Preface

There are many textbooks devoted to digital signal processing (DSP), but very few that relate DSP to the special concerns of automated testing. Those aimed at graduate study focus on theory, derivations, and proofs, while applications-oriented texts tend to deal with problems of communications engineering or laboratory research.

Knowing DSP theory is not the same as knowing what to do when asked to test a million automobile radios, or flash converters, or compact disc D/A converters, or CODECs, or video amplifiers, or switched-capacitor filters. DSP theory alone does not tell you how to measure nanovolts per root hertz in a production environment, or 0.01 degrees of phase shift, or -110 dB ninth harmonic distortion.

Neither does a knowledge of electronic engineering, by itself. Nor does traditional experience with automatic test equipment (ATE). It is the union of ATE and DSP that has proved most fruitful in the last few years, providing effective solutions to increasingly difficult test problems: those demanding laboratory accuracy at production speed.

The papers in this tutorial specifically address such problems and solutions. In writing and assembling this material, it was my intent to provide a bridge between DSP theory and the physical world of electrical components and circuits. Since there are a number of excellent texts that develop the underlying principles, I have tried to emphasize instead the mathematical concepts rather than the derivations—to show the forest instead of the trees, so to speak. As much as anything, my goal was to establish a philosophy of DSP-based testing: How to think, how to approach a problem, how to create a solution, and how to determine if it really works properly. My hope is that even the reader not directly involved with testing will find food for thought in the concepts.

There are three sections to the text. The first section, divided into 12 chapters, is drawn largely from material originally prepared as class notes and seminar handouts, but which have been updated and expanded to stand alone, without the instructor's presence. The second part (Chapter 13) consists of reprints of five papers presented at past IEEE International Test Conferences, and which supplement the techniques covered in Chapters 1 through 12. The last section begins with a short list of current references, and concludes with a large and historically significant bibliography reprinted from a highly recommended IEEE Press reference [8], *Digital Signal Processing* by Rabiner and Gold.

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