

Specifications: Models 7730E Series, Ball-Wedge Wire Bonder, Manual X-Y-Z

Last Revised: 09/19/18 - microscope

WEST•BOND Model 7730E is a thermosonic ball-wedge wire bonder designed to interconnect wire leads to semiconductor, hybrid, or microwave devices. The machine bonds gold wires ranging from 0.0007 in. to 0.002 in. Bonds are made by the ball-to-wedge technique using ultrasonic energy and work piece heat. Wire is clamped and threaded vertically through a hollow capillary, allowing independent feeding action. The connection is begun with a ball formed on the end of the wire stock by electric discharge, and completed by a wedge bond under the end of the capillary tool. The bonding tool is guided manually by the operator using hand/eye reference to bond targets and elevations.

This series differs from the 7700E series in that the ultrasonic frequency is 110 Khz instead of 63 Khz.

Embodied in this series is a new and unique West-Bond three-axis micromanipulator in which the entire mechanism is arrayed above the work plane, so that there is now no limit to the size of a work piece. Each of the X, Y, and Z axes is straight-line and purely orthogonal, and each can be braked pneumatically on signal. In this application, all axes are braked during the ultrasonic bond time to aid operator control. Dual counterweights balance the pantograph arm and the tool support individually, and they are complemented by an adjustable spring to counterbalance different tool assemblies. The resulting feel and balance are the best of all the model series.

It should be understood that the pneumatic axis brakes cannot prevent deliberate efforts at movement, but that they are a significant aid in maintaining correct tool to work contact during bonding.

Range of movement of the tool by manipulator control is 0.5625 in. vertically and 0.6250 in. in horizontal directions with an 8/1 ratio of mechanical advantage.

Tool heads of this series are built around a new K~Sine Transducer, Model No. 34-C, operated at 110 KHz at power of 3.0 watts maximum. This transducer operates with a tool of 0.750" length mounted top flush. The wire clamp is air-opened and spring-closed, and has a self-contained closure pivot. A pivot about a separate axis generates the wire feed motions. Alignment of clamps to the tool is facilitated by individual adjustments along three axes. Actuation of all clamp motion is by the same spiral cam of an inboard motor and is transferred through the pivots of the four-bar linkage. Appropriate clamp motion settings for each method are configured in software and are retained in non-volatile memory.

The tool assembly is mounted on a four-bar linkage, like the "B" Series, so the tool remains vertical and can be extended down to any position that tunes ultrasonically. In standard arrangement, the extended tool provides clearance of 0.28125 in. under the ultrasonic transducer stack, and 0.3750 in. everywhere else above the work plane. Rigid bearing mounts, rather than taper loading, fix the strut bar of this assembly so that any required bond force can be applied. The standard set of force springs generates 10 to 150 grams, and together with the work-sensing firing switch, are built into the four-bar linkage. A dual force mechanism, operated pneumatically, acts to change between two pre-set force values, and either high or low force may be programmed for any bond. Radiant tool heat with panel mounted, constant current control is included.

An optical encoder built into the Z axis tracks the vertical tool motion in order to measure the elevation above each bond at which to initiate ball formation. To form precisely sized balls, a motor-shaft-mounted spiral cam drives the clamps to feed an exact new length, and a controlled quantity of electrical energy is discharged to the free wire end.

The high-resolution optical encoder enables a second function unique to West-Bond's "E" Series: Upon touchdown, contact is sensed by opening of firing switch contacts but initiation of ultrasonic energy, and the setting of the axis brakes, is withheld until the control is moved downward an additional amount sufficient to follow the deformation of the wire during bonding.

Control of machine logic, motor motions, and Ultrasonic energy is programmed to and executed by West-Bond Part No 8776 CPU containing a Motorola 68000 microprocessor and 256 KB of nonvolatile RAM. All machine configuration constants and bond settings are programmable at the machine panel, prompted by a series of "screens" displayed on a 4-line 40-character LCD. Thirty separate buffers of bond settings for a wire type can be entered and selected during bonding by a selector switch. Each wire type can have approximately 21 stitch bonds, each with its own settings of high or low force and of ultrasonic power and time. All programmed values are displayed during bonding. At "home", various options are enabled.

The ultrasonic transducer is K~Sine Model 34-C, one wave in length, operating at a nominal frequency of 110 KHZ. Built in ultrasonic power supply is K~Sine Part No 9060, three Watts, dual channel. Settings of power and time program values are sent via an eight-bit interface. Adjustment of current for radiant tool heat is included with the panel controls.

The mechanism of this series was designed to mount above a customer's work handling system, to be confined entirely above the work plane, and so not to have any base or work platform. In this configuration, models of this series are designated as "7~~~EX". For use as stand-alone complete bonding machines, the mechanism will be completed with a plain base and the bolt-on work platform from "C" Series, and will be designated as "7~~~E". An adjustable height platform, Feature -79C, is available as an option for "E" machines.

In either the "E" or the "EX" configurations, an optional control arm is included to move the single control point five inches vertically from its normal position near the machine base to a new location above the work plane. When the high control location is used, the customer must provide a suitable operator's forearm rest. This is essential both for the operator's safety and comfort, and to provide a stable platform from which to direct control motions with the accuracy required for wire bonding.

Mounting points for the "EX" version of this mechanism are provided at two foot locations at the work plane elevation 5.000 in. above table surface, approximately 22.000 in. apart, and 10.000 in. to the rear of the work point. Alternately, the mechanism can be mounted at a single location at the rear of the main plate, 0.3750 in. above the work plane; however, preferably in combination with one of the two side mounts.

Protection against Electrostatic Discharge is implemented by finishing exposed tool assemblies and other moving parts by Electro less Nickel plating, which is conductive; and all exposed painted parts with a powder-coated paint that is dissipative.

Definitions of complete stand-alone Models of this Series:

- **Model No. 7730E.** This machine with a single tool assembly No 9044 for ball bonding.
- **Model No. 7730EX.** This machine, specified as Model 7700E, except without base.

Features available for "E" Models of this Series:

- **Feature No. 79.** Adjustable height work platform.

The microscope recommended for this model is either the Olympus SZ51-60E with the "Luxuray" LED illuminator #10265. Neither microscope nor illuminator is included. One recommended bonding tool is included.

All work holders are priced separately, and should be ordered separately. A universal heated non-rotating workholder, Part No 3800.001, and a universal rotating workholder, Part No 3800.056, each capable of holding most common substrate devices between a pivoted clamp lever and adjustable backstops, are maintained in stock and are available for delivery in the same time span as the machine. Quite a large number of previously designed special work holders, both heated and unheated, are available but are not stocked, and cannot be promised for delivery with the machine. These should preferably be on an order separate from the machine order, but if not, the machine order must state that partial deliveries are allowed. Work holders for new work pieces requiring custom design and fabrication will be quoted upon receipt of drawings and samples: These must be ordered on separate purchase orders.

Compressed air, regulated to 50 psig, is required. Connection is via 1/4-inch tubing.

Electrical service required is 50-60 Hz, single phase, either 115 VAC or 230 VAC, selected by manual switch. A fuse and three-prong power cord connector are provided for 115 VAC: For 230 VAC, these must be changed to conform to local requirements. The electrical power supply, Part No 8849, is packaged in a separate enclosure 8.75"wide x 8.00" deep x 3.00" high.

"E" Series machine size is 24.0" wide x 21.250" deep x 11.625" high, exclusive of microscope, or 15.00" in height to scope eyepieces. Weight is 60 lb. uncrated, or 140 lb. accessorized and crated.

"EX" Series machine size is 22.312" wide x 14.625" deep x 6.625" high above work plane, exclusive of microscope, or 10.0" high from work plane to scope eyepieces. Weight is 40 lb. uncrated, or 115 lb. accessorized and crated.