Please note that this is a work in progress and it is being augmented just about every day!

PDF DOCUMENTATION
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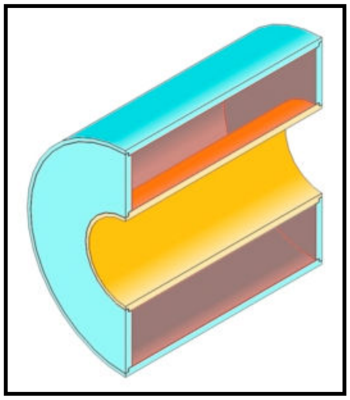
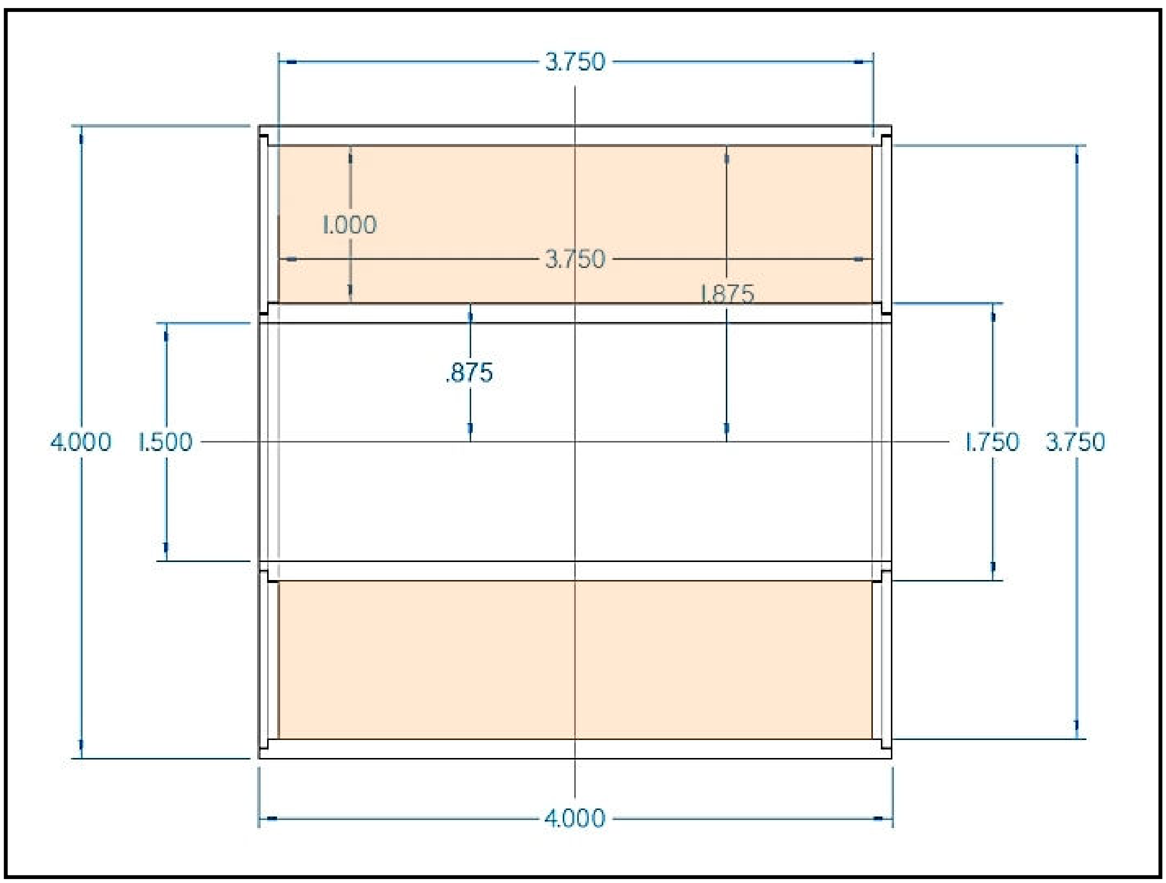
DESIGN GOALS

Given: Cut-away and Outline drawings of a housing to contain a single solenoid type coil are shown below. The housing overall length, outer diameter and inner diameter are defined by the customer as per their requirements. All housing parts are to be non-magnetic. The I.D. sleeve shall be non-conductive (phenolic). The housing cylinder and end plates shall be aluminum to facilitate heat transfer from the coils to the surrounding air space.

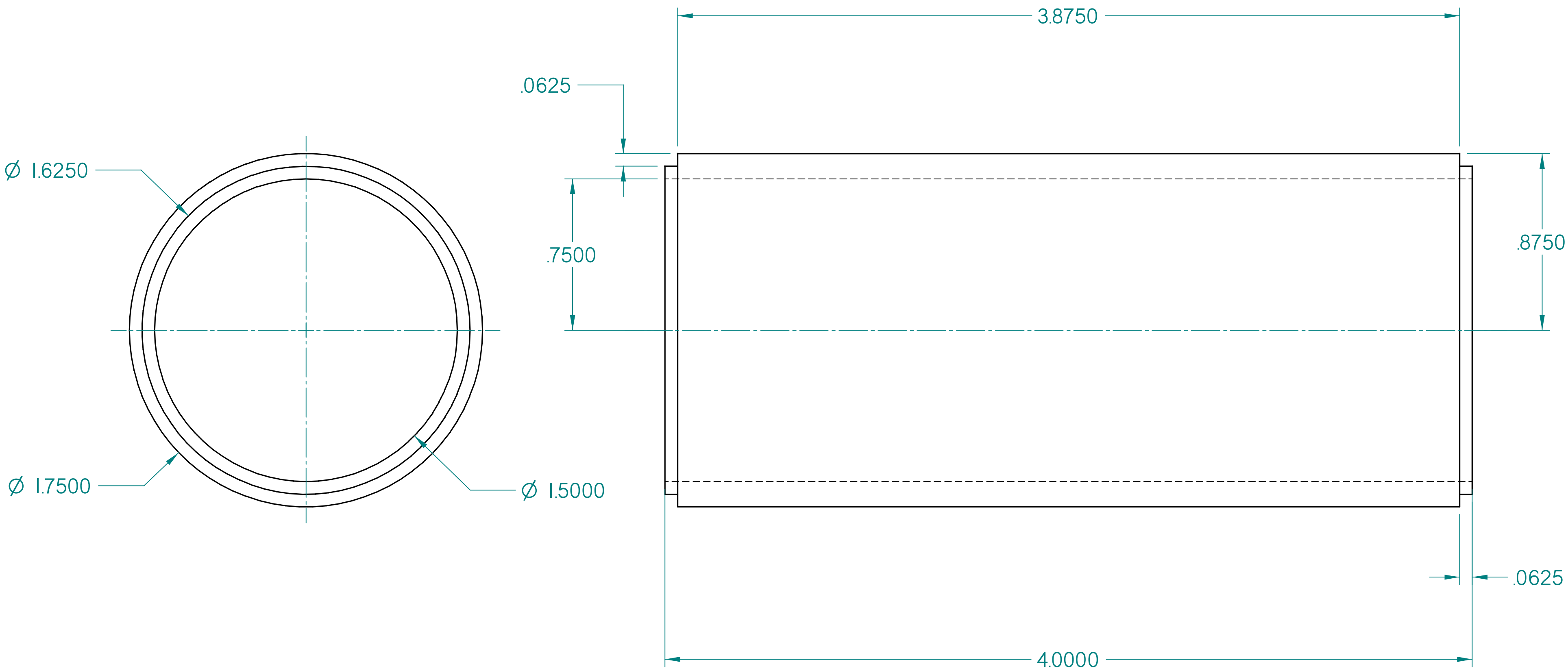
Objective: To wind a coil in the available (shaded) volume that will yield a 200 +/- 5% gauss peak field while drawing 1.0 amp of D.C. current. The power requirement shall not exceed 10 watts.



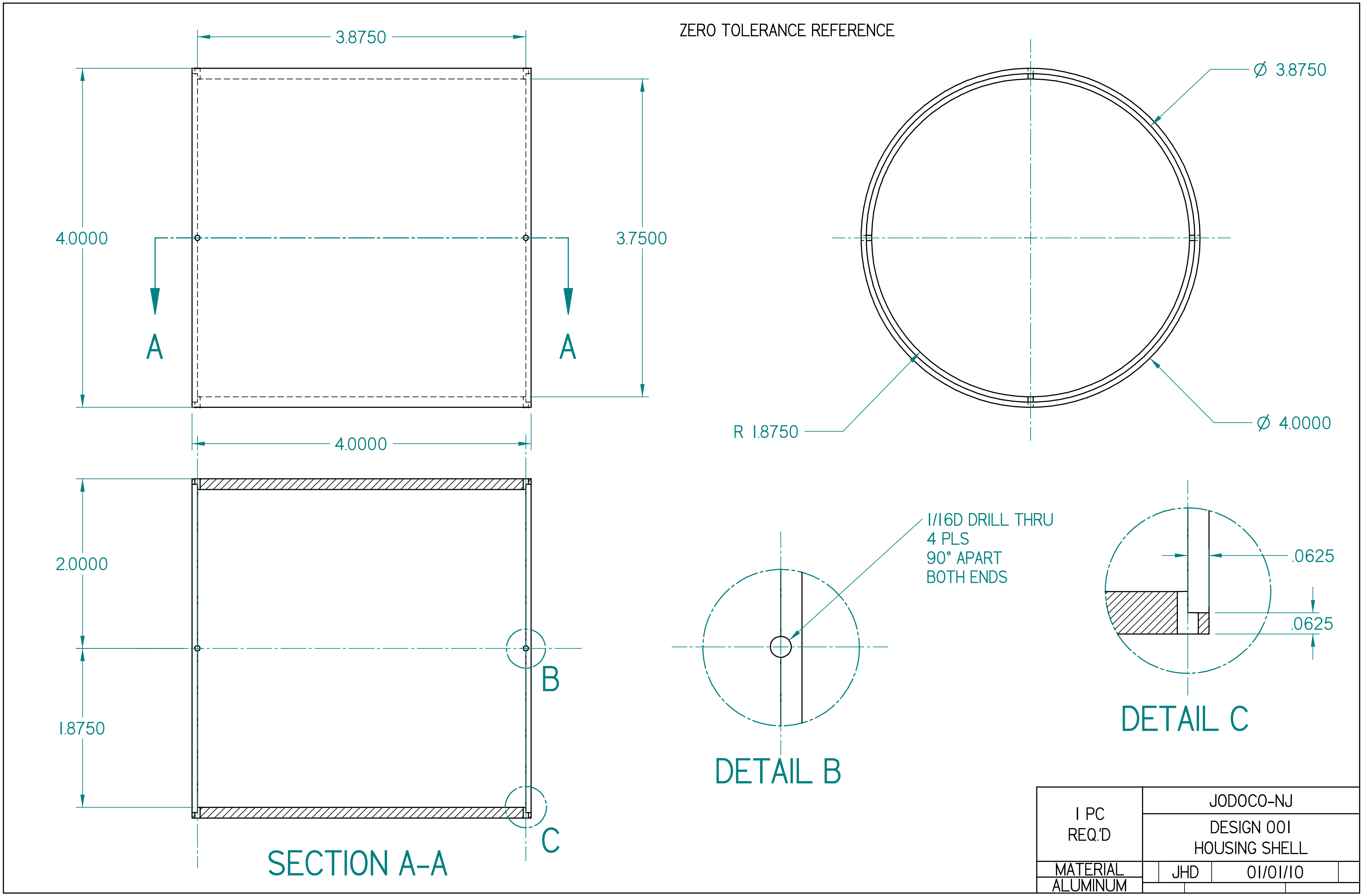
The 3D solid cut-away (left) and the outline sketch (below) were created using Solid Edge 3D Demo, Jasc Paint Shop Pro and Micrografix Picture Publisher.

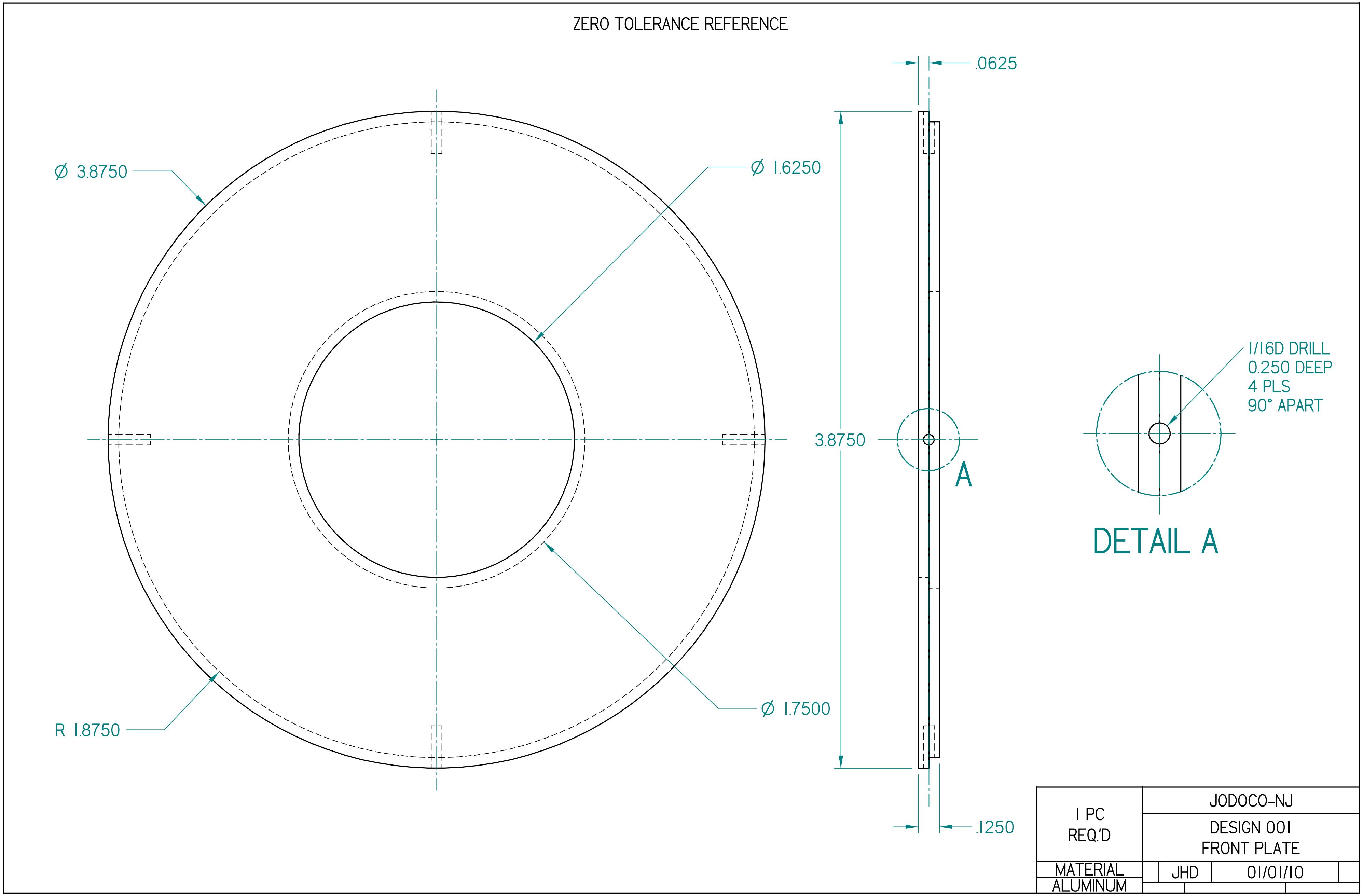


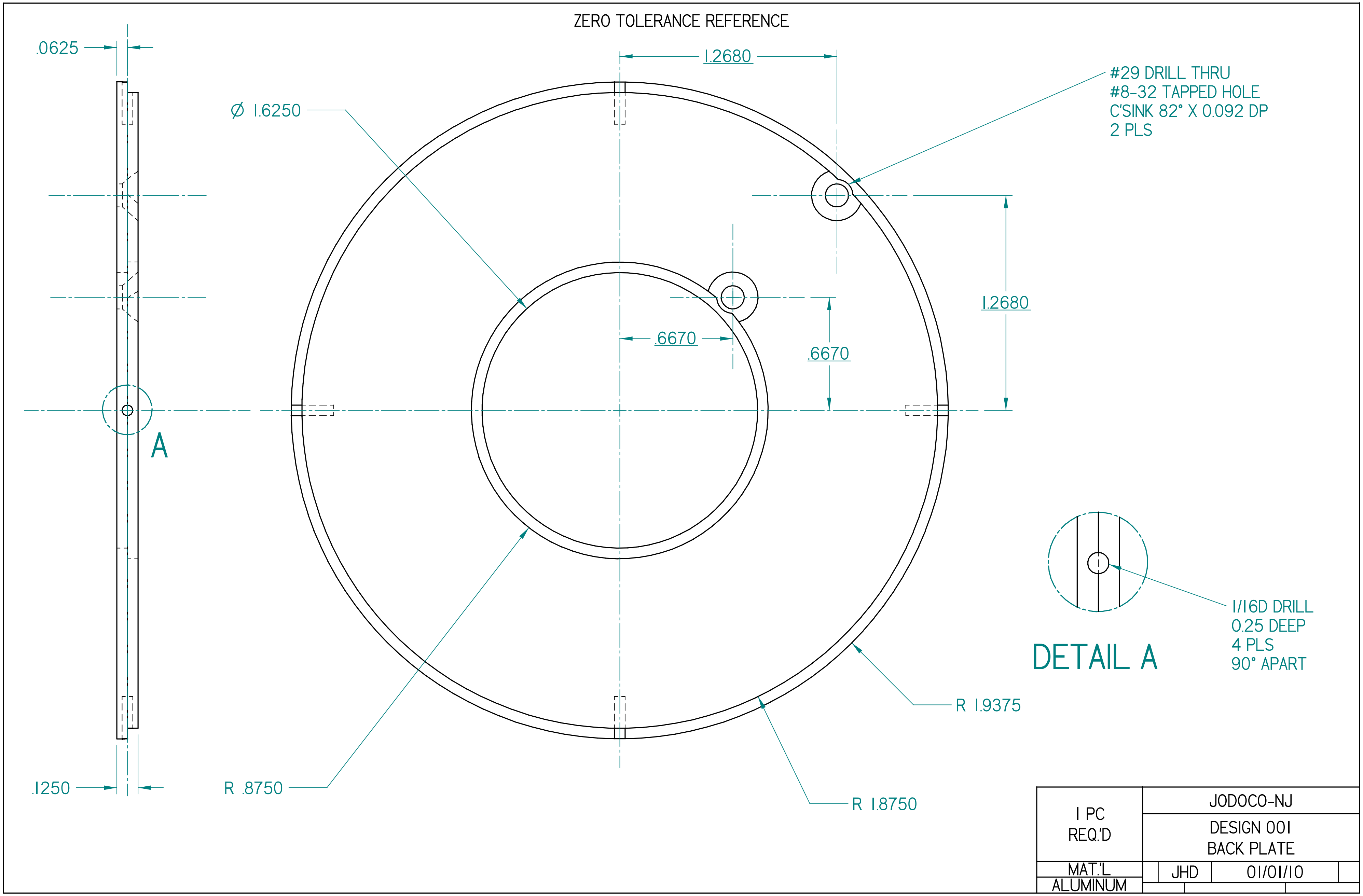
ZERO TOLERANCE REFERENCE



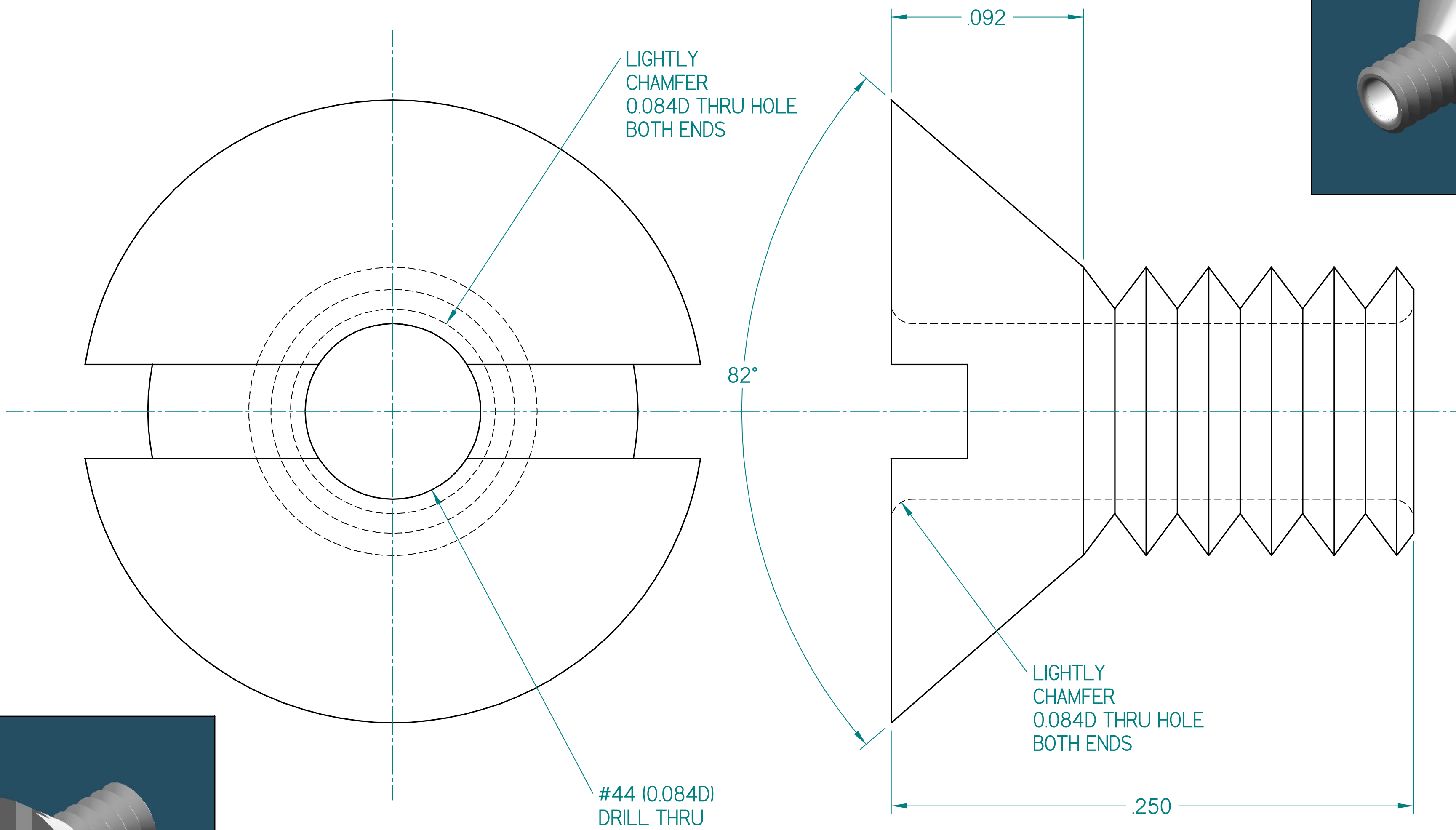
1 PC REQ'D	JODOCO-NJ		
	DESIGN 001 I.D. SLEEVE		
MAT.'L		JHD	01/01/10
PHENOLIC			

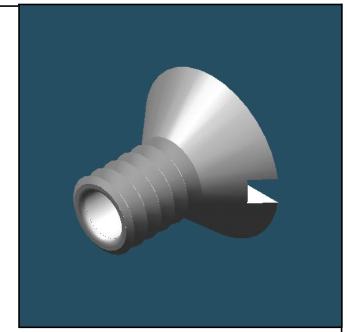

ZERO TOLERANCE REFERENCE
3.8750
4.0000
3.7500
A
A
Ø 3.8750
R 1.8750
Ø 4.0000
4.0000
2.0000
1.8750
B
C
SECTION A-A
1/16D DRILL THRU
4 PLS
90° APART
BOTH ENDS
.0625
.0625
DETAIL B
DETAIL C
1 PC
REQ.'D
JODOCO-NJ
DESIGN 001
HOUSING SHELL
MATERIAL
ALUMINUM
JHD
01/01/10

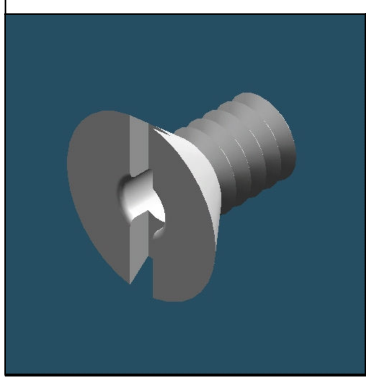

ZERO TOLERANCE REFERENCE
Ø 3.8750
Ø 1.6250
Ø 1.7500
R 1.8750
.0625
3.8750
.1250
A
1/16D DRILL
0.250 DEEP
4 PLS
90° APART
DETAIL A
1 PC
REQ.'D
MATERIAL
ALUMINUM
JODOCO-NJ
DESIGN 001
FRONT PLATE
JHD
01/01/10



ZERO TOLERANCE REFERENCE
.0625
1.2680
#29 DRILL THRU
#8-32 TAPPED HOLE
C'SINK 82° X 0.092 DP
2 PLS
Ø 1.6250
1.2680
.6670
.6670
A
DETAIL A
1/16D DRILL
0.25 DEEP
4 PLS
90° APART
R 1.9375
.1250
R .8750
R 1.8750
1 PC
REQ'D
MAT'L
ALUMINUM
JODOCO-NJ
DESIGN 001
BACK PLATE
JHD
01/01/10



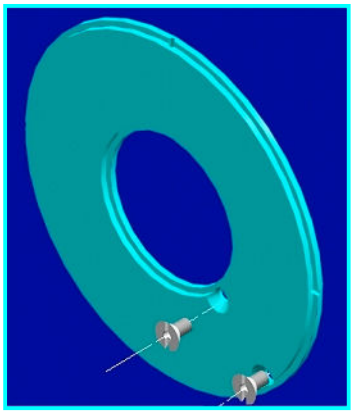




THESE INSERTS SCREW INTO THE #8-32 TAPPED HOLES IN THE BACK PLATE.
TRIM THE EXCESS SCREW HEAD MATERIAL OUT OF THE I.D. AND O.D. STEPS
TO ALLOW ASSEMBLY WITH THE I.D. SLEEVE AND HOUSING SHELL
THE 0.084D HOLE WILL ACCOMMODATE #18E TEFLON LEAD WIRE (0.074D)

2 PCS REQ.'D	JODOCO-NJ	
	LEAD WIRE EXIT INSERT (#8-32 SCREW MODIFIED)	
MAT.'L	JHD	01/01/10
NYLON		

BACK END PLATE
LEAD EXIT INSERTS

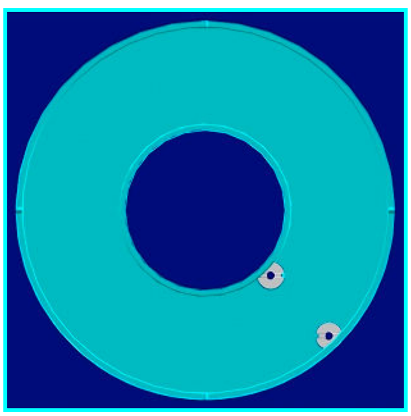


This view shows the inside face of the Back End Plate.

The 2 Lead Exit Inserts (modified #8-32 Nylon Screws) are screwed into the threaded, C'Sinked holes as shown.

The inside lead exit hole will accommodate the #18E Teflon Lead Wire attached to the START of the internal solenoid coil.

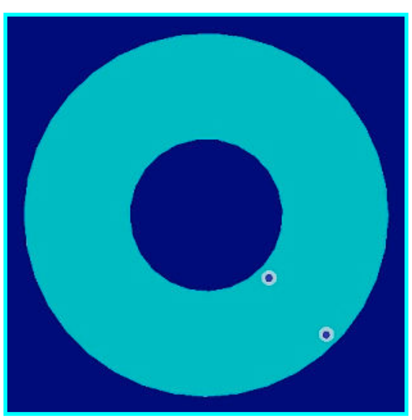
Likewise, the outside lead exit hole will accommodate the #18E Teflon Lead Wire attached to the FINISH of the internal coil.



Again, we have a view of the inside face of the Back End Plate.

Here we show the inserts (screws) fully seated and trimmed too allow the inside and outside steps to mate with the I.D. Sleeve and Housing Shell respectively.

Once the sleeve and shell are in place the inserts can not rotate or come loose.



This view shows the outside face of the Back End Plate with Lead Exit Inserts in place.

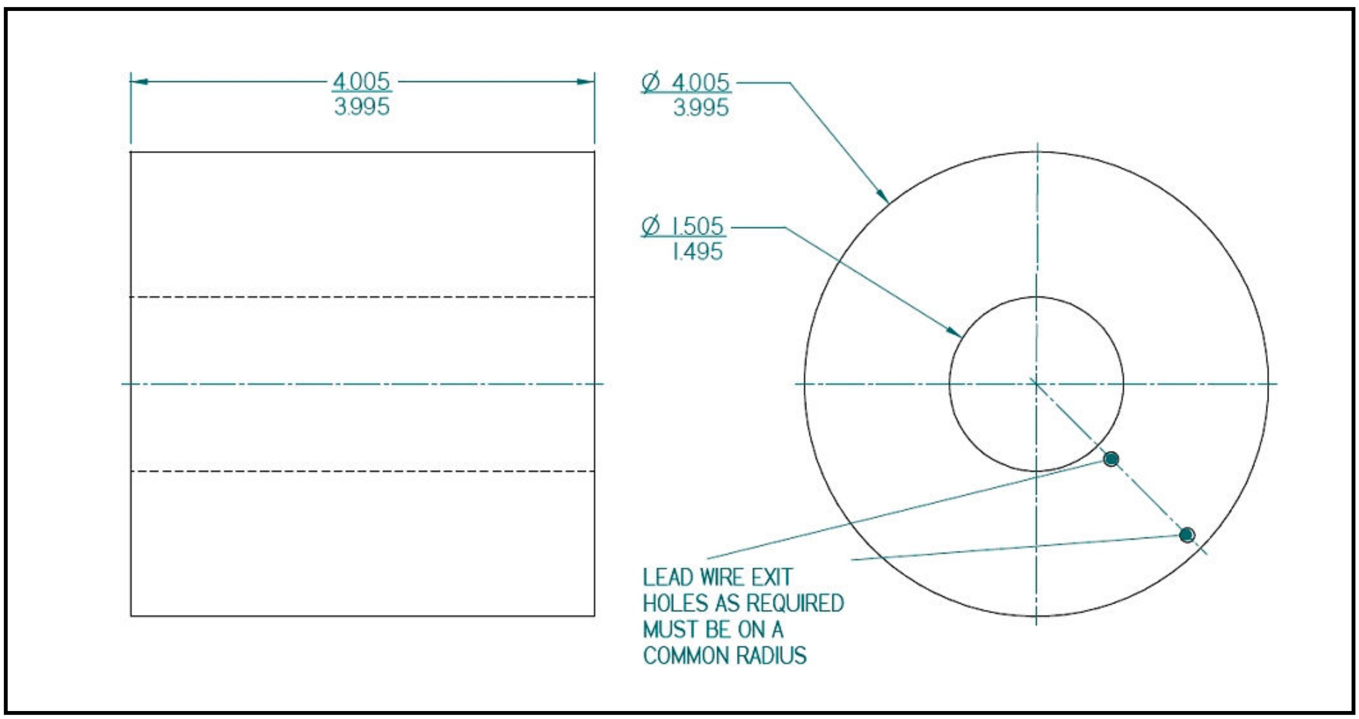
CRITICAL DIMENSIONS OUTLINE DRAWING and NOTES

The dimensional tolerances shown in the outline drawing below are required to meet the customer's specifications.

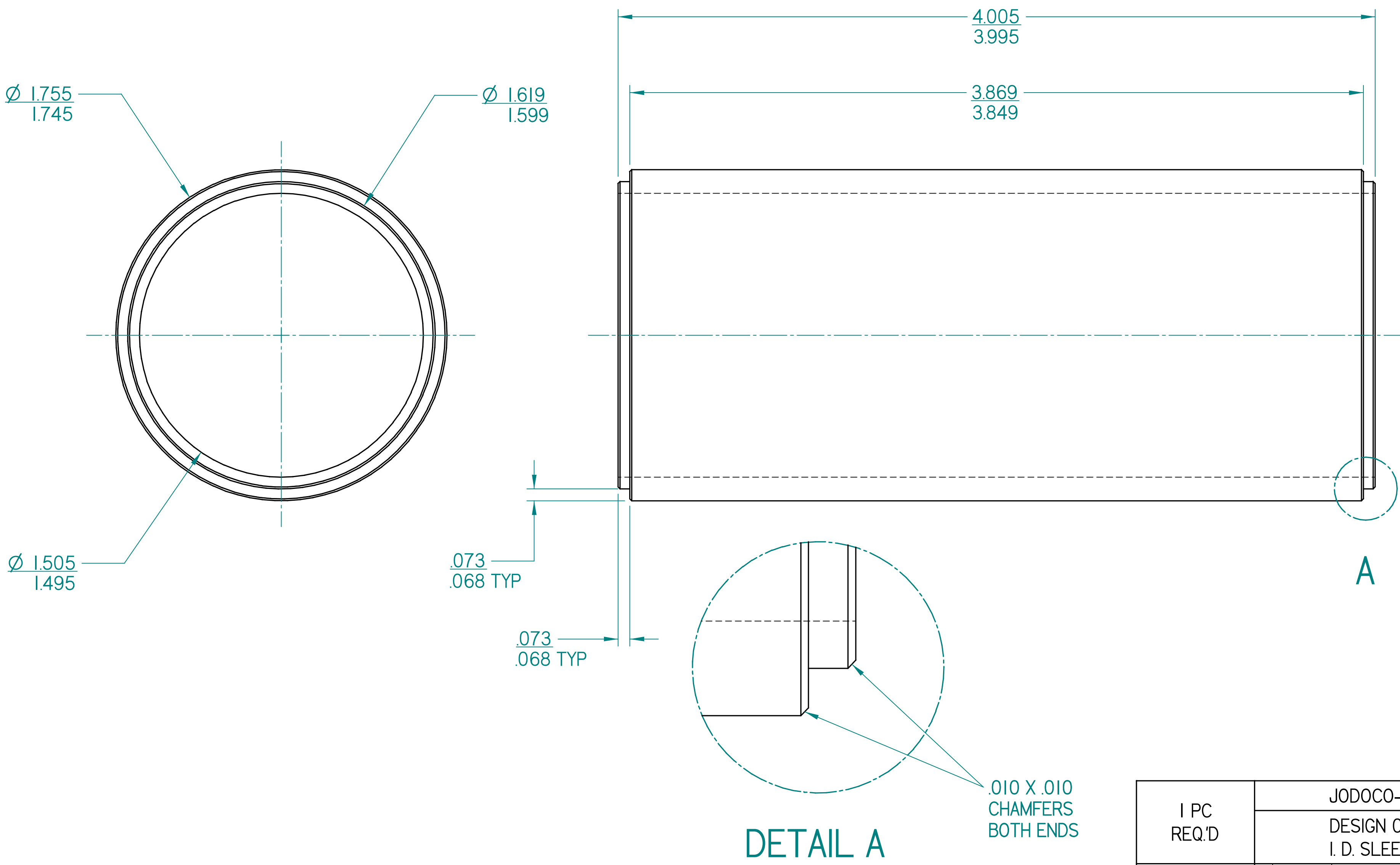
The thickness of the End Plates and the Wall thicknesses of the I.D. Sleeve and Housing Shell shall be 0.125" nominal.

The I.D. Sleeve is made of Phenolic (non-magnetic and non-conductive).

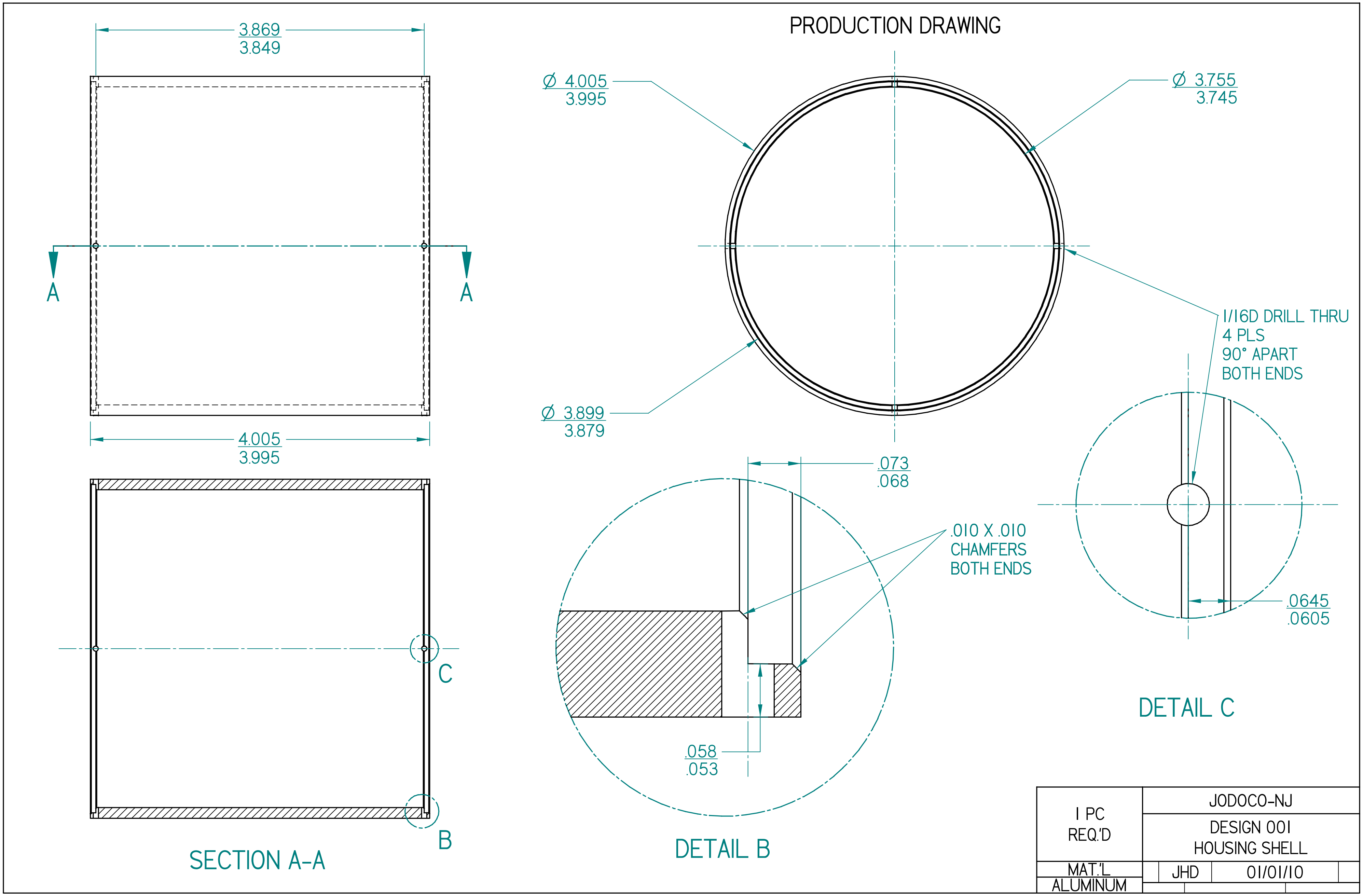
The Housing Shell and End Plates are Aluminum (non-magnetic and good heat transfer).



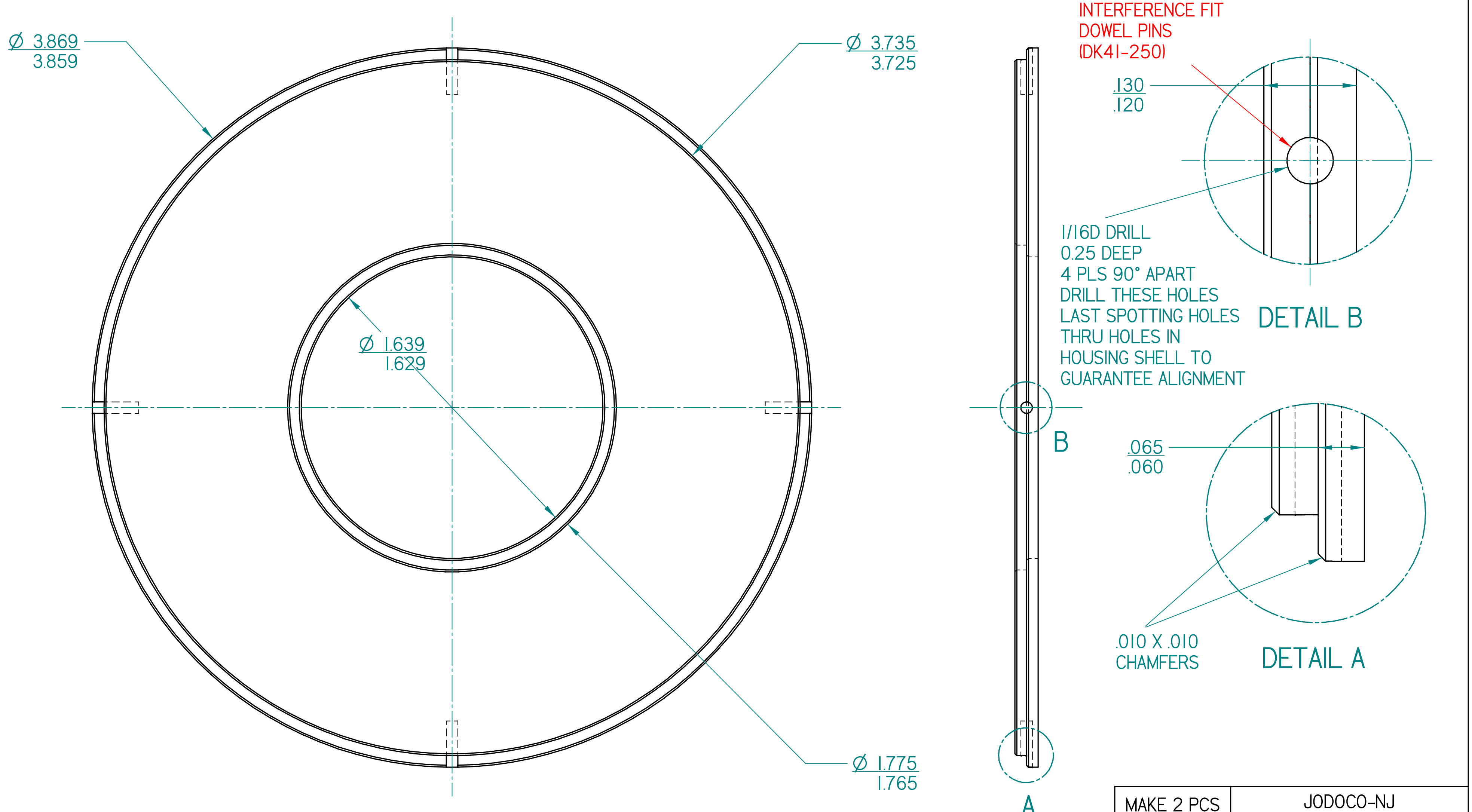
PRODUCTION DRAWING



1 PC REQ'D	JODOCO-NJ
	DESIGN 001 I. D. SLEEVE
MAT'L	JHD 01/01/10
PHENOLIC	

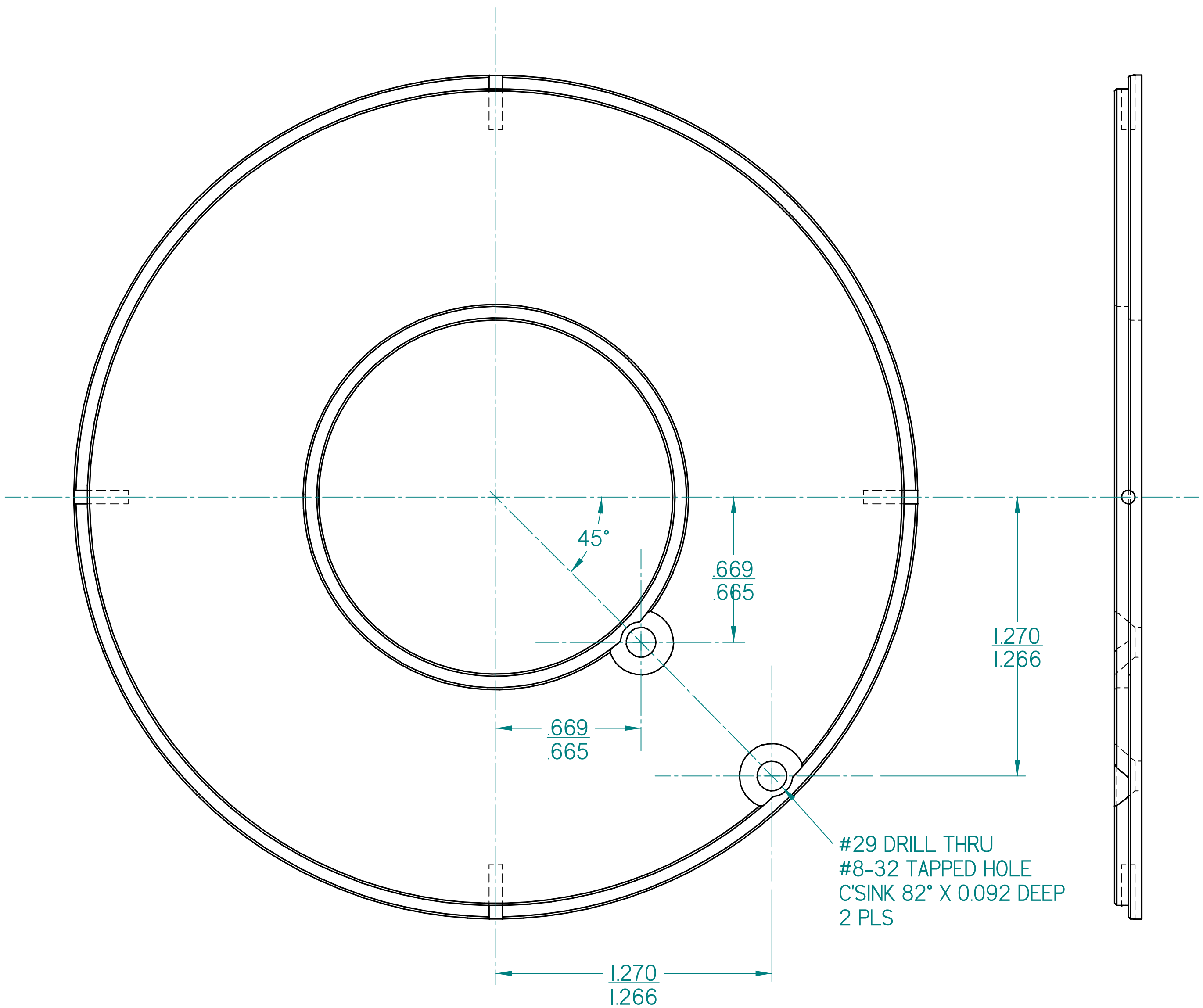

PRODUCTION DRAWING
3.869
3.849
4.005
3.995
A
A
Ø 4.005
3.995
Ø 3.755
3.745
Ø 3.899
3.879
1/16D DRILL THRU
4 PLS
90° APART
BOTH ENDS
.073
.068
.010 X .010
CHAMFERS
BOTH ENDS
.0645
.0605
.058
.053
C
B
SECTION A-A
DETAIL B
DETAIL C
1 PC
REQ'D
JODOCO-NJ
DESIGN 001
HOUSING SHELL
MAT'L
ALUMINUM
JHD
01/01/10

PRODUCTION DRAWING



MAKE 2 PCS (1 PC FOR BACK PLATE)	JODOCO-NJ	
	DESIGN 001 FRONT PLATE	
MAT'L ALUMINUM	JHD	01/01/10

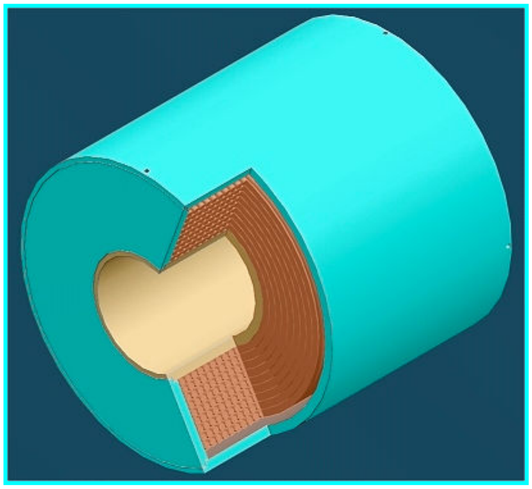
PRODUCTION DRAWING



THIS BACK PLATE IS EXACTLY THE SAME AS THE FRONT PLATE EXCEPT FOR THE 2 C'SINKED #8-32 TAPPEDH HOLES WHICH WILL ACCOMODATE THE NYLON LEAD EXIT INSERTS

1 PC REQ'D	JODOCO-NJ		
	DESIGN 001 BACK PLATE		
MAT'L ALUMINUM		JHD	01/01/10

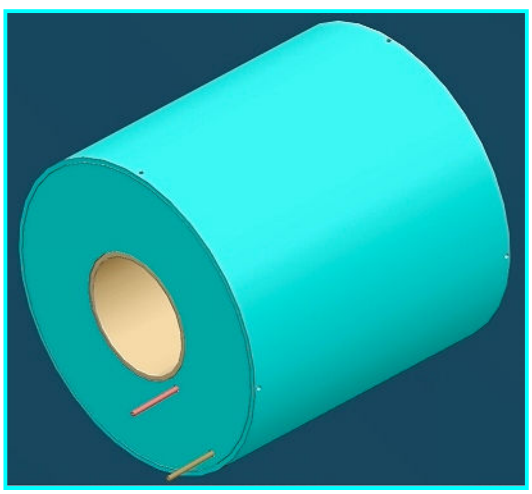
ASSEMBLED UNIT



Front and Side View:

The Front Plate is held in place by 4 - 1/16D Interference Fit Dowel Pins (such as DK41-250).

The cut-away shows a graphic representation of the solenoid coil wound to fit in this unit.



Back and Side View:

The Back Plate, like the Front Plate, is held in place 4 – 1/16D Interference Fit Dowel Pins.

Cut-off sections of the red and brown lead wires are shown exiting the Back Plate.

This page reserved for AutoCAD drawing samples.

This page reserved for AutoCAD drawing samples.

This page reserved for AutoCAD drawing samples.

This page reserved for AutoCAD drawing samples.

COIL PARAMETERS

The items in red are required by a coil design program I wrote in C to calculate the items in blue. This page is outputed by that program. The program can combine up to 5 coils. We're just building a simple air-core solenoid. Several wire sizes were chosen and the total number of turns that could be placed in the available volume was calculated knowing the wire diameters. Turns/inch was then calculated. The #18E magnet wire results are shown here.

```
AuxF2_WireSize.......:  0
AuxF1_WireSize.......:  0
Main_WireSize........: 18
AuxB1_WireSize.......:  0
AuxB2_WireSize.......:  0
----------
Gauss at Center......:  198.1813
Desired Gauss........:  200.0000
----------
AuxF2_Len............:    0.0000 Spacer1..............:    0.0000
AuxF2_ID.............:    0.0000 AuxF2_OD.............:    0.0000
AuxF2_TPI............:    0.0000 AuxF2_Current........:    0.0000
AuxF2_TotalTurns.....:    0.0000 AuxF2_MeanDia........:    0.0000
AuxF2_TotalLen.......:    0.0000 AuxF2_CoilResistance.:    0.0000
AuxF2_CoilPower......:    0.0000
----------
AuxF1_Len............:    0.0000 Spacer2..............:    0.0000
AuxF1_ID.............:    0.0000 AuxF1_OD.............:    0.0000
AuxF1_TPI............:    0.0000 AuxF1_Current........:    0.0000
AuxF1_TotalTurns.....:    0.0000 AuxF1_MeanDia........:    0.0000
AuxF1_TotalLen.......:    0.0000 AuxF1_CoilResistance.:    0.0000
AuxF1_CoilPower......:    0.0000
----------
Main_Coil_Len........:    3.7500 Spacer3..............:    0.0000
Main_Coil_ID.........:    1.7500 Main_Coil_OD.........:    3.7500
Main_Coil_TPI........:  485.6800 Main_Coil_Current....:    1.0000
Main_TotalTurns......: 1821.3000 Main_MeanDia.........:    2.7500
Main_TotalLen........: 1311.2419 Main_CoilResistance..:    8.3736
Main_CoilPower.......:    8.5280
----------
AuxB1_Len............:    0.0000 Spacer4..............:    0.0000
AuxB1_ID.............:    0.0000 AuxB1_OD.............:    0.0000
AuxB1_TPI............:    0.0000 AuxB1_Current........:    0.0000
AuxB1_TotalTurns.....:    0.0000 AuxB1_MeanDia........:    0.0000
AuxB1_TotalLen.......:    0.0000 AuxB1_CoilResistance.:    0.0000
AuxB1_CoilPower......:    0.0000
----------
AuxB2_Len............:    0.0000
AuxB2_ID.............:    0.0000 AuxB2_OD.............:    0.0000
AuxB2_TPI............:    0.0000 AuxB2_Current........:    0.0000
AuxB2_TotalTurns.....:    0.0000 AuxB2_MeanDia........:    0.0000
AuxB2_TotalLen.......:    0.0000 AuxB2_CoilResistance.:    0.0000
AuxB2_CoilPower......:    0.0000
----------
I for Desired Gauss..:    1.0092
TotalResistance......:    8.3736
TotalPower...........:    8.5280
```

PROGRAM CALCULATED FIELD DATA

The program also creates data table files to be used by spreadsheet/graphing software. Below are some excerpted sections for our coil design. The first column is axial distance. The second column is the axial field strength of our proposed coil. The program calculates data from the center of the coil +/- 30 inches. We are going to graph only the data for the center of the unit +/- 4 inches (**26 – 34** inches or 0 – 8 inches as shown in the graph on the next page). The last 5 columns are not relevant.

.
.
.

26.01084	16.9300	0.0000	0.0000	0.0000	0.0000	16.7759
26.03585	17.2682	0.0000	0.0000	0.0000	0.0000	17.1111
26.06086	17.6151	0.0000	0.0000	0.0000	0.0000	17.4548
26.08587	17.9710	0.0000	0.0000	0.0000	0.0000	17.8075
26.11088	18.3362	0.0000	0.0000	0.0000	0.0000	18.1693
26.13589	18.7109	0.0000	0.0000	0.0000	0.0000	18.5406
26.16090	19.0955	0.0000	0.0000	0.0000	0.0000	18.9217
26.18591	19.4902	0.0000	0.0000	0.0000	0.0000	19.3128
26.21092	19.8953	0.0000	0.0000	0.0000	0.0000	19.7142
26.23593	20.3112	0.0000	0.0000	0.0000	0.0000	20.1264
26.26094	20.7382	0.0000	0.0000	0.0000	0.0000	20.5495
26.28595	21.1767	0.0000	0.0000	0.0000	0.0000	20.9840
26.31096	21.6270	0.0000	0.0000	0.0000	0.0000	21.4301
26.33597	22.0894	0.0000	0.0000	0.0000	0.0000	21.8883
26.36098	22.5643	0.0000	0.0000	0.0000	0.0000	22.3589
26.38599	23.0522	0.0000	0.0000	0.0000	0.0000	22.8424
26.41100	23.5534	0.0000	0.0000	0.0000	0.0000	23.3390
26.43602	24.0683	0.0000	0.0000	0.0000	0.0000	23.8492
26.46103	24.5974	0.0000	0.0000	0.0000	0.0000	24.3735
26.48604	25.1410	0.0000	0.0000	0.0000	0.0000	24.9122
26.51105	25.6998	0.0000	0.0000	0.0000	0.0000	25.4659
26.53606	26.2740	0.0000	0.0000	0.0000	0.0000	26.0349
26.56107	26.8642	0.0000	0.0000	0.0000	0.0000	26.6197
26.58608	27.4709	0.0000	0.0000	0.0000	0.0000	27.2208

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33.53897	24.5974	0.0000	0.0000	0.0000	0.0000	24.3735
33.56398	24.0683	0.0000	0.0000	0.0000	0.0000	23.8492
33.58900	23.5534	0.0000	0.0000	0.0000	0.0000	23.3390
33.61401	23.0522	0.0000	0.0000	0.0000	0.0000	22.8424
33.63902	22.5643	0.0000	0.0000	0.0000	0.0000	22.3589
33.66403	22.0894	0.0000	0.0000	0.0000	0.0000	21.8883
33.68904	21.6270	0.0000	0.0000	0.0000	0.0000	21.4301
33.71405	21.1767	0.0000	0.0000	0.0000	0.0000	20.9840
33.73906	20.7382	0.0000	0.0000	0.0000	0.0000	20.5495
33.76407	20.3112	0.0000	0.0000	0.0000	0.0000	20.1264
33.78908	19.8953	0.0000	0.0000	0.0000	0.0000	19.7142
33.81409	19.4902	0.0000	0.0000	0.0000	0.0000	19.3128
33.83910	19.0955	0.0000	0.0000	0.0000	0.0000	18.9217
33.86411	18.7109	0.0000	0.0000	0.0000	0.0000	18.5406
33.88912	18.3362	0.0000	0.0000	0.0000	0.0000	18.1693
33.91413	17.9710	0.0000	0.0000	0.0000	0.0000	17.8075
33.93914	17.6151	0.0000	0.0000	0.0000	0.0000	17.4548
33.96415	17.2682	0.0000	0.0000	0.0000	0.0000	17.1111
33.98916	16.9300	0.0000	0.0000	0.0000	0.0000	16.7759
34.01417	16.6003	0.0000	0.0000	0.0000	0.0000	16.4492

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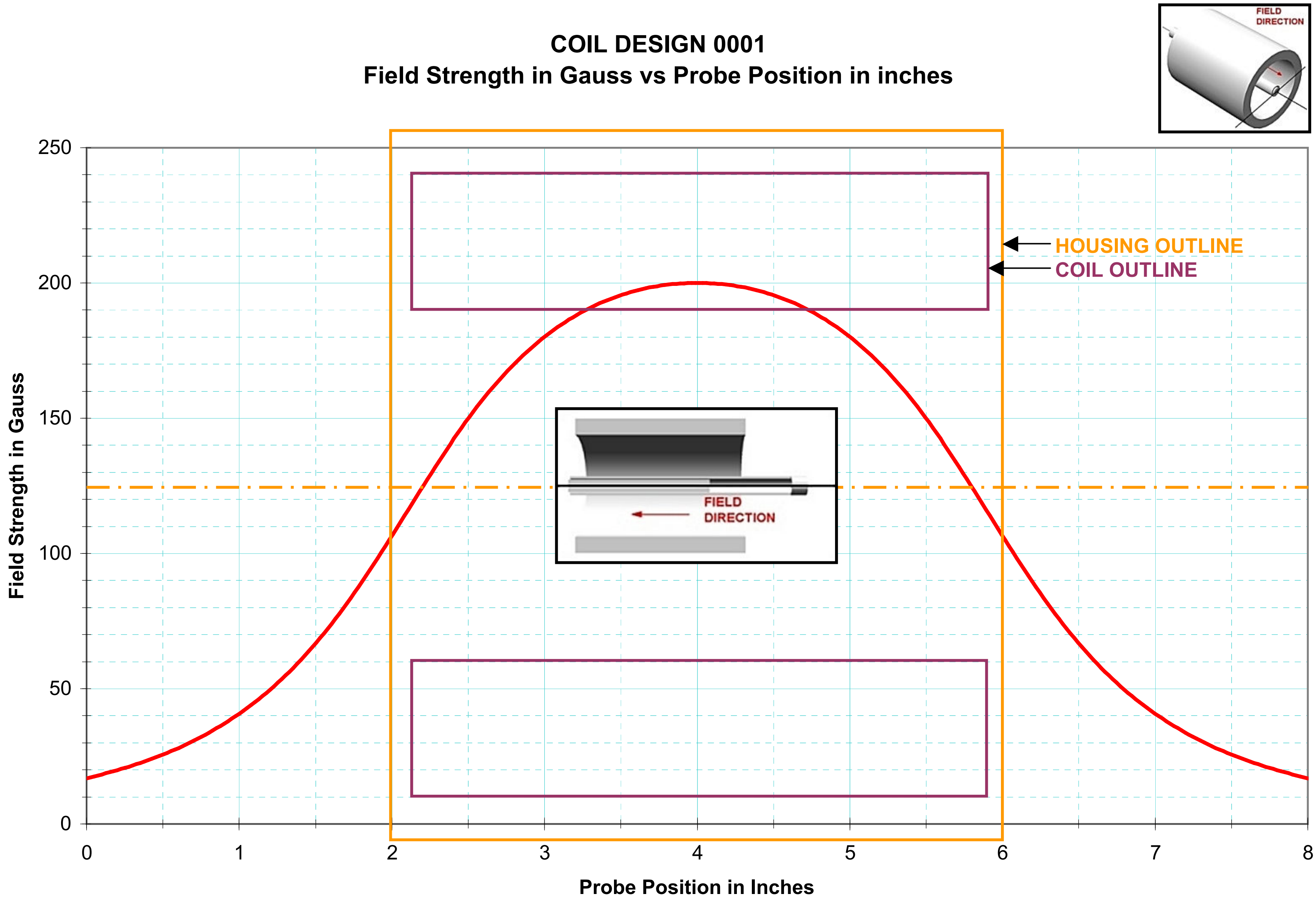
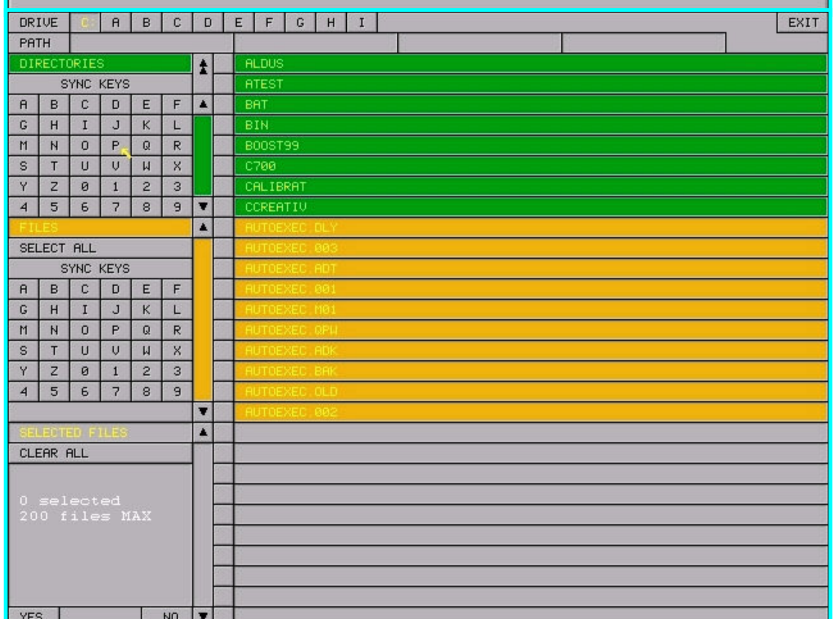
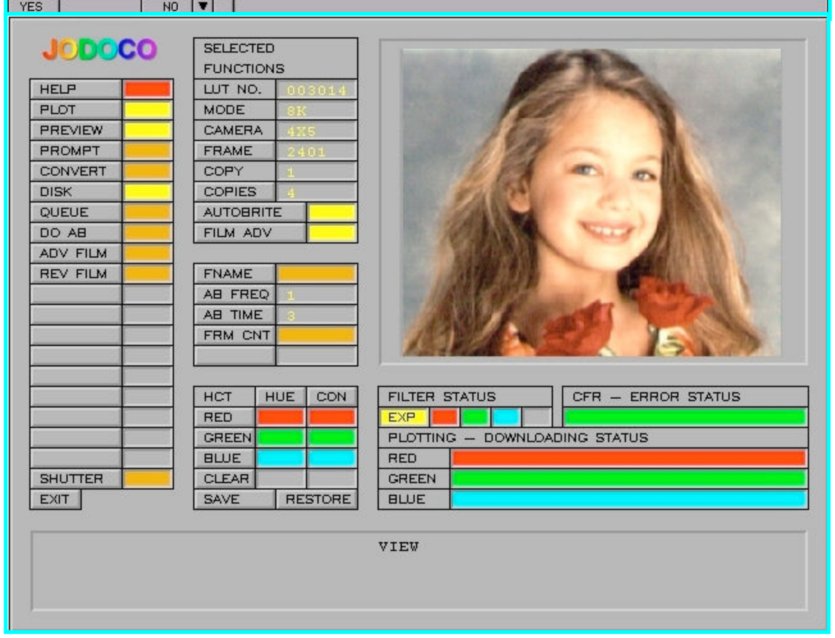
COIL DESIGN 0001
Field Strength in Gauss vs Probe Position in inches



C/C++ Programming – GUI Creator





When I first began programming in C, I rewrote a basic program I used to print checks for paying my bills. The first version was strictly dialogue oriented. Then I thought it would be neat to represent the layout of the check graphically on screen. Used graphic functions in uSoft C to create a GUI with panels, labeled buttons, text display windows and a dialogue box. Each button had a subroutine (function) associated with it. Each button function's entry and exit code was identical. Each button had it's own call to whatever function was written to perform the button's job. The same was true for all graphic items. Realizing the repetitive nature of it all, I rewrote the program setting up numbered button arrays, text display window arrays and so on for all graphic items as well as text string arrays for corresponding buttons. This all worked out very well.

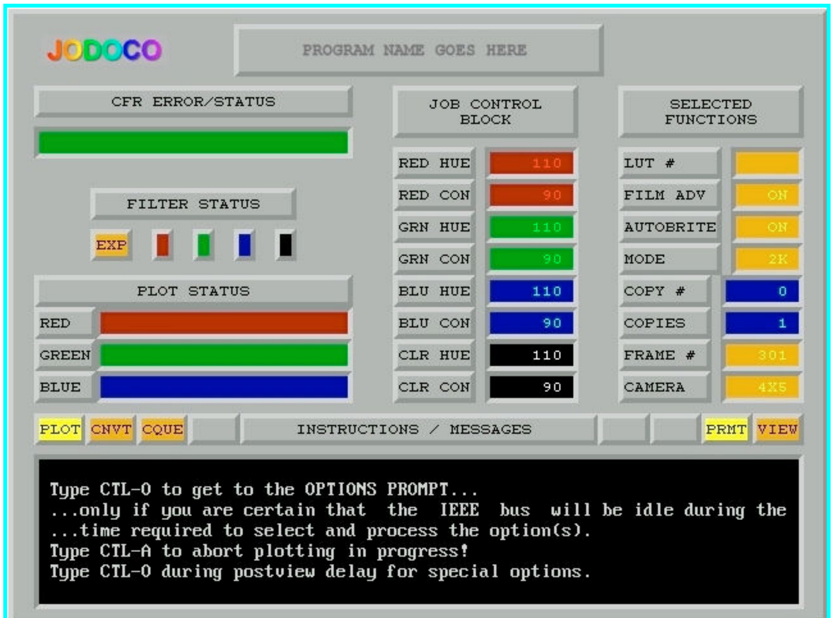
After this exercise, I realized that any kind of GUI layout could be defined using this program as a template (thought of calling it a C-Shell). Hence, renamed a copy of the program GUI.C and replaced specific nomenclature with generic. Made sure the program supported: Panels, Buttons, Display Windows, Dialog Boxes, Graphic Work Areas and drawing simple boxes for sectioning areas on the GUI.

Mapping image files into the GUI was fun. Had to graduate from 16 color video mode to 256 (max at the time) to display decent pictures. Therefore, two versions of the GUI.C program came into existence … GUI16.C and GUI256.C.

Using the GUI programs as templates facilitated the writing of many programs used to operate tests stands and prove out hardware interfaces to company products such as film recorders and camera interfaces. Programs are all DOS-Stand Alone as well as run-able via Windows OS.

The first GUI on this page is a capable of calling and running programs. The second is a File-Selector for subsequent program use. The last demonstrates mapping a video image file into a local work area for confirmation before sending to film.

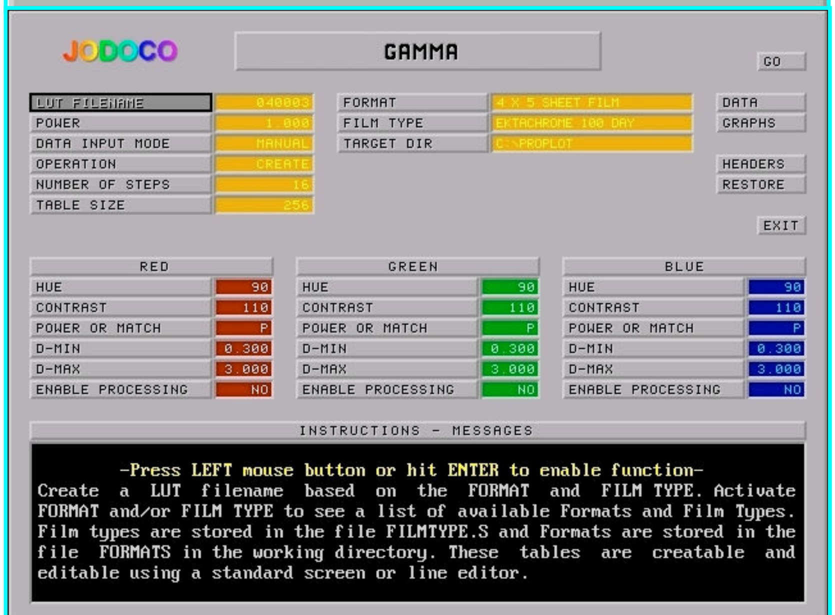
C/C++ Programming – GUI Creator (cont.'d)



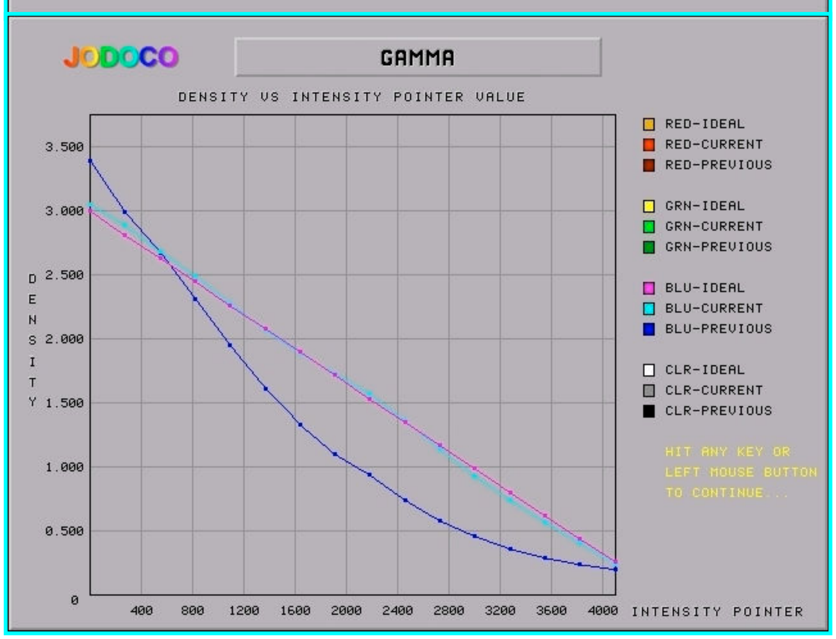
This GUI controls a program that sends image data to a film recording device.

Plot Status progress bars show the data transfer in process. Note that color data is stored in Red, Green and Blue Field Files.

The Dialogue Box displays useful information and instructions.



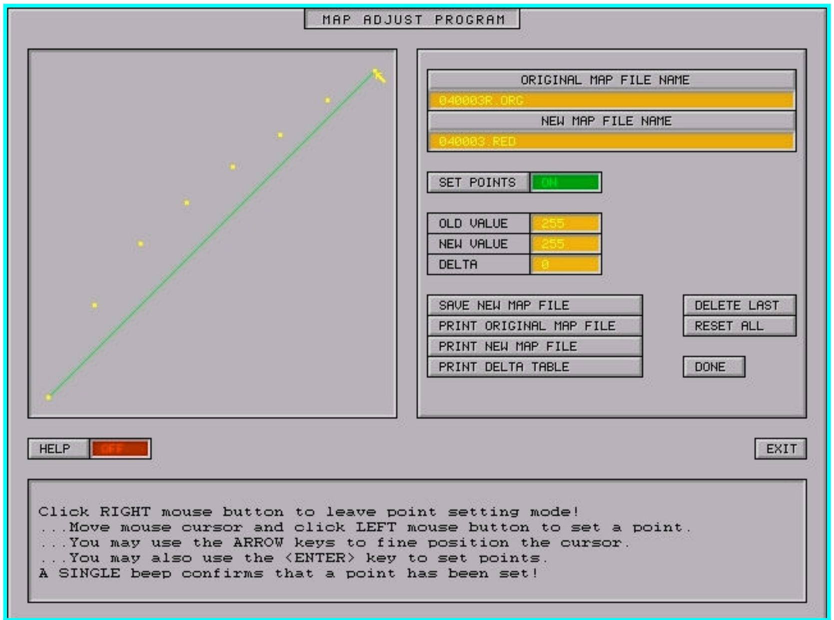
Here we have a GUI that controls a program allowing an operator to create brightness and contrast look-up tables to optimize using the full dynamic range of the film in use. In essence, this is a Gamma Correction program to calibrate the recording device and film combo.



This GUI is used to display graphs showing the film densities achieved as a result of the Gamma correction process. Video DACs are 12-bit (0-4096). A graduated step wedge is printed to film (BLUE-PREVIOUS). The desired response is shown (BLUE-IDEAL). The table-corrected result is shown (BLUE-CURRENT). The result is acceptably close to the ideal.

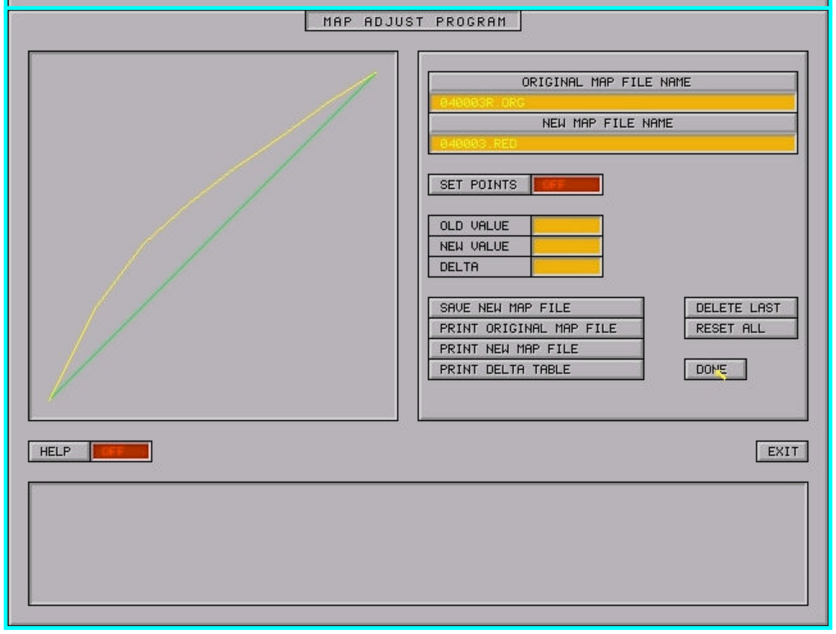
As you can see, this graph represents the blue field data.

C/C++ Programming – GUI Creator (cont.'d)



Here we have two views of the same GUI that allows an operator to modify brightness/contrast look-up tables manually.

The operator places set points (first GUI) in the graphic work space.



The program "connects the dots" and takes the data represented by the green curve and creates a modified table (yellow) which may now be used by the recording device.

Info on the actual C programs (GUI, GUI16 and GUI256) to soon follow…