ThermoForma

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Telephone: (740) 373-4763
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Models:

3771 / 3772
3773 / 3774
3775 / 3776
3777 / 3778
3779 / 3780
3785 / 3786
3787 / 3788

Laboratory and Chromatography Refrigerators

Operating and Maintenance Manual
Manual No. 7003771 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.

51-1483-05 Rev. A

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:

1-740-373-4763	Direct
1-888-213-1790	Toll Free, U.S. and Canada
1-740-373-4189	FAX
http://www.forma.com	Internet Worldwide Web Home Page
fservice@forma.com	Service E-Mail Address

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

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

THEMO FORMA MODELS

PART #	MODEL #	MODEL TYPE	CUBIC FEET	DOOR TYPE	VOLTAGE
52-1996-33	3771	Refrigerator	27.3	1 Glass Hinged	115
52-1996-34	3772	Refrigerator	27.3	1 Glass Hinged	220
52-1996-35	3773	Refrigerator	27.3	1 Solid Hinged	115
52-1996-36	3774	Refrigerator	27.3	1 Solid Hinged	220
52-1996-37	3775	Refrigerator	49.1	2 Glass Hinged	115
52-1996-38	3776	Refrigerator	49.1	2 Glass Hinged	220
52-1996-39	3777	Refrigerator	49.1	2 Solid Hinged	120
52-1996-40	3778	Refrigerator	49.1	2 Solid Hinged	220
52-1996-41	3779	Refrigerator	76.2	3 Glass Hinged	115
52-1996-42	3780	Refrigerator	76.2	3 Glass Hinged	220
52-1996-43	3785	Chromatography	27.3	1 Glass Hinged	115
52-1996-44	3786	Chromatography	27.3	1 Glass Hinged	220
52-1996-45	3787	Chromatography	49.1	2 Glass Hinged	115
52-1996-46	3788	Chromatography	49.1	2 Glass Hinged	220

Except for routine cleaning, these medium 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.

TABLE OF CONTENTS

SECTION I - GENERAL INFORMATION

COMPONENT IDENTIFICATION

SECTION II - ELECTRICAL & REFRIGERATION INFORMATION

REFRIGERATION SPECIFICATIONS

CONTROL ANNUCIATOR PANEL INFORMATION

TABLE OF CONTENTS - *continued*

SECTION III - MAINTENANCE & REPAIR

TROUBLESHOOTING GUIDES

SECTION IV - PARTS LISTS

DUE TO CONTINUING PRODUCT IMPROVEMENTS, ALL DATA AND INFORMATION IN THIS MANUAL IS SUBJECT TO CHANGE WITH-

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

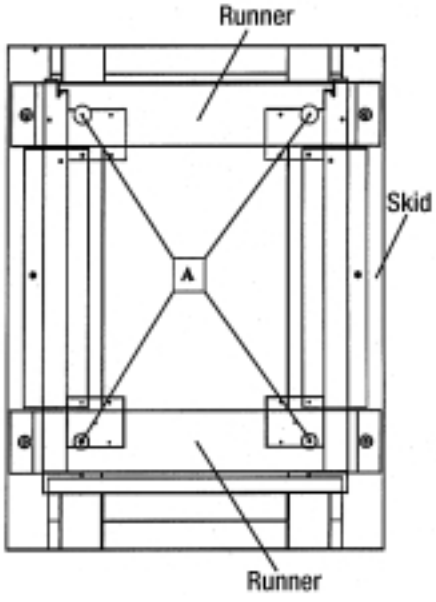
The cabinet should be moved as close as possible to the operating location before removing crate base. Be sure to follow the steps in the "**INSPECTING FOR DAMAGES**" instructions.

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.



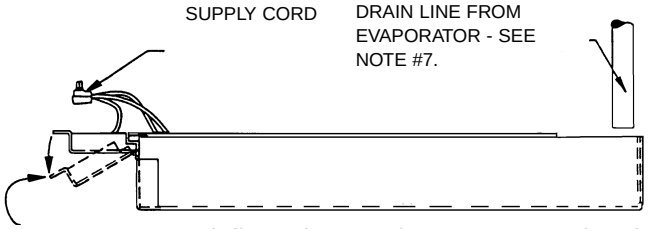
IMPORTANT:

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.**)
10. Cabinet should not be loaded with product until cabinet has operated for 24 hours and reached desirable storage temperature.

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.

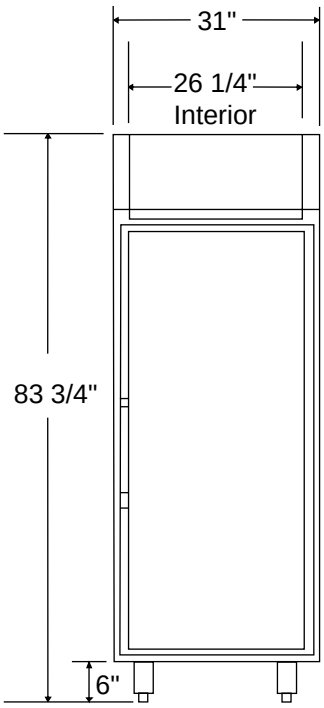
PRIOR TO STARTING THE CABINET

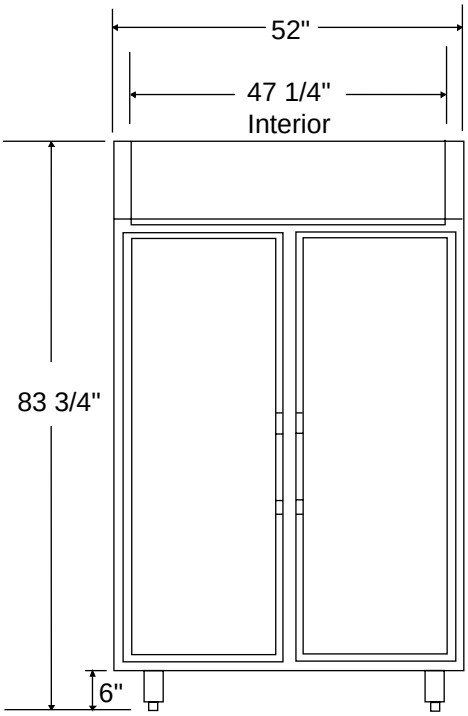
Supply voltage must be checked in order to determine the correct position of the variable voltage switch located on the auto transformer. This will ensure the cabinet is operating at the correct optimum voltage. In the event the transformer supply line plug does not match the electrical outlet, the plug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

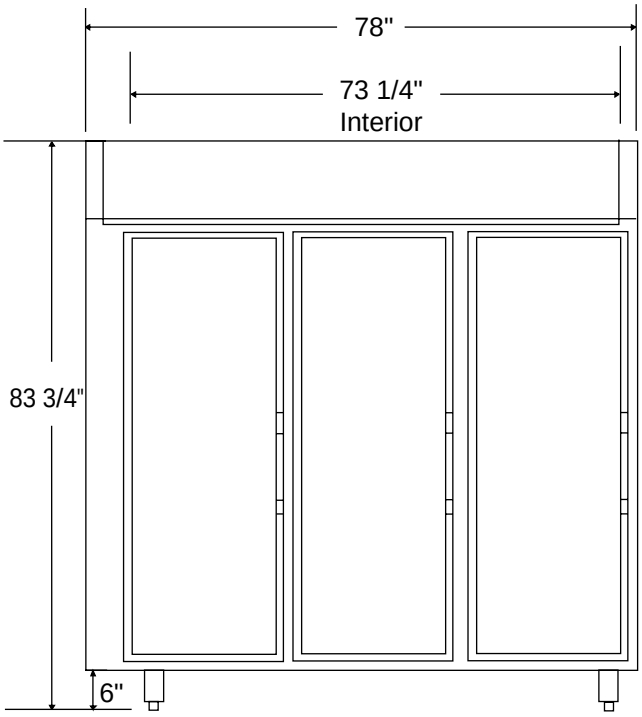
Refer to page 41 for transformer layout.

DIMENSIONAL DRAWINGS

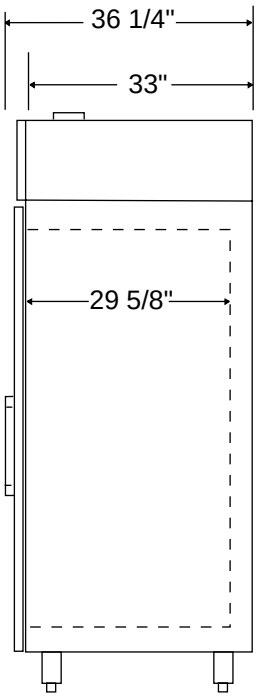
Medium Temp., Top Mount, Glass Pull Door Refrigerators







SIDE VIEW



SPECIFICATIONS
Medium Temp., Top Mount, Glass Pull Door Refrigerators

SPECIFICATION	1-DOOR	2-DOOR	3-DOOR
Compressor Mount	Top	Top	Top
Temperature Range	37° to 55° (3° to 13°C)	37° to 55° (3° to 13°C)	37° to 55° (3° to 13°C)
Number of Doors	1	2	3
Door Construction	Double Pane	Double Pane	Double Pane
Hinge Type	Torsion Bar	Torsion Bar	Torsion Bar
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"
Capacity - Gross	27.3 $ft.^3$	49.1 $ft.^3$	76.2 $ft.^3$
Shipping Weight (Approx.)	470 lbs.	785 lbs.	1080 lbs.
Compressor Size	1/3 Hp.	1/2 Hp.	1/2 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	R404A	R404A	R404A
Refrigerant Control	Expansion Valve	Expansion Valve	Expansion Valve
Amp Rating - Data Plate	**3771:** 11.2; **3772:** 6.3	**3775:** 13.8; **3776:** 6.1	**3779:** 16.0; **3780:** 8.2
	3785: 13.2; **3786:** 7.5	**3787:** 15.8; **3788:** 8.8	
Electrical Specs. (V / HZ / PH)	115 / 60 / 1 (Export: 220V/50 Hz)	115 / 60 / 1 (Export: 220V/50 Hz)	115 / 60 / 1 (Export: 220V/50 Hz)
UL & CUL Listed	Yes	Yes	Yes
Interior Finish	Powder Coat Finish	Powder Coat Finish	Powder Coat Finish
Exterior Finish			
Lighting	2 Insul. 1500 Milliamp Fluor. Lamps	3 Insul. 1500 Milliamp Fluor. Lamp	4 Insul. 1500 Milliamp Fluor. Lamps
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 41 for information on how to set transformer during installation.

1-DOOR:	2-DOOR:	3-DOOR:
3771	3775	3779
3785	3787	
EXPORT MODELS:	**EXPORT MODELS:**	**EXPORT MODELS:**
3772	3776	3780
3786	3788	

SPECIFICATIONS
Medium Temp., Top Mount, Solid Pull Door Refrigerators

SPECIFICATION	1-DOOR	2-DOOR
Compressor Mount	Top	Top
Temperature Range	37° to 55° (3° to 13°C)	37° to 55° (3° to 13°C))
Number of Doors	1	2
Door Construction	Foam-in-Place	Foam-in-Place
Hinge Type	Camlift / Spring Assist	Camlift / Spring Assist
Insulation - CFC-Free	Foam-in-Place Urethane	Foam-in-Place Urethane
Wall Thickness	2 3/8"	2 3/8"
Capacity - Gross	27.3 ft.^{3}	49.1 ft.^{3}
Shipping Weight (Approx.)	440 lbs.	604 lbs.
Compressor Size	1/3 Hp.	1/3 Hp.
Condenser Type	Fin & Tube Forced Air	Fin & Tube Forced Air
Evaporator Type	Fin & Tube Forced Air	Fin & Tube Forced Air
Refrigerant Type	R404A	R404A
Refrigerant Control	Cap Tube	Cap Tube
Amp Rating (Data Plate)	**3773:** 8.9; **3774:** 5.2	**3777:** 8.9; **3778:** 5.2
Electrical Specs. (V / HZ / PH)	115 / 60 / 1	115 / 60 / 1
UL & CUL Listed	Yes	Yes
Interior Finish	Powder Coat Finish	Powder Coat Finish
Exterior Finish		
Compressor Make	Americold	Americold
Electrical Information	15 Amp Service Cord	15 Amp Service Cord

MODEL DESIGNATION INFORMATION

NOTE: Export Models use a transformer. See page 41 for information on how to set transformer during installation.

1-DOOR:

3773

EXPORT MODEL:

3774

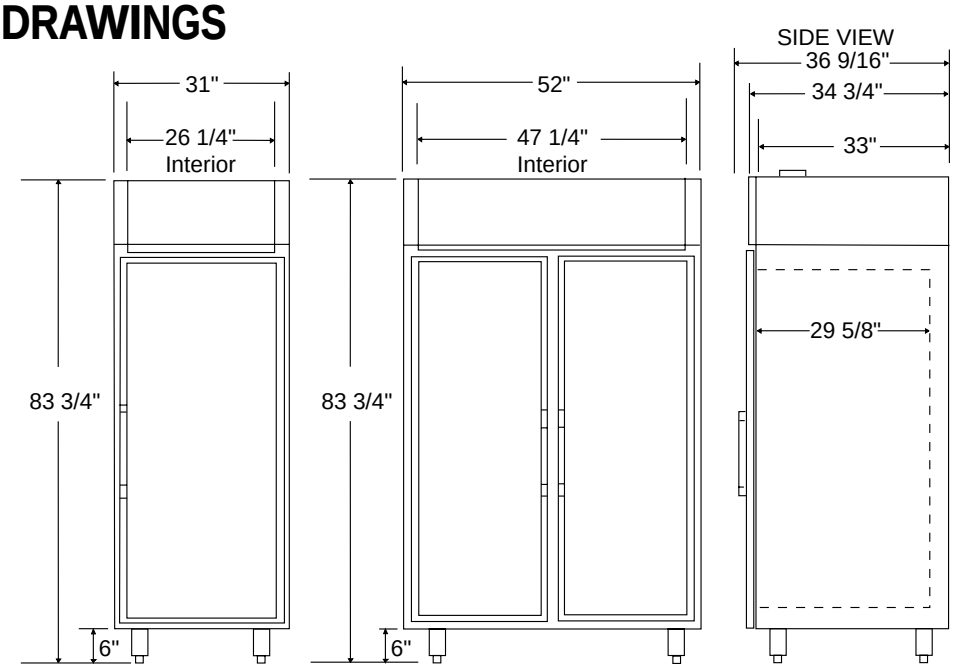
2-DOOR:

3777

EXPORT MODEL:

3778

DIMENSIONAL DRAWINGS
Medium Temp., Top Mount, Solid Pull Door Refrigerators



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.

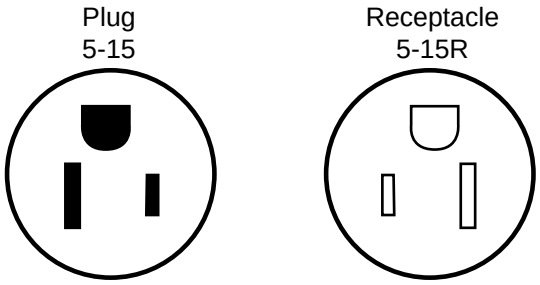
IMPORTANT

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

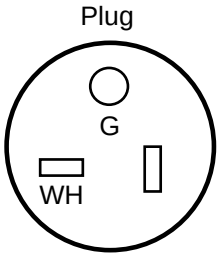
WARNING

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



RATING: 125V, AC 20 Amp



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

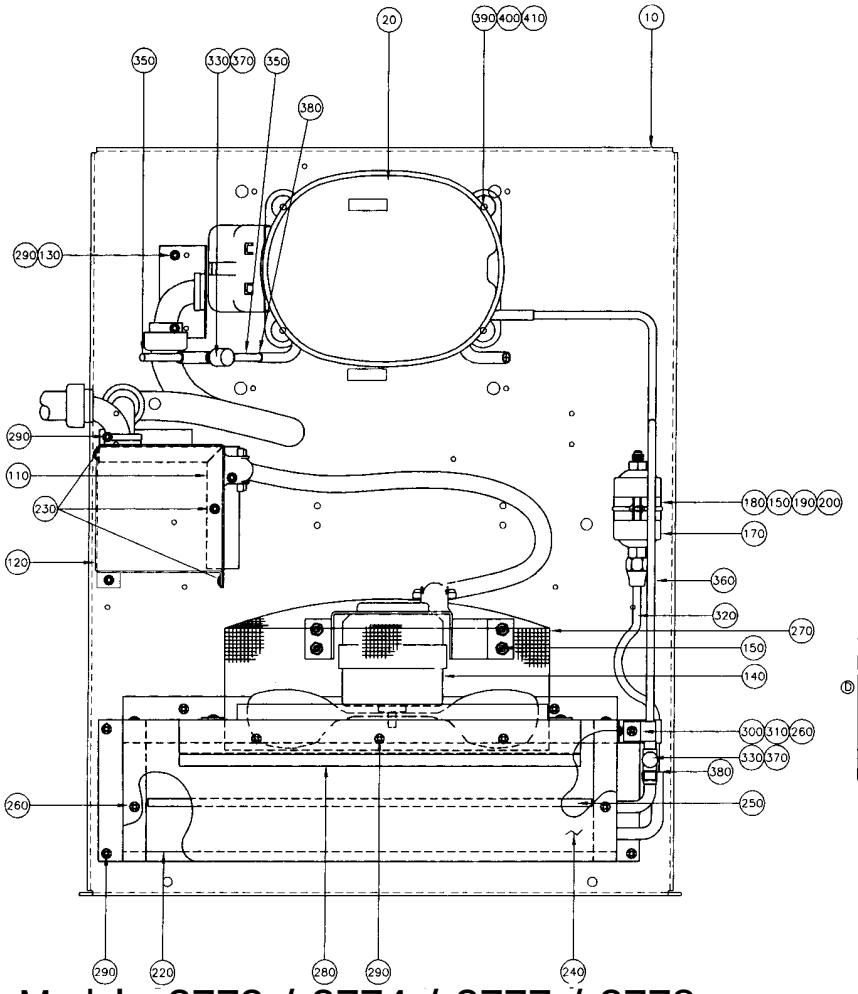
Serial Number Rating Plates on each vertical cabinet are located on the inside upper left hand corner. This plate contains all technical data necessary to the operation of the cabinet. (Sample below.) Warranty administration is based on the serial number as printed on the rating plate.

<table>
<tr><td colspan="3">MODEL</td><td colspan="3">SER.</td></tr>
<tr><td>REFRIGERANT</td><td colspan="5">VOLTS</td></tr>
<tr><td>TYPE</td><td colspan="2"># WIRES</td><td>PHASE</td><td colspan="2">HERTZ</td></tr>
<tr><td>CHARGE</td><td colspan="3">TOTAL AMPS</td><td rowspan="2">MINIMUM CIRCUIT AMPACITY</td><td rowspan="2">MAXIMUM FUSE SIZE OR HACR TYPE CIRCUIT BREAKER</td></tr>
<tr><td>DESIGN PRESSURE (PSIG)
HIGHSIDE</td><td>REFRIG. CYCLE</td><td>DEFROST CYCLE</td><td>LOCKED ROTOR</td></tr>
<tr><td>LOWSIDE</td><td colspan="3"></td><td></td><td></td></tr>
</table>

CONDENSING UNIT ASSEMBLY Component Identification

Models: 3771 / 3772 / 3785 / 3786

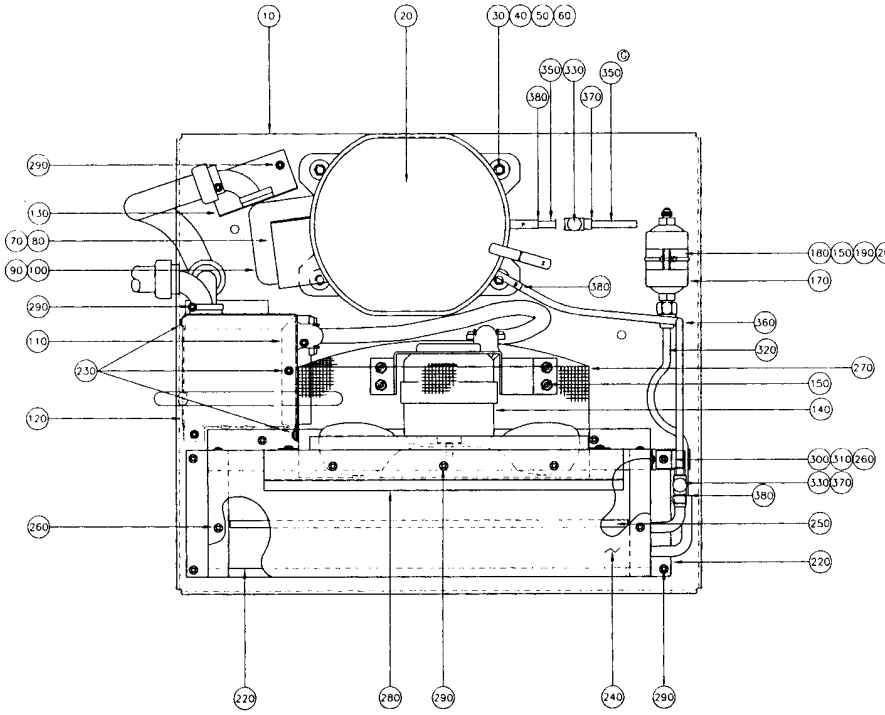
50-0142-*



SEQ	DESCRIPTION
10	PLATE, UNIT BASE
20	COMPRESSOR
30	MOUNTING GROMMET
40	MOUNTING SLEEVE
50	SCREW, 5/16
60	WASHER
70	MOTOR PROTECTOR
80	MOTOR STARTER
90	COVER, COMPRESSOR
100	STRAP, COVER
110	START ASS'Y
120	COVER, START ASS'Y
130	SUPPORT ANGLE, CONDUIT
140	MOTOR & BRK'T ASS'Y
150	SCREW, 1/4
160	
170	FILTER DRIER
180	CLAMP, DRIER
190	SCREW, #10
200	NUT, HEX
210	
220	CONDENSER COIL
230	SCREW, #10B
240	FAN SHROUD
250	FOAM TAPE, SPRINGFELT
260	SCREW, #6
270	WIRE SCREEN
280	ANGLE, FAN GUARD
290	SCREW, #10TEC
300	SUPPORT, TUBE CLAMP
310	CABLE CLAMP
320	TUBE ASS'Y COND TO DRIER
330	ACCESS FITTING
(D) 340	
350	COPPER LINE
360	DISCHARGE LINE
370	BRAZING ALLOY
380	SOLDER, WIRE
390	MOUNTING KIT
400	SCREW, 1/4-20
410	WASHER, 1/4" FLAT

Models: 3773 / 3774 / 3777 / 3778

50-0141-*



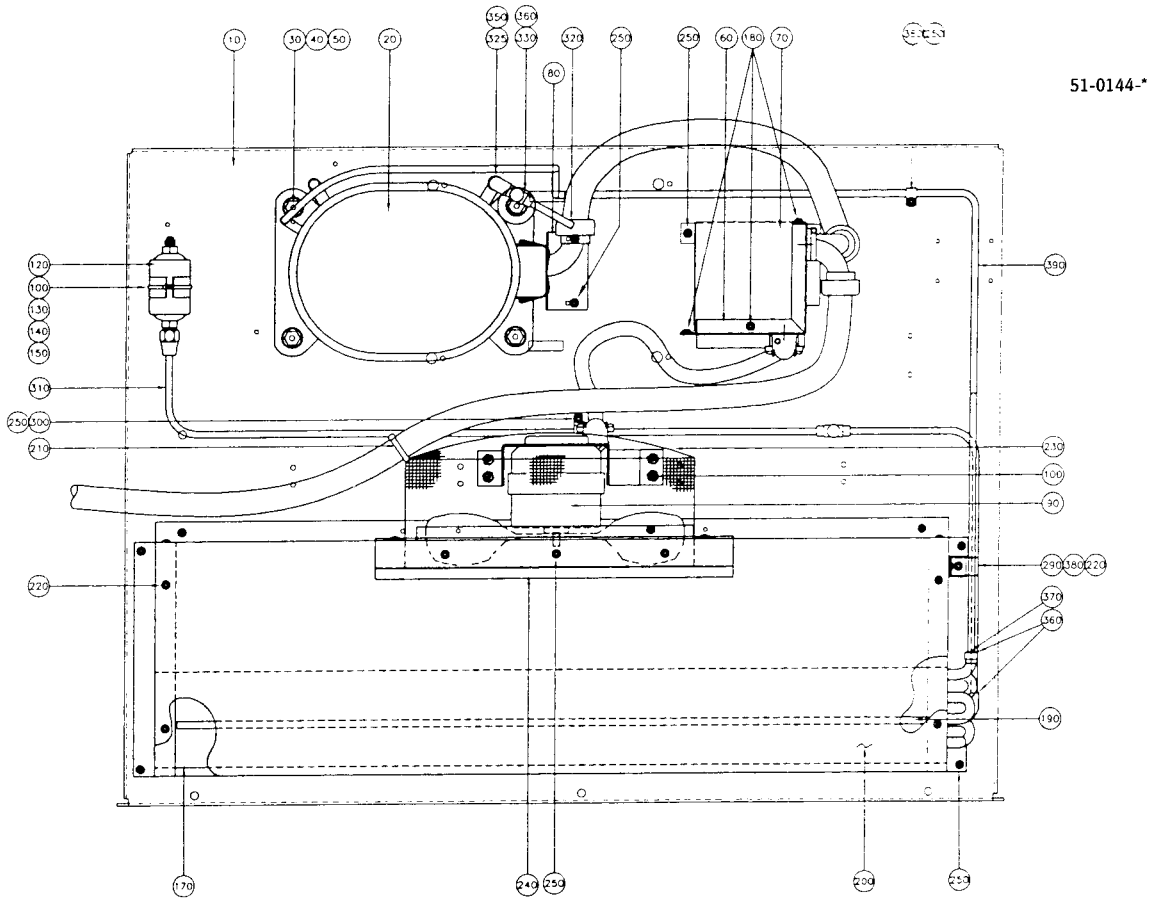
SEQ	DESCRIPTION
10	PLATE, UNIT BASE
20	COMPRESSOR
30	MOUNTING GROMMET
40	MOUNTING SLEEVE
50	SCREW, 5/16
60	WASHER
70	MOTOR PROTECTOR
80	MOTOR STARTER
90	COVER, COMPRESSOR
100	STRAP, COVER
110	START ASS'Y
120	COVER, START ASS'Y
130	SUPPORT ANGLE, CONDUIT
140	MOTOR & BRK'T ASS'Y
150	SCREW, 1/4
160	
170	FILTER DRIER
180	CLAMP, DRIER
190	SCREW, #10
200	NUT, HEX
210	
220	CONDENSER COIL
230	SCREW, #10B
240	FAN SHROUD
250	FOAM TAPE, SPRINGFELT
260	SCREW, #6
270	WIRE SCREEN
280	ANGLE, FAN GUARD
290	SCREW, #10TEC
300	SUPPORT, TUBE CLAMP
310	CABLE CLAMP
320	TUBE ASS'Y, COND TO DRIER
330	ACCESS FITTING
340	PROCESS TUBE
350	COPPER LINE
360	DISCHARGE LINE
370	BRAZING ALLOW
380	SOLDER, WIRE
(D) 390	ACCORDIAN COIL
(B) 400	FLUSH BUSHING
(C) 410	CLAMP, ACCORDIAN COIL

CONDENSING UNIT ASSEMBLY Component Identification

Models: 3775 / 3787

Export Models: 3776 / 3788

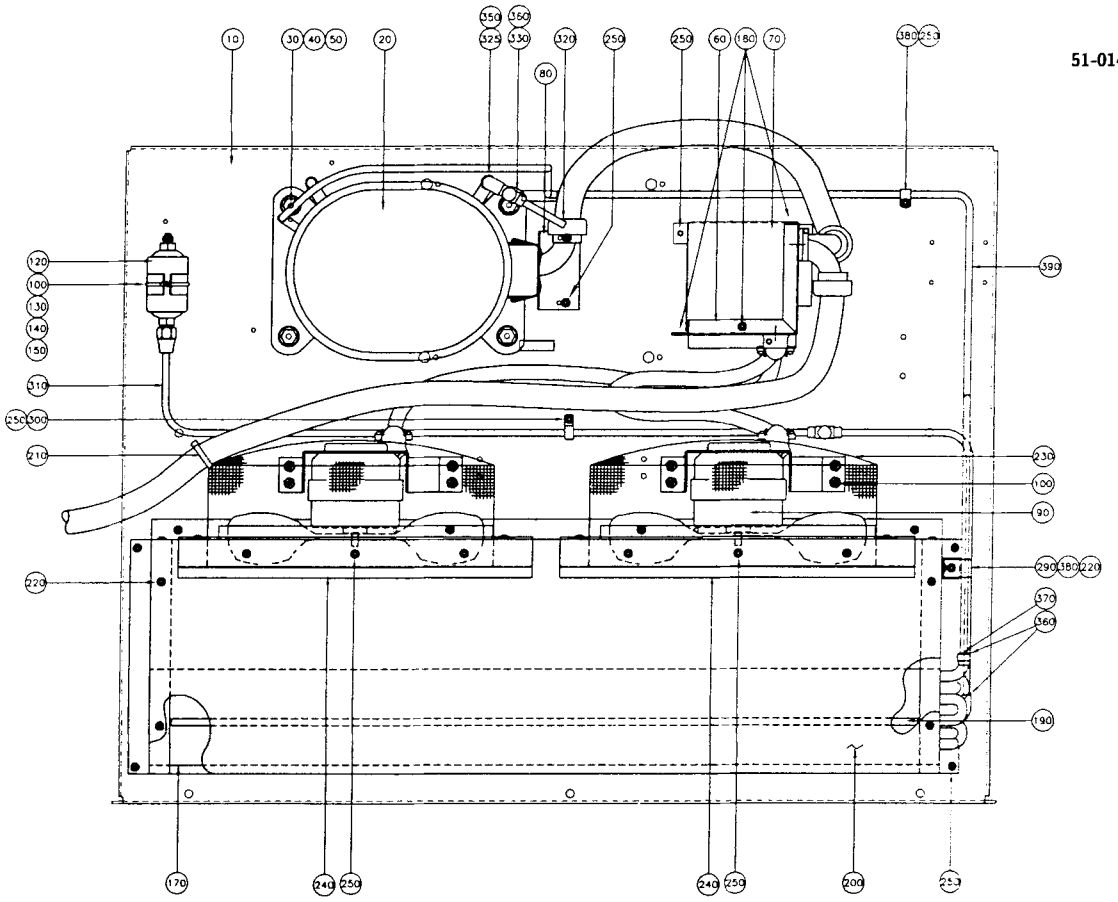
NOTE: See Parts Section IV.



SEQ	DESCRIPTION
10	PLATE, UNIT BASE
20	COMPRESSOR
30	MOUNTING KIT, COMP
40	BOLT, 5/16
50	FLAT WASHER
60	START ASS'Y, COMPR
70	COVER, START BOX
80	SUPPORT ANGLE, CONDUIT
90	MOTOR & BRK'T ASS'Y
100	SCREW, 1\4-20
110	
120	FILTER/DRIER
130	CLAMP
140	SCREW, #10MCH
150	NUT, #10
160	
170	COIL, CONDENSER
180	SCREW, #10B
190	TAPE, SPRINGFELT
200	SHROUD, COND FAN
210	WIRE TIE, NYLON
220	SCREW, #6TEC
230	WIRE SCREEN
240	ANGLE, FAN SHROUD
250	SCREW, #10TEC
260	DISCHARGE LINE, COMP TO TEE
270	TEE, 3/8 X 3/8 X 1/4
280	DISCHARGE LINE, COND
290	SUPPORT, TUBE CLAMP
300	TUBE CLAMP
310	TUBE ASS'Y, COND TO DRIER
320	LINE, TEE TO ACC
325	REDUCING ELL, 1/2 X 3/8
330	ACCESS FITTING
340	
350	BRAZING ALLOY
360	SOLDER, WIRE
370	FLUSH BUSHING 3/8 X 1/4
380	TUBE CLAMP 1/4"
390	DISCHARGE LINE, COMP TO COND

CONDENSING UNIT ASSEMBLY Component Identification

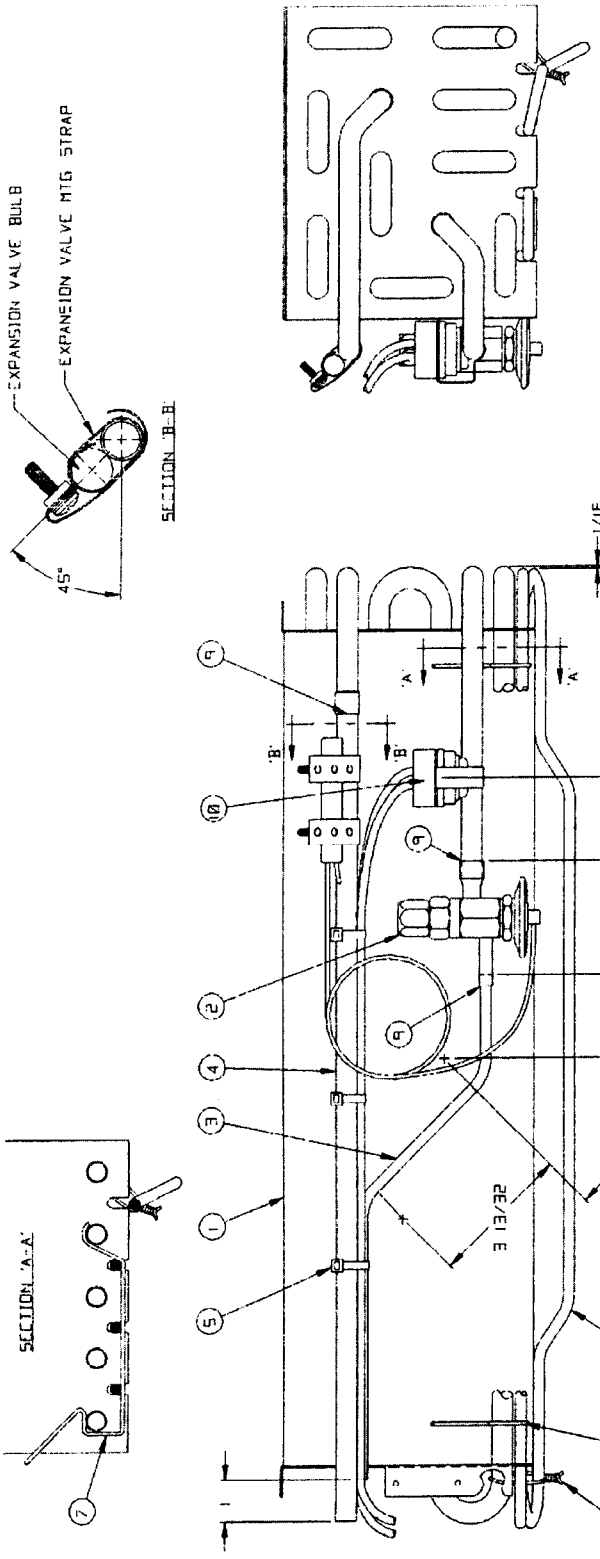
Models: 3779
Export Models: 3780



SEQ	DESCRIPTION
10	PLATE, UNIT BASE
20	COMPRESSOR
30	MOUNTING KIT, COMP
40	BOLT, 5/16
50	FLAT WASHER
60	START ASS'Y, COMPR
70	COVER, START BOX
80	SUPPORT ANGLE, CONDUIT
90	MOTOR & BRK'T ASS'Y
100	SCREW, 1\4-20
110	
120	FILTER/DRIER
130	CLAMP
140	SCREW, #10MCH
150	NUT, #10
160	
170	COIL, CONDENSER
180	SCREW, #10B
190	TAPE, SPRINGFELT
200	SHROUD, COND FAN
210	WIRE TIE, NYLON
220	SCREW, #6TEC
230	WIRE SCREEN
240	ANGLE, FAN SHROUD
250	SCREW, #10TEC
260	DISCHARGE LINE, COMP TO TEE
270	TEE, 3/8 X 3/8 X 1/4
280	DISCHARGE LINE, COND
290	SUPPORT, TUBE CLAMP
300	TUBE CLAMP
310	TUBE ASS'Y, COND TO DRIER
320	LINE, TEE TO ACC
325	REDUCING ELL, 1/2 X 3/8
330	ACCESS FITTING
340	
350	BRAZING ALLOY
360	SOLDER, WIRE
370	FLUSH BUSHING 3/8 X 1/4
380	TUBE CLAMP 1/4"
390	DISCHARGE LINE, COMP TO COND

EVAPORATOR COIL ASSEMBLY Component Identification

Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3785 / 3787
Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3786 / 3788



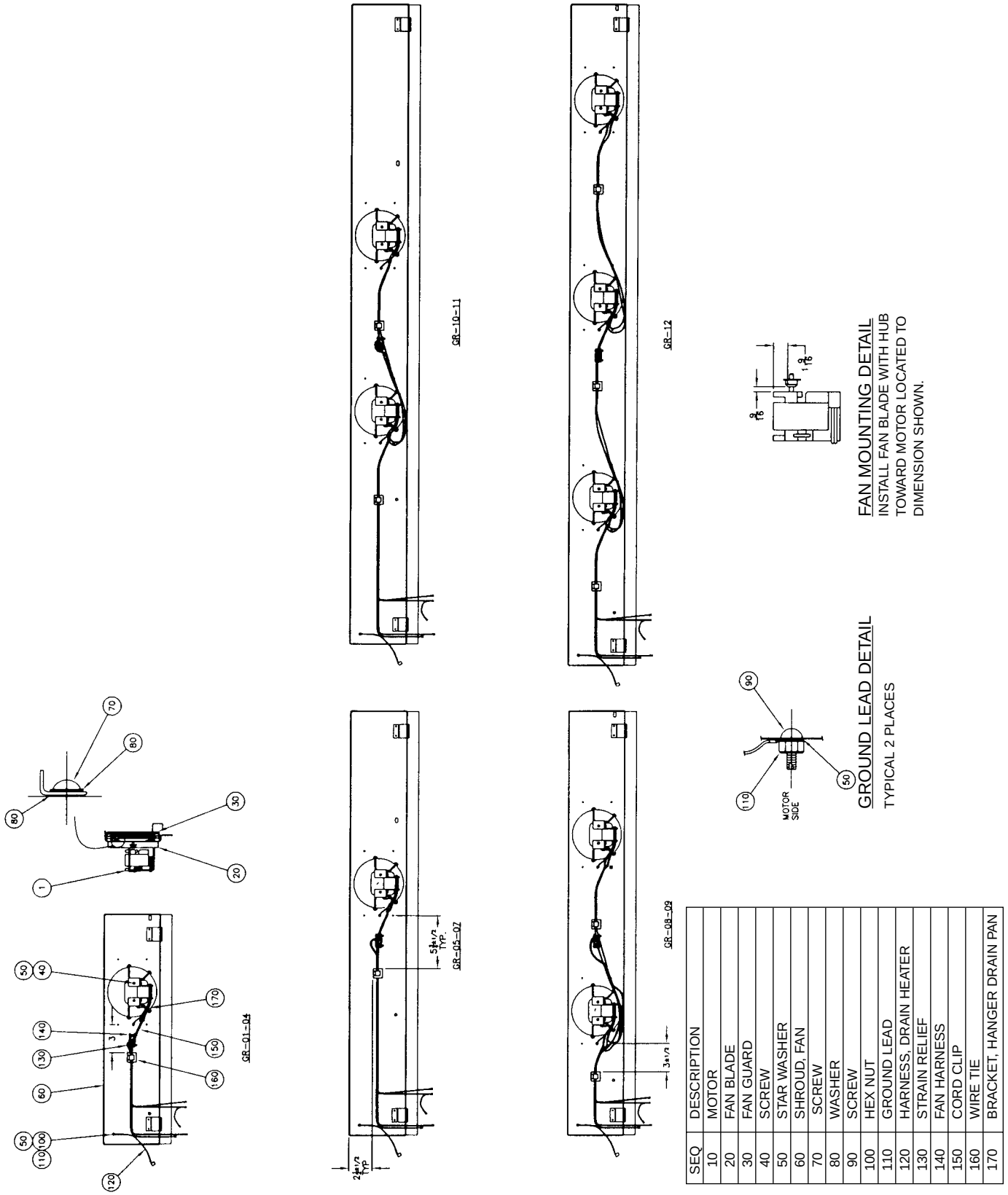
ITEM	DESCRIPTION
1	Coil, Evaporator
	Coil, Evaporator
2	Expansion Valve
3	Copper Tubing, 1/4
4	Copper Tubing, 1/2
5	Wire Tie, Nylon
9	Brazing Alloy

Note: Glass models shown.
Solid door models captube replaced T.X.V..

EVAPORATOR FAN SHROUD ASSEMBLY Component Identification

Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3785 / 3787

Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3786 / 3788



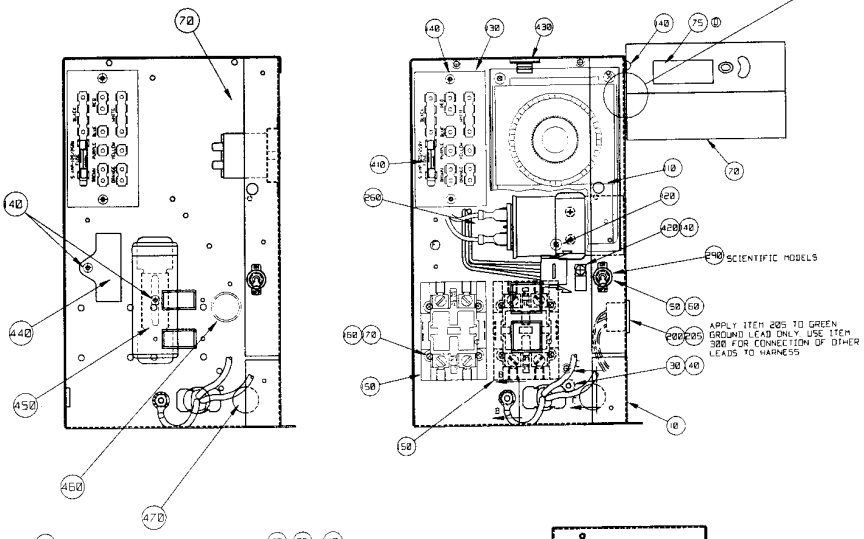
SEQ	DESCRIPTION
10	MOTOR
20	FAN BLADE
30	FAN GUARD
40	SCREW
50	STAR WASHER
60	SHROUD, FAN
70	SCREW
80	WASHER
90	SCREW
100	HEX NUT
110	GROUND LEAD
120	HARNESS, DRAIN HEATER
130	STRAIN RELIEF
140	FAN HARNESS
150	CORD CLIP
160	WIRE TIE
170	BRACKET, HANGER DRAIN PAN

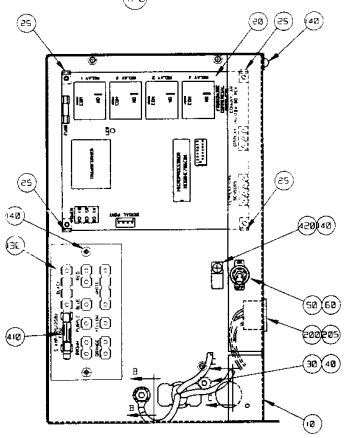
ELECTRICAL BOX ASSEMBLY Component Identification

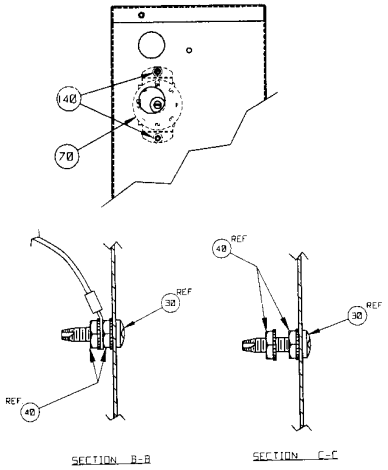
Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3785 / 3787

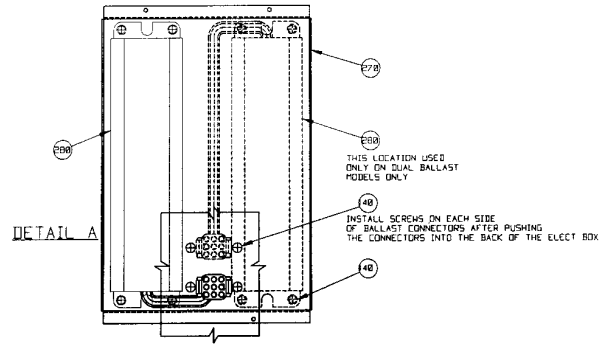
Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3786 / 3788

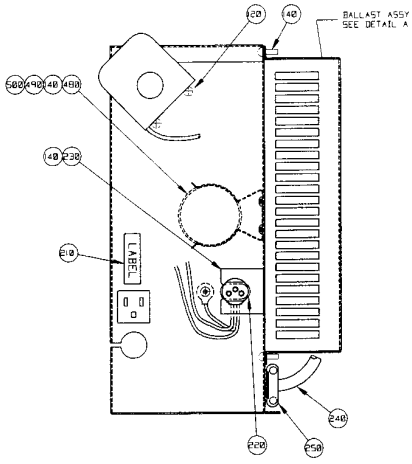
SEQ	DESCRIPTION
10	BOX, ELECTRICAL
20	CONTROLLER BOARD
25	CIRCUIT BOARD STANDOFF
30	SCREW
40	HEX NUT
50	TOGGLE SWITCH (SHOWN) OR HOLE PLUG (NOT SHOWN)
60	INDICATOR PLATE, (ON/OFF)
70	THERMOSTAT
75	DECAL, ALARM THERMOSTAT
80	CONDUIT NUT
90	REDUCING WASHER
100	CHASE NIPPLE
110	DEFROST TIMER
120	SCREW
130	TERMINAL BOARD
140	SCREW
150	RELAY (POWER)
160	SCREW
170	HEX NUT
180	
190	
200	RECEPTACLE
205	TERMINAL - RING
210	LABEL, AMPERAGE
220	HARNESS, DRAIN 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	SPLICE 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	FUSE
420	STRAIN RELIEF
430	WIRE CLIP
440	RUN CAPACITOR
450	START CAPACITOR
460	HOLE BUSHING
470	HARNESS ASSY, COMPRESSOR
480	CLAMP, KICKPLATE
490	CAPACITOR, RUN 55 MFD/370 60
500	HARNESS, CAPACITOR





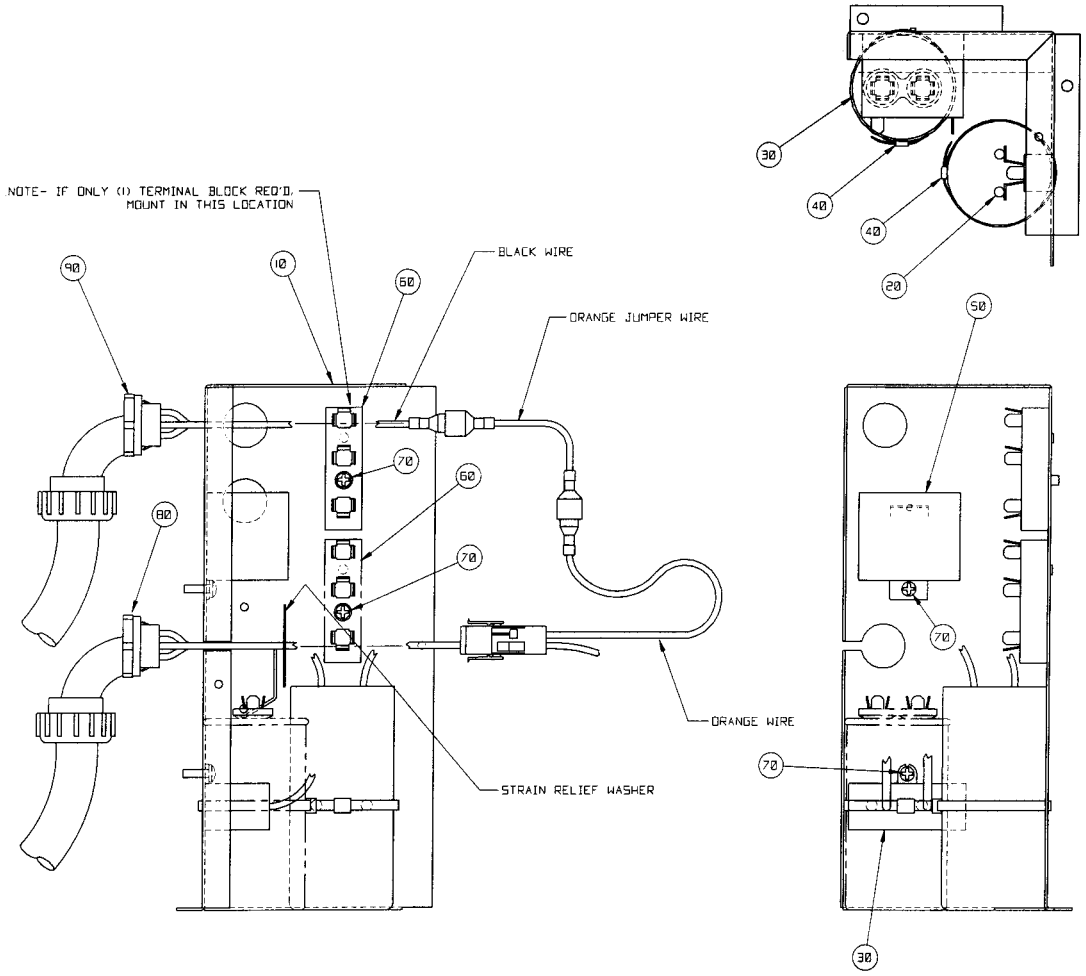






START KIT Component Identification

If applicable



SEQ	DESCRIPTION
10	BOX, COMPRESSOR COMPONENT
20	CAPACITOR, START
30	CAPACITOR, RUN
40	STRAP, TIE
50	RELAY, START
60	TERMINAL BLOCK
70	SCREW, #8
80	HARNESS, COMPRESSOR
90	HARNESS, ELECTRICAL BOX
100	
110	

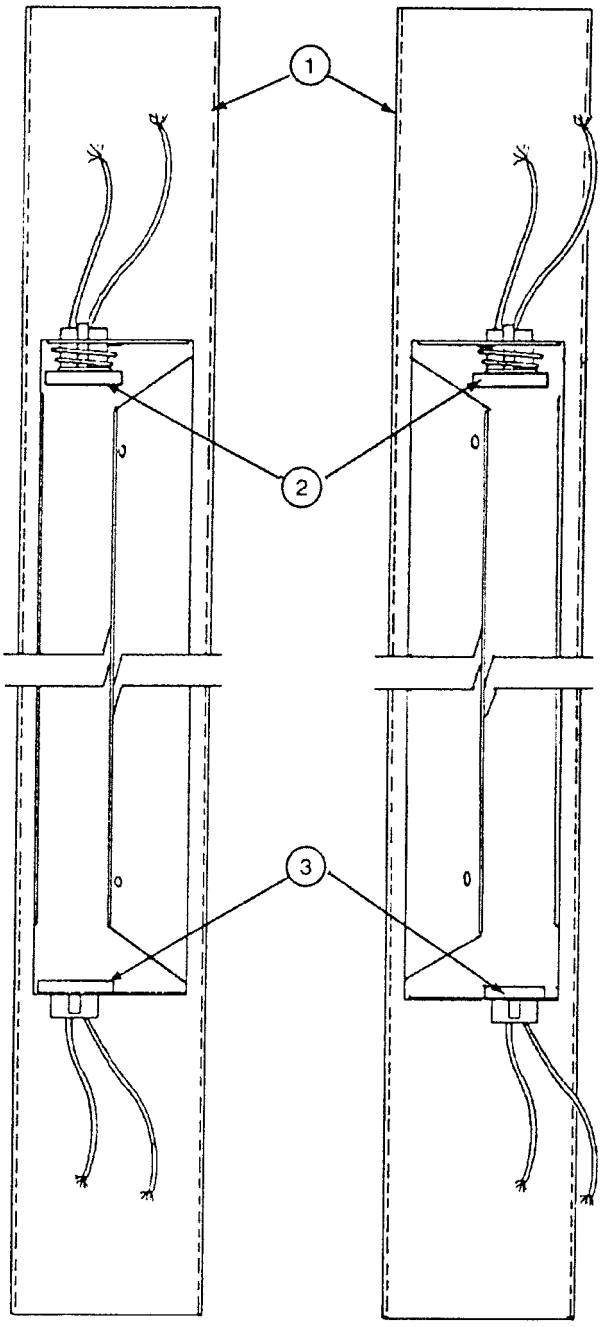
NOTES-

1) SOME PARTS DEPICTED IN THIS ASSY DRAWING MAY NOT BE USED ON ALL GROUP NO'S.

2) ALL WIRING CONNECTIONS NOT SHOWN FOR CLARITY. FOR WIRING INFORMATION SEE WIRING DIAGRAM

SIDE LIGHT ASSEMBLY

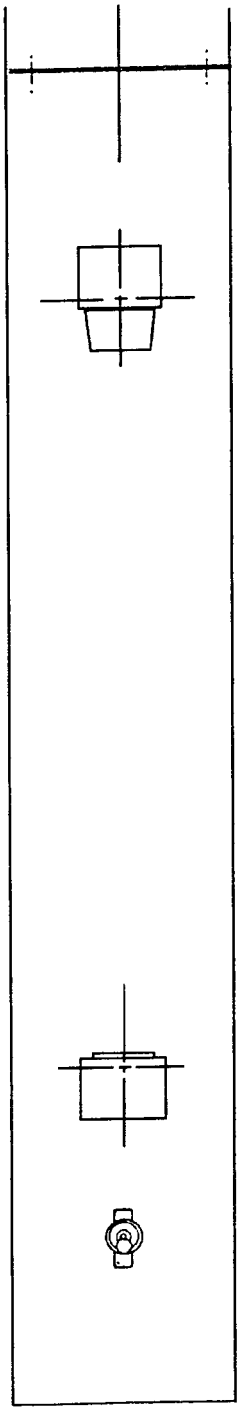
Models: 3771 / 3785
Export Models: 3772 / 3786

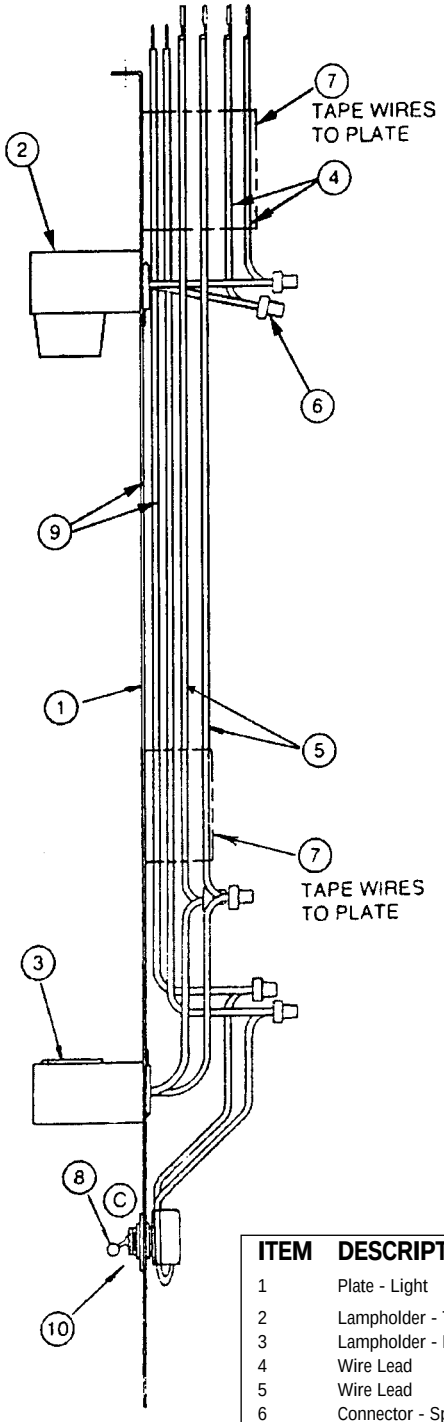


ITEM	DESCRIPTION
1	Lamp Bracket LH
2	Lampgolder - Top
3	Lampholder - Bottom

MULLION LIGHT FIXTURE ASSEMBLY

Models: 3775 / 3779 / 3785 / 3787
Export Models: 3776 / 3780 / 3786 / 3788





ITEM	DESCRIPTION
1	Plate - Light
2	Lampholder - Top
3	Lampholder - Bottom
4	Wire Lead
5	Wire Lead
6	Connector - Splice Cap
7	Tape - Grey Duct
8	Switch - Toggle
9	Wire Lead
10	Hole Plug

SECTION II
Electrical & Refrigeration Information

REFRIGERATION SPECIFICATIONS

Medium Temp., Glass, 1-Door Refrigerator

Models: 3771 / 3785 & Export Models: 3772 / 3786

SYSTEM COMPONENTS - R404A

Compressor Model Number	Copeland ASE24C3E-IAA
Compressor Horsepower	1/3
Recommended Operating Temp. Range	37°F to 55°F (3°C to 13°C)
Cabinet Volts	115
Expansion Device	Sporlan FBS-¼-C BP40
Charge Refrig. Type / Oz. / Grams	R404A / 23 oz. / 652.0

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)	40/-1	40/-1	40/-1
Suction Pressure (PSIG)	44	45	49
Discharge Pressure (PSIG)	211	236	269
Compressor Amps	6.3	6.3	6.5
Total Refrigeration Amps	8.7	8.8	9.0

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

REFRIGERATION SPECIFICATIONS

Medium Temp., Solid, 1-Door Refrigerator

Model: 3773 Export Model: 3774

SYSTEM COMPONENTS - R404A

Compressor Model Number	Americold HP 121
Compressor Horsepower	1/3
Recommended Operating Temp. Range	37°F to 55°F (3°C to 13°C)
Cabinet Volts	115
Expansion Device	Cap Tube 7' x .054
Charge Refrig. Type / Oz. / Grams	R404A / 15 oz. / 425.2

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)	37 / 2.7	37 / 2.7	36 / 2.2
Suction Pressure (PSIG)	39	41	44
Discharge Pressure (PSIG)	192	216	247
Compressor Amps	3.9	4.0	4.2
Total Refrigeration Amps	5.7	5.8	6.0

REFRIGERATION SPECIFICATIONS

Medium Temp., Glass, 2-Door Refrigerators

Models: 3775 / 3787 & Export Models: 3776 / 3788

SYSTEM COMPONENTS - R404A

Compressor Model Number	Copeland AST54CIE-IAA
Compressor Horsepower	1/2
Recommended Operating Temp. Range	37°F to 55°F (3°C to 13°C)
Cabinet Volts	115
Expansion Device	Sporlan FBS-¼-C BP40
Charge Refrig. Type / Oz. / Grams	R404A / 23 / 652

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)	49 / 9	49 / 9	49 / 9
Suction Pressure (PSIG)	47	48	49
Discharge Pressure (PSIG)	238	271	306
Compressor Amps	11	11.4	11.2
Total Refrigeration Amps	14	14.7	14.6

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

REFRIGERATION SPECIFICATIONS

Medium Temp., Solid, 2-Door Refrigerators

Model: 3777 & Export Model: 3778

SYSTEM COMPONENTS - R404A

Compressor Model Number	Americold HP 121
Compressor Horsepower	1/3
Recommended Operating Temp. Range	37°F to 55°F (3°C to 13°C)
Cabinet Volts	115
Expansion Device	Sporlan Cap Tube 7' x .054
Charge Refrig. Type / Oz. / Grams	R404A / 15 oz. / 425.2

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)	39 / 3.8	39 / 3.8	39 / 3.8
Suction Pressure (PSIG)	37	42	45
Discharge Pressure (PSIG)	196	230	264
Compressor Amps	3.9	4.2	4.4
Total Refrigeration Amps	5.8	6.0	6.2

REFRIGERATION SPECIFICATIONS

Medium Temp., Glass, 3-Door Refrigerators

Model: 3779 & Export Model: 3780

SYSTEM COMPONENTS - R404A

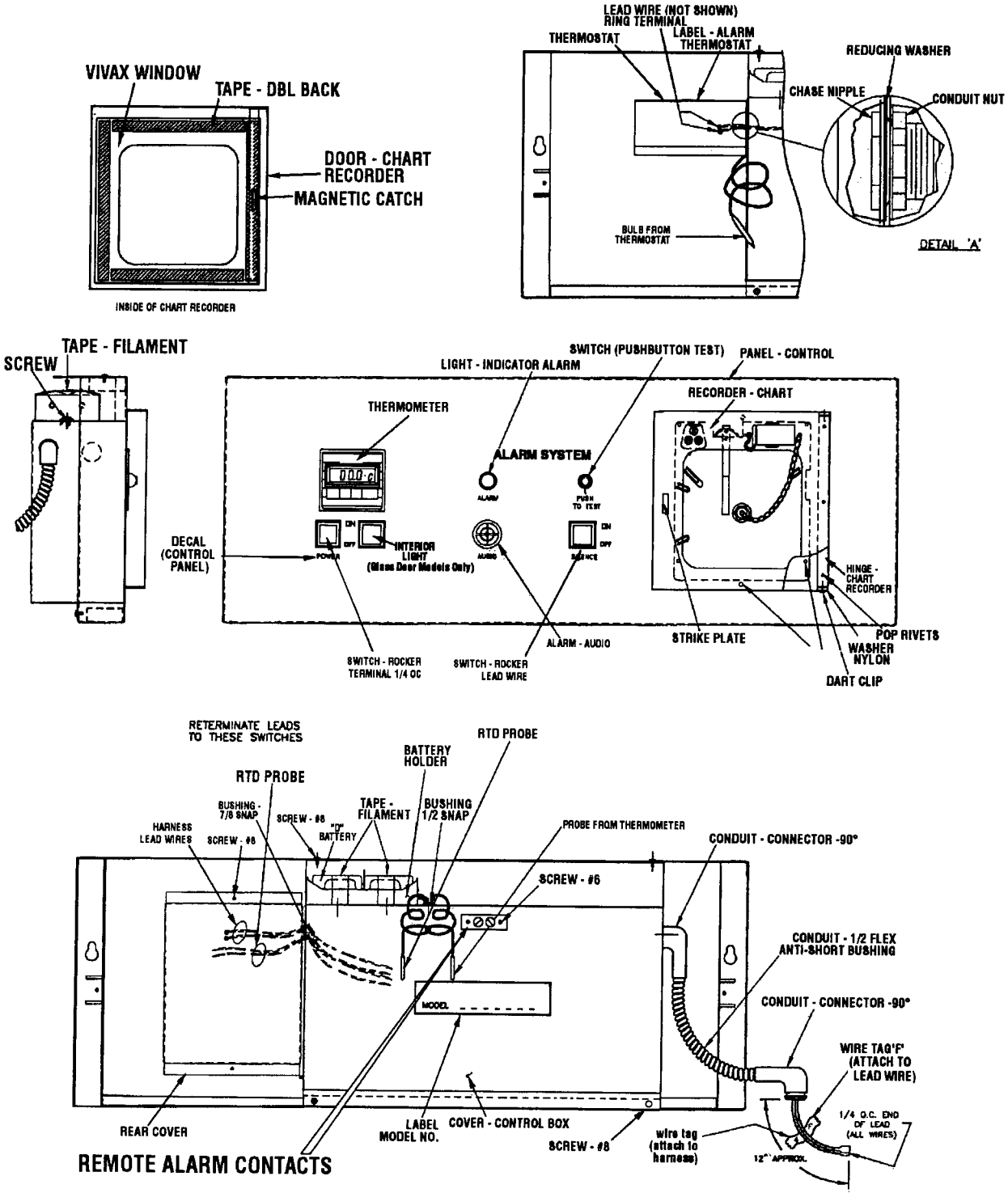
Compressor Model Number	Copeland AST54CIE-CAA
Compressor Horsepower	1/2
Recommended Operating Temp. Range	37°F to 55°F (3°C to 13°C)
Cabinet Volts	115
Expansion Device	Sporlan FBS-¼-CPBP40
Charge Refrig. Type / Oz. / Grams	R404A / 24 / 680.4

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)	35 / 1.6	35 / 1.6	32 / 0.0
Suction Pressure (PSIG)	42	42	43 / 303
Discharge Pressure (PSIG)	205	239	321
Compressor Amps	9.4	9.6	10
Total Refrigeration Amps	13.9	14.1	14.4

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

CONTROL PANEL LAYOUT
Medium Temperature Models

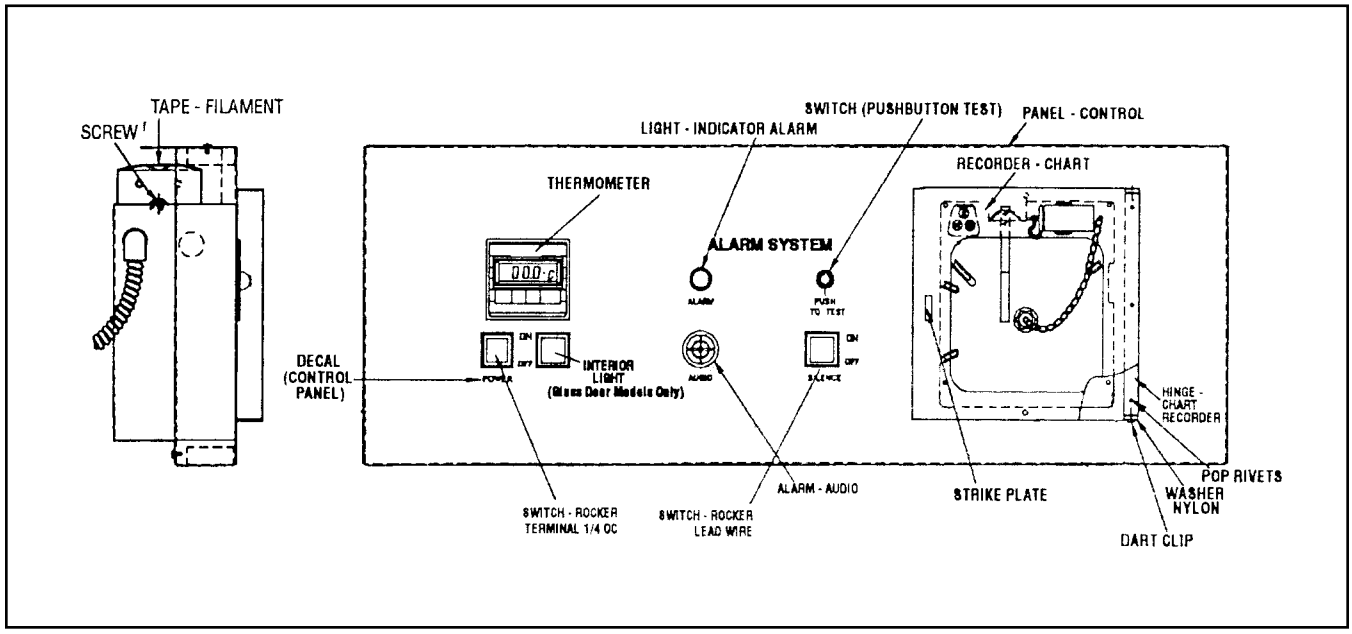


CONTROL ANNUNCIATOR PANEL

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 rocker switch on the control panel on glass door units and a push button switch on solid door units.
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 functionability 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 6 V 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

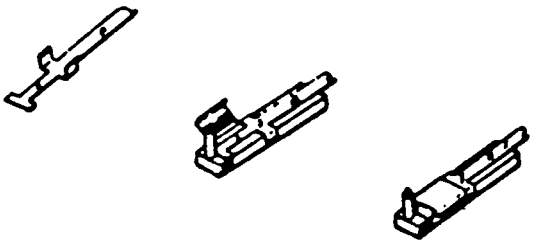
Press and hold the “change chart” button (#3) for one second until the pen begins to move to the left of the chart. To remove the chart, unscrew the knob at the center of the chart. Position the new chart so that the correct time line coincides with the time line groove on the chart plate. Again push 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 ben ding 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

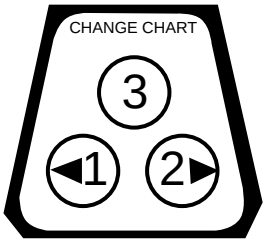
This recorder has been accurately calibrated at the factory. Before making any adjustments, this instrument should be in service for 24 hours. Thereafter, if any adjustment is required, perform the following procedure:

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 left arrow to move to the left. (See Figure 2.)

FIGURE 2



BATTERY BACKUP

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.

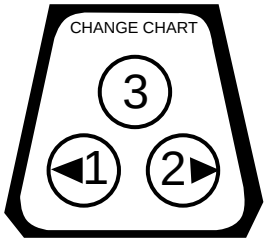
BATTERY LOCATION & REPLACEMENT

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.)

FIGURE 3



After 5 seconds, the light will turn solid green and the pen arm moves to indicate probe temperatures and begins recording. If further adjustment is necessary, press “change chart” again and repeat the procedure.

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. Please see temperature recorder calibration check (above on the left).

COBEX Model #C-921

Description:

6" Skeleton in Electronic Recorder

One Relay Output

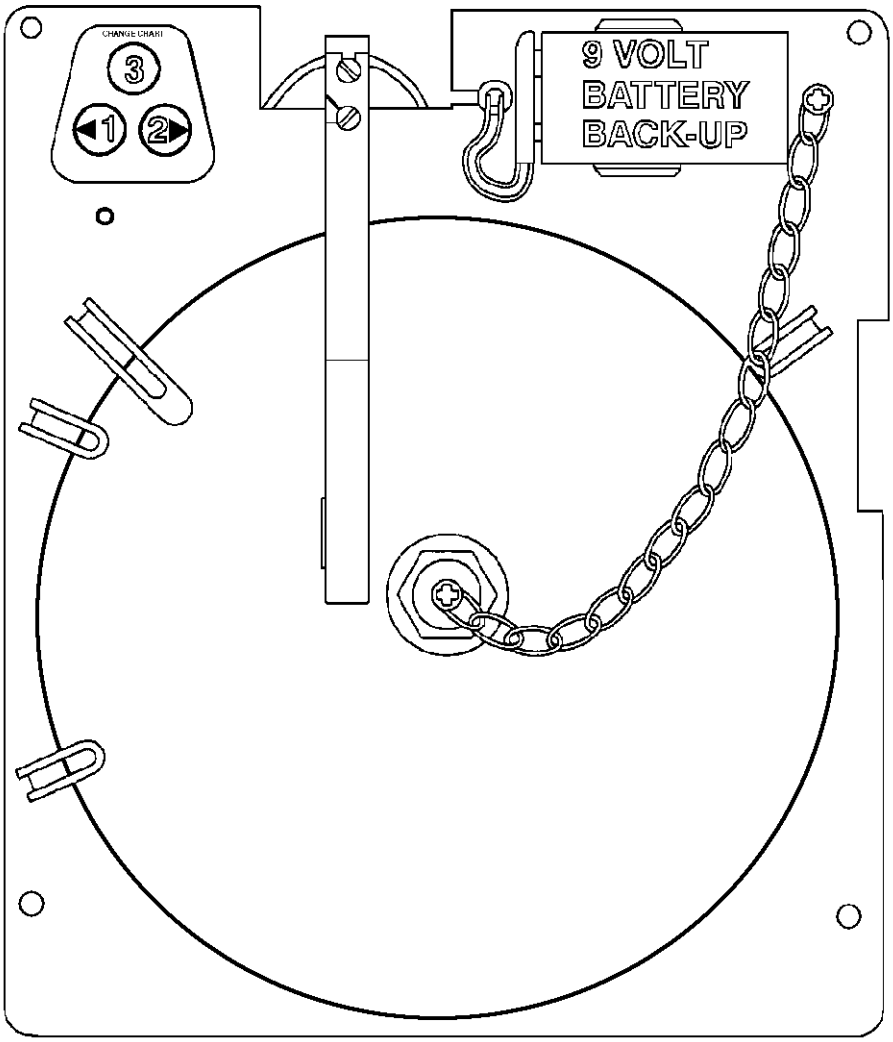
Dual Voltage 110/220V - 50/60 Hz.

9-volt Battery Back-up

Chart Paper - Ink Chart

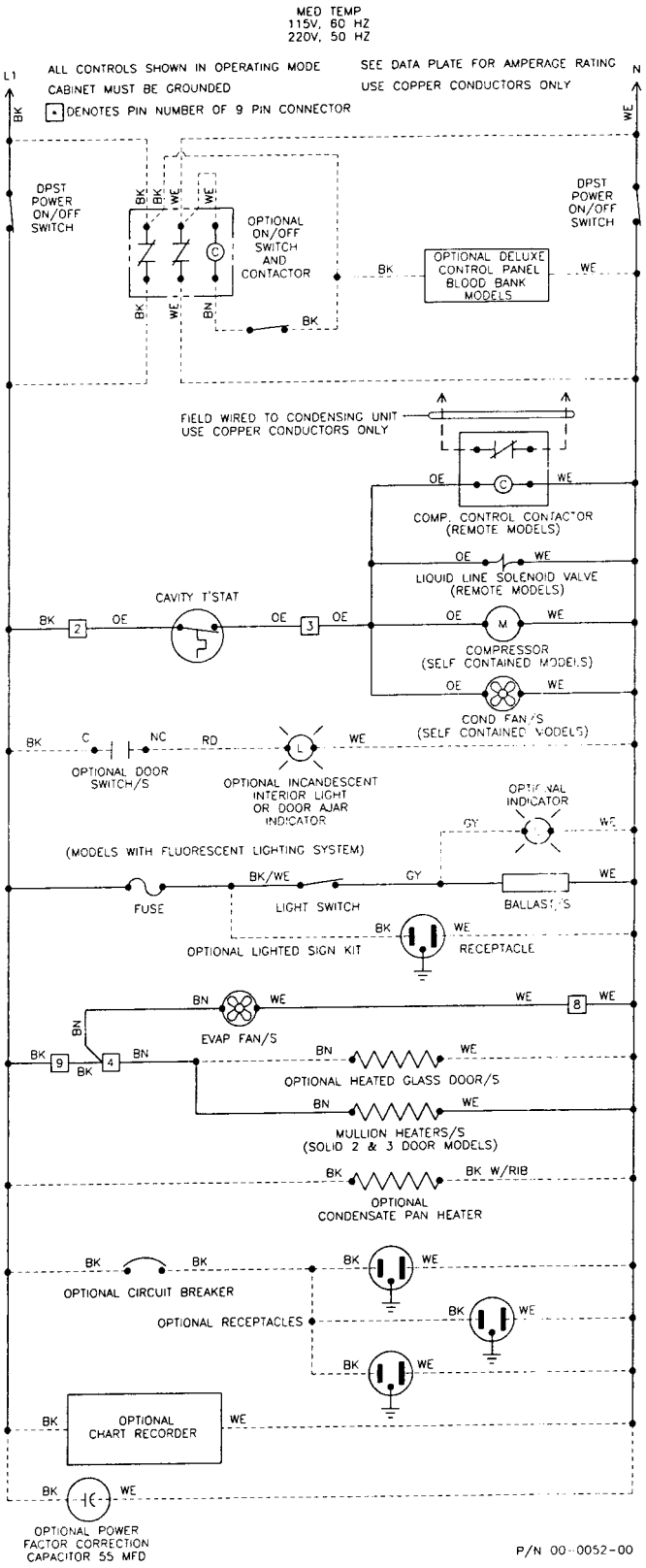
Refer to Cabinet Wiring Diagram (Control Panel section for proper connection information).

CHART RECORDER			
Type of Cabinet	**Temperature Range**	**Box of Charts Part No.**	**Settings Setup Number**
Base Model Refrigerator	-5°C to 25°C	197077	3



LADDER WIRING DIAGRAM

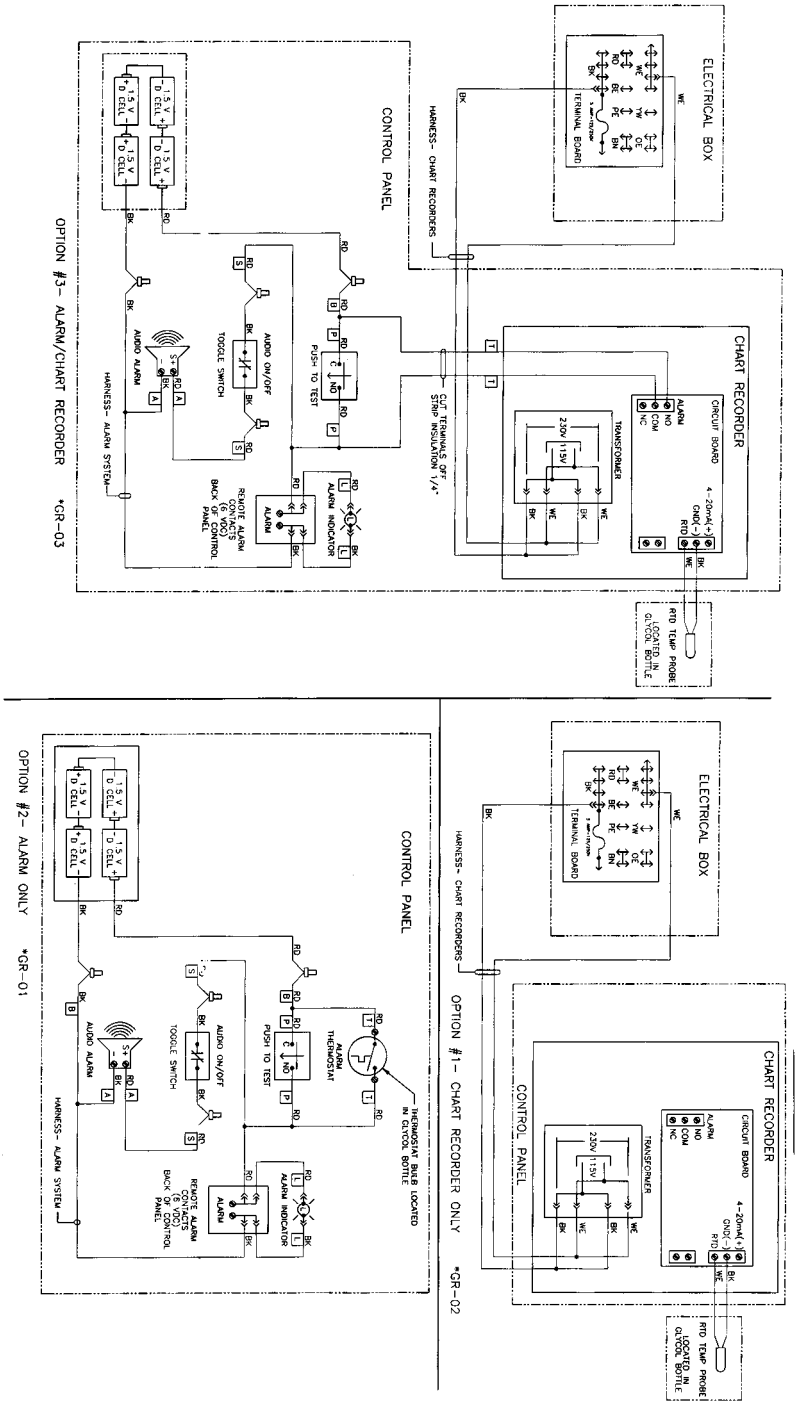
Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3785 / 3787
Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3786 / 3788



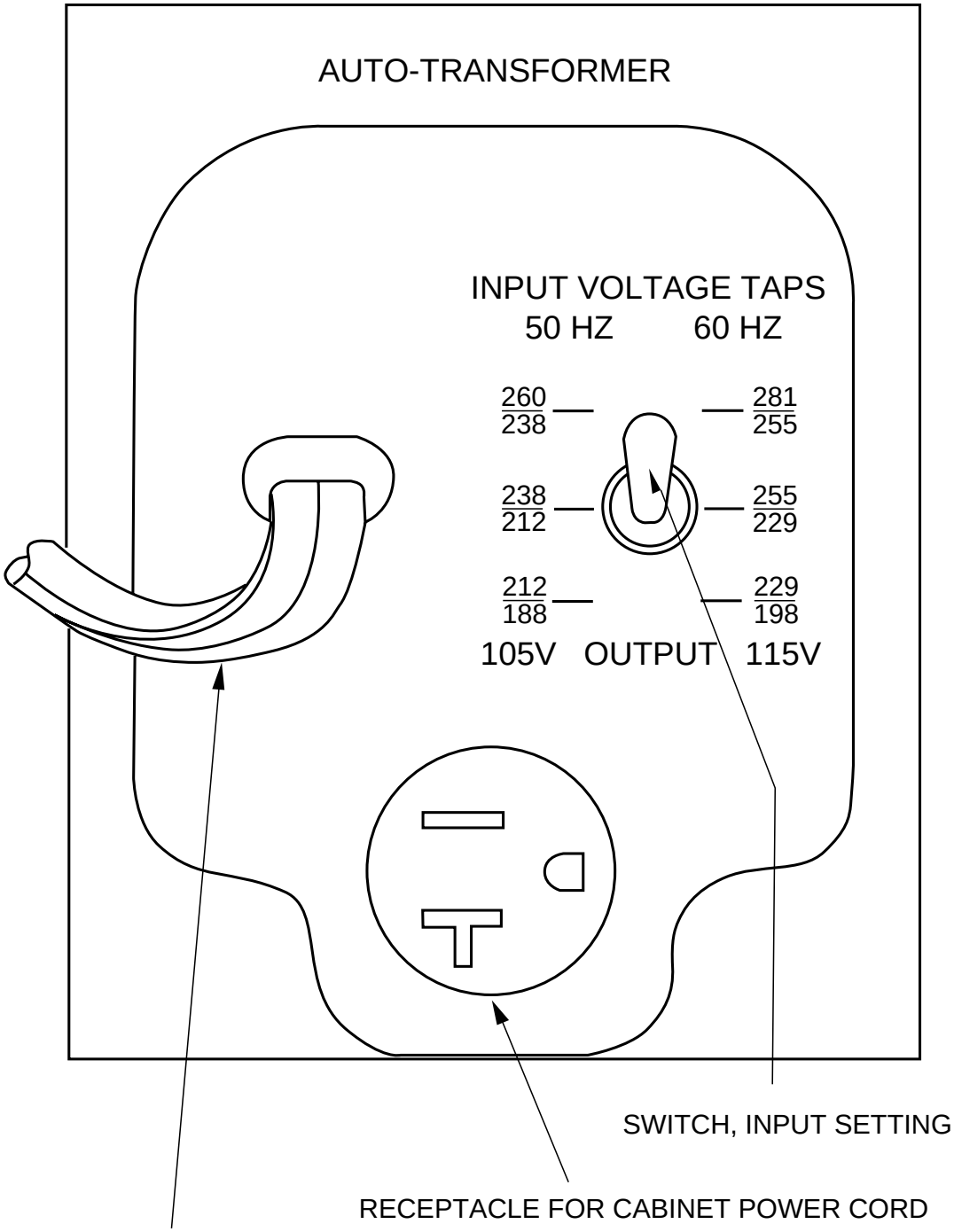
*See page 33 for information on transformer.

CONTROL PANEL WIRING DIAGRAM

Standard / Options



TRANSFORMER LAYOUT



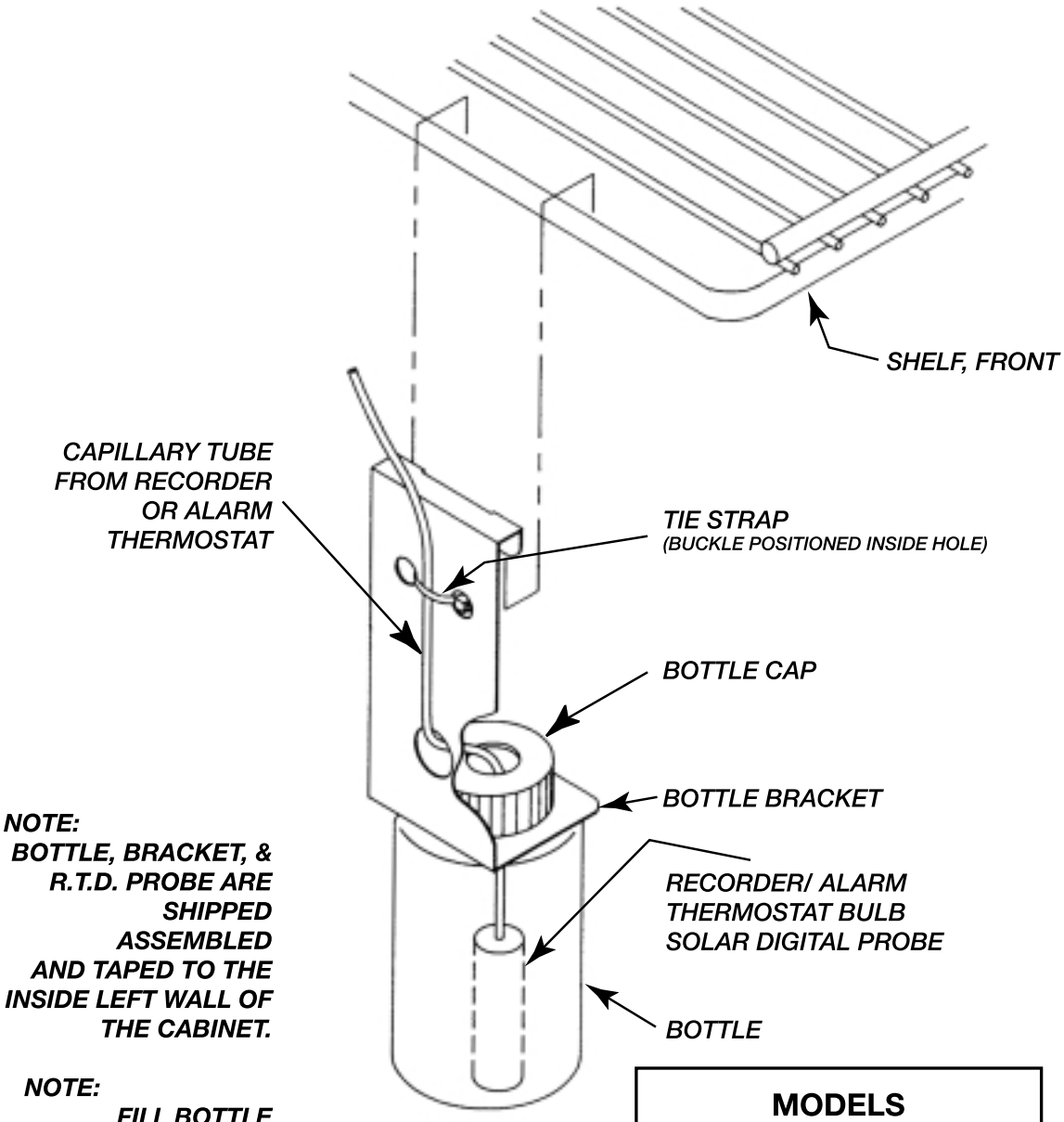
TRANSFORMER POWER CORD; PLUG INTO WALL OUTLET

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.



NOTE:
BOTTLE, BRACKET, & R.T.D. PROBE ARE SHIPPED ASSEMBLED AND TAPED TO THE INSIDE LEFT WALL OF THE CABINET.

NOTE:
FILL BOTTLE WITH TWO PARTS GLYCERIN AND ONE PART WATER.

MODELS

Chart Recorder with Alarm or Alarm Thermostat

(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 hard (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 electrical 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 crimp. ers, 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?

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 typically 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:

1. Add the refrigerant to the system until you reach a balanced pressure. This will give you an approximate static charge.
2. 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.

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 90% 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 tight.
C. The circuit is not 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 & 4 are O.K., the relay is good. If items 3 & 4 are not as indicated, change the 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.

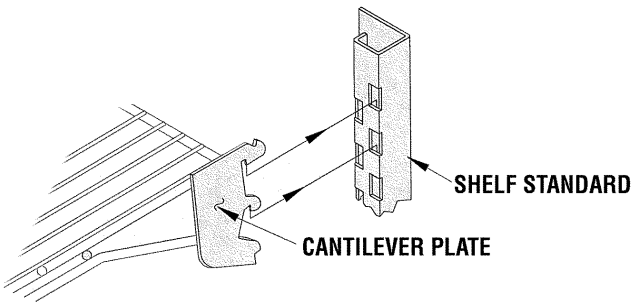
If the multimeter remains on a low resistance reading, a short circuit is indicated.

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.

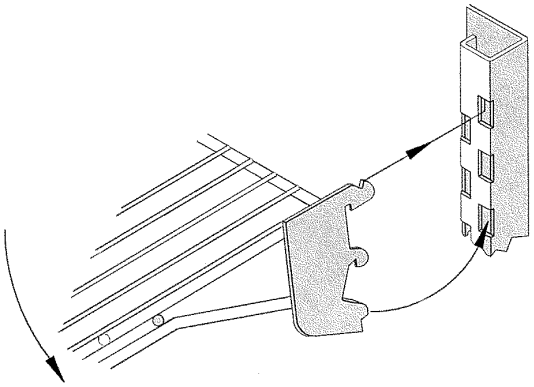
SHELVING/DRAWER Installation & Adjustment

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 o 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.



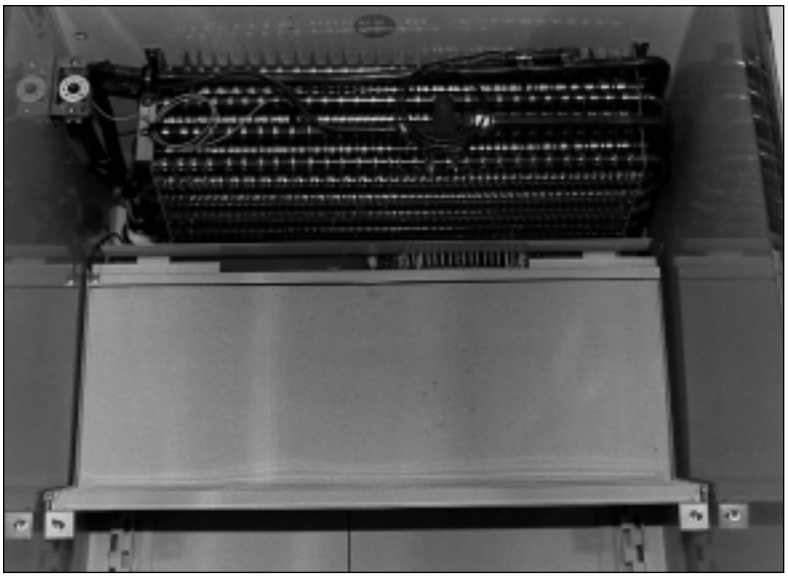
To slope shelves, insert the cantilever plate tabs into the rectangular holes in the desired position on the shelf standard. Lift up on the rear of the shelf so that the top tab is locked behind the top of the rectangular hole. HOld the rear of the shelf up while lowering the front of the shelf until 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. Lock screws.
2. Drop the front of the pan and swing it back.
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.



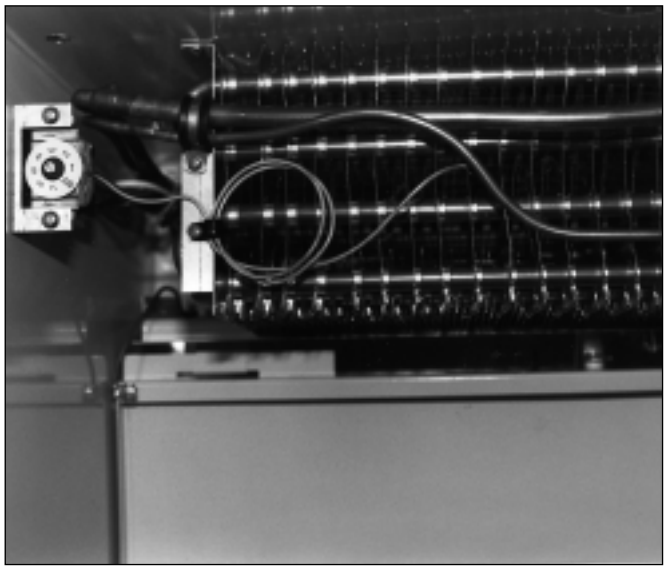
THERMOSTAT REPLACEMENT

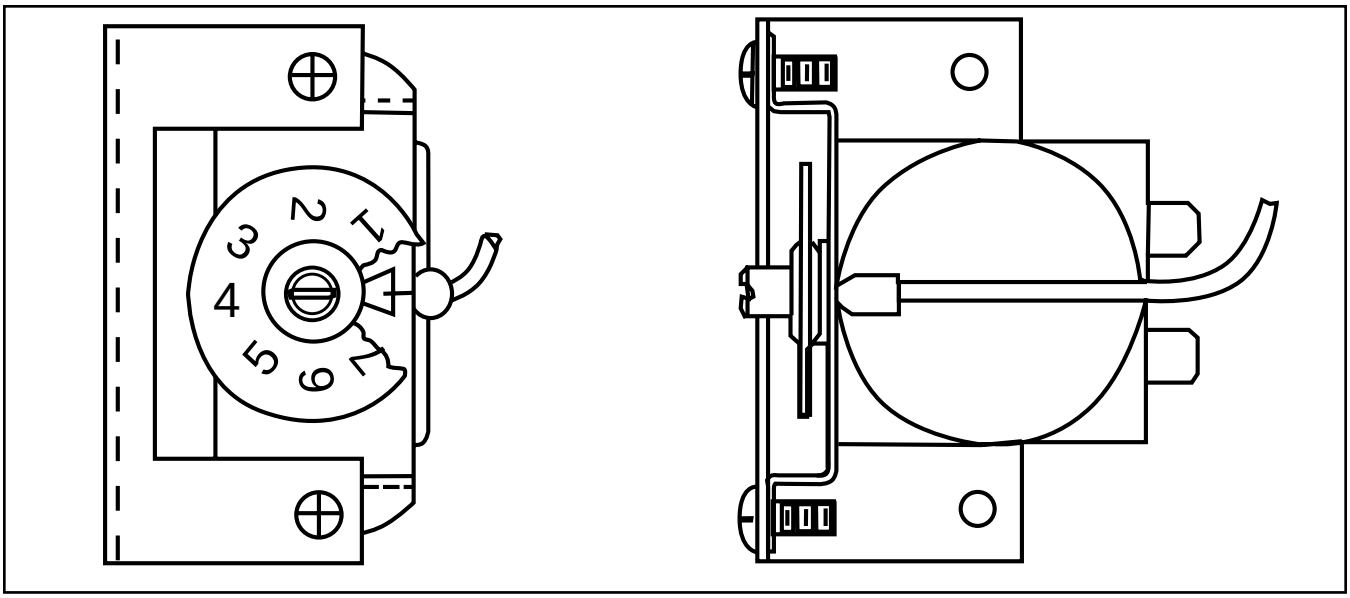
Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3785 / 3787
Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3786 / 3788

The thermostat is located in the upper left hand corner of the drain pan area. It functions to control the temperature within the cavity of the cabinet.

1. Disconnect power to the cabinet.
2. Lower evaporator drain pan.
3. Remove screws on mounting bracket.
4. Slide thermal bulb assembly out of cabinet.
5. Replace thermostat into position as indicated in above photo.
6. Replace screws.
7. Replace evaporator drain pan.
8. Reconnect power to cabinet.

(Do not crimp capillary tube. This will affect thermostat's performance or make it inoperable.)

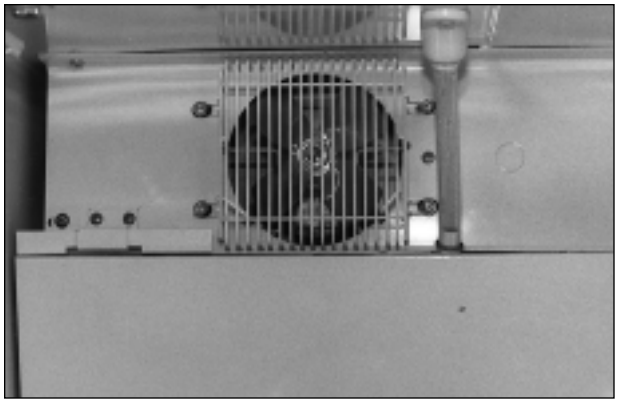




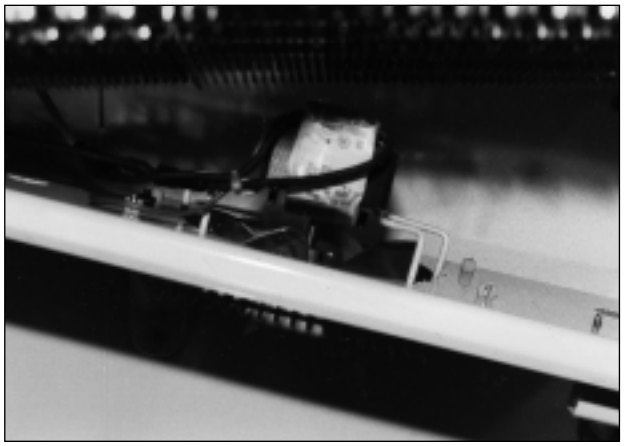
WARM		MID		COLD	
C.I.	C.O.	CI.	CO.	C.I.	C.O.
61.3°	—	50°	25°	—	3.7°

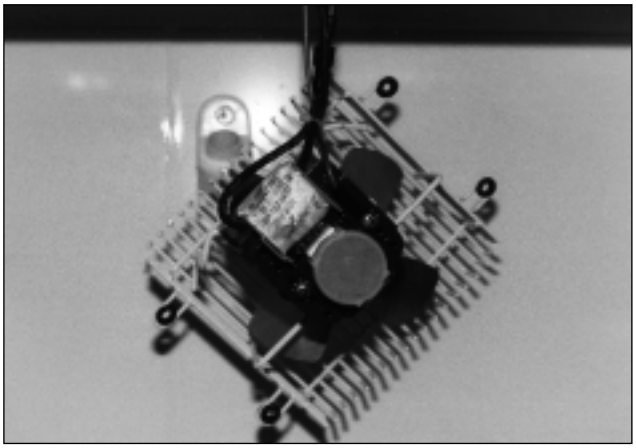
EVAPORATOR FAN MOTOR REPLACEMENT

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



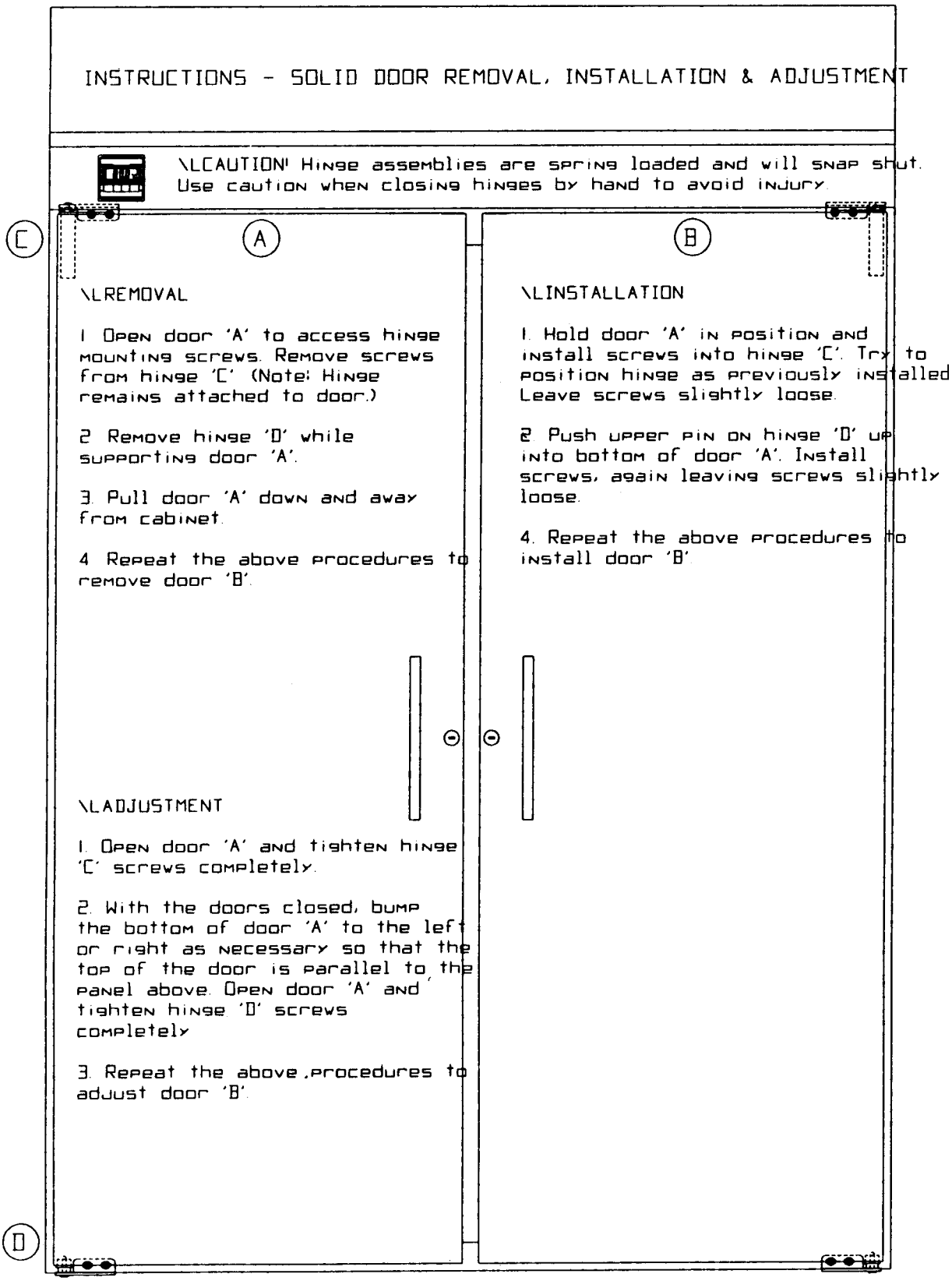
1. Disconnect the power to the cabinet
2. Remove the screws from the fan guard housing.
3. Drop the motor down out of the drain pan.
4. Disconnect the power leads to the motor.
5. Place the new motor onto the bracket.
6. Reconnect the power leads.
7. Raise the motor into the drain pan.
8. Replace the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





INSTRUCTIONS-SOLID DOOR REMOVAL

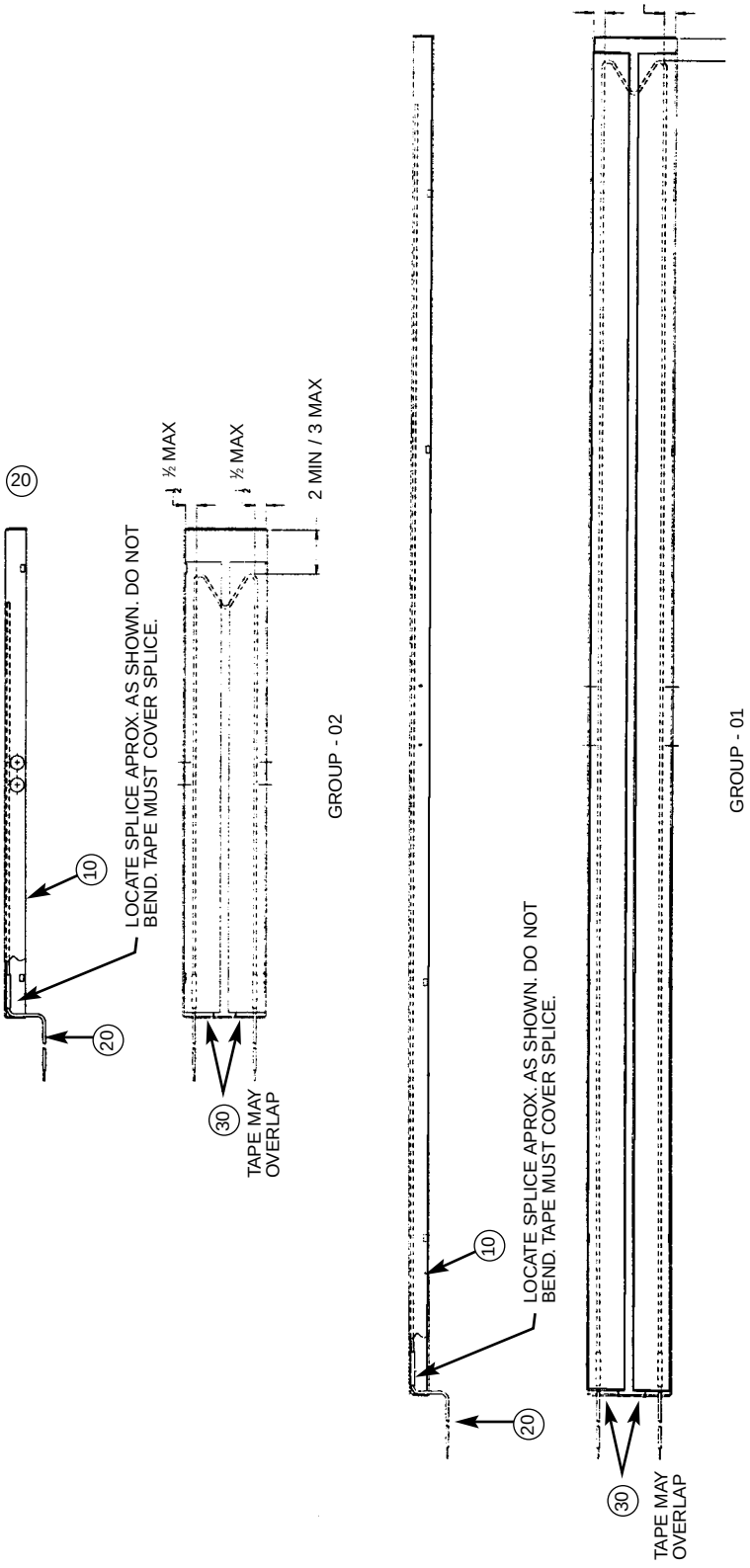
Installation & Adjustment



CABINET CENTER MULLION Heated Component Identification

Models: 3771 / 3773 / 3775 / 3777 / 3779 / 3787

Export Models: 3772 / 3774 / 3776 / 3778 / 3780 / 3788



SEQ	DESCRIPTION
10	MULLION PLATE
20	MULLION HEATER
30	TAPE

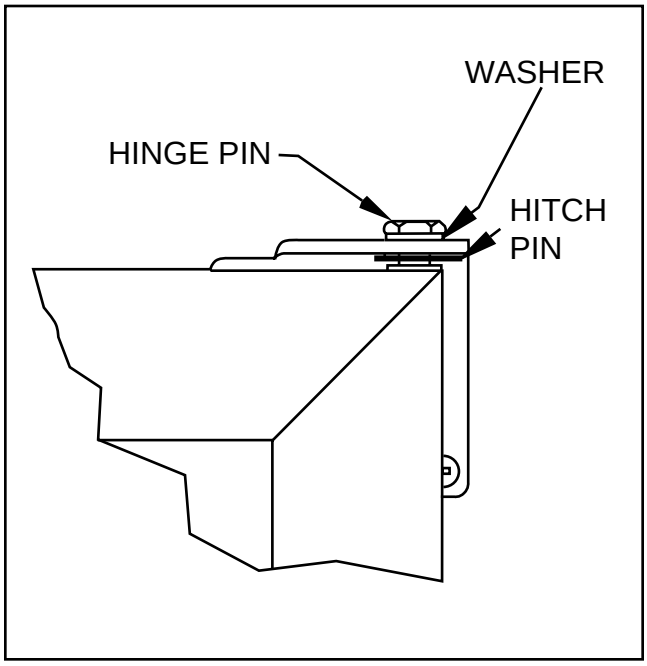
TORSION ROD HINGED DOORS - Maintenance & Removal

GLASS DOOR CABINETS ONLY

MAINTENANCE - ALIGNING DOORS

Proper alignment of the cabinet doors will eliminate hinge binding and provide correct gasket seal.

1. Check the cabinet level and door alignment by firmly closing each door. Observe the movement of the other doors. They should open slightly, then close and seal.
2. The hinge wings fastened to the cabinet door have slotted mounting holes for adjustment.
3. Additional adjustment can be made by adding shims between the hinge wing and either the door or the cabinet face.



REMOVING DOORS:

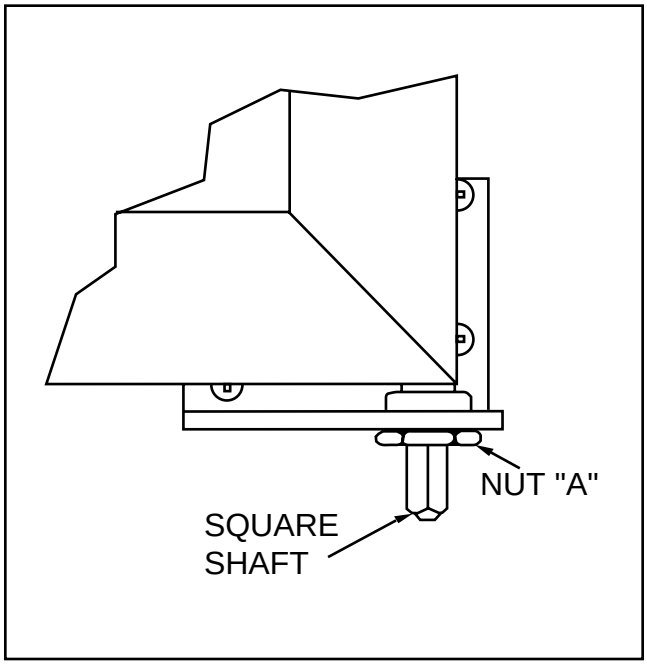
1. Loosen lower hex nut (Nut “A”) and release tension on the torsion rod.
2. Remove the hitch pin from the upper hinge pin.
3. Hold the door steady and unscrew the pin at top of the door. The door can now be lifted out of the lower hinge- bracket

REINSTALLING DOORS:

1. Set lower square shaft on door in lower hinge bracket
2. Insert top hinge pin and tighten to 12 ft./lbs. torque.

NOTE: Washer must be in place so top pin will not loosen and disconnect from door hinge.

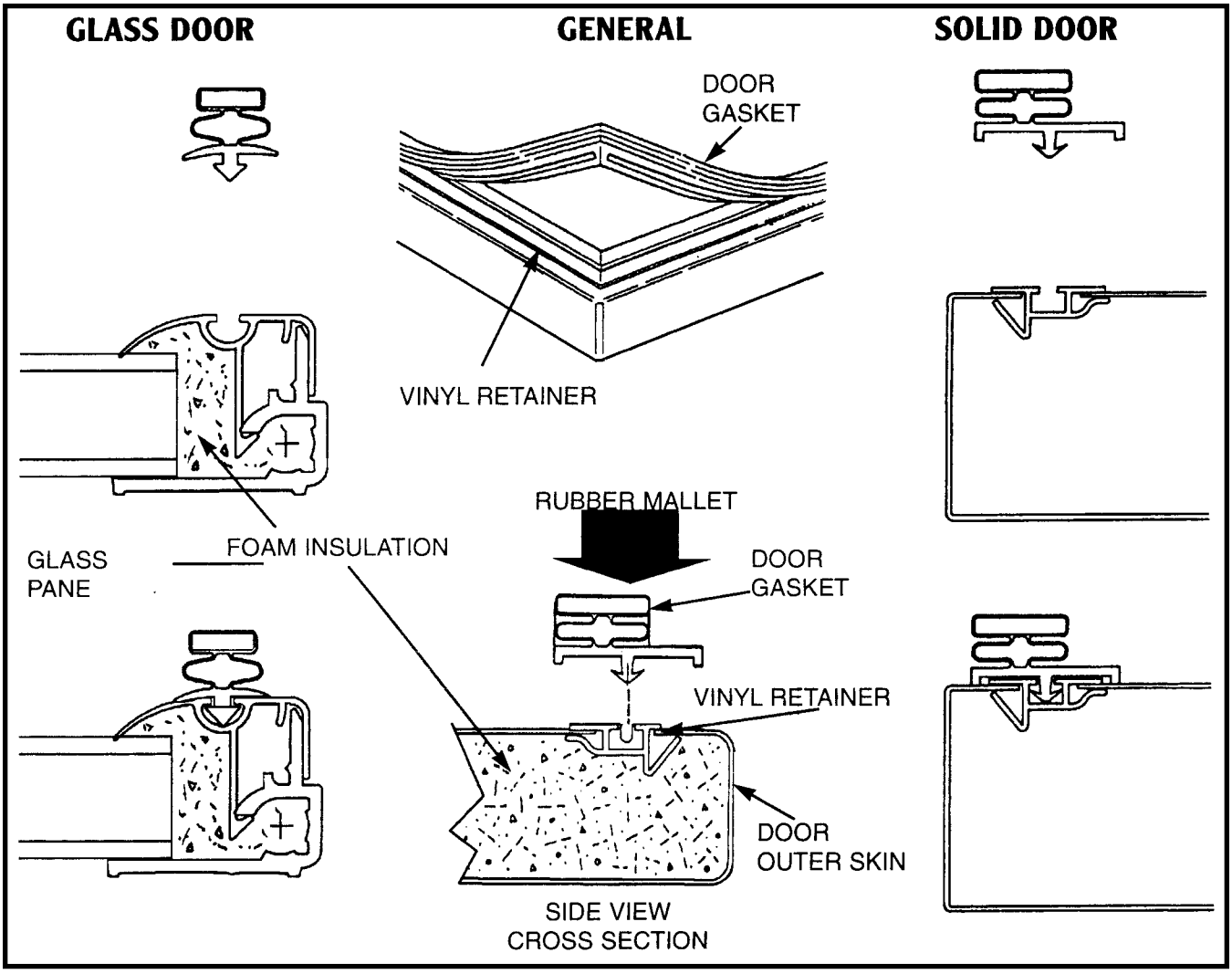
3. Insert hitch pin through hole in upper hinge pin.
4. Run Nut “A” up snug. (You may have to loosen Nut “A” as you tighten tension as noted in Step 5)
5. Set tension on door by turning square shaft in the direction the door closes. Set tension so that the door will self close when opened approximately 1” (Do not overtighten so door will slam.) Tighten Nut “A” so tension can be maintained.



TORQUE ROD REMOVAL

1. Loosen Nut “A” and remove door.
2. Attach vice grip to shaft and drive rod form door.
3. Insert new rod assembly into aluminum from slot provided.
4. Reattach Nut “A”.

DOOR GASKET REPLACEMENT

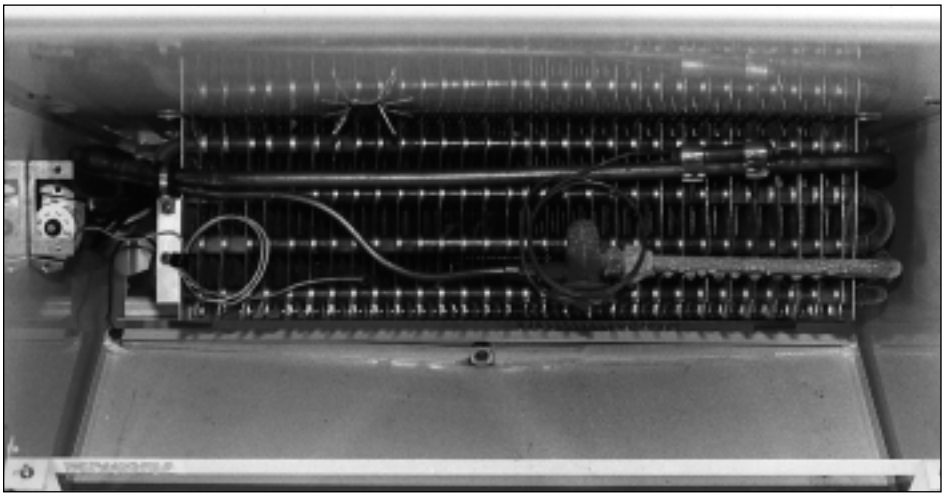


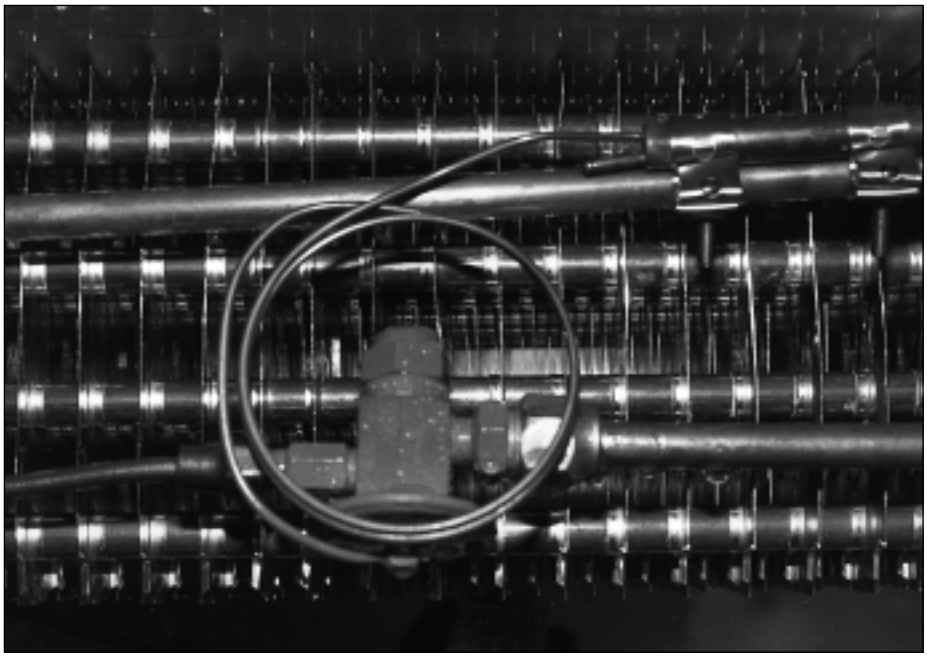
Thermo Forma gasketing is replaceable on glass or solid door models. A retainer is molded into the door frame. The door gasket is then tapped into the retainer and secured for airtight door seal.

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 a Sporlan BIF 1/4-C. 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

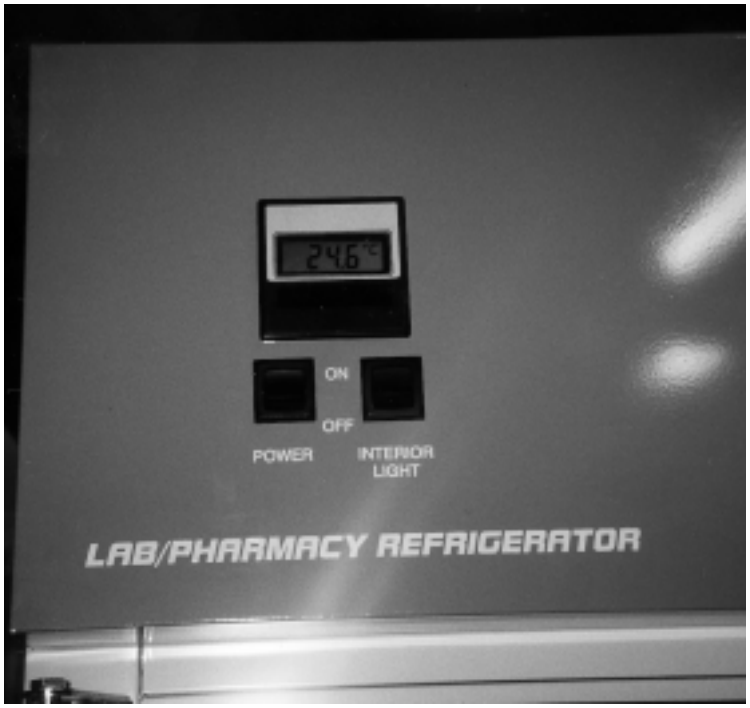
The condenser fan motor is located directly behind the condenser coil in the machinery compartment.

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 front top 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 top front panel.

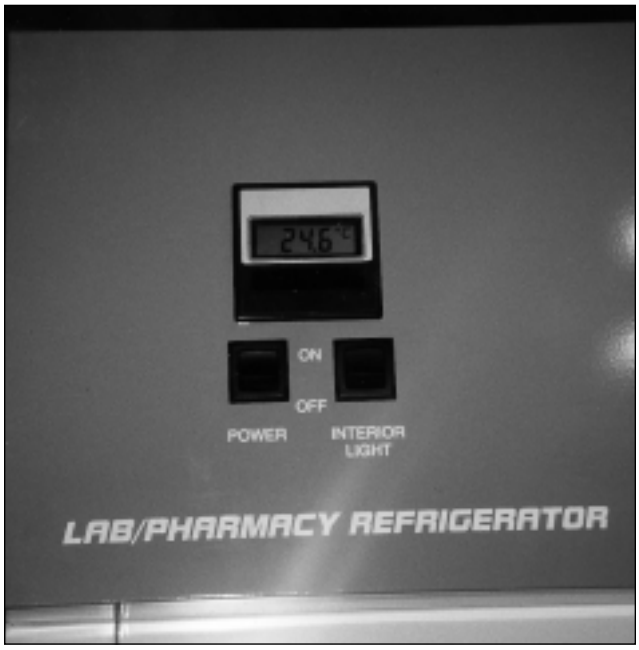
1. Disconnect the power to the cabinet.
2. Remove the front panel by removing 2 retainer screws located on the top of the cabinet and then lifting to disengage.
3. Remove the control panel rear cover.
4. Detach switch leads.
5. Remove the rocker power supply switch by depressing the plastic retainer clips and push.
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.



LIGHT SWITCH REPLACEMENT

On glass door models, the light switch is located on the front control 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 lifting to disengage.
3. Remove the control panel rear cover.
4. Disconnect wire leads from the light switch.
5. Remove the light switch from the control panel by depressing the plastic retainer clips and push.
6. Replace with new switch and reattach wiring.
7. Replace rear cover. Remount panel to cabinet.
8. Reconnect the power to the cabinet.



DIGITAL THERMOMETER / BATTERY REPLACEMENT

The thermometer can eaisly 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.

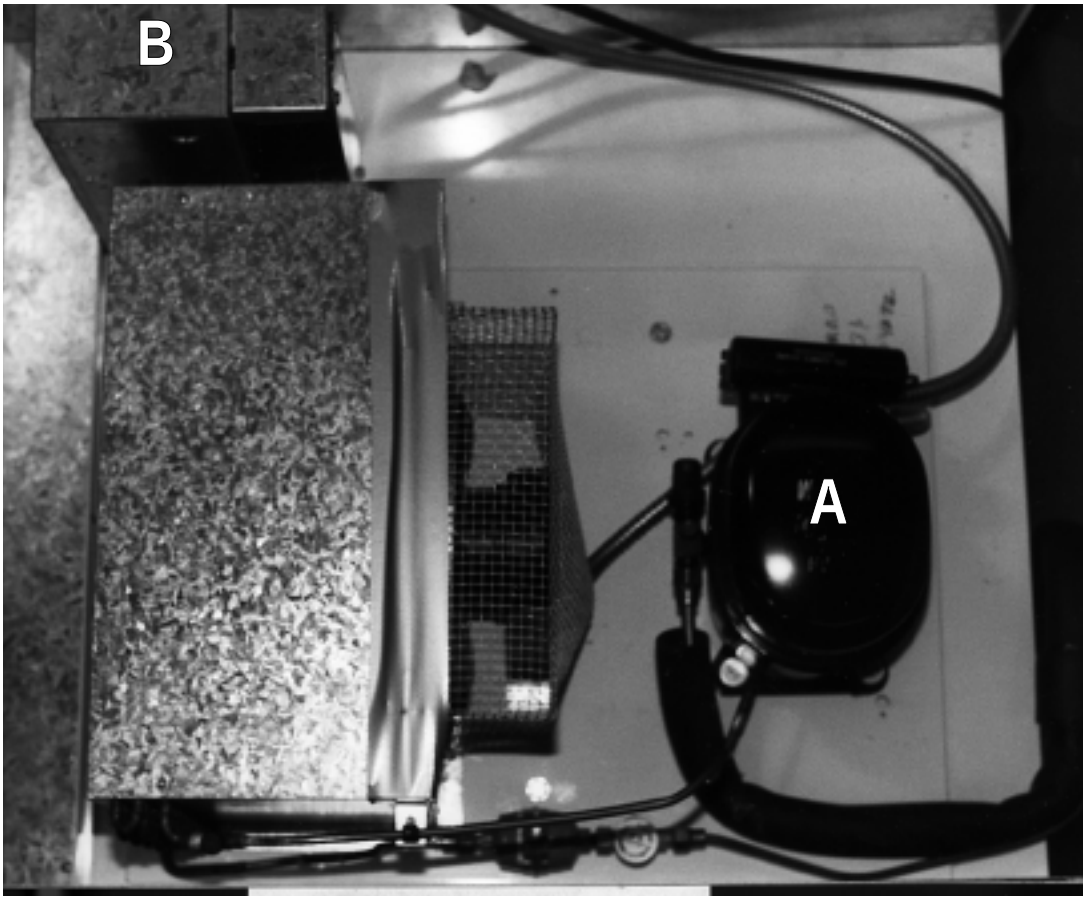
Remove two plastic nuts and bracket (rear of thermometer). The thermometer can now be removed form the panel.

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

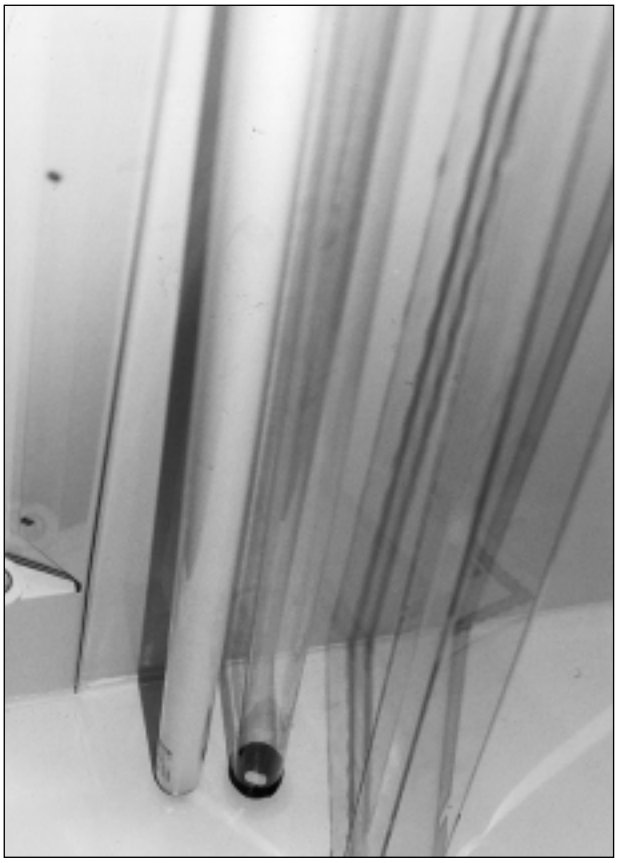
BALLAST REPLACEMENT

The ballast is located in the machinery compartment (A), attached to the back of the electrical control box (B).

1. Disconnect the power to the cabinet.
2. Remove the front panel.
3. Remove the cover panel on the electrical wiring box.
4. Disconnect the leads to the ballast.
5. Replace the ballast with correct part.
6. Replace the electrical wiring box cover panel.
7. Replace the front panel.
8. Reconnect the power to the cabinet.



FLUORESCENT BULB REPLACEMENT



1. Remove the plastic outer lamp shield.
2. Grasp the bulb.
3. Raise the bulb up. Pull out of the socket.
4. Remove the lamp shields and the end caps.
5. Place a new bulb in the shield. Attach the end caps.
6. Insert the bulb into the cabinet, push up and snap into place.

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.

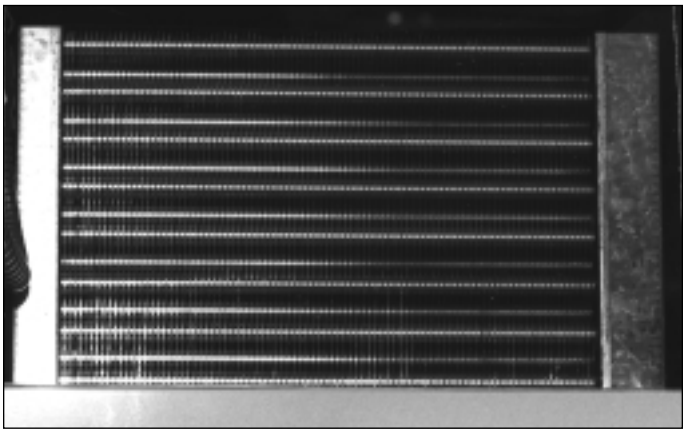


FIG. 1

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.

MACHINERY TROUBLESHOOTING GUIDES

UNIT WILL NOT RUN.	Blown fuse.	Check power for “live” circuit. If outlet is “dead” but building has power, replace the fuse. Try to determine the cause of the over-load 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.
	Fan 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	Clean the condenser and the ducts. condenser ducts.
	Thermostat control capillary not properly installed.	Refer back to removal/installation instructions detailed in this manual.

MACHINERY TROUBLESHOOTING GUIDES

CABINET RUNS CONTINUOUSLY.	Not enough air circulation around cabinet or circulation is restricted.	Relocate cabinet or provide proper clearances 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 grounded.	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.	Short 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 underseed cord being used.
	Short compressor.	Check with meter and also ground before replacing.
CABINET LIGHTS WON'T WORK.	Light switch off or defective.	Try new bulb or 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.

MACHINERY TROUBLESHOOTING GUIDES

UNIT RUNS TOO MUCH.	Abnormally high, heavy use of cabinet.	Heavy usage requires more operation Check usage 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 liner results in lost refrigeration effort.	Remove excess charge.
	Restricted air flow over condenser or air or non-condensable gases in system.	Correct the condition.
	High room temperature.	Check for temperature variance. Correct condition.
	Compressor inefficient.	Replace.
	Thermostat setting too cold.	Raise setting.
UNIT SHORT CYCLES.	Cycling on overload because of high/low line voltage with variance more or less than 10% from 115 volts. May also be caused by head pressures too high.	Check voltage, head pressure and air passages. Repair and correct condition.
PRODUCT TOO COLD.	Thermostat set too cold.	Set warmer. (Setting #1 is the warmest; #7 is the coldest.)
	Thermostat bulb contact bad.	If the bulb contact is bad, the bulb temperature will lag behind the sleeve temperature, causing the unit to run longer and make the cabinet too cold. Make sure bulb makes good contact with the bulb well.
	Room temperature abnormally low.	Correct conditions.
PRODUCT TOO WARM.	Thermostat set too warm.	Set colder. (setting #1 is the warmest; #7 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 GUIDES

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. Make sure discharge shut-off and receiver. valves are open if applicable.
	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 TROUBLESHOOTING GUIDES

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 compressor for proper application.
	Discharge 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 motor cooling.	Correct cooling system.
	Compressor tight.	Check oil level. Check for binding condition.
	Unbalanced line (three-phase).	Check voltage of each phase. If not equal, correct condition of unbalance.
	Discharge valve leaking or broken.	Replace valve plate.
STARTING CAPACITORS BURNT OUT.	Short cycling.	Reduce number of starts to 20 or less per hour.
	Prolonged operation on 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.
	Capacitor terminals shorted by water.	Install capacitors so terminals won't be wet.
RUNNING CAPACITORS BURNT OUT.	Excessive line voltage.	Reduce line voltage to not over 10% above rating of motor.
	High line voltage and light load.	Reduce voltage if over 10% excessive.
	Capacitor terminals shorted by water	Install capacitors so terminals won't be wet.
RELAYS BURNT OUT.	Low line voltage.	Increase voltage to not less than 10% above motor rating.
	Excessive line voltage.	Reduce voltage to not more than 10% above motor rating.
	Incorrect running capacitor.	Replace with correct capacitor.
	Short cycling.	Reduce number of starts per hour.
	Relay vibrating.	Mount relay rigidly.
	Incorrect relay.	Use relay recommended for specific motor compressor.

FLUORESCENT LAMP TROUBLESHOOTING GUIDES

Thermo Forma uses standard fluorescent lamps in all of its applications. Standard one- and two-lamp ballast circuits are used.

Replacement lamps should be purchased over the counter from a local electrical wholesaler.

The table below indicates general problems that may be encountered with fluorescent lighting applications, possible causes, and corrective maintenance suggestions.

NORMAL END OF LIFE. **Lamp won't operate. Flashes momentarily and goes out or blinks on and off.** **Ends probably blackened.**	Normal failure. Active material on cathodes exhausted.	Replace lamp promptly.
SHORT LIFE.	Wrong lamp type used.	Replace with lamp type marked in owner's manual.
	Wrong type of starter.	Replace with correct starter.
	Ballast not supplying the specified electrical values.	Replace with correct ballast for rating for lamp size.
	Wrong type of ballast used.	Replace ballast with proper type.
	Too low or too high voltage.	Check primary voltage with range specified on ballast name plate.
	Poor circuit contact. (likely at lamp-holders.)	Lampholders should be rigidly mounted and lamp securely seated.
	Ballast improperly or incompletely connected.	Study ballast label wiring diagram and check connections.
	Too many lamp starts.	Average life for most lamps is dependent on number of starts and hours of operation.
END BLACKENING. **Dense blackening at one end or both, extending 2"-3" from base.**	Normal end of life.	Replace lamp promptly.
	Mercury deposit - generally within 1" of lamp end.	Should evaporate as lamp is operated.
	Poor circuit contact likely at the lampholder.	Lampholders should be rigidly mounted and lamp securely seated.
	Ballast improperly or incompletely connected.	Study ballast wiring instructions and check connections.
	Wrong type lamp used.	Replace with correct lamp type.
	Wrong type of starter or defective starter causing on/off blinking or prolonged flashing at each start.	Replace with proper starter.
	Ballast installed not supplying the specified electrical values.	Replace with ballast of correct rating for lamp size.
	Line voltage too low or too high.	Check line voltage with range specified on ballast plate.
	Ballast improperly or incompletely connected.	Study ballast label wiring instructions and check connections.

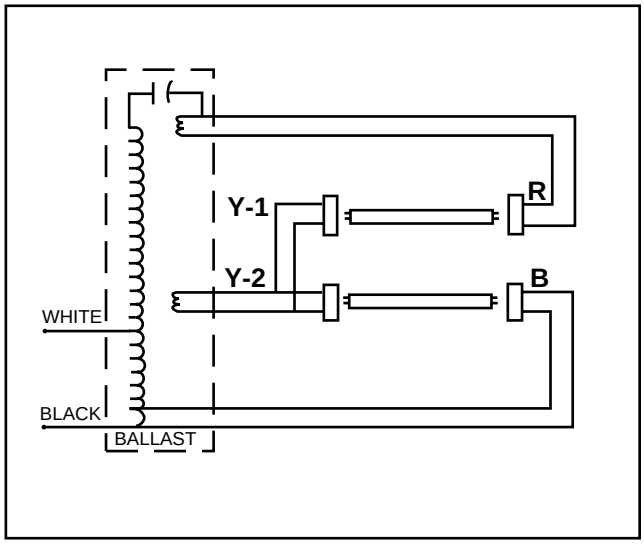
FLUORESCENT LAMP TROUBLESHOOTING GUIDES

NORMAL END OF LIFE. NO STARTING EFFORT OR SLOW STARTING.	Normal failure. Active material on Open lamp cathode circuit due to broken cathode, air leak, or by open weld. of light.	Replace lamp promptly. If open, circuit is shown by continuity test or viewing end of bulb against a pinhole Replace lamp.
	Wrong lamp type used.	Replace with lamp type indicated in owner's manual.
	Starter at end of life.	Replace starter.
	Starter sluggish.	Replace starter.
	Ballast installed not supplying the specified electrical values.	Replace with correct ballast of correct rating for lamp size.
	Temperature cold air contact to bulb.	Correct installation of lamp protection tubes, or shields to prevent cold air effects.
	Circuit voltage.	Check voltage and correct if possible.
DECREASED LIGHT OUTPUT. Full illumination of bulbs requires correct assembly of all components of lighting system.	Temperature operation, cold air affects lamp performance.	Properly install jacketed lamps where applicable.
	Circuit voltage.	Check voltage and correct if possible.
	Ballast improperly or incompletely connected.	Study ballast label wiring instructions and check connections.
	Dust or dirt on lamp or fixture.	Clean.
BLINKING ON/OFF: Accompanied by shimmering effect during "lighted" period.	Normal failure. Active material on cathodes exhausted.	Replace lamp promptly.
	Possible lamp fault in some lampholders.	Replace lamp. Investigate further if successive lamps blink or flicker during "lighted" period.
	Wrong type of starter or defective starter.	Replace with proper starter.
	Ballast installed not supplying the specified electrical circuit.	Replace with correct ballast with correct rating for lamp size.
	Circuit voltage.	Check voltage and correct if possible.
	Loose circuit contact.	Lampholders should be rigidly mounted and lamp securely seated.
OVERHEATED BALLAST.	Wrong lamp type used.	Replace with correct lamp number located in owner's manual.
	Wrong ballast used. Wrong voltage rating.	Replace ballast.
	Circuit voltage.	Check voltage and correct to design specifications.
	Ballast improperly or incompletely connected.	Study ballast label. Correct if installed wrong.

MEASUREMENTS - STARTING LAMP VOLTAGE
Typical Two-Lamp RS Ballast

Starting Voltage

The largest percentage of light ballasts used today are of the two-lamp Rapid Start type. In order to read starting or open circuit voltage, as it often called, remove both lamps from their sockets. The high voltage (OVC) which starts and operates the lamp is always between the “R” and “B” sockets. The two lamps are in series between these sockets. The Y-1 and Y-2 connections provide cathode heat, and serve to connect the lamp ends together. Because the leads between Y-1 and Y-2 are connected together by jumper leads, they are always wired to sockets at one end of the fixture. Therefore, the “R” and “B” sockets are always at the other end of the fixture. This means that in order to measure the voltage which starts the lamps (OVC), the meter probes must be placed in the sockets at one end of the fixture. The Y-1 and Y-2 end of the fixture will read zero while the “R” and “B” end of the indoor ballast should read as follows:



Lamp Type	Min. RMS Voltage	HO	Min. RMS Voltage	1500 MA.	Min. RMS Voltage
F40	256	48"	256	48"	250
F30	215	72"	395	72"	350
		96"	465	96"	470

SECTION IV
Parts Lists

page 66 - BLANK

REPLACEMENT PARTS LIST:	ONE DOOR		TWO DOOR		THREE DOOR
DATE 9/1/00					
MODELS 37--	71,72,85,86.	73,74,	75,76,87,88,	77,78.	79.80.
	GLASS	SOLID	GLASS	SOLID	GLASS
DISCRIPTION.	PART #	PART #	PART #	PART #	PART #
EVAP. COIL	18-0713-00	18-0713-00	18-0713-00	18-0713-00	18-0714-01
TXV.VALVE	18-0386-08	XXXXXXXX	18-0386-08	XXXXXXXX	18-0386-09
HEAT. EXCHANGE	50-0219-01	50-0222-01	50-0218-00	50-0222-02	50-0218-00
HARNESS, EVAP.	19-1652-02	19-1652-02	19-1652-02	19-1652-02	19-1652-02
THERMOSTAT	19-1030-02	19-1030-02	19-1030-02	19-1030-02	19-1030-02
EVAP. MOTOR	19-1221-00	19-1221-00	19-1221-00	19-1221-00	19-1221-00
EVAP. MTR. BLADE	19-1223-00	19-1223-00	19-1223-00	19-1223-00	19-1223-00
EVAP. FAN GUARD	15-0319-00	15-0319-00	15-0319-00	15-0319-00	15-0319-00
LAMP HOLDER TOP	19-0957-01	XXXXXXXX	19-0957-01	XXXXXXXX	19-0957-01
LAMP HOLDER BTM.	19-0957-02	XXXXXXXX	19-0957-02	XXXXXXXX	19-0957-02
HARNESS, BALLAST	19-1685-01	XXXXXXXX	19-1685-02	XXXXXXXX	19-1685-03
MULLION HEATER	XXXXXXXX	XXXXXXXX	19-1657-01	19-1657-01	19-1657-01
TRIM BREAKER SIDE	10-0806-02	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	10-0806-10
DOOR SWITCH	XXXXXXXX	19-0969-00	XXXXXXX	19-0969-00	XXXXXXXX
HINGE LOW, RH	03-1232-02	25-0178-09	03-1232-02	25-0178-09	XXXXXXXX
HINGE, LOW LH	XXXXXXXX	XXXXXXXX	03-1232-01	25-0178-08	03-1232-01
HINGE, UPPER LH	XXXXXXXX	XXXXXXXX	03-1231-03	25-0178-02	03-1231-03
HINGE UPPER RH	03-1231-04	25-0178-03	03-1231-04	25-0178-03	XXXXXXXX
RELAY- CONTACTOR	19-1005-00	19-1005-00	19-1005-00	19-1005-00	19-1005-00
POWER CORD	19-0620-00	19-0620-00	19-0620-00	19-0620-00	19-0967-00
LIGHT BALLAST	19-1710-00	XXXXXXXX	19-1710-00	XXXXXXXX	19-1710-00
ELEC. BOX .HARNESS	19-1675-02	19-1675-02	19-1675-02	19-1675-02	19-1675-02
LIGHT FUSE	19-0970-00	XXXXXXXX	19-0970-00	XXXXXXXX	19-0970-00
THERMOMETER DIGITAL	19-1050-03	19-1050-03	19-1050-03	19-1050-03	19-1050-03
SWITCH, ROCKER	19-1310-00	19-1310-00	19-1310-00	19-1310-00	19-1310-00
EVAP. DRAIN PAN	50-3849-01	50-3849-01	50-3849-02	50-3849-02	50-3849-03
SOLUTION, BOTTLE	10-0933-01	10-0933-01	10-0933-01	10-0933-01	10-0933-01
FLOR. LAMP	19-1040-00	XXXXXXXX	19-1040-00	XXXXXXXX	19-1040-00
LIGHT SHIELD. W / ENDS	10-0983-00	XXXXXXXX	10-0983-00	XXXXXXXX	10-0983-00
SIDE LIGHT COVER	10-0809-00	XXXXXXXX	10-0809-00	XXXXXXXX	10-0809-00
DOOR ASSY. LH.	XXXXXXXXX	XXXXXXXX	51-1027-13	51-0172-05	51-1027-13
DOOR ASSY. RH.	51-1027-16	51-0172-02	51-1027-14	51-0172-06	XXXXXXXX
ACCORDIAN COIL	50-0221-00	XXXXXXXX	50-0220-00	XXXXXXXX	50-0220-00
DOOR GASKET	10-0822-02	10-0882-05	10-0822-01	10-0882-06	10-0822-01
DOOR , TORQUE ROD	50-3159-00	XXXXXXXX	50-3159-00	XXXXXXXX	50-3159-00
HINGE, CARTRIDGE	XXXXXXXXX	25-0178-01	XXXXXXX	25-0178-01	XXXXXXXX
HOLD OPEN ARM LH.	XXXXXXXXX	XXXXXXXX	25-0543-01	XXXXXXXX	25-0543-01
HOLD OPEN ARM RH.	25-0543-02	XXXXXXXX	25-0543-02	XXXXXXXX	XXXXXXXX
COMPRESSOR	16-0221-00	16-0310-00	16-0222-00	16-0310-00	16-0222-00
COMP. O L.	17-0144-00	17-0316-00	17-0148-00	17-0316-00	17-0148-00
START. RELAY	17-0142-00	17-0286-00	17-0146-00	17-0286-00	17-0146-00
START CAP.	17-0143-00	17-0291-00	17-0147-00	17-0291-00	17-0147-00
RUN CAP.	XXXXXXXX	17-0288-00	17-0149-00	17-0288-00	17-0149-00
COND. FAN MTR.	19-0933-00	19-0933-00	19-0933-00	19-0933-00	24-0396
COND. FAN BLADE	19-0101-00	19-0101-00	19-0101-00	19-0101-00	19-0410-00
FILTER / DRIER	18-1106-00	18-1106-00	18-1106-00	18-1106-00	18-1106-00
CONDENSER COIL	18-1211-01	18-1211-01	18-0546-02	18-1211-01	18-0546-02
SHELF KIT	51-1046-06	51-1046-06	51-1046-01	51-1046-01	51-1046-01
CONDENSATE PAN	02-0757-00	02-0757-00	02-0757-00	02-0757-00	02-0757-00
CONDENSATE PAN HTR.	19-1688-00	19-1688-00	19-1688-00	19-1688-00	19-1688-00
LEG KIT	33-0504-01	33-0504-01	33-0504-01	33-0504-01	33-0504-01

REPLACEMENT PARTS LIST: OPTIONS	
DATE	5/1/00
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.

Rev. 1 1/17/01

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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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Rev. 1 1/17/01