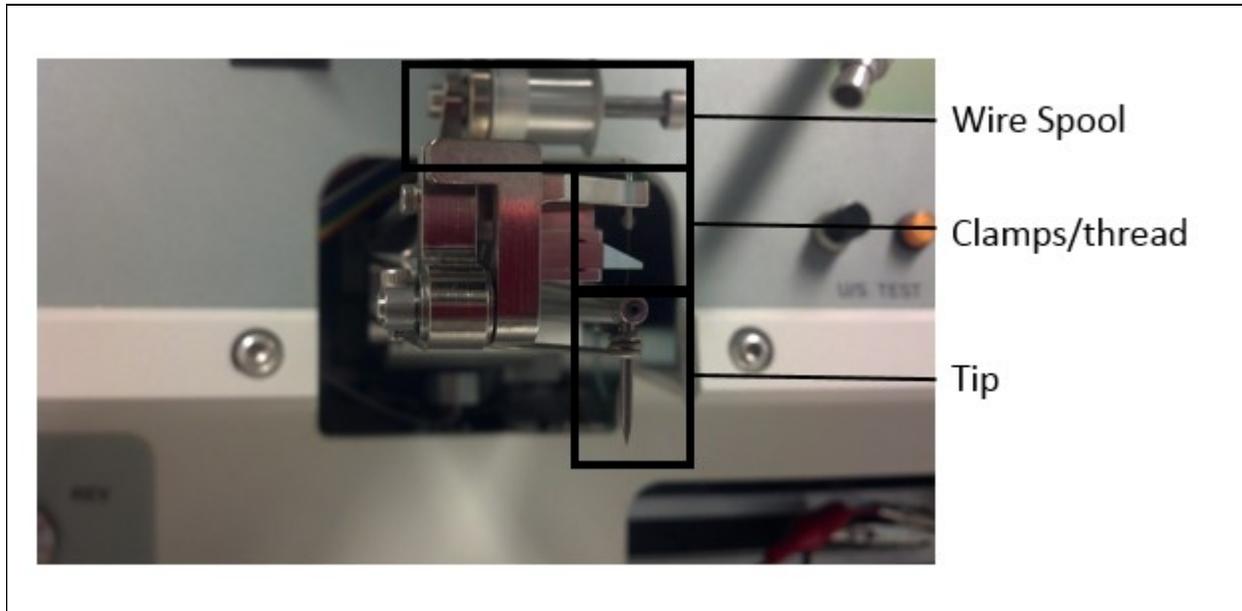


Westbond 7476D and 7476E

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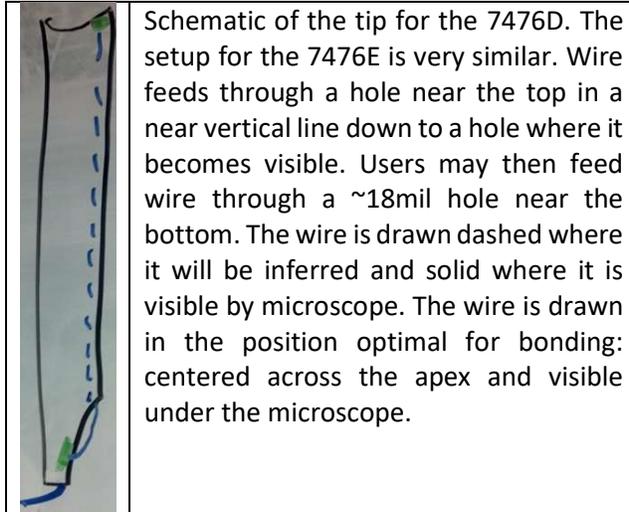
The main portion of the tool for the 7476D. The wire spool feeds through a hairpin shaped hole to fasten the wire, followed by air-powered pneumatic motored clamps, and into the vertically fashioned hole and tip, to come to rest through a ~18mil hole (tip specific) viewable through a microscope. The 7476E is extremely similar except in three respects: first, the wire is typically Au instead of Al; second, the lever apparatus is manipulated so that it bends vertically instead of in an arc; third, the tip is a different model, the most important difference being that the 7476D tip is rectangular at the apex and the 7476E tip is hemispherical.

Shortcut:

Typical machine parameter starting parameters for the 7476D and 7476E (optimum usually lies around these): 1st bond power 170, 1st bond ultrasonic time 70ms, 1st bond force low, 2nd bond power 240, 2nd bond ultrasonic time 90ms, 2nd bond force high, wire pull 7 steps, wire tail 55 steps. Gold wire (7476E) is much more substrate dependent than Aluminum wire (7476D.)

Description of parameters

Both wirebonders primarily catalyze formation of electrical connections using brief sonication pulses. A typical wirebonding job requires optimization of these parameters as well as careful manual control of the apex and position of the wire.



Manual cues consist of wire position, angle of attack, and spooling angle. The wire should always be centered below the tip. The angle of attack should be adjusted so that the wire acts as a buffer between the tip and the substrate (see above). The spooling angle after a successful first bond should be approximately 45 degrees, to balance normal and shear stress on the wire. After unspooling, users should check for the distinctive fan shape of a successful bond before making a second bond. Users should not change manual cues and instead adjust machine parameters, which are more precise. Rethreading is done manually as well, and training is suggested.

Machine Parameters.

- (1) Number of bonds. Most users choose 2. At Columbia we typically suggest that the first bond is on the carrier substrate and the second on the experimental substrate.
- (2) Sonication strength. First bond should typically be weaker than the second bond. This parameter is typically the only parameter that is adjusted when optimizing the machine. The balance is between parameters that will allow wire to stick vs. parameters that will damage objects on the chip. It certainly is possible that no optimum exists.
- (3) Sonication time. Sonication time is typically kept <100ms.
- (4) Wire Pull. After the last bond the bonder will pull sharply a specified number of motor steps to snap the wire at the apex, then push the wire back that same number of steps.
- (5) Wire tail. This is how many steps the wire pushes back after a pull. Typically at Columbia we set this high so that we can see the wire under the microscope after a bond.
- (6) High/Low force. Dual force is just set to "On." High and low forces are the force at which sonication starts, and were set by the tech at the time that the machine was serviced.

If something goes wrong

- (1) Wire unthreaded from the tip.
 - a. Attempt to rethread. If leaving the tip unthreaded report a problem on badger.
- (2) Wire unthreaded from the machine.
 - a. Top hairpin: bit by bit. Skip clamps. Get straight wire and thread through the vertical part of the tip all at once. Bit by bit occasionally works as well. Reset the wire inside the clamps. Finally, the tip apex, which is at a ~45 degree angle, can be threaded. If leaving the wire unspooled report a problem on badger.
- (3) Wire clogged.
 - a. Can attempt to dislodge the wire by pressing "U/S Test" on the machine while opening and closing the clamps. If this fails, remove the wire from the tip and clear with a tungsten wire, then rethread the wire. If uncomfortable doing so report a problem on badger.
- (4) Tip broken.
 - a. Do not attempt to fix it, immediately report a problem on badger.
- (5) Out of, or almost out of, wire.
 - a. If the machine is low on wire, report a problem on badger.
- (6) Others.
 - a. The badger system automatically sends the superuser an email when a problem is uploaded. REPORT PROBLEMS IF THERE ARE PROBLEMS.
 - b. Most "problems" turn out to be optimization issues. The wirebonder is a difficult instrument to optimize. Successful use of the tool requires patience.