

WEST•BOND®

**MODEL 747677E**

**Three Way Convertible  
Manual Wedge-Wedge  
and Ball-Wedge Bonder**

**SERIAL#** \_\_\_\_\_

**P.O.#** \_\_\_\_\_

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## PRODUCT OVERVIEW

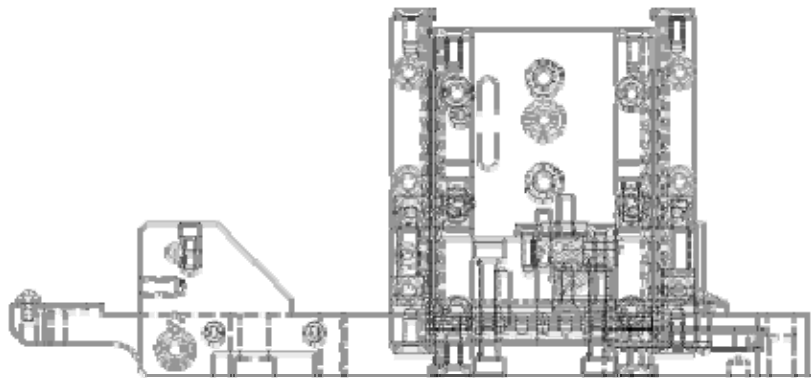
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### Models 7400E Series, Wedge-Wedge Wire Bonders, Manual X-Y-Z

#### *Overview / Application*

The base model of this series is Model 7400E, an ultrasonic/thermosonic wedge-wedge wire bonder designed to interconnect wire leads to semi-conductor, hybrid or microwave devices. The machine bonds aluminum or gold wires ranging from 0.0007 in. to 0.002 in. Bonds are made by the wedge-wedge technique using ultrasonic energy to attach aluminum wire at room temperature and adding work piece heat for gold wire. Wire is clamped and threaded diagonally under the bonding wedge, allowing independent feeding action but requiring front-to-back bonding direction. The bonding tool is guided manually by the operator using hand/eye reference to bond targets and elevations.

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.

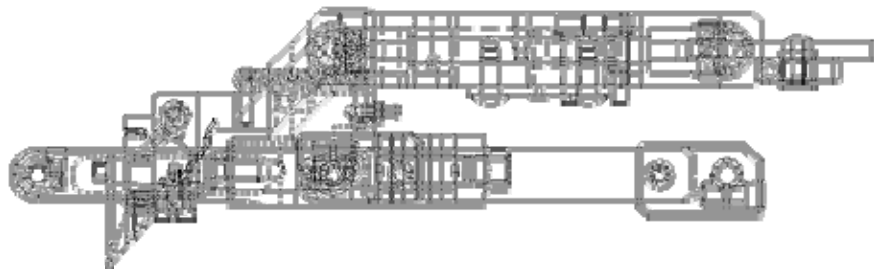


It should be understood that the pneumatic axis brakes cannot prevent deliberate efforts at movement, but that they are a significant aid in maintaining correct tool to work contact during bonding.

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.

#### *Bond Tool Head Assembly*

The new forward-pivot tool assemblies of this series are built around K~Sine Transducer, Model No. K-24EW, operated at 63 KHz. It is driven by K~Sine Part No. 10345 Ultrasonic Power Supply, four Watts, dual channel, with power and time set as program values. This



transducer uses a bond tool of 0.750" length dropped 0.65625" below center. Vertical clearance is a full 0.375" everywhere under these tool heads and all other mechanism except for wire presentation at 45° for angled feed. Wire Clamps are air-opened and spring-closed, and have self-contained closure pivots. A

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## PRODUCT OVERVIEW

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separate pivot about an axis located to serve both overhead and angled feed generates the clamp motions along their lines of feed action. To change between angled feed and overhead feed, it is necessary only to exchange the small clamp assemblies and to change the wire drag means. 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. Motions toward the tool are spring-driven, while the more powerful motor drives away from the tool – to ease concerns during set-up.

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 15 to 250 grams, and together with the work-sensing firing switch, is 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.

A high-resolution optical encoder is fitted to the Z-axis to provide position measurement of each bond elevation and then to initiate clamp re-closing to control wire loop arch consistency. This 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.

### ***Electrical Software and Hardware***

Control of machine logic, motor motions, and Ultrasonic energy is programmed to and executed by West-Bond Part No 8100 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 ultrasonic power and time. All programmed values are displayed during bonding. At "home", various options are enabled.

### ***Mechanical***

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

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## PRODUCT OVERVIEW

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plate, 0.3750 in. above the work plane; however, preferably in combination with one of the two side mounts.

Standard bonding method of Model 7400E is 45° wire feed, clamps behind the tool, traditional wedge-wedge. Optionally, bonding can be done by West·Bond's patented "deep access" method, vertical feed with overhead clamps.

### ***ESD Protection***

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. 7476E:** This machine with single wedge bond tool head, Assy. No. 9305, with angled clamp Assy. No. 9048 and overhead clamp Assy. No. 9049, for bonding by either wedge method.
- **Model No. 747677E:** This machine with two bond tool heads, Assy. No. 9305 with the two clamp assemblies for wedge bonding as above, and with tool head Assy. No. 9220 for ball bonding, all convertible.
- **Model No. 7700E:** This machine with a single ball bond tool head Assy No. 9220



### **Definitions of Models of this Series without base or work platform:**

- **Model No. 7476EX:** This machine, specified as Model **7476E**, except without base.
- **Model No. 747677EX:** This machine specified as Model **747677E**, except without base.
- **Model No. 7700EX:** This machine, specified as Model **7700E**, except without base.



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## PRODUCT OVERVIEW

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### Features Available for both "E" and "EX" Models of this Series:

- **Feature No. 70:** Adjustable height work station with a rotary platform to rotate work about the center of tool X-Y range. Assembly No. 8965. Recommended to pre-align bonds front to back. Not for "EX" models.
- **Feature No. 79:** Adjustable height work platform. Assembly No. 8965. Not for "EX" models.



### *Machine Configuration*

The microscope recommended for this series is Nikon SMZ-660 with Luxuray LED illuminator. Neither microscope nor illuminator is included; however, wiring and receptacle for this illuminator are built in. One recommended bonding tool is included.

All work holders are priced separately, and should be ordered separately. A universal unheated work holder, capable of holding most common substrate devices between a pivoted clamp lever and adjustable backstops, is maintained in stock and is available for delivery in the same time span as the machine. This workstation modified for screw-adjustable height is also available from stock. 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.

### *Services Required*

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 automatically. 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 8850, is packaged in a separate enclosure 8.75"wide x 8.00" deep x 3.00" high.

### *Dimensions*

"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 95 lb. crated.



## ACCESSORY DESCRIPTIONS

The specifications define Features that add additional capabilities or utilities to the basic machine models, and cross reference those models with which the Features may be combined.

**Non Heated Workholder:** Non-rotating Epoxy Transfer & Die Placement workholder for substrates up to 1.000" x 1.000", with mechanical clamp and adjustable backrails: Assembly No. 3600.018.



**Non Heated Work holder:** Non-rotating work holder for substrates up to 1.000" x 1.000". Work piece is held by mechanical clamp, with 2 Position, 2.000" x 2.000" fluoroware supports. Assembly No. 3600.220.

**K~1200D, Temperature Controller:** A 400 watt microprocessor-based Temperature Controller provides precise control with a minimum of set-up. The K~1200D is a programmable controller linked to the work holder heating elements through two solid state relays. The controller offers flexibility, while the solid state relays offer dependability. K~1201D is a 600 watts version for larger applications.



### Free Furnace Work holders:

This furnace is free in the sense that it is not connected to the machine but may be readily inter-changed with the Free Anvil normally used for ultrasonic bonding, giving work piece heat capability to any machines of the 4K, 5K or 7K Series.



**-45C: Free Furnace Work holder:** for substrates up to 1.000" x 1.000", mechanical clamp, adjustable backstop with rotating die mirror presentation. Assembly No. 3800.009.

**-45C.358 Free Furnace Work holder:** for substrates up to 1.000" x 1.000", mechanical clamp, adjustable backstop, with cavity inert atmosphere. Adjustable height, rotating 2.00" x 2.00" fluoroware support. Assembly No. 3800.358.





**ACCESSORY DESCRIPTIONS**



**45G.353 Free Furnace Work holder:** 2" x 2" substrates, mechanical clamp, adjustable backstop, cavity inert atmosphere. With 2"x2" fluoroware die presentation. Assembly No. 3800.353.

**-45G.402 Free Furnace Work holder:** 2" x 2" substrates, mechanical clamp, adjustable backstop, cavity inert atmosphere. With 2"x2" fluoroware support and rotating die mirror presentation. Assembly No. 3800.402.



**K~1300 Gas Flow Assembly:** Comprised of K~1310 Gas Flow Control and K~1320 Laminar Flow Nozzle. Used to compliment West Bond Cavity Inert Atmosphere Work holders for Eutectic die attachment.

**K~1310 Gas Flow Control:** The operator, by means of an on/off footswitch, releases the gas to the work area. Immediately after the scrub cycle stops, the footswitch is activated and the die is showered with cool forming gas. A manual adjustment is provided to meter the amount of gas to be released.



**K~1311 Vacuum Flow Control:** The operator, by means of an Off/On footswitch, can disengage the vacuum to the work area releasing the part to replace with another. A vacuum gauge on the front of the control box displays the pressure in inches of Mercury.

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## CAUTIONS

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Contained in this section are cautions to be observed during 7374E Installation and Operation.

### ***Wiring***

All machine wiring has common ground connected to machine chassis and continuous through the power supply, cord and cord plug. Make sure the receptacle for this plug has a good ground connection.

### ***Safety and Comfort***

Some ergonomic studies suggest that long periods of repetitive motion may be traced to certain types of physical discomfort leading to possible injury. We have compiled specific instructions herewith to minimize your chances of experiencing carpal tunnel syndrome (CTS), tendonitis, and tenosynovitis.

It is recommended that your work environment be comfortable for your work situation. A carefully planned work environment can actually increase productivity. WEST•BOND recommends that you adopt the following steps for a healthy physical and mental approach to your work.

### ***Exercises***

Many motor oil-manufacturing companies often claim that your car engine is most subject to wear and tear when you first start it up in the morning. This is due to the lack of oil on the metal bearing surfaces offering protection when the car is first started. To a great extent, the same can be said for the tendons, bones, and joints that form your body. In the early morning hours, your body tends to retain fluid from its over night rest, and the first time these tendons and joints are put to use, there is often a feeling of stiffness and tightness, and when utilized in an abrupt fashion, can often lead to inflammation and at times injury.

Therefore, it is considered appropriate if not mandatory for most people engaged in physical activities such as sports or heavy labor, such as construction, to perform a variety of warm-up exercises before beginning their job. We have found the same philosophies and many of these same exercises just as beneficial for those individuals who are placed in a seated position for long periods of time where they utilize primarily their upper extremities, and most importantly, their hands and wrists.

We are therefore, suggesting the following gentle warm-up program to be done by you before leaving for work. Begin by gently tilting your head both to the right and left side, to the point of comfortable tension. Next, tilt your head forward and backward, and lastly, turn your head both to the left and to the right. Each of these positions is taken to the end of their natural range of motion and held for a brief period of time. Do not take any of these movements beyond the point of comfort.

Next, for the shoulders, perform a series of simple, slow, shoulder circles in both a forward and backward direction. Five to ten repetitions in each direction should be enough to warm up the shoulder musculature.

Next, while standing, lift your arms laterally out to the side, away from your body and over your head. Repeat this motion five times. For added benefit, make large, wrist circles with your hands while your arms are overhead.

Lastly, and possibly most importantly, it is important that you carefully flex and extend your wrist prior to beginning your workday. Using the opposite hand to bend the wrist downward does this. This is best done with the arm in a forward position with the elbow straight. To assist in wrist extension, lift your wrist up, using the palm of the opposite hand, pressing against the fingers to assist in lifting the wrist. These stretches are done only to the point of comfortable tension and are repeated with both hands.

These basic exercises will get you off to a good start in the morning and allow your drive to work to be more comfortable and less likely to increase the tension and tightness in your upper back, shoulders and hands.

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## CAUTIONS

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### ***Work Station Exercises***

Sometimes it is only when we take breaks at work that we realize how stiff or uncomfortable we have become from working in a seated position. When we concentrate intensely on our work, these types of discomfort often go unnoticed and therefore, we recommend the following exercise program.

### ***After Work Cool-Down Exercises***

When you return home from work, it is helpful to relax the hard working muscle groups by repeating your morning exercise program. Many people also find that taking a gentle walk or similar forms of activity provide a nice change of pace from the immobile routine encountered at work. Please check with your physician, however, before beginning any type of exercise program.

Take periodic breaks several times during the work schedule. Gently press your hands against a table, stretch, and hold for several seconds. Stretch and massage your fingers, hands, wrists and forearms throughout the day. Shake your hands and fingers to relieve any tension and to promote blood flow. Rotate your shoulders forward and backward in a full circle several times daily. Try to use different muscle groups throughout the day, i.e. if sitting for prolonged periods, get up and walk around several times a day.

If you experience pain any time during the operation of your WEST•BOND machine, consult a qualified health professional.

### ***Chair And Table Top***

When evaluating your workstation, pay particular attention to those surfaces that come in contact with your wrist and forearms. Sharp edges or hard surfaces should be modified to form a work surface that is comfortable at the point of contact. Reshaping corners and applying a more comfortable softer surface in the work area can be extremely helpful.

The chair should be comfortable and provide firm support to the lumbar region (lower back). The chair should be adjustable in height so that your forearms form approximate right angles with the upper arms while hands rest upon the tabletop. Next, ensure feet rest flat on the floor and, if not, use a footrest that is high enough so that your thighs are reasonably parallel to the floor while seated. During the course of operating your WEST•BOND machine, maintain this recommended posture—any slouching puts unnecessary strain on your back and may weaken muscles over time.

### ***Microscope / Monitor***

It is important to look away from the microscope eyepieces and/or monitor frequently. Try to focus on an object about 20 feet away from several seconds. Eyepieces of the microscope should be clean and microscope should be frequently calibrated for parfocal viewing.

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## CAUTIONS

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### *Micromanipulator*

The hand controls on your WEST•BOND machine have been designed for minimal exertion of the hand and fingers. The position of the control knob is purposely set to coincide with a natural rest position of the hand (fetal position). During operation, the operator should rest his/her hand, wrist, and forearm on the tabletop so that the thumb, index and middle fingers gently grip the manipulator knob. With the work piece centered in the microscope, and the tool centered to the optics, usual movement or excursion of the manipulator is usually within plus or minus one-half inch, which is well within natural flexure of the thumb and fingers gripping the control knob. The force required to move the mechanism is somewhat equivalent to pushing a pencil while writing. Following the recommendations set forth in "Exercises" above vastly relieves any perception of muscle fatigue.

The last key point; all these guidelines should be applied to your home work station and home activities, particularly home computers. They should also be applied to video games and your recreational television viewing.

After a long day at work, your body does not need more of the same type of activity when you return home. Remember, diversity of physical activity may well be the simplest and most meaningful recommendation to avoid repetitive stress syndrome such as carpal tunnel syndrome.

## INSTALLATION

### STEP 1

Remove the accessory box, identify and account for all contents.

| √ | ITEM                      | PART NO.    | √ | ITEM                       | OPTION     |
|---|---------------------------|-------------|---|----------------------------|------------|
|   | Manipulator Control Arm   | (P/N 8253)  |   | Adjustable Height Platform | (optional) |
|   | 90 Degree Clamp Assembly  | (P/N 9049)  |   | Microscope                 | (optional) |
|   | Tool, Bonding (45 degree) | (P/N 50674) |   | Illuminator                | (optional) |
|   | Tool, Bonding (Ball)      | (P/N 50678) |   | Illuminator Nut            | (optional) |
|   | Tool, Bonding (90 degree) | (P/N 50780) |   | Work Holder                | (optional) |
|   | Tooling Head Assy. (Ball) | (P/N 9220)  |   | Temperature Controller     | (optional) |
|   | 100 PSI Regulator         |             |   | Check Packing Slip         |            |

### STEP 2

Remove the accessory pedestal insert and carefully lift the 747677E and the attached shipping board from the bottom of the shipping carton.

**CAUTION: DO NOT LIFT BY THE X-Y-Z MANIPULATOR ARM**

### STEP 3

Remove the six shipping bolts that fasten the 747677E to the shipping board. ( It is suggested to save all packing material for use during any future equipment relocation).

### STEP 4

Position the 747677E where it will be used.

### STEP 5

Locate the micromanipulator arm from the accessory box and install it in the mounting collar. Tighten the two mounting collar cap screws with approximately equal force. The vertical registration pin in the mounting collar should interconnect with the manipulator arm to insure correct installation.

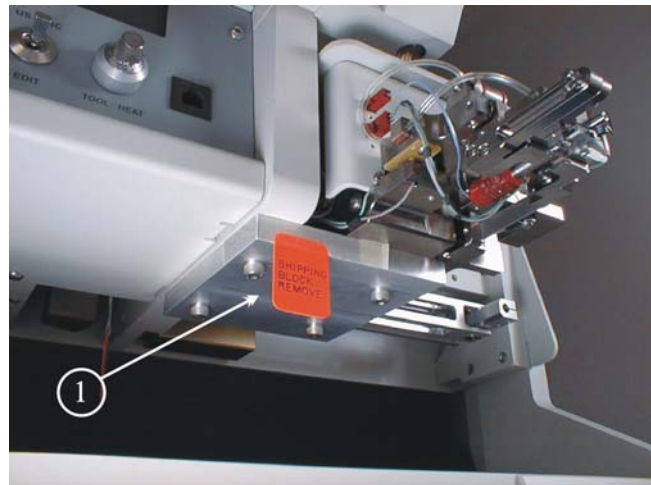
**(DO NOT MOVE THE MICROMANIPULATOR PRIOR TO THE COMPLETION OF STEP 9).**

### STEP 6

Remove the back and two top covers of the machine in order to gain access to the shipping blocks.

### STEP 7

Remove the Y-Slide Shipping Bracket (P/N 8758) ① located just behind and below the tooling head assembly. Remove the four shipping cap screws.

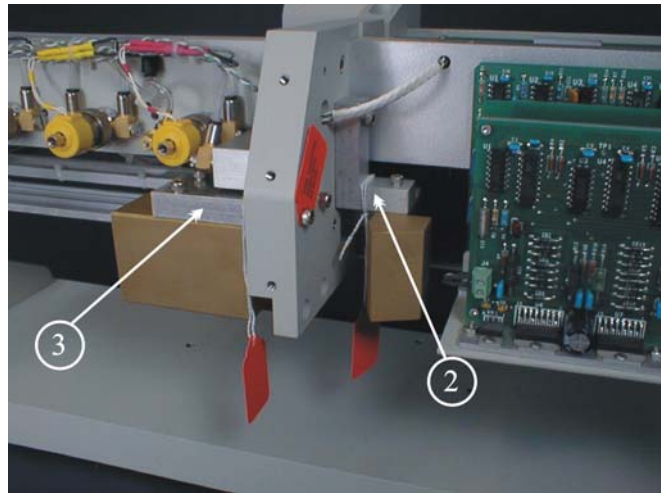




## INSTALLATION

### **STEP 8**

Remove the X-Y-C Weight Shipping Bracket (P/N 8757) ② located behind the PCB boards and to the right of the main support, viewing the machine from the back. Remove the two shipping cap screws.

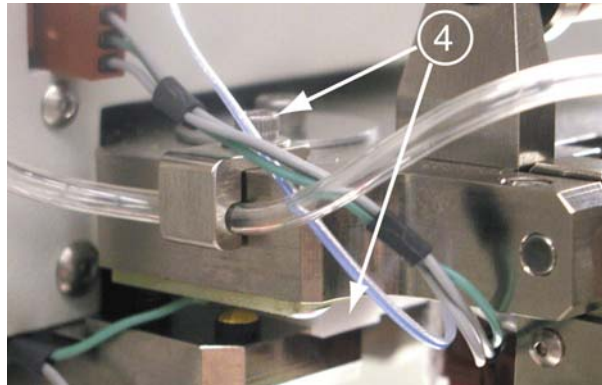
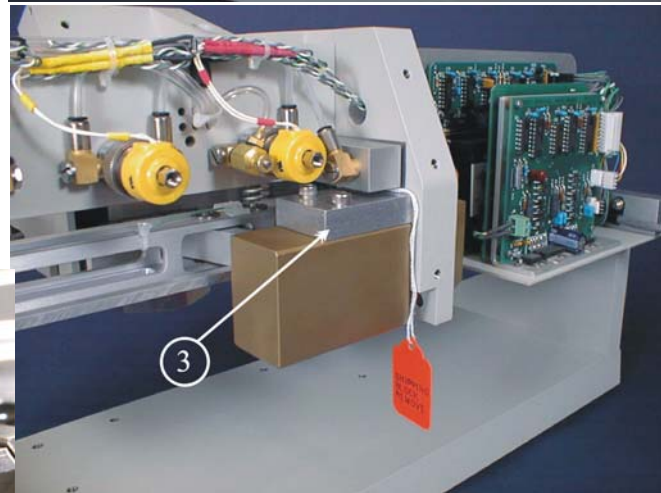


### **STEP 9**

Remove the Z-C Weight Shipping Bracket (P/N 8759) ③ located to the left of the main support, viewing the machine from the back. Remove the two shipping cap screws that go through the main support, then lifting the micromanipulator arm up access is gained to remove the two cap screws securing the bracket to the counterweight.

### **STEP 10**

Remove the Firing Switch Shipping Block (P/N 6873.002) ④ located under the tooling head. Remove the cap screw and washer on top of the tool head. Gently pull the shipping block free, being careful not to harm the transducer.



### **STEP 11**

Replace the machine covers removed in STEP 6.

### **STEP 12**

Locate the compressed air fitting on the rear panel. Connect a ¼" OD polyethylene to supply 50 psi.

### **STEP 13**

Plug the 12 pin Bendex connector into the 747677E power supply (P/N 8850) and then plug the AC line cord of the power supply into 100 – 115 volts and 50/60Hz.

**The 7476E is now ready for operation. Please refer to the next section to understand several important aspects of successful wire bonding with the 747677E.**



**MACHINE SET-UP**

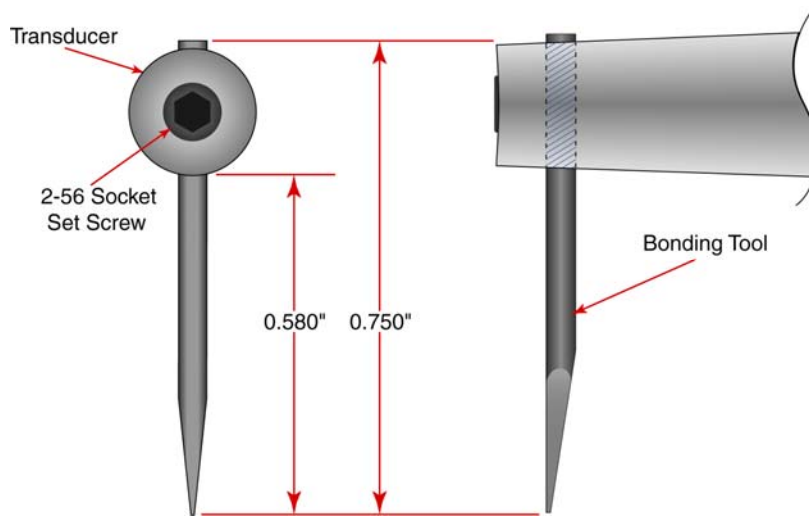
***Bond Tool Installation***

The choice of bonding tools is instrumental to high quality bonding. The 7476E requires that the shank diameter of the tool be 1/16" and that the length of the tool, for 45 degree wire feed, be .750". If Clamp Assembly No. 9049 has been specified, offering vertical wire feed, then a .750" tool length is recommended. A shorter (.625") or a longer (.828") tool may be used for deep access.

**45 DEGREE WIRE FEED (Assembly No. 9048)**

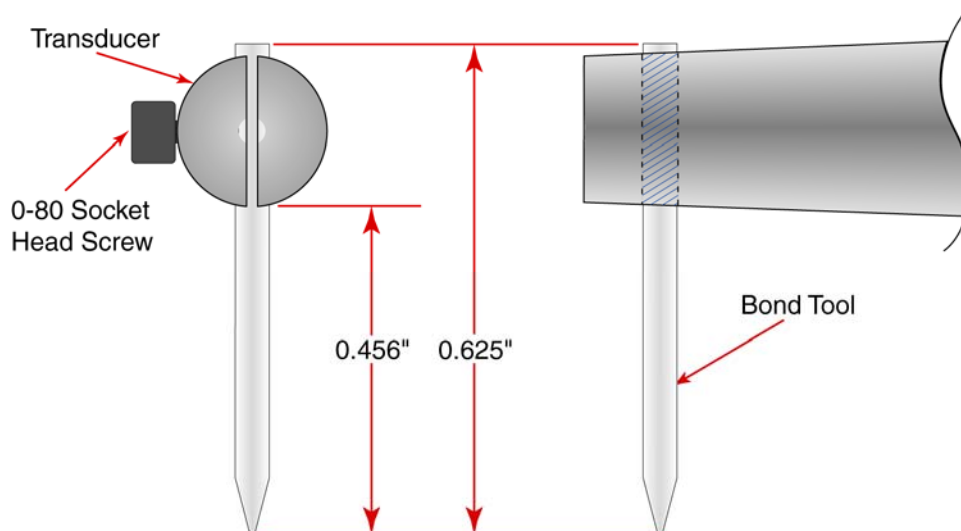
**DEEP ACCESS WIRE FEED (Assembly No. 9049)**

Loosen the transducer set screw and insert the bonding tool through bottom of transducer, It may be helpful to have clamps open when positioning tool. The bonding tool should be positioned according to the drawing below for a good starting position prior to running the Ultrasonic Positioning Utility (UPU)



**BALL BONDING WIRE FEED (Assembly No. 9220)**

The choice of bonding tools is instrumental to high quality bonding. Assy No. 9220 requires that the shank diameter of the tool be 1/16" and that the length of the tool be 0.625" or for deeper access 0.750".





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## MACHINE SET-UP

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### *Ultrasonic Positioning Utility (UPU)*

In past years, tool height has been determined by design. To effect this end, tool height gauges have been supplied with wire bonding machines, allowing the user to set the tool height at the designed bond point. However, we have found that the designed tool height does not always allow the most efficient transfer of ultrasonic energy from transducer to tool. This is due largely to the fact that no two bonding tools are exactly alike. **WEST•BOND** has developed the UPU to obtain this optimum transfer of ultrasonic energy with *every tool*. Granted, each tool will continue to be different and will therefore require different setup variables. The UPU just provides the best way to setup and transfer the maximum amount of ultrasonic energy to each tool.

The UPU consists of a specially designed circuit to provide a measure for placement of each tool. This raw data is crunched by a software routine, which then displays a relative number on the machine's LCD. When adjusting the tool height, the goal is to obtain the highest possible numerical value for each tool installed. As all tools are different, this value will be slightly different for each bonding tool.

### BOND TOOL POSITION SETUP

Press and hold the FEED/OPEN switch in the FEED position. Turn the Machine on. Use the EDIT button to get new readings for tool drop. Move tool up or down to get the highest number possible.

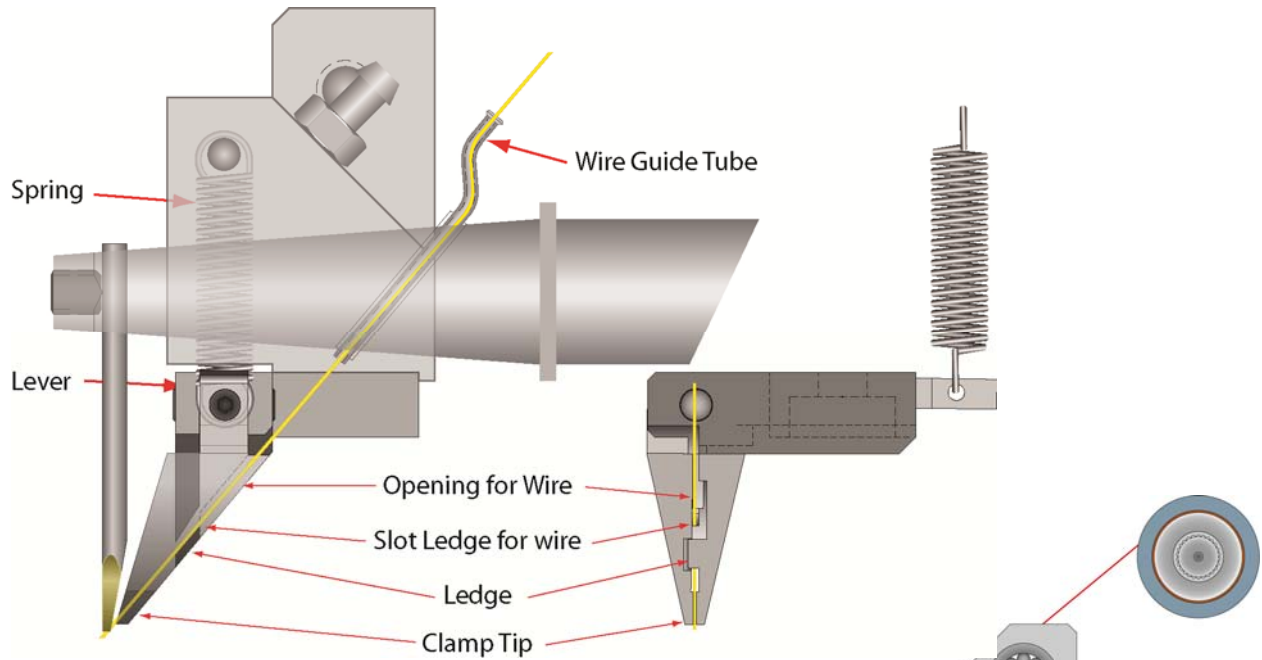
Set tool for maximum reading.

|  |
|--|
| ***** BOND TOOL POSITION SETUP<br>Change tool extension to maximize value.<br>Current value = 33                      Old value = 27<br>EDIT = Read new value              FEED = Escape |
|--|

**MACHINE SET-UP**

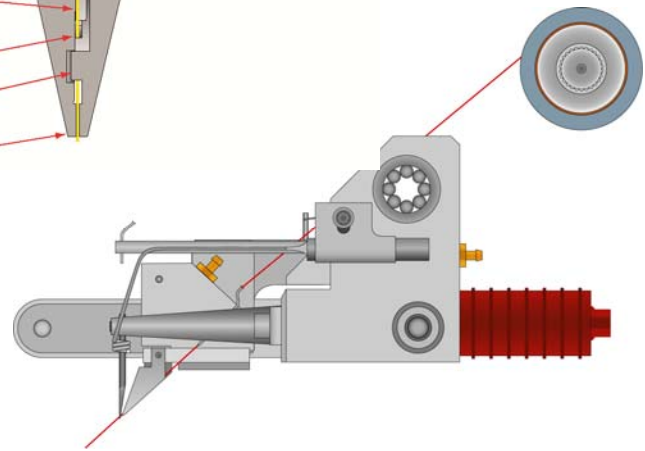
***Bonding Wire Installation***

The 747677E is equipped with a standard 1/2" ball bearing spool mount. Slide the 1/2" spool over the spool mount such that the wire de-spools over the top (counter clock-wise when viewed from the right side). Carefully route wire through guide tube, clamps and then bonding tool. To open clamp, press the TORCH / THREAD switch up once. To close the clamp press the TORCH / THREAD switch down once. To feed more wire through the tool, press the TORCH / THREAD switch down once, or hold for more wire. The TORCH / THREAD switch is located on the left side of control panel. See below for wire route drawings.



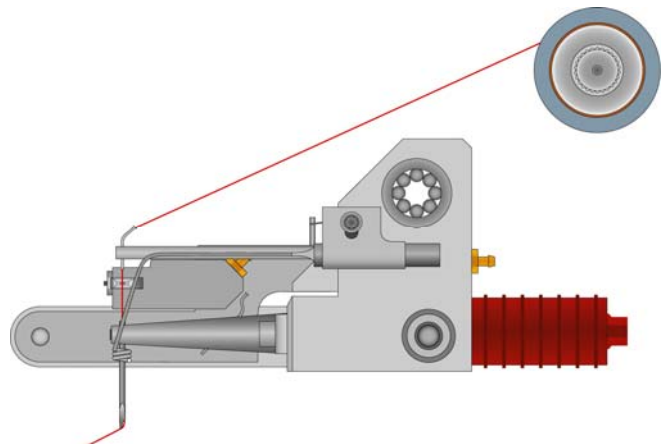
**45° TOOLING HEAD**

The 45° clamp blades need the wire fed through them to keep the wire from coming out of the clamps during looping. There is a small shelf that the wire needs to pass over before the tool is threaded.



**90° TOOLING HEAD**

The 90° clamp blades are straight forward, wire from the spool to the wire guide, then thread down through the center of the bond tool. Move the wire to the opening of the clamp blades. And finally thread the wire through the 45° hole at the bottom of the wedge.



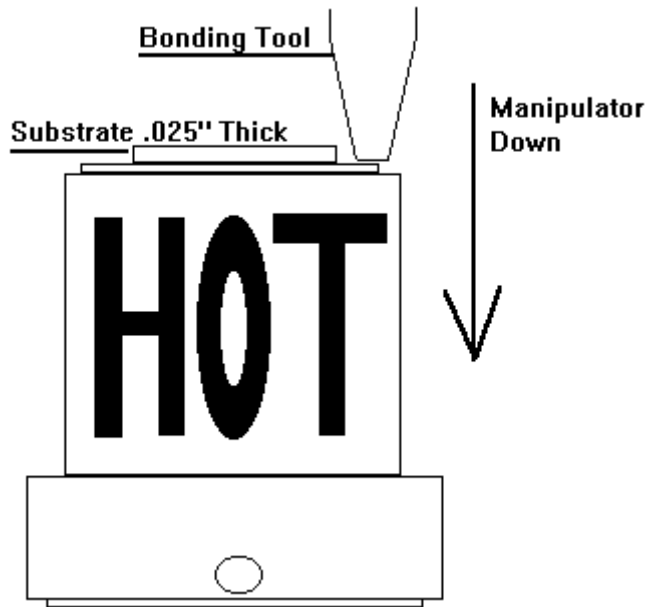
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## MACHINE SET-UP

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### ***Work Platform Adjusting (Feature -79)***

The height adjustment of the work platform is critical for quality wire bonding. If the work platform is not adjusted properly, the bonding tool may not be perpendicular to the work surface. To check for proper height adjustment simply compare the height of the surface requiring bonding to the position of the bonding wedge while holding the micromanipulator in its maximum down position. When properly set, the lowest required bonding level should be approximately 20 - 30 mils (635 - 762 $\mu$ m) above the tip of the bonding tool.



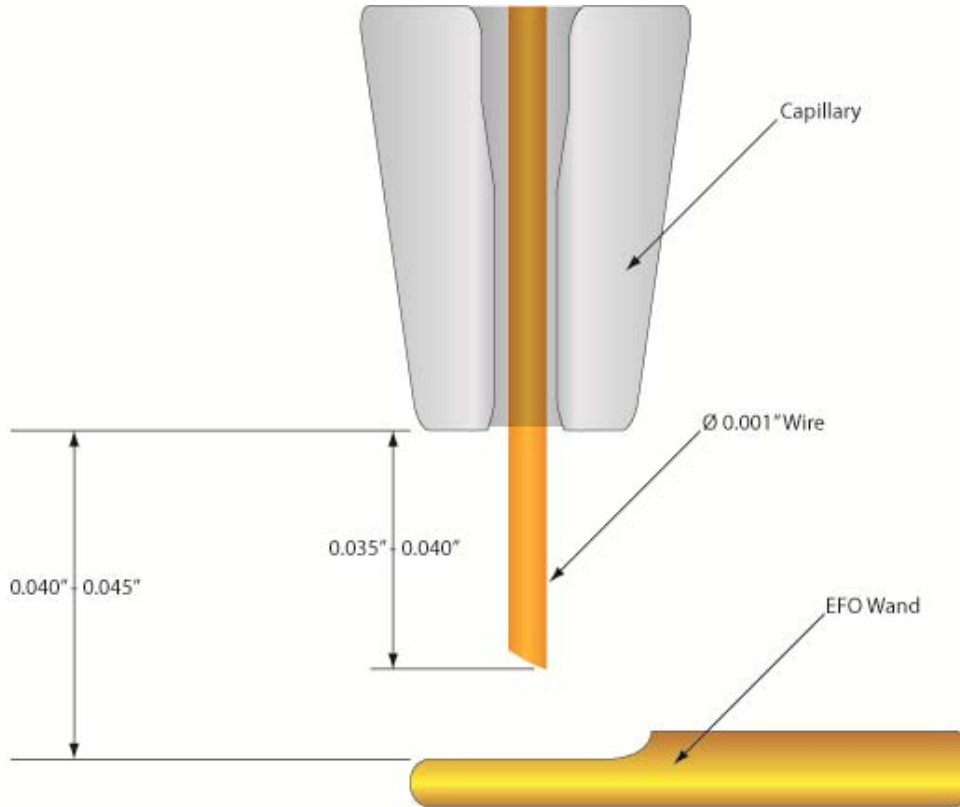
If adjustment to the work platform is required, simply locate the adjustment knob on front edge of the work platform and turn to adjust as required.

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**MACHINE SET-UP**

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***Torch Wand / Tail Setup***



The above drawing represents the recommended setup for 0.001" wire. These numbers are approximations and may vary for different applications.

**Recommended Settings:**

Wire Size: 0.001"  
Tail Length: ~0.035" (95 Steps)  
Tool to Torch: ~0.045"  
Wire Gap: ~0.010"

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### OPERATION

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The operation of the 747677E has been specifically designed for versatile and dependable operation. The following information will allow the operator to utilize the 747677E to its full potential. This section is specifically directed at operator use.

Any questions related to programming or troubleshooting will be discussed in their respective sections.

#### ***Operator Controls***

In this section the individual front panel items will be addressed.



#### **POWER Switch**

Located on the Power Module Assembly (P/N 8850) activates entire 747677E. Upon power-up, the microprocessor will complete several internal tests and display a description of any problem detected. Refer to the *Troubleshooting* section if an error is reported.

**Note:** Several switches have dual functions and are labeled for both functions.

#### **THREAD / NEXT – TORCH / PREV Switch**

This switch performs several functions. From the main screen this switch acts as an OPEN – FEED switch for the 7400 and 7600 models and THREAD – TORCH for the 7700 model. To open the wire clamps, push the switch to the up position, labeled THREAD. To closed the clamps and feed wire through the tool, press the switch to the down position, labeled TORCH. Press the switch to down when the clamp is already closed to activate the clamp through one complete cycle and feed additional wire through the bonding tool. The feed cycle will automatically repeat if the switch is held down. Hold the THREAD – TORCH switch up to effect auto-repeating long strokes (Functions only on 76xxE, the switch must be actuated back and forth for the 74xxE systems).

During programming, press the switch in either direction while in the edit menus to page forward or backwards through the menus.

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## OPERATION

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If the Self Thread feature has been activated in the Machine Settings sequence, the O/N-F/P switch will respond as follows: Press the switch to the up to open the clamps and allows the operator to pre-load the special Self-Threading tool. Press the switch to the down to retract the wire clamp, which allows the wire to align itself to the feed-through hole. Press the switch down again to feed the wire through the feed-through hole. Press the switch down now and the clamp will feed wire through the bonding tool. (see page 19)

### BUFFER Switch

The BUFFER switch is used to changed between thirty different buffers. Each of the buffers holds the bond settings and bonds per wire data for a particular wire type. Machine settings are global and are not affected by this switch.

### UP / DOWN Switch

This switch also performs several functions. First if this switch is held down while the machine is being powered up, an options menu will be displayed to change machine types. Second from the main screen this switch will control tail feed, if the tail length is excessive push the switch to the UP position and the tail length will be reduced. DOWN to increase tail length. Third, when in the Edit menus the UP / DOWN switch will allow the operator to increase or decrease the desired settings.

### US / ESC – EDIT Switch

The operator may enter the Buffer and Machine Settings sequence by pressing down on this switch while at the main screen. The selected buffer displayed at the main screen will be the buffer accessed when the EDIT button is pressed. Select the desired buffer prior to pressing the EDIT button. Once in any of the sub-menu routines, this switch is used to page through the available menus, the NEXT / PREV switch can perform the same function for scrolling through the menus. The ESC (Escape) switch, while in the EDIT menus will allow the operator to leave the edit sequence at any time and return to the main screen. The US switch allows the operator to test the ultrasonic link to the transducer. The US Signal will appear as **<U/S is active>** on the screen above the switch when the switch is pressed. This switch is an excellent way to offer ultrasonic energy to a vertical-feed tool while threading.

### TOOL HEAT Dial

The TOOL HEAT Dial ranges from a setting of 0 to 10, turn control knob from zero to activate the Radiant Heater. See the *Technical Information* section for a chart of approximate temperatures for various tool heater settings.



### **Negative Electronic Flame Off**

#### **Power Switch**

The power switch turns the power on to the NEFO unit. Always turn this unit off when servicing the torch or head assembly.

**OPERATION**

**Power Dial**

Sets the Ball Forming Current to a constant. The voltage will vary to keep the power the same to consistently make the same size ball each time. The power dial will set the current from 7.5ma – 25ma.

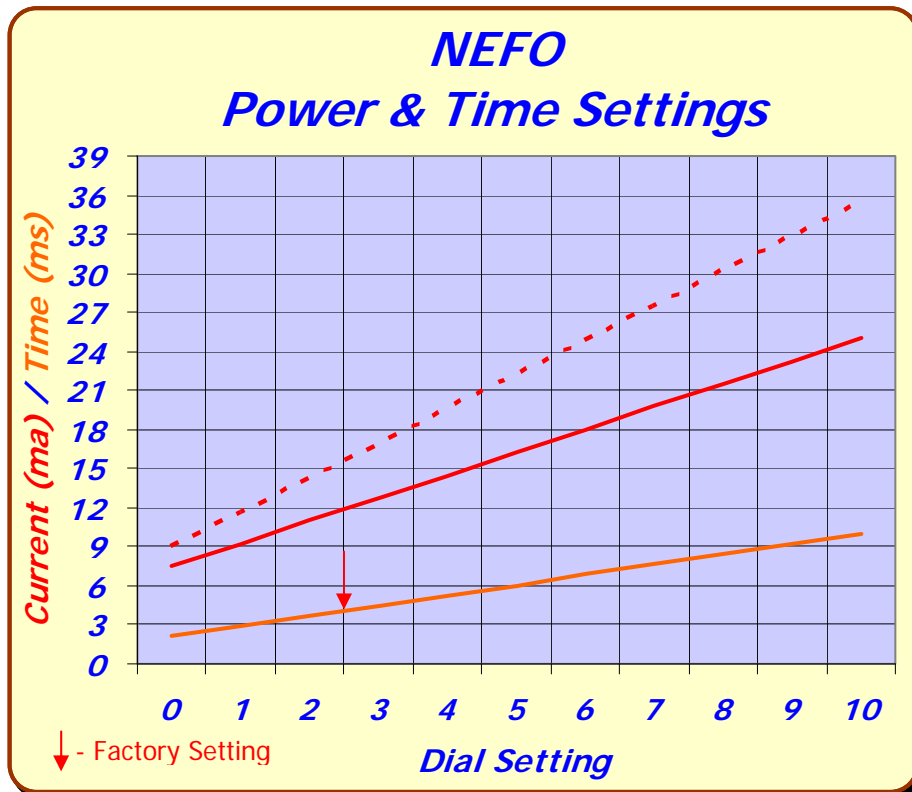
The current setting can be adjusted to a 9ma – 35.5ma range for larger balls on 1.5 – 2.0 mil wire. Jumper E1 on the mother board (Lower PCB) should be changed from pins 1-2 to 2-3 for the high power setting.

**Time Dial**

Ball Forming Time, or a cut-off time for ball formation. Forming time is set between 2.1ms to a maximum of 10ms. Factory setting of the time is at 2.5 (approximately 4ms), this is the optimum setting.

**LEDs**

The Open and Short LED's are for designation of a ball fault. If the Open LED is lit, then the gap between the end of the wire and the torch tip is too large for ball formation. If the Short LED is lit, then the wire has contacted the torch tip causing a short where no spark is formed.



**Wire Bonding**

The actual execution of wire bonding with WEST•BOND's **747677E** is rather straight forward. The patented micromanipulator, positioned to the right of the work platform, is directly linked to the tooling head assembly through an 8:1 ratio. This mechanical ratio and sophisticated mechanical link allows the operator to accomplish extremely precise and fine adjustments to the tooling head position.

To produce the first wire bond, simply use the micromanipulator to lower the bonding tool to the bond location and gently touch the tip of the tool to the bond surface. The **747677E** detects contact and will automatically activate the ultrasonic energy on contact. Also during the ultrasonic bonding time the



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## OPERATION

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system will brake the X, Y and Z axes to inhibit movement that would otherwise disturb the bond. If the “Beep On Contact” option has been selected, an audible beep will be heard while the bond is being made. The machine then opens the wire clamp and prepares for the second bond.

After completing the first bond, gently lift the micromanipulator and move the bonding tool through the looping path. When the tool has been lifted to the programmed loop height, an additional beep will be heard. This is only an indicator of the bonding tool height.

Once the operator has reached the crest of the loop and reverses direction, moving down toward the second bond site, the machine will automatically close the clamp at the programmed distance below the crest. See *Programming* for instructions on changing the loop height indicator and drop-before-clamp distances.

Accomplishing the second bond is a repeat of the first bond sequence. A wire may be programmed to have a maximum of 21 bonds. After the terminating bond, the wire clamp will automatically close and pull back to terminate the wire and will then wait until the operator lifts from the terminating bond site before feeding new tail length for the next wire.

### **Basic Operation**

The following is an interpretation of the messages displayed by the [747677E](#) during operation. The rectangles on the left represent the LCD and examples of its contents. Additional LCD messages are described in the *Programming* and *Troubleshooting* sections.

#### “HOME”

|  |             |
|--|-------------|
| Bond 1 of 21                             | Buffer 1    |
| Power: 300                               | Time: 30 ms |
| EDIT = Bond & Machine settings, 45° feed |             |

Ready for first bond  
45°/90° feed – Programmable during power up.

#### **BONDING SEQUENCE** (Begin by using the X-Y-Z Micromanipulator to touch tool to the bond pad.)

|                       |             |
|-----------------------|-------------|
| Bond 1 of 21          | Buffer 2    |
| Power: 300            | Time: 30 ms |
| Wire clamp is open.   |             |
| Lift from first bond. |             |

First bond is complete.  
Tool is still in contact.  
User must lift the tool from the bond.

|                            |             |
|----------------------------|-------------|
| Bond 2 of 21               | Buffer 2    |
| Power: 350                 | Time: 50 ms |
| Wire clamp is open.        |             |
| Proceed to stitch bond #2. |             |

Tool is off surface, ready to make second bond

|                            |             |
|----------------------------|-------------|
| Bond 2 of 21               | Buffer 2    |
| Power: 350                 | Time: 50 ms |
| Proceed to stitch bond #2. |             |

Tool has descended, wire clamp has closed;  
ready for second bond.

Repeat sequence until last bond is terminated.

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## OPERATION

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### **NORMAL THREADING SEQUENCE** (Begin by pressing CLAMP switch to the up to open clamp.)

|  |             |
|--|-------------|
| Bond 21 of 21                            | Buffer 2    |
| Power: 450                               | Time: 35 ms |
| Wire clamp is open.                      |             |
| Thread the tool, and press TORCH switch. |             |

Terminating bond data is automatically loaded. If feed is 90° and THREAD is held 0.75 second, long feed strokes are executed. "press TORCH switch" means press the CLAMP switch to the down.

|                            |             |
|----------------------------|-------------|
| Bond 21 of 21              | Buffer 2    |
| Power: 450                 | Time: 35 ms |
| Wire clamp is closed.      |             |
| Proceed to bond off excess |             |

Bond off excess wire. Then bond as normal.

### **SELF-THREAD SEQUENCE** (Special self threading tool required. )

|  |          |
|--|----------|
| SELF-THREAD, Step #1                     | Buffer 2 |
| Wire clamp is open.                      |          |
| Position wire in clamp, and press TORCH. |          |

Automatically resets to first bond. "press TORCH" means press the CLAMP switch to the down position, labeled TORCH. (see page 19)

|                                   |          |
|-----------------------------------|----------|
| SELF-THREAD, Step #2              | Buffer 2 |
| Wire clamp is closed.             |          |
| Ready to self-thread.             |          |
| Press TORCH switch again to pull. |          |

The wire clamp is closed.

|                                     |          |
|-------------------------------------|----------|
| SELF-THREAD, Step #3                | Buffer 2 |
| Inching is live.                    |          |
| Ready to self-thread.               |          |
| Press TORCH switch again to thread. | 60       |

After inching the clamp, the pull stroke will be adjusted and stored for future use. Bond-off is unnecessary. Relative whole step position count is displayed in lower right corner.

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## PROGRAMMING

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The following pages demonstrate the expected displays and programmable options of the 747677E. The programmable features are broken into two sections. One section is called “BOND BUFFER SETTINGS” and the other section is called “MACHINE SETTINGS.”

### ***Bond Buffer Settings***

Bond buffer settings options are commonly used by the operator. The 747677E has thirty memory buffers, each pertaining to one wire type. The options available for programming in this section are listed below:

BONDS PER WIRE  
LIFT BEFORE TORCH (Ball Bond Only)  
ULTRASONIC POWER  
ULTRASONIC TIME  
FORCE  
LOOP HEIGHT  
DROP BEFORE CLAMP (45° Only)

### ***Machine Settings***

Machine settings are items generally used for initial machine setup and are infrequently changed. Options in this section may require some modifications if the application changes significantly. The machine settings are global for all buffers. The options available for programming in this section are listed below:

WIRE PULL  
WIRE TAIL  
DUAL FORCE  
CALIBRATE FORCE (HIGH)  
CALIBRATE FORCE (LOW)  
BALL FAULT (Ball Bond Only)  
BEEP ON CONTACT  
SECURITY BOND  
    ULTRASONIC POWER  
    ULTRASONIC TIME  
    FORCE (HIGH/LOW)  
BOND COUNTER  
    RESET BOND COUNTER  
    BOND COUNTER LIMIT  
ULTRASONIC POWER DURING FEED  
SELF THREAD  
MODEL / SOFTWARE REVISION LEVEL DISPLAY  
CLAMP HOME POSITION

From the main screen, press the EDIT switch to begin to edit the bond and machine settings. The EDIT switch or the PREV / NEXT switch must be depressed to select the next available option. The following pages give detailed descriptions of the programmable features above.

To adjust any specific number or option use the UP / DOWN switch.

NOTE: The 747677E will not bond while in the EDIT mode. To quit editing and resume bonding, the operator can either press ESC, or go through the entire edit sequence.

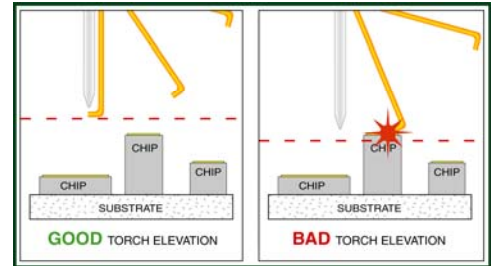
## PROGRAMMING

### BONDS PER WIRE

In this menu, select the number of bonds per wire for the current buffer. The maximum number of bonds per wire is 21.

### LIFT BEFORE TORCH (7700E Only)

This setting, measured in mils, specifies how high the operator needs to lift the manipulator arm, after the termination bond, for the EFO wand swings down to form a new ball. This setting needs to be well above the package walls so the Torch does not contact the package during flame-off.



### ULTRASONIC POWER

Specify the ultrasonic power level for a specific bond in this menu. The bond number will be displayed in the upper left position of the display (for example, “Bond 1 of 3”). The power level range from 0 to 999. The suggested power level of 300 is an arbitrary starting point for new applications. Applications vary extensively and may require a substantial deviation for the suggested level.

The Ultrasonic Power Supply (PCB#10345) is equipped with two user selectable power levels. If the jumper (E1) is in the Low position (pins 2 & 3) the power output is 0 to 2 watts, and the High position (pins 1 & 2), the power output is 0 to 4½ watts.

**Recommendation:** Set the bond force to an appropriate level for the specific wire size intended for bonding. Adjust the POWER and TIME settings of the 747677E to accomplish visually correct wire bonds. Now evaluate the current ultrasonic levels based on pull-test results and make adjustments accordingly. NOTE: The bonds are more responsive to a power level increase than to a time increase. A change in time is a gentler way to affect the bond. For a thermocompression bond, set the power to zero.

### ULTRASONIC TIME

Specify the ultrasonic time, in milliseconds, for a specific bond. The bond number will be displayed in the upper right portion of the display (example: “Bond 1 of 3”). The suggested time is “30ms” and is an arbitrary starting point for new applications. Applications vary extensively and may require a substantial deviation from the suggested level. See the above recommendation in the *Ultrasonic Power* section.

### FORCE

Select either the “HIGH” force or the “LOW” force for the specified bond. Use the UP/DOWN switch to change the current setting. The operator may specify the high or low force setting for each and every bond within a wire.

**NOTE:** If the Dual Force option has not been selected in the Machine Settings sequence, then this “Force High/Low” option will not appear, and the “HIGH” force setting will be used for all wire bonds in all buffers. Remember this menu is only for selecting one of two pre-set force levels to be applied to a given wire bond. The number of grams for each of the two force levels is adjusted in the Machine Settings sequence, and cannot vary from buffer to buffer.

### LOOP HEIGHT

Use this function to specify the height at which an audible beep will occur. This beep is designed to assist the operator in producing consistent loop heights. The loop height does not affect any mechanical functions. The equivalent distance in microns is displayed in parentheses. Enter zero to disable the beep. The 747677E automatically rounds the entry to the nearest multiple of five mils, but a nonzero number is never rounded to zero.

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## PROGRAMMING

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### DROP BEFORE CLAMP (45° Tool Only)

Use this function to specify the distance below the apex of the tool path at which the clamps should close on the wire. After completing the first bond the clamps will be open allowing the operator to travel upward and back. Once the operator has obtained the crest of the loop and reverses direction, beginning the downward descent to the second bond site, the 747677E will automatically close the clamps at a specified number of mils below the crest of the tool motion. Enter zero to keep the clamp open. The 747677E automatically rounds the entry to the nearest multiple of five mils, but a nonzero number is never rounded to zero.

### WIRE PULL

This option allows the operator to increase or decrease the distance the clamp blades pull back to break the wire after the terminating bond. The suggested setting, 34 for 45° and 24 for 90°, is displayed on the menu. The numerical selection defines the number of motor steps. This operation is not used for the 7700E model. Each motor step is equal to 0.000221”(5.61µm). To increase the clamp pull stroke, increase the “wire pull” number. Excessive wire pull may cause the wire to become unthreaded.

### WIRE TAIL

This option allows the operator to increase or decrease the length of the tail: meaning the wire length offered for view prior to performing the first bond. The suggested setting of 28 for the 45° and 18 for the 90° is displayed on the menu.

For the ball bond head this setting determines how much wire is presented to the EFO-wand for flame off. The numerical selection defines the number of motor steps. Each motor step is equal to 0.000221”(5.61µm). To increase the tail length, increase the “wire tail” number.

### DUAL FORCE

This option allows the operator to select the “DUAL FORCE” feature “ON” or “OFF”. When the “OFF” selection has been made, the “CALIBRATE FORCE (LOW)” menu will not be displayed and the higher specified force will be applied to all wire bonds. The factory setting is “ON”. To change the setting of this option simply press the UP/DOWN button.

If Dual Force is “ON” the low force will be suggested for the first bond and the high force will be suggested for the consecutive bonds. These are suggestions only. Thus low force or high force may be specified for any bond in any order.

### CALIBRATE FORCE (High)



This option allows the operator to calibrate the “Force” setting by simply adjusting the force adjustment knob. This black plastic knob ← is located directly to the right of the tooling head. To increase the bond force turn the knob counter-clockwise. To decrease the bond force turn the knob clockwise. Measure the force by placing a gram gauge just in front of the bond tool and lift until the machine beeps. Repeat to verify force is correct.

**NOTE:** A change in the “HIGH FORCE” setting will also change the low force setting.

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## PROGRAMMING

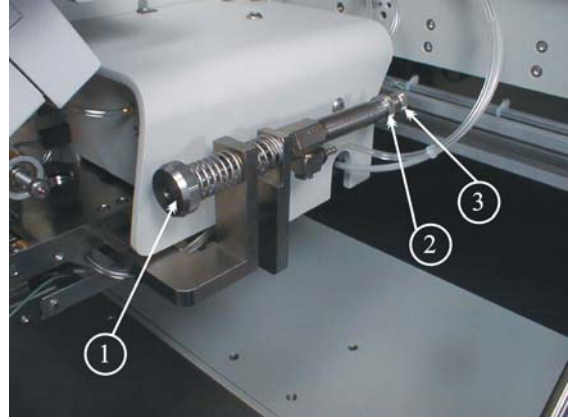
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### CALIBRATE FORCE (Low)

This screen will only be displayed if the operator has selected the “DUAL FORCE” option. Having selected “ON” for the “DUAL FORCE” option, the operator is allowed to calibrate the low force setting while at this menu.

The operator should expect to hear the air cylinder activate when entering this menu. The air cylinder will deactivate when leaving this menu. **REMINDER:** This menu is for calibrating or establishing the “LOW FORCE” setting.

To adjust the low force setting, loosen the knurled lock nut ↑ and turn the adjustment knob → located behind the high force adjustment. When viewed from the rear of the bonder, counter-clockwise adjustments will reduce the bonding force. Use a gram gauge to measure the force.



### BALL FAULT (Ball Bond Only)

This feature checks the discharge of the EFO wand versus internal threshold settings. If the threshold is either exceeded or not met then the system will alert the operator giving them a ball fault message. At this time the operator can either fix or ignore the message depending on the balls status.

### BEEP ON CONTACT

The audible beep indicator during bonding may be silenced by setting this feature to “OFF”. The suggested setting is “ON”.

The “OFF” selection will not terminate beeper operation for loop height indication or during the feed stroke after the last wire bond. Loop height indication can be disabled separately.

### SECURITY BOND (7700E Only)

This option when ON will add an additional bond after the termination bond of the Ball-Wedge bond. This bond, security ball, is placed on top of the termination bond to add additional strength to the wire bond. Turning this feature ON will enable the following three menus.

#### ULTRASONIC POWER (SECURITY BOND)

Specify the ultrasonic power level for the security bond in this menu. The power level range from 0 to 999. The suggested power level of 300 is an arbitrary starting point for new applications. Applications vary extensively and may require a substantial deviation for the suggested level.

#### ULTRASONIC TIME (SECURITY BOND)

Specify the ultrasonic time, in milliseconds, for the security bond. The suggested time is “30ms” and is an arbitrary starting point for new applications. Applications vary extensively and may require a substantial deviation from the suggested level. See the above recommendation in the *Ultrasonic Power* section.

#### FORCE (SECURITY BOND)

Select either the “HIGH” force or the “LOW” force for the security bond. Use the UP/DOWN switch to change the current setting.

**NOTE:** If the Dual Force option has not been selected in the Machine Settings sequence, then this “Force High/Low” will default to the “HIGH” force setting

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## **PROGRAMMING**

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### **BOND COUNTER**

The first menu setting for the Bond Counter is just an ON / OFF selection. Selecting ON will show the Bond Count on the Home Menu screen and will also enable the next two menu items. If OFF is selected the machine will still count the number of bonds that the machine has made but will not display any of this information to the operator, and the following two menus will be skipped going directly to Ultrasonic Power During Feed

### **RESET BOND COUNTER**

Using the UP / DOWN Switch will either clear the current Bond Count to Zero (UP) or reset the Bond Count to what it was when entering this menu (DOWN). If the operator leaves this menu after resetting the number to Zero, then the DOWN switch will no longer recover the count.

### **BOND COUNTER LIMIT**

The Bond Counter Limit will allow the operator to set a maximum number of bonds that a tool can make before the machine gives a warning the tool has exceeded its life and should be replaced. The Maximum Bond Count is 30,000 bonds and is settable in increments of 500.

### **ULTRASONIC POWER DURING FEED**

The entered number controls the amount of ultrasonic energy applied through the tool during the feeding or threading of the wire. This ultrasonic energy is critical in assisting vertical feed bonding tools. The 45° tools usually do not benefit from ultrasonics during feed. The 747677E will suggest "0" for a 45° feed tool and "200" for a 90° feed tool and ball bond.

### **SELF THREAD (45° Tool Only)**

A specially designed bonding tool is required to utilize this feature (consult the factory). Refer to below for detailed directions on threading the special bonding tool. The 747677E "THREAD / TORCH" switch will perform the following sequence if this feature has been selected "ON".

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| 1. Press CLAMP switch to THREAD. | Clamp opens and pull back.            |
| 2. Press CLAMP switch to TORCH.  | Clamp closes and pull back farther.   |
| 3. Press CLAMP switch to TORCH.  | Clamp moves forward to Home position. |

Utilizing this feature will require some technique development by the operator. Follow the instructions below closely. Please feel free to contact your WEST•BOND representative or the factory regarding any difficulties. The suggested setting is "OFF" if you are not sure whether a self-threading tool is installed. To change the selection of this feature, press the ENTER button.

### **MODEL / SOFTWARE REVISION LEVEL DISPLAY**

The software version along with model number and release date will be displayed here.

### **SET CLAMP HOME**

Power off the machine. Press and **HOLD** the EDIT switch. Power the machine back-up. Use the UP/DOWN switch to set clamp home position to desired clamp position.

When the message displayed states that the A Motor is at the home position, verify that the 45° clamps are not touching the bond tool.

NOTE: If clamps home position is set to Zero then the machine will have no tail inching control in the forward direction.

Default Values are as follows:

|           |                                |
|-----------|--------------------------------|
| 45°       | 16                             |
| 90°       | 30                             |
| Ball Bond | not available for user change. |



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## PROGRAMMING

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### CHANGE MACHINE MODEL

Power off the machine. Press and **HOLD** the UP/DOWN switch in the DOWN position. Power the machine back up. Use the UP/DOWN switch to select the model. Press the EDIT switch to accept the model change.

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## TROUBLESHOOTING

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### *Poor Bond Quality*

The following are possible causes for poor bond quality. Poor bond quality could mean either a bond does not meet visual criteria, does not adhere to bonding surface, or produce unacceptable bond pull tests.

There are six key areas where the problem may be found causing poor bond quality.

1. Tool
  - a. Position
  - b. Clamping Force, Set Screw Torque
  - c. Characteristics / Geometry of Tool / Condition of Tool
  - d. Condition of Bonding Surface
  - e. Bonding Surface Area
2. Work holder
  - a. Temperature / Stability
  - b. Heat Transfer
  - c. Rigidity
  - d. Environment
  - e. Positioning Accuracy
3. Wire
  - a. Size
  - b. Type
  - c. Breaking Load
  - d. Elongation
  - e. Age / Condition / Quality
  - f. Uniformity / Twist / Curl
4. Bonded Wire
  - a. Wire / Tool Interface
  - b. Optimized Bonding Schedule
  - c. Location
  - d. Wire Curl
  - e. Intermetallics
  - f. Time / Temperature Environment
  - g. Bond Interface Condition
  - h. Ergonomics
5. Bonding Surface
  - a. Metal Purity
  - b. Metal Uniformity
  - c. Metal Thickness
  - d. Surface Contamination
  - e. Surface Texture
  - f. Metal Bondability, Initial and after Time/Temp.
6. Bonder
  - a. Mechanical / Electrical Calibration of Machine
  - b. Optimized Bonding Schedule
    - i. Ultrasonic Energy
    - ii. Ultrasonic Time
    - iii. Bond Pressure
    - iv. Temperature
  - c. Operator Skill
  - d. Ergonomics

## TROUBLESHOOTING

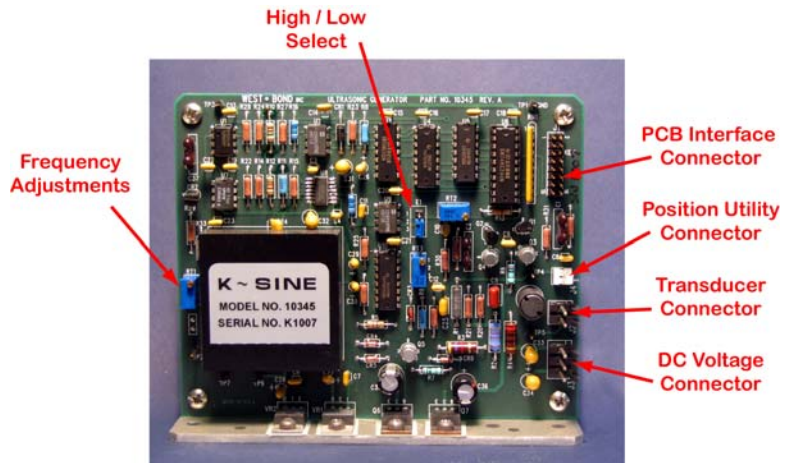
### Ultrasonic Board (P/N A-10345)

#### IN-MACHINE CALIBRATION

1. Equipment required:
  - 1.1 An oscilloscope.
  - 1.2 A multi-meter (true RMS voltages up to 100 KHz).
  - 1.3 20 Ohm resistor, 5 Watt minimum.

\* All following measurements are made with respect to circuit common TP1\*

2. DC voltage verification:
  - 2.1 Turn on bonder main power and leave it idle at home.
  - 2.2 Using DC volt meter, verify the DC voltages as follows:
    - At J3 pin 1 for -15 VDC
    - At J3 pin 3 for +15 VDC
    - At TP6 for -5 VDC
    - At TP7 for +5 VDC
    - At TP3 for -1.2 VDC
    - At TP5 for 0 VDC



3. Oscillator calibration:
  - 3.1 Disconnect transducer at connector J2.
  - 3.2 Connect the oscilloscope probe to TP2.
  - 3.3 Verify that the signal is a 5V square wave.
  - 3.4 Adjust potentiometer RT1 till the scope reads about 63.5 KHz (15.75uS).
4. Output voltage calibration:
  - 4.1 Connect a 20 Ohm, 5 Watt resistor across pin 1 and pin 2 of connector J2. Take care not to short across 2 pins.
  - 4.2 Connect AC volt meter and oscilloscope probes to TP5.
  - 4.3 Connect jumper E1 pin1 to pin 2 (high power output).
  - 4.4 Remove PCB Interface (J1)
  - 4.5 Connect a jumper wire from J1-pin1 to TP7 (5vdc)
  - 4.6 Verify that the meter reads .038 Vrms (0.100 Vp-p) and scope shows a clean sine wave.
  - 4.7 Adjust RT4 to obtain the reading
  - 4.8 Remove jumper and reconnect J1
  - 4.9 Program selected channel to have bond power 999 (full power) and bond time 999 (999mS).
  - 4.10 While trigger the selected channel, verify that the meter reads 8 Vrms (22.63Vp-p) and scope shows a clean sine wave. Adjust RT2 to obtain the reading.
  - 4.11 Connect jumper E1 pin 2 to pin 3 (low power output).
  - 4.12 While trigger the selected channel, verify that the meter reads 4.5 Vrms (12.73Vp-p). Adjust RT3 to obtain the reading.
5. Final check:
  - 5.1 Remove 20 Ohm resistor at connector J2 and connect machine transducer to it.
  - 5.2 Return jumper E1 pin connections to original position.
  - 5.3 Connect Oscilloscope to TP5 and trigger ultrasonics and verify frequency of <65KHz.
  - 5.4 Remove all test leads.
  - 5.5 Press the machine reset switch or recycle machine main power, verify that there is no error message from the machine.

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**TROUBLESHOOTING**

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Typically, bonding problems are related to incorrect parameter selection. If you are experiencing any difficulties please contact the WEST•BOND customer service department for immediate and personal assistance. The customer service technician will then have the opportunity to ask questions that will identify the required solution. Please have Machine Model and Serial Numbers available.

In the event that service is desired, contact the WEST•BOND sales or service departments. Do not return the 747677E without first contacting WEST•BOND for packing and shipping instructions. A shipment will not be accepted unless it has been authorized.

Use the section below to maintain a service record for your 747677E.

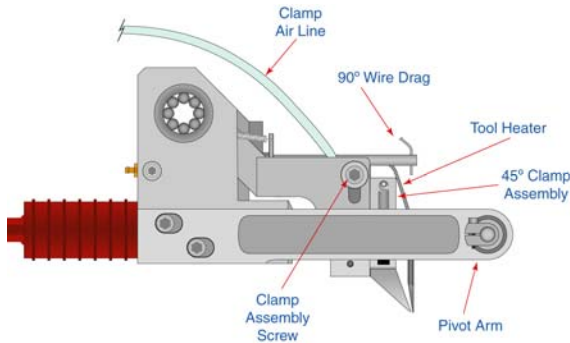
| <b>DATE</b> | <b>PROBLEM</b> | <b>SOLUTION</b> | <b>TECHNICIAN</b> |
|-------------|----------------|-----------------|-------------------|
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The 747677E software performs diagnostic tests of the hardware, software, and stored data and will prompt the operator if there is a problem.

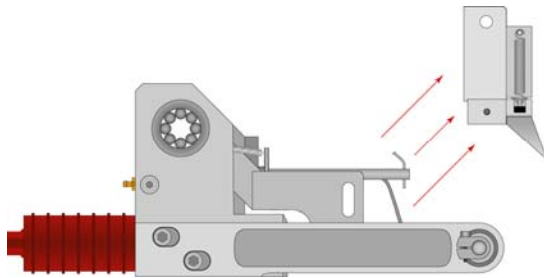
**TOOL ASSEMBLY CONVERSION**

**Clamp Assembly Change**

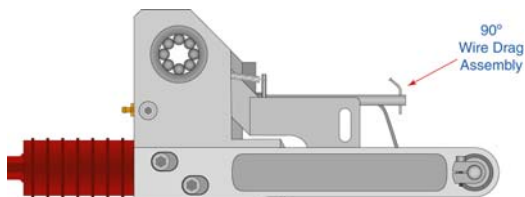
The Model **747677E** Series offers the ability to wire bond with the 45 degree wire feed tool assembly or the Deep Access wire feed tool assembly. The conversion process from one tool assembly to another should take approximately 5 minutes. Please review the following instructions to insure proper execution of the exchange on our **Model 747677E** Series wire bonder.



- 1) Remove the **bonding tool**. Disconnect the Clamp Air Line from the front cover panel and the small clamp securing the hose to the side of the head assembly. (Enter the Edit Sequence so that the machine will not fire ultrasonics when the head is being moved around).

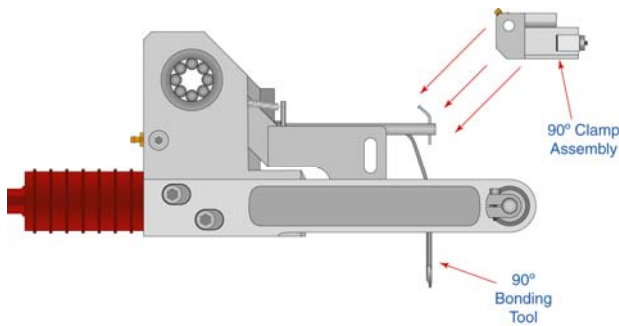


- 2) Holding the Tooling Head remove the clamp release screw and remove head assembly.

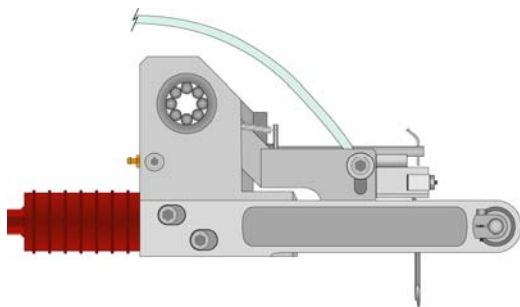


- 3) If not already done, Insert the Wire Drag Assembly. Position the wire drag tube so that it lines up front/back and left/right with the transducer hole for the bonding tool.

**TOOL ASSEMBLY CONVERSION**



**4)** Insert the 90° Tooling head into the location the 45° was just removed from. Insert the Clamp Screw to secure Tooling Head. Align the clamp assembly so that the top surface of the clamps are flush with the top of the mounting surface. Tighten the Clamp Screw.



**5)** Connect the Clamp Air Line to the front cover. reinstall the air hose clamp to the side of the tooling head leaving a little loop between the hose clamp and the clamp assembly. Verify the Alignment and actuation of the Tooling Head is correct for proper bonding.

**6)** Change Model Number for the selected clamp assembly. (see below)

**Reverse Steps in order to re-install the other 45° Tooling Head on the 7476E.**

- A)** The Clamp Home position does NOT need to be used to set the 45° Tooling Head.
- B)** Position the new 45° Tooling Head so that the Top and Front sides are flush with the Clamp Screw Block.
- C)** Press and hold down the Down switch when turning on the power. The following menu will be displayed. Select the model that is intended for use using the UP/DOWN switch and press EDIT to continue.

```

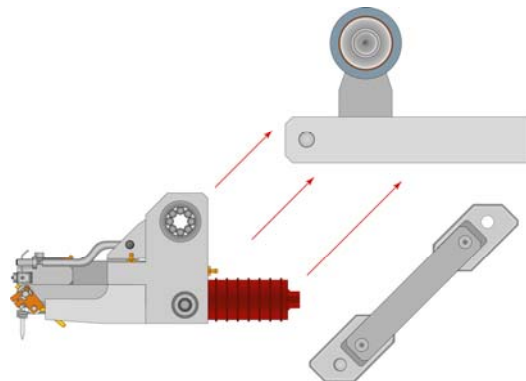
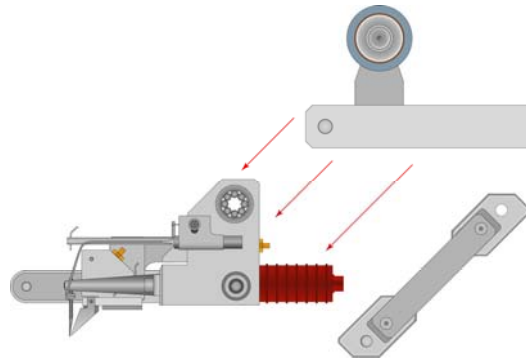
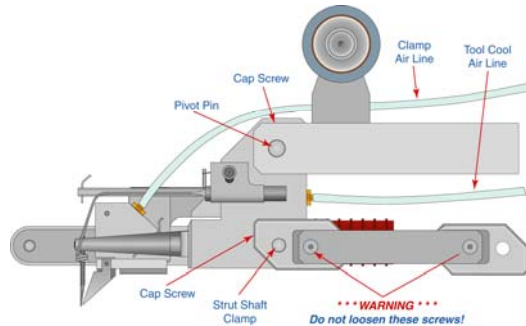
USE UP/DOWN SWITCH TO SELECT MODEL
->MODEL 7400E - Wedge Bonder
MODEL 7600E - Deep-Access Wedge Bonder
MODEL 7700E - Ball Bonder EDIT=Continue
    
```

Please do not hesitate to contact your local Sales/Service representative for assistance or call the **WEST•BOND** factory at (714)978-1551 and ask for the service department.

## TOOL ASSEMBLY CONVERSION

### *Wedge to Ball Bonder Tool Head Conversion*

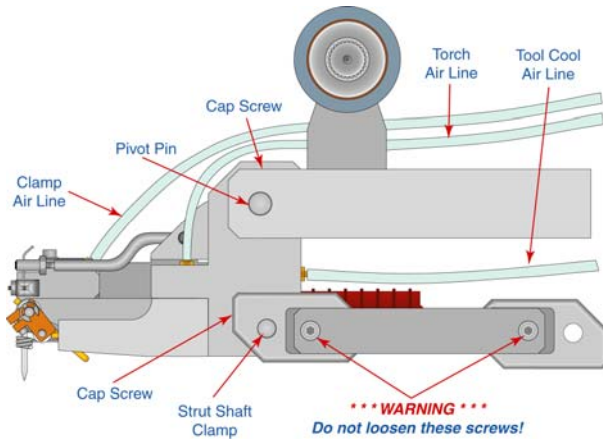
The 747677E also offers the ability to change the entire head assembly to convert the machine into a ball bonder. The conversion process from one head assembly to another should take approximately 10 minutes. Please review the following instructions to insure proper execution of the exchange on our 747677E wire bonder.



- 1) Remove bonding tool, disconnect the air hose and both connectors from the front panel cover. Also remove the small clamp on the left side of the head holding the air hose to the tool head plate.
- 2) Disconnect the FORCE STRUT ARM from the head assembly. The FORCE STRUT ARM is connected to the head assembly with a Dutch Key Assembly to the CLAMP, STRUT SHAFT (P/N 8086) on the right side of the tooling head. To remove loosen the cap screw on the front side of the Clamp and push the pin (SHAFT, STRUT P/N 7952.001) inside and then lower the FORCE STRUT ARM to a relaxed position. Do not pull the FORCE STRUT ARM excessively to the right. Excessive pull to the right could induce drag against the tooling head when reassembled. Do not loosen the two button head screws, these are set at the factory for head perpendicularity.
- 3) Maintain a secure grip of the tooling head and loosen the CAP SCREW securing the pivot pin located on the top right hand side to the tooling head. This CAP SCREW need only be loosened sufficiently to allow the PIVOT PIN to slide to the right. Once the PIVOT PIN been releases and slides to the right the tooling head will be free and may be removed. Do Not remove the CAP SCREW or PIVOT PIN. It is not necessary to remove the CAP SCREW and PIVOT PIN from the tooling head in order to remove the tooling head. As you drop the head away from the machine disconnect the TOOL COOL air hose attached at the rear of the head.
- 4) Reattach the TOOL COOL to the back of the BALL BOND HEAD and gently maneuver the BALL BOND HEAD assembly between the fixed and loose PIVOT PINS. Using two Allen wrenches push the loose PIVOT PIN with one wrench and then tighten the CAP SCREW with the other. There should be no side-to-side play of the head assembly.



**TOOL HEAD CONVERSION**



- 5) Bring the FORCE STRUT ARM up and slide the STRUT SHAFT through the mounting hole and clamp the shaft by tightening the Dutch Key. Locate the air lines for the clamps and the torch and connect them to their respective hose barbs on the front panel. Plug in each of the connectors (3 total) into the sockets on the front panel. Finally, change the machine model number as described below.

***Change Model Number of Machine***

Press and hold down the Down switch when turning on the power. The following menu will be displayed. Select the model that is intended for use using the UP/DOWN switch and press EDIT to continue.

```

USE UP/DOWN SWITCH TO SELECT MODEL
MODEL 7400E - Wedge Bonder
MODEL 7600E - Deep-Access Wedge Bonder
->MODEL 7700E - Ball Bonder  EDIT=Continue
    
```

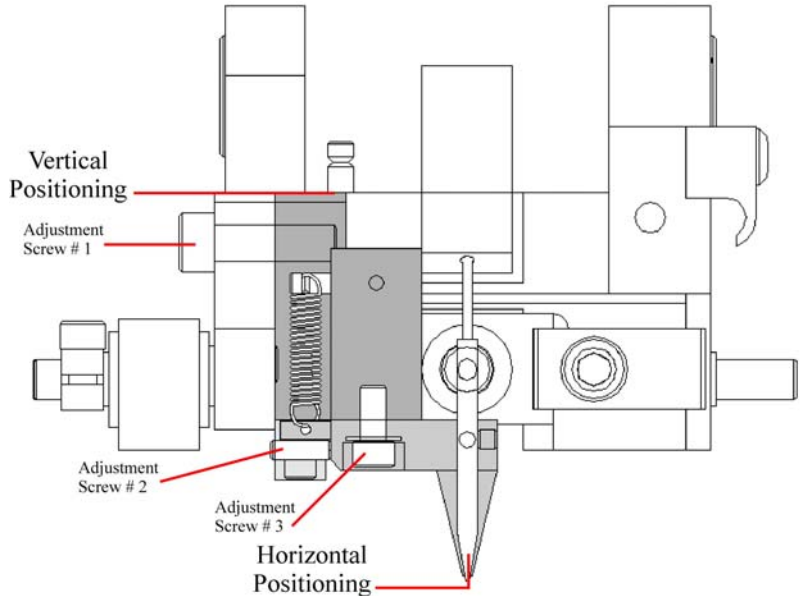
Please do not hesitate to contact your local Sales/Service representative for assistance or call the **WEST•BOND** factory at (714)978-1551 and ask for the service department.

## TOOL ASSEMBLY CONVERSION

### Clamp Adjustment

Tools required setting 45° Clamp  
Blades:

1. Small Mirror (single surface mirror preferred)
2. 0.028" Allen wrench
3. 5/64" Allen wrench
4. 3/32" Allen wrench
5. Bond Tool (0.750" Length)
6. Bonding wire
7. Work holder.



The following procedure is for setting the 45-degree clamp blades. When adjusted properly the clamps will feed the wire through the bond tool straight, leaving the wire tail directly under the bond foot for all subsequent bonds.

Press the [EDIT](#) button prior to making adjustments. This will keep the machine from looking at the firing switch during adjustments.

#### Vertical Positioning:

1. Using the 3/32" Allen wrench, loosen Adjustment Screw #1.
2. Position the Clamp Assembly so that the top of the assembly and the top of the tooling body are flush. Run finger over to feel for elevation differences.
3. Tighten Adjustment Screw #1.

Install Bonding tool and wire.

#### Horizontal Positioning:

4. Using the 5/64" Allen wrench, loosen Adjustment Screw #3, and lightly tighten
5. Using the 0.028" Allen wrench, back Adjustment Screw #2 out (**Do Not Remove**)
6. Using the index finger of your right hand, push the lower clamp assembly to the left while holding the entire head assembly with your left hand.
7. Place the mirror on the workholder, under the clamp assembly. Focus the microscope so the back of tool and clamps are visible in the mirror.
8. Using Adjustment Screw #2, Push the lower clamp assembly to the right until the wire from clamps to bond tool is straight.
9. Tighten Adjustment Screw #3.

#### Testing:

10. Keeping the work holder and mirror under the clamp assembly. Exit the EDIT Menu (ESC).
11. Looking through the microscope. Open and Close the clamps several times. Note any alignment issues. (Repeat: **Horizontal Positioning** if there is a problem).
12. Again, looking through the microscope, attempt several feed cycles, noting any alignment problems.

**WEST•BOND MODEL 747677E SERIES INSTRUCTION MANUAL**

**SPARE PARTS**

***General Recommended Spare Parts for 747677E***

| <b>Part No</b> | <b>Description</b>  | <b>Manufacturer Name</b>    | <b>Manufacturer P/N</b> | <b>Rec. Spare</b> |
|----------------|---|-----------------------------|-------------------------|-------------------|
| 339.001        | Pivot Bearing Shaft, 0.4300" Long                                       |                             |                         | 1                 |
| 342            | Bar, Tie, Manipulator   |                             |                         | 1                 |
| 572.002        | Bracket, Ball Joint (heavy duty)  |                             |                         | 1                 |
| 573            | Spring, Ball Joint  |                             |                         | 1                 |
| 574            | Shaft, Ball Joint   |                             |                         | 1                 |
| 575            | Plate, Ball Joint Backing   |                             |                         | 1                 |
| 846            | Nut, Wire Puller Tension  |                             |                         | 1                 |
| 1200           | Contact Pin   |                             |                         | 1                 |
| 2057.003       | Spring, Compression, 0.562" OD, 0.03"d, 1.250" Free; 0.75 Lb @ 0.75 in. | Superior Springs            |                         | 1                 |
| 2363           | Thumb Screw, No. 10-32 x 1.50" long                                     |                             |                         | 1                 |
| 2431           | Shaft, Tie Bar, .1247" O.D., .625" Long                                 |                             |                         | 2                 |
| 3021           | Heater, Radiant, Bond Tool, Without Ground Wire, Used on "E" Series     | DeWeyl Tool Co., Inc.       | A-3021                  | 1                 |
| 3336           | Spring, Compression, 0.010" Wire x 0.170" OD x 0.782" Free Length       | Superior Springs            | A-3336                  | 1                 |
| 3475.01        | Gage, Bonding Tool (K~27-C) 0.625" Tool Length, .456"                   |                             |                         | 1                 |
| 3475.013       | Gage, Bonding Tool, .750" Tool Length, .580"                            |                             |                         | 1                 |
| 4129.001       | PCB, Photocell Sensor Assembly (modified)                               | K~Sine                      | 4129.001                | 1                 |
| 4187           | PCB, Radiant Heater Control Assembly                                    | K~Sine                      |                         | 1                 |
| 6307           | Dual Force Cylinder Modification  | Clippard                    | 3SSAR-1/2-ENP           | 1                 |
| 6836           | PCB, Photocell Sensor with LED Indicator Assembly                       | K~Sine                      |                         | 1                 |
| 6919           | Torch Tip   |                             |                         | 1                 |
| 6938           | Radiant Heater Clamp  |                             |                         | 1                 |
| 8461           | PCB, Firing Switch Contact Assembly                                     | K~Sine                      | K~8461                  | 1                 |
| 8749           | PCB, Machine Control, "E" Series  | K~Sine                      |                         | 1                 |
| 8750           | PCB, CPU Assembly, "E" Series   | K~Sine                      |                         | 1                 |
| 8846.001       | Assembly, PCB 11568 DC-DC Converter & Motor Driver, "E" Models          | K~Sine                      | 8846.001                | 1                 |
| 8850           | Power Module Assembly, Model 7KE, 70PTE                                 | K~Sine                      | 8850                    | 1                 |
| 9000           | Xducer Assembly, Model K~24-EW, 63KHz                                   | K~Sine                      | K~24-EW                 | 1                 |
| 9011           | Piston, Clamp Blade, Model 4500E  |                             |                         | 1                 |
| 9258           | Wire Drag Tube, Model 7700D, 7600E                                      |                             |                         | 1                 |
| 9303           | Wire Drag Tube, Model 7400E   |                             |                         | 1                 |
| 9744           | PCB, Interconnector, Model 7476E  | K~Sine                      |                         | 1                 |
| 9747           | PCB, Interconnector, Model 7700E  | K~Sine                      |                         | 1                 |
| 12217          | Optical Encoder, with PCB Assembly Inter-connector                      | K~Sine                      |                         | 1                 |
| 50003          | Ball Thrust Bearing, 0.375" OD x 0.156" Shaft                           | MPB                         | S6A7B                   | 2                 |
| 50006          | Ball Bearing, Shielded, Extended Inner Race, 1/8" ID x 1/4" OD          | New Hampshire Ball Bearings | SSRI-418ZZEE (ABEC 7)   | 2                 |

**WEST•BOND MODEL 747677E SERIES INSTRUCTION MANUAL**

**SPARE PARTS**

| <b>Part No</b> | <b>Description</b>   | <b>Manufacturer Name</b>    | <b>Manufacturer P/N</b> | <b>Rec. Spare</b> |
|----------------|--|-----------------------------|-------------------------|-------------------|
| 50007          | Teflon Bearing, Plain, 3/16" ID x 1/4" Long                          | PIC                         | B14-3                   | 1                 |
| 50008          | Ball Bearing, Flanged, Extended Inner, 1/8" ID x 1/4" OD             | New Hampshire Ball Bearings | SSRIF-418ZZEE (ABEC 7)  | 2                 |
| 50009          | Stepper Motor, 4 Phase, 1.8 Deg, 17 x 33 mm long                     | Mycom                       | PS443-01B               | 1                 |
| 50015          | Male Connector, 1/8" Tube to No 10-32 Thd, Quick Disconnect          | Legris                      | 3171-53-20              | 1                 |
| 50033          | Solenoid Valve, 12 VDC, 3 Way, Normally Closed                       | Clippard                    | EV-3-12                 | 1                 |
| 50035          | Miniature Needle Valve   | Clippard                    | MNV-1                   | 1                 |
| 50056          | Pressure Regulating Valve, 5-100 psi                                 | Norgren                     | R07-100-RNKA            | 1                 |
| 50068          | Ball Bearing, Flanged, Shielded, 3/16" ID x 1/2" OD                  | New Hampshire Ball Bearings | SSRF3ZZRA7P25L01        | 2                 |
| 50084          | Sub-Miniature Hose Barb, #3-56 Thd to 1/16" ID Hose, Nickel Plate    | Clippard                    | 11750-2-ENP             | 1                 |
| 50086          | Spring, Extension, 0.012" Wire x 0.094" OD x 0.75" Long              | Associated Spring Corp.     | E0094-012-0750S         | 1                 |
| 50103          | Ball Bearing, Flanged, 1/4" ID x 1/2" OD                             | New Hampshire Ball Bearings | SSRIF814ZZRA7P25L01     | 2                 |
| 50106          | Ball Bearing, Flanged, Extended Inner, 5/32" ID x 5/16" OD           | New Hampshire Ball Bearings | SSRF3ZZRA7P25L01        | 1                 |
| 50111          | Ball Bearing, Shielded, Extended Inner, 1/8" ID x 5/16" OD           | New Hampshire Ball Bearings | SR2-5PPEE               | 2                 |
| 50135          | Spring, Compression, 0.020" Wire x 0.240" OD x 1/2" Free Length      | Associated Spring Corp.     | C0240-020-0500S         | 1                 |
| 50145          | Spring, Extension, 0.016" Wire x 0.120" OD x 0.625" Long             | Associated Spring Corp.     | E0120-016-0620S         | 1                 |
| 50419          | Potentiometer, 10 Turn, 0-50K Ohms                                   | Spectrol Electronics        | 534-1-1-503             | 1                 |
| 50892          | LCD Display, P/N: SSM44083-TS-BG-LY-12, with HDR208SG15 Header       | Shelly Associates           | SSM44083-TS-BG-LY-12    | 1                 |
| 54013          | Switch, Toggle, Chrome Plated Round Handle (Mom-Off-Mom)             | NKK                         | M2018B2B1W01-RO         | 1                 |
| 54014          | Linear Bearing, 3mm Dia x 50mm L, Resin Cage, 11 Crossed Rollers, SS | NB                          | SVS3050-11Z-DS/CU-SMI   | 2                 |
| 54015          | Linear Bearing, 3mm Dia x 75mm L, Resin Cage, 17 Crossed Rollers, SS | NB                          | SVS3075-17Z-DS/CU-SMI   | 1                 |

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## WARRANTY

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- a. Seller warrants to the original Buyer that each new product manufactured by WEST•BOND is free from defects in material and workmanship. Seller's liability hereunder shall be limited to the replacement of any product manufactured by WEST•BOND provided that the defective product is returned within one year from date of invoice to the WEST•BOND factory in Anaheim, California, with transportation charges prepaid. Upon examination by WEST•BOND, a product found defective due to manufacture and not the result of abuse, unauthorized alteration or normal wear, will be replaced. Seller makes no warranty concerning products or accessories not manufactured by WEST•BOND. However, Seller will give all reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is appropriate under the terms of that manufacturer's own warranty. No product may be returned to the factory without a Return Material Authorization (RMA) number issued by authorized factory personnel.
- b. This warranty is in lieu of all other warranties expressed or implied. WEST•BOND expressly disclaims any and all warranties of merchantability and fitness for a particular purpose. No employee, agent or representative of Seller has any authority to obligate Seller beyond that specifically included herein unless agreed to in writing by an authorized officer of Seller.
- c. Seller assumes no liability or risk for any special, direct, indirect or consequential damage caused by defective products manufactured by WEST•BOND.

Rev. 4/99

### ***Patent Information***

This series machine is covered under the following patents:

5190206          Self-Thread Wedge Bond Tool

6164514          "E" Series – X-Y-Z Micromanipulator, orthogonal and independently locked axes.

**WEST•BOND INC.**  
1551 S. Harris Court  
Anaheim, California 92806-5932  
Web Site: [www.westbond.com](http://www.westbond.com)  
E-mail: [sales@westbond.com](mailto:sales@westbond.com)  
Phone: (714)978-1551  
Fax: (714)978-0431

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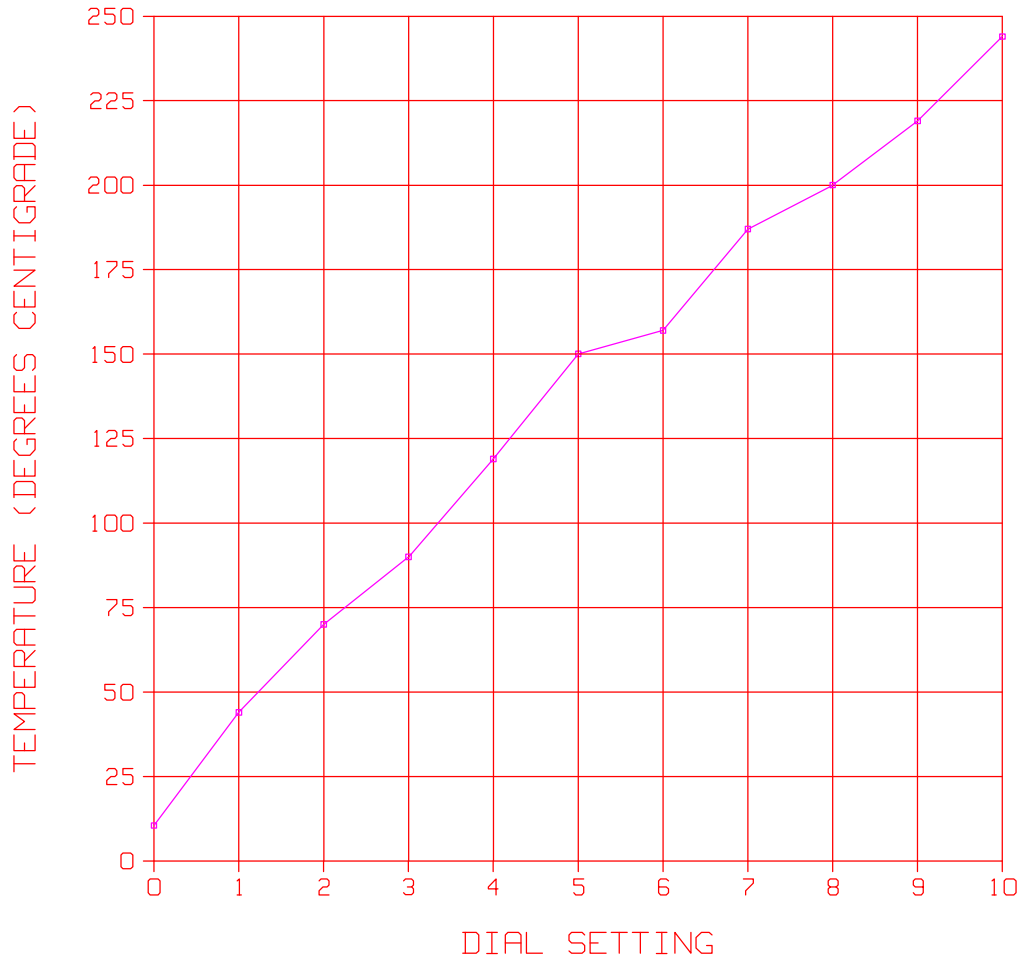
**TECHNICAL INFORMATION**

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***Radiant Heater For Tool***

This machine has been equipped with a radiant heater for the wedge bonding tool.

The heater temperature is adjusted by the potentiometer located on the right side of the front panel, marked "Tool Heat".



***Model 7476E***  
**2 ½ TURN, 0.750 TOOL LENGTH**

**NOTE:** Temperatures may vary depending upon environment.

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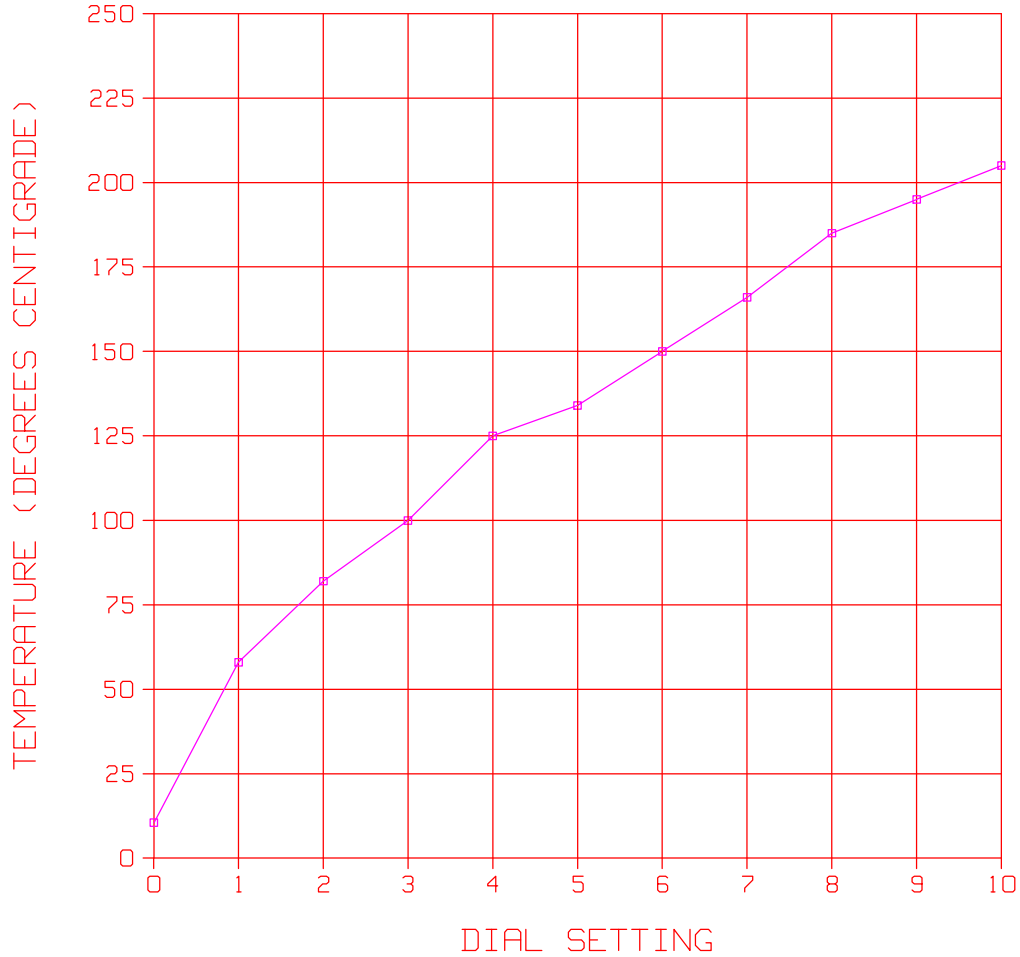
**TECHNICAL INFORMATION**

---

***Radiant Heater For Tool***

This machine has been equipped with a radiant heater for the wedge bonding tool.

The heater temperature is adjusted by the potentiometer located on the right side of the front panel, marked "Tool Heat".



***Model 7700E***

**2 ½ TURN, 0.625 TOOL LENGTH**

**NOTE:** Temperatures may vary depending upon environment.



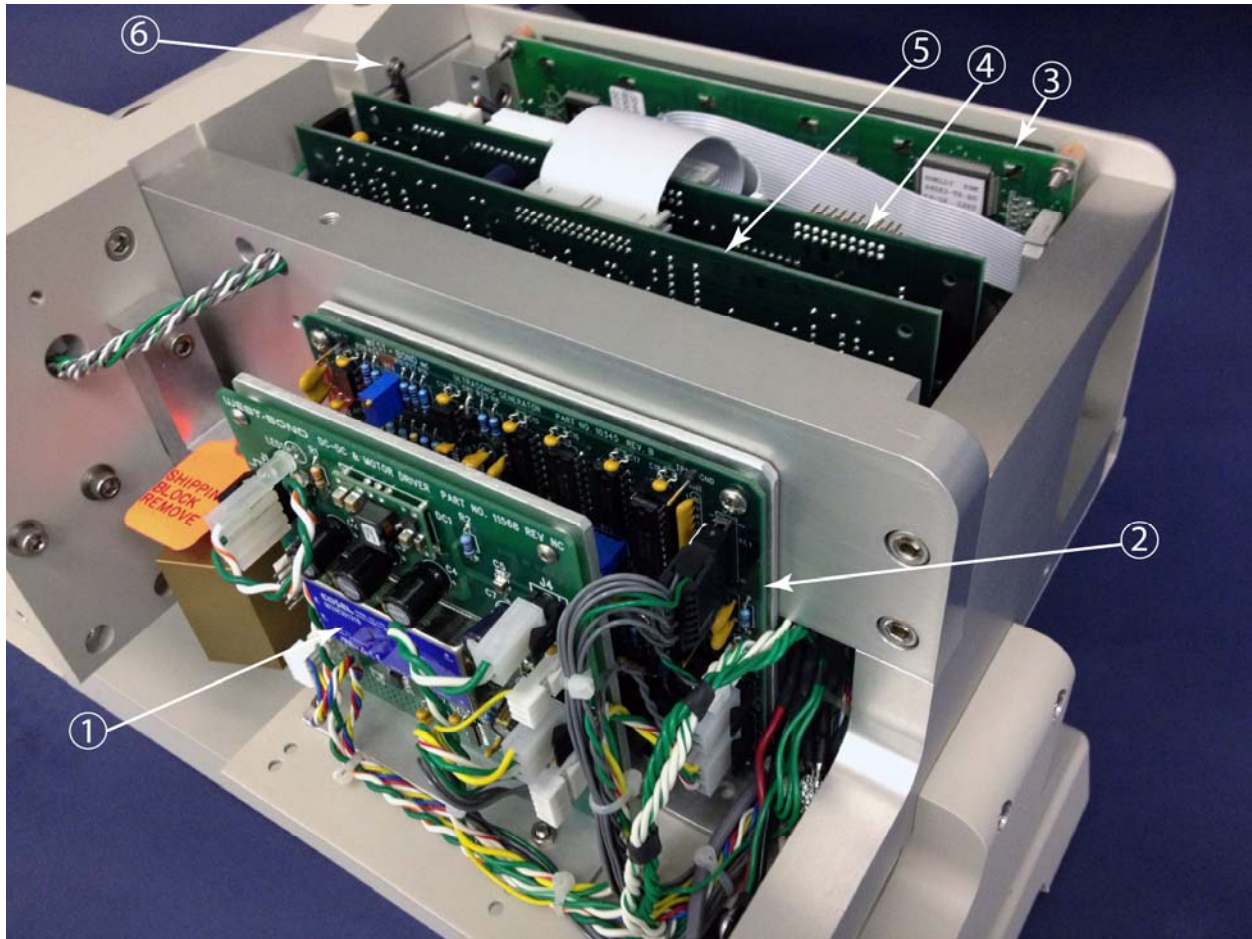
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## SYSTEM DRAWINGS

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### *PCB's – Rear of Machine*

- 1 PCB, 11568 Motor Driver / DC-DC Converter (order as 8846.001)
- 2 PCB, Ultrasonic Generator, Dual Channel, 4 Watts, Built-in Assembly P/N 10345
- 3 LCD Display, P/N: SSM44083-TS-BG-LY-12, with HDR208SG15 Header P/N 50892
- 4 PCB, Machine Control, "E" Series P/N 8749
- 5 PCB, CPU Assembly, "E" Series P/N 8750
- 6 Microscope Ground



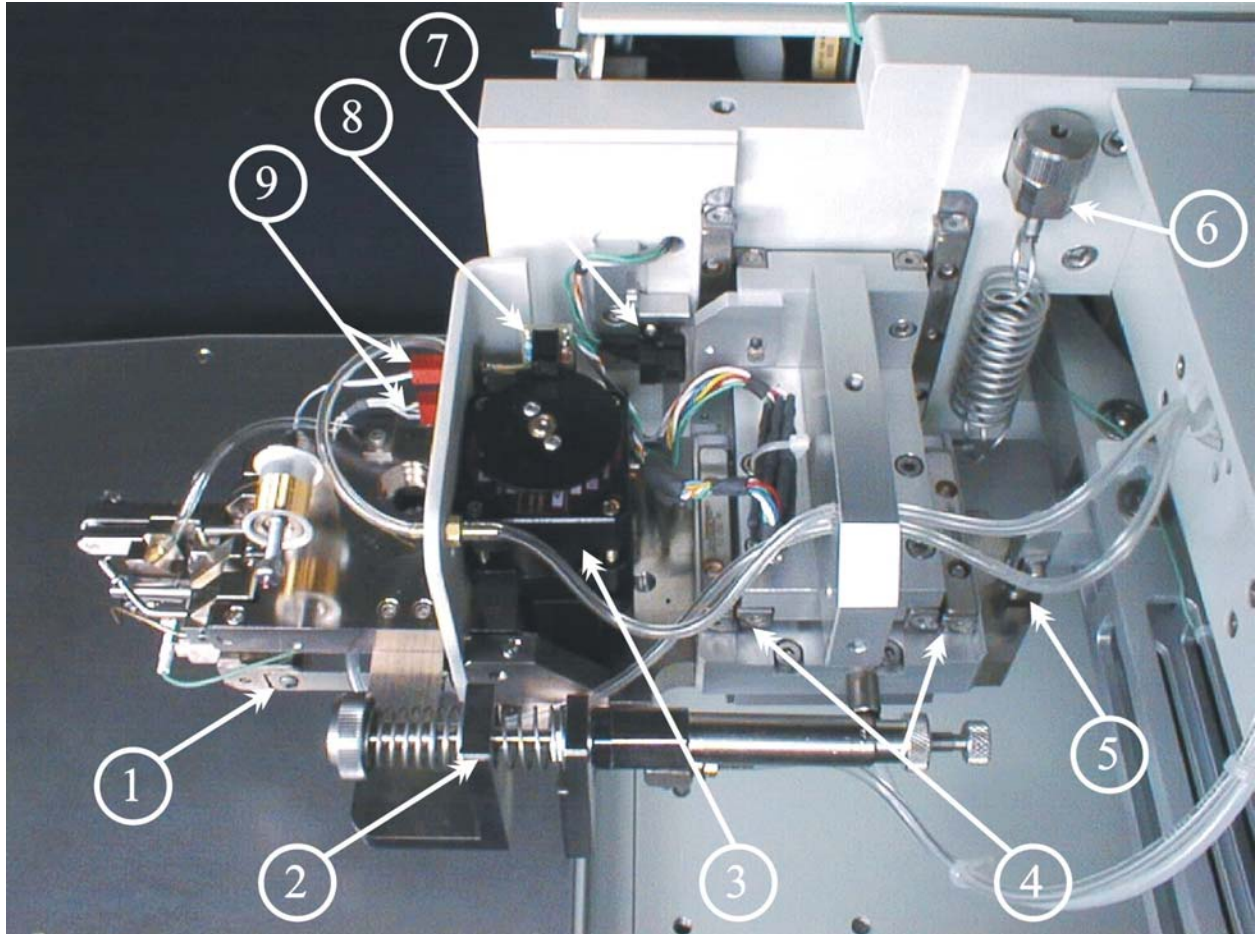
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**SYSTEM DRAWINGS**

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***A-Motor & Linear Bearing Assembly***

- 1 Perpendicularity Adjustment Screw
- 2 Bond Force Adjustment
- 3 A-Motor
- 4 X-Y-Z Linear Bearing Assemblies
- 5 Ball Joint Assembly P/N 8255
- 6 Z – Counter Balance Assembly
- 7 Optical Encoder Module Assembly P/N 12217
- 8 Home Sensor – PCB, Photocell Sensor Assembly P/N 4129
- 9 Transducer and Radiant Heater Connections



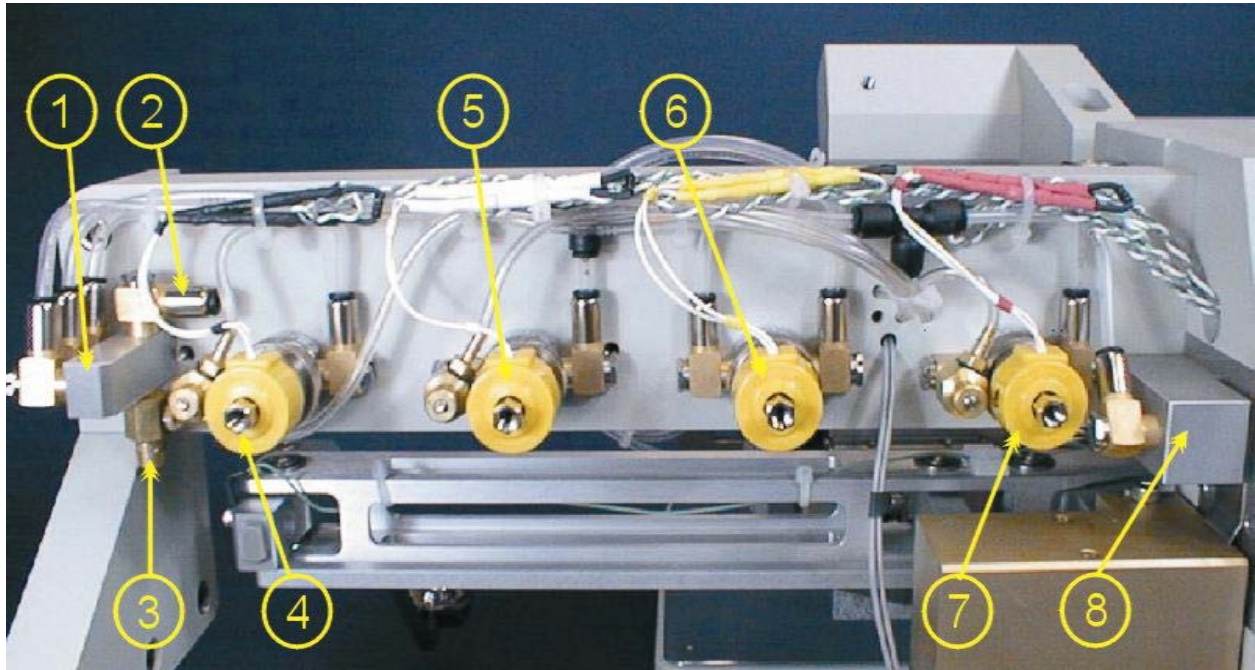
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## SYSTEM DRAWINGS

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### *Air System*

- 1 Air Manifold
- 2 Air In
- 3 Tool Cool Needle Valve
- 4 Dual Force Solenoid - Solenoid Valve, 12 VDC, 3 Way, Normally Open P/N 50034
- 5 Torch (EFO) Solenoid - Solenoid Valve, 12 VDC, 3 Way, Normally Open P/N 50034
- 6 Air Brake Solenoid - Solenoid Valve, 12 VDC, 3 Way, Normally Open P/N 50034
- 7 Clamp Solenoid - Solenoid Valve, 12 VDC, 3 Way, Normally Open P/N 50034
- 8 Z-Brake Assembly





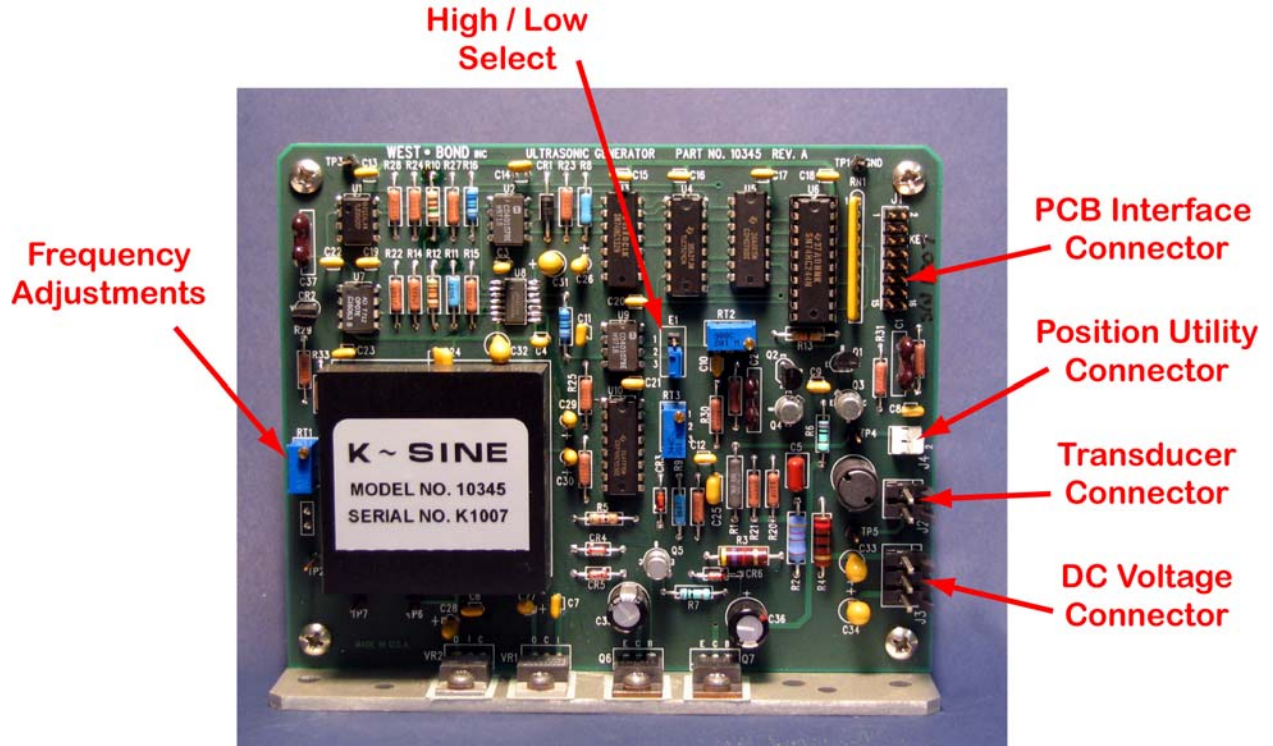
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**SYSTEM DRAWINGS**

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**Ultrasonic Power Supply**

*P/N 10345*



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**SCHEMATICS**

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**THE FOLLOWING PAGES CONTAIN DRAWINGS  
AND SCHEMATIC INFORMATION  
FOR THE 747677E SERIES**

Models 747677E use the following schematics:

|           |                           |
|-----------|---------------------------|
| CB-6836   | Photo Sensor Circuit      |
| CD-8749-1 | Machine Control Circuit - |
| CD-8749-2 | Machine Control Circuit - |
| CD-8749-3 | Machine Control Circuit - |
| CD-8749-4 | Machine Control Circuit - |
| CD-8749-5 | Machine Control Circuit - |
| CB-8750-1 | Microprocessor Circuit -  |
| CB-8750-2 | Microprocessor Circuit -  |
| CB-8776   | Motor Driver Circuit      |
| CB-8777   | DC-DC Converter           |
| CB-8850   | AC-DC Power Module        |
| CB-8891   | Electronic Torch Circuit  |
| CB-8894   | System Wiring Diagram     |
| CB-10345  | Ultrasonic Generator      |