LabRecon - Code Link with other programming environments

LabRecon software (Windows or Mac OS X) and hardware provides a stimulating educational environment for science and engineering by allowing students and educators to easily create rich graphical interfaces for measurements, robotic control, or simulation.

This document presents multpile examples using the “Code Link” feature, wherein LabRecon can serve as an interface for other programming languages.

Interfaces with the following languages:

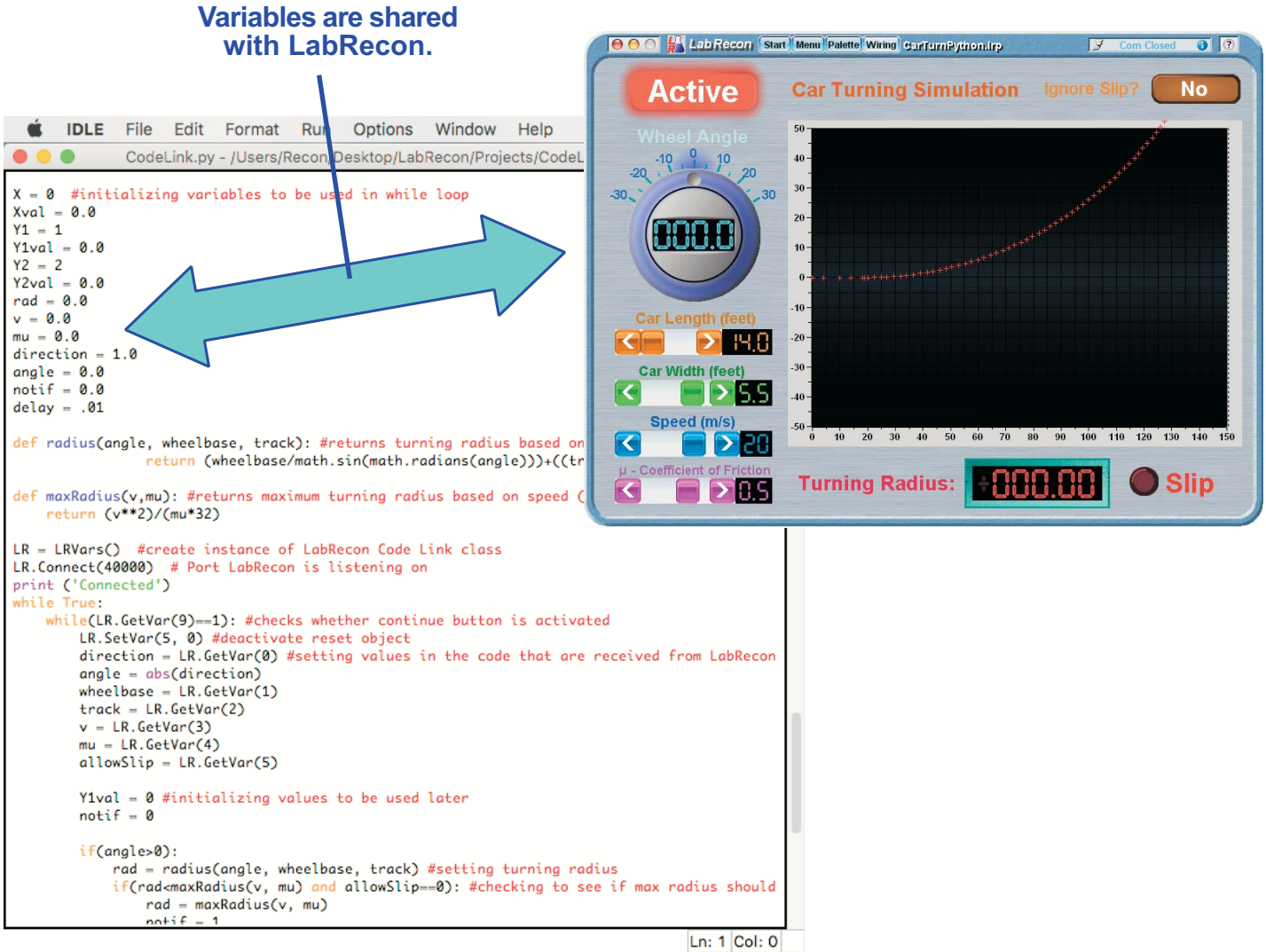
- **Java**
- **Python**
- **C/C++**
- **Javascript**
- **Visual Basic**

Car turning dynamics with Python code

Below is an example, written in Python, for a physics simulation of a car turning radius accounting for friction between the tires and the road.

The LabRecon Panel allows Python variables to be controlled with buttons, a knob, and scrolls and output variables to be displayed and plotted on an XY Chart.

Variables are shared with LabRecon.

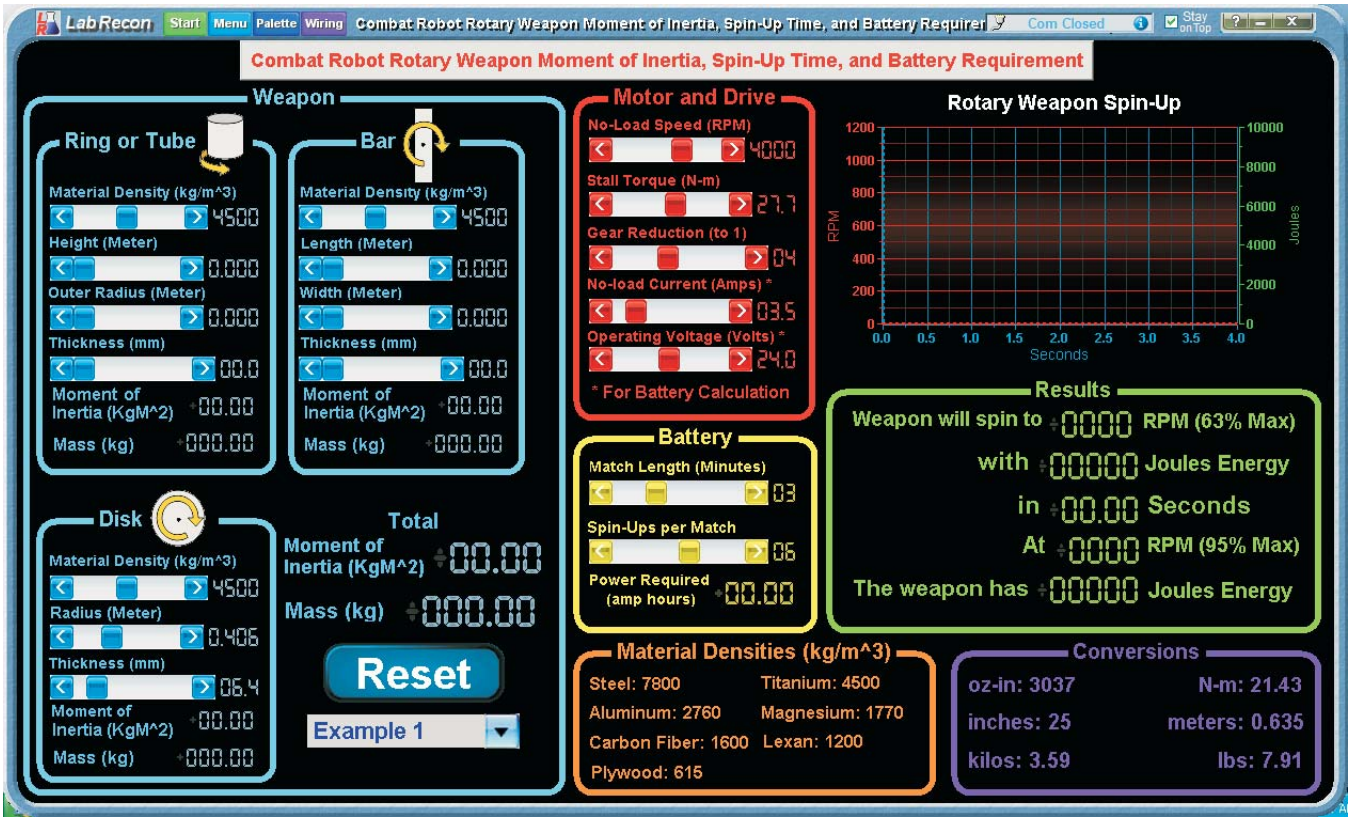


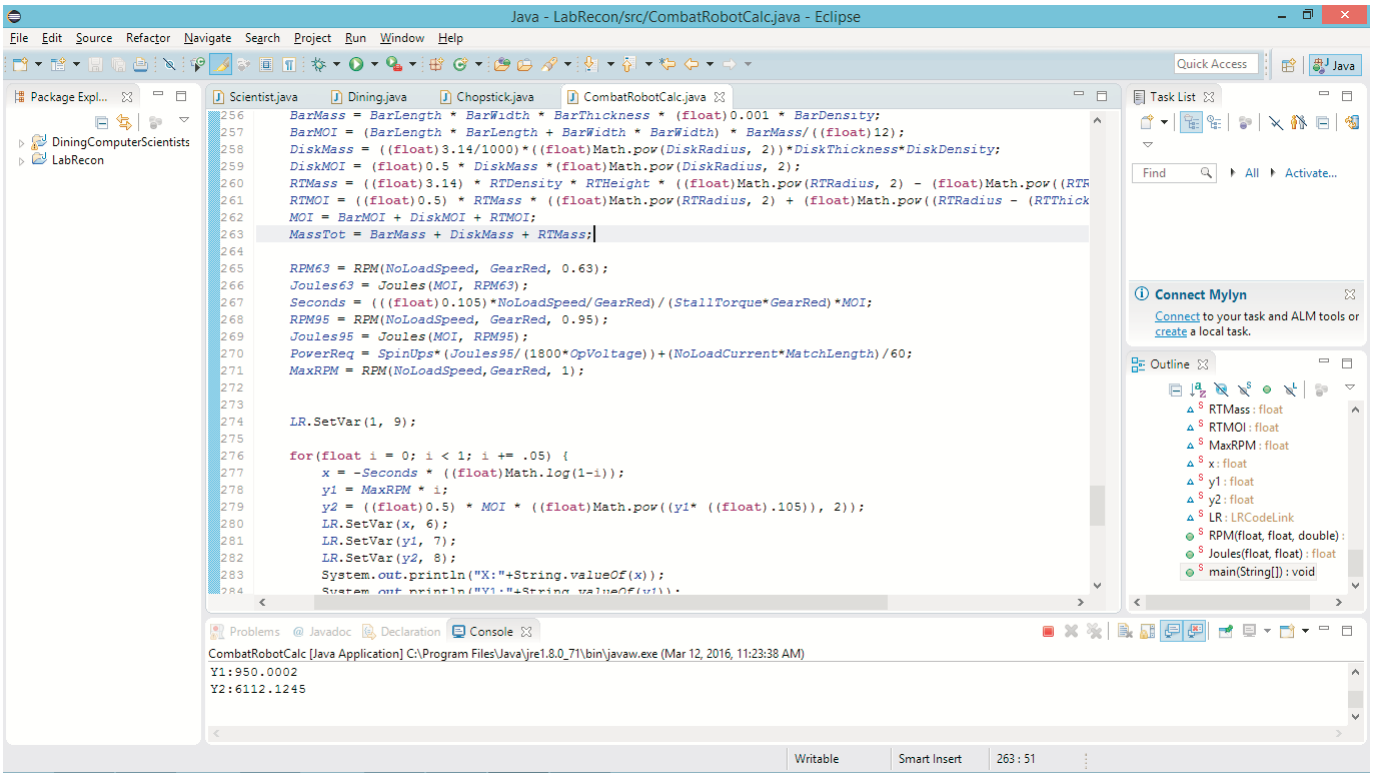
Battle-Bot weapon dynamics with Java code

Up to 40 variables can be shared between LabRecon and the programming environment.

Java code has been written to model the dynamics of a rotating weapon of a BattleBot.

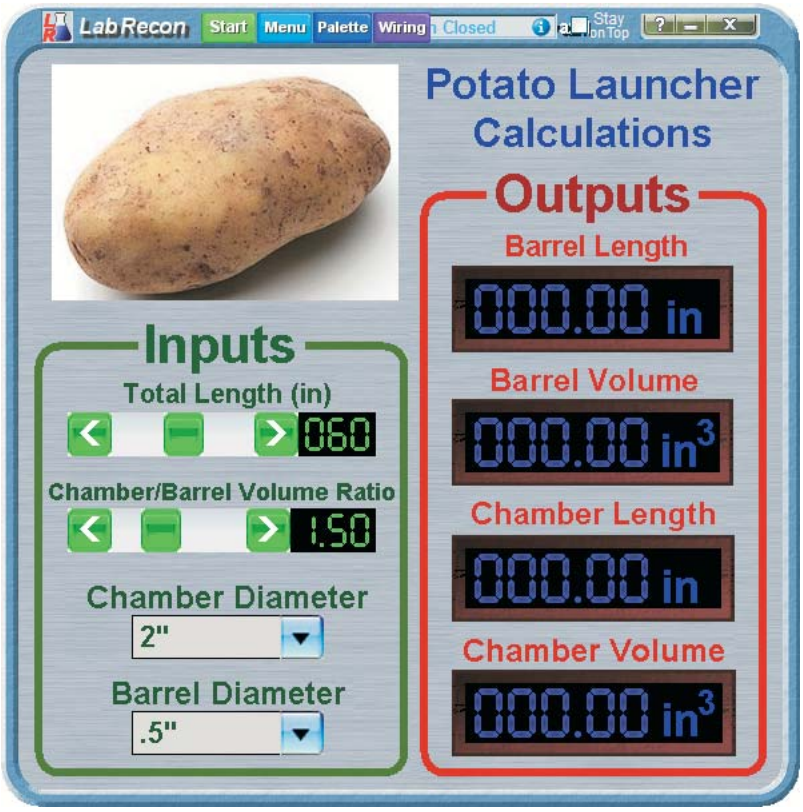
A panel was created to allow many input parameters to be controlled by scrolls with performance results displayed and charted.

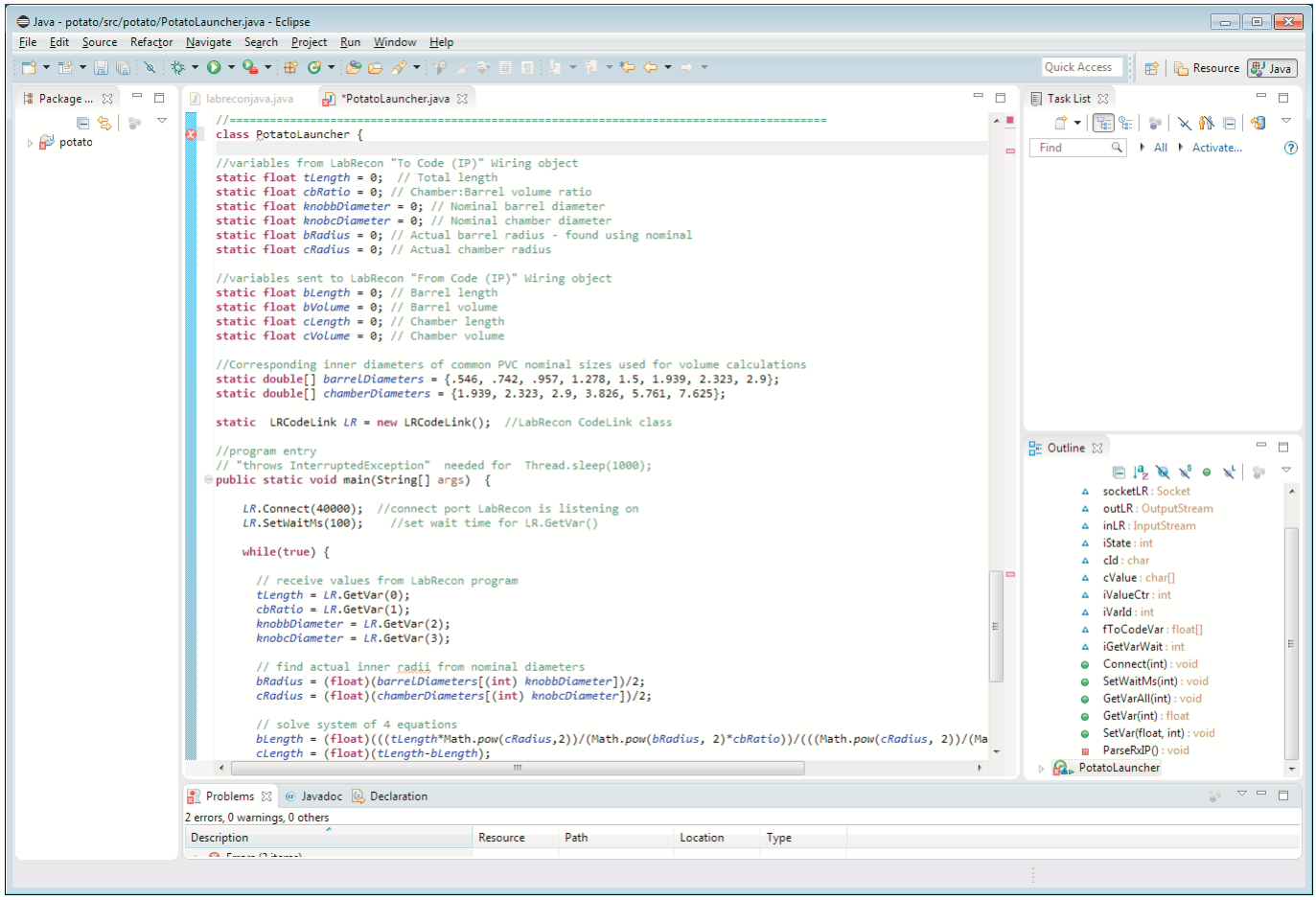




Potato launcher calculations with Java code

This example shows Java code with a panel created to perform calculations for a potato launcher fabricated from PVC piping.





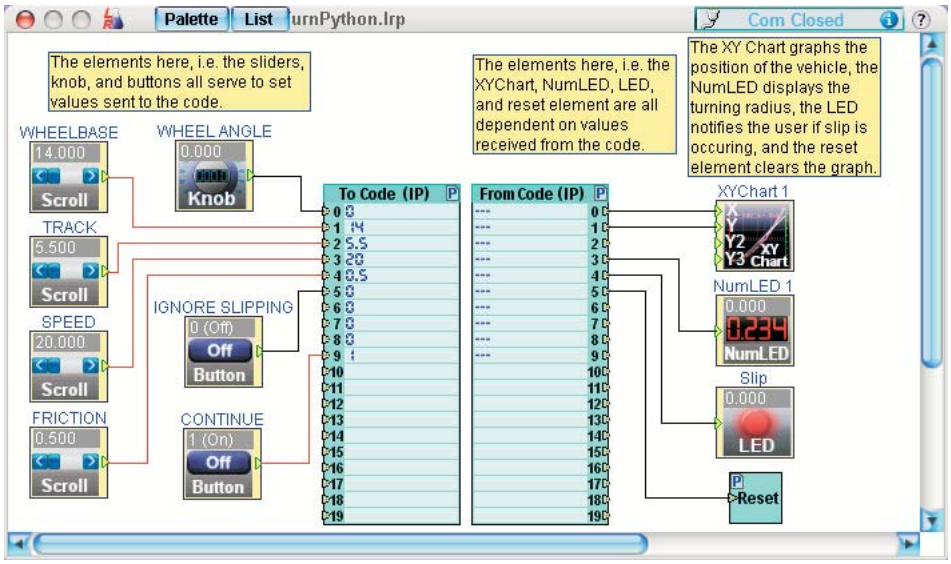

```
//=============================================================================
class PotatoLauncher {

//variables from LabRecon "To Code (IP)" Wiring object
static float tLength = 0;  // Total length
static float cbRatio = 0; // Chamber:Barrel volume ratio
static float knobbDiameter = 0; // Nominal barrel diameter
static float knobcDiameter = 0; // Nominal chamber diameter
static float bRadius = 0; // Actual barrel radius - found using nominal
static float cRadius = 0; // Actual chamber radius

//variables sent to LabRecon "From Code (IP)" Wiring object
static float bLength = 0; // Barrel length
static float bVolume = 0; // Barrel volume
static float cLength = 0; // Chamber length
static float cVolume = 0; // Chamber volume

//Corresponding inner diameters of common PVC nominal sizes used for volume calculations
static double[] barrelDiameters = {.546, .742, .957, 1.278, 1.5, 1.939, 2.323, 2.9};
static double[] chamberDiameters = {1.939, 2.323, 2.9, 3.826, 5.761, 7.625};

static  LRCodeLink LR = new LRCodeLink();  //LabRecon CodeLink class

//program entry
// "throws InterruptedException"  needed for  Thread.sleep(1000);
public static void main(String[] args)  {

    LR.Connect(40000);  //connect port LabRecon is listening on
    LR.SetWaitMs(100);    //set wait time for LR.GetVar()

    while(true) {

      // receive values from LabRecon program
      tLength = LR.GetVar(0);
      cbRatio = LR.GetVar(1);
      knobbDiameter = LR.GetVar(2);
      knobcDiameter = LR.GetVar(3);

      // find actual inner radii from nominal diameters
      bRadius = (float)(barrelDiameters[(int) knobbDiameter])/2;
      cRadius = (float)(chamberDiameters[(int) knobcDiameter])/2;

      // solve system of 4 equations
      bLength = (float)(((tLength*Math.pow(cRadius,2))/(Math.pow(bRadius, 2)*cbRatio))/(((Math.pow(cRadius, 2))/(Ma
      cLength = (float)(tLength-bLength);
```

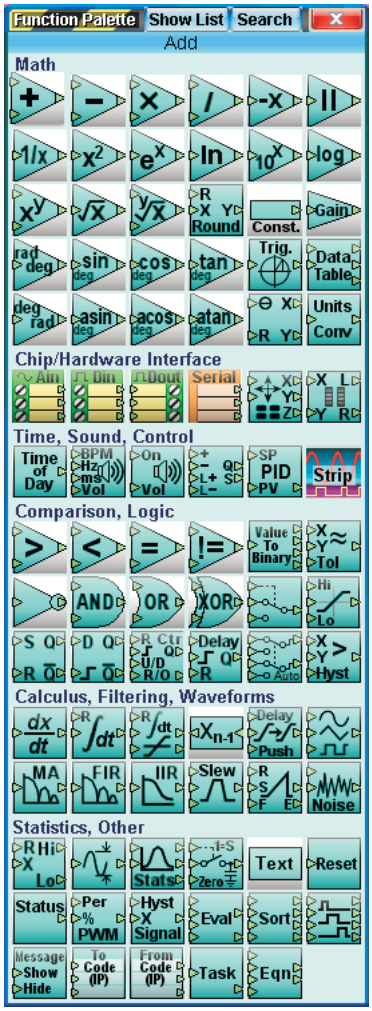

LabRecon Wiring view

LabRecon's Wiring view allows one to create connections between display and control objects on the Panel and LabRecon Wiring functions.

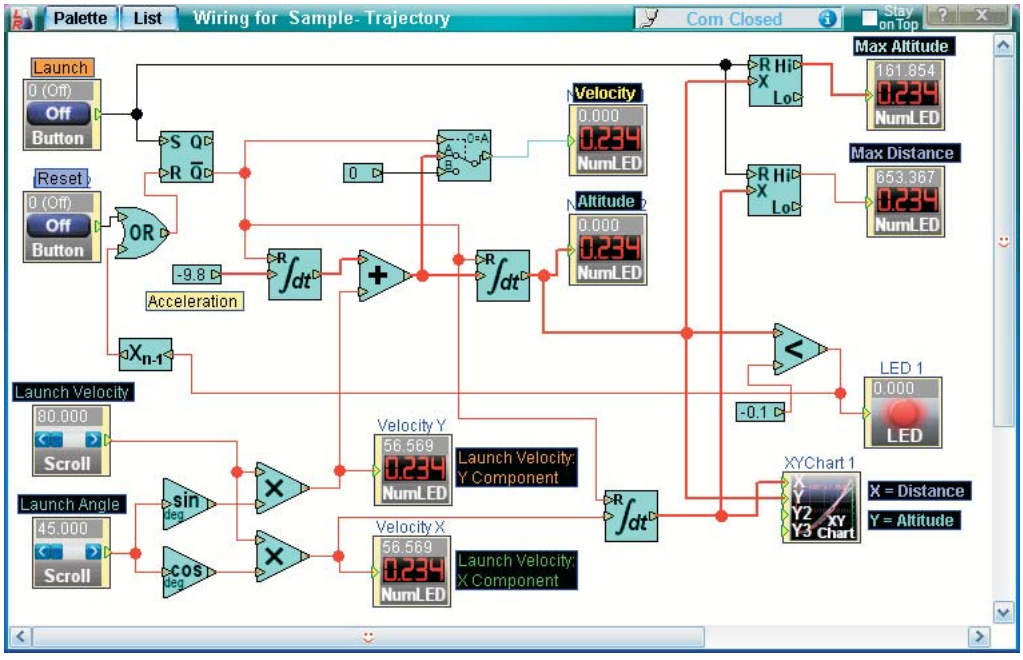
Below is the Wiring for the Car turning dynamics project, wherein the LabRecon "To Code" and "From Code" functions provide the link to the Python code.

The wires provide a "graphical extension" of the variables in the user's code.



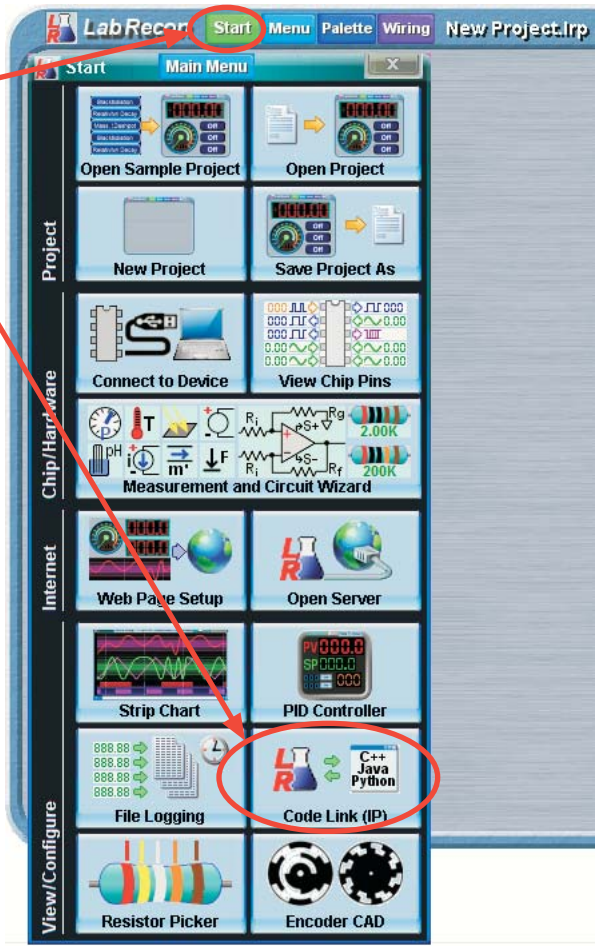


LabRecon has many additional Wiring functions, as its palette shows, to allow LabRecon to serve as a powerful graphical programming language on its own or in combination with user text based code.



Opening Code Link Status

Clicking on the LabRecon **"Start"** and then on the **"Code Link (IP)"** tile opens the status window shown below, provides example code and diagnostics.



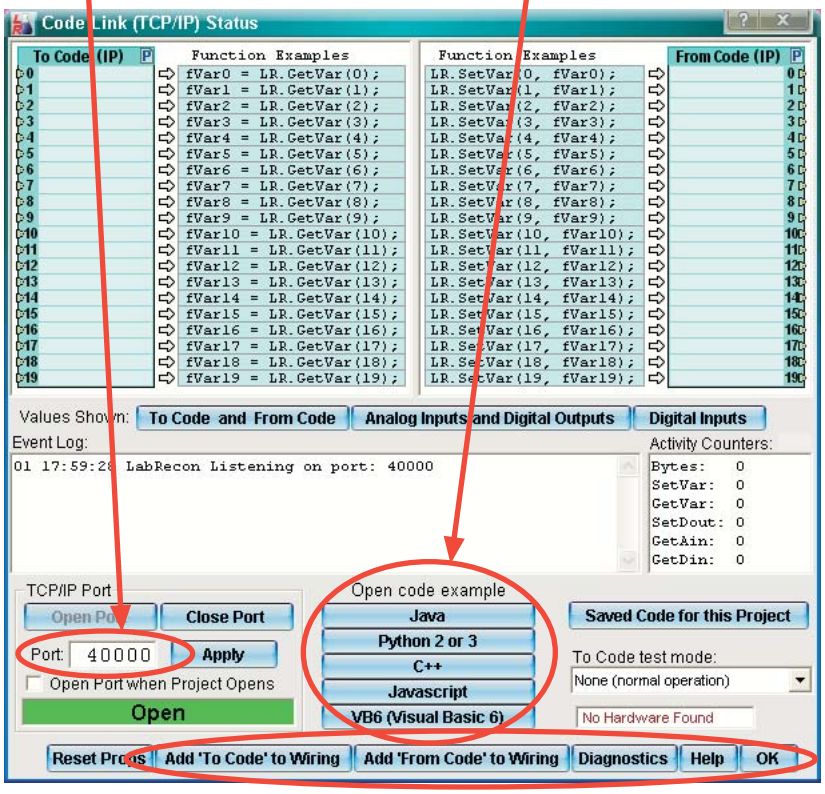
LabRecon acts as a **TCP/IP server** and accepts connections on the port number shown. By default the port is **40000**, but a different port number can be entered if desired.

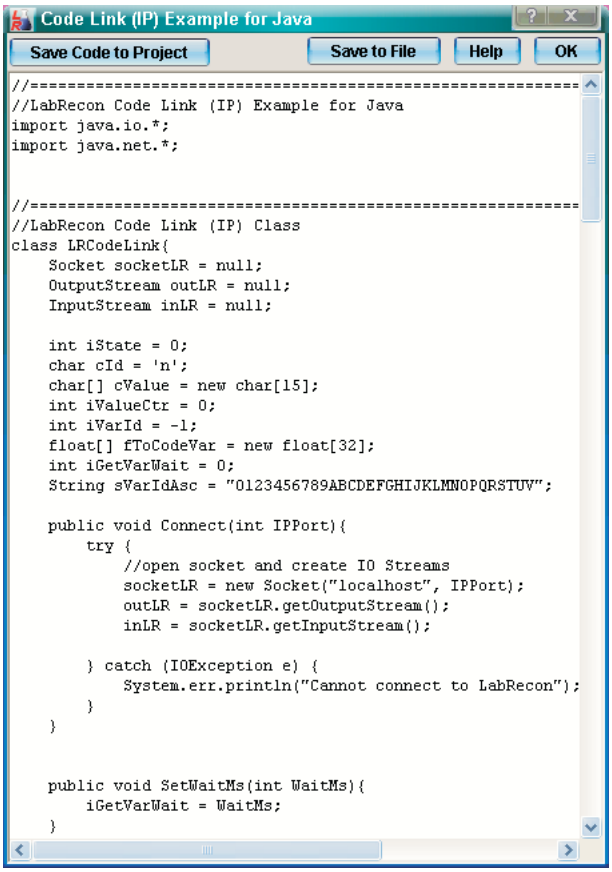
As demonstrated in the code examples, the user's code connects to the LabRecon server port as a **client** and sends simple ASCII messages to set or request variables. The user's code typically uses an **IP address of 127.0.0.1** (local host) when running on the same computer as LabRecon.

The bottom buttons can add the Code Link objects onto the **Wiring** and can also open a **Diagnostics** window to view TCP/IP events.

Clicking on a **"Code example"** button will open a code window, as shown on right, wherein the code can be copied and pasted into the code edittor of the user's choice.

TCP/IP Port





Additional Documents at www.LabRecon.com/Documents

LabRecon - Getting Started with the IoT (Internet of Things).pdf
LabRecon - Getting Started with the Measurement Wizard.pdf
LabRecon - Getting Started with Simulations.pdf
LabRecon - Equation Object.pdf
LabRecon - Getting Started with Robotics.pdf
LabRecon - Chip Datasheet (rev 2.0).pdf
LabRecon - MiniDAQ Datasheet (rev1.0).pdf
LabRecon - Chip Quick Start Sheet.pdf
LabRecon - Breadboard Experimenter (rev0).pdf
LabRecon - Photovoltaics.pdf
LabRecon - Reflow Oven PID Control.pdf
LabRecon - Measurement Configuration.pdf

Instructional Videos

www.LabRecon.com/videos

Revisions to this Document

Rev 0 Initial release

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