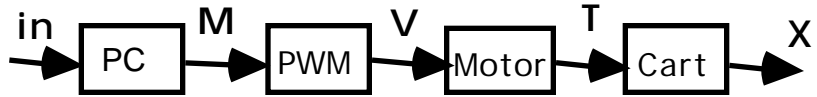


4: PROJECT INFORMATION

XRC/248

Crane Positioning System



The position control system consists of a cart on rails coupled to a DC electric motor. The torque of the motor is manipulated by the pulse width modulating power supply under the table. The input signal (0-100% of 10 volts DC) to the power supply comes from the computer. The torque moves the cart via a chain.

The position of the cart is detected by potentiometer ("pots" are variable resistors) that has 10 volts DC across the ends. The voltage on the wiper of the pot is sent to the computer.

Operation

Turn on computer system with the upper right button on the CPU.

Whenever the computer is turned on, the data acquisition board sends a "100% on" signal to the crane's power supply. If the cart is not all the way to the end of the rails away from the motor, it will go there rapidly in the "power up" sequence. Be aware!

Proper Shutdown

Always make sure the cart is at the end of the rails away from the motor.

System Parameters

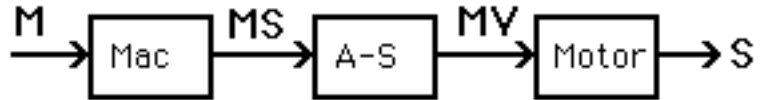
The parameters that are important to know about your system are

- Spring constant
- Mass of cart
- Friction of cart, gears & motor

Computer Hardware

Computer	KeyData
RAM	16 meg
Processor	Intel 80486DX
Speed	50 MHz
Disk	210 meg
Data Aq. Board	Lab-PC+

SRC/249

Simple Motor Speed System

The motor speed control system consists of a 3-phase, 5 hp electric motor that is coupled to a DC generator. The speed of the motor is manipulated by the variable-voltage, variable-frequency power supply on the wall. The input signal (0-100 % of 10 volts DC) to the power supply comes from the computer. The generator produces about 85 volts which can be connected to one or two banks of light bulbs to provide a load for the generator.

The speed of the motor-generator set is detected by a photocell and chopper wheel. The pulses from the photocell are converted to a voltage (0-10 volts DC) that is sent to the computer. The computer converts this to RPMs (in 100s) for display & recording.

Operation

Turn on computer system with the key at the top right of the keyboard.

Turn on the power for the motor with the three top-left circuit breakers in the cabinet behind the door. Push the green "Start" button on the Accuspede box. The Plexiglas lid for the motor-generator set must be closed for the motor to run.

Whenever the computer is turned on, the data acquisition board sends a "100% on" signal to the Accuspede. If the power is on and the motor is in a "run" condition, it will run full speed in the "power up" sequence. Be aware!

To operate the pulse-to-voltage converter, its power must be turned on. The power switch for the converter is the little toggle switch on the aluminum box.

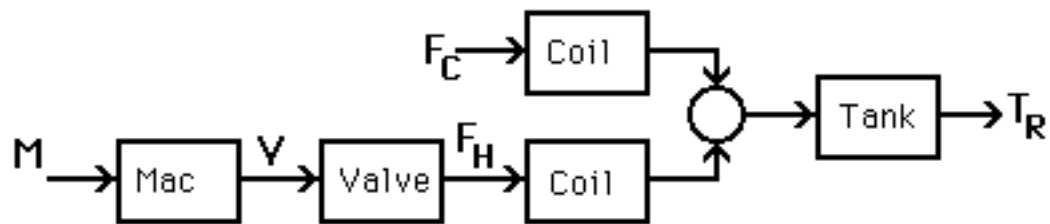
Proper Shutdown

Turn off the power to the motor (behind the door) and turn off the pulse-to-voltage converter.

Computer Hardware

Computer	Macintosh Quadra 650
RAM	24 meg
Processor	Motorola 68040
Speed	33 MHz
Disk	500 meg
Data Aq. Board	NB-MIO-16

TRC/303

Simple Temperature System

Reference: Smith & Corripio, pp. 64-71, 115-122

The temperature control system consists of a reservoir of water which can be heated or cooled by two copper coils in the reservoir that have hot or cold water running through them. A video is available that shows the inner construction of the reservoir.

The hot water comes from an ordinary hot water heater. The flow rate of the hot water is varied by changing the speed of a pump. The speed of the pump's 3-phase motor is manipulated by the variable-voltage, variable-frequency power supply on the wall.

The input signal (0-100% of 10 volts DC) to the power supply comes from the computer. The cold water flow rate is varied with a manual valve; the cold water is simply tap water.

The temperature of the reservoir is determined by a "resistance temperature device" or RTD. An RTD is a 100 platinum resistor that changes resistance when it changes temperature. The RTD is connected to an Analog Devices signal conditioner that converts the resistance to a voltage (0-5 volts) for the computer to read.

Operation

Make sure the water heater is plugged in. Turn on computer system with the key at the top right of the keyboard. Turn on the power supply beneath the table-top. The circulating water pump must be operating for the experiment to function; plug it in and turn it on with the push-button switch. Adjust the cooling water supply to the desired flow rate by observing the rotameter on the wall.

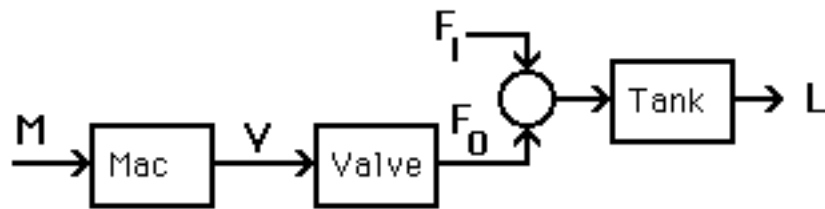
Proper Shutdown

Turn off the power supply beneath the table-top, turn off the water-circulating pump and the cooling water supply.

Computer Hardware

Computer	Macintosh IIfx
RAM	24 meg
Processor	Motorola 68030
Speed	25 MHz
Disk	120 meg
Data Acq. Board	Lab-NB

LRC/307

Simple Water Level System

Reference: Smith & Corripio, pp. 85-89, 104-115

The level control system consists of a water tank. The water entering the tank is supplied through a manual valve and a rotameter flowmeter. The tank also has a variable-speed pump connected to the bottom that receives a signal from the computer telling it how fast to pump the water out. The computer sends a voltage (0-100% of 10 volts DC) to an Analog Devices signal conditioner that converts it to a 4-20 ma signal that the pump recognizes.

The level of water in each tank is detected by air bubblers that are connected to pressure transducers. The pressure required to push a bubble into the tank is the hydrostatic head due to the depth of the water. The pressure is converted by the transducer into a voltage (0-10 volts DC) that is read by the computer.

Operation

Turn on computer (with the key at the top right of the keyboard), the power supply beneath the table-top and the pump (Reverse). Adjust the water supply to the desired flow rate by observing the rotameter on the side of the cabinet. Make sure the bubblers are operating (usually they can be heard).

Proper Shutdown

Turn off the pump and the power supply beneath the table-top.

System Parameters

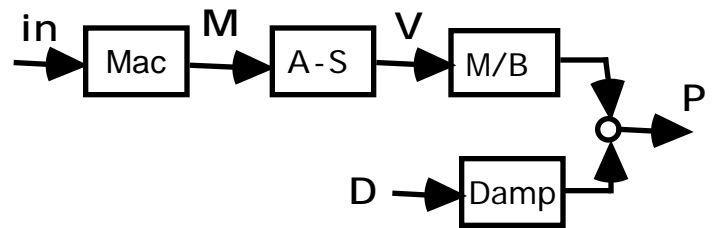
The parameters that are important to know about your system are

Cross sectional area of the tank	Valve coefficient
Flow rate vs. setting of the pump	
Flow rate through the rotameter	

Computer Hardware

Computer	Macintosh II
RAM	20 meg
Processor	Motorola 68030
Speed	33 MHz
Disk	80 meg
Data Acq. Board	Lab-NB

PRC/308

Air Pressure System

The pressure control system consists of a air blower powered by a 3-phase electric motor. The speed of the motor is manipulated by the variable-voltage, variable-frequency power supply on the wall. The input signal (0-100% of 10 volts DC) to the power supply comes from the computer.

The air goes into one or more of the outlet ducts. The pressure in the first manifold is detected by a pressure transducer. The pressure is converted by the transducer into a voltage (0-10 volts DC) that is read by the computer.

Operation

Turn on computer system with the key at the top right of the keyboard.
Turn on the Accuspede power supply on the wall with the toggle switch.

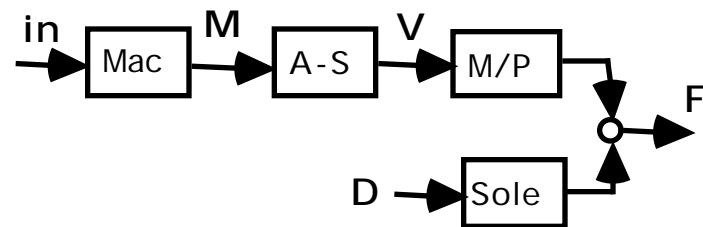
Proper Shutdown

Turn off the Accuspede power supply at the wall.

Computer Hardware

Computer	Quadra 950
RAM	24 meg
Processor	Motorola 68040
Speed	33 MHz
Disk	210 meg
Data Aq. Board	NB-MIO-16

FRC/309

Water Flow System

The flow control system consists of a water pump powered by a 3-phase electric motor. The speed of the motor is manipulated by the variable-voltage, variable-frequency power supply on the wall. The input signal (0-100% of 10 volts DC) to the power supply comes from the computer.

The water goes into one or more of the outlet pipes. The flow in the first pipe is detected by a MicroMotion mass flow meter. The MicroMotion sends out a signal of 4-20 ma that is fed through a 500 resistor to convert it to a voltage (1-5 volt DC) that is read by the computer.

Operation

Turn on computer system with the key at the top right of the keyboard.

Turn on the power to the Micro-Motion mass flow meter and the solenoid. Push the "Run" button on the Accuspede power supply.

Whenever the computer is turned on, the data acquisition board sends a "100% on" signal to the Accuspede. If the power is on and the pump motor is in a "run" condition, it will run full speed in the "power up" sequence. Be aware!

Proper Shutdown

Push the "Stop" button on the Accuspede. Leave the Accuspede plugged in (it seems to be sluggish to operate properly if it doesn't stay plugged in all the time). Turn off the power to the solenoid and the Micro-Motion mass flow meter.

Computer Hardware

Computer	Macintosh Centris 650
RAM	16 meg
Processor	Motorola 68040
Speed	33 MHz
Disk	230 meg
Data Aq. Board	NB-MIO-16