# Engine Knock Detector Start-Up Kit

## Engine Knock Detector Start-Up Kit

**Benefits**

*Open source code based on LabVIEW™ graphical development environment*
*Real-time detection of a wide variety of automotive engine knock noises*
*Upgradeable using standard PC-based technology*
*Engine Knock Detector Example Program included (downloadable from the Web)*
*Accurate measurement capability*
*Intuitive graphical interface*
*Signal conditioning for microphone input signal*

**Features**

*Real-time display, detection, and storage of engine-knock waveforms*
*Tunable, wavelet-based algorithm automatically detects engine-knock noises*
*Easily modified software architecture*
*Low-cost engine knock detection tool*
*Portable components for use on the bench top or with a laptop computer*

***DOWNLOAD THE ENGINE KNOCK EXAMPLE PROGRAM***

**ni.com/automotive/autovi_exchange.htm**

## Overview

*We designed the National Instruments Engine Knock Detector Start-Up Kit for real-time detection and storage of engine knock audio waveforms. Using your PC and an inexpensive, seperately purchased microphone, you can detect engine knock noises and store them directly on your hard drive.*

*The kit uses existing PC technology and common data acquisition hardware to simplify configuration and lower cost. We built the kit around the Engine Knock Detector Example Program, an example application that you can download from the National Instruments Web site at* ***ni.com/automotive/autovi_exchange.htm*** *The program is part of a set of unsupported examples that are intended as starting points for a wide variety of automotive applications. With the open source code architecture, you can modify the example for individual applications and connect to other I/O devices. The kit requires the LabVIEW graphical development environment and the Signal Processing Toolset for LabVIEW, both sold separately.*

## Application

*The Engine Knock Detector Start-Up Kit is intended for use by engine designers and testers. The kit differentiates between continuous sounds and transient sounds, such as engine knock noises. When it detects an engine knock noise, the software triggers an event counter, and the signal containing components store the knock noise to disk. You can tune the knock detection algorithm to detect different classes of knocks. After collection, you can review and play back the data through the PC sound card, using an included data review utility.*

## Engine Knock Detector Start-Up Kit Components

*We listed the recommended configuration for the Engine Knock Detector Start-Up Kit below. You must purchase the hardware and software components separately.*

## Hardware

*• Data acquisition*
*• Signal conditioning*
*• Microphone**

**You must purchase the microphone and an appropriate cable separately. An omnidirectional mono microphone with an impedance of 500 Ω is recommended.*

## Software

*• LabVIEW 5.1 (or higher)*
*• Signal Processing Toolset for Windows*
*• Engine Knock Detector Example Program**

**The Engine Knock Detector Example Program is free and downloadable from the National Instruments Web site. To use the source code you need LabVIEW graphical programming software and the LabVIEW Signal Processing Toolset.*

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# Engine Knock Detector Start-Up Kit

## Data Acquisition

*The recommended configuration includes high-performance data acquisition hardware with analog, digital, and counter/timer I/O. Choice of an exact configuration varies depending on your needs. Please contact National Instruments for other configuration suggestions.*

| Application | Portable Use | Benchtop Use | Benchtop and Rack Use |
|---|---|---|---|
| Computer | Laptop PC | Desktop PC | PXI™-based computer |
| Recommended DAQ hardware | The DAQCard™-AI-16XE-50 is a PCMCIA card that features: | The PCI-6034E is a PCIbus card that features: | The PXI-6052E is a PXI board that features: |
| | • Analog inputs – 16 single ended, 8 differential channels | • Analog inputs – 16 single ended, 8 differential channels | • Analog inputs – 16 single ended, differential channels |
| | • Sampling rate – 200 kS/s, 16-bit resolution | • Sampling rate – 200 kS/s, 16-bit resolution | • Sampling rate – 333 kS/s, 16-bit resolution |
| | • Digital I/O – 8 TTL lines | • Digital I/O – 8 TTL lines | • Digital I/O – 8 TTL lines |
| | • Counter/timers – 2 up/down, 24-bit resolution | • Counter/timers – 2 up/down, 24 bit resolution | • Counter/timers – 2 up/down, 24 bit resolution |
| | • The PR68-68F cable is recommended for this use | • The SH-68-68EP is recommended for this use | • Analog outputs – 2 channels, 16-bit<br>• The SH-68-68EP is recommended for this use |

## Signal Conditioning

*Signal conditioning components for the Engine Knock Detector Start-Up Kit come from a family of products that offer a range of sensor connectivity, excitation, and isolation for pressure, temperature, and amplification. The kit is based on the SC-2345, a portable, modular signal conditioning chassis that integrates signal conditioning, connectivity, controls, and indicators in a shielded chassis. The table below lists suggested signal conditioning modules for the Engine Knock Detector Start-Up Kit.*

| Module | Description | Application | Features |
|---|---|---|---|
| SCC-AI05 | Dual-channel isolated analog input module | Amplification, isolation, and filtering for microphone input | • Both channels have 10 kHz lowpass noise filters and gain amplifiers |
| SC-2345 | Carrier for SCC modules and panelette connectors | Base for signal conditioning and connectivity | • Laptop carrier<br>• Up to 16 channels of signal conditioning<br>• Modular connectivity |
| BNC Panelette Connector | Dual BNC panelette connector | Provides BNC connector for microphone input | • 2 BNC connectors occupy a single SC-2345 slot |
| Toggle Panelette | Dual toggle switch | Turns on acquisition | • 2 three-position toggle switches |
| LED Panelette | Quad LED indicator panel | Indicates if a knock has been detected | • Four different color LEDs including resistors for direct connection to a TTL level signal |
| Blank Connector Panelette | Blank panelette to cover unused connector areas | Closes unused areas of SC-2345 | • Black metal filler panels |

# Engine Knock Detector Start-Up Kit

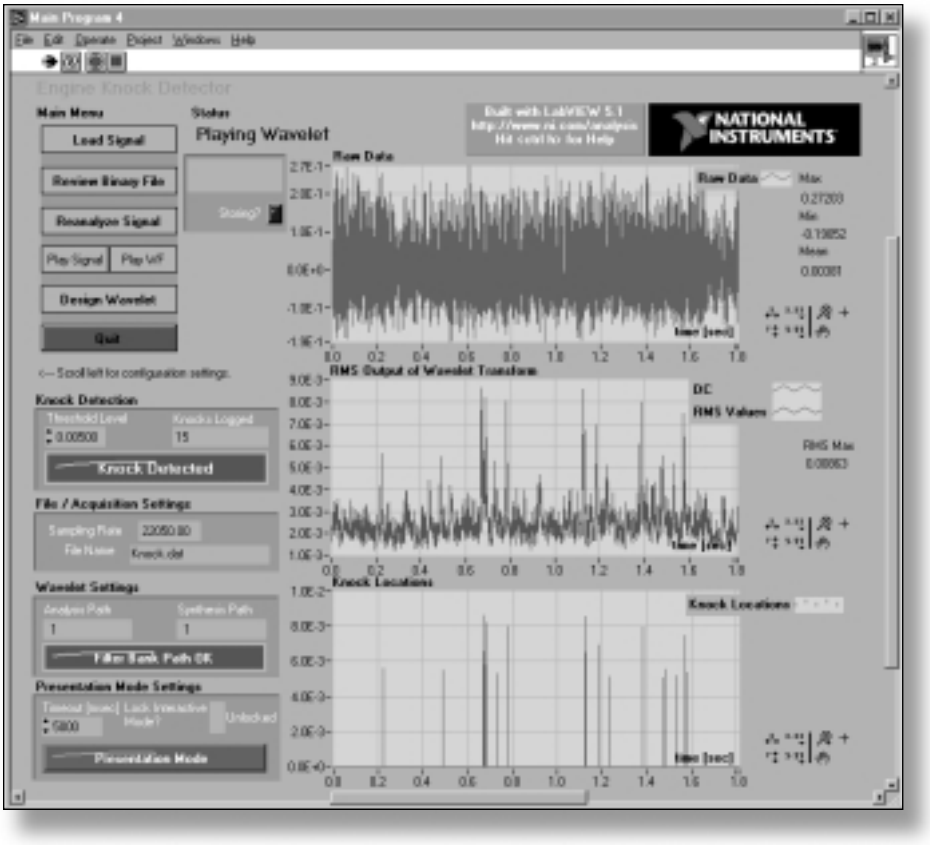


***Figure 1. Engine Knock Detector Example Program Front Panel***

## Engine Knock Detector Example Program

*The Engine Knock Detector Example Program differentiates between continuous sounds and transient sounds such as engine knock noises. You can download the software from the National Instruments Web site at* ***ni.com/automotive/engine_knock1.htm*** *The Engine Knock Detector Example Program requires LabVIEW and the LabVIEW Signal Processing Toolset.*

*Engine Knock Detector Program features:*

- *Web-based and downloadable program*
- *LabVIEW source code with comments included*
- *Real-time monitoring and detection of engine knock noises*
- *Tunable, wavelet-based knock-detection algorithm*
- *User-selectable continuous acquisition and storage of knock events*
- *Data reviewer utility*
- *Audio review capabilities through a standard PC sound card.*

## LabVIEW

*We built the Engine Knock Detector Example Program with LabVIEW, a flexible graphical environment for development of high-performance PC-based systems for measurement and automation. LabVIEW combines easy-to-use graphical application development with the flexibility of a powerful programming language.*

## LabVIEW Signal Processing Toolset

*To detect engine knock, the Engine Knock Detector Example Program relies on the wavelet and filter-bank design component of the LabVIEW Signal Processing Toolset. The Signal Processing Toolset includes stand-alone executables and add-on signal analysis tools for use with LabVIEW.*

# Engine Knock Detector Start-Up Kit

## Technical Support

National Instruments strives to provide you with superior technical support worldwide. We currently offer electronic technical support along with our technical support centers staffed by Applications Engineers.

To provide you with immediate answers and solutions 24 hours a day, we maintain an extensive online technical support system. Web support is available at no cost to all registered users, and can be found at **ni.com/support**

To handle questions that cannot be answered by an automated system, National Instruments provides no-cost standard technical support via phone and e-mail for registered users on all products. In the Americas, phone support is available on non-holiday weekdays from 7:00 a.m. to 7:00 p.m. central time by calling (512) 794-0100. Internationally, contact your local office. National Instruments sponsors a wide variety of group activities, such as user group meetings at trade shows and at large industrial sites. Our users also receive our quarterly Instrumentation Newsletter™ and AutomationView™ newsletters to get the latest information on new products, product updates, application tips, and current events. In addition, sign up for NI News, our electronic news service at **ni.com/news**

## Warranty

All National Instruments data acquisition, computer-based instrument, VXIbus, and MXI™ bus products are covered by a one-year warranty. GPIB hardware products are covered by a two-year warranty from the date of shipment. The warranty covers board failures, components, cables, connectors, and switches, but does not cover faults caused by misuse. The owner may return a failed assembly to National Instruments for repair during the warranty period. Extended warranties are available on most products at an additional charge.

Information furnished by National Instruments is believed to be accurate and reliable. National Instruments reserves the right to change product specifications without notice.

## Seminars/Training

Free and fee-paid seminars are presented several times a year in cities around the world. Comprehensive, fee-paid training courses are available at National Instruments offices, and major cities of the world are onsite at your facility. Visit our Web site at **ni.com/custed** to obtain information about courses or to preregister.

## Ordering Information

**LabVIEW and LabVIEW Toolsets**

***LabVIEW Full Development System***

*Windows 2000/NT/9x…….. .....776670-03*

***LabVIEW Professional Development System***

*Windows 2000/NT/9x .....……...776678-03*

***LabVIEW Signal Processing Toolset***

*Windows 2000/NT/9x…….. .....777136-01*

** To use Engine Knock Detector Program source code, you must have LabVIEW (FDS or PDS) and the LabVIEW Signal Processing Toolset.*

**Data Acquisition**

*For portable use:*

*DAQCard-AI-16XE-50..... 777231-01*

*PR68-68F ribbon cable…..... 183646-0R1*

*For desktop use with a PCI-based computer:*

*PCI-6034E.....778075-01*

*SH68-68EP .....184749-01*

*For benchtop and rack use with a PXI-based computer:*

*PXI-6052E.....777962-01*

*SH68-68EP .....184749-01*

**SCC Signal Conditioning**

*SCC-AI05..... 777459-24*

*SC-2345..... 777722-01*

*BNC panelette ..... 184737-01*

*Toggle panelette.....185378-01*

*LED panelette.....185376-01*

*Blank panelette (X8)..... 184483-01*

*For other configurations, please contact National Instruments or visit the National Instruments Web site at ni.com/automotive/autovi_exchange.htm*

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