WEST•BOND®

MODEL 454647E

Three Way Convertible
Semi-Automatic Wedge-Wedge
And Ball-Wedge Bonder

SERIAL#_____
P.O.#_____

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INTRODUCTION

WEST•BOND'S new "E" Version starts the twentieth year of the Model 4500 tradition. This machine was revolutionary at its inception as the first to make a wire bond connection fully under programmable software control executed digitally by motors, thus making possible the manufacture of high frequency, high power semiconductor devices where connections must be identical. The original design, with digi-switches for input and with LED's to display individual data lines by binary value, remained unchanged by customer insistence until finally supplanted by the current 4500 Model of the "B" Series. Now, Model 454647E brings forward the new advances of the "E" Series, notably the placement of all machine mechanism above the work plane to allow unlimited access, and the setting of axis brakes to lock on target. In this model the tool, rather than the work, is moved, both for alignment and for bonding, with the work pre-rotated. There is choice of alignment by either microscope or video. Bond heads are built around a 63 kHz ultrasonic transducer and provide full three-way convertibility.

When operating in the 4500E mode, the 454647E is an ultrasonic 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 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.

When operating in the 4600E mode, the 454647E is a thermosonic wedge-wedge wire bonder designed to interconnect wire leads to semiconductor, hybrid, or microwave devices. The machine bonds aluminum or gold wires ranging from 0.0007 in. to 0.002 in. and aluminum or gold ribbon ranging from 0.0005 in. x 0.002 in. to 0.001 in. x 0.01 in. Bonds are made by the wedge-wedge technique using ultrasonic energy and work piece heat. Wire is clamped and threaded vertically through a hollow wedge, allowing independent feeding action but requiring front-to-back bonding direction.

When operating in the 4700E mode, the 454647E is a thermosonic ball-wedge wire bonder designed to interconnect wire leads to semiconductor, hybrid, or microwave devices. The machine bonds gold wires ranging from 0.0007 in. to 0.002 in. Bonds are made by the ball-to-wedge technique using ultrasonic energy and work piece heat. Wire is clamped and threaded vertically through a hollow capillary, allowing independent feeding action. The connection is begun with a ball formed on the end of the wire stock by electric discharge, and completed by a wedge bond under the end of the capillary tool. The bonding tool is guided manually by the operator using hand/eye reference to bond targets and elevations.

PRODUCT OVERVIEW

Application

Machines of this series bond aluminum or gold wires from 0.0007 in. to 0.002 in. diameter, primarily to stitch bond a succession of parallel multi-arch wires, but useful for bonding any program of shaped connections. Three bond methods are available by tool head conversion; angled-feed wedge bonding, vertical-feed wedge bonding, and ball bonding. Both wedge bond methods require front-to-back wire progress, hence pre-rotation of the work piece. Wherever possible, angled feed wedge bonding is recommended because clamps very near the bond foot can have the best effect to work the wire into arches. Ball bond connections can be similarly shaped, even by complex motions, if rotation is pre-set. This machine is also uniquely capable of making a succession of spaced single-ball bonds. Further, a machine of this series can be assembled without feed mechanism to Tab Bond a pattern of connections, such as on the flex circuits of computer disk read heads.

Mechanical

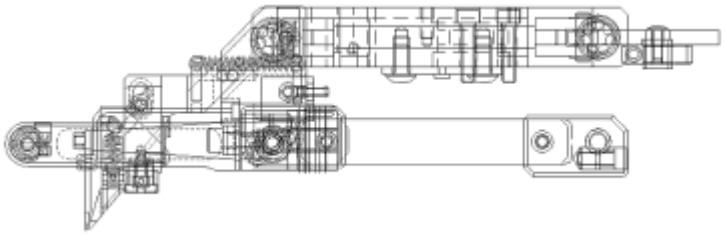
Bonding mechanism is constructed of four axes, straight-line and orthogonal, stacked in an array. Two axes, X and Y, are driven by micromanipulator for positioning, then held by pneumatic brakes for bonding. Two axes, W (in Y direction) and Z, are driven by programmed motors to create and arch the connection. The vertical view video camera is mounted atop the X-Y axes so that the manipulator moves its target crosshairs. When video method is chosen, the tool is withdrawn along the W axis during alignment. When aligning by microscope, target is judged by an angled view of the tool at a search elevation just above the work. Approach to search and then down to contact can be controlled by a separate manual encoder that generates clocks to drive the Z Motor directly, or can be controlled at the keypad or by a push-button on the right-hand control. These different methods can be used interchangeably in any sequence. Similarly, alignment by microscope or video is optional. Video alignment allows bonding of the entire connection after a single input accepting the targeting of the critical bond, though requiring extra runs on the W axis to hide the tool. Microscope alignment allows direct view of and placement of all bonds with minimum movements. The work piece is aligned front-to-back on a large platform that is fully adjustable through the bond plane. Alignment can be checked before bonding by scanning methods. The work platform is also adjustable in elevation.

Ranges, Ratios, and Resolutions

- X-Y Positioning, by Manipulator — 0.625" Total, +/- 0.3125" @ 8/1 Ratio
- Y Stroke (W axis), by Motor — 0.500" Total, 0.200" Forward, 0.300" Rearward from target point
- Maximum Bond Span — 0.299” Maximum wire length
- Resolution — 0.00333" per half-step, 0.000208" per micro-step
- Z Stroke, by Motor — 0.500" Total, 0.460" Up, 0.040" Down
- Resolution — 0.00333" per half-step, 0.000208" per micro-step
- Z Encoder, Manual — 0.125" Touchdown from Search @ 8/1 Ratio
- Resolution — 0.001" per encoder transition
- Work Platform, by Thumbscrew — 0.730" Total, 0.140" Above, 0.590" Below (measurements made with respect to bond height)

PRODUCT OVERVIEW

Bond Tool Head Assemblies



The new forward-pivot tool assemblies of this series are built around K~Sine Transducer, Model No. 24-W, 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 length of 0.750". 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 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.

Machine Configuration

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, a model of this series is designated as "454647EX". For use as a stand-alone complete bonding machine, the mechanism will be completed with a plain base having a bolted-on, adjustable height, work platform, and will be designated as "454647E". In either the "E" or the "EX" configurations, optional control arms are included to move both the manipulator control point and the Z axis encoder control point five inches vertically from their normal positions near the machine base to new locations above the work plane. When the high control arrangement is used, the customer must provide suitable operator's forearm rests. 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. The manual Z Encoder method of controlling tool descent is optional.

Mounting points for the "EX" version of this mechanism are provided at two foot locations at the work plane elevation, approximately 22.312 in. apart, and 8.734 in. to the rear left, and 13.093 in. rear right, of the work point.

Electrical Software and Hardware

A software program controls operation of motors and other actuators, as configured by setup values, in response to operator’s inputs. It accepts entry of data about User’s Devices to create different Types of connections. These Types may have any number of Bonds, up to 100, and may be repeated for any number of Wires up to the maximum of 6000 individual Bonds. Data to define all the motions required to create the connections are stored in Buffers that are selected by the keypad. Default values are 30

PRODUCT OVERVIEW

Electrical Software and Hardware

Types of 5 Bonds per Type which yields 40 Device Buffers. **WEST•BOND** Part No 8100 CPU, containing a Motorola 68000 microprocessor and 256 KB of nonvolatile RAM executes the software program.

A keypad is provided for direct entry and editing of both configuration and user data and for selection of operation options. Entry and execution is prompted at the machine panel by a series of "screens" displayed on a 4-line 40-character LCD. All programmed values are displayed during bonding.

Built in ultrasonic power supply is ***K~Sine*** Part No 10345, four Watts, dual channel. Settings of power and time program values are sent via an eight-bit interface. Adjustment of current for radiant tool heat is included with the panel controls.

Operating Controls

KEYPAD

Twelve-key pad for entry of program data, setting of Modes, and direct control of machine actions. At left hand.

Z ENCODER

Generates Z-Axis motor step clocks: A home sensor parallels the G Key and the Ball Button. At left hand with both high and low control arms.

X-Y MANIPULATOR

Moves tool head, TV camera, and motorized slides atop X-Y-Axes with 8-to-1 mechanical advantage. At right hand with both high and low control arms.

BALL BUTTON

Push-button switch in the manipulator control ball. Parallels the G Key but also acts to lock only the X-Axis for scanning the bond path along the Y-Axis, front-to-back.

ROTARY WORK TABLE (OPTIONAL)

Rotates about the center of tool motion range to pre-set the alignment of bonds front-to-back.

Modes of Operation

MONITOR OR MICROSCOPE

When toggled by Key 9, the bond tool moves along the W-Axis between the target position above this bond, and a retracted position out of camera view.

Monitor: Target the beginning bond of the sequence on the television monitor screen. Move the camera cross hairs to the bond point by the X-Y Manipulator.

Microscope: Target all bonds by direct view of the tool through the microscope.

INHIBIT AUTO

Modifies only the Full-Auto Mode. It is set for each bond during Bond Edit.

On: Full-Auto pauses at each search elevation for X-Y targeting while the key is held.

Off: Full-Auto proceeds with no pauses.

PRODUCT OVERVIEW

Modes of Operation

FULL-AUTO OR HALF-AUTO

This mode is toggled by Key 8

Full-Auto: Start by G Key or Ball Button or Z Encoder. Lock manual X-Y slides and bond all bonds of this wire. Pausing is controlled by Inhibit Auto described above.

Half-Auto: Controlled by G Key or Ball Button or Z Encoder. This is a press and release sequence with pauses at each search and loop elevation.

INCH MODE

Start by Zero Key. Executes Half-Auto mode except proceeds down in slow steps from each search to contact while key is held. Available any time tool is stopped.

Definitions of Models in this Series

All E Series machine models are finished with selected materials and protective coatings to prevent electrostatic discharge to user's work piece.

MODEL NO. 4546E

This machine with single wedge bond tool head, Assembly No. 9004, with angled clamp Assembly No 9048 and overhead clamp Assembly No 9049, for bonding by either wedge method.

MODEL NO. 4546EX

This machine, specified as Model 4546E, except without base.

MODEL NO. 454647E

This machine with two bond tool heads, Assembly No 9004 with the two clamp assemblies for wedge bonding as above, and with tool head Assembly No 9044 for ball bonding, all convertible.

MODEL NO. 454647EX

This machine specified as Model 454647E, except without base.

MODEL NO. 4700E

This machine with one tool head Assembly No 9044 with ***K~Sine*** Transducer, Model No. 34-C, for ball-wedge applications. Software also allows spaced, single-ball bonding.

MODEL NO. 4700EX

This machine specified as Model 4700E, except without base.

Services

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

Electrical service required is 50-60 Hz, single phase, either 115 VAC or 230 VAC; however, input must be configured at the factory for 230 VAC. 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.

Dimensions

"E" Series machine size is 24.218" wide x 22.297" deep x 11.000" high, exclusive of microscope, or 15.000" in height to scope eyepieces. Weight is 75 lb. uncrated, or 110 lb. crated.

"EX" Series machine size is 22.312" wide x 16.500" deep x 6.000" high above work plane, exclusive of microscope, or 10.0" high from work plane to scope eyepieces. Weight is 55 lb. uncrated, or 90 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 back rails: *Assembly No. 3600.018*

Non Heated Workholder: Non-rotating workholder 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 workholder 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 Workholders:
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 workpiece heat capability to any machines of the 4K, 5K or 7K Series.

-45C: Free Furnace Workholder: 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 Workholder: 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 Workholder: 2" x 2" substrates, mechanical clamp, adjustable backstop, cavity inert atmosphere. With 2" x 2" fluoroware die presentation. *Assembly No. 3800.353*

-45G.402 Free Furnace Workholder: 2" x 2" substrates, mechanical clamp, adjustable backstop, cavity inert atmosphere. With 2" x 2" 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.

CAUTIONS

Contained in this section are cautions to be observed during 454647E 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.

CAUTIONS

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.

CAUTIONS

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

Unpacking and Inspection

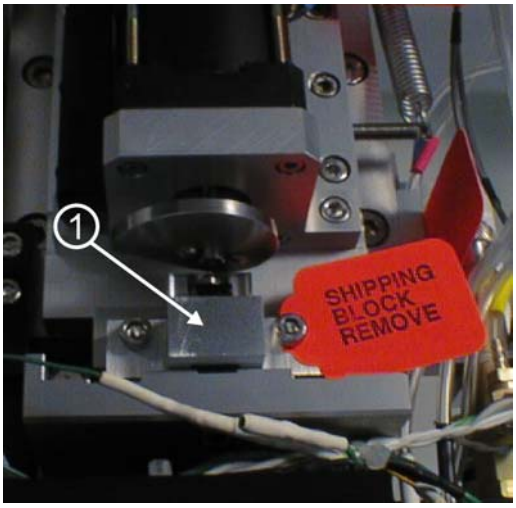
STEP 1

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

✓	ITEM	OPTION	✓	ITEM	OPTION
	Manipulator Control Arms	standard		Air Regulator	standard
	Key Pad	standard		Additional Wire Clamps (90°)	standard
	Video Monitor	standard		Additional Ball Bond Head	standard
	Camera	standard		Microscope	(optional)
	Camera Cables	standard		Illuminator	(optional)
	NEFO Unit	standard		Work Holder	(optional)
	Crosshair Generator	standard		Temperature Controller	(optional)

STEP 2

Remove the accessory pedestal insert and carefully lift the 454647E and the attached shipping board from the bottom of the shipping carton.



STEP 3

Remove the six shipping bolts that fasten the 454647E to the shipping board.

NOTE! Save all packing material for use during any future equipment relocation

STEP 4

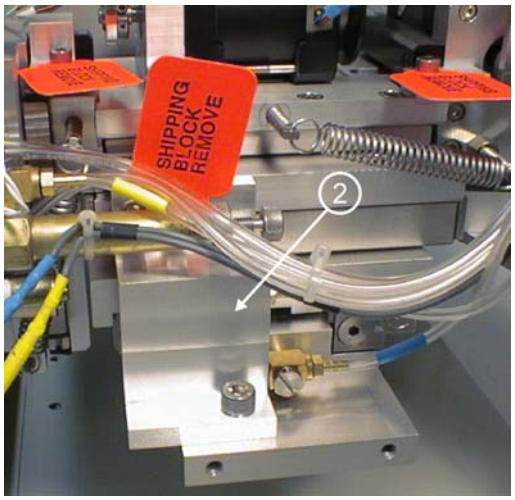
Position the 454647E where it will be used.

STEP 5

Remove the cover of the X-Y-Z Assembly unit to gain access to the shipping blocks.

STEP 6

Remove the *two* Z-Mount Shipping Brackets (P/N's 9081 and 9082) ← located just behind and below the microscope mount. Remove the two shipping cap screws to remove the brackets.



STEP 7

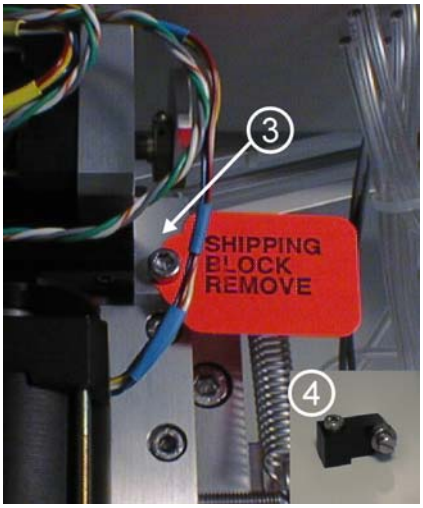
Remove the X Mount Shipping Bracket (P/N 9079) ↑ located behind and just below the dual force cylinder. Remove the shipping cap screw at the bottom and two more at the top of the bracket.

STEP 8

Remove the Y-Mount Shipping Bracket (P/N 9080) → located at the back of the X-Y-Z Assembly. Remove the two shipping cap screws. Replace the Shipping bracket with the Cam Follower Mount Y-Slide (P/N 8928) ↓, Tie Wrapped to the X-Y-Z Cover.

INSTALLATION

Unpacking and Inspection



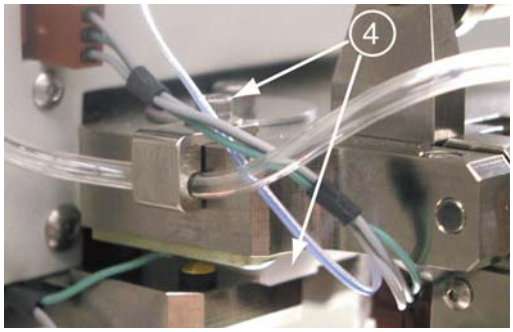
STEP 9

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 to insure correct installation.

CAUTION! Never attempt to lift the machine by the micromanipulator arm!

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.



Connecting the Accessories

STEP 1 - *AIR*

Connect ¼" poly-flow tubing from air regulator to rear panel Adjust for approximately 50 psi nominal.

STEP 2 - *MICROSCOPE*

Attach the Microscope Mount to the Microscope Support, located in the center of the machine, using the screw and washer provided. Position the Mount so that it is completely forward, close to the operator.

Attach the Microscope to the Microscope Arm assembly. Adjust the arm to place the Microscope in the maximum up position. Attach the Illuminator to the Microscope using the adapter which threads into the Microscope. Position the wire for the Illuminator in the direction of the Microscope Arm Assembly, away from the operator.

Place the Microscope into the Microscope mount on the machine using caution not to interfere with the video camera assembly.

After all accessories are connected and the machine is ready to bond, the Microscope needs to be adjusted and properly centered. (See Thread and Bond-Off Section, page 33).

STEP 3 - *VIDEO CROSSHAIR GENERATOR*

Connect the BNC cable from the VIDEO OUT connector of the Crosshair Generator to the VIDEO IN connector on the Video Monitor. Plug in both units to 110VAC, 50-60Hz.

INSTALLATION

Connecting the Accessories

STEP 4 - *CAMERA*

Check Camera (Horizontally Mounted). Make sure the Camera Body and Lens Assembly are perpendicular to X-Y Platform. The Camera is factory set, However it may have been disturbed during shipping. See page 17 for realignment procedure.

CAUTION! Never attempt to move or lift machine with the Camera or Camera Mount !!!

Connect the BNC cable from the *VIDEO OUT* connector of the camera to the *VIDEO IN* of the Crosshair Generator.

STEP 5 - *KEY PAD*

Attach the Key Pad cable to the 9 pin D-Sub connector that exits from the left-rear side of the machine.

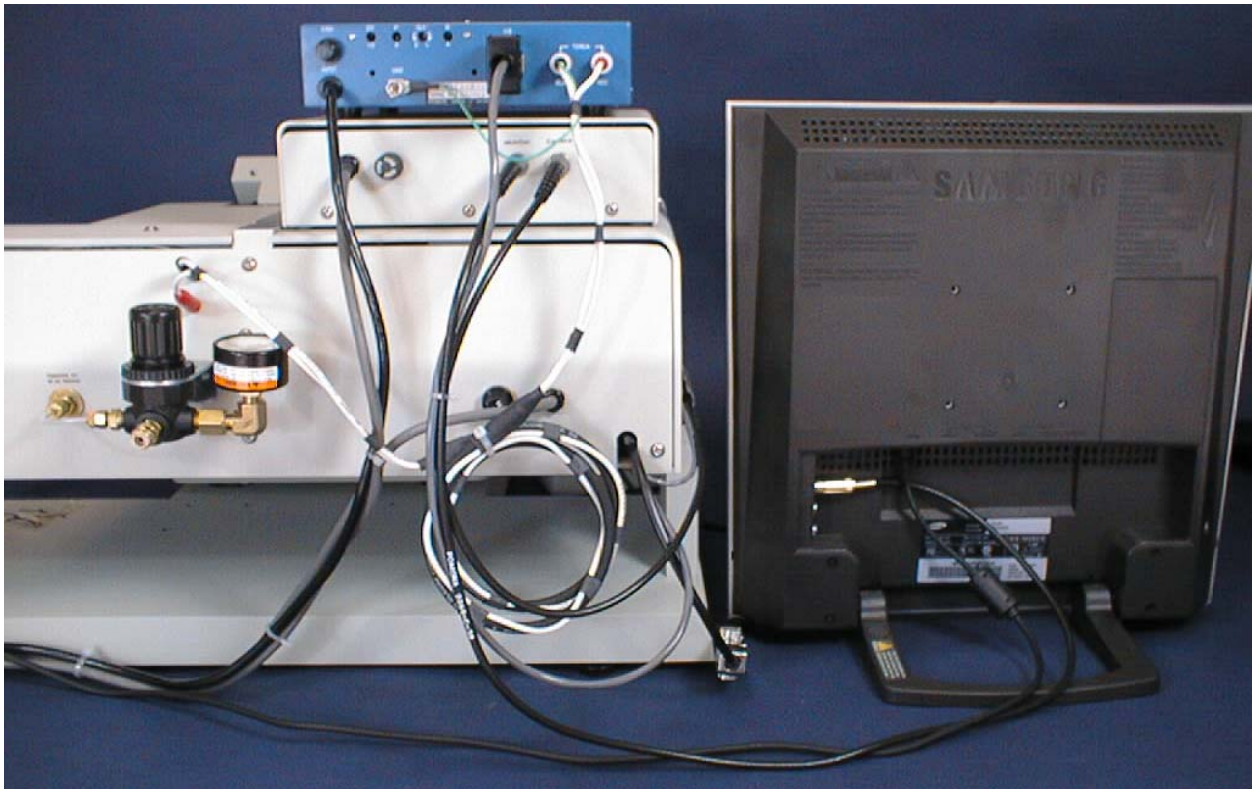
STEP 6 - *NEGATIVE EFO GENERATOR*

Set the Generator on top the crosshair generator, ensure the power switch is off and plug into 110VAC. Locate the cable with the Honda connector coming out of the back of the 454647E and connect it into the back of the NEFO Generator. Remove the torch cable from its bag and plug into the rear of the NEFO Generator. Attach the ground to the provided thumb nut. Finally plug the torch cable into the 454647E paying special attention to ensure that each end of the cable is plugged into its correct color connectors. (i.e. red to red and black to black)

STEP 7** - *WORKHOLDER /TEMPERATURE CONTROLLER*

Connect the 5-pin Bendix connector of the Workholder to the rear of the Temperature Controller. If the Workholder has Vacuum, connect the Orange hose from the Workholder to a Vacuum Supply. Plug the Temperature Controller to 110VAC, 50-60Hz.

***** OPTIONAL***



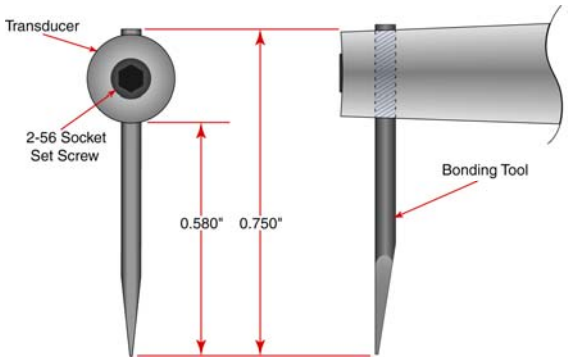
INSTALLATION

Bond Tool Installation

45° AND 90° WEDGE BONDING TOOL

The bonding wedge is a major influence on a successful program. Taking the time to establish the correct wedge for each specific application will ensure high quality bonding. The 454647E requires that the shank diameter of the tool be 1/16". The ***K~Sine*** K~24-W transducer used in this wedge-wedge configuration has been specially developed in conjunction with an 0.750" (19mm) length tool. Different length tools can be used, however an entirely different setup (with regards to ultrasonic power, ultrasonic time, and force) will be required.

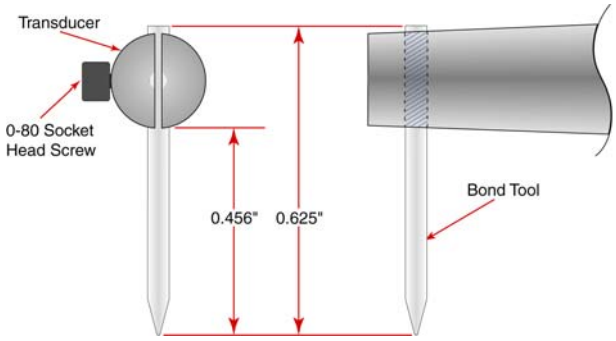
To install the bonging tool, loosen the transducer set screw and insert the bonding tool through bottom of transducer. If the machine is in the 4500E mode, it may be helpful to have clamps open when installing the tool. Positioning the bonding tool according to the drawing below gives the user a good starting position to begin running the Ultrasonic Positioning Utility (UPU). See page 67 for details on the UPU.



BALL BONDING CAPILLARY

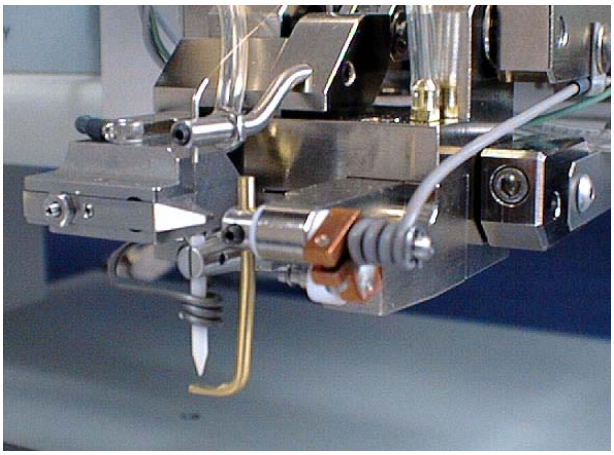
Just as the bonding wedge is a major influence to a successful program, so is the ceramic capillary used for ball bonding. Taking the time to establish the correct wedge for each specific application will ensure high quality bonding. When in the 4700E mode, the 454647E requires that the shank diameter of the tool be 1/16". The ***K~Sine*** K~27-EC transducer used in this ball bond configuration has been specially developed to work with a 0.625" (16mm) length capillary. Different length TORCH WANDS can be ordered to accommodate a variety of capillary lengths, up to 1" (25mm).

To install the bonging tool, 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. Positioning the bonding tool according to the drawing below gives the user a good starting position to begin running the Ultrasonic Positioning Utility (UPU). See page 67 for details on the UPU.



INSTALLATION

Torch Wand and Tail Setup

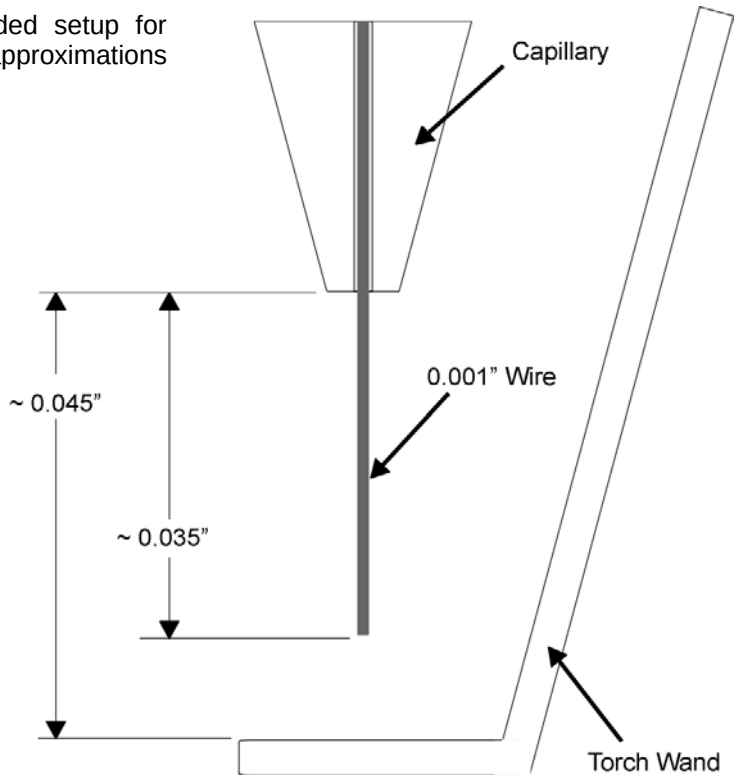


Ball size is affected by many different factors including Ball Size setting, Tail Length, distance between the tool and the Torch Wand, wire diameter, wire elongation, wire quality (age), and Torch Wand cleanliness. When all settings are optimized (per application), the ball will form just below the tip of the capillary and the machine will pull the ball up into the pocket on the bottom of the tool in preparation of the next bond. If the tail length is too short, the Tool to Torch distance is too short, or the ball size setting is turned up too high, the ball will form up inside the capillary. This causes deformed balls and also shortens the life of the ceramic tool.

This drawing represents the recommended setup for 0.001” gold wire. These numbers are approximations and may vary for different applications.

RECOMMENDED SETTINGS

Wire Size:	0.001”
Tail Length:	~0.035”
Tool to Torch:	~0.045”
Wire Gap:	~0.010”

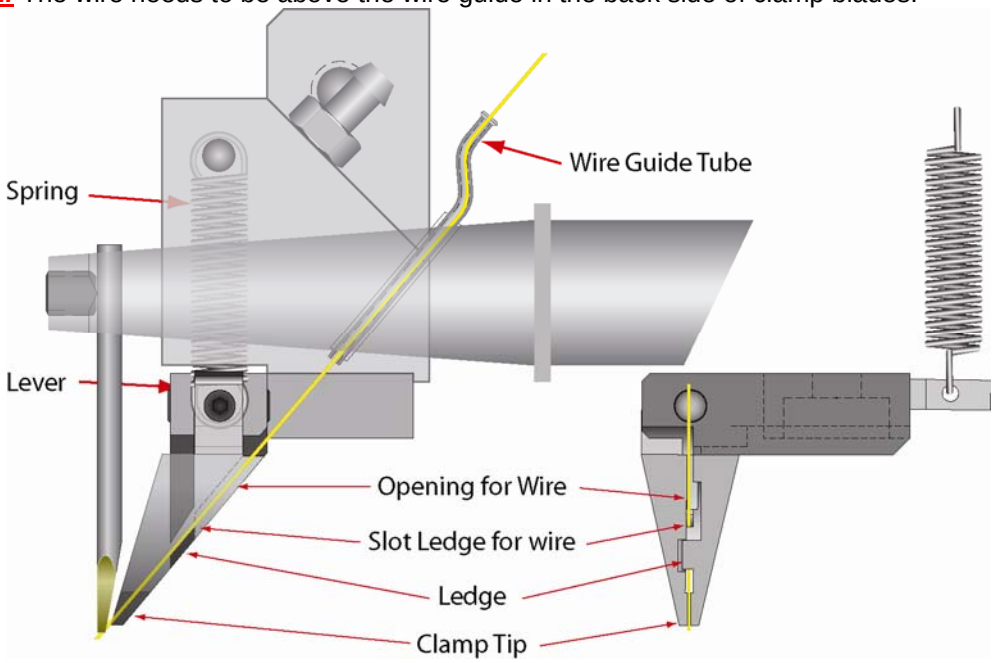


INSTALLATION

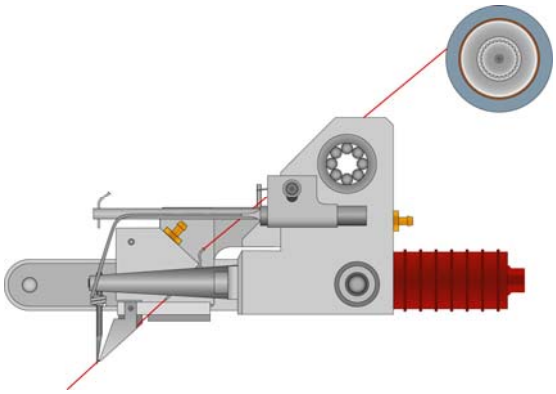
Installing the Bonding Wire

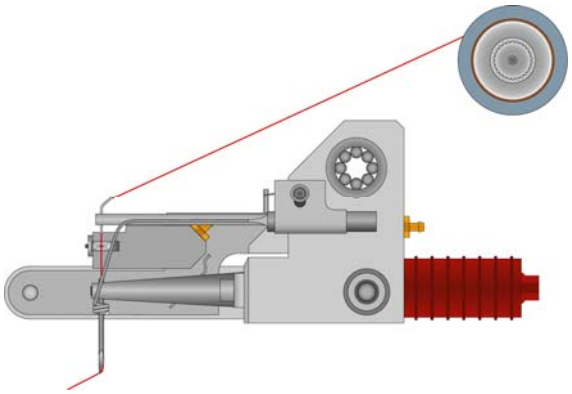
The 454647E is equipped with a standard ½" Ball Bearing Spool Mount. Slide the ½" spool over the Spool Mount such that the wire de-spools over the top (counter-clockwise when viewed from the right side). Carefully route the wire through guides, transducer, clamps and bonding tool. With the 45° Bonding head, the wire runs through guide tube, which runs through the transducer. From the home menu, press 6 on the keypad to manually open and thread the clamp blades making sure that the clamps fully capture the wire.

NOTE! The wire needs to be above the wire guide in the back side of clamp blades.



The guide tube for the 90° has a single bend for adding a slight drag to the wire. Because of these bends, it is necessary to "inch" the wire through by holding the tweezers close to the Guide Tube. When the wire is visible below the Guide Tube, pull the wire through. Turn on the machine power. Press the "6" key, for THREAD and BOND-OFF mode, to open the Clamp Blades. (Air must be connected and active as the clamp open and close functions are operated by air.) Thread the wire through the Clamp Blades, then through the Bonding Tool. To Close or Open the Clamp Blades, press the "6" Key, or to feed more wire through the tool, Press the "A" key, (For more information on threading the tool see page 33.) The bonding wire should be positioned according to the drawings below.





INSTALLATION

Adjusting the Camera Focus

The camera focus is set at the factory before shipment. Unfortunately, the bumping and jarring that the machine encounters during shipment may upset this delicate adjustment. A slight adjustment may be required to bring the camera back into factory specifications. Below you will find a detailed set of instructions to effect this adjustment. **WEST•BOND** recommends reading all of the steps prior to attempting any adjustment. This is to familiarize the operator with the camera configuration, allowing for a quicker and more effective adjustment process. If you encounter any difficulties or have any questions, feel free to contact **WEST•BOND** or your local factory representative technical support for help.

STEP 1 - SETTING THE WORK HEIGHT

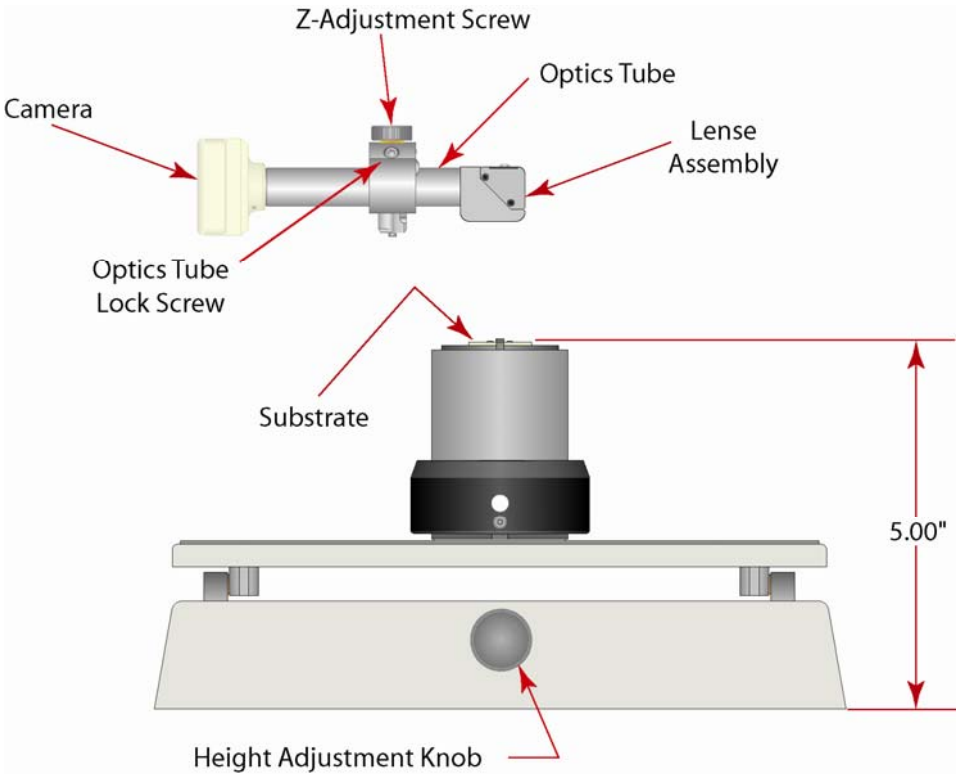
Place the package (a.k.a. the part to be bonded) upon its workholder and refer to page 28 to correctly set the WORK HEIGHT. When this is properly set, there will be a 5 inch differential between the bottom edge of the platform and the top of the bonding surface.

STEP 2 – INCH DOWN AND BOND OFF

From the home menu (ALIGN BOND MENU) press key 6 to go to the THREAD AND BOND menu. Using the G key, look into the microscope, inch down onto your work surface, and bond off. In this mode all of the machine's brakes will lock in order to keep the bonding surface underneath the camera eye.

STEP 3 – ADJUSTING CAMERA HEIGHT

Loosen the Thumb Nut $^{1}/_{4}$ to $^{1}/_{2}$ of a turn. This nut simply locks up the camera adjustment and it is not necessary to loosen it excessively. Located in the top of the adjustment block, above the THUMB NUT is the CAMERA Z-ADJUSTMENT SCREW. Insert a $^{1}/_{8}$" Allen wrench and turn slowly while observing the bonding surface in the monitor. Turning this screw clockwise will raise the camera assembly while counter-clockwise will lower it. Once the optimum focus is achieved, lock down the thumb nut and press the A key. Bond off again and set the crosshairs.



INSTALLATION

Adjusting the Camera Focus

STEP 4 – SETTING THE CROSSHAIRS

Use the digi-switches on the crosshair generator to move the crosshairs up and down or left and right. If the bond did not stick then the operator may choose to bond again by pressing the A key or, if everything is correct, key G may be pressed to accept the crosshair settings. If the bond is outside of the camera screen it may be necessary to adjust the camera position and bring the bond back into the center of the screen.

STEP 5 – ADJUSTING CAMERA POSITION

First, using the digi-switches on the crosshair generator set the cross hairs to target directly in the center or lower center of the screen (placement of the crosshairs in the lower center of the screen will allow the operator to see both first and last bond if they are close together). Next, ensure that the camera head is square with the body of the camera. Looking from the right side of the machine you can look down the side of the camera head and the camera body. If these two are not square with each other the onscreen image may appear to be rotated in comparison to the image seen through the microscope.. Once these two are aligned, locate the DUTCH KEY SCREW holding the OPTICS TUBE ASSEMBLY. Insert a $^{7}/_{64}$" Allen wrench into the socket head screw and loosen $^{1}/_{2}$ turn. ***Do Not Remove This Screw!*** When this screw is loosened it will allow the optics tube to rotate and slide left and right. Using these two adjustable axis position the crosshairs over the bond. Snug down the DUTCH KEY SCREW. Do not over tighten this screw. At this point it may be necessary to readjust the focus as outlined in step 3. If the focus is ok, then bond off again and make any small final adjustments to the crosshairs.

NOTE! This is a delicate procedure that may require a bit of finesse and patience. Once this camera is properly set up, a re-adjustment need not be performed unless the camera head is knocked or jarred.

The 454647E is now ready for operation. Please refer to the next section to understand several important aspects of successful wire bonding with the 454647E.

MACHINE CONTROLS

Front Panel

The 454647E Semi-Automatic Wire Bonder has been specifically designed to be versatile, dependable, and easy to use. To effect this end, the following sections have been developed to help the operator take advantage of its advanced bonding features. A in-depth study and understanding of this section will result in better bonds, higher gram pulls, and faster set up times.

POWER SWITCH

Activates entire 454647E. Upon power-up, the microprocessor will complete several internal tests and display a description of any problem detected. Refer to the *Troubleshooting* section (page 99) if an error is reported.

RESET SWITCH

When pressed, the machine re-homes all motor positions and returns the user to the home menu. This button should be pressed once before the power is turned off. This prevents the tool head from “snapping” back into the home position if it is down at search height when the power is turned off.

TOOL HEAT

See page 107 for dial settings and the corresponding temperature.

INTENSITY

This knob controls the available amount of camera backlighting. In bright (white surfaced) packages this backlight is unnecessary and is difficult to even notice. However, in a dark or deep package this option can greatly increase the visibility of the bonding pads.

MACHINE CONTROLS

Front Panel

CAMERA BACKLIGHT JACK

This jack is directly controlled by the Intensity Knob described above.

LCD

The Liquid Crystal Display is used by the 454647E to communicate machine status, menu prompts, explanations, and options. Four lines of text are available and each line is capable of displaying 40 characters.

Z CONTROL LEVER

Located at the far left on the machine front panel, this lever acts to bring the tool down to bond. As with the manipulator arm, **WEST•BOND** includes two Z-control levers (one high position style and the other low position style).

GO BUTTON (NOT SHOWN)

This is the small push-button switch located in the manipulator control ball. The Go button controls two different features depending upon how it is used. When the button is quickly pressed and released it operates the X-Axis braking system. This is done to aid the operator in scanning the bond path along the Y-Axis. If this button is pressed and held, the bonder automatically goes to Search before first bond. It pauses at search until the Go button is released. Once released, the machine will complete the bonding sequence (if in Full-Auto mode). If the machine is set in Half-Auto mode, it will pause before each operation, requiring a press of the Go button to proceed.

Key Pad

The KEY PAD, located on the left-hand side of the machine, enables the operator to access the programmable and high level functions of the machine. Take extra time to read the LCD during your first few programs for guidance to proper key strokes. Soon enough an operator will develop time saving memorization of the menu's and their location in the software. See the key format in *Programming* section for more details (pages 40 to 87).

The following reserved keys will be used in most menus:

KEY 1 = PREVIOUS MENU or ESCAPE **-** Press key "1" to escape to the previous menu.

KEY 2 = GO TO **-** Press key "2" for Go To options, such as: Go To Device, or Go To Type.

KEY 3 = HOME **-** Press key "3" to escape from any menu level, or to return to the Align or "Home" Menu.

MACHINE CONTROLS

Crosshair Generator Controls

POWER

Activates the Crosshair Generator. Even if the crosshairs are not used, this unit must be turned on for the video signal to be passed through to the monitor.

FILL

This switch turns the crosshairs on and off on the monitor.

INTENSITY

Controls the color and brightness of the crosshairs. When the Intensity knob is turned all the way counter-clock wise, the crosshairs are bright white. When the knob is turned all the way clock wise, the crosshairs will be black. Depending upon the package, the user may select between these two colors to allow greater crosshair visibility.

HORIZONTAL CONTROL

This digital potentiometer controls the position of the horizontal crosshair. Increasing this number lowers the position of this crosshair, while decreasing this number raises the crosshair on the display screen.

VERTICAL CONTROL

This digital potentiometer controls the position of the vertical crosshair. Increasing this number moves the position of this crosshair to the right, while decreasing this number moves the crosshair on the display screen to the left.

MACHINE CONTROLS

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.

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.

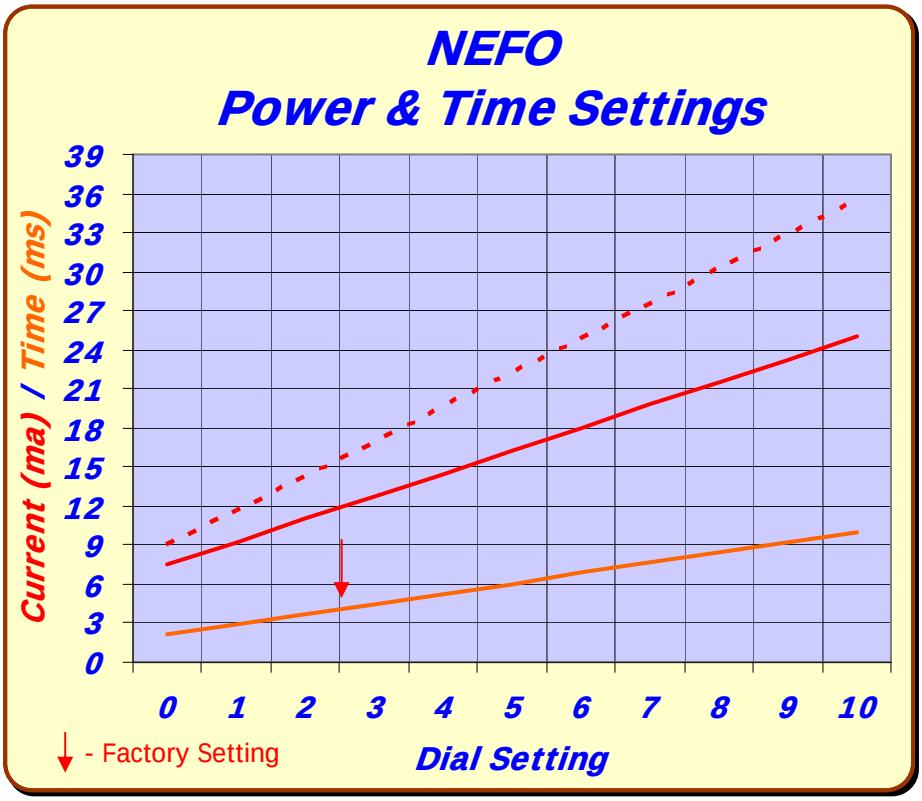
The current setting can be adjusted to a 9ma – 35.5ma range for larger balls on 1.5 – 2.0 mil wire. Jumper E1 on the mother board (Lower PCB) should be changed from pins 1-2 to 2-3 for the high power setting.

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.

LED'S

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.



OPERATION

The 454647E Semi-Automatic Wire Bonder has been specifically designed to be versatile, dependable, and easy to use. To effect this end, the following sections have been developed to help the operator take advantage of its advanced bonding features. A in-depth study and understanding of this section will result in better bonds, higher gram pulls, and faster set up times.

Wire Bonding

The process of wire bonding with **WEST•BOND'S** 454647E is rather straight forward. The micromanipulator control, positioned to the right of the work platform, is linked to the tool head and camera assemblies through an 8:1 ratio. This mechanical link allows the operator to accomplish extremely precise and fine adjustments to the tool head and camera assemblies.

To create the first wire bond, simply use the micromanipulator to position the monitor's crosshairs over the critical bond and press the G key, the manipulator GO BUTTON, or the 0 key. Below is a list of 4 different machine modes that correspond to the keys listed above.

FULL-AUTO MODE

Once this mode is selected and the G key or GO BUTTON is pressed, the bonding sequence will continue without operator intervention until the completion of one entire wire run. In this mode the operator may stop the bonding at anytime by pressing and holding any key. For selection details and more information regarding this mode see page 29.

HALF-AUTO MODE

The operator is required to press the G key, or the GO BUTTON, each time the machine approaches the work to make a bond. This mode allows the operator to manually select a bonding point by using the micromanipulator to position the tool prior to contact. The bonding sequence of this mode is described as follows: At first bond, the tool will stop at search if the "G" key is pressed and held, allowing XY movement, and the bonding sequence will continue upon release of the "G" key. For selection details and more information regarding this mode see page 30.

MANUAL MODE

This mode allows the operator to *slowly* lower the Tooling Head by pressing the 0 key until the Bonding Tool gently touches the bond surface. At anytime the operator can manually select a bonding point by using the micromanipulator to position the tool prior to contact. If it is necessary to raise the already lowered bond tool, the operator can press the 5 key to raise the Tooling Head. For more information regarding this mode see page 32.

Z-LEVER MANUAL MODE

By using the Z-axis control arm, the operator can slowly inch down to the first SEARCH ELEVATION. The operator can take over with the keypad or Go button at any time.

OPERATION

Align Menu or "Home" Menu

The following messages are displayed by the 454647E during operation. The rectangles on the left represent the LCD and examples of its contents. The key format at the bottom of the page indicates the key functions available when viewing the screen described.

ALIGN MENU 1 for alignment of the critical bond of any given bond sequence. (This is the default mode, also called "Home" Menu.

DISPLAY IN 4500E AND 4600E MODES

```
ALIGN BOND 1 of 5       USE MICROSCOPE.
Device 1, Type 2, Wire 1
7=Lock X     8=More options  9=Monitor
A=Feed       0=Manual bond   G=Full-Auto
```

DISPLAY IN 4700E MODE

```
ALIGN BOND 1 of 5       USE MICROSCOPE.
Device 1, Type 2, Wire 1
7=Lock X     8=More options  9=Monitor
A=Torch      0=Manual bond   G=Full-Auto
```

Key Format:

1	Go To Device/Type 2	Home 3
Edit 4	Info 5	Thread Or Bond-off 6
Lock / Move X Axis 7	More Options 8	Microscope / Monitor 9
Feed A	Manual Bond 0	Half- Or Full-Auto G

OPERATION

More Options

As if 8 was pressed in Align Menu 1

```
Device 1 of 30          0=Model Selection
               2=Go To  3=Home menu
4=Edit         5=Info   6=Thread/Bond-off
               8=Toggle Mode  9=Scan
```

- ***To call "More Options"***

  From the HOME menu press 8

Key Format:

Help 1	Go To Device/Type 2	Home 3
Edit 4	Info 5	Thread or Bond-off 6
Previous wire 7	Toggle Auto mode 8	Next wire 9
Previous Menu A	Toggle Mode 0	Scan G

OPERATION

Information

To see this menu, *press and hold* key 5 in the More Options Menu.

```
Model 454647E,“Version 5.50”    -->4500
West Bond Inc.
             IN MOST MENUS
1=Escape       2=Go To        3=Home
```

Go to previous menu upon release of key 5. This screen is also seen briefly during power-up.

```
Model 454647E,“Version 5.50”-Aug 10,2000
West Bond Inc.
             IN MOST MENUS
1=Escape       2=Go To        3=Home
```

If key 5 is held for 5 seconds the Software date will replace the model number in the upper right corner

- ***To call “Info”***

  From the MORE OPTIONS menu press and *hold* key 5

Key Format:

Escape 1	Go To Device/Type 2	Home 3
4	5	6
7	8	9
A	0	G

OPERATION

Align Menu 2

This menu is used for scanning the other bonds or changing the Y Offsets. The purpose is to verify all the bond positions to decide whether the station needs to be rotated or not; since bonding motion is straight-front-to-back.

```
SCAN BOND
Device 1, Type 1: (2 Bonds)
-->USE MANIPULATOR TO ALIGN TV CROSSHAIR
    TO BOND 1 AND PRESS 9 WHEN READY
```

```
Y OFFSET of Bond #1: Always 0


7=Move XY                  9=Next bond
A=Prev menu
```

Bond 1 is not moveable. Use key 7 to realign the TV crosshairs to bond 1 if not centered on Bond 1.

```
SCAN BOND 2 of 2:   120 from Bond 1
             5=Increase    (0.02500")
7=Prev bond  8=Y restore   9=Next bond
A=Prev menu  0=Decrease    G=OK
```

The X-Y Manipulator is Locked. Use 5 or 0 to adjust the Bond position.

NOTE! 120 is an example of Y offset position, this number will be updated to a permanent number when the G key is pressed if the new number is different.

> ***To call "Align Menu 2"***
>
> From the HOME menu press 8 (MORE OPTIONS) and then press 9 (SCAN BONDS)

Key Format:

1	2	Home 3
4	Increase 5	6
Previous bond 7	Restore 8	Next bond 9
Previous menu A	Decrease 0	OK G

OPERATION

Work Height Elevation

Before any new part is to be programmed, or run for the first time, the work elevation needs to be verified. This is so that the search elevations and the looping heights will be correct, and no damage to the tool will occur.

```
Restart Height Elevation: 1400 from top
4=Key in       5=Up           (0.29167")
7=Work Height  8=Suggest
A=Prev Option  0=Down      G=Next Option
```

Suggested setting is 800 for 4700E Mode.

```
     == WORK HEIGHT VERIFICATION ==
          (Look in microscope)
  Tool will run down during this mode.
Select the median bond height & Press G
```

Select a bond area that will be in the middle of the bond range and press G. Adjust the Table according to the LCD.

> ***To call "Work Verification Menu"***
>
> At the HOME menu press 4 (EDIT), 6 (MACHINE), 9 (RESTART HEIGHT), and then 7 (WORK HEIGHT VERIFICATION)

Key Format:

Previous menu 1	Go To Device/Type 2	Home 3
Key In 4	↑ Y up 5	6
Work Height 7	Suggest 8	9
Previous Option A	↓ Y down 0	Next Option G

OPERATION

Full-Auto Bonding

The bonding sequence continues without operator intervention until the completion of one complete wire run. The operator may stop bonding in this mode by pressing any key.

FULL-AUTO BONDING (G was pressed in the Align or "Home" menu, or from Manual Bonding)

```
Bond 1 of 5        -->Look in microscope.
Force: Low    Power: 240   Time: 20ms
-> Any key halts bonding
   (hold until activity stops).
```

ϑ ***To change from "Half-Auto" Mode to "Full-Auto" Mode***

From the HOME menu press the 8 key twice.

Key Format:

Manual Bond 1	Manual Bond 2	Manual Bond 3
Manual Bond 4	Manual Bond 5	Manual Bond 6
Manual Bond 7	Manual Bond 8	Manual Bond 9
Manual Bond A	Manual Bond 0	Manual Bond G

OPERATION

Half-Auto Bonding

The operator is required to press the G key, or the GO BUTTON, each time the machine approaches the work to make a bond. This mode allows the operator to manually select a bonding point by using the micromanipulator to position the tool prior to contact. The bonding sequence of this mode is described as follows: At first bond, the tool will stop at search if the G key is pressed and held, allowing X-Y movement, and the bonding sequence will continue upon release of the G key. Without holding the G key, the tool will not stop at search height. At the second bond, the tool will automatically stop at Loop Height, allowing X-Y movement. Pressing and holding the G key at this point will bring the tool down to search elevation for final X-Y adjustments. If the G key is not held the tool will approach the work until a bond is made. This sequence will repeat until the completion of that wire.

HALF-AUTO BONDING (G was pressed in the Align or "Home" menu, or from Manual Bonding)

```
Bond 1 of 2          Look in microscope.
Force: High    Power: 240   Time: 20ms
Tool is at Search.  Use manipulator to
move and release G when ready to bond.
```

If G is pressed and *held* this menu is displayed. Otherwise first bond is automatically completed and the machine pauses at the next menu, Loop Height.

```
At Loop Height:   Bond 2 of 2
Force: High   Power: 240   Time: 20ms
7=Lock X
             0=Manual bond   G=Half-Auto
```

From this menu if G is pressed and *held* then the machine will stop at Search and the next menu is displayed before the last bond is completed.

```
Bond 2 of 2          Look in microscope.
Force: High    Power: 240   Time: 20ms
Tool is at Search.  Use manipulator to
move and release G when ready to bond.
```

Pressing (or releasing if held) G one more time will complete the last bond.

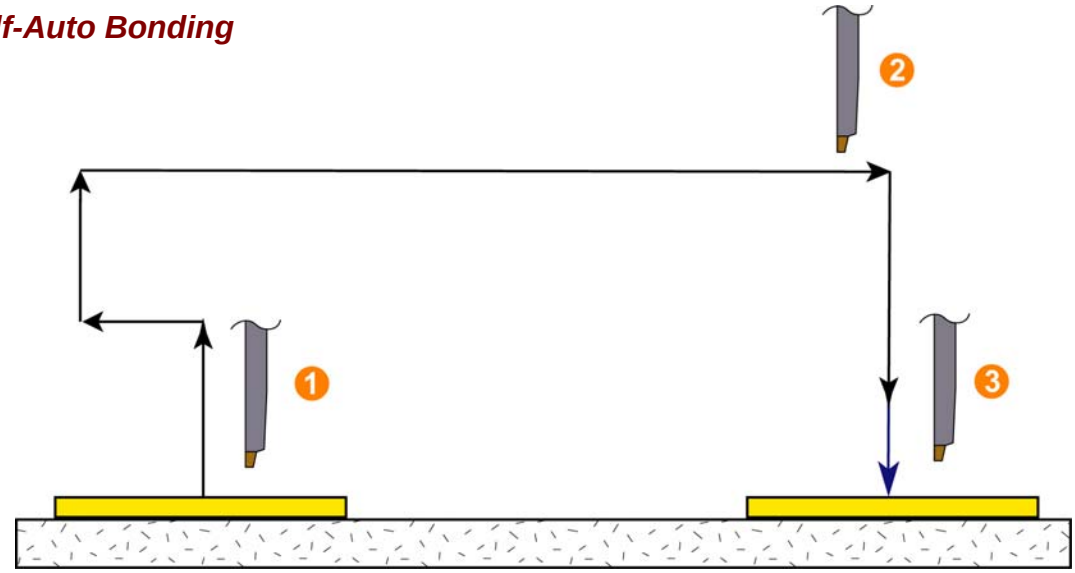
At ***Search:*** Pressing and holding "G" key will stop the tool at search elevation (allowing XY Movement).

At ***Loop Height:*** The tool will automatically stop at Loop Height (allowing XY Movement).

> ***To change from "Full-Auto" Mode to "Half-Auto" Mode:***
>
> From the HOME menu press the 8 key twice.

OPERATION

Half-Auto Bonding



1. **Search After First Bond**
   The tool will stop here if the G key is pressed and held. This allows the movement of the X-Y manipulator. The bonding sequence will continue once the G key is released.
2. **Loop Height**
   When in HALF-AUTO mode the tool will automatically stop here to allow movement of the X-Y manipulator for targeting. Press the G key to complete the bonding sequence.
3. **Search Before Second Bond**
   The tool will stop here if the G key is pressed and held after loop height. This allows the movement of the X-Y manipulator for final targeting. The bonding sequence will continue once the G key is released.

NOTE! This process is also allowed in Full-Auto mode if the first bond is inhibited.

Key Format:

1	2	3
4	5	6
7	8	9
A	0	Manual Bond G

OPERATION

Manual Bonding

This mode allows the operator to *slowly* lower the Tooling Head by pressing the 0 key until the Bonding Tool gently touches the bond surface. At anytime the operator can manually select a bonding point by using the micromanipulator to position the tool prior to contact. If it is necessary to raise the already lowered bond tool, the operator can press the 5 key to raise the Tooling Head. Depending on whether the machine is set-up in half-auto or full-auto mode, the bond to will proceed to the loop height or the search height of the second bond.

```
Bond 1 of 5          -->Look in microscope
             5=inch up     6=Open clamp
7=Inch Tail (+)            9=Inch Tail (-)
A=Feed       0=inch down   G=Full-Auto
```

6 = Close clamp (If the clamps are open.)

A = Feed (Only available at first bond)

2 = Go To Device/Type

3 = Exit to Align

> ***To call "Manual Bonding"***
>
> From the HOME menu press 0 (MANUAL BOND MODE). Or press and release any key while auto bonding.

Key Format:

1	Go To Device/Type 2	Home 3
4	↑ inch up 5	Open Clamp 6
Inch tail Forward 7	8	Inch tail Backward 9
Feed A	↓ inch down 0	Half- or Full-Auto G

OPERATION

Thread or Bond-off

From this menu, the operator can utilize the key pad to facilitate the threading of the wire guide, the clamps, and finally, the bonding tool. After the bonding tool has been threaded, the operator can then inch down to contact the work and bond off any excess wire.

```
Thread & bond using Type 1 Bond 2
4=Ultrasonics 5=Inch up    6=Close clamp
7=Move XY
A=Feed      0/G=Inch down & bond-off
```

If clamps are open, the 6=Close clamps. If the XY is movable, then key 7 = Lock XY

0 = Inch down & Bond off at a slow rate

G = Inch down & Bond off at a fast rate

> ***To call "Thread or Bond-off" Menu***
>
> From the HOME menu press 6 (THREAD / BOND-OFF) then follow the instructions on the LCD.

Key Format:

1	Go To Device/Type 2	Home 3
4	↑ inch up 5	Close Clamp 6
Move XY 7	8	9
Feed A	↓ slow inch down & bond-off 0	↓ fast inch down & bond-off G

OPERATION

Adjust the Crosshairs

Once the wire has been successfully bonded off, the system will prompt the operator to adjust the crosshairs on the external crosshair generator. If the bond does not stick then the operator can choose to bond again by pressing key A.

```
ADJUST VIDEO CROSSHAIRS
--> Adjust video crosshair onto bond


A=Bond again                          G=OK
```

Use the digi-switches on the crosshair generator to move the crosshairs up and down or left and right. Key G is then pressed to accept the crosshair settings.

> ***To call "Adjust crosshairs" Menu***
>
> From the HOME menu press 6 (THREAD / BOND-OFF) and then press 0 or G to BOND-OFF wire.

Key Format:

Escape 1	2	Home 3
4	5	6
7	8	9
Bond again A	0	OK G

OPERATION

Monitor or Microscope

This option allows the operator to select between using the microscope or the monitor for bond placement. When toggled by key 9, the bond tool moves along the Y Axis between the target position above the bond, and a retracted position out of camera view. The display on the Menu is the option to be switched to. (i.e. key 9 = Monitor; pressing key 9 will switch to monitor operation).

Using the monitor, the operator targets the bond using the crosshairs on the television monitor screen to begin the bonding sequence. Using the microscope, the operator bonds by direct view of the tool through the microscope, however, in this setting, the tool head blocks the camera's view.

*NOTE: Critical Bond (page 75) is ignored when in the Microscope mode.

```
ALIGN BOND 1 of 2            USE MONITOR.
Device 1 of 30
7=Lock X   8=More options    9=Microscope
A=Feed     0=Manual bond     G=Full-Auto
```

Machine is now MONITOR in mode. Pressing key 9 will convert the machine to MICROSCOPE mode.

```
ALIGN BOND 1 of 2          USE MICROSCPE.
Device 1 of 30
7=Lock X   8=More options    9=Monitor
A=Feed     0=Manual bond     G=Full-Auto
```

Machine is now in MICROSCOPE mode. Pressing key 9 will convert the machine to MONITOR mode.

> 9 ***To change between "Monitor or Microscope"***
>
> From the HOME menu press 9 (MONITOR / MICROSCOPE) to toggle between modes.

Key Format:

1	Go To Device/Type 2	Home 3
Edit 4	Info 5	Thread / Bond-Off 6
Lock X 7	More Options 8	Microscope / Monitor 9
Feed A	Manual Bond 0	Full Auto G

OPERATION

Go To

This option allows the operator to specify where the bonding sequence should begin. Specify either by the Device #, Type #, then Wire #

Go To (Device)

```
GO TO
  Device: 1 of 30


A=Backspace or Escape          G=OK
```

Screen 1 of the Go To Sequence. The default is the current device.

G = OK or Go To (Type).

The A key will exit if pressed multiple times

> ***To call "Go To (Device)"***
>
> From the HOME menu press key 2 (GO TO) then follow the instructions on the LCD.

Key Format:

1	2	3
4	5	6
7	8	9
Escape A	0	OK G

OPERATION

Go To (Type)

This is screen 2 of the Go To Sequence (G was pressed in screen 1 of Go To Sequence).

```
GO TO
  Type: 1 of 30


A=Backspace or Escape            G=OK
```

When the device has been changed, Type 1 is selected as the factory default. Otherwise, the current type displayed is the point where bonding left off at.

The A key will exit if pressed multiple times

Go To (Wire)

```
GO TO
  Wire: 1 of 5


A=Backspace or Escape            G=OK
```

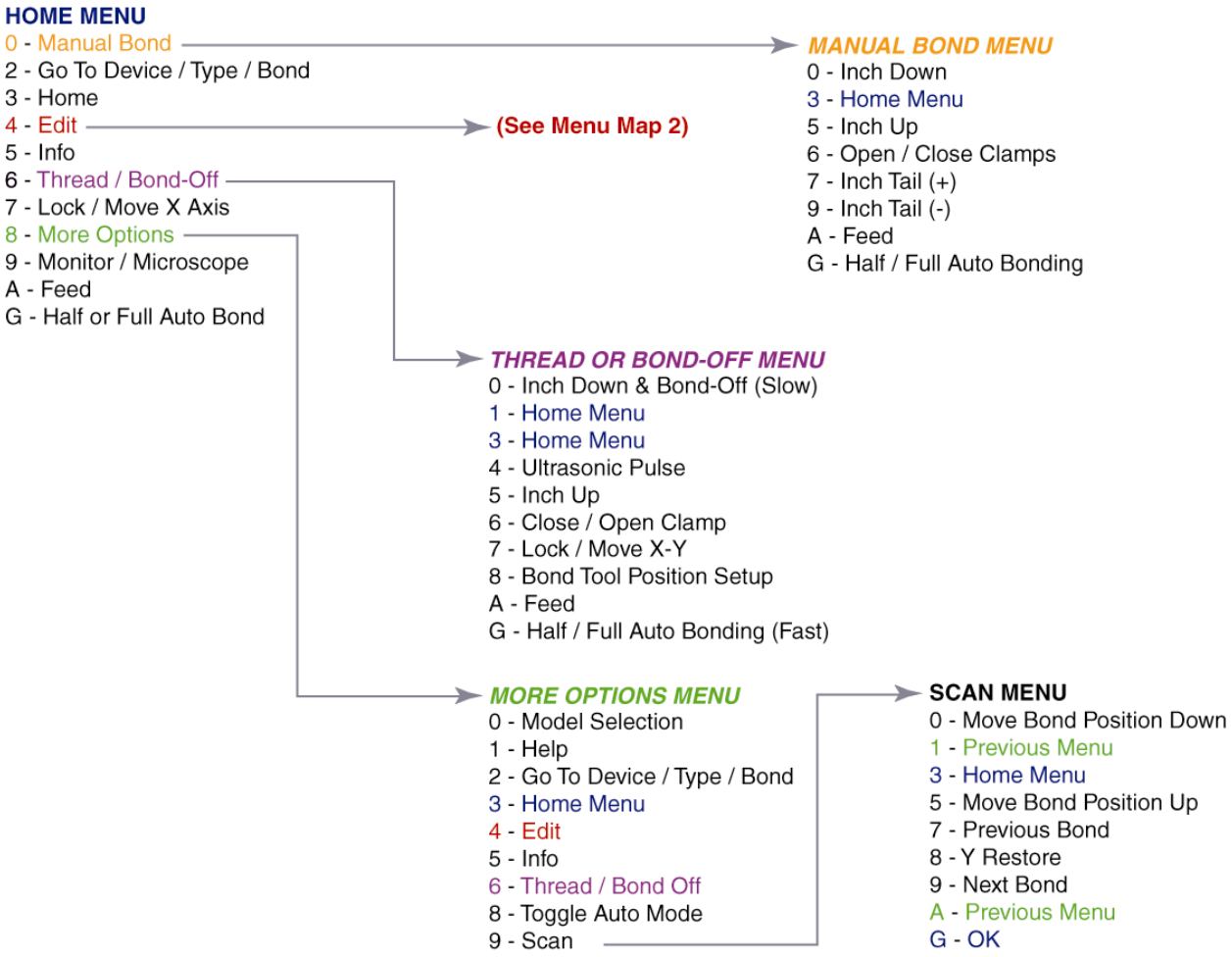
> ***To call "Go To (Type)"***
>
> From the HOME menu press 2 (GO TO) then follow the instructions on the LCD.

Key Format:

1	2	3
4	5	6
7	8	9
Backspace Or Escape A	0	OK G

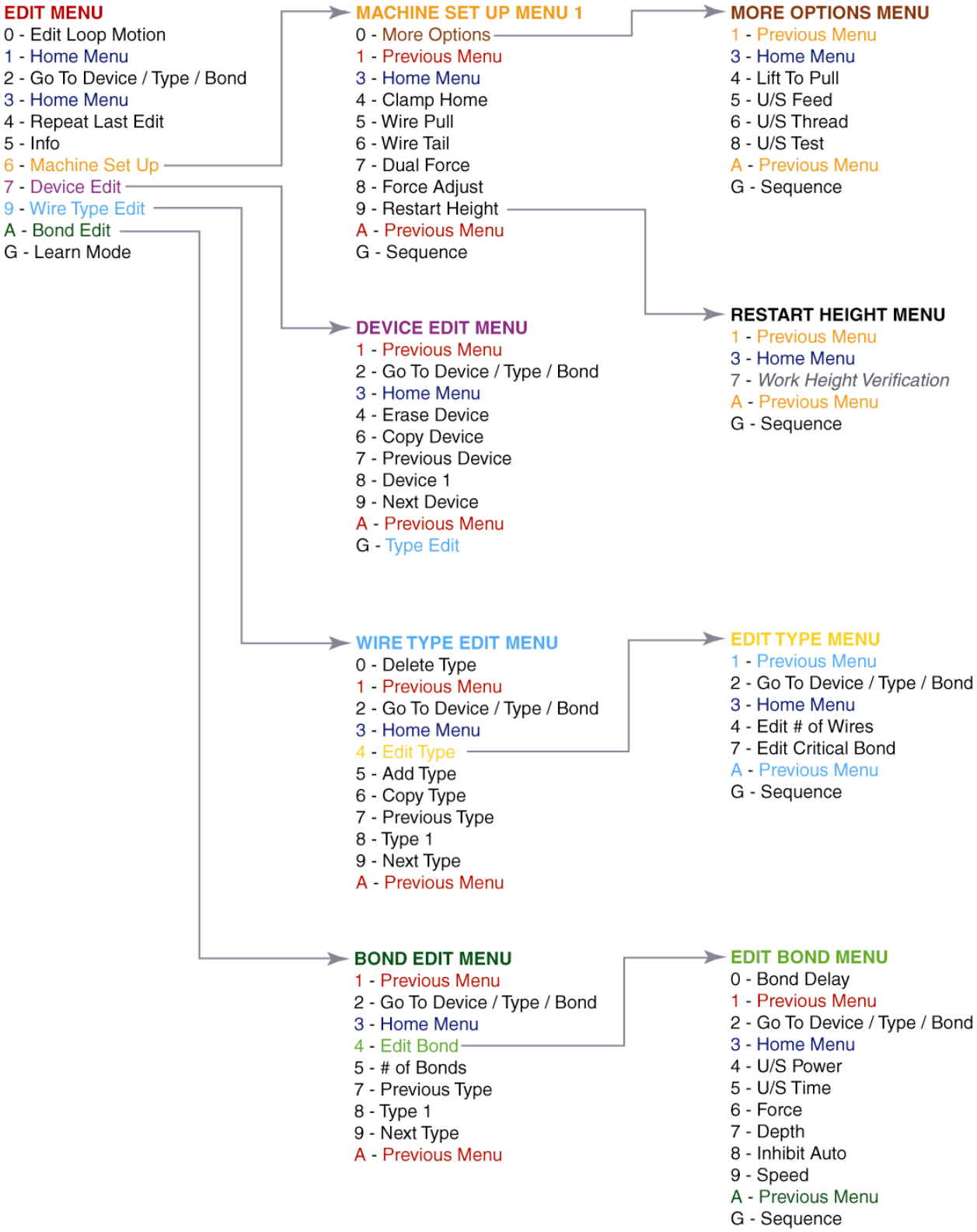
MENU MAP

Model 4546E



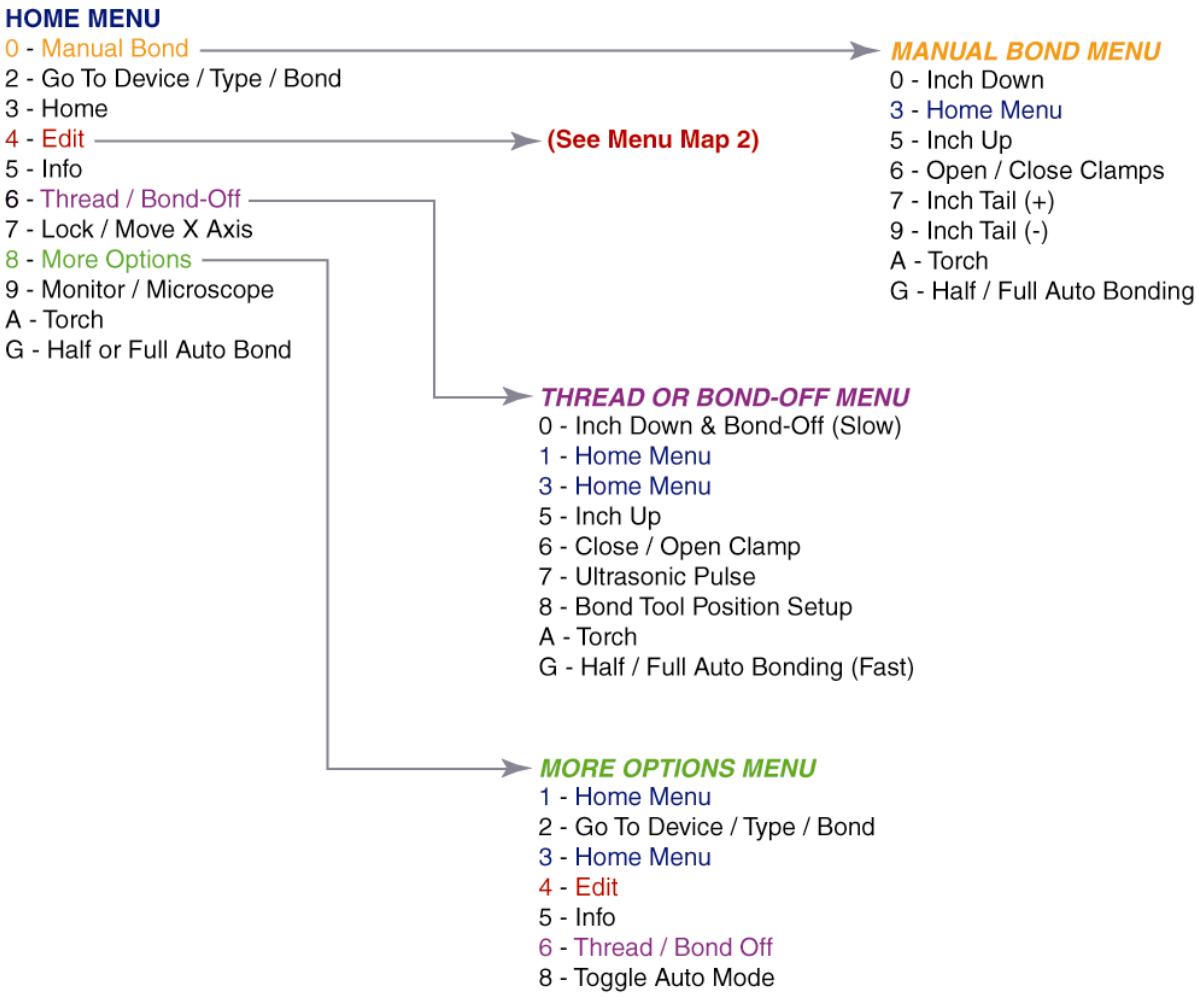
MENU MAP

Model 4546E (continued)



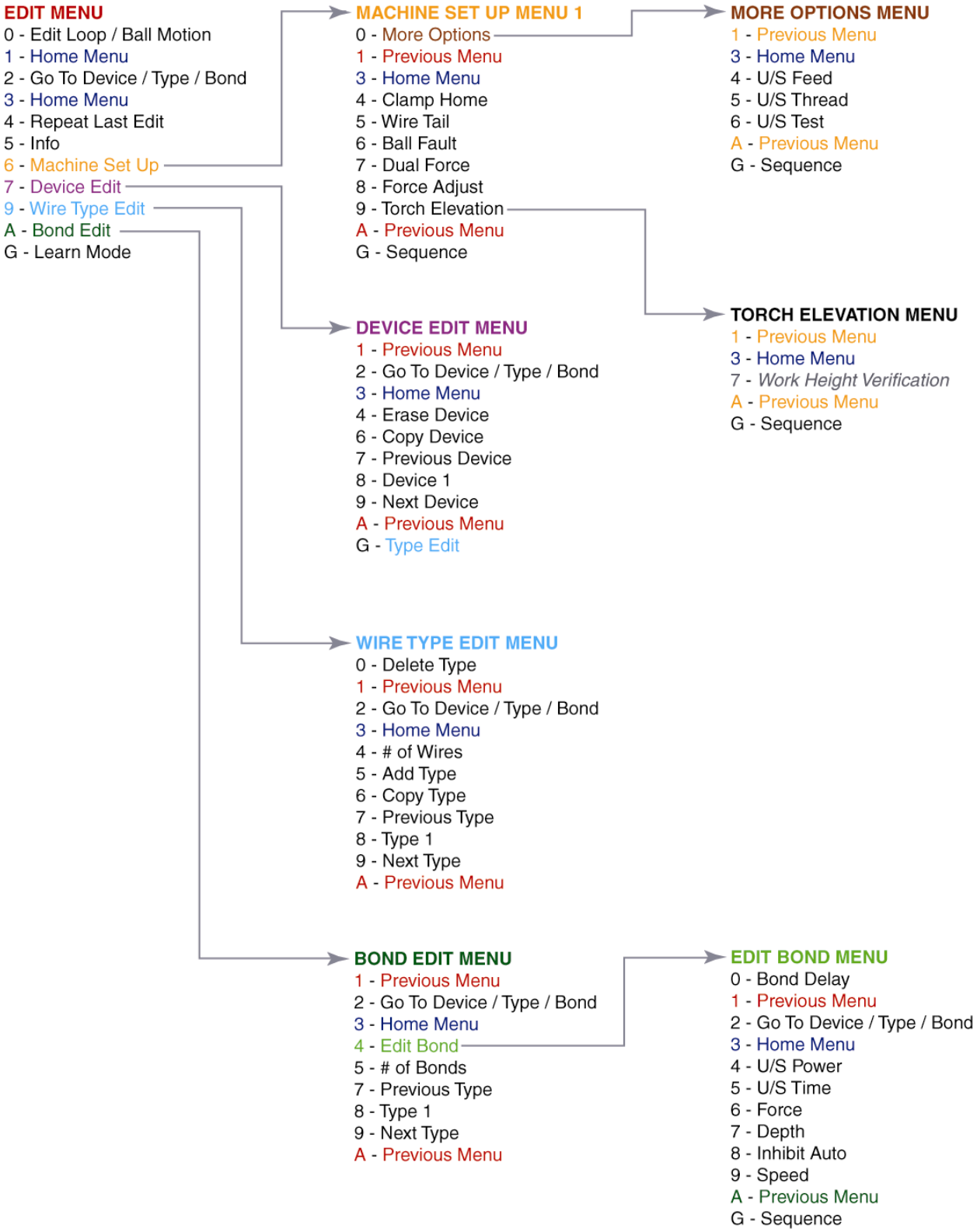
MENU MAP

Model 4700E



MENU MAP

Model 4700E (continued)



PROGRAMMING

The following pages demonstrate the expected displays and programmable options of the 454647E. The programmable features are broken into two sections: One section is called MACHINE SETTINGS and the other is called USER DATA SETTINGS.

Machine Settings

These are items generally used for initial machine set-up and are infrequently changed. Options in this section may require some modification if the application changes significantly. Here are the options available for programming in this section:

1. CLAMP HOME – *page 54*
2. WIRE PULL – *page 55*
3. WIRE TAIL – *page 56*
4. BALL FAULT – *page 57*
5. DUAL FORCE – *page 58*
6. FORCE ADJUST – *page 59*
7. RESTART HEIGHT – *page 61*
8. LIFT-TO-PULL – *page 62*
9. ULTRASONIC POWER DURING FEED – *page 63*
10. ULTRASONIC POWER DURING THREAD – *page 64*
11. ULTRASONIC DIAGNOSTIC TEST – *page 65*

User Data Settings

These are options commonly used by the operator. For this reason they have been separated from the MACHINE SETTINGS and stored into DEVICES, WIRE TYPES, or BONDS. Each device allows one or more wire types. Each wire type allows one or more bonds. Here are the options available for programming in this section:

1. DEVICE EDIT – *page 68*
2. WIRE TYPE EDIT – *page 71*
3. BOND EDIT – *page 79*

The DEVICE EDIT MENU is designed to do the following tasks:

a. COPY DEVICE – *page 70*

b. ERASE DEVICE – *page 69*

PROGRAMMING

User Data Settings

Wire TYPE EDIT MENU is designed to the following tasks:

1. EDIT TYPE – *page 73*
    a. EDIT NUMBER OF WIRES – *page 74*
    b. LOOP EDIT – *page 88*
    c. EDIT CRITICAL BOND – *page 75*
2. ADD TYPE – *page 76*
3. COPY TYPE – *page 77*
4. DELETE TYPE – *page 72*

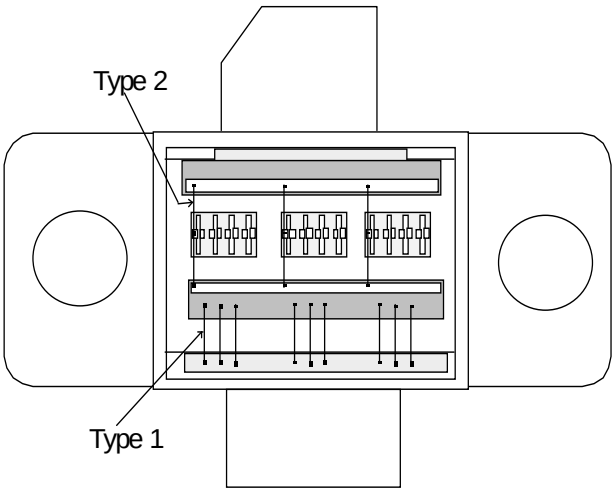
The BOND EDIT MENU is designed to do the following tasks:

1. EDIT BOND – *page 79*
    a. EDIT ULTRASONIC POWER – *page 80*
    b. EDIT ULTRASONIC TIME – *page 81*
    c. EDIT BOND FORCE – *page 82*
    d. EDIT BOND DEPTH – *page 83*
    e. EDIT INHIBIT AUTO-MODE – *page 84*
    f. EDIT SPEED – *page 85*
    g. EDIT PRE-BOND DELAY – *page 86*
2. EDIT NUMBER OF BONDS - *page 87*

Wire Types

EXAMPLE OF A DEVICE

The diagram to the right shows an example of a device, which has two wire types. Where the number of wires for Type 1 is 9 with 2 bonds each wire, and the number of wire for Type 2 is 3 with 3 bonds for each wire.



NOTE: When Ball Bonding (Ball-Wedge), there should be a maximum of 2 bonds per wire, as a capillary can not guild the wire through a second loop.

PROGRAMMING

Learn to Setup Device

This option is designed to take the operator through an simple part setup. Other, more advanced parameters may need to be adjusted for optimum bonding results, but this quick setup will cover all of the basics.

> ❡ ***To call "Learn to Setup Device"***
>
> From the HOME menu press 4 (EDIT) and then press G (LEARN MODE).

```
LEARN TO SETUP DEVICE 1:
                5=Go To
7=Prev device   8=Device 1    9=Next device
A=Prev menu                   G=OK
```

→ ***PRESS KEY G*** ←

This menu is the only place where the name of the Device can be set or changed and it can only be accessed through this LEARN MODE.

```
EDIT NAME OF DEVICE 1: _
4="A"           5=Increase    6="Z"
7=Left          8="_"         9=Right
A=Prev option   0=Decrease    G=OK
```

→ ***PRESS KEY G*** ←

See page 43 for a description of WIRE TYPES.

```
DEVICE 1:    HOW MANY WIRE TYPES?    1
4=Key in        5=Increase

A=Prev option   0=Decrease    G=OK
```

→ ***PRESS KEY G*** ←

Here the operator is asked to specify the number of wires desired in each WIRE TYPE. This menu will repeat itself - one time for each wire type specified (i.e. if 6 was entered in the previous menu, the machine will ask for the number of wires required in each type by repeating this menu 6 times).

```
HOW MANY WIRES FOR TYPE 1? 0
(0 wire means repeat this type forever.)
4=Key in        5=Increase
A=Prev option   0=Decrease    G=OK
```

→ ***PRESS KEY G*** ←

PROGRAMMING

Learn to Setup Device

In this menu the operator is asked to specify the number of bonds for each WIRE TYPE. Two bonds equal one loop, three bonds will create two loops, and so on. As with the afore mentioned menu, this menu will repeat itself - one time for each wire type specified.

```
HOW MANY BONDS FOR TYPE 1?  2
4=Key in        5=Increase
7=Prev type     8=Type 1      9=Next type
A=Prev option   0=Decrease    G=OK
```

→ ***PRESS KEY G*** ←

The critical bond is typically the bond to be placed upon the smallest pad or the most difficult pad to target. The CRITICAL BOND setting *does not* set which bond goes first. For example: a wire type with three bonds per wire (2 loops) may have the second bond (the middle bond) set as the critical bond. This would allow the operator to target the center pad immediately prior to bonding. Therefore, the machine would place the first and third bonds in direct relation to this second *critical* bond pad. This menu will also repeat itself - one time for each wire type specified.

```
CRITICAL BOND FOR TYPE 1 is Bond 1


7=Prev bond     8=Bond 1      9=Next bond
A=Prev option                 G=OK
```

→ ***PRESS KEY G*** ←

The machine will now step the operator through a sequence designed to set up the desired loop shape.

```
ABOUT TO EDIT LOOP MOTION for Type 1
-> Use manipulator to align TV crosshair
   to Bond 1 and press G when ready
A=Prev option
```

→ ***PRESS KEY G*** ←

Depending upon the model mode the machine is in you may or may not see this menu.

```
EDIT LOOP MOTION
Device 1 Type 1: (2 Bonds)
-> LOOK IN MICROSCOPE,
   SELECT BOND 1 AND PRESS G WHEN READY.
```

→ ***PRESS KEY G*** ←

PROGRAMMING

Learn to Setup Device

SEARCH FOR BOND 1 is the point where the tool will pause if run in either half-auto mode or if a key is held in the full-auto mode. From this vantage point the operator can make any last minute changes to the bond targeting.

```
Edit SEARCH for Bond #1: 2024 from Home
4=Key in      5=Inch up       (0.42167″)
7=Move XY     8=Suggest    9=Erase search
A=Prev menu   0=Inch down  G=Next option
```

→ *PRESS KEY G* ←

The number of motor steps the motor raises up off of the work, after first bond, before making any movement in the Y direction. Typically this elevation is used prior to backbend to aid in creating proper loop shape.

```
Z-BEFORE-Y before Bond #2: 50 steps
4=Key in      5=Inch up        (0.01042″)
              8=Suggest
A=Prev option 0=Inch down   G=Next option
```

Too few motor steps in this setting can cause the wire to be pulled off of the work if the operator is also using the backbend feature.

→ *PRESS KEY G* ←

This particular feature is an excellent aid in creating good loop shape when using a 454647E in the 4600E and 4700E modes. The position of the clamps on the 4500E mode allow greater control of the wire requiring less finesse when it comes to loop motion. BACKBEND occurs immediately after the motor has counted up the specified number of Z-BEFORE-Y steps. An excessive amount of BACKBEND can easily peel the first bond from the work. However, if used properly, BACKBENDING can add not only shape, but also height to your wire loops. To achieve truly effective BACKBENDS, the operator needs to strike a balance between the number of Z-BEFORE-Y steps versus the number of BACKBEND steps.

```
BACKBEND before Bond #2: 0 Y step
4=Key in       5=Increase      (0.00000″)
               8=Suggest
A=Prev option  0=Decrease   G=Next option
```

→ *PRESS KEY G* ←

The highest point the tool reaches in the looping procedure. It is important to remember that this maximum tool height does not equate to loop height. As the tool begins it descent toward the work surface, this high point of the wire will be pulled down with the tool. Wire loop height is dependant upon many factors other than just LOOP ELEVATION (contributing factors: Z-BEFORE-Y, BACKBEND, Y-OFFSET, LOOP ELEVATION, NUDGE-UP, wire size, wire strength, wire material, bonding tool, clamp position, etc.).

```
LOOP ELEV before Bond #2: 100 steps
4=Key in       5=Inch up       (0.02083″)
               8=Suggest
A=Prev option  0=Inch down  G=Next option
```

→ *PRESS KEY G* ←

PROGRAMMING

Learn to Setup Device

Position the tool above the second bond. This setting is the distance between the first and second bond in motor steps.

```
MOVE BOND #2 of 2:    120 from Bond 1
               5=Increase      (0.02500")
               8=Y restore
A=Prev option  0=Decrease   G=Next option
```

→ *PRESS KEY G* ←

A feature available only in the 4500E model mode, the CLAMP AT LOOP option can help to create a higher, more pronounced loop shape when the clamps close at LOOP HEIGHT.

4500E ONLY

```
Close CLAMP AT LOOP HT above Bond #2:
               5=Close
               8=Suggest
A=Prev option  0=Open       G=Next option
```

→ *PRESS KEY G* ←

Search Before Bond 2 is the point where the tool will pause if run in either half-auto mode or if a key is held in the full-auto mode. From this vantage point the operator can make any last minute changes to the bond targeting.

```
Search before Bond #2:  61 from Loop
4=Key in       5=Inch up      (0.01271")
               8=Suggest    9=Erase srch
A=Prev option  0=Inch down  G=Next option
```

→ *PRESS KEY G* ←

Last chance for changes to spacing between bonds.

```
MOVE BOND #2 of 2:        120 from Bond 1
   FINAL       5=Increase      (0.01271")
 ADJUSTMENT    8=Y restore  9=Erase srch
A=Prev option  0=Decrease   G=Next option
```

→ *PRESS KEY G* ←

PROGRAMMING

Learn to Setup Device

Available only in the 4500E mode, this feature is similar to CLOSE CLAMP AT LOOP HEIGHT, and allows the operator to have more control over the loop shape. Closing the clamps at second search is not as noticeable in most applications, however, if NUDGE-UP is being used then it becomes absolutely necessary to have the clamps close at this second search elevation.

4500E ONLY

```
Close CLAMP AT SEARCH above Bond #2:
               5=Close
               8=Suggest
A=Prev option  0=Open       G=Next option
```

→ ***PRESS KEY G*** ←

ADVANCED PROGRAMMING

Main Edit Menu

MAIN EDIT MENU

EDIT	0=Edit loop motion
4=Repeat last edit	6=Machine setup
7=Device edit	9=Wire type edit
A=Bond edit	G=Learn mode

1 or 3 = Exit Edit

2 = Go To Device/Type

4 = Repeat Last Edit

5 = Info

- ***To call "Main Edit Menu"***

  From the "Home" Menu, Press 4 (Edit)

Key Format:

Escape 1	Go To Device/Type 2	Home 3
Repeat Last Edit 4	Info 5	Machine Setup 6
Device Edit 7	8	Wire Type Edit 9
Bond Edit A	Edit Loop Motion 0	Learn Mode G

ADVANCED PROGRAMMING

Machine Setup Menus

FOR 4500E AND 4600E MODES ONLY

MACHINE SETTINGS MENU #1

```
Machine Settings Menu #1
4=Clamp home 5=Wire pull    6= Wire tail
7=Dual force 8=Force adjust 9=Restart ht
A=Prev menu  0=More options G=Sequence
```

1 = Edit Menu, 3 = Home,

0 = Machine Settings Menu #2

G = Sequence – This will step the operation through the machine settings of both Menu #1 and Menu #2

- ***To call "Edit Machine Settings Menu #1"***

  From the HOME menu press 4 (EDIT), and then press 6 (MACHINE).

Key Format:

Previous Menu 1	2	Home 3
Clamp home 4	Wire pull 5	Wire tail 6
Dual force 7	Force adjust 8	Restart height 9
Previous Menu A	More options 0	Sequence G

ADVANCED PROGRAMMING

Machine Setup Menus

FOR 4500E AND 4600E MODES ONLY

MACHINE SETTINGS MENU #2

```
Machine Settings Menu #2:
4=Lift-to-pull 5=U/S feed 6=U/S thread
               8=U/S test
A=Prev menu                G=Sequence
```

1 = Edit Menu, 3 = Exit Edit,

G = Sequence – This will step the operation through each of the machine settings; both Menu #1 and Menu #2

- ***To call "Edit Machine Settings Menu #1"***

  From the HOME menu press 4 (EDIT), 6 (MACHINE), and then press 0 (MORE OPTIONS)

Key Format:

Previous Menu 1	2	Home 3
Lift-to-pull 4	U/S Feed 5	U/S thread 6
7	U/S Test 8	9
Previous Menu A	0	Sequence G

ADVANCED PROGRAMMING

Machine Setup Menus

FOR 4700E MODE ONLY

MACHINE SETTINGS MENU #1

```
Machine Settings Menu #1
4=Clamp home 5=Wire tail    6=Ball fault
7=Dual force 8=Force adjust 9=Restart ht
A=Prev menu  0=More options G=Sequence
```

1 = Edit Menu, 3 = Home,

0 = Machine Settings Menu #2

G = Sequence – This will step the operation through the machine settings of both Menu #1 and Menu #2

- ***To call "Edit Machine Settings Menu #1"***

  From the HOME menu press 4 (EDIT), and then press 6 (MACHINE).

Key Format:

Previous Menu 1	2	Home 3
Clamp home 4	Wire tail 5	Ball Fault 6
Dual force 7	Force adjust 8	Restart height 9
Previous Menu A	More options 0	Sequence G

ADVANCED PROGRAMMING

Machine Setup Menus

FOR 4700E MODE ONLY

MACHINE SETTINGS MENU #2

```
Machine Settings Menu #2:
4= U/S feed   5=U/S thread 6=U/S test
              8=Wire Break Z Offset
A=Prev menu                G=Sequence
```

1 = Edit Menu, 3 = Exit Edit,

G = Sequence – This will step the operation through each of the machine setting of both Menu #1 and Menu #2

- ***To call "Edit Machine Settings Menu #1"***

  From the HOME menu press 4 (EDIT), 6 (MACHINE), and then press 0 (MORE OPTIONS)

Key Format:

Previous Menu 1	2	Home 3
U/S Feed 4	U/S thread 5	U/S Test 6
7	Wire Break Z Offset 8	9
Previous Menu A	0	Sequence G

ADVANCED PROGRAMMING

Clamp Home

This option allow the operator to specify the position of the clamps in relationship to the Bonding Tool. For best Loop Control and tail consistency, in 45° applications, position the clamps in their most forward position and then move the clamps back a very short distance. This will allow the forward tail adjustment by the operator when required. Use the keypad, see diagram below, to adjust the clamp home position while in this menu. The "0" key will move the clamp blades closer to the tool and key "5" will move them away from the tool or use the "4" key to key in a specific number.

In the event a specific application contains a component immediately behind the desired bond location, simply reposition the clamp blades farther behind the Bonding Tool to obtain the necessary clearance.

NOTE! Some level of loop control will be lost as the distance between the Bonding Tool and the clamps is increased. Re-adjust bond parameters, such as Z-Before-Y or Loop Height, if loop profile after bonding is different from the previous clamp settings.

The suggested settings for the clamp home position with a 90° application is 48 motor steps and 16 for 45° application.

CLAMP HOME or MACHINE SETTINGS SEQUENCE

```
Clamp Home: 16 steps from FWD limit
4=Key in      5=Increase
              8=Suggest
A=Prev menu   0=Decrease   G=Next option
```

80 steps is the suggested setting for 4700E

Program in A motor half-steps

8 = Restore after suggestion is made

> ***To edit "Clamp Home"***
>
> From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 4 (CLAMP HOME)

Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Wire Pull

FOR 4500E AND 4600E MODES ONLY

This option allow the operator to increase or decrease the distance the clamp blades pull back to break the wire after the termination bond. The suggested settings are 34 for 45° and 30 for 90° applications is displayed on the menu. The numerical selection defines the number of motor steps. To increase the clamp pull stroke, increase the "Wire Pull" number. Excessive wire pull may cause the wire to become unthreaded. To change the selected number, use the "4" key to key data, or the "5" key to increase, or the "0" key to decrease.

WIRE PULL (See ϑ below or G was pressed from Edit Clamp Home Menu).

```
Wire Pull: 34 steps
4=Key in        5=Increase
                8=Suggest
A=Prev option   0=Decrease   G=Next option
```

Program in A motor half-steps.

8 = Restore after suggestion is made.

ϑ ***To edit "Wire Pull"***

From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 5 (WIRE PULL)

Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Wire Tail

This option allows the operator to increase or decease the length of the tail: meaning the wire length offered for view prior to performing the first bond. The suggested settings of 24 steps for 45° (4500E), 35 steps for 90° (4600E), and 60 steps for 90° ball (4700E) applications are displayed on the menu. The numerical selection defines the number of motor steps. To increase the tail length, increase the tail number. To change the selected number, use the “4” key to key data, or the “5” key to increase, or the “0” key to decrease.

WIRE TAIL (See ϑ below or G was pressed from Edit Wire Pull Menu)

```
Wire Tail: 24 steps
4=Key in        5=Increase
                8=Suggest
A=Prev option   0=Decrease   G=Next option
```

60 steps is the suggested setting for 4700E

Program in A motor half-steps.

8 = Restore after suggestion is made.

ϑ ***To edit “Wire Tail”***

FOR 4500E AND 4600E MODES ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 6 (WIRE TAIL)

ϑ ***To edit “Wire Tail”***

FOR 4700E MODE ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 5 (WIRE TAIL)

Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Ball Fault

FOR 4700E MODE ONLY

When the BALL FAULT DETECTION is turned on, the machine will detect a short or open condition in relation to the torch wand and the gold wire. The factory suggests that the BALL FAULT DETECTION setting be left on.

```
Ball Fault Detection: On
                5=On
                8=Suggest
A=Prev option   0=Off       G=Next option
```

- ***To edit "Ball Fault"***

  From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 6 (BALL FAULT)

Key Format:

Previous Menu 1	2	Home 3
4	On 5	6
7	Suggest 8	9
Previous option A	Off 0	Next option G

ADVANCED PROGRAMMING

Dual Force

This option allows the operator to select whether the “Dual Force” feature is “ON” or “OFF”. When the “OFF” selection is made, the “Low Force Calibration” menu will not be displayed and the higher specified force will be applied to all wire bonds. To change the setting of this option simply press the “0” key for “OFF” or the “5” key for “ON”. If this feature is selected to the “ON” position, 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. See page 82 for details on how to select High or Low force for each individual bond.

NOTE! The Dual Force factory setting is “OFF” in the 4500E and the 4600E modes. In the 4700E mode, “Dual Force” is “ON” and set up for 20 grams of difference.

DUAL FORCE (See ϑ below or G was pressed from Edit Wire Tail Menu).

```
Dual Force: Off
                5=On
                8=Suggest
A=Prev option   0=Off        G=Next option
```

8 = Restore after suggestion is made.

ϑ ***To edit “Dual Force”***

From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 7 (DUAL FORCE)

Key Format:

Previous Menu 1	2	Home 3
4	On 5	6
7	Suggest 8	9
Previous option A	Off 0	Next option G

ADVANCED PROGRAMMING

Force Adjust

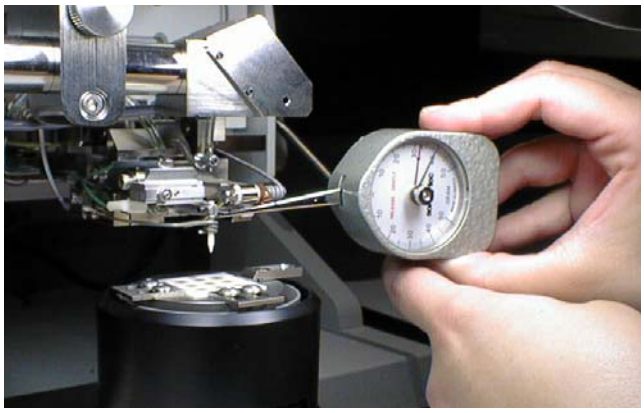
This option allows the operator to calibrate the HIGH FORCE setting by simply adjusting the force adjustment knob. This ADJUSTMENT KNOB is located to the right of the tool head assembly (see picture on the next page). To increase the bond force, turn the knob counter-clockwise (CCW). To decrease the bond force turn the knob clockwise. To determine the force for bonding use a gram gauge as illustrated in the picture below. Lift the tooling head, Just in front of the Bonding Tool, with the gram gauge. The system will signal the operator when the firing switch opens, This will signify the High Force setting.

HIGH FORCE (Displayed if Dual Force is On)

```
CALIBRATE HIGH FORCE
  Use force gage to measure Calibration
  Force at the tool.
A=Prev option              G=Next option
```

FORCE (Displayed if Dual Force is Off)

```
CALIBRATE FORCE
  Use force gage to measure Calibration
  Force at the tool.
A=Prev option              G=Next option
```



- ***To edit "High Force" (If Dual Force is ON) or "Force" (If Dual Force is OFF)***

  From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 8 (FORCE ADJUST)

Key Format:

1	2	Home 3
4	5	6
7	8	9
Previous option A	0	Next option G

ADVANCED PROGRAMMING

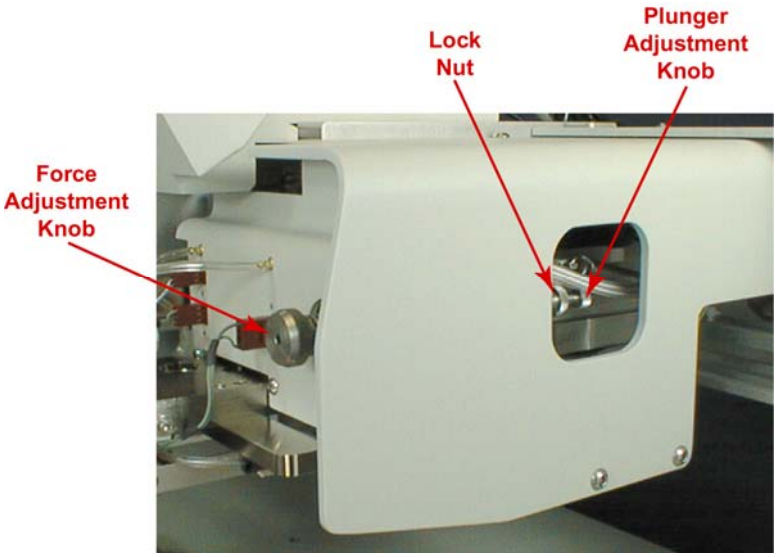
Low Force

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 used for calibrating or establishing the LOW FORCE setting.

To Adjust the LOW FORCE setting, loosen the knurled LOCK NUT and turn the knurled PLUNGER ADJUSTMENT KNOB located on the opposite end of the HIGH FORCE knob. Use the gram gauge to determine the LOW FORCE setting. See page 82 for details on how to select High or Low force for individual bonds.



LOW FORCE (Displayed if Dual Force is On)

```
CALIBRATE LOW FORCE

  Use force gage to measure Calibration

  Force at the tool.

A=Prev option                G=Next option
```

- ***To edit "Low Force" (If Dual Force is ON) or "Force" (If Dual Force is OFF)***

  From the HOME menu press 4 (EDIT), 6 (MACHINE), 8 (FORCE ADJUST), then G (SEQUENCE)

Key Format:

1	2	Home 3
4	5	6
7	8	9
Previous option A	0	Next option G

ADVANCED PROGRAMMING

Restart Height

RESTART HEIGHT ELEVATION

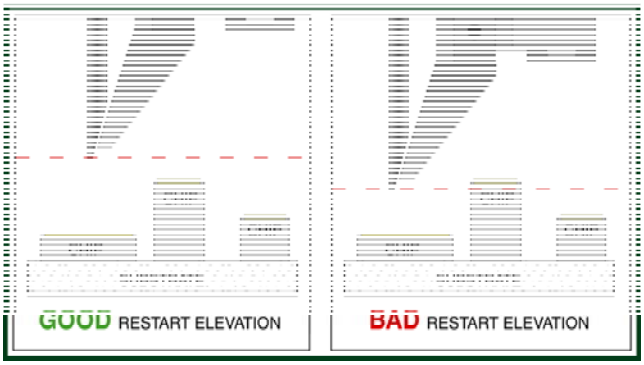
```
Restart Height Elevation: 1400 from top
4=Key in       5=Up           (0.29167″)
7=Work height  8=Suggest
A=Prev option  0=Down      G=Next option
```

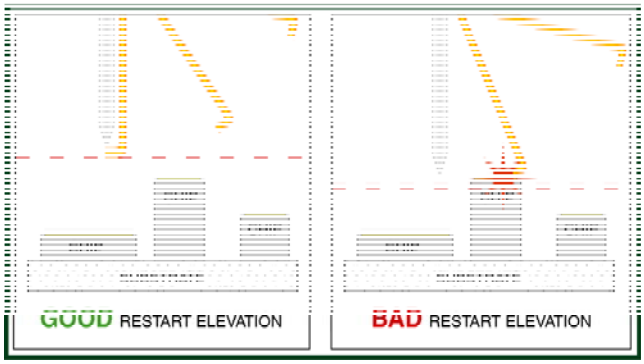
800 is the suggested elevation for the 4700E

Programmed in Z Motor half-steps from home

7=Work Height Verification (see page 28)

> ϑ ***To edit "Restart Height Elevation"***
>
> From the HOME menu press 4 (EDIT), 6 (MACHINE), and then 9 (RESTART HT).





Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Up 5	6
Work height 7	Suggest 8	9
Previous option A	↓ Down 0	Next option G

ADVANCED PROGRAMMING

Lift Before Pull

FOR 4500E AND 4600E MODES ONLY

To change the selection of this feature press the "5" key for ON or the "0" key for OFF option. The 454647E will wait until the Tooling Head has lifted off the terminating bond site before actuating the pull stroke if this feature is selected to "ON". The suggested setting is "OFF". This feature can prove beneficial for those applications in which the terminating bond is made on delicate or sensitive components, or for applications with extremely soft wire.

LIFT BEFORE PULL (**Display this menu if 45° feed tool is in use.**)

```
Lift Before Pull: Off
                  5=On
                  8=Suggest
A=Prev option     0=Off        G=Next option
```

LIFT BEFORE PULL (**Display this menu if 90° feed tool is in use.**)

```
Lift Before Pull: 6 (1Z= .0002083")
4=Key in          5=Up
                  8=Suggest
A=Prev option     0=Down       G=Next option
```

> ✪ ***To edit "Lift Before Pull"***
>
> From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), then 4 (LIFT-TO-PULL).

Key Format:

Previous Menu 1	2	Home 3
4	On 5	6
7	Suggest 8	9
Previous option A	Off 0	Next option G

ADVANCED PROGRAMMING

Ultrasonic Power During Feed

The number entered controls the amount of ultrasonic energy applied to the tool during the feeding of the wire. This ultrasonic energy is critical in assisting vertical feed bonding tools. The 45° tools usually do not benefit from ultrasonic during feed. If this setting is increased to too high a setting, it may actually shake the wire out of the tool. If this setting is set so that it exceeds the "Ultrasonic Power during Thread" (see next page), then the power during thread will be increased to make them equal.

ULTRASONIC POWER DURING FEED

```
Ultrasonic Power During Feed: 400
4=Key in        5=Increase
                8=Suggest
A=Prev option   0=Decrease   G=Next option
```

Normally used only for 90° applications

✪ ***To edit "Ultrasonic Power During Feed"***

FOR 4500E AND 4600E MODES ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), then 5 (U/S FEED)

✪ ***To edit "Ultrasonic Power During Feed"***

FOR 4700E MODE ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), then 4 (U/S FEED)

Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Ultrasonic Power During Thread

Similar to the Ultrasonic power during feed option, except that this ultrasonic power level is used during the long clamp stroke (Executed by pressing key “6” from the thread and bond-off menu). The values suggested by the 454647E are the same as those for the ultrasonic power during feed option. The 454647E will reject values that are lower than the power during feed.

ULTRASONIC POWER DURING THREAD

```
Ultrasonic Power During Thread: 400
4=Key in        5=Increase
                8=Suggest
A=Prev option   0=Decrease   G=Next option
```

Normally used only for 90° applications

✪ ***To edit “Ultrasonic Power During Thread”***

FOR 4500E AND 4600E MODES ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), and then 6 (U/S THREAD)

✪ ***To edit “Ultrasonic Power During Thread”***

FOR 4700E MODE ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), and then 5 (U/S THREAD)

Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Ultrasonic Diagnostic Test

This feature performs a diagnostic evaluation of the ultrasonic system during the power-up sequence. To change the selection of this feature press key “5” to turn ON or key “0” to turn OFF the option.

ULTASONIC DIAGNOSTIC TEST

```
Ultrasonic Diagnostic Test: On
                5=On
                8=Suggest
A=Prev option   0=Off       G=Next option
```

To edit “Ultrasonic Diagnostic Test”

FOR 4500E AND 4600E MODES ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), and then 8 (U/S TEST)

To edit “Ultrasonic Diagnostic Test”

FOR 4700E MODE ONLY

From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), and then 6 (U/S TEST)

Key Format:

Previous Menu 1	2	Home 3
4	On 5	6
7	Suggest 8	9
Previous option A	Off 0	Next option G

ADVANCED PROGRAMMING

Wire Break Z Offset

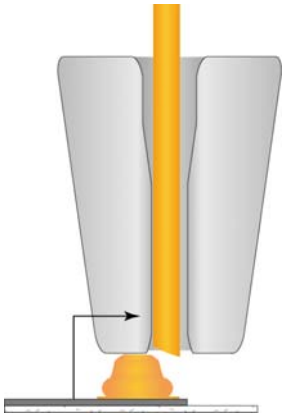
This option is used when ball or stud bumping. The tool is moved to the top of the ball bond and then takes a step backwards to terminate the wire at the top of the ball.

The number entered controls the elevation of the tool before the Y motor takes a step back to terminate or wipe the wire off the top of the ball bond.

WIRE BREAK Z OFFSET

```
Wire Break Z Offset: 7    (1Z=.0002083")
4=Key in       5=Increase
               8=Suggest
A=Prev option  0=Decrease  G=Next option
```

> ***To edit "Wire Break Z Offset"***
>
> From the HOME menu press 4 (EDIT), 6 (MACHINE), 0 (MORE OPTIONS), then 8 (WIRE BREAK Z OFFSET)



Key Format:

Previous Menu 1	2	Home 3
Key in 4	↑ Increase 5	6
7	Suggest 8	9
Previous option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

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 *****
Change tool extension to maximize value.
Current value = 33        Old value = 27
A = Escape            G = Read new value
```

ϑ ***To call "Bond Tool Position Setup***

From the HOME menu press 6 (THREAD & BOND), and then 8 (BOND TOOL POSITION SETUP).

Key Format:

1	2	3
4	5	6
7	8	9
Escape A	0	Read New Value G

ADVANCED PROGRAMMING

Device Edit Menu

From this menu option the operator can create new devices, copy device properties to another device for modification, or simply select a device to be used. There can be as many as thirty devices programmed on the 454647E.

DEVICE EDIT MENU

```
Edit Device 20 of 30:
4=Erase device              6=Copy device
7=Prev device  8=Device 1   9=Next device
A=Prev option               G=Type edit
```

Key “4” will erase the device data.

Key “7” or “9” will step the operator through the devices.

Key “8” will return the operator to Device 1.

> ✪ ***To Call “Device Edit”***
>
> From the HOME menu press 4 (EDIT), and then press 7 (DEVICE EDIT)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Erase device 4	5	Copy device 6
Previous Device 7	Device 1 8	Next device 9
Previous Menu A	0	Type Edit G

ADVANCED PROGRAMMING

Erase Device

This option will allow the operator to erase all data from the selected device.

ERASE DEVICE

```
ERASE ALL DATA from Device 2:
                  Are you sure?
                              A=No
(This device has 3 types.)   G=Yes
```

> ✪ ***To call "Erase Device"***
>
> From the HOME menu press 4 (EDIT), 7 (DEVICE EDIT) and then press 4 (ERASE DEVICE)

Key Format:

Previous Menu 1	2	Home 3
4	5	6
7	8	9
Previous Menu A	0	Erase all data from this device G

ADVANCED PROGRAMMING

Copy Device

This option will allow the operator to copy a device to another location for modification of a new device or package with similar properties.

COPY DEVICE

```
COPY DEVICE 5 of 30 to Device: 30
              5=Next destination
7=Prev source               9=Next source
A=Prev menu   0=Prev destination    G=OK
```

Key “5” can advance one past the last device #, which is also the default. Key “G” creates the copy, and goes to the Edit Device Menu.

Key“1” or “A” = Device Edit Menu

> ✪ ***To Call “Copy Device”***
>
> From the HOME menu press 4 (EDIT), 7 (DEVICE EDIT) and then press 6 (COPY DEVICE)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
4	Next device 5	6
7	8	9
Previous Menu A	Previous Device 0	OK G

ADVANCED PROGRAMMING

Wire Type Edit Menu

From this menu option the operator can create new types, copy type properties to another type for modification, or simply select a type to be used. There can be as many as thirty different types programmed on the 454647E.

WIRE TYPE EDIT MENU

```
Device 2 of 30: TYPE 2 of 3
4=Edit type  5=Add type      6=Copy type
7=Prev type  8=Type 1        9=Next type
A=Prev menu  0=Delete Type 3
```

Key “7” or “9” will step the operator through the types.

Key “8” will return the operator to Type1.

Key “0” will erase the device data.

> ✪ ***To call “Wire Type Edit” Menu***
>
> From the HOME menu press 4 (EDIT) and then press 9 (TYPE EDIT)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Edit Type 4	Add type 5	Copy type 6
Previous type 7	Type 1 8	Next type 9
Previous Menu A	Delete Type 3 0	Next option G

ADVANCED PROGRAMMING

Delete Type

This option allows the operator to delete one type from the end of the wire type list.

DELETE TYPE

```
DELETE TYPE 3 of 3:
                  Are you sure?
                              A=No
(This type has 2 bonds.)      G=Yes
```

> ✪ ***To call "Delete Type "***
>
> From the HOME menu press 4 (EDIT), 9 (TYPE EDIT), and then press 0 (DELETE TYPE)

Key Format:

Previous Menu 1	2	Home 3
4	5	6
7	8	9
Previous Menu A	0	Delete this type G

ADVANCED PROGRAMMING

Edit Type

From this menu option, the operator can edit the number of wires in a type or change the CRITICAL BOND of the current type.

TYPE EDIT MENU

```
Device 2 of 30: Type 1 of 3
4=# of wires
7=Critical bond
A=Prev menu                G=Sequence
```

> ✪ ***To Call "Edit Type" Menu***
>
> From the HOME menu press 4 (EDIT), 9 (TYPE EDIT), and then press 4 (EDIT TYPE).

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Edit # of wires 4	5	6
Critical bond 7	8	9
Previous Menu A	0	Sequence G

ADVANCED PROGRAMMING

Edit Number of Wires

This enables the operator to specify how many wires are in a specific type.

NOTE! When the number of wires in a type is 0, the machine will bond the specified type indefinitely, or until it is interrupted and changed by the user.

EDIT NUMBER OF WIRES

```
Device 2 Type 3: Edit # of WIRES: 2
4=Key in       5=Increase
7=Prev type    8=Type 1    9=Next type
A=Prev option  0=Decrease  G=Next option
```

✪ ***To Call "Edit Number of Wires"***

From the HOME menu press 4 (EDIT), 9 (WIRE TYPE EDIT), 4 (EDIT TYPE), and then 4 (# OF WIRES)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key In 4	↑ Increase 5	6
Previous type 7	Type 1 8	Next type 9
Previous Option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Edit Critical Bond

This option allow the operator to specify the critical bond for a set type of wires, where the placement of the second or third bond may be more critical than the first. The operator would then align the crosshairs to the second or third bond before executing the bonding sequence.

EDIT CRITICAL BOND

```
Device 2  Type 1: EDIT CRITICAL BOND: 3
4=Key in        5=Next Bond
7=Prev type     8=Bond 1    9=Next type
A=Prev option   0=Prev Bond        G=OK
```

> ***To Call "Edit Critical Bond"***
>
> From the HOME menu press 4 (EDIT), 9 (WIRE TYPE EDIT), 4 (EDIT TYPE), then 7 (CRITICAL BOND)

*NOTE: If the system is set in Microscope Mode (page 35) the Critical Bond will be ignored and the operator must align to bond 1.

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	Next bond 5	6
Previous type 7	Bond 1 8	Next type 9
Previous Option A	Previous bond 0	OK G

ADVANCED PROGRAMMING

Add Type

This option allows the operator to add one type (with two bonds, Editable later) to the end of type list, which shares the same Device Number.

```
Device 1 of 30  Type 1 of 1
4=Edit type    5=Add type   6=Copy type
7=Prev type    8=Type 1     9=Next type
A=Prev menu    0=Delete type
```

> ✪ ***To Call "Add Type"***
>
> From the HOME menu press 4 (EDIT), 9 (WIRE TYPE EDIT), and then 5 (ADD TYPE)

Key Format:

Return to Edit 1	Go To Device/Type 2	Home 3
Edit Type 4	Add Type 5	Copy Type 6
Previous Type 7	Type 1 8	Next Type
Previous Menu A	Delete Type 0	G

ADVANCED PROGRAMMING

Copy Type

This menu enables the operator to copy types of wires to another type within a device.

COPY TYPE

```
COPY TYPE 2 of 3 to Type: 3
4=Key in      5=Next Destination
7=Prev source               9=Next source
A=Prev menu  0=Prev destination  G=OK
```

Key “5” can advance one past the last type # which is also the default

Key “G” performs the copy and goes to the Edit Type Menu.

> ✪ ***To Call “Copy Type”***
>
> From the HOME menu press 4 (EDIT), 9 (WIRE TYPE EDIT), and then 6 (COPY TYPE)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	Next bond 5	6
Previous Source 7	8	Next Source 9
Previous Menu A	Previous bond 0	OK G

ADVANCED PROGRAMMING

Bond Edit Menu

This menu is the starting point for the editing of the bond parameters for a specified type.

BOND EDIT MENU

```
Device 2: Type 1 of 3      (2 bonds)
4=Edit bond    5=# of bonds
7=Prev type    8=Type 1    9=Next Type
A=Prev menu
```

> ✪ ***To Call "Bond Edit" Menu***
>
> From the HOME menu press 4 (EDIT) and then press A (BOND EDIT)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Edit bond 4	# of bonds 5	6
Previous type 7	Type 1 8	Next type 9
Previous Menu A	0	G

ADVANCED PROGRAMMING

Edit Bond

This option allows the operator to edit the following data: Ultrasonic Power, Ultrasonic Time, Bond Force, Bond Depth, Inhibit Auto Mode, Speed and Pre-Bond Delay.

EDIT BOND

```
Device 2 Type 3: Bond #1 of 5
4=U/S power    5=U/S time      6=Force
7=Depth        8=Inhibit auto  9=Speed
A=Prev menu    0=Bond delay    G=Sequence
```

> ✪ ***To Call "Edit Bond" Menu***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), and then press 4 (EDIT BOND)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
U/S power 4	U/S time 5	6
Depth 7	Inhibit auto 8	Speed 9
Previous Menu A	Bond delay 0	Sequence G

ADVANCED PROGRAMMING

Edit Ultrasonic Power

From this menu the operator can increase or decrease the Ultrasonic Power applied to the wire for bonding. The scale is 000 (no ultrasonic power) to 999 (full ultrasonic power). The built-in ultrasonic generator has a high/low switch to allow the operator a wider range of bonding possibilities. The low scale has a finer resolution and a maximum output of 2 watts. The high scale has a maximum output power of 4.5 watts. See page 119 for details regarding this board mounted select switch.

EDIT ULTRASONIC POWER

```
ULTRASONIC POWER, Bond 5: 240
4=Key in      5=Increase   6=Copy
7=Prev bond   8=Suggest    9=Next bond
A=Prev menu   0=Decrease   G=Next option
```

> ✪ ***To edit "Ultrasonic Power"***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), then 4 (ULTRASONIC POWER)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	↑ Increase 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Menu A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Edit Ultrasonic Time

From this menu the operator can increase or decrease the Ultrasonic Time applied to the wire for bonding. The scale is 000 ms to 999 ms.

EDIT ULTRASONIC TIME

```
ULTRASONIC TIME, Bond #5: 15 msecs
4=Key in      5=Increase   6=Copy
7=Prev bond   8=Suggest    9=Next bond
A=Prev option 0=Decrease   G=Next option
```

> ✪ ***To edit "Ultrasonic Time"***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), then 5 (ULTRASONIC TIME)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	↑ Increase 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	↓ Decrease 0	Next Option G

ADVANCED PROGRAMMING

Edit Bond Force

This menu is only available if the Dual Force option has been selected. This menu will allow the operator to specify whether a bond should receive High or Low force. This can be changed from bond to bond.

EDIT BOND FORCE

```
FORCE for Bond #5: High
              5=High       6=Copy
7=Prev bond   8=Suggest    9=Next bond
A=Prev option 0=Low        G=Next option
```

> ✪ ***To edit "Bond Force"***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), then 6 (FORCE)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
4	High 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	Low 0	Next option G

ADVANCED PROGRAMMING

Edit Bond Depth

This option allows the operator to set how many Z motor step are to be taken *after* the work has been contacted. By following the wire into the work, the tool can negate the dampening effects of a soft surfaced substrate.

EDIT BOND DEPTH

```
Depth for Bond #3: 2 Z steps
4=Key in       5=Increase   6=Copy
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Decrease   G=Next option
```

✪ ***To edit "Bond Depth"***

From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), then 7 (BOND DEPTH)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	↑ Increase 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Edit Inhibit Auto Mode

If this mode is turned on, the Bonding sequence will be interrupted at the specified bond allowing the operator to manually align the bond. The operator needs to hold the “G” key or the GO button during the bonding sequence for the inhibit mode to take place.

INHIBIT AUTO MODE

```
INHIBIT AUTO MODE for Bond #5: Off
              5=On          6=Copy
7=Prev bond   8=Suggest     9=Next bond
A=Prev option 0=Off         G=Next option
```

> ✪ ***To edit “Inhibit Auto Mode”***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), and then 8 (INHIBIT AUTO MODE)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
4	On 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	Off 0	Next option G

ADVANCED PROGRAMMING

Edit Speed

From this menu, the operator may specify the speed in which a specific bond is to be place at to reduce the impact for certain bonds. There are six speeds available for each bond. 0 being the Fastest and 5 being the slowest.

NOTE! Speed setting 4 and 5 have a 100ms pause at Search elevation for very light bond forces. This works to cancel the inertia effect resulting from the machine operating at these higher speeds.

```
SPEED for Bond #1 is 1
(0 through 5)  5=Slower    6=Copy
7=Prev bond    8=Suggest   9=Next bond
A=Prev option  0=Faster    G=Next option
```

✪ ***To edit "Speed"***

From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), and then 9 (SPEED)

Key Format:

Previous Menu A	Go To Device/Type 2	Home 3
4	↑ Slower 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	↓ Faster 0	Next option G

ADVANCED PROGRAMMING

Edit Pre-Bond Delay

Directly after the tool contacts the work surface and counts a specified number of Z-steps into the work, it has a small pre-bond delay before the ultrasonics are fired. This is done to cancel any remaining motor or motion vibrations in the machine, and to allow it to make a good solid bond. This option enables the operator to increase the delay time before the ultrasonic power is used. The default value for this function is 5 msecs.

PRE-BOND DELAY

```
DELAY before Bond #5: 5 msecs
4=Key in      5=Increase   6=Copy
7=Prev bond   8=Suggest    9=Next bond
A=Prev option 0=Decrease   G=OK
```

Minimum Pre-Bond Delay = 0 msecs.

Maximum Pre-Bond Delay = 25 msecs.

> ✪ ***To edit "Bond Delay"***
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), 4 (EDIT BOND), and then 0 (BOND DELAY)

Key Format:

Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	↑ Increase 5	Copy 6
Previous bond 7	Suggest 8	Next bond 9
Previous Option A	↓ Decrease 0	OK G

ADVANCED PROGRAMMING

Edit Number of Bonds

This option allow the operator to specify the number of bonds for the specified wire type. (Maximum of 5)

NUMBER OF BONDS

```
Device 2 Type 3: Edit # of Bonds: 5
4=Key in      5=Increase
7=Prev type   8=Suggest    9=Next type
A=Prev menu   0=Decrease   G=Next option
```

> ✪ **To edit "# of Bonds":**
>
> From the HOME menu press 4 (EDIT), A (BOND EDIT), and then 5 (# OF BONDS)

Key Format:

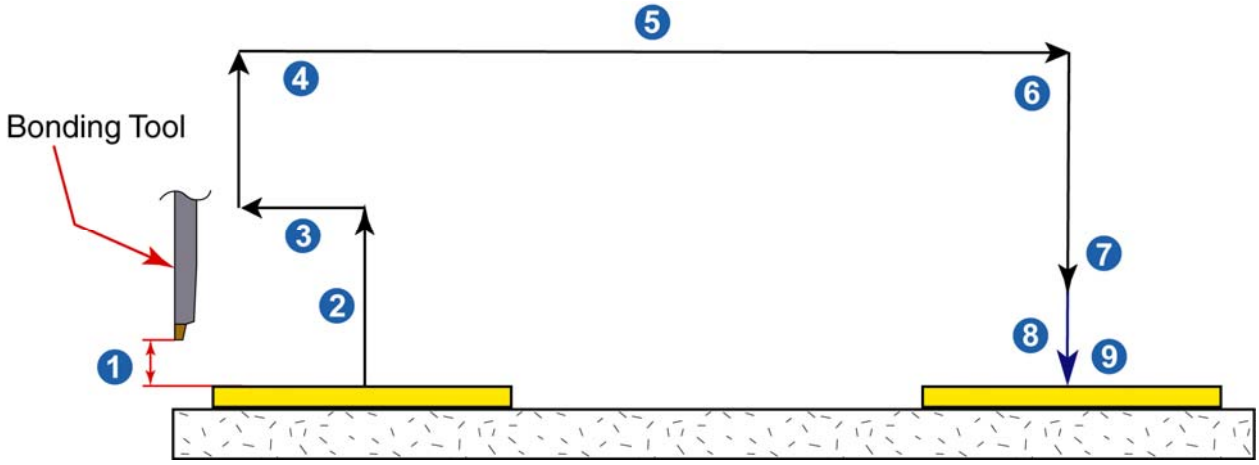
Previous Menu 1	Go To Device/Type 2	Home 3
Key in 4	↑ Increase 5	6
Previous bond 7	Suggest 8	Next bond 9
Previous Menu A	↓ Decrease 0	Next option G

ADVANCED PROGRAMMING

Edit Loop Motion

The most effective way to evaluate the necessary changes required for proper looping, or bond position, of the bonding programs wire structure is to actually begin bonding with the 454647E's default values. Bond only one wire at a time; if the loop shape is not as desired, edit one or more of the following data:

1. Edit **SEARCH ELEVATION** for top (Bond 1 Only)
   An elevation at which the operation can visually place the bond.
2. Edit **Z-BEFORE-Y** (Before bond 2)
   An elevation used prior to backbend to aid in creating proper loop shape.
3. Edit **BACKBEND** (Before bond 2)
   A step backward to aid in loop shape.
4. Edit **LOOP ELEVATION** (Before bond 2)
   The maximum elevation at which the tool rise to create loop.
5. Edit **Y-OFFSET** for Bond 2 (1st Adjustment)
   The distance from 1st to 2nd bond in Y motor steps.
6. Edit **CLOSE CLAMP AT LOOP HEIGHT** (Before bond 2) ***4500E ONLY***
   Option as to whether the clamps are to stay open or close prior to 2nd search elevation. This will also help determine loop shape.
7. Edit **SEARCH ELEVATION** Before bond 2 (below loop)
   An elevation at which the operation can visually place the bond.
8. Edit **Y-OFFSET** for Bond 2 (Final Adjustment)
   The distance from 1st to 2nd bond in Y motor steps. Final placement.
9. Edit **CLOSE CLAMP AT SEARCH** (Before bond 2) ***4500E ONLY***
   Option as to whether the clamps are to stay open or close prior to 2nd bond. This will also help determine loop shape.



NOTE! 1 Z Micro-Step = 0.000208 inch = 0.208 mil = 5.2832 microns.
1 Y Micro-Step = 0.000208 inch = 0.208 mil = 5.2832 microns.

> ***To call "Edit Loop Motion"***
>
> From the HOME menu press 4 (EDIT), 0 (LOOP MOTION) and then G to step Tool Head through the bonding motion or press 4 to EDIT individual looping parameters.

ADVANCED PROGRAMMING

Edit Loop Menu

The operator can set up the machine's loop shape in one of two ways. From the main EDIT LOOP MENU key G can be pressed and the machine will walk the operator through all of the loop shape settings. Or, if key 4 is selected, the user can modify each setting individually.

```
EDIT LOOP MENU                4=Loop Edit
Device 1, Type 1: (2 Bonds)
-> LOOK IN MICROSCOPE,
   SELECT BOND 1 AND PRESS G WHEN READY
```

G = Sequence through each of the items listed in the screen shot below

4 = For more advanced users- allows operator to change the loop settings individually.

```
LOOP EDIT: Type 1 of 1
4=Search      5=Z-Before-Y   6=Backbend
7=Loop elev   8=Y offset     9=Clamp mode
A=Home menu   0=Loop pull    G=Nudge-up
```

The Clamp Mode feature is only available in the 4500E mode.

> ***To call "Loop Menu"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), and then press 4 (LOOP EDIT).

Key Format:

Escape 1	Go To Device 2	Home 3
Search 4	Z-Before-Y 5	Backbend 6
Loop Elevation 7	Y-Offset 8	Clamp Mode 9
Home Menu A	Loop Pull 0	Nudge-up G

ADVANCED PROGRAMMING

Search

An elevation at which the operation can visually place the bond. When the machine is in Half-Auto mode or any key is held in Full-Auto mode, the bonder stops here at SEARCH to allow the operator to make any final adjustments to the bond position. This position should be set far enough from the chip to avoid contact at this elevation- yet it should be close enough to make visual bond targeting possible.

```
EDIT SEARCH for Bond #1: 2024 from Home
4=Key in      5=Up              (0.42167")
7=Prev bond   8=Suggest     9=Next bond
A=Prev menu   0=Down        G=Next option
```

Using keys 7 and 9, the operator can scroll through all of the bonds in a single wire. This feature makes programming quick and easy.

```
EDIT SEARCH for Bond #2: 145 from Loop
4=Key in      5=Up              (0.03021")
7=Prev bond   8=Suggest     9=Next bond
A=Prev menu   0=Down        G=Next option
```

Notice the Search elevation on bond 2 is measured from the loop, not from Home as with the first bond.

> ***To call "Search"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 4 (SEARCH).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Up 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Menu A	Down 0	Next Option G

ADVANCED PROGRAMMING

Z-Before-Y

The number of motor steps the motor raises up off of the work, after first bond, before making any movement in the Y direction. Typically this elevation is used prior to backbend to aid in creating proper loop shape.

```
Z-BEFORE-Y before Bond #1: n/a
              5=Info
                              9=Next bond
A=Prev option                 G=Next option
```

Notice there is no Z-Before-Y setting available *before* the first bond. This motion takes place directly *after* the first bond.

```
Z-BEFORE-Y before Bond #2: 50 steps
4=Key in      5=Up              (0.01042")
7=Prev bond   8=Suggest     9=Next bond
A=Prev option 0=Down        G=Next option
```

Too few motor steps in this setting can cause the wire to be pulled off of the work if the operator is also using the backbend feature.

> ***To call "Z-Before-Y"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 5 (Z-BEFORE-Y).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Up 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Down 0	Next Option G

ADVANCED PROGRAMMING

Backbend

This particular feature is an excellent aid in creating good loop shape when using a 454647E in the 4600E and 4700E modes. The position of the clamps on the 4500E mode allow greater control of the wire requiring less finesse when it comes to loop motion. BACKBEND occurs immediately after the motor has counted up the specified number of Z-BEFORE-Y steps. An excessive amount of BACKBEND can easily peel the first bond from the work. However, if used properly, BACKBENDING can add not only shape, but also height to your wire loops. To achieve truly effective BACKBENDS, the operator needs to strike a balance between the number of Z-BEFORE-Y steps versus the number of BACKBEND steps.

```
BACKBEND before Bond #1: n/a
                5=Info
                              9=Next bond
A=Prev option                 G=Next option
```

Notice there is no Backbend setting *before* the first bond. This motion takes place *after* the first bond and Z-Before-Y takes place.

```
BACKBEND before Bond #2: 0 Y step
4=Key in        5=Increase      (0.00000")
7=Prev bond     8=Suggest     9=Next bond
A=Prev option   0=Decrease    G=Next option
```

- ***To call "Backbend"***

  From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 6 (BACKBEND).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Increase 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Decrease 0	Next Option G

ADVANCED PROGRAMMING

Loop Elevation

The highest point the tool reaches in the looping procedure. It is important to remember that this maximum tool height does not equate to loop height. As the tool begins it descent toward the work surface, this high point of the wire will be pulled down with the tool. Wire loop height is dependant upon many factors other than just LOOP ELEVATION (contributing factors: Z-BEFORE-Y, BACKBEND, Y-OFFSET, LOOP ELEVATION, NUDGE-UP, wire size, wire strength, wire material, bonding tool, clamp position, etc.).

```
LOOP ELEV before Bond #1: n/a
               5=Info
                              9=Next bond
A=Prev option                 G=Next option
```

Notice there is no Loop Elevation setting available *before* the first bond. This height is reached directly before the second bond is made.

```
LOOP ELEV before Bond #2: 100 steps
4=Key in       5=Up             (0.02083")
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Down       G=Next option
```

> ***To call "Loop Elevation"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 7 (LOOP ELEVATION).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Up 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Down 0	Next Option G

ADVANCED PROGRAMMING

Y-Offset

This is the distance between the first and second bond in motor steps.

```
Y OFFSET before Bond #1: Always 0
               5=Info
                            9=Next bond
A=Prev option               G=Next option
```

```
Y OFFSET before Bond #2:  120 from Bond 1
4=Key in       5=Increase      (0.02500")
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Decrease   G=Next option
```

> ***To call "Y-Offset"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 8 (Y-OFFSET).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Increase 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Decrease 0	Next Option G

ADVANCED PROGRAMMING

Close Clamp at Loop Height

The operator can set up the machine's loop shape in one of two ways. From the main EDIT LOOP MENU key G can be pressed and the machine will walk the operator through all of the loop shape settings. Or, if key 4 is selected, the user can modify each setting individually.

4500E ONLY

```
Close CLAMP AT LOOP HT ABOVE Bond #1: n/a
               5=Info
                            9=Next bond
A=Prev option               G=Next option
```

```
Close CLAMP AT LOOP HT ABOVE Bond #2:
4=Key in       5=Close
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Open       G=Next option
```

> ***To call "Close Clamp at Loop Height"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 9 (CLOSE MODE).

Key Format:

Escape 1	Go To Device 2	Home 3
4	Close 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Open 0	Next Option G

ADVANCED PROGRAMMING

Close Clamp at Search

The operator can set up the machine's loop shape in one of two ways. From the main EDIT LOOP MENU key G can be pressed and the machine will walk the operator through all of the loop shape settings. Or, if key 4 is selected, the user can modify each setting individually.

4500E ONLY

```
Close CLAMP AT SEARCH ABOVE Bond #1: n/a
               5=Info
                            9=Next bond
A=Prev option               G=Next option
```

```
Close CLAMP AT SEARCH ABOVE Bond #2:
4=Key in       5=Close
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Open       G=Next option
```

> ***To call "Close Clamp at Search"***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), 9 (CLOSE MODE), and then press G (NEXT OPTION).

Key Format:

Escape 1	Go To Device 2	Home 3
4	Close 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Open 0	Next Option G

ADVANCED PROGRAMMING

Loop Pull

This option “cuts” a 45° angle from the loop height to the work surface. This feature works to lower the loop height. (5 steps = 1mil)

```
LOOP PULL before Bond #1: n/a
               5=Info
                            9=Next bond
A=Prev option               G=Next option
```

```
LOOP PULL before Bond #2: 0 Y step
4=Key in       5=Increase      (0.00000”)
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Decrease   G=OK
```

> ***To call “Loop Pull”***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press 0 (LOOP PULL).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Increase 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Decrease 0	Next Option G

ADVANCED PROGRAMMING

Nudge Up

This option is used to increase loop height. Just before making the second bond, the machine can be set to “walk” back toward the first bond while at search above the second bond. This effectively nudges up the loop height. To work effectively, the search above second bond should be set fairly low to the work.

```
NUDGE-UP before Bond #2: 0 Y step
4=Key in       5=Increase      (0.00000”)
7=Prev bond    8=Suggest    9=Next bond
A=Prev option  0=Decrease   G=OK
```

> ☞ ***To call “Nudge-Up”***
>
> From the HOME menu press 4 (EDIT), 0 (EDIT LOOP MOTION), 4 (LOOP EDIT), and then press G (NUDGE-UP).

Key Format:

Escape 1	Go To Device 2	Home 3
Key In 4	Increase 5	6
Previous Bond 7	Suggest 8	Next Bond 9
Previous Option A	Decrease 0	Next Option G

TROUBLESHOOTING

Poor Bond Quality

The following are possible causes for poor bond quality. Poor bond quality could either mean 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. Workholder
   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

Inconsistent Looping

The 454647E's 45° Tooling Head configuration offers excellent looping control. The bonding wires natural characteristics and tendencies are to resist and sometimes refuse to bends or form a loop in a desired fashion. Please refer to the following list for consideration to solve any experience with inconsistent loop control on your application.

1. "Loop Height" Profile is too low.
2. Insufficient "Backbend" during looping.
3. Insufficient "Z-Before-Y" during looping.
4. Excessive "Loop Pull" during looping.
5. Clamps remain open while descending to the 2nd Bond.
6. Bonding tool feed through hole is excessive for wire diameter.
7. Bonding tool feed through hole angle is not applicable for this application. (Generally, a 45° feed through hole is recommended.)
8. Clamps are not centered properly with Bonding Tool.
9. Force Calibration need to be verified.
10. Using of aged or damaged wire.

TROUBLESHOOTING

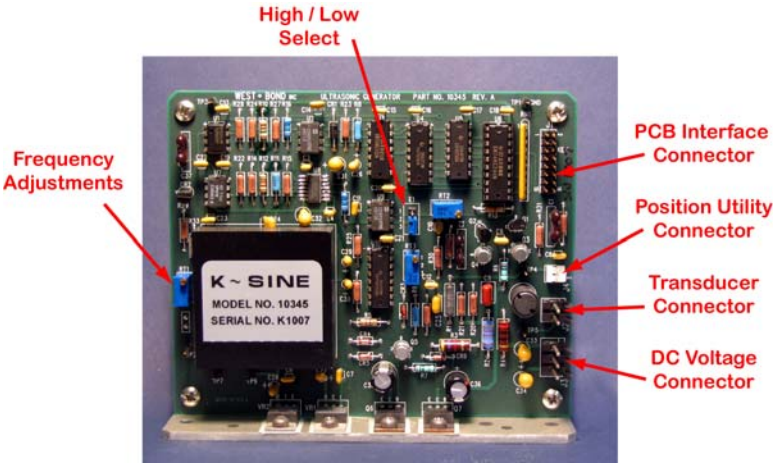
Ultrasonic Board (P/N A-10345)

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).

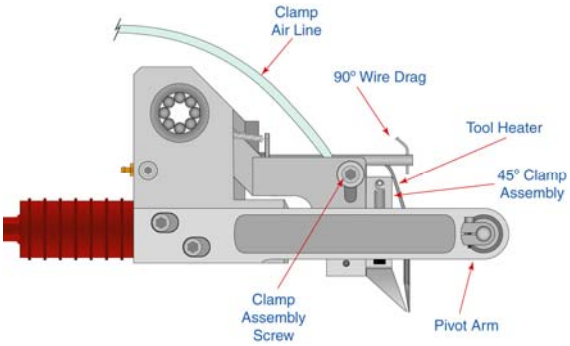
4. Output voltage calibration:
   - 4.1 Connect a 20 Ohm, 5 Watt resistor across pin 1 and pin 2 of connector J2. Take care not to short across 2 pins.
   - 4.2 Connect AC volt meter and oscilloscope probes to TP5.
   - 4.3 Connect jumper E1 pin1 to pin 2 (high power output).
   - 4.4 Remove PCB Interface (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.

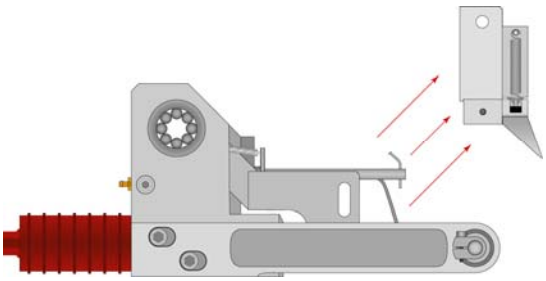
TOOL HEAD CONVERSION

45° to 90° Tool Head Conversion

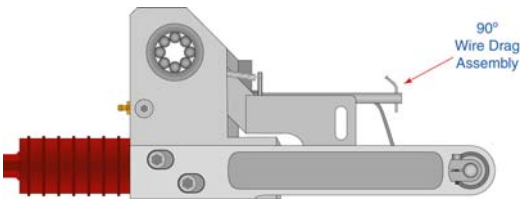
The 454647E offers the ability to wire bond with the 45 degree wire feed tool assembly or the Deep Access wire feed tool assembly. The conversion process from one tool assembly to another should take approximately 5 minutes. Please review the following instructions to insure proper execution of the exchange on our 454647E 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.



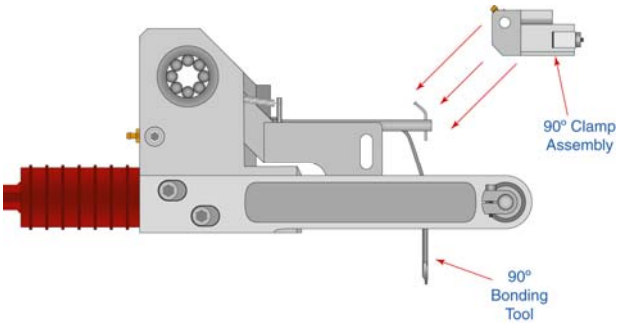
2) Holding the Tooling Head remove the clamp release screw and remove clamp assembly.

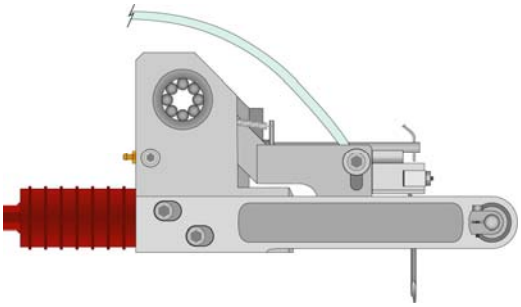


3) If not already done, Insert the Wire Drag Assembly. Position the wire drag tube so that it lines up front/back and left/right with the transducer hole for the bonding tool.

TOOL HEAD CONVERSION

45° to 90° Tool Head Conversion





4) Insert the 90° clamp assembly into the location the 45° clamp assembly was just removed from. Insert the Clamp Screw to secure clamp assembly. 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 panel. Verify the Alignment and actuation of the Clamp Assembly is correct for proper bonding.

6) Change Model Number for selected clamp assembly. (See page 105).

90° to 45° Tool Head Conversion

REVERSE THE ABOVE STEPS (PAGES 102 TO 103) TO RE-INSTALL THE 45° TOOLING HEAD CLAMP ASSEMBLY

A) Position the new 45° Tooling Head so that the Top and Front sides are flush with the Clamp Screw Block.

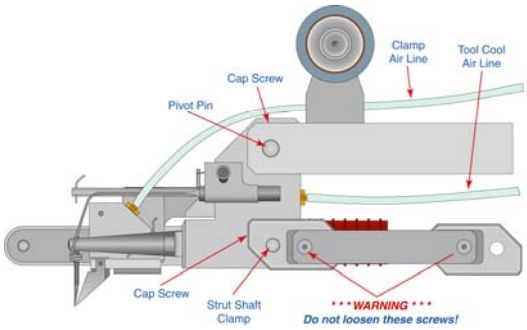
B) Align the clamps so that the wire feeds at 45° through the transducer, clamps and tool.

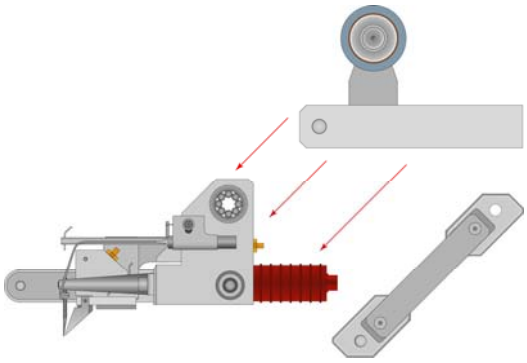
Please do not hesitate to contact your local Sales/Service representative for assistance or call the **WEST•BOND** factory at (714) 978-1551 and ask for the service department.

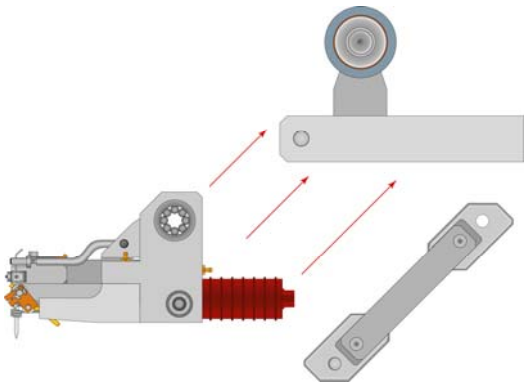
TOOL HEAD CONVERSION

Wedge to Ball Bonder Tool Head Conversion

The 454647E also offers the ability to change the entire head assembly to covert 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 454647E wire bonder.







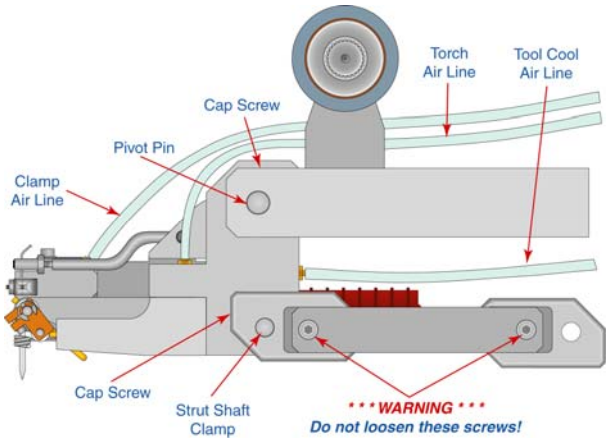
1) Remove bonding tool, disconnect the air hose and both connectors from the front panel cover. Also remove the small clamp on the left side of the head holding the air hose to the tool head plate.

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

This option selects the model for the current tooling head installed.

```
Indicate Model Number of the machine:
->5=Model 4500E Wedge Bonder
  6=Model 4600E Deep-Access Wedge Bonder
  7=Model 4700E Ball Bonder   A=ESC G=OK
```

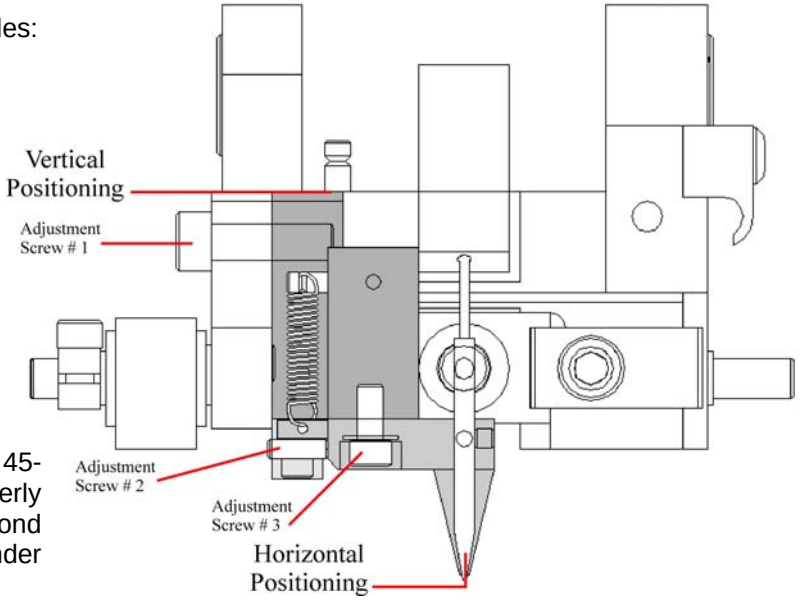
ϑ ***To call "Model Selection"***

From the HOME menu press 8 (MORE OPTIONS) and then press 0 (MODEL SELECTION)

CLAMP ADJUSTMENT

Tools required to setup the 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.

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.
4. Install Bonding tool and wire.

Horizontal Positioning

5. Using the 5/64” Allen wrench, loosen Adjustment Screw #3, and lightly tighten
6. Using the 0.028” Allen wrench, back Adjustment Screw #2 out. ***DO NOT REMOVE!***
7. 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 have.
8. 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.
9. Using Adjustment Screw #2, Push the lower clamp assembly to the right until the wire from clamps to bond tool is straight.
10. Tighten Adjustment Screw #3.

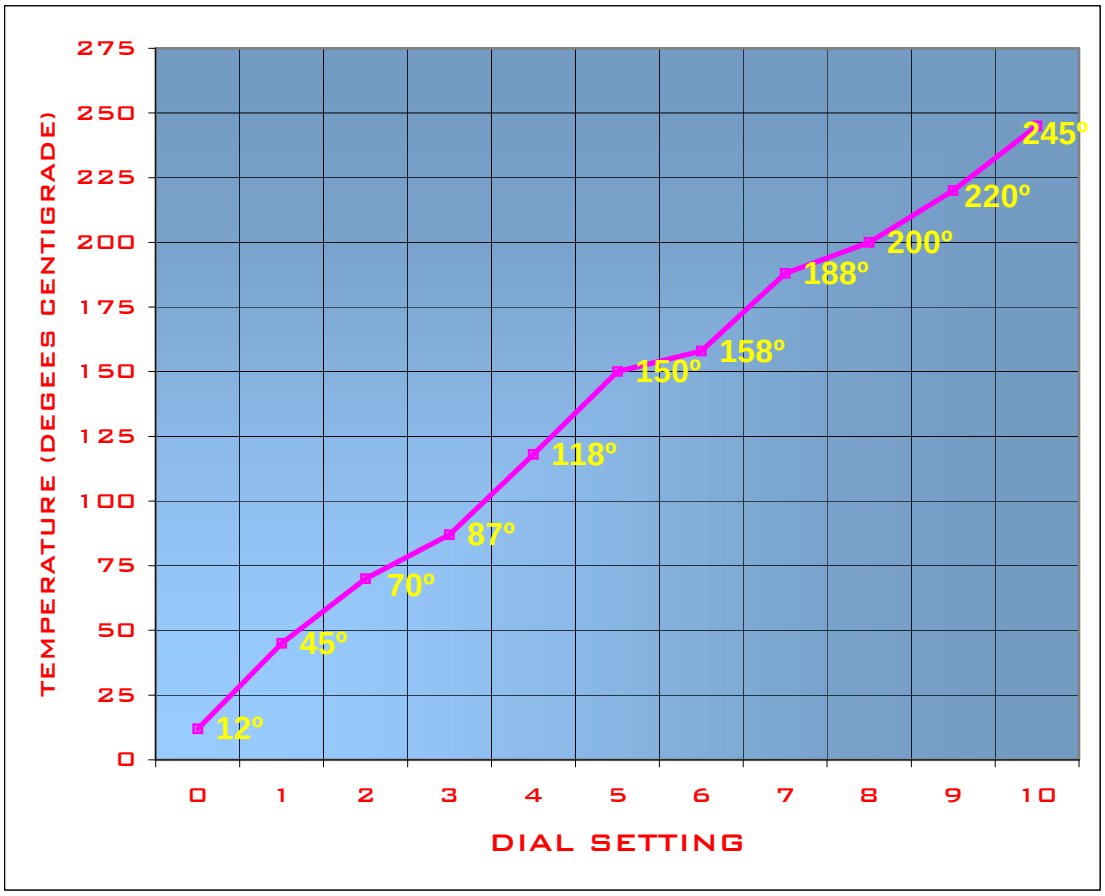
Testing

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

RADIANT HEATER CHARTS

Dial Settings for 0.750” Tools

This machine has been equipped with a Radiant Heater, which provides radiant heat around the bonding tool. The heater temperature is adjusted by the multi-dial labeled TOOL HEAT, located on the front panel.



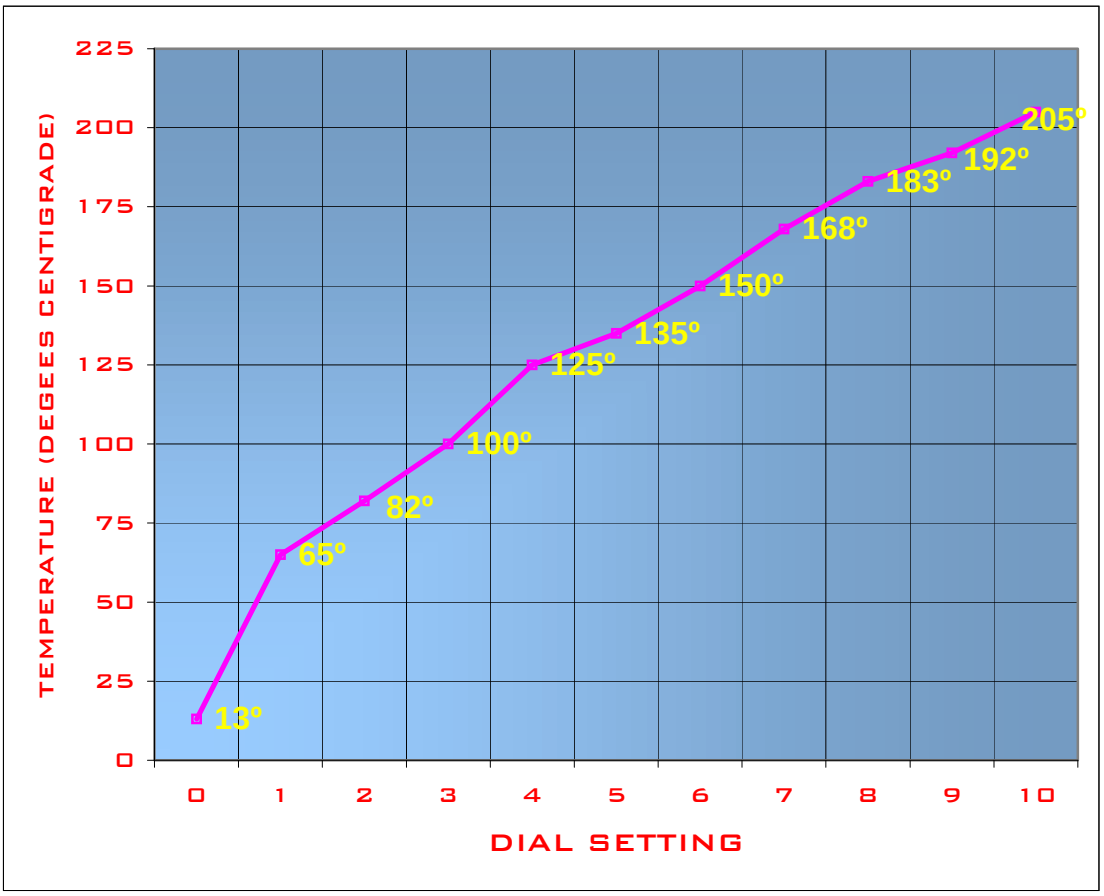
Model 4546E

2½ Turn Heater at 0.750” Tool Length

RADIANT HEATER CHARTS

Dial Settings for 0.625" Tools

This machine has been equipped with a Radiant Heater, which provides radiant heat around the bonding tool. The heater temperature is adjusted by the multi-dial labeled TOOL HEAT, located on the front panel.



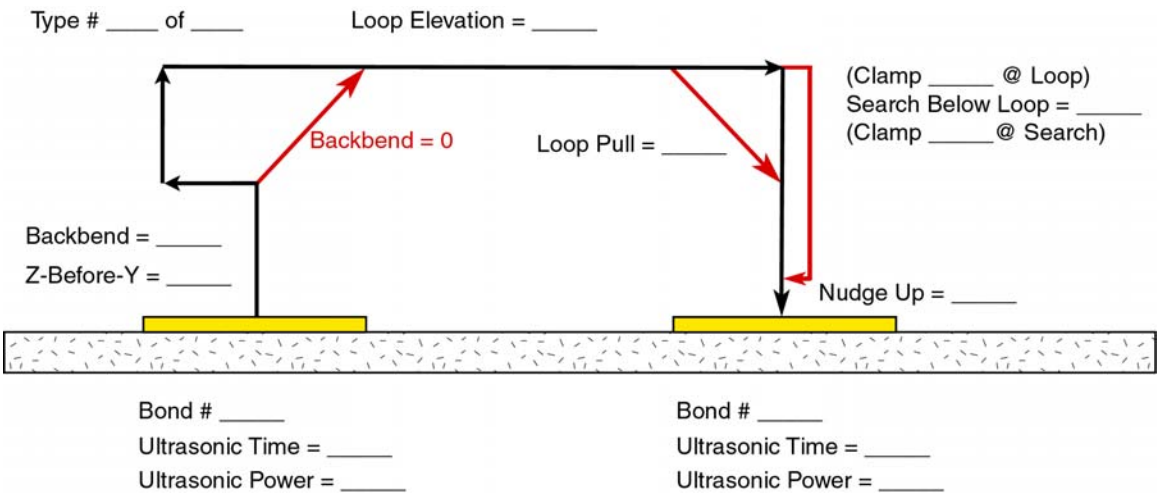
Model 4700E

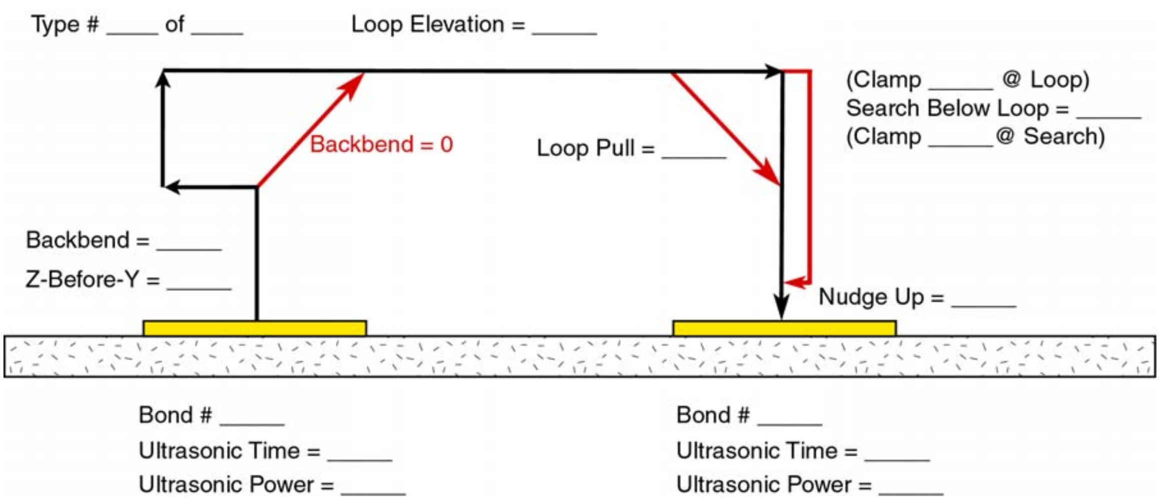
2½ Turn Heater at 0.625" Tool Length

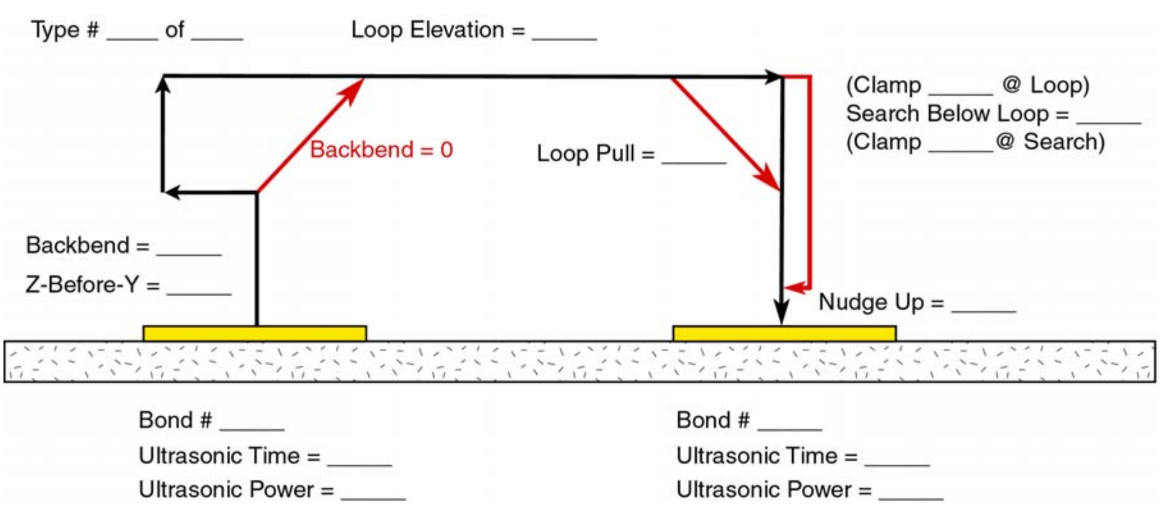
APPLICATION AND BOND SCHEDULE

Description and pertinent information:										
Model and Configuration:										
Machine:										
Tool:										
Workholder:				*Temp:*						
Tool Heat:										
Wire / Ribbon:			*Size:*			*Elongation:*				
Bond Settings	*WIRE TYPE DATA*									
Type	*1*		*2*		*3*		*4*		*5*	
No. of Wires										
No. of Bonds										
Critical Bond										
LOOPING PROFILES										
Search Elev. 1										
Z Before Y										
Back Bend										
Loop Elev.										
Y-Offset										
Clamp @ Loop										
Search Below Loop										
Clamp @ Search										
BOND PARAMETERS										
	1	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*
U/S Power										
U/S Time (ms)										
Bond Force (grams)										
Z Depth										
Loop Speed										
Bond Delay (ms)										
MACHINE SETTINGS										
Clamp Home			*Wire Pull*				*Wire Tail*			
Restart Height			*Lift B4 Pull*							
U/S Feed			*U/S Thread*							

APPLICATION AND BOND SCHEDULE







WARRANTY

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:

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

WEST•BOND®

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SPARE PARTS

Part No	Description	Manufacturer Name	Manufacturer P/N	Rec. Spare
339.001	Pivot Bearing Shaft, 0.4300" Long			1
342	Bar, Tie, Manipulator			1
846	Nut, Wire Puller Tension			1
1200	Contact Pin			1
2057.004	Spring, Compression, 0.562" OD x 1.5" Free; 1.5 Lb @ 0.50 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
4134	Button, Switch			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
8750	PCB, CPU Assembly, "E" Series	K~Sine		1
9000	Xducer Assembly, Model K~24-EW, 63KHz	K~Sine	K~24-EW	1
9011	Piston, Clamp Blade, Model 4500E			1
9028	PCB, DC/DC Converter Assembly, Model 4500E	K~Sine		1
9037	PCB, Motor Driver, Model 4500E	K~Sine		1
9090	PCB, I/O Circuit, Model 4500E	K~Sine		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
50001	Stepper Motor, 4 Phase, 1.8 Deg, 17 x 47mm long (2KB-F,G 4KE-Y,Z motors)	Mycom	PS445-01B	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
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
50028	Ball Bearing, Shielded, Extended Inner, 5/32" ID x 5/16" OD	New Hampshire Ball Bearings	SSRI-5532ZZEE	2
50033	Solenoid Valve, 12 VDC, 3 Way, Normally Closed	Clippard	EV-3-12	1

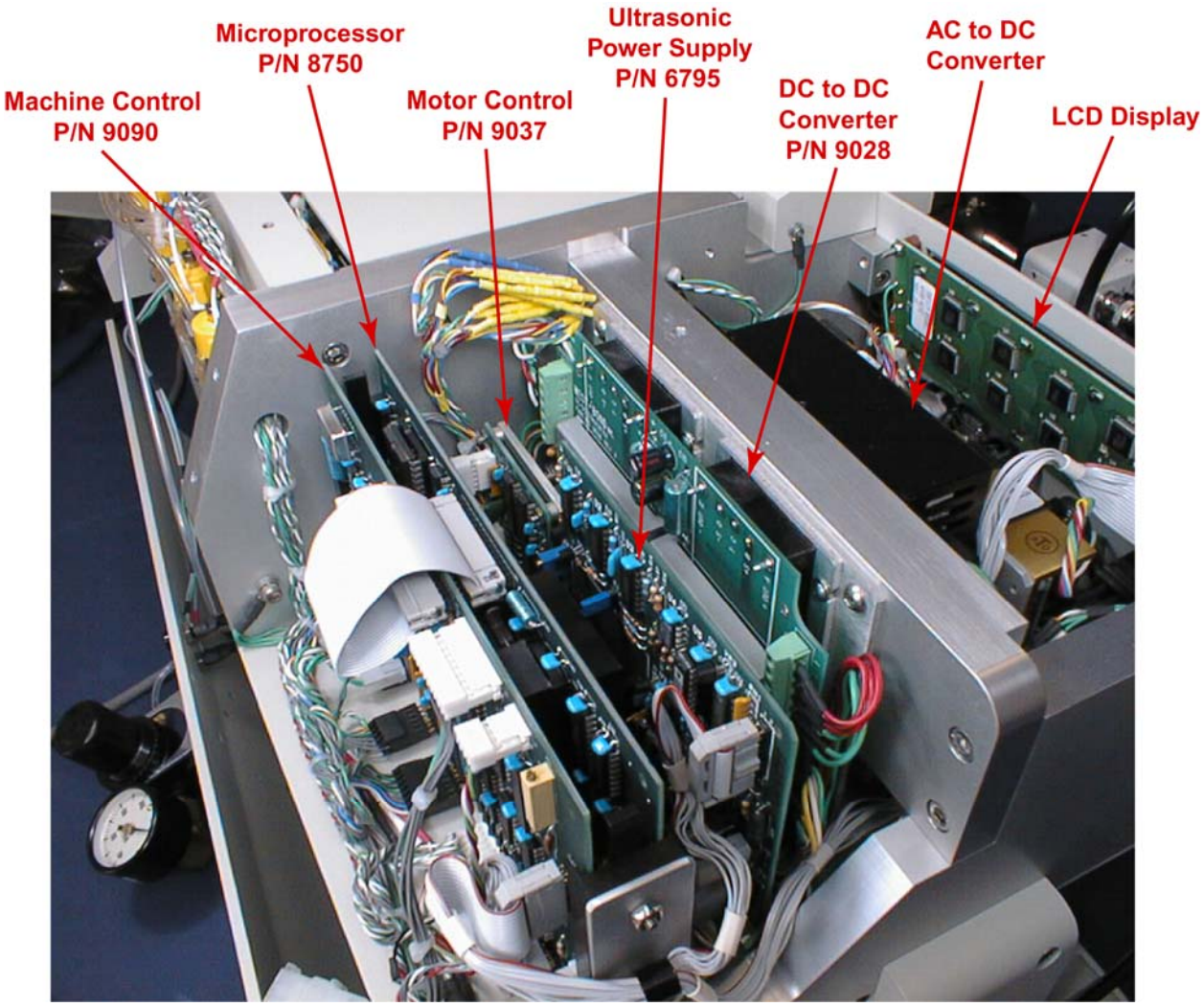
SPARE PARTS

Part No	Description	Manufacturer Name	Manufacturer P/N	Rec. Spare
50042	Spring, Extension, 0.026" Wire x 0.240" OD x 1.50" Long	Associated Spring Corp.	E0240-026-1500S	1
50056	Pressure Regulating Valve, 5-100 psi	Norgren	R07-100-RNKA	1
50062	Switch, Push Button, Single Pole	Micro Switch	1PB16	1
50063	Switch, Push Button, Power	Cutler/Hamer Eaton	205CS94425	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
50106	Ball Bearing, Flanged, Extended Inner, 5/32" ID x 5/16" OD	New Hampshire Ball Bearings	SSRF3ZZRA7P25LO1	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
50164	Switch, Pushbutton	Micro Switch	11SM144	1
50187	Fuseholder, Panel	Littelfuse	342001	1
50290	Spring, Compression, 0.012" Wire x 0.088" OD x 0.375" Free	Associated Spring Corp.	C0088-012-0380S	1
50291	Optical Encoder Module	Hewlett-Packard	HEDS-5605-A06	1
50292	Pulley, Precision Grooved Round Belt, 1.500" OD, 0.250" Bore	PIC	AE7-2	1
50301	Solenoid, Push, 1 Lb Force, Nom.	Ledex	195203-134	1
50306	Belt, 0.70" Round Dia. Pulley, 1.489 I.D.	PIC	AF2-1	1
50338	Cam Follower Assembly, 0.3125" OD, No 2-56 Thd	PIC	P1-22	1
50364	Power Supply, 250W AC Front End Chassis Mount	Vicor Express	VI-FKE6-CUX	1
50464	Cord, Power	Volex	17239B8	1
50892	LCD Display, P/N: SSM44083-TS-BG-LY-12, with HDR208SG15 Header	Shelly Associates	SSM44083-TS-BG-LY-12	1
54015	Linear Bearing, 3mm Dia x 75mm L, Resin Cage, 17 Crossed Rollers, SS	NB	SVS3075-17Z-DS/CU-SMI	1

TECHNICAL INFORMATION

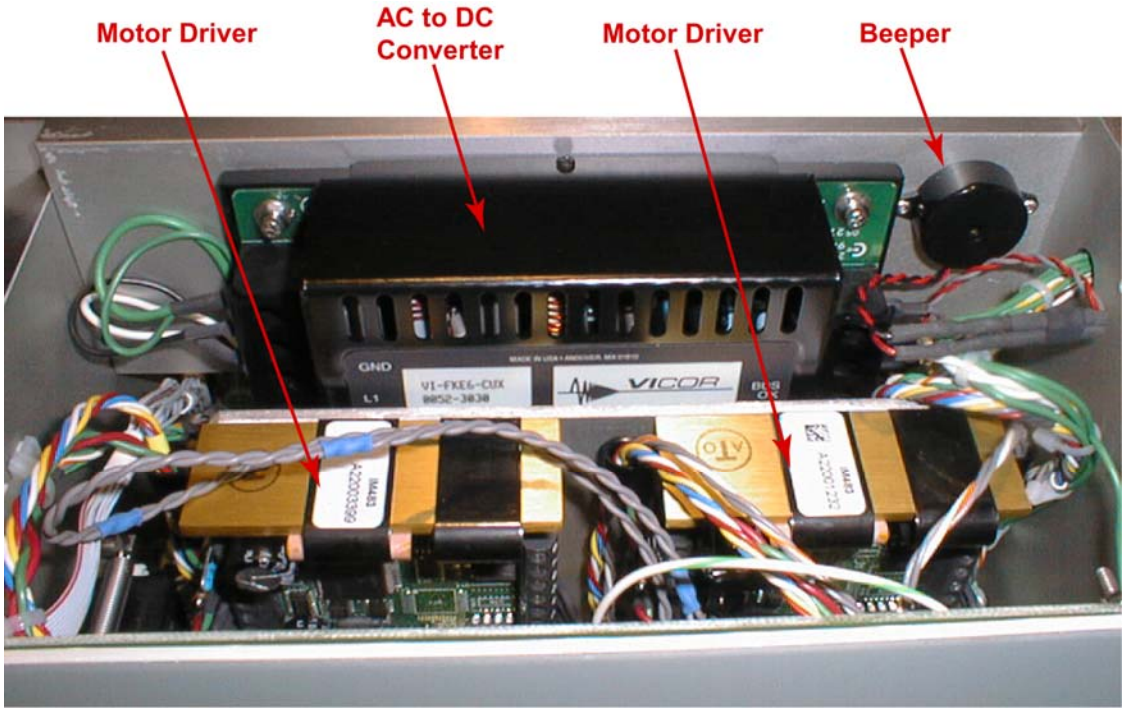
The following pages contain pictures to help the user identify parts and become familiar with the workings of the machine.

PCB's and Power Supplies



TECHNICAL INFORMATION

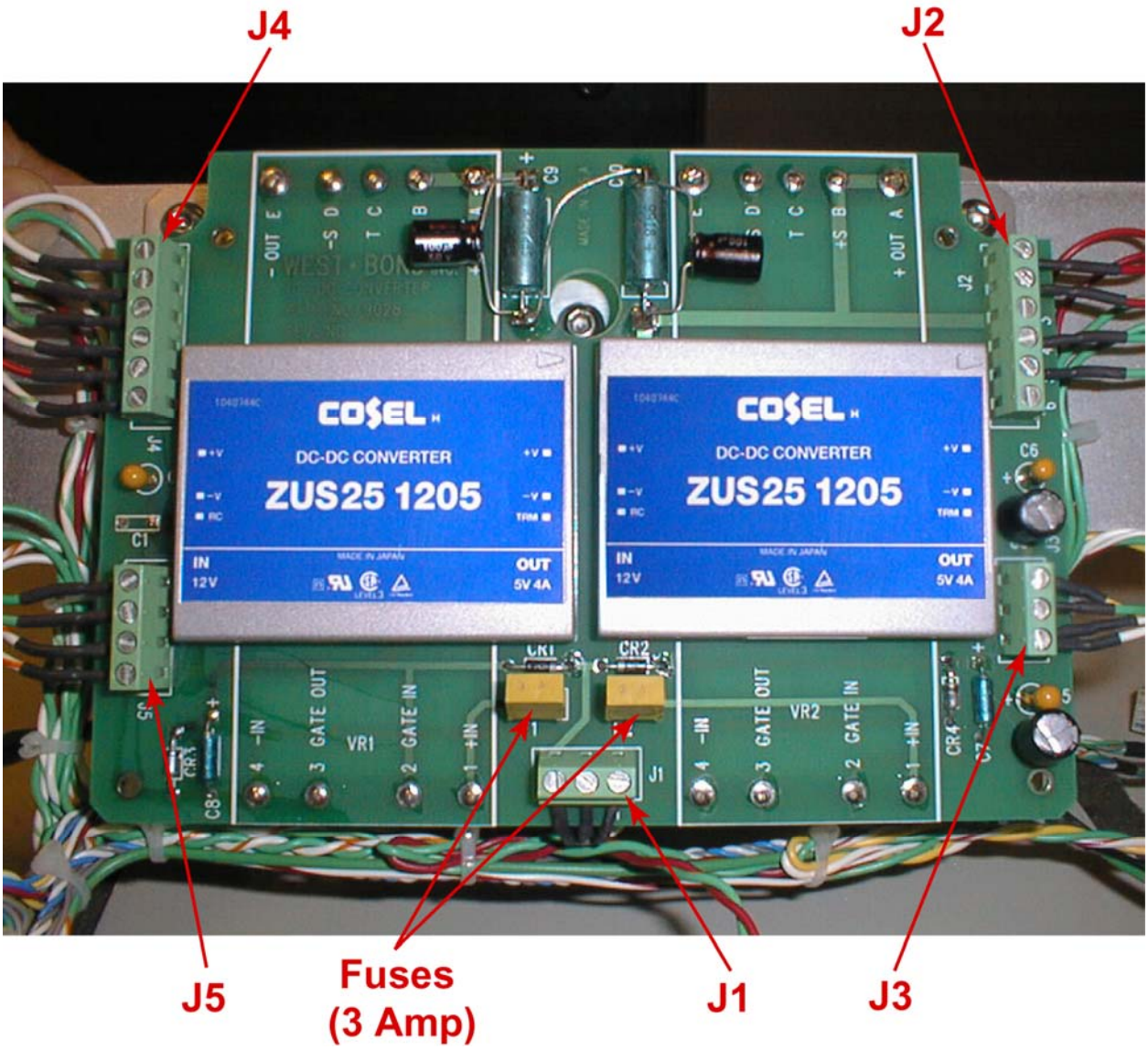
Motor Drivers



AC to DC Converter

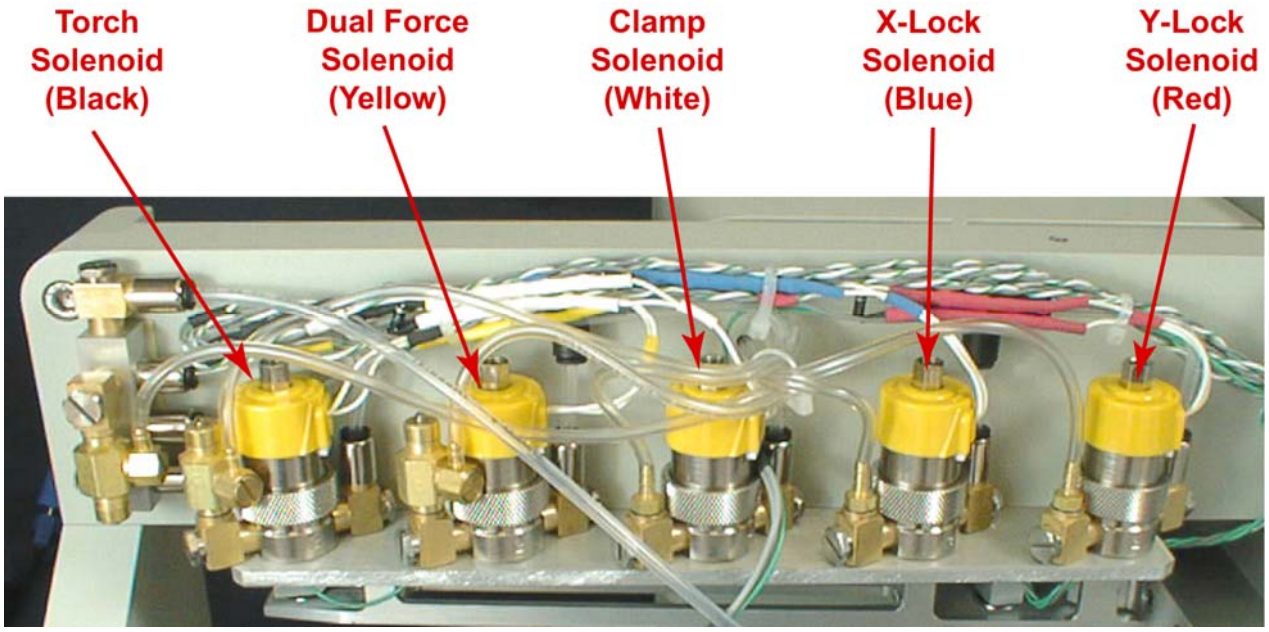
TECHNICAL INFORMATION

DC to DC Converter

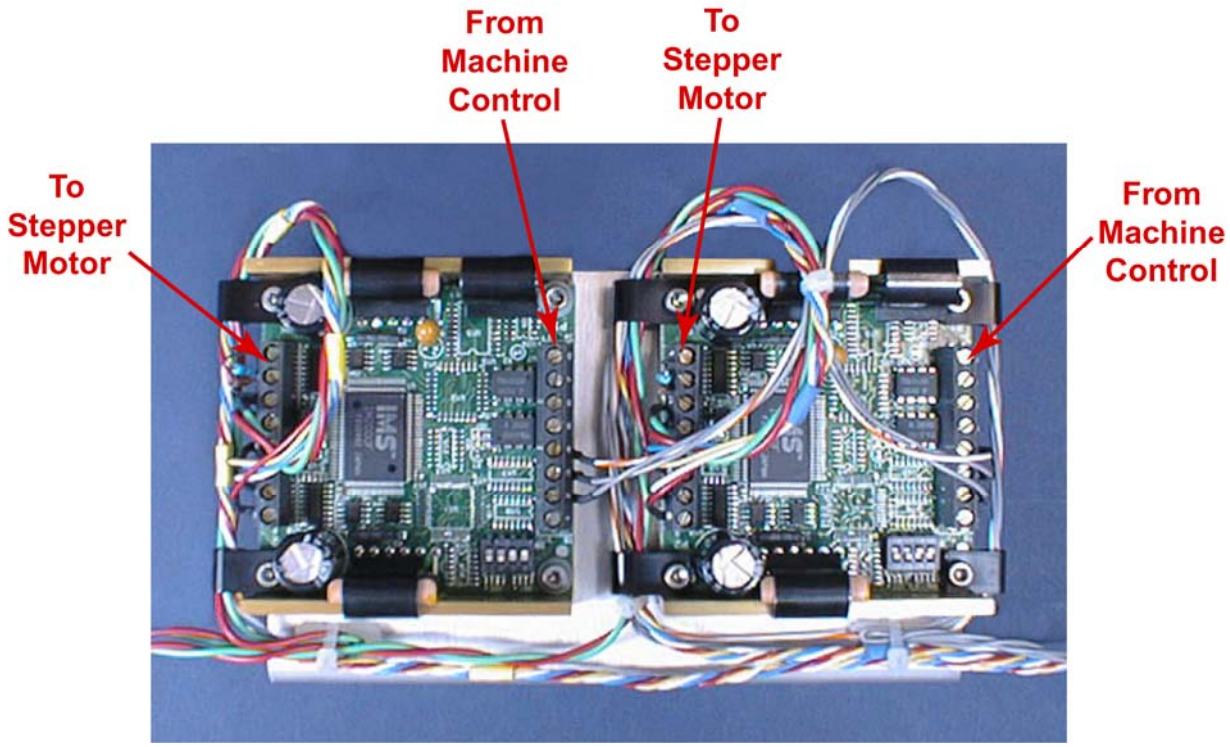


TECHNICAL INFORMATION

Solenoids

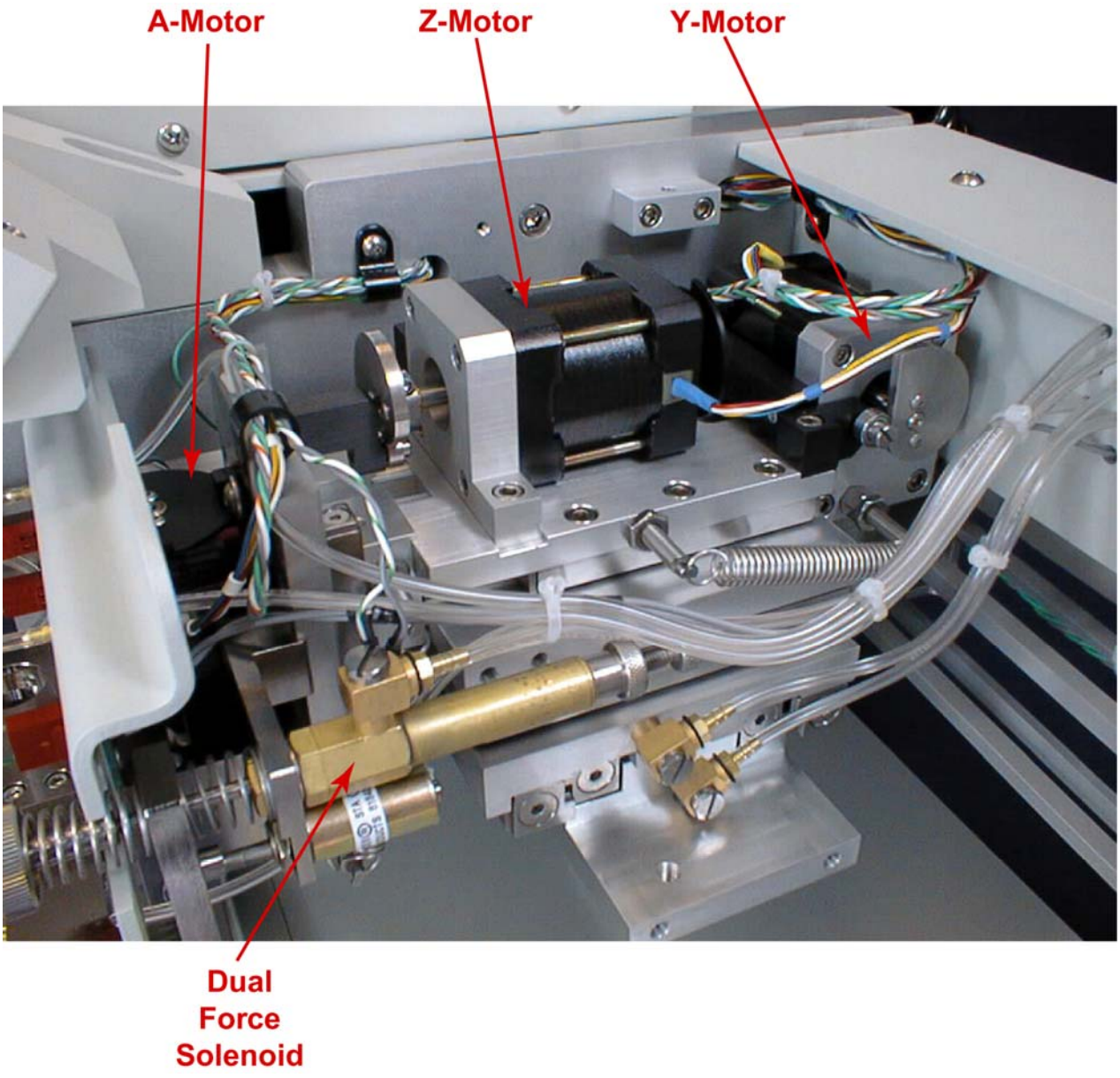


Motor Driver Boards



TECHNICAL INFORMATION

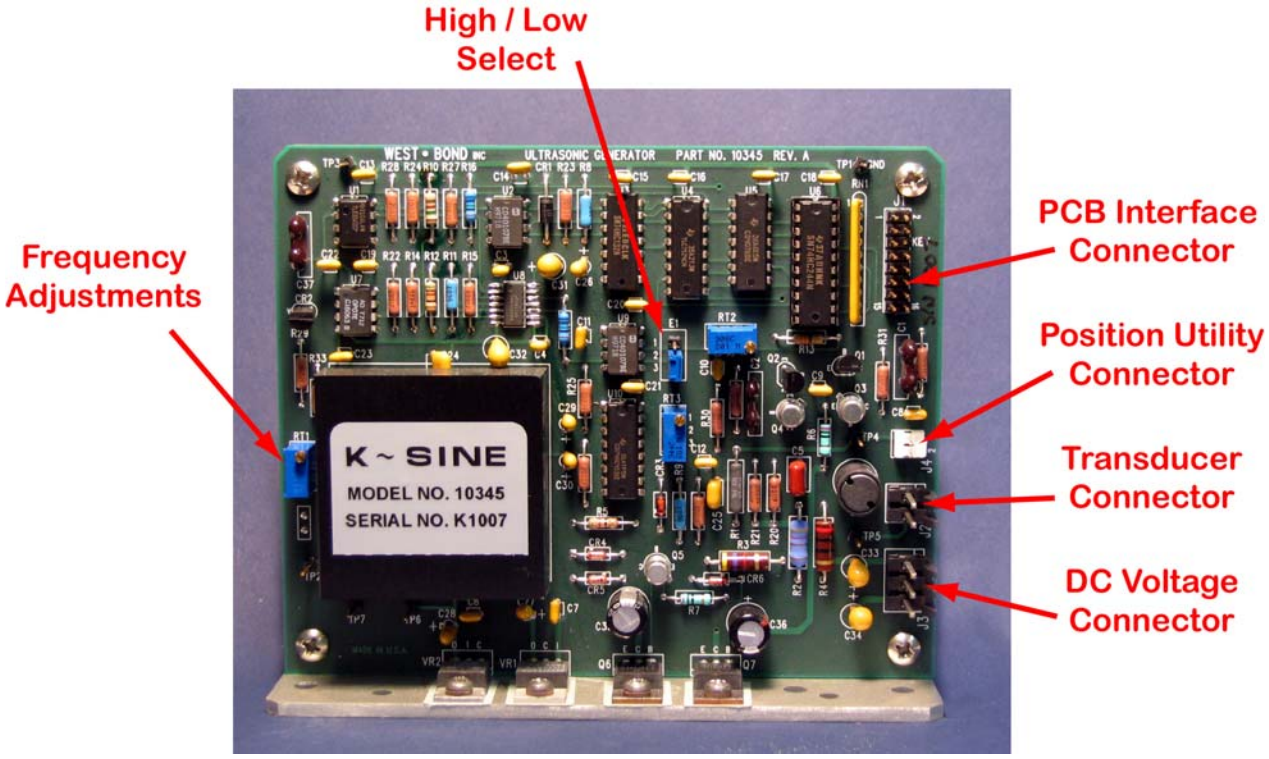
X-Y-Z Head Assembly



TECHNICAL INFORMATION

Ultrasonic Power Supply

(P/N 10345)



SCHEMATIC INFORMATION

THE FOLLOWING PAGES CONTAIN
SCHEMATIC INFORMATION
FOR THE 454647E SERIES

MODEL 454647E USES THE FOLLOWING SCHEMATICS:

4129	Photo Sensor Circuit
4189	Heater Control Circuit
6836	Photo Sensor Circuit
8750-1	Microprocessor Circuit
8750-2	Microprocessor Circuit
9028	DC-DC Converter
9037	Motor Driver Circuit
9090-1	I/O Circuit
9090-2	I/O Circuit
9090-3	I/O Circuit
9090-4	I/O Circuit
9090-5	I/O Circuit
9201-1	System Wiring Diagram
9201-2	System Wiring Diagram
9201-3	System Wiring Diagram
10317-1	NEFO Power Circuit
10317-2	NEFO Power Circuit
10318-1	NEFO Interface Circuit
10318-2	NEFO Interface Circuit
10345	Ultrasonic Generator