Teardown Report
Frigidaire Wine Cooler

Overview:
Stand alone, 8 bottle thermoelectric wine cooler with digital display and electronic temperature control. Dual pane glass door.
Frigidaire 8 Bottle Thermoelectric Wine Cooler

- Product: Thermoelectric Wine Cooler (8 bottle)
- Manufacturer: Electrolux
- Manufactured date: 2013
- Purchased from: Lowes
- Purchase price: $99
- Country of origin: Canada
- Key specifications:
  - Approximate dimensions: 10"W x 18.2"H x 20.2"D
  - Refrigerator Temp: 46-66 degrees F
  - Power Consumption: 50 -70 W
  - Power Requirement: 110 V AC, 1 Amp
Why a Zebulon Solutions’ Teardown?

• General
  – Understand key sub-systems of existing design
  – Understand supply chain considerations
  – Understand manufacturing process
  – Understand potential design pitfalls

• Specific to the Thermoelectric Wine Cooler
  – Understand assembly of thermoelectric module including fans
  – Itemize components in the assembly

• Disclaimer
  – All information contained herein is based on estimates made without access to any design documentation or proprietary information
  – These estimates may or may not accurate
  – No warranty is provided or implied
High Level View

Thermoelectric Wine Cooler

- Holds up to eight (8) bottles of wine
- Working Temperature Range between 46-66 degrees F
- Stand Alone/countertop installation
While most people use wine coolers for storing wine, at Zebulon Solutions we’ve modified 9 thermoelectric wine coolers like this one to function as temperature chambers for testing new products.
Thermoelectric Wine Cooler

- Holds up to eight (8) bottles of wine
- Working Temperature Range between 46-66 degrees F
- Stand Alone/countertop installation

Back (cover removed)
Features

- Temperature Display
- Temperature Adjust Arrow keys
- Recessed door handle
- Light switch
- Leveling Leg
Features

- Light
- Door Frame
- Shelf (4x)
- Fan cover
- Magnetic Seal
Block Diagram

Main Controller
Printed Circuit Board Assembly (PCBA)

110 VAC Power input

AC to DC convertor

Temperature Adjustment

LED Temp Control Board

LEDs

Heat Sink Fan

Peltier Module

Cold Sink Fan
Key Component: Peltier Module

- Thermoelectric coolers consist of a Peltier Module, a Heat Sink, a Cold Sink and two fans
- The key component is the Peltier module, a thermoelectric solid state device based on the Peltier effect, whereby a using voltage to transfer heat from one side of the device to the other. Depending on the direction of the current, it can be used for either heating or cooling although using it for cooling purposes is most common. Lack of moving parts means long life but its efficiency is low.
Teardown of Internals

- Remove back cover (10 screws)
- Remove thermoelectric cooler assembly (2 screws)

Heat Sink Fan
Heat Sink External to the cooling chamber

Cold Sink Internal to the cooling chamber

Single unit Peltier module with heat and cool sinks
Teardown of Internals

- Remove heat sink fan assembly (2 screws)
- Remove fan from fan shroud (4 screws)
- Remove cold sink fan shroud (4 screws)
- Remove cold sink fan (2 screws)

Heat Sink Fan
PN: TX9025L12S
12VDC 0.16A
92mm x 92mm x 25mm thick

Fan shroud
Custom molded plastic

Cold Sink Fan
PN: TX8025L12S
12VDC 0.08A
80mm x 80mm x 24.2mm thick
Supply Chain

- Critical elements of the supply chain would include:
  - Digital display
  - Main Controller PCBA
  - Cold Sink Fan
  - Heat Sink Fan
  - Cold Sink
  - Heat Sink
  - Peltier module
  - Magnetic door seal
  - Glass for door (two panes)
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Summary

- Product is designed to dissipate heat in order to cool contents placed inside (wine)
- This particular model is no longer available
- Having a small volume to cool, this is a practical use of a Peltier cooler
- Few moving parts to fail, the two fans
Zebulon Solutions is a product development services company specializing in productization: turning R&D projects into manufacturing ready products.

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