



ABBESS INSTRUMENTS AND SYSTEMS, INC.

P.O. Box 498, ASHLAND, MASSACHUSETTS 01721

Phone (508) 881-8811 Fax (508) 881-4884

E-mail abbess@abbess.com <http://www.abbess.com>

Thermal Vacuum System User Manual



TABLE OF CONTENTS

Introduction

Safety Considerations – Read before operation

Installation

Chamber Location and Set-Up

Vacuum System Description

Technical Operation and Equipment Description

Vacuum Cycle Controller

Sequence of Operation

Maintenance and Cleaning

Calibration

Service and Returns

Shipping – Claims for Damage or Shortage

Warranty

Contacting Abbess Instruments

Additional Documentation

Appendix A - Setting InstruTech SuperBee Target Vacuum Pressure

Abbess Control/Wiring Schematic

Product Literature/Manuals Enclosed Separately

- **Varian –Triscroll 600 Vacuum Pump**
- **Watlow F4-SH Temperature Controller**
- **Controls/Accessories**

INTRODUCTION

Abbess Instruments' Thermal Vacuum Chamber Systems are designed and produced for use in production and testing applications requiring an exposure to or process within a controlled vacuum environment at specific temperature. The chambers are often custom designed for specific end-user requirements in recreating extreme atmosphere and temperature situations. Our customers use our full range of vacuum systems for testing or degassing packaged products, liquids and solids, EMI and altitude testing electronics, computers, complete systems, shock impact targets, plasma, space simulation or degassing large parts or components for research, and development.

Abbess designs rugged equipment and practical systems for continuous and demanding analytical, manufacturing and production use, with safety and a long life in mind. The vacuum chambers are constructed of heavy aluminum, steel or stainless steel and feature customer replaceable O-ring seals, designed and fabricated to withstand repeated opening and reseal actions. Chambers are He leak tested to a rate of $10e-7$ cc/sec or better as required by end user needs and are designed to maintain this level for extended robust use dependent on seal condition and customer practice. .

Most Thermal Vacuum Chamber systems are made up of these basic functional components:

Chamber: a vacuum container or chamber.

Pump: a vacuum pump or pumps or other means of creating a vacuum.

Thermal System: aluminum or copper plates feed thru connected to heating and/or cooling or alternative thermal systems which apply heat to the chamber structure.

Hose: a hose, plumbing or tubing needed to connect the chamber to the pump.

Valves: to control vacuum and release/break the vacuum.

Vacuum Pressure Gauge: to measure actual pressure inside the chamber.

Temperature Gauge: to monitor thermal elements and process within the chamber.

Monitoring and control of the system are attuned to specified process needs and configured to both optimize the end use operation time and assure the proper cycling of vacuum equipment. Vacuum and thermal systems are integrated into the overall system control allowing for continuous operator involvement in the operations within the chamber.

SAFETY CONSIDERATIONS – READ THIS SECTION BEFORE OPERATION

This equipment is designed for use in manufacturing or laboratory environments by trained technicians. Use of this equipment beyond its stated intended purpose and operating parameters is not recommended and will be the sole responsibility of the user. This equipment should not be modified or altered. Abbess Instruments assumes no liability for any misuse of or modification to this product and such misuse or modification will immediately void all warranties.

This equipment should be used in accordance with the operating instructions contained in this manual. For alternative uses not covered in this manual, please contact Abbess Instrument's technical department for product suitability, safety, and alternative operating instructions.

The following are general safety guidelines recommended when using this product. Please consult your laboratory safety officer for any additional safety steps that may be necessary for your specific application or material.

1. **Make sure your operator reads and understands this manual before operating the equipment.**
2. This equipment is to be operated indoors only.
3. This equipment is to be operated in a well-lit area.
4. This equipment is to be operated with an ambient temperature of between 10 degrees C and 40 degrees C.
5. This equipment is to be operated with an ambient humidity of between 20 and 85 percent.
6. Thoroughly review your MSDS (Material Safety Data Sheets) for all chemicals to be used with this equipment.
7. If the equipment is fitted with an optional internal thermal source (i.e. Thermal Plate) the user must ensure that temperatures do not exceed the auto ignition point(s) of materials placed in chamber.
8. Hand and eye protection are required when using this product. Additional protection may be required with respect to the materials being used. Please consult your laboratory safety officer.
9. This product should only be used with adequate ventilation.
10. A trained electrical technician should conduct repairs of electrical components. Incorrect replacement parts or assembly may damage the product and create a serious safety hazard for the user. Factory repair is highly recommended.
11. The use of samples containing ether based, fuel, munitions, or other extremely flammable or explosive materials, compounds, or residues should not be used in this equipment.
12. Use of acidic or base material may damage this product and are not recommended unless the product was ordered with the optional protective coating in Teflon or made of Stainless steel.

Installation

Chamber Location and Set-Up

Equipment must be SET-UP and installed in a LOCATION meeting the following criteria and with attention paid to the following areas of concern:

- This equipment is to be operated indoors only.
- This equipment is to be operated in a well-lit area.
- This equipment is to be operated with an ambient temperature of between 10 degrees C and 40 degrees C.
- This equipment is to be operated with an ambient humidity of between 20 and 85 percent.

This equipment is to be operated on a stable floor, deck, or platform capable of safely supporting it and the intended operation.

- This equipment maybe secured to the floor, deck or platform as required.
- Electrical power connections should be provided as required by licensed professional trades people and in compliance with all applicable codes and ordinances.
- Adequate ventilation for people, process, and equipment must be provided.
- All system components must be assembled, calibrated, tested, and secured as needed for the safe and specified operations.

Vacuum System Description

The Thermal Vacuum System allows items placed inside to be exposed to vacuum pressure as well as specified temperatures via the electrically heated elements of the chamber system. The entire system can be controlled manually, by starting/stopping the pump(s) and opening/closing valves. Optionally, a Vacuum Cycle Controller (VCC) can be used to automate some or all of the control functions. The VCC enables system control via panel-mounted buttons and indicators and can optionally be controlled by a PC with a user-specific Graphical User Interface (GUI).

The Vacuum System consists of the following major components (See Figs. 1 - 8):

- Vacuum Chamber - A front loading Aluminum Cube with Stainless Steel Sheathing System over thermal insulation.
- Vacuum Pump- Triscroll 600 Vacuum Pump as manufactured by Varian. Provided with Inlet and Exhaust filters. Power and automatic control integrated in the VCC controller
- Thermal System – Thermal pad heating elements mounted to each chamber surface are controlled by PID temperature Controller mounted in Process Control Enclosure.

Note: Extensive power demand of the thermal system necessitates sequencing the thermal process after pump down to set point pressure levels is complete..

- Process Control Enclosure – Contains component necessary for controlling the system as well as logic and interfaces for the Vacuum Cycle Controller.
 - Process Timer Control
 - Temperature Controller (See manufacturer specific documentation).
 - Status Indicators – Provide visual indication of system status.
 - Vacuum Cycle Controller – Control ON/OFF buttons, main power switch.
- Pressure Gauge
 - Pressure Transducer/ Gauge Controller – Provides pressure display and set point valve control per integral Pressure Transducer data. Also provides pressure set-point relays that can be used for various system control functions.
- Control Valves
 - Automatic Vent Valve – Automatic solenoid valve vents air or N2 purge into chamber based on control input from Vacuum Cycle Controller.
- Mobile Cart – Heavy-duty cart/stand with chamber and pumping system mounted.

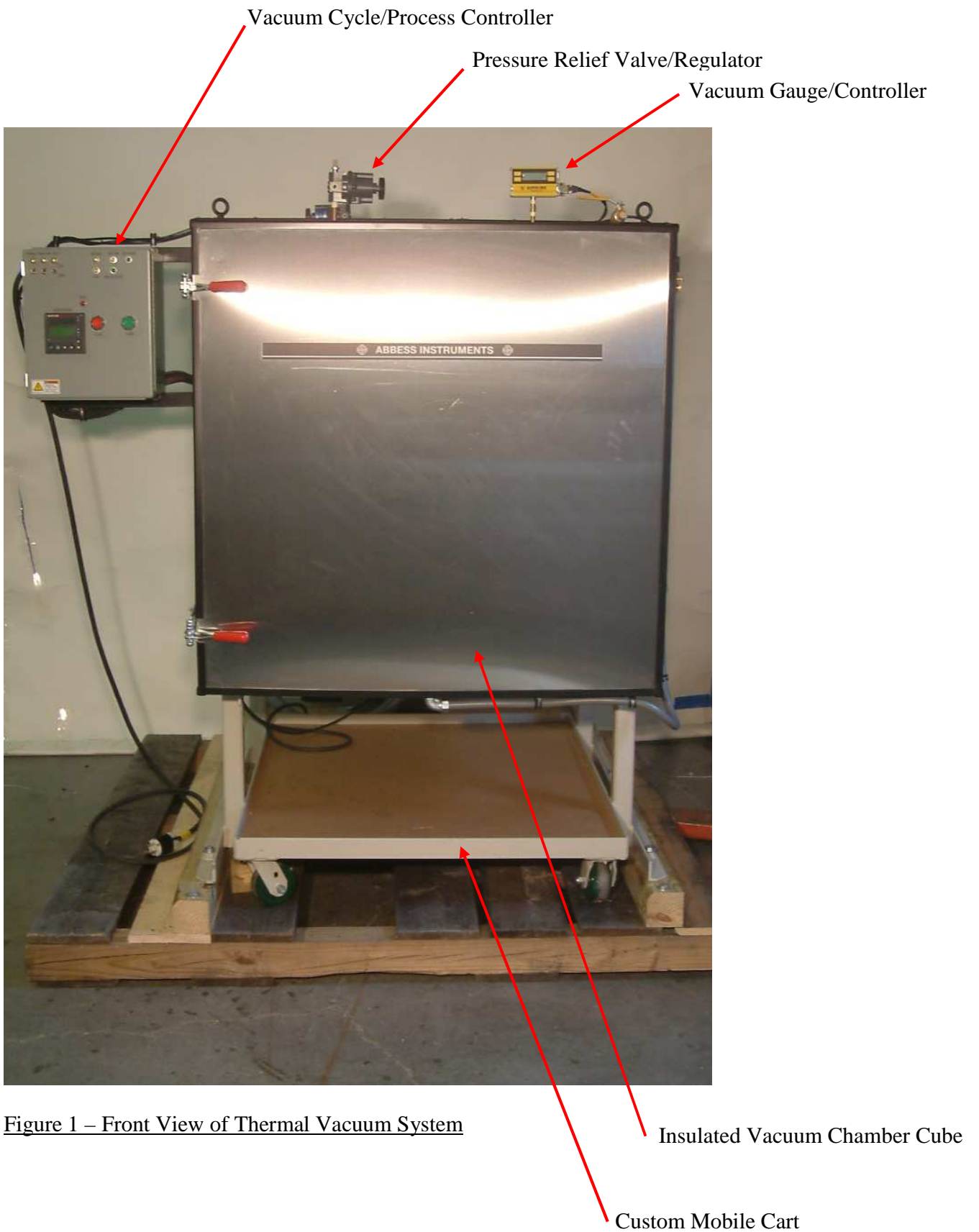


Figure 1 – Front View of Thermal Vacuum System

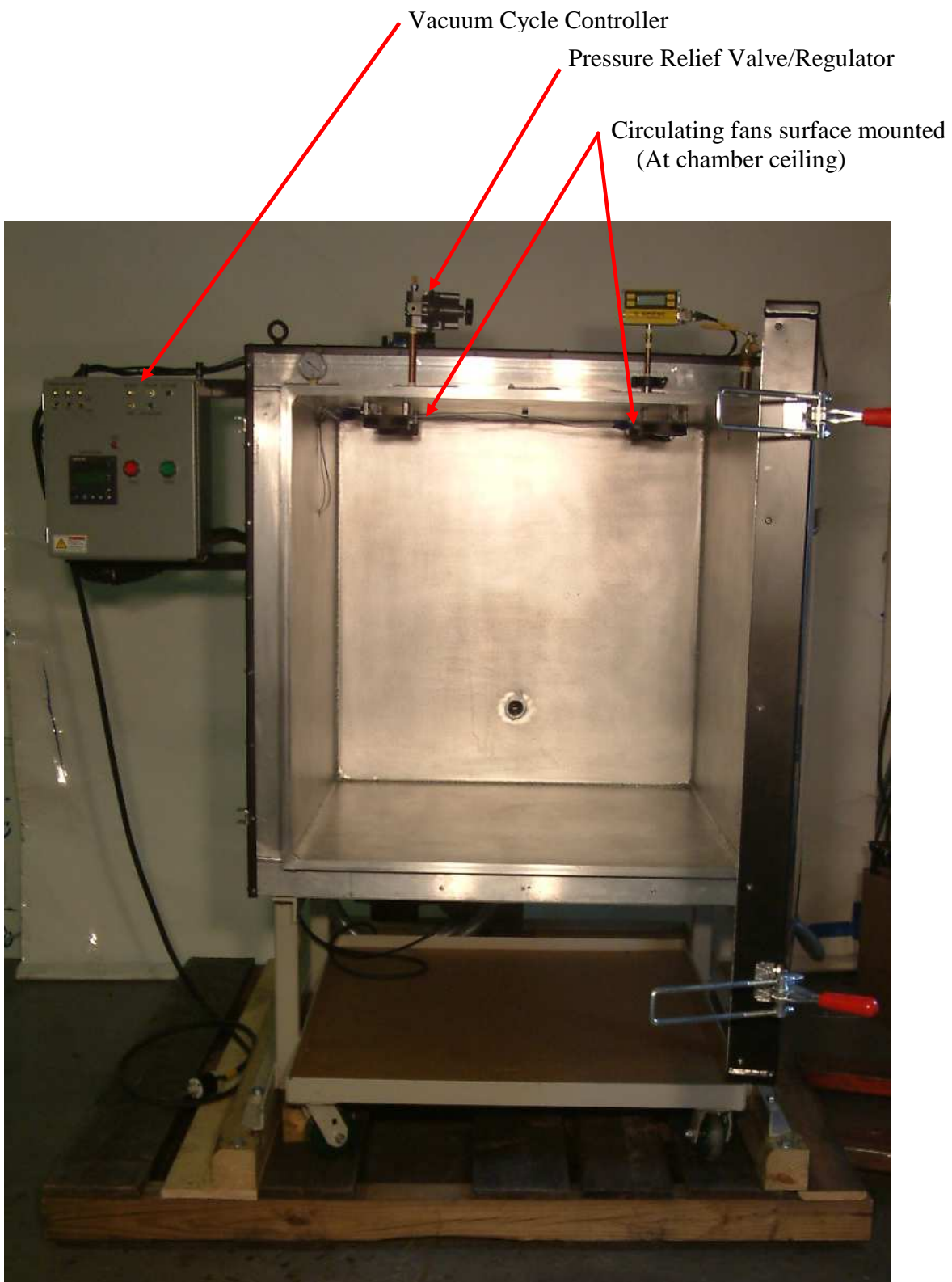
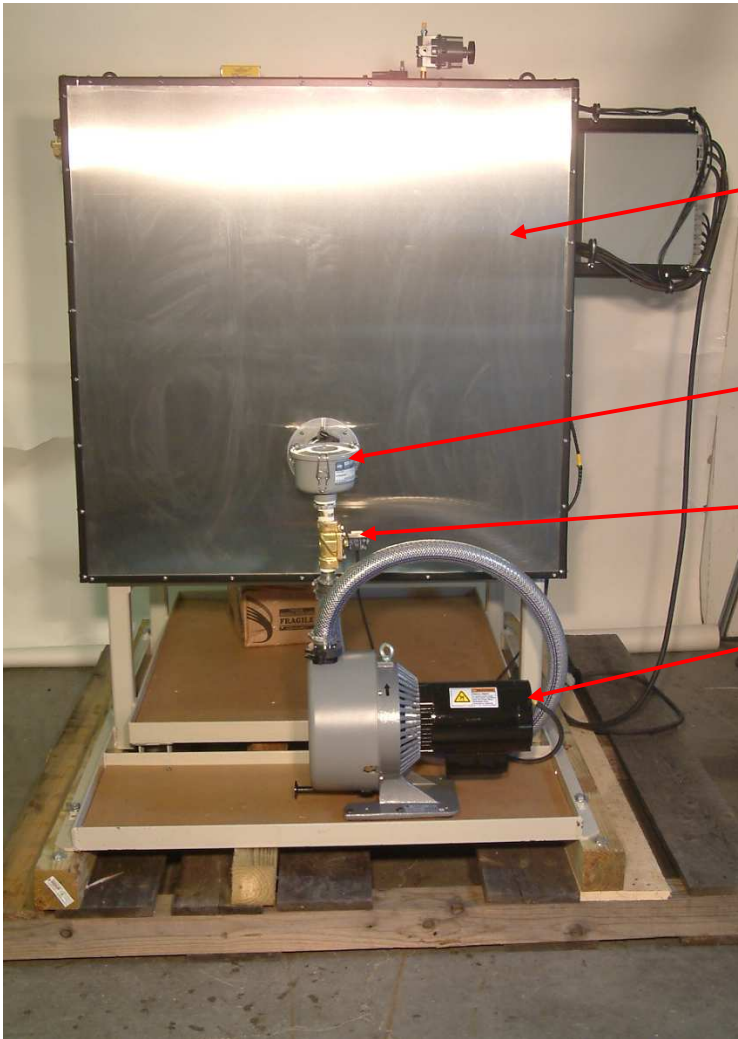


Figure 2 – Front View of Thermal Vacuum Chamber - Open



Chamber Cube with Stainless Steel Sheathing System over Insulated Panel

Inlet Filter

Solenoid Vacuum Valve

Triscroll 600 Vacuum Pump

Figure 3 – Rear View of Vacuum System



Figure 4 – Detail View of Vacuum Pump



Figure 5 – View of Gauge Controller and Manual Vent

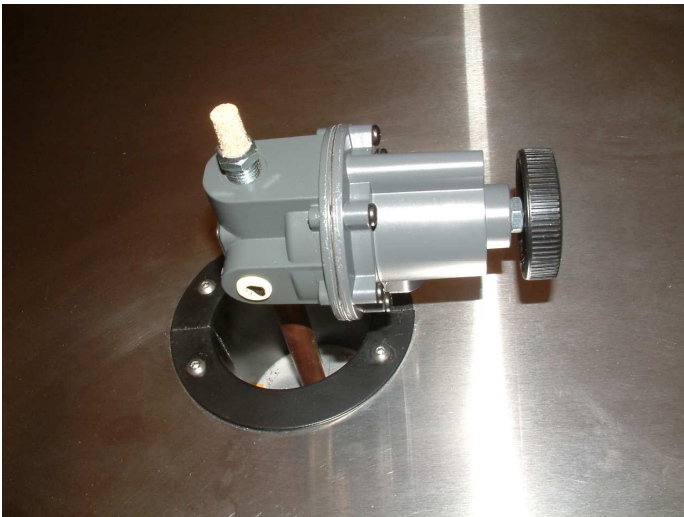


Figure 6 – View of Pressure Relief Vent/Valve



Figure 7 – View of Solenoids (Purge Gas Port and Vent)

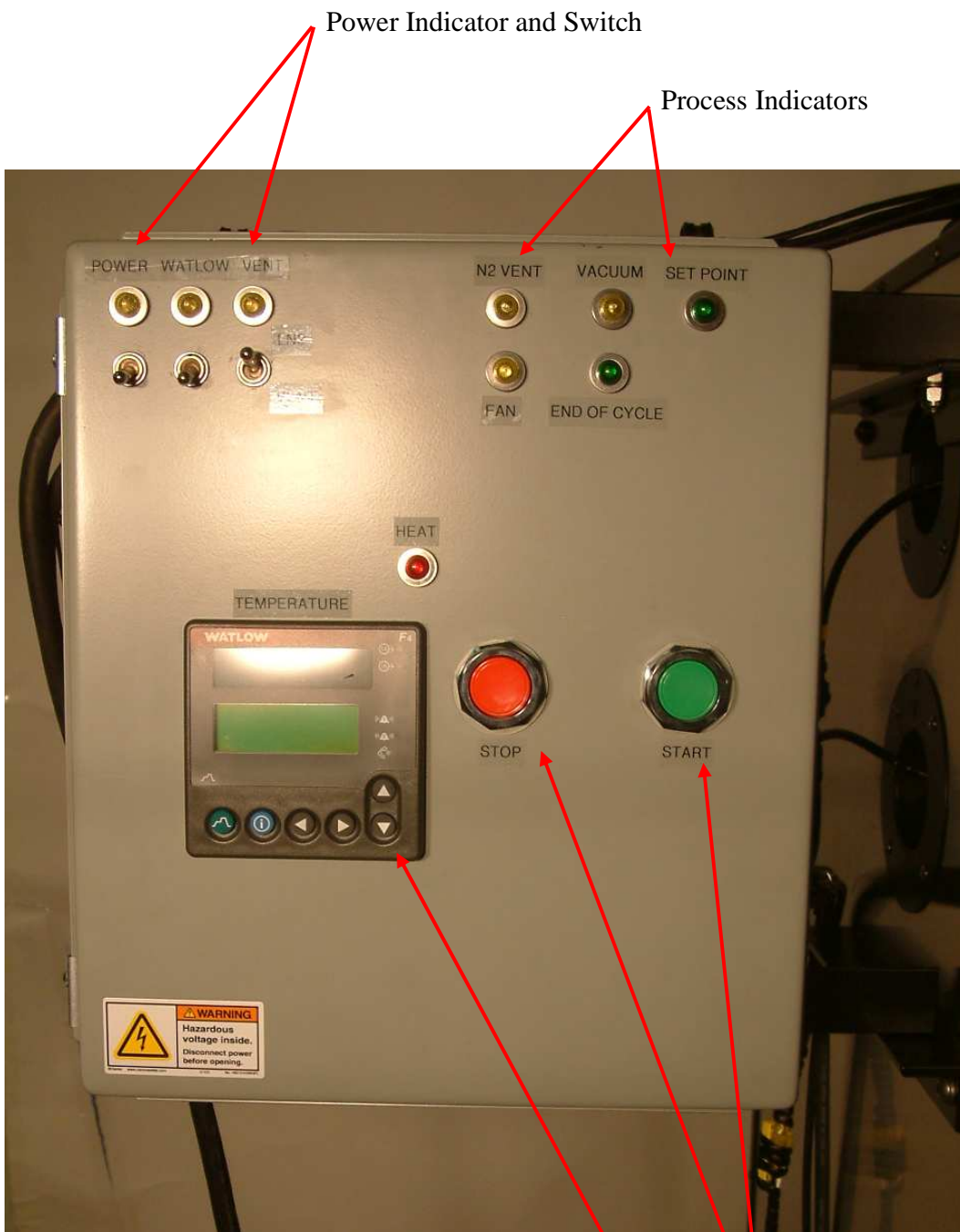


Figure 8 – Thermal Vacuum Cycle Control Detail

Start and Stop Button Controls

Temperature Controller

Vacuum Cycle Controller - Sequence of Operation

1. The operator can load the open chamber at atmospheric pressure and ambient temperature.
2. Secure the chamber with the latches. Close and check all manual vent valves.
3. Pressure and process timer parameters are pre-set and tested before shipment. Temperature settings and profile to be determined by operator (Refer to component product literature for instruction on adjustments).
4. On the Vacuum Cycle Controller (grey panel) switch on the POWER.
 - The power light indicator will turn on. (YELLOW)
 - Temperature Controller (Watlow F4-SH) has its own power toggle and switches on at any time (see note below about thermal profile/process).
 - Pressure Controller (Instrutech-‘SuperBee’) will turn on.
 - The operator may enter temperature set points using the Up and Down arrow on the Temperature Controller.
(Note: Do not run thermal process while in active vacuum pump down)
 - The operator may adjust timer duration on the IDEC-RTE Timer
(located at VCC Enclosure interior).
5. On the Vacuum Cycle Controller (grey panel) press the START button (Green).
 - The pump will begin to pump down the chamber.
 - Vacuum valve will open and Vacuum light indicator will be lit.
 - Once pressure set point is reached, IDEC-RTE Timer will start timing for the pre-set duration/cycles/N2 gas purge sequences.
 - Thermal Process is operator controlled through the Watlow F-4 SH for temperature profile within the N2 Purge Sequences and should not be configured for active thermal process during pump down. Once the duration/cycles are completed and elements have returned to safe handling temperatures the chamber can be opened for access.

(Note: Power is active to the vacuum valve (whether open or closed) at pump down and as vacuum level is sustained to maintain vacuum integrity and avoid backstreaming through the pump system.)

Note: There is a switch that allows the operator to vent lab atmosphere instead of N2 to the chamber. This must be switched manually. If the toggle switch is set for N2 then the system will perform the process as described above. With the toggle not set for either option the system will pump down to set point, time and once timer is up the chamber will remain under vacuum until either N2 or lab atmosphere air vent is selected.

6. At any time, to stop the system operation press the STOP button (Red) on the Vacuum Cycle Controller (grey panel). The pump will shut down and manual vent valves can be utilized.

NOTE: Opening to the chamber to lab/atmosphere conditions with thermal elements at extreme temperature can cause injury, damage to system components and introduce debris and contaminants to the chamber environment.

Once the chamber pressure and temperature have reached levels equivalent with ambient conditions it is safe to open and access the chamber.

Maintenance and Cleaning

Cleaning the Stainless Steel Components - The Stainless Steel components may be cleaned with a cleaner approved for use with Stainless Steel. Non-abrasive cleaners are recommended to preserve the surface finish. Non-abrasive scouring pads are recommended. Scrapers and non-metallic scouring pads may be used on heavily soiled areas. If scrapers are used caution must be used to not damage the chamber surface. Rinse all areas with water using a sponge or towel. Dry thoroughly.

NOTE: DO NOT RINSE ELECTRICAL EQUIPMENT UNDER RUNNING WATER!!!

Recommended Cleaning Agents (Cannot contain oil)

Sheila Shine – Stainless Steel cleaner and polish	non-abrasive
Simple Green – All purpose cleaner	non-abrasive
Orange Clean – All purpose cleaner	non-abrasive

Decontamination – No hazardous materials are used in this equipment. In the event of a hazardous material spill by the user or outside source, immediately contact your laboratory safety officer or the manufacturer of the material for instructions on clean up or other decontamination procedures. Reference your Material Safety Data Sheets (MSDS) for instructions on proper clean-up and handling procedures.

Calibration

Calibration of all components is subject to user's internal calibration standards.

Service and Returns

In the event a product purchased from Abbess Instruments needs service or must be returned please follow the outlined procedures below

Contact Abbess Instruments Technical Support Department

Before returning any product to Abbess Instruments for any reason, please contact Abbess Instruments at 508-881-8811. Support is available Monday through Friday from 8:30 AM to 5:00 PM EST. Support is available free of charge to customers of Abbess Instruments in good standing for all products sold by Abbess Instrument.

Pack the Product for Return Shipment

The product should be packaged in its original shipping carton or crate if available. If other packaging is required, use a suitable shipping container, which will allow a minimum of 2 inches clearance between the product and the walls of the shipping carton or crate. Peanuts, semi rigid foam, cardboard, and other items may be used inside for packaging. Care should be taken when packaging heavy items. Some packaging, such as peanuts, will allow the item to shift in transit and may result in damage.

Insurance

Most common carriers offer insurance. UPS and Federal Express automatically insure your product up to \$100 without charge. It is highly recommended that you insure your product. Abbess Instruments is not liable for any return shipping damages.

Documentation

When returning items to Abbess Instruments, a packing slip or other document must be included with the following information: Contact person's name and phone number, return address, and statement of the problem.

How Will Your Return be Handled?

Abbess Instruments will evaluate the returned item for damage. If the return is a repair, the product will be examined for problems and a repair estimate will be made. The contact person will be contacted, at which time a Purchase Order will be requested. After the PO is issued, the product will be repaired and return shipped. The repair will be done in an expeditious manner. The contact person will be notified immediately in the event any shipping damage has occurred.

Shipping – Claims for Damage or Shortage

Abbess Instruments makes a sincere effort to ensure your purchase is properly packed and all items listed on the packing slip are in fact enclosed with the shipment. In the event that your purchase is damaged or if any items are missing, please follow the procedures below.

All packaging material must be retained until the issue is resolved.

Thoroughly search all packing material for missing items. Review your packing list for back ordered items and the manual for a list of items affiliated with your purchase.

Contact Abbess Instruments immediately at 508-881-8811.

Carrier is responsible for breakage in transit! Goods shipped by Abbess Instruments were delivered to the carrier in good condition. They were packed with great care using standard approved packaging methods.

If you receive damaged goods, please follow these steps so that we can ensure proper credit to you:

Contact the carrier damage inspection. Hold original carton and merchandise for the inspector.

Please notify Abbess Instruments immediately—(508) 881-8811. **DO NOT** return damaged goods to Abbess Instruments without authorization. **DO NOT** return goods that have not been inspected by the carrier.

We are willing to assist you in every possible manner, but please be aware that if you fail to follow the above procedure, the freight carrier or Abbess Instruments may not honor your claim

STANDARD WARRANTY

ABBESS INSTRUMENTS PRODUCT (THE UNIT) WAS CAREFULLY TESTED AND INSPECTED BEFORE LEAVING THE FACTORY.

WE WARRANT THIS PRODUCT TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR 12 MONTHS FROM THE DATE OF RECEIPT, WITH THE FOLLOWING EXCEPTIONS:

ABBESS ACRYLIC LIDS AND ACRYLIC VACUUM CHAMBERS ARE DESIGNED TO BE ROBUST, HOWEVER DUE TO THE NATURE OF ACRYLIC, ARE NOT MEANT TO WITHSTAND BEING DROPPED, HAVING A POINT LOAD PLACED ON THEM OR WITHSTANDING SHARP BLOWS. THEY ARE ALSO PRONE TO BECOMING SCRATCHED AND ABRADED, ESPECIALLY WHEN CAUSTIC SAMPLES ARE PLACED INSIDE OF THE CHAMBER OR WHEN SOLVENTS CONTAINING CAUSTICS OR ABRASIVES ARE USED TO CLEAN THE ACRYLIC COMPONENTS OF THE CHAMBER. FOR THESE REASONS ABBESS WILL ONLY WARRANT THESE ACRYLIC PARTS FROM DEFECTS IN THE WORKMANSHIP AND THE MATERIAL THEMSELVES, BUT NOT FOR ANY EFFECTS OF MISHANDLING OR OTHERWISE NORMAL USE THAT CAN BE DETRIMENTAL TO ACRYLIC.

ALL REFRIGERATION/COOLING UNITS ARE WARRANTED FOR NINETY (90) DAYS.

THE COMPONENTS OF ABBESS VACUUM CHAMBER SYSTEMS ARE, BY THEIR NATURE, DELICATE. ABBESS INSTRUMENTS STRONGLY RECOMMENDS THAT ALL SYSTEMS CONTAINING ELECTRONICS BE SHIPPED BY AIR. ABBESS CANNOT BE RESPONSIBLE FOR COMPONENTS BECOMING LOOSE OR DAMAGED DURING TRANSIT. WE HAVE FOUND THROUGH OUR EXPERIENCES THAT REGARDLESS OF HOW WELL ELECTRONICS ARE PACKED FOR SHIPPING THEY ARE PRONE TO DAMAGE. FOR THAT REASON WE WILL ONLY SHIP SYSTEMS CONTAINING VACUUM COMPONENTS AND ELECTRONICS VIA AIR UNLESS SPECIFIED OTHERWISE BY THE CUSTOMER. IF A CUSTOMER CHOOSES TO SHIP ANOTHER MODE OF TRAVEL THE CUSTOMER MUST TAKE FULL RESPONSIBILITY, IN WRITING, FOR ANY DAMAGE INCURRED IN SHIPPING.

WARRANTIES WILL BECOME VOID IF VACUUM CHAMBERS ARE KEPT IN AN ENVIRONMENT THAT CAUSES CONTAMINATION TO THE CHAMBER AND ANY OPERATING DIFFICULTIES CAUSED BY DIRT OR CONTAMINATION WILL NOT BE COVERED BY WARRANTY.

IN THE EVENT OF DEFECT IN MATERIALS OR WORKMANSHIP, WE WILL EITHER REPAIR OR REPLACE, AT OUR OPTION, ANY PART WHICH IN OUR JUDGMENT SHOWS EVIDENCE OF SUCH DEFECT.

THIS WARRANTY DOES NOT COVER WEAR OR EXPENDABLE ITEMS SUCH AS GASKETS/O-RINGS/GASKETS OR OIL. THIS WARRANTY DOES NOT APPLY IF, IN OUR OPINION, THE UNIT HAS BEEN MISUSED, ABUSED, ALTERED, TAMPERED WITH, OR USED IN LIFE-CYCLE TESTING. ABBESS WILL ONLY BE RESPONSIBLE UP TO THE COST OF THE UNIT. THIS WARRANTY DOES NOT COVER ANY CONSEQUENTIAL DAMAGES. AT THE END OF THE WARRANTY PERIOD, ABBESS SHALL BE UNDER NO FURTHER WARRANTY OBLIGATION EXPRESSED OR IMPLIED.

FOR THIS WARRANTY TO BE VALID A COPY OF THE PACKING LIST MUST BE SIGNED, DATED AND RETURNED TO ABBESS WITHIN 2 DAYS OF RECEIPT OF THE UNIT.

FOR SERVICE PLEASE REQUEST A RETURN MATERIAL AUTHORIZATION (RMA) NUMBER FROM ABBESS BY CALLING 1-508-881-8811 AFTER AN RMA HAS BEEN ASSIGNED, SHIP THE UNIT, FREIGHT PREPAID, IN THE ORIGINAL CRATING, PREPAID.

THERE WILL BE A CHARGE FOR ALL REPAIRS MADE THAT ARE NOT, UNDER ABBESS JUDGMENT, MADE AS WARRANTY REPAIRS.

CONTACTING ABBESS INSTRUMENTS

Shipping Address:

Abbess Instruments and Systems, Inc.
70 Bartzak Dr.
Holliston, MA 01746
USA

Mailing Address:

Abbess Instruments and Systems, Inc.
PO Box 498
Ashland, MA 01721
USA

Phone: 508-881-8811

Fax: 508-881-4884

Email: abbess@abbess.com

Appendix A ~ Setting InstruTech SuperBee Target Vacuum Pressure

The two set point relays in the InstruTech CVM-201 Controllers are used to determine the points at which the controller starts the soak timer and closes the vacuum inlet valve. The following table describes these set points and their initial values:

Initial Factory Settings:

<u>Set Point</u>	<u>Function</u>	<u>Initial Value</u>
SP1 ON	Trigger dry soak timer to start	300 Torr
SP1 OFF	Atmosphere, trigger basket to raise	350 Torr
SP2 ON	Closes Vacuum Inlet Valve	300 Torr
SP2 OFF	Opens Vacuum Inlet Valve	350 Torr

Note: Refer to instructions as follow and InstruTech Vacuum Gauge Controller User's Manual for detailed instructions on operating the controller.



InstruTech CVM-201 Vacuum Pressure Gauge

Setup and Operation

User Interface Basics:

The menus within the CVM-201 user interface have been designed for easy operation and a natural progression of setup parameters. The following sections give a brief explanation of the features for added clarity. The four buttons to the left and right of the display are the programming buttons. During programming of the CVM-201, the display will identify what function each button represents. To begin programming, press any of the four Programming Buttons. After setting the various parameters, press the SAVE/EXIT key to save the new setting and return to the main screen. To continue setting additional parameters, scroll forward with the MORE key until you reach the desired parameter.

Menu Item Explanations:

SET UNITS

This should be the first parameter that is set. This will be the units (Torr, mBar, or Pascal) that are used for all other settings. If the setpoints have already been set, changing units is not recommended because the setpoints will return to their default setting. [Factory default = Torr.]

SET ATM (i.e. room atmosphere, will vary with local altitude and weather conditions)

Setting the Span Point (Atmosphere Adjust):

1. Go to the “Set ATM” screen. With the chamber open, adjust the pressure on the screen to the known value using the INCRease and DECRease keys on the left side of screen. Press the SAVE/EXIT key to save the new atmosphere value. Typical ATM at sea level = 760 Torr.

SET SP1 ON and SET SP2 ON:

These setpoints correspond to the turn on points for each relay. The relays will turn on when the pressure drops below this setting.

SET SP1 OFF and SET SP2 OFF:

These setpoints correspond to the turn off points for each relay. The relays will turn off when the pressure rises above this setting.