

## Refrigerator timer

### PURPOSE:

Apply higher resistance to the thermostat circuit of a pair of Danfoss 12V BD50 refrigeration compressors (one for the refrigerator and one for the freezer) to increase speed for 3 hours when warm product is placed in the refrigerator.

A single button starts the cycle and if pressed before the cycle ends aborts the cycle and returns the compressor to normal speed. Nine elements of a 10 segment LED array displays the time left in 20 minute increments. The tenth is used to display compressor fault codes.

The device consists of a display board with both LED arrays and the start/stop switches and two identical logic boards. The schematic includes only one logic board.

### COMPONENTS:

One gate of a 4093 is used to debounce the switch.

A 4013 is wired as an on/off switch to start and stop the cycle.

A second gate of the 4093 inverts the output of the 4013 and operates a reed relay which substitutes the resistance.

A 4541 timer supplies a pulse every 20 minutes to a 4017 counter that drives the LED array.

The 10<sup>th</sup> output (Q9) of the 4017 is used to end the cycle by flipping the 4013 and disable the 4017.

Operation: The first press of the switch resets the timer and the counter and starts the cycle. The second press aborts the cycle. The timer works correctly and at the end of the cycle the relay is de-energized and no LEDs are lit. However I have three problems, all of which are related and will cause operator confusion.

First on power up Q0 of the 4017 is high giving the false indication that a cycle has started even though the relay has not been activated. The first push of the switch actually starts the cycle. I need a way to make all of the 4017 outputs low or maybe set only Q9 high on power up.

Second, if the switch is press to abort the cycle the relay is de-energized but the 4017 resets to Q0 high leaving the circuit in the same status as at power on.

Third, after a cycle has completed pressing the switch once to restart the cycle only resets the 4017. A second press is required to actually start the cycle. I see why it is happening but can't figure a way to get a single reset pulse only on the start of a cycle.