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CORPORATION

DUAL TEMPERATURE OPERATION

FML/FMLG

REFRIGERATED MERCHANDISERS

INSTALLATION / SERVICE INSTRUCTIONS

Eng. No. 124869G

May, 1989

Supersedes #124869F

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Section 1

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IMPORTANT
KEEP IN STORE FOR FUTURE REFERENCE

Quality that sets industry standards.

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

CRS-S1-78

GENERAL INFORMATION

This instruction contains information concerning the refrigeration and electrical requirements for FML/FMLG models ONLY when they have been equipped for DUAL TEMPERATURE OPERATION. Each refrigerator that is intended for dual temperature operation must be installed as described in this instruction.

Dual Temperature FML/FMLG models will be factory equipped with thermostatic controls that allow the selection of either low temperature (frozen meat) display or medium temperature (fresh packaged meat) display operation.

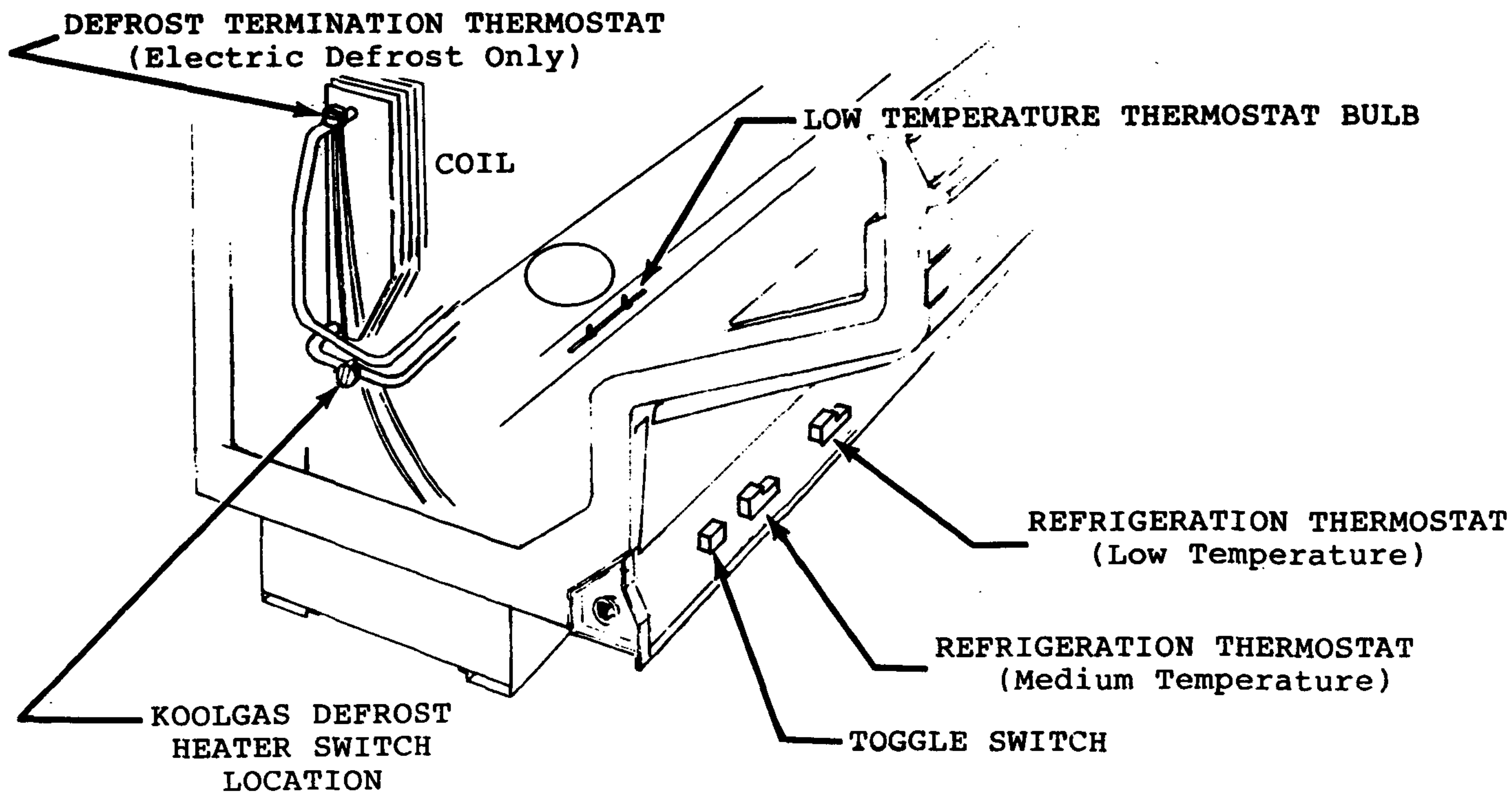
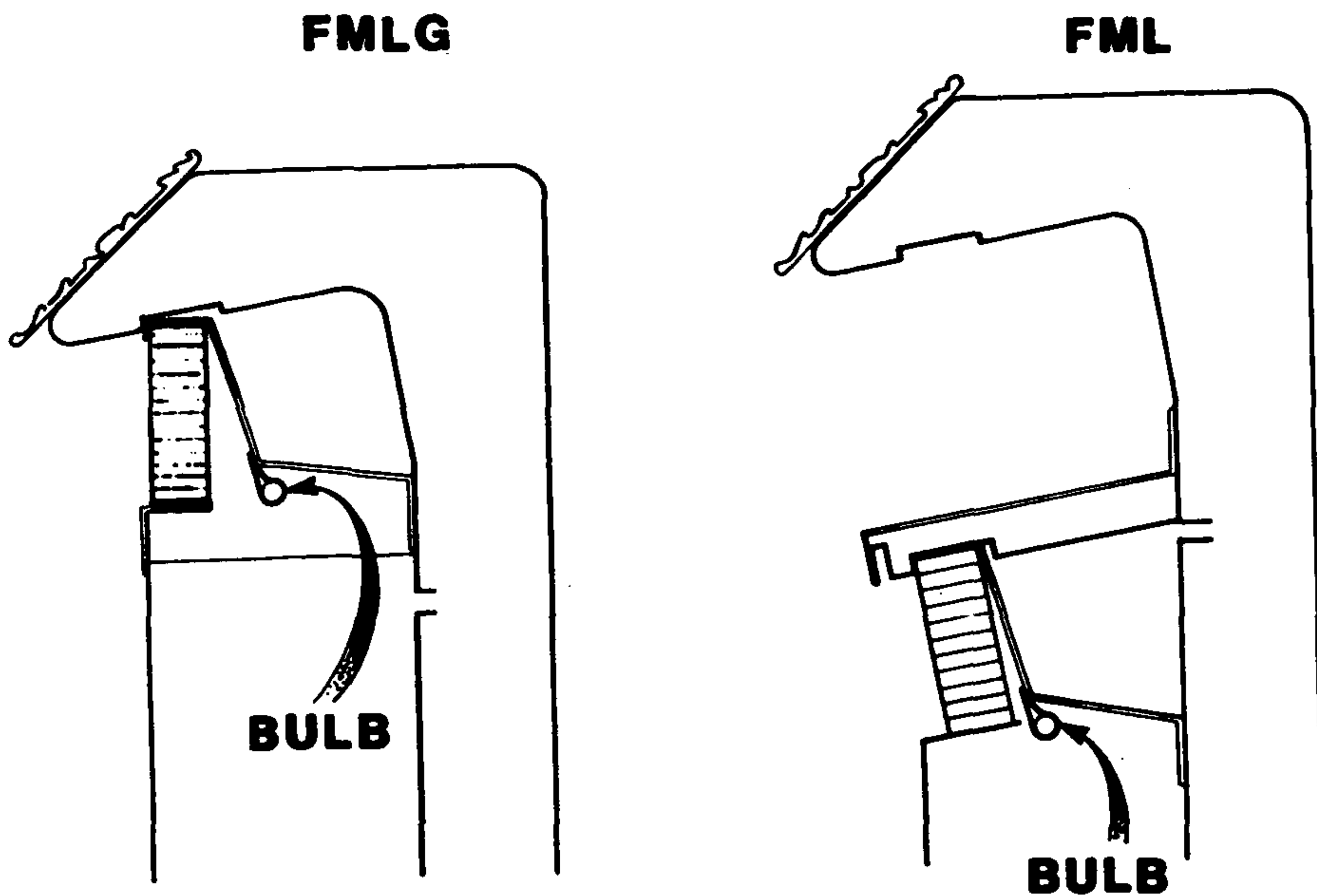
The following Table relates the factory installed Dual Temperature Operation kits that are needed for different types of refrigeration systems. The parts list below the Table, contains the discrete components that are added to the standard FML/FMLG models for each of the Dual Temperature Operation kits.

REFRIGERATION SYSTEM	TYPE OF DEFROST	KIT REQUIREMENTS (Nomenclature)	
		One Refrigerator On Each System	Each Additional Refrigerator On The Same System
CONVENTIONAL MULTIPLEXING	ELECTRIC (Temperature Terminated)	(05GC)	(01GC)
MIXED MULTIPLEXING	ELECTRIC (Temperature Terminated)	(05GC)	(01GC)
	KOOLGAS (Time Terminated)	(04GC)	None

<u>PARTS LIST</u>				
QUANTITY (05GC)(04GC)(01GC)	PART NUMBER	DESCRIPTION	PART	
			NUMBER	DESCRIPTION
2	2	-	113625	Refrigeration Thermostat Penn Control #A19AGD-21 type: close-on-rise range: -30°F to +50°F
1	1	-	111816	Toggle Switch Arrow Hart #8273-G
1	-	1	252122	Defrost Termination Thermostat T.I. #20425F32-497-914 type: close-on-rise closes: +52°F ± 3° opens: +32°F ± 6°

CONTROL LOCATIONS

MEDIUM TEMPERATURE THERMOSTAT BULB
(Bulb Center Line Is 21" From Left Hand End Of Case)



ELECTRICAL

CONNECTIONS

All electrical connections are to be made in the electrical wireway behind the splashguard at the left hand end of the refrigerator.

WIRING IDENTIFICATION

All electrical circuits are identified by colored plastic bands which correspond to the "color code sticker" located inside the wireway.

"COLOR CODE STICKER"

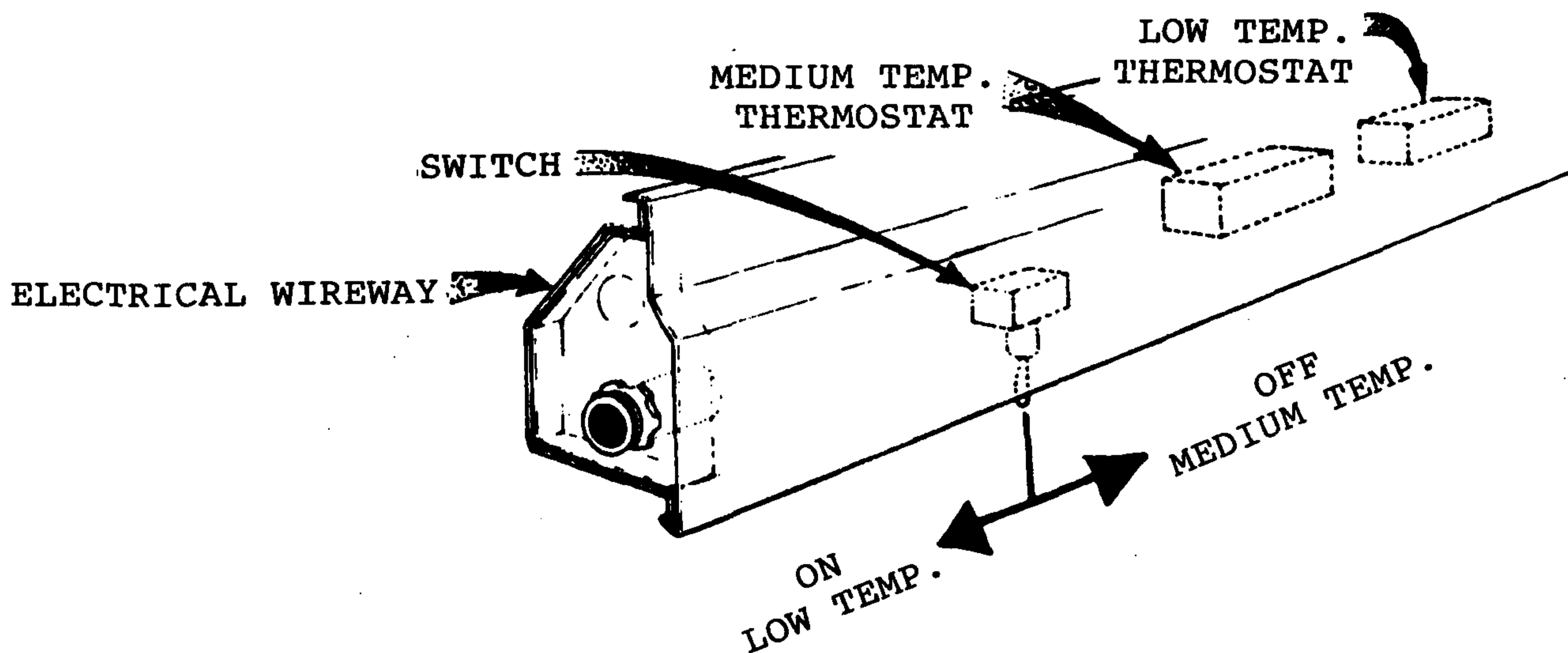
WIRING COLOR CODE

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



SERIAL PLATE AMPERAGES

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 MODEL	120 VOLT, 60 Hz CIRCUITS			208 V, 60 Hz CIRCUIT
	FANS and ANTI-SWEAT HEATERS ①	CYCLABLE ANTI-SWEAT HEATERS ②	KOOLGAS SUPPLEMENTAL HEATER ③	DEFROST HEATER (Single Phase) ④
FML-8	0.5	1.5	4.0	6.9
FML-12	1.0	2.2	6.0	10.2
FMLG-8	0.5	2.0	5.3	6.9
FMLG-12	1.0	2.7	8.0	10.2

NOTES:

The fans and anti-sweat heaters must operate continuously.



These 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 cyclable anti-sweat heaters.



This circuit is for the finned heater that is controlled by a disc type thermostat, mounted on the evaporator, and is energized during KOOLGAS defrost only. It may be connected in parallel with the fan and anti-sweat heater circuit.

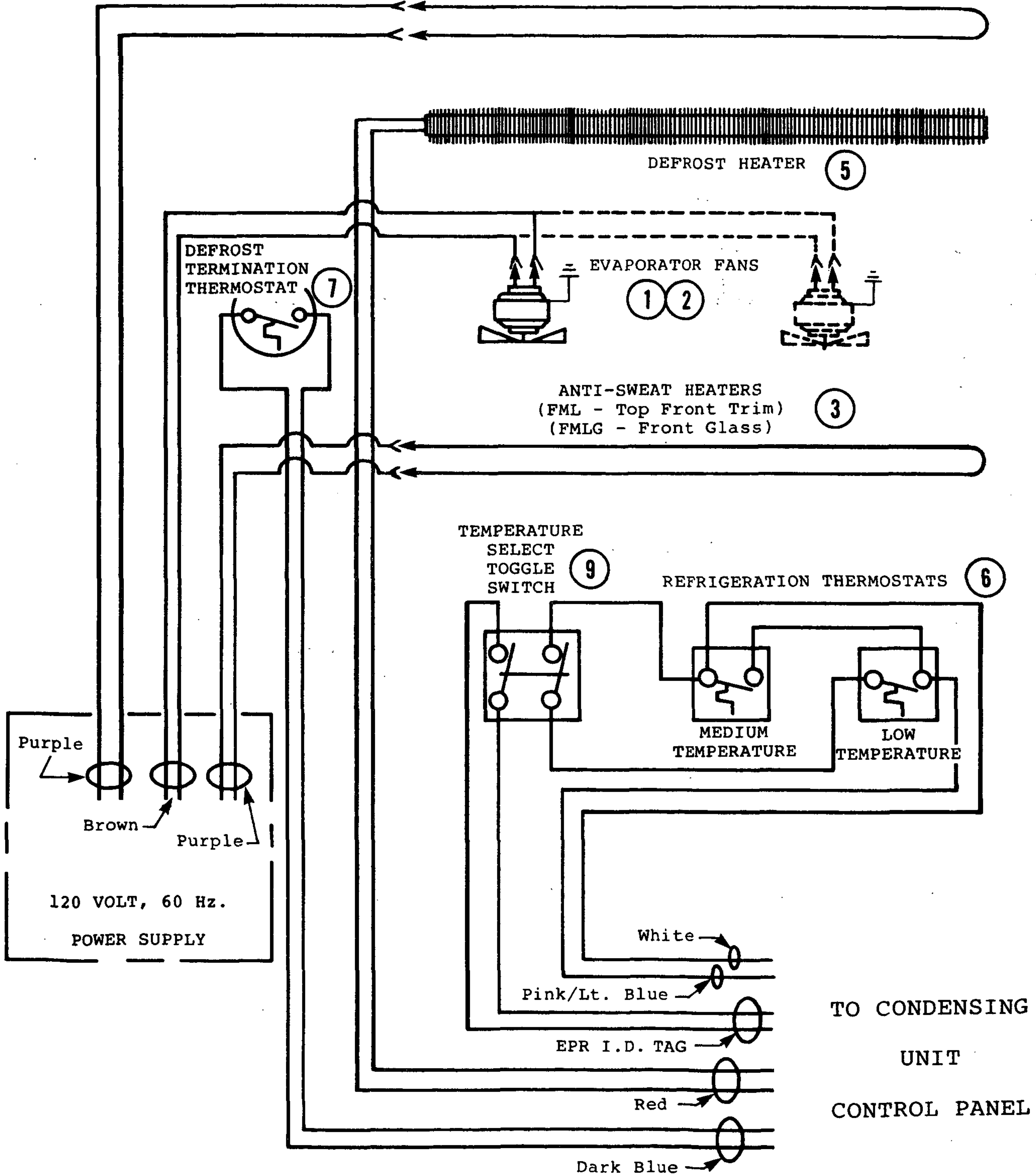


Electric defrost only. Not required for KOOLGAS defrost.

In addition to the circuits listed above, control wiring from the refrigerator to the condensing unit control panel will be required as shown in the following wiring diagrams.

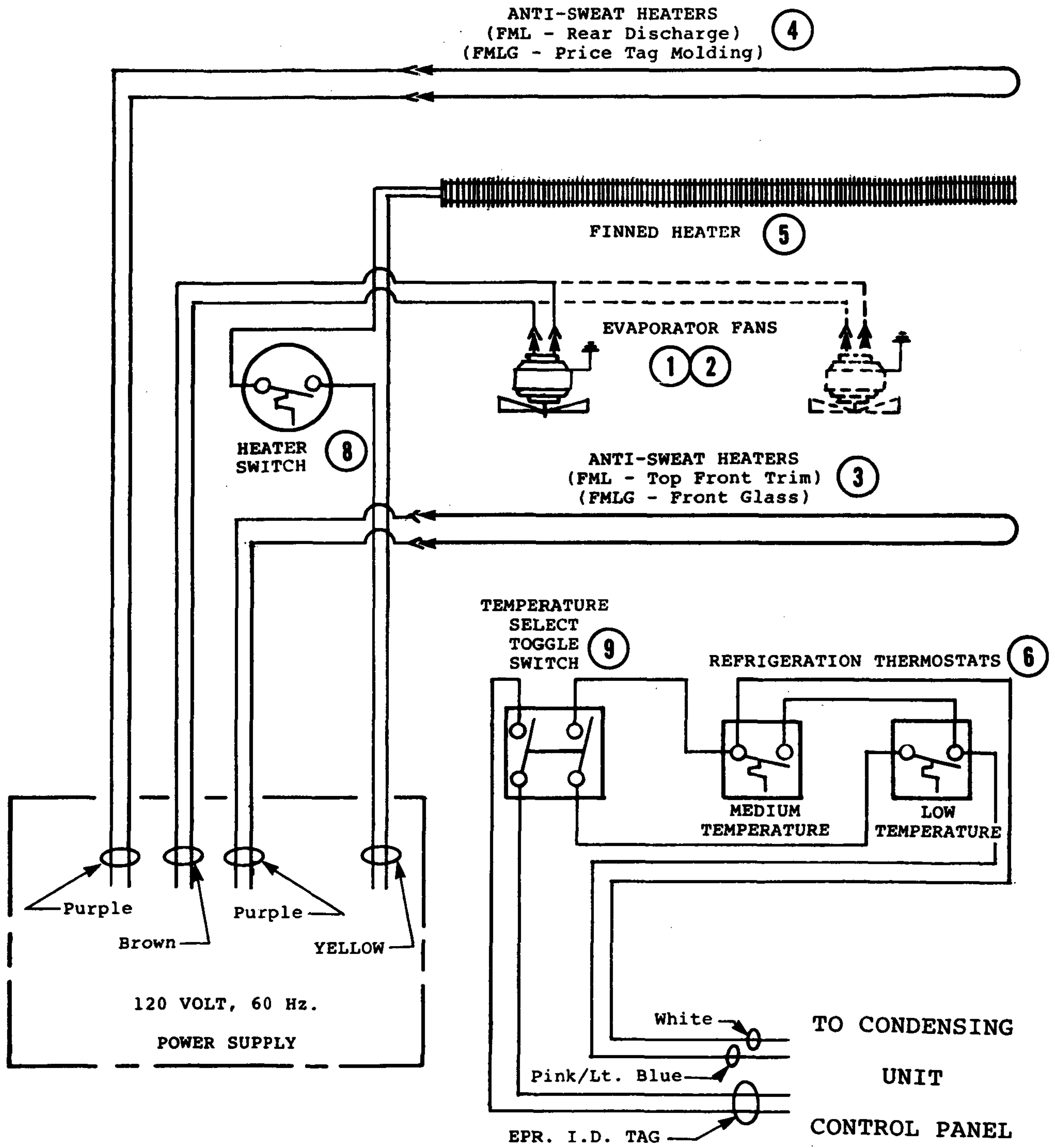
FML-FMLG
DUAL TEMPERATURE
CASE WIRING DIAGRAM
(Electric Defrost)

ANTI-SWEAT HEATERS
(FML - Rear Discharge)
(FMLG - Price Tag Molding) (4)



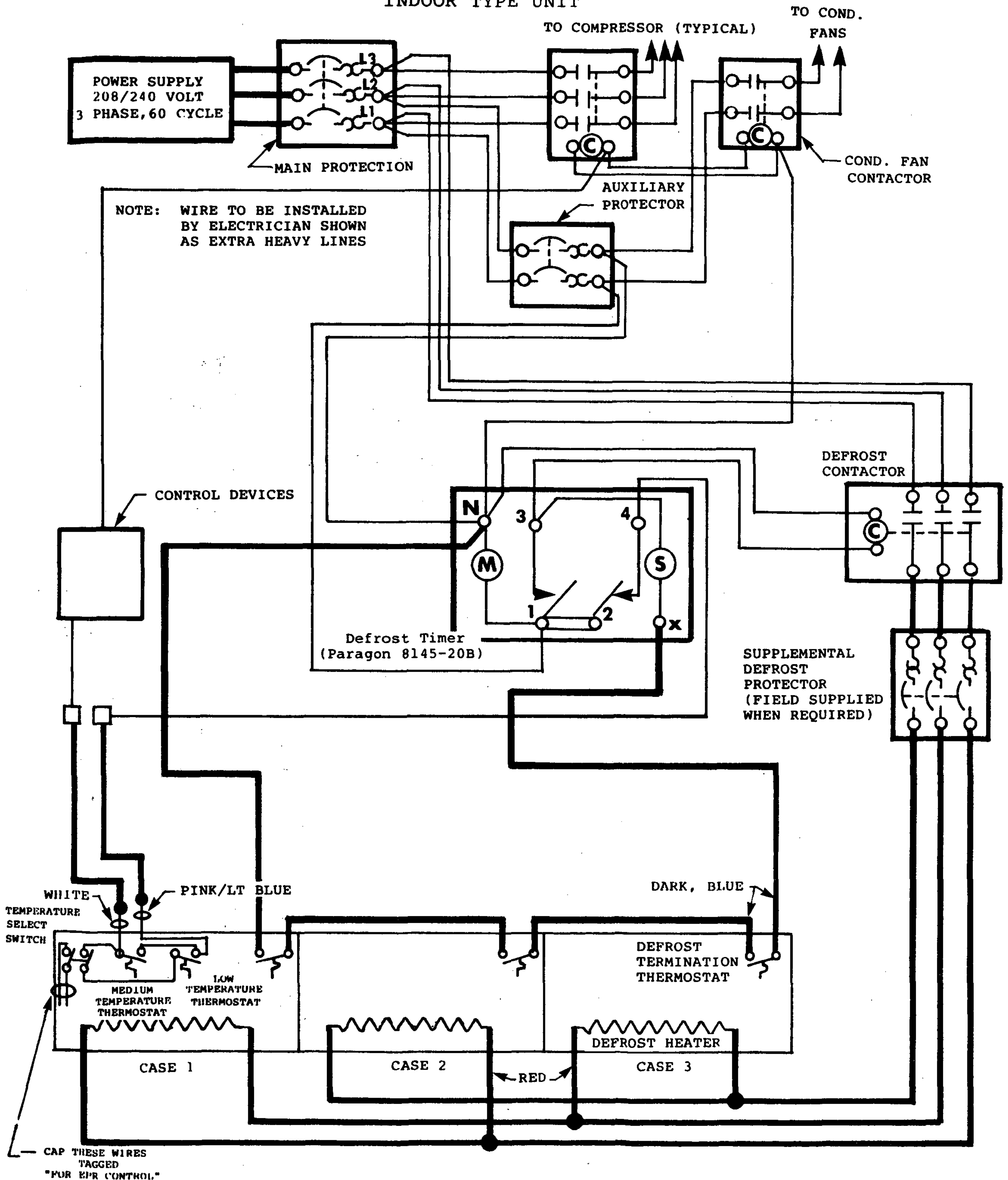
- REFRIGERATOR MUST BE GROUNDED -

FML - FMLG
DUAL TEMPERATURE
CASE WIRING DIAGRAM
(KOOLGAS Defrost)



- REFRIGERATOR MUST BE GROUNDED -

TYPICAL CONVENTION MULTIPLEXING
WIRING DIAGRAM
INDOOR TYPE UNIT



NOTE: WIRE TO BE INSTALLED
BY ELECTRICIAN SHOWN
AS EXTRA HEAVY LINES

CONTROL DEVICES

Defrost Timer
(Paragon 8145-20B)

SUPPLEMENTAL
DEFROST
PROTECTOR
(FIELD SUPPLIED
WHEN REQUIRED)

WHITE
TEMPERATURE
SELECT
SWITCH

PINK/LT BLUE

DARK, BLUE

DEFROST
TERMINATION
THERMOSTAT

DEFROST HEATER

CASE 1

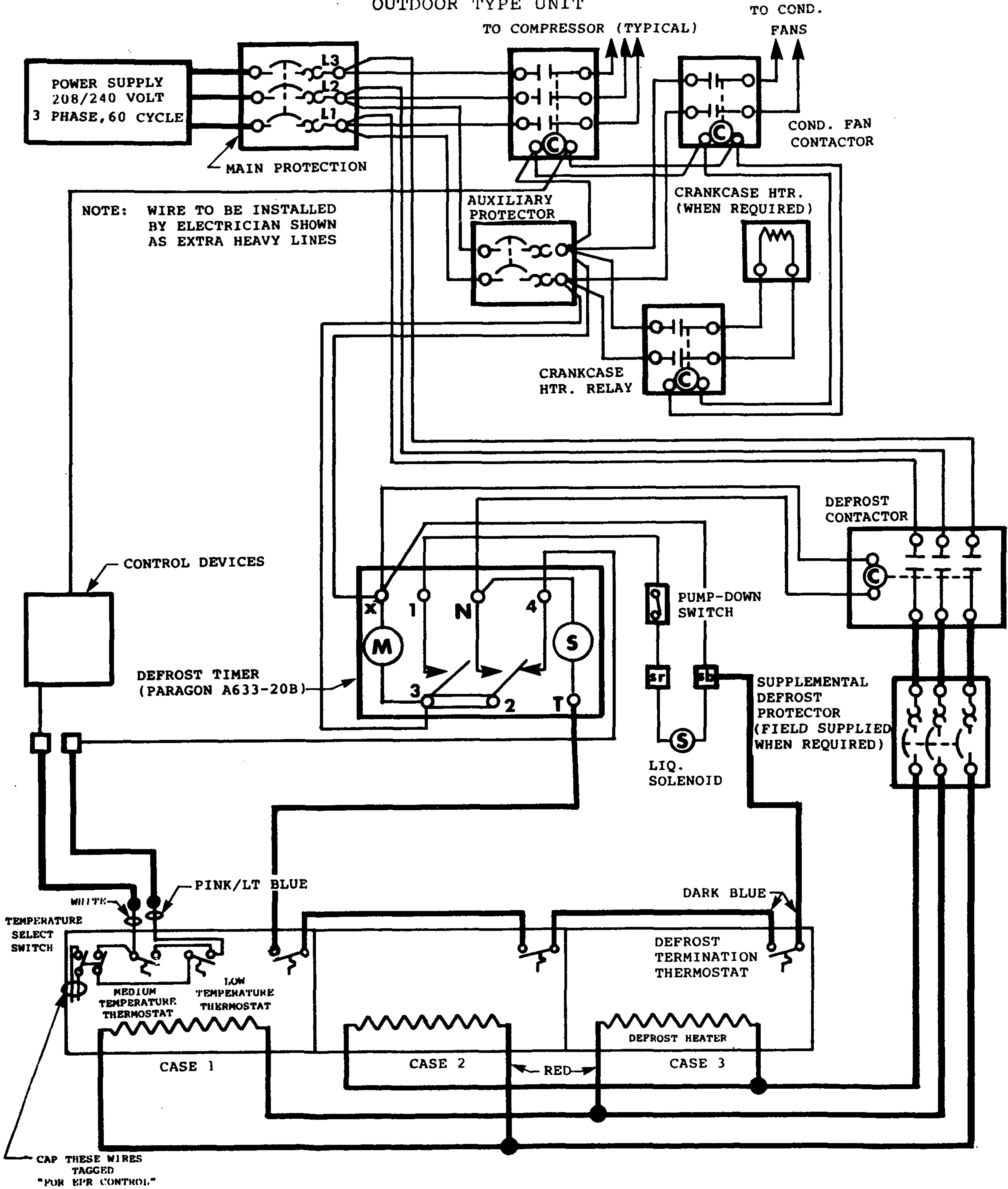
CASE 2

CASE 3

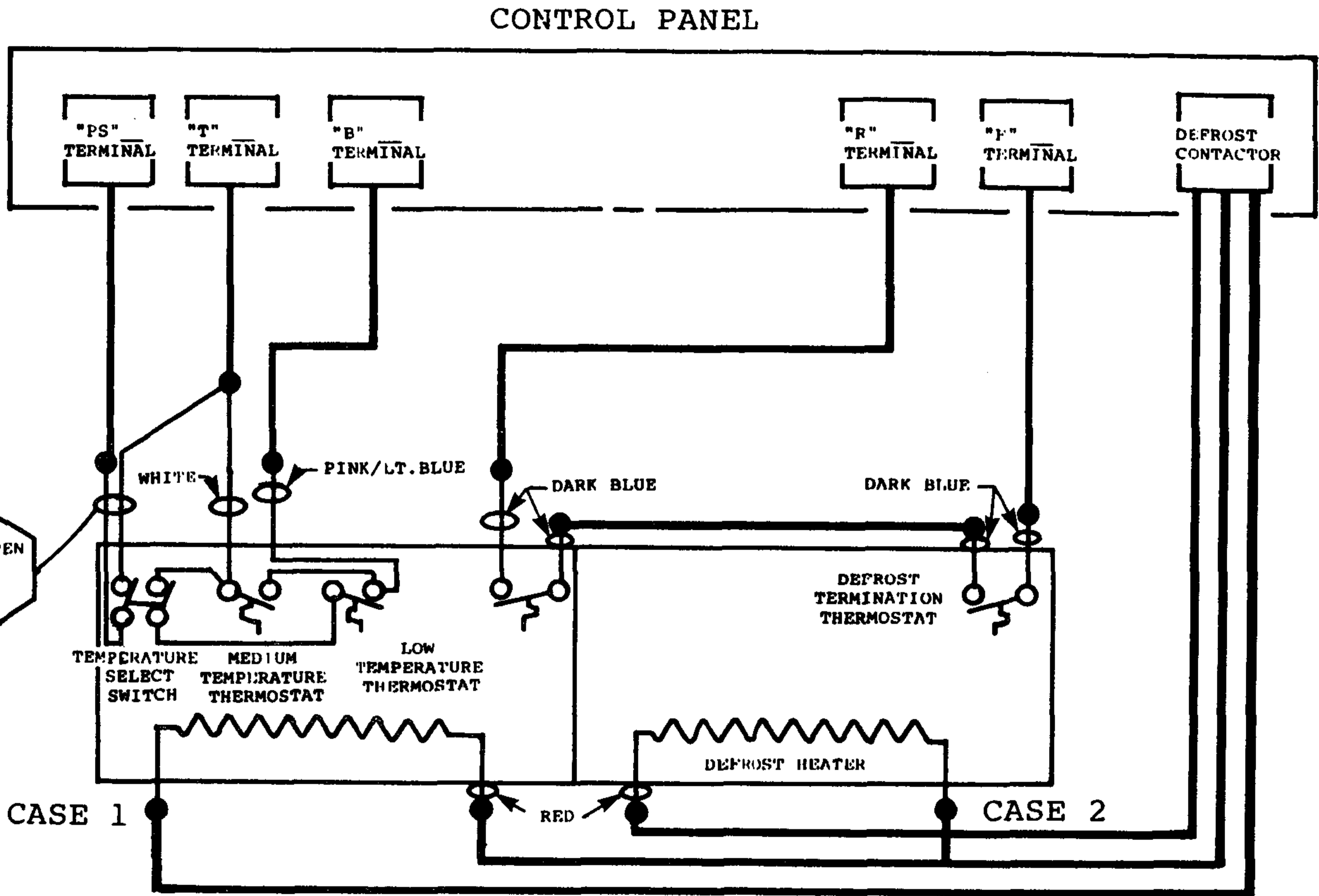
RED

CAP THESE WIRES
TAGGED
"FOR EPR CONTROL."

TYPICAL CONVENTIONAL MULTIPLEXING WIRING DIAGRAM OUTDOOR TYPE UNIT



WIRING DIAGRAM
 MIXED MULTIPLEXING
 (Electric Defrost)

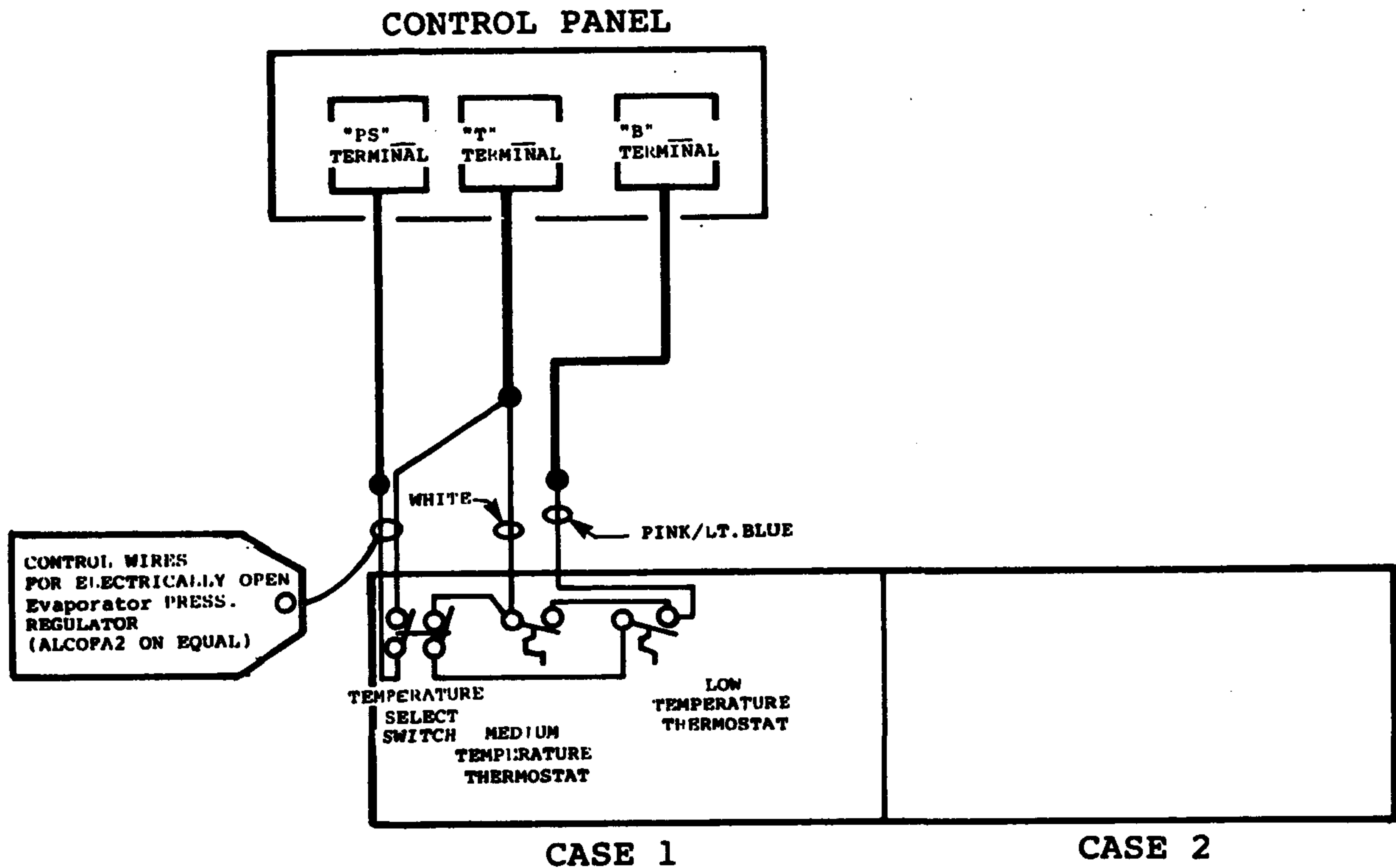


NOTES:

Wires to be installed by electrician are shown as extra heavy lines. Connect to terminals "()" with suffix number that corresponds to system number.

Refer to Control Panel for complete wiring diagram.

WIRING DIAGRAM
MIXED MULTIPLEXING
(KOOLGAS Defrost)

**NOTES:**

Wires to be installed by electrician are shown as extra heavy lines. Connect to terminals "()" with suffix number that corresponds to system number.

Refer to Control Panel for complete wiring diagram.

ELECTRICAL REPLACEMENT PARTS

<u>ITEM</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1.	058698	Fan Motor - GE#5KSP51CL-227 6W CW
2.	252116	Fan Blade - Morrill FV700 CW15SS Embossing toward motor
3.	038986	Top Trim Anti-Sweat Heater - .8 amps, 150 ohms FML-8
	038987	Top Trim Anti-Sweat Heater - 1.2 amps, 100 ohms - FML-12
	090354	Front Glass Anti-Sweat Heater - .78 amps, 153 ohms - FMLG-8
	090355	Front Glass Anti-Sweat heater - 1.2 amps, 102 ohms - FMLG-12
4.	044309	Rear Discharge Anti-Sweat Heater - .75 amps, 160 ohms - FML-8
	044310	Rear Discharge Anti-Sweat Heater - 1.2 amps, 120 ohms - FML-12
	044305	P.T.M. Anti-Sweat heater - 1.5 amps, 103 ohms - FMLG-8
	044306	P.T.M. Anti-Sweat Heater - 1.5 amps, 80 ohms - FMLG-12
5.	058657	Defrost Heater - FML-8, FMLG-8 6.9 amp, 208 volt, 30 ohms (Electric Defrost) 4.0 amp, 120 volt, 30 ohms (Koolgas Defrost) FML
	121252	Defrost Heater - FMLG-8, (Koolgas Defrost) 5.3 amp, 120 volt, 21 ohms
	058658	Defrost Heater - FML-12, FMLG-12 10.2 amp, 208 volt, 20 ohms (Electric Defrost) 6.0 amp, 120 volt, 20 ohms (Koolgas Defrost) FML
	121253	Defrost Heater - FMLG-12 (Koolgas Defrost) 8.0 amp, 120 volt, 15 ohms
6.	113625	Refrigeration Thermostat - Penn Control #A19AGD-21 (optional)
7.	252122	Defrost Termination Thermostat - T.I. #20425 F32-497-914 (optional-Electric Defrost)
8.	122940	Defrost Heater Thermostat Switch - T.I. *20420F28 -442-343 (KOOLGAS Defrost)
9.	111816	Toggle Switch DPST

REFRIGERATION

(Conventional Multiplexing)

These refrigerators will be equipped for operation on R-502 refrigerant. It is essential that they be equipped with a non-pressure limiting expansion valve.

It is also recommended that a Crankcase Pressure Regulating valve be installed at the compressor to prevent overloading of the compressor when the refrigerator is used for medium temperature operation.

CONTROL SETTINGS AND ADJUSTMENTS

After all installation work has been completed and as soon as refrigeration has started, adjust the controls in the following sequence.

1. Adjust the condensing unit's low pressure control as shown in the following Table.
2. Remove the trip pins from the defrost timer dial and set the fail-safe to one hour.
3. Set the refrigeration thermostats to:
+10°F for medium temperature thermostat
-20°F for low temperature thermostat
4. Set temperature select switch for medium temperature operation.
5. Measure discharge air temperature. When the temperature reaches that shown in the Table for medium temperature thermostat, adjust the medium temperature thermostat to open its contacts.
6. Change the temperature select switch to low temperature operation.
7. Measure discharge air temperature. When it reaches -5°F, check the expansion valve setting in each refrigerator as shown herein. Adjust the valves if necessary.
8. When the discharge air temperature reaches that shown in the Table for low temperature thermostat, adjust the low temperature thermostat to open its contacts.
9. After the refrigerators have been in operation for several hours and their evaporators have a normal frost load, manually advance the defrost timer and initiate a defrost. As the discharge air temperature in each refrigerator reaches the termination temperature shown in the Table the defrost should terminate.
10. Adjust the defrost timer to the correct time of the day and set the defrost frequency and failsafe as shown in the Table.

CONVENTIONAL MULTIPLEXING

CONTROL SETTINGS:

REFRIGERATION CONTROL SETTINGS				DEFROST CONTROL SETTINGS		
REFRIGERATION THERMOSTAT	DISCHARGE AIR TEMPERATURE ①	LOW PRESSURE CONTROL		FREQUENCY	TEMPERATURE TERMINATION ②	FAILSAFE ③
		CUT-OUT	CUT-IN			
MEDIUM TEMPERATURE THERMOSTAT	Open at +23°F.	2 psig (R-502)	32 psig (R-502)	Every 12 Hours	48°F to 52°F	46 Min.
LOW TEMPERATURE THERMOSTAT	Open at -10°F.					

①

Measure discharge air temperature at the center of the discharge honeycomb in the center of the refrigerator.

②

Defrost is terminated by the defrost termination thermostat. If more than one refrigerator is connected to the same condensing unit, the defrost termination thermostats of each refrigerator must be wired in series to the condensing unit defrost timer.

③

The failsafe setting must not control the length of defrost. Defrost must be terminated by the defrost termination thermostats. This is especially important when less than 208 volts are supplied to the defrost heaters or when heavy shopping demands have created excess frost on the evaporator.

REFRIGERATION
(Mixed Multiplexing)

These refrigerators will be equipped for operation on R-502 refrigerant. The refrigeration thermostat circuit should control a liquid line solenoid.

In addition to the factory installed controls, a field supplied evaporator pressure regulator, equivalent to the ALCO FAV2 regulator described on page 16, must be installed in the suction line to prevent the upstream pressure from exceeding the lower limit of the pressure pilot setting when the refrigerators are being used for medium temperature display.






CONTROL SETTINGS AND ADJUSTMENTS


After all installation work has been completed and as soon as refrigeration has started, adjust the controls in the following sequence:


1. Remove the trip pins from the defrost timer dial and set the fail-safe to one hour.
2. Set the temperature select switch for medium temperature operation.
3. Set the refrigeration thermostats to:
+10°F for medium temperature thermostat
-20°F for low temperature thermostat
4. Adjust the Evaporator Pressure Regulator valve as shown in the following Table.
5. Measure discharge air temperature. When the temperature reaches that shown in the Table for medium temperature thermostat, adjust the medium temperature thermostat to open its contacts.
6. Change the temperature select switch to low temperature operation.
7. Measure discharge air temperature. When it reaches -5°F, check the expansion valve setting in each refrigerator as shown herein. Adjust the valves if necessary.
8. When the discharge air temperature reaches that shown in the Table for low temperature thermostat, adjust the low temperature thermostat to open its contacts.
9. **ELECTRIC DEFROST REFRIGERATORS ONLY:** After the refrigerators have been in operation for several hours and their evaporators have a normal frost load, manually advance the defrost timer and initiate a defrost. As the discharge air temperature in each refrigerator reaches the termination temperature shown in the Table the defrost should terminate.
10. Adjust the defrost timer to the correct time of the day and set the defrost frequency and failsafe (or length) as shown in the Table.


MIXED MULTIPLEXING


CONTROL SETTINGS


REFRIGERATION CONTROL SETTINGS			DEFROST CONTROL SETTINGS			
REFRIGERATION THERMOSTAT	DISCHARGE AIR TEMPERATURE 	EVAPORATOR PRESSURE REGULATOR 	FREQUENCY	ELECTRIC DEFROST		KOOLGAS DEFROST
				TEMPERATURE TERMINATION	FAILSAFE	LENGTH
MEDIUM TEMPERATURE THERMOSTAT	Open at +23°F.	40 - 44 psig (R-502)	Every 12 Hours	48°F to 52°F 	46 Min. 	14 Minutes 
LOW TEMPERATURE THERMOSTAT	Open at -10°F.					

 1 Measure discharge air temperature at the center of the discharge honeycomb in the center of the refrigerator.

 2 Refer to the following page for information concerning the EPR valve.

 3 Defrost is terminated by the defrost termination thermostat. 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 control panel.

 4 The failsafe setting must not control the length of defrost. Defrost must be terminated by the defrost termination thermostat. This is especially important when less than 208 volts are supplied to the defrost heaters or when heavy shopping demands have created excess frost on the evaporator.

 5 KOOLGAS defrost is time initiated and time terminated. The defrost length listed above is based upon laboratory testing but operation under actual store conditions may require that this time be lengthened to accomplish 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, refrigerator temperature operating lower than that recommended, seasonal ambient changes, etc.

Each system shown on the store legend must have "staggered" defrosts to maintain compressor loading and sufficient supply of defrost gas.

EVAPORATOR PRESSURE REGULATOR

(ALCO FAV2 SERIES)

OPERATION

This regulator is a standard evaporator pressure regulator with a factory installed pilot solenoid. When the pilot solenoid is de-energized, the regulator controls the evaporator pressure and prevents the upstream pressure from going below the pressure pilot setting. When energized, the regulator opens and no longer controls the evaporator pressure.

Size selection for the ALCO FAV2 evaporator pressure regulator is shown in the following table.

REFRIGERATORS MULTIPLEXED LENGTH	EVAPORATOR PRESSURE REGULATOR ALCO MODEL NUMBER	REFERENCE INFORMATION	
		Connection Size	Voltage
0 to 8 feet	FAV2 - 11	1 - 1/8"	230
12 to 20 feet	FAV2 - 12		
24 to 36 feet	FAV2 - 13		
40 to 48 feet	FAV2 - 14		

ADJUSTMENT

The pressure adjusting stem is covered by a seal cap located on the top of the pressure pilot. Rotating the stem in a clockwise direction increases the evaporator pressure. Counterclockwise stem rotation decreases the evaporator pressure. One full turn will change the evaporator pressure approximately 4 psig. A pressure gauge should be used when making adjustments.

SERVICING

All service operations may be performed without removing the regulator from the line.

Pilot Assembly: The entire pilot assembly is removable from the upper body by using an ordinary wrench on the hexagon boss at the top of the pilot housing. If the diaphragm and the pilot seat become dirty, clean them with a soft, clean cloth. If necessary, the seat can be removed from the housing. When replacing the pilot assembly, be sure to include a pilot gasket of the correct thickness. The use of more than one gasket or an excessively thick gasket will cause the regulator to modulate improperly and prevent it from closing.

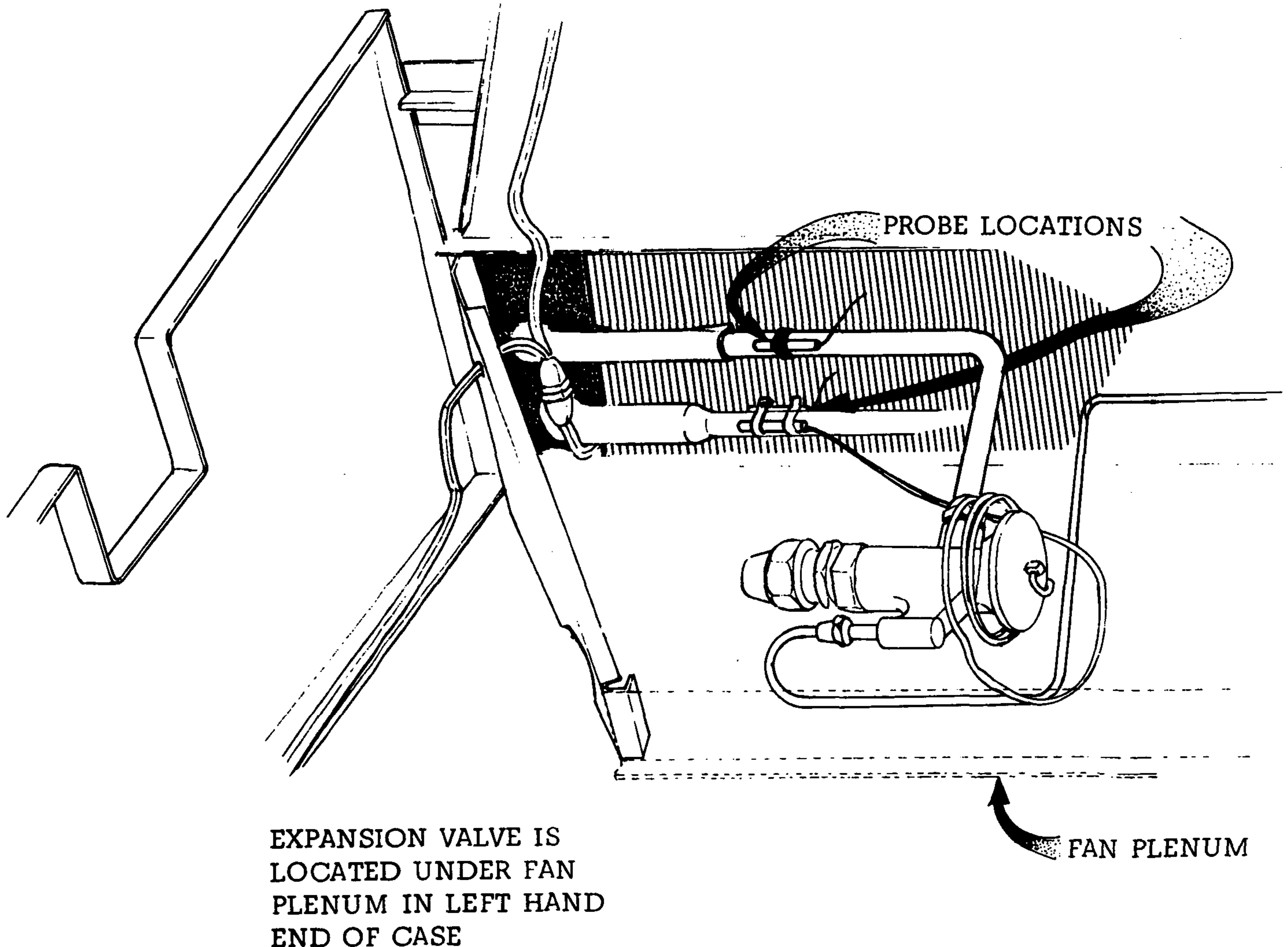
Main Valve: The upper body is removed from the lower body by removing four cap screws. The main piston slides freely in the upper body and care should be taken to prevent the piston from dropping out of the upper body when disassembling the regulator. The cage assembly can be lifted out of the body. To inspect the valve disc, restrictor plug and seat, compress the cage spring.

If the valve disc shows signs of wear, erosion or if the seat is cut, the cage assembly must be replaced. When reassembling the regulator, place all gaskets in their proper position, using only one gasket of the correct thickness at each location. Check the pressure holes in the lower body, body gaskets, cage flange and in the upper body to be sure they are in their proper positions.

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 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 bulb and the other securely taped to the coil inlet line as close to the back panel as practicable (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 to 5°F. With this adjustment, during a portion of the hunting the temperature difference between the probes may be less than 3°, at times as low as 0°F. Make adjustments 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.



REFRIGERATION PARTS LIST (Sporlan Nomenclature)

MODEL	TYPE OF DEFROST	REFRIGERANT	BALANCED PORT EXPANSION VALVE
ALL 8' MODELS	Off Time	R-502 R-12 R-22	BFR AZ BFF AZ BFV AZ
	Koolgas *	R-502 R-12 R-22	Y920 BGR AZ Y920 BGF AZ Y920 BGV AZ
ALL 12' MODELS	Off Time	R-502 R-12 R-22	BFR AZ BFF AZ BFV AZ
	Koolgas *	R-502 R-12 R-22	Y920 BGR AZ Y920 BGF AZ Y920 BGV AZ

*These expansion valves are provided with a special 3/8" side outlet port which allows the liquid condensed in the coil during defrost to bypass the expansion valve port and return and return into the liquid line.