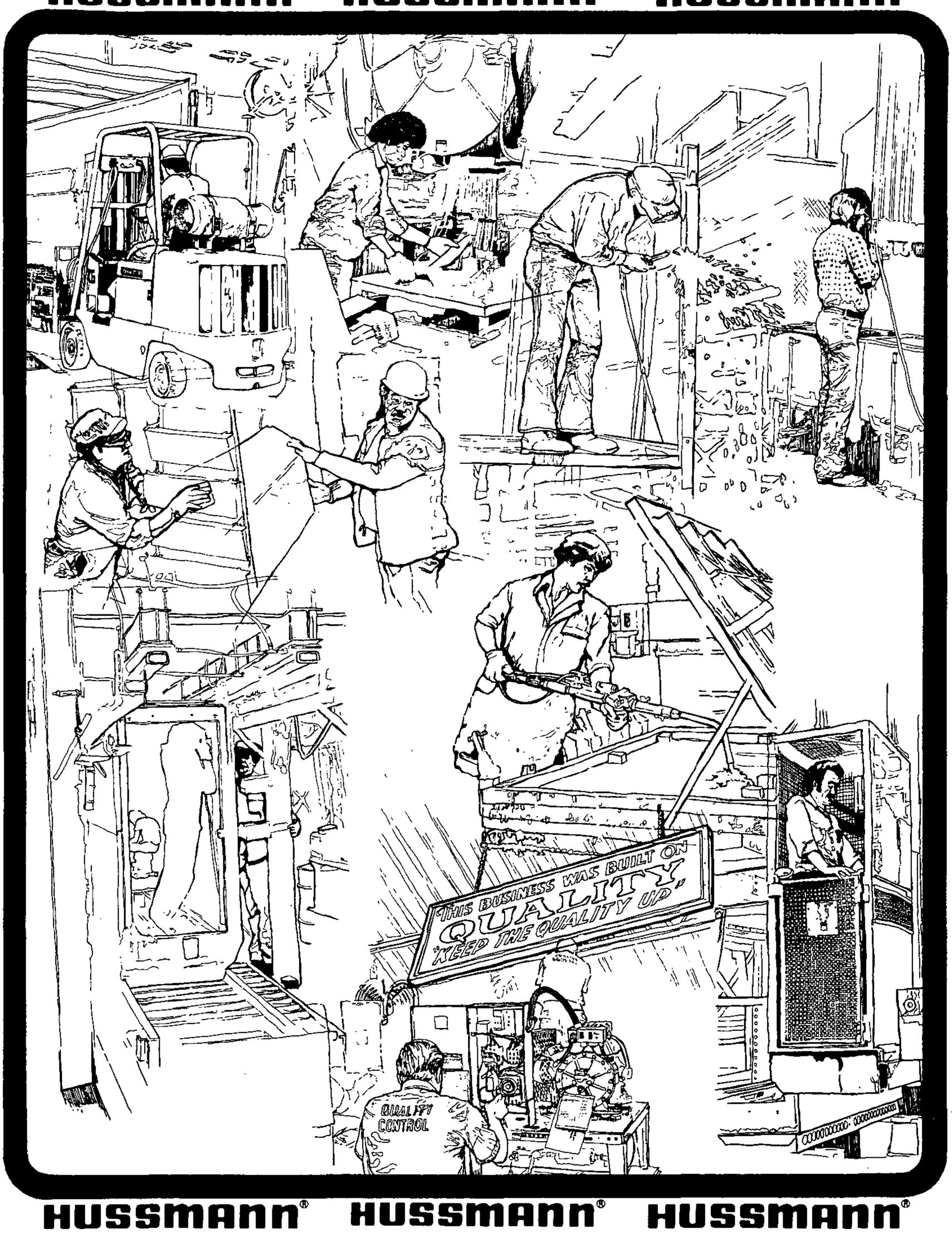
HUSSMANN®

CORPORATION



MWI

Wide Island Refrigerated Meat/Deli Merchandisers

INSTALLATION / SERVICE INSTRUCTIONS

ENG. NO. 323671C
March, 1989
Supersedes #323671B
Dated March, 1988
Section 1

TABLE OF CONTENTS

IMPORTANT
KEEP IN STORE FOR FUTURE REFERENCE

Quality that sets industry standards.

THIS MERCHANDISE CONFORMS TO THE
COMMERCIAL REFRIGERATOR MANUFACTURER'S ASSOCIATION
HEALTH AND SANITATION STANDARD

CRS-S1-86

HUSSMANN® 12999 St. Charles Rock Road • Bridgeton, MO 63044 USA • (314) 291-2000 • FAX (314) 298-4767

Section 1

GENERAL INFORMATION

Model Description

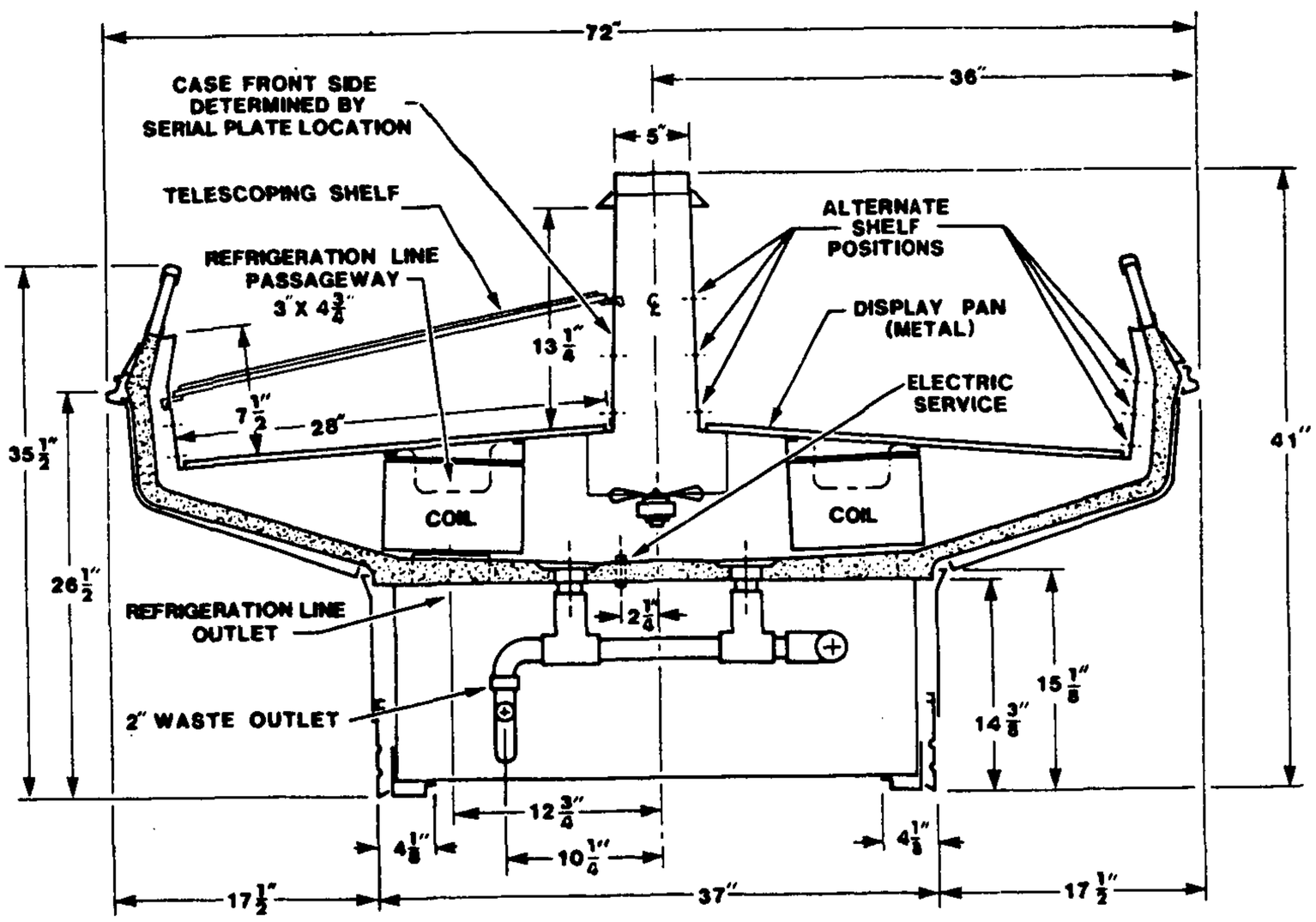
The MWI wide island refrigerated merchandiser is specifically designed to display and protect packaged meat or deli products. It is available in 6, 8, or 12 ft lengths, and a 6 ft wrap-around end unit. When ordered, it wil be factory joined to the parent 6, 8, or 12 ft length models.

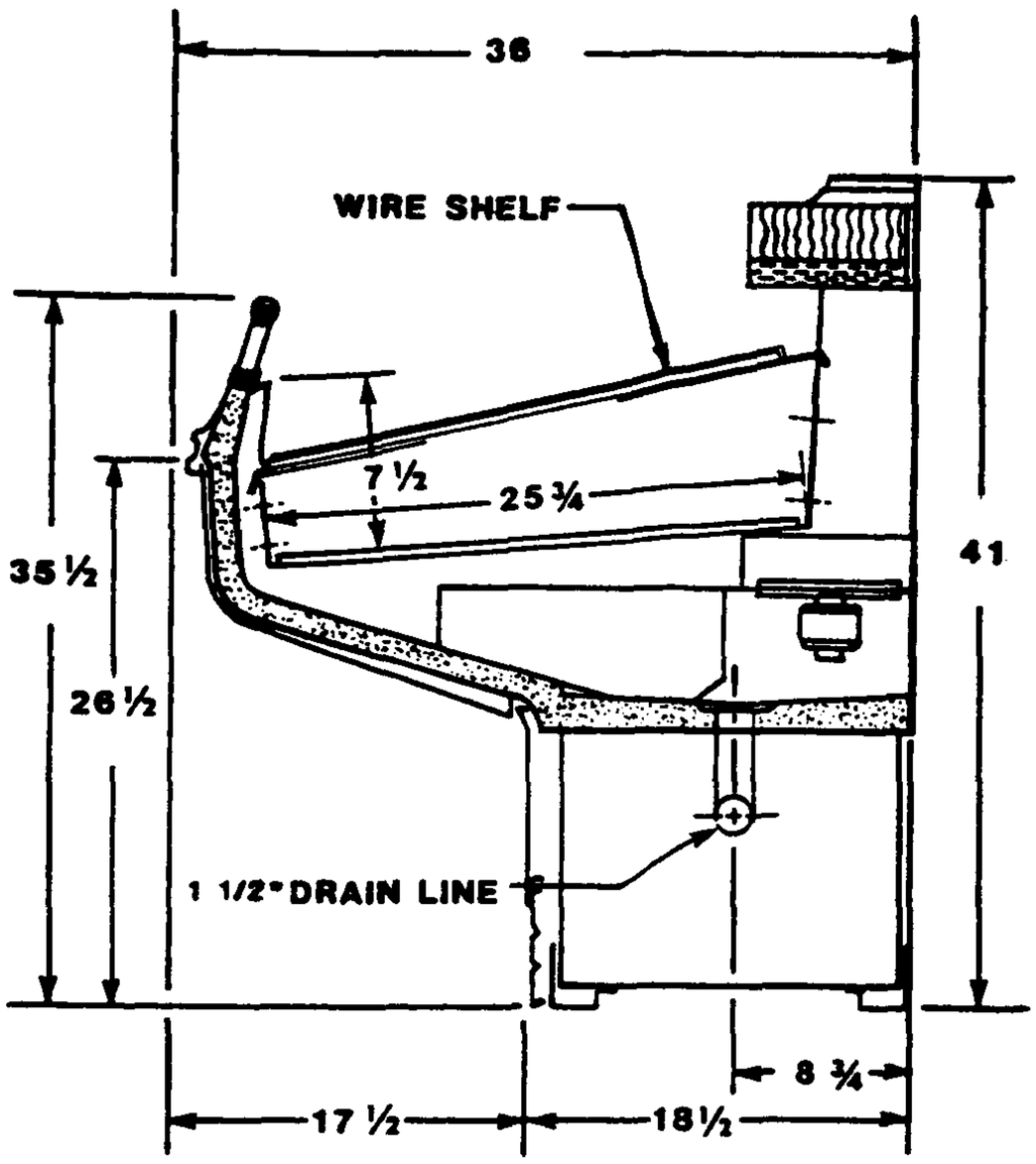
Model Nomenclature	Description
MWIC-6	Refrigerated Wide Island Merchandiser (6 ft long)
MWI-8	Refrigerated Wide Island Merchandiser (8 ft long)
MWI-12	Refrigerated Wide Island Merchandiser (12 ft long)
MWI-6	Refrigerated Wrap-Around End Merchandiser

Application

These models are designed for use in air conditioned stores where temperatures are maintained at or below 75°F, and relative humidity 55%.

MWI - MWIC





IMPORTANT:

This end case is not free-standing. -----CASE IS FRONT HEAVY.-----Should it ever be separated from its parent case, CAUTION must be taken to prevent tipping.

MWI PLAN VIEW

SECTION 2

INSTALLATION

SHIPPING DAMAGE

All equipment should be thoroughly examined for shipping damage before and when unloading.

This equipment has been carefully inspected at our factory and the carrier has asumed responsibility for safe arrival. If damaged, either apparent or concealed, claim must be made to the carrier.

APPARENT LOSS OR DAMAGE

If there is an obvious loss or damage, it must be noted on the freight bill or express receipt and signed by the carrier's agent, otherwise, carrier may refuse claim. The carrier will supply necessary claim forms.

CONCEALED LOSS OR DAMAGE

When loss or damage is not apparent until after equipment is uncrated, a claim for concealed damage is made. Upon discovering damage, make request in writing to carrier for inspection within 15 days and retain all packing. The carrier will supply inspection report and required claim forms.

SHIPPING BRACES

Move the fixture as close as possible to its permanent location, then remove all shipping braces and their fasteners. Remove all separately packed accessories, such as joint kits, shelves, ect.

LOCATION

All open refrigerators are sensitive to store air movement. Do not allow air conditioning, electric fans, open doors or windows, etc., to create air currents around these cases.

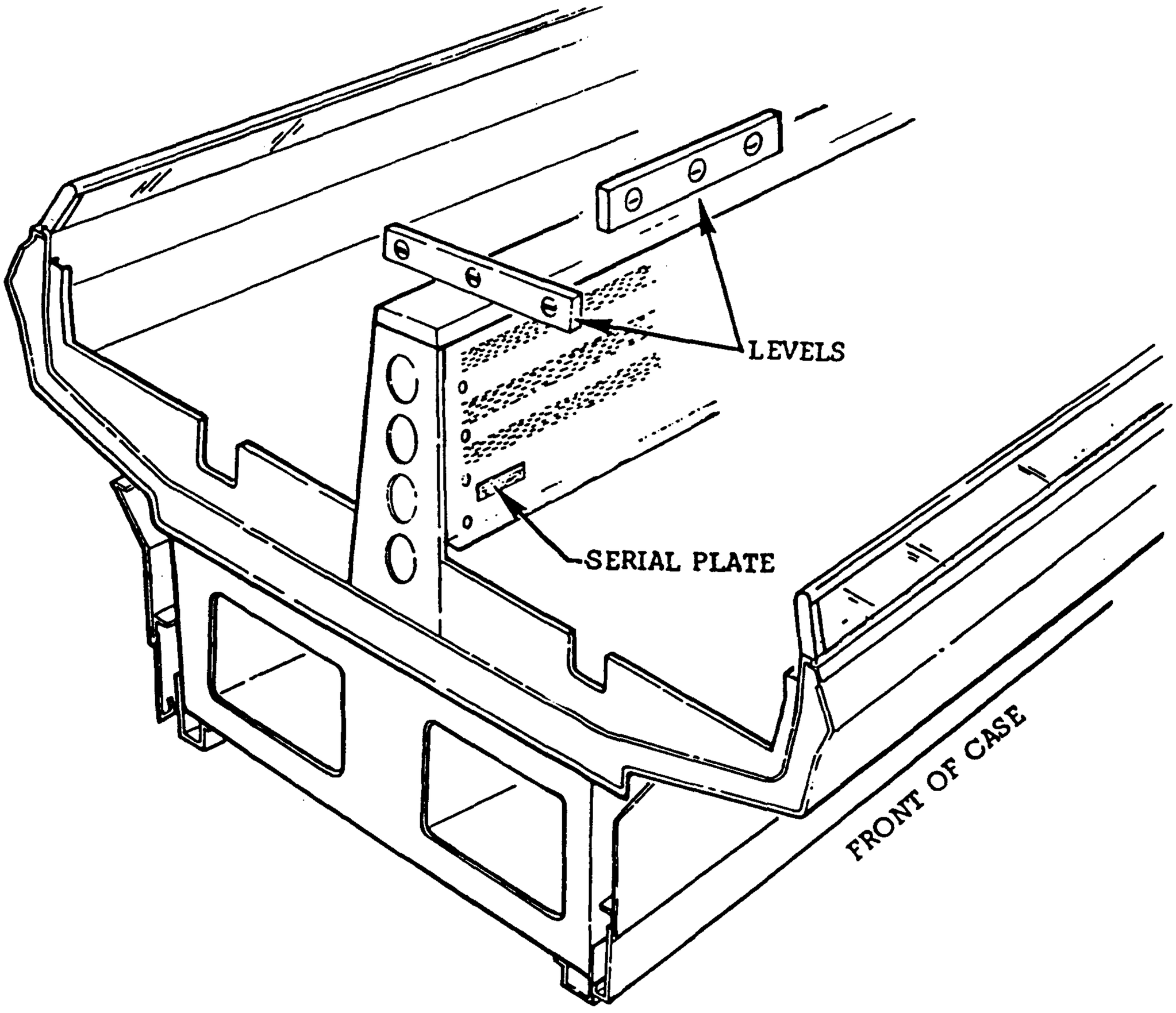
The front of these cases is readily identified by the location of the Serial Plate. (See following illustration.) Since all electrical and refrigeration connections will be made at the front side, they will need to be orientated according to the store plan layout.

JOINING

These refrigerators are of sectional construction; two or more may be joined in line to give one continuous display. For joining, a joint kit is required. Instructions for joining are provided with each kit.

LEVELING

REFRIGERATORS MUST BE INSTALLED IN A LEVEL PLANE TO ALLOW PROPER OPERATION OF THE REFRIGERATOR COILS AND DRAINING OF DEFROST WATER. Use a 24 inch carpenters level as shown below to level.



WASTE OUTLET AND WATER SEAL

The Waste Outlets are located at the center of these cases, one on each side. Each waste outlet will be interconnected with factory installed drip piping and when a 6' end case is ordered, its waste outlet will also be interconnected as shown in the following illustration.

In addition to the factory installed piping, each 6'/8' and 12' parent case will also be supplied with a Street Ell, and a 2 inch Water Seal to be field installed. The street Ell and Water Seal must be installed to prevent air leakage and insect entrance to the case. They may be installed on either side and may be oriented to run any direction. The following illustration shows the piping configurations for a single parent case, a single parent case with one end case, and a single parent case with two end cases.

NOTE: PVC-DWV SOLVENT CEMENT IS RECOMMENDED. FOLLOW THE MANUFACTURERS INSTRUCTIONS.

DRIP PIPING

NOTE: IMPROPERLY INSTALLED DRIP PIPING CAN SERIOUSLY INTERFERE WITH THE OPERATION OF THE REFRIGERATED EQUIPMENT AND RESULT IN COSTLY MAINTENANCE AND PRODUCT LOSS. BELOW ARE RECOMMENDATIONS WHICH SHOULD BE FOLLOWED WHEN INSTALLING DRIP PIPING.

1. Never use pipe smaller than the nominal diameter of the pipe supplied with the case.

2. Always provide as much down hill slope ("fall") as possible; 1/8 inch per foot is the preferred minimum.

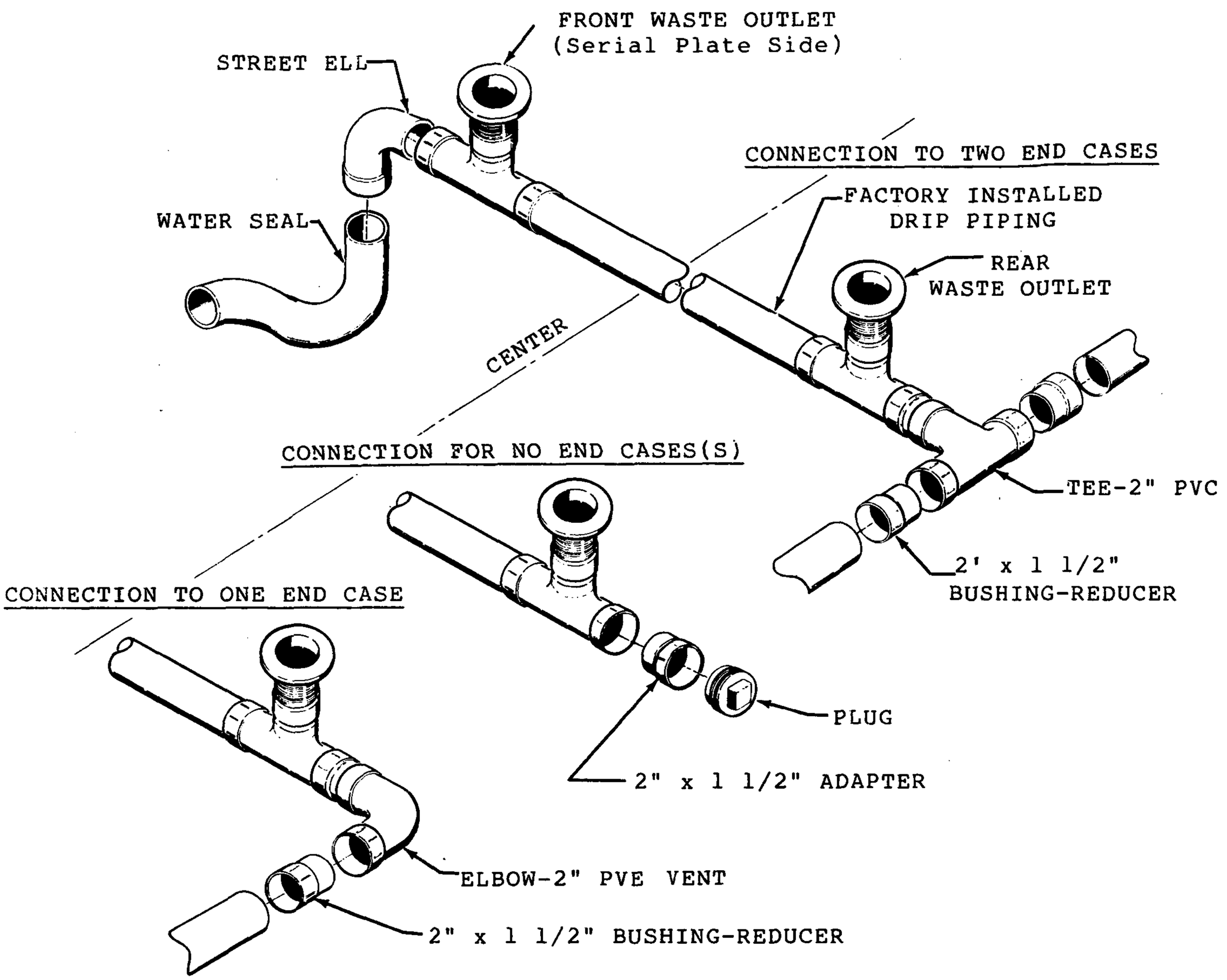
3. Avoid long runs of drip pipes which make it impossible to provide the "fall" necessary for good drainage.

4. Never use two water seals in series in any one drip pipe. Double water seals will cause an air lock and prevent draining.

5. Prevent drip pipes from freezing. Where pipes are located in a cold air space, provide means to prevent freezing.

   NEVER install drip pipes in contact with uninsulated suction lines. Suction lines should be insulated with a non-absorbant insulation such as Armstrong's Armaflex.

6. Provide a suitable air break between flood rim of floor drain and outlet of drip pipes.



When a 6' end case is joined to one end of both ends of the parent case, all interconnecting piping of the six foot end case will be complete and the water seal can only be installed to the front of the case as shown above.

INSTALLING SPLASHGUARD

The splashguard is shipped separately inside of each refrigerator. After cases have been leveled and joined and all drip piping, electrical and refrigeration work has been completed, install the splashguard. The Splashguard Leveling Bracket (Item A) has a maximum extension of one (1) inch for uneven floors. After adjusting brackets flush with the floor, position splashguard UP BEHIND THE FRONT PANEL FIRST, then position the low portion over the previously adjusted brackets. See illustration.

For fixtures that are to be elevated off the floor, install Elevating Member Splashguard Kit according to the instructions supplied with the kit.

SEALING SPLASHGUARD TO FLOOR

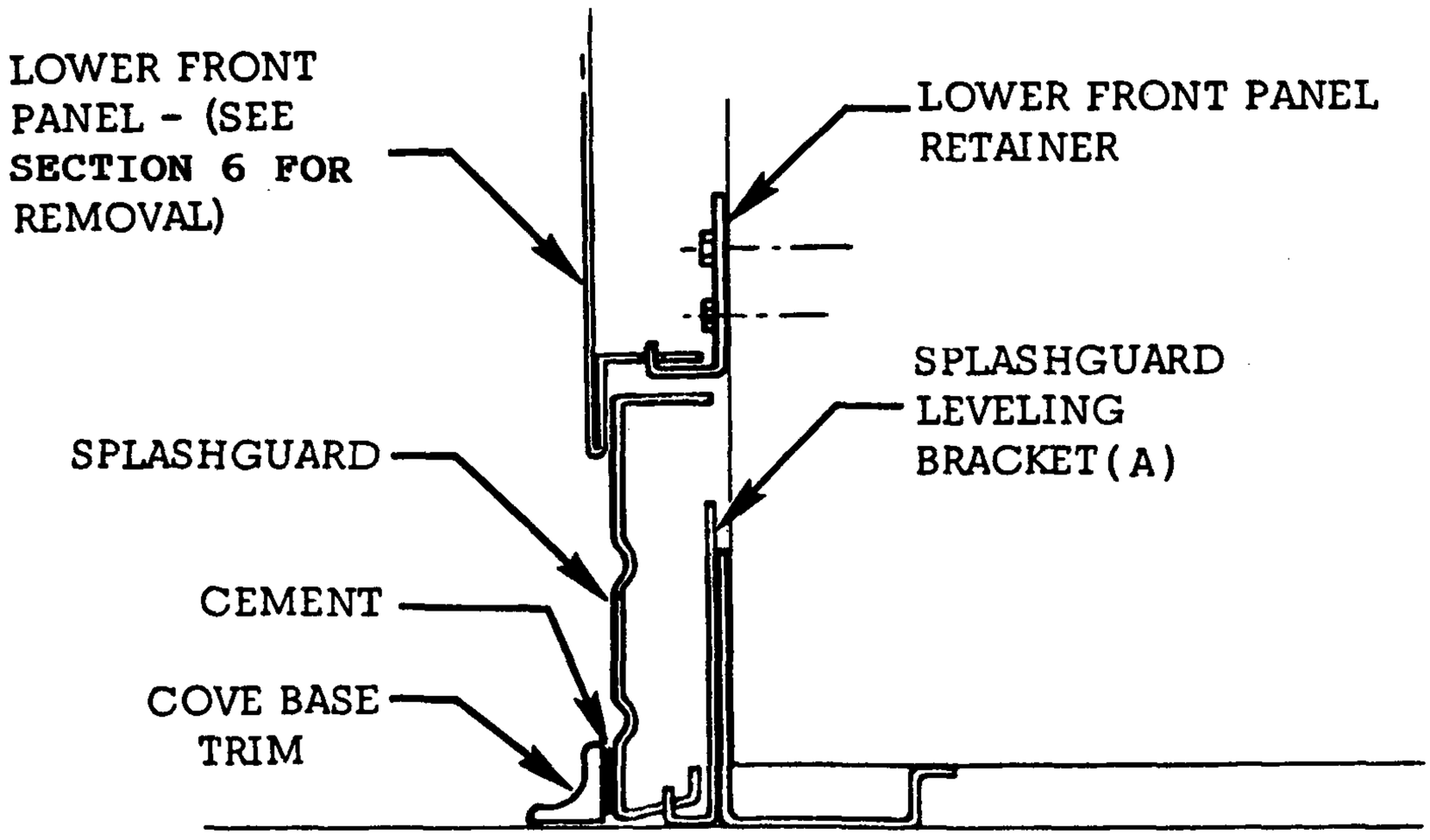
If required by local sanitary codes or if customer so desires, splashguards may be sealed to the floor using a Vinyl Cove Base Trim such as produced by Armstrong, Kentile, Johnson, etc., from local floor covering supplier, (see illustration below). The size needed will depend on how much the floor is out of level.

When installing the cove base trim to the splashguard:

STEP 1. Remove all dirt, wax and grease from surface area of splashguard where adhesion will be necessary. This will insure a good, secure installation.

STEP 2. Apply a good contact cement to the cove base trim and allow the proper drying time according to directions supplied with cement.

STEP 3. Install cove base trim so that it is lying flush with store floor.



SECTION 3

REFRIGERATION

REFRIGERANT

These refrigerators will be equipped for operation on R-502 refrigerant unless otherwise specified on the factory order. The correct type of refrigerant will be stamped on the refrigerators serial plate located at the left hand end on the interior back liner.

REFRIGERANT PIPING

LINE SIZES: Liquid Line.... 3/8" OD
Suction Line....7/8" OD

OUTLET LOCATION

The refrigerant line outlet is located at the right hand end of the refrigerator as viewed from the front beneath the display pans.

After connections have been made, seal this outlet thoroughly both on the inside and the outside. We recommend using aerosol dispensed urethane type of insulation.

MULTIPLEXING

Piping of refrigerators operating on the same refrigeration system may be run from refrigerator to refrigerator through the end frame saddles provided for this purpose. DO NOT RUN REFRIGERANT LINES THROUGH REFRIGERATORS THAT ARE NOT ON THE SAME REFRIGERATION SYSTEM or poor refrigeration control and compressor failure can occur.

LINE SIZING

Refrigerant lines should be sized as shown on the refrigeration legend that is furnished for the store (not furnished by Hussmann). If a legend has not been furnished, refer to the Hussmann Application Engineering Manual for guidance.

OIL TRAPS

P-traps (oil traps) must be installed at the base of all suction line vertical risers.

PRESSURE DROP

Pressure drop can rob the system of capacity. To keep the pressure drop to a minimum, keep the refrigerant line run as short as possible using a minimum number of elbows. Where elbows are required, use long radius elbows only.

INSULATION

For refrigerators with other than KOOLGAS defrost, the suction and liquid lines should be clamped or taped together and insulated for a minimum of 30 feet from the refrigerator. For refrigerators with KOOLGAS defrost, the suction and liquid lines should not contact each other and should be insulated separately for a minimum of 30 feet from the refrigerator. Additional insulation for the balance of the liquid and suction lines is recommended wherever condensation drippage is objectionable.

REFRIGERATION PARTS LIST (SPORLAN NOMENCLATURE)

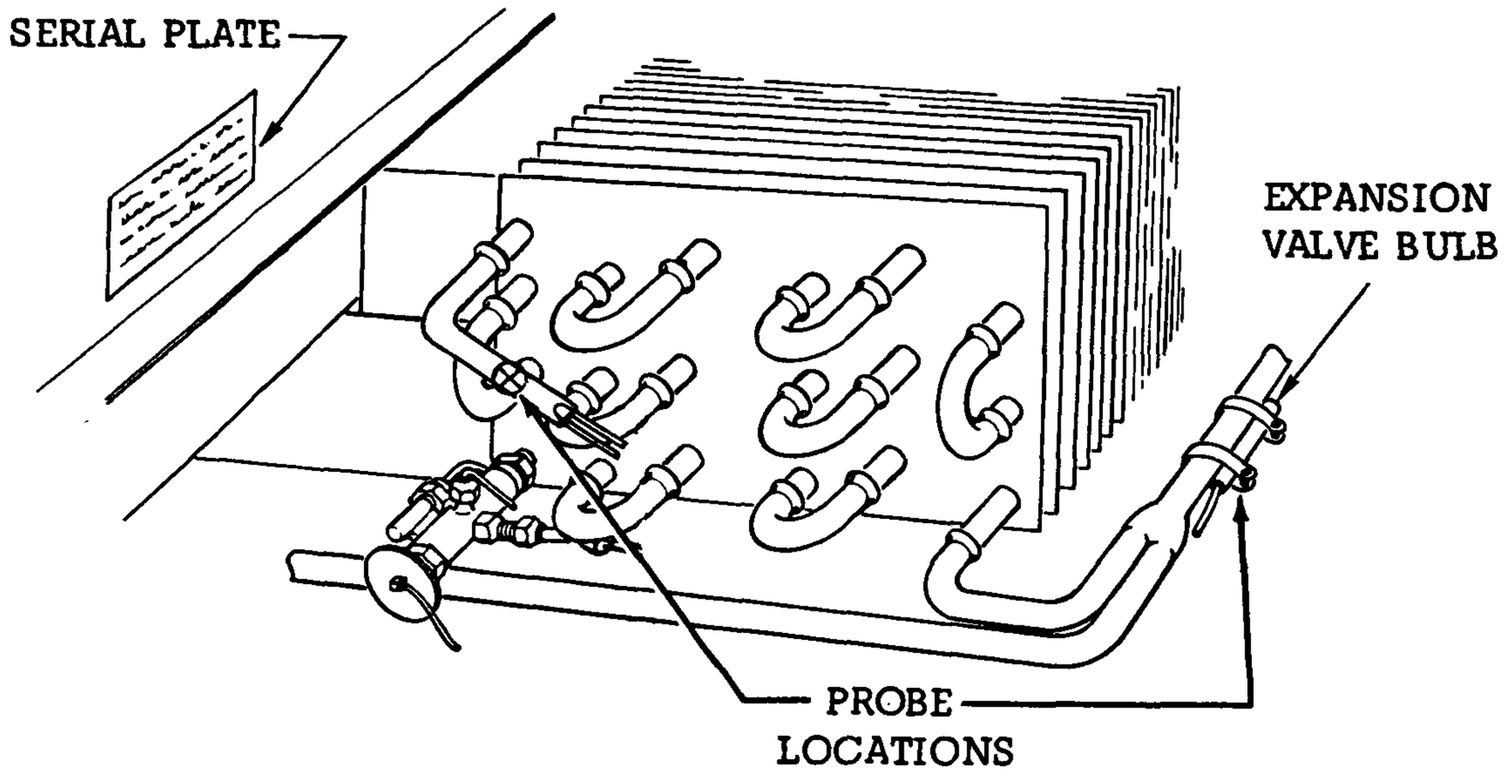
Model	Type of Defrost	Refrig	Balanced Port Expansion Valve	Distributor*
MWI6	Off-Time	R-502 R-22 R-12	BFR-A-C BFV-A-C BFF-A-C	None None None
MWIC6	KOOLGAS	R-502 R-22 R-12	Y920 BGR-A-C Y920 BGV-A-C	None None
	Off-Time	R-502 R-22 R-12	BFRE-A-C BFVE-A-C BFFE-A-C	D115-2-¼-1 D115-2-¼-1 D115-2-¼ 1-½
	KOOLGAS	R-502 R-22 R-12	BFRE-A-C BFVE-A-C ------	D116-2-¼-1 (3/8) D116-2-¼-1 (3/8) ------
MWI8	Off-Time	R-502 R-22 R-12	BFRE-A-C BFVE-A-C BFFE-A-C	D115-2-¼-2 D115-2-¼-1-½ D115-2-¼-1-½
	KOOLGAS	R-502 R-22 R-12	BFRE-A-C BFVE-A-C ------	D116-2-¼-2 (3/8) D116-2-¼-1-½ (3/8) ------
MWI12	Off-Time	R-502 R-22 R-12	BFRE-C-C BFVE-A-C BFFE-C-C	D115-2-¼-2 D115-2-¼-2 D115-2-¼-2-½
	KOOLGAS	R-502 R-22 R-12	BFRE-C-C BFVE-A-C ------	D116-2-¼-2 (3/8) D116-2-¼-2 (3/8) ------

*Some of these refrigerant distributors are provided with a special 3/8 inch side outlet which allows the liquid condensed in the coil during defrost to bypass the expansion valve and flow into the liquid line.

EXPANSION VALVE ADJUSTMENT

The expansion valve, located at the left-hand end under the display pans, must be adjusted to a setting which will fully feed the evaporator. To achieve the proper setting the refrigerator must first have been in operation long enough to have reached the approximate intended operating temperature and air flow should not be restricted by heavy frost formation on the evaporator. Adjust valves as follows:

Attach two sensing probes (either thermocouple or thermister types) to the evaporator, one under the clamp holding the expansion valve, and the other taped securely to the inlet line of the evaporator. (See sketch below.) Some "hunting" of the expansion valve is normal. The valve should be adjusted so that during the "hunting" the greatest difference between the two probes is 3 to 5°. With this adjustment, during a portion of the hunting, the temperature difference between the two probes may be less than 3°, and at times 0°. Make adjustment of no more than one-half (1/2) turn at a time of the valve stem and wait for at least 15 minutes before rechecking the probe temperatures and making further adjustments.



CONTROLS AND ADJUSTMENTS - CONVENTIONAL MULTIPLEXING

Refrigeration temperature may be controlled by either the condensing units low pressure control or by a refrigeration thermostat (one per condensing unit). Thermostatic control is preferred since it will provide a more consistent year 'round control of temperature.

Standard defrost is time initiated and pressure terminated for indoor condensing units (time terminated for outdoor units).

Electric Defrost Heater is optional.

Refrigeration Controls					Defrost Controls		
MWI	Discharge Air Temperature (1)	Refrig	Low Pressure Control When Thermostat Controls Temp cut-out	cut-in	Defrost Frequency	Pressure Term.	Failsafe (2)
Meat	20°	R-502	20 psig	32 psig	Every 8 hrs	89 to 94 psig	60 min
Deli	26°	R-502	24 psig	42 psig			

(1) Discharge air temperature is to be measured by attaching a service thermometer at the moire grill in the top panel at the center of the case.

(2) When the case is equipped with an optional electric defrost heater, the failsafe setting is 35 minutes. The defrost timer of outdoor condensing units must control a liquid line solenoid for pump-down prior to defrost only. The failsafe setting for outdoor units must be increased 4 minutes to compensate for the pump-down period.

CONTROLS AND ADJUSTMENTS-MIXED MULTIPLEXING

Refrigeration temperature may be controlled by either a refrigeration thermostat or a CDA valve (Close on Drop in Air Temperature). Both of these controls are optional items and may be ordered factory installed.

The refrigeration thermostat is the same as that for conventional multiplexing. The CDA valve will have its sensor installed in the same location as the refrigeration thermostat bulb. The valve itself will be installed at the condensing unit. Further information on the CDA valve concerning wiring, adjusting and servicing can be found in the Instruction manual furnished with the condensing unit.

Defrosts will be off-time as standard or Koolgas if ordered as an option.

Off-time is time initated and time terminated.
Koolgas defrost is time initated and time terminated.

Refrigeration Control			Defrost Control	
MWI	Discharge Air Temp (1)	Defrost Frequency	Off-Time Failsafe	Koolgas Length of Defrost (2)
Meat Deli	20°F 26°F	Every 8 Hours	60 min	14 min

(1) Discharge temperature is to be measured by attaching a service thermometer at the moire grill in the top rear panel at the center of the case. Adjust the refrigeration control (CDA valve or refrigeration thermostat) to maintain the discharge air temperature shown.

(2) KOOLGAS defrost is time initiated and time terminated. The defrost lengths above are based upon laboratory testing. Operation under actual store conditions may require that they be lengthened to accomodate a thorough defrost. Some of the store conditions that can contribute to a longer defrost are: low head pressure, long runs of refrigerant lines, store ambient, fixture temperature operating lower than recommended, and seasonal ambient changes.

Each system shown on the store legend must have staggered defrost to maintain stable compressor loading and sufficient supply of defrost gas. When practical, defrost should occur when the store is closed.

KOOLGAS defrost cases are factory equipped with a Disc-type, fixed setting, thermostat to shut the main case fans off during defrost. The thermostat is factory installed on the coil and is spliced into one side of the fan circuit. The thermostat opens on termperature rise at approximately 38°F, and closes at approximately 28°F. Therefore, during installation of these cases, the main case fans will not run until the refrigerator is operating.

SECTION 4

ELECTRICAL

CONNECTIONS

All electrical connections are made in the electrical entrance box located at the left hand end of the refrigerator, behind the lower front panel. See Service Tips section for removal of the lower front panel.

WIRING IDENTIFICATION

Leads for all electrical circuits are identified by colored plastic bands which correspond to the "color code sticker" located near the electrical entrance box.

"COLOR CODE STICKER"

WIRING COLOR CODE

LEADS FOR ALL ELECTRICAL CIRCUITS ARE IDENTIFIED BY A COLORED PLASTIC BAND: NEUTRAL WIRE FOR EACH CIRCUIT HAS EITHER WHITE INSULATION OR A WHITE PLASTIC SLEEVE IN ADDITION TO THE COLOR BAND.

PINK.....REFRIG. THERMOSTAT LOW TEMP	**GREEN***.....GROUND
LIGHT BLUE.....REFRIG. THERMOSTAT NORM. TEMP.	**ORANGE OR TAN**.....LIGHTS
DARK BLUE.....DEFROST TERM. THERMOSTAT	**MAROON**.....RECEPTACLES
PURPLE.....ANTI-SWEAT HEATERS	**YELLOW**.....DEFROST HEATERS, 120V
BROWN.....FAN MOTORS	**RED***.....DEFROST HEATERS, 208V

* EITHER COLORED SLEEVE OR COLORED INSULATION

ELECTRICIAN NOTE: CASE MUST BE GROUNDED

*Either colored band or colored insulation.

CAUTION

THE REFRIGERATOR MUST BE ELECTRICALLY GROUNDED. ALL WIRING AND CONNECTIONS MUST COMPLY WITH NEC AND ANY LOCAL CODES.

SERIAL PLATE AMPERAGES

Size all field wiring to the serial plate amperages stamped on the serial plate. The actual amps may be less than that specified.

AMPERAGES

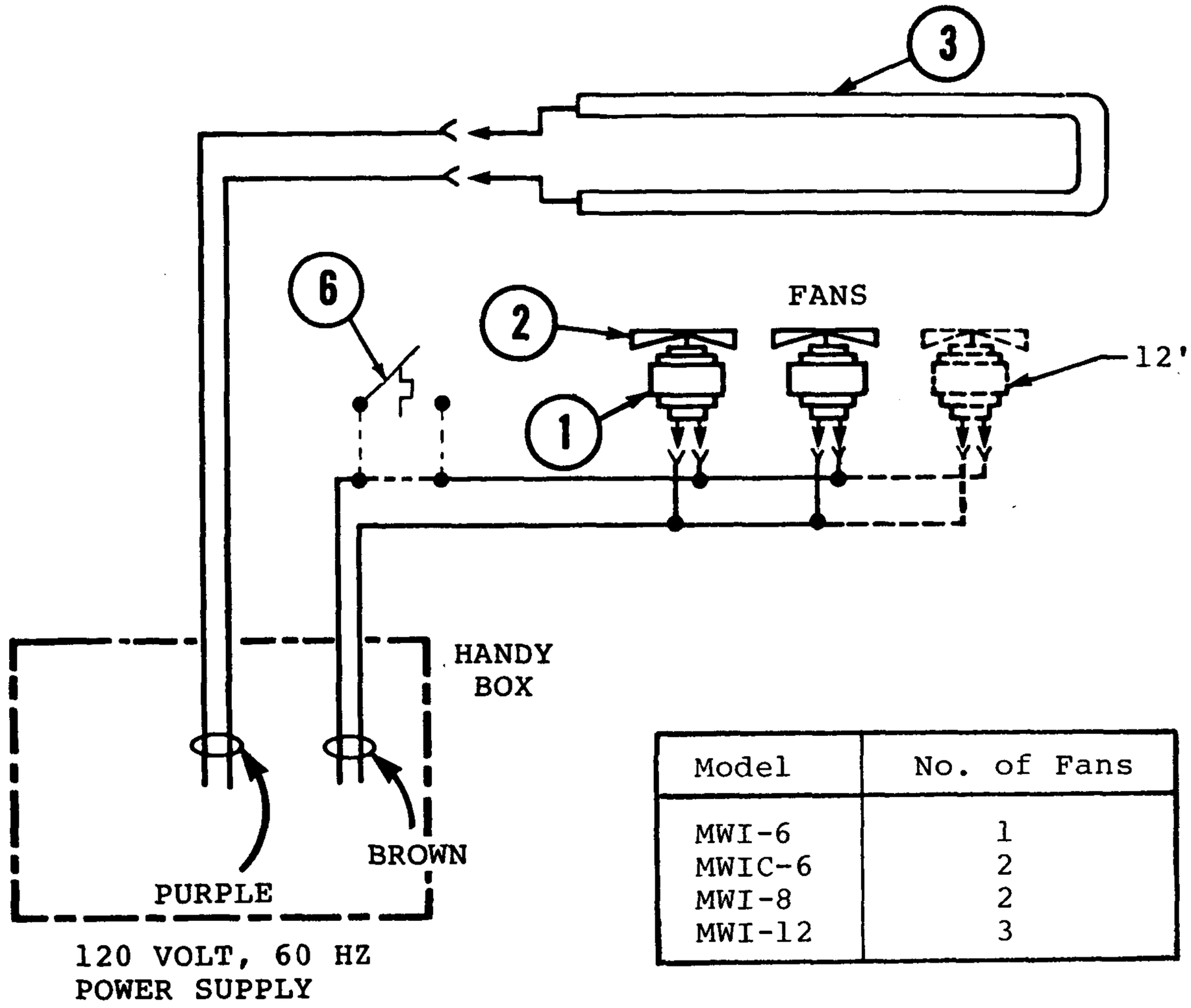
Model	120 Volt, 60 hz Circuits	208 Volt, 60 hz
	Fans and Anti-Sweat Heaters	Optional Defrost Heater (Single Phase)
MWI6	1.0	4.6
MWIC6	2.6	10.2
MWI8	2.9	10.4
MWI12	4.2	15.6

In addition to the circuits described above, an optional refrigeration thermostat or CDA Sensor will require wiring from the refrigerator to the condensing unit control panel. See wiring diagrams in this section.

WIRING DIAGRAM

MWI

FANS & ANTI-SWEAT HEATERS



Model	No. of Fans
MWI-6	1
MWIC-6	2
MWI-8	2
MWI-12	3

REFRIGERATORS MUST BE GROUNDED

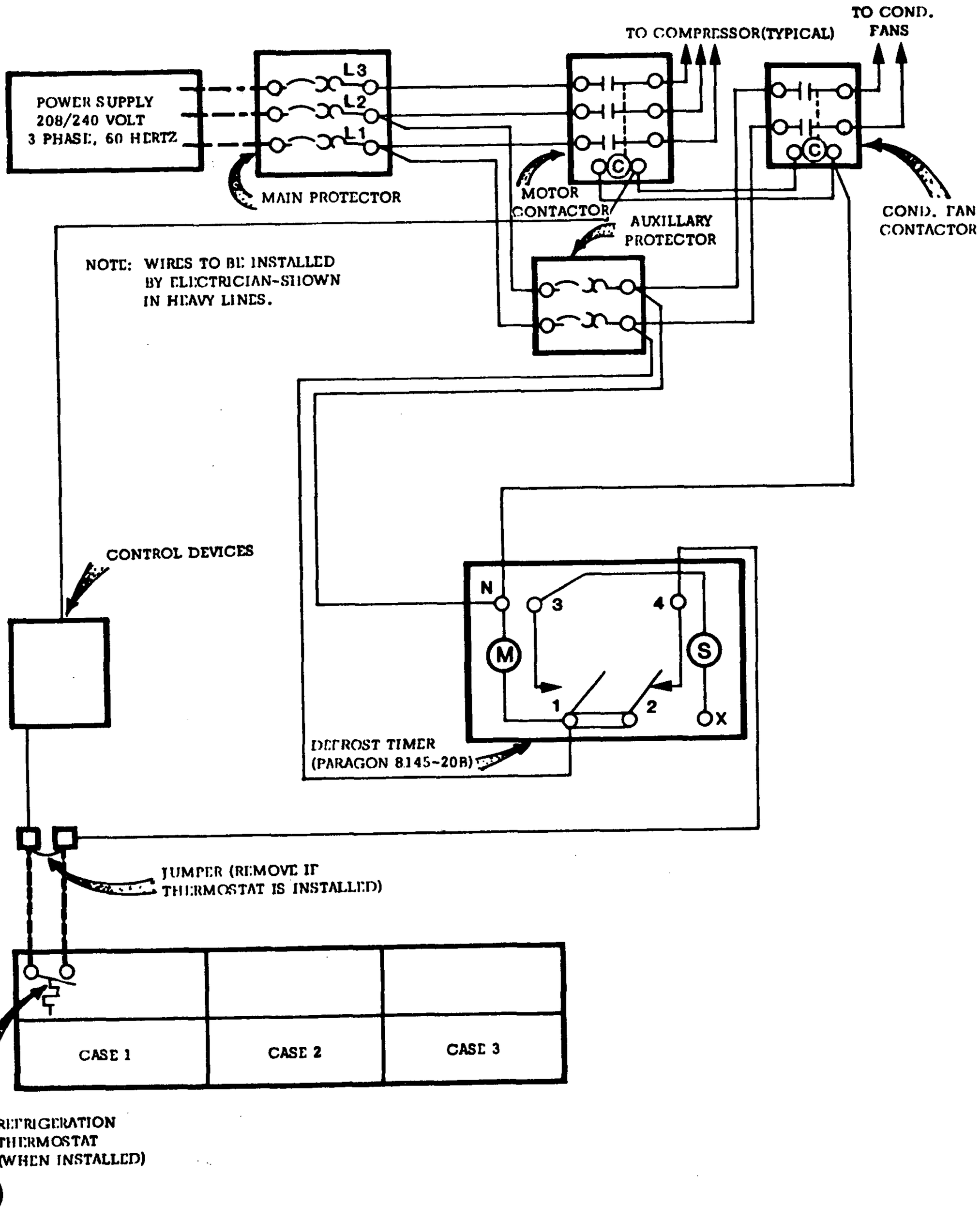
ELECTRICAL REPLACEMENT PARTS

ITEM NO.	PART NUMBER	DESCRIPTION
1.	0013527	FAN MOTOR - MWI6 GE# KSM51ECG3739 (9W CW 120 V.)
	047000	FAN MOTOR - MWIC6, MWI8, MWI12 GE# KSM51ECG3734 (9W CW 120 V.)
2.	0323649	FAN BLADE - MWI6 MORRILL #FV700CW40P
	0261609	FAN BLADE - MWIC6, MWI8, MWI12, MORRILL #FV800 CW20P

ITEM NO.	PART NUMBER	DESCRIPTION (continued)
3.	0310900	CENTER RAIL ANTI-SWEAT HEATER-MWIC6 120 V., 104 OHMS, 1.15 AMP.
	0302212	CENTER RAIL ANTI-SWEAT HEATER-MWI8 120 V., 80 OHMS, 1.6 AMP.
	0302213	CENTER RAIL ANTI-SWEAT HEATER-MWI12 120 V., 57.1 OHM, 21. AMP
4.	0137880	REFRIGERATION THERMOSTAT, OPTIONAL W.R. #1609-103
5.	0309624	DEFROST HEATER-MWI6, OPTIONAL 208 V., 45.2 OHM, 4.6 AMP
	0252030	DEFROST HEATER-MWIC6, OPTIONAL 208 V., 40.8 OHM, 5.1 AMP
	0131434	DEFROST HEATER-MWI8, OPTIONAL 208 V., 40 OHM, 5.2 AMP
	0131435	DEFROST HEATER-MWI12, OPTIONAL 208 V., 26.7 OHM, 7.8 AMP
6.	0100939	FAN SWITCH-OPTIONAL KOOLGAS DEFROST T.I. #20425L32-765-34

CONVENTIONAL MULTIPLEXING - INDOOR TYPE UNIT

CONDENSING UNIT & CONTROL PANEL WIRING DIAGRAM

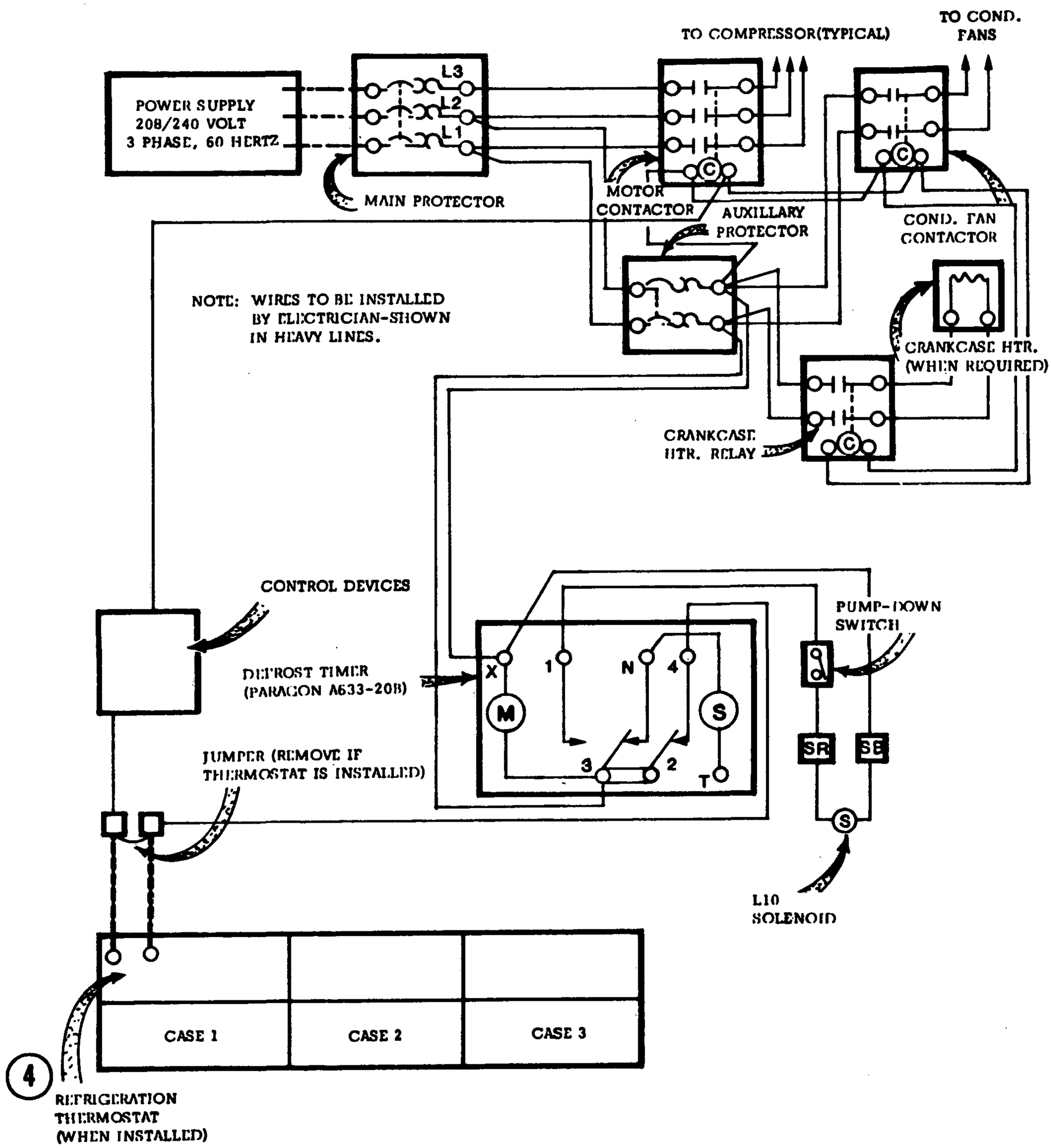


WARNING

REFRIGERATOR MUST BE GROUNDED

CONVENTIONAL MULTIPLEXING - OUTDOOR TYPE UNIT

CONDENSING UNIT & CONTROL PANEL WIRING DIAGRAM



WARNING
REFRIGERATOR MUST BE GROUNDED

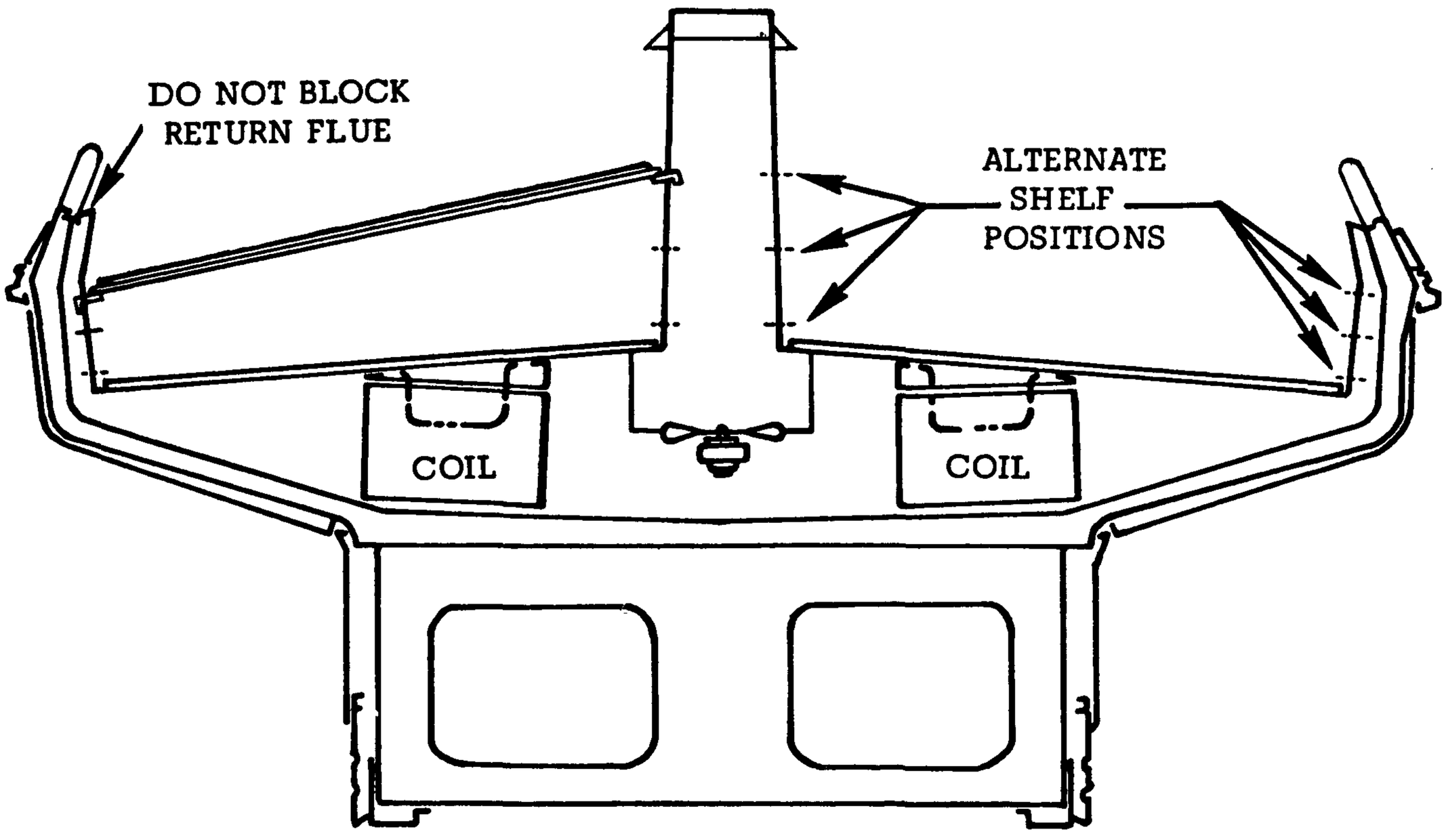
SECTION 5

USER'S INFORMATION

STOCKING

Merchandise should not be placed in this refrigerator until all refrigeration controls have been adjusted and refrigerator is at proper operating temperature.

At no time should the refrigerator be stocked beyond the load limits indicated on the fixture.



CARE AND CLEANING

Long life and satisfactory performance of any equipment is dependent upon the care given to it. To insure long life, proper sanitation and minimum maintenance costs, the fixture should be thoroughly cleaned, debris removed and the interior washed down monthly.

To facilitate quick and complete cleaning, this refrigerator has been designed with removable front shelf supports. These supports are removable in four foot sections without the need for tools by simply lifting each section up and off of the shoulder rivets located at both ends of each section.

The interior bottom of each fixture is easy to clean, corrosion resistant material designed for maximum sanitation. All domestic detergents, even ammonia base cleaners are recommended. Sanitizing solutions will not harm the case interior bottom, however, these sanitizer should be used according to the manufacturers directions.

CAUTION: DO NOT USE STEAM OR EXTREMELY HOT WATER TO WASH THE INTERIOR BOTTOM OF THESE CASES.

To prevent mold and mildew, "BAC-GARD" manufactured by Holliston Laboratories, INC., may be used for killing bacteria and odors. "ONE STROKE ENVIRON" manufactured by Vestal Laboratories, Division of W. R. Grace and Company, may also be used.

When cleaning, do not use a hose with high water pressure and never introduce water into the fixture faster than the drip pipe, can carry it away.

To preserve the exterior finish of the fixture, use warm water and a mild detergent.

DO NOT USE ABRASIVE CLEANERS OR STEEL WOOL SCOURING PADS AS THESE WILL MAR THE FINISH.

SECTION 6

SERVICE TIPS

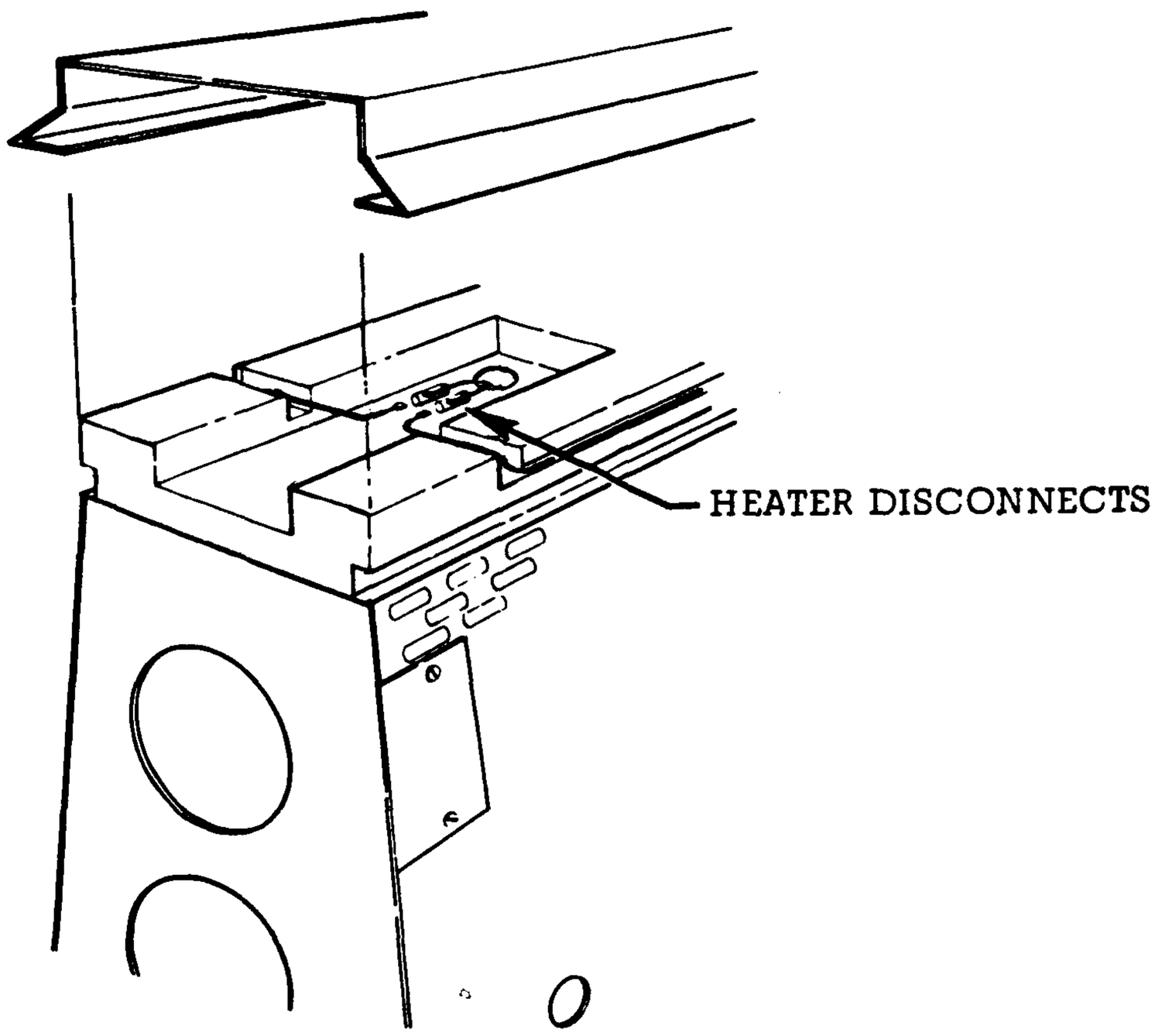
WARNING

ALWAYS DISCONNECT THE ELECTRICAL POWER AT THE MAIN DISCONNECT WHEN SERVICING OR REPLACING ANY ELECTRICAL COMPONENT OF THIS REFRIGERATOR. THIS INCLUDES, BUT IS NOT LIMITED TO SUCH ITEMS AS FANS, HEATERS AND THERMOSTATS.

CENTER RAIL ANTI-SWEAT HEATER

1. Disconnect 120 volt power source.
2. Remove center rail cover and any joint trims.
3. Disconnect heater from harness at left end of case.
4. Remove heaters from channels.
5. Replace in reverse order of removal.

NOTE: MAKE CERTAIN THAT HEATER IS IN THE CHANNELS AND THE ALUMINUM GROUND STRAP AT EACH END OF CENTER RAIL IS IN PLACE BEFORE REPLACING CENTER RAIL COVER.



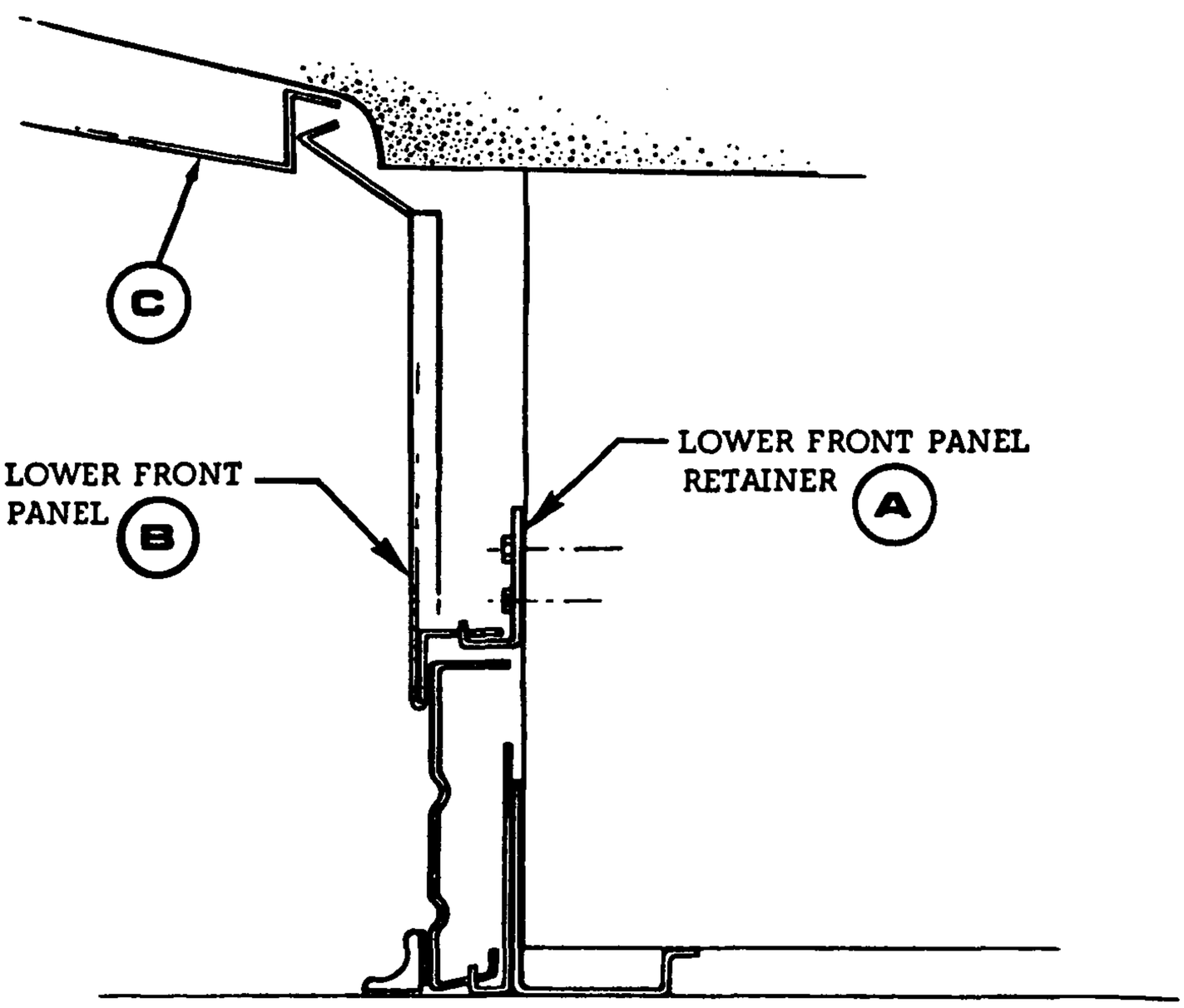
REMOVAL AND REPLACEMENT OF LOWER FRONT PANEL

A. TO REMOVE PANEL:

1. Slide panel upward off Retainer (A).
2. Pivot lower end of panel outward of fixture.
3. Remove panel (B).

B. TO REPLACE PANEL:

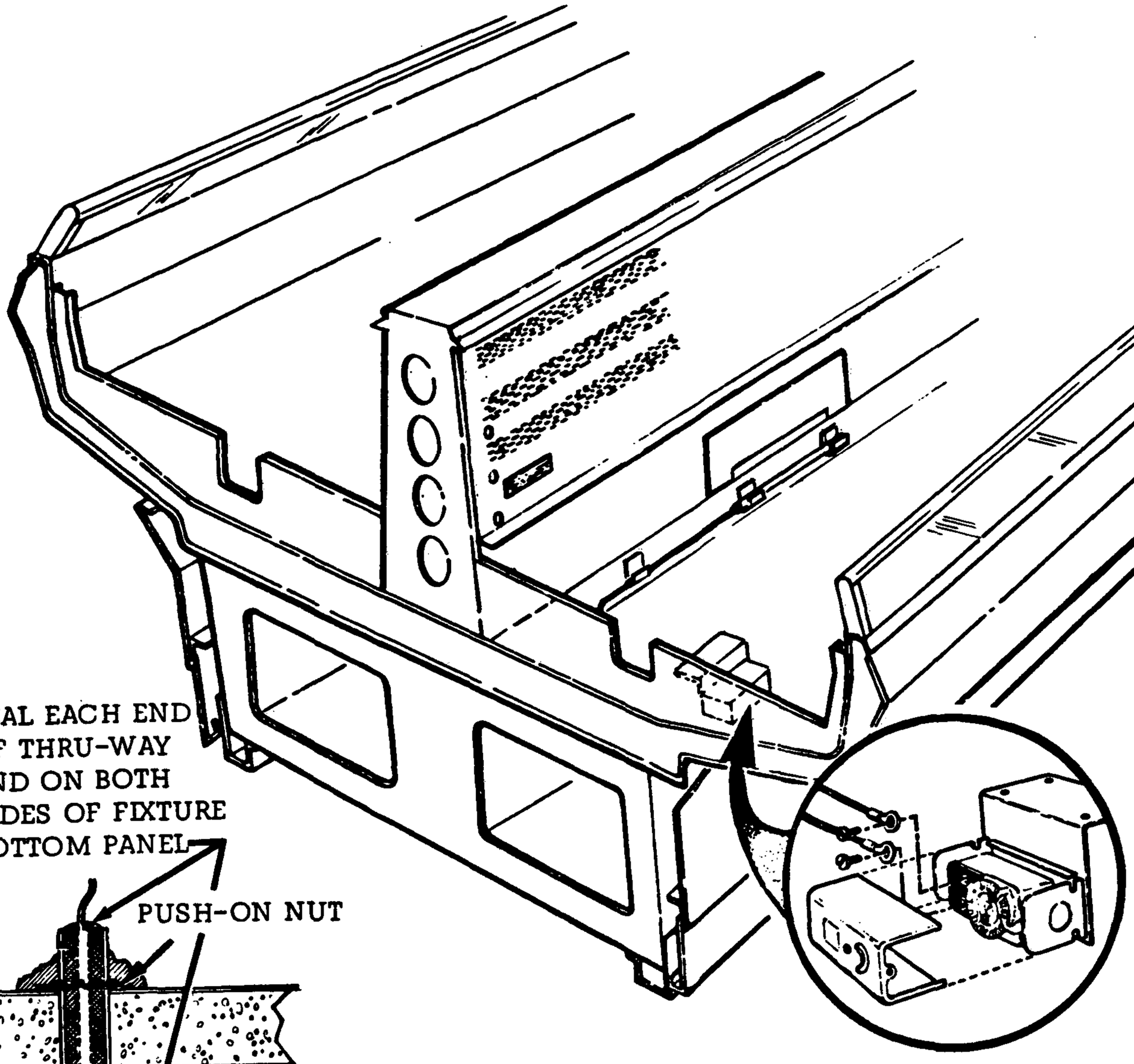
1. Insert upper edge of Panel (B) under the Exterior Upper Front Panel (C).
2. Pivot lower edge of Panel (B) toward fixture.
3. Slide Panel, upward; then lower into position onto Retainer (A).



REFRIGERATION THERMOSTAT & CDA VALVE SENSOR LOCATION

When these optional items are factory installed, they will be installed as shown below. Both the CDA sensor and refrigeration thermostat bulb will be fastened to the fan plenum cover on the serial plate side of the case beneath the display pans and approximately 24" from the left-hand end of the case.

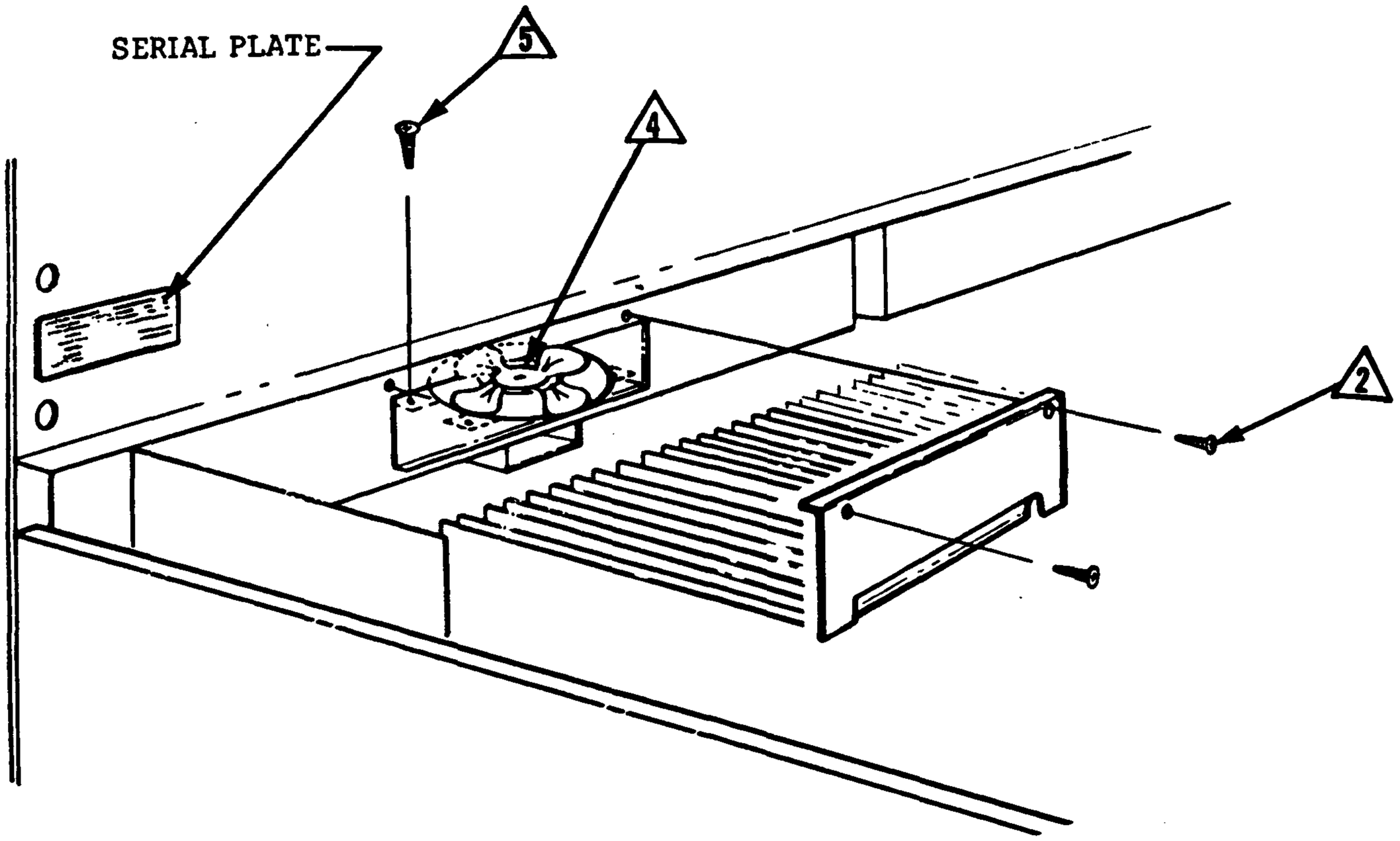
The sensor leads and the capillary tube of the thermostat will be routed down the plastic nipple to the bottom of the case.



FAN MOTOR AND FAN BLADES

IMPORTANT: FAN BLADE EMBOSSED SIDE TO FACE AWAY FROM MOTOR. DO NOT REVERSE WHEN REPLACING.

1. Remove the bottom display pans from the serial plate side of the case.
2. Remove the access panel from the fan plenum.
3. Disconnect fan motor from wiring harness.
4. Remove fan blade.
5. Remove screws which hold fan bracket to plenum.
6. Slide motor and bracket out from beneath plenum.
7. Replace in reverse order.



REPAIRING ALUMINUM COIL

The aluminum coils used in Hussmann refrigerated cases may be easily repaired in the field. Materials for repair are found at refrigeration wholesalers.

Hussmann recommends the following solders and techniques:

1. Zinc based 720°F solder. This solder makes a strong durable repair and is also cathodic protection, preventing corrosion of the tubing near the repair. This does not need a coating over the solder area. It may be 95% to 98% zinc with the remainder aluminum. Solders in this group are made by:

   Platt Brothers
   Box 1030
   Waterbury, CT
   (203) 753-4194

   New Products, Inc.
   269 Freeman Street
   Brooklyn, NY 11222

   Mathiessen and Hegler Zinc Company
   Lasalle, IL

   Three major differences between soldering aluminum and copper must be followed for best results. a. The heat must be applied on the opposite side of the tube from the solder. b. While keeping the solder molten, wire brush under the solder pool. c. Move the flame back and forth along the tube to prevent melting the tube.

2. Solders with lower melting point (600°F or less). Solders that contain metals other than the zinc and aluminum combination above will require a protective coating. This coating must be flexible to withstand defrosts. Windshield sealant by 3M, sold in auto parts stores, is one good material.

3. Solder/flux the same technique may be used with all these solder/flux systems. Heat from the back side of the tube, keep rubbing the solder on the fluxed repair area until it melts. Continue heating carefully until the solder flows, wetting the tube. Wash flux off with very hot water, dry, coat with windshield sealant. Use two coats and extend coat at least 1" each way from the solder to be sure of good coverage.

Some solder manufacturers are:

#505 Solder and #505 Flux:	Allweld Alloys 2027 Laura Avenue Huntington Park, Ca (213) 583-9004
Alu-Sol 45D Multicore Solder:	Multicore Solders Westbury, CT 11590 (516) 334-7450
Strongset #509 (5) and 509 Flux:	All-State Welding Alloys Co. Toronto, Canada
Eutector-Alutin 51-S Solder and Alutin 51 Flux:	Eutectic Corporation 40-45 172 nd Street Flushing, NY