

Cybortronics Inc.

Model HR2060W Chamber

The Model HR2060W is a single bay, water cooled, temperature cycling chamber specifically designed for the commercial electronics environment.

Specifications for the chamber are as follows:

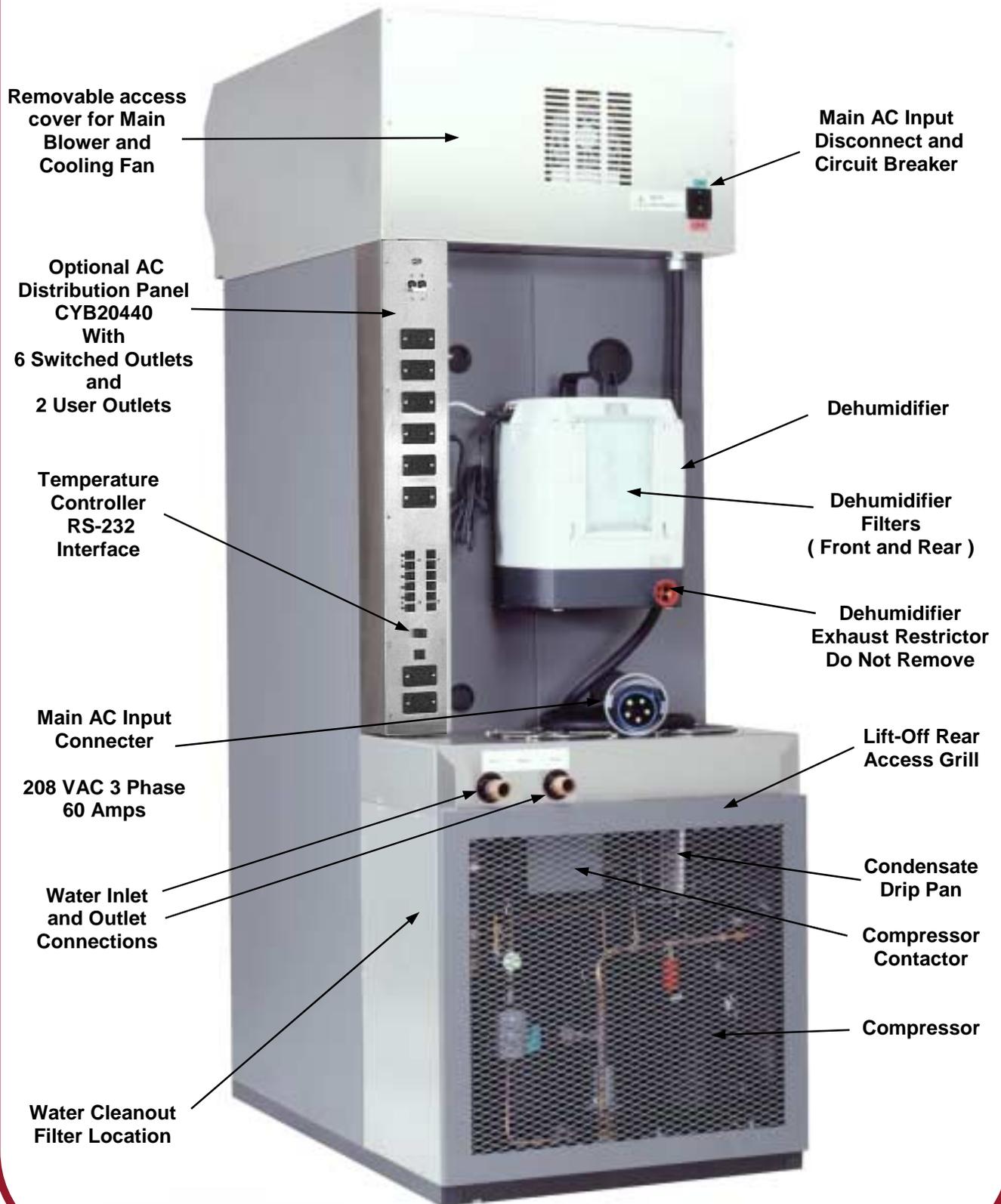


- **Temperature range of -10°C to $+80^{\circ}\text{C}$**
- **Temperature rate of change of 6°C per minute with no live load and 50 lbs. of Fixtured Product**
- **60,000 BTU Refrigeration System**
 - **Self contained within the chamber.**
 - **R-507 Ozone Safe Refrigerant**
 - **Compressor Inhibit if Refrigerant lost**
- **40,000 BTU Heating System**
- **1500 CFM Air Recirculation with Vertical Airflow design**
- **Watlow Model 981 Temperature Controller**
 - **20 step Ramp & Soak profiling**
 - **RS-232 , RS-422, or EIA 485 Communications Interface**
- **Safety Alarms with LED Display and Audible alert**
 - **Over-Temperature**
 - **Blower Failure**
- **Front Panel Display and Control of Alarm Status and UUT Power Control**
- **Triple Pane Glass Doors for product visibility**
- **Brushed Stainless Steel and Granite Grey Powder-Coat Exterior for High-Tech appearance**
- **AC Power requirements of 208 VAC, 3 Phase, 60 Amps**

HR2060 Chamber Front View



HR2060 Chamber Rear View





C Y B O R T R O N I C S

Model HR2060W Chamber User's Guide

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Section I

HR2060 Chamber Functional Description

Following is a functional description of the various elements of the HR2060 Chamber. These elements consist of the Front Panel, the Air Recirculation System, the Heating System, the Cooling System, and the Alarm System. Please see Figure 1.1 for a complete schematic of the electrical components of the HR2060 Chamber. All serviceable component parts with the exception of the blower and the refrigeration components are located under the 'hood' of the chamber. This hood is hinged at the top and has two knurled screws in the lower left and right corners to allow access to the Power Control Plate, the CYB20480 Relay Module, and the Watlow Model 146 Over-temperature Limit Control. See Figure 1.2 for the layout of the control panel.

Front Panel -

The Front Panel contains the Watlow Model 981 Temperature Controller, the UUT Power Control, and the Alarm Control . Please see Figure 1.3 for the layout of this panel. The Watlow Temperature Controller is the 'brains' of the chamber, controlling all heating and cooling functions. Output 1 (L1) of the controller is connected to the heating circuit. Output 2 (L2) is connected to the cooling circuit. The fourth output (L4) is the RS-232 communications interface. The L4 LED will flash whenever serial data is being sent from the controller. An RJ-45 connector is mounted in the column on the rear of the chamber providing the serial connection. Please see Figure 1.4 for a quick guide to the Watlow operation. All further details of the Watlow can be found in the Watlow 'Series 982 User's Manual'. Data communications interfacing and commands can be found in the 'Data Communications with the Watlow Series 988 Family of Controllers User's Guide'.

The UUT Power Control consists of a switch to control the On/Off state of the AC to the UUT outlets in the optional CYB20440 AC Distribution Panel. See Section III for a description of this unit if this option is installed. An LED shows the status of this switch.

The Alarm Control consists of LED's showing the status of the Over-temp and Blower alarms. If the associated LED is on, then an alarm condition exists. The Audible switch allows resetting the Over-temp alarm if this alarm condition exists.

Air Recirculation System -

An 1500 CFM blower is powered continuously from 208 VAC through fuse F6. This blower pulls air vertically up through the product, the refrigeration system's evaporator coil, across the heating coils, and then directs the airflow down the back wall of the chamber. A separate 100 CFM cooling fan is attached to the blower motor.

Heating System -

The heating circuit is comprised of three 4000 watt nichrome heating elements mounted just above the evaporator coil in the top of the chamber. For safety reasons, three Solid State Relays (SSR2, SSR3, SSR4) are used to control these heating elements. Each heater is removable and is fused at 30 amps by fuses F1, F2, and F3. The negative control line to all three SSR's is the L1 output of the Watlow 981 Temperature Controller. If Output 1 (L1) is on, this terminal is grounded and will turn on the SSR's. The positive control line to the three SSR's is a switched +12 VDC line. This line will be opened by the K1 or K2 relays on the CYB20480 module if an Over-temp or Blower alarm condition exists. All three legs of the 208 VAC input power will then be removed upon an alarm condition.

Cooling System -

The cooling circuit consists of an 3.5 HP Copeland Compressor System with an associated control circuit. The system uses ozone safe R-507 refrigerant. Output 2 (L2) of the Watlow 981 Temperature Controller, when active, will turn on the refrigeration solenoid by grounding the negative side of SSR1. At the same time, relay SP2 on the CYB20480 module is energized which closes the contact to the Off Delay Timer. The timer then applies 115 VAC thru the pressure switches the 3 Phase Line Monitor to contactor K2 to turn on the 208 VAC three phase to the compressor. Time delay fuses (F11, F12, F13) of 15 amp capacity are used for the compressor due to the motor start-up current draw. If the compressor has lost refrigerant, the pressure switches will open, disabling contactor K2. The timer will keep the compressor running for a minimum of 3 minutes even if Output 2 has turned off. This extends the life of the compressor by assuring proper separation of the Freon and oil in the compressor. The flow of Freon is controlled by the solenoid valve controlled by SSR1. When the Freon flow is turned off but the compressor is still running, a 'hot gas bypass' valve is opened to allow the Freon to re-circulate.

This system uses a water cooled condenser that requires 10 gallons per minute of clean, room temperature or colder water for proper operation. Chamber cooling performance is very dependent on the flow rate and water temperature.

Dehumidifier System -

A Munters dehumidifier is installed centered on the rear of the chamber. This dehumidifier is controlled by the Alarm 3 (L3) output of the Watlow and is turned on during a specific temperature range, typically between -1 and 35 deg. C. The SYS menu on the Watlow Controller is where these programmed temperatures can be found. Fuse F10 provides AC power to the dehumidifier and the K1 relay contact is closed to turn on the dehumidifier via a low voltage control line. The dehumidifier pulls in air from the chamber and blows it through a desiccant filled wheel that absorbs any moisture in the chamber. The air is then returned to the chamber. The desiccant wheel rotates to another part of the dehumidifier where the moisture is removed by hot air being blown over it.

Alarm System -

The Over-temp Alarm consists of a Watlow Model 146 Limit Control that when activated, turns on relay K1 on the CYB20480 module. This in turn will close contacts to turn on the front panel LED indicating an alarm condition and turn on the Sonalert audible device. Another set of contacts will open the +12 VDC line controlling the SSR's used for the heating coils. This switched +12 VDC line is also used in the interface cable to the optional AC Distribution Panel. This will turn off the SSR's in this panel and remove all AC from the UUT's, removing all heat load from the inside of the chamber and protecting the UUT's from damage. The Over-temp Alarm is a latching alarm and will stay active until the problem is resolved and the alarm is manually reset. The reset switch is a momentary rocker switch located below the Alarm Display on the front panel. The chamber is shipped with the Over-temp Alarm set to 75°C . Access to this control is obtained by raising the 'hood' of the chamber.

The Blower Alarm is an air-flow switch which when activated due to a blower failure or slow spin condition, will turn on relay K2 on the CYB20480 module. A set of contacts will then turn on the front panel LED indicating the alarm condition along with the Sonalert sounding. A second set of contacts performs the same functions as the Over-temp Alarm, turning off the heaters and the AC to the UUT's. This alarm is self-resetting.

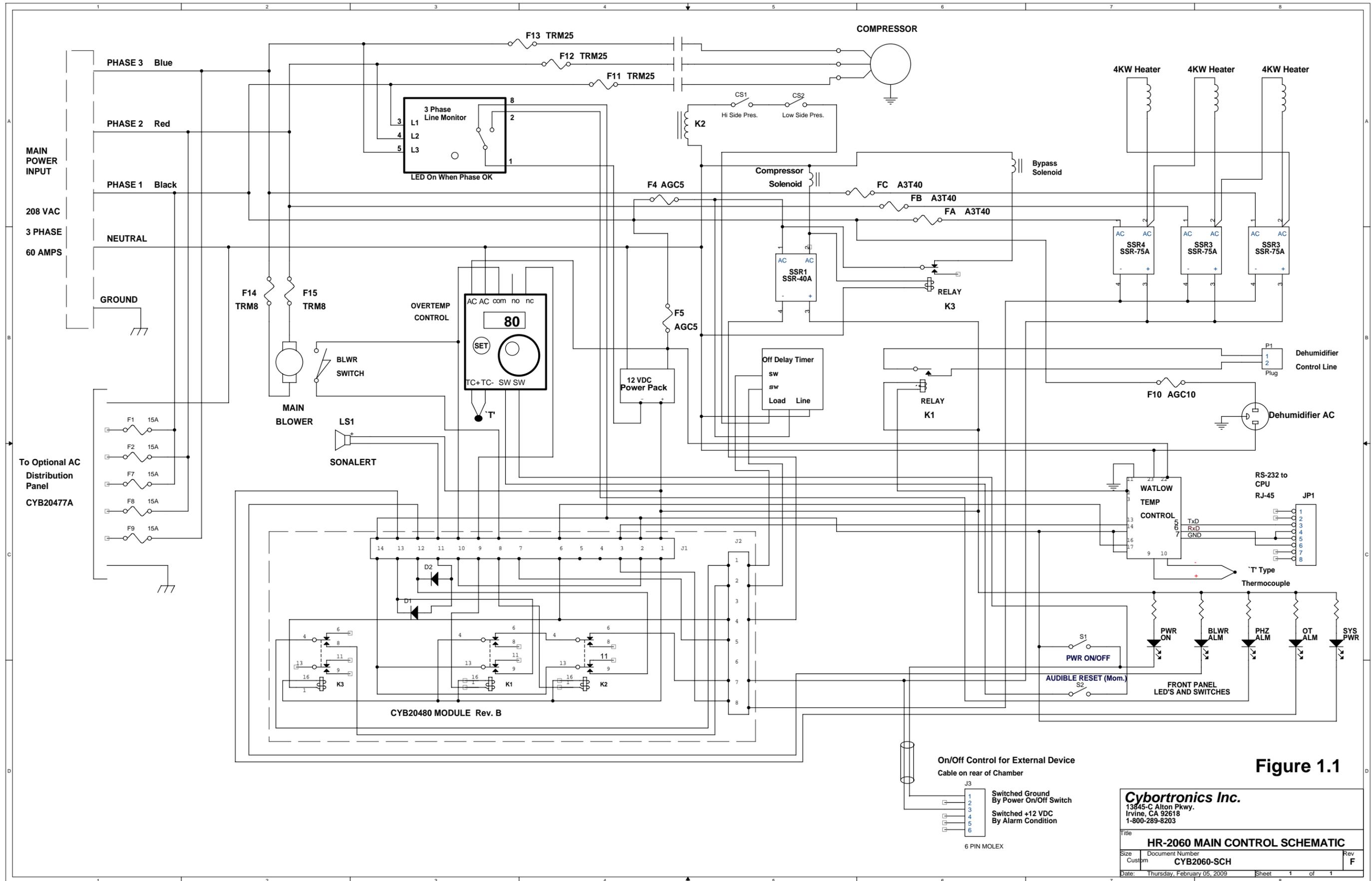


Figure 1.1

Cybortronics Inc.
13845-C Alton Pkwy.
Irvine, CA 92618
1-800-289-8203

Title: **HR-2060 MAIN CONTROL SCHEMATIC**

Size: Document Number: **CYB2060-SCH** Rev: **F**

Date: Thursday, February 05, 2009 Sheet 1 of 1

HR Series Chamber Control Panel (under front hood of chamber)

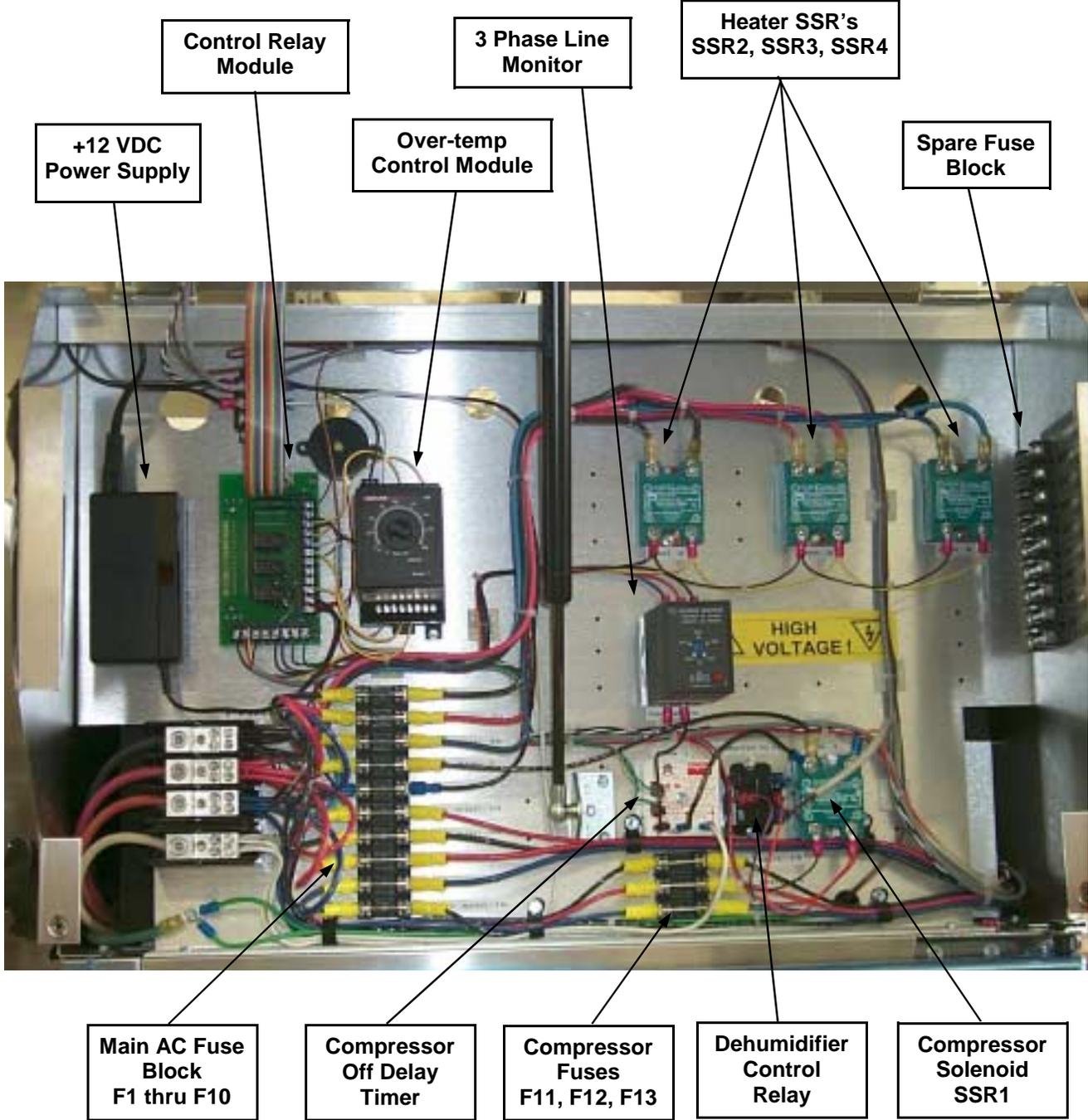
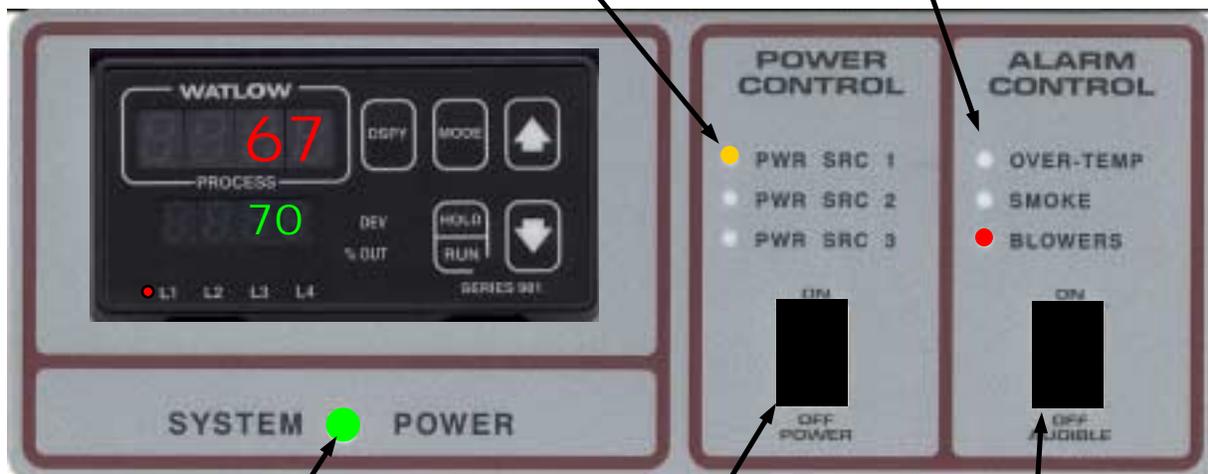


Figure 1.2

CHAMBER CONTROL PANEL

INDICATES STATUS OF AC POWER TO POWER SUPPLY RACK

ALARM INDICATOR LED'S IF LIT, INDICATES ALARM CONDITION.
(BLOWER ALARM SHOWN)



INDICATES CHAMBER +12 VDC POWER SUPPLY IS OPERATIONAL.

ENABLES/ DISABLES AC POWER TO THE UUT AC POWER PANEL OR POWER SUPPLY RACK.

PUSH DOWN TO RESET THE OVER-TEMP ALARM. MOMENTARY ACTION.

Figure 1.3

Watlow Controller Quick Operation Guide

RED DISPLAY

This display will normally indicate the current temperature in the chamber. It will also indicate the value of the parameters displayed in the GREEN display.

DISPLAY KEY

This key will cause the GREEN display to step thru displaying the set-point, the deviation from set-point, the % of output power, and whether the temperature is displayed in °C or in °F.

MODE KEY

The 1st press of this key will enter the SYS menu.

Use up arrow key to step to PID menu or PROG menu. See Watlow manual to set PROG values and steps.



UP and DOWN ARROWS

These keys are normally used to change the set-point of the controller. When pressed simultaneously for approx. 3 seconds, you will enter the setup mode. Please see the WATLOW MANUAL.

L1 thru L4 DISPLAY

- L1** - Indicates that the heaters are on.
- L2** - Indicates that the cooling system is on.
- L3** - Dehumidifier Control
- L4** - Indicates that data is flowing over the RS-232 port.

GREEN DISPLAY

This display will normally indicate the current set-point. It will also indicate other functions depending on the use of the DISP key and the MODE key. Values of these other functions are displayed in the RED display.

RUN / HOLD KEY

Pressing this key once will allow you to select which of the 4 Ramp and Soak profiles to run. The RUN Led will flash at this time. Pressing the key again will start the selected profile. The RUN Led will be on steady while a profile is running. If a profile is running, pressing this key will stop execution of that profile and the RUN Led will be off.

Figure 1.4

Section II

Maintenance

The following items require periodic maintenance on the Cybortronics HR2060 Chamber.

Condenser Water Cooling Line Strainer -

The Strainer for the water inlet line to the condenser should be cleaned on a monthly basis. This strainer is shipped loose and should be mounted to the water inlet line external to the chamber. Turn off water. Remove the square tipped end cap from the strainer housing. Have a small pail available to catch any water that may run out of the housing. Remove the strainer and wash off any foreign matter that may have accumulated. Apply more sealing compound or Teflon tape to the end cap, re-install the strainer, and screw on the end cap tightly. The water may now be turned back on. Check that no water leaks from the end cap before operating the chamber. All other refrigeration components are accessible by removing the access grill at the rear of the refrigeration compartment. The grill hangs on two studs at the top and is held in place by magnetic strips. Some models of chambers may also require the removal of the left side stainless panel of this compartment.



DEHUMIDIFIER SYSTEM FILTERS -

The dehumidifier filters at the front and rear ends of the dehumidifier system should be checked and replaced as necessary every month dependent on factory conditions. These filters will slide out of their tracks with the dehumidifier still mounted to the chamber. These filters can be disassembled, washed in water, dried and re-used several times.

DEHUMIDIFIER REPLACEMENT FILTER: DF-90



**Filter
Locations
Front and
Rear**

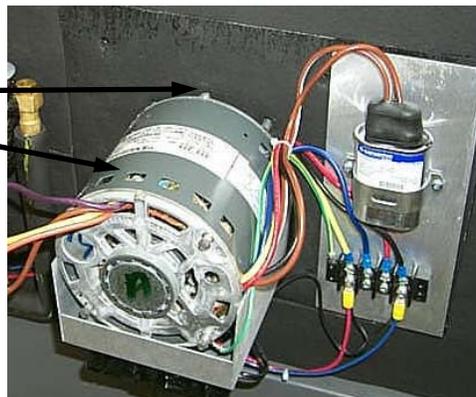
**Lift up to
remove**

**Exhaust Restrictor
Do Not Remove**

BLOWER MOTOR LUBRICATION -

The circulation blower on the HR2040 should be oiled once a year. The oil filler holes are located at the rear and the front faces of the motor at the 12:00 o'clock position. Using any light machine oil or automotive oil, apply only 2 drops of oil to each bearing port. **CAUTION: ONLY US 2 DROPS OF OIL EACH SERVICE INTERVAL. TOO MUCH OIL ADDED CAN CONTAMINATE THE INTERIOR OF THE SYSTEM AND IT'S PRODUCT CONTENTS!**

**Oil hole
locations**



BLOWER REPLACEMENT INSTRUCTIONS -

(Complete assembly) Should the blower assembly need replacing, disconnect all power from the chamber by removing the power cord from its receptacle. Remove the mounting screws for the stainless cover that houses the main disconnect On/Off breaker. Remove and rest this cover on top of the chamber. The motor is mounted on an 8 x 10 inch aluminum mounting plate. After removing the electrical connections from the blower terminal block, remove the 4 - #8 screws from the mounting plate, lift and draw the motor, plate and blower wheel from the air box cover. Install the new pre-assembled blower assembly and replace the 4 - #8 screws that secure it. Before attaching the electrical, make certain that the blower wheel spins freely and does not touch any surrounding metal. If the blower wheel collides with the blower inlet ring, remove the assembly and adjust the blower wheel back toward the motor face by 1/4 inch. Re-attach the electrical wiring to the correct terminals and replace the stainless cover and hardware.

BLOWER COMPLETE ASSEMBLY PART NUMBER: BMA3M487
BLOWER MOTOR ONLY: 3M487

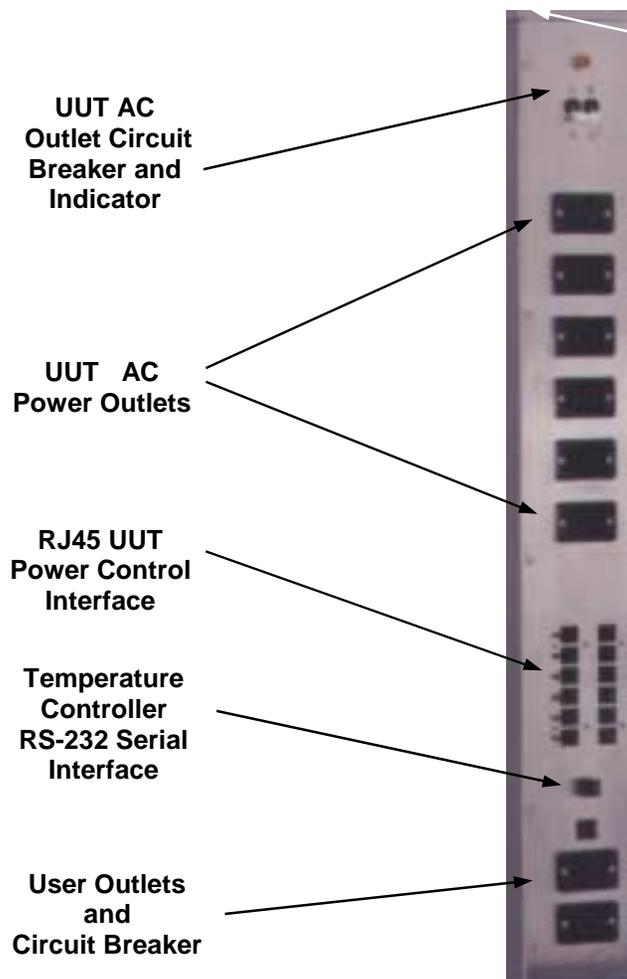
REFRIGERATION SYSTEM CHECK -

This is only required if the cold cycle performance seems to be slow, or if the refrigeration system does not run when cooling is commanded. The refrigeration system is comprised of a 3.5 hp three phase, 208-230 V compressor system charged with R507 refrigerant. The lubrication oil is a synthetic oil known as Polyol Ester Oil. At normal operating load, the current draw by the compressor should measure approximately 8 to 13 Amps. This chamber should transition from 70°C to 0°C in approximately 6 minutes with no heat generated internally by the product under test and a condensing water temperature of 20°C or less. Should this transition test take 50 % longer or more under these conditions, a leak detection should be done on the system, and gas can be added as required. Each system is configured with a low and high pressure gas switch. If no contactor is heard when the L2 lamp is lit on the controller (signifying request for cooling) and the compressor does not start, the system should be checked for leaks. Under normal operating conditions, the high pressure side of the system should not exceed 350 pounds. The low pressure side of the system should not exceed 80 pounds of suction. The total capacity of the HR2060 system is 10 pounds of R507. Do not overfill.

Section III

CYB20440 AC Distribution Panel

The CYB20440 AC Distribution Panel is an option available in both 115 VAC and 208 VAC single phase versions. This panel provides six (6) Switched Outlets and two (2) User Outlets which are on continuously. The 6 Switched Outlets are controlled by individual Solid State Relays. Each of these SSR's are turned on or off by a connection to the DTR signal line on the RJ-45 interfaces located below the outlets. Two RJ-45's are provided for each outlet such that an serial control cable may be `passed thru' the panel to facilitate the connection to ground and DTR for the SSR's. An LED is also attached to each DTR line. The ground line is passed thru a relay connected to the chamber control circuit. This relay is controlled via the Power On/Off switch located on the front panel of the chamber. The relay will also be turned off if any alarm condition is present in the chamber. This will then disable all SSR's and remove AC power to any product plugged into the 6 UUT Outlets.



Section IV

Installation and Site Prep

Power Requirements -

The Cybotronics Model HR2060W Chamber requires an AC input of 208 VAC, 3 Phase `Y`, at 60 Amps. Actual chamber current draw is typically 45 Amps. Proper phasing of the AC line **MUST** be followed for the chamber to work properly. An 3 Phase Line Monitor will inhibit compressor operation if it detects an out of phase condition. This Line Monitor is located under the control panel on the front of the chamber and has an LED indicator to indicate if the AC is connected in phase or not. This indicator must be on. If not, reversing 2 of the 3 phase line will usually correct the problem. If the chamber is to be connected directly to a Junction box and not using the provided plug, the following is the color code of the line cord attached to the chamber:

Phase 1 -	Black
Phase 2 -	Red
Phase 3	Orange
Neutral -	White
Ground -	Green

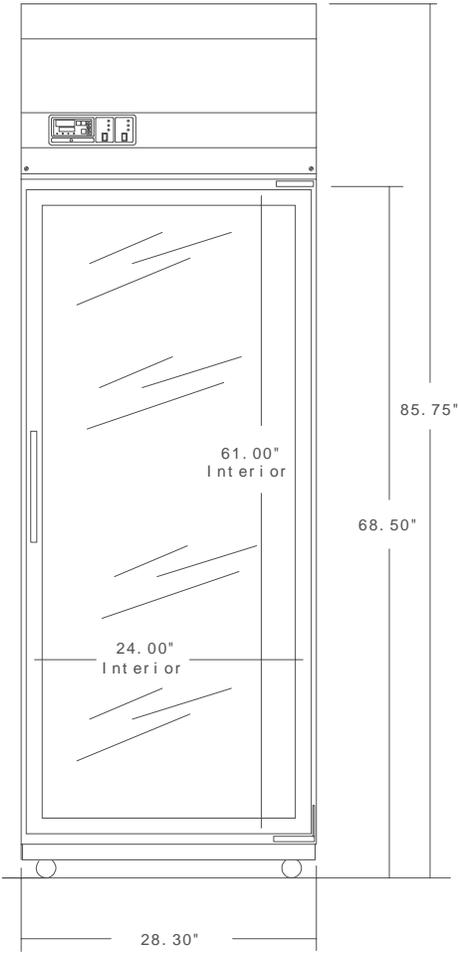
Water Requirements -

The chamber requires clean water provided at a flow rate of at least 10 gallons per minute. A throttle valve will regulate the flow rate as the chamber is going cold. Proper performance depends on this water being 20°C or colder. The ramp rate of the chamber going cold will be determined by this water temperature.

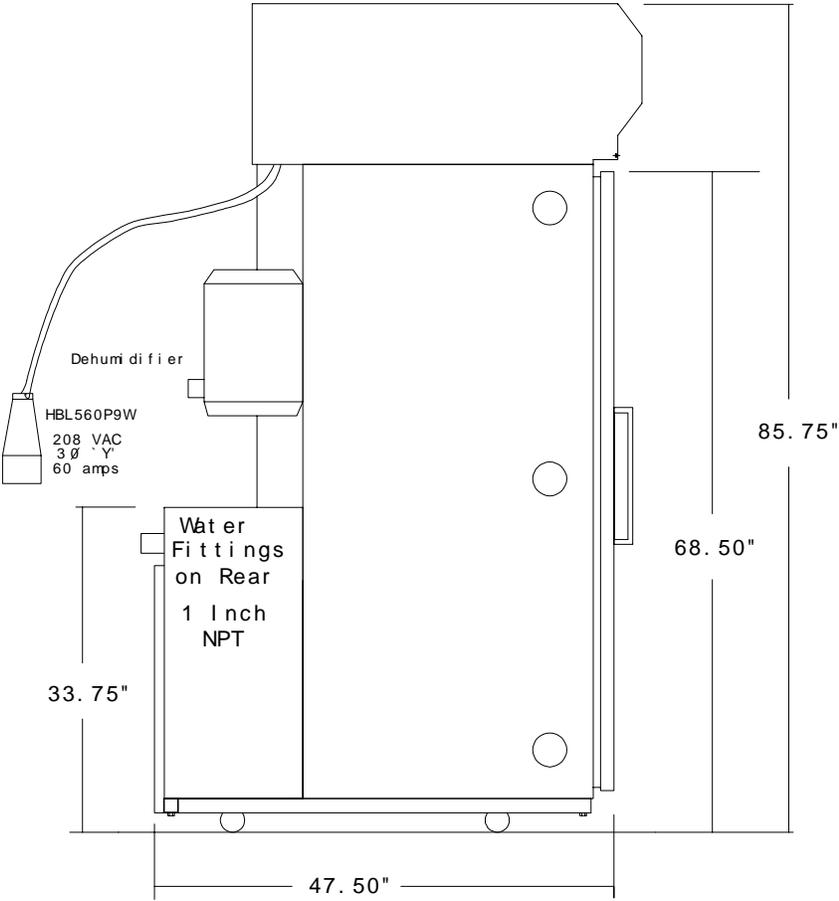
Dimensions and Electrical /Water Connection Locations -

The following 3 pages show all chamber dimensions, electrical and water connection locations.

HR2060 Chamber Dimensions Front View



HR2060 Chamber Dimensions Side View



HR2060 Chamber Dimensions Footprint

