Name: *Allen Ben Philipose*

Registration No: *18BIS0043*

Subject Code: *ECE3029*

Slot: *L15 + L16 + L29 + L30*

Faculty: *Dr. Sivakumar R*

Lab Assesment – 4

Analog-to-Digital Conversion

Aim

Design and analyse the performance of the following pulse code modulation

(i) Convert pulse amplitude modulation signal into digital and vice versa using ADC with m=1

(ii) Convert pulse amplitude modulation signal into digital and vice versa using ADC with m=0.5 – which can be integrated later into the system

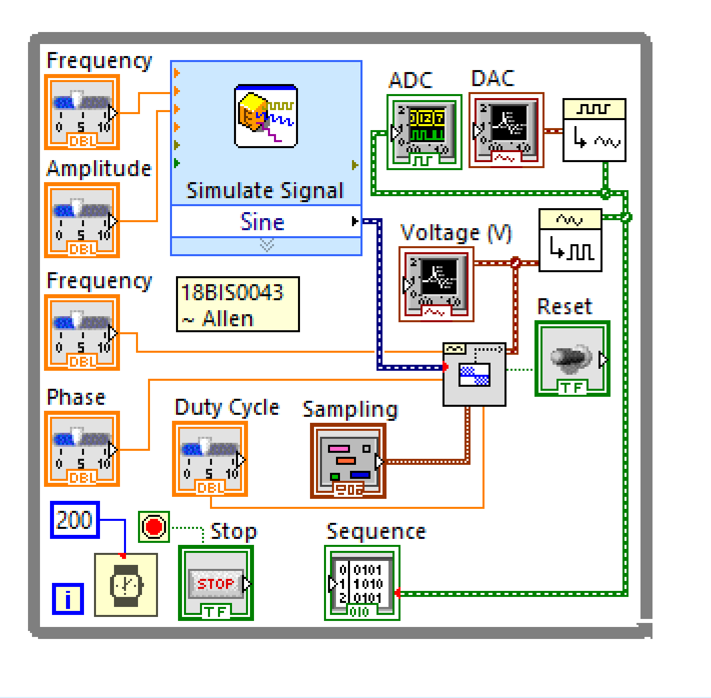
Abstract

Initially, the sinusoidal wave has to be converted to a pulse amplitude wave and then converted to the digital format using an ADC.

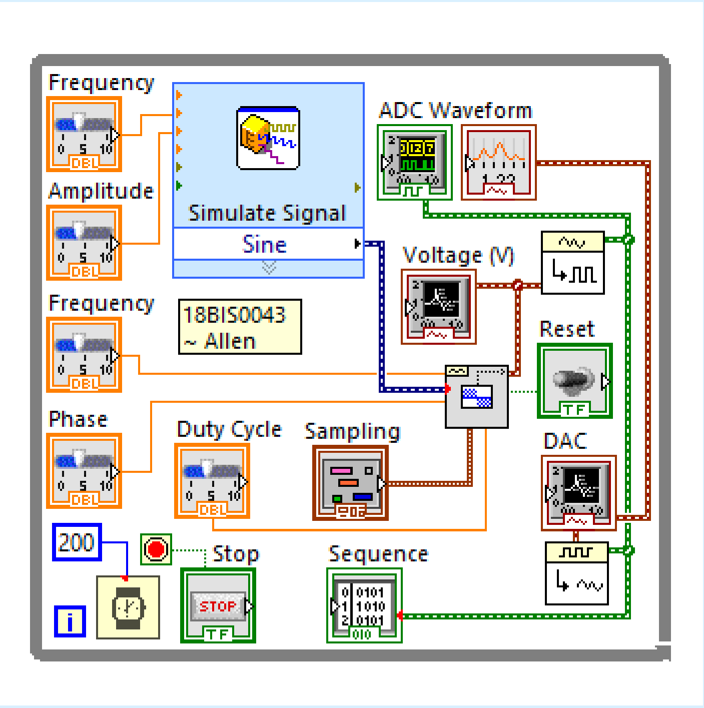
Therefore, this LabVIEW program accepts the amplitude, the frequency of the message wave, the duty cycle, phase and frequency of the pulse wave (where amplitude isn't required since it is controlled by the sinusoidal wave), from the user, for displaying the output.

The pulse code wave can be displayed by a 16-bit display and should be later converted to the pulse amplitude wave using a DAC at the receiver end. Take precaution to observe that the pulse amplitude waves at both ends, before ADC and after DAC should be same for the message to be transmitted properly.

Circuit Diagram



To display additional information for the waveform, we can use a separate add-on instrument called “waveform”, which can show the amplitude levels for a particular timestamp



Components and Features

- ✓ *Input Slides with digital display for Message amplitude, Message Frequency, Pulse frequency, Pulse duty cycle and Pulse Phase is given at the main setup panel.*

- ✓ *This prototype gives the user plenty of control over the input and the desired output and is well cleanly displayed with minimal number of output screens and simple instructions easily understandable for any common worker to work on.*

- ✓ *Reset button to clear the memory of square wave generators to avoid congestion while plotting graphs*

- ✓ *The stop button can be considered as a switch off to the running loop and will return the program to the initial menu freezing the current output.*

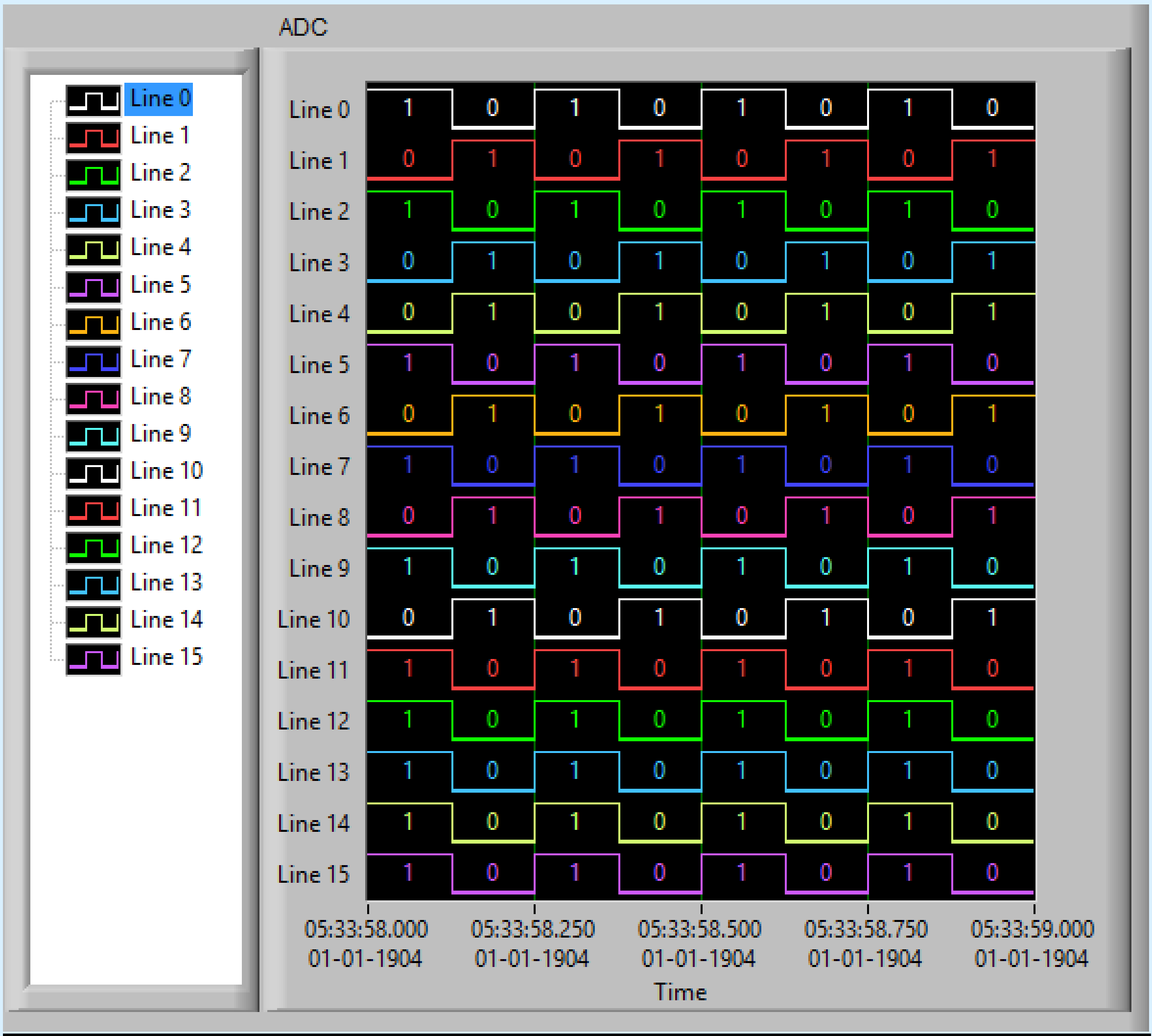
- ✓ *A* ***16-bit digital value*** *gives a very high level of accuracy to the amplitude of the wave that is received and hence can be very useful in avoiding noise effects during the transmission.*

- ✓ *The sequence box displays the amplitude values, where in the current scenario: -1V is 0 and 1V is* 2^{16} *= 65536. The amplitude is shown in such a way in the display hence can be converted to a very precise value of amplitude voltage*

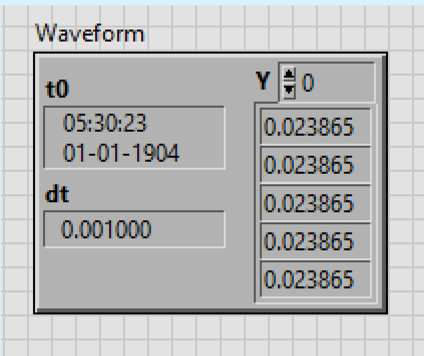
- ✓ *ADC – Analog to Digital Converter*
  DAC – Digital to Analog Converter

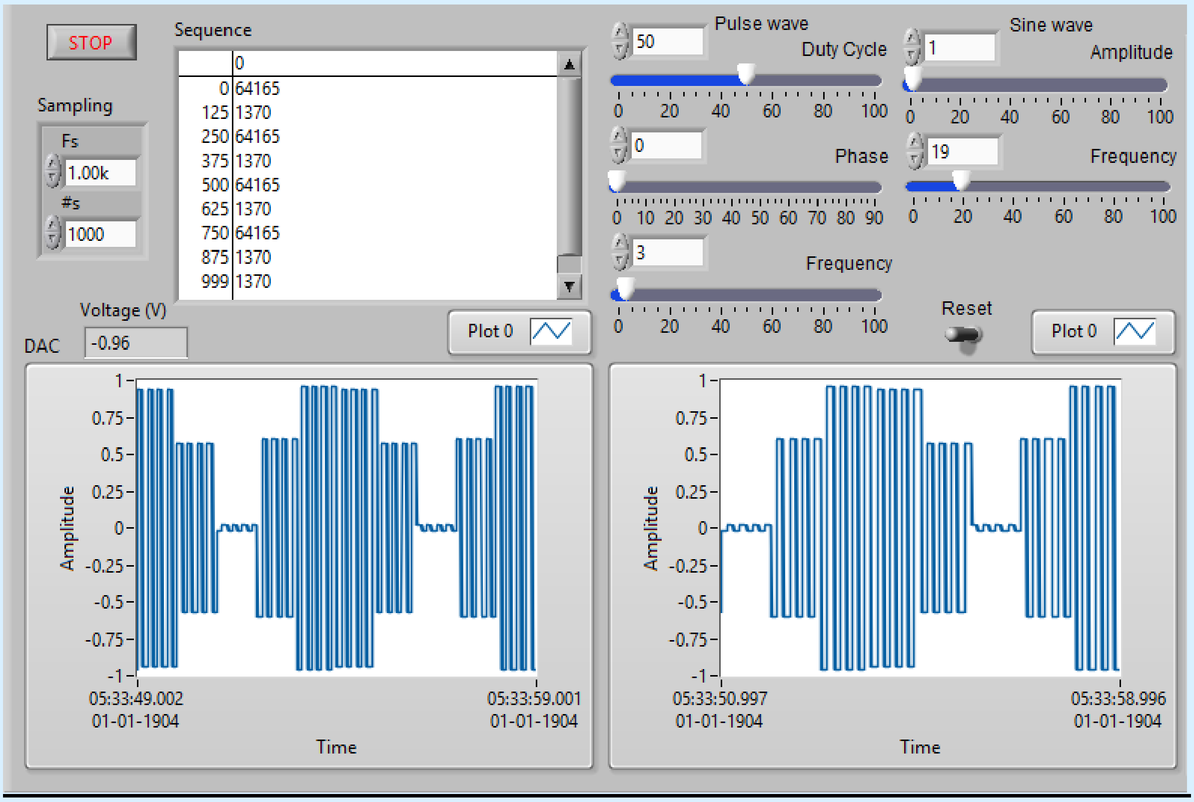
  Both these are provided by the LabVIEW software for easy demonstration of pulse code modulation in software methods.

Board Diagram



This window gives more information on the amplitude





Result

The message signal is modulated using PAM, and then converted to digital using pulse code modulation using an ADC on the transmitting end and can be demodulated on the receiver end to attain the amplitude values when passed through a DAC using LabVIEW software.