

### OVERVIEW

The LDX-36000 series High Power Current Source is a versatile instrument that can function in both continuous-wave (CW) and quasi-continuous-wave (QCW) modes. The QCW mode includes two modes. The standard pulse mode is optimized for short pulse widths above the maximum CW current. The hard pulse mode is designed to deliver longer pulse widths up to the maximum CW current. This technical note presents pulse characteristics of these two QCW modes, based on measurements of rise and fall times and pulse overshoot, width, and frequency.

### TEST PROCEDURE & RESULTS

The LDX-36000 series High Power Current Source was connected to a low-inductance resistive load while one current carrying wire from the instrument passed through a LEM IT-400-S current transducer. The output of the transducer was connected to a calibrated LeCroy Waverunner LT344 oscilloscope. The oscilloscope was used to measure rise time, fall time, and pulse overshoot during standard pulse QCW operation for each of the LDX-36000 models. The results are presented in Table 1 and 2.

Model Number	Mean Measured Rise Time	Mean Measured Fall Time	Specified Maximum Rise/Fall Time
LDX-36010-12	9.70 $\mu$ s	9.10 $\mu$ s	10 $\mu$ s
LDX-36010-35	5.11 $\mu$ s	6.33 $\mu$ s	10 $\mu$ s
LDX-36018-35	5.41 $\mu$ s	7.23 $\mu$ s	10 $\mu$ s
LDX-36025-12	8.32 $\mu$ s	6.53 $\mu$ s	10 $\mu$ s
LDX-36040-30	4.31 $\mu$ s	5.18 $\mu$ s	20 $\mu$ s
LDX-36050-12	10.97 $\mu$ s	7.00 $\mu$ s	20 $\mu$ s
LDX-36070-30	8.43 $\mu$ s	8.79 $\mu$ s	20 $\mu$ s
LDX-36085-12	11.3 $\mu$ s	15.1 $\mu$ s	20 $\mu$ s
LDX-36125-12	12.95 $\mu$ s	16.73 $\mu$ s	20 $\mu$ s
LDX-36125-24	14.80 $\mu$ s	17.80 $\mu$ s	20 $\mu$ s

TABLE 1: Rise and Fall Time for Standard Pulse Mode, Pulse Amplitude at 1/2 Full Scale

Model Number	Maximum Measured Pulse Overshoot	Specified Maximum Pulse Overshoot
LDX-36010-12	2.34%	5.00%
LDX-36010-35	4.02%	5.00%
LDX-36018-35	4.45%	5.00%
LDX-36025-12	2.44%	5.00%
LDX-36040-30	2.04%	5.00%
LDX-36050-12	1.72%	5.00%
LDX-36070-30	2.74%	5.00%
LDX-36085-12	1.52%	5.00%
LDX-36125-12	2.66%	5.00%
LDX-36125-24	1.73%	5.00%

TABLE 2: Pulse Overshoot for Standard Pulse Mode, Measured at Various Pulse Amplitudes

Further tests were run with a calibrated LDX-36018-35. The test setup was identical except the LDX-36018-35 was connected to a diode load. The oscilloscope was used to measure worst case pulse width and pulse frequency accuracy for both standard and hard pulse operation. The results of these tests are presented in Tables 3, 4, 5, and 6.

Pulse Width Setpoint	Worst Case Measured Pulse Width	Worst Case Error	Specified Maximum Error
40.00 $\mu$ s	34.76 $\mu$ s	-5.24 $\mu$ s	$\pm$ 10 $\mu$ s
80.00 $\mu$ s	74.98 $\mu$ s	-5.02 $\mu$ s	$\pm$ 10 $\mu$ s
100.0 $\mu$ s	94.82 $\mu$ s	-5.18 $\mu$ s	$\pm$ 10 $\mu$ s
250.0 $\mu$ s	244.7 $\mu$ s	-5.3 $\mu$ s	$\pm$ 10 $\mu$ s
500.0 $\mu$ s	494.9 $\mu$ s	-5.1 $\mu$ s	$\pm$ 10 $\mu$ s
1.000 ms	994.4 $\mu$ s	-5.6 $\mu$ s	$\pm$ 10 $\mu$ s

TABLE 3: LDX-36018-35 Pulse Width Accuracy for Standard Pulse Mode, Pulse Amplitude at 1/2 Full Scale

# TECH NOTE

Pulse Frequency Setpoint	Worst Case Measured Frequency	Worst Case Error	Specified Maximum Error
5.000 Hz	5.00 Hz	0.00 Hz	±0.005 Hz
10.00 Hz	10.00 Hz	0.00 Hz	±0.010 Hz
60.00 Hz	60.00 Hz	0.00 Hz	±0.060 Hz
250.0 Hz	250.05 Hz	+0.05 Hz	±0.250 Hz
500.0 Hz	500.21 Hz	+0.21 Hz	±0.500 Hz
1000 Hz	1000.6 Hz	+0.6 Hz	±1.000 Hz

TABLE 4: LDX-36018-35 Pulse Frequency Accuracy for Standard Pulse Mode, Pulse Amplitude at ½ Full Scale

Pulse Width Setpoint	Worst Case Measured Width	Worst Case Error	Specified Maximum Error
1.000 ms	1.00505 ms	+5.05 µs	±20 µs
4.000 ms	4.00411 ms	+4.11 µs	±20 µs
25.00 ms	25.0042 ms	+4.2 µs	±20 µs
100.0 ms	100.004 ms	+ 4 µs	±20 µs

TABLE 5: LDX-36018-35 Pulse Width Accuracy for Hard Pulse Mode, Pulse Amplitude at ½ Full Scale

Pulse Frequency Setpoint	Worst Case Measured Frequency	Worst Case Error	Specified Maximum Error
0.10 Hz	0.10 Hz	0.00 Hz	±0.0001 Hz
0.40 Hz	0.40 Hz	0.00 Hz	±0.0004 Hz
2.00 Hz	2.00 Hz	0.00 Hz	±0.002 Hz
8.00 Hz	8.00 Hz	0.00 Hz	±0.008 Hz
50.0 Hz	50.01 Hz	+0.01 Hz	±0.050 Hz
200.0 Hz	199.90 Hz	-0.10 Hz	±0.200 Hz

TABLE 6: LDX-36018-35 Pulse Frequency Accuracy for Hard Pulse Mode, Pulse Amplitude at ½ Full Scale

## CONCLUSION

These results demonstrate that performance of the LDX-36000 series High Power Laser Diode Current Source can exceed published specifications. The specifications allow for variations in the manufacturing process between each instrument. Each ILX Lightwave instrument undergoes calibration and accuracy testing to ensure it meets or exceeds specifications. For the LDX-36000 series this procedure includes testing of overshoot and rise and fall time, among other specifications. Regular yearly calibration allows this performance to be maintained for the lifetime of the instrument.

The results above reflect the typical performance of the LDX-36000 series with proper cabling and simple loads. The actual performance when using an LDX-36000 series will depend on the specific cabling and type of load being used in a given application.