User's Guide

Laser Diode Controller
LDC-37x4C
LabView Driver

ILX Lightwave®
A Newport Corporation Brand

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Chapter 1: Introduction

This chapter is an introduction to the LDC-37X4C Laser Diode Controller LabVIEW Instrument Driver. This chapter also includes:

- ✓ LabVIEW Instrument Driver Overview
- ✓ USB Communication Overview
- ✓ GPIB Communication Overview

LDC-37X4C LabVIEW Instrument Driver Overview

The LDC-37X4C LabVIEW Instrument Driver is a collection of Virtual Instruments (VIs) that allow for remote control of the instrument. These VI's can be used either independently or as building blocks for a larger, more complex VI. Remote control can be accomplished using VISA sessions over either of the two communication channels listed below.

USB Communication

The USB connector is located on the rear panel of the instrument. This USB connector is the square "B"-style connector. A standard USB A/B cable is required.

Configuring the COM Port

With the connected instrument powered on, open National Instruments Measurement & Automation Explorer and select the port to which the instrument is connected. The correct port will be listed under **My System → Devices and Interfaces → Serial & Parallel**. If the instrument is connected to a remotely accessed computer, please see the troubleshooting section of Chapter 3.

When the correct port is highlighted, the Baud rate, Data bits, Parity, Stop bits and Flow control can be adjusted. From the drop down menu, select the following values:

Baud: 19,200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

After the correct values are selected, click **Validate** and then **Save**. The COM port is now configured.

GPIB Communication

The GPIB connector is also located on the rear panel of the instrument. See the LDC-37X4C Product Manual for instructions on setting the GPIB address using the front panel controls.

Chapter 2: Operation

This chapter is an introduction to the LabVIEW software and the LDC-37X4C Laser Diode Controller LabVIEW Instrument Driver. This chapter also includes:

- ✓ Common Instrument Driver Features
- ✓ LDC-37X4C Sub-VI Descriptions
- ✓ LDC-37X4C VI Descriptions

Front Panel vs. Block Diagram

The Front Panel appears when a sub-VI is opened. The Front Panel for every sub-VI includes VISA session IN and OUT ports, as well as error IN and OUT ports. Additionally, there are inputs and outputs relating to the specific operation the VI.

To open the Block Diagram of the sub-VI, select **Window** in the toolbar of the Front Panel and choose **Show Block Diagram**. The Block Diagram displays the code that communicates with the instrument. The information required by the code appears as a labeled icon in the Block Diagram and is input by the user on the Front Panel. The information output by the code also appears as a labeled icon and is displayed on the Front Panel.

The Front Panel and the Block Diagram of a sub-VI are two different views of the same code.

VISA Session IN and OUT

The VISA Session box on the Front Panel provides a drop down menu of the remote addresses available. The VISA Session OUT outputs the VISA Session address that was input to the sub-VI. Although this seems redundant inside of the sub-VI, it creates flow between sub-VIs. See the example below.

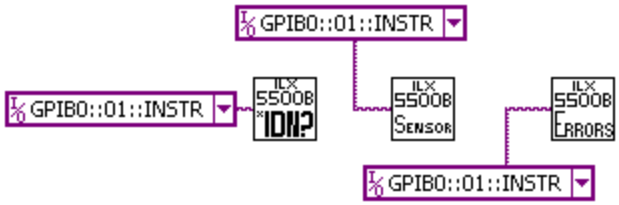

Figure 1: Three sub-VIs without VISA Session IN/OUT are controlling the same instrument.

Figure 2: Three sub-VIs with VISA Session IN/OUT are controlling the same instrument. The VISA Sessions OUT make it possible to input the address once and reduce the clutter.

Updating the Sub-VI

Press the white arrow located in the toolbar of the Front Panel and the Block Diagram to execute the sub-VI. To execute a sub-VI means to update the instrument with values input by the user or query the instrument. If there is not a white arrow, but a broken gray arrow, see the Errors.

LDC-37X4C Sub-VI Descriptions

LDC-37X4C Read Instrument ID

Queries the instrument with the IEEE 488.2 command *IDN? and returns the manufacturer, model number, serial number and firmware version number as a string.

LDC-37X4C Read Errors

Reads the instrument's error queue and returns it as a string. See the LDC-37X4C Manual for more information.

LDC-37X4C Read Laser Condition Status Register

Reads all conditions from the Laser Condition Status Register (Power Limit, Laser Current Limit, Voltage Limit, Interlock Error, Open Circuit, Output Shorted, Out of Tolerance, Output On, Ready for Cal Data) and returns them as a set of booleans.

LDC-37X4C Set/Read Laser Control Mode

Sets the Laser Control Mode (I_{HBW}, I, or P) using an enumerated value, or reads the control mode and returns it as a string.

LDC-37X4C Set/Read Laser Current Limit

Sets or reads the Laser Current Limit parameters(I1-I5) in mA. See the LDC-37X4C Manual - Remote Commands - **`LASer:LIMit:I#`**.

LDC-37X4C Set/Read Laser Current Setpoint

Sets or reads the setpoint for the laser control current in mA.

LDC-37X4C Read Laser Current

Reads the most recent laser current measurement in mA.

LDC-37X4C Set/Read Laser Output Enable

Turns the laser on or off, or queries the status of the laser and returns it as a boolean.

LDC-37X4C Set/Read Laser Photodetector Current Setpoint

Sets or reads the laser photodetector current setpoint in μA.

LDC-37X4C Read Laser Photodetector Current

Reads the most recent laser photodetector current measurement in μA.

LDC-37X4C Set/Read Laser Photodetector Power Setpoint

Sets or reads the laser photodetector power setpoint in mW.

LDC-37X4C Read Laser Photodetector Power
Reads the most recent laser photodetector power measurement in mW.

LDC-37X4C Set/Read Laser Photodiode Power Limit
Sets or reads the laser photodetector power limit in mW.

LDC-37X4C Set/Read Laser Voltage Limit
Sets or reads the laser compliance voltage limit value in Volts.

LDC-37X4C Read Laser Voltage
Reads the most recent laser voltage measurement in Volts.

LDC-37X4C Set/Read Laser Output Range
Sets or reads the laser output range. This parameter is a number between 1 and 5 and is described in the 37X4C Manual Remote Commands Section under **LASer:RANge.**

LDC-37X4C Set/Read Radix
Sets or reads the current radix for remote number entry and display. The input to Set Radix is an enumerated value that can be DEC, HEX, BIN, or OCT. Read Radix returns the radix as a string.

LDC-37X4C Read TEC Condition Status Register
Reads all conditions from the TEC Condition Status Register (Out of Tolerance, TEC Current Limit, Voltage Limit, Output On, Ready for Cal Data, Booster Enabled, Sensor Open, High Temp Limit, TE Module Open) and returns them as a set of booleans.

LDC-37X4C Set/Read TEC Constants
Sets or reads the Steinhart-Hart equation constants (C1,C2,C3).

LDC-37X4C Set/Read TEC Current Limit
Sets or reads the TEC current limit.

LDC-37X4C Set/Read TEC Current Setpoint
Sets or reads the TEC current setpoint.

LDC-37X4C Read TEC Current
Reads most recent TEC current measurement.

LDC-37X4C Set/Read TEC Gain
Sets or reads the TEC Gain. Possible values are 1, 3, 10, 30, 100, 300.

LDC-37X4C Set/Read TEC Mode
Sets or reads the TEC control mode. Possible values are I_{TE}, R, or T. Input to Set is an enumerated value and the output of read is a string.

LDC-37X4C Set/Read TEC Output Enable
Turns the TEC on or off, or queries the status of the TEC.

LDC-37X4C Set/Read TEC Resistance Setpoint
Sets or reads the TEC resistance setpoint in kΩ.

LDC-37X4C Read TEC Resistance
Reads the current TEC resistance in kΩ.

LDC-37X4C Read Sensor Type
Reads the selected TEC sensor type and returns it as a string. Possible values are Thermistor at 100μA, Thermistor at 10μA, LM335, AD590, or N/A. The N/A indicates that the sensor select switch is in the RTD position, which is no longer used.

LDC-37X4C Set/Read TEC Temperature Limit
Sets or reads the TEC temperature limit in degrees Celsius.

LDC-37X4C Set/Read TEC Temperature Setpoint
Sets or reads the TEC temperature setpoint in degrees Celsius.

LDC-37X4C Read TEC Temperature
Reads the most recent TEC temperature measurement in degrees Celsius.

LDC-37X4C Example VI Description

LDC-37X4C Example VI
The example VI uses the sub-VI's to allow the user to set and read various parameters of the device using a simple interface.

Chapter 3:
Errors and Troubleshooting

This chapter is an introduction to the LDC-37X4C Laser Diode Controller LabVIEW Instrument Driver's common errors. This chapter also includes:

- ✓ Troubleshooting
- ✓ NI Spy

Errors

Broken Gray Arrow: If a broken gray arrow appears in the toolbar (where the white arrow should be) and the white arrow is not there, this indicates an error in the code. Click on the broken arrow to see a list of the errors in the sub-VI. Enter the Block Diagram to correct these errors.

Troubleshooting

I want to configure the COM port, but the correct port is not appearing in Measurement & Automation Explorer.

In Measurement & Automation Explorer (MAX), select **View** and then **Refresh.** The COM port to which the instrument is connected will appear.

The instrument that I want to configure is connected to a computer that I am remotely accessing.

The COM port needs to be configured on the computer to which the instrument is connected.

The VISA address that I want to select in a sub-VI does not appear in the drop down menu of the Front Panel.

Select **Refresh** at the bottom of the drop down list and the VISA address will appear.

NI Spy

NI Spy is a free program that is available on the National Instruments website. When the application is opened and the capture is started, every interaction between the computer and the instrument is recorded. All errors are documented and explained.