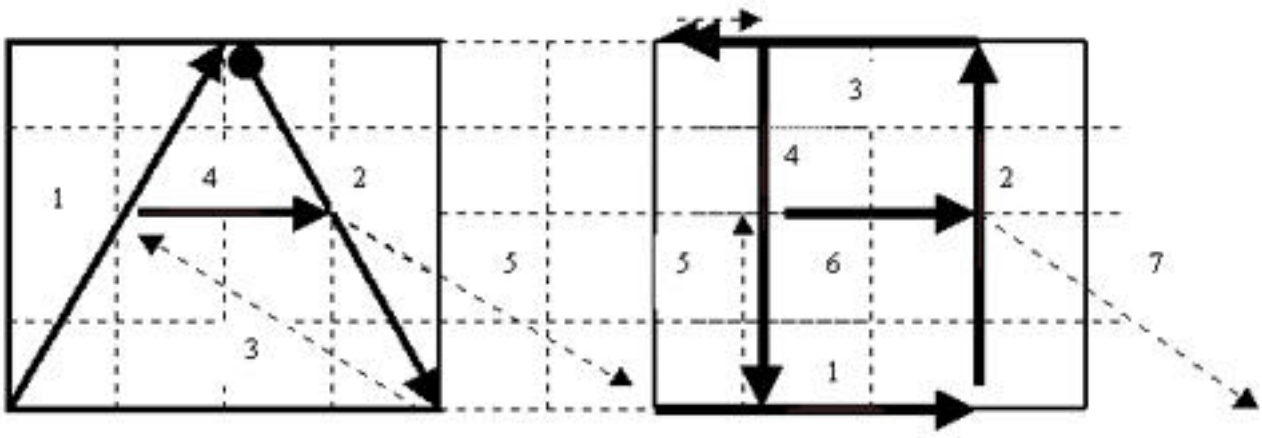

Figure a) Examples of Character Writing (Letters A and B are shown here)

The plotter can also write the 26 English characters in upper case, and the numbers 0-9. Each character/number is break into strokes. The character is put into a 4X4 square, so that the beginning and the end of each stroke is given a coordinate. Here is how we implement the character writing:

a) Rules of the game

1. Character writing always starts from the lower left corner of the square. (0,0)
2. Character writing always ends at (6,0), which is the beginning of the next character.

b) Implementing with codes

We have a function called ***move_by(int x1, int y1, int pen),*** which will move the cursor by (x1,y1) with the pen up/down specified. An example of writing the letter A with the following sequence:

Stroke 1: move_by(2,4,pen_down);
Stroke 2: move_by(2,-4,pen_down);
Stroke 3: move_by(-3,2,pen_up);
Stroke 4: move_by(2,0,pen_down);
Stroke 5: move_by(3,-2,pen_down);

Notice that after stroke 5 is finished, the letter A is written and the cursor is at where the next letter will begin.

c) Font size

The plotter is capable of writing characters in given font sizes. This is achieved by shifting the coordinates of each stroke. For example, if we want to make the letter 4 times as big, we enter in the hyper-term, font=2. For the strokes, we actually have for A:

Stroke 1: move_by(2<<font,4<<font,pen_down);
Stroke 2: move_by(2<<font,-4<<font,pen_down);
Stroke 3: move_by(-3<<font,2<<font,pen_up);
Stroke 4: move_by(2<<font,0<<font,pen_down);

Stroke 5: move_by(3<<font,-2<<font,pen_down);

d) other functions implemented for character writing
In order to make the plotter a more complete character printing device, we also implemented the following functions:
1. home(void) : Takes us to the start (upper right hand corner) of our paper
2. newline(void): When at the end of the line, go to a new line.(functions as ENTER key)
3. space(void): works as the space bar.

e) Further exploring and suggestions
The next step we will take to make this plotter a better cartridge-free printer is to implement lower case letters and punctuation marks. If the reader is enthusiastic, it would be a great idea to encode some Chinese or Japanese characters in the chip too since those characters are all in straight line strokes too.