

GENERAL PROCESS AND OPERATION SPECIFICATION

iBond 5000 Dual Wire Bonder

I. SCOPE

- A. The iBond5000 Dual wire bonder uses either aluminum or gold wire of diameter 1mil to make a strong electrical connection between two points on a sample. In industry, a wire bonder makes electrical connections between the integrated circuit and its package.

II. SAFETY

- A. Always keep your hands out of the working area while the bonding head is in operation
- B. The work holder can get hot and has the potential to burn or melt objects touching it.

III. APPLICABLE DOCUMENTS, MATERIALS AND REQUIREMENTS

- A. For a table of initial POWER, TIME, and FORCE settings, refer to factory manual.
- B. AggieFab provides 1 mil aluminum and 1 mil gold wires as part of normal lab fees.
 - 1. Approved substrate materials are glass, Si, and PVDF. For Aluminum wire bonding (wedge-wedge bonding), heating is not required. For Au wire bonding (Ball to wedge bonding), heated stage at 150 °C is required.
 - 2. The system can do ONLY 1 mil Au and Au bonding.
- C. For more information about the detailed operation of this tool refer to the iBond5000 Factory manual (Ask AggieFab staff for a copy).

IV. OPERATION

- A. Turn on the tool and prepare sample:
 - 1. Turn on interlock in the iLab.
 - 2. Turn on the machine by flipping the red switch on the back of the left-hand side of system.
 - 3. Lower the work holder to its minimum height and place it off to the side.
 - i Avoid contacting the wedge when removing the work holder.
 - 4. Load sample
 - i The sample should sit flat and tight on the work holder and clamped. Bonds may fail if this is done incorrectly.
 - ii Don't use tape to mount samples.
- B. Rethread the wedge (If needed):
 - 1. Refer to "Appendix B". Ask Aggiefab staff for help unless you are fully trained.
- C. Set the stage height:
 - 1. Lower the work holder to its minimum height.
 - 2. Put the work holder underneath the wedge.
 - 3. Wake up the machine by pressing button on lower side of the screen
 - 4. Load Recipe.
 - i Press "MANAGE" then in the Application Press "LOAD APP". You will be prompted with recipes in the system. Select the required one and Press "LOAD". Note that you do not have to press any other button except load recipe. Do not modify any other parameters.
 - 5. Move the work holder so that the wedge is approximately above the lowest bond surface.

6. Hold the left mouse button and look through microscope at the height of the wedge compared to the sample surface.
 - i. Press “Reset” (on the screen)
 - ii. Release the mouse button
 - iii. Raise the work holder a small amount.
 - iv. Continue adjusting the work holder height until the wedge is slightly above the lowest bond surface when the left mouse button is held.
- D. Heat the work holder (This is applicable ONLY for doing ThermoCompression Bonding, i.e., Au wire bonding, OR Ball to Wedge Bonding):
 - i. Go to the “info” tab on top middle of screen.
 - ii. Increase the work holder temperature to 150 °C.
 - iii. Turn “ON” the “W/H Heater”.
 - iv. Wait until the temperature is reached to 150 °C.
 - v. Then press the back button.
 - vi. Please do not touch/modify any other option.
- E. Make a bond:
 1. Make sure the screen is showing the bond 1 values.
 2. Bond 1:
 - i. While **holding** the mouse at the center position, move the work holder so that the wedge is above the desired bond area.
 - a. Bonds are always done going towards the back of the tool (Y-Direction). The tool will automatically move the sample based on the “Step” parameter.
 - ii. Release the button slowly.
 - a. The wedge will make first bond there.
 3. Bond 2:
 - i. Move the wedge above the desired bond area using either the mouse or by moving the work holder carefully.
 - ii. Press the left side button.
 - iii. Bring 2nd pad under the wedge. Then release the mouse button.

Note:

- I. The first bond will always be **Ball in case of Au wire** whereas it will be **Wedge in case if Al wire**. Otherwise, whole process (Bond 1 and Bond 2) will be same for Ball-wedge and Wedge to wedge.
- II. **For Wedge to Wedge** bonding, the mouse will be moving only in Y-DIRECTION and can be done using only Al wire.
- III. **For Ball to wedge** bonding, the mouse can be moved in any directions after making first ball on the surface of the sample. This can be done only using Au wire.
- F. Unload sample and turn off tool:
 1. Turn off the “W/H heat” in case of Au wire (**Ball**) bonding.
 2. Lower the work holder and slowly move it out from under the wedge.
 3. Unload sample.
 4. Gently place the work holder back under the wedge.
 5. Turn off the machine by flipping the red switch on the left.

V. SIGNATURES AND REVISION HISTORY

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Date: 2/18/2025

Revision	Author	Date	Revision Notes
A	Dr. Vibhor Kumar	01/21/2025	<u>First version for new wire bonder</u>

1 mil Aluminum Wire Bonding Parameters:

Parameter	Meaning	Bond 1 Value	Bond 2 Value
Search	Height the wedge moves to before bonding	1.44	1.44
Power	Ultrasonic bonding power.	2.23	2.34
Time	Bond time.	3.4	3.4
Force	How hard the wedge presses the wire against the bonding surface.	1.39	1.58
Step	Distance the stage moves forward after first bond.	2	N/A
Kink	Extra wire length added before going to the loop height.	0	N/A
Reverse	Distance stage moves back after bond 2.	0	N/A
Yspeed	Stage Speed.	1	N/A
Loop	Height the wedge rests at after bond 1.	1.68	N/A
Tail	Length of wire left on sample after second bond.	N/A	4.74
Tear	Force used to tear wire after second bond.	N/A	6.4

Appendix B: Rethreading the Wedge

1. Raise the “CLAMP” and “TOOL” lifter (left side)
2. Thread the wire through the 90° of the wedge hole.
3. Gently push the wire on back of the wedge hole so that it came out of the hole at the lower end of the hole.
4. Thread the wire through the tip of the wedge. (Figure 1)
 - a. Make sure there is enough wire to work with (Figure 1, Step 1)
 - b. Using the tweezers, grab the wire close to its end. (Figure 1, Step 2)
 - i. Make sure the wire on the wedge side of the tweezers is straight and short.
 - c. Move the wire behind the wedge and thread it in the backhole of wedge tip. (Figure 1, Step 3)
 - i. If the wire kinks, it needs to be cut and straightened. Go back to step (a).
 - ii. Keep in mind that the hole at the back of the wedge is at 45° and that using a different angle won't work.
 - iii. Figure 2 shows what a normal wedge looks like. The wedge on the tool may vary slightly than the figure.
 - d. A little bit of wire should be exiting the tip. (Figure 1, Step 4)
 - e. Pull the bent wire through and cut any access wire. (Figure 1, Step 5)
 - i. The tool will not feed correctly if the wire is twisted between the tip and the spool.
5. Lower the “CLAMP” and “TOOL” lifter (left side)

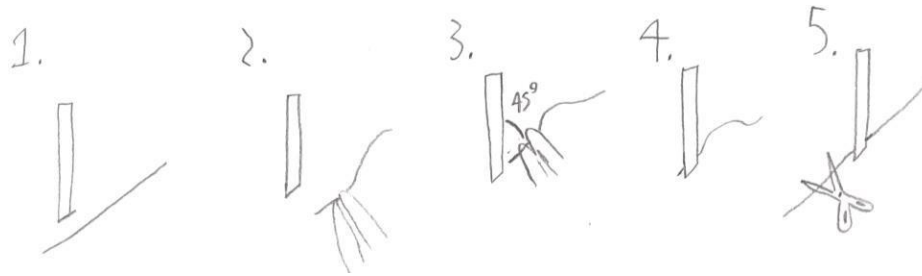


Figure 1: How to rethread the tip of the wedge

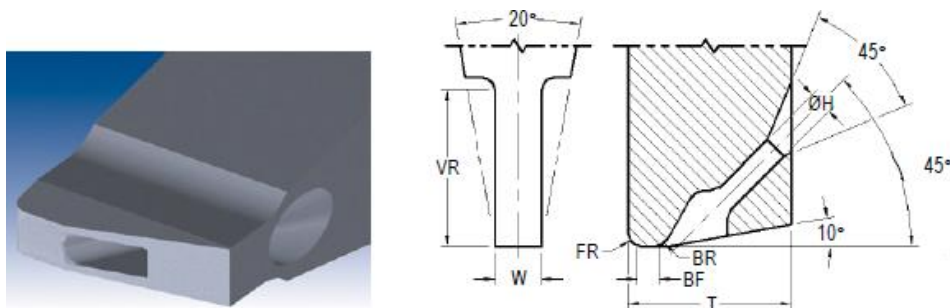


Figure 2: Wedge tip geometry