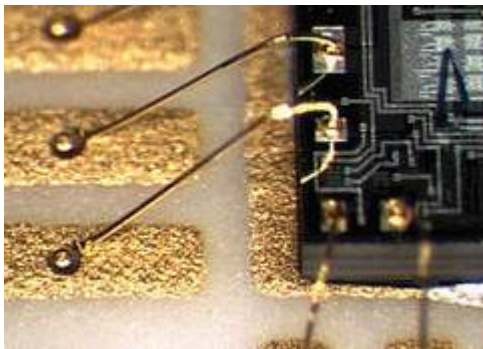


TPT

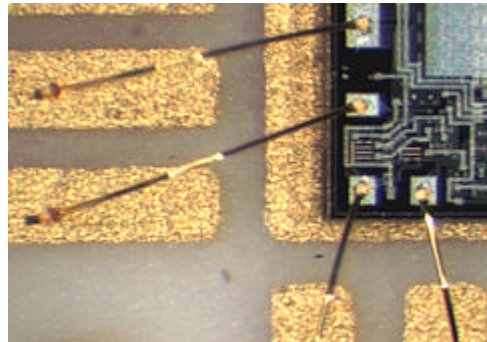
HB12/14/16 Wire Bonder

Operation Manual

Version 1.13



Ballbonding



Wedgebonding

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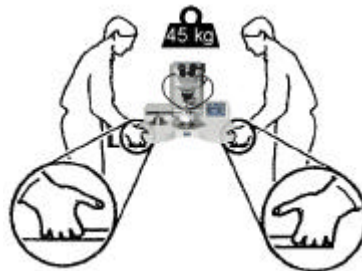
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3. UNPACKING AND PACKING INSTRUCTIONS

A. Unpacking Instructions

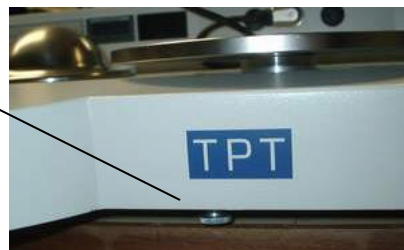
1. Remove the top layer of protective foam.
2. Carefully remove all the boxes and bubble wrapped items containing the bonder accessories from the crate.
3. Remove all side protective foam
4. Transfer the bonder to its final work area.

Two people needed for transportation



Do not remove nylon tie wraps, or foam shipping blocks until the bonder is ready to go into the final work area.

5. Remove Table Lock Screw







6. See section “ 7 ” (Page 20) for set-up procedures.

B. Packing Instructions

See Page 36



4. Safety Instruction

1. Read Instruction:
All the safety and operation instructions should be read before the Bonder is operated.
2. Do not remove Safety Instruction from User Manual
3. When carrying the Bonder around, do not subject the Bonder to heavy shock or vibration. Two people needed for Transportation
4. The Bonder should be installed on a solid horizontal base
5. Power Sources: The Bonder be operated only from the power source indicated on the marking label.
The Bonder is equipped with a three-wire grounding plug
Do not defeat the safety purpose of the grounding plug.
6. Protection Circuitry: The Bonder is equipped with two power line fuses at the power connector and four fuses inside behind the power connector for SI2, SI3 & SI4 for Heated Work Holder, SI1 for Illuminator,
7. The Cover should only be opened after powering down the machine and removing the power cord from the wall outlet
-  8. Laser Spot Light, Attention!
Don't stare into the beam. Direct viewing into the Beam can cause permanent eye damage. Please note regulations according to EN 60825-1 and VBG 93 Laser class 2, P = 1mW
-  9. Hot machine parts:
The maximum temperature of heated Work holder is 250°C.
Allowing parts cooling down before replacing Heated Work holder, illumination lamps or any other hot machine part.
-  10. EFO (Electronic Flam Off) Only If Bonder is equip with EFO System
Do not touch the electrode or the wire during bonding or when manually firing the EFO. **The System produces a High Voltage spark.** The potential shock hazard is not usually considered life threatening. However, TPT recommends that those persons with abnormal heart conditions or artificial heart stimulation devices (e.g. pacemakers) should not be permitted to operate or service this Bonder
-  11. Bonding Tools have sharp edges, beware of touching them.
12. All Service and maintenance should be performed by trained, authorized personnel.

5. INTRODUCTION

The HB 12/14/16 ultrasonic wire bonder is characterised by vertical feed of wire or ribbon, manual X-Y control of the work piece, and motorised control of the Z & Y Axis for bond tool. The HB12/14/16 has the exclusive TFT Touch Panel Operation System.

This manual is designed to provide the operator with an understanding of the equipment operation, characteristic features of the bonder, adjustments available to insure the best results in wire bonding, and troubleshooting procedures for fault isolation and correction of malfunctions.

It is strongly recommended that all operations and maintenance people read this manual thoroughly, and obtain hands-on operating experience with the bonder. The precision and ease of operation of the equipment, and quality of the bonding will be better appreciated by using the bonder. Familiarity will also facilitate expeditious introduction of the equipment in production and enhance productivity.

HB12 is a manual/ semiautomatic thermosonic wire or ribbon wedge bonder. This bonder was designed to make 0.5 to 3.0 mil gold or aluminium wire or up to 1.0 x 10. 0 mil gold or aluminium ribbon electrical interconnections on a wide range of microelectronic packages.

HB14 is a manual/ semiautomatic thermosonic wire ball bonder. This bonder was designed to make 0.7 to 2 mil gold wire electrical interconnections on a wide range of microelectronic packages.

HB16 is a manual/ semiautomatic thermosonic wire bonder for Wedge bonding, Ball bonding and Ball Bumping.

The HB Bonder is characterized by precision mechanism for manual X-Y control of the work platform and workpiece, a semiautomatic Z & Y control of the bonding tool, and electronic control of the bonding variables (Force, Ultrasonics, Temperature and Time). Standard features designed into the HB include: Leica 6:1 Zoom Stereo-microscope with 20X eyepieces, and area illuminator; work stage with mechanical or vacuum clamping provisions. All Bond parameters and programs are operated with 6,5" TFT Touch Panel Display. A variety of options are available to enhance operability in special applications.

The design considerations were operator comfort and ease of operation, reliability of the bonding system, low inertial impact of the bonding tool, and operator safety. The mechanical assembly of the bonder consists of close tolerance bonder parts for precision operation and control. The electrical assembly is composed of highly reliable electronic components integrated into a modular assembly to facilitate ease of adjustment and troubleshooting.

6. BASIC ULTRASONIC BONDING

The Model HB12/14/16 employs the basic ultrasonic bonding method. Bonding of two metals using the ultrasonic method results from three variables: force, ultrasonic energy and time.

- Force is introduced to promote plastic flow (deformation) and intimate coupling between the bonding tool, the wire and the substrate.
- Ultrasonic (62 kHz) scrubbing displaces surface contaminants and insures metal to metal coupling.
- Time is set sufficiently long to cause solid state diffusion.

If the Model HB12/14/16 is used for gold wire bonding, heat is used as a fourth variable to eliminate surface contaminants.

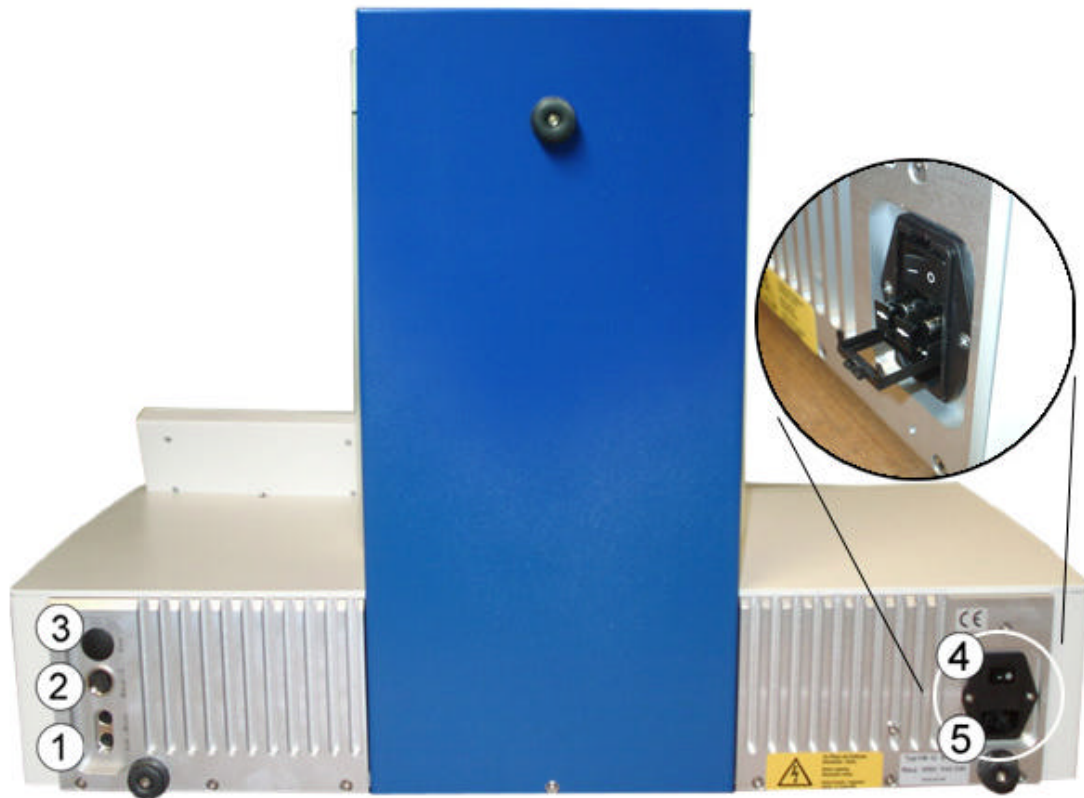
HB12/14/16 front view



Figure 1

1. Microscope
2. Dual Fiber Optic Illuminator
3. Laser Spot light targeting system
4. FFD 3,25" to store Bonding programs
5. Controller for Heater Stage
6. Controller for Tool Heater
7. Bond head
8. EFO System (Only Ball Bonder)
9. 6,5" TFT Touch Panel Operator System
10. Control - Puck
11. Heater Stage
12. X - Y-Bondtable, Motorised in Y

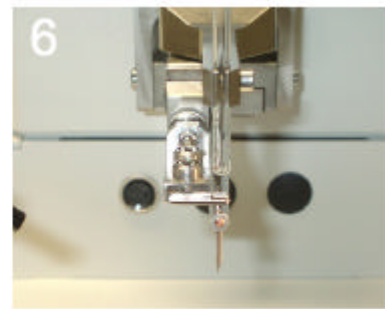
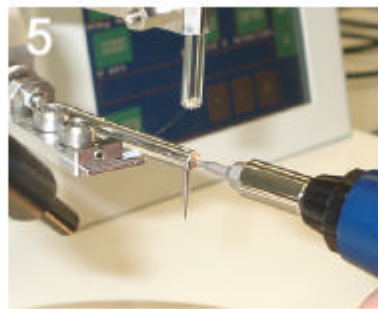
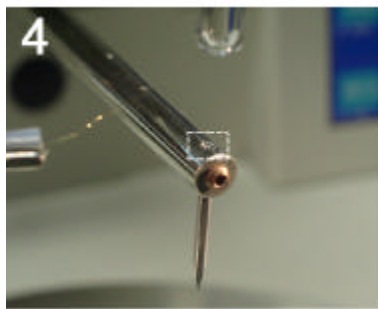
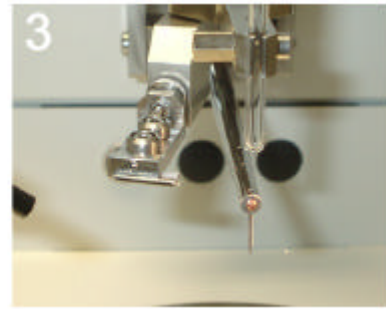
HB12/14/16 back view



1. PC Keyboard and Mouse Connector
2. Manual Z- Connector (Option) see Page 38
3. Foot switch Stitch bonding
4. On / Off Switch
5. Power Connector AC 230V Europe T 3,15 A Fuse
AC 115V USA T 6,30 A Fuse
AC 100V Japan T 6,30 A Fuse

Figure 2

Tool Installation



Tool must be flush with the top of the transducer

5. screw tool with 25 Ncm



Wedge and Capillary in Ball bonding Transducer with Tool Heater

Figure 3

The bonding tool is fitted into the 1/16 inch diameter hole in the ultrasonic transducer and the top of the wedge tool must be flush with the top of the transducer. Secure by tightening the special set screw with Torque Wrench 25 cNm.

Wedge bonding Tool: 1/16" dia. x 0.750 long bonding wedge with a '45 wire or ribbon feed angle is recommended.

Ball Bond Tool : Capillary 1/16" dia. x 0.450 long is recommended

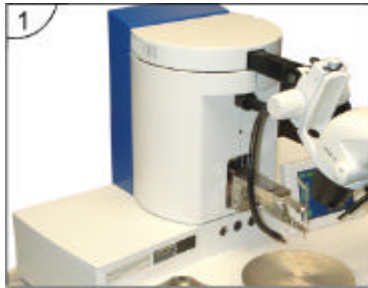
Refer to your tool supplier catalogue for the tool suitable for the specific application.

Figure 1 consists of eight panels illustrating the process of mounting a sample on a microtome. Panels 1 through 6 are photographs showing the physical steps: 1. The sample is placed on the microtome stage. 2. The sample is secured with a metal block. 3. The sample is secured with a metal block. 4. The sample is secured with a metal block. 5. The sample is secured with a metal block. 6. The sample is secured with a metal block. Panels 7 and 8 are photographs showing the sample being mounted on the microtome. Panel 8 includes a schematic diagram with three parts: (a) shows the sample being mounted on the microtome. (b) shows the sample being mounted on the microtome. (c) shows the sample being mounted on the microtome.

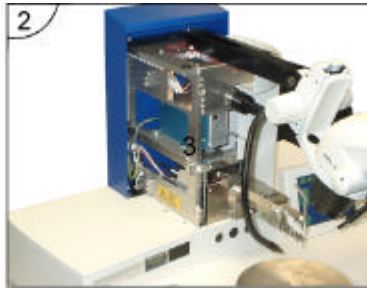
Figure 1 consists of three schematic diagrams labeled (a), (b), and (c), and a detailed cross-sectional view of the crack tip. Diagram (a) shows a vertical rod with a rectangular block at the top. Diagram (b) shows the rod being pushed down into the block. Diagram (c) shows the rod being pulled up, creating a crack. The detailed cross-section shows the crack tip with dimensions: 4445 & 4345, 45°, 45°, 15°, 10°, PR, DR, BL, and T.

For motorised Wire Spool Maximum Wire Diameter 50μ and Ribbon until 100 x 20μ

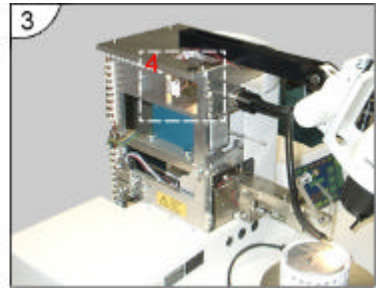
Change Halogen Lamp 8V 20W



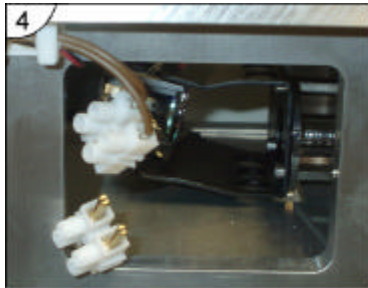
1. Switch Off Bonder



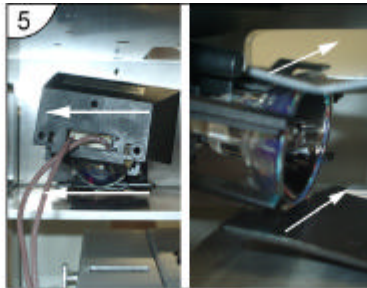
2. remove left and upper housing



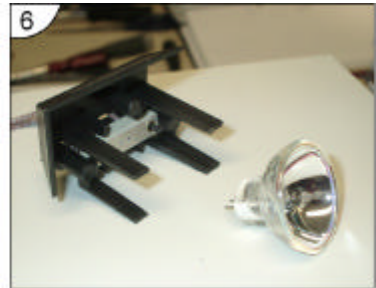
3. remove back



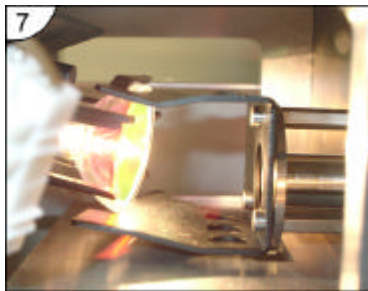
4. disconnect cable



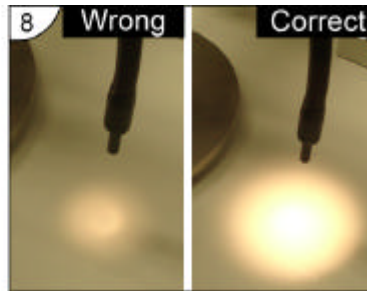
5. remove lamp holder



6. change lamp



7.adjust lamp by moving
left and right



8. until light is bright

Figure 5

Menu Base Settings Touch Panel Display

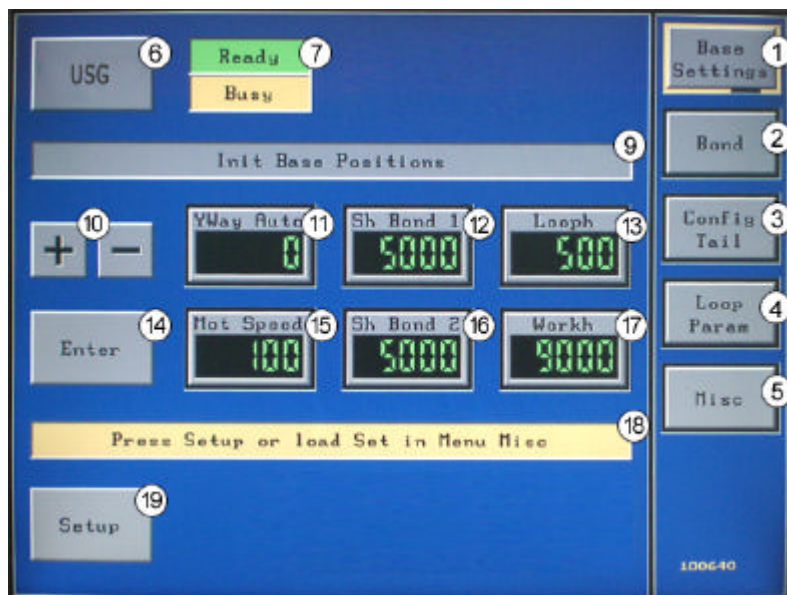


Figure 6

- | | | |
|-----|---------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu "Bond" can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menu |
| 5. | Misc | here are the light adjusted , and all parameter saved/load to 3,5" Disc & Harddrive and Bond timer displayed. |
| 6. | USG | US Generator |
| 7. | Ready | display green = Bonder OK |
| 9. | Info | here are fault & other Information displayed |
| 10. | +/- | switch to change value to + or - |
| 11. | Yway Auto | switch for Y-way adjustment (see page 23) |
| 12. | Sh Bond 1 | switch for 1st. search height adjustment |
| 13. | Loop h | switch for Loop height adjustment |
| 14. | Enter | Button for confirmation of change value |
| 15. | Mot Speed | adjust Bond Speed for Z and Y travel
Press button and adjust with + / - button Speed from 25 to 100% |
| 16. | Sh Bond 2 | switch for 2nd search height adjustment |
| 17. | Work h | switch for upper work height position (Bond tool) |
| 18. | Info | Info for Set up procedure |
| 19. | Setup | switch for Auto height Set Up (see page 33) Reset with Feed Button |

Menu Bond Touch Panel Display



Figure 7

- | | | |
|-----|------------------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu "Bond" can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menu |
| 5. | Misc | here are the light adjusted , and all parameter saved/load to 3,5" Disc & Harddrive and Bond timer displayed. |
| 6. | Bond 1 | green = Bonder ready for 1 st . Bond and switch for reset to 1 st Bond |
| 7. | Ready | display green = Bonder OK, yellow = Bonder in Bond process |
| 8. | Search | yellow = Bonder in US Search, red = Bonder in error |
| 9. | Info | here are fault & other Information displayed |
| 10. | Bond 2 | green = Bonder ready for 2nd.Bond |
| 11. | U/S | switch for 1st. Bond US energy |
| 12. | Prog | display of loaded Program # and change saved Programs |
| 13. | LSet | display of loaded Loop Profile # .and change saved programs |
| 14. | U/S | switch for 2nd. Bond US energy |
| 15. | Time | switch for 1st. Bond time |
| 16. | Wedgebonden/Ballbonden | Display of Bond Mode |
| 17. | Time | switch for 2nd Bond time |
| 18. | Force | switch for 1st. Bond force |
| 19. | Bond Mode | Full Automatic, Semi Automatic, Manual, Step (see page 38 for description) |
| 20. | Force | switch for 2nd Bond force |
| 21. | Clamp | switch for Wire clamp open/closed |
| 22. | +/- | switch to change value to + or - |
| 23. | Test | switch for test of US-Energy |

Menu Config Tail Touch Panel Display

Wedgebonder



Table Tear

Clamp Tear

Figure 8

- | | | |
|----|---------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu "Bond" can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menue |
| 5. | Misc | here are the light adjusted , and all parameter saved/load to 3,5" Disc & Harddrive and Bond timer displayed. |
| 6. | Wedgebonder | Button to change Bond Mode, Wedgebonder, Ballbonder, Bumping |
| 7. | Tail | No function |
| 8. | Stitch | Button to change stitch Mode from 1-2-2 to 1-2-1 |

Table Tear :

- | | | |
|-----|--------------|---|
| 9. | Tail/Up CO | switch for Tail up clamp open (Z-way) |
| 10. | Tail/Back CO | switch for Tail back clamp open (Y-way) |
| 11. | +/- | switch to change set value to + or - |
| 12. | Tail/Back CC | switch for Tail back clamp closed (Y-way) |

Clamp Tear :

- | | | |
|-----|--------------|--|
| 9. | Tail/Up CO | 0 |
| 13. | Feed back CC | switch for Tail back, clamp move upwards |
| 11. | +/- | switch to change set value to + or - |
| 14. | Feed forw CC | switch for Tail forwards, clamp move downwards |

Menu Config Tail Touch Panel Display

Ballbonder

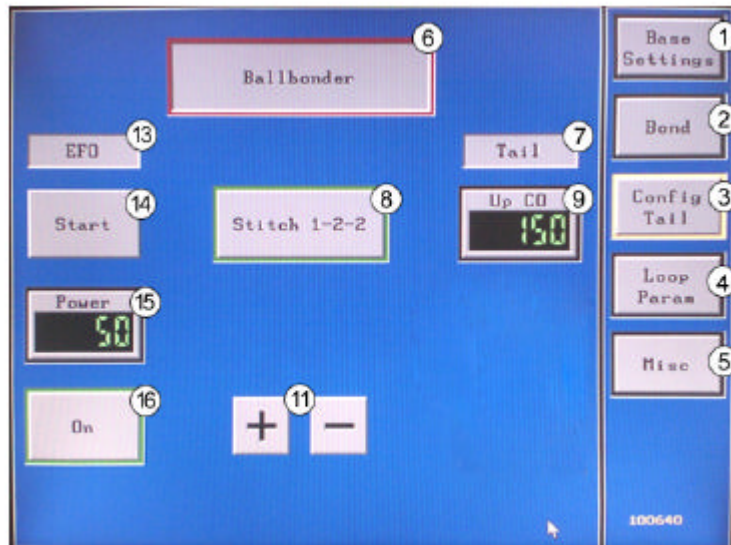
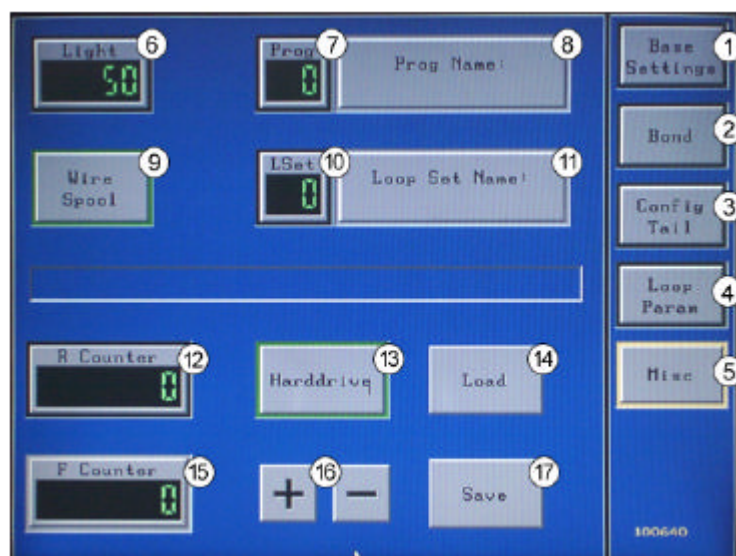


Figure 9

- | | | |
|-----|---------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu "Bond" can the bond be activated |
| 3. | Config Tail | here are all Bond parameter displayed |
| 4. | Loop Param | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 5. | Misc | Loop Profile Menu |
| | | here are the light adjusted , and all parameter saved/load to 3,5" Disc & Harddrive and Bond timer displayed. |
| 6. | Ballbonder | Button to change Bond Mode, Wedgebonder, Ballbonder, Bumping |
| 7. | Tail | No function |
| 8. | Stitch | Button to change stitch Mode from 1-2-2 to 1-2-1 |
| 9. | Tail/Up CO | switch for Tail up clamp open (Z-way) |
| 13. | EFO | No funktion |
| 14. | Start | switch to activate EFO energy (only Ballbonden) |
| 15. | Power | Value for EFO Power/ Energy |
| 16. | ON/OFF | ON = EFO starts automatically after 2 nd Bond |
| | | OFF = EFO start only by pushing Start button |

Menu Misc Touch Panel Display



- | | | |
|-----|----------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu "Bond" can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menue |
| 5. | Misc | here are the light adjusted , and all parameter saved/load to 3,5" Disc & Harddrive and Bond timer displayed. |
| 6. | Light | switch to set light value |
| 7. | Prog | switch to activate Bond Prog. |
| 8. | Prog Name | |
| 9. | Wire Spool | switch ON/OFF Wire Spool (only in Service Mode) |
| 10. | LSet | switch to activate LSet |
| 11. | Loop Set Name | |
| 12. | R Counter | reset able counter, 2 x push and hold 3 sek. |
| 13. | Harddrive/Disk | switch to change from Harddrive to Disk |
| 14. | Load | switch to activate Load Data |
| 15. | F Counter | Bond counter not reset able |
| 16. | - | switch to change set value to + / - |
| 17. | Save | switch to Save Data |

Menu Loop Param Touch Panel Display

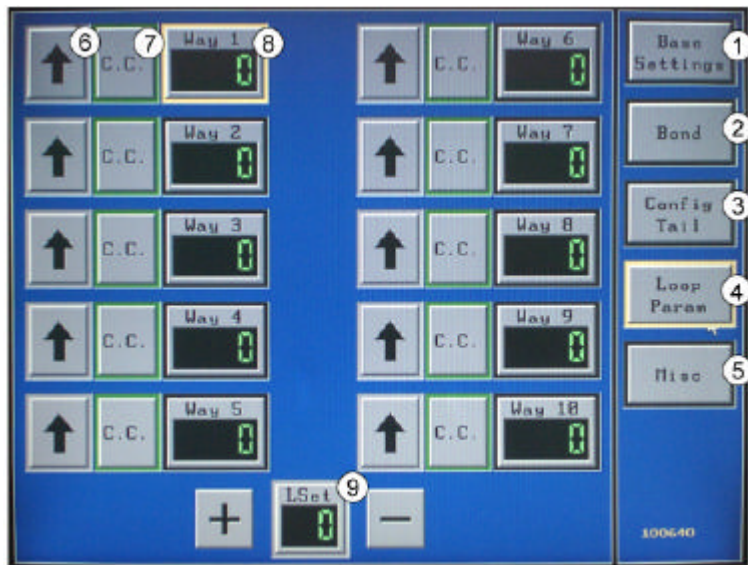


Figure 10

Loop Profile Software can be used to create Loop shapes.
with maximum 10 Steps
Save Loop Profile in Menu “ Misc”

- | | | |
|----|---------------|---|
| 1. | Base Settings | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | Bondmenu, only in Menu “Bond” can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menu |
| 5. | Misc | here are the light adjusted , and all parameter saved/load to 3,5” Disc & Harddrive and Bond timer displayed. |
| 6. | arrow | Button to adjust direction of Bond head movement, up, down, forward & backward |
| 7. | CO/CC | Movement with closed or open clamp |
| 8. | 0000 | travel distance in Micron |
| 9. | +/- | switch to change set value of distandce to + or – |

Menu Keyboard Touch Panel Display



Figure 25

at any number field touch twice, Keyboard pad appears

Bond arm HB12/14/16 Bonder

12 mm Wedge Bond tool – deep access
 200 mm Diameter Work stage
 165 mm deep reach transducer
 90° Bond Tool

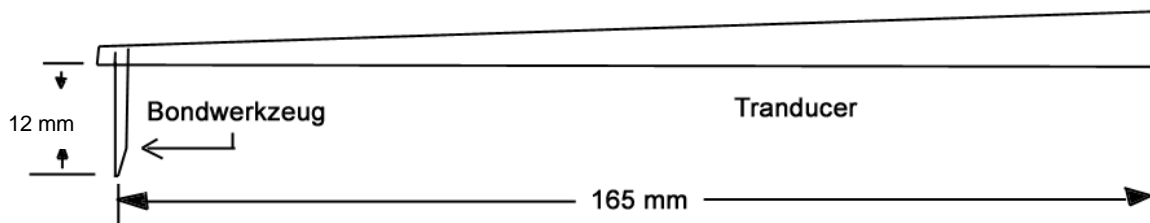
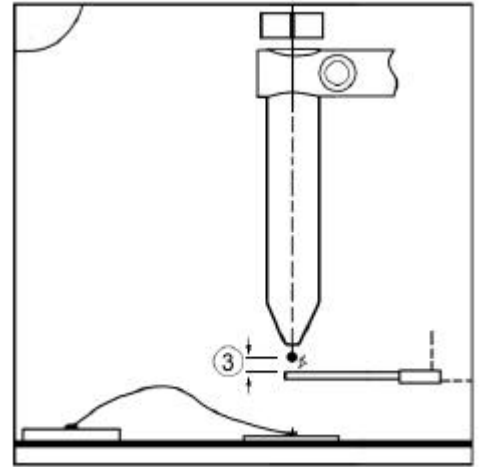
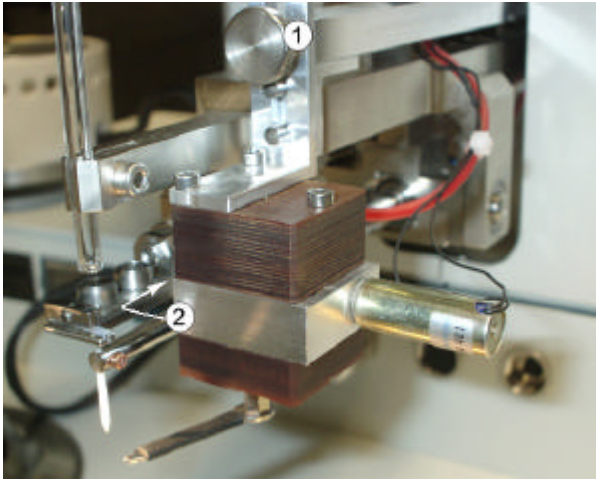


Figure 12

EFO System (only Ball Bonding HB14 & HB16)



For Automatic adjustment press Setup Button in Menu Axis Setup
(only at Ball Bond Mode)

1. EFO Wand height adjustment
2. EFO Wand side adjustment
3. gap between wire and EFO Wand should be
100 μ to 300 μ for 25 μ Wire and
300 μ to 600 μ for 50 μ Wire
4. LOW setting for 17 μ to 25 μ wire
HIGH setting for 30 μ to 50 μ wire
5. Adjustment for EFO Time
6. Adjustment for EFO Delay
7. Ground Screw

DANGER: Do not touch EFO Wand , 750V discharge

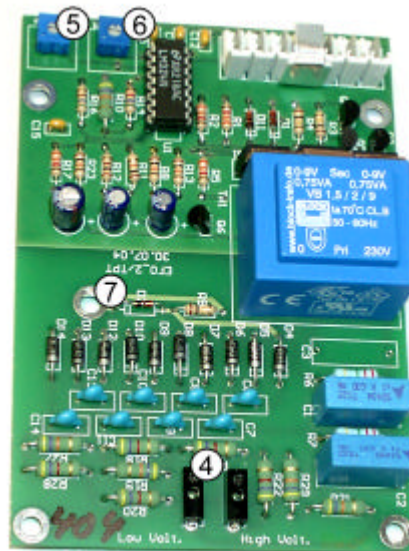


Figure 16

7. Set Up for Bonding

7.1. Set the HB Bonder on the workbench and remove all tagged shipping blocks, shipping screws, and tie wrap. All of the shipping provisions may be removed without disassembly of the bonder. Do not remove any of the bonder's enclosures at this time.

7.2. Unpack the boxes containing the accessories. Check the contents of these boxes against your packing list.

7.3 Attach the Dual Fiber Optic arm (Option H55):

Dual Fiber Optic Illuminator: The adjustable dual fiber optic illuminator incorporates a 8 volt, 20 watt halogen lamp.

The Illuminator Intensity can be programmed in “Misc “ Menu (Figure 10 / Page 16)

To change lamp open upper and left cover (Figure 5 / Page 11)

7.4 Assemble the microscope to its mounting arm. Install the microscope into the optical mount of the bonder and secure it in position with the set screw on the right side of the microscope mount.

The HB Bonder is equipped with a microscope mount. Figure 1 (Page 7) shows HB12 with a Leica 6:1 Zoom Stereo-microscope with 20X eyepieces. This microscope (Option H10) has a magnification range of 20X - 60X.

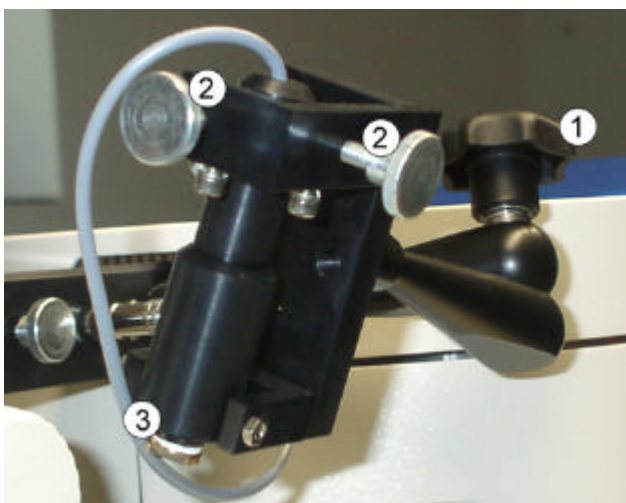
For more Information see Leica User Manual in Section Accessories

7.5 Laser Spotlight (Option H50)

Mount the Spotlight holder on the Microscope holder Figure 1 (3) (Page 7)

Beam-Distance to Bondlevel is about 90 mm

ATTENTION ! Don't stare into the beam. Direct viewing into the beam or reflected beam can cause permanent eye damage. Laser class 2 / $P_o = 1 \text{ mW}$ / $\lambda = 635 \text{ nm}$



1. Knob for rough adjustment
2. Screw for fine adjustment
3. Screw for focus adjustment

Figure 21

7.6 Tool Installation

The bonding tool is fitted into the 1/16 inch diameter hole in the ultrasonic transducer and the top of the wedge tool must be flush with the top of the transducer. Secure by tightening the special set screw with Torque Wrench 25 cNm.

Wedge bonding Tool: 1/16" dia. x 0.750 long bonding wedge with a '45 wire or ribbon feed angle is recommended.

Ball Bond Tool : Capillary 1/16" dia. x 0.450 long is recommended

Refer to your tool supplier catalogue for the tool suitable for the specific application.

Tool Installation Figure 3 (Page 9)

7.7 Work Stage connector and Height Adjustment

1. Position the work stage holding a work piece on the work platform, but not under the bonding tool.
3. The bonder is factory adjusted so that the Bond level is 76 mm above the round work table surface.
4. Plug in the work stage cable into the matching connector.

TPT optional work stage H26 is a heated work stage with provisions for both vacuum clamping and mechanical clamping. Mechanical clamping provisions allow clamping of work pieces with dimensions of up to 25 mm. Mechanical clamping adjustments are accomplished with the adjustable back stop. When the vacuum clamping provision is used, a vacuum hose must be attached to the work stage vacuum tube to provide a vacuum in the hole in the work stage top plate. Figure 20 shows the mechanical clamping configuration of the H26 work stage.

For Controller Information see 2132 User Manual in Section Accessories



1. Mechanical clamping
2. Screw to remove plate
3. Vacuum Hose



Figure 20

7.8 Power-On

Before plugging the power cord into the A. C. power source, check the label located on the rear of the HB Bonder . If the label does not agree with the available A. C. power, do not plug in the power cord. Check the A. C. power socket for correct wiring.
POWER ON/OFF Switch is on back left side,
TFT Display light on indicate that POWER is on. Figure 1- (9) / (Page 7)

7.9 Loading the Bonding Wire in the Motorised Wire Spool

Open left cover and tack out spool holder
Place spool of wire in spool mount with the wire starting end up.
(Install Wire Guide Glass tubes in Wire Spool Holder and Bondhead Fig. 4 Page 10)
Feed the bonding wire through wire tension tubes and wire guide
Place motorized wire holder in place
Feed the wire through glass tube above bonding tool
Move clamp to side
Feed wire through bonding tool
Move clamp back, make sure that wire is correct placed in clamp

For motorised Wire Spool Maximum Wire Diameter 50 μ and Ribbon until 100 x 20 μ
Figure 4 Loading Bonding Wire (Page 10)

7.10. Temperature Controller for Work Stage & Tool Heater

To set work stage temperature (only used by Gold Wire) 120°C – 150°C
press “ up “ for more temperature and “ down “ for lower temperature.



ON / OFF Heater Controller

Figure 17

To adjust the required temperature (Set point)

Press and release quickly the 1 or 2 button. The set point will be displayed for 2 seconds

Press and hold 1 button to lower the set point

Press and hold 2 button to raise the set point

7.11 Adjust Search height, Loop height and Work height

A: Automatically with “Set Up” Button: see page 33

B: Manually:

Press Search Height 1st Bond in Menu “Base Settings”
and adjust with +/- until you reach the request search height
then press “Enter” button to confirm the value

The same for 2nd Bond search height ,Loop and Work height parameter.
Search height 1st Bond = height tool stop before 1st.bond
by pressing and hold start button on control puck (Figure 15)

Search height 2nd.Bond = height tool stop before 2nd.bond
by pressing and hold start button on control puck (Figure 15)

Loop Height = Height Bond tool rise after 1st Bond
Work height = Height Bond tool rise after 2nd Bond

7.12 Adjust Y-Way Bond Length

Press Y-way Auto in Menu “Base Settings”
and adjust with +/- until you reach the request Bond length
then press “Enter” button to confirm the value

After 1st. Bond Y table travels to programmed value

7.13 Adjust Bonding Parameter in Menu “Bond”

U/S

The ultrasonic is used to adjust the relative strength of the U/S signal to the tool.
The U/S settings may be adjusted from 0 to 2000
(0 to 2 Watt)

TIME

The TIME control is used to set the time period for application of force and ultrasonic energy during the bond cycle. Bond time is available from 15 milliseconds to 2000 milliseconds.

FORCE

The FORCE control is used to set the amount of force that will be applied to the bonding tool during the bonding cycle. The first and second bond forces are adjustable from 15 grams to 100 grams.

Starting Parameters

Table below shows initial set-up parameters only. Actual parameter values will vary depending on process, materials and specific applications.

<u>WEDGE Bonding</u>		Bond Wire Size:	.7 Mil 17μ	1.0 Mil 25μ	2 Mil 50μ
Ultrasonic	1st		150	220	400
	2nd		180	280	600
Time	1st		150	200	200
	2nd		150	200	200
Force	1st		100	300	300
	2nd		100	300	400
Temperature			120°C	120°C	120°C
Wedge Tool: 19 mm Long Wire Hole Diameter			38μ	38μ	102μ

<u>Ball Bonding</u>		Bond Wire Size:	.7 Mil 17μ	1.0 Mil 25μ	2 Mil 50μ
Ultrasonic	1st		150	200	400
	2nd		180	350	600
Time	1st		150	200	200
	2nd		150	200	200
Force	1st		100	300	400
	2nd		100	300	400
Temperature			120°C	120°C	120°C
Kapillare Tool: 11,1 mm Long Wire Hole Diameter			25μ	38μ	89μ

7.14 Tail Parameters

The TAIL controls the amount of wire feed forward for the new tail after termination of the last bond.

In Menu "Config Tail" adjust tail parameters

Starting Parameters	for 25μ	for 50μ Wire Wedge Bonding
Tail Up CO	200	300
Tail Back CO	100	200
Tail Back CC	300	400

Starting Parameters	for 25μ	for 50μ Wire Ball Bonding
Tail Up CO	300	500

7.15 Control Puck



Figure 15 Control Puck

1. Tail feed Backwards
2. Bond Start switch
3. Tail feed Forwards

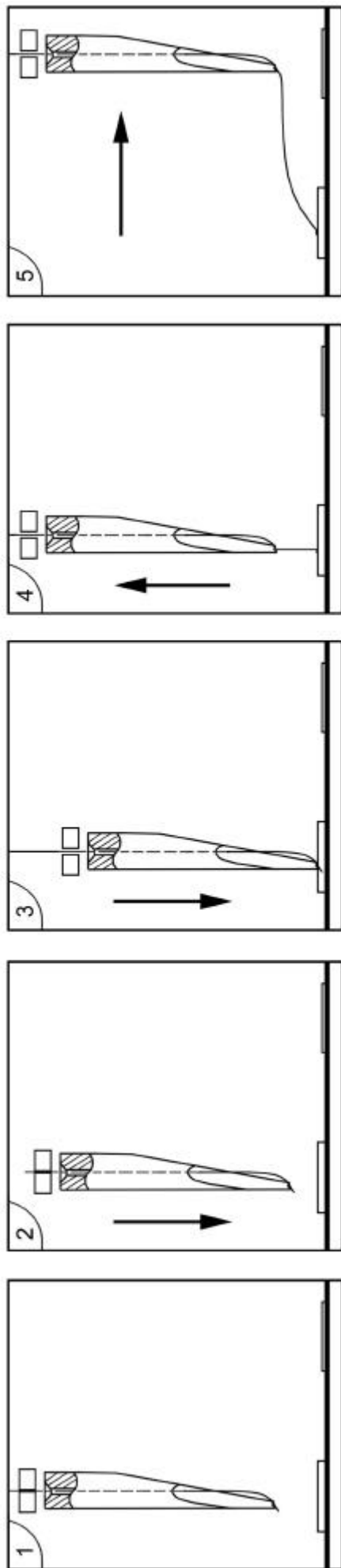
Control Puck "X-Y" Axis Controls - 7 :1 ratio manipulator

8. Bonding Sequence

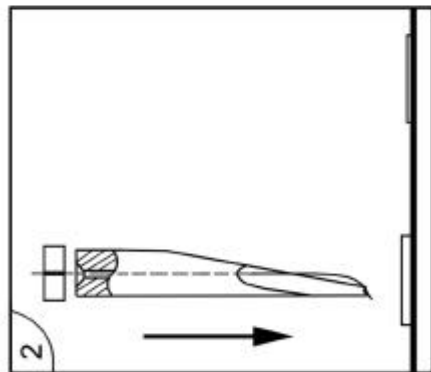
Figure 13 **Operation Sequence** for Wedge Bonding

Figure 14 **Operation Sequence** for Ball Bonding

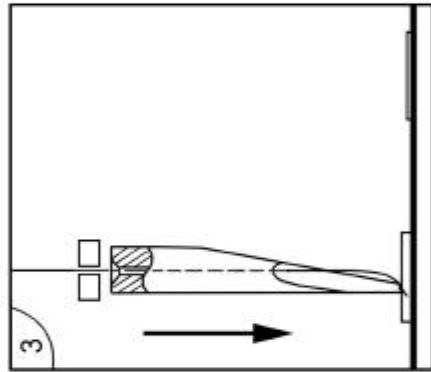
Following the Operation Sequence to run Bonder .



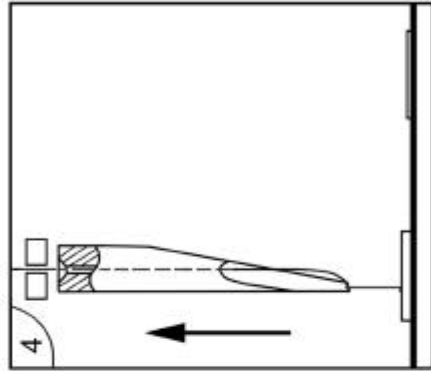
1. Start Position
Operator positions target under spotlight. Clamp is closed



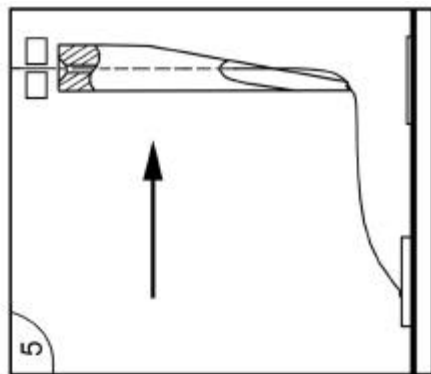
2. Operator holds down Control Puck Start button
Bond Head travels down to 1st search height
Operator repositions target if necessary.



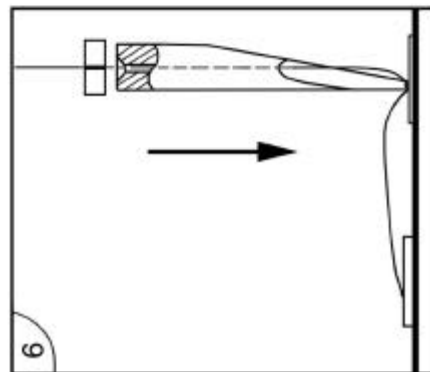
3. Operator releases Control Puck Start button
Bond tool descends to 1st Bond Parameters



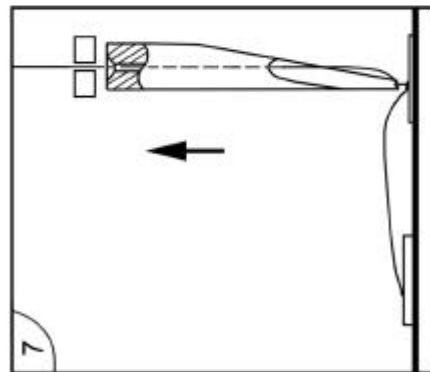
4. clamp opens and tool rise to loop height



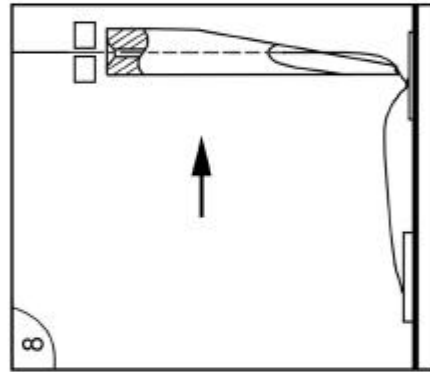
5. Operator positions 2nd target under spotlight and/or Y-Table moves to programmed position



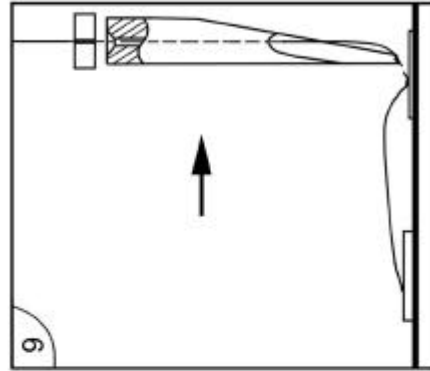
6. Operator holds down Control Puck Start button. Bond Head travels down to 2nd search height. Operator repositions target if necessary..
Operator releases Control Puck Start button. Bond tool descends to 2nd Bond Parameters



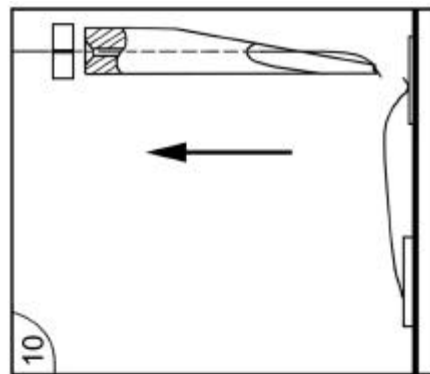
7. Tool rise to programmed Tail up (clamp open) position



8. Tool moves to programmed Tail y-way (clamp open) position

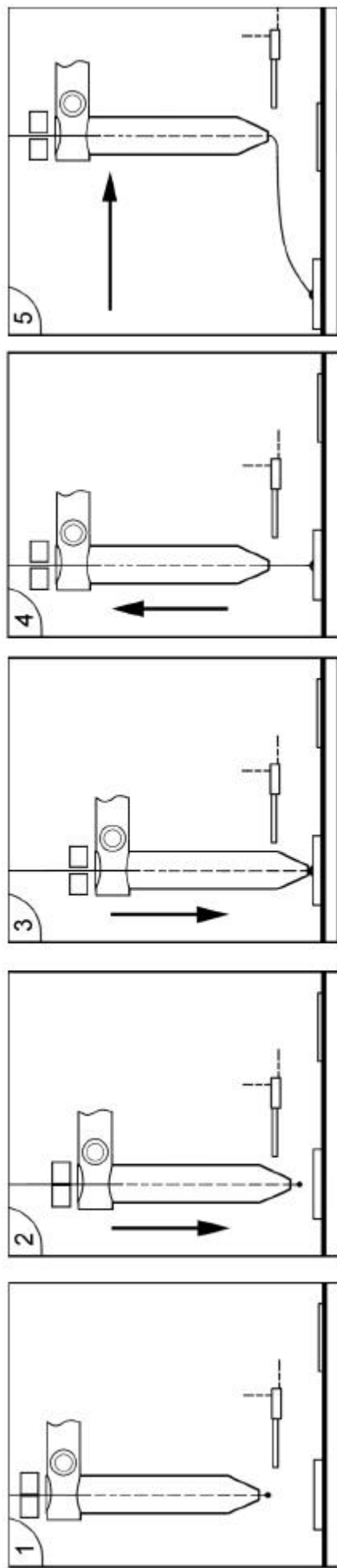


9. Tool moves to programmed Tail y-way (clamp closed) position

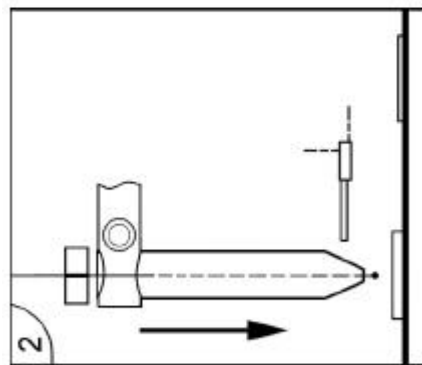


10. Tool moves to programmed Work height position

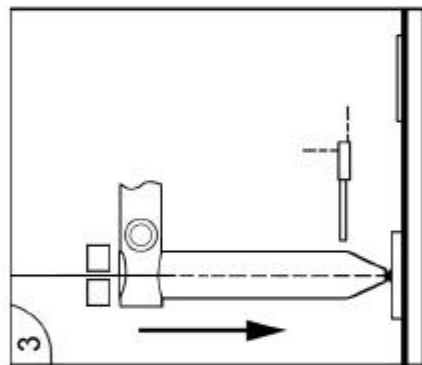
Wedge Bonding Sequence
Figure 13



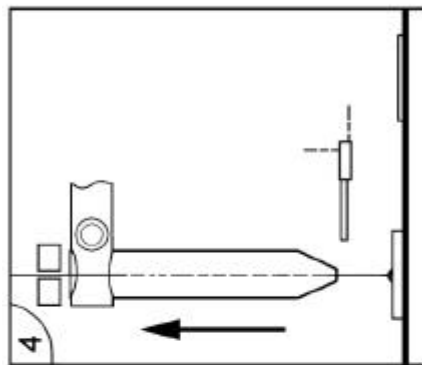
1. Start Position
Operator positions target under
spotlight. Clamp is closed



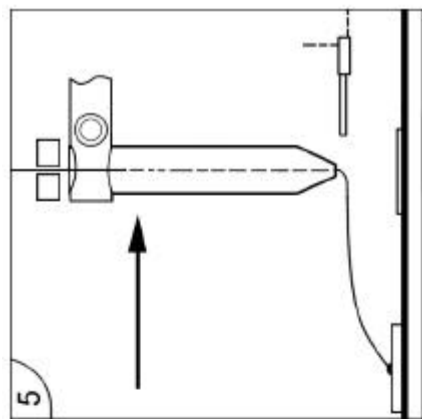
2. Operator holds down Control
Puck Start button, Clamp opens
Bond Head travels down to
1st.search height
Operator repositions target if
necessary.



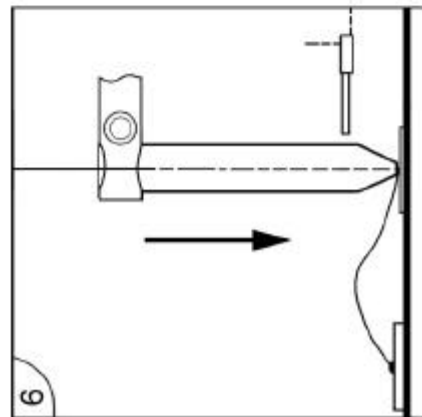
3. Operator releases Control Puck
Start button
Bond tool descends to 1st. Bond
Parameters activate all Bond
Parameters



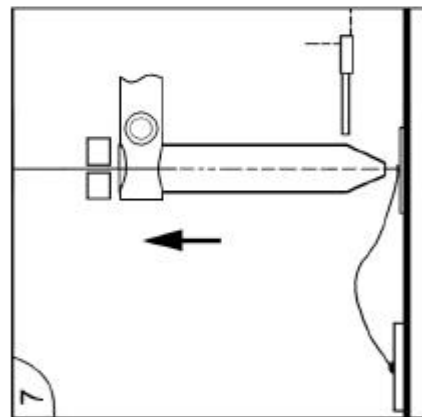
4. after Bond tool rise to loop height



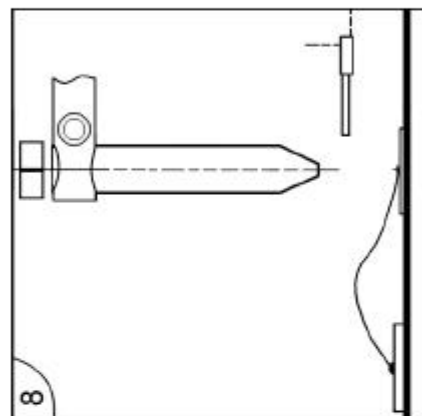
5. Operator positions 2nd target
under spotlight
and/or Y-Table moves to
programmed position



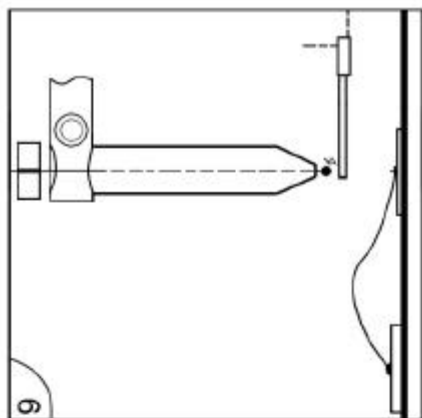
6. Operator holds down Control Puck Start
button
Bond Head travels down to 2nd .search
height
Operator repositions target if necessary.
Operator releases Control Puck Start
button
Bond tool descends to 2nd Bond
Parameters activate all Bond Parameters



7. Tool rise to programmed Tail up
(clamp open) position



8. Tool moves to programmed Work
height (clamp closed) position



9. EFO Wand moves under Tail (Wire
end) and forms Ball

Ball Bonding Sequence
Figure 14

9. Ultrasonic Generator

The signal from the logic control circuit, the ultrasonic generator provides 62 kHz power to the transducer at a level set on program. The ultrasonic energy is applied until the bond time is complete. (PLL) phase loop lock system is provided to insure work piece coupling, and to maintain transducer operation at the specified frequency.

10. Force system

The force generator provides current to effect the bond force. On signal from the logic control circuit, the current is provided to the force solenoid in a ramped fashion until the preset level is reached. At this level the power is held until the bond time is over. The force level and bond time are preset by the front touch panel controls.

11. Electronic force adjustment

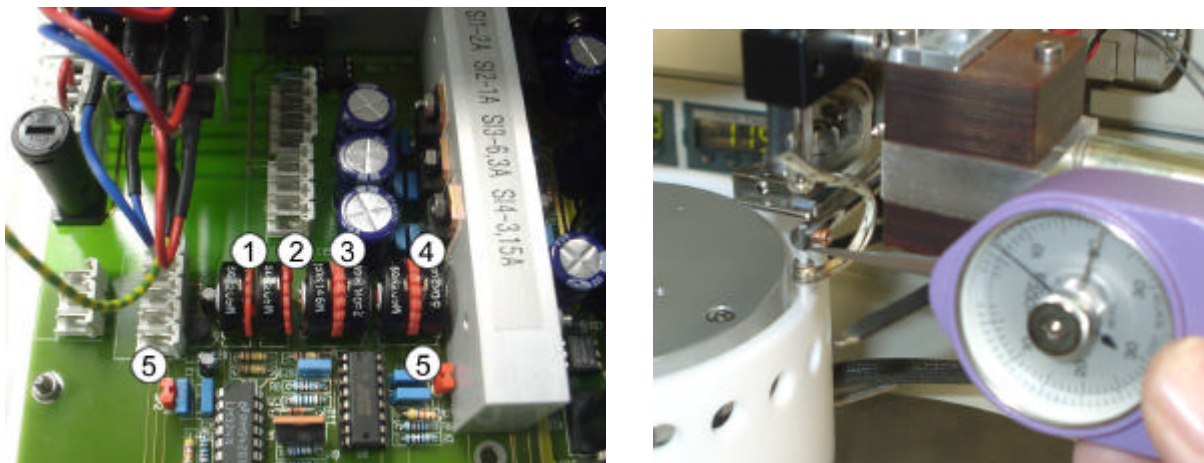


Figure 22

1. Red wheel # 1 to adjust static Bond force (18 gram standard) to back = lower

Use a gram gauge to measure the static bond head force. Place the point or arm of the gram gauge at the end of the transducer. Slowly raise the gauge until the transducer lifts and a gauge reading is required force

2. Red wheel #2 adjust to front (do not move)
3. Red wheel #3 adjust Force Rise time, to back = short time (standard)
4. Red wheel #4 adjust Force fall time, to front = short time (standard)
5. If two red jumpers are removed Force rise & fall times are 1/3

12 .TDSW Touch down switch adjustment

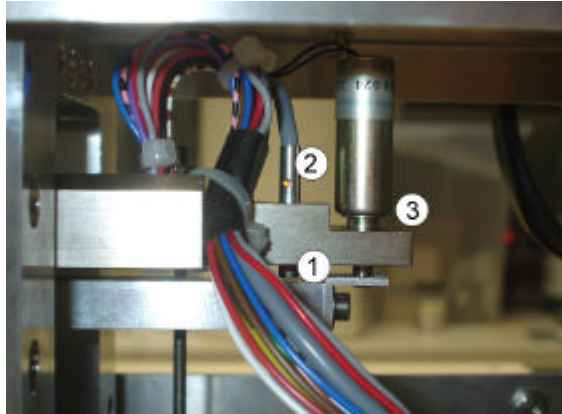


Figure 23 TDSW Touch Down Switch

1. TDSW Touch Down Switch
2. Loosen screw on side (2) and adjust gap between Bond arm and TDSW with Set screw until yellow (2) light is ON = No touch down

13. Clamp Force and gap Adjustment

There is no convenient way to measure the clamp force. The user must therefore be alert to deformation of the wire to identify excess force. When force is inadequate, the wire clamps will not hold the wire in the tool during closed clamp conditions or will not break the wire after second bond.

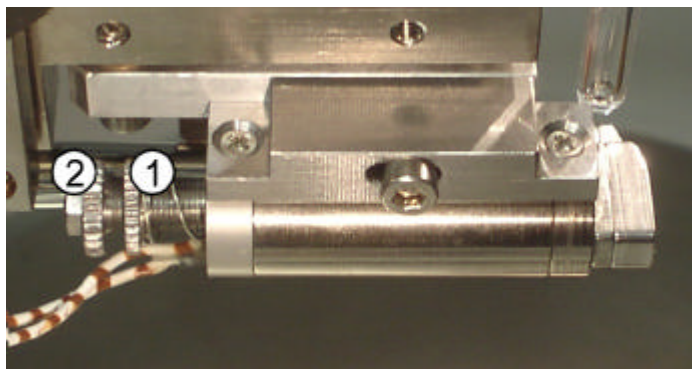


Figure 18

1. Clamp force adjustment
2. Clamp gap adjustment

14. Stitch Bonding is activate with Foot switch

The HB has basic 1-2-2 and 1-2-1 bond parameter capability. In 1-2-2 stitching mode, the first bond parameters are applied for the first bond, and second bond parameters are applied at subsequent bonds. Stitch Foot switch is connected on back of Bonder.

|

A: If Foot switch is activate before first Bond, then automatically 3 Bonds are Bonded, before Terminating wire.

B: When the Foot switch is actuated after first bond, the bonder will not terminate the bonding cycle after Foot switch is released.

15. Motorised Wire Spool

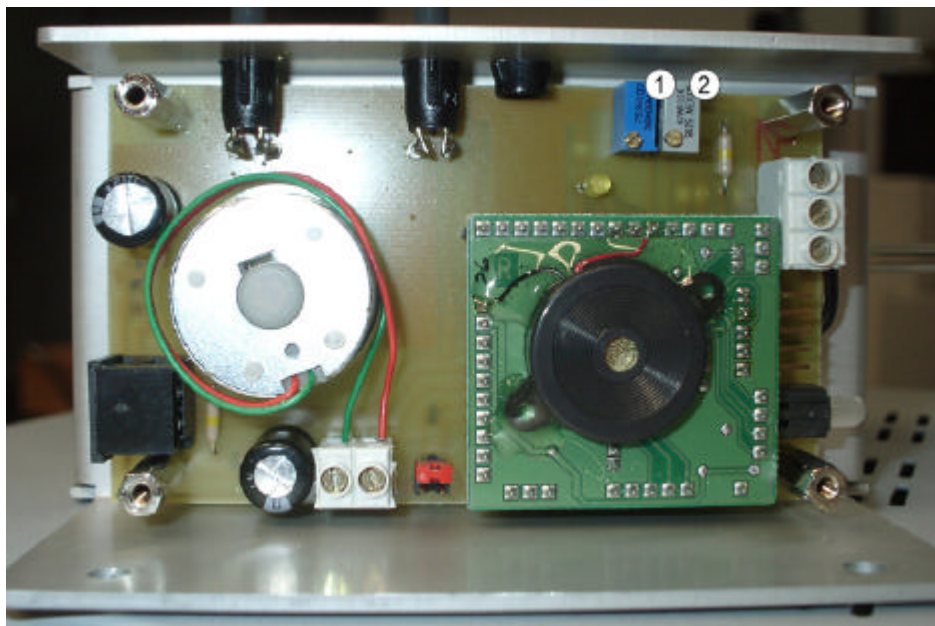


Figure 19

1. Adjustment for run time of motor (clock wise = more time)
2. Adjustment for sensibly of start sensor (clock wise = less sensible)

16. Tool Heater

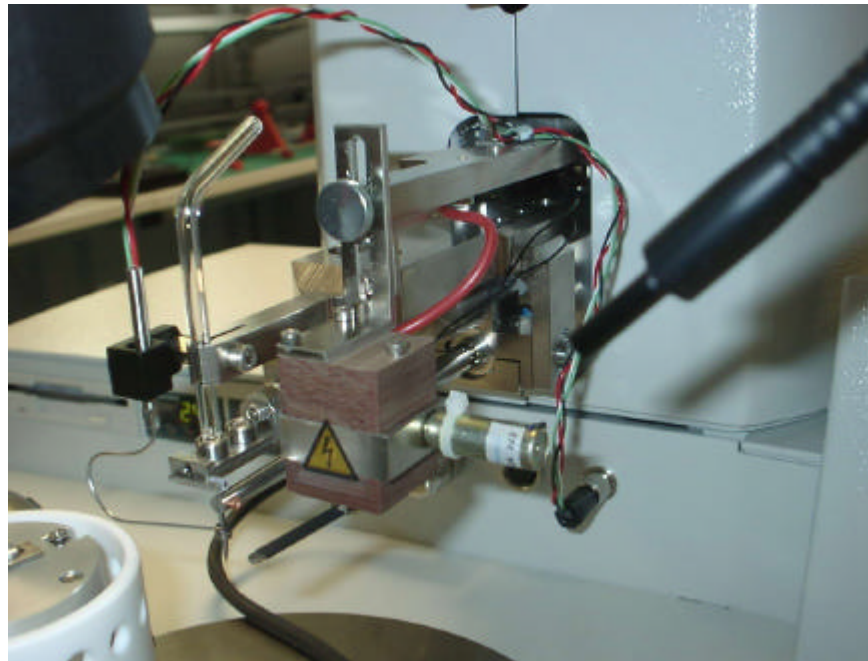


Figure 24

Option H40 Tool Heater with Temperature Controller

Option H41 Spare Tool Heater with Thermocouple

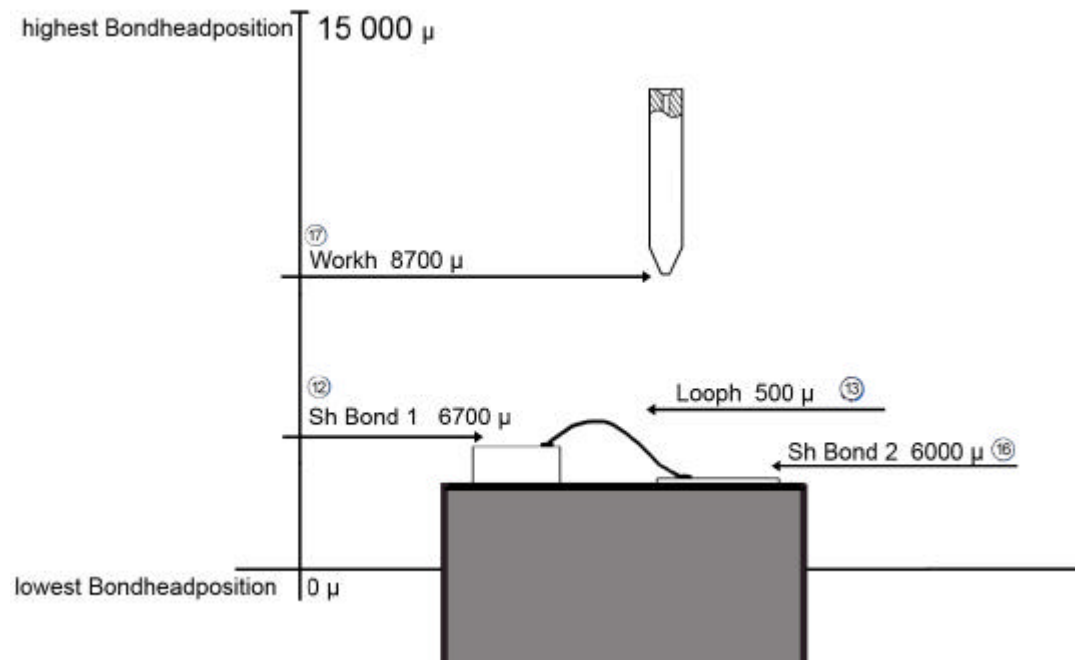
17. Troubleshooting

Troubleshooting for bonding problems see section
"Wire Bond Technology"

HB Bonder technical problems:

<u>Symptom / Error Message</u>	<u>Cause / Corrective Action</u>
A. No Bond Head movement	switch Bonder Off/On Adjust TDSW switch (Page 29) Switch to Menu "Bond"
B. No Ball after Bond	Check if ON/OFF in Menu Config Tail is ON Check gap between wire and EFO Wand (for 25 μ wire 100 to 400 μ)
C: Low EFO Power	EFO Board has No Ground screw (Page 19)
D: Tail is moving sideways under Wedge Tool	Tool longer as 19 mm Hole in Wdgel to big Clamp defect Wedge defect
E: Error no USG found using Demo Mode	Transducer not connected on US Board US Board Defect D-Sub Connect Bond head not connected 24V missing Motherboard Defect
F: Set up error, using defaults	Bond level to deep
G. "Setup. Offset.WB" not found in File	Wrong Software in use
H. Display Freezes after Power on and touching „ Setup“ button	The cause is TDSW is not closed (not closed LED OFF) A: to less Static force, adjust static force to 20g to 25g see page 28 Reed wheel #1 B: TDSW gap is to big, adjust TDSW gap see page 29 user manual C: No free movement of Transducer Transducer can not go to upper position Check mechanical parts for free movement

18. "Setup" Software in Menu Base Setting



Setup Button can be used to find automatically
Search height for 1st and 2nd Bond and Loop and Work height.

Setup procedure:

1. Press Set Up Button (19)
Work-Height is set automatic to 2000 after Bond level
2. Press Start Button on Control-Puck (Page 25 Figure 15)
Bondtool is moving to 1st Bond level .
Measured Height minus 200 is Displayed in "Sh 1st. Bond "
3. Press Start Button on Control-Puck (Page 25 Figure 15)
Bondtool is moving to 2nd.Bond level
Measured Height minus 200 is Displayed in Sh nd Bond
4. At Ball bonding Mode Press Start Button again
Work-Height = Measured EFO Arm distance to Bondtool
5. Loop Height is Measured Height Plus 300

Set up procedure can be done every time.

19. Bond tools for HB Wire Bonder:

Capillary:	25μ Wire	41413-0010-334	Micro Swiss 11.10 mm Tool length
	50μ Wire	41413-0020-334	Micro Swiss
	25μ Wire	1572-15-437 GM	Gaiser 11 mm Tool length
	25μ Wire	1572-15-750 GM	Gaiser 19 mm Tool length
	50μ Wire	1572-35-437 GM	Gaiser
Wedge	25μ Wire	4445-1520-3/4-CG-F	Gaiser
	50μ Wire	4445-3540-3/4-CG-F	Gaiser
	20 x 100 μ Ribbon	4645R-.8-4-3.0-3/4-CG	Gaiser

90° Wedge Tool

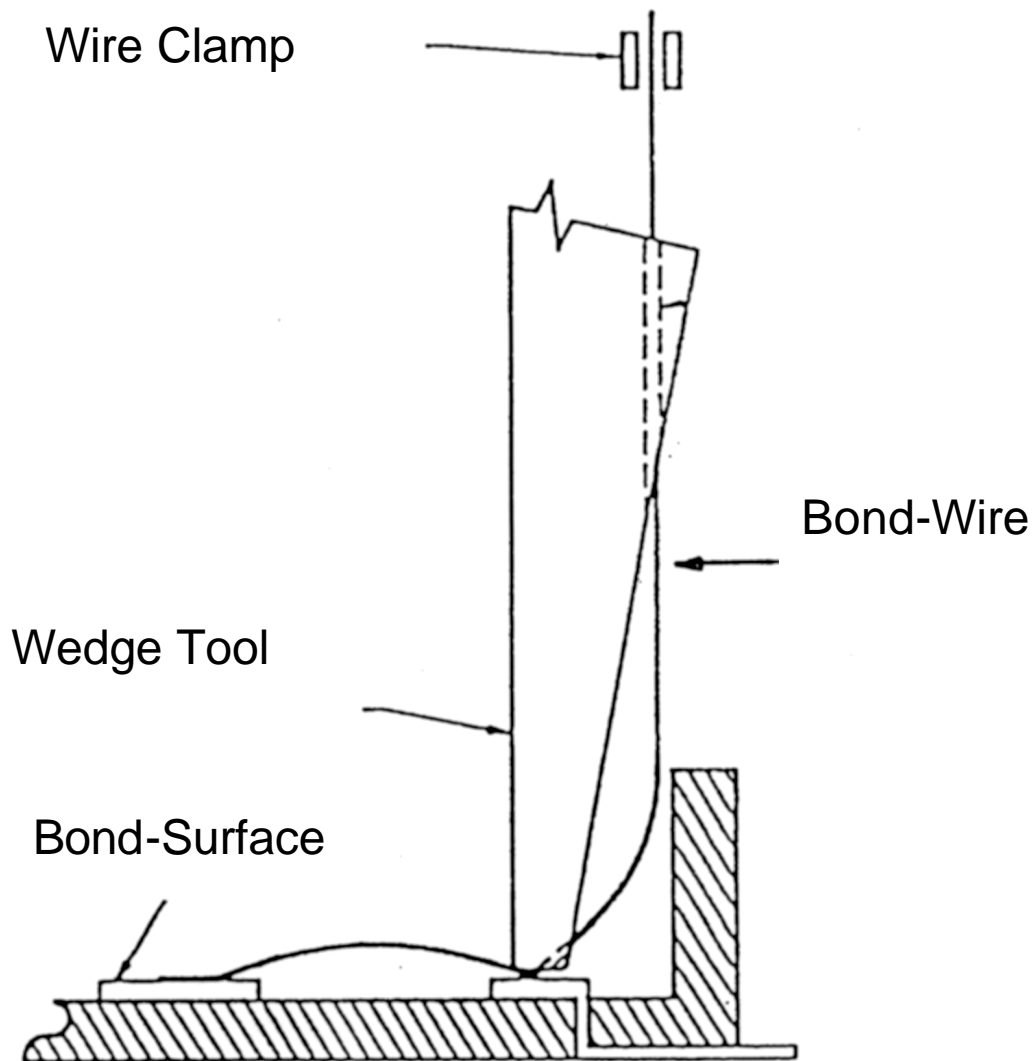


Figure 11

20. Packing Instructions

1. Remove from Bonder:

- A. Bondtool (wedge, Capillary)
- B. Bond Wire
- C. Glass wire Guide
- D. Dual Fiber Optic Illuminator
- E. Microscope with Holder
- F. Laser Spot light targeting system
- G. Heater Stage
- H. Remove Control - Puck
- I. and any other options from Bonder.

2. Secure the work plate by inserting the Table Lock Screw.
Tighten softly the screw to secure the work plate.

3. Secure Display with Carton
4. Secure Tower-Cover with soft foam
5. Secure between Transducer and clamp with foam

6. Carefully move Bonder in wooden box

Pack accessories (i.e., work stage, microscope, illuminator, eyepieces, etc.) in bubble wrap in separate boxes. Position these items at suitable locations around the sides Of the bonder so that they are secure from movement and so the to foam cover can be installed.

7. Place the foam cover around and over Bonder .

8. Position and bolt the wooden cover on to the crate.

1H



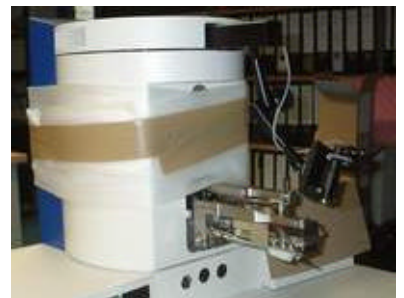
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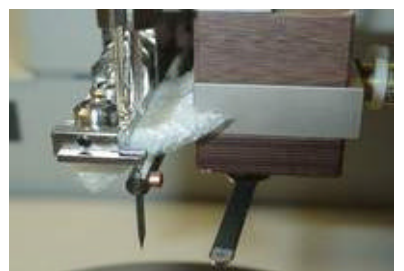
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4



5



6



7



8



21. SPECIFICATION

The HB12/14/16 is a bench top size wire bonder, easy to operate and ideal for laboratories, pilot and pre-production runs and small scale production lines. One Deep-access 90° Bond head for wire and ribbon bonding. No hardware change necessary. Easy operation with 6,5" TFT Touch Panel Operator System. Digital self tuning Ultrasonic generator, Stitch bonding, 99 Program storage capacities and Heater stage Controller. Motorised 2" Wire Spool

Options:

- H10 Zoom Stereo-Microscope Leica S6 20x
- H11 Zoom Stereo-Microscope Leica MZ6 20x
- H26 Adjustable height heated work stage surface 60 mm Ø
- H29 Adjustable height heated work stage surface 90 mm Ø
- H30 Additional Soft & Hardware for Wedge/Ball Bonding
- H40 Tool Heater and Temperature Controller with LCD Display
- H50 Spot light targeting System
- H51 Manual Z-Control
- H53 FDD 3,25" to store Bonding programs
- H54 Motorised Y travel for Step-Back and Loop control
- H55 Dual Fiber Optic illuminator
- H56 High/Low Ultrasonic Power Selector 1 or 2 watt
- H60 Bonding tool for 25µ wire
- H70 Gold-Wire 25m, 60 Meter, 2" Spool
- H72 ½" Wire Spool Adapter
- H73 Torque Wrench 25 cNm for Bonding Tool
- H35 Loop Profile Software

Technical specifications

Ultrasonic system	62 kHz transducer, PLL Control
Ultrasonic power :	0 - 2 watt output
Bond time:	15 - 5000 msec.
Bond force:	15 - 100 grams
Gold and Aluminium wire Ø	17 to 76µ (0,7 to 3 mil)
Gold ribbon	up to 25 x 250µ (1x 10 mil)
Motorised Wire Spool	50,8 mm (2 inch) Option
Wire termination	table tear
Wire feed angle	90° for Wire and Ribbon
Motorized Y travel	stepback up to 6 mm (240 mil) Option
Motorized Z travel	15 mm
Throat depth	165 mm (6,7")
Fine Table motion	10 mm (0,55 ")
Mouse ratio	6:1
Temperature controller	up to 250°C +/- 1°C
Electrical Requirements	100 – 120 / 220 - 240V +/-10% 50/60 Hz 10A max.
Operating temperature range	18°C – 32°C
Physical Dimensions	680 mm W x 640 mm D x 490 mm H
Weight	Net 50 kg
Industry Standard	CE standard

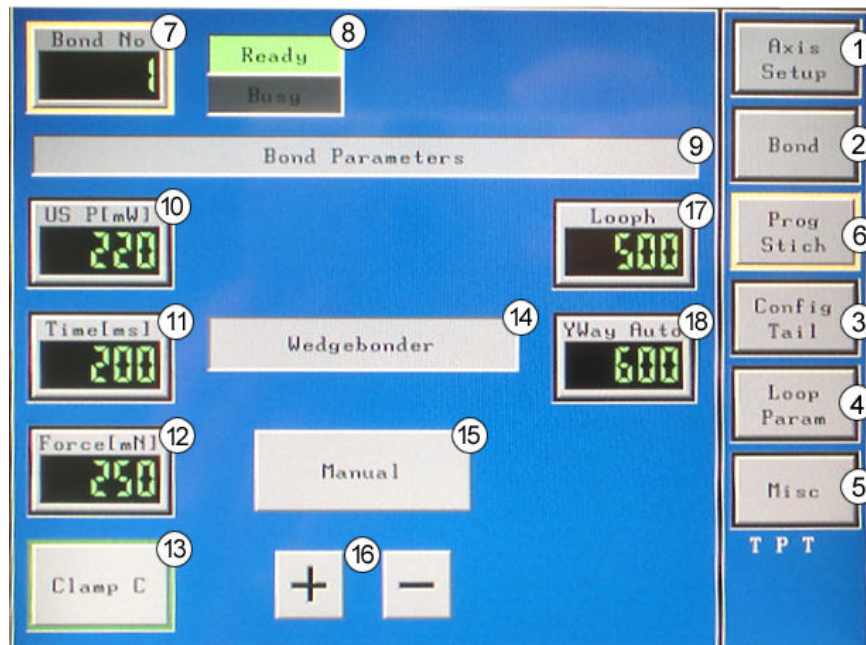
NOTE: These specifications are subject to change without prior notice.

22. Bond Mode Button # 19 in Menu Bond

1. Full Automatic : After press Bond Button one complete Wire Bond is made
No possibility to correct position on 2nd Bond
2. Semi Automatic : After press Bond Button and Hold Bond Button
Bond Tool is moving to 1st Bond Search Height.
After release Bond Button 1st Bond is made and tool is moving
To Loop Height and Y-Distance .
After press Bond Button and Hold Bond Button
Bond Tool is moving to 2nd Bond Search Height
After release Bond Button 2nd Bond is made and Tool is moving
To Start Position (Work Height)
3. Step – Mode : With Bond Button Tool will be Step thru Tail Sequence
and Loop Sequence if any programmed
4. Manual Mode : Only with Option H51 Manual Z-Control
The Operator using Manual Z-Control to move Bond Tool to
Bond surface. After touching Bond surface 1st Bond is made
Automatically and Tool is rising 100 Microns.
Then Operator is moving Bond Tool by using Manual Z control
and X-Y Manipulator to 2nd Bond Position. After touching
Bond Surface 2nd Bond is Made and Tool is rising to Start Position
(Work Height)

23. Programmable Stich Function (Maximum 4 loops with 5 Bonds)

Menu Prog Stich Touch Panel Display



- | | | |
|-----|-------------|---|
| 1. | Axis Setup | Start menu after Bonder switch on, to program all X & Y ways |
| 2. | Bond | For standard bonding, only in Menu "Bond" can the bond be activated here are all Bond parameter displayed |
| 3. | Config Tail | here are all Tail parameters adjusted and program changed from Wedge- to Ball-Bonding (Option) |
| 4. | Loop Param | Loop Profile Menue |
| 5. | Misc | here are the light adjusted , and all parameter saved/load |
| 6. | Prog Stich | For special Stich bonding prog. Max. 4 loops and 5 bonds |
| 7. | Bond No. | Stich Bond 1 , 2, 3, 4 or 5 |
| 8. | Ready | display green = Bonder OK, yellow = Bonder in Bond process |
| 10. | U/S | Bond US energy |
| 11. | Time | Bond time |
| 12. | Force | Bond force |
| 13. | Clamp | switch for Wire clamp open/closed |
| 14. | Wedgebonden | Display of Bond Mode Wedge/Ball |
| 15. | Bond Mode | Full Automatic, Semi Automatic, Manual, |
| 17. | Loop | Loop Height |
| 18. | Y Way | Y-Way Automatic move |
| 16. | +/- | change value to + or - |

Programm Stich can only run in "Prog Stich" Menu

Puck Bond Button = Start Stich Prog. Bond 1

Puck feed Button = Rest Stich Prog. to Bond 1