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Pick and Place Fiducial Requirements

A minimum of 2 Fiducials is required for SMT machine placement, ideally in the extreme corners of the board so that the distance between the fiducials for a given board size is maximized.

Fiducial Marks can be any shape, but common ones include

- i) Circle
- ii) Square
- iii) Rectangle
- iv) Cross-hair ('+' symbol)

The fiducial mark must be constructed on the copper layer to enable the machine to locate the pads required for accurate placement. The use of pad holes, vias, etc as fiducials will add an error to the placement accuracy due to the pcb manufacturers registration error for these layers.

Smallest size of any fiducial mark is 0.5mm. Recommended size is 0.75mm. The recommended shape is a circle, followed by square, then cross hair.

Fiducial mark to be surrounded by a solder mask exclusion area equal to twice the size of the fiducial mark. No other marks or features to be contained within the solder mask exclusion area.

Fiducial recognition is performed by a machine mounted camera and is normally performed by automatic shape recognition of the fiducial mark at board insertion stage. Manual operator recognition via a joystick with cross hairs while viewing a magnified image of the fiducial mark is performed if automatic machine recognition is not able to completed successfully.

The fiducial solder mask exclusion area should be at least 2mm from the board edge to allow clearance from board edge holders.

Local fiducial marks for fine pitch parts are not required, provided the board fiducial marks are available and usable.

Recommended fiducial mark location is one mark in the lower left corner of the board, and a second mark in the top right corner of the board. If there is insufficient PCB room in these locations, then the marks can be any vacant region of the board with the maximum possible distance between the marks.

If space is an issue, then the marks can also be located underneath PTH connectors or components, and even SMT parts as the fiducial marks are only required to locate the board at the beginning of SMT Assembly.

The fiducial mark should not be included in the solder paste stencil design as the solder paste will obscure vision of the fiducial mark. Separate solder stencil fiducials should be used if required.

Fiducial mark dimensions are recommended to be defined in metric dimensions (eg. 1mm, 1.25mm 1.5mm etc). Any non-standard or imperial dimensions are fine, but need to be accurately defined in the PCB CAD data.