

VIDEO-AUTO DIE BONDER MODEL 8030 A

As modified by www.semiequipment.com



Maintenance & Operation Manual

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This is a work in progress, and is not complete.

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1. INTRODUCTION

A. General Description

This manual describes the installation, checkout adjustments and operation of Foton's fully automatic, Die Bonder Model 8030A with modifications by www.semiequipment.com. Most areas still apply to the standard Foton 8030A and will be an assistance for regular Foton 8030A users and technicians. The Foton 8030A was designed and built by Foton Production Automation, in both Germany and the USA up until Foton closed its doors in 1988.

The 8030A is an fully automatic die bonder. Full magazines are loaded into the input elevator, and empty magazines into the output elevator, or programmable 'X-Y' Table. Wafer matrix on rings, or on film frames are manual or automatically loaded and rotationally aligned to the optical inspection system. Die sizes and criteria are programmed into the computer in a self-teaching mode. Then all bonding functions, die alignment, inspection, and bonding operations are controlled by the 16 bit mini-computer. A buffer battery protects the RAM in case of temporary power failure or shutdown.

Bonder components are assembled to an all aluminum cast, desk-type frame. Operator and computer terminal controls, video system and zoom optics are mounted in the overhead control console. The maintenance control terminal and operator panels are mounted on both front and rear console panels. The console rests on two supports. An input transformer is mounted on the inside of the rear lower center access door, allowing input voltages from 110V 220V. The main power supplies and PC boards are mounted in the right and left drawers, in electronic racks. There are three racks or chassis in each drawer. The drawers are suspended from the top and roll out on double slide rails on each side.

The die presentation system consists of a stepping motor driven ejector station mounted on the top center of the desk. A wafer ring holder or film frame is automatically positioned and aligned over the ejector by an 'x-Y' table. The table is stepper motor driven and controlled by the computer and video system. The 'X-Y' table is mounted on the center portion of the desk-like top.

High-speed die bonding is achieved by designing minimal weight and improved electronic control of the stepping motors. A 3" to 6" wafer diameter work area is available by changing the ring holder and wafer diameter travel limit ring. A 180-degree rotation head and pickup arm assembly is mounted on a stepping motor driven 'X-Y' mechanism.

When the computer accepts a die that is presented to the video system, the pickup arm rotates and passes through a die sensor, or sensed by vacuum, to see if a die is present. When a die is present, the arm continues to the die bond position and places the die on the unit. If there is no die, the arm returns to the ejector to attempt another die pick up.

1. INTRODUCTION

A. General Description – continued

The **semiequipment.com** modified 8030A bonder, has an external PC that controls an rear 'X-Y' table, with vision control. The vision control locates the parts on the table or indexer, corrects the table to the optical center of the rear optics, to give a very precise location for die placement. This feature, also allows for inspection of the unit to be bonded, and in the case of epoxy dispense, allows the inspection of the epoxy before die placement, and a captured image after die placement for operator inspection. The software for the table allows for quick change over, with preprogrammed motions, and inspections. Additional features can be programmed on request.

1. INTRODUCTION

A. General Description - continued

Exact pickup and die bond positions, are controlled by the computer with the head 'X-Y' stepping mechanism. Scrubbing action is computer controlled with the head 'X-Y' stepping motors. Also, multi chip programs utilize the head 'X-Y' and /or and index 'X-Y' mechanism.

An opto-electronic controlled index system with input and output stack or magazine elevators and roller feeds is used for leadframe transport or computer controlled rear 'X-Y' table. Magazines are raised and lowered by stepping motors. Strips are inserted into the track, and the output magazine by air actuated cylinder with push rods. The alignment pins are raised and lowered by electromagnetic solenoids. Strips are transported through the index track by two stepping motors and three or more pinch rollers, depending on how long the strips are.

Heater blocks are designed for the product, both preform and die bonding. Temperatures are controlled by pyrometers with a range of 50-600 degrees C. Pyrometers are located in the face of the right electronic drawer. A flowmeter, on the side of the magazine changer or the console support arms controls the nitrogen flow in the heat tunnel to transfer heat and retard oxidation.

The model 8030A is capable of all three basic methods of die bonding; Eutectic, Epoxy, and Preform.

Eutectic bonding is accomplished by maintaining a temperature in the heat tunnel sufficient enough to plastize the surfaces of the die and unit its being attached to. When the die is placed on the unit, the back of the die, and unit surface material, flow together forming a strong bond. A nitrogen atmosphere is used to retard oxidation during the die bonding process.

In epoxy die bonding, a small dot or pattern of epoxy is printed on the unit before the die is placed. Epoxy bonding can be done with no or very low heater block temperatures. A screen printing type of dispenser is available and is mounted on an 'X-Y-Z' slide mechanism on the left rear console support arm. Each epoxy head can have up to five patterns, per customer die size. One or two part epoxy can be used.

Preform bonding is accomplished by placing a proper size piece of preform on the unit and a die on top of the preform. Scrubbing action of the die is used to achieve proper wetting. A preformer is available and can be mounted on an 'X-Y-Z' slide mechanism, on the left rear console support arm.

1. INTRODUCTION

B. Illumination System

1. Reflective

The reflective illumination housing is secured to the bottom of the zoom optics. It contains a beam splitter. Incident light is thus reflected down onto the wafer and back up through the beam splitter to the camera. The reflective system plugs into the bottom of the control console on the right hand side of the optic system. The reflective illumination is controlled by the LIGHT 2 10-turn potentiometer.

2. Fluorescent Darkfield

A circular neon light is used in cases of very dull chip surfaces. The fluorescent illumination is mounted on the bottom of the reflective illumination housing. It is connected to the electrical system in the same area as the reflective illumination. The light is turned on or off by the LIGHT switch.

3. Fiber Optics Darkfield

When oblique lighting is required, because of water surface conditions, a third optical illumination system is use. A 10-turn potentiometer LIGHT 1 varies illumination intensity through the fiber optics.

1. INTRODUCTION

C. Specifications

Width:	120 cm (47.2")
Depth:	78 cm (30.7")
Height:	178 cm (70")
Weight:	520 kg (1144 lbs)
Power:	220V +/- 5V, 50/60 cycles, 16 amp
Current:	Depends on heating system used. When a supply voltage cannot be maintained at 220V +/-1, a step up transformer must be used.
Vacuum:	21" HG
Nitrogen:	Regulated to .3-.4 Bar at 500 liter/hr.
Compressed air:	Regulated to 2-4 Bar.

1. INTRODUCTION

D. Installation

The 8030A is shipped in a wooden box packed tightly with foam rubber packing to prevent damage during transit. Be very careful when unpacking the bonder. Unpack all the spare parts and components from boxes. Be sure no parts are left in the wrapping paper or packing material.

The bonder is equipped with four casters for easy moving to perform maintenance or to move the bonder from one floor location to another. Also there are four 'Jack' legs. When the bonder is in its desired operation location, the 'Jack' should be adjusted down to remove weight from the casters making the bonder solid for bonding. The bonder must be placed on a sturdy floor away from external vibrations

1. Remove the braces from under the console.
2. Level the bonder with the Jack legs and be sure it is resting solid on all four legs.
3. Open both electronic drawers and make sure all PC boards, plug-in units, cable connectors, and plugs are tight.
4. Check for any bolts, which may have vibrated loose during shipping.
5. Remove transport protection on both electronic drawers.
6. Connect vacuum, air and nitrogen to the bonder.
7. Plug bonder into voltage source, verify that the secondary of the transformer located on the back panel, is at 220V +- 5V.
8. Turn on logic power, and motor power, and verify 70V DC +- 2V in the right hand electronic drawer, adjust taps on 220V transformer to adjust this fixed voltage
9. Adjust bonder and set up for bonding, after system has reached static temperature.

1. INTRODUCTION

E. Common terms

The following terms are used interchangeably by different semiconductor equipment manufacturers.

Die bond – die attach

Die – chip – pellet – wafer – bar

Wafer – slice

Index station – workholder – indexer

Leadframe – strip – tape

Flag – die pad – island – bar pad

Heater – furnace – heat tunnel

Preform foil – ribbon – tape

Mylar – foil

Elevator – lift

Magazine – carrier

Pickup arm – swing arm – bond head

Scribe area – street

Kerf – saw notch

Mill – thou - .001”

Start position – rest – home – initialize

Turn (on or off): switch – actuate – depress

Quality control – quality assurance

Slit sensor – opto sensor – light sensor

Ejector: Pin – needle

Power lines: Live – hot – phase – high – (+)

Neutral – common – low (-)

Machine ground – earth ground

U = Voltage adjust

V = Over voltage adjust

J = Current limiting adjust

1. INTRODUCTION

E. Control Panel Key Abbreviations

ALN	Align Program	WCI	Wafer Change Inhibit
JMP	Jump Program	EMT	Empty Index Track
CAP	Calculate Angular Placement	EPI	Epoxy Preform Inhibit
PUR	Pickup Reticule	RFL	Preform Length
ENA	(gray) Program Area Enable	SLM	Select Monitor
VLH	Left Variance Button (orange)	VFW	Up Variance Button (orange)
EOW	End Of Wafer	PUD	Pickup Delay
ELO	Eliminate Overage	TDD	Touch Down Delay
NOR	Number of Retests	ASD	After Scrub Delay
SRI	Surface reference Indicate	PFD	Preform Delay
TST	Test Alignment	VID	Video
VRH	Right Variance Button (orange)	VBW	Down Variance button (orange)
MDP	Multi Die Program	DIS	Die Select
FPP	Free Programmable Position	CAR	Carrier
SMD	Select Mode	RWK	Rework
SLP	Select Position	POS	Position Set
DVA	Digital Video Adjust	AAA	Auto Angle Adjust
WJP	Wafer Jump	WBG	Wafer Begin
DID	Die Distance	PUH	Pickup Height
DIN	Die Number	HPP	Head Pickup Position
SPC	Single Position Correction	HBP	Head Bond Position
MPC	Matrix Position Correction	ABP	Adjust Bond Position
DVT	Digital Video Test Adjust	RLW	Reel Wind
WAJ	Wafer Adjust	WED	Wafer End
SBM	Scrub Mode	WHC	Workholder Cycle
SBC	Scrub Bond Cycles	ILP	Inhibit Leadframe Position
SBA	Scrub Bond Amplitude	IDX	Index Delay
SET	Stores selected data	DBT	Delay Before Touchdown
MUL	Multi Die Lineup	CNT	Count (menu)
WCC	Wafer Change Cycle	EPC	Epoxy/Preform Cycle
WCL	Wafer Clamp	EJT	Eject
WEX	Wafer Expand	PUI	Pickup Inhibit
AWA	Adjust Wafer Angle	ECC	Eliminate Collet Check
WMP	Wafer Mapping	SEL	Select (menu)
PID	Pickup Inked Die	HDC	Hold Down Clamp
IMD	Interrupted Mode	DIO	Data Read In/Out
ENA	(blue) Service Area Enable		
RUN	Start Automatic Run	STOP	STOP

II. CONTROLS

A. Wafer Monitor

All operation controls are located on the control console, the Center Bridge and the right electronic drawer panel.



The wafer monitor controls provide light intensity and TV adjustment necessary to present a video picture with proper contrast, so the computer can measure, align, and inspect the die.

1. **SCAN:** A two position scanning switch. Normal for normal scanning, Under Scan for displaying the picture with the size reduced by 10%.
2. **SYNC:** A two position switch, INT when composite video signal is supplied without external sync. The bonder should always be operated on the internal position.
3. **V-Hold:** Vertical hold controls are use to regain picture's stability if the entire picture is rolling up or down.
4. **Contrast:** controls the contrast of the monitor's picture.
5. **Bright:** The brightness control adjusts the overall light intensity of the monitor picture. Clockwise increases the brightness.
6. **Power:** This push button switch turns power on or off to the monitor. When power is on, the indicator on the left bottom will be illuminated.
7. **Light 1:** Top 10 turn pot, just to the right of the monitor, adjust the light intensity thru the fiber optics illuminator.
8. **Light 2:** Second from top 10 turn pot, adjust the reflective light located in the optics assembly. Adjust for as much light as possible without camera overdrive.
9. After adjusting any lighting be sure to adjust the DVA and DVT as any lighting level change will effect those adjustments

II. CONTROLS

A. Wafer Monitor-continued

10. D-Video Align: This 10 turn pot adjusts the light/dark pattern on the monitor when the DVA Button is active. It must be adjusted so the kerfs are well defined, and as wide as possible without losing any of the die edge white surface reflection. There may be up to 20% of the center die surface area appearing black. Lock the potentiometer after the adjustment is made.
11. D-Video Test: This 10 turn pot adjusts the light/dark pattern on the monitor when DVT Button is active. It must be adjusted so that a good quality die surface is white, and an inkdot, or surface defect is black. In addition, it must also be adjusted so that when moving outside of the wafer area, that there is no reflection from the tape.
12. Light (Darkfield Neon): This switch turns power on or off to the Neon ring's ballast transformer. The neon ring must be used on some die surfaces to give proper illumination to the video system to digitize the video signal to the computer.

B. INSPECT MONITOR (RIGHT MONITOR 2)

The inspect monitor (optional on Foton 8030A) is situated on the right side of the console. The postbond inspection camera is located on the back of the machine. All of the postbond inspect monitor controls server the same function and are adjusted in the same way as the wafer monitor.

On **Semiequipment.com** modified systems. The rear inspection and monitoring are preformed on a PC based monitor located on the left side of the machine.

II. CONTROLS

C. Terminal Keyboard

TERMINAL KEYBOARD



The terminal keyboard contains two LED displays, 16 data (hexadecimal) switches and 12 computer control switches.

1. LED Display

- 1.1 ADD – the display under ADD will show computer addresses. It will always be in hexadecimal
- 1.2 DATA – The display under DATA will show computer data. It will always be in hexadecimal.
- 1.3 DECIMAL – The display above DECIMAL will show all data converted into decimal.
- 1.4 I = INPUT – Shows status end of selected input. LED on = Input low; LED off = Input high.
- 1.5 F = FLAG BIT – Shows status of the selected flag bit. LED on = Flab bit low; LED Off = Flag bit high.
- 1.6 S = STATUS BIT – Shows if Boolean function of the input and flag bit fulfills a condition. LED on = fulfilled; LED off = Not fulfilled.
- 1.7 P = PARITY (EVEN PARITY) – To control the data transmission. LED on = Parity error.
- 1.8 4 2 1 = The LED's indicate clock pulses during single clock operation

II. CONTROLS

C. Terminal Keyboard - continued

2. Hexadecimal Keyboard

The 16 button switches, '0' through 'F', are used for hexadecimal data entry.

3. Computer control Switches

There are twelve control switches on the right side of the terminal keyboard, under the data display. Six switches have LED's in the top portion of the switch. These switches serve two functions. When the led is illuminated, the second function is active, this is the one with the bar above it. When its not illuminated, the function without the bar above it is active.

3.1 (-) Second Function Selection

This key enables the second function of the computer control switches. When LED is on, the second function of the other five switches can be enabled.

3.2 T/L (Terminal Line)

The second function of this switch (T LED illuminated) indicates terminal will communicate with the computer. When the LED is off, it indicates the external RS232 will communicate with the computer.

3.3 S/R Single Step/Run

Single step (S) is second function of this switch. This switch selects single stepping of the run mode of the computer. Run is the first function and is engaged in the operation of the computer when the LED is off.

3.4 I/E (Output Inhibit/Enable)

Computer output inhibit is the second function of this switch. When the LED is off, the computer output is enabled. When the LED is on, outputs from the computer are disabled.

3.5 S/C (single Clock-Clock/Cycle)

This switch is used to check the structure of the computer instructions. One instruction consists of eight clock pulses. One clock cycle of the computer runs through eight clock pulses without stopping. In single cock, the computer can be stepped one clock pulse at a time.

II. CONTROLS

C. Terminal Keyboard - continued

3.6 W/R (Write/Read)

When a second function of this switch is engaged, the keyboard is enabled for writing into the computer. The normal read function (LED off) is the working condition of the computer.

3.7 WRT (Write)

Depressing this switch will write data into RAM. Data can only be written into RAM when the W/R LED is on.

3.8 DPC (Decrement Program Counter)

Depressing this switch will decrease the program counter one step each time it is actuated, but will not execute the instruction in the data field.

3.9 RST (Reset)

By depressing RST the program counter is set to zero. All outputs are turned off.

3.10 LPC (Load Program Counter)

Depressing LPC is setting the program counter to the address value indicated in the data display. The hexadecimal number to be loaded into the program counter is first keyed in from the hexadecimal keyboard into the data area. Then pressing LPC will move the address entered in the data field, to the address field.

3.11 IPC (Increment Program Counter)

Depressing this switch will increase the program counter one step each time it is actuated, but will not execute the instruction in the data field.

3.12 STP (Step Through Program)

Depressing this switch will step the computer through the program, one step at a time, executing the instructions in the data field.

II. CONTROLS

D. Operator Panel



The STOP button LED's must be on solid before using any of the buttons on the operator panel. The variance buttons will work in conjunction with the operator's panel, program or service panel.

When using any of the button features, and making changes with the variance buttons, SET has to be actuated to store the new information, and most often to exit that feature.

II. CONTROLS

D. Operator Panel - continued

1. TST (Test)

During the automatic program, each die presented to the optical system will be aligned in the best 'X-Y' direction for pickup. When the die is properly aligned and the inspection is good, the LED in the TST switch will illuminate. If the alignment or an acceptable test cannot be achieved, the program will automatically jump to the next die. When the bonder is in the WJP mode or WAJ mode of the operator's panel, depressing TST will cause the computer to attempt to align and inspect the die on the wafer in the front of the machine. If the die is rejected, the pattern generator will leave four squares at the outer corners of the die. Missing die will generate no pattern. If the RWK led is lit, pressing test will cause the rear inspection to attempt to inspect and correct the workholder device position, and dispense epoxy if epoxy is enabled.

2. SLM (Select Monitor)

On the new style program, this function can be used to disable correction of the rear inspection system. This is useful for testing the rear 'X-Y' Table when cycling without product on the indexer. On the older style 8030A programs, there was no function enabled for this button.

3. VID (Video)

When the video pushbutton switch is actuated, a normal picture is displayed on the monitor. It is also used to return the normal video picture when either DVA or DVT is actuated.

4. DVA (Digital Video Align)

Actuating the digital video align button, LED on, will display a light and dark pattern of the die and kerf. This pattern is used by the computer to measure the die and precisely align each die for pickup. What is important, in this view, is to see the edge of the die.

5. DVT (Digital Video Test)

Actuating the digital video test button, LED on, will display a light and dark pattern on the monitor. This pattern if light reflection is used by the computer to inspect the quality of the die in comparison to the die surface condition that was taught to the computer.

1. AAA (Auto Angular Adjust)

This switch activates the automatic angle adjustment subroutine. When the computer cannot do the AAA, the bonder will display error code 23. This feature is only available with older 8030A machines that have not had the conversion to rotating collet installed.

II. CONTROLS

D. Operator Panel – continued

2. RWL (Reelwind)

This button will only function on 8030A's that have a reel to reel indexer installed. This function, RLW with the LED on, allows the reels to be wound or unwound using the up and down, left and right variance buttons. The left and right variance buttons will operate the input reel, and the up and down buttons will operate the output reel.

3. MLU (Multi Die Line Up)

MLU is actuated when multi die matrix placement utilizing a separate 'X-Y' table as the indexer. This only works with 'X-Y' tables that are directly controlled by the EZAG minicomputer and not the newer style PC based 'X-Y' tables. When the MLU LED is on, using the left and right variance buttons will cause the table to move the maximum possible distance in the X direction, and using the up and down variance buttons will cause the table to move to the maximum extents in the Y direction.

4. WMP (wafer mapping)

This feature was never installed in the Foton 8030A's.

5. CNT (Counter)

Depressing the CNT button, will allow the up and down variance buttons to be enabled, to be used to select from the menu the following items, from 1 to 6. After selection of one of the menu items, press set to see those counts. To clear all the counts, see code 6.

Code 1:

Total number of pickups attempted by the pickup arm.

Code 2:

Total number of units bonded.

Code 3:

Number of die rejected by the pattern recognition system.

Code 4 and 5:

Reserved for special customer features.

Code 6:

Selecting 6 in the menu, and holding STOP, when pressing SET will clear counts 1,2,3 back to zero.

II. CONTROLS

D. Operator Panel – continued

6. SEL (Select)

There are several different select mode programs for 8030A's.

For PRE June 18, 1984 bonders. When the SEL LED is on, the display initially shows 0, using the up and down variance buttons select one of the following selections, then press set to select that function.

To exit the routine without executing any function, select 0, then press SET.

Mode

- 0 - Load Leadframe code 0FA0
- 2-6 - Open modes for customer requirements.
- 7 - Load basic machine values (1A6A).
- 8 - Stepper motor adjustment program (1B80).
- 9 - Rotor motor disk adjustment program (1B88).
- 10 - Table initialization, wafer 'X-Y' table to center position.

For machines manufactured after June 18, 1984, but do not have the multi tasking software upgrade, use the following functions.

To exit the routine without executing any function, select 0, then press SET.

Mode

- 0 - Reload of basic machine values (hold stop, and depress set)
- 1 - Load Leadframe code 1
- 2-19 Load alternate leadframe codes if present
- 20 Table initialization, wafer 'X-Y' table to center position
- 21 Stepper motor adjustment program (1B80)
- 22 Rotor motor disk adjustment program (1B88)
- 23 Not used.
- 24 Align actuator ring.
- 25 PTS (Adjust Pattern Size)
- 26 APP (Adjust Pattern Position)
- 27-29 Not Used
- 30 Clear memory in multi die program.

II. CONTROLS

D. Operator Panel – continued

For machines with the multi tasking software, or the Semiequipment.com modifications, use the following features.

To exit the routine without executing any function, select 0, then press SET.

Mode

- 0 Reload of basic machine values (hold stop, and depress set)
- 1 Select subroutine to load leadframe codes. (Can be multiple leadframe codes in submenu.)
- 2 RS232 functions if installed.
- 3-18 Not Used.
- 19 Collet Purge.
- 20 Table initialization, wafer 'X-Y' table to center position
- 21 Stepper motor adjustment program.
- 22 Rotor adjustment program.
- 23 Not Used
- 24 Ring Alignment Program.
- 25 PTS (Adjust Pattern Size)
- 26 APP (Adjust Pattern Position)
- 27 Low/High Speed Teach Jump (0 = Fast, 1 = Slow)
- 28 Not Used
- 29 Not Used
- 30 Not Used
- 31 I/O Test program, use VFW, VBW button to select the input/output, using the VLH, and VRH to set the output on or off, if there is an output available. You have to convert any input select from hexadecimal to decimal to enter the proper select. Example: use the VFW till the display shows 64, press the ALN button on the operator keyboard. The SET LED will turn on when the input is low, and off when the input is high. Pressing the VLH button will turn on the output 64 (hex 0040) which is the LED for the ALN, pressing the VRH will turn the output off. Pressing the SET button will exit the service routine.

II. CONTROLS

D. Operator Panel – continued

7. 13. 14. 15. (Variance buttons)

There are four variance buttons, the two on the left have arrows pointing left and right, and are used to perform any motion in the 'X' direction (bondhead, X-Y table). The other two variance buttons with the arrows pointing up and down are used to perform any motion in the system in the 'Y' direction. (bond head, Y-Y table).

To increase or decrease process adjustments use the up or down variance buttons. All changes made with the variance buttons will show on the DECIMAL display in decimal.

When making data adjustments and the WJP button is flashing, this is indicating that the high-speed change option is available. When using the variance buttons without depressing the flashing WJP button, the count will increment or decrement slowly. When depressing and holding the flashing WJP button, and using any variance button, the count will change quickly.

If a maximum or minimum for any count is reached, the corresponding variance button will turn off, indicating the maximum or minimum has been reached.

The variance buttons, have additional functions, depending on what mode the die bonder is in. If the bonder is in the run mode, and the down variance button is pressed, the wafer table will change rows, and direction. While using the WJP and WAJ buttons, the variance buttons are used to move around the die matrix on the ring or film frame.

16. WMP (Jump)

The WJP button can be used after the computer has been taught the alignment and jump program. When the WJP button LED is on, actuating one of the variance buttons will then move the wafer table one die at a time left, right, up or down depending on the variance button depressed. A short actuation will jump the table one die, holding the variance button down, the table will continue to jump in the direction selected, unless hitting the wafer limit ring. In the case the table limit ring is actuated the table will jump back to the die position before hitting the ring. The WJP LED can be turned off by selection another operation, or depressing the STOP button.

17. WAJ (Wafer Adjust)

The adjust button is used to set the computer in a mode to traverse the table either in 'X' or 'Y' direction. Actuating the correct variance button for the direction desired performs this function. The motor will run with a lower frequency and can be stopped in any position by releasing the variance button. The wafer adjust button is used to position a die in the center of the monitor for the align program, or to move a die to the center of the monitor screen at any time.

II. CONTROLS

D. Operator Panel – continued

18. WBG (Wafer Begin)

Depressing WBG for the first time will move the table in the 'X' direction to the center of travel, and then in the 'Y' direction to place the wafer completely under the optical system to the limit of the wafer diameter control. Depressing the WBG button a second time, will move the table in the "Y" direction until the first row of die are positioned under the optical system and then center the die to the alignment. The wafer begin state is also set, and if RUN is selected, the table will move to the beginning of the row, reverse direction, and start picking up die.

19. WED (Wafer End, Load/Unload Position)

Depressing WED will turn the WED LED on, indicating the WED subroutine has been entered. Then selecting either the up or down variance button will make the wafer traverse to the selected 'Y' limit of the table. Press STOP to exit the WED subroutine.

20. WLU (Wafer Line Up)

Depressing WLU will move the table in the 'Y' direction from one 'Y' direction table limit to the other in a continuous loop. This is used to perform the theta alignment of the wafer in the ring or film frame. Depress STOP to exit the WLU subroutine.

21. RUN

Depressing the run switch will start automatic bonding functions.

22. STOP

The STOP button in the operator's panel has two LED's. It is used to stop the automatic bonding and any other function

Error conditions are displayed on the DECIMAL display in decimal, the STOP LED's will flash. Correcting the problem, then pressing the STOP button will clear the error and or reset the bondhead.

The STOP button is also used in conjunction with the WHC button to reset the workholder. The STOP lights must be flashing to reset the workholder. First depress the stop button and hold while tapping the service ENA (Blue ENA). This will cause the lights to flash. Then depress and hold the STOP button and the WHC button at the same time. This will cause the workholder to reset. Release the buttons as soon as the motors start. Some workholder may require the SET to be depressed also.

II. CONTROLS

E. Program Panel (GREY SWITCHES)

Depressing the gray ENA switch, LED on, enables all the gray key functions on the program pane. EAN can only be actuated when the STOP LED's are on solid. After actuating RESET, the LED light will flash; then press STOP for about one second. The machine then resets and the STOP LED's are on solid. The program keyboard is used to address the computer to adjust bonding parameters, teach die sizes and criteria, and to setup the die pickup and placement positions. All switches in the program keyboard panel have LED's, which when illuminated, indicate that function is engaged for setup, align, readout, or an alternative function is engaged.

Using the variance buttons on the operator panel while the appropriate switch is activated can change all variable information. All final adjustments are stored into the memory by depressing the SET button.

ALIGNMENT KEYS

1. ALN (Align)

When the ALN button is depressed, the computer will automatically measure the die size and count surface reflection light pixels of the die centered in the monitor screen. Before the align button is depressed, the optical zoom should be adjusted so no more than three to five die are showing across the width of the monitor screen. The rows of die vertically are not as important, unless the die height exceeds $\frac{3}{4}$ of the screen area. In which case, the magnification should be reduced.

When the ALIGN program starts, the pattern generator will illuminate four square dots. These dots will move vertically and horizontally along the perimeter of the center die. The die will be measured, centered and the size stored in memory. After the die has been measured the program will inspect and record the die as the reference die quality (98%) of the reference die into memory. After the align program has been accepted by the computer, the auto jump program will be executed, measuring the distance from one die to another in both 'X' and 'Y' direction. Moving from the reference die to the adjacent die up and to the left performs this measurement.

If the adjustments of the Digital Video Align (DVA) or Digital Video Test (DVT) were not properly adjusted before teaching the Align (ALN), the computer may not be able to distinguish the edges, or surface conditions of the die, and will show an error 20, or 21. Depressing the STOP button will clear the error, allowing the proper adjustments and re-teaching of the reference die.

The default auto jump routine uses calculations of the die size, to estimate the distance to the adjacent die for fast teaching of the jump distance. It may be necessary on very small die to require the auto jump program to do this in a step by step fashion. Please reference SEL 27 for setting the bonder to use the fast / slow jump program.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

The jump can be reprogrammed using the JMP button performing the jump teach program. When it is desirable to cycle the bondhead without the wafer table jumping, for setup or troubleshooting; depress the STOP before the jump subroutine is completed will set the jump distance to zero.

2. JMP (Jump)

Jump is automatically initiated with the ALN program, but some times it may be necessary to re-teach the jump when changing wafers, or moving into a bad section of the wafer. Where you desire not to re-teach the die reference, but just the die jump.

Depressing the JMP button will start the process of measuring the distance in 'X' and 'Y' from the reference die to the upper left row and column. This is then stored into memory, and the JMP LED will go out.

The default auto jump routine uses calculations of the die size, to estimate the distance to the adjacent die for fast teaching of the jump distance. It may be necessary on very small die to require the auto jump program to do this in a step by step fashion. Please reference SEL 27 for setting the bonder to use the fast / slow jump program.

3. CAP (Calculate Angular Placement) (Only Used on Old Program)

When angular die placement is used, the angle must be calculated to allow proper alignment function in 'X' and 'Y' direction, while the actual movement is carried out in the respective angle.

Depress CAP, LED on, When the ALN button is actuated, the alignment pattern moves to the extreme left and right side of the screen to achieve maximum accuracy for the angle calculation. After the calculation has been performed, the alignment pattern disappears and the respective data are automatically stored. Error code 0019 will be displayed when the calculation cannot be made.

4. PUR (Pickup Reticle)

When PUR is actuated, LED on, a white cross will be displayed by a pattern generator on the TV monitor screen. By depressing STOP, the PUR LED will go off. This allows use of other buttons for further setup while the pickup reticle remains on the screen. When depressing SET, the PUR LED will also go off, but the alignment pattern (if align has already been performed) will show up on the screen.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

5. ENA (Program Enable)

Program ENA must be actuated, LED on, to enable the setup and process adjustment buttons to be used. Then the variance buttons will function to change parameters, make adjustments and service functions. ENA can only be actuated if the STOP LED's are on solid and service ENA off. After actuating RESET, the LED lights will flash, then press STOP for about 1 second. The machine then carries out the reset and the STOP LED's are on solid.

6. EOW (End of Wafer)

When resetting the machine and depressing EOW, LED on, the display shows '0'. Otherwise the display shows the last value set. The value on the display shows how often the alignment system is allowed to jump past the edge of wafer before the 'X-Y' table changes direction. The number of jumps is adjusted with the up or down variance button.

7. ELO (Eliminate Overrange)

When the ELO LED is off, and the alignment program is in the run mode, the computer looks for any two sides of the die and aligns to it. IT will accept a die that is larger than the one used in align program. The die is 'overrange'. When the LED is on, the overrange acceptance is eliminated and the pattern recognition will reject any die that is larger than the original taught die size.

8. NOR (Number of Retests)

With LED on, the display shows number of retests that are performed, if the die is rejected by the computer. With the variance buttons 0-5, retests can be programmed. By depressing SET, the number of desired retests is stored.

9. SRI (Surface Reference Indicate)

The die surface is divided into three fields for inspection. These three fields can be adjusted to inspect each die between 90 and 100% of the original surface condition.

Field 1 is the four corner areas of the die. Field 2 is the portion along the four edges of the die connecting the four corner fields. Field 3 is the remaining center position of the die.

These three fields are inspected on each die. When the computer has a borderline rejection, it will re-inspect that die the number of programmed times before rejecting it.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

These functions are comprised in the SRO subroutine and settings are carried out by depressing the variance buttons for number 1,2 or 3.

1 = SR1

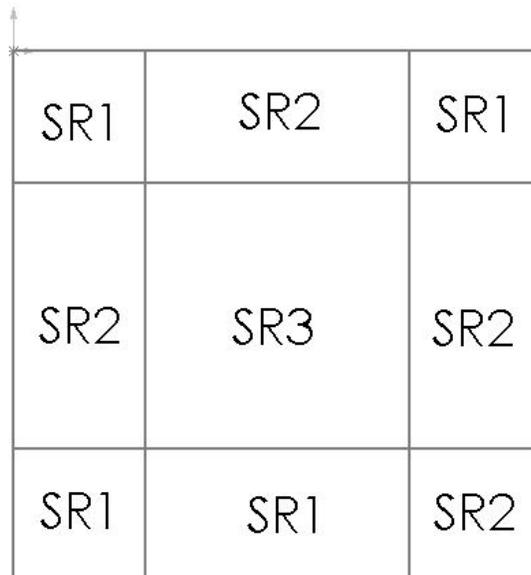
Actuating SR1, after the original die has been taught to the computer, displays 98% of the surface light count of all four corners as seen in the original die. The sensitivity for Field 1 can be adjusted from 90 to 100% by using the variance buttons. Store the desired sensitivity by depressing SET.

2 = SR2

Actuating SR2, LED on, will display 98% of the surface light count seen on all four edges of the original die. Sensitivity for the four edges of the die can be adjusted between 90 and 100% by using the variance buttons. The desired sensitivity is stored in memory by depressing SET.

3 = SR3

Actuating SR3 displays 98% of the light count that was recorded from the center of the original die. Sensitivity can be adjusted from 90-100% of the original count with variance buttons. The desired sensitivity is stored in memory by depressing SET. When actuating SET, the display shows the respective value and sensitivity is stored. Depressing SET again means leaving the selection loop.



SR1	SR2	SR1
SR2	SR3	SR2
SR1	SR1	SR2

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

Special Operation Functions

10. WCI (Wafer Change Inhibit)

When the WCI LED is on, automatic wafer change is inhibited. When LED is off, wafers will be changed automatically.

11. EMT (empty)

This switch is used to finish bonding a strip without inserting a new strip from the input magazine. The EMT program is used to terminate die bonding for any reason when it is necessary to empty the index track. These are three different ways of doing it:

11.1 When the last strip in the input elevator is loaded, the elevator will index down one pitch at a time searching for a strip. After the programmed number of attempts to find a strip, the machine will finish bonding the strip and the index track will be emptied automatically.

11.2 By depressing the STOP button, and then the EMT button, the EMT LED will turn on. Depress RUN, the strip in the workholder will be bonded and the track emptied automatically leaving the STOP LED flashing and EMT LED on solid.

11.3 Finally, the operator can interrupt searching by depressing STOP and EMT LED will turn on automatically and no further searching will take place. Then depress RUN to empty the track. After the track is emptied, STOP will flash and EMT LED is on solid.

12. EPI (Epoxy/Preform Inhibit)

When LED is on, the epoxy dispenser or preformer, whichever is mounted on the bonder, is inhibited from operation.

13. PFL (Preform Length)

This button can only be actuated if preformer is attached to the machine. LED is switched on or off by the hardware depending on whether the machine is equipped with a preformer or an epoxy system. If PFL is actuated, the display shows the programmed preform length. By depressing the variance buttons, the length can be changed. The new length is then stored by depressing SET.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

DELAYS

14. PUD (Pickup Delay)

When PUD is actuated, LED on, the data display will show that the pickup arm will remain in the die pickup position after the injection. The computer is programmed to start with 0050 (50 milliseconds) each time the PROM data is loaded. Pickup delay is read 1 ms increments. Pickup delay is adjusted by depressing the PUD button and then changing the time by using the variance button. The maximum delay time is two seconds. The up and down variance buttons increase or decrease the pickup time.

Programs written after October 1984 will have three different pickup delays available:

1. Will be when pickup arm is full down for pickup, but just before the ejector cycles.
2. Will be when pickup arm is full down and ejector has cycled to the full up position.
3. Will change the ejector motor upward movement from ramp speed to frequency 2 speed.

See ADJUSTMENT section 7A for the adjustment procedure.

When the variance button with the left arrow has LED illuminated, the count time will change slowly. By depressing the variance button with the right arrow, the count will change rapidly.

15. TDD (Touch Down Delay)

LED on, the display shows touch down delay in ms. This is either a delay before the scrub when a scrub action is programmed, or just a touch down delay when scrub cycles are set zero. By depressing SET, the TDD LED goes off and the delay time is stored.

16. ASD (After Scrub Delay)

This display time takes place after the scrub motion. With the LED on, delay time is increased or decreased with the variance buttons. Delay time is in ms.

17. PFD (Preform Delay)

When Led is on, the display shows preform delay in ms; the time that the preformer presses the preform ribbon on the unit. Delay time is changed with the variance buttons and stored by depressing SET.

MULTI DIE OPERATION

18. MDP (Multi Die Program)

When the MPD LED is on the multi die program is called up. When the LED is off the regular single die program is used.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

19. FPP (free Programmable Position)

When FPP is activated, LED on, the bond head goes to HBP. The pickup arm remains 20 motor steps above normal HBP position. With the variance buttons move the bond head to the desired location. Depress SET. The display will immediately show the number of the bond position and then back to the motor step count. There are 192 available bond positions. If an attempt to program more than 192 positions is made error code 3333 is displayed.

To get out of FPP subroutine depress STOP, the head will initialize.

20. SMD (Select Mode)

When SMD is activated the select mode for multi die categories is called up. With the variance buttons die categories from 0-60 can be called up for programming and bonding. Use SET to activate the desired mode and STOP to leave the SMD subroutine.

21. SLP (Select Position)

The SLP button is used to select programmed bond positions and assign them to a mode. To do this:

-Select the die category to be bonded from the select mode SMD.

- SLP
- With variance buttons call up the desired position data display
- SET
- Continue to call up as many bond positions as required and SET each one
- Depress STOP to get out of this subroutine

22. DID (Die Distance)

This switch is used only for multi chip matrix of waffle pack. When LED is on, the distance from one die to the other in 'X' and 'Y' position can be programmed. The programmed distance is adjusted by actuating the variance buttons; left/right is for 'X' direction and up/down is for 'Y' direction. The display shows the distance that is stored. This switch can only be used in conjunction with CAR.

23. DIN (Die Number)

The switch is used only for multi chip matrix of waffle pack. When LED is on. Number of die in the 'X' and 'Y' direction can be programmed by actuating the up and down variance buttons for 'Y' direction and is left or right variance buttons for the 'X' direction. The display shows the number of die that is stored. This switch can only be used in conjunction with CAR.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

24. SPC (Single Position Correction)

SPC is for single die bond position correction. To make a correction:

- Call up the mode that the position to be corrected is in

Then depress SPC. The bond head moves to the first bond position of that mode.

Depress SET again and the bond head returns to home position. Depress SPC and the bond head moves to the second programmed position. Continue until the position to be corrected shows on data display.

- Move the bond head to the correct bond position
- SET will store the corrected address, continue correcting as many bond positions as needed, SET each one
- Depress STOP to get out of this subroutine

25. MPC (Matrix Position Correction)

MPC is used primarily for a shift problem or when one tape is used to program more than one bonder. To use the matrix position correction:

- Call up the mode to be corrected
- MPC, the head will go to HBP and the first bond position in that mode
- With the variance buttons correct the bond position
- SET
- STOP

When the entire matrix is corrected it does not change the original address. The change remains as long as the mode is activated for bonding. Whenever a different mode is selected, the correction is dropped. The next time the mode is called up the same correction must be made again.

26. DIS (Die Select)

Not Programmed

27. CAR (carrier)

When the CAR LED is on, the carrier placement program is activated. The die placement matrix is programmed with DIS for die size and DIN for number of die to be placed in 'X' and 'Y'. When the CAR LED is off, the matrix placement program is no longer activated.

28. RWK (Rework)

At the 8010 this button is used for finding the next position on the pick and place table after the bonder is reset.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

29. POS (Position SET)

Not Programmed

Bond Parameters

30. PUH (Pickup Height)

The PUH button can only be enabled when either HPP or HBP is activated. This button enables the 'Z' motor height subroutine, so the height of the pickup arm in either the pickup or die bond position can be adjusted. The 'Z' motor steps are displayed. The computer is programmed for 360 motor steps.

The height can be increased or decreased by using the up or down variance buttons. The lower limit of travel is 400 motor steps. When the proper height of the pickup arm is achieved, store it in memory by depressing the SET button. When the SET button is depressed, the 'X' or 'Y' direction. If further 'X' or 'Y' adjustment is necessary, depress SET and then actuate HPP or HBP for further adjustments in the 'X' or 'Y' direction.

NOTE: In HBP the height adjustment is for setup purpose only (adjustment of die collet should be done with 360 steps to allow over travel for bonding pressure. In actual RUN mode, the pickup motor always goes to 400 motor steps.

31. HPP (Head Pickup Position)

When HPP is actuated, LED on, the bonding head rotates to the die pickup position and displays the motor step position in the 'X' direction on the data display. The computer is programmed to start with 2000 steps. The bonding head can be adjusted either left or right with the variance buttons.

Depressing the up or down variance buttons one time will turn the LED on the right or left variance buttons off and the variance button for the up or down will illuminate.

The computer is programmed to start with 2000 steps. By depressing the up or down buttons the second time, the head can be adjusted in the 'Y' direction. The 'Y' direction motor steps will appear on the data display. To store the desired head location in memory and return the bond head to reset position, depress SET.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

32. HBP (Head Bond Position)

When HBP is actuated, LED on, the bonding head will move to the die bond position and display the 'X' motor steps on the data display. The correct position for the die placement can now be adjusted. Depress the variance buttons for either right or left movement on the axis until the desired location is reached. Then depress the variance button up or down once to go into the 'Y' motor step position, then depress the second time to move the bonding head to the desired location, store the new motor steps in memory by depressing SET. The collet height is adjusted in HBP. After depressing PUH, the display must show 360 for proper adjustment. In actual RUN mode, the bond arm will always be lowered to the full down position (400 motor steps).

33. ABP (Adjust Bond Position)

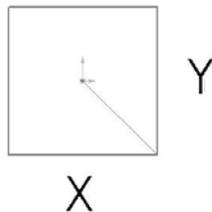
When the ABP LED is on, the same adjustment can be made as in HBP, except the pickup arm does not go to bond position; it remains in home position. This allows adjusting the bond position even when there is an epoxy or preform unit in bond position.

34. SBM (Scrub Mode)

Available Scrub Modes:

0 = When '0' scrub mode is selected there will be no SBA or SBC and no delay time, only bond time delays are available with SMB '0'.

1 = Normal rectangular, 'X' only or 'Y' only scrub mode.

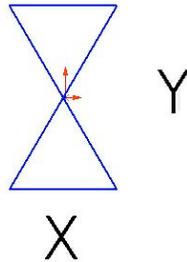


There is a 40 ms delay in the first scrub cycle, 10ms at the first corner and at end of scrub cycle, and 5ms at each corner for each cycle after the first cycle.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

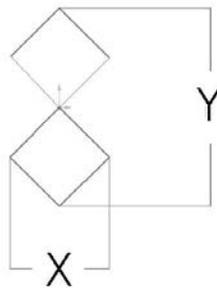
2 = Scrub mode in an hourglass.



There is 50 ms delay in the first cycle, 10ms at each corner and 10ms at end of the cycle, 5ms per corner for each additional cycle.

3 = Scrub mode

There is a 70 ms delay in the first cycle, 10 ms at each corner and 10 ms at the end of the cycle, 5 ms per corner fore additional cycle.



34.1 Scrub modes for bonder programmed before June 18, 1984.

When the SBM led is off, scrub mode 1 is in effect. When SBM LED is on, scrub mode 3 is in effect.

To program no scrub, no delays, set SBC, SAX and SAY to '0'.

II. CONTROLS

E. Program Panel (GREY SWITCHES) continued

34.2 All three scrub modes are available on bonders programmed after June 18, 1984.

- 1) Actuate program ENA, LED on
- 2) Actuate SBM, LED on
- 3) With up/down variance buttons select desired scrub mode
- 4) Actuate SET, the SBM LED will go off
- 5) Actuate program ENA, LED off

35. SBC (Scrub Cycles)

When SBC is actuated, LED on, the number of scrub cycles contained in memory will appear on the data display. The number indicates scrub cycles, not time.

The computer is programmed for 6 cycles. The number of cycles can be adjusted by using the variance buttons. When the desired number of cycles is obtained, it is stored in memory by depressing the SET button.

36. SBA (Scrub Amplitude)

Scrub amplitude is in two motor step increments for scrub mode 1, 2 and 4 scrub increments for scrub mode 3. Scrub mode 3 is programmed to start with SAX-12 steps and SAY-24 steps.

When SBA is actuated, LED on, the variance buttons will illuminate. The up/down buttons are for 'Y' direction and both be illuminated when SBA is first actuated. The WJP LED will be flashing. When the WJP button is actuated with the up or down variance button, motor step count will change rapidly; when WJP is released, the count will change slower.

By depressing the left and right variance buttons at the same time, the program will change for 'X' tavel adjustment with both left and right LED's on. The WJP button controls fast and slow count for the 'X' direction in the same way as it did for the 'Y' direction. Depressing SET stores the 'X' and 'Y' motor steps and turns off the SBA LED.

37. SET (Set)

The SET button is used to store in memory all final adjustments to the computer. When in the HPP and HBP, the SET button returns the bonding head to its home position and stores the 'X', 'Y' and 'Z' motor step counts in memory. On future programs workholder error codes will flash the SET button, not the WHC button. Clear the problem and depress SET to resume bonding.

II. CONTROLS

F. Service Panel (BLUE Switches)

These 17 keys are used to service, troubleshoot, and simulate various functions. Service ENA (blue) must be turned on to actuate these switches. The computer must be in run mode, program ENA (gray) turned off and the STOP LED's on solid before service ENA can be enabled.

WAFER CHANGE

1. WCC (Wafer Change Cycle)

WCC can only be actuated when the expander table is in WED position, because this is the only position where film frames can be loaded/unloaded from expander table.

Each actuation of WCC moves the wafer changer one step at a time through its complete cycle. Keeping WCC depressed allows the cycle to operate in a continuous movement. By releasing WCC at any time, the wafer changer will stop at the next position of the cycle. Depress STOP to exit the WCC subroutine, the wafer changer automatically goes back to its home position.

The interrupted mode allows adjustment of the wafer changer system as it proceeds through the cycle. A complete cycle consists of the following steps:

- 1.1** The expander table moves to WED position and wafer handler initializes
- 1.2** Expander table opens
- 1.3** Wafer changer arm moves to frame load/unload position (B)
- 1.4** Arm moves to load/unload position (B)
- 1.5** Arm moves the clamp into the expander table (C)
- 1.6** Clamp closes and arm pulls film frame out of expander table (D)
- 1.7** Arm moves clamp to intermediate height (E)
- 1.8** Arm in 'X' direction (F)
- 1.9** Arm in 'Z' direction (A)
- 1.10** Clamp rotates 90° from horizontal to vertical position
- 1.11** Arm moves at frame travel height to the first or memorized magazine slot (G)
- 1.12** Arm moves down inserting frame into the magazine (H)
- 1.13** Clamp opens and moves up to search height (I)
- 1.14** Clamp moves at search height to next slot (J)
- 1.15** Clamp moves down to frame pickup height (H)
- 1.16** Clamp moves to next slot. If slot is empty the arm continues searching until a frame actuates opto sensor OOOE
- 1.17** Clamp closes, arm pulls frame out of magazine and moves up to frame travel height (G)
- 1.18** Arm initializes in 'X' direction (A)
- 1.19** Clamp rotates 90° from vertical to horizontal position
- 1.20** Arm moves down to intermediate height (F)

II. CONTROLS

F. Service Panel (BLUE Switches)

- 1.21** Arm moves at intermediate height to (E)
- 1.22** Arm moves down to load/unload position (D)
- 1.23** Arm moves to clamp enter position (B)
- 1.24** Arm moves to expander position (C)
- 1.25** Clamp opens and moves back to load/unload position (B)
- 1.26** Arm moves up to home position (A)
- 1.27** Expander table closes clamping and expanding wafer

INSERT DRAWING HERE

II. CONTROLS

F. Service Panel (BLUE Switches)

When starting the process with an empty expander table, 1.6 to 1.15 are not applicable. Coming from the expander position the arm initializes in 'X' direction, moves up to search travel height, the clamp rotates 90° from horizontal to vertical position, moves at search travel height to first magazine first slot, moves down to frame pickup height and continues 1.16.

2. WCL (Wafer Clamp)

The wafer clamp can only be actuated when the expander table is in the WED position. Depressing WCL allows opening and closing of the wafer clamp mechanism.

LED off, the expander table is open

LED on, the expander table is closed to the clamping position

3. WEX (Wafer Expand)

WEX can only be actuated when the expander table is in WED position. Depress WEX, the wafer mylar is expanded to the programmed number of motor steps.

LED on, mylar is expanded

LED off, the wafer is clamped, not expanded

When WEX is on, the display shows number of expansion steps from clamp position to the selected rate of expansion. The program starts with '0' motor steps, 800 steps is maximum expansion.

By depressing the up variance button, expansion increases. By depressing the down variance button, expansion decreases.

Depress SET to store the desired expansion motor steps.

4. AWA (Adjust Wafer Angle)

When the AWA LED is on, the wafer can be rotationally adjusted with the variance buttons. The right variance button rotates the wafer matrix clockwise. The left variance button rotates the wafer matrix counterclockwise. Depress SET when wafer is at desired angle.

II. CONTROLS

F. Service Panel (BLUE Switches)

WORKHOLDER + MACHINE

5. WHC (Workholder Cycle)

This button is used to manually index leadframes through the index track. When the track is empty, depressing this button will insert a strip from the input magazine into the track and run as far as the first locating pin. Then, each depression of the WCC button will cycle the workholder one index stop. When WHC is held actuated, indexing is continuous until WHC is released.

When the WHC button LED is on and bonder is in RUN mode, the computer disregards leadframe sensors, so the bonder can operate without leadframes.

To reset the elevators, the STOP button LED's must be flashing. Depressing the STOP and WHC buttons together and hold them actuated until the elevator motors start running. Both elevators will drive into start position, resetting the elevators and setting the elevator and index unit counters to zero.

To turn WHC LED off, depress WHC and SET at the same time.

There are 3 subroutines that can be accessed with the WHC button:

- 0001 Manual indexing and running in the auto mode without leadframes or elevator input/output error codes for setup or troubleshooting.
- 0002 To manually jog the elevator(s) down one magazine slot at a time.
- 0003 Automatic indexing with no bonding.

To access these subroutines:

- Stop LED's must be on solid
- Actuate service ENA, LED on
- With the up variance button select the desired subroutine, 0001, 2 or 3.
- Actuate SET, the display turns off and that subroutine is activated.

5.1 Subroutine 0001 (Manual Indexing)

When this subroutine is activated, depressing WHC will insert a strip or boat into the index track from the input elevator. Each time the WHC button is momentarily actuated, the workholder will complete one index step cycle. When the WHC button is held actuated, the workholder will continue to cycle as if in the auto run mode.

When this subroutine is activated and the bonder is placed in the RUN mode, the computer disregards the leadframe input/output and Skan-A-Matic sensors so the workholder can be operated without leadframes. However, a 103 or 104 error can be simulated by blocking the appropriate Skan-A-Matic.

II. CONTROLS

F. Service Panel (BLUE Switches)

5.2 Subroutine 0002 (Manual Elevator Jog)

When this subroutine is activated, each actuation of the WHC button will step the elevator down one magazine pitch at a time. Manual elevator jog is used to setup, adjust or troubleshoot the elevators.

5.3 Subroutine 0003 (Auto Index)

When WHC subroutine 0003, auto index is activated and the RUN button actuated, the workholder cycles without the alignment system or the bondhead working. This subroutine is basically to reflow some types of product.

6. ILP (Inhibit Leadframe Position)

When ILP is actuated, LED on, power will be turned off to all index stepping motors and solenoids. This allows easy maintenance, troubleshooting, adjusting strip position or removing jammed strips.

7. IXD (Index Delay)

Various index delays can be adjusted by depressing IXD and using the variance button.

Depressing the variance buttons after entering IXD allows selection of modes 1 thru 5. Depressing SET stores the specific mode and the delay time is displayed in 1 ms increments. The delay time can be changed with the variance buttons. Actuating WJP with the variance buttons will give fast count change. Depressing SET stores the desired delay time and switches back to the display of delay modes.

The following delay times can be adjusted:

- | | |
|---------|--|
| Delay 1 | Index cycle delay = delay after each index cycle, either in the automatic feed-in mode or the manual mode with WHC |
| Delay 2 | Delay to lower heater block automatically when the machine operation is stopped. |
| Delay 3 | Delay to heat up the substrate again after the heater block was lowered a short time. |
| Delay 4 | Delay to heat up the substrate again after the heater block was lowered a long time. |
| Delay 5 | The time that the heater block stays in the down position determines whether delay 3 or 4 are selected. |

II. CONTROLS

F. Service Panel (BLUE Switches)

8. DBT (Delay Before Touchdown)

The delay before touchdown is to allow mechanical vibration of the rotor and pickup arm to stop before placing the die. When the DBT LED is on, the delay time is adjusted with the up or down variance button. Time is in 1 ms increments. The desired delay time is placed into memory by depressing SET.

9. EPC (Epoxy Preform Cycle)

Actuating EPC will cycle either the epoxy dispenser or the preformer one complete cycle. This facilitates setup, adjustment and troubleshooting, without cycling the indexer. When the EPC LED is turned on and the preformer is cycled by the EPC, WHC or RUN button, all preform check sensors are disabled and will not display an error code.

10. EJT (Ejector)

This switch is to manually cycle the ejector pin. It is used for troubleshooting, adjusting ejector pin height, or setting the ejector pin to the center of the pickup reticle.

When LED is on, the ejector motor has rotated 180° placing the ejector pin in full up position. Never move the wafer ring while the EJT LED is on; it will break the ejector pin. Depressing the EJT button, LED off, will then place the pin in the full down position.

EJT can be operated by actuating either services ENA or program ENA. The EJT is actuated with HPP, LED on, the pickup arm is in full down pickup position. During this operation, both ejector and pickup arm vacuum will be on, and the ejecting operation ejector pin height can be observed.

11. PUI (Pickup Inhibit)

To cycle the bonder without picking up the die, depress service ENA and PUI, LED on. Turn ENA off, leaving the PUI LED on. In this mode the die bonder will serve all other functions of the program except picking up a die. The ejector motor and collet vacuum will not turn on.

12. ECC (Eliminate Collet Check)

When the ECC LED is on, the plugged collet check is eliminated. There will be no 0006 error codes.

13. PID (Pickup Inked Die)

When the PID LED is on, the bonder will pickup only inked die in the run mode. The SR3 area is inverted. SR1 and SR2 perform their normal functions, thus chipped dies are not picked up.

II. CONTROLS

F. Service Panel (BLUE Switches)

14. HDC (Holddown Clamp)

When the HDC LED is off, the holddown clamp remains in the raised position while manually indexing or in the run mode. With the HDC LED on, the holddown clamp cycles normally in the manual or automatic run modes.

15. IMD (Interrupt Mode)

The interrupt mode is used for checking, setting up or troubleshooting the die bonder. It will momentarily stop the bond head at the critical position, which are:

- Pickup arm over wafer
- Pickup arm lowered for pickup
- Ejector motor rotated 180° pin full up
- Pickup arm in die bond position
- Pickup arm full up over strip
- Pickup arm in rest position

The bond head will automatically stop in each of these positions for approximately one second for observation. If it is desired to stop at one of these positions, depressing the IMD button can stop the cycle. By depressing STOP and IMD together, the bonder head will finish the cycle with normal speed.

16. DID (Data Read In/Out)

With DID LED on, it is possible to select wither '0' or '1' mode.

When SET is actuated in mode '0' data is read in.

When SET is actuated in mode '1' data is read out.

17. ENA (Enable, Service)

This button enables the service keyboard. The LED must be on before any of the other service buttons can be actuated. Once the desired buttons are depressed, ENA must be turned off so the normal cycle can be run, inhibiting the function indicated by the key that is actuated. To turn off any service LED that has been actuated, ENA must be turned off, and turned on, which will turn off the actuated switch. Then again turn ENA off.

II. CONTROLS

G. Additional Key Functions

1. Variance Buttons

1.1 In motor PCB adjustment program 1B80

Left Enables frequency 1 adjustment

Right Enables frequency 2 adjustment

Up Enables ramp adjustment

Down Enables driver PCB current adjustment

1.2 WJP

Variance button with AWA

Right Rotates the expander table clockwise

Left Rotates the expander table counterclockwise

1.3 WJP

The WJP Led flashed when process adjustments PFL, PUD, TDD< ASD, PFD, PUH, HPP, HDP, ABP, SBA, IXD and DBT are called up. Actuating WJP and the variance button give a fast count change, releasing the WJP returns to a slow count change.

II. CONTROLS

H. Power Circuit Breakers

The power circuit breakers are located in the front center panel of the bonder, between the electronic drawers.

1. Main Power

This 32-amp circuit breaker controls the power supply to the bonder. It is to be turned on first when powering up and off last when shutting down the die bonder.

2. Control

This 6-amp circuit breaker turns power on or off to the power supplies which provide all the power to the PCB's and operating controls. It must be turned on after the main power supply is turned on, and must be turned off after the motor power is turned off.

3. Motor

This 6 amp circuit breaker turns power on or off to the stepping motor 70V power supplies. The motor circuit breaker must be turned on after the control power is turned off.

II. CONTROLS

H. Power Circuit Breakers - Continued

4. Heater

This 16-amp circuit breaker provides power to temperature control units and TRIAC's which regulate the power to the heating elements. Then main power switch must be on to supply power to the heater circuit breaker.

5. Temperature Control System

5.1 PCB ECS 920-0

This printed circuit board contains the +/- 12V supply for the ECS 920-0, power to the 220V N relay. The relay located in the temp control chassis, which maintains power to the heating elements and an input signal to the computer, which stops bonding operation if there is a power outage or a runaway control.

5.2 PCBV ECS 921-0

This PCB contains the 615-5M TRIAC and electronic control system for two heating elements. Each control circuit has a DIL switch; HC1 for one circuit and HC2 for the other. Each DIL switch contains two toggle switches, C1 and C2. Switch C1 positions HC1 and HC2 turn the heater control circuit output to the computer on. When only one heating element is used, the other circuit C1 toggle switch must be in the '1' position. Example, when an element is connected to L1 (24) and L2 (26) is not used, toggle switch C1, HC2 must be in position 1.

Switch C2 is the bonder operation turn off delay when there is a power control problem. Position T1 will turn the bonder off in 90-110 seconds; T2 in 180-220 seconds.

NOTE:

When first starting up a bonder, it is best to bring the heater temperature in steps of 100°C initial heatup time requires a constant draw of current longer than switch C2 is set at (T1 or T2), the circuit will consider the long current draw as a runaway controller and signal the computer to turn off bonder operation.

II. CONTROLS

I. Temperature Control System

The temperature controllers are mounted in the front panel of the right electronic drawer. One to four controllers can be used as product requires.

1. Heater 1

This is the preform temperature control and is used to maintain the desired temperature at the preform station. The temperature is set by the adjustment knob for desired process temperature and is electronically controlled.

2. Heater 2

This is the bond temperature control and is used to maintain the desired temperature for die bonding. One, two or more zones are used depending on the heater block in the index station. The temperature is set by the adjustment knob for the desired process temperature and is electronically controlled.

3. Heater 3 and 4

These temperature controllers are used for additional profile control or a cool down zone.

III. MACHINE ASSEMBLIES

A. Video System and Optics

1. Video System

There are two video systems. The first is the wafer system. It is the optics over the wafer matrix and the left monitor. The second optical system is optional. The camera and optics are mounted over the workholder and displayed on the right monitor. This system can be used for visual inspection, automatic postbond inspection or precise alignment of the die to the package. Both monitors operate and are adjusted the same way. However, the second optical system has its own electronics; 6021 or 6025 for visual inspection or the computer controlled system. The optional postbond computer is installed between the two electronic drawers.

The wafer video system consists of a power supply, monitor, camera, optical system and a set of PC boards. All of these are contained in the control console and left hand electronics drawer. The wafer video system precisely aligns die to the PUR with the 'X-Y' table and the computer inspects the digitized signals.

The die presentation station is computer controlled through the wafer video optics. The computer controls alignment and inspection of the die through light pixel count reflections. There are three patterns generated by the mark generator PCB, an reticle pattern for aligning the die ejector, four square dots for the alignment of the chip, and an acceptance pattern, which shows the inside of the die perimeter when the die has been inspected and accepted.

The PUR (Pickup Reticle) is a white cross on the monitor screen. This reticle will appear by pressing the program ENA and the PUR button. The PUR is used to align the ejector pin and the collet to the optical center of the video system. The ejector pin is manually adjusted to the center of the crosshair. The collet is aligned to the pickup reticle in the HPP position with:

- 1) Coarse positioning by mounting bolts of the bond head.
- 2) The 'X-Y' variance buttons. The bonding head must be adjusted so the pickup reticle is in the exact center of the collet impression.

The second pattern consists of four small square patterns which appear on the monitor screen and are seen during align, and automatically theta alignment. The optics must first be adjusted to the display no more than three die across the width of the screen. When the align button is depressed,, these four patterns will follow the edges of the center die and the computer records the size of the die as well as the surface conditions. After this process the die will be centered exactly to the PUR and the acceptance pattern will appear in the die.

III. MACHINE ASSEMBLIES

Video System and Optics - continued

The third pattern consists of a band of white dots just inside the perimeter of the die. This indicates that the computer has aligned, inspected and accepted the die as a good die. This also indicates the computer has counted and recorded the light pixel count for each of the three areas, and placed in ram, the acceptance levels for these areas, which is 98% of the light count recorded for the respective areas. This value is used to determine the acceptance levels of the corners, sides, and middle of future die inspections.

The inspection program consists of three fields. The four corners are field1 (SR1). The area along the edges of the die between the corners is considered field 2 (SR2) and shows up as white dots when the die is accepted. Field 3 (SR3) is the remaining area in the center portion of the die, surrounded by the SR1, SR2 fields.

The sensitivity of these fields is computer controlled. 98% of the taught good die will be recorded in RAM. Each field can be called up and individually adjusted from 90% to 100% of the taught values. Depressing Program ENA, then SRI, select the desired field, 1,2 or 3. Then press set. This display will then show the current acceptance value, and the variance buttons can be used to alter the acceptance value. Depressing SET again, will store the value.

After the die inspection has been completed, the jump is automatically performed. As the die was measured for the initial acceptance values, this pixel to motor step value was also calculated for performing the Jump Teach Routine. After the align program is completed, it automatically makes the calculated jump, centers the die, makes corrections to the calculated jump and jumps back to the original die. It checks the jump distance and makes another correction if necessary. The new jump moves the die from one column to the left and up one row. Actuating the jump button can still perform a jump program. In addition due to varying die sizes, there is fast jumps teach, and a slow jump teach, please reference the SEL function 27.

There may be times that it is desired that the wafer does not move through the wafer matrix, such as test cycling the bonder. To stop the auto jump, press JMP, and press stop before the jump is complete.

2. Camera

A video camera attached to the optics is used for viewing the wafer or the bonded units. The camera is attached to the optical system and aligned on the machine. There are three set screws, 120 degrees apart that secure the camera to the optics. These screws are also used of align the centerline of the camera optics to the centerline of the zoom optics.

III. MACHINE ASSEMBLIES

Video System and Optics – continued

3. Optics

The magnification of the zoom optical system must be capable of displaying three die across the face of the monitor screen. The optical lens has a 1:5 ratio and a zoom capability from 12 to 60 power. For different magnification power, an adapter lens is placed between the camera and optical assembly to either increase or decrease magnification.

At present there are four adapters available. A .5X or half power lens for large die, a 2X and 3X for small die and an adapter ring with no lens, which gives a 1:1 ratio.

On older machines without a theta collet, the optical assembly can be adjusted from +/- 45 degrees for angular die placement.

Focusing is accomplished by rotating the focus bold on the optical 'Z' slide

4. Illumination

4.1 Reflective

The reflective illumination system is secured to the bottom of the optical assembly with a clamping bolt. This housing contains a beamsplitter lens, a bulb, a focus adjustment bot and three filament alignment bolts. The cord plugs into a socket in front of the right console support arm. Light intensity is controlled with the LIGHT 2, 10-turn potentiometer.

4.2 Neon

When a darkfield neon light is required, it is bolted to the bottom of the reflective illumination housing. It is turned on and off with the LIGHT switch.

4.3 Fiber Optics

When darkfield oblique lighting is required, the fiber optics tube is secured to the reflective housing with a jointed arm so that the angle of the fiber optic tip can be adjusted to the wafer as required by the optical/video system. The intensity is controlled by the LIGHT1, 10-turn potentiometer.

III. MACHINE ASSEMBLIES

Die Presentation System

The die presentation system consists of the 'X-Y' table which moves the die matrix under the optical system, the ringholder or expander table that holds the die matrix, and the die ejector station which lifts the individual die to the collet.

1. 'X-Y' Table

An 'X-Y' table moves the ringholder under the optical system and is computer controlled with stepping motors. It aligns the die correctly for pickup by the collet. The table is mounted in the front center cavity of the desk top casting.

1.1 Stepping Motors

There are two complete slide assemblies. The 'X-Y' table. They are both computer controlled and mounted internally in the 'X-Y' table casting. Allowing greater maneuverability in a small area. A timing belt from each motor pulley drives the respective leadscrew. The leadscrews have a .100 inch pitch, the motors have 800 steps per revolution. The movements of the 'X-Y' table, is 0.003175 mm per stop or 0.000125 inch per step.

1.2 'X-Y' Slides

There are two complete slide assemblies. The "X" slide for left and right movement and the "Y" slide for front and back movements. Linear caged roller bearings in the slides with gib adjustments maintain the high accuracy movements. A half nut follower system that is spring loaded against a square cut threaded leadscrews for movements.

1.3 Travel Limit Ring/Limit Switch Ring.

The 'X-Y' table limits can be varied to run 3, 4, 5 or 6" wafers. Table travel limits are controlled by the travel limit rings of different sizes which correspond to wafer sizes.

The limit switch ring contains eight travel limit switches and eight opto sensors. The switches and sensors are positioned every 45 degrees starting with a position dead center to the front. There is a 'C' shaped actuator ring that floats inside the limit switch ring.

The actuator ring is positioned by eight special built viler type bolts. These bolts have spring-loaded plungers in them. There is one bolt threaded through the circumference of the limit switch ring by each opto sensor and microswitch. These bolts are adjusted to hold the actuator ring concentric with the opto sensors. There is just enough play between the spring-loaded plunger tip and the actuator ring that the ring can rotate freely. The actuator ring itself must be perfectly round, it must not actuate any opto sensor while being rotated. Once the travel limit ring forces the actuator ring into a sensor and the computer reverses direction and drives the table away from the limit, the spring-loaded plungers push the actuator ring out of the opto sensor.

III. MACHINE ASSEMBLIES

Die Presentation System

To be continued

- A. Video System and Optics
- B. Die Presentation System
- C. Die Ejector
- D. Bonding Head
- E. Epoxy Dispenser
- F. Preform Station
- G. Automatic Wafer Handler
- H. Expander Table
- I. Pneumatics
- J. Leadframe Type Workholders
- K. Boat Workholders
- L. TO-220 Workholders
- M. Reel to Reel Workholders

ADJUSTMENTS

- A. Process Adjustments
- B. Optical Adjustments
- C. Bond Head Adjustment
- D. Die Ejector
- E. 'X-Y' Table
- F. Epoxy Station
- G. Preformer Adjustments
- H. Expander Table
- I. Leadframe Type Workholder Adjustments
- J. Boat Type Workholders (C-DIP)
- K. TO-220 Workholders
- L. Electronic PCB Adjustments
- M. Wafer Handler Adjustments

OPERATING PROCEDURES

- A. Startup
- B. Load and Align Wafer
- C. Load Elevators
- D. Process Adjustments
- E. Production Operation
- F. Empty the Index Track
- G. Standby
- H. Shutdown
- I. Multi-die Program
- J. Drive Motors off 'X-Y' Limit Switches
- K. Drive Motors off Limit Switches After Reset
- L. Load Preformer
- M. Load Wafer handler Magazines

P.M. & OVERHAUL

- A. P.M. Schedule
- B. Wafer 'X-Y' Table
- C. Bond Head Assembly
- D. Remove Workholder
- E. Remove Die Ejector
- F. Remove Optics
- G. Change Heater Elements
- H. Subassembly Installation & Check List
- I. Subassembly Alignment Procedure

ELECTRONICS

- A. Power
- B. Motor Drive PCBs
- C. Motor Control Logic PCBs
- D. EZAG 16 Bit Minicomputer
- E. Input/Output PCBs
- F. Video PCBs
- G. Scan-A-Matics
- H. Cable Identification
- I. Buffer Battery

VIII. TROUBLESHOOTING

A. Error Codes

Error codes is divided up by machine section. Codes 0000-0099 are the main bonder; except for minor exceptions such as multi die programs. Codes 100 to 199 are reserved for the input elevator, codes 200 to 299 are reserved for track, codes 300 to 399 are reserved for output elevator, codes 400-499 is reserved for epoxy/preform equipment.

Error Area

- 1 Rotor Step Loss
- 2 Pickup or Z direction step loss
- 3 Bond head X limit
- 4 Bond head Y limit
- 5 Die ejector error (old style programs)

- 7 Table Limit X or Y

- 9 Missed pickup of die

- 19 Calculate Angular Position Failure
- 20 Alignment error during teach die
- 21 Alignment error during teach jump
- 22 X
- 23 Auto Angular Adjust failed.

- 92 Die ejector did not home down.
- 93 Die ejector did no move up.

Many of the indexer errors are dependent on the type of indexer. Below are listed typical error codes, based on newer systems.

- 100 Input elevator reset error
- 101 (usually) Input elevator pusher failure

- 200 Track

- 300 Output elevator reset error

- 400 Epoxy/Preform dispenser not home
- 401 Error epoxy air dispenser (bond position epoxy system)
- 402 Error retracting from bond (bond position epoxy system)
- 403 Error extending to bond position (bond position epoxy system)

VIII. TROUBLESHOOTING

B Troubleshooting

Work on trouble shooting matrix here.

VIII. TROUBLESHOOTING

C. Assignment Lists, Basic Bonder Schematics, Indexer Schematics

Wiring lists were generated for each machine, and shipped with them. It is not uncommon for these to be lost or misplaced. You can download indexer schematics, a general indexer schematic, basic troubleshooting using the EZAG terminal interface, and basic machine input and output assignments, and other helpful documents and programs that will assist you in troubleshooting your Foton 8030A, from www.semiequipment.com in the Document Downloads section of the web site.

For further assistance please contact sales@semiequipment.com or call us at (972) 420-0090.