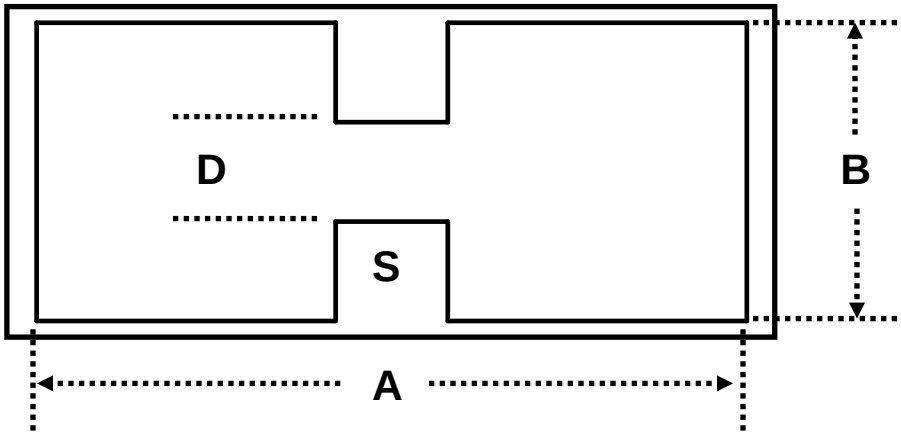
Quick Start User Manual: WRDguide



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. *WRDguide.exe*: The executable software product.
    b. *WRDguide.DEF*: Default Data File read by *WRDguide.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: *WRDguide.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: *WRDguide.exe* performs Electrical Synthesis, Dimensional Synthesis and Frequency Analysis of any Double or Single Ridge Waveguide Transmission Line.

The executable file: *WRDguide.exe* reads the Default Data File: *WRDguide.DEF* each time you start the program. As such, you can change Data Entries inside *WRDguide.DEF* to suite your

most common Double & Single Ridge Waveguide Transmission Line designs, using the guidelines written in *WRDguide.DEF*.

When you start using the software product, you are asked to enter key design parameters for your Double or Single Ridge Waveguide Transmission Line. If you press <ENTER> on your computer's keyboard, the software product uses the Data Entry from your Default Data File: *WRDguide.DEF* for that design parameter. As such, you can change any/all Data Entries in *WRDguide.DEF* suite your most common Ridge Waveguide designs, without having to enter those values when asked by the executable file: *WRDguide.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: WRDguide.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 Double & Single Ridge Waveguide Transmission Lines.

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 Dimensional Synthesis and for Frequency Analysis of your Double & Single Ridge Waveguide Transmission Lines, 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 Frequency Analysis and for Synthesis of your Double & Single Ridge Waveguide Transmission Lines, 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 physical dimensions planned for manufacture of your Double & Single Ridge Waveguide Transmission Line.

You can create any number of User Input Data files, each of which defines the actual physical dimensions of your Double & Single Ridge Waveguide Transmission Lines. Once created, you can enter that Input Data filename when asked by the software product, for Frequency Analysis and for comparison with actual measured swept-frequency 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. . . . . .

AtlantaRF

WRD Size	MIL-DTL-23351 Dash No.	Material Alloy	Frequency Range (GHz)	TE10 Mode Cut-off Freq, GHz	RF Power Rating (One Atmosphere)		WRD Width: A (Inches)	WRD Height: B (Inches)	Ridge Width: S (Inches)	Ridge Gap: D (Inches)
					CW(kW)	Peak(kW)				
WRD-200D24	4-025	Aluminum	2.00-4.80	1.666	50.0	450	2.590	1.205	0.648	0.512
WRD-250D30	-	Aluminum	2.60-7.80	2.093	24.0	120	1.655	0.715	0.440	0.150
WRD-350D24	4-029	Aluminum	3.50-8.20	2.915	18.0	150	1.480	0.688	0.370	0.292
WRD-475D24	4-033	Aluminum	4.75-11.0	3.961	8.0	85	1.090	0.506	0.272	0.215
WRD-500D36	2-025	Aluminum	5.00-18.00	4.222	4.0	15	0.752	0.323	0.188	0.063
WRD-580D28	-	Aluminum	5.80-16.00	4.892	5.2	32	0.780	0.370	0.200	0.120
WRD-650D28	-	Aluminum	6.50-18.00	5.348	4.0	25	0.720	0.321	0.173	0.101
WRD-700D26	-	Aluminum	7.00-18.50	5.679	4.3	28	0.686	0.310	0.173	0.105
WRD-750D24	4-037	Aluminum	7.50-18.00	6.239	4.8	35	0.691	0.321	0.173	0.136
WRD-110C24	4-041	Aluminum	11.00-26.50	9.363	1.4	15	0.471	0.219	0.118	0.093
WRD-180C24	4-045	Aluminum	18.00-40.00	14.995	0.8	5	0.288	0.134	0.072	0.057

Design Parameters for Standard Double Ridge Waveguide

```
WRDguide.DEF contains all default data values read by Program: WRDguide.exe.
  0.720              :A      = Ridge Waveguide Width……..Inches
  0.321              :B      = Ridge Waveguide Height…….inches
  0.101              :D      = Ridge Waveguide Gap ……Inches
 10.0                :F       = Analysis Frequency……..GHz
 18.0                :Fmax  = Maximum Frequency for Analysis……GHz
  6.0                :Fmin  = Minimum Frequency for Analysis……..GHz
  0.5                :Fstep = Analysis Frequency Step Size……GHz
  1.0                :IZ      = Selects Analysis Impedance= Z(P,I);Z(V,I);Z(P,V)
  1.0                :M      = Selects Double(=1.0) or Single(=2.0) Ridge W/G
  4.0                :RES   = Conductor Resistivity……..Micro-Ohm-cm
  0.173              :S       = Ridge Width……Inches
  0.3                :Smax  = Maximum Ridge Width for Synthesis..Inches
  0.1                :Smin  = Minimum Ridge Width for Synthesis….Inches
  0.02               :Sstep = Ridge Width Step Size for Synthesis…Inches
125.0                :SR      = Conductor Surface Roughness…….Micro-Inches
300.0                :Zmax  = Maximum Impedance for Synthesis….Ohms
 50.0                :Zmin  = Minimum Impedance for Synthesis…...Ohms
100.0                :Zo      = Impedance for Synthesis……Ohms
 25.0                :Zstep = Impedance Step Size for Synthesis…..Ohms
WRDguide.DAT         :FN     = Default filename for your Output Data Storage
                     |
                     |____ The first 20 characters are read by WRDguide.exe
```

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

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

The User is invited to change any/all data values in WRDguide.DEF to data values you commonly use for your RF/microwave designs of Double & Single Ridge Waveguide, so you do not have to enter data values when prompted by WRDguide.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 standard WRD-750 Double Ridge Waveguide operating across its Frequenct Range: 7.5 to 18.0 GHz.

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**: WRDguide.DEF

Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
RF/Microwave Computer-Aided Engineering Software.
Program: WRDguide (v. 1.1) Date: 10/16/2012

This program performs Impedance ANALYSIS and Dimensional SYNTHESIS
for Double and Single RIDGE WAVEGUIDE transmission lines.

Please select a Program FUNCTION:
*1 = ANALYSIS of Impedances from known Dimensions.
2 = SYNTHESIS of Ridge Gaps from known Impedances.
Program FUNCTION selected = **1**

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

Please select a Synthesis OPTION:
*Option 1: Ridge Gap Synthesis versus Impedances.
Option 2: Ridge Gap Synthesis with Frequency Analysis.
Option 3: Ridge Gap Synthesis with Sensitivity Analysis.
Synthesis OPTION selected = **2**

Select METHOD for Ridge Gap Synthesis versus Impedance:
*1 = Synthesis from a range of Impedance levels.
2 = Synthesis with a range of Ridge Widths (one Zo level).
Synthesis METHOD selected = **1**

Design Parameters for standard Double Ridge Waveguide:

WRD Size	Low Freq GHz	High Freq GHz	W/G Width (A)	W/G Height (B)	Ridge Width (S)	Ridge Gap (D)
WRD-250	2.60	7.80	1.655"	0.715"	0.440"	0.150"
WRD-350	3.50	8.20	1.480"	0.688"	0.370"	0.292"
WRD-475	4.75	11.00	1.090"	0.506"	0.272"	0.215"
WRD-500	5.00	18.00	0.752"	0.323"	0.188"	0.063"
WRD-650	6.50	18.00	0.720"	0.321"	0.173"	0.101"
WRD-750	7.50	18.00	0.691"	0.321"	0.173"	0.136"
WRD-110	11.00	26.50	0.471"	0.219"	0.118"	0.093"
WRD-180	18.00	40.00	0.288"	0.134"	0.072"	0.057"

Please enter the following DIMENSIONAL DATA:
-Double(=1*) or Single(=2) Ridge = **1**
-Waveguide Width (A), Inches = **0.720**
-Waveguide Height (B), Inches = **0.321**
-Ridge Width (S), Inches = **0.173**

Enter Operating FREQUENCY where IMPEDANCE level exists:
-Operating Frequency, GHz = **10.0**
-Minimum Impedance at 10.00GHz,Ohms = **50.0**
-Maximum Impedance at 10.00GHz,Ohms = **300.0**
-Imped. Step Size at 10.00GHz,Ohms = **25.0**

Select Guide IMPEDANCE for Synthesis:
*1 = Power-Current Impedance: Z(P,I)
2 = Voltage-Current Impedance: Z(V,I)
3 = Power-Voltage Impedance: Z(P,V)
Guide IMPEDANCE selected = **1**

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: **WRguide-SYN.DAT**

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

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RF/Microwave Computer-Aided Engineering Software.
Program: WRDguide (v. 1.1) Date: 10/16/2012

This program performs Impedance ANALYSIS and Dimensional SYNTHESIS
for Double and Single RIDGE WAVEGUIDE transmission lines.

Please select a Program FUNCTION:
*1 = ANALYSIS of Impedances from known Dimensions.
2 = SYNTHESIS of Ridge Gaps from known Impedances.
Program FUNCTION selected = **1**

Please select an Analysis OPTION:
*1 = Impedance Analysis versus Ridge Widths.
2 = Frequency Analysis of Ridge Waveguide.
3 = Sensitivity Analysis of Impedance.
Analysis OPTION selected = **2**

Select FREQUENCY for Impedance Analysis versus Ridge Widths:
*1 = Analysis at Infinite Frequency.
2 = Analysis at one Operating Frequency.
FREQUENCY selected = **1**

Design Parameters for standard Double Ridge Waveguide:

WRD Size	Low Freq GHz	High Freq GHz	W/G Width (A)	W/G Height (B)	Ridge Width (S)	Ridge Gap (D)
WRD-250	2.60	7.80	1.655"	0.715"	0.440"	0.150"
WRD-350	3.50	8.20	1.480"	0.688"	0.370"	0.292"
WRD-475	4.75	11.00	1.090"	0.506"	0.272"	0.215"
WRD-500	5.00	18.00	0.752"	0.323"	0.188"	0.063"
WRD-650	6.50	18.00	0.720"	0.321"	0.173"	0.101"
WRD-750	7.50	18.00	0.691"	0.321"	0.173"	0.136"
WRD-110	11.00	26.50	0.471"	0.219"	0.118"	0.093"
WRD-180	18.00	40.00	0.288"	0.134"	0.072"	0.057"

Please enter the following DIMENSIONAL DATA:
-Double(=1*) or Single(=2) Ridge = **1**
-Waveguide Width (A), Inches = **0.720**
-Waveguide Height (B), Inches = **0.321**
-Ridge Gap (D), Inches = **0.101**
-Minimum Ridge Width (Smin), Inches = **0.1**
-Maximum Ridge Width(Smax), Inches = **0.3**
-Width Step Size (Sstep), Inches = **0.02**

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: **WRDguide-ANA.DAT**

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

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

```
-------------------------------------------------------------------------------------------------
 WRDguide (v. 1.0)                          Date:10/16/2012 at 11:22:37 Hours
          Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
          RF/Microwave Computer-Aided Engineering Design Data For
                DOUBLE Ridge Waveguide Transmission Lines:

          A = 0.7200"          Ridge Gap Synthesis          RES =  4.000
          B = 0.3210"        ======================          SR =125.000
                                    (OPTION 1.1)

                          Z(P,I)     Bandwidth        Results at Infinite Frequency
  Ridge  Ridge             at         Results    ----------------------------------------------
    Gap  Width          10.000    ----------      Guide Impedances          Peak   Ridge
      D      S             GHz      FC10  FC20   Z(P,I)  Z(V,I)  Z(P,V)   Power  Power
   (In.)  (In.)         (Ohms)     (GHz) (GHz)   (Ohms)  (Ohms)  (Ohms)    (kW)    (%)
-------------------------------------------------------------------------------------------------
 0.0310 0.1730          50.00     3.287 20.287    47.22   49.29   51.46    12.7    92.2
 0.0511 0.1730          75.00     4.034 19.530    68.63   73.21   78.10    22.7    88.1
 0.0732 0.1730         100.00     4.662 18.885    88.47   96.42  105.07    34.5    83.9
 0.0965 0.1730         125.00     5.209 18.378   106.70  118.71  132.06    47.8    79.6
 0.1204 0.1730         150.00     5.694 17.990   123.31  139.92  158.76    61.9    75.4
 0.1445 0.1730         175.00     6.127 17.693   138.30  159.86  184.79    76.6    71.2
 0.1683 0.1730         200.00     6.516 17.457   151.72  178.42  209.83    91.6    67.2
 0.1918 0.1730         225.00     6.863 17.266   163.64  195.52  233.61   106.8    63.2
 0.2148 0.1730         250.00     7.174 17.105   174.16  211.12  255.92   122.3    59.5
 0.2374 0.1730         275.00     7.451 16.954   183.40  225.24  276.61   138.2    56.1
 0.2600 0.1730         300.00     7.698 16.813   191.48  237.93  295.64   155.1    52.8
-------------------------------------------------------------------------------------------------
Output Data stored in User filename: WRDguide-SYN.DAT
```

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

WRDguide (v. 1.0) Date:10/16/2012 at 11:26: 8 Hours

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RF/Microwave Computer-Aided Engineering Design Data For

DOUBLE Ridge Waveguide Transmission Lines:

A = 0.7200" Impedance Analysis RES = 4.000

B = 0.3210" ========== SR =125.000

D = 0.1010" (OPTION 1.1)

Normal-ized Ridge Width S/A	Ridge Width S (In.)	Bandwidth Results LC10 (In.)	FC10 (GHz)	FC20 (GHz)	Results at Infinite Frequency Guide Impedances Z(P,I) (Ohms)	Z(V,I) (Ohms)	Z(P,V) (Ohms)	Peak Power (kW)	Ridge Power (%)
0.1389	0.1000	2.0786	5.678	17.902	129.70	149.00	171.17	40.4	67.6
0.1667	0.1200	2.1251	5.554	18.126	123.72	140.80	160.24	43.2	71.3
0.1944	0.1400	2.1666	5.448	18.278	118.20	133.44	150.64	45.9	74.5
0.2222	0.1600	2.2033	5.357	18.329	113.10	126.80	142.16	48.7	77.2
0.2500	0.1800	2.2354	5.280	18.255	108.38	120.80	134.65	51.4	79.6
0.2778	0.2000	2.2629	5.216	18.047	104.01	115.36	127.96	54.1	81.8
0.3056	0.2200	2.2861	5.163	17.727	99.95	110.42	121.99	56.7	83.6
0.3333	0.2400	2.3050	5.120	17.323	96.18	105.92	116.64	59.3	85.3
0.3611	0.2600	2.3198	5.088	16.873	92.67	101.80	111.83	61.9	86.8
0.3889	0.2800	2.3304	5.065	16.405	89.40	98.04	107.51	64.4	88.2
0.4167	0.3000	2.3369	5.051	15.941	86.35	94.59	103.61	66.8	89.4

Output Data stored in User filename: WRDguide-ANA.DAT

Figure 4-2: Typical Output Data for **Impedance Analysis** from WRDguide.exe