



TECHNICAL COMMUNICATIONS CENTER

BULLETIN #SR-220

March 30, 1999

RUUD AIR CONDITIONING DIVISION
5600 OLD GREENWOOD ROAD, FORT SMITH, ARKANSAS 72908

TO: ALL RUUD AIR CONDITIONING DIVISION DISTRIBUTORS

**SUBJECT: NEW RANCO DDL DEMAND DEFROST CONTROL
OPERATION AND SERVICE INFORMATION**

The Ruud Air Conditioning Division is now installing the new RANCO DDL demand defrost control in split system heat pumps. Since this control is new and different, the Rheem Learning Center is providing the attached training bulletin to our customers to facilitate understanding of the new control. The bulletin explains the control's function, operation, wiring, service, and troubleshooting procedures.

The new control:

- Requires 24 VAC power to the control at all times.
- Uses a variable temperature difference between sensors.
- Has an on-board defrost relay.
- Calibrates itself upon initial power up, or after a power interruption.

Please distribute this training bulletin to your customers who install and service heat pumps. It provides necessary technical direction and information that promotes best product reliability and highest customer satisfaction.

Sincerely,

RUUD AIR CONDITIONING DIVISION

A handwritten signature in black ink that reads "Peter M. Van Lancker". The signature is written in a cursive, flowing style.

Peter M. Van Lancker
Senior Training Administrator
National Service Department

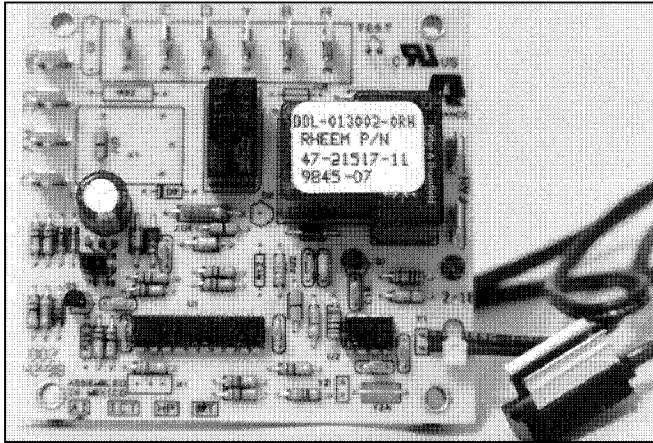


TRAINING BULLETIN

No. 1-99

RANCO Demand Defrost Control

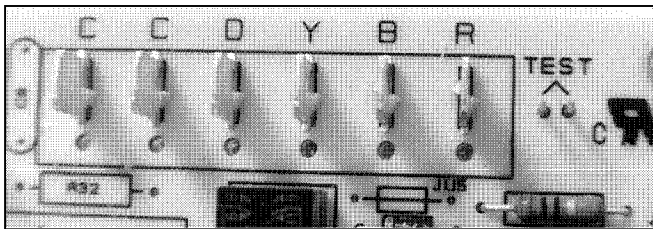
RANCO DDL Defrost Control



RANCO Part #: - DDL - 013002 - 0RH
Factory Part #: - 47 - 21517 - 11
Power Input: - 24 VAC (+/- 25%) and 240 VAC

1. 24 VAC applied between "R" and "C" terminals.
2. 24 VAC applied to "Y" terminal calculates compressor run time.
3. 24 VAC applied to "B" terminal to reversing valve terminal on onboard defrost relay.

Low Voltage Connections



4. 240 VAC applied to "FAN" terminal on onboard defrost relay.

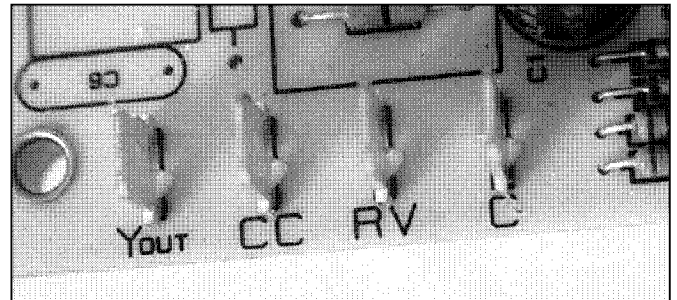
Fan Terminals



Power Output - 24 VAC / 240 VAC

1. 24 VAC to compressor contactor from "Yout" terminal.
2. 24 VAC to reversing valve from terminal "RV".
3. 24 VAC to auxiliary heat from terminal "D".
4. 240 VAC to outdoor fan from terminal "FAN".

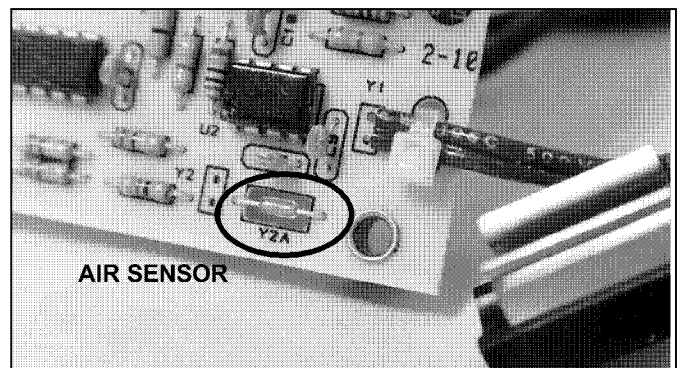
Output Terminals



Temperature Measurement

1. Two temperature sensors:
 - a. Air sensor is mounted on control board (Y2A);
 - b. Coil sensor (Y1) is mounted to outdoor coil copper tube;
 - c. Coil sensor wire length: 24 inches.

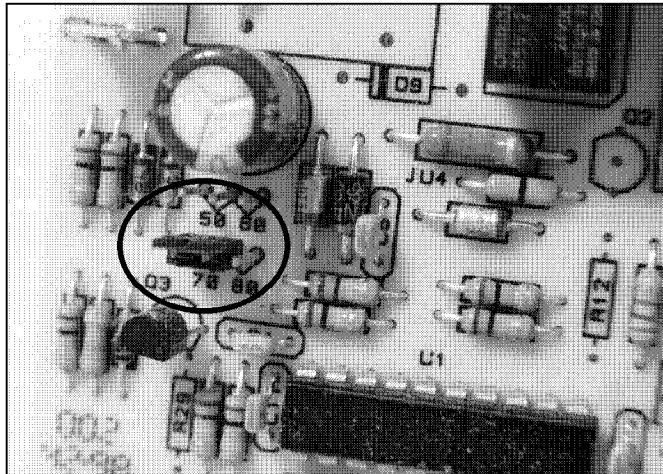
Sensor Locations



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2. Defrost initiated by temperature difference between air and coil sensors (if coil below 35°F, and lock out time exceeded).
3. Defrost terminated by coil sensor temperature or time (14 minutes).
4. Defrost termination temperature field adjustable (50°F, 60°F, 70°F, and 80°F); factory set for 70°F.

Termination Settings



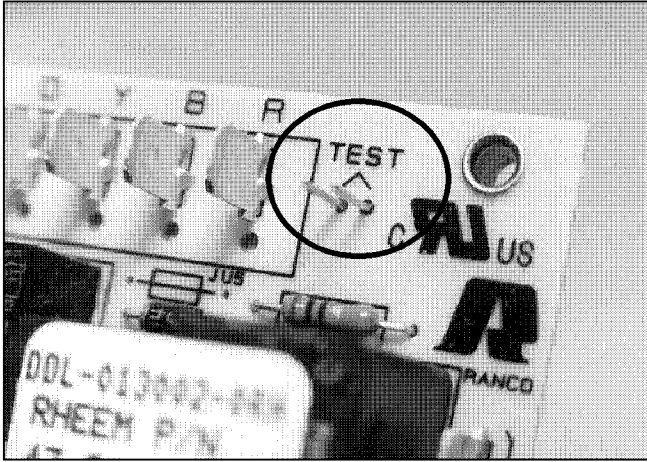
System Parameters

1. Coil temperature must be below 35°F for defrost to occur.
 2. Defrost determined by temperature difference between coil and air sensors.
 3. Defrost terminated by temperature OR time.
 - a. Coil temperature termination is field selected (70°F factory setting).
 - b. Termination by time if defrost lasts for 14 minutes.
 4. Defrost lock out period:
 - a. 34 minutes of run time must elapse before allowing another defrost.
 - b. Defrost is not allowed during the first two minutes of compressor operation to allow pressures and temperatures to stabilize.
- Defrost Function:** The control monitors outdoor ambient temperature, outdoor coil temperature, and compressor run-time to determine when to defrost and when to terminate defrost.
1. Upon initial power up (or after loss of power) a sacrificial defrost occurs in order to calibrate the control. It checks the time needed to warm the outdoor coil to termination temperature with what should be a clean, frost-free coil.
 2. Defrost cannot occur unless the coil sensor is below 35°F.
 3. The control continually monitors both coil temperature and outdoor air temperature. When the correct temperature difference occurs, it initiates defrost. Correct temperature difference is not fixed as with previous demand defrost controls. The initiate temperature difference changes as the outdoor ambient becomes colder.
 4. Upon initiation, the control stops the outdoor fan, de-energizes the reversing valve, and sends power to the air handler to cycle on auxiliary heat.
 5. During defrost the control continues to monitor coil temperature and time in defrost.
 6. Defrost terminates when the coil sensor reaches termination temperature (factory set for 70°F). The control then powers the outdoor fan, powers the reversing valve, and cycles off auxiliary heat.
 7. **OR**, defrost also terminates after 14 minutes in defrost.
 8. If defrost terminates on sensor temperature, **OR AFTER 14 MINUTES WITH THE COIL TEMPERATURE ABOVE 35°F FOR MORE THAN 4 MINUTES**, the control assumes a frost-free coil.
 9. The control does not allow another defrost for 34 minutes. This avoids an unnecessary defrost caused by transient system conditions.
 10. If the system terminates after 14 minutes, **AND THE COIL TEMPERATURE STAYS BELOW 35°F**, it assumes defrost was not fully accomplished and, after 34 minutes running in the heat mode, it performs another sacrificial defrost.
 11. After 6 hours of run time with no defrost and the sensor below 35°F, the control conducts a forced defrost. This ensures adequate oil return to the compressor.
 12. Should the thermostat satisfy during defrost from auxiliary heat, the control immediately (no 34 minute wait) goes into defrost upon the next call for unit operation.
 13. If the coil temperature exceeds the termination temperature or if the coil temperature exceeds outdoor ambient air temperature (cooling operation) all defrost operations are suspended.

Testing

1. There must be a "Y" call for compressor operation to perform the "TEST". To test, momentarily jumper the "TEST" pins with a metal strip. The initiation temperature is ignored. The unit responds to normal time and temperature controls while in "TEST". If a sensor failure is detected, no defrost occurs.

Test Pins



IMPORTANT: As long as the "TEST" pins remain shorted, termination temperature is ignored and defrost remains on for only 3.5 seconds.

2. Remove the "TEST" pin jumper within 3.5 seconds, and monitor coil temperature at the defrost sensor location.

Termination should occur when the coil reaches termination temperature. Be aware that there is a temperature and time lag between the coil reaching termination temperature and when the sensor responds to terminate defrost.

3. Termination should occur when the defrost sensor reaches termination temperature (70°F factory setting).
4. If the control does not perform as previously described, replace it.

NOTE: If the ambient sensor fails, the control initiates defrost every 34 minutes with the coil temperature below 35°F.

If the coil sensor fails, the control cannot initiate defrost.

Defrost Control Replacement

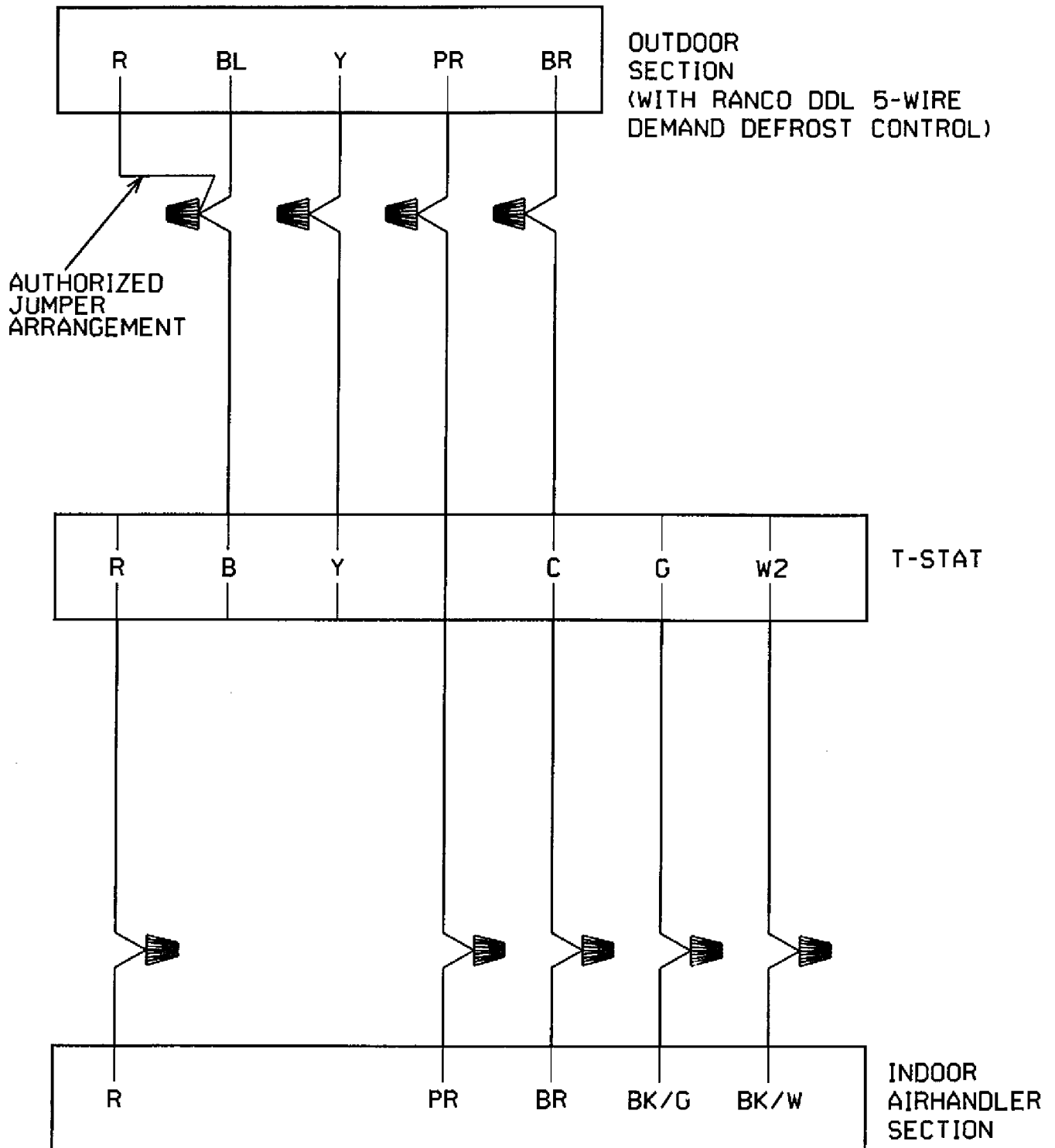
All split system heat pumps now use the new RANCO DDL - 013002 - 0RH (47 - 21517 - 11) defrost controls.

Since this new control must be powered continuously, a minimum of 5 conductor low voltage wires must be run to the outdoor unit. Previous wiring used four conductor low voltage wire.

If replacing a defrost control on a unit with only four conductor low voltage wire, and installing five conductor wire is impossible, connect the "red" and "blue" control wires at the outdoor unit to the control wire attached to the "B" terminal from the thermostat. Use the following wiring diagram in such cases.

WIRING DIAGRAM

SUBJECT: RECOMMENDED RANCO DDL DEMAND DEFROST WIRING ARRANGEMENT FOR FOUR-WIRE THERMOSTATS



Troubleshooting the Ranco DDL - 013002 - 0RH Defrost Control

