LINE CONSTANT PARAMETER

Many of the parameters required to model power system transmission lines are not readily available. The line constant parameter program, LINEC.EXE, uses transmission tower configuration data and conductor data to determine the positive and zero modal parameters. The modal parameters are in turn used in the PC-EMTP to model the power system transmission lines.

The 24-line limitation includes both ground wires and conductors. Bundled conductors are permitted but the geometry is restricted to equal spacing about the center. If the bundled conductor option is selected, the user is prompted for the number of conductors in the bundle and the bundle radius.

There are two methods for specifying the conductor height; either specifying the conductor height and sag or specifying the equivalent conductor height and leaving the sag equal to zero. Negative values are valid when specifying the conductor's horizontal position. Appendix 3 is an edited sample output from this program. The output from this program may be saved on disk or the output may be directed to the line printer.

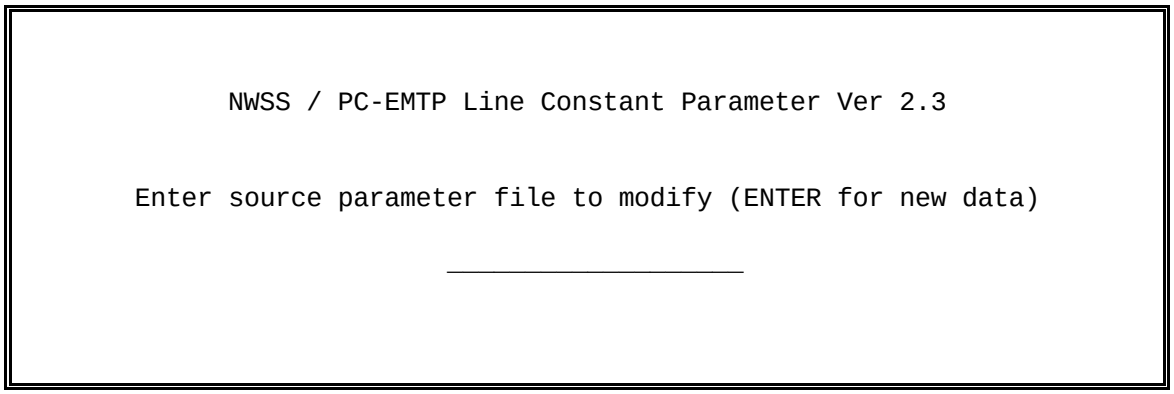

Figure 1. Line Constant Parameter start-up screen.

The line constant parameter program is run directly by launching the LineC.exe from Windows.. The first screen, shown in Figure 1, prompts the user for a source data file. The source parameter file may be any output file previously generated by this version of LINEC.EXE. To create a new line output record, just press the **[ENTER]** key.

The next screen requests general system specifications as shown in Figure 2. Default values reflect common usage. The field labeled "NUMBER of CIRCUITS" identifies a multiple multi-phase system as may be encountered

in a power corridor. The maximum number of phases per circuit is six and each circuit is limited to two shield wires. The line length is a scaling factor for data to be entered in per mile units. (Maybe some day I'll be converted to the metric system.) GROUND RESISTANCE has units ohm-meters. The last field, CONDUCTOR BUNDLE is used for bundled phase conductor. Use the left and right cursor positioning keys to select the desired data field and the END key to advance to the next screen.

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     NWSS /  PC-EMTP Line Constant Parameter Ver 2.3

  NUMBER OF PHASES PER    LINE                  GROUND   CONDUCTOR
  CIRCUITS   CIRCUIT     LENGTH    FREQUENCY  RESISTANCE  BUNDLE
      1         3     1.00000E+00  6.0000E+01 1.0000E+02    1




CURSOR ARROWS - Change Fields   |  END - Enter Circuit Data
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Figure 2. General System Specifications

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                PER MILE PHASE DATA for CIRCUIT 1

        CONDUCTORS   BUNDLE     CONDUCTOR   CONDUCTOR   CONDUCTOR
  PHASE IN BUNDLE  RADIUS (IN)  RESISTANCE  DIA. (IN)   GMR  (FT)
    A       1      1.0000E+00   1.7200E-02  1.0190E+00  3.520E-02
    B       1      1.0000E+00   1.7200E-02  1.0190E+00  3.520E-02
    C       1      1.0000E+00   1.7200E-02  1.0190E+00  3.520E-02
    S0      0      1.0000E+00   0.0000E+00  0.0000E+00  0.000E+00
    S1      0      1.0000E+00   0.0000E+00  0.0000E+00  0.000E+00



             CONDUCTOR    CONDUCTOR   CONDUCTOR
  PHASE     HEIGHT (FT)   SAG  (FT)   HORZ. (FT)
    A       5.5000E+01   0.0000E+00  -1.0000E+01
    B       5.5000E+01   0.0000E+00   0.0000E+00
    C       5.5000E+01   0.0000E+00   1.0000E+01
    S0      0.0000E+00   0.0000E+00   0.0000E+00
    S1      0.0000E+00   0.0000E+00   0.0000E+00




          NWSS / PC-EMTP Line Constant Parameter Ver 2.3
  PgUP/PgDn-Change Circuit | CURSOR ARROWS - Change Fields | END
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Figure 3. Circuit data entry screen

The third screen has multiple pages depending upon the number of circuits previously specified. The data fields for alternate circuits are selected by using the "PgUp" and "PgDn" keys. The circuit is identified at the top of the screen. The field labeled "CONDUCTORS IN BUNDLE" is predefined by the data specified in the CONDUCTOR BUNDLE field in the second screen. If this field is zero, the conductor is removed from the circuit as illustrated by the two shield wires in Figure 3.

NOTE: For multi-circuit data, all circuits must have the same number of phases. This does not apply to shield wires as they are removed by matrix reduction during computations.

Note also that GMR is now to be specified in feet to conform with common published data. If data is being entered for a new system, i.e. no file was specified in the initial screen, then entering data in the top row of the field will cause the data to be replicated down through the remaining rows. This replicate function does not propagate into the shield wire rows nor does it apply to the conductor horizontal position field. (This assumes horizontal conductor tower construction.) Selecting a data field below the top row disables the replicate feature for that column. A similar feature exists for the shield wire rows. Remember, a zero in the CONDUCTORS PER BUNDLE field tells the program to ignore that conductor regardless of any other existing data for that phase. If the CONDUCTORS PER BUNDLE is greater than 1, access is then permitted into the third field, BUNDLE RADIUS.

When the conductor data has been completely specified, the END key will advance the user to the fourth screen shown in Figure 4. The user is permitted to select the destination of the output data. Entering "N" will cause the program to execute all computations but the input and output data is discarded. The "P" option directs all output data to the printer connected to the LPT1 or default line printer port. Only when the "D" option is selected, is the data saved to disk.

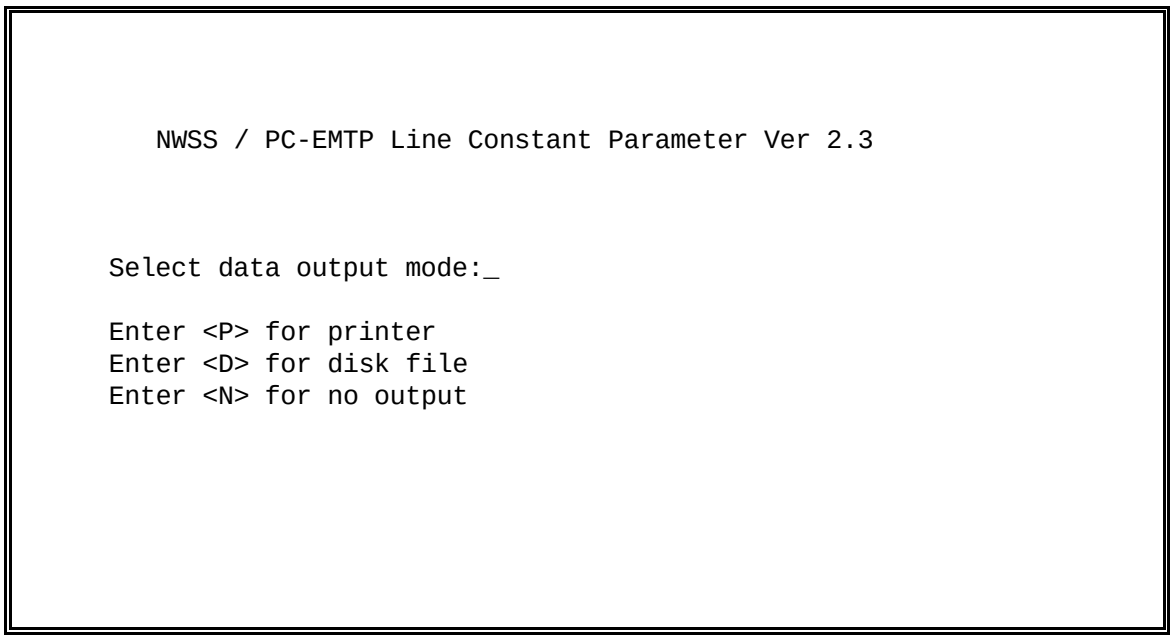

Figure 4. Line constant parameter output data mode

The output file assumes that the printer is set for 16 characters per inch (128 character width) or that a wide carriage printer is being used. Even so, the total system matrix will not be sent to the output for systems with more than 9 phases (3, 3 phase circuits). Also, it is not directed to the output for single circuit systems because the same data is available in the circuit data summary section.