

Operator and Maintenance Manual

Surface Mount Device

Placement Machine

Model RV4s

Software version V3.5 Dated June 2000

(Graphics yet to be amended)

Prepared By:

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SECTION 1 - GENERAL INTRODUCTION

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1.1.1 GENERAL DESCRIPTION

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SECTION 1 - GENERAL INTRODUCTION

1.1 GENERAL DESCRIPTION & PRINCIPLE OF OPERATION

1.1.1 GENERAL DESCRIPTION

The RV4s is designed to place surface mount devices sized from 0402 to 20 thou QFP's onto a printed circuit board.

The pick and place equipment specified in this manual is used to apply SMD's in precise and repeatable positions

Since the system is manufactured on an individual basis for each customer, actual component specifications will vary, but in general the unit consists of a robotic arm free to move in four axes, X, Y, Z, and R, component feeders, A power and control module, a P.C., a console to house all the equipment and all interconnecting leads.

The robotic arm is located within a steel enclosure, incorporating an access door which is fully glazed. The door and two removable side panels, are fitted with electrical safety interlocks. The base of the enclosure forms a storage area for the power and control module and the P.C.

The RV4s offers speeds of up to 3,600 pph, with on-the-fly ccd correction and an enhanced multiple DSP based drive system. The RV4s can place all standard packages from 0402 to 20 mil QFP's. The system is supplied complete with software.

1.1.2 PRINCIPLE OF OPERATION

Each job is programmed using either the RVcad or RVgerber software. These two programmes allow the import of both board layout and bill of materials information and display a realistic view of P.C.B. and components.

Rvsetup is then used to allocate components to feeders and finally Rvplace is the programme used on a daily basis to control manufacture of products. Rvplace is a powerful program allowing any mix of programmed components to be placed.

Component Definition Files (CDF's) are supplied for most standard SMD packages allowing total control of the placement of each device. Facility is made for the user to introduce non-standard packages as required simply by introducing a new package name into the bill of materials.

Small components are placement corrected on-the-fly using a head mounted high resolution camera and frame grab system – leading to an extremely high level of repeatability and accuracy. A separate fixed camera station is used for multiple image correction of larger devices

Unlike simple mechanical centering systems the vision system is able to determine the precise dimensions of the device and therefore prevent placement of incorrectly picked components (such as a small component picked on the edge). As this is a non-contact centering method, fragile devices are not subject to the possibility of damage.

1.2 SAFETY REQUIREMENTS

All safety requirements are in accordance with the appropriate Safety and Health Act.

The following procedures must be understood so as to prevent injury to all Service/Maintenance personnel.

1.2.1 DOOR INTERLOCKS

All access doors to the console are interlocked with the machine by means of micro-switches, to prevent access while the arm is in motion. The interlocks are designed to allow the operator to open the cover and inspect the product safely. With the cover open the system runs at a slower speed and a software prompt is included to warn the operator prior to each movement of the arm.

Other moving parts (i.e. Feeders are not interlocked to allow maintenance personnel to manually operate and replenish these devices with the doors open or closed. Precautions should be used to lock out all controls whenever maintenance is performed with the covers open. If required it is possible, during manufacture, to change the lockout policy to allow operation in accordance with local regulations.

1.2.2 SOFTWARE WARNINGS

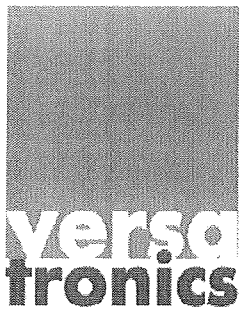
If the software detects that the doors are open, the operator is given the option to allow movement of the arm only after acknowledgment of the on-screen warning of impending movement of the equipment and the dangers associated with such movement.

NOTE: **UNDER NO CIRCUMSTANCES** should these interlocks be overridden!

1.3 COMPLIANCE WITH EEC REGULATIONS AND CE MARKING

1.3.1 Certification included as follows :

EEC Machinery Directive - Declaration of Conformity



Versatronics Ltd.
Freeland, Witney
Oxon
OX8 8HZ

Tel: 01993-883373

Fax: 01993-883108

E-Mail: Support@versatronics.demon.co.uk

EEC MACHINERY DIRECTIVE

DECLARATION OF CONFORMITY – RV4s Ser. No. :-

Issued : 06 Feb 00

Business Name : Versatronics Ltd.
Unit 6, Wroslyn Road Industrial Estate
Wroslyn Road
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Tel: 01993-883373
Fax: 01993-883108

Responsible Person : D. E. Clements - Managing Director

Description of Machinery :

Surface mount device pick and place machine incorporating computerised control.

Machine No:

In service : 06 Feb 00

Compliance with Directives :

EEC Machinery Directive 89/392/EEC
Amendments 91/368/EEC, 93/44/EEC, 93/68/EEC
CE Marking Directive 93/68/EEC

Standards :

Machinery is designed and manufactured in conformity with the following standards :

EN 292 - Safety of Machinery - Basic concepts, general principles for design
EN 60204 - Electrical equipment of machinery

Technical File :

Ref: Operator and Maintenance Manual – Versatronics Ltd
Machine No.

.....

Contents :

- General introduction
- Equipment description
- Installation requirements/procedures
- Operation
- Maintenance
- Troubleshooting
- Spare parts
- Drawings and Bills of Materials

Certification :

Apparatus described within this document conforms with the requirements of EEC Directives and Standards as listed above.

Signed :

D. E. Clements

Date :

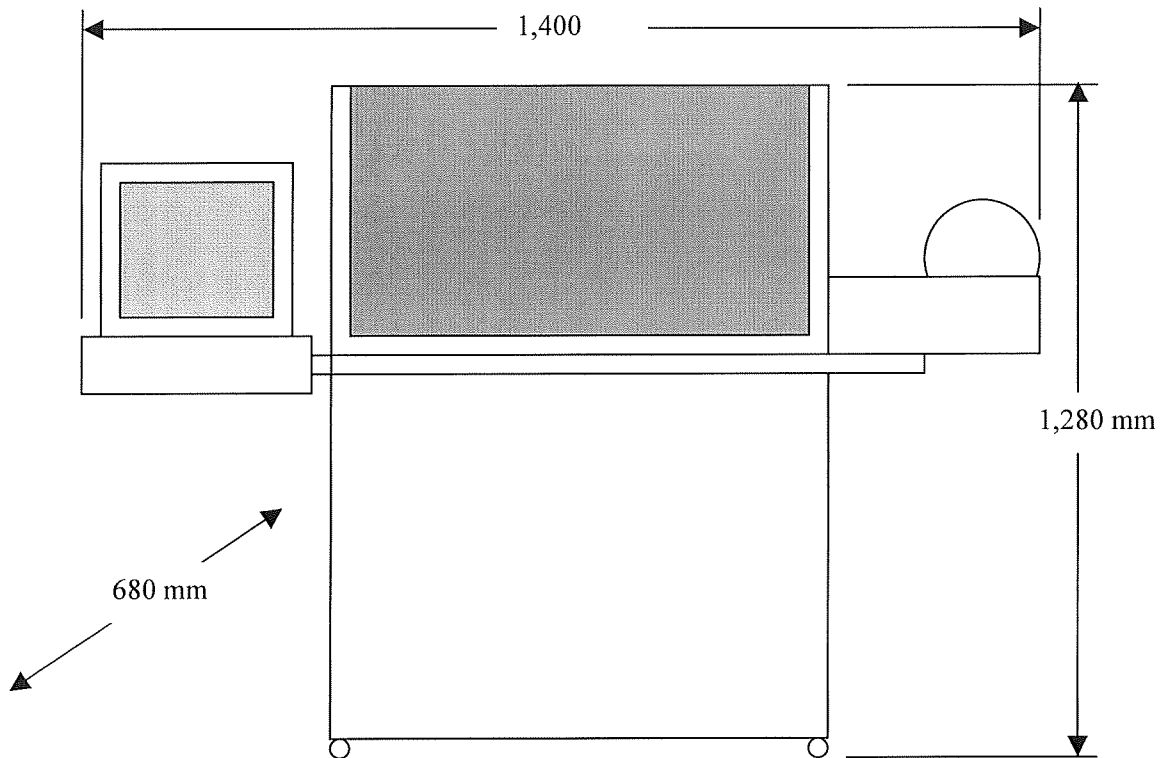
SECTION 2 - EQUIPMENT DESCRIPTION

- 2.1 CONSOLE ASSEMBLY**
- 2.2 P.C. ASSEMBLY**
- 2.3 POWER AND CONTROL MODULE ASSEMBLY**
- 2.4 ROBOTIC ARM ASSEMBLY**

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2.1 CONSOLE

2.1.1 CONSOLE DIMENSIONS



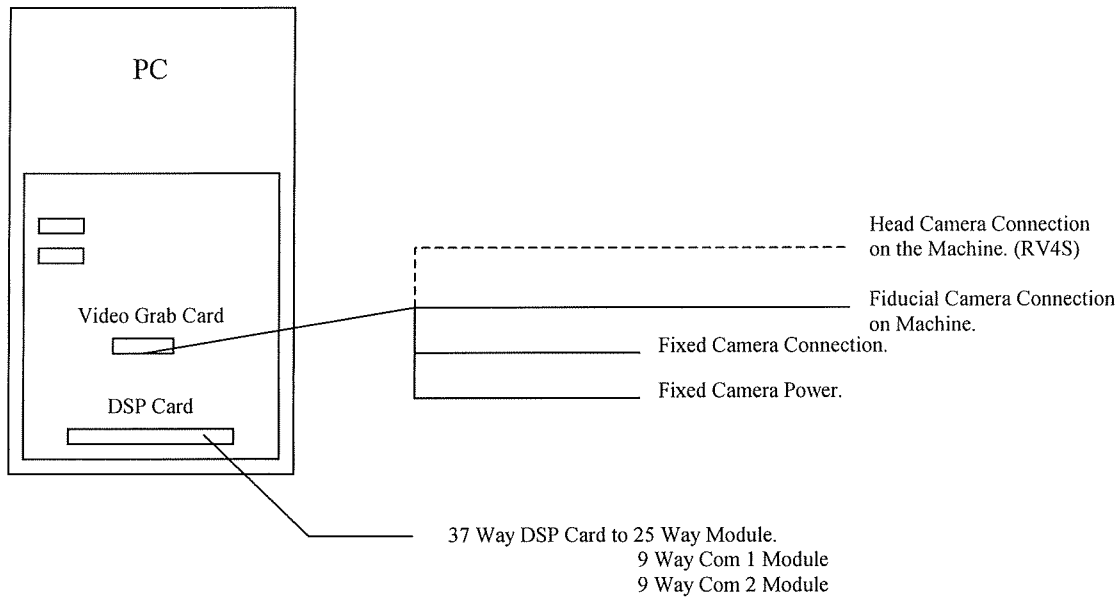
2.1.2 CONSOLE DESCRIPTION

The console is a self-contained, wheeled, steel cabinet, complete with a steel frame cover assembly designed to support four plexiglass covers, one of which is hinged to allow access to the machine. The console also comprises a steel arm designed to support a p.c. monitor and keyboard. On the right hand side of the lower assembly is a door (not shown) to allow access to the p.c. and the power and control module.

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2.2 P.C. ASSEMBLY

2.2.1 P.C. CONNECTIONS



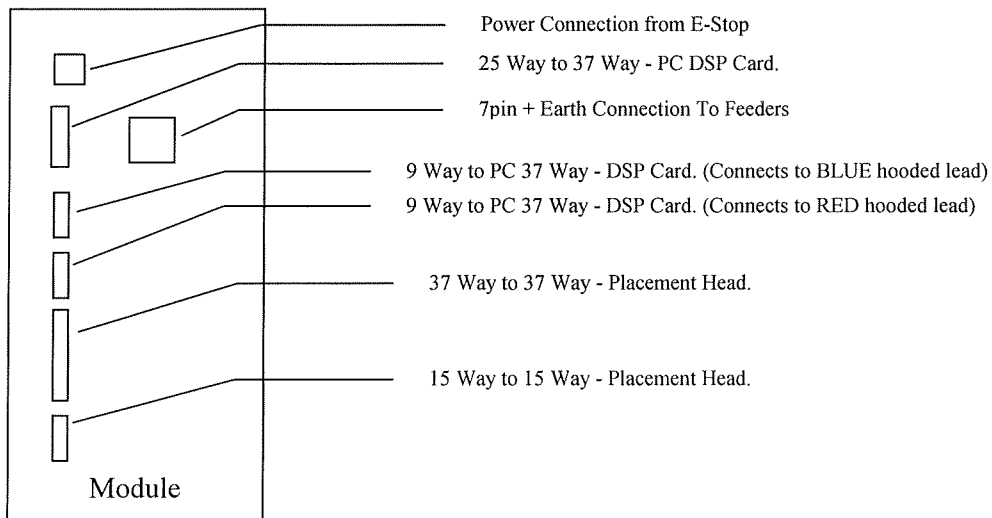
2.2.2 P.C. DESCRIPTION

The P.C. is a standard unit comprising mini tower, monitor, keyboard, mouse and interconnecting cables. A video grab card is installed in one PCI slot and a Digital Signal Processor and Serial Communications card is installed in one ISA slot.

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2.3 POWER AND CONTROL MODULE CONNECTIONS

2.3.1 POWER AND CONTROL MODULE CONNECTIONS



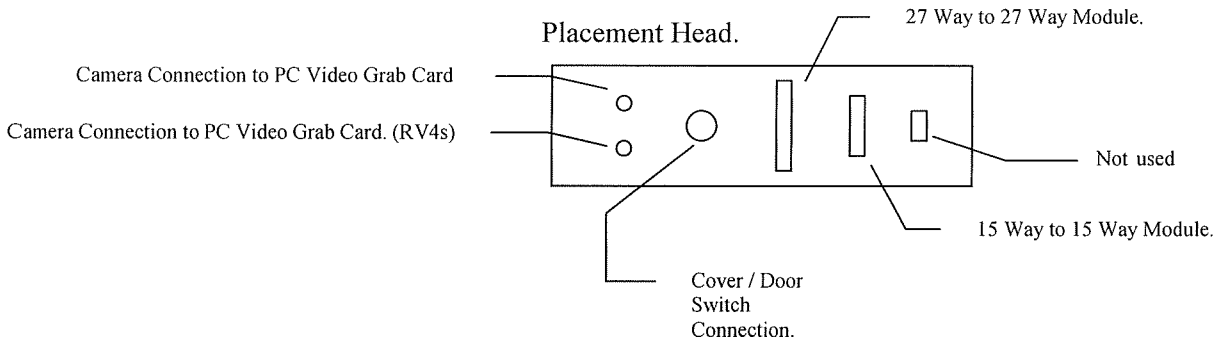
2.3.2 POWER AND CONTROL UNIT DESCRIPTION

The power and control module is self-contained in a steel enclosure and consists of a power supply capable of supplying all system voltages and power requirements and four stepper motor driver cards, one for each axis.

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2.4 PLACEMENT HEAD

2.4.1 PLACEMENT HEAD CONNECTIONS



2.4.2 PLACEMENT HEAD DESCRIPTION

The placement head is a robotic arm of steel and aluminium construction. Two stepper motors are mounted inside the unit to allow control of the X and Y axes and two further stepper motors are mounted on the head assembly to allow control of the Z and R axes. A

P.C.B. is mounted on the arm assembly to allow communications with the P.C. and monitoring of the system. In the case of the RV1s two cameras are mounted on the unit to allow for video monitoring of PCB position and Components prior to and during placement.

(RV4s includes a third camera for improved speed during the placement of smaller components).

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SECTION 3 - INSTALLATION REQUIREMENTS / PROCEDURES

- 3.1 **INSTALLATION**
- 3.2 **SERVICES TO BE PROVIDED BY THE BUYER**
- 3.3 **RECEIVING EQUIPMENT**
- 3.4 **HANDLING**
- 3.5 **SITE PREPARATIONS**
- 3.6 **UTILITY REQUIREMENTS**
- 3.7 **COMMISSIONING OF THE UNIT**

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3.1 **INSTALLATION**

Versatronics will supply the services of an engineer for the purpose of :-

- A. Installation of the entire system, comprising :
 - Console
 - Placement machine
 - P.C.
 - Power and control module
 - Electrical connections
- B. Start-up and commissioning of the equipment
- C. Upon instruction of the buyer, at his cost, Instruction of buyer's personnel in SMD board manufacture, to include paste, placement and reflow techniques

3.2 **SERVICES TO BE PROVIDED BY THE BUYER**

- A. Preparation of the site to accept the equipment.
- B. All installation, wiring, builder's work, foundations, etc.
- C. All cross-site electrical wiring.
- D. Electrical power supply as specified in this manual

3.3 **RECEIVING EQUIPMENT**

Upon receiving equipment, the following steps should be taken

- A. Check packing lists against number of crates received
- B. IF DAMAGE IS EVIDENT, file damage report to carrier and notify Versatronics immediately.

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3.4 **HANDLING**

Care should be used when handling any part of the equipment as delivered. Damage may be caused to the placement head by any rough handling.

3.5 **SITE PREPARATIONS**

The following site preparations must be made prior to installation:

- A. The overall dimensions of the unit are specified in para. 2.1.1. These dimensions should be considered as the minimum dimensions.
- B. Power should be supplied as detailed in para. 3.6.

3.6 UTILITIES

The machine is self-contained and as such requires only a 240Vac single phase supply fused at 13 Amps.

3.7 COMMISSIONING OF THE UNIT

After all equipment has been installed and interconnected, the entire system is to be checked before start-up. A Systems check has been performed prior to shipping. It is recommended that a further systems check be carried out upon commissioning of the unit by a Versatronics engineer.

**IF POWER IS APPLIED PRIOR TO INSPECTION BY
A VERSATRONICS ENGINEER ALL WARRANTIES
ARE VOID.**

(end of page)

SECTION 4 - OPERATION

- 4.1 **INFORMATION REQUIRED PRIOR TO START-UP**
- 4.2 **MACHINE START UP PROCEDURE**
- 4.3 **BILL OF MATERIALS INSTRUCTIONS**
- 4.4 **COMPONENT DEFINITION FILES**
- 4.5 **RVCAD INSTRUCTIONS**
- 4.6 **RVGERBER INSTRUCTIONS**
- 4.7 **RVSETUP INSTRUCTIONS**
- 4.8 **FEEDER SETUP INSTRUCTIONS**
- 4.9 **RVPLACE INSTRUCTIONS**

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4.1 INFORMATION REQUIRED PRIOR TO START-UP

4.1.1 GENERAL INFORMATION

Prior to start-up of a new project the following information is required :-

- a). Component positional information. This may be in the form of gerber information (see section 4.1.2) or CAD data (see section 4.1.3).
- b). Bill of materials (BOM) information. This may be generated manually or automatically (see section 4.3).
- c). Step and repeat information from the PCB manufacturer or Gerber information (see section 4.6)

4.1.2 INTRODUCTION TO GERBER FILES

Gerber files are a standard file format used to produce photoplots for PCB or screen manufacture.

There are two main elements in a Gerber file - a "DRAW" command, and a "FLASH" command (sometimes called by other names).

The "DRAW" command is used to draw a continuous line from one point to another point.

The "FLASH" command is used to form a shape (usually a pad shape) at one particular point.

Additionally these commands have dimensional information associated with them (Dcode or aperture codes) to determine the width of track or size and shape of pad.

For simplicity we will divide gerber files into two types. RS-274X and "older" types.

RS-274X Gerber files is the modern standard and the files will have the draw, flash and Dcode/aperture codes information embedded within the file itself (together with dimensional and scale information).

RS274X Gerber files are automatically displayed in a true representation.

With older Gerber format files, elements are initially represented in a simple manner - a "FLASH" (pad) being represented by a small light grey square, and a "DRAW" (track) by a thin green line, with no reference being made to the original widths. The apertures may be edited to give a true representation.

Older Gerber files usually have a separate aperture file.

In both cases only the flashed pad element is use to derive component centre information, sometimes it is necessary to convert tracks to pads (see section 4.6) where the original Gerber file was generated with pads "drawn" as opposed to "flashed".

(cont.)

4.1.2 (cont.)

When gerber information is received from the design department, there are several “layers” available. These layers will include all information required by the PCB manufacturer to enable him to manufacture the PCB. Not all of this information is required to program the PCB for placement using the Versatronics RV system.

The minimum information required in the gerber file is the paste layer. This layer provides the most basic information required, i.e. component positional information. Whilst this information is sufficient for programming, the placement procedure will be greatly enhanced if further layers are available.

The optimum for efficient and speedy programming are paste, track and ident layers (see section 4.6).

4.1.3 **INTRODUCTION TO CAD DATA REQUIREMENTS.**

The information output generated by CAD packages varies greatly and may be specified by the user dependant upon the relationship with the designer of the PCB.

The minimum information required is component position in the form X, Y, and R information. The X and Y (lateral and up/down information may be in either absolute or relative values. Whilst relative is the preferred option the Versatronics software will accept either value. The R (rotation) value is required, and usually supplied, in 0.1 (tenth) degree increments.

The preferred information is X, Y, R, and a component reference. The component reference information should be in the format R1, C1..., indicating the circuit reference in the same way as the BOM component reference. This will allow the programming software to match pad position information to BOM information. (see section 4.4).

4.1.3 **INTRODUCTION TO THE BILL OF MATERIALS**

Bill of materials (BOM) files come in a wide variety of formats, dependent on the method of generation (CAD, manual filter or simple text file). The programming software allows for a wide variety of formats including manually entering data and automatically filtering a text file (see section 4.3).

The requirements for a bill of materials are component reference, component type and component part number. All three elements are required for the software to operate efficiently.

4.1.4 **INTRODUCTION TO STEP AND REPEAT**

Step and repeat information is only required for multiple board placements (commonly called biscuits). Step and repeat information is generated either by the design department or by the PCB manufacturer. The information is in the form of x and Y displacements (the distance between adjacent boards). If a multiple board gerber is available the programming software has the ability to measure the step and repeat. (see section 4.5)

4.2 MACHINE START-UP AND CLOSE DOWN PROCEDURE

4.2.1 NORMAL START-UP PROCEDURE

- A. Ensure that the machine is supplied with mains power via the 3-pin plug.
- B. Ensure the pick-up head is in the park position. (on the left hand side at rear)
- C. Ensure the emergency stop button is in the out position. (twist to check)
- D. Ensure the feeders are turned on. (red switch on each feeder)
- E. Press the green button. (all feeders will self test)
- F. Open the door on the right hand side of the console.
- G. Turn on the computer. (vacuum pump will run for approx. 2 seconds)
- H. Wait for Windows to load fully.
- I. In windows select the desired operation.

4.2.2 NORMAL CLOSE DOWN PROCEDURE

- A. Close the program in use (in Rvplace the arm will move to the park position).
- B. Close down windows (the p.c. will power down without operator action).
- C. Press the small red button.

4.2.3 EMERGENCY STOP PROCEDURE

- A. In the event of an emergency, push the large red mushroom head button.

Note: - this operation will stop any movement of the machine but will not close down the computer. This is to allow for a normal shutdown of the computer to prevent loss of data in the event of an inadvertent operation of the E-STOP button.

- B. After operation of the E-STOP button, the computer must be closed down completely and the system re-started in accordance with section 4.2.1

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4.3 BILL OF MATERIALS INSTRUCTIONS

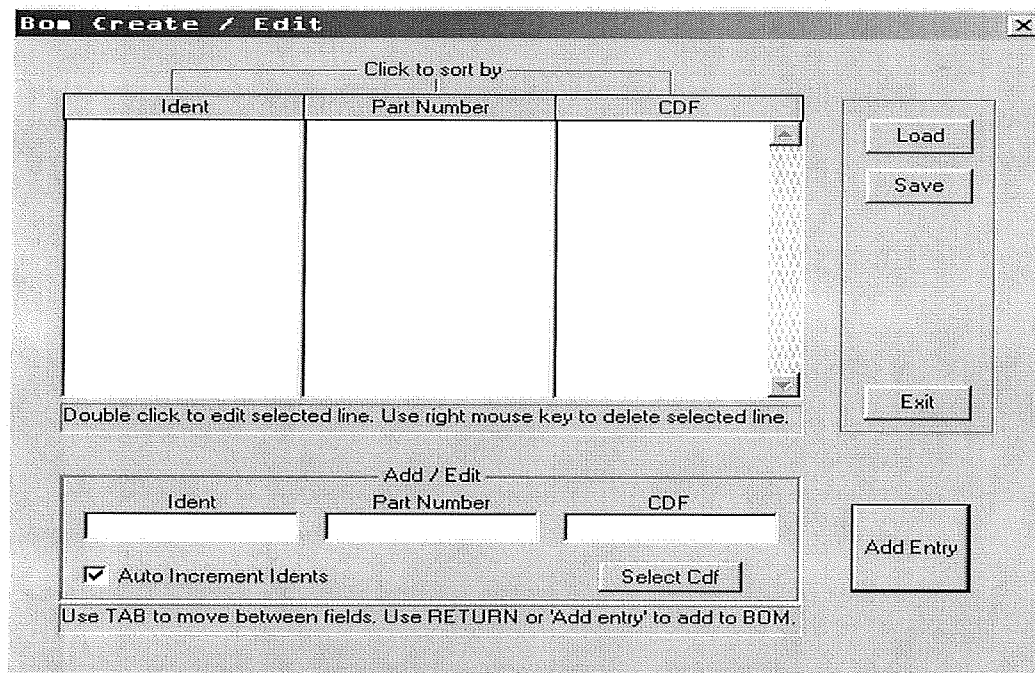
4.3.1 GENERAL BOM INFORMATION

Bills of materials must be created in order for the software to assign components to positions on the PCB. The BOM filter enables the conversion of most ASCII format BOM files into a standard form needed by RV programs. Sometimes the CAD generated placement file is, in effect, an extended BOM file with XY and angle information also included.

Within the programming software there is the ability to enter component information directly into a Versatronics **B**ill of **M**aterials (VBM). Or to “autofilter” a pre-prepared ASCII text file, to create a VBM.

4.3.2 MANUAL VBM CREATION

Start the RV Gerber program, select “Bom”, select “Manual Edit/Create”. The Bom Create / Edit window will be displayed: -



The window may be broken into two sections, upper and lower.

The upper area of the window shows the current Bom at left and on the right has the option to load a previously created Bom for editing, save the current Bom or to exit the window.

The lower portion of the window contains the direct entry area for manual input of component information. To enter information click in the “ident” box and enter the circuit reference i.e. R1, IC10..., pressing the tab key will move the cursor to the Part Number field to allow entry of the part number in any desired format. A further press of the tab key will allow entry of the **C**omponent **D**efinition **F**ile (CDF).

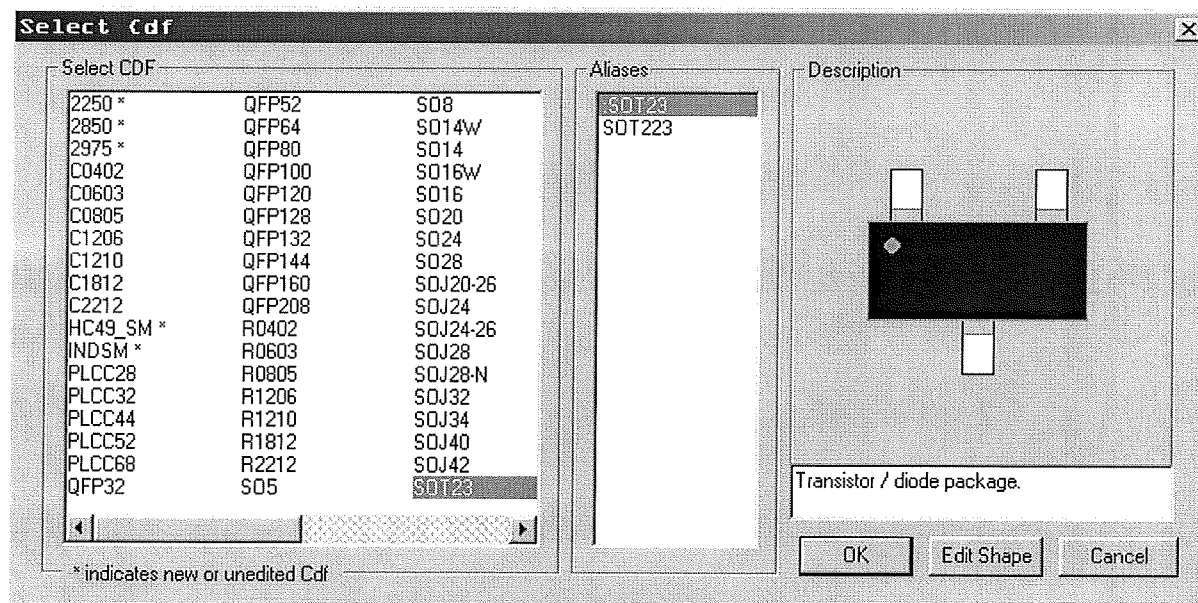
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4.3.2 (cont)

This field has two options either type the CDF name directly or click on the “Select CDF” button.

Typing the CDF allows entry of unknown CDF types for selection later during the place components operation (see section 4.4).

Selection of the “Select CDF” option will bring up the following window.



The window contains three main areas, “Select CDF”, “Aliases” and “Description”. To select a cdf simply double-click on the desired cdf type in the Select cdf area.

The alias list describes any other valid names for this component type (this is purely for reference and may not be edited or selected at this time. See section 4.4).

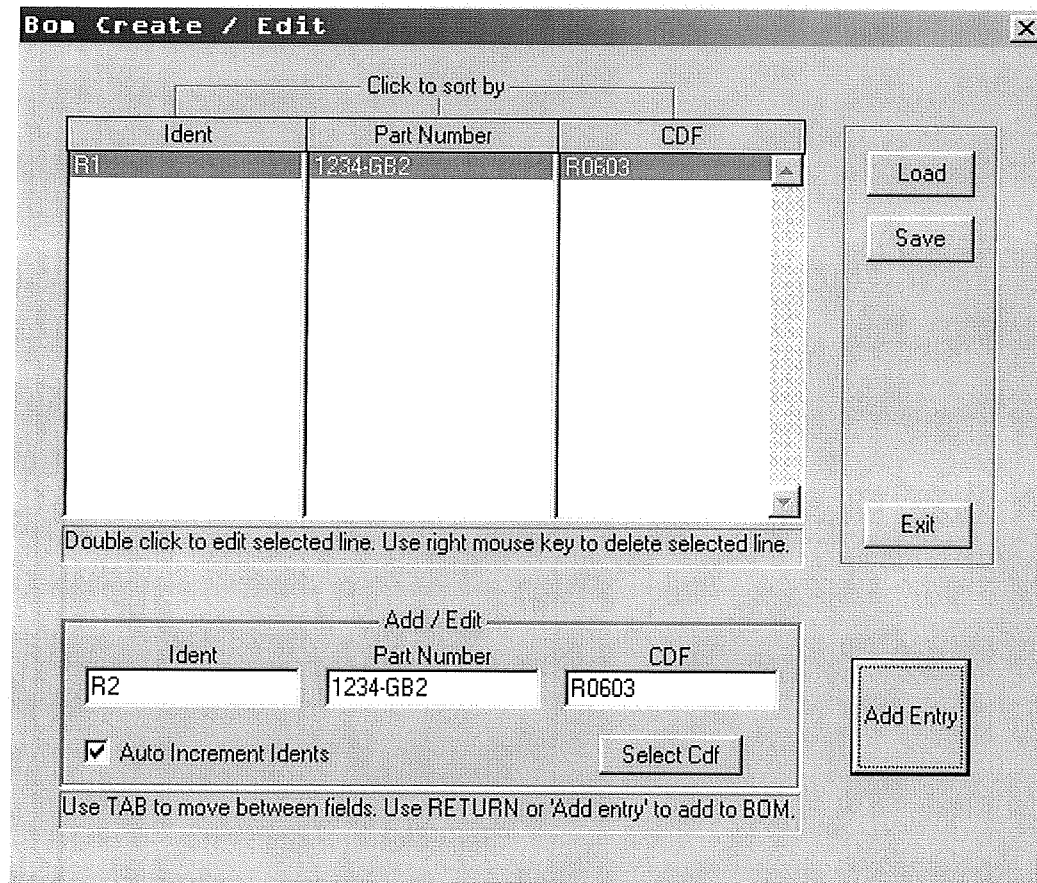
The description area contains a picture of the selected device, a short text description, facility to edit the shape of the cdf picture (NOTE: - editing the shape will not affect the component sizes contained in the cdf. It is merely a pictorial representation). This area also contains the window control buttons to select or cancel options.

NOTE: - DETAILED INFORMATION ON CDF’S, INCLUDING EDITING, SIZING, CREATION AND IMAGE CONTROL IS AVAILABLE IN SECTION 4.4

(cont)

4.3.2(cont).

Once information is entered in these three fields pressing the “Add entry” button will transfer the information to the top window as shown below. If “Auto Increment Idents” is checked (click to check, click to uncheck), the ident value will increase by 1. This is to allow faster input of components.



1.1 GETTING STARTED

The source BOM file must contain the following information -

- ◆ Component idents (e.g. IC12)
- ◆ Part numbers (e.g.74LS138)
- ◆ Package type description (e.g. SOIC16)

Often, the BOM file will include information, which may not be required for the placement of the board, such as through hole component information. Sometimes package type descriptions may be incomplete or missing. It is also likely that for a double-sided board, information for both sides of the board will be included in a single BOM.

Because of these reasons it may be necessary to perform some manual editing¹ of the BOM file before commencing programming.

Use an editing package such as WordPad (included with Windows95) to edit, or create the source BOM file. Save a copy (or two for a double sided board), and edit the copy to delete unnecessary items, and add any missing information.

Remember to load and save the files as text (ASCII) and ensure all BOM files are saved in the C:\versatronics\rv\Bom directory.

1.2 SEQUENCE OF EVENTS

With a known format BOM file, once the BOM file has been modified if necessary (see Getting started), the subsequent steps are -

1. Select **Bom Autofilter** from the main menu bar.
From the Bom Converter dialog box -
2. Select **Load BOM**. A window shows several lines of the file you have selected
3. Select **Load format**. Load the correct format file for this BOM type.
4. Select **Convert**. Assuming there are no error messages, the output window now shows the converted BOM. At this stage, confirm that the number of components found is the number expected.
5. Select **Save**. Save the file as a .VBM file. (Versatronics **B**ill of **M**aterials) in the C:\versatronics\rv\Bom directory.

This .VBM file can be loaded into either of the programming packages as the bill of materials file, when required.

1.3 EDITING THE FORMAT

Before editing the format, ensure you are familiar with the basic concepts involved. See Source BOM file format for more information. Use an editing package such as WordPad (included with Windows95) to edit, or create the source BOM file. Save a copy (or two for a double-sided board), and edit the copy to delete unnecessary items, and add any missing information. Remember to load and save the files as text (ASCII).

1. From the Bom converter dialog box, select Edit format.
2. The property sheet has 3 pages with tabs at the top - Start / End strings | General format | Ident format
3. To select between these pages click on the tabs.

1.3.1 Start / End strings

As the name suggests, start / end strings are used to determine the start or end of data. These are optional functions and are often not needed. One or more of any of the following can be used.

The data start string function is used to tell the converter where the Bom starts. This is used in the case where there is a header in the file, or where the layer data starts for a double-sided board. If the data starts immediately in the file then this function is not needed. Some examples of a data start string are -

"%COMPONENT SIDE START" or "LAYER 1"

The first ident (e.g. "R1") could be used as the data start string, however this would not necessarily apply to all BOM files, and would lead to this function being changed on a board-by-board basis. It is usually better to manually edit the files to exclude unnecessary data.

To enable this function, click on the **not used** check box to remove the check.

Click on **Select**.

If a file has not already been loaded, then the file selection dialog box is used to select either the actual BOM, or a representative file of this format.

The dialog box which is now opened has two views, the File view, (put the cursor on the required line to select) and the Field view (select the character string by highlighting the required text). To select a different file, click on the **Open New File** button at the top of the screen.

When the required text has been selected, select **OK** and the selected text appears in the **Data start string** edit box. (text can be entered directly into this box, however it must be an exact, case-sensitive match)

1.3.2 Data end string.

The data end string is selected in the same way as the data start string. Some examples of a data end string are -

"%COMPONENT SIDE END" or "LAYER 2"

1.3.3 Line start string.

The line start string is selected in the same way as the data start string. Some examples of a line start string are -

"\$C" or "*COMP"

1.3.4 Line end string.

The line end string is selected in the same way as the data start string. Some examples of a line end string are -

"\$-C" or "*END COMP"

1.3.5 General format

The general format page is used to set up the positions of **Part number** and **Component type** fields, as well as some general parameters.

1.3.5.1 Part Number position.

The Part Number is the device number such as "74AC138".

The first decision required is whether to use field or column alignment. This depends on whether the file is neatly arranged with fields directly below each other or not (column order). Where possible it is better to use field order. Select **Column no.** or **Field no.** to suit

Click on **Select**

If a file has not already been loaded, then the file selection dialog box is used to select either the actual BOM, or a representative file of this format.

The dialog box which is now opened has two views, the File view, (put the cursor on the required line to select) and the Field view (select the part number position by highlighting the required text - in column mode, click on the first character). To select a different file, click on the **Open New File** button at the top of the screen.

When the required position has been selected, click **OK**

The field or column position now appears in the **part number position** edit box.

1.3.5.2 Component Type position.

This function operates in the same way as Part Number position. The Component type is the generic package type such as "PLCC 44".

1.3.5.3 Spaces in names.

Select from no spaces, 1 space or 2 spaces. Note that names will have an underscore inserted instead of a space in the final VBM file. Note also that if there is only 1 space between different fields, **no spaces** must be selected

1.3.5.4 'From To' format.

Select whether a range is allowable with a hyphen separating the start and end, such as "R1-17".

1.3.5.5 Comment character.

If the file uses a comment character such as "%", then type the character in the comment character field. All subsequent text on the line will then be ignored.

1.3.6 Ident format

1.3.6.1 First line position.

The first decision required is whether to use field or column alignment. This depends on whether the file is neatly arranged with fields directly below each other or not (column order). Where possible it is better to use field order. Select the **Column no.** or **Field no.** radiobutton to suit

Click on **Select**

If a file has not already been loaded, then the file selection dialog box is used to select either the actual BOM, or a representative file of this format.

The dialog box which is now opened has two views, the File view, (put the cursor on the required line to select) and the Field view (select the part number position by highlighting the required text - in column mode, click on the first character). To select a different file, click on the **Open New File** button at the top of the screen.

When the required position has been selected, click **OK**

The field or column position now appears in the **First line position** edit box.

1.3.6.2 Subsequent line position

Where multiple lines are used, select the start position in the same way as above.

1.3.6.3 Ident list terminates on -

Usually the ident list will terminate where there is no delimiter (such as a comma, see below) before the end of a line, however you can force termination at a column position. Click the required radiobutton, and select the column position (if column mode used), in the normal way.

1.3.6.4 Ident field delimiter

Normally the delimiter used is a comma, however it is possible to use whitespace or a special character (eg ".:"). Select which method by clicking on the required choice, and enter the special character, if required.

When editing is complete, save the format, then test it on a source BOM. Make a note of any errors and modify the format if necessary.

1.3.7 Source BOM file format

1.3.7.1 Fields or columns?

Information fields can be described as being in either field or column order. In the following example -

```
Word0      Word1 Word2      Word3
column 0 .....column 25
```

- "Word2" is considered to be field number 2 (field numbering starts at 0). Alternatively "Word2" could be described as starting at column 25 - its physical position in the line.

In general, field order is simpler to use, but column order can give advantages in some cases (such as with multiple lines of idents) - however column data must line up exactly between lines.

1.3.7.2 Idents.

Idents may be in the following formats -

- R1 - single ident
- R1,R2,R3 - multiple idents, character start, comma separated
- R1,2,3 - multiple idents, 1st ident with common character string, comma separated.
- R1-R3 - range of idents, character start, hyphen separated
- R1-3 - range of idents, 1st ident with common character string, hyphen separated

A combination of any of the above is allowed, for example-

R1, R7, R8-11,18,R19,23-27

- is perfectly legal (although somewhat untidy).

1.3.7.3 *Multiple lines of idents.*

Multiple lines of idents are possible, however with some restrictions -

Example1.

| | | |
|----------------------------|------|------------------|
| R1,2,3, 4,5,6, 7,8,9 | 1206 | 1K 1/4w resistor |
|----------------------------|------|------------------|

With idents as the first field in the line, the part number and package type fields must be on the last line.

Example 2.

| | | |
|------------------|------|----------------------------|
| 1K 1/4w resistor | 1206 | R1,2,3, 4,5,6, 7,8,9 |
|------------------|------|----------------------------|

With idents as the last field in the line, the part number and package type fields must be on the first line.

No other multiple line configurations are possible when using field order for idents. When using column order, however, the above restrictions do not necessarily apply.

1.3.7.4 *Other fields*

The part number and component type fields are usually single word character strings. Where they are not, multiple words can be linked automatically by selecting the spaces in names option.

Gerber Files

1.4 INTRODUCTION

The Gerber programming software is a convenient way of programming the placement positions of a board, using a standard file format produced by all PCB CAD software.

Among the advantages of this method is the fact that programming is essentially graphics based - very much WYSIWYG.

1.5 GETTING STARTED

The following files are needed to begin Gerber programming -

- ◆ Bom file in VBM format.
- ◆ Component side Gerber layer - usually the solder mask or screen layer.
- ◆ Recommended, but optional, ident Gerber layer.

Once programming has been completed the file is saved in a TFR (Transfer) format, which embeds the Bom, placement, fiducial and Gerber information. This file can be produced on a separate off-line PC and later transferred to the Rv machine local PC for machine specific setup - step and repeat, feeder allocation, etc.

Only the pad element is used to derive component centre information, sometimes it is necessary to convert tracks to pads where the original Gerber file was generated with pads "drawn" as opposed to "flushed".

1.6 SEQUENCE OF EVENTS

The normal sequence of events for Gerber programming is as follows -

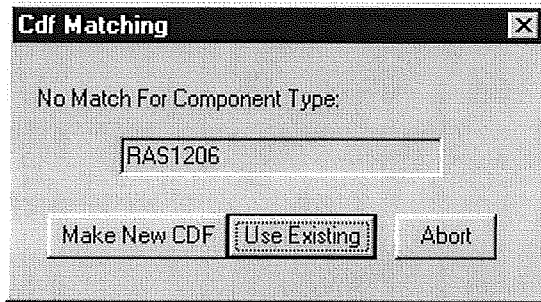
- ◆ Convert Bom file to VBM format.
- ◆ Load component side Gerber layer
- ◆ Load Ident Gerber Layer
- ◆ Load VBM file and allocate CDF's
- ◆ Program components
- ◆ Program board references (fiducials)
- ◆ Save as a TFR file

1.6.1 Loading Bom files

From the menu select **File|Open Bom**. Use the File Open dialog to select the required VBM file from the C:\versatronics\rv\Bom directory.

1.6.2 Matching Cdf files

If the component type fields in the source Bom are not the same as those in the CDF library, then the following dialog box will be displayed -



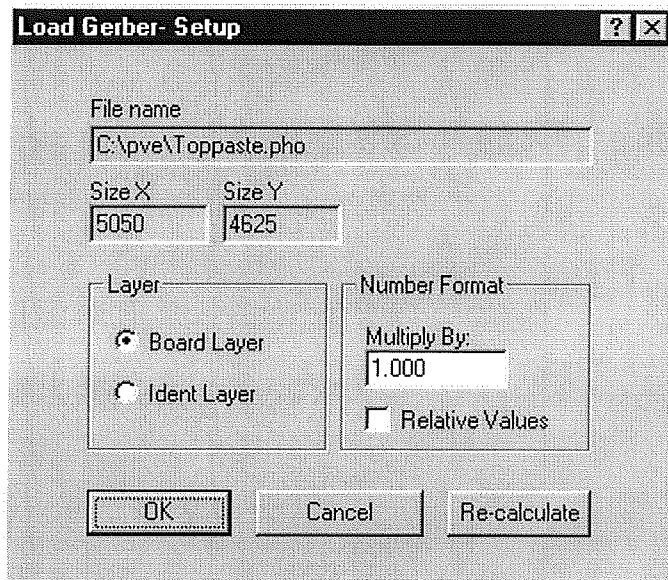
Select **Make New CDF** to add to the CDF library - a list of current CDF files is displayed. Select one of these existing CDF files as a basis for the new cdf.

Select **Use Existing** to add this name as an alias for an existing CDF file - again select from a list of existing CDF files. In this way many different names can refer to a single CDF file.

1.6.3 Loading Gerber files

From the menu select **File|Open Gerber**. Use the File Open dialog to select the required layer which has previously been saved into the C:\versatronics\rv\Gbr directory.

The Setup dialog box is displayed -



Select board or ident layer, whichever is being loaded

1.6.3.1 Changing scale.

If the size (size is in 0.001" units) is not correct, the scale can be modified by entering a multiplier in the **Multiply By** edit box.

Example 1. Dimensions are 10x too big.

Enter 0.1 in **Multiply By** box. Click **Re-calculate** to display new size.

Example 2. Dimensions are in 0.01mm.

Enter 0.3937 in **Multiply By** box. Click **Re-calculate** to display new size.

Click **OK** to display the layer.

1.6.3.2 Relative Values

Most Gerber files are in absolute units, however if the layer is displayed incorrectly, reload the layer with the **Relative Values** box checked.

The layer can be reloaded as many times as necessary until it is displayed correctly.

1.6.4 Modify Gerber layers

It is sometimes necessary to modify the Gerber layers, to rotate or flip in the X or Y. It is also possible that the layers do not line up with each other, or with the component placements from a Tfr file generated by the CAD programming software.

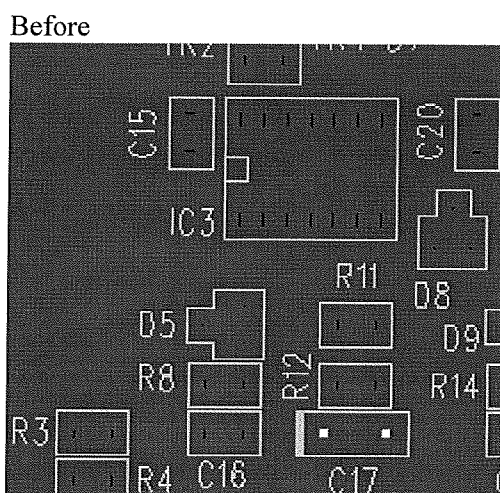
Note that Gerber layer modifications should not take place after component programming - only the Gerber layers are effected by the following functions.

1.6.4.1 Modify | Toggle tracks

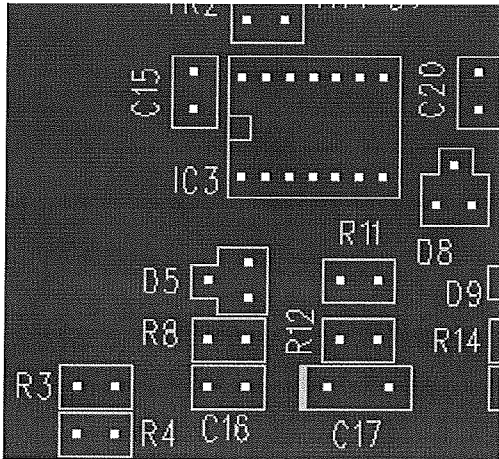
This function turns tracks on or off.

1.6.4.2 Modify | Tracks to pads

In the example below, the effect of selecting this function can be clearly seen



After

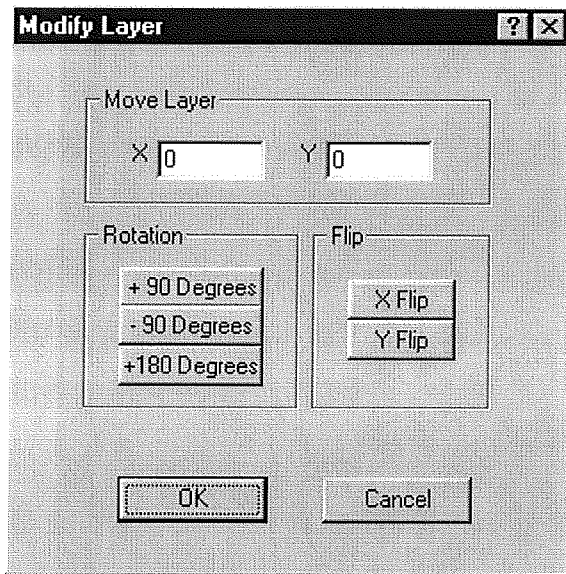


Modify | Modify both layers

Modify | Modify board Gerber

Modify | Modify Ident Gerber

Selecting any of the above will cause the following dialog to be displayed -



1.6.4.3 Move layer

By typing the offset (in 0.001" units) into the X or Y box, the layer(s) will be moved by this amount.

1.6.4.4 Rotation

Selecting one of the rotation buttons will cause rotation of the layer(s).

1.6.4.5 Flip

Selecting X or Y flip will invert the X or Y plane.

1.6.5 Transfer files

the TFR (Transfer) format file embeds the Bom, placement, fiducial and Gerber information. This file can be produced on a separate off-line PC and later transferred to the Rv machine local PC for machine specific setup - step and repeat, feeder allocation, etc.

At any stage the job can be saved as a TFR file.

1.6.5.1 Tfr file operations



File | Open transfer file



File | Save transfer file



File | Save transfer file as

1.6.6 Display functions

The following display functions are available -



Display | Zoom All



Display | Zoom Window



Display | Zoom In



Display | Zoom Out

1.6.7 Placing components

Once the Bom file has been loaded, select -

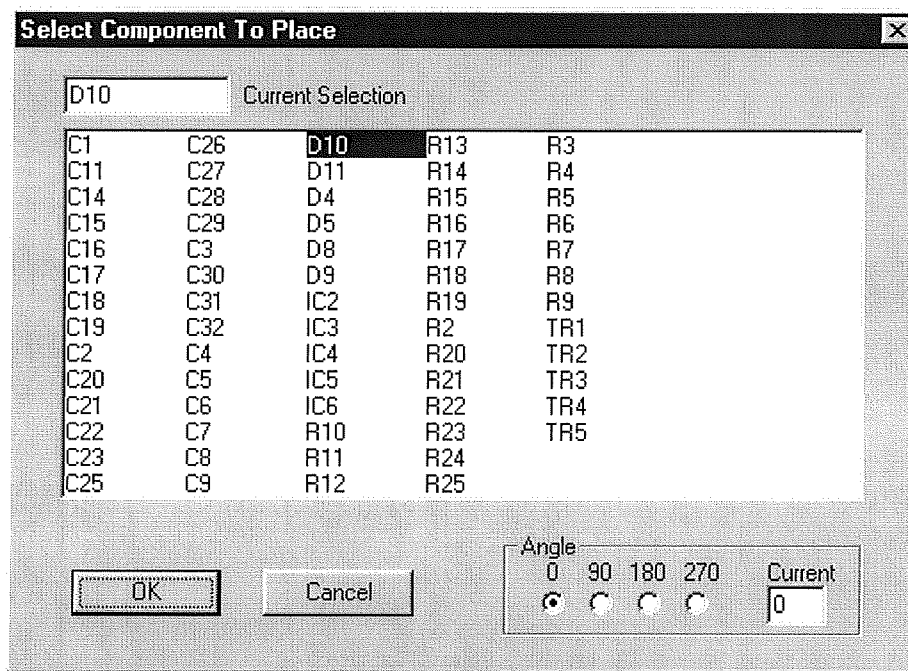


Program | Place Components

1.6.7.1 Selecting a component to place.

Move the cursor into the displayed board area and click the *right* mouse key.

You should then see the idents of the components left to program, displayed in a selection dialog -



There are three ways to select a component from the dialog -

1. Highlight and double click.
2. Highlight and click **OK**
3. Type the ident in the **current selection** box, and click **OK**.

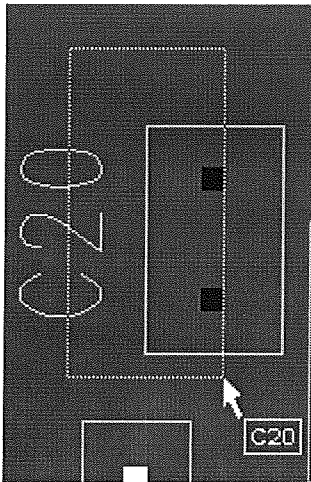
To pre-select the angle of the component, click on an angle button, or type the angle in the **current** box.

Once selection has been made, note that the selected ident name follows the mouse as it moves.

1.6.7.2 Selecting the placement position.

By clicking and holding down the left mouse button, the normal windows group selection box is drawn as the mouse moves.

From the top left position of the required component footprint, drag the box to include the component pads -



The selected pads are shown highlighted in blue. To de-select pads, drag the box around the pads to be de-selected. Once the required pads have been highlighted, click the *right* mouse key, and the component is placed.

At this stage the angle of placement may be changed in 90 degree increments by hitting any keyboard key.

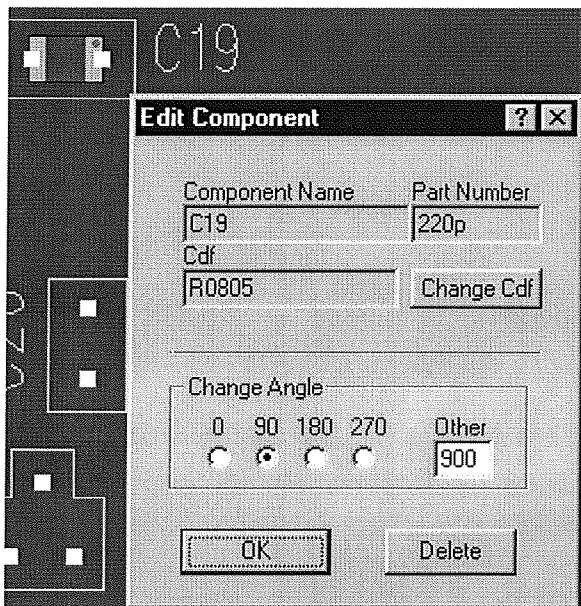
Note. The component centre location is calculated using only the pads selected in the extreme top, left, bottom and right positions, so be sure not to select vias or other pads which are outside the component's footprint.

During this pad selection process, if a previously placed component is included in the box, then all currently highlighted pads will be de-selected, and the component itself highlighted. This is a quick method of de-selecting all pads. The highlighted component can also be edited or deleted. See editing components.

1.6.8 Editing components

At any time during placement, previously placed components may be edited.

If any component or components are included in the pad selection process (see placing components), they are highlighted and by clicking the *right* mouse key the following dialog appears -



This shows the component name, part number and CDF file for this component. If more than one component has been selected, then these information fields are not available.

You can -

- ◆ Change the angle, using the radio buttons or by typing in the **Other** box
- ◆ Change the CDF file used. Click on the **Change Cdf** button and select a different one.
- ◆ Delete this component or components

1.6.9 Adding references

Board references, or fiducial marks are used to align the board on the pick & place machine.



Refs | Add refs

Following selection of this function, pads will highlight as the cursor moves around the board. Click on the left mouse key to add a reference. If the reference pads are not shown on the board layer, then select the nearest pad - an offset can be added later in the RvSetup program. If the reference pads are on a different layer, then this layer may be loaded instead. See Loading Gerber files

Normally a minimum of 2 references should be programmed.

1.6.10 Deleting references

Use this function to delete any incorrectly programmed references.



Refs | Delete refs

As the cursor moves, the nearest reference will highlight. Click the left mouse key to delete.

1.7 CREATING CDF FILES.

The CDF (Component Description File) contains all the critical information for handling and inspecting the relevant package types. Each CDF file is split into three pages.

1.7.1 Page 1 – Component.

The screenshot shows a dialog box titled 'R1206' with three tabs: 'Component', 'Machine', and 'Advanced'. The 'Component' tab is selected. Under 'Component Information', there is a 'Component Description' section with the following fields: 'Chip Type' (dropdown), 'Comp Type' (text box with '00'), 'NW Corner' (dropdown), 'Pin One' (text box with '120'), 'Tool 1' (dropdown), and 'Tool' (text box with '20'). Below this is an 'Adhesive' section with a checkbox for 'Glue Dot Enable' (unchecked), a 'Size 1' dropdown, and a 'Dot Size' text box. There is also a checkbox for 'Run-time test' (unchecked). At the bottom, there are 'OK', 'Cancel', and 'Apply' buttons. A text box at the bottom of the dialog states: 'The fields on this page contain the basic device information needed by the system. Dimensions should be in 0.001 inch units and to the outside edge of pins.'

This page contains the following information.
Component Description.

1.7.1.1 Comp Type

This shows the type of component, i.e. Chip, BGA, PLCC, SOIC, QFP etc.

1.7.1.2 Pin one

This is for polarised components. Pin one is measured when the component is being picked from the right hand feeder bank.

1.7.1.3 Tool

Selects the required Tool number 1 – 5 depending on component size.

1.7.1.4 X

X dimension in thou when the component is being picked from the right hand feeder bank.

1.7.1.5 Y

Y dimension in thou when the component is being picked from the right hand feeder bank.

1.7.1.6 Z

Z dimension (component height) in thou. This is used to tell the machine the placement height, if this dimension is in correct then the component will either be dropped on to the PCB or placed so hard that it will be damaged..

1.7.1.7 Adhesive

If your machine is fitted with a glue dispenser this switches on the dispenser and controls the dot size.

1.7.1.8 Run Time Test

This is used for CDF adjustment during component placement.

1.7.2 Page 2 – Machine.

This page contains the following information.
Machine Fields.

1.7.2.1 Pick

The time delay in milliseconds at the bottom of the picking stroke to allow a vacuum to be created between the component and the nozzle.

1.7.2.2 Camera

The time delay in milliseconds the component spends over the camera.

1.7.2.3 Settle

The time delay in milliseconds to contain vibration before placement.

1.7.2.4 Place

The time delay in milliseconds at the bottom of the placement stroke to ensure insertion into the solder paste.

1.7.2.5 Z Speed

Controls the picking and placement speeds.

1.7.2.6 R Speed

Controls the rotation speed.

1.7.2.7 XY Speed

Controls the arm movement speed.

1.7.2.8 Placement Bias

This allows a placement position adjustment on all components using this CDF. The X and Y positions are in thou and are read in the picking orientation. Rotational adjustments are in 1/10th of a degree. Clockwise = positive number, i.e. to move 1 degree anti-clockwise then input -10.

1.7.2.9 Placement Pressure

This controls the placement pressure and is selected depending on the component being placed.

1.7.2.10 Reject Bin Location

This gives the option of the default position which is just in front of the tool holder or four alternative positions which can be taught by the operator. This is used if high value or fragile components want to be kept separate from other rejected components.

1.7.3 Page 3 – Advanced.

This page contains the following information.

1.7.3.1 Pick X Bias

This offsets the picking position in the X. This would be used if the required flat picking surface of the component is not central.

1.7.3.2 Pick Y Bias

This offsets the picking position in the Y. This would be used if the required flat picking surface of the component is not central.

1.7.3.3 Pre-Rotate

This allows you to modify the rotation of the component over the camera, this rotation will be added before inspection and then removed before placement.

1.7.3.4 Prog Rotate

This add a rotation to the placement position, this is

used if the CAD extraction data has the wrong component rotations.

1.7.3.5 Centre Override

This controls the camera used for component inspection. On the RV1s this is not important, as there is only one camera. On the RV4s the software can choose Force OTF (On The Fly) which will always use the head camera, or Force Fixed which will always use the fixed camera. Automatic will let the software choose the camera for you depending on the component dimensions.

1.7.3.6 Threshold Override

This controls the quantity of detail the camera sees. If the image of the component is not clear then the camera will need to see more so a negative number is input. If the image is all fuzzy around the edges or the camera is picking up reflection from the tool then the threshold need to be increased.

1.7.3.7 Pick Tolerance

This determines the magnification of the four shot inspection of large devices. The higher the number, the more area of the component will be photographed.

1.7.3.8 Min dim %

This is the percentage tolerance the component can be under sized.

1.7.3.9 Max dim %

This is the percentage tolerance the component can be over sized.

1.7.3.10 Size Reject

The camera is looking for the component edges for size inspection. If the underside of the components has detail on it such as markings of a moulding injection point then the camera may pick up this. If the number in this field is 10 then the camera will reject any detail smaller then 10 thou.

1.7.3.11 Merge Moves

If this box is ticked it will smooth out the picking and placement actions, i.e. it will start to move X-Y before the Z has reached its highest point, and then the Z will start to move down before the X-Y is in its final position.

1.7.3.12 Correction Type

This controls the inspection method for the component. Either all data for chips, lead ends for SOIC's and QFP's and centres for PLCC's. This inspection method must be considered when inputting the component dimensions otherwise the vision system will reject good components.

1.7.3.13 Sweep

This number in $1/10^{\text{th}}$ of a degree dictates the maximum rotation error the component can have before inspection, if this number is exceeded the component will be rejected immediately.

1.7.3.14 A Step

This is the accuracy of the correction. An A-Step of 1 will correct to $1/10^{\text{th}}$ of a degree before placement,

1.7.3.15 Lock X

Any variation of the component position on the tool is adjusted before placement and then fed back to the picking position. Ticking this box will lock the X pick position.

1.7.3.16 Lock Y

Ticking this box will lock the Y pick position.

1.7.3.17 Half Index

When placing 0402 devices this will tell the machine to pick from twice from different positions on the tape before indexing the feeder.

CAD Files.

1.8 INTRODUCTION

The CAD Component Extraction software is the quickest way to program the component placement positions using the CAD information available from all PCB CAD software.

This method has the advantage when the same CAD system is used so the formats for all jobs are identical.

1.9 SEQUENCE OF EVENTS.

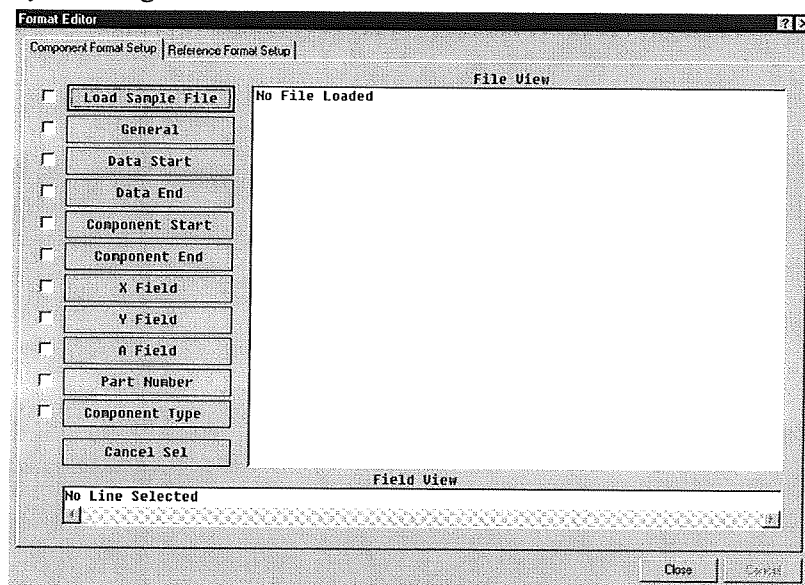
- ◆ Convert Bom file to VBM format.
- ◆ Load CAD data.
- ◆ Edit component extraction format. (If all subsequent jobs come from the same CAD system then this only needs to be completed on the first job).
- ◆ Edit reference extraction format. (If all subsequent jobs come from the same CAD system then this only needs to be completed on the first job).
- ◆ Extract the data.
- ◆ Save as a TFR file.

1.9.1 Loading CAD data.

1. From the menu select **File|New**. The program will then ask for a previous tfr file to be selected to copy the extraction format information. Once the format has been set, loading the previous job will mean that editing it for subsequent jobs from the same CAD system will be unnecessary.
2. Select the file.
3. Enter the new file name in the C:\versatronics\rv\tfr directory.
4. Select the CAD data file. (This should be saved in the C:\versatronics\rv\cad directory.)
5. Select the Bom file from the Bom directory.
6. All the data has now been loaded, if this is the first time this method has been used the format will have to be edited. If not then from the menu select **Extract|Extract Components**.

1.9.2 Editing Component Format.

From the menu select **Edit Formats|Edit Component Format**. Ensure you are on the correct page by selecting the correct tab.

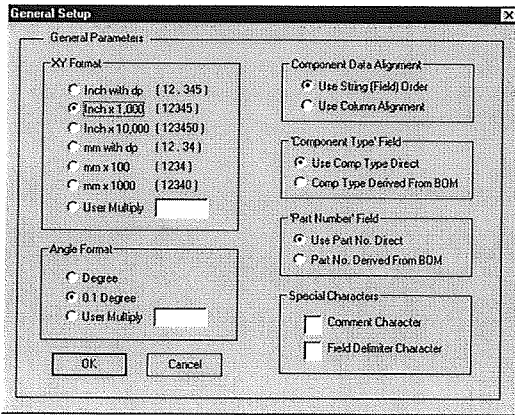


1.9.2.1 Load Sample File.

This reloads the original CAD data file.

1.9.2.2 General.

This selects the format of the original data.



1.9.2.2.1 XY Format.

Select the format of the original component positional data.

1.9.2.2.2 Angle Format.

Select the format of the original component rotation data.

1.9.2.2.3 Component Data Alignment.

This decides whether to use field or column alignment. It depends on whether the file is neatly arranged with fields directly below each other or not (column order). Where possible it is better to use field order. Select

Column no. or Field no. to suit

1.9.2.2.4 'Component Type' Field.

The component type (i.e. PLCC44) can be extracted from the original CAD file or can be cross referenced via the ident (i.e. IC2) to the BOM file. If the information is taken directly from the CAD file then the ident is not recognised and will not show up when using the component inspection option.

1.9.2.2.5 'Part Number' Field.

The part number (i.e. 74LS138) can be extracted from the original CAD file or can be cross referenced via the ident (i.e. IC2) to the BOM file. If the information is taken directly from the CAD file then the ident is not recognised and will not show up when using the component inspection option.

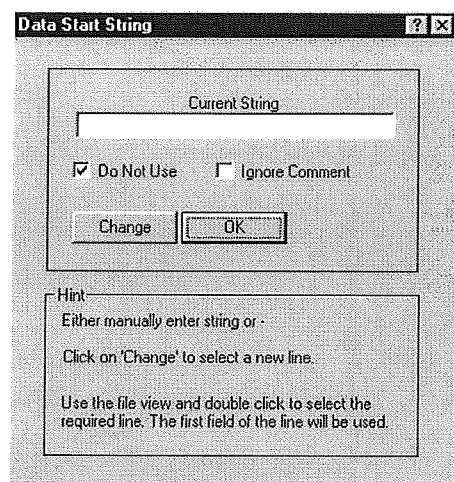
1.9.2.2.6 Comment Character.

If the file uses a comment character such as "%", then type the character in the comment character field. All subsequent text on the line will then be ignored.

1.9.2.2.7 Field Delimiter Character.

If the file uses a character such as "," to separate the fields then type the character in the Field Delimiter Character field.

1.9.2.3 Data Start.



As the name suggests, data start strings are used to determine the start of data. The data start string function is used to tell the converter where the Cad starts. This is used in the case where there is a header in the file, or where the layer data starts for a double sided board. If the data starts immediately in the file then this function is not needed. Some examples of a data start string are -

"%COMPONENT SIDE START" or "LAYER 1"

To select remove the check mark from the do not use box and click on "Change".

Select the required line by double clicking on it and then selecting "OK".

1.9.2.4 Data End

The data end string is selected in the same way as the data start string. Some examples of a data end string are -

"%COMPONENT SIDE END" or "LAYER 2"

1.9.2.5 Component Start.

The component start string is selected in the same way as the data start string. Some examples of a line start string are -

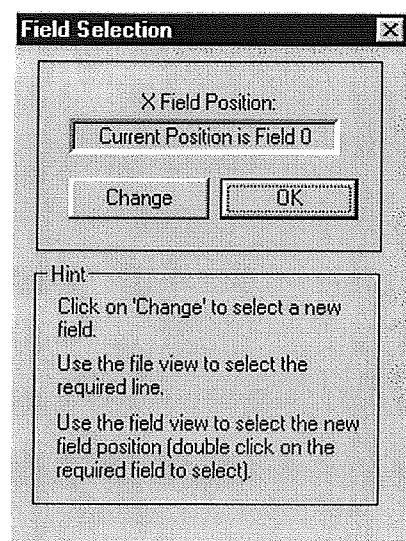
"\$C" or "*COMP"

1.9.2.6 Line end string.

The component end string is selected in the same way as the data start string. Some examples of a line end string are -

"\$-C" or "*END COMP"

1.9.2.7 X Field.



This selects the X positional data.

Select "Change".

Select a line containing the X Field data so it appears in the Field View.

Double click on the X Field or if using column format then double click on the first character of the X data.

Select "OK".

1.9.2.8 Y Field.

This selects the Y positional data.

Select "Change".

Select a line containing the Y Field data so it appears in the Field View.

Double click on the Y Field or if using column format then double click on the first character of the Y data.

Select "OK".

1.9.2.9 A Field.

This selects the rotation data.

Select "Change".

Select a line containing the rotation data so it appears in the Field View.

Double click on the rotation or if using column format then double click on the first character of the rotation data.

Select "OK".

1.9.2.10 Part Number.

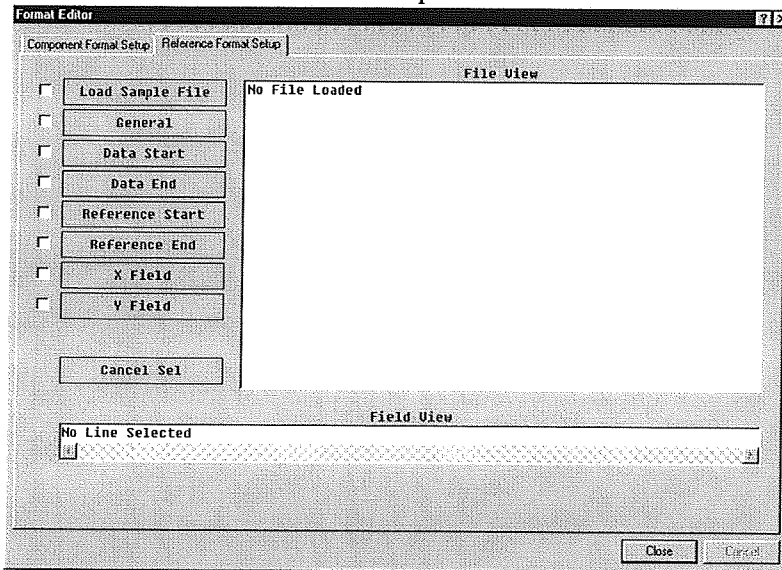
This selects the part number. If in General you selected "Part No. Derived from Bom" then using the same method as the X field select the component ident (i.e. IC2). If not then select the Part Number.

1.9.2.11 Component Type.

This selects the component type. If in General you selected "Comp type. Derived from Bom" then using the same method as the X field select the component ident (i.e. IC2). If not then select the Component Type.

1.9.3 Editing Reference Format.

Select the "Reference Format Setup" tab.

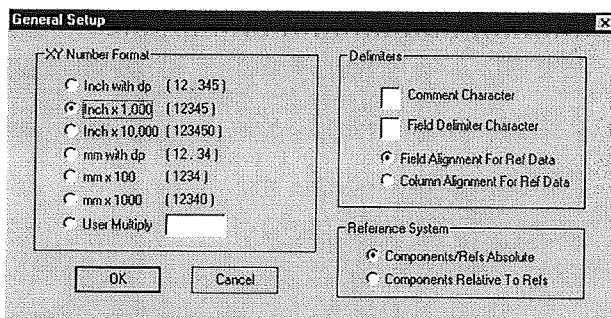


1.9.3.1 Load Sample File.

This reloads the original CAD data file.

1.9.3.2 General.

This select the format of the original data.



1.9.3.2.1 XY Number Format.

Select the format of the original component positional data.

1.9.3.2.2 Delimiters.

If the file uses a comment character such as "%", then type the character in the comment character field. All subsequent text on the line will then be ignored.

If the file uses a character such as “,” to separate the fields then type the character in the Field Delimiter Character field.

Choose between column and field alignment depending on the layout of the original data. Where possible it is better to use field order. Select **Column no.** or **Field no.** to suit

1.9.3.2.3 Reference System.

Choose whether the component and reference data is absolute to an identical datum, or whether the components have been positioned relative to the references.

1.9.3.3 Data Start.

As the name suggests, data start strings are used to determine the start of data. The data start string function is used to tell the converter where the Cad starts. This is used in the case where there is a header in the file, or where the layer data starts for a double sided board. If the data starts immediately in the file then this function is not needed. Some examples of a data start string are -

"%COMPONENT SIDE START" or "LAYER 1"

To select remove the check mark from the do not use box and click on “Change”.
Select the required line by double clicking on it and then selecting “OK”.

1.9.3.4 Data End

The data end string is selected in the same way as the data start string. Some examples of a data end string are -

"%COMPONENT SIDE END" or "LAYER 2"

1.9.3.5 Reference Start.

The reference start string is selected in the same way as the data start string. Some examples of a line start string are -

"Fid" or "Ref"

1.9.3.6 Reference End.

The reference end string is selected in the same way as the data start string. Some examples of a line end string are -

"End Fid" or "End Ref"

1.9.3.7 X Field.

This selects the X positional data.

Select “Change”.

Select a line containing the X Field data so it appears in the Field View.

Double click on the X Field or if using column format then double click on the first character of the X data.

Select “OK”.

1.9.3.8 Y Field.

This selects the Y positional data.

Select “Change”.

Select a line containing the Y Field data so it appears in the Field View.

Double click on the Y Field or if using column format then double click on the first character of the Y data.

Select "OK".

1.9.4 Extracting the Component Data.

Once the formats have been setup select "Close". Now the data can be extracted. From the menu select **Extract| Extract Components**. The correct image of the PCB should now be displayed. At any time the formats can be amended and the extraction procedure repeated. The finished transfer (tfr) is now saved in the tfr directory.

RVSetup Program

1.10 INTRODUCTION

The RvSetup program is primarily used to convert a TFR file and produce a run-time job file. Functions include step & repeat, fiducial editing, component editing and feeder allocation.

1.11 SEQUENCE OF EVENTS

The normal sequence of events to produce the runtime JOB file is as follows -

- ◆ Load a TFR file
- ◆ Edit components, if necessary
- ◆ Allocate components to feeders
- ◆ Step & repeat the board, if required
- ◆ Edit or add references
- ◆ Save the modified TFR file and export the JOB file

1.11.1 Transfer files

the TFR (Transfer) format file embeds the Bom, placement, fiducial and Gerber information. This file can be produced on a separate off-line PC and later transferred to the Rv machine local PC for machine specific setup - step and repeat, feeder allocation, etc.

At any stage the job can be saved as a TFR file.

1.11.1.1 Tfr file operations



File | Open transfer file



File | Save transfer file



File | Save transfer file as

1.11.1.2 Display functions

The following display functions are available -



Display | Zoom All



Display | Zoom Window



Display | Zoom In



Display | Zoom Out

1.11.2 Inspect modes

There are three inspect / editing functions. In each case the component or component group can be edited in a number of ways - see editing components.

As each component is highlighted, an information box is displayed with the cursor.

1.11.2.1 Inspect Modes



Inspect | Show Single Comp Info

Highlights a single component. This mode can be selected at any time by clicking the *right* mouse key.

Inspect | Show All Identical Parts

Highlights all parts with the same part number.

Inspect | Show All Identical Cdfs

Highlights all parts which use the same cdf file.



Inspect | End Inspect Mode

Ends inspect mode.

Inspect modes can also be ended by clicking the *right* mouse key.

1.11.3 Editing components

1.11.3.1 The component edit dialog.

Once a component or component group has been selected (see inspect modes), click on the highlighted component(s) to display the component editing dialog. Shows the properties for the selected component(s) and allows certain properties to be changed.

Edit Individual Component

Component data

74HC14 Part Number

S014 CDF

0 Modified Angle

Note: Modified Angle = Original angle + CDF Program Rotate + board rotation + any rotation added in this dialog box.

Original data

0 Original angle

:S014 Original component type name

IC4 Original BOM ident

Change

Use a different CDF Edit CDF

Change Angle Edit Part Number

OK

Click on the buttons in the "Change" fields to edit the component(s).

1.11.3.2 Use a different CDF.

Click this button to select from the list of CDF files.

1.11.3.3 Change angle

Click to display the change angle dialog box. Allows the selection of +90, -90 or +180 degrees.

1.11.3.4 Edit CDF

Click to change the CDF file properties.

1.11.3.5 Edit part number

Displays the message to edit the part number box directly.

1.11.4 Rotations

Board rotations may be made at any time.

The functions are -

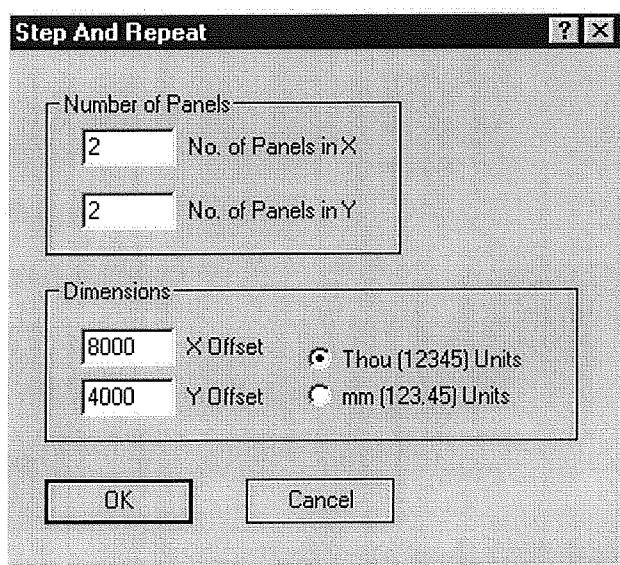
- Rotations | 0 degrees,
- Rotations | 90 degrees,
- Rotations | 180 degrees,
- Rotations | 270 degrees,

1.11.5 Step and repeat

Use the step & repeat function for panels. Reference editing should be made prior to applying the step and repeat. Feeder allocation should be performed after step and repeat.



Setup | Step & repeat



Enter the number of panels in the relevant X and Y boxes. Select the units required and the panel offsets.

The parameters can be changed at any time. Remove step and repeat by entering 1's in the number of panels boxes.

1.11.6 Adding references

Board references, or fiducial marks are used to align the board on the pick & place machine

Where the TFR file does not contain references, they may be added with the following function.



Refs | Add refs to comp centres

Components will highlight as the cursor is moved around the board. Click on the required component to add a reference to the component centre.

Obviously as the reference is added to the centre of the component, It will normally be necessary to edit the position to align with the reference mark on the board. Use the **Refs | Select / Edit Refs** function for this.

Normally a minimum of 2 references should be programmed.

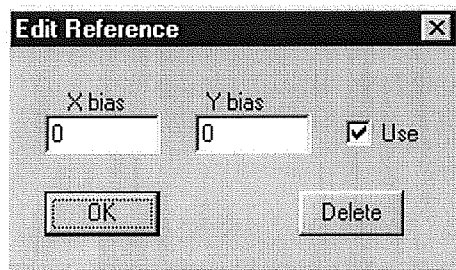
1.11.7 Editing references

Use this function to edit the position of references, or to delete or select as "used".



References | Select/edit refs

Click on the highlighted reference and the following dialog box is displayed.



Edit position by typing the required offset in the X or Y bias box. Click on the use checkbox to toggle between used or not used. Use the delete button to permanently erase the reference.

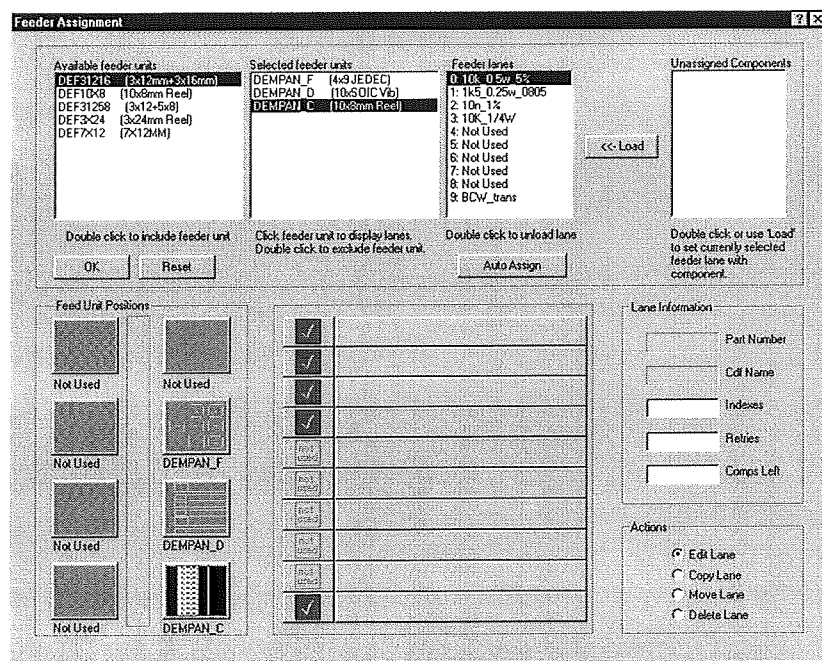
1.11.8 Assigning feeder units

Feeder assignment is one of the major functions of the setup program. Feeder units are selected and components are allocated to feeder lanes, using the part number information from the BOM.



Feeders

The large feeder allocation dialog box is displayed.



The top left listbox labelled **Available feeder units** is used to select feeder units to be used in this job, from all the available units.

To select, double click on the required unit. The feeder unit name is then removed from the available feeder units listbox and moved to the **Selected feeder units** listbox. At the same time, an icon representing the feeder type is shown in one of the 8 feeder unit positions at the bottom left of the dialog.

To de-select a feeder unit, double click the feeder unit in the **Selected feeder units** listbox.

To allow the program to automatically select the best configuration of feeder units for this job, click **Auto Assign**.

1.11.9 Assigning components

The top right listbox labelled **Unassigned components** in the feeder allocation dialog box, contains a list of part numbers found in the BOM.

As feeder units are deleted from, or moved to the **Selected feeder units** listbox, this list of components will increase or reduce as components are automatically assigned to feeders which already contain the component name.

Individual components may be assigned by the following method-

1. Highlight the feeder unit from the **Selected feeder units** listbox.
2. Highlight the feeder lane from the **Feeder lane** listbox
3. Highlight the component from the **Unassigned components** listbox and click **Load** or double click the required component in the **Unassigned components** listbox.

To delete a component from a feeder lane, double click the feeder lane in the **Feeder lane** listbox or use the delete lane function (see editing lanes).

If any changes are made to a component, i.e. changing the CDF, the component will have to be deleted from its allocated feeder unit by double clicking on the part number, and then re-allocated to that feeder track for the changes to be recognised.

1.11.10 Moving feeder units

Feeder unit positions are displayed in the bottom left of the feeder allocation dialog box. In order to move a feeder unit click on the icon, then click on the new position. If the new position already has a feeder unit then the units are swapped.

1.11.11 Editing feeder lanes

Feeder unit positions are displayed in the bottom left of the feeder allocation dialog box. In order to edit a feeder unit click on the icon, the feeder units lanes are then displayed in the bottom centre of the dialog box.

Click on the radio buttons to the bottom right, to make the following actions -

1. Edit lane. Click on the required lane - the information for that lane is displayed. You can edit the retries, indexes and component count.
2. Move lane. Click on the required lane, then click on the lane to move to.
3. Copy lane. Click on the required lane, then click on the lane to copy to.
4. Delete lane. Click on the lane to be deleted.

1.11.12 Feeder listing.

Once all the components have been assigned and the job exported, a feeder report is produced and saved in the \JOB directory as "FEEDERS.REP".

1.11.13 Exporting the job

The job can be explicitly exported using the following function. Alternatively it will be exported when exiting from the program when the TFR file is saved.



Export

Once all the required actions have been completed, the job can be exported. A message box is displayed showing the results and the job is saved in the \JOB directory as "CURRENT.JOB". A feeder report is also saved.

RV place program.

1.12 INTRODUCTION.

The RV Place program is the software that controls the final setup of the job and running the placement system.

1.13 SEQUENCE OF EVENTS.

- ◆ Setup Feeder Units.
- ◆ Setup PCB References.
- ◆ Teach References To Vision System.
- ◆ Placing The Components.
- ◆ Correcting Errors.

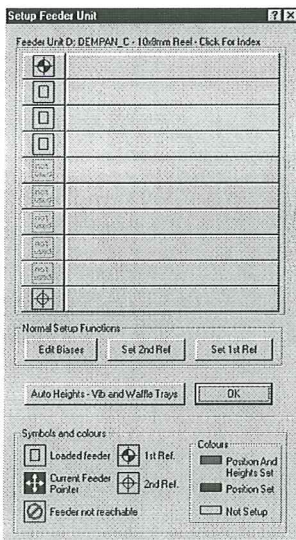
1.13.1 Setting Up Feeder Units.

Setting up the picking positions and heights on the feeder units is initially completed on the whole feeder unit, and any small adjustments to specific tracks can be made after.

1. Set 1st Ref.
2. Set 2nd Ref. (If Required)
3. Set Height. (Set height for each feeder separately or as a complete unit).
4. Edit biases. (If required, usually on Vib feeders or for 0402 components).

After starting RV Place and if necessary completing the warm-up procedure, exit from the main placement screen by clicking "Exit".

From the menu select **Setup| Setup Feeders**.



1.13.1.1 1st Reference.

Click on the 1st reference button. The head will pick up tool one as this is used as the guide for setting the reference.

Move the head using the head control buttons so the tool lines up with the waiting component in the track indicated with the 1st reference symbol on the feeder set up screen. The tool should just be touching the component.

Clicking on the feeder track in the setup screen will index the feeder.

On 0402 components it is better to have the tool just above the tape as the picking action can disturb other components in the tape.

Click "OK".

The software now gives you the option to set this feeder height for all feeders in this unit, just the feeder being set or the option to reset the pick height.

Once the 1st reference has been set the 2nd reference position is calculated by the software.

1.13.1.2 2nd Reference.

This position can be reset using the same procedure as above.

1.13.1.3 Edit Biases.

This allows the picking position to be reset for an individual feeder track. Keep selecting "No" until the required track has been selected. The positions is then adjusted as above.

This will need to be completed on vibratory feeders where different width sticks are being used.

1.13.1.4 Auto Heights – Vib and Waffle Trays.

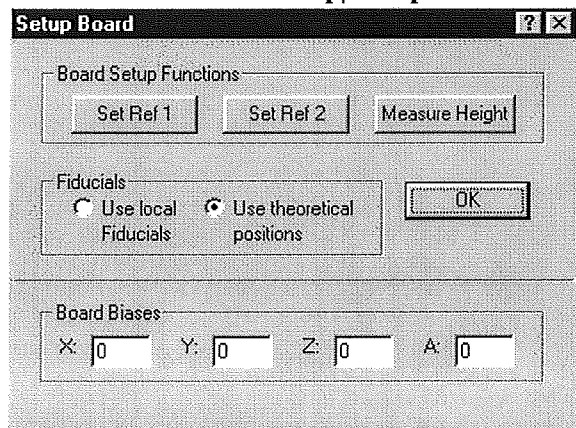
This will lower the nozzle over each feeder track and individually measure the picking height using the nozzle over travel sensor.

1.13.2 Setting Up PCB References.

The actual positions of the programmed reference points need to be taught into the software.

1. Set Ref 1.
2. Set Ref 2.
3. Measure PCB height.

From the menu select **Setup| Setup PCB.**



1.13.2.1 Set Ref 1.

Click on this button and the machine will select tool 1.

Move the head so the tool lines up with the 1st reference position.

Click "OK".

The 2nd reference position will be calculated by the software, but this position can be verified if required.

The software will then measure the height of the PCB.

Any global adjustments can be made to the placement positions in this screen. X,Y and Z

adjustments are made in thousands of an inch. Angular adjustments will rotate the whole PCB around reference 1, and are made in 1/10th of a degree. Positive number will rotate the PCB clockwise.

1.13.3 Teaching the Fiducial Vision system.

This is completed in the main placement screen.

Click on the Fiducial Correct icon. This will reveal the teaching screen.

The teaching sequence is:

1. Edit the position (If necessary).
2. Edit the clip position to hide any other pads which could confuse the vision system.
3. Set the camera threshold (toggle between real view and camera view and adjust the threshold until a clear image of the fiducial is achieved.)
4. Test the image using the "Test" button.
5. If the test is successful then select "Auto" button. This will then calculate and variation and adjust the placement positions to compensate for this.
6. If a good image can not be achieved select "Use Current Positions" to come out of this screen.

Once the fiducials have been taught the Auto Fiducial Correct box can be checked. The vision system will then inspect the fiducials at the beginning of every PCB.

1.13.4 Placing Components.

Clicking on "Place All" will start the placement sequence.

To interrupt the placement at any time press the space bar once.

At the end of the placement sequence any errors will be indicated and logged by the software, so once they have been corrected the repair sequence can be completed.

1.13.5 Correcting Errors.

Any errors will be shown at the end of the placement sequence. Each error feeder track will be indicated with a white ! on a red background.

REFERENCES AND GLOSSARY

CDF

The CDF (Component Descriptor File) is a Versatronics format file containing all the necessary information regarding a component types (e.g. "PLCC44") XYZ dimensions, vacuum pickup tool used, pin one location, etc.

For further information on CDF files, see the relevant help topic..

TFR

the TFR (Transfer) format file embeds the Bom, placement, fiducial and Gerber information. This file can be produced on a separate off-line PC and later transferred to the pick & place local PC for machine specific setup.

VBM format

This is Bill of Materials format used by Versatronics programs, containing ident, part number and component type data - usually generated by the BOM conversion filter.

For further information on Bom conversion, see the relevant help topic.

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