



Forma Scientific, Inc.

Covers Models:

1184/1186, 1185, 1194/1196

Biological Safety Cabinet

Class II, Type A/B3

Manual 7001186

IMPORTANT: READ THIS TECHNICAL MANUAL CAREFULLY TO DETERMINE PROPER INSTALLATION, OPERATION, AND USAGE PROCEDURES. PAY CAREFUL ATTENTION TO ALL CAUTIONS AND WARNINGS.

CAUTION: ALL INTERNAL ADJUSTMENTS AND MAINTENANCE MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

March 1992

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SECTION 1 - RECEIVING

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- 1.1 Preliminary Inspection
- 1.2 Visible Loss or Damage
- 1.3 Concealed Loss or Damage
- 1.4 Responsibility for Shipping Damage
- 1.5 Unpacking List

1.1 PRELIMINARY INSPECTION

This item was thoroughly inspected and carefully packed prior to shipment and all necessary precautions were taken to ensure safe arrival of the merchandise at its destination. Immediately upon receipt, before the unit is moved from the receiving area, carefully examine the shipment for loss or damage. Unpack the shipment and inspect both interior and exterior for any in-transit damage.

1.2 VISIBLE LOSS OR DAMAGE

If any loss or damage is discovered, note any discrepancies on the delivery receipt. Failure to adequately describe such evidence of loss or damage may result in the carrier refusing to honor a damage claim. Immediately call the delivering carrier and request that their representative perform an inspection. Do not discard any of the packing material and under no circumstances move the shipment from the receiving area.

1.3 CONCEALED LOSS OR DAMAGE

If damage is discovered upon unpacking the shipment, stop further unpacking, retain all packaging material and immediately notify the delivering carrier, requesting that an inspection be performed as soon as possible. Again, under no circumstances move the shipment from the receiving area.

1.4 RESPONSIBILITY FOR SHIPPING DAMAGE

For products shipped F.O.B. Marietta, Ohio, the responsibility of Forma Scientific, Inc. ends when the merchandise is loaded onto the carrier's vehicle.

On F.O.B. Destination shipments, Forma Scientific's and the carrier's responsibility ends when your Receiving Department personnel sign a free and clear delivery receipt.

Whenever possible, Forma Scientific, Inc. will assist in settling claims for loss or in-transit damage.

1.5 UNPACKING LIST

The "Installation/Operation" manual is taped down to the interior work chamber of the cabinet.

Included with the Installation/Operation manual are four 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 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

Table of Contents

- 2.1 Description
- 2.2 Theory of Operation
- 2.3 Airflow Diagram (Fig. 2.0)

2.1 DESCRIPTION

The Model 1184/1186/1194/1196 Series is a Class II, Type A/B3 cabinet. The "Type A/B3" designation indicates two alternative uses of the cabinet. When vented directly into the laboratory room, the unit serves 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 with low-to-moderate risk hazard to the user and/or the experiment. 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, 2nd Edition, May 1988. The Model 1184/1186/1194/1196 cabinets are designed to meet the requirements of the National Sanitation Foundation Standard #49.

The cabinet is available in a sliding or hinged window version. 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" during all work procedures. If the window is raised higher than the designated 10", the air barrier at the front of the cabinet will be weakened and containment will be seriously impaired.

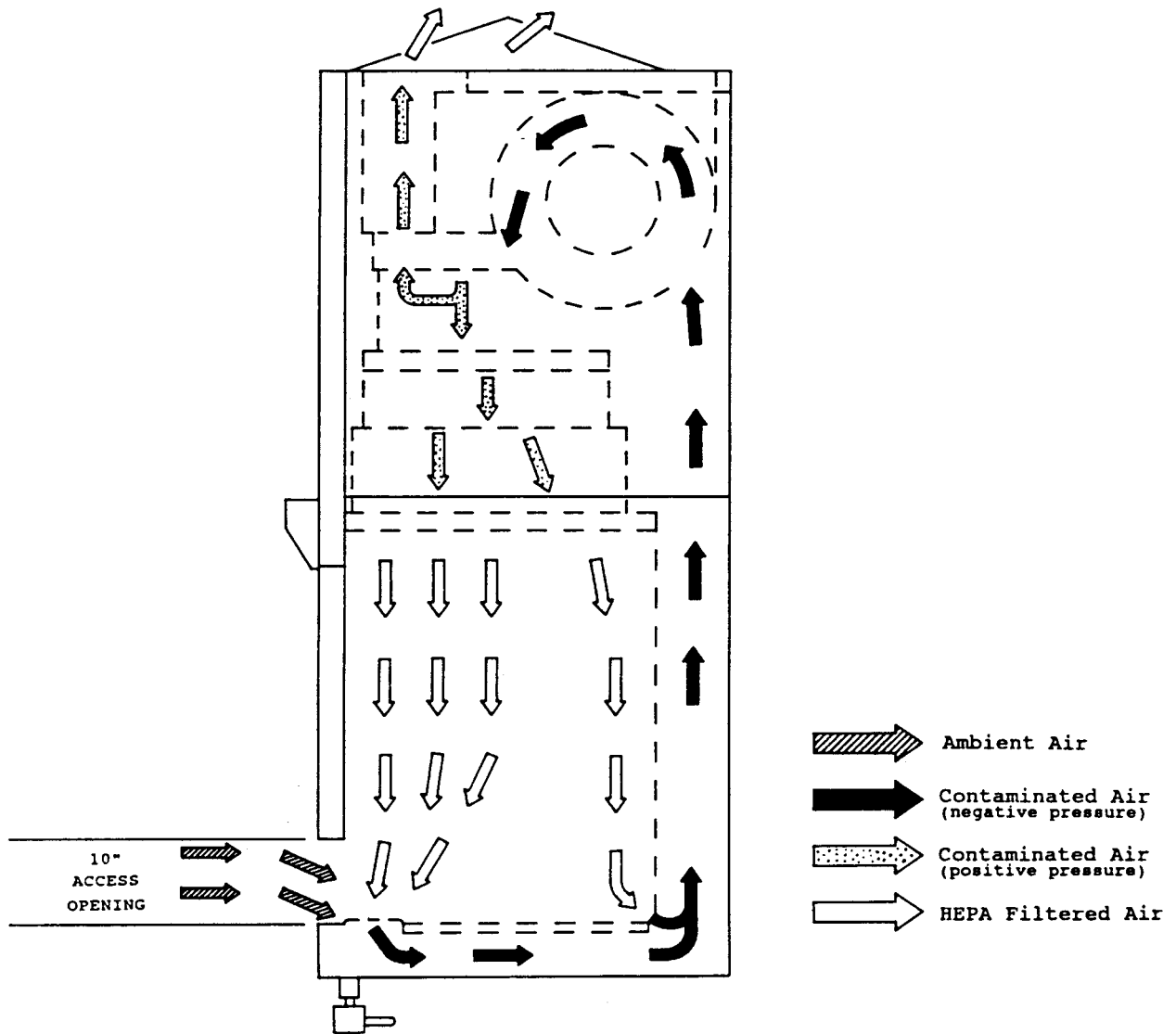
2.2 THEORY OF OPERATION

Figure 2.0 on the following page shows the general airflow pattern of the cabinet.

Clean HEPA 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 must be 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 containment properties of the unit. All work must be performed beyond the intake grille, on the solid work tray.

2.3 AIRFLOW DIAGRAM FIGURE 2.0



SECTION 3 - INSTALLATION OF CABINET

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- 3.1 Location
- 3.2 Power Connection
- 3.3 Plumbing Connection
- 3.4 Exhaust Requirements

3.1 LOCATION

Locate the cabinet on a firm level surface in an area of minimum ambient temperature fluctuation. The cabinet should be placed in a somewhat remote area of the laboratory, away from disruptive air currents caused by excessive personnel traffic, air-conditioning or heating ductwork, and/or laboratory windows and doors. Proper cabinet location is very vital, as drafts can disrupt critical air flow characteristics and allow room contaminants to ENTER or ESCAPE the cabinet work area.

Where space permits, a clear fourteen-inch area should be permitted on each side of the cabinet for maintenance and proper performance purposes. A recommended twelve-inch height should be permitted from the top of the cabinet to the ceiling.

3.2 POWER CONNECTION

NOTE: The electrical wall outlet(s) leading to the cabinet should be accessible for electrical testing.

This cabinet is equipped with two power cords, one for the internal blower motor/lights and the other for the duplex utility outlets. It is recommended that the cords be plugged into separate circuits, so if the duplex outlets overload, the cabinet itself will not shut down.

Connect each power cord to an adequate power supply. Please refer to Section 9 or the electrical data plate (mounted on the front of the unit) for exact electrical specifications.

3.3 PLUMBING CONNECTION

Two service valves are standard with each cabinet. These valves are located on the right and left side of the workstation.

NOTE: REMOVE HOLE PLUGS FOR ACCESS! Connection to utilities should be made with proper materials for the individual service.

All service valves are piped within the cabinet. External connection is to 3/8" FPT coupling.

NOTE: Identification INDEX BUTTONS are supplied.

The cabinet will support a TOTAL of six service valves. The additional four service valves may be purchased from Forma Scientific Inc.

CAUTION! EXPLOSIVE/FLAMMABLE SUBSTANCES SHOULD NEVER BE USED IN THE CABINET, UNLESS APPROVED AND MONITORED BY A BIOLOGICAL SAFETY OFFICER OR OTHER QUALIFIED INDIVIDUAL.

3.4 EXHAUST REQUIREMENTS

Filtered air from the cabinet may be exhausted directly into the room or, if safety requires, be vented to the atmosphere through an external exhaust system.

CAUTION! BEFORE INSTALLATION OF THE CABINET, CONSULT A BIOLOGICAL SAFETY OFFICER OR OTHER QUALIFIED INDIVIDUAL FOR CABINET-TYPE EXHAUST REQUIREMENTS.

A) DIRECT ROOM EXHAUST

- 1) Locate the exhaust filter guard (on top of cabinet).
- 2) Remove and save the four acorn-type nuts and washers that secure the exhaust filter guard.
- 3) Remove cardboard cover plate from top of cabinet.
- 4) Replace the exhaust filter guard with the slope toward the front and the back of the unit. Secure with the four acorn-type nuts and washers removed in Step #2.

B) EXTERNAL EXHAUST SYSTEM (For Class II Type B3 Only)

The intermediate connection of the cabinet to any external exhaust system (in-house) can be performed by using an exhaust transition, which is available for purchase from Forma Scientific Inc. This exhaust transition requires a minimum of 16-1/2" headroom from the top of the cabinet.

CAUTION: THE EXHAUST SYSTEM SHOULD HAVE SAFEGUARDS AGAINST EXHAUST FAILURE. IT IS REQUIRED THAT A BIOLOGICAL SAFETY OFFICER OR INDUSTRIAL HYGIENIST OR OTHER QUALIFIED INDIVIDUAL REVIEW THE AGENTS AND CHEMICALS UTILIZED WITHIN THE CABINET TO DETERMINE IF ADDITIONAL FILTRATION TREATMENT IS NECESSARY BEFORE VENTING TO THE ATMOSPHERE.

The exhaust system must be capable of handling the volume of air passing through the cabinet.

EXHAUST REQUIREMENTS ARE APPROXIMATELY:

Model 1184: 339-369 CFM
Model 1186: 505-556 CFM
Model 1194: 339-369 CFM
Model 1196: 510-561 CFM

SECTION 4 - OPERATION OF CABINET

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4.1 Control & Indicating Devices

- A) Blower Switch
- B) Light Switch
- C) Ultra-Violet Light (Optional)
- D) Alarm By-Pass Switch
- E) (sliding window models only)
- F) Static Pressure Gauge (in. w.g.)
- G) Blower Speed Control
- H) Blower Motor/Lights Reset Button (15 Amp)
- I) Receptacle Reset Button (15 Amp)
- J) Duplex Receptacles
- K) Drain Valve
- L) Service Valves
- M) Exhaust Filter Guard
- N) Sliding Window Assembly

4.2 Overview of Cabinet Drawing

4.3 Overview of Control Panel (Models 1184/1186)

4.4 Overview of Control Panel (Models 1194/1196)

4.1 CONTROL & INDICATING DEVICES

(REFER TO DRAWINGS 4.0, 4.1 and 4.2 FOR PROPER IDENTIFICATION)

Before operating the cabinet, it is recommended that the user(s) become familiar with the following items on the cabinet.

A) BLOWER SWITCH

The blower switch controls the on/off power to the internal blower.

B) LIGHT SWITCH

The "dual purpose" light switch controls power to the fluorescent lamp or the optional ultra-violet lamp (both lamps are located in the work area).

NOTE: WITH THE ULTRA-VIOLET LAMP OPTION, THE SWITCH PROVIDES THE FOLLOWING SETTINGS; "OFF"= CENTER, FLUORESCENT "ON" TOP SIDE, AND ULTRA-VIOLET "ON" BOTTOM SIDE. ONLY ONE LAMP MAY BE LIT AT ONE TIME.

C) ULTRA-VIOLET LIGHT (OPTIONAL)

CAUTION: EYES OR SKIN SHOULD NOT BE EXPOSED TO ULTRA-VIOLET LIGHT. RECOMMENDED USAGE IS ONLY WHEN LAB IS NOT IN USE.

Cabinets may be equipped with an ultra-violet germicidal light as optional equipment. The "dual purpose" light switch labeled "Lights" controls power to the optional ultra-violet lamp.

NOTE: WITH THE ULTRA-VIOLET LAMP OPTION, THE SWITCH PROVIDES THE FOLLOWING SETTINGS; "OFF" = CENTER, FLUORESCENT "ON" TOP SIDE, AND ULTRA-VIOLET "ON" BOTTOM SIDE. ONLY ONE LAMP MAY BE LIT AT ONE TIME.

D) ALARM BY-PASS SWITCH (SLIDING WINDOW MODELS ONLY)

The "ALARM BY-PASS" switch permits the operator to disable/silence the audible "Window Above 10" Alarm" for approximately five minutes.

NOTE: The "RED" visual indicator will remain illuminated.

This allows the operator to load or unload the work area without an audible alarm. A "ring-back" feature serves to remind the operator that the window is still above the 10" level.

E) STATIC PRESSURE GAUGE (IN. W.G.)

The static pressure gauge, located on the control panel, measures the air pressure differential across the filters, providing an indication of filter "loading". As the filters become loaded, the resistance to air passage 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, by a qualified service technician. The filters must be replaced if proper airflow cannot be obtained.

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

F) BLOWER SPEED CONTROL

The blower speed control, located on the interior right side of the control panel, is used to adjust the air velocity from the internal blower motor. A clockwise turn of the screw adjustment will increase air velocity and a counter-clockwise turn will decrease it.

CAUTION! BLOWER SPEED WAS FACTORY-SET AND SHOULD ONLY BE CHANGED BY A QUALIFIED TECHNICIAN.

G) BLOWER MOTOR/LIGHTS RESET BUTTON (15 Amp)

The reset button (located on the left side of the control panel, directly below the Receptacle Reset Button) is an inline circuit breaker for the internal blower motor and lighting. If an overload condition occurs, the circuit breaker will trip, and the button will protrude from the panel. Depressing the button will reset the circuit breaker.

NOTE: SHOULD AN OVERLOAD CONDITION OCCUR;

1. TURN POWER OFF TO BLOWER.
2. TURN POWER OFF TO LIGHTING.
3. DEPRESS THE BLOWER MOTOR/LIGHTING RESET BUTTON.

H) RECEPTACLE RESET BUTTON (15 Amp)

The receptacle reset button (located directly above the Blower Motor/Lights Reset Button) is an inline circuit breaker for the receptacles only. If an overload condition occurs the circuit breaker will trip, and the button will protrude from the panel. Depressing the button will reset the circuit breaker.

NOTE: SHOULD AN OVERLOAD CONDITION OCCUR!

1. TURN POWER OFF TO APPLIANCE/APPARATUS.
2. UNPLUG APPLIANCE/APPARATUS FROM RECEPTACLE.
3. TURN RECEPTACLE POWER SWITCH TO OFF POSITION.
4. DEPRESS THE RECEPTACLE RESET BUTTON.

I) DUPLEX RECEPTACLES

A duplex receptacle (115 Volt, 15A) is located on the left and right side wall of the workstation.

NOTE: POWER IS SUPPLIED TO THE DUPLEX RECEPTACLES THROUGH THE RECEPTACLE SWITCH, LOCATED ON THE CONTROL PANEL.

J) DRAIN VALVE

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

CAUTION: IF AN ACCIDENTAL SPILL OCCURS, IMMEDIATELY CONSULT A BIOLOGICAL SAFETY OFFICER OR OTHER QUALIFIED INDIVIDUAL FOR PROPER PROCEDURES. TO INSURE PROPER CONTAINMENT OF A SPILL, CONNECT A SEALED HOSE FROM THE VALVE TO A SEALED CONTAINER.

K) SERVICE VALVES

Two service valves are standard with each cabinet. These valves are located on the right and left side of the work station and can be coded with the type of service that they supply.

NOTE: Identification INDEX BUTTONS are supplied.

The cabinet will support a TOTAL of six service valves. Additional service valves may be purchased from Forma Scientific Inc.

L) EXHAUST FILTER GUARD

The exhaust filter guard, located on top of the exhaust filter, prevents the storage of objects on the housing and protects exhaust air flow.

M) HINGED WINDOW ASSEMBLY

The hinged window assembly allows the operator to raise the glass window to place product/auxiliary equipment, etc. within the work area.

CAUTION! WHEN ACTUAL WORK IS BEING PERFORMED IN THE CABINET, THE HINGED WINDOW MUST BE CLOSED! THIS IS TO AVOID CONTAMINATION TO BOTH PRODUCT AND PERSONNEL.

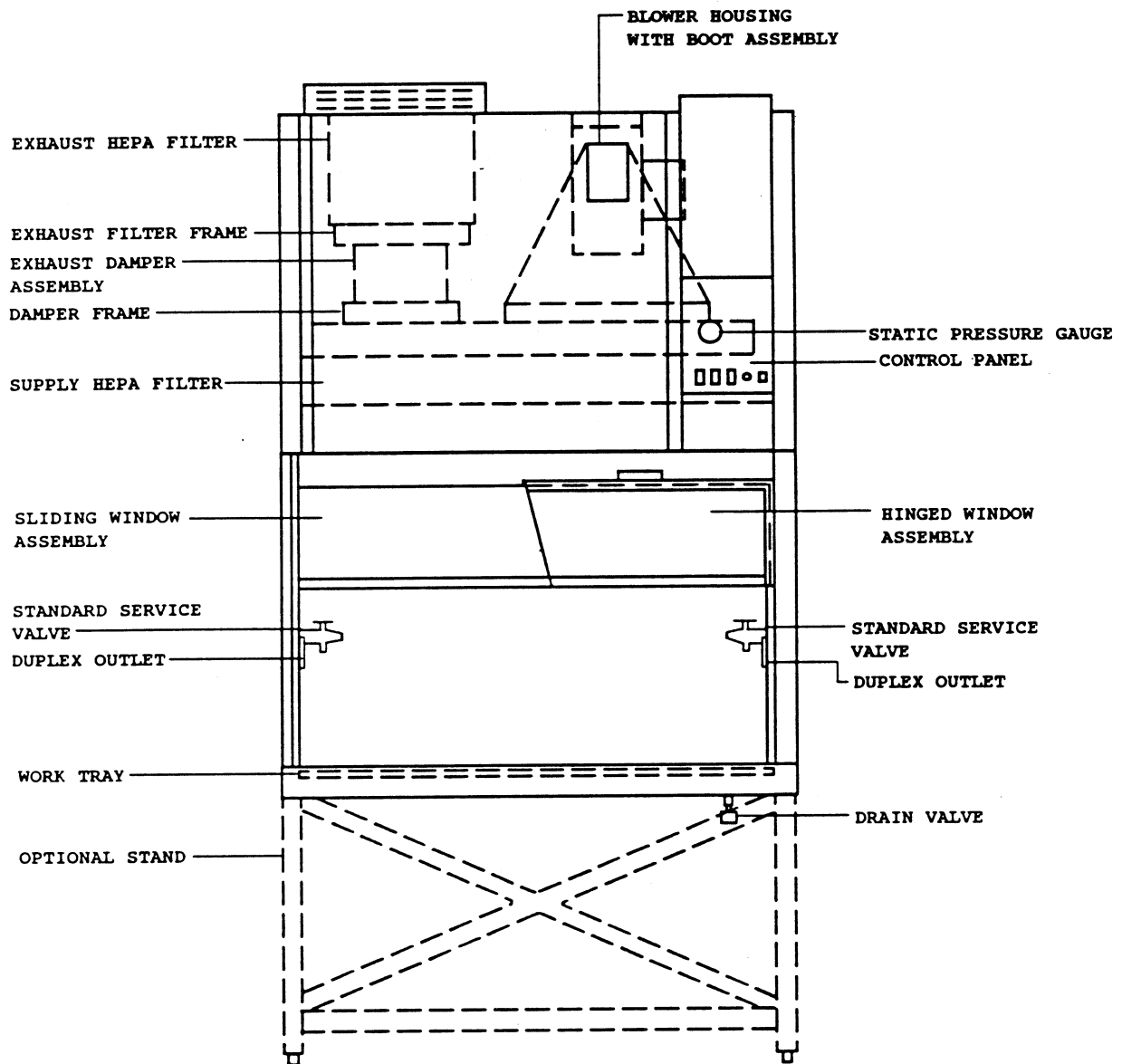
N) SLIDING WINDOW ASSEMBLY

The sliding window assembly allows the operator to raise the glass window to place product/auxiliary equipment, etc. within the work area.

CAUTION! WHEN ACTUAL WORK IS BEING PERFORMED IN THE CABINET, THE SLIDING WINDOW MUST BE PLACED AT THE 10" LEVEL! THIS IS TO AVOID CONTAMINATION TO BOTH PRODUCT AND PERSONNEL.

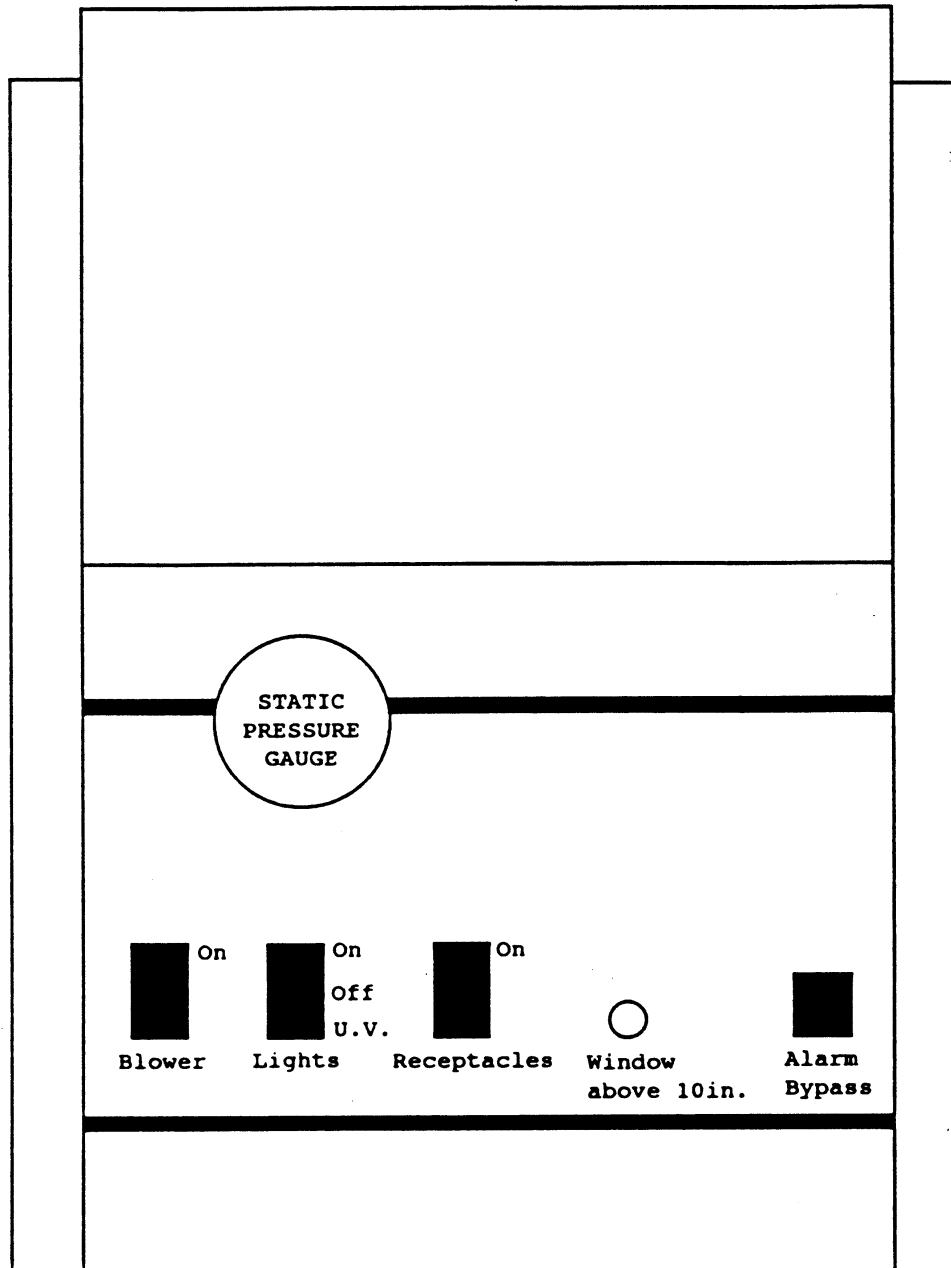
NOTE: IF THE SLIDING WINDOW IS ABOVE THE 10" LEVEL, A VISUAL (RED INDICATING LIGHT) AND AUDIBLE (BUZZER SOUND) WILL ALARM TO NOTIFY THE OPERATOR(S) OF AN UNSAFE CONDITION.

SECTION 4.2



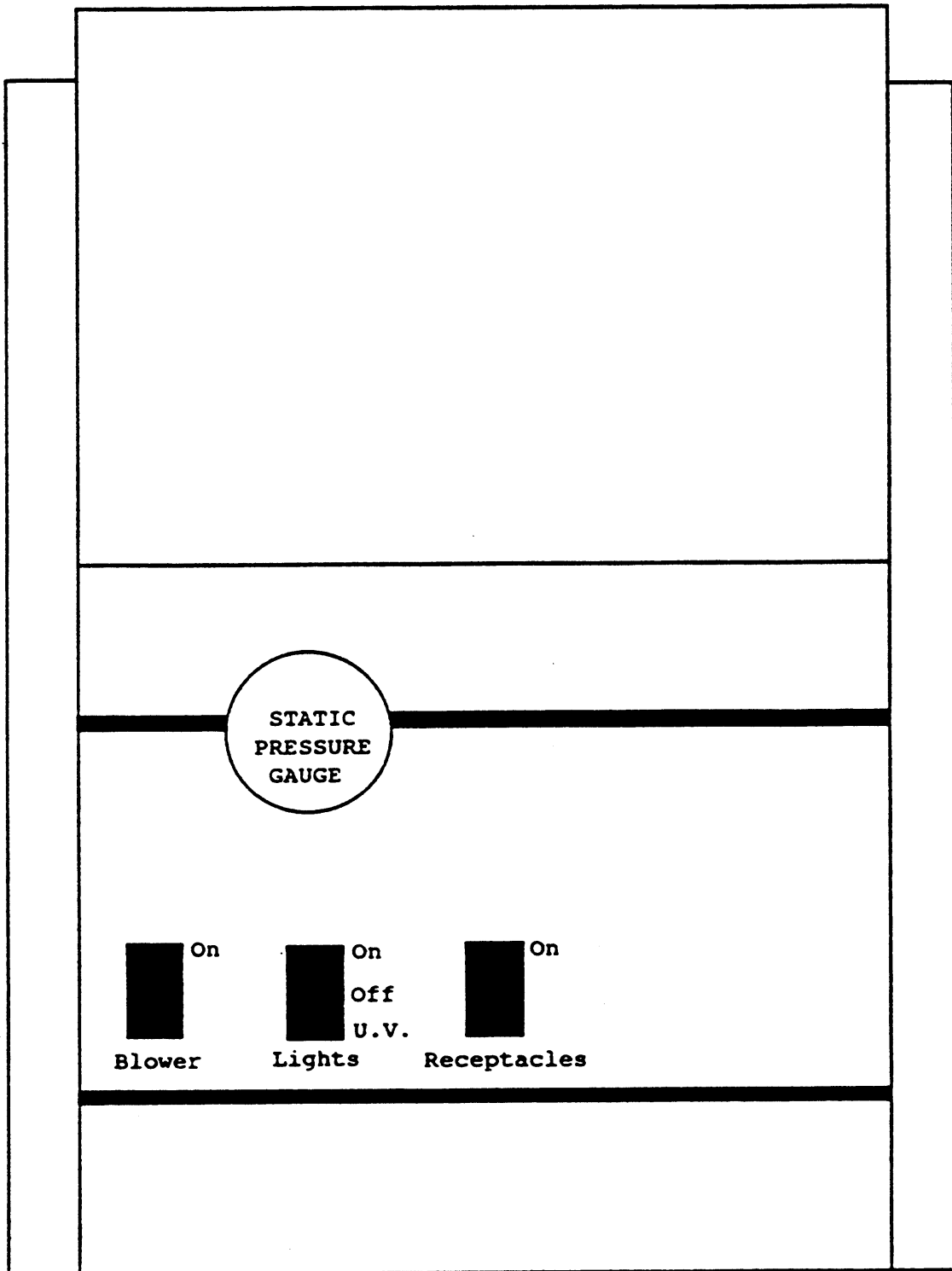
**DRAWING #4.0
OVERVIEW OF CABINET**

SECTION 4.3



**DRAWING #4.1
OVERVIEW OF 1184/1186
CONTROL PANEL**

SECTION 4.4



DRAWING #4.2
OVERVIEW OF 1194/1196 CONTROL PANEL

SECTION 5 - GENERAL CAUTIONS

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5.1 General Caution Notes

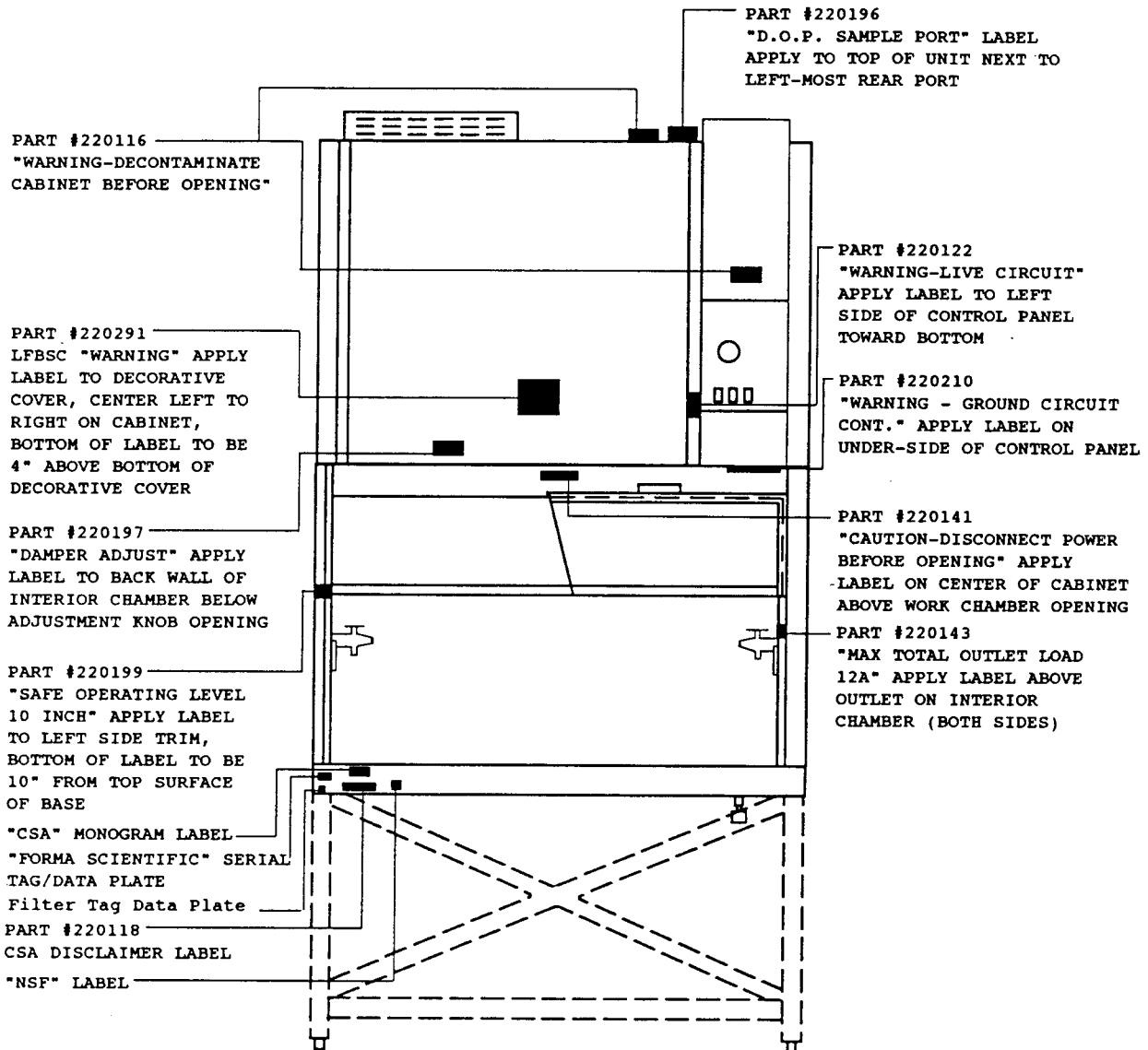
5.2 Important Label Location Drawing

5.1 GENERAL CAUTION NOTES

CAUTION NOTES

- 1. FOLLOWING INITIAL INSTALLATION, THE UNIT MUST BE THOROUGHLY TESTED AND CERTIFIED.**
- 2. ALL ACTIVITIES TO BE PERFORMED WITHIN THE CABINET SHOULD BE APPROVED BY A BIOLOGICAL SAFETY OFFICER OR OTHER QUALIFIED INDIVIDUAL.**
- 3. 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.**
- 4. 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.**
- 5. IF THE CABINET IS TO BE USED FOR BIOLOGICAL OR TOXICOLOGICAL APPLICATIONS, IT MUST BE MONITORED BY A BIOLOGICAL SAFETY OFFICER OR OTHER QUALIFIED INDIVIDUAL.**
- 6. IF THE UNIT NEEDS TO BE SERVICED, IT MUST BE DECONTAMINATED TO PROTECT SERVICE PERSONNEL FROM CONTAMINATION. THE CABINET MUST THEN BE RECERTIFIED BY A QUALIFIED CERTIFYING AGENCY.**
- 7. NONE OF THE PERFORATIONS IN THE WORK AREA MAY BE COVERED OR BLOCKED, AS AIR FLOW WILL BE DISRUPTED, AND CONTAMINATION OF PRODUCT OR PERSONNEL MAY OCCUR.**
- 8. DO NOT USE CABINET FOR ANY TYPE OF STORAGE.**

5.2 IMPORTANT LABEL LOCATION DRAWING



NOTE:

IF ANY OF THE ABOVE "LABELS" ARE LOST OR DAMAGED IN ANYWAY, PLEASE CONSULT THE
FORMA SCIENTIFIC SERVICE DEPARTMENT FOR A FREE REPLACEMENT!

PHONE 1-800-848-3080

FAX 614-373-4189

TELEX 29-8205

SECTION 6 - CABINET START-UP

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- 6.1 General Recommendations
- 6.2 Use of Auxiliary Equipment in the Cabinet
- 6.3 Cabinet Check
- 6.4 Start-Up Procedure

6.1 GENERAL RECOMMENDATIONS

- 1) Keep the movement in the room to a minimum when the cabinet is in use.
- 2) Keep all laboratory doors closed to prevent drafts that will disturb critical air flow characteristics.
- 3) Pre-plan cabinet use, and place everything required for the complete procedure in the cabinet so that nothing passes through the air barrier (in or out) during the procedure.
- 4) Practice good aseptic technique to insure safe use of the cabinet.
- 5) If a spill occurs, clean it up immediately. Decontaminate the work area and all affected equipment.
- 6) Do not cover or block exhaust grille.
- 7) Do not cover or block any perforations in the work area.

6.2 USE OF AUXILIARY EQUIPMENT IN THE CABINET

The use of auxiliary equipment in the cabinet is acceptable only if the proper precautions are taken. Any appliance used in the work area will cause turbulence and disturb air flow. Use of such equipment should be carefully managed. The equipment should be placed at the rear of the work space where air turbulence will have a minimal effect.

BLENDER: A blender may be used in the cabinet, but because of the extreme amount of aerosol it produces, and due to the increased turbulence it causes, it is recommended that as much other equipment as possible be removed from the cabinet.

6.3 CABINET CHECK

- 1) Check to see that the DRAIN VALVE is closed (handle in a horizontal position), so that if a spill should occur on the work surface, it will remain in the drain system and not drain onto the laboratory floor and cause contamination.
- 2) Check to see that ALL SERVICE VALVES are closed.

6.4 START-UP PROCEDURE

- 1) Place power switch to lights in "ON" position.
- 2) Check the intake and exhaust grills to ensure they are not blocked.
- 3) Place power switch to blower in "ON" position.
- 4) Place everything needed in the cabinet.
- 5) Place viewing window at 10" height (SLIDING TYPE).
Close viewing window (HINGED TYPE).

SECTION 7 - TROUBLESHOOTING

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7.1 Troubleshooting Guide

7.1 TROUBLESHOOTING GUIDE

The following is intended as a guide to troubleshooting the system should a problem develop. 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: ACTUAL SERVICING OF THE UNIT MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY!

PROBLEM 1: AIR FLOW IN THE CABINET WORK AREA AND THROUGH THE EXHAUST FILTER IS INADEQUATE.

POSSIBLE CAUSES:

- 1) Exhaust filter is blocked by laboratory materials or the protective shipping cover.
- 2) If the biological safety cabinet is connected to an exhaust system, this may indicate 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.
- 3) Low voltage being applied to the blower motor.
- 4) Blower motor or speed control is defective.
- 5) SUPPLY HEPA filter and EXHAUST HEPA filter may be loaded. Decontaminate the unit and replace both HEPA FILTERS.

CAUTION: 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:

- 1) Check lamp pins and socket ends for contact.
- 2) Starter for U/V light could be defective.

PROBLEM 3: FLUORESCENT LIGHT MALFUNCTION

POSSIBLE CAUSES:

- 1) Check lamp pins and socket ends for contact.
- 2) Defective lamp.

PROBLEM 4: LOUD SCREECHING NOISE

POSSIBLE CAUSES:

- 1) Indicates bad bearings in motor blower unit.
- 2) Blower scroll is rubbing against housing.

SECTION 8 - ROUTINE MAINTENANCE

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8.1 Checking the Static Pressure Gauge "Zero"

8.2 Re-zeroing the Static Pressure Gauge

8.3 Adjusting the Damper

8.4 Biological Safety Cabinet Test Grids

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 completely 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 rechecked for proper zeroing when the cabinet is shut off. When the cabinet is started up and proper airflow balance has been affected, the reading on the gauge should be taken and recorded. This initial reading will serve as a base line indication of subsequent filter loading, and when the reading increases by approximately 50% (from initial reading), the airflow balance should again be checked, and replacement of the filters will probably be required. Refer to Section 8.2 "Re-zeroing the Static Pressure Gauge".

8.2 RE-ZEROING THE STATIC PRESSURE GAUGE

1. Cabinet must be turned "OFF".
2. Remove front cover from static pressure gauge. Grasp front cover and turn counter-clockwise.
3. Locate Allen-type adjustment screw beside gauge needle.
4. Turn adjustment screw counter-clockwise to lower reading or clockwise to raise reading.

8.3 ADJUSTING THE DAMPER

Since the HEPA filter resistance may vary considerably 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!**

1. Layout test grids (refer to Sections 8.4 and 8.5).
2. Start-up cabinet and allow to run for a minimum of twenty minutes.
3. Take airflow measurements. If airflow specifications are not sufficient, open control panel and check voltage on backside of power switch. **NOTE: AIRFLOW MEASUREMENTS AT FACTORY ARE RECORDED WITH CABINET BEING CONNECTED TO A 115 VOLT POWER SUPPLY.**
4. Locate triac board in upper left hand corner (behind control panel). Measure (using a true RMS Voltmeter) and record voltage drop across the white and black wire leading to terminal strip. The voltage pot is located on the lower right side and is labeled "VOLTAGE POT". Clockwise adjustment of this pot increases voltage supply to the blower motor. Adjust 2-3 volts accordingly (either up or down, depending upon the airflow required). Retake 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.

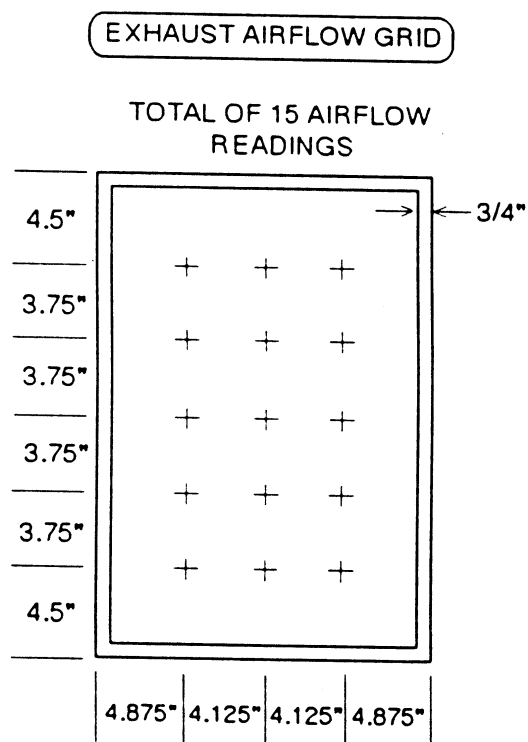
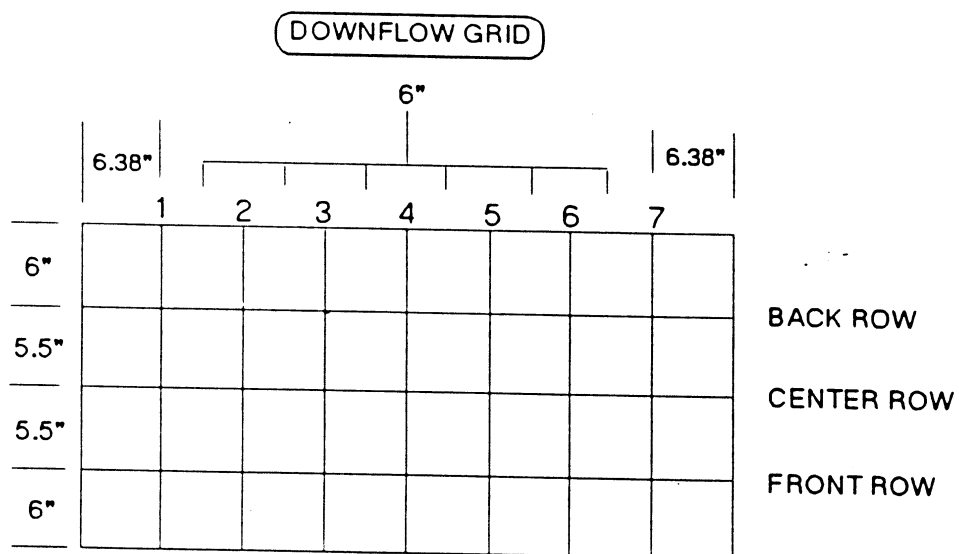
1. The damper adjustment is located above the supply diffuser screen (toward left back wall) and is labeled "DAMPER ADJUST ACCESS".

NOTE: THE SPROCKET TYPE ADJUSTMENT WHEEL IS NUMBERED FROM 0 TO 9. 0= (FULLY CLOSED, CW) AND 9= (FULLY OPEN, CCW).

2. Note position (from 0-9) on damper adjust sprocket). With a screwdriver or similar tool, turn the sprocket type adjustment wheel clockwise to fully close the damper. **NOTE: EACH INDIVIDUAL ATTEMPT (WHEN ADJUSTING THE DAMPER) MUST START FROM THE FULLY CLOSED POSITION.**

EXAMPLE: Note position (from 0-9 on damper adjust). If the present position is 4 and your supply velocity is **HIGH** and the exhaust velocity is **LOW**, adjust the damper sprocket fully closed (0) and then to approximately 5. Re-take airflow readings and repeat this step until the correct airflow balance is achieved.

8.4 BIOLOGICAL SAFETY CABINET TEST GRIDS (MODELS 1184/1185/1194)

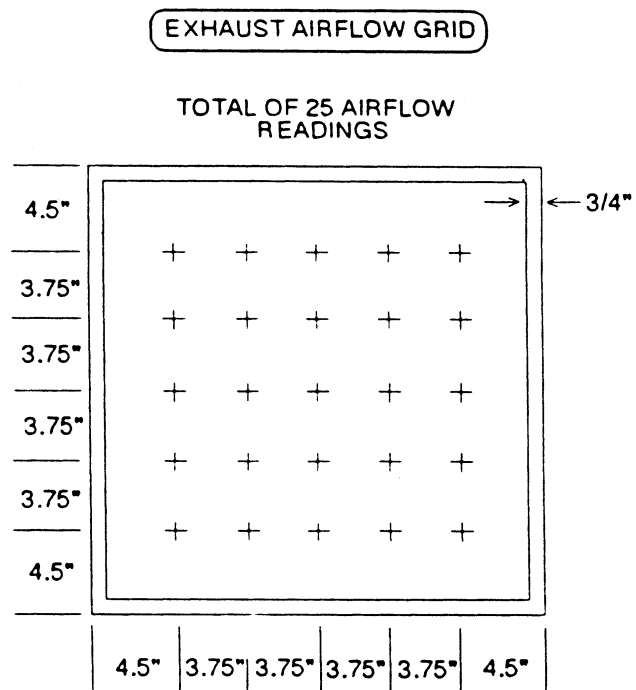
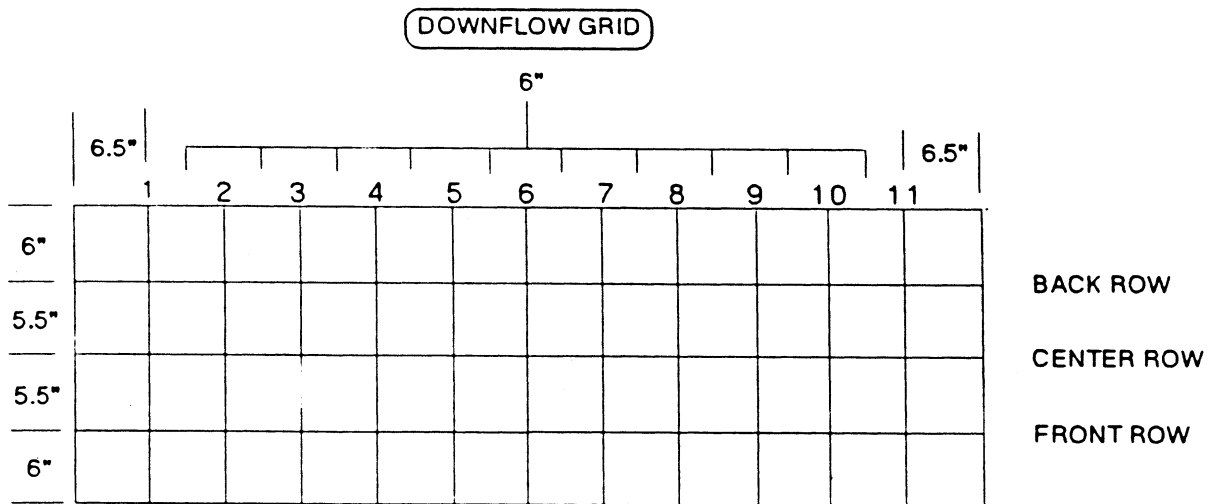


WORK ACCESS OPENING FACE AREA= 3.385 (ft.sq.)

OPEN EXHAUST AREA= 2.428 (ft.sq.)

* Total area minus obstructed area

8.5 BIOLOGICAL SAFETY CABINET TEST GRIDS (MODELS 1186/1196)



WORK ACCESS OPENING FACE AREA= 5.052 (ft.sq.)
 OPEN EXHAUST AREA= 3.398 (ft.sq.)

* Total area minus obstructed area

SECTION 9 - SPECIFICATIONS

Table of Contents

- 9.1 Model 1184 (4' Cabinet with sliding window)
- 9.2 Model 1185 (4' Cabinet with sliding window)
- 9.2 Model 1186 (6' Cabinet with sliding window)
- 9.3 Model 1194 (4' Cabinet with hinged window)
- 9.4 Model 1196 (6' Cabinet with hinged window)

9.1 MODEL - 1184 (4' CABINET WITH SLIDING WINDOW)

~ CONSTRUCTION

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel
Finish: Antique White with Windsor Blue Trim
Baked-on Powder Coat Epoxy Paint

~ DIMENSIONS

Exterior: 54"W x 64"H x 32.5"F-B

Interior: 49"W x 28.33"H x 22.25"F-B

~ ELECTRICAL REQUIREMENTS

Main: 100-125 VAC, 1 Phase, 2 Wire, 60 Hz, 10 FLA
Receptacle: 115 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Circuit Breaker: 15 Amp

~ FILTERS

(1) Supply HEPA Filter (18"W x 48"F-B x 5-7/8"H)
(1) Exhaust HEPA Filter (18"W x 24"F-B x 11.5"H)

~ LIGHTS

(1) Fluorescent 60W, (F48T12/CW/HO)
(1) Optional UV 30W, (G30T8) Germicidal Lamp

~ BLOWER MOTOR

3/4 HP, 1625 RPM

~ CAPACITY OF DRAIN PAN

Approximately: 21.14 Gallons

9.2 MODEL - 1185 (4' CABINET WITH SLIDING WINDOW)

~ CONSTRUCTION

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel
Finish: Antique White with Windsor Blue Trim
Baked-on Powder Coat Epoxy Paint

~ DIMENSIONS

Exterior: 54"W x 64"H x 32.5"F-B

Interior: 49"W x 28.33"H x 22.25"F-B

~ ELECTRICAL REQUIREMENTS

Main: 220 VAC, 1 Phase, 2 Wire, 50 Hz, 6 FLA
Receptacle: 220 VAC, 1 Phase, 2 Wire, 50 Hz, 12 FLA
Circuit Breaker: 15 Amp

~ FILTERS

(1) Supply HEPA Filter (18"W x 48"F-B x 5-7/8"H)
(1) Exhaust HEPA Filter (18"W x 24"F-B x 11.5"H)

~ LIGHTS

(1) Fluorescent 60W, (F48T12/CW/HO)
(1) Optional UV 30W, (G30T8) Germicidal Lamp

~ BLOWER MOTOR

3/4 HP, 1625 RPM

~ CAPACITY OF DRAIN PAN

Approximately: 21.14 Gallons

9.3 MODEL - 1186 (6' CABINET WITH SLIDING WINDOW)

~ CONSTRUCTION

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel
Finish: Antique White with Windsor Blue Trim
Baked-on Powder Coat Epoxy Paint

~ DIMENSIONS

Exterior: 78"W x 64"H x 32.5"F-B

Interior: 73"W x 28.33"H x 22.25"F-B

~ ELECTRICAL REQUIREMENTS

Main: 100-125 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Receptacle: 115 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Circuit Breaker: 15 Amp

~ FILTERS

(1) Supply HEPA Filter (18"W x 72"F-B x 5-7/8"H)
(1) Exhaust HEPA Filter (24"W x 24"F-B x 11.5"H)

~ LIGHTS

(1) Fluorescent 85W, (F72T12/CW/HO)
(1) Optional UV 30W, (G30T8) Germicidal Lamp

~ BLOWER MOTOR

3/4 HP, 1050 RPM

~ CAPACITY OF DRAIN PAN

Approximately: 30.38 Gallons

9.4 MODEL - 1194 (4' CABINET WITH HINGED WINDOW)

~ CONSTRUCTION

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel
Finish: Antique White with Windsor Blue Trim
Baked-on Powder Coat Epoxy Paint

~ DIMENSIONS

Exterior: 54"W x 64"H x 32.5"F-B

Interior: 49"W x 28.33"H x 22.25"F-B

~ ELECTRICAL REQUIREMENTS

Main: 100-125 VAC, 1 Phase, 2 Wire, 60 Hz, 10 FLA
Receptacle: 115 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Circuit Breaker: 15 Amp

~ FILTERS

(1) Supply HEPA Filter (18"W x 48"F-B x 5-7/8"H)
(1) Exhaust HEPA Filter (18"W x 24"F-B x 11.5"H)

~ LIGHTS

(1) Fluorescent 60W, (F48T12/CW/HO)
(1) Optional UV 30W, (G30T8) Germicidal Lamp

~ BLOWER MOTOR

3/4 HP, 1625 RPM

~ CAPACITY OF DRAIN PAN

Approximately: 21.14 Gallons

9.5 MODEL - 1196 (6' CABINET WITH HINGED WINDOW)

~ CONSTRUCTION

Work Surface: Type 304 Stainless Steel, #4 Finish
Cabinet: Cold Rolled Steel
Finish: Antique White with Windsor Blue Trim
Baked-on Powder Coat Epoxy Paint

~ DIMENSIONS

Exterior: 78"W x 64"H x 32.5"F-B

Interior: 73"W x 28.33"H x 22.25"F-B

~ ELECTRICAL REQUIREMENTS

Main: 100-125 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Receptacle: 115 VAC, 1 Phase, 2 Wire, 60 Hz, 12 FLA
Circuit Breaker: 15 Amp

~ FILTERS

(1) Supply HEPA Filter (18"W x 72"F-B x 5-7/8"H)
(1) Exhaust HEPA Filter (24"W x 24"F-B x 11.5"H)

~ LIGHTS

(1) Fluorescent 85W, (F72T12/CW/HO)
(1) Optional UV 30W, (G30T8) Germicidal Lamp

~ BLOWER MOTOR

3/4 HP, 1050 RPM

~ CAPACITY OF DRAIN PAN

Approximately: 30.38 Gallons

SECTION 10 - ACCESSORIES

10.1 Accessories (Chart)

10.1 ACCESSORIES - TYPE A/B₃ CABINETS

DESCRIPTION:	ORDER NO.	1184	1186	1194	1196
Service Valve, Vacuum	191141	-	-	-	-
Service Valve, Air	191142	-	-	-	-
Service Valve, Nitrogen	191143	-	-	-	-
Service Valve, Gas	191144	-	-	-	-
UV Light, 30W	191419	-	-	-	-
UV Light, 30W Portable	191070	-	-	-	-
Ground Fault, Duplex Outlet (R.S.)	191540	-	-	-	-
IV Rod, Stainless Steel 4' Cabinet	191522	-	-	-	-
IV Rod, Stainless Steel 6' Cabinet	191523	-	-	-	-
(* See note below)					
*30" Modular Stand, 4' Cabinet	191552	-	-	-	-
*30" Modular Stand, 6' Cabinet	191553	-	-	-	-
*36" Modular Stand, 4' Cabinet	191556	-	-	-	-
*36" Modular Stand, 6' Cabinet	191557	-	-	-	-
Locking Caster for modular stand	191416	-	-	-	-
Adjustable Foot Rest 4' Cabinet	191127	-	-	-	-
Adjustable Foot Rest 6' Cabinet	191129	-	-	-	-
Low Air Flow Alarm	191168	-	-	-	-
Exhaust Transition	191570	-	-	-	-

NOTE:

* APPROXIMATE HEIGHT FROM FLOOR TO WORK STATION.

ACCESSORIES ARE CUSTOMER INSTALLED!

SECTION 11 - REPLACEMENT PARTS

11.1 Model 1184/1185 Replacement Parts

11.2 Model 1186 Replacement Parts

11.3 Model 1194 Replacement Parts

11.4 Model 1196 Replacement Parts

11.1 MODEL 1184/1185 - REPLACEMENT PARTS

STOCK #	DESCRIPTION
191510	1184, 4' Sliding Window
156079	3/4 HP Blower Motor (1625 RPM)
170045	Capacitor, Motor 25MFD, 370V
190109	Triac Speed Control, Type C
225250	Ballast (Fluorescent Lighting)
225414	48" Fluorescent Lamp (60W, 120V)
230054	Circuit Breaker, 15A SP
430200	Line cord Assembly, 15A, 120V, Hospital Grade
310036	Locking Pot, 150K-OHM (Blower Ctrl)
760063	Filter, Exhaust HEPA 18x24x11-1/2
760154	Filter, Supply HEPA 18x48x6
500009	Ballast, (U.V. Lighting)
141014	30W Germicidal Lamp
250013	Relay, DPDT. 10A. 120V
280005	Pilot Light, #312, Red
300055	Delay Relay, 3 to 300 Seconds
360095	Rocker Switch, SPST, Flat Black
360096	Pushbutton Switch, SPDT
360105	Rocker Switch, SPDT
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
7001186	1186/1196 Tech Manual

MODEL 1185

STOCK #	DESCRIPTION
275012	Transformer, 1.5 KVA, 240/120V
460052	Plug, European, 220V, 16A
500023	Ballast, F48T12, 220V, 50 Hz
500022	Ballast, 1 F30T8, 220V, 50 Hz

11.2 MODEL 1186 - REPLACEMENT PARTS

STOCK #	DESCRIPTION
191511	1186, 6' Sliding Window
156039	3/4 HP Blower Motor (1050 RPM)
170039	Capacitor, Motor 15MFD, 370V
190109	Triac Speed Control, Type C
225250	Ballast (Fluorescent Lighting)
225418	72" Fluorescent Lamp (85W, 120V)
230054	Circuit Breaker, 15A SP
430200	Line cord Assembly, 15A, 120V, Hospital Grade
310036	Locking Pot, 150K-OHM
285812	Plug 15A, 120V Hospital Grade
360157	Rocker Switch (5A)
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
760064	Filter, Exhaust HEPA 24x24x11-1/2
760153	Filter, Supply HEPA 18x72x6
500009	Ballast, (U.V. Lighting)
141014	30W Germicidal Lamp
420057	25VA Transformer
7001186	1186/1196 Tech Manual

11.3 MODEL 1194 - REPLACEMENT PARTS

STOCK #	DESCRIPTION
191530	1194, 4' Hinged Window
156079	3/4 HP Blower Motor (1625 RPM)
170045	Capacitor, Motor 25MFD, 370V
190109	Triac Speed Control, Type C
225250	Ballast (Fluorescent Lighting)
225414	48" Fluorescent Lamp (60W, 120V)
230054	Circuit Breaker, 15A SP
430200	Line cord Assembly, 15A, 120V, Hospital Grade
310036	Locking Pot, 150K-OHM
760063	Filter, Exhaust HEPA 12x24x11-1/2
760154	Filter, Supply HEPA 18x48x6
500009	Ballast, (U.V. Lighting)
141014	30W Germicidal Lamp
250013	Relay, DPDT. 10A. 120V
280005	Pilot Light, #312, Red
300055	Delay Relay, 3 to 300 Seconds
360095	Rocker Switch, SPST, Flat Black
360096	Pushbutton Switch, SPDT
360105	Rocker Switch, SPDT
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
7001186	1186/1196 Tech Manual

11.4 MODEL 1196 - REPLACEMENT PARTS

STOCK #	DESCRIPTION
191531	1196, 6' Sliding Window
156039	3/4 HP Blower Motor (1050 RPM)
170039	Capacitor, Motor 15MFD, 370V
190109	Triac Speed Control, Type C
230054	Circuit Breaker, 15A SP
430200	Line cord Assembly, 15A, 120V, Hospital Grade
310036	Locking Pot, 150K-OHM
285812	Plug, 15A, 120V, Hospital Grade
225250	Ballast (Fluorescent Lighting)
225418	72" Fluorescent Lamp (85W, 120V)
360157	Rocker Switch (5A)
249025	Valve Body w/Tip
104008	Gauge, Static Pressure
760064	Filter, Exhaust HEPA 24x24x11-1/2
760153	Filter, Supply HEPA 18x72x6
420057	25VA Transformer
500009	Ballast, (U.V. Lighting)
141014	30W Germicidal Lamp
7001186	1186/1196 Tech Manual

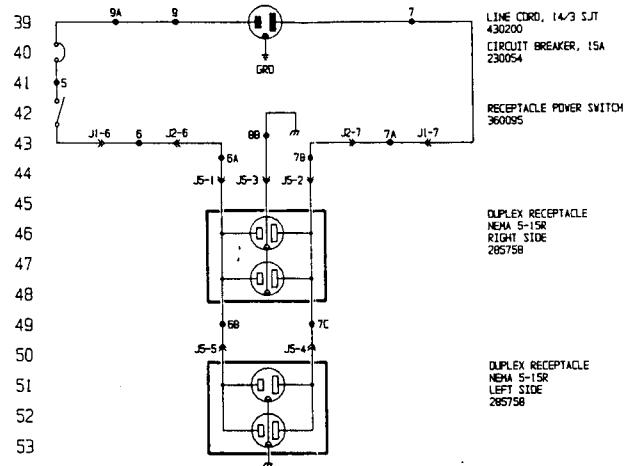
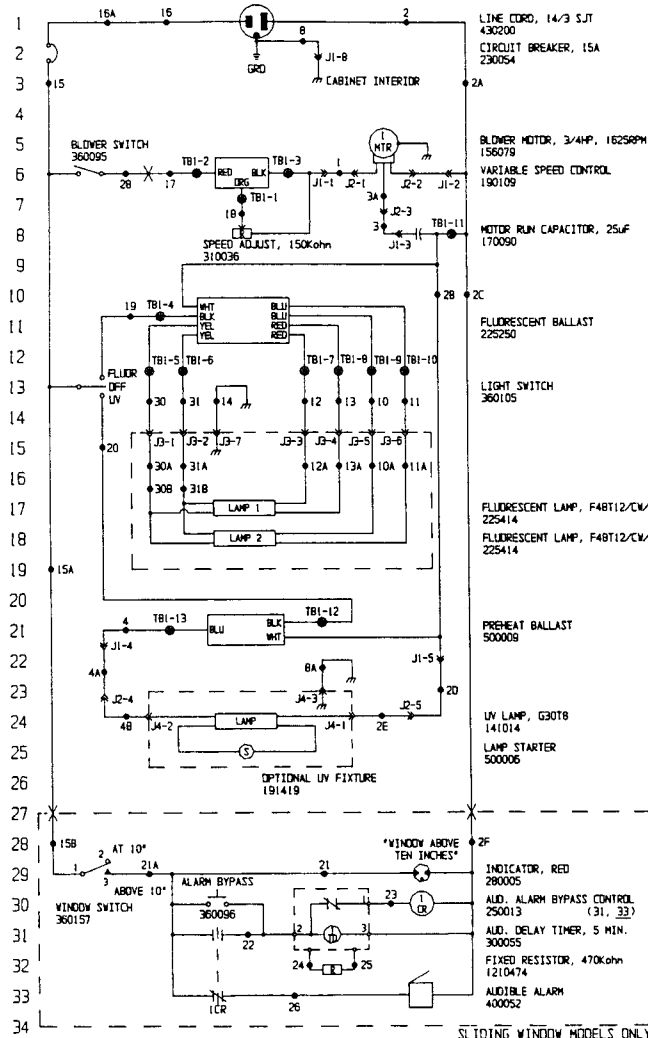
SUPPLEMENTS

POWER CONNECTION
100-130 VAC, 1PH, 2W, 60HZ, 10FLA

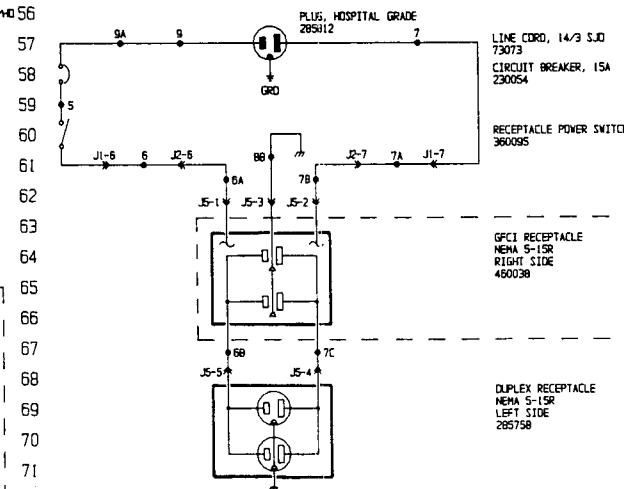
POWER CONNECTION - STANDARD DUPLEX RECEPTACLES
115 VAC NOMINAL, 60HZ, 12FLA MAX.

WIRE REFERENCE CHART

WIRE NO.	GAUGE	COLOR
1	16	BLACK
2	14	WHITE
2A	16	WHITE
2B	20	WHITE
2C	20	WHITE
2D	16	WHITE/BLACK
2E	16	WHITE
2F	18	WHITE
3	16	YELLOW
3A	16	RED
4	16	ORANGE
4A	16	ORANGE
4B	16	BLACK
5	16	BLUE
6	16	BROWN
6A	14	ORANGE
6B	16	BLACK
7	14	WHITE
7A	16	GRAY
7B	14	RED
7C	16	WHITE
8	16	GREEN
8A	16	GREEN
8B	14	GREEN
9	14	BLACK
9A	16	BLACK
10	20	BLUE
10A	22	BLUE
11	20	BLUE
11A	22	BLACK
12	20	RED
12A	22	RED
13	20	RED
13A	22	BROWN
14	16	GREEN
15	16	BROWN
15A	20	BROWN
15B	18	BROWN
16	14	BLACK
16A	16	BLACK
17	16	RED
18	20	ORANGE
19	16	PURPLE
19A	18	BLACK
20	20	YELLOW
21	20	RED
21A	18	RED
22	20	BLUE
23	20	PURPLE
24	18	RESISTOR LEAD
25	18	RESISTOR LEAD
26	18	BLACK
26A	16	ORANGE
30	20	YELLOW
30A	22	YELLOW
30B	18	YELLOW
31	20	YELLOW
31A	22	ORANGE
31B	18	YELLOW



POWER CONNECTION - OPTIONAL GFCI RECEPTACLES
115 VAC NOMINAL, 60HZ, 12FLA MAX.



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NOTES:

ICR	Last Wire Number	Parts List Reference Number
13	Last Terminal Number	Panel
31	Last Wire Number	Refrigeration
		Wiring

CUSTOMER APPROVAL/REFERENCE

APPROVED BY

DATE OF APPROVAL

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SHOULD BE KEPT TO BE SECURED TO OTHERS FOR ANY PURPOSE AND USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM FORMA SCIENTIFIC

REV	NO.	DATE	BY	DESCRIPTION OF REVISION
4	HD-638	9-09-92	JAS/COE	Rev. Plug & Cord
3	51-299	4-28-92	JAS/JAS/LON	Rev. Alarm Wire Gages
2	HD-515	1-30-91	JAS/JAS/LON	Add 2nd floor lamp
1	HD-490	5-1-90	JAS/JAS/LON	Rev. time delay 300055

DATE 3-3-90

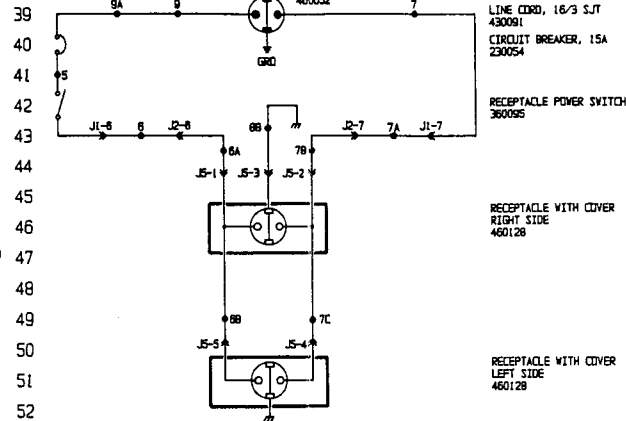
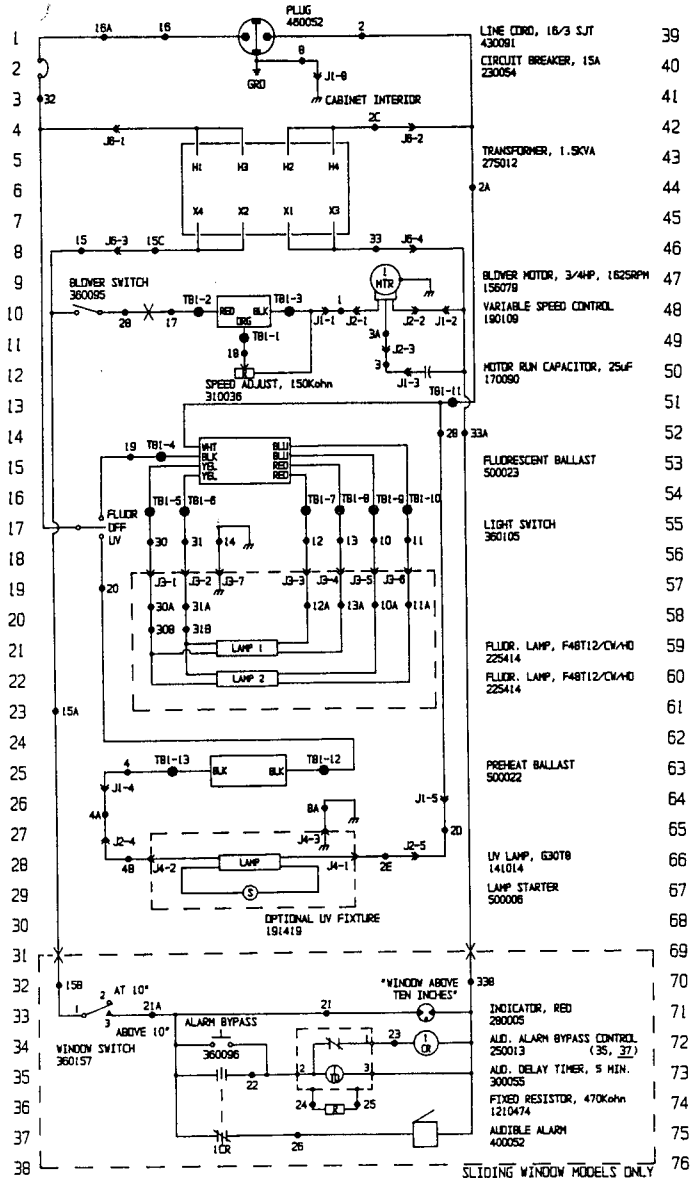
FORMA SCIENTIFIC

1184-70-0-D

CUSTOMER	JOB NUMBER	DWG TITLE	LOCATION
Forma Scientific	1184-70-0-D	Electrical Schematic	DRAWING NUMBER
			1184-70-0-D

POWER CONNECTION
220VAC, 1PH, 2W, 50HZ, 6FLA

POWER CONNECTION - RECEPTACLES
220VAC NOMINAL, 1PH, 2W, 50HZ, 12FLA MAX.

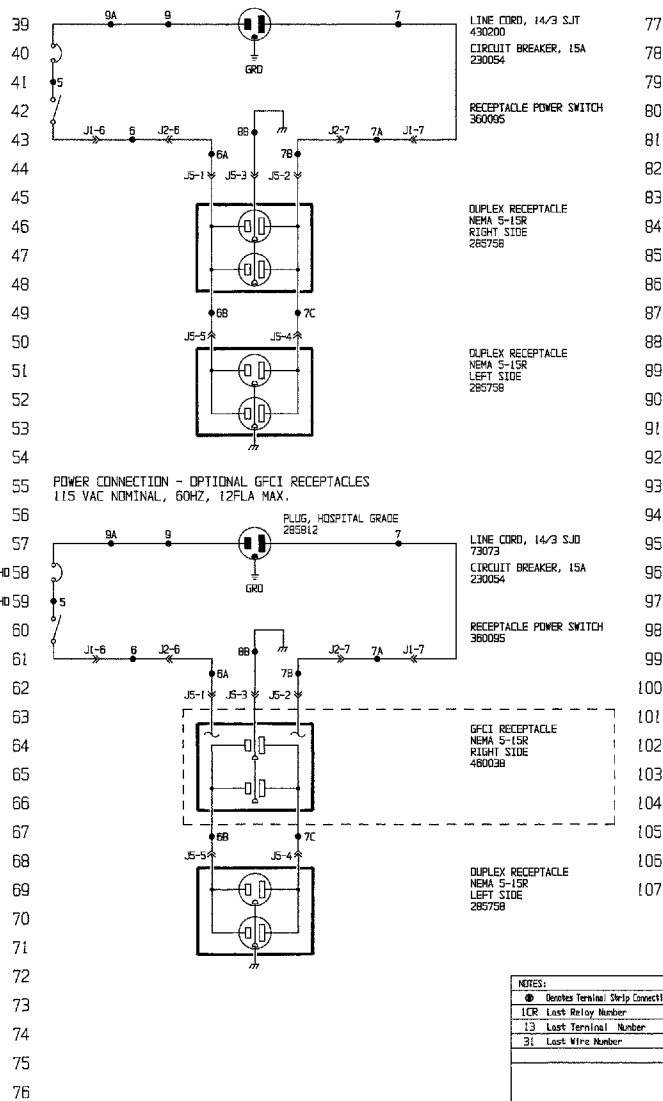


WIRE REFERENCE CHART

WIRE NO.	GAUGE	COLOR
1	18	BLACK
2	18	BLUE
2A	18	WHITE
2B	20	WHITE
2C	18	BLUE
2D	18	WHITE/BLACK
2E	18	WHITE
3	18	YELLOW
3A	18	RED
4	18	ORANGE
4A	18	ORANGE
4B	18	BLACK
5	18	BLUE
6	18	BROWN
6A	14	ORANGE
6B	18	BLACK
7	18	BLUE
7A	18	GRAY
7B	14	RED
7C	18	WHITE
8	18	GREEN
8A	18	GREEN
8B	14	GREEN
9	18	BROWN
9A	18	BLACK
10	20	BLUE
10A	22	BLUE
11	20	BLUE
11A	22	BLACK
12	20	RED
12A	22	RED
13	20	RED
13A	22	BROWN
14	18	GREEN
15	18	BROWN
15A	20	BROWN
15B	18	BROWN
15C	18	BLACK
16	18	BROWN
16A	18	BLACK
17	18	RED
18	20	ORANGE
18A	18	PURPLE
19	18	BLACK
19A	18	YELLOW
20	20	RED
21	20	RED
21A	18	RED
22	20	BLUE
23	20	PURPLE
24	RESISTOR LEAD	
25	RESISTOR LEAD	
26	18	BLACK
28	18	ORANGE
30	20	YELLOW
30A	22	YELLOW
30B	18	YELLOW
31	20	YELLOW
31A	22	ORANGE
31B	18	YELLOW
32	18	BROWN
33	16	WHITE
33A	20	WHITE
33B	18	WHITE

NOTES:		CUSTOMER APPROVAL/REFERENCE	
① Denotes Terminal Strip Connection 1CR Last Relay Number 13 Last Terminal Number 33 Last Wire Number		APPROVED BY _____ DATE OF APPROVAL _____ THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE REPRODUCED OR USED FOR ANY PURPOSES WITHOUT THE WRITTEN PERMISSION FROM FORM SCIENTIFIC	
Parts List Reference Number Assembly Panel Refrigeration Wiring		2 10-237 8-25-92 JAS/JAS Chg. Lamps & Ballast 1 ST-29917-17-92 JAS/JAS/Rev. Alarm Wire Gages REVISION NO./DATE BY (KAWPPO) DESCRIPTION OF REVISION DATE 12-5-91 OWN CPG CAD CPG APP LOU SCALE NTS CUSTOMER JOB TITLE 1185 LF8SC, 220V/50Hz ONE TITLE Electrical Schematic LOCATION HODOS01 JOB NUMBER DRAWING NUMBER 1185-70-0-0	


POWER CONNECTION - STANDARD DUPLEX RECEPTACLES
115 VAC NOMINAL, 60HZ, 12FLA MAX.



WIRE NO.	GAUGE	COLOR
1	16	BLACK
2	14	WHITE
2A	16	WHITE
2B	20	WHITE
2C	20	WHITE
2D	16	WHITE/BLACK
2E	16	WHITE
2F	18	WHITE
3	16	YELLOW
3A	18	RED
4	16	ORANGE
4A	18	ORANGE
4B	16	BLACK
5	16	BLUE
6	16	BROWN
6A	14	ORANGE
6B	16	BLACK
7	14	WHITE
7A	16	GRAY
7B	14	RED
7C	16	WHITE
8	16	GREEN
8A	16	GREEN
8B	14	GREEN
9	14	BLACK
9A	16	BLACK
10	20	BLUE
10A	22	BLUE
11	20	BLUE
11A	22	BLUE
12	20	RED
12A	22	RED
13A	22	BROWN
14	16	GREEN
15	16	BROWN
15A	20	BROWN
15B	18	BROWN
16	14	BLACK
16A	16	BLACK
17	16	RED
18	20	ORANGE
19	16	PURPLE
19A	18	BLACK
20	20	YELLOW
21	20	RED
21A	18	RED
22	20	BLUE
23	20	PURPLE
24	RESISTOR LEAD	
25	RESISTOR LEAD	
26	18	BLACK
28	16	ORANGE
29	16	YELLOW
30	20	YELLOW
30A	22	YELLOW
30B	18	YELLOW
31	20	YELLOW
31A	22	ORANGE
31B	18	YELLOW

NOTES:		CUSTOMER APPROVAL/REFERENCE	
<input checked="" type="checkbox"/> Double Terminal Strip Connection	Parts List Reference Number	APPROVED BY	DATE OF APPROVAL
<input type="checkbox"/> LCR Last Relay Number	<input type="checkbox"/> Assembly	DATE OF APPROVAL	
<input type="checkbox"/> Last Terminal Number	<input type="checkbox"/> Panel		
<input type="checkbox"/> Last Wire Number	<input type="checkbox"/> Re-Integration		
<input type="checkbox"/> Wiring	<input type="checkbox"/> Wiring		

I HEREBY CERTIFY THAT THE INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT I AM NOT PROVIDING ANY INFORMATION FOR UNLAWFUL PURPOSES WITHOUT NECESSARY PERMISSION FROM FORM SCIENTIFIC.


Form Scientific

JOB TITLE: 118B, 118B LF8C
 DWS TITLE: Electrical Schematic
 LOCATION: H005001 DRAWING NUMBER: 118B-70-0-D