11. Real Time Computer Control

Classroom Activity:

Students are given the following problem to solve as a team: They work for a large engineering firm. The president has acquired a machine with no software drivers and he wants them to make the machine work. He also gives them two tests the machine needs to perform. The students use their problem solving, computer programming and resource gathering skills for this exercise.

Grade(s): 9-12

Strand: Physics

Type of Activity: Independent study

Preparation: varies

Time needed to complete the task: 1200 + minutes

Materials/Resources for teachers:

stepper motor

translation module

power supply

interface circuit pentium

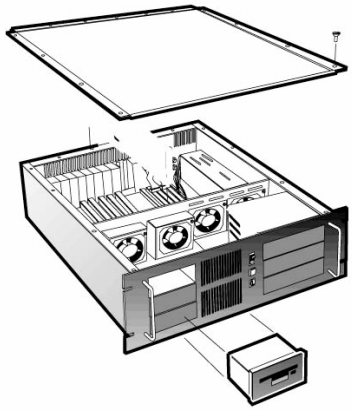
programming software (in a previous case students used Pascal)

Materials/Resources for students:

Students find their own resources in texts and on the Internet.

Activity Description:

Students need to understand the problem, the requirements for the demonstration, set up a specification of what they intended to accomplish and partition the problem. The members of the team have to communicate with each other. In terms of skills and specific knowledge, the students have to understand how the computer hardware worked, the principles of physics as they apply to motor systems (mass, friction, inertia), and the mathematical concepts of velocity ratios and angular linear transformations. The most difficult part is to discover how to take a time indeterminate control system and use it to control a time determinant process.



Students are given an industrial stepper motor and its associated electronics. The tests they need to demonstrate are:

- Using a graphical interface, allow the user to control the angular position of the motor shaft by manipulating a dial on the computer screen with a mouse. The computer would control the motor to follow the dial in real time.
- 2Using a graphical interface, allow the user to control the rotational velocity of the motor in real time.

Tips:

Let students discover the problem areas in the project and then discuss solutions. Allow students to select the solution.