PURPOSE

The LDX-3600 Series High Power Laser Diode Drivers operate in CW or QCW mode. The instruments have an integrated pulse control circuit, so that in QCW mode, the user is able to adjust Pulse Width (PW), Duty Cycle (DC%), and Frequency (Freq). In this mode, the output pulse is operated in either constant DC% mode or constant frequency mode i.e., in constant DC% mode, the pulse duty cycle is held constant while pulse width and frequency are adjusted. Similarly, in constant frequency mode, the pulse frequency is held constant while pulse width and duty cycle are adjusted. This tech note reviews the effect on PW, DC%, and Freq parameter ranges while in either constant duty cycle mode or constant frequency mode.

GOVERNING FORUMLAS

The LDX-3600 Series automatically adjusts the allowable parameter ranges based on the operating mode the user has selected.

The formulas used to determine the allowable range for each parameter are as follows:

(1) $DC\% = (PW * Freq) * 100$

(2) $PW = (DC\% / 100) / Freq$

(3) $Freq = (DC\% / 100) / PW$

All three of the parameters must remain in the allowed operating range of the instrument. Figure 1, *Allowed QCW Operating Range*, provides a graphical representation of the allowable operating ranges for the LDX-3650 and LDX-3660.
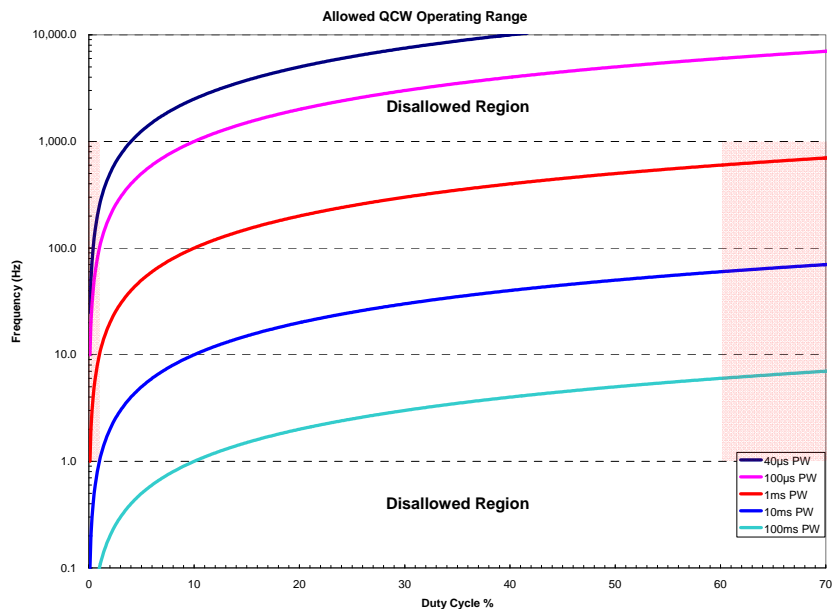

FIGURE 1 – Allowed QCW Operating Range

CONSTANT DC% MODE

When operating in Constant DC% mode if the PW is adjusted, the instrument will adjust the frequency to maintain the DC% set-point. The PW range is limited by the DC% set-point and the frequency range of the instrument.

Changing PW:

- DC% remains constant
- Min Freq = 1 Hz
- Max Freq = 1000 Hz
- As PW increases (↑) Frequency decreases (↓)
- Minimum allowed PW = 40μsec
- Maximum allowed PW = 1 sec

  - Minimum $PW_{(2)} = (DC\%/100) / 1000$
  - Maximum $PW_{(2)} = (DC\%/100) / 1$

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When operating in Constant DC%, adjusting DC% will adjust frequency while holding PW constant.

DC% range is limited by the PW set point and the frequency range of the instrument.

Changing DC%:

- PW remains constant
- Min Freq = 1 Hz
- Max Freq = 1000 Hz
- As DC% increases (↑) Frequency increase (↑)
- Minimum allowable DC% = 0.1 %
- Maximum allowable DC% = 60 %

  - Minimum DC%$_{(1)}$ = (PW * 1) * 100
  - Maximum DC%$_{(1)}$ = (PW * 1000) * 100

CONSTANT FREQ MODE

When operating in Constant Freq. mode, if the PW is adjusted, the instrument will adjust the DC% to maintain the frequency set-point. The PW range is limited by the frequency set-point and the DC% range of the instrument.

Changing PW:

- Freq remains constant
- Min DC% = 0.1%
- Max DC% = 60%
- As PW increases (↑) DC% Increase (↑)
- Minimum allowed PW = 40µsec
- Maximum allowed PW = 1 sec

  - Minimum PW$_{(2)}$ = (0.1/100) / Freq
  - Maximum PW$_{(2)}$ = (60/100) / Freq

When operating in Constant Freq, adjusting frequency will adjust the DC% while holding PW constant. The Freq range is limited by the PW set point and the DC% range of the instrument.

Changing Freq:

- PW remains constant
- Min DC% = 0.1%
- Max DC% = 60%
- As Freq increases (↑) DC% increase (↑)
- Minimum allowable Freq = 1 Hz
- Maximum allowable Freq = 1000 Hz

  - Minimum Freq$_{(3)}$ = (1 / 100) / PW
  - Maximum Freq$_{(3)}$ = (60 / 100) / PW

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