# TECH 4243
Lab #3
Ver 1.0

Background: Magnetic card readers have been used in Point of Sale systems at businesses for years. They work on the same principle as other magnetic media (hard drives, cassette tapes etc) using magnetic fields to store data. In the case of credit cards, two tracks are encoded on the magnetic strip: a clock pulse and data. Here is a sample of the first few characters of an encoded card[1]:
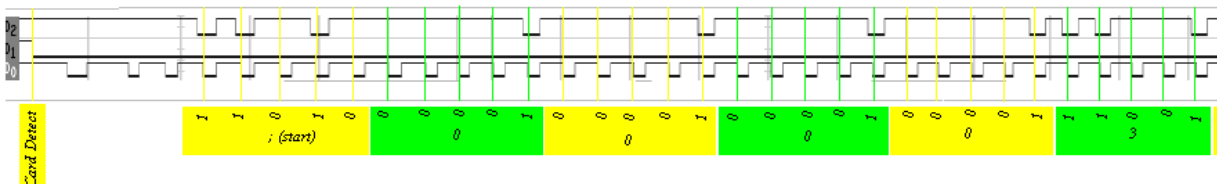
In the above: D0 is the clock, D1 is card detect and D2 is the data encoded on the card. The data is encoded on the card using the ANSI/ISO BCD Data format according to the following table[2]:

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Figure 6:          ANSI/ISO BCD Data Format
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    • Remember that b1 (bit #1) is the LSB (least significant bit)!
    • The LSB is read FIRST!
    • Hexadecimal conversions of the Data Bits are given in parenthesis (xH).



        --Data Bits--   Parity
        b1  b2  b3  b4   b5    Character  Function<>

        0   0   0   0    1       0 (0H)    Data
        1   0   0   0    0       1 (1H)     "
        0   1   0   0    0       2 (2H)     "
        1   1   0   0    1       3 (3H)     "
        0   0   1   0    0       4 (4H)     "
        1   0   1   0    1       5 (5H)     "
        0   1   1   0    1       6 (6H)     "
        1   1   1   0    0       7 (7H)     "
        0   0   0   1    0       8 (8H)     "
        1   0   0   1    1       9 (9H)     "
        0   1   0   1    1       : (AH)    Control
        1   1   0   1    0       ; (BH)    Start Sentinel
        0   0   1   1    1       < (CH)    Control
        1   0   1   1    0       = (DH)    Field Separator
        0   1   1   1    0       > (EH)    Control
        1   1   1   1    1       ? (FH)    End Sentinel<>

            ***** 16 Character 5-bit Set *****
                10 Numeric Data Characters
                3 Framing/Field Characters
                3 Control Characters<>
```
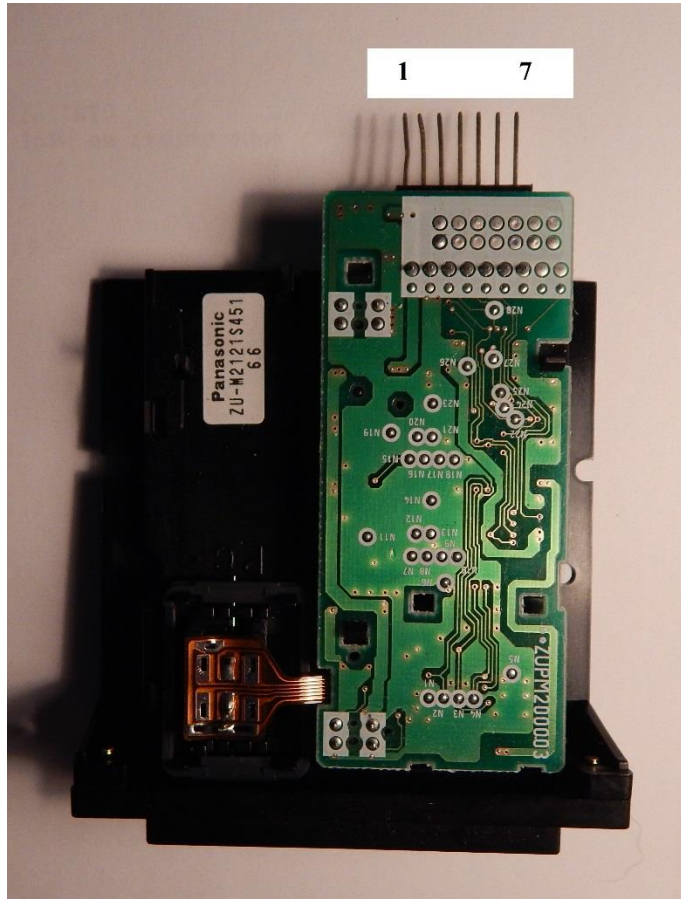
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[1] http://dankohn.info/projects/mag_card.htm
[2] http://dankohn.info/projects/mag_card/Sci_Electronics%20FAQ%20Repair%20Card%20Readers.htm

We will be using a MCR-12 Magnetic Card reader.

Connector Pin #	Signal Name
1	+5v
2*	/RDT
3*	/RCL
4*	/CLD
5*	/CLD1
6*	/CLD2
7	Gnd

* - pull up resistor (10KΩ required)

Where:

/RDT	Read Data – at the moment /RCL changes from high to low (falling edge) /RTD contains the INVERTED data (a high = 0, a low = 1)
/RCL	Read Clock – falling edge indicates /RTD is ready to be read
/CLD	Card Load – Signal will go low when card is being inserted, go high when fully inserted and then go low while being removed. This pin will remain high when no card is present.

Procedure:

1) Use /RCL (Connected to the INT0 pin) to trigger an interrupt. Use a GLOBAL variable to count the number of interrupts and print this value on the terminal in the main loop. This number should be aprox 150 counts (one direction – insert or removal of card).

2) Now add to main a loop to wait for the /CDL pin to go low before going into the print count loop.

3) Within the interrupt, check the /RDT pin, if the pin is 0 put a '1' in a global char array (using count as the index value], if the pin is 1 put a '0' in the global char array.

4) Now add to main the code necessary to print the char array when the /CDL pin goes high.

Copy the produced string of ones and zero's and print them out. Manually decode the card number and prove it read the expected numbers.

Turn in code (via online submission) and hand written decoded card value(s).