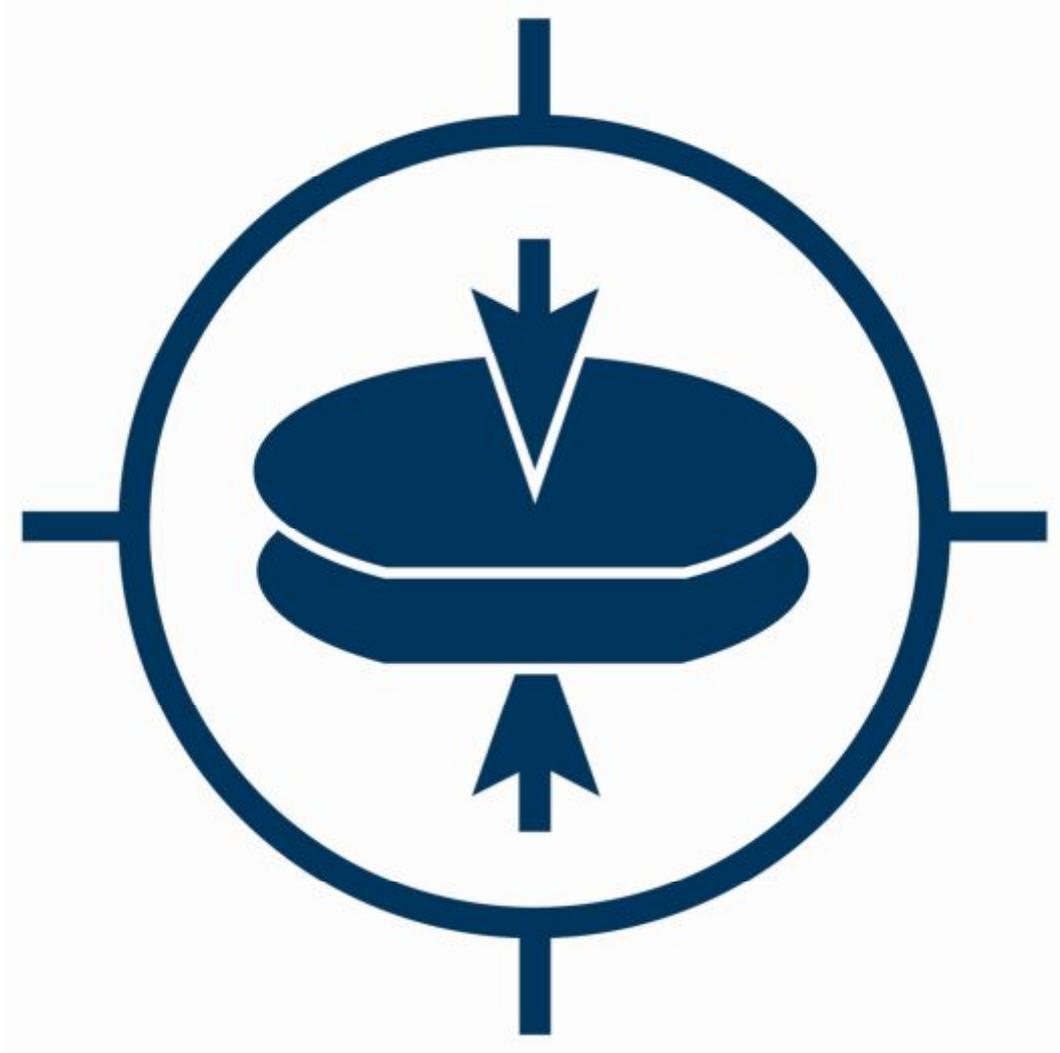


User Guide



Substrate Bonder SB6L

REV 09 - 10/12

This User Manual is subject to review and revision

COMPANY CONFIDENTIAL

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Any correspondence regarding this manual should be directed to:

Suss MicroTec Lithography GmbH
Ferdinand-von-Steinbeis-Ring 10
75447 Sternefels
Tel.: +49 (0)7045 - 41 697
Fax: +49 (0)7045 - 41 605
www.suss.com

New Features in This Release

DESCRIPTION	SECTION(S)
REV 09	
Added Information about setting tool pressure per wafer size	5.5.4.5.1
REV 08	
Replaced Cover Page	Title Page and Front Matter
Added Light Beacon Option	1.3.4 and 2.4
REV 07	
Updated all Warning/Caution/Danger labels	All
Added Explosion Risk Warning	Throughout
Added Consumables table	6.2.2
Added information on Graphite Tooling and warnings	2.3, 2.4, 4.1.3.3, 6.2.6, 6.2.7, 6.2.13.2, 6.2.16, 6.2.16.2, and 6.2.17
Added Omron Digital Heater Controller	4.1.7
REV 06	
Corrected CDA specification	2.5 Facility Requirements Basic System
REV 05	
Corrected power supply description so manual conforms to schematic drawing	2.5 Facility Requirements Basic System
REV 04	
Corrected Pressure Head Depth Adjustment Using Matrix table	Section 5.2.4.2.
REV 03	

DESCRIPTION	SECTION(S)
Changed Vacuum Level from “90-95 mbar” to “0.8 bar or better Relative”	Section 3.2 Facilities Table
REV 02	
Changed product name from Elan CB6L to SB6L	Everywhere
REV 01	
Content Update and Editorial Corrections	Everywhere
REV 00	
This is the first release of this manual.	NA

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1 SAFETY INFORMATION

1.1 Overview

The general safety precautions and procedures described here apply to all individuals working with the equipment covered by this manual. Generate specific safety procedures with regard to the particular application and configuration of the equipment and local codes. Operators must be thoroughly familiar with these procedures. Post the procedures in a conspicuous location to expose all equipment operators to the information on a continuing basis.

Anyone working with or near the equipment described in this manual should also observe normal safety precautions applicable to the operation of semiconductor production and processing equipment.

1.1.1 Safety Warnings in Documents

Within this manual, safety precautions and warnings are included in the text to identify potentially hazardous procedures. The safety warnings are formatted as follows: hazard symbol to the left with the safety header and text to the right (see example below). The safety header is capitalized. The text is usually one or more sentences. The first sentence defines the hazard and remainder of the text identifies a way to avoid the hazard.

**DANGER!****Hazardous Voltage.****Risk of electrical shock or burn.**

Do not remove equipment covers while electrical voltage is present.

Switch off machine for service work.



Wear safety goggles, gloves, and protective clothing.



Consider and observe the Material Safety Data Sheets.

1.1.2 Symbols and Notes

Symbols and accompanying information are used to highlight conditions and information the user needs to be aware of to reduce equipment operational problems, or to minimize potentially harmful situations.

Notes are information that the user or operator needs to know for optimum system operation, or to minimize potential problems.

1.2 Safety Hazards Descriptions

This section describes specific safety hazards or potential hazards, which may be associated with the use of this equipment, the possible consequences of human interaction with the hazard, and methods for avoiding it.

1.2.1 Electrical

Hazardous voltages may be exposed when the Process Chamber is open, or internal covers or connectors are removed from any component of the system.

**DANGER!****Hazardous Voltage.****Risk of electrical shock or burn.**

Do not remove equipment covers while electrical voltage is present.

Switch off machine for service work.



Wear safety goggles, gloves, and protective clothing.



Consider and observe the Material Safety Data Sheets.

Only qualified personnel are authorized to perform electrical system service. If electrical problems occur during system operation, immediately notify supervisory or maintenance personnel. In the event of an emergency, an Emergency Off (EMO) switch is available (see Section 1.3.2).

**Note**

Never use the EMO switch to control system power during normal operation.

To ensure against the danger of electrical shock or hazards during service or maintenance, the main power must be disconnected and a lockout/tagout procedure implemented as described in Section 1.3.4. The lockout device or procedure should be in accordance with the Code of Federal Regulations (CFR) 1910.147. The lockout device or process must also ensure that the equipment being controlled cannot be operated until the lockout device or process is removed.

1.2.2 Mechanical Entanglement

Improper operation of this machine may result in serious injury. Moving actuators and other components could jam fingers, hands, or other parts of the body. Ensure that the substrate handling systems are clear of obstructions before operating the system.



CAUTION!
Moving machine components!
Risk of hand and finger injuries by squeezing.
Keep hands and fingers out off process chamber.
Switch off machine for service work.

1.2.3 Thermal

Proper operation of this equipment involves high temperature processes. Thermal hazards may result from premature contact with heated portions of the equipment or the media. Protective gloves are required to minimize against thermal hazards.



CAUTION!
Hot Surfaces!
Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!

1.2.4 Noise Emission

The equipment covered by this manual may produce airborne noise emissions with a maximum sound pressure level of 75 dB(A). Sound level measurements were made using a calibrated sound decibel meter in accordance with ANSI S1.13-1971 (R1986) in a test/production area where the background noise level was 70 dB(A).



Note

The noise emission level actually produced is highly dependent on the type of exhaust tubing used to connect the Substrate Bonder to the facility's exhaust system. It is the Customer's responsibility to use an appropriate type of exhaust tubing, or install noise abatement equipment, or both so that the noise level is 75 dB(A) or lower when the system is operating..

1.2.5 Electromagnetic

The equipment covered by this manual contains computer and other electronic circuits that operate at frequencies of up to one GHz. Currently, there is debate regarding the potential effects of long-term exposure to radiation of this type.

1.2.6 Cleaning Agents

Some cleaning agents, such as isopropyl alcohol and acetone, are flammable solvents and must be used in accordance with Federal, State, and local regulations. These chemicals should be treated as hazardous materials. Proper precautions must be taken in the storage, use, and disposal of them. Environmental regulatory restrictions may also exist limiting the quantity of such solvents stored at a facility.



WARNING!
Isopropyl alcohol (IPA).
Irritating/ Highly flammable media.

Avoid skin contact and inhaling vapors.
Use in well-ventilated areas.
Keep away from flames and sparks.
Consider and observe the Material Safety Data Sheet.



Note

Flammable solvents can cause injury or death if ignited. Keep away from all ignition sources. Only properly trained personnel should be engaged in handling the cleaning agents. Wipe away all cleaning fluids or residues and remove all cleaning agent containers from the area before returning the equipment to operation.

1.2.7 Contamination

Some of the chemicals that may be used in conjunction with this machine are corrosive, or toxic, or both. Contact with these chemicals or inhalation of their vapors may result in severe health risks. The user should analyze the specific process (or processes) run on the machine for possible out gassing affects and respond appropriately to reduce or eliminate any identified risks.



WARNING!
Corrosive media.
Health hazard due to contact and inhalation.

Avoid skin and eye contact.
Do not inhale.



Wear safety goggles, gloves, and protective clothing.



Consider and observe the Material Safety Data Sheets.



Note

Corrosive or toxic chemicals may be present. Contact with these chemicals or inhalation of their vapors may result in severe health risks. After chemical spillage, leakage, or exhaust system failure, evacuate the area immediately, notify your supervisor, and consult the appropriate Material Safety Data Sheet for further instructions

1.2.8 Heavy Objects

Some Substrate Bonder components are heavy. Attempting to lift or move these objects without sufficient personnel or mechanical assistance can cause spinal damage and other injuries.



CAUTION!
Ergonomic hazard!
Risk of damage to the spine by lifting or moving heavy objects.
 Use personnel or mechanical assistance for lifting heavy objects

Load	Assistance
<18 kg	1 Person
18-32 kg	2 Persons
32-55 kg	3 Persons
>55 kg	Fork Lift

1.2.9 Explosion Risk

The Process Chamber is pressurized. Attempting to open the chamber while it is under pressure or vacuum may result in an explosion causing damage to the machine and injury, with possible death to nearby individuals.



WARNING!
Pressurized Assembly!
Risk of explosion.
 Tool pressure bellows could burst causing severe injury.
 Relieve tool pressure and Lock Out/Tag Out system before opening lid.

1.3 Safety Systems and Procedures

As with any equipment of this type, rigorously follow proper precautions and procedures to avoid hazardous conditions.

The special safety systems are designed into the equipment are described in the following paragraphs. Understanding them is critical to maximizing their effectiveness.

1.3.1 Equipment Warning Labels

Safety hazards on the equipment known to SUSS at the time of this manual's publication are identified by labels located on or in the equipment in the immediate vicinity of the hazard. These labels signify the presence of a hazard or potential hazard which may be encountered during installation, maintenance, or operation of the equipment, or when in proximity to the equipment.

All safety labels on the equipment conform to Semiconductor Equipment and Materials International (SEMI) Specifications S1-0701, and OSHA (29 CFR 1910.144-149) and ANSI (Z535.4) guidelines. These labels contain one or more symbols or pictographs and the following three types of information:

An identifying header, used to signify the level of the hazard.

A description, identifying the *nature of the hazard*, and the possible or actual *consequences* of human interaction with the hazard.
 A *method* for avoiding the hazard.

The identifying header on a safety label indicates the severity of a hazard or potential hazard. Three headers are used on the labels:

- DANGER** The word DANGER on a label is used to point out an immediate hazard that, if not avoided, will result in severe personal injury or death.
- WARNING** The word WARNING on a label calls attention to a potential hazard or unsafe practice that, if not avoided, can result in severe personal injury or death.
- CAUTION** The word CAUTION on a label is used to signify a hazard or unsafe practice that, if not avoided, can result in minor or moderate personal injury, or product or equipment damage.

Figure 1-1 through Figure 1-5 identify the locations of the labels. The following table lists the text used on the labels.

Table 1-1 Warning Label Text

WARNING LABELS	
ID	LABEL TEXT
Danger HV & Hot Surface	Danger. High Voltage. Hot Surface. Turn off and lock out main power disconnect. Allow to cool before servicing. Can cause shock, severe burns, or death.
Hazardous Voltage Enclosed	Warning. Hazardous voltage enclosed. Voltage or current hazard sufficient to cause shock, burn, or death. Disconnect and lockout power before servicing.
Burn Hazard, Fixture May Be Hot	Warning. Thermal Hazard. Fixture may be hot. Wear protective gloves.
Outlets Energized After EMO	Warning. Computer power. These outlets remain energized after EMO activation.

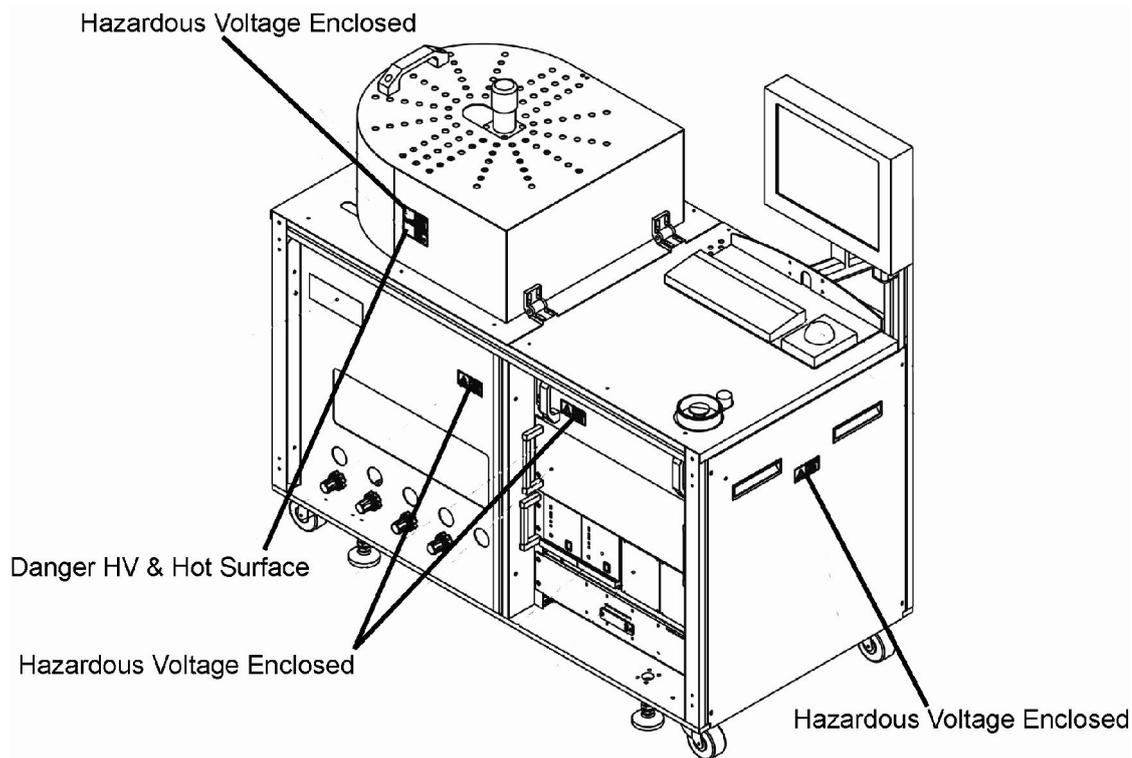


Figure 1-1 Location of Warning Labels – Exterior, Front and Right Side

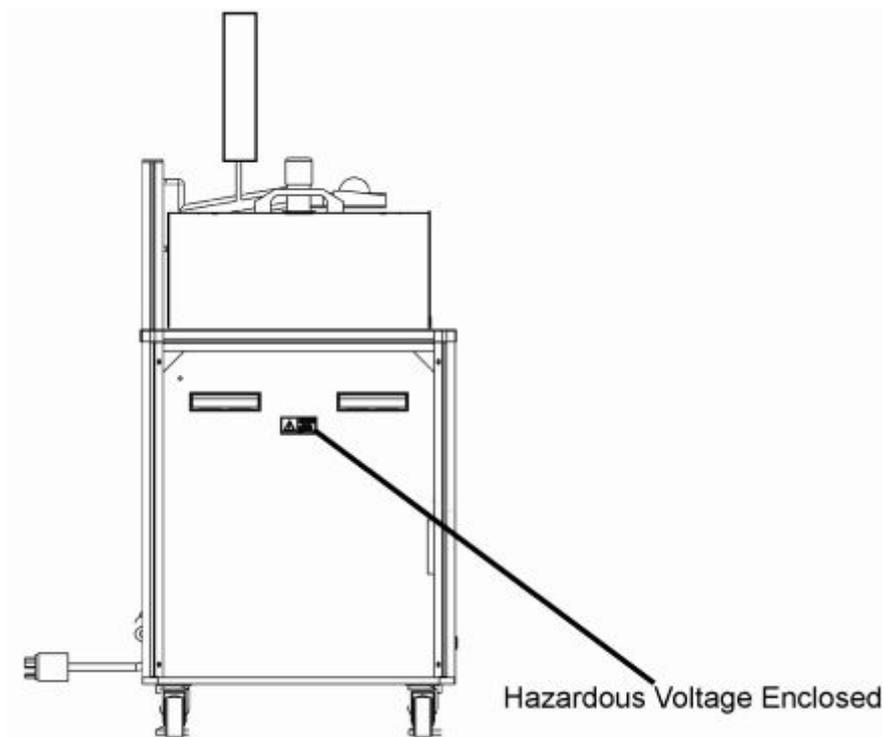


Figure 1-2 Location of Warning Labels – Exterior, Left Side

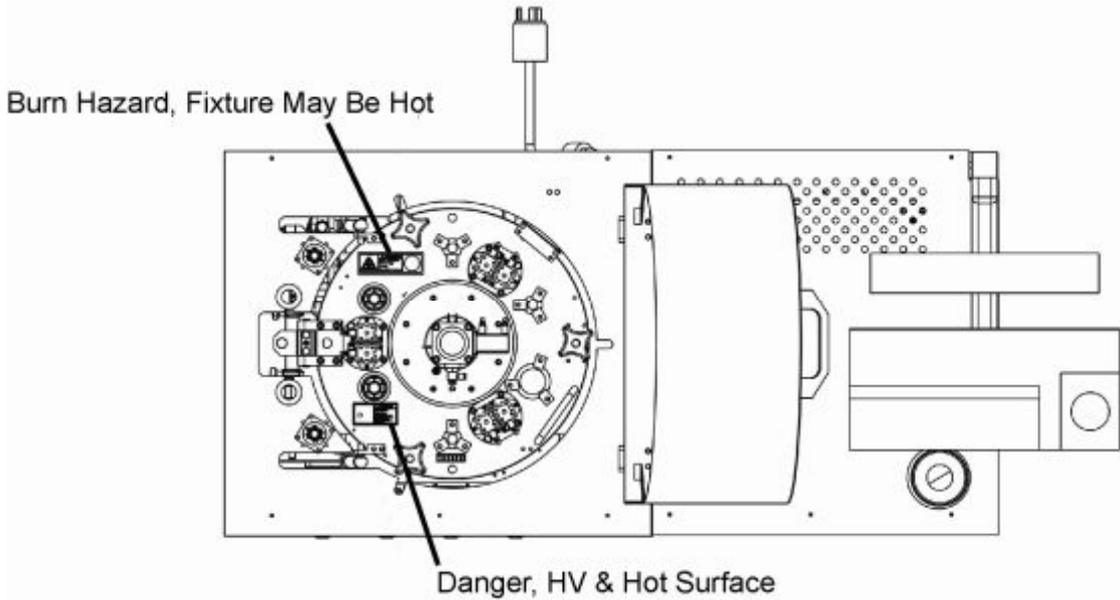


Figure 1-3 Location of Warning Labels – Top of Pressure Chamber

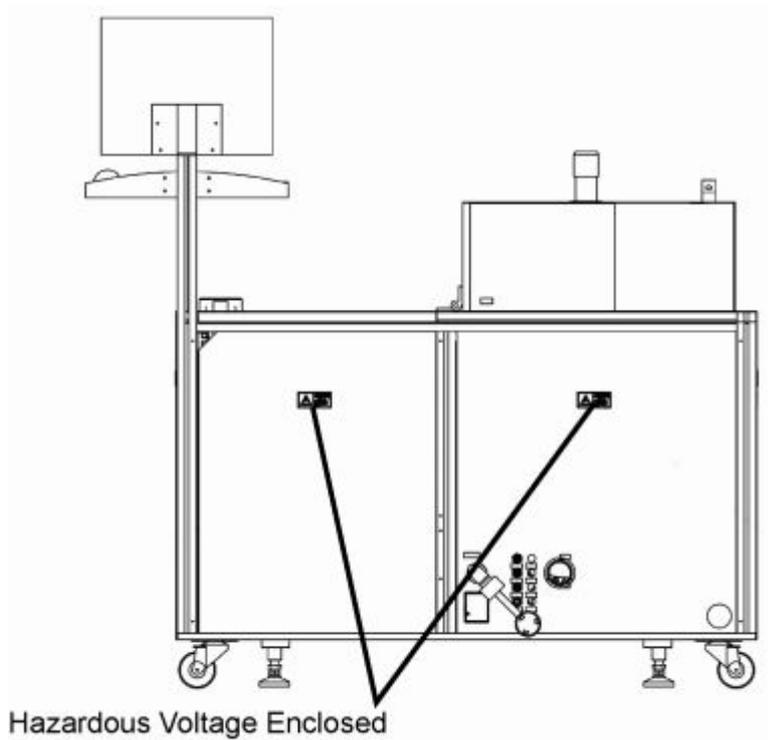


Figure 1-4 Location of Warning Labels – External, Rear View

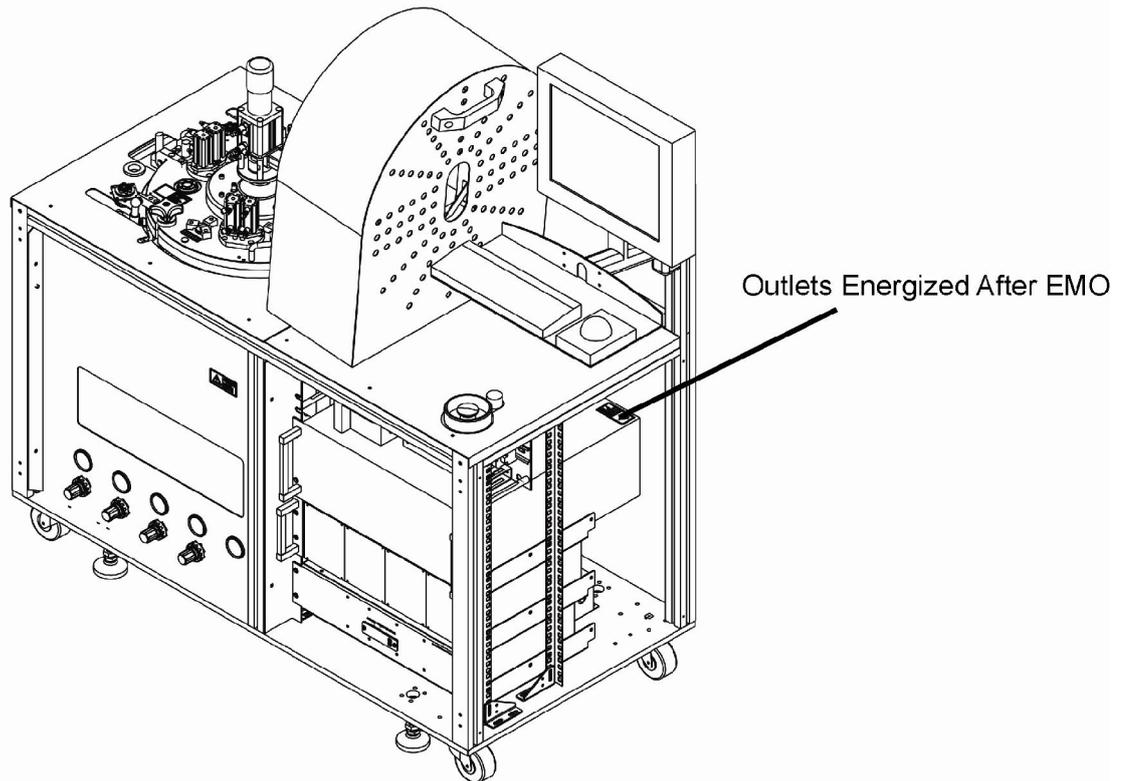


Figure 1-5 Location of Warning Labels – Internal

1.3.2 Electrical Emergency Off (EMO)

The SB6L is equipped with an Emergency Off (EMO) switch (see Figure 1-6). Activating it removes power to the system halting all mechanical motion. After activating the EMO, disconnect the system from the main power source and allow it to cool prior to touching any internal components.



Figure 1-6 Location of EMO Switch

1.3.3 Process Chamber Interlock

The Process Chamber Interlock prevents recipe processing and interrupts power to the optional High Voltage Power Supplies unless the Process Chamber Lid is closed and secured.

**DANGER!****Hazardous Voltage.****Risk of electrical shock or burn.**

Do not defeat or modify interlock or safety system sensor.

Unauthorized modifications to interlocks or safety sensors may result in serious injury, death, or damage to the equipment.

Unless specifically authorized by individual system configuration, no interlock or safety system sensor may be defeated or modified.

1.3.4 Light Beacon (Optional)

The SB6L can be equipped with an optional three color light beacon mounted to the back of the console monitor. The lights can be programmed; however, they generally follow the information presented in Table 1-2. (Refer to the SB6L Service Manual for information on programming the Light Beacon lamps.)



Figure 1-7 SB6L Console with Optional Light Beacon

Table 1-2 Light Beacon Status Indications (Default)

Lamp	Description
Flashing Red	Indicates an error has occurred preventing continued system operation (see also Buzzer)
Yellow	Steady illumination indicates that the system is in Idle mode Flashing indicates that processing is complete, but system not in Idle mode.
Green	Steady illumination indicates system software is running and machine is in normal “safe” operating condition
Buzzer	Audible alarm that sounds with Flashing Red lamps to indicate system error

1.3.5 Lockout/Tagout Procedures

The following table lists the four types of service tasks defined by SEMI specification S2-0706e:13.2.

Table 1-3 Types of Lockout/Tag Out Procedures

Type	Description
Type 1	Equipment is fully de-energized. An example of a Type 1 service task would be the repair or replacement of an electronic rack component.
Type 2	Equipment is energized, but energized circuits are covered or insulated. Type 2 work includes tasks where the energized circuits are or can be measured by placing probes through suitable openings in the covers or insulators.
Type 3	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are no greater than 30 VAC (rms), 42.4 V peak, 60 VDC, or 240 VA in dry locations.
Type 4	Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are greater than 30 VAC (rms), 42.4 V peak, 60 VDC, or 240 VA in dry locations. Potential exposures to radio-frequency currents, whether induced or via contact, exceed acceptable limits. (This service task is not applicable to this equipment.)

1.3.5.1 Type 1 General Lockout/Tag out Procedure

Use the following procedure to ensure that the system is isolated from all potentially hazardous energy when performing a Type 1 service task:

1.3.5.1.1 Lockout/Tag out Procedure

Isolate the equipment from all energy sources as described in Sections 1.3.6 and 1.3.7. Ensure it is locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy-isolating device when it is locked or tagged out.

1.3.5.1.2 Responsibility

All technicians on the manufacturing floor and the manufacturing manager should be instructed in the safety significance of the lockout/tag out procedure. All employees whose work operations are or may be in the area should be instructed in the purpose and use of the lockout/tag out procedure. It is the manufacturing manager's responsibility to ensure that all employees are trained. The technician(s) are responsible for ensuring that the machine is locked or tagged out before repair is attempted. In the event that neither a technician nor the manufacturing manager is available, the machine room manager assumes responsibility for the lockout/tag out procedure.

1.3.5.1.3 Preparation

When preparing for a lockout/tag out situation, survey the area to locate and identify all isolating devices in order to be certain which switch(s), valves, or other isolating devices apply to the machine to be locked out and tagged out.

1.3.5.1.4 Sequence of Lockout/Tag out Procedure

Notify all effected employees that a system will be locked or tagged out and the reason for this action. The authorized employee performing the service will have knowledge of the type and magnitude of energy that the equipment use during operation and the hazards involved.

1. Place the necessary switches, valves, or other energy isolating devices to the positions or settings required to ensure the system is isolated from its energy source(s).
2. If the system is operating, shut it down by using the system's normal shutdown procedure (see Section 5.1.4).



Note

Shutting down the system does not remove energy stored in the equipment. Stored energy must be dissipated or restrained as described in Sections 1.3.6 and 1.3.7

3. Lockout, tag out, or lockout and tag out the energy isolating devices with assigned individual lock(s) and tag(s). If locks are used, one key should remain with the person repairing the machine and another should be given to the manager in charge of the production floor.

4. Ensure that no personnel are exposed to hazardous situations. Then use the system operating controls to ensure that the equipment will not start up as a final check on the disconnected the energy sources.

**Note**

Return all operating controls to their 'neutral' or 'off' position at the end of the Tag out/Lockout procedure.

5. The equipment is now locked out and tagged out.

1.3.5.2 Restoring the Machine to Normal Operation

After service is complete and the equipment is ready to return to normal operation, inspect the area around the system to ensure that no one is exposed to any hazardous situation.

Remove all tools from the equipment, replace all guards, ensure all employees are safe, and remove all lockout/tag out devices.

Restore power to the equipment and restart the system according to Section 5.1.1.

1.3.6 Electrical Energy Isolation

Completely isolate the equipment from its main power source by unplugging the system's main power cord, or setting the remote main power switch (customer supplied) to its OFF position, or both. If the electrical energy isolation method involves unplugging a power cord, a plug housing with a padlock must be installed on the power cord plug.

1.3.7 Pneumatic Energy Isolation

Operate the customer-supplied pneumatic valves to isolate completely the equipment from its sources of nitrogen, compressed air, and vacuum. Disconnect the supply tubing from the **Facilities Connection Panel**, located on the rear of the equipment. Then install and secure the **Facilities Supply Cover** (see Figure 1-8) so that the **Facilities Connection Panel** is blocked or inaccessible.

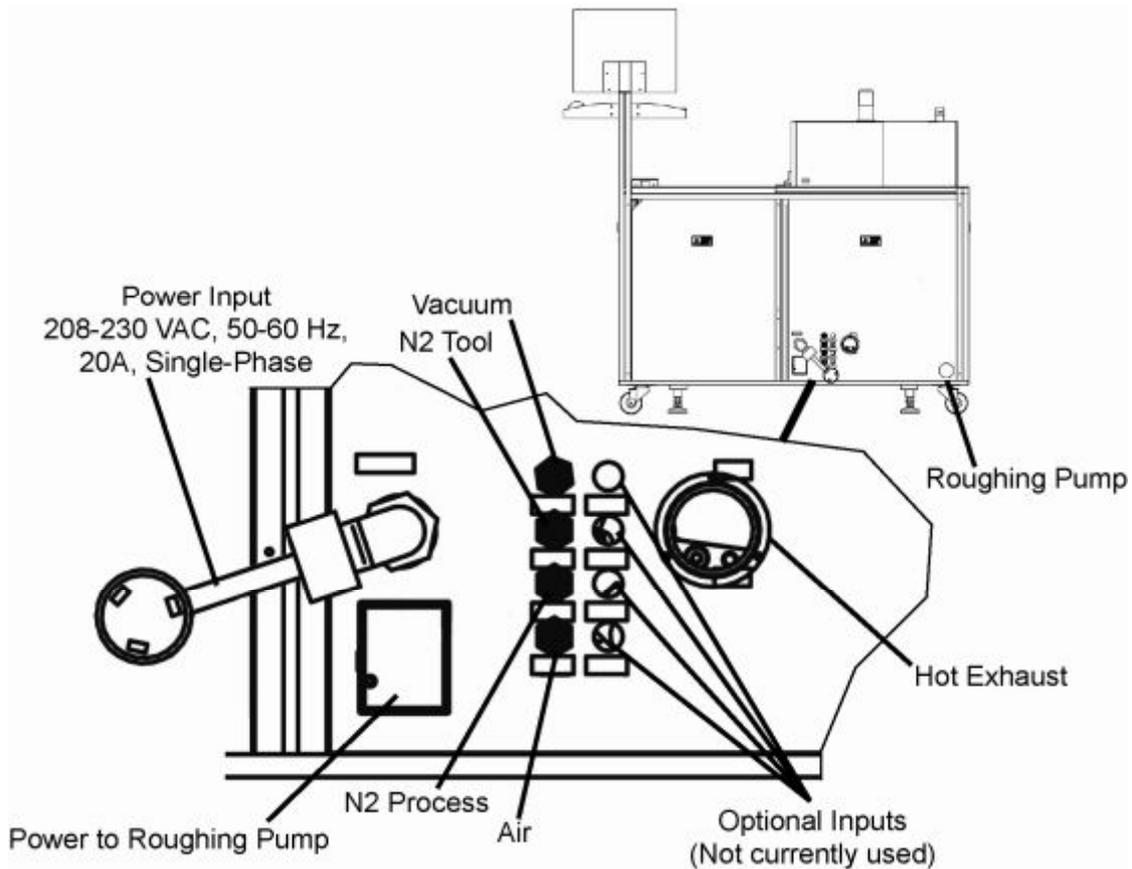


Figure 1-8 Facilities Connection Panel

1.3.8 Thermal Energy Isolation

Thermal energy which may be stored within the equipment should be rendered safe by waiting until any part of the equipment or media which may have been heated during a process has had sufficient time to cool down to 40° C or lower.

1.3.9 Mechanical Energy Isolation

The system is not capable of storing mechanical energy.

1.3.10 Chemical Energy Isolation

The system is not capable of storing chemical energy.

1.3.11 Exhaust Flow Provisions

1.3.11.1 Primary Process Exhaust

Adequate exhaust flow must be provided to insure safe operation of the equipment. The customer is responsible for installing couplings or other devices between the Substrate Bonder's exhaust connection at the point of egress and the customer's external exhaust system. The customer supplied exhaust couplings must also

contain access ports through which exhaust measurements can be made using appropriate instruments at regular intervals.

All necessary provisions must be made for adequate exhausting with zero leakage. Under normal operating conditions, leakage should not exceed one (1) percent of the American Conference of Industrial Hygienists (ACGIH) recommended Threshold Limit Value (TLV) or Permissible Exposure Limits (PEL), whichever is lower. Emissions from the equipment into the work area should not exceed 25% of the TLV or PEL during maintenance activities. Care must also be taken to comply with all Federal, state, local and customer regulations applicable to the specific chemicals in use.

SUSS shares knowledge of environmental regulations applicable to the use of the Substrate Bonders. SUSS also maintains working relationships with third party experts in the field. The company will suggest sources for guidance for complying with existing regulations on request.

1.3.11.2 Auxiliary Exhaust System

The customer should also provide a redundant auxiliary drop-down exhaust system for use during maintenance activities within the machine enclosure. This auxiliary exhaust system is in addition to the customer provided primary process exhaust system. The same exhaust leakage provisions for the Primary Process Exhaust apply to the Auxiliary Exhaust System.

1.3.12 Seismic Protection Procedure

SUSS recommends a set of four brackets and seismic approved drop-in concrete anchors from Worksafe Technologies (Product Number - LF 4248S) for seismic restraint. Contact Worksafe Technologies for an alternative to the anchors if the floor is not concrete. Figure 1-9 shows dimensions for determining mounting locations and Figure 1-10 identifies the center of mass and weight distribution for the system.

For more information, contact:

Worksafe Technologies
Valencia, CA USA
(661) 257-2527
www.worksafetech.com

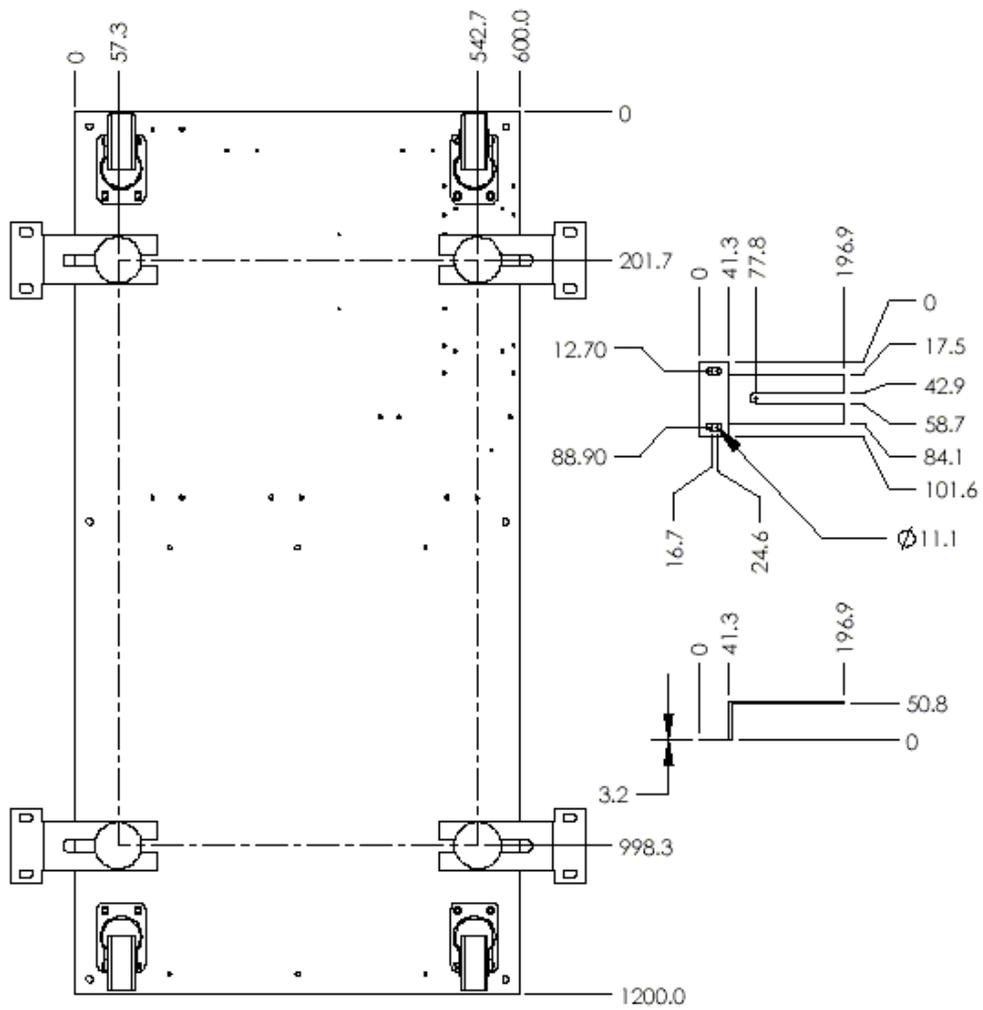


Figure 1-9 Seismic Protection Bracket Locations

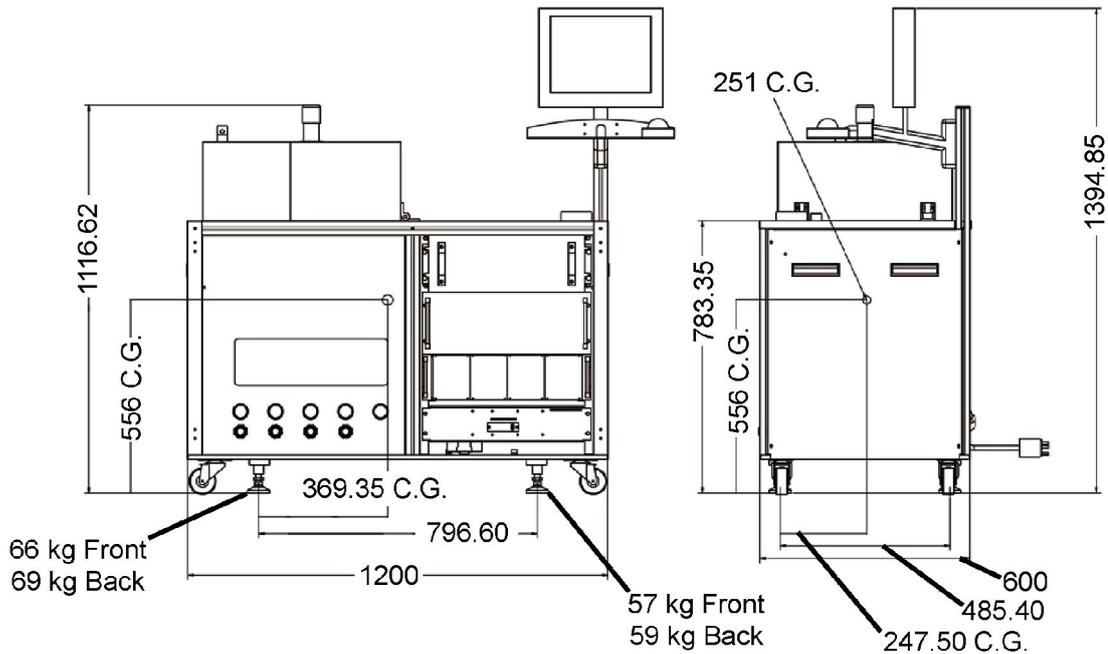


Figure 1-10 Location of Center Of Mass

1.4 Recommended Safety Equipment

The minimum recommended customer supplied safety equipment that must be available at the installation site, includes:

- Proper Fire Protection Equipment, including Fire Extinguisher
- Chemically Resistant Clean Room Gloves
- Safety Goggles and Face Shield
- Lab Coat and Apron
- Vent Hood
- Eyewash Station

1.5 Outside Contractors

Any outside contractor who is employed to service SUSS equipment must supply the appropriate manager with a copy of his company's lockout/tagout procedure. The contractor's procedure must be equal to or better than the procedure documented in this manual.

1.6 Policy

1.6.1 Customer Requirements

All personnel having contact with or proximity to the equipment must be provided with all safety information available in each of the equipment manuals, and they must be properly trained in the safety requirements of the system.

All personnel working with the equipment must be properly trained in its operation, including all applicable safe operating instructions and procedures described in this manual.

All safety information provided in this manual and all other applicable safety and site preparation information supplied by or referred to by SUSS must be adhered to.

The Customer must not remove, modify, obscure, or in any other way alter the content or readability of any safety labels or placards located on or inside the equipment.

The Customer must not install additional labels or placards or make any other additions or modifications that have the effect of drawing attention away from, or reducing the effectiveness of, any safety labels or placards installed by SUSS.

1.6.2 Void of Warranty

Failure to adhere to any or all Customer Requirements specified within this manual will void the equipment warranty and any other related contracts made between the purchaser and SUSS.

SUSS disclaims responsibility for any death, injury, property damage, or other loss caused by or resulting from failure to adhere to any of these Customer Requirements, as well as Federal, state, and local guidelines and regulations.

1.7 Related Documents

The documents listed below contain information and regulations relating to the safe operation of the equipment covered by this manual. It is the responsibility of the purchaser of this equipment (the Customer) to obtain the latest versions of these documents and to incorporate their contents into the purchaser's own safety procedures.

1.7.1 International Standards

- SEMI S2-93A Safety Guidelines for Semiconductor Manufacturing Equipment
- SEMI S1-90 Safety Guidelines for Visual Hazard Alerts
- SEMI S8-95 Safety Guidelines for Ergonomic/Human Factors Engineering of Semiconductor Manufacturing Equipment
- EU Low Voltage Directive
- EU Machinery Directive
- EU EMC Directive

1.7.2 Occupational Safety and Health Act Regulations

Contact the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

- | | |
|-------------|---|
| 21 CFR 1010 | Performance Standards for Electronic Products |
| 21 CFR 1040 | Performance Standards for Light Emitting Products |
| 21 CFR 1910 | Occupational Safety and Health Administration Standards |

SAFETY INFORMATION



Contact the National Electrical Manufacturers Association, 2101 L Street NW #300, Washington, DC 20037

National Electrical Code (NFPA 70, 1993)
An American National Standard (FM-70-90SB)
Electrical Installations in Hazardous Locations (FM-HLH-88)

Obtain from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269

Electrical Standard for Industrial Machinery (NFPA 79, 1994)

Contact the International Conference of Building Officials and Western Fire Chiefs Association 5360 South Workman Mill Rd., Whittier, CA 90601
Uniform Fire Code (UFC) (ISSN-0896-9736)

1.8 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) are shipped with the SB6L for all chemicals supplied with the system. Keep these data sheets in a secure and available location near the system, along with the MSDS for all customer-supplied chemicals used with the system.

2 GENERAL DESCRIPTION

2.1 Overview

The SUSS SB6L (see Figure 2-1) is the ideal complement to the SUSS Bond Aligner. It is a universal tool for wafer bonding processes for micro electro-mechanical system applications such as:

- Anodic Bonding (AB)
- Silicon Fusion Bonding (SFB)
- Adhesive Bonding (ADB)
- Thermal Compression Bonding (TCB)

After alignment on the Bond Aligner, the substrate stacks are mechanically clamped using the transport fixture for further processing in the Substrate Bonder.



Figure 2-1 SB6L Substrate Bonder

2.2 Features

- Wafer and substrate sizes:
 - Up to 150 mm (6 inches)
- Higher yield using the local clean room concept
- Vacuum down to 5×10^{-5} mbar absolute
- Bonding in controlled environment
- Flexible process control using a Windows operating environment with data recording and analysis
- Optimized bonding routines can be replicated

2.3 Configuration

The SB6L basic configuration includes:

- Basic system with pneumatic and machine control, and onboard computer system
- Substrate Transport Fixture for secured loading process
- A Process Chamber

2.4 Optional Equipment

Additional accessories include:

- Various Sandwich Plate and Pressure Plate Kits for different substrate sizes, Bond Heads and High Voltage Supplies.
- Equipment for high vacuum down to 5×10^{-5} mbar absolute (controlled and uncontrolled)
- Tool Kits (Pressure and Sandwich Plates) available in SiC, SST, and Graphite
- Optional Light Beacon for displaying system status



Note

Center pins are also available for SiC and Graphite Tools. In either case, the Center Pin is made from the same material as the Pressure and Sandwich Plates.

Table 2-1 SiC and Graphite Plate Flatness and Parallelism

Material	Flatness	Parallelism
SiC	2 μm	2 μm
Graphite	26 μm	26 μm

3 INSTALLATION

Refer to the SB6L Service Manual for unpacking and installation procedures.

4 COMPONENT DESCRIPTION

4.1 Basic Configuration

The SUSS SB6L Substrate Bonder can be equipped to process wafer sizes up to 150 mm (6 in) with devices as small as 1 cm². The basic equipment includes:

- Lower Heater Assembly
- A Basic Vacuum System
- Process Chamber
- Control Electronics
- Transport Fixture
- Pressure Head and Bond Head
- Process Environment Control System

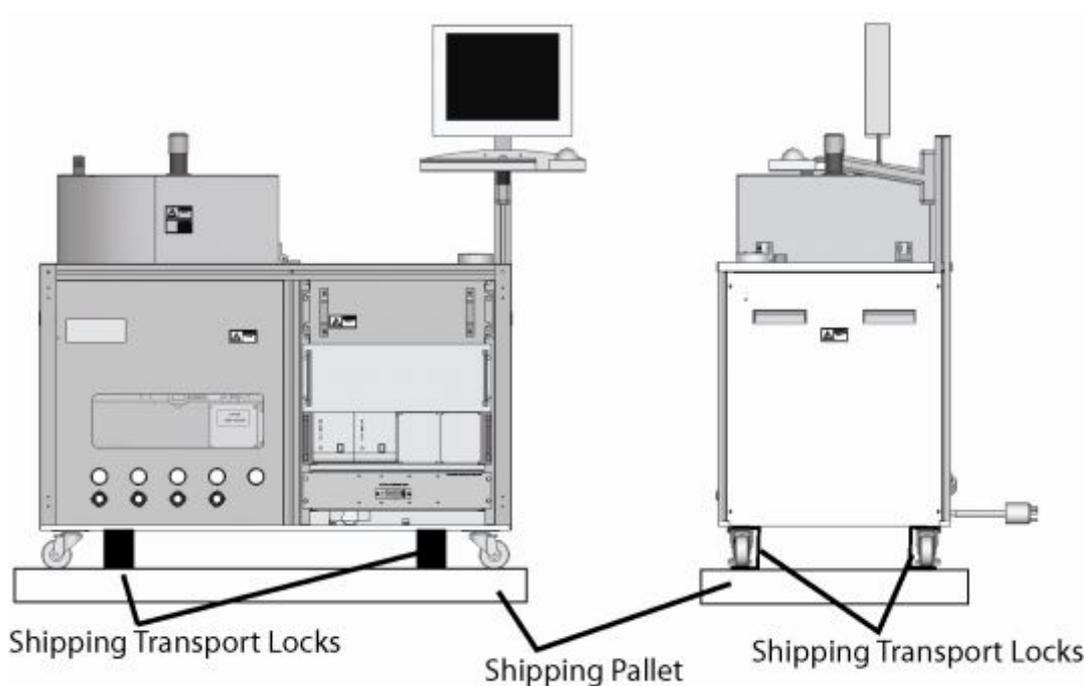


Figure 4-1 SB6L Console (Also Showing Location of Transport Locks)

Table 4-1 Dimensions and Weights

	Length	Width	Height	Weight
SB6L	1200 mm (46.8 in)	600 mm (23.4 in)	1394.85 mm (54.4 in)	251 Kg (552.7 lb.)

4.1.1 Facility Connections

All the facility connections are located on the back of the SB6L console.

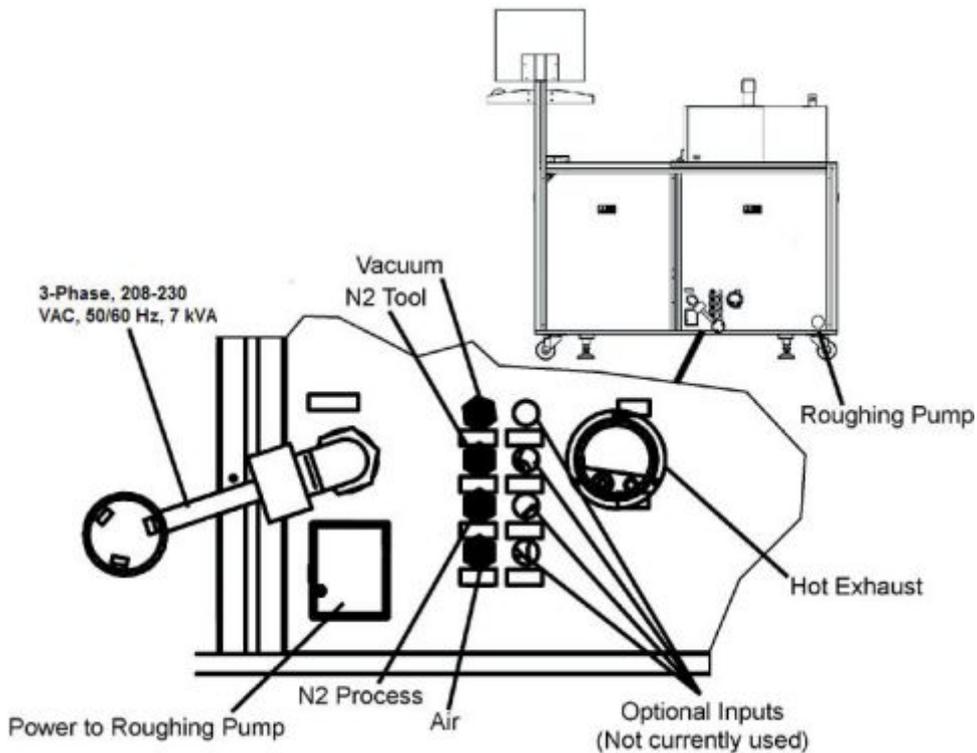


Figure 4-2 SB6L Facilities Connections (on Rear Console)

The following facilities are or may be required depending on the configuration of the SB6L:

Table 4-2 List of Basic Facility Requirements

Facility	Description
<p>Power Supply</p>	<p>3-Phase, 208-230 VAC, 50/60 Hz, 19A, 7 kVA Accessible outlet located within 12 feet of system</p> <p>Connections according to national standards:</p> <ul style="list-style-type: none"> • U.S. and countries following U.S. standards: P-pair and GND • EU, China and countries following EU standards: P+N+PE <p>Note  The remote power disconnect switch or the power outlet must be located such that it is in sight from, readily accessible to, and no more than 20 feet (12 feet for a power outlet) from the machine operator station. The operating handle of this disconnect device should also be no higher than 64.5 inches from the ground.</p>

Compressed Air	6 to 10 bar absolute, oil-free, dry, dust-free: particles < 40 µm Consumption: 170 slpm (6 scfm) maximum Tube: Outer diameter 8 mm (5/16 in)
Vacuum	0.8 bar or better relative, optional for pressure bonding Consumption: 16.7 slpm (0.6 scfm) maximum Tube: Outer diameter 8 mm (5/16 in)
Nitrogen	N ₂ Consumption: 8.4 slpm (0.3 scfm) maximum 102.9 to 110.3 psig, oil-free, dry, dust-free: particles < 40 µm Tube: Outer diameter 8 mm (5/16 in) <div style="display: flex; align-items: center;"> <p>Note Only use inert gas. The use of forming gas is NOT permitted. Contact SUSS before using helium.</p> </div>
Exhaust	Tube: Outer diameter 50.8 mm (2 in), heat resistant up to 350° C Requirement: 10.6 cfm, 0.21 mbar absolute

4.1.2 Process Chamber

The standard Process Chamber is designed for pressures from 5x10e⁻⁵ mbar absolute up to atmospheric pressure. The Process Chamber has two basic components (see Figure 4-3):

- Chamber Lid
- Chamber Body



Note

Do not use any toxic, aggressive, abrasive, or other dangerous medium in the Process Chamber.

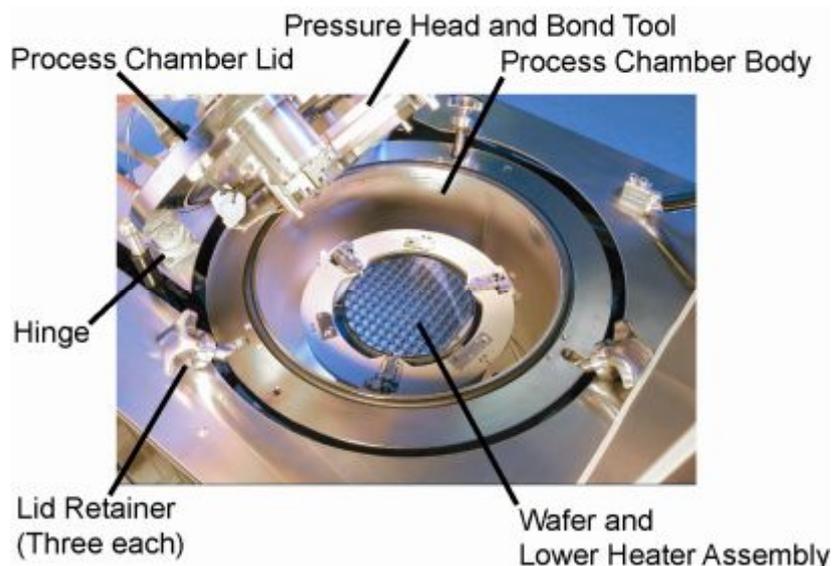


Figure 4-3 Process Chamber Components

4.1.2.1 Chamber Lid

The top tool flange, three spacer and clamp actuators (spaced at 120° intervals), a optional pressure control valve, the circuit board for the sensor connections, the top heater power connection, thermocouple feed through, high voltage electrode connections, and additional vacuum connectors are attached to the chamber lid. Three hand-tightened retainers evenly spaced around the chamber's rim secure the hinged Process Chamber lid. The hinge mechanism allows easy access inside the chamber for loading the fixture, maintenance and service work.



WARNING!
Pressurized Assembly!
Risk of explosion.

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid (see Section 1.3.4).

4.1.2.2 Chamber Body

The Process Chamber Body includes a purge valve, pressure gauges used to monitor the internal pressure of the Process Chamber, and optional process control valve and Turbo Pump. The purge valve ventilates the chamber after completing a bond process.

Mounted to the chamber body bottom is a safety burst disc, which activates at 1.5 bar absolute to ensure against overpressure situations (see Section 6.2.11).



Note

Purging can only be performed while the Turbo Pump is shut off.

Mounted to the chamber body are an environment control valve and a shut off valve.

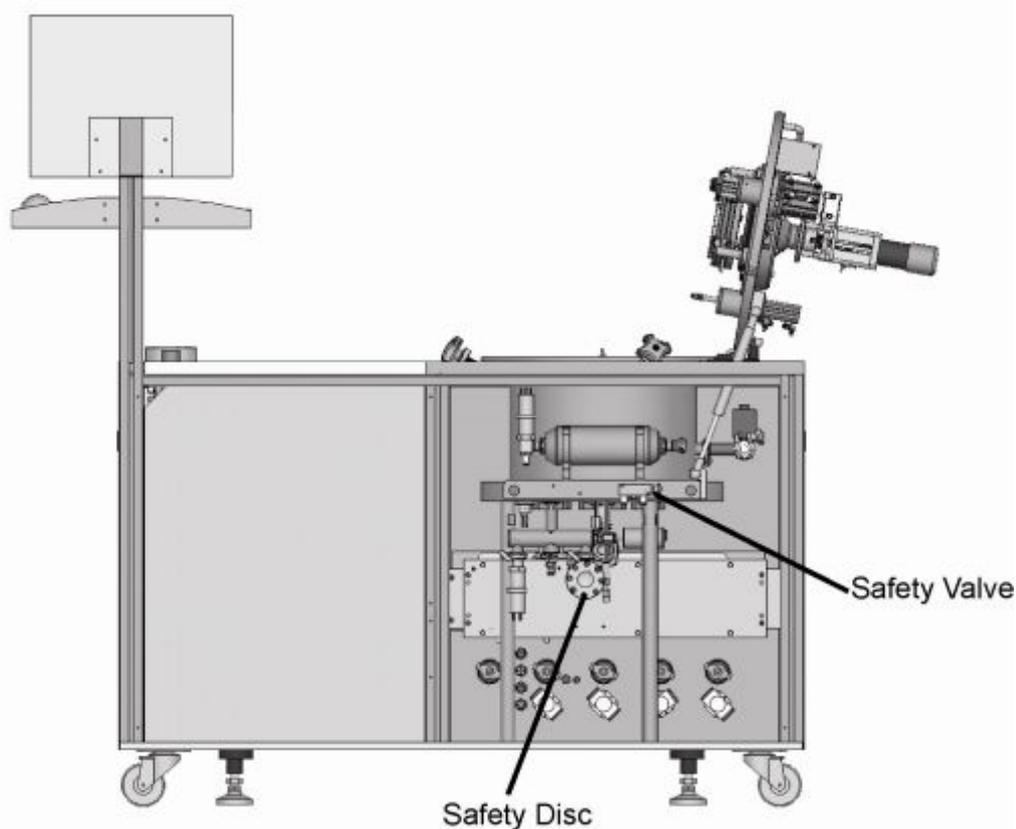


Figure 4-4 Location of Safety Disc and Safety Valve (Inside Rear Cabinet Panel)

4.1.3 Pressure Head and Bond Head

4.1.3.1 General

The Pressure Head and Bond Head combination (known as the Universal Bond Tool) is for users who need to implement various bond processes within a single tool - either to save changeover time or in order to combine certain bond processes.

A typical Universal Bond Tool features:

- The ability to handle wafer stacks up to 6 mm thick
- Manual stroke adjustment of Pressure Head to compensate for differences in the wafer stack height
- Pneumatic control of the Pressure Head

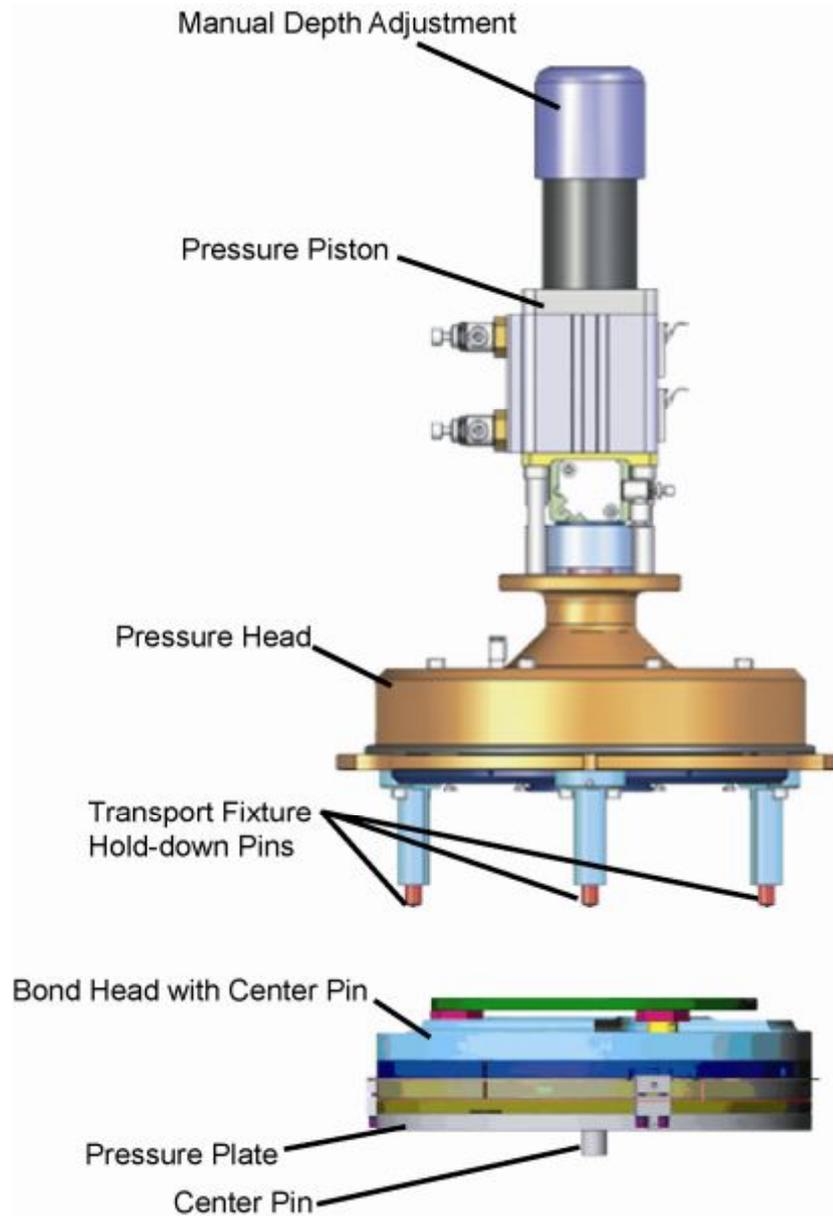


Figure 4-5 Universal Bond Tool (Simplified)

4.1.3.2 Standard Universal Tool Combinations

The Universal Bond Tool consists of a pressure head, a bond head, the precision manual depth adjustment, tooling plates (pressure plates) and all wiring and connectors.

They have one or more of the following characteristics:

- Even pressure applied to the wafer stack
- High voltage applied to the wafer stack
- Uniform heat applied to the wafer stack

The Bond Tool can be equipped with the following standard Pressure Plates:

- 100mm, 125 mm, or 150 mm Stainless Steel with center pin hole
- 100mm, 125 mm, or 150 mm Stainless Steel without center pin hole

The SB6L ships with a stainless steel Bond head with Center Pin. The spring-loaded center pin maintains wafer alignment during the bonding process.

**Note**

Each Bond Head with Center Pin ships with three springs of varying stiffness (soft, medium and hard). Spring selection depends on the process, wafer thickness, or both. Refer to Section 6.2.17 for Center Pin and Center Pin Spring removal and replacement procedure. Refer to Section 6.2.14 for Pressure Plate replacement procedure.

4.1.3.3 Optional Universal Tool Combinations

The Bond Tool can be equipped with the following optional Pressure Plates:

- 100 mm, 125 mm, or 150 mm SiC with center pin hole
- 100 mm, 125 mm, or 150 mm SiC without center pin hole
- 100 mm, 125 mm, or 150 mm Graphite with center pin hole
- 100 mm, 125 mm, or 150 mm Graphite without center pin hole

4.1.4 Lower Heater Assembly and Sandwich Plate

The Lower Heater Assembly and Sandwich Plate (see Figure 4-6) heat the wafers to a pre-set bond temperature (up to 500° C). Thermocouples control the temperature during processing and prevent it from overheating. Compressed air is used for cooling after processing or to lower the temperature during a process.

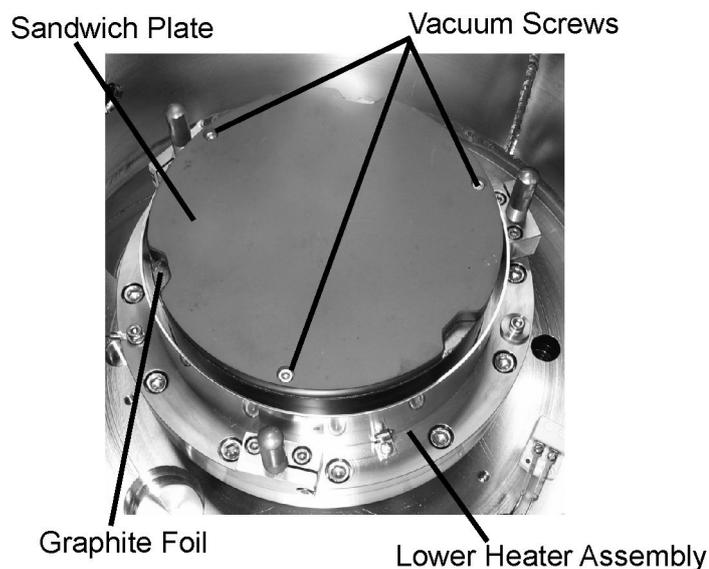


Figure 4-6 Lower Heater Assembly with Graphite Foil and Sandwich Plate

4.1.5 Pressure Control System

The Pressure Control System basic configuration includes:

- Process Chamber with chamber lid
- Two pressure gauges
- Safety valve
- Purge valve
- Environmental Control valves
- Shut-off valve

Pressure Control System options include:

- Turbo pump
- Roughing pump

For a description of the turbo and roughing pumps, and control valves, refer to the manufacturer's instructions delivered with the system.

4.1.6 Control Electronics

The Control Electronics are located on the cabinet top and in the right cabinet panels (see Figure 4-7). On top of the cabinet are the:

- Emergency Off (**EMO**) pushbutton switch
- **Start** switch

The right cabinet houses the:

- Main Power Breaker, fuses, and AC Distribution System
- Computer, including: Disk Drives, Power Supply, and Reset switches
- Optional High Voltage Power Supplies (Positive and Negative)
- Lower and Upper Heater Control Unit with test points

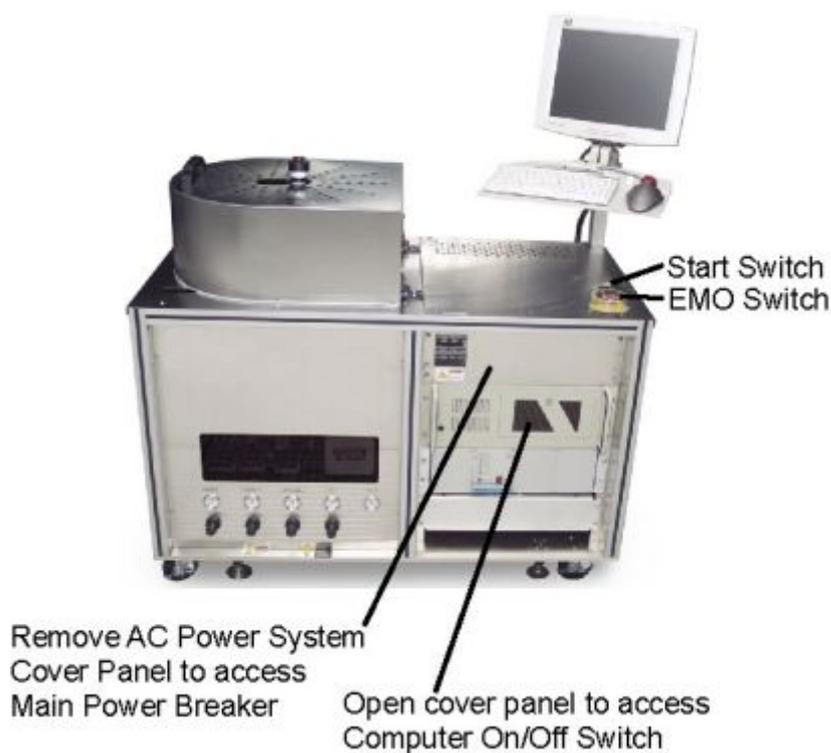


Figure 4-7 SB6L Location of Control Electronics

4.1.7 Omron Digital Heater Controller

The Omron Digital Heater Controller is standard on later models of the SB6L and available as a retrofit kit on earlier models (contact SUSS MicroTec for details). Two controllers are used, one for the Top Heater and one for the Bottom Heater. Each controller is connected to the Heater Assembly (Wattage Controller) and to the Computer System (see Figure 4-8 and refer to schematic 06,1000108).

For more information on the setup of the Omron Digital Heater Controller, refer to the SB6L Service Manual (06,1016301).

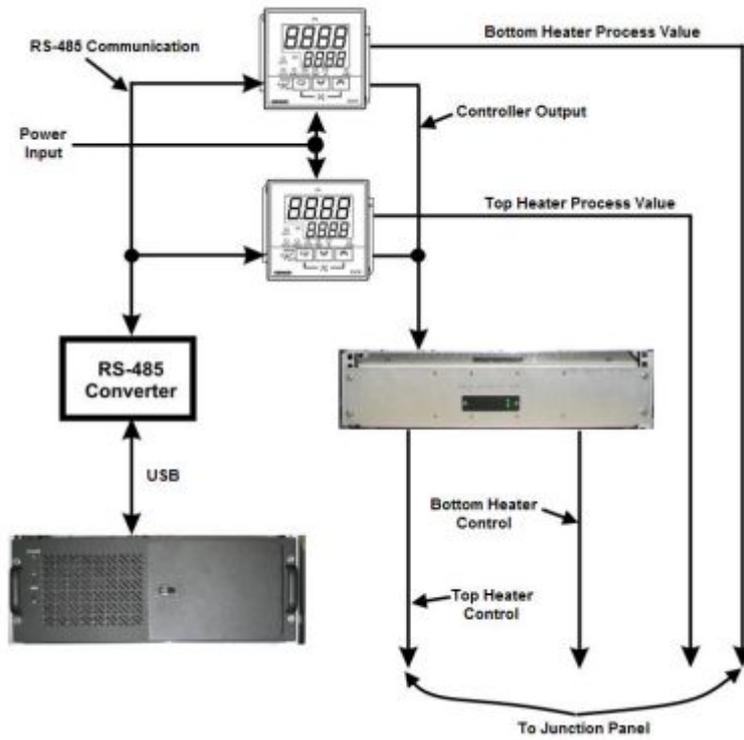


Figure 4-8 Heater Controller Simplified Block Diagram

4.1.8 Transport Fixture

After alignment on a SUSS Bond Aligner, the wafer stack is mechanically secured to a Transport Fixture (see Figure 4-9) for transport to a Substrate Bonder.

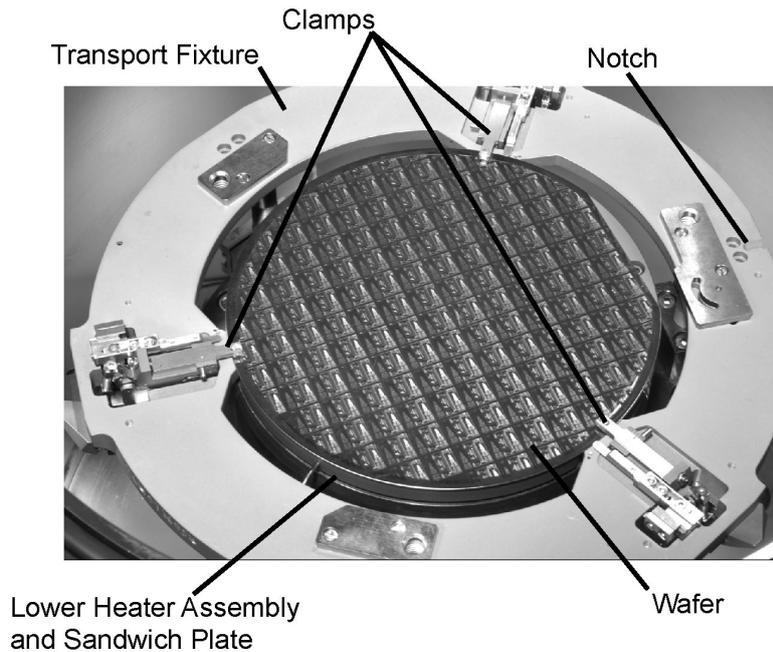


Figure 4-9 Typical Transport Fixture and Wafer Stack

Spacers positioned between the wafers maintain a precise gap prior to bonding and clamps press down on the top of the wafer stack to ensure against shifting during transport.

Lifting the Process Chamber hood and opening the Process Chamber Lid allows access to the Process Chamber. The Transport Fixture is manually loaded onto the Lower Heater Assembly, or loaded using the optional Fixture Loader. The Transport Fixture Notch should face away from the Process Chamber Lid hinge. Processing can begin after securing the Process Chamber Lid and lowering the Process Chamber hood.

**Note**

The Processing Chamber Interlock prevents system operation unless the Process Chamber Lid is securely fastened to the chamber body.

For a complete description of the Transport Fixture, determine the type of fixture and then refer to the appropriate manual:

- 06,1024033 Transport Fixture Service Manual
- 06,1029035 Transport Fixture Gen IV User Guide

4.2 Pressure Gauges and Controls

A row of five pressure gauges and four pressure regulators are available in the lower left cabinet (see below).



Figure 4-10 Pressure Gauges and Regulators

4.3 Process Environment Control System (Optional)

4.3.1 Overview

The optional Process Environment Control System permits bonding in controlled, uncontrolled, and programmable process environments. Both the **Process Control Program** and the **Vacuum Control System** are used. A safety disc (burst pressure at 1.5 bar absolute) is installed for overpressure security (see Figure 4-4).



Note

Electromagnetic valves marked with a *V* and the Turbo and Roughing pumps can be switched either On or Off by clicking on their respective symbol on the PCP Maintenance-Chamber page. Motorized valves marked with a *VM* can be set to a specified percentage open or closed using the spin boxes on the same page. The Chamber pressure controller has to be stopped for these functions to work (refer to the SB6L Service Manual).

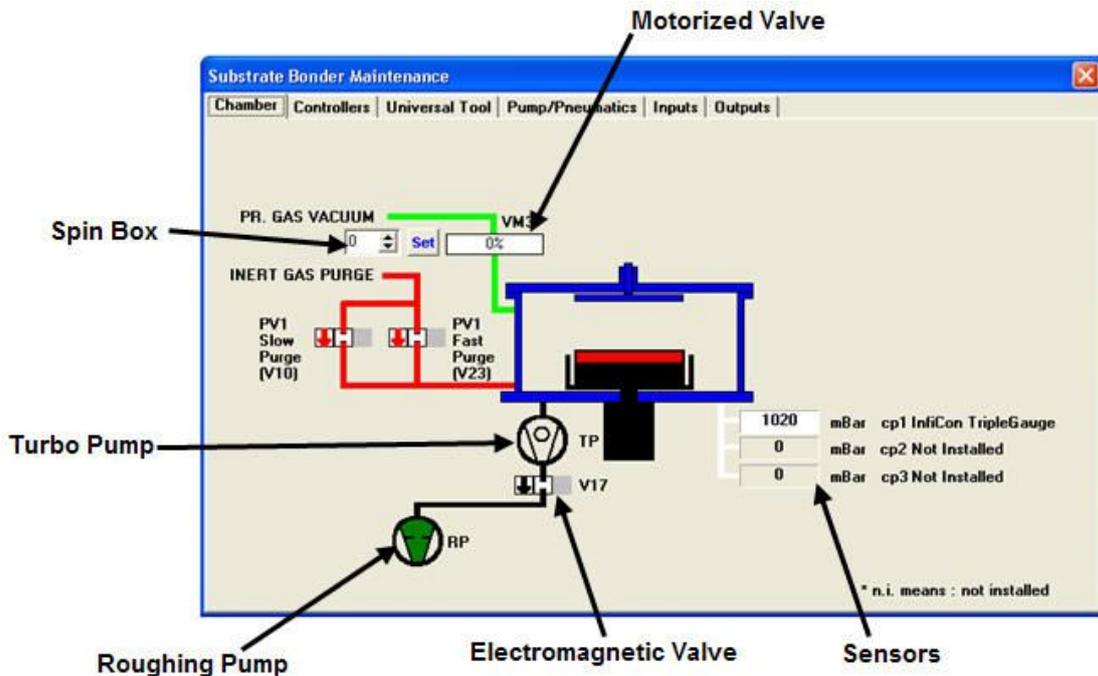


Figure 4-11 PCP Process Chamber Vacuum Control

Table 4-3 SB6L Controller System Options

Controller System (Configuration)	Over Pressure	Vacuum		
		Uncontrolled	Controlled	
			Simple	Up- stream
Pneumatic Equipment (Installed)				
PV1 (Inert gas purge)	-	X	X	X
VM3 (Process gas vacuum)	-	-	X	X
V17 (Shut off valve)	-	X	X	X
Controller Types That Can Be Used Within a Recipe				
Pump down 5.00e ⁻⁵ – 950 mbar	-	X	X	X
2-Point of Simple Control	X	-	X	X
Upstream 5.00e ⁻⁵ – sc-limit*	-	-	-	X
Purge	X	X	X	X
 Notes *sc-limit: simple controller limit **max-p: maximum pressure				

4.3.2 Uncontrolled Pump Down and Purge

An uncontrolled chamber evacuation is possible by switching on both the Roughing and Turbo pumps and opening V17 (see Section 5.6).

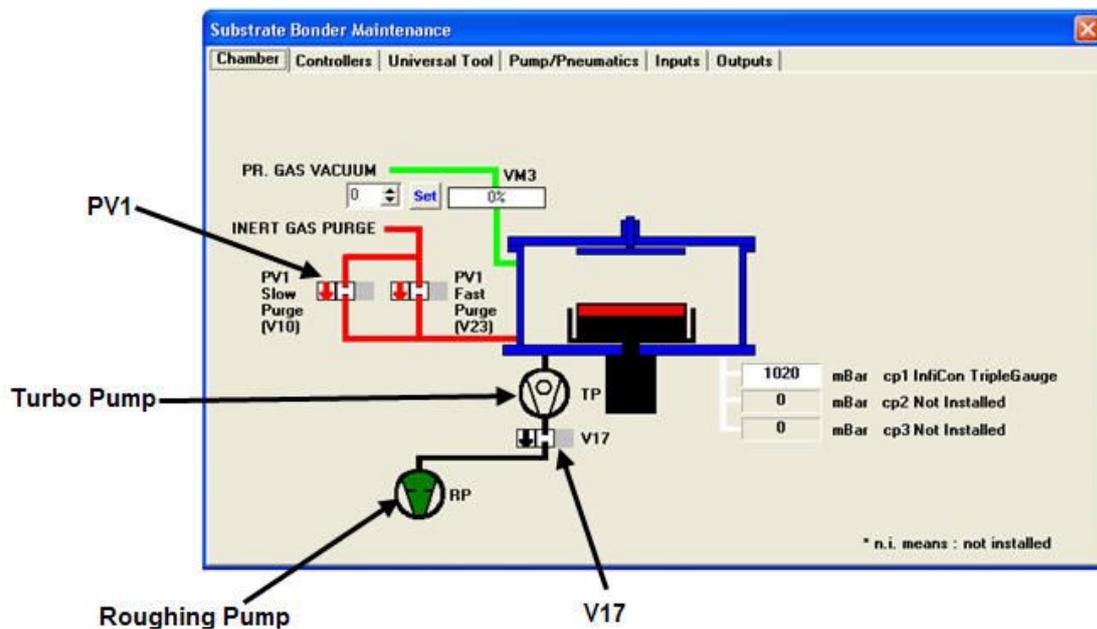


Figure 4-12 Uncontrolled Pump Down and Purge

In an uncontrolled Process Chamber evacuation (pump down and purge), the recipe moves to the next process step when the pressure has dipped below the user defined target value. The lower limit is automatically set to OFF.



Note

Each value specified in a recipe has a lower and upper limit. For example, if you select uncontrolled pump down and the target is 1 mbar, then the default upper limit is 110% of the target value, or 1.1 mbar. The lower limit is disabled (set to OFF) because, in this situation, the system has no means of controlling it. A user would choose this function to Section 5.5 for more information.

The Process Chamber purges through PV1 in the range from $10e^{-x}$ mbar to atmosphere. Once the pressure in the chamber is in the ambient pressure region, PV1/V17 controls the chamber pressure. Selecting the purge controller stops the Turbo Pump.

4.3.3 Automatic Vacuum Control

There are two ways to control system vacuum automatically: simple and upstream.

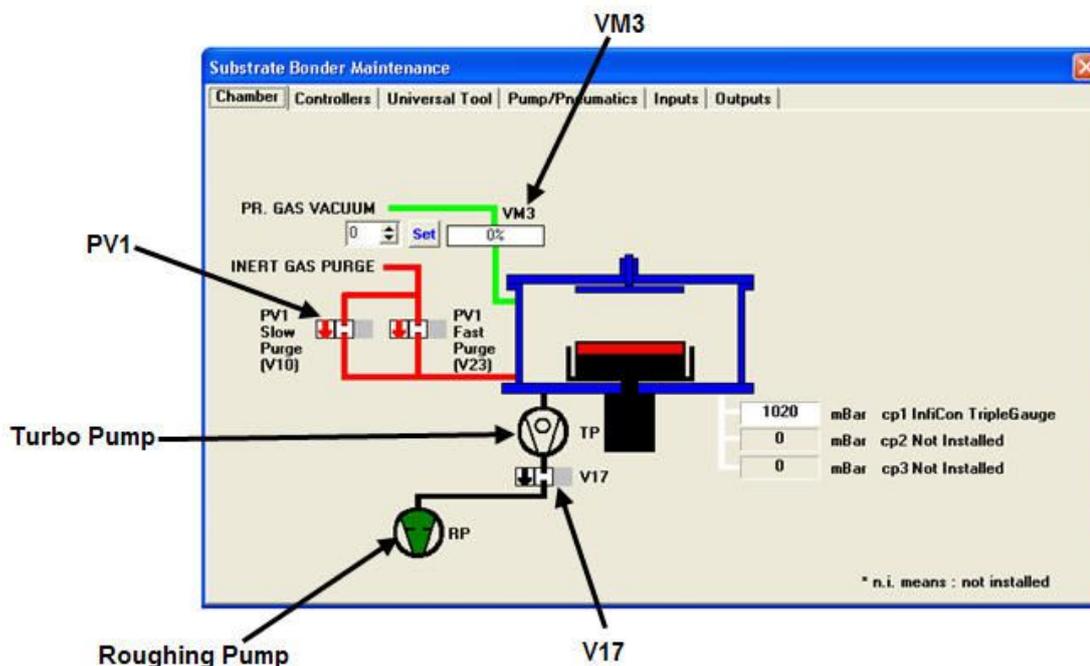


Figure 4-13 Automatic Vacuum Control

4.3.3.1 Controlled - Simple - 2-Point Controlling

The simple controller is a 2-point controller and uses the Roughing Pump to pump the Process Chamber down to the target range (from 1000 mbar to 10 mbar). Opening and closing PV1 and V17 controls the pressure.

Pressure values exceeding the programmed limits initiates a pump down. Regaining the target range stops the pump down.

4.3.3.2 Controlled - Upstream

The upstream control valve VM3 controls the vacuum in the chamber upon reaching the target range (10e-4 mbar to 10 mbar) by flowing small amounts of process gas into the chamber.

The balance of gas inlet (controlled by VM3) and the gas throughput of the pump configuration determine the control accuracy at the target pressure. The Turbo and Roughing pump are both used in this configuration.



Note

Depending on environmental conditions and the pump configuration, the Turbo Pump may become hot during prolonged operation with high target pressures. The Turbo Pump automatically shuts off when it reaches 60° C, minimizing risk to the pump and other equipment. For detailed information, refer to the Turbo Pump manufacturer's manual and other collateral material delivered with the machine.

4.4 Transport Fixture

After alignment on a SUSS Bond Aligner, the wafer stack is mechanically secured to a Transport Fixture (see Figure 4-9) for transport to a Substrate Bonder.

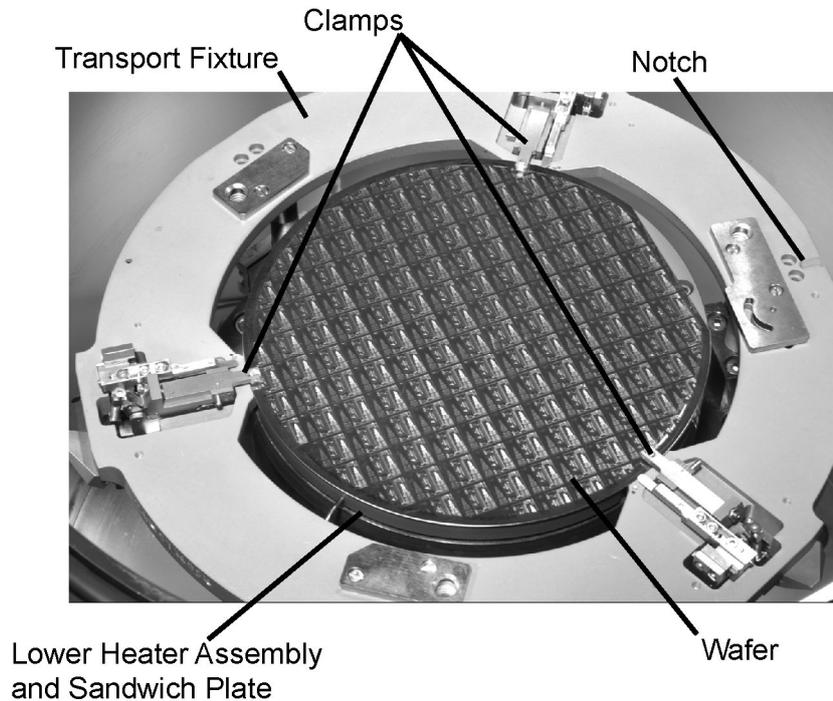


Figure 4-14 Typical Transport Fixture and Wafer Stack

Spacers positioned between the wafers maintain a precise gap prior to bonding and clamps press down on the top of the wafer stack to ensure against shifting during transport.

Lifting the Process Chamber hood and opening the Process Chamber Lid allows access to the Process Chamber. The Transport Fixture is manually loaded onto the Lower Heater Assembly, or loaded using the optional Fixture Loader. The Transport Fixture Notch should face away from the Process Chamber Lid hinge. Processing can begin after securing the Process Chamber Lid and lowering the Process Chamber hood.



Note

The Processing Chamber Interlock prevents system operation unless the Process Chamber Lid is securely fastened to the chamber body.

For a complete description of the Transport Fixture, determine the type of fixture and then refer to the appropriate manual:

- 06,1024033 Transport Fixture Service Manual
- 06,1029035 Transport Fixture Gen IV User Guide

5 OPERATING INSTRUCTIONS

5.1 System Start-Up and Shutdown

This section includes information for the startup, shutdown, and user management of the Substrate Bonder.

5.1.1 Start-Up Procedure

Use the following procedure to turn on the SB6L and prepare it for use.

**Note**

The SB6L will not process recipes and power will not be applied to the optional High Voltage Power Supplies unless the Process Chamber Lid is firmly secured to the Process Chamber Body (see Section 1.3.3).

1. Ensure the Emergency Off switch is de-activated (not depressed).

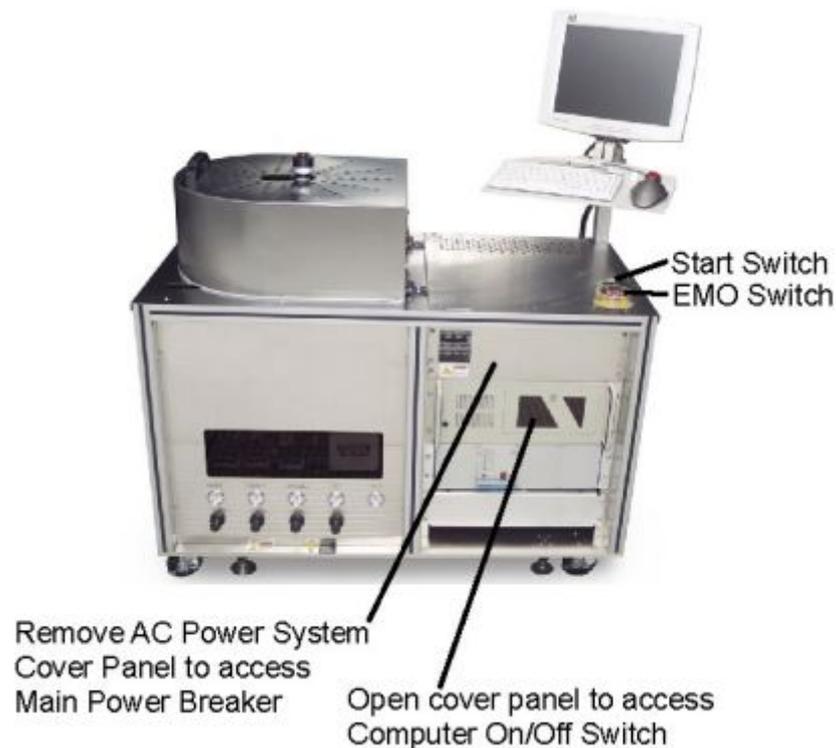


Figure 5-1 Locations of Startup Controls and Power Switches

2. Remove the AC Power System Cover Panel by loosening the four panel mounting bolts and pulling the cover down then out
3. Set the Main Breaker to the On position.

4. Open the Computer Access Panel and set the Computer Power Switch to the On position.
5. Set all other remaining equipment power switches to their On position.
6. The computer will boot up and display the **Windows Login** dialog box at the end of the computer's boot up sequence. Enter a User Name and Password to start loading the **Process Control Program (PCP)**. A startup screen displays while PCP loads (see Figure 5-2).

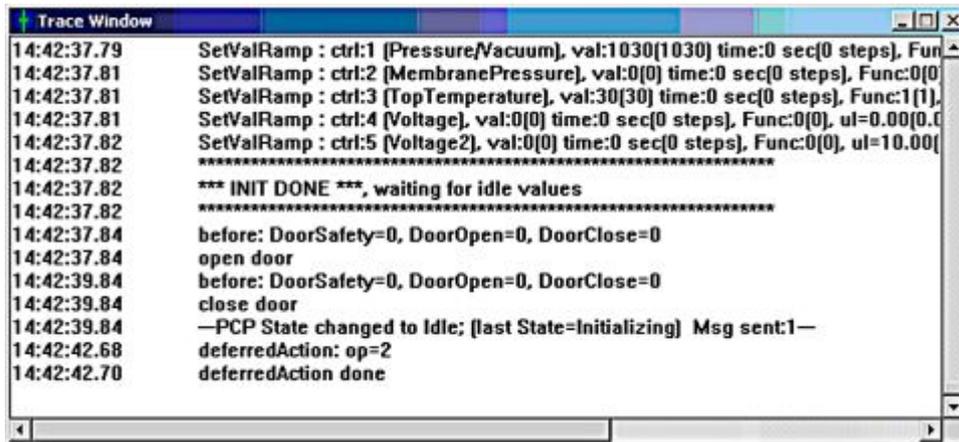


Figure 5-2 Process Control Program Startup Screen

7. A **User Action Required** message displays at the end of the program loading sequence requesting the user to press the console **START** pushbutton switch (see Figure 5-1), which initiates system startup.

The **START** pushbutton flashes green to indicate that the system is ready for startup. It changes to solid green after the **Start** button is pressed, and the **User Interface** replaces the **User Action Required** message box.



Figure 5-3 User Interface Start Up Screen

8. The **PCP Navigator (Navigator)** displays after successful initialization (see Figure 5-4).



Name	Function
Login	Opens Login In dialog box.
Control	Opens Control Center window
Status	Opens Status window
Recipe	Opens Recipe editor
Users	Opens Manage Users window
Service	Opens Maintenance window
Config	Opens system Configuration window
Data	Opens Data File Viewer application
Exit	Exits Navigator
About	Opens About SB6L window

Figure 5-4 PCP Navigator

5.1.2 Logging In/Logging Out

Click *Login* on the Navigator to open the **Log In** dialog box (see Figure 5-5). To log in, select your *User Name* and enter your *Password*, choose *Log In as New Current User*, then click *OK* or press the keyboard *Enter* key. Click *Cancel* to abort the login.

To log out, select *Log Out Current User* and click *OK*.

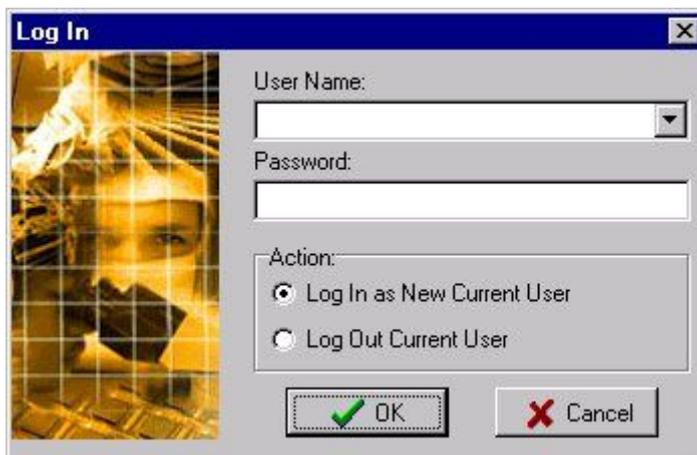


Figure 5-5 Login Window

5.1.3 User Management

There are four user levels for the SB6L default security setup:

1. **SUSS Service:** A Super User. Only used by SUSS personnel or by factory trained technicians working on the system. Has access to all system functions, including maintenance functions.
2. **Customer Master:** A customer designated Super User responsible for the system's user setup. Has access to all system functions, including maintenance functions.
3. **Equip Manager:** Customer-designated user for situations when the customer is not interested in setting up individual users. Limited access to functions, including maintenance functions.
4. **Operator:** A user with access limited to operator functions only.

A *Super User* or authorized *Equip Manager* can add new users, modify existing user profiles, change passwords, or delete users.



Note

Only the SUSS Service cannot be changed.

5.1.3.1 Adding New Users

1. Click *Users* on the **Navigator** to open the **Manage Users** dialog box (see Figure 5-6).

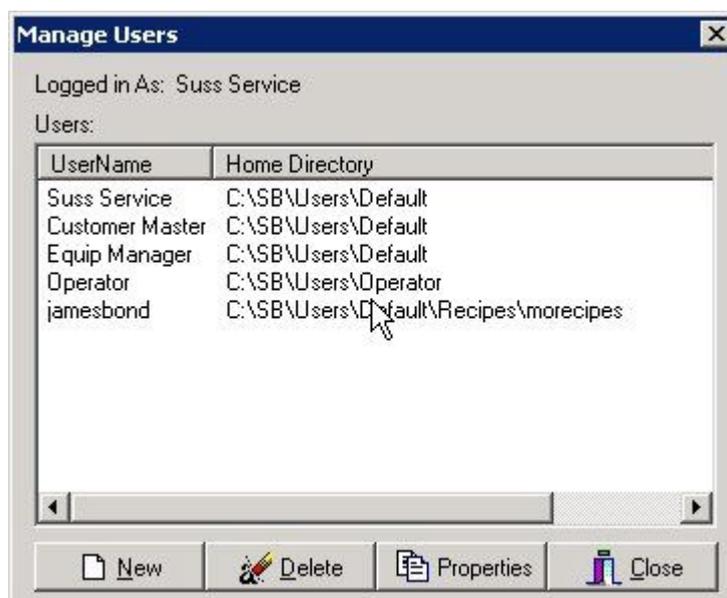


Figure 5-6 Manage Users Dialog Box

2. Click *New* to open the **Add New User** dialog box. Enter a *User Name* and *Password* for the new user. (You must reenter the password for confirmation.)

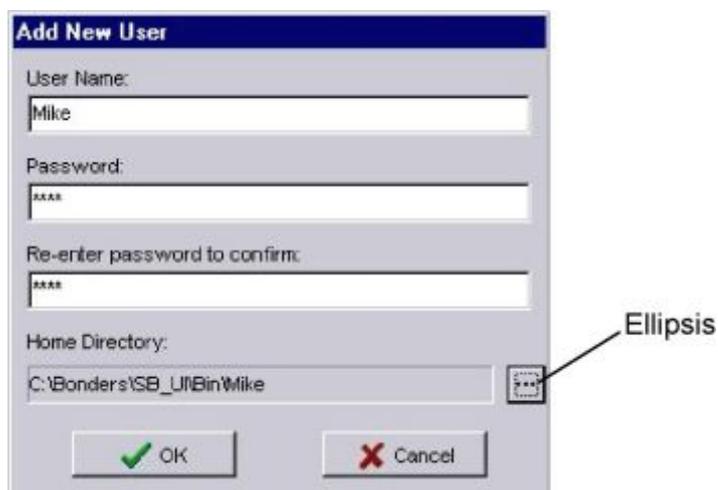


Figure 5-7 Add New User Dialog Box

3. If necessary, click the *Ellipsis* to open the **Browse for Folder** dialog box and assign a new *Home Directory* for the user; otherwise, click *OK* to create the new user account, close the **Add New User** dialog box return to **Manage Users**.

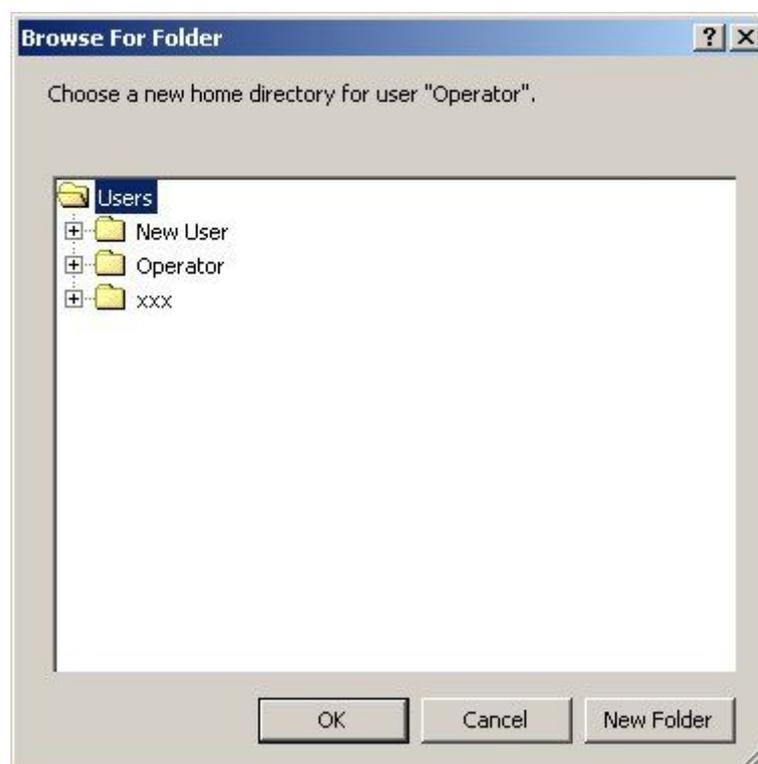


Figure 5-8 Choose User Directory Dialog Box

4. Use the **Browse for Folder** dialog box to select the folder or subfolder for the home directory, or create a new folder or subfolder for the user's home directory. Click **OK** to close **Browse for Folder** and open the **Confirm Home Director Change** dialog box.



Figure 5-9 Confirm Directory Change Dialog

5. The **Confirm Home Directory Change** dialog box also allows copying of recipes and data files from an existing folder to the new user folder. Check the appropriate box, and then click **Yes** to confirm the change. Copy the appropriate information to the new directory and return to **Manage Users**. Click **NO** to close the dialog box without changing the home directory and return to **Manage Users**.

5.1.3.2 Modifying Existing Users and Setting User Properties

Use the following procedure to modify or set the user properties, including preferences and authorizations.

1. Click *Users* on the **Navigator** to open the **Manage Users** dialog box (see Figure 5-6).
2. Click **Properties** to open the **User Properties** dialog box for the selected user and select the *Preferences* tab.
3. Click the appropriate Option to set the default temperature, pressure, and force units and the appearance of the user's desktop on login.

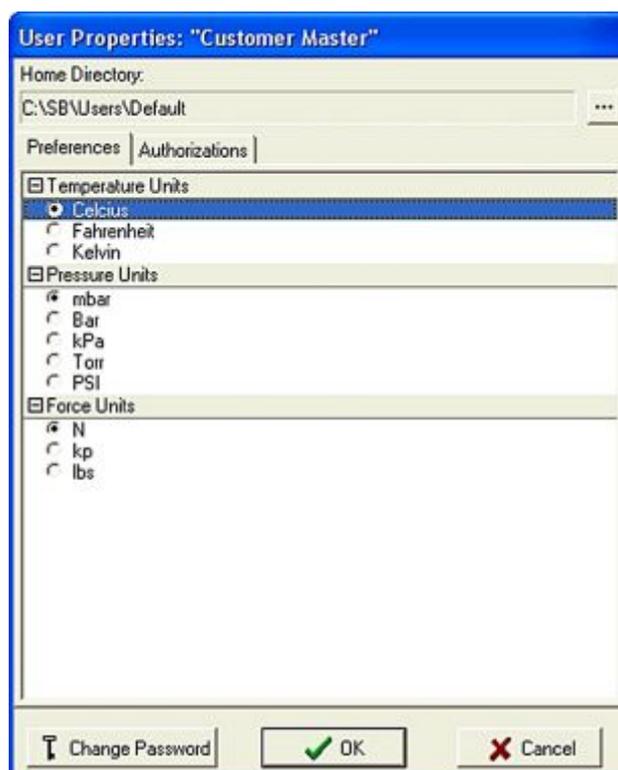


Figure 5-10 User Properties – Preferences

4. Click the *Authorization* tab and check the authorizations assigned to the user.

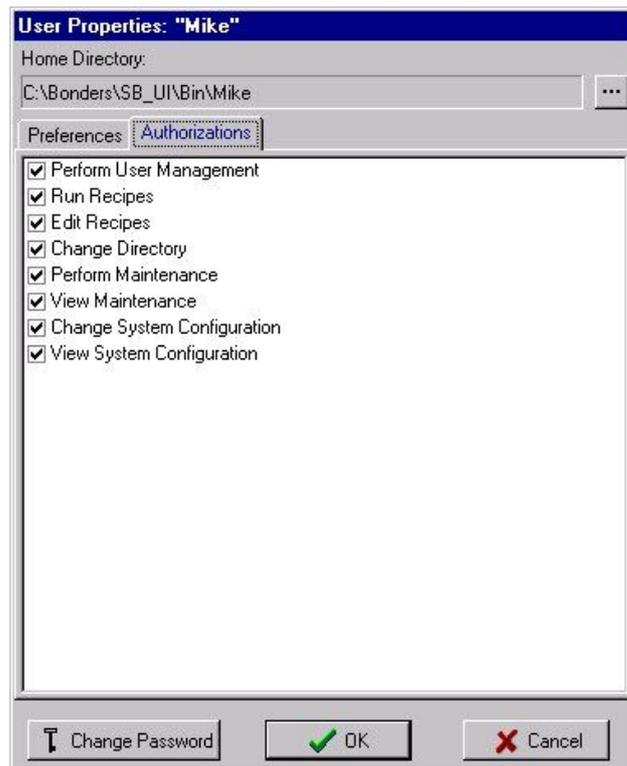


Figure 5-11 User Properties – Authorizations

5. To change the password, click *Change Password* to open the **Change Password for “username”** dialog box. Enter and confirm the new password, then click *OK* to save the new password.



Figure 5-12 Change Password

6. Click *OK* to save the changes and close the **User Properties** dialog box.

5.1.3.3 Deleting Users

1. Click *Users* on the **Navigator** to open the **Manage Users** window (see Figure 5-6).
2. Highlight the user to delete and click *Delete*.

**Note**

This operation is not reversible. Ensure the correct user is selected prior to clicking the *Delete* button.

3. Click *OK* to close the **Manager Users** window.

5.1.4 Shutdown Procedure

Use the following procedure to shut down the Substrate Bonder.

1. Click ***Exit*** on the **Navigator**.

**Note**

Closing the Navigator does not stop the PCP. This allows the user to connect the SB6L to a remote computer system via standard 100Base-T (IEEE 802.3u) network interface and to operate it from a remote location.

2. To halt the current process and close the **Process Control Program**, right click **PCP** on the **Windows Task Bar** and select *Close* from the popup menu.
3. Shut down the computer system by clicking *Start* on the **Windows Task Bar**, then selecting *Shutdown* in the **Windows Shutdown** dialog that appears. Click *OK* to shut down the computer. .

**Note**

On some computer systems, it may be necessary physically to turn off the computer system after Windows has completed the Shutdown sequence.

4. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).

5.2 System Operation

5.2.1 Process Control Program Navigator

The **Process Control Program (PCP) Navigator** accesses the various components of the program (see Figure 5-13).

**Note**

All components of the PCP are not available to all users.



Name	Function
Login	Opens Login In dialog box.
Control	Opens Control Center window
Status	Opens Status window
Recipe	Opens Recipe editor
Users	Opens Manage Users window
Service	Opens Maintenance window
Config	Opens system Configuration window
Data	Opens Data File Viewer application
Exit	Exits Navigator
About	Opens About SB6L window

Figure 5-13 PCP Navigator

5.2.2 The SB6L Control Center

The **SB6L Control Center** controls bonder processing. From the **Control Center** window, users can load or unload fixtures, load recipes, start, abort, or finish processes, and respond to error messages.



Note

The modified recipe has to be reloaded after saving the changes for those changes take effect.

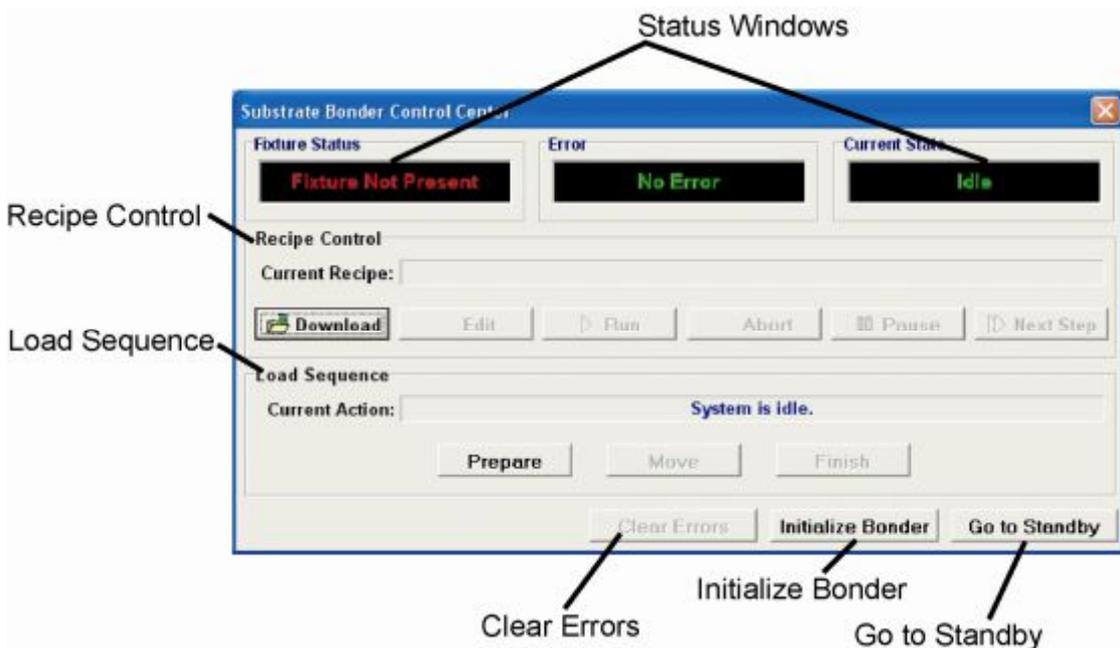


Figure 5-14 Control Center

Table 5-1 Control Center Description

Name	Function	
Status Windows		
Fixture Status	Displays the Transport Fixture status in the Process Chamber. Status messages are: <ul style="list-style-type: none"> • Fixture Not Present – No fixture is present in the Process Chamber • Fixture Present – Fixture is present in the Process Chamber 	
Error	Displays error messages produced by the PCP when it encounters problems during fixture loading, processing, or recipe control (see Section 5.4).	
Current State	Displays current operating state of the Substrate Bonder. Current states include:	
	<i>Idle</i>	System is not processing a recipe
	<i>Processing</i>	System is currently processing a recipe
	<i>Paused</i>	Recipe processing has been paused
	<i>Aborted</i>	Execution of current recipe processing has been aborted
	<i>Prepare for Load</i>	<i>Prepares system for fixture loading</i>
	Prepare for Unload	Prepares system for fixture Unloading
	Standby	Places system in standby condition
	Ready to Load	Indicates that system is ready to load fixture
	Ready to Unload	Indicates that system is ready to unload fixture
	Ready to Process	Indicates that system is ready to begin recipe process

Name	Function
Recipe Control	
Current Recipe	List the name of the currently loaded recipe, or, if no recipe is currently loaded, "No Recipe Loaded" is displayed.
Download	Opens a dialog box listing current recipes available for downloading.
Edit	Opens the Recipe Editor window.
Run	Active when recipe has been loaded. Clicking <i>Run</i> starts the recipe and changes the Current State status window to "Processing." If system configuration is incompatible with the recipe, an error screen displays (see Section 5.4).
Abort	Halts execution of current recipe and changes Current State status window to "Abort." Processing is completed by running the Unloading Sequence
Pause	Pauses the processing. Displays "Paused" in the Current State status window and changes button caption to <i>Resume</i> .
Next Step	Moves an interrupted process to the next step in the process's sequence. This button is not available when the process is last step in the process.
Load Sequence (Partially grayed out if no fixture present in Process Chamber)	
Current Action	Displays current action is loading or unloading sequence. Current actions are: <ul style="list-style-type: none"> • System is Idle – System is between processes • Ready to Process – Instructs user that system is ready to start processing wafer stack.
System Controls	
Clear Errors	Clears Error status window, but does not clear the condition causing the error. <div style="display: flex; align-items: center; margin-top: 10px;">  <div> <p>Note</p> <p>Click Clear Error only when the cause of the error is known and there are no hazards to the system or to the user; otherwise, the system could be damaged, or the user could be injured.</p> </div> </div>
Initialize Bonder	Initializes SB6L and sets system in Idle mode after initialization.
Go to Standby	Moves SB6L from Idle Mode to Standby mode.

5.2.2.1 Fixture Present Confirmation

A confirmation dialog box displays when the **PCP Control Center** opens asking the user if a Transport Fixture is present in the Process Chamber.



Note

If the Control Center is opened while a process is running, the fixture confirmation will not display.



Figure 5-15 Fixture Location Confirmation Dialog

Click **Yes** if a fixture is present. The SB6L will start to process the current recipe without the load procedure.



Note

The SB6L has no Transport Fixture sensor, so answering the question incorrectly could cause damage to the system.

Click **No** if a fixture is not present in the Process Chamber. If a fixture is not present, the **PCP Control Center Current State** status window displays “Fixture Not Present” and enables the Load Sequence portion of the window (see Figure 5-14).

5.2.2.2 Loading Sequence

If the **PCP Control Center** opens without a Transport Fixture in the Process Chamber, only the *Prepare* button is active in the Load Sequence panel. Use the following procedure to load a Transport Fixture in the Process Chamber.



Note

It is possible to load a fixture into the machine without a recipe being active.

1. Ensure a wafer stack is loaded onto the **Transport Fixture**.



Wear clean room gloves when handling the Transport Fixture.

- Click *Prepare* in the **PCP Control Center**, lift the Process Chamber hood, loosen the Process Chamber lid retainers, and slide them out of the way (see Figure 5-16).



CAUTION!
Hot Surfaces!
Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!

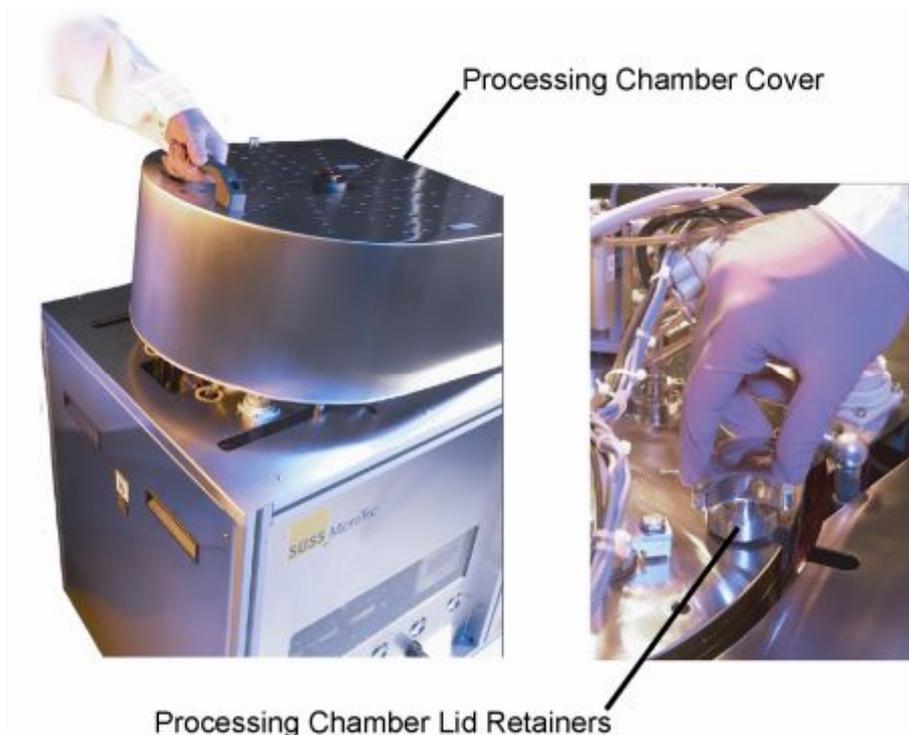


Figure 5-16 Process Chamber Cover and Chamber Lid Retainers

- Open the Process Chamber and using ratchet with socket, raise the Fixture Loading Tool to its maximum height (see Figure 5-18). This is the load position.



Note
Turning the ratchet clockwise (to the right) raises the Fixture Loading Tool. Turning the ratchet counterclockwise (to the left) lowers the Fixture Loading Tool.

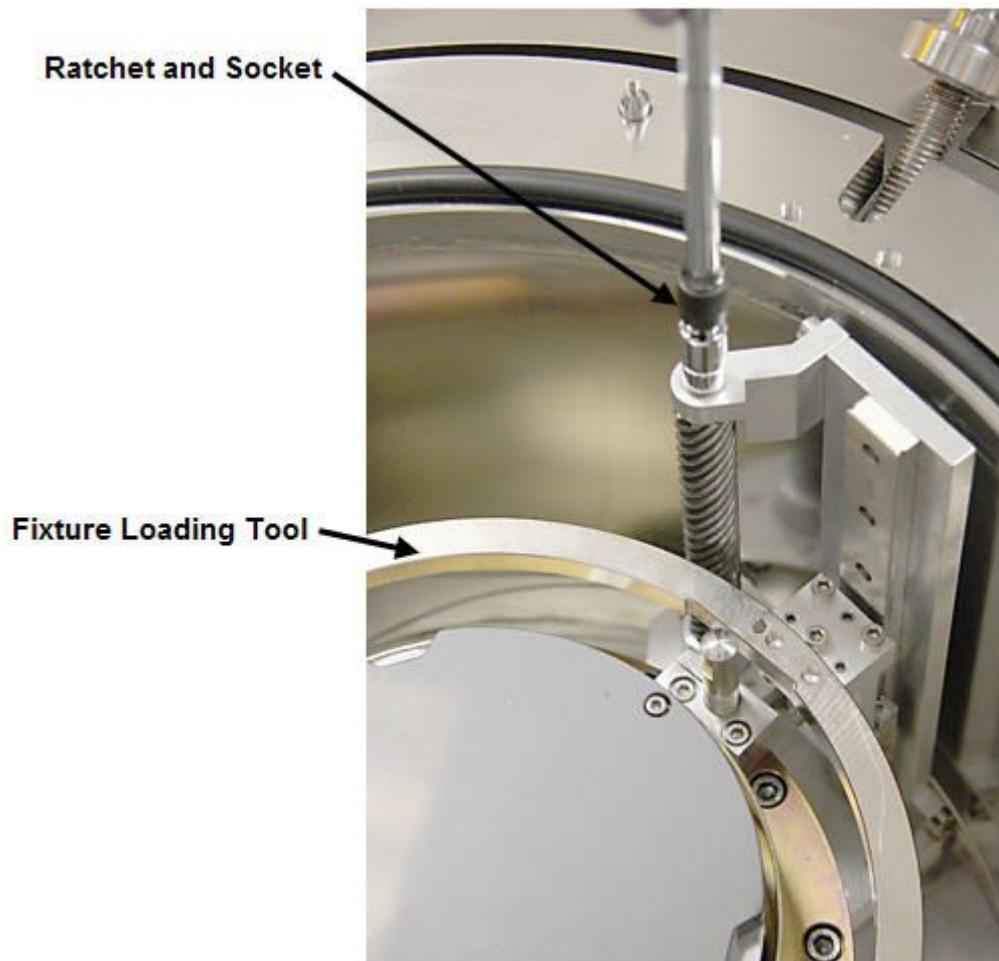


Figure 5-17 Fixture Loading Tool

4. Place the Transport Fixture on the Transport Loading Tool so that the Alignment Pins seat in the Alignment Posts and the Notch is facing away from the Process Chamber hinge.

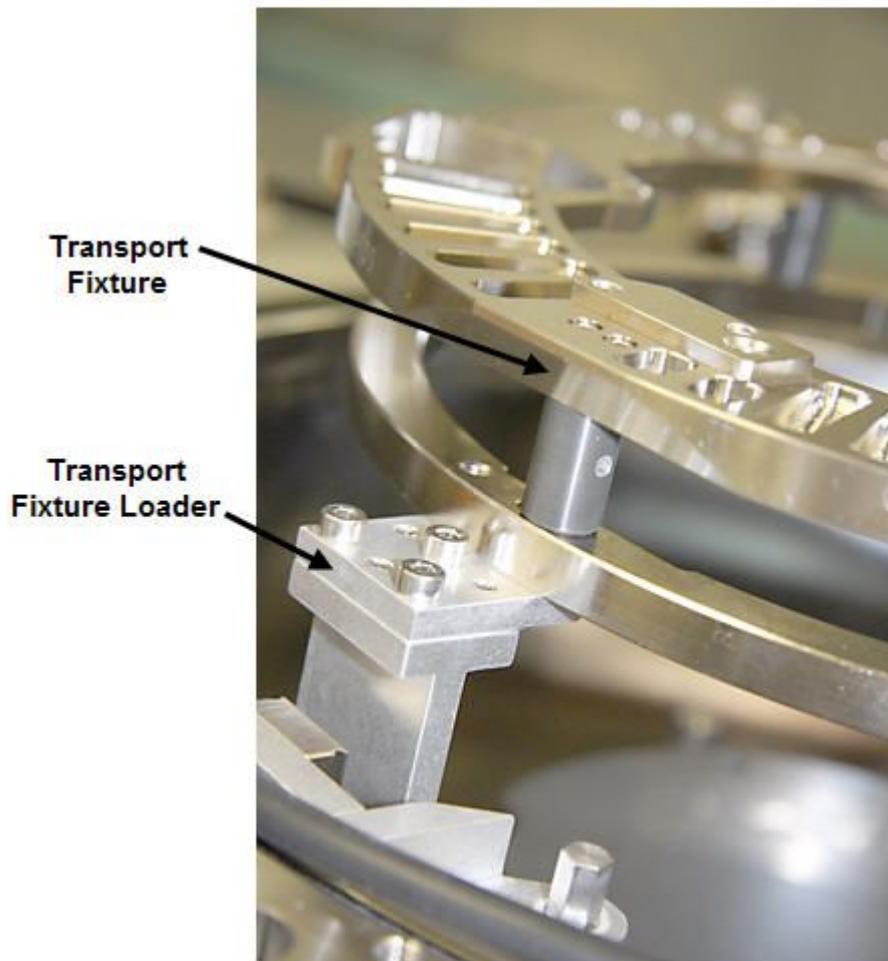


Figure 5-18 Transport Fixture on Fixture Loading Tool

5. Use the ratchet with socket, slowly lower the Fixture Loading Tool until the Transport Fixture rests on the Lower Heater Assembly and is free of the Fixture Loading Tool.



CAUTION!

Hot Surfaces!

Risk of burns caused by touching.

Wait until surface has cooled down below 40° C.

Wear protective gloves when touching it!

6. Close and secure the Process Chamber lid and lower the Process Chamber cover.



Note

The SB6L will not process recipes and power will not be applied to the optional High Voltage Power Supplies unless the Process Chamber Lid is firmly secured to the Process Chamber Body (see Section 1.3.3).

- If necessary, adjust the Pressure Head Depth (see Section 5.2.2.3).

**Notes**

If the wafer thickness has changed since the last bonding process, the Pressure Head must be readjusted prior to initiating the recipe (see Section 5.2.2.3.2).

- Click *Finish* in the **PCP Control Center**. “Ready to Process” will display in the Current State status window.

5.2.2.3 Pressure Head Depth Adjustment

The SB6L Pressure Head uses manual adjustment to ensure proper wafer bonding. Use the following procedure to adjust the Pressure Head depth. The following procedures offer different methods of ensure proper head depth. All assume that a Transport Fixture with wafer(s) is loaded in the Process Chamber, the Process Chamber Lid is closed and secured, and the Process Chamber Covered lowered.

**Note**

The Pressure Head Depth needs adjusting every time the wafer stack thickness changes or one systems equipped with a center pin, if the center pin or center pin spring is replaced (see Section 6.2.17).



Figure 5-19 Location of Pressure Head Manual Depth Adjuster

5.2.2.3.1 Initial Pressure Head Depth Adjustment

Use this procedure for initial Pressure Head Depth Adjustment or if bonding failures indicate Pressure Head Adjustment is necessary.

- With the Universal Tool in the up position, loosen the Pressure Head Adjuster set screw and rotate the Pressure Head Manual Adjuster

counterclockwise (to the left) to its upper end limit (touching the red button, see Figure 5-20).

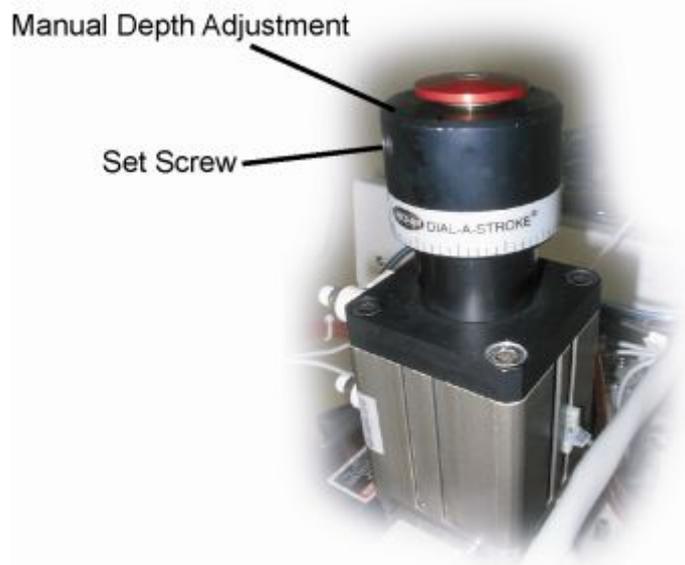


Figure 5-20 Location of Pressure Head Adjuster Set Screw

2. Move the Universal Tool to the down position and slowly turn the Pressure Head Manual Adjuster clockwise (to the right) until you feel resistance. Note the position of the Manual Pressure Head Adjuster.
3. Move the Universal Tool to the up position. Complete the depth adjustment by rotating the Manual Pressure Head Adjuster clockwise (to the right) an additional 120° (one-third rotation). Then tighten the setscrew to lock the knob from moving during normal operation.

5.2.2.3.2 Depth Adjustment Using Matrix

Use this procedure to adjust the Pressure Head Depth up or down accordingly when there is a change in the wafer stack being processed.

1. Locate the current wafer stack height and the new wafer stack height in the table below.



Note

The pitch of the Manual Adjuster is 1.6 mm per complete revolution.

Table 5-2 Wafer Stack Adjustment Guide

Wafer Stack Adjustment Guide			
Current Wafer Stack Height	New Wafer Stack Height	Turn Adjuster Knob in Pressure Head (All Values +/- 1/16 Turn)	
		Clockwise	Counterclockwise
0 μm	1500 μm	1-1/8 Turn	
500 μm	1000 μm	1/3 turn	
750 μm	1000 μm	1/6 turn	
500 μm	1300 μm	1/2 turn	
750 μm	1300 μm	1/3 turn	
500 μm	1500 μm	2/3 turn	
1500 μm	500 μm		2/3 Turn
1300 μm	750 μm		1/3 Turn
1300 μm	500 μm		1/2 Turn
1000 μm	750 μm		1/6 Turn
1000 μm	500 μm		1/3 Turn

- Loosen the Pressure Head Adjuster set screw and turn the Pressure Head Adjuster the number of turns in the direction indicated move the Pressure Head Depth to the new setting (see Figure 5-20).
- Tighten the set screw to ensure against movement during normal operation.

5.2.2.4 Unloading Sequence

Use the following procedure to unload a Transport Fixture after processing is complete, or after aborting a process.



CAUTION! Hot Surfaces!

Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!

- Click *Prepare* in the **PCP Control Center** to equalize the pressure in the Process Chamber to ambient pressure and to cool the upper and lower heaters to their unload temperatures (as specified in the Configuration page, Section 5.7). "Ready to Unload" displays in the **Status** window

Current State display (see Section 5.2.3) when the unload temperatures are reached.

2. Lift the Process Chamber cover, loosen the Process Chamber lid retainers, and slide them out of the way (see Figure 5-16).
3. Open the Process Chamber and use the ratchet with socket to raise the Fixture Loading Tool to the top of its travel.
4. Remove the Transport Fixture from the Process Chamber. If replacing it with a new Transport Fixture and wafer stack, refer to Section 5.2.2.2.
5. If the Transport Fixture and wafer stack is not being replaced, lower the Transport Loading Tool to its lowest position, close the Process Chamber and secure the Process Chamber Retainers. Close and secure the Process Chamber lid and lower the chamber cover.



Note

Failure to lower the Transport Loading Tool to its lowest position will cause possible damage to the loading tool mechanism.

6. Click *Finish* in the **PCP Control Center**. “Ready to Process” will display in the *Current State* window (see Figure 5-14).

5.2.3 Status Window

The Status window displays detailed information about the real-time status of the SB6L, such as top and bottom heater temperatures, Process Chamber pressure and process voltage or current.

Click the **Navigator Status** button to open the **Status** window.

The target parameters for the current step display when initiating a bond process. If no process is running, the various IDLE condition states.

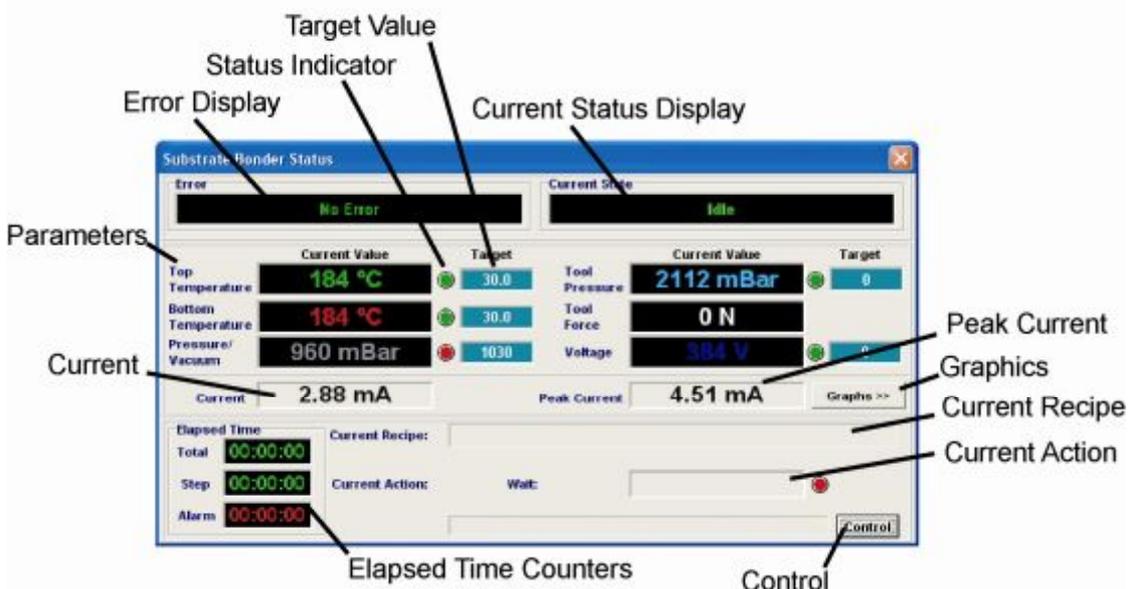


Figure 5-21 Status Window

Table 5-3 Status Window Descriptions

Name	Function	
Error Display	Displays error messages produced by the Process Control Program when it encounters problems during fixture loading, processing, or recipe control.	
Current State Display	Current operating state of the Substrate Bonder. Current states include:	
	Idle	System is not processing a recipe
	Processing	System is currently processing a recipe
	Paused	Recipe processing has been paused
	Aborted	Execution of current recipe processing has been aborted
	Prepare for Load	<i>Prepares system for fixture loading</i>
	Prepare for Unload	Prepares system for fixture Unloading
	Standby	Places system in standby condition
	Ready to Load	Indicates that system is ready to load fixture
	Ready to Unload	Indicates that system is ready to unload fixture
	Ready to Process	Indicates that system is ready to begin recipe process
Parameters	Displays the current value and target value for six different operating parameters: Top Temperature, Bottom Temperature, Pressure/Vacuum, Tool Pressure, Tool Force, and Voltage.	
Status Indicator	<p>A <i>Status</i> indicator is present for each parameter.</p> <p>The Status indicator flashes yellow when a process is initiated and the parameters move toward their target values. They glow green when the parameter's current value reaches the target value.</p> <p>The <i>Status</i> indicator flashes red if a parameter does not reach the target value before a predetermined ramp time is</p>	

Name	Function	
	complete.	
Target Value	The preset temperature, pressure, or voltage operating values based on the current operating status of the Substrate Bonder.	
Current	Value of current operating current in mA.	
Peak Current	Displays the value of the peak current reached during the current process.	
Graphs/No Graphs	Toggles between displaying or not displaying selected graphs, or recipe data at the bottom of the Status window (see Section 5.2.3.1).	
Elapsed Time	Three elapsed time counters:	
	Total	Total elapsed process time
	Step	Total elapsed time for the current recipe step
	Alarm	Total elapsed time of an error alarm, if an error is detected during processing.
Current Recipe	List the name of the currently loaded recipe, or, if no recipe is currently loaded, it displays “No Recipe Loaded.”	
Current Action	Current recipe process step.	
Control	Opens the Control Center (see Section 5.2.2).	

5.2.3.1 Status Window – Graphs

Clicking *Graph/No Graph* toggles between an expanded Status window that displays relevant parameters in a graphical format, or the standard window without the graphical display. The selected tab determines the actual parameters displayed. The following example shows the **Temperature** tab with *Graph* selected.

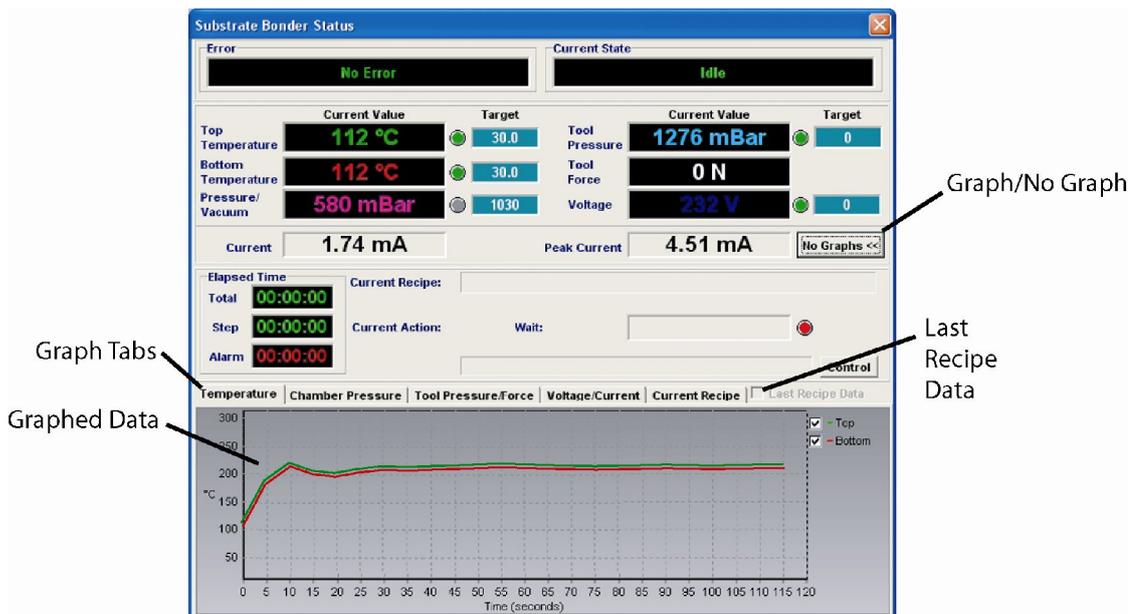


Figure 5-22 Status with Graphs - Temperature Page Shown

An overview of the recipe can be displayed by clicking on the *Current Recipe* tab. Clicking **Last Recipe Data** replaces the real time data from the current process with data from the previously run process.

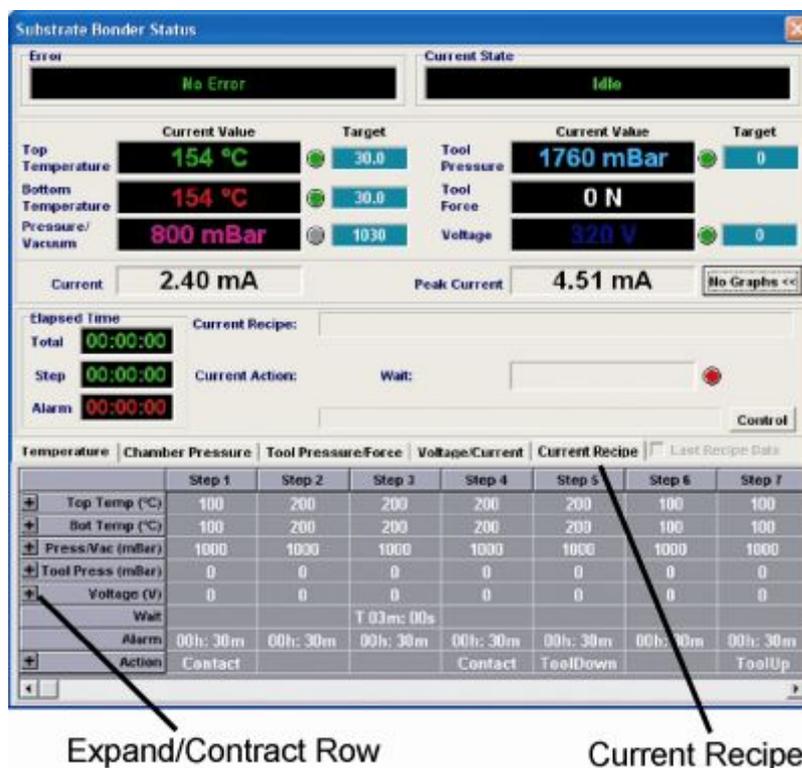


Figure 5-23 Status with Recipe Displayed

5.2.4 Recipe Control

The **PCP Control Center** *Current Recipe* field displays the currently selected recipe. ("No Recipe Loaded" is displayed until a recipe has been selected).

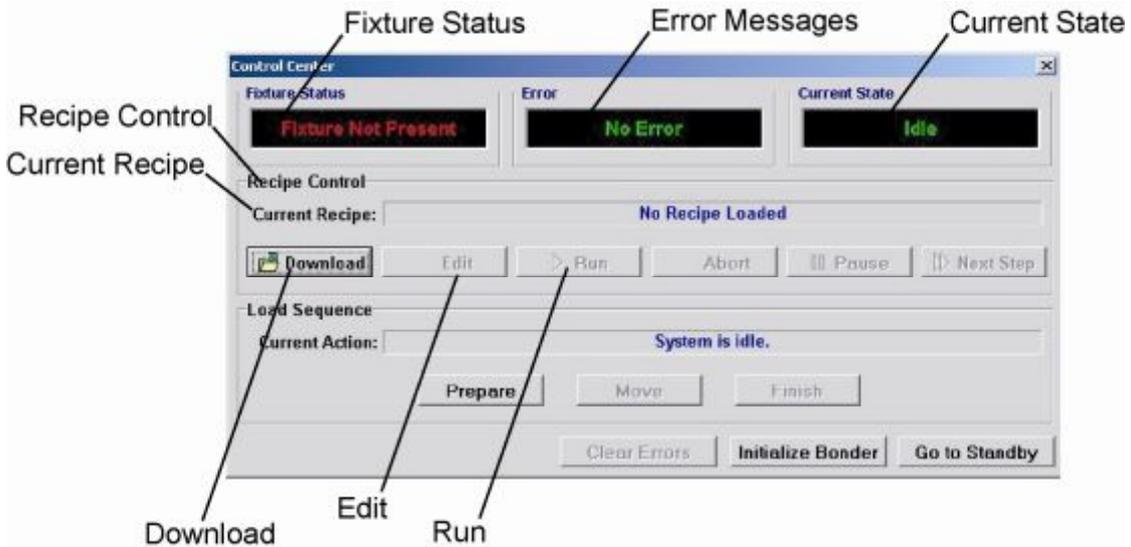


Figure 5-24 Control Center Recipe Controls

Clicking *Recipe Control Download* opens a standard Windows dialog box for selecting new user's recipes. Highlighting a recipe from the list and clicking *Open* downloads the selected recipe to the SB6L (see Figure 5-25).

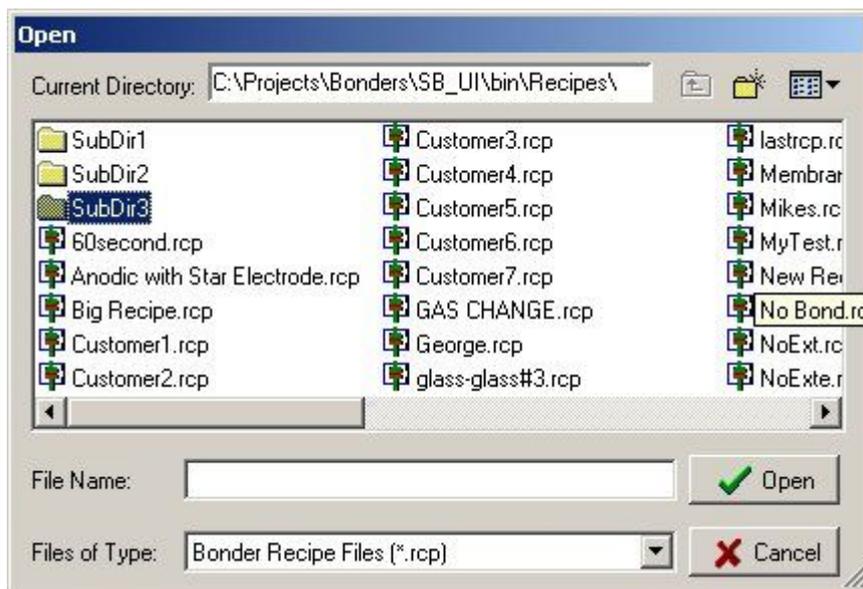


Figure 5-25 Open Recipe Dialog Box

To modify the current recipe, click the **Control Center** *Edit* button to open the **Recipe Editor** window (see Figure 5-13 and Section 5.5.2).



Note

The modified recipe has to be reloaded after saving the changes for those changes take effect.

5.2.5 Recipe Processing



Note

The Pressure Head must be adjusted prior to creating or testing any recipe processes.

Click the **Control Center** *Run* button to process the current recipe. Once the recipe starts processing, the *Run* button is disabled and the *Abort* button becomes active.



Note

If the system configuration is incompatible with the recipe, an error screen displays when the *Run* button is clicked. Refer to Section 5.4 for a list of possible error messages and suggested remedial actions.

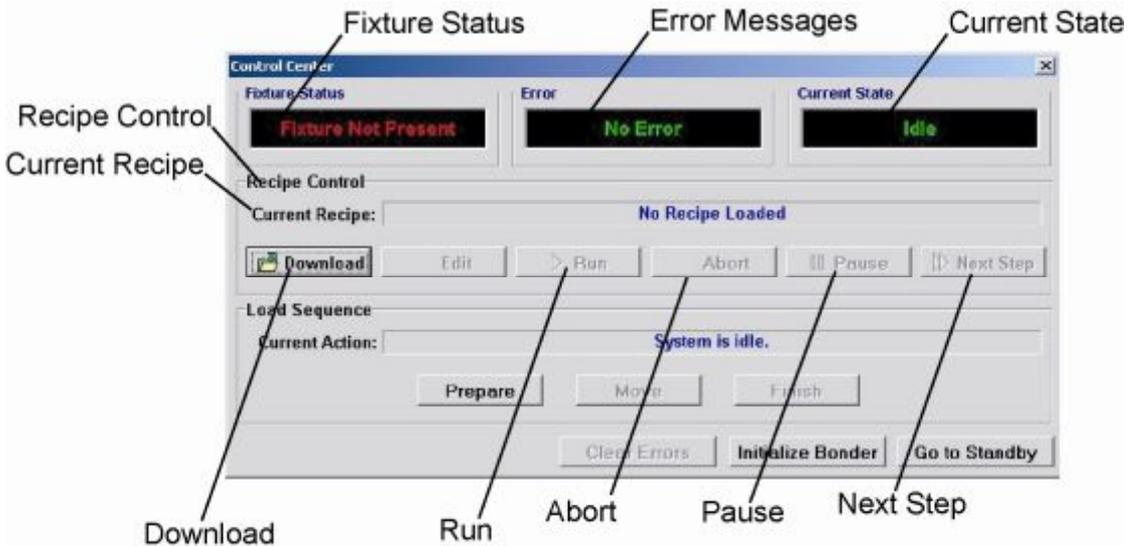


Figure 5-26 Recipe Processing Control Buttons

Table 5-4 Recipe Processing Control Center Descriptions

Name	Function
Run	Only enabled when a recipe has been selected and system is not in a processing mode; otherwise, button is grayed out. Clicking starts the recipe process and changes the Control Center Current State display to "Processing." When system is processing, the <i>Run</i> button is disabled and the <i>Abort</i> button is enabled. The progress of the recipe can be monitored by clicking the Navigator Status button (see Section 5.2.1).
Abort	Terminates recipe processing and displays "Aborted" in the Control Center Current State window. Removing the Transport Fixture after the process is aborted is accomplished through the unloading sequence (see Section 5.2.2.4).
Pause/Resume	Pauses recipe processing, displays "Pausing" in the Control Center Current State window, and changes the Pause button to a Resume button. In the Paused state, the remaining recipe steps can be altered, saved and updated via <i>Download</i> . Clicking <i>Resume</i> resumes recipe processing with the current step. Clicking <i>Next Step</i> resumes recipe processing with the next step in the processing sequence.
Next Step	Resumes a paused recipe process with the next step in the recipe sequence. This button is disabled when the recipe being processed has reached it's last step.

The **Navigator** can be closed while a recipe is being processed without aborting the current recipe process. Click the **Navigator Exit** button to close it. It can be re-opened locally, or from a remote computer system connected to the SB6L through a network connection. In either case, re-opening the **Navigator** does not affect any currently running process.

If the **Navigator** is opened from a remote computer system, the **PCP Control Center** and **Status** window can be used by the remote system to control and monitor the recipe process. Only the *Elapsed Time* display resets, because of the login from another computer (see Section 5.2.3).

5.2.6 Initialization and Stand-by

Click the **Control Center Initialize Bonder** button to prepare the SB6L for processing. "Initializing" displays in the *Current State* status window (see Figure 5-13). The system changes to the Idle state at the end of the initialization sequence and the *Current State* status window displays *Idle*.

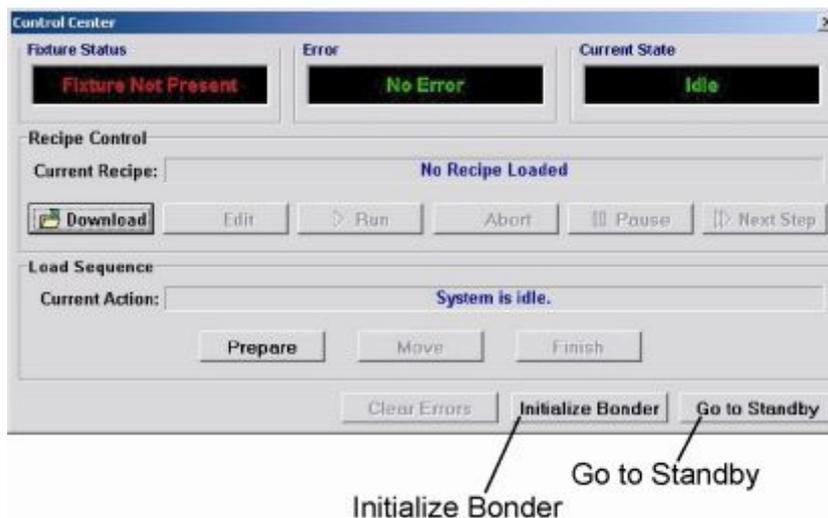


Figure 5-27 Control Center Initialize and Standby Buttons

It is not necessary for the upper heater to reach its idle temperature for initialization to be completed. Initialization should be carried out whenever the exact system status is not known, such as after any recipe process interruption.



Note

Initialization should be carried out whenever the exact system status is not known, such as after any recipe process interruption.

The system can be left in idle mode after initialization, or set to stand-by mode by clicking *Go to Standby*. In this mode, the SB6L remains energized and operating parameters are set to standby. It can be left in standby mode for extended periods, such as overnight.

The standby mode parameters are user set in the **Configuration: Machine** page (see Section 5.7)

5.3 The Data Viewer

The **Data Viewer** graphically displays the contents of selected process data files. Clicking the **Navigator Data** button (see Figure 5-13) opens the **Data Viewer**. All buttons are disabled (grayed out) when it is first opened, with the exception of *Open Datafile* and *Exit*. Importing a data file enables the remaining buttons.

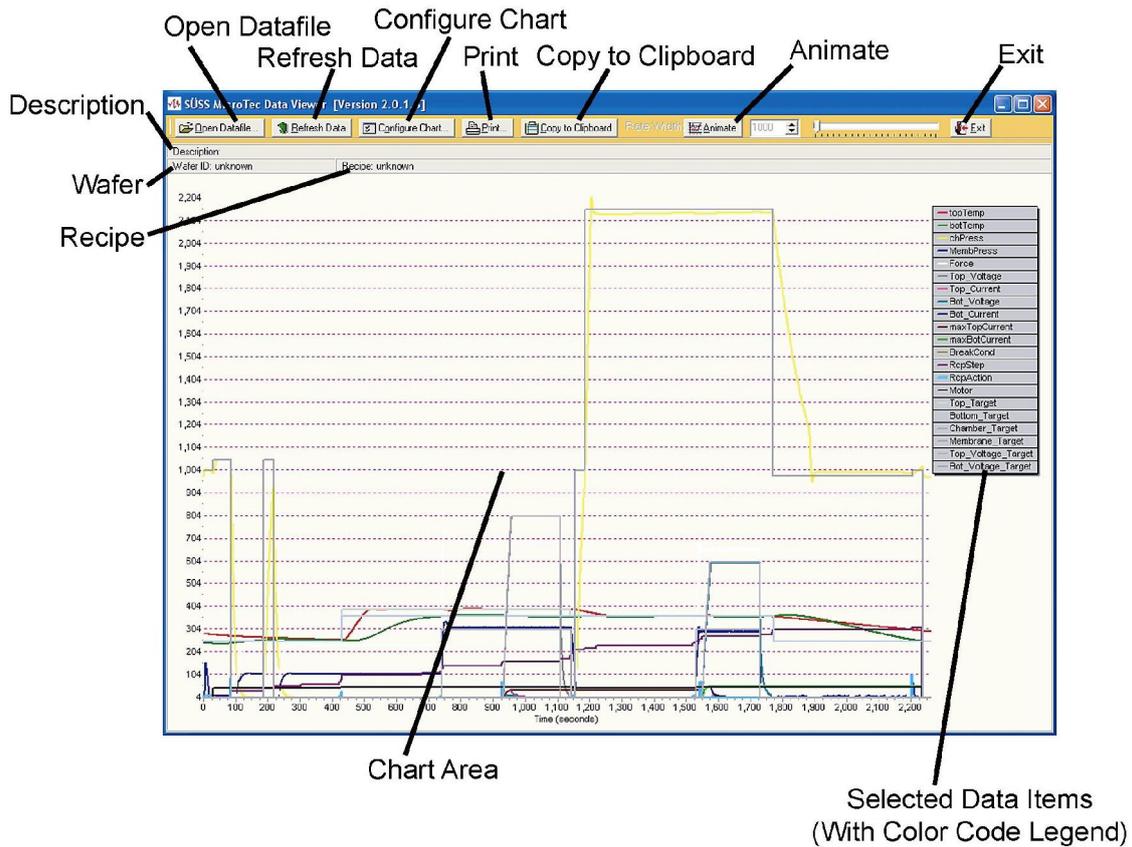


Figure 5-28 Data Viewer

Table 5-5 Data Viewer General Description

Name	Function
Open Datafile	Displays standard Windows Open file dialog for selecting and importing a previously saved process data file for the current user.
Refresh Data	Updates chart with most current data from selected data file.  Note This is especially useful for graphic files that are being updated in real time.
Configure Chart	Opens the Chart Configuration dialog box
Print	Opens the TeeChart Print Preview dialog box.
Copy to Clipboard	Copies current chart to Windows clipboard for pasting into other applications, such as Microsoft Word.
Exit	Closes Data Viewer
Description	Describes type of information displayed in Chart Area.

Name	Function
Wafer	Identifier of wafer used to collect data displayed in current chart.
Recipe	File name of current recipe.
Chart Area	Graphic display of selected data file elements as per the information entered in the Configure Chart dialog box.
Selected Data Items	List of available items selected through the Configure Chart dialog box for charting with associated color code associations.

5.3.1 Configuring Data View

The **Chart Configuration** dialog box configures the **Data Viewer**. This dialog allows users to select data to graph from a list of available items, and sets the parameters guiding the graphical display of the data.

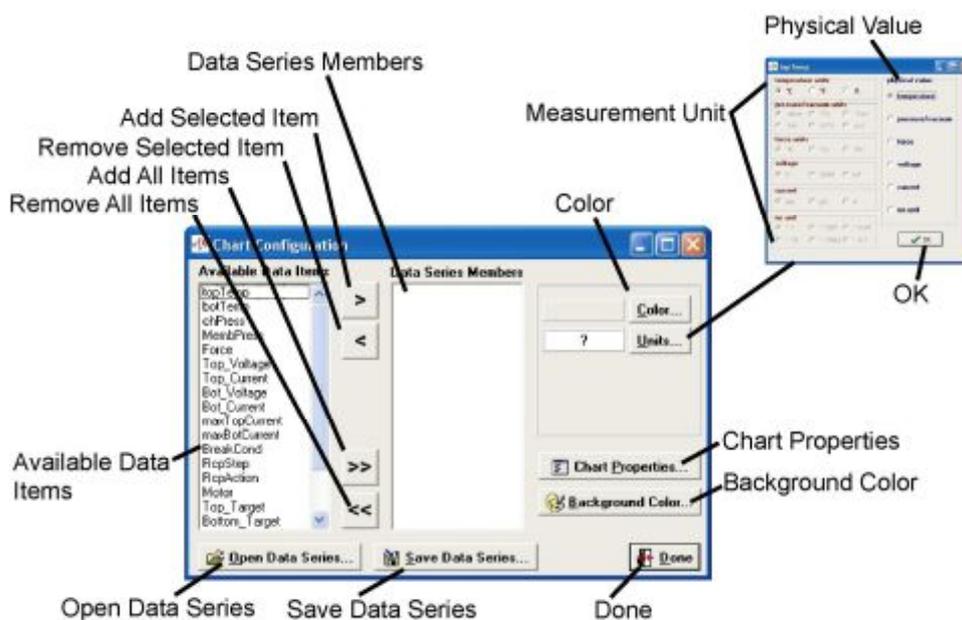


Figure 5-29 Chart Configuration

Table 5-6 Data Viewer Chart Configuration Description

Name	Function
Available Data Items	A list of all available data items for the current recipe.
Data Series Members	Items selected for graphical display in the Data Viewer . These items either can be selected from the <i>Available Data Items</i> list, or loaded from a saved <i>Data Series</i> file.

Name	Function
Open Data Series	Loads saved <i>Data Series</i> file.
Save Data Series	Saves <i>Data Series Members</i> in a file for later use.
Background Color	Changes chart area background color.
Chart Properties	Opens the Editing DataChart dialog box.
Units	Opens Units dialog box for selecting physical values and measurement units to highlighted <i>Data Series Member</i> .
Color	Opens color palette for selecting line color for highlighted <i>Data Series Member</i> .
Add Selected Item	Adds highlighted item in <i>Available Data Items</i> list to <i>Data Series Member</i> list.
Remove Selected Item	Removes highlighted item in <i>Data Series Member</i> from list.
Add All Items	Adds all items in <i>Available Data Items</i> list to <i>Data Series Member</i> list
Remove All Items	Removes all items from <i>Data Series Members</i> list
Done	Click to complete <i>Chart Configuration</i> and return to the Data Viewer with the <i>Data Series Members</i> displayed according to the parameters set in the <i>Chart Properties</i> .

5.3.2 Editing Data Chart Properties

The **Editing DataChart** tab sets the parameters governing the data displayed in the **Data Viewer** and the exporting and printing of the charted data.

Each of the dialog boxes associated with the **Chart Properties** button has a Help button used to describe the various tabs and buttons for that dialog box.

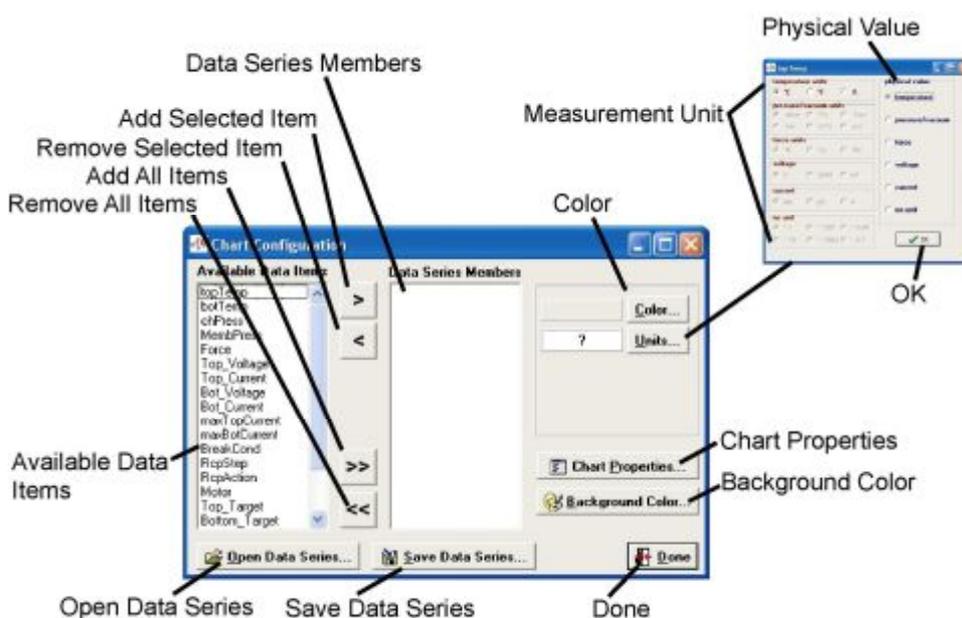


Figure 5-30 Chart Configuration

Table 5-7 Data Viewer Chart Configuration Description

Name	Function
Available Data Items	A list of all available data items for the current recipe.
Data Series Members	Items selected for graphical display in the Data Viewer . These items either can be selected from the <i>Available Data Items</i> list, or loaded from a saved <i>Data Series</i> file.
Open Data Series	Loads saved <i>Data Series</i> file.
Save Data Series	Saves <i>Data Series Members</i> in a file for later use.
Background Color	Changes chart area background color.
Chart Properties	Opens the Editing DataChart dialog box.
Units	Opens Units dialog box for selecting physical values and measurement units to highlighted <i>Data Series Member</i> .
Color	Opens color palette for selecting line color for highlighted <i>Data Series Member</i> .
Add Selected Item	Adds highlighted item in <i>Available Data Items</i> list to <i>Data Series Member</i> list.
Remove Selected Item	Removes highlighted item in <i>Data Series Member</i> from list.

Name	Function
Add All Items	Adds all items in <i>Available Data Items</i> list to <i>Data Series Member</i> list
Remove All Items	Removes all items from <i>Data Series Members</i> list
Done	Click to complete <i>Chart Configuration</i> and return to the Data Viewer with the <i>Data Series Members</i> displayed according to the parameters set in the <i>Chart Properties</i> .

5.4 Error and Warning Messages

Encountering an operating or processing error halts processing and displays an **Error Message**. The error message informs the user of the time of the error, the nature of the problem and offers a suggested solution.

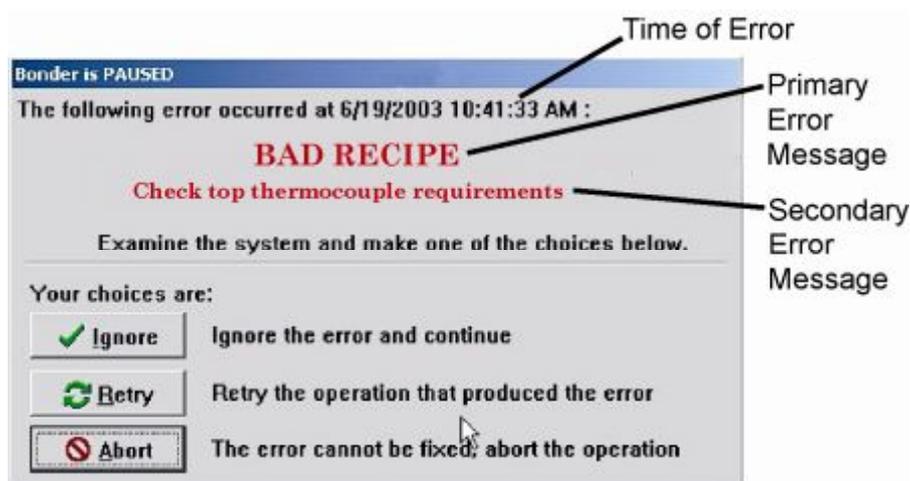


Figure 5-31 Error Message

Table 5-8 Error Message Window Description

Name	Function
Ignore	Closes the Error Message and resumes system operation without resolving the problem.

Name	Function
Retry	<p>The program repeats the command causing the error.</p> <div style="display: flex; align-items: flex-start;">  <div> <p>Note</p> <p>If the error is hardware related, this command should only be used when the hardware error has been resolved; otherwise, equipment serious damage may occur.</p> </div> </div>
Abort:	<p>Aborts the recipe.</p>

5.4.1 Primary Error Messages

The following table lists the primary error messages produced by the **PCP**. Supplemental or secondary message text, which more specifically describes the condition causing the error, is listed in Section 5.4.2 Secondary Error Messages. These secondary error messages are cross-referenced in the “Action” column where applicable.

Table 5-9 Table of Primary Error Messages

Message	Cause	Action
ACTION	Error while performing an action	Call SUSS Service (see Section 7).
BAD_COMMAND	Unknown command was sent	Verify version of PCP and interface program
BAD_INI_FILE	Bad version of configuration file	Call SUSS Service (see Section 7).
BAD_NUM_PARAM	Number of parameters do not match	Call SUSS Service (see Section 7).
BAD_RECIPE	Unable to process the recipe (The recipe does not match system configuration)	See Section 5.4.2
BAD_RECIPE_VERSION	Any kind of version mismatch	Call SUSS Service (see Section 7).
CFG_CHANGED	Hardware configuration was changed	Call SUSS Service (see Section 7).
CMD_QUEUE	Command queue is full	Call SUSS Service (see Section 7).

Message	Cause	Action
CMD_SYNTAX	Bad command syntax or illegal character in command string	Check hardware, or TCP/IP communication
COMMUNICATION	Communication error	Check TCP/IP or serial communication
CONFIGURATION	Error occurred during configuration procedure	Call SUSS Service (see Section 7).
CPS	One of the chamber pressure sensors not working	Call SUSS Service (see Section 7).
CTRL_NOT_FINISH	Controller is unable to reach final value	Call SUSS Service (see Section 7).
EMERGENCY_OFF_ACT	Emergency off condition	Hardware: check hard drive, defragment hard drive
ERR_NOT_CLEARED	Previously occurred error was not cleared	Clear errors when Control Center Current State displays Aborted or Initialize
FILE_NOT_FOUND	Can't find the file	Verify directory and filename
HEATER	Heater failure	See Section 5.4.2
HIGHVOLTAGE	Error in HV** subsystem	Check high voltage power supplies
HW_ME300	ME300 hardware error	Check analog board ME300
HW_TIMEOUT	Time-out when accessing hardware	Call SUSS Service (see Section 7).
INITIALIZATION	Error during initialization	Call SUSS Service (see Section 7).
INTERLOCK_OPEN	Check if any interlock switches are open	Call SUSS Service (see Section 7).
INTERNAL	An internal software error has occurred	Call SUSS Service (see Section 7).

Message	Cause	Action
LIMIT	Limit-check failed (at least one input is out of valid range)	Check analog input cards for max and min borders
LOW_MEMORY	Not enough memory	Call SUSS Service (see Section 7).
MEMBRANE	Membrane error	See Section 5.4.2
NO_INIT	Machine not yet initialized	Initialize the bonder
NO_MEDIA	Check Facilities	Check Facilities
NO_MORE_COLS	No more columns in recipe file or bad column selected	Check recipe and save it again
NO_RECIPE	Recipe file is closed	Open desired recipe
NOT_CONNECTED	Tried to send commands but no connection is established	Try to connect or restart the PCP and interface program
OPTO	OPTO hardware error	Check OPTO board
POST	Error during power on self test	Call SUSS Service (see Section 7).
PUMP	PUMP hardware error	Call SUSS Service (see Section 7).
QUEUE	Not enough space in queue	Call SUSS Service (see Section 7).
RECIPE_ACTIVE	Recipe file is active	Close recipe
RECIPE_ALARM	Alarm time condition	Check the reason
RECIPE_COLUMN	Problems reading recipe column	Check recipe, save it and start again
RECIPE_HALT	Recipe file is not active	Open recipe
RECIPE_OPENED	Recipe file is opened	Call SUSS Service (see Section 7).
SERIAL	Serial hardware error	Check serial connection
SYNC_TIMEOUT	Timeout when waiting for some synchronization object	Call SUSS Service (see Section 7).

Message	Cause	Action
WATCHDOG	Software watchdog time-out	Call SUSS Service (see Section 7).
WRONG_PARAMETER	Unknown parameter used when called an internal function	Check version of PCP and interface program
*PCP – Process Control Program **HV – High Voltage		

5.4.2 Secondary Error Messages

Table 5-10 Table of Secondary Error Messages

Bad Recipe Errors	
Error Number	Description
1	Check top thermocouple requirements
2	Check bottom thermocouple requirements
3	Check top heater requirements
4	Check bottom heater requirements
5	Chamber Pressure Control (CPCI) is required
6	Purge Gas Valve (PUGI) is required
7	Process Gas Valve (PGVI) is required
8	Bypass valve (BYVI) is required
9	Not Used
10	Not Used
11	Not Used
12	Universal Tool required
13	Required Positive High Voltage is not available
14	Required Negative High Voltage is not available
15	Required Positive MaxCurrent is not available

16	Required Negative MaxCurrent is not available
17	Required Electrodes are not available
18	Required Tool Pressure Sensor is not available
19	Required Chamber Pressure Sensor is not available
20	Required Top Heater Temperature is too high
21	Required Bottom Heater Temperature is too high
22	Not Used
Heater Errors	
1	SB6L™ Watchdog Bottom Heater
2	SB6L™ Watchdog Top Heater
3	Thermocouple Bottom Substrate broken
4	Thermocouple Top Substrate broken
5	Thermocouple Bottom Heater broken
6	Thermocouple Top Heater broken
7	Heater Test Bottom Heater failed
8	Heater Test Top Heater failed
9	Thermocouple broken or Bottom Heater over Maximum
10	Thermocouple broken or Top Heater over Maximum
Membrane Errors	
1	Tool could not be moved up
2	Tool could not be moved down
3	Not Used
4	Not used
5	Not Used
6	Not Used

5.5 Recipe Creation and Editing



Note

The Pressure Head must be adjusted prior to creating or testing any recipe processes.

5.5.1 Overview

A recipe determines the values the SB6L uses during processing. The hardware configuration determines parameter limits for the recipe values are determined by the hardware configuration. The recipe values entered or edited through the **Recipe Editor** window **Cell Editor**. The Recipe Matrix displays the values for the current recipe process.

5.5.2 Recipe Editor Window

Open the Recipe Editor Window by either clicking the Control Center *Edit* button (see Section 5.2.2) or the **Navigator Recipe** button (see Figure 5-13). The **Recipe Editor** has three major sections: Recipe Control, Comment line, and Recipe Matrix. A horizontal scroll bar at the bottom of the Recipe Matrix allows viewing of all steps in the process.

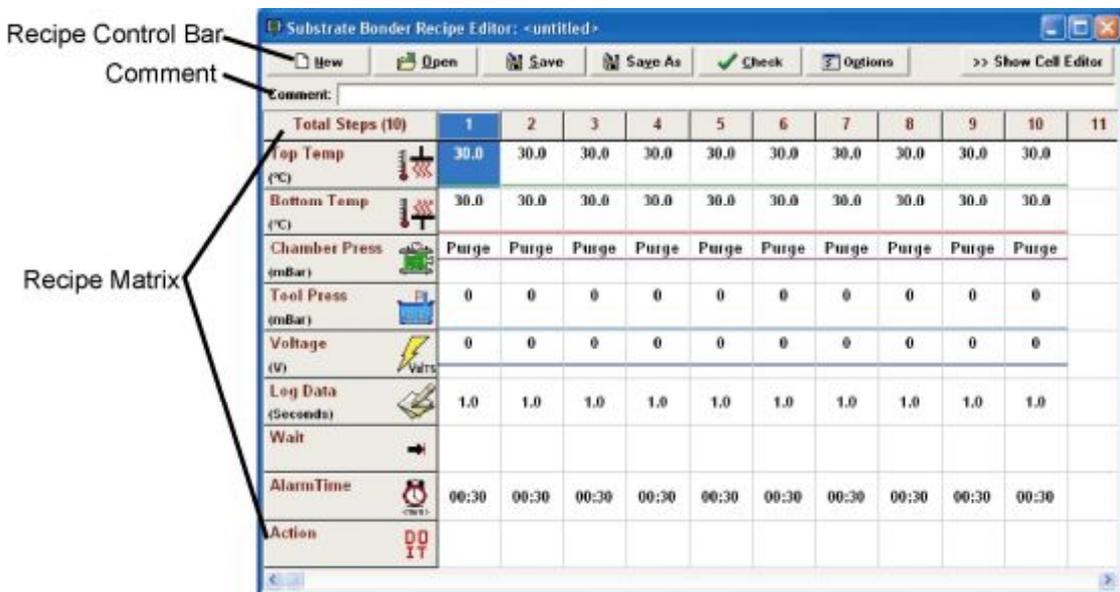


Figure 5-32 Recipe Editor (Cell Editor Hidden)

Table 5-11 Recipe Editor Description

Name	Function	
Recipe Control	<i>New</i>	Creates new recipe with Recipe Matrix set to default values
	<i>Open</i>	Open and existing recipe
	<i>Save</i>	Save current recipe under name displayed in Comments
	<i>Save As</i>	Save current recipe under name different from that shown in Comments
	<i>Check</i>	Validates current recipe
	<i>Show/Hide Cell Editor</i>	Toggles the Cell Editor opened and closed.
Comment	Displays the name of the current recipe	
Recipe Matrix	The recipe, including processing step numbers	

5.5.3 Recipe Matrix

Bond processes are controlled by a recipe created or edited using a matrix. The Recipe Editor Matrix consists of rows representing the various parameters and actions, and columns representing the individual process steps. A recipe can consist of an infinite number of steps (columns), with the rows defining the parameters used during that process step. Recipe parameters are entered or edited through a Cell Editor. The cell selected from the matrix for editing and the step numbers are both highlighted in blue.

All parameters are defined for a given process in the individual cells of the matrix. No parameter can exceed the limits set in the Configuration Window (see Section 5.7). If a parameter is not available due to current hardware configuration, the relevant row of the recipe matrix is disabled (grayed-out).

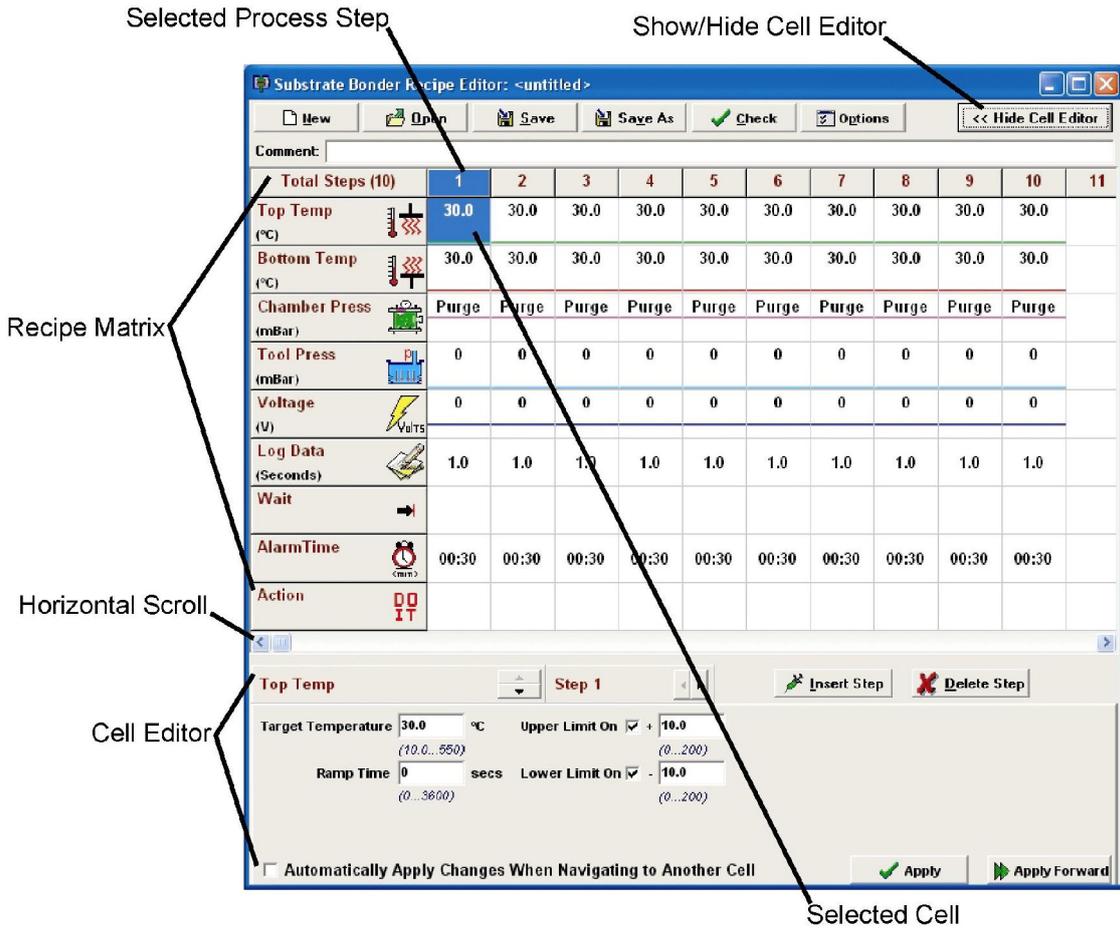


Figure 5-33 Recipe Editor with Cell Editor Open

Table 5-12 Recipe Matrix Description

Name	Function		
Total Steps (xx)	Identifies total number of steps (XX) in recipe process. An infinite number of steps can be used in a recipe. Selecting a cell in the Matrix highlights the associated column (Selected Process Step).		
Recipe Matrix	Row Name	Description	Section
	<i>Top Temp</i>	The top heater parameters, including target temperature, ramp time, and upper and lower temperature limits	Section 5.5.4.2
	<i>Bottom Temp</i>	The bottom heater parameters, including target temperature, ramp time, and upper and lower temperature limits	Section 5.5.4.3

Name	Function		
	<i>Chamber Press</i>	The pressure or vacuum inside the process chamber	Section 5.5.4.4
	<i>Tool Press</i>	Sets the differential pressure in the membrane bellows compared with the chamber pressure	Section 5.5.4.5
	<i>Voltage</i>	Sets the target voltage, ramp time, and upper and lower electrode voltage and current limits	Section 5.5.4.6
	<i>Log Data</i>	Sets the logging data interval for the current step	Section 5.5.4.7
	<i>Wait</i>	Sets a wait time or process termination criteria for the step	Section 5.5.4.8
	<i>Alarm Time</i>	Sets a specific time after which the recipe process will be terminated. (See also SB6L Control Center, Section 5.2.2)	Section 5.5.4.9
	<i>Action</i>	Specifies the actions to be performed before other parameter changes in the current recipe step are implemented	Section 5.5.4.10
Horizontal Scroll	Moves the user back and forth through the recipe steps		
Cell Editor	A series of panels allowing the user to edit selected recipe matrix cells. Cell Editor is toggled open or closed by the Show/Hide Cell Editor button		
Selected Cell	Selects the cell to be displayed in the Cell Editor and the cell editor that will be used (based on the Recipe Matrix Row Name)		
Recipe Matrix	The recipe, including processing step numbers		

5.5.4 Cell Editor Panels

5.5.4.1 Overview

Every Cell Editor panel includes a number of common controls and information boxes placed across the top and bottom of the cell editor panel. These controls and boxes

inform the user of the cell selected for editing and any information entered into it. The parameters for selected cells are displayed in the Cell Parameters section.

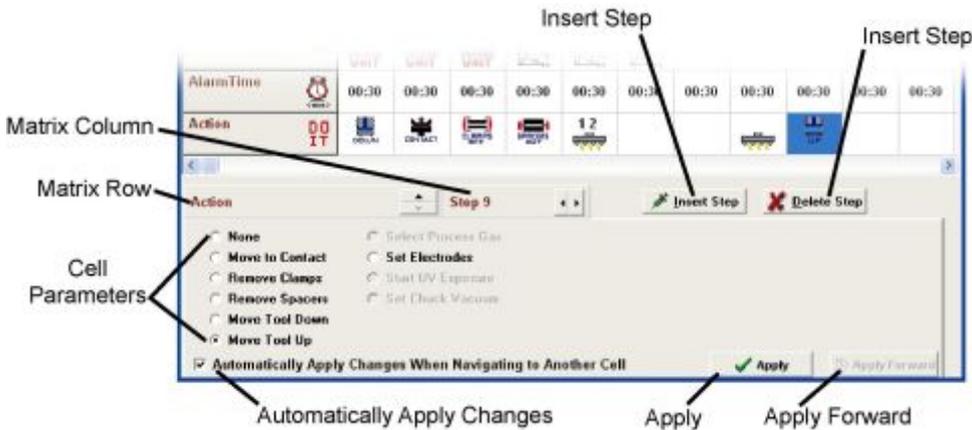


Figure 5-34 Recipe Editor Common Controls

Table 5-13 Recipe Editor Common Control Descriptions

Name	Function
Matrix Row	The name of the matrix row containing the cell being edited and up and down arrows to navigate to other rows of the matrix.
Matrix Column	The name of the matrix column containing the cell being edited, and left and right arrows to navigate to other columns of the matrix.
Automatically Apply Changes When Navigating to Another Cell	If checked, causes changes made to the current cell to be automatically applied when any other cell in the matrix is selected.
Insert Step	Used to insert a column in the matrix before the current column.
Delete Step	Used to delete the current column from the matrix.
Apply	Applies the changes made in the panel to the selected cell.
Apply Forward	Enters the current values into all further steps of the row until a column containing different values is encountered.
Cell Parameters	Individual recipe cell parameters.

5.5.4.2 Top Temperature Cell Editor

The Top Temperature Cell Editor sets the target temperature, ramp time, and upper and lower limits for the top heater.

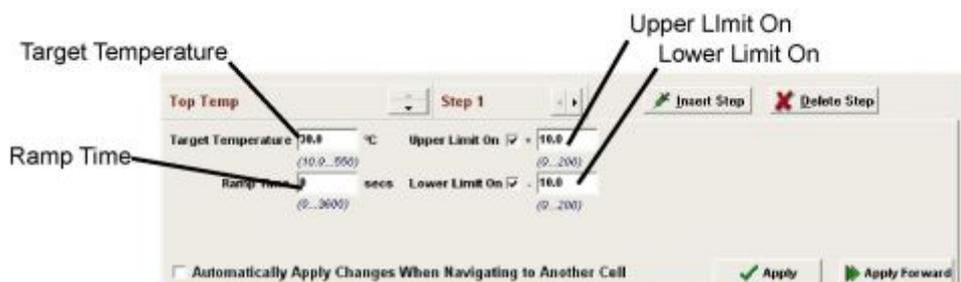


Figure 5-35 Top Temperature Cell Editor

Table 5-14 Top Temperature Cell Editor Description

Name	Function
Target Temperature	Sets the target operating temperature for the top heater.
Upper Limit On	When enabled, sets the upper operating temperature for the top heater.
Lower Limit On	When enabled, sets the lower operating temperature for the top heater.
Ramp Time	<p>Determines the time in which the target value must be reached. The Top Temperature target lamp (see Section 5.2.3) next to the Current Value display on the Status Screen flashes yellow during ramping and glows green when ramping is complete.</p> <p>If the Ramp Time is completed before the target value is achieved, the target lamp flashes red.</p> <p>Note Using a ramp time is optional.</p> 

5.5.4.3 Bottom Temperature Cell Editor

The Bottom Temperature Cell Editor is used to set the target temperature, ramp time, and upper and lower limits for the bottom heater.

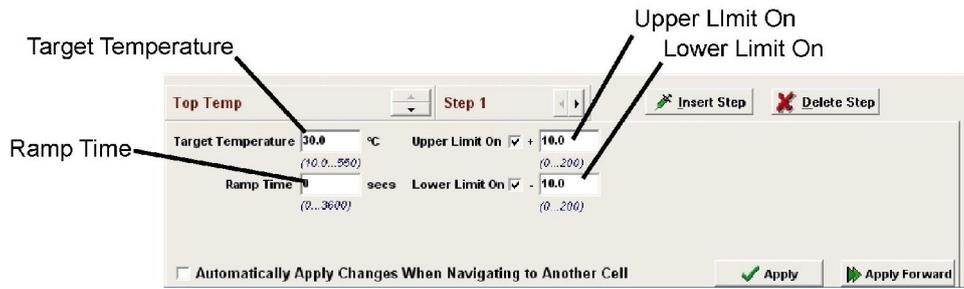


Figure 5-36 Bottom Temperature Cell Editor

Table 5-15 Bottom Temperature Cell Editor Descriptions

Name	Function
Target Temperature	Sets the target operating temperature for the bottom heater.
Upper Limit On	When enabled, sets the upper operating temperature for the bottom heater.
Lower Limit On	When enabled, sets the lower operating temperature for the bottom heater.
Ramp Time	<p>Determines the time in which the target value must be reached. The Bottom Temperature target lamp (see Section 5.2.3) next to the Current Value display on the Status Screen flashes yellow during ramping and glows green when ramping is complete.</p> <p>If the Ramp Time is completed before the target value is achieved, the target lamp flashes red.</p> <p>Note  Using a ramp time is optional.</p>

5.5.4.4 Chamber Pressure Cell Editor

The Chamber Pressure Cell Editor sets the target pressure, ramp time, and upper and lower limits for the Process Chamber pressure. The *Controller Type* section specifies which controller controls Process Chamber pressure.

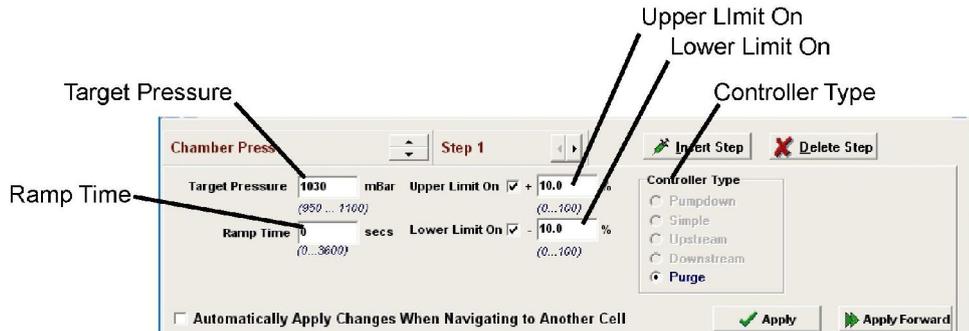


Figure 5-37 Chamber Pressure Cell Editor

Table 5-16 Chamber Pressure Cell Editor Description

Name	Function
Target Pressure	Sets the target operating pressure for the Process Chamber.
Upper Limit On	When enabled, sets the upper operating pressure for the Process Chamber. The upper limit is a percentage of the target value.
Lower Limit On	When enabled, sets the lower operating pressure for the Process Chamber. The lower limit is a percentage of the target value.
Ramp Time	<p>Determines the time in which the target value must be reached. The Pressure/Vacuum target lamp (see Section 5.2.3) next to the Current Value display on the Status Screen flashes yellow during ramping and glows green when ramping is complete.</p> <p>If the Ramp Time is completed before the target value is achieved, the target lamp flashes red.</p> <p>Note  Using a ramp time is optional.</p>

5.5.4.5 Tool Pressure Cell Editor

The Tool Pressure Cell Editor is used to set the target pressure, ramp time, and upper and lower limits for the Universal Bonding Tool.

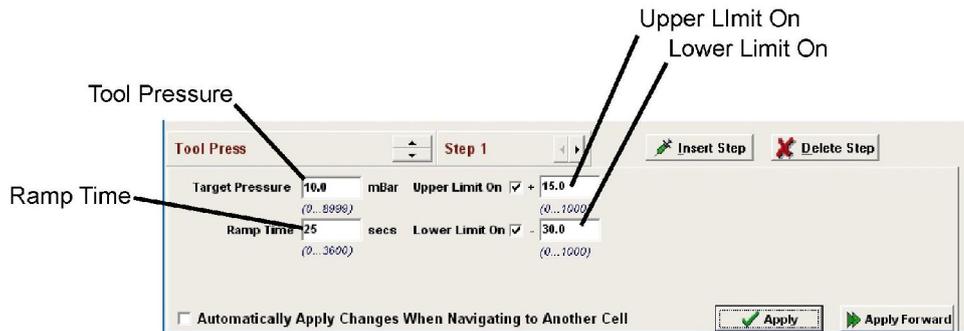


Figure 5-38 Tool Pressure Cell Editor

Table 5-17 Tool Pressure Cell Editor Description

Name	Function
Target Pressure	Sets the target operating pressure for the Universal Bonding Tool.
Upper Limit On	When enabled, sets the upper operating pressure for the Universal Bonding Tool.
Lower Limit On	When enabled, sets the lower operating pressure for the Universal Bonding Tool.
Ramp Time	<p>Determines the time in which the target value must be reached. The Tool target lamp (see Section 5.2.3) next to the Current Value display on the Status Screen flashes yellow during ramping and glows green when ramping is complete.</p> <p>If the Ramp Time is completed before the target value is achieved, the target lamp flashes red.</p> <p>Note  Using a ramp time is optional.</p>

5.5.4.5.1 Setting Tool Pressure

The SBe product line has a maximum tool force generation capability of 20kN at a tool pressure value of 9000mbar. Due to the construction styles present in both the upper and lower heater assemblies, this value may only be applied when bonding larger sized wafers (see Figure 5-39). Tool force must be limited when bonding wafers smaller than 12,272 mm² (corresponds to a Semispec, 125mm diameter round wafer).

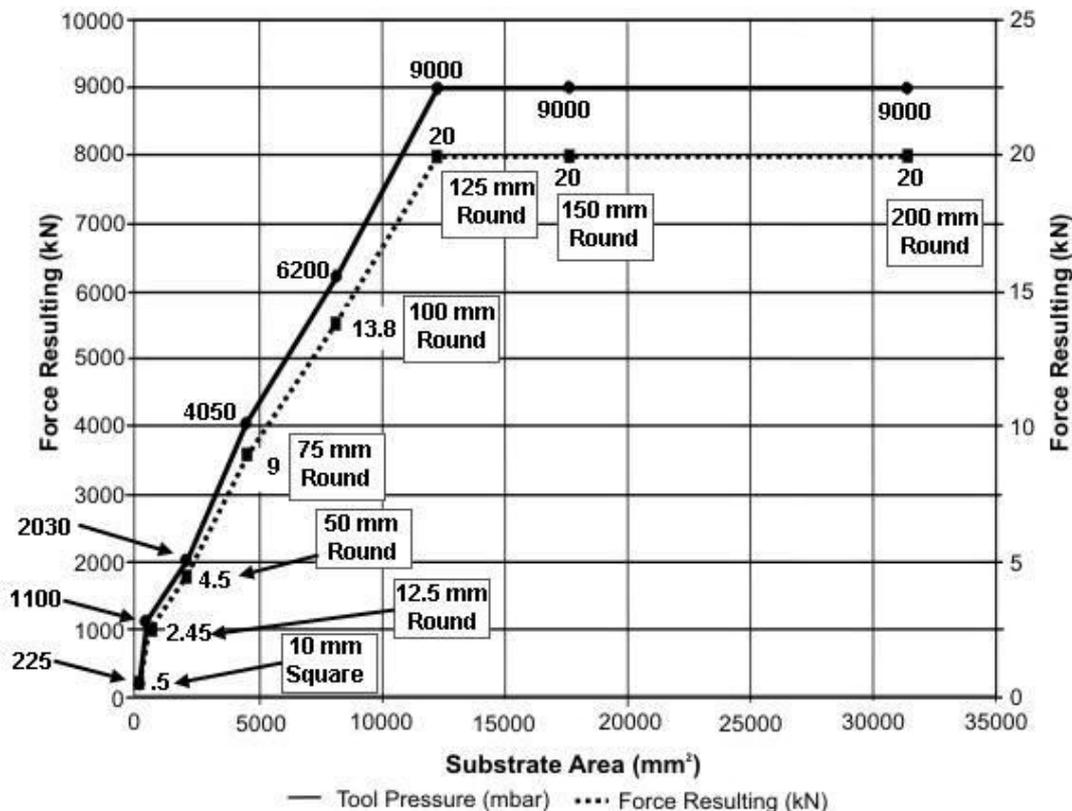


Figure 5-39 Force Versus Area Limiting Curve

Use the following procedure to set the tool force (reference Figure 5-39).

1. Calculate area of proposed substrate.
2. Find area on X axis.
3. Trace directly up (Y axis, right hand scale) to lower curve (dashed line). Resulting number represents the maximum force which may be applied to this wafer size using standard Silicon Carbide tooling.
4. Trace further up to intercept the upper curve (solid line). This value (Y axis, left hand scale) is the corresponding tool force which when utilized in the bonding recipe, will generate the specified tool force.

5.5.4.6 Voltage Cell Editor

The Voltage Cell Editor is used to set the target voltage, ramp time, and upper and lower limits for the electrode voltage as well as limit on current.



Figure 5-40 Voltage Cell Editor

Table 5-18 Voltage Cell Editor Description

Name	Function
Target Voltage	Sets the target operating voltage for the selected electrode.
Upper Limit On	When enabled, sets the upper operating voltage for the selected electrode.
Lower Limit On	When enabled, sets the lower operating voltage for the selected electrode.
Ramp Time	<p>Determines the time in which the target value must be reached. The Voltage target lamp (see Section 5.2.3) next to the Current Value display on the Status Screen flashes yellow during ramping and glows green when ramping is complete.</p> <p>If the Ramp Time is completed before the target value is achieved, the target lamp flashes red.</p> <p>Note  Using a ramp time is optional.</p>

5.5.4.7 Log Data Cell Editor

The Log Data Cell Editor is used to set the logging data interval for the current step. A Data Logging Interval of "0" means data logging during this step occurs only at the beginning and at the end of the step. In this case, the Recipe Matrix cell for Log Data displays OFF. In all other cases, the Data Log cell indicates the data logging time interval in seconds.

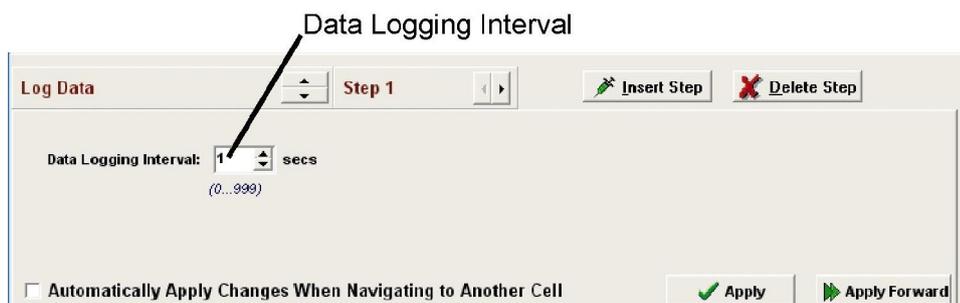


Figure 5-41 Log Data Cell Editor

5.5.4.8 Wait Cell Editor

The Wait function controls system operation through the addition of recipe wait conditions and current change abort conditions. The Wait Cell Editor has two *Wait* time buttons (one for hours and minutes, one for minutes and seconds), three current change condition buttons, a *PAUSE* button, and a Clear button.

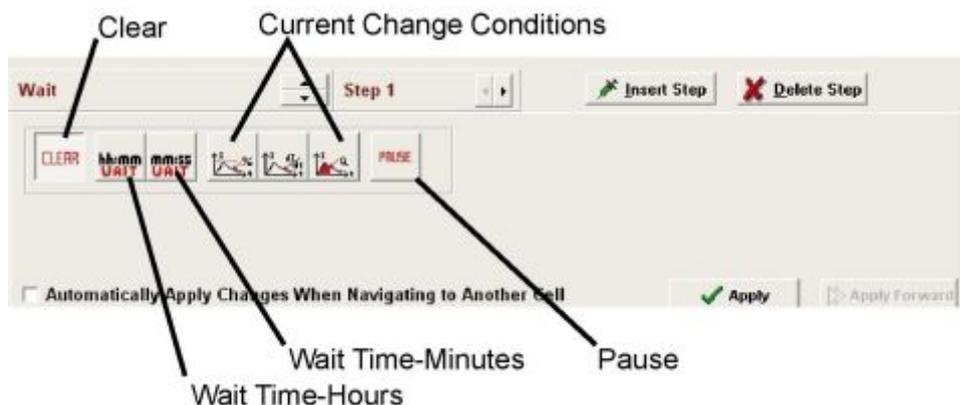


Figure 5-42 Wait Cell Editor

Table 5-19 Wait Cell Editor Description

Name	Function
	Clears the current cell in the Recipe Matrix.
	Selects a wait time in hours and minutes
	Selects a wait time in minutes and seconds

Name	Function	
Current Change Conditions	Max. Percentage Current 	The recipe will move to the next step if a specified percentage of the maximum current is reached. This abort criterion is activated at each new bond peak.
	Current Derivative 	The recipe will move to the next step if a value defined by a current differential is reached. This abort criterion is activated at each new bond peak.
	Moved Charge 	The recipe will move to the next step when a preset value of the integral I/dt is reached. This abort criterion is determined by the sum of all bond peaks during the process.
	Inserts a pause in the recipe. This button works the same as clicking the Pause button in the Recipe Control Center window (see Section 5.5.2) After a Pause, the <i>Next Step</i> button in the Control Center must be clicked to continue the recipe.	

5.5.4.8.1 Maximum Current Termination

The current button allows the process to be ended once a specified percentage of the maximum current is reached. This abort criterion is activated at each new bond peak.

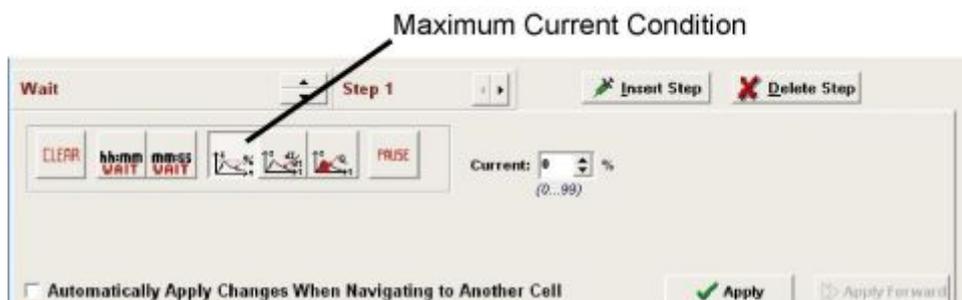


Figure 5-43 Wait Time Cell Editor – Current

For example, in Figure 5-46, the Bonding Process is terminated when the percentage of current drops to 20% of maximum bonding current.

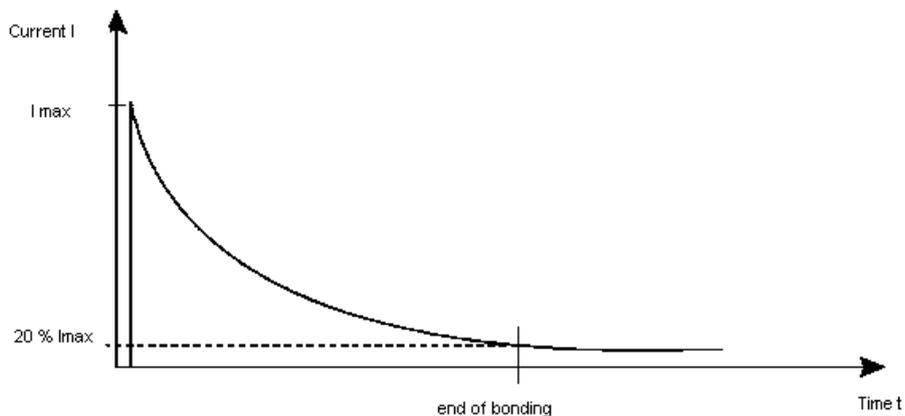


Figure 5-44 Abort Criterion: Maximum Current Percentage

5.5.4.8.2 Current Derivative Termination

The current derivative button terminates the bond process when a value defined by the slope of the curve (di/dt) is reached. It is activated at each new bond peak.

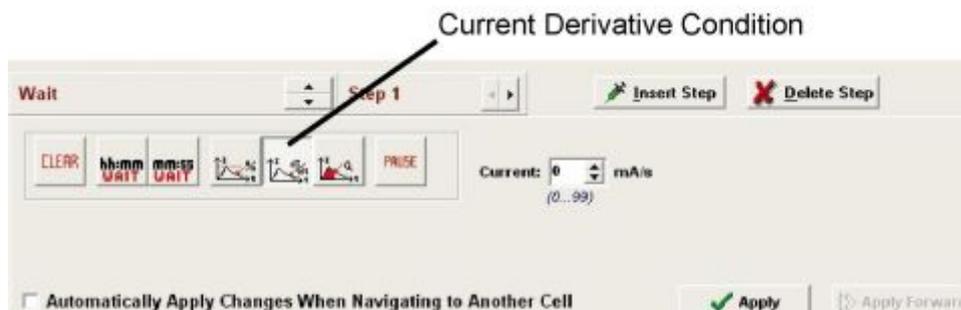


Figure 5-45 Wait Time Cell Editor – Current Derivative

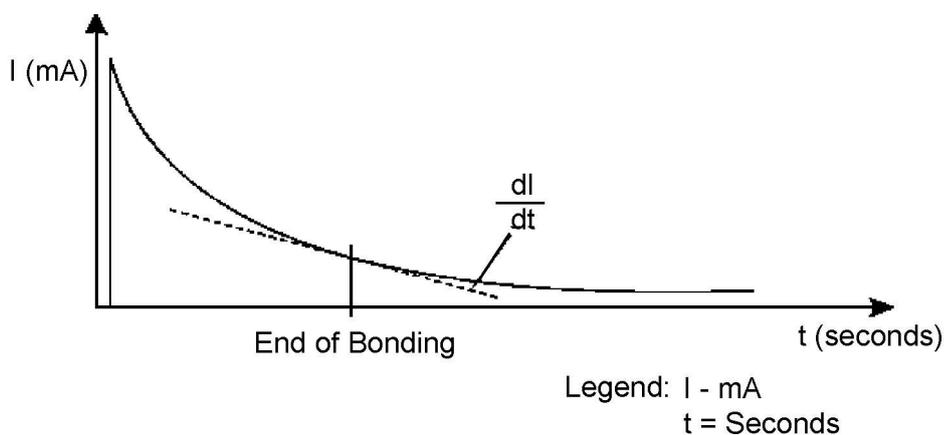


Figure 5-46 Abort Criterion: Changes in Current

5.5.4.8.3 Charge Termination

The charge button terminates the bond process when a preset value of the integral I/dt is reached. This abort criterion is determined by the sum of all bond peaks during the process.

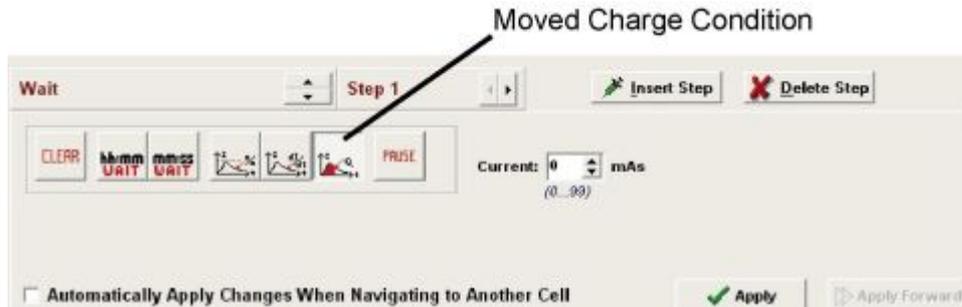


Figure 5-47 Wait Time Cell Editor – Charge

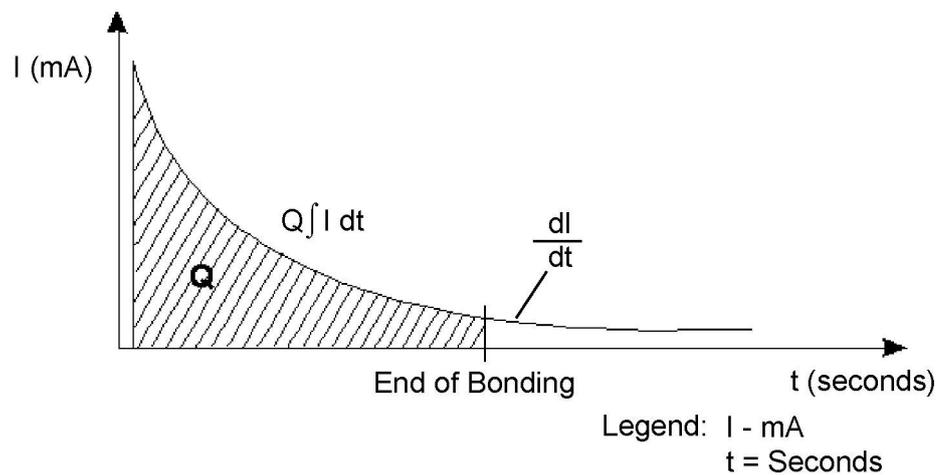


Figure 5-48 Abort Criterion: Moved Charge (Integral)

5.5.4.9 Alarm Time Cell Editor

The Alarm Time Cell Editor specifies an elapsed time after which the recipe process aborts.



Figure 5-49 Alarm Time Cell Editor

5.5.4.10 Actions Cell Editor



Note
The Pressure Head must be adjusted prior to creating or testing any recipe processes.

The Actions Cell Editor specifies various actions to be performed before other recipe parameter changes are implemented. A graphic symbol is displayed in the associated Action cell of the Recipe Matrix (see Figure 5-33).



Figure 5-50 Actions Cell Editor (Remove Spacers selected)

Table 5-20 Actions Cell Editor (Remove Spacers selected) Description

Name	Symbol	Function
None		No tool action performed.
Move to Contact		Moves the Z-axis to contact position. Note Contact position is based on wafer thickness, which can be set to a value between 0–9999 µm.
Remove Clamps		Opens the clamps
Remove Spacers		Removes the spacers

Name	Symbol	Function
Move Tool Down		Moves the Universal Bonding Tool down.
Move Tool Up		Moves the Universal Bonding Tool up.
Set Process Gas		(Optional) Allows the user to select up to four different process gases for the process.
Set Electrodes	 No Electrodes Set  Two Electrodes Set	Switches the Electrode Relays On or Off.
Set UV Exposure		(Optional) Turns on UV lamps.
Set Chuck Vacuum		(Optional) Applies vacuum to Sandwich Plate.

5.5.5 Recipe Check

Clicking the *Check* button in the Recipe Editor Matrix (see Figure 5-32) starts a recipe validation function for detecting any errors or potential problems (warnings) in the programmed sequence. Both display in the **Results of Recipe Check** window.

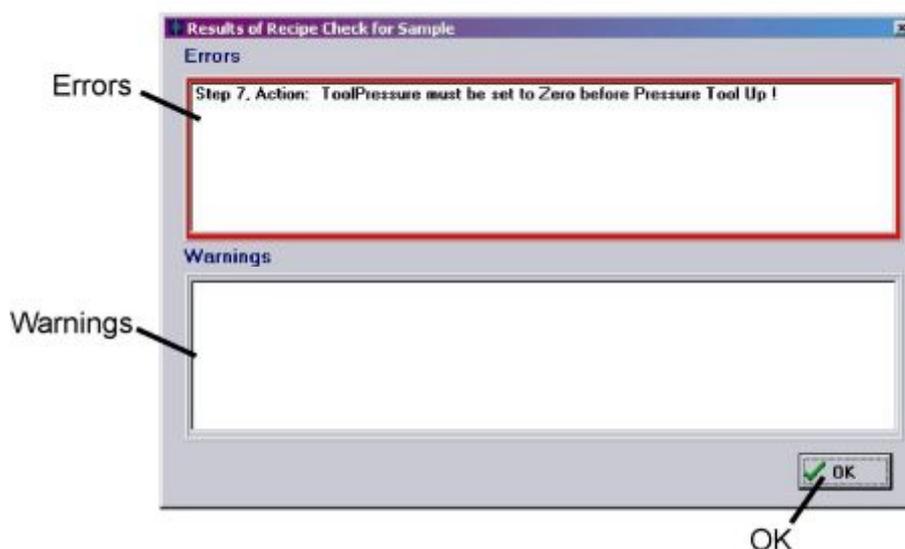


Figure 5-51 Recipe Check Errors and Warnings

Step numbers that have errors display in the *Errors* portion of the **Results of Recipe Check** window with corrective actions indicating where the recipe must be altered for it to run properly.



Note

Failure to use the Recipe Check function whenever a new recipe is created or an existing recipe is altered could lead to system damage, download errors, or both.

Clicking on the error listing in the **Recipe Check Errors** window opens the **Recipe Editor** with the cell in question highlighted (see Section 5.5.2). Click *Show Cell Editor* to open the cell editor corresponding to the error and make the necessary correction.



Note

Uncorrected errors will prevent the recipe from loading or running.

Warnings will not prevent a process from running; however, they must be considered to prevent possible damage to the system or other potentially hazardous conditions. For example, a missing action in a recipe to remove clamps could result in damage to the clamps or tooling blades.



Note

Warnings must be addressed to prevent possible damage to the system or other potentially hazardous conditions.

5.6 Maintenance (Service) Window

The **Maintenance** window's tabbed pages allow authorized users (Super Users and SUSS engineers) access to testing the SB6L and its components. Other users will be able to view the pages, but with all controls and functions disabled (grayed out).

Access the **Maintenance** window by clicking the *Service* button on the **Navigator** (see Section 5.2.1). Refer to the SB6L Service Manual for information about and access rights to the **Maintenance** window.

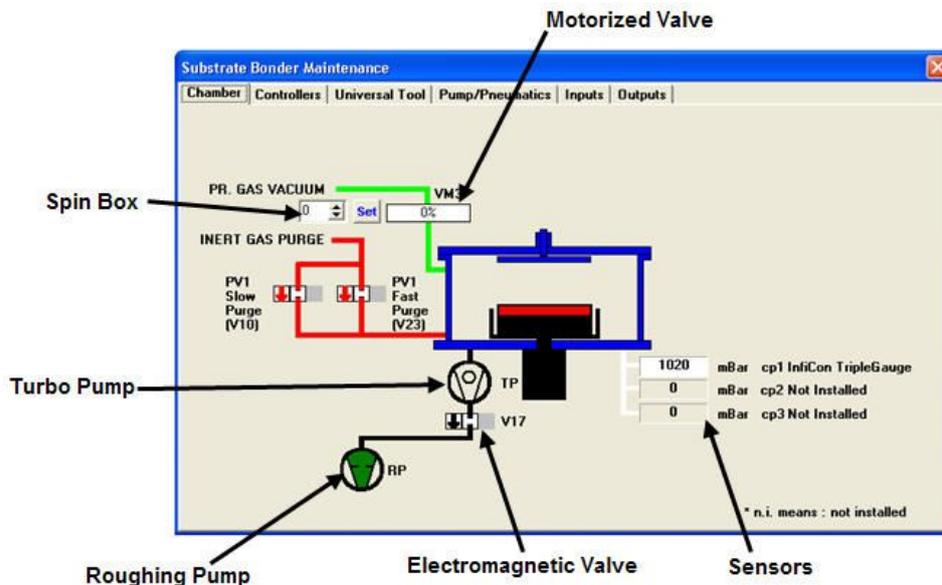


Figure 5-52 Maintenance Window - Chamber Page

5.7 Configuration Window

Use the **Configuration** window to review, define, and configure the Substrate Bonder. The basic configuration is entered by SUSS Service. Clicking the **Navigator Config** button opens the **Configuration** window (see Figure 5-4). The window is divided into Configuration Tabs and Tab Parameters with a *Save* and *Cancel* button at the window bottom. A complete explanation of the **Configuration** window and tabs is in the SB6L Service Manual.



Note

While the **Configuration** window parameters can be viewed by all users, they can only be changed by those with authorization (see Section 5.1.3).

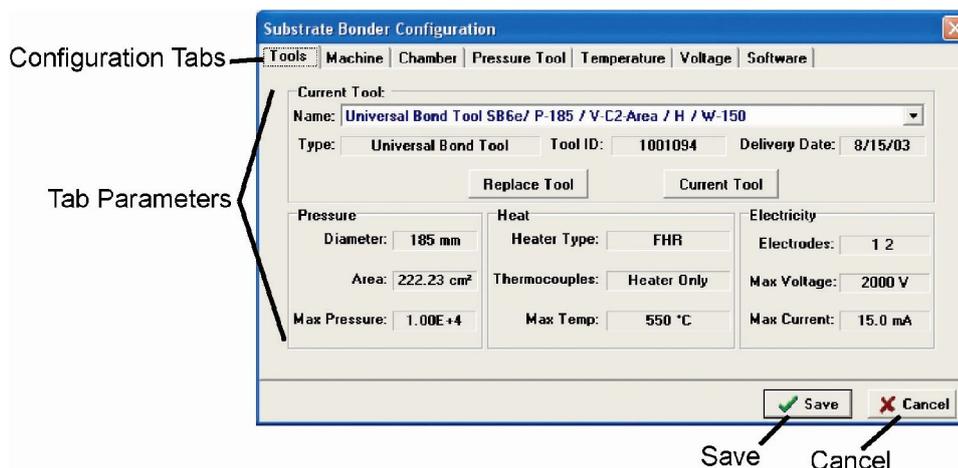


Figure 5-53 Configuration Window (Typical)

Table 5-21 Configuration Window Description

Name	Function
Configuration Tabs	Series of tabs that open individual configuration pages: Tools, Machine, Chamber, Pressure Tool, Temperature, Voltage, Software
Tab Parameters	Series of fields that allow user modification of operating parameters (by changing tool), or viewing preset parameters
Save	Saves new configuration and prompts user to initialize SB6L for changes to take effect.
Cancel	Cancels changes and closes Configuration window

6 MAINTENANCE

6.1 Overview

Perform the maintenance procedures in this section on a routine basis or at the frequency described in Section 6.2.1. Ensure all processing has stopped prior to performing any maintenance procedure and observe all safety precautions and warnings.



Note

Some of the chemicals that may be used in conjunction with this machine are corrosive, toxic, or both. Other chemicals may be flammable. Before proceeding with any of the maintenance tasks described in this section, consult the Material Safety Data Sheets for the chemicals in use and observe all applicable safety precautions including, but not limited to, the use of personal protective equipment.



WARNING!

**Irritating/ Highly flammable media.
Health hazard due to contact and inhalation.**

Avoid skin and eye contact.



Do not inhale.

Keep sources of ignition away.



Wear safety goggles, gloves, and protective clothing.



Consider and observe the Material Safety Data Sheets.



WARNING!

**Corrosive media.
Health hazard due to contact and inhalation.**

Avoid skin and eye contact.

Do not inhale.



Wear safety goggles, gloves, and protective clothing.



Consider and observe the Material Safety Data Sheets.

6.2 General Preventive Maintenance

While performing general preventive maintenance checks will greatly improve the overall performance of the SB6L, users should also be constantly alert for any

unusual machine noises, behavior, operational changes, or process results as they may indicate problems that could damage the system if left uncorrected.

6.2.1 Maintenance Schedule

The following table offers a proactive maintenance schedule designed to ensure optimal performance of the SB6L. Use the information presented in the table as a basis for developing an approved preventive maintenance schedule that integrates effectively with the production process.

The maintenance schedule includes daily, weekly, monthly, quarterly, semi-annual, and annual procedures.

Table 6-1 Maintenance Schedule

Frequency	Assembly	Description	Procedure (Section)
As Required	Console Electronics	Replace System Start switch lamp.	6.2.9
	Pumps	Replace seal and lubricate	6.2.8
	Center Pin	Replace Center Pin, Center Pin Spring and Axial Bearing	6.2.17
Daily	System	Visually check system integrity	6.2.3
	Console	Clean console exterior	6.2.5
	Process Chamber	Clean Process Chamber interior	6.2.6

Frequency	Assembly	Description	Procedure (Section)
Monthly	Universal Bond Tool	Clean Pressure and Sandwich Plates. (Heavily process dependent)  Note Pressure and Sandwich Plates should be cleaned as necessary, but at a minimum of once per month.	6.2.13
	Process Chamber Lid Retainer	Clean threads and lubricate with a suitable high vacuum compatible grease such as Torr Lube Extreme Grease	6.2.16
Bi-Monthly	Varies	Check function of all Safety Valves	6.2.11
Quarterly	Lower Heater Assembly	Replace graphite foil on lower heater  Note Change Quarterly (every three months) or every 1000 hours of operation.	6.2.12

6.2.2 Consumables

The following table lists the consumable items required for operator maintenance.

Table 6-2 List of Consumables for Operator Maintenance

Name	Description
Acetone	Acetone (CH ₃ COCH ₃) is a colorless, mobile, flammable liquid with medium polarity making it an excellent solvent.

Name	Description
	 <p>WARNING! Irritating / Highly flammable media. Acetone May Dissolve Plastics Avoid skin contact and inhaling vapors. Use in well-ventilated areas and keep away from flames and sparks. Only properly trained personnel should be engaged in handling the cleaning agents (isopropyl alcohol and acetone). Wipe away and remove from the system all cleaning fluids and residue before restoring it to operation Consider and observe the Material Safety Data Sheet.</p>
Isopropyl Alcohol (IPA)	<p>IPA (C₃H₈O) is an excellent cleaning agent that does not affect plastics. It is used for general cleaning and to remove acetone residue.</p>  <p>WARNING! Isopropyl alcohol (IPA) Irritating / Highly flammable media. Avoid skin contact and inhaling vapors. Use in well-ventilated areas and keep away from flames and sparks. Only properly trained personnel should be engaged in handling the cleaning agents (isopropyl alcohol and acetone). Wipe away and remove from the system all cleaning fluids and residue before restoring it to operation Consider and observe the Material Safety Data Sheet.</p>
Methanol	<p>Methyl Alcohol (CH₃OH) is an excellent cleaning agent for removing oil/grease/fingerprints.</p>  <p>WARNING! Methyl Alcohol (Methanol) Irritating / Highly flammable media. Avoid skin contact and inhaling vapors. Use in well-ventilated areas and keep away from flames and sparks. Only properly trained personnel should be engaged in handling the cleaning. Wipe away and remove from the system all cleaning fluids and residue before restoring it to operation Consider and observe the Material Safety Data Sheet.</p>

Name	Description
Clean Room Wipes	Lym-Tech Scientific C1 or equivalent. Lint free wipes, suitable for use in a Class 100 level clean room.
Protective Gloves	MAPA Advantech TRILites 994 or equivalent. Powder free, nitrile.
Razor Blades	<p>Single-edge razor blades for cleaning built up residue on pressure and Upper Carriers.</p> <div style="display: flex; align-items: center;">  <p>CAUTION! Do Not Use Razor Blades on Graphite Tooling. The use of razor blades, or any other scraping device, on Graphite Pressure of Sandwich Plates may damage the plates and make them unusable.</p> </div>

6.2.3 Visual Checks

Conduct a thorough daily visual check of the Substrate Bonder. Key areas to observe include the Pressure and Bond heads, contact plates and, if equipped, electrodes. Keep these parts free of dust and residues and inspected for signs of wear, since the use of scratched or damaged parts will result in poor equipment performance.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.



Note
Clicking Exit closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting “Close” from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.



Note
On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should $< 40^{\circ}$ C. Verify the temperature prior to touching any components.

**CAUTION!****Ergonomic hazard!****Risk of damage to the spine by lifting or moving heavy objects.**

Use personnel or mechanical assistance for lifting heavy objects

8. Lift the Process Chamber cover (see Figure 6-1).

**Figure 6-1 Process Chamber Cover**

9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin.

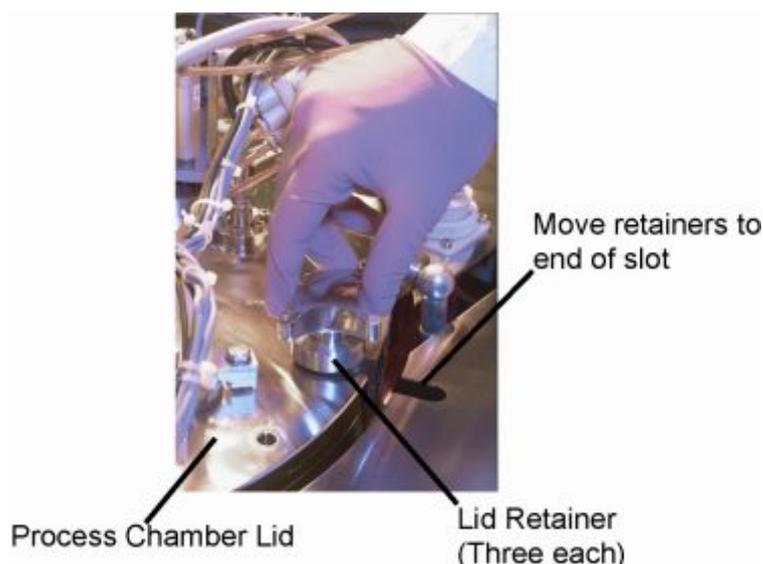


Figure 6-2 Location of Process Chamber Lid Retainers

10. See Section 6.2.7 if debris from a broken wafer is visible.
11. See Section 6.2.6 if the chamber is visibly contaminated, but no broken wafer is visible.
12. See Section 6.2.13 if either the Pressure Plate or the Sandwich Plate is contaminated. If the pressure plate or sandwich plate are cracked or chipped, they must be replaced (see Sections 6.2.14 and 6.2.15).
13. Close and secure the Process Chamber lid.
14. Lower the Process Chamber cover.
15. Remove the lock out/tag out (see Section 1.3.4).
16. Restart the system (see Section 5.1.1).
17. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.4 Test Run

With a wafer loaded in a Transport Fixture, run an abbreviated operating program (recipe) to verify that each major assembly is functioning properly, including:

- Ensure the Transport Fixture loads onto the Lower Heater Assembly properly.
- The Clamp Actuators operate properly.
- The Spacer Actuators operate properly.
- The Top and Bottom Heaters Ramp Up properly and maintain the correct operating temperatures.
- If an Anodic bond tool is installed, verify that the application of voltage is within the preset parameters.
- Verify the application of the bond force by the top tool bellows.
- Verify unloading of the Transport Fixture.

6.2.5 Exterior Cleaning

The exterior panels of the tool are mirror-polished stainless steel. Routine cleaning is necessary both to maintain the appearance of the system and to preserve its integrity.



WARNING!
Isopropyl alcohol (IPA) and Acetone.
Irritating/ Highly flammable media.

Avoid skin contact and inhaling vapors.

Use in well-ventilated areas.

Keep away from flames and sparks.

Consider and observe the Material Safety Data Sheet.

1. Carefully wipe down the exterior surfaces with acetone and clean room wipes.
2. Follow by wiping down the system with isopropyl alcohol and clean room wipes.

6.2.6 Chamber Interior Cleaning

Process Chamber cleanliness, including internal components, can have a significant impact on the Substrate Bonder's performance. Contaminants can delay or prevent the chamber from pumping down to the required vacuum. The most common source of contamination is skin contact. Always wear clean room gloves when working in or around the Process Chamber and be aware of other exposed skin. Avoid contact between the exposed skin and the Process Chamber interior.



WARNING!
Pressurized Assembly!
Risk of explosion.

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

Use the following procedure to clean the chamber interior if the chamber is visibly contaminated or pump down performance is deteriorating:



Note
Use caution when working on the Pressure or Sandwich Plates, especially the Graphite Plates, as they can be easily damaged (see Section 6.2.13.2).

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.

**Note**

Clicking Exit closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.
8. Lift the Process Chamber cover (see Figure 6-1).
9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.

**CAUTION!**
Hot Surfaces!

Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!



10. Use clean room wipes and acetone to clean exposed surfaces.

**WARNING!**
Isopropyl alcohol (IPA) and Acetone.
Irritating/ Highly flammable media.

Avoid skin contact and inhaling vapors.
Use in well-ventilated areas.
Keep away from flames and sparks.

Consider and observe the Material Safety Data Sheet.



WARNING!

**Isopropyl alcohol (IPA) and Acetone Will Damage Graphite Tooling
Use Care Not to Scrape Graphite Pressure or Sandwich Plates**

See Section 6.2.13.2 for Graphite Tooling cleaning procedures.

11. Use isopropyl alcohol and clean room wipes to remove any acetone residue from the exposed surfaces.
12. Close the Process Chamber lid and secure it using the lid retainers removed in Step 9.
13. Lower the Process Chamber cover.
14. Remove the lock out/tag out (see Section 1.3.4).
15. Restart the system (see Section 5.1.1).
16. Select the SB6L Maintenance-Controller and set the top and bottom heaters to maximum (500°C) and the Pressure Chamber pressure to uncontrolled pump down.
17. Allow the system to outgas under these conditions for one hour.
18. Press the Console START pushbutton to initialize the system (see Figure 5-1).
19. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.7 Wafer Breakage Cleanup

Use the following procedure if a wafer breaks inside the chamber:



WARNING!

**Pressurized Assembly!
Risk of explosion.**

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.



Note

Call SUSS Service if there is reason to believe the thermocouple may have been damaged because of a wafer breaking.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.

**Note**

Clicking Exit closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.
8. Lift the Process Chamber cover (see Figure 6-1).
9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin.
10. If there is evidence of a broken wafer, carefully remove all large pieces from the chamber. Then use a clean room approved Vacuum Cleaner and vacuum the inside of the chamber. Be careful not to touch any of the components inside the chamber with the nozzle.

**Note**

Use caution when working on the Pressure or Sandwich Plates, especially the Graphite Plates, as they can be easily damaged.

11. Use Acetone and Isopropyl to wipe down the chamber after the debris is removed.
12. Contact SUSS Service if there is evidence of debris entering the Turbo Pump.
13. If skin contact or another source has contaminated the inside of the chamber, clean it as described in Section 6.2.6.
14. Close and secure the Process Chamber lid.
15. Lower the Process Chamber cover.

**CAUTION!****Ergonomic hazard!****Risk of damage to the spine by lifting or moving heavy objects.**

Use personnel or mechanical assistance for lifting heavy objects

16. Remove the lock out/tag out (see Section 1.3.4).
17. Restart the system (see Section 5.1.1).
18. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.8 Pumps

Refer to the manufacturer's maintenance guidelines and instructions for the **Roughing Pump** and **Turbo Pump** shipped with your system.

6.2.9 Replace System Start Switch Lamp

The system Start switch is illuminated. Replace the lamp as follows:

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.

**Note**

Clicking Exit closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).

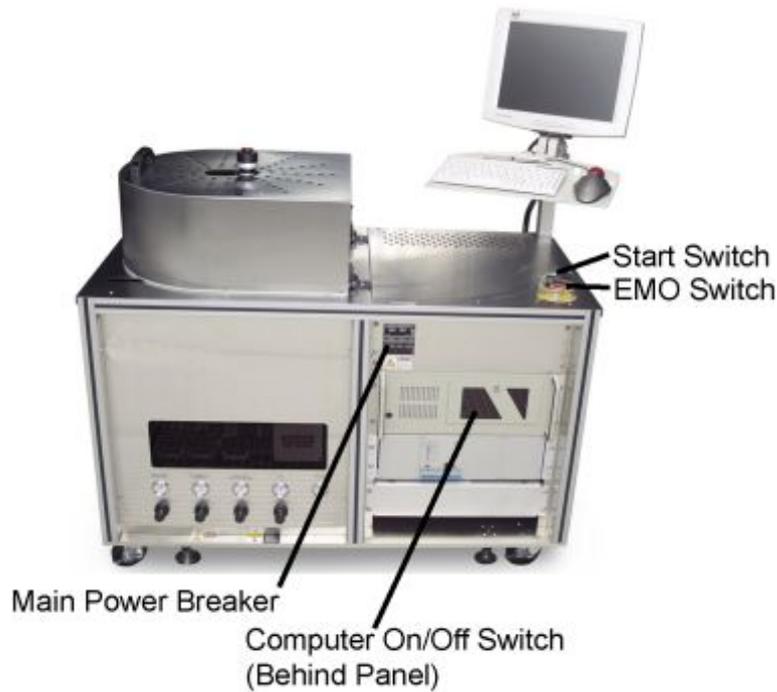


Figure 6-3 Location of Start Switch, Main Power Breaker and component power switches

6. Unscrew the **Start** switch bezel.
7. Remove the defective lamp.
8. Install the new lamp.
9. Reinstall the bezel.
10. Restart the system (see Section 5.1.1).
11. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.10 Replace Fuses

Keep the following types and quantities of fuses available.

Table 6-3 List of Replaceable Fuses

SUSS Part Number	Description	Amount
06,61004480	FUSE, 3.15A, SLOW BLOW	6
06,1004637	FUSE, 12A, SLOW BLOW	4
06,61008796	FUSE, DIN 41571, 0.5A FUSE, SLOW BLOW	6

SUSS Part Number	Description	Amount
06,61008893	FUSE, DIN 41571, 10A, SLOW BLOW	6
06,61009202	FUSE, DIN 41571, 2A, SLOW BLOW	6
06,61009245	FUSE, DIN 41571, 4A, SLOW BLOW	6

Fuses are mounted on the terminal strip on the power distribution assembly located behind a cover panel. A label on the assembly indicates the size and location of each fuse.

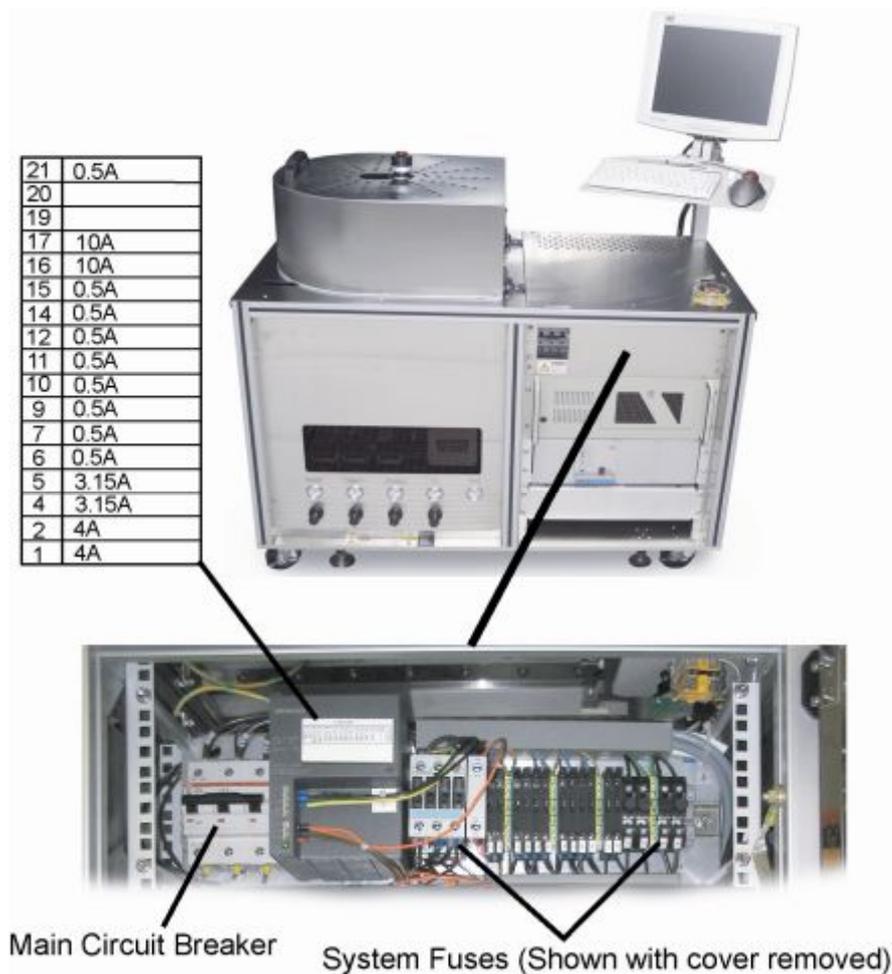


Figure 6-4 Location of System Fuses

When a fuse blows, identify it and then replace it as described below:

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.

2. Click *Exit* on the **Navigator**.

**Note**

Clicking *Exit* closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).



Figure 6-5 Location of Equipment Power Switches

6. Lock out/tag out the system (see Section 1.3.4).
7. Remove the panel covering the Main Circuit Breaker.
8. Replace the defective fuse.
9. Replace the panel.

10. Remove the lock out/tag out (see Section 1.3.4).
11. Restart the system (see Section 5.1.1).
12. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

**Note**

If the fuse blows again, this is an indication of an electrical problem that must be corrected prior to continuing. Notify your supervisor that a problem exists before attempting to replace the fuse again.

6.2.11 Safety Valve (Pressure Relief Valve)

Check the safety valves at least every two months (eight weeks).

Log out of the Process Control Program (see Section 5.1.2).

Verify the operation of safety valve VS1, located in front of valve PV1 by using valve DRV5 to gradually increase the pressure at the safety valve to 1.2 bar absolute. The valve should open. Replace the valve if it does not open. Retest any replaced valve.

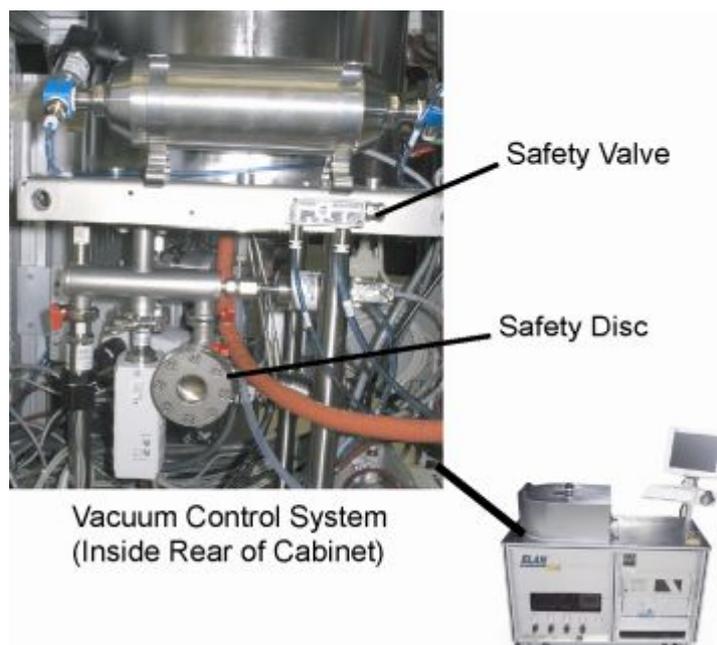


Figure 6-6 Location of Safety Valve and Safety Disc

6.2.12 Replacing Graphite Foil Disc

A graphite foil disc between the heater and the sandwich plate improves thermal conductivity in a vacuum. The disc deteriorates with use and should be replaced every three months (quarter). .)

**Note**

If skin contact or another source has contaminated the inside of the Process Chamber during this procedure, clean it as described in Section 6.2.6.

**WARNING!****Pressurized Assembly!****Risk of explosion.**

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.

**Note**

Clicking Exit closes the Navigator user interface but not the PCP.

3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.

**CAUTION!****Hot Surfaces!****Risk of burns caused by touching.**

Wait until surface has cooled down below 40° C.

Wear protective gloves when touching it!



8. Lift the Process Chamber cover (see Figure 6-1).
9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
10. Remove the small clamp securing the thermocouple sheath to the heater flange. Set it aside and then carefully pull the thermocouple out of the bore on the outside diameter of the Sandwich Plate and set the thermocouple aside.
11. Remove the three screws securing the Sandwich Plate to the Lower Heater Assembly and set them aside.

**Note**

These screws are non-standard screws; therefore do not use standard screws to reattach the sandwich plate to the lower heater as this may damage the Sandwich Plate during operation.

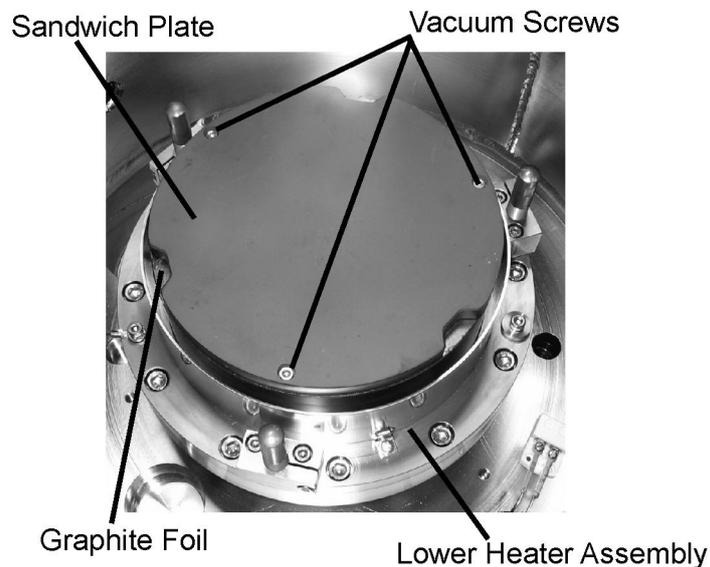


Figure 6-7 Location of Sandwich Plate and Graphite Foil

12. Use clean room wipes to clean the front and back of the Sandwich Plate with acetone followed by isopropyl alcohol. Set the Sandwich Plate aside.



WARNING!
Isopropyl alcohol (IPA) and Acetone.
Irritating/ Highly flammable media.
Flammable solvents can cause injury or death if ignited
Avoid skin contact and inhaling vapors.
Use in well-ventilated areas.
Keep away from flames and sparks.
Consider and observe the Material Safety Data Sheet.



WARNING!
Isopropyl alcohol (IPA) and Acetone Will Damage Graphite Tooling
Use Care Not to Scrape Graphite Pressure or Sandwich Plates
See Section 6.2.13.2 for Graphite Tooling cleaning procedures.

13. Remove and discard the old graphite foil disc.
14. Using clean room wipes, clean the top of the heater with acetone followed by wiping with isopropyl alcohol.
15. Install the new graphite foil disc on the Lower Heater Assembly followed by the Sandwich Plate.
16. Ensure the holes in the heater line up with the holes in the graphite foil disc and the sandwich plate, and then reinstall the three vacuum screws removed in Step 11.
17. Replace the thermocouple and clamp.
18. Close the Process Chamber lid and secure it using the lid retainers removed in Step 9.
19. Lower the Process Chamber cover.
20. Remove the lock out/tag out.
21. Restart the system (see Section 5.1.1).
22. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.13 Cleaning the Pressure and Sandwich Plates

Residue can build up on the working surfaces of the sandwich and pressure plates. They should be cleaned every month or after every 1000 hours of use, or whenever daily visual inspection reveals buildup.

6.2.13.1 Cleaning Procedure (SST or SiC Tooling)



Note
Always wear clear room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be thoroughly cleaned.

**WARNING!**

Pressurized Assembly!

Risk of explosion.

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

**Note**

Use caution when working on the Pressure or Sandwich Plates, especially the Graphite Plates, as they can be easily damaged (see Section 6.2.13.2).

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.

**Note**

Clicking Exit closes the Navigator user interface but not the PCP.

2. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
3. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.

**Note**

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

4. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
5. Lock out/tag out the system (see Section 1.3.4).
6. Wait for the system to cool down before opening the Process Chamber cover. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.

**CAUTION!**

Ergonomic hazard!

Risk of damage to the spine by lifting or moving heavy objects.

Use personnel or mechanical assistance for lifting heavy objects

7. Lift the Process Chamber cover (see Figure 6-1).



CAUTION!
Hot Surfaces!

Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!

8. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
9. Use clean room wipes and acetone followed by isopropyl alcohol to clean the sandwich and pressure plates. If there appear to be particles baked onto either plate, carefully scrape them off with a straight razor, then clean the surface with acetone and isopropyl alcohol again.



WARNING!
Isopropyl alcohol (IPA) and Acetone Will Damage Graphite Tooling
Use Care Not to Scrape Graphite Pressure or Sandwich Plates

See Section 6.2.13.2 for Graphite Tooling cleaning procedures.



WARNING!
Isopropyl alcohol (IPA).
Irritating/ Highly flammable media.

Avoid skin contact and inhaling vapors.
Use in well-ventilated areas.
Keep away from flames and sparks.
Consider and observe the Material Safety Data Sheet.

10. Close and secure the Process Chamber lid.
11. Lower the Process Chamber cover.
12. Remove the lock out/tag out.
13. Restart the system (see Section 5.1.1).
14. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.13.2 Cleaning Procedure (Graphite Tooling)



Note

Always wear clean room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be

thoroughly cleaned.



WARNING!
Pressurized Assembly!
Risk of explosion.

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.



Note

Use caution when working on the Graphite Pressure or Sandwich Plates as they can be easily damaged.



Note

Use caution when working on the Pressure or Sandwich Plates, especially the Graphite Plates, as they can be easily damaged (see Section 6.2.13.2).

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.



Note

Clicking Exit closes the Navigator user interface but not the PCP.

2. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
3. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.



Note

On some computer systems, it may be necessary to physically turn off the computer system after Windows has completed the Shutdown sequence.

4. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
5. Lock out/tag out the system (see Section 1.3.4).
6. Wait for the system to cool down before opening the Process Chamber Cover. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.



CAUTION!
Ergonomic hazard!
Risk of damage to the spine by lifting or moving heavy objects.
 Use personnel or mechanical assistance for lifting heavy objects



CAUTION!
Hot Surfaces!
 Risk of burns caused by touching.
 Wait until surface has cooled down below 40° C.
 Wear protective gloves when touching it!

7. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
8. Carefully remove the Sandwich and Pressure Plates (see Sections 6.2.14 and 6.2.15).
9. Ultrasonically clean each plate in de-ionized water (DI) for 15 minutes (maximum) per treatment.



Note
 Prolonged exposure of Graphite tooling to ultrasonic energy may produce “pitting” in the graphite materials.



Note
 If water volume in the ultrasonic cleaning system is small, use three 5-minute cleaning steps with fresh DI water for each step.



Note
 Because the Graphite tooling is soft and scratches easier, do not use any scraping device on the Pressure or Sandwich Plate surface.

10. If there appear to be oil/grease/fingerprints or particles baked onto either plate, ultrasonically clean the plates for 15 minutes in methanol, then immediately immerse the plates in DI water and ultrasonically clean for a minimum of five minutes and a maximum of 15 minutes.



Note
 Do not dry parts between methanol cleaning and DI cleaning.

**WARNING!****Methanol.****Irritating/Highly flammable media.**

Avoid skin contact and inhaling vapors.

Use in well-ventilated areas.

Keep away from flames and sparks.

Consider and observe the Material Safety Data Sheet.

**Note**

If there appear to be oil/grease/fingerprints or particles baked onto either plate, do not use chlorinated solvents, such as TCE, to remove them. Chlorinated solvents are hard to remove from the Graphite plates and may cause contamination in the system.

**CAUTION!****Do Not Use Chlorinated Solvents.**

Chlorinated Solvents May Contaminate System.

Chlorinated solvents (such as TCE) may result in contamination of system.

Chlorinated solvents difficult to remove.

11. Bake the cleaned Pressure and Sandwich Plates in vacuum (preferred) or inert atmosphere furnace for one to two hours at between 120° C and 260° C (preferred).

**Note**

Avoid exposure to air, oxygen, or moisture at temperatures above 350° C as oxidation may occur.

12. Replace the Sandwich and Pressure (see Sections 6.2.14 and 6.2.15).
13. Close and secure the Process Chamber lid.
14. Lower the Process Chamber cover.
15. Remove the lock out/tag out.
16. Restart the system (see Section 5.1.1).
17. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.14 Replacing the Pressure Plate

Replace damaged or worn Pressure Plates. Also, replace the Pressure Plate if the size of the wafers being bonded change. Always wear clear room gloves when working in the Pressure Chamber.

**Note**

Always wear clear room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be thoroughly cleaned.

**WARNING!****Pressurized Assembly!
Risk of explosion.**

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

**Note**

Use caution when working with Graphite Pressure or Sandwich Plates, as they can be easily damaged.

Use the following procedure to replace the pressure plate:

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.
3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.
5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.

**CAUTION!****Hot Surfaces!**

Risk of burns caused by touching.

Wait until surface has cooled down below 40° C.



Wear protective gloves when touching it!

**WARNING!****Pressurized Assembly!
Risk of explosion.**

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

8. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
9. If present, disconnect the thermocouple from the Pressure Plate.
10. Measure and record the gap between the two halves of the clamp.

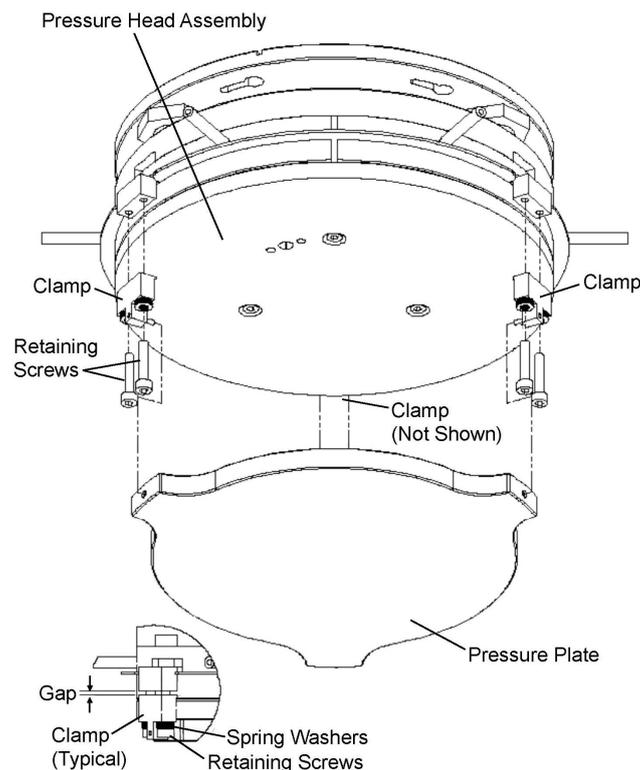


Figure 6-8 Pressure Plate Assembly

1. There are three clamps. Remove the two screws securing each clamp, ensuring the spring washers are kept with each screw for use later when the new pressure plate is installed. A pin in each clamp protrudes into the Pressure Plate; remove the clamp by pulling it away from the center of the plate.



Note

Loosen the two screws securing each clamp until the clamp can be removed by pulling it outward away from the center of the plate. Firmly hold the Pressure Plate to keep it from sliding and possible getting damaged while removing the clamps.

2. Remove the old Pressure Plate.
3. Place the new Pressure Plate on the Bond Head.

4. Loosely reattach the clamps using the screws removed in Step 12 by first inserting the small pin in the appropriate hole in the new Pressure Plate and gently pushing it toward the center of the plate. Then slowly tighten the screws a little at a time, alternating between screws. Stop when the gap is the same as measured in Step 11.
5. Reattach the thermocouple.
6. Close and secure the Process Chamber lid.
7. Lower the Process Chamber cover.
8. Remove the lock out/tag out.
9. Restart the system (see Section 5.1.1).
10. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.15 Replacing the Sandwich Plate

Replace damaged or worn Sandwich Plates. Also, replace Sandwich Plates if the size of the wafers being bonded changes. Always wear clear room gloves when working in the Pressure Chamber.

**Note**

Always wear clear room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be thoroughly cleaned.

Use the following procedure to replace the Sandwich Plate:

**Note**

Use caution when working with Graphite Pressure or Sandwich Plates, as they can be easily damaged.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.
3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.
5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).

7. Wait for the system to cool down before opening the Process Chamber cover. The temperature of all surfaces should $< 40^{\circ}\text{C}$. Verify the temperature prior to touching any components.

**WARNING!****Pressurized Assembly!**

Risk of explosion.

Tool pressure bellows could burst causing severe injury.

Relieve tool pressure and Lock Out/Tag Out system before opening lid.

8. Lift the Process Chamber cover (see Figure 6-1).

**CAUTION!****Ergonomic hazard!**

Risk of damage to the spine by lifting or moving heavy objects.

Use personnel or mechanical assistance for lifting heavy objects

**CAUTION!****Hot Surfaces!**

Risk of burns caused by touching.

Wait until surface has cooled down below 40°C .

Wear protective gloves when touching it!

9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
10. If present, remove the small clamp that secures the thermocouple sheath to the heater flange, set it aside and then carefully pull the thermocouple out of the bore on the outside diameter of the Sandwich Plate and set it aside.

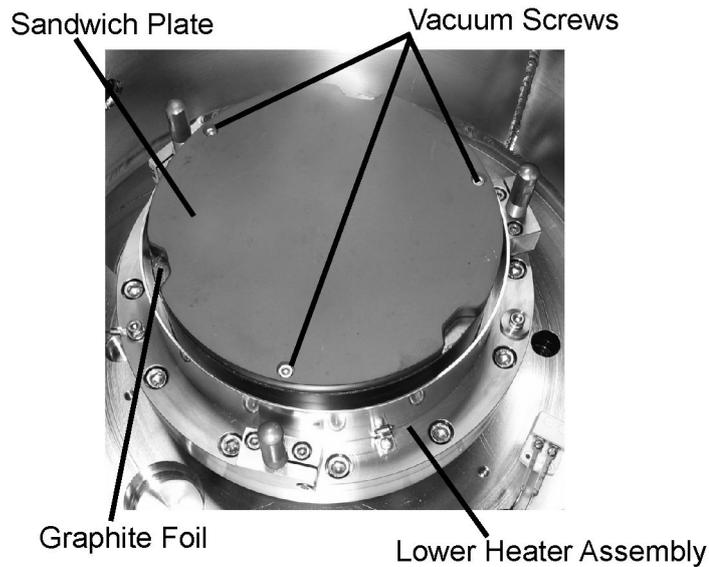


Figure 6-9 Sandwich Plate Assembly

11. Remove the three screws securing the Sandwich Plate.
12. Remove the old Sandwich Plate and Graphite Foil.
13. Place a new Graphite Foil sheet and the new Sandwich Plate on the Lower Heater Assembly, ensuring the screw holes are aligned with those in the Lower Heater Assembly.
14. Replace the Sandwich Plate retaining screws.
15. If necessary, replace the thermocouple.
16. Close the Process Chamber lid and secure it using the lid retainers removed in Step 9.
17. Lower the Process Chamber cover.
18. Remove the lock out/tag out.
19. Restart the system (see Section 5.1.1).
20. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.16 Clean Process Chamber Retainer Threads

The Process Chamber Retainer Threads need to be cleaned monthly for smooth operation when opening the Process Chamber Lid.



Note

Always wear clear room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be thoroughly cleaned.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.
3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting "Close" from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.
5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system (see Section 1.3.4).
7. Wait for the system to cool down before opening the Process Chamber cover. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.



CAUTION!
Hot Surfaces!

Risk of burns caused by touching.
Wait until surface has cooled down below 40° C.
Wear protective gloves when touching it!

8. Lift the Process Chamber cover (see Figure 6-1).



CAUTION!
Ergonomic hazard!

Risk of damage to the spine by lifting or moving heavy objects.
Use personnel or mechanical assistance for lifting heavy objects

9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Do not open the lid.



WARNING!
Pressurized Assembly!
Risk of explosion.

Tool pressure bellows could burst causing severe injury.
Relieve tool pressure and Lock Out/Tag Out system before opening lid.



Note

Use caution when working on the Pressure or Sandwich Plates, especially the Graphite Plates, as they can be easily damaged (see Section 6.2.13.2).

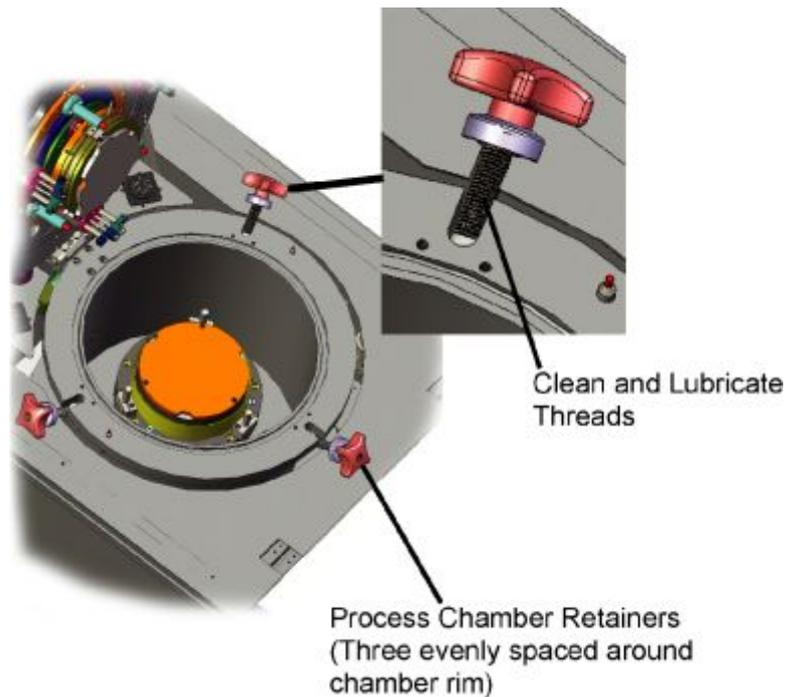


Figure 6-10 Location of Process Chamber Retainers

10. Unscrew the handles from the studs and put it aside. Clean the threads of the stud with isopropyl alcohol and apply a light coating of high vacuum compatible grease (Torr Lube Extreme Grease or equivalent) to them.



WARNING!

Isopropyl alcohol (IPA) and Acetone Will Damage Graphite Tooling
Use Care Not to Scrape Graphite Pressure or Sandwich Plates
 See Section 6.2.13.2 for Graphite Tooling cleaning procedures.



WARNING!

Isopropyl alcohol (IPA).
Irritating/ Highly flammable media.

Avoid skin contact and inhaling vapors.

Use in well-ventilated areas.

Keep away from flames and sparks.

Consider and observe the Material Safety Data Sheet.

11. Clean the internal thread of the handle with isopropyl alcohol and apply a light coating of high vacuum compatible grease (Torr Lube Extreme Grease or equivalent) to the inside threads. Replace the handles on the studs.
12. Move the Pressure Chamber Retainers back to their closed position and secure tightly.
13. Lower the Process Chamber cover.

14. Remove the lock out/tag out.
15. Restart the system (see Section 5.1.1).
16. Perform a Test Run, and then return the system to operation (see Section 6.2.4).

6.2.17 Replacing the Center Pin, Center Pin Spring and Axial Bearing



Note

Always wear clear room gloves when working in the Pressure Chamber. If skin or other contaminants enter the chamber during this procedure, the pressure chamber must be thoroughly cleaned.

1. Click *Status* on the **Navigator** to open the **Status** window (see Section 5.2.1 and Section 5.2.3). Note the current temperature of the top and bottom heaters.
2. Click *Exit* on the **Navigator**.
3. Close the **Process Control Program** by right clicking the **PCP** button on the **Windows Task Bar** and selecting “Close” from the popup menu.
4. Shut down the computer system by clicking *Start* on the Windows Task Bar and selecting *Turn Off Computer*. Then select *Shutdown* in the Windows Shutdown dialog that appears.
5. Set the computer and other electronic equipment power switches to their Off position, then set the SB6L Main Power breaker to OFF and close the facility connections (see Figure 4-2).
6. Lock out/tag out the system.
7. Wait for the system to cool down before opening the Process Chamber. The temperature of all surfaces should < 40° C. Verify the temperature prior to touching any components.
8. Lift the Process Chamber cover (see Figure 6-1).
9. Loosen the three Process Chamber lid retainers and move them away from the lid (see Figure 6-2). Then lift the lid being careful to not to pinch any cables or tubes between the lid and the hinge support. Avoid contamination by wearing clean room gloves and avoid contacting the inside of the Pressure Chamber with exposed skin. If there is evidence of a broken wafer, follow the procedure in Section 6.2.7.
10. Use Center Pin Removal Tool (06,183668) to remove the center pin by turning the Center Pin Guide Bushing counterclockwise (CCW). Remove the center pin, compression spring and axial bearing as one unit by holding the compression spring toward the closed end of the center pin.

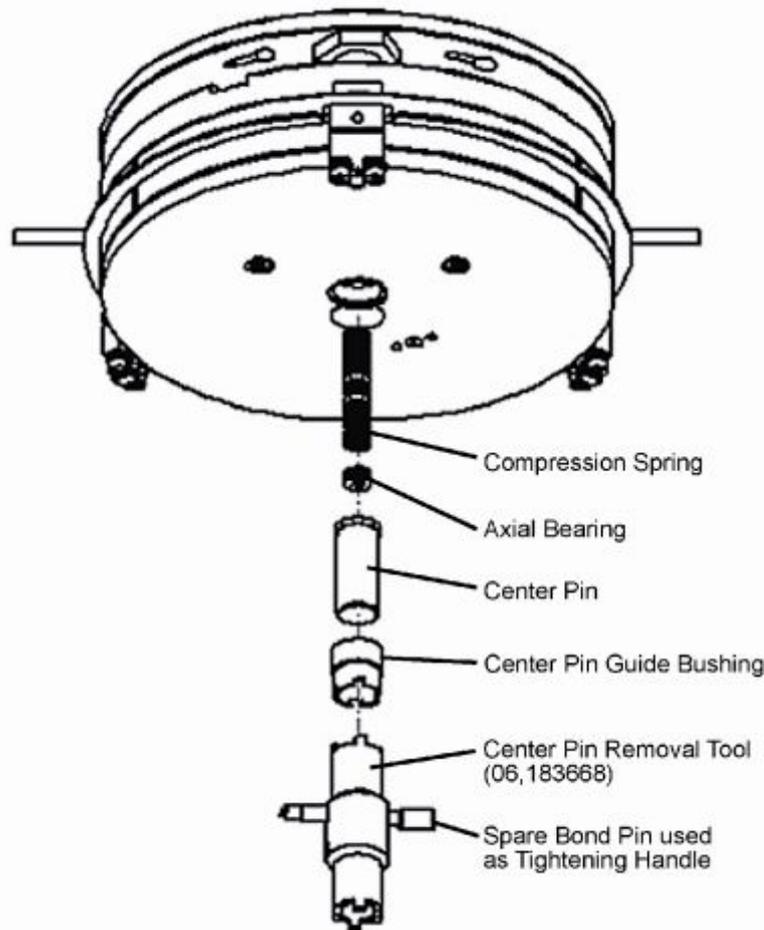


Figure 6-11 Center Pin Replacement

11. Turn the center pin over, slowly release the pressure from the compression spring, and then remove it from the bore of the center pin.
12. Carefully turn over the center pin to remove the axial bearing from the bore. Check the axial bearing for smooth function and replace if necessary.
13. Replace the compression spring if necessary.
14. Replace the center pin if necessary.
15. Install the axial bearing and compression spring back into the center pin bore, ensuring the compression spring turns freely.
16. Slide the center pin/bearing/compression spring assembly in Center Pin Guide Bushing and reinstall in the Bond Head. Tighten the guide bushing only thumb tight and ensure the center pin moves easily in and out of the Pressure Plate. If necessary, use a spare Bond Pin as a tightening handle.
17. Close and secure the Process Chamber lid.
18. Lower the Process Chamber cover.
19. Remove the lock out/tag out.
20. Restart the system (see Section 5.1.1).

21. Perform a Test Run, and then return the system to operation (see Section 6.2.4)

6.2.18 Spare Parts Kit

SUSS recommends the following items be kept on site to ensure optimum performance and minimal system downtime.

PART NO.	DESCRIPTION	QUANTITY
06,1000384	O-Ring (Top Tool)	1
06,1000423	VALVE, AIR PILOTED	1
06,1000589	Asm, Clamp & Spacer Actuator	1
06,1000616	MEASURING GAUGE DMP331 16BAR	1
06,1000638	Cable, Clamp/Spacer Actuator Sensor	2
06,1000806	PCB, Chamber Cover	1
06,151203	PRESSURE SWITCH	1
06,152278	O-Ring (Clamp & Spacer Actuator/Lid)	1
06,152279	O-Ring (Chamber Lid/Chamber)	1
06,167484	Burst Disc, Overpressure	1
06,1001087	Screw, Sandwich Plate	3
06,187425	Graphite Foil, 150 mm	2
06,177298	PRESSURE CONVERTER	1
06,61004480	FUSE, 3.15A, SLOW BLOW	6
06,1004637	FUSE, 12A, SLOW BLOW	4
06,61008796	FUSE, DIN 41571, 0.5A FUSE, SLOW BLOW	6
06,61008893	FUSE, DIN 41571, 10A, SLOW BLOW	6
06,61009202	FUSE, DIN 41571, 2A, SLOW BLOW	6
06,61009245	FUSE, DIN 41571, 4A, SLOW BLOW	6

7 SERVICE INFORMATION

7.1 Overview

The SUSS Substrate Bonders are carefully designed and solidly built to exacting standards in order to provide many years of reliable performance. To ensure continued optimum performance and a long operating life, proper routine maintenance and care are essential.

7.2 Technical Assistance

If you are unable to resolve technical or operations issues with the SB6L using this manual, additional assistance is available at:

U.S., Canada, and Mexico – Contact SUSS MicroTec, Inc. Customer Support at 800-TOP-SUSS or 800-867-7877.

International – Refer to the following table or contact the SUSS MicroTec Inc. office which processed your order or which is currently handling your account can give you specific instructions on whom to contact for additional help or to answer any questions.



Note

To ease procedures please always provide the equipment number or serial number.

	Service	Parts / Logistics	TechSupport
	<ul style="list-style-type: none"> * Request for service engineer * Quotation for service visit 	<ul style="list-style-type: none"> * Quotation for spare parts * Spare parts order * Billing 	<ul style="list-style-type: none"> * Technical advice during tool down * <i>Parts identification</i> * <i>Point of contact for application support</i> * <i>Hardware upgrades</i>
Maskaligner MA100/150/200E, CC MA200compact MA300 DSM8, DSM200 MJB4, MA6/8, MA8Gen3 LithoCluster	Customer Support SMTL Garching alignerservice.de@suss.com Tel.: +49 89 32007 - 281 Fax: +49 89 32007 - 245	Product Center SMTL Garching alignerparts.de@suss.com Tel.: +49 89 32007 - 122 Fax: +49 89 32007 - 107	Mario Franziszi alignerservice.de@suss.com Tel.: +49 89 32007 211
Bonder SB6/8/E BA6/8/200/300 SB150/200 ABC200, CBC200 XBC300 CB8, SB6L, NP12, CL8	bonderservice.de@suss.com Tel.: +49 89 32007 - 281 or 304 Fax: +49 89 32007 - 245	bonderparts.de@suss.com Tel.: +49 7045 41 - 820 Fax: +49 7045 41 - 605	Karl-Heinz Wickmair bonderservice.de@suss.com Tel.: +49 89 32007 - 228
Coater/Developer Delta Gamma ACS200/300 RC8 Falcon	Customer Support SMTL Sternenfels coaterservice.de@suss.com Tel.: +49 7045 41 - 982 Fax: +49 7045 41 - 605	Product Center SMTL Sternenfels coaterparts.de@suss.com Tel.: +49 7045 41 - 696 Fax: +49 7045 41 - 790	Hotline Tel.: +49 7045 41 - 697 Georg Kurz Tel.: +49 7045 41 - 736 coaterservice.de@suss.com Tel.: +49 7045 41 - 736 Fax: +49 7045 41 - 605
Old Generation Tools MA150RH/ML MA14/16/56/100/150 MJB3, 21, 45, 55 MA56, 25,26 MA1006, RA120	SMT Reman service.smtr@suss.com Tel.: +49 89 32007 - 567 Fax: +49 89 32007 - 555	SMT Reman sales.smtr@suss.com Tel.: +49 89 32007 - 551 Fax: +49 89 32007 - 555	Herrmann Kronburger service.smtr@suss.com Tel.: +49 89 32007 - 550 Fax: +49 89 32007 - 555

8 DECOMMISSIONING EQUIPMENT

Decommissioning is a formal process to permanently remove a piece of equipment from operational status. It includes dismantling and disposal or recycling of the system or components and deals with the potential liabilities associated with the aforementioned actions. The purpose of this section is to provide guidance in developing a decommission plan.



Note

Decommissioning in this aspect includes addressing recycling and reuse of equipment when either required by regional, national, or local regulations, or by internal corporate guidelines.

By necessity, this document is limited in scope. The designated project manager for the equipment decommissioning is responsible for ensuring the legal requirements (regional, national, and local) applying to the decommissioning of the equipment are adhered to and that all the necessary permits are obtained prior to the actual decommissioning.

8.1 Applicable Documents

- SEMI S2-0200 Standard, "Safety Guidelines for Semiconductor Manufacturing Equipment".
- SEMI S8 Standard, "Safety Guidelines for Ergonomics/Human Factors Engineering for Semiconductor Manufacturing Equipment".
- SEMI S12-0298 Standard, "Guidelines for Equipment Decontamination".
- SEMI S16-0600 Standard, "EHS Guidelines for Semiconductor Manufacturing Equipment Disposal".
- SEMI S13-305 Standard, "R8-2 Decontamination and Decommissioning Information"
- SEMI S18-1102 Standard, "Section 6.3 Isolation (Lockout/Tagout)"
- OSHA 29 CFR 1910.147, "The control of hazardous energy (lockout/tagout)"

8.2 Developing a Decommissioning Plan

8.2.1 Purpose of a Decommissioning Plan

This purpose of a formal decommissioning plan is to ensure the equipment is decommissioned or removed in a manner that will allow lowest possible risk to employees, operations or maintenance activities.

8.2.2 Steps in Developing a Decommissioning Plan

There are essentially five steps to developing a decommissioning plan:

- Initiation – Start decommissioning planning, identify project manager

- Information gathering – Initiate an audit of what needs to be done, operational review and logistics, document review (regulations, permits, site history), external support
- Creating the draft decommissioning plan – Regulatory assessment and approvals, remedial evaluations, prioritization (cost, risks), recycling/reuse assessment
- Review by authorities – Submit plan for review by cognizant authorities
- Revised and implement – Incorporate regulatory review and obtain final approval for revised decommissioning plan

8.2.3 Initiation

This phase involves identifying the internal personnel responsible for developing and implementing the decommissioning plan. The decommissioning project manager (DPM) will be responsible for ensuring all phases of the plan are achieved and all regulatory guidelines and regional, national and local laws affecting equipment decommissioning are adhered to.

8.2.4 Information Gathering

This phase includes an operational review of the equipment being decommissioned and the logistics involved with the decommissioning, including information on recycling and reuse of components or subsystems. In addition to auditing what needs to be accomplished to decommission the equipment, a thorough review of applicable regional, national and local laws and regulations is required and a risk assessment of environmental and operational impact of the decommission developed.

8.2.4.1 Legal Requirements

It is important to identify the legal requirements for the decommissioning at the beginning of the process. It is encouraged to make contact with the appropriate authorities to understand their requirements as they differ depending on the region, nation and locality. This will also ensure the most up-to-date legal requirements are used to develop the decommissioning plan.

8.2.5 Create the Draft Decommissioning Plan

The Draft Decommissioning Plan should include a timeline for gathering the necessary regulatory permits and scheduling inspections. It should also include the development of a formal sign-off sheet (see Section 1.3) and identify the personnel responsible for the various aspects of the decommissioning, such as decontamination of equipment, disconnection and sealing of facility inputs (power, vacuum, CDA, process gas, etc.), physical removal of equipment from operating area, disassembly and recycling operations and final disposition.

8.2.6 Review By Authorities

The Draft Decommissioning Plan should be reviewed by the appropriate regulatory authorities to ensure adherence to laws and regulations governing decommissioning of electronic systems for the equipment's location. The review should also include members of the corporate staff knowledgeable about SEMI standards.

8.2.7 Revise and Implement the Plan

The final phase of developing the Decommissioning Plan is to incorporate changes identified by the draft plan reviewers and set a formal schedule for the decommissioning.

8.2.8 Safety Sign-off Sheet

The purpose of the safety sign-off process, for decommissioning and removal of equipment or both is to ensure the decommissioning and removal of all designated equipment and support systems are executed in a manner consistent with applicable codes, regulations, and sound engineering practices.

8.2.9 Responsibilities

It is the responsibility of the DPM, with cooperation from the Environmental Health and Safety (EHS) representative, and Facilities Engineer to apply professional judgment and knowledge above that which is included in this specification and shall comply with all applicable equipment specific decontamination procedures. The DPM is also responsible for ensuring contract or sub-contract decommissioning personnel adhere to the Decommissioning Plan and for resolving or escalating all issues on a punch list which are out of compliance.

The designated EHS representative is responsible for identifying items critical for final signoff when requested and for maintaining records of the completed Decommissioning Sign-off Checklist for one year.

The DPM is responsible for obtaining and posting the Equipment Decommissioning/Removal Sign-off Checklist at or near the subject equipment, and for scheduling the necessary sign-offs.

8.2.10 Safety

Proper personal protective equipment (PPE) must be worn at all times when decontaminating equipment. At a minimum, the following PPE should be used:

- Chemical resistant gloves
- Safety glasses
- Face shield
- Arm guards
- Chemical apron
- Cartridge respirator (if solvent fumes, acid fumes, or dusts are present)
- Airline respirator or Self Contained Breathing Apparatus (if toxic gases are present)
- Tyvek Suit and Shoe Covers- for large jobs where the possibility that contamination may touch clothes. Work on potentially contaminated floors is an example.

Material Safety Data Sheets (MSDS) must be available for review prior to and throughout the implementation of the decommissioning plan.

All hazardous waste materials generated from decontaminations must be properly handled as hazardous wastes in accordance with regional, national, local, and corporate hazardous waste codes, rules and regulations in force at the time the decommission plan is implemented.

All sources of harmful energy must be locked out and tagged out to prevent accidental start-up or release of liquids or gases. Types of lock-outs will depend on the type of tools to be decontaminated and the energy sources involved. If in doubt, refer to SEMI SEMI S18-1102 Standard, "Section 6.3 Isolation (Lockout/Tagout)," or OSHA 29 CFR 1910.147, "The control of hazardous energy (lockout/tagout)."

8.2.11 Safety Sign-off Sheet Contents

The Equipment Decommissioning Safety Sign-Off Checklist is divided into three parts:

- Coversheet
- Tool Isolation
 - Hazardous Production Material (HPM) Isolation
 - Inert Facilities and Inert Process Gas Isolation
 - Electrical Isolation
 - Miscellaneous Items
- Sign-Off Punch List

8.2.11.1 Coversheet

The coversheet must be completed by the Decommissioning Project Manager. Once the DPM obtains the necessary signatures, the equipment can be decommissioned provided that the punch-list items have been completed.

8.2.11.2 Tool Isolation

The Equipment Engineer and the Facilities Engineer shall ensure that all line items listed on the HPM Isolation specific procedure are completed. HPM isolation involves any process or system, associated with the tool, that handles (or comes in contact with) chemicals that have a NFPA rating greater than 2 for Health or Flammability.

Contaminant	Decontamination Criteria
pH (Corrosives)	pH = 5-9
Fluoride Ion	Non-detect using a Spilfyter strip.
Solvents/Photoresist	No free liquids. Remove solids and residues as much as possible. Discoloration allowed.
Coolants and Oils	No free liquids.
Arsenic	Less than 50 micrograms/ 100 cm ² .
Lead	Less than 4 micrograms/ 100 cm ² .
Phosphorous Compounds	No visible residue.
DI Water	Drain.



Contaminant	Decontamination Criteria
Other	Refer to EHS representative

The DPM shall ensure that:

- All line items listed on the Inert Facilities and Inert Process Gas Isolation specific procedure are completed. Inert facilities and inert process gases include all gases and liquids which are not considered to be hazardous process materials, such as clean dry air (CDA), nitrogen (N₂), helium, argon and water (H₂O).
- All line items listed on the Electrical Isolation specific procedure and miscellaneous specific procedures are completed and complied with, and
- Review the tool, prior to scheduling all reviews with the EHS Department. Furthermore, the DPM is responsible for contacting the EHS representative when the tool is ready for review.

8.2.11.3 Sign-Off Punch List

The DPM will ensure that all punch list items, derived from previous reviews, are addressed and completed before release of the equipment, or any of its support equipment, for decommissioning or relocation.

8.2.11.4 Training

Personnel involved in the decommissioning of equipment must have the following training courses completed and up to date:

- General Safety
- Chemical Safety
- Hazardous Waste Handling
- Hazardous Gas Handling (for tools involving toxic gases)
- Respirator Safety (if a respirator must be used)
- Lock-out/Tag-out Safety

8.2.11.5 Records

Completed copies of the Equipment Decommissioning Safety Sign-off Checklist will be kept on file for one year.

8.2.11.6 Sample Equipment Decommissioning Sign-off Checklist

The following sample checklist is for example purposes only. It should be adapted to the specific situation and equipment being decommissioned.

Equipment Decommissioning Sign-off Checklist

Sign as procedures are completed. Attach sign-off checklist to the tool.

Equipment Decommissioning Cover Sheet	
Applicant:	Date of Decommissioning
Name of Organization:	
Equipment Owner (if other than above):	
Tool Identification	Equipment Description
Tool ID Code:	
Tool Name:	
Location:	
Supplier:	
Model:	

DECOMMISSIONING EQUIPMENT



systems (internal and external to the tool) and venting from gas panels been isolated from their sources, purged, and removed; and have the remaining lines been cut back (to reduce tripping and bump hazards) and capped?				
4. Has support equipment been purged (or drained)?				
5. Has support equipment, which is to continue serving other tools, been isolated from the tool, and lines purged (or drained) and properly capped or decontaminated?				
6. Has the tool and its support equipment been isolated from the house exhaust system and abatement system? Has all exhaust ductwork been removed to the nearest blast-gate and capped. Has the remaining branch(es) been balanced?				
7. Have all associated vacuum pump roughing lines and exhaust lines been isolated and removed from pump-to-tool and pump-to-house exhaust or abatement system?				
8. Has the abatement system been decontaminated?				
9. Have all removed segments of process gas lines, vents, pumping lines, bulk delivery, waste drains and exhaust ductwork been decontaminated, and have provisions been made for the proper disposal of all hazardous waste generated by the removal of this tool?				
10. Has appropriate regulatory agencies been informed about abatement device removal?				
11. Has all process piping labeling been updated to reflect any changes in direction of flow or contents?				

INERT FACILITIES AND INERT PROCESS GAS ISOLATION				
Description	DPM	Facilities Engineer	EHS Rep	NA
1. Has all inert facilities piping and inert process piping been isolated from the tool?				
2. Has all inert facilities piping been isolated from support equipment and capped?				
3. Have affected fire suppression systems been isolated from the tool?				
4. Have any building fire alarms been altered in any way during tool removal? If yes, attach testing report results.				

ENERGY ISOLATION				
Description	DPM	Facilities Engineer	EHS Rep	NA
1. Has all stored energy at the tool been discharged?				
2. Has all stored energy at support equipment been discharged?				
3. Have all energy sources to the tool been locked?				
4. Have all energy sources to support equipment been locked out?				
5. Is all remaining electrical wiring and equipment protected from water potential?				
6. Have all electrical feeds to tool and support equipment been removed back to the electrical panel?				
7. Have breakers and panel index card been relabeled as spare?				



8. Are all remaining electrical junction covers secured?				
9. Is good wiring management exhibited for all remaining wiring?				

MISCELLANEOUS				
Description	DPM	Facilities Engineer	EHS Rep	NA
1. Have all wall, floor, and ceiling penetrations, which were created by the removal of the tool (or its support equipment), been properly sealed?				
2. Has support equipment, which is to remain in service, been relabeled to reflect the removal of this tool (HAZCOM labels, tool associations, etc.)?				
3. Have all Building Maintenance Service (BMS) points been deleted?				
4. Have all hazardous gas monitoring tubes been removed, and has all associated documentation been completed and updated?				
5. Have surfaces exposed to corrosives pH test between 5 and 9?				
6. Have wipe samples been obtained for any metals such as arsenic or lead. Attach lab results.				
7. Has all unneeded equipment been removed from the area?				
8. Has all unnecessary clutter been cleaned and removed from the area?				
9. Has all unnecessary tape, debris or tags on walls, floors and equipment been removed?				
10. Check/Cleanup of all Equipment and work areas impacted by the Equipment removal.				

SIGN-OFF PUNCHLIST		
Issue	Responsibility	Completion Date

Have all punch list items been completed? Please initial if completed:

_____ (DPM)

_____ (Facilities Engineer)

_____ (EHS Representative)