key.

Input peripherals

The Hardware configuration of Input peripherals may be chosen between 4 types:

- mouse and keyboard
- graphic tablet and keyboard
- digital drafting device, mouse and keyboard
- digitizer, mouse and keyboard

Mouse

- Mouse MICROSOFT or compatible

Mouse sensitivity may be changed by means of configuration program DIGISET.EXE.

Values between 1 and 20 may be assigned. This value is proportional to mouse sensitivity.

Graphic tablet

- format UNI A4 or more, with data format BIT PAD EMULATION
- OCE' serie 645*

Switches must be set this way:

DSW1

1	OFF	disable command from PC
2	OFF	disable digitizing external to active area
3,4	ON,OFF	sampling mode: presence stream
5	OFF	coordinate mode: absolute
6,7,8	ON,OFF,ON	sampling rate: 70 points/second

DSW2

1	OFF	output format: binary
2	OFF	(non significant)
3,4,5	OFF,OFF,OFF	No increment mode
6,7,8	OFF,OFF,ON	RESOLUTION: 127 (5 lines/mm)

DSW3

1	ON	parity and framing error check
2	ON	parity ODD
3	OFF	1 stop bits
4	ON	enable CS control
5	OFF	cursor output code: B type
6,7,8	ON,ON,OFF	baud rate: 9600

DSW4

1	OFF	buzzer off
2	OFF	max sampling rate: 150 points/second
3	OFF	BIT PAD EMULATION
4	OFF	loopback test: normal operation

- format UNI A4 or more, with data format BIT PAD EMULATION
- SUMMAGRAPHICS serie 1201 and 1812

Baud Rate 9600, Data Bits 8, Stop Bits 1, Parity Odd

- GRAPHTEC serie KD4300 e KD4600

Switches must be set this way:

DSW1

1	OFF	output format binary
2	OFF	terminator CR
3	OFF	fixed
4	OFF	disable beeper
5,6	ON,OFF	stream mode
7,8	OFF,OFF	data transfer rate max

DSW2

1	OFF	resolution 0.1 mm
2	OFF	data length 8 bits
3,4	ON,OFF	parity odd
5	ON	1 stop bit
6,7,8	ON,ON,ON	baud rate: 9600

DSW3

1,2,3,5,6,7,8	OFF	
4	ON	MM Series

Tablet works in MM Series emulation.

Serial line must be connected to input port specified in Hardware configuration file.

Digital drafting device

- NEOLT MX DIGIT 2000 in formats 100x170 e 120x220.

Switches must be set this way:

1	OFF	disable CTS
2	OFF	italian language
3	OFF	trasmission type M
4	ON	1 stop bit
5	ON	parity (EVEN)
6	OFF	parity enabled
7	ON	7 bit characters
8,9,10	OFF,OFF,OFF	baud rate: 9600

Serial line must be connected to input port COM1/COM2 of Personal Computer, according to configuration set.

- MUTOH CX 3000

Switches must be set this way:

1	OFF	disable beeper
2	ON	cartesian axes x, y
3,4	OFF,ON	transmission type Point Mode
5,6,7	ON,ON,ON	baud rate: 9600
8	ON	disable CTS

Serial line must be connected to input port COM1/COM2 of Personal Computer, according to configuration set.

Digitizer

OCE' Serie G6301

Interface RS232

Format: "@,FL.ZN,FL.IX,SGNX,X6,X5,X4,X3,X2,SGNY,Y6,Y5,Y4,Y3,Y2,CR,LF"

Baud Rate 9600, Data Bits 7, Stop Bits 1, Parity Even

Protocol RTS / CTS, Continuous Transmission

Term. echo YES, FIFO Buffer NO

Serial line must be connected to input port COM1/COM2 of Personal Computer, according to configuration set.

Output Peripherals

Plotter

Plotter functionality produces data in HPGL format.

- HP7475A

Switches must be set this way:

S2=0S1=0	no parity
D	environment ENDLINE
MET	A4 A3 paper format
A4	A4 paper format
A3	A3 paper format
b4=1 b3=0 b2=1 b0=0	9600 baud rate

Serial line must be connected to input port COM1/COM2 of Personal Computer, according to configuration set.

Printer

- EPSON MX-80
- EPSON MX-100
- EPSON FX-80
- EPSON LX-80
- EPSON FX-100
- IBM Graphics Printer
- OKIDATA
- GEMINI

Parallel line must be connected to input port LPT1/LPT2 of Personal Computer, according to configuration set.

Peripherals Drivers.

DIGIVGA.DEV: driver for graphic board.

TABSUMM.COM: driver for graphic tablet Summagraphics.

TABOCE.COM: driver for graphic tablet Océ Graphics.

DIGOCE.COM: driver for digitizer Océ Graphics.

MOUSEMIC.COM: driver for Microsoft mouse.

TECNEOLT.COM: driver for model NEOLT drafting device.

TECMUTOH.COM: driver for model MUTOH drafting device.

DIGIEPSN.PRN: driver for printer.

Use of peripherals

Function keys of peripherals are described here after.

Mouse

Microsoft Mouse

- Right key: command delete.
- Left key: command confirm.

Graphic tablet

- Side key: command delete
- Stylus edge: command confirm

Digital drafting device

NEOLT MX DIGIT 2000

- key (TX): command delete
- key (.): command confirm
- key (1): defines point to be inserted as INITIAL
- key (2): command confirm
- key (3): deletes last point introduced
- key (4): command delete

- key (5): defines point to be introduced as FINAL
- key (6): defines point to be introduced as STAND ALONE
- key (7): defines point to be introduced as TANGENT
- key (8): defines point to be introduced as NORMAL
- key (9): defines point to be introduced as ANGULAR

Take care in positioning commands menu enclosed to documentation.

Menu origin must be the same as quotes origin sent by drafting device to computer.

For example, with NEOLT, position the menu bottom right (at the end of bars movement), than turn the drafting device on and push key CL.

MUTOH CX 3000

- key (FE): command delete
- key (FW): command confirm
- key (PS): reference axis origin
- key (FS): defines point to be introduced as INITIAL
- key (1): defines point to be introduced as INITIAL
- key (2): -----
- key (3): delete last point introduced
- key (4): command delete
- key (5): defines point to be introduced as FINAL
- key (6): defines point to be introduced as STAND ALONE
- key (7): defines point to be introduced as TANGENT
- key (8): defines point to be introduced as NORMAL
- key (9): defines point to be introduced as ANGULAR

Digitizer

OCE' Serie G6301

- Stylus edge: confirm command
- mouse: first and second key confirm command
- mouse: third and fourth key delete command

APPENDIX 2

Configuration Files

Names and locations of Files requested for CAD MATISSE operation are listed here after.

Directories names are assigned:

\MATCNC90 system directory

\MATCNC90\LINGUE language files directory

In the system directory, executable files, files batch, configuration files, character and symbols files are present.

In the language files directory all language files are present, together with loading executable files.

Executable Files

DIGI.EXE	MATISSE
DIGICNF.EXE	defines customisation variables
DIGISET.EXE	defines configuration variables correlated to hardware environment
DIGICUST.EXE	defines all variables connected to data display and insertion modes
ICONDOC.EXE	defines index for Help on Line.
DIGILOT.EXE	controls use of plotter
MESSAGES.EXE	loads messages in extended memory

Files Batch

POINTING.BAT loads drivers for input peripherals

Characters and symbols files

FONT3 contains graphic characters adopted in screen menu

*.FNT contain characters used for messages and coordinates insertion

DRAWCNF.CNF defines colours in screen menu

DIGICONE.CNF contains icones for command menu

FRECCIAS.DRW contains the icone for screen menu

FRECCIAG.DRW contains the icone for screen menu

MENU.DRW contains the icone for screen menu

ESCLAMAT.DRW contains the icone for screen menu

Configuration files

DIGI.CNF	contains customization parameters.
DIGI.SET	contains configuration parameters connected to hardware environment
CUSTOM.CNF	contains parameters connected to data display and insertion modes

Files produced by MATISSE

*.DGT	profile drawn with MATISSE
*.PLT	instruction for plotter in HPGL language
CUSTOM.CNF	contains parameters connected to data display and insertion modes

APPENDIX 3**Allowed sequences of points****STAND ALONE**

STAND ALONE,STAND ALONE,
STAND ALONE
STAND ALONE,INITIAL,FINAL
STAND ALONE,INITIAL,TANGENT

STAND ALONE, STAND
ALONE,INITIAL
STAND ALONE,INITIAL,ANGULAR
STAND ALONE,INITIAL,NORMAL

INITIAL

INITIAL,FINAL,STAND ALONE
INITIAL,ANGULAR,FINAL
INITIAL,ANGULAR,TANGENT
INITIAL,TANGENT,NORMAL
INITIAL,NORMAL,ANGULAR
INITIAL,NORMAL,NORMAL

INITIAL,FINAL,INITIAL
INITIAL,ANGULAR,ANGULAR
INITIAL,ANGULAR,NORMAL
INITIAL,NORMAL,FINAL
INITIAL,NORMAL,TANGENT

FINAL

FINAL,STAND ALONE,STAND ALONE
FINAL,INITIAL,FINAL
FINAL,INITIAL,TANGENT

FINAL,STAND ALONE,INITIAL
FINAL,INITIAL,ANGULAR
FINAL,INITIAL,NORMAL

ANGULAR

ANGULAR, FINAL, STAND ALONE	ANGULAR, FINAL, INITIAL
ANGULAR, ANGULAR, FINAL	ANGULAR, ANGULAR, ANGULAR
ANGULAR, ANGULAR, TANGENT	ANGULAR, ANGULAR, NORMAL
ANGULAR, TANGENT, NORMAL	ANGULAR, NORMAL, FINAL
ANGULAR, NORMAL, ANGULAR	ANGULAR, NORMAL, TANGENT
ANGULAR, NORMAL, NORMAL	

TANGENT

TANGENT, FINAL, STAND ALONE	TANGENT, FINAL, INITIAL
TANGENT, ANGULAR, FINAL	TANGENT, ANGULAR, ANGULAR
TANGENT, ANGULAR, TANGENT	TANGENT, ANGULAR, NORMAL
TANGENT, TANGENT, NORMAL	TANGENT, NORMAL, FINAL
TANGENT, NORMAL, ANGULAR	TANGENT, NORMAL, TANGENT
TANGENT, NORMAL, NORMAL	

NORMAL

NORMAL, FINAL, STAND ALONE	NORMAL, FINAL, INITIAL
NORMAL, ANGULAR, FINAL	NORMAL, ANGULAR, ANGULAR
NORMAL, ANGULAR, TANGENT	NORMAL, ANGULAR, NORMAL
NORMAL, TANGENT, FINAL	NORMAL, TANGENT, ANGULAR
NORMAL, TANGENT, TANGENT	NORMAL, NORMAL, FINAL
NORMAL, NORMAL, ANGULAR	NORMAL, NORMAL, TANGENT
NORMAL, NORMAL, NORMAL	

APPENDIX 5

Colors

BLACK	0
BLUE	1
GREEN	2
AZURE	3
RED	4
MAGENTA	5
YELLOW	6
WHITW	7
GREY	8
BRIGHT_BLUE	9
BRIGHT_GREEN	10
BRIGHT_AZURE	11
BRIGHT_RED	12
BRIGHT_MAGENTA	13
BRIGHT_YELLOW	14
BRIGHT_WHITE	15

INTRODUCTION

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- Freeze
- Geometric Arc
- Geometric Circle
- Geometric Composition
- Geometric Point
- Geometric Polygon
- Geometric Segment
- Initial Point
- Inversion
- Junction
- L Function
- Level

Levels Storage
 Mill Radius
 Normal Point
 Not Specified Axis Simmetry
 Object Erase
 Point
 Preceding Point
 Profile
 Profile Insertion
 Recall Levels
 Reference Axis
 Reset
 Rotation
 Route
 Route-Profile Connection
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APPENDIX 3

Allowed sequence of points	
Stand Alone	1
Initial	1
Final	1
Angular	2
Tangent	2
Normal	2

APPENDIX 5

Colors	1
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