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Application Note: Using the SQM-242 Card

Introduction

The SQM-242 card is a powerful QCM-based deposition controller on a PCI card. This paper discusses concepts and implementation alternatives for using the SQM-242.

The SQM-242 card provides the basic deposition control functions of reading crystal frequency, and adjusting a power supply output, to achieve a desired deposition rate. To accomplish this, the SQM-242 needs only a few setup parameters such as Sensor and Output assignments, Density and Z Factor, and desired Rate. These parameters are passed to the SQM-242 card via a Windows DLL, provided with the card.

Other common deposition controller functions such as data display, process recipe storage, and digital I/O are provided by an application program written in a high level programming language such as C, Visual Basic, LabView, Wonderware, etc. Sigma provides several sample programs that can be used as-is, or enhanced to meet your specific needs.

In addition, Sigma offers the full-featured SQS-242 codeposition program. The SQM-242 card, SQS-242 software, and an inexpensive PLC turn any Windows 2000/XP computer into a very powerful codeposition controller.

Software Options

End-users may find the sample programs adequate for monitor applications. They also work nicely in research applications, where manual control is more important than automated, multi-layer process control capabilities. If only a few additional functions are needed, or you have existing LabView programs, you might choose to enhance one of the sample programs. The SQS-242 software is probably the most cost and time effective solution for more elaborate applications.

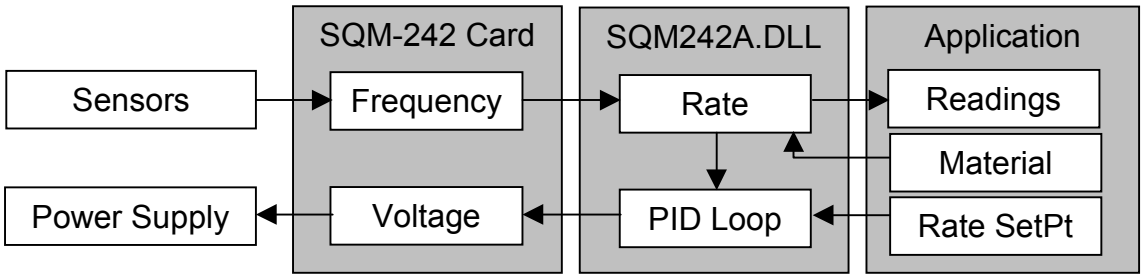
OEM's generally take one of two paths. OEM's that already have an HMI program for building recipes, and a PLC controlling their vacuum system, may want to talk directly to the SQM-242 card. With this option, your program sends the basic material and setpoint data to the SQM-242 card via the SQM242A.DLL. The SQM-242 card controls deposition rate and supplies readings to your program. Your program is responsible for the user interface and digital I/O.

OEM's that are using the operator interface and digital I/O functions of a stand alone deposition controller may find the SQS-242 program is the best solution. You can control the SQS-242 program with ASCII commands similar to those used for RS-232 communications with stand-alone controllers. Commands can be sent to the SQS-242 program via RS-232, Ethernet, or Windows ActiveX.

Using the SQM242A.DLL

When the SQM-242 card is installed, Windows loads the SQM242A.DLL into the Windows system directory. A Windows program uses the DLL function calls to communicate directly to the SQM-242 card.

The DLL provides only the functions required to configure the SQM-242 card to control deposition rate, and to return rate, thickness and frequency readings. The block diagram below illustrates how the DLL interfaces an application to the SQM-242 card:

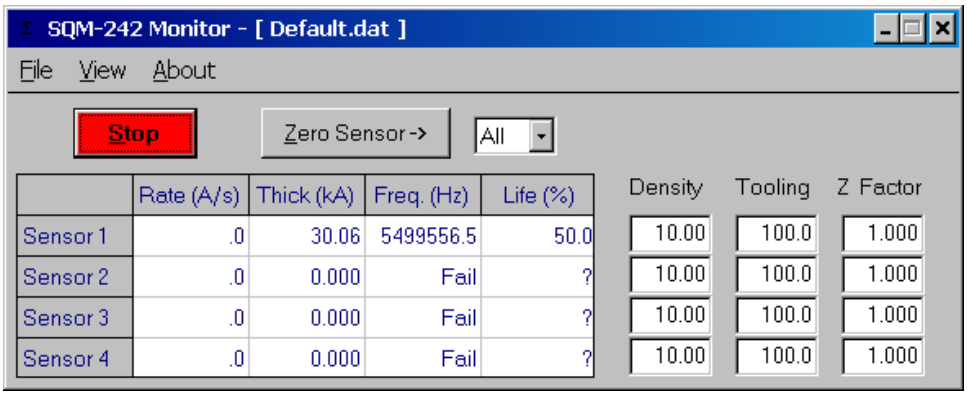


Detailed DLL function descriptions are provided in the SQM-242 User Manual. The sample programs discussed next illustrate how to add more functionality to the DLL commands.

SQM-242 Sample Programs

In addition to setting up the SQM-242 card to control deposition, an application program needs to provide auxiliary functions such as data display, process recipe storage, and digital I/O. The Sigma Program CD and www.sig-inst.com contain several fully functional sample programs written in C, Visual Basic, and LabView. The source code is included, and you are free to modify the programs as desired.

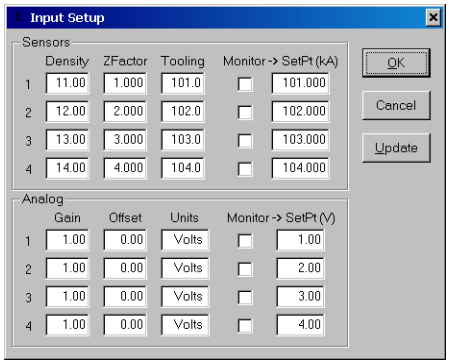
The **SQM-242 Monitor** program is a simple Visual Basic program that functions as a Quartz Crystal Monitor. As seen in the screen shot below, the program provides user entry fields for Sensor material setup, and displays Rate, Thickness, Frequency, and Crystal Life.



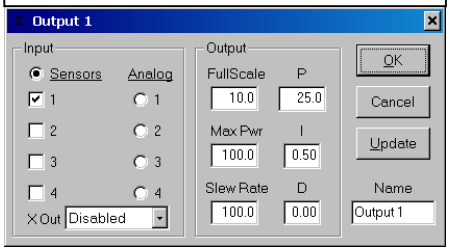
The Start/Stop button controls operation, and the Zero Sensor button nulls the accumulated thickness reading. A few additional capabilities, such as logging readings and storing the current program setup parameters to disk are also included. The monitor program is very useful for understanding the DLL function calls required to transfer data to and from the SQM-242 card.

The **SQM-242 CoDep** program expands the SQM-242 Monitor program to control deposition of up to six materials simultaneously. It illustrates the concepts of mapping sensors to a controlled output, establishing rate and thickness setpoints, adjusting the PID control loop, and using the SAM-242 Analog card.

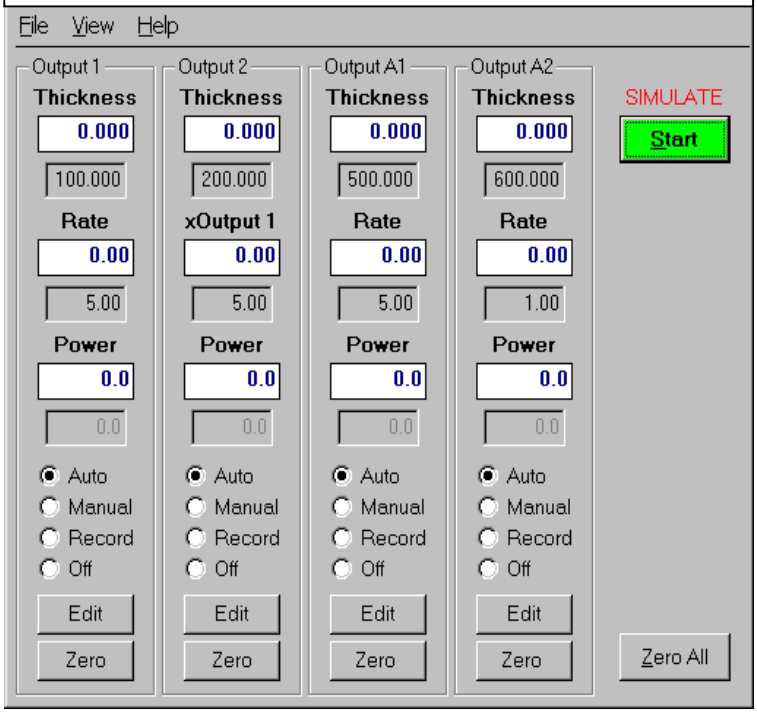
Setup Input Paramaters



Setup Output Paramaters



Control Rate & Thickness of each Material



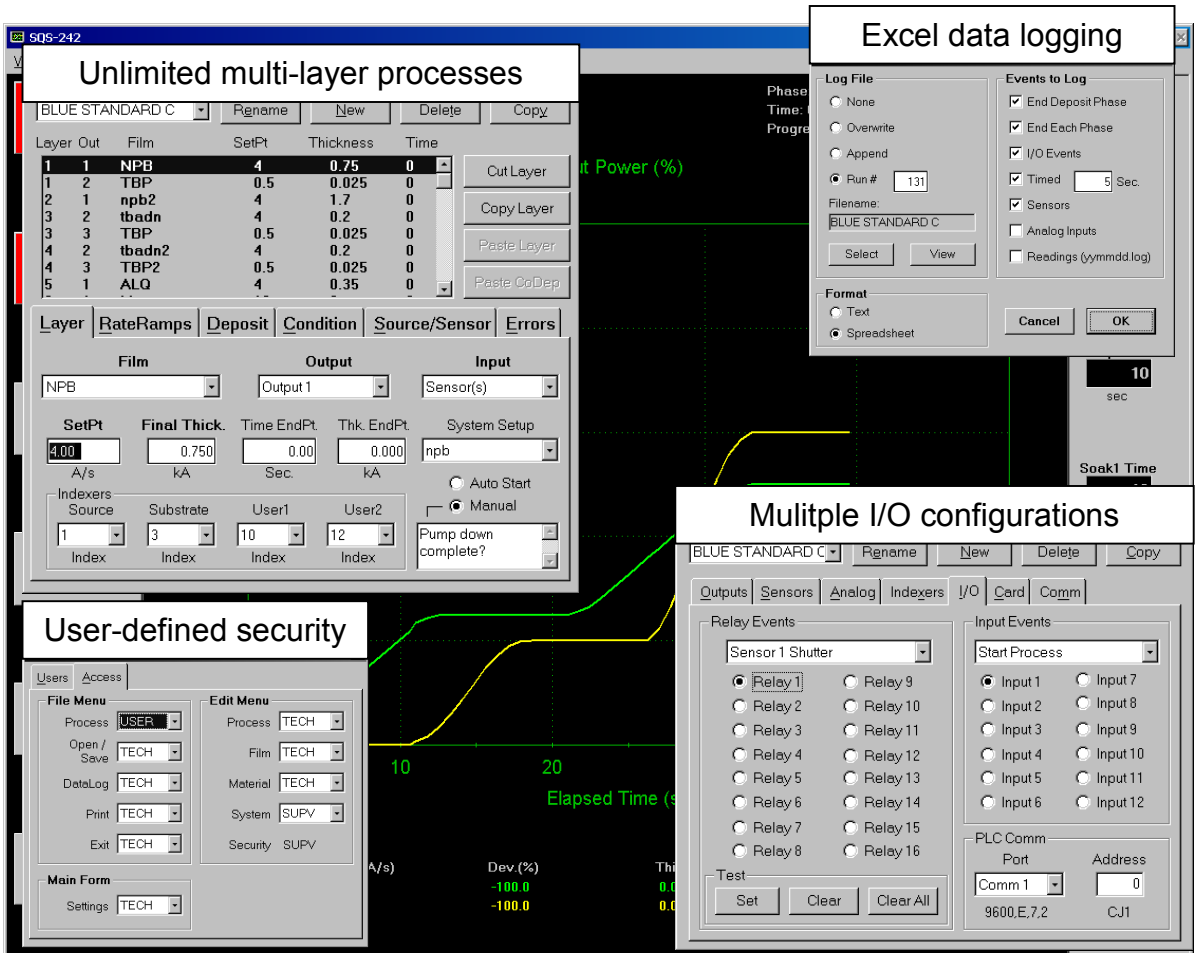
The SQM-242 CoDep program is also written in Visual Basic. A similar LabView program is also supplied.

Another sample program, **SQM-242 Multi**, controls up to six SQM-242 cards simultaneously, that's 24 sensors and 12 outputs! In addition to the sample programs, Sigma provides technical support for those wishing to develop their own SQM-242 card application.

The sample programs are functional, and they illustrate the basic concepts required to develop an application. However, they do not include many of the auxiliary functions expected from a stand alone deposition controller. Examples are graphing, multi-layer recipes, pre/post conditioning, and digital I/O.

SQS-242 Codepositon Control Program

Sigma's optional SQS-242 program provides all of the capabilities expected in a turnkey deposition controller. The features are too extensive to cover here, but this screen shot gives an overview of some of the capabilities. A fully functional version with User manual, limited to 30 runs, is included on the Program CD and our web site.



The SQS-242 software can be used alone, or integrated into existing OEM systems. An extensive ASCII command set (see User Manual) allows your application to turn over control to the SQS-242, or instruct it to sit in the background until needed.

Process recipes developed in the SQS-242 program are stored in a Microsoft Access compatible database, or data can be transferred from your application at run time. Digital I/O can be handled by our inexpensive PLC option, or by your application.

What Next?

Please contact Sigma Instruments, or one of our local representatives. We'll listen!