EMC Data Acquisition and Control System

by
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The Challenge: Creating a generic EMC data collection and analysis system for various electromagnetic compatibility tests in the Visteon Corp. laboratory.

The Solution: Developing an easy-to-use, generic test system in LabVIEW that utilizes multiple GPIB devices, an NI-DAQ board, and Active X commands for the customer's laboratory.

Introduction

V I Engineering, a Select Integrator in the NI Alliance Program, was contracted by Visteon Corp. to create an application that was easy for test engineers to set up a test, and generic enough for use in many applications throughout their laboratory. Visteon Corp. also wanted this application to save them money and optimize engineers' time.

The application is divided into three separate program sections: patch panel configuration, test executive, and report generator. The application controls three function generators, a power supply, a character generator, a VCR, and a chart recorder using GPIB and RS-232 communications, in addition to collecting data from an NI data acquisition card. This data is then analyzed to determine the pass/fail status of a given test. The information is saved in a specified report format using NI reports that the user can print. The LabVIEW program is a stand-alone routine, and other test executive applications can interface with it using Active X commands.

Patch Panel Configuration

We used the patch panel configuration for test setup, which requires no communication with external hardware or software programs. With this approach, the test engineer can create the set up at his desk and e-mail it to a technician for execution. The main screen of the patch panel configuration features a representation of the EMC lab patch panel. With the actual EMC lab patch panel, the operator can make connections between the test instruments and the DAQ data channels using BNC cables. The operator can tell the software which instrument channels are connected to which data channels with the patch panel configuration (Figure 1).
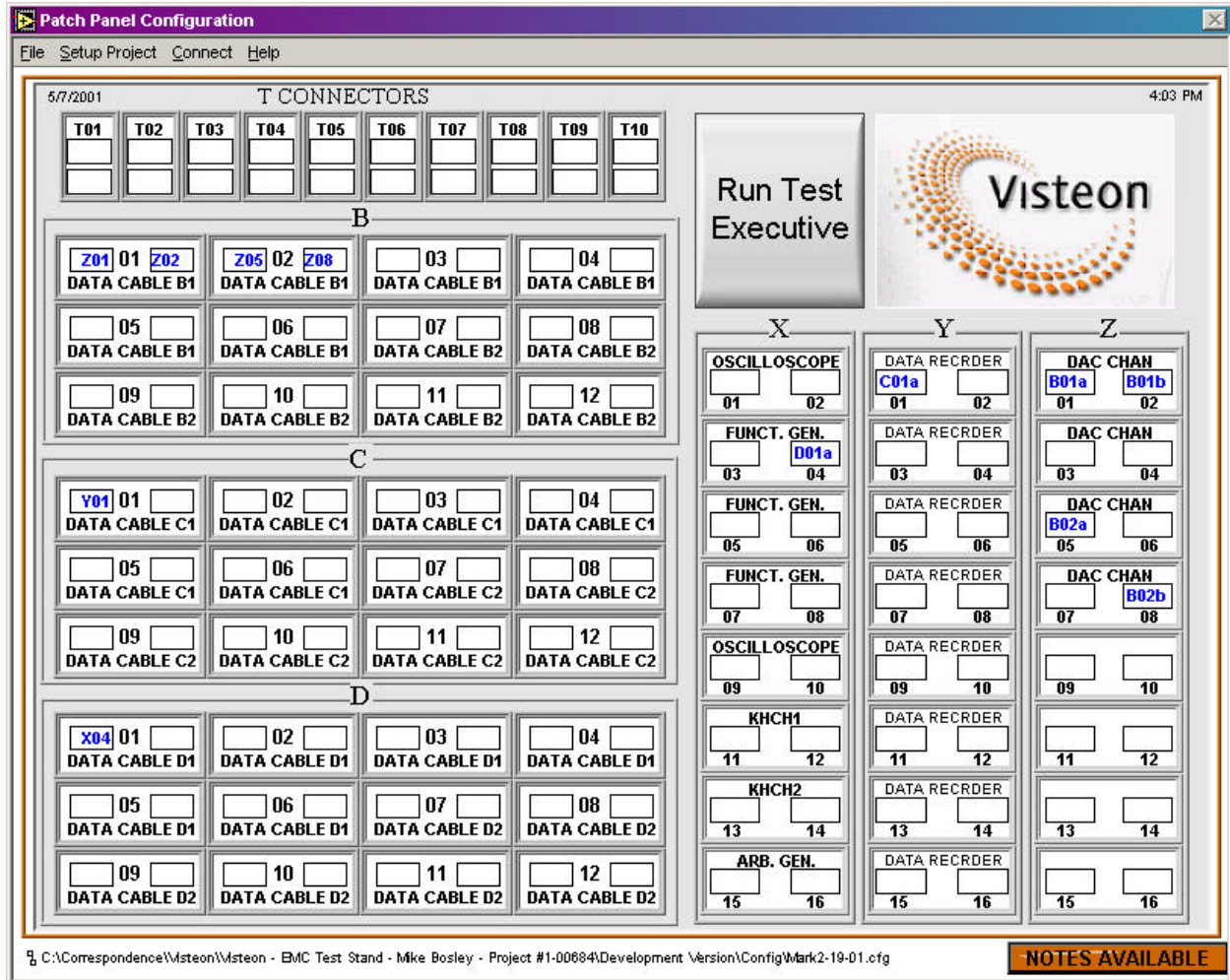
Figure 1. Patch Panel Configuration Screen

To make a connection, the user selects a data channel from the connect pull-down list. Once selected, a channel set-up screen pops up (Figure 2). When the user selects an instrument, a list of that instrument's available channels displays. The user continues to make or break connections and configure channels until the connections on the patch panel configuration screen match those on the physical EMC lab patch panel.
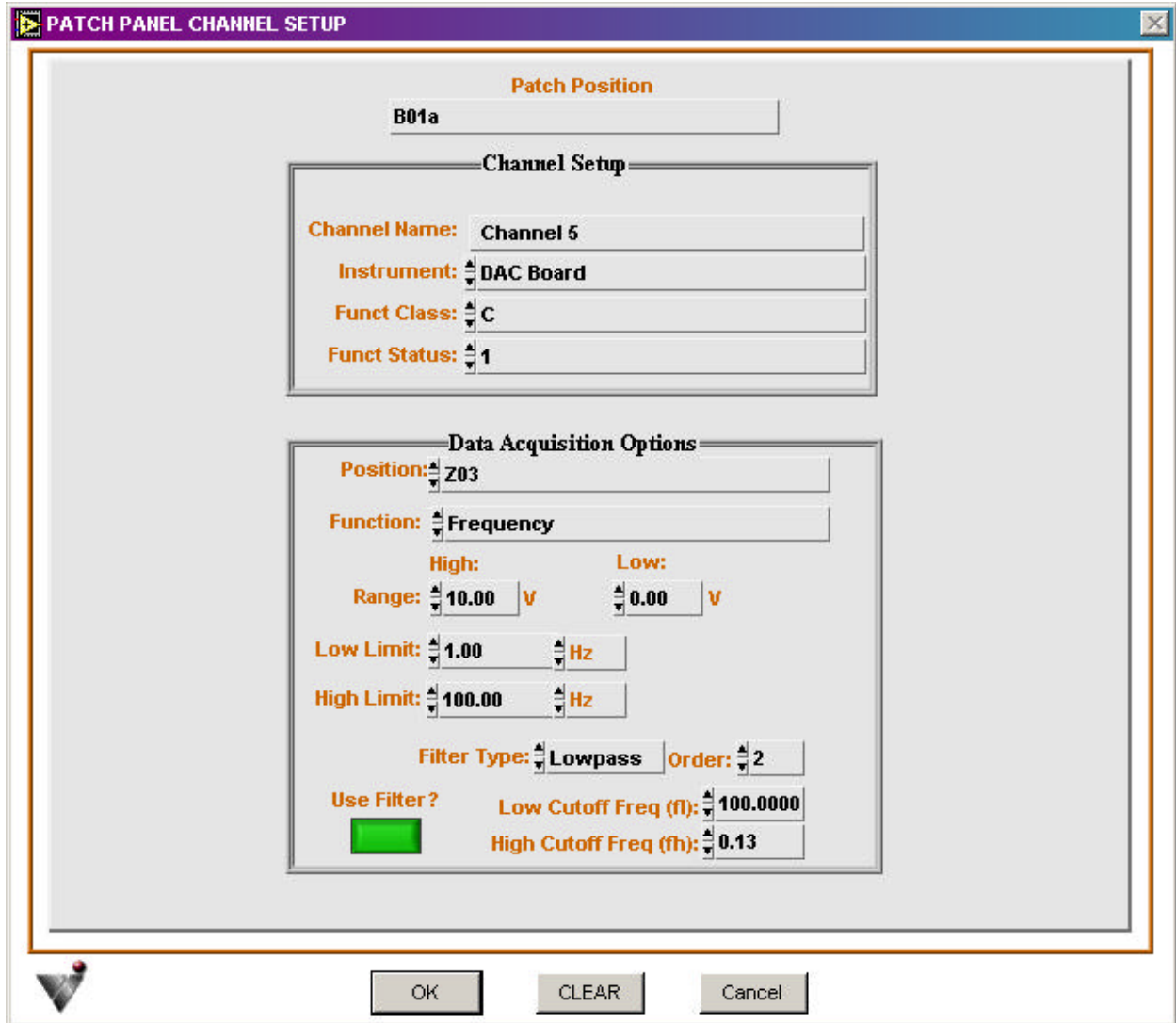
Figure 2. Patch Panel Channel Setup Screen

In addition to the EMC lab patch panel, several other controls are available for setting up a test. The user has the option to operate the power supply and with a button or toggle they can enable or disable the Panasonic VCR Video recorder. In addtion, the user can set up the sampling rate for the chart recorder and data acquisition card.

When the user has finished setting up a test with the patch panel configuration, they can generate and save a configuration file.

Test Executive
The test executive initializes test equipment, communicates with the Visual Basic program for scheduling information, and analyzes acquired data based on information contained in the configuration file (Figure 3).
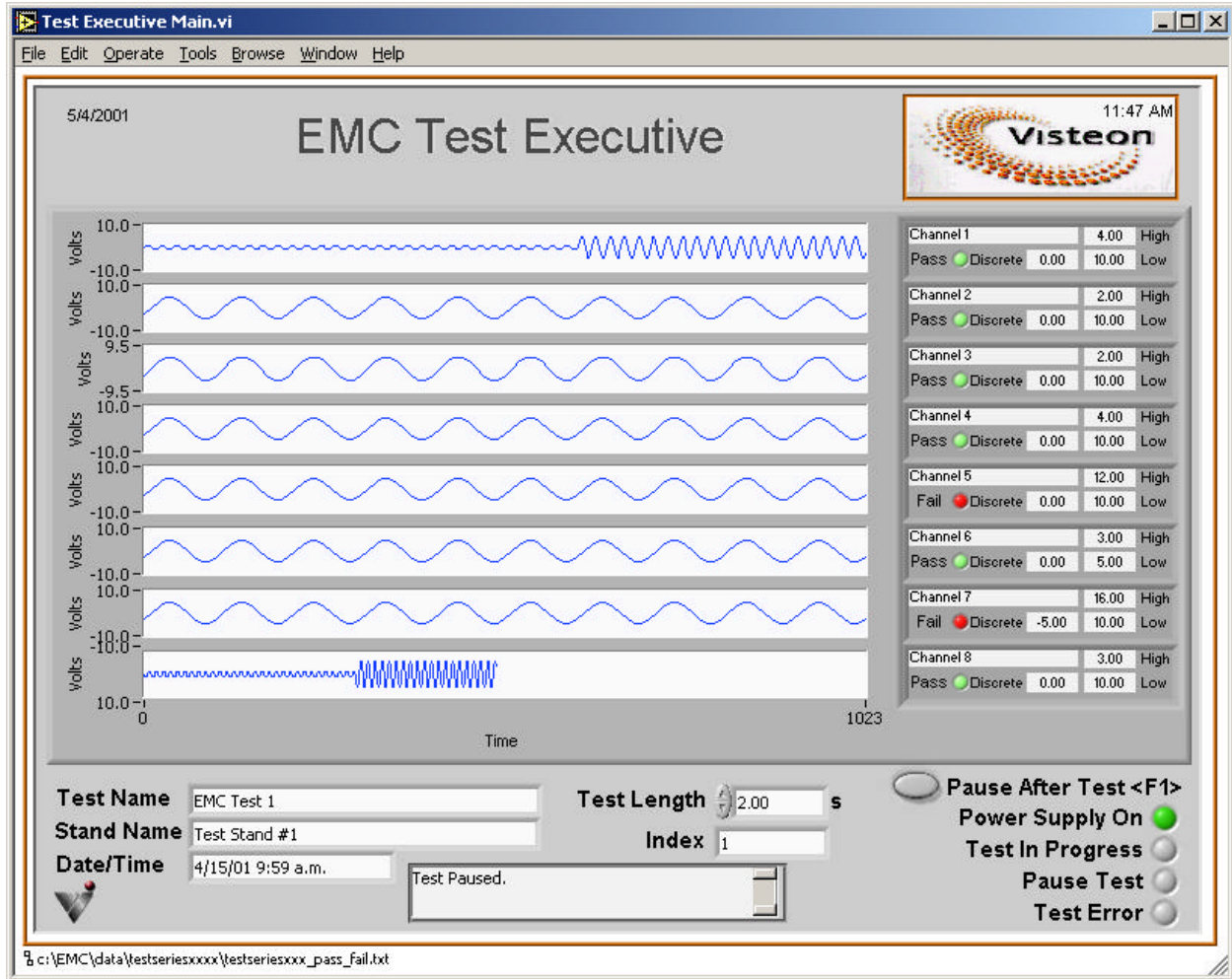
Figure 3. Test Execution Screen

An overview of the sequence of functional steps for the test executive is as follows:

1) When the patch panel configuration program is finished and a test begins, the test executive refers to the configuration file to initialize the test instruments.
2) Wait for the Visual Basic program to start the test via Active X commands that interface with the LabVIEW front panel and press the start test button. The Visual Basic program controls how many tests are run in a test series, among its other tasks.
3) Trigger the generator functions and acquire measurement data.
4) Analyze measurement data and compare to pass/fail criteria in configuration file. The operator will have the ability to press a hotkey to create a test failure and add comments. Analysis consists of checking if the signal from a DAQ input channel remains within the range specified by the high and low limit values for that channel. How the Test Executive uses this high and low limit information depends on the analysis function selected for that channel.
5) Update the character generator, which inserts a label to the recorded section of videotape.
6) Enter any required data and comments to be saved along with the recorded data.
7) Send a message to the Visual Basic test program indicating test pass or fail results.
8) Save measurement data arrays in a binary test measurement file.
9) Save pass/fail test results in an ASCII test data file.

Report Generator

The report generator prints preformatted reports from the ASCII files generated in the test execution screen. The user can choose which report to view on the report generator main screen. The selected report displays its data in a graphical format. The user can customize each report before printing a hardcopy. You can add an option in the future to automatically generate reports to a *.pdf file.

Summary

In summary, the EMC Test Software accomplished the goals it set out to achieve, including:

- Test Engineers can use the stand-alone patch panel configuration routine to generate configuration files from their desk and e-mail them to technicians for implementation. Test configurations set up from this screen are flexible and intuitive to create.
- The ability to assign any number of channels available on the given hardware, with unique channel names, ranges, limits, filter types, analysis criteria and other functions, coupled with the ability of Visual Basic to use Active X to manipulate the test execution panel's buttons and strings, makes this application suitable for many laboratory tests.
- Visteon was able to replace the $25,000 Chart Recorder devices with a $1,795 PCI-MIO-16E-1 data acquisition card, plus saved money on strip chart recorder paper (~$40 per 100 sheets).
- The time it takes to run a test and create reports for executed tests is drastically reduced from the old DOS program. A future enhancement of automatically generating reports and PDF files will further reduce the time it takes to execute tests. This will give the user the ability to start a test and come back a day later to a stack of reports that are ready to use.