Conversion of optical prescription between Code V and Zemax optical modeling software packages

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Abstract

There are two contending optical ray tracing software packages that compete directly in their specific market, Zemax by Zemax Development Corporation and Code V by Optical Research Associates. They are a classical battle that can be easily compared to the fight between Window PC users and Mac OS users. This paper is written because of this fact, the fact that few people are competently trained on both packages, or even have access to both packages. This paper will attempt to easy the conflict by outlining how to use the built in conversion capabilities of both software packages to convert foreign prescriptions into their own format.





Chapter 1 - Step by step instructions

1.1 Conversion of a Zemax file into Code V:

There are two option in Code V to easily convert a save Zemax "X.zmx" lens prescription into a Code V file. Run the macro out of the macro directory and execute the macro from the command line. They both involve accessing the pre-made macros that are a part of the collection of macros available with the Code V software package.

1.1.1 Option One:

1 - New lens from (× % &	∦ ∦⇒ ∥5	🍇 🕪 Ate 💥 S	₩ ₩ 9D 3					_	
Lens Data Manager	🗖 Lens Data	🗆 Lens Data Manager									
- Command Window - Review Spreadsheets	System D	System Data Surface Properties									
Listings Analysis Windows Optimization	Surface #	Surface Name	Surface Type	Y Radius	Thickness	Glass	Refract Mode	Y Semi-Aper	rture		
Plot Windows	Object		Sphere	Infinity	Infinity		Refract		0		
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	Command	Window ear Text RDY 0.000 S 0 0 1: RDY 0.000	000 ; TF	HI 0.1000 HI 0.000	E+14 ; GLA .	AIR					
	CODE V> SURFACE CODE V> CODE V> = DDM M = SEE 0	Window earText RDY 0.000 S 0 0 1: RDY 0.0000 G0 G0	000 ; TF 000 ; TF	H 0.1000 H 0.00	E+14 ; GLA . 0000 ; GLA .	AIR					
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	CODE V> SURFACE CODE V> CODE V> SURFACE CODE V> CODE V>	Window RDY 0.000 S 0 0 1: RDY 0.000 GO	000 ; TP 000 ; TP	HI 0.1000 HI 0.00	E+14 ; GLA :	AIR					

Default Code V Screen:

Figure 1 shows the default Code V new lens screen.

File Select:



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File Edit Lens Display Re	eview Analysis	Optimization 1	Tools Window Help								
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		User Graphics		F 7766 - 8	~~ <u>~</u>	<u> </u>					
Lens Data Manager	🗖 Lens Data	Manager	Macro Manager								Â
Command Window Review Spreadsheets	System Data		Editor								
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- Plot Windows	Object	-	Paterit Leris Search	in	ity	Infinity		Refract		0	
···· Error Log	Stop		Add To Favorites	in	ity	0.0000		Refract	1.0000	0	
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Macro Manager	, 1	DIM: Milim	eters Apertures Use	d: User-D	efined a	nd Defaults	Use ZX Plane: N	o f/ 5.0000	e EPD: 2.0000	Image Dist:	0.0000
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Figure 2. Shows where to access the "Macro Manager" tab in Code V.

Browse for Macro:

		Remove
Favorites		Bun
Hecent Files Sample Macros	[Edit
		Add to Favorites
		Assign to Toolbar
		Assign to Menu
		Close

Figure 3. Shows the macros browsing pop up, that is use to navigate to the conversion file.





Select "zemaxtocv"

Open			? 🔀
Look in:	i macro	🛨 🗢 🗈 📩	
My Recent Documents Desktop My Documents My Computer	userhoe.seq userint.seq usersur1.seq usersur1.seq usersur2.seq usersur.seq usersur.seq utolchng.seq vp_data.seq vp_lot.seq yyb.seq yyb.seq yyben.seq yybelp.seq	yybnew.seq yybplot.seq yybread.seq yybsave.seq yybsetup.seq yybspc.seq zcir.seq zli.seq Type: CODE V Se Date Modified: 1 Size: 88,4 KB	equence File 2/12/2008 12:06 PM
	<		
My Network Places	File name:	•	Open
	Files of type:	Macro Files (*.seq)	Cancel
🔽 Use Internal f	ile names		
🗌 🗖 Only Show Hi	ighest Version ##s		

Figure 4. Shows the directory where the conversion macro is stored.

Run Macro:

Macro File: C:\CODEV100\macro\zemaxtocv.seq		Remove
Favorites	_	Run Edit Add to Favorites Assign to Toolbar Assign to Menu
Macro Arguments:		

Figure 5. Show the selected macro file. Hit "Run" to activate the file.





Select Zemax file to be converted

Macro zemaxtocv.seq	X
Macro to convert a Zemax .ZMX file into a CODE V file	
Name of Zemax .ZMX file 7 with fold C\OPTI515.zmx	
OK Cancel	
Name of Zemax lens file (with drive and path, if needed)	



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- Command Window	System [Data S	Surface Propertie	s								
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Analysis Windows C:\CODEV100\macrc	Surface #	Surface Name	Surface Type	Y Radius	Thickness	Glass	Refract Mode	Y Semi-Aperture	Nor			
- Optimization	Object		Sphere	Infinity	131.2875		Refract	0				
Plot Windows	1		Asphere	Infinity	14.0000	BK7_SCHOT	Refract	47.9636 ⁰				
Error Log	2		Sphere	-177.1122 V	46.5104		Refract	48.6089 ^O				
	3		Sphere	Infinity	126.8999		Refract	48.0376 ⁰				
	4		Sphere	Infinity	0.0000		Refract	65.3125 ^O B	asic Dec			
	5		Sphere	Infinity	0.0000		Reflect	65.3125 ^O				
	6		Sphere	Infinity	-126.9138		Refract	46.6778 ^O B	asic Dec			
	7		Asphere	2058.4712 ^V	-14.0000	BK7_SCHOT	Refract	45.3232 ^O				
	8		Sphere	1000 2014 V	16 0000	ern ecuor	Dofront	AE SODEO	-			
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	Stop		Conic	ca 🕸 🛛 🗛 💼 📘	3							
	11		Sphere		-			·				
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		1	C	ODE V> ver n	u 2010 191101							
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		- i	na t utal		ABB							
		Error Log										
		Clear Text							ata a			
	l F	CVUSER\OPT	I515.ZMX	-> Warning: Make	surface apert	ures oversi	ze on surfa	ces where the ca	optic			
		CVUSER\OPT	T515 ZMX	-> Warning:	The ZEMAX st	stem has on	e or more s	urface comments				
		els (SLBs),	1010. brin	·	THE STIRN ST	rootin nuo on		arrase somments	×			
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CODE V		DIM: Milime	ters Aperture	is Used: User-Defined and D	efaults Use Z	(Plane: No	f/ -2.1390 EPD: -	420.3961 Image Di	st: -131.2875			
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Macro Run Complete

Figure 7. Shows the completed conversion of the optical prescription.





1.1.2 Option Two:

Open Macro file:

1	zemaxtocv.seq		_ 🗆 🗙
1" 1	Sequence:	ZEMAXTOCV	
1	Purpose:	Convert a saved Zemax lens file to a CODE V lens.	
	Syntax:	in ZEMAXTOCV Zemax_file	
	Inputs:	<pre>Zemax_file - name of Zemax lens file. If using drive,</pre>	
	Notes:	 Not all Zemax lens features are modeled. Commands or surface features which are ignored are listed during macro execution. Currently, pickups may not be modeled correctly if there are paraxial lenses in the Zemax model. Currently, zoom data are not converted, so the resulting CODE V lens is not zoomed. 	
	Buffers:	Lowest buffers not in use (deleted after use).	
<u>!</u>	Author:	R. Juergens Date: 01-02-96	

Figure 8. Open the macro in a text editor.

😨 CODE V -				1 2 2					_ 7 X	
File Edit Lens Display Re	view Analysis	Optimization To	ols Window Help							
🛛 D 📽 🖲 🔀 🖨 🖪	X 🖻 🛍	Ω ± ⊆ ± [≝ ‰ 📾] 🕼 🛛 🛛 🧶 📢	?					
* 1 - New lens from C	VMAC - Z	× % 🚳	∅	🕼 💴 Are 💥 🕍	₩ <u>1</u> 12					
Lens Data Manager	Lens Data	Manager							3 🔺	
Command Window Review Spreadsheets	System Data Surface Properties									
Listings Analysis Windows Optimization	Surface #	Surface Name	Surface Type	Y Radius	Thickness	Glass	Refract Mode	Y Semi-Aperture	-	
Plot Windows	Object		Sphere	Infinity	Infinity		Refract	0		
· Error Log	Stop		Sphere	Infinity	0.0000		Refract	1.0000 0		
	Image		Sphere	Infinity	0.0000		Refract	1.0000 0		
				End	Of Data					
	Command	Window								
								- - - -		
< · · · >	CODE V>	n ZEMAXTOC	V 'C:\CVUSER	OPTI515.zmx'				-	I	
CODE V		DIM: Milimet	ers Apertures Us	ed: User-Defined and (Defaults Use Z	(Plane: No	f/ 5.0000e EPD: 2	2.0000 Image D	st: 0.0000	
🦺 start 🔰 🕴 🥔 🧕	🧕 👋 🖻	🕯 🕴 😴 сор	EV-	CodeV-converti	CVUSER	CVEdit	- zemax	% *** 🛃 🖿 🛃	9:40 PM	

Copy Syntax line:

Figure 9. Shows the command line entry needed to access the conversion macro.





1.2 Outputs after Conversion:

1.2.1 Error Log:

Once the conversion macro is run Code V will print a running list of the items that were flagged during the conversion process. Items are flagged because they were correctly converted or because they were ignored and not converted.

Message:

"Some information will not be converted. Changes in either CODE V or ZEMAX may invalidate converted information. Due to differences between CODE V & ZEMAX ray aiming & vignetting factors, it is recommended that you set vignetting for the converted system.

A concise listing of conversion warnings appears on the Tabbed Output Window 'Info' tab and in the Error log."

Examples:

- 1. Temperature and pressure specified.
- 2. Glass catalog list ignored
- 3. Field weighting not used.
- 4. Pupil X shifts not used
- 5. Surface label 'surf' on S2 has been deleted.
- 6. Circular aperture pickup not specified
- 7. Please check converted lenses carefully.

1.2.2 Macro Run Log:

The macro run log that is printed is an extremely detailed log of every surface and change that happened while converting the prescription.

Message:

"The ZEMAX system has one or more surface comments (COMM) defined. CODE V has converted these to surface labels (SLBs), must be unique. If identical COMMs were defined on multiple surfaces, only the final instance will appear in the CODE V lens."

Examples:

Warning: Glass catalog list ignored

Warning: Ray aiming not used





Warning:	Pupil shift for ray aiming not used.
-	Zemax command SDMA ignored
	Zemax command XFLN ignored
	Zemax command YFLN ignored
	C C

Warning: Field weighting not used Zemax command FWGN ignored

1.2.3 Macro "ZEMAXTOCV"

! Sequence: ZEMAXTOCV 1 ! Purpose: Convert a saved Zemax lens file to a CODE V lens. 1 ! Syntax: in ZEMAXTOCV Zemax file ! ! Inputs: Zemax file - name of Zemax lens file. If using drive, path, or extender, enclose in quotes. If the extender is omitted, .zmx is assumed. ! Т ! Notes: 1. Not all Zemax lens features are modeled. Commands or surface features which are ignored are listed during ! ! macro execution. 2. Currently, pickups may not be modeled correctly if there 1 are paraxial lenses in the Zemax model. ! 3. Currently, zoom data are not converted, so the resulting I. CODE V lens is not zoomed. 1 1 ! Buffers: Lowest buffers not in use (deleted after use). 1 ! Author: R. Juergens Date: 01-02-96

1.3 Conversion of a Code V file into Zemax:

The conversion process for inputting Code V prescriptions into Zemax is virtually the same process as the Z-C conversion. However, unlike the Z-C, the C-Z process take place in a DOS.exe outside of Zemax.





- 1.3.1 Step by Step Process:
 - 1) Copy the Code V X.seq file into the common directory that Zemax uses as a default on your computer.
 - 2) It is easiest if you copy the "seq2zmx.exe" into the same common directory that Zemax used.



Figure 10 Shows the needed file in a common directory.

- 3) Go to the "Start" Menu on your windows desktop and select "run"
- 4) A window will pop up, enter "cmd" and hit enter.
- 5) You now have access to the DOS system for conversion
- 6) Change path into your Zemax common folder where you already copied the .seq file.



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C:\WINDOWS\system32\cmd.exe	- 🗆	×
Volume Serial Number is 5AEF-5583		-
Directory of C:\CVUSER\Zemax		_
11/02/2009 05:42 PM <dir></dir>	-	
11/02/2009 05:42 PM <dir> 11/02/2009 11:34 AM 931 dbg.seq</dir>		
10/08/2009 10:52 AM 73,728 seq2zmx.exe 10/08/2009 10:52 AM 1.256 seq2zmx.txt		
3 File(s) 75,915 bytes		
C:\CUUSER\Zemax>		
		Ŧ

Figure 11 Show the DOS folder that the files are in.

7) There is a executable file called "seq2zmx.exe" run the file by typing "seq2zmx"



Figure 12 Shows the command line inputs

8) The command line to ask for a input/output and log name. Provide the X.seq name of the Code V file you are trying to convert. Provide a X.zmx for the Zemax file you are trying to create. Provide a name for the log file X.txt that will be where the conversion process and error messages will be stored.



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C:\WINDOWS\system32\cmd.exe	- 🗆 🗙
Volume Serial Number is 5AEF-5583	
Directory of G:\CUUSER\Zemax 11/02/2009 05:42 PM <dir> .</dir>	
11/02/2009 05:42 PM <dir> 11/02/2009 11:34 AM 931 dbg.seq 10/08/2009 10:52 AM 73,728 seq2zmx.exe 10/08/2009 10:52 AM 1,256 seq2zmx.txt 3 File(s) 75,915 bytes 2 Dir(s) 136.042.151.936 bytes free</dir>	
C:\CVUSER\Zemax>seq2zmx dbg.seq dbg.zmx Vignetting factors based on upper vignetting Vignetting factors need to be reset Done. Unconverted commands stored in log file.	
C:\CVUSER\Zemax>	
	-

Figure 13 Shows the DOS output once the program was run.

9) The executable will run and convert as much of the prescription as possible, it is important to check the log file for what convert really took place.

3 File(s) 75,915 bytes 2 Dir(s) 136,042,151,936 bytes free
C:\CUUSER\Zemax>seq2zmx dbg.seq dbg.zmx Vignetting factors based on upper vignetting Vignetting factors need to be reset Done. Unconverted commands stored in log file.
C:\CUUSER\Zemax>dir Volume in drive C is Raytheon Volume Serial Number is 5AEF-5583
DIFECTORY OF C:\CVUSER\ZEMAX
11/02/2009 05:48 PM <dir> -</dir>
11/02/2007 05-36 FM \D1K/
11/02/2009 05:48 PM 1,007 dbg.zmx
10/08/2009 10:52 AM 73,728 seq2zmx.exe
11/02/2009 05:48 PM 1,727 seq2zmx.LOG
10/08/2007 10:52 Hm 1,256 Seq22mX.tXt 5 File(c) 78 649 butes
2 Dir(s) 136,037,904,384 bytes free

Figure 14 Shows the new X.zmx and X.LOG file that were created in the directory.

10) Open the new X.zmx file in Zemax, to verify the conversion worked.





1.4 Outputs after Conversion:

1.4.1 Run Log:

Once the conversion executable is run in DOS, the process will produce a running list of the items that were flagged during the conversion process. Items or surfaces are flagged because they were correctly converted from Code V to Zemax. This file is saved with a default name of seq2zmx.LOG and will contain all the information on the conversion.

Examples of LOG:

Input file : dbg.seq Output file: dbg.zmx

Code V (TM) commands not converted or converted with warnings:

Surface: 3 in ZEMAX, 3 in Code V

Unlike Code V conversion macro, you are very limited in the amount of information that the LOG file contains. You therefore must be suspect that the conversion worked correctly, because of the lack of information.

1.5 Executable "SEQ2ZMX.exe"

SEQ2ZMX v 1.3

Utility to convert Code V(TM) sequence files to ZEMAX files

Syntax:

SEQ2ZMX INPUTFILENAME OUTPUTFILENAME LOGFILENAME

Where INPUTFILENAME is the input sequence file name, i.e. LENS.SEQ





OUTPUTFILENAME is the output ZEMAX file name, i.e. LENS.ZMX LOGFILENAME is the optional log file name. Default = seq2zmx.LOG File names may include the drive and path.

Supported Commands:

Aspheric surface type Conic surface type Cylindrical surface type Grating surface type Spherical surface type Default dimensions Numerical aperture, F/# PIM solve Radius or curvature, thickness, glass Wavelengths, reference wavelength, and weights Field angles, object height, and paraxial image height Title X,Y,Z tilts, decenters, BEN and DAR commands Zooms on thickness

Disclaimer:

This utility is provided as is without warranty either expressed or implied. The utility is intended to convert simple Code V ver. 8.1 sequence files to ZEMAX lens files. Not all Code V commands are supported. Complex systems may require additional editing within ZEMAX. Unconverted commands are stored in the log file. E-mail conversion suggestions to support@zemax.com.





Chapter 2 - Conclusion

We have found during this paper that it is easy to convert back and forth between Code V and Zemax files. The conversion process for both software packages is very similar and produces about the same result, when comparing the prescription file itself. The conversion process does a solid 80% job in converting from one file format to another. Code V seems to have an edge in the number of things it converts from Zemax to Code V. Overall Code V seems to do a better job doing the whole process, mostly because of vast increase in information that the log file saves. Zemax requires a second step of run the conversion outside of Zemax, which could be seen as both good and bad. The final take away from this paper is that there are built in converter for both packages and they work as well.





Chapter 3 - Appendix

Product information:

3.1 Code V:

3.1.1 Key Features



In addition to such basic capabilities as lens modeling and <u>spot diagrams</u>, CODE V has a vast array of technical, graphical, and ease-of-use features. The following list of "key features" is just a small subset of what is available. See the <u>technical description</u> for a more detailed look at capabilities.

- Optimization (including Global Synthesis)
- Ease of use (GUI interface and commands)
- Extensive built-in libraries of optical system models (patents, etc.), components, and optical glass
- Extensive graphics (<u>pictures</u>, <u>data plots</u>, <u>shaded displays</u>), including <u>3D</u> <u>visualizations</u> and <u>diffraction-based image simulations</u>
- Database/modeling Features
- Tolerancing (including extremely fast and accurate wavefront differential tolerancing)
- <u>Interferogram</u> interface (supports computer-aided closed-loop alignment)
- Non-sequential surface modeling for unusual systems
- Powerful command language (with Macro-PLUS programming)
- Fast 2D Image Simulation with an input bitmap file (including diffraction)
- The most accurate, efficient beam propagation analysis available

CODE V is the most comprehensive "tool box" for optical modeling, design and analysis available today.





3.1.2 General

CODE V is an integrated system of modules, allowing a wide variety of optical computations to be performed on a common input lens data base. The various functions and major capabilities of CODE V are grouped into what are referred to as "options"; this term does not imply that they are optional to the customer or licensee in terms of being able to obtain CODE V without them, but optional in the context of program usage.

Considerable attention has been paid to making the CODE V program easy to use, without sacrificing flexibility or power. A graphical user interface (GUI) is provided, allowing users to navigate around the program by the use of pulldown menus and toolbar buttons, eliminating the need to remember numerous commands; however, commands can be used as well, or a combination of menus and commands. Frequent CODE V users often migrate to command mode, at least for the options they use most often. A library of over 2400 lens models from patents and other sources also contribute to ease of use by providing many possible starting points for new designs.

Extensive on-line help is integrated into the program. This allows users to obtain help on any lens data topic, CODE V option, or immediate command (input/output, etc.). In addition, context sensitive help gives help on the screen currently active. The on-screen help includes all the information and graphics available in the three-volume reference manual in a convenient and easily searched format.

Lenses without symmetry, i.e., systems with three-dimensional tilts and/or decenters, are easily input and modeled in CODE V, and all the analyses, image evaluation options, and optimization are carefully designed to handle such systems.

A wide variety of surface types are available, including diffraction gratings, generalized aspheric surfaces, and holographic surfaces. In addition, the user can create a userdefined surface type, allowing optimization and analysis of specialized surface types that have not been anticipated in the program. Features such as solves and pickups simplify the definition of lens models. Visual Systems can be analyzed in angular units and accomodation can be varied during optimization.

Gradient-index materials can be defined and used as well as can lens arrays (such as GRIN-rod arrays). The capability to handle non-sequentially traced surfaces is also provided; in this case the surfaces are ray traced in the order they are encountered by the light rays rather than the order in which they are entered. A given physical surface is entered only once, but may be encountered many times by the same ray. This facilitates the ray tracing and analysis of a number of special types of optical systems; these include systems with roof mirrors or prisms, corner cubes, light pipes and light collectors of various types, segmented windows, and resonators.

Systems with up to 21 different configurations, each of which may contain up to 25 different object points, can be simultaneously optimized or analyzed. This multi-





configuration (zoom) feature can be used in the design of conventional zoom lenses as well as for many other applications. These include systems with interchangeable elements, reversible components, scanning systems, and systems corrected for multiple object and image conjugates. A general pick-up capability allowing coupling of different types of variables can be used to set up the system for analysis and optimization.

A very powerful programming language called Macro-PLUS(tm) is integrated with CODE V. This is a modern, high-level programming language within CODE V which encompasses the following separate but related aspects of CODE V command mode usage (macros can be written in command mode and run from either command or GUI mode):

- Storing of commands for later execution from a file
- Freedom to use an arithmetic expression in place of a numeric input item
- Access to a broad range of CODE V maintained and calculated data
- User-defined variables, arrays, and functions
- Conditional and looping constructs (FOR, IF, UNTIL, WHILE)
- User-controlled input/output statements with sophisticated format control
- Ability to read from and write to text files stored on disk
- Storing of any CODE V output in the Worksheet Buffer(tm) for later manipulation

A growing library of macros, some written by ORA and some by users, is provided with CODE

3.2 Zemax:

3.2.1 ZEMAX-SE

ZEMAX-SE contains most of the tools needed for sequential optical system design of imaging systems. More advanced features, like Physical Optics, Non-Sequential ray tracing, Polarization ray tracing and others are contained in <u>ZEMAX-EE</u>.

General Capabilities

3D placement of optical surfaces Unlimited number of surfaces, variables, optimization targets etc Multiple Configuration capability Thermal Analysis Point sources, extended sources, .bmp and .jpg sources Telecentric sources





Uniform, Lambertian and Gaussian illumination Source size define by subtended angle, height or image height (real and paraxial) Focal or afocal operation

3.2.2 ZEMAX-EE

ZEMAX-EE contains all the features and capabilities of <u>ZEMAX-SE</u>, plus the following additional capabilities:

Sequential Surfaces

ZEMAX-EE supports the following additional surfaces:

Туре	Description
Birefringent Surface	Models uniaxial crystal polarization components
Jones Matrix	Models idealized polarization components
Non-sequential components	Allows non-sequential objects and ray-tracing to be used in an otherwise sequential system. Ideal for prism modeling or incorporating CAD objects inside a sequential ray trace model
NURBS	Radial and Toroidal NURBS surfaces for freeform optical design
Optically Fabricated Hologram	Comprehensive modeling of optically fabricated holograms, in which two separate optical systems illuminate a common variable-line- space grating, which is then read out by a third optical system. Allows simultaneous optimization and tolerancing of the construction and playback opticla systems.
User-defined surfaces	A powerful capability to write surfaces that are not built-into ZEMAX. Several samples are provided, as examples of how to write such surfaces, and these can also be used just like a built-in surface. The supplied user-defined surfaces include:
	Lens Arrays (rotationally symmetric and cylinder lenses) Filter surfaces to modulate a surface's transmission Gradient Index surfaces





3.2.3 ZEBASE

ZEBASE is a collection of over 600 sequential optical designs in ZEMAX format on CD. ZEBASE includes a copy of Milton Laikin's book, *Lens Design*. ZEBASE includes designs from the book as well as many other sources.

The 360 page ZEBASE User's Guide shows a Layout, Ray Fan Plot, and Field Curvature and Distortion Plots, as well as useful data such as EFL, F/#, and Field of View for each lens.

How is ZEBASE used?

The toughest part of any optical design is knowing where to start! ZEBASE solves this problem by providing a comprehensive catalog of well designed lenses from which new solutions may be derived. To find a good starting point, simply look through the list of categories in the ZEBASE User's Guide. Then, load up a sample lens file in ZEMAX format, and begin your modifications!

What type of lenses are represented?

ZEBASE includes samples of singlets, doublets, achromats, triplets, eyepieces, magnifiers, afocal systems, beam expanders, air spaced triplets, inverse telephotos, retrofocus, wide angles, telephotos, Petzval lenses, microscope objectives, double Gauss lenses, endoscopes, periscopes, riflescopes, mirror telescopes, scanning lenses, projection lenses, zoom lenses, and more.

Requirements

ZEBASE is only useful if you have ZEMAX! Some designs require ZEMAX-EE.

3.2.4 2009 Price List

ZEMAX® Optical Design Programs - Single-User License

ZEMAX-SE (System Requirements)	\$2,000.00
Includes one key, one year of support and upgrades via download	Buy Now
from the web.	
ZEMAX-EE (System Requirements)	\$4,500.00
Includes one key, one year of support and upgrades via download	Buy Now





from the web.	
Shipping, United States / International	Free / \$50.00
	\$4,500.00 per
ZEMAX-EE - Available in 5-User, 10-User, and 25-User Licenses	User License
Includes one network key, one year of support and upgrades via download from the web. This product cannot be ordered online: please contact <u>sales@zemax.com</u> or <u>your local distributor</u> for ordering information.	
Shipping, United States / International	Free / \$50.00
ZEMAX® support and upgrades	
Support for ZEMAX (Single-User License) One year of support and upgrades via download from the web.	\$700.00 <u>Buy Now</u>
Support for ZEMAX (Network License) One year of support and upgrades via download from the web.	\$700.00 per User License <u>Buy Now</u>
Upgrade to EE Requires current support. Obsolete key types must be returned for upgrade.	\$2,500.00 <u>Buy Now</u>
Conversion to Network License Credit given for returned single user license keys. This product cannot be ordered online, please contact <u>sales@zemax.com</u> or <u>your</u> <u>local distributor</u> for ordering information.	

ZEBASETM database of 600+ optical designs in ZEMAX format

ZEBASE [™]	\$500.00
ZEBASE includes the database on CD, a printed catalog of the lens	Buy Now
designs, and the book "Lens Design", by Milton Laikin.	

Shipping, United States / International

Free / \$50.00





Chapter 4 - References

- 1) Code V Product content provided by <u>http://www.opticalres.com/index.html</u>
- 2) Zemax Product content provided by <u>http://www.zemax.com/</u>
- 3) Rick Juergens, a former ORA employee and current Raytheon modeling master.