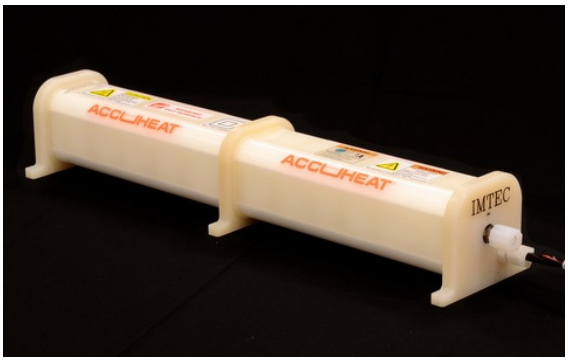
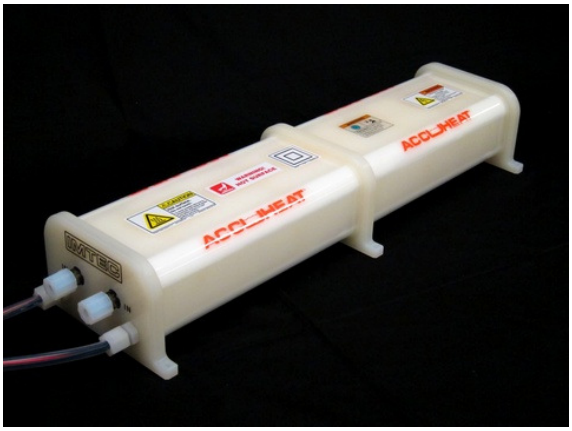
IMTEC





ACCUHEAT®

G-SERIES GAS HEATERS

MODELS 3500 AND 7000

INSTRUCTION MANUAL

PART NUMBER 10-018-0038

CE

UL REGISTERED FIRM
ISO 9001
A4203

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Manual Part Number:	10-018-0038
Release Date:	5/15/2017

Instruction Manual Revision History

Date	Section	Description
5/15/2017	Entire Manual	Initial release of gas heater manual. Released new manual part number.

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PREFACE

This preface includes the following topics:

- intended use and audience
- basic safety considerations
- customer support
- conventions used in this manual
- how this manual is organized
- standard IMTEC Accuheat warranty
- table of contents

CAUTION	
	**USING IMPROPER CONFIGURATION VALUES CAN CAUSE PRODUCT OR EQUIPMENT DAMAGE** Do not enter set-up or configuration values outside the specified range for any given heater or optional device. To do so may seriously damage your product or equipment.

Intended Use of this Equipment

IMTEC's Accuheat G Series Heaters are not to be used for any purpose other than for which they were designed. What product is to be produced and how the heater and any optional equipment are to be configured for the allowed processing chemicals and parameters are stated in this Instructions Manual.

Intended Audience

The level of detail in this manual assumes you have previously been trained to install, operate and maintain these systems.

This document supplements that training and addresses the comprehensive needs of Process Engineers and Maintenance personnel. After reading and understanding this information, Process Engineers are responsible for disseminating the appropriate level of information to their Equipment Operators.

Safety Considerations

Your company's policies and procedures for safely operating any of the Accuheat G Series Heaters supersede the safety considerations listed below. It is your responsibility to follow your company's safety procedures. If there are none, follow those established by OSHA, NEC, DEQ, and/or the DOT, as a minimum.

Environmental Information

The following laws and regulations are applicable to the operation and maintenance of IMTEC's Single Tube Accuheat Systems.

- Air Emissions are regulated under the US Clean Air Act and local regulations applicable to the emissions of acids, bases and organic compounds.
- Wastewater emissions are regulated under the US Clean Water Act and applicable local pretreatment regulations.
- Solids contaminated with acids and other chemicals are regulated as hazardous wastes.

General Safety

- Never open or disassemble the heater housing. There are no serviceable parts inside the tube.
- Do not attempt to work on or with hazardous gasses or electrical equipment without proper safety training and certification, and personal protective equipment.
- Lockout and tag the electrical and/or gas systems before any repair or replacement tasks. Refer to this Instructions Manual for this equipment and your company's safety policies and procedures for repair instructions.
- Before attempting any procedures, know how to perform emergency first aid response for electrical shock and exposure of hazardous gasses.
- Review & understand emergency escape routes to safe areas.

Electrical Safety

- During periods of lightning activity, do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration.
- Before attempting any procedures, locate the main electrical source and understand how to safely control it.
- Whenever possible, disengage the heater and optional devices from their electrical sources before attempting repairs.
- Notify nearby personnel that you are attempting to operate or service this equipment. Follow your company's lockout and tagout operating procedures.

Environmental Safety

- Never attempt operations or repairs involving hazardous gasses alone. Always have another person within sight and voice range.
- Always use appropriate personal protective equipment.

Before Powering Up the Heater

- Understand the system's alarm indications and automatic system interlocks (refer to Section 2, *Safety Requirements*).
- Ensure that all safety devices in the work area are properly installed and functional.

Cleanroom Requirements

Specific cleanroom requirements can vary widely according to the class rating, i.e., Class 10, Class 100, etc. IMTEC's products qualify as Class 1. While performing maintenance or operating the system, follow your company's policies and procedures for this equipment.

Customer Support

In the case of emergency or equipment failure, refer to the **Emergency Contact Form** (under separate cover).

For assistance in operating, troubleshooting, or maintaining your heater, refer first to this and any other manuals supplied to you by IMTEC. If these manuals do not address your specific question, please contact IMTEC Customer Service:

IMTEC Acculine, LLC. 49036 Milmont Drive Fremont, CA 94538	Phone: (510) 770-1800 Fax: (510) 770-1400
Email: imtec@imtecacculine.com	From 8:00 a.m. to 5:00 p.m., PST, Monday through Friday

When calling, please be at the system, if possible, and be prepared to give a detailed description of the problem.

Customer (EHS) Contact Information

In the event that IMTEC needs to contact the customer regarding EHS issues related to the Accuheat In-line heater, they will use the contact provided on the Purchase Order or that provided on a returned warranty registration card. In the event the equipment is moved to a different location you can send new contact information via mail to IMTEC's address above. Please note company name, address, product serial number, and contact information.

NOTE
Review your contract warranty statements regarding specific instructions for receiving help.

Preventive Maintenance

Weekly:

1. Visually inspect the heaters housing. Discoloration or structural distortion near the outlet may indicate an overheating condition.

2. Visually inspect the gas tubing and flaretek nuts. Ensure that there is no sign of distortion or leakage.

Conventions Used In This Manual

1. The word “WARNING” when used in warning boxes is defined as: **IMPROPER USE OF THIS EQUIPMENT CAN CAUSE SEVERE INJURY OR PRODUCT DAMAGE!**
2. The word “CAUTION” when used in warning boxes is defined as, **POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!**
3. The following **WARNING** and **CAUTION** boxes are samples used to identify potential hazards that could occur if the heater is used improperly or if unsafe practices are followed.

WARNING		
	**IMPROPER USE OF THIS EQUIPMENT CAN CAUSE SEVERE INJURY OR PRODUCT DAMAGE!** To ensure operator, equipment, and product safety, follow the instructions and use care when operating this equipment.	

CAUTION	
	**POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!** Equipment or product damage can occur if care is not taken.

A **NOTE** box highlights special information.

NOTE
Specific information is placed in a NOTE box when clear procedural understanding is essential.

The following conventions are used throughout the manual:

Data entries on pictured control screens or menus. Unless stated otherwise, all example values on pictured data entry

screens are for display purposes only and were not intended to be considered as recommended values for your equipment.

Boldface text indicates the actual words used in a screen command or on an equipment label.

How To Use This Manual

The level of detail in this manual, and listed below, covers the necessary information to install, operate, maintain, and service Single Tube Accuheat Systems.

Instruction Manual Revision History Page: details any changes made to the manual, the date the change took place, and what specific information was changed, added or deleted. If changes or updates are added to your individual manual, a new Revision History Page will be sent to you along with those changes.

Preface, includes the intended use and audience, basic safety considerations, customer support, conventions used in this manual, how this manual is organized, standard IMTEC Accuheat warranty, and a table of contents.

Section 1, ***Introduction***, is a description of the various models for the Accuheat Single Tube Systems including: a theory of operations, specifications, and facility requirements.

Section 2, ***Safety Requirements***, is a detailed description of all safety features and their functions and interactions.

Section 3, ***Unpacking Procedures***, lists the procedures for inspecting and unpacking the Accuheat Single Tube Systems and optional equipment.

Section 4, ***Installation Procedures***, included is a set of drawings indicating the connections to be made specific to your system.

Section 5, ***Operating Instructions***, gives instructions on how to operate the heater and optional equipment after installation.

Section 6, ***Troubleshooting and Maintenance Procedures***, covers typical troubleshooting techniques, maintenance schedule and procedures. If the heater needs to be returned for servicing this section give instructions for removing the heater for preparation for repair.

Updates. In the event new information is required, such as, corrections or updates after shipment of this documentation, IMTEC will send this new information to you. Upon initial shipment of this manual this section will be empty.

Accuheat G-Series Limited Warranty – (Non-Warranty of Merchantability, Fitness and Limitation of Liability)

Terms and Conditions

1. IMTEC warrants the Accuheat In-Line Heater, whether new or remanufactured, to be free from manufacturing defects in materials and workmanship for a period of **one year** from the date of original shipment from our factory, with the following exceptions:
   - **IMTEC quartz ware is guaranteed to remain sound and whole in normal usage for a period of 45 days from the date of initial shipment.**

NOTE
"Remanufactured" applies to the complete rebuilding of a customer-owned Accuheat unit to new in-line heater specifications, including heaters, cable attachments, insulation and the like.

2. This Warranty, with the exception noted above, is limited as follows: In the event of a defect, IMTEC agrees, at its option, to repair or replace the defective unit or refund the purchase price and IMTEC's liability is limited thereto. Heaters repaired or replaced under warranty will bear the remainder of the original equipment warranty.
3. All repairs must be made at IMTEC's place of business. Buyer pays the cost of returning the product to IMTEC's factory. Any such return must be pre-authorized by IMTEC using issuance of an IMTEC Returned Goods Authorization (RGA) number. The RGA number must be displayed on the returned merchandise. It is the buyer's responsibility to retain the original packing materials or to obtain authorized replacement packing materials from IMTEC should the heater ever need to be returned to the factory. Refer to Section 6, *Maintenance Procedures*, for the Returned Goods Authorization procedures.
4. The period of warranty commences as of the date of shipment from IMTEC.

Warranty Exclusions

1. While other Exclusions may apply, IMTEC specifically does not guarantee, and accepts no responsibility for the following:
   - Failure caused by incorrect plumbing: for example, installing with flow opposite to the direction indicated in this manual and on the Accuheat housing.
   - Corrosion of the quartz components by non-compatible gasses.
   - Damage as a result of misuse of the IMTEC-supplied Power Modulator.
   - Failure to use the power modulator will void all warranty unless specifically authorized by Imtec.
   - Damage as a result of operating the Accuheat outside the specified limits.
   - Customer modifications to the housing, electrical circuitry, safety sensors and/or accessories;
   - Improper transportation, handling, or installation damage, including, but not limited to, insufficient air gap around the perimeter of the Accuheat; insufficient support of plumbing lines, creating stress on the plumbing connections; use of plumbing nuts other than those supplied with the unit; placement of the Accuheat in a corrosive environment; immersion of the Accuheat in water or other fluids.
   - Unauthorized customer modification to any portion of the system.

NOTE
Unauthorized customer modification(s) may void all warranties.

Damage Related to Shipment

It is the buyer's responsibility to carefully inspect each quartz Accuheat In-Line Heater upon receiving it and to determine if any breakage has occurred during shipping. Claims for quartz found broken in shipment are not the responsibility of IMTEC and should be submitted to the freight carrier. IMTEC recommends such claims be submitted within 5 days of Receipt of Shipment.

Packaging

It is the buyer's responsibility to retain the original packing materials or to obtain authorized replacement packing materials from IMTEC should the equipment ever need to be returned to the factory.

In Conclusion:

NOTE
IMTEC does not warranty merchantability or fitness for any purpose and there are no warranties, expressed or implied other than those expressly stated in this document. IMTEC is not responsible for any consequential, incidental or other damages whatsoever. IMTEC's liability is limited to the repair or replacement of such defective product OR refund of purchase price, at IMTEC's sole option, as stated above. All claims must be made in a timely manner and within the warranty period to be considered valid. Please contact IMTEC at:
IMTEC® Acculine, LLC. **49036 Milmont Drive** **Fremont, CA USA 94538** **Telephone: (510) 770-1800** **Fax: (510) 770-1400** **On the Web at: *www.imtecacculine.com*** **E-mail: *imtec@imtecacculine.com***

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Preface

1. Introduction

2. Safety Requirements

3. Product Inspection

4. Installation Procedures

5. Operating Instructions

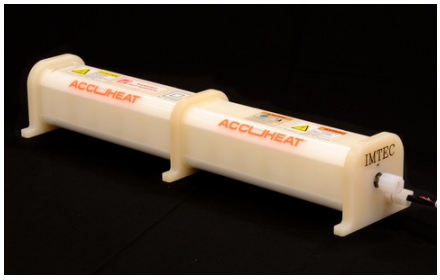
6. Troubleshooting and Maintenance Procedures

Appendix A

Drawings and Schematics

Updates

NOTE
The Updates section will be empty if this is the Initial shipment of this manual. Updates will follow at the discretion of IMTEC.



1 INTRODUCTION

This section describes the IMTEC Accuheat G-Series of In-Line Heaters. This series includes the Model 3000 and 7000. This section includes the following information:

- Overview of the basic models
- Components Overview
- Specifications
- Facilities Requirements

1.1 Overview – Basic Model

The Accuheat G-Series is an efficient in-line gas heater combining low cost-of-ownership with an extended service life. these models have all-quartz heated surfaces for process purity and can be applied to a number of uses, including Nitrogen, Argon, CDA, and the heating of any gas which is quartz-compatible.

These heaters conductively transfer heat for better efficiency and their low-mass heater arrays minimize temperature overshoot. The proprietary gas flow pattern is designed for optimal heat transfer, so the Accuheat can be used for a wide range of flow conditions.

1.1.1 Power Modulators

The basic purpose of the power modulator is to extend the life of the heater. The standard power modulator assures that the heater element does not exceed 300°C.

The purpose of the power modulator is to allow the heater to provide as much heat to the process gas as possible in varied applications without overheating.

Since process temperatures vary with the type of gas and flow rate the IMTEC heater is capable of providing the maximum amount of heat for any application. When heat is applied beyond where it can be absorbed, the element temperature rises. When the heat reaches the setpoint of the power modulator, the signal to a correctly wired power relay is interrupted until the element temperature drops down below the setpoint where it once again allows the power relay to energize.

It is important to know that the surface temperatures where the gas contacts the quartz will be much higher than measured in the outflowing gas.

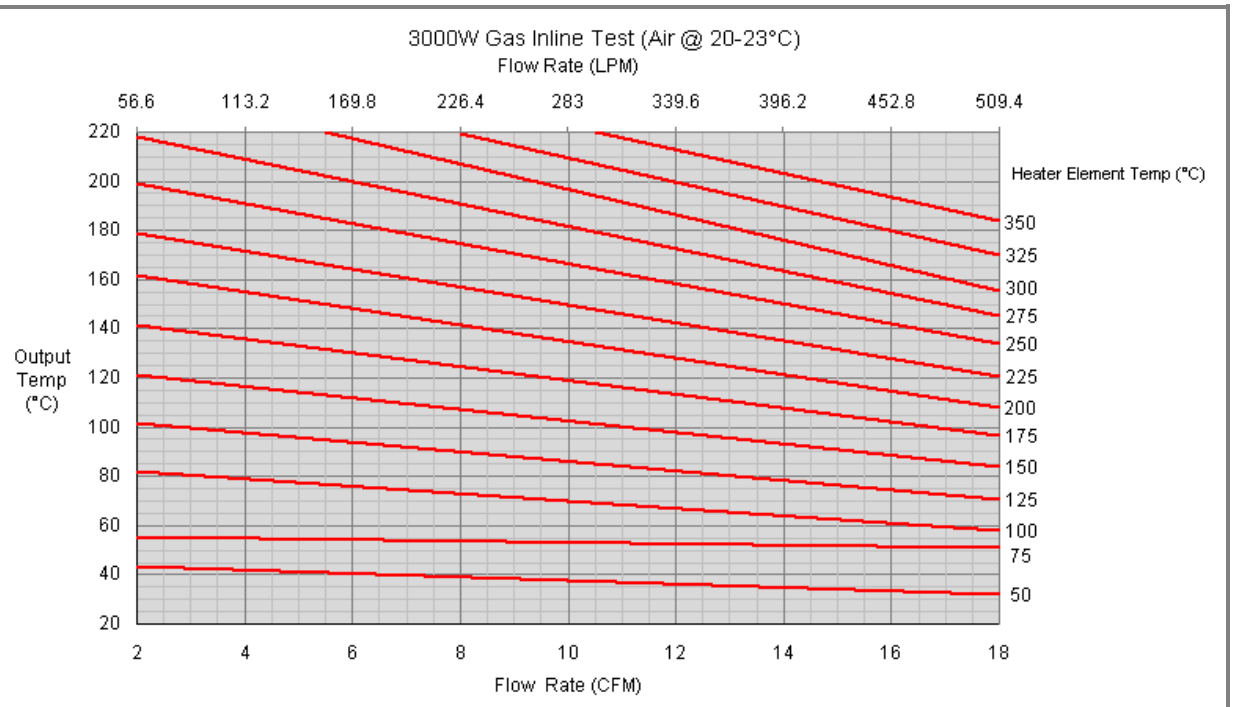
1.2 Theory of Operation – Heat-Up Times

The heat-up time curves in the following figure, reflect the Δt between inlet and outlet at various flow rates using an Accuheat G-series gas heater operating with clean dry air. The results do not include heat loss from plumbing or other system components. A Model G3500 was used to for these tests with a line voltage of 208V. Heat-up rates will vary with the voltage used.

WARNING

BURST HAZARD

Do not exceed 60 PSI / 414 kPa operating pressure and 392° F / 200° C operating temperature.



Typical Heat-Up Times.

1.3 Specifications

The specifications included in this section are for general use only. A model specific drawing and schematic is included with each heater. Refer to these drawings when working with the heater.

1.3.1 Environmental Specifications

Environmental Temperature	In door use only at 5°C to 40°C
Environmental Humidity	Maximum relative humidity is 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Altitude	Up to 2000 meters (6561.66 feet).
Supply Voltage	MAINS supply voltage fluctuations up to ±10% of the nominal voltage. Transient over voltages typically present on the MAINS supply.
Pollution	Applicable rated pollution degree 1

1.4 Facilities Requirements

The Accuheat G-Series heaters are designed to work anywhere in the range of 200-240VAC. Wattage will be dependent on supply voltage. The table below provides information on typical USA and International voltages.

Facilities Requirements				
Model	**Line Voltage**	**Wattage**	**Minimum Recommended Circuit Breaker**	**Draw / wattage**
Model 3500	**208V** (AC 1ϕ) 50/60 Hz.	3000	20A	14.5
	240V (AC 1ϕ) 50/60 Hz.	4000	25A	16.6
Model 7000	**208V** (AC **3**ϕ) 50/60 Hz.	6000	40	28.9
	240V (AC **3**ϕ) 50/60 Hz.	8000	*45*	*33.4*
Modulator Power	**Input** is 24VAC ± 10%, 50-60 Hz ± 5%, 10 VA (watts) maximum power consumption. **Output** is 8 amps at 240VAC or 30 VDC maximum resistive load or 250VA pilot duty, 120/240 VAC maximum inductive load.			

This concludes Section 1, *Introduction*.

2 SAFETY REQUIREMENTS

The following recommendations and requirements are included for personal and equipment safety. Please read them completely before installing and operating your Accuheat in-line heater system.

NOTE
These recommendations are advisory in scope. ***IMTEC assumes no responsibility for the correct or incorrect installation or use of this equipment in any user's facility***. IMTEC recommends that installation of this equipment be confined to licensed contractors, OEM-provided personnel and/or trained Facility Maintenance personnel.

Ensure you are familiar with your company's Equipment Safety Regulations and Specifications, the local fire marshal codes and applicable electrical code requirements for compliance.

CAUTION	
	**USING IMPROPER CONFIGURATION VALUES CAN CAUSE PRODUCT OR EQUIPMENT DAMAGE** Do not enter set-up or configuration values outside the specified range for any given heater or optional device. To do so may seriously damage your product or equipment.

IMTEC's Accuheat G Series Systems are not to be used for any purpose other than for which they were designed. What product is to be produced and how the heater and any optional equipment are to be configured for the allowed gasses and parameters are stated in this Instruction Manual.

2.1 Emergency Contact

In the case of emergency or equipment failure, refer to the **Emergency Contact Form** (under separate cover). For assistance in operating, troubleshooting, or maintaining your heater refer first to this and any other manuals supplied to you by IMTEC. If these manuals do not address your specific needs and questions, please contact IMTEC Customer Service:

IMTEC Acculine, LLC. 49036 Milmont Drive Fremont, CA 94538	Phone: (510) 770-1800 Fax: (510) 770-1400
Email: imtec@imtecacculine.com	From 8:00 a.m. to 5:00 p.m., PST, Monday through Friday

When calling, please be at the system, if possible, and be prepared to give a detailed description of the problem.

2.2 Electrical Safeguard Recommendations

Refer to this section and the attached schematics for electrical safety information on the heater. Refer to the controller manufacturer's documentation for electrical safety information and recommendations.

The Equipment that this heater will be installed in must have a Semi S2-approved EMO circuit, where "*the EMO actuator (button), when activated, must place the equipment into a safe shutdown condition, without generating any additional hazard to personnel or the facility*". The EMO actuator is required to be installed in close proximity to the equipment and within easy reach of the operator and is required to be marked as a disconnect device according to S2-approved regulations.

Some G-Series heaters have multiple heater elements. If you are using one circuit breaker and/or control relays for multiple elements, the rating of the breaker may exceed the current capacity of the heater wiring. Where this occurs, the elements should be individually protected by a fuse or other appropriate protection device. It is the responsibility of the customer to ensure that all wiring in the circuit is properly rated and protected.

WARNING

DANGEROUS VOLTAGE IS PRESENT!

Hazardous voltages exist. To minimize risk of electrical shock, do not open the heater housing. Use caution around exposed circuits. Check area for exposed contacts prior to contacting this equipment.

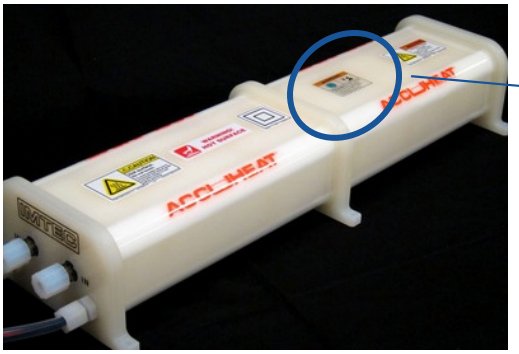
To ensure operator, equipment, and product safety, use care when operating this equipment. The following warnings must be adhered to.

- The Accuheat comes with safety devices. For your safety and to ensure the Accuheat works as designed, do not disconnect or modify them. Report any malfunctions to IMTEC Customer Service.
- The heater's housing is made of PVDF: avoid any chemicals that could attack this material.
- The use of a GFCI protection device is required for safe operation of the In-Line Heater. The reference ground provided is not intended for use as a safety ground.
- Some heater models use multiple heater elements that may be powered from a common electrical supply. In this case the current rating of the supply circuit breaker may exceed the current rating of the individual heater wires. Where this is the case, each heater element must have its own circuit protection.

2.3 In-Use Safety Precautions

CAUTION	
	**HOT SURFACES!** Surfaces may be as hot as 200°C. Do not move the heater or touch the hot surfaces of the heater.

The following warning labels are placed on the equipment. Adhere to these safety labels. Do not exceed the label's recommend operating pressures or temperatures.



Burst hazard. Do NOT exceed 60 PSI/414 kPa operating pressure

CAUTION

Hot Surfaces.
Do Not Touch.
Hot surfaces inside. Do not touch. To avoid possible skin burns, disconnect and lockout power and allow surfaces to cool before servicing.

WARNING

Hazardous Voltage Enclosed
Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lock out power before servicing.

The In-Line Heater must be enclosed in a secondary containment area that will prevent exposure to hazardous gasses in the event of a leak. It is strongly advised that this enclosure be protected with interlocks to prevent operation if the enclosure is not properly sealed.

Read, understand, follow and implement the following general warnings and cautions during the use of this system.

GENERAL WARNINGS	GENERAL CAUTIONS
	• Ensure that all protective sensors and automatic shutdowns are attached and functional. • Take extra care when using volatile flammables: fumes are more dangerous than liquids. • The heater's housing is made of PVDF: Avoid any chemicals that could attack this material. • **DO NOT** apply power to the heater without gas flowing through it. • An over-temperature safety controller is required for installation. Specifications for this device are can be found in this manual. • There are no specific procedures for shutting-down the heater, except for maintaining gas flow. Ensure heater power is shut down while the gas is still flowing. Then maintain flow for at least one minute to ensure withdrawal of stored heat from the heater.

2.3.1 Environmental Specifications

Environmental Temperature	In door use only at 5°C to 40°C
Environmental Humidity	Maximum relative humidity is 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Altitude	Up to 2000 meters (6561.66 feet).
Supply Voltage	MAINS supply voltage fluctuations up to ±10% of the nominal voltage. Transient over voltages typically present on the MAINS supply.
Pollution	Applicable rated pollution degree 1

2.3.2 Power Modulator

This power modulator must be installed internal to an electrical enclosure.

2.3.3 Thermal Snap Switch Information

The snap switch is a self resetting thermostatic snap switch that is adhered to an aluminum block on outlet end of the quartz tube and will open if the temperature is exceeded. It is a critical safety device and must be incorporated properly to assure safe operation.

The snap switch trips at 288°C. Typically if there is gas flowing through the tube the switch does not trip. If for some reason, the flow is interrupted or too low for the set point temperature, the quartz that is not in contact with liquid may continue to increase in temperature without being sensed by other devices. If the snap switch reaches 288°C, then the snap switch will open. It is the integrators responsibility to use this switch as part of their control circuit. It typically would be hard wired so that it would remove all power to the heater and require acknowledgement/reset before power could be re-applied.

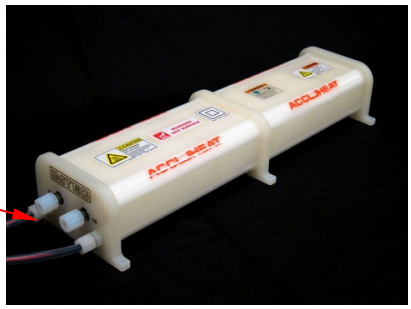
The snap switch UL rating for 6000 cycles is 6A at 120VAC or 1.5 amps at 240VAC. Non UL rating of 5000 cycles for 30VDC/AC is 7 amps.

3 PRODUCT INSPECTION

This chapter describes guidelines to follow when unpacking and inspecting the IMTEC Accuheat In-Line Heater and standard optional equipment.

NOTE
These guidelines have also been included with the shipping manifest attached to the outside of the shipping container.

3.1 Unpacking Considerations

CAUTION	
	**HANDLE WITH CARE!** Quartz, like glass, is fragile and breaks on impact. Handle as for any fragile quartz material. Protect the inlet and outlet tubes from impact at all times. Do not lift the heater by the nuts as these nuts are mounted directly on quartz fittings. Mishandling may result in non-warranty covered breakage (see below). **Do not lift the heater by the nuts or quartz stems.** 

3.2 Inspecting the Packaging

Before opening the shipping container, please look for evidence of transportation damage. It is your responsibility to notify the shipper promptly of any claims of freight damage. Please contact IMTEC also, so that we may be of assistance with an expeditious repair or replacement of the damaged parts.

CAUTION	
	**POTENTIAL EQUIPMENT DAMAGE!** Keep the IMTEC packaging and box in which the system and any options were shipped. If the system should ever need to be returned to IMTEC, it **must** be returned in an appropriate container to minimize risk of shipping damage. If the original container is not available, purchase a packing kit from IMTEC for a nominal fee.

3.3 Checking the Contents

The Accuheat In-Line heater's shipping carton will contain the following items.

Quantity	Equipment
1	Accuheat In-Line heater (model specific)
1	Standard Power Modulator
1	This Instruction Manual
2 or 4	Flaretek Nuts (Typically threaded onto the stems) Two for G3500 and four for G7000.
1	Warranty Registration Card (in an envelope)

NOTE
If any of the above items are missing, contact IMTEC immediately.

If the system is shipped consolidated with other components, check your receiving documents and / or additional manuals for a checklist of the pertinent items.

This concludes Section 3, *Product Inspection*.

4 INSTALLATION PROCEDURES

NOTE

The information provided in this section pertains to standard Accuheat models. Certain OEM specific models may have different plumbing and electrical connections in addition to other unique attributes. Where there are discrepancies between this document and your heater refer to the drawings and schematics that came with the heater.

This section includes the following topics:

- Controller Recommendations
- Plumbing Recommendations
- Installation Procedures
- System Schematics

4.1 Emergency Off (EMO) Recommendations

The heater is installed as an internal device within the host equipment. The heater receives its electrical power from the host equipment. The host equipment must provide EMO devices to remove all power including removing power from the heater. This EMO device must be installed close to the equipment and within easy reach of the operator.

The host equipment must connect the over temperature and thermal snap switch to a Semi–compliant safety interlock circuit that will remove the power to the heaters if the maximum settings are exceeded for the thermocouple or if the thermal snap switch opens. Refer to Section 4.4, *Installation Procedures*, for power modulator wiring information.

4.2 Controller Recommendations

A controller is necessary for process temperature control and over-temperature protection. If you use a non-IMTEC controller, that controller must drive a separate relay circuit for heater power. The relay circuit should have a primary and secondary relay in series for the line supply to the heaters, with a SSR or other sufficient, high-cycle rated switching relay used as the primary, and a simple electromagnetic-closed secondary safety relay.

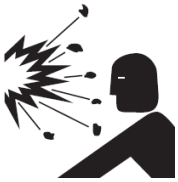
The over-temperature controller should be capable of reaching and maintaining a 340° setpoint.

4.3 Plumbing Recommendations

The quartz fittings are “flared tube” and accommodate 3/8” OD Teflon tubes flared by means of a Flaretek™ flaring tool, or equivalent. All plumbing connections and fittings must be supported to eliminate any strain on the heater’s quartz plumbing connections. Recommended continuous operating pressure is no more than 40psi (275 kPa, 2.81 kg/cm^2, 2.76 bar).

The direction of the flow is critical to safe operation. Make sure to observe in and out markings on the heater housing.

Never allow the quartz tube to become over pressurized. Read and understand the warning below.

WARNING		
	**BURST HAZARD** Never configure the recirculation loop with valves that could close on either side of the heater and prevent a release of pressure. If a reactive chemistry is allowed to be sealed inside an inline heater with no pressure relief, a burst of the quartz can occur. Do not exceed 60 PSI / 414 kPa operating pressure and 392° F / 200° C operating temperature.	

When attaching tubing to the heater, allow for some expansion / contraction of the tubing during heat cycling. The tube should be allowed to expand/contract without putting any stress on the quartz stems.

4.4 Installation Procedures

Installation of any of the Single Tube Accuheat models are divided into these parts:

- Installing the Power Modulator
- Installing the Heater
- Connecting the Power Modulator
- Connecting the Heater Power And Sensors
- Connecting the Heater Plumbing

4.4.1 Installing the Power Modulator

CAUTION	
	**POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!** The **Power Modulator** must be electrically connected to the heater and used as part of the control circuitry, or the warranty is void! This device must be installed in an enclosure electrical compartment.

Install the Power Modulator in a chemical-free environment such as an enclosed electronics compartment of the equipment.

1. Drill and tap two 2.7 mm (0.106) diameter holes in the desired panel location. Mount the Power Modulator using two (2) #6 (M3.5) screws. IMTEC recommends mounting the modulator as close to the heater control relay as possible (Figure 4-2).

   Alternatively, this modulator can be DIN Rail mounted using DIN 50022, 35 mm X 7.5 (1.38-inch X 0.30-inch).

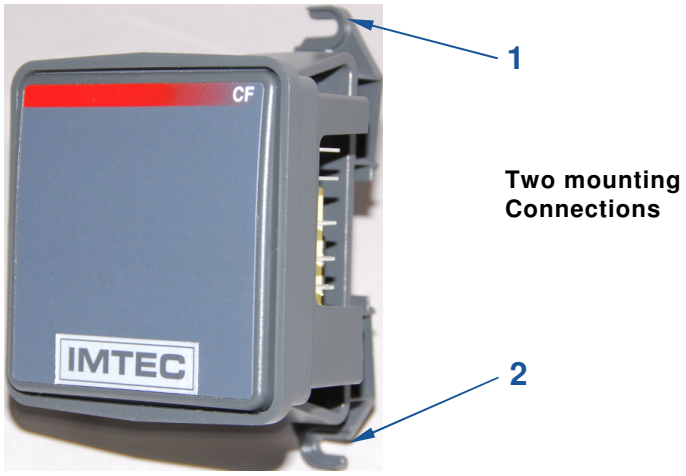


***Figure 4–1**. Power Modulator mounting connections.*

4.4.2 Installing the Accuheat In-Line Heater

There is no specified minimum or maximum distance from the point of use, but shorter runs of tubing will lose less heat and typically proved a more stable process temperature. Insulating the plumbing lines where possible will also help minimize heat loss.

Select a suitable location with a sturdy platform for mounting the heater. Heaters may be mounted vertically or horizontally. Make sure to check your specific model and follow the mounting instructions. Ensure all operating environment requirements are

adhered to as stated in Section 1.4, *Specifications*, and Section 1.5, *Facilities Requirements*.

CAUTION

POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!

A typical heater may be installed horizontally or vertically. If installing the heater in a vertical orientation, the “OUT” end must be oriented upwards. Please follow the instruction on the heater when installing vertically or warranty may be voided.

4.4.2.1 Horizontal Installation

1. Using six (6) ¼-inch diameter (6mm) screws (not provided), pre-drill (tapping as necessary) the mounting platform.

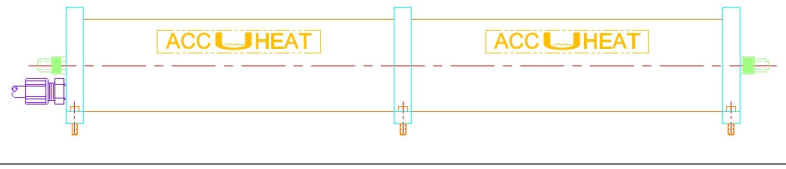


***Figure 4–2**. Side view of the Heater Horizontal Orientation Installation.*

CAUTION

POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!

Do not install the heater without a minimum of a 5-inch air gap clearance on all sides — heat buildup and / or heater failure may result.

2. Ensure that the heater has at least a 5-inch (12mm) air gap clearance on all sides.
3. Connect power and plumbing as described in Sections 4.4.3 and 4.4.5.

4.4.2.2 Vertical Installation

1. Using eight (8) ¼-inch diameter (6mm) screws (not provided), pre-drill (tapping as necessary) the mounting platform. Make sure that the Vertical installation label is facing up (Figure 4-4). Mount the Accuheat 6000 to the platform in a level position (±1° at both “x” and “y” axes).

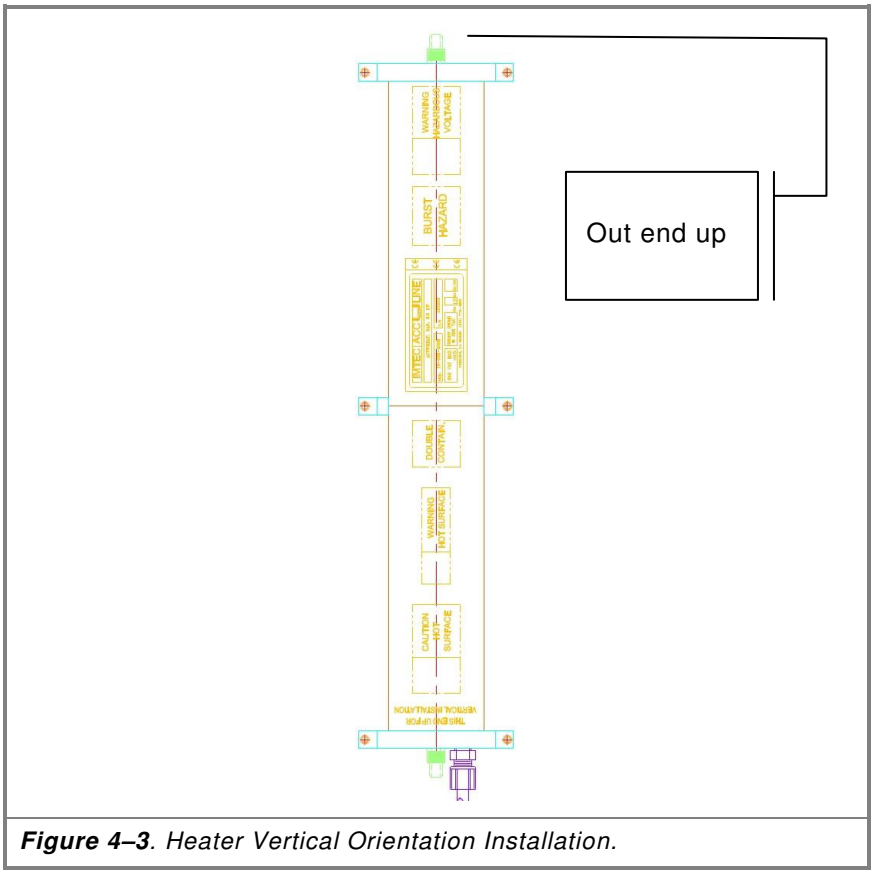


***Figure 4–3**. Heater Vertical Orientation Installation.*

CAUTION

POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!

Do not install the heater without a minimum of a 5-inch air gap clearance on all sides — heat buildup and / or heater failure will result.

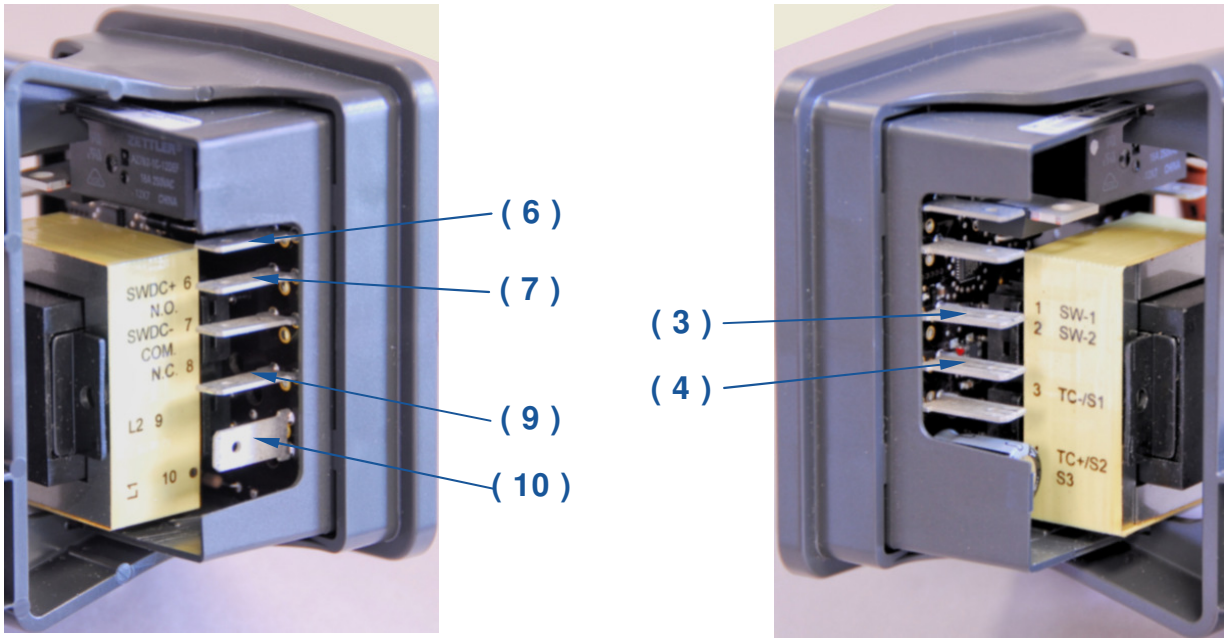
2. Ensure that the heater has at least a 5-inch (12mm) air gap clearance on all sides.
3. Connect power and plumbing as described in Sections 4.4.3 and 4.4.5

4.4.3 Connecting the Power Modulator

The Power Modulator is provided with 6.4 mm (0.25-inch) quick connect, push-on terminals. Refer to Table 4-1 below for power and connection descriptions.

***Table 4-1**. Power Modulator Output Specifications and Connections Descriptions.*

Modulator Power Input and Output Power Specifications	**Input** is 24VAC ± 10%, 50-60 Hz ± 5%, 10 VA (watts) maximum power consumption. **Output** is 8 amps at 240VAC or 30 VDC maximum resistive load or 250VA pilot duty, 120/240 VAC maximum inductive load. IMTEC part number 10-000-2367 for DIN Rail Mount – Spade Terminals, Type J-210 to 1038°C, Control Type-Heat (@300°C) 230-240VAC 50/60 Hz.



(3)	Position 3 – Thermocouple Negative (TC–)
(4)	Position 4 – Thermocouple Positive (TC+)
(6)	Position 6 – Normally Open Relay. (Switching relay contacts. To be wired in series with heater control signal so that when Power modulator relay opens, power to heater is interrupted.) (Switched to open when temperature exceeds 375°C)
(7)	Position 7 – Common (Switched to open when temperature exceeds 375°C)
(9)	Position 9 – Primary Power (VAC Voltage In)
(10)	Position 10 – Primary Power (VAC Voltage In)

4.4.4 Connecting the Heater Power and Sensors

CAUTION	
	**POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!** An over temperature safety controller is required for installation. If your heater controller has a separate overtemperature input compatible with a J-type thermocouple, a second safety controller is not necessary. A J-Type thermocouple is provided and the required set point is 340°C.

Electrical schematics have been provided with this manual to serve as the most common standards for electrical and control connection recommendations. Select the appropriate standard for your configuration and wire the system as indicated in the schematics. If your configuration does not match one of these standards, please contact IMTEC Customer Service for assistance.

Thermal Snap Switch Information:

The snap switch is a self resetting thermostatic snap switch that is adhered to the end of the quartz tube on the outlet side and will interrupt the control signal. It is a critical safety device and must be utilized to prevent equipment damage in certain fault conditions.

The snap switch trips at 288°C. Typically if there is gas flowing through the tube the switch does not trip. If for some reason, the tube is interrupted or too low for the set point temperature, the quartz may continue to increase in temperature without being sensed by other devices. If the sensore reaches 288°C, then the snap switch will open. It is the integrators responsibility to use this switch as part of their control circuit. It typically would be hard wired so that it would remove all power to the heater and require acknowledgement/reset before power could be re-applied.

The snap switch UL rating for 6000 cycles is 6A at 120VAC or 1.5 amps at 240VAC. Non UL rating of 5000 cycles for 30VDC/AC is 7 amps.

4.4.5 Other recommended safety devices

A gas flow switch should be incorporated on the outlet side of the heater to assure that gas is flowing any time the heater is on. How this switch is incorporated into the control system will depend on the application. The switch should have a normally open contact that is held closed by the gas flow and it should be made of materials compatible with the gas used at the maximum temperatures expected.

4.4.6 Connecting the Heater Plumbing

Accuheat Single-tube models require only two plumbing connections. It is important to follow the guidelines below.

1. Slip the tube nuts supplied with the heater onto the equipment 3/8-inch O.D. PFA tube.

NOTE
The Accuheat quartz stems require the use of Teflon Flaretek nuts. Replacement tube nuts are available from IMTEC. Reference P/N 10-005-0702.

2. For each fitting, flare the tube ends with a Flaretek or equivalent flaring mandrel and slip the ends of the flared tube over the quartz fitting.
3. Ensure that the flow direction corresponds to the “INLET” and “OUTLET” fittings as necessary. Failure to correctly plumb the heater will void the warranty.
4. Install the tube nuts and firmly hand-tighten the nuts. Do not use pliers.
5. Install brackets or other such support as necessary to eliminate any strain on the heater’s quartz fittings.

This concludes Section 4, *Installation Procedures*.

5 OPERATING INSTRUCTIONS

This section describes the operation of a typical Accuheat Single Tube In-Line Heater. The information includes:

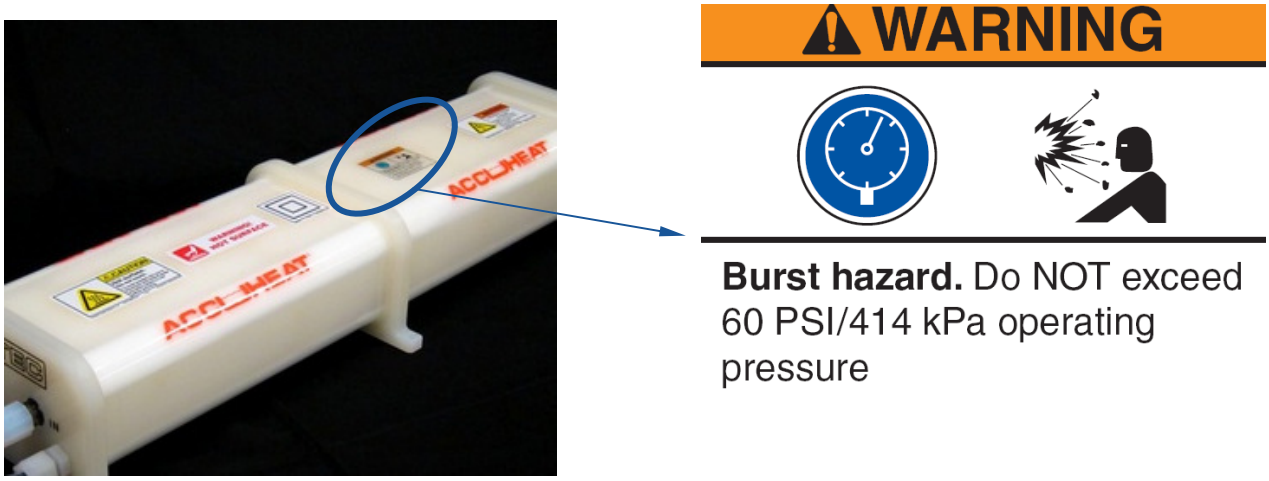
- Safety Precautions
- Controls and Indicators
- Ramp-Up
- Shut-down

5.1 Safety Precautions

As stated in Section 2, *Safety*, and re-stated here for your safety:

CAUTION	
	**HOT SURFACES!** Surfaces may be as hot as 200°C. Do not move the heater or touch the hot surfaces of the heater.

The following warning labels are placed on the equipment. Adhere to these safety labels. Do not exceed the label's recommend operating pressures or temperatures.



CAUTION

Hot Surfaces.
Do Not Touch.
Hot surfaces inside. Do not touch. To avoid possible skin burns, disconnect and lockout power and allow surfaces to cool before servicing.

WARNING

Hazardous Voltage Enclosed
Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lock out power before servicing.

WARNING

DANGEROUS GASSES MAY BE PRESENT!

The In-Line Heater must be enclosed in a secondary containment area that will prevent escape of hazardous gasses in the event of a leak. It is strongly advised that this enclosure be protected with interlocks to prevent operation if the enclosure is not properly sealed.

Read, understand, follow and implement the following general warnings and cautions during the use of this heater.

GENERAL WARNINGS

GENERAL CAUTIONS

- Ensure that all protective sensors and automatic shutdowns are attached and functional.
- Take extra care when using volatile flammables: fumes are more dangerous than liquids.
- The heater's housing is made of PVDF: avoid any chemicals that could attack this material.
- **DO NOT** apply power to the heater without fluid circulating through it.
- An over-temperature safety controller is required for installation. Please contact IMTEC Customer Service for specification.
- There are no specific procedures for shutting-down the heater, except for maintaining pump flow. Ensure that the heater power is shut down while the fluid is still recirculating. Then maintain recirculation for at least three minutes to ensure withdrawal of stored heat from the heater.

5.2 Controls and Indicators

The standard heater has no indicators or user controls. External controllers must be used with this equipment. Refer to the operating instructions of the external controller used with this application.

5.3 Ramp-Up

Ensure that gas is flowing before powering up the heater. Ideally, the INLET pressure at the heater should not exceed 40 PSI (275 kPa, 2.81 kg/cm^2, 2.76 bar). The absolute maximum is 60 PSI as stated on the product's warning label.

CAUTION

POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!

Do not power-up the heater unless there is gas flowing through it.

5.4 Shut-Down

There are no specific procedures for shutting-down the heater, except for maintaining gas flow.

Ensure that the heater power is shut down while the gas is still flowing, then maintain recirculation for at least two minutes to ensure withdrawal of stored heat from the heater.

This concludes Section 5, *Operating Instructions*.

6 TROUBLESHOOTING and MAINTENANCE PROCEDURES

6.1 Troubleshooting Procedures

Most problems related to heating involve the “non”-IMTEC supplied control system and interlock systems that are used in conjunction with the heater. Most troubleshooting is performed to determine if the heater has failed or whether the symptoms are related to an external system. The heater has no user serviceable parts inside and should never be opened for any reason.

The following table lists common symptoms, probable causes, and corrective actions.

Symptom	Possible Cause	Check	Corrective Action
Heater does not heat	No Power to the heater	When the control system is calling for heat, check for voltage to all heater elements. This should be checked at the end of the heaters power cable to eliminate all other connections and interlocks.	If no voltage is present, refer to the control system schematic provided by the tool maker for troubleshooting information. If there is voltage at the heater wires, measure heater resistance as noted below.
	Heater Element Failure	Disconnect the heater power wires from the control system and measure the resistance of the heater element(s) to see that they are within +/-10% of the specification. Refer to model specific information for specs.	If the resistance is in spec, the heater elements are good. If they are out of spec, the unit should be returned to Imtec for repair. In most cases, the heaters can be rebuilt.
Heater Snap Switch is open	No or insufficient flow	Ensure that gas flow through the heater is not interrupted and is sufficient for the temperatures requested.	Correct the gas flow and measure resistance of the heater elements to ensure they were not damaged. Once the heater has cooled the snap switch should reset.
	Defective Snap Switch	When the heater has been deenergized for at least 15 minutes, measure for continuity across the snap switch leads.	If the tube is not being heated and the snap switch reads open, it is defective. The heater should be returned to Imtec for repair.
Overtemp circuit has tripped	Improper Overtemp setpoint	Check to see that the Overtemp setpoint is a minimum of 25°C above the setpoint of the power modulator setpoint.	Raise the Overtemp setpoint accordingly.

Symptom	Possible Cause	Check	Corrective Action
	Defective Overtemp controller	This item is not supplied by Imtec. Refer to the documentation supplied with your tool for troubleshooting.	Repair or replace as necessary.
	One J-type thermocouple is defective	Connect both thermocouple leads to a thermocouple meter. With a cool heater both thermocouple should read within a few degrees of each other.	If the thermocouple is defective, the spare thermocouple may be used. If both are defective, the heater must be returned to Imtec.
	Power modulator is faulty	If both thermocouples check ok, the power modulator may be defective. Connect a J-type thermocouple simulator up to the power modulator and set for 10°C above it's setpoint. This should cause the interlock relay contacts to open.	If the contacts do not open the power modulator is defective and should be replaced. Contact Imtec for a replacement.

This ends the Troubleshooting Procedures. It the heater needs to be returned to IMTEC for servicing go to Section 6.3, *Removing the Heater.*

6.2 Maintenance Procedures

Monthly: Check to ensure that the plumbing connections at the INLET and OUTLET are tight.

Visually inspect the heater housing for any signs of overheating.

Quarterly: Check all heater safety interlocks to verify they perform as designed. Refer to the equipment control documentation for information on safety interlocks.

NOTE

There are no other maintenance procedures nor are there any periodic maintenance (PM) procedures necessary. The follow information readies the heater for returning it to the IMTEC factory for repair.

6.3 Removing the Heater

WARNING

DANGEROUS VOLTAGE IS PRESENT!

Hazardous voltages exist. Use caution around exposed circuits.

Check area for exposed contacts prior to contacting this equipment.

To ensure operator, equipment, and product safety, use care when operating this equipment. The following warnings must be adhered to.

- The Accuheat comes with safety devices. For your safety and to ensure the Accuheat works as designed, do not disconnect or modify them. Report any malfunctions to IMTEC Customer Service.
- The heater's housing is made of TFE Teflon: avoid any chemicals that could attack this material.

CAUTION

POTENTIAL PRODUCT OR EQUIPMENT DAMAGE!

A heater that has suffered an electrical failure may be returned to IMTEC for economical repair. However, breakage of the quartz will significantly increase repair costs and may result in the heater not being able to be repaired. Be particularly careful of the quartz flared INLETS and OUTLETS; carefully re-mount the knurled Teflon nuts to protect these quartz items.

1. Ensure all electrical power has been turned off to the heater
2. If the heater was used with any non-inert gasses, purge the heater with Nitrogen for at least one minute to assure no hazardous gasses remain.
3. Lock out and Tag out the electrical supply and then disconnect the heater wiring from any control systems.
4. Disconnect the tubes on the INLET and OUTLET.

5. Carefully re-mount the knurled Teflon nuts to protect the quartz stems.
6. Wipe down the housing externally with a damp wipe.
7. Remove any hold-down hardware.
8. Remove the heater.

NOTE

When returning the heater for repair, drain, dry, and repackage it as described in Section 6.4, *Return Authorization Procedures*.

6.4 Return Authorization Procedures

The following policies and procedures are for returning a heater for repair to the IMTEC factory

- Return Policies
- Obtaining a Return Authorization
- Packing the heater for return

6.4.1 Return Policies

1. All heaters should be returned in IMTEC shipping containers. If the original container is no longer available, a shipping container can be purchased for a nominal fee from IMTEC Customer Service.
2. All returned heaters must be authorized by an IMTEC representative. If a heater is shipped to IMTEC without a Returned Goods Authorization (RGA) number, the heater will be refused by the IMTEC Receiving Department and returned to the sender.
3. All freight charges are the responsibility of the shipper. Insure for full or repaired value.

6.4.2 Obtaining a Return Authorization Number

1. Please have the following information ready:
   - Serial number of the heater
   - Reason for the repair
   - Type of gasses used with the heater
   - Process temperature used
   - Repair Purchase Order Number (used for tracking; there can be no charge amount until the heater has been evaluated by IMTEC).

2. Call IMTEC Customer Service at 510-770-1800 and request an RGA number.
3. If needed, order a shipping container kit.

NOTE
Always follow your company's procedures for handling and shipping of chemically contaminated material. Follow any applicable local, state, and Federal laws in regards to shipping chemically contaminated materials.

6.4.3 Packing Heater for Return or Decommissioning

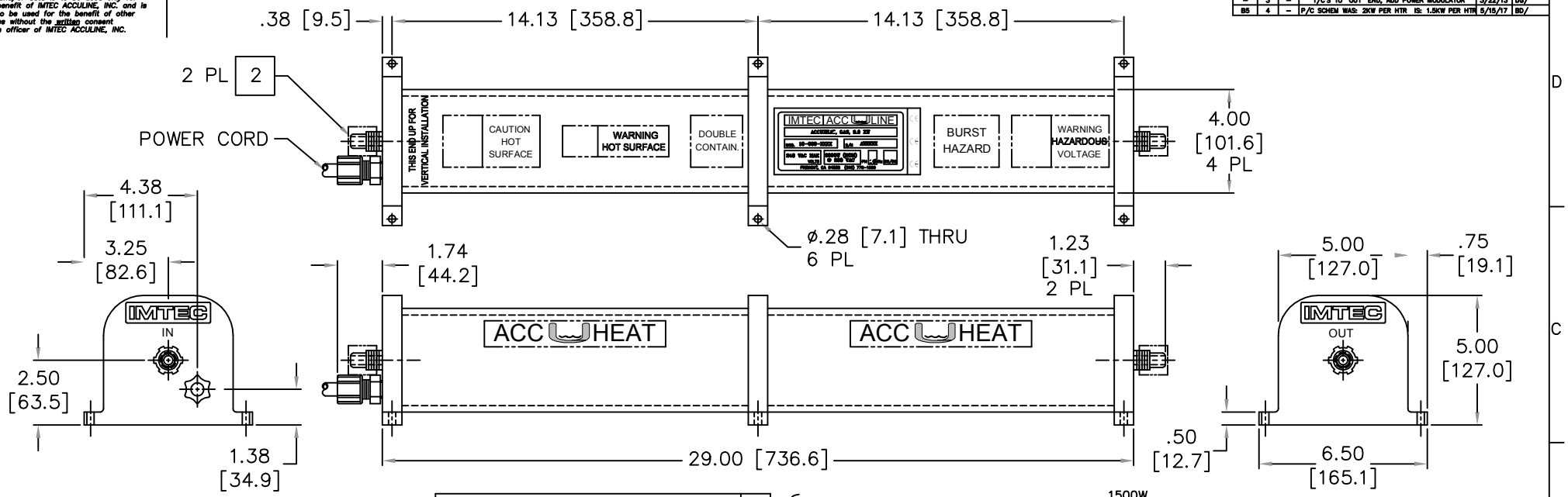
1. Have the heater shipping container ready.
2. Ensure that heater housing has been neutralized of all chemicals. Test with pH paper.
3. Provide a description of the gasses and process temperature used with the heater.
4. Disconnect the electrical connections and plumbing and tape the power cable to the outside.
5. Insert the heater into an approved plastic bag.
6. Carefully and completely squeeze out all of the trapped air. Seal the bag with a tie-wrap.
7. Carefully place the bagged heater into the lower molded foam section in the shipping container.
8. Place upper molded foam section in place over the heater.
9. Pull up the bag liner, twist its top once and squeeze out all trapped air. It is important that all trapped air be removed. Twist the liner excess to seal out the air and use a tie-wrap to secure the liner top. This ends the decommissioning steps.
10. Insert any photos, diagrams and documentation of chemicals and process temperature into a sealable plastic bag and place on top of box liner.
11. Seal the heater's shipping container with packing tape. Do not staple the container closed.
12. Remove the backing and secure a shock watch and companion label to the side of the container.
13. Write or apply the following labels on all sides of container (except bottom). These labels are: "***GLASS***" and "***FRAGILE***".
14. Mark the RGA number legibly on the sides of the container.
15. Ship the container to IMTEC.

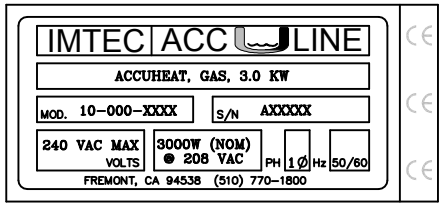
NOTE
IMTEC provides pick-up service for products requiring repair in the Santa Clara Valley. Call IMTEC Customer Service for information.

If you have any questions about IMTEC's return authorization policies or procedures, please contact IMTEC at:

IMTEC Acculine, LLC. 49036 Milmont Drive Fremont, CA 94538	Phone: (510) 770-1800 Fax: (510) 770-1400
Email: imtec@imtecacculine.com	From 8:00 a.m. to 5:00 p.m., PST, Monday through Friday

REVISIONS					
ZONE	REV	ECN	DESCRIPTION	DATE	APPROVED
–	1	–	INITIAL DWG	6/30/11	DG/
–	2	–	ADDED .75 TO LENGTH AND ADD SNAP SWITCH	10/13/11	DG/
–	3	–	T/C'S TO "OUT" END, ADD POWER MODULATOR	3/22/13	DG/
B5	4	–	P/C SCHEM WAS: 2KW PER HTR IS: 1.5KW PER HTR	5/15/17	BD/





NOTES: UNLESS OTHERWISE SPECIFIED

1 MATERIAL:
HEATER TUBE AND STEMS: QUARTZ
HOUSING AND ENDCAPS: PVDF
MOUNTING CLAMPS AND SUPPORT: PVDF

2 QUARTZ 1/2" FLARED TUBE STEM.

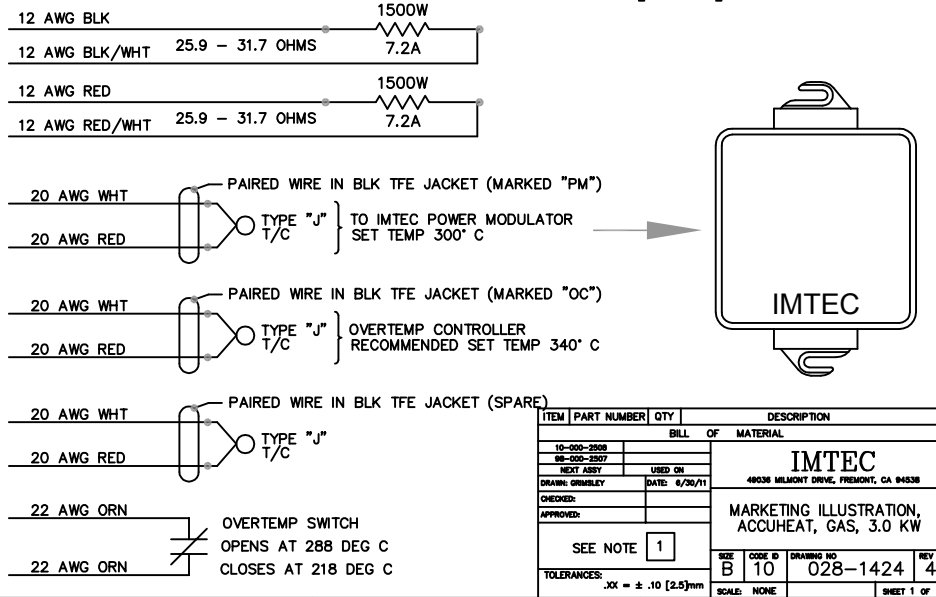
3. A THERMOSTATIC SWITCH (OPENS AT 288°C) IS MOUNTED ON THE "OUT" END OF THE QUARTZ HEATER TUBE ASSY.

4. THREE J-TYPE THERMOCOUPLES ARE MOUNTED ON THE HEATER ELEMENT ON THE "OUT" END OF THE QUARTZ HEATER TUBE.

5. STANDARD ORING MATERIAL FOR QUARTZ STEMS IS VITON. TEFLON ENCAPSULATED VITON OR FLUOROPOLYMER SEALS OPTIONAL.

6. DIMENSIONS ARE IN INCHES, MILLIMETERS IN [BRACKETS].

POWER & SENSOR CORD



ITEM	PART NUMBER	QTY	DESCRIPTION

BILL OF MATERIAL

10-000-2508	
98-000-2507	
NEXT ASSY	USED ON
DRAWN: GRIMSLEY	DATE: 6/30/11
CHECKED:	
APPROVED:	

SEE NOTE 1

TOLERANCES: .XX = ± .10 [2.5]mm

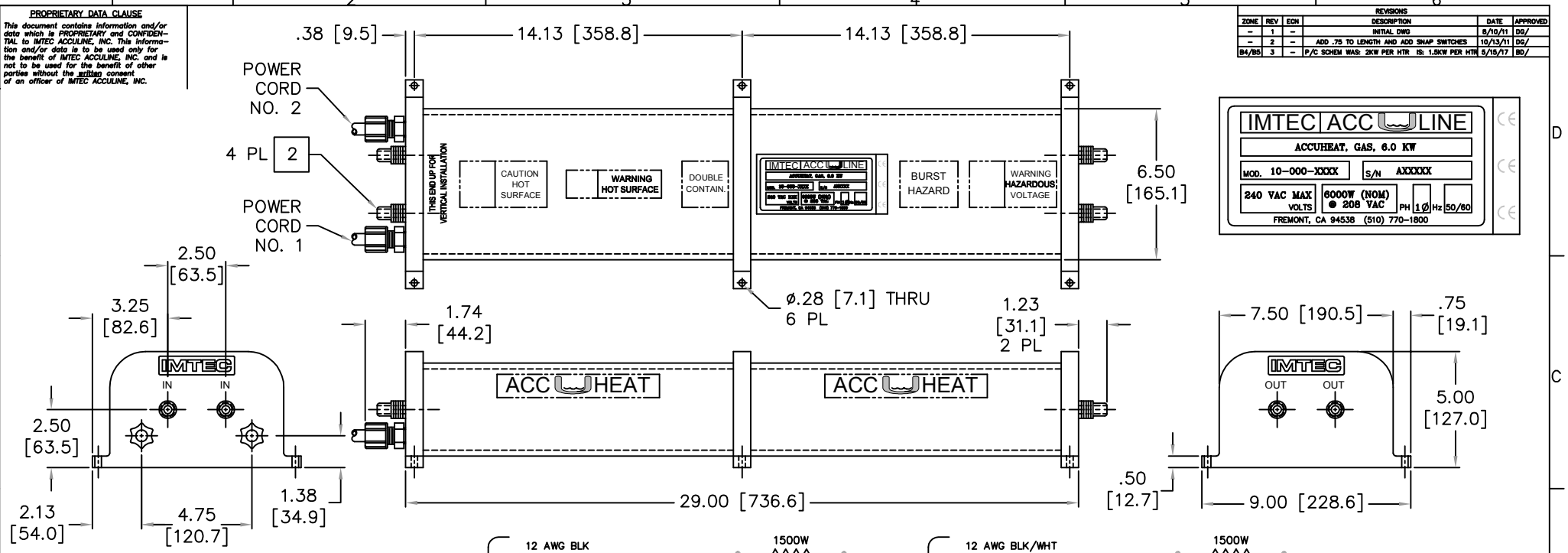
IMTEC
49036 MILMONT DRIVE, FREMONT, CA 94538

MARKETING ILLUSTRATION, ACCUHEAT, GAS, 3.0 KW

SIZE	CODE ID	DRAWING NO	REV
B	10	028-1424	4

SCALE: NONE SHEET 1 OF 1

REVISIONS					
ZONE	REV	ECN	DESCRIPTION	DATE	APPROVED
–	1	–	INITIAL DWG	8/10/11	DG/
–	2	–	ADD .75 TO LENGTH AND ADD SNAP SWITCHES	10/13/11	DG/
B4/B5	3	–	P/C SCHEM WAS: 2KW PER HTR IS: 1.5KW PER HTR	5/15/17	BD/



NOTES: UNLESS OTHERWISE SPECIFIED

1 MATERIAL:
HEATER TUBE AND STEMS: QUARTZ
HOUSING AND ENDCAPS: PVDF
MOUNTING CLAMPS AND SUPPORT: PVDF

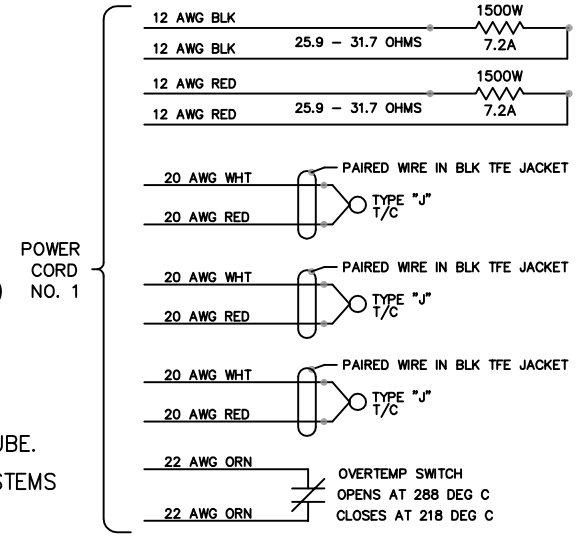
2 QUARTZ 1/2" FLARED TUBE STEM.

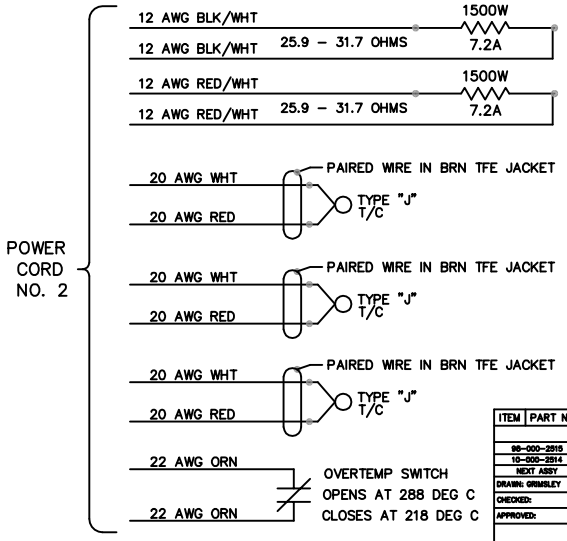
3. A THERMOSTATIC SWITCH (OPENS AT 288°C) IS MOUNTED ON THE "OUT" END OF EACH QUARTZ HEATER TUBE ASSY.

4. THREE J-TYPE THERMOCOUPLES ARE MOUNTED ON THE HEATER ELEMENT ON THE "IN" END OF EACH QUARTZ HEATER TUBE.

5. STANDARD ORING MATERIAL FOR QUARTZ STEMS IS VITON. TEFLON ENCAPSULATED VITON OR FLUOROPOLYMER SEALS OPTIONAL.

6. DIMENSIONS ARE IN INCHES, MILLIMETERS IN [BRACKETS].





ITEM	PART NUMBER	QTY	DESCRIPTION
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	10-000-2514		
	NEXT ASSY		USED ON

DRAWN: GRIMSLEY DATE: 8/11/11
CHECKED:
APPROVED:

SEE NOTE 1

TOLERANCES: .XX = ± .10 [2.5]mm

IMTEC
1295 FORGEWOOD AVE, SUNNYVALE, CA-94089

MARKETING ILLUSTRATION, ACCUHEAT, GAS, 6.0 KW

SIZE	CODE ID	DRAWING NO	REV
B	10	028-1427	3

SCALE: NONE SHEET 1 OF 1