OPTI 380B Intermediate Optics Laboratory

Lab 3

Introduction to LabView and GPIB interfacing

HARDWARE INTERFACES

SERIAL (one bit at a time)

RS-232

USB 1.1

USB 2.0

Firewire (IEEE 1394)

I2C (or I^2C)

- "Inter-Integrated Circuit" Bus
- 2-wire serial interface standard (Philip's Semiconductor, early '80s)
- Original use was to connect a CPU to peripheral chips in a TV set
- Physically consists of 2 wires and a ground connection
    - -- Serial Data Line (SDA)
    - -- Serial Clock Line (SCL)
- Runs at fairly low speed (100kHz-400kHz)
- Does allow for full-duplex communication between multiple devices
- Each IC on the bus has a unique address
- Max. # of devices connected to the bus is dictated by the max. allowable capacitance on the lines (400pF). Typical device capacitance is 10pF.
- Master (computer) / Slave (external peripheral devices) interface

"The I2C bus is a two-wire serial bus. One wire is the Serial Clock Line (SCL), and the other is the Serial Data Line (SDL). The bus is controlled by a bus master device that tells slave devices when they can access the bus. Each slave has a unique 7-bit or 10-bit address. When the master device accesses a slave, it sends the address and a read/write bit. Then, the addressed slave acknowledges the connection and the master can send or receive data to or from the slave."

PARALLEL (one byte at a time)

Parallel port (IEEE 1284 “Centronics”)

GPIB (General Purpose Interface Bus) IEEE-488, “HP-IB”

LabView

(Laboratory Virtual Instrument Engineering Workbench

(LabVIEW) A package from National Instruments Corp originally developed to provide a graphical user interface to instruments connected by the IEEE 488 (GPIB) bus. It has powerful graphical editing facilities for defining and interconnecting "virtual instruments

G. M. Vose and G. Williams. *LabVIEW: Laboratory virtual instrument engineering workbench*. Byte, pages 84--92, September 1986.

LabVIEW is a software package for use in laboratory computing. The name of the software is an acronym for Laboratory Virtual Instrument Engineering Workbench and is designed as a complete set of applications for instrument and process control, data acquisition and scientific computing including simulation and data analysis. There are also facilities for signal processing, data base operations and graphics capabilities. In fact, the software consists of a higher level of computer programming language, called G and numerous subroutines all of which are utilized and accessed by an intuitive diagramming technique. Programming with LabVIEW amounts to wiring ready made or user made icons together in a block diagram. A LabVIEW program is called a virtual instrument (VI) and consists of two parts: (1) a front panel with controls and indicators which take the input and output data; (2) a wiring diagram which is a block diagram of wired icons. The net result is a modular system for on-line laboratory applications and scientific computing. This should appeal to engineers and scientists who are partisan to block diagramming. The scope of what can be done with LabVIEW software is, indeed very large. LabVIEW has over 175 built in functions some as simple as the sine function or square root function and others as complicated as a white noise generator, cross-correlation, or inverse matrix function. Each function is represented by an icon which can have one or more inputs and outputs.