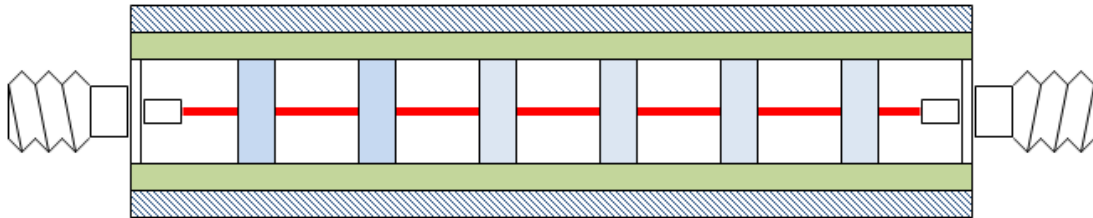# Quick Start User Manual: CLPfilter

1.0   Getting Ready:

The software product you purchased is located inside a ZIP file that you can open, by following these steps:

1. Double-click on the ZIP file you purchased. This action starts the ZIP Wizard application, which contains the software product.
2. The ZIP Wizard automatically opens the software product you purchased and stores it inside your computer.
3. Once the software product is unzipped, right-click on the application's *filename* and single-click: "Extract". This action will extract all files located inside the software product and store them inside your computer:
    a. *CLPfilter.exe*: The executable software product.
    b. *CLPfilter.DEF*: Default Data File read by *CLPfilter.exe*
    c. *Quick Start User Manual*: This User Manual.
    d. *License*: License Agreement for the software product.
4. NOTE: All files unzipped inside your computer must be located in the same file folder, since several Data Files are read by the executable software product.
5. Open the License Agreement so you know the terms & conditions for using the software product. Return the software product for a full refund if you do not agree with those terms & conditions, as stated in the License Agreement.
6. Open the Default Data File: *CLPfilter.DEF* using Notepad and read the description contained inside.

Once the above software files are extracted and stored inside your computer, just double-click on the executable file to start using the product.

2.0   How I Works:

Software product: *CLPfilter.exe* performs Electrical Synthesis, Dimensional Synthesis and Frequency Analysis of Lowpass Filters constructed in Coaxial transmission lines. That is: Coaxial Lowpass Filters.

The executable file: *CLPfilter.exe* reads the Default Data File: *CLPfilter.DEF* each time you start the program. As such, you can change Data Entries inside *CLPfilter.DEF* to suite your most common Coaxial Lowpass Filter designs, using the guidelines written in *CLPfilter.DEF*.

When you start using the software product, you are asked to enter key design parameters for your Coaxial Lowpass Filter. If you press <ENTER> on your computer's keyboard, the software

product uses the Data Entry from your Default Data File: *CLPfilter.DEF* for that design parameter. As such, you can change any/all Data Entries in *CLPfilter.DEF* to suite your most common Coaxial Lowpass Filter designs, without having to enter those values when asked by the executable file: *CLPfilter.exe*. Just press <ENTER> on your computer's keyboard and your Default Data values are used for that Data entry by the software product.

Figure 2-1 shows the baseline data entries for Default Data file: CLPfilter.DEF.

Certain design parameters have a "default answer", shown as an asterisk (*), which enables you to press <ENTER> on your keyboard, if that "default answer" (= *) is your selection.

Lastly, all Data entries (including Default Data entries) are included in the Output Data format so you know the basis for your Synthesis and for your Analysis of Coaxial Lowpass Filters.

Most data entries are straight-forward and easy to understand for those skill-at-the-art of RF/microwave design…….and those not-so-skilled. So, let us know where improvements are needed as you operate the software product.

3.0 Screen Shots: Input Data

Screen-shots for User Input Data entry are shown in Figures 3-1 and Figure 3- 2 for Electrical & Dimensional Synthesis and for Frequency Analysis of your Coaxial Lowpass Filters, respectively.

4.0 Screen Shots: Output Data

Screen-shots of Output Data calculated by the software product are shown in Figures 4-1 and Figure 4-2 for Electrical & Dimensional Synthesis and for Frequency Analysis of your Coaxial Lowpass Filters, respectively.

The Output Data from the software product can be stored in a User-defined filename:
    A. Enter a *filename*.**xls** for storage in a spreadsheet.
    B. Enter *filename*.**doc** for Output Data storage in a word processor.
    C. Enter *filename*.**txt** for Output Data storage as a text file.

The Output Data files can be used for presentations to your Customers, e-mails to your colleagues, and for graphical plots of your Output Data.

5.0 User Data Files:

For the Analysis Option, the software product reads a User's Input Data filename to analyze the Frequency response of a physical Coaxial Lowpass Filter planned for manufacture, prior to fabrication.

You can create any number of User Input Data files, each of which defines the actual physical dimensions of your Coaxial Lowpass Filters. Once created, you can enter that Input Data filename when asked by the software product, for Frequency Analysis and for comparison with actual measured data for that design.

6.0   Software Bugs

Every effort has been applied to minimize "software bugs" inside the software product. Yet, we invite all Users to notify us if you find one. Many thanks!

Inside the software product, you will find "User-friendly Error Traps", which identify errors in your Data Entry. The software product notifies you when an error is detected and asks for a different Data Entry, so the software product performs within the proper technical bounds for the technology.

7.0   Customer Satisfaction:

Many thanks for purchasing our RF/microwave CAE software product. We hope you find the product useful in your high frequency designs, both in Synthesis of your designs and in Analysis of your designs. Please let us know where our software product can be improved, and what your needs are for another software product you could use. . . . .. perhaps we can develop that software product for you.

Our best regards. . . . .

Atlanta RF

Typical cut-away view of a Coaxial Lowpass Filter
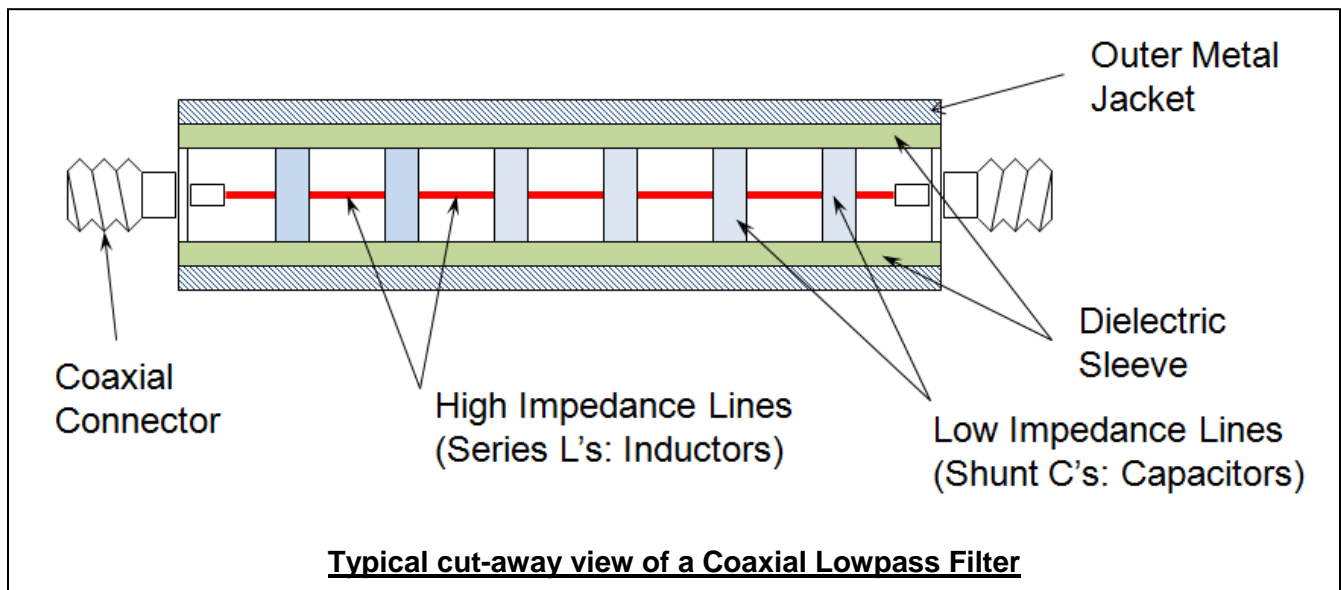
```
CLPfilter.DEF contains all Default Data values read by Program: CLPfilter.exe
    0.02        :AM    = Passband Amplitude ripple (Chebyshev response), dB
    24.0        :A1    = Attenuation at skirt frequency (F1)......................dB
  2800.0        :FC1   = Low-pass cut-off frequency...................................MHz
 10000.0        :Fmax  = Maximum Analysis Frequency..............................MHz
  1000.0        :Fmin  = Mimimum Analysis Frequency..............................MHz
  2865.0        :F1    = Out-of-band Skirt Frequency...............................MHz
   250.0        :Fstep = Analysis Frequency step size.............................MHz
     9.0        :N     = Number of sections in your filter...........................Integer
     0.0        :ZIL   = Imaginary part of  Load  Impedance.....................Ohms
     0.0        :ZIS   = Imaginary part of Source Impedance....................Ohms
    50.0        :Zo    = System characteristic Impedance.........................Ohms
    50.0        :ZRL   = Real part of  Load  Impedance............................Ohms
    50.0        :ZRS   = Real part of Source Impedance...........................Ohms
     0.1175     :Bs    = Source Impedance's Outer Conductor Diameter..Inches
     0.0        :Ds    = Source Impedance's Inner Conductor Diameter..Inches
     2.0        :ERs   = Source's Relative Dielectric Constant
    50.0        :Zos   = Source Impedance..............................................Ohms
     0.1175     :B1    = High Impedance's Outer Conductor Diameter….Inches
     0.0        :D1    = High Impedance's Inner Conductor Diameter…..Inches
     1.0        :Er1   = High Impedance's Relative Dielectric Constant
   110.0        :Zo1   = High Impedance Line Impedance........................Ohms
     0.1175     :B2    = Low Impedance's Outer Conductor Diameter.....Inches
     0.0        :D2    = Low Impedance's Inner Conductor Diameter…..Inches
     2.0        :ER2   = Low Impedance's Relative Dielectric Constant
    10.0        :Zo2   = Low Impedance Line Impedance........................Ohms
     0.1175     :BL    = Load Impedance's Outer Conductor Diameter....Inches
     0.0        :DL    = Load Impedance's Inner Conductor Diameter…Inches
     2.0        :ErL   = Load's Relative Dielectric Constant
    50.0        :ZoL   = Load Impedance.................................................Ohms
     0.0002     :DLTAN = Insulator's Dielectric Loss Tangent
   125.0        :SR    = Conductor's RMS Surface Roughness....Micro-Inches
     4.0        :RES   = Conductor's Resistivity.............................Micro-Ohm-Cm
CLPfilterE.DAT  :FNIE  = Default Input  filename for your Electrical Circuit
CLPFilterD.DAT  :FNID  = Default Input  filename for your Distributed Filter
CLPfilter.DAT   :FNO   = Default Output filename for your Output Data Storage
                |
                |____ The first 20 characters are read by CLPfilter.exe
```

Default Data File: CLPfilter.DEF is read by RF/microwave software product:
CLPfilter.exe when you start the program. As such, the executable file
(CLPfilter.exe) and this Default Data File (CLPfilter.DEF) must be located in
the same Folder or Subfolder in your computer.

The executable program (CLPfilter.exe) reads the first 20 characters in each
line from CLPfilter.DEF, so keep those first 20 characters for data, and do not
shorten any line in this Default Data File: CLPfilter.DEF.

The User is invited to change any/all data values in CLPfilter.DEF to data values
you commonly use for your RF/microwave designs of multi-section Coaxial Lowpass
Filters, so you do not have to enter data values when prompted by CLPfilter.exe
(just press ENTER on your computer's keyboard and your Default Data values will
be assigned to that data entry).

NOTE: The default data values shown above are for 9-section Coaxial Lowpass
Filter with a cut-off frequency = 2.8GHz, realized with alternating high/low-
impedance transmission lines.

Thank you for choosing Atlanta RF for your RF/microwave CAE software products.

Figure 2-1: Baseline data entries (and Instructions) in **Default Data file**: CLPfilter.DEF

Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
RF/Microwave Computer-Aided Engineering Software
Program: CLPfilter (v. 1.0)   Date:11/ 7/2012

This Program performs Electrical SYNTHESIS, Dimensional SYNTHESIS
and Frequency ANALYSIS of Lumped Element Low-pass Filters and
Distributed Element Coaxial Low-pass Filters.

 Please select a Program FUNCTION:
   1 = Frequency ANALYSIS of a known Filter Design.
  *2 = Electrical SYNTHESIS of a new Filter Design.
Program FUNCTION selected = **2**

 Please select a Synthesis OPTION:
   1 = Synthesis of Filter`s ELECTRICAL Circuit.
  *2 = Synthesis of Filter`s DISTRIBUTED Circuit.
Synthesis OPTION selected = **2**

 Please select a SUBOPTION for Filter Design:
  *1 = Chebyschev (Equi-ripple) Response.
   2 = Butterworth (Maximally flat) Response.
Response SUBOPTION selected = **1**

 Please enter the following DIMENSIONAL DATA:

   ------------- SOURCE IMPEDANCE --------------
   -Outer Cond. Diameter (B), Inches = **0.1175**
   -Inner Cond. Diameter (D), Inches =
   -Relative Dielectric Constant, Er = **2.0**
   -Line Impedance Level (Zo), Ohms = **50.0**
   -Inner Cond. Diameter (D), Inches = 0.0361

   ---------- HIGH IMPEDANCE SECTIONS ----------
   -Outer Cond. Diameter (B), Inches = **0.1175**
   -Inner Cond. Diameter (D), Inches =
   -Relative Dielectric Constant, Er = **1.0**
   -Line Impedance Level (Zo), Ohms = **110.0**
   -Inner Cond. Diameter (D), Inches = 0.0188

   ---------- LOW IMPEDANCE SECTIONS ----------
   -Outer Cond. Diameter (B), Inches = 0.1175
   -Inner Cond. Diameter (D), Inches =
   -Relative Dielectric Constant, Er = **2.0**
   -Line Impedance Level (Zo), Ohms = **10.0**
   -Inner Cond. Diameter (D), Inches = 0.0928

   -------------- LOAD IMPEDANCE ---------------
   -Outer Cond. Diameter (B) ,Inches = **0.1175**
   -Inner Cond. Diameter (D), Inches =
   -Relative Dielectric Constant, Er   = **2.0**
   -Line Impedance Level (Zo), Ohms = **50.0**
   -Inner Cond. Diameter (D), Inches = 0.0361

 Please enter the following DESIGN DATA:
    -Select the Filter`s CONFIGURATION:
      *1 = Standard Circuit.
       2 = Dual Circuit.
     CONFIGURATION of Filter selected = **1**

   -Low Pass Cutoff Frequency (FC1), MHz = **2800.0**
   -Passband Amplitude Ripple   (Am), dB   = **0.02**
   -Resultant Passband VSWR level   = 1.145
   -Number of sections in Filter (N < 30) = **9**
   -Impedance Level of System (Zo), Ohms = **50.0**

> User Data
> Entries are
> shown in
> **RED text**

Figure 3-1: Typical Input Data entry for **Dimensional Synthesis** in CLPfilter.exe

Filter calculations completed. Select next OPERATION:
    1. Perform FREQUENCY ANALYSIS.
    2. Design a NEW Filter.
    *3. EXIT to operating system.
OPERATION selected = **1**

Please enter the following ELECTRICAL DATA:
    -Conductor Resistivity, micro-Ohm-cm = **4.0**
    -RMS Surface Roughness, micro-Inch = **125.0**
    -Insulator`s Dielectric Loss Tangent   = **0.0002**

Please enter Frequency range for Filter ANALYSIS:
    -Analysis Start Frequency, MHz = **1000.0**
    -Analysis Stop Frequency, MHz = **10000.0**
    -Analysis Step Frequency, MHz = **250.0**

Is Output Data STORAGE desired (1=YES)= **1**
Enter a FILENAME (up to 20 characters) for Output Data storage:
    -Enter: Filename.xls for storage in a spreadsheet
    -Enter: Filename.doc for storage in a word processor
    -Enter: Filename.txt for storage as a text document
    Enter your FILENAME for Output Data Storage: **CLPF-ANAD.DAT**

User Data Entries are shown in **RED text**

Figure 3-2: Typical Input Data entry for **Frequency Analysis** in CLPfilter.exe

```
--------------------------------------------------------------------------------------------
CLPfilter (v. 1.0)                          Date:11/ 7/2012 at 22: 7: 9Hours
        Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
        RF/Microwave Computer-Aided Engineering Design Data
              for COAXIAL LOW-PASS Filters.

        SYNTHESIS of the Distributed Circuit for your LOW
          PASS Filter results in the following data:

        Design Frequencies:          Filter Parameters:
        ==================           ====================
        FC1 = 2800.0000 MHz       Design   = Low Pass
                                  Sections =  9
                                  Response =  Chebyschev
                                  Ripple   = 0.020 dB


        Cond. Diameter  Relative           TE11   Peak
Section    (Inches)     Dielectric   Zo    Cutoff Power  Length
Number  Inner   Outer   Constant  (Ohms)  (GHz)   (kW)  (Inches)
--------------------------------------------------------------------------------------------
Source  0.0361  0.1175   2.0000    50.00  34.584  0.621
  1     0.0928  0.1175   2.0000    10.00  25.263  0.819  0.0577
  2     0.0188  0.1175   1.0000   110.00  55.143  0.184  0.4671
  3     0.0928  0.1175   2.0000    10.00  25.263  0.819  0.1355
  4     0.0188  0.1175   1.0000   110.00  55.143  0.184  0.5674
  5     0.0928  0.1175   2.0000    10.00  25.263  0.819  0.1406
  6     0.0188  0.1175   1.0000   110.00  55.143  0.184  0.5674
  7     0.0928  0.1175   2.0000    10.00  25.263  0.819  0.1355
  8     0.0188  0.1175   1.0000   110.00  55.143  0.184  0.4671
  9     0.0928  0.1175   2.0000    10.00  25.263  0.819  0.0577
Load    0.0361  0.1175   2.0000    50.00  34.584  0.621
                                     Total length of filter = 2.5959
--------------------------------------------------------------------------------------------
Output Data stored in User Filename: CLPF-SYND.DAT
```

Figure 4-1: Typical Output Data for **Dimensional Synthesis** from CLPfilter.exe

```
-------------------------------------------------------------------------------------------------
CLPfilter (v. 1.0)                              Date:11/ 7/2012 at 22: 7: 9Hours
            Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
            RF/Microwave Computer-Aided Engineering Design Data
                    for COAXIAL LOW-PASS Filters.

        Rs = 50.00 Ohms                     Rl = 50.00 Ohms
        Xs =  0.00 Ohms                     Xl =  0.00 Ohms
         Sr = 125.0 u-inches             DLTAN =0.0002
        Res =   4.0 u-ohm-cm


    Frequency ANALYSIS of the  9-Section  Chebyschev  Low Pass
     DISTRIBUTED Filter results in the following response profile:


                                                  Thru Path
     Analysis   Input Impedance, Ohms  Input  ============   Time
     Frequency  ==================     Port   Loss   Phase   Delay
       (MHz)     Real    Imaginary  VSWR    (dB)   (Deg)   (nsec)
    -------------------------------------------------------------------------------------------
      1000.0000   52.37     -4.56     1.11   -0.132 -150.29   0.426
      1250.0000   48.49     -6.62     1.15   -0.165  171.00   0.434
      1500.0000   46.64     -2.82     1.10   -0.177  131.32   0.448
      1750.0000   51.40     -0.06     1.03   -0.193   90.14   0.467
      2000.0000   54.72     -4.73     1.14   -0.238   47.19   0.489
      2250.0000   50.19     -4.57     1.10   -0.266    1.65   0.527
      2500.0000   53.43      2.84     1.09   -0.314  -48.39   0.589
      2750.0000   52.62      0.29     1.05   -0.405 -106.27   0.726
      3000.0000   34.40     47.28     3.12   -2.155  174.07   0.997
      3250.0000  231.22    462.38    23.29  -10.661  103.14   0.543
      3500.0000   14.12   -223.63    74.64  -19.591   67.45   0.293
      3750.0000    2.57   -117.45   126.92  -26.956   46.08   0.194
      4000.0000    1.14    -85.12   170.59  -33.120   31.08   0.144
      4250.0000    0.69    -68.66   209.39  -38.390   19.62   0.113
      4500.0000    0.48    -58.37   245.87  -42.957   10.42   0.092
      4750.0000    0.36    -51.18   281.16  -46.948    2.79   0.078
      5000.0000    0.29    -45.79   315.81  -50.450   -3.69   0.067
      5250.0000    0.24    -41.55   350.05  -53.524   -9.31   0.058
      5500.0000    0.21    -38.11   384.03  -56.214  -14.24   0.052
      5750.0000    0.18    -35.23   417.85  -58.556  -18.62   0.046
      6000.0000    0.16    -32.78   451.53  -60.573  -22.56   0.042
      6250.0000    0.14    -30.65   485.04  -62.284  -26.13   0.038
      6500.0000    0.13    -28.78   518.37  -63.702  -29.39   0.035
      6750.0000    0.12    -27.11   551.49  -64.835  -32.38   0.032
      7000.0000    0.11    -25.62   584.24  -65.686  -35.16   0.030
      7250.0000    0.10    -24.26   616.59  -66.256  -37.75   0.028
      7500.0000    0.09    -23.02   648.36  -66.538  -40.18   0.026
      7750.0000    0.09    -21.87   679.29  -66.523  -42.47   0.025
      8000.0000    0.08    -20.81   709.18  -66.193  -44.65   0.024
      8250.0000    0.08    -19.82   737.66  -65.524  -46.74   0.023
      8500.0000    0.07    -18.88   764.17  -64.479  -48.77   0.022
      8750.0000    0.07    -17.99   788.01  -63.005  -50.74   0.022
      9000.0000    0.07    -17.13   807.97  -61.020  -52.71   0.022
      9250.0000    0.07    -16.30   821.84  -58.398  -54.70   0.023
      9500.0000    0.07    -15.48   824.98  -54.920  -56.80   0.024
      9750.0000    0.07    -14.65   804.42  -50.155  -59.18   0.030
     10000.0000    0.08    -13.74   702.85  -43.009  -62.48   0.049
    -------------------------------------------------------------------------------------------
    Output Data stored in User Filename: CLPF-ANAD.DAT
```

Figure 4-2: Typical Output Data for **Frequency Analysis** from CLPfilter.exe