

QUICK START GUIDE

Forward Discrete Fourier Transform HP15c CE software pac

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Introduction:

This software pac implements an N-point forward Discrete Fourier Transform for any real-valued matrix in row-vector form when stored in `Matrix A` (e.g., `R 1 15`).

See https://en.wikipedia.org/wiki/Discrete_Fourier_transform for technical details of math involved.

Who is this for?

This is for anyone who is ever in dire need of calculating the Forward DFT of a *real-valued* sequence with no computer or advanced calculator in sight. This software pac can run with the calculator in default mode or 15.2 mode (see *Size and Timing Considerations* section for details).

Excel file includes listing, comments, stack states, sanity check example, and timing table.

Note: Program is short enough that inputting by hand is not objectionable plus the added benefit of not having to blow away existing programs. The `.mem` file is provided for those who would rather not type it in.

To calculate N-point Forward DFT:

Prerequisites:

Stack: N/A

Registers: None

Matrices: `Matrix A` of size [1 N] containing a real-valued sequence

where $N = \{1 \dots 20\}$ for default mode (max N is assuming no other data in memory)
 $N = \{1 \dots 52\}$ for 15.2 mode (max N is assuming no other data in memory)

Usage:

Press **GSB B** (state of stack does not matter)

Output:

`Matrix B` of size [N 2]

where column 1 contains the real part of the result
column 2 contains the imaginary part of the result

Registers used: R0, R1, R.0, R.1, R.2, R.4, R.5

BONUS: To only calculate the kth-point of the N-point Forward DFT:

Prerequisites:

Stack: k in the x-register

where $k = \{0 \dots N-1\}$

Registers: None

Matrices: Matrix A of size [1 N] containing a real-valued sequence

where $N = \{1 \dots 20\}$ for default mode (max N is assuming no other data in memory)

$N = \{1 \dots 52\}$ for 15.2 mode (max N is assuming no other data in memory)

Usage:

Press **GSB A** (with k in x-register)

Output:

Value of Forward DFT at bin k is stored in R. 4 (real part) and R. 5 (imaginary part)

Registers used: R0, R1, R. 0, R. 1, R. 2, R. 4, R. 5

Size and Timing Considerations:

Program size: 74 instructions, 83 bytes

Max DFT size: 20 points in default mode, 52 points in 15.2 mode
(assuming no other data or programs in memory.)

Execution Time vs Number of Points

