

Thermo Forma

**Models:
1284, 1285, 1286, 1287,
1288, 1290 and 1291**

Biological Safety Cabinets
Class II, Type A/B3

Operating and Maintenance Manual

Manual No: 7001284 Rev. 13

Read This Instruction Manual.

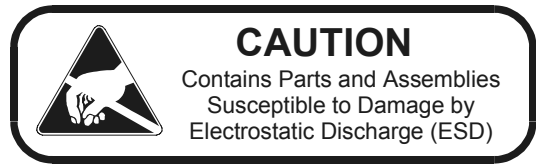
Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.



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

CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.

Refer to the serial tag on the back of this manual.



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MANUAL NUMBER 7001284

--	21077/HD-1376	9/20/02	Removed certifiers list, added reference to website	ccs
13	20630/HD-1350	5/14/02	Updated wiring diagram, added fuse labels	aks
12	19938/HD-1330	5/8/01	Updated wiring diagrams, relay source change, alternate view	ccs
--	19691/HD-1314	3/14/01	Updated 1284-72 to rev 13 w/ the addition of the transformer shield (1291)	ccs
--	19343/HD-1305	9/8/00	Specified location of thumbscrew (Section 9.4), updated 1284-72 & 1285-72	ccs
11	--	8/5/00	Quark format, added 8" dia. measurement to 191570-00 drawing	ccs
10	19029/HD-1295	6/16/00	Added exclusion on FLA rating	ccs
--	19002/SI-7906		Wire harness chg (1284 & 1285-72 drawings)	
9	18861/HD-1283	4/12/00	Model 1286 blower motor chg, updated Section 9.2	ccs
--	18863/HD1283			

REV	ECR/ECN	DATE	DESCRIPTION	By
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Alerts the user to important operating and/or maintenance instructions. May be used alone or with other safety symbols. Read the accompanying text carefully.



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.



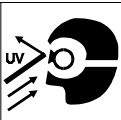
Potential biological hazards. Proper protective equipment and procedures must be used when following instructions associated with this symbol. Reference O.S.H.A. Regulation 1910-1030.



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.



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.

- * *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.*

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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.

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Whatever Thermo Forma 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 7:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

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International customers please contact your local Thermo Forma distributor.

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Section 1 - Receiving

1.1 Unpacking 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 attached to the drain handle, 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

2.1 Description

The Models 1284, 1285, 1286, 1287, 1288, 1290 and 1291 are Class II, Type A/B3 cabinets. The “Type A/B3” designation indicates two alternative uses of the cabinet. When vented directly into the laboratory room, the unit serves as a “Type A” unit. When vented to the outside atmosphere, through an in-house exhaust system, it serves as a “Type B3” unit. 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, 3rd Edition, May 1993.

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.

2.2 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

3.1 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.

3.2 Power Connection

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 dedicated circuit. Refer to Section 9 or to the serial plate on the front of the unit for electrical specifications.

3.3 Plumbing Connection

Two service valves are standard with each cabinet and located on the right and left side of the work station. All service valves are piped within the cabinet. External connection is a 3/8" FPT coupling. Identification index buttons are supplied.

The cabinet will accommodate four service valves. An additional two service valves may be purchased from Thermo Forma.



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.

a. 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 3-1.

3.4 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.

a. 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.

b. External Exhaust System (For Class II Type B3 Only)

If an external exhaust system is needed, use a canopy (thimble) connection (Figure 3-2). When the cabinet is certified, check the opening in the canopy to ensure inward airflow, using a smoke stick. Verify that the building exhaust system is sized to exhaust 30% more air than the cabinet exhausts. Models 1284, 1285 and 1288 exhaust an air volume of 356-390 CFM. Models 1286, 1287, 1290 and 1291 exhaust an air volume of 530-581 CFM. This helps to ensure proper air balance at the front access opening for adequate containment.

IMPORTANT! 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.

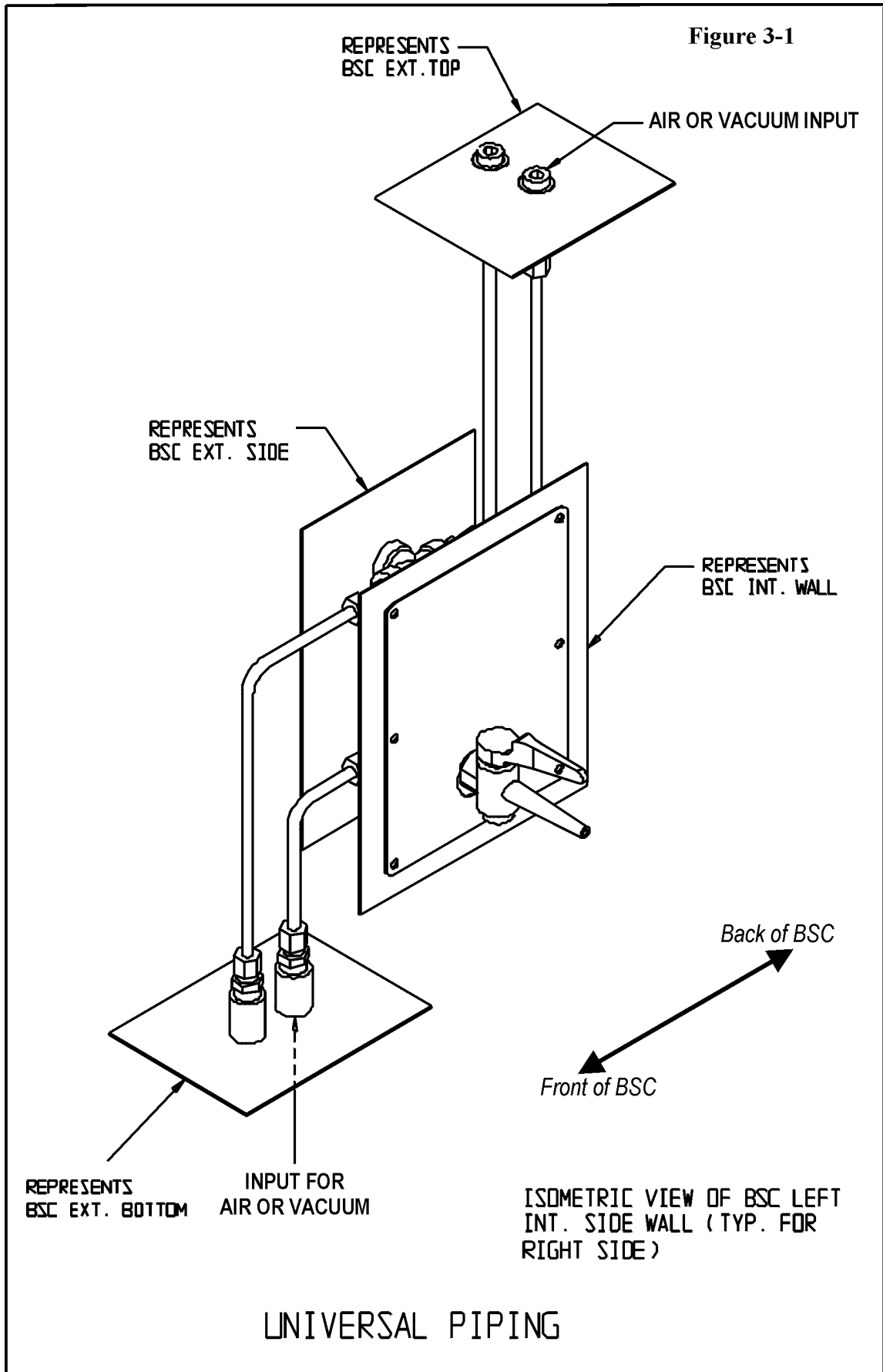
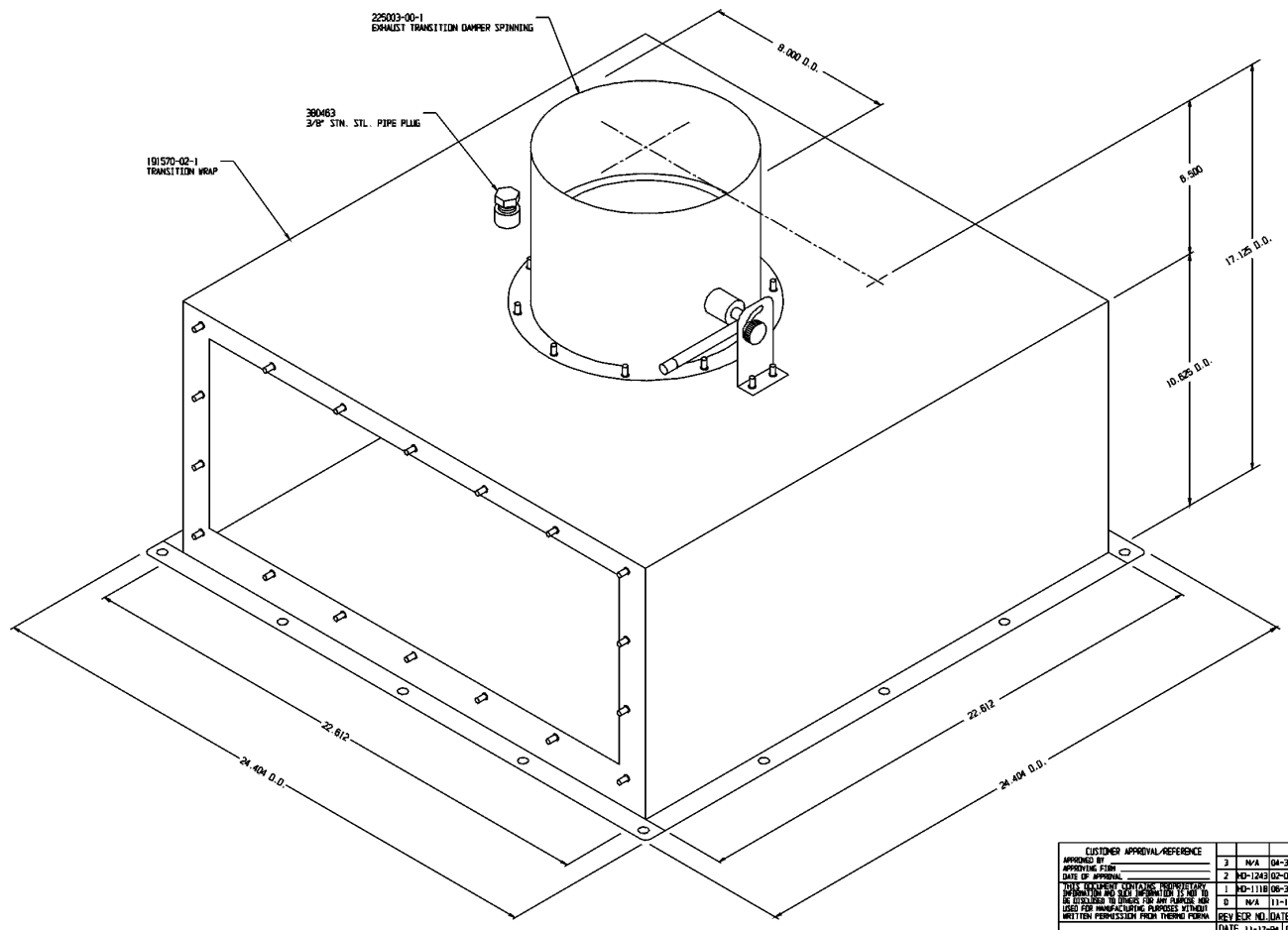


Figure 3-2



191570-00-1 EXHAUST TRANSITION ASSEMBLY

CUSTOMER APPROVAL REFERENCE		APPROVED BY	DATE	DESCRIPTION
3	N/A	04-20-01	LEN/KOO/LEN	ADDED SPINNING O.D. DIMENSION
2	MD-1243	02-01-90	MEN/POK/LEN	ADDED 390483 PIPE PLUG
1	MD-1118	08-30-87	POK/POK/LEN	RELOCATE LOCKING BRACKET
0	N/A	11-17-84	LEN/POK/LEN	RELEASED FOR PRODUCTION
REV	REV. NO.	DATE	BY	DESCRIPTION OF REVISION
		11-17-84	LEN	LEN CAD KEO APPL LEN SCALE: N.T.S.
CUSTOMER:				
JOB TITLE: 191570 EXHAUST TRANSITION AT/THE/RELE W/DAMPER				
DWG TITLE: ASSEMBLY				
LOCATION:	JOB NUMBER:	DRAWING NUMBER:		
		191570-00-0-0		



3.5 Remote Alarm Contacts (Models 1288, 1290 and 1291)

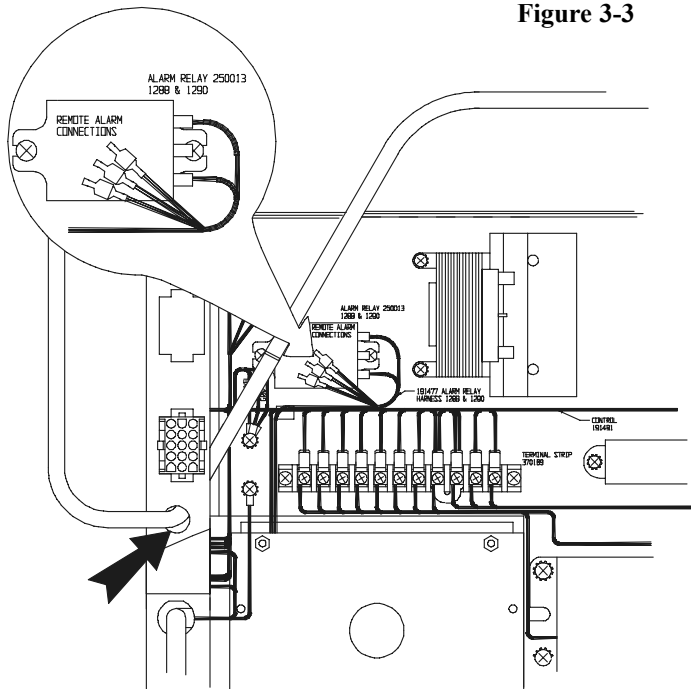


This area contains hazardous voltages. The procedure should be done by qualified personnel only.

For facilities requiring remote alarms connected to biological safety cabinets, a relay with normally open and normally closed contacts is installed in the blower electrical circuit. The alarm contacts are pre-wired as shown in Figure 3-3 and on the Model 1288, 1290 and 1291 electrical schematics at the back of this manual. See Figure 3-3 for the remote alarm contact relay location.

The relay wires are identified N.O., N.C., and COM and are fitted with quick-connect terminals with the connector mates installed. The connectors need only to be pulled apart, the alarm wiring crimped onto the connectors and the two halves pushed back together. The alarm wiring within the enclosure must be 18 to 22 gauge jacketed cable, rated for a minimum of 300V. The wires exit the control section of the cabinet through a hole identified by the large black arrow in the illustration below.

Figure 3-3



Section 4 – Operation

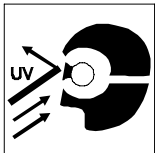
4.1 Control and Indicating Devices (Refer to Figures 4-1, 4-2, and 4-3)

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) - Recommended usage is only when the laboratory is not in use.



Caution! Eyes or skin should not be exposed to ultra-violet light.

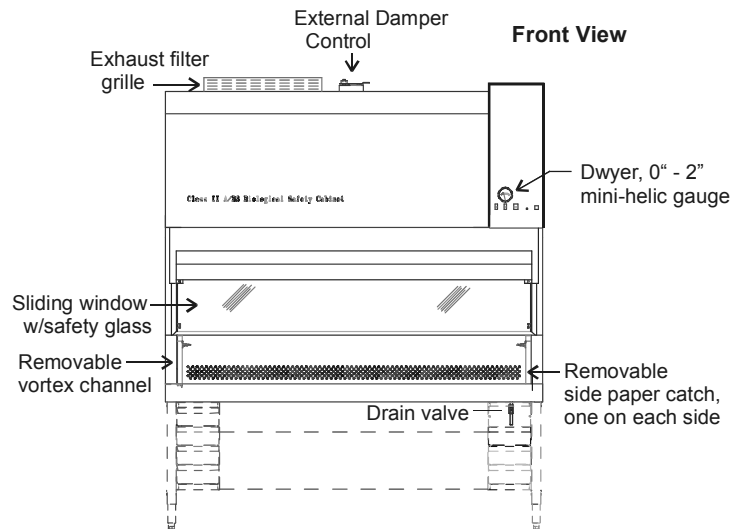
On cabinets equipped with the optional ultra-violet germicidal light, the dual purpose “Lights” switch provides the following settings:

“Off” = center

“On” top = fluorescent lamp

“On” bottom = ultra-violet lamp

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



Series 1284 Class II A/B3 Biological Safety Cabinet

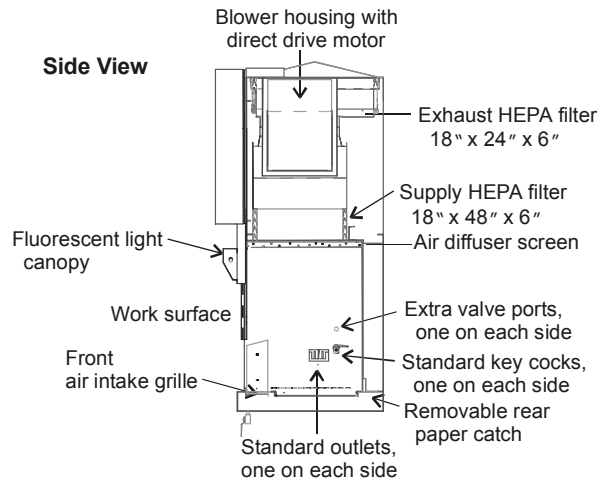


Figure 4-1
4 ft. Series, Models 1284, 1285, and 1288

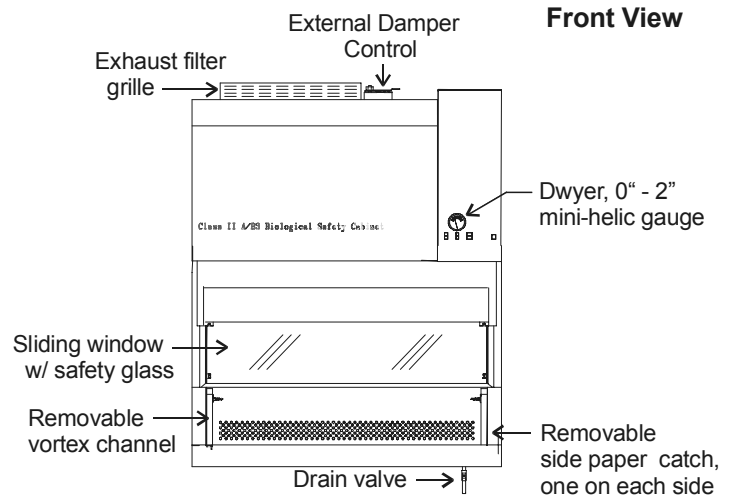
Alarm By-pass Switch - The Alarm By-pass switch silences the audible “Window Above 10 Inch” alarm for five minutes. The red visual indicator remains illuminated. The alarm rings-back to remind the operator that the window is still open more than 10 inches.

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.

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

Blower Speed Control - The blower speed control is accessed from the rear of the control panel by removing the screw on the bottom of the control panel and swinging 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 4-4) Turning the screw clockwise increases air velocity; counterclockwise decreases it.

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



Series 1286 Class II A/B3 Biological Safety Cabinet

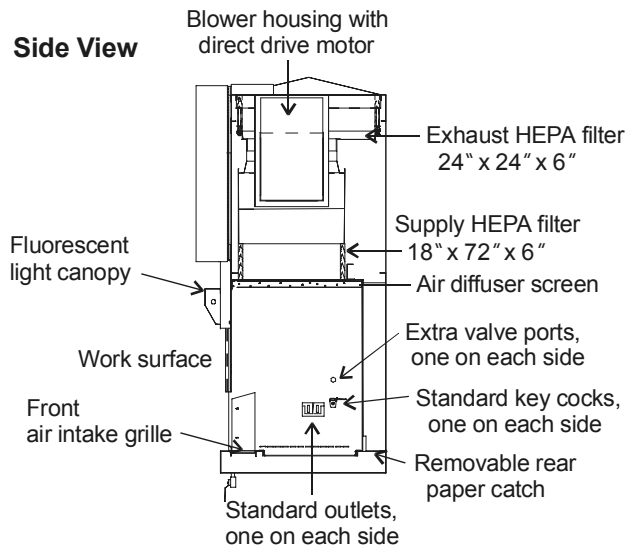


Figure 4-2
6 ft. Series, Models 1286, 1287, 1290, 1291

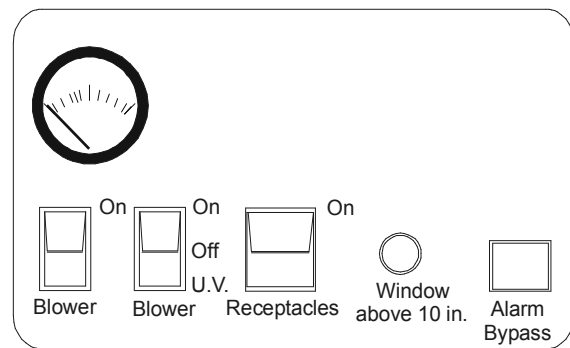


Figure 4-3



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.

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 4-5.

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.

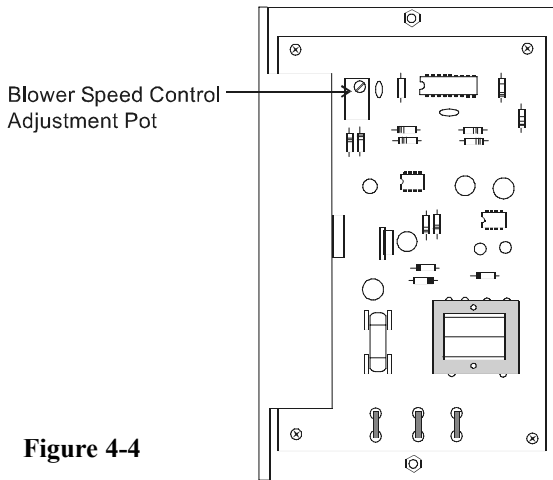


Figure 4-4

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

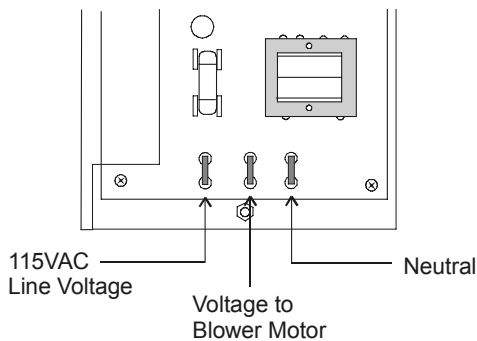


Figure 4-5

Receptacle Fuses (7 Amp - Models 1284/1285/1288, 3 Amp - Models 1286/1287/1290/1291) - The receptacle fuses (2), located directly below the blower motor/lights Reset button, are for the receptacles only. If an overload occurs, the fuses will open and require replacement.

- Note:**
- Turn the power off.
 - Unplug the unit.
 - Replace the fuses -
P/N 230182, 7 Amp, 1/4" x 1 1/4"
P/N 230166, 3 Amp, 1/4" x 1 1/4"
(Two spare fuses are located in a bracket on the inside of the control panel.)

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, 1285 and 1288. Models 1286, 1287, 1290 and 1291 have a maximum load of 2 amps total. Models 1285 and 1287 are equipped with 2 single European 230V receptacles.

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.



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 - Two service valves are standard with each cabinet. These valves are located on the right and left side of the workstation and can be coded with the type of service that they supply. Identification index buttons are supplied.

The cabinet supports four service valves. Additional valves may be purchased from Thermo Forma.

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 warns that an unsafe condition exists.



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 5 - General Cautions

5.1 Caution Notes

- 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.
- Ultra-violet lighting should not be used while personnel are using the cabinet. If exposure cannot be avoided, the proper safety gear/clothing must be worn. Consult a biological safety officer or other qualified individual for proper procedures.
- 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 from contamination. After servicing, the cabinet must be recertified by a qualified certifying agency.



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.

- 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 - Cabinet Start-Up

6.1 General Recommendations

- 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.

6.2 Use of Auxiliary Equipment in the 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.

6.3 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.

6.4 Start-Up Procedure

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

Section 7 - Troubleshooting

Section 8 - Routine Maintenance

7.1 Troubleshooting Guide

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.*



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

Problem 1: 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.



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

Problem 2: Ultra violet light malfunction

Possible causes:

- Check lamp pins and socket ends for contact.
- Starter is defective for the UV light.

Problem 3: Fluorescent light malfunction

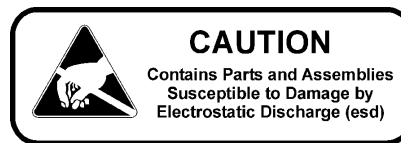
Possible causes:

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

Problem 4: Loud screeching noise

Possible causes:

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



8.1 Checking the 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 8.2). 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.

8.2 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.

8.3 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.



Adjustments must be made by qualified personnel only!

1. Layout test grids (refer to Section 8.4).
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 bottom of the control panel and swinging the panel door open. Locate the blower motor circuit board. (Figure 4-4 & 4-5) Using a true RMS voltmeter, measure and record the voltage drop across the white and black wires leading to the terminal strip. (Figure 4-4) 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.

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 8-1 below) is located on the top of the cabinet.
2. Loosen the wingnut, move the lever to the desired position and retighten the wingnut.

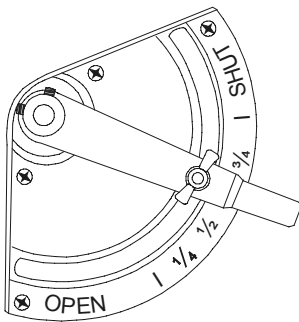
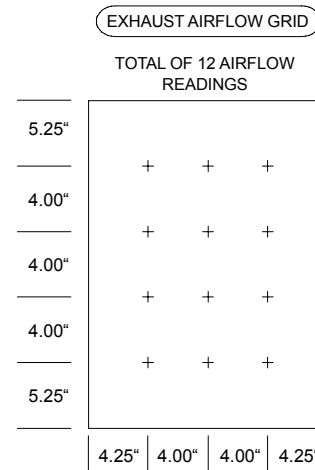
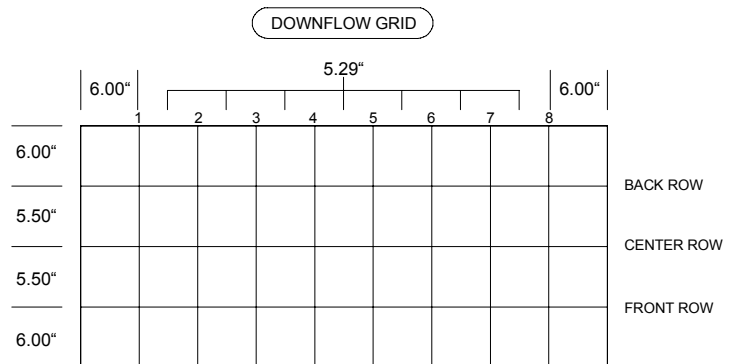


Figure 8-1

Copies of the factory airflow test sheets are available in Section 15.

8.4 Biological Safety Cabinet Test Grids

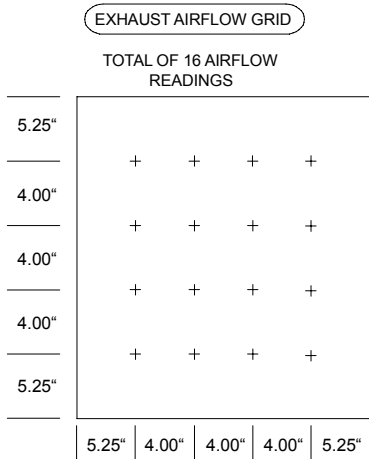
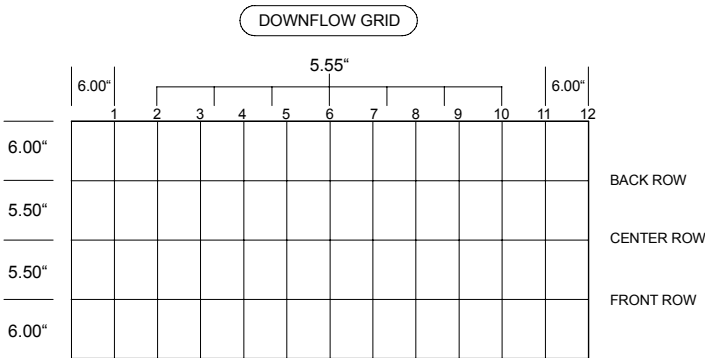
a. 4-foot Series, Models 1284, 1285, and 1288



Work access opening face area = 3.403 ft.sq.
 Open exhaust area* = 2.461 ft.sq.
 *Total area minus obstructed area

b. 6-foot Series, Models 1286, 1287, 1290, and 1291

Section 9 - Service



Work access opening face area = 5.052 ft.sq.
 Open exhaust area* = 3.368 ft.sq.
*Total area minus obstructed area

A list of certification companies is included on the Thermo Forma website, or call the Services department. See Page iii.



Service to the unit must be performed by qualified personnel. Recertify the cabinet after servicing.



Before service is to be performed on the cabinet, the unit must be decontaminated!

9.1 Replacing the Blower Motor (Models, 1284, 1285 and 1288, 4-foot)

a. Reversing the motor wiring (4 foot 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.

b. Replacing the motor

1. Turn the unit off and disconnect it from the power source.
2. Remove all dress panels.
3. Remove the access panel.
4. Unfasten the two latches connecting the blower to the air plenum.
5. Remove the bolt toward the front of the cabinet that connects the blower housing bracket to the top of the cabinet.
6. Remove the front screw on the right hand side of the cabinet that connects the blower housing bracket to the right hand wall of the cabinet.
7. Loosen - do not remove, the two remaining bolts that connect the blower housing bracket to the top of the cabinet.
8. Loosen - do not remove, the two remaining screws that connect the blower housing bracket to the right wall of the cabinet.
9. Slide the blower housing toward the rear of the cabinet as far as it will go.
10. Unbolt the removable inlet collar from the blower housing.

11. Unbolt the four-point motor mounting bracket from the blower housing.
12. Disconnect the motor wiring harness at the quick-connect plug.
13. Pull the motor, motor mounting bracket, removable inlet collar and blower wheel out of the blower housing.
14. Be sure to mark on the motor shaft the location of the blower wheel so that the new motor shaft can be lined up correctly with the required blower wheel position to fit properly inside the blower housing.

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).

9.2 Replacing the Blower Motor (Model 1286 Series 6-foot)

1. Turn the unit off and disconnect it from the power source.
2. Remove all dress panels.
3. Remove the access panel.
4. Unfasten the two latches connecting the blower to the air plenum.
5. Remove the two bolts toward the front of the cabinet that connect the blower housing brackets to the top of the cabinet.
6. Loosen - do not remove, the four remaining bolts that connect the blower housing brackets to the top of the cabinet.
7. Slide the blower housing toward the rear of the cabinet as far as it will go.
8. Disconnect the motor wiring harness at the quick-connect plug.
9. Unbolt the removable inlet collar from the blower housing.
10. Pull the motor, motor mounting bracket, removable inlet collar, and blower wheel out of the blower housing.
11. Be sure to mark on the motor shaft the location of the blower wheel so that the new motor shaft can be lined up correctly with the required blower wheel position to fit properly inside the blower housing.

9.3 Replacing the Filters, All Models



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 the power source.
2. Close the window.
3. Remove the screw on the bottom left side, which secures the control panel, and swing the panel open.
4. Remove the eight screws securing the dress panel. Remove the panel and set it aside.
5. Remove the four hex nuts securing the lower cross brace and set the brace to the side.
6. Remove all hex nuts securing the pressure plate.
7. Pry the pressure plate loose from the gasket and set it to the side.
8. Pull the Velcro boot loose from the exhaust filter plenum.
9. Release the two latches securing the supply plenum to the blower housing.
10. Disconnect the vinyl tubing that connects the Mag gauge to the plenum.
11. 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.
12. Remove the front filter hold-down studs (2 on the four-foot models, 3 on the six-foot models) in front of the plenum.
13. Slide the plenum from the cabinet.
14. Remove the supply filter and clean the filter flange.
15. Loosen - do not remove, the four bolts, springs and washers that secure the exhaust filter.
16. Slide the exhaust filter out, clean the filter flange and install the new filter, ensuring that *the gasket is on the top*.
17. Tighten the hex nuts to secure the new exhaust filter in position.
18. Install the new supply filter with the *gasket side down*.
19. 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 10 – Specifications

10.1 Models - 1284, 1285, and 1288 (4' Cabinet with Sliding Window)

Construction Work Surface: Type 304 Stainless Steel, #4 Finish
 Cabinet: Cold Rolled Steel and Type 304 Stainless Steel
 Finish: Antique 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, 14 FLA
 (Total amps include 5A receptacle)
 Circuit Breaker: 20 Amp
 Receptacle - NEMA 5-20R
 Exhaust System Volume Requirements: 356-390 CFM

1285 Main/Outlets (5): 230VAC, 1 Phase, 2 Wire, 50 Hz, 11 FLA
 (Total amps include 5A receptacle)
 Circuit Breaker: 15 Amp
 Receptacle - European
 Exhaust System Volume Requirements: 356-390 CFM

1288 Main/Outlets (5): 100VAC, 1 Phase, 2 Wire, 50 Hz, 14 FLA
 (Total amps include 5A receptacle)
 Circuit Breaker: 20 Amp
 Receptacle - NEMA 5-20R
 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)

9.4 Replacing the Control Panel, All Models



Make certain power is disconnected from the unit prior to control panel removal.

Note: 2 people are required to perform this procedure.

1. Remove (2) screws – a slotted screw located at the right corner of the top surface of the control panel, and a thumbscrew located at the left corner of the bottom surface of the panel. Swing the panel open.
2. Remove (2) #8-32 x 3/8" slotted screws that fasten the light canopy cable retainer plate to the bottom side of the control panel mount. Disconnect the light canopy electrical cable at the 9-position mate-n-lok connection.
3. Disassemble the sliding window switch mounting bracket assembly from the unit, which is mounted to the lower channel (where the bottom of the control panel was fastened), by removing the (2) #8-32 x 3/8" Phillips head screws.
4. Disconnect the control panel electrical harness at the 15-position mate-n-lok connection located at the top rear of the panel.
5. Remove the tubing clamp and vinyl tubing from the upper end of the HEPA filter located inside the control panel. Pull the tubing out of the panel, making note of its routing for reassembly.
6. With one person supporting the weight of the control panel, remove the (4) 1/4-20 lockwasher hex nuts that fasten the control panel assembly to the front surface of the cabinet.
7. Repeat the above steps in reverse order to reassemble the control panel to the cabinet.

Lights	(2) Fluorescent 60W, (F48T12/CWX/HO) (1) Optional UV 30W, (G30T8) Germicidal Lamp	1291	Main/Outlets (5): 100VAC, 1 Phase, 2 Wire, 60 Hz, 16 FLA (Total amps include 2A receptacle) Circuit Breaker: 20 Amps Receptacle - NEMA 5-15R Exhaust System Volume Requirements: 530-581 CFM
Blower Motor	3/4 HP, 1625 RPM		
Drain Pan Capacity	18.7 Gallons		

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)
----------------	---

10.2 Models - 1286, 1287, 1290 and 1291 (6' Cabinet with Sliding Window)

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

Lights	1286/1290/1291 (2) Fluorescent 85W, (F72T12/N/HO) 1287 (2) Fluorescent 85W, (F72T12/CW/HO) (1) Optional UV 30W, (G30T8) Germicidal Lamp
---------------	---

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
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Blower Motor	3/4 HP, 1500 RPM
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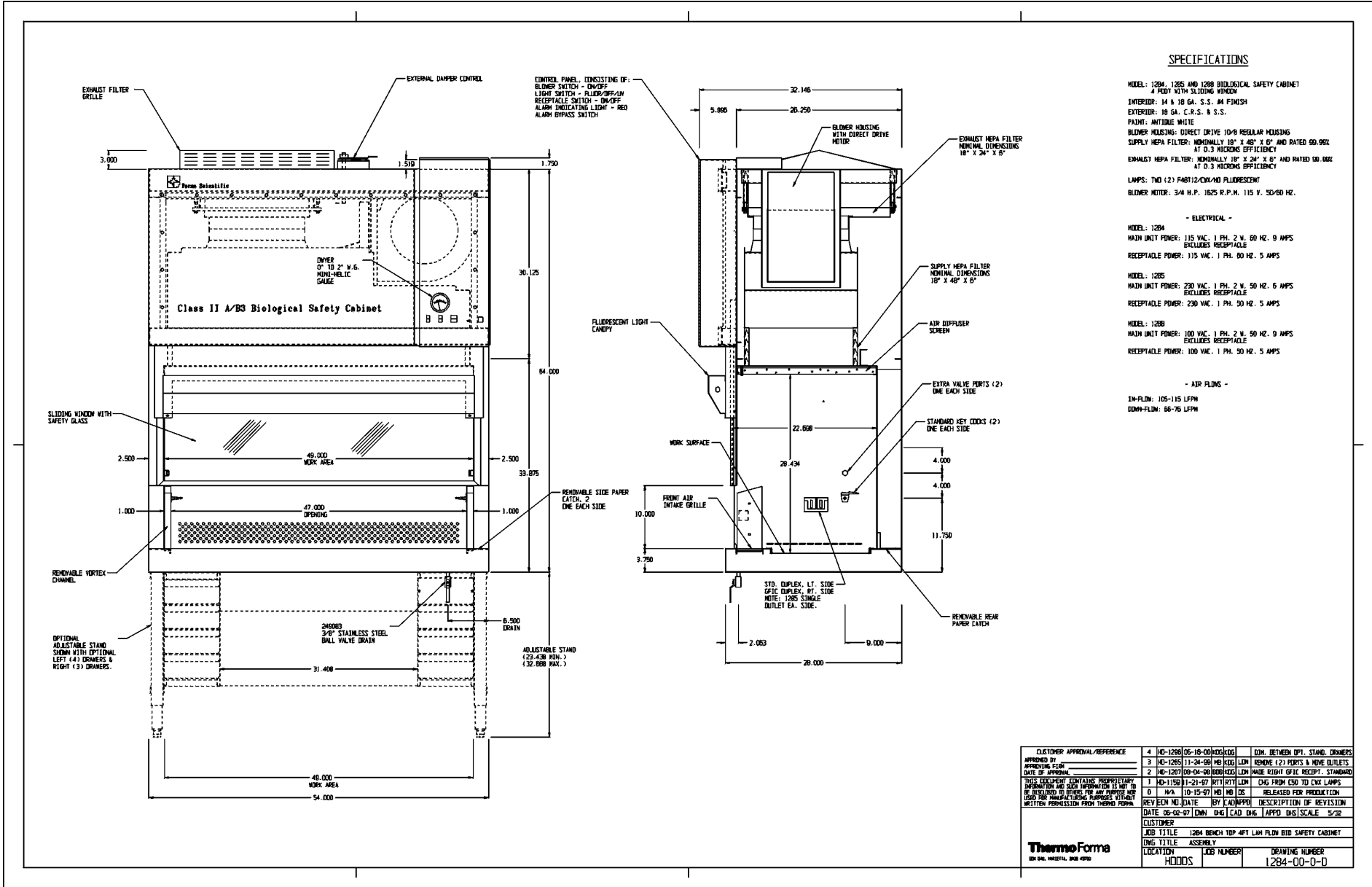
Electrical Requirements

1286	Main/ Outlets (5): 115VAC, 1 Phase, 2 Wire, 60 Hz, 15 FLA (Total amps include 2A receptacle) Circuit Breaker: 20 Amps Receptacle - NEMA 5-15R Exhaust System Volume Requirements: 530-581 CFM
------	---

Drain Pan Capacity	27.0 Gallons
---------------------------	--------------

1287	Main/Outlets (5): 230VAC, 1 Phase, 2 Wire, 50 Hz, 8.5 FLA (Total amps include 2A receptacle) Circuit Breaker: 20 Amps Receptacle - European Exhaust System Volume Requirements: 530-581 CFM
------	---

1290	Main/Outlets (5): 100VAC, 1 Phase, 2 Wire, 50 Hz, 13.5 FLA (Total amps include 2A receptacle) Circuit Breaker: 20 Amps Receptacle - NEMA 5-15R Exhaust System Volume Requirements: 530-581 CFM
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SPECIFICATIONS

MODEL: 1284, 1285 AND 1288 BIOLOGICAL SAFETY CABINET
 4 FOOT WITH SLIDING WINDOW
 INTERIOR: 14 X 18 GA. S.S. 84 FINISH
 EXTERIOR: 18 GA. C.R.S. & S.S.
 PAINT: ANTIQUE WHITE
 BLOWER HOUSING: DIRECT DRIVE 10-9 REGULAR HOUSING
 SUPPLY HEPA FILTER: NOMINALLY 18" X 48" 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) F40T12/CW/40 FLUORESCENT
 BLOWER MOTOR: 3/4 H.P. 1625 R.P.M. 115 V. 50/60 HZ.

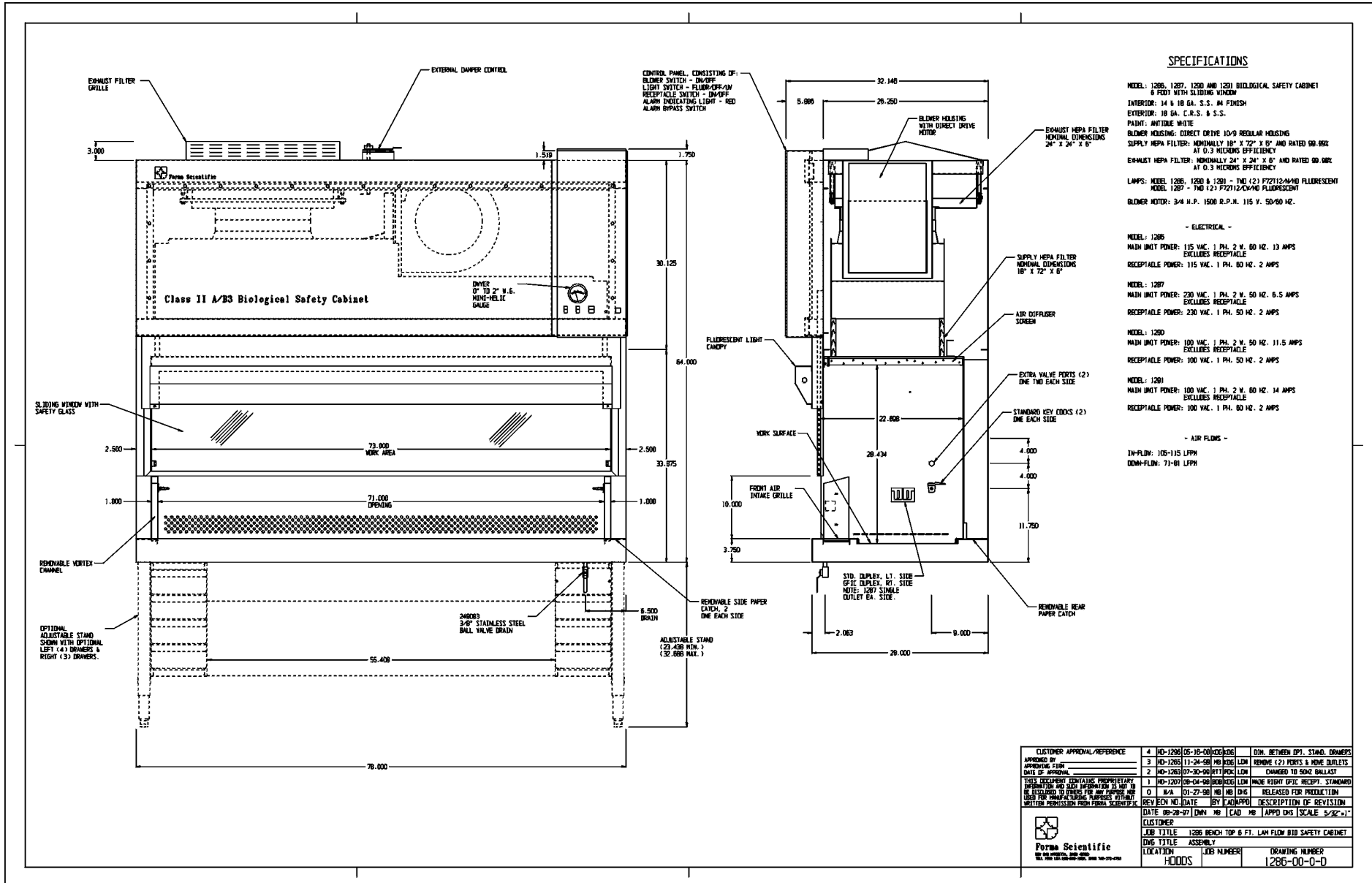
- ELECTRICAL -
 MODEL: 1284
 MAIN UNIT POWER: 115 VAC. 1 PH. 2 W. 60 HZ. 9 AMPS
 EXCLUDES RECEPTACLE
 RECEPTACLE POWER: 115 VAC. 1 PH. 60 HZ. 5 AMPS

MODEL: 1285
 MAIN UNIT POWER: 230 VAC. 1 PH. 2 W. 50 HZ. 6 AMPS
 EXCLUDES RECEPTACLE
 RECEPTACLE POWER: 230 VAC. 1 PH. 50 HZ. 5 AMPS

MODEL: 1288
 MAIN UNIT POWER: 100 VAC. 1 PH. 2 W. 50 HZ. 9 AMPS
 EXCLUDES RECEPTACLE
 RECEPTACLE POWER: 100 VAC. 1 PH. 50 HZ. 5 AMPS

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

CLIENTER APPROVAL/REFERENCE	NO.	DATE	BY	DESCRIPTION
APPROVED BY:	4	10-16-97	MJ/KJG	CHG. BETWEEN OPT. STAND. DRAWERS
DATE OF APPROVAL:	3	11-24-98	ME/KJG	REMOVE (2) PORTS & INLET OUTLETS
THIS EQUIPMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS TO BE RESTRICTED TO PERSONS WHOSE EMPLOYERS HAVE WRITTEN PERMISSION FROM THERMO FORMA.	2	08-04-98	BRB/KJG	REMOVE RIGHT OF IC RECEPT. STANDARD
	1	11-21-97	RTT/RTT/LON	CHG FROM CSO TO CW LAMPS
	0	10-15-97	ME/KJG	RELEASED FROM PRODUCTION
CUSTOMER: Thermo Forma 1204 BENCH TOP 4FT LAM FLOW BIO SAFETY CABINET JOB NUMBER: 1284-00-0 DRAWING NUMBER: 1284-00-0				



MODEL (S): 1284, 1285, 1288

Test Voltage: 100, 115, 230 Frequency: 50, 60 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 at the window edge.

Rear Wall

Total Sum _____ ÷ 24 = average down flow velocity _____ LFPM.

Acceptable down flow range 66-76 in linear feet per minute.

Work Access Opening Airflow

A. Thermoanemometer Method

12 Readings

4 inches above the exhaust filter, 4.25 inches from the inside edge of the filter with successive points 4.00 inches side-to-side and 5.25 inches from inside filter edges with successive points 4.00 inches rear to front.

Exhaust filter area	2.461 sq. ft.
Front access opening	3.403 sq. ft.
Acceptable range for face velocity	120-130 fpm

B. Direct Reading Instrument Method

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

TESTED BY: _____ DATE: _____

MODEL (S): 1286, 1287, 1290, 1291

Test Voltage: 100, 115, 230

Frequency: 50, 60 Hz

FLA: _____

Magnehelic Gauge Reading _____

Damper Position: _____

Position from "Open"

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

NOTE: Use True RMS volt meter.

True RMS Voltage To motor: _____

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 at the window edge.

Rear Wall

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

Acceptable down flow range 71-81 in linear feet per minute.

Work Access Opening Airflow

A. Thermoanemometer Method

16 Readings

4 inches above the exhaust filter, 5.25 inches from the inside edge of the filter with successive points 4.00 inches side-to-side and 5.25 inches from inside filter edges with successive points 4.00 inches rear to front.

Exhaust filter area	3.368 sq. ft.
Front access opening	5.052 sq. ft.
Acceptable range for face velocity	100-110 fpm

B. 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

TESTED BY: _____ DATE: _____

Section 11 – Accessories**Section 12 - Parts List**

Description	Order Number	12.1	Model 1284	Description
Service Valve	191275			
Armrest, 4' cabinet	191509		Stock #	
Armrest, 6' cabinet	191512		156106	3/4 HP Blower Motor (1625 RPM)
Lab Chair with arms	191486		170045	Capacitor, Motor 25MFD, 370V
Lab Chair without arms	191487		190396	Motor Speed Control
Storage Cabinet, left side	191494		225250	Ballast (Fluorescent Lighting)
Storage Cabinet, right side	191495		141042	48" Fluorescent Lamp (60W, HO)
UV Light, 30W	191419		230054	Circuit Breaker, 15A SP
UV Light, 30W portable	191070		430304	Line cord Assembly, 20A, 120V, Hospital Grade
IV Rod, stainless steel, 4' cabinet	191571		760178	Filter, Supply HEPA 18" x 48" x 5-7/8" (Donaldson P/N P195042, Pressure Range: 0.78"-1.05" at 890 cfm) filter drop pressure tested per IES-RP-CC001.3 *See page 12.3
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			
Low Air Flow Alarm	191168		760179	Filter, Exhaust HEPA 18" x 24" x 5-7/8" (Donaldson P/N P194683, Pressure Range: 0.40"-0.65" at 360 cfm) filter drop pressure tested per IES-RP-CC001.3 *See page 12.3
Exhaust Transition	191570			
Hydraulic Stand, 4' cabinet	191518			
Hydraulic Stand, 6' cabinet	191519			
Adjustable Stand, 4' cabinet	191550			
Adjustable Stand, 6' cabinet	191551		500009	Ballast, (UV Lighting)
2-drawer storage cabinet, left side of stand	191524		141014	30W Germicidal Lamp
Service Valve Kit, use w/ Universal Piping	191597		280005	Pilot Light, #312, Red
Universal Piping Kit*	191620		300305	Delay Relay, (fixed 5 min.)
ADA Control Panel*	191496		360095	Rocker Switch, SPST, Flat Black
			360096	Push-button Switch, SPDT
			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"

*factory installed

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
460052	European Plug, 230V, 16A

The parts for the Model 1288 are the same as the Model 1284 with the addition of:

Stock #	Description
420098	Transformer, 12VA, 115V primary/12.6V secondary

12.2 Model 1286

Stock #	Description
156109	HP Blower Motor (1500 RPM)
170045	Capacitor, Motor 25MFD, 370V
190396	Motor Speed Control
225250	Ballast (Fluorescent Lighting)
141043	72" Fluorescent Lamp (85W, HO)
230054	Circuit Breaker, 15A SP
430304	Line cord Assembly, 20A, 120V, Hospital Grade
760180	Filter, Supply HEPA 18" x 72" x 5-7/8" (Donaldson P/N P195043, Pressure Range: 0.78"-1.05" at 1350 cfm) filter drop pressure tested per IES-RP-CC001.3 *See page 12.3
760181	P/N P195118, Pressure Range: 0.30"-0.50" at 352 cfm) filter drop pressure tested per IES-RP-CC001.3 *See page 12.3
500009	Ballast, (UV Lighting)
141014	30W Germicidal Lamp
300305	Delay Relay, (fixed 5 min.)
280005	Pilot Light, #312, Red
360096	Push-button Switch, SPDT
360096	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"

The parts for the Model 1291 are the same as the Model 1286 with the addition of:

Stock #	Description
420098	Transformer, 12VA, 115V primary/12.6V secondary
420057	Transformer, 175VA, dual primary/dual secondary

***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" of water (rounded)

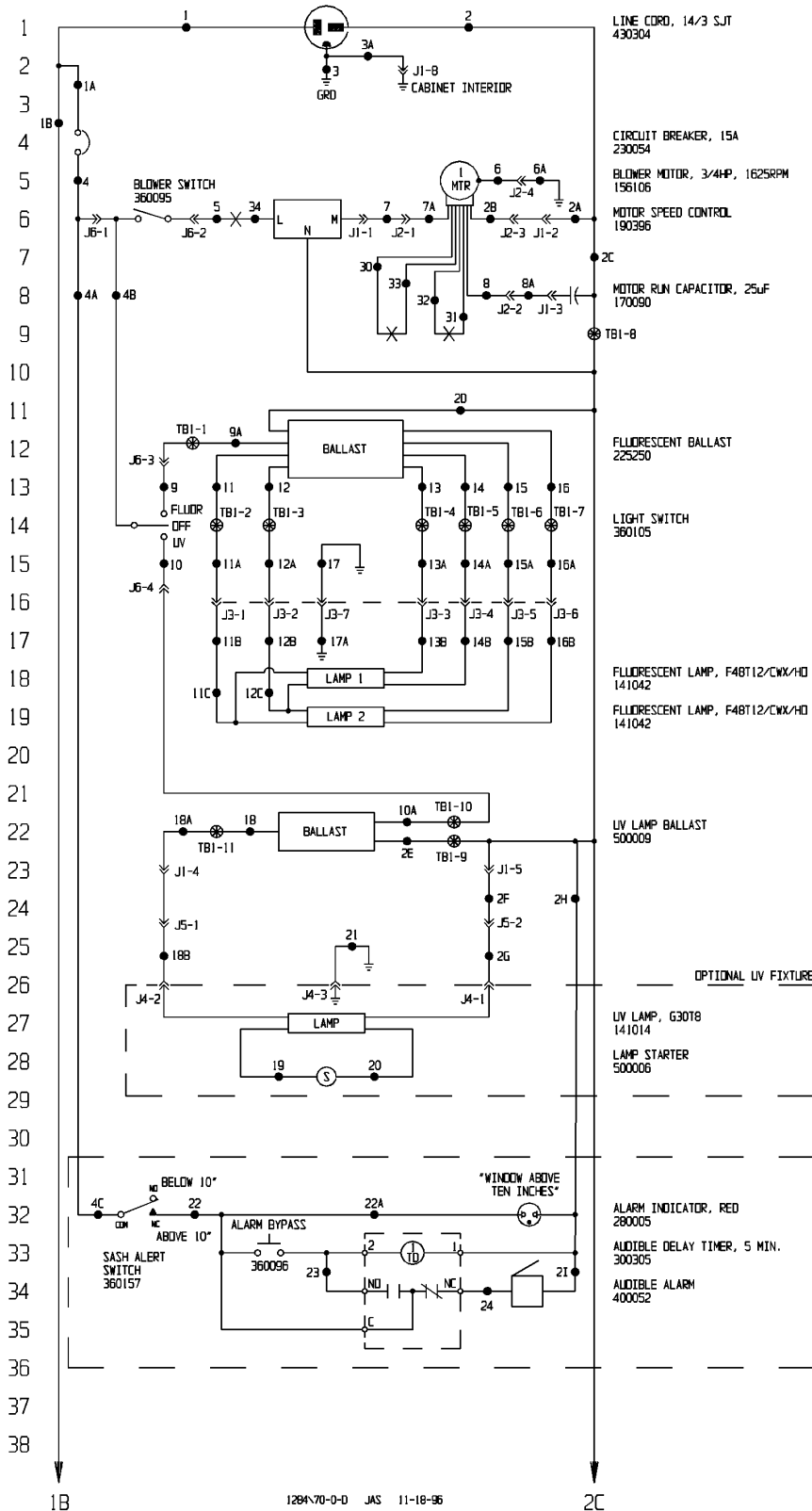
The parts for the Model 1287 are the same as Model 1286 with the addition of:

Stock #	Description
275012	Transformer, 1.5KVA, 240/120V
460052	European Plug, 230V, 16A
225418	72" Fluorescent lamp (85W, HO)

The parts for the Model 1290 are the same as Model 1286 with the addition of:

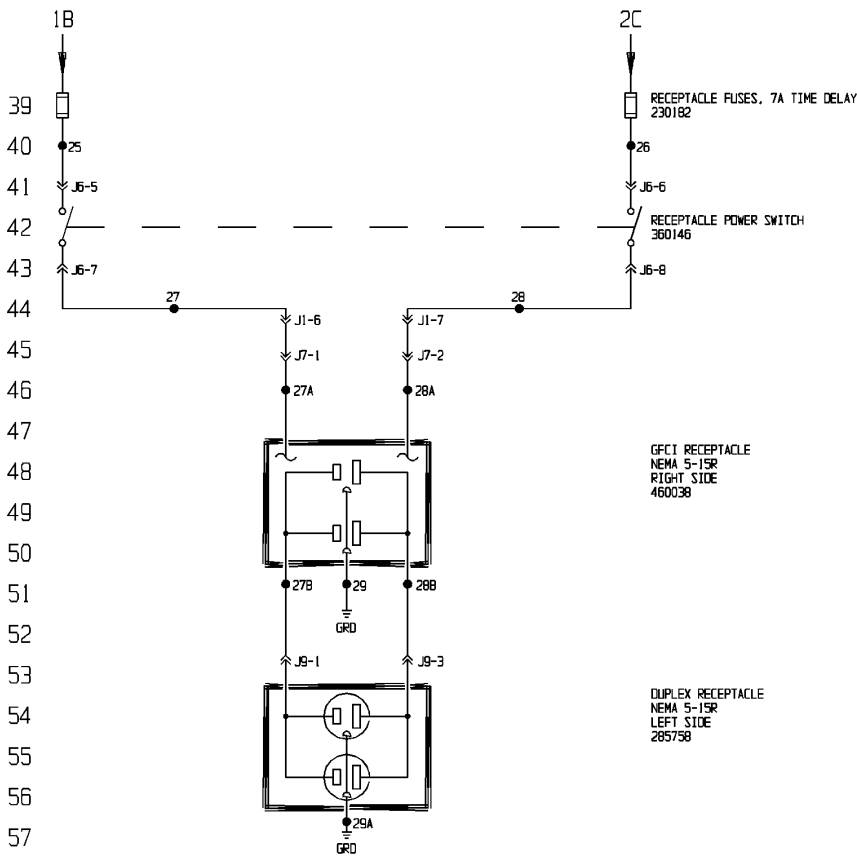
Stock #	Description
420065	Transformer, 175VA, dual 115V primary/12/24V secondary
500028	Ballast, 220V, 50Hz (UV Lighting)
420098	Transformer, 12VA, 115V primary/12.6V secondary

POWER CONNECTION
115 VAC, 1 PH, 2W, 60HZ, 9FLA (EXCLUDING 5AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
 Forma Model:
 1284
 Bio-Safety Cabinet

1284-70-0-D Rev. 5
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Electrical Schematic
Forma Model:
1284
Bio-Safety Cabinet
1284-70-0-D Rev. 5
Page 2 of 3

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77	1	14	BLACK
78	1A	14	BLACK
	1B	16	BLACK
79	2	14	WHITE
	2A	16	WHITE
80	2B	18	WHITE
	2C	16	WHITE
	2D	18	WHITE
	2E	18	WHITE
81	2F	16	GRAY
	2G	18	WHITE
82	2H	20	WHITE
	2I	18	WHITE
83	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
	4	14	BROWN
	4A	20	BROWN
84	4B	16	BROWN
	4C	18	ORANGE
85	5	16	BLUE
	6	18	GREEN
	6A	16	GREEN
86	7	16	BLACK
	7A	18	BLACK
	8	18	BROWN
87	8A	16	BROWN
	9	16	PURPLE
88	9A	18	BLACK
	10	16	ORANGE
	10A	18	BLACK
89	11	18	YELLOW
	11A	20	YELLOW
	11B	22	YELLOW
90	11C	18	YELLOW
	12	18	YELLOW
91	12A	20	YELLOW
	12B	22	ORANGE
	12C	18	YELLOW
92	13	18	RED
	13A	20	RED
	13B	22	RED
93	14	18	RED
	14A	20	RED
94	14B	22	BROWN
	15	18	BLUE
	15A	20	BLUE
95	15B	22	BLUE
	16	18	BLUE
	16A	20	BLUE
	16B	22	BLACK
96	17	16	GREEN
97	17A	22	GREEN
	18	18	BLUE
	18A	16	BLUE
98	18B	18	BLACK
	19	18	BLACK
	20	18	BLACK
99	21	18	GREEN
	22	18	RED
	22A	20	RED
	23	20	BLUE
	24	18	BLACK
100	25	16	YELLOW
	26	16	GRAY
	27	16	ORANGE
101	27A	18	ORANGE
	27B	18	BLACK
	28	16	RED
102	28A	18	RED
	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
103	30	18	BROWN
	31	18	ORANGE
104	32	18	PURPLE
	33	18	YELLOW
105	34	16	RED
106			
107			

NOTES:


⊕ Denotes Terminal Strip Connection	Parts List Reference Number
1TD Last Relay Number	○ Assembly
1I Last Terminal Number	⊙ Panel
34 Last Wire Number	○ Refrigeration

CONNECTOR	FUNCTION	LOCATION
J1 (15 PDS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 PDS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (8 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 (5 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (4 PDS.)	RIGHT-SIDE RECEPTACLE	RIGHT RECEPTACLE SOCK.
J9 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL

CUSTOMER APPROVAL/REFERENCE

APPROVED BY _____
DATE OF APPROVAL _____

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Forma Scientific

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TOLL FREE U.S.A. 800-949-3800, OHIO 614-373-4763

5	HD-1295	06-02-00	GLS	KDG	LDN	NOTED EXCLUDING 5AMP RECEPT.
4	HD-1207	07-31-98	BOB	KDG	LDN	RIGHT GFIC RECEPT. TO STANDARD
3	SI-6557	07-07-98	DWL	KDG	LDN	CHANGED 360195 SWITCH TO 36014E
2	HD-1179	04-14-98	RTT	PDK	LDN	CORRECT WIRES 31 & 33
1	HD-1159	01-20-98	RTT	RTT	DS	CHG FROM C50 TO CWX LAMPS

REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
		DATE 11-18-96	DWN	JAS	CAD	APPD DS SCALE NTS

CUSTOMER _____

JOB TITLE 1284 4FT. BIO-SAFETY CABINET

DWG TITLE ELECTRICAL SCHEMATIC

LOCATION HOODS

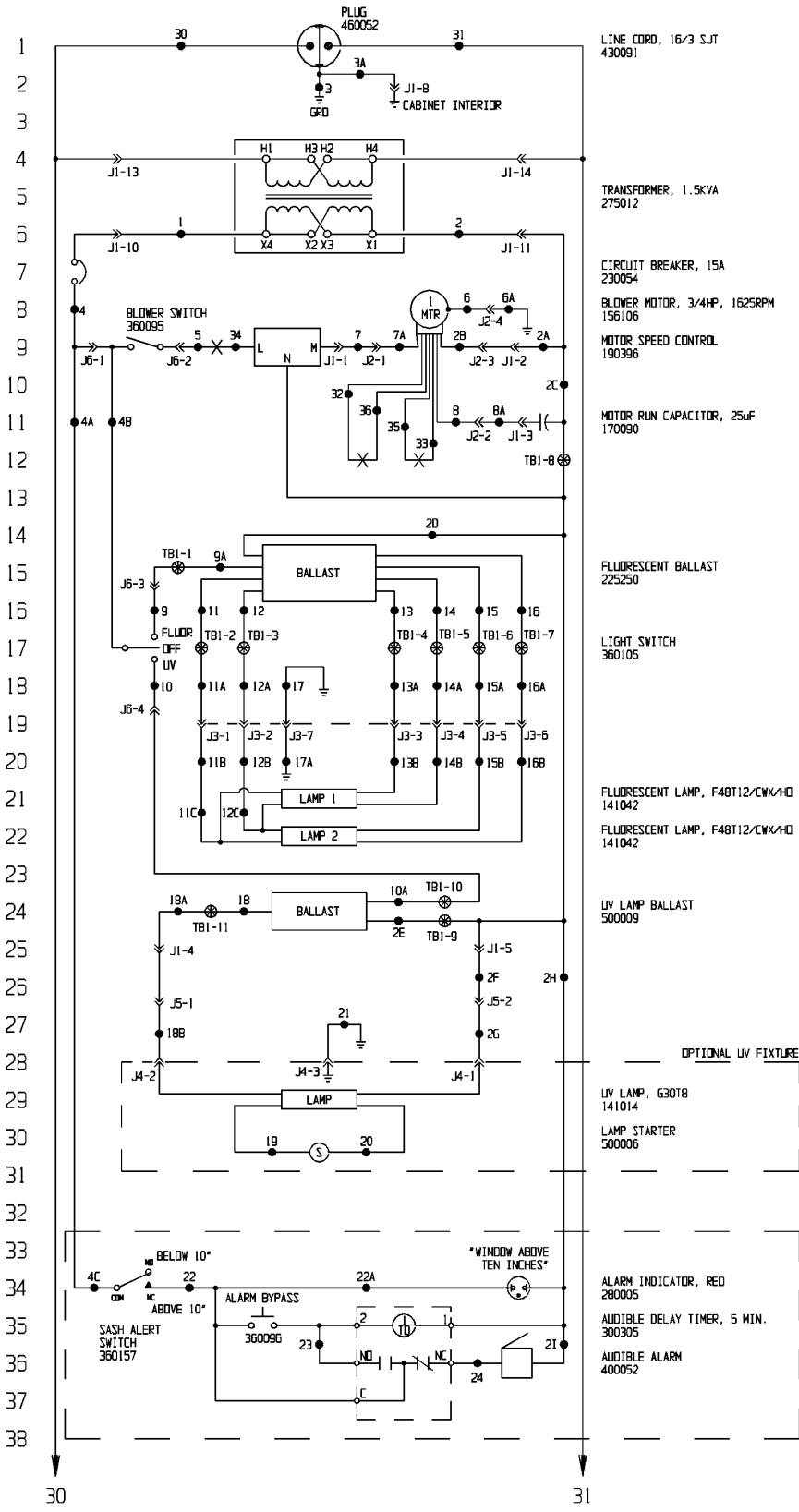
JOB NUMBER _____

DRAWING NUMBER 1284-70-0-0

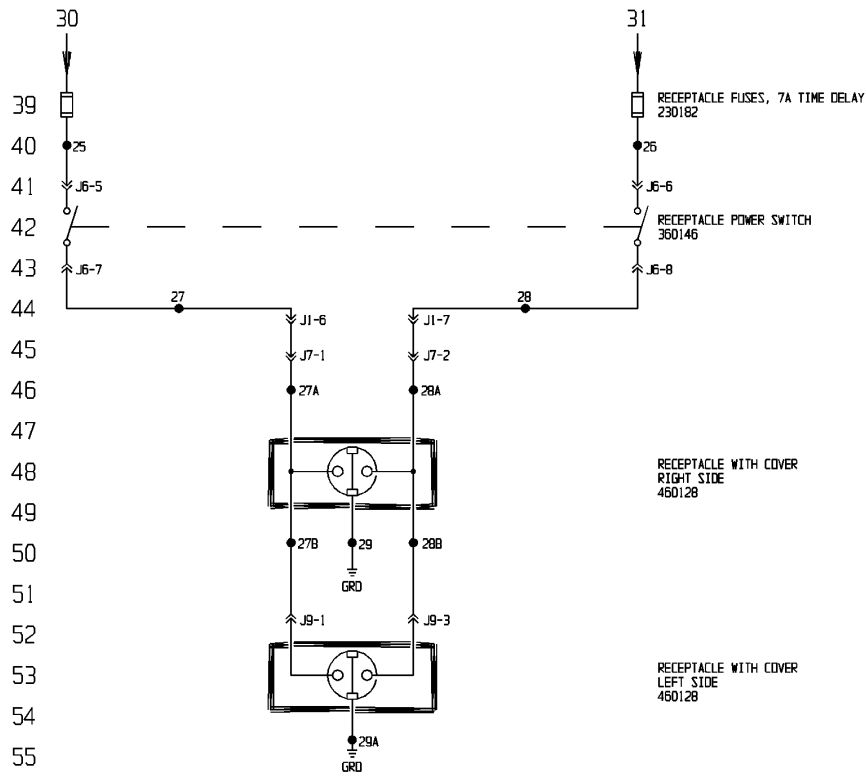
Electrical Schematic
Forma Model:
1284
Bio-Safety Cabinet

1284-70-0-D Rev. 5
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POWER CONNECTION
230 VAC, 1PH, 2W, 50HZ, 6FLA (EXCLUDING 5AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
Forma Model:
1285
Bio-Safety Cabinet
1285-70-0-D Rev. 5
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Electrical Schematic
Forma Model:
1285
Bio-Safety Cabinet
1285-70-0-D Rev. 5
Page 2 of 3

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77			
78	1	14	BLACK
	1A	14	BLACK
	1B	16	BLACK
79	2	14	WHITE
	2A	16	WHITE
	2B	18	WHITE
80	2C	16	WHITE
	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
	2G	18	WHITE
82	2H	20	WHITE
	2I	18	WHITE
83	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
	4	14	BROWN
84	4A	20	BROWN
	4B	16	BROWN
	4C	18	ORANGE
85	5	16	BLUE
	6	18	GREEN
86	6A	16	GREEN
	7	16	BLACK
	7A	18	BLACK
87	8	18	BROWN
	8A	16	BROWN
88	9	16	PURPLE
	9A	18	BLACK
	10	16	ORANGE
89	10A	18	BLACK
	11	18	YELLOW
90	11A	20	YELLOW
	11B	22	YELLOW
	11C	18	YELLOW
91	12	18	YELLOW
	12A	20	YELLOW
92	12B	22	ORANGE
	12C	18	YELLOW
	13	18	RED
93	13A	20	RED
	13B	22	RED
94	14	18	RED
	14A	20	RED
	14B	22	BROWN
95	15	18	BLUE
	15A	20	BLUE
96	15B	22	BLUE
	16	18	BLUE
	16A	20	BLUE
97	16B	22	BLACK
	17	16	GREEN
	17A	22	GREEN
98	18	18	BLUE
	18A	16	BLUE
99	18B	18	BLACK
	19	18	BLACK
	20	18	BLACK
	21	18	GREEN
	22	18	RED
100	22A	20	RED
	23	20	BLUE
101	24	18	BLACK
	25	16	YELLOW
	26	16	GRAY
102	27	16	ORANGE
	27A	18	ORANGE
103	27B	18	BLACK
	28	16	RED
	28A	18	RED
104	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
105	30	16	BROWN
	31	16	BLUE
106	32	18	BROWN
	33	18	ORANGE
	34	16	RED
107	35	18	PURPLE
	36	18	YELLOW

NOTES:


⊕ Denotes Terminal Strip Connection	○ Assembly
17D Last Relay Number	○ Panel
11 Last Terminal Number	○ Refrigeration
36 Last Wire Number	

CONNECTOR	FUNCTION	LOCATION
J1 (15 POS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 POS.)	BLINDER 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 (5 POS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 POS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (5 POS.)	RIGHT SIDE RECEPTACLE	RIGHT RECEPTACLE BOX
J9 (3 POS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 POS.)	BALLAST CONNECTIONS	CONTROL PANEL

CUSTOMER APPROVAL/REFERENCE

APPROVED BY _____
 APPROVING FIRM _____
 DATE OF APPROVAL _____

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Forma Scientific

BOX 640 BURELTON, OHIO 43750
 TEL: 614.392.3800 FAX: 614.391.7473

5	HD-1285	06-02-00	GLS	KDG	LON	NOTED EXCLUDING SAMP RECEIPT
4	HD-1207	07-31-98	BOB	KDG	LON	REMOVED CONNECTORS, RIGHT RECEPT
3	SI-6557	07-07-98	DNL	KDG	LON	CHANGED 360155 SWITCH TO 360146
2	HD-1178	04-14-98	RTT	PKK	LON	CORRECT WIRES 33 & 36
1	HD-1159	01-20-98	RTT	DS	DS	CHG FROM C50 TO CWX LAMPS

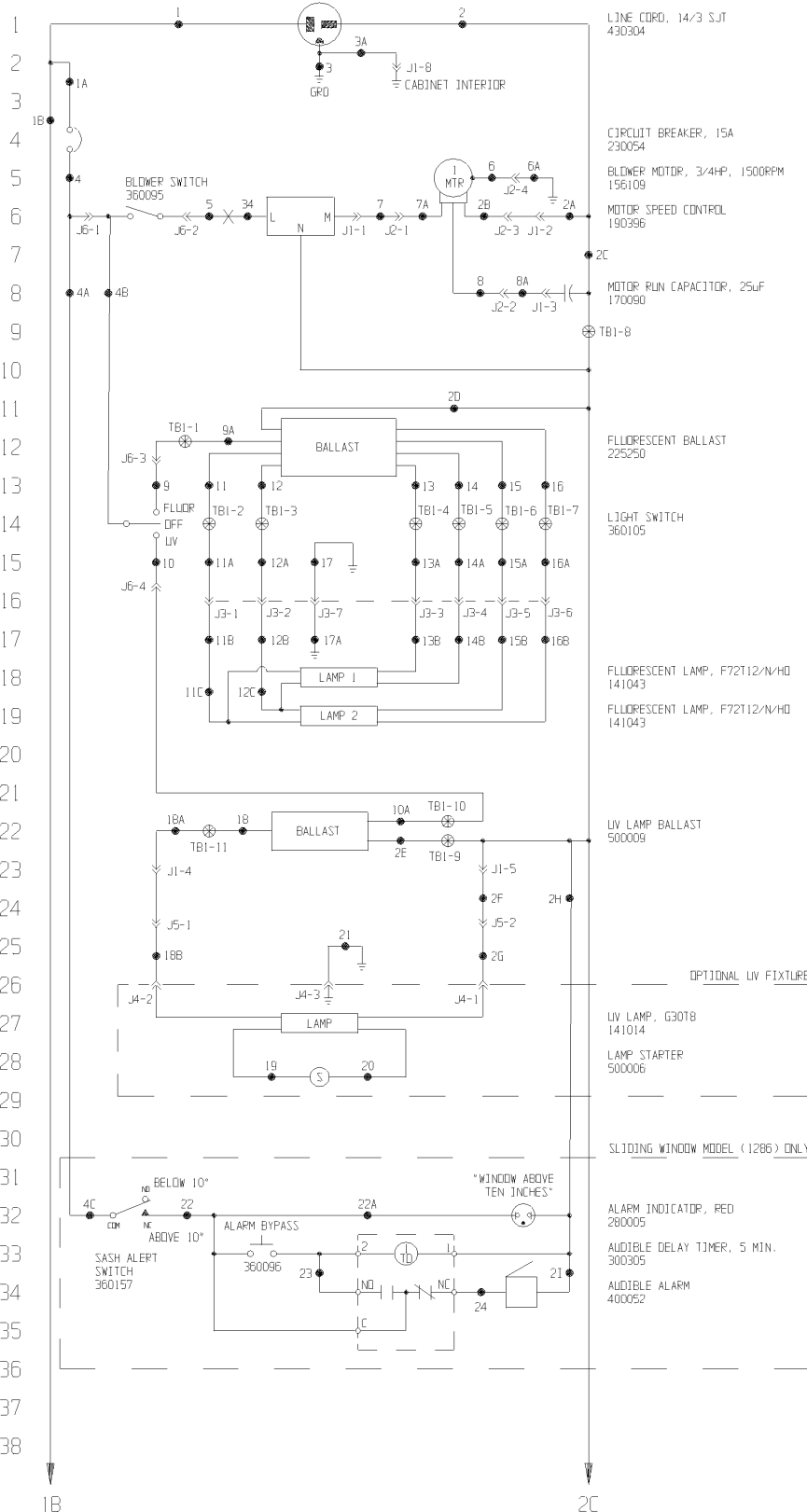
REV	ECR NO.	DATE	BY	CAO	APPD	DESCRIPTION OF REVISION
		03-05-97	DWN	JAS	CAO	JAS APPD DS SCALE NTS

CUSTOMER	
JOB TITLE	1285 4FT. BIO-SAFETY CABINET - 230V/50HZ
DWG TITLE	ELECTRICAL SCHEMATIC
LOCATION	HOODS
JOB NUMBER	DRAWING NUMBER
	1285-70-0-D

Electrical Schematic
 Forma Model:
 1285
 Bio-Safety Cabinet

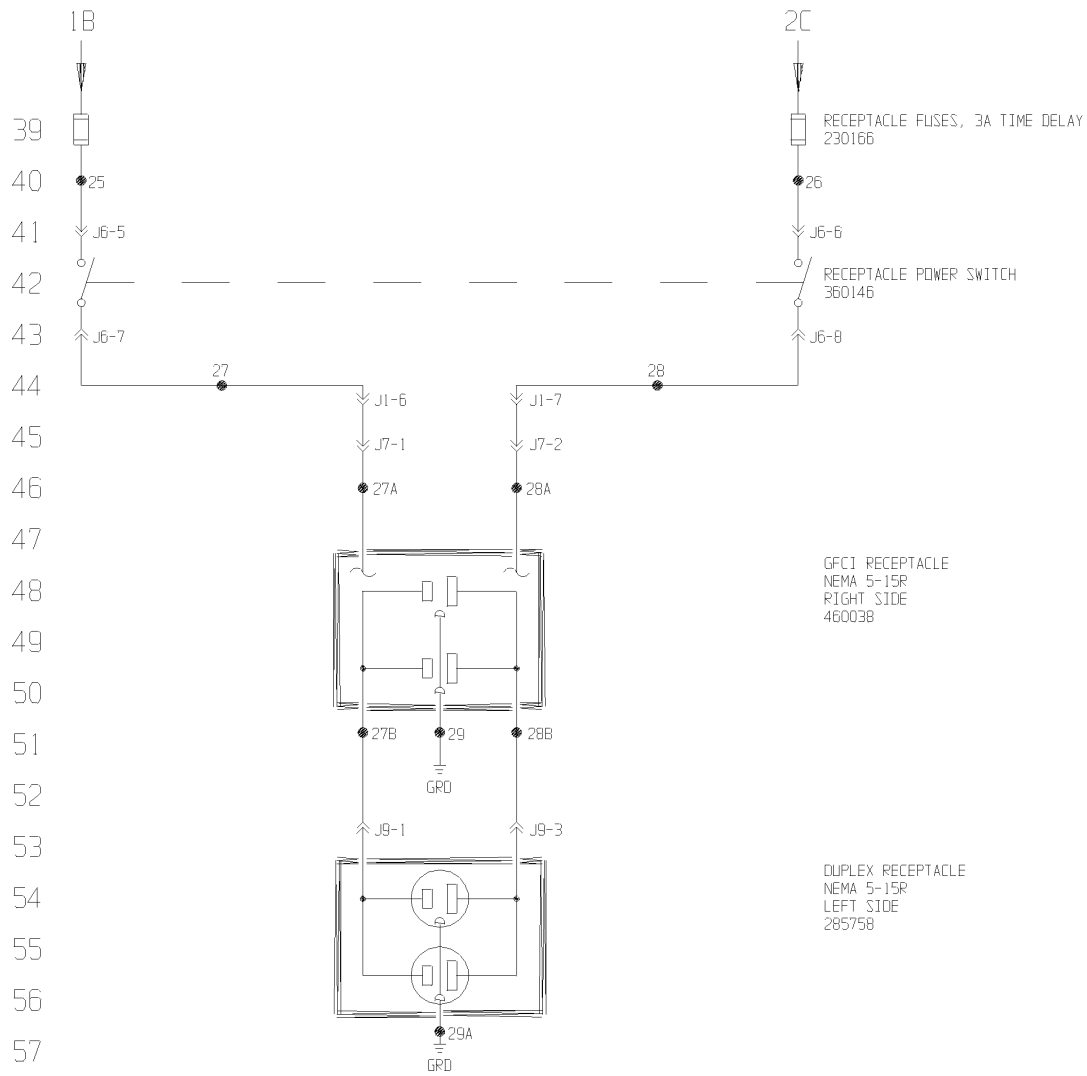
1285-70-0-D REV.5
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POWER CONNECTION
 115 VAC, 1PH, 2W, 60HZ, 13FLA (EXCLUDING 5AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
 Forma Model:
 1286
 Bio-Safety Cabinet

1286-70-0-D Rev. 4
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


Electrical Schematic
Forma Model:
1286
Bio-Safety Cabinet

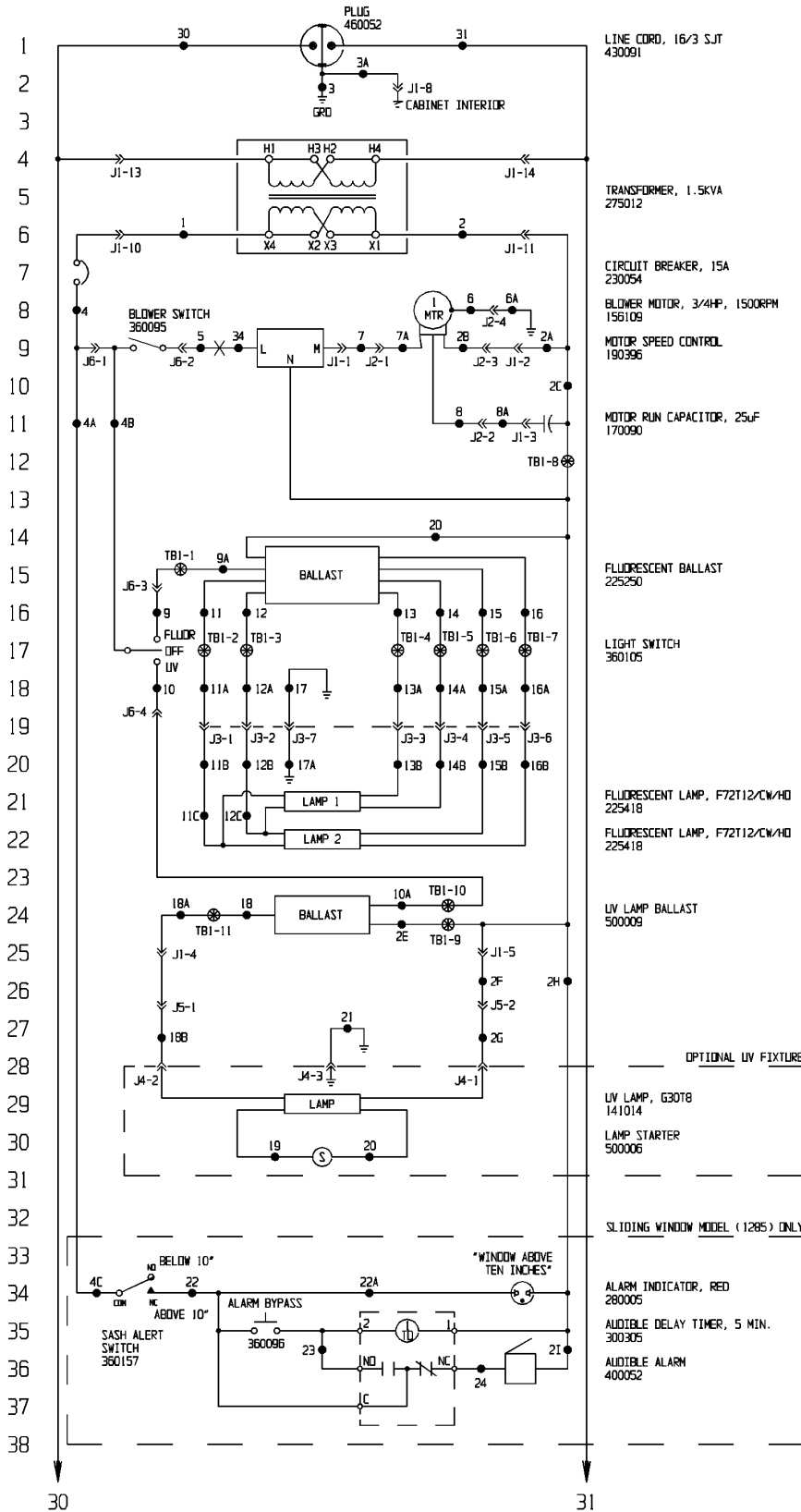
1286-70-0-D Rev. 4
Page 2 of 3

		WIRE REFERENCE CHART		
		WIRE NO.	GAUGE	COLOR
77		1	14	BLACK
78		1A	14	BLACK
		1B	16	BLACK
79		2	14	WHITE
		2A	16	WHITE
		2B	18	WHITE
80		2C	16	WHITE
		2D	18	WHITE
		2E	18	WHITE
81		2F	16	GRAY
		2G	18	WHITE
82		2H	20	WHITE
		2I	18	WHITE
		3	14	GREEN/YELLOW
83		3A	16	GREEN/YELLOW
		4	14	BROWN
84		4A	20	BROWN
		4B	16	BROWN
		4C	18	DRANGE
85		5	16	BLUE
		6	18	GREEN
		6A	16	GREEN
86		7	16	BLACK
		7A	18	BLACK
		8	18	BROWN
87		8A	16	BROWN
		9	16	PURPLE
		9A	18	BLACK
88		10	16	DRANGE
		10A	18	BLACK
		11	18	YELLOW
		11A	20	YELLOW
		11B	22	YELLOW
89		11C	18	YELLOW
		12	18	YELLOW
		12A	20	YELLOW
		12B	22	DRANGE
		12C	18	YELLOW
92		13	18	RED
		13A	20	RED
		13B	22	RED
93		14	18	RED
		14A	20	RED
94		14B	22	BROWN
		15	18	BLUE
		15A	20	BLUE
95		15B	22	BLUE
		16	18	BLUE
		16A	20	BLUE
		16B	22	BLACK
96		17	16	GREEN
		17A	22	GREEN
97		18	18	BLUE
		18A	16	BLUE
98		18B	18	BLACK
		19	18	BLACK
		20	18	BLACK
99		21	18	GREEN
		22	18	RED
		22A	20	RED
		23	20	BLUE
		24	18	BLACK
		25	16	YELLOW
100		26	16	GRAY
		27	16	DRANGE
101		27A	18	DRANGE
		27B	18	BLACK
		28	16	RED
102		28A	18	RED
		28B	18	WHITE
		29	18	GREEN
103		29A	18	GREEN
		30	N/A	N/A
104		31	N/A	N/A
		32	N/A	N/A
105		33	N/A	N/A
		34	16	RED

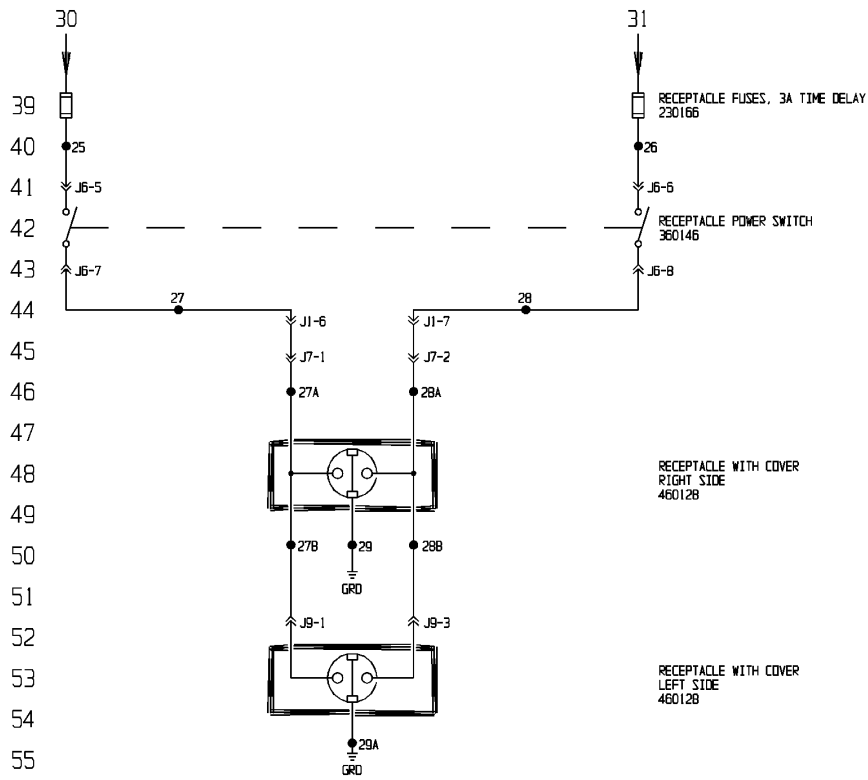
NOTES:		CUSTOMER APPROVAL/REFERENCE		4	HO-1295	06-02-00	GLS	KDG	LDN	NOTED EXCLUDING ZAMP RECEPT.		
⊗	Denotes Terminal Strip Connection	Parts List Reference Number	APPROVED BY	3	HO-1207	07-31-98	BDB	KDG	LDN	RIGHT GFCI RECEPT. TO STANDARD		
LT0	Last Relay Number	○ Assembly	DATE OF APPROVAL	2	SJ-6557	07-07-98	DWL	KDG	LDN	CHANGED 360155 SWITCH TO 360148		
11	Last Terminal Number	○ 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 FORMA SCIENTIFIC									
34	Last Wire Number	○ Refrigeration	1	HO-1179	04-14-98	RTT	PKK	LDN	REMOVED WIRES 30, 31, 32 & 33			
CONNECTOR		FUNCTION	LOCATION	REV	ECR NO.	DATE	BY	CAD	APPO	DESCRIPTION OF REVISION		
J1 (15 POS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)	DATE	02-26-97	DWN	JAS	CAD	JAS	APPO	DS	SCALE	NTS
J2 (5 POS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)	CUSTOMER									
J3 (9 POS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)	JOB TITLE 1286 6FT. BIO-SAFETY CABINET									
J4 (4 POS.)	1/4" LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)	DWG TITLE ELECTRICAL SCHEMATIC									
J5 (2 POS.)	1/4" RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)	LOCATION			JOB NUMBER			DRAWING NUMBER			
J6 (5 POS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)	HOODS						1286-70-0-D			
J7 (2 POS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)										
J8 (4 POS.)	RIGHT SIDE RECEPTACLE	RIGHT RECEPTACLE CORD										
J9 (3 POS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)										
T61 (11 POS.)	BALLAST CONNECTIONS	CONTROL PANEL										

 <p>Forma Scientific</p> <p>800 840 MARQUETTA, INDIA 45750 TELE. FREE USA 800-948-3080, DND 014-973-4763</p>		<p>Electrical Schematic Forma Model: 1286 Bio-Safety Cabinet</p> <hr/> <p>1286-70-0-D Rev. 4 Page 3 of 3</p>	
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POWER CONNECTION
230 VAC, 1PH, 2W, 50HZ, 6.5FLA (EXCLUDING 2AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
Forma Model:
1287
Bio-Safety Cabinet
1287-70-0-D Rev. 4
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Electrical Schematic
Forma Model:
1287
Bio-Safety Cabinet
1287-70-0-D Rev. 4
Page 2 of 3

WIRE REFERENCE CHART

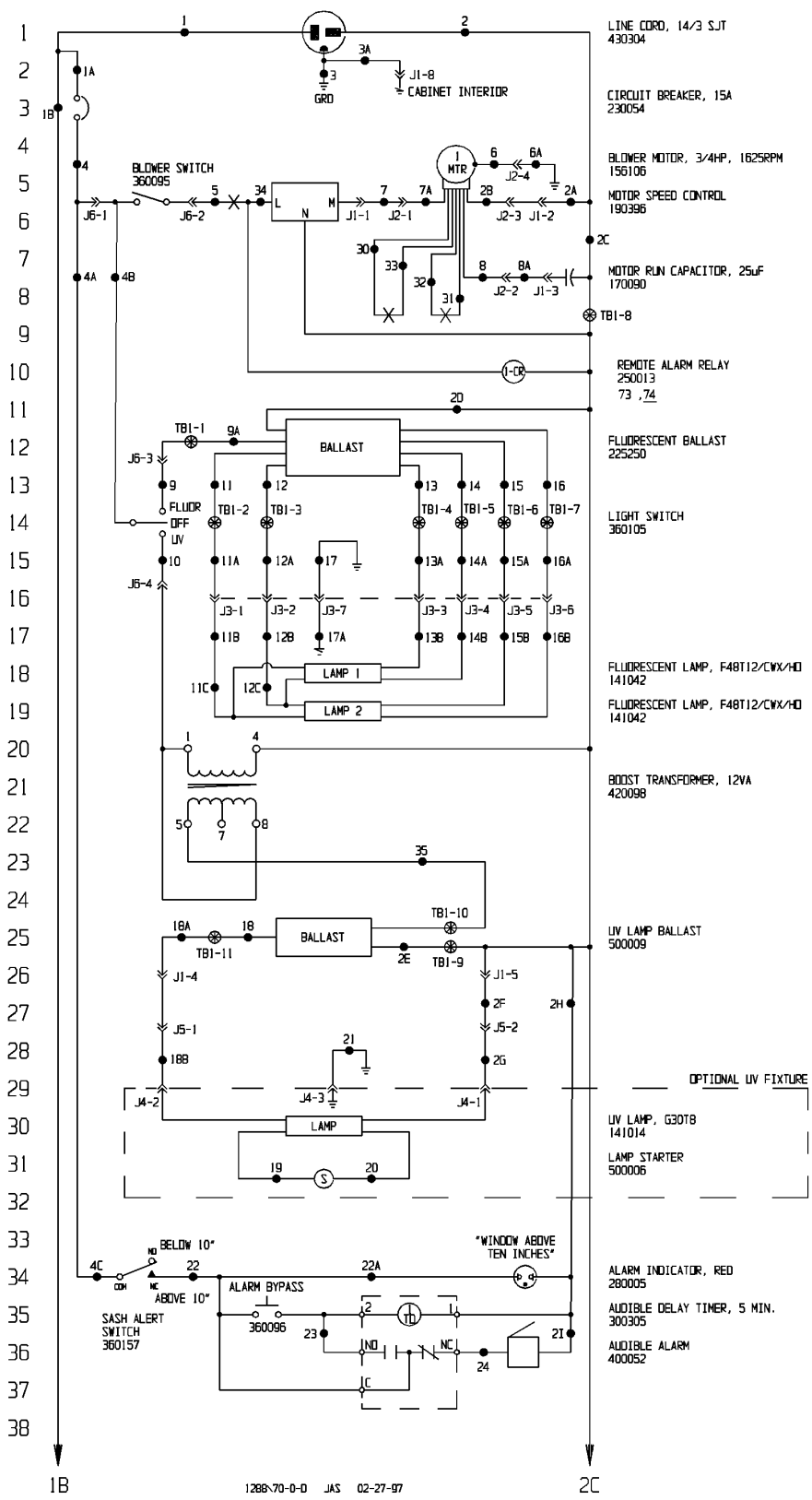
	WIRE NO.	GAUGE	COLOR
77			
78	1	14	BLACK
	1A	14	BLACK
	1B	16	BLACK
79	2	14	WHITE
	2A	16	WHITE
80	2B	18	WHITE
	2C	16	WHITE
81	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
82	2G	18	WHITE
	2H	20	WHITE
	2I	18	WHITE
83	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
84	4	14	BROWN
	4A	20	BROWN
	4B	16	BROWN
85	4C	18	ORANGE
	5	16	BLUE
86	6	18	GREEN
	6A	16	GREEN
87	7	16	BLACK
	7A	18	BLACK
	8	18	BROWN
88	8A	16	BROWN
	9	16	PURPLE
89	9A	18	BLACK
	10	16	ORANGE
	10A	18	BLACK
90	11	18	YELLOW
	11A	20	YELLOW
91	11B	22	YELLOW
	11C	18	YELLOW
92	12	18	YELLOW
	12A	20	YELLOW
	12B	22	ORANGE
93	12C	18	YELLOW
	13	18	RED
94	13A	20	RED
	13B	22	RED
	14	18	RED
	14A	20	RED
	14B	22	BROWN
96	15	18	BLUE
	15A	20	BLUE
	15B	22	BLUE
97	16	18	BLUE
	16A	20	BLUE
98	16B	22	BLACK
	17	16	GREEN
	17A	22	GREEN
99	18	18	BLUE
	18A	16	BLUE
	18B	18	BLACK
	19	18	BLACK
100	20	18	BLACK
	21	18	GREEN
	22	18	RED
101	22A	20	RED
	23	20	BLUE
102	24	18	BLACK
	25	16	YELLOW
	26	16	GRAY
103	27	16	ORANGE
	27A	18	ORANGE
104	27B	18	BLACK
	28	16	RED
	28A	18	RED
105	28B	18	WHITE
	29	18	GREEN
	29A	18	GREEN
106	30	16	BROWN
	31	16	BLUE
107	32	N/A	N/A
	33	N/A	N/A
	34	16	RED

NOTES:		
⊗ Denotes Terminal Strip Connection	Parts List Reference Number	
1TD Last Relay Number	○ Assembly	
11 Last Terminal Number	⌒ Panel	
34 Last Wire Number	○ Refrigeration	
CONNECTOR	FUNCTION	LOCATION
J1 (15 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/LAMP RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)
J6 (5 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (5 PDS.)	RIGHT SIDE RECEPTACLE	RIGHT RECEPTACLE BOX
J9 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (11 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL

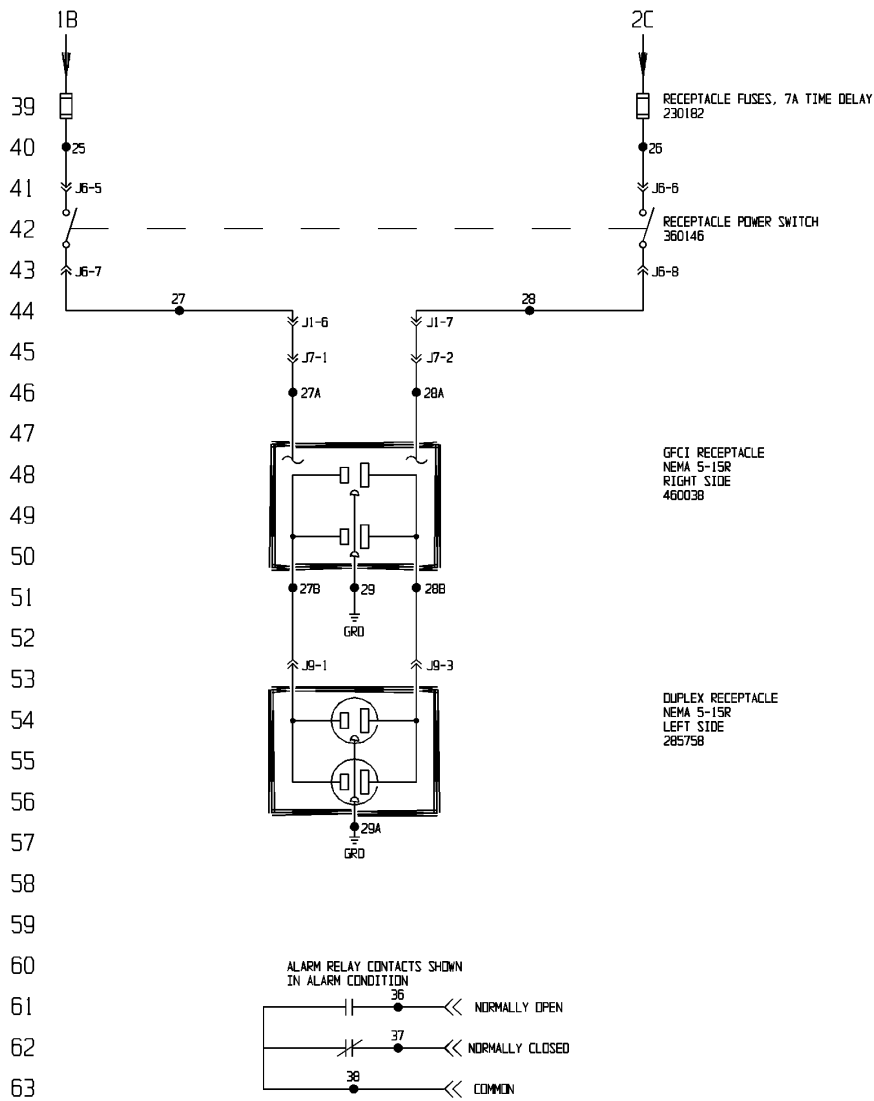
CUSTOMER APPROVAL/REFERENCE		4	HD-1295	06-02-00	GLS	KDG	LON	NOTED EXCLUDING ZAMP RECEPT.
APPROVED BY		3	HD-1207	07-31-98	BOB	KDG	LON	REMOVED CONNECTORS, RIGHT RECEPT.
DATE OF APPROVAL		2	SI-6557	07-07-98	DWL	KDG	LON	CHANGED 360155 SWITCH TO 360146
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION IS NOT TO BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM FORMA SCIENTIFIC								
REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION		
0	N/A	11-18-97	RTT	RTT	DS	RELEASED FOR PRODUCTION		
DATE	07-18-97	DWN	JAS	CAD	JAS	APPD	DS	SCALE NTS
CUSTOMER								
JOB TITLE	1287 6FT. BIO-SAFETY CABINET - 230V/50HZ							
DWG TITLE	ELECTRICAL SCHEMATIC							
LOCATION	JOB NUMBER	DRAWING NUMBER						
HOODS		1287-70-0-D						

Electrical Schematic
 Forma Model:
 1287
 Bio-Safety Cabinet
 1287-70-0-D Rev.4
 Page 3 of 3

POWER CONNECTION
100 VAC, 1 PH, 2W, 50HZ, 9FLA (EXCLUDING 5AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
Forma Model:
1288
Bio-Safety Cabinet
1288-70-0-D Rev. 5
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Electrical Schematic
Forma Model:
1288
Bio-Safety Cabinet

1288-70-0-D Rev. 5
Page 2 of 3


WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77			
78	1	14	BLACK
	1A	14	BLACK
	1B	16	BLACK
79	2	14	WHITE
	2A	16	WHITE
	2B	18	WHITE
80	2C	16	WHITE
	2D	18	WHITE
	2E	18	WHITE
	2F	16	GRAY
	2G	18	WHITE
82	2H	20	WHITE
	2I	18	WHITE
83	3	14	GREEN/YELLOW
	3A	16	GREEN/YELLOW
	4	14	BROWN
84	4A	20	BROWN
	4B	16	BROWN
	4C	18	ORANGE
85	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
	10	16	ORANGE
89	11	18	YELLOW
	11A	20	YELLOW
90	11B	22	YELLOW
	11C	18	YELLOW
	12	18	YELLOW
91	12A	20	YELLOW
	12B	22	ORANGE
92	12C	18	YELLOW
	13	18	RED
	13A	20	RED
93	13B	22	RED
	14	18	RED
94	14A	20	RED
	14B	22	BROWN
95	15	18	BLUE
	15A	20	BLUE
	15B	22	BLUE
96	16	18	BLUE
	16A	20	BLUE
	16B	22	BLACK
97	17	16	GREEN
	17A	22	GREEN
98	18	18	BLUE
	18A	16	BLUE
	18B	18	BLACK
99	19	18	BLACK
	20	18	BLACK
	21	18	GREEN
	22	18	RED
	22A	20	RED
100	23	20	BLUE
	24	18	BLACK
101	25	16	YELLOW
	26	16	GRAY
	27	16	ORANGE
102	27A	18	ORANGE
	27B	18	BLACK
103	28	16	RED
	28A	18	RED
	28B	18	WHITE
104	29	18	GREEN
	29A	18	GREEN
105	30	18	BROWN
	31	18	ORANGE
106	32	18	PURPLE
	33	18	YELLOW
	34	16	RED
107	35	18	BLK
	36	18	BRN
	37	18	BLU
	38	18	BLK

NOTES:

⊗ Denotes Terminal Strip Connection	Parts List Reference Number	
ITD-1CR Last Relay Number	○ Assembly	
11 Last Terminal Number	⊙ Panel	
3B Last Wire Number	○ Refrigeration	
CONNECTOR	FUNCTION	LOCATION
J1 (15 PDS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)
J2 (5 PDS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (8 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 (5 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (5 PDS.)	RIGHT SIDE RECEPTACLE	RIGHT RECEPTACLE BOX
J9 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (1 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL

CUSTOMER APPROVAL/REFERENCE
 APPROVED BY _____
 APPROVING FIRM _____
 DATE OF APPROVAL _____
 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 FORMA SCIENTIFIC

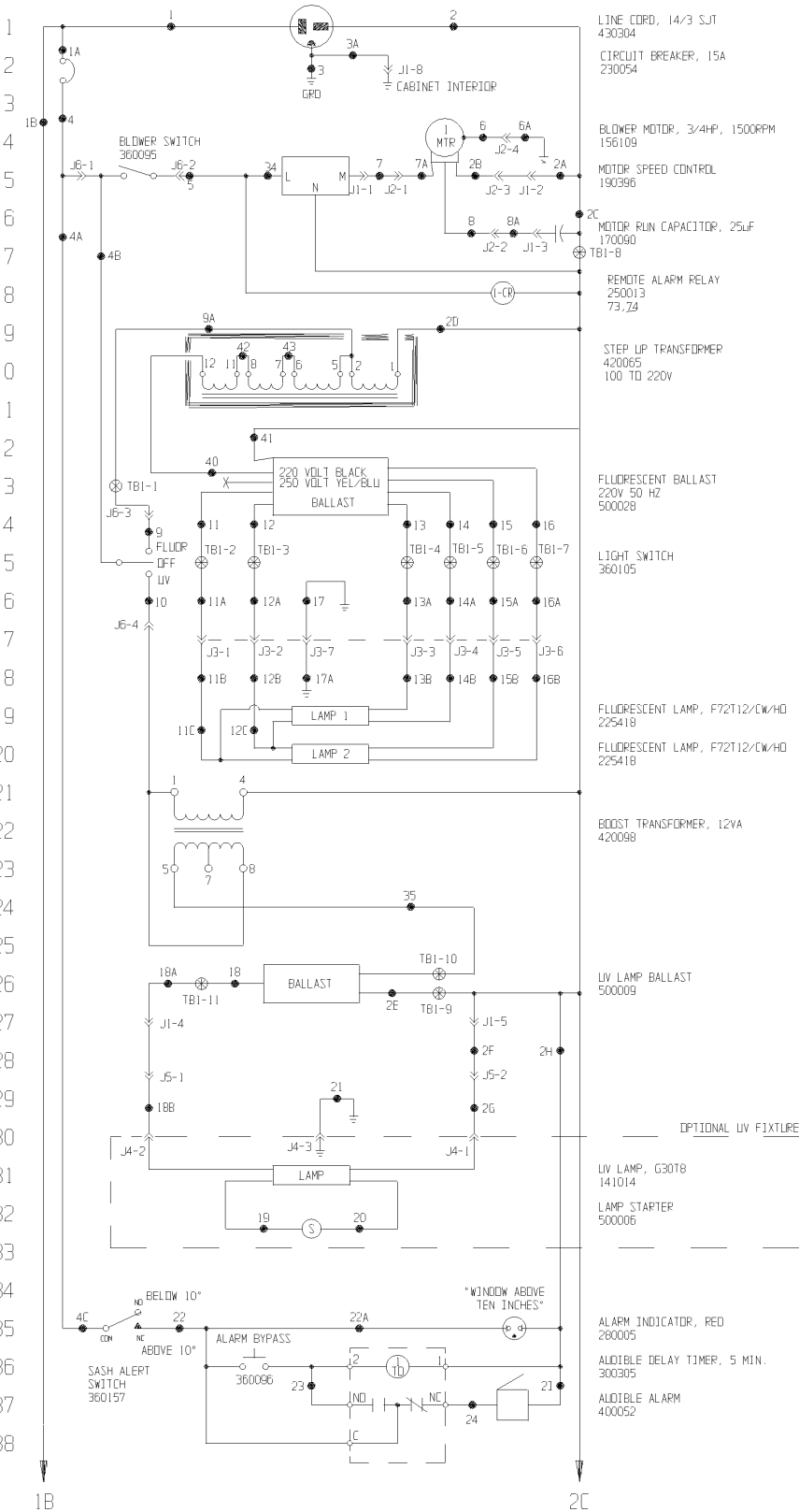


Forma Scientific
 BOX 940 MARLBOROUGH, MA 01450
 TEL: FREE USA 800-640-3060, 010 814-373-0765

5	HD-1295	06-02-00	GLS	KDG	LON	NOTED EXCLUDING SAMP RECEPT.				
4	HD-1207	07-31-98	BOB	KDG	LON	RIGHT GFIC RECEPT. TO STANDARD				
3	SI-6957	07-07-98	DWL	KDG	LON	CHANGED 3601SS SWITCH TO 360146				
2	HD-1179	04-14-98	RTT	PKL	LON	CORRECT WIRES 31 & 33				
1	HD-1159	01-20-98	RTT	DS	DS	CHG FROM C50 TO CWK LAMPS				
REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION				
	DATE	02-27-97	DWN	JAS	CAD	JAS	APPD	DS	SCALE	NTS
CUSTOMER										
JOB TITLE 1288 4FT. BIO-SAFETY CABINET - 100V/50HZ										
DWG TITLE ELECTRICAL SCHEMATIC										
LOCATION										
JOB NUMBER										
DRAWING NUMBER										
HOODS										
1288-70-0-D										

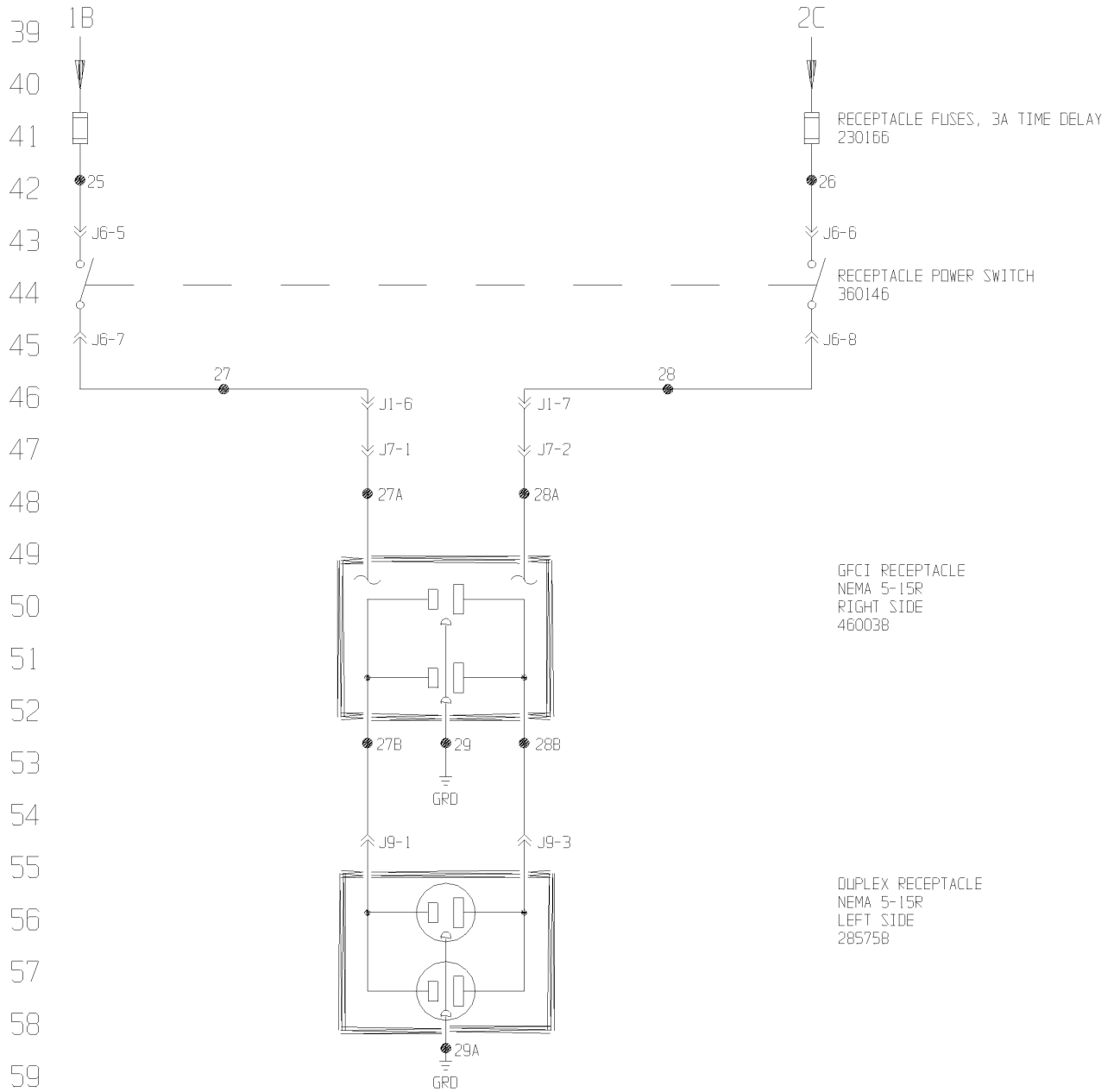
Electrical Schematic
 Forma Model:
 1288
 Bio-Safety Cabinet
 1288-70-0-D Rev. 5
 Page 3 of 3

POWER CONNECTION
 100 VAC, 1PH, 2W, 50HZ, 11.5FLA (EXCLUDING 2AMP CONVENIENCE RECEPTACLES)

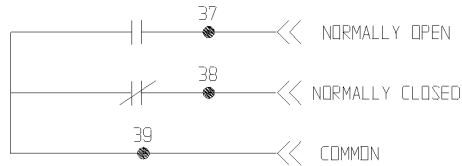


Electrical Schematic
 Forma Model:
 1290
 Bio-Safety Cabinet

1290-70-0-D Rev. 6
 Page 1 of 3



ALARM RELAY CONTACTS SHOWN
IN ALARM CONDITION




Electrical Schematic
Forma Model:
1290
Bio-Safety Cabinet

1290-70-0-D Rev. 6
 Page 2 of 3

WIRE REFERENCE CHART

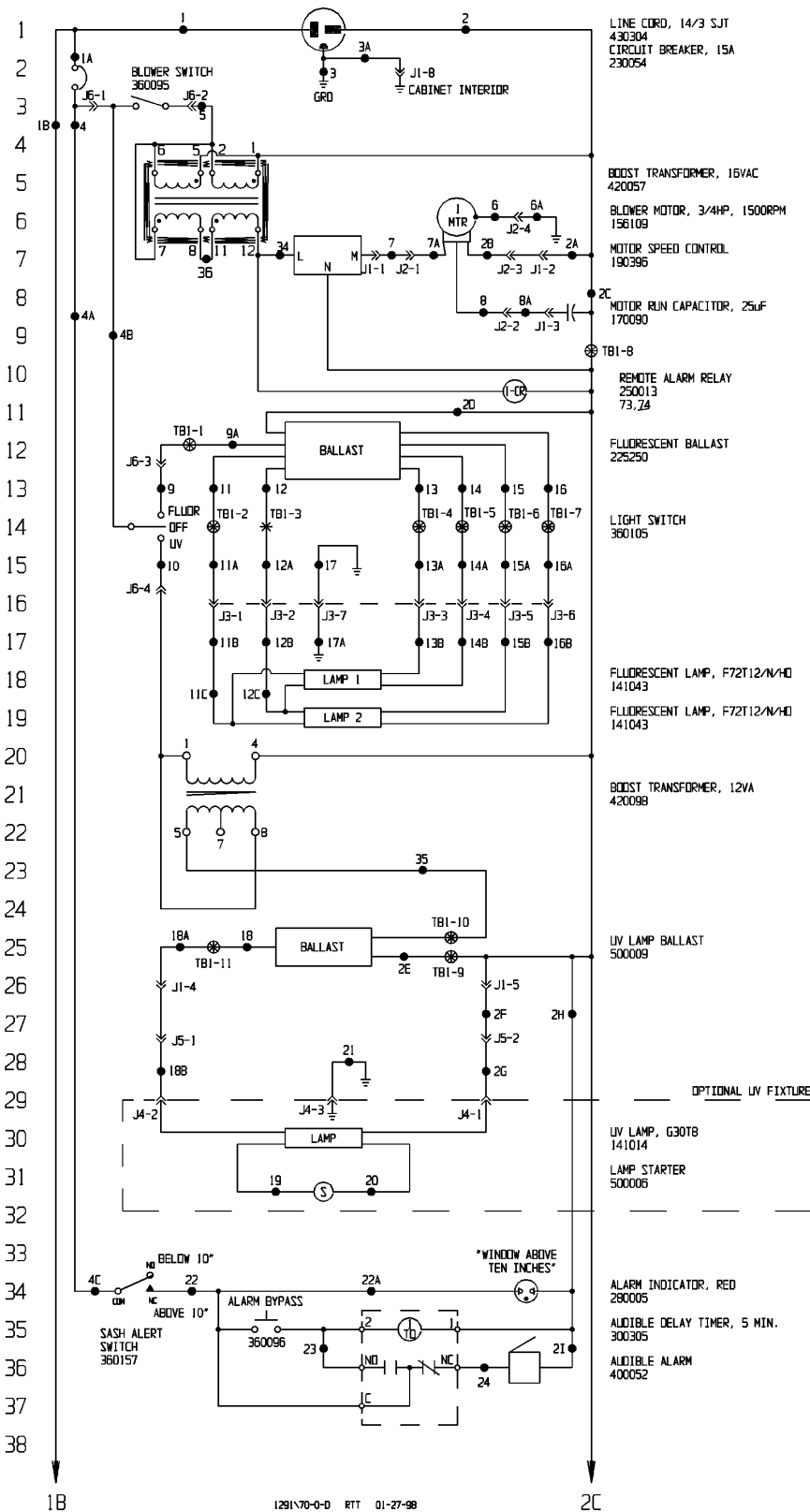
	WIRE NO.	GUAGE	COLOR
77	1	14	BLACK
78	1A	14	BLACK
	1B	16	BLACK
79	2	14	WHITE
	2A	16	WHITE
	2B	18	WHITE
80	2C	16	WHITE
	2D	18	WHITE
	2E	18	WHITE
81	2F	16	GRAY
	2G	18	WHITE
	2H	20	WHITE
82	2I	18	WHITE
	3	14	GREEN-YELLOW
83	3A	16	GREEN-YELLOW
	4	14	BROWN
	4A	20	BROWN
84	4B	16	BROWN
	4C	18	ORANGE
85	5	16	BLUE
	6	18	GREEN
	6A	16	GREEN
86	7	16	BLACK
	7A	18	BLACK
	8	18	BROWN
87	8A	16	BROWN
	9	16	PURPLE
	9A	18	PURPLE
88	10	16	ORANGE
	11	18	YELLOW
89	11A	20	YELLOW
	11B	22	YELLOW
	11C	18	YELLOW
90	12	18	YELLOW
	12A	20	YELLOW
	12B	22	ORANGE
91	12C	18	YELLOW
	13	18	RED
92	13A	20	RED
	13B	22	RED
	14	18	RED
93	14A	20	RED
	14B	22	BROWN
94	15	18	BLUE
	15A	20	BLUE
	15B	22	BLUE
95	16	18	BLUE
	16A	20	BLUE
	16B	22	BLACK
96	17	16	GREEN
	17A	22	GREEN
	18	18	BLUE
97	18A	16	BLUE
	18B	18	BLACK
98	19	18	BLACK
	20	18	BLACK
	21	18	GREEN
99	22	18	RED
	22A	20	RED
	23	20	BLUE
100	24	18	BLACK
	25	16	YELLOW
101	26	16	GRAY
	27	16	ORANGE
	27A	18	ORANGE
102	27B	18	BLACK
	28	16	RED
	28A	18	RED
103	28B	18	WHITE
	29	18	GREEN
104	29A	18	GREEN
	30	N/A	N/A
	31	N/A	N/A
105	32	N/A	N/A
	33	N/A	N/A
106	34	16	RED
	35	18	BLK
	36	N/A	N/A
107	37	18	BRN
	38	18	BLU
	39	18	BLK
	40	18	BLK
	41	18	WHT
	42	18	RED
	43	18	DRG

NOTES:		CUSTOMER APPROVAL/REFERENCE		6	HD-1295	06-02-00	GLS	KDG	LON	NOTED EXCLUDING 2AMP RECEPT.		
⊕ Denotes Terminal Strip Connection	Parts List Reference Number	APPROVED BY	5	HD-1263	07-19-99	RTT	RTT	LON		ADD 220V 50HZ BALLAST		
110 Last Relay Number	○ Assembly	DATE OF APPROVAL	4	HD-1207	07-31-98	EDB	KDG	LON		RIGHT GFCI RECEPT. TO STANDARD		
11 Last Terminal Number	◇ 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 FORMA SCIENTIFIC										
43 Last Wire Number	○ Refrigeration	REV	ECR	NO.	DATE	BY	CAD	APPO	DESCRIPTION OF REVISION			
CONNECTOR	FUNCTION	LOCATION	 Forma Scientific <small>800 646 863/871A, 0410 45790 TEL. FREE USA 800-948-3886, 0410 740-373-4765</small>									
J1 (15 PDS.)	CABINET PASS-THRU CONN.	CONTROL PANEL (TOP REAR)	DATE	02-27-97	OWN	JAS	CAD	JAS	APPD	OHS	SCALE	NTS
J2 (5 PDS.)	BLOWER MOTOR	CAB. TOP HOUSING (INTERIOR)	CUSTOMER									
J3 (8 PDS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)	JOB TITLE 1290 6FT. BIO-SAFETY CABINET - 100V/50HZ									
J4 (4 PDS.)	1/4" LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)	DWG TITLE ELECTRICAL SCHEMATIC									
J5 (2 PDS.)	1/4" RECEPTACLE CONN.	CAB. TOP HOUSING (INTERIOR)	LOCATION									
J6 (5 PDS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)	JOB NUMBER									
J7 (2 PDS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)	DRAWING NUMBER									
J8 (3 PDS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)	1290-70-0-D									
TB1 (11 PDS.)	BALLAST CONNECTIONS	CONTROL PANEL										

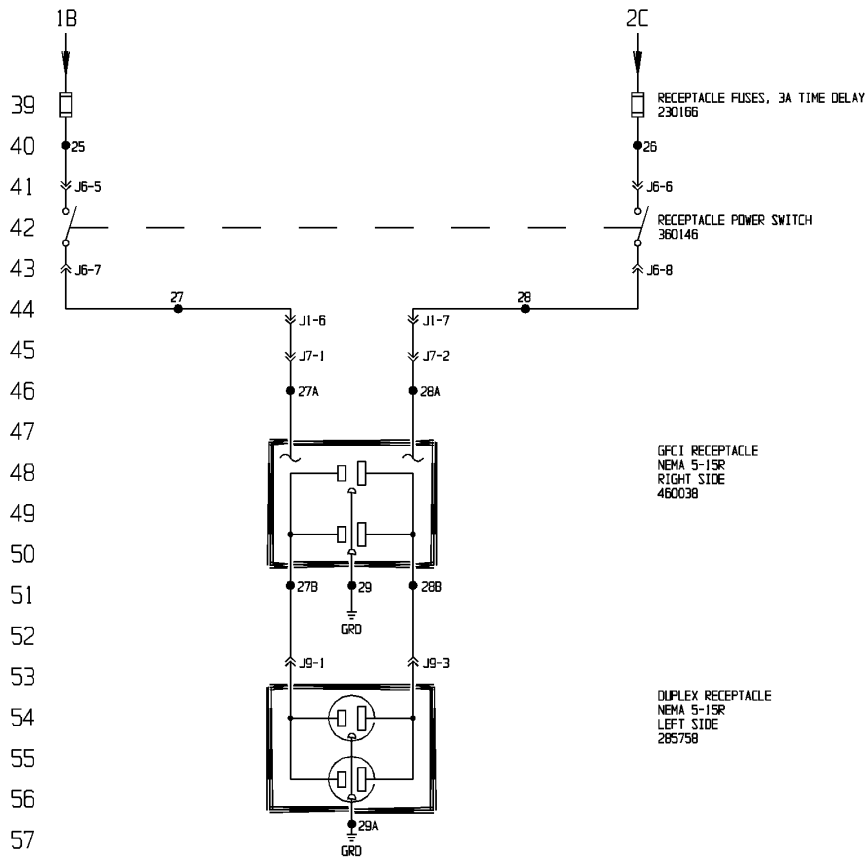
Electrical Schematic
Forma Model:
1290
Bio-Safety Cabinet

1290-70-0-D Rev. 6
Page 3 of 3

POWER CONNECTION
100 VAC, 1PH, 2W, 60HZ, 14FLA (EXCLUDING 2AMP CONVENIENCE RECEPTACLES)



Electrical Schematic
Forma Model:
1291
Bio-Safety Cabinet
1291-70-0-D Rev. 4
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Electrical Schematic
 Forma Model:
 1291
 Bio-Safety Cabinet
 1291-70-0-D Rev. 4
 Page 2 of 3

WIRE REFERENCE CHART

	WIRE NO.	GAUGE	COLOR
77	1	14	BLACK
78	1A	14	BLACK
	1B	18	BLACK
79	2	14	WHITE
	2A	18	WHITE
	2B	18	WHITE
80	2C	18	WHITE
	2D	18	WHITE
	2E	18	WHITE
81	2F	18	GRAY
	2G	18	WHITE
	2H	20	WHITE
82	2I	18	WHITE
	3	14	GREEN/YELLOW
83	3A	18	GREEN/YELLOW
	4	14	BROWN
84	4A	20	BROWN
	4B	18	BROWN
	4C	18	ORANGE
85	5	16	BLUE
	6	18	GREEN
	6A	18	GREEN
86	7	18	BLACK
	7A	18	BLACK
	8	18	BROWN
87	8A	18	BROWN
	9	18	PURPLE
	9A	18	BLACK
88	10	18	ORANGE
	11	18	YELLOW
89	11A	20	YELLOW
	11B	22	YELLOW
	11C	18	YELLOW
90	12	18	YELLOW
	12A	20	YELLOW
	12B	22	ORANGE
91	12C	18	YELLOW
	13	18	RED
92	13A	20	RED
	13B	22	RED
	14	18	RED
93	14A	20	RED
	14B	22	BROWN
	15	18	BLUE
94	15A	20	BLUE
	15B	22	BLUE
95	16	18	BLUE
	16A	20	BLUE
	16B	22	BLACK
96	17	18	GREEN
	17A	22	GREEN
97	18	18	BLUE
	18A	16	BLUE
	18B	18	BLACK
98	19	18	BLACK
	20	18	BLACK
	21	18	GREEN
99	22	18	RED
	22A	20	RED
	23	20	BLUE
	24	18	BLACK
	25	18	YELLOW
100	26	16	GRAY
	27	16	ORANGE
	27A	18	ORANGE
101	27B	18	BLACK
	28	18	RED
102	28A	18	RED
	28B	18	WHITE
	29	18	GREEN
103	29A	18	GREEN
	30	N/A	N/A
	31	N/A	N/A
104	32	N/A	N/A
	33	N/A	N/A
105	34	16	RED
	35	18	BLK
	36	16	DRG
106	37	18	BAN
	38	18	BLU
107	39	18	BLK

NOTES:

⊗ Denotes Terminal Strip Connection Parts List Reference Number

170 Lost Relay Number ○ Assembly

11 Lost Terminal Number ○ Panel

38 Lost Wire Number ○ Refrigeration


CONNECTOR	FUNCTION	LOCATION
J1 (15 POS.)	CABINET PASS-THRU CONN	CONTROL PANEL (TOP REAR)
J2 (15 POS.)	BLINDER MOTOR	CAB. TOP HOUSING (INTERIOR)
J3 (19 POS.)	FLUORESCENT LIGHTING	CONTROL PANEL (INTERIOR)
J4 (14 POS.)	W/Y LAMP RECEPTACLE	WORK CHAMBER (RIGHT SIDE)
J5 (12 POS.)	W/Y RECEPTACLE CONN	CAB. TOP HOUSING (INTERIOR)
J6 (15 POS.)	SWITCH PANEL CONNECTIONS	CONTROL PANEL (INTERIOR)
J7 (12 POS.)	RIGHT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
J8 (15 POS.)	RIGHT 250V RECEPTACLE	FRONT RECEPTACLE BR.
J9 (13 POS.)	LEFT RECEPTACLE CORD	CAB. TOP HOUSING (INTERIOR)
TB1 (13 POS.)	BALLAST CONNECTIONS	CONTROL PANEL

CUSTOMER APPROVAL/REFERENCE

APPROVED BY _____

DATE OF APPROVAL _____

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Forma Scientific

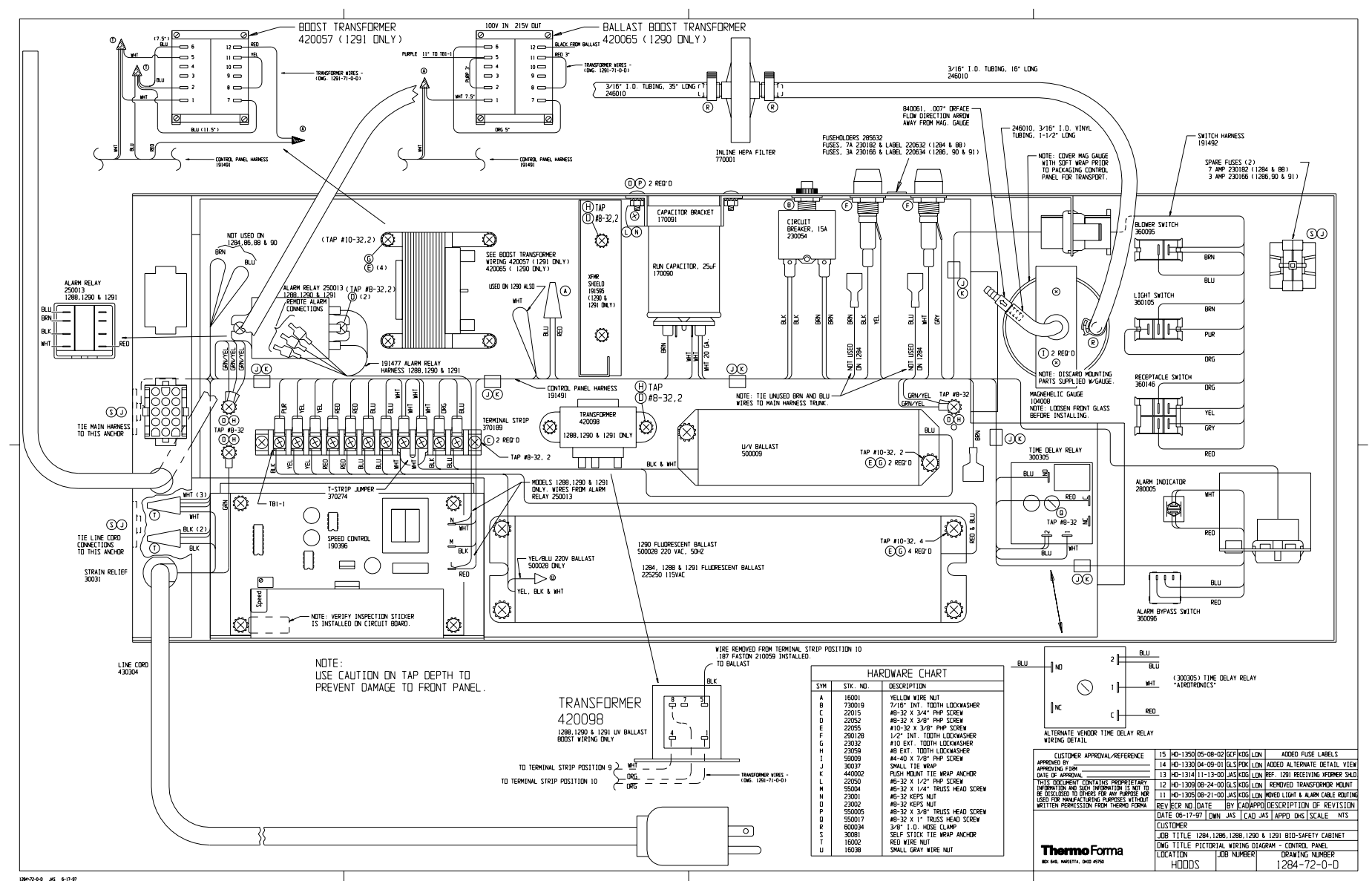
REV. 040 24001775, 0100 4500
 FULL PRICE USA 000-000-0000, 0103 010-000-0000

4	HO-1295	06-02-00	GIS	KDG	LON	NOTED EXCLUDING 2AMP RECEPT
3	HO-1207	07-31-98	BDB	KDG	LON	RIGHT 6PIC RECEPT TO STANDARD
2	SI-8957	07-07-98	QWL	KDG	LON	CHANGED 380155 SWITCH TO 360146
1	HO-1179	04-14-98	RTT	POK	LON	REMOVED WIRES 30, 31, 32 & 33
0	HO-1161	1-27-98	RTT	RTT	DS	RELEASED FOR PRODUCTION
REV	ECR NO.	DATE	BY	CAD	APPD	DESCRIPTION OF REVISION
DATE	J-20-98	DWN	RTT	CAD	RTT	APPD DS SCALE NTS
CUSTOMER						
JOB TITLE 1201 BCF BIO-SAFETY CABINET - 100V-60-2						
DWG TITLE ELECTRICAL SCHEMATIC						
LOCATION	HOODS	JOB NUMBER	DRAWING NUMBER			
			1291-70-0-0			

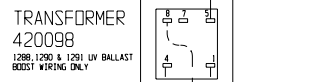
Electrical Schematic
 Forma Model:
 1291
 Bio-Safety Cabinet

1291-70-0-0 REV.4
 Page 3 of 3

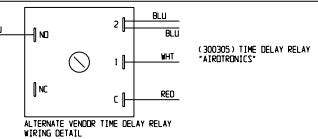
13-22



NOTE: USE CAUTION ON TAP DEPTH TO PREVENT DAMAGE TO FRONT PANEL.



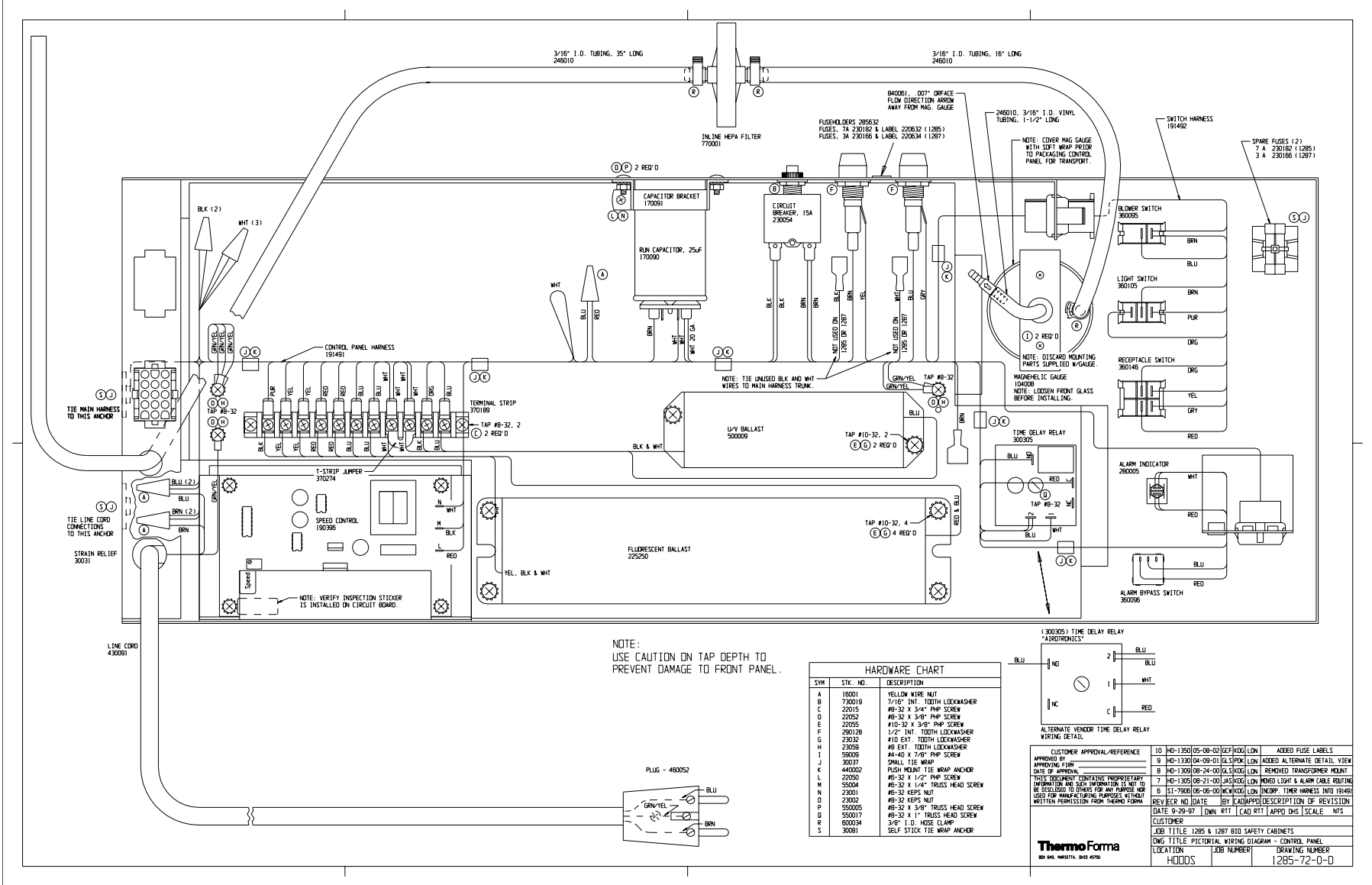
HARDWARE CHART		
SYM	STK. NO.	DESCRIPTION
A	16001	YELLOW WIRE NUT
B	730019	7/16" INT. TOOTH LOCKWASHER
C	22015	#8-32 X 3/4" PHP SCREEN
D	22052	#8-32 X 3/8" PHP SCREEN
E	22055	#10-32 X 3/8" PHP SCREEN
F	26012B	1/2" INT. TOOTH LOCKWASHER
G	23032	#10 EXT. TOOTH LOCKWASHER
H	23059	#8 EXT. TOOTH LOCKWASHER
I	58009	#4-40 X 7/8" PHP SCREEN
J	30077	SMALL TIE WRAP
K	440002	PUSH MOUNT TIE WRAP ANCHOR
L	22050	#8-32 X 1/2" PHP SCREEN
M	55004	#8-32 X 1/4" TRUSS HEAD SCREW
N	23001	#8-32 KEPS NUT
O	23002	#8-32 KEPS NUT
P	550005	#8-32 X 3/8" TRUSS HEAD SCREW
Q	550017	#8-32 X 1" TRUSS HEAD SCREW
R	600034	3/8" I.D. HOSE CLAMP
S	30081	SLIP STICK TIE WRAP ANCHOR
T	16002	RED WIRE NUT
U	16038	SMALL GRAY WIRE NUT



CUSTOMER APPROVAL/REFERENCE		15	16	17	18	19	20
APPROVED BY:	14	15	16	17	18	19	20
SITE OF APPROVAL:	13	14	15	16	17	18	19
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	12	13	14	15	16	17	18
REV	11	12	13	14	15	16	17
DATE	06-17-97	06-17-97	06-17-97	06-17-97	06-17-97	06-17-97	06-17-97
BY	DMN	JAS	CAD	JAS	APPRO	OMS	SCALE
DESCRIPTION	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS
DESCRIPTION OF REVISION	ADDED FUSE LABELS	ADDED ALTERNATE DETAIL VIEW	REMOVED TRANSFORMER MOUNT	REMOVED TRANSFORMER MOUNT	REMOVED TRANSFORMER MOUNT	REMOVED TRANSFORMER MOUNT	REMOVED TRANSFORMER MOUNT
CUSTOMER	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET	1288, 1290, 1291 BID-SAFETY CABINET
JOB TITLE	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS
LOCATION	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS	HOODS
JOB NUMBER	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0
DRAWING NUMBER	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0	1284-72-0-0

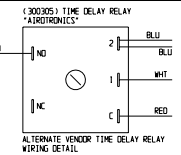
Thermo Forma
801 646, 800111, 8002 4970

13-23



HARDWARE CHART

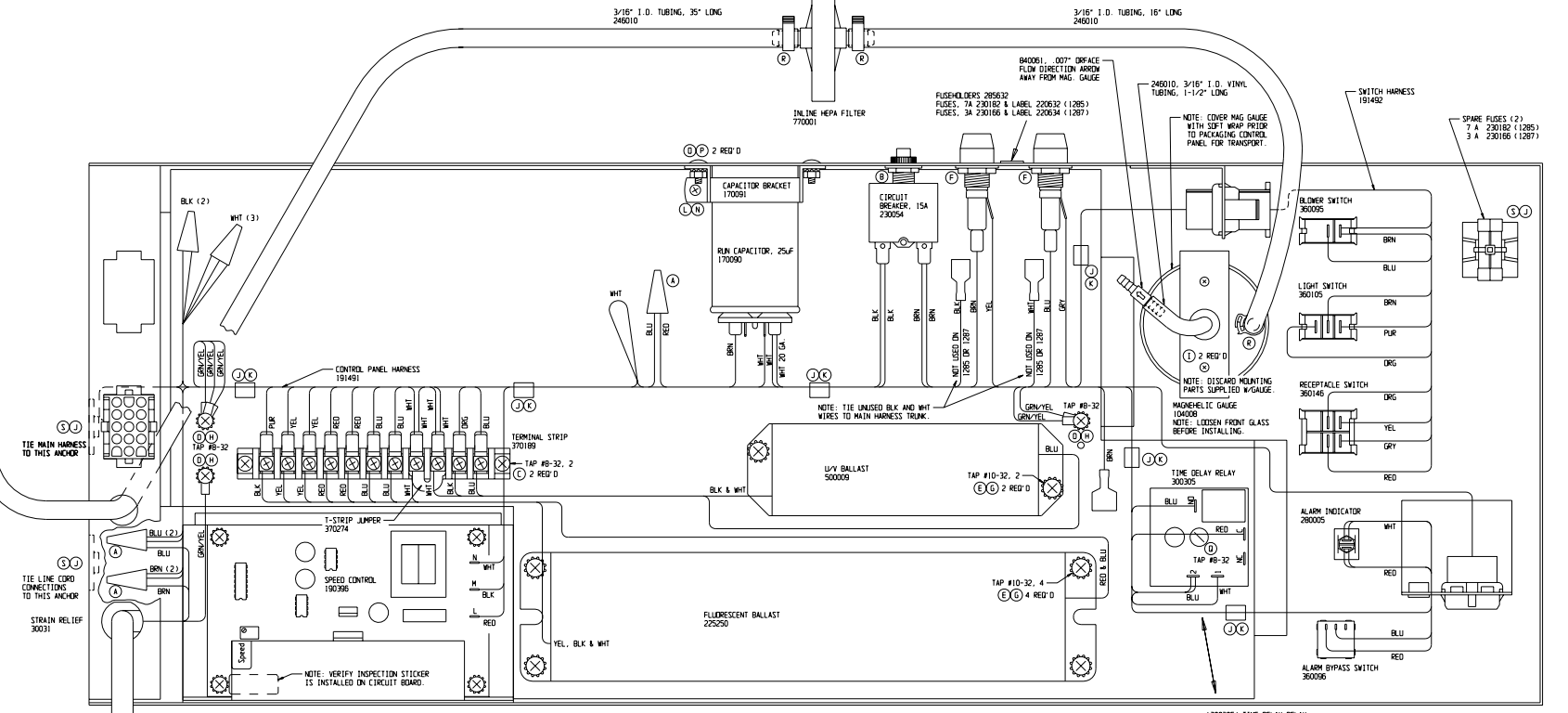
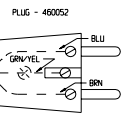
SYM	STK. NO.	DESCRIPTION
A	16001	YELLOW WIRE NUT
B	730019	7/16" INT. TOOTH LOCKWASHER
C	22015	#8-32 X 3/4" PHF SCREW
D	22052	#8-32 X 3/8" PHF SCREW
E	22055	#10-32 X 3/8" PHF SCREW
F	290128	1/2" INT. TOOTH LOCKWASHER
G	23032	#10 EXT. TOOTH LOCKWASHER
H	23059	#8 EXT. TOOTH LOCKWASHER
I	59009	#4-40 X 7/8" PHF SCREW
J	30037	SMALL TIE WRAP
K	440002	PUSH MOUNT TIE WRAP ANCHOR
L	22050	#8-32 X 1/2" PHF SCREW
M	55004	#8-32 X 1/4" TRUSS HEAD SCREW
N	23001	#8-32 KEPS NUT
O	23002	#8-32 KEPS NUT
P	550005	#8-32 X 3/8" TRUSS HEAD SCREW
Q	550017	#8-32 X 1" TRUSS HEAD SCREW
R	60034	3/8" I.D. NUTS CLAMP
S	30081	SELF STICK TIE WRAP ANCHOR



APPROVED BY	TO	NO-1290 (05-08-02) (CP) (K) (L) (N)	ADDED FUSE LABELS
DATE OF APPROVAL	BY	NO-1290 (04-09-01) (L) (S) (PK) (L) (N)	ADDED ALTERNATE DETAIL VIEW
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	NO-1305 (08-24-00) (L) (S) (K) (L) (N)	REMOVED TRANSFORMER MOUNT
	REV	NO-1305 (08-21-00) (L) (S) (K) (L) (N)	MOVED LIGHT & ALARM CABLE ROUTING
	REV	SI-7906 (06-06-00) (N) (K) (L) (N) (IND) (P)	THIRN HARNESS INTO 19149
	REV	NO-1290 (09-07) (L) (N) (R) (L) (C) (AD) (R) (T) (AP) (D) (S) (SCALE) (N) (S)	
CUSTOMER			
JOB TITLE: 1285 & 1287 BIO SAFETY CABINETS			
DWG TITLE: PICTORIAL WIRING DIAGRAM - CONTROL PANEL			
LOCATION	JOB NUMBER	DRAWING NUMBER	
HOODS		1285-72-0-0	

Thermo Forma
800-871-9876, 484-4470

NOTE:
USE CAUTION ON TAP DEPTH TO
PREVENT DAMAGE TO FRONT PANEL.



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 Forma

**Millcreek Road, P.O. Box 649
Marietta, Ohio 45750
U.S.A.**

Telephone (740) 373-4763
Telefax (740) 373-4189
