

Agilent U2331A USB Modular Multifunction Data Acquisition Device

Using the U2331A in the construction industry

Application Bulletin

Introduction

Agilent U2331A data acquisition (DAQ) device can be used to measure various types of parameters in the construction industry. It is important for one to know the concept of the types of measurement needed in the industry, which this bulletin will touch on. People in the construction industry often test parameters such as pressure, strain, temperature, displacement, and force. By measuring the said parameters, engineers are able to determine if a structure will be able to withstand sudden changes in a normal operating environment, and estimate the degradation of certain construction materials, which are constantly used over a certain period. There is a distinct awareness of monitoring the integrity of such materials and their structure formation.



Operation Principle

Most tests done in the construction industry are of a destructive nature. It involves materials such as concrete, steel, timber, and fiber reinforced polymer. These materials are connected to necessary signal conditioners and the U2331A is used to measure the specific parameter under test. The U2331A acts as a link between the materials under test and the data logging software in your PC.

A leading company in the United States has used the U2331A to measure pressure, strain, displacement, and force as well as temperature effect on their construction materials. An exerting known force is applied to the test element, and the U2331A is used to record the changes in the test element. The block diagram of the test system setup is shown in the following page (Figure 1).

The aim of this test system setup is to keep the applied force from the hydraulic power unit separated from the system that controls the U2331A, so that both are independent of one another. This is achieved by using various sensors and signal conditioners to interface with the U2331A.



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Test System Setup

The U2331A has 32 channels of differential inputs to measure. It is able to provide fast and accurate measurement of up to 3 MSa/s sampling rate for a single channel, and offers a resolution of 12-bit. Different voltage transducers are used for different test applications. All tests are done in the laboratory and the instruments can be up to 50 feet away from the test location. The sampling rate speed required for each channel is 4.8 kHz.

The test system is set up such that the test program outputs an array of approximately 115,000 elements per second. The test program is written so that the array is stored in a file and overwritten every second with newly collected data. A secondary program reads the array from the file every second, performs the plotting and mathematical calculation, and stores the stream of results to a new file. The test system was set up this way to prevent the adverse effects on the data acquisition such as the program slowing down or even hanging, due to the complexity and the number of formulas and plots involved. Figure 2 shows the test program graphical user interface. This test program measures parameters such as pressure, strain, temperature, displacement, force, and the impact that occurs to the particular area under test.

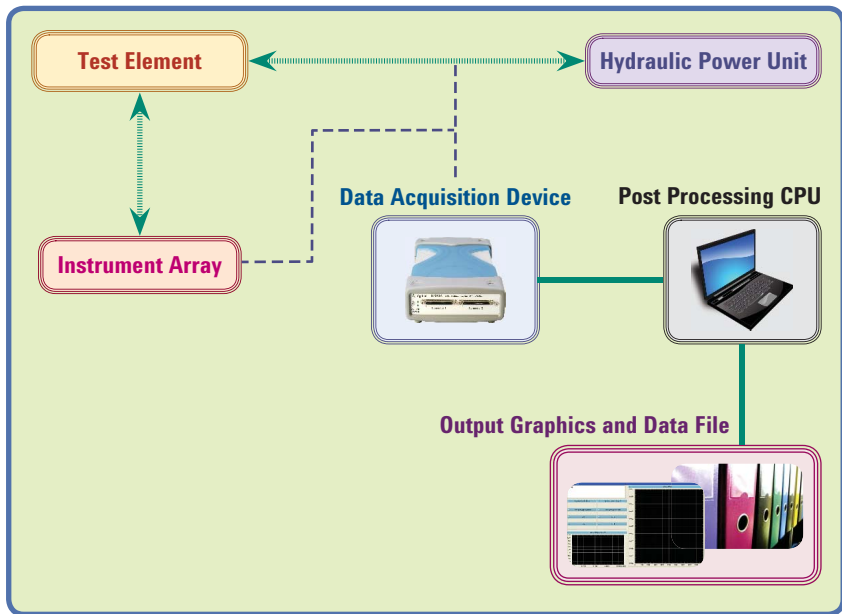


Figure 1. Flow control of the data acquisition test system

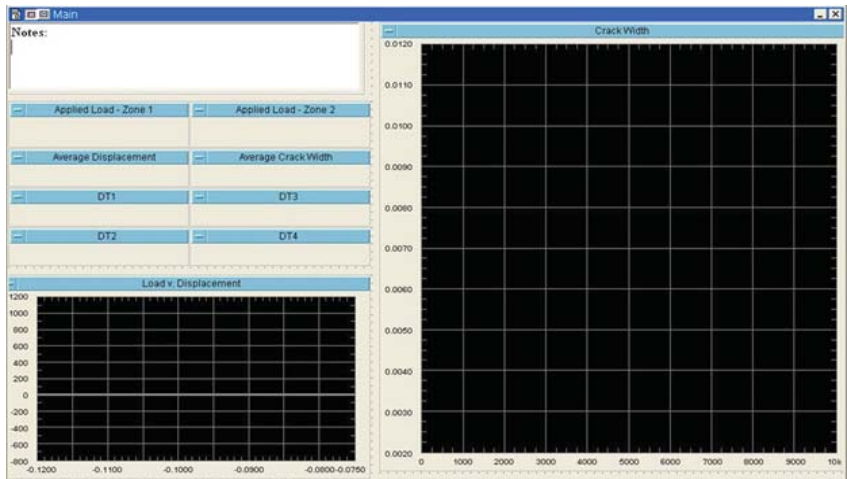


Figure 2. Test program graphical user interface

Summary

There are many solutions offered today for both dynamic and static measurements. However, the U2300A Series USB modular multifunction DAQ devices is not new in the construction industry, and is able to accommodate to a growing demand for more features and transducers in this industry. The U2331A is a portable, easy-to-setup, and cost effective solution. The key advantages that separate the U2331A from other solutions are listed below:

1. The U2331A is able to provide multi-channel, high speed transfer rate with the Hi-Speed USB 2.0 standard offered. It can measure up to 3 MSa/s for a single channel used, or up to 1 MSa/s collectively if more channels are used.
2. The U2331A can be used as a standalone unit, or used as a modular unit with the U2781A USB modular product chassis. You will be able to expand your application system — in terms of channel count and functionality — by slotting in various U2331A units into the U2781A chassis.
3. The Agilent VEE/VEE Pro software offers easy graphical access to the programming tasks, and allows you to see the programming flow in a more commonly acceptable format.



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