
HP 35635T VXI Programmers Toolkit

Product Overview

Software Development Environment

Are you developing:

- Custom, high performance VXI Systems?
- High channel count FFT based measurement systems?
- Signal capture and analysis software?
- Systems needing multiple DSP processors?

If so, VXI Programmers Toolkit and HP's VXI hardware combine to help solve your measurement problem. The HP 35635T VXI Programmers Toolkit makes all the power, performance and versatility of the HP E1485 digital signal processing module readily available to the programmer. Toolkit provides the tools and libraries needed to write downloadable code which executes within the HP E1485 module. These tools include:

- Signal processing operating system (SPOS)
- Signal processing interface library (SPIL)
- Shared RAM FIFO library
- DSP algorithm library
- Software development tools
- Debugging tools
- Hands-on training

Programs for measurement control and signal processing are developed on a HP series 300/400/700 host workstation using standard ANSI C software tools. Using the DSP library provides easy access to the Motorola 96002 processors in the HP E1485. The resulting code is then compiled with the GNU C cross-compiler (gcc is supplied with this Toolkit software package under the GNU General Public License). The host program needs the ANSI C compiler for its code generation.

Once compiled, the program binaries are then downloaded to the HP E1485 for execution. Programs can be stored on the HP E1485 in on-board flash ROM for standalone applications that execute upon power up. A set of host utilities is included in Toolkit to facilitate downloading the code.

Signal Processor Operating System (SPOS)

SPOS is the operating system for the HP E1485 signal processor. At power-on, SPOS is usually booted from the system ROM, but applications that require a specific revision of SPOS may wish to download SPOS at runtime. When running, SPOS provides the runtime environment

Software Development Environment and Training for the HP E1485 DSP Module

for the HP E1485. The runtime aspect of SPOS contains three major elements, the signal processor interface library (SPIL), the digital signal processing (DSP) library (DSPLIB96), and the ASCII command interpreter.

SPOS allows multiple processes for message communication and interpretation, a downloaded user process and a debug process. Only one user application process may run at a time in the HP E1485.

Signal Processor Interface Library (SPIL)

The Signal Processor Library (SPIL) facilitates the development of downloadable code with C function calls that hide the hardware complexity from the user. These functions handle the VXI I/O for controlling other VXI devices, host communication messages, DSP control and status, Local Bus and VME data transfers, internal data transfers, timer operations, software signaling, math functions and program debugging. There are over 150 function commands in the library, as well as, over 70 SICL (Standard Instrument Control Library) commands.

Shared RAM FIFO Library

This library provides the functionality for using the shared RAM in the HP E1485 as a FIFO memory with overlapping reads and writes to improve data transfer rates from the HP E1485 to the host computer. This library used SICL (Standard Instrument Control Library) for mapping FIFO memory into the user's process.

DSP Library (DSPLIB96)

A library of digital signal processing algorithms for the Motorola 96002 processors is standard with Programmers Toolkit (see following list).

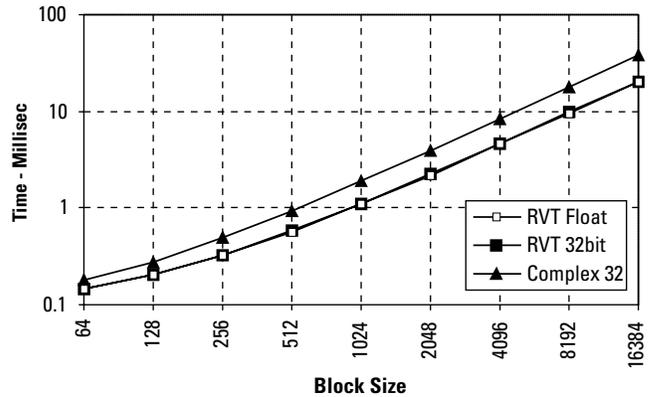
There are also tools provided with HP 35635T to allow user written algorithms to be added to the DSP Library. Support for creating the additional user written programs comes from Motorola's standard 96002 assembly development software.

DSP Library Functions for Motorola 96002

Add	FIT Wait
Average	Flip
Bit Reverse	Histogram
Block Cnstant	Loop
Conjugate	Mag Squared
Cnvt to Float	Multiply
Copy Block	Offset
Cross Power	Phase
End	Random
End Loop	Scale
FFT	Subtract
FIT I/O	User Window
FIT in Overlap	Window

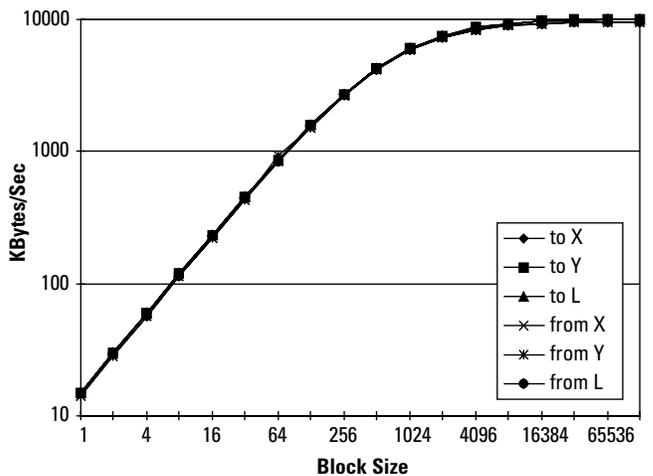
**Figure 1
FFT Calculation Times**

The computational times associated with the FFT for a real 32 bit floating point transform, a real 32 bit integer transform and a complex 32 bit floating point transform include the time required to perform windowing.



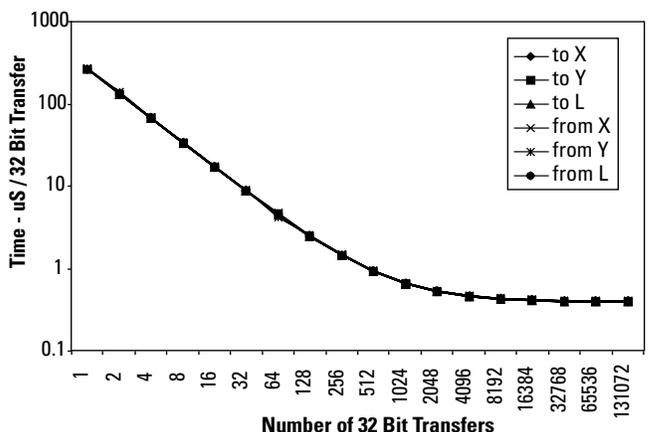
**Figure 2
Data Transfer Rates**

The data transfer rate between the Motorola 68030 RAM to the 96002 signal processor RAM is dependent upon the block size because of the associated overhead to setup a block transfer. The read and write times between the X, Y and L memories are approximately equal.



**Figure 3
Transfer Times for 32 bit Transfers**

The time associated with transferring data between the Motorola 68030 and 96002 processor RAM are in microseconds per 32 bit transfer as a function of the block size. Again, the transfer times are approximately equal for the X, Y and L memories.



Software Development Tools

The HP 35635T Toolkit includes software tools to aid program development.

- Debugging Tools: Read/Write to hardware registers and RAM locations from the host. Dynamically monitor VXI traffic, specify hardware registers and RAM locations using an RS232 terminal connected to the HP E1485.
- Simple X11 window graphing functions to aid data visualizations.
- HP-UX command line interface to communicate with the hardware.
- Tools to download compiled programs into the signal processor modules.
- Tools to convert programs generated with Motorola software to programs for downloading to the DSP processors.
- Data type conversion tools.
- Documentation: system reference manual.

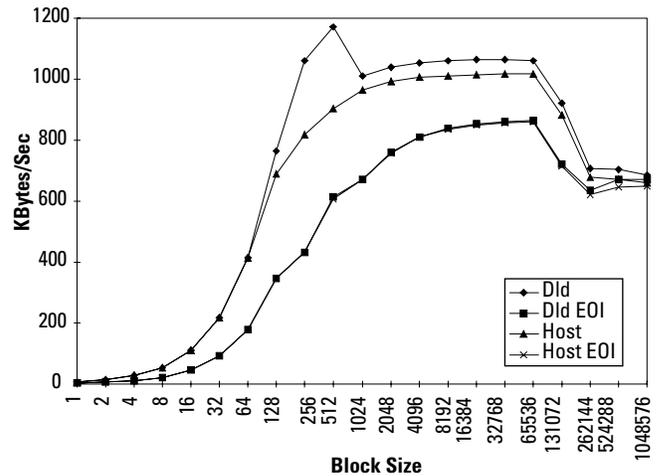
Prerequisites

To be effective using this software development environment, you should be experienced in: C programming (especially pointers and structures), the HP-UX operating system, digital signal processing and VXI fundamentals.

HP offers training classes in C programming, HP-UX, and VXI fundamentals. Contact your HP representative for details.

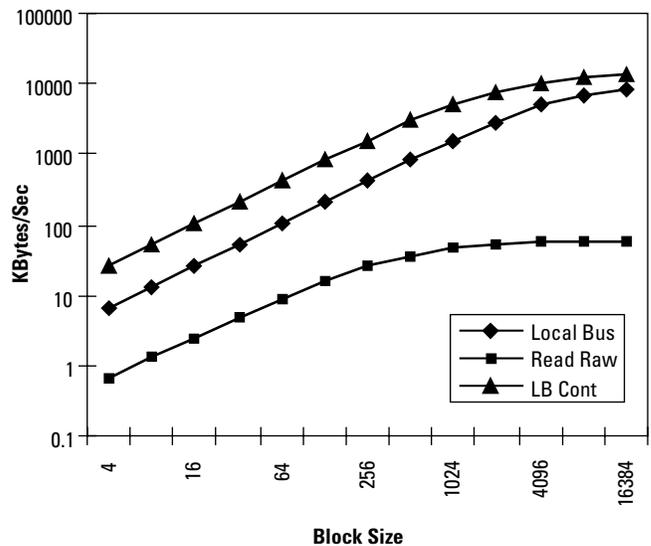
**Figure 4
Shared RAM FIFO
Transfer Rates**

The transfer rates between the host and shared RAM FIFO were determined using a series 700 workstation with a MXI interface.



**Figure 5
Data Transfer
Rates over
Local Bus**

The data transfer rates from the HP 1430A to the HP E1485A using local bus and raw reads show the performance improvements of local bus transfers.



Software Upgrades

New revisions to this software will be offered for sale as changes to the Toolkit product are made.

Ordering Information

- 35635T** HP E1485 Software Programming Tools and Training
- Opt.300** Delete Programmer's HP E1485 Software
- Opt.U20** Upgrade HP E1485 Software Programming Tools to Release 2.0

For More Information

HP E1485 Technical Specifications p/n 5965-9821E

Warranty Information

The HP 35635T comes with a 3 month warranty.

For more information about Hewlett-Packard test & measurement products, applications, services, and for a current sales office listing, visit our web site, <http://www.hp.com/go/tmdir>. You can also contact one of the following centers and ask for a test and measurement sales representative.

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Printed 11/97

5966-2277E