

Introduction to Biomedical Engineering

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LabVIEW-based Experiment System and Local Field Potential Recording in Brain Slices

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How to Construct a System using LabVIEW

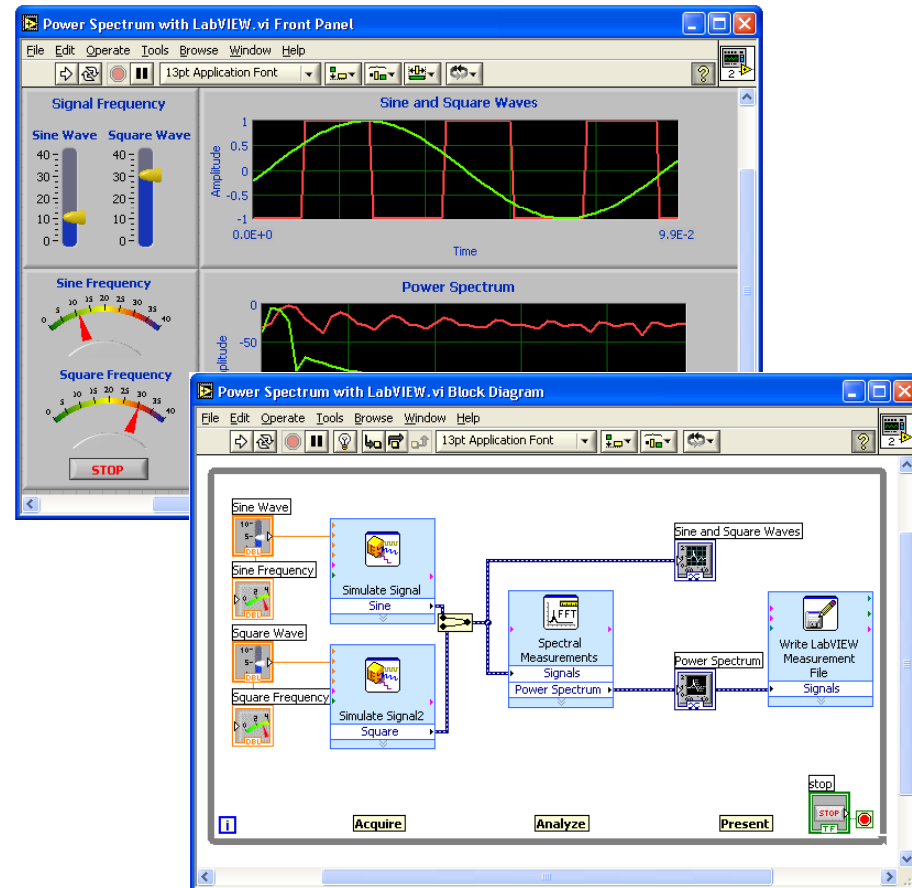
Introduction to LabVIEW
System Overview

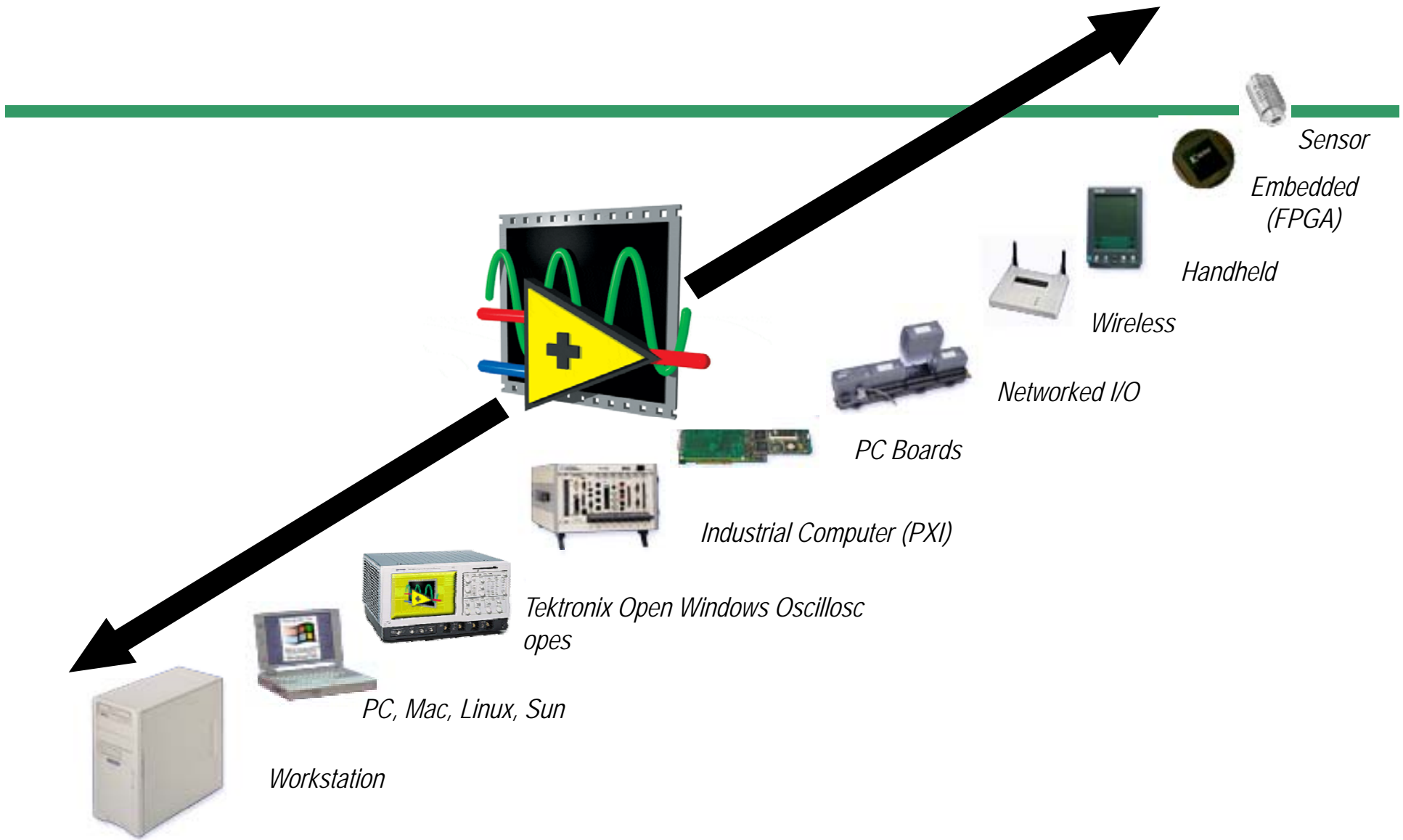


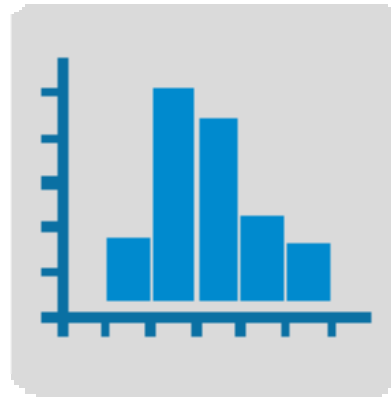
Introduction to LabVIEW

Graphical Programming for Test, Measurement, and Control

- Rapid application development with Express VIs and easy-to-use graphical environment
- Interactive measurement assistants and powerful redesigned DAQ interface for connecting to all types of I/O
- Expanded targeting options from Real-Time to FPGA to PDA
- Localized in French, German, and Japanese (Korean documentation)







Acquire, Analyze, and Present

Nearly all test, measurement, and control applications can be divided into 3 main components: the ability to acquire, analyze, and present data. LabVIEW is the easiest, most powerful tool for acquiring, analyzing, and presenting real-world data.

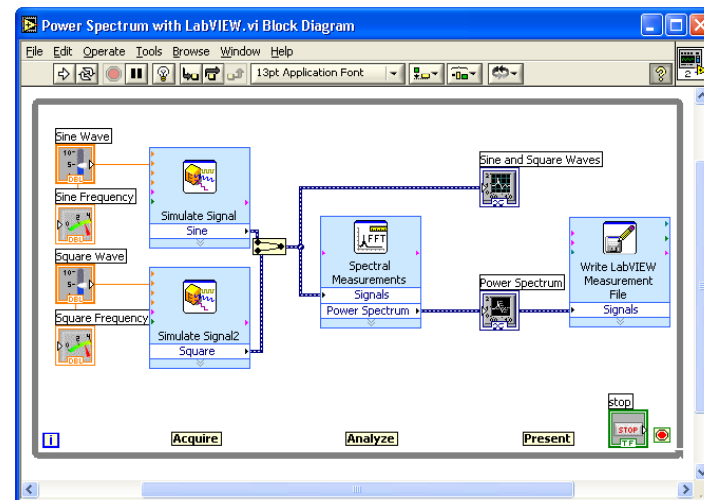
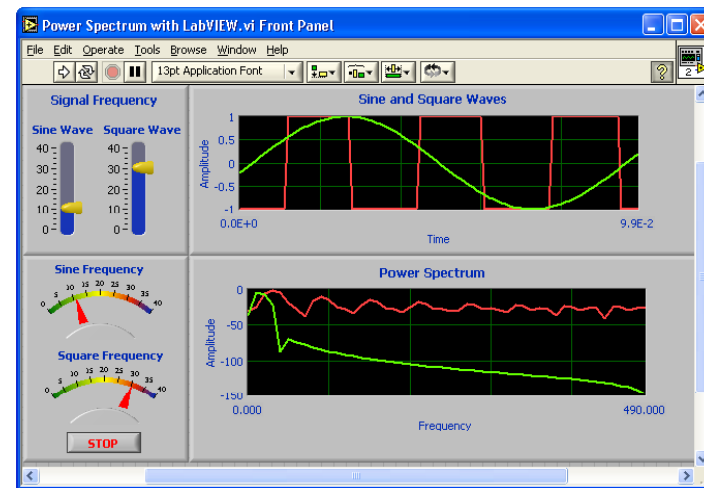


Front Panel

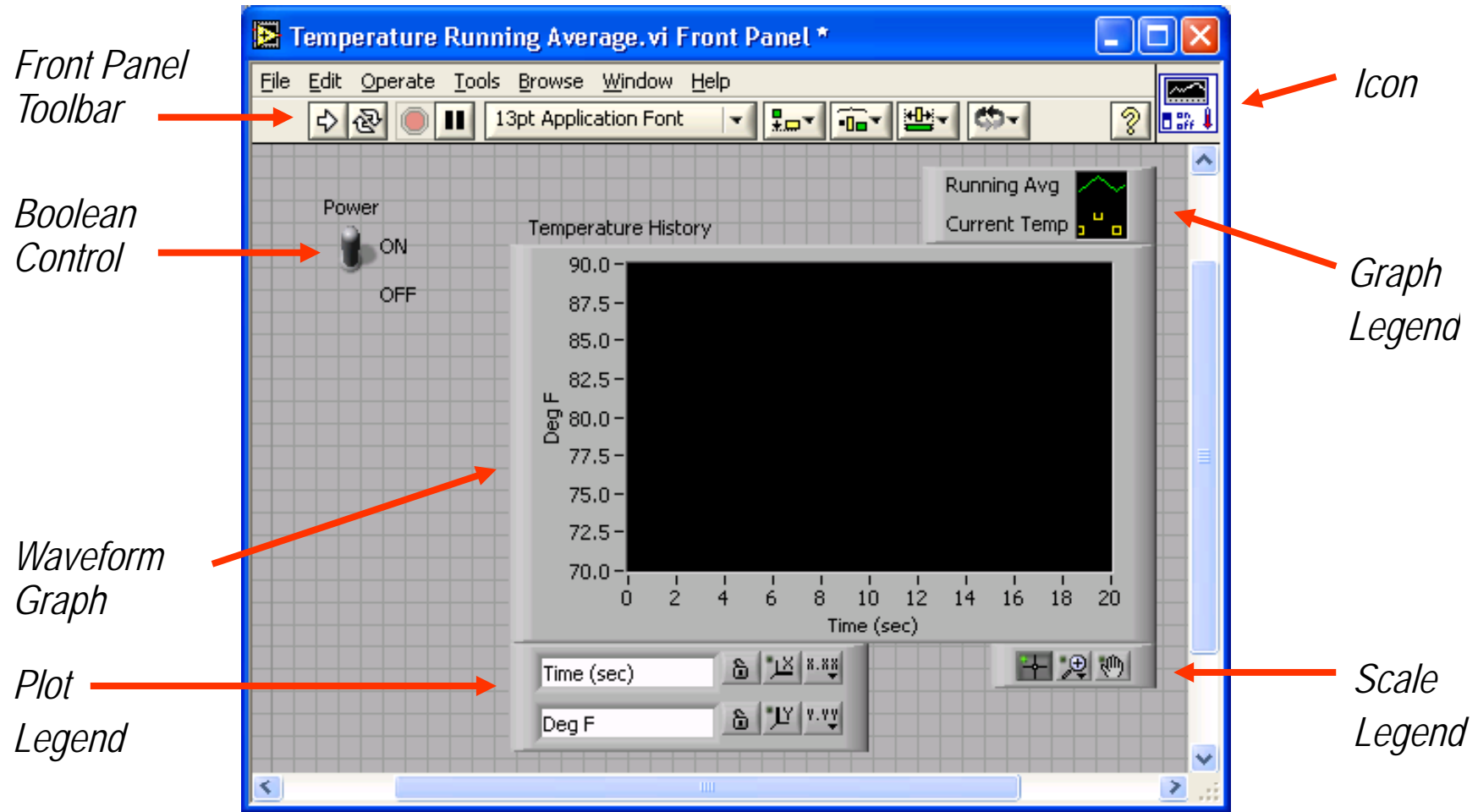
- **Controls = Inputs**
- **Indicators = Outputs**

Block Diagram

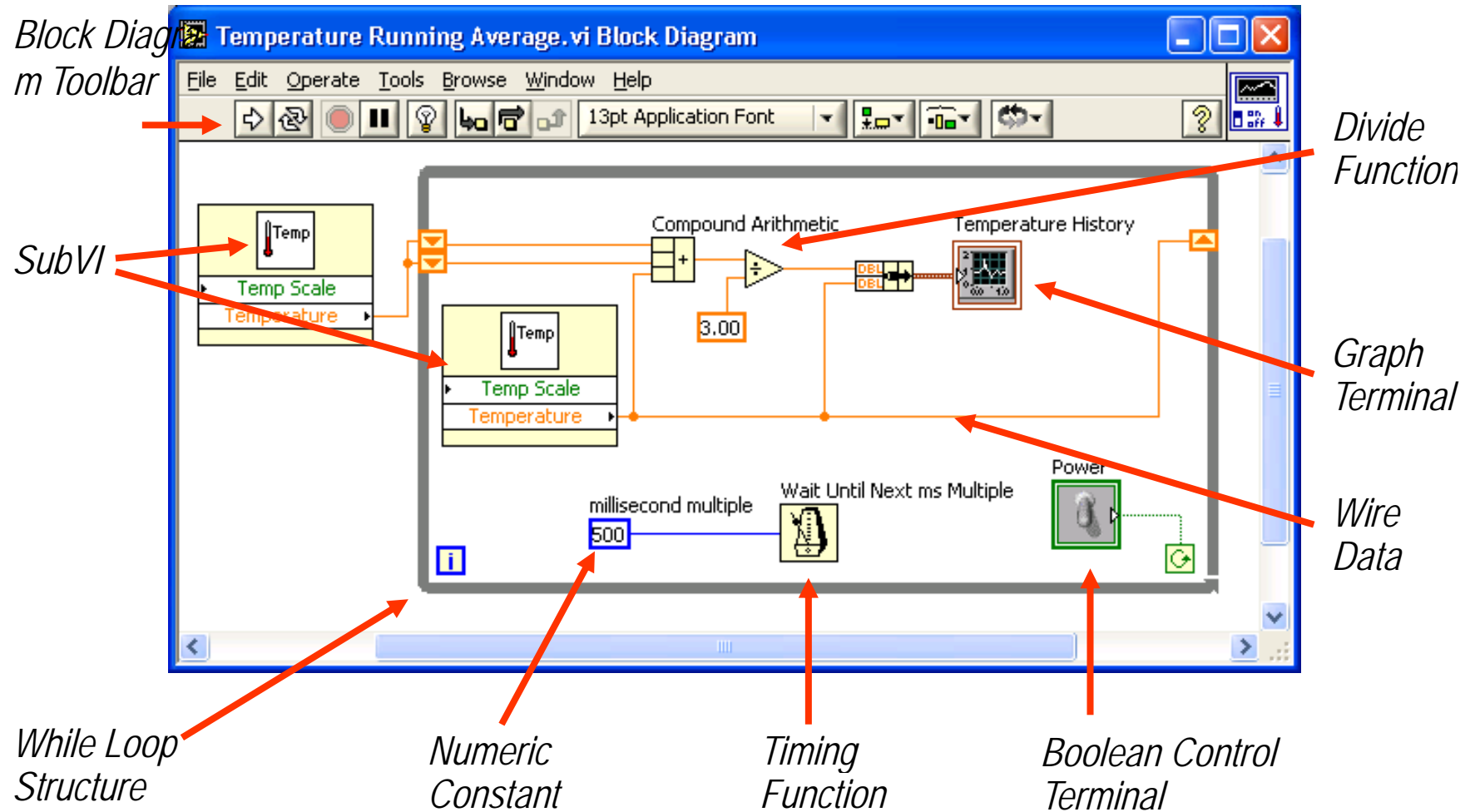
- **Accompanying “program” for front panel**
- **Components “wired” together**



VI Front Panel

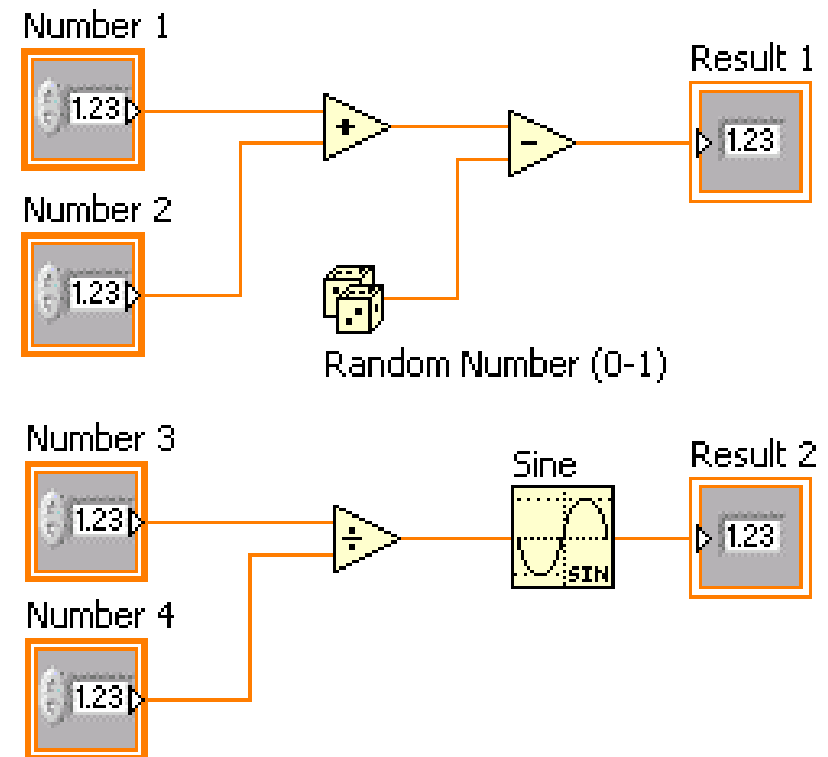


VI Block Diagram



Dataflow Programming

- *Block diagram executes dependent on the flow of data; block diagram does NOT execute left to right*
- *Node executes when data is available to ALL input terminals*
- *Nodes supply data to all output terminals when done*

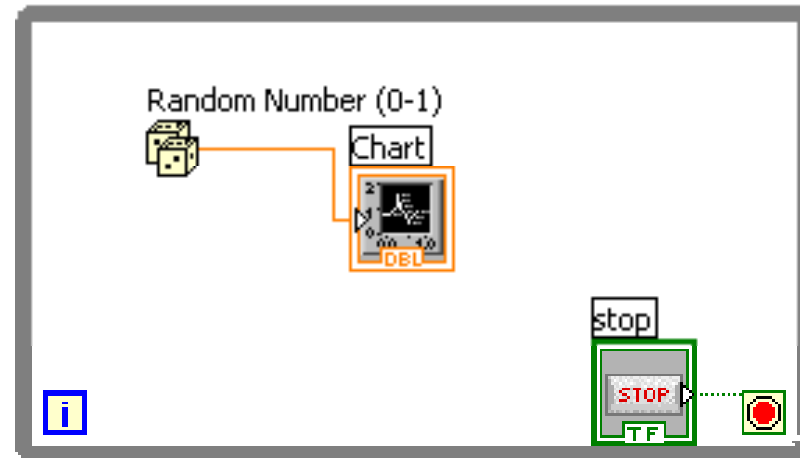


Loops, for example

While Loops

- Have Iteration Terminal
- Always Run at least Once
- Run According to Conditional Terminal

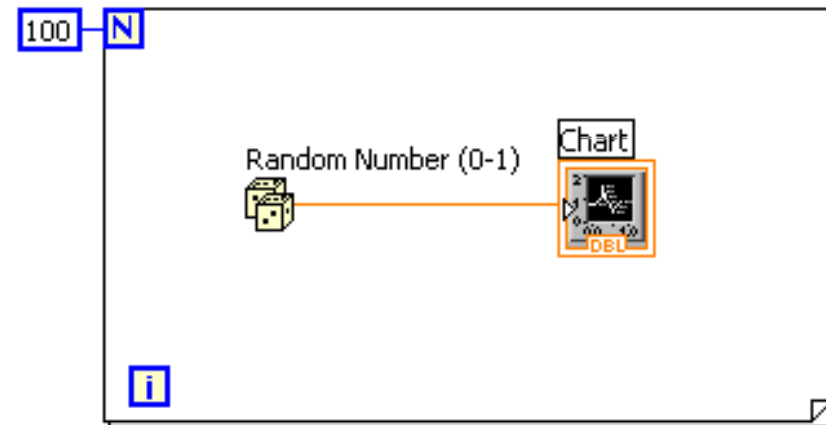
While Loop



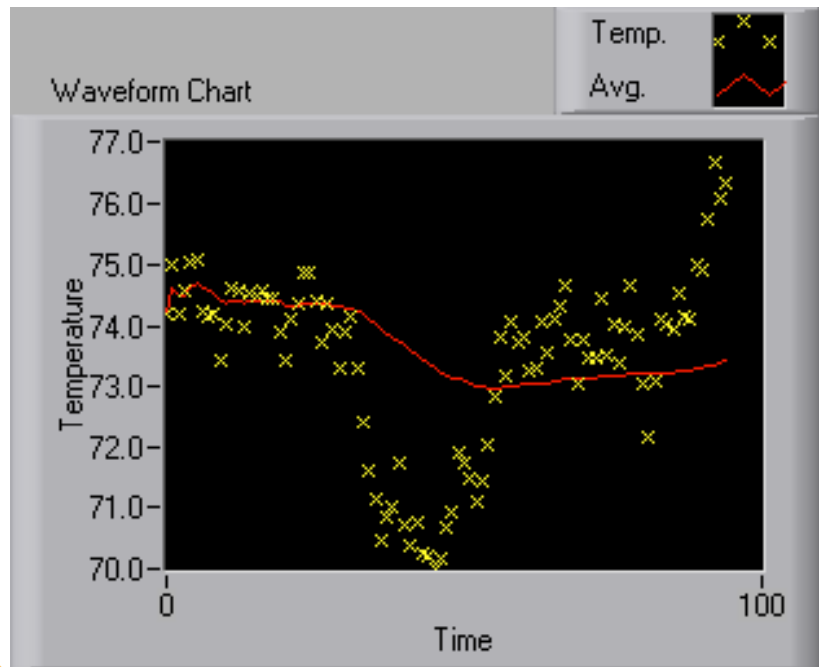
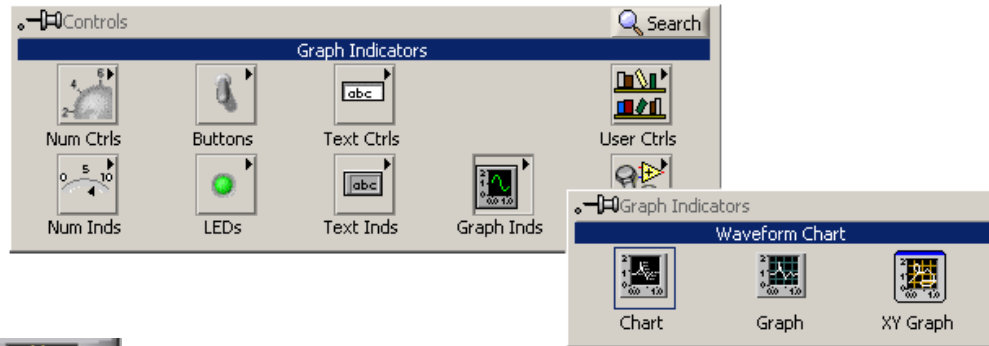
For Loops

- *Have Iteration Terminal*
- *Run According to input **N** of Count Terminal*

For Loop



Charts

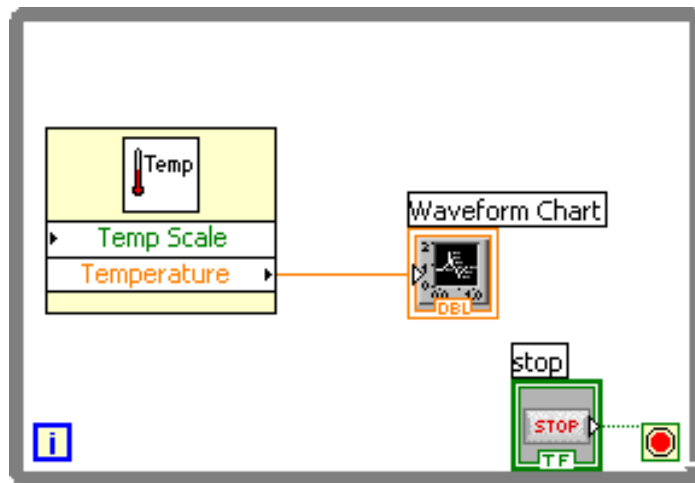


**Waveform chart – special
numeric indicator that can
display a history of values
Controls >> Graph Indicators
>> Waveform Chart**

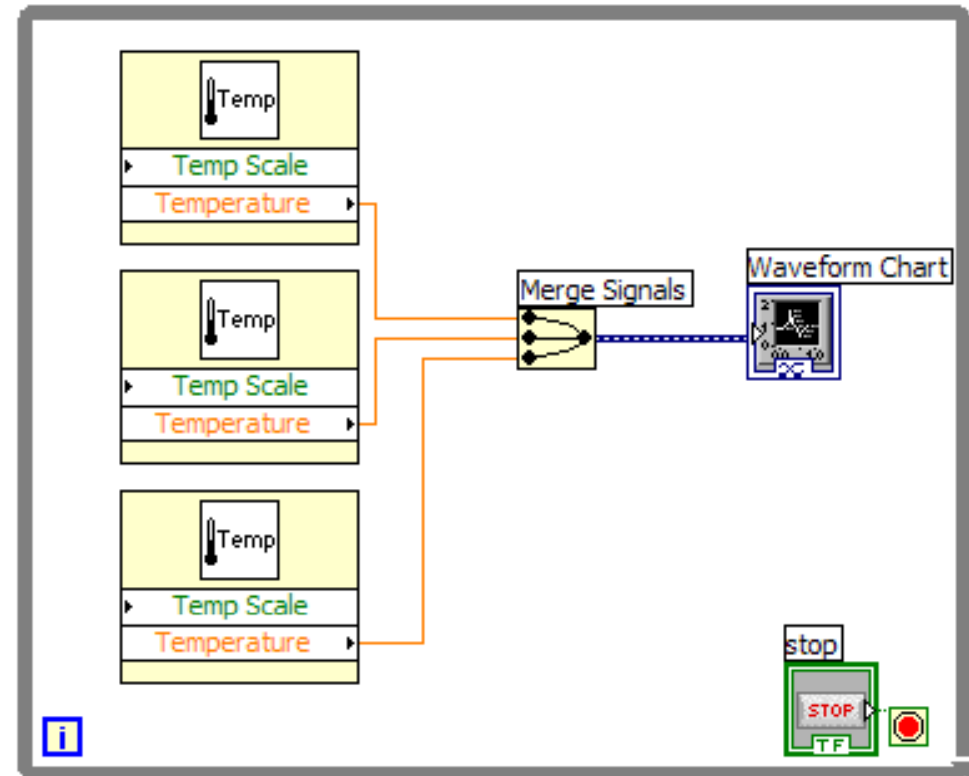


Wiring Data into Charts

Single Plot Charts

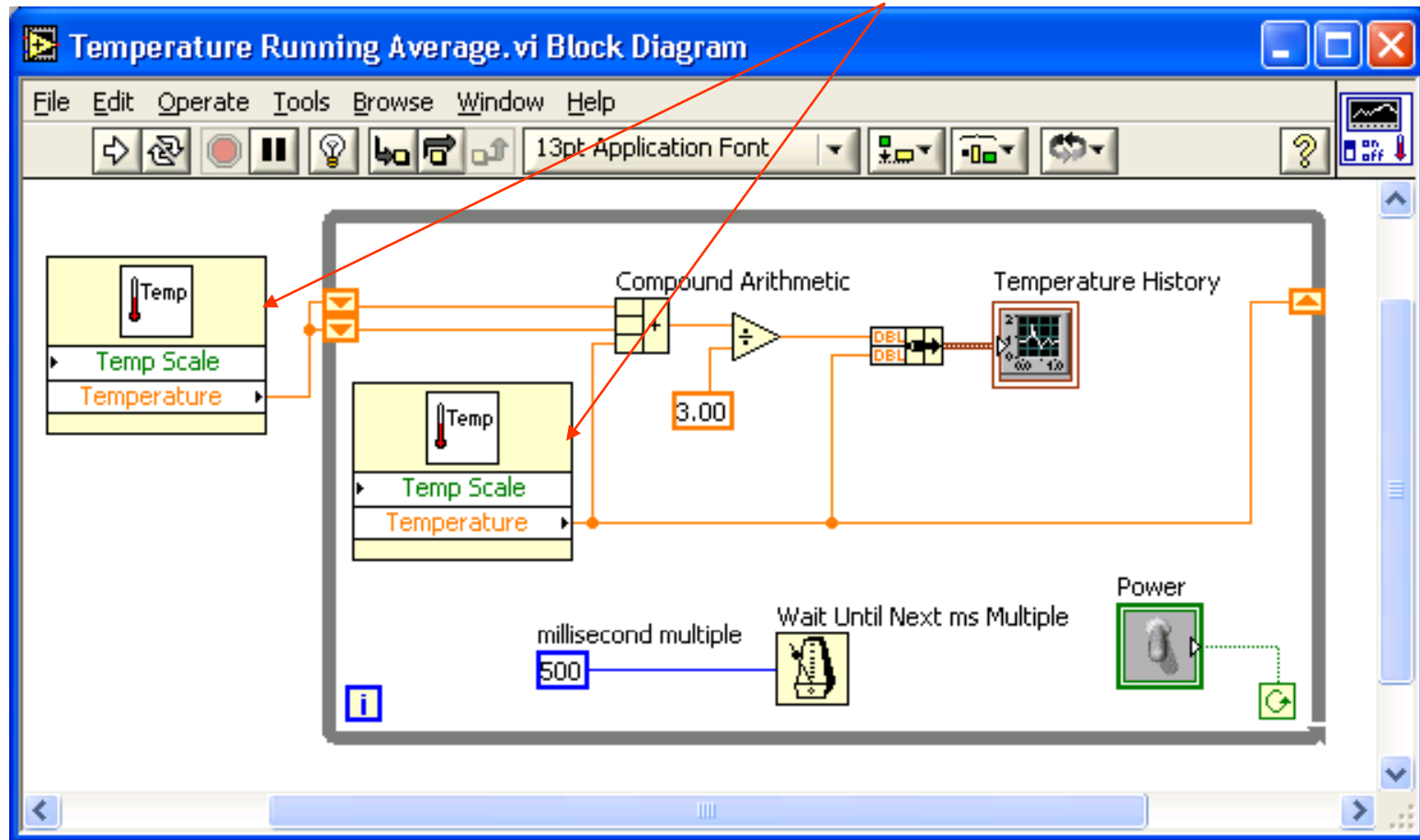


Multiplot Charts



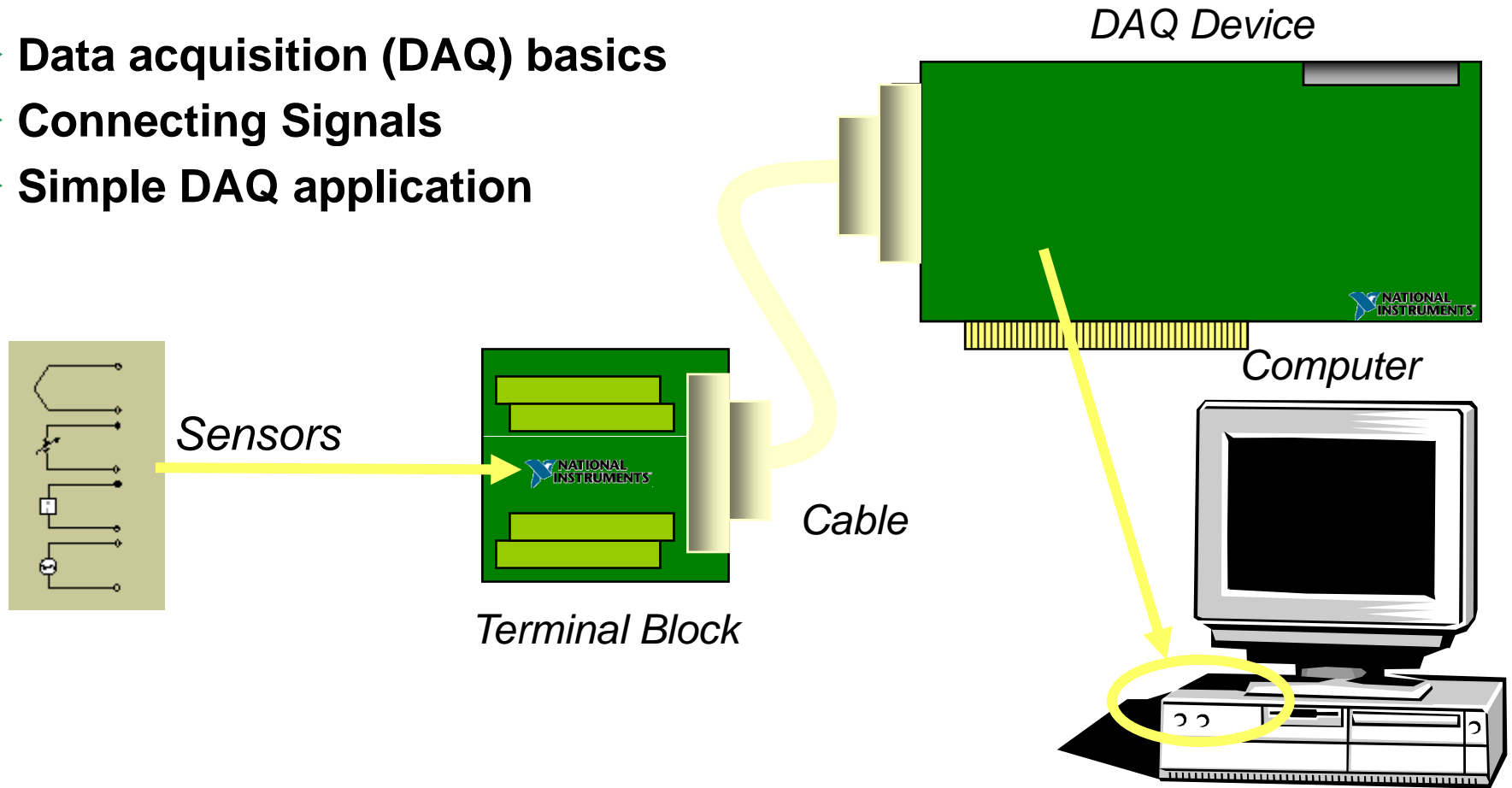
SubVIs

Sub VIs

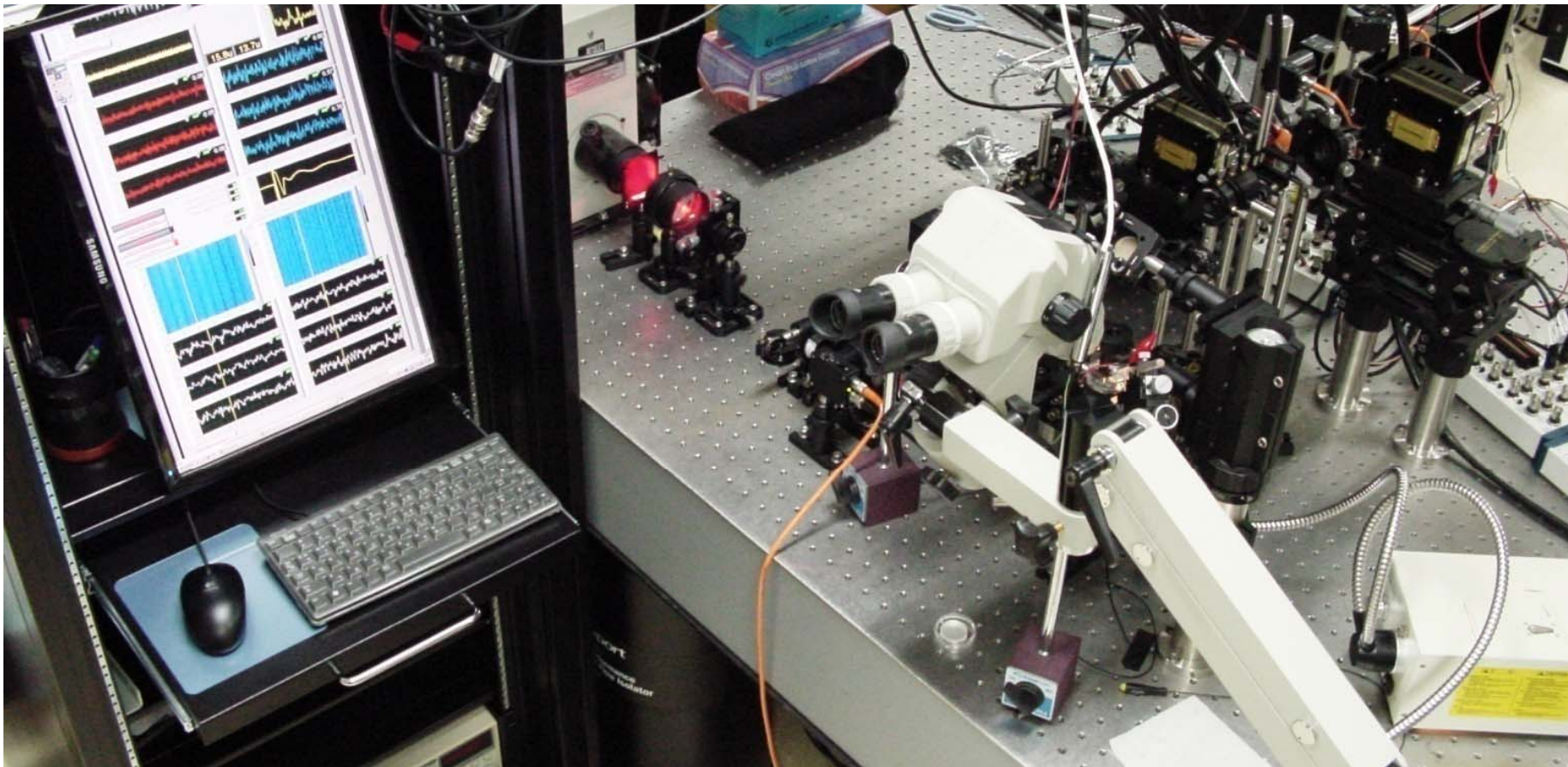


Data Acquisition

- ▶ Data acquisition (DAQ) basics
- ▶ Connecting Signals
- ▶ Simple DAQ application



System Overview



HIGH-SPEED NIR T+R SPECTROMETER

June 2008
Jonghwan Lee

Configuration

Folder name: 0807-2

Clock Frequency: 3.0 MHz (0.1 ~ 4)

Integration time: 450 us (10 ~ 1000)

Acquisition rate: 300 lines/loop

Scan time: 581 us

Line rate: 1020 lines/sec

Loop period: 0.294 sec

Counter for START: %PXI1Slot2/ctr0

Task for Detector 1: %NIRS1

Task for Detector 2: %NIRS2

Counter for StimTrg: %PXI1Slot3/ctr0

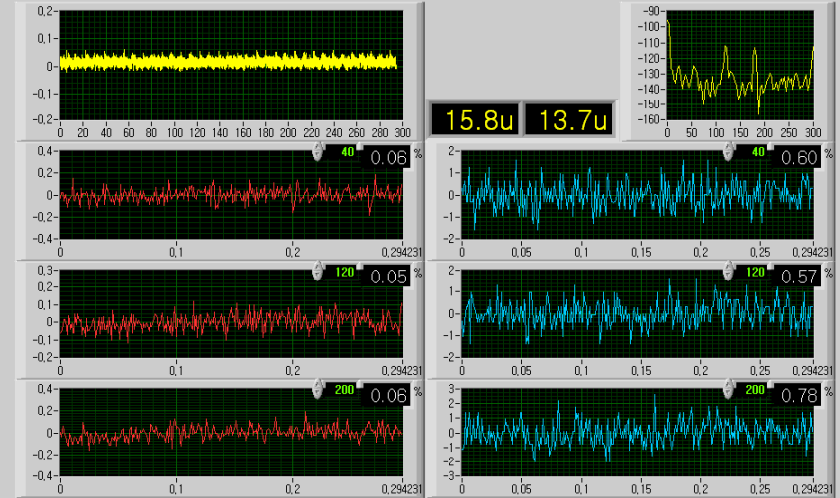
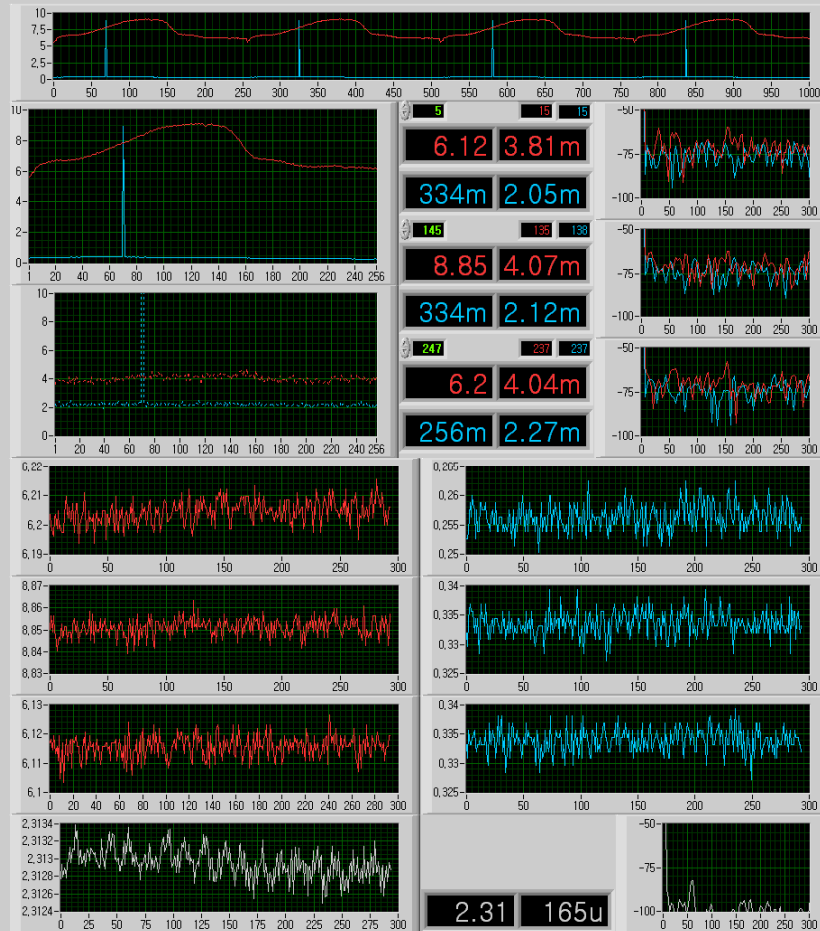
Electrical recording gain: 10000

Electrical stimulation duration: 200 us

Electrical stimulation period: 1.0 sec

Start Measurement

Measurement



Noise Reduction

Force Averaging

Reset Average

Stimulate

Save Response Only

Start Save

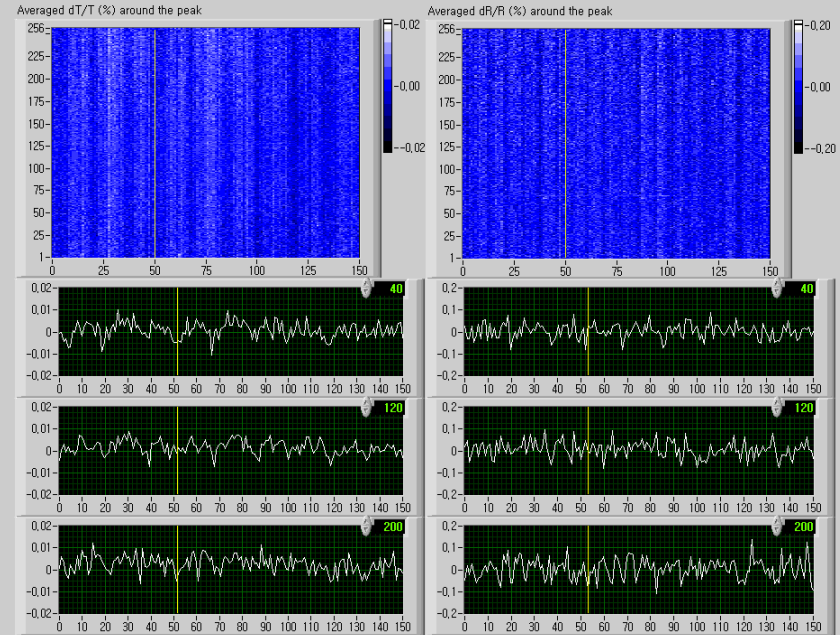
Stimulation intensity (uA): 50

Timebin before stim. (ms): 50

Timebin after stim. (ms): 100

Avg No: 276

File No: 010



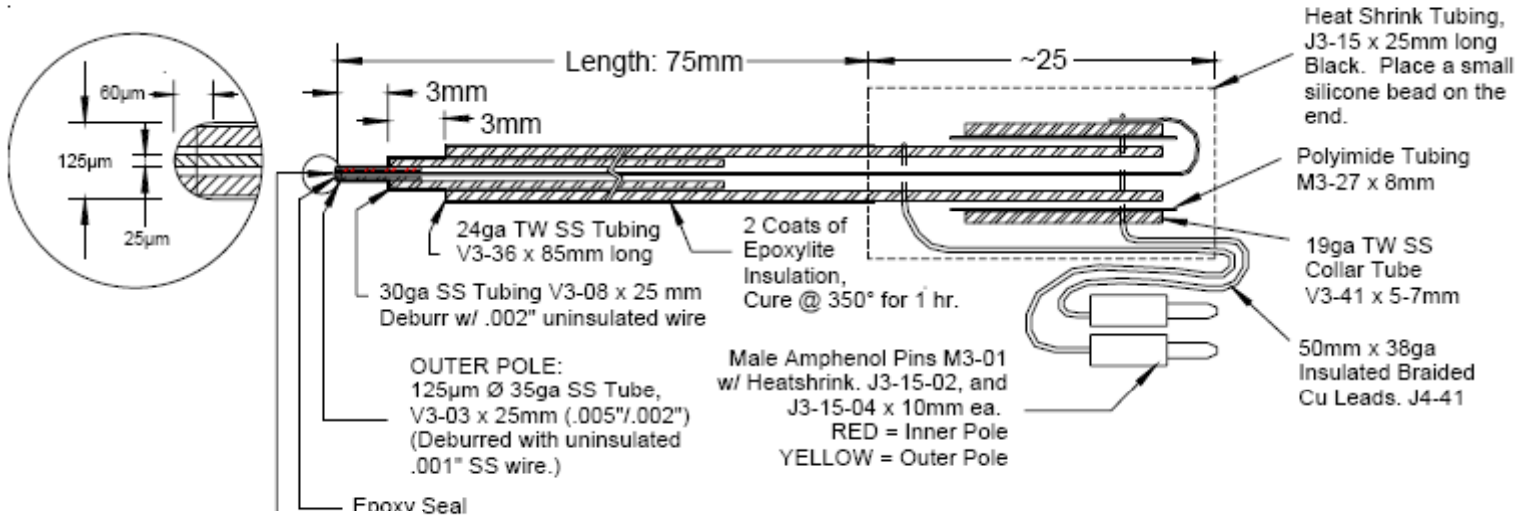
B

How to Use the System to record LFPs

Electrodes
Rat Hippocampal Slice
Population Spikes and EPSPs

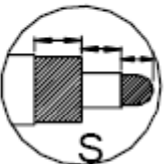
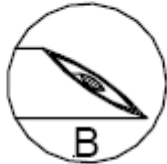
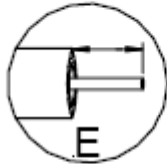
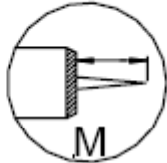
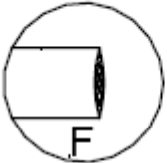
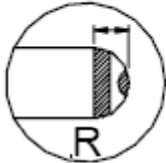


Electrodes



50% of Outer Pole diameter height standard. (Specify other if needed.)

100 µm standard. (Specify other if needed.)
Inner Pole must be > 75 µm. (See Inner Pole note.)

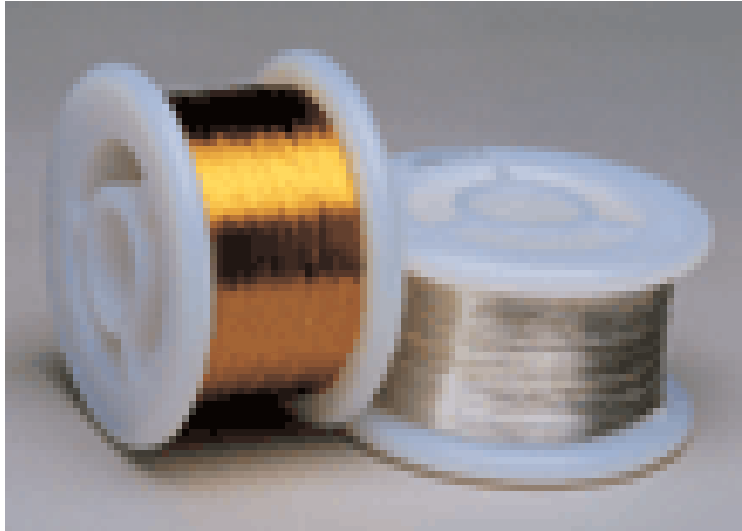


60° Angle standard. (Specify other if needed.)

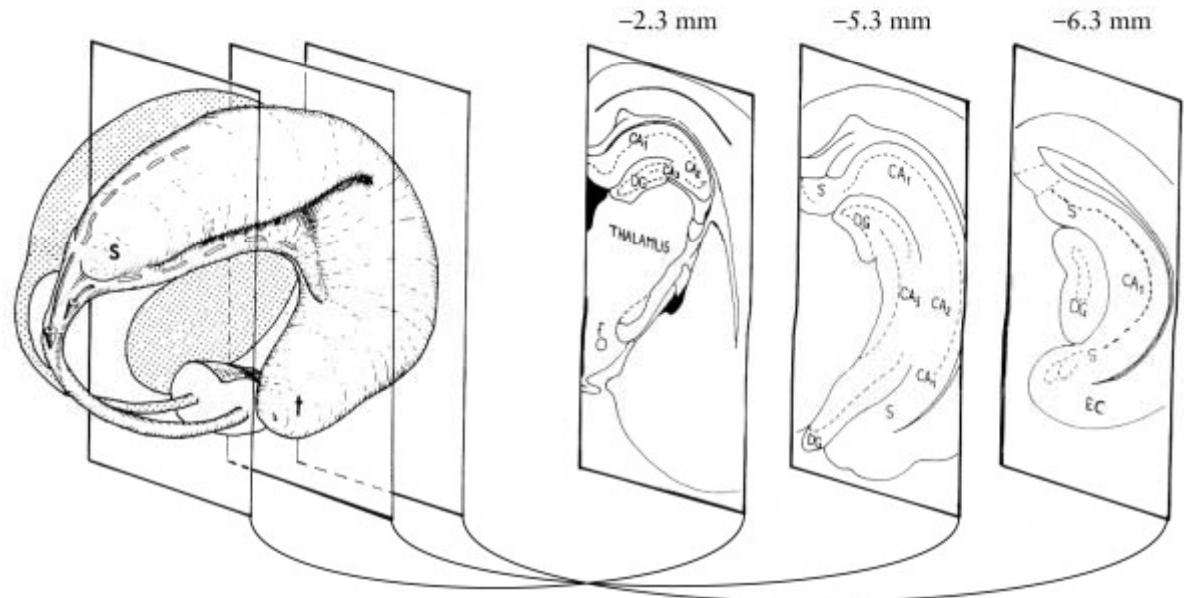
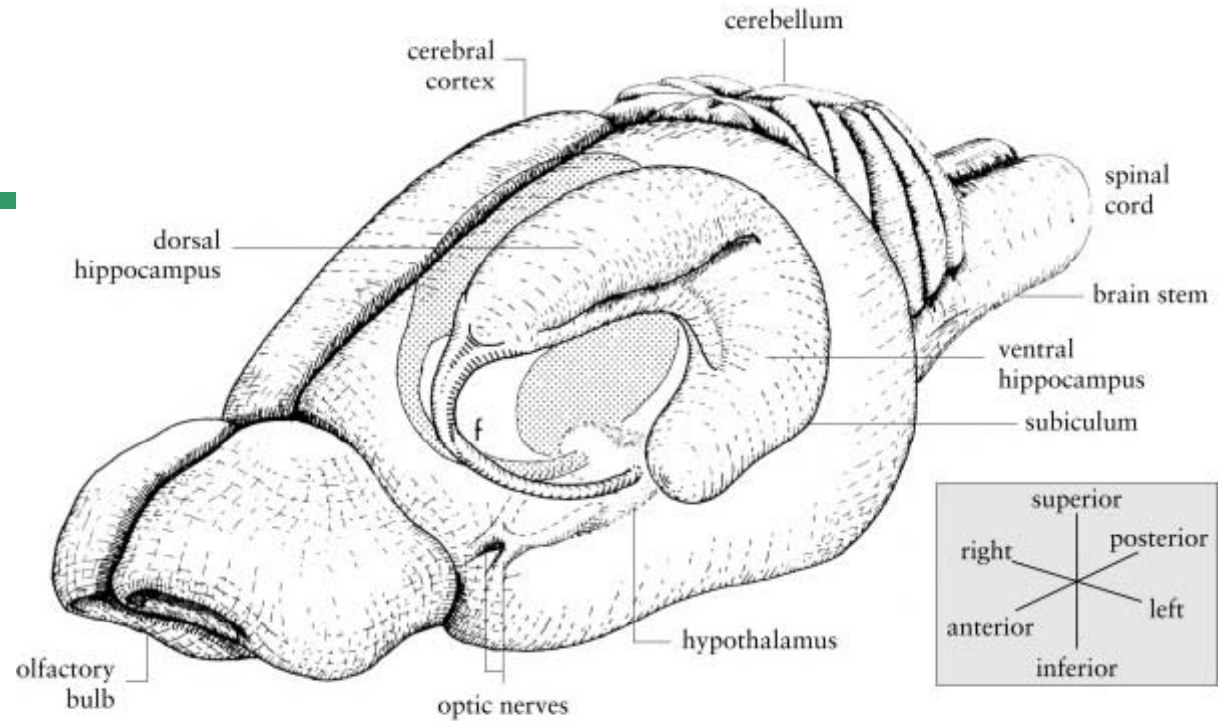
100 µm standard. (Specify other if needed.)

45° Angle standard. (Specify other if needed.)

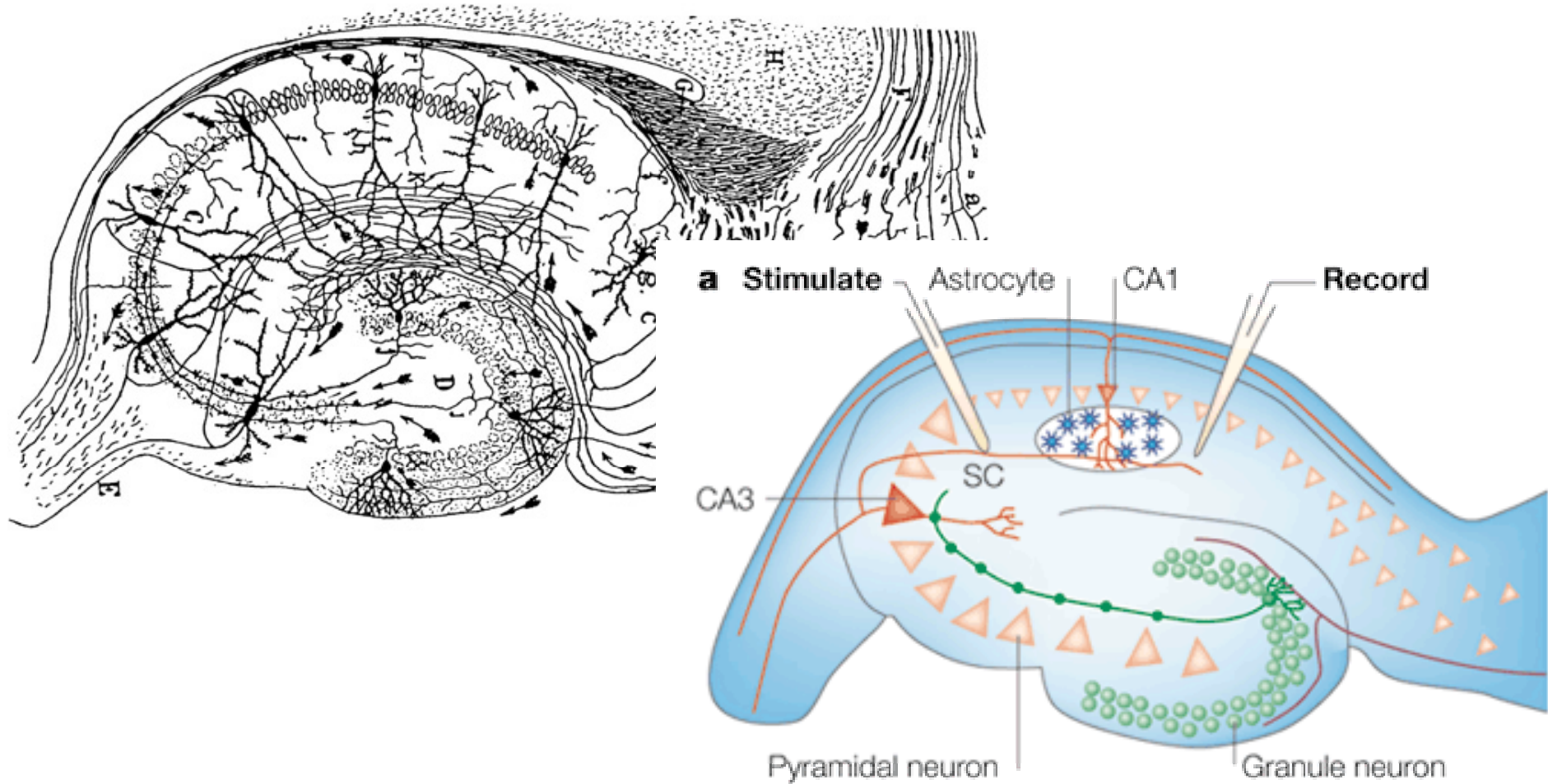
100 µm exposures, 100 µm separation standard. (Specify others if needed.)



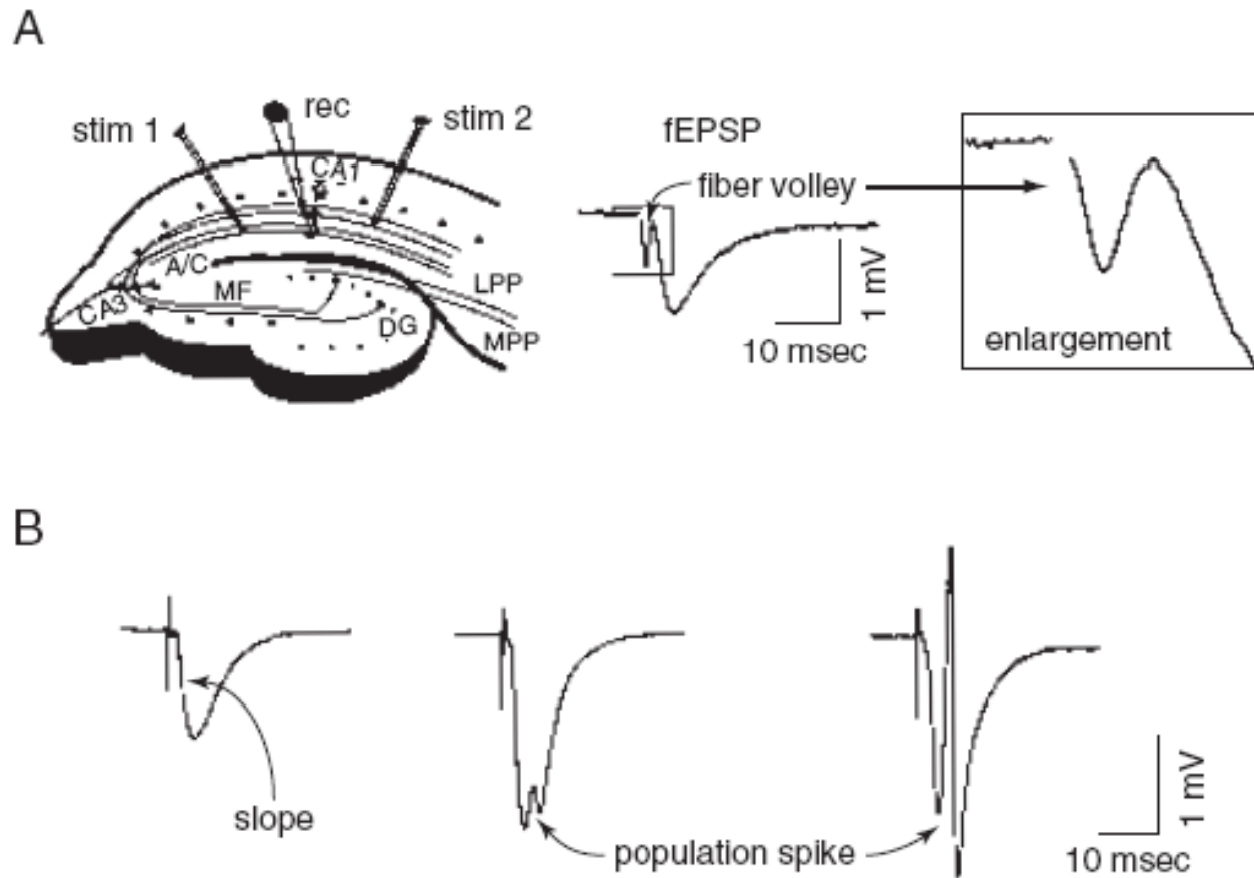
Hippocampus



Rat Hippocampal Slice



Population Spikes and EPSPs



Experiment Session



Seoul National University

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