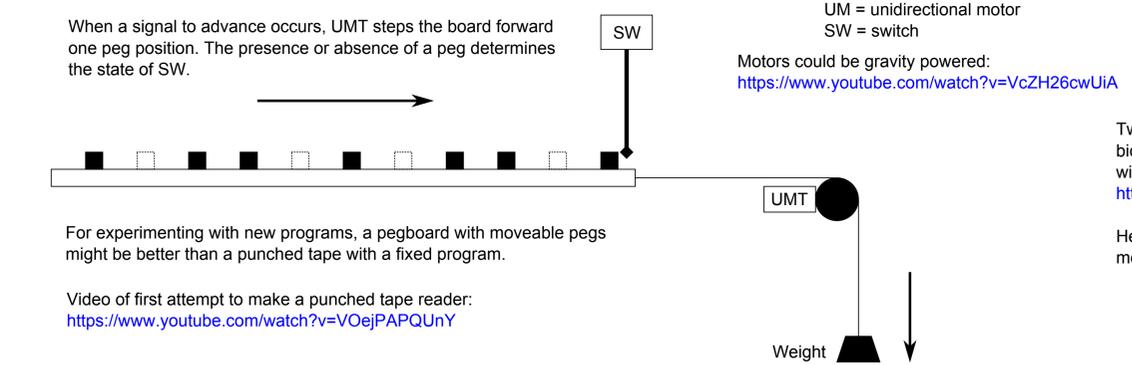
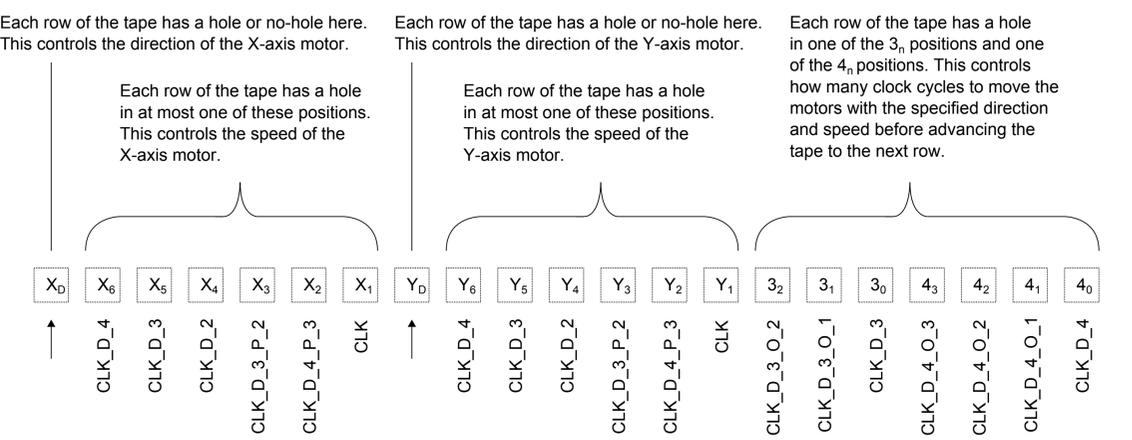


This diagram shows a punched-tape driven control system for a 2D plotter. It uses about 30 relays in total. Each row in the punched tape specifies a straight line path. The maximum length of a straight line path is 12 motor steps, so longer lines have to be made from shorter paths joined together. By adding extra count stages to the signal generator (and extra corresponding tape hole positions) the maximum line length could be increased, and the range of possible directions could also be increased.

This is a greatly simplified implementation of the idea described in this post:  
<http://forums.reprap.org/read.php?2,202918,203672#msg-203672>

The signal generator part of the circuit could be replaced with a set of cam wheels controlling switches to provide the equivalent pattern of signals - not sure whether this will be more reliable or less reliable than using relays.

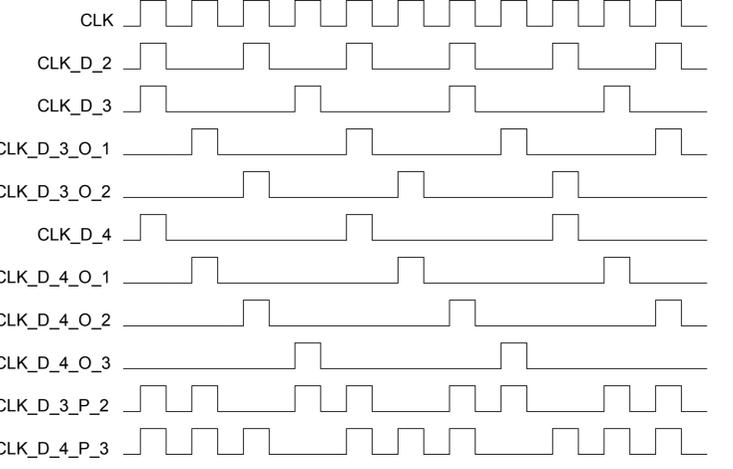


Each row on the tape can be written as:  
 X(d)(speed)Y(d)(speed):(N)

Where  
 (d) is a direction: F for forward, R for reverse  
 (speed) is either 0, 1, 3/4, 2/3, 1/2, 1/3, 1/4  
 (N) is the number of clock cycles to count before advancing the tape

For example, a program for moving the head along an octagonal path is:

XF0YF1:12  
 XF1YF1:12  
 XF1YF0:12  
 XF1YR1:12  
 XF0YR1:12  
 XR1YR1:12  
 XR1YR0:12  
 XR1YF1:12

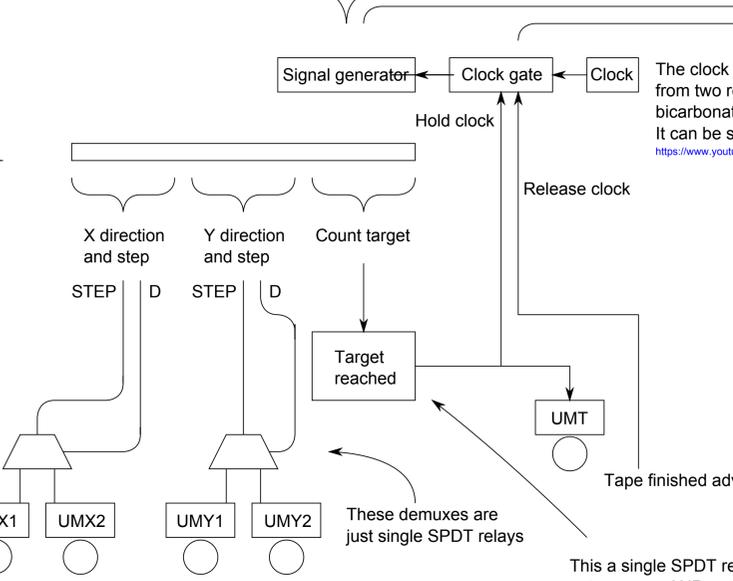


A video of almost all of the signal generator circuit is here:  
<https://www.youtube.com/watch?v=KcFXQk8daFk>

These signals are used to select a target count. Any pair of \_D\_3 and \_D\_4 signals only coincide once every 12 clock cycles.

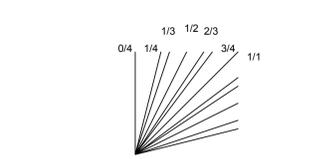
These signals are used to select the motor speed

These two signals are produced by ORing together other signals

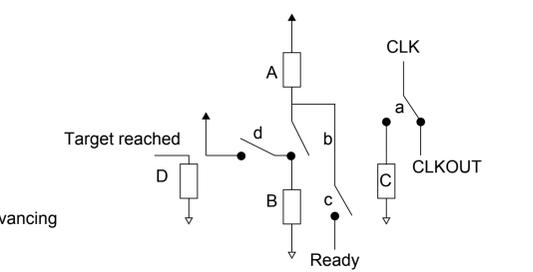
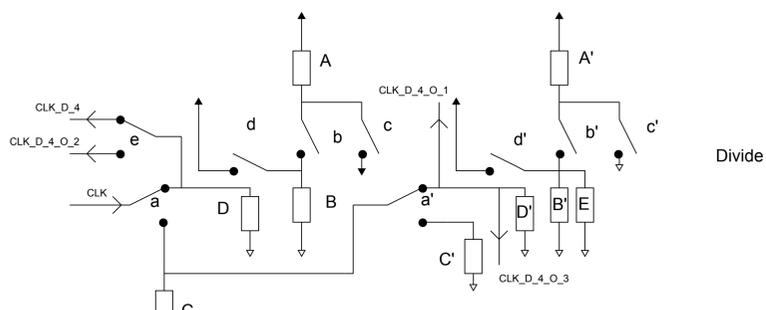
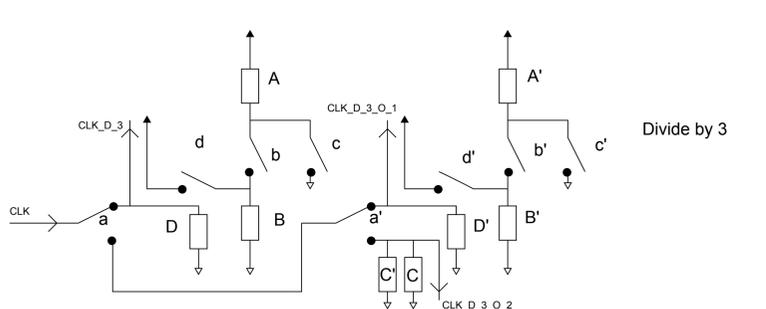


Two unidirectional motors can be used to produce bidirectional linear motion, either using a differential or with the mechanism in this video:  
<https://www.youtube.com/watch?v=MWUs36X0KAq>

Here we have two unidirectional motors per axis - so we have bidirectional linear X,Y motion.



With the motor speeds available, there are 48 possible movement directions, 12 per quadrant as shown above. Note that the lines will be jagged like the approximations to straight lines drawn on a bitmap display, not straight as shown here. The resolution of the plotter will determine how visible the jaggedness is.



A video of almost all of the relay part of the system is here:  
<https://www.youtube.com/watch?v=u3wFzTgOBfw>

In the video I used bipolar stepper motors rather than unidirectional motors. The bipolar steppers required a 14 relay driver circuit, rather than the single relay per axis needed for the unidirectional motors, so this video has 26 more relays than will be used if I make a version using unidirectional gravity powered motors.

This video has no punched tape - instead, whenever the circuit pauses (i.e. the clock gate diverts the clock away from the signal generator), I manually change the speed, direction and count connections that would be done by the advancing tape, then I release the clock.