MRSI-M3
Die Bonder
Operational Manual
July 2017

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A.   TEACHING PROCEDURES

2.1 Teach Station

Follow these steps to teach a new station:
1) Click **TEACH STATION** in the **TEACH** dropdown menu
2) Set parameters for teaching:
    a) Station type – whether the station is an input or output (usually input)
    b) Station Number – the number listed under the wafflepack
    c) Taught as – either wafflepack or wafer (usually wafflepack).
3) Not sure if necessary to include stopped here

2.2 Teach Waffle Pack

Follow these steps to teach a new waffle pack:
1) Click **TEACH WAFFLEPACK** in the **TEACH** dropdown menu
2) Enter a name for the Wafflepack you are teaching and press **Teach**
3) Set parameters for teaching
    a) Station Number – the number listed under the wafflepack
    b) Camera Number – Should be one
    c) Number of pockets along the X - should match the number of pockets from left to right
    d) Number of pockets along the Y - should match the number of pockets from top to bottom
    e) Teach points per pockets – Should be one unless there are big pockets
4) Teach the center of pockets by lining the camera up on the pocket, pressing **OK** and double clicking the approximate center of pocket. If you have trouble to see, adjust lighting.
    a) Center of pocket [1,1] is the upper left pocket
    b) Center of pocket [N,1] is the upper right pocket
    c) Center of pocket [1,N] is the lower left pocket
5) Teach Height (you can line up with camera one and switch to camera two) May have to increase lighting when switching to camera 2. Auto focus with laser to keep camera in focus. The focal length is used to find the height.
    a) For top of the Wafflepack choose a space in between pockets, press OK
    b) For bottom of the Waffle pack choose the bottom of the pocket, press OK
6) After finished click **To View and Save Data t**hen **Save** in the next window
7) Press **Check** to have the machine verify the accuracy of your recipe

2.3 Teach Die (Single Picture with Checkpoints)

Follow these steps to teach a new die
1) Click **TEACH DIE** in the **TEACH** dropdown menu
2) Enter a name for the Die and press **Teach**
3) Go to Die Location menu:
    a) Input Station Number – The number under the Wafflepack
    b) Camera Number – Should be one
    c) Wafflepack Name – Pick the Wafflepack the Die is in
    d) Press **Go To**
    e) Teach Focus if not already taught (click button and focus camera over the object)
    f) Press **Next** when finished
4) Set Parameters for Teaching menu:
    a) Die Center -Select "1 picture" for regular sized dies

b) Orientation Method - Select "check points"
c) Fiducials – Check if you need finely adjusted placement and orientation
d) Lockup Camera Orientation – should select "check points"
e) Bumps – Features on the underside of the die select if you want to use the features on bottom of the die to orientate the camera

5) Teach menu:
   a) Teach Die Edges :
      i) Adjust lighting so the contrast between the pocket and die is large and press **OK**.
      ii) Click "**Click to change ROI**." Adjust ROI box to be about the size of the pocket. Press **Teach**.
      iii) Select *Boundary Analysis* and press **Next.**
      iv) Adjust filter and threshold parameters to make the contrast even greater then press **Next**.
      v) Select the *Shape*, *Transition* and *Control* and press **Next**.
      vi) Press **START** to tract the die edges if acceptable press the green smiley face.
      vii) Press **Accept** in the Teach Die Boundary Window.
   b) Teach Orientation:
      i) Set lighting – adjust lighting if needed to improve contrast
      ii) Teach orientation – Leads to the Point checking menu where you can adjust the following parameters
         (1) Image – Normal
         (2) Shape – Choose Rectangle
         (3) Method – Choose average
         (4) Radius – Adjust the size of the check points
         (5) Accept – The tolerance for acceptable contrast
      iii) **Press Set Check Points** and double click two distinct features with contrast of at least 100 apart. This will affect the orientation by setting points that the machine will look for later to know how the machine should be angled.
      iv) Press **Teach** then **Next**
      v) In the Teach Pattern window press **START** and if the scan is good click the green smiley face then quit to Teach Menu

6) Select Angle Offset, if necessary
7) Select Pick Offset, if necessary
8) Display Tip – Choose a tip from the dropdown menu (the smaller the number the larger the size) the tip should be around one fourth of the surface area of the die.
9) Press **OK** then **Save**

2.4 Teach Alignment

Alignments create a reference frame or coordinate system for parts. When a program is taught the locations of parts are learned in relation to alignments. When a program is run, the alignment is checked and compared to the taught alignment. Adding more alignments ensure that a part is placed and orientated correctly. Below are the types of alignments available:

Alignment Type	Description
Assembly Station	Creates starting point for all programs. Taught once during setup. Can be taught later if maintenance alters assembly location.
Boat	Creates a grid of locations to the let the program build on each location in the part carrier. Not required.
Global Alignment	Always use a global alignment with any program.

Edge	Two points that sent origin and orientation of all program data. Program origin is edge point 1. Program orientation is the direction from edge point 1 to point 2. Optional part of global alignment only. Not required.
Height	One height point raises or lowers entire program. Three height points will tilt the X and Y plane.
Multi-Up	Creates a grid of program locations inside the global alignment. Optional part of global alignment only. Not required.
Pads	Program a group of features to adjust the program locations. Average offset is used to adjust X and Y location and orientation of program. Will not shrink or stretch the program locations.
Local Alignment	Used after global alignments. Adjusts the remaining program by the average of the X and Y offset. Will not shrink or stretch the program locations.
Nested Alignment	Local alignment taught in reference to another local alignment.

Below are the steps to teach an alignment.
1) Click **TEACH ALIGNMENT** in the **TEACH** dropdown menu
2) Enter a name for the Alignment and press **Teach**
3) **Answer if it is a local alignment.**
   a) If **No** follow the steps below **2.5 Teach Global Alignment**:
   b) If **Yes** follow the steps below **2.6 Teach Local Alignment**:

2.5 Teach Global Alignment

Follow these steps to teach a global alignment:
1) Under Alignment Teaching Input window
   a) Select Boat Number and other parameters
   b) Select what type of alignment to use under the Method box (Selected Edge, Height, Pad)
   c) Adjust Multi-Up and Pad parameters if necessary
   d) Select **Teach**.
   e) Follow the following subsections to teach alignments:
      i) **2.7 Teach Edge Alignment**
      ii) **2.8 Teach Height Alignment**
      iii) **2.9 Teach Multi-up Alignment**
      iv) **2.10 Teach Pad Alignment**

2.6 Teach Local Alignment

Follow these steps to teach a local alignment:
2) Under Alignment Teaching Input window
   a) Select Base alignment and station number.
   b) Select what type of alignment to use under the Method box
   c) Select **Teach**.
3) Got an Error Could not finish this part of manual
4) Q. If your pattern is outside Field of View what should I do? No way to move pattern on the screen.

2.7 Teach Edge Alignment

Edge alignments are used in Global alignments only. Follow the steps below to teach Edge Alignment:
1) Select E1 this will be the origin.

a) In the next window adjust the position of the camera and lighting once satisfied press **OK.**
b) Select the method for finding edge **Boundary Analysis** of **Pattern Matching.** <mark>Change ROI, if necessary.</mark> Click **Next.**
c) Adjust the parameters in the following window to increase contrast and click **Next.**
d) Press **Start** and if the edge is clear enough press the green smiley**.**
2) Repeat the same steps for E2 this will define the X axis.
3) When finished click **Save.**

2.8 Teach Height Alignment

Height alignments are important for information for placing dies and dispensing substrate. Follow the steps below to teach Height Alignment.
1) Select the total number of points you will be using. Selecting one point will move it up or down a height. Selecting 3 points will tilt the X and Y plane.
2) Select what point wish to teach and click **POINT**
   a) Move camera and adjust lighting to point and press **OK**
   b) Double click the point you wish to teach with the cursor
   c) After Press **Height**
3) After points have been taught. You can add an optional safe height to prevent the machine from crashing into parts when moving. After press **SAVE.**

2.9 Teach Multi-up Alignment

Multi-Up defines a grid of locations for repeating the substrate program in each pocket of a boat. Follow the steps below to teach Multi-up Alignment:
1) Teach M1 this will the origin of the multi-up grid
   a) Move camera and adjust lighting to point and press **OK**
   b) Double click the point you wish to teach with the cursor
2) Teach M2 (if necessary) this will be the last unit of in the X axis. Defines the X axis. Follow the steps above to teach M2.
3) Teach M3 (if necessary) this will be the last unit in the Y axis. Defines the Y axis. Follow the steps above to teach M3.
4) Press **SAVE**

2.10 Teach Pad Alignment

Pads help align parts further and are great if an area is not reliable for placement. Pads are also needed if edge alignment is not good enough. A minimum of two pads must be taught to correct offset and rotation. Up to 16 pads can be taught, extra pads reduce the need for operation intervention, reduce error caused by one pad being found improperly. Compensates for differences between products from different suppliers. Follow the steps below to teach pads:
1) Select the pad to teach.
   a) In the next window adjust the position of the camera and lighting once satisfied press **OK.**
   b) Select the method for finding edge **Boundary Analysis** of **Pattern Matching.** Click **Next.**
   c) Adjust the parameters in the following window to increase contrast and click **Next.**
   d) Press **Start** and if the edge is clear enough press the green smiley**.**
2) Repeat the process for more pads. When finished press **SAVE**.

2.11 Teach Substrate

Follow the steps below to teach substrate:
1) Click **TEACH SUBSTRATE** in the **TEACH** dropdown menu
2) Enter a name for the Die and press **Teach**
3) Adjust the parameters in the **Substrate-Teaching Input** menu:
   a) # Placements – The maximum number of placements that can be taught. Always choose a number higher than the total placement number expected.
   b) Alignment – Choose the alignment to be used for the first placement (must be a global alignment)
4) In the **Placement Parameters** window select the radio button next to the operation that you wish to perform. More information can be found in the subsections listed below:
   a) **2.12 Die Placement**
   b) **2.13 Dispensing**
   c) **2.14 Needle Cleaning**
   d) **2.15 Local Alignment**
   e) **2.16 Switch Off**
5) After an operation is taught press **SAVE**
6) Press **ADD>** to add more operations to the list
7) Press **FINISH** when done.

Things to do:
1. 2.12 Die Placement
2. 2.13 Dispensing
3. 2.14 Needle Cleaning
4. 2.15 Local Alignment
5. 2.16 Switch Off
6. Teach Dispense Pattern
7. Operational Procedure Section
   i. Starting up machine
   ii. Production setup
   iii. Running Production, simulation
   iv. Turning off machine
   v. Maintenance

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