

DSP-93 Control

Macintosh Development Environment for the TAPR/AMSAT DSP-93

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November 16, 1994

This article describes the DSP-93Control application, a Macintosh® interface for the TAPR/AMSAT DSP-93 digital signal processing unit. The purpose of the interface is to provide the following features for Macintosh users:

- Download of already-assembled software to the DSP-93, either in Macintosh or DOS file formats
- Fast, efficient Edit/Assemble/Download cycle for development of TMS320C25 assembly programs
- Various utility programs, such as oscilloscope, function generator, and spectrum analyzer
- Integrated communications terminal that utilizes the Apple Communications Toolbox.

The program runs on a Macintosh computer running Mac™OS 7.0 or later. It is written in MPW C++ , and uses the MacApp object framework, version 3.0.1. The framework is an object-oriented interface to the MacOS, and provides a clean, robust implementation.

This article should be read in conjunction with the previous article *D93WE - a Windows Development Environment for the TAPR/AMSAT DSP-93* by T.C. McDermott, N5EG. Both that program and the application described in this article were written to provide similar functionality to users of the DSP-93 in different computer environments. Thus I will describe only unique elements of this application or elements which were implemented differently.

The Integrated Terminal Emulator

When this application is launched for the first time, the user is asked to configure the serial port used by the terminal emulator. Because the Apple Communications Toolbox is utilized, any serial port on the Macintosh may be used, even additional serial ports provided by add-in serial interface

cards. Baud rates up to 57.6 kbs may be specified although the default rate of 19.2 kbs will probably be used for the DSP-93. The baud rate may be changed “on the fly” by choosing **DSP-93 Serial Configuration...** from the **Settings** menu. A maximum of about 32000 characters are retained in the scrollable terminal window. Text may be selected and copied to the clipboard, but the characters in the terminal window may not be altered.

A menu item in the Settings menu is provided to let the user choose whether to echo characters typed into the terminal. This option should not be chosen for the DSP-93 as that unit echos the characters.

The Integrated Text Editor

An existing text file may be opened by choosing **Open...** from the **File** menu. New text files may be created by choosing **New** from the **File** menu. The editor is a full-featured text editor following the Macintosh user interface guidelines. Styles, copy, paste, undo, and search and replace are supported. A maximum of about 32000 characters is supported in each file. An arbitrary number of text editing windows may be opened simultaneously. Printing to the chosen output device is supported.

Assembling Programs

An integrated assembler for the TMS320C2x is provided by choosing the **Assemble** item in the **Actions** menu.. The assembler does not handle the #include macro (actually it does if you precede the # with a space - it works but gives an error message). The assembler does not handle all expression operators and other niceties that the DOS based TASM 3.0 does. It is sufficient to assemble many simple programs including all the test programs provided with the DSP-93.

The output of the assembler is written to the same folder that contains the assembly source file. The object file name is the same as the assembly source file name with .OBJ appended. The listing file name is the same as the assembly source file name with .LST appended. Both files are Macintosh format files (the line end character is an ASCII 13 (CR)). The user is informed about any errors which may have occurred in the assembly. The listing file may be opened in the integrated text editor.

Running Programs on the DSP-93

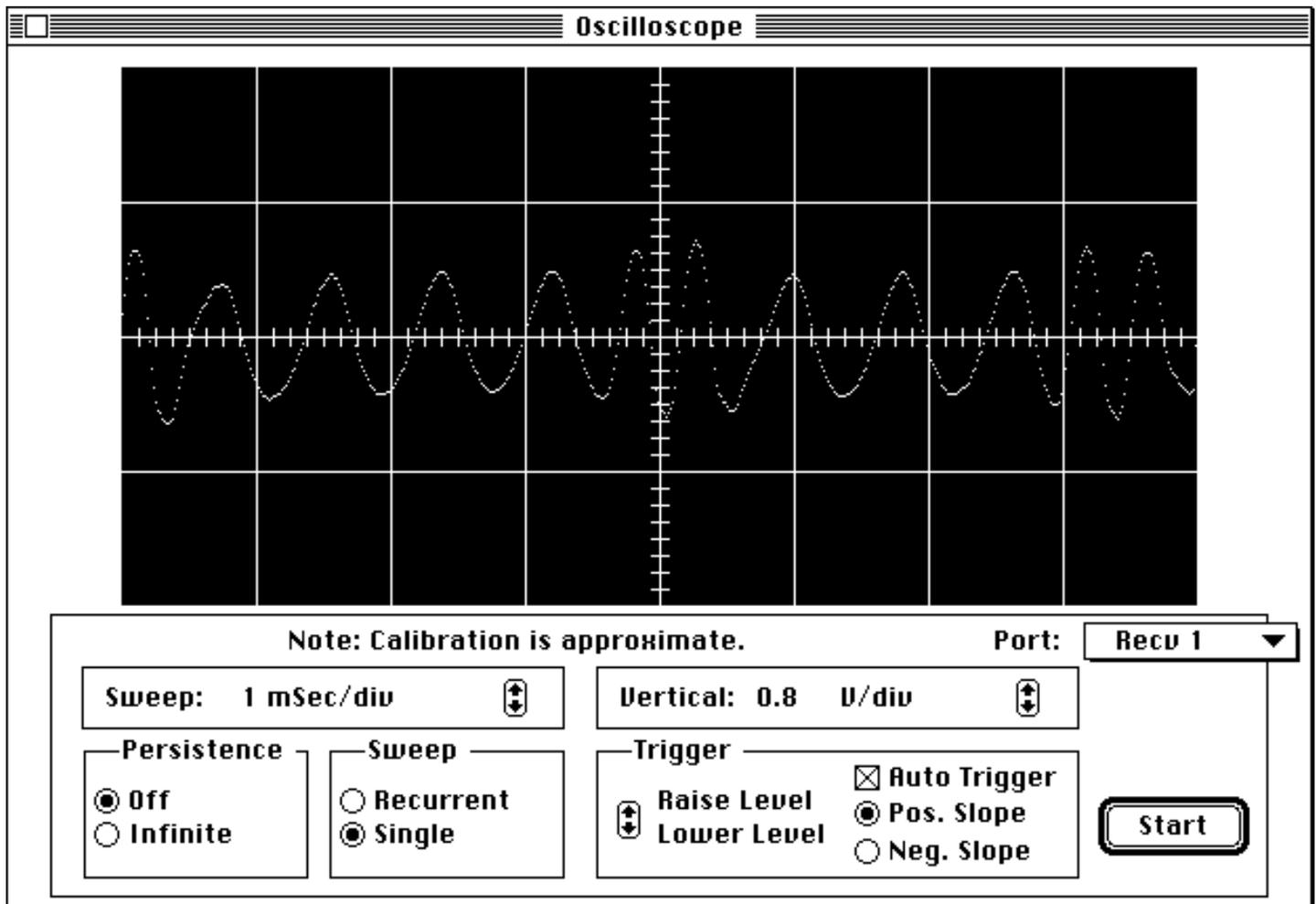
The application can down-load programs to the DSP-93 using object code in either DOS format files (the line end character is an ASCII 13 (CR) followed by an ASCII 10 (LF)) or .Macintosh format files (the line end character is an ASCII 13 (CR)). Two menu items are provided for this in the **Actions** menu.

The program downloaded to the DSP-93 is automatically executed on completion of the loading sequence.

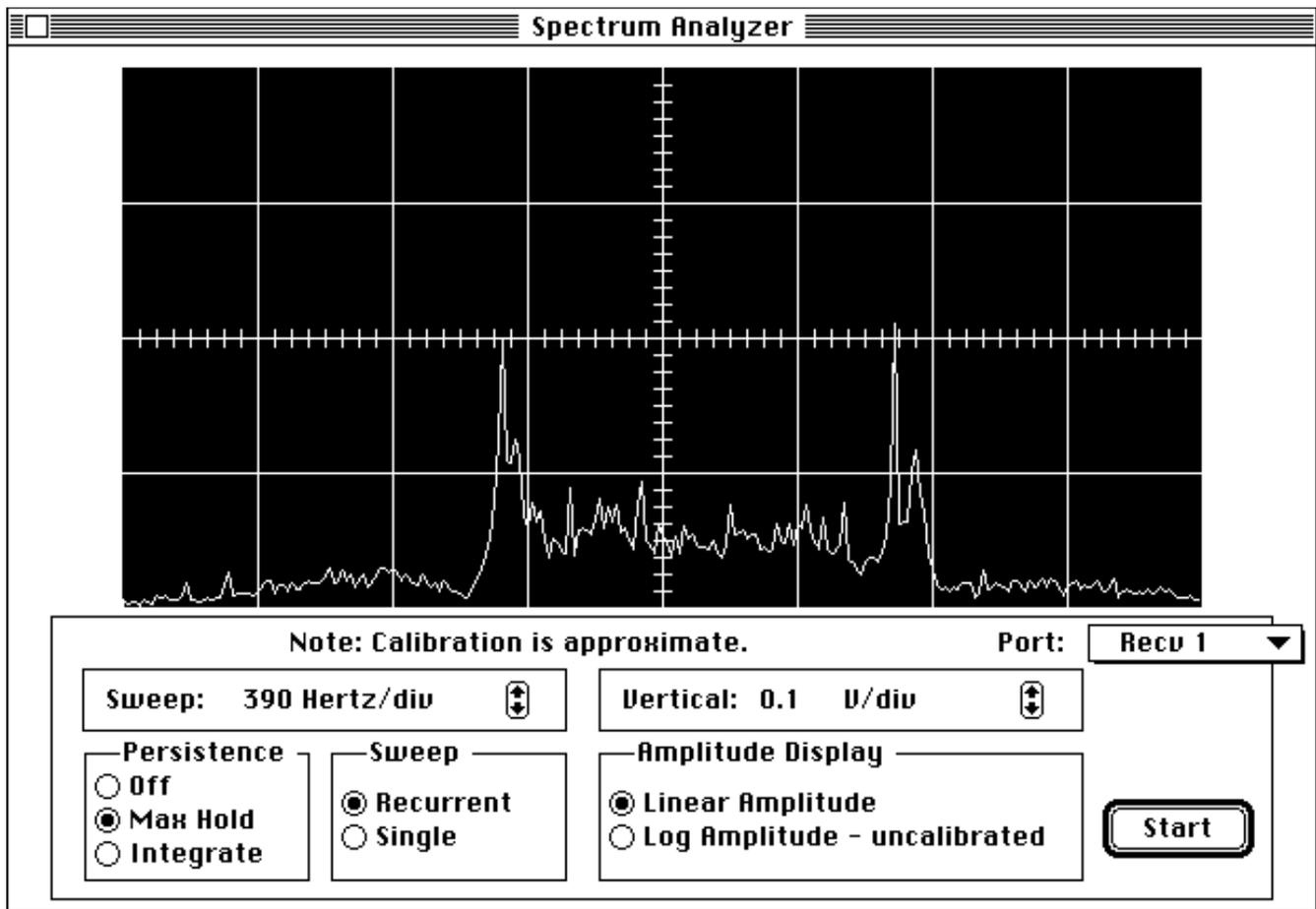
The DSP-93 Instruments

The same three instruments, Sampling Oscilloscope, Spectrum Analyzer, and Function Generator, that are described in the D93WE article are supported by this application. The interface and window appearance are virtually identical. See the D93WE article for a full discussion of the instruments.

The instruments are loaded and executed by choosing an instrument in the **Instruments** menu. This application assumes that the Macintosh version of the object files supplied with D93WE are to be loaded. If the appropriate object file is not found in the folder that contains the DSP-93Control application, the user is asked to locate the appropriate object file.



Oscilloscope: The display shows a 1200 bps packet audio signal. Note the two different periods of the waveform corresponding to different binary digits.



Spectrum Analyzer: The display shows a 1200 bps packet audio signal. Note the two peaks corresponding to the low and high tones of the AFSK signal.

The Future

I would like to provide an assembler with more complete functionality. If you know of C source code for such a beast, please let me know.

Acknowledgments

I would like to thank Tom McDermott, N5EG, for writing the DSP-93 instruments and documenting their interface so clearly. I would also like to thank Bob Stricklin, N5BRG, for his loader code for the DSP-93.

Although this application and D93WE were developed independently, there is an amazing similarity in the source code of the two programs. This is most likely due to both of us using an object-oriented application framework. If anyone has the inclination to develop software for today's GUIs, I *strongly* urge you to learn and use an object framework. Although the learning curve may appear steep, the results, once you are able to see over the peak, are worth it.