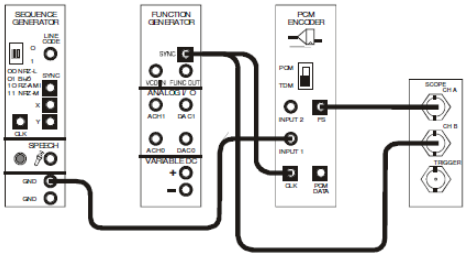
PCM ENCODING

EXPERIMENT RESULTS:



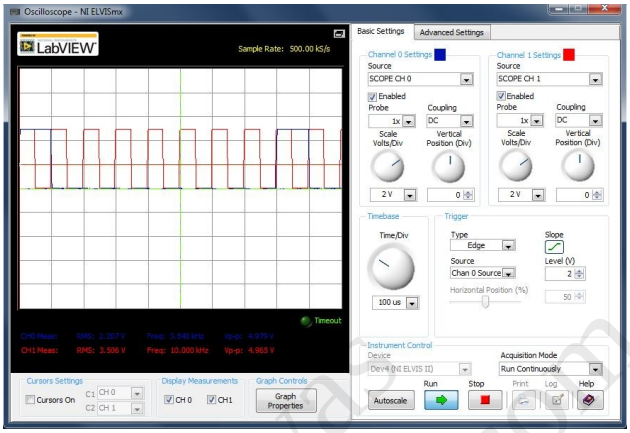


***Figure 1**: The above figures shows a set-up for PCM encoding using a static DC Voltage and the resulting output of the set-up.*

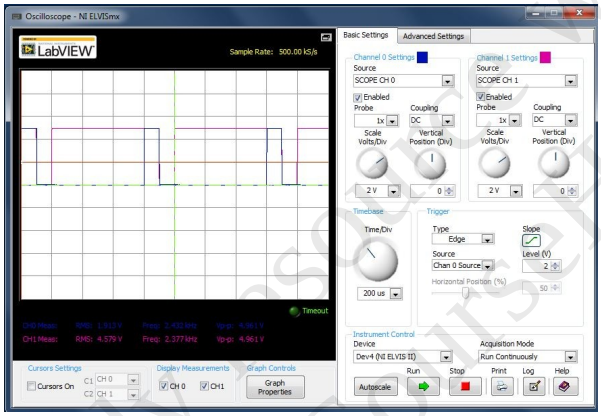
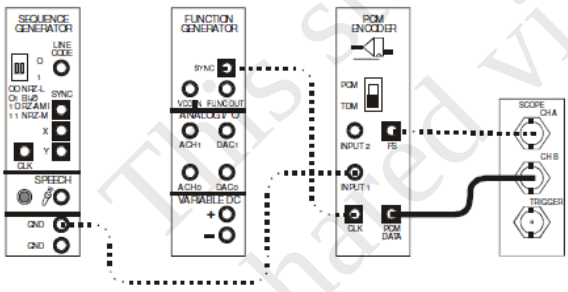


***Figure 2**: Resulting output of the above set-up after setting scope's slope control to the "-"position.*



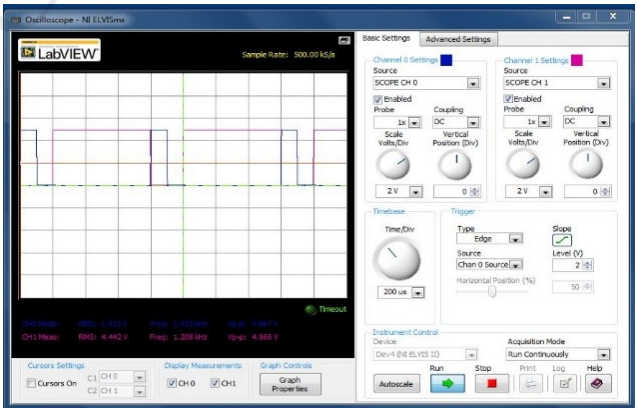
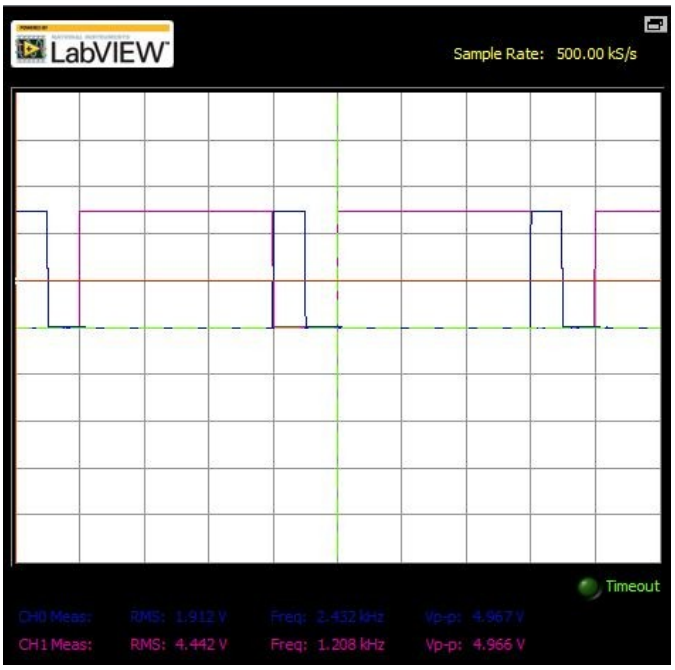


***Figure 3**: Displaying 10 bits of the PCM Encoder module's data output.*

Question 1



Indicate on your drawing the start and end of the frame.

Question 2

Indicate on your drawing the start and end of each bit.

Question 3

Indicate on your drawing which bit is bit-0 and which is bit 7.

Question 4

What is the binary number that the PCM encoder module is outputting?

- The number should be 10000000. But it will vary above and below this number from unit to unit due to small amounts of DC offset.

Question 5

Why does the PCM Encoder module output this code for 0V DC and not 0000000?

- So that the PCM encoder will encode voltages above and below 0V.

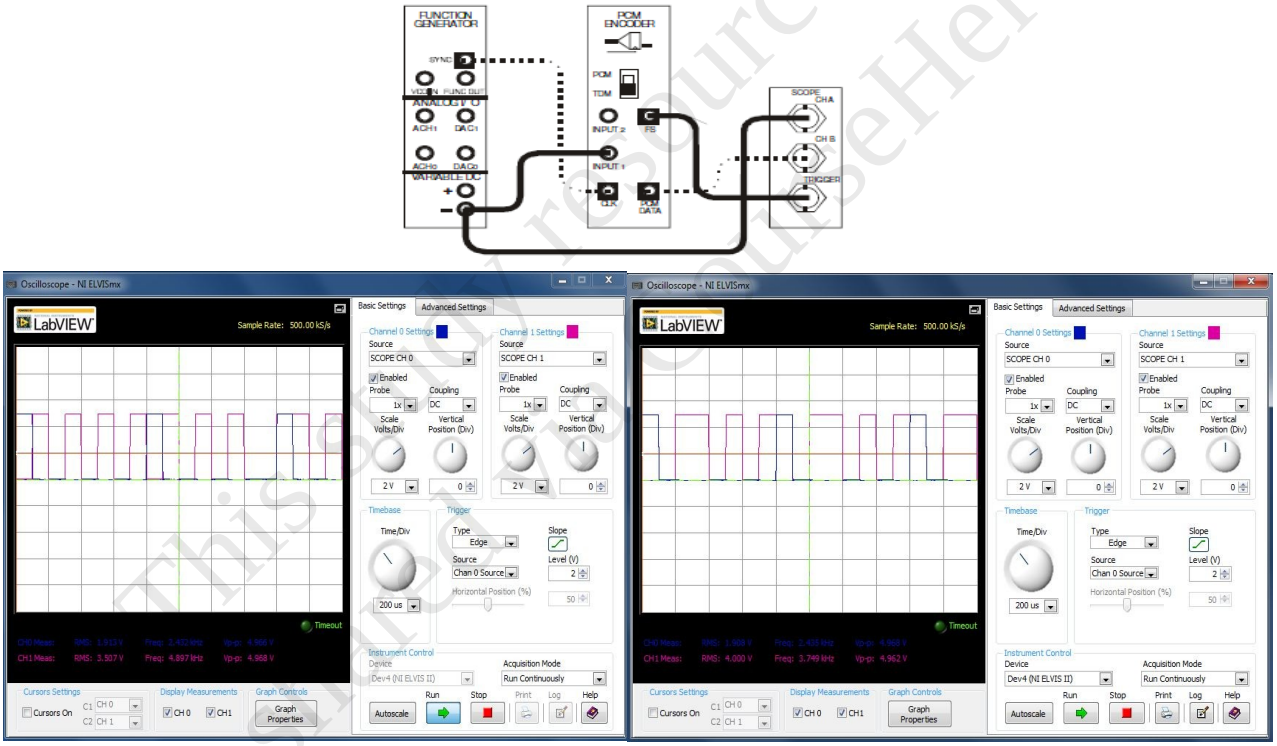


***Figure 4**: Varying the DC Voltage of PCM encoder module and Setting the scope's trigger source control to the trigger position.*

Question 6

What happens to the binary number as the input voltage increases in the negative direction?

- *The number gets smaller*

Question 7

What happens to the binary number as the input voltage increases in the positive direction?

- *The number gets bigger*

Question 8

What is the maximum allowable peak-to-peak voltage for an AC signal on the PCM encoder module's input?

- *5Vp-p. The values in table 1 and 2 should be about 2.5V*

Question 9

Calculate the difference between the PCM encoder module's quantization levels by subtracting the values in table 1 and 2 and dividing the number by 256

- *19.5 mV*

Table 1

PCM Encoder's output code	PCM Encoder's input voltage
00000000	

Table 2

PCM Encoder's output code	PCM Encoder's input voltage
11111111	

Question 10

Why does the code on PCM encoder module's output change continuously?

- *Due to the reason that its voltage is different every time it samples the input signal.*

PCM DECODING

EXPERIMENT RESULTS:

***Figure 1**: The PCM Encoder module's PCM Data output at 1V and 1.5V respectively.*

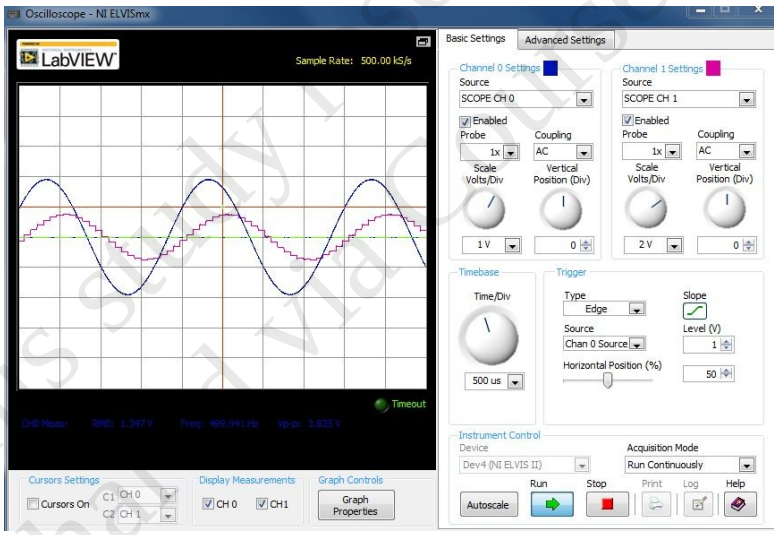


***Figure 2**: The PCM Encoder module's PCM Data output when the function generator is activated.*

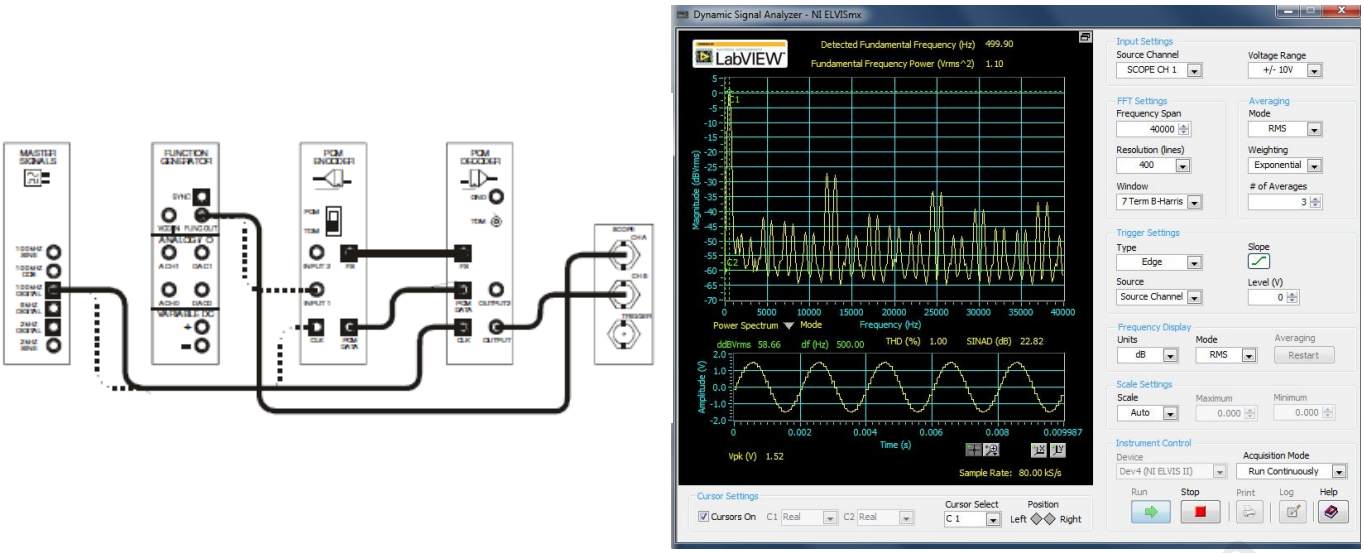


***Figure 3**: The set-up and resulting output of PCM Decoder module.*

Question 1

What does the PCM decoder's stepped output tell you about the type of signal that it is?

- *The output is a PAM signal*

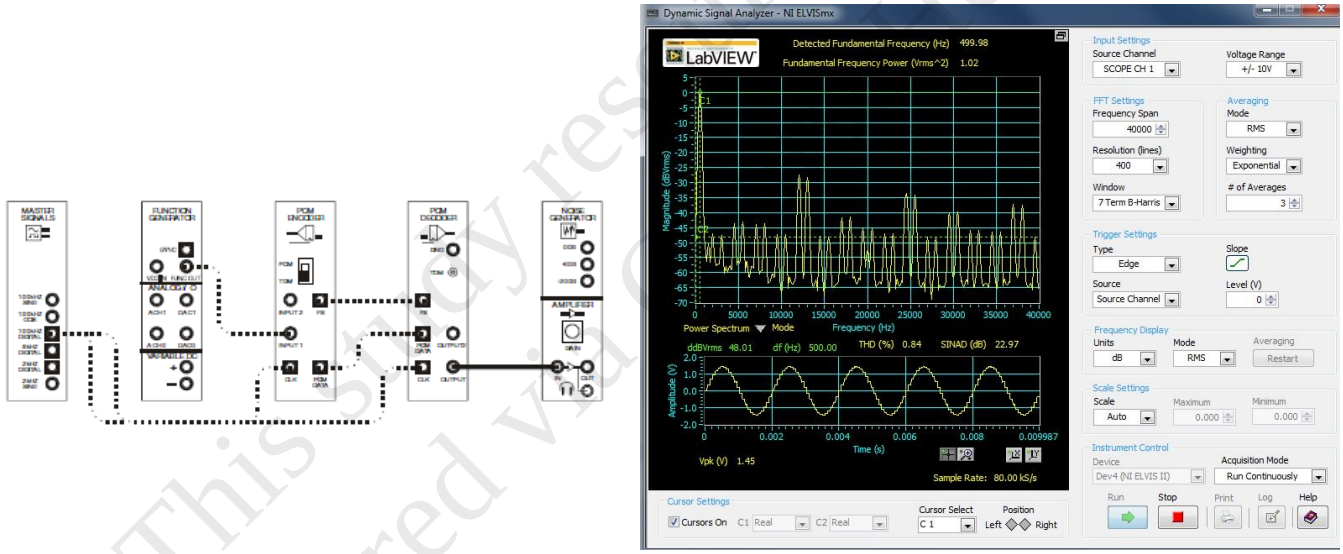


***Figure 4**: The set-up and resulting output of PCM decoder module when the amplifier module's lead us disconnected.*

Question 2

What must be done to the PCM decoder module's output to reconstruct the message properly?

- *The signal must pass through a low-pass filter.*

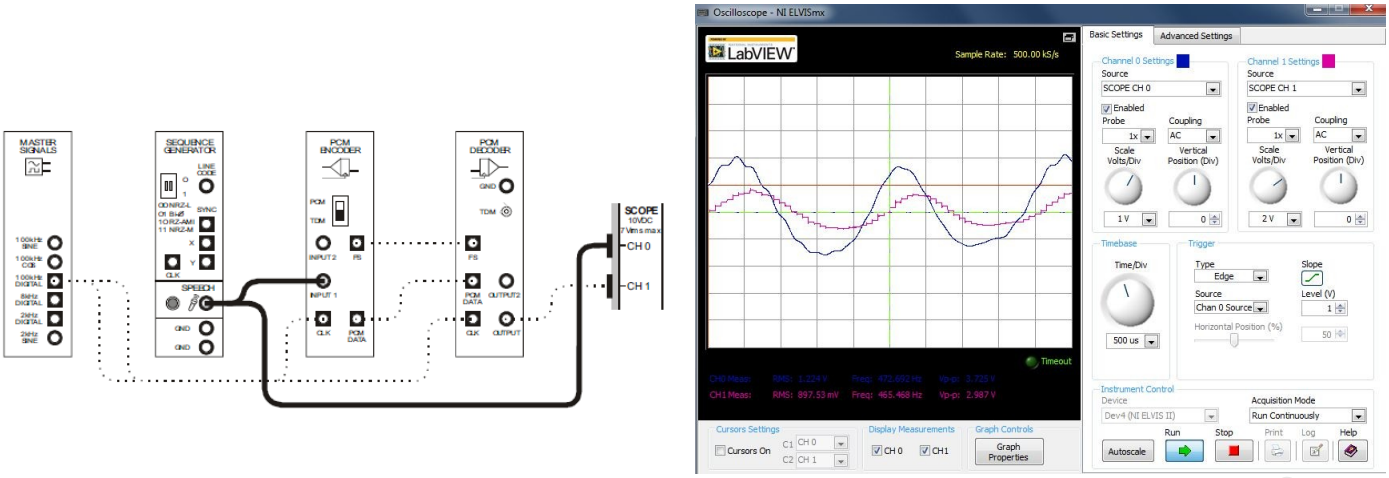


***Figure 5**: The set-up and resulting output of Encoding and decoding speech*

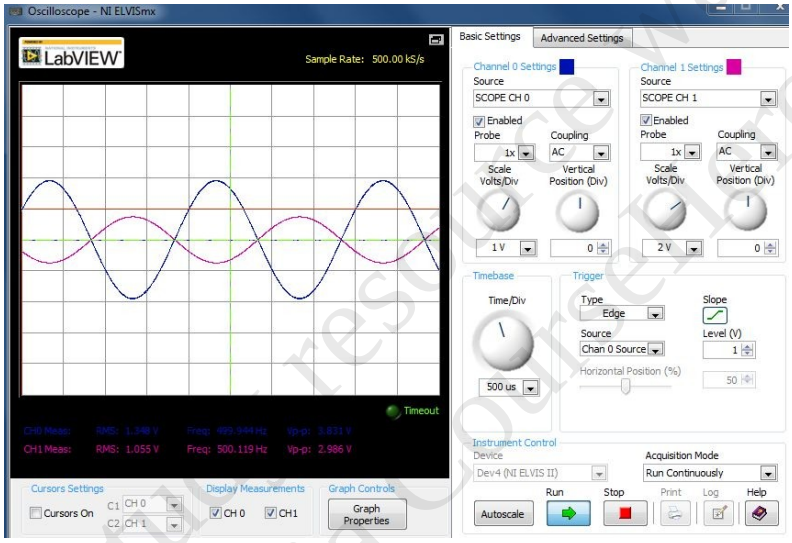


***Figure 6**: The resulting output when the tuneable low-pass filter module was used to reconstruct the original message from the PCM Decoder module's PAM output.*

Question 3

Even though the two signals look and sound the same, why isn't the reconstructed message a perfect copy of the original message?

- *Dues to quantization error/noise*

PCM Encoding and Decoding

In partial fulfillment for the course
ECE 106.1 (Digital Communications Laboratory)
1st Term, A.Y. 2018-2019

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