

(Also for 3250)
**3240 FORTRAN
 ENHANCEMENT
 PACKAGE**

PRODUCT DESCRIPTION

The 3240 FORTRAN Enhancement Package (FEP) is a fully integrated firmware and software package which significantly improves FORTRAN VII program and compiler execution speeds. The FEP improves performance by providing selected FORTRAN Run-Time Library (RTL) routines and compiler routines implemented for high-speed Writable Control Store (WCS). The FEP is transparent to a customer's system. FORTRAN programs are compiled normally and no special source statements are needed to take advantage of the package.

The FEP provides state-of-the-art algorithms of extremely high accuracy to benefit all users. It significantly enhances the processing performance of the powerful Perkin-Elmer 3240 computer by automatically enabling user programs to run faster than the assembly language equivalent.

FEATURES

- Speed — The FORTRAN routines in the FEP run at about twice the speed of any comparable Common Assembly Language (CAL) implementation.
- Accuracy — The FEP provides highly accurate 32-bit and 64-bit results.
- Transparency — FEP simply plugs into a Perkin-Elmer 3240 system with WCS without any source program modifications.
- Versatility — The microcoded functions can be called from FORTRAN VII and CAL programs.

OPERATIONAL CHARACTERISTICS

The FEP provides FORTRAN users with two important avenues of performance improvement: first, a set of RTL routines whose speed and accuracy benefit users in almost every FORTRAN application; and second, compiler support routines to increase the efficiency of the optimizing compiler.

The FEP contains all the software necessary to yield immediate performance improvements. The package includes the microcoded firmware and a special WCS loader that also provides power fail recovery. Sixteen FORTRAN RTL and two compiler routines are implemented for the 2K Writable Control Store. The degree to which user program performance improves depends on the extent to which user programs call the WCS RTL.

The average timing improvement for each run-time library routine is shown in the table. Note that the WCS routines run in less than half the time of the assembly language implementations. This means, for example, that a user program spending 30% of its computing time in the RTL can run 15% faster with FEP.

The compiler routines are used by the FORTRAN VII optimizing compiler to expedite the compilation speed. The processor realizes a 30% speed improvement while globally optimizing FORTRAN programs.

COMPARATIVE FORTRAN RTL TIMES
(in microseconds)

RTL Routines	WCS RTL Times (with entry and exit) in WCS*	Assembly Level Routine Times Without WCS
Single Precision		
SQRT	28	74
EXP	48	94
SIN	40	123
COS	39	121
ALOG	43	89
ALOG10	43	90
ATAN	31	69
.RXXR	220	290
Double Precision		
DSQRT	53	109
DEXP	82	148
DSIN	97	204
DCOS	98	209
DLOG	84	127
DLOG10	84	129
DATAN	78	134
.DXXD	213	391

*The total WCS routine time includes entry and exit linkage. The system used for these measurements was a Perkin-Elmer Model 3240 processor.

ACCURACY

In addition to the speed benefits, the FEP Run Time Library routines offer extreme accuracy. Whereas many algorithms sacrifice speed for accuracy or vice versa, the FEP routines optimize both.

Exhaustive testing has shown that the FEP run-time routines produce the best results possible for a 32-bit architecture. An intensive study of the algorithms used to evaluate mathematical functions yielded sophisticated techniques that produce the greatest possible accuracy from the machine representation of real numbers.

The results underwent stringent critical analysis and evaluation. The FEP results were compared to very accurate data prepared by our mathematicians. The Points to be tested were chosen carefully, not at random. All accuracy measurements were made at the algorithmic weak-points, where any inaccuracies would be magnified. At least 500 samples were used for each test.

The two major criteria under evaluation by these tests were:

1. that most errors must be one bit or less
2. that the worst case errors must not exceed three bits.

The FEP meets and exceeds these criteria for virtually all RTL routines.

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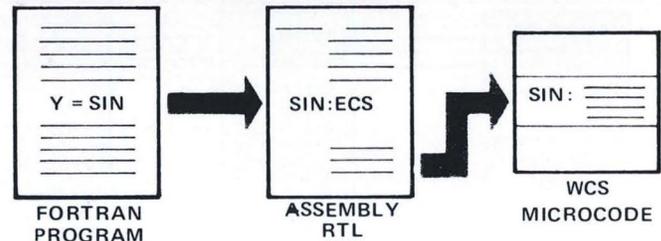
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COMPATIBILITY AND TRANSPARENCY

Any Perkin-Elmer 3240 system can be enhanced by the FEP. The FORTRAN assembly language routines are replaced by the FEP library, but no source FORTRAN need be altered. The new system automatically uses the WCS routines.

When the user's program calls an RTL routine which is implemented in the WCS, the assembly RTL issues the linkage into WCS (to the entry point for the appropriate routine). For example, a program that calls the SIN routine still enters the assembly RTL entry point called SIN. The FEP assembly RTL immediately enters the WCS microcoded SIN implementation:



CAL programs can also call the WCS RTL routines. Detailed documentation describes the entry and exit linkage to the CAL modules.

SYSTEM REQUIREMENTS

- Perkin-Elmer Model 3240 Processor with WCS, Power Fail/Auto Restart and DFU option
- OS/32 (R05 or higher) and associated system requirements
- FORTRAN VII (R03 or higher)

PERKIN-ELMER PRODUCT NUMBERS

- S90-028-31 3240 FORTRAN Enhancement Package with Functional Programs on 800 CPI magnetic tape
- S90-028-71 3240 FORTRAN Enhancement Package with Functional Programs on 1600 CPI magnetic tape
- S90-028-61 3240 FORTRAN Enhancement Package with Functional Programs on 10MB disc

RELATED DOCUMENTATION

- 29-578, 29-579 FORTRAN VII 32-bit Run Time Library
- 29-686 3240 Micro-Programming Reference Manual
- 29-478 Common Micro Code (MICROCAL) Assembler

Manufacturing facilities, and Sales/Service offices throughout the world.

The information contained herein is intended to be a general description and is subject to change with product enhancement.