MITS Design Pro CAM-Lab for ElevenLab

Precautions

Intended Use

The intended use of the PCB Prototyping Machine is to process PCB by milling, drilling and routing. Any other uses are strongly prohibited.

While Processing

Keep away from the machine especially the spindle head while processing. Spindle head is constantly moving. Be sure to keep away and not to get your caught in the machine. Make sure to wear eye protective gear/goggle while processing.

Power Voltage

The allowable voltage for Eleven Lab $85V \sim 264V$. If the voltage of your region is out of range, be sure to use voltage regulator.

Working Area

The working area of Auto Lab is **229mm x 300mm**. Be sure to process within the working area of Auto Lab.

• Dry Run and Milling Speed

Below is the optimal speed for Auto Lab.

Dry Run	\cdots 20~30mm/sec
Milling Speed	\cdots 12~18mm/sec
Routing Speed	\cdots 1~ 2mm/sec

If the processing speed is too fast during processing or manual operation, step-out could occur to the machine.

Milling/Drill/Routing Tool Settings

The machine will process with the settings in **CAM Pref.** \rightarrow **Milling** \cdot **Drill** \cdot **Routing**. If the parameter in the setting is missing or unintended value, there is a possibility of tools breaking or processing error occurring. Be sure to check the parameter in the settings.

♦ Vacuum Cleaner

While processing, if the dust from the PCB piles up, not only the processing quality is affected by it, there also is a chance of spindle motor malfunction. Be sure to use Vacuum Cleaner while processing.

CAD with Dongle Key

Make sure to remove Dongle key when you are using the prototyping machine. Connection error may occur and prototyping machine may be unable to use.

♦ Tools and RPM

For processing, set the RPM to $30 \sim 40$. The unit in the software is x 1000RPM. To drill $0.3 \sim 0.4$ mm size holes, set the Lower2 $3 \sim 4$ mm/sec.

IMPORTANT

To drill 0.3~0.4mm size holes, go to **CAM Pref.** \rightarrow **Board Maker** and set the **Lower2** 3~4mm/sec. After setting the Lower2 speed slower, make sure to set **Drill Wait** and **Before Cutting** longer than the default setting. If not, there is a possibility of spindle head moving too early before the drilling is completely penetrated.

Transportation

Since the Auto Lab precision machine, use the container box which was used for shipping. For long distant transportation using carrier, make sure to select carrier with great handle care with the transportation. Do not apply any force to the shaft, lead screw, spindle head while transportation. It could result to have the accuracy to drop.

Spindle Motor Cleaning

Note that spindle motor and collet are ultra-precision component. In order to keep the machine performance well, daily checkup and cleaning is necessary. Spindle motor may result to malfunction when dust or debris are caught between tool and collet, decreasing the holding power of the tools. Make sure to check and clean the spindle motor before using.

♦ Warranty

The term of warranty for PCB Prototyping Machine is 1 year with the intended use. Note that spindle motor and consumable supplies are not included in the warranty. Also note that even within the warranty period, below circumstances will be considered as charged repair. <u>Improper use, inappropriate assembly,</u> <u>damage/breakage by carelessness, natural disaster, abrasion, modification,</u> <u>use of non-genuine components/parts, use in undesignated voltage.</u> Please operate with great care when you are using the machine without any training.

Contents

20

•	Introduction ••••••••••••••••••••••••••••••••••••	4
•	Prototyping Machine Part Name ••••••••••••••••••••••••••••••••••••	5
•	CAM-Auto Screen Basic Operation ••••••••••••••••••••••••••••••••••••	7
•	Setup Operation Check • • • • • • • • • • • • • • • • • • •	8
Ι.	Procedures •••••• P. 1	0
Ⅱ.	Preparation ••••••••••••••••••••••••••••••••••••	1
Ⅲ.	Set Milling Sequences ••••••P.1	4
IV.	Adjust •••••• P.1	7
V.	Process Top Layer	0
VI.	Adjust/Align Bottom Layer ••••• P.3	4
VII.	Process Bottom Layer ••••• P. 3	9
VII.	After Completed ••••• P. 4	3
	Trouble Shooting (USB, RS232C Serial Connection) ••••••• P.4	4
	Trouble Shooting (Prototyping Machine) ••••••••••••••••••••••••••••••••••••	6

v/#

Introduction

This manual is a tutorial guide to prototype PCB with Design Pro **CAM-Lab**. For further explanation, "mdemo.mit" file is used, which is automatically saved on to your computer when the software is installed.

Below are the board and the tools used in this tutorial guide.

Board

- Double-Sided Copper Cladded
- Thickness: 1.6mm
- Copper Thickness: 35μ m

Tools

- 90° Milling Bit 36mm
- Drill Bit O.8mm 38mm
- Router Bit 1.0mm 38mm

<File Used> mdemo.mit



Prototyping Machine Part Name



- 1 Power Switch
- 2 Spindle Head
- **3** Working Table



- 4 Pressure Foot
- 5 Depth Adjustment Screw
- $\boldsymbol{6}$ USB Camera
- ${\bf 7}$ Tool Change Lever
- 8 Vacuum Nozzle



- **9** AC IN (Power Plug)
- 10 AC OUT (Vacuum Outlet)
- 11 Fuse Holder
- 12 USB Port
- 13 Dip Switch
- 14 RS-232C Port
- 15 Vacuum Hose Connector

• CAM-Lab Screen Basic Operation

CAM-Lab Screen

MDesign Pro(CAM-Auto) - NoTitle		
The View Information Work Prefs. CAM Prefs. Inp Meter Help		Application
Cop ▼ No. 4 Type:C Width1:0,100 ▼ Line ▼ Inm ▼		(3)
化酰氨化化化 化放油化化 的复数形式 化铁连水石 经非正式 化分子 化分子 化分子		
化清洁 医马克斯氏 医马克斯氏 化化合金 医水子 化分子 化分子 化分子 化分子 化化分子		
化氯化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化化		
ata yan mala yan kata pan saya kata yan kata		
en o a a a caso e caso de a a a caso de a a a caso de a a caso de a a caso de a a caso de a a a caso de a a a Nome a a a caso de a a a a caso sela a a a a caso de a a a a caso de a a a a caso de a		
***************************************		***************
		и и и и и кака и и и и и и и и И и и и и и ки и и и и и и и и

	-0.000 0.258	
	J J J	

- 1 Command Icons
- ② CAD Origin
- (3) Application

Basic Operation

Mouse Scroll : Move Up/Down Shift + Scroll : Move Right/Left

Ctrl + Scroll : Zoom In/Out

Keyboard

Esc : Pause Milling Backspace : Undo Shift + Backspace : Redo Delete : Delete Selected Element

Setup Operation Check

1. Connect the power cable to the AC In (Power Plug).



2. Attach and hold the vacuum hose by fixing the plastic vacuum holder on the backside of the machine with the screw.



3. Attach vacuum hose into the connector.



4. Connect the USB cable to the USB port.



5. Connect the Vacuum Cleaner to the Prototyping Machine with power cable. Be sure to turn the Vacuum Cleaner power "On" at all time.



6. Turn the power switch "On". The spindle head will move to the back left corner.



Warning: Please contact us if the machine does not move to the back left corner.

I. Procedures

The below is the procedures to produce prototype PCB.

<u>Preparation</u>

— Open "mdemo.mit" file

— Setup underlay and PCB

t

<u>Set Milling Sequence</u> ↓

<u>Adjust</u>

— Set P1P2
 — Camera Offset
 — Adjust Milling Width
 — Drill Fiducial Holes

Process Top Layer

- Drill (Top)
- Mill (Top)
↓

Adjust Bottom ↓

Process Bottom Layer

- Route (Btm)

II. Preparation

2

First you will begin with the below steps.

- 1 0 pen mdemo.mit file (1~2)
- 2 Set underlay and PCB on working table (3~4)

mdemo.mit file (below)







1. Click on Application and select CAM-Lab



2. Go to File \rightarrow Open and select mdemo.mit file. The files are saved as below for each OS.

Windows 7 :

Document \rightarrow Public Document \rightarrow Mits Software \rightarrow MT Path \rightarrow Data \rightarrow mdemo.mit

Windows Vista :

Public \rightarrow Documents \rightarrow Mits Software \rightarrow MT Path \rightarrow Data \rightarrow mdemo.mit

Windows XP :

Local Disc (C:) \rightarrow Documents and Settings \rightarrow All Users \rightarrow Shared Document \rightarrow Mits Software \rightarrow MT Path \rightarrow Data \rightarrow mdemo.mit



3. Next you will set underlay and PCB on to the working table. Clear the working table and place the underlay. Use the masking tape to hold the underlay.



4. Clear the underlay and place the PCB. Use the masking tape to hold the PCB.



You've completed the underlay and PCB setup. Now you will proceed to Set Milling Sequences.



III. Set Milling Sequences

Now you will set Milling Sequence. The sequence is as below.

udli

- Drill (Top)
- Mill (Top)
- Mill (Btm)
- Routing (Btm)

	ОК
	Cancel
_	Milling Sequence List
>> Dri Mil Mil Ro	III (Top) I (Top) I (Btm) uting (Btm)
	>> Dri Mil Mil Ro

1. Click on Start Job Icon

File	View	Information	Work Prefs.	CAM Prefs.	Trip Mete	er H	Help		
0	€ ¢	ି 🏠 🗟			D 🕂	Ş			
Тор		▼ No.	4 Type:C Wi	dth1:0.100			▼ Line	💌 mm	-

2. Window shown below will appear. Click Yes(Y).

Welcome. Click Yes to load machine parameters.	Welcome. Click Yes to load machine parameters.	formation	
Click Yes to load machine parameters.	Click Yes to load machine parameters.	Welcome.	
		Click Yes to load machine	parameters.
		Olick res to load machine	parameters.

Milling Sequence Settings window will appear.
 Check and see X quantity and Y quantity is set to 1.

X quantity		ОК
Y quantity 1		Cancel
Milling Job List		Milling Sequence List
iii (Top) xuting (Top) II (Btm) iii (Btm) xuting (Btm)	>>	
٠		Simulation mode

4. Next you will move the jobs from Milling Job List to Milling Sequence List. Double click on Drill (Top) in Milling Job List. The job will move to the Milling Sequence List.

Milling Sequence Settings	×	Milling Sequence Settings	×
X quantity 1	ОК	X quantity 1	ОК
Y quantity 1	Cancel	Y quantity 1	Cancel
Milling Job List Mill (Top) Drill (Top) Pouting (Top) Prill (Btm) Routing (Btm)	Milling Sequence List	Miling Job List Mili (Top) Drill (Top) Routing (Top) Mili (Btm) Drill (Btm) Routing (Btm)	Milling Sequence List Drill (Top)
• ·	Simulation mode		Simulation mode

- 5. Repeat the above and move the below jobs to the Milling Sequence List.
 - Mill (Top)
 - Mill (Btm)
 - Routing (Btm)

Milling Sequence S	ettings	×
X quantity	1	ОК
Y quantity	1	Cancel
Milling Job List Mill (Top) Drill (Top) Routing (Top) Mill (Btm) Drill (Btm) Routing (Btm)	>>	Milling Sequence List Drill (Top) Mill (Top) Mill (Btm) Routing (Btm)
•		Simulation mode

6. Click OK and the machine will move.

Now Milling Sequence setting is completed.

IV. Adjust

In Adjust you will do the below steps.

- Set P1 P2 (2~5)
 Set Camera Offset (6~14)
 Set Milling Width (15~17)
 Drill Fiducial Holes (18~25)
- P1 P2 : P1 P2 are the points used to determine the actual working area during the prototyping. As shown in the picture below, P1 is the intersected point which is 2mm to the left and down from the working area P2 is 2mm right and up from the working area. You will set P1 and P2 is automatically calculated and derived.



 Board Top/Bottom Change window will appear Click Adjust and Manual Operation Window will appear

						Manual Operation				
						CAMERA TOP Spindle ON OFF	Put mouse cursor ins Up Middle U Down U	de this frame to use arro To PD(standby poin BACK LEFT FRONT	w keys t) P2 UR RIGHT LR	OK Cancel Set P1-P Re-Skey Set P3
rd Top / Bo	ttom Change				×	Mara Balancian	×× 5mp	to dride Record	To Initial	Drill P1-P Surface
Milling Job	Drill (Top)		-			Move distance(mm) Dry run(mm/sec) Thickness(mm)	10.0000 30.0000 1.6000	Drill wait(ms) Mill spd. (mm/sec) Underlay(mm)	100 12.0000 1.6000	
Change top of	the board					Depth of cut(mm) Lower 1(mm/sec) Spindle(1000rpm)	3.0000 12.000 40	Lower2(mm/sec)	6.0000	
Continue	Redo	Skip	Adjus	t Suspe	end	"If P1 needs to b	e set, move head to des	X: -40.0000	Y: (190.0000 ;, dick OK.*

Now you will set P1 and P2.

2. Move the machine to the front left corner by using the Movement Icon (FRONT, BACK, LEFT, RIGHT) and entering distance to move per click in Move Distance.

						P2
Move distance(mm)	10.0000	Drill wait(ms)	100	UL	BACK	UR
Dry run(mm/sec)	30.0000	Mill spd. (mm/sec)	12.0000	LEFT		RIGHT
Thickness(mm)	1.6000	Underlay(mm)	1.6000	ш	FRONT	1 LR
Depth of cut(mm)	3.0000				1	
Lower 1(mm/sec)	12.000	Lower2(mm/sec)	6.0000	P1	P3	
Spindle(1000rpm)	40					To Initial

3. After moving the head to the left corner, click Set P1-P2.



4. Confirm P2 window will appear. Click No(N).



5. Click P1 and P2 button to check if the spindle head stays inside the PCB.



<u>WARNING</u> : Do not set P1 all the way at the left corner. Camera will not be able to use to read the fiducial hole when the board is flipped over.



P1 P2 setting is completed. Now you will set Camera Offset.



6. First, click P1 button.

7. Now you will change tools.

Turn the Tool Change Lever to the right and open the collet chuck.



Remove the dummy tool.



Insert the Milling Bit inside the collet chuck.



Make sure to insert the Milling Bit all the way inside and turn the Tool Change Lever to the left to close the collet chuck.



Tool Change is completed.

8. Use the depth adjustment to make the tip of the tool same height level as the pressure foot. The tool will move **down** when the depth adjustment is rotated **clock-wise** and **up** when rotated **counter clock-wise**.



- $\underline{\text{IMPORTANT}}$: The tool will move $3\,\mu\,\text{m}$ with 1 click on depth adjustment. 1 revolution will move 0.5mm.
- **9.** Click **ON** to turn the spindle on and click **DOWN** to move the spindle head down.

		To	P0(standby po	int)
	Up			P2
1	Middle	UL	BACK	UR
TOP		LEFT		RIGHT
pindle		ш	FRONT	LR
ON OFF		P1	P3	



10. Click **UP** to move the spindle head back up and **OFF** to turn the spindle off.



- Now you will check if the surface of the board has been milled.
 Repeat 8~10 until the board is milled.
- When the surface of the board is milled, clicked CAMERA. The head will move to camera position.





13. Launch Design View.



If the Design View does not display image from the USB camera, click **Source** and select appropriate camera.

Format	Source	Setting	Marker		🔲 Stay on top
				-	

14. Use the switch on the camera USB cable to adjust the light.



15. Next you will set the camera.



Click Marker button and click on the checkbox for ON and Stay on top.



Marker will be displayed on the window and Marker setting will be shown below. Click on the **Black colored box** and set the color of the marker. Click and select **Red** and click OK.





Circle diameter and Gauge interval will be used to align the center to P1.

Click on Format and select 640 x 480 x 16b and click OK.

	- D X
	Format
	640x480x16b (YUY2)
Format Source Setting Marker ON Stay on top	OK Cancel

For calibration, set as 90 pixel = 1 mm and click Set.



Design View will stay on top of other application. Move the Design Pro Manual Operation window as below.



Camera setting is now completed.

16. Click Offset

		To P0(star	ndby point)
Offset	Up		P2
	Middle	UL BA	
TOP	Dawa	LEFT	RIGHT
Spindle	Down		
		P1 P	3

 Camera Offset Window will appear. Check if the milled circle is on Design View screen. Click Snap to circle.

	Align center of camera with reference of spindle	×
1	Put mouse cursor inside this frame to use arrow keys	1
-		Offset
	UP Back	Cancel
	Z- Left Right	
$\land \forall - $	Front	
	Z+ Snap to circle	
	Z move 0.5000 mm XY move 100000 mm	

The machine will automatically move and align to the center of the circle. Click **OK**.



<u>*If the milled circle is not on the Design View screen, enter distance to move</u> per click in XY move and use movement icons.

Put mouse curso	r inside this frame	e to use arro	ow keys	Official
UP		Back	J	Cance
Z-	Left] [Right	
Z+		Front		
			Snap to circle	

Check if the center of the camera is aligned to the milled circle and click
 Offset.

	Align center of camera with reference of spindle	×
T T	Put mouse cursor inside this frame to use arrow keys	
	UP Back	Cancel
+++++++	Z- Left Right	
	Z+	
	Snap to circle	
	Z move 0.5000 mm XY move 1.0000 mm	

If the center of the camera is not aligned to the milled circle, enter distance to move in XY move and use Circle diameter on Design Viewon Design View to align.

19. Click CAMERA button and end camera mode.

CAPIEICA		T	o PO(standby po	iint)
Offset	Up			P2
1	Middle	UL	BACK	UR
TOP		LEFT		RIGHT
pindle	Down	u	FRONT	LR
		P1	P3	

Camera offset is not completed. Now you will set milling width.

20. Click **P2**.

		P2	
UL	BACK	UR	
LEFT		RIGHT	
LL	FRONT	LR	
P1	P3		E
		To Initial	

21. Move the spindle head 5mm to the right by entering the **Move Distance 5** and clicking **RIGHT** button once.

		To	o PO(standby poi	nt)
	Up			P2
	Middle	UL	BACK	UR
TOP		LEFT	_ [RIGHT
Spindle	Down	ш	FRONT	LR
		P1	P3	
				To Initial
	<<	Snap to cird	e Reca	pture Settin
_	-			Leas.

22. Click **CAMERA** button and click **Milling Width**.



23. Check Milling Width window will appear. Click Go.

lick Go to che	ck milling width	
Go		
	-	

24. The machine will automatically mill and measure the milling width. The result will be shown. Use the depth adjustment screw to set it to 0.3mm. Rotate the depth adjustment screw clock wise to widen the milling width and counter clockwise to thin it.



25. After depth adjustment screw is set, click **Go** again. The machine will automatically move 1mm back and mill.



26. Repeat 23~25 until the result becomes 0.3mm. After it becomes 0.3mm, click Close.

Check Milling Width	
Click Go to check milling width	
Test cut Close	

27. Click CAMERA and end camera mode.

		Po(stanuby po	any
Up			P2
Middle	UL	BACK	UR
Down	LEFT		RIGHT
DOWNT	u	FRONT	LR
	P1	P3	
	Up Middle Down	Up Middle Down LL P1	Up Middle UL BACK Down LL FRONT P1 P3

Milling width setting is now completed. Next you will drill fiducial hole.

28. Turn the Tool Change Lever and change the tool to 0.8mm drill.



29. Click **Drill P1-P2**. Confirmation of drilling holes window will appear. Click **Yes(Y)**. The machine will automatically move to P1P2 and drill holes.



30. Click **CAMERA** button to double-check the offset. If the P1 and the center of the Design view is not aligned, repeat **16~18**.

	To P0(standby po	vint)	
Middle	UL BACK		
OP Down		RIGHT	

31. Click **OK** on the Manual Operation window.

		To	P0(standby poir	nt)	
	Up			P2	Cancel
	Middle	UL	BACK	UR	
TOP	Dama	LEFT		RIGHT	Set P1-P2
Spindle	Down	ш	FRONT	LR	Re-Skew
ON OFF		P1	P3		Set P3
				To Initial	Drill P1-P2

Adjust is now completed. You will now move on to Process Top Layer.

VI. Process Top Layer

Next you will process Top layer of the PCB.

1 - Drill (Top) (1∼3) 2 - Mill (Top) (4∼5)

Drill Top (Below)



Mill Top (Below)



Top Layer Completed (Below)



1. Check to see if the Milling Job is set as Drill (Top) and click Continue.

Ailling Job	Drill (Top)	
hanna tan of	the board	
unange top on		

2. Tool Change Window will appear. Check to see if the Milling Job is Drill (Top) and the diameter is 0.8000. Click Continue.

Milling Jo	ob Drill ((Top)	
	Change to	the following tool:	
Fool No.	8	Diame	eter 0.8000
		F	2PM 40
ost No.:	4 C	omment	
	million	Settings	٥
F Step	(milling)		the second se
Cor	ntinue	Fwd. Skip	Rev. Skip

3. Drilling will begin. Data which will be drilled will show in yellow and data drilled will show in red.





4. After drilling is finished, Board Top/Bottom Change window will appear. Check to see if the Milling Job is set as **Mill (Top)** and click **Continue**.

Milling Job	Mill (Top)	J	
	the heard		
Change top of	UIC DOBIO		

5. Tool Change Window will appear. Change the tool to 90° Milling Bit. Check to see if the Milling Job is Mill (Top) and the diameter is 0.3000. Click Continue.

	Tool Change	×
	Milling Job Mill (Top)	
	Change to the following tool:	
in II and	Tool No. 11 Diameter 0.3000)
	Speed 12.0 RPM 30	
	Post No.: 1 Comment:	Ĵ,
	☐ Step milling Settings	
	Continue Fwd. Skip Rev. Skip	
TT BO	Manual Redo Suspend	

6. Milling will begin. Data which will be milled will show in yellow and data milled will show in red.



7. After milling, the spindle head will move backwards.



Top layer prototype is now completed. Next you will flip the board over and align the fiducial points (P1 P2 points).



VII. Adjust/Align Bottom Layer

Next you will flip the board over and adjust/align to the fiducial points (P1 P2 points).

1 - Flip the board over (1~3)
2 - P1 P2 Adjust/Align (Bottom) (4~11)









1. Remove the tape on the PCB. Do not throw it away, it will be reused.



2. Flip the board over. Bring the left side of the board to the right side when it is flipped over.





3. Move the PCB to the left side and reused the tape to hold it down.



Next you will adjust/align P1 P2.

4. On Design Pro, Board Top / Bottom Change window is shown. Click Adjust.



5. Manual Operation window will show up. Click on P1.

P2			
UL	BACK	UR	
LEFT		RIGHT	
LL	FRONT	LR	
	P3	P1	
		To Initial	ANITS -

Open Design View Design View window.

and click CAMERA button in Manual Operation

		1	To PO(standby po	pint)
	Up	P2		
	Middle	UL	BACK	UR
BOTTOM	Down	LEFT		RIGHT
ndle		ш	FRONT	LR
			P3	P1
				To Initial

7. Use the movement button (FRONT, BACK, RIGHT, LEFT) to find the P1 hole on the Design View screen.



8. After confirming the P1 hole in the Design View window, click Snap to circle.

Put mouse cu	ursor inside this	frame to use an	rrow keys
1	To	PO(standby po	oint)
Up	P2		
Middle	UL	BACK	UR
Down	LEFT		RIGHT
	ш	FRONT	LR
		P3	P1
			To Initial
<<	Snap to circl	e Rec	apture Se

9. The machine will automatically move and align to the center of the circle. Click OK. Check if the center of the P1 and camera is aligned and click Set P1-P2.

Diamet	er of Snapp	ed Circle	_0
Min.:	0.8216	mm	
Max.:	0.8309	mm	
Average	e: 0.8262	mm	
2nd pix	el ratio: 0.98		ОК
			Set P1-P2
	+ +	1 1 1 1	Set P1-P2 Re-Skew
			Set P1-P2 Re-Skew Set P3

10. Confirm P2 window will appear. Click **Yes(Y)**.



 The machine will move to P2. Repeat 7~9 to use Snap to circle and align center of the P2 to the camera and click Set P1-P2.

	1.20		4 IM
	1 + + +		
	An A Anna An Anna An Anna An Anna An	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	10 - E -
Put mouse curs	to rinside this frame to use arrow keys		
Up	P2		
Middle	UL BACK UR		
Down	LEFT RIGHT	Set P1-P2	
	LL FRONT LR P3 P1	Re-Skew	
	To Initial	Set P3	
(Snap to circle Recapture Settin	Drill P1-P2	

12. Click OK on the Manual Operation window.

CAMERA		To	PO(standby po	pint)	UK
Offset	Up	P2			Cancel
- 1	Middle	UL	BACK	UR	
BOTTOM		LEFT		RIGHT	Set P1-P2
Spindle	Down	LL	FRONT	LR	Re-Skew
ON OFF			P3	P1	Set P3
				To Initial	Drill P1-P2

Bottom layer adjust/align is completed.

VIII. Process Bottom Layer

Lastly, it is the prototyping of the bottom layer.

1 - Mill (Btm) (1~3) 2 - Routing (Btm) (4~6)

Milling Bottom (Below)



Routing Bottom (Below)



Bottom Layer Completed (Below)



1. Check to see if the Milling Job is set as Mill (Btm) and click Continue.

Ailling Job	Mill (Btm)	
	a of the based	
hange botton	TOT THE DUALD	

2. Tool Change Window will appear. Check to see if the Milling Job is Drill (Top) and the diameter is 0.8000. Click Continue.

Milling Jo	b Mill (i	Btm)	
Tool No.	11	Diame	eter 0.3000
Speed	12.0	F	RPM 30
ost No.:	1 C	omment	
☐ Step	milling	Settings	٥
Cor	ntinue	Fwd. Skip	Rev. Skip
Ma	nual	Redo	Suspend

3. Milling will being. Data which will be milled will show in yellow and data milled will show in red.



4. After drilling is finished, Board Top/Bottom Change window will appear. Check to see if the Milling Job is set as **Routing (Btm)** and click **Continue**.

Milling Job	Routing (Btm)	
	E II - I - I - I - I - I - I - I - I - I	
Change botton	of the board	

5. Tool Change Window will appear. Change the tool to Router Bit 1.0mm. Check to see if the Milling Job is Routing (Btm) and the diameter is 1.0000. Click Continue.

Too	l Change	e				×
	Milling Jo	ЬR	louting (Btm)			
		Change	to the following to	ol:		
	Tool No.	1		Diameter	1.0000	
A Charles	Speed	2.0		RPM	40	
	ost No.:	8	Comment:			
	🗖 Step	milling	Settings		٢	
	Con	tinue	Fwd. Skip		Rev. Skip	
$L_{L,\theta,\theta,\dots,\theta,h} \neq 1$	Mar	nual	Redo		Suspend	

6. Routing will being. Data which will be routed will show in yellow and data milled will show in red.



1	P 🕤	1	-	1			-	D	1	-	V .																						
	2	• No.	4 T:	pe:C	lidth	1:0.1	00		_	2	Gri	d	•	nn	*]																	
											1																						
																								1									
																								•	1								
																								1									
																								1									
																								÷.									
											i i	T												1									
																								£									
																												F	Post N	0. T		Sub F	Pe
													5																				
														1															rip 3	396.20	92 /	Limit	

7. Closing Confirmation window will appear. Click **Close**.

	All th	e milling jobs h	nave been finished.	
		Select the	command.	
	Restart	Redo	Manual	Close
-				

Prototyping is completed.

Top Layer



IX. After Completed

Remove the masking tape from the PCB and use the brush to scrub the PCB.



Use the cutter knife or nipper to separate the finished PCB from the blank PCB.

Change from Router Bit to Dummy Tool.



<u>WARNING: Make sure to change back to Dummy Tool. The spindle motor needs to hold</u> <u>on to a tool at all time to maintain the retentive power.</u>

Turn the power switch off.



All operation is finished now.

Trouble Shooting (USB, RS232C Serial Connection)

- Prototyping Machine does not activate after clicking Start Job icon
 Enter SHIFT + ESC on the keyboard. Check the below points:
 - Prototyping Machine Switch is On
 - RS-232C Serial Cable/USB Cable is not connected
 - * For RS-232C Serial Cable, use Straight connection cable. Do not use reverse/cross connection.
 - If you are using USB, go to WINDOWS Device Manager in Control Panel. Check MITS USB driver is properly installed.

* If the Prototyping Machine does not activate with properly installed MITS USB driver, go to **CAM Prefs.** \rightarrow **Board Maker** in Design Pro. Set the RS232C port to USB. Click OK on the Board Maker Setting window and close Design Pro. The setting changed will be applied after the software is closed.

- 2. Port Open Error message appears after clicking 📕 Start Job icon
 - Go to CAM Prefs. \rightarrow Board Maker and select the port/cable you are using on RS232C port.
 - After selecting to the port, close Design Pro. The changes will be applied after the software is closed.
- 3. Prototyping Machine does not activate after clicking Start Job icon. If the connection does not suspend after entering SHIFT + ESC on the keyboard;
 - Turn the Power Switch Off and enter SHIFT + ESC again.
 - Go to Control Panel→Device Manager. Change the setting for USB Root Hub. (See next page)

<USB Root Hub Setting>

Go to Device Manager. Right click on USB Root Hub and select Properties.



Select Power Management tab and remove the check mark in the box for **Allow the computer to turn off this device to save power**.



Repeat the above for all of the USB Root Hub in Device Manager.

After setting has been changed, restart your computer.

If the connection trouble with USB cable does not resolve with the above, please use the USB Serial converter cable. We kindly ask you to source locally.

Trouble Shooting (Prototyping Machine)

◆ Working Area

When the machine moves out of the working area during processing or manual operation, the error message will appear.

Hardware Limit Error: Recovery (Manual Operation)

Click **Initial**. The spindle head will move to initial position and recover from hard limit error.

Hardware Limit Error: Recovery (While Processing) Click Suspend

If $\boxed{\mathbb{X}}$ is shown and stays, enter **SHIFT** + **ESC** on the keyboard. After doing so, turn the power switch off and back on.

♦ Step-Out

When step-out occurs, the software coordinates and the actual coordinates will be misaligned. Click **Initial** button in Manual Operation window to move the spindle head to initial position to realign the origin coordinates.

Lubricate Lead Screw

Lubricate the lead screw using the oil when abnormal sounds occur from the X, Y, Z-axis while processing. After coated with the oil, move the spindle head with manual operation to coat evenly.

* (Suggested Product : STP OIL TREATMENT)