# Signal Analysis Using LabVIEW

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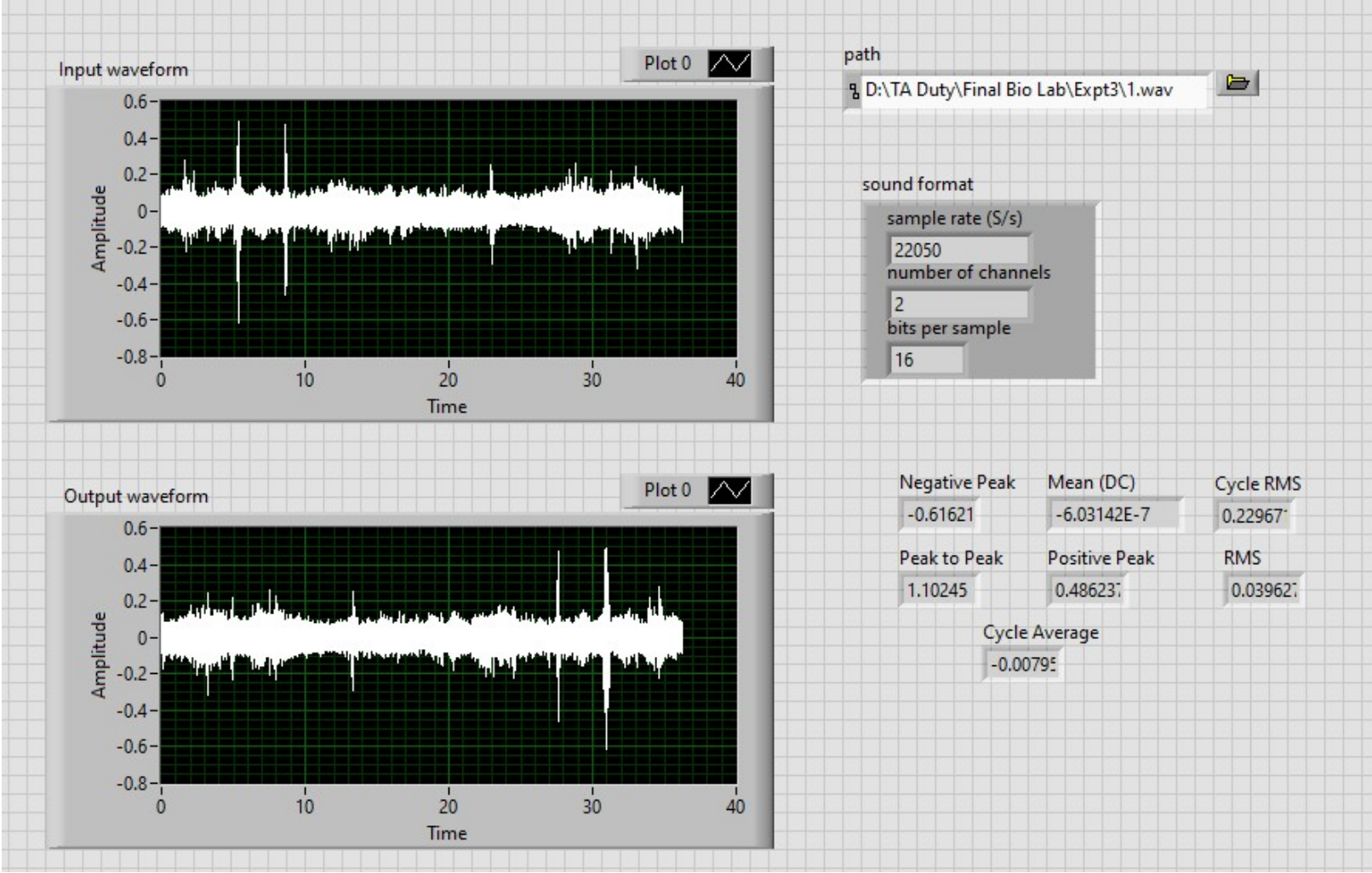
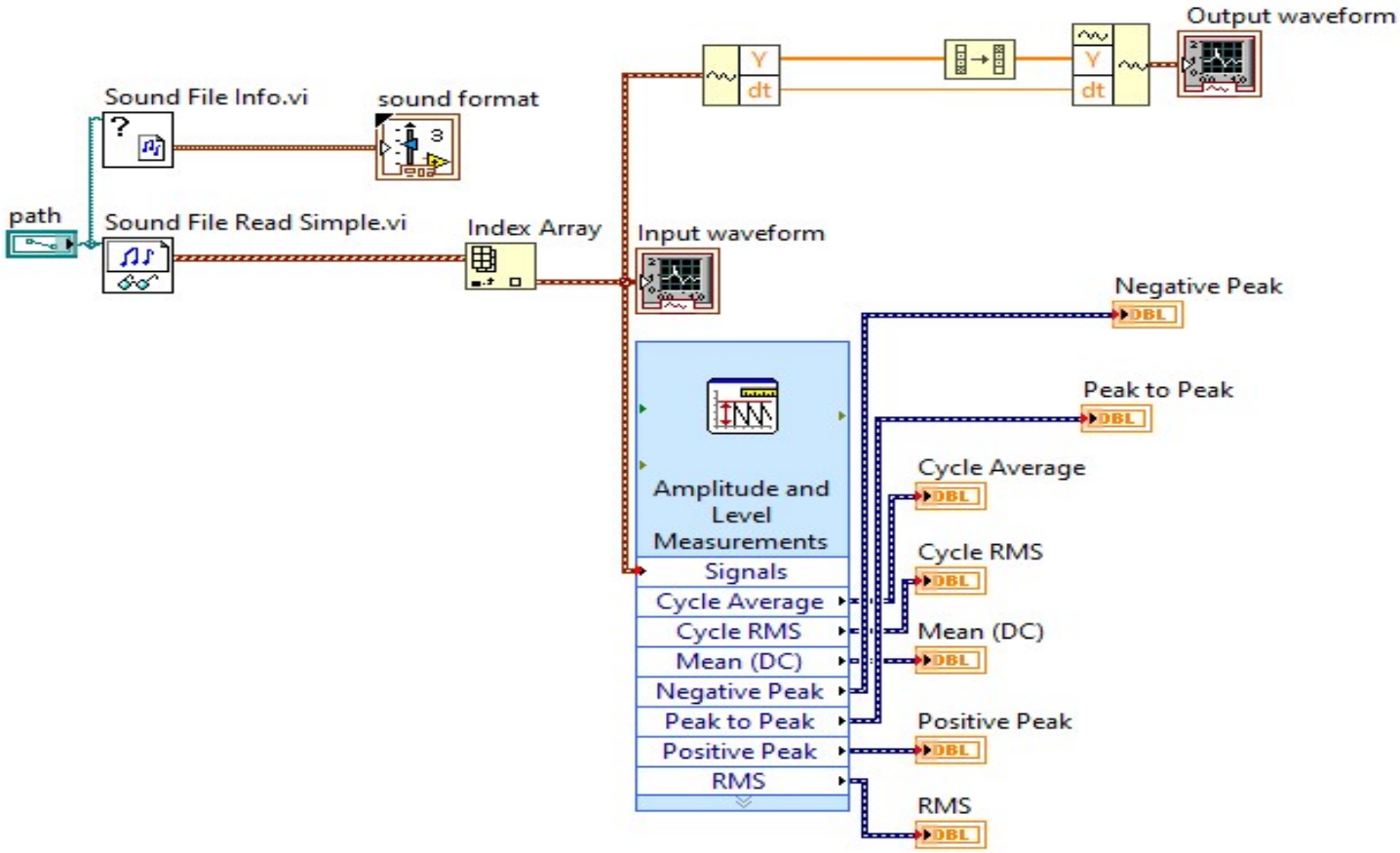
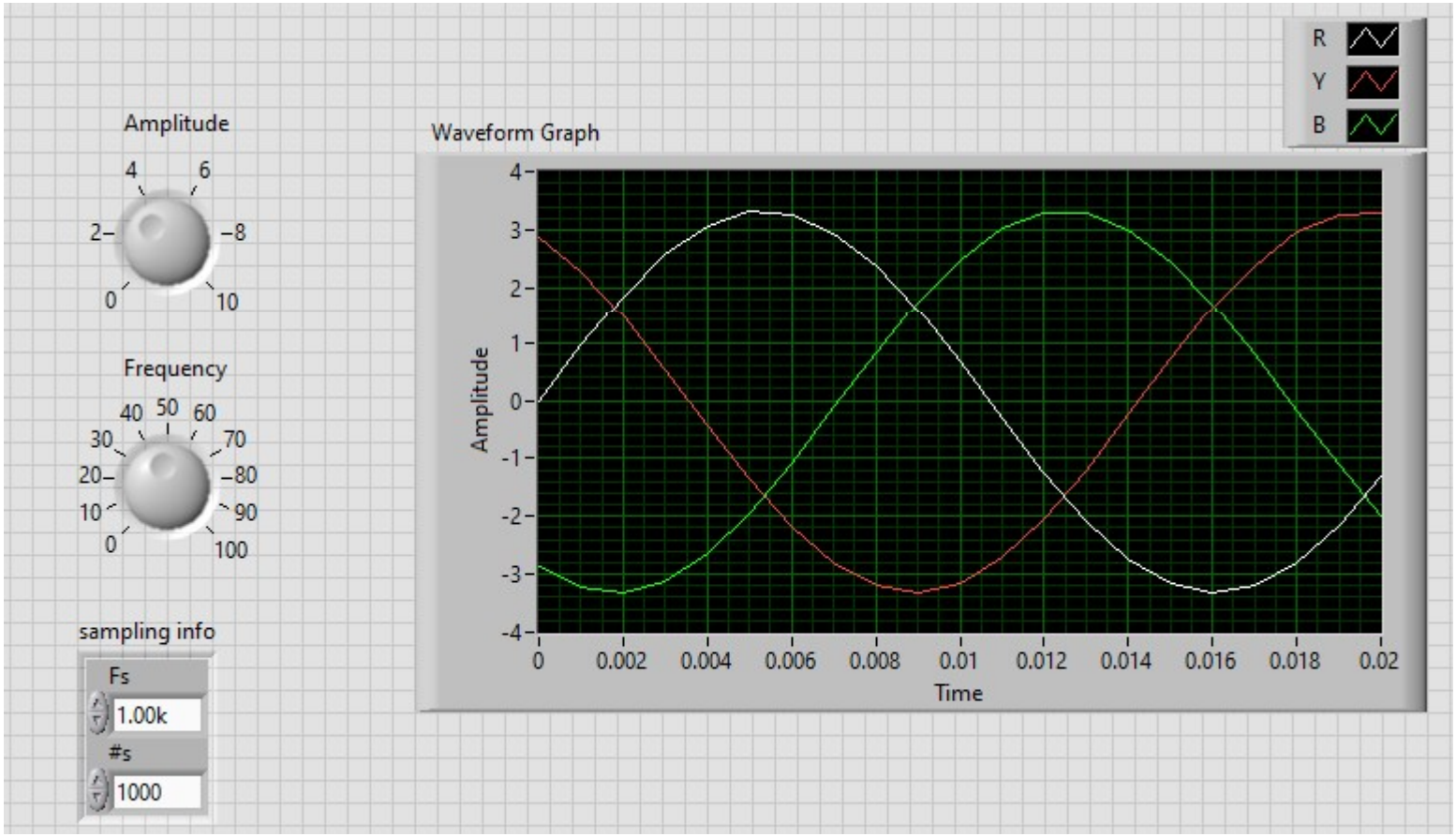
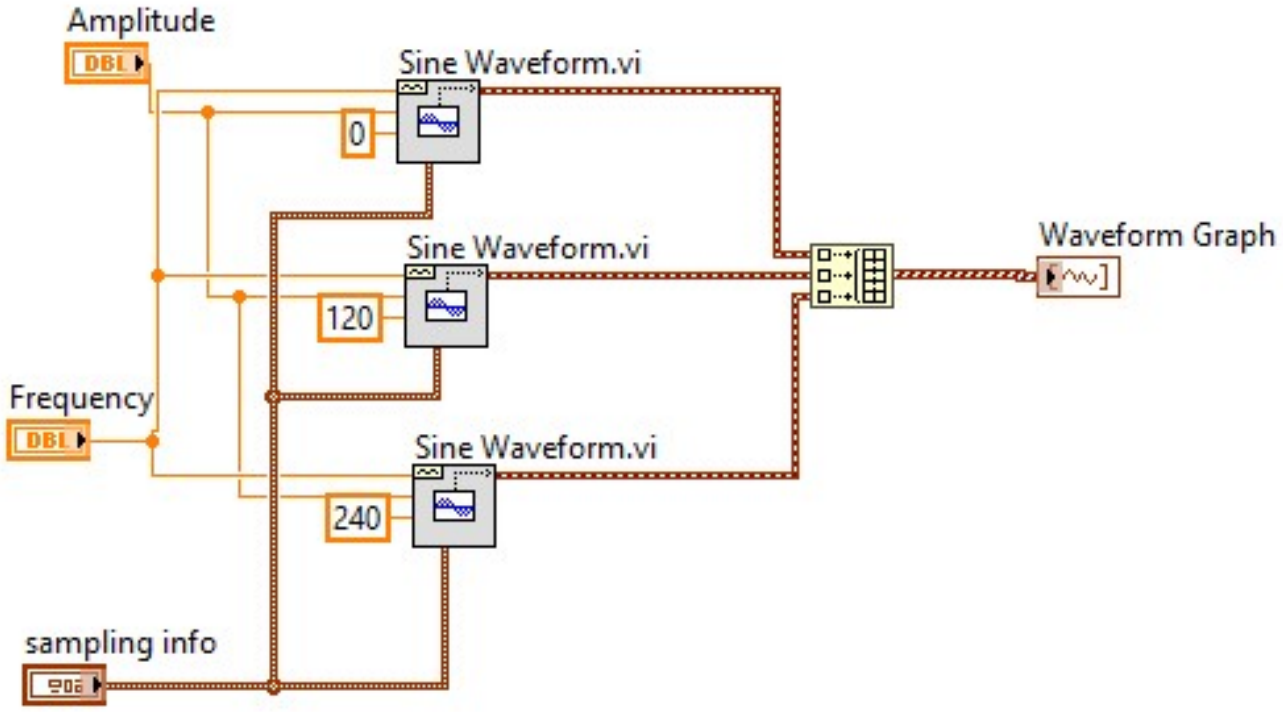
# Expt#1: Read Sound file



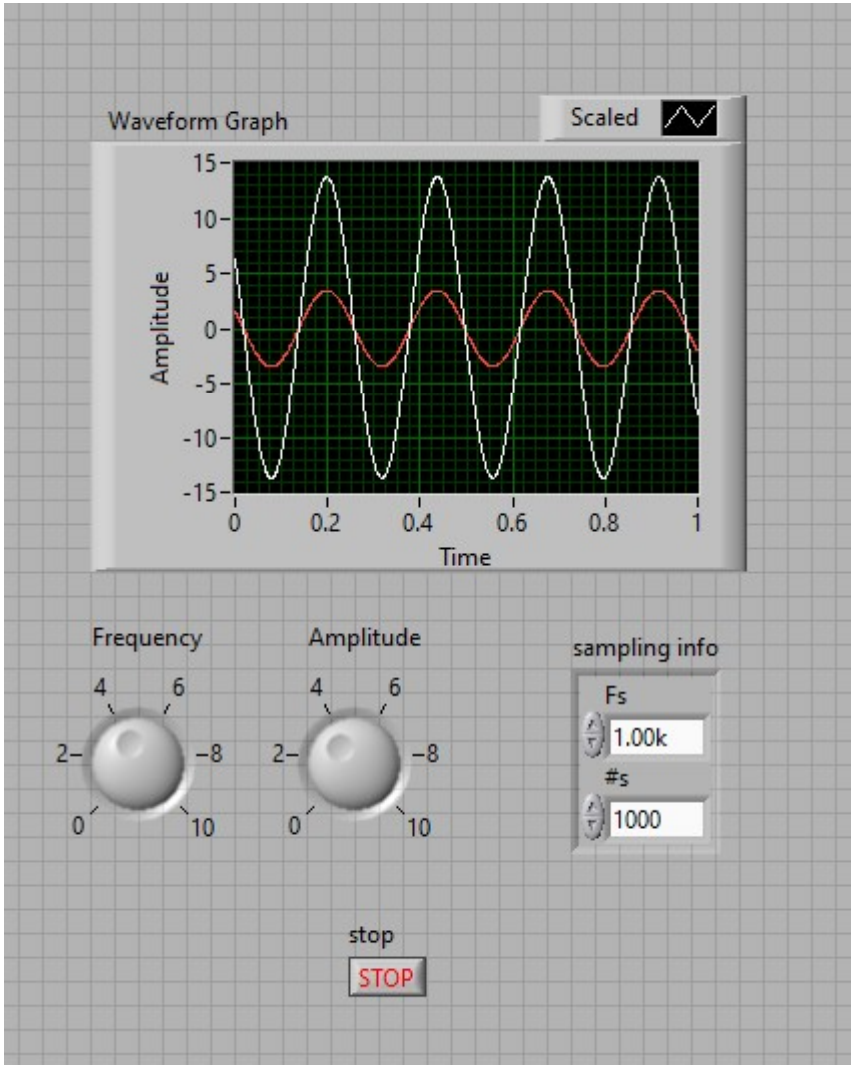

Output waveform
Y
dt
Y
dt
Sound File Info.vi
sound format
path
Sound File Read Simple.vi
Index Array
Input waveform
Negative Peak
Peak to Peak
Cycle Average
Cycle RMS
Mean (DC)
Positive Peak
RMS
Amplitude and Level Measurements
Signals
Cycle Average
Cycle RMS
Mean (DC)
Negative Peak
Peak to Peak
Positive Peak
RMS
DBL

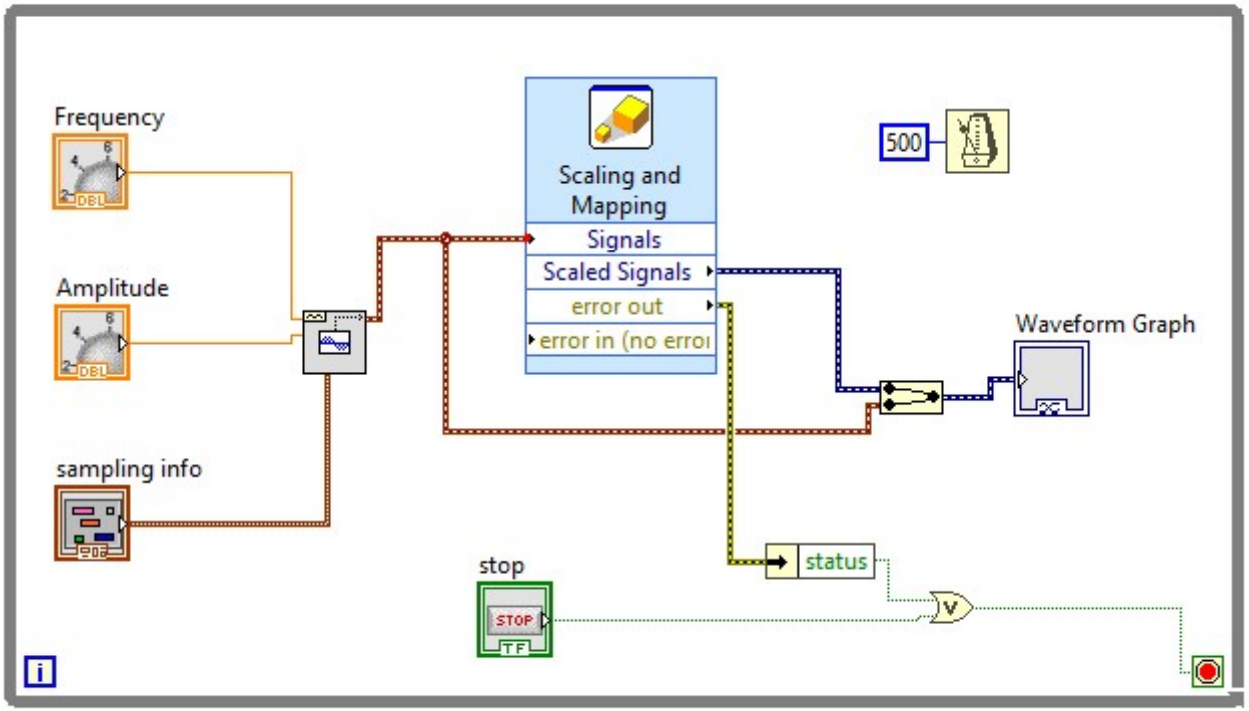
# Expt#2: Generate 3-phase signal



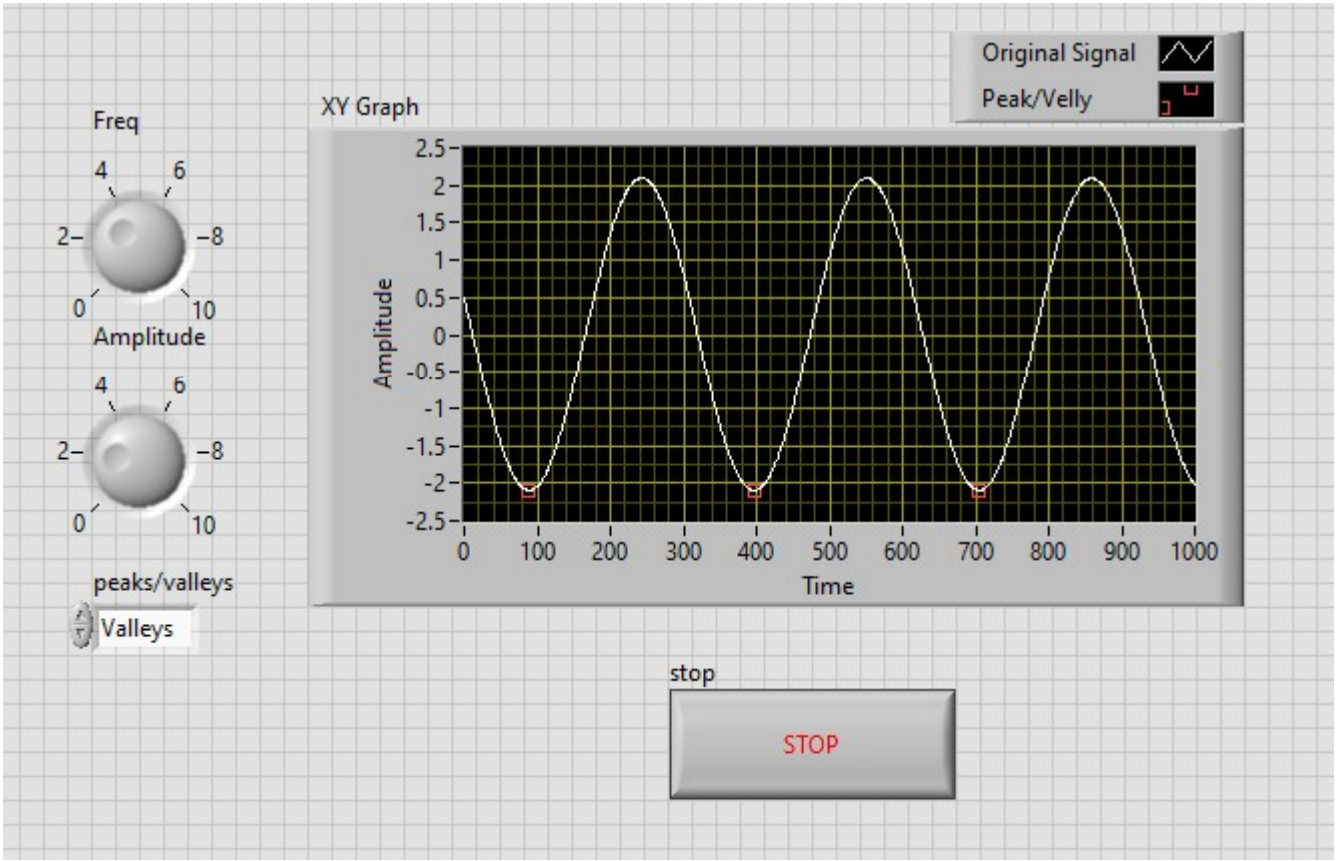

Amplitude
DBL
Sine Waveform.vi
0
Sine Waveform.vi
120
Waveform Graph
Frequency
DBL
Sine Waveform.vi
240
sampling info

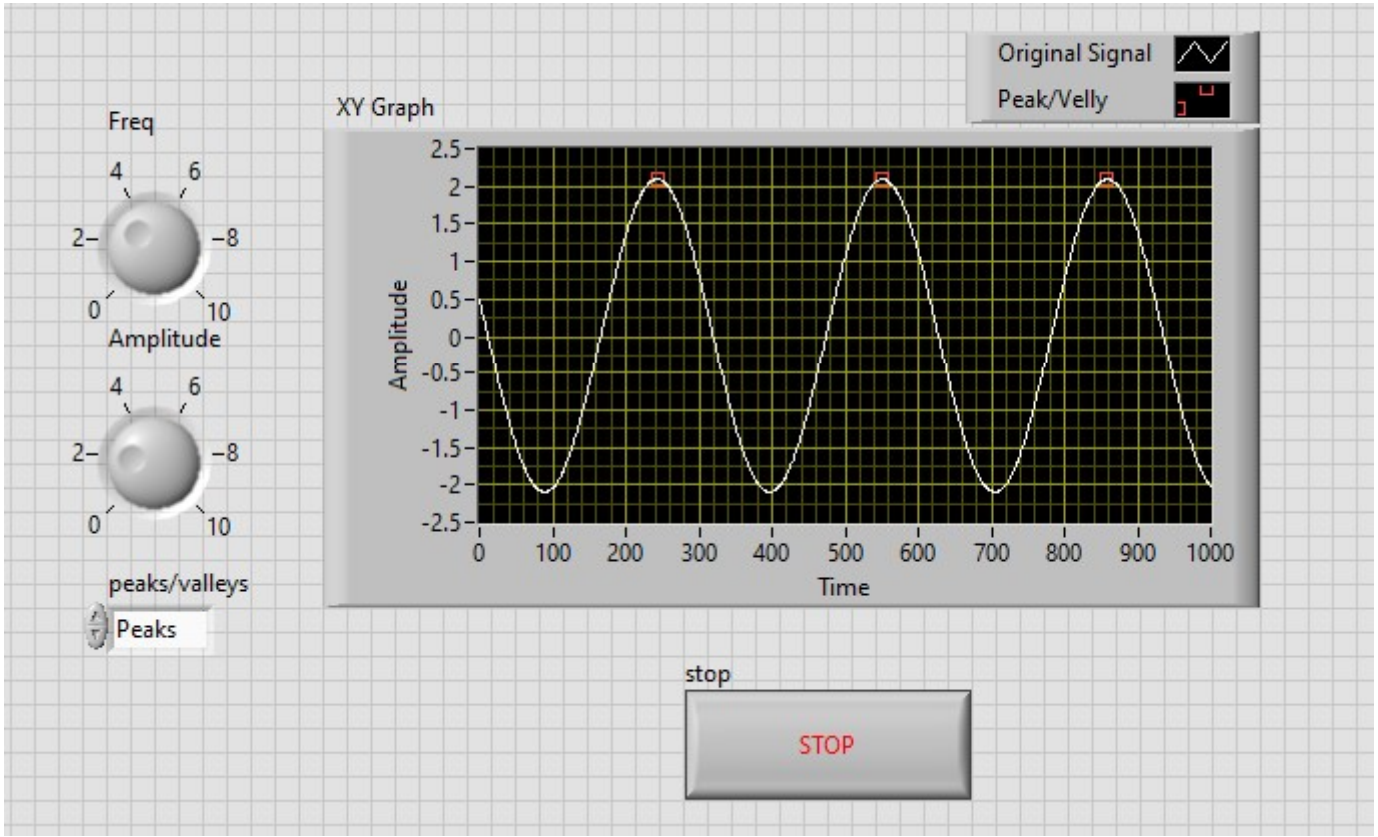
# Expt#3: Scaling of signal

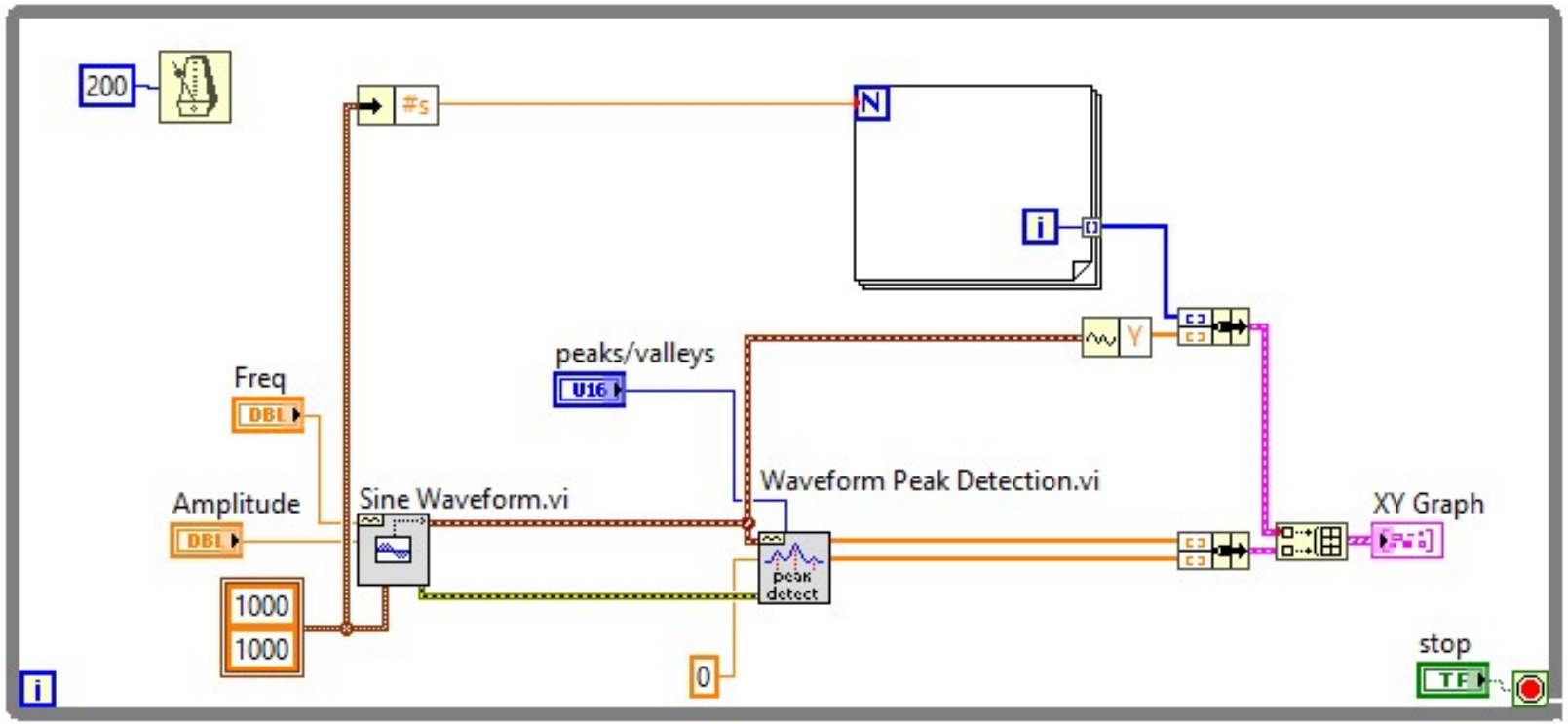



Frequency
Amplitude
sampling info
Scaling and Mapping
Signals
Scaled Signals
error out
error in (no erro
500
Waveform Graph
status
stop
STOP
TF

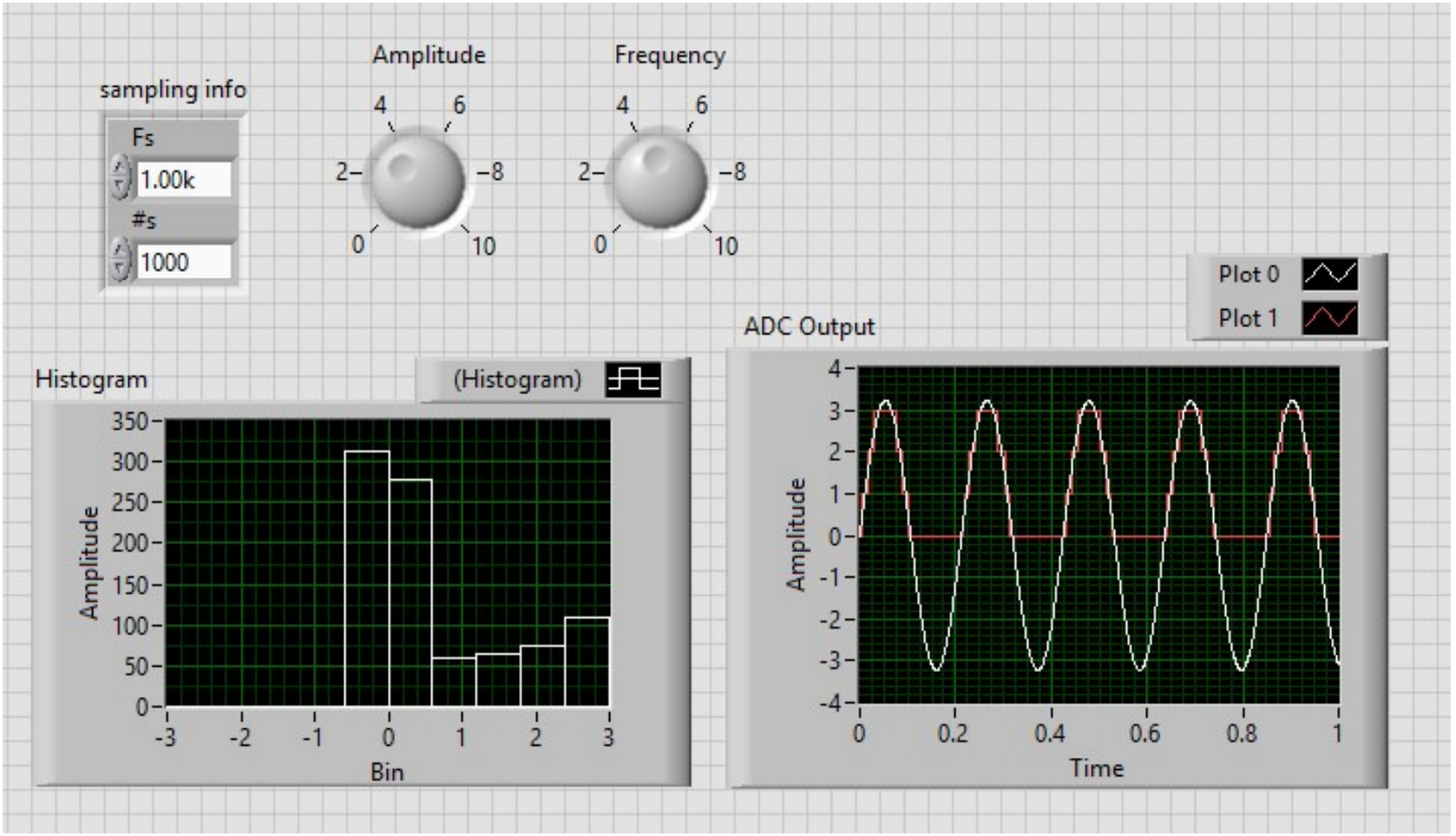
# Expt#4: Peak and Valley Detection of signal

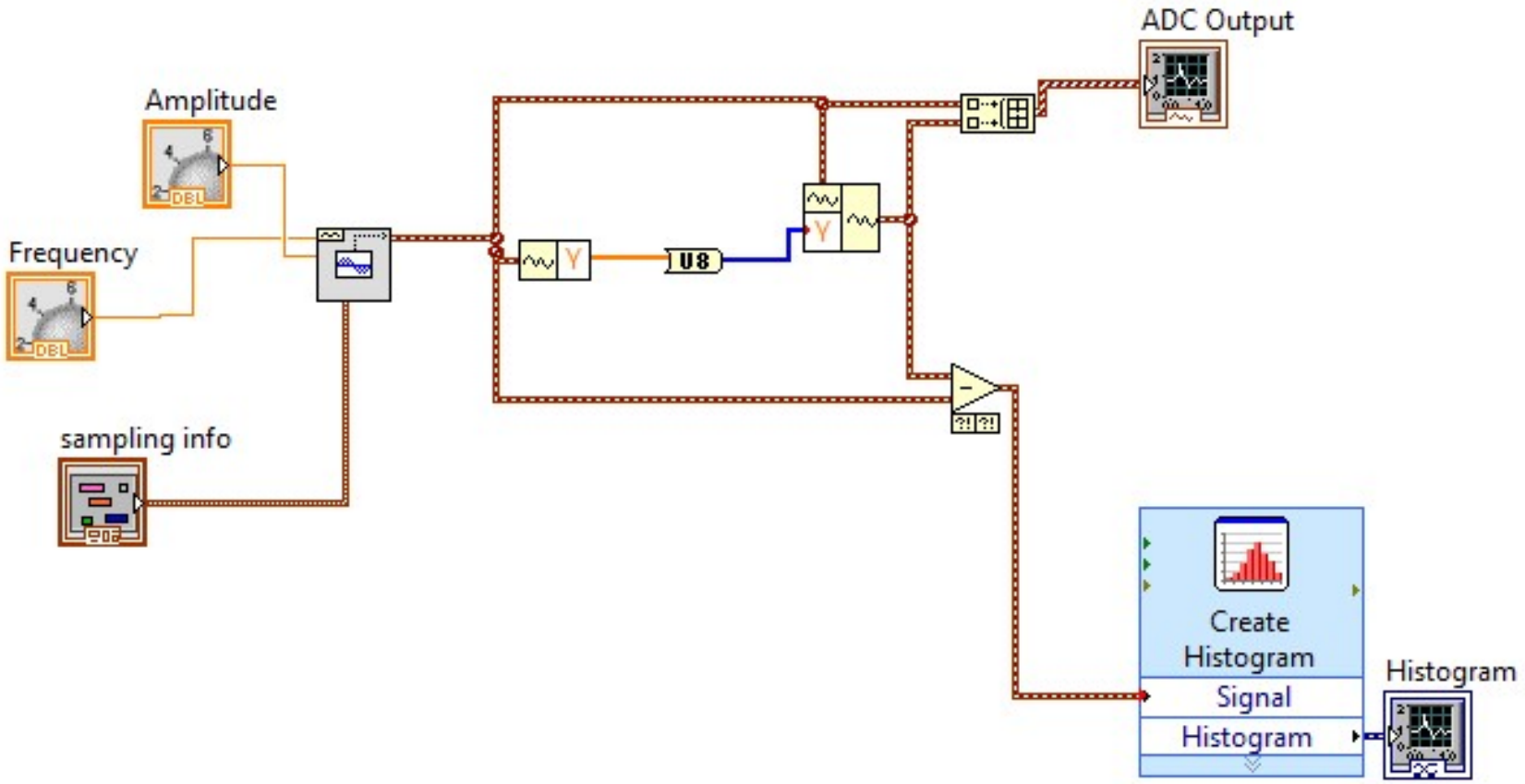



Original Signal
Peak/Velly
XY Graph
Freq
4
6
2
8
0
10
Amplitude
4
6
2
8
0
10
peaks/valleys
Peaks
Amplitude
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
100
200
300
400
500
600
700
800
900
1000
Time
stop
STOP

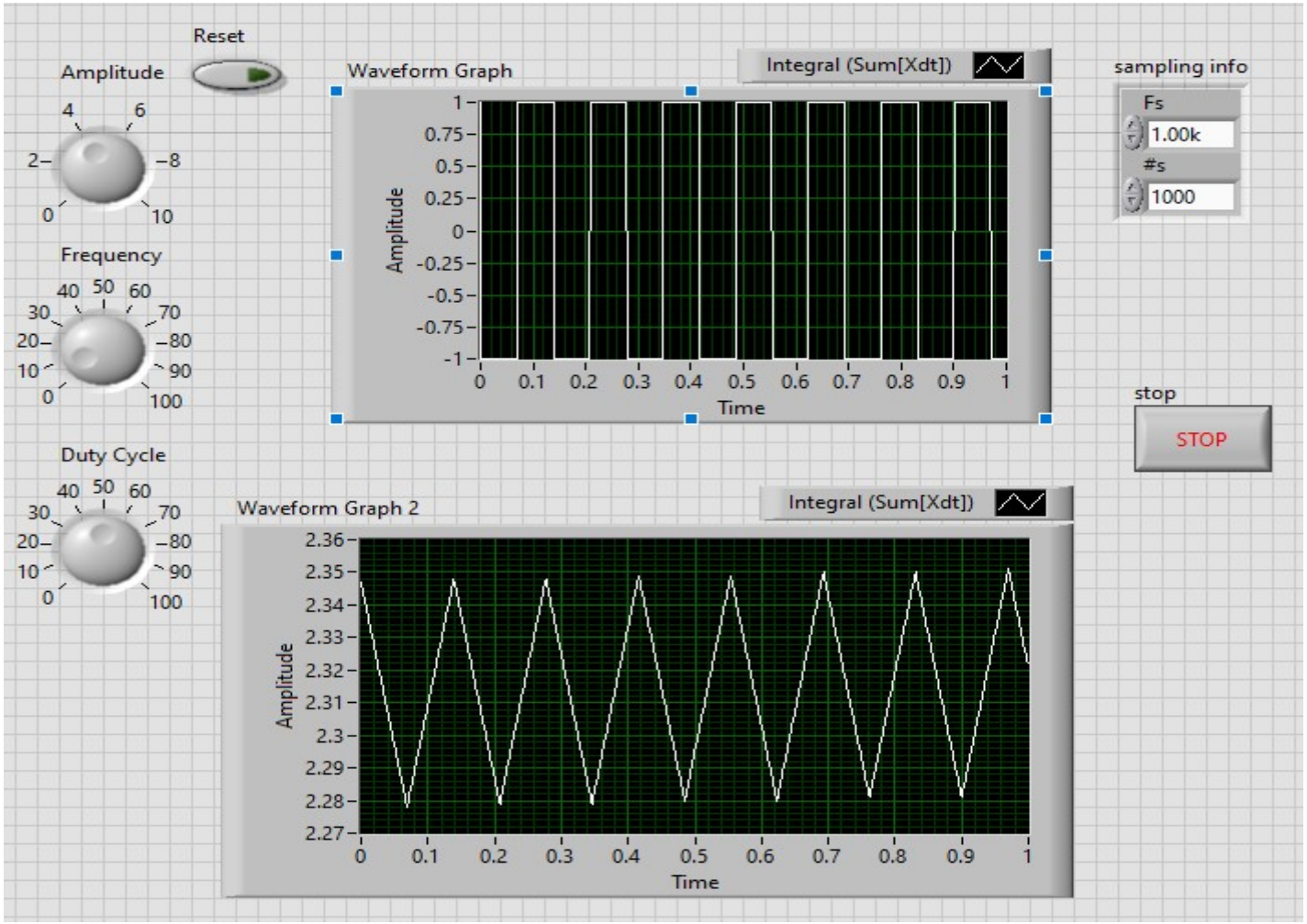

200
#s
N
i
Y
peaks/valleys
U16
Freq
DBL
Amplitude
DBL
Sine Waveform.vi
Waveform Peak Detection.vi
peak detect
XY Graph
1000
1000
0
stop
TF
i

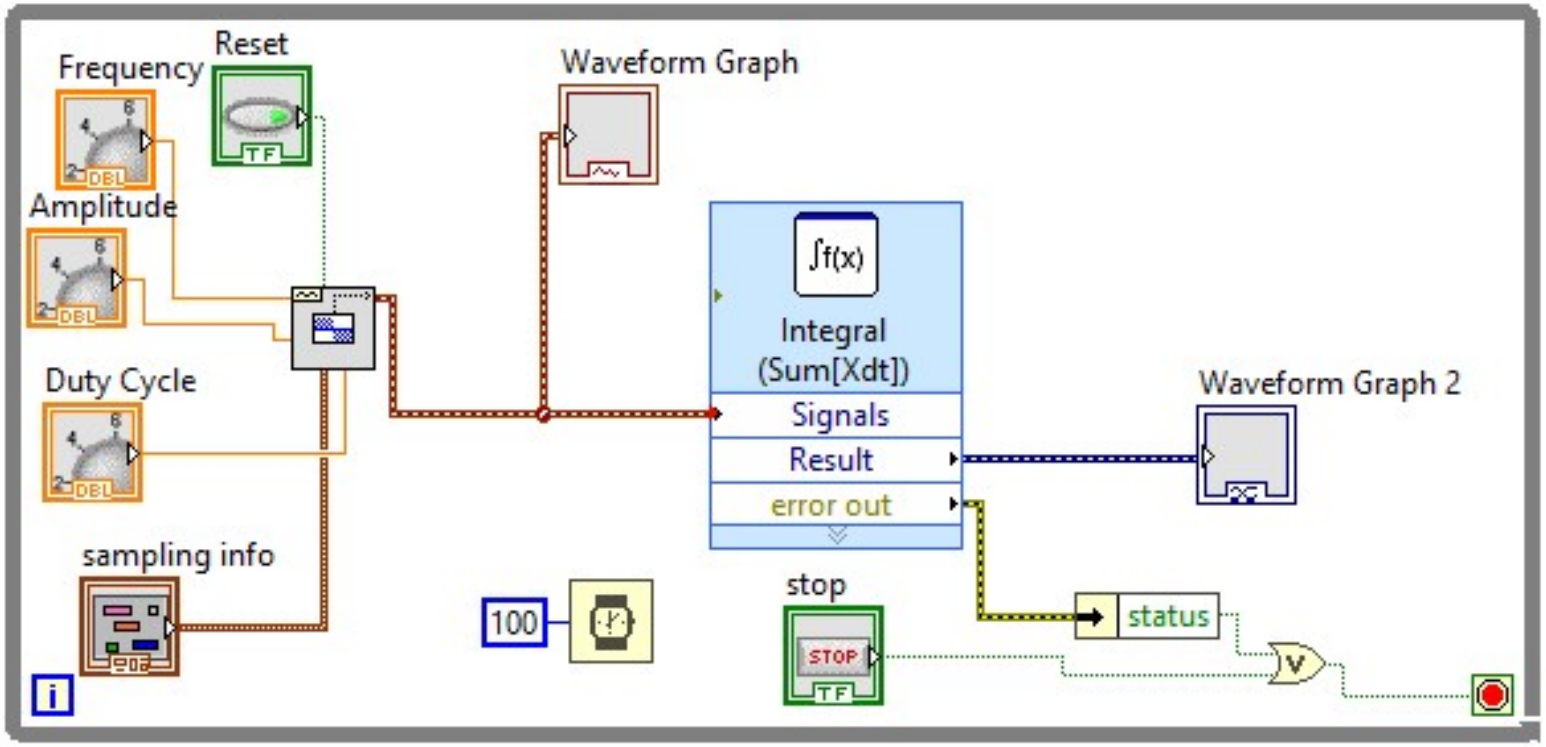
# Expt#5: A/D Converter of Signal



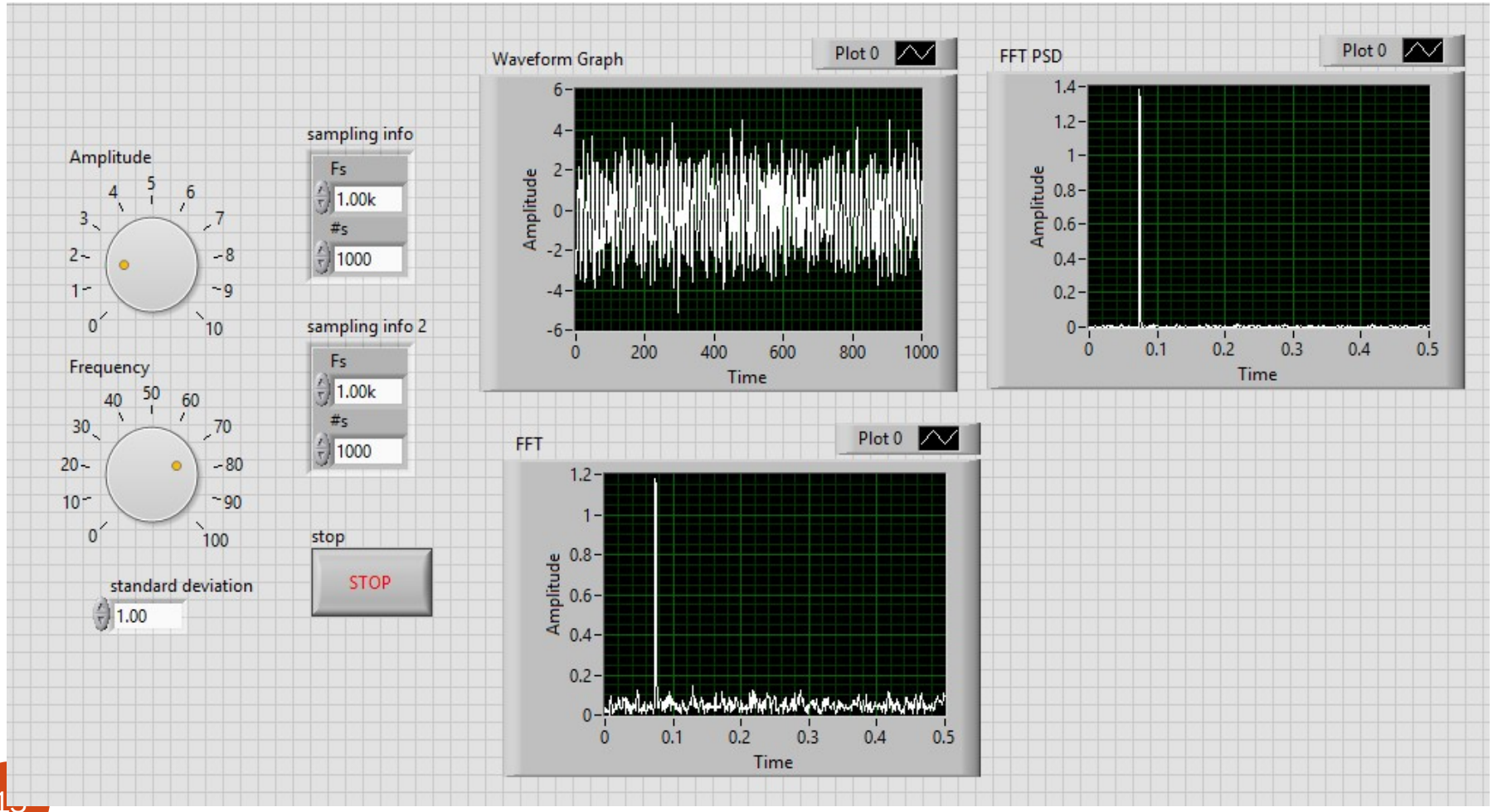

ADC Output
Amplitude
Frequency
sampling info
U8
Create
Histogram
Signal
Histogram
Histogram

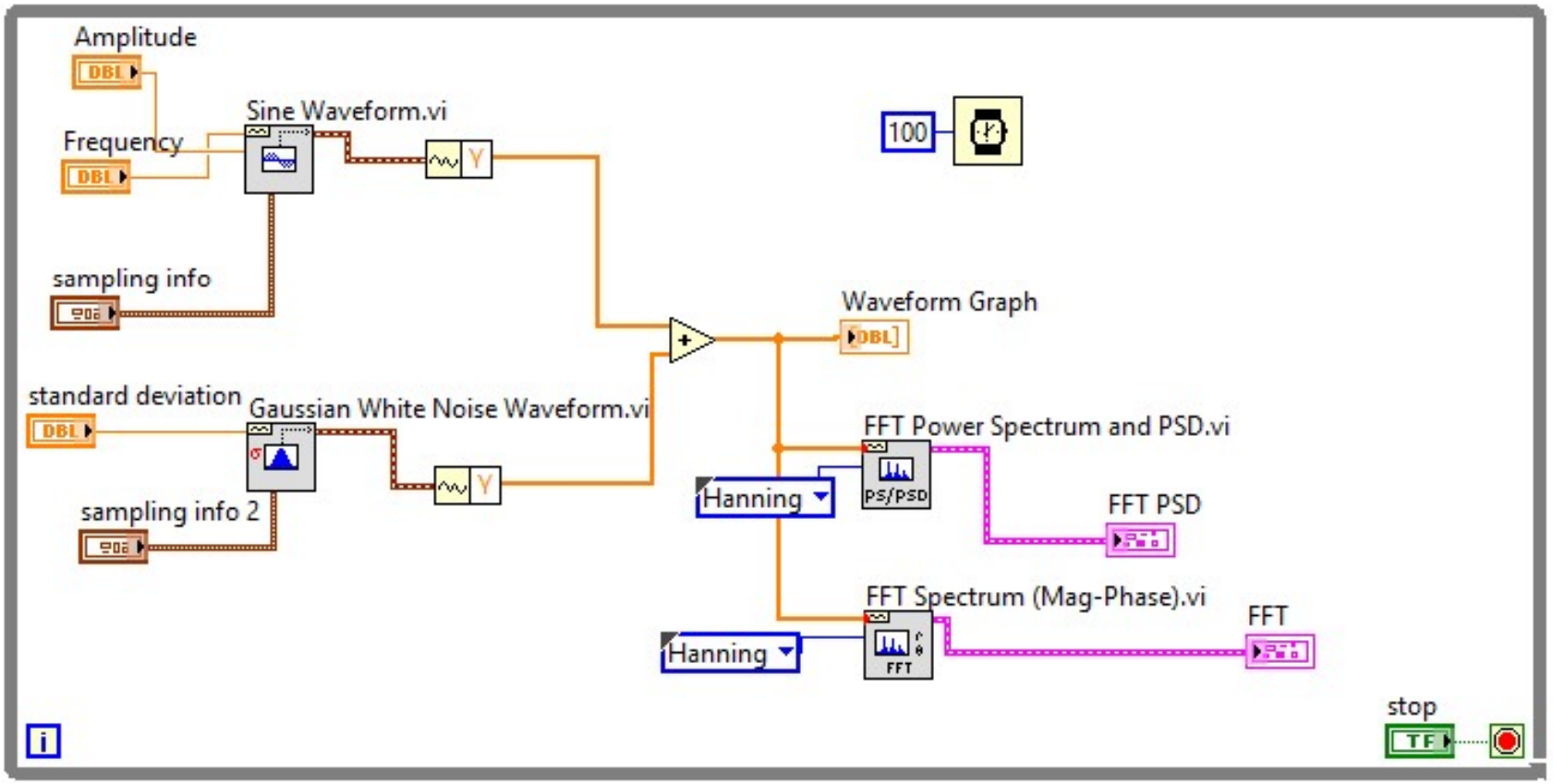
# Expt#6: Square Wave and Sawtooth Signal



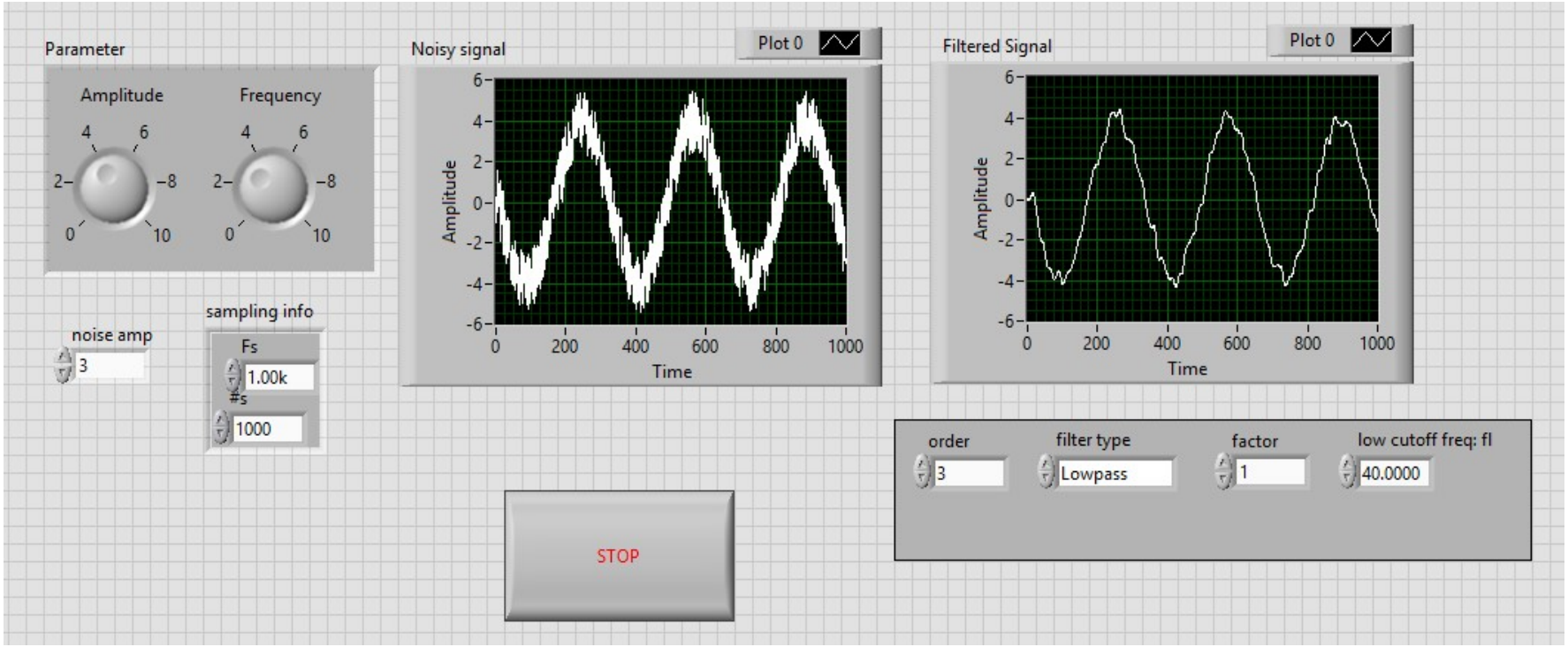

Frequency
Reset
Waveform Graph
Amplitude
Duty Cycle
Integral
(Sum[Xdt])
Signals
Result
error out
Waveform Graph 2
sampling info
100
stop
STOP
TF
status

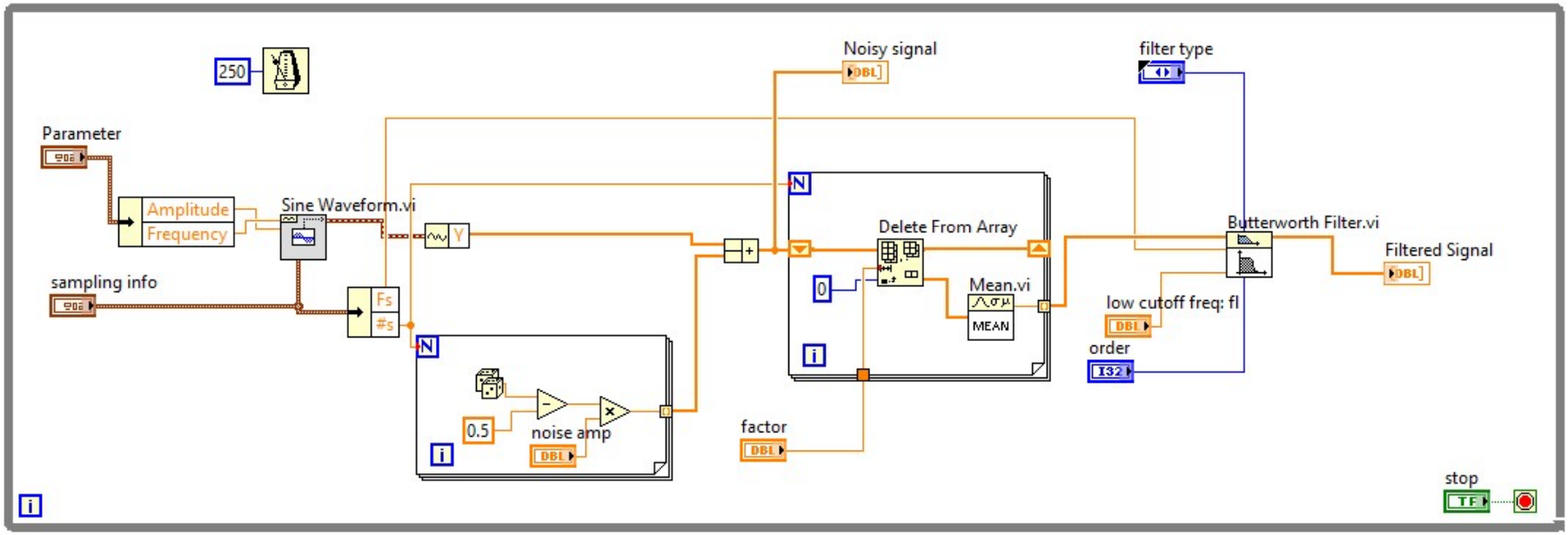
# Expt#7: Noisy Signal



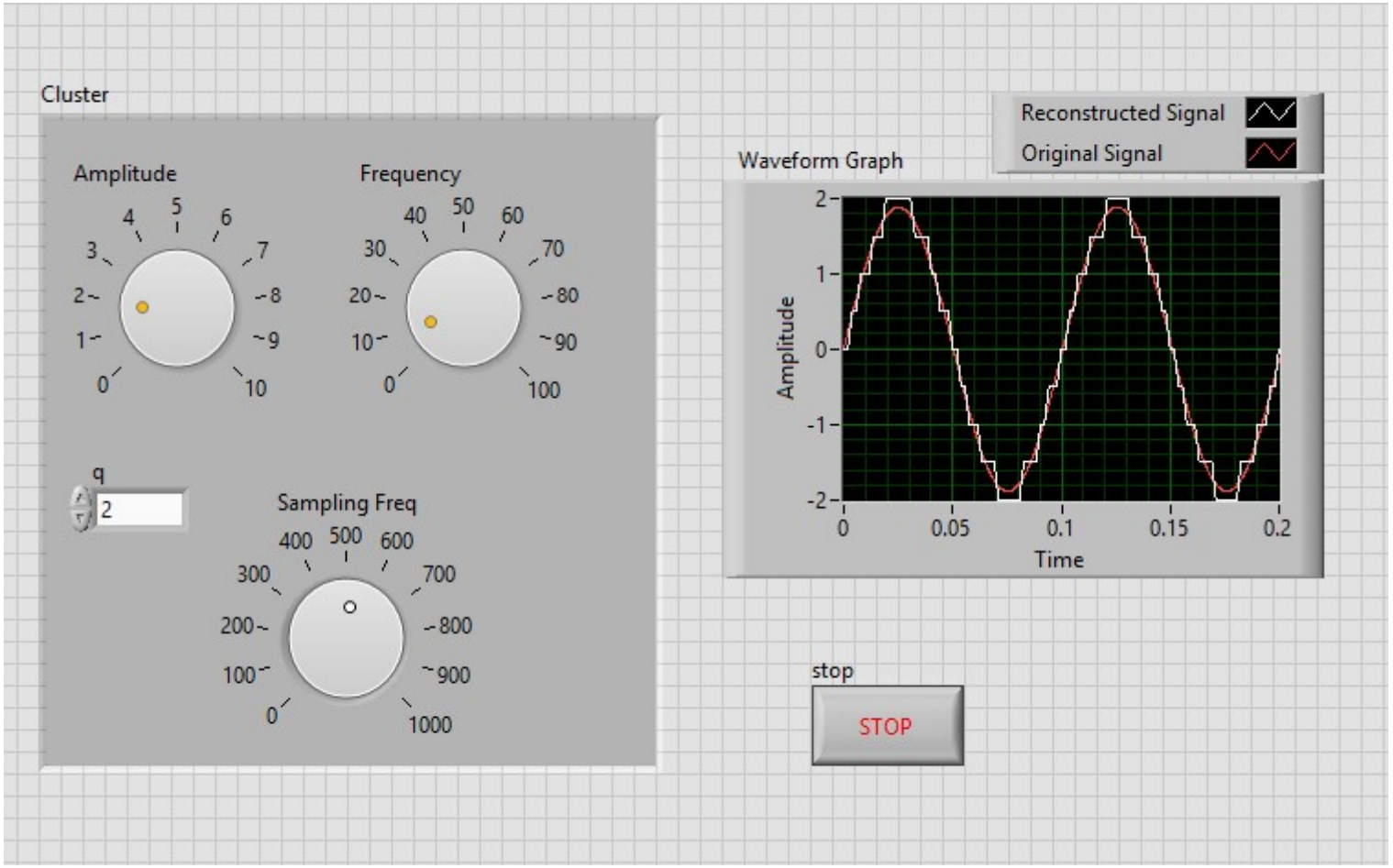

Amplitude
DBL
Frequency
DBL
Sine Waveform.vi
Y
100
sampling info
Waveform Graph
DBL
standard deviation
DBL
Gaussian White Noise Waveform.vi
Y
FFT Power Spectrum and PSD.vi
PS/PSD
Hanning
FFT PSD
sampling info 2
FFT Spectrum (Mag-Phase).vi
FFT
Hanning
FFT
stop
TF
i

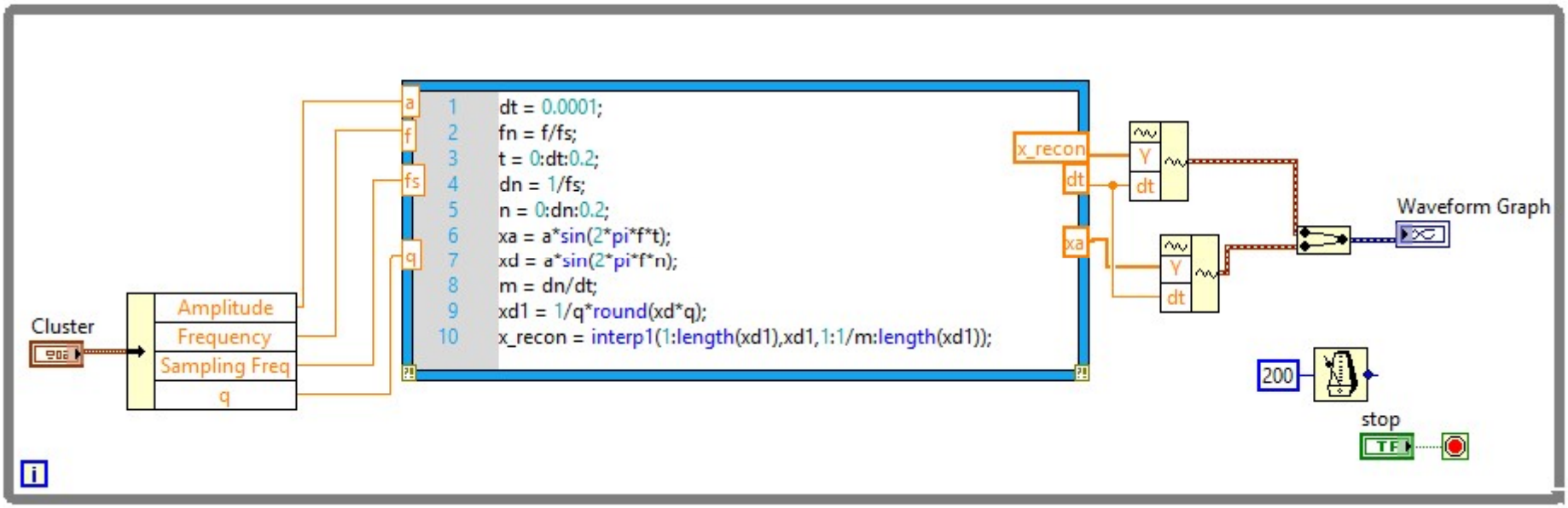
# Expt#8: Noisy Signal-II



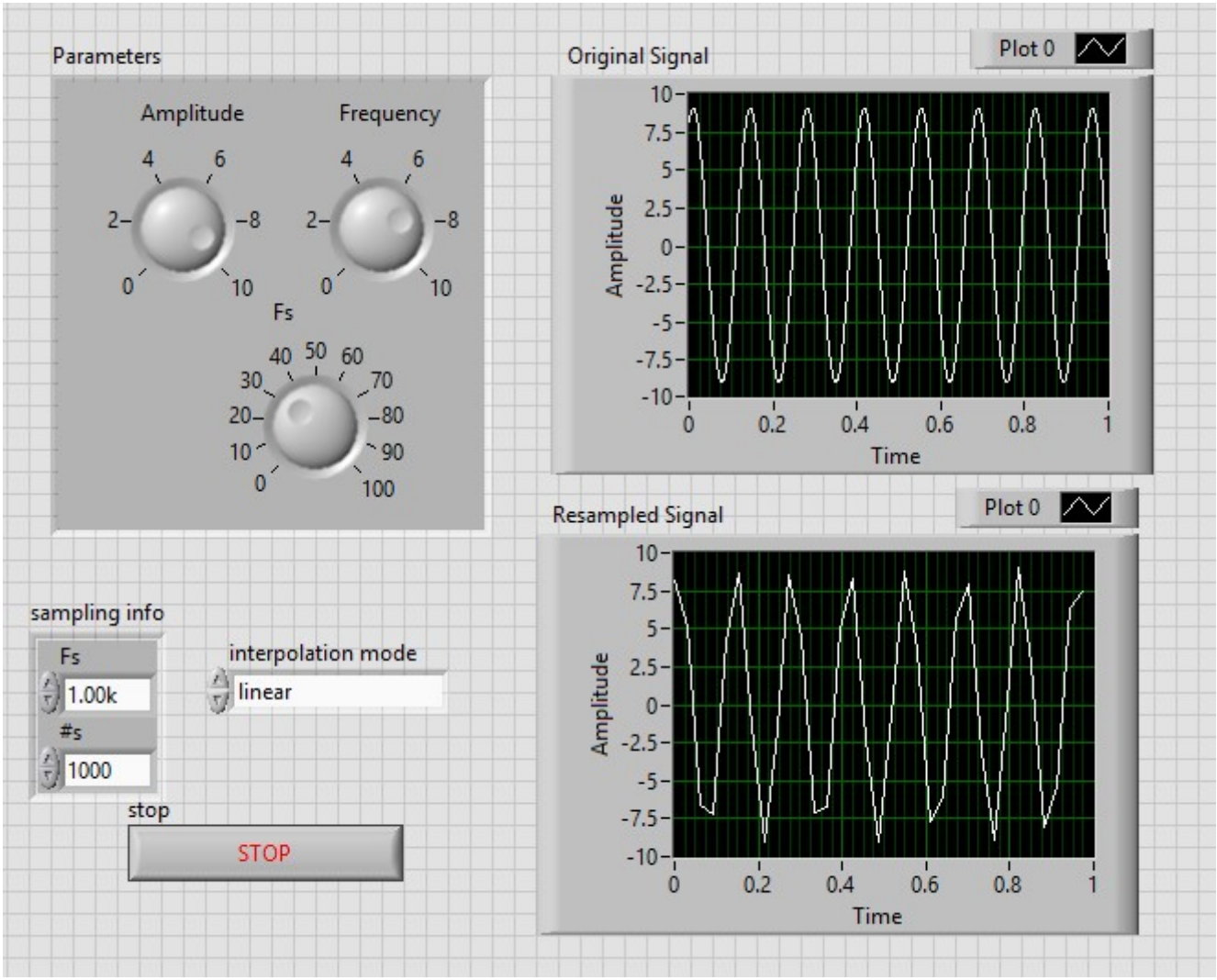

250
Noisy signal
filter type
Parameter
Amplitude
Frequency
Sine Waveform.vi
Y
sampling info
Fs
#s
N
i
0.5
noise amp
DBL
factor
Delete From Array
0
Mean.vi
MEAN
low cutoff freq: fl
order
I32
Butterworth Filter.vi
Filtered Signal
stop
TF

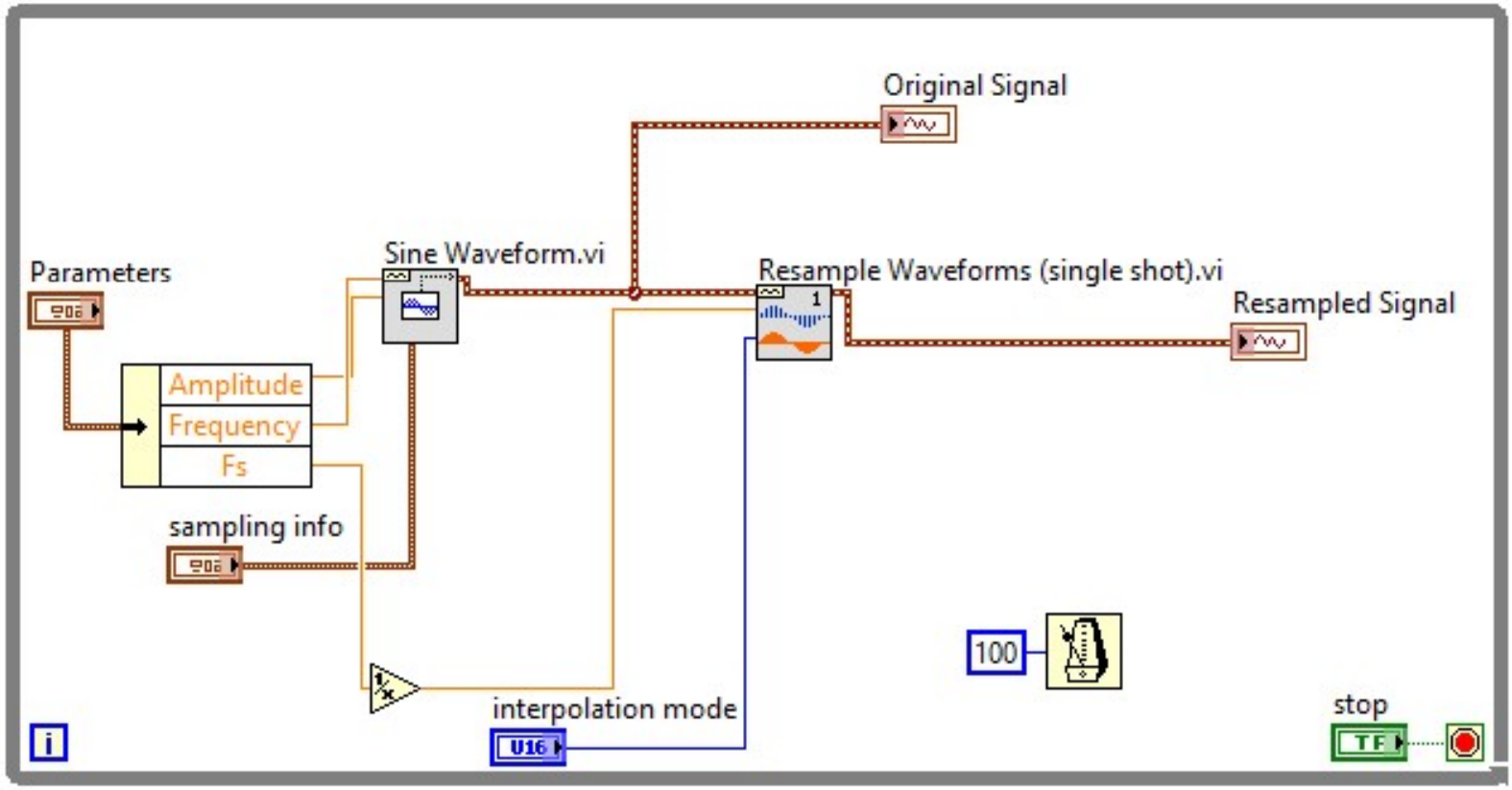
# Expt#9: Reconstruction of Signal



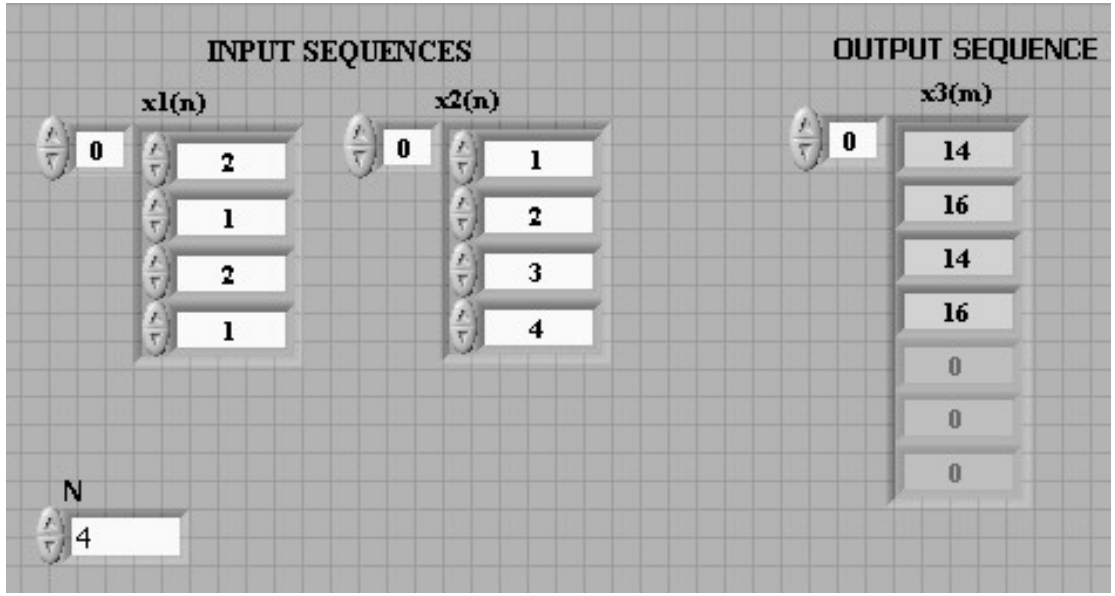

Cluster
Amplitude
Frequency
Sampling Freq
q
a
f
fs
q
1 dt = 0.0001;
2 fn = f/fs;
3 t = 0:dt:0.2;
4 dn = 1/fs;
5 n = 0:dn:0.2;
6 xa = a*sin(2*pi*f*t);
7 xd = a*sin(2*pi*f*n);
8 m = dn/dt;
9 xd1 = 1/q*round(xd*q);
10 x_recon = interp1(1:length(xd1),xd1,1:1/m:length(xd1));
x_recon
dt
xa
Y
dt
Y
dt
Waveform Graph
200
stop
TF

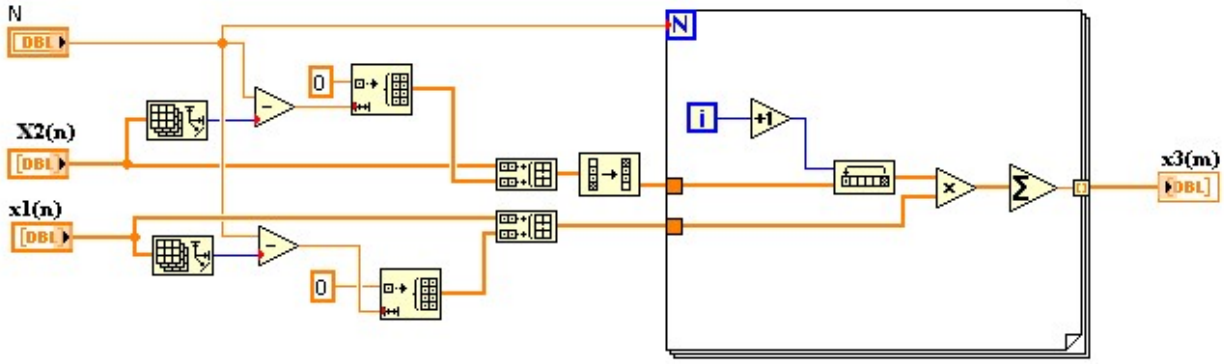
# Expt#10: Reconstruction using Interpolation methods



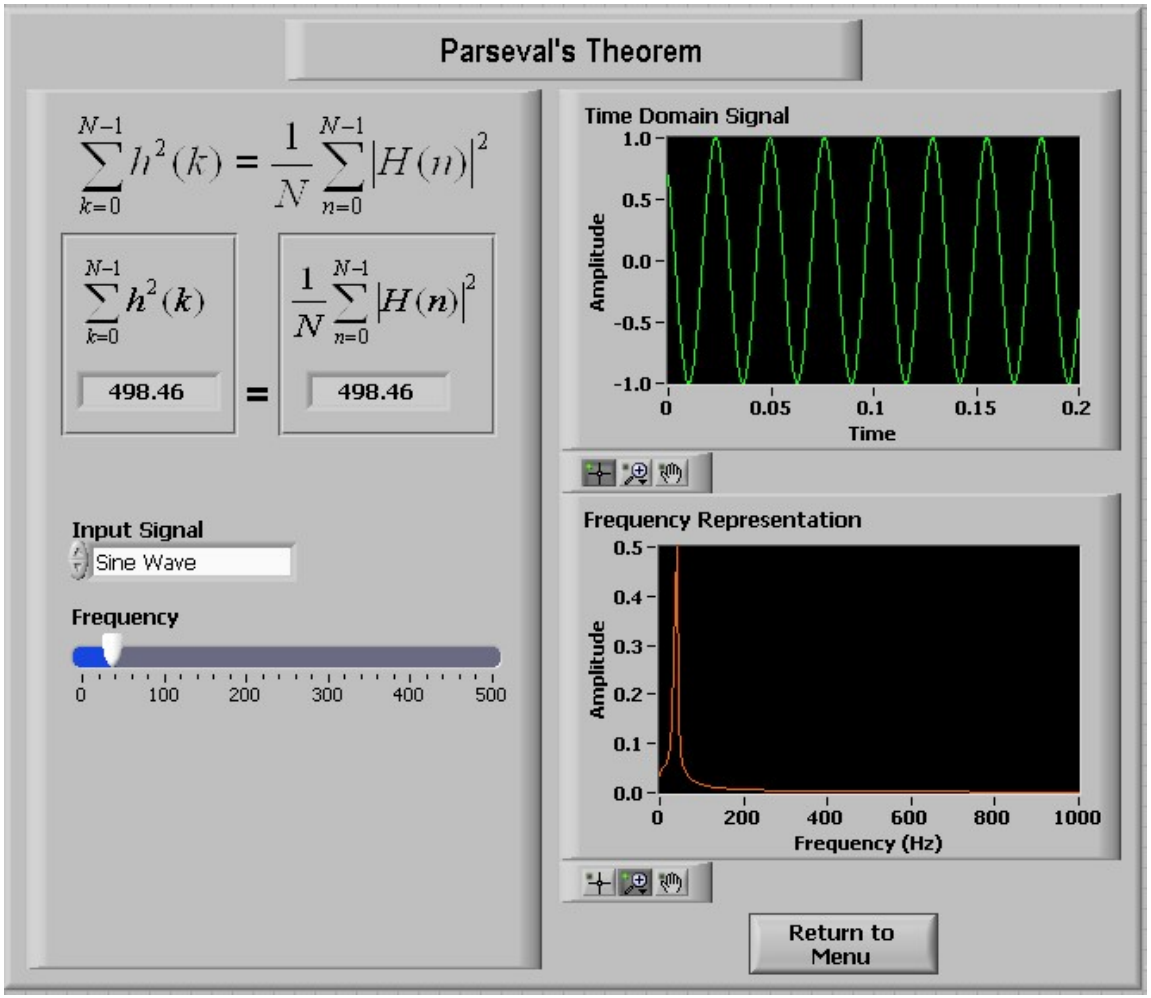

Original Signal
Parameters
Sine Waveform.vi
Resample Waveforms (single shot).vi
Resampled Signal
Amplitude
Frequency
Fs
sampling info
100
interpolation mode
U16
stop
TF

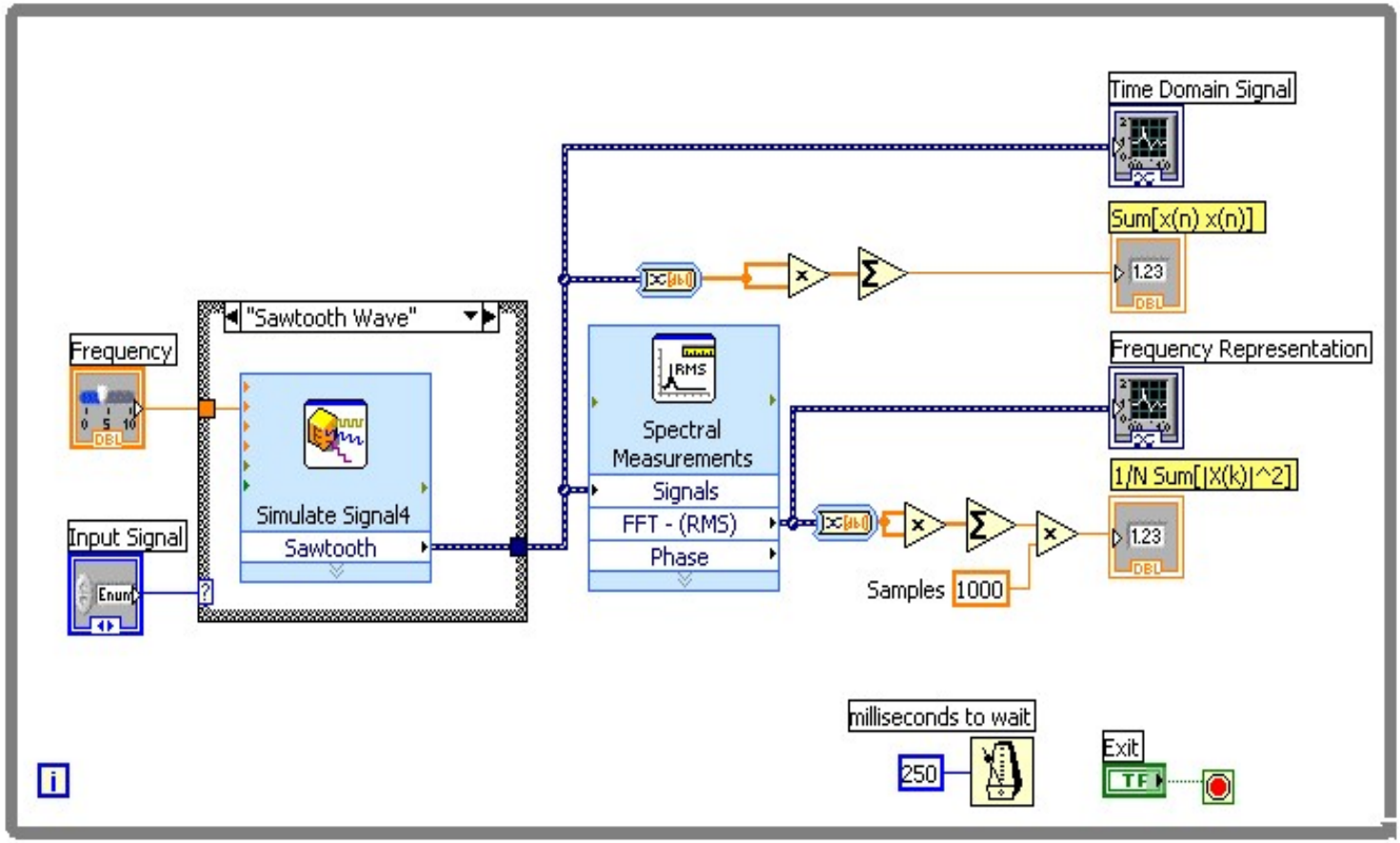
# Expt#11: Linear Convolution



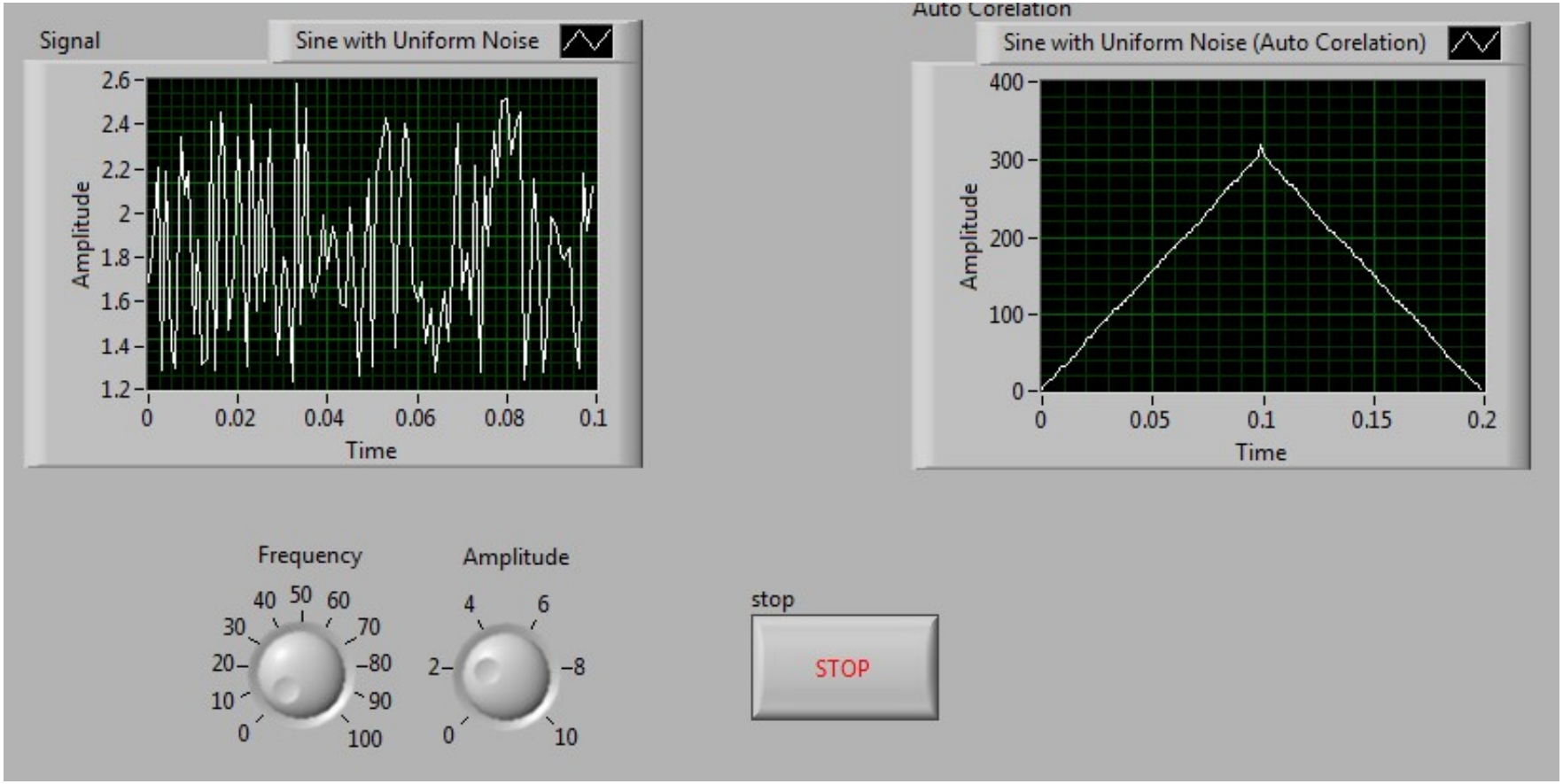



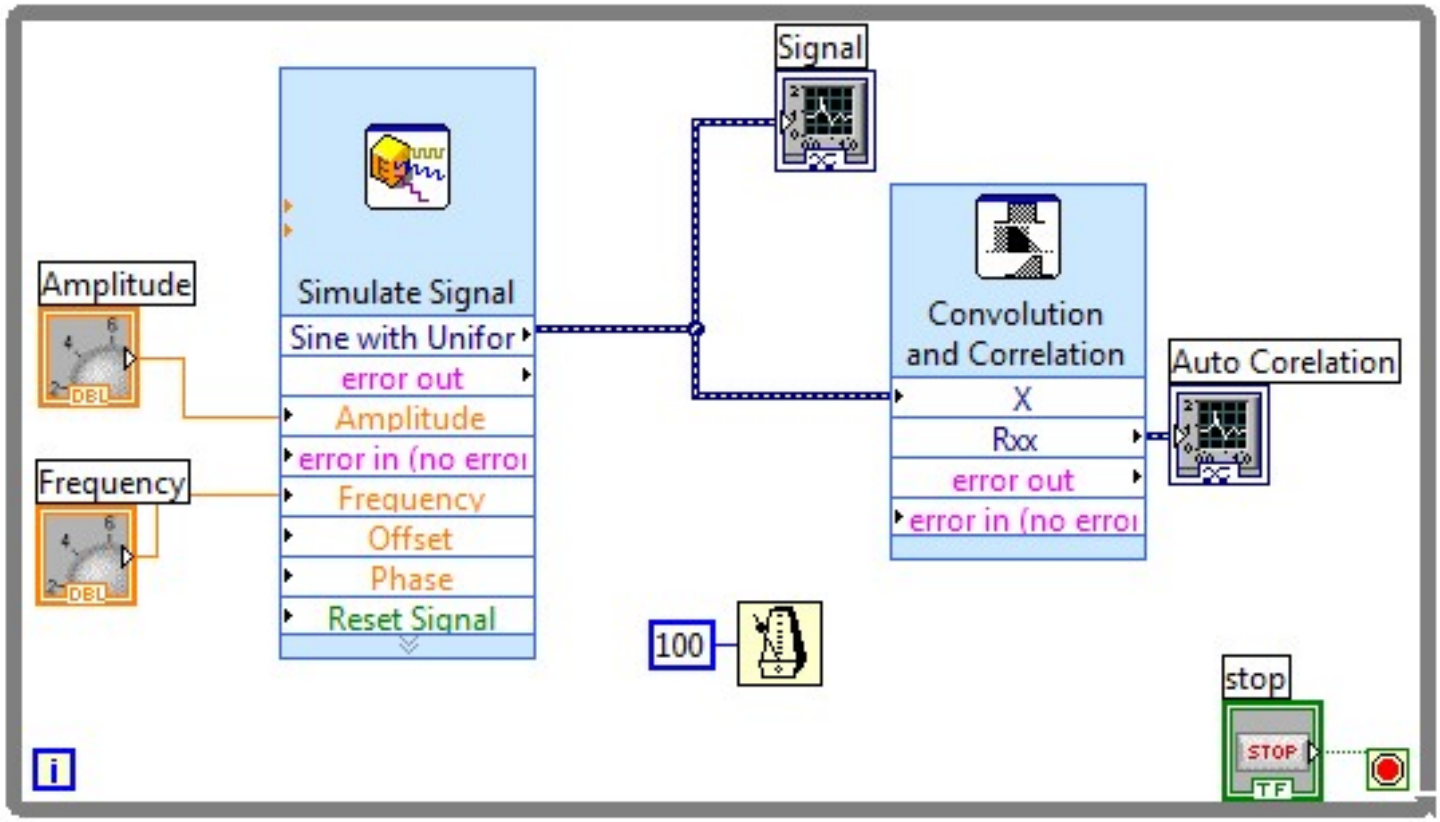
# Expt#12: Parseval Theorem



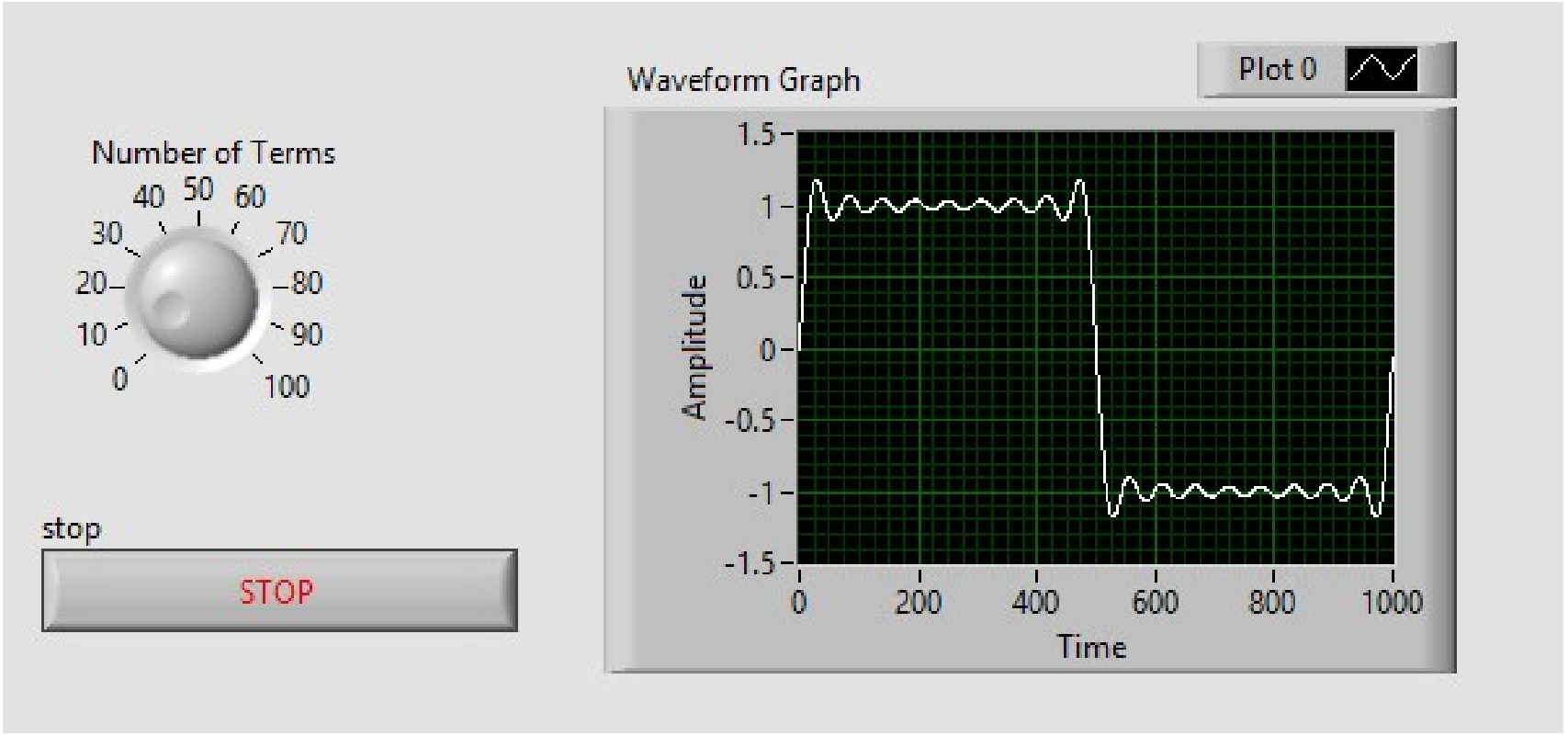

Time Domain Signal
Sum[x(n) x(n)]
"Sawtooth Wave"
Frequency
Simulate Signal4
Sawtooth
Spectral Measurements
Signals
FFT - (RMS)
Phase
Frequency Representation
1/N Sum[|X(k)|^2]
Input Signal
Samples
1000
milliseconds to wait
250
Exit

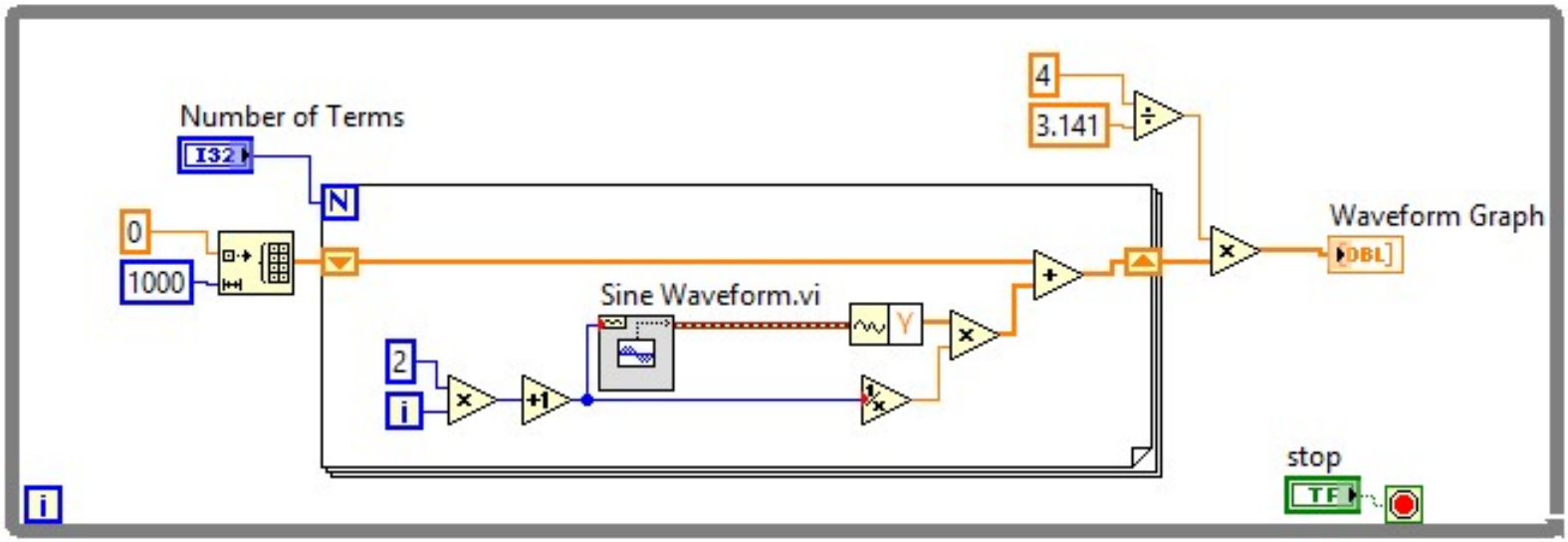
# Expt#13: Correlation



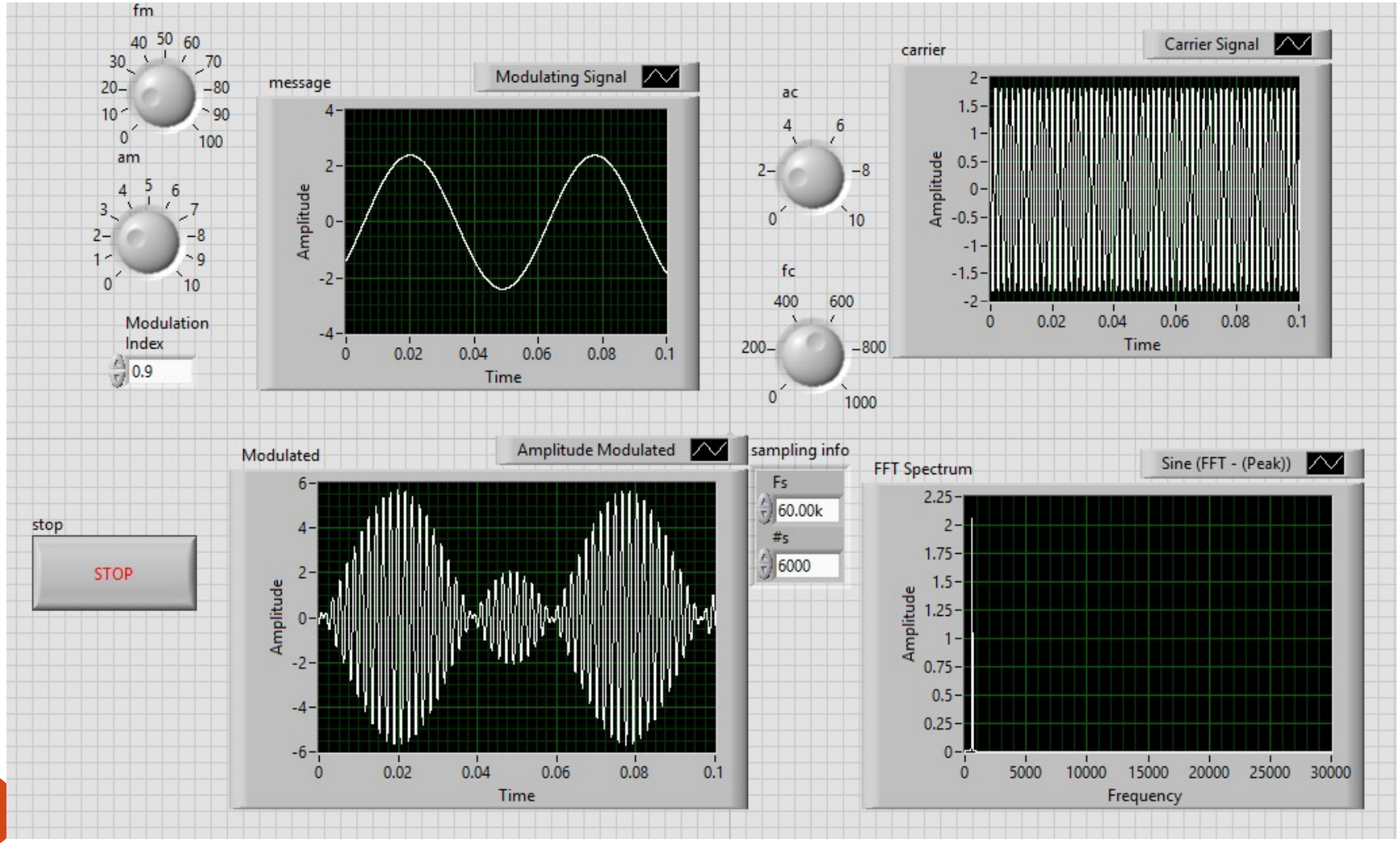

Signal
Amplitude
Simulate Signal
Sine with Unifor
error out
Amplitude
error in (no erroi
Frequency
Frequency
Offset
Phase
Reset Signal
Convolution
and Correlation
X
Rxx
error out
error in (no erroi
Auto Corelation
100
stop
STOP
TF

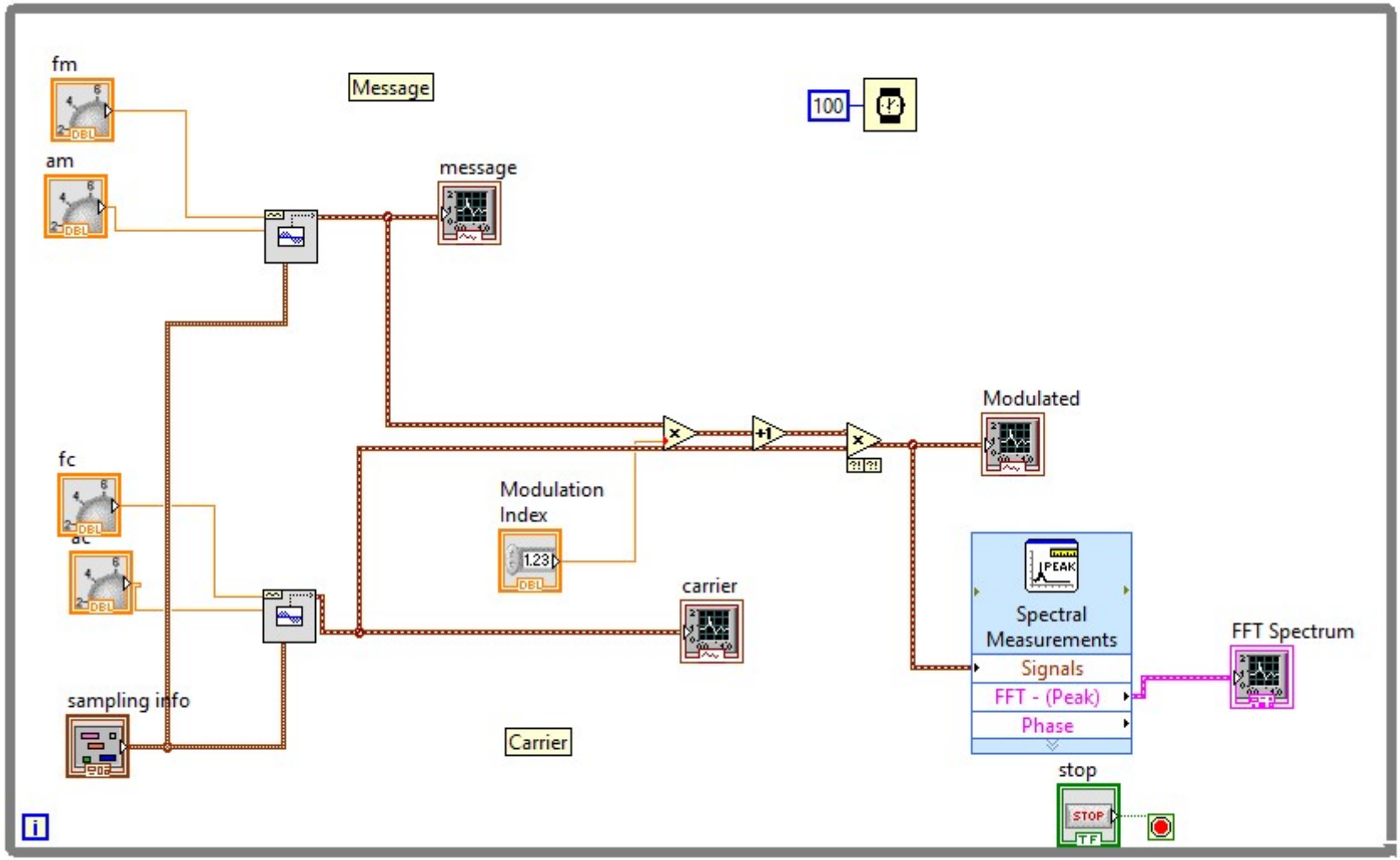
# Expt#14: Gibb's Phenomena




Number of Terms
I32
N
0
1000
Sine Waveform.vi
Y
2
i
+1
4
3.141
Waveform Graph
DBL
stop
TF
i

# Expt#15: Amplitude Modulation

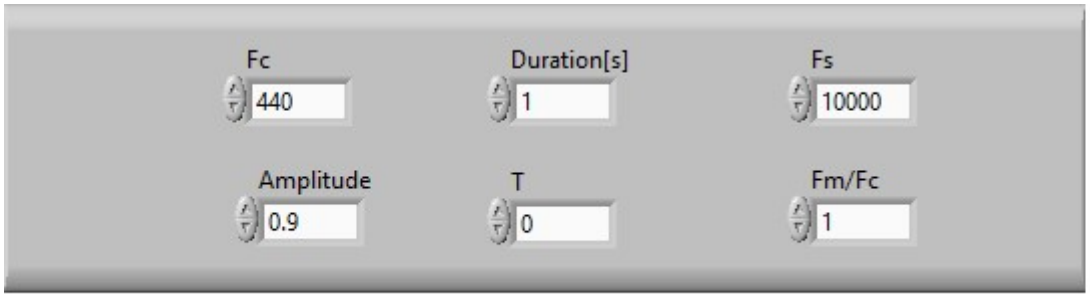


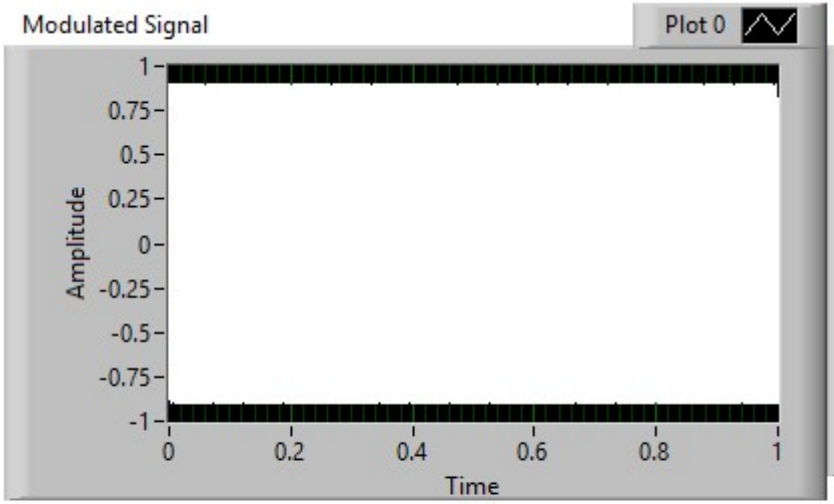

fm
Message
100
am
message
Modulated
fc
Modulation
Index
1.23
ac
carrier
Spectral
Measurements
Signals
FFT - (Peak)
Phase
FFT Spectrum
sampling info
Carrier
stop
STOP

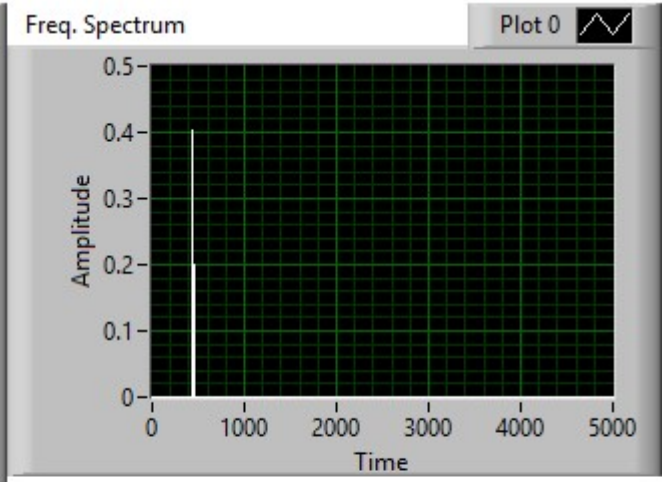
- **AM Signal Detection**
- FG1: Amplitude=8 V, Frequency=500 Hz, sine wave.
- FG2: Amplitude=5 V, Frequency=9 kHz, sine wave
- **Envelope Detection**
- FG1: Amplitude=5 V, Frequency= 1 kHz, sine wave.
- FG2: Amplitude=5 V, Frequency=98 kHz, sine wave
- **OverModulation**
- FG1: Amplitude=6.5 V, Frequency=500 Hz, sine wave.
- FG2: Amplitude=5 V, Frequency=18 kHz, sine wave

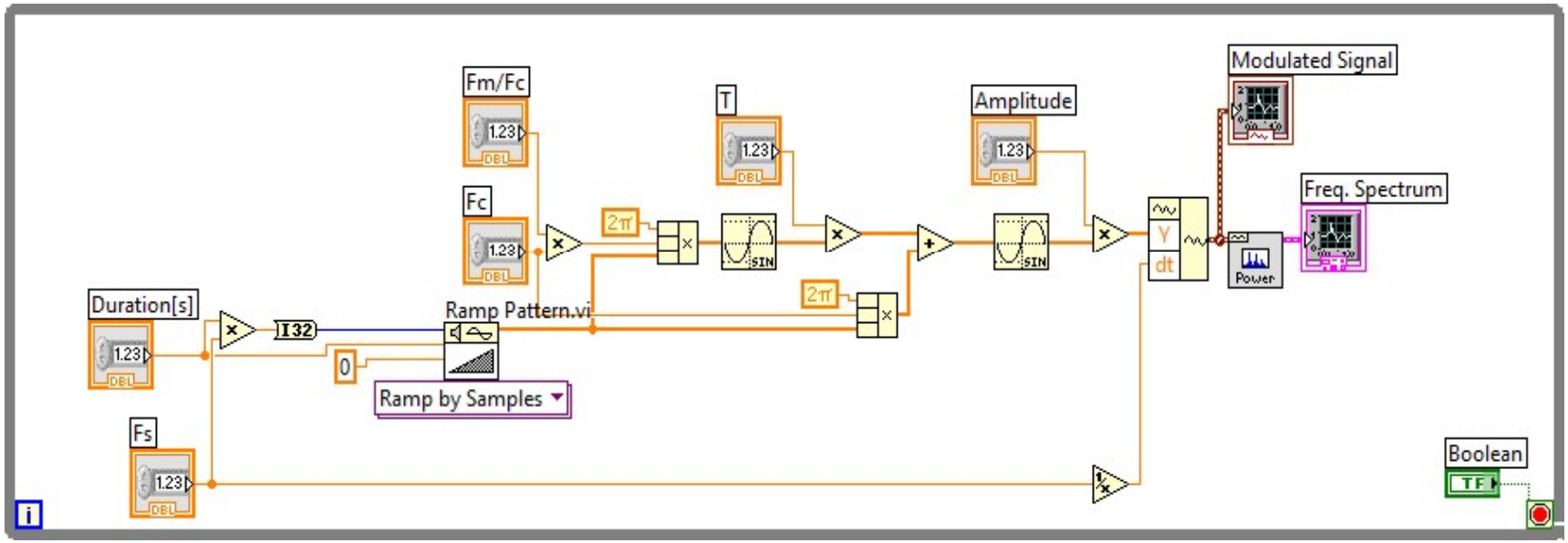
- **Coherent detection of overmodulated AM signal**
- FG1: Amplitude=6.5 V, Frequency=500 Hz, sine wave.
- FG2: Amplitude=5 V, Frequency=18 kHz, sine wave

# Expt#16: Frequency Modulation

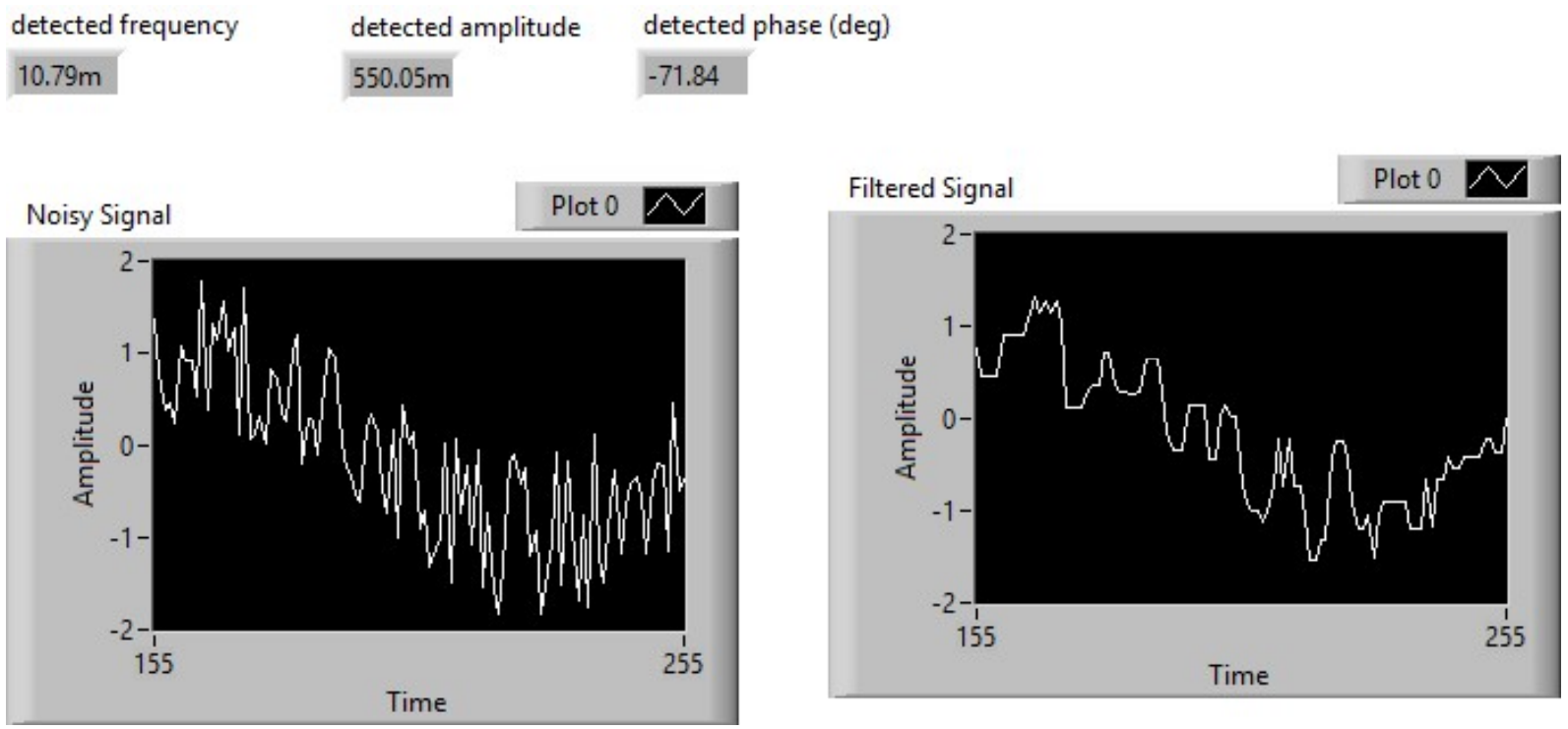


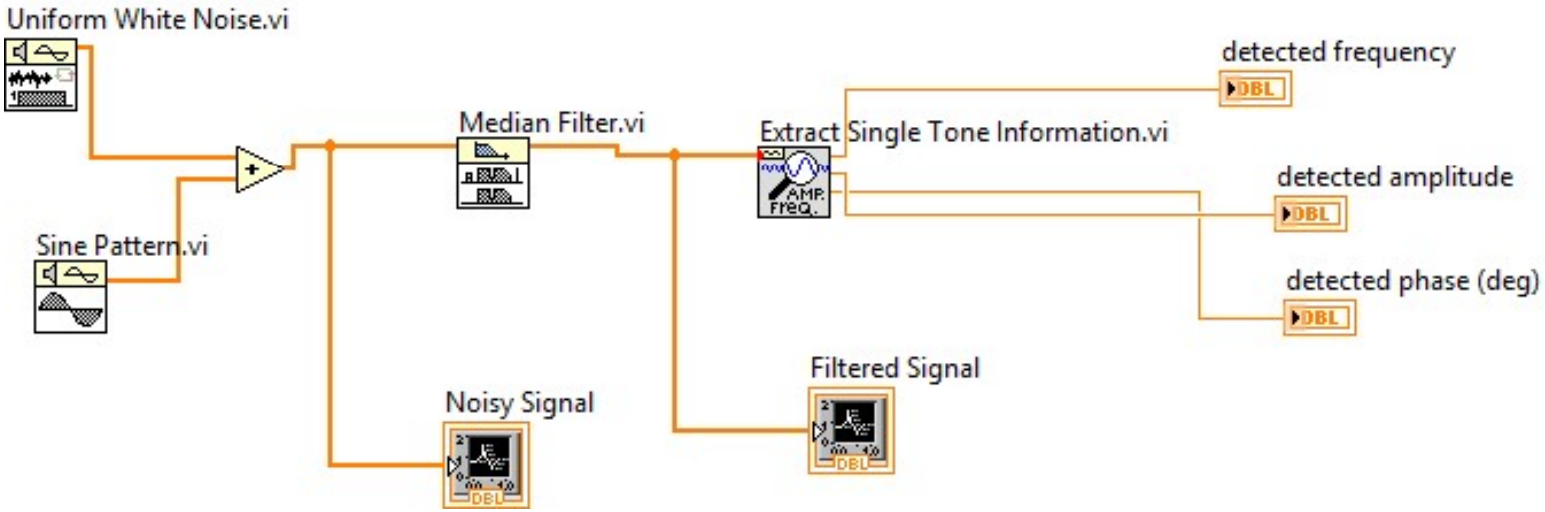



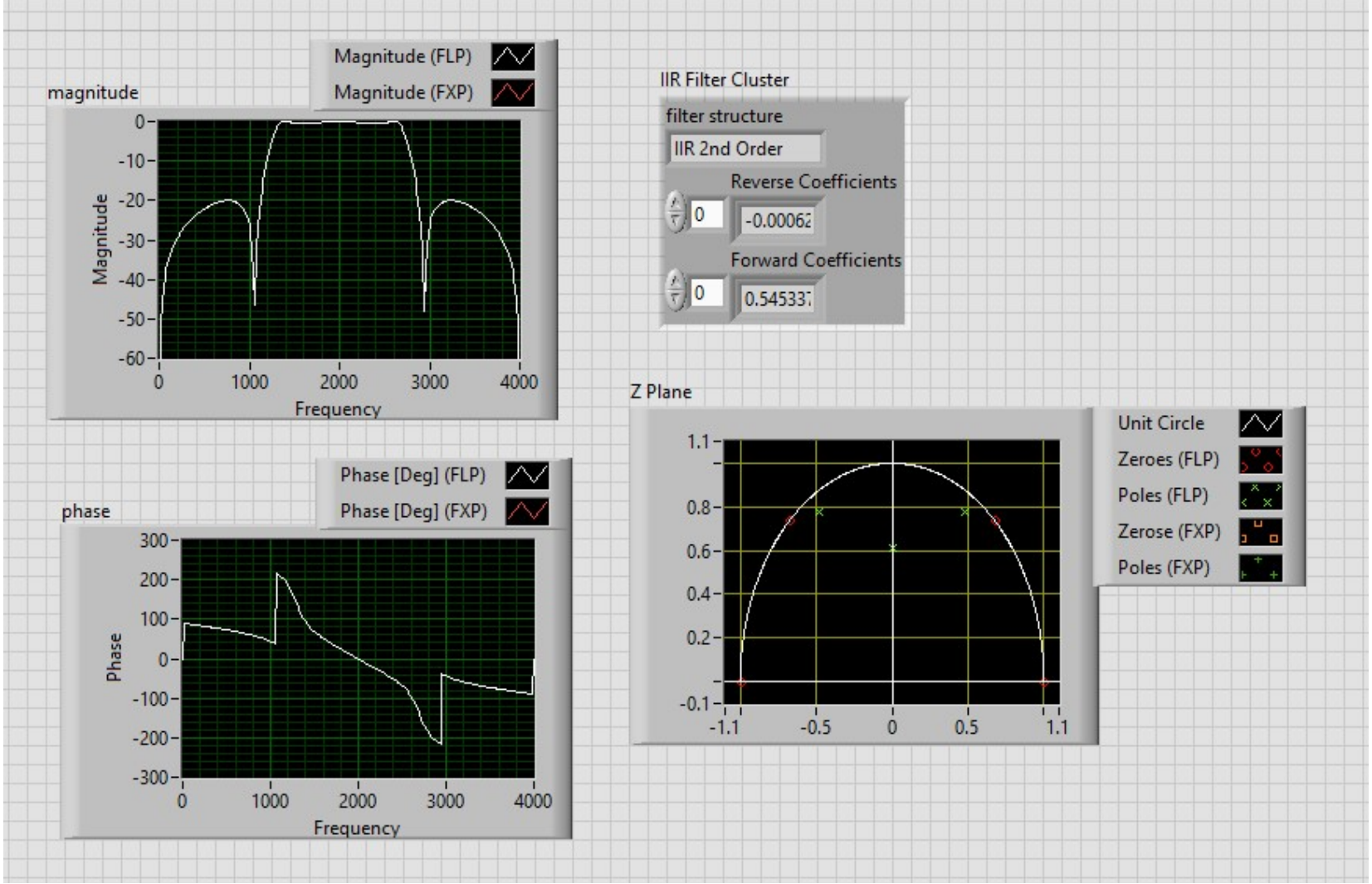


Modulated Signal
Fm/Fc
T
Amplitude
Freq. Spectrum
Fc
2π
Duration[s]
I32
Ramp Pattern.vi
2π
0
Ramp by Samples
Fs
Power
Boolean
TF

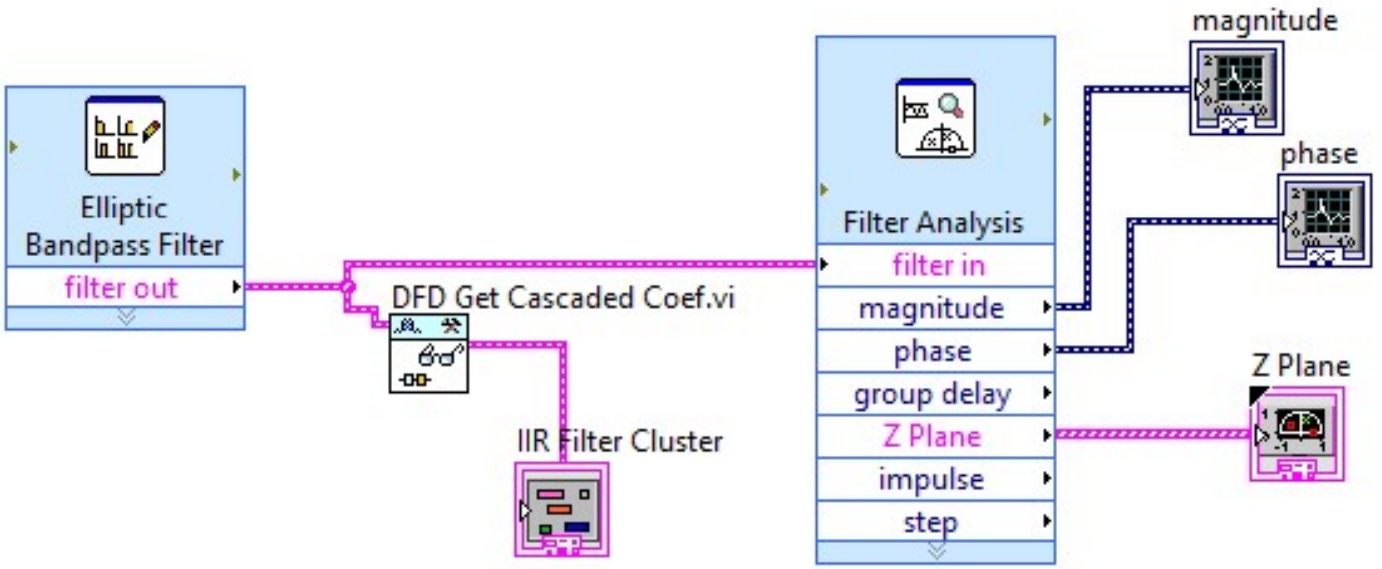
# Expt#17: Median Filter

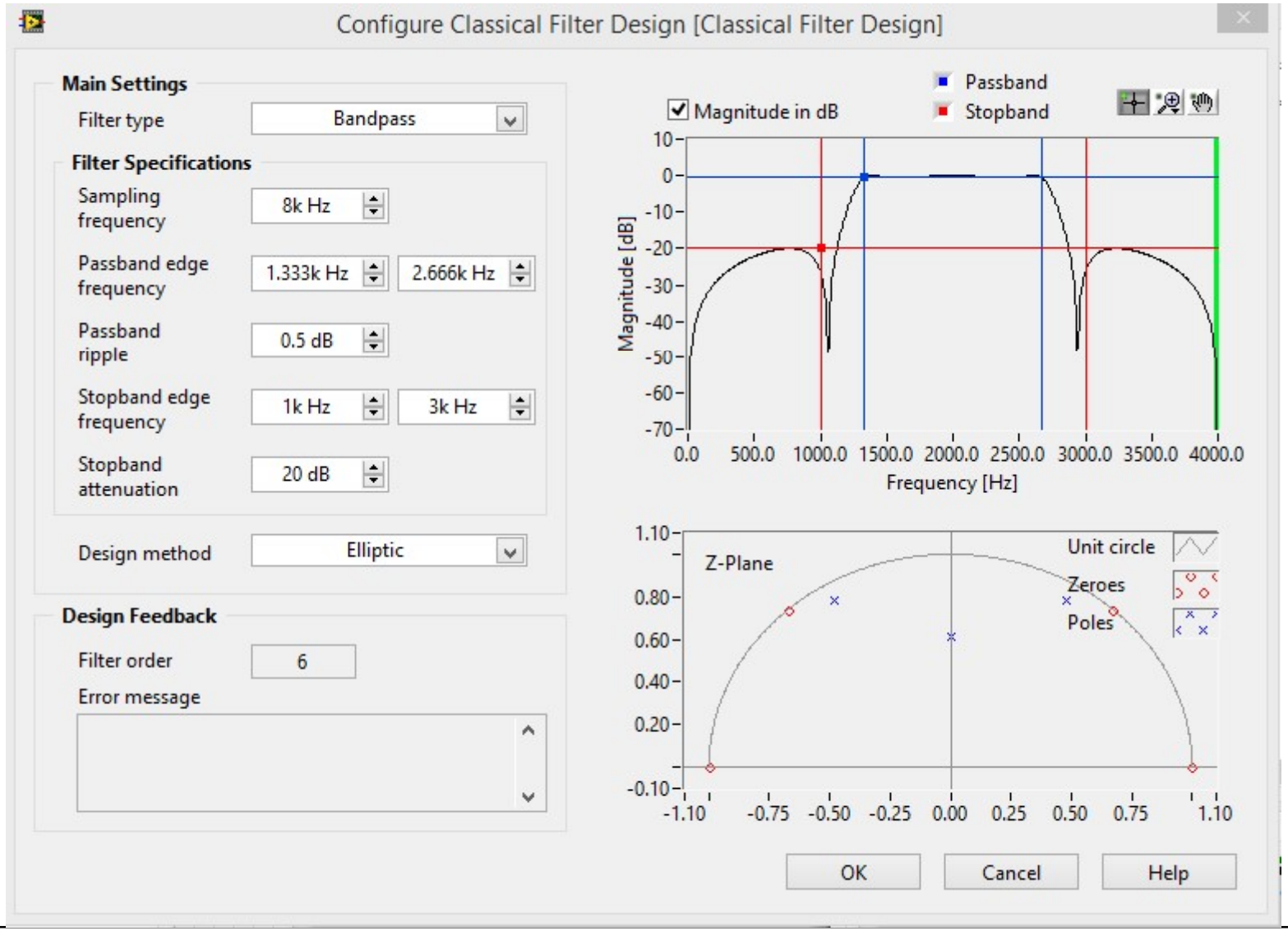



Uniform White Noise.vi
Sine Pattern.vi
Median Filter.vi
Noisy Signal
Extract Single Tone Information.vi
AMP
FREQ
detected frequency
DBL
detected amplitude
DBL
detected phase (deg)
DBL
Filtered Signal
DBL

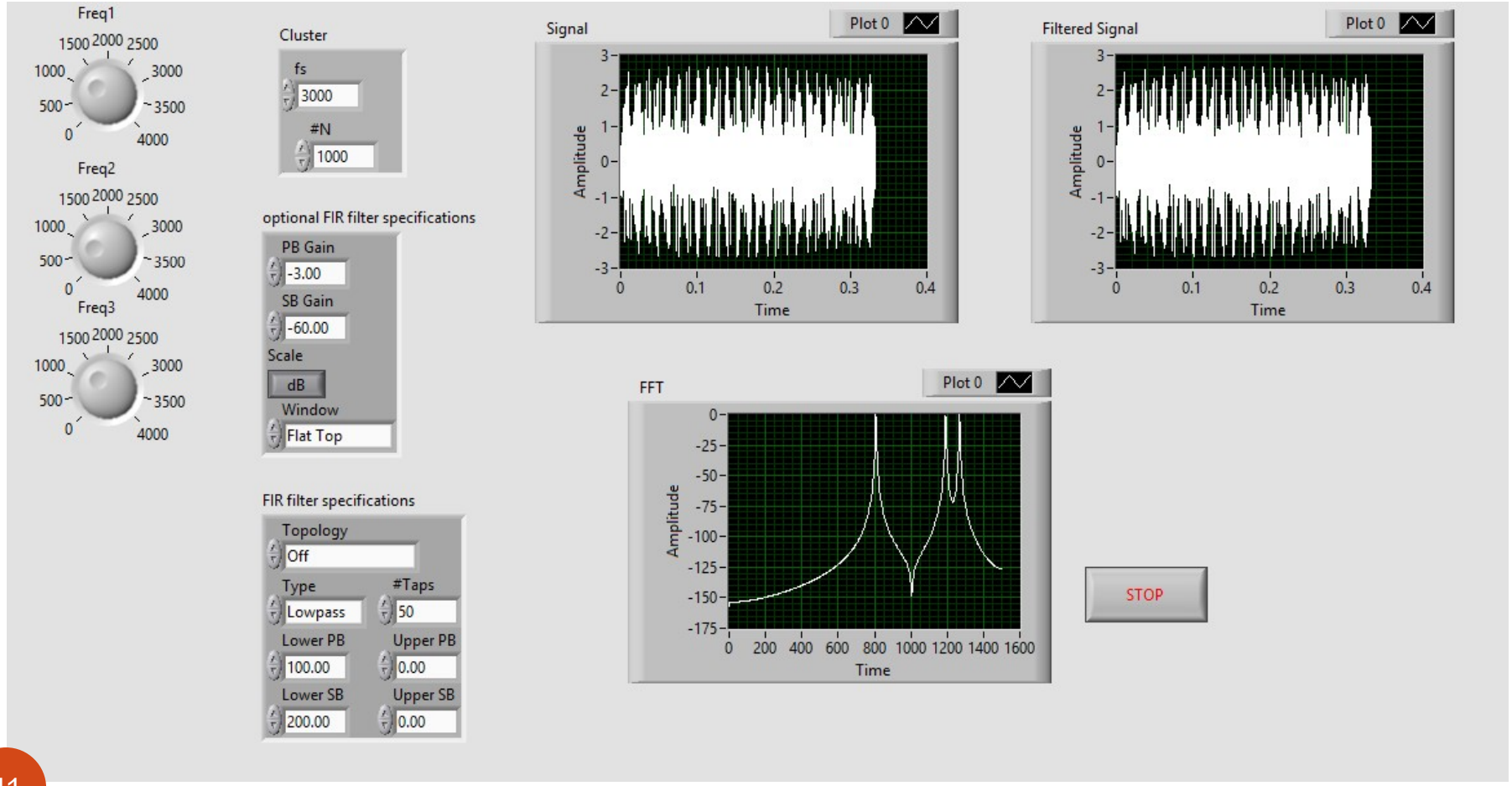
# Expt#18: IIR Filter Design

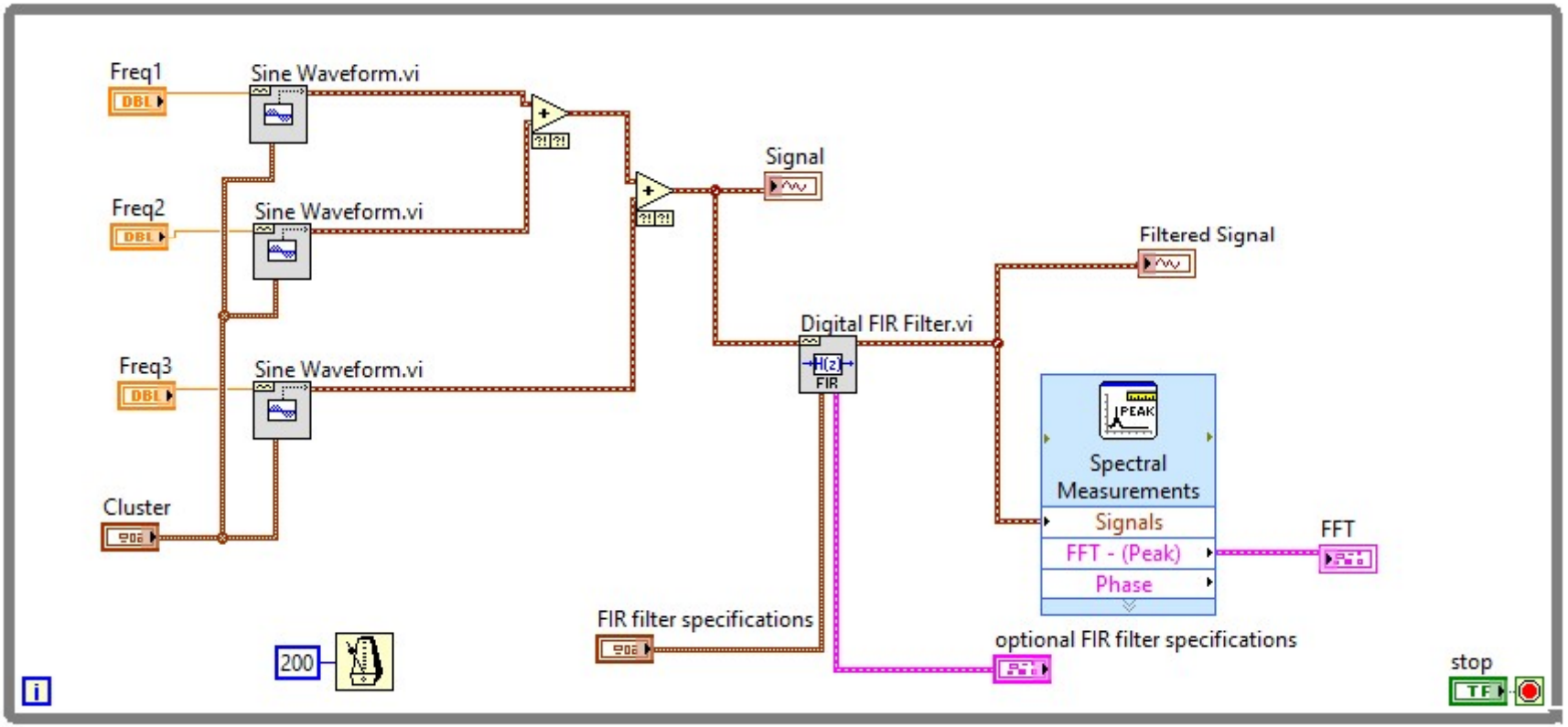



Elliptic
Bandpass Filter
filter out
DFD Get Cascaded Coef.vi
IIR Filter Cluster
Filter Analysis
filter in
magnitude
phase
group delay
Z Plane
impulse
step
magnitude
phase
Z Plane

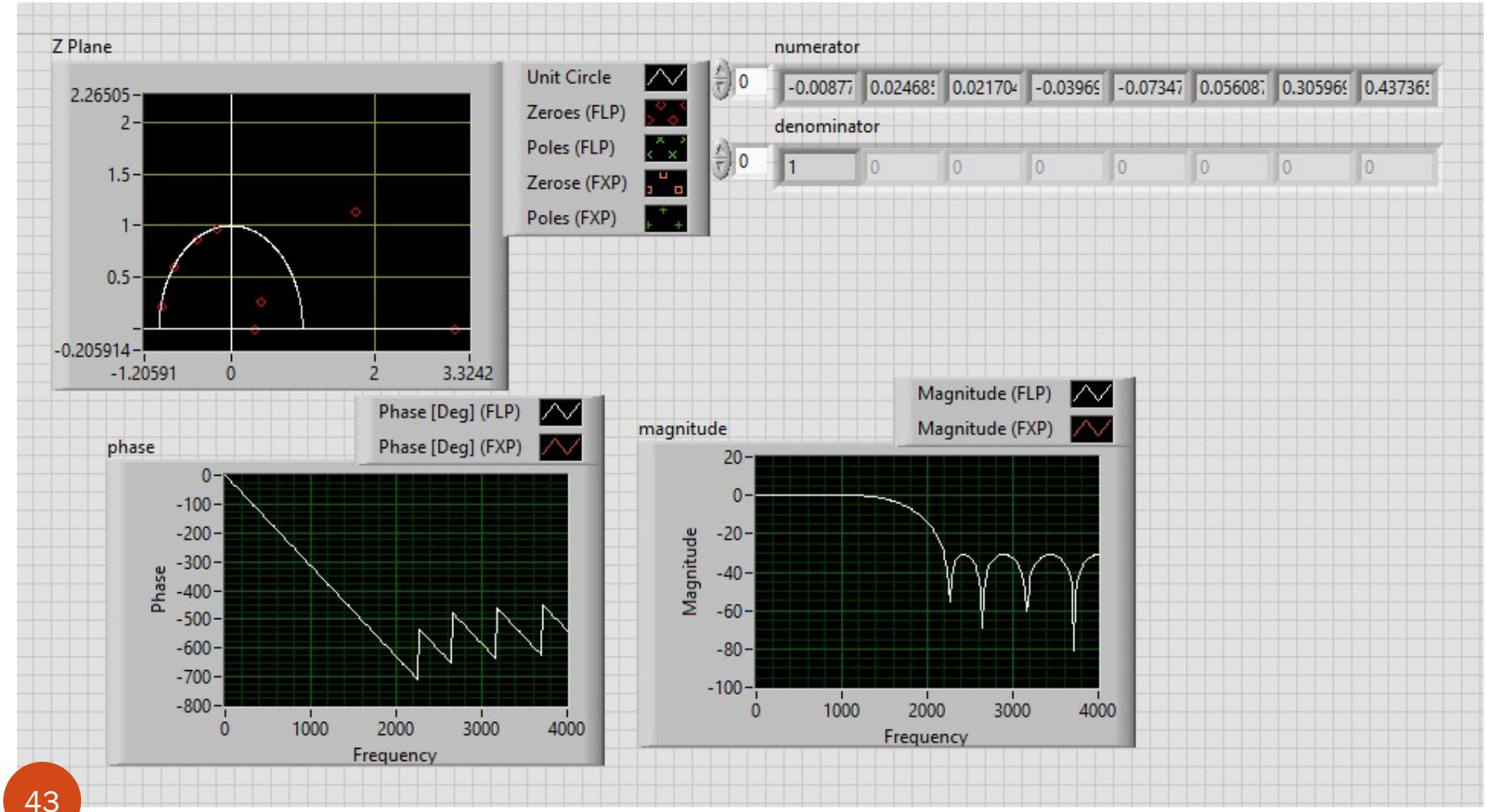

Configure Classical Filter Design [Classical Filter Design]
Main Settings
Filter type
Bandpass
Filter Specifications
Sampling frequency
8k Hz
Passband edge frequency
1.333k Hz
2.666k Hz
Passband ripple
0.5 dB
Stopband edge frequency
1k Hz
3k Hz
Stopband attenuation
20 dB
Design method
Elliptic
Design Feedback
Filter order
6
Error message
Magnitude in dB
Passband
Stopband
Magnitude [dB]
Frequency [Hz]
Z-Plane
Unit circle
Zeroes
Poles
OK
Cancel
Help

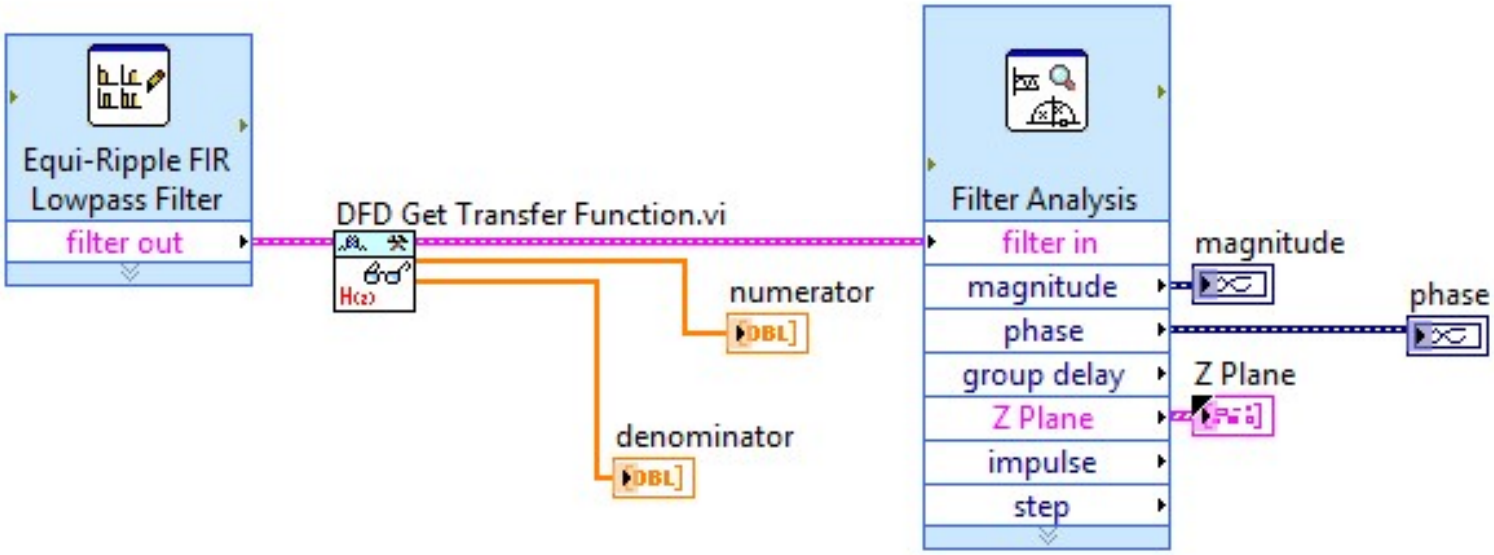
# Expt#19: FIR Filter Design




Freq1
Sine Waveform.vi
Freq2
Sine Waveform.vi
Freq3
Sine Waveform.vi
Cluster
Signal
Digital FIR Filter.vi
FIR
Filtered Signal
Spectral Measurements
Signals
FFT - (Peak)
Phase
FFT
FIR filter specifications
optional FIR filter specifications
200
stop

# Expt#20: FIR Filter Design-II




Equi-Ripple FIR
Lowpass Filter
filter out
DFD Get Transfer Function.vi
numerator
denominator
Filter Analysis
filter in
magnitude
phase
group delay
Z Plane
impulse
step
magnitude
phase
Z Plane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# Thank You