PC INSTRUMENTS

PCI-343/344 Arbitrary Waveform Generators

High Performance Instrumentation in a PC

NEW FROM

Features

- **12-Bit Resolution at 50 MSPS**
- **Memory Segmentation with Linking and Looping**
- **DDS Clock Generator**
- **24 Volts Peak-to-Peak**

The PCI-343 and PCI-344 Arbitrary Waveform Generators occupy one PC expansion slot and combine the performance of advanced stand-alone generators with the convenience of the personal computer. Besides the features listed above, the PCI-343 and PCI-344 also provide 0.01% frequency accuracy, three selectable output filters, independent gain and offset controls, and software functions for nine standard waveform shapes. The single channel PCI-343 and the dual channel PCI-344 are both capable of pulses with 20 ns widths and 12 ns risetimes.

Powerful waveform memory control is a hallmark of these generators. The waveform memory can be divided into segments, with each segment having a different length and a different waveform. A waveform sequence can be created by linking segments together in any order, and each segment can be repeated up to 32767 times. Up to 16 waveform sequences can be created and switching between sequences can occur in as little as 20 ns. This extensive memory control makes it possible to create complex waveforms such as video test patterns, simulations of disk drive data, and encoded communication signals.

Waveforms can be created using the Waveform Builder provided in BenchTop™ software, or they can be imported from spreadsheets or math programs, or waveforms can be transferred from one of PC Instruments' oscilloscope cards. Waveform editing is also provided via the mouse or a text entry dialog box.

Engineers at PC Instruments have many years of experience designing instrumentation for automatic test systems and understand that it's the "little things" that make a generator well-behaved in every aspect of its operation. The following features exemplify our attention to the details:
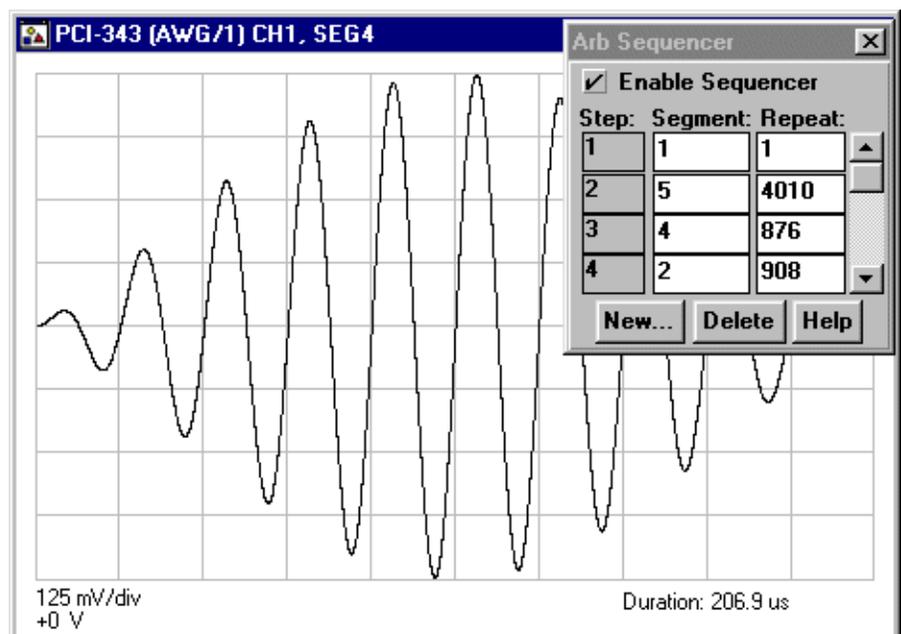
1) The outputs power-up in a high impedance state,

Applications

- **Power Line Disturbance Tests**
- **Simulate Modulated Communication Signals**
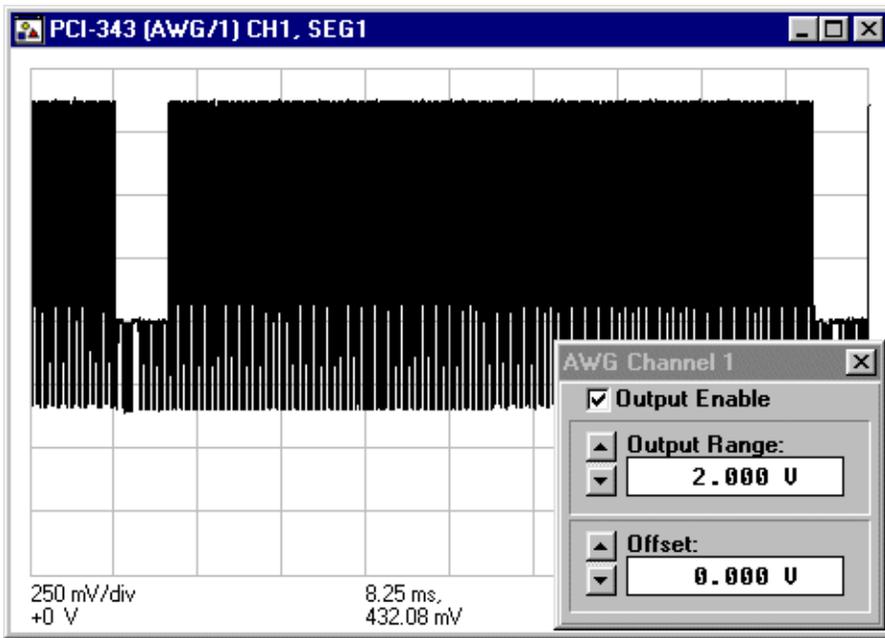- **ATE Systems and Process Control**
- **Create Video Test Patterns**

2) The outputs can be shorted to ground,

3) The output amplitude and offset circuits execute changes smoothly without any glitches due to range changing,

4) Channels can be shorted {i.e. summed} without damage,

5) The output reverse power protection works whether the computer is turned on or off,

6) The clock circuit employs a DDS technique that makes sample clock changes instantaneous and without the annoying frequency "lock-up" drift associated with phase-lock loop designs, and

7) To reduce noise, these generators are built with multilayer circuit boards and each power supply is locally regulated to eliminate the noise that can be found on a PC's power supply.

BenchCom software is included with every arbitrary waveform generator and provides test engineers and systems integrators the tools necessary to integrate the PCI-343 and PCI-344 generators into their test environment. Included in the BenchCom bundle are programmer's libraries for C and C++, 16-bit and 32-bit DLLs for Windows applications, the BenchTop Lite graphical user interface, and support for third party applications. Contact the factory for the latest additions to the BenchCom software bundle.

PC INSTRUMENTS

526 South Main Street
Akron, OH 44311
330-762-8500
FAX 330-762-8855
www.pcinstruments.com
info@pcinstruments.com

A sequence of waveforms can be created by linking waveform segments together. Up to 16 sequences can be created, each with 255 steps, and each step can be repeated from 1 to 32767 times or until a trigger is recognized.

PCI-343 (AWG/1) CH1, SEG1

AWG Channel 1

☑ **Output Enable**

▲ **Output Range:**
▼ **2.000 V**

▲ **Offset:**
▼ **0.000 V**

250 mV/div
+0 V

8.25 ms,
432.08 mV

Video Test Pattern Generator

- **• 50 MSPS and 12 Bits**
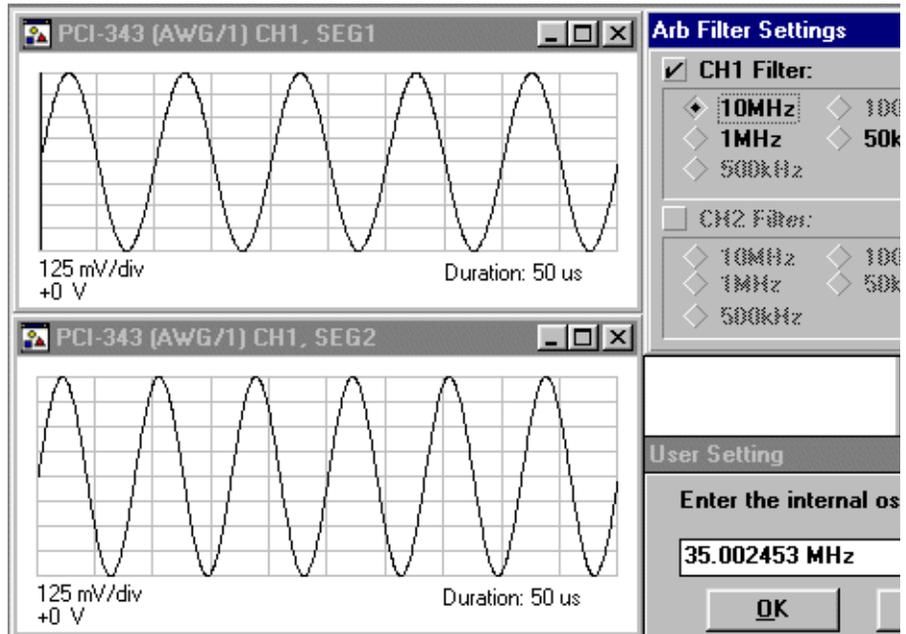- **• Linking and Looping**
- **• Programmable Sync Out**

The PCI-343 can be used as a video test pattern generator by using a spreadsheet to create a standard test pattern or a custom pattern and then loading the information into the PCI-343. In this application, the powerful waveform memory control features of the PCI-343 can be taken advantage of to create video test patterns without requiring a large amount of memory or slow load times. As an example, the waveform memory of the PCI-343 can be divided into variable length segments, and each waveform memory segment can hold a "piece" of the video test pattern and the sequencer of the PCI-343 can link the waveform pieces together and loop within a waveform memory segment to repeat a section of the video test pattern. Also, the Sync Out of the PCI-343 can be programmed to occur in any location facilitating the triggering of measurement instruments such as digital oscilloscopes. The 12-bit resolution and 50 MSPS update rate of the PCI-343 can easily create video test patterns for NTSC, PAL, SECAM, and the new video formats. Contact the factory for assistance in video test pattern generation. An output impedance of 75Ω is available on all waveform generators from PC Instruments.

FSK, xDSL, QPSK, PM, øM, DPSK, ...

- **• DDS Clock Generator**
- **• Multi-Page Sequencer**
- **• PC or External Symbols**

The PCI-343 is an excellent generator to use for creating a wide variety of baseband modulation waveforms. The multi-page sequencer memory of the PCI-343 can be used as a lookup table to create modulation formats such as FSK, ADSL, xDSL, PM, øM, DPSK, and others. Digital input streams (i.e. symbols) can be generated by the PC or from an external source. These symbols are used to address one of the pages of the sequencer memory. Each sequencer memory page not only contains the modulated waveform, but it can also contain the transition from one symbol to another, therefore making it possible to simulate filters. Frequency selection is augmented by the clock circuit of the PCI-343. The clock circuit is based on a DDS circuit and features sampling frequencies from 0.029 Hz to 50 MHz in 0.029 Hz increments.

PCI-343 (AWG/1) CH1, SEG1

125 mV/div
+0 V

Duration: 50 us

PCI-343 (AWG/1) CH1, SEG2

125 mV/div
+0 V

Duration: 50 us

Arb Filter Settings

✔ **CH1 Filter:**
◆ **10MHz** ◇ 100
◇ 1MHz ◇ **50k**
◇ 500kHz

☐ CH2 Filter:
◇ 10MHz ◇ 100
◇ 1MHz ◇ 50k
◇ 500kHz

User Setting

Enter the internal os

35.002453 MHz

OK

Combine An Arbitrary Waveform Generator With An Oscilloscope From PC Instruments...
To get a Frequency Response Analyzer, Impedance Analyzer, Network Analyzer, Stimulus-Response System, Sensor Calibration System, ATE System, Functional Test System, ...

PC Instruments Inc. • 330-762-8500 • FAX 330-762-8855 • info@pcinstruments.com • www.pcinstruments.com

PCI-343/4 Arbitrary Waveform Generators

- **Simultaneous Outputs**
- **Channel Summing**
- **Multi-Page Sequencer**

QAM Modulation

Quadrature Amplitude Modulation (QAM) signals can be created by the PCI-344 using its multi-page sequencer, simultaneous outputs, and channel summing capability. The multi-page sequencer can be programmed to output a particular phase and amplitude for each symbol. The symbols can be received from the PC or an external device. Errant modulation characteristics can be simulated such as phase jitter and amplitude variation. Each channel has a dedicated output amplifier, DAC, and waveform memory. The channels are updated simultaneously eliminating undesired phase shift between the I and Q outputs. Also, the I and Q outputs can be summed and connected to the input of an up-converter for transmission.
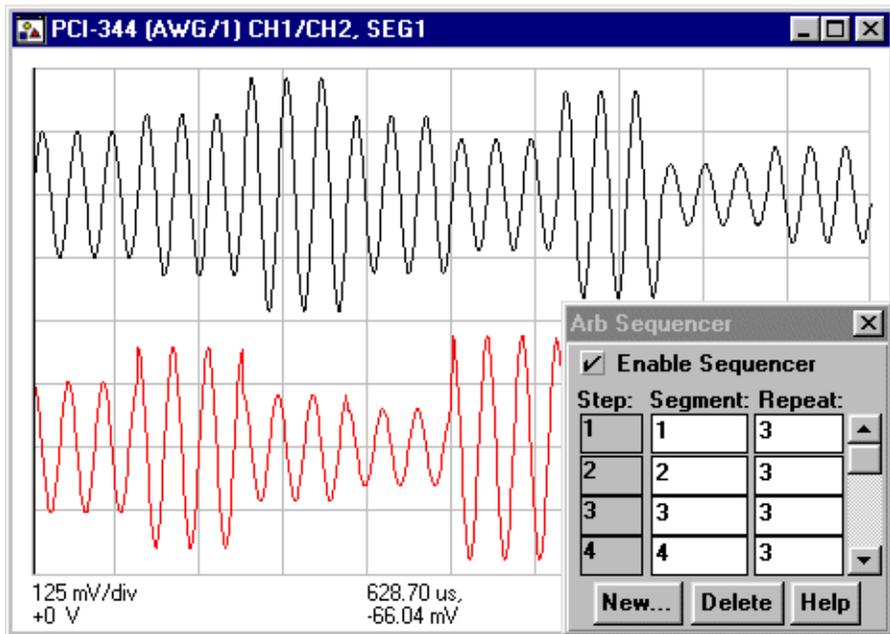
Power Line Disturbance Simulation and Testing

Power Line Disturbance (PLD) tests require the waveform control and synchronization provided by the PCI-344. A typical PLD system will use one segment to store a nominal waveform, and use other segments to hold "fault" waveforms such as brown-outs, ring waveforms, surges and others found in the IEC specification. Each segment can be repeated from 1 to 32767 times, or the segment can use the Loop Until Trigger Mode. The Loop Until Trigger Mode will repeat a segment until a trigger is recognized, and then the sequencer will advance to the next segment in the sequence. The trigger can either be initiated by an external signal or the PC (i.e. software trigger). The Loop Until Trigger Mode is used in PLD testing to continuously maintain the power lines until an aberrant waveform is required. And, the multi-page sequencer memory can hold up to 16 different fault waveforms that can be individually addressed by the PC or an external device. The Master/Slave option provides phase synchronization between several arbitrary waveform generators in multi-phase PLD tests.

- **Loop Until Trigger Mode**
- **Phase Synchronization**
- **Master/Slave**

PC INSTRUMENTS
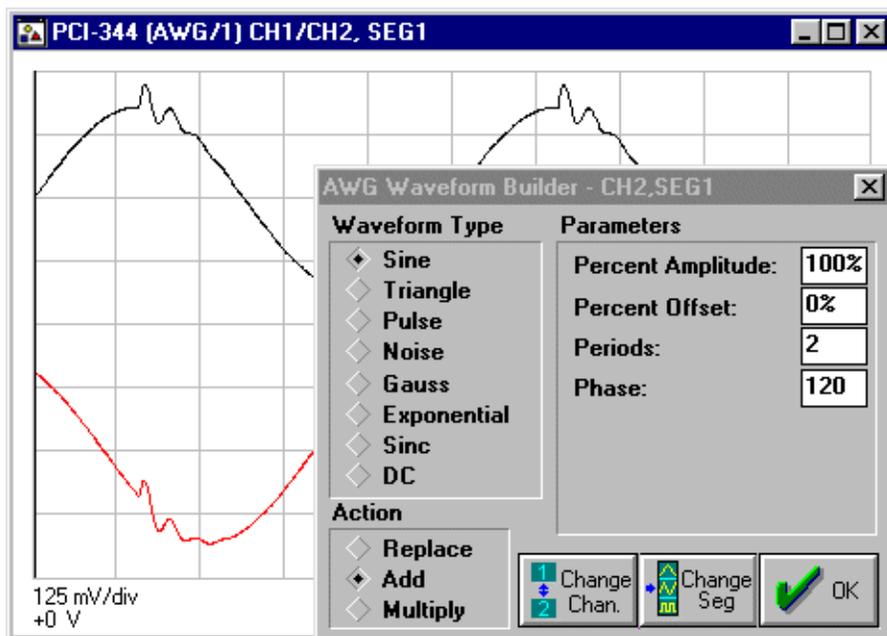
PCI-343/344 Arbitrary Waveform Generators

Vertical Section

Channels	One (PCI-343), Two (PCI-344)
Vertical Resolution	12 Bits
Amplitude	200 mVpp to 24 Vpp
	100 mVpp to 12 Vpp (into 50 Ω)
Amplitude Resolution	3 Digits
Amplitude Increment (minimum)	3 mV
Offset	± 12 Volts, ± 6 Volts (into 50Ω)
Offset Resolution	3 Digits
Offset Increment (minimum)	3 mV
Output Features	Continuous Short to Ground, Waveform Summing, 50Ω Impedance & Output Enable
Maximum Sinewave Frequency	10 MHz
Rise Time (10% to 90%)	12 ns
RMS Noise (Typical, DC to 20 MHz)	1 mV
Filters (selectable)	10MHz, 1 MHz, & 50 kHz
Synchronized Digital Outputs	2 (PCI-343), 4 (PCI-344)

Horizontal Section (DDS Control)

Sample Clock Source	Internal or External
Internal Sample Rate	0.029 SPS to 50 MSPS
Sample Rate Increment	0.029 SPS
Frequency Accuracy	± 20 ppm
External Clock Jitter (Typical)	< 1 ns

Memory Control

Memory Length	32 ksamples per channel (128 ksamples per channel optional)
Segments	1 to 255
Segment Length	4 to Memory Length
Steps per Sequence	1 to 255
Step Loop Count	1 to 32767, or Loop Until Trigger
Sequences	1 to 16
Sequence Selection	External or PC
Minimum Sequence Switch Time	20 ns

Trigger Section

Modes	Continuous (50 MSPS), Triggered (40 MSPS), and Gated (40 MSPS)
Sources	External, Bus (Software), and Master
Multiple Generators	Master/Slave Option Synchronizes Triggering and Sample Clock

Connections

Function Out	BNC (50Ω Output Resistance)
Sync Out	BNC (TTL Compatible)
Synchronized Digital Outputs	Header
Trigger In	BNC (TTL Compatible)
Frequency	DC to 25 MHz
Clock In	Header (TTL Compatible)
Frequency	DC to 25 MHz
AM External	Header (Option)

General

Standard Waveforms (9)	Sine, Sawtooth, Square, Pulse, Gaussian Pulse, Exponential Pulse, Sin(x)/x, Pseudo-Random Noise, and DC.
Waveform Addition and Multiplication	
Import ASCII Waveform Files	
Glitchless Controls	Sample Rate, Amplitude, Offset, and Filter
Specified Temperature Range	18°C to 28°C
Calibration	12 Months, Covers-On (no adjustments), Constants stored in On-board EEPROM

Software

Programming Support	16-Bit and 32-Bit DLLs, C and C++ Programmer's Libraries, Many Example Programs
User Interface	BenchTop™ Lite
Third Party Drivers	LabView™ and Many Others

Computer Requirements

Bus ISA 16-Bit, One expansion slot per card. Half-size. Base I/O address 000h to 3F0h. Range 16 bytes.

PC Bus Power Requirements

+5V	+12V	-5V	-12V
1.9 A	240 mA	0 mA	240 mA