Part II Speed of Light In Fiber Optic Cable

**Setup**

1. Turn on oscilloscope.
2. Set controls as follows: Vertical Switch – both, Trigger Mode - Auto Trigger source - Ch1 Trigger Slope – Positive, Ch 1 volt/div = 1, Ch 2 volt/div = 0.5, Input Coupling - AC, Time/div – 50 ns, Add/Alt/Chop – Alt
3. Connect probe between Ch1 and blue Reference point on circuit board. Connect probe ground to ground point near Reference point.
4. Connect probe between CH 2 and Delay point and probe ground to nearby ground point on board.
5. Set CH 2 input selector to GND.
6. Plug in adapter and connect to jack on circuit board. Yellow LED on board should be on.
7. Turn the Calibration Delay knob to 12 o’clock position. Connect short (~ 15cm) piece of fiber optic cable between D3 and D8 and tighten nuts.

**Calibration**

1. Make sure probe is in 1X position if 1X/10X type. A pulse should be visible on CH 1 ( ~ 3.5v high).
2. Turn CH 2 input to AC. A second pulse that went through the short cable should be visible (~1v high).
3. Use the positioning controls so Ch2 baseline is on top of Ch1 baseline.
4. Adjust positioning controls so Ch 1 peak is on left side. Adjust calibration knob to put CH 2 peak on top of Ch. 1 peak. Use scope magnification controls and lower sec/div to get best fit.
5. Turn off magnification and set time/div back to 50 ns (.05 microsec). Remove short cable and put in box.

**Measurement & Analysis**

1. Do the steps below first using 20m cable and then repeat with 40m cable. If you are using the 100 Mhz scope look for a 20/100 button near bottom of front of scope. Use whichever position gives clearest scope display.
2. Connect the cable between D3 and D8. Do not change calibration control.
3. There should be a higher start pulse on the left and a weaker return pulse to the right. Adjust time/div as needed to separate peaks.
4. Measure the number of divisions between peaks to nearest 1/10 division. Multiply by time/div to get time.
5. Use length of cable (m) and time between peaks (sec) to get speed of light in cable. Compute index of refraction (book value ~1.49).