

## **Forced Convection Serial Dual Evaporator Household Refrigerator Charge Sensitivity and Temperature Control by Fan Cycling**

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### **ABSTRACT**

Household refrigerator manufacturers are currently very interested in dual evaporator refrigerators due to improved cabinet humidity regulation, and the potential of greater efficiency. In American-style auto-defrost combination refrigerator-freezers, air is blown over a single evaporator to both compartments. Dual evaporator designs have separate evaporators for the fresh food and freezer compartments and no airflow between the compartments. This study is an experimental investigation of the basic performance parameters and behavior of a forced convection dual evaporator household refrigerator. Although various configurations for the refrigerant circuitry have been proposed, this study considers only serial connection where the refrigerant flows through the fresh food evaporator and then through the freezer evaporator without a pressure drop between the evaporators. Control of the fresh food cabinet air temperature was achieved by cycling the fan off and on during operation. Performance tests were conducted using a prototype refrigerator at several different charges and two different fan cycle length settings. This fan cycling affected both the performance of the prototype and the charge distribution inside the system. The length of the fan cycle is a significant factor in determining the charge required and the refrigerant state at the evaporator exit. The fan cycle length and charge must be chosen so that the evaporator exit is neither excessively superheated nor two-phase at any point during the fan cycle.