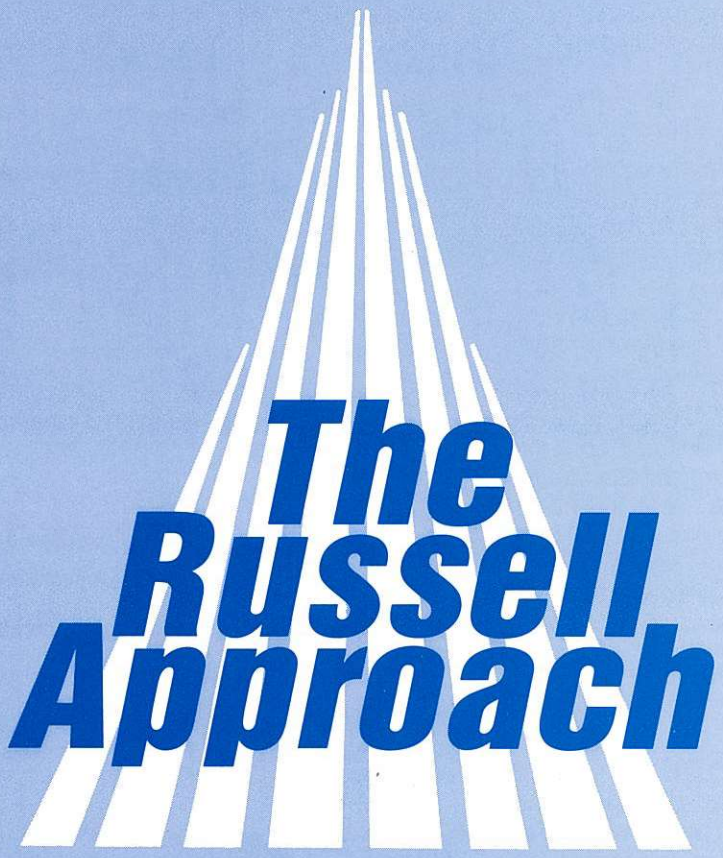
Russell

Hot Gas

TECHNICAL BULLETIN NO. 201.3
OCTOBER 1990

HOT GAS DEFROST SYSTEM



hot gas defrost system

THE RUSSELL RE-EVAP DEFROST SYSTEM* utilizes a method of re-evaporation of the condensed liquid in the suction line. The heart of the system is the Russell Heat Exchanger Re-Evaporator, an uncomplicated mechanism which performs the dual function of a top-grade heat exchanger and accumulator and a manually controlled by-pass to the suction line which provides latent heat for defrosting, as well as constant oil return to compressor.

The small metering by-pass valve attached to the Heat Exchanger Re-Evaporator must be manually adjusted after installation. As a guide, adjust valve during defrost to a point where frost on suction line falls short of compressor body. A natural tendency is to open this valve too wide, whereas under normal conditions, THE VALVE BARELY OPENED WILL PROVIDE PROPER DEFROST HEAT.

REFRIGERATION CYCLE — System operates in normal manner.

DEFROST CYCLE — Time clock initiates defrost cycle. Evaporator fans turn off. Liquid line solenoid valve closes. Hot-gas line solenoid opens, discharging hot gas to the evaporator where it condenses and tends to entrain itself. Resulting refrigerant and oil surges are caught in the Heat Exchanger Re-Evaporator and, through the valve, slowly metered into the suction line.

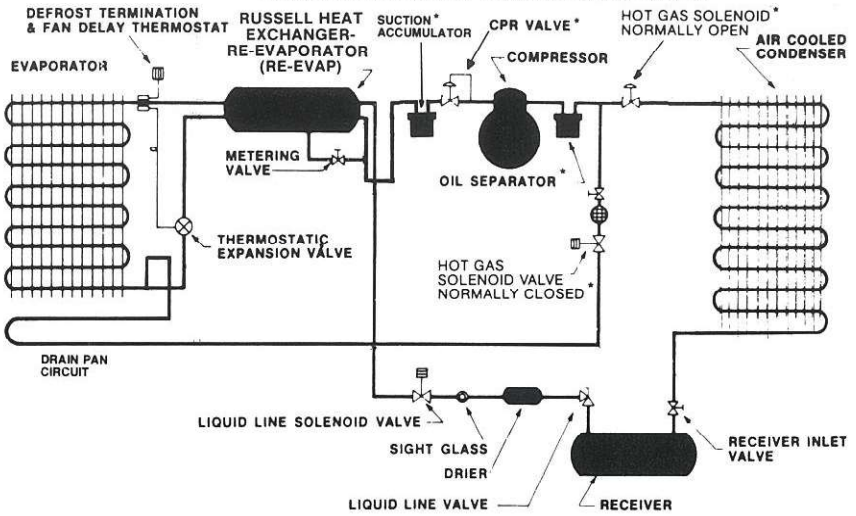
RE-COOLING CYCLE — When coil is completely defrosted, terminating thermostat ends the defrost by resetting timer to refrigeration cycle. Hot-gas line solenoid closes and liquid line solenoid opens. Through the time-delay function of thermostat, current to fans is held back until coil is cooled sufficiently to prevent air flow across the warm evaporator.

NOTE — On initial start up, evaporator fans will not come on until defrost terminating thermostat is cooled.

GENERAL INSTALLATION — Good refrigeration practice requires care in sizing refrigerant lines correctly and in proper selection of components. The typical schematics shown are offered for guidance only. If condensing unit will be in low temperature ambient consult factory for installation information.

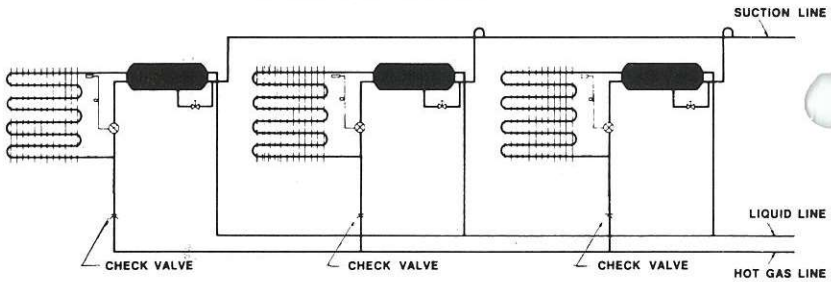
*For use with R-12, R-22 or R-502 Refrigerants.

TYPICAL SCHEMATIC 1: SINGLE EVAPORATOR OPERATING ONE COMPRESSOR & AIR COOLED CONDENSER



*INCLUDED IN RUSS-CON AND RUSS-E-CON HOT GAS DEFROST PROVISIONS

TYPICAL SCHEMATIC 2: MULTIPLE EVAPORATORS OPERATING ON ONE COMPRESSOR.



NOTE CHECK VALVES IN EACH HOT GAS LINE (SUPPLIED BY OTHERS)

WIRING & CONTROL DATA / *Wiring Diagrams on Page 5.*

Compressor must operate during defrost cycle.

DIAGRAM 1 shows typical installation with box thermostat controlling compressor through liquid line solenoid valve. At start of defrost, timer contacts stop fans, close liquid line solenoid valve and opens hot gas solenoid valve. When evaporator temperature rises to indicate frost-free condition, terminating thermostat closes red and black (R-Y) contacts, solenoid in clock is energized resetting clock to refrigeration cycle, hot gas solenoid valve closes and liquid line solenoid valve opens. Fans will not start until defrost terminating thermostat cools and closes red and brown (R-B) contacts.

DIAGRAM 2 shows multiple unit installation with two terminating thermostats. Defrost will not terminate until both thermostats are warmed. Fan delay will end when red and brown (R-B) contacts of either thermostat close.

Note 1. On initial start of the sytem, the fans will not run until the fan delay thermostat is cooled to approximately 25° or the low point setting of DTFD.

Note 2. When a fan delay is used, the motor current must not exceed the current rating of the control contacts. The timer rating is 40 amps. The nonadjustable clamp on DTFD thermostat is 16 amps. The rating of the adjustable remote bulb DTFD thermostat is 8 amps (or 16 amps on the Ultra-Temp). Separate contactors should be used when fan motor amperage exceeds applicable DTFD rating or voltage is different from timer. Fan contactors, if required, are provided with the Ultra-Temp unit cooler.

Note 3. When an electric drain line heater is used, it may be connected across terminals "N" and "3".

HOT GAS DEFROST SYSTEMS

Hot Gas Defrost systems can be described as re-evap, reverse cycle, or alternating evaporator.

Re-evap System

The re-evap system (sometimes called three pipe) uses three pipes . . . one for liquid line, one for suction line and one for hot gas. In addition, a heat exchanger/re-evaporator is used at the suction outlet of the evaporator. The hot gas is taken from the discharge line, between the compressor and the condenser, through a hot-gas solenoid valve, then to the evaporator drain pan circuit, distributor tee, thru the coil.

Reverse Cycle System

In the reverse cycle a changeover valve is located in the discharge-suction line of the compressor, so that when defrost is required, the valve changes over from the normal refrigeration flow so that the dis-charged gas flows into suction connection and by passes TX valve. With this arrangement it is necessary to have a receiver so that the inlet and the outlet of the receiver are capable of being reversed — and, also, an evaporating means on the condenser so that in the defrost cycle it becomes an evaporator.

Alternating Evaporator System

In the alternating evaporator hot-gas defrost system a third line is taken off the compressor discharge line, as in the re-evap system, and it is piped with solenoids at each evaporator, so that hot-gas defrost is accomplished on one or more evaporators while the remaining evaporators continue to function in a normal manner. The liquid from the defrosting evaporators is reintroduced into the main liquid line and it is necessary that 60% or greater capacity be retained in the normal refrigeration cycle to offset the capacity that is being removed by the units on hot gas defrost.

The Russell evaporator may be ordered for hot gas defrost so that it is capable of operating on one of the three systems described above. From the following diagram it is obvious that the unit is equipped with a hot-gas drain pan circuit, (except on Flo-Temps above 28°F room temperature) which receives the hot gas first, and then to the evaporator coil. The re-evap system requires the use of the heat exchanger/re-evaporator in the suction line and is piped to accept the expansion valve and liquid line from the distributor tee.

On the reverse cycle, it is necessary that check valves be placed in the suction hot-gas line, as well as on the by-pass of the TX valve for proper operation, per the diagram.

On alternating evaps the check valve should be installed the same as the reverse cycle, except that a suction stop valve should be installed in the suction line to prevent short circuiting of hot gas into the suction line.

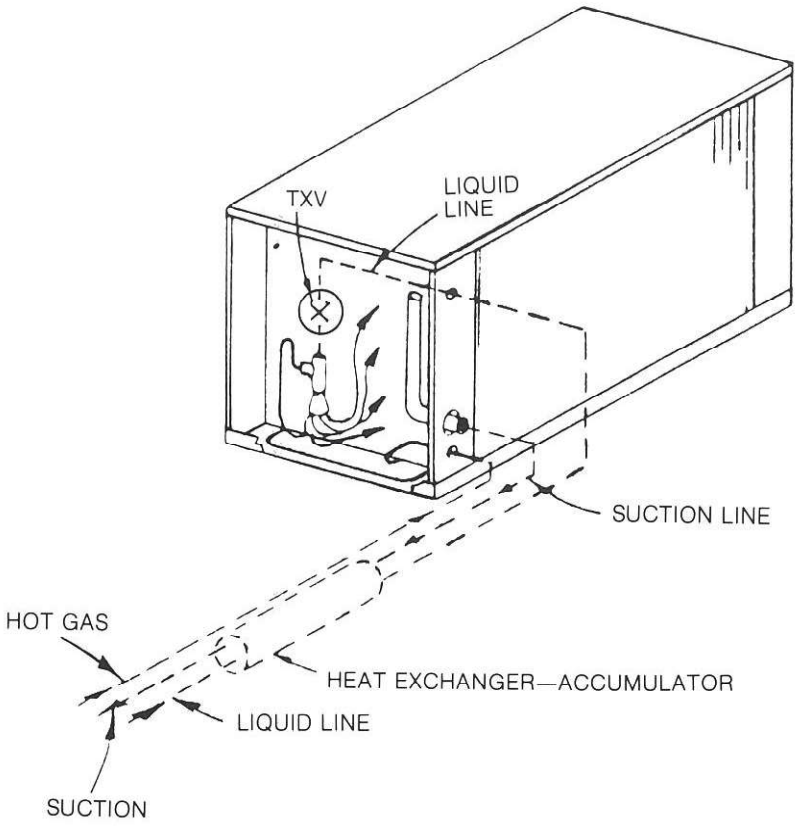
As shipped standard from Russell, internal piping and connections of the evaporator are the same for both reverse cycle and alternating evaporator.

Russell evaporators are designed with interconnecting piping for minimum pressure drop within the evaporator. The installer must size the hot-gas line, based upon length of run and capacity of the line, per appropriate ASHRAE or similar line sizing charts.

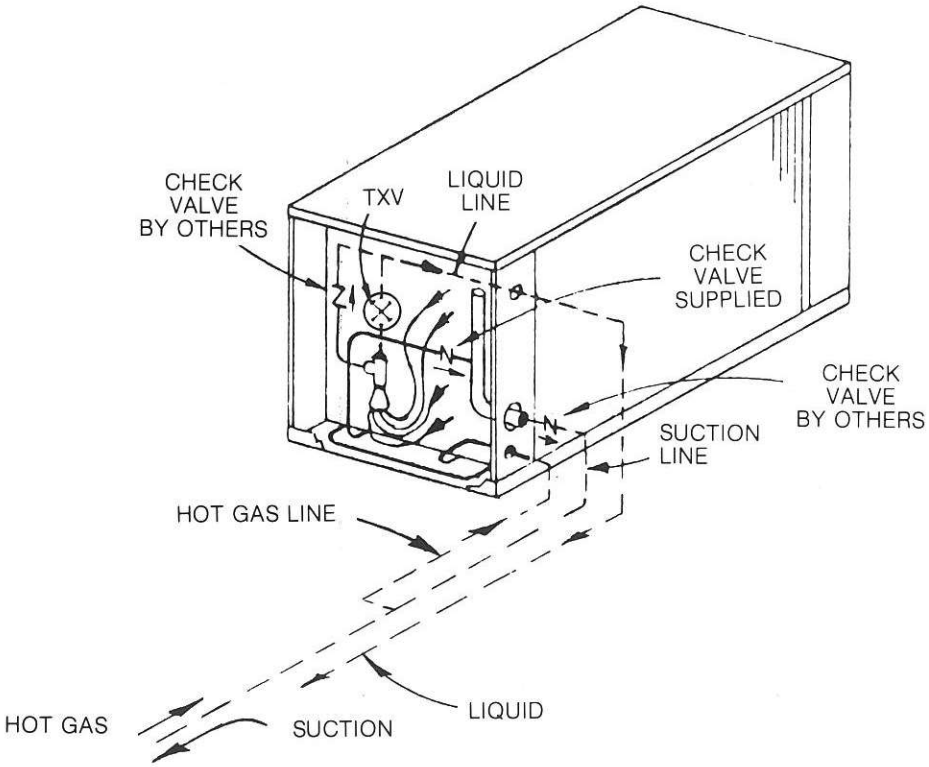
The electrical arrangement should be as shown in the appropriate wiring diagram on page 5.

When two HEA's are required, pipe parallel.

RE-EVAP.



REVERSE CYCLE OR ALTERNATING EVAPORATOR



WIRING DIAGRAMS / Specifications

DIAGRAM 1 / Single Unit Wiring

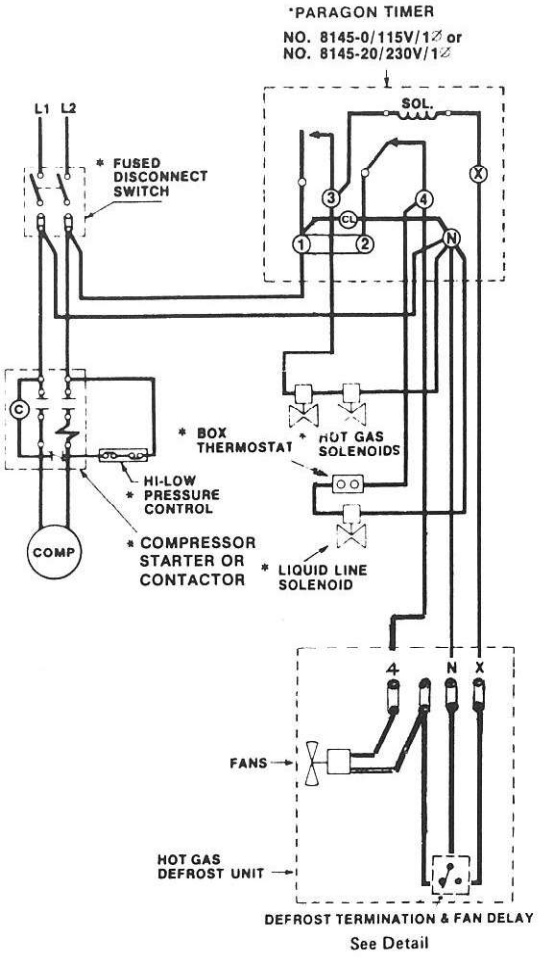


DIAGRAM 2 / Multiple Unit Wiring

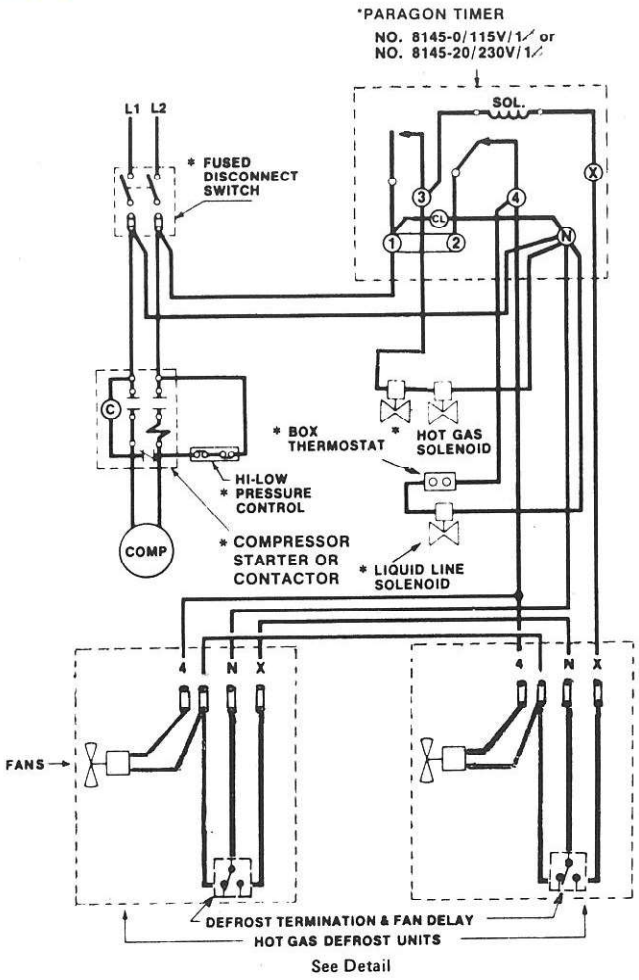
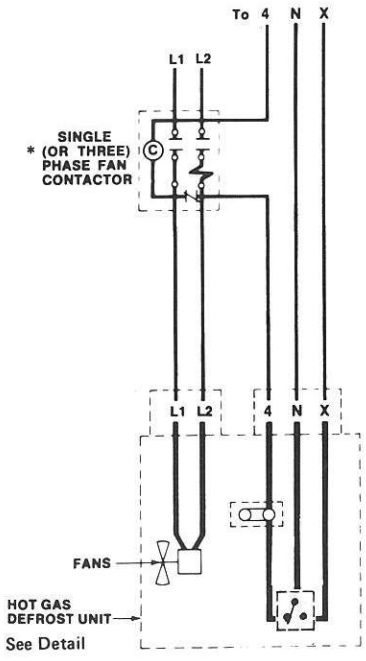


DIAGRAM 3 / Unit with Fan Contactor

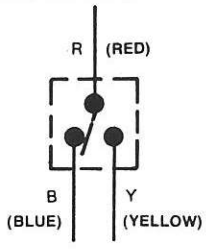


FACTORY WIRING
FIELD WIRING

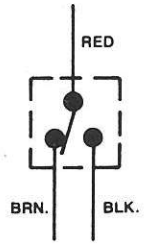
C	Holding Coil
CL	Clock Motor
DTFD	Defrost Termination & Fan Delay
SOL	Timer Release Solenoid

*Items marked with asterisk not included in catalog price. Must be ordered separately.

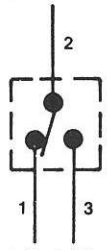
DTFD DETAILS



Adjustable Remote Bulb Thermostat
(8 amps max)



Non-Adjustable Thermostat
(16 amps max)

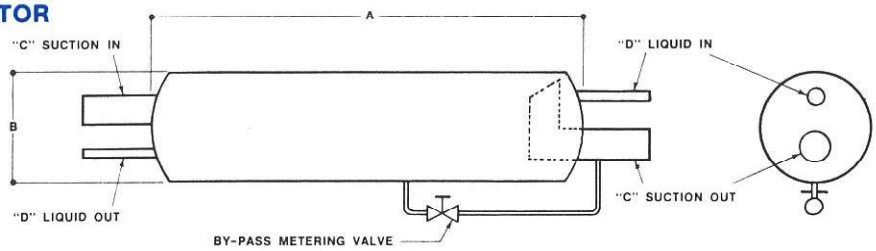


Adjustable Remote Bulb Thermostat
(16 amps max)

SPECIFICATIONS / *Tables*

Russell HEAT EXCHANGER-ACCUMULATOR

NOTE: Level mount the Heat-Exchanger-Accumulator within refrigerator space as close to evaporator as possible. Metering valve in down position as shown.



CAPACITY AND DIMENSIONS

EVAPORATOR CAPACITY	MODEL NO.	A	B	C (OD)	D (OD)
UP TO 6,000	HEA-1A	9-3/4	5	7/8	3/8
6,000 TO 12,000	HEA-2A	15-3/4	5	1-1/8	1/2
12,000 TO 24,000	HEA-3A	27-3/4	5	1-3/8	1/2
24,000 TO 36,000	HEA-4A	37-3/4	5	1-5/8	5/8
36,000 TO 55,000	HEA-5A	45-3/8	6	2-1/8	5/8
55,000 TO 80,000	HEA-6A	64-3/8	6	2-5/8	7/8

HOT GAS DEFROST TIMER

115 volt 60 cycle–Paragon 8145-0
230 volt 60 cycle–Paragon 8145-20

HOT GAS DEFROST TERMINATING THERMOSTATS

All thermostats are SPDT either fixed clamp-on type or adjustable remote bulb.

CHECK VALVES, CPR VALVES, SO VALVES, SOLENOID VALVES AND STRAINER

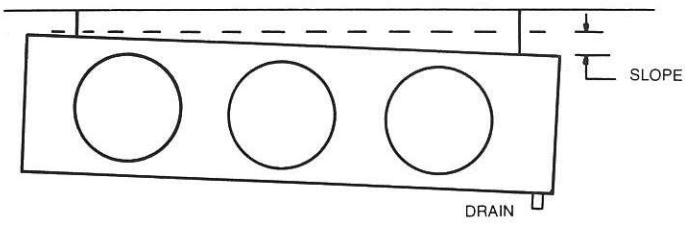
(supplied by others)

HOT GAS DEFROST LINE SIZING

Total Maximum Evaporator Capacity – Tons

Line Size	R-12		R-22		R-502	
	Short	Long	Short	Long	Short	Long
1/2	3/4	1/2	1-1/2	1	1-1/4	3/4
5/8	1-1/2	1	2-3/4	2	2-1/2	1-1/2
7/8	4	2-3/4	7	5	6-1/2	4
1-1/8	8-1/2	5-1/2	16	11	13	9
1-3/8	15	9	23	17	21	15
1-5/8	22	15	40	27	34	23
2-1/8	43	30	76	52	66	44
2-5/8	80	55	145	100	130	83

NOTE: Short = Runs under 50 feet. Long = Runs over 50 feet.



HANGING INSTRUCTIONS

Slope unit to drain as shown in diagram (below left). Drain end must be lowest part. For Ultra Temp, use channel provided for spacing on chart below.

	ALL-TEMP UNIT	SUPER-TEMP UNIT OR ULTRA-TEMP UNIT
SLOPE	1 Fan — ¼″	1 Fan — ½″
	2 Fan — ½″	2 Fan — ⅞″
	3 Fan — ¾″	3 Fan — 1-¼″
	4 Fan — 1″	4 Fan — 1-⅝″
	5 Fan — 1-¼″	
	6 Fan — 1-½″	

RPS 3000 1090