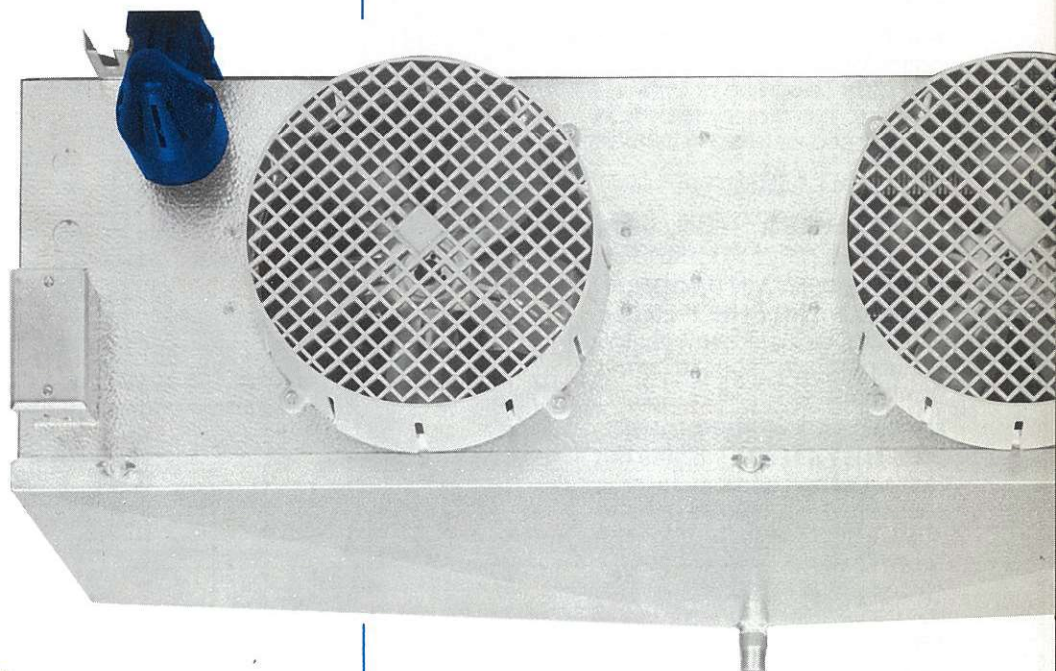


EYE-BEAM

Automatic Demand Defrost Control System



Underwriters Laboratory Recognized

Russell

Russell Coil Company
a subsidiary of ARDCO, INC.

221 South Berry Street Brea, California 92621
PATENT PENDING

IB-1 EYE-BEAM

The Russell Eye Beam is a true demand defrost control system. The "eye" watches the frost grow on the fins and when it affects the efficiency of the system it initiates the defrost cycle, turning off the fans and the compressor (depending on defrost method). The system will terminate the defrost cycle when the temperature of the refrigeration coil reaches the high cut-out setting of the unit DTFD (defrost thermostat). It will then turn on the compressor. When the coil temperature reaches approximately 25° F, the system will command the fans to turn on.

The Eye Beam only initiates a defrost when needed. In some applications, the refrigeration systems have operated days without defrosting.

Eye Beam is available today as an option to the Russell All Temp and Ultra Temp line of Unit Coolers. It is factory tested on the unit and installed in minutes.

ADVANTAGES:

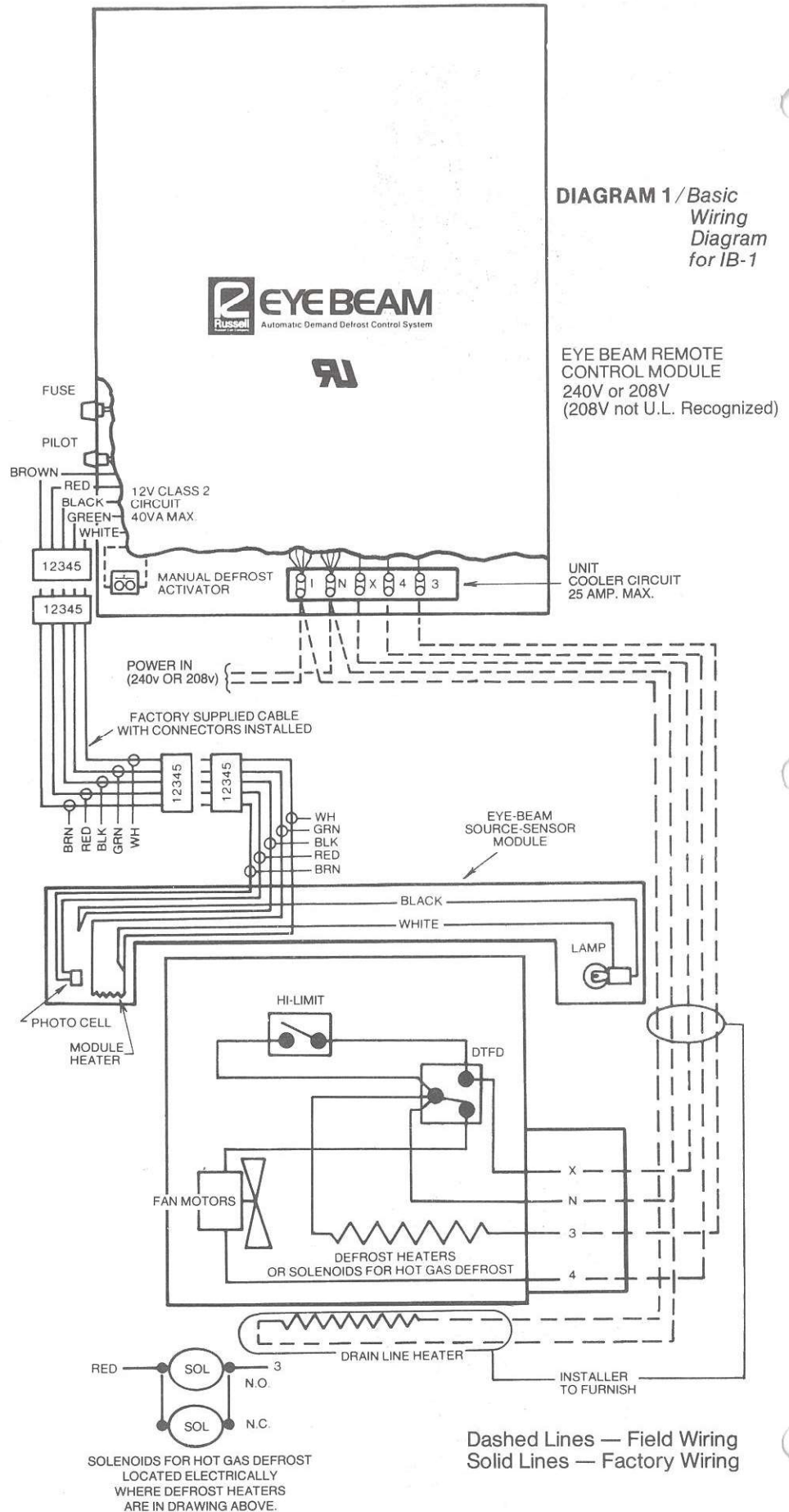
SAVES ENERGY—Only defrosts the unit cooler when required.

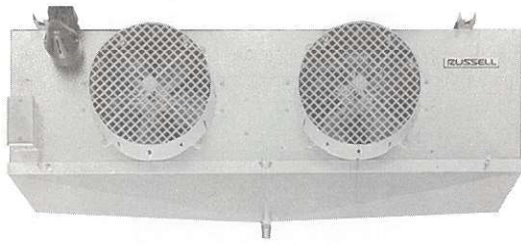
HELPS MAINTAIN PRODUCT QUALITY AND SHELF LIFE—Unnecessary defrosts resulting in temperature "shocks" are eliminated.

MANAGES THE REFRIGERATION SYSTEM—Initiates the defrost based on frost build-up reducing the light between the source and sensor and terminates the defrost based on temperature of the coil. Controls the compressor, fans and defrost provisions.

SHOWS IT IS OPERATING—The light in the Eye Beam Source-Sensor Module on the coil glows blue and the pilot light on remote control module glows green. When either one is not on, the control system is not operating properly.

FAILS SAFE—The Eye Beam fails into refrigeration mode. By means of a momentary switch a defrost can be manually initiated until the system is repaired or replaced. If the DTFD should fail, the defrost terminating function is taken over by the Hi-Limit Thermostat in the unit cooler.





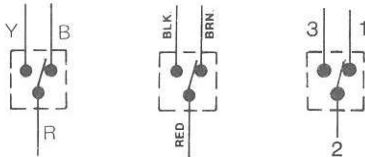
WIRING DIAGRAMS / Specifications

LEGEND

EYE-BEAM (IB-I)

- TH Box Thermostat
 - LLS Liquid Line Solenoid
 - Hi-Lo High-Low Pressure Switch
 - DTFD Defrost Termination and Fan Delay
 - Field Wiring
 - Factory Wiring
- | For Diagrams 2 thru 8

DEFROST TERMINATION AND FAN DELAY THERMOSTAT



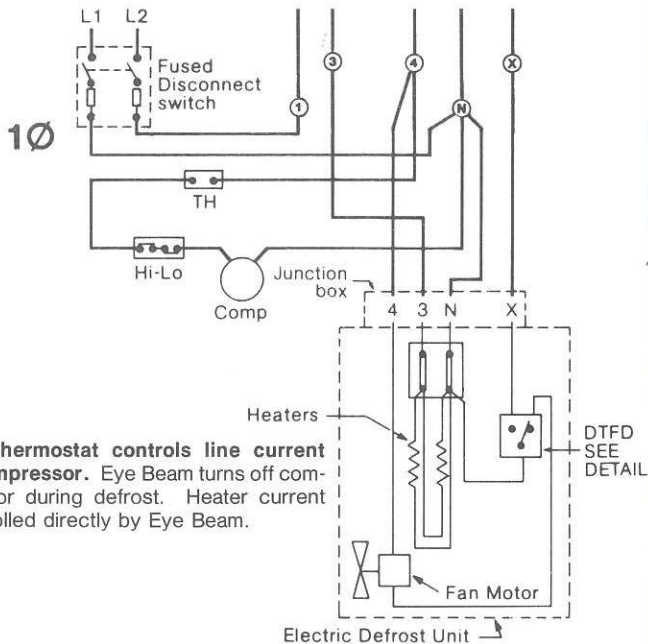
NOTE: All wiring diagrams are for Russell Eye Beam (IB-I). They also can be used for Paragon No. 8145-0 or -20 Timer.

ADJUSTABLE
REMOTE
BULB
(8 amps max.)

NON-
ADJUSTABLE
CLAMP-ON
(16 amps max.)

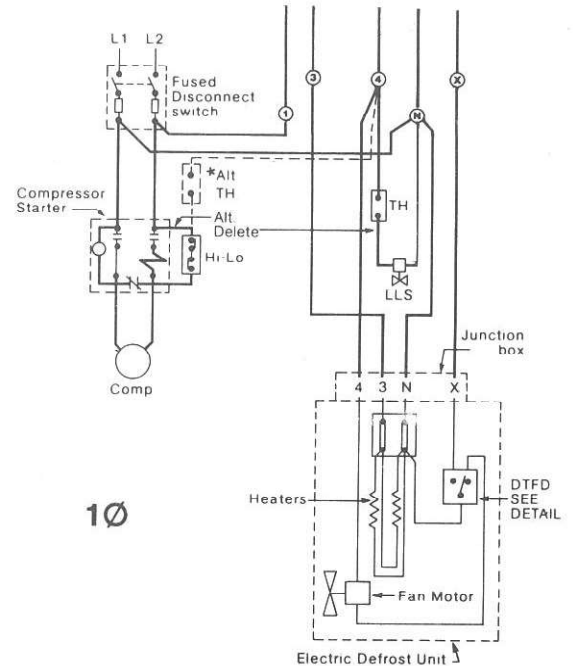
ADJUSTABLE
REMOTE BULB
(20 amps max.)

DIAGRAM 2 / Box Thermostat controls line to compressor



Box thermostat controls line current to compressor. Eye Beam turns off compressor during defrost. Heater current controlled directly by Eye Beam.

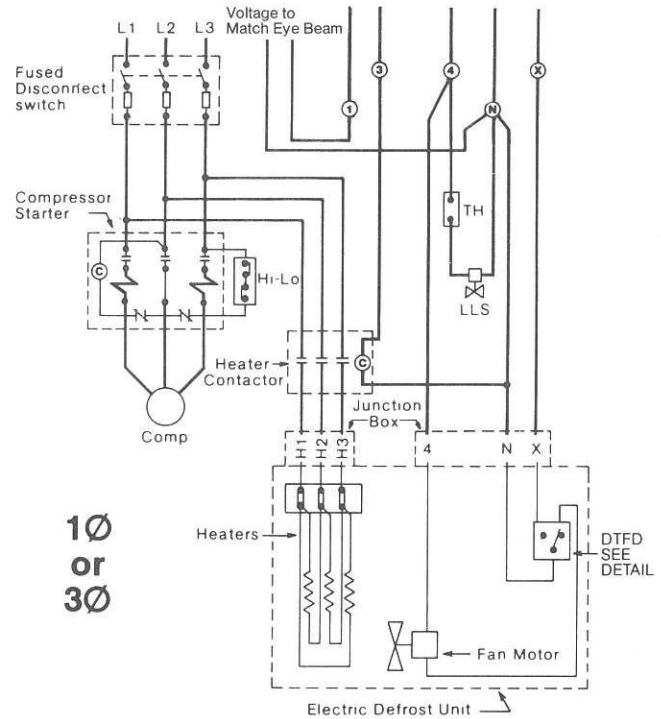
DIAGRAM 3 / Box Thermostat Controls Liquid Line Solenoid



Box thermostat controls liquid line solenoid. Compressor shuts off from pressure control. Heater current controlled directly by Eye Beam.

***Alternate:** Box thermostat controls compressor starter. Eye Beam turns off compressor during defrost. Delete LLS above and its wiring; TH is connected in series with Hi-Lo.

DIAGRAM 4 / Heaters Controlled By Contactor

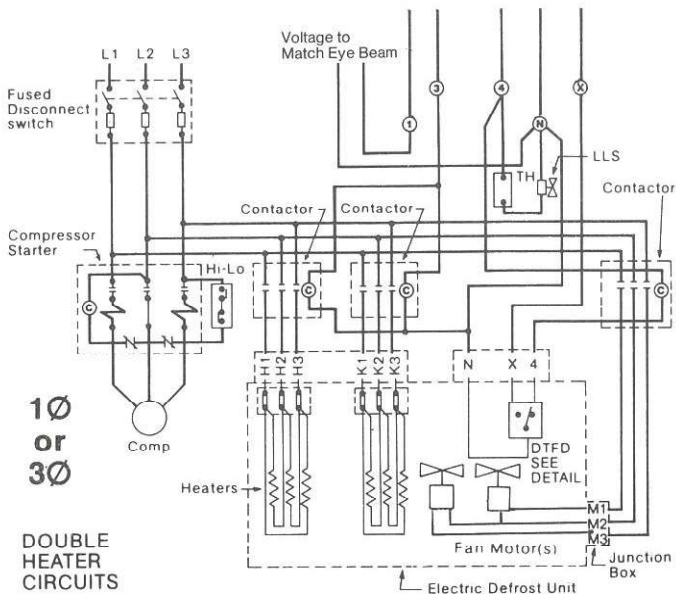


Heaters controlled by contactor. Box thermostat controls liquid line solenoid. Compressor shuts off from pressure control. Heaters controlled by contactor either single or 3 phase. (3 phase shown.)

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WIRING DIAGRAMS / Specifications (Cont'd)

DIAGRAM 5 / Double Heater Circuits

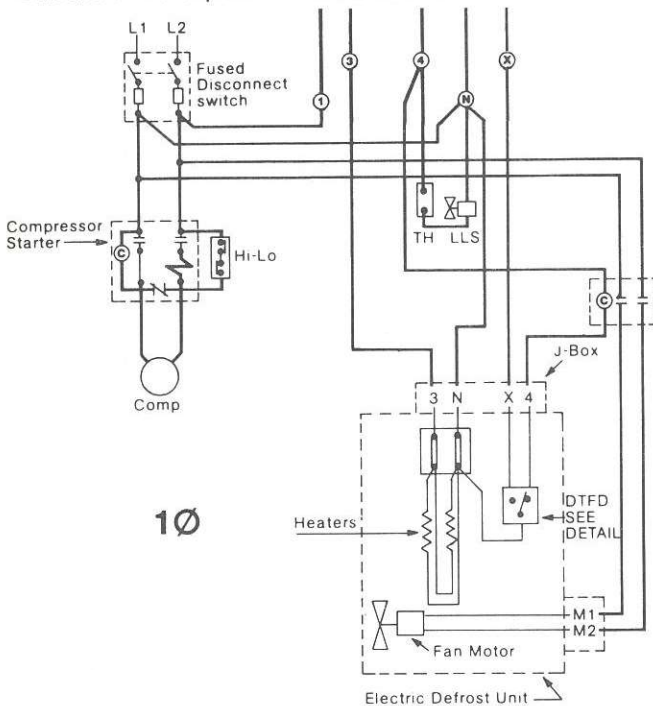


1Ø
or
3Ø

DOUBLE
HEATER
CIRCUITS

Motors and heaters controlled by contactors. Box thermostat controls liquid line solenoid. Compressor shuts off from pressure control. Double heater circuit used when single-circuit amperage would exceed 48 amps. Motors and heaters may be either single or 3 phase. (3 phase shown.)

DIAGRAM 6 / Separate Fan Contactor



1Ø

Separate fan contactor for motor current that exceeds control amps. Box thermostat controls liquid line solenoid. Compressor shuts off from pressure control. Heater controlled directly by Eye Beam. Fan motors controlled by contactor may be either single or 3 phase. (Single phase shown.)

DESCRIPTION:

The Eye Beam Source-Sensor Module mounts over the unit cooler. The light source shines a beam of light all the way through the fins focusing on a sensor. As frost builds up, reducing the flow of air through the coil and retarding refrigeration efficiency, it also reduces the amount of light to the sensor. The solid state electronic circuit in the control module senses this and initiates the defrost cycle.

SEQUENCE OF OPERATION — ELECTRIC DEFROST SYSTEM

REFRIGERATION CYCLE — System operates in normal manner.

ELECTRIC DEFROST CYCLE — Eye Beam initiates a defrost cycle when frost reduces the light beam intensity. Terminal # 4 in the Eye Beam Control Module is de-energized (fans stop and compressor stops directly or by pressure control) and Terminal # 3 is energized (heaters come on).

DEFROST TERMINATION AND FAN DELAY CYCLES.

When the temperature in the coil reaches the high setting of the defrost termination control (DTFD) the single-pole, double-throw switch is switched over, closing a circuit through "X" to "N". This causes the Eye Beam Control Module to energize Terminal # 4 and deenergize Terminal # 3, switching the system to the refrigeration cycle. The compressor starts. The fan delay (DTFD) will switch on the fans when the coil has cooled sufficiently to prevent air flow across the warm evaporator and possible water blow-off into the room.

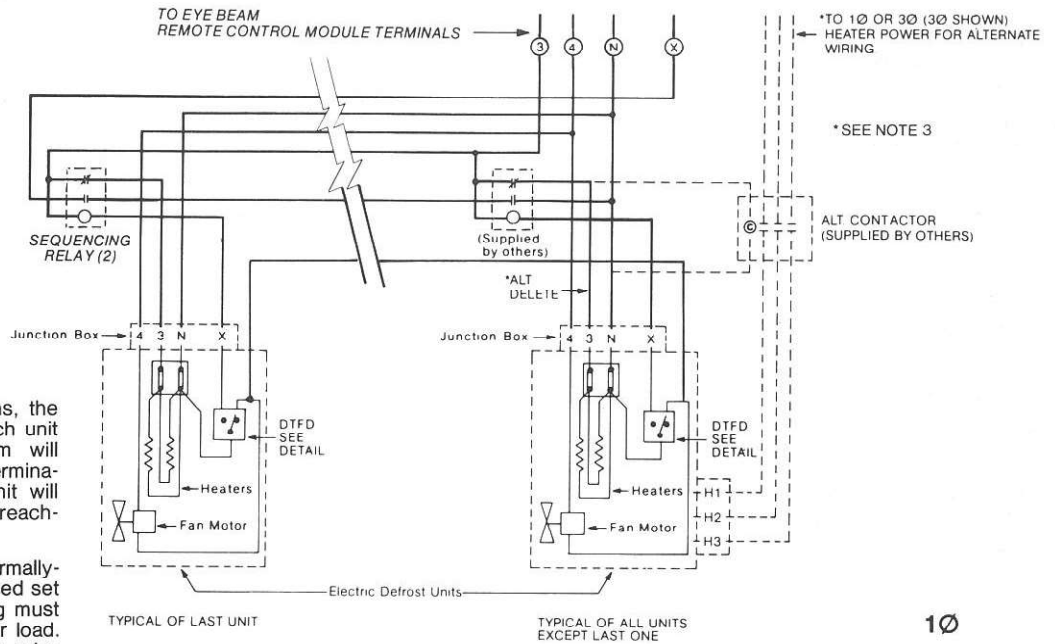
SEQUENCE OF OPERATION — HOT GAS DEFROST SYSTEM

HOT GAS DEFROST (RE-EVAP CYCLE) — Eye Beam initiates the defrost cycle when frost reduces the amount of light to the sensor. Evaporator and condenser 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-Accumulator and, through the bleed valve, are slowly metered into the suction line.

RE-COOLING CYCLE — When coil is completely defrosted, the terminating thermostat ends the defrost and starts the refrigeration cycle. Hot-gas line solenoid closes and liquid line solenoid opens. Fan delay function (DTFD) holds back current to fans until coil is cooled sufficiently to prevent air flow across the warm evaporator and possible water blow-off into room.

WIRING DIAGRAMS / Specifications (Cont'd)

DIAGRAM 7 / Multiple Unit Installation
 with External Sequencing Relays — 1Ø (and/or 3Ø Heaters)
 Eye Beam mounted on one unit. (1)



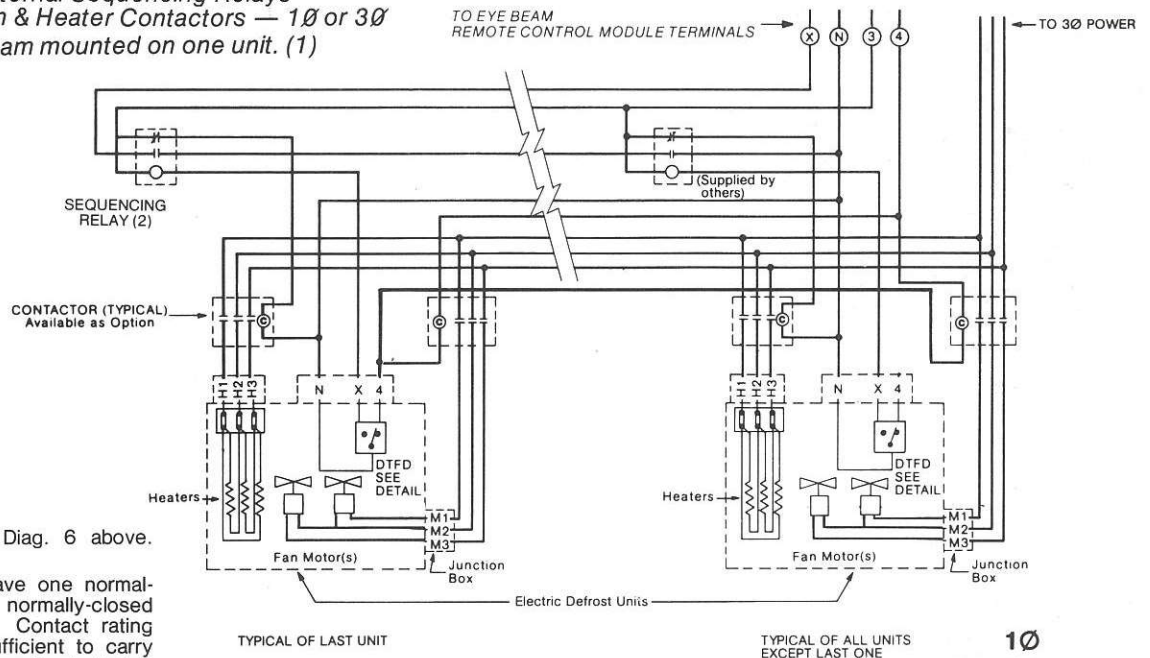
Note 1. On multiple unit installations, the defrost will terminate in each unit separately and Eye Beam will reset after all units have terminated. The fans in each unit will come on when the first unit reaches set point.

Note 2. Relays shown have one normally-open and one normally-closed set of contacts. Contact rating must be sufficient to carry heater load. A double pole double throw relay may be used, utilizing the N.O. and N.C. contacts as shown. Recommend Potter and Brumfield PRD11 AGO, Deltrol 900-DPDT or equivalent (30A rated)

Note 3. Typical alternative wiring for 3Ø heaters or for 1Ø heater load that exceeds contact rating or sequencing relay. Wire #3 would not appear in J-Box.

1Ø

DIAGRAM 8 / Multiple Unit Installation
 with External Sequencing Relays
 and Fan & Heater Contactors — 1Ø or 3Ø
 Eye Beam mounted on one unit. (1)

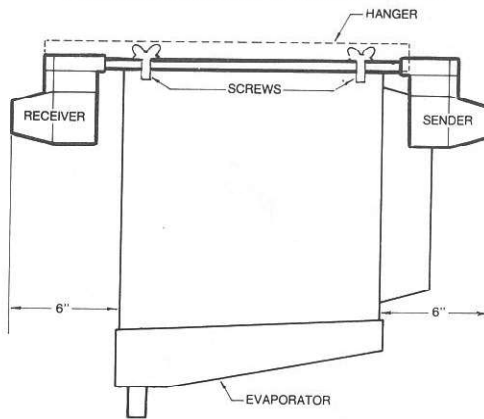


Note 1. See Note 1 in Diag. 6 above.

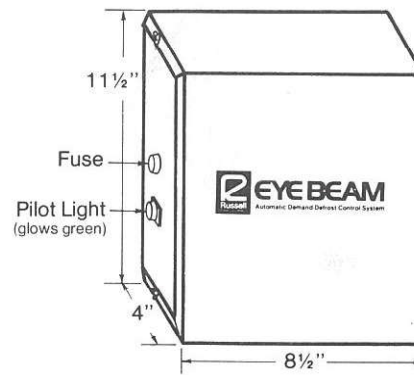
Note 2. Relays shown have one normally-open and one normally-closed set of contacts. Contact rating need only be sufficient to carry control circuit current. A double pole double throw relay may be used utilizing the N.O. and N.C. contacts as shown. Recommend Deltrol 101 U-DPDT or equivalent.

1Ø
 or
 3Ø

EYE BEAM SOURCE-SENSOR MODULE



EYE BEAM REMOTE CONTROL MODULE



INSTALLATION PROCEDURE:

The Eye Beam has been factory installed, tested and then removed from the evaporator for shipment, in a separate container.

1. To mount the Eye Beam Source and Sensor (the "U" shaped assembly) remove the two wing screws on top of the unit, mount the "U" over the unit — It will only mount one way — and screw the Eye Beam to the unit.
2. Select the location for the Eye Beam Remote Control Module — it must be inside a building preferably near the door to the cooler, but not inside the cooler. Remove the screws from the cover of the module and mount the back to the wall. Note: It cannot be located outdoors.
3. Mount the unit cooler and make the proper wiring connection between the Eye Beam Remote Control Module and evaporator using Terminals X, N, 3 and 4 using proper electrical practice and in accord with existing codes. The frost sensing circuit is a 12 VDC, Class II circuit and is protected by a 5 amp fuse. For guidance use appropriate wiring diagrams in this bulletin or the Russell ED or HG bulletins. Plug the Eye Beam cable together at both Eye Beam modules using the factory supplied cable.

NOTE: Do not run this Class II circuit cable in same conduit as high voltage wiring.

4. Install the balance of the system using good refrigeration practice in sizing refrigerant lines correctly and in proper selection of components.

The power supplied to the Eye Beam Control Module must be either 208 or 240 Volts 50/60 Hz. and connect to Terminals 1 and N through a fused disconnect switch common to the condensing unit.

NOTE: Do not use 208V on 240V or vice versa.

5. Before turning over the system to your customer, we recommend you review the Eye Beam features with them.
 - # 1. The Source for the Eye Beam glows blue on the coil due to the light bulb. If it is out, the system is not working and your customer should contact you. (See # 3 Trouble Shooting)
 - # 2. Point out the green pilot light on the Control Module which when "on" indicates proper

system operation. If it is not "on" your customer should contact you. (See # 4 Trouble Shooting)

- # 3. The Eye Beam is equipped with a manual defrost switch. Point out the button in the Eye Beam Remote Control Module, which can be used to initiate a defrost cycle. CAUTION THE CUSTOMER THAT HIGH VOLTAGE IS ON THE SYSTEM AND CARE SHOULD BE USED IN USING THE MANUAL DEFROST SWITCH.

TROUBLE SHOOTING EYE BEAM

1. Check to make sure power lines and fuse are okay. Fuse is AGC5-12V.
2. Check Eye Beam Source/Sensor Module. If green pilot light and blue source light on, receiver should be receiving full beam of light. With piece of paper observe that light should impinge on center of receiver lens.
 - 2a. LIGHT INTENSITY — If light beam is obviously low, check entering voltage at Terminals 1 and N. If 240 transformer, tap should be 240. If 208 transformer, tap should be 208. Voltage at Terminals 6 and 11 should be 12 VAC, see #5.
3. Blue light out on coil — turn off power and replace with 12V, # 1156 bulb. Turn on power. One extra light is supplied inside each Remote Control Module. If not available at your local A.R.W. Wholesaler, your nearest auto parts store should have it in stock.
4. Green pilot light out on Remote Control Module — check Blue light on coil, if out replace (See # 3) and green light should come on, if not, system is in failure. Use the manual defrost switch to initiate defrosts and contact your local Russell Authorized Wholesaler for in-stock Control Module emergency replacement.
5. If required, swap for emergency replacement from ARW Wholesaler. If out of warranty there will be a fixed replacement charge. If in warranty, the replacement unit will complete the warranty of the original unit. If out of warranty, there will be a 90 day warranty on the replacement module.

Russell

Russell Coil Company

221 South Berry Street/Brea, California 92621
(714) 529-1935/(213) 691-3246