ELNC1236 Final Assembly and Testing

You MUST have your Pre-Assembly (soldering) mark prior to using this document.

Make sure that you have fixed any problems as pointed out in the COMMENTS box at the bottom of your Pre-Assembly Marking Sheet.

Due date is Friday, July 30th at 4:30pm
Each day late is –20%

Final Drilling

1. If you have not done so already, increase the pilot holes in the top of the hand-held enclosure for the rotary switch (SW3) to **10.5mm** and the two potentiometer (R9, R10) holes to **6.5mm**. *Drill very slowly through the plastic!* Remove any burrs left behind.

2. Make sure that the surface of the top is clean and dry. Place the self-adhesive decal on the top piece of the hand-held enclosure, ensuring that the edges line-up. **NOTE:** Take your time placing the decal, as there is little room for error.

3. For the ON/OFF hole, drill a **3mm** hole through the centre of the mark/cross, then increase the size of the hole to **12mm** for the rocker switch (SW1). Drill the DC Offset hole through the mark – **4mm** to allow a small screwdriver access.

4. Using the end plate jig, drill out the two BNC connector holes to **11mm**. Also drill out the DIP Switch access hole to **6.5mm**.

5. Make sure that you remove all burrs from all of the holes that have been drilled.

Switch Wiring

1. Place the 2 wires previously soldered to the rocker switch through the ON/OFF hole. Loosely secure the washer and nut onto the switch to hold it in place. **NOTE:** Do not tighten the hardware until the switch operation is verified as the switch may need to be rotated 180°.

2. Solder the two blue wires from the rocker switch (SW1) to the PCB.

Verify Operation

1. Make sure that your PCB is not resting on any conductive material.

2. Connect your 9V Battery to the Battery Clip.

3. Toggle the rocker switch to the ON position to apply power to the Function Generator, at this point both LED's should be ON.
   Watch for the following:
   - Any smoke or other indication of excessive current draw.
   - Listen for any sounds such as hissing or popping.
   - Use your sense of smell to check for any overheating components – *check for ICs heating up*.

   If you discover any of the above conditions, try to note roughly where it's occurring, turn OFF the power immediately and unplug the battery. Begin Troubleshooting.

4. Use a DMM for the next step:
   Measure the voltages of U1:
   - Measure Pin 8 ($V_{DD,}$ red test lead) to Pin 3 (GND, black test lead), then Pin 5 (V_{OUT}) to Pin 3 (GND). Record these values in the table provided, they should be approximately $\pm$ 8-9VDC.

   Measure the voltages of U2:
   - Measure Pin 12 to GND (Black battery lead), then Pin 4 to GND (Black battery lead). Record these values in the table provided, they should also be approximately $\pm$ 8-9VDC.

5. Using a BNC-BNC cable, connect one end to an Oscilloscope:
   - Connect the other end of the cable to the Sine Wave Output and verify that you have a symmetrical Sine Wave, adjusting the Amplitude, Frequency and Range Selector.
   - Move DIP Switch 1 (between the BNC connectors) to the up position to change the output to a Triangle Wave. Verify that you have a symmetrical Triangle Wave, adjusting the Amplitude, Frequency and Range Selector.
   - Move the cable to the Square Wave output and verify that you have a symmetrical Square Wave, adjusting the Frequency and Range Selector.

Calibration

For ease of marking, everyone will set the DC Offset of the Function Generator to zero with the following conditions set:

- Make sure the Tri/Sine selector DIP Switch is in the down position.
- Connect the BNC-BNC cable to the Sine Wave Output.
- Set the Frequency to 1kHz.
- Set the Amplitude to $3V_{PP.}$
- On the Oscilloscope, use the AC-GND-DC Coupling, to set the trace to 0V (centre of the screen).
- Set the scope to DC coupled and adjust R8 of the Function Generator until the positive peak (1.5 V) exactly equals the negative peak (-1.5 V). Your DC Offset is now set to zero. Do not adjust for the remainder of your testing.

Testing

Sine Wave (Using an Oscilloscope):

1. Set the Frequency Range Selector to 100 Hz.
2. Measure the minimum frequency. Also measure the minimum and maximum Amplitude at this frequency. Record the measurements in the table provided.
3. Measure the maximum frequency. Also measure the minimum and maximum Amplitude at this frequency. Record the measurements in the table provided.
4. Change the Frequency Range Selector to the next range.
5. Repeat steps 2, 3 and 4 until all ranges have been tested.

Triangle Wave (Using an Oscilloscope):

1. Set the Frequency Range Selector to 100 Hz.
2. Measure the minimum frequency. Also measure the minimum and maximum Amplitude at this frequency. Record the measurements in the table provided.
3. Measure the maximum frequency. Also measure the minimum and maximum Amplitude at this frequency. Record the measurements in the table provided.
4. Change the Frequency Range Selector to the next range.
5. Repeat steps 2, 3 and 4 until all ranges have been tested.

Testing (continued)

Square Wave (Using an Oscilloscope):

1. Set the Frequency Range Selector to 100 Hz
2. Measure the minimum frequency and the Amplitude. Record the measurements in the table provided.
3. Measure the maximum frequency and the Amplitude. Record the measurements in the table provided.
4. Change the Frequency Range Selector to the next range.
5. Repeat steps 2, 3 and 4 until all ranges have been tested.

Complete all measurement tables plus the Oscilloscope charts.

Final Assembly

1. Slide the end plate over the BNC connectors on your PCB, paying close attention to the orientation of the centre hole for DIP Switch access.

2. Insert the board into the bottom of the hand-held enclosure and make sure that the end plate fits into the grooves of the bottom piece. Secure the PCB using the #4-1/4" screws to the bottom of the hand-held enclosure. Do not over-tighten the screws – the plastic can easily be stripped.

3. Fit the top into place and secure it from the bottom with the 4 screws that came with the enclosure. Make sure that the battery clip is accessible through the battery compartment door and the rocker switch wiring does not get pinched in the case.

4. Secure the knob to the shaft of the Frequency Range Selector switch using the set screw.

5. Put the knobs in place for the two potentiometers. Make sure that the inserts (caps) properly indicate where the minimum and maximum is.
   TIP: The indicator on the insert (cap) should be facing the same direction as the flat edge inside the knob.

6. Re-test all functions to make sure that the Function Generator is still fully operational.

Measurements

	DC Voltages
U1 – Pin 8 to Pin 3	
U1 – Pin 5 to Pin 3	
U2 – Pin 12 to GND	
U2 – Pin 4 to GND	

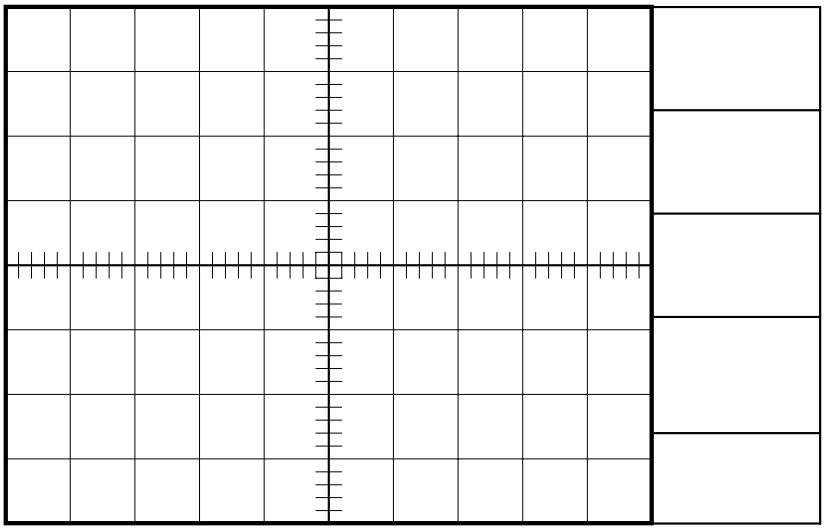
SINE Wave	Frequency	Amplitude MIN (pp)	Amplitude MAX (pp)
100 Hz Minimum			
100 Hz Maximum			
1 kHz Minimum			
1 kHz Maximum			
10 kHz Minimum			
10 kHz Maximum			
100 kHz Minimum			
100 kHz Maximum			

TRIANGLE Wave	Frequency	Amplitude MIN (pp)	Amplitude MAX (pp)
100 Hz Minimum			
100 Hz Maximum			
1 kHz Minimum			
1 kHz Maximum			
10 kHz Minimum			
10 kHz Maximum			
100 kHz Minimum			
100 kHz Maximum			

SQUARE Wave	Frequency	Amplitude
100 Hz Minimum		
100 Hz Maximum		
1 kHz Minimum		
1 kHz Maximum		
10 kHz Minimum		
10 kHz Maximum		
100 kHz Minimum		
100 kHz Maximum		

Triangle Wave – 10kHz $7V_{PP}$

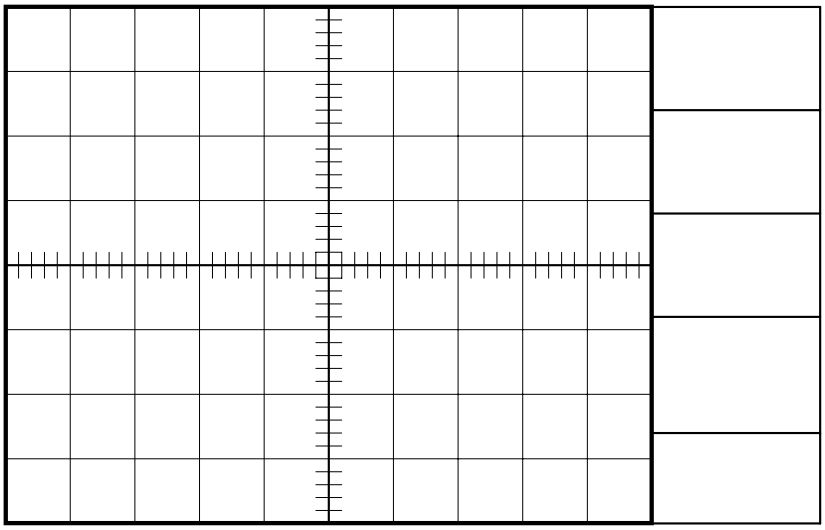
Set the output of the Function Generator as above and draw the waveform below. Setup the Oscilloscope to display at least one complete cycle and adjust vertical sensitivity for most accurate reading of amplitude. Record the Volts/Div and Sec/Div settings below the chart.



Volts/Div _____ Sec/Div _____

Sine Wave – 1kHz 10V_{PP}

Set the output of the Function Generator as above and draw the waveform below. Setup the Oscilloscope to display at least one complete cycle and adjust vertical sensitivity for most accurate reading of amplitude. Record the Volts/Div and Sec/Div settings below the chart.

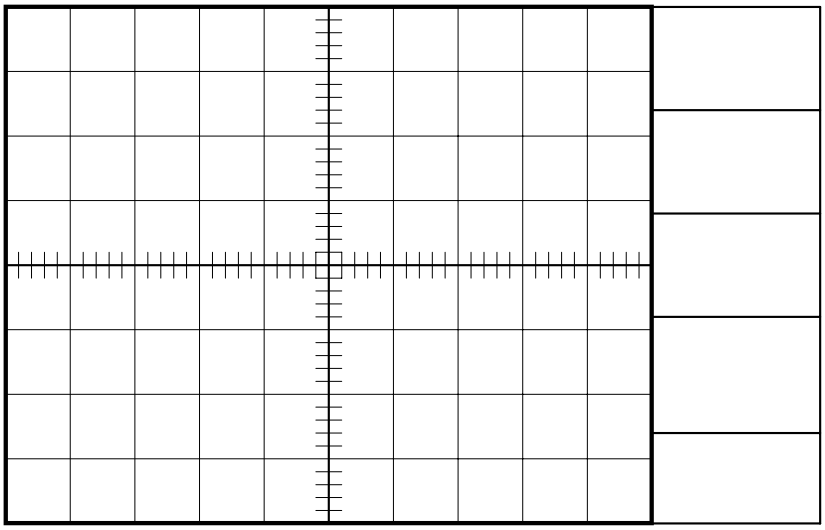


Volts/Div _____ Sec/Div _____

Square Wave – 2 kHz & 85 kHz

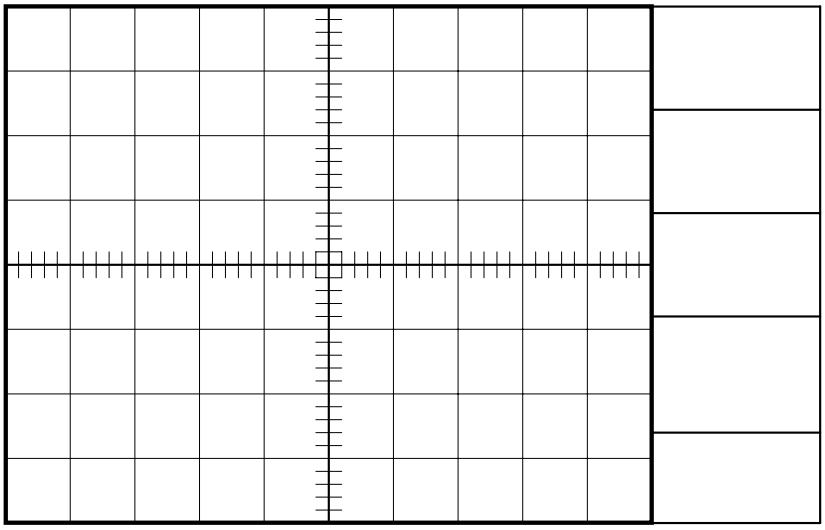
Set the output of the Function Generator as above and draw the waveform below. Setup the Oscilloscope to display at least one complete cycle and adjust vertical sensitivity for most accurate reading of amplitude. Record the Volts/Div and Sec/Div settings below the chart.

2 kHz



Volts/Div _____ Sec/Div _____

85 kHz



Volts/Div _____ Sec/Div _____