

Wire Bonding Manual
for the
Kulicke & Soffa Ltd. Dicing Systems Wire Bonder
Model 4526

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This manual is intended to inform members of the UNLV research team under Dr. R. Jacob Baker how to operate the Model 4526 Auto-Stepback Wedge Bonder.

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Standard Operating Procedure

I) **Initial Setup:** We will be operating the wire bonder in **Semi/Auto Mode** and using a **30° wire feed**.

a) Ensure the “SEMI AUTO” switch is in the “SEMI AUTO” position, then turn on the wire bonder using the power switch.



The “SEMI AUTO” and “Power” switches are located on the right and left control panels, respectively.

When the wire bonder powers on, it will run through a test cycle, then the bonding arm will default to its reset position (“HIGH” or “LOW” height).

b) Ensure the “LIGHT” switch is in the “ON” position.



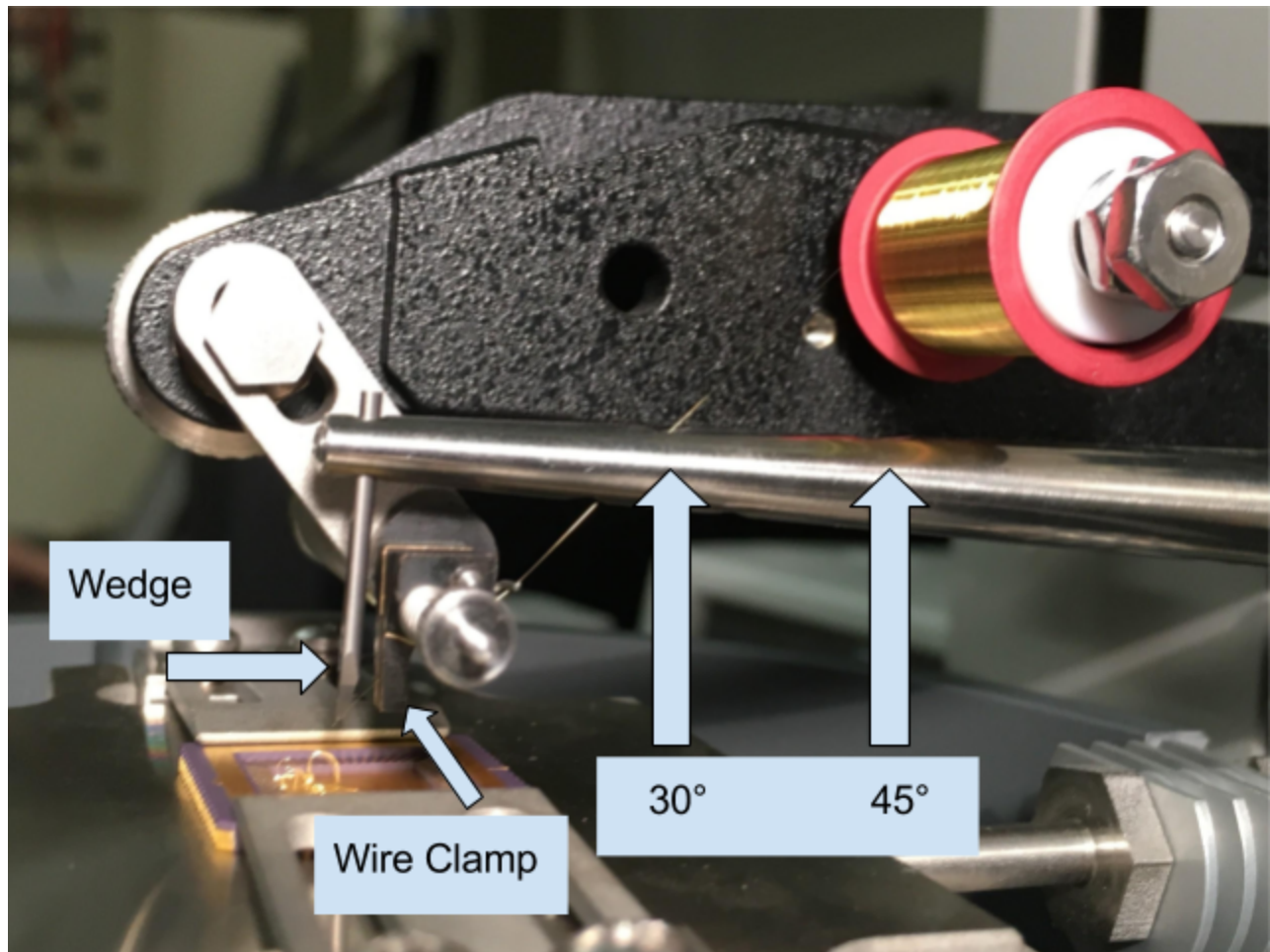
The “LIGHT” switch is located on the left control panel.

II) **Threading the wire bonder:** The Gold (Au) 1.0mil diameter wire must be threaded through a series of parts.

a) The wire must first be fed from the 0.5" spool (located on the bonding head directly above the wire clamp) through either the 30° wire feed hole in the bonding arm.

Note: Use gloves when handling the wedge or wire in order to prevent hand oils from entering the wedge holes.

Tip: When threading the wire it is recommended to use good quality tweezers and to tear a piece off from the end of the wire in order to have a straight sharp end.



b) The wire must then be fed through the wire clamp.

Open the clamp by switching the 'CLAMP' switch to the up position.

Also, lift the clamp lifter handle up to increase the space between the clamp and the wedge for easier access.

Then, feed the wire between the two plates of the clamp, close the clamp by switching the 'CLAMP' switch to the down position, and push the clamp lifter handle down.



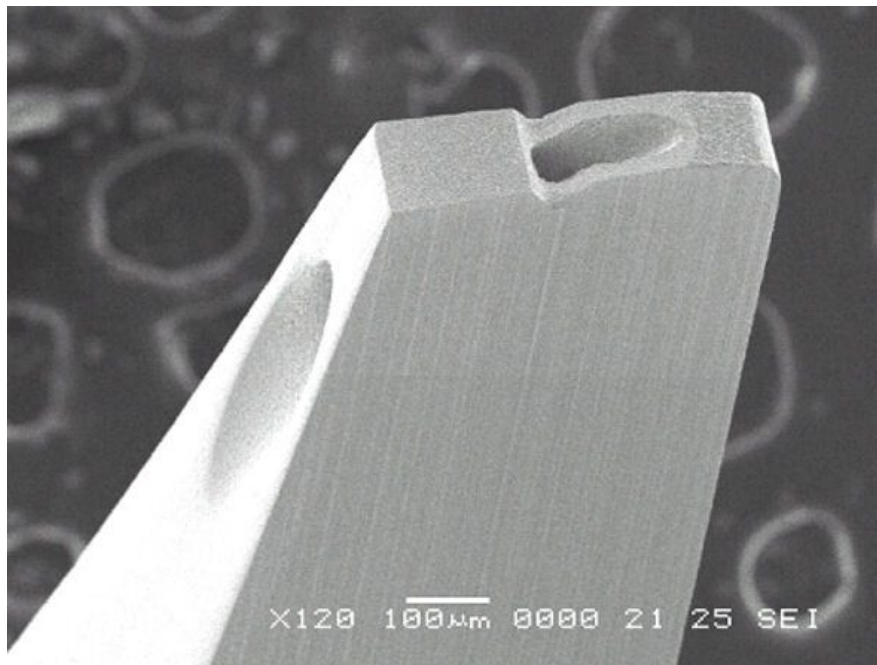
The "CLAMP" knob is located on the left control panel.



Wire clamp in the closed position

Note: After some time the clamp will automatically close, and the "2nd" indicator light on the left control panel will blink..Additionally, if the "RESET LEVEL" switch is in the "LOW" position, the bonding arm move to the "HIGH" position. If this happens, simply reset the bonder using the "RESET" switch and the clamp will open.

c) Next, the wire must be threaded through the wire bonding wedge.



The wire bonding wedge has an opening that is facing away from the operator.

Tip: If having difficulty threading the wire, remove the wedge using the Allen wrench provided. When putting the wedge back in place, use a wedge gauge to return the wedge to its proper height position. For our operation we are using the #750 wedge gauge.



Wedge gauges #750 and #828



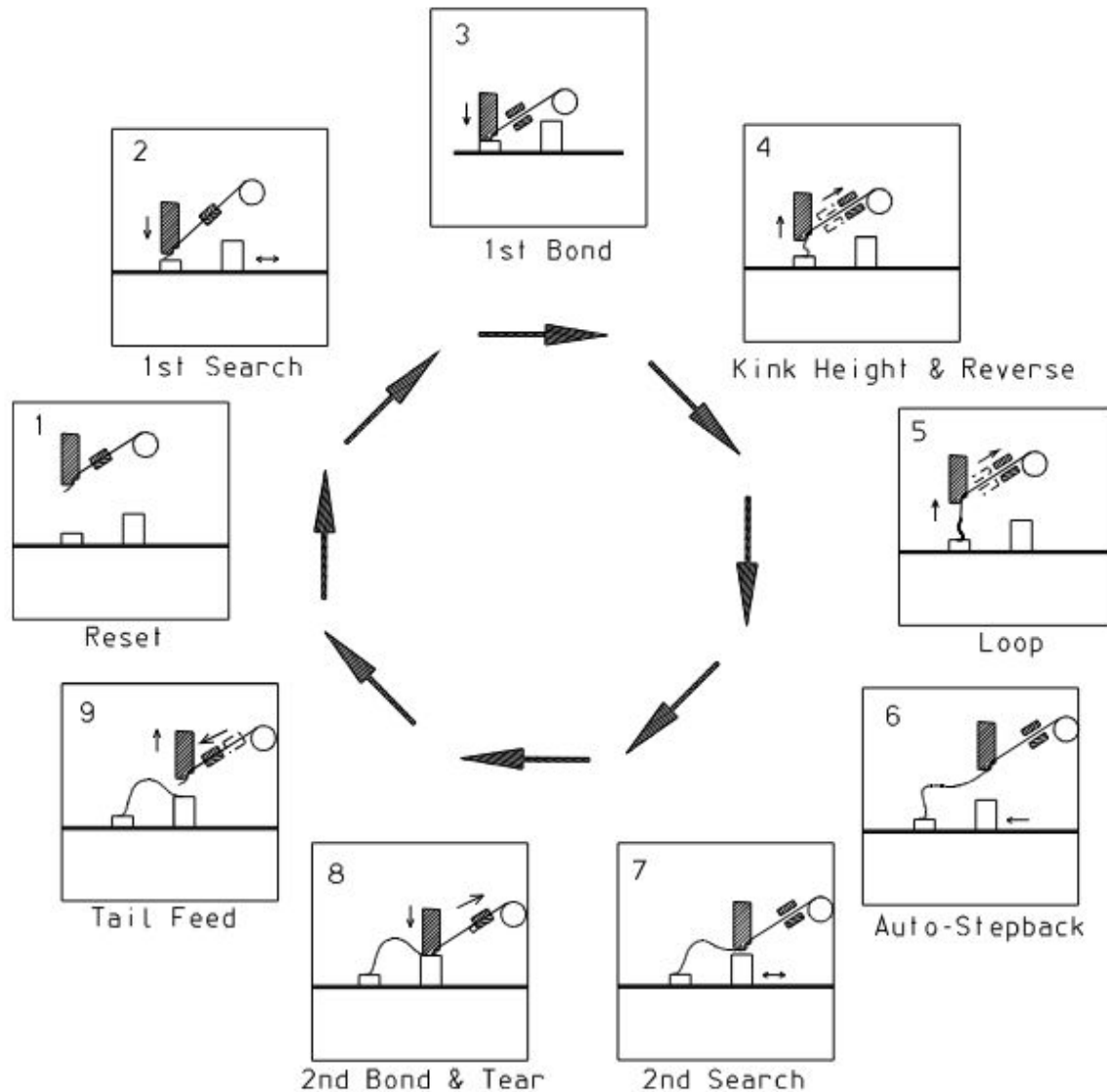
Wedge gauge operation

III) Setting the Height of the Workholder:

- a) Place the device that you want to wire bond on the workholder, and ensure it is properly secured using the workholder clamps.
- b) Set the “LOOP” dial on the left control panel to “1”.
- c) Press and release the left mouse button on the multi-mouse. The bonding head will lower to its lowest position and remain there. Ensure the “2nd” indicator light is on.
- d) Place the workholder with the device under the bonding head. Hold the top of the workholder and rotate the screw-like base of the workholder clockwise until the wedge barely touches the lowest bonding level of the device.
- e) Set the “LOOP” dial to “10”, then press and release the left mouse button on the multi-mouse in order to return the bonding head to the reset position.

Note: After following these steps the bonder will be able to operate in its maximum range of motion.

IV) The Bonding Process: The figure below demonstrates the wire bonding process



Wedge Bonding Cycle in Semi/Auto Mode - 30° Wire Feed

1. Reset

Again, when the wire bonder powers on, it will run through a test cycle, then the bonding arm will default to its reset position (“HIGH” or “LOW” height).controlled by the “RESET LEVEL” switch.

After changing the reset level, the three-position “RESET” switch must be flipped to the “RESET” (momentary) position in order to reset the bonding arm to its other reset level (from “LOW” to “HIGH” or vice versa).

The “RESET” switch in the mid-position permits normal operation.



The “RESET” and “RESET LEVEL” switches are located on the right control panel.

2. 1st Search

When the left mouse button on the multi-mouse is held down, the bonding wedge lowers to the 1st search height at which the wedge is directly above the first bond pad.

Tip: When attempting to complete the first bond, set the “SEARCH” knob to “10” then move down from there until the wedge is directly above the first bond pad in order to prevent accidentally hitting your device with the wedge.

Note: The search height can be adjusted during the bonding process. Therefore, while holding down the left button on the multi-mouse, you can change the value of the search height and see the wedge move in real time.



The “SEARCH” knobs are located on the left control panel. The top knob is for the first bond and the bottom knob is for the second bond.

3. 1st Bond

When the left mouse button on the multi-mouse is released after being held down, the bonding wedge lowers from the 1st search height and comes in full contact with the bond pad causing the wire to be bonded to the pad using ultrasonic energy.

The “2nd” indicator light will then light up instead of the “1st” indicator light, indicating you are attempting the second bond.

Tip: When the wedge is at the first search height above the first bond pad, ensure the wire is in the middle of the wedge rather than on the side of the wedge to guarantee the wire is bonded between the pad and the wedge.

The bond parameters include Power, Time, and Force:

Power: the amount of ultrasonic energy applied

Force: the downward force exerted by the bonding head during the bond

Time: the amount of time the ultrasonic energy and bonding force are applied



The bond parameter knobs are located on the left control panel. The top row corresponds to the first bond while the bottom row corresponds to the second bond.

Tip: When attempting to complete the first bond it is suggested that initial bond parameters be set following the table below. However, parameters change depending on the specific application.

| Parameter | Setting | | | |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| | 18 μm Gold | 25 μm Gold | 25 μm Alum | 25 x 125 μm Ribbon |
| Static bond force (gm) | 7 – 10 | 15 | 15 | 15 |
| Wire clamp gap (μm) | 70 | 100 | 100 | 100 |
| Wire clamp force (gm) | 80 – 100 | 80 – 100 | 80 – 100 | 100 – 120 |
| Workholder temperature ($^{\circ}\text{C}$) | 150 | 150 | | 150 |
| Initial Bond Dial Settings | | | | |
| 1 st POWER | 0 – 1 | 1 – 2 | 1 – 2 | 2 – 4 |
| 1 st TIME | 3* | 5* | 4 | 5* |
| 1 st FORCE | 0 – 1 | 1 – 2 | 1 – 2 | 4 – 5 |
| 1 st FORCE (gm) | 12 – 14 | 25 – 30 | 25 – 30 | 60 – 80 |
| LOOP | 3 | 4 | 4 | 4 |
| 2 nd POWER | 1 – 2 | 1.5 – 2.5 | 1.5 – 2.5 | 2.5 – 4.5 |
| 2 nd TIME | 3* | 5* | 5 | 5* |
| 2 nd FORCE | 0 – 1 | 1 – 2 | 1 – 2 | 5 |
| 2 nd FORCE (gm) | 14 – 16 | 25 – 30 | 25 – 30 | 60 – 80 |
| TAIL | 3 | 5 | 5 | 7 |

Initial Bond Parameter suggestions

4. Kink Height & Reverse

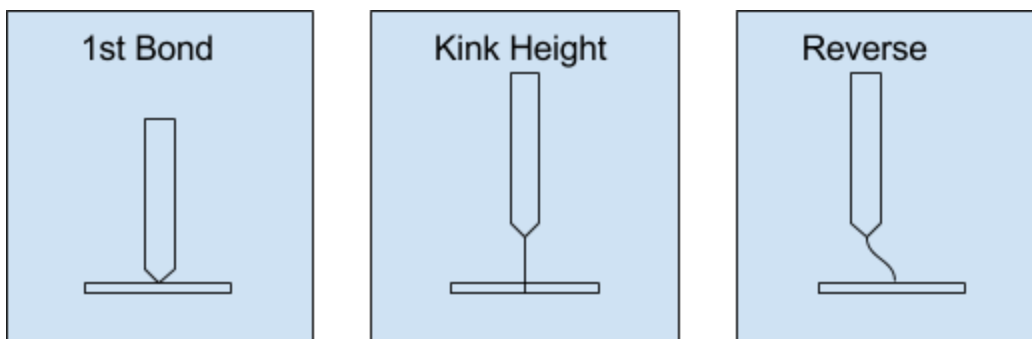
The kink height (controlled by the “KINK HEIGHT” knob) is the height the wedge goes to after the first bond.

The reverse (controlled by the “REVERSE” knob) is a motion where the wedge goes towards the operator (the workholder actually moves away from the operator, giving the impression that the wedge moves towards the operator and front of the chip). This feature is used in order to create asymmetrical loops.



The “KINK HEIGHT” and “REVERSE” knobs are located on the right control panel.

Note: With reverse or kink height set to zero, the wedge will go directly to the loop height, not creating a kink.



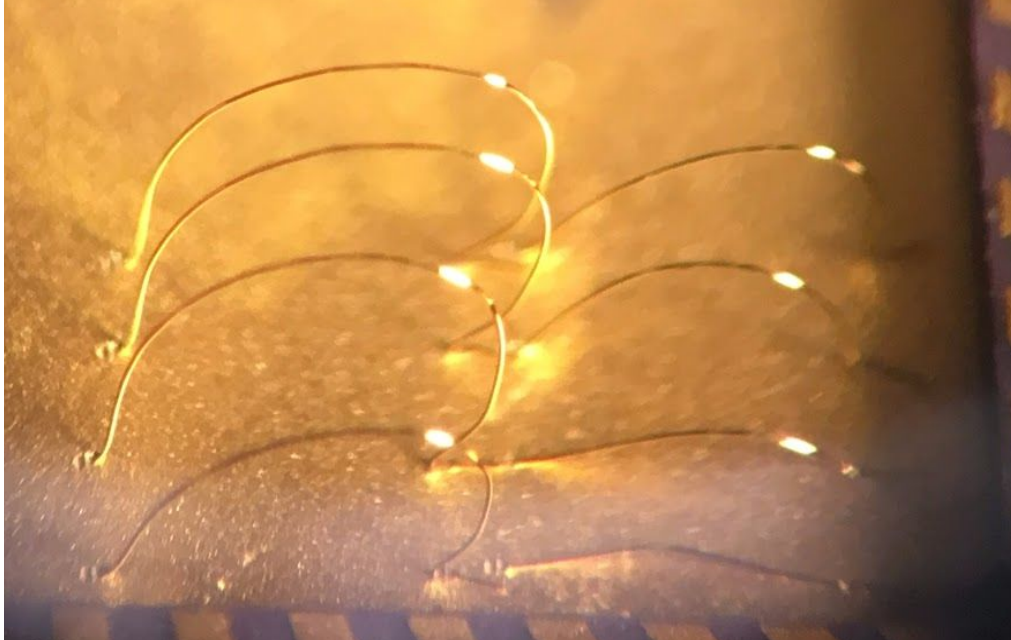
The reverse motion in the figure above is towards the operator.

5. Loop

The loop height (controlled by the “LOOP” knob) is the height to which the bonding head rises after performing the first bond. The loop height can be adjusted in real time.



The “LOOP” knob is located on the left control panel.



The above figures shows loops of different sizes. From the bottom right and going up, the “LOOP” knob was increased starting from 3 to 10.

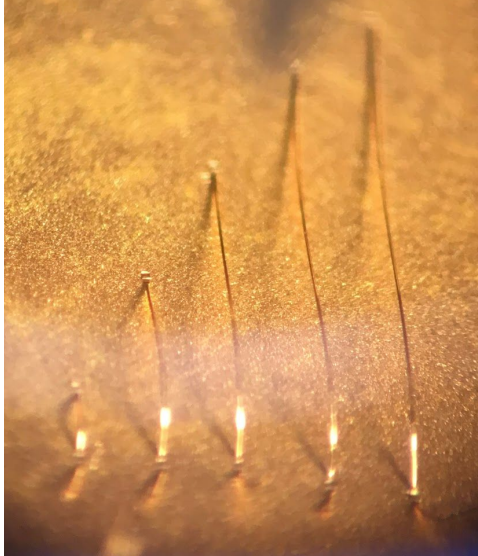
6. Auto-Stepback

Auto-Stepback is the Y-axis motion of the workholder from the first bonding pad to the second bonding pad.

The “STEP BACK” knob controls the distance the wedge automatically moves away from the operator (the workholder actually moves towards the operator, giving the impression that the wedge moves away from the operator and towards the back of the chip) in preparation of creating the second bond.



The “STEP BACK” knob is located on the right control panel.



The above figure shows completed bonds varying in step back distances. From left to right, the “STEP BACK” knob was increased starting from 2 to 10 in increments of 2.

7. 2nd Search

After the first bond has been made, the bonding head is at the specified loop height at some step back distance. At this time, the workholder can be moved if the wedge is not near the pad you are attempting to make the second bond to.

When the left mouse button on the multi-mouse is held down, the bonding wedge lowers to the 2nd search height at which the wedge is directly above the second bond pad.

Tip: When attempting to complete the second bond, set the “SEARCH” knob to “10” then move down from there until the wedge is directly above the second bond pad in order to prevent accidentally hitting your device with the wedge.

Note: The search height can be adjusted during the bonding process. Therefore, while holding down the left button on the multi-mouse, you can change the value of the search height and see the wedge move in real time.

8. 2nd Bond & Tear

When the left mouse button on the multi-mouse is released after being held down, the bonding wedge lowers from the 2nd search height and comes in full contact with the bond pad causing the wire to be bonded to the pad using ultrasonic energy. The “1st” indicator light will then light up instead of the “2nd” indicator light, indicating you are ready to begin the next bond.

Reference **1st Bond** for a description of the bond parameters and what values to set them.

Tip: When the wedge is at the second search height above the second bond pad, ensure the wire is in the middle of the wedge rather than on the side of the wedge to guarantee the wire is bonded between the pad and the wedge.

Tear is the force the bonder uses to tear the wire after the second bond is complete.



The “TEAR” knob is located on the right control panel.

9. Tail Feed

The tail feed is the amount of gold wire that is fed through the wedge after the second bond has been made, the wire has been teared, and the bonder is ready to begin the next bond. The tail length is controlled by the “TAIL” knob.

Note: If there is no tail after the second bond try lowering the second bond settings, increasing the tail length, and ensuring the clamp lifter is lowered.

Tip: A tail value of 4 is good for most applications. However, excess wire is usually guaranteed at that setting.



The “TAIL” knob is located on the left control panel.

Ordering New Bonding Wedges

Wedge #: 4WNL4-2025-T5G-M00

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Chalman Technologies

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sales@cti-rep.com

OR

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