

# The WB0DGF / W8IO Antenna Site

## Mininec 3

(updated 11 Jan 2014)

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## Mininec History

The original MININEC was written by John Rockway with a little prodding and support from Jim Logan. It is often stated that MININEC is just a little version of its big brother, NEC-2. There are actually significant differences between these two codes. Both codes use the Method of Moments to solve for currents on electrically thin wires. However, each code starts with a different version of the integral formulation for the currents and fields for wires. Then, each follows significantly different algorithms for implementation of the Method of Moments.

In 1980, when the first version of MININEC was written, PCs had not been on the market for very long. PCs were typically limited to 16K memory with a 8 bit word length. There was no FORTRAN. MININEC had to be written in BASIC. The first version of MININEC was written in 500 lines BASIC and required 32k of memory. Nonetheless, this version proved surprisingly accurate for dipoles and monopoles. The first public release of MININEC occurred in 1982. The code was 550 lines of BASIC and would run on an APPLE II computer with 64 kilobytes of memory. It could compute the current distribution, impedance, and far field pattern of an arbitrarily oriented set of wires in free space or over a perfectly conducting ground plane. In interpreter BASIC (there were no BASIC compilers then) the problem size was limited to 10 wires and 50 currents (or 70 segments with junctions).

In 1984, partly to meet the demand for MININEC as well as share other computer algorithms, the authors teamed up with two colleagues, Peter Li and Dan Tam. They published a book that contained an improved version of MININEC along with some other useful algorithms. MININEC2, as it became known, was not significantly different from its predecessor, but the limitation for wires intersecting the ground plane was removed.

In the mid-80's, computers were getting faster, had more memory, and utilized math coprocessors. BASIC compilers also became available. These factors opened up new vistas for MININEC. In 1986, the authors released MININEC3. This code featured a new user interface which automatically determined wire connections from the user inputs for wire end coordinates. It could also read and interpret a limited NEC input data set. However, there was no way to save and edit geometry data. MININEC3 included near fields, a Fresnel reflection coefficient correction to the patterns for real ground, and an expanded lumped parameter loading option. MININEC had grown to just over 1600 lines of BASIC. With a math coprocessor and a BASIC compiler, MININEC3 could solve antenna problems up to 50 wires and 50 current unknowns. The NOSC public domain version of MININEC 3.13 was distributed via ACES (Applied Computational Electromagnetics Society) as part of the NEEDS 2.0 package. It was interactive but had no built-in structure viewer nor output plotting.

The next MININEC effort by the authors produced the MININEC SYSTEM in 1988. The release of the MININEC SYSTEM happened to coincide with the introduction of Microsoft Windows that took the PC world by storm. However, the authors were too close to publication to backtrack and implement a Windows system. This was the first version of MININEC that required a compiler, a BASIC compiler for DOS. Up to 50 wires and 90 current samples or 190 segments were permitted without recompiling.

In 1991 and 1992, Roy Lewallen, W7EL, and Brian Beezley, K6STI, introduced advanced versions of MININEC (ELNEC, MN and AO) which included better user interfaces and graphics displays.

In 1995, the authors published the first of a series of MININEC for Windows codes. The first code was MININEC Professional for Windows. An improved solution of the potential-integral formulation for the currents resulted in a more accurate formulation in the solution for the currents on wires. In addition, FORTRAN was used for the computationally intensive portions of MININEC. This led to an increase in speed over previous versions of MININEC. Because it was a Windows application, text and graphical outputs were easily transferred to other Windows applications such as spreadsheets and word processors. Mouse support and printer drivers were also supplied by the Windows environment. Entries were made in tables through individualized window screens. On line, context sensitive help was provided along with diagnostic preprocessing diagnostics. MININEC Professional was dimensioned for 1000 wires and 2000 unknowns.

In 1996, the authors published MININEC Broadcast Professional for Windows which was similar to its predecessor, but more powerful. Additional features included an improved voltage source model, a plane wave source model, automated convergence testing, design analysis post processing, array synthesis, and ground wave calculations. MININEC Broadcast Professional was dimensioned for 2000 wires and 4000 unknowns. Also in 1996, the authors published MININEC for Windows, a simplified version of MININEC Professional which is more suitable to first time users and their pocketbooks. This code is dimensioned for 400 wires and 800 unknowns.

In 1999, the authors published another improved set of codes, the *Expert* MININEC Series. The new series featured "Expert" assistance in selecting appropriate input dialog boxes while constructing a model. Context sensitive help was still an important feature. Accuracy and speed were also improved.

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## Advantages of Mininec

You might ask - why care about MININEC when we have NEC-2 and NEC-4 available. MININEC does have certain advantages when compared to either NEC2 or NEC-4. Some of them include [close-spaced wires](#), [close-spaced wires of different diameters](#), [tapered-diameter elements](#), [different diameter wires joined at an angle](#), and [placing sources at a wire junction](#).

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## Mininec Preservation Project

Recently, I was asked about MININEC. I have been using NEC81, NEC-2, NEC-3 and NEC-4 codes since the early to mid 1980s. I dabbled with MININEC back in the late 80's and early 90's, but since I had the superior NEC codes available, I rarely used MININEC. I looked around the Internet to see what versions of MININEC were still available and was surprised to see that most of the companies that had produced versions of MININEC had disappeared. Most had apparently gone out of business. Even the free versions were difficult to find. The two exceptions seem to be [MMANA-GAL](#) and [NEC4WIN](#). Even these versions are completely different in operation from the original MININEC. You can still find the 1986 version of MININEC-3 in the unofficial [NEC Archives](#), maintained by Ray Anderson, WB6TPU. However, this version was written in an older version of BASIC, one that is not completely compatible with today's compilers for 32 and 64 bit operating systems such as Windows 7 and 8. What I hope to do is modify the 1986 Basic source code slightly so that it will compile with [FreeBasic](#) and make the source code and executable available to people from this web site. Still, MININEC will have most if not all of the old limitations of the 1986 code. Perhaps, if anyone else is interested, they can use different compilers to make MININEC slightly more user-friendly. I will gladly post links to their site, or make their version available here.

## MNN3

Using the source code from the NEC Archive web site, I have modified it slightly so that it will compile in FreeBasic using the QuickBasic compatibility option (-lang qb -s gui). The main changes are:

- Rename the array variables which have the same name as standard variables
- Add support for lower-case Yes/No responses to questions
- Replace the QuickBasic reserved word IS by variable name ISX
- Set the program window to 800x600 pixels (FreeBasic Screen 19 command)

I am still working on the MNPRES and MNPOST programs which normally accompany MININEC, so the area within MININEC which automatically loads the MININEC.INP file has temporarily been remarked out.

Here is a link to the original MININEC files from the NEC Archive - [MININEC3.ZIP](#)

Here is a link to the latest version of my MNN3 executable file - [MNN3.ZIP](#) (11-30-13)

When running MNN3, please make sure that your screen resolution is at least 800 x 600. When calculating radiation patterns, you will need to limit the number of data points so they don't scroll off the top of the screen. Otherwise, just save the pattern to a text file for later viewing and plotting. Please send any comments to me at rgcox2 (at) gmail.com.

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## mNEC version 1.0

Using the Basic source code from the NEC Archive and modifying it quite extensively, I have created the program called **mNEC**. This version of MININEC will run in Windows XP, Vista, 7 and 8 in a 800x600 pixel window and has the following features:

- mNEC can load, read and analyze standard NEC-2 antenna data files
- mNEC will also allow you to create geometry interactively, wire by wire
- the interactive option implements the same features as MNN3

When loading standard NEC-2 files:

- mNEC will load the data from GW lines in standard NEC-2 files
- mNEC will sense the GS line and prompt the user for INCH to METER conversion
- mNEC will ignore the comment lines and every line after GE (geometry end)
- mNEC will automatically add 1 segment to each wire in order to create an even number of segments (and allow a center pulse on each)
- mNEC will NOT detect or use variables for wire dimensions (such as used in 4NEC2 files)
- mNEC will NOT use TL transmission line data from NEC-2 files. Transmission lines may be built from wire geometry.
- you must manually tell mNEC the frequency, excitation pulse(s) and load data for the analysis
- you may open the geometry viewer (mVIEW) from the main menu in mNEC - this opens a new window and pauses the main program

- you may open NOTEPAD from the main menu, but the argument (input file) will not be passed along - this also pauses the main program
- temporary files will be created in the current directory during normal operation of mNEC

Known bugs in version 1.0:

- If you misspell the input NEC-2 file name or type in a file name that does not exist, the program will lock up. You can use the Task Manger to quit.

Here is a link to the latest version of mNEC executable files - [WB0DGF mNEC 1.00.ZIP](#) (1-11-14)

The mNEC.zip folder contains executables mNEC.exe and mVIEW.exe as well as sample NEC antenna files. Place all files in the same folder before running mNEC. mVIEW loads a temporary file created during normal operation of mNEC. This temporary file is deleted when mNEC quits. When calculating radiation patterns, you will need to limit the number of data points so they don't scroll off the top of the screen. Otherwise, just save the pattern to a text file for later viewing and plotting. I typically use "0,5,19" for the Zenith angles and "0,0,1" for Azimuth angles in a partial elevation data list on the screen.

If you have questions or comments on mNEC, please contact me: rgcox2 (at) gmail.com

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References:

- [MININEC - the Other Edge of the Sword - Feb 1991 QST](#)
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Comments are welcome!

contact Roger: email to WB0DGF @ ARRL.NET

or

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