

ThermoForma

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Models:

3795 / 3796

3797 / 3798

3799 / 3800

3801 / 3802

Laboratory Freezers Operating and Maintenance Manual

Manual No. 7003795 Rev. 3

Read this Instruction Manual

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

*Caution: Any internal adjustments and maintenance must be performed
by qualified service personnel.*

51-1483-06 Rev. B

Do You Need Information or Assistance on Thermo Forma Products?

If you do, please contact us 8:00 A.M. to 7:00 P.M. (Eastern Standard Time) at:

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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.

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

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:

Thermo Forma
Millcreek Road, P.O. Box 649
Marietta, OH 45750

International customers please contact your local Thermo Forma distributor.

SECTION I

General Information

Thermo Forma MODELS

PART #	FORMA MODEL #	MODEL TYPE	CUBIC FEET	DOOR TYPE	VOLTAGE
52-1996-25	3795	Freezer	27.3	1 Solid Hinged	115
52-1996-26	3796	Freezer	27.3	1 Solid Hinged	220
52-1996-27	3797	Freezer	49.1	2 Solid Hinged	115
52-1996-28	3798	Freezer	49.1	2 Solid Hinged	220
52-1996-29	3799	Freezer	76.2	3 Solid Hinged	115
52-1996-30	3800	Freezer	76.2	3 Solid Hinged	220
52-1984-31	3801	Cold Wall Freezer	27.3	1 Solid Hinged	115
52-1984-32	3802	Cold Wall Freezer	27.3	1 Solid Hinged	220

Except for routine cleaning, these low temperature cabinets will require little maintenance. In the unusual event that repair should be necessary, this manual presents information that is helpful in maintaining, diagnosing, and repairing these cabinets.

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Model: 3801 & Export Model: 3802	
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Models: 3795 / 3797 / 3799 &	
Export Models: 3796 / 3798 / 3800	
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Models: 3795 / 3797 / 3799 &	
Export Models: 3796 / 3798 / 3800	
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ELECTRICAL & REFRIGERATION SPECIFICATIONS

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DUE TO CONTINUING PRODUCT IMPROVEMENTS, ALL DATA AND INFORMATION IN THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE.

HANDLING & INSTALLATION

FREIGHT DAMAGES & SHORTAGES

IMPORTANT

The cabinet was inspected and packaged at the factory, and should arrive in excellent condition. The transportation company or other parties involved in the shipment are responsible for loss and/or damage. Always make an inspection before and after uncrating. Inspect the crated units before locating (preferably at the point of unloading by the transportation company).

INSPECTING FOR DAMAGES

Note: Always use care when removing shipping tape, blocks, pads, hardware or other material until you are satisfied that the unit is completely operational. Contact Thermo Forma if technical assistance is required.

Check the cartons or containers. If these are damaged in any way, open them and inspect the contents in the driver's presence. If damage is detected:

1. Have the driver note the nature and extent of the damage on the freight bill.
2. Notify the transportation company at once to request an inspection. Carrier claim policies usually require inspections to be made within 15 days of delivery.
3. If damage is noticed, file a claim with the transportation company.

FILING A CLAIM

File a claim for loss at once with the transportation company for: A cash adjustment; Repairs; or Replacement.

When filing your claim, retain all packaging materials and receipts.

HANDLING THE CABINET

Note: The refrigeration system of the cabinet is designed to operate with the cabinet located on a level surface. **Do not tilt the cabinet more than 10° to any side.** If the cabinet must be tilted on an angle for handling or moving purposes, allow it to sit in an upright position 30 minutes prior to starting.

CHOOSING A LOCATION

This model cabinet should be situated to allow proper air circulation. These cabinets require a 2" minimum clearance behind and 12" between the top of the cabinet and the ceiling for proper air circulation.

The cabinet must be installed on sturdy, solid, level floor.

The cabinet must be located so it can be plugged into a

properly grounded three-prong electrical outlet of 115 volt, 60 hz. The electrical outlet should not be controlled by a wall switch which might be turned off accidentally.

UNCRATING THE CABINET

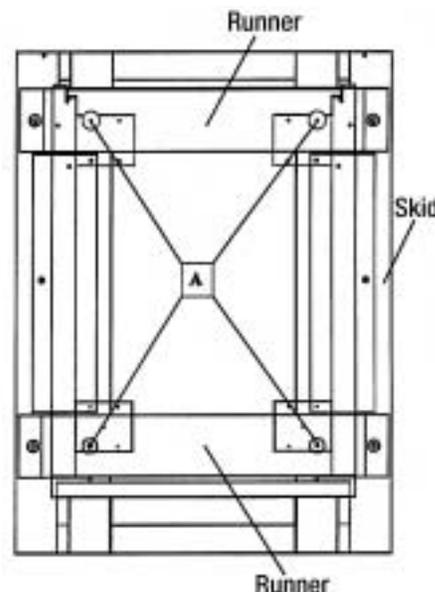
The cabinet should be moved as close as possible to the operating location before removing crate base. Be sure to follow the steps in the "INSPECTING FOR DAMAGES" instructions.

INSTALLING THE CABINET (Models with Top Mounted Compressor)

Whenever possible leave the crate base on the cabinet until it is moved close to the final position. When it is necessary to move the cabinet through a doorway, it may be necessary to remove the crate base.

Wood runners are provided on the underside of the cabinet for ease in sliding. These runners should be left attached to the cabinet when the crate base is removed and should remain attached until after the legs are installed. The cabinet can then be pushed around more easily without scratching the floor. The runners also prevent damage to the electrical receptacle and condensate pan hardware on the cabinet bottom.

After the cabinet has been moved to the approximate final location, remove the package containing the legs from the cabinet interior. Tape the doors to prevent accidental opening when handling. Raise the sides of the cabinet high enough to mount the legs at the locations provided on the bottom of the cabinet.



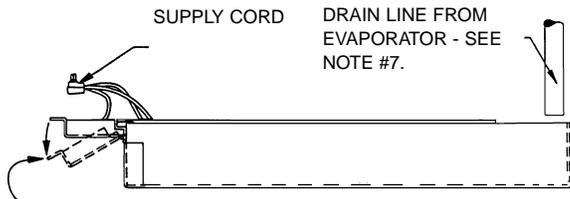
IMPORTANT:

AFTER REMOVAL OF WOOD RUNNER, REPLACE BOLT "A" INTO LEG MOUNTING BRACKETS. THIS IS EXTREMELY IMPORTANT TO THE SECURE ATTACHMENT OF THE CABINET LEG. THERE MUST BE FOUR (4) BOLTS SECURING EACH LEG.

Level the cabinet by means of the leg adjustments. Cabinet doors are self-closing, and the cabinet must be level to operate properly.

CONDENSATE PAN INSTALLATION INSTRUCTIONS

**MAKE SURE THE CABINET IS DISCONNECTED
FROM ITS POWER SOURCE**



1. Remove and discard protective cover over electrical receptacle on bottom of cabinet
2. Bend down front part of housing. (See above.)
3. Insert condensate evaporator pan assembly into the slide supports on the underside of the cabinet by pushing toward back of cabinet until it stops.
4. Plug supply cord into receptacle in underside of cabinet.
5. Bend up front part of housing. Line up slot with rivnut in cabinet bottom and insert thumbscrew through slot onto rivnut in cabinet bottom. Insert thumb screw through slot onto rivnut and tighten.
6. The assembly will now operate when power is supplied to the cabinet.
7. Inspect rear of cabinet to ensure that the drain line from the evaporator is properly positioned over the condensate pan.

CABINET STARTUP

Once the cabinet has been located in its permanent location and the proper power and grounding have been provided, the following items must be checked or completed:

1. Cut and remove the compressor hold-down band (if applicable) so the compressor “floats” freely.
2. Check for traces of oil on the compressor pan which could mean a broken or leaking refrigeration line. **UNDER NO CIRCUMSTANCE SHOULD THE COMPRESSOR BE STARTED WHEN OIL IS PRESENT UNTIL INSPECTED BY A SERVICE TECHNICIAN.**
3. **INSPECT THE FACTORY WIRING FOR TERMINALS THAT MIGHT HAVE VIBRATED LOOSE IN SHIPPING. TIGHTEN ALL SCREW-TYPE TERMINALS.**
4. Check the refrigeration lines to see that they are “free” and no damage was done during shipping.

5. Check fan blade(s) for “free” operation.
6. Turn on the main power switch. Once the compressor starts, the voltage should be checked at the compressor terminals to determine if there is proper voltage to the compressor. The voltage should not exceed 10% above or below the rated compressor voltage.

EXAMPLE: If the voltage reads 115 volts with no load and it drops below 103 volts when the compressor starts, it may indicate that the supply wiring is too small or that the wire run is too long.

7. Make sure that the drain line has not been dislodged or broken during shipping and that the drain trap terminates properly in the condensate pan or floor drain. (See **Condensate Pan** on top mounted compressor.)
8. Listen for any unusual noise such as lines vibrating, etc. Correct problem by tightening screws, slightly bending tubing, etc.
9. Check proper tension on doors. (See **Door Torque Adjustment.**)

THERMOSTAT SETTINGS

The freezer is shipped from the factory with a thermostat setting of approximately the mid-point of the operating range. Final thermostat setting must be made in the field.

Allow the cabinet to operate until the compressor cycles on the thermostat. The normal operating temperature range is: 0°F to -22°F (-18°C to -30°C).

The thermostat is easily adjusted with a standard screwdriver. In models where the thermostat has control settings 1 through 7, turn the thermostat to a higher number to lower the cabinet temperature. Other models use thermostats with actual temperature settings indicated.

NOTE: DO NOT OPERATE THE CABINET WITH THERMOSTAT SETTING BELOW -23°F (-30°C) ON FREEZERS.

DEFROST SETTING (Forced Air Models Only)

Set the time-of-day on the defrost clock and check to see that the defrost pins are set to the desired defrost times. (The defrost clock is located in the wiring box.) The factory settings are as follows:

Freezers: Two (2) defrosts per day (6 a.m. & 10 p.m.).
Failsafe pin set at 40 minutes.

CABINET OPERATION

There are two thermodiscs located on the evaporator coil. The purpose of one is to keep the evaporator fan motors and anti-condensate heaters off after defrost cycles until the coil reaches 32°F (0°C). This prevents moisture from being pulled down into the product area and provides faster pull-down. The purpose of the other control is to de-energize the defrost heater and to energize the trip solenoid in the time clock to terminate the defrost cycle when the fin coil reaches 62°F (17°C).

When the refrigeration system first starts up, the room temperature and the coil temperature are above 62°F (17°C). The fan delay thermostat is open and the fans and anti-condensate heaters remain off. The fan motors will come on when the evaporator temperature is pulled down to approximately 32°F (0°C). This fan delay control cannot be adjusted. If a single fan motor fails to start when the thermostat is below 32°F (0°C), it may be an indication of a defective fan motor. If all fan motors fail to start, it is an indication of a defective fan delay control.

MANUAL DEFROST (Cold Wall Models)

DEFROSTING & CLEANING

A complete defrost will be required periodically, depending on the usage of the cabinet. To defrost:

1. Unload cabinet of product.
2. Pull power supply cord from wall receptacle.
3. To hasten process, set pans of warm water on shelves of storage compartment, or let a fan blow into the storage area, with the door open.
4. Wipe all shelving and wall surfaces clean and dry.
5. Remove shelves and shelf standards if necessary for thorough cleaning.
6. Return all components, plug in power cord.
7. Once cabinet has attained desired temperature, reload cabinet with product.

IMPORTANT NOTE

Door may be hard to open for a short period of time after closing. Wait a few seconds to allow interior air pressure to balance.

EXPORT MODELS

Export model cabinets come equipped with an auto transformer located in the unit compartment. The selector switch can be set to various customer voltage requirements - Factory Setting: Mid position for an incoming voltage between 212V and 238V.

PRIOR TO STARTING THE CABINET

Supply voltage must be checked in order to determine the correct position of the variable voltage switch located on the auto transformer. This will ensure the cabinet is operating at the correct optimum voltage. In the event the transformer supply line plug does not match the electrical outlet, the plug can be changed to one with equal voltage-ampere rating.

Refer to page 34 for transformer layout.

WAYS TO MINIMIZE FROST & ICE BUILDUP INSIDE FREEZERS

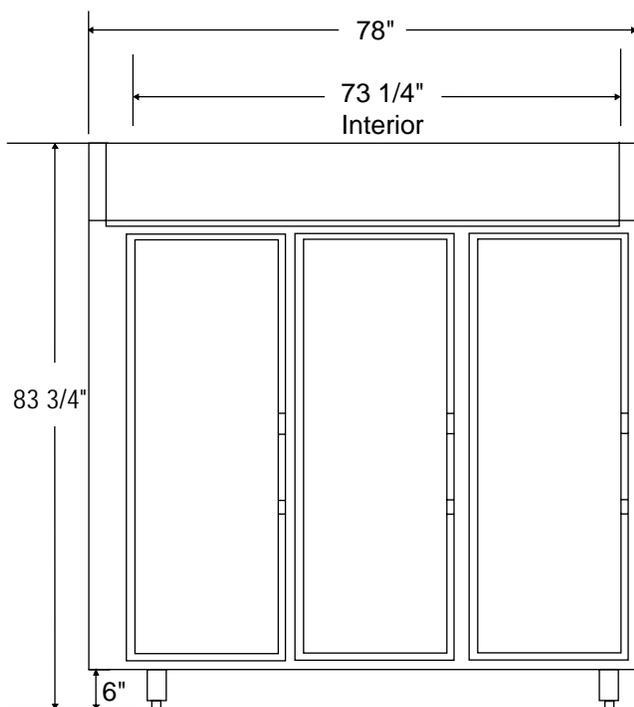
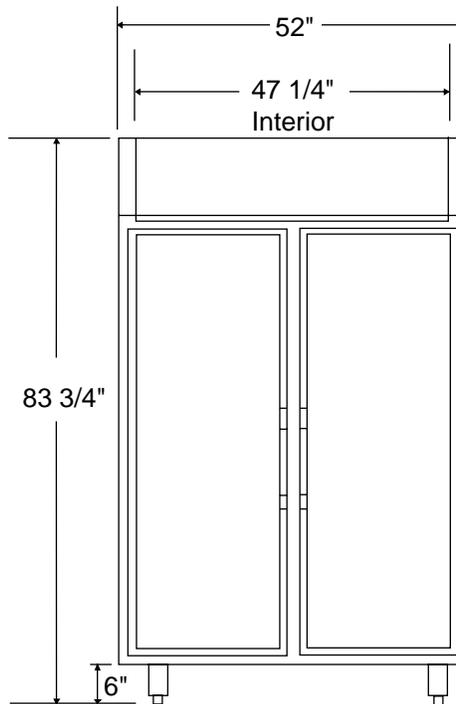
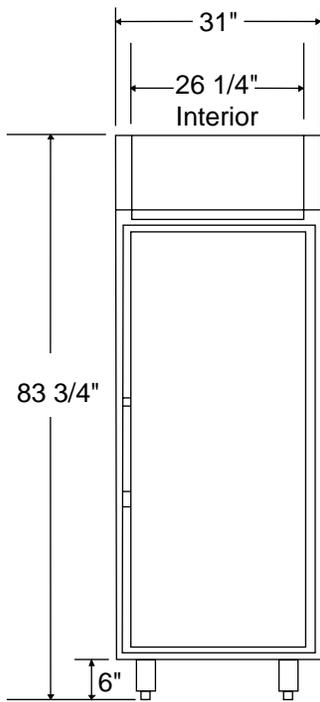
Moisture-laden air migrates into the freezer during door openings and, under normal operation, will be absorbed or removed by the refrigeration system and the defrost cycle. The lower the temperature is in the freezer, the more rapidly frost and ice will accumulate. Opening doors frequently will also increase frost and ice buildup.

There are several things that you can do to reduce the accumulation of ice/frost on the interior parts of the cabinet and product. If this icing condition exists, the following items should be checked and corrected as required:

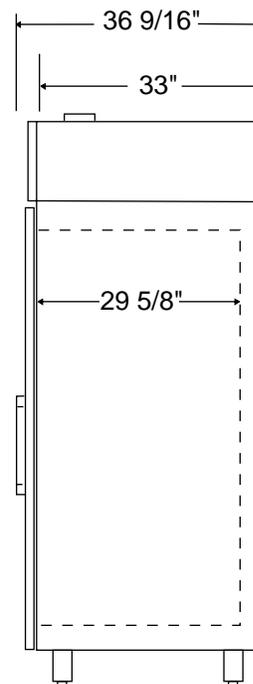
1. Minimize door openings.
2. Keep the length of time door is open to a minimum.
3. Check the door gaskets for possible air leaks. Look for frost patches around the door openings of both the inner and outer doors. Make sure that gasket seals all around door opening; any leak will allow moist outside air to enter the cabinet.
4. Make sure the door latches work properly.
5. These freezers are designed to operate in range of -18°C to -30°C. Keep freezer thermostat set as high as possible to minimize frost buildup.
6. Look for moisture draining from the drain tube at the rear of the cabinet during and after a defrost. This is normal and tells you that the unit is going through proper defrost cycle. The drain line must be properly trapped as shipped from the factory.
7. Evaporator defrost heater and the drain tube heater must work properly and have proper voltage supply.
8. The defrost heater and drain heater must be in their proper locations.
9. Ensure that the freezer is sealed where tubing enters upper left hand corner of the cabinet.
10. The freezer should not be located where excessive drafts from doors or air conditioning vents can blow into it.

DIMENSIONAL DRAWINGS

Low Temperature, Top Mount, Solid Pull Door Freezers



SIDE VIEW



SPECIFICATIONS

Low Temperature, Top Mount, Solid Pull Door Freezers

SPECIFICATION	1-DOOR	2-DOOR	3-DOOR
Compressor Mount	Top	Top	Top
Temperature Range	0° to -20° (-18° to -30°C)	0° to -20° (-18° to -30°C)	0° to -20° (-18° to -30°C)
Number of Doors	1	2	3
Door Construction	Foam-in-Place	Foam-in-Place	Foam-in-Place
Hinge Type	Camlift / Spring Assist.	Camlift / Spring Assist.	Camlift / Spring Assist
Number of Shelves	4 x 1 bottom rack	8 x 2 bottom rack	12 x 3 bottom rack
Shelf Type	Cantilever, Epoxy Coated Steel Wire	Cantilever, Epoxy Coated Steel Wire	Cantilever, Epoxy Coated Steel Wire
Shelf Adjustment	3/4"	3/4"	3/4"
Insulation - CFC-Free	Foam-in-Place Urethane	Foam-in-Place Urethane	Foam-in-Place Urethane
Wall Thickness	2 3/8"	2 3/8"	2 3/8"
Shipping Weight (Approx.)	460 lbs.	660 lbs.	870 lbs.
Compressor Size	1/3 Hp.	1/2 Hp.	3/4 Hp.
Condenser Type	Fin & Tube Forced Air	Fin & Tube Forced Air	Fin & Tube Forced Air
Evaporator Type	Fin & Tube Forced Air	Fin & Tube Forced Air	Fin & Tube Forced Air
Refrigerant Type	R-404A	R-404A	R-404A
Refrigerant Control	Expansion Valve	Expansion Valve	Expansion Valve
Amp Rating - Data Plate	3795: 7.7; 3796: 4.4 3801: 3.7; 3802: 1.8	3797: 13.6; 3798: 8.2	3799: 16.0; 3800: 9.6
Electrical Specs. (V / HZ / PH)	115 / 60 / 1 Export: 220 V / 50 Hz.	115 / 60 / 1 Export: 220 V / 50 Hz.	115 / 60 / 1 Export: 220 V / 50 Hz.
NSF	NSF7	NSF7	NSF7
UL Listed	Yes	Yes	Yes
Interior Finish	Baked Enamel, Coved Corners	Baked Enamel, Coved Corners	Baked Enamel, Coved Corners
Exterior Finish	Baked Enamel	Baked Enamel	Baked Enamel
Compressor Make	Copleweld	Copleweld	Copleweld
Electrical Information	15 Amp Service Cord	20 Amp Service Cord	20 Amp Service Cord

MODEL DESIGNATION INFORMATION

NOTE: Export Models use a transformer.

See page 33 for information on how to set transformer during installation.

1-DOOR:

3795 / 3801

EXPORT MODEL:

3796 / 3802

2-DOOR:

3797

EXPORT MODEL:

3798

3-DOOR:

3799

EXPORT MODELS:

3800

GROUNDING INSTRUCTIONS

This appliance is equipped with a three-prong (grounding) plug for your protection against shock hazards. The appliance should be plugged directly into a properly grounded three-prong receptacle.

Where a two-prong wall receptacle is encountered, it must be replaced with a properly grounded three prong receptacle in accordance with the National Electrical Code and local codes and ordinances. The work must be done by a licensed electrician.

IMPORTANT

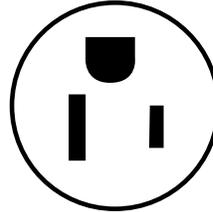
Do not under any circumstances cut or remove the round grounding prong from the equipment plug.

WARNING

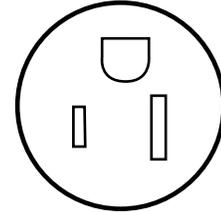
Consult a licensed electrician if you have any doubt about the grounding of your wall receptacle. Only a licensed electrician can determine the polarization of your wall receptacle. Only a properly installed three-pronged wall receptacle assures the proper polarization with the equipment plug.

RATING: 115V, AC 15 Amp

Plug
5-15

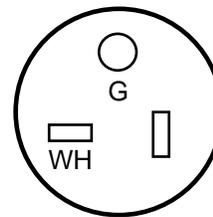


Receptacle
5-15R



RATING: 125V, AC 20 Amp

Plug



FLAMMABLE MATERIAL STORAGE

To meet the requirements for storing flammable material, cabinet has no opening other than the door, or any electrical components below compressor compartment.

DO NOT MODIFY CABINET OR REMOVE LABEL ON THE FRONT WHICH SPECIFIES STORAGE LIMITS!!

SERIAL RATING PLATES

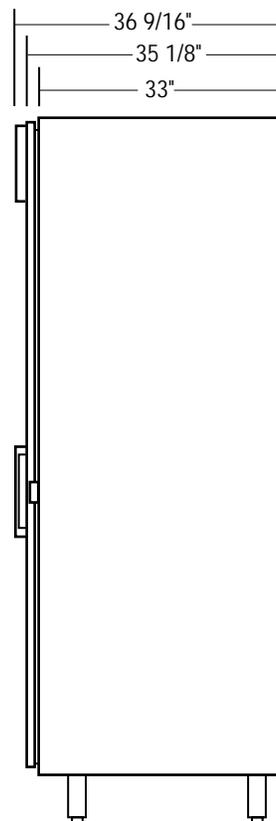
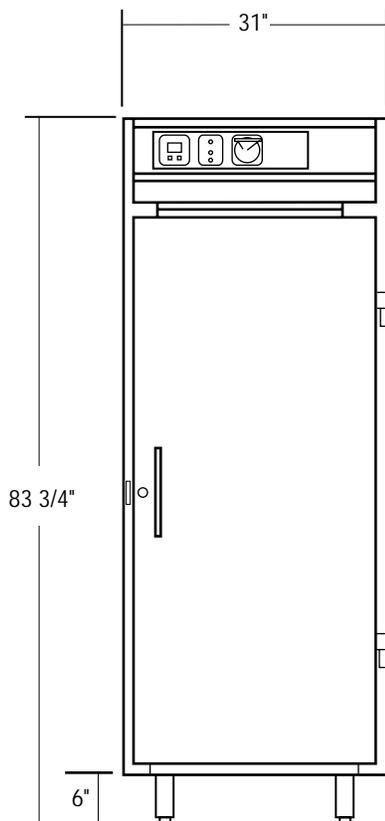
Serial Number Rating Plates on each vertical cabinet are located on the inside upper left hand corner. This plate contains all technical data necessary to the operation of the cabinet. (Sample below.) Warranty administration is based on the serial number as printed on the rating plate.

MODEL		SER.				
REFRIGERANT	VOLTS					
TYPE	# WIRES	PHASE		HERTZ		
CHARGE	TOTAL AMPS			MINIMUM CIRCUIT AMPACITY	MAXIMUM FUSE SIZE OR HACR TYPE CIRCUIT BREAKER	
DESIGN PRESSURE (PSIG)	REFRIG. CYCLE	DEFROST CYCLE	LOCKED ROTOR			
HIGH SIDE						
LOW SIDE						

SPECIFICATIONS: Low Temperature, Top Mount, Solid Pull Door Freezers
Flammable Material Storage
Model: 3801 & Export Model: 3802

SPECIFICATION	3801 / 3802*
Capacity (cu.ft. / litres)	27.3 / 773
Temperature Range	-30°C (-22°F)
Exterior: (in.) HWD	83 ¾ X 31 X 36 ⅞
(cm)	213 x 79 x 97
Interior: (in.) HWD	60 ⅝ X 26 ¼ X 29 ⅝
(cm)	154 x 67 x 75
Doors: Keylock	Single, solid
Legs	6" adjustable
Shelves	Cantilever, 4 + bottom rack
Interior Lighting	none
Insulation: Urethane	Walls: 2 ⅜" / Door: 2"
Refrigerant	R-404A
Compressor	1/3 Hp.
Condenser	Fin and Tube
Air Circulation	Gravity
Refrigerant Control	Capillary
Evaporator	Cold Wall
Thermostat	Adjustable
Defrost	Manual
Voltage - Domestic	115/60/1
Voltage - Export	230/50/1
Amp Rating - Data Plate	3801: 3.7 3802: 1.8
Supply Plug	5-15 NEMA
Shipping: Cubic Feet	87
Weight - Domestic	460 lbs.
Weight - Export	594 lbs.

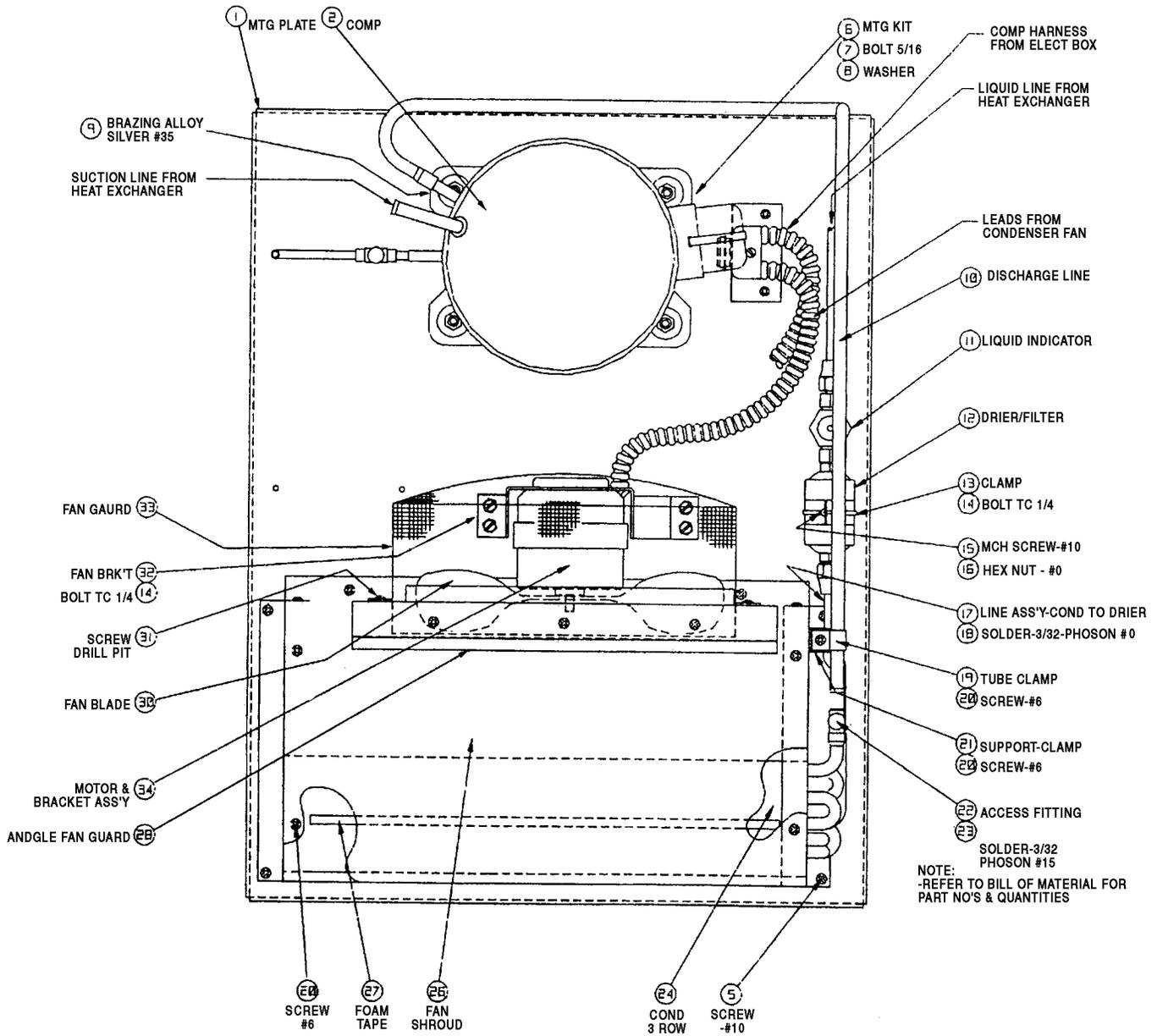
DIMENSIONAL DRAWINGS



CONDENSING UNIT ASSEMBLY - 1-Door Top Mount Freezers

Model: 3795 & Export Model: 3796 Component Identification

(See Section IV Page 65 for Part Numbers.)



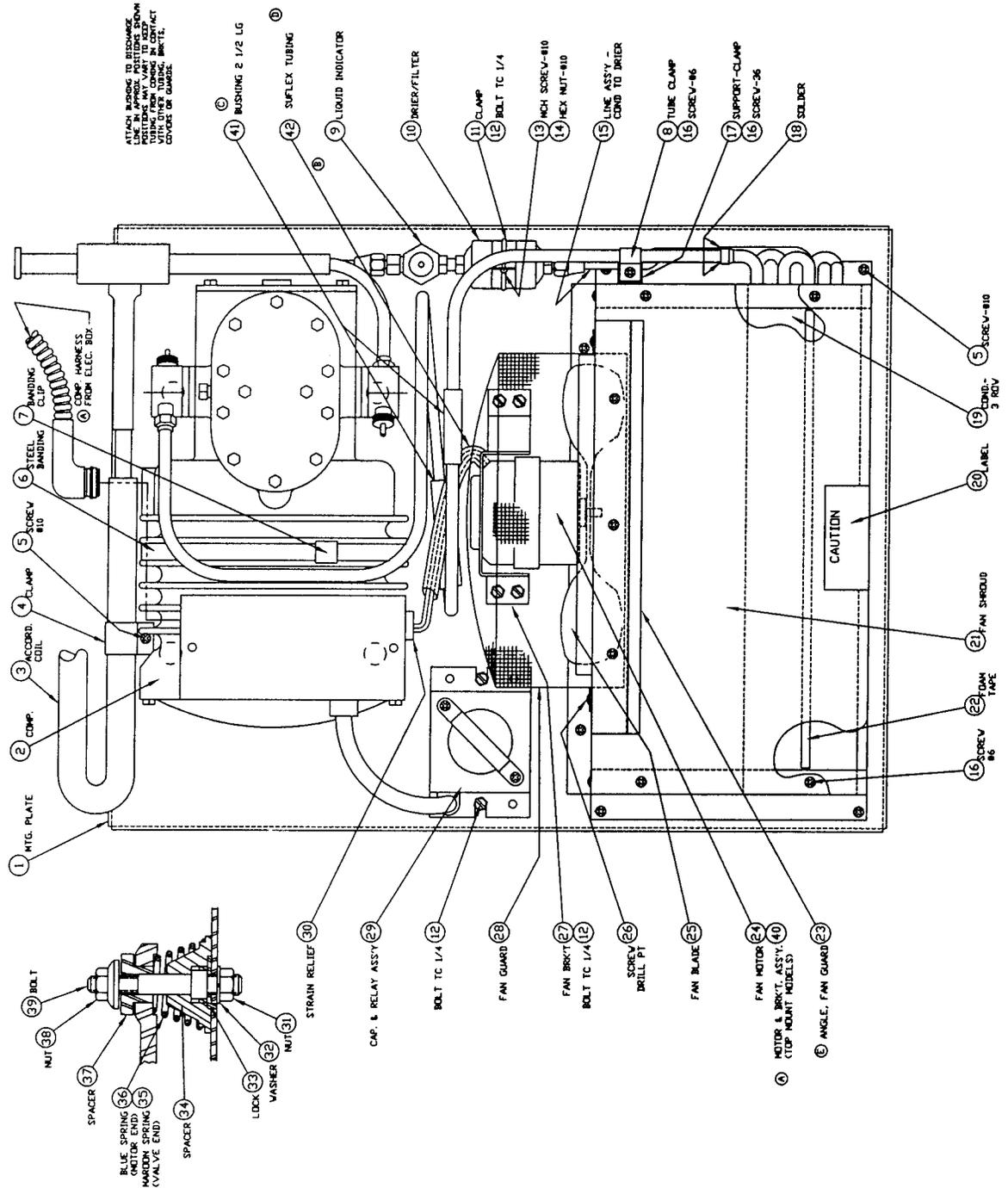
CONDENSING UNIT ASSEMBLY - 2 & 3-Door Top Mount Freezers

Models: 3797 / 3799

Component Identification

Export Models: 3798 / 3800

(See Section IV Page 66 & 67 for Part Numbers.)



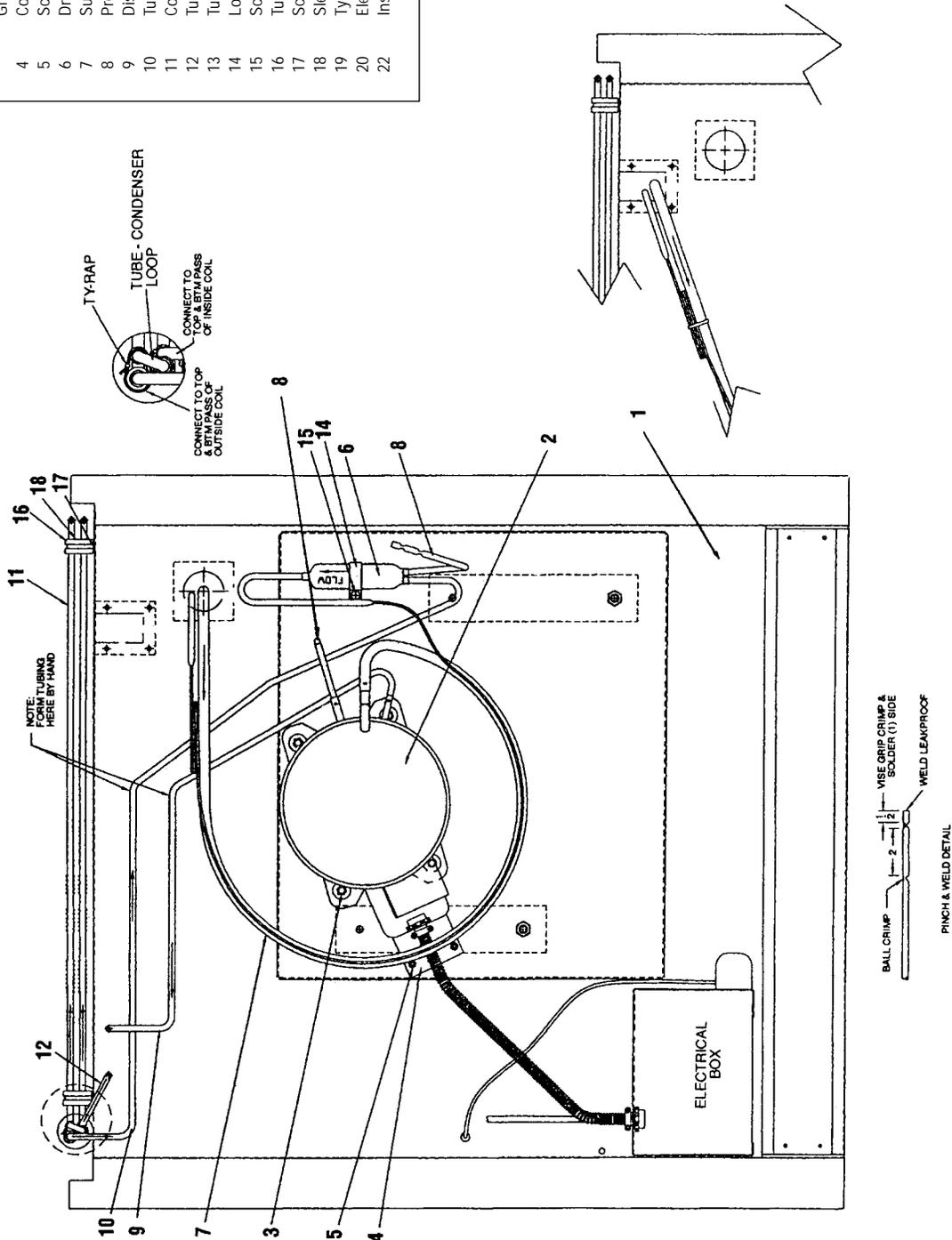
COMPRESSOR AREA LAYOUT -Component Identification

Model: 3801 & Export Model: 3802

Flammable Material Storage

(See Section IV Page 68 for Part Numbers.)

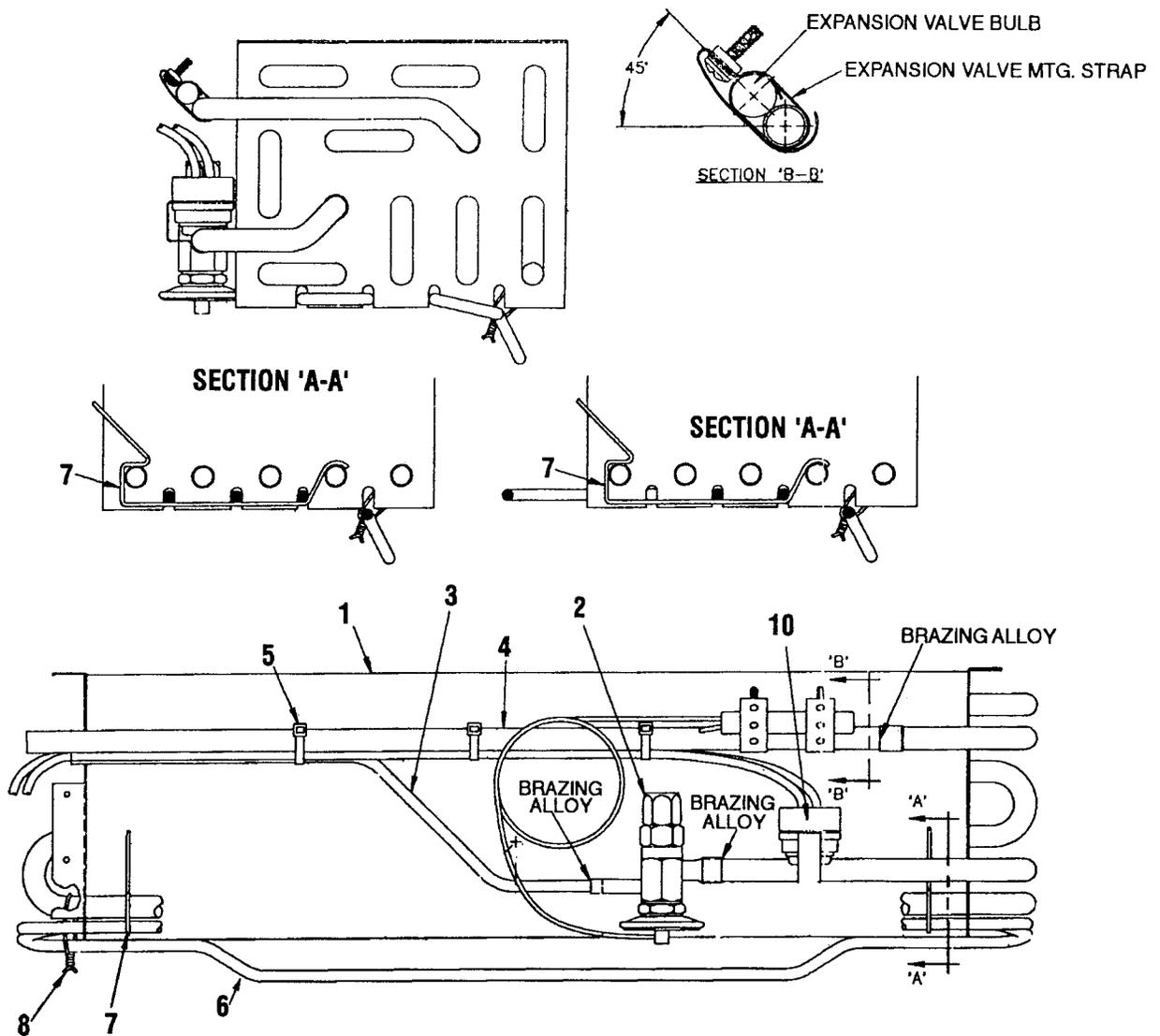
ITEM	DESCRIPTION
1	Compressor Pan
2	Compressor - HP-121
3	5/16 Flat Washer
	Bolt - 5/16 x 18
	Sleeve
	Grommet
4	Conduit Connector Support
5	Screw - #10 x 1/2 SMS BP
6	Drier (Spinco)
7	Suction Line Ass'y
8	Process Tube
9	Discharge Line
10	Tube - Condenser to Drier
11	Condenser
12	Tube - Door Htr to Cond.
13	Tube - Condenser Loop
14	Loop Clamp
15	Screw - SM 1/2 TR HD PHIL APT
16	Tube Clamp
17	Screw - #10 Self Drill Point
18	Sleeve - Rubber
19	Ty-Rap
20	Electrical Box
22	Insulation Tape



EVAPORATOR COIL ASSEMBLY - R-404A Component Identification

Models: 3795 / 3797 / 3799

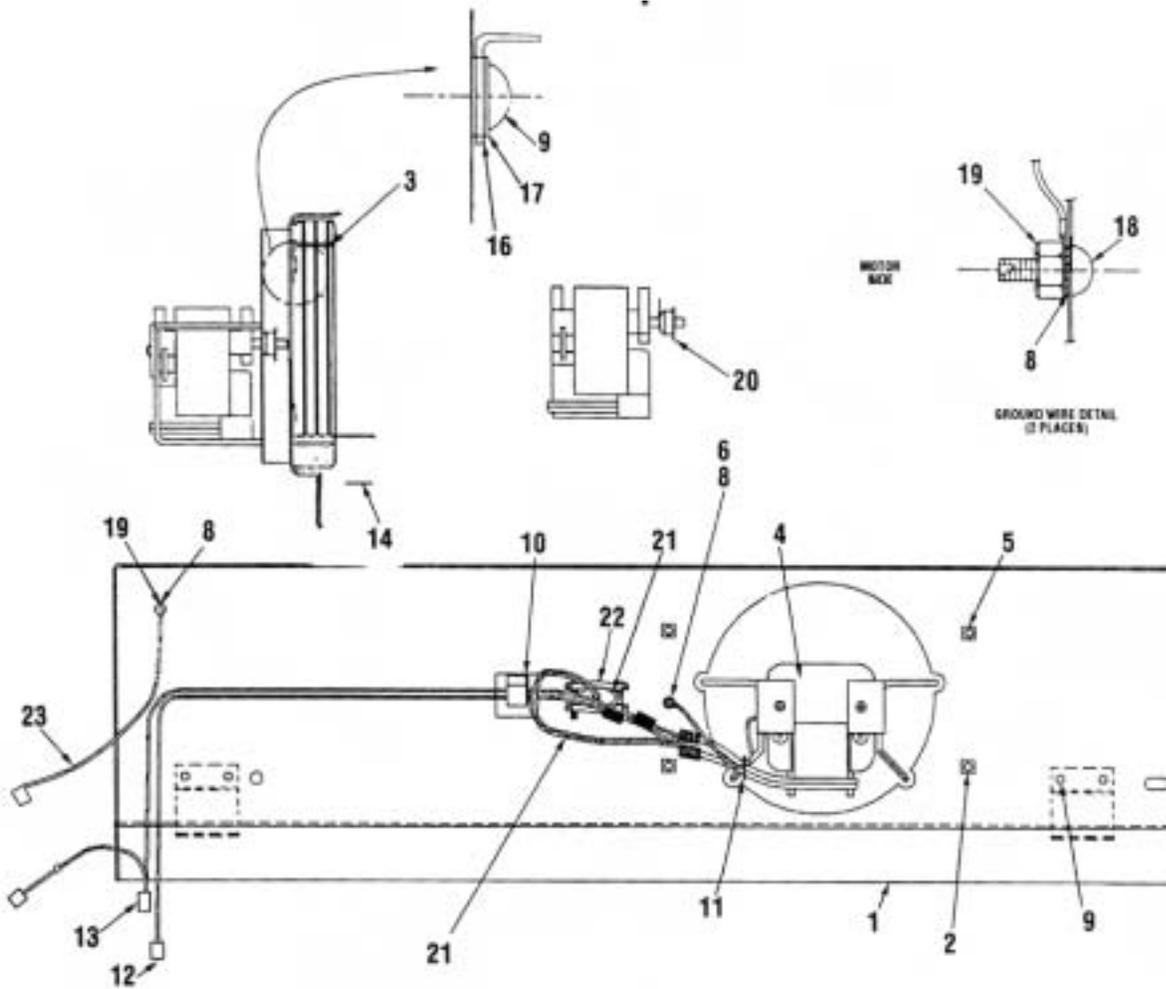
Export Models: 3796 / 3798 / 3800



ITEM	DESCRIPTION
1	Coil - Evaporator
	Coil - Evaporator
2	Expansion Valve
3	Copper Tubing - 1/4
4	Copper Tubing - 1/2
5	Wire Tie - Nylon
6	Heater - Defrost
	Heater - Defrost
7	Retainer - Heater
8	Copper Wire
9	Brazing Alloy
10	Thermostat - Defrost Term.
11	Wire Lead
12	Wire Lead

EVAPORATOR FAN SHROUD ASSEMBLY Component Identification

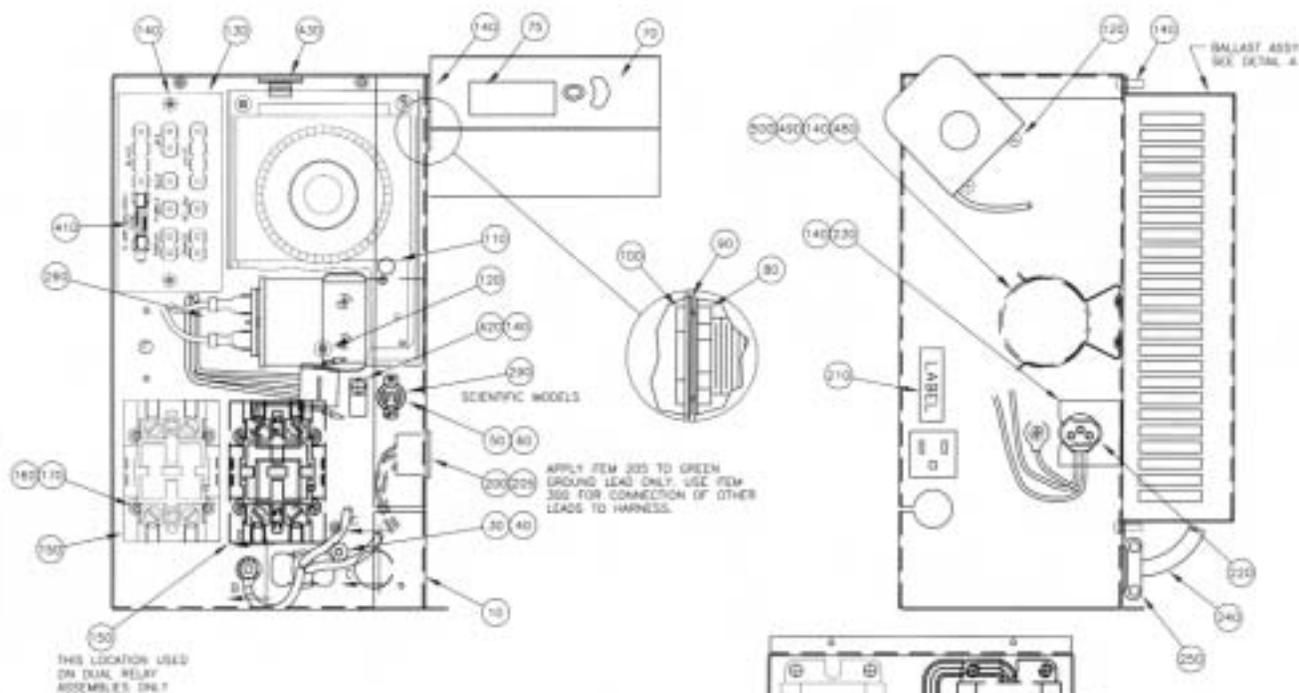
Models: 3795 / 3797 / 3799 & Export Models: 3796 / 3798 / 3800



ITEM	DESCRIPTION
1	Fan Shroud
	Fan Shroud
	Fan Shroud
2	Screw -#10B x 1/2
3	Fan Guard
4	Fan Motor - 115V
5	Nut - Nylon Expansion
6	Screw - #10-32 x 3/8
8	Washer - Ext. Tooth
9	Screw - #8B x 3/8
10	Cord Clip
11	Wire Tie (Small)
12	Wire Lead
13	Wire Harness
14	Drain Pan Hanger
16	Grommet - Rubber
17	Washer - Flat
18	Screw - #10-24 T.C.
19	Nut - #10-24 Hex
20	Fan Blade
21	Drain Heater Recept. Hrns.
22	Strain Relief
23	Ground Wire

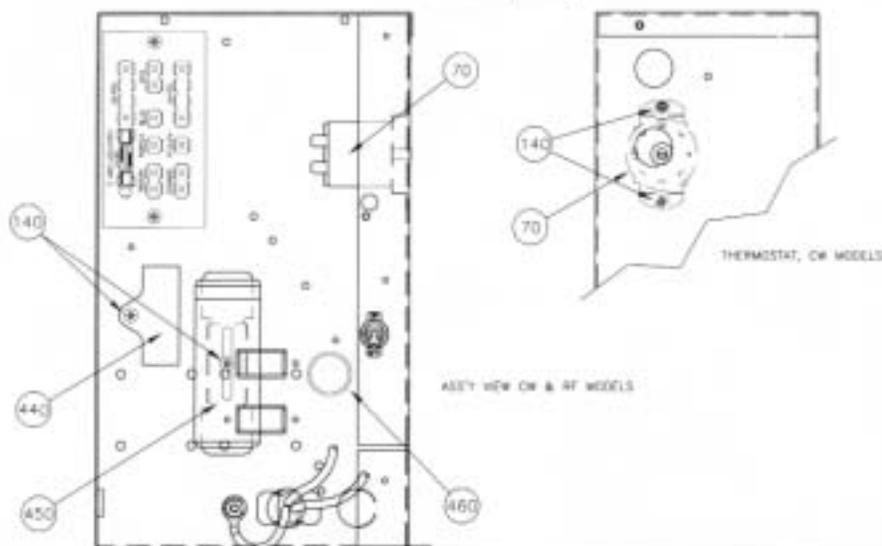
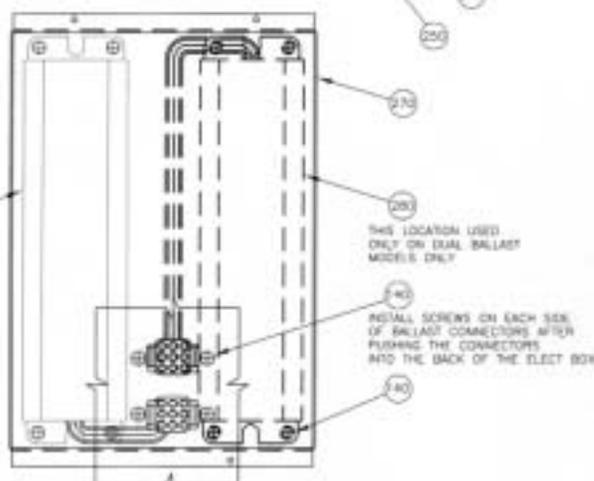
ELECTRICAL BOX ASSEMBLY - 1-Door Component Identification

Models: 3795 / 3797 / 3799 & Export Models: 3796 / 3798 / 3800



REQ	DESCRIPTION
10	BOX, ELECTRICAL
20	CONTROLLER BOARD
24	CIRCUIT BOARD STAGGER
26	MICROCHIP
27	PRIMARY
28	LABEL
30	SCREW
40	HEX NUT
50	TOGGLE SWITCH (SHOWN) OR HOLE PLUG (NOT SHOWN)
60	INDICATOR PLATE, (ON/OFF)
70	THERMOSTAT
75	DECAL, ALARM THERMOSTAT
80	CONDUIT NUT
90	RESIZING WASHER
100	CHARGE NOZZLE
110	DEFROST TIMER
120	SCREW
130	TERMINAL BOARD
140	SCREW
150	RELAY (POWER)
160	SCREW
170	HEX NUT
180	
190	
200	RECEPTACLE
205	TERMINAL - WIRE
210	LABEL, AMPERAGE
220	HARNESS, DRAW PAN
230	RETAINER CLIP
240	POWER CORD
250	STRAIN RELIEF
260	HARNESS, DELUX CONTROL PANEL
270	BOX, BALLAST HOUSING
280	BALLAST
290	HOLE PLUG (NOT SHOWN)
300	SPICE CAP (NOT SHOWN)
310	HARNESS, SERVICE (NOT SHOWN)
320	HARNESS, ELECTRICAL BOX AREA (NOT SHOWN)
330	HARNESS, THERMOSTAT (NOT SHOWN)
340	HARNESS, COMPRESSOR CONTACTOR (NOT SHOWN)
350	HARNESS, LIGHTED SIGN KIT (NOT SHOWN)
360	HARNESS, HARDENING CABINET JUMPER (NOT SHOWN)
370	HARNESS, REVERSING FAN RELAY (NOT SHOWN)
380	HARNESS, POWER (NOT SHOWN)
390	HARNESS, JUMPER (NOT SHOWN)
400	HARNESS, JUMPER (NOT SHOWN)
410	PLUG
420	STRAIN RELIEF
430	WIRE CLIP
440	PLUG CAPACITOR
450	START CAPACITOR
460	ROLL BUSHING
470	
480	CLAMP, ROD/PLATE
490	CAPACITOR, RUN 50 MFD/370-60
500	HARNESS, CAPACITOR

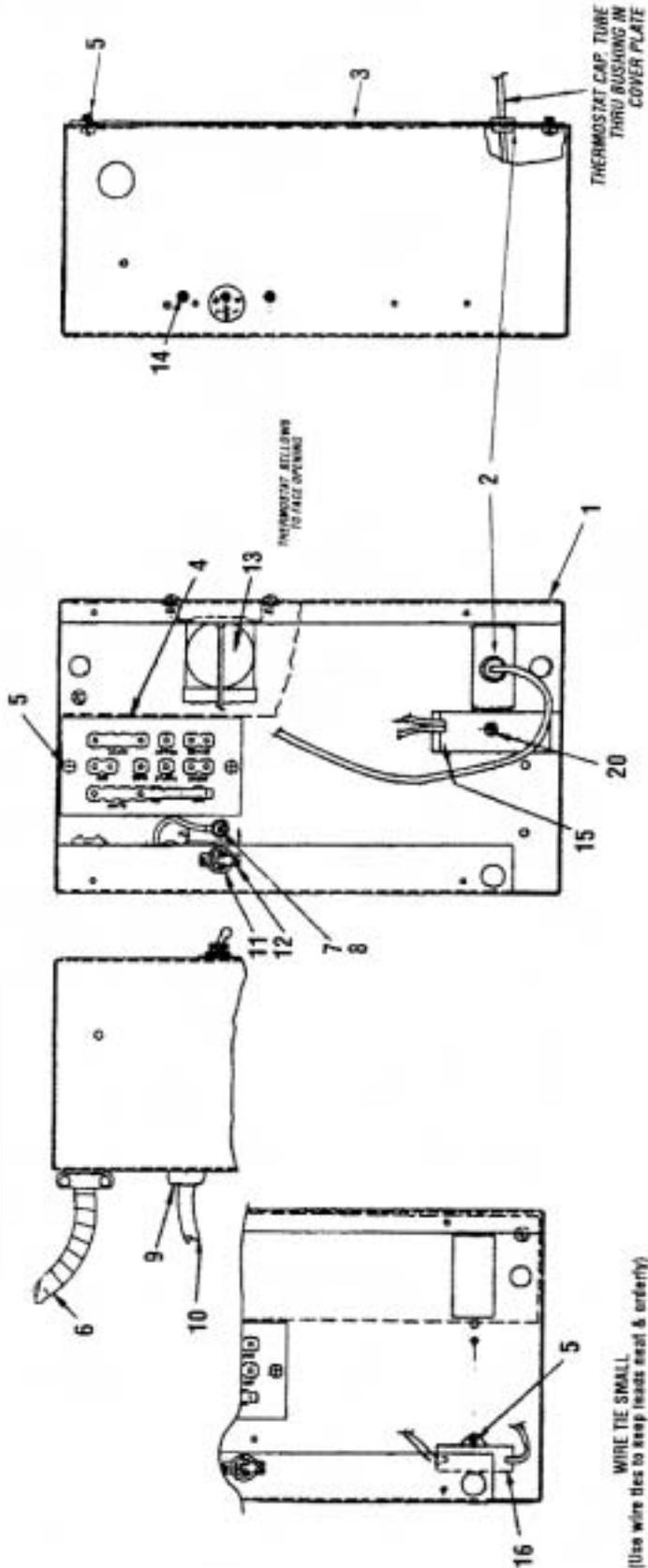
DETAIL A



ELECTRICAL BOX ASSEMBLY - 1 -Door Models

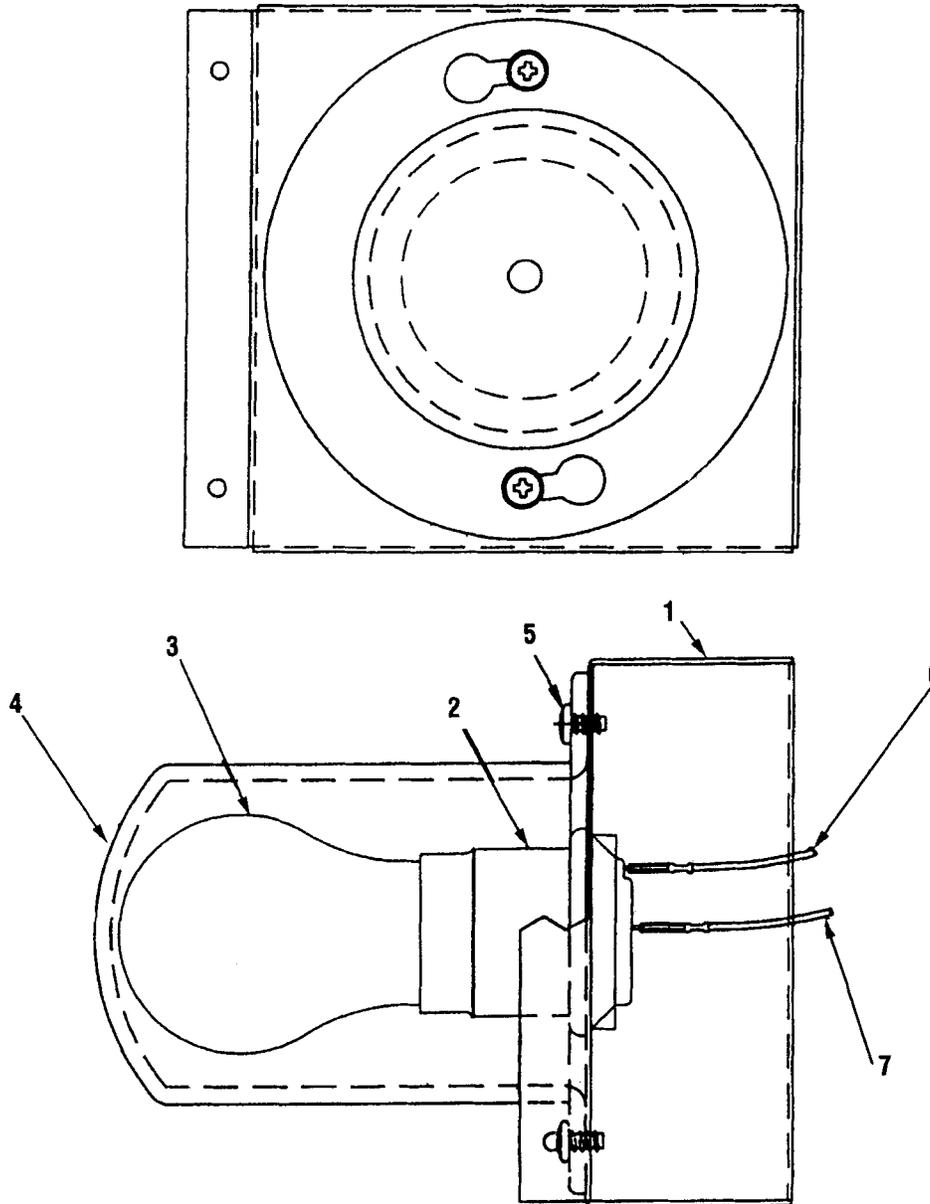
Model: 3801 & Export Model: 3802 - Component Identification

ITEM	DESCRIPTION
1	Electrical Box
2	1/2" Bushing
3	Cover Plate
4	Terminal Board
5	Screw - #8 x 3/8" B' SMS
6	Comp. Supply Harness
7	Screw - #10-24 x 5/8 M.S.
8	Screw - 310-24 KEPS (Green)
9	Strain Relief
10	Service Cord
11	Toggle Switch
12	ON-OFF Plate
13	Thermostat Assembly
14	Screw - #8-32 x 3/8 M.S.
15	Start Capacitor - Compressor
16	Run Capacitor - Compressor
17	Wire Lead - Supply Switch
18	Wire Lead - Supply Switch
19	Wire Tie - Small
20	Screw - #8 x 5/16" B' SMS
18	Wire Lead



INCANDESCENT LIGHT ASSEMBLY - Component Identification

Models: 3795 / 3797 / 3799 & Export Models: 3796 / 3798 / 3800



ITEM	DESCRIPTION
1	Box, Light MTG
2	Lamp Socket
3	Incandescent Bulb
4	Light Guard
5	Screw - #8
6	Wire Lead
7	Wire Lead
8	Label - 40 Watt

SECTION II
Electrical &
Refrigeration
Information

GENERAL LOW TEMPERATURE FREEZER COMPONENT SPECIFICATIONS

	1-DOOR	2-DOOR	3-DOOR
Center Mullion Heater 115V		Total Watts 25 529 Ohms	Total Watts 25 529 Ohms
Perimeter Heater 115V	Total Watts 63.8 207 Ohms	Total Watts 57.5 230 Ohms	Total Watts 57.5 230 Ohms
Condensate Heater 115V	Total Watts 175 76 Ohms	Total Watts 175 76 Ohms	Total Watts 175 76 Ohms
Drain Heater 115V	Total Watts 6.0 2204 Ohms	Total Watts 6.0 2204 Ohms	Total Watts 6.0 2204 Ohms
Defrost Heater 115V	Total Watts 800 16.5 Ohms	Total Watts 800 16.5 Ohms	Total Watts 1250 10.6 Ohms
Lamp	40 Watts	40 Watts	40 Watts
Evap. Fan Delay	Close 32° / Open 52°	Close 32° / Open 52°	Close 32° / Open 52°
Defrost Termination	Close 30° / Open 60°	Close 30° / Open 60°	Close 30° / Open 60°
Defrost Time / Temp. Failsafe	Thermodisc Approx. 20 Min. 40 min.	Thermodisc Approx. 20 Min. 40 min.	Thermodisc Approx. 20 Min. 40 min.

REFRIGERATION SPECIFICATIONS

Model: 3801 & Export Model: 3802

Low Temp., Solid, 1-Door Freezers — Flammable Material Storage

SYSTEM COMPONENTS - R-404A Refrigerant

Compressor Model Number	Americold HP-121-1
Compressor Horsepower	1/3
Recommended Operating Temp. Range	0°F to -22°F (-18°C to -30°C)
Cabinet Volts	115 (Export Transformer: 220V 50/60Hz.)
Expansion Device	Cap Tube - 8' x .036
Charge Refrig. Type / Oz.	R-404A / 14

SYSTEM PERFORMANCE - *PRESSURE READINGS TAKEN PRIOR TO COMPRESSOR CUT-OUT (SETTING NO. 4)*

AMBIENT	70°F / 21.1°C	80°F / 27°C	90°F / 32.5°C
Cavity Temp. (F/C)	-9 / -20.6	-10 / -20.6	-16 / -20.6
Suction Pressure (PSIG / Kpa)	11# / 68	13# / 89	13# / 103
Discharge Pressure (PSIG / Kpa)	239# / 1629	266# / 1820	287# / 2034
Compressor Amps	3 (Export: 1.8)	3.1 (Export: 1.9)	3.1 (Export: 1.9)
Total Refrigeration Amps	3.1 (Export: 1.9)	3.2 (Export: 1.9)	3.1 (Export: 1.9)

NOTE: REFER TO SERIAL DATA PLATE FOR REFRIGERANT TYPE & CHARGE.

REFRIGERATION SPECIFICATIONS

Model: 3795 & Export Model: 3796

Low Temp., Solid, 1-Door Freezers

SYSTEM COMPONENTS - R-404A Refrigerant

Compressor Model Number	Copeland RS43CIE-IAA
Compressor Horsepower	1/2
Recommended Operating Temp. Range	0°F to -22°F (-18°C to -30°C)
Cabinet Volts	115 / 60 / 1(Export Transformer: 220V 50/60Hz.)
Expansion Device	Sporlan FBR-¼-ZP
Charge Refrig. Type / Oz. / Grams	R-404A / 22 / 623.7

SYSTEM PERFORMANCE - *PRESSURE READINGS TAKEN PRIOR TO COMPRESSOR CUT-OUT (SETTING NO. 5)*

AMBIENT	70°F / 21.1°C	80°F / 27°C	90°F / 32.5°C
Cavity Temp. (F/C)	-4 / -20	-5 / -21	-6 / -7
Suction Pressure (PSIG / Kpa)	9.8 / 67	10.8 / 74	12.5 / 86
Discharge Pressure (PSIG / Kpa)	192 / 1323	212 / 1461	251 / 1730
Compressor Amps	7.2 (Export: 4.3)	7.4 (Export: 4.4)	7.3 (Export: 4.3)
Total Refrigeration Amps	9.4 (Export: 5.6)	9.6 (Export: 5.7)	9.4 (Export: 5.6)

REFRIGERATION SPECIFICATIONS

Model: 3797 & Export Model: 3798

Low Temp., Solid, 2-Door Freezers

SYSTEM COMPONENTS - R-404A Refrigerant

Compressor Model Number	Copeland KAGB-005E-IAA
Compressor Horsepower	1/2
Recommended Operating Temp. Range	0°F to -22°F (-18°C to -30°C)
Cabinet Volts	115 / 60 / 1 (Export Transformer: 220V 50/60Hz.)
Expansion Device	Sporlan FBR-¼-ZP
Charge Refrig. Type / Oz. / Grams	R-404A / 22 / 623.7

SYSTEM PERFORMANCE - *PRESSURE READINGS TAKEN PRIOR TO COMPRESSOR CUT-OUT (SETTING NO. 5)*

AMBIENT	70°F / 21.1°C	80°F / 27°C	90°F / 32.5°C
Cavity Temp. (F/C)	-3.5 / -19	-4.0 / -20	-4.5 / 21
Suction Pressure (PSIG / Kpa)	9 / 62	9 / 62	9.5 / 65
Discharge Pressure (PSIG / Kpa)	222 / 1530	240 / 1654	265 / 1827
Compressor Amps	8.0 (Export: 4.8)	8.0 (Export: 4.8)	8.0 (Export: 4.8)
Total Refrigeration Amps	11.0 (Export: 6.6)	11.0 (Export: 6.6)	11.0 (Export: 6.6)

NOTE: REFER TO SERIAL DATA PLATE FOR REFRIGERANT TYPE & CHARGE.

REFRIGERATION SPECIFICATIONS

Model: 3799 & Export Model: 3800

Low Temp., Solid, 3-Door Freezers

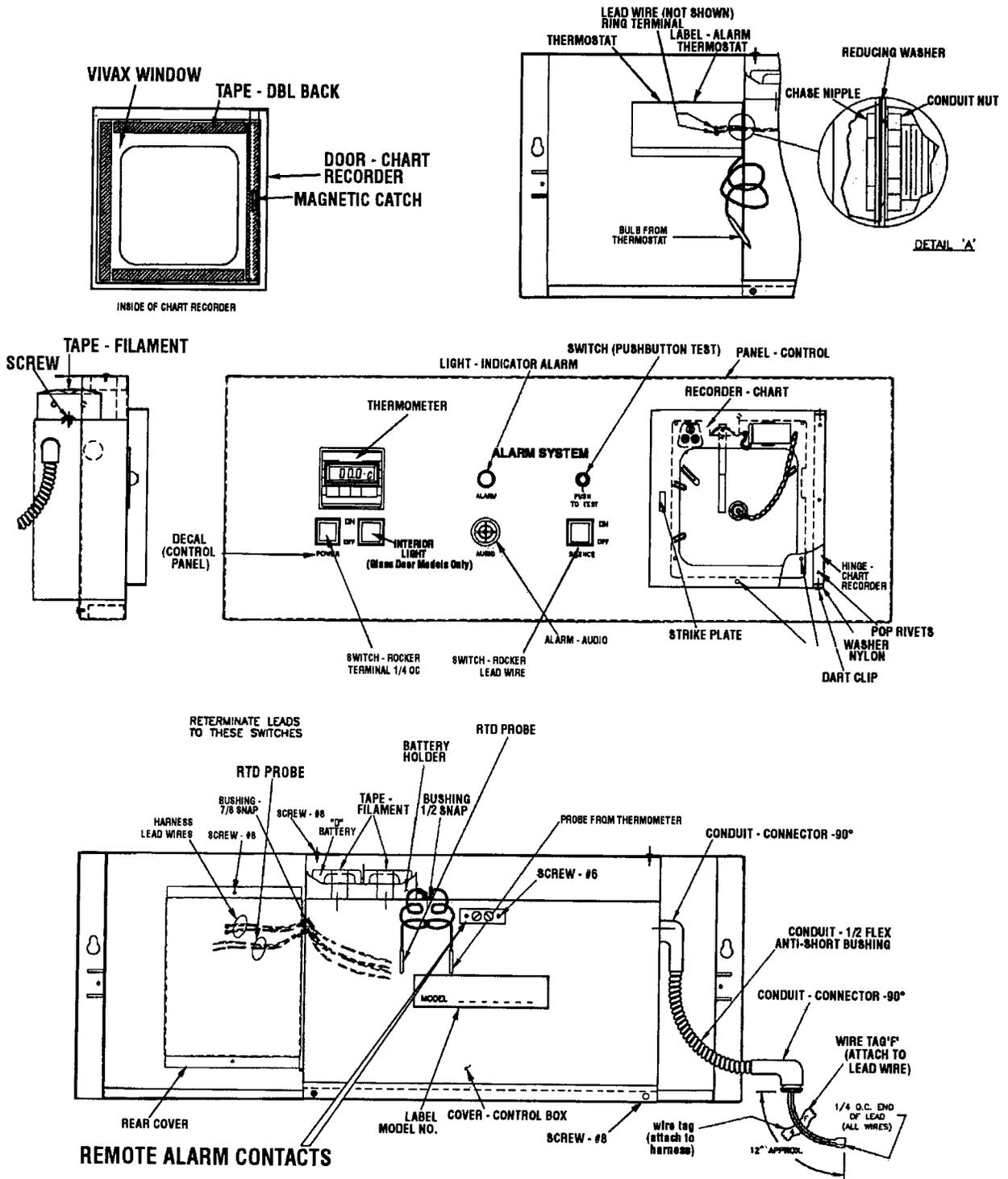
SYSTEM COMPONENTS - R-404A Refrigerant

Compressor Model Number	Copeland KAJB-007E-IAA
Compressor Horsepower	3/4
Recommended Operating Temp. Range	0°F to -22°F (-18°C to -30°C)
Cabinet Volts	115 / 60 / 1 (Export Transformer: 220V 50/60Hz.)
Expansion Device	Sporlan FBS-¼-ZP
Charge Refrig. Type / Oz. / Grams	R-404A / 25 / 708.75
Crank Case Pressure Regulator	Sporland CR-06 (10 PSIG)

SYSTEM PERFORMANCE - *PRESSURE READINGS TAKEN PRIOR TO COMPRESSOR CUT-OUT (SETTING NO. 5)*

AMBIENT	70°F / 21.1°C	80°F / 27°C	90°F / 32.5°C
Cavity Temp. (F/C)	-5 / -21	-6 / -21	-7 / -22
Suction Pressure (PSIG / Kpa)	7 / 48.3	7.5 / 51.7	8 / 55.2
Discharge Pressure (PSIG / Kpa)	205 / 1413	245 / 1689	270 / 1861
Compressor Amps	8.5 (Export: 5.1)	8.5 (Export: 5.1)	8.5 (Export: 5.1)
Total Refrigeration Amps	12.9 (Export: 7.7)	12.9 (Export: 7.7)	12.8 (Export: 7.7)

CONTROL PANEL LAYOUT



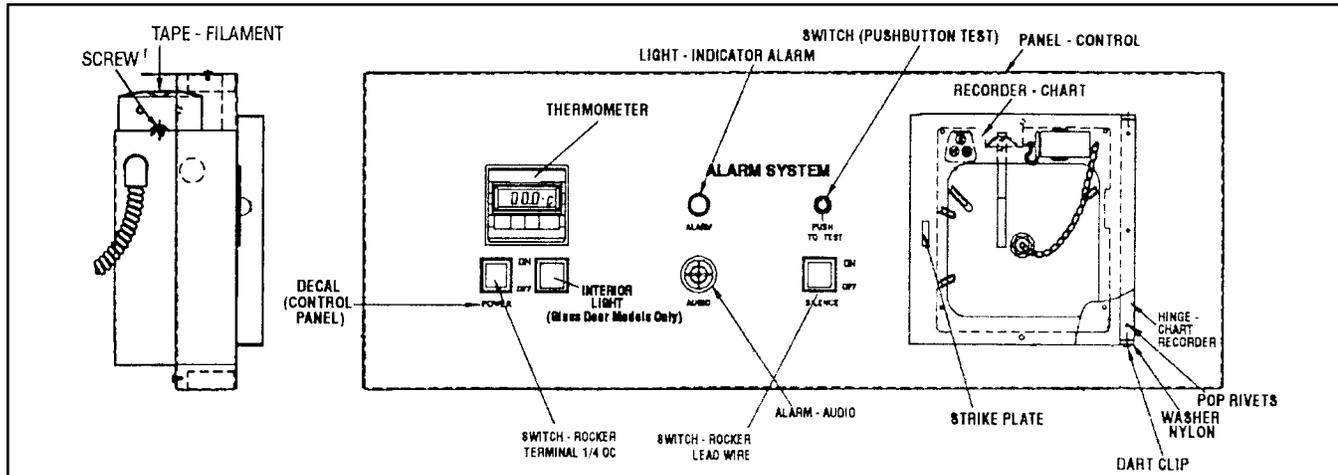
CONTROL ANNUNCIATOR PANEL

GENERAL

The control annunciator panel is designed to provide the user with a convenient way of monitoring cavity conditions, turning the interior light on and off and turning the cabinet power on and off.

1. Cabinet power is controlled by an ON/OFF switch.
2. The interior cabinet light is controlled by a push button door switch.

3. The digital process meter monitors cavity temperature and displays the measurement on a LCD screen in degrees centigrade (°C). This thermometer is both solar powered and battery assisted. In the event there is not enough light the 3 volt battery will take over. The battery is located on the rear of the thermometer and is held in place by a metal clip. The thermometer is not tied to any electrical circuit.



ALARM SYSTEM

This alarm is designed to queue the attendant of an immediate alarm condition. The system has both an audio and visual alarm signal for alarming on high cavity temperature, plus a contact to connect a remote alarm. The alarm system has a battery supply and will operate whether or not the cabinet has power.

1. Upon installation and after the cabinet is down to temperature, remove the paper tab separating the batteries in their holder. The battery holder is located on the reverse side of the control annunciator panel. Batteries are non-rechargeable. The batteries can be reached from the top of the cabinet with the aid of a step ladder, or by removing the control panel and resting it on top of the cabinet. To do this, remove the two screws from the top mounting tabs and lift the panel off of the mounting studs.
2. The high temperature alarm indicates to the attendant that the cavity conditions are in excess of the predetermined high temperature limit. The temperature alarm is signalled from the optional chart recorder installed, or the alarm thermostat located behind the control annunciator panel. To set the alarm thermostat, simply position the pointer on the desired temperature alarm limit. See the section

“Optional Chart Recorder” for setting the alarm limit when a chart recorder is installed.

3. A button is provided for testing proper alarm system signaling. When depressed, the batteries are used to power the visual alarm indicator, audio alarm indicator, and 6V DC remote alarm contacts. This test should be conducted daily to insure functionality and satisfactory battery charge. Batteries should be replaced at least once a year with 4 good quality alkaline “D” cell batteries as this is the only power for the alarm system.
4. The system is provided with a rocker switch that may be used to silence the audio portion of the alarm signal during an alarm condition. No other functions are affected by this switch. If the toggle switch is turned off to silence the audio alarm, be sure to turn the switch back on as soon as the cabinet temperature returns to normal and the signal light goes out.
5. Contacts are provided on the reverse side of the control annunciator panel to power a remote alarm from the cabinet battery supply. The remote alarm should be a low ampere 6V DC device such as an audio alarm or small signal light to avoid running down the battery too fast.

EMERGENCY PROCEDURE PLANNING

Post adjacent to or on the cabinet instructions to follow in the event of an alarm condition.

1. Persons to be notified and the telephone numbers of each.
2. The location of other refrigerators/freezers that might have space for emergency storage.
3. The telephone number to call for electrical/refrigeration repair.

CHART RECORDER

The circular chart recorder is designed for convenience in maintaining essential records of cavity temperature twenty-four hours a day. The drive motor is supplied from the cabinet power supply and will operate any time the master power supply switch is "ON" and the cabinet is plugged in. The recorder will continue to indicate temperature in a power failure condition for approximately 24 hours with the 9-volt battery backup installed.

CHART PAPER CHANGE

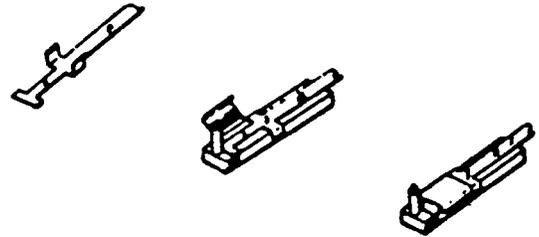
Press and hold the "change chart" button (#3) for one second until the pen begins to move to the left of the chart. To remove the chart, unscrew the knob at the center of the chart. Position the new chart so that the correct time line coincides with the time line groove on the chart plate. Again push the "change chart" pushbutton (#3) for one second until the pen begins to move back onto the chart. Check to make sure that the pen is marking on the paper. If not, lightly adjust the pen arm to establish contact with the paper.

MARKING SYSTEMS: MARK-A-MATIC II INKING SYSTEM

The pen consists of a self-contained ink reservoir with a porous plastic stylus which is snapped around the outer edge of the pen arm. Two (2) screws are provided at the top of the pen arm to adjust the length to ensure that the pen tracks the time line on the chart. Check the length after each pen replacement and adjust accordingly if required. If the stylus does not touch the chart, adjustment can be made by slightly bending the pen arm in the center. Do not use more pressure than is necessary to create a fine line. Note: As the pen ink supply runs out the pen color will become lighter. This indicates that the pen should be replaced.

REPLACEMENT OF PEN

All recorders are provided with fiber tipped cartridge pens. The body of the cartridge is color coded to designate the red (No. 1) and the blue (No. 2 optional) pens. The pen is securely held on the special "U" clip tab arm by means of a snap-on hinge at the bottom.



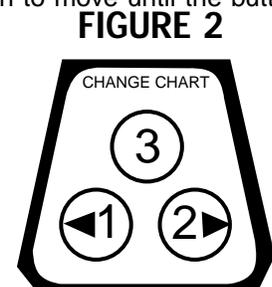
For ease of replacement it is suggested that the 2 screws that hold the pen arm be loosened and the pen and arm be removed as an assembly. Unsnap the plastic hinge, remove and discard the old pen. Replace the new cartridge by opening the hinge and snapping it securely around the pen arm.

Note: In non-inking units, replacement of the pen is not necessary.

TEMPERATURE RECORDER - CALIBRATION CHECK

This recorder has been accurately calibrated at the factory. Before making any adjustments, this instrument should be in service for 24 hours. Thereafter, if any adjustment is required, perform the following procedure:

1. Place a Certified Test Thermometer in the solution bottle alongside the sensor.
2. After three (3) minutes, compare the recorder to the test thermometer.
3. If an adjustment is required, a correction can be made by pressing the left and right arrow buttons. The pen does not begin to move until the button is pushed for at least five (5) seconds. Press the right arrow (#2) button to move the pen to the right. Press the left arrow (#1) button to move pen to the left. (See Figure 2.)



BATTERYBACKUP

If AC power fails the LED will change to short green flashes. The 9 volt DC battery will allow the recorder to sense and record temperatures for approximately 24 hours. The LED will also exhibit short green flashes when the battery is low and requires changing. A solid green light indicates the power is OK.

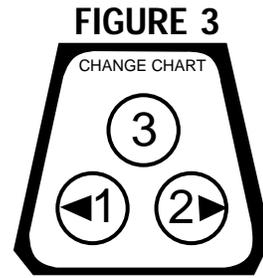
BATTERY LOCATION & REPLACEMENT

6" Recorders: Open door. Battery is located at the upper righthand corner.

SETTING THE ALARM SET POINT

Press the "change chart" button (#3) to bring the pen arm off the chart. When the button is pressed again, the pen comes onto the chart.

The pen arm stops briefly at the edge of the chart. The pen arm then moves to the control set point position and the green LED light turns off. This continues for five (5) seconds during which time the set point can be adjusted using the left (#1) and the right (#2) arrows. (See Figure 3.)



HOW TO CHANGE SETUP

The recorder has been shipped preprogrammed with multiple ranges. There is a sticker on the front side of the unit with a description of each setup number. In order to select between the setups, push the "change chart" button and let the pen come off the chart. Press and hold for five seconds either the left or right arrow. Release the arrow. The LED will begin to flash. By simply counting the flashes you will know the setup number.

The setup number can be changed by briefly pressing the left and right arrows to increase or decrease the count. Once the desired setup number is flashing, press the "change chart" button to bring the pen arm back to the chart. Recording will begin in the new setup.

NOTE: Changing ranges may require slight offset calibration check (See "TEMPERATURE CALIBRATION CHECK" on page 27.)

COBEX Model #C-921

Description:

6" Skeleton Electronic Recorder

One Relay Output

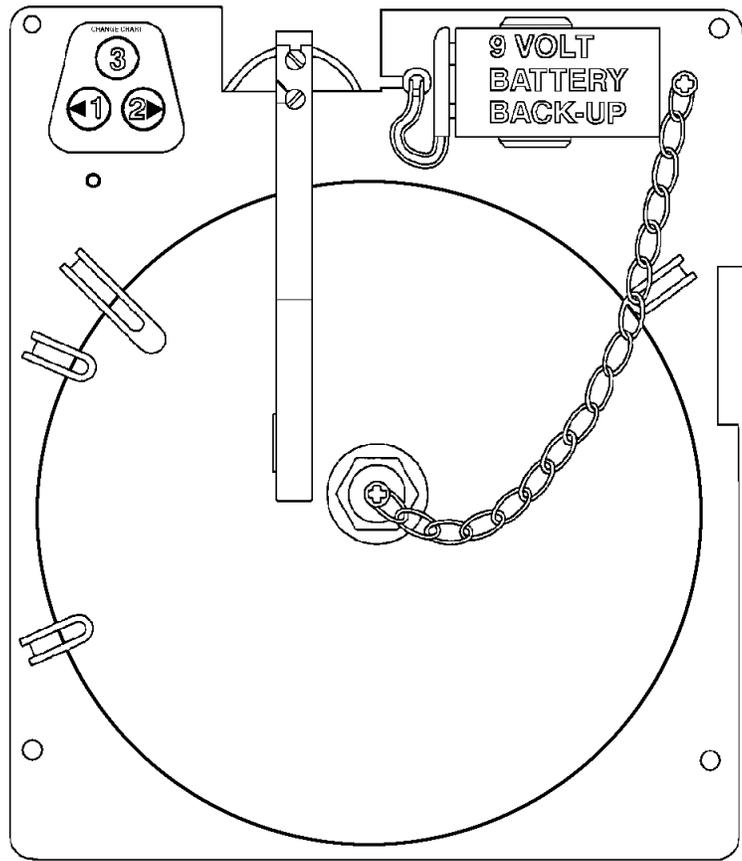
Dual Voltage 110/220V - 50/60 Hz.

9-volt Battery Back-up

Chart Paper - Ink Chart

Refer to Cabinet Wiring Diagram (Control Panel section for proper connection information).

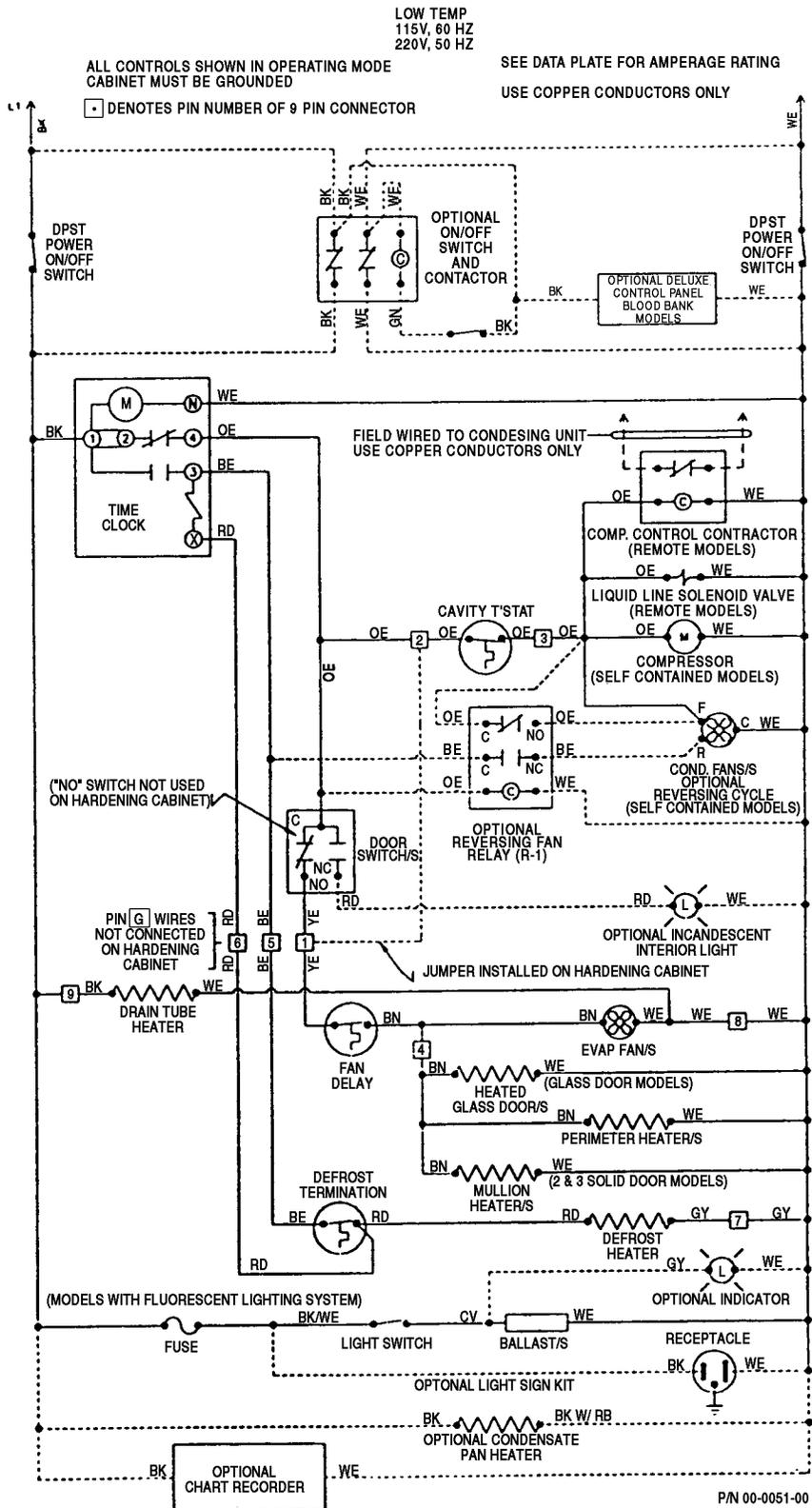
CHART PAPER BY CHART RECORDER & TEMPERATURE RANGE			
Type of Cabinet	Temperature Range	Box of Charts Part No.	Settings Setup Number
Base Model Freezer	-45°C to 0°C	197078	4



LADDER WIRING DIAGRAM

*See page 33 for information on transformer.

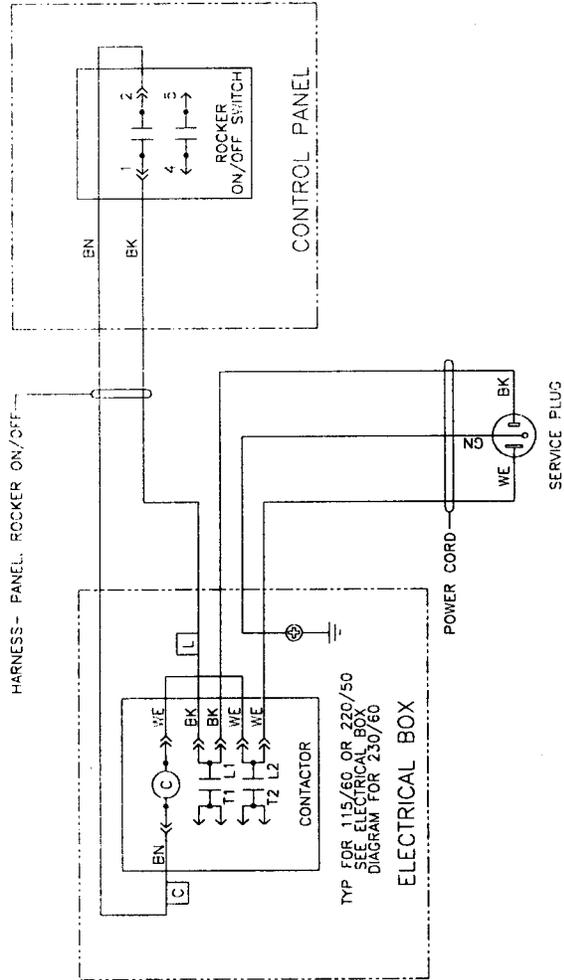
Models: 3795 / 3797 / 3799 & Export Models: 3796 / 3798 / 3800



WIRING DIAGRAM

*See page 33 for information on transformer.

Models: 3795 / 3797 / 3799 & Export Models: 3796 / 3798 / 3800

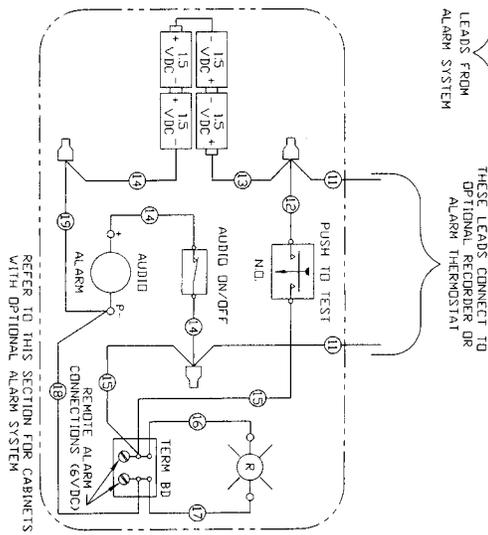
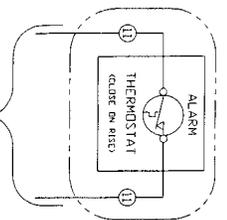
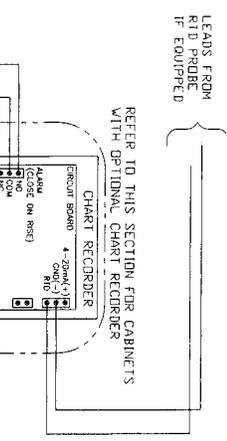
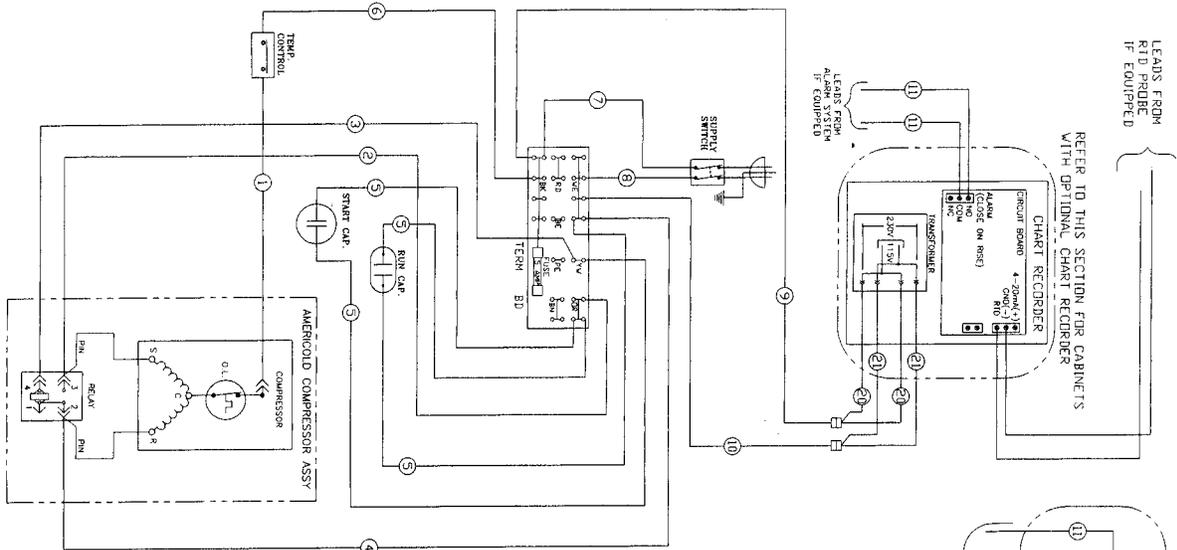
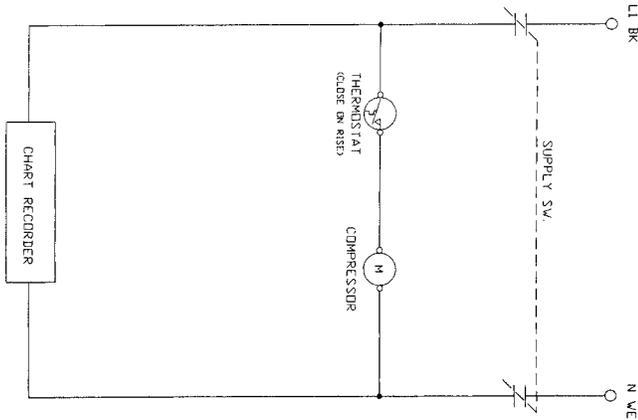


OPTION #2- ROCKER ON/OFF SWITCH *GR-03

WIRING DIAGRAM - 3801 & Export Model: 3802*

*See page 33 for information on transformer.

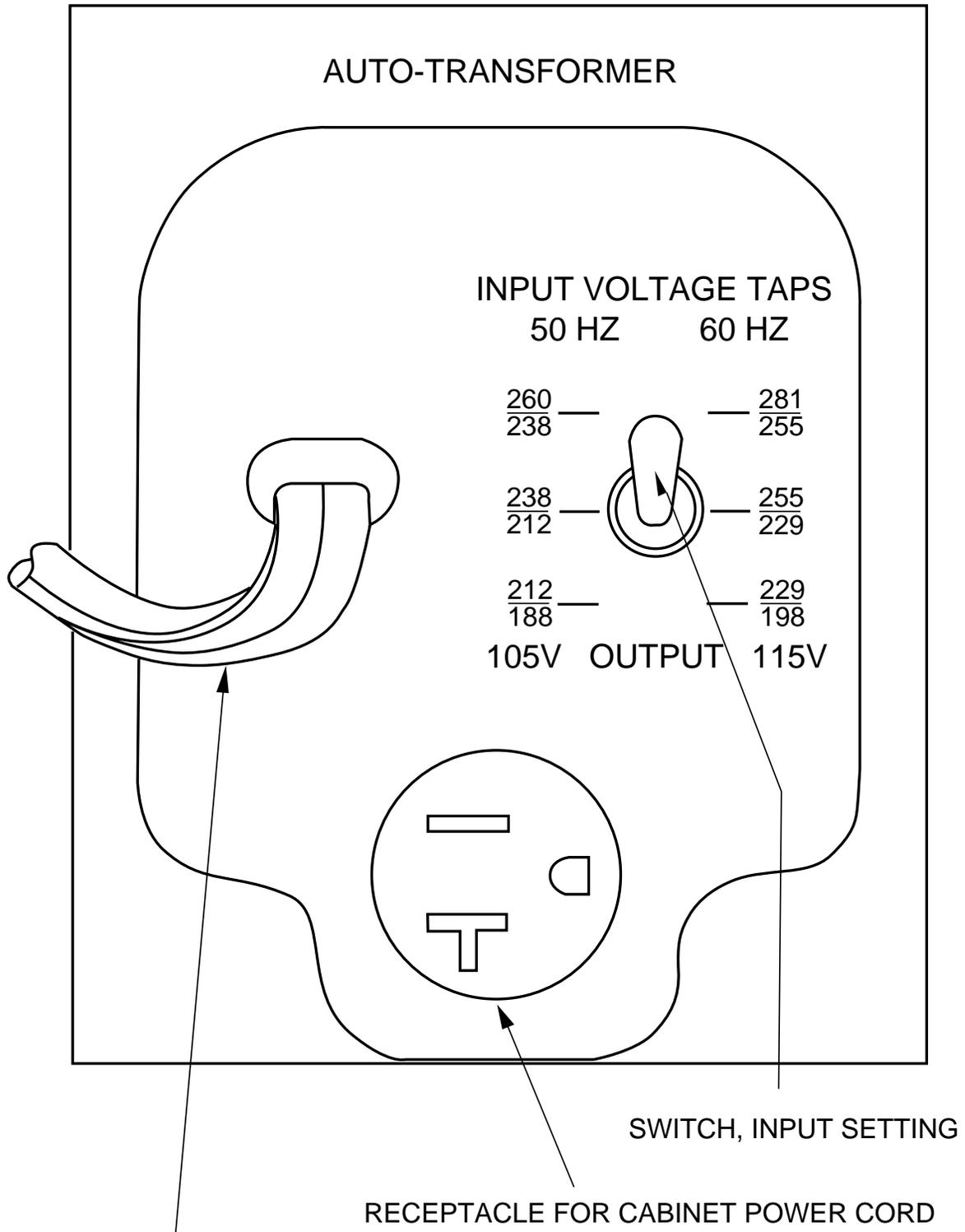
F	REVISE VIEW OF COMPRESSOR SWITCHED LEADS TO 3 & 4	REV 1	12-11-81	3801
E	CONNECTED WIRE ON DR. LEADS 2 & 3	REV 2	6-3-79	3801A
D	REVISE VIEW OF CHART RECORDER THERM. 15-452-01	REV 3	12-16-78	3801-3802
C	REWORKED WIRING ON LEADS TO MATCH ACTION RELAY ON	REV 4	7-27-77	3801-3802
B	REWORKED WIRING ON LEADS TO MATCH ACTION RELAY ON	REV 5	11-21-76	3801-3802
A	REWORKED WIRING ON LEADS TO MATCH ACTION RELAY ON	REV 6	9-23-76	3801-3802
1	PRODUCTION RELEASE	REV 7	9-23-76	3801-3802



20	12-A-1054-03	WHITE THERM. SSY
19	12-A-1054-02	BLACK THERM. SSY
18	18R015012A	18R015012A
17	18R015011A	18R015011A
16	18R015010A	18R015010A
15	12-A-1054-01	CREED THERM. SSY
14	18R015009A	18R015009A
13	18R015008A	18R015008A
12	18R015007A	18R015007A
11	18R015006A	18R015006A
10	18R015005A	18R015005A
9	18R015004A	18R015004A
8	18R015003A	18R015003A
7	18R015002A	18R015002A
6	18R015001A	18R015001A
5	18R015000A	18R015000A
4	18R014999A	18R014999A
3	18R014998A	18R014998A
2	18R014997A	18R014997A
1	18R014996A	18R014996A

RD = RED	GN = GREEN
BK = BLACK	PE = PURPLE
BN = BROWN	GY = GRAY
VE = WHITE	IN = VAN
DE = DRUMMER	LV =
CA =	WIRE TYPE
DA =	WIRE CODE
GA =	WIRE DETAIL
PA =	WIRE
QA =	WIRE
RA =	WIRE
SA =	WIRE
TA =	WIRE
UA =	WIRE
VA =	WIRE
WA =	WIRE
XA =	WIRE
YA =	WIRE
ZA =	WIRE
AA =	WIRE
BA =	WIRE
CA =	WIRE
DA =	WIRE
EA =	WIRE
FA =	WIRE
GA =	WIRE
HA =	WIRE
IA =	WIRE
JA =	WIRE
KA =	WIRE
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TRANSFORMER LAYOUT



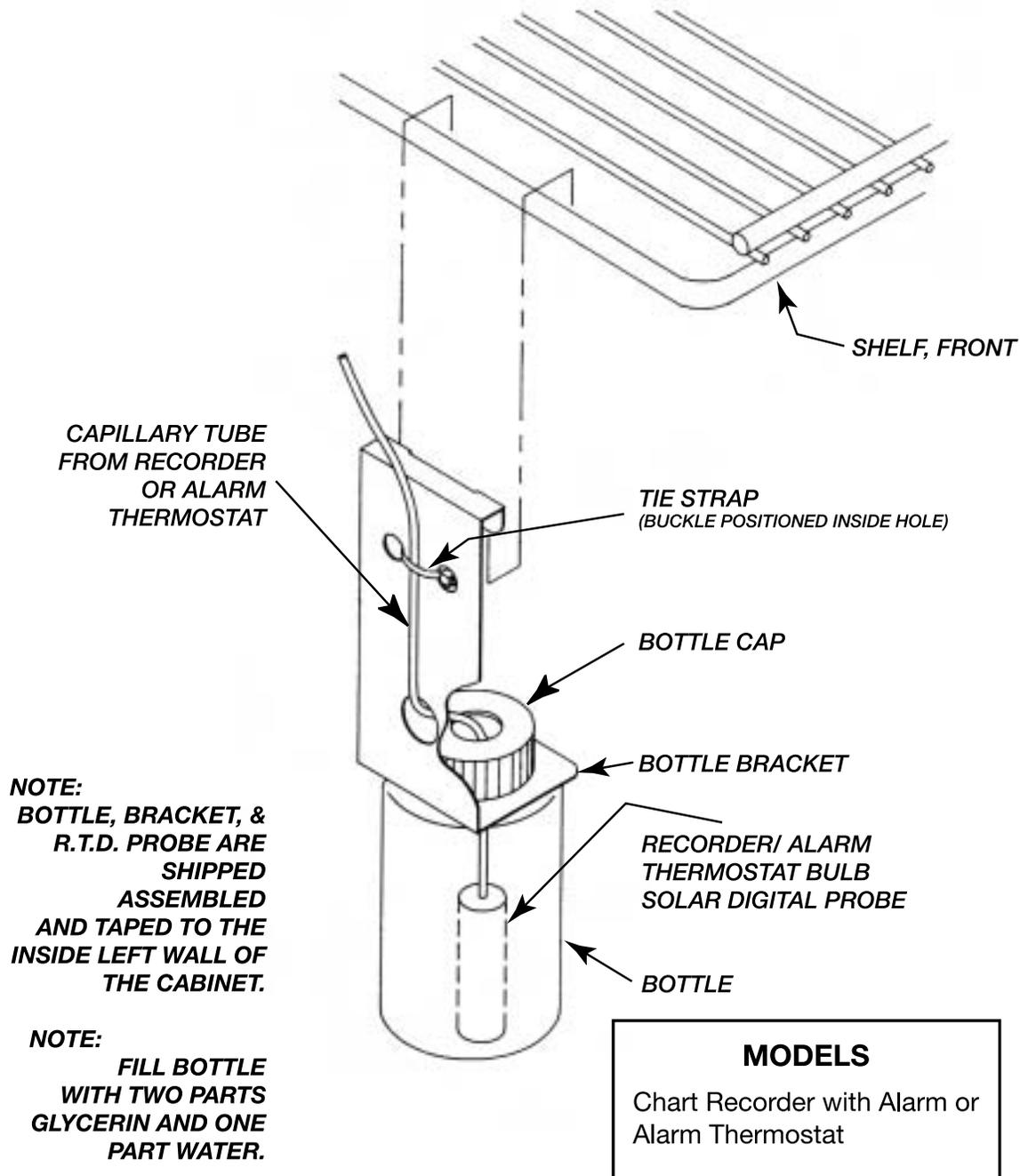
TRANSFORMER POWER CORD; PLUG INTO WALL OUTLET

NOTE: Appropriate plug to be determined upon installation by a licensed electrician in accordance with national electrical code, local codes and ordinances.

TEMPERATURE PROBE BOTTLE INSTRUCTIONS

Some applications call for the thermal bulb from the alarm chart recorder (and solar digital thermometer) to be immersed in a bottle of solution (two parts glycerin, one part water).

This will reduce the air temperature swing as indicated.



(Bottle location for standard shelving applications.)

SECTION III

Maintenance & Repair

Thermo Forma requires compliance to all Federal and Local CFC reclamation laws by service companies engaging in system processing.

WARNING

To avoid the possibility of an electrical shock, turn OFF the thermostat and unplug the power cord of the cabinet before cleaning or touching electrical connections or parts.

MAINTENANCE & REPAIR

PRE-SERVICE CHECK LIST

You may avoid the cost and inconvenience of an unnecessary product call by first reviewing this check list of the most frequently encountered situations that are not the result of defective workmanship or materials.

COMPRESSOR RUNS TOO MUCH

1. A refrigerated cabinet automatically compensates for product loading by running longer and more often. Before calling for service, check running time for at least one hour the first thing in the morning (before store traffic starts).
2. Be sure the doors seal. A faulty gasket seal will cause increased running time.
3. Check the room temperature. The warmer the room, the more the compressor will run.
4. Check the condenser to be sure the face is clean. Dirt and lint will raise pressures and increase running time. Use a brush or vacuum to clean the condenser.
5. Be sure condenser fan operates.
6. Check to see that evaporator fans are running.
7. If product is too cold, try setting the Temperature Control (thermostat) warmer. This will result in warmer cabinet temperature and reduced running time.
8. Check insufficient ventilation to condenser.

CABINET DOES NOT OPERATE

1. Be sure cabinet is plugged in.
2. Check that breakers or fuses are good and all switches in the supply line are ON.
3. Be sure that cabinet Master Power Supply Switch is ON.
4. If you are in an area with voltage problems, try shutting off all non-essential electric equipment

LIGHT IS OFF

1. If the cabinet is operating, be sure the lamp is properly seated in sockets.
2. If cabinet is not running, check that Master Power Supply Switch and Light Switch are ON, fuses are okay, no switch in the supply is OFF, and that the cabinet is plugged in.

CUSTOMER COMPLAINT ON STORED PRODUCT

1. Check cleaning solutions used inside cabinet.
2. Check cleaning solutions, paint, or other contaminants used in store maintenance.
3. Sometimes the ingredients used in some products or

containers will contaminate other products.

4. **Be sure to follow a weekly schedule for cleaning cabinet interior.**

SERVICE

In the event of a malfunction, damage to the cabinet, or if the cabinet requires service beyond the items in the "Pre-Service Checklist," contact your local service company or the dealer from whom the cabinet was purchased.

POWER FAILURE

Do not open the cabinet doors unnecessarily if power is cut off due to electrical failure. The cabinet will start up if the power supply returns, but will require sufficient time to reach maximum cold storage performance.

CABINET FAILURE

1. If the cabinet has stopped operating, check that the cabinet is securely plugged in and turned on. Contact a licensed electrician to locate and correct any power supply problems.
2. Provisions for other storage of the product may be required to prevent spoilage.

If you call for service, describe your problem and give the following information to the service representative:

Cabinet Model No. _____

Serial No. _____

(These numbers are located on a silver serial number rating plate in the upper left side of the cabinet interior.)

TOOLS:

To provide full service diagnostics and repairs on these cabinets, the following tools are needed:

A Multimeter

An Electronic Leak Detector

An Electronic Micron Gauge

A Vacuum Pump capable of pulling to 50 microns

Four Hand Valves

A Compound Gauge Set

A cylinder of nitrogen with a regulator capable of 10 to 400 pounds.

Standard refrigeration hand tools, e.g.: wrenches, tube cutter, swage and flare tools, wire strippers, wire crimpers, wire cutters, slot and phillips head screwdrivers.

PRODUCT HISTORY

The first rule in servicing a refrigeration system is to determine if the problem is an electrical or mechanical failure.

First, try to obtain the product's history of operation from the customer. This will help identify the source of the problem.

Good facts from the cabinet user can help identify whether the problem is electrical, within the refrigeration system, or a "misapplication by the user". Get the history of operation and failure by asking these questions:

- 1) Were there any brown-outs or power outages that they are aware of?
- 2) Is the cabinet on a dedicated circuit?
- 3) Has any other equipment in this area had operational problems?
- 4) When was the last time the cabinet's operation was confirmed as working properly?
- 5) When was a problem noticed?
- 6) How long has the equipment run without this problem? (Years? Weeks? Days? Hours?)
- 7) Was anything tried prior to your arrival?
- 8) What is the cabinet being used for?
- 9) Frequency of door openings?

The refrigeration system should only be entered if it is absolutely necessary. It is critical that a clean, uncontaminated system be maintained.

If a system is unable to reach the proper operating temperature, a test of the unit's mechanical refrigeration components is required.

COMPRESSOR EFFICIENCY TEST

To test the compressor, place compound gauge on the compressor's suction port.

While the compressor is running, close off the suction line so that only the port and valve are part of the compressor's low side.

When the valve is closed and vacuum has started, time how long it takes to pull the compressor's low side to its lowest possible vacuum.

Compressors used on Thermo Forma cabinets should be capable of pulling at least 20 to 22 inches of vacuum in less than 40 seconds.

Next, shut off the compressor and watch the gauge. A one or two inch rise in pressure is acceptable, since a small amount of freon may remain on the low side of the compressor, after which the reading should stabilize.

If the pressure continues to rise, the discharge reeds in the valve head have failed, allowing high pressure gas to return to the compressor.

If the compressor pulls less than 20 inches, the suction reeds have failed.

If the compressor takes longer than 40 seconds to pull to its ultimate low vacuum, one or both cylinders are not functioning as they should. Any reading less than these will require replacement of the compressor.

ENTERING THE SYSTEM

Entering the system should only be done as a last resort. Extreme care must be used no matter what the reason for entering the system. Of course there are times when it cannot be avoided, such as component or compressor replacement, or a leak within the system.

The system must also be entered any time you need to obtain the operating pressures. Again, use extreme caution to avoid any possible contamination.

Cabinets that use hermetic compressors do not have valve ports, so Thermo Forma has designed process stubs for both suction and discharge sides of the system.

Line taps should only be used to obtain pressure readings, and not for the reprocessing of the system. The opening of a line tap is too restrictive for the pressure of vacuum procedures.

On a hermetic compressor system, once you have determined that reprocessing a system is required, recover refrigerant and remove the line taps.

Install hand valves at the process stub ends. Hand valves will be less restrictive to flow because of a larger opening. They will also be easier to use during repair procedures.

EVACUATION

Once the system has been cleaned and components have been replaced, you are ready to initiate the final servicing procedures necessary to achieve proper cabinet operation. Drier should be replaced prior to system processing.

Pull an evacuation to approximately 50 microns.

CHARGING

You should use a charging cylinder to measure in the correct amount of refrigerant. The charging methods are:

Weigh in the refrigerant using a scale calibrated in ounces.

The cabinet's operation is now ready to be tested. A final check of the refrigeration lines should be made before running the cabinet.

Be sure the refrigeration lines are not kinked or rubbing against each other.

Also check that the door seals properly. An air leak will affect proper operation, and the cabinet's ability to reach its coldest temperature

Run the cabinet at both 100% run, and a cycling temperature for at least 24 hours. If the temperature and pressures are correct, the system can be considered repaired.

Hermetic systems should now have their process stubs pinched off, hand valves removed and the ends brazed shut.

Triple evacuation method should be used along with the following equipment:

1. Manifold gauge set with shut off valve.
2. Two-stage high vacuum pump.
3. Electronic vacuum gauge.

NOTE: *Final system valve off of 500 microns should be obtained.*

COMPRESSOR INSTALLATION & MAINTENANCE

TO CHANGE THE COMPRESSOR:

1. Disconnect the power supply to the cabinet.
2. Disconnect the power supply leads at the compressor.
3. Disconnect wires to relay and capacitors.
4. Remove relay and starting capacitor and install on new compressor.
5. Remove defective compressor from condensing unit base.
6. Set new compressor in place.
7. Reconnect relay and capacitor wires.
8. Reconnect power supply lead.
9. Leak test, evacuate, and weigh in charge.

CHANGING DRIER

If flare connected, make sure flares and faces of fittings on new drier are clean and in good condition before installing new drier.

If sweat connected, clean tubing close to original drier before cutting tubing in clean area. Check that ends of the replacement drier are clean, then make brazed connection using as little heat as possible.

Cut tubing only with tube cutters, not hacksaws, to avoid metal filings from entering the system. Driers must be replaced any time you enter the system, except when you are obtaining pressures.

SERVICE VALVES

The compressors on some cabinets have service valves for measuring suction and discharge pressures.

Two types are used. The first type is connected directly to the compressor body or shell and back seats to connect gauges to the access port. The second (Schrader type) is on the end of a process tube and requires a gauge or charging line with a depressing pin to open valve when the connection is made.

CAUTION

This type valve should be tightly capped except when making the gauge connection.

TO CHECK FOR OPEN WINDINGS

Use a multimeter. Measure ohms between "C" and "R" and between "C" and "S."

Add these values together. The resistance should equal S to R.

If there is no reading, the compressor winding or windings are open and the compressor should be replaced.

TO CHECK FOR GROUNDED COMPRESSOR

Use multimeter. Touch probe from each terminal to an unpainted surface of compressor body. If there is no ground, there will be no change of the meter.

WARNING

Be Careful Not to Touch Uninsulated Parts of the Meter Probes.

A reading indicates a ground and the compressor should be replaced.

If there is voltage at the compressor terminals and the compressor tries, but does not run, check voltage at the compressor terminals while attempting to start the compressor. If the voltage at the compressor terminals is below 20% of the nameplate voltage, it is possible the motor may not have developed sufficient torque to start. Check to determine if:

- A. Wire sizes are adequate.
- B. Electrical connections are loose.
- C. The circuit is overloaded.
- D. The power supply is adequate.

A defective relay or capacitor may prevent the compressor starting.

TO CHECK OUT THE RELAY

1. Disconnect the cabinet from the power supply.
2. Remove the wires from the relay.
3. Touch probes to the contact terminals. Meter should show infinity if closed.
4. Touch probes to the terminals of coil. The meter should show a resistance reading.

If items 3 and 4 are O.K., relay is good. If items 3 and 4 are not as indicated, change relay.

TO CHECK CAPACITORS

1. Disconnect the cabinet from the power supply.
2. Make sure the capacitors are discharged before checking. (Shunt across the terminal of capacitor with a heavy insulated wire.)
3. Remove the wires from the capacitors.
4. Any capacitor found to be bulging, leaking, or damaged should be replaced.
5. Use a multimeter to check the **run and start** capacitors for shorts or open circuits.

With a good capacitor, the indicator should first move to a reading and then gradually increase to infinity.

If there is no reading change, an open circuit is indicated.

If the multimeter remains on a low resistance reading, a short circuit is indicated.

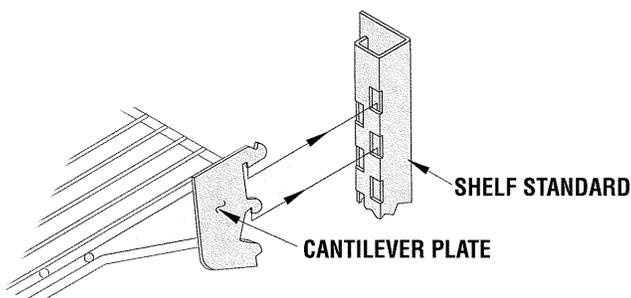
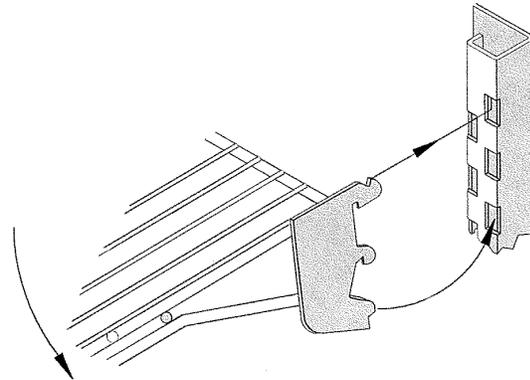
On run capacitor, touch probes to metal case and each terminal. If meter show any reading, a ground is indicated. All defective capacitors should be replaced.

SHELVING/DRAWER Installation & Adjustment

To install shelves or drawers in a level position, insert the cantilever plate tabs into the rectangular holes in the desired position on the shelf standard. Lower the rear of the shelf so that the slots in the plate are completely down over the bottom of the holes.

NOTE: Supporting the front of the shelf with one hand while pushing down on the rear of the shelf will help ease installation.

To slope shelves, insert the cantilever plate tabs into the rectangular holes in the desired position on the shelf standard. Lift up on the rear of the shelf so that the top tab is locked behind the top of the rectangular hole. Hold the rear of the shelf up while lowering the front of the shelf until the bottom tab is inserted in the appropriate hole in the shelf standard.



EVAPORATOR DRAIN PAN REPLACEMENT

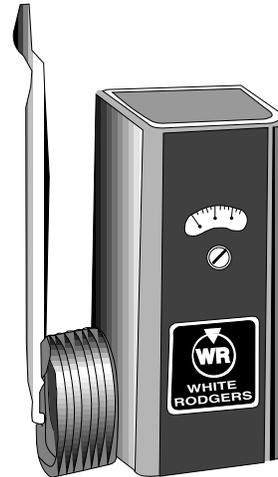
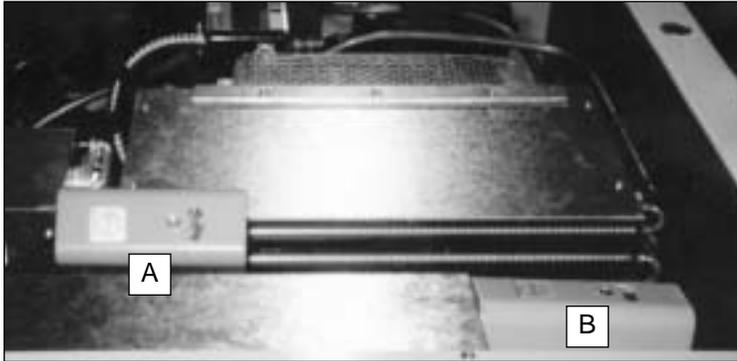
The evaporator drain pan is located in the upper interior of the cabinet. It pivots down for ease of accessibility.

1. Disconnect the power to the cabinet
1. Release R.H. and L.H. quarter-turn fasteners.
2. Drop the front of the pan and swing it down.
3. Disconnect the ground wire.
4. Raise the pan, unhook from back.
5. Remove the drain line from the drain hole.
6. Remove the pan from the cabinet.
7. Reconnect the power to the cabinet.



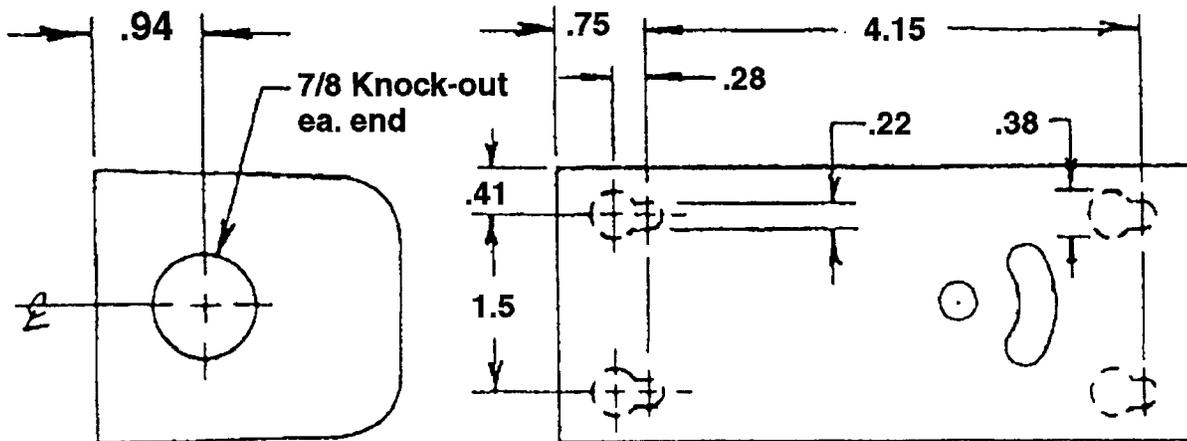
THERMOSTAT REPLACEMENT

The thermostat is located just behind the control panel and can be accessed by removing the control panel or with the use of a small step ladder. The thermostat is secured to the electrical wiring enclosure (**Fig. A**). The optional alarm thermostat is attached RH side of the control panel (**Fig. B**). It can be set depending on customer requirements.



1609-101

Type	Range °F	Diff. °F	Capillary Length	Bulb Size	Switch Action	Full Elec. Rating	Motor Rating (Full Load)	
							120v AC	240v AC
1609-10	-30 to +90 (-34 to +32°C)	Adj. 3 1/2 to 40 (2 to 22°C)	5 ft.	5 3/4 x 3/8"	Close on Rise	FGH	16A	8A

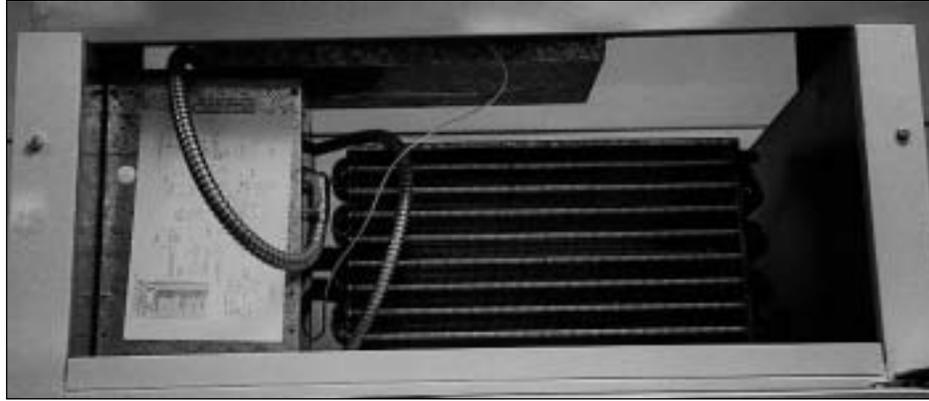


MOUNTING HOLES

CONDENSER & ELECTRICAL BOX ACCESS

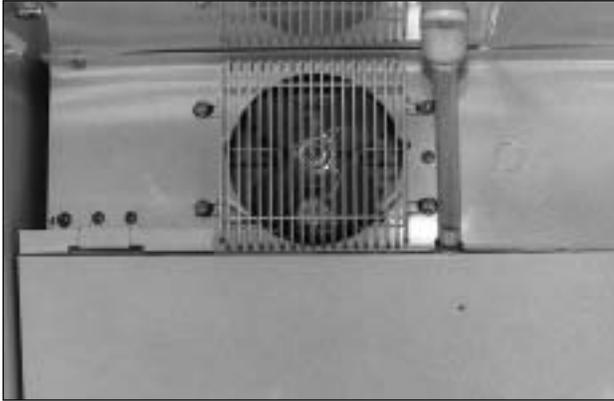
TOP MOUNT MODELS

Electrical box can be accessed by removing front grill or control panel. There are tabs on each end of control panel top. Remove lock down screws and lift up on panel. By lifting panel, the key slots disengage from the shoulder bushing located on each end of the panel.

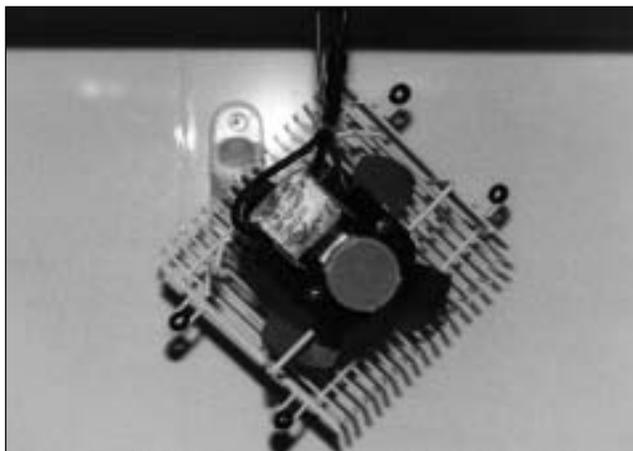


EVAPORATOR FAN MOTOR REPLACEMENT

The evaporator fan motor is located in the cabinet interior behind the evaporator coil.



1. Disconnect the power to the cabinet
2. Remove the screws from the fan guard housing.
3. Drop the motor down out of the fan shroud.
4. Disconnect the power leads to the motor.
5. Place the new motor onto the bracket.
6. Reconnect the power leads.
7. Raise the motor into the fan shroud.
8. Replace the mounting screws.
9. Reconnect the power to the cabinet.

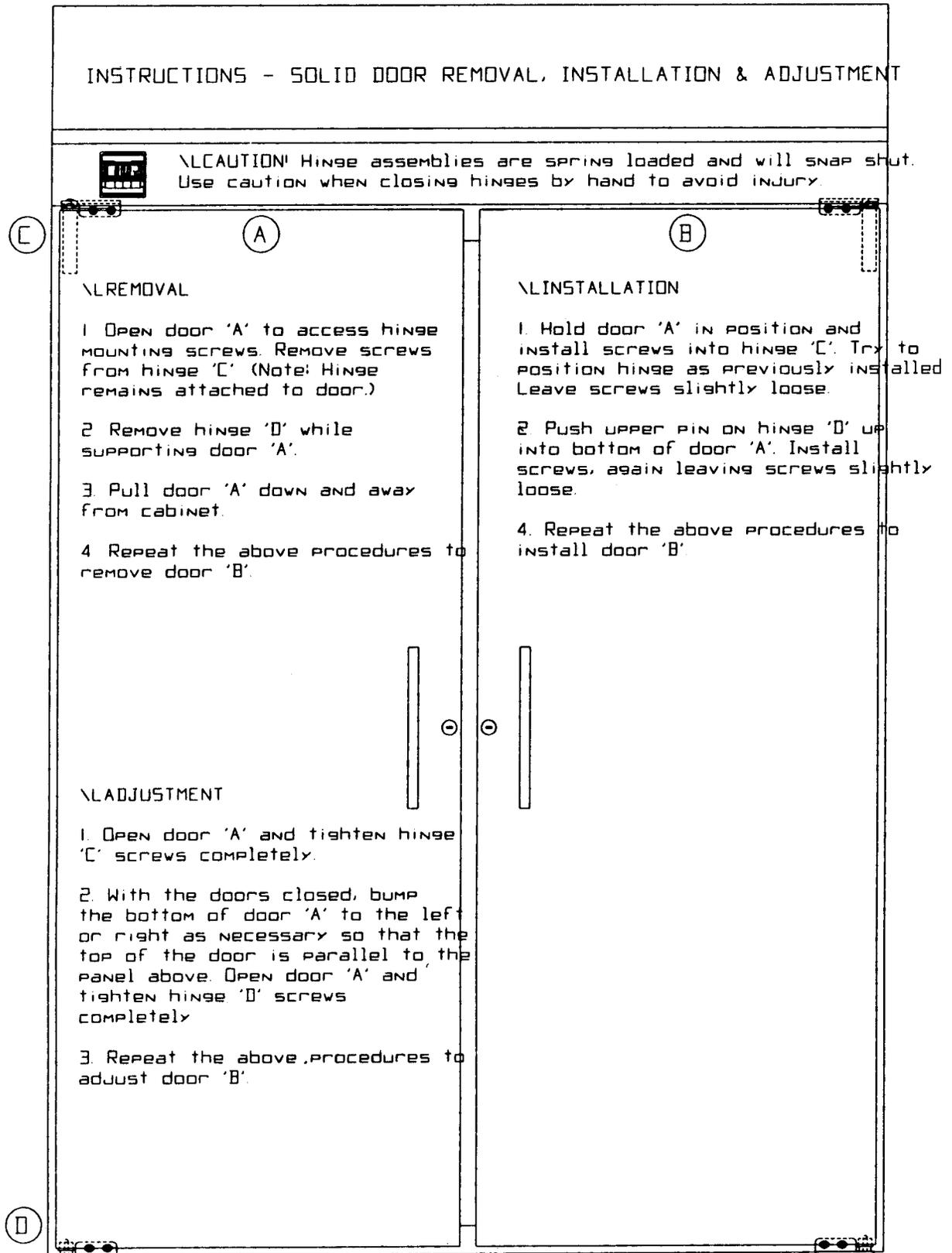


INSTRUCTIONS - SOLID DOOR REMOVAL

Installation & Adjustment

INSTRUCTIONS - SOLID DOOR REMOVAL, INSTALLATION & ADJUSTMENT

 **CAUTION!** Hinge assemblies are spring loaded and will snap shut. Use caution when closing hinges by hand to avoid injury.



(A)

(B)

(C)

(D)

REMOVAL

1. Open door 'A' to access hinge mounting screws. Remove screws from hinge 'C'. (Note: Hinge remains attached to door.)
2. Remove hinge 'D' while supporting door 'A'.
3. Pull door 'A' down and away from cabinet.
4. Repeat the above procedures to remove door 'B'.

INSTALLATION

1. Hold door 'A' in position and install screws into hinge 'C'. Try to position hinge as previously installed. Leave screws slightly loose.
2. Push upper pin on hinge 'D' up into bottom of door 'A'. Install screws, again leaving screws slightly loose.
4. Repeat the above procedures to install door 'B'.

ADJUSTMENT

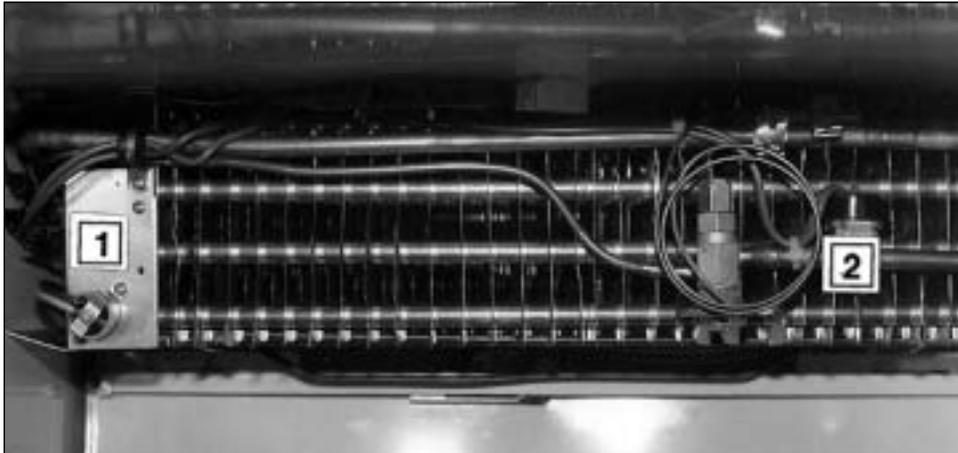
1. Open door 'A' and tighten hinge 'C' screws completely.
2. With the doors closed, bump the bottom of door 'A' to the left or right as necessary so that the top of the door is parallel to the panel above. Open door 'A' and tighten hinge 'D' screws completely.
3. Repeat the above procedures to adjust door 'B'.

FAN DELAY & DEFROST TERMINATION CONTROL REPLACEMENT

FAN DELAY: FIG. 1

1. Disconnect power supply from cabinet.
2. Turn two (2) quarter turn fasteners located at each end of the evaporator drain pan.
3. Remove the thermodisc and contact bracket from the coil. Remove two (2) screws that hold the delay to the bracket.
4. Disconnect the delay at the ring bundle.
5. Replace with correct part in reverse order.

Close - 32° / Open 52°



DEFROST TERM. CONTROL: FIG. 2

1. **CAUTION: Disconnect the power supply from the cabinet.**
2. Turn two (2) quarter turn fasteners located at each end of the evaporator drain pan.
3. Remove the thermodisc retainer clip.
4. Cut the wire ties that hold the wire to the copper tubing.
5. Remove the thermodisc and contact bracket to access the wiring bundle.
6. Install with the correct part. Retie at the wiring bundle and resecure the disc to the suction line.

Close - 30° / Open 60°

DEFROST HEATER REPLACEMENT

DISCONNECT THE POWER SUPPLY TO THE CABINET.

1. Turn quarter turn fasteners located on each end of the evaporator pan assembly.
2. Evaporator drain pan assembly will hinge down.
3. The defrost heater is located beneath the evaporator coil. Remove the wire retainers that hold the heater in the slotted fin area.
4. Carefully install the new part being careful to not damage the fin coil.
5. Reconnect the wiring and retie with plastic straps.

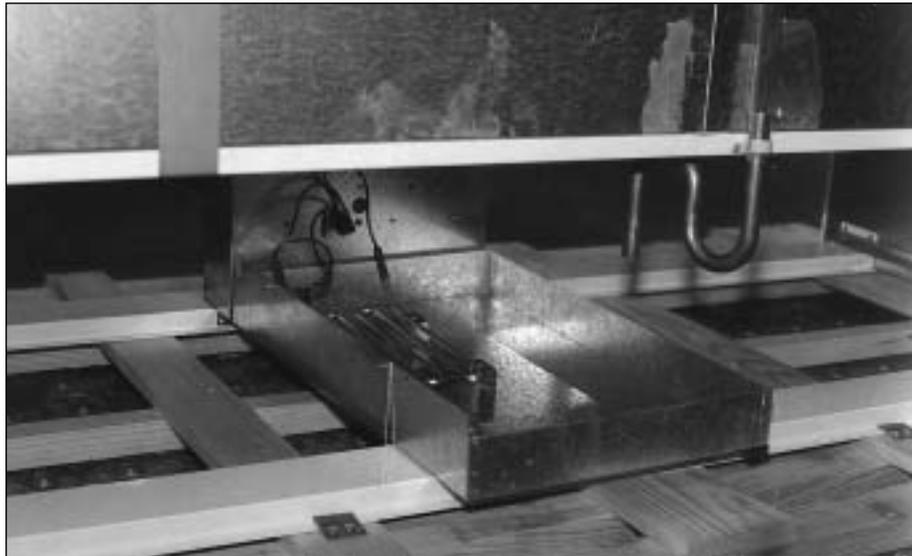


2 & 3-DOOR CONDENSATE HEATER REPLACEMENT

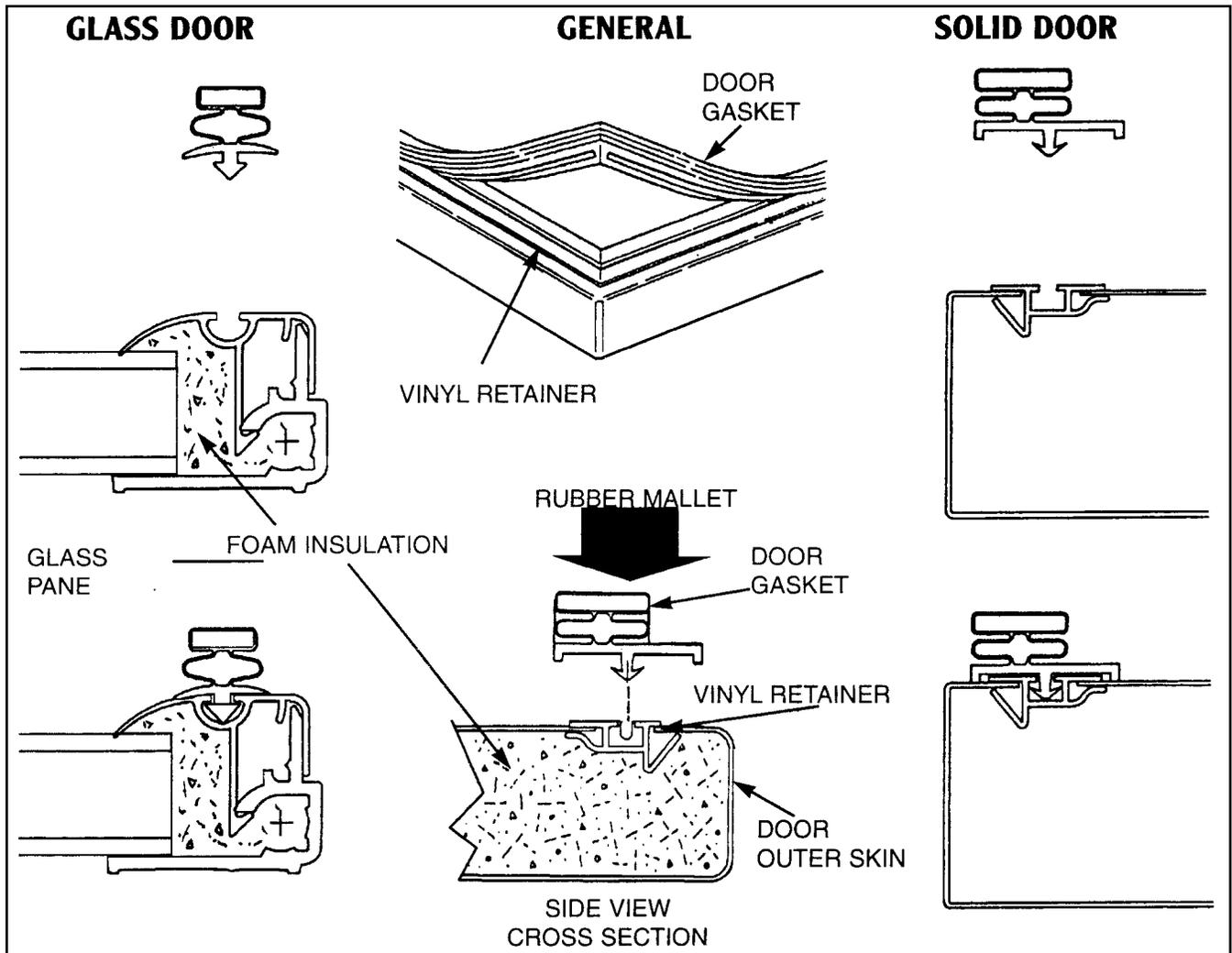
1. Disconnect power to the cabinet.
2. Disconnect the heater lead from the back of the electrical box.
3. Determine if the heater thermodisc is open. If not, remove heater from the bracket tabs.
4. Install with the correct part number, mount, and reconnect.

CAUTION!!

WIRES SHOULD BE WIRE-TIED UP AND AWAY FROM THE CONDENSATE PAN!



DOOR GASKET REPLACEMENT

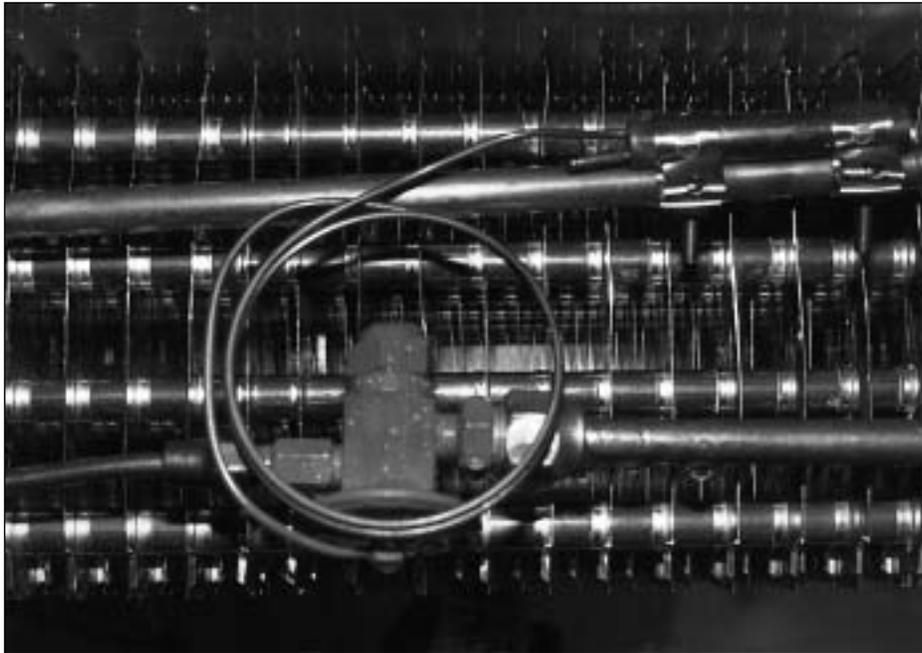
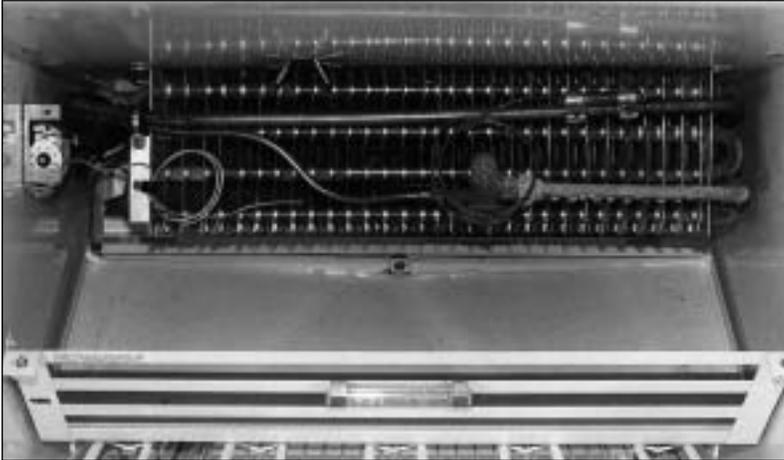


Thermo Forma gasketing is replaceable on glass or solid door models. A retainer is molded into the door frame. The door gasket is then tapped into the retainer and secured for airtight door seal.

1. Remove door from cabinet.
2. Lay door front down on a flat, firm, nonscratch surface.
3. Pry up one corner of gasket with a putty knife or screwdriver. Pull gasket from perimeter of door retainer. Clean new gasket and straighten to insure proper fit.
4. Pull gasket from perimeter of door retainer.
5. Clean new gasket and straighten to insure proper fit.
6. Place gasket over retainer in door frame.
7. Using a rubber mallet, tap the gasket into the retainer. (NOTE: Gasket can be soaked in warm water to make pliable.)
8. Place door back onto cabinet.

METERING DEVICE REPLACEMENT

The refrigerant metering device in this cabinet is expansion valve. It is located on the face of the evaporator coil behind the drain pan.



1. Disconnect power to the cabinet.
2. Remove the evaporator drain pan.
3. Isolate the valve from the remainder of the system.
4. Remove the valve and replace with exact part number new valve.
5. Reposition the sensing bulb in original location.
6. Replace the drain pan.
7. Reconnect power to the cabinet.

CONDENSER FAN MOTOR REPLACEMENT

The condenser fan motor is located directly behind the condenser coil in the machinery compartment.

1. Disconnect the power to the cabinet.
2. Remove the front top panel.
3. Remove the metal screen fan guard.
4. Disconnect the wire at the junction box.
5. Remove the motor from the fan motor mounting bracket.
6. Replace with correct motor.
7. Reconnect the wires at the junction box.
8. Replace the fan guard screen.
9. Replace the top front panel.
10. Reconnect the power to the cabinet.



MASTER POWER SUPPLY SWITCH REPLACEMENT

The master power supply switch on the top mount cabinets is located on the front top panel.

1. Disconnect the power to the cabinet.
2. Remove the front panel by removing 2 retainer screws located on the top of the cabinet and then lifting to disengage.
3. Remove the control panel rear cover.
4. Detach switch leads.
5. Remove the rocker power supply switch by depressing the plastic retainer clips and pushing.
6. Replace with new switch.
7. Reattach the electrical leads.
8. Replace the cover with the screws
9. Replace the front panel.
10. Reconnect the power to the cabinet.



DIGITAL THERMOMETER –BATTERY REPLACEMENT

The thermometer can easily be removed by:

1. Remove two retaining screws located at the top front edge of the control panel.
2. Lift the panel up. This will disengage the key slots at the rear of the panel.
3. Rest control panel on top of the cabinet. Remove the rear cover.

NOTE: If the display is reading LLL the 3v battery needs to be replaced. This can be done without removing the thermometer from the panel.

Remove two plastic nuts and bracket (rear of thermometer). The thermometer can now be removed from the panel.

Remove the thermometer sensing element from its bracket. The sensing element can now be pulled up through the top of the cabinet. Replace sealant when new part is installed.

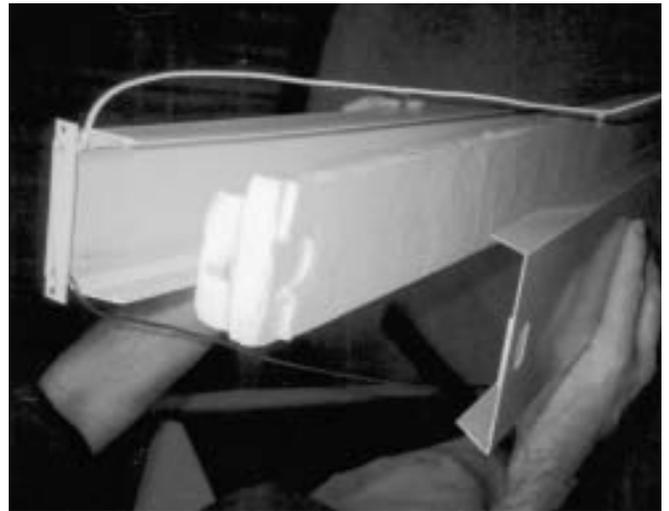
CENTER MULLION HEATER REPLACEMENT

DISCONNECT POWER SUPPLY TO CABINET!

Center mullion heaters not foamed in place on later models. The heater can be accessed from inside the cabinet.

Remove lamp (if applicable).

Spread inner plastic extrusion apart. Working down one side and then the other. Slide a putty knife about 3/4" between mullion back panel and



PERIMETER HEATER REPLACEMENT

1. Disconnect the power supply to the cabinet.
2. Allow trim to warm up.
3. Insert the edge of the putty knife $\frac{1}{16}$ " under the outer flange of the trim breaker.
4. Rotate handle down to approximately 45° .
5. Bump the putty knife handle until breaker trim releases (see figure 1).
6. Remove all trim in the same manner.
7. Locate perimeter heater exit points.
8. Pull defective heater from groove provided.
9. The perimeter heater is plugged into a terminal board located in the upper or lower raceway depending on the application.
10. Install new heater and reseal wire exit points.
11. Replace trim and seal with a silastic compound.

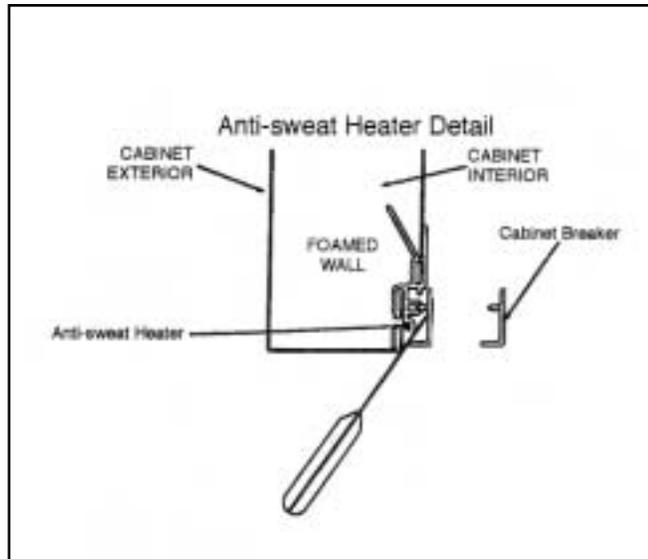


FIGURE 1



FIGURE 2



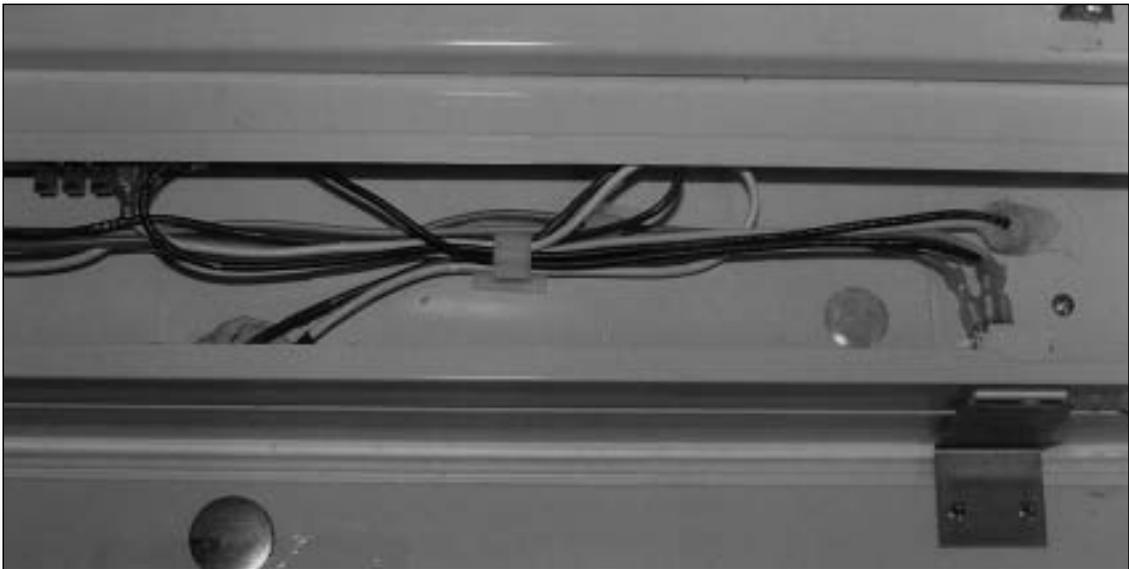
FIGURE 3

CABINET RACEWAY - DOOR SWITCH REPLACEMENT

1. Disconnect the power supply to the cabinet.
2. Access the raceway (top or bottom mount) by removing the front panels.
3. Remove the raceway cover.
4. Squeeze the plastic retainer and pop out of raceway.
5. Disconnect the wires from the switch. (Switch has common normally open and normally closed contacts.)

Terminal board located in this raceway has a number of functions:

1. Power to center mullion heater;
2. Power to perimeter heaters
3. Power to door receptacles.



TOUCH-UP PAINTING INSTRUCTIONS - Spray Paint

1. Sand to bare metal on affected area and its edges until the edges are smooth or feathered. This insures that you are spraying on to a clean area that has adhesion.
2. Use an automotive primer (lacquer) over the bare metal.
3. Scuff sand the primered area lightly.
4. Test spray can before using on cabinet surface. Apply in short, even strokes holding can 10" to 12" from surface, and moving rapidly during use. Apply paint in thin layers (4-5 layers minimum) with air drying time in between coats. Scuff sand very lightly between coats. This will remove uneven spots or roughness and will create a high gloss, smooth finish.
5. Use rubbing compound (preferred) or wax over the finished area after a few days of hardening/drying time.

CLEANING

CAUTION:

Make sure cabinet is disconnected from its power source prior to any cleaning or maintenance.

CLEANING THE CABINET EXTERIOR

Wipe the exterior occasionally with a cloth dampened in mild detergent water; rinse, and wipe dry with a soft, dry cloth. Do not use abrasive or caustic cleaners or scouring pads.

CLEANING THE CONDENSER - FIG. 1

1. Periodic cleaning of the condenser, located in the machinery compartment, can be easily accomplished by brushing the coils with a soft brush and/or using a vacuum cleaner with a brush attachment.
2. Be sure that dirt, dust, and collection of other debris do not build up to a point air circulation through the condenser is restricted.
3. Clean the condenser at least twice a year.

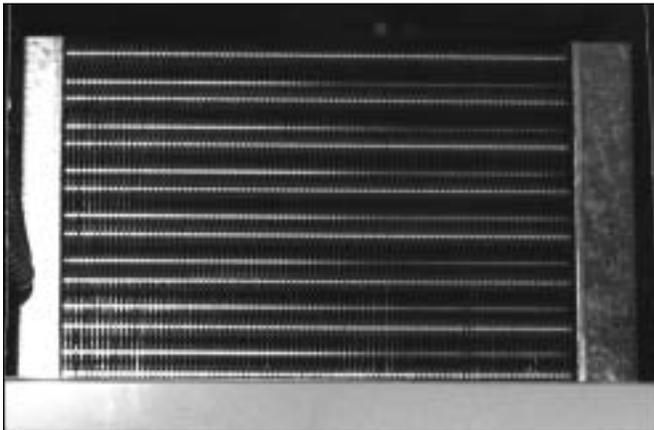


FIG. 1

CLEANING THE STORAGE COMPARTMENT

IMPORTANT: Do not use any objects or cleaners which may leave residues, odors, or particles. Avoid the use of strong chemicals or abrasive cleaners which may damage the interior surfaces and contaminate product within the storage area.

1. Remove product and store in another suitable cabinet, if possible. Be sure to prevent spoilage of the product which may occur if it is left at room temperature.
2. Turn OFF the Master Power Supply Switch.
3. Remove the shelving.
4. Wash the inside surface of the doors and the entire interior storage area with warm water and baking soda solution—about a tablespoon of baking soda per quart of water. Rinse thoroughly with clear water and wipe dry. This procedure can also be used for cleaning the door gaskets.
5. Wash, rinse, and dry the shelving while it is outside of the cabinet, using the same procedure as described for the storage area.
6. Be sure to correctly reinstall the shelving, turn ON the Master Power Supply Switch, check the setting of the Temperature Control, and allow time for cooling of the storage area before storing product.

WARNING

To avoid the possibility of an electrical shock, turn OFF thermostat and unplug the electric cord of the cabinet before cleaning touching electrical connections or parts.

TROUBLESHOOTING GUIDES

UNIT WILL NOT RUN.	Blown fuse.	Check power outlet for "live" circuit. If outlet is "dead" but building has power, replace the fuse. Try to determine the cause of the overload or short circuit.
	Low voltage.	Check outlet with voltmeter. Should check 115V plus or minus 10%. If circuit is overloaded, either reduce load or have electrician install separate circuit If unable to remedy any other way, install auto-transformer.
	Open motor or temperature control.	Jumper across terminals of control. If unit runs and connections are all tight, replace control. Power element may have lost charge or points may be dirty. Repair or replace thermostat.
	Open relay.	Check relay. Replace if necessary.
	Open overload.	Check overload. Replace if necessary.
	Open compressor.	Check compressor. Replace if necessary.
	Open service cord.	Check with ohmmeter at unit, If no circuit and current is indicated at outlet, replace or repair.
	Broken lead to compressors or cold control.	Repair or replace broken leads.
	Service cord not plugged in.	Plug in cord.
CABINET TOO WARM.	Thermostat position set too warm, not allowing unit to operate often enough.	Turn knob to colder position.
	Evaporator or condenser motor not running.	Check and replace fan motor if necessary.
	Shortage of refrigerant.	Check for leaks. Repair, evacuate and recharge system.
	Not enough air circulation around cabinet.	Relocate cabinet or provide clearance to allow sufficient circulation.
	Dirty condenser or obstructed condenser ducts.	Clean the condenser and the ducts.
	Thermostat control capillary not properly installed.	Refer back to removal/installation instructions detailed in this manual.
CABINET RUNS CONTINUOUSLY.	Not enough air circulation around cabinet or circulation is restricted.	Relocate cabinet or provide proper clearance around cabinet. Remove restriction.
	Cooling large quantities of product or heavy loading.	Explain to customer that heavy loading causes long running time.
	Refrigerant charge.	Undercharged or overcharged. Check, evacuate, and recharge with proper charge.
	Room temperature too warm.	Ventilate room as much as possible.
	Thermostat defective.	Check control. If it allows unit to operate all the time, replace control.

NOISY OPERATION.	Loose flooring or floor not firm.	Tighten flooring or brace floor.
	Tubing contacting cabinet or other tubing.	Move tubing gently!
	Cabinet not level.	Level cabinet.
	Compressor mechanically groned.	Replace compressor mounts.
	Fan hitting drain pan or mechanically grounding.	Move fan.
	Shipping bands rubbing.	Make sure all shipping bands have been cut and removed.
	Loose fan blades or motor.	Tighten fan blades and/or motor.
	Loose parts or refrigeration or electrical lines out of place.	Tighten all loose fittings. Move misplaced lines.
UNIT CYCLES ON OVERLOAD.	Shorted relay.	Replace relay.
	Weak overload protector.	Replace overload protector.
	Low Voltage.	Check outlet with voltmeter. Underload voltage should be 115V plus or minus 10%. Check for several cabinets on same circuit or extremely long or undersized cords being used.
CABINET LIGHTS WON'T WORK.	Light switch off or defective.	Try new bulbs. Inspect lampholders for signs of bad connections.
COMPRESSOR WON'T RUN.	Incorrect voltage.	Check voltage to compressor terminal board. Voltage must be plus or minus 10% of nameplate voltage.
UNIT RUNS TOO MUCH.	Abnormally high, heavy use of cabinet.	Heavy useage requires more operation. Check useage and correct or explain.
	Shortage of refrigerant. Unit must run longer and will operate at a lower than normal suction pressure.	Put in the normal charge and check for leaks.
	Overcharge of refrigerant. Excessively cold or frosted suction line results in lost refrigeration effort.	Remove excess charge.
	Restricted air flow over the condenser or air or non-condensable gases in system.	Correct the condition.
	High room temperature.	Check for temperature variance. Correct condion.
	Compressor inefficient.	Replace.
	Thermostat setting too cold.	Raise setting.
PRODUCT TOO COLD.	Thermostat set too cold.	Set warmer. (Setting #1 is the warmest; #7 is the coldest.)
	Room temperature abnormally low.	Correct conditions.
PRODUCT TOO WARM.	Thermostat set too warm.	Set colder. (Setting #1 is the warmest; #7 is the coldest.)
	Thermostat contact points dirty or burned.	Clean or replace thermostat.
	Thermostat out of adjustment.	Readjust or change thermostat.
	Excessive service load or abnormally high room temperature.	Educate customer about problems that are caused by improper loading and excessive room temperature fluctuations.
	Excessive frost accumulation.	Defrost the cabinet.

COMPRESSOR TROUBLESHOOTING

WON'T START. NO HUM.	Open line circuit.	Check wiring, fuses, receptacle.
	Protector open.	Wait for reset — check current.
	Control contacts open.	Check control, check pressures.
	Open circuit in stator.	Replace stator or compressor.
WON'T START. HUMS INTERMITTENTLY. (cycling on protector)	Improperly wired.	Check wiring against diagram.
	Low line voltage.	Check main line voltage, determine location of voltage drop.
	Open starting capacitor.	Replace starting capacitor.
	Relay contacts not closing.	Check by operating manually. Replace relay if defective.
	Open circuit in start winding.	Check stator leads. If leads are all right, replace compressor.
	Stator winding grounded (normally will blow fuse.)	Check stator leads. If leads are all right, replace compressor.
	High discharge pressure.	Eliminate cause of excessive pressure: blocked condenser; defective cond. fan motor; non-condensable in system, etc.
	Tight compressor.	Check oil level — correct binding condition, if possible. If not, replace compressor.
	Weak starting capacitor or one weak capacitor of a set.	Replace.
COMPRESSOR STARTS - MOTOR WON'T GET OFF STARTING WINDING.	Low line voltage.	Bring up voltage.
	Improperly wired.	Check wiring against diagram.
	Defective relay.	Check operation—replace relay if defective.
	Running capacitor shorted.	Check resistances. Replace capacitor if defective.
	Starting and running windings shorted.	Check capacitance — replace if defective.
	Starting capacitor weak or one of a set open.	Check capacitance - replace if defective.
	High discharge pressure.	Check discharge shutoff valves. Check pressure.
	Tight compressor.	Check oil level. Check binding. Replace compressor if necessary.
COMPRESSOR STARTS & RUNS BUT CYCLES ON PROTECTOR.	Low line voltage.	Bring up voltage.
	Additional current passing through protector.	Check for added fan motors and pumps connected to wrong side of protector.
	Suction pressure too high.	Check ventilation, restrictions and over-charge.
	Protector weak.	Check current - replace protector if defective.
	Running capacitor defective.	Check capacitance. Replace if defective.
	Stator partially shorted or grounded.	Check resistances; check for ground. Replace if defective.
	Inadequate compressor cooling.	Correct cooling system.
	Compressor tight.	Check oil level. Check for binding condition.
	Discharge valve leaking or broken.	Replace valve plate on hermetic only.

STARTING CAPACITORS BURN T OUT.	Short cycling.	Reduce number of starts to 20 or less per hour.
	Prolonged operation of starting winding.	Reduce starting load (install crankcase pressure limit valve), increase voltage if low — replace relay if defective.
	Relay contacts sticking.	Clean contacts or replace relay.
	Improper relay or incorrect relay setting	Replace relay.
	Improper capacitor.	Check parts list for proper capacitor rating: mfd. and voltage.
RUNNING CAPACITORS BURN OUT.	Excessive line voltage.	Reduce line voltage to not over 10% above rating of motor.
	High line voltage and light load.	Reduce voltage of over 10% excessive.
	Capacitor voltage rating too low.	Install capacitors with recommended voltage rating.
RELAYS BURN OUT	Low line voltage.	Increase voltage to not less than 10% under compressor motor rating.
	Excessive line voltage.	Reduce voltage to maximum of 10% above motor rating.
	Incorrect running capacitor.	Replace running capacitor with correct mfd. capacitance.
	Short cycling.	Reduce number of starts per hour.
	Relay vibrating.	Mount relay rigidly.
	Incorrect relay.	Use relay recommended for specific motor compressor.

SECTION IV

Parts Lists

REPLACEMENT PARTS LIST:		ONE DOOR		TWO DOOR		THREE DOOR	
DATE	3/23/01						
MODELS		3796-3796	3801-3802		3797-3796		3799-3800
FSLT. 404a		SOLID	SOLID		SOLID		SOLID
DISCRIPTION.		PART #	PART #		PART #		PART #
EVAP. COIL		18-0713-00	XXXXXXXX		18-0713-00		18-0714-00
TXV VALVE		18-0386-04	XXXXXXXX		18-0386-04		18-0386-06
DEFROST HEATER		19-0952-01	XXXXXXXX		19-0952-01		19-0952-03
HEAT. EXCHANGE		50-3771-03	50-4056-02		50-3776-03		50-3776-00
DEFROST TERM.		19-1071-00	XXXXXXXX		19-1071-00		19-1071-00
HARNES. EVAP.		19-1652-01	XXXXXXXX		19-1652-01		19-1652-01
EVAP. FAN DELAY		19-0954-00	XXXXXXXX		19-0954-00		19-0954-00
THERMOSTAT		19-1031-00	19-1222-00		19-1031-00		19-1031-00
EVAP. MOTOR		19-1221-00	XXXXXXXX		19-1221-00		19-1221-00
EVAP. MTR. BLADE		19-1223-00	XXXXXXXX		19-1223-00		19-1223-00
EVAP. FAN GUARD		15-0319-00	XXXXXXXX		15-0319-00		15-0319-00
LAMP HOLDER TOP		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
LAMP HOLDER BTM.		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
PERIMETER HEATER		19-0966-02	XXXXXXXX		19-0966-01		19-0966-01
HARNES. BALLAST		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
MULLION HEATER		XXXXXXXX	XXXXXXXX		19-1657-01		19-1657-01
TRIM BREAKER SIDE		10-0806-02	10-0806-02		10-0806-02		10-0806-02
TRIM BREAKER TOP,BTM.		10-0806-03	10-0806-03		10-0806-10		10-0806-10
DOOR SWITCH		19-0969-00	XXXXXXXX		19-0969-00		19-0969-00
HINGE LOW, RH		25-0178-09	25-0178-09		25-0178-09		XXXXXXXX
HINGE, LOW LH		XXXXXXXX	XXXXXXXX		25-0178-08		25-0178-08
HINGE, UPPER LH		XXXXXXXX	XXXXXXXX		25-0178-02		25-0178-02
HINGE UPPER RH		25-0178-03	25-0178-03		25-0178-03		XXXXXXXX
DEFROST TIMER		24-0513	XXXXXXXX		24-0513		24-0513
RELAY- CONTACTOR		19-1005-00	XXXXXXXX		19-1005-00		19-1005-00
POWER CORD		19-0620-00	19-0620-00		19-0967-00		19-0967-00
LIGHT BALLAST		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
ELEC. BOX HARNES		19-1675-01	XXXXXXXX		19-1675-01		19-1675-01
LIGHT FUSE		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
THERMOMETER DIGITAL		19-1050-03	XXXXXXXX		19-1050-03		19-1050-03
SWITCH, ROCKER		19-1310-00	19-1310-00		19-1310-00		19-1310-00
EVAP. DRAIN PAN		50-3849-01	XXXXXXXX		50-3849-02		50-3849-03
DRAIN TUBE HEATER		19-1240-01	XXXXXXXX		19-1240-01		19-1240-01
SOLUTION, BOTTLE		10-0933-01	XXXXXXXX		10-0933-01		10-0933-01
FLOOR LAMP		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
LIGHT SHIELD. W / ENDS		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
SIDE LIGHT COVER		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
DOOR ASSY. LH.		XXXXXXXX	XXXXXXXX		51-0172-05		51-0172-05
DOOR ASSY. RH.		51-0172-02	51-0172-02		51-0172-06		XXXXXXXX
ACCORDIAN COIL		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
DOOR GASKET		10-0882-05	10-0882-05		10-0882-06		10-0882-06
DOOR, HANDLE		25-5055-00	25-5055-00		25-5055-00		25-5055-00
HINGE, CARTRIDGE		25-0178-01	25-0178-01		25-0178-01		25-0178-01
HOLD OPEN ARM LH.		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
HOLD OPEN ARM RH.		XXXXXXXX	XXXXXXXX		XXXXXXXX		XXXXXXXX
COMPRESSOR		16-0310-00	16-0310-00		16-0322-00		16-0323-00
COMP. O.L.		17-0316-00	17-0316-00		XXXXXXXX		XXXXXXXX
START. RELAY		17-0286-00	17-0286-00		17-0163-00		17-0163-00
START CAP.		17-0291-00	17-0291-00		17-0164-00		17-0165-00
RUN CAP.		17-0288-00	17-0288-00		XXXXXXXX		17-0166-00
COND. FAN MTR.		19-0933-00	XXXXXXXX		19-0933-00		19-0933-00
COND. FAN BLADE		19-0101-00	XXXXXXXX		19-0101-00		19-0101-00
FILTER / DRIER		18-1106-00	12-3024		18-1106-00		18-1106-00
CONDENSER COIL		18-0546-01	18-1214-01		18-0546-01		18-0546-01
HELPER KIT		51-1046-06	51-1046-06		51-1046-01		51-1046-01
CONDENSATE PAN		02-0757-00	XXXXXXXX		02-0757-00		02-0757-00
CONDENSATE PAN HTR.		19-1688-00	XXXXXXXX		19-1688-00		19-1688-00
LEG KIT		33-0504-01	33-0504-01		33-0504-01		33-0504-01
CRO VALVE		XXXXXXXX	XXXXXXXX		XXXXXXXX		18-0315-00

REPLACEMENT PARTS LIST: OPTIONS		
DATE	3/23/01	
DISCRIPTION.	PART #	
TRANSFORMER EXPORT	24-0531	
INTERIOR LIGHT SWITCH	19-1003-00	
ALARM LIGHT - RED	19-1063-00	
SWITCH - PUSH TO TEST	19-1125-00	
SONA ALERT	24-0261	
SWITCH -SILENCE	19-0729-00	
CHART RECORDER	19-0545-00	
CIRCUIT BOARD	19-0545-01	
PIN ARM MOTOR	19-0545-02	
CHART MTR. & SPINDLE	19-0545-03	
6" CHART PLATE	19-0545-04	
TRANSFORMER- CHART	19-0545-05	
RELAY	19-0545-06	
MEMBRANE SWITCH	19-0545-07	
ALARM THERMOSTAT	19-1031-00	

ACCESSORIES PARTS LIST

PART

DESCRIPTION

201128	ELECTRONIC TEMPERATURE CHART RECORDER 6", 7-Day, Single Pen, Range of -5°C to 25°C when installed on refrigerators and chromatography refrigerators; -45°C to 0°C when installed on freezers. Includes battery back-up. Factory installed.
400129	AUDIBLE/VISUAL ALARM SYSTEM Alerts user to temperature deviations above setpoint. Alarm point is user adjustable. Silence feature requires manual reset. Alarm circuit can be tested at the touch of a button. Includes remote alarm contacts and battery back-up. Factory installed.
201129	ELECTRONIC TEMPERATURE CHART RECORDER & AUDIBLE/VISUAL ALARM SYSTEM Combines features of #201128 Electronic Temperature Chart Recorder and Stock #400129 Audible/Visual Alarm System. Factory installed.
224260	FULL SIZE SHELF Fits hinged single door refrigerators, chromatography refrigerators and freezers. Dimensions: 23.1"W x 25.2"F-B (58.7 cm x 64.0 cm) Maximum Capacity: 6 per door.
224261	FULL SIZE SHELF Fits hinged double door refrigerators, chromatography refrigerators and freezers. Dimensions: 23.1"W x 22.9"F-B (58.7 cm x 58.2 cm) Maximum Capacity: 6 per door.
224262	FULL SIZE SHELF Fits 43.8 cu. ft (1240.0 liters) sliding door refrigerators, and chromatography refrigerators. Dimensions: 23.6"W x 20.4"F-B (59.9 cm x 64.0 cm) Maximum Capacity: 6 per door.
224263	FULL SIZE SHELF Fits 32.3 cu. ft (914.6 liters) sliding door refrigerators, and chromatography refrigerators. Dimensions: 17.1"W x 20.4"F-B (43.4 cm x 64.0 cm) Maximum Capacity: 6 per door.
224264	HALF SIZE SHELF Fits hinged single, double, and triple door refrigerators, chromatography refrigerators and freezers. Dimensions: 23.1"W x 11.1"F-B (58.6 cm x 28.2 cm) Maximum Capacity: 6 per door.
224265	HALF SIZE SHELF Fits 43.8 cu. ft (1240.0 liters) sliding door refrigerators, and chromatography refrigerators. Dimensions: 23.6"W x 11.1"F-B (59.9 cm x 28.2 cm) Maximum Capacity: 6 per door.
224266	HALF SIZE SHELF Fits 32.3 cu. ft (914.6 liters) sliding door refrigerators, and chromatography refrigerators. Dimensions: 17.1"W x 11.1"F-B (43.4 cm x 28.2 cm) Maximum Capacity: 6 per door.
224267	PULLOUT DRAWER: Constructed of solid stainless steel with ball bearing rollers. Fits hinged single door refrigerators, chromatography refrigerators and freezers Dimensions: 20.4"W x 3.4"H x 23.5"F-B (51.8 cm x 8.6 cm x 59.7 cm) Maximum Capacity: 6 per door.

ACCESSORIES PARTS LIST

PART #	DESCRIPTION
224268	PULLOUT DRAWER: Constructed of solid stainless steel with ball bearing rollers. Fits hinged double and triple door refrigerators, chromatography refrigerators and freezers Dimensions: 18.2"W x 3.4"H x 23.5"F-B (46.2 cm x 8.6 cm x 59.7 cm) Maximum Capacity: 6 per door.
224269	DRAWER PARTITION: Durable vinyl dividers are slotted to permit a variety of storage configurations. Designed to fit Stock #224267.
224270	DRAWER PARTITION: Durable vinyl dividers are slotted to permit a variety of storage configurations. Designed to fit Stock #224268.
195201	STAINLESS STEEL INTERIOR: Factory installed for hinged single door refrigerators, chromatography refrigerators and freezers.
195202	STAINLESS STEEL INTERIOR: Factory installed for hinged double door and sliding door refrigerators, chromatography refrigerators and freezers.
195203	STAINLESS STEEL INTERIOR: Factory installed for hinged triple door refrigerators, chromatography refrigerators and freezers.
8960	STAND ALONE VOLTAGE COMPENSATOR* 120V, 1 PH., 50/60 Hz., 15 Amp Receptacle. Maximum Load: 12 Amps. Complete with NEMA 5-15 Plug and Receptacle. LOW: Cut-In: 110V, Cut-Out: 115V, Volts Boost: 10 HIGH: Cut-In: 125V, Cut-Out: 120V, Volts Buck: 10
8961	STAND ALONE VOLTAGE COMPENSATOR* 120V, 1 PH., 50/60 Hz., 20 Amp Receptacle. Maximum Load: 15 Amps. Complete with NEMA 5-20 Plug and Receptacle. LOW: Cut-In: 110V, Cut-Out: 115V, Volts Boost: 10 HIGH: Cut-In: 125V, Cut-Out: 120V, Volts Buck: 10
8962	STAND ALONE VOLTAGE COMPENSATOR* 220V, 1 PH., 50/60 Hz., 15 Amp Receptacle. Maximum Load: 12 Amps. Complete with NEMA 6-15 Plug and Receptacle. LOW: Cut-In: 210V, Cut-Out: 220V, Volts Boost: 18 HIGH: Cut-In: 235V, Cut-Out: 225V, Volts Buck: 18
120260	CASTERS: Fits hinged single and double door refrigerators, chromatography refrigerators and freezers. Customer installed.
120261	CASTERS: Fits hinged triple door refrigerators, chromatography refrigerators and freezers. Customer installed.
120262	CASTERS: Fits sliding door refrigerators, and chromatography refrigerators. Customer installed.
195199	POLE MAST: .5" (1.3cm) diameter with mounting hardware. Factory installed.
195200	CAPPED ACCESS PORT: 2.0" (5.1cm), left wall. Factory installed.
195215	CAPPED ACCESS PORT: 2.0" (5.1cm), right wall. Factory installed.
197077	PAPER - CIRCULAR CHART: -5°C to +25°C, replacement for Stock #201128 and #201129 Recorders.
197078	PAPER - CIRCULAR CHART: -45°C to 0°C, replacement for Stock #201128 and #201129 Recorders.

THERMO FORMA LAB AND PHARMACY REFRIGERATORS/FREEZERS AND CHROMATOGRAPHY REFRIGERATORS WARRANTY

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

During the first year of the warranty period, component parts proven to be defective in materials or workmanship will be repaired or replaced at Thermo Forma Scientific's expense, labor included. **Thermo Forma Lab and Pharmacy Refrigerators/Freezers and Chromatography Refrigerators** include an additional four year warranty on the compressors, parts only, F.O.B. factory. Installation and calibration is not covered by this warranty agreement. The Thermo Forma Service Department must be contacted for warranty determination and direction prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs and door gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original one year warranty period. The Thermo Forma Service Department must give prior approval for the return of any components or equipment.

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

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

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



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THERMO FORMA LAB AND PHARMACY REFRIGERATORS/FREEZERS INTERNATIONAL DEALER WARRANTY

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period. Dealers who stock our equipment are allowed an additional four months for delivery and installation, providing the warranty card is completed and returned to the Thermo Forma Service Department.

During the first year of the warranty period, component parts proven to be defective in materials or workmanship will be repaired or replaced at Thermo Forma's expense, labor excluded. **Thermo Forma Lab and Pharmacy Refrigerators/Freezers** include an additional four year warranty on the compressors, parts only, F.O.B. factory. Installation and calibration is not covered by this warranty agreement. The Thermo Forma Service Department must be contacted for warranty determination and direction prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs and door gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original one year warranty period. The Thermo Forma Service Department must give prior approval for the return of any components or equipment.

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

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

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



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