Allwin21 Corporation

AccuThermo®
AW410 / AW610
Rapid Thermal Process System

Installation Manual

Allwin21 Corporation
220 Cochrane Circle, Morgan Hill CA 95037
www.allwin21.com

ALLWIN21
ACCUTHERMO®
AW410 / AW610

RAPID THERMAL PROCESS SYSTEM

INSTALLATION MANUAL

Allwin21 Corporation
220 Cochrane Circle
Morgan Hill, CA 95037

Document #: AW-900-708 Rev. G
Written by: Rick Forney
November, 2011

SERVICE INFORMATION

Customer technical support is available from Allwin21 Corporation to provide information not included in this manual. The Customer Support Department is open Monday through Friday, 9:00 a.m. to 6:00 p.m., Pacific Time.

Field service support and parts are available from Allwin21 Corporation. The office is open Monday through Friday, 9:00 a.m. to 6:00 p.m., Pacific Time.

Allwin21 Corporation

Customer Service
Phone: 408-778-7788
Fax: 408-904-7168
Email: info@allwin21.com

Document Disclaimer
Swagelok is a trademark of Crawford Fitting Company.
VCR is a trademark of Cajon Company.
Pentium® is a registered trademark of the Intel Corporation.
AccuThermo® is a registered trademark of Allwin21 Corporation.

Allwin21 Corporation makes no representations or warranties with respect to this Manual, except as outlined in the product warranty. Further, Allwin21 reserves the right to make changes in the specifications of the product described within this Manual at any time without notice and without obligation to Allwin21 Corporation.

Statement of Confidentiality
The information contained herein is confidential to and the property of Allwin21 Corporation. It may not be reproduced nor disclosed in whole or in part by any method without the prior written permission of Allwin21 Corporation. All software is copyrighted and the property of Allwin21 Corporation.

Copyright 2006 – 2011 by Allwin21 Corporation. All rights reserved.

WARRANTY

Allwin21 Corporation warranty labor, if necessary, will be provided during normal business hours of 9:00 AM to 6:00 PM, Monday through Friday, except certain holidays.

To receive field service or parts replacement during a system warranty period, the customer shall promptly provide to Allwin21 Corporation details of any product or component thought to be defective and request a Return Material Authorization (RMA). Within fourteen (14) days after receipt of the RMA number from Allwin21 Corporation, the customer shall return the defective product or component to Allwin21 Corporation freight paid. As soon as is practicable after issue of the RMA, Allwin21 Corporation shall repair/replace and return any product/component found to be defective.

Repaired/replaced and returned products and components will be warranted as above for the duration of the warranty period of the defective product, and shall be comprised of new or re-worked components. Returned product not subject to warranty shall be disposed of at customer's cost and subject to customer's instructions.

Items not covered under the warranty include, but are not limited to:

- Quartzware
- Consumable parts
- O-rings and gaskets
- Fuses
- Thermocouples
- Susceptor
- Mass Flow Meter

Allwin21 Corporation products are normally intended to be used in a semiconductor processing environment in accordance with the functional, environmental, and operational standards published by Allwin21 Corporation or generally accepted in the industry. Allwin21 Corporation shall have no warranty obligation with respect to any product which has been modified or altered, or with respect to data contained in any product returned to Allwin21 Corporation by the customer without written approval.

Allwin21 Corporation liability to the customer or anyone claiming through or on behalf of the customer with respect to any claim or loss arising out of the purchase and/or sale of any Allwin21 Corporation product shall be limited to the original purchase price amount of the product. In no event shall Allwin21 Corporation be liable for consequential damages, losses, or reprocurement costs arising out of the purchase and/or sale of any Allwin21 Corporation product, and an action to recover the purchase or to compel such replacement or adjustment shall be customer's sole remedy under the Uniform Commercial Code or otherwise.

All claims must be reported to Allwin21 Corporation before the end of the warranty period. Allwin21 Corporation may not honor claims for repair or replacement if reported after the warranty has expired.

Allwin21 Corporation has no means of determining whether repair or replacement was covered by terms of this warranty. All claims must be reported promptly. The burden of proof will be the responsibility of the customer or its agent, and all associated costs will be borne by the same.

In order to honor a warranty for any Allwin21 system, the customer is required to perform the recommended preventive maintenance (PM) on the system. Allwin21 Corporation will perform PM training during system start-up. PM contracts are available from Allwin21 Corporation at an additional charge.

Buyer will be granted a personal, non-transferable, non-exclusive perpetual license to use only the number of copies of the software that are provided by the Seller and only on the equipment on which it was originally installed, loaded, or mounted by the Seller. Without Seller's consent, Buyer may not copy the software for any purpose. Buyer may not remove the software or attempt to execute the software on any other equipment than the equipment on which the software was originally loaded, installed, or mounted.

Buyer shall not, whether through the use of disassemblers or any other means, attempt to reverse engineer, decompile, disassemble, or derive any source code from the software. Buyer shall not permit any third party to do so. Buyer shall not cause the software to be destroyed, disabled, or modified in its operation. Any attempt to do any of the things defined in this paragraph shall be a material breach of this Agreement and shall immediately entitle Seller to exercise any remedy herein or available at law or in equity.

THE FOREGOING IS THE SOLE WARRANTY OFFERED BY ALLWIN21 CORPORATION WITH RESPECT TO ITS PRODUCTS AND COMPONENTS. ALLWIN21 CORPORATION MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED AND EXCLUDED BY ALLWIN21 CORPORATION.

PREFACE

INTENDED AUDIENCE

This manual has been written for technicians and process development engineers working with the AccuThermo® AW410 or the AccuThermo® AW610 Rapid Thermal Processing (RTP) System. It provides an overview of the system operation and maintenance procedures, as well as a troubleshooting guide. Please read this manual carefully before operating the AccuThermo® RTP System.

DOCUMENT CONVENTIONS

FONT CONVENTIONS

The following font conventions are used in this manual.

Bold

Software screen selections are represented in **bold** type.

Italic

Screen names are shown in *italic* type.

First Letter Capitalized

Operating modes are shown in normal type with the first letter capitalized.

For example:

"Select **Recipe** from the *Main Menu* screen to enter the Recipe Programming mode."

TABLE OF CONTENTS

Table of Contents

LIST OF FIGURES

1. INTRODUCTION

1.1 SYSTEM DESCRIPTION

The AccuThermo AW410 and the AccuThermo AW610 are rapid thermal processing (RTP) systems, which uses high intensity visible radiation to heat single wafers for short process periods of time at precisely controlled temperatures. The process periods are typically 1-600 seconds in duration, although periods of up to 9999 seconds can be selected.

🏷 NOTE

Process periods longer than 600 seconds in duration are normally used only for maintenance testing purposes at low lamp intensity settings.

These capabilities, combined with the heating chamber's cold-wall design and superior heating uniformity, provide significant advantages over conventional furnace processing.

The AccuThermo RTP system, figures 1-1 and 1-2, consists of an oven unit and a controller computer running the Allwin21 RTAPRO controller software. The wafer to be processed is placed on a quartz tray that slides into a quartz isolation tube in the oven unit. Two banks of lamps, one above the quartz tube and one below it, provide the source of energy for heating the wafer. The lamps can be controlled manually and automatically from the controller computer.

The RTAPRO control software allows full control and diagnostics of the AccuThermo RTP system. In addition, it allows the creation of recipes for automated control of the temperature and, optionally, process gas flow.

The control software uses a set of operating instructions known as recipes to automatically control the AccuThermo RTP system. These recipes are created by the Process Engineer to monitor and control the parameters of the processing cycle. The Operator then uses the software to select and run the process parameters (steady state temperature, process time, ramp rates, etc.).

The RTAPRO software is also used to create, delete, copy, modify and store the recipes and to execute system diagnostics.

AccuThermo AW410 / AW610 Systems

Figure 1-1: *Single gas system*

Figure 1-2: *Multiple gas system with attached gas box*

1.2 FEATURES

KEY FEATURES

- Closed-loop temperature control with pyrometer or thermocouple temperature sensing.
- Precise time-temperature profiles tailored to suit specific process requirements.
- Fast heating and cooling rates unobtainable with conventional technologies.
- Consistent wafer-to-wafer process cycle repeatability.
- Elimination of external contamination.
- Small footprint and energy efficiency.
- The watchdog timer shuts down the lamps to prevent run-away heating of the wafer.

APPLICATIONS

The AccuThermo RTP system is a versatile tool that is useful for many applications:

- Ion Implant Activation
- Polysilicon Annealing
- Oxide Reflow
- Silicide Formation
- Contact Alloying
- Oxidation and Nitridation
- GaAs Processing

HEATING, COOLING, AND TEMPERATURE MEASUREMENT

The following list contains the key features of the AccuThermo RTP system heating, cooling and temperature measurement systems:

- High-intensity visible radiation heats wafers for short periods of 1 to 9999 seconds at precisely controlled temperatures in the 400°C to 1200°C range. (1 to 600 second heating periods are used typically.)
- Tungsten halogen lamps and cold heating chamber walls respectively allow fast wafer heating and cooling rates.
- The system delivers time and temperature profiles tailored to suit specific process requirements.
- Pyrometer or thermocouple sensing offers precise closed-loop temperature control.
- Cooling N2 flows around the lamps and quartz isolation tube

- MFC controlled gases (up to four) flow through the heating chamber for purge and/or process purposes.

1.3 SYSTEM PROCESS SPECIFICATIONS

Following are the specifications for the AccuThermo Rapid Thermal Processor (RTP) system.

- **Wafer handling:** Manual loading of wafer into the oven, single wafer processing.
- **Wafer sizes:** 2", 3", 4", 5" and 6" wafers.
- **Ramp up rate:** Programmable, 10°C to 200°C per second.
- **Recommended steady state duration:** 0-300 seconds per step.
- **Ramp down rate:** Programmable, 10°C to 250°C per second. Ramp down rate is temperature-and-radiation-dependent and the maximum is 125°C per second.
- **Recommended steady state temperature range:** 150°C - 1150°C
- **ERP temperature accuracy:** ±1°C, when calibrated against an instrumented thermocouple wafer (ITC).
- **Thermocouple temperature accuracy:** ±0.5°C
- **Temperature repeatability:** ±0.5°C or better at 1150°C wafer-to-wafer. (Repetition specifications are based on a 100-wafer set.)
- **Temperature uniformity:** ±5°C across a 6" (150 mm) wafer at 1150°C. (This is a one sigma deviation 100 angstrom oxide.) For a titanium silicide process, no more than 4% increase in non-uniformity during the first anneal at 650°C to 700°C.
- **Process/Purge gas inputs:** Any inert and/or non-toxic gas regulated to 30 PSIG and pre-filtered to 1 micron. Typically, Nitrogen (N2), oxygen (O2), argon (Ar), and/or helium (He) are used.

2. SAFETY PRECAUTIONS

2.1 OVERVIEW

This section provides information intended to prevent damage to the AccuThermo RTP system and injury to operation and maintenance personnel. All hazards are not covered, only those most prevalent and serious. Your full understanding of the capabilities and limitations of this equipment is necessary for safe and efficient operation.

☠ WARNING

Only ALLWIN21 or qualified personnel should install, start up, operate and/or repair the AccuThermo RTP system. Damage to the system or injury to personnel could result if the preceding actions are carried out by unqualified personnel.

Prior to applying power or starting up the AccuThermo RTP system, follow these safety precautions:

- Check all utilities for proper connections. Connect only those gases specified for use in the system.
- Make sure the cabinet cover is on.
- Check the scrubber exhaust to make sure it is properly connected to the facility scrubber. Ensure the facility scrubber is operating properly. Check the purge outlet for any restrictions.

2.2 NOTES, CAUTIONS AND WARNINGS

When operating and maintaining the AccuThermo RTP system, the following safety procedures and precautions must be followed to avoid certain hazards. Observe all warnings and cautions. Their purpose is to protect personnel from injury and long term health hazards and to protect the machine from damage.

Pay special attention to notes, cautions and warnings located in appropriate areas in this manual.

NOTE

Notes provide additional important information which requires special attention.

CAUTION

Cautions alert you to avoid system damage.

WARNING

Warnings are given for personnel safety to prevent bodily harm.

2.3 SAFETY FEATURES

- There is a watchdog timer on the AccuThermo RTP system control board that will shut off the lamps if the software or computer freezes.
- Chamber Door Interlock Switch: This interlock detects if the chamber door is closed. If the chamber door is not closed, then the heating source will not come on. This cannot be bypassed. The process gases will be turned off if the chamber door is open. This is hardware and software controlled. The hardware will close the pneumatic shutoff valves and set the MFC setpoint control to 0 volts (close). The software will logically reset the gas flow to 0 slpm and close the gas pneumatic valves.
- Cabinet Cover Interlock Switch: This interlock detects if the cabinet cover has been removed. If the cabinet cover has been removed, then the heating source is turned off by disengaging the power contactor. This can be bypassed by a maintenance person by pulling up on the switch into the maintenance position. As soon as the cabinet cover is replaced, the cabinet cover interlock switch is automatically reset to detect the removal of the cabinet cover. If the cabinet cover is removed, the process gases will be turned off.
- EMO (Emergency Off): When the EMO is depressed, the power to the entire machine is turned off.
- Overheat Thermal Switch: If the oven overheats (>150°F), there is a thermal switch that opens and the heating source is turned off by disengaging the power contactor. Once the chamber has cooled below 135°F, the thermal switch can be reset by pressing on the thermal switch reset button.
- Water Flow Switch: The water needs to flow at the recommended rate that is specified in the Installation chapter of this manual. If the flow rate drops below this, the heating source is turned off by disabling the lamp control circuit. However, if the oven plates are below 95°F (35°C), the water may not need to flow. This is to prevent condensation on the oven in an un-air-conditioned facility. If the oven plates are less than 50°F (10°C), the water valve is closed, preventing the oven from being cooled more. If this happens, the chiller control temperature has been set too low.
- Electrical: The main circuit breaker on the rear panel of the chassis removes all electrical power from the machine. There are no storage devices (e.g. capacitors) within the machine.
- Pneumatic: The pneumatics is used to operate the Positive Shut-off valves. If there is no air pressure, these valves will close. If the power is removed from the AccuThermo RTP system, then the pneumatic gas valves close automatically.

2.4 UTILITIES INSPECTION

Inspect the system utility connections and sources before switching on the AccuThermo® system.

Visually inspect the following utilities to make sure connections are secure:

- Electrical power.
- Gas-handling inlets.
- Cooling water inlet and outlet for chamber cooling
- Nitrogen or Clean Dry Air (CDA) inlet for system pneumatics
- Pump outlet
- Scrubber connection
- Scrubber Exhaust
- Cooling Exhaust

CAUTION

Make sure the purge outlet is not restricted. If this outlet is restricted, the increased pressure inside the quartz chamber will cause it to break.

Check for possible water leaks at the cooling water inlet and water outlet connections.

If any of the utilities are disconnected or any connections appear to be leaking, correct the problem. Make sure the house scrubber is operating if processing with hazardous gases or processing wafer which outgas.

NOTE

Before applying power to the system, the PC-controller computer must be connected; the purge gas and cooling water must be turned on.

2.5 SYSTEM OPERATION

During system operation, be aware of the following:

- Experimental substrates contain unknown impurities which may outgas during processing.

☠ WARNING

Allwin21 cannot anticipate the number and variety of materials a user may experiment with, and is not responsible for any potential hazards which may result from wafer outgassing.

2.6 MAINTENANCE

During the maintenance operation, observe the following precautions:

- Do not use replacement parts not provided or recommended by Allwin21.

☠ WARNING

Allwin21 is not liable for any damage or injury which may occur when unauthorized parts are used.

- Disconnect power to the system before performing any maintenance activity requiring the removal of access covers.
- Whenever the quartz isolation tube is changed, perform a gas leak test on the process chamber. Replace the O-rings on the isolation tube.

2.7 GAS HANDLING

Be aware of the following cautions when working with gases in the AccuThermo RTP system:

- Only use gases that have been specified for use in the AccuThermo RTP system. Typically these include nitrogen (N_2), argon (Ar), Forming Gas, oxygen (O_2) and helium (He).

CAUTION

Allwin21 Corp. is not liable for the use of gases not recommended by the factory.

- Make sure the specified gases are connected to the proper inlets on the rear panel.

WARNING

Failure to properly connect the gas lines may result in dangerous gas mixture that could cause harm to personnel and/or the system.

WARNING

There will be no chemical exposures during normal routine maintenance. However, if the need arises that a gas valve has to be changed, then it is the maintenance person's responsibility to follow all safety procedures for gas exposure.

2.8 HAZARDS

The AccuThermo RTP system presents certain hazards if operated or maintained improperly. These fall into the following categories:

- Electrical shock hazards
- Process gas hazards
- Process byproduct hazards
- Oxygen hazards
- Thermal hazards.

2.8.1 ELECTRICAL SHOCK HAZARDS

The AccuThermo RTP system requires electrical power which is distributed through the machine. Safety interlocks are installed to shut off electrical power to the system when the cover is removed. Only qualified troubleshooting maintenance technicians should be permitted to work on an uncovered AccuThermo RTP system. Allwin21 assumes no liability for injuries or deaths caused by operation with interlocking devices defeated. Caution and safety measures characteristically taken with AC and DC circuitry are imperative.

2.8.2 PROCESS GAS HAZARDS

An AccuThermo RTP system process may use these two complex process gases: 02 or forming gas (5% to 12% H2 in N2 or Ar), depending on user application. 02 is an oxidant and it supports combustion. It must be handled with care. Forming gas is non-toxic and odorless. It is flammable and never should be stored at 125°F or greater. Inhalation of forming gas should be avoided.

Make sure the forming gas mixture is correct.

2.8.3 PROCESS BYPRODUCT HAZARDS

The process byproducts found in the chamber surfaces of the AccuThermo RTP system should be treated as potentially hazardous.

☠ WARNING

Avoid skin, eye, and respiratory contact with process byproducts. Some byproduct chemistries have hazardous characteristics. Failure to avoid skin, eye, and respiratory contact with process byproducts may result in injury or death of personnel.

Due to the variations in chemistry employed to meet application requirements, the exact constituents of effluents from the process family cannot be defined. However, the following general precautions should be observed:

- Solvent-proof neoprene or viton gloves should be worn while maintaining the chamber surfaces and its accessories.

Allwin21 Corp. claims no responsibility for the safety of the byproducts of the AccuThermo Rapid Thermal Processor system.

2.8.4 OXYGEN HAZARDS

In RTP systems, oxygen (O_2) may be utilized as a process gas, either alone or in conjunction with other gases. A possible EXPLOSIVE condition exists.

Oxygen is an oxidizing agent which vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Any time there is heat, and if the concentration of oxygen is greater the 21% of the volume, the condition for an explosion exists. It should be noted this potential condition exists anytime oxygen is connected to the system.

Use appropriate procedures when processing with oxygen.

2.8.5 THERMAL HAZARDS

The quartz tray and quartz isolation tube must be allowed to cool down before they are serviced. Allow 20 to 30 minutes for the system to cool before servicing. Burns may result if the system is touched before it has been allowed to cool sufficiently.

In addition, use of solvents, such as IPA (isopropyl alcohol) or acetone to clean the chamber, may pose a hazard if used while the chamber is still hot.

🏷 NOTE

The control system contains three safety shutoffs. The first is a watchdog timer that turns OFF the heating lamps if the control software has been interrupted for more than approximately 2 seconds.

The second shutoff shuts down the heating lamps and the MFC's if the measured temperature is above 1250°C. These high readings indicate that the thermocouple is broken or disconnected from the Controller board, in which case the interface reads something greater than 1250°C.

The third safety shutoff shuts down the heating lamps if the outer chamber walls exceed 65°C. This would only happen if there was no water flow.

PAGE INTENTIONALLY LEFT BLANK

3. INSTALLATION REQUIREMENTS

3.1 PURCHASER'S RESPONSIBILITY

The purchaser of a new AccuThermo® RTP system is primarily responsible for preparing for the system's installation. This responsibility includes preparing the physical site to accept the sub-systems and providing the prescribed power, gas, vacuum, and exhaust supplies and lines. Electrical connections must be arranged for by the purchaser (user).

3.2 ALLWIN21 SERVICE

3.2.1 FIELD SERVICE INSTALLATION

An optional service Allwin21 provides is the installation of the AccuThermo® RTP system. If it is desirable to have an Allwin21 Field Service Engineer to install the system, contact Allwin21.

The installation is provided after the AccuThermo® RTP system is in place and all of the support utilities have been connected as described in this manual. The Allwin21Field Service Engineer will verify correct installation and system operation.

The following is an overview of the activities the Allwin21 Field Service Engineer will carry out.

1) Conduct a thorough visual inspection of the system.
2) Inspect all utility connections.
3) Verify that supplied utilities meet system requirements
4) Inspect quartzware for damage and contamination, and install quartzware as needed.
5) Power on and exercise the system software to ensure subsystems are responding properly to operator commands.
6) Run system tests and calibration checks.
7) Verify that all interlocks, flow switches are operating correctly.
8) Verify that the gas subsystem is operating properly.

Allwin21Field Service Engineers use a standard checklist and worksheet to ensure that the above activities are carried out and that test results are documented.

3.2.2 TRAINING

Allwin21offers optional training courses for Process and Equipment Engineers. If you wish to be factory trained for in-depth service and maintenance, contact Allwin21.

3.3 INSTALLATION PROCESS OVERVIEW

3.3.1 INSTALLATION PROCEDURES

This manual describes how to install the AllWin21 AccuThermo RTP system and perform an operational check of the system. These activities are outlined in the following sequence of steps.

The following steps are an overview of the activities which should be completed by the customer prior to the arrival of the support engineer, if requested. More details on each of these activities are provided in subsequent sections in this manual.

- ☐ Prepare the site floor space.
- ☐ Prepare the site utility connections.
- ☐ Unpack the AccuThermo RTP oven, computer, pyrometer chiller (optional) and any additional parts.
- ☐ Inspect the system for damage or missing parts.
- ☐ Connect the utilities to the AccuThermo RTP system and chiller.
- ☐ Install and connect the computer to the AccuThermo RTP system.

If it is desired to have an Allwin21 Field Service help in the installation of the AccuThermo® RTP system, then they will do the following steps. Otherwise, the purchaser must do them. Refer to the Service Manual for detailed information on performing the following steps:

- ☐ Inspect and install the quartzware.
- ☐ Power-up the system.
- ☐ Confirm proper operation. Do a confidence check of the system (refer to the ***Service*** Manual).
- ☐ Check for temperature accuracy.
- ☐ For system troubleshooting, refer to the ***Service Manual***.

3.3.2 REQUIRED TOOLS

You need the following tools to install your AccuThermo RTP system:

- Allen wrench set (SAE or non-metric)
- Screwdriver set
- Open-end wrenches (SAE or non-metric)
- Latex gloves
- Test wafers
- K-Type thermocouple that matches the process wafer configuration

3.4 SITE REQUIREMENTS

3.4.1 FACILITY PREPARATION

CAUTION

Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.

NOTE

All facilities required for the operation of the Allwin21 AccuThermo RTP system and its support equipment should be completed before any connections are made to any part of the equipment.

3.4.2 SPACE REQUIREMENTS

Equipment	Deminsions
AccuThermo RTP system	*10.5" H x 18" W x 17" D*
AccuThermo RTP system with attached 4-line Gas Box	*10.5" H x 26" W x 17" D*
AccuThermo RTP system with attached 6-line Gas Box	*10.5" H x 29.75" W x 17" D*
Pyrometer Chiller	*28" H x 10.75" W x 19" D*

The AllWin21 AccuThermo® RTP system should be placed on top of a work bench. Space must be made available on the work surface next to the oven for a mid-size desktop computer (PC), computer LCD monitor, keyboard, and mouse. Note that the PC, used as the user interface and system controller, must be located within 5 feet of the AccuThermo RTP oven.

Space may also be required, on the floor near the oven, for an external pyrometer chiller unit (optional). The AccuThermo RTP system, when configured with the optional Extended Range Pyrometer (ERP), must be equipped with a chiller.

Finally, while chamber-cooling water can be provided to the AccuThermo RTP chamber from the facility supply, AllWin21 recommends use of a chamber heat exchanger. Typically, the heat exchanger is installed near the oven. If this option is selected, sufficient additional space near the AccuThermo RTP oven will also be required.

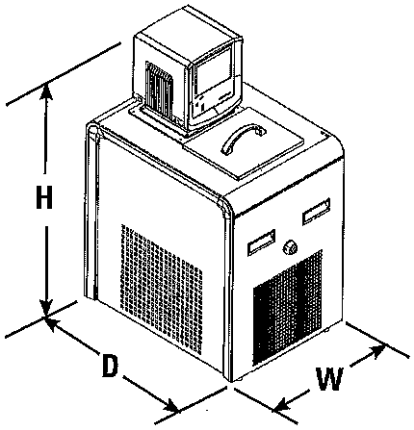

Figure 3-1: *Pyrometer Chiller*

3.5 FACILIITIES

3.5.1 UTILITY CONNECTIONS

The notes in this chapter are designed to help the facility engineer connect the AccuThermo RTP system plumbing and other utilities in a practical and functional manner. This chapter also emphasizes certain practices and requirements that are considered particularly important for system operation and serviceability.

All utilities are connected at the rear utility panel of the system. Refer to figure 3-1, below.

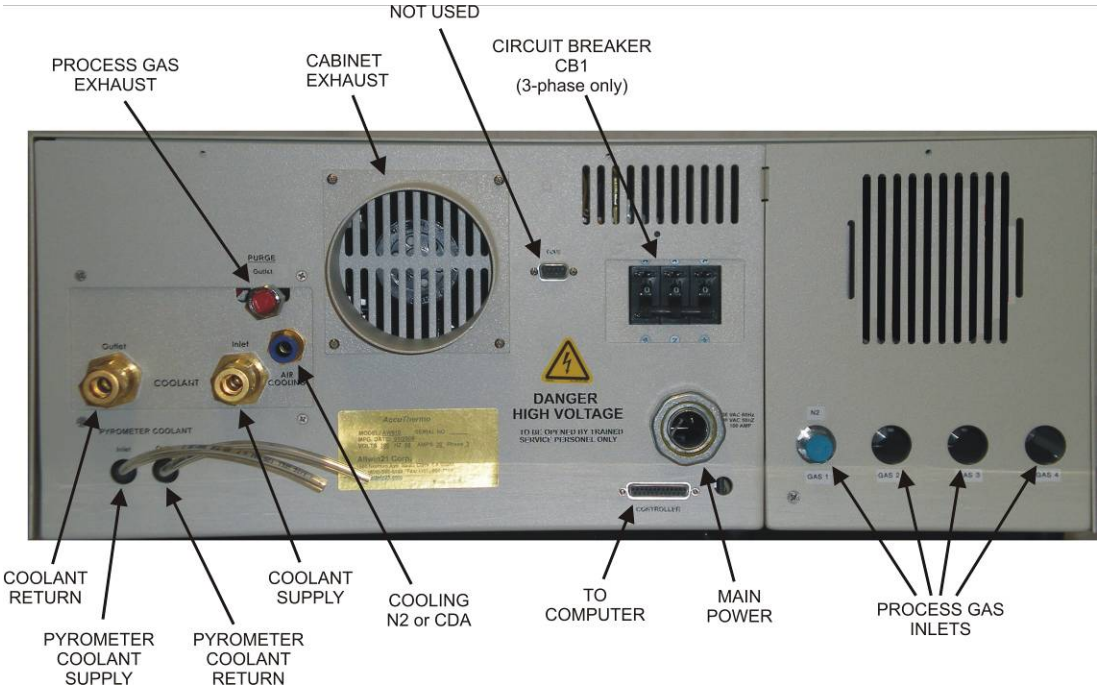

Figure 3-2: *AccuThermo RTP System Rear Utility Panel Connections*

3.5.2 AIR CONDITIONING

The moisture in the ambient air around the AccuThermo RTP should not condense on any part of the system.

Requirements

AIR CONDITION	
Temperature:	20-30°C
Humidity:	Non-condensing

3.5.3 ELECTRICAL

Requirements

Power requirements vary between the United States, Europe and Japan. It also varies if the system is constructed as a single phase or 3-phase unit. Specifications for each are shown in the tables below.

Single Phase Requirements

USA	*voltage:* *208 VAC (240 VAC optional)* *# phases:* *single phase* *# wires:* *2 supply and 1 ground* *current:* *90 Amp maximum power consumption* *frequency:* *60 Hz*
Europe	*voltage:* *220 VAC (240 VAC optional)* *# phases:* *single phase* *# wires:* *2 supply and 1 ground* *current:* *90 Amp maximum power consumption* *frequency:* *50 Hz*
Japan	*voltage:* *200 VAC* *# phases:* *single phase* *# wires:* *2 supply and 1 ground* *current:* *90 Amp maximum power consumption* *frequency:* *50/60 Hz*

3-Phase Requirements

USA	*voltage:* *208 VAC (240 VAC optional)* *# phases:* *3-phase* *# wires:* *3 supply, 1 neutral and 1 ground* *current:* *50 Amp maximum power consumption* *frequency:* *60 Hz*
Europe	*voltage:* *380 VAC (415 VAC optional)* *# phases:* *3-phase* *# wires:* *3 supply, 1 neutral and 1 ground* *current:* *50 Amp maximum power consumption* *frequency:* *50 Hz*
Japan	*voltage:* *200 VAC* *# phases:* *3-phase* *# wires:* *3 supply and 1 ground* *current:* *50 Amp maximum power consumption* *frequency:* *50/60 Hz*

- Separate power distribution box with slow trip circuit breakers are required.
- Locate the separate power disconnect box within easy reach.
- Total AC power line length should not exceed 25 feet
- An isolation transformer is recommended to reduce interference to other equipment. Refer to section titled "***AC Power Connection***".

NOTE

Follow proper electrical codes in selecting the electrical cables and making the electrical connections.

NOTE

3-phase electrical facility supply lines are to be in the 'Y' (star) configuration. Japan is the exception. The supply lines in Japan are known to be in the delta configuration, which will work only for Japanese configured systems.

Accessories Requirements

Specification	Equipment	Voltage	Frequency	Current	Notes
USA	*Chiller*	*110-120*	*60 Hz*	*11 A*	*1*
	Computer	*110-120*	*60 Hz*	*Variable*	*2*
Europe	*Chiller*	*220-240*	*50 Hz*	*5.5 A*	*1*
	Computer	*220-240*	*50 Hz*	*Variable*	*2*
Japan	*Chiller*	*100*	*50/60 Hz*	*11 A*	*1*
	Computer	*100*	*50/60 Hz*	*Variable*	*2*

Note 1: 2 supply wires and 1 ground wire
Note 2: Computer current will be dependent upon the computer manufacturer.

AC Power Connection

The AccuThermo RTP systems are capable of heating single wafers very rapidly. This capability means that the AccuThermo RTP system has very high instantaneous current demands. Therefore, special care must be taken in connecting the AC power from the facility main AC lines to the AccuThermo RTP system.

The main power lines from the facilities AC source must be kept as short as possible to reduce distributed line inductance, preferably with a line length of less than 25 feet. As the AC power distribution lines become longer, there is a higher resistance or distributed inductance in the wire. This distributed line inductance can result in power line disturbances if measured close to the AccuThermo RTP system AC power connections. These disturbances can result in the AccuThermo RTP system and other equipment on the same distribution panel having operational problems.

To reduce the possibility of electrical interference with other equipment, it is recommended that the AccuThermo RTP system be connected to a separate power distribution panel mounted close to the facilities main transformer. No other equipment should be connected to the same distribution panel and facilities isolation transformer as the AccuThermo RTP system. If more than one AccuThermo RTP system is installed in the same location, each AccuThermo RTP system should have its own distribution panel and facilities isolation transformer (refer to Figure 3-2). The system should be connected to a customer-supplied time delay circuit breaker. Flexible armored cable is recommended to allow the system to be moved for easy maintenance access. Follow local electrical codes in making the electrical connections.

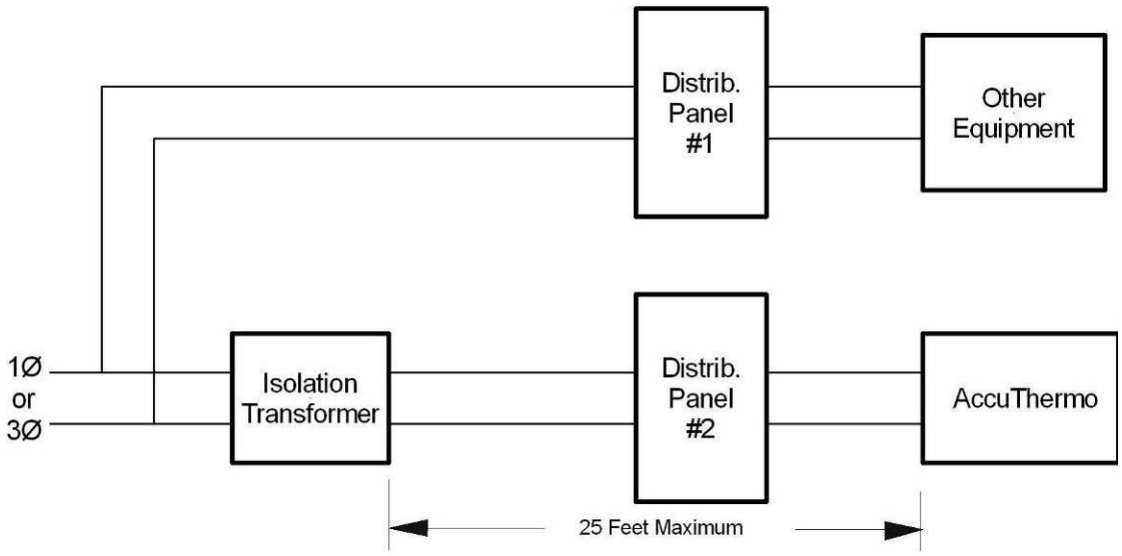

Figure 3-3: *Recommended AccuThermo RTP system power Distribution Diagram*

In summary, the following guidelines should be followed when you connect the AccuThermo RTP system power in order to ensure proper system operation:

- Put the AccuThermo RTP system on a separate power distribution box from other equipment, preferably with its own power transformer. The power distribution box should be accessible from the system.
- Use the correct size circuit breaker (time delay) and house wiring (AWG #4 or larger).
- The distance from the AccuThermo RTP system to the transformer should be as short as possible, preferably with a line length of less than 25 feet.

3.5.4 ADEQUATE COOLING

The heating chamber incorporates three cooling subsystems:

- A nitrogen or air cooling system to reduce residual heating of the quartz isolation tube and lamps.
- A water cooling system for the chamber walls and door.
- A closed loop pyrometer cooling system, to maintain the pyrometer at a constant temperature.

The chamber cooling system operates during any period when power is applied to the lamps and must remain operational for 5 minutes after lamp power has been removed. The air system provides a continual flow through the system cabinet, around the lamps and the quartz isolation tube. This eliminates residual heat from the chamber. The pyrometer cooling system operates continuously, whenever power is applied to the pyrometer chiller, to stabilize and maintain the temperature of the pyrometer.

3.5.5 ADEQUATE TUBING SIZE

Adequate gas and air flow is essential to the proper operation of the system. If the tubing inner diameter is too small, the gas flow rate can be reduced. If the tubing is too long, the gas flow rate can also be reduced.

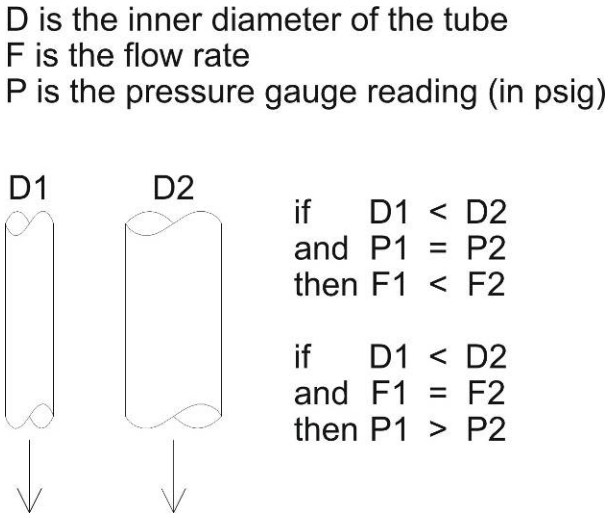

Figure 3-4: *Gas Pressure and Flow Rate Relationship for Different Tube Diameters*

Tubing is Too Small

As depicted in figure 3-3, the smaller diameter tubing (D1) needs to have a higher pressure so it can have the same amount of gas flow rate as the larger diameter tubing (D2). For D1 to have the same flow rate as D2, the pressure in D1 must be greater than in D2. However, it may be impractical to increase the pressure due to equipment constraints.

If the diameter of the line is small, then the pressure of the air will have to be very high to get adequate air flow. Also, if another system opens their air valve, the pressure and volume of air will decrease. A high air pressure can cause other problems in the structural integrity of the chamber.

Tubing is Too Long

Friction in tubing (gas line or air line) that has a very long length can be a major factor to reduce the flow rate of gas through the line. The result is the volume cannot be maintained once the valve is opened to allow flow and the pressure will drop significantly from a static state.

If the length of the line is very long, then the amount of air flow will be restricted, because of friction between the air and tubing wall.

It is advisable to have adequate size diameter for the required length of tubing.

3.5.6 COOLING AIR

When the AccuThermo® is in use, heat radiating from the lamps and the wafer raises the temperature of the quartz window. During a process, the quartz window heats up, but not as much as if there was no cooling air. CDA or nitrogen is used to cool the quartz window and lamps, and to maintain proper temperature of the system. This provides a processing environment with an even temperature range for repeatable cycles. Stabilizing the quartz avoids non-uniformity issues.

To remove residual heat, the cooling air should be left on for at least five minutes after the process has ended.

Adequate Cooling Air

The *quartz isolation tube* ***cooling system*** is one of the most important subsystems in the AccuThermo RTP System. During the heating cycle, cooling nitrogen or air flows around the exterior of the quartz isolation tube and through the heating chamber, to maintain a consistent quartz temperature range. Adequate nitrogen or compressed air flow is essential to the proper operation of the system.

Causes for insufficient air flow:

- The tubing diameter is too small.
- The tubing is too long for the size of the diameter,
- Regulator is too restrictive. Should be at least 12 cfm at 20 psi.

The required flow rate is essential to ensure reliable and repeatable temperature measurement. To reach the required flow rates, the distribution tubing size must be at least 1/2" diameter. 3/8” OD tubing is required to hook up to the system. See the *Adequate Tubing Size*.

NOTE

To reach the required flow rates, the distribution tubing size must be at least 1/2" diameter. 3/8” OD tubing is required to hook up to the system.

Requirements

Quartz Isolation Tube Cooling Air

type	*Nitrogen (N_2) or Clean-Dry-Air (CDA) oil-and-water-free, filtered to 3 microns*	
flow rate	*10-15 scfm (283-425 slpm)*	*minimum*
inlet pressure	*40 psig (300 kPa)*	*typical*
fitting	*3/8" Parker Push-Lok*	
tubing	*3/8" OD nylon tubing*	

CDA is an acronym for "Clean Dry Air". This means the compressed air supplied to the system needs to be filtered and it needs to have the moisture removed. Also, it cannot have any oil in it. CDA can be compressed air from an air compressor or non-process nitrogen. The non-process nitrogen is usually referred to as "House Nitrogen". House nitrogen may not be pure enough to be used for processing, however, it is very clean and it is dry.

Configuration

Figure 3-4 shows the recommended configuration for the supply of nitrogen (N2) or compressed air (CDA), used for cooling the quartz isolation tube. The configuration illustrated below simplifies maintenance and troubleshooting activities. The nitrogen shutoff valve should be conveniently located so that the nitrogen can be turned off when the system is not in use.

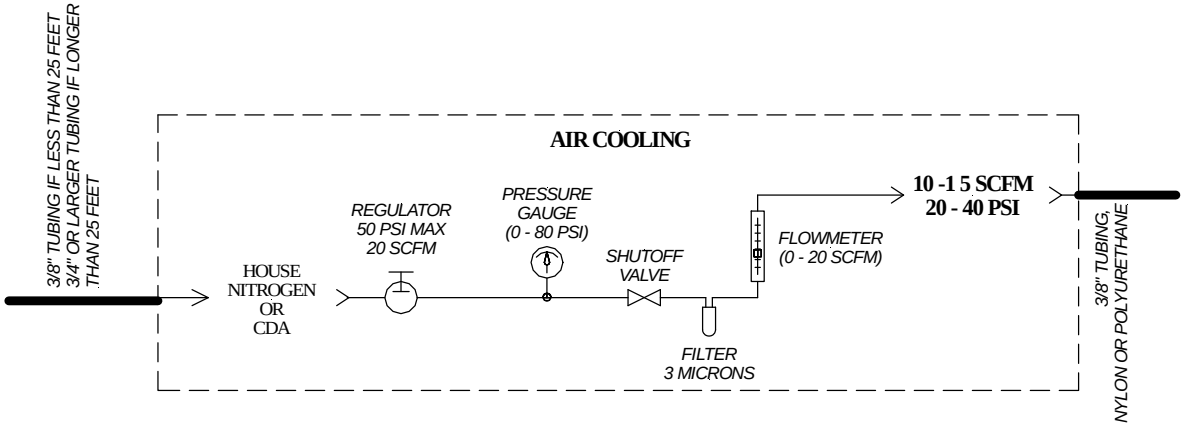

Figure 3-5: *Recommended Non-Process Nitrogen Supply/CDA Configuration*

🏷 NOTE

The isolation tube cooling system is designed to operate with nitrogen. It is acceptable to use compressed air, as illustrated in figure 3-4.

3.5.7 COOLING WATER

During wafer processing, cooling water for the chamber flows through the AccuThermo oven walls to remove excess heat. This helps stabilize the chamber walls so it does not break the quartz isolation tube due to expansion.

Adequate operation of the cooling water system is extremely important for proper system operation. At least the minimum requirement of water should be flowing through the system during, and immediately after, wafer heating. A flow switch, located near the cooling water outlet, disables the lamps if the water flow falls below the minimum requirement.

🏷 NOTE

The chamber walls must be kept below 35 °C.

A solenoid allows water to flow through the heating chamber walls at the beginning of the first heating cycle. Water continues to flow for 5 minutes after the last cycle has been completed. The AccuThermo system switches the water flow off and on as needed to prevent heating chamber overcooling and to save water.

Water cooling is used to keep the chamber cool. The water is circulated through water passages and tubes in the chamber walls and chamber door. This protects the chamber from overheating.

The chamber cooling includes these components:

- Water flow sensor switch to detect if water is flowing at the recommended flow rate.
- Water solenoid valve to allow water to flow whenever the lamps are on. This valve will stay open for 5 minutes after the process has ended.
- Overcooling thermo switch shuts off the water whenever the temperature of the chamber walls is below 10°C.
- Overcooling thermo switch allows the lamps to turn on whenever the temperature of the chamber walls is below 23°C.

Requirements

Oven Cooling Water

type	*100% distilled water* *ISO 3696 Grade 1 (resistivity at < 10 MOhm-cm corrected to 25°C)* *pre-filtered with conventional particulate filter to 100 microns* **(No DI Water)**	
flow rate	*2 gpm (7.5 lpm)*	*minimum*
pressure differential	*30 – 50 psi (2.1 – 3.5 kg/cm^2)*	
inlet pressure	*30 psig (2.11 kg/cm^2)*	*minimum*
	40 psig (2.81 kg/cm^2)	*typical*
	60 psig (4.22 kg/cm^2)	*maximum*
inlet temperature	*59°F (15°C) (3 °C above dew point)*	*minimum*
	68°F (20°C)	*typical*
	95°F (35°C)	*maximum*
oven fitting, inlet and outlet	*1/2" tube x 3/8" male pipe Swagelok*	
atmospheric humidity	*non-condensing*	

It is recommended that a closed loop water temperature controller be used.

It is recommended that distilled water be used for cooling the process chamber.

Do not use deionized (DI) water for the chamber coolant. DI water has had the conductive ions that cause galvanic corrosion between dissimilar metals removed. However, since this is not the normal state of water, when it is too pure deionized water is aggressive to metal. The leaching of metallic ions from the metal surface is seen in pitting. Eventually, the pitting will become so extensive that the cooling passages will develop pinhole leaks.

Do not use normal tap water. Tap water leads to calcareous (calcium) deposits necessitating frequent unit decalcification. Calcium tends to deposit itself inside the cooling passages. The cooling efficiency of the water is reduced and the service life of the equipment shortened.

Adding Ethylene Glycol to the distilled water may be done, but the solution should be changed periodically. When Ethylene Glycol breaks down, its by-products are corrosive to copper. Many of the water fittings on the AccuThermo® RTP system are made of brass, an alloy of copper.

Refer to the heat exchanger manufacturer's manual for the proper type and condition of the cooling water.

Configuration

The customer must supply a water filter. The water filter is connected to the water source line of the AccuThermo® RTP system. It is recommended to be 100 micron (nominal). It is used to filter out sediment, dirt and sand. A filter inspection should be part of the periodic maintenance routine.

A flow meter is required on the AccuThermo water supply line so the water flow rate can be visually inspected on a periodic basis. Pressure gauges installed on the system water inlet and outlet lines are very useful during system troubleshooting. (Refer to figure 3-5.)

A compressed air fitting connected to the system water inlet line will allow service procedures to be easily carried out which require purging cooling water from the AccuThermo system.

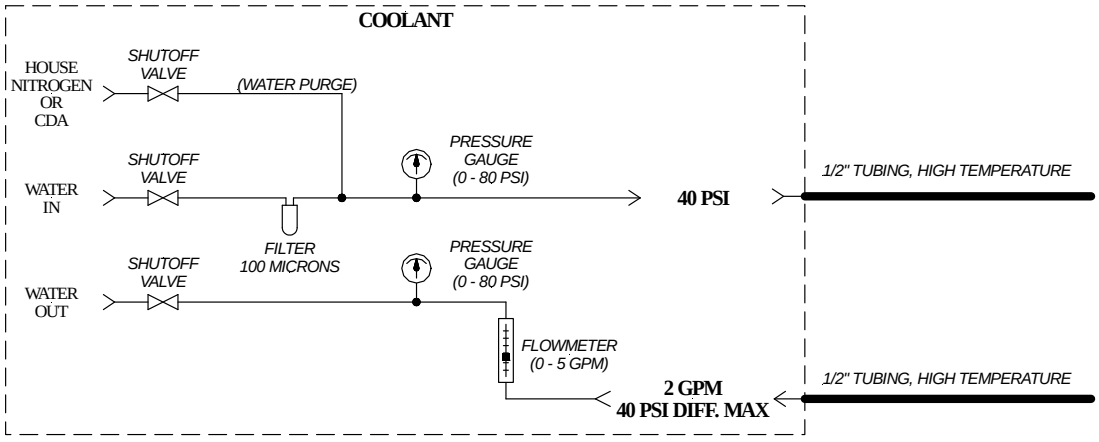

Figure 3-6: *Optimal Cooling Water Supply Configuration*

The water temperature should be at least 3°C above the dew point. This prevents condensation buildup on the chamber. Condensation can degrade the gold reflective plating on the inside of the chamber plates. It can also drip onto electrical connections and short them and create other problems.

Recommended Chillers & Heat Exchangers

Because of the many varied processes that are used with this machine by many different companies and institutions, we cannot recommend a particular chiller or heat exchanger. If we do, then it would be one that is "over kill" for 99% of users, one that will do the job if the machine was working very hard and for long times.

There are 21 lamps and they are rated at 1.5kW each. This means the AccuThermo RTP has the potential of producing about 32.5kW of heat when full on, but this is never achieved for more than a few seconds. Part of the heat is removed by the cooling air and part by the cooling water.

Our requirement is to use a chiller or heat exchanger that will have a flow rate of 2-3 gpm (7.6-11.4 lpm) with a maximum differential pressure of 40 psi (max input pressure of 60psi). The inlet water temperature should not exceed 35°C.

The setpoint temperature for the cooling water should be set to at least 3°C above the dew point. This prevents condensation buildup on the chamber. Condensation can degrade the gold reflective plating on the inside surfaces of the chamber plates and corrode the plates. It can also drip onto electrical connections and short them and create other problems. For example: if the dew point is 12°C (see the weather report for your area), then the cooling water temperature should not be below 15°C.

And, definitely, the water should be changed periodically. And don't forget to check the water level daily. 2-3 cups of water can evaporate from a chiller in a single day.

3.5.8 PROCESS GAS

Requirements

Process Gases

type	*Any inert and/or non-corrosive gas.* *Typically, Nitrogen (N2), oxygen (O2), argon (Ar), and/or helium (He) are used.*	
pressure	*15 psig (1.1 kg/cm^2)*	*minimum*
	20 psig (1.4 kg/cm^2)	*typical*
	30 psig (2.1 kg/cm^2)	*maximum*
flow rate	*0-10 SLPM*	
filtering	*pre-filtered to 1 micron*	
fitting	*1/4" female VCR fitting or 1/4" tube Swagelok*	

CAUTION

The total gas flow into the chamber should never exceed 20 SLPM. Greater than this may rupture the quartz isolation tube.

Configuration

The AccuThermo RTP system can use one to six inert or non-toxic gases as inputs. Each of these gas inputs is connected to a separate MFC. The supply lines for the process gases are connected to 1/4" male VCR fittings on the right rear of the AccuThermo RTP oven (refer to figure 3-1). It is recommended that the tubing used for the process gas supply line be electro-polished 316L stainless steel. This tubing is not supplied with the system.

NOTE

To minimize wafer contamination, all process gas supply tubing should be made of electro polished stainless steel.

Process gas supply input pressures should be 20 psig. Individual flow rates are controlled by MFC's. Figure 3-6 shows the recommended configuration for the process gas supply system.

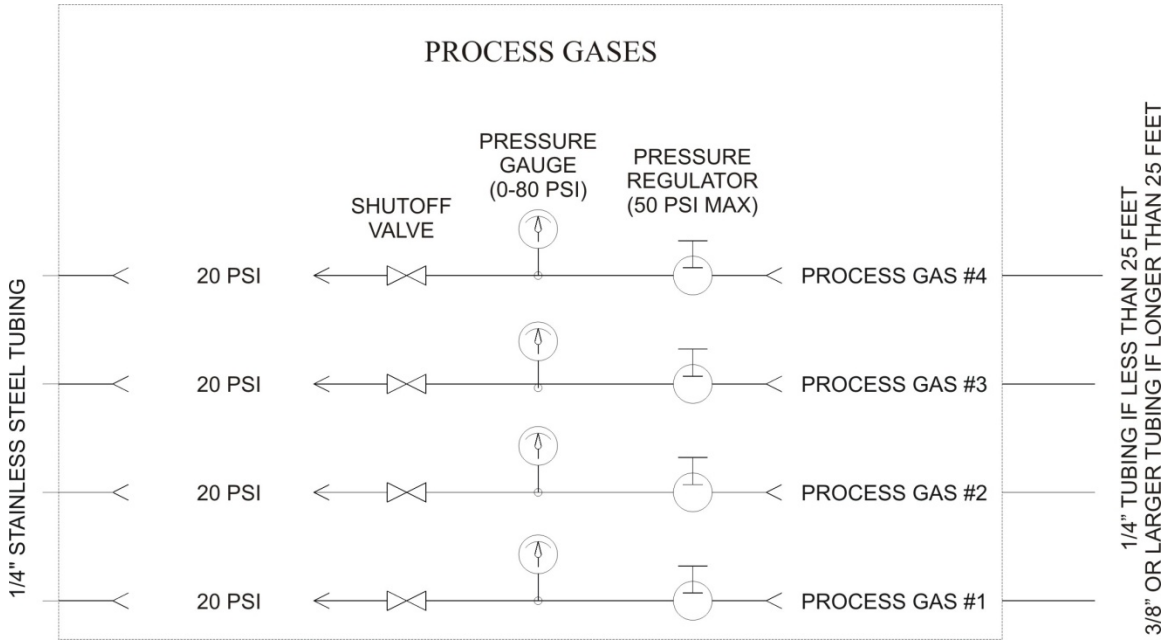

Figure 3-7: *Optimal Process Gas Supply Configuration*

NOTE

There are no pressurized vessels in this unit. However, the end-user needs to provide connection to such vessels in a safe manor that is compliance with local and industrial regulations. It is the end-user's responsibility to meet these requirements.

NOTE

The "Purge In" label on the rear of the chamber unit is for a legacy purpose. Originally, there was only one control for process gas. It was controlled by a rotometer on the front of the unit. The process gas would enter at the "Purge In" port and exit at the "Purge Out" port.

The "Purge In" is no longer used since the MFC is the only device to control gas flow rate.

Gas Box Venting

🏷 NOTE

The Gas Box is inside the main cabinet. It has its own exhaust port. There is no fan in the gas box to force air through. The cabinet exhaust port is only intended to exhaust the hot cooling air from the chamber. The cabinet exhaust port has a fan to make sure there is no build-up of hot air inside the cabinet. The cabinet exhaust should not be relied upon to exhaust HPM gases. Also, there is a partition between the chamber section and the gas box which will greatly inhibit good exhaust of HPM gases from the left side of the cabinet if there is a leak.

3.5.9 PROCESS EXHAUST

Requirements

Process Gas Exhaust	*exhaust back pressure (scrubber draw)*	*0.5" water (0.9 mmHg)*	*minimum*
		0.75" water (1.4 mmHg)	*typical*
		1.0" water (1.9 mmHg)	*maximum*
	fitting	*1/4" male VCR fitting out to building scrubber system*	

Configuration

The process exhaust, to carry used process gases out of the heating chamber, should be connected to the facility exhaust system if there are hazardous materials present in the exhaust from the wafer process.

CAUTION

The AccuThermo RTP is designed to be used at atmospheric pressure. If a vacuum is applied to the process exhaust, the quartz isolation tube will break.

The process exhaust on the rear panel of the oven cabinet (refer to figure 3-1) carries spent process gases to the facility exhaust (see figure 3-10). Even though only inert or non-toxic gases are recommended for connection to the AccuThermo RTP gas system inlets, depending on the type of wafers being processed, the exhaust may be toxic and hazardous. If this is the case, then the purge outlet must be connected to a ***facility scrubber***.

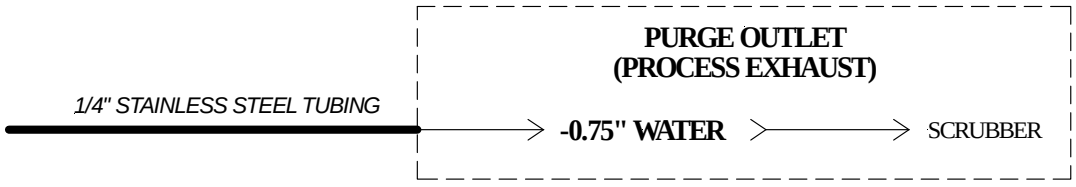

Figure 3-8: *Recommended Process Exhaust Configuration*

The process gas exhaust outlet, located on the rear of the AccuThermo, should be connected to the facility scrubber. The outlet is a 1/4" female VCR fitting.

CAUTION

Do not block the process gas outlet. This will cause pressure to build up inside the quartz isolation tube and it <u>will</u> break.

3.5.10 CDA (PNEUMATIC)

Requirements

Compressed Pneumatic Actuation Gas Valve (optional)	*type*	*Clean Dry Air (CDA) or Nitrogen (N2) oil-and-water-free*
	Inlet Pressure	*80 psig (550 kPa) ± 5 psig (35 kPa)*
	flow rate	*Less Than 1 SCFM Typical*
	fitting	*1/4" tube Swagelok*

Connection

The AccuThermo system can use one to six inert or non-toxic gases as inputs. Each of these gas inputs are connected to a separate MFC and (optionally) pneumatically operated shut off valve. The supply line for the compressed pneumatic air, figure 3-8, is connected to the 1/4" male Swagelok fitting on the rear of the chassis (see figure 3-1).

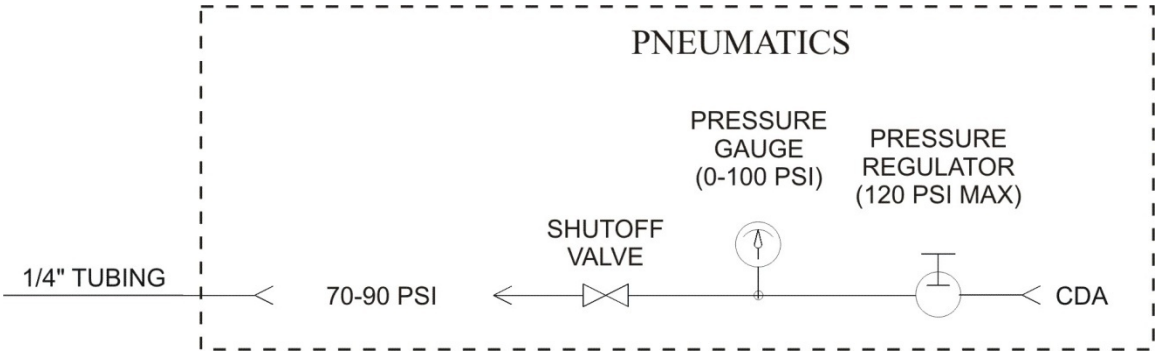

Figure 3-9: *Recommended Pneumatic Configuration*

3.5.11 CABINET EXHAUST

Requirements

Oven Cabinet Exhaust	*flow rate*	*100 scfm (3000slpm)*
	fitting	*4" exhaust vent connected to house exhaust system*

Gas Box Exhaust (optional)	*flow rate*	*100 scfm (3000slpm)*
	fitting	*4" exhaust vent connected to house exhaust system*

Configuration

There are two cabinet exhaust outlets on the AccuThermo RTP system that may need to be connected to the facility exhaust system. Refer to figure 3-9.

- The cabinet exhaust port (located just behind the chamber, see figure 3-1) draws air from the clean room through the cabinet to flush out the hot air. It maintains the temperature on the right side of the cabinet. This exhaust should have a flow rate of 100 CFM for proper operation.
- The gas box exhaust port (located on the left side, see figure 3-1) removes potential gas leaks from the gas box before any gas can get into the clean room. It should have a maximum flow rate of 100 CFM.

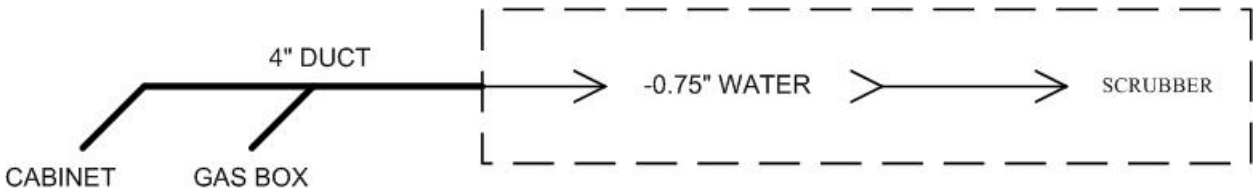

Figure 3-10: *Recommended Cabinet Exhaust Configuration*

NOTE

The Gas Box is inside the main cabinet. It has its own exhaust port. There is no fan in the gas box to force air through. The cabinet exhaust port is only intended to exhaust the hot cooling air from the chamber lamps. The cabinet exhaust port has a fan to make sure there is no build-up of hot air inside the cabinet. The cabinet exhaust should not be relied upon to exhaust HPM gases. Also, there is a partition between the chamber section and the gas box which will greatly inhibit good exhaust of HPM gases in the left side of cabinet.

3.5.12 PYROMETER COOLING WATER

The AccuThermo® RTP system has a separate, closed-loop water system to cool the pyrometer, if one is installed in the system. The water chiller unit, which must be located near the system, circulates water through the pyrometer to maintain a constant pyrometer temperature. The chiller should be set to maintain a constant and stable pyrometer temperature of 20˚C.

Requirements

Pyrometer Cooling Water

type	*100% distilled water*
inlet temperature	*20°C (3°C above dew point)*
flow rate	*9-15 gph (34-56 lph)*
pyrometer fittings, inlet and outlet	*1/4" Swagelok*
atmospheric humidity	*non-condensing*

Please see the chiller manufacturer's manual for installation requirements, operation, and maintenance. If there are any problems with the chiller, please contact the manufacturer for help. Allwin21 Corp. can only give you minimum support for the chiller.

It is recommended that distilled water be used for cooling the pyrometer.

Do not use deionized (DI) water for the pyrometer coolant. DI water has had the conductive ions that cause galvanic corrosion between dissimilar metals removed. However, since this is not the normal state of water, when it is too pure deionized water is aggressive to metal. The leaching of metallic ions from the metal surface is seen in pitting. Eventually, the pitting will become so extensive that the cooling passages develop pinhole leaks.

Do not use normal tap water. Tap water leads to calcareous (calcium) deposits necessitating frequent unit decalcification. Calcium tends to deposit itself inside the cooling passages. The cooling efficiency of the water is reduced and the service life shortened.

Adding Ethylene Glycol to the distilled water may be done, but the solution should be changed periodically. When Ethylene Glycol breaks down, its by-products are corrosive to copper. Many of the water fittings on the AccuThermo® RTP system are made of brass, an alloy of copper.

The pyrometer was calibrated at 20°C. The atmospheric humidity must be non-condensing at 20°C; otherwise condensation will destroy the electronics inside the pyrometer.

There are no interlocks with the pyrometer cooling water, so there are no sensors to determine if the cooling water for the pyrometer is flowing. The computer will not be able to determine if the cooling water for the pyrometer is flowing.

4. SETUP

4.1 UNPACKING AND INSPECTING

4.1.1 UNCRATING

The AllWin21 AccuThermo RTP system is shipped in one crate: a heating chamber cabinet, computer, PC monitor, accessories and a chiller for the pyrometer (optional).

Unpacking should not take place until the manual is removed and the unpacking instructions are thoroughly understood.

If the container shows visible signs of damage upon delivery, notify the carrier **immediately**, and do not proceed with unpacking until a carrier's agent is present.

The AccuThermo® RTP system should be removed from its sealed plastic shroud only in an appropriate particulate free environment to avoid contamination prior to its installation.

To open this package, follow the steps below:

Step 1. Remove the clamps that hold down the top of the crate, and then remove the top of the crate.

Step 2. Remove the packing material.

Step 3. Lift out the Chamber Cabinet.

☠ WARNING

Chamber Cabinet weighs over 90 lbs. (41 kg).

Use proper handling precautions.

Step 4. Carefully unpack the chiller and accessories. Use care when unpacking accessories and spares and check that none of the parts are damaged.

Step 5. Carefully unpack the computer and monitor.

🏷 NOTE

Do not discard shipping crate. You may wish to use them later if the system must be returned to AllWin21 for repair.

4.1.2 INSPECTING

The AccuThermo RTP system has been thoroughly inspected and tested at the factory prior to shipment, and should be operational when received.

The system has been shipped in a specially designed container to prevent any equipment damage. However, if the container shows visible signs of damage upon delivery, notify the carrier **immediately.** Do not notify Allwin21, as the initial claim for damages must be filed with the carrier. Retain all shipping containers and packing material for damage inspection.

Visually inspect the unit for dents, scratches or other visible signs of shipping damage. If you notice any shipping damage, notify the carrier **immediately**.

Compare the contents of the accessories box with the AllWin21 packing list to make sure all items have been shipped. Handle the quartzware with care. If any parts are missing or broken, notify AllWin21 immediately. The appendix in the ***Service*** manual lists procedures and phone numbers to obtain replacement parts.

🏷 NOTE

The quartz isolation tube is shipped inside the chamber. Once the system is inside the cleanroom, open the chamber door and verify that the isolation tube was not damaged during shipment.

4.1.3 UNPACKING

CAUTION

***DO NOT USE THE DOOR HANDLE* TO MOVE THE AccuThermo RTP SYSTEM**

Step 6. Move the AccuThermo RTP system to a semi-clean area, and remove the protective cover. Wipe any dirt accumulation from the system.

Step 7. Remove all packing material from the Main Console.

- Remove plastic cover from each of the gas and vacuum fittings at the back of the system.

Step 8. The quartz isolation tube is shipped inside the chamber. Once the system is inside the cleanroom, open the chamber door and verify that the isolation tube was not damaged during shipment.

4.2 FACILITIES

4.2.1 POSITION SYSTEM

Step 1. Position the AccuThermo® RTP system in its final place. Ensure the unit is level.

Step 2. Position the Pyrometer Chiller (optional) in its final place.

4.2.2 CHASSIS COVER

Step 3. Remove the top cover from the AccuThermo® RTP system. Refer to the ***Service*** manual, section "***Chamber Unit Cabinet Cover Removal***".

4.2.3 COOLING AIR

Step 4. Attach 3/8" cooling air tubing to the "**AIR COOLING**" port.

4.2.4 COOLING WATER

Step 5. Attach the cooling water hose from the "**WATER RETURN**" port on the heat exchanger to the "**COOLANT RETURN**" port on the AccuThermo® RTP system.

Step 6. Attach the cooling water hose from the "**WATER SUPPLY**" port on the heat exchanger to the "**COOLANT SUPPLY**" port on the AccuThermo® RTP system.

4.2.5 CDA (PNEUMATICS)

Step 7. Connect the 80 psig Nitrogen to the port marked "CDA" (see figure 3-2).

4.2.6 PROCESS GASES

Step 8. Connect gas lines to the gas input ports. See figure 3-2.

4.2.7 PROCESS EXHAUST

Step 9. Connect the facility scrubber to the Process Exhaust port.

4.2.8 CABINET EXHAUST

Step 10. Connect House Exhaust to the 4” diameter fittings at the rear of the AccuThermo® RTP system for the “Cabinet Exhaust” and the “Gas Box Exhaust” (figure 3-2).

4.2.9 PYROMETER COOLING

The AccuThermo RTP system has a separate, closed-loop water system to cool the pyrometer, if one is installed in the system. A water chiller unit, which must be located near the system, circulates water through the pyrometer to maintain a constant pyrometer temperature. The chiller should be set to maintain a constant and stable pyrometer temperature of 20˚C.

The chiller unit water connections are made to the two 1/4" tubes on the rear of the AccuThermo RTP system between the oven water cooling connections. Refer to figure 3-1. The tubing between the chiller and the AccuThermo® RTP are user supplied.

If a pyrometer is installed in the AccuThermo® RTP system, then follow these steps.

Two union connectors are supplied with the AccuThermo® RTP system to make these connections.

Step 11. Connect the tubing on the back of the chiller labeled **PUMP OUTLET** to the tube on the back of the AccuThermo® RTP system labeled **PYROMETER INLET**.

Step 12. Connect the tubing on the back of the chiller labeled **PUMP INLET** to the tube on the back of the AccuThermo® RTP system labeled **PYROMETER OUTLET**.

Step 13. Fill the chiller with the recommended coolant type. Refer to the manufacture’s manual for the amount of coolant to put into the reservoir.

Step 14. Plug the chiller unit into the proper outlet; refer to chiller manufacture’s manual. The chiller draws approximately 12 Amps.

CAUTION

Do not operate the chiller with low water level. The chiller may overheat and cause damage to the refrigeration unit.

4.2.10 ELECTRICAL CONNECTIONS

Step 15. Once the facility AC power and other facility connections have been routed to the AccuThermo RTP system, use the following procedure for connecting the AC power to the system. There are two different methods to connect the power cables to the AccuThermo® RTP system: Single-Phase, and 3-Phase. Determine which method needs to be followed to connect the power cables to the AccuThermo® RTP system.

☠ WARNING

Make sure the AC power from the distribution panel is OFF before you begin this procedure. Follow proper lock-out/tag-out procedures.

Single-Phase Cable Connections

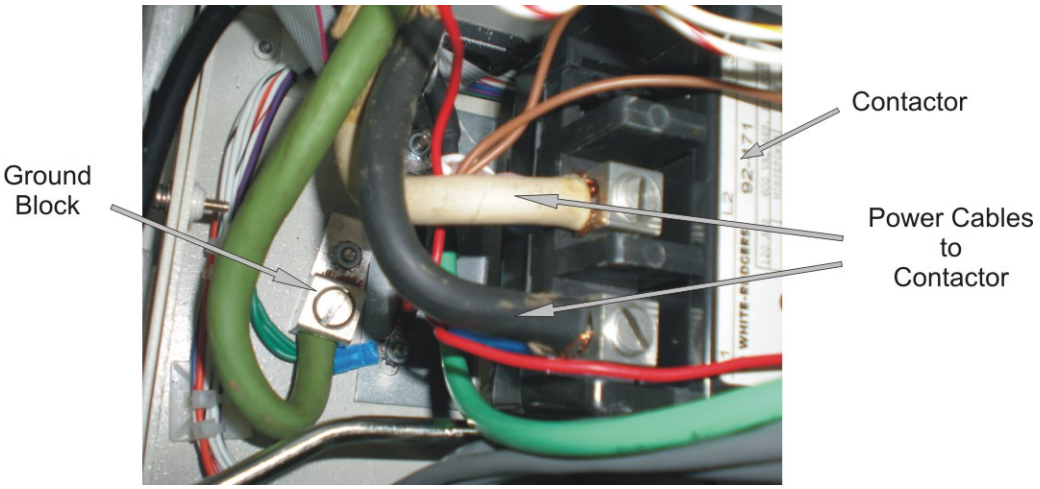

Figure 4-1: *Single-Phase System showing Ground Block*

3-Phase Cable Connections

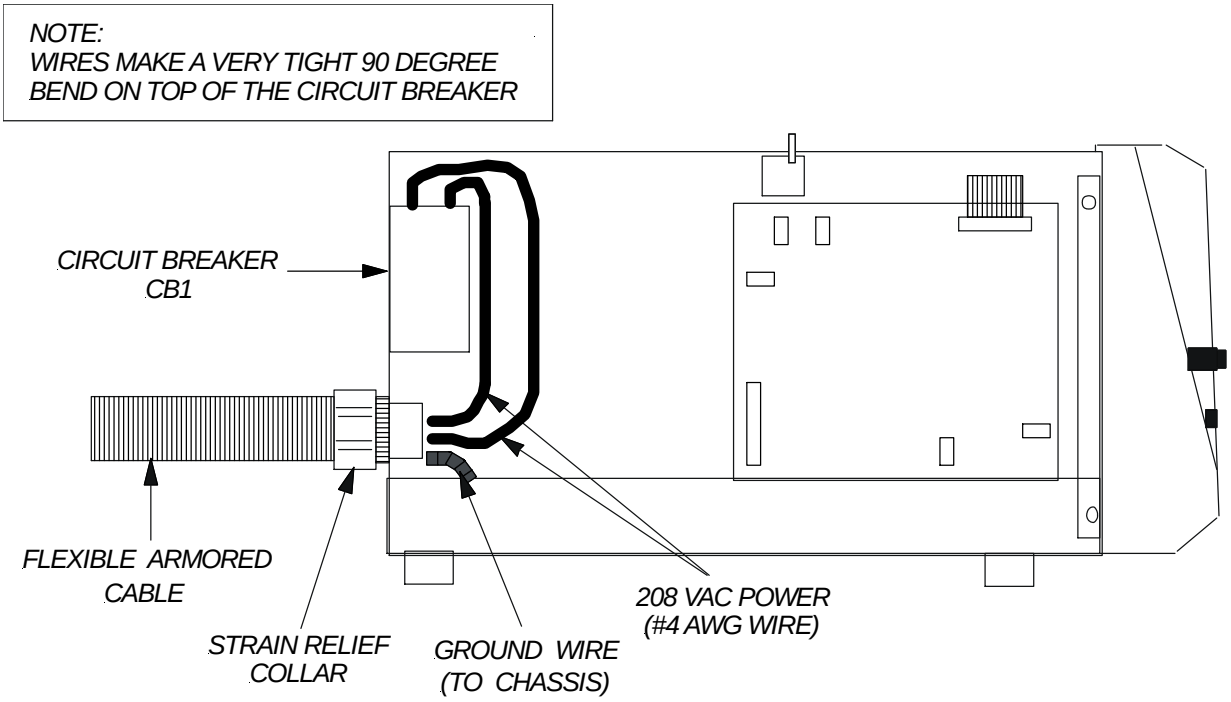

Figure 4-2: *3-Phase AC Power Connections with Circuit Breaker*

Figure 4-3: *3-Phase AC Power showing Ground Block*

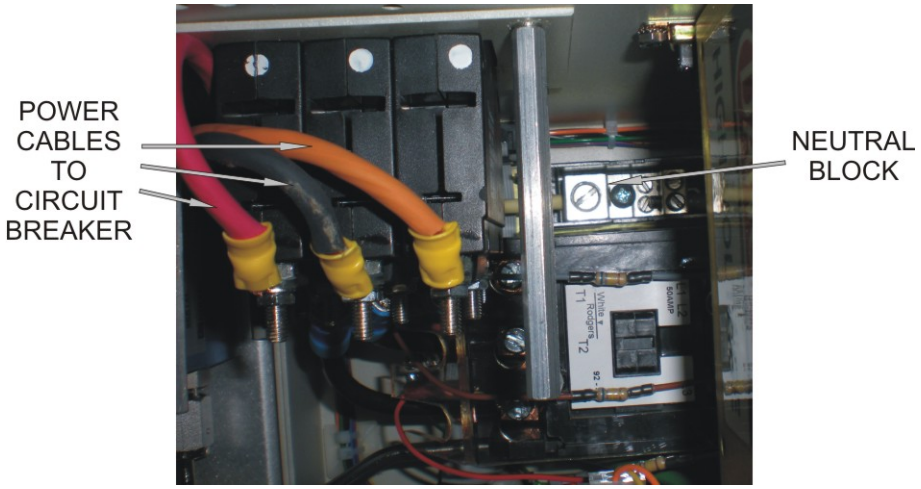

Figure 4-4: *3-Phase AC Power showing Neutral Block*

☠ WARNING

Make sure the AC power from the AccuThermo RTP system distribution panel is OFF before you begin this procedure. Even with the AC power switch on the front panel in the OFF position, high voltage still exists on various components inside the system. Follow proper lock-out/tag-out procedures.

Step 16. Remove the top cover from the AccuThermo RTP system.

Step 17. Loosen the cable strain relief collar located on the rear panel of the system.

Step 18. Feed the power cable through the strain relief collar.

Step 19. Connect wires to system. The order of the connections is not important for proper system operation.

a. For 3-phase systems: Remove one nut and one washer from each of the top terminals of the circuit breaker and connect the power cables, securing the cables with the terminal nuts and washers. The order of the cables is not important for proper system operation. Refer to figures 4-2, 4-3, and 4-4.

b. For single-phase systems: Loosen the screws for L1 & L2 of the contactor and connect the power cables, securing the cables with the hold-down screws. The

order of the cables is not important for proper system operation. Refer to figure 4-1.

Step 20. For 3-phase systems: Connect the neutral wire to the neutral block (figure 4-4). The neutral block is between the contactor and the rear chassis wall.

Step 21. Connect the ground wire (green or green/yellow) to the ground block on the bottom of the AccuThermo RTP chassis (figure 4-1 and figure 4-3).

Step 22. Tighten the strain relief collar on the rear of the AccuThermo RTP system and make sure that it is holding the power cable securely.

Step 23. Verify that all cables are connected. Verify the ribbon cable to J5 of AW-900-058 main control board is still connected properly.

Step 24. There is no need to install the top cover until all utilities are connected.

4.2.11 INSTALLING THE COMPUTER

This section describes the procedure for installing the AllWin21 AccuThermo RTP Graphical User Interface (GUI) computer and connecting this computer system to the AccuThermo Rapid Thermal Processor (RTP) chamber.

Overview of the Computer

The AccuThermo RTP oven is controlled by a computer that is supplied with the AccuThermo RTP system.

The computer interface kit shipped with your AccuThermo RTP system includes the following parts:

Description	Quantity
Allwin21 AccuThermo RTP computer	1
Monitor	1
Keyboard	1
Mouse	1
Computer and Monitor AC Power Connection Cables	2
25-pin M-M D-sub Connector Cable , 6-feet long	1

🏷 NOTE

At least 85% of all problems can be attributed to connectors. At AllWin21 we have these simple rules which we follow.

1) Do not drop connectors. It can bend and damage pins and crack the housing, etc. Treat connectors like "eggs". Treat PCB like "glass".

2) Take the time to tighten all holding screws. A loose connector may not have good contact. It may also bend the pins.

3) Do not plug connectors in & out too many times.

4) Fix the connector correctly the first time. A bad "fix" can further damage the connector.

Interconnection of the Computer Assembly

This computer is configured at the factory, prior to shipment, with all of the hardware components and software applications needed to operate as the user interface for the AccuThermo RTP system.

Use the following steps and figure 4-6 to complete the power connection and all input/output components of the AccuThermo RTP system computer:

Step 25. Make sure the computer is turned OFF and it's AC power input cable has not been connected to a power source

Step 26. Make sure the monitor is turned off and it's AC power input cable has not been connected to a power source

Step 27. Connect the monitor video input cable to the matching monitor connector on the back of the computer

Step 28. Connect the keyboard cable connector to the matching keyboard connector on the back of the computer. For some models of computers, there is an adaptor cable to allow the keyboard and the mouse to share the same port.

Step 29. Connect the mouse cable connector to the matching mouse connector on the back of the computer

Step 30. Connect the computer power supply to the computer. Connect the AC power cable to the computer power supply and the other end to an AC power connector.

Step 31. Connect the AC power cable to the Monitor and the other end to an AC power connector.

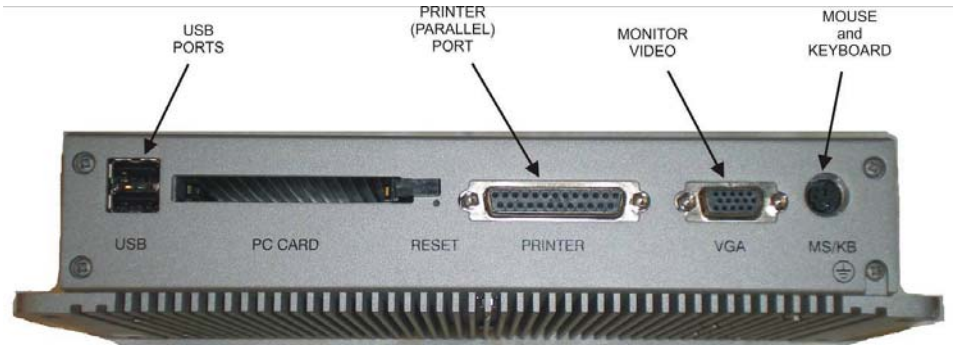

Figure 4-5: *Computer Rear View*

Connecting Computer to AccuThermo RTP System

Connecting the computer to your AccuThermo RTP oven unit consists of simply connecting the appropriate cables between the computer and the AccuThermo RTP chamber unit.

Step 32. Connect the 25-pin M-M D-sub connector cable between the computer's "Parallel Port", and the AccuThermo RTP oven 25-pin connector, labeled "Controller" (refer to figure 4-6).

Figure 4-6: *Computer to AccuThermo RTP System Interconnect Diagram*

Step 33. Tighten all cable hold-down screws at each end of all of the cables installed on the computer and on the AccuThermo RTP oven unit.

4.3 INSTALLING THE QUARTZ WAFER TRAY

The AccuThermo RTP system uses two major pieces of quartzware. These are the quartz isolation tube and the quartz wafer support tray. The AccuThermo RTP systems are normally shipped with the quartz isolation tube installed. The quartz wafer support tray is shipped in a separate packing container inside the shipping crate. It is recommended that the quartz isolation tube be removed, inspected for damage and cleaned prior to putting the system in service. Procedures for removing and installing the quartzware are detailed in the ***Service*** manual.

PAGE INTENTIONALLY LEFT BLANK

5. FACILITIES CHECKLIST

5.1 ELECTRICAL

Line-to-Line	Line-to-Neutral
200	*100*
208	*120*
220	*130*
240	*140*
380	*220*
415	*240*

		measured	units

1-phase (single phase)

max load	*90 Amps*		
Voltage between Load Wires			
	1 & 2 =		*VAC*
Voltage between Load Wires and Ground			
	1 & ground =		*VAC*
	2 & ground =		*VAC*

3-phase

max load	*50 Amps*		
Voltage between Load Wires			
	1 & 2 =		*VAC*
	2 & 3 =		*VAC*
	1 & 3 =		*VAC*
Voltage between Load Wires and Neutral			
	1 & neutral =		*VAC*
	2 & neutral =		*VAC*
	3 & neutral =		*VAC*
Voltage between Load Wires and Ground			
	1 & ground =		*VAC*
	2 & ground =		*VAC*
	3 & ground =		*VAC*
Voltage between Neutral & Ground			
	Neutral & ground =		*VAC*

Comments:

5.2 COOLING WATER

	spec	measured	units
flow rate	*2*		*gpm*
inlet pressure	*30 – 60*		*psi*
pressure differential	*30 – 40*		*psi*
inlet temperature	*20 (15 – 25)*		*°C*
tube size	*1/2”*		*inch*

Comments:

5.3 COOLING AIR

	spec	measured	units
flow rate	*10 – 15*		*scfm*
inlet pressure	*20 – 30*		*psi*
tube size	*3/8”*		*inch*
tube length	*if greater than 25 ft., then ½” – ¾”*		
Are there any other equipment that are connected to this air line?			

Comments:

5.4 PROCESS GAS

	spec	measured						units
		1	2	3	4	5	6	
flow rate	*0 – 20*							*slpm*
inlet pressure	*20 (15 – 30)*							*psi*
tube size	*1/4"*							*inch*
tube length	*if greater than 25 ft., then 3/8”*							

Comments:

5.5 PROCESS EXHAUST

	spec	measured	units
exhaust back pressure (scrubber draw)	*0.75 (1.4)*		*inches of water (mmHg)*

Comments:

5.6 CDA (PNEUMATICS)

	spec	measured	units
inlet pressure	*80*		*psi*
flow rate	*< 1 scfm*		*scfm*
tube size	*1/4"*		*inch*

Comments:

5.7 CABINET EXHAUST

	spec	measured	units
flow rate	*20*		*scfm*

Comments:

5.8 PYROMETER CHILLER

	spec	measured	units
Temperature	*20*		*°C*

Comments:

6. INITIAL START UP

6.1 OVERVIEW

This section describes how to power-up the AccuThermo RTP system for the first time. Prior to applying power to the system, a visual inspection of the facilities is required. It is also recommended that you read the list of safety precautions given in the *Safety Precautions* section of this manual.

To complete the start up procedures, you must be familiar with the use of the menu screens to execute and interrupt a cycle in Run mode.

If any irregularities occur during power-up, power down the system and immediately notify the service engineer in charge.

☠ WARNING

Check the system utility connections and sources before starting up the AccuThermo RTP system.

6.2 UTILITIES INSPECTION

Inspect the system utility connections and sources before starting up the AccuThermo RTP system. Refer to figure 6-1 for the location of each utility connection on the rear of the oven unit.

Visually inspect the following utilities to make sure connections are secure:

- Electrical power.
- Gas-handling inlets.
- Purge Outlet (Process Exhaust).
- Cooling water inlet and outlet for chamber cooling.
- Nitrogen or Clean Dry Air (CDA) inlet for cooling air.
- Nitrogen or Clean Dry Air (CDA) inlet for system pneumatics.
- Scrubber connections.
- Cabinet Exhaust.

Check the Utilities Specifications in the ***Installation Requirements*** chapter for proper settings.

CAUTION

Make sure the purge outlet is not restricted. This will cause the quartz isolation tube Error! Reference source not found.**to over pressurize and it will break.**

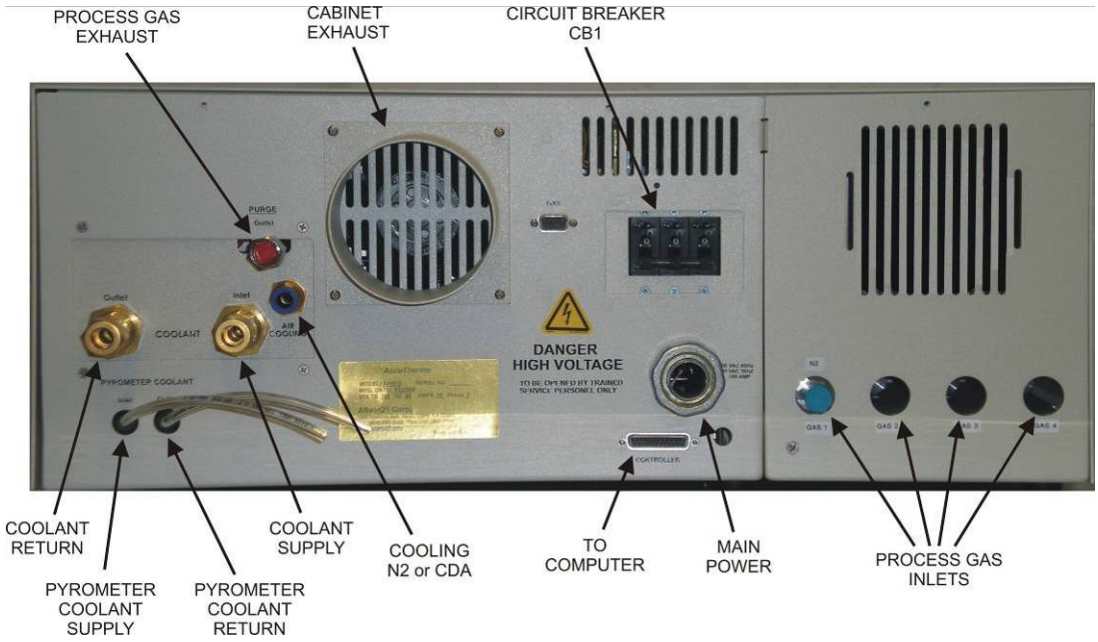

Figure 6-1: *Rear Utility Panel Connections*

Check for possible water leaks at the cooling water inlet and water outlet connections.

If any of the utilities are disconnected or any connections appear to be leaking, correct the problem. Make sure the house scrubber is operating if processing with hazardous gases or processing wafers which outgas.

NOTE

Before applying power to the system, the computer must be connected; the cooling water and cooling air must be turned on.

6.3 FRONT CONTROL PANEL

The front control panel houses the controls and meters that indicates system status and provides manual control over the system. Refer to figure 6-2.

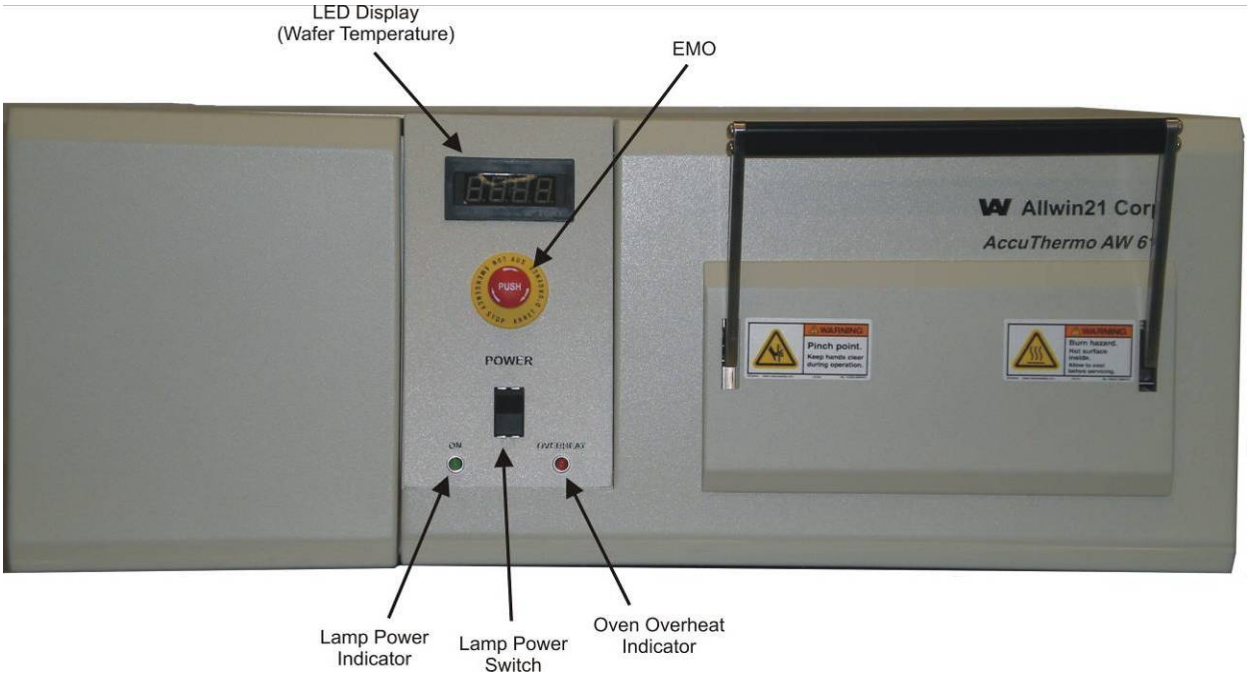

Figure 6-2: *Front Control Panel*

The features of the front control panel are:

LED Display — This shows the temperature of the wafer inside the chamber. (Disregard the decimal point.)

EMO (Emergency Off) — Shuts down the lamps.

Lamp Power Indicator — The green LED indicates when power is available to the lamps for heating the sample inside the chamber.

Lamp Power Switch — This ON/OFF switch controls power to the lamps for heating the sample inside the chamber.

Overheat Indicator — This red LED is lit when either of the following two conditions occur:

- The outside surface of the oven chamber bottom plate is equal to or greater than 65°C.
- The wafer temperature exceeds the set point of the Wafer High Temperature Interlock.

6.4 INITIAL START-UP AMD TESTING

This section describes the procedures for powering-up the system and the test procedures that must be performed directly after power-up to ensure safe AccuThermo RTP system operation.

6.4.1 PYROMETER CHILLER START UP

After the facility connections have been made and the chiller filled with water, the chiller unit may be turned on to check for leaks and adjusted for proper operation. Refer to the chiller manufacture's manual and to figure 3-13.

Step 1. Turn ON the pyrometer chiller.

Step 2. Set the chiller to 20°C using the keypad on the controller.

NOTE

The pyrometer chiller temp should be set at 20 ± 0.5 °C.

Step 3. Check to ensure that the pyrometer chiller flow is in the range between 9 gallons-per-hour (gph) and 15 gph. The minimum acceptable pyrometer cooling water flow is 6 gph.

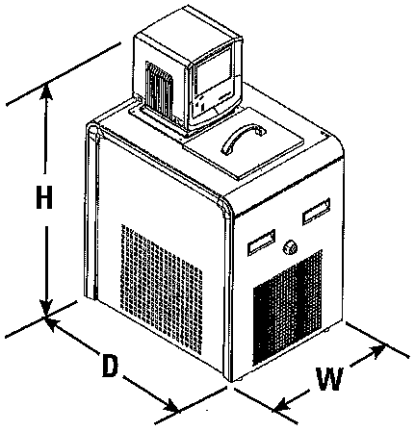

Figure 6-3: *AccuThermo RTP Pyrometer Chiller*

Step 4. Monitor the water temperature on the controller's display. The temperature should begin to drop after a few minutes and stabilize to approximately 20°C within 90 minutes. Once the water temperature has stabilized, the amber HEAT LED will turn ON. If the water temperature stabilizes above or below 20°C, adjust the unit slightly and allow it to stabilize again.

NOTE

Any change in pyrometer cooling water temperature will affect the calibration of the pyrometer. Always verify that the water temperature has stabilized at 20°C prior to running a process cycle.

Step 5. Check all of the water connections between the chiller and the pyrometer on the bottom of the AccuThermo RTP oven. Make sure that there are no leaks.

CAUTION

Do not operate the system under pyrometer control until the pyrometer cooling water temperature has stabilized.

6.4.2 INITIAL POWER-UP

The AccuThermo RTP system is ready to power-up at this point in the installation procedure. The following steps describe the power-up sequence.

CAUTION

Be alert at all times during the initial power-up procedures. If at any time during these initial procedures the lamps turn on at high intensity unexpectedly, immediately turn the power switch OFF. The system can heat up a wafer very rapidly until it melts. This can cause extensive damage to the AccuThermo RTP system.

Step 6. Ensure that the system power input circuit breakers and power switches are set to off:

- ☐ The wall circuit breaker(s) for the computer and AccuThermo RTP system are off.
- ☐ Circuit breaker (CB1) on the rear of the AccuThermo RTP system is off (CE and 3-phase versions only).
- ☐ The computer power is off.
- ☐ The AccuThermo RTP system LAMP POWER switch (on the front control panel) is off.

CAUTION

Make sure the LAMP POWER switch on the AccuThermo RTP system Error! Reference source not found.**control panel is OFF prior to proceeding. If the AccuThermo RTP system Lamp Power switch is on when the computer power switch is turned on, the lamps in the heating chamber could turn on.**

Step 7. Ensure all gas valves are turned off.

Step 8. Make sure the EMO button is reset.

Step 9. Verify there is no restriction to the purge outlet (process exhaust). Verify it is set to the proper negative pressure.

Step 10. Verify the cabinet exhaust is set to the proper flow rate.

Step 11. Turn on the facility circuit breakers for the AccuThermo RTP system.

Step 12. Turn on the facility safety switch for the AccuThermo RTP system.

Step 13. Turn on the circuit breaker on the rear of the AccuThermo RTP system (CE and 3-phase versions only).

Step 14. Power up the computer. After the computer has boot-up, it will display the AccuThermo RTP system *Main Menu*, as shown in figure 6-4.

CAUTION

The AccuThermo® RTP unit should always power up before the computer boots. This will guarantee the computer and the AccuThermo® RTP unit will be in sync.

Figure 6-4: *Main Menu*

6.4.3 FACILITY TESTING AND ADJUSTMENTS

Step 15. Turn on the cooling water. Verify it is set to the proper flow rate, pressure, and temperature.

Step 16. Turn on the quartz isolation tube cooling air (CDA/nitrogen). Verify it is set to the proper flow rate and pressure.

Step 17. Open the chamber door about 1 cm.

CAUTION

Open the chamber door 1 cm prior to turning on the system. This will ensure the quartz chamber will not over pressurize if there is a problem with the gas system.

Step 18. Turn on the gas valves. Verify the input pressure is set to the proper pressure.

6.4.4 MANUAL MODE TESTS

Manual mode installation tests consist of two procedures. The first procedure tests the chamber control and the second procedure ensures that the chamber is communicating with the controller.

Computer Communication and System Control Test

This test verifies the AccuThermo RTP system lamps are turning on properly and that there is communication between the computer and the AccuThermo RTP oven unit.

Step 19. Power to the AccuThermo® RTP system and the computer should already be turned on. The AccuThermo® RTP control software should be running.

Step 20. Turn on the cooling water and cooling air (CDA/nitrogen).

Step 21. Select Diagnostics from the *Main Menu*.

Step 22. Click on the water valve icon. The water flow should stop. Click on it again to make the water flow.

Step 23. Click on the air valve icon. The air flow should stop. Click on it again to make the air flow.

Step 24. Open and Close the chamber door. The indicator "**Door Close**" should change from green to gray when the door is opened.

Step 25. Set 3 to 5 slpm of nitrogen flow to ensure tube purging. Observe that there is gas flow being displayed on the Diagnostics screen.

Enable the lamps.

CAUTION

When testing manual lamp control, carefully watch the TC temperature so it does not rise above 500°C.

Step 26. Load a TC wafer into the oven and connect it to the TC connectors on the inside of the chamber door, observing proper polarity (refer to section "*Install and Test the TC Wafer*" in the ***Service*** manual).

Step 27. Turn on the lamp power using the front panel **Lamp Power** switch. The green Lamp ON light indicates the lamps are enabled. You will also hear a loud "clunk" when the switch is turned on. This is the sound of the contactor engaging.

Step 28. Enable the lamps by clicking on the button with the lamp icon. The lamp should turn red.

Step 29. Set the lamp intensity to 5% and watch for a rise in TC temperature on the display and the appearance of light from the lamp sockets. After you have observed a rise in temperature, disable the lamps.

Step 30. If you do not notice a rise in temperature, call AllWin21 Field Service for assistance. Telephone numbers are listed in the front of this manual.

Step 31. If the results of this test are correct, the system installation has been completed and the tool can be placed into operation.

Step 32. END OF PROCEDURE

Refer to the ***Operational Manual*** for complete instructions on AccuThermo RTP system operation, recipe creation, and optimization.

Refer to the ***Service Manual*** for complete instructions and assistance on AccuThermo RTP system tool troubleshooting.

CAUTION

Do not operate the system under pyrometer control until the pyrometer cooling water temperature has stabilized.

6.5 SYSTEM OPERATION

During system operation, be aware of the following:

- The cooling subsystems (water and air) must be used at all times and should be operational for at least 5 minutes following the last cycle of the lamps.
- Experimental substrates contain unknown impurities which may outgas during processing.

WARNING

Allwin21 cannot anticipate the number and variety of materials a user may experiment with, and is not responsible for any potential hazards which may result from wafer outgas.

CAUTION

Make sure both Water Cooling and Air Cooling are on before enabling the lamps or running a process. Cooling both the chamber and quartz isolation tube is very important to prevent breaking the quartz isolation tube and destroying the water seals.

CAUTION

Do Not Power-Down the AccuThermo RTP system unless it has been more than 5 minutes since the last use of the unit. Let the system cool down with cooling water and cooling air.

NOTE

The pyrometer chiller should be left on to ensure a quick start-up for the next time the system will be used.

APPENDIX

A: PROBLEM REPORTING

Email the following problem report to: info@allwin21.com

Give a brief description of the problem in the subject line in 8 words or less.

PROBLEM REPORT

Contact Name			
Company Name			
Address			
Telephone		*Email*	

Equipment Model		*Equipment Serial #*	
Equipment Designation Name (name you refer to machine)			

Date	
Software Version	
Problem	

Electrical	*voltage*		*# of phases*	
	wire size		*circuit breaker size*	
	line frequency			
Chamber Cooling Water	*flow rate*		*inlet temperature*	
	inlet pressure		*diff. press.*	
Cooling Air	*flow rate*		*tubing diameter and length*	
	pressure			
Pyrometer Cooling Water	*temperature*			
Process Gas	*pressure*		*tubing diameter and length*	
Process Exhaust	*negative pressure*			
Pneumatic Air	*pressure*			

Please give as much detail and information as possible to replicate the problem at our facility.

When you comment on an issue that involves the software (example: error 0007), tell us:

- *How did the error occur?*
- *Is it repeatable?*

Take a picture of the ENTIRE screen and send it to us. There are much more information on other areas of the screen that may help us determine the problem.

B: HOW TO ORDER / RETURN EQUIPMENT

The information contained in this appendix includes the following:

- How to order equipment and parts
- How to return parts
- How to exchange parts
- What to do when the system is down
- Service Agreements

B.1 HOW TO ORDER EQUIPMENT AND PARTS

To order parts from Allwin21 Corporation, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-778-7788

To obtain a quote and information concerning part availability, please have the following information ready:

- System model number (example: AccuThermo AW610)
- Serial number of the system
- Part number of the required part
- Purpose of order (spares, failed part, etc.)
- "Ship To:" address
- "Bill To:" address
- Purchase order number

B.2 HOW TO RETURN PARTS

NOTE

An RMA (Return Material Authorization) number must be obtained from AllWin21 prior to shipping any parts back to AllWin21.

A Return Material Authorization (RMA) Number is required in order to return or exchange system parts. To obtain an RMA number, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-778-7788

Return any failed parts to the following address:

Allwin21 Corporation
220 Cochrane Hill
Morgan Hill, CA 95037
Attn: RMA # _____

Ensure that the RMA (Return Material Authorization) number is included with any returned part(s). Include the following information with the part:

- System model number (example: AW610)
- Part number of failed part
- Detailed failure information
- Serial number of system and of the failed parts (if applicable)
- "Ship To:" address
- "Bill To:" address
- Purchase order number
- RMA (Return Material Authorization) number

As the customer, it is your responsibility to return the part(s) in a proper packing container. Failure to return the part properly could result in further damage to the part.

NOTE

The RMA (Return Material Authorization) number must be visible on the outside of the package when returning a failed part. Allwin21 Corporation will not accept returned parts without an RMA number. This could result in the sender being billed for the full purchase price.

B.3 HOW TO EXCHANGE PARTS

After troubleshooting to isolate a failed part, replace the part with a site spare if one is available. If the system is down due to an isolated failed part and no site spare is available, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-778-7788

Contact Allwin21 Field Service to properly identify the failed part. Allwin21 will issue an RMA (Return Material Authorization) number to you which must be included when the failed part is returned. The failed part MUST be returned to Allwin21 within ten (10) days in the proper packing container or the full purchase price will be billed. Replacement parts under warranty are shipped out in the timeliest manner possible.

All returned parts must be shipped in the same packing material as the replacement part. Failure to return the part in the proper packing container could result in further damage to the part.

B.4 WHAT TO DO WHEN SYSTEM IS DOWN

If the system is down and you cannot isolate or fix the problem within a reasonable period of time, call Allwin21 Corporation Customer Service for telephone assistance or a service visit. Telephone numbers are staffed by trained Allwin21 Corporation technicians, who can provide on-the-spot help with difficult problems and advice on repairs.

Allwin21 Corporation
Customer Service
Phone: 1-408-778-7788

B.5 TIPS FOR TROUBLESHOOTING

- Solve the real problem. Do not create one or more new problems to solve existing problem.
- Face the problem. Do not escape from the problem.
- Find the problem (if you find the problem, the problem is already 50% resolved)
- Find the root causes and reasons the problem exists.
- Follow the protocol and standards.
- Follow the documents.
- Double check, triple check.
- Ask if you are not sure.

B.6 RULES FOR EQUIPMENT MAINTENANCE

- Treat all the connectors like eggs. Never "drop" the connector on the ground or on any other hard surface.
- Pull out a PCB board at least 30 seconds after turning off the machine.

  dU=dI/dt,
  Even at a very low leakage current, the voltage will be very high when the PCB is removed too soon. Many boards are damaged due to this phenomenon.
- Turn on the machine at least 10 seconds after turning it off. This is because the inductance circuit is still at a high voltage after the machine was turned off. Many machines get problems after being shut down and then turned on too quickly.
- Always check facility condition before turning on the machine.

B.7 EQUIPMENT TROUBLESHOOTING EXPERIENCES

- >80% of equipment down time is caused by connectors. There are many kinds of reasons for bad connections:

a. loose connectors
b. corroded or oxidized pins of the connectors
c. broken wires in the cable

- >90% of RF problems are caused by the RF cable and connectors.
- >75% of machine down time is caused by wafer transport.
- >95% wafer breakage problems is caused by wafer transport.
- Do not think there is a big issue in the problem first; always think and start from small issue first.

C: MAINTENANCE PLANS

C.1 EXTENDED MAINTENANCE PLANS

AllWin21 commitment to customer support carries on past the warranty period. By offering a choice of extended maintenance plans, we can satisfy most of your service requirements. Contact Allwin21 Field Service or Sales Administration for more details.

C.2 SERVICE TRAINING

AccuThermo system uptime may be increased dramatically by having trained in-house personnel and spare parts kits. Operator and Service training (a one day course) are available at Allwin21 for a fee. These courses cover the following types of information:

- System overview
- Operation
- Software use
- Recipe construction
- Temperature control and optimization
- Preventive maintenance
- Electronics operation and troubleshooting
- Temperature monitoring using the thermocouple and pyrometer

Students are usually Applications Specialists, Equipment Engineers, System Operators and Maintenance Technicians. Emphasis is on hands-on work, as the classes are small and allow personalized instruction.

D: MANUAL REVISION HISTORY

Date	Rev.	Description
Nov. 2011	*G*	*Initial Release; split from the Technical Manual*

INDEX

S

T

W