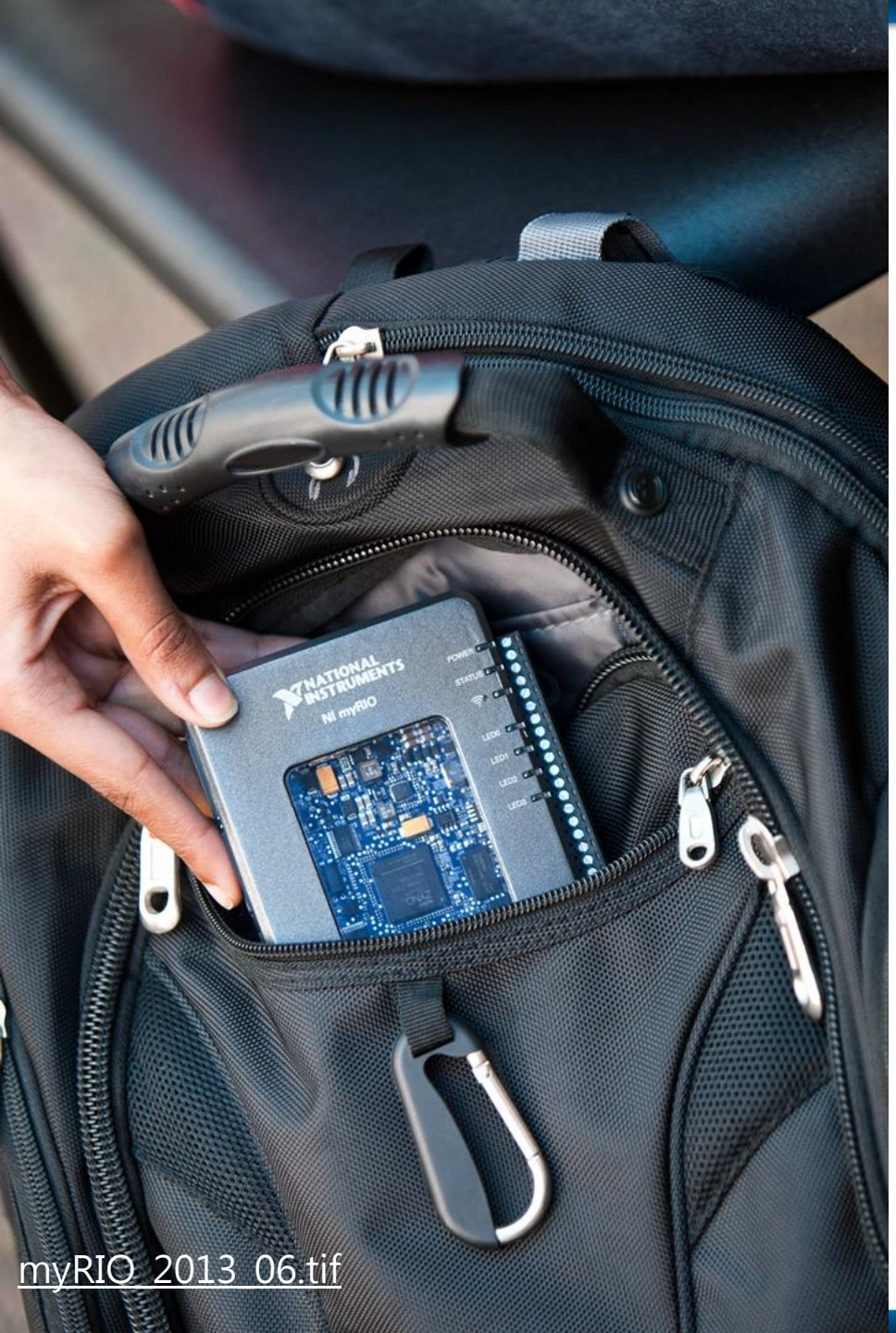

myRIO_2013_06.tif

NI myRIO

Design Real Systems, Fast

NATIONAL INSTRUMENTS

The Problem

Today’ s tools do not let engineering students accomplish **real projects** within 14 weeks.

The Solution

Students need a powerful hardware / software solution that allows them to get up to speed quickly

NI myRIO coming !!

NI MyRIO

- 概觀
- NI myRIO 是一種創新的軟硬體 平台，可以幫助學生「實作工程」，更快 設計出實用的系 統。 NI myRIO 搭載最 新的 Zynq 整 合式系統單晶片 (SoC)，同時配 備雙核心 ARM® Cortex™- A9
- 處理器與 FPGA，並且共 有 28,000 個可設定的邏輯單 元、10 個類比輸 入通道、6 個類比 輸出通道、音訊 I/O 通道，以及 高達 40 個數位 輸入/輸出 (DIO) 通 道。 NI myRIO 的設計
- 與價位非常適合學術 使用者，此外還有堅 固的機殼版本，其中 配備內建 WiFi、3 軸式 加速規與數個可設定 的 LED。

Hardware

NI myRIO

- Xilinx Zynq FPGA and Dual-Core ARM Cortex A9

- WiFi

- 40 lines DIO

-10 Channels analog in, 6 Channels out

-Stereo audio I/O

-Programmable in C/C++

-User defined LEDs and button

-3-axis accelerometer

- Compatible with NI miniSystems

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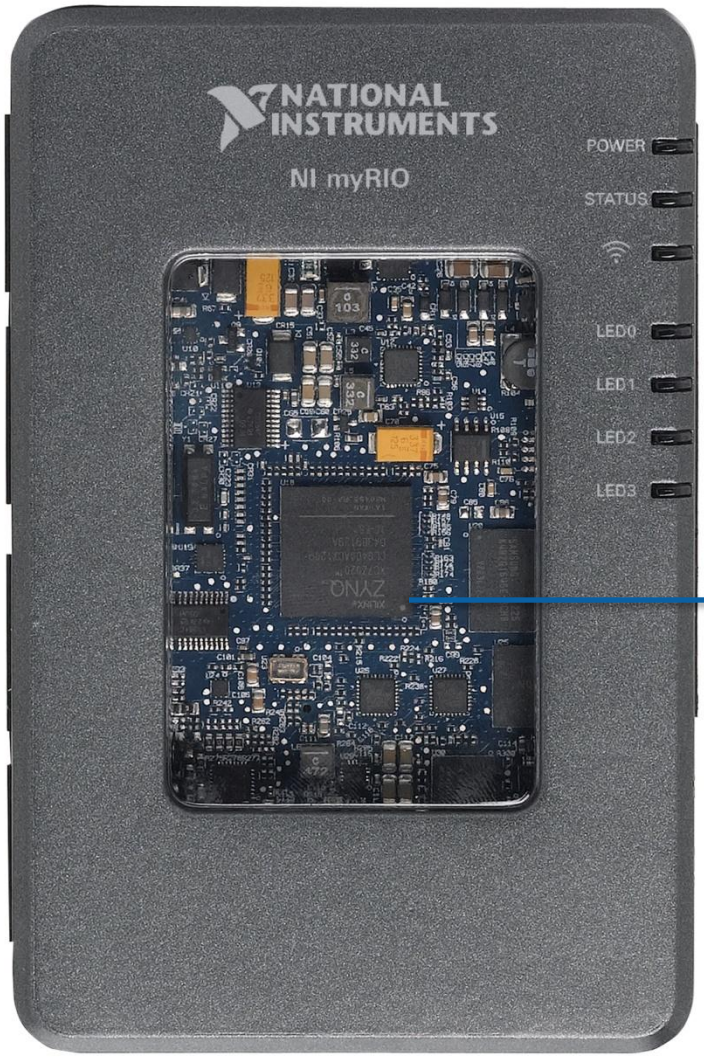
NI myRIO Product Overview: Front View



User Defined LEDs

XILINX Zynq
(Dual-Core ARM Cortex-A9 processor and Xilinx FPGA)

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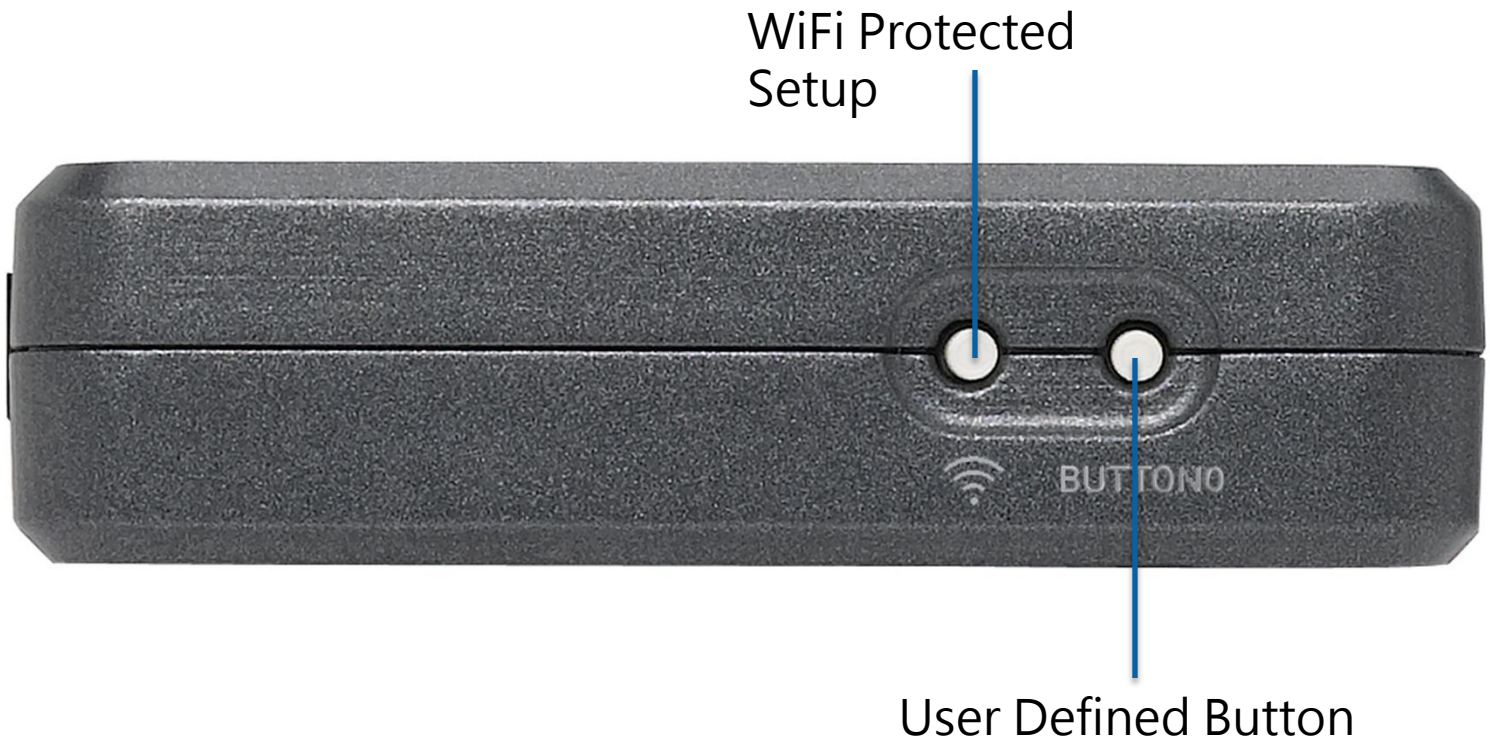
Back View

Built-in Accelerometer

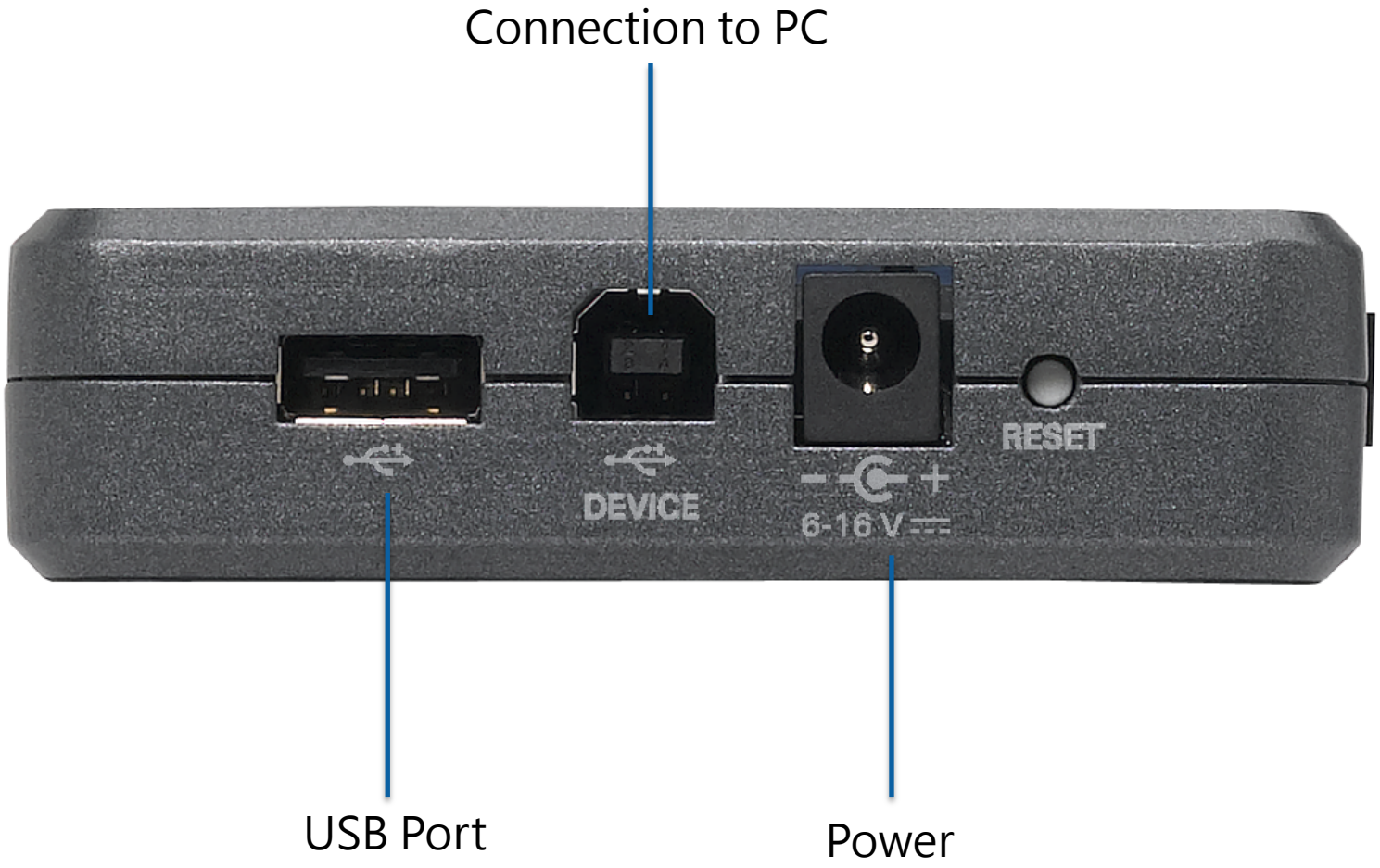
Mounting Holes

Getting Started

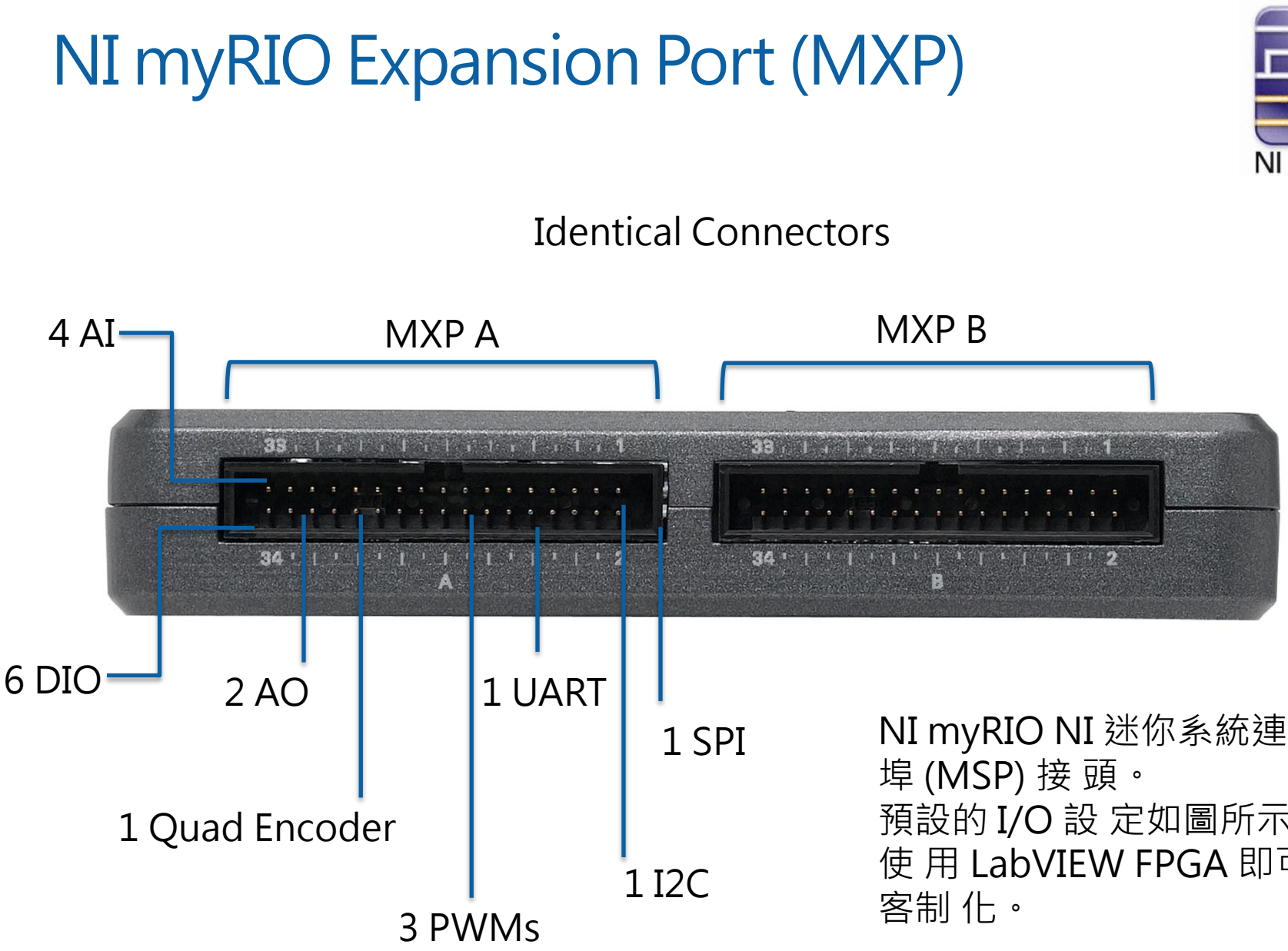
Bottom View



Top View



NI myRIO Expansion Port (MXP)



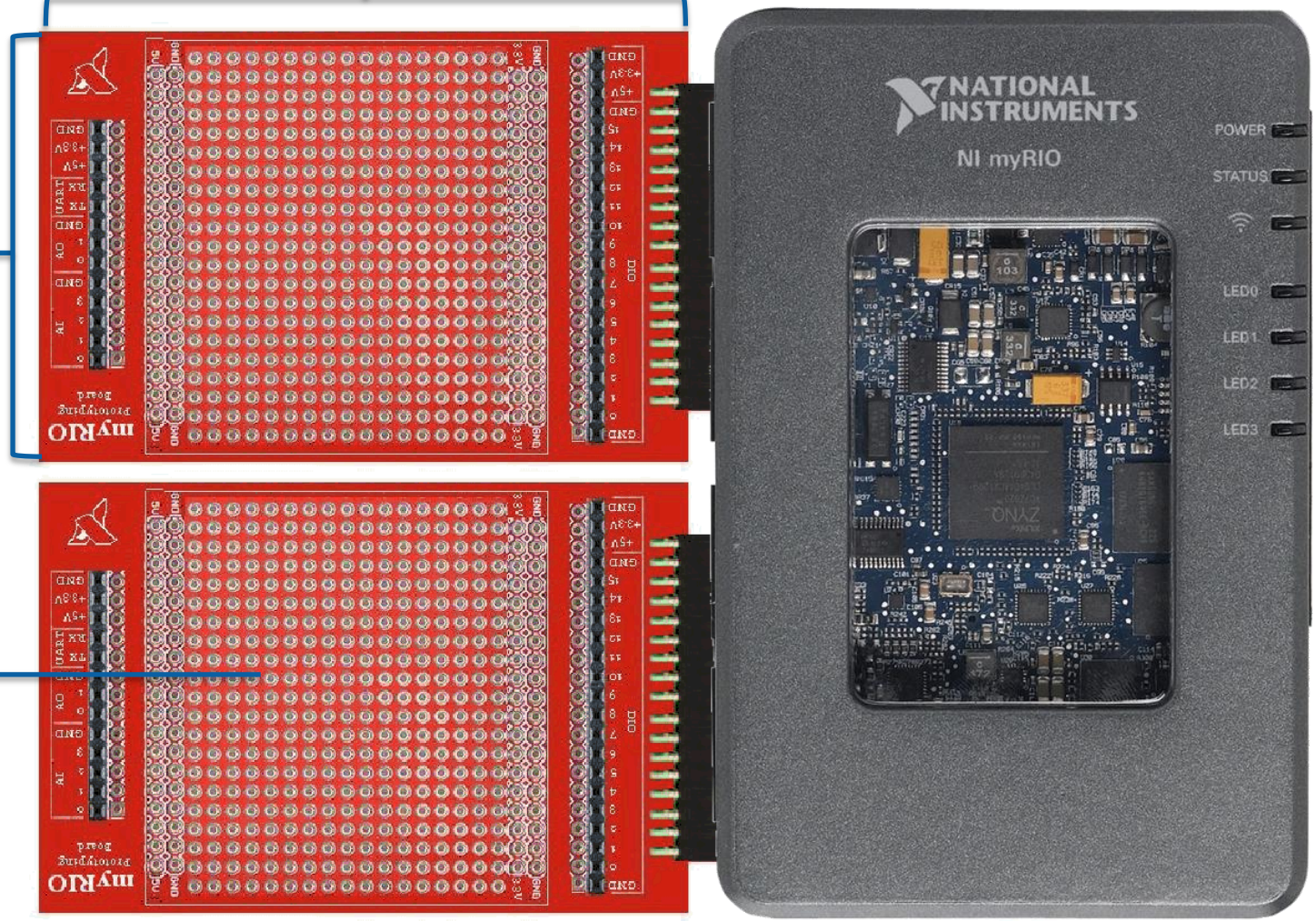
NI myRIO NI 迷你系統連接埠 (MSP) 接 頭。
預設的 I/O 設 定如圖所示。
使 用 LabVIEW FPGA 即可客制 化。

MXP Accessory

Included in box

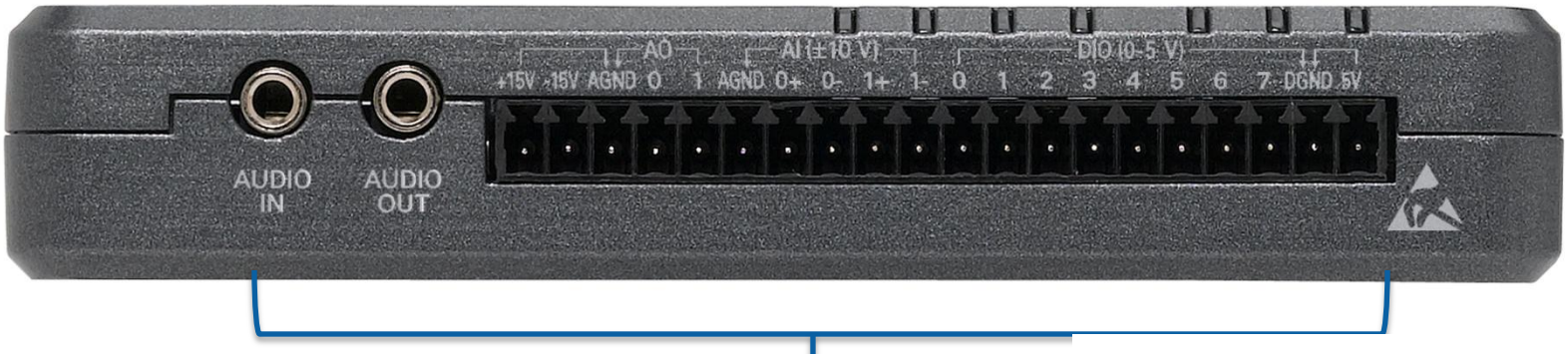
Made by NI

100mm spacing
for breadboard

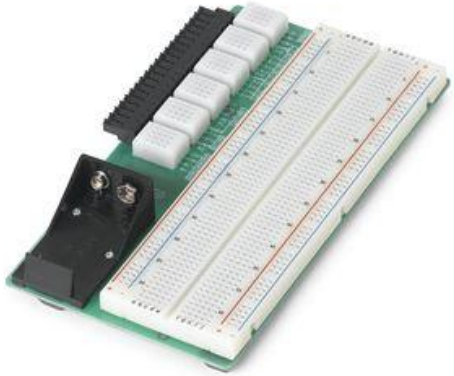


miniSystems Port (MSP)

NI Multisim



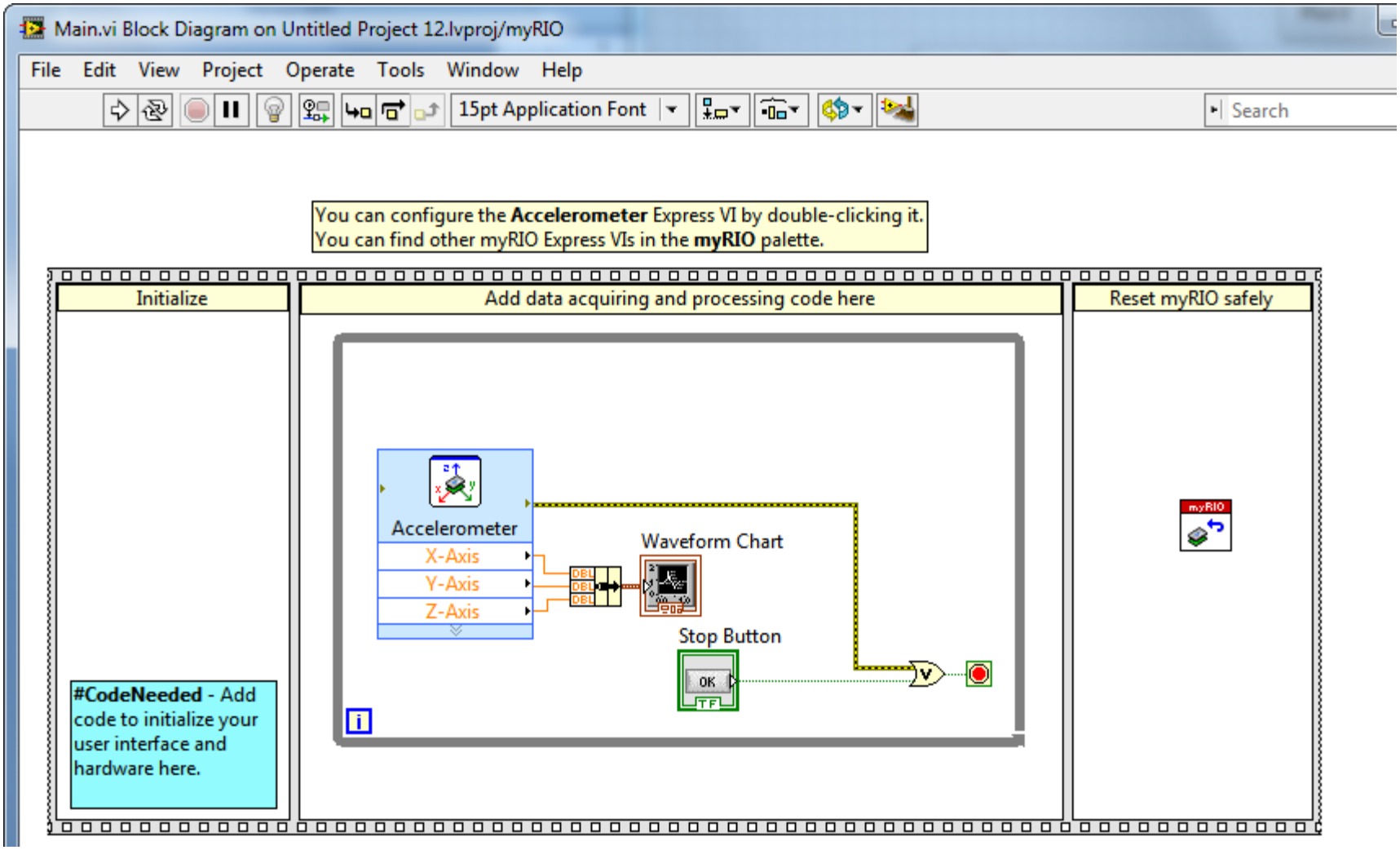
Identical to NI myDAQ
可外接miniSystem或是
提供基本IO功能



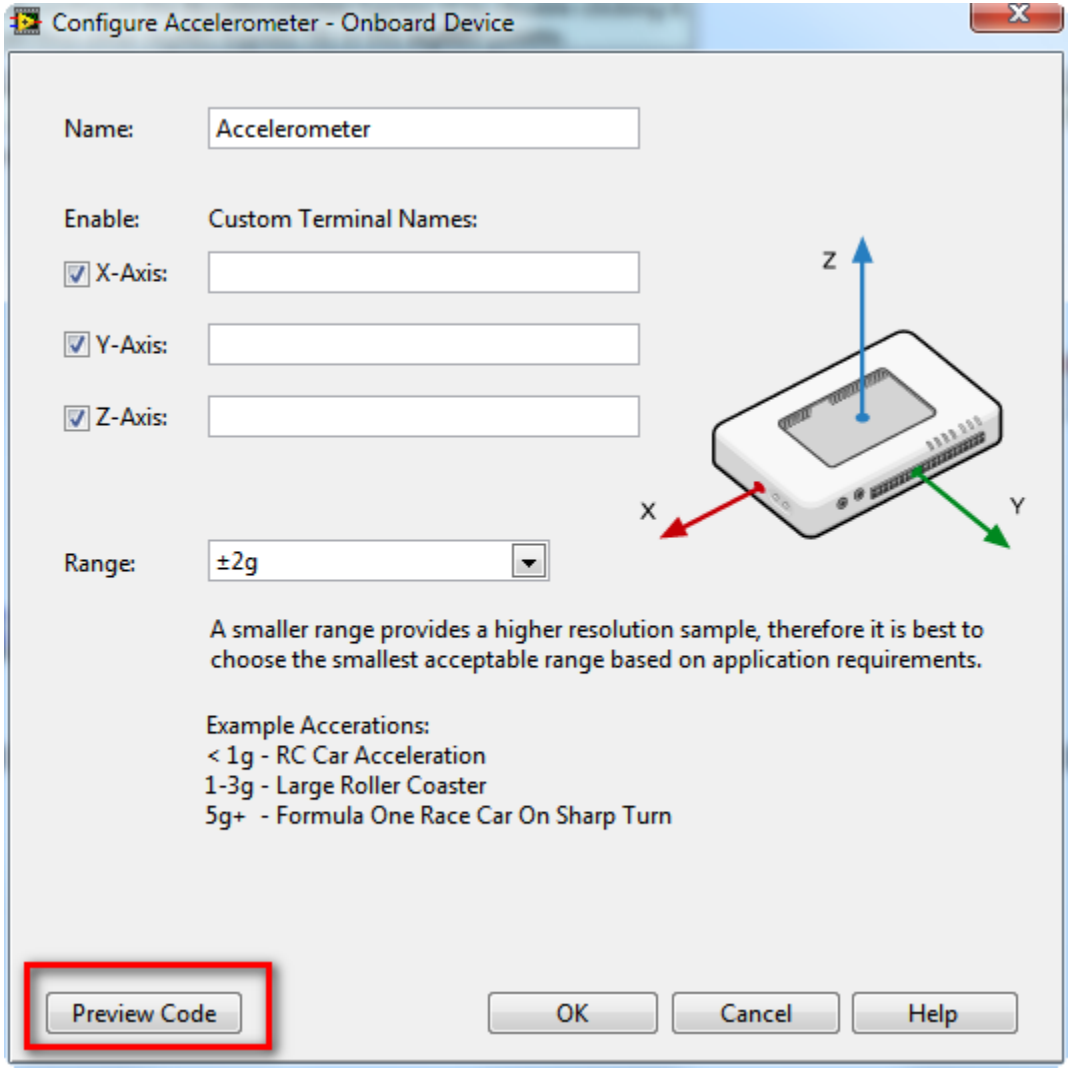
Additional Features

- 經濟實惠的工具，透過單一裝置即可教導並實踐多種設計概念
- 10 個類比輸入、6 個類比輸出、40 個數位 I/O 通道
- 內建 WiFi、LED、按鈕與加速規
- Xilinx FPGA 與雙核心 ARM® Cortex™-A9 處理器
- 支援 LabVIEW 與 C 程式設計功能；適用於不同的程式設計程度

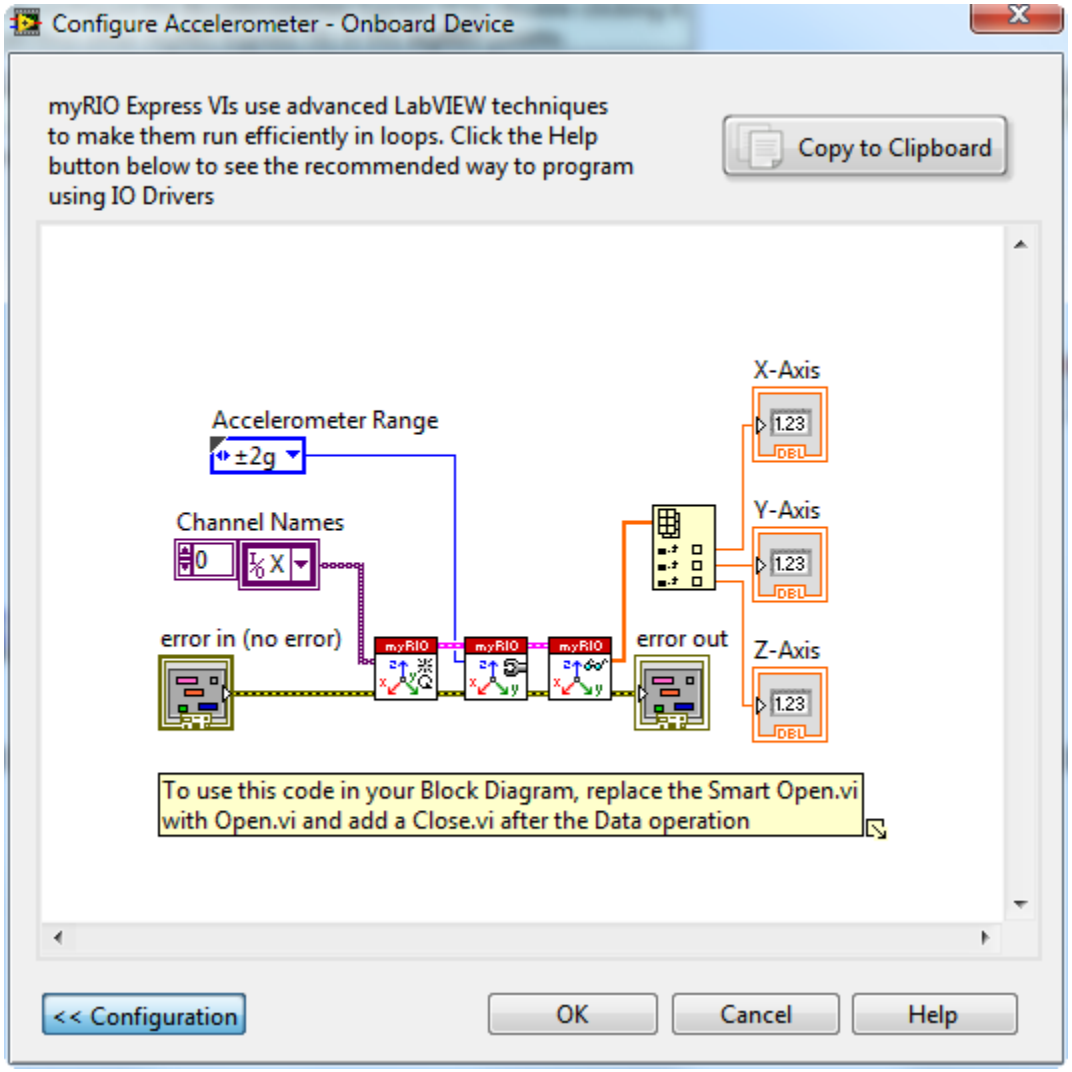
圖形化程式開發介面 Real Time Template VI



現成設定環境：
Configuration Window of Express VI

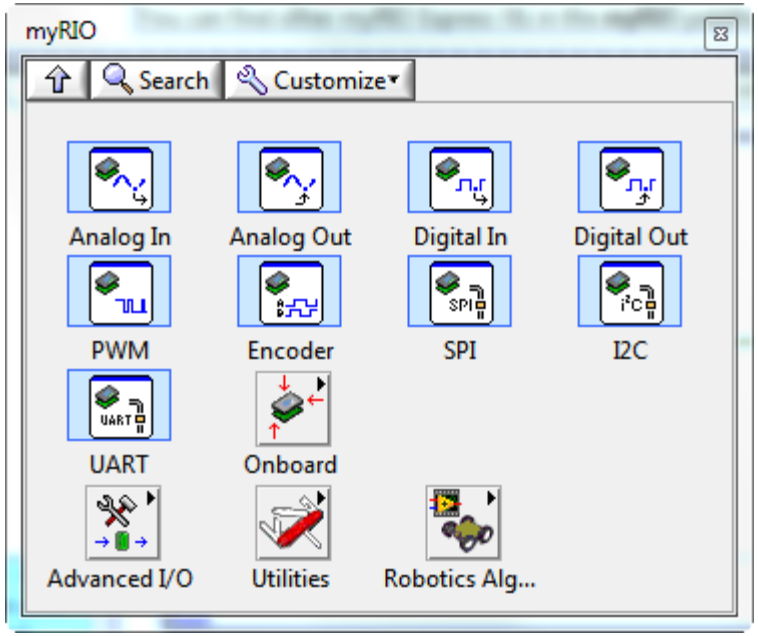


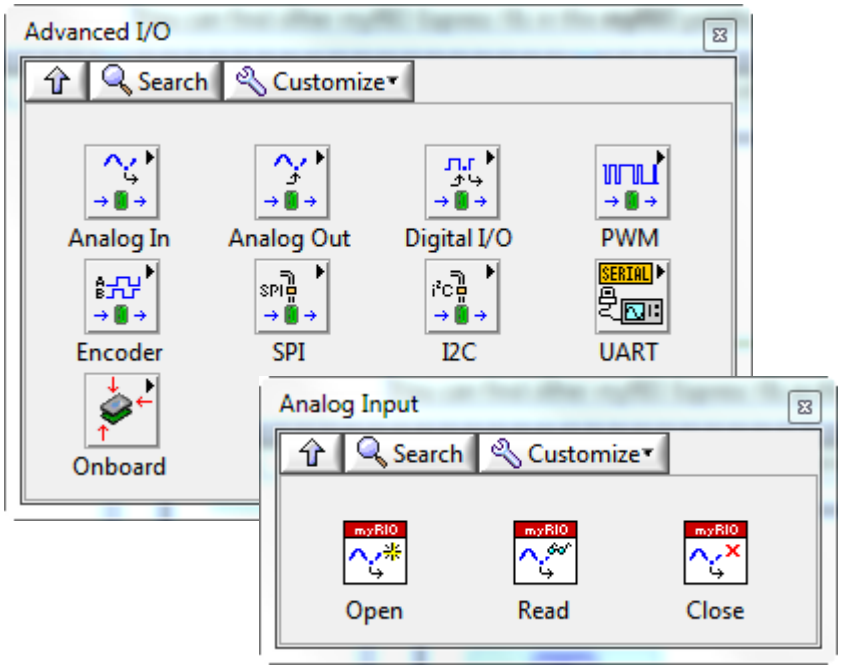
Code Preview



NATIONAL INSTRUMENTS

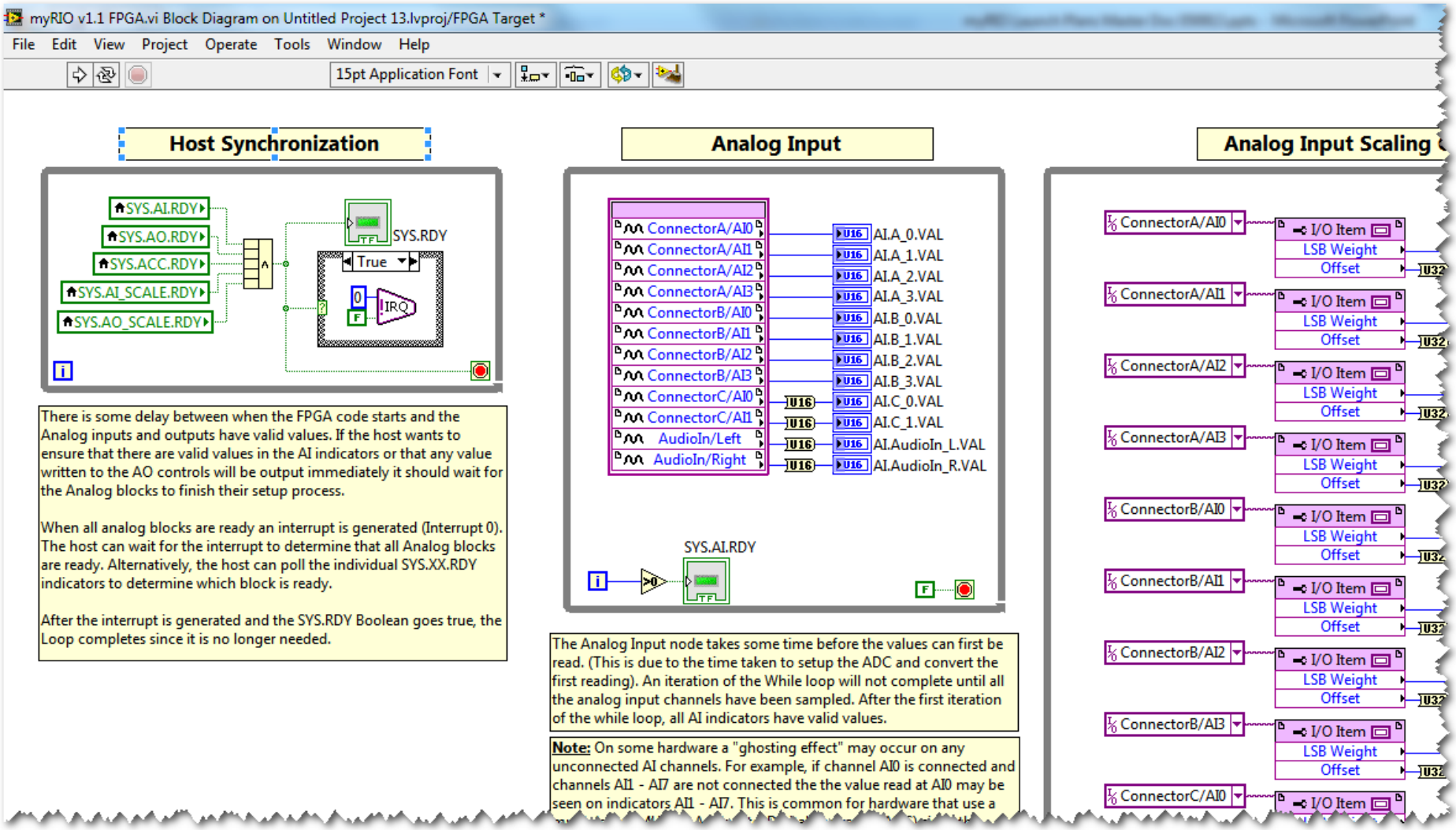
NI 提供NI myRIO Module軟體套件



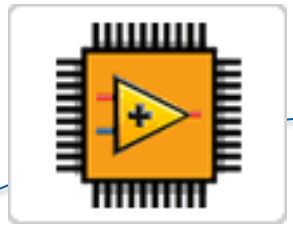


方便開發使用與上手、全圖形化介面

Shipping FPGA Personality



NI myRIO Ecosystem at Release



FPGA Personality Library

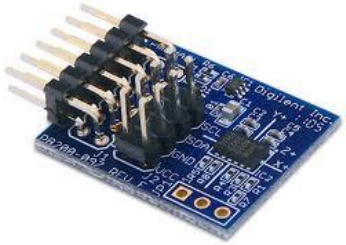
Arduino Shields

iWorx Sensors

NATIONAL INSTRUMENTS LabVIEW™

LEGO Sensors

Vernier Sensors



Digilent Pmods

提供現成16個應用的專案操作教材：
NI myRIO Project Essentials Guide

2 Discrete LED

LEDs, or light-emitting diodes, provide simple yet essential visual indicators for system status and error conditions. Figure 2.1 shows the four types of LEDs included in the SparkFun "LED Mixed Bag (5mm)" kit http://www.sparkfun.com/products/9881.

Figure 2.1: Discrete LEDs; from left to right: standard red and green, high-efficiency in various colors, and RGB.

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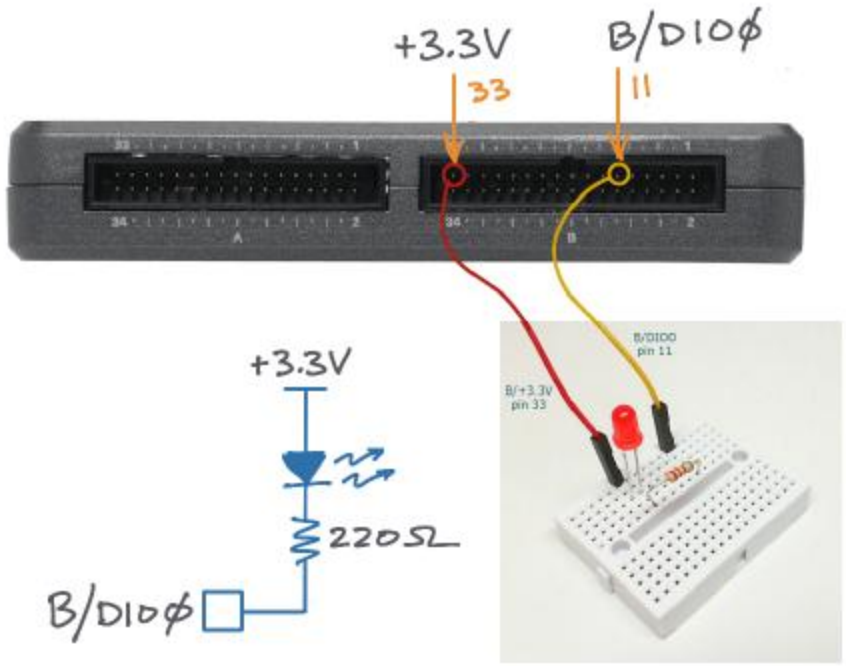
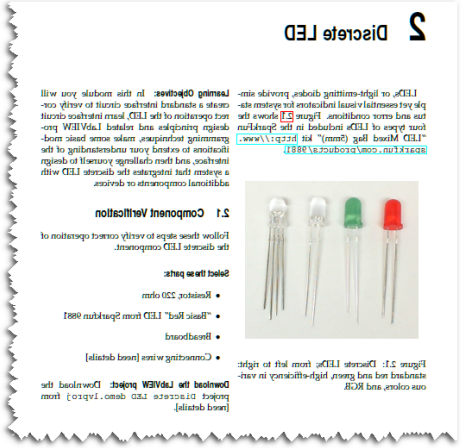
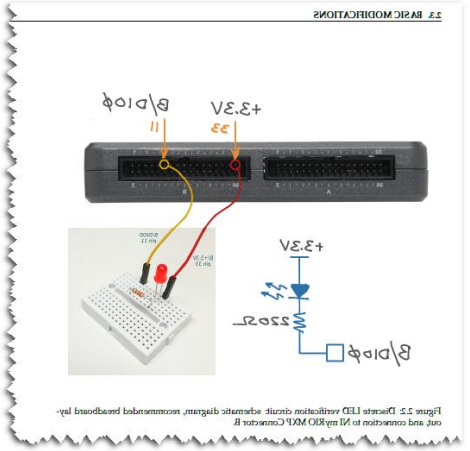


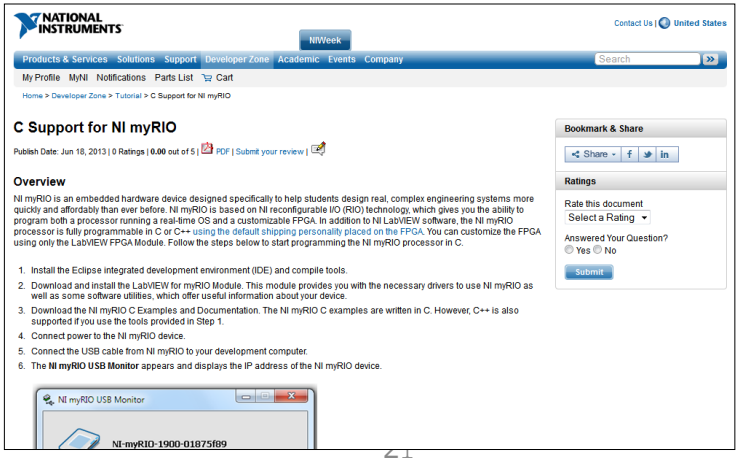
Figure 2.2: Discrete LED verification circuit: schematic diagram, recommended breadboard layout, and connection to NI myRIO MXP Connector B.

NI myRIO 豐富的教材與網路資源

Project Library - 5-8 Initial Projects
Student On Line Training Video
LabVIEW Pro 開箱文
Hand-on for NI myRIO
- Intro to LabVIEW
- Intro to NI myRIO
- Simple myRIO Out of the Box Program
- Programming onboard sensors and devices
- Exploring FPGA







提供IO開發板與三種應用套件：標準感測、機電系統、嵌入式系統供選搭

Part
MXP Breakout
Spare Power Supply
Standard starter kit (MXP protoboard, Basic sensors, Battery holder, parts kit)
Mechatronics kit (motor, motor drive, encoder, IR sensor, display, pushbuttons, etc.)
Embedded Programming Kit (display, VGA/HDMI, audio codec)

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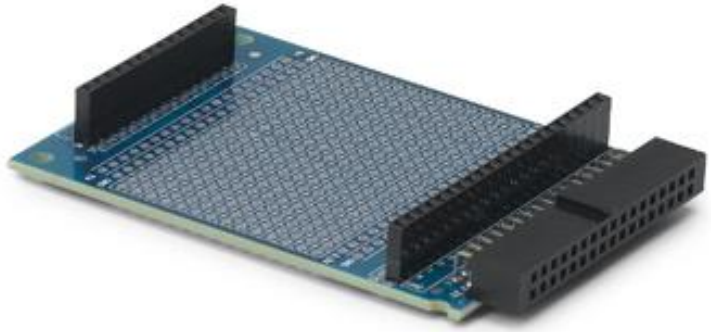
NI myRIO Expansion Port (MXP) Protoboard Accessory Breakout Board for NI myRIO MXP Ports

- Wire directly to MXP connector inputs and outputs
- Predrilled holes for soldering
- Standard breadboard spacing
- Accessory connector mates with 34-pin MXP connectors on NI myRIO



NI myRIO 入門組合 Sensor kit

- 數位裝置 (LED、切換器、7 段式顯示)
  類比裝置 (電位計、熱敏電阻器、光敏電阻器、力量感測電阻器、霍爾效應)
  音訊裝置 (麥克風、擴音器、警報器)
  其他裝置 (電池架、編碼器、DC 馬達、基本的電子元件)

NI myRIO 機電系統 Kit

- The NI myRIO Mechatronics Kit features a variety of commonly used motors, sensors, and components. Some of the contents of the kit include:

  2 DC gear motors with encoders
  H-bridge driver
  Accelerometer
  Triple-axis gyro
  Infrared proximity sensor
  Ambient light sensor
  Ultrasonic range finder
  Compass
  Hobby servo motors

NI myRIO 嵌入式系統 Kit

- The NI myRIO Embedded Systems Kit contains common sensors, devices, and a display. Some of the items featured in the kit include:

  RFID reader kit
  Numeric keypad
  LED matrix
  Digital potentiometer
  Character LCD (UART or SPI)
  Digital temperature sensor
  EEPROM

Audience Care Abouts

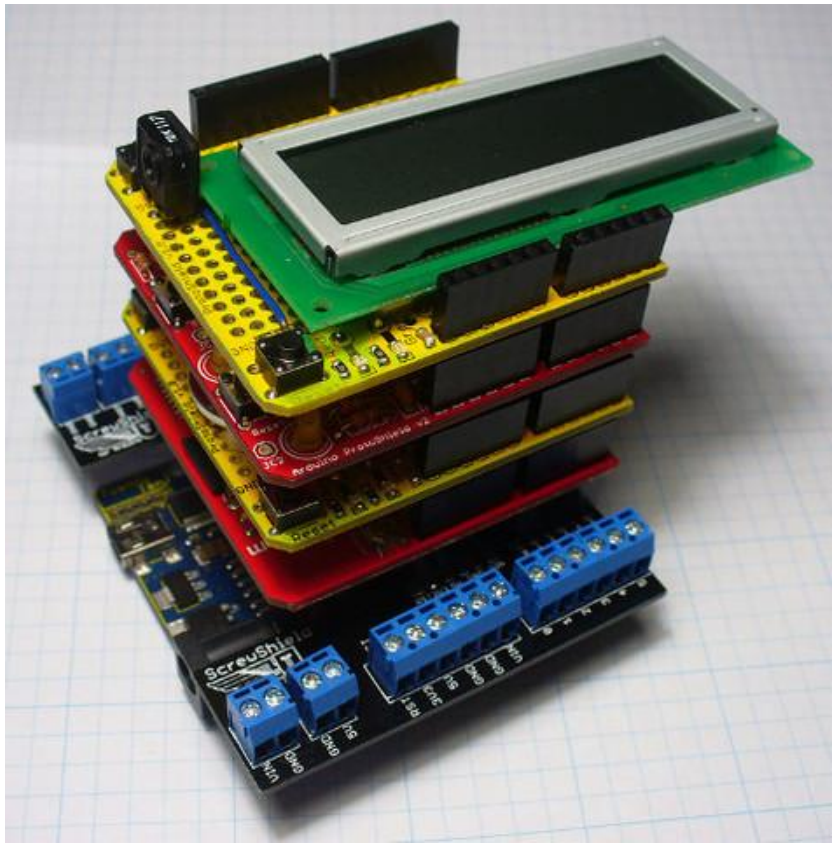
Senior Design
Educators / Students

- Complete real-world projects on time
- Project ideas and courseware

CRoME
Educators

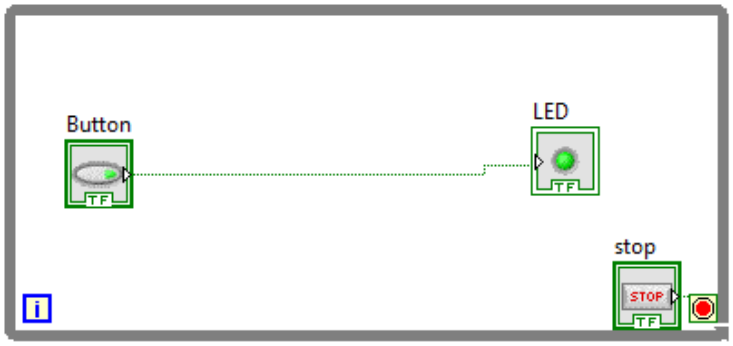
- Teach multiple concepts on one device.
- Implementation to existing courses

vs Form Factor　　all in one 整合各應用功能



vs Programming

圖形化程式高度簡化文字程式開發時程與複雜性




```
int ledPin = 13; // choose the pin for the LED
int inPin = 7;   // choose the input pin (for a pushbutton)
int val = 0;     // variable for reading the pin status

void setup() {
  pinMode(ledPin, OUTPUT);  // declare LED as output
  pinMode(inPin, INPUT);    // declare pushbutton as input
}

void loop(){
  val = digitalRead(inPin);  // read input value
  if (val == HIGH) {         // check if the input is HIGH
    digitalWrite(ledPin, LOW);  // turn LED OFF
  } else {
    digitalWrite(ledPin, HIGH);  // turn LED ON
  }
}
```

Customer Quotes

- "The compact size of the myRIO combined with the power and flexibility of the onboard FPGA make it the ideal controller for embedded robotics applications."

– *Nick Morozovsky, UCSD*

- "If I had made a list of everything I wanted in a portable I/O device, it would have looked almost exactly like the spec sheet of myRIO. This little unit is an amazing piece of engineering."

– *Dan Dickrell, University of Florida*

User solutions conveying the value of NI RIO technology

"From Controls Course to Final-Year Design to Industry"
- **Dr. Galen King, Purdue University**

Benefits:

1. Exposed students to real time controller similar to tools in industry

2. Due to graphical programming, students now using FPGA skills in their senior design projects

3. Projects at such a high level they have gained national exposure including CNN news coverage

Link: http://sine.ni.com/cs/app/doc/p/id/cs-15048

Conclusion

- Real world projects in one semester
- Teach all Controls, Robotics, Mechatronics and Embedded concepts on one device
- Getting started experience ensures student success quickly
- Every student has their own ‘personal’ lab equipment
- Free labs and tutorials integrate with existing curriculum
- Customize device through graphical FPGA programming
- Use your existing sensors and actuators
- Get latest industry-used technology at fraction of the cost