Section 12. DDS Evaluation Techniques

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PC-based Evaluation Boards for DDS Devices

Given the proliferation of Personal Computers throughout most cultures and economies of the world, it makes good sense to choose the PC as a programming vehicle to aid in the designer's evaluation of DDS products. Software written in Visual Basic© or C++ programming languages allow designers to fully operate the DDS via a menu-driven "control panel", in a Windows© environment, as displayed on their PC monitor.

Mathematical computations of the frequency tuning words and control words necessary to achieve fixed or dynamic operation of the DDS are performed in the control software thus allowing the evaluator immediate bench access to performance results. Finally, a quality printed circuit board that is simple to comprehend and alter, yet provides uncompromised and consistent performance is essential to obtain reliable results.
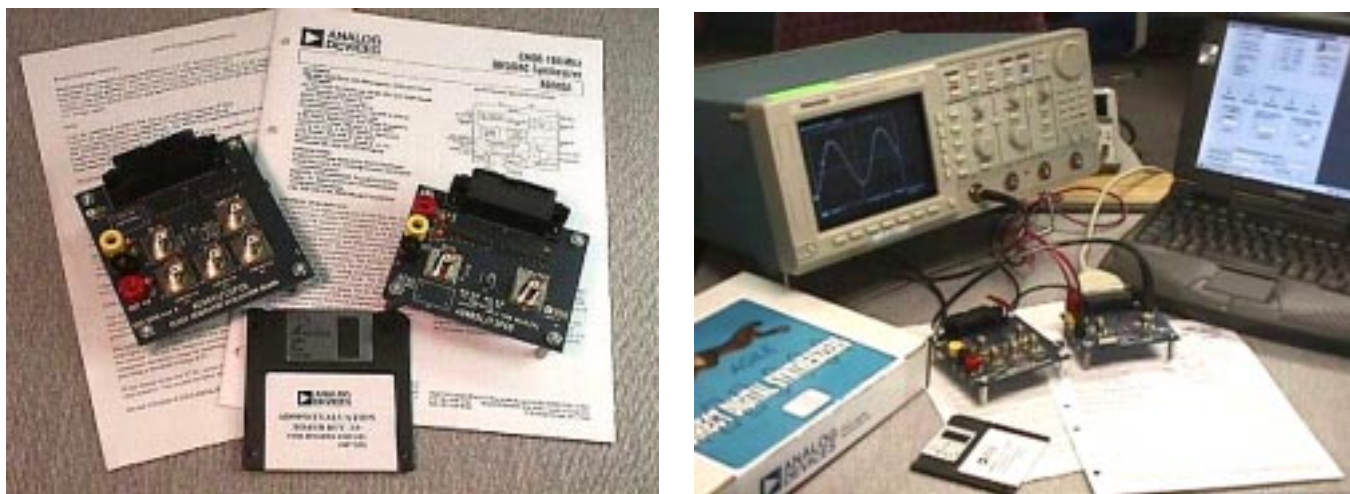

Figure 12-1. Typical Evaluation Kits for DDS Products

Pictured above are two Analog Devices DDS evaluation kits. Included in each kit are device data sheets, operating software, an evaluation board instruction manual, and the assembled evaluation board with DUT included. Although the DDS IC can be operated at very high speeds on the evaluation board, the instructions or programming to the IC are coming from a relatively slow PC printer port. To perform sophisticated high-speed frequency or phase changes such as frequency hopping, spread-spectrum, frequency or phase modulation requires additional user-provided hardware (FPGA, micro-controller or other) and software routines .

Basic Considerations for Bench Evaluation

To get the best performance from an evaluation board, care must be taken when connecting test and measurement devices so that performance is not adversely affected. Oscillators driving the DDS should be equal to or better than the quality you expect to see at the output of the DDS. See Section 5 of this tutorial material for examples showing the effects of good and poor clocking sources on the DDS output quality. Spectrum analyzers should be calibrated and properly configured so that the analyzer input mixer is not overdriven by the DDS signal, which causes erroneous spectral representations. If an output filter is provided on the evaluation board, make certain that no unusual loads (improperly terminated transmission lines, highly-capacitive probes, long leaded test probes, etc.) are placed at the input or output of the filter which would cause an impedance mismatch between the DDS output and the filter.

For those who do not wish to purchase an evaluation board, the data sheets for Analog Devices DDS products contain the PCB layout (usually not-to-scale) and schematic diagrams of the evaluation board. Furthermore, the PCB Gerber files can be provided on disk or via email upon request.   For many applications, simply observing the PCB layout and number of layers of the evaluation board is sufficient for designers to be able to duplicate (or improve upon) the electrical performance using in-house PCB resources more closely aligned with the designers end product.