

# MM-PLOT

CAD COMPATIBLE DATA TRANSLATION SOFTWARE

by

MICROMAT®

## Welcome

Welcome to the **MICROMAT® MM-PLOT®** software system - the fastest, simplest and, more importantly, the most productive way to prepare, load and optimise CAD data for your PCB drilling machine. The last thing you need to have to worry about is how to decipher the data supplied to you by your customers.

**MM-PLOT** removes that worry - totally!

Drill data format problems have suddenly become things of the past!

## About MM-PLOT

**MM-PLOT** makes you more productive by giving you the ability to read all formats of CAD drill data automatically and by allowing you to graphically display and process them directly on screen over a representation of the bed of your drilling machine.

**MM-PLOT** is easy-to-use, powerful software, developed by Micromat especially for the PCB manufacturer to allow you to drill holes more cost effectively. It's simple command structure makes it a pleasure to use and the built in drill path optimiser really can reduce drilling time, in some instances by up to 50%.

CAD generated PCB drilling data can be read directly into **MM-PLOT** from MS-DOS disks. The input data can be in any of the normal industry standard formats, in EIA or ASCII code, in metric or imperial measure. The drill data will be shown on the computer screen as a pattern of dots, overlaid on a graphic representation of the table area of your drilling machine.

Drill patterns can be *moved, rotated, flipped, step-and-repeated, scaled, expanded, sorted* in tool number order, *optimised*, for shortest drill path, and *saved* back to disk for storage.

The drill file can be loaded into the drilling machine from the computer by using the RS232 serial link and Micromat's **MM-FILE** data transfer software.

**MM-PLOT** has been developed primarily for use with Micromat drilling machines but it is also able to translate drill data for use with other makes of drilling machine.

The ability to read CAD data from disk, and to prepare it for loading into the drilling machine, can easily save many hours of work spent manually programming the job from filmwork and can prevent the time consuming mistakes and positioning errors normally associated with manual programming.

If you have never used a computer system, **DON'T PANIC**. You will find that just a few minutes spent reading this manual will make the process of reading CAD generated drill data a simple and worthwhile accomplishment.

Some sample drill files have been included on your master disk and the following pages will show you how they can be viewed and processed by using **MM-PLOT**.

## **SYSTEM REQUIREMENTS**

**MM-PLOT** will run on any MS-DOS (IBM compatible) computer system with a colour graphics capability, and although it will operate with any combination of hard or floppy disk drives, the following configuration is strongly recommend.

Computer	minimum AT or '286' with 640K RAM.
Graphics	EGA or VGA colour monitor.
Floppy disks	5.25" AND 3.5", both HIGH density.
Hard disk	20 Mbytes minimum.

The computer system must have at least one parallel printer port (for the software security key) and one asynchronous serial communication port (for connection to the drilling machine via **MM-FILE**).

While a hard disk is not essential, it is far more convenient to have the **MM-PLOT** software installed on a hard disk than to have to load it from a floppy disk each time the system is switched on.

Both 5.25" and 3.5" HIGH density floppy disk drives will be required, since CAD data could be supplied to you on either high or low density disks. With HIGH density drives fitted to your computer you will have the ability to read both high and low density formats.

## **GETTING STARTED**

Before attempting to install your **MM-PLOT** software on your computer system you should make a working copy of your **MM-PLOT** disk.

To do this you will need a new 5.25" or 3.5" disk depending on your computer system's floppy drive type. The supplied master disk is low density so either low or high density disks are suitable.

- 1 Switch on and start your computer so that the system prompt is on the screen. This will normally be either C:> or A:>.
- 2 Use the DOS (Disk Operating System) command "DISKCOPY"  
to make a working copy of your **MM-PLOT** master disk as follows:-
  - a Type *diskcopy a: a:* and press the ENTER or RETURN key.
  - b Follow the screen prompts to place first the master **MM-PLOT** disk into drive A: (source disk) and then a new blank disk into the drive (target disk).

Place the original master disk somewhere safe. The new working copy will be used for the software installation process and as a source of sample drill files.

## **INSTALLING MM-PLOT ON YOUR COMPUTER SYSTEM**

### a/ **IF YOU HAVE A COMPUTER WITH A HARD DISK.**

1. Switch on and start your computer so that the system prompt C:> is on the screen.
2. Insert the **MM-PLOT** working copy system disk into drive A or B depending on your systems configuration.
3. Type *a:install a c* or *b:install b c* and then press the ENTER or RETURN key.

### b/ **IF YOU HAVE A COMPUTER WITH ONLY FLOPPY DRIVES.**

1. Switch on and boot your computer so that the system prompt A:> is on the screen.
2. Using a new disk, make a bootable DOS disk by using the DOS command " **FORMAT** " with the " /S " option.

The complete instructions for this procedure will be found in the manual which came with your PC.

3. Place the new bootable disk in drive A then place your **MM-PLOT** working copy disk in drive B and copy all the files onto the newly formatted disk by using the DOS command " **COPY b:\*. \* a:** "

(Even if you only have one floppy drive then the DOS command will still be " **COPY b:\*. \* a:** " and you should follow the screen prompts.)

This disk is now your **MM-PLOT** system disk and should be placed in drive A each time you switch on your computer system.

## **STARTING AND RUNNING MM-PLOT**

Connect the **MM-PLOT** security key to the **parallel printer port** of your PC. The printer port is a 25 way **SOCKET** on the rear of your computer. Any 25 way or 9 way **PLUGS** on the rear panel of your system are **SERIAL** ports and are used for RS232 communications. If in doubt then consult the hardware manual which came with your computer system.

If a printer is connected to the Security Key then it **MUST** be switched ON. If a printer is connected but switched OFF, the system will not operate.

## **MM-PLOT WILL NOT OPERATE WITHOUT THE SECURITY KEY**

### **STARTING MM-PLOT FROM A HARD DISK SYSTEM**

From the root directory DOS prompt ( C:\> ) type **MMP** and press ENTER.

Alternatively you may have a menu system which selects **MM-PLOT** for you.

For learning purposes, please ensure that your working master copy of **MM-PLOT** is in drive A and that it is **NOT** write protected.

This disk contains some sample drill data and this will be used as a teaching aid together with the rest of this manual.

### **STARTING MM-PLOT FROM A FLOPPY DISK SYSTEM**

Simply insert your prepared bootable disk with the copied **MM-PLOT** files into drive A and switch on your computer. Please ensure that the disk is **NOT** write protected.

As soon as the **MM-PLOT** program starts, the **MAIN MENU** will be displayed and the **DATA DRIVE** will be shown as drive A.

The opening MAIN MENU screen is shown below.

CAD DATA TO MICROMAT COMPATIBLE DRILL FILE	
1	To select input filename
S	To select data drive
Q	To quit MM-PLOT
DATA DRIVE: A:\*.*	MAIN MENU
MM-PLOT V3	Copyright (c) Micromat Limited 1990-92

You are given 3 options.

Pressing **Q** will end the program and return you to DOS.

Pressing **S** will allow you to change the setting of the DATA DRIVE either temporarily, while **MM-PLOT** is running, or permanently, so that, when you launch **MM-PLOT**, the DATA DRIVE will be set to your particular requirements.

**NOTE:**

The **DATA DRIVE** is the drive and path where **MM-PLOT** will store information. Data can be read from any location simply by typing the full drive and path name but it will only be stored at the location indicated by **DATA DRIVE** on the **MAIN MENU**.

Since drill data will normally be supplied to you on 5.25" floppy disks, drive A will probably be the normal drive for your customer's drill files.

If drill data is supplied to you on 3.5" floppy disks then you should change the DATA DRIVE to drive B, the 3.5" drive.

Follow this example to change the DATA DRIVE to drive B.

1. Press **S** and the DRIVE MENU will be displayed as below.

CAD DATA TO MICROMAT COMPATIBLE DRILL FILE	
Data drive is set to A:\*.*	
Enter new drive (or <ENTER> for no change)	
DATA DRIVE: A:\*.*	DRIVE MENU
MM-PLOT V3	Copyright (c) Micromat Limited 1990-92

2. Press **B**
3. Press the **ENTER** key.
4. Ignore the FORMAT MENU for now and press the Spacebar to return to the MAIN MENU.

The DATA DRIVE is now set to drive **B** and drill data will be read from, and written to this drive. However, the next time you start **MM-PLOT**, the DATA DRIVE will revert back to drive **A**.

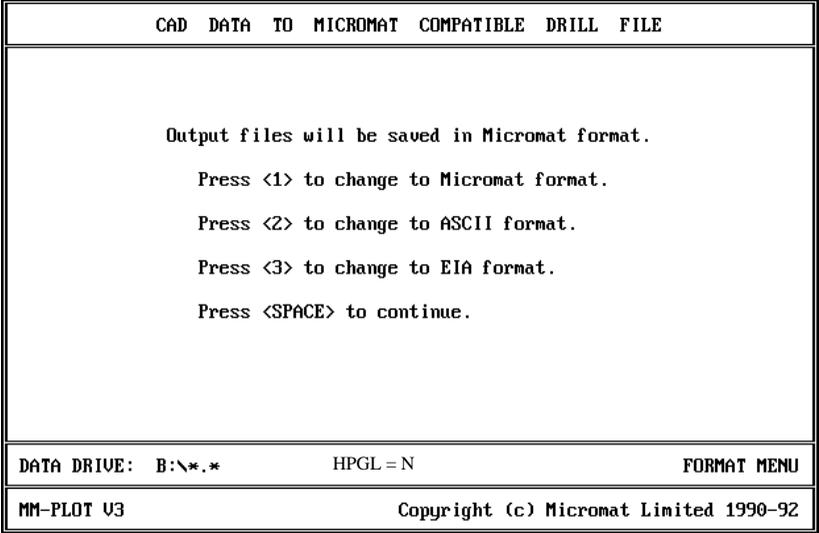
**Try it now:-**

Press **Q**, wait for the DOS prompt, then restart **MM-PLOT** by typing **MMP** and pressing **ENTER**

The DATA DRIVE will be set back to **A**.

**MAKING PERMANENT CHANGES TO THE DATA DRIVE**

1. Press **S** at the MAIN MENU screen to display the DRIVE MENU.
2. Press **B** (to set the DATA DRIVE to floppy disk B
3. Press the **ENTER** key and the FORMAT MENU will be displayed.



At this point, the format of the saved drill files can also be changed. If the output from **MM-PLOT** is to be fed via **MM-FILE** into a MICROMAT drilling machine, then the best format will be Micromat. Other drilling machines may require either Sieb & Meyer, ASCII or EIA formats and pressing either **1**, **2**, **3** or **4** will change the appropriate settings.

(ASCII files are also viewable on the PC screen with most simple text editors or word processors)

Pressing the Spacebar will exit from the **FORMAT MENU** and any altered settings will only be active until the next time **MM-PLOT** is launched.

In order to make any changes to the Data Drive and the Output Format permanent, hold down the **Alt** key, and at the same time press **S**.

Your changes will be saved and used the next time you launch **MM-PLOT**.

CAD DATA TO MICROMAT COMPATIBLE DRILL FILE	
Output files will be saved in Micromat format. Press <1> to change to Micromat format. Press <2> to change to ASCII format. Press <3> to change to EIA format. * * * Configuration saved * * * Press <SPACE> to continue.	
DATA DRIVE: B:\*.*	FORMAT MENU
MM-PLOT V3	Copyright (c) Micromat Limited 1990-92

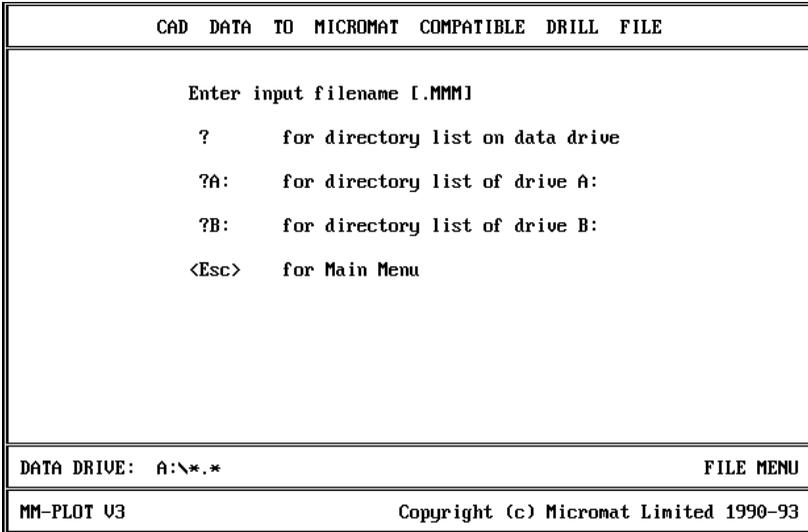
Press the **Spacebar** to return to the MAIN MENU screen.

Press **Q**, wait for the DOS prompt, then restart **MM-PLOT** and you will see that the DATA DRIVE will be set to **B**.

Now, please use the above procedure to set the **DATA DRIVE** permanently back to **A** and the **format** to suit your drilling machine.

## **SELECTING AN INPUT FILE**

Pressing 1 at the MAIN MENU, 'select input filename', will take you to the FILE MENU where you can list the files contained on a disk and select the required filename to load into MM-PLOT.



The FILE MENU is shown above and again there are several options.

By simply pressing the **ESC** or the **ENTER** key, you will be returned to the MAIN MENU to change the data path or to shut down the program.

You can select a file by typing its name, if you know it, or by typing a query (?) and pressing **ENTER** to will see a list of the files on the DATA DRIVE and select the required file by highlighting it with the ARROW keys.

Try it now. Type ? and press **ENTER**.

( By typing **?B:** and pressing **ENTER**, the list of files will be from drive **B** but remember that any processed files will be saved on the DATA DRIVE regardless of their origin.)

The files which end with **.MMM** are sample drill files for this exercise.

Files supplied to you by your customers will have many different filenames but some common extensions (endings) are *filename.TXT* or *filename.DRL* or *filename.SPL* or some other three character extension.

The **.MMM** is a special extension used by **MM-PLOT** so that Micromat processed files can be recognised.

If you know the name of the file you wish to load, you can enter it's name instead of the ?

If the file has **.MMM** as it's extension you do not have to enter the **.MMM**

Work through the following pages to see how simple it is to load and manipulate a drill file to make it ready to use on your drilling machine.

Start at the FILE MENU with the working copy of your **MM-PLOT** master disk in whichever drive is appropriate and with the DATA DRIVE set to the corresponding letter ( A or B ).

The simplest way to select a file is to type the ? (query), press ENTER, and then to move the highlight bar with the arrow keys to select the required filename.

```
Directory of A:\*.*
```

```
AUTOEXEC.BAT  
BD.MMM  
BIGDEMO.MMM  
DEMO.MMM  
EXTRABED.DAT  
F-GERBER.MMM  
F.MMM  
INSTALL.BAT  
MICROMAT.ICO  
MMP.BAT  
MMPLLOT.EXE  
MSHERC.COM  
PRTSC.COM  
PRTSC.DOC  
START.BAT
```

<ARROW> keys to select input filename, <SPACE> to accept

Use the arrow keys to highlight the file **F.MMM** then press the **Spacebar**.

**MM-PLOT** will select the highlighted file and then display the BED MENU.

This menu is to allow the selection of the bed size of your drilling machine so that you may view the drill file with the positions of the holes shown in relation to the bed of your drilling machine.

**THE BED MENU**

CAD DATA TO MICROMAT COMPATIBLE DRILL FILE	
Input filename: A:\F.MMM	
<1>	MM 470 bed.
<2>	MM 600 bed.
<3>	MM 470 ATC bed.
<4>	MM 600 DH ATC bed.
↑	Select bed size.
DATA DRIVE: A:\*.*	BED MENU
MM-PLOT V3	Copyright (c) Micromat Limited 1990-92

The common Micromat bed sizes are available with selections **1** to **4**.

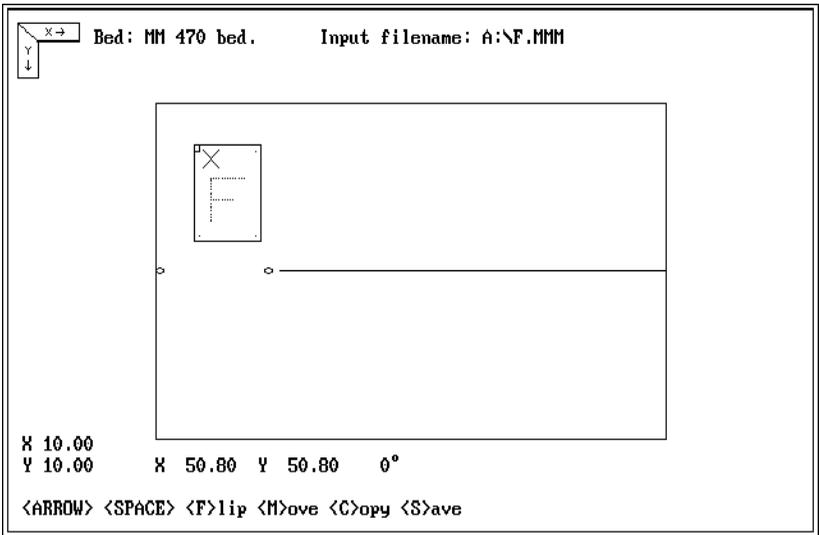
Press **1**, or the number corresponding to the bed size of your machine, and **MM-PLOT** will scan the file **F.MMM** in order to determine its format and to decide whether the units are inches or millimetres.

(If you need a different size machine bed or have your own custom tooling system, you may want to add more bed size options to this screen. To do this you will have to use an ASCII text editor to modify the file **EXTRABED.DAT** which is included on your **MM-PLOT** master disk. Instructions detailing this procedure are included within the file.)

The screen will display a representation of the bed of the selected drilling type of machine and **MM-PLOT** will proceed to read the drill file and plot the positions of the holes, after which a box will be drawn around the minimum and maximum positions. Note that this box is **NOT** an indication of the outline of the finished board since this information is not included in any drill file. It is merely an indication of the extremes of the drilling.

A cross indicates the position of the first hole of the drill file and its coordinates are shown directly under the bed outline.

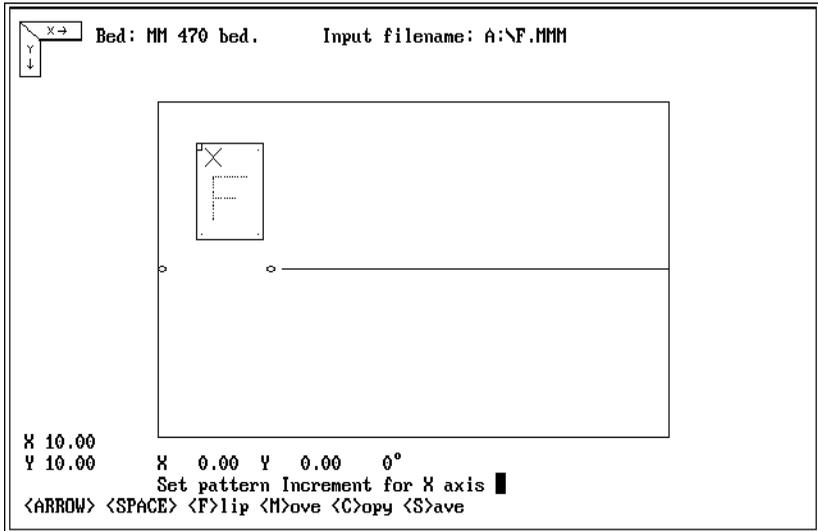
A small square is placed in the corner of the drilling outline for orientation purposes.



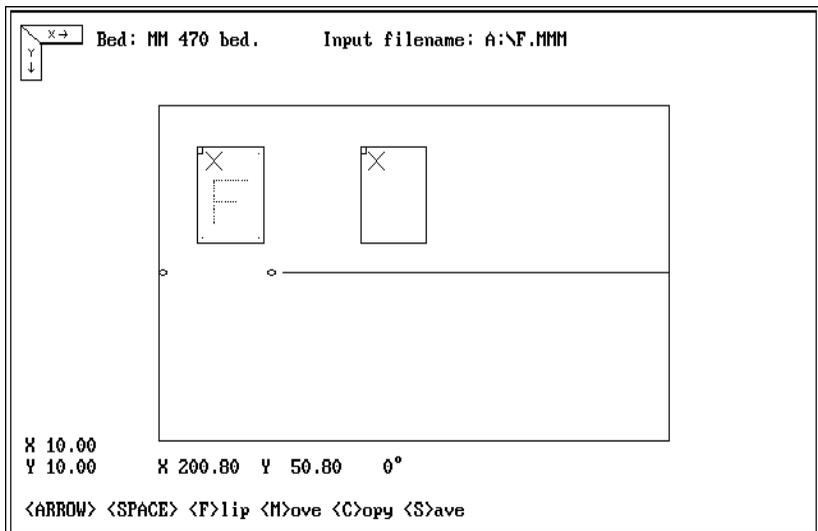
The bottom line of the screen shows the commands, and their associated keys, which are now available to move or copy (step and repeat) the pattern as required.

The arrow keys will move the outline of the pattern in steps of 10mm in both the X and Y axes. The distance which the outline will move for each press of the arrow keys is shown by the X and Y values above the word <ARROW>.

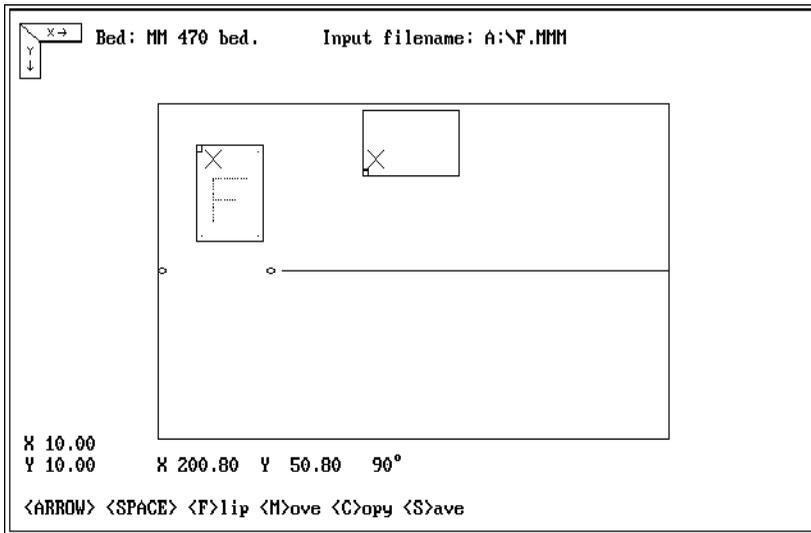
To change either the X or Y value simply press either the **X** or **Y** key, enter the desired movement distance in millimetres and then press **ENTER**. To change back to a value of 10mm, simply press the **X** or **Y** key followed by **ENTER**.



Use the **ARROW** keys to practise moving the outline around the drill bed. Notice that the position display shows the position of the first hole with reference to the zero XY position.

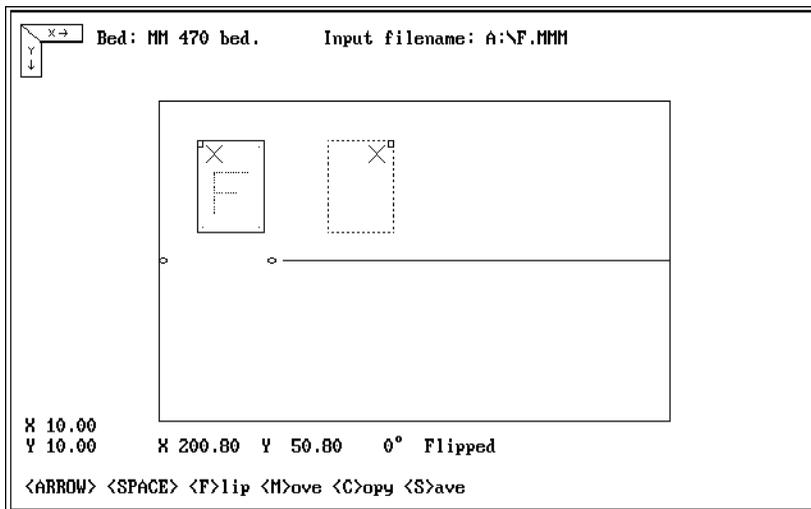


The Spacebar is used to **ROTATE** the pattern around the first hole position in steps of **90** degrees.



Use the Spacebar to rotate the outline.

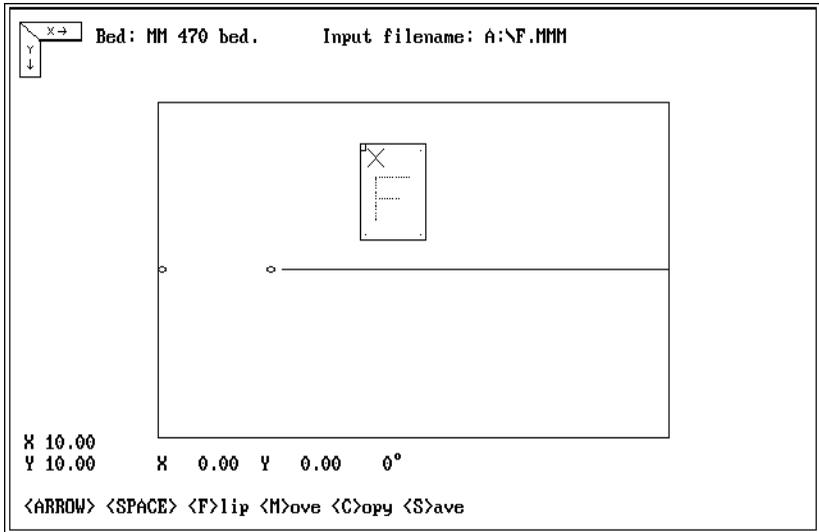
The **F** key will **FLIP** the pattern about the first hole position in the original patterns X axis, each time it is pressed. The outline will appear as a broken line to indicate that the pattern has been flipped



Use the **F** key to **FLIP** the outline.

When the outline is in the required position, press the **M** key to **MOVE** the original pattern and re-plot the holes in their new position within the newly positioned outline.

If the position needs to be moved again, the **arrow** keys, **Spacebar** and **F** key can be reused as many times as necessary to achieve the correct position.

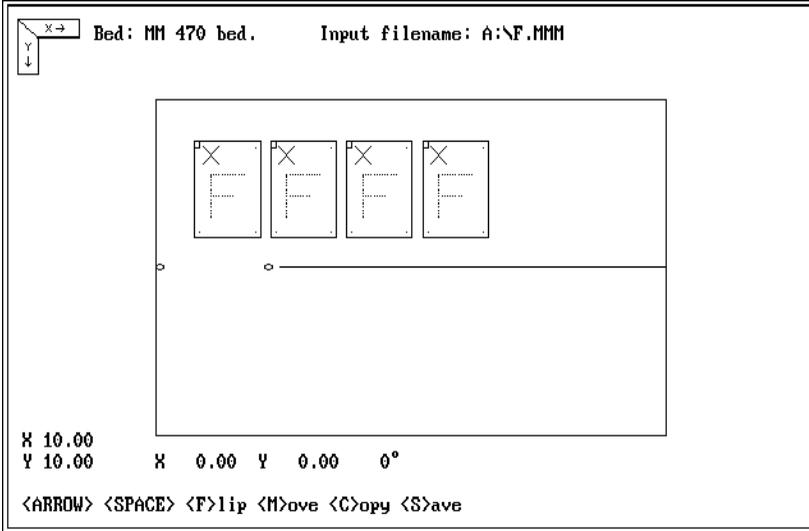


Note that the displayed X and Y coordinates of the first hole position change to **zero** each time the outline is fixed in position with the **M** key.

This is to allow accurate positioning of any step-and-repeated patterns.

To create step-and-repeated patterns, first use the **arrow** keys, the **Spacebar** and the **F** key to position the first drill pattern and fix it in place by pressing **M**. Then, again using the **arrow**, **Spacebar** and **F** keys, place the outline for each repeated pattern in its correct position with the required orientation and spacing and press the **C** key.

A **Copy** of the pattern will fill each new outline.

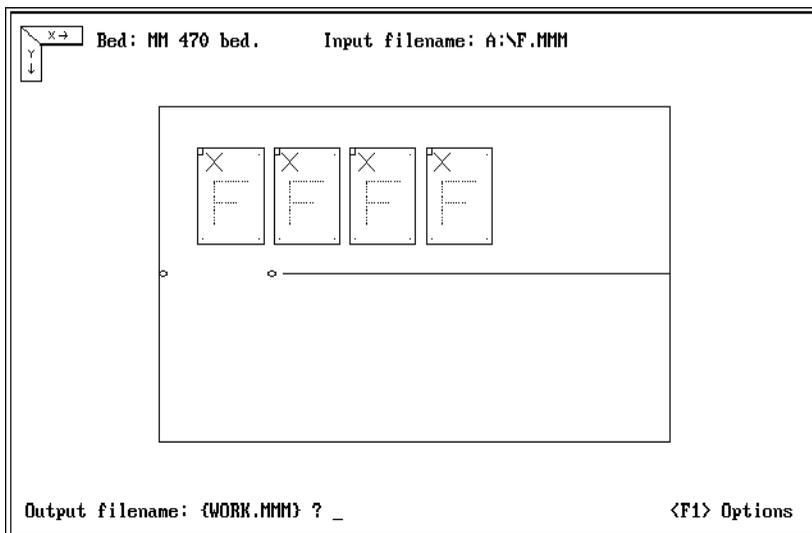


Use the **C** key to create **COPIES** of the original pattern.

Note that the displayed X and Y coordinates of the first hole of each pattern are set to zero each time a pattern is moved or copied. When the outline is moved by the **arrow**, **Spacebar** or **F** keys, the X and Y values show the relative position of the first point of each new outline. This allows the exact positioning of patterns with relation to each other.

When the move or copy is complete, the drill program, as shown on the screen, can be saved to the DATA DRIVE by pressing the **S** key.

Press the **S** key and the following screen will be displayed.



At this point you can enter your own *filename* to save the file on the DATA DRIVE or just press **ENTER** to accept the default name of **WORK.MMM**

Pressing the '**F1**' key before saving the file will access the **Expand, Sort and Optimise** options before saving the file.

If you always accept the default filename, then the file saved to the DATA DRIVE and the file to be loaded to the drilling machine will always be the same i.e. **WORK.MMM**

If you decide to give the file a different name, then it must comply with the normal DOS rules and can only contain up to eight alphanumeric characters followed, optionally, by a point and a three character extension. If no extension is entered, then **MM-PLOT** will append **.MMM** to the filename.

Please note that the drill file can be saved at any time and that it is not essential that all the available features of **MM-PLOT** are utilised. More often than not a simple move will be all that is required, followed by drill path optimization to speed the drilling process.

The newly saved drill program will be stored on the Data Drive as either a MICROMAT binary format file or an ASCII or EIA file in a five digit format, depending on the options selected at the FORMAT MENU. The dimensions are always in millimetres and stored as multiples of 0.01mm.

After saving the drill file, press the **Spacebar** and the next screen shows a breakdown of the extents of the drill file along with the quantities of holes of different tool sizes.

Output filename: A:\WORK.MMM		
Statistics	X	Y
First hole	50.80	50.80
Maximum	301.44	121.92
Minimum	40.64	43.18
Min to Max	260.80	78.74
Tool No 1	4	
Tool No 2	16	
Tool No 3	148	
Total holes	168	

<I>nput <O>utput <ESC>

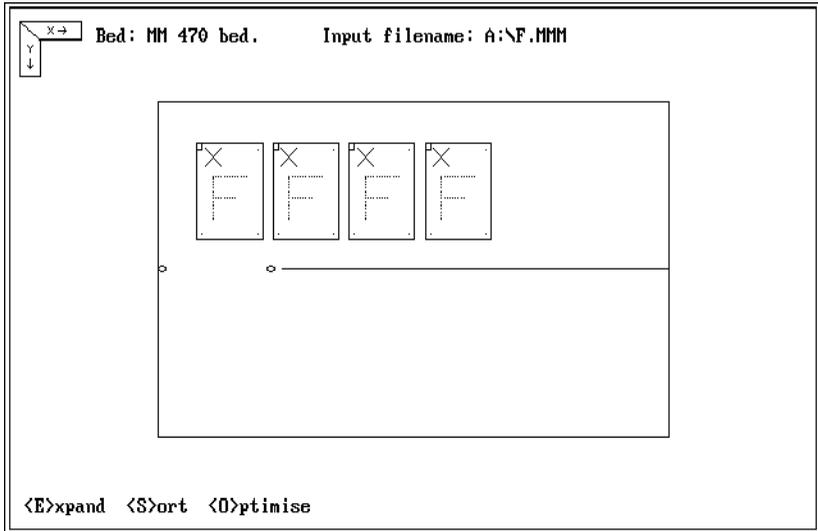
Pressing **I** will show the same data for the **Input** file for comparison purposes.

Input filename: A:\F.MMM		
Statistics	X	Y
First hole	50.80	50.80
Maximum	91.44	121.92
Minimum	40.64	43.18
Min to Max	50.80	78.74
Tool No 1	1	
Tool No 2	4	
Tool No 3	37	
Total holes	42	

<I>nput <O>utput <ESC>

Press **O** to re-view the **Output** file data or the **Escape** key to take you back through the menus to allow you to enter a new filename or to exit **MM-PLOT**.

If, instead of entering a filename, the 'F1' key is pressed, then **Expand**, **Sort** and **Optimise** options are available.

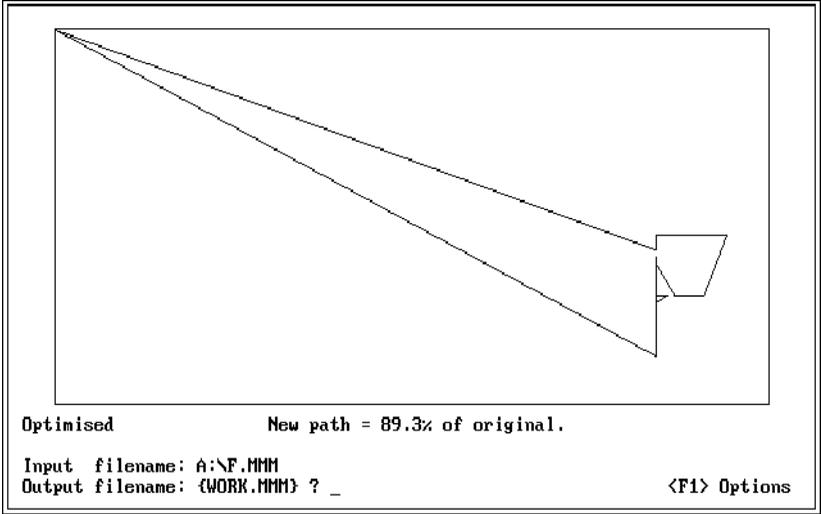


The **EXPAND** option (press **E**) operates in exactly the same way as the Micromat Expand function and will remove any Micromat Repeat and Bracket commands and convert the drill file into one which contains only Hole commands.

The **SORT** option (press **S**) will organise the file into Tool number order. i.e. Tool 1 followed by Tool 2 etc.

### **DRILL PATH OPTIMISER**

Selecting **O** for **OPTIMISE** will result in **MM-PLOT** reorganising the drill path to allow drilling in the shortest possible time. The new drill path length is displayed as a percentage of that of the original file.



**Optimise** should always be the **last** option chosen.

The screen will indicate the length of the optimised drill path as a percentage of the original.

The drill path length of the output from some CAD packages can be reduced by over 50%, resulting in a dramatic improvement in drill output.

If the final program has been step-and-repeated then it should be test drilled to ensure that each pattern is registered with the filmwork. Small position changes for each pattern can be easily effected on the drilling machine before the program is loaded back into **MM-PLOT** for Sorting and Optimization.

After any selected options have been completed you will be again be prompted to enter a name for the new drill file or you can accept the default of **WORK.MMM** by simply pressing the **ENTER** key.

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## USEFUL INFORMATION

### NO DRILL PATTERN DISPLAYED?

Sometimes, after **MM-PLOT** has finished reading a drill file, the display will remain blank and this can be due to the coordinates of the drill file being either negative values, or values so large that they do not fit on the screen. To make the pattern visible on the screen, simply press the 0 (zero) key and the smallest value coordinates will be placed at the zero point of the display (top left) with an outline showing the extents of the pattern. Press **M**, the complete pattern will be shown inside the outline, and it can then be manipulated as normal.

It may be that the data file being read is not valid drill data and this can only be determined by viewing the file with a text editor, or similar program, when experience will determine the data type.

If it is not drill data then **MM-PLOT** has no hope of displaying it as such.

### WRONG SIZE PATTERN?

If a drill pattern looks too small or too large, it may be because **MM-PLOT** has been unable to determine whether the dimensions are inches or millimetres. If it is obvious that the displayed pattern is not the correct size then simply press the + key to make it bigger, or the - key to make it smaller, using a scaling factor of 254. This method will solve most of the scaling problems you are likely to encounter.

If you would like to **SCALE** the pattern then just press the \* key and enter the scaling factor - enter a 2 to make both axes twice their normal size, enter 0.5 to make them half size. (or 0.995 to make them just a bit smaller)

To scale a pattern in **X** or **Y** axes, simply type an **X** or a **Y** before the scaling factor.

- e.g.    **X2** or **Y2** will make the **X** or the **Y** axis twice size,  
          **X0.5** or **Y0.5** will make the **X** or the **Y** axis half size,  
          **X1.1Y0.9** will make the **X** axis bigger and the **Y** axis smaller.

## **DIFFERENT DATA TYPES**

A number of data files have been included on the master disk and we ask that you load each of these files in order to learn and understand the operation of **MM-PLOT**.

If **MM-PLOT** is being used in conjunction with a Micromat drilling machine then the Micromat data format should be selected at the FORMAT MENU. This selection will allow **MM-PLOT** to automatically determine the format of any incoming data and convert the output file to Micromat code. If the incoming data has been generated by one of the many reputable PCB CAD systems there should be no problems with **MM-PLOT**. Data which has been edited by hand or regenerated from other systems or from paper tape will probably cause a lot of problems, so stick with CAD data on a disk!

Routing data as produced by software such as **ECAM**, using **M15** and **M16** commands will be converted to Micromat DOWN and UP routing commands.

**HPGL** plotter files from **AutoCad®** or **AutoSketch®** will also be converted to Micromat routing data, but first the **HPGL** switch on the FORMAT MENU must be set to **Y** by pressing the **H** key. Ideal for engraving lettering etc.

**GERBER®** photo-plot data will **NOT** be converted to accurate drill data as there is absolutely no guarantee that every hole position will be contained in the Gerber data file. Beware anyone who says it is possible - photo-plot data **cannot** be converted **automatically** to drill data! That is why there are Drill files and there are also Photo-plot files! They are **NOT** the same!

Every effort has been made to ensure trouble free operation of **MM-PLOT**. If you have any problems concerning it's operation or it's compatibility with a particular data format then please let us know so that we can either improve our product or give you a solution to your production problem. Please remember that whatever data you may load into your drilling machine, you should *always* drill a sample panel to satisfy yourself that it is exactly what it should be. There is no point in drilling hundreds of panels with the wrong drill pattern - is there?

**HAPPY DRILLING**