In Detkin Lab: Friday, November 21, 12:00 PM
Due: Handin will be part of HW 8

Work in teams of 2 (or 3) as specified:

<table>
<thead>
<tr>
<th>Team</th>
<th>Members</th>
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<tbody>
<tr>
<td>1</td>
<td>Addithya</td>
</tr>
<tr>
<td>2</td>
<td>Daniel</td>
</tr>
<tr>
<td>3</td>
<td>Kelsey</td>
</tr>
<tr>
<td>4</td>
<td>Michelle</td>
</tr>
<tr>
<td>5</td>
<td>Sahil</td>
</tr>
<tr>
<td>6</td>
<td>Yifing</td>
</tr>
<tr>
<td>7</td>
<td>Billy</td>
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We suggest you collect the answers on this sheet and **not** stop to capture waveforms on Intuilink (with one exception noted below).

You only need to capture voltages and resistances to 2 decimal significant figures.

1. Setup to drive a pulse into the long (100 ft.) coaxial cable and watch both ends of the transmission line.
   - Waveform generator drives short coaxial cable
   - Use T-junction to couple short coaxial cable to long coaxial cable and observe this source end on one channel of oscilloscope
   - Use T-junction to observe sink end of long cable on a second oscilloscope channel
   - Initially, leave this final T-junction unterminated

   ![Diagram](attachment://diagram.png)

   - Set waveform generator to generate as small a pulse as you can measure on the scope (about 30 ns) with a long period between pulses.
   - Set the waveform generator for internal termination at 50 Ω (this gives you a series termination at the source)
2. Observe and characterize the result.

(a) You should see the pulse at the far end of the long coaxial cable. (You may need to adjust the trigger level for the associated scope channel.)

(b) What is the delay between the two ends of the cable? 

(c) How does the pulse at the far end of the cable compare to the source end? (shape? voltage compared to original pulse?)

<table>
<thead>
<tr>
<th>Shape</th>
<th>Voltage</th>
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(d) What reflections (if any) can you see at either end of the line? (shape? voltage relation to original pulse?)

<table>
<thead>
<tr>
<th>Source</th>
<th>Number</th>
<th>Shape</th>
<th>Voltage (each pulse)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sink</td>
<td>Number</td>
<td>Shape</td>
<td>Voltage (each pulse)</td>
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</tbody>
</table>
3. Terminate the sink end of the cable (formally open T at the end of the cable) with the potentiometer terminator.

(a) For what resistance do you see no reflection? 

(b) For what resistances do you get a negative reflection? 

(c) For what resistances do you get a positive reflection? 

(d) For what resistance do you get a positive reflection one-half the magnitude of the open-circuit reflection? 

4. Retune the potentiometer termination for no reflection and leave attached for the remainder of the lab.
5. Use another T-junction to add another 100 ft. cable between the 100 ft. cable and the oscilloscope T-junction.

(a) How does this change the waveforms? (delay? reflections? shape? voltages?)

6. Add another 100 ft. cable to the new T-junction between the 100 ft. and 100 ft. cable (so the two 100 ft. cables branch in parallel).

(a) When this cable is unterminated, how does this change the waveforms? (delay? reflections? shape? voltages?)

(b) When this cable is properly terminated, how does this change the waveforms? (delay? reflections? shape? voltages?)

(This is the one waveform you may want to capture in Agilent Intuilink; there will be a question on HW8 that is based on this waveform.)
7. Replace this new (100 ft.) cable with a short (5–10 ft.) cable and relate this to the two cases above (case with no branching cable, case with 100 ft. branching cable)

(a) When this cable is unterminated, how does this change the waveforms? (delay? reflections? shape? voltages?)

(b) When this cable is terminated, how does this change the waveforms? (delay? reflections? shape? voltages?)