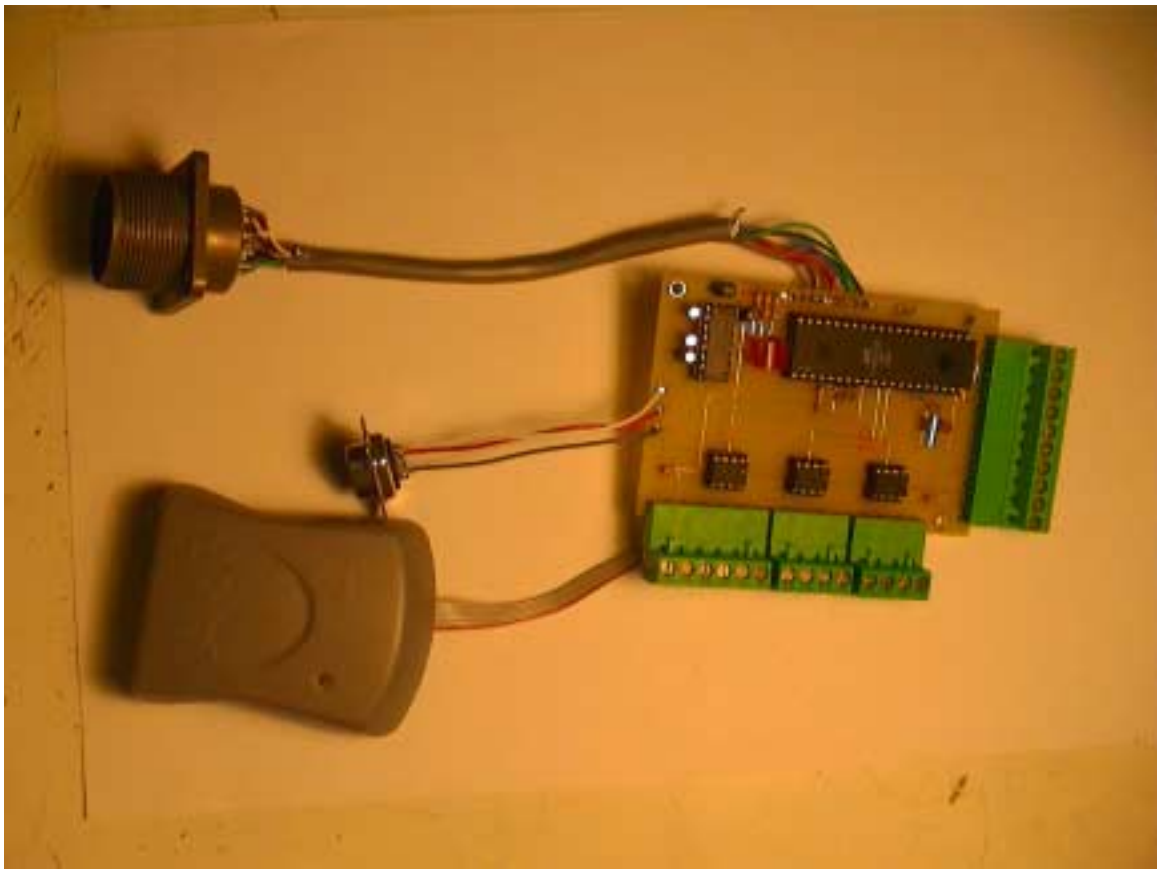
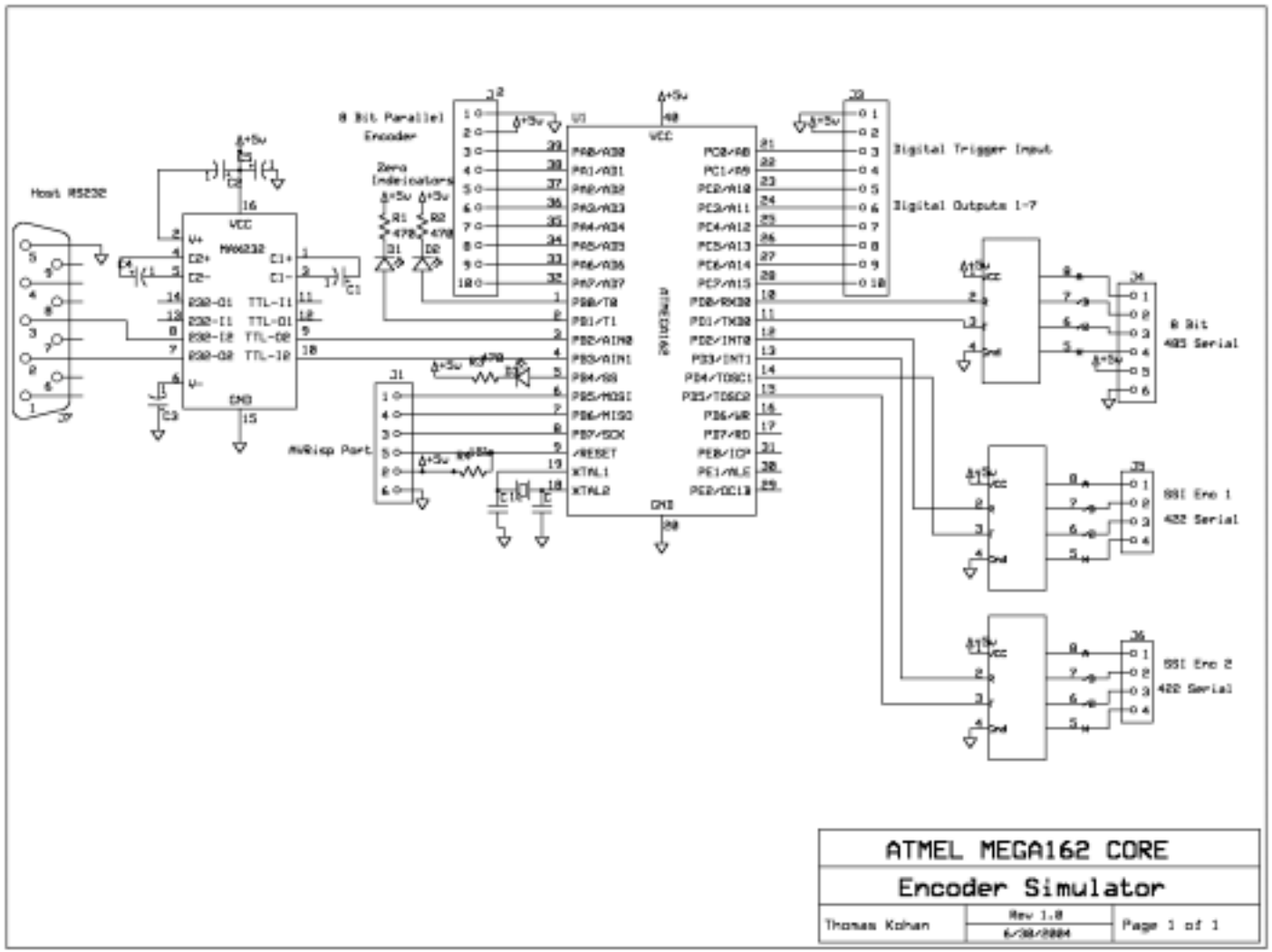
Encoder Simulator

In the world of manufacturing, absolute encoders provide control systems with important feedback from mechanical devices. An rotary absolute encoder produces a unique output at some specified granularity for the angular position of a shaft. Typical outputs are parallel and serial digital data streams. When troubleshooting or developing new programs for control systems, simulation of the target system can be desirable due to unavailability of the target system for experiment, risk of damage to the target, and physical distance of the deeloper from the target location. While digiital signals can be simulated by switches and LED's, and analog signals by adjustable voltage sources, encoder input requires hand-turning an encoder or a motor driven encoder. Instead, why not a fully electronic simulator with the ability to set the speed of the rotation, and start and stop on demand as in the actual system?

This Encoder Simulator is programmed by the user through a simple Windows interface. Communication to the simulator is through RS232. Both 8 bit and 12 bit encoders are supported. In fact two simultaneous encoders can be simulated. Each of the two encoders can be programmed to increment at its own rate, so an effective gear ratio between the two can be produced. Start/stop of the encoders can be through the user program or a digital input from the target simulator. Additionally, a few digital outputs can be set to turn on and off at specific encoder positions to provide stimulus for the target simulator.

At the core of the Encoder Simulator is an Atmel Mega162. The features of thei chip make it ideally suited for this device. Sporting two UART's, one can be devoted to the user communications while the other can be used to provide a non-standard serial conversion of the 8 bit parallel encoder output. In actual practice, noisy manufacturing machines often contribute to their own problems by disrupting TTL parallel encoder signals. The chip also has edge triggered inputs that can be used for the clock signals from serial encoders. The large number of remaining digital I/O points are used to communicate with the other hardware. To get separate data rates for two simultaneous encoders is easy with two 16 bit timers that have access to separate prescalers with prescaling of 1 to 1024. The user enters parts per minute (PPM) values for each encoder to set the virtual rotation speed. The Mega's internal MUL operation and other efficient arithmetic operations make the coversion to clock times for the encoder very simple. The Mega does all the work, the Windows program is just a user friendly terminal program. The Encoder Simulator uses LED's for visual feedback of rotation speed to the user.




Host RS232
MAX232
8 Bit Parallel
Encoder
Zero
Indicators
ATMEGA162
Digital Trigger Input
Digital Outputs 1-7
8 Bit
485 Serial
SSI Enc 1
422 Serial
SSI Enc 2
422 Serial
ATMEL MEGA162 CORE
Encoder Simulator
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