

Model 1284 Series

Class II, A2 Biological Safety Cabinet

Operating and Maintenance

Manual 7021284 Rev. 2



Analyze • Detect • Measure • Control™

Thermo
ELECTRON CORPORATION



Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. ▲



Caution All internal adjustments and maintenance must be performed by qualified service personnel. ▲

The material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Thermo Electron Corporation makes no representations or warranties with respect to this manual. In no event shall Thermo be held liable for any damages, direct or incidental, arising out of or related to the use of this manual. ▲



Caution Lamps, thermometers and thermoregulators contain mercury. Do not put in trash! Recycle or dispose as hazardous waste. ▲.



MANUAL NUMBER 7021284

2	23059/HD-1472	1/17/06	GFI reset switch reminder	aks
--	--	6/20/05	Added UV replacement info to Page 9-3	ccs
--	21497/HD-1424	9/8/04	Added factory-installed anchoring system accessory	ccs
--	--	6/7/04	Clarify test pages	ccs
1	22280	4/20/04	Update to incorporate new constricted testing method	aks
	22197	4/8/04	Blower motor replacement	aks
--	21984	11/13/03	Updated 1284 test sheet (added "four inches above window edge")	ccs
0	21741/HD-1405	8/7/03	Release 6	aks
REV	ECR/ECN	DATE	DESCRIPTION	By



Caution Alerts the user to important operating and/or maintenance instructions. May be used alone or with other safety symbols. Read the accompanying text carefully. ▲



Caution Potential electrical hazards Only qualified persons should perform the instructions and procedures associated with this symbol. ▲



Hazard Do not touch. Instructions associated with this symbol should only be carried out when using special handling equipment or when wearing special, protective clothing. ▲



Potential biological hazards Proper protective equipment and procedures must be used when following instructions associated with this symbol. Reference O.S.H.A. Regulation 1910-1030. ▲



Potentially hazardous energy Equipment being maintained or serviced must be turned off and locked off to prevent possible injury. Reference O.S.H.A. Regulation 1910-147. ▲



Caution Hot surface(s) present which may cause burns to unprotected skin or to materials which may be damaged by elevated temperatures. ▲



Warning Skin damage and/or eye injury can result from the light produced by ultra violet light sources installed in this equipment. Never work in this unit with the ultra violet light operating. ▲



Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the WEEE symbol. Thermo Electron has contracted with one or more recycling/disposal companies in each EU Member State European Country, and this product should be disposed of or recycled through them. Further information on Thermo Electron's compliance with this directive, the recyclers in your country and information on Thermo Electron products will be available at www.thermo.com.

- ✓ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- ✓ Always dissipate extreme cold or heat, or wear protective clothing.
- ✓ Always follow good hygiene practices.
- ✓ Each individual is responsible for his/her own safety.

Do You Need Information or Assistance on Thermo Electron Corporation Products?

If you do, please contact us 8:00 a.m. to 6:00 p.m. (Eastern Time) at:

1-740-373-4763

1-888-213-1790

1-740-373-4189

<http://www.thermo.com/forma>
services.controlenv@thermo.com

Direct

Toll Free, U.S. and Canada

FAX

Internet Worldwide Web Home Page

Service E-Mail Address

Our **Sales Support** staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or make arrangements to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

Our **Service Support** staff can supply technical information about proper setup, operation or troubleshooting of your equipment. We can fill your needs for spare or replacement parts or provide you with on-site service. We can also provide you with a quotation on our Extended Warranty for your Thermo products.

Whatever Thermo products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

When more extensive service is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

Thermo Electron Corporation
Controlled Environment Equipment
Millcreek Road, PO Box 649
Marietta, OH 45750

International customers, please contact your local Thermo Electron distributor.

Table of Contents

Section 1	Packing List	1-1
Section 2	Introduction	2-1
	Theory of Operation	2-1
Section 3	Installation	3-1
	Location	3-1
	Power Connection	3-2
	Plumbing Connection	3-2
	Exhaust Requirements	3-3
Section 4	Certification Testing	4-1
	Locating a Certification Company	4-1
Section 5	Operation	5-1
Section 6	General Cautions and Cleaning	6-1
	Cleaning	6-2
Section 7	Cabinet Start-Up	7-1
	Use of Auxiliary Equipment in Cabinet	7-1
	Cabinet Checklist	7-1
	Start-Up Procedure	7-2

Section 8	Troubleshooting	8-1
Section 9	Routine Maintenance	9-1
	Zeroing the Static Pressure Gauge	9-1
	Checking Static Pressure Gauge “Zero”	9-1
	Adjusting the Damper	9-2
	Biological Safety Cabinet Test Grids	9-3
	Blower Control	9-5
	Receptacle Fuses	9-5
	UV Switch Adjustment Procedure	9-6
Section 10	Service	10-1
	Replacing Blower Motor	10-1
	Replacing Filters, All Models	10-2
Section 11	Specifications	11-1
	Environmental Conditions	11-3
Section 12	Accessories	12-1
Section 13	Parts List	13-1
	Filter Pressure Drop Conversion	13-3
Section 14	Electrical Schematics	14-1
	Warranty Information	

Section 1 **Packing List**

Included with the installation/operation manual are four identification index buttons. These buttons may be used to identify the type of service supplied to the service valves. Also included in a separate bag is the drain valve. Attached to the valve is a small Allen wrench used for calibrating the Static Pressure Gauge. This Allen wrench should be kept with the manual at all times.

Section 2 Introduction

The Models 1284, 1285, 1286 and 1287 are Class II, Type A2 cabinets. The “Type A2” designation indicates two alternative uses of the cabinet. The unit may be vented directly into the laboratory room or vented to the outside atmosphere, through an in-house exhaust system. Either usage of the cabinet offers both personnel and product protection.

The cabinet can be used in low-to-moderate risk environments and is designed to NSF, International Standard #49. Class 1, 2, and 3 (low-to-moderate risk) agents are described in the “Biosafety In Microbiological And Biomedical Laboratories”; CDC NIH Publication No. (NIH) 88-8395, March 2002.

The cabinet’s window permits the user to place auxiliary equipment and research implements in the work area. The work opening must be held to 10 inches during all work procedures. If the window is raised higher than the designated 10 inches, the air barrier at the front of the cabinet will be weakened and containment will be seriously impaired.

Theory of Operation

Clean, filtered air descends through the work zone with approximately 40% being discharged through the exhaust HEPA filter with the remaining air recirculating through the supply HEPA filter into the work area. Exhausted air is replaced by room air entering the system through the front access opening.

Room air entering the work zone, through the front access opening, completes the air barrier at the unit face and is responsible for the containment properties of the unit. All work must be performed beyond the intake grille, on the solid work tray.

Section 3 Installation

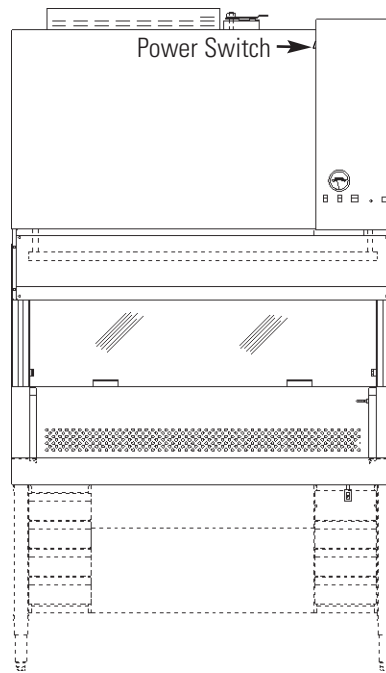


Figure 3-1. Power Switch Location

Location

Locate the cabinet on a firm, level surface in an area of minimum temperature changes. The cabinet should be placed away from disruptive air currents caused by excessive personnel traffic, air-conditioning or heating ductwork, or laboratory windows and doors. Proper cabinet location is important, as drafts disrupt critical airflow characteristics and allow room contaminants to enter or escape the cabinet work area.

Where space permits, fourteen inches should be allowed on each side of the cabinet for maintenance. A twelve-inch height should be available from the top of the cabinet to the ceiling.

Place a bubble-type level on the work surface. Adjust the leveling feet until the cabinet is level and the most comfortable working height is achieved. Ensure that all four leveling feet are fully flush against the floor to prevent vibration.

Warning Model 1284/1285 weighs 735 lbs. Model 1286/ 1287 weighs 940 lbs. Have sufficient personnel available to lift it. ▲

Power Connection

The power switch is located on the left side of the control panel (Figure 3 - 1). The power switch is also a circuit breaker that protects the unit. The electrical wall outlet leading to the cabinet should be accessible for electrical testing.

This cabinet is equipped with one power cord supplying power to the blower, lights and receptacles. The cord should be plugged into a grounded, dedicated circuit. Refer to Section 11, Specifications, or to the serial plate on the front of the unit for electrical specifications. With the power switch turned off, plug the line cord into the wall outlet.

Plumbing Connection

All models have one standard service valve located on the right side of the work station. Service valves are piped within the cabinet. External connection is a 3/8" FPT coupling. Identification index buttons are supplied. Each cabinet can accommodate a total four service valves.

Explosive/flammable substances should never be used in the cabinet, unless approved and monitored by a biological safety officer or other qualified individual. However, if flammable gas is used, emergency shut-off valves must be located in an accessible area external to the cabinet.

Universal Plumbing Option

The Universal Plumbing option is factory installed. External connection (1/4" NPT) to the unit is available on the top and the underside of the cabinet, as well as the standard side connection. See Figure 3-2.

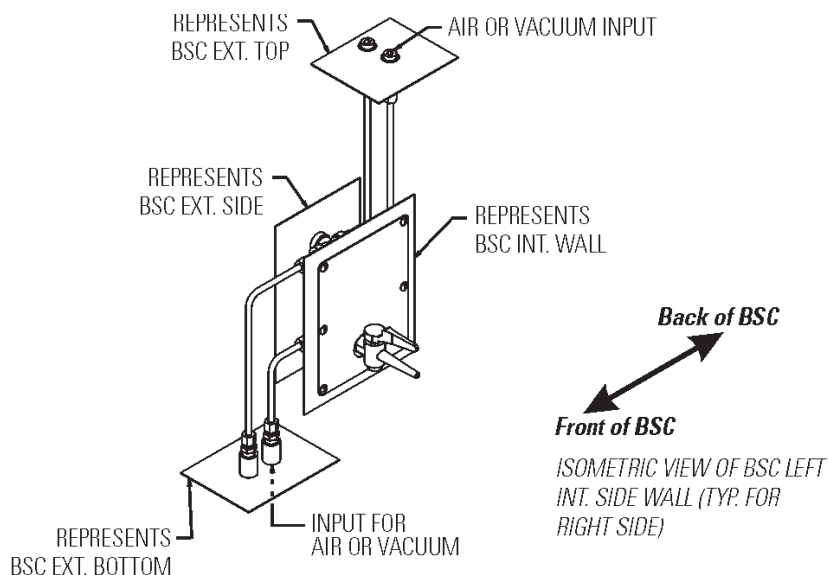


Figure 3-2. Universal Piping

Exhaust Requirements

Filtered air from the cabinet may be exhausted directly into the room or vented to the outside through an external exhaust system. Consult a biological safety officer or other qualified individual for cabinet-type exhaust requirements. Refer to NSF Standard, NSF 49-2002, Annex E.

Direct Room Exhaust

A cardboard cover plate is shipped under the exhaust filter guard. It must be removed before the unit is placed into service. Locate the exhaust filter guard on the top of the cabinet. Remove the guard and discard the cardboard. Secure the exhaust filter guard as previously.

External Exhaust System (for Class II Type A2)

If an external exhaust system is needed, use a canopy (thimble) connection (Figure 3-3). When the cabinet is certified, check the opening in the canopy to ensure inward airflow, using a smoke stick. Ensure proper air balance at the front access opening for adequate containment. Verify that the building exhaust system is sized to exhaust 30% more air than the cabinet exhausts. Models 1284 and 1285 exhaust an air volume of 358-391 CFM. Models 1286 and 1287 exhaust an air volume of 531-580 CFM.



Warning The exhaust air must be drawn from the cabinet through a dedicated exhaust system (only one BSC per exhaust system). The exhaust system may be connected to the collar (optional exhaust transition) located on the top of the unit.

The exhaust system should have safeguards against exhaust failure. It is required that a biological safety officer, industrial hygienist or other qualified individual review the agents and chemicals used inside the cabinet to determine if additional filtration treatment is necessary before venting to the atmosphere. ▲

Optional Exhaust Transition

Canopy/Thimble style - P/N 191570 Release 1-5 units, P/N 191782 Release 6 units. Refer to the unit serial tag to determine release level.

Nominal Exhaust Requirements

4 foot models - Nominal 375 CFM Direct method and calculated method.
Nominal 487 CFM, when sizing to exhaust 30% more air (than the cabinet exhausts)

6 foot models - Nominal 556 CFM

Nominal 722 CFM, when sizing to exhaust 30% more air (than the cabinet exhausts)

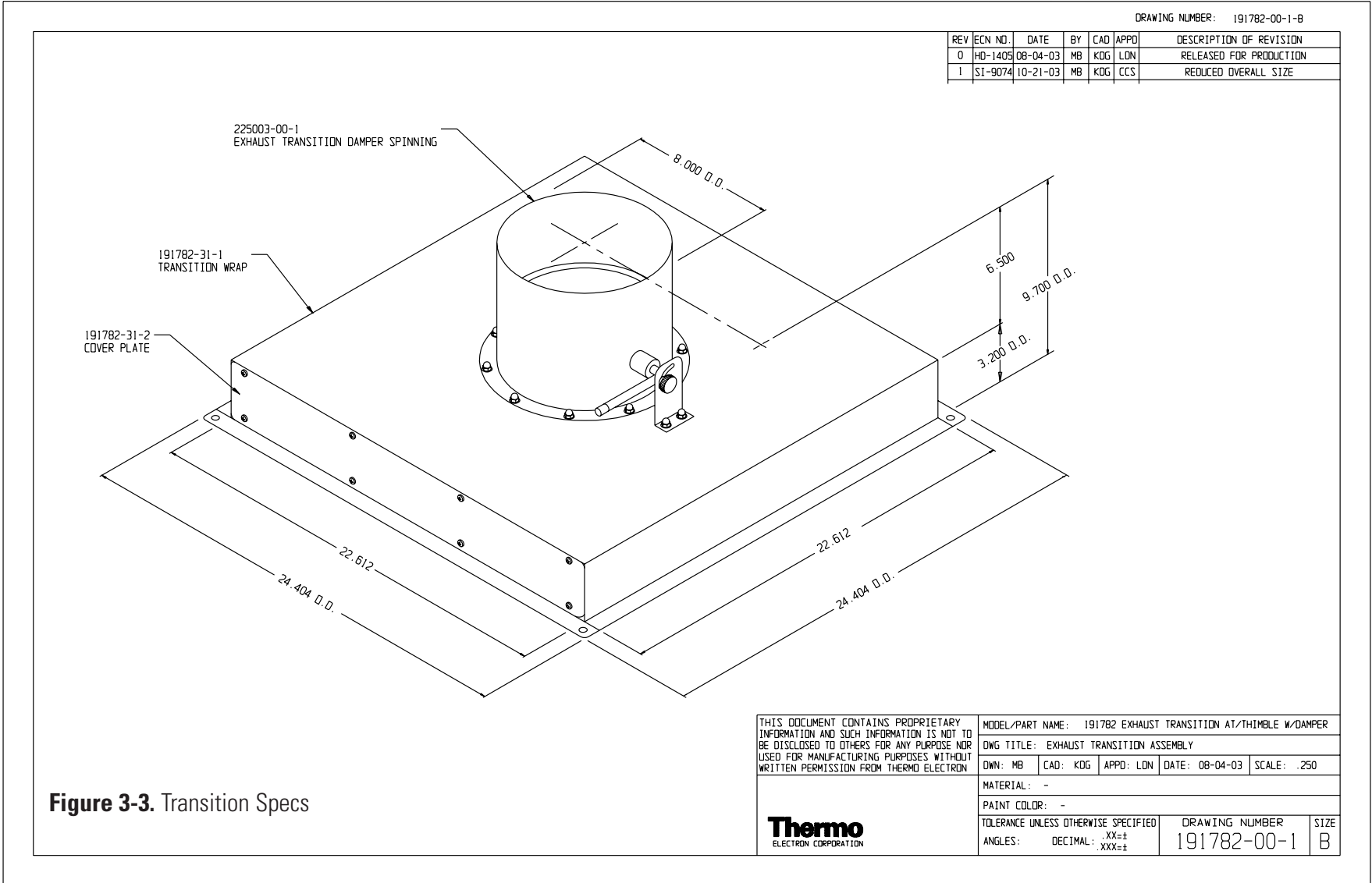


Figure 3-3. Transition Specs

Section 4 Certification Testing

Caution Service and certification must be performed by qualified personnel. ▲

Locating a Certification Company

Biological safety cabinet certification consists of a series of tests designed to verify that the cabinet is performing within operating parameters established by the manufacturer.

To assure that a biological safety cabinet is operating as intended, each cabinet should be field-tested at the time of installation and at least annually thereafter. Cabinets should be re-certified whenever HEPA filters are changed, internal maintenance is performed, or is relocated.

Three industry-related organizations maintain lists of companies and individuals who are active in the certification industry. You may contact these organizations at the addresses listed below.

NSF International (NSF) and International Air Filtration Certifiers Association (IAFCA) sponsor certifier accreditation programs. Accredited certifiers have demonstrated proficiency at testing biological safety cabinets by successfully completing written and/or practical examinations.

Biohazard Cabinet Field Certifier Program

NSF International

PO Box 130140

789 N. Dixboro Rd

Ann Arbor, MI 48113-0140

Telephone (734) 769-8010 Or (800) NSF-MARK

Fax (734) 769-0109

<http://www.nsf.org/Certified/Biohazard-Certifier>

IAFCA
PO Box 12155
Columbus, OH 43212
Telephone (888) 679-1904
Fax (614) 486-1108
<http://www.iafca.com/certifier.html>

The Controlled Environment Testing Association (CETA) is a trade association devoted to promoting and developing quality assurance within the controlled environment testing industry. A list of active members is available by contacting the organization.

Controlled Environment Testing Association
1500 Sunday Drive
Suite 102
Raleigh, NC 27607
Telephone (919) 787-5181
Fax (919) 787-4916
http://www.cetainternational.org/members/corp_indiv.htm

For your convenience we have included a partial list of agencies that perform certification on our website. Select Certification Companies located under the Services and Support heading at www.thermo.com/forma. If you do not find someone listed in your area, please contact the Technical Services Department for additional references.

Note Unless certification was expressly called for in the specification, quotes and/or purchase order, the cost for this on-site testing is to be paid for by the customer. ▲

Section 5 Operation

Before operating the cabinet, become familiar with the following items:

Blower Switch- The blower switch controls power to the internal blower.

Light Switch- The “Lights” switch controls power to the fluorescent lamp or the optional ultraviolet lamp. Both lamps are located in the work area.

Ultra-Violet Light - Optional

Warning On cabinets equipped with ultra violet lights, the lights must be turned off when working in the unit. Potential eye damage may result from viewing the light produced by ultra violet sources. The UV interlock on this cabinet prevents ultra violet illumination when the sliding window is raised. Make sure the sliding window is within approximately 3/8” of the fully closed position. ▲

On cabinets equipped with the optional ultra-violet germicidal light, the dual purpose “Lights” switch provides the following settings:

“Off” = center

“On” top = fluorescent lamp

“On” bottom = ultra-violet lamp on with the window completely down.

Note Either the fluorescent lamp or the ultra-violet lamp may be lit at one time. ▲

Alarm By-pass Switch - The Alarm By-pass switch silences the audible “Window Above 10 Inch” alarm for approximately five minutes. The red visual indicator remains illuminated. The alarm rings-back to remind the operator that the window is still open more than 10 inches.

Static Pressure Gauge (In. W.G.) - The static pressure gauge measures the air pressure differential across the filters providing an indication of filter “loading”. As the filters become loaded, resistance increases and the reading on the static pressure gauge increases accordingly. When the reading increases by 50% from original measurement, cabinet airflow should be checked with a thermoanemometer. Replace the filters if proper airflow cannot be obtained.

Note The static pressure gauge should not be used as a direct measure of airflow. ▲

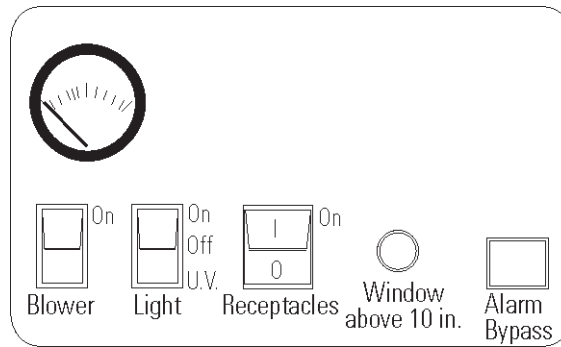


Figure 5-1. Control Panel

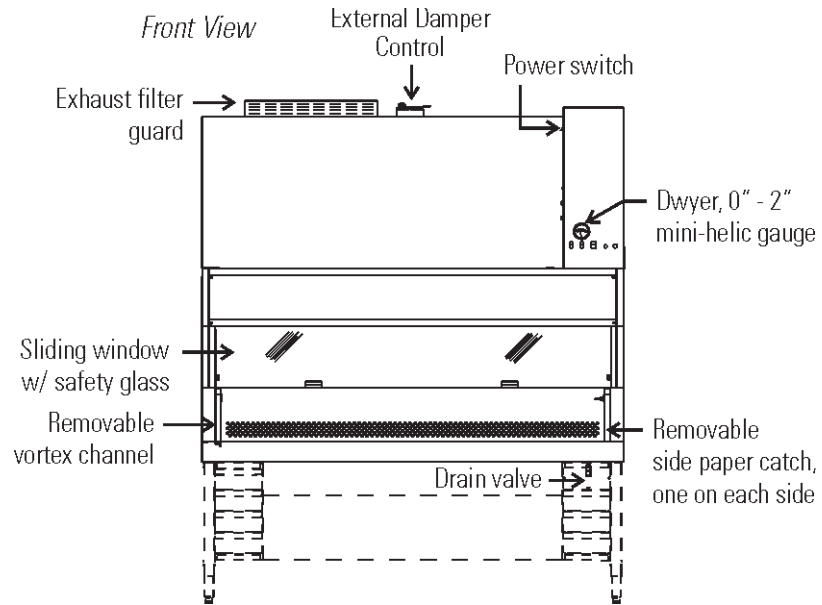


Figure 5-2. Front View of 4 ft. Unit with Components Indicated

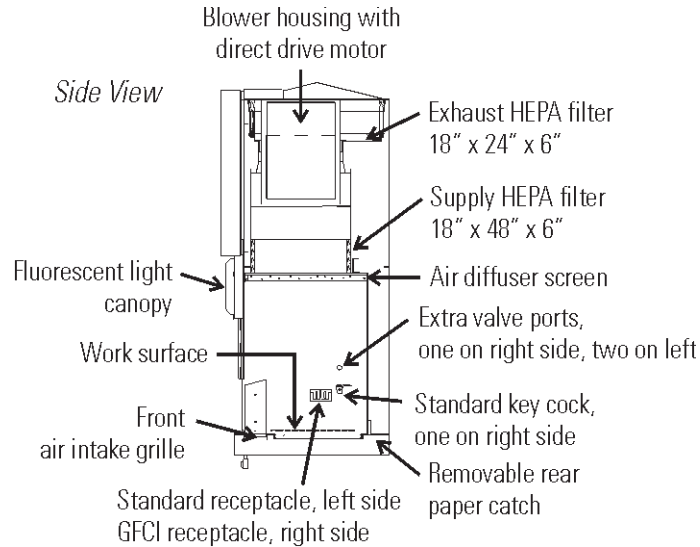


Figure 5-3. Side View of 4 ft. Unit with Components Indicated

Power Switch - mains disconnect/circuit breaker for the cabinet.

Blower Motor/Lights Reset Button (15 Amp) - The Reset button (located on the left side of the control panel, directly above the Receptacle fuses) is an in-line circuit breaker for the internal blower motor and lighting. If an overload occurs, the circuit breaker will trip and the button will protrude from the panel. Depress the button to reset the circuit breaker.

- Note**
- Turn power off to the blower.
 - Turn power off to the lighting.
 - Press the blower motor/lighting Reset button. ▲

Receptacles - Receptacles (115 Volts) are located on the left and right sidewall of the workstation. Power is controlled by the receptacle switch located on the control panel. The maximum load is 5 amps total for Models 1284 and 1285. Models 1286 and 1287 have a maximum load of 2 amps total. Models 1285 and 1287 are equipped with 2 single European 230V receptacles.

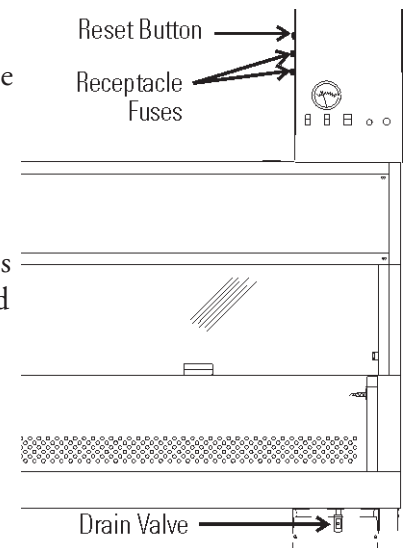


Figure 5-4. Locations

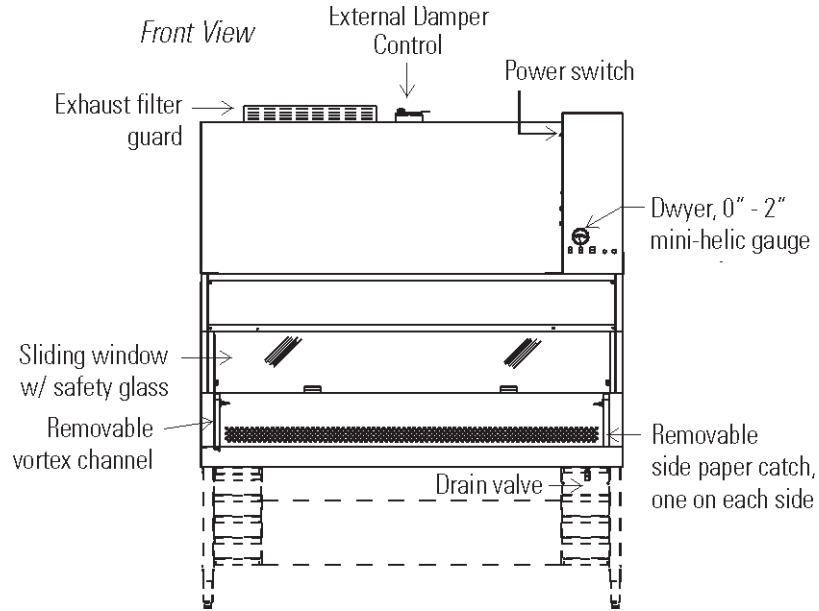


Figure 5-5. Front View of 6 ft. Units with Components Indicated

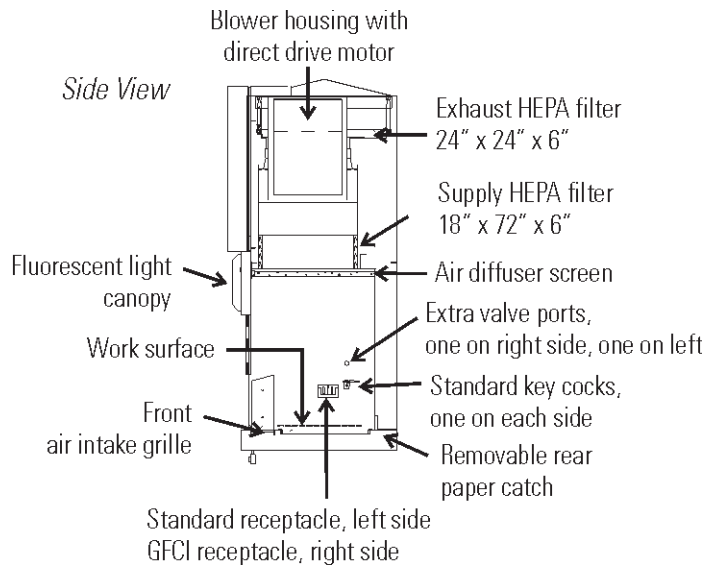


Figure 5-6. Side View of 6 ft. Units with Components Indicated

Drain Valve - The drain valve, located on the right front side of the cabinet, is provided for the safe drainage of the drain pan. This valve must remain closed while work is being performed in the cabinet and be used only in the event of a major spill.

Warning If a spill occurs, immediately consult a biological safety officer or other qualified individual for proper procedures. To contain a spill, connect a sealed hose from the drain valve to a sealed container. ▲

Service Valves - All models have one standard service valve located on the right side of the cabinet. The valve(s) can be coded with the type of service they supply. Identification index buttons are supplied.

The cabinet supports four service valves. Additional valves are available.

Exhaust Filter Guard - The exhaust filter guard, located on top of the exhaust filter, protects the exhaust airflow and prevents the storage of objects on top of the housing.

Sliding Window Assembly - The sliding window assembly allows the operator to raise the glass window to place items within the work area. If the sliding window is above the 10-inch level, a red light and audible alarm warn that an unsafe condition exists.

Warning When work is being performed in the cabinet, the sliding window must be at the 10-inch position to avoid contamination to product and personnel. ▲

Section 6 **General Cautions and Cleaning**

Cautions follow.

- Following initial installation, the unit must be thoroughly tested and certified.
- All activities to be performed within the cabinet should be approved by a biological safety officer or other qualified individual.
- Since the HEPA filters remove particulates only (not gas), explosive/flammable substances should never be used in the cabinet, unless approved and monitored by a biological safety officer or other qualified individual.
- If the cabinet is to be used for biological or toxicological applications, a biological safety officer or other qualified individual must monitor it.
- If the unit needs to be serviced, it must be decontaminated to protect service personnel. After servicing, the cabinet must be recertified by a qualified certifying agency.
- None of the perforations in the work area may be covered or blocked, as airflow will be disrupted and contamination may occur.
- Paper catches should always be kept free of debris.

Section 6

General Cautions and Cleaning

Cleaning

For general cleaning of dirt, dust and fingermarks, use a general household (non-abrasive) cleaner with a soft cloth or sponge and warm water. Cleaning should always be followed by rinsing with clean water and wiping the surface completely dry.

Before each use, the work surface, interior walls and interior surface of the window should be wiped with an appropriate disinfectant.

At the end of the work day, decontaminate the work surface, cabinet sides and back, and interior of the glass.

Warning Alcohol, even a 70% solution, is volatile and flammable. Use it only in a well ventilated area that is free from open flame. If any component is cleaned with alcohol, do not expose the component to open flame or other possible hazard. Allow the alcohol to fully dry before turning power on. ▲

Caution Do not use strong alkaline or caustic agents. Stainless steel is corrosion-resistant, not corrosion-proof. Do not use solutions of sodium hypochlorite (bleach) as they may also cause pitting and rusting. ▲

Section 7 Cabinet Start-Up

General recommendations follow.

- Keep movement in the room to a minimum when the cabinet is in use.
- Keep all laboratory doors closed to prevent drafts that may disturb critical airflow.
- Pre-plan cabinet use and place everything needed in the cabinet so that nothing passes through the air barrier (in or out) during the procedure.
- Practice good aseptic technique to ensure safe use of the cabinet.
- If a spill occurs, clean it up immediately. Decontaminate the work area and all affected equipment.
- Do not cover or block the exhaust grille.
- Do not cover or block any perforations (air holes) in the work area.

Use of Auxiliary Equipment in Cabinet

Use auxiliary equipment in the cabinet only if proper precautions are taken. Appliances used in the work area will cause turbulence, disturb the airflow and need to be carefully managed. The equipment should be placed at the rear of the workspace where it will have minimal effect.

A blender may be used in the cabinet. But because of the amount of aerosol it produces and the turbulence it causes, it is recommended that it be removed from the cabinet as soon as possible.

Cabinet Checklist

1. Verify that the Drain valve is closed (the handle turned horizontal).
2. Verify that all service valves are closed.
3. Verify that the cardboard exhaust filter protector has been removed.

Start-Up Procedure

1. Turn the power switch on.
2. Turn the light on.
3. Check the intake and exhaust grilles to ensure they are not blocked.
4. Turn the blower on.
5. Place everything needed into the cabinet.
6. Place the viewing window at 10 inches.

Section 8 Troubleshooting

The following is a guide to troubleshooting the system. If a contaminated area of the cabinet must be entered to determine and/or resolve the source of a particular problem, *the cabinet must first be decontaminated.*

Caution Servicing of the unit must be performed by qualified service personnel. ▲

Problem: Airflow in the cabinet work area and through the exhaust filter is inadequate.

Possible causes:

- Exhaust filter is blocked by laboratory materials or the protective shipping cover.
- If the biological safety cabinet is connected to an exhaust system, there may be inadequate exhaust suction or back pressure in the duct system. The system must be rebalanced to handle the correct air volume. A biological safety officer should be consulted.
- Low voltage is being applied to the blower motor.
- Blower motor or speed control is defective.
- Supply HEPA filter and Exhaust HEPA filter may be loaded. Decontaminate the unit and replace both HEPA filters.

Warning Before any maintenance work is performed in the biological safety cabinet, the unit must first be decontaminated. ▲

Problem: Ultra violet light malfunction

Possible causes:

- Make sure the sliding window is within approximately 3/8" of the fully closed position.
- Check lamp pins and socket ends for contact.
- U.V. lamp is defective.
- Starter is defective for the UV light.
- Check UV interlock switch adjustment.

Problem: Fluorescent light malfunction

Possible causes:

- Check lamp pins and socket ends for contact.
- Lamp is defective.

Problem: Loud screeching noise

Possible causes:

- Bearings are bad in the motor blower assembly.
- Blower wheel is rubbing against the housing.

Problem: No power at GFCI outlet

Possible cause:

- Switch requires reset.

Section 9 Routine Maintenance

Warning Before any maintenance work is performed in the biological safety cabinet, the unit must first be decontaminated. ▲

Checking Static Pressure Gauge “Zero”

Note In order to provide an accurate reading, the indicating needle of the static pressure gauge should be precisely at zero when the cabinet is shut off. If the cabinet is connected to a central exhaust system, the exhaust system must also be shut off. ▲

Following HEPA filter replacement, the static pressure gauge should be checked for zero when the cabinet is shut off. (refer to Section 9.2). When the cabinet is started up and proper airflow balance has been reached, the reading on the gauge should be recorded. This initial reading will serve as a baseline indication of subsequent filter loading. When the reading increases by approximately 50%, the airflow balance should again be checked. Replacement of the filters may be required.

Zeroing the Static Pressure Gauge

1. Turn the cabinet off.
2. Remove the front cover from the static pressure gauge by grasping the front cover and turning it counterclockwise.
3. Locate the Allen-type adjustment screw beside the gauge needle.
4. Turn the adjustment screw counterclockwise to lower the reading; clockwise to raise it.

Adjusting the Damper

Since the HEPA filter resistance may vary from filter to filter (even filters of the same size), a damper has been installed in the cabinet exhaust system for maintaining proper airflow balance. The purpose of the damper is to regulate the amount of exhaust air, intake velocity and supply velocity. The damper has been preset at the factory and should not be readjusted unless the proper velocities cannot be obtained.

Caution Adjustments must be made by qualified personnel only! ▲

1. Layout test grids (examples in this section).
2. Start-up the cabinet and allow it to run for at least twenty minutes.
3. Take airflow measurements. If airflow specifications are not sufficient, open the control panel and check the voltage on the power switch.

Note Airflow measurements and voltages are recorded at the factory with the cabinet connected to the appropriate AC power supply. ▲

4. Open the hinged control panel by removing the screw on the top and bottom of the control panel and swinging the panel door open. Locate the blower motor circuit board. (Figure 9-1 & 9-2) Using a true RMS voltmeter, measure and record the voltage drop across the white and black wires leading to the terminal strip. (Figure 9-1) The blower speed control adjustment pot is located on the upper left side of the board. Clockwise adjustment of this pot increases voltage supply to the blower motor, counterclockwise adjustment lowers the voltage supply. Adjust it 2-3 volts, up or down, depending upon the airflow required. Retake the airflow measurements.

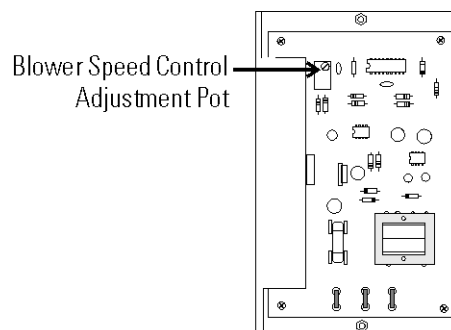


Figure 9-1. Pot Location

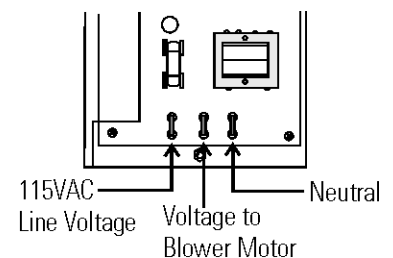


Figure 9-2. Terminal Locations

If it is determined that the damper must be adjusted in order for the proper airflow balance to be maintained, adjust it as follows:

1. The damper control (Figure 9-3) is located on the top of the cabinet.
2. Loosen the wingnut, move the lever to the desired position and retighten the wingnut.

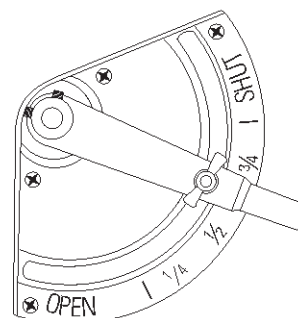


Figure 9-3. Damper Control

Note Copies of the factory airflow test sheets are available in the Specifications section. ▲

Biological Safety Cabinet Test Grids

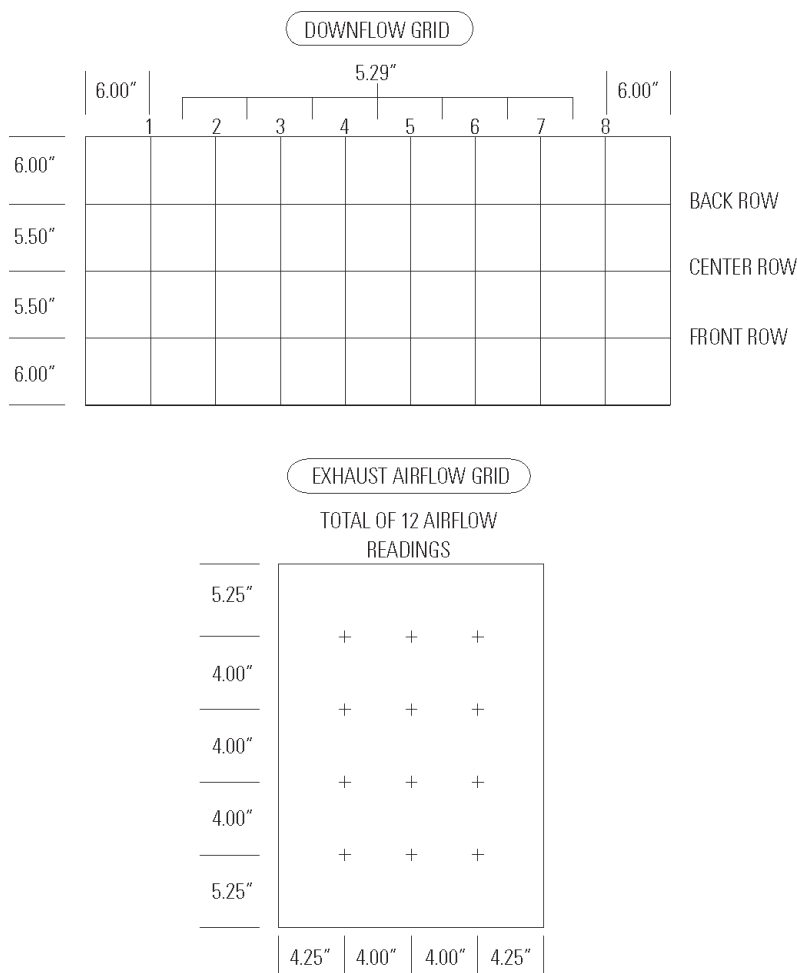
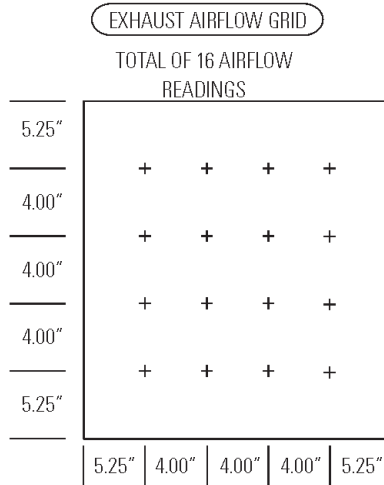
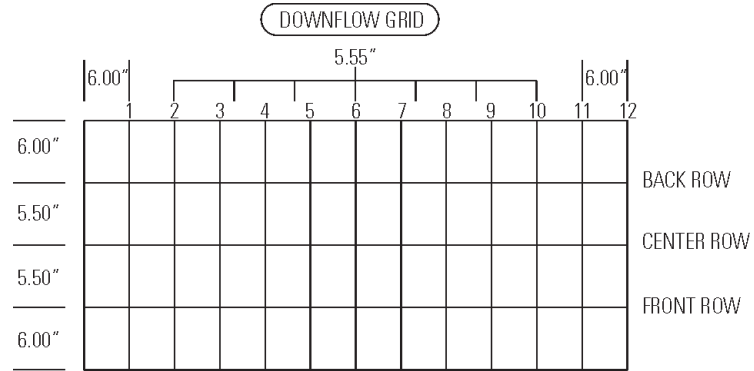


Figure 9-4. 4 ft. Models 1284 and 1285

BSC Test Grids (continued)



Work access opening face area = 5.052 ft.sq.

Open exhaust area* = 3.368 ft.sq.

*Total area minus obstructed area

Figure 9-5. 6 ft. Models 1286 and 1287

Note A list of certification companies is included on the Thermo Electron Corporation website (thermo.com), or call the Technical Services department. See Page iii. ▲

Blower Control

Warning Live voltage is present on the control terminals of the switches and dials on the front of the blower panel. Avoid touching these controls when reaching into the control panel and making any adjustments. ▲

Blower Speed Control

The blower speed control is accessed from the rear of the control panel by removing the thumbscrew on the exterior top and screw located at the bottom front of the control panel. Swing the control panel door open. The blower speed is adjusted by turning the screw on the variable resistor mounted on the circuit board adjacent to the controller. Refer to Figure 9-1. Turning the screw clockwise increases air velocity; counter-clockwise decreases it.

Caution The blower speed is factory-set and should only be changed by a qualified technician. ▲

Measuring Blower Motor Voltage

Both blower motor voltage and line voltage are measured at the three terminal connectors at the top of the circuit board. Refer to Figure 9-2.

Receptacle Fuses

Receptacle Fuses

7 Amp - Models 1284/1285

3 Amp - Models 1286/1287

The receptacle fuses (2), located directly below the blower motor/lights Reset button, are for the receptacles only. If an overload occurs, the fuses open and require replacement.

Note

- Turn the power off.
- Unplug the unit.
- Replace the fuses - P/N 230182, 7 Amp, ¼" x 1¼",
P/N 230166, 3 Amp, ¼" x 1¼"

(Spare fuses (2) are located in a bracket on the inside of the control panel.) ▲

UV Switch Adjustment Procedure

Warning This procedure must be performed by qualified service personnel only. ▲

Check UV interlock switch adjustment by fully closing the window and slowly raising. The UV light should turn off at a window gap no greater than 3/8". If adjustment is required, locate bracket with two screws on the right side light housing. Loosen these screws approximately one turn. Adjust the window gap to 3/8". While observing the UV light, adjust the bracket up or down until the lamp just turns off. Tighten screws and verify correct operation.

Note UV light does not illuminate instantaneously. ▲

Caution These lamps lose their effectiveness over a period of time and should be replaced when intensity drops below the optimum level (approximately every six months). ▲

Section 10 Service

Warning Before service is to be performed on the cabinet, the unit must be decontaminated! Service must be performed by qualified personnel only. Recertify the cabinet after servicing. ▲

Replacing Blower Motor

1. Turn the unit off and disconnect it from the power source.
2. Close the window.
3. Open the control panel.
4. Remove the four thumbscrews securing the lamp housing cover. Remove the cover.
5. Remove the dress panel.
6. Disconnect the window balance cord from one side of the window.



Warning The balance cord is under extreme tension! Grip the cord attachment tab securely, disconnect, and allow the cord to retract slowly toward the top of the unit to avoid damage to the cord. ▲

7. Remove the access panel.
8. Unfasten the two latches connecting the blower to the air plenum.
9. Disconnect the motor wiring harness (mate-n-lock).
10. Remove the plenum access panel. Remove the 1/4" nuts and all threads (2 front, 2 back for 1284/1285 & 3 front, 3 back for 1286/1287) securing the panel. Lift and remove the panel. Remove the supply filter.
11. Remove the three bolts toward the front of the cabinet that connect the blower housing bracket to the top of the cabinet.

12. Remove the 3 front screws or bolts on the right hand side of the cabinet that connect the blower housing bracket to the right hand wall of the cabinet.
13. Slide the blower housing assembly out of the cabinet.
14. Remove the mounting brackets and blower throat from the existing assembly and install on the replacement housing.
15. Install the housing assembly in the cabinet and secure.
16. Connect the motor wiring harness at the quick-connect plug.

Note After the motor is installed, but before replacing the plenum access panel, turn the motor on to ensure that rotation is in the clockwise direction (when viewed from the motor side of the blower). ▲

17. Replace and assemble the components in reverse order.

Reversing the motor wiring (4 ft. models only)

1. On the replacement motor: Disconnect the faston connectors securing the Orange wire to the Brown wire and Yellow wire to the Purple wire.
2. Reconnect the Orange wire to the Purple wire and the Yellow wire to the Brown wire.

Replacing Filters, All Models

Warning Dispose of the old filters per established laboratory practices. If necessary, consult a bio-safety officer or other appropriate person. ▲

1. Turn the unit off and disconnect it from power source.
2. Close the window.
3. Remove the thumbscrews securing the lamp housing cover. Remove the cover.
4. Open the control panel.
5. Remove the screws securing the dress panel. Remove the panel and set it aside.

6. Disconnect the window balance cord from one side of the window.



Warning The balance cord is under extreme tension! Grip the cord attachment tab securely, disconnect, and allow the cord to retract slowly toward the top of the unit to avoid damage to the cord. ▲

7. Remove all hex nuts securing the pressure plate.
8. Pry the pressure plate loose from the gasket and set it to the side.
9. Pull the Velcro boot loose from the exhaust filter plenum.
10. Release the two latches securing the supply plenum to the blower housing.
11. Disconnect the vinyl tubing that connects the Mag gauge to the plenum.
12. Remove the hex nuts (4 on the four-foot models, 6 on the six-foot models), springs, washers and hold-down brackets securing the plenum.
13. Remove the front filter hold-down studs (2 on the four-foot models, 3 on the six-foot models) in front of the plenum.
14. Slide the plenum from the cabinet.
15. Remove the supply filter and clean the filter mounting surface.
16. Loosen - do not remove, the four bolts, springs and washers that secure the exhaust filter.
17. Slide the exhaust filter out, clean the filter mounting surface and install the new filter, ensuring that the gasket is on the top.
18. Tighten the hex nuts to secure the new exhaust filter in position.
19. Install the new supply filter with the gasket side down.
20. Reinstall the supply plenum and assemble the components in reverse order.

The cabinet must be recertified after filter replacement.

Assembly Notes

- Latches connecting the plenum to the blower housing have a safety lock that must be released prior to opening the latch.
- When tightening the filter hold-down nuts, the springs should be compressed from 1/2 to 3/4 of their original height.
- Ensure that the vinyl tubing from the Mag gauge is reconnected to the supply plenum.
- The Velcro connection on the exhaust boot must be smooth with no gaps or loose spots to ensure proper sealing.

Section 11 Specifications

Models - 1284 and 1285 (4' Cabinet with Sliding Window)

Construction

Work Surface: Type 304 Stainless Steel, #4 Finish

Cabinet: Cold Rolled Steel and Type 304 Stainless Steel

Finish: White Baked Powder TCI Hybrid Paint

Dimensions

Exterior: 54.0"W x 64.0"H x 32.5"F-B

Interior: 49.0"W x 28.3"H x 22.25"F-B

Electrical Requirements

1284 - Main/Outlets (5): 115VAC, 1 Phase, 2 Wire, 60 Hz, 13.5 FLA
(Total amps include 5A receptacle)

Circuit Breaker: 20 Amp

Receptacle - NEMA 5-20R, 0.5 ma leakage current

Exhaust System Volume Requirements: 356-390 CFM

1285 - Main/Outlets (5): 230VAC, 1 Phase, 2 Wire, 50 Hz, 9.6 FLA
(Total amps include 5A receptacle)

Circuit Breaker: 15 Amp

Receptacle - European, 0.5ma leakage current

Exhaust System Volume Requirements: 356-390 CFM

Filters

(1) Supply HEPA Filter (48"W x 18"F-B x 5-7/8"H)

(1) Exhaust HEPA Filter (18"W x 24"F-B x 5-7/8"H)

Lights

(2) Fluorescent 32W, (F32/T8)

(1) Optional UV 30W, (G30T8) Germicidal Lamp

Blower Motor

3/4 HP, 1625 RPM

Drain Pan Capacity

18.7 Gallons

Models - 1286 and 1287 (6' Cabinet with Sliding Window)

Construction

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel and Type 304 Stainless Steel
Finish: White Baked-on Powder TCI Hybrid Paint

Dimensions

Exterior: 78.0"W x 64.0"H x 32.5"F-B
Interior: 73.0"W x 28.3"H x 22.25"F-B

Electrical Requirements

1286 - Main/ Outlets (5): 115VAC, 1 Phase, 2 Wire, 60 Hz, 13.8 FLA
(Total amps include 2A receptacle)

Circuit Breaker: 20 Amp

Receptacle - NEMA 5-20R, 0.5ma leakage current

Exhaust System Volume Requirements: 530-581 CFM

1287 - Main/Outlets (5): 230VAC, 1 Phase, 2 Wire, 50 Hz, 7.5 FLA
(Total amps include 2A receptacle)

Circuit Breaker: 15 Amp

Receptacle - European, 0.5 ma leakage current

Exhaust System Volume Requirements: 530-581 CFM

Filters

(1) Supply HEPA Filter (72"W x 18"F-B x 5-7/8"H)

(1) Exhaust HEPA Filter (24"W x 24"F-B x 5-7/8"H)

Lights

(2) Fluorescent 32W, (F32/T8)

(1) Optional UV 30W, (G30T8) Germicidal Lamp

Blower Motor

3/4 HP, 1500 RPM

Drain Pan Capacity

27.0 Gallons

Environmental Conditions

The biological safety cabinets are designed to be electrically safe in the following environmental conditions:

- Indoors
- Altitude: Up to 2,000 meters
- Temperature: 5°C to 43°C
- Humidity: 80% RH at or below 31°C, decreasing linearly to 50% RH at 40°C
- Mains Supply Fluctuations: $\pm 10\%$ of nominal.
- Installation Category II ¹
- Pollution Degree 2 ²
- Class of Equipment I

¹ Installation category (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500V for a 230V supply and 1500V for a 120V supply.

² Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.

Section 11
Specifications

MODEL (S): 1284, 1285

Test Voltage: 115, 230 **Frequency:** 60, 50 Hz **FLA:** _____

Magnehelic Gauge Reading _____

Damper Position: _____

Position from "Open"

(Test points on speed control board - Terminal "N" neutral and Terminal "M" motor.)

True RMS Voltage To motor: _____

NOTE: Use True RMS volt meter.

Velocity Profile: 6.0 Inches from side with successive points 5.29 inches apart.
6.0 Inches from rear wall with successive points 5.50 inches apart in a plane four inches above the window edge.

Rear Wall

Total Sum _____ \div 24 = average down flow velocity _____ LFPM.

Acceptable down flow range 65-75 in linear feet per minute.

Work Access Opening Airflow

A. Direct Reading Instrument Method

Inflow volume (~ exhaust volume)	_____	cu. ft.
\div Front access opening	3.403	sq. ft.
= Calculated face velocity	_____	LFPM
Acceptable range for face velocity	105-115	LFPM

B. Thermal Anemometer Method

11 Readings

1.5 inches below bottom edge of window (3" high constricted opening), 6.00" from inside edges of the access opening (sidewalls), with successive pts. 3.70" side to side. NOTE: Gaps between window and front face of side wall must be sealed during testing. Thermal anemometer probe must be positioned at a 30° angle from front nosing. Multiply K factor of 1.10 by average velocity reading.

Three inch access opening	1.021 sq. ft.
Ten inch access opening	3.403 sq. ft.
Acceptable range for face velocity	105-115 LFPM

TESTED BY: _____ **DATE:** _____

MODEL (S): 1286, 1287

Test Voltage: 115, 230 Frequency: 60, 50 Hz FLA: _____

Magnehelic Gauge Reading _____

Damper Position: _____

Position from "Open"

(Test points on speed control board - Terminal "N" neutral and Terminal "M" motor.)

True RMS Voltage To motor: _____

NOTE: Use True RMS volt meter.

Velocity Profile: 6.0 Inches from side with successive points 5.55 inches apart.
6.0 Inches from rear wall with successive points 5.50 inches apart in a plane four inches above the window edge.

Rear Wall

Total Sum _____ ÷ 36 = average down flow velocity _____ LFPM.

Acceptable down flow range 70-80 in linear feet per minute.

Work Access Opening Airflow

A. Direct Reading Instrument Method

Inflow volume (~ exhaust volume)	_____	cu. ft.
÷ Front access opening	5.052	sq. ft.
= Calculated face velocity	_____	LFPM
Acceptable range for face velocity	105-115	LFPM

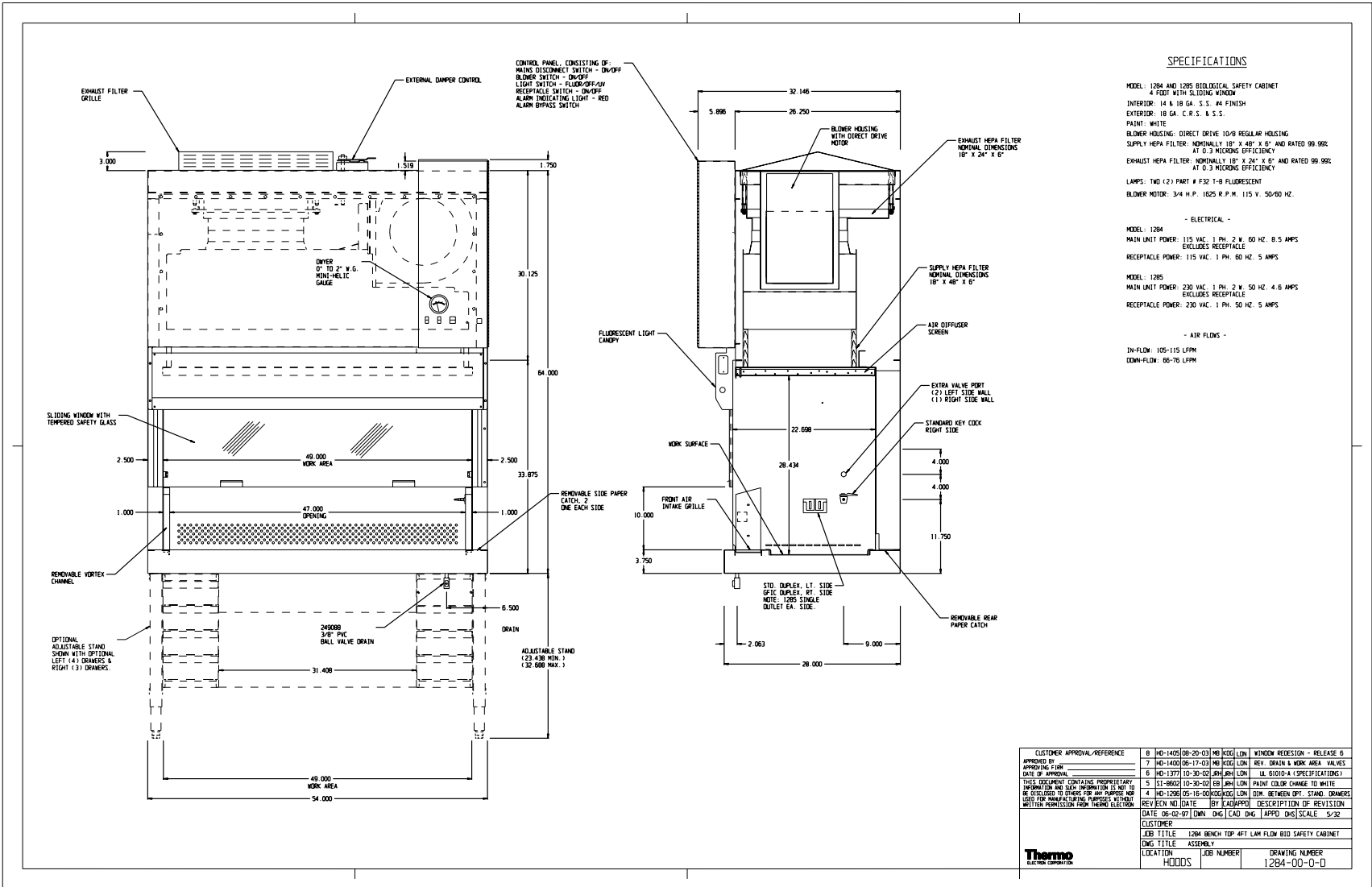
B. Thermal anemometer Method

17 Readings

1.5" below bottom edge of window (3" high constricted opening), 6.00" from inside edges of the access opening (sidewalls), with successive pts. 3.80" side to side. NOTE: Gaps between window and front face of side wall must be sealed during testing. Thermal anemometer probe must be positioned at a 30° angle from front nosing. Multiply K factor of 1.08 by average velocity reading.

3" access opening	1.516 sq. ft.
10" access opening	5.052 sq. ft.
Acceptable range for face velocity	105-115 LFPM

TESTED BY: _____ DATE: _____



SPECIFICATIONS

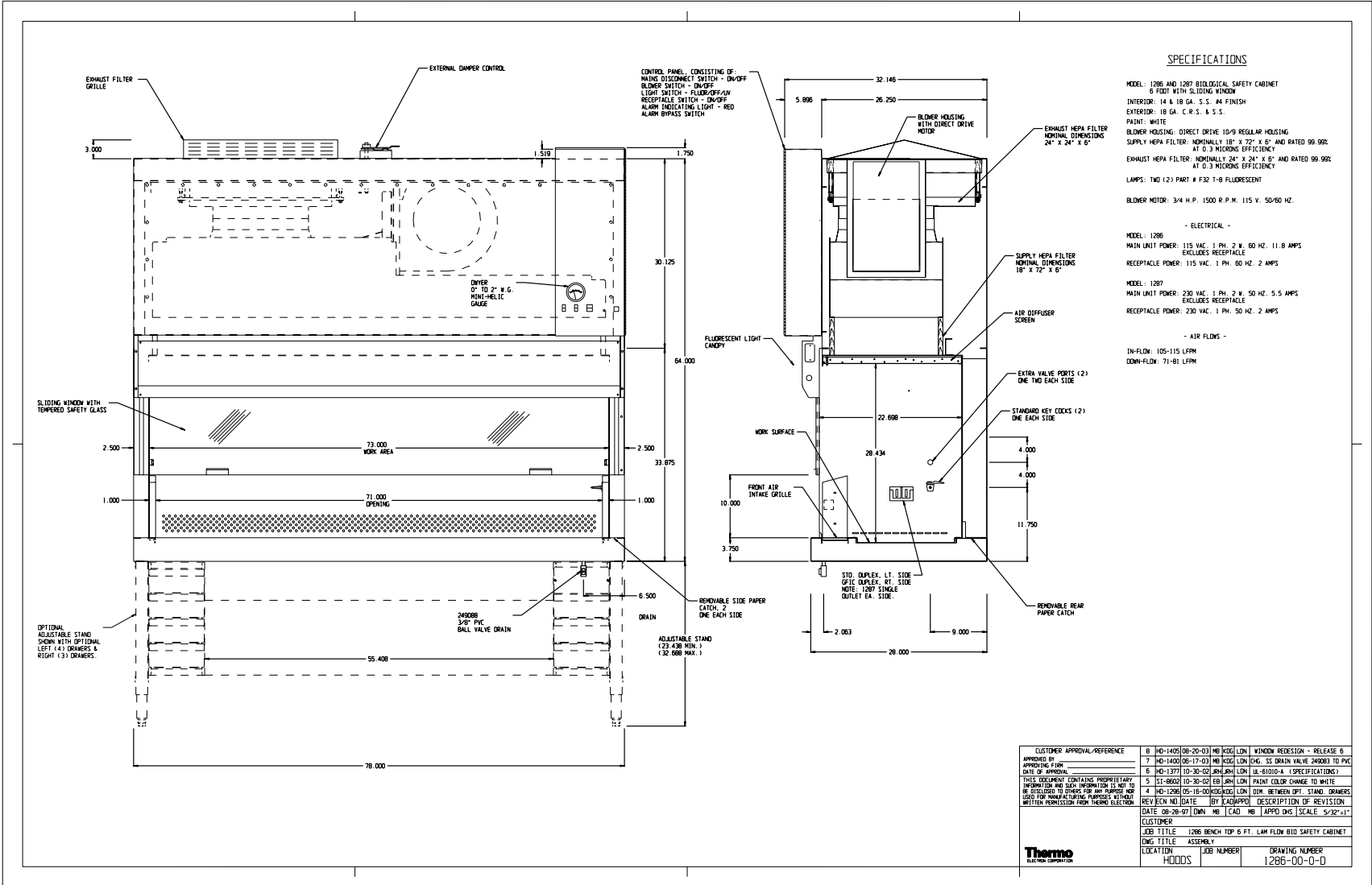
MODEL: 1284 AND 1285 BIOLOGICAL SAFETY CABINET
 4 FOOT WITH SLIDING WINDOW
 INTERIOR: 14 & 18 GA. S.S. #4 FINISH
 EXTERIOR: 18 GA. C.R.S. & S.S.
 PAINT: WHITE
 BLOWER HOUSING: DIRECT DRIVE 10-8 REGULAR HOUSING
 SUPPLY HEPA FILTER: NOMINALLY 18" X 24" X 6" AND RATED 99.99% AT 0.3 MICRONS EFFICIENCY
 EXHAUST HEPA FILTER: NOMINALLY 18" X 24" X 6" AND RATED 99.99% AT 0.3 MICRONS EFFICIENCY
 LAMPS: TWO (2) PART # F32 1-8 FLUORESCENT
 BLOWER MOTOR: 3/4 H.P. 1625 R.P.M. 115 V. 50/60 HZ.

- ELECTRICAL -
 MODEL: 1284
 MAIN UNIT POWER: 115 VAC. 1 PH. 2 W. 60 HZ. 8.5 AMPS
 EXCLUDES RECEPTACLE
 RECEPTACLE POWER: 115 VAC. 1 PH. 60 HZ. 5 AMPS
 MODEL: 1285
 MAIN UNIT POWER: 230 VAC. 1 PH. 2 W. 50 HZ. 4.6 AMPS
 EXCLUDES RECEPTACLE
 RECEPTACLE POWER: 230 VAC. 1 PH. 50 HZ. 5 AMPS

- AIR FLOWS -
 IN-FLOW: 105-115 LFPM
 DOWN-FLOW: 66-76 LFPM

CUSTOMER APPROVAL/PREFERENCE	
APPROVED BY	8 MD-1405 (08-20-03) RD JKS/LON WINDOW REVISION - RELEASE 6
DATE OF APPROVAL	7 MD-1405 (08-17-03) RD JKS/LON REV: DRAIN & WORK AREA VALVES
	6 MD-1377 (10-30-02) JKH/JKH/LON IL 81010-A (SPECIFICATIONS)
	5 SI-0602 (10-30-02) EB JKH/LON PAINT COLOR CHANGE TO WHITE
	4 MD-1286 (05-16-00) KDC/KDC/LON DIM. BETWEEN OPT. STAND DRAWERS
REVISION NO./DATE	(BY FNAME/PM) DESCRIPTION OF REVISION
DATE: 08-02-97	DWN DNG CAD DNG JAPRO DMS SCALE: 5/32
CUSTOMER	
JOB TITLE	1284 BENCH TOP 4FT LAM FLOW BIO SAFETY CABINET
DWG TITLE	ASSEMBLY
LOCATION	JOB NUMBER DRAWING NUMBER
HODDS	1284-00-0-D





Section 12 Accessories

Description	Order Number
Service Valve	191275
Armrest, 4' cabinet	191509
Armrest, 6' cabinet	191512
Lab Chair with arms	191486
Lab Chair without arms	191487
Storage Cabinet, left side	191494
Storage Cabinet, right side	191495
UV Light, 30W	191419
UV Light, 30W portable	191070
IV Rod, stainless steel, 4' cabinet	191571
IV Rod, stainless steel, 6' cabinet	191572
Adjustable Foot Rest, 4' cabinet	191127
ULPA Filter, 4 ft. cabinets, (1) exhaust & (1) supply*	760192
ULPA Filter, 6 ft. cabinets, (1) exhaust & (1) supply*	760193
Exhaust Transition	191782
Hydraulic Stand, 4' cabinet	191518
Hydraulic Stand, 6' cabinet	191519
Adjustable Stand, 4' cabinet	191550
Adjustable Stand, 6' cabinet	191551
2-drawer Storage Cabinet, left side of stand	191524
Service Valve Kit, use w/ Universal Piping	191597
Universal Piping Kit*	191620
ADA Control Panel*	191496
Caster Pan, BSC Stand (customer installed)	191684
Low Flow Alarm	191168
4 ft. Anchoring System*	191788
6 ft. Anchoring System*	191794

*factory installed

Section 13 Parts List

Model 1284

Stock #	Description
156106	3/4 HP Blower Motor (1625 RPM)
170045	Capacitor, Motor 25MFD, 370V
190396	Motor Speed Control
500030	Ballast (Fluorescent Lighting)
141048	48" Fluorescent Lamp (32 Watt)
230054	Circuit Breaker, 15A SP
430263	Line cord Assembly, 20A, 120V,
760178	Filter, Supply HEPA 18" x 48" x
760179	Filter, Exhaust HEPA 18" x 24" x
500009	Ballast, (UV Lighting)
141014	30W Germicidal Lamp
360095	Rocker Switch, SPST, Flat Black
360105	Rocker Switch, SPDT
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
360146	Rocker Switch, DPST
230182	Fuses, 7 Amp, 1/4" x 1-1/4"
230204	Circuit Breaker/Switch 18A
400163	Sash Alarm Board

The parts for the Model 1285 are the same as those listed above with the addition of the following:

Stock #	Description
275012	Transformer, 1.5KVA, 240/120V
460270	European Cord, 230V, 16A
230203	Circuit Breaker/Switch 13A

Model 1286

Stock #	Description
156109	HP Blower Motor (1500 RPM)
170045	Capacitor, Motor 25MFD, 370V
190396	Motor Speed Control
500030	Ballast (Fluorescent Lighting)
141048	Fluorescent Lamp (32 Watt)
230054	Circuit Breaker, 15A SP
430263	Line Cord Assembly, 20A, 120V,
760180	Filter, Supply HEPA 18" x 72" x
760181	Filter, Exhaust HEPA 24" x "24 x 5-7/8"
500009	Ballast, (UV Lighting)
141014	30W Germicidal Lamp
360095	Rocker Switch, SPST, Flat Black
360105	Rocker Switch, SPDT
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
360146	Rocker Switch, DPST
230166	Fuses, 3 Amp 1/4" x 1-1/4"
230204	Circuit Breaker/Switch 18A
400163	Sash Alarm Board

The parts for the Model 1287 are the same as Model 1286 with the addition of:

Stock #	Description
275012	Transformer, 1.5KVA, 240/120V
430270	European Cord, 230V, 16A
230179	Circuit Breaker/Switch 10A

Filter Pressure Drop Conversion

Pressure drop across a HEPA filter is linear which allows one to accurately predict the pressure drop at various CFM if given a starting value. It is a straight proportion from one setting to the other.

Example:

A filter rating of 0.31" of water at 352 CFM needs to be converted to 530 CFM.

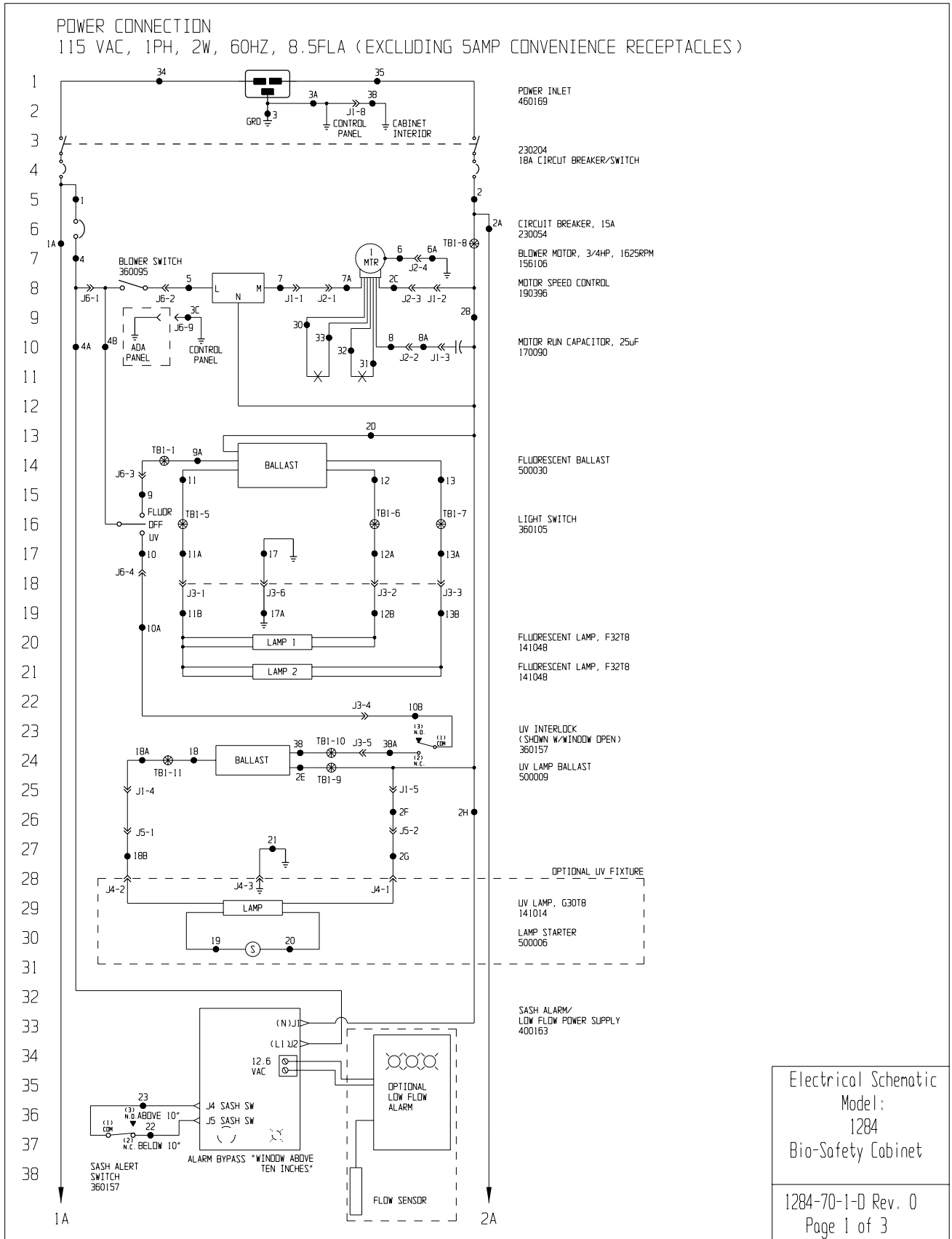
The formula is as follows:

$$\frac{0.31}{352} = \frac{x}{530}$$

Solving for x (the needed pressure drop at 530 CFM)

$$x = \frac{(0.31) * 530}{352}$$

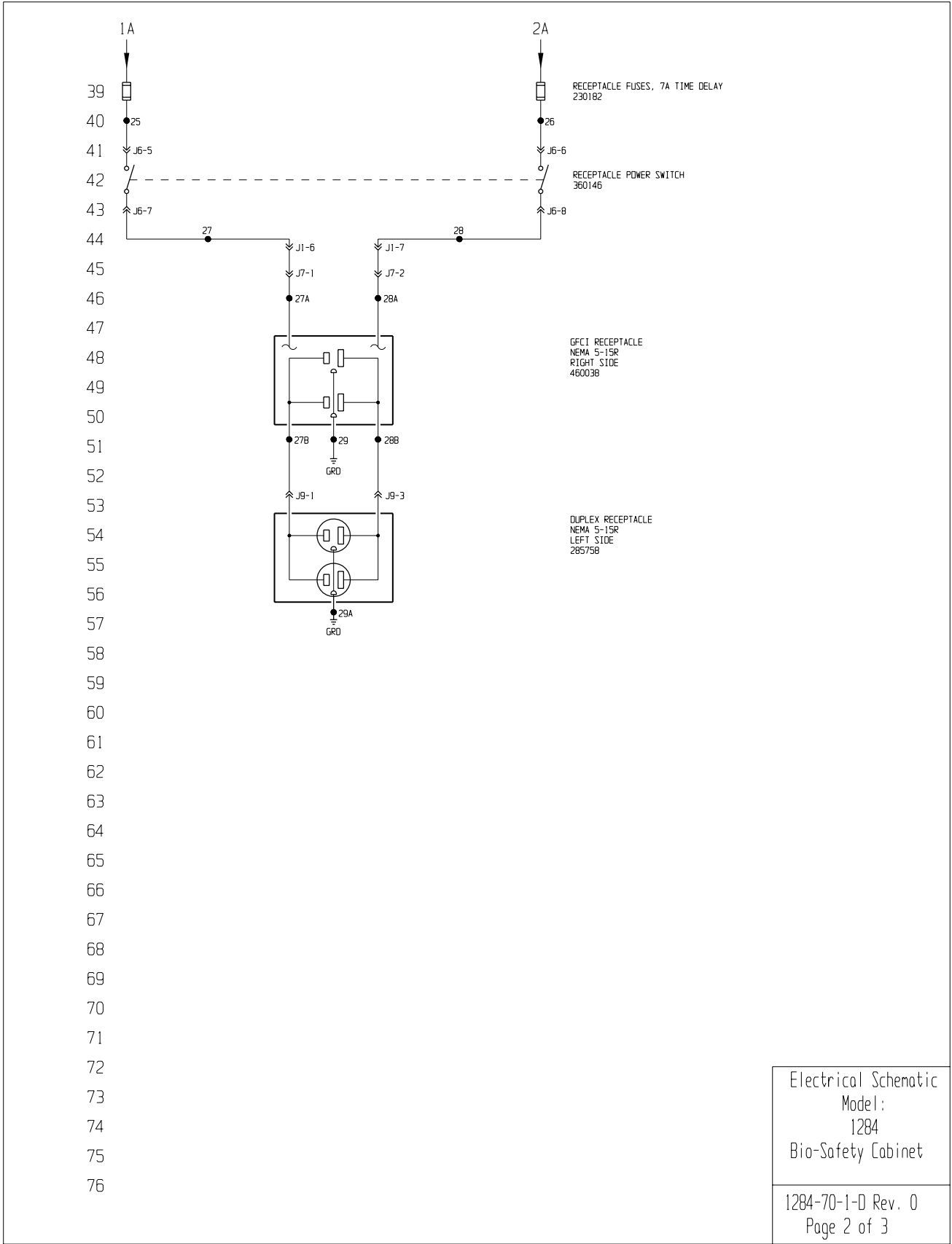
$$x = 0.47" \text{ of water (rounded)}$$



Electrical Schematic
Model:
1284
Bio-Safety Cabinet

1284-70-1-D Rev. 0
Page 1 of 3

Section 14
Electrical Schematics



Electrical Schematic
Model:
1284
Bio-Safety Cabinet

1284-70-1-D Rev. 0
Page 2 of 3

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77	1	12	BLACK
78	1A	16	BROWN
	2	12	WHITE
79	2A	16	BLUE
	2B	16	WHITE
	2C	18	WHITE
80	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
81	2G	18	WHITE
	2H	20	WHITE
82	2I	N/A	N/A
	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
83	3B	16	GREEN/YELLOW
	3C	16	GREEN/YELLOW
	3D	N/A	N/A
84	4	14	BROWN
	4A	20	BROWN
	4B	16	BROWN
85	4C	N/A	N/A
	5	16	BLUE
86	6	18	GREEN
	6A	16	GREEN
	7	16	BLACK
87	7A	18	BLACK
	8	18	BROWN
	8A	16	BROWN
88	9	16	PURPLE
	9A	18	BLACK
89	10	18	ORANGE
	11	18	RED
90	11A	20	RED
	11B	18	RED
	12	18	BLUE
91	12A	20	BLUE
	12B	18	BROWN
	13	18	BLUE
92	13A	20	BLACK
	13B	18	BLACK
	17	16	GREEN
93	17A	18	ORANGE
	18	18	BLUE
	18A	16	BLUE
94	18B	18	BLACK
	19	18	BLACK
95	20	18	BLACK
	21	18	GREEN
96	22	20	RED
	22A	N/A	N/A
	23	20	RED
97	24	N/A	N/A
	25	16	YELLOW
	26	16	GRAY
98	27	16	ORANGE
	27A	18	ORANGE
	27B	18	BLACK
99	28	16	RED
	28A	18	RED
100	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
101	30	18	BROWN
	31	18	ORANGE
102	32	18	PURPLE
	33	18	YELLOW
	34	12	BROWN
103	35	12	BLUE
	36	N/A	N/A
	37	N/A	N/A
104	38	18	BLACK
	38A	18	YELLOW

NOTES:		
⊕	Denotes Terminal Strip Connection	Parts List Reference Number
⊖	Lost Relay Number	○ Assembly
⊙	11 Lost Terminal Number	○ Panel
⊚	38 Lost Wire Number	○ Refrigeration
CONNECTOR	FUNCTION	LOCATION
J1 (9 PDS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 PDS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (9 PDS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)
J4 (4 PDS.)	UV LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)
J5 (2 PDS.)	UV RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)
J6 (6 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
T81 (11 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM THERMO FORMA

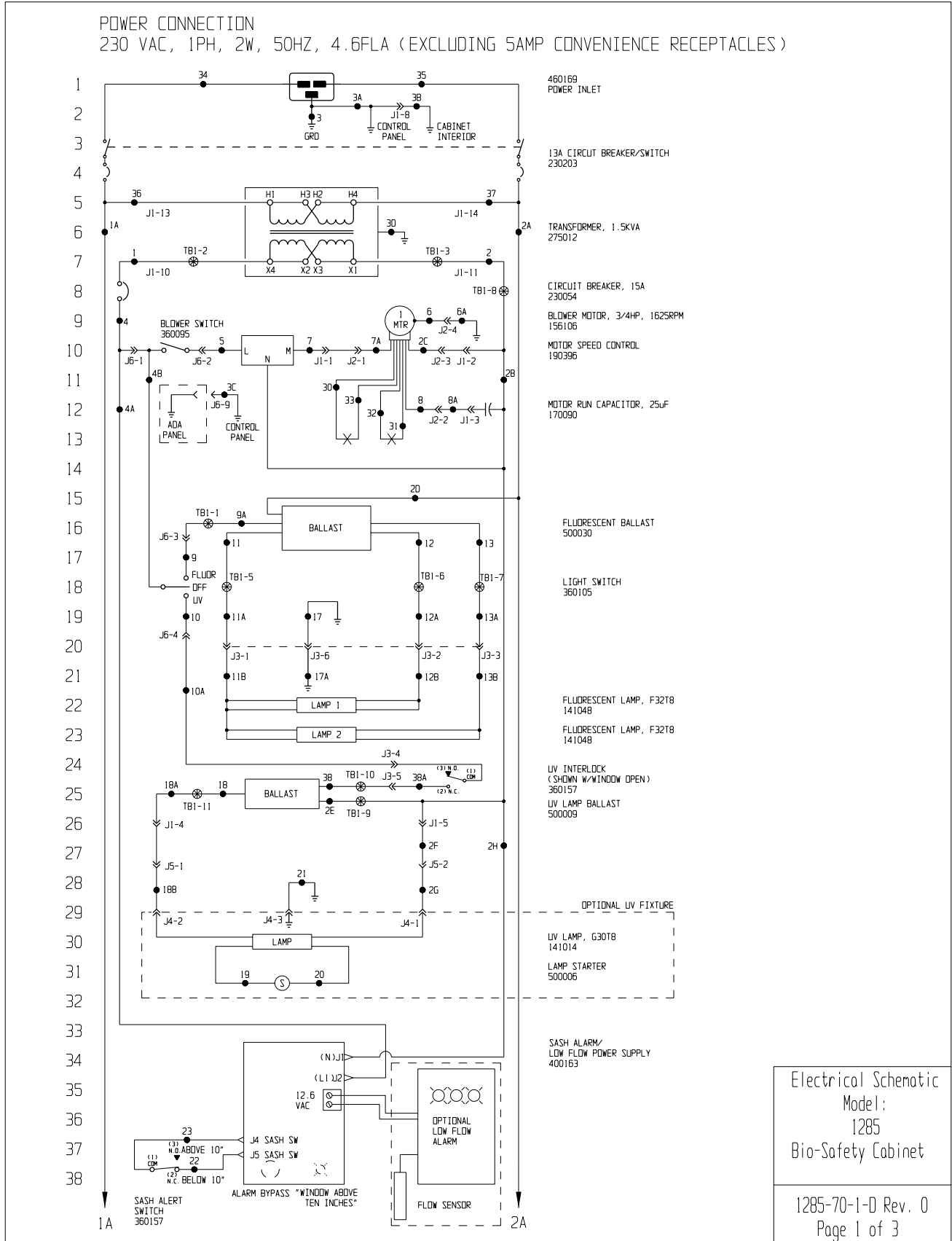
Thermo Forma
BOX 649, MARIETTA, OHIO 45750

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
0	HD-1405	07-14-03	RTT	RTT	AKS	REL. 6, RELEASED FOR PRODUCTION
		07-10-03	DWN	RTT	CAD	RTT APPD FCA SCALE NTS
CUSTOMER						
JOB TITLE 1284 4FT. BIO-SAFETY CABINET						
DWG TITLE ELECTRICAL SCHEMATIC						
LOCATION		JOB NUMBER		DRAWING NUMBER		
HOODS				1284-70-1-D		

Electrical Schematic
Model:
1284
Bio-Safety Cabinet

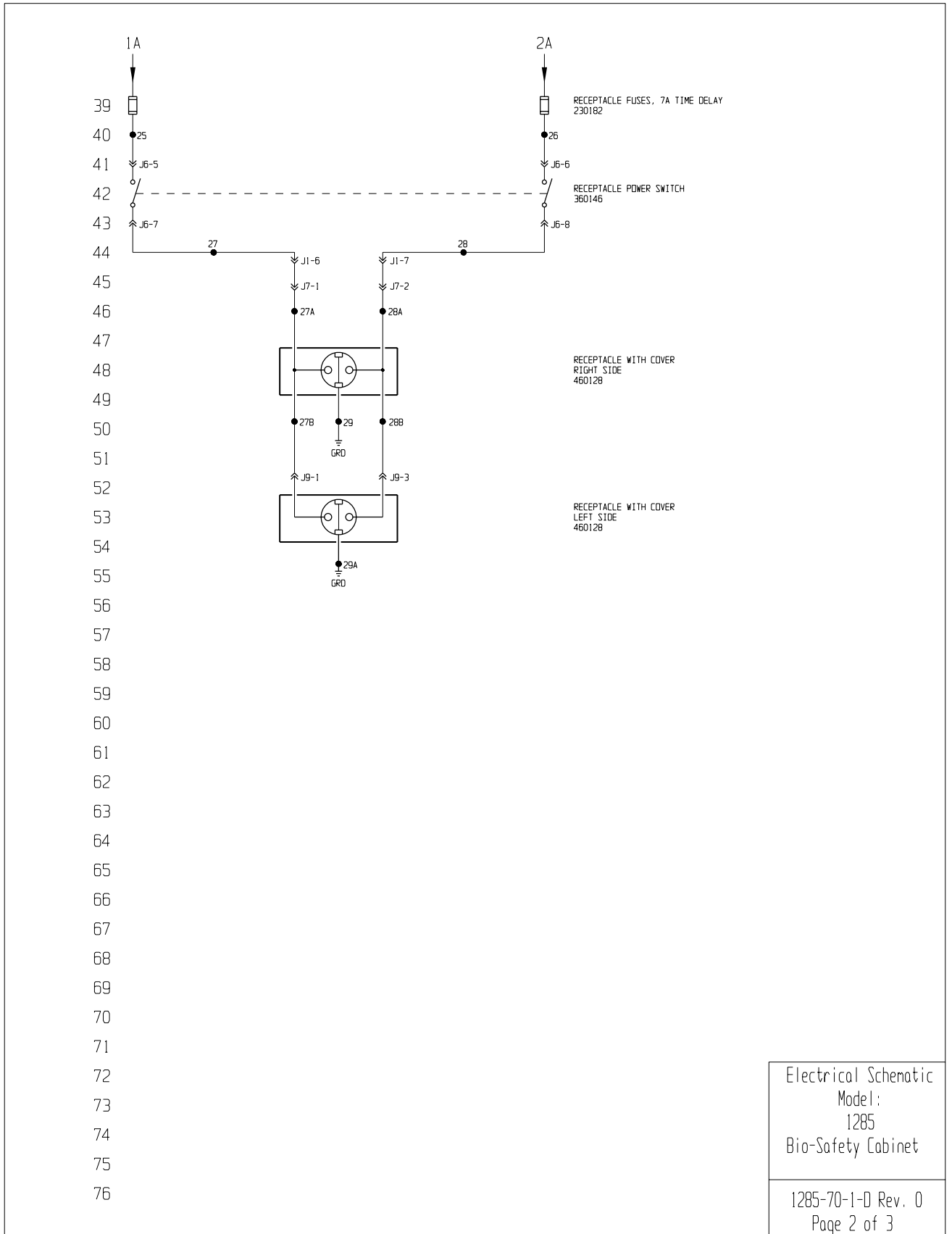
1284-70-1-D Rev. 0
Page 3 of 3

Section 14
Electrical Schematics



Electrical Schematic
Model:
1285
Bio-Safety Cabinet

1285-70-1-D Rev. 0
Page 1 of 3



Electrical Schematic
Model:
1285
Bio-Safety Cabinet

1285-70-1-D Rev. 0
Page 2 of 3

Section 14
Electrical Schematics

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77			
78	1	12	BLACK
	1A	16	BROWN
	2	12	WHITE
79	2A	16	BLUE
	2B	16	WHITE
	2C	18	WHITE
80	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
81	2G	18	WHITE
	2H	20	WHITE
82	2I	N/A	N/A
	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
83	3B	16	GREEN/YELLOW
	3C	16	GREEN/YELLOW
	3D	16	GREEN/YELLOW
84	4	14	BROWN
	4A	20	BROWN
	4B	16	BROWN
85	4C	N/A	N/A
	5	16	BLUE
86	6	18	GREEN
	6A	16	GREEN
	7	16	BLACK
87	7A	18	BLACK
	8	18	BROWN
	8A	16	BROWN
88	9	16	PURPLE
	9A	18	BLACK
89	10	16	ORANGE
	11	18	RED
90	11A	20	RED
	11B	18	RED
	12	18	BLUE
91	12A	20	BLUE
	12B	18	BROWN
	13	18	BLUE
92	13A	20	BLACK
	13B	18	BLACK
	17	16	GREEN
93	17A	18	ORANGE
	18	18	BLUE
	18A	16	BLUE
94	18B	18	BLACK
	19	18	BLACK
95	20	18	BLACK
	21	18	GREEN
	22	18	RED
96	22A	N/A	N/A
	23	20	RED
97	24	N/A	N/A
	25	16	YELLOW
	26	16	GRAY
98	27	16	ORANGE
	27A	18	ORANGE
	27B	18	BLACK
99	28	16	RED
	28A	18	RED
100	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
101	30	18	BROWN
	31	18	ORANGE
	32	18	PURPLE
102	33	18	YELLOW
	34	12	BROWN
	35	12	BLUE
103	36	12	BROWN
	37	12	BLUE
104	38	18	BLACK
	38A	16	YELLOW
105			
106			
107			

NOTES:		
⊕	Denotes Terminal Strip Connection	Parts List Reference Number
	Last Relay Number	○ Assembly
11	Last Terminal Number	○ Panel
3B	Last Wire Number	○ Refrigeration
CONNECTOR	FUNCTION	LOCATION
J1 (9 POS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 POS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (9 POS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)
J4 (4 POS.)	UV LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)
J5 (2 POS.)	UV RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)
J6 (9 POS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 POS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (3 POS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 POS.)	BALLAST CONNECTIONS	CONTROL PANEL

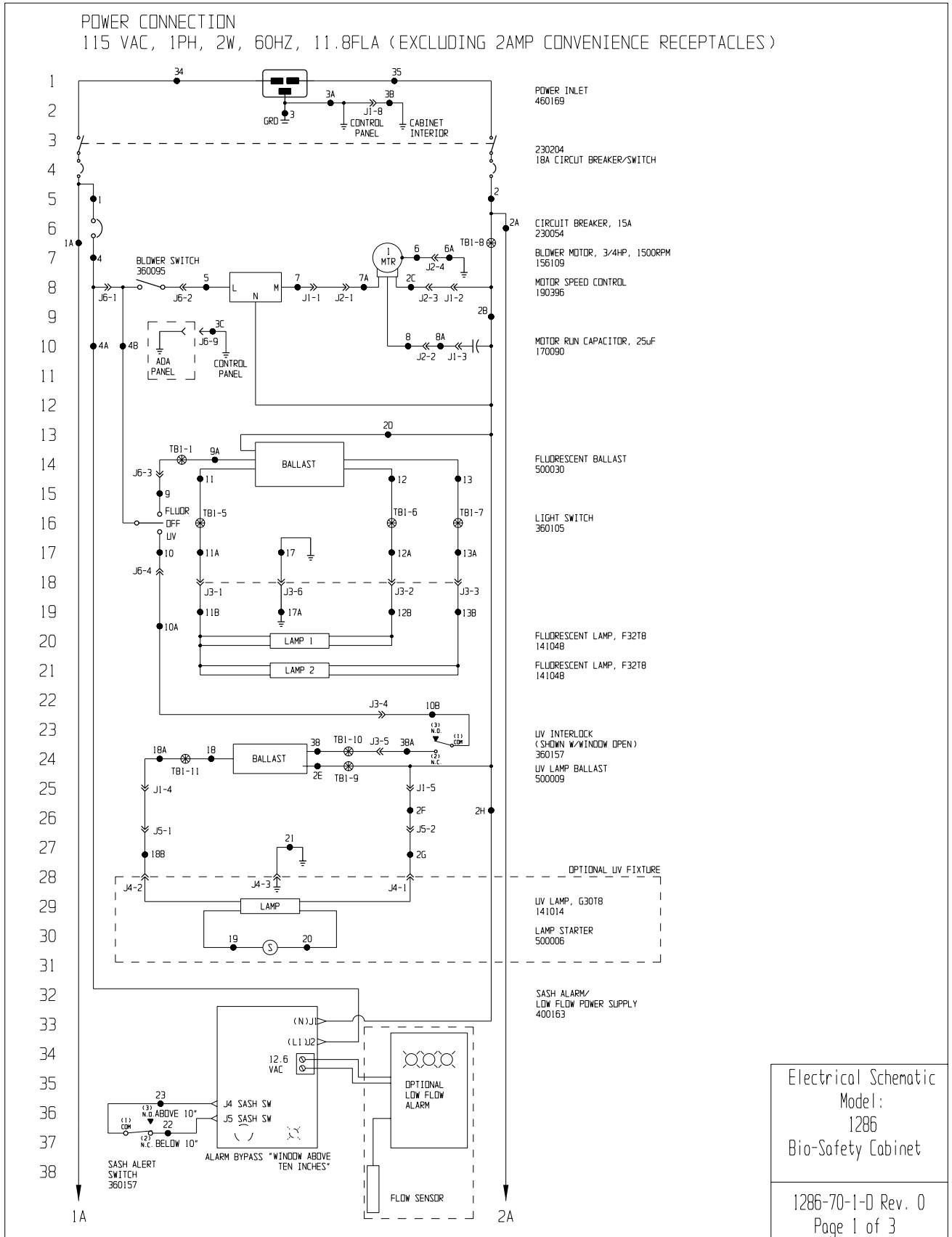
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM THERMO FORMA



REV	ECR NO.	DATE	BY	CAD	APPO	DESCRIPTION OF REVISION
0	HD-1405	07-14-03	RTT	RTT	AKS	REMOVED CONNECTORS, RIGHT RECEPTACLE
DATE 07-14-03 DWN RTT CAD RTT APPD FCA SCALE NTS						
CUSTOMER						
JOB TITLE 1285 4FT. BIO-SAFETY CABINET - 230V/50HZ						
DWG TITLE ELECTRICAL SCHEMATIC						
LOCATION HOODS		JOB NUMBER		DRAWING NUMBER 1285-70-1-D		

Electrical Schematic
Model:
1285
Bio-Safety Cabinet

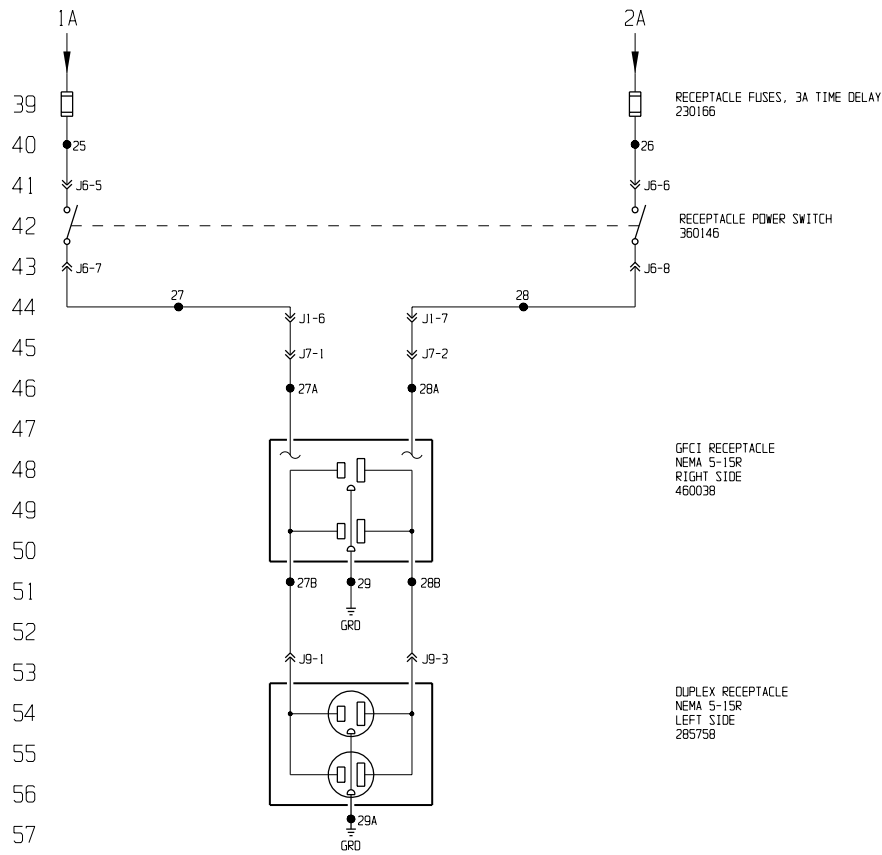
1285-70-1-D Rev. 0
Page 3 of 3



Electrical Schematic
Model:
1286
Bio-Safety Cabinet

1286-70-1-D Rev. 0
Page 1 of 3

Section 14
Electrical Schematics



Electrical Schematic
Model:
1286
Bio-Safety Cabinet

1286-70-0-0 Rev. 6
Page 2 of 3

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77	1	12	BLACK
	1A	16	BROWN
78	2	12	WHITE
	2A	16	BLUE
79	2B	16	WHITE
	2C	18	WHITE
80	2D	18	WHITE
	2E	18	WHITE
81	2F	16	GRAY
	2G	18	WHITE
	2H	20	WHITE
82	2I	18	WHITE
	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
83	3B	16	GREEN/YELLOW
	3C	16	GREEN/YELLOW
	3D	N/A	N/A
84	4	14	BROWN
	4A	20	BROWN
	4B	16	BROWN
85	4C	18	ORANGE
	5	16	BLUE
	6	18	GREEN
	6A	16	GREEN
	7	16	BLACK
87	7A	18	BLACK
	8	18	BROWN
	8A	16	BROWN
88	9	16	PURPLE
	9A	18	BLACK
89	10	16	ORANGE
	11	18	RED
	11A	20	RED
90	11B	18	RED
	12	18	BLUE
	12A	20	BLUE
91	12B	18	BROWN
	13	18	BLUE
92	13A	20	BLUE
	13B	18	BLACK
93	17	16	GREEN
	17A	18	ORANGE
	18	18	BLUE
94	18A	16	BLUE
	18B	18	BLACK
	19	18	BLACK
95	20	18	BLACK
	21	18	GREEN
	22	18	RED
96	22A	20	RED
	23	20	BLUE
97	24	18	BLACK
	25	16	YELLOW
	26	16	GRAY
98	27	16	ORANGE
	27A	18	ORANGE
99	27B	18	BLACK
	28	16	RED
	28A	18	RED
100	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
101	30	N/A	N/A
	31	N/A	N/A
102	32	N/A	N/A
	33	N/A	N/A
	34	N/A	N/A
	34	12	BROWN
103	35	12	BLUE
	36	N/A	N/A
104	37	N/A	N/A
	38	18	BLACK
105	38A	16	ORANGE
106			
107			

NOTES:

⊕	Denotes Terminal Strip Connection	Parts List Reference Number
ITD	Last Terminal Number	○ Assembly
11	Last Terminal Number	○ Panel
3B	Last Wire Number	○ Refrigeration

CONNECTOR	FUNCTION	LOCATION
J1 (15 POS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 POS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (9 POS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)
J4 (4 POS.)	UVY LAMP RECEPTACLE	WDRK CHAMBER (RIGHT SIDE)
J5 (2 POS.)	UVY RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)
J6 (5 POS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 POS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (4 POS.)	RIGHT-SIDE RECEPTACLE	RIGHT-RECEPTACLE-BOX
J9 (3 POS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 POS.)	BALLAST CONNECTIONS	CONTROL PANEL

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM THERMO FORMA

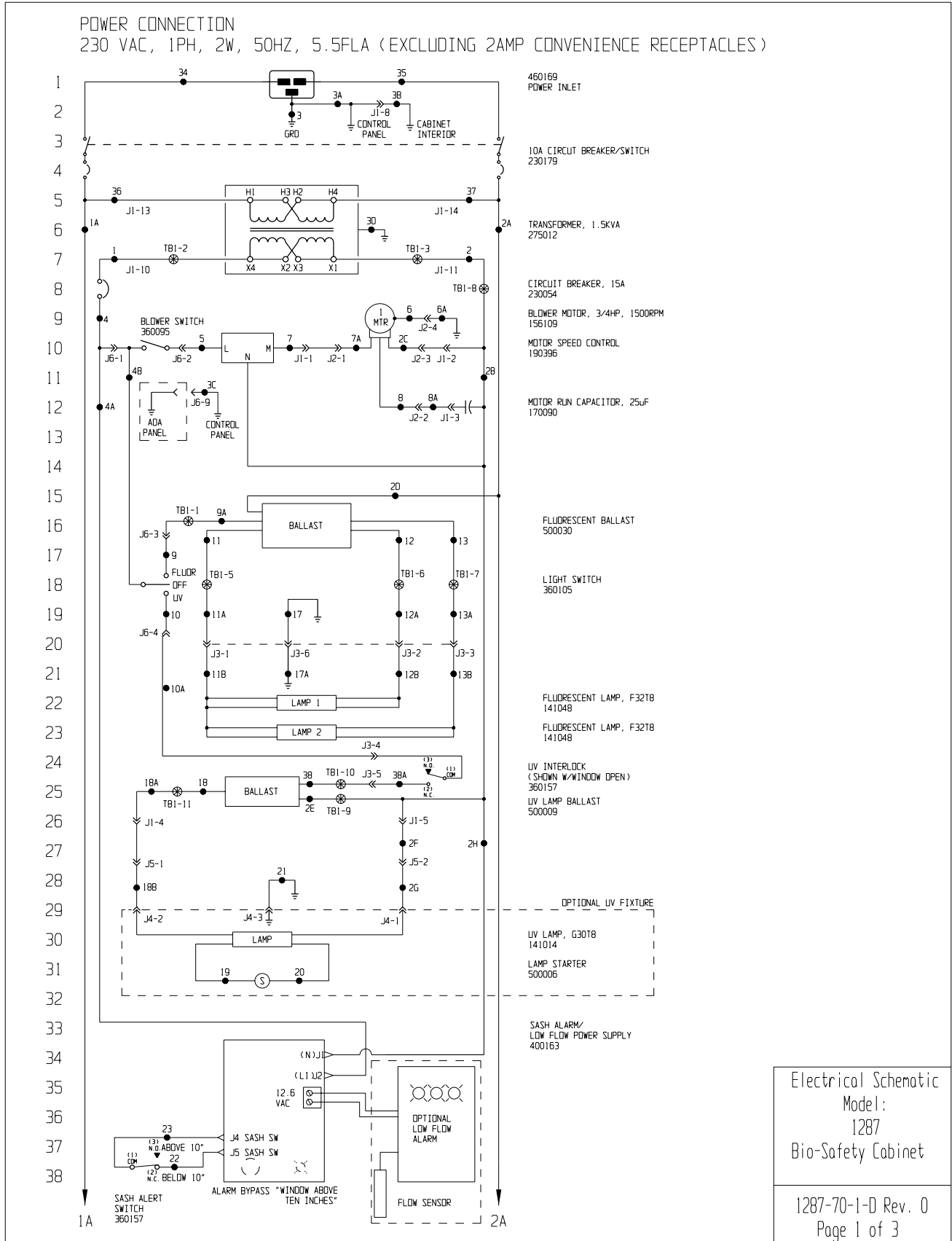
Thermo Forma
BOX 849, MARIETTA, OHIO 45750

6	HD-1377	02/25/03	GLS	GLS	AKS	REMOVE WIRES 14 THRU 16
5	HD-1377	09-20-02	GLS	GLS	MSB	UL RELISTING UP-DATES
4	HD-1295	06-02-00	GLS	KDG	LON	NOTED EXCLUDING 2AMP RECEPT
3	HD-1207	07-31-98	BOB	KDG	LON	RIGHT OFIC RECEPT. TO STANDARD
2	SI-6557	07-07-98	DWL	KDG	LON	CHANGED 360155 SWITCH TO 360146
REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
DATE	02-26-97	DWN	JAS	CAD	JAS	APPD DS SCALE NTS
CUSTOMER						
JOB TITLE 1286 BFT. BIO-SAFETY CABINET						
DWG TITLE ELECTRICAL SCHEMATIC						
LOCATION	JOB NUMBER		DRAWING NUMBER			
HOODS			1286-70-0-0			

Electrical Schematic
Model:
1286
Bio-Safety Cabinet

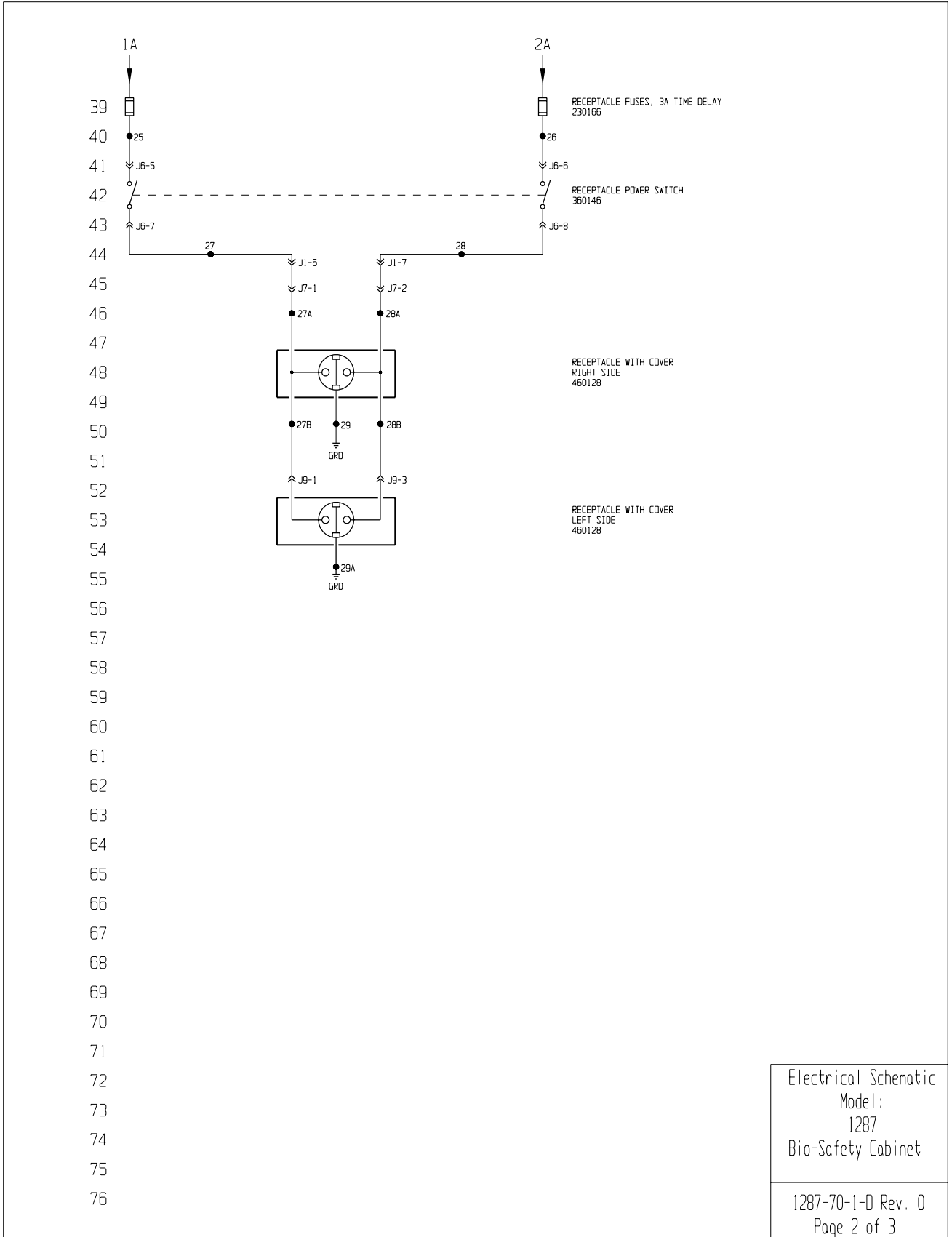
1286-70-0-0 Rev. 6
Page 3 of 3

Section 14
Electrical Schematics



Electrical Schematic
Model:
1287
Bio-Safety Cabinet

1287-70-1-0 Rev. 0
Page 1 of 3



Electrical Schematic
Model:
1287
Bio-Safety Cabinet

1287-70-1-D Rev. 0
Page 2 of 3

Section 14
Electrical Schematics

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77	1	12	BLACK
78	1A	16	BROWN
	2	12	WHITE
79	2A	16	BLUE
	2B	16	WHITE
	2C	18	WHITE
80	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
81	2G	18	WHITE
	2H	20	WHITE
82	2I	N/A	N/A
	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
83	3B	16	GREEN/YELLOW
	3C	16	GREEN/YELLOW
	3D	16	GREEN/YELLOW
84	4	14	BROWN
	4A	20	BROWN
	4B	16	BROWN
85	4C	N/A	N/A
	5	16	BLUE
	6	18	GREEN
86	6A	16	GREEN
	7	16	BLACK
87	7A	18	BLACK
	8	18	BROWN
	8A	16	BROWN
88	9	16	PURPLE
	9A	18	BLACK
89	10	16	ORANGE
	11	18	RED
90	11A	20	RED
	11B	18	RED
	12	18	BLUE
91	12A	20	BLUE
	12B	18	BROWN
	13	18	BLUE
92	13A	20	BLACK
	13B	18	BLACK
93	17	16	GREEN
	17A	18	ORANGE
	18	18	BLUE
94	18A	16	BLUE
	18B	18	BLACK
95	19	18	BLACK
	20	18	BLACK
	21	18	GREEN
96	22	18	RED
	22A	N/A	N/A
	23	20	RED
97	24	N/A	N/A
	25	16	YELLOW
	26	16	GRAY
98	27	16	ORANGE
	27A	18	ORANGE
99	27B	18	BLACK
	28	16	RED
	28A	18	RED
100	28B	18	WHITE
	29	18	GREEN
101	29A	18	GREEN
	30	N/A	N/A
102	31	N/A	N/A
	32	N/A	N/A
103	33	N/A	N/A
	34	12	BROWN
	35	12	BLUE
104	36	12	BROWN
	37	12	BLUE
	38	18	BLACK
105	38A	16	YELLOW

NOTES:		
⊗ Denotes Terminal Strip Connection	○ Assembly	Parts List Reference Number
11 Lost Terminal Number	○ Panel	
38 Lost Wire Number	○ Refrigeration	
CONNECTOR	FUNCTION	LOCATION
J1 (3 PDS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 PDS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (9 PDS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)
J4 (4 PDS.)	UV LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)
J5 (2 PDS.)	UV RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)
J6 (9 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J9 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM THERMO FORMA

Thermo Forma
BOX 649, MARIETTA, OHIO 45750

0	HO-1405	07-14-03	RTT	RTT	AKS	REL. 6.	RELEASED FOR PRODUCTION
REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION	
	DATE	07-14-03	DWN	RTT	CAD	RTT	APPD FCA SCALE NTS
CUSTOMER							
JOB TITLE 1287 6FT. BIO-SAFETY CABINET - 230V/50HZ							
DWG TITLE ELECTRICAL SCHEMATIC							
LOCATION		JOB NUMBER		DRAWING NUMBER			
HOODS				1287-70-1-0			

Electrical Schematic
Model:
1287
Bio-Safety Cabinet

1287-70-1-0 Rev. 0
Page 3 of 3

THERMO ELECTRON CORPORATION LAMINAR FLOW EQUIPMENT WARRANTY USA

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner.

During the first thirty-six (36) months, component parts proven to be non-conforming in material or workmanship will be repaired or replaced at Thermo's expense, including labor. Installation, calibration and certification is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any component or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-888-213-1790 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contract your local distributor for warranty information.

Rev. 3 4/03



THERMO ELECTRON CORPORATION LAMINAR FLOW EQUIPMENT WARRANTY INTERNATIONAL

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner.

During the first thirty six (36) months, component parts proven to be non-conforming in material or workmanship will be repaired or replaced at Thermo's expense, excepting labor. Installation, calibration and certification is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, filters and gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any component or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-888-213-1790 (USA or Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contract your local distributor for warranty information.

Rev. 3 4/03



Locating a Certification Company

Biological safety cabinet certification consists of a series of tests designed to verify that the cabinet is performing within operating parameters established by the manufacturer.

To assure that a biological safety cabinet is operating as intended, each cabinet should be field-tested at the time of installation and at least annually thereafter. Cabinets should be re-certified whenever HEPA filters are changed, internal maintenance is performed, or is relocated.

Three industry-related organizations maintain lists of companies and individuals who are active in the certification industry. You may contact these organizations at the addresses listed below.

NSF International (NSF) and International Air Filtration Certifiers Association (IAFCA) sponsor certifier accreditation programs. Accredited certifiers have demonstrated proficiency at testing biological safety cabinets by successfully completing written and/or practical examinations.

Biohazard Cabinet Field Certifier Program
NSF International
PO Box 130140
789 N. Dixboro Rd
Ann Arbor, MI 48113-0140
Telephone (734) 769-8010 Or (800) NSF-MARK
Fax (734) 769-0109
<http://www.nsf.org/Certified/Biohazard-Certifier>

IAFCA
PO Box 12155
Columbus, OH 43212
Telephone (888) 679-1904
Fax (614) 486-1108
<http://www.iafca.com/certifier.html>

The Controlled Environment Testing Association (CETA) is a trade association devoted to promoting and developing quality assurance within the controlled environment testing industry. A list of active members is available by contacting the organization.

Controlled Environment Testing Association
1500 Sunday Drive
Suite 102
Raleigh, NC 27607
Telephone (919) 787-5181
Fax (919) 787-4916
http://www.cetainternational.org/members/corp_indiv.htm

For your convenience we have included a partial list of agencies that perform certification on our website. If you do not find someone listed in your area, please contact Thermo Forma's technical services department for additional references.

Thermo Electron Corporation
Controlled Environment Equipment
401 Millcreek Road
Marietta, Ohio 45750
United States

www.thermo.com