TECH NOTE

LDX-3600 GPIB Timing Study

INTRODUCTION

When using GPIB to perform automated tests or experiments, it can be very important to know the execution speed and effects of the GPIB commands being used. Having this information can help determine maximum sending speeds, determine required settling times after certain command execution, and help with understanding maximum speeds that can be expected to be achieved in automated control loops. This technical note examines both the execution speed and required settling time of several commonly used GPIB commands for the LDX-3600 family of high power laser diode current drivers.

TEST SET UP

An LDX-3660 with version 1.01 of firmware was connected to a high power diode through an ILX Lightwave CC-340 cable. The LDX-3660 was controlled with custom GPIB software that can run test scripts from text files. The voltage across the high power diode load was monitored with a LeCroy Waverunner LT344 Oscilloscope.

TEST PROCEDURE

Several commonly used GPIB commands were selected to test the speed of the GPIB interface in the LDX-3600. The execution speed of each command or query was determined by measuring the time it took to repeatedly send 1,000 commands (or queries) as fast as the LDX-3660 would allow. The time was then divided by the number of commands sent to determine the average command execution time. The results are shown in Table 1.

As a second test, a combination test script was written to combine several GPIB commands and check the results from the first test. The voltage

across the power diode was monitored with the oscilloscope to make sure the commands were executed as expected. The combination test script used for this test was started after the output was enabled. With the output enabled, the combination test script would change the current output between 0A and 2A. After each current change command was issued, the operation complete query (*OPC?) was issued to make sure the current had settled before issuing the next command. Once the operation complete query responded, a voltage measurement and photo diode current measurement command were issued. The combination test script was run so that it would have a total of 1000 set (LDI), wait (*OPC?), measure (LDV?), and measure (PPD?) cycles.

RESULTS

The average time to repetitively complete a step in current (LDI), wait for the current to settle (*OPC?), read the voltage (LDV?), and read the photodiode current (PPD?) was 182ms. This number was determined by running the combination test script referred to in the procedure section. It should be noted that the time required to execute the combination script is almost 20ms longer than the sum of the times required to execute each of the individual commands that comprise the script. This discrepancy is most likely caused by the firmware in the LDX-3600 encountering delays when dealing with changing commands as opposed to executing the same command repeatedly.

There are a few key points to be made relative to the data in Table 1. The first point to be noted is that while the results listed in Table 1 should be close to the actual execution time of an individual



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TECH NOTE

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command, it should be expected that there will be some variation when examining the sending speed of individual commands (as opposed to looping them one after another). Aside from the LDI command and query, it can be seen that most commands and queries take about the same amount of time to complete, with the queries taking slightly longer than the commands. The final point is that to achieve an accurate time for the current setting, the operation complete query must be made to make sure the instrument's firmware has completed the current change.

If this step is not performed, subsequent measurements might be made before the current change has completed, resulting in inaccurate measurements.

Understanding the GPIB timing issues in an automated test can dramatically improve both the test's development time and the automated test's results.

	Average Execution Speed	
	Command	Query
*IDN?	N/A	23ms
LAS:LDI	115ms*	81ms
LAS:LDV?	N/A	31ms
LAS:PPD?	N/A	18ms
LAS:LIM:T	17ms	20ms
LAS:LIM:I	16ms	18ms
LAS:LIM:V	16ms	19ms

*Includes *OPC? query after each LAS:LDI command to make sure the current change had completed

TABLE 1



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