

TEXAS INSTRUMENTS ONLINE ELECTRONICS CHALLENGE

VRC 7682 Wingus & Dingus

INTRODUCTION



After seeking some advice from an electronics engineer, we chose to dismantle a RMCDM9 refrigerated container controller he had lying around.

OVERVIEW



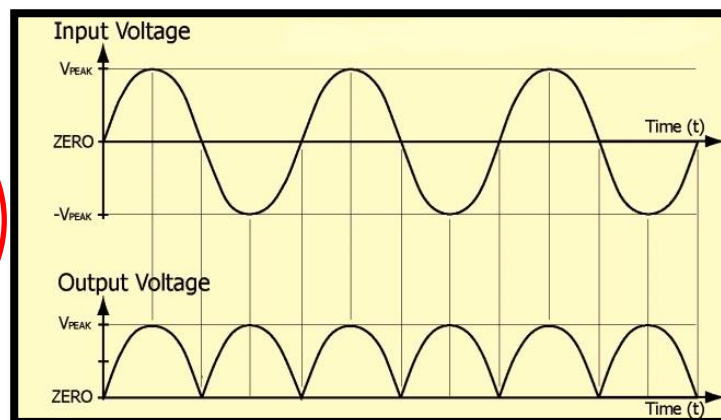
There are two boards:

- Microprocessor board with display and buttons
- Refrigeration plant interface with multi-pin sockets

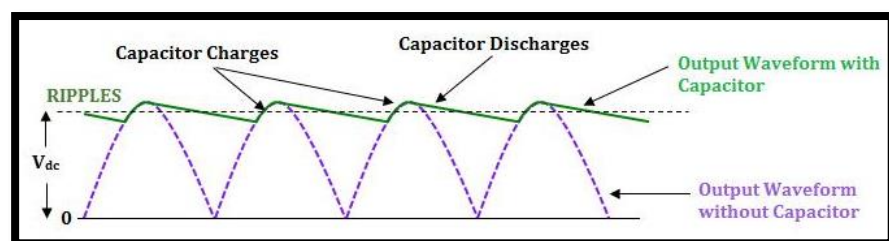
POWER SUPPLY



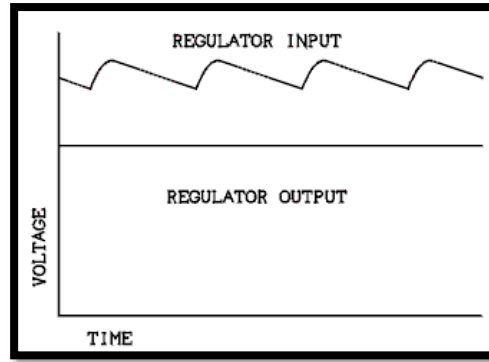
The AC to DC power supply is made up of a bridge rectifier, smoothing capacitor and linear voltage regulator.



The KBU4B bridge rectifier converts AC to DC using 4 diodes.

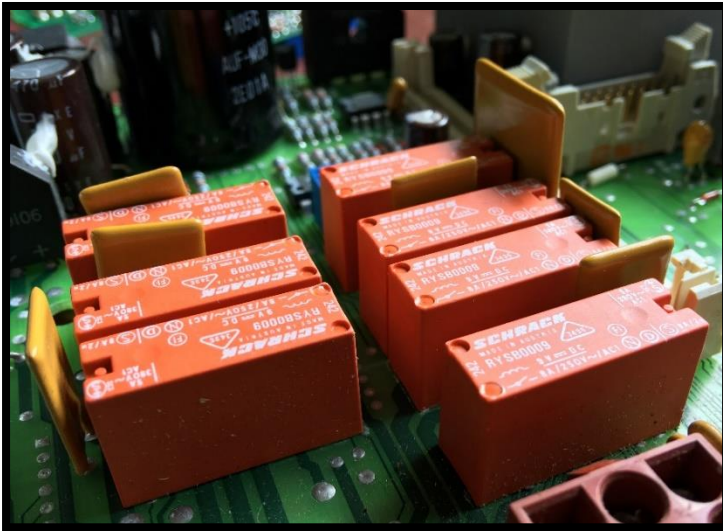


The 10000uF capacitor smooths the bridge rectifier output.



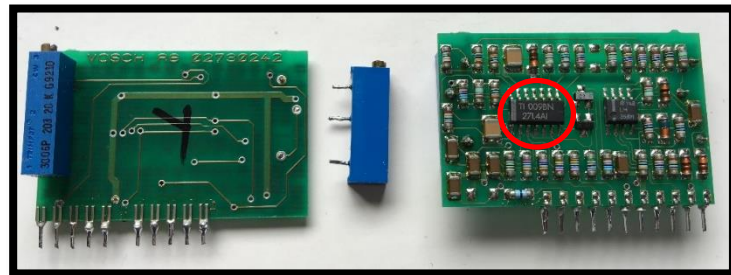
An LM340T12 voltage regulator produces a constant 12Vdc output. Unwanted energy is dissipated as heat through an aluminium heatsink.

HIGH POWER SWITCHING



Electromagnetic relays switch high power refrigeration plant circuits controlling fans and the compressor.

TEMPERATURE MEASUREMENT

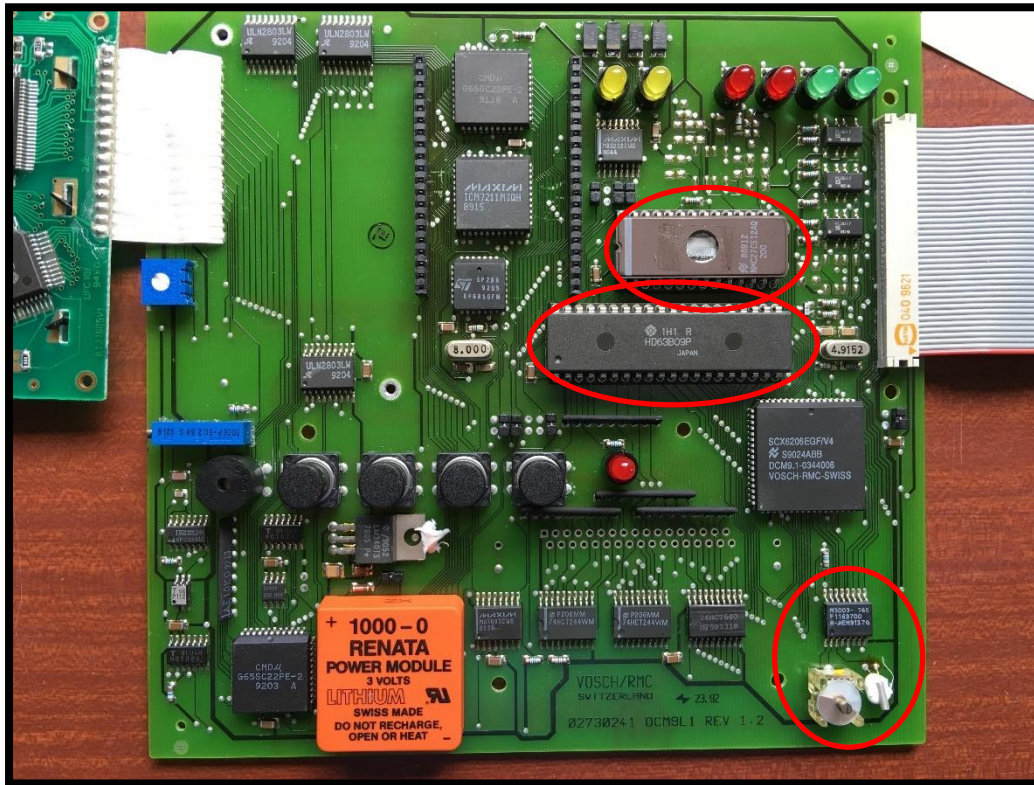


External PT100 Resistance Temperature Device (RTD) probes measure supply and return air temperatures.

Measurement modules with Texas Instruments 27L4AI quad op-amp ICs produce voltage output from RTDs for the microprocessor board, which converts analog voltage to digital values.

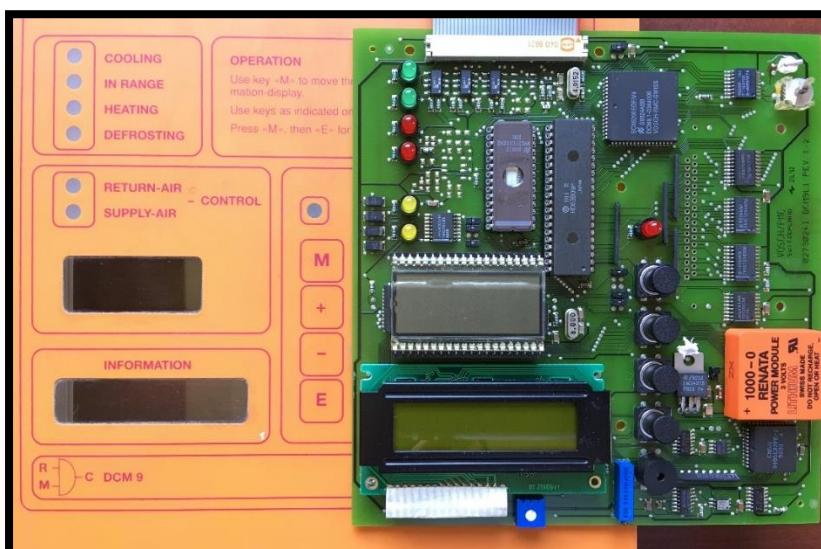
Two multi-turn variable resistors are used to calibrate offset and scale for the PT100 platinum probes. PT100 probe resistance increases with temperature, and is 100Ω at 0°C. They are very accurate.

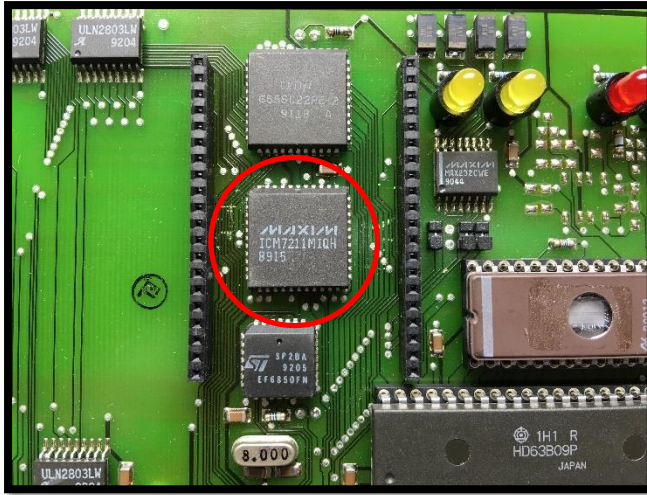
MICROPROCESSOR BOARD



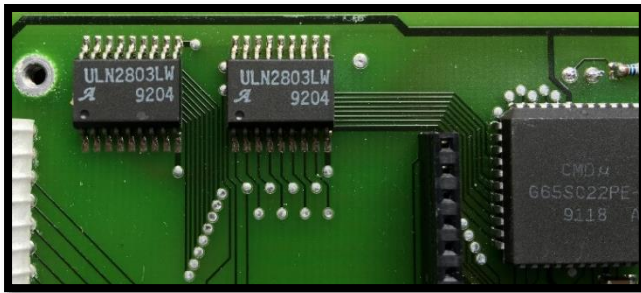
The HD63B09P is an 8-bit microprocessor and the software is stored in a NMC27C512AQ EPROM. There is a real-time clock M3003-16S and a variable capacitor used for a trimming the quartz crystal.

DISPLAY

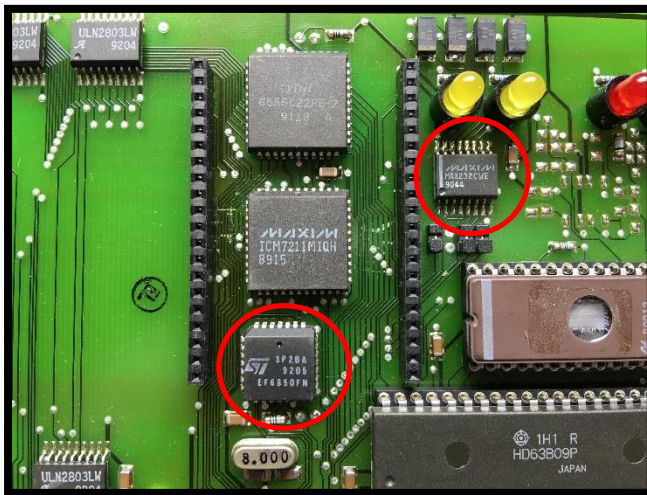




ICM7211MIQH converts Binary Coded Decimal to 7 segment digits on the 4-digit LCD temperature display.



I/O interfacing IC G65SC22PE connected to ULN2803 drivers control relays and LEDs.



An EF6850FN and MAX232CWE provide a serial port for temperature history download.

CONCLUSION

We found both discrete and integrated components in this unit.

Dismantling old hardware seems more instructive than highly integrated miniaturized newer technologies.

REFERENCES

Datasheet reference links in description.