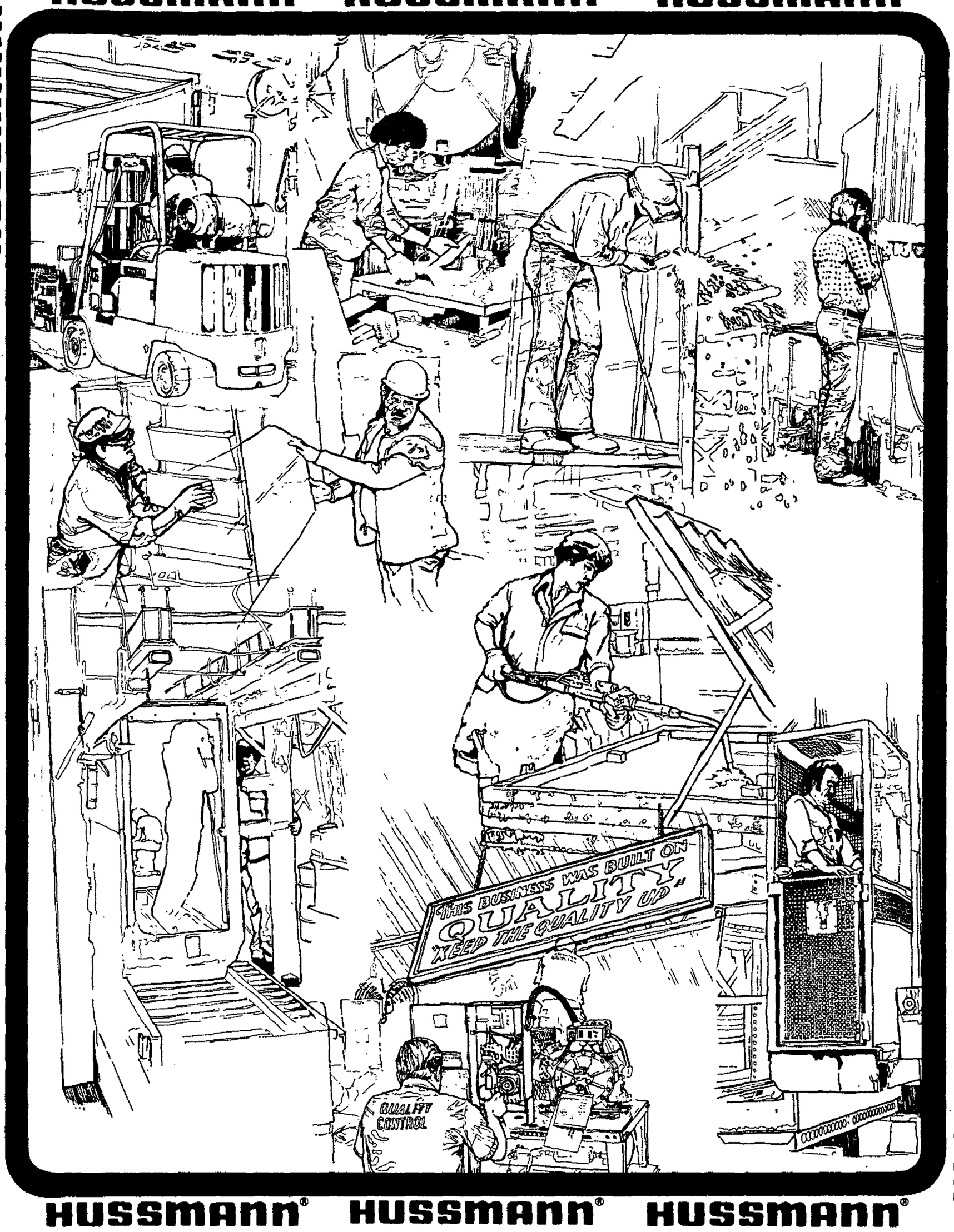
HUSSMANN®

CORPORATION



FMA – FMGA

(Reverse Air Defrost)
REFRIGERATED MERCHANDISERS
for
FRESH MEAT AND DELICATESSEN PRODUCTS

INSTALLATION / SERVICE INSTRUCTIONS

ENG. #334410A
June, 1989
Supersedes #334410
Dated August, 1987
Section 1

TABLE OF CONTENTS

TABLE OF CONTENTS

REVISION CHANGES ("A")

1. R-502 Standard, page 8
2. Changed Low Pressure Control Settings, page 11

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

SECTION 1

GENERAL INFORMATION

MODEL DESCRIPTION

This installation instruction covers the refrigeration and electrical information for the refrigerated merchandisers listed below that have been factory equipped with Reverse Air Defrost.

MODEL	DESCRIPTION	PRODUCT
FMA	Single Deck	Fresh Meat & Delicatessen
FMGA	Single Deck with Front Glass	

The FMA and FMGA are available in 8' and 12' models.

APPLICATION

FOR SATISFACTORY PERFORMANCE AND TO MAINTAIN THE BEST PRODUCT CONDITION, STORE AIR SHOULD NOT EXCEED 75°F, 55% RELATIVE HUMIDITY.

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 assumed 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 it's permanent location and then remove all packaging and shipping braces. Remove all separately packed accessories such as kits, shelves, etc. Remove and discard the shipping screws at each end of the fan plenum. The plenum is hinged for easy access to the area beneath the evaporator.

WARNING: DO NOT REMOVE SHIPPPING BRACES AT EACH END OF CASE UNTIL THE CASE IS PROPERLY LAGGED TO THE FLOOR. THE CASE IS TOP HEAVY AND COULD TIP OVER CAUSING SERIOUS INJURY.

EXTERIOR LOADING

The superstructures for these cases are not structurally designed to support excessive external loading such as the weight of a person, therefore, do not walk on top of these refrigerators or damage to refrigerator and serious personal injury could occur.

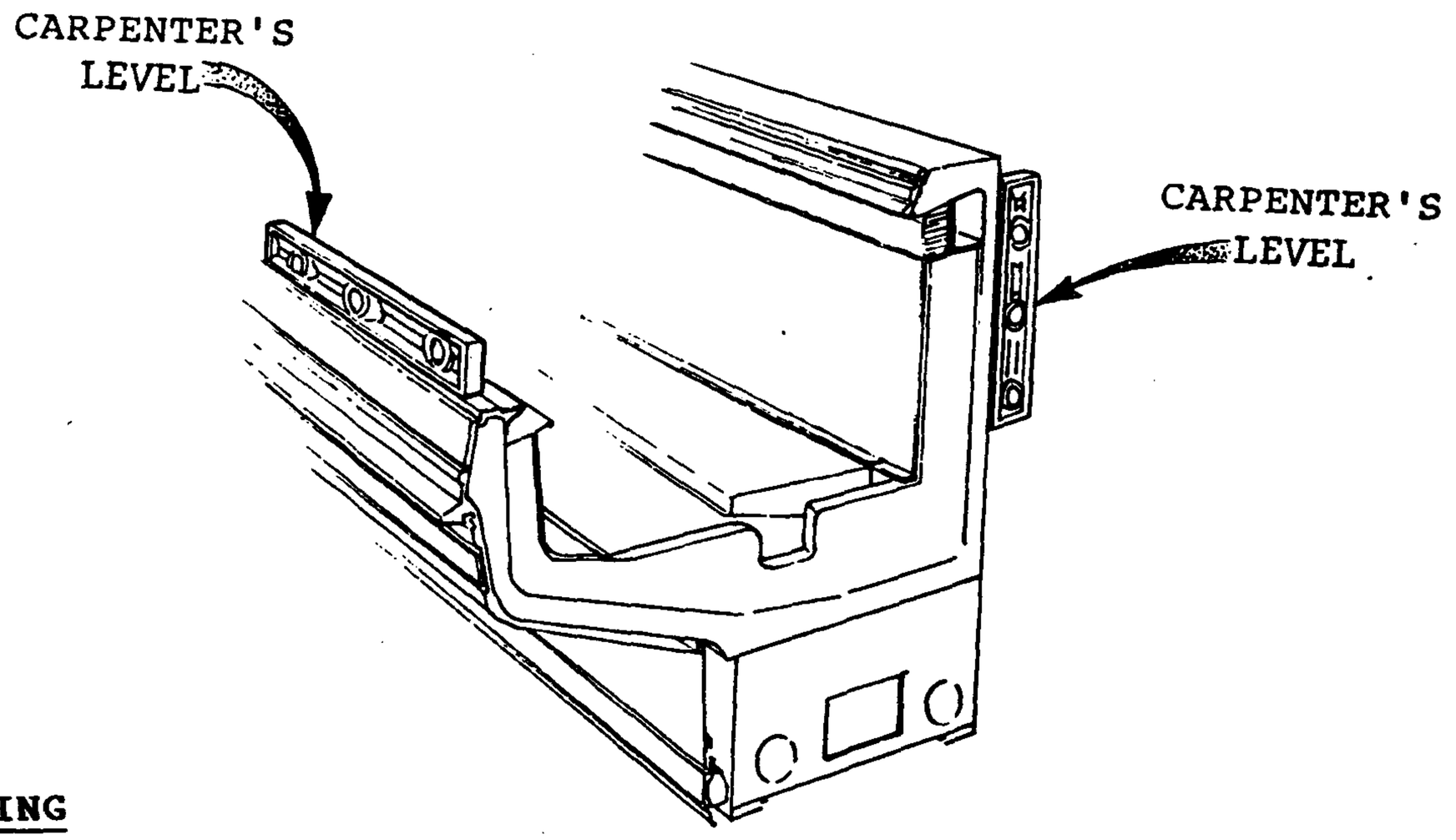
LOCATION

This refrigerator, like other open refrigerators, is sensitive to air disturbance. Air currents passing around this refrigerator will seriously impair its operation. Do not allow air conditioning, electric fans, open doors or windows, etc. to create air currents around this case.

To prevent sweating on the exterior surfaces of this refrigerator, there must be a minmum clearance of 4" between the back and/or ends of this fixture and adjacent walls, cases, shelving or coolers.

LEVELING

Refrigerators must be installed level to insure proper operation of the refrigeration system and to insure proper drainage of defrost water. Use a carpenter's level as shown below when leveling cases. Leveling wedges or shims are provided with each case for use if needed.



JOINING

These refrigerators are of sectional construction which means that two or more may be joined in line yielding one long continuous display that requires only one pair of end assemblies. The material to join these refrigerators and the method of joining them is supplied in a separate joint kit.

ANCHORING OF FMA, FMGA CASES

The forward projection of the refrigerator makes anchoring a necessity to prevent the cases from tipping forward. A suggested method is to remove the lower back panel and anchor the case to the floor through the rear skid. Reinstall the lower back panel. Refer to the following illustration:

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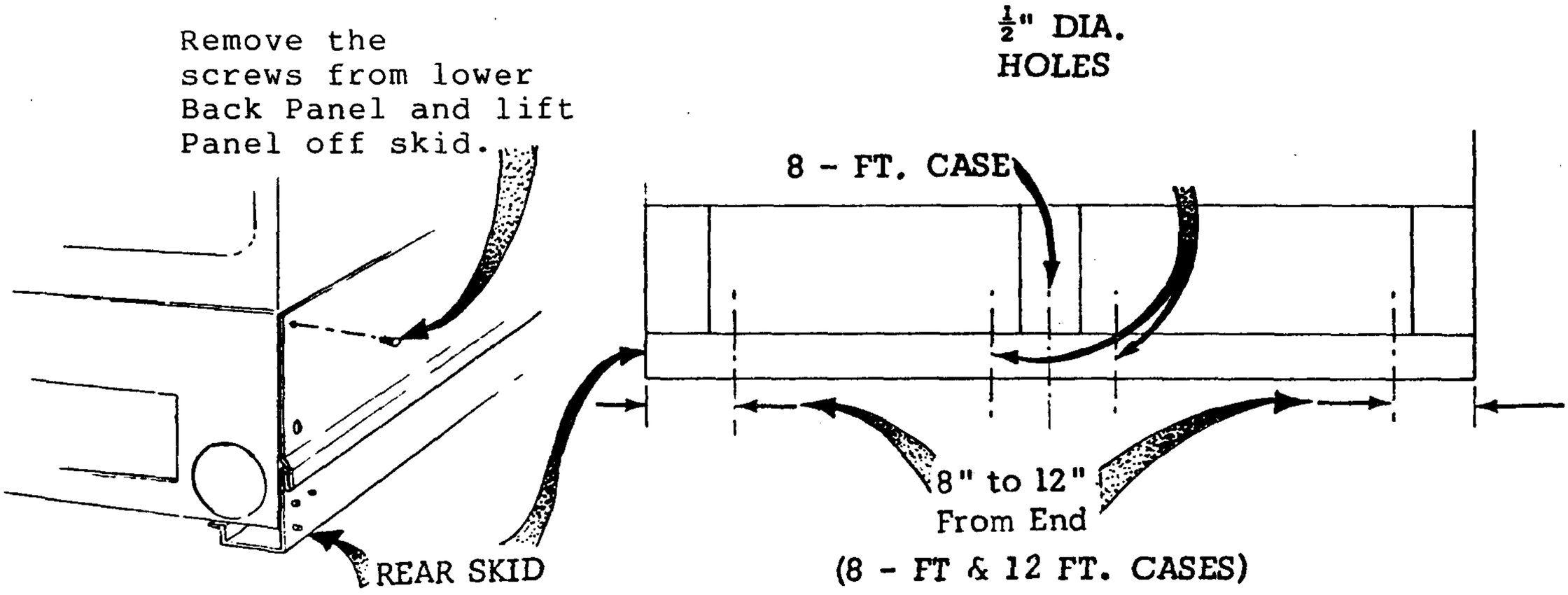
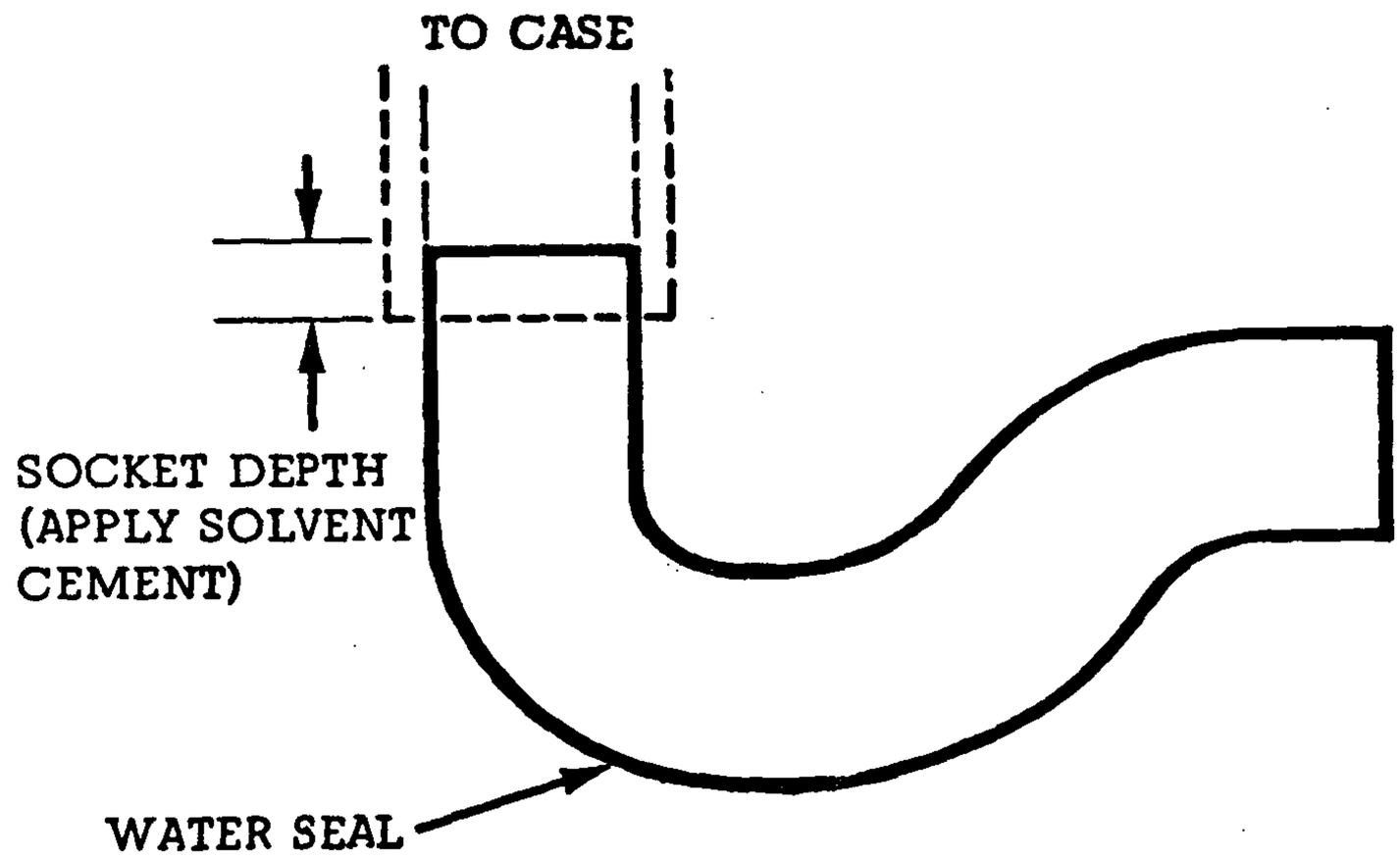


WASTE OUTLET AND WATER SEAL

The Waste Outlet is located at the center of these fixtures allowing drip piping to be run under the fixture lengthwise, to the front or the rear.

A 2 inch water seal is supplied with each fixture. The water seal must be installed to prevent air leakage and insect entrance into the fixture. See illustration.

NOTE: PVC - DWV, SOLVENT CEMENT IS RECOMMENDED. FOLLOW THE MANUFACTURER'S INSTRUCTIONS.



INSTALLING DRIP PIPING

Poorly or improperly installed drip pipes can seriously interfere with the operation of this refrigerator, and result in costly maintenance and product losses. Please follow the recommendations listed below when installing drip pipes to insure a proper installation:

STEP 1. Never use pipe for drip piping smaller than the nominal diameter of the pipe or water seal supplied with the case.

STEP 2. When connecting drip piping, the "water seal" must be used as part of the drip piping to prevent air leakage or insect entrance. Store plumbing system floor drains should be at least 12" off center of case to allow use of the "water seal" pipe section. Never use two water seals in series in any one drip pipe. Double water seals in series will cause a lock and prevent draining.

STEP 3. Always provide as much down hill slope ("fall") as possible; 1/8" per foot is the preferred minimum.

STEP 4. Avoid long runs of drip piping. Long runs make it impossible to provide the "fall" necessary for good drainage.

STEP 5. Provide a suitable air break between flood rim of the floor drain and outlet of drip pipe.

STEP 6. Prevent drip pipes from freezing:

a. Do not install drip pipes in contact with uninsulated suction lines. Suction lines should be insulated with a non-absorbent insulation material such as Armstrong's Armaflex.

b. Where drip pipes are located in dead air spaces such as between refrigerators or between a refrigerator and a store wall, provide means to prevent freezing.

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 leveling brackets have 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 lower portion over the previously adjusted brackets.

SEALING SPLASHGUARDS TO FLOOR

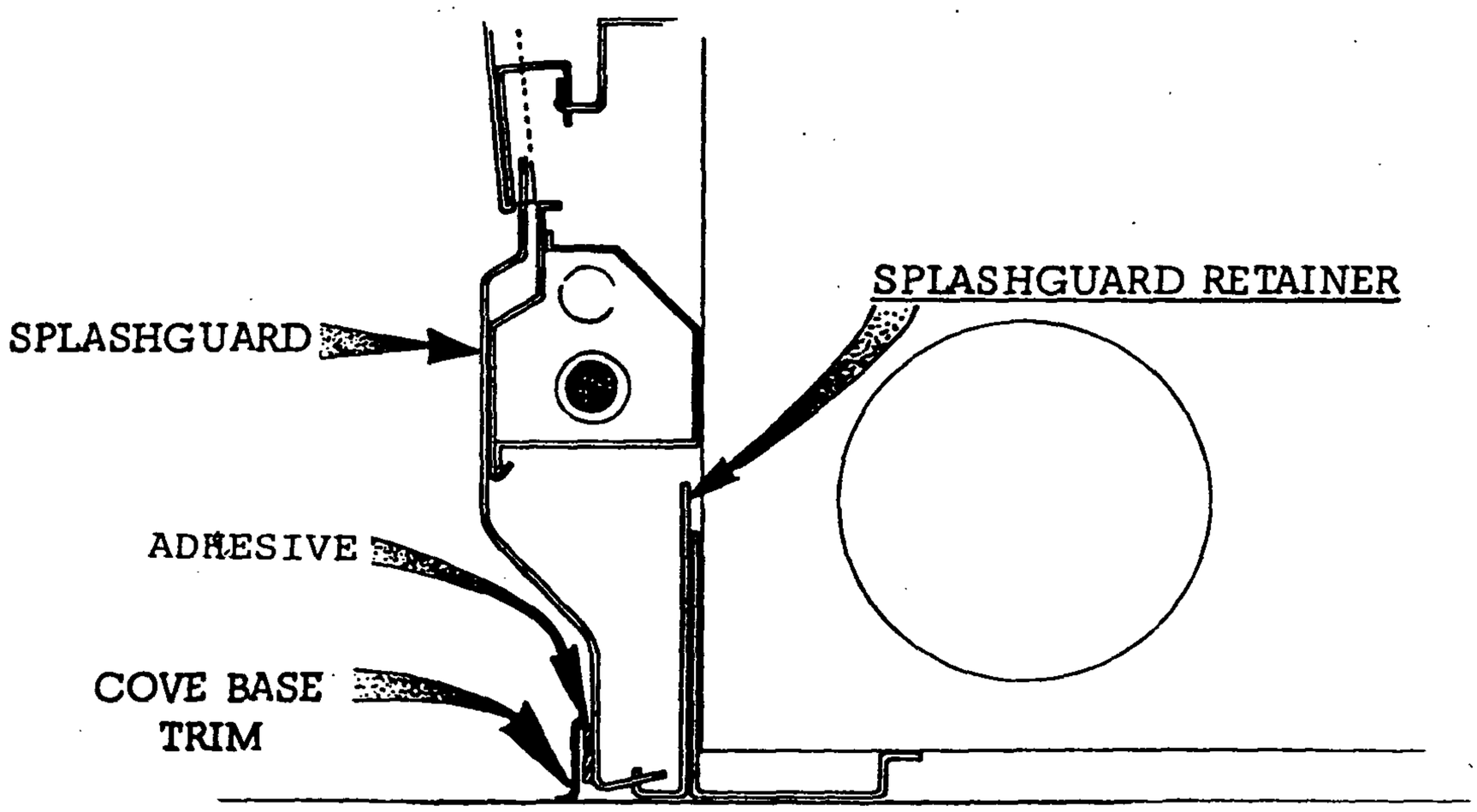
If required by local sanitary codes or if customer so desires, splashguards may be sealed to the floor using a Vinyl Cove Base Trim such as produced by Armstrong, Kentile, Johnson, etc. from a local floor covering supplier, (see Illustration below). The size needed will depend on how much the floor is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

When installing the cover 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 adhesive to the cove base trim and allow the proper drying time according to directions supplied with the product.

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 throughly both on the inside and the outside. We recommend using an 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

The suction and liquid lines should be clamped or taped together and insulated for a minimum of 30' 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	REFRIGERANT	BALANCED PORT EXPANSION VALVE	DISTRIBUTOR
All 8 Foot	Reverse Air	R-502 R-22 R-12	BFRE-A-C BFVE-A-C BFFE-A-C	
All 12 Foot	Reverse Air	R-502 R-22 R-12	BFRE-A-C BFVE-A-C BFFE-A-C	D115-3-1/4-1/2 D115-3-1/4-1/3 D115-3-1/4-1/2

EXPANSION VALVE ADJUSTMENT

Expansion valves 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 be restricted by heavy frost formation on the evaporator. Adjust valves as follows:

Attach two sensing probes (either thermocouple or thermistor types) to the evaporator, one under the clamp holding the expansion valve bulb and the other securely taped to the coil inlet line as close to the back panel as practical (see Illustration 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°F to 5°F. With this adjustment, during a portion of the hunting the temperature difference between the probes may be less than 3°F, at times as low as 0°F. Make adjustment of no more than one-half (1/2) turn at a time of the valve stem and wait for at least fifteen 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 constant year round control of temperature. When the optional refrigeration thermostat is factory installed, it will be located in the electrical raceway at the left hand end of the case and with its sensing bulb fastened above the evaporator.

Defrosts are time initiated and temperature terminated. The defrost termination thermostat will be factory installed on the evaporator outlet. It is a non-adjustable, single pole, single throw type thermostat.

APPLICATION	REFRIGERATION CONTROL				DEFROST CONTROL		
	DISCHARGE AIR TEMPERATURE ⚠1	REFRIGERANT	LOW PRESSURE CONTROL When ⚠2 Thermostat controls temperature		Defrost Frequency	Temperature Termination ⚠3	Failsafe ⚠4
			Cut-Out	Cut-In			
Fresh Meat	20°F	R-502	20 psig	32 psig	Every 12 Hours	48°F	70 min.
Deli-Cheese	30°F	R-502	20 psig	32 psig			

⚠1 Discharge air temperature is to be measured at the center of the discharge honeycomb at the center of the case.

⚠2 Set the pressure control as shown then adjust the thermostat to stop the compressor at the discharge air temperature shown above.

⚠3 Defrost will terminate at approximately 48°F discharge air temperature. If more than one refrigerator is connected to the same condensing unit, the defrost termination thermostat of each refrigerator must be wired in series to the condensing unit defrost timer.

⚠4 Defrost must be terminated by the defrost termination thermostat. 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 optional refrigeration thermostat is the same as that for conventional multiplexing. The optional 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.

Standard defrost is the same as that for conventional multiplexing, and is time initiated and temperature terminated.

APPLICATION	REFIGERATION CONTROL	DEFROST CONTROL		
			DEFROST (2)	
	Discharge Air Temperature (1)	DEFROST FREQUENCY	Temperature Termination (3)	Length or (Failsafe)
Fresh Meat	20°F	Every 12 Hours	48°F	70 Min.
Deli/Cheese	30°F			

(1) Discharge air temperature is to be measured at the center of the discharge honeycomb at the center of the case. Adjust the refrigeration control (refrigeration thermostat or CDA valve) to maintain the temperature shown above.

(2) Defrost termination thermostat. All like refrigerators connected to the same condensing unit must have their defrost termination thermostat wired in series.

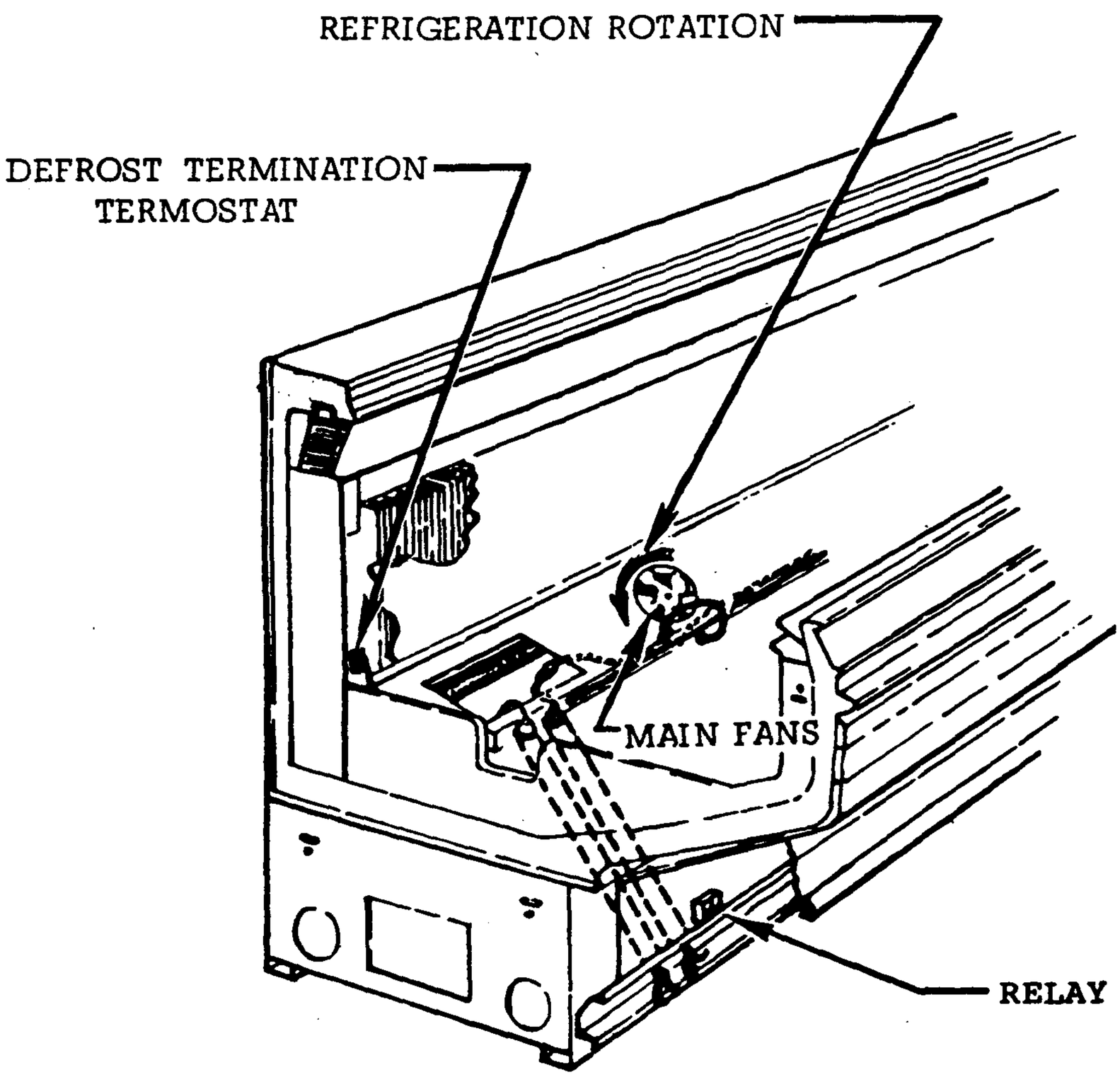
REVERSE AIR DEFROST

The Reverse Air Defrost method uses store air which is moved into and circulated through the refrigerator. The defrost cycle is timer initiated and temperature terminated. When defrost is initiated:

1. The 208 volt pilot circuit energizes the Reversing Relay causing its contacts to switch which reverses the rotation of the main fans.

2. The reversed main fans will then move store air from the ambient into the rear discharge air honeycomb and circulate the air down through the coil and out the return grille.

3. Defrost is terminated when the non-adjustable defrost termination thermostat senses a rise in temperature to (+48°F) allowing the relay to switch back to its normal position and the main fans back to their refrigeration rotation.



SECTION 4

ELECTRICAL

CONNECTIONS

All electrical connections are to be made in the electrical wireway behind the splashguard at the left hand end of the case (shown below).

IDENTIFICATION OF WIRING

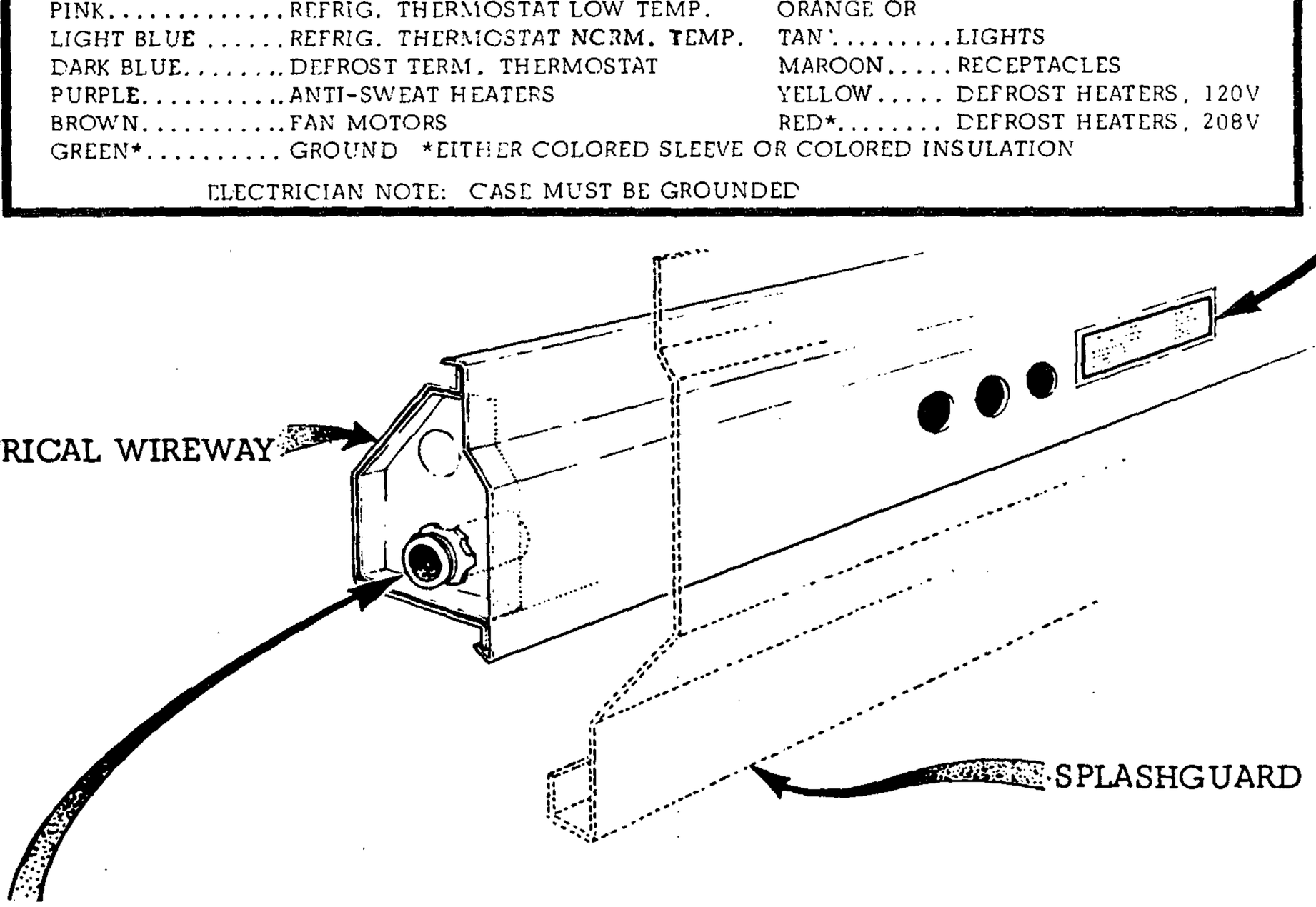
Leads for all electrical circuits are identified by colored plastic bands which correspond to the "color code sticker" located inside of the case wireway (shown below).

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

ELECTRICIAN NOTE: CASE MUST BE GROUNDED



For electrical connections when two or more cases are installed in line, remove the splashguards, end caps and raceway cover. Install the nipple and nuts (which are provided with each case) between the two cases being connected. This provides a passageway for electrical wires from one case to the other.

SERIAL PLATE AMEPERAGES

Serial Plate amperages are the amperage figures that are stamped on the refrigerator's Serial Plate. All field wiring must be sized to the Serial Plate amperages, however, the actual amps may be less than that specified.

CASE MODELS	120 Volt, 60 Hz CIRCUITS	
	FANS ⚠1	ANTI-SWEAT HEATERS ⚠2
FMA-8	0.3	0.8
FMA-12	0.6	1.0
FMGA-8	0.3	0.8
FMGA-12	0.6	1.0

NOTES:

⚠1 The fans must operate continuously.

⚠2 All the anti-sweat heaters can be cycled off by connecting them to an energy saving controller or they may be wired to the fan circuit for continuous duty. The wires for these heaters will be tagged in the wireway, identifying them as cyclical anti-sweat heaters.

3 In addition to the circuits described above, each of the following components require control wiring from the refrigerator to the condensing unit control panel (See Wiring Diagrams in this section).

a. REFRIGERATION THERMOSTAT (field or factory installed)

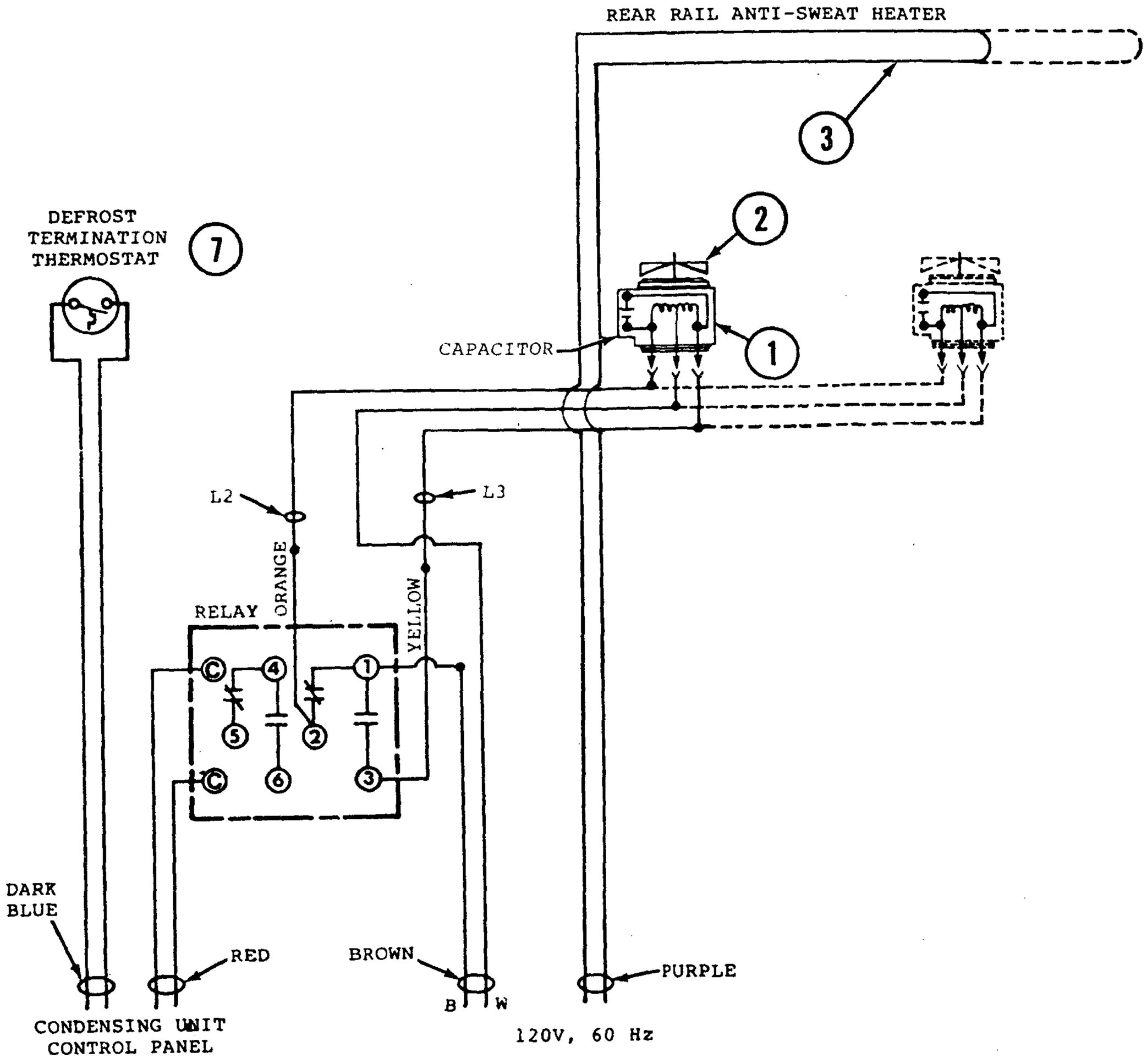
b. RELAY

C. DEFROST TERMINATION THERMOSTAT

NOTE: ALL FIELD INSTALLED WIRING MUST COMPLY WITH NEC AND LOCAL CODES.

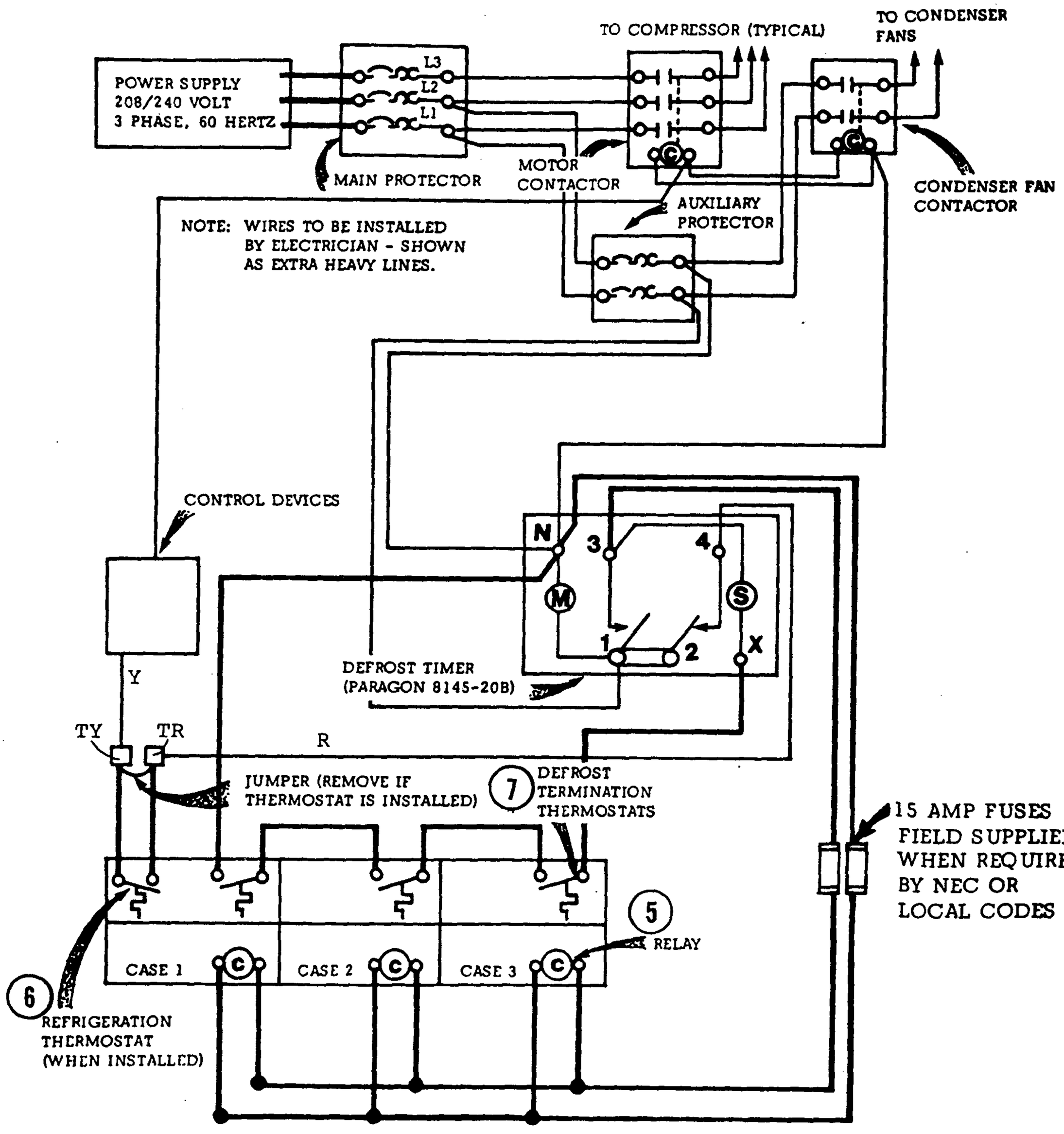
WIRING DIAGRAM
FMA - FMGA
REVERSE AIR DEEFROST

RIBBED INSULATION INDICATES NEUTRAL



WARNING
REFRIGERATOR MUST BE GROUNDED

CONVENTIONAL MULTIPLEXING - INDOOR TYPE UNIT
CONDENSING UNIT & CONTROL PANEL WIRING DIAGRAM



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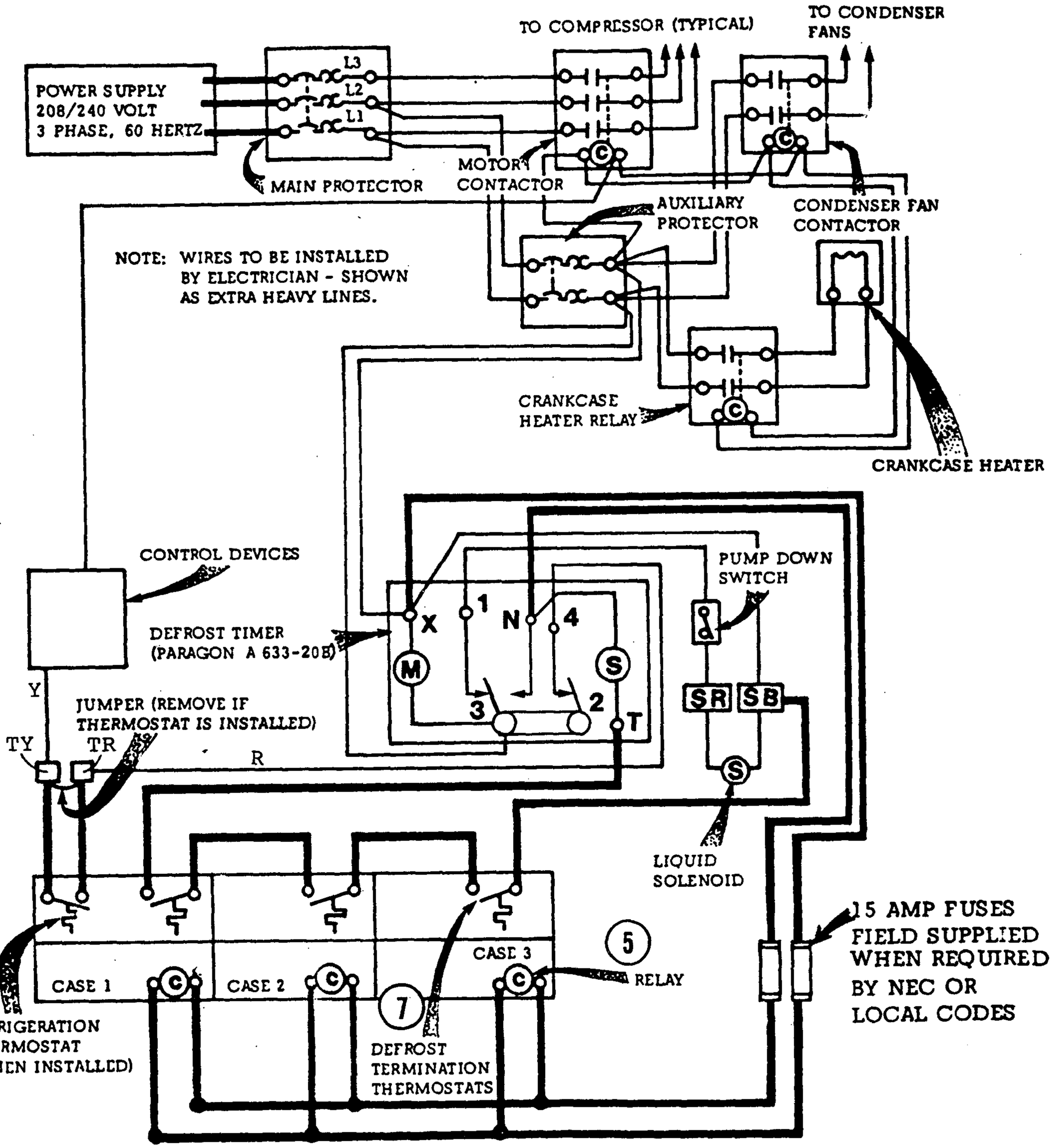
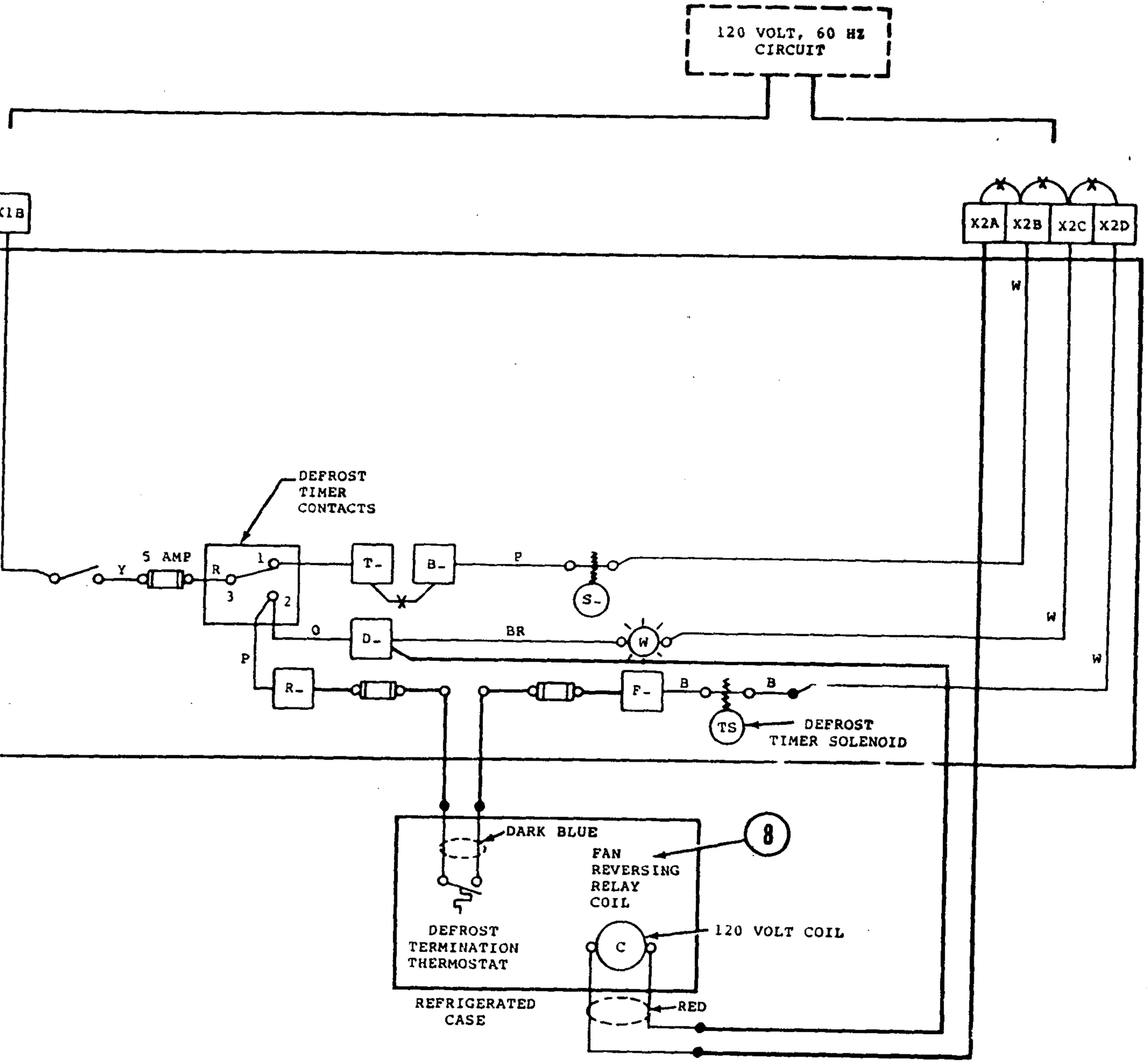


WARNING

REFRIGERATOR MUST BE GROUNDED

WIRING DIAGRAM
REVERSE AIR DEFROST CASE
TO
SUPER PLUS CONTROL PANEL



NOTES: 1 REFER TO THE WIRING DIAGRAM IN SUPER PLUS MANUAL FOR LEGEND AND NOTES PERTAINING TO CONTROL PANEL WIRING AND COMPONENTS.

2 FIELD WIRING SHOWN AS HEAVY LINES.

3 WHEN DEFROST TIMER SOLENOID IS ENERGIZED THE DEFROST TIMER CONTACTS MECHANICALLY SWITCH FROM DEFROST MODE TO REFRGIERATION MODE.

ELECTRICAL REPLACEMENT PARTS

ITEM NO.	PART NUMBER	DESCRIPTION
1.	302555	Fan Motor - EMS #RS4BEB9 E1 (See Note 1)
2.	142780	Fan Blade - Morrill FV800CW25S-Embossing toward motor - FMA, FMGA-8
	141070	Fan Blade - Morrill FV800 CW 20S - Embossing toward motor - FMA, FMGA-12
3.	109417	Rear Rail Anti-Sweat Heater - .75 amp, 160 ohms-8'
	109418	Rear Rail Anti-Sweat Heater - 1.0 amp, 120 ohms - 12'
4.	123592	Relay, DPDT, Honeywell #R4222D-1047
5.	113625	Refrigeration Thermostat Penn #A19GD-21 (optional)
6.	311588	Defrost Termination Thermostat - T.I. #24025F (optional)
7.	253603	Relay, DPDT, Honeywell #R422D-1005 (Kit 07LB)

NOTE 1: Capacitor supplied with motor; 2.5 mfd.

SECTION 5

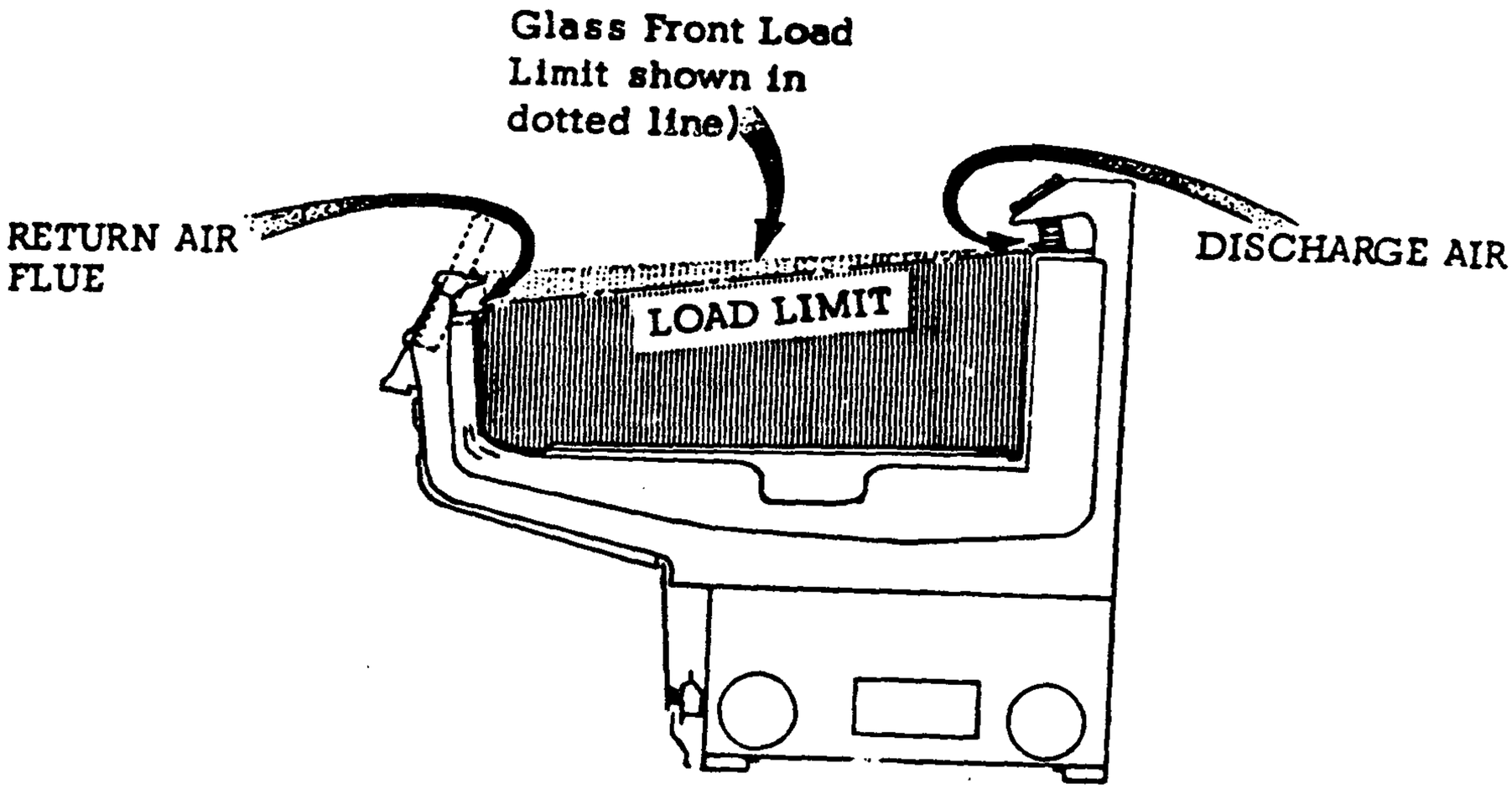
USERS INFORMATION

STOCKING

Merchandise should not be placed in these refrigerators until they are at the designed operating temperatures, approximately 2-3 hours.

When stocking, never allow product to extend beyond the load limit decals affixed to the interior of the refrigerator. AIR DISCHARGE AND RETURN AIR FLUES MUST BE UNOBSTRUCTED AT ALL TIMES TO PROVIDE PROPER REFRIGERATION AND AIR CURTAIN PERFORMANCE.

Since all food items are perishable, packages should be periodically rotated to maintain freshness.



AIR DISCHARGE AND RETURN FLUES MUST BE UNOBSTRUCTED AT ALL TIMES OR OPERATION WILL BE SERIOUSLY AFFECTED.

SHELVES

Since display shelves can be adjusted to several positions permitting shallow displays or after removal, volume display (for bulky items such as hams or chickens).

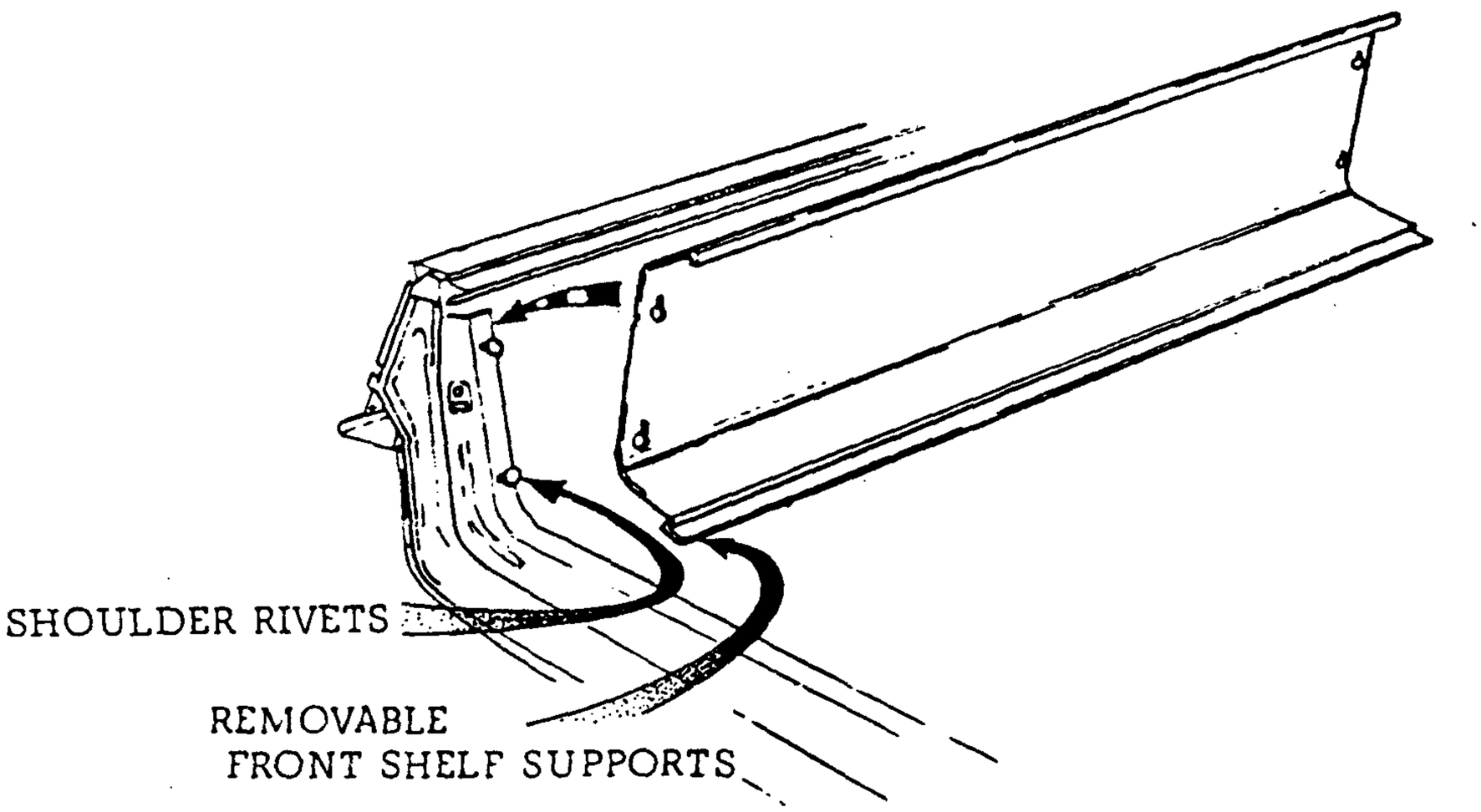
DISPLAY LIGHTING

Both the temperature and the rate of discoloration of fresh red, cured, smoked and table ready meats increases with higher light intensity and is affected differently by the various types of lighting presently in use. The total light intensity from all light sources should be limited to a maximum of 100 foot candles at the product level including no more than 30 foot candles from incandescent lamps if a shelf life of more than 2 to 3 days is expected.

CARE AND CLEANING

Long life 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 removals front and lower 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 (see illustration below).



The fan plenum is hinged for easy acess to the area beneath the evaporator for cleaning. The plenum is fastened down for shipping purposes with a screw at each end. If these have not been removed, do so and discard.

CAUTION **BE SURE PLENUM IS PROPERLY LOWERED INTO POSITION AFTER CLEANING OR PRODUCT LOSS WILL RESULT DUE TO IMPROPER REFRIGERATION.**

The interior bottom of this case is any 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 sanitizers should be used according to the manufacturer's directions.

CAUTION: **DO NOT USE STEAM OR EXTREMELY HOT WATER TO WASH THE INTERIOR BOTTOM OF THESE CASES. WHEN CLEANED, DO NOT USE A HOSE WITH HIGH WATER PRESSURE AND NEVER INTRODUCE WATER INTO THE FIXTURE FASTER THAN THE WASTE OUTLET CAN CARRY IT AWAY.**

To preserve the exterior finish of the fixture, use warm water and 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, THERMOSTATS, AND FLUORESCENT LAMPS THAT MAY BE INSTALLED IN THE OPTIONAL SUPERSTRUCTURE FOR THESE CASES.

TROUBLESHOOTING FAN MOTORS

I. ALL MOTORS STOPPED

A. Cause: Open Circuit: Faulty Relay

Test: Check voltage to fan motors
Remove and check relay

II. ALL MOTORS FAIL TO REVERS

Cause: Faulty relay

Test: Remove and check relay

III. ONE MOTOR MALFUNCTIONS

Cause: Faulty motor

Test: Substitute with new motor

IV. MOTOR ROTATION INCORRECT

(See page 8 for correct rotation)

Cause: Motor polarity reversed

Test: Check wiring of fan circuit to relay.

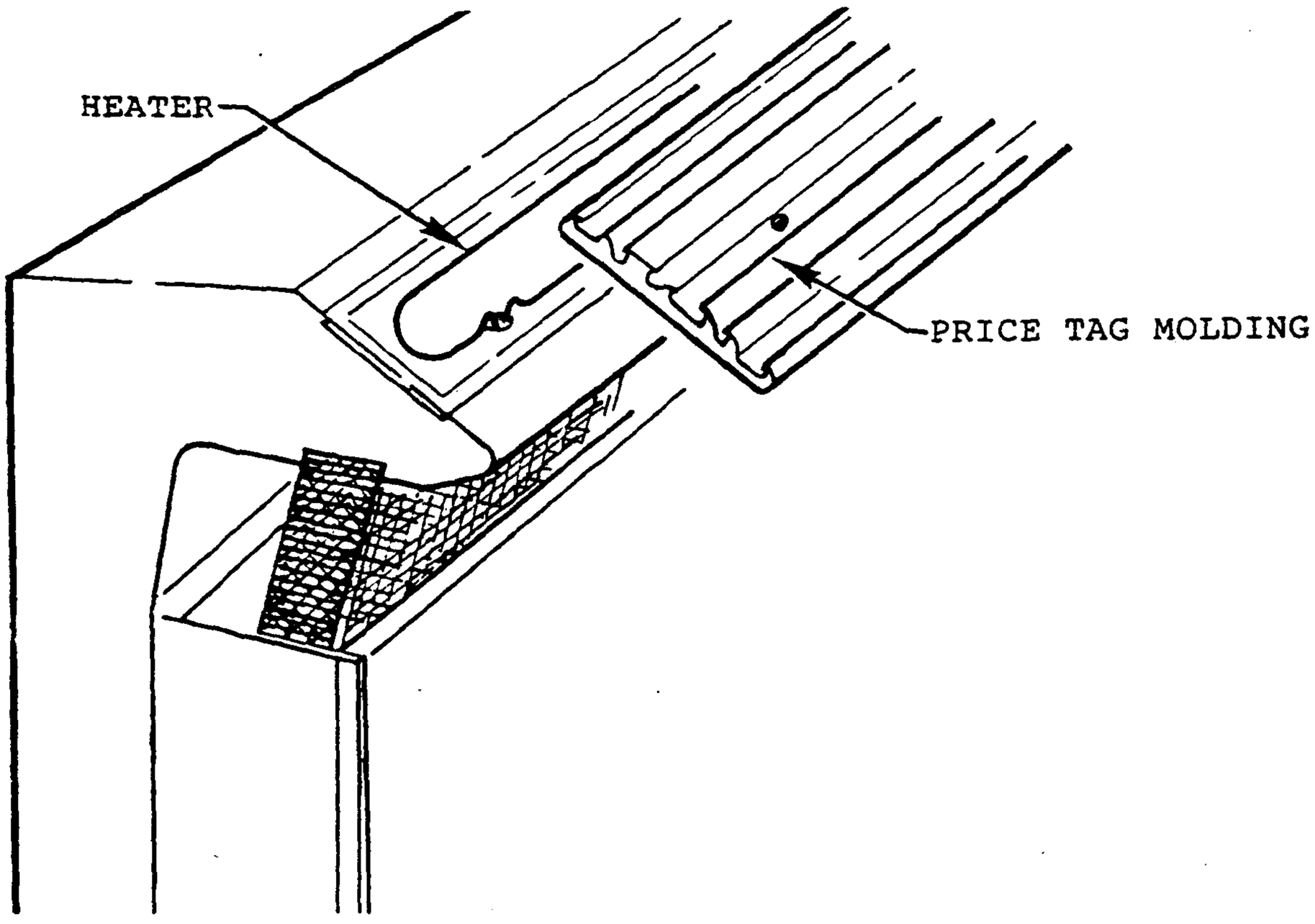
FAN BLADE REPLACEMENT

The evaporator fans are located at the center front of these cases directly beneath the display pan. Should the fans or blades ever need servicing, ALWAYS REPLACE THE FAN BLADES WITH THE RAISED EMBOSSING SIDE OF THE BLADE INSTALLED TOWARD THE MOTOR.

ANTI-SWEAT HEATER LOCATION AND REPLACEMENT

A. Price Tag Moulding Anti-Sweat Heater (Rear Rail)
This heater is located immediately below the price tag molding that is fastened to the back of the case. To remove:

1. Remove screws holding price tag molding and lift molding from case.
2. Disconnect the faulty heater at its supply harness and replace the heater. See parts list for replacement heater.
3. Re-install all parts in reverse order of removal.



HONEYCOMB REMOVAL & CLEANING

CAUTION: DO NOT TEAR THE HONEYCOMB

1. Remove the honeycomb assembly as follows:
   a. Remove screws (Item A) along the bottom of the honeycomb assembly.

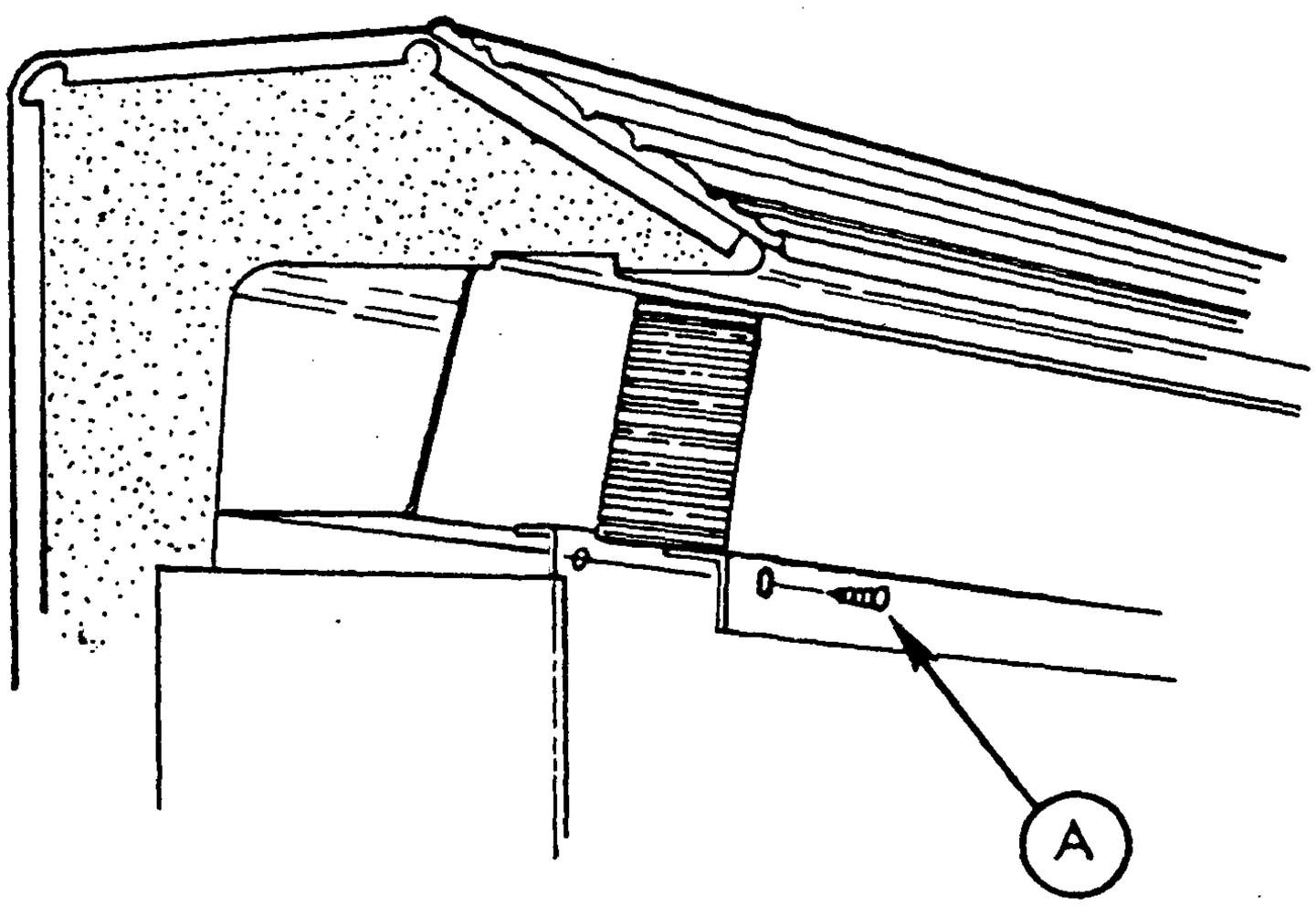
   b. Remove the honeycomb assembly.

2. To clean honeycomb:
   a. Mix a powdered detergent, such as "Ajax" or "Comet", in warm water. (6 to 7 tablespoons per gallon)

   b. Immerse or spot clean the honeycomb. Use care not to damage the cell structure of the honeycomb.

   c. Rinse thoroughly in clean water. Shake excess water from honeycomb and dry. (If heat is used, do not exceed 140°F dry heat).

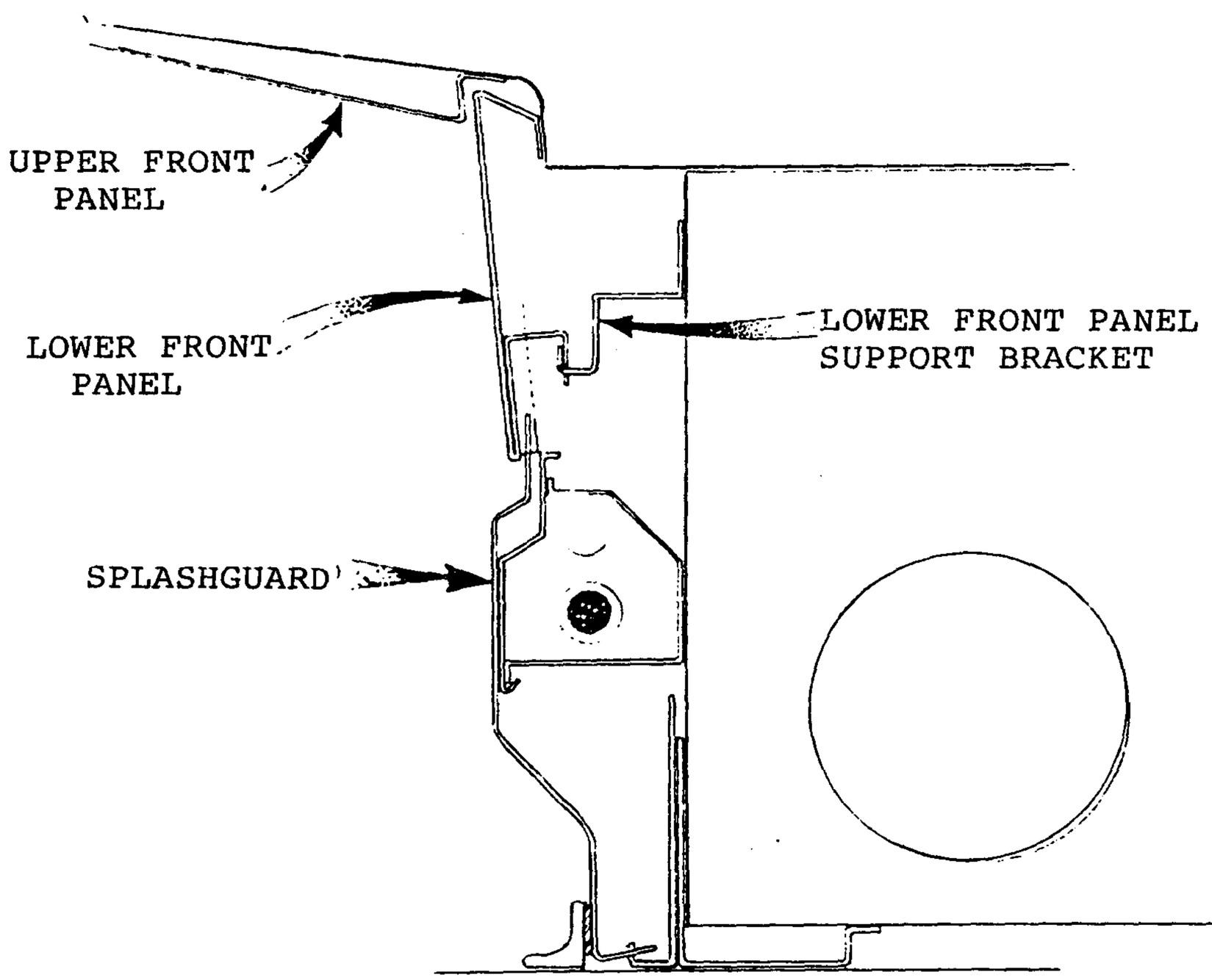
3. Install the honeycomb by reversing the above procedure.



REMOVEAL OF LOWER FRONT PANEL

1. Remove lower front panel by lifting up, pulling out and away from support brackets then lowering from behind the upper front panel. See illustration below.

2. Reverse the above procedure to install.



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