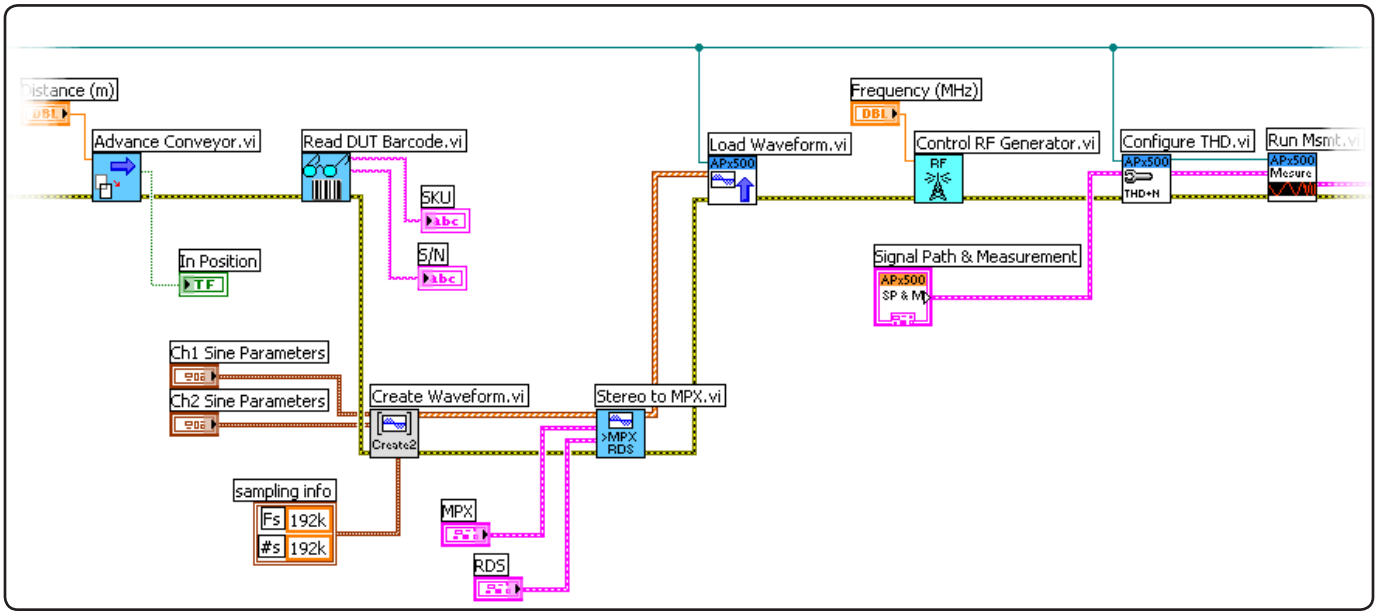
APx Automation with LabVIEW

APx performance within an integrated automation environment



Audio Precision's LabVIEW driver for APx instruments allows any APx audio analyzer to be completely controlled from within LabVIEW, opening up a vast world of possibilities.

National Instrument's LabVIEW is a graphical programming language that can interface with over 7,000 instruments to provide data acquisition, industrial measurement, automated testing, and instrument control. Integrated through LabVIEW, instruments such as meters, sensors, actuators, motors, oscilloscopes, switchers, and RF generators can work alongside APx analyzers in a complete LabVIEW measurement or automation system.

In addition, LabVIEW has advanced data processing and graphing capabilities that supplement those in the APx500 measurement software.

LabVIEW uses icons instead of lines of text to create applications. LabVIEW programs are called virtual instruments, or VIs, because their appearance and operation imitate physical instruments, like oscilloscopes, volt meters, or FFT analyzers. With the driver, LabVIEW users can quickly and efficiently develop APx applications with clean, concise LabVIEW code.

Use Case:
LabVIEW and APx in Production Test

APx is often selected for production test because of its high speed, multichannel capability and powerful measurement features. After these prerequisites, the key requirement for a good production test instrument is tight integration with rest of the line.

Using the APx LabVIEW driver, any APx analyzer can be incorporated into a larger LabVIEW environment, sending and receiving instructions and sharing data with other instruments or processes.

Basic automation can be achieved by making simple block diagrams that call pre-saved APx measurements sequences, or you can use individual VIs for more complex integration.

Experienced LabVIEW users will also be able to take advantage of LabVIEW's feature-rich library of front panel controls and indicators to create intuitive and highly customized user interfaces, as shown in Figure 2.

As part of a LabVIEW automated system, APx analyzers can easily interact and exchange data with other parts of the process.

For example, a bar code scan might determine what tests and test limits the APx analyzer loads. Likewise, the results of the APx tests might determine if a product on a conveyer is routed to packaging or to rework.

At the conclusion of testing, the results may be output by the built-in APx report generator, processed by LabVIEW, or saved in an external database.

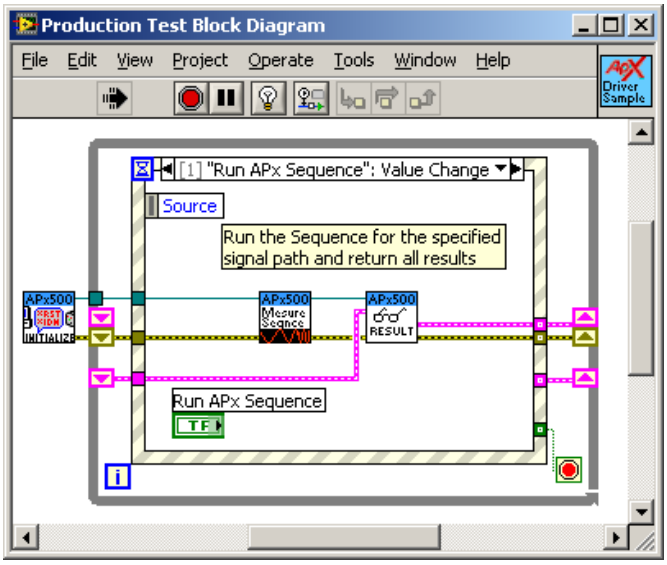


Figure 1 Production test block diagram in LabVIEW using APx VIs.

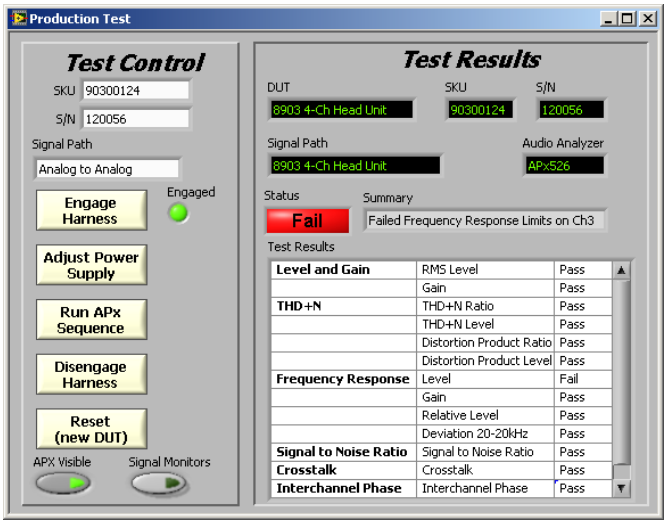


Figure 2 Production test user interface (custom LabVIEW VI).

Use Case:
LabVIEW and APx in R&D

LabVIEW has thousands of mathematical and scientific functions available, including VIs for waveform generation, waveform conditioning (filtering, DSP, etc.), probability, and statistics. It also has extensive graphing capabilities. Combine this with the APx LabVIEW driver, which greatly simplifies acquiring and accessing APx audio test data from LabVIEW, and you have a powerful R&D platform.

For example, you can make polar plots of loudspeaker directivity response (Figure 3), do custom calculations on the spectral peaks of a multitone FFT, or plot the spectrogram of a chirp signal (Figure 4).

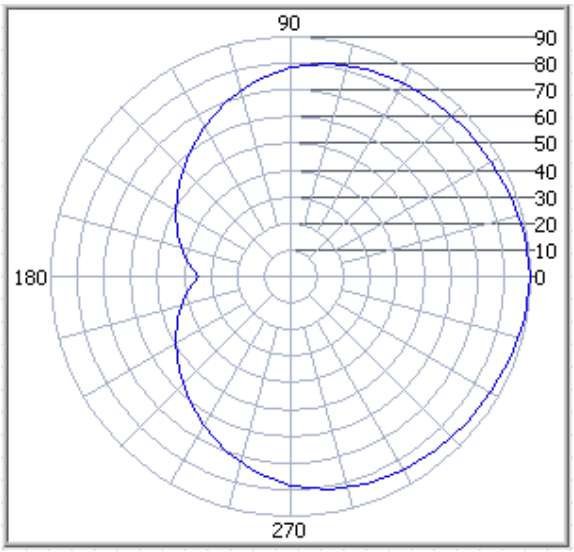


Figure 3 Polar plot of loudspeaker directivity. SPL at 1 kHz (dB).

There's even a driver VI to get back all FFT points from all channels of an APx signal analyzer measurement. But be careful! APx supports FFTs up to 1 million points in size. With channel counts as high as 16 in the APx586, that can end up being a lot of data.

Automation Alternatives

If you don't use LabVIEW, there are other ways to control and automate APx analyzers.

The comprehensive APx API (Application Programming Interface) is built on the Microsoft .NET platform, allowing custom APx programs to be developed in any .NET capable language, including Visual Basic and C# (as well as LabVIEW).

For non-programmers, the APx500 software has many test automation features built in, including the measurement sequencer, customizable user prompts, lockable projects, and the ability to call external applications.

Common Challenges

- Make sure that any Signal Paths or Measurements that you are trying to access from LabVIEW already exist in the APx project. Otherwise, APx will generate an error message.
- Be careful when running the UI invisibly. If you forget to close APx, the application will still be in memory, even though the UI is not visible. If this happens, you can stop the APx's process using the Windows Task Manager.

Tips for Optimum Testing

- Take advantage of the APx500 UI to set up a project file pre-configured with all the necessary signal paths, measurements and settings. Then use the LabVIEW driver to load the projects file, access the signal paths and change settings programmatically, as required.
- If you need a special signal, like sine waves with different frequencies, phase relationships, or DC offsets, you can create .wav files using LabVIEW and then load them into a project file to access with any measurement in the project from your LabVIEW program.
- The most convenient way to access an APx instrument with LabVIEW is through a LabVIEW driver. If, for some reason, you prefer not to use the driver, APx500 also allows interfacing to LabVIEW through .NET connectivity (using the APx API Developer Tools).

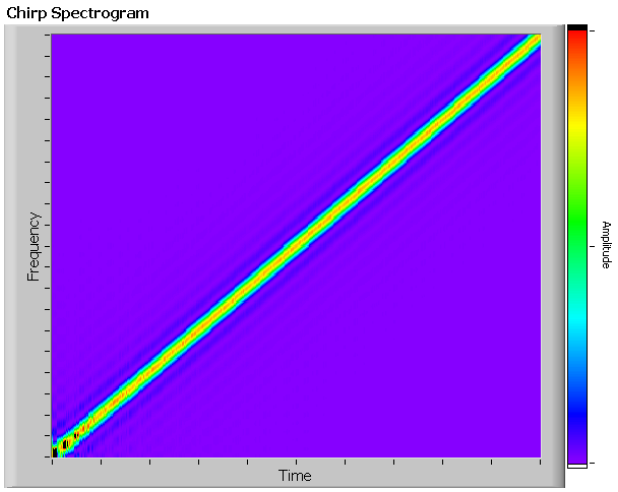


Figure 4 Chirp Spectrogram

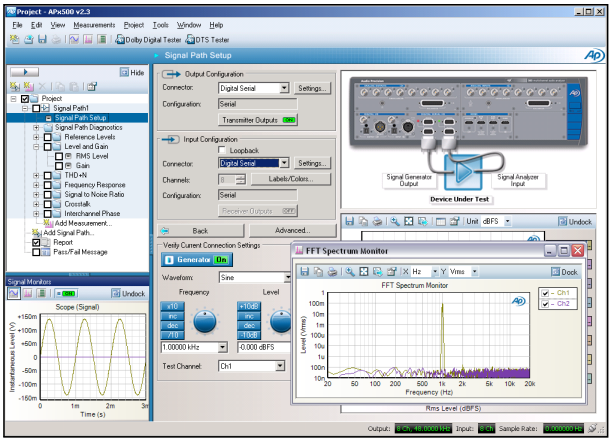
Step by Step:
Adding audio test to a production line

Let's look at the steps required to add six key audio measurements to a power amp production line final test.

1 **Create a project using the APx UI**. APx has the most advanced UI in audio test—so let's use it. From inside APx, define the Signal Path(s), select the tests you want from the Measurement Navigator, edit any necessary values, and define limits. Save the project.

2 **Open LabVIEW and create a new VI.** Add more VIs from the APx LabVIEW driver to load and control the APx projects you created above. Construct a block diagram in LabVIEW that includes the APx VIs and any other instruments, sensors, and devices that will be controlled by LabVIEW.

3 **Begin testing.** The operator runs the production line, and APx performs the tests. Results may be fed back to a simplified UI for the operator, directed to control other equipment, or be sent to a database or report.



Using LabVIEW with other AP Audio Analyzers

LabVIEW connectivity is provided for all AP analyzers. All 2700G Series, P1 and ATS-1 analyzers have LabVIEW drivers. All 2700 Series and ATS-2 analyzers can be controlled through ActiveX automation. The G versions of these analyzers can be controlled through low level GPIB commands.

	APx500	2700A	2700G	ATS-2A	ATS-2G	P1/ATS-1
LabVIEW driver	●		●			●
.NET connectivity	●					
ActiveX automation		●	●	●	●	
Low level GPIB commands			●		●	●

Additional Resources @ AP.com

AP LabVIEW Resources
http://ap.com/download/labview

APx LabVIEW Driver
http://ap.com/display/file/257

APx API Developer Tools
http://ap.com/display/file/138

APx500 User Manual
http://ap.com/display/file/25

For more information or a demonstration, please contact your local AP sales partner http://ap.com/contact.

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