Temperature Control System
for
Environmental Chambers
upto several hundred cubic metres

Developed by Vecur Wireless, Inc.
San Diego, CA 92127

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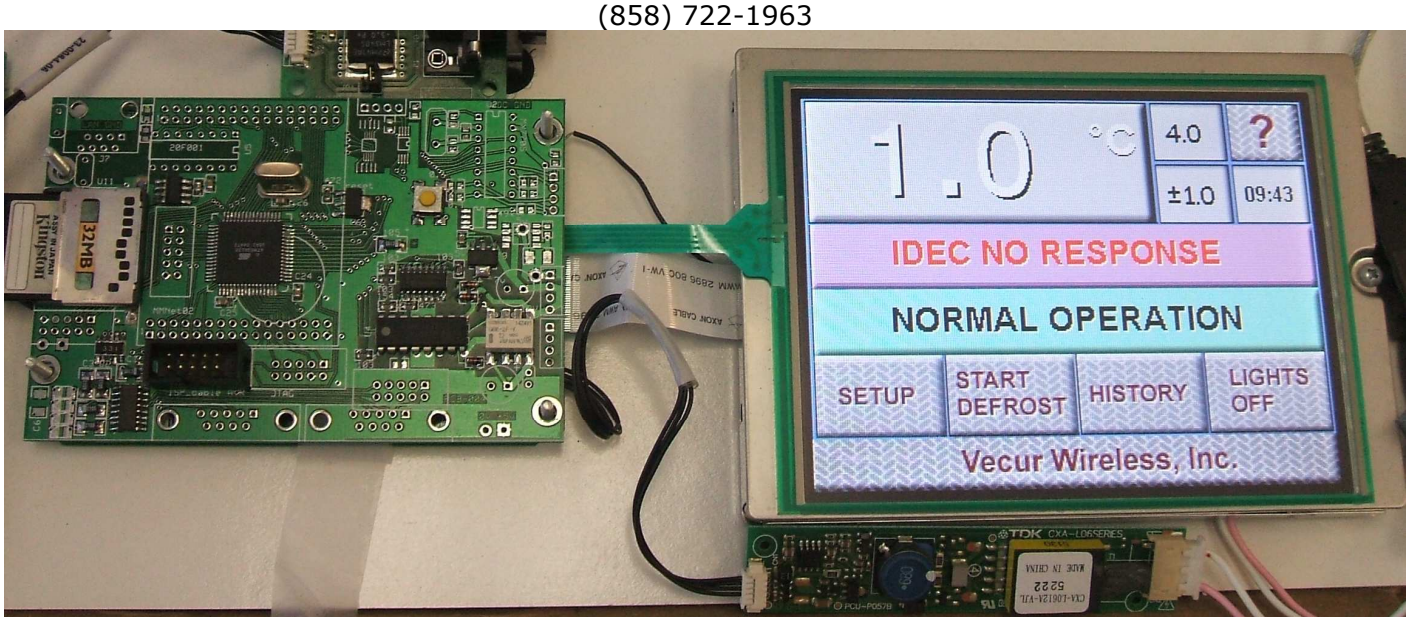

Figure 1: Temperature Controller and LCD/Touch panel

What is it?

A temperature control system, to adjust the ambient air temperature within a large room or chamber. It uses an LCD touch panel as the user interface to configure and control the system. It also has custom hardware and software developed for this specialized application. This platform however, is customizable for many other applications requiring a relatively cost effective custom solution.

Who Would Use such a device?

Academia or biotech companies would be typical users, but could be any application where a volume of air (or other medium) needs to be kept at a constant temperature, or requiring tight resolution shift in temperature.

Is there any Competition:

There do exist controllers that may perform the same functionality as this control device, no doubt. The benefit of this product is the customizability of the hardware, software and LCD GUI. The control hardware can be priced lower than the PLC type devices out there. The software may take a little longer than the PLC, but it's a trade of development time and production cost of the hardware. Mostly boils down to the ROI and how long the continued revenue lasts.

How does it work?

A PID control loop takes input from single or multiple high resolution temperature measuring device(s). These temperature devices would be wired, wireless or both. A

setpoint is entered into a control panel as to the desired temperature, the hysterisis and several other parameters. The output controls (in this particular case), a needle valve, which controls the amount of hot-gas that is bypassed within the refrigeration system. This valve allows a very fine adjustment of temperature within the evaporator coil, which provides the cool air. The evaporator temperature is dispursed with the environment, typically using high volume fans.

How was it developed?

During the conception phase, a microcontroller was chosen that was cost effective, had sufficient peripherals to perform the required functions and additional hardware to support the system. The system consists of a microcontroller based control board and an LCD touch panel as the user interface.

Who developed it?

Tapio Vahamaki and Henrik Jonson. Tapio is an embedded firmware/software/hardware engineer, having developed developing control systems for various applications. Henrik Jonson is a software engineer, both in developing application level software and embedded systems software. Both are excellent at low level debugging, using standard bench tools, instruments and developing any customized software and/or hardware to perform testing, prototyping or evaluation.

Stage of product?

It was developed as a prototype for a single temperature application. The device is ready for further enhancement for similar or other applications, with possibly some hardware re-works or re-design and software enhancements. The baseline is existing to expand upon with less effort, since the bulk of the work has been performed.

Benefits of product?

The prototype, as it currently stands, was constructed cost effectively, a standard microcontroller was chosen, very scalable and provides the necessary and attractive user interface.

Details of Product:

The hardware consists of:

- Kyocera TFT LCD/Touch Panel module
- Reach Technology LCD video controller
- Vecur Wireless controller:
    - Atmel AVR ATmega128 microcontroller
    - 3 different ADC devices
    - Stepper motor controller (used for hot gas bypass valve)
    - SD/MMC memory connector – to log temperature activity for later analysis.
    - Ethernet connectivity, via daughter ATmega128 controller, for real time temperature analysis and remote control of the controller.

Future of Product:

Presently awaiting an application that would utilize this type of controller, but also is ready to be customized for other similar or different applications, that would call for a embedded user interface.

Finally:

A similar product may be customized for 'your' application.
Vecur specializes in embedded real-time control system development. With 24 years experience developing custom embedded control systems.

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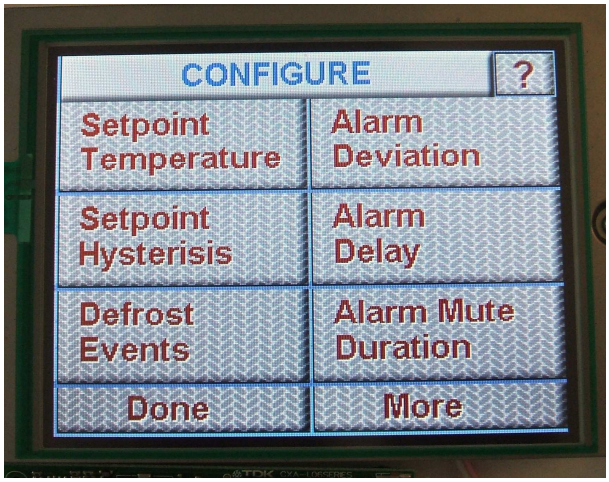

Figure 2: configuration screen

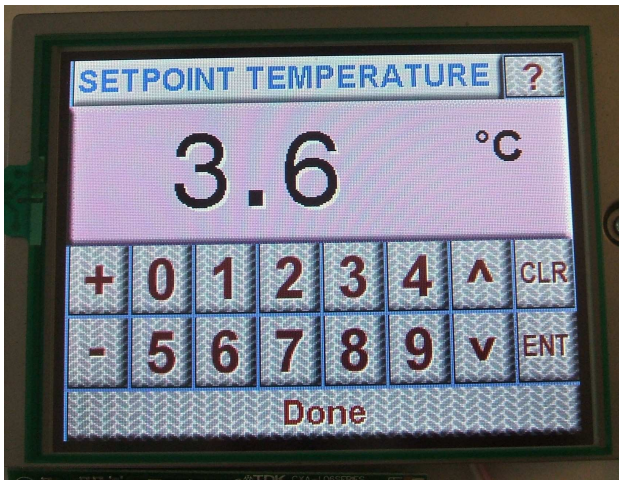

Figure 3: Setpoint temperature screen

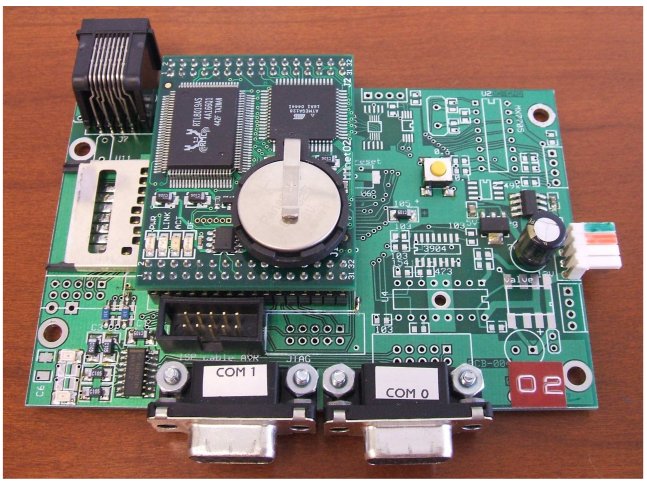

Figure 4: Temperature controller with external ATmega controller containing an ethernet interface

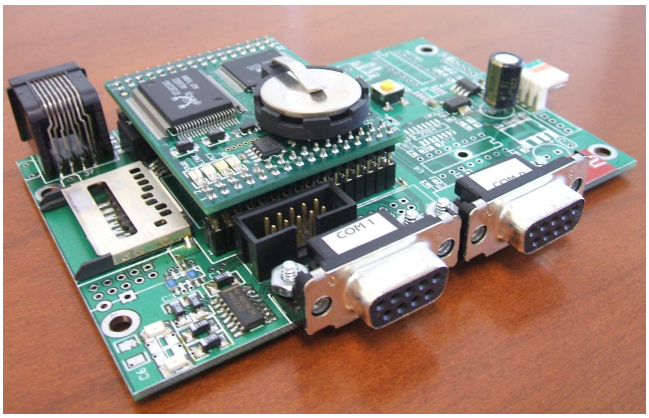

Figure 5: Different angle, showing the external ATmega controller