TECH NOTE

Pulse Parameters and LDP-3830 Control Modes

PURPOSE

This technical note briefly discusses the characteristics of ideal pulse waveforms. These are discussed in relation to the pulse parameters, control modes, and trigger in and trigger out of the LDP-3830 Pulsed Precision Laser Diode Driver.

BACKGROUND

Below, in Figure 1, is an ideal pulse waveform that shows pulse width and Pulse Repetition Interval (PRI).

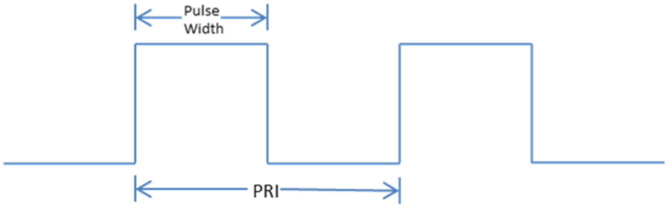

FIGURE 1: Ideal Pulse Waveform, Duty Cycle = 50%

Pulse width is the amount of time that the waveform is active or high. PRI is the amount of time from the beginning of one pulse to the beginning of another pulse. The ideal pulse shown in Figure 1 above has a duty cycle of 50%. Duty cycle is the percentage of time that the pulse is high relative to the PRI. A duty cycle of 50% means that half the time the pulse is high, while the other half it is low.

The LDP-3830 has three different control modes for creating the desired pulse waveform, constant PRI, constant DC%, and EXT (or external trigger mode). Constant PRI mode holds the PRI constant for a set pulse width. During this mode the LDP-3830 will automatically adjust the duty cycle to maintain the constant PRI set by the user, based on the following equation:

$$PRI = \frac{PW}{DC}$$

The second mode, constant DC%, will maintain a constant duty cycle according to the pulse width set by the user. The PRI will be automatically adjusted during constant DC% mode, based on the following equation:

$$DC = \frac{PW}{PRI} \times 100$$

EXTERNAL TRIGGER MODE

The last mode available for the LDP-3830 is the external trigger mode (EXT). This mode uses an input TTL signal on the trigger in BNC on the back of the LDP-3830 to control PRI. The EXT trigger mode outputs the current pulse waveform when the input TTL signal goes high.

The LDP-3830 also has the ability to output a trigger out signal when the LDP-3830 outputs a current pulse. The trigger out signal can be used to time when a measurement is going to be acquired, such as a photo detector measuring a gas cell.

Delays between the trigger in signal and other output signals from the LDP-3830 must be considered when using the EXT mode. Not accounting for the delays while taking measurements from the trigger out can result in measurements when the current pulse is low, causing faulty data.

To understand the typical delay difference from a trigger in to trigger out, current monitor output, and measured optical output the LDP-3830 was configured to output a 450ns pulse when a trigger in signal was received. Figure 2 shows an 80ns delay from the trigger in to a trigger output.

This delay is present due to the time required for the signal traveling through the internal circuitry of the LDP-3830 to reach the trigger out output BNC.

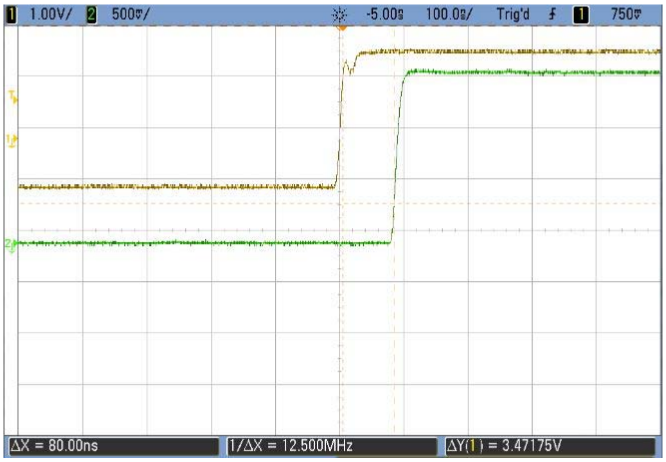

FIGURE 2: Trigger In to Trigger Out Delay, 80ns

Figure 3 shows a 140ns delay from the trigger in to the current monitor output. This delay is larger than the delay between trigger in and trigger out due to the travel through the CC-385 Pulse Output cable to the LPB-386 Pulse Board.

FIGURE 3: Trigger In to LPB-386 Current Monitor Delay, 140ns

Figure 4 shows a 190ns delay from the trigger in to the measured optical output. This is the delay from the laser diode internals, fiber travel, and detector.

FIGURE 4: Trigger In to Optical Output Delay, 190ns

SUMMARY

The typical measured delays from the trigger-in of the LDP-3830 are summarized in Table 1. Understanding the various delays from a trigger-in is important in setting the timing of the various measurement devices of the application such as a high speed detector. The reported delays are typical and variations can be present in the measured delays leading to longer or shorter delays.

	Typical Delay from Trigger-In
Trigger-Out	80ns
Current Monitor	140ns
High Speed Detector	190ns

TABLE 1: Summary of Typical Delays Seen from Trigger-In