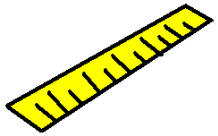
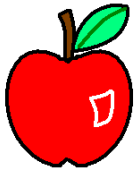
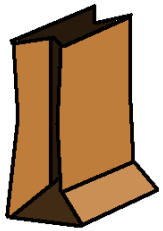
J&H Machine Tools





LUNCH 'N LEARN



ZEISS

Macros

J&H Machine Tools

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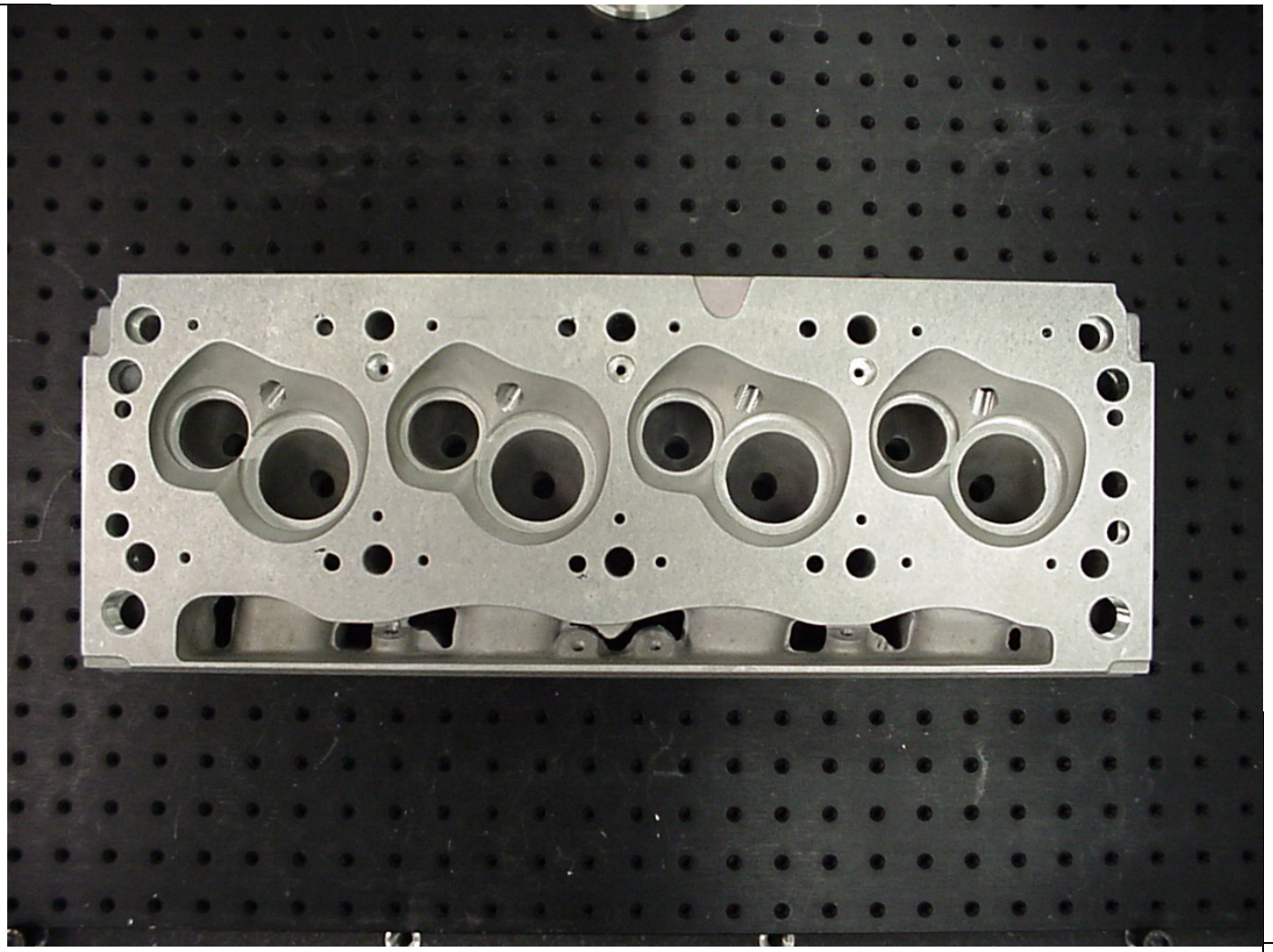
ZEISS

Macros are similar to patterns and are used on parts with repeating features and characteristics.

A perfect example is this cylinder head.



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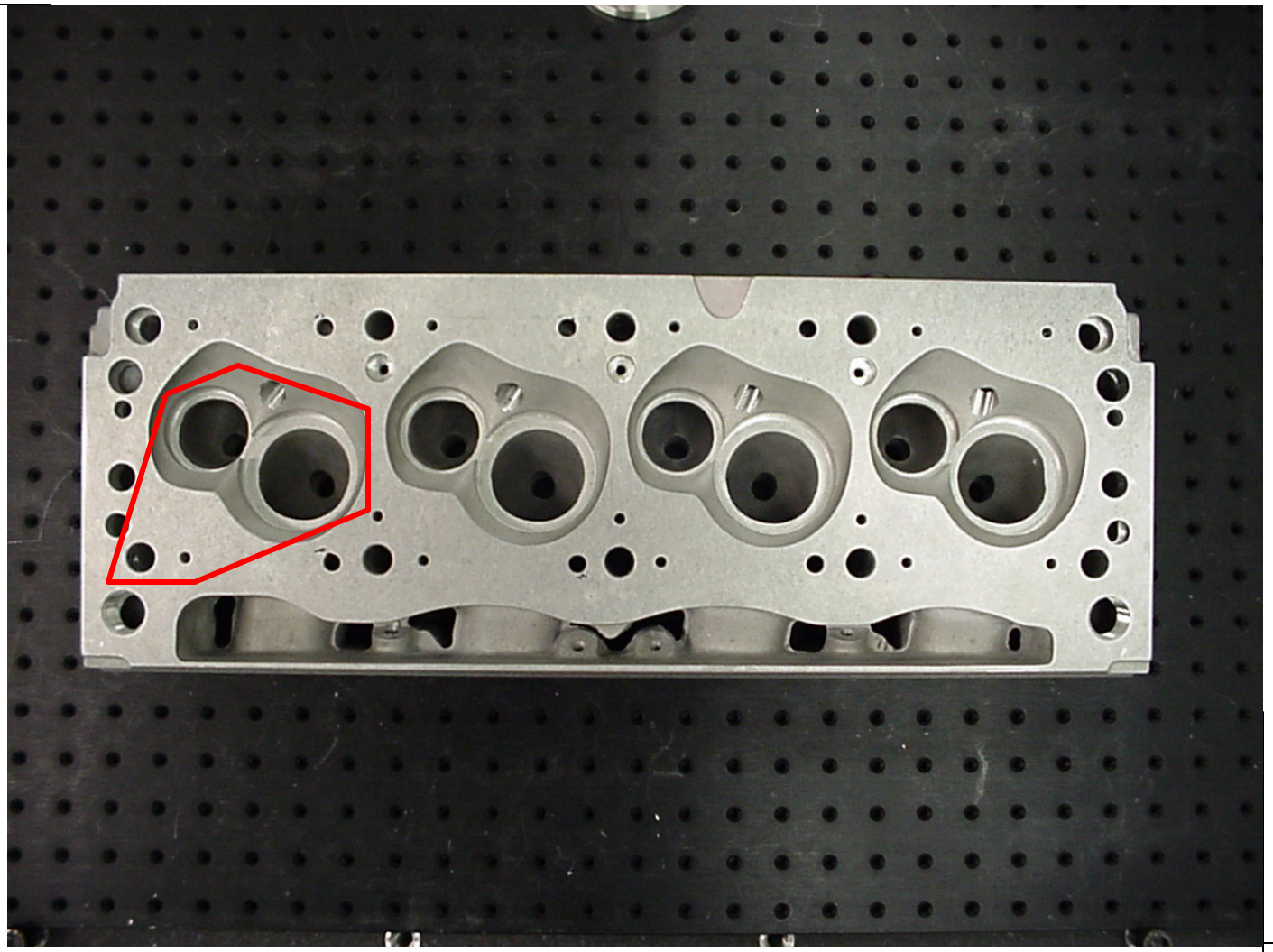
Here we see a group of features that are all repeated in a linear pattern.

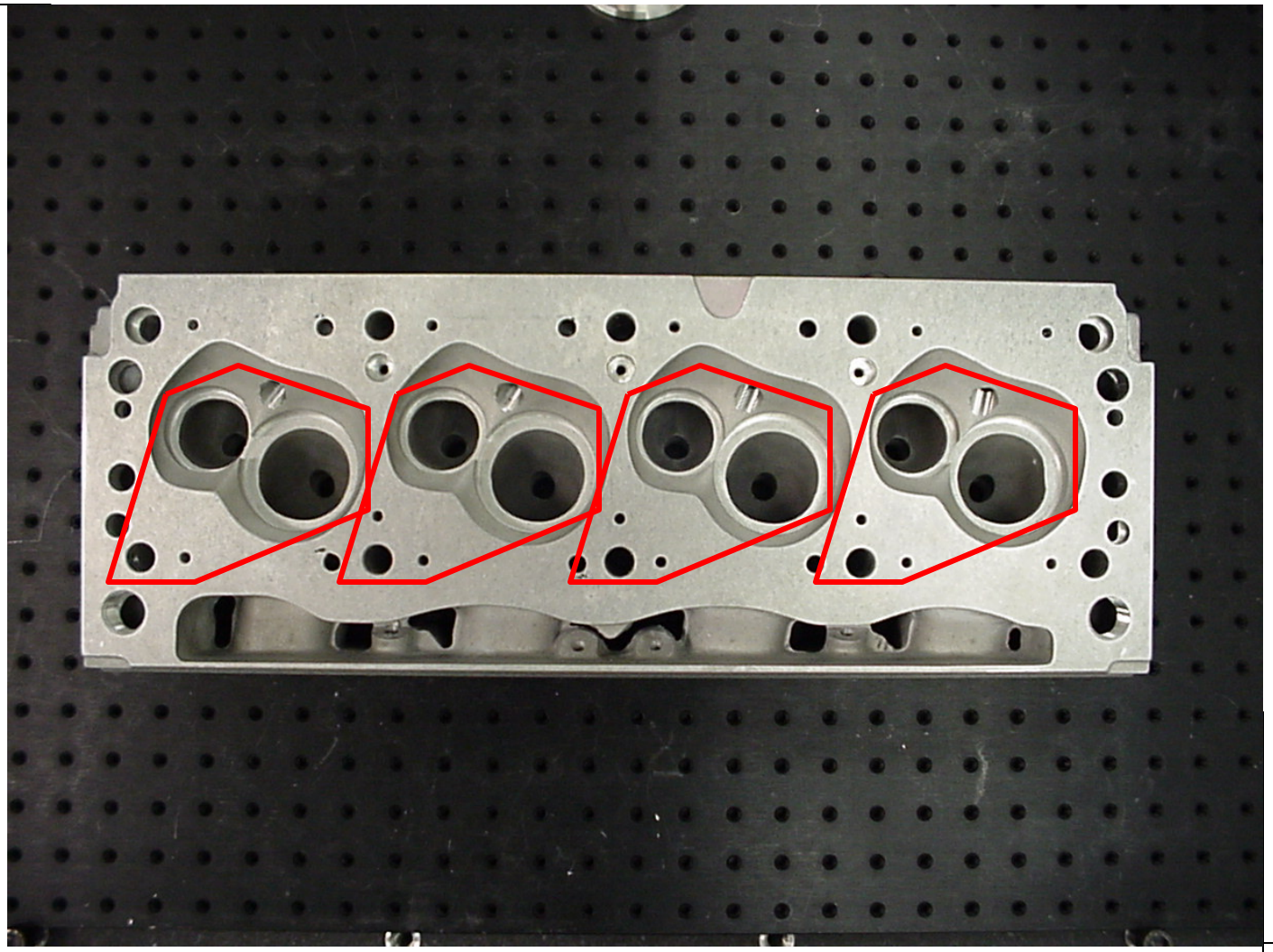


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

Here we see a group of features that are all repeated in a linear pattern.



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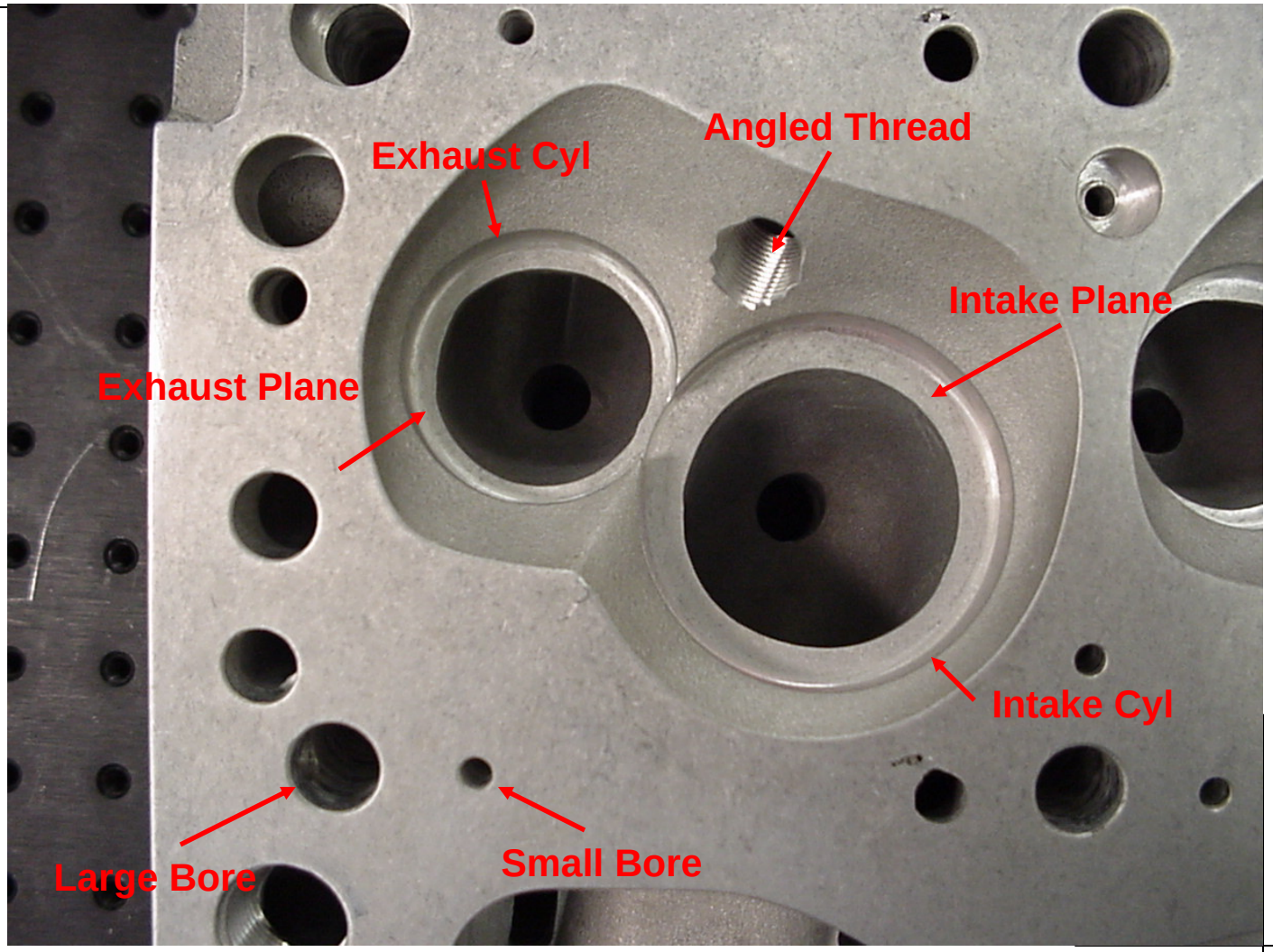
All seven of these features are found in the linear pattern of the cylinder head, and therefore they (along with their characteristics) will make up our Macro.



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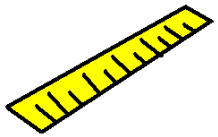
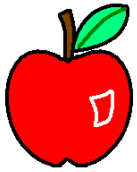
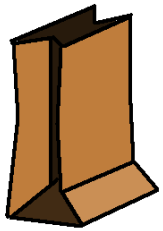




LUNCH 'N LEARN



ZEISS

Macro Set-Up

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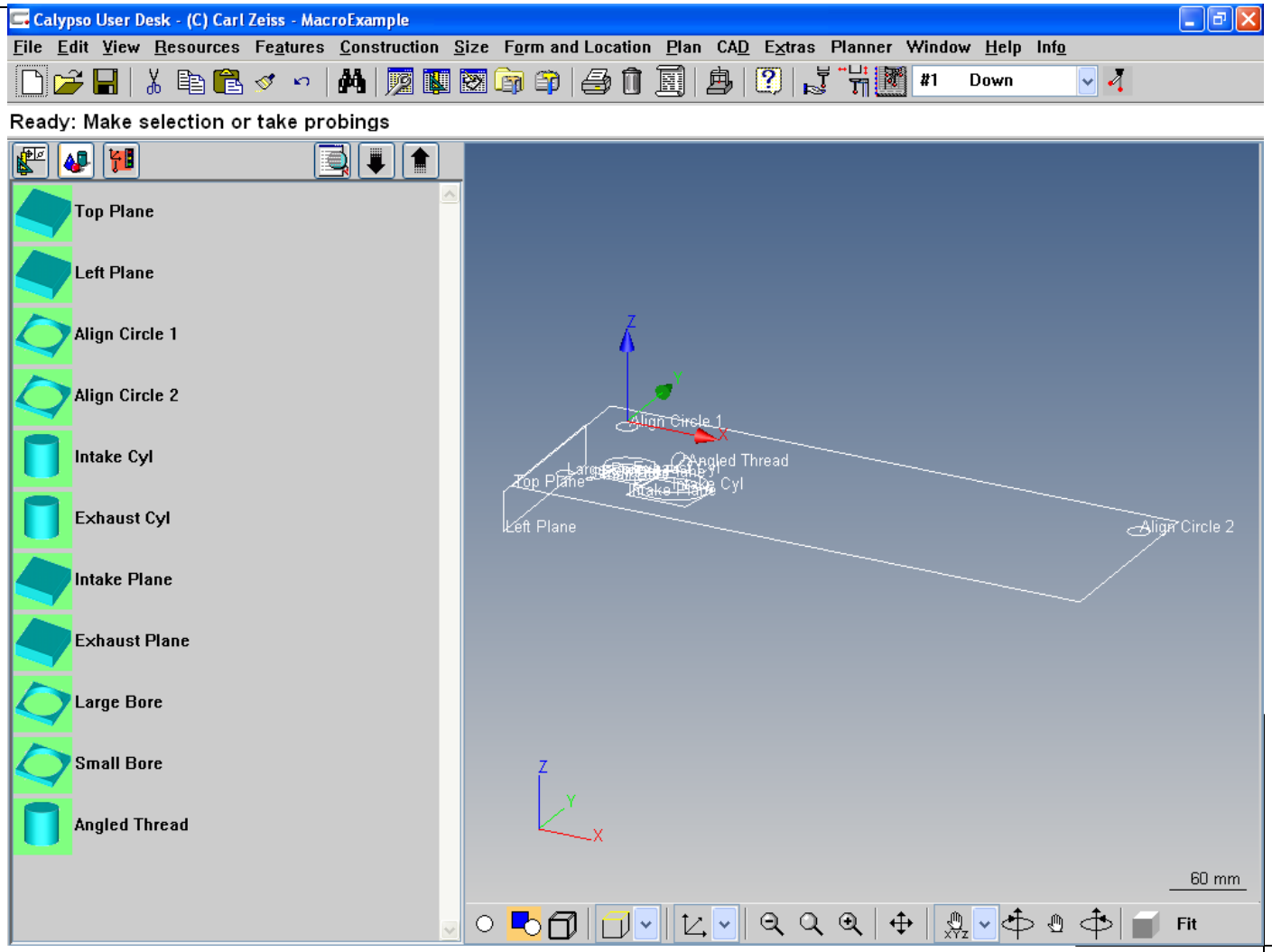
LUNCH 'N LEARN

We begin by writing a full program including a Base Alignment for the first set of Macro features and characteristics.

This program will be referred to as the Base Program.



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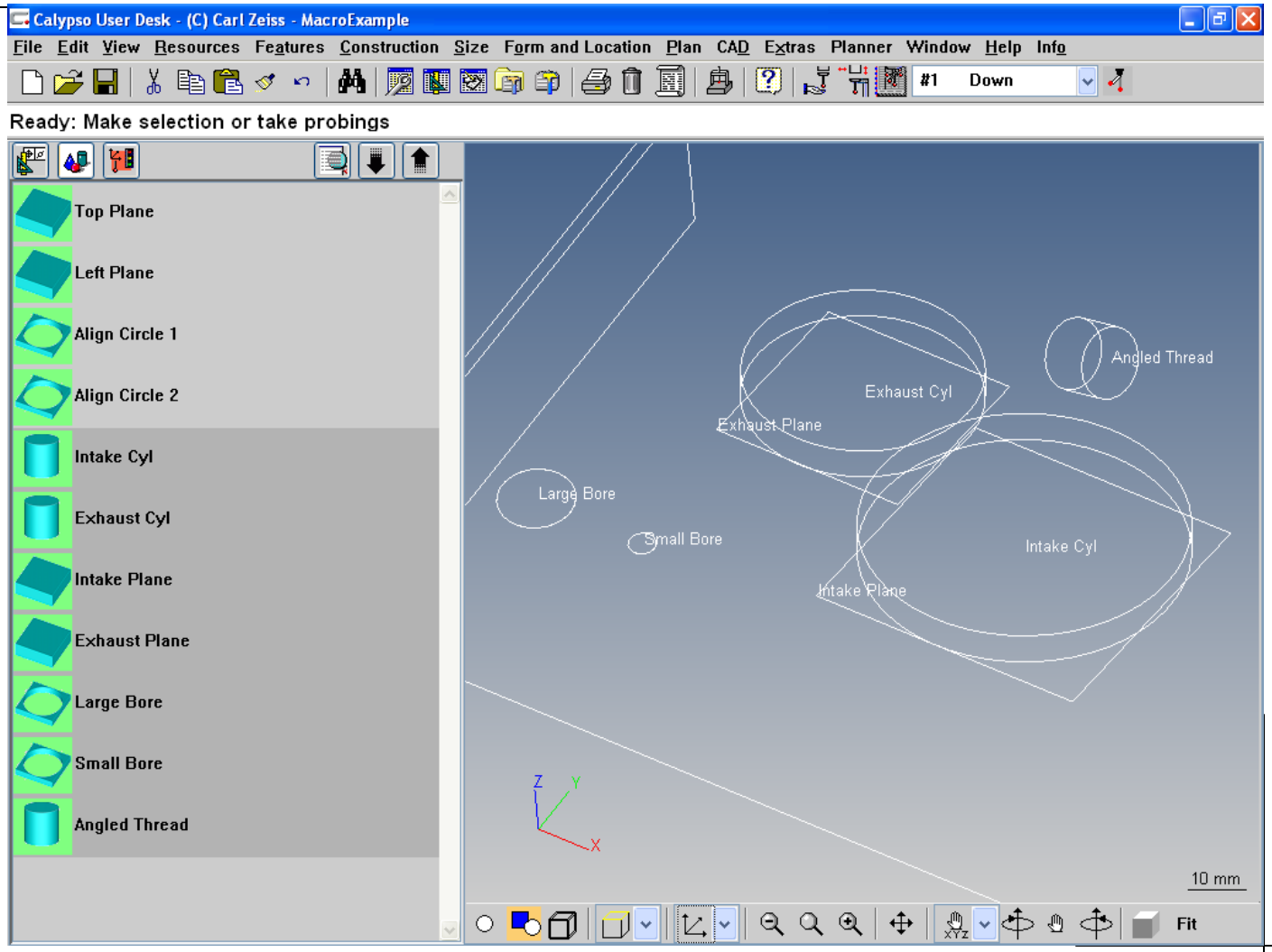
These are the seven features that will make up our Macro.



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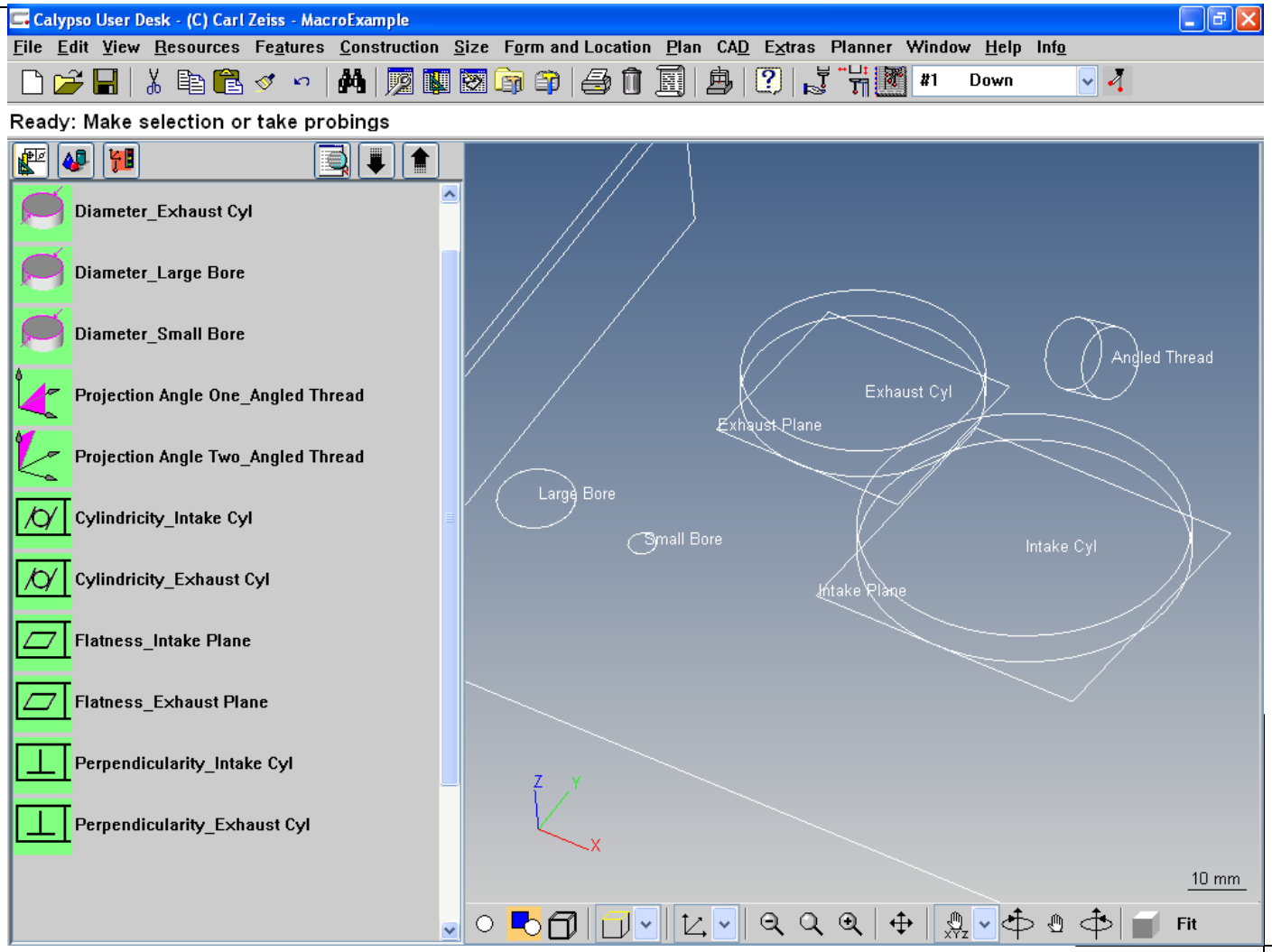
These are the characteristics that are associated with our Macro features.



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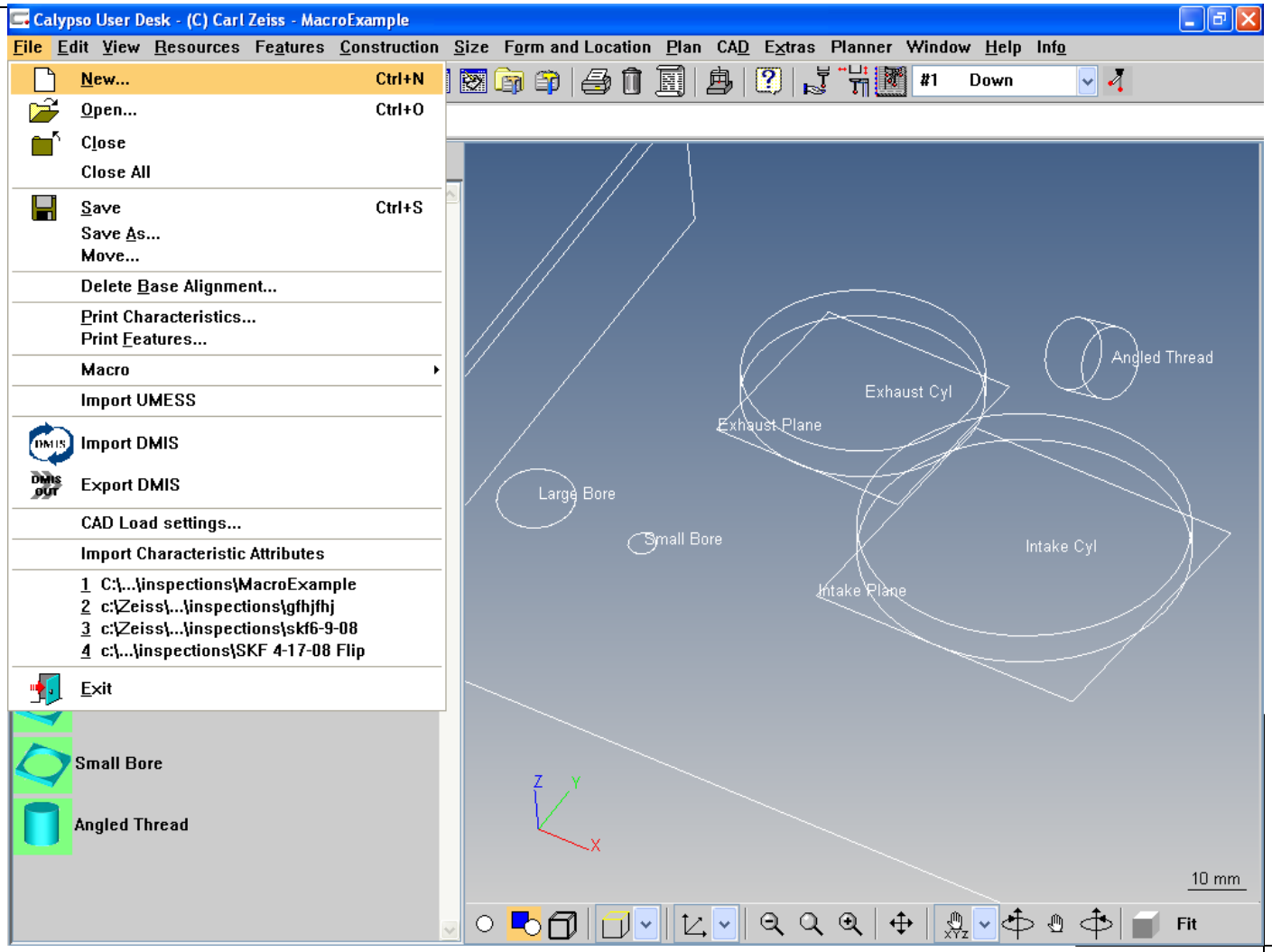
Now, to create our Macro, we start a new measurement plan.



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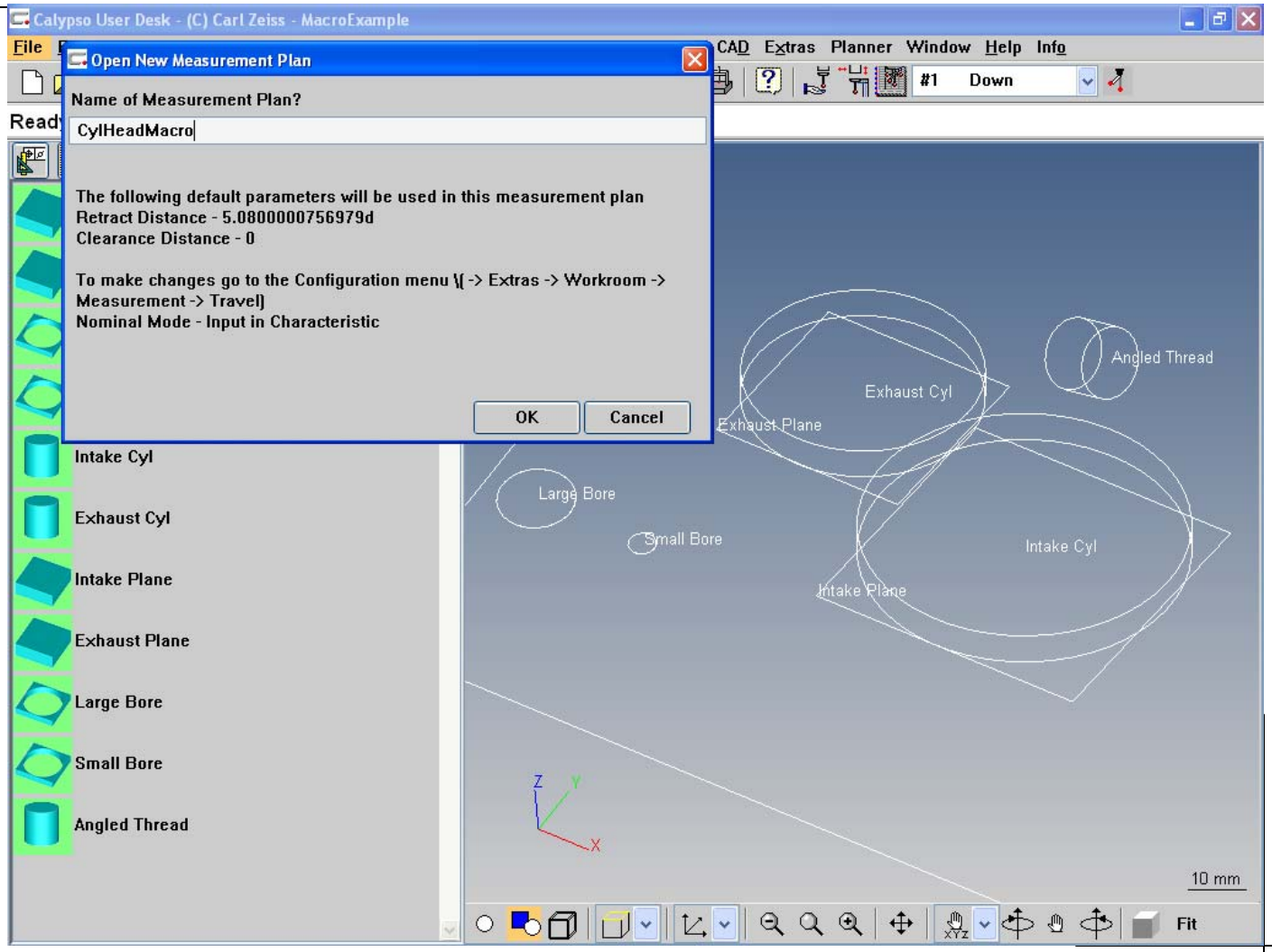
The name of the measurement plan will be the name of your Macro.



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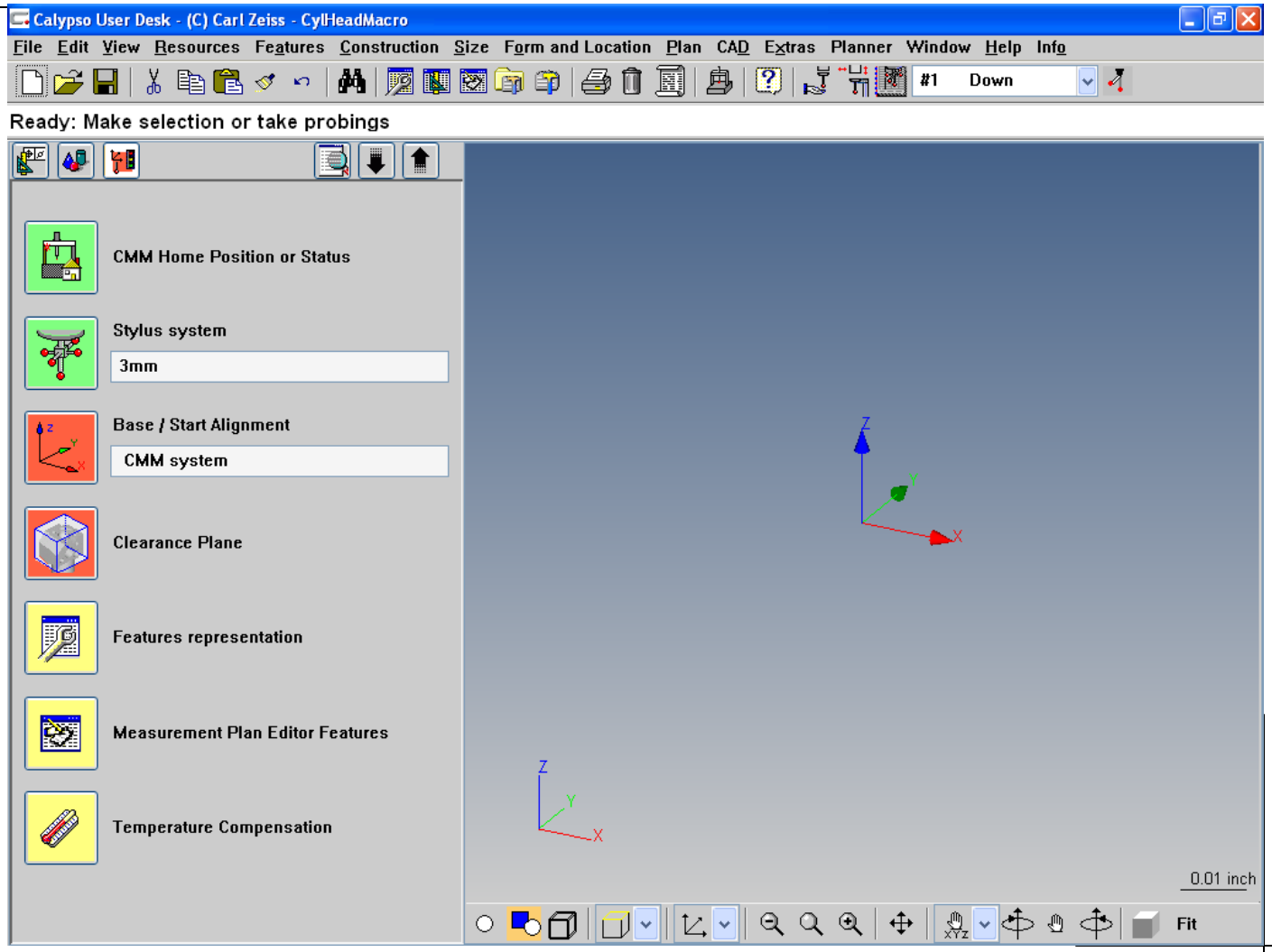
This program will be referred to as the Macro Program.



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LUNCH 'N LEARN

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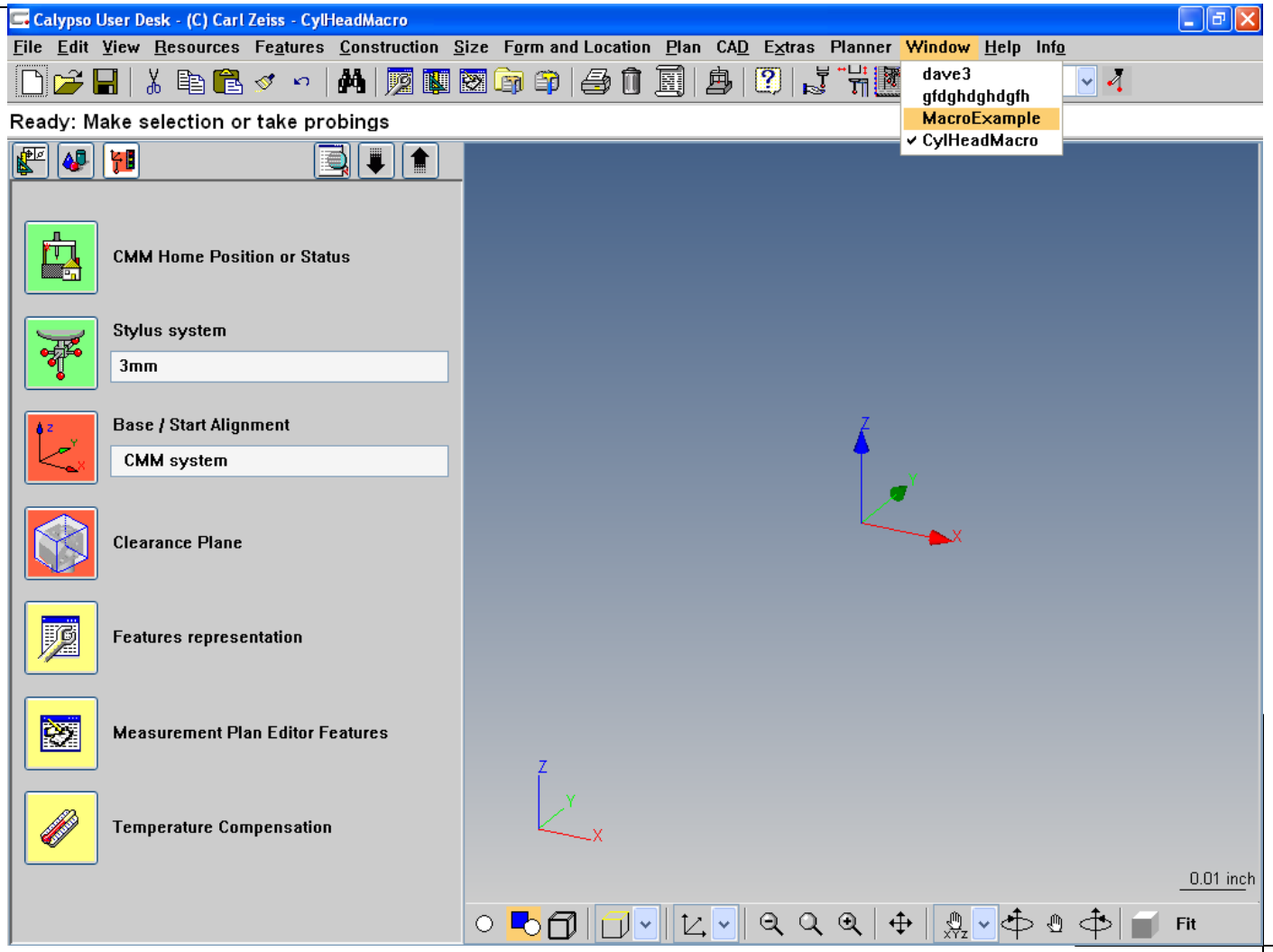
Switch back to your Base Program.



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LUNCH 'N LEARN

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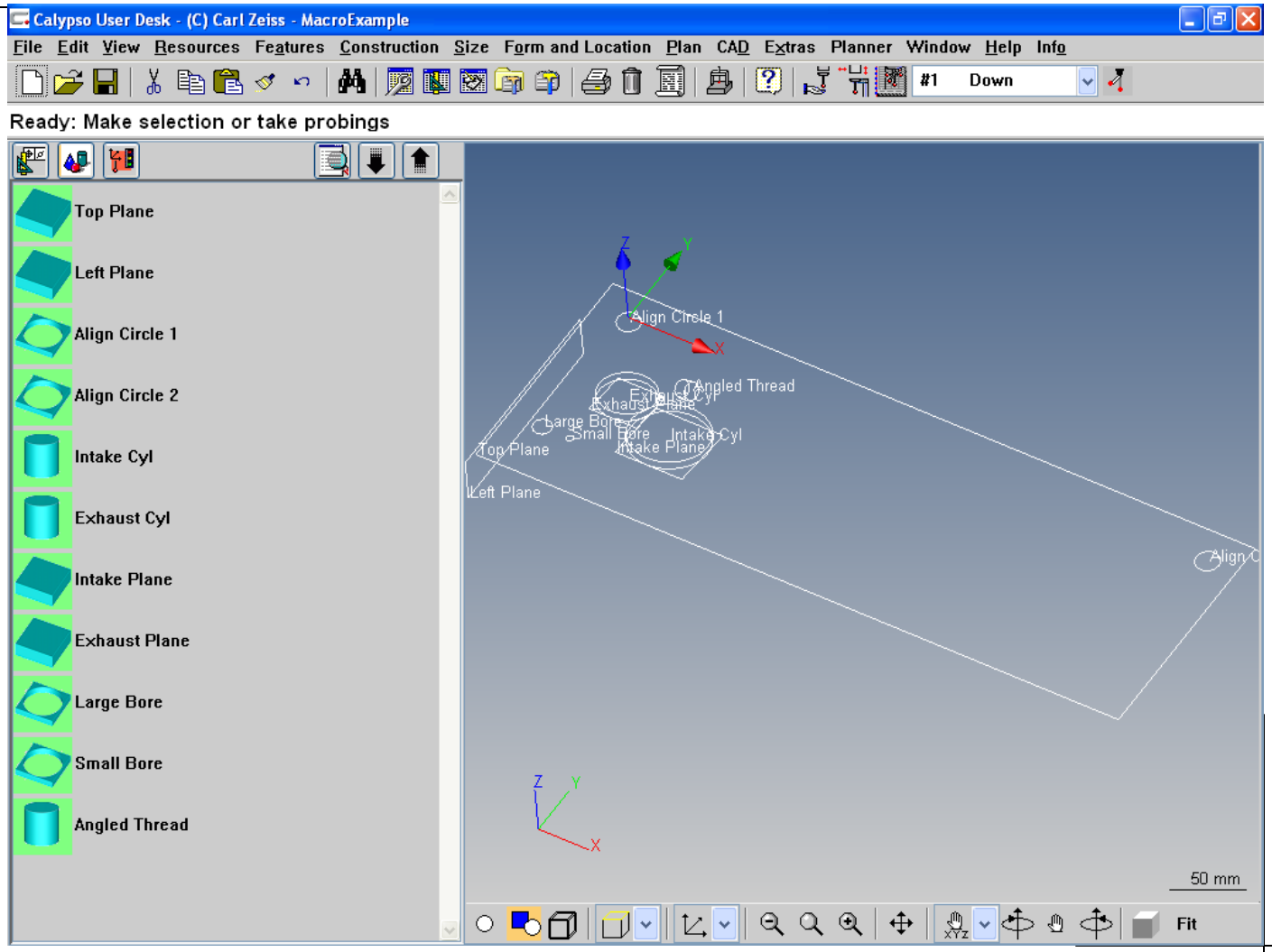
Switch back to your Base Program.



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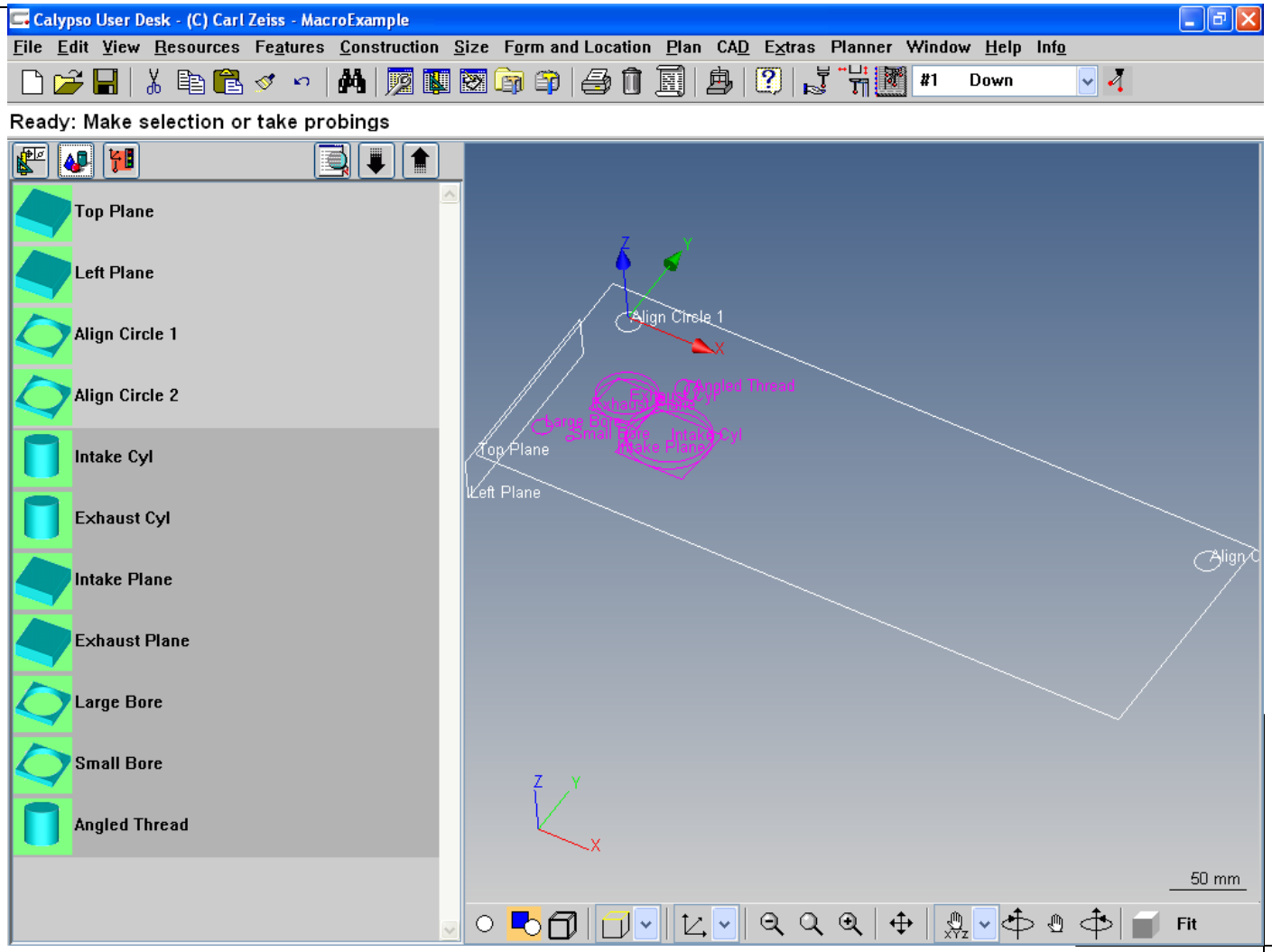
Now we copy our seven features that make up our Macro.

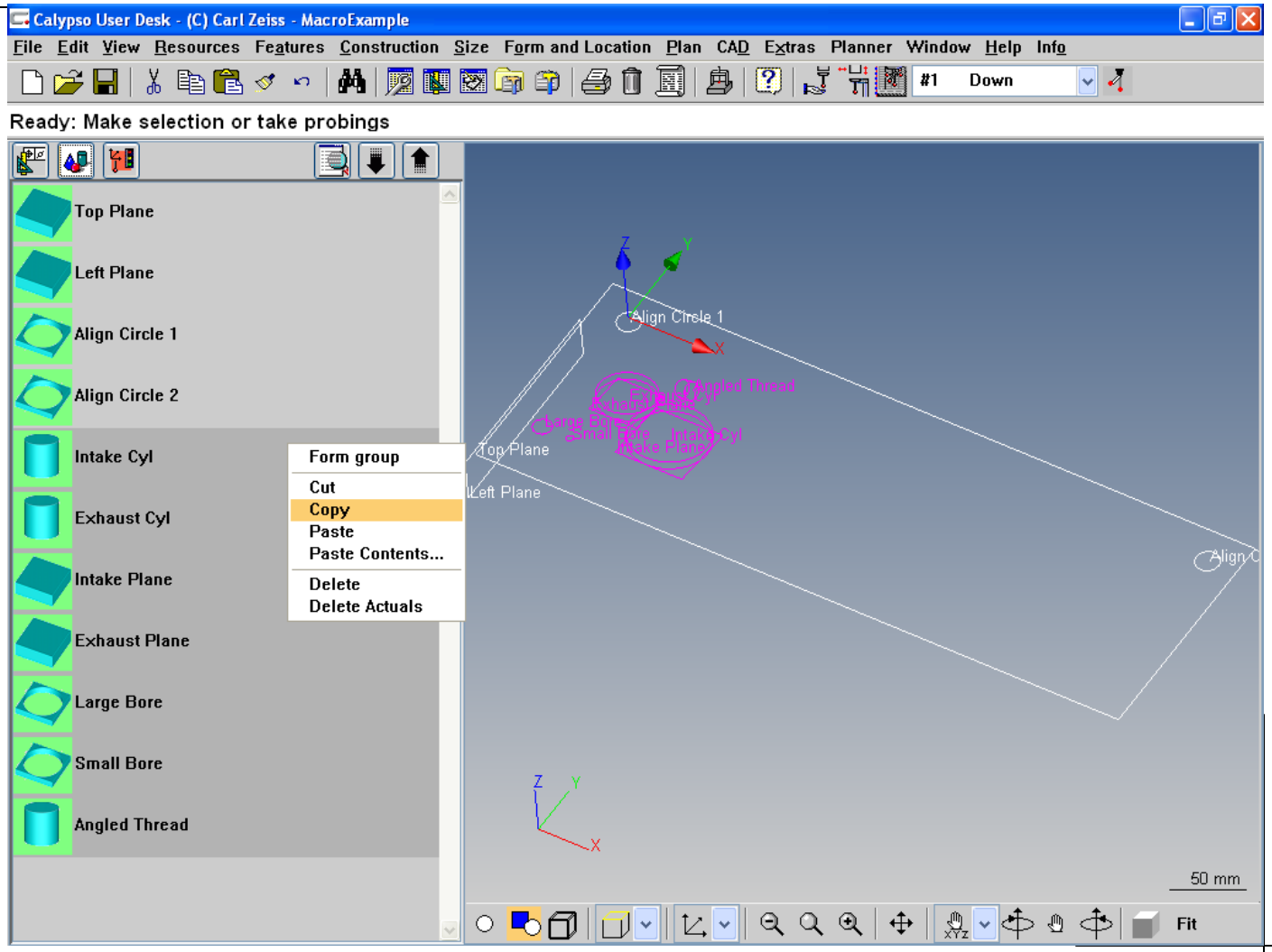


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

Now we copy our seven features that make up our Macro.



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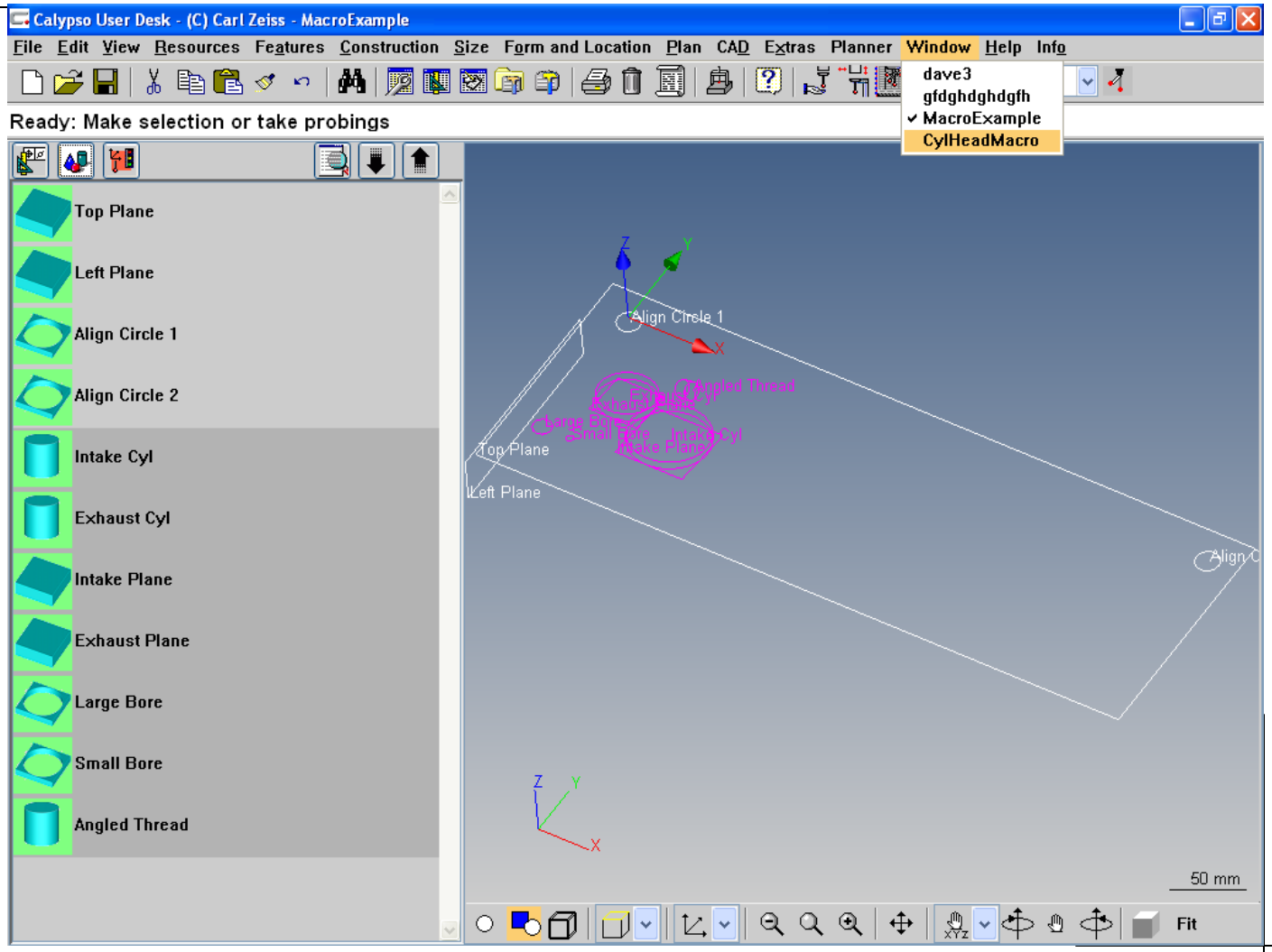
Back in the Macro Program...



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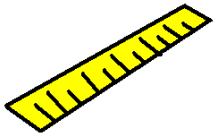
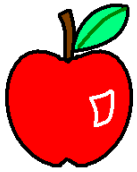
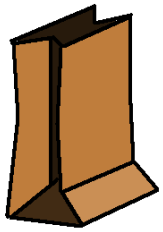


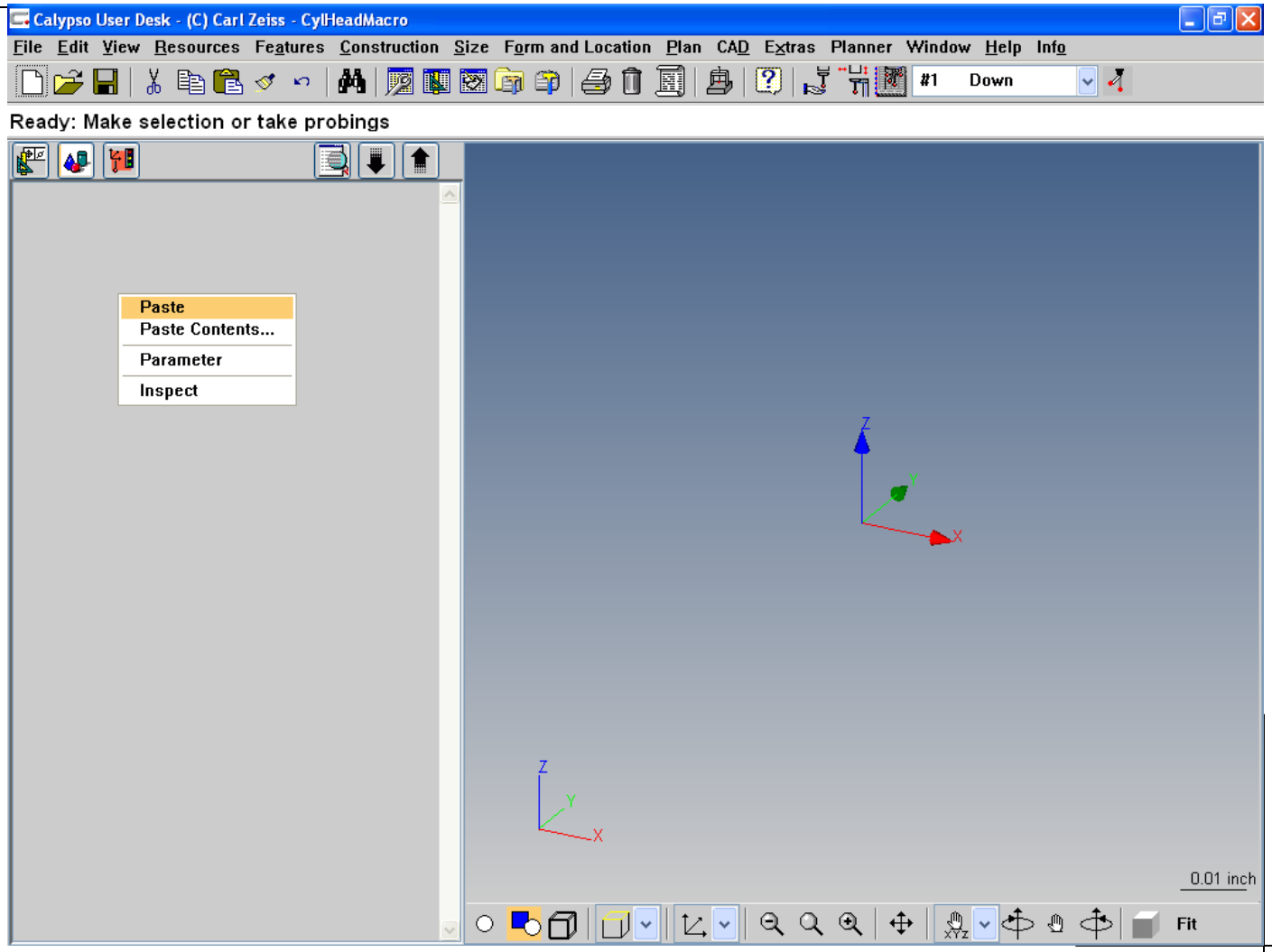




ZEISS

LUNCH 'N LEARN

…we paste the features into the feature list of the Macro Program.



J&H Machine Tools

LUNCH 'N LEARN

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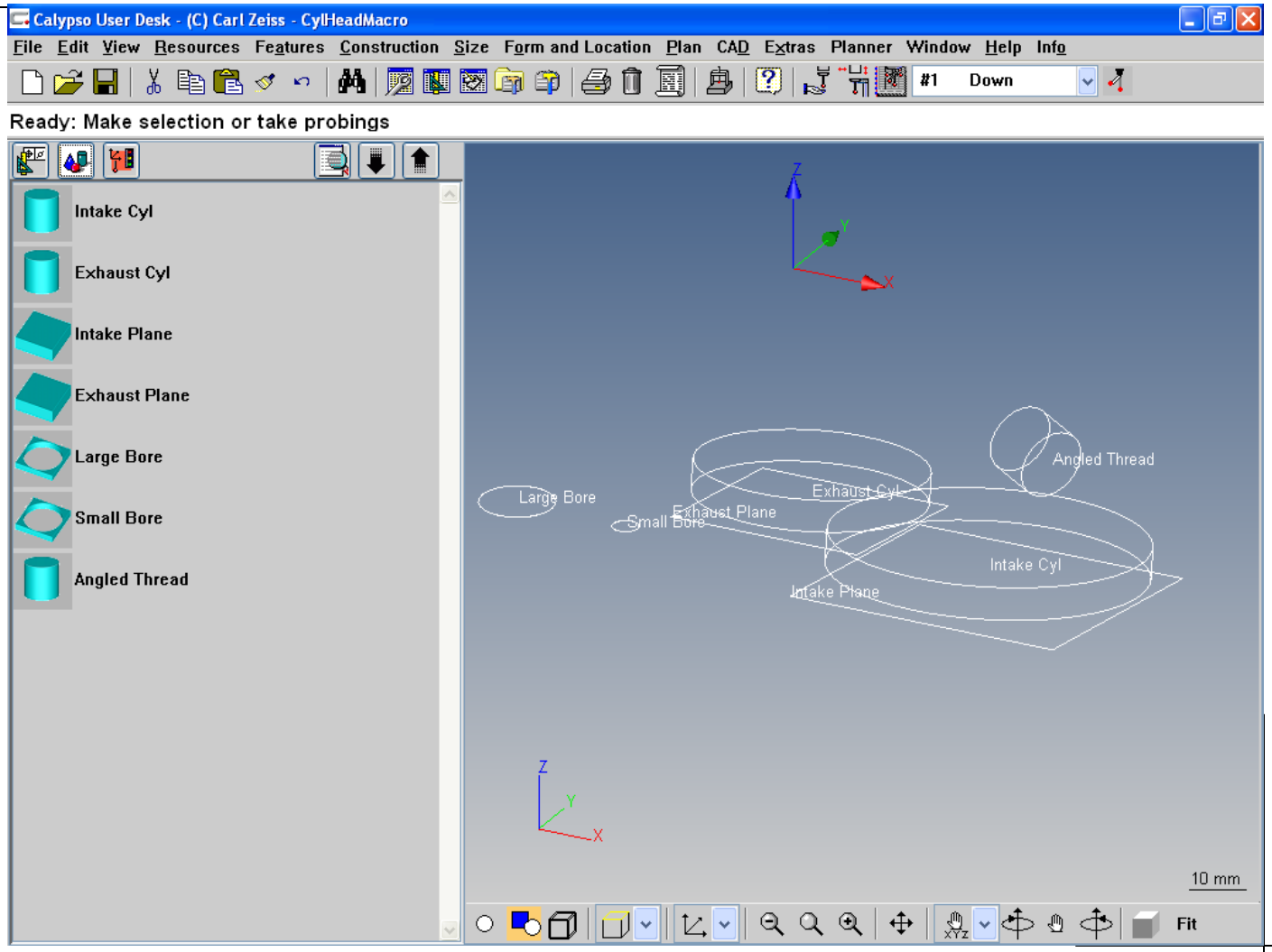

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LUNCH 'N LEARN

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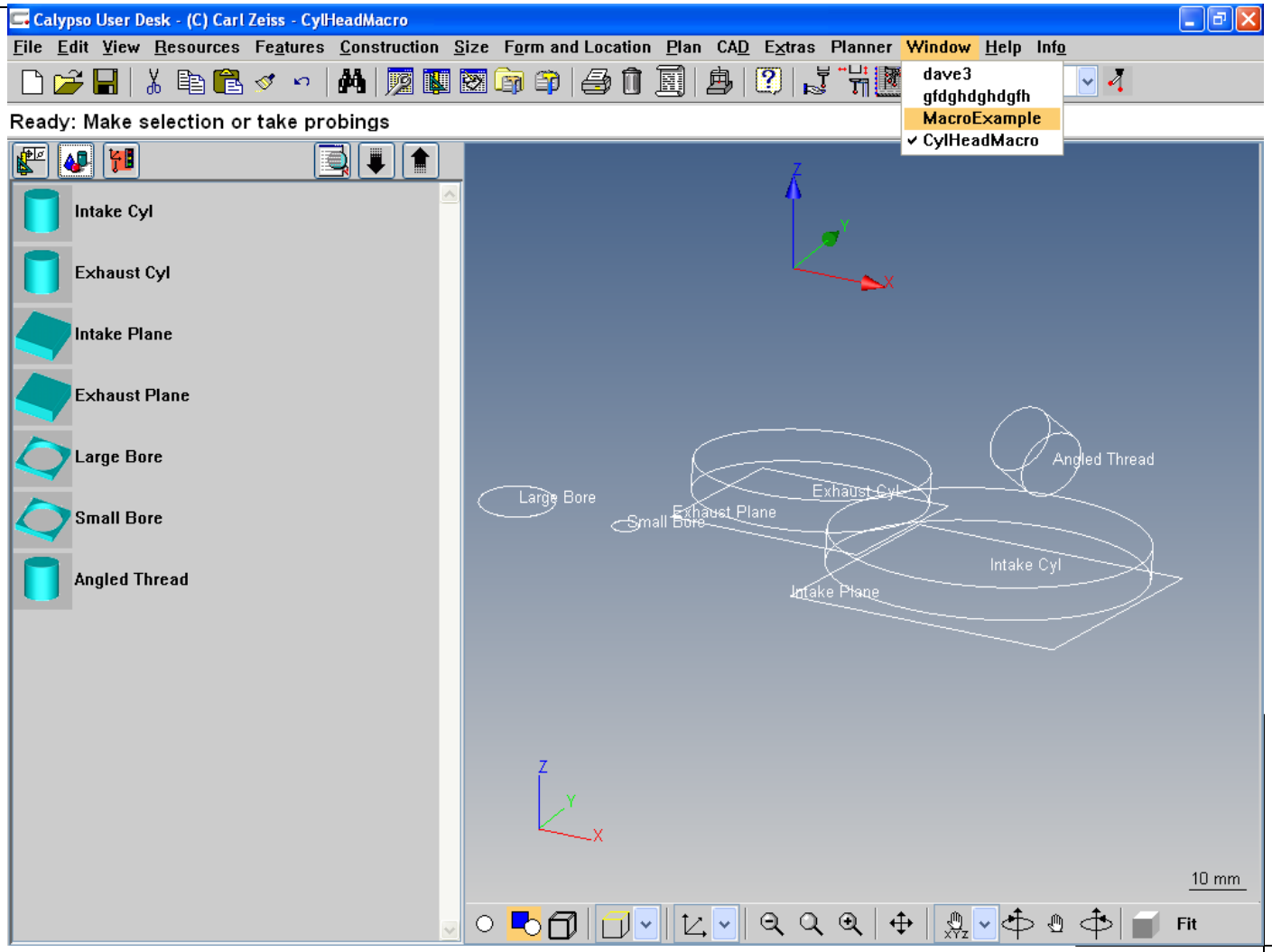
Now switch back to the Base Program...



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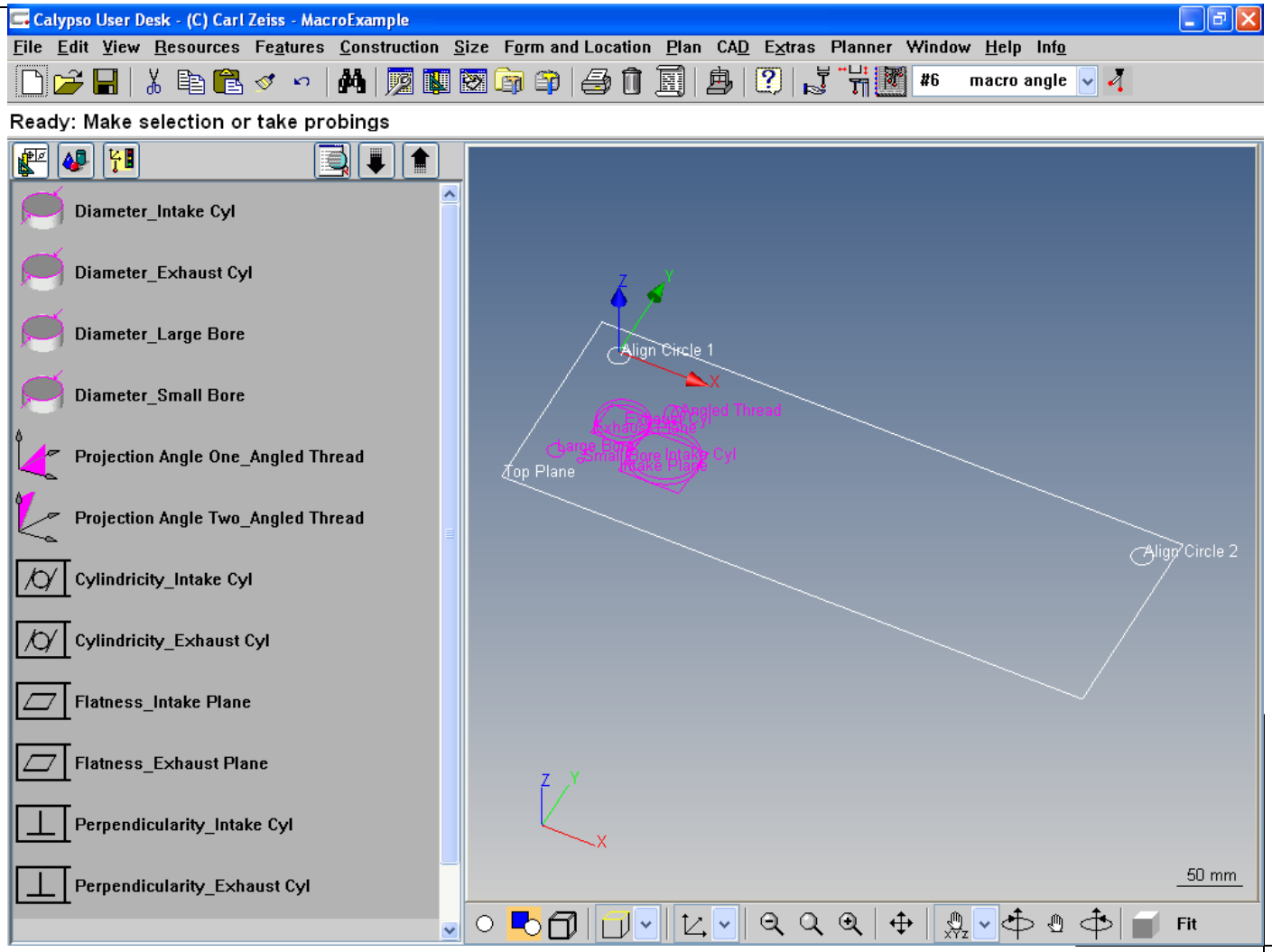
…and do the same with the characteristics associated with the Macro features.



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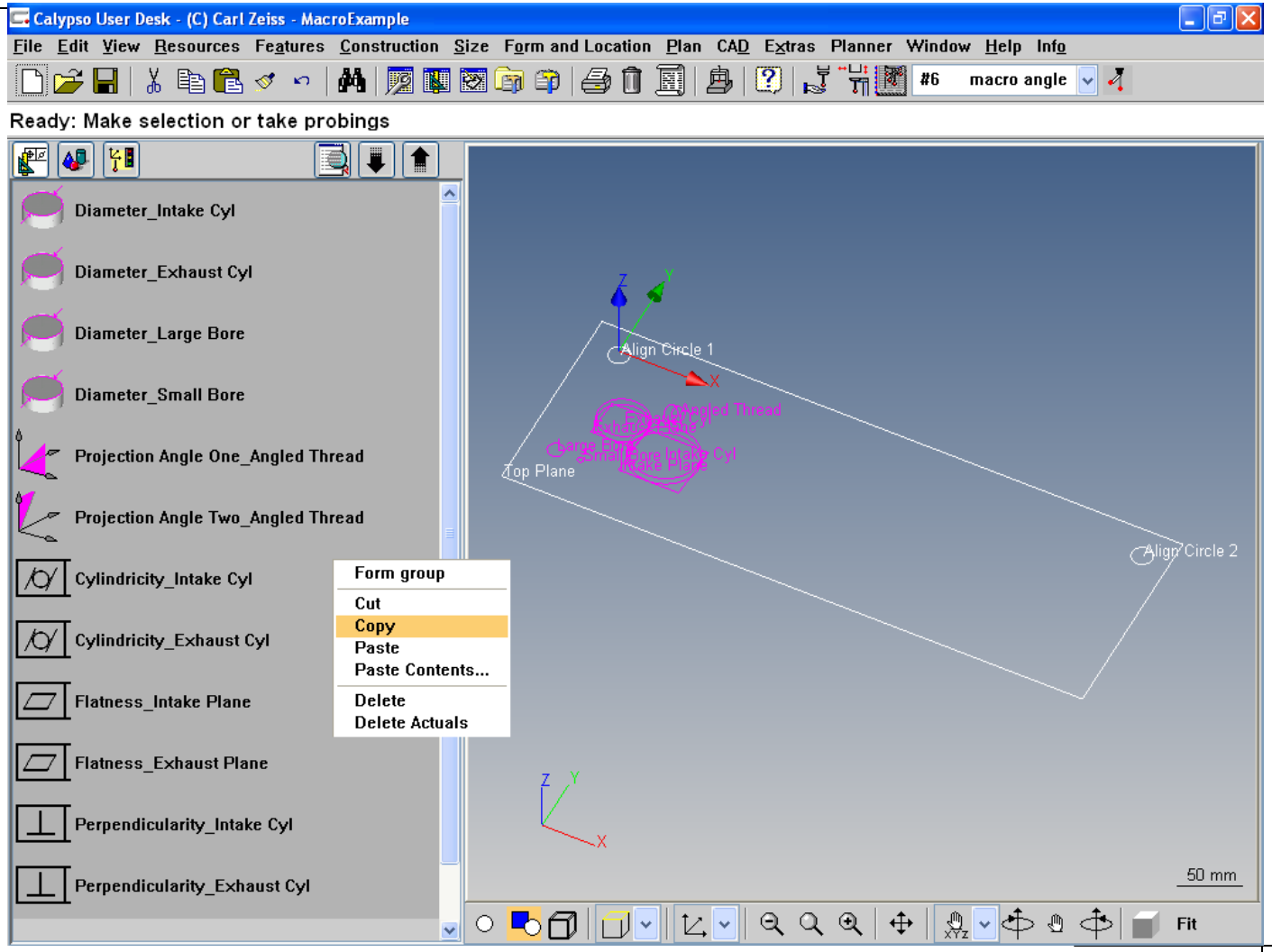
…and do the same with the characteristics associated with the Macro features.



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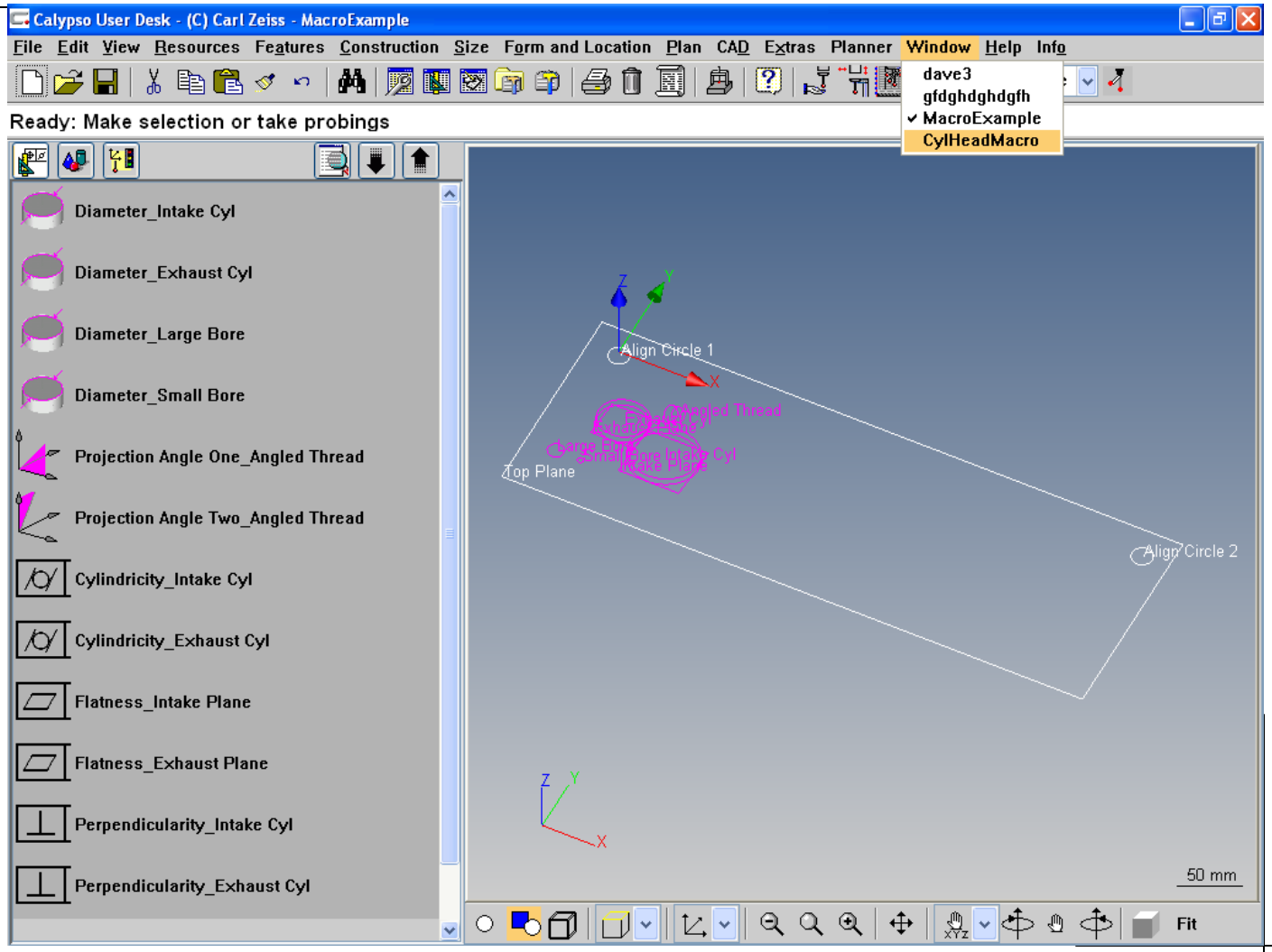
LUNCH 'N LEARN

ZEISS

…and do the same with the characteristics associated with the Macro features.



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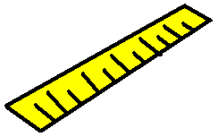

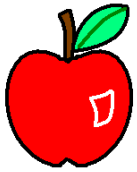

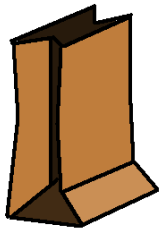

ZEISS

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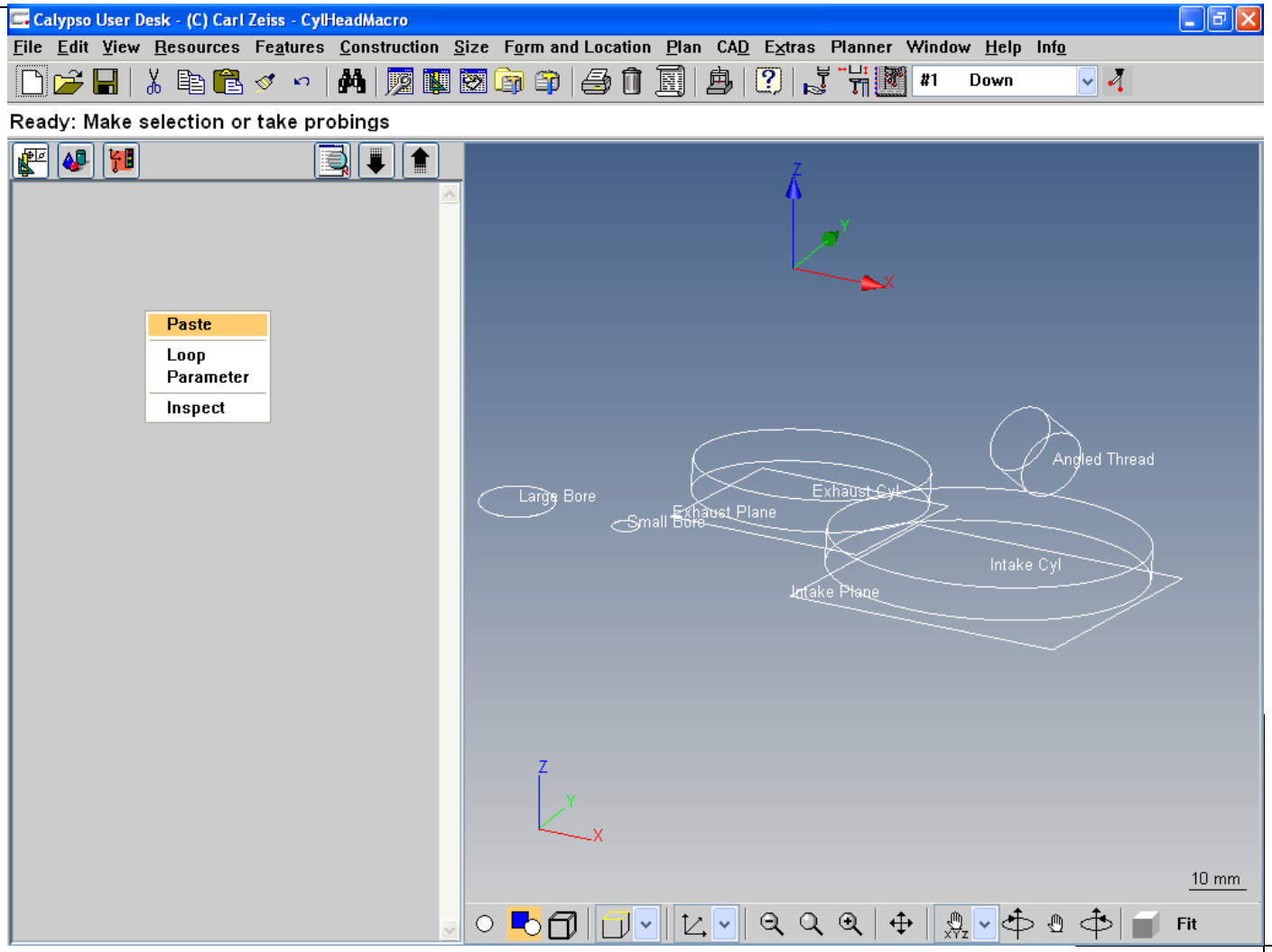
…and do the same with the characteristics associated with the Macro features.



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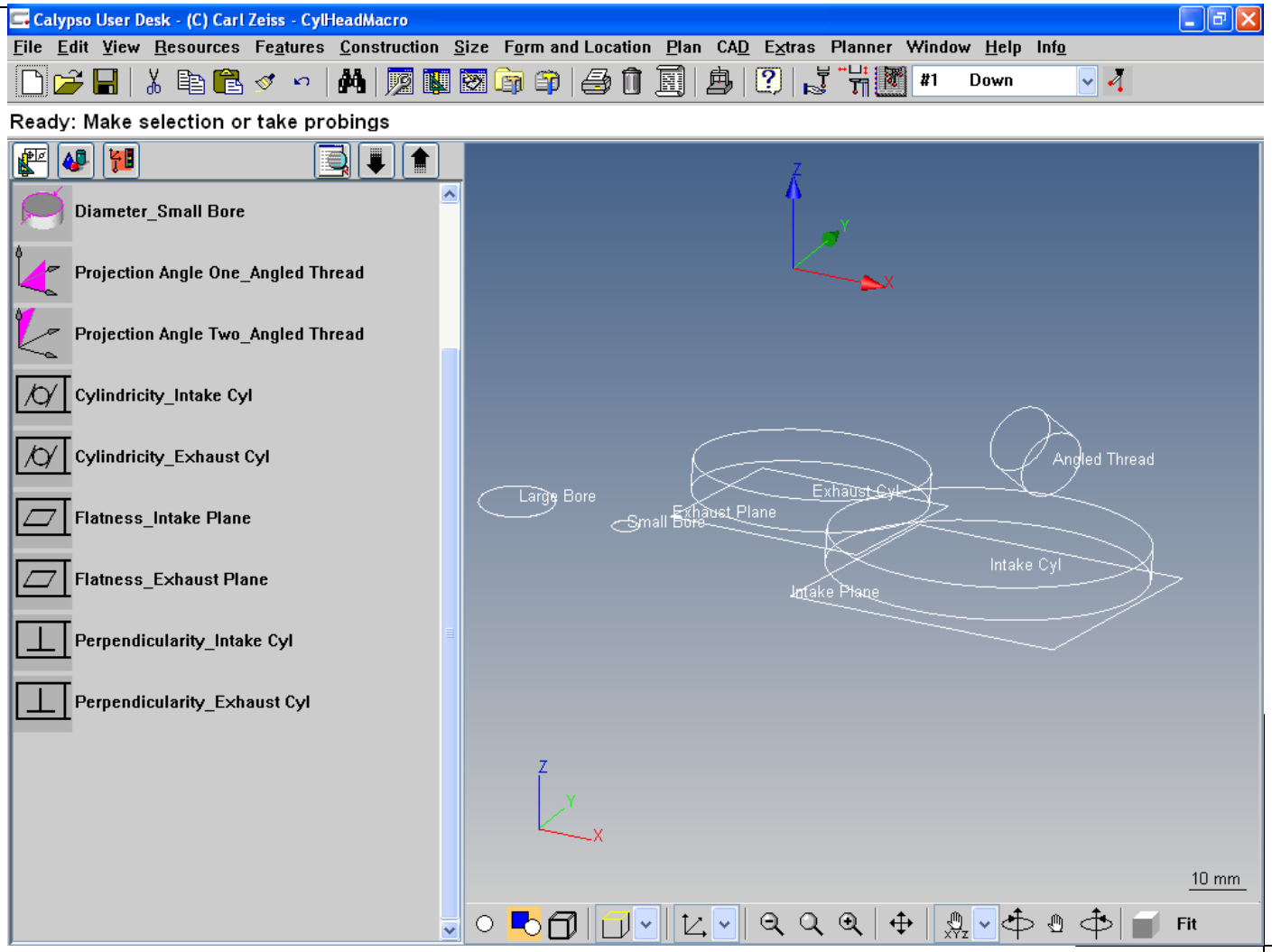
Now our Macro program has its features and characteristics.



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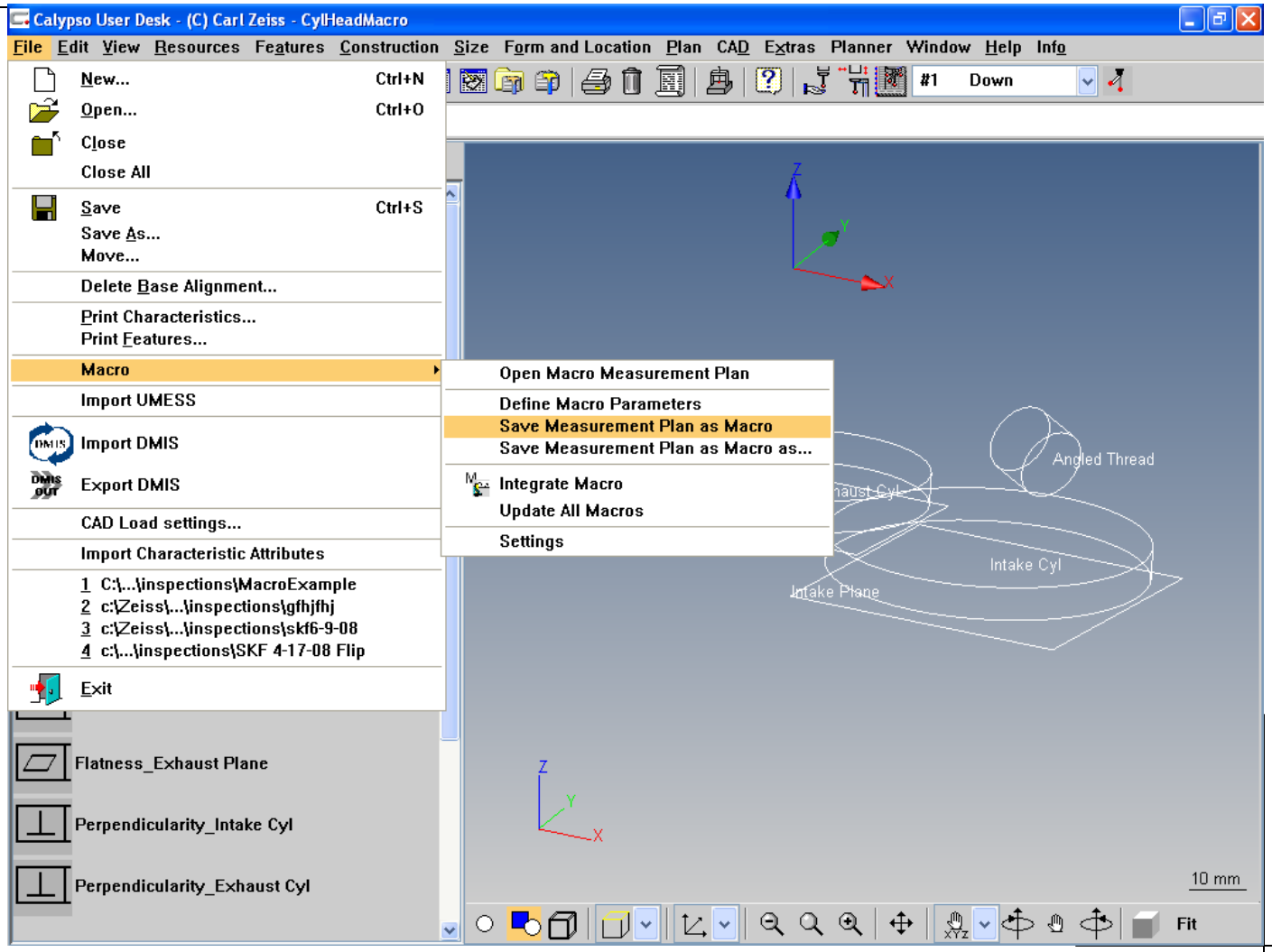
Now we save our measurement plan as a Macro:

File>Macro>Save Measurement Plan as Macro



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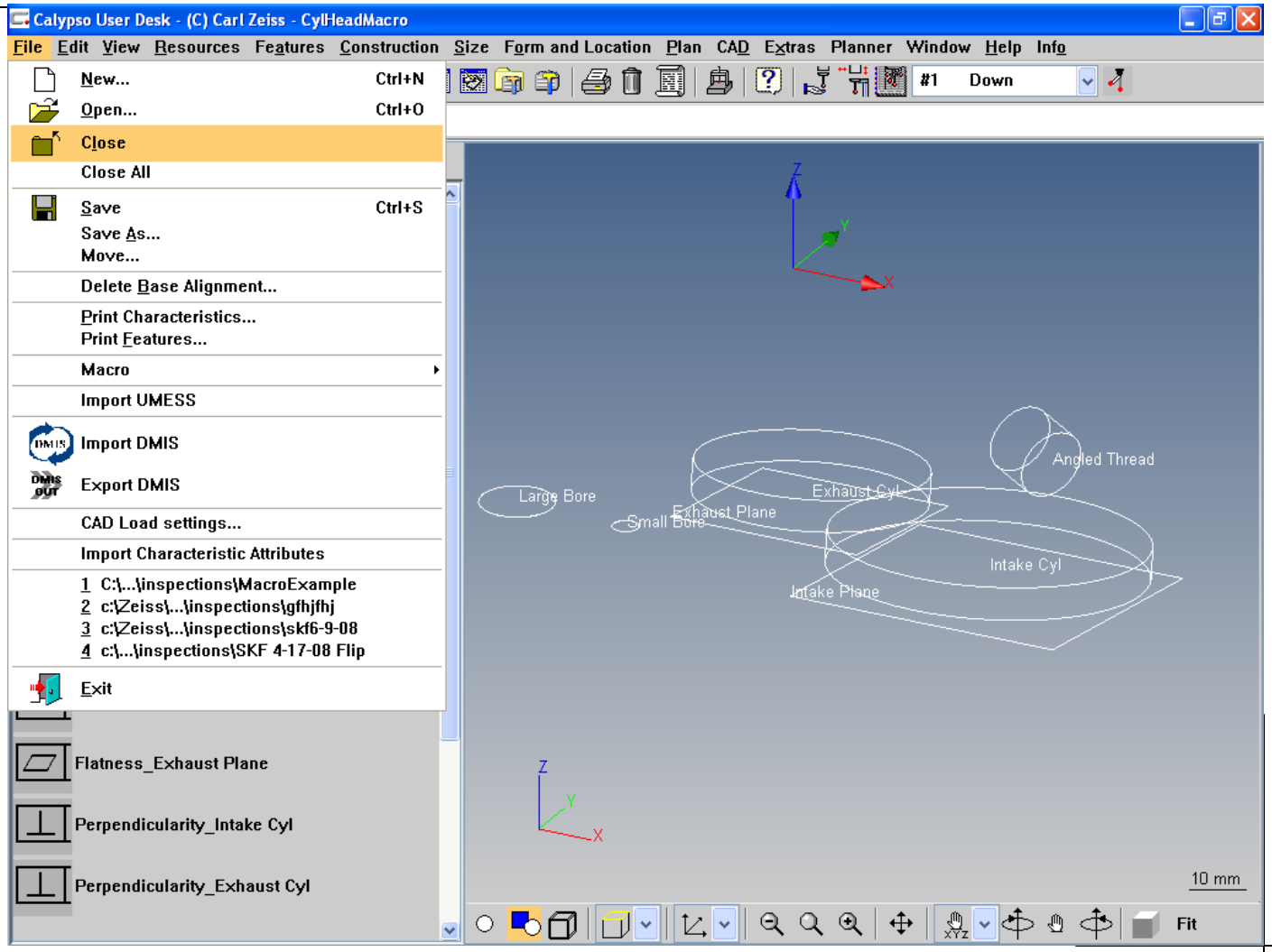
And finally, close the Macro Program.



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LUNCH 'N LEARN

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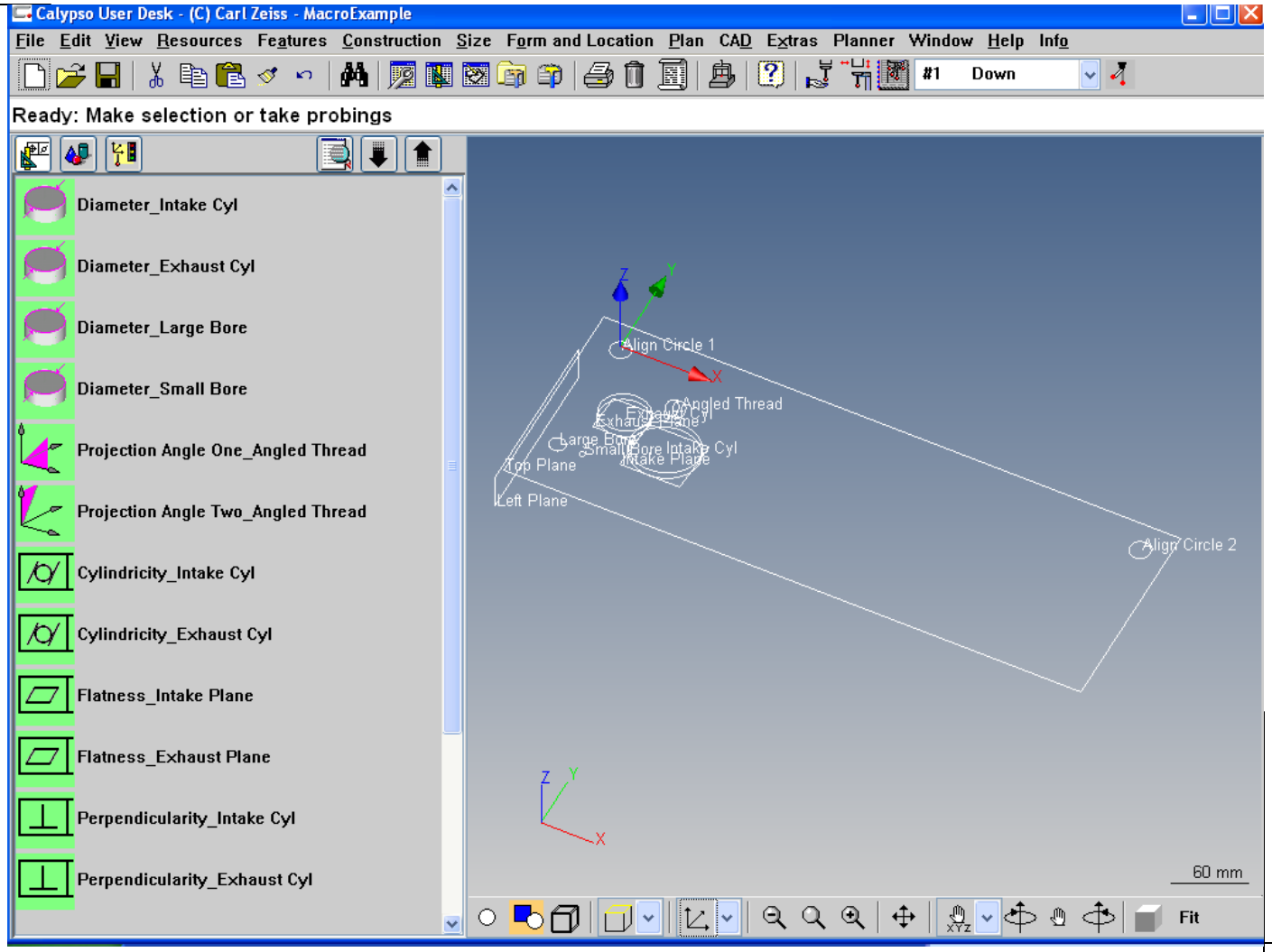
Now we can get rid of the Macro features and characteristics, as they will soon be replaced by our Macro.



J&H Machine Tools

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ZEISS

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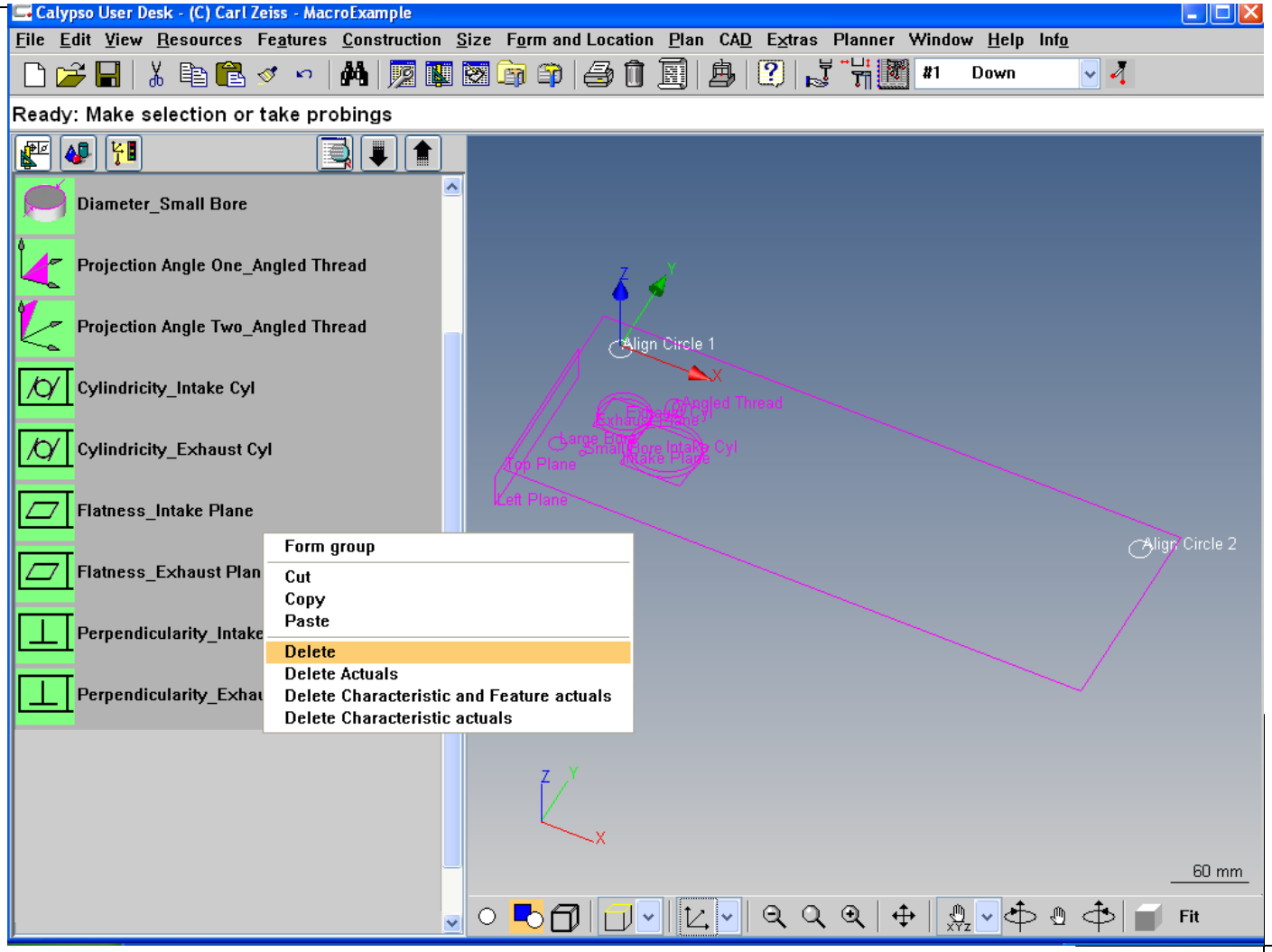

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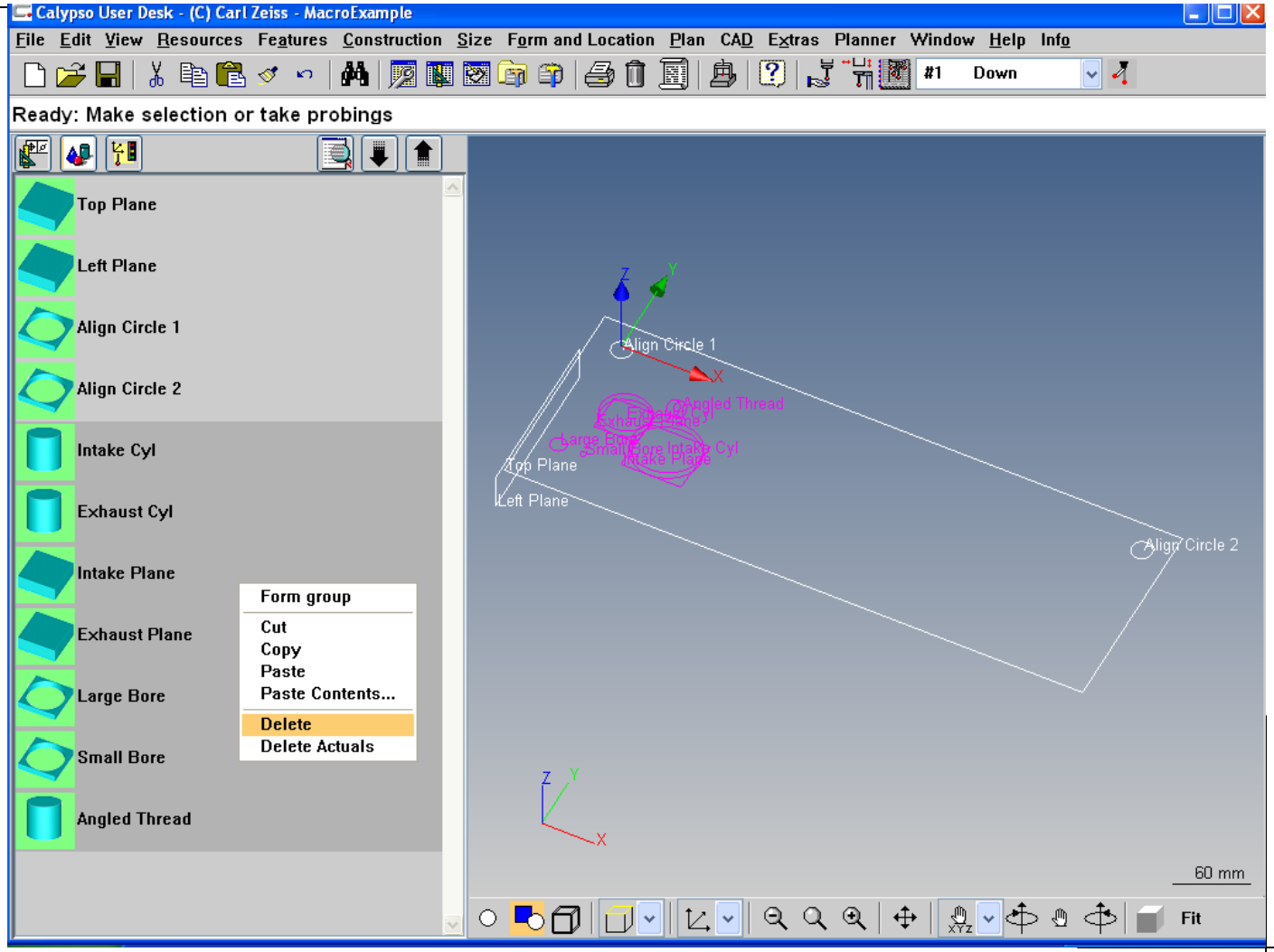
ZEISS

Now we can get rid of the Macro features and characteristics, as they will soon be replaced by our Macro.



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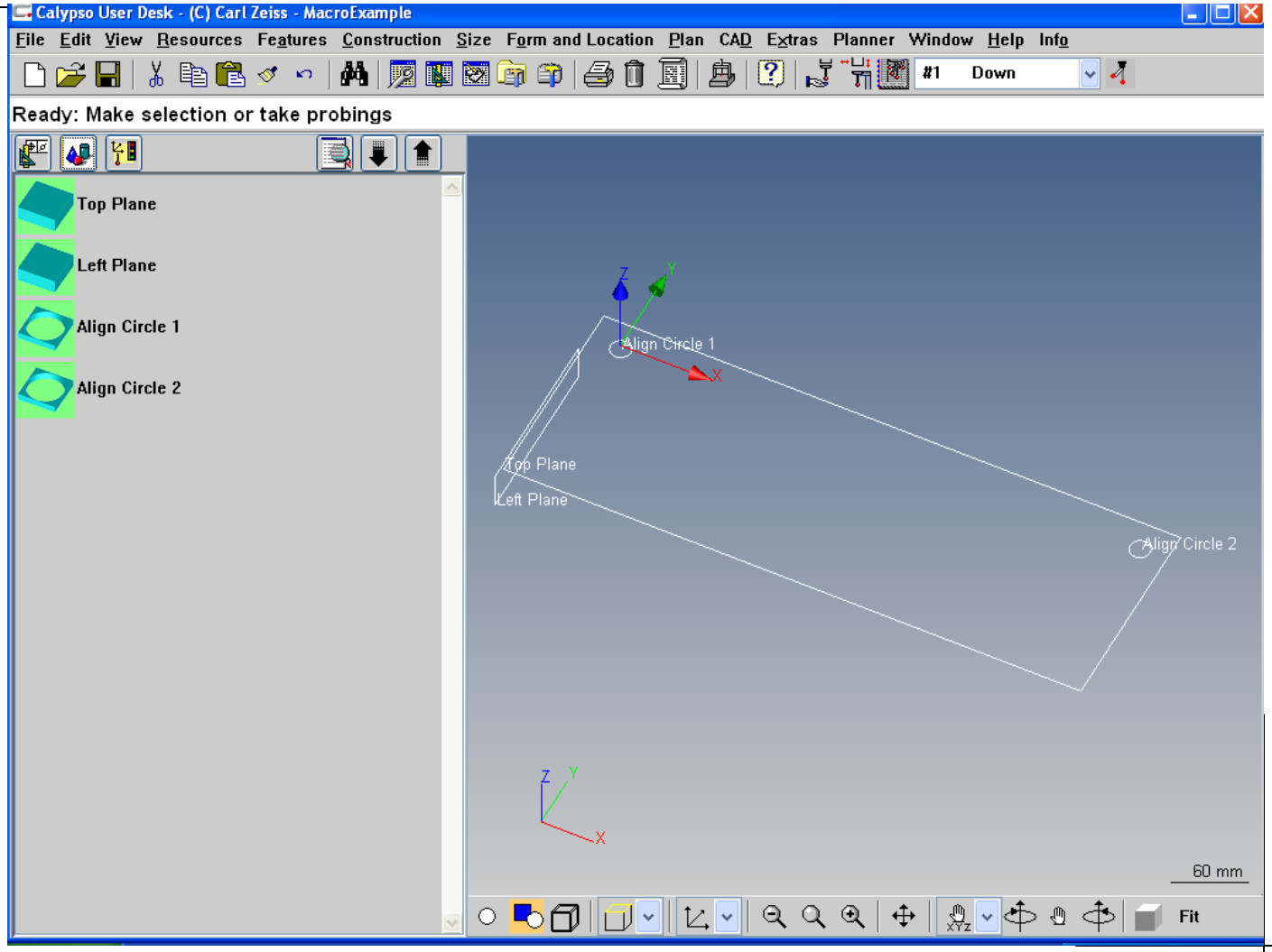
Now with the old Macro features and characteristics gone, we are ready to drop in our Macro.



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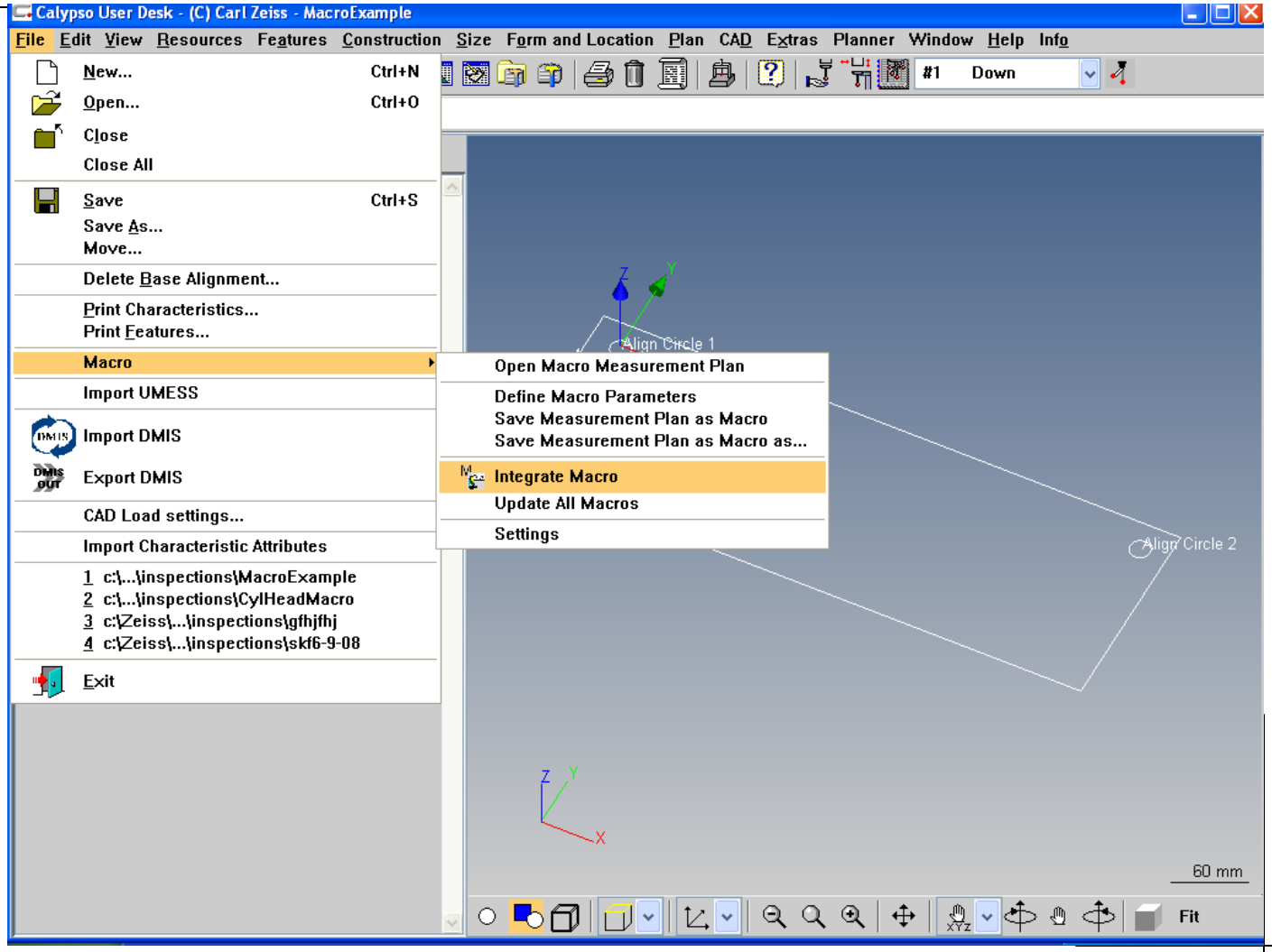
File>Macro>
Integrate Macro



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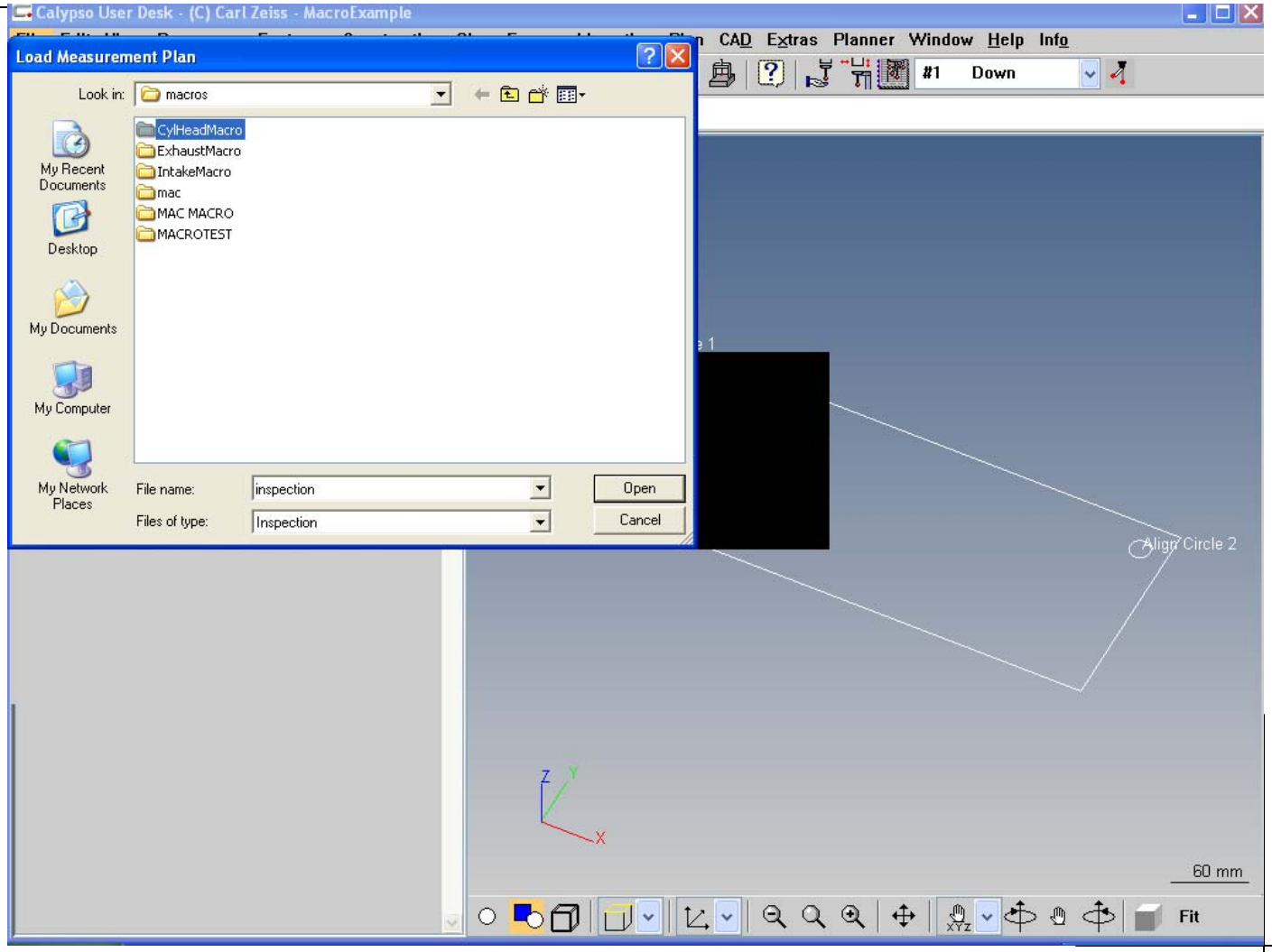
Choose the Macro name that was just created.



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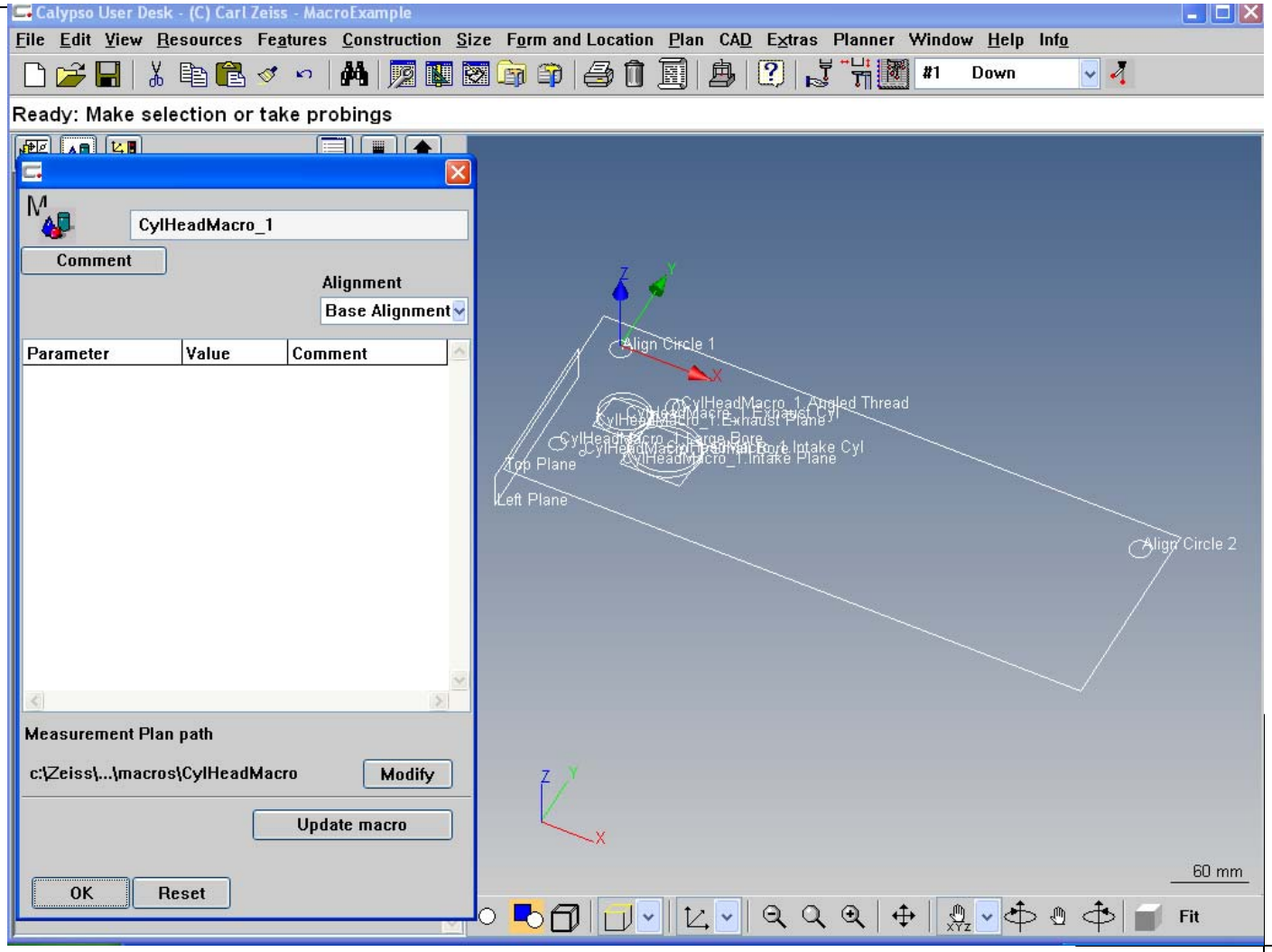
Press OK to the Macro screen.

(More on the Macro screen later.)



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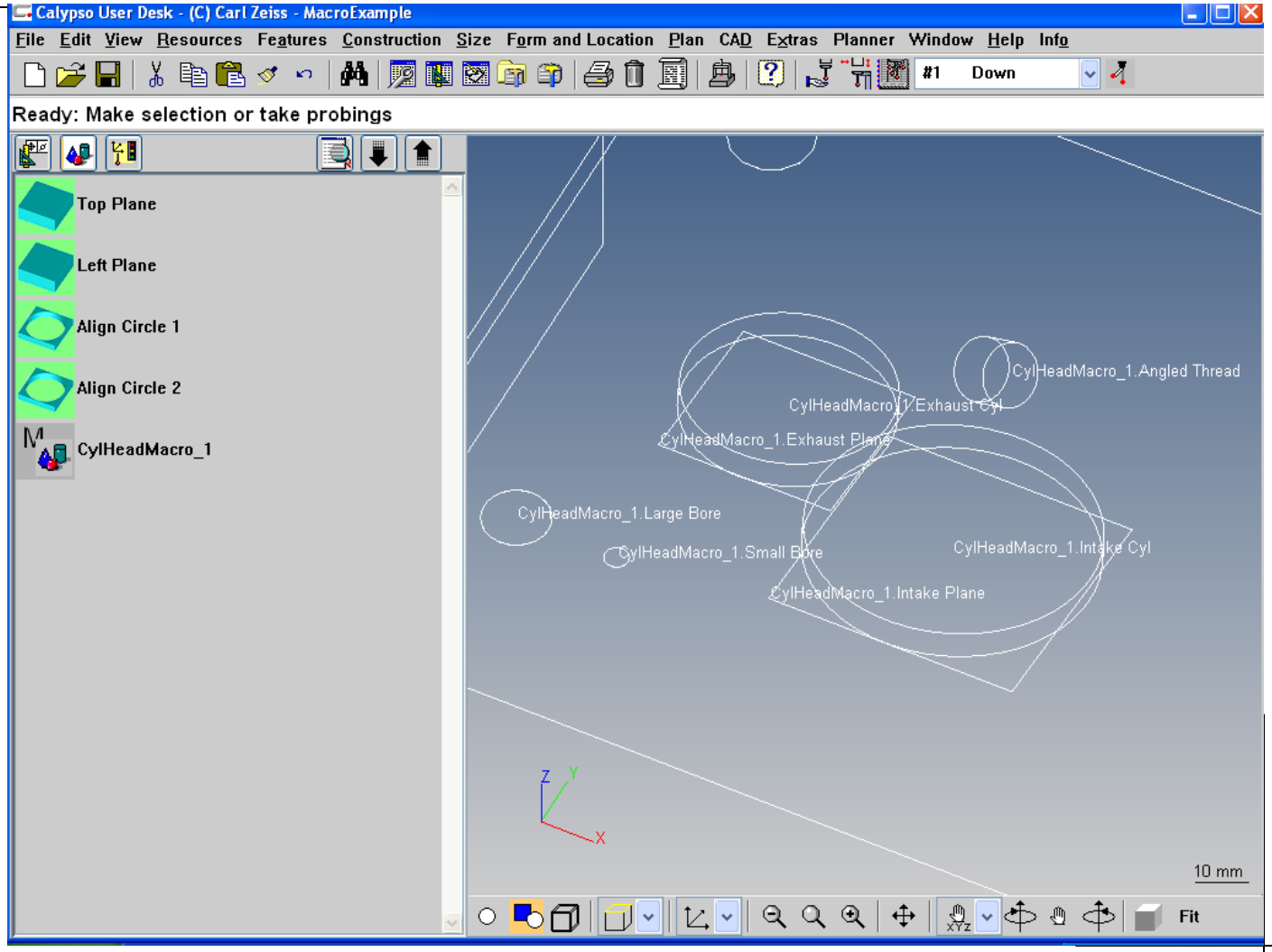
And we find our Macro in our Feature list and our Macro features appear in our CAD window.



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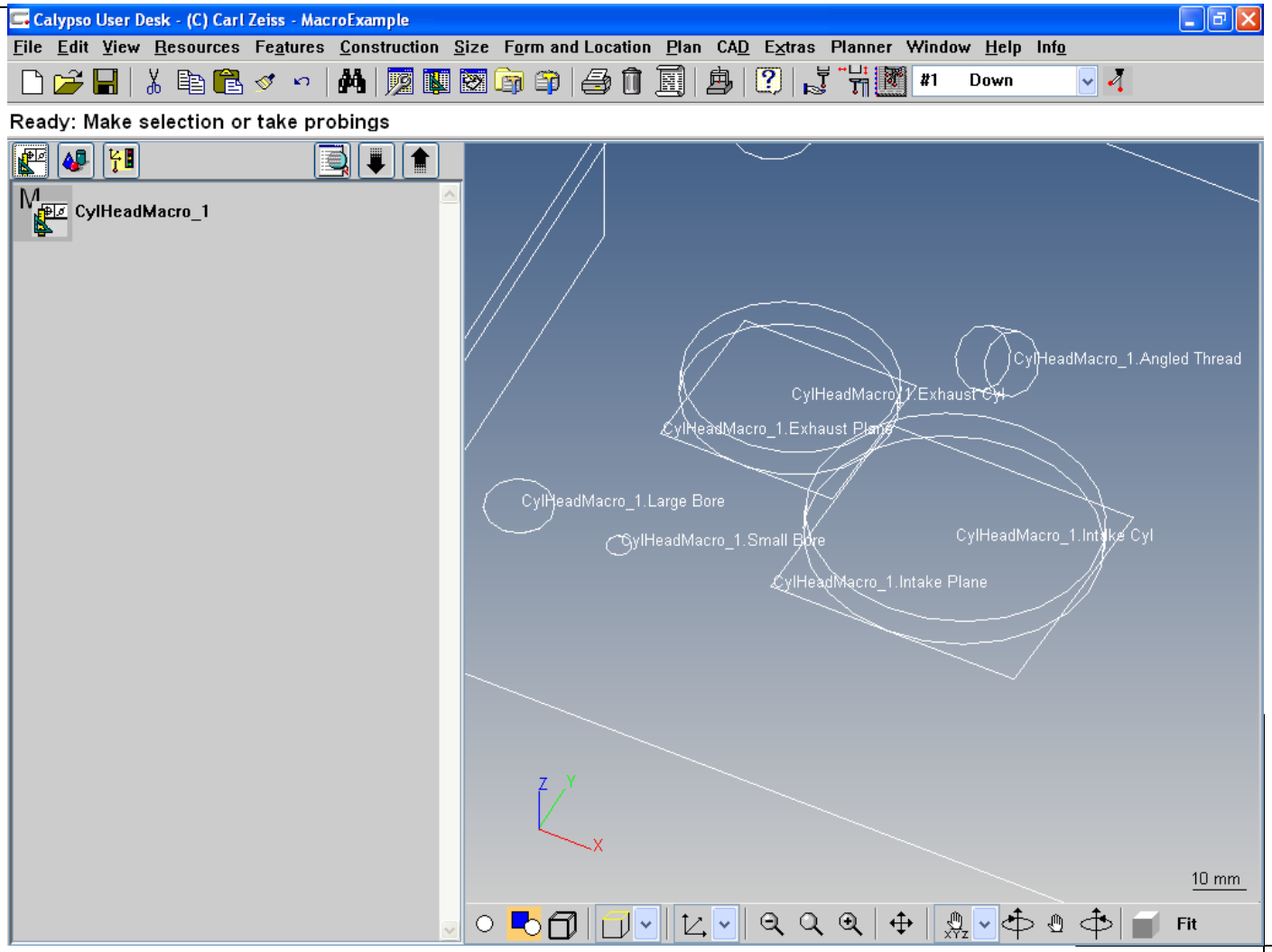
Our Macro also appears in the Characteristic list, which holds all of the characteristics tied to our Macro features.



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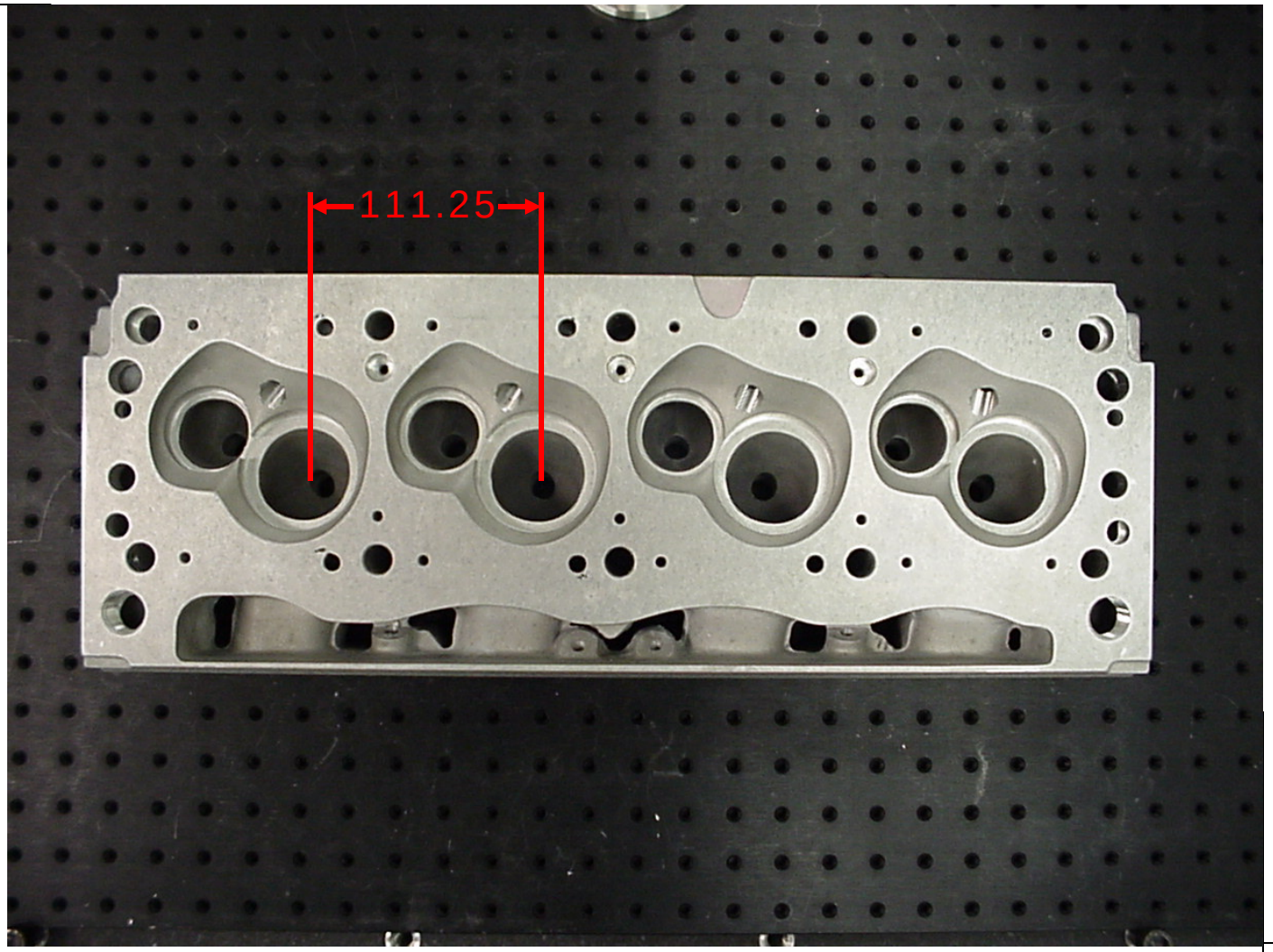
The distance between our Macro patterns is found on the print.



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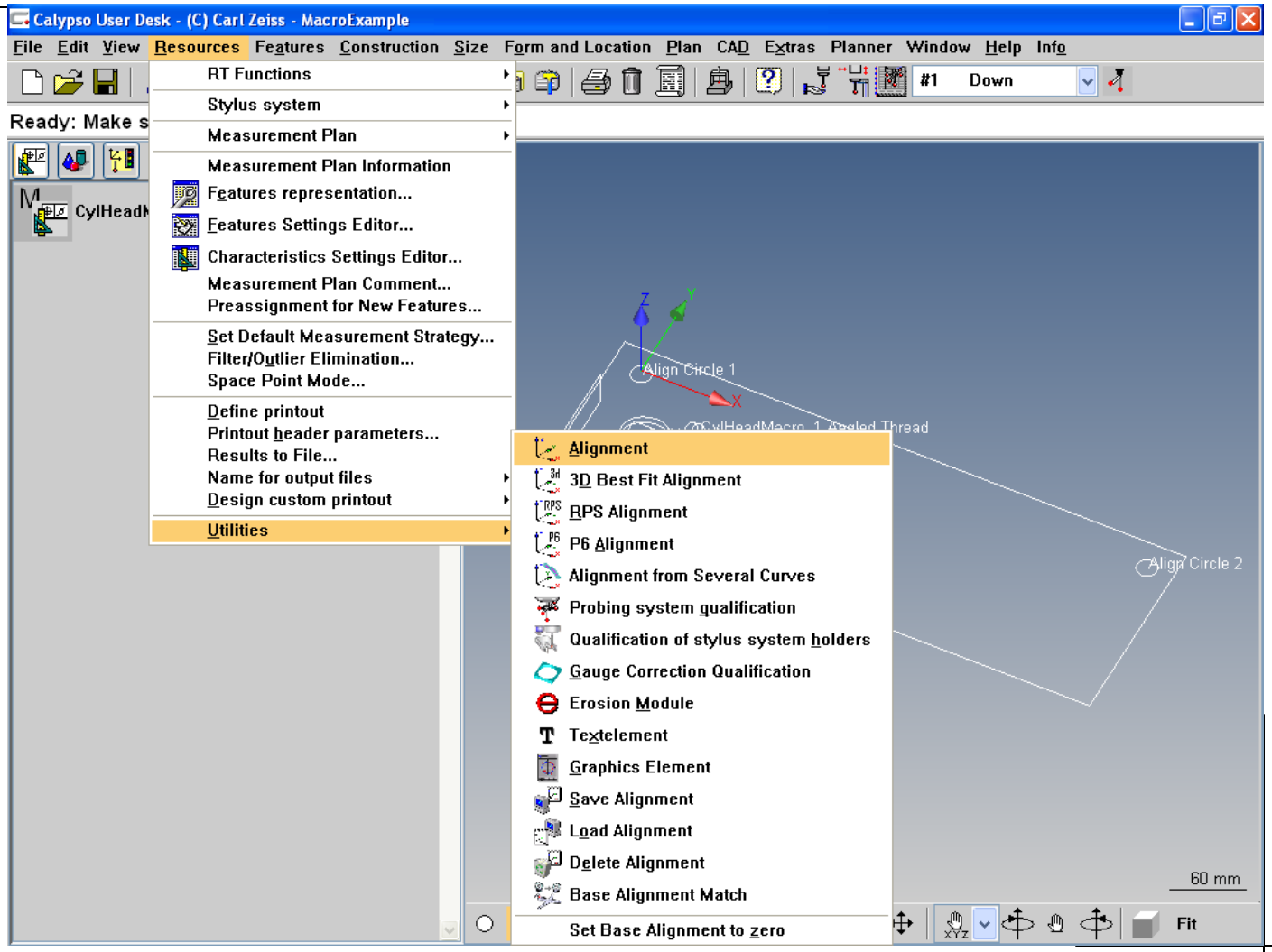
In order to offset the next Macro, we use a Secondary Alignment.

Utilities> Alignment



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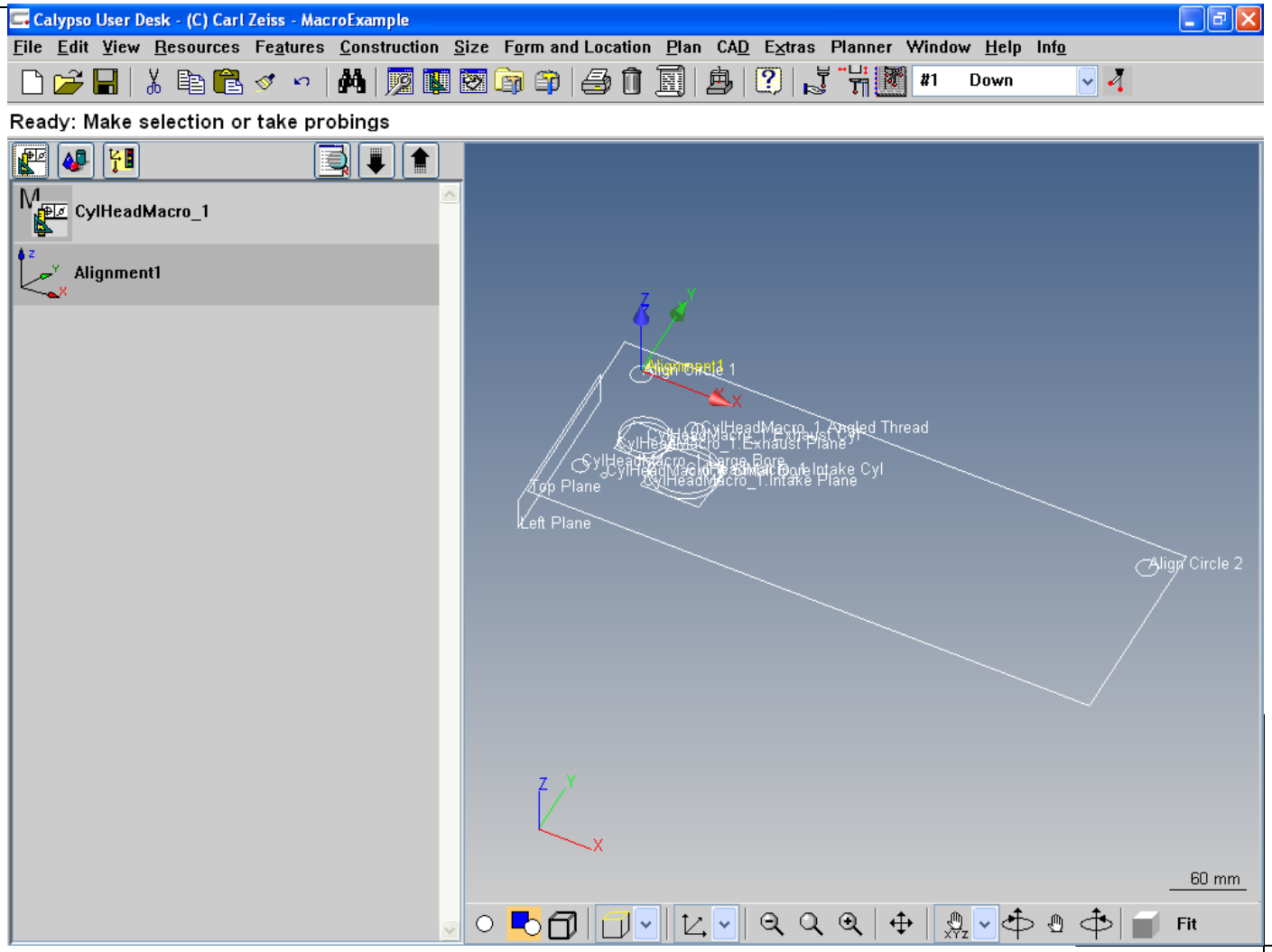
LUNCH 'N LEARN

In order to offset the next Macro, we use a Secondary Alignment.

Utilities> Alignment



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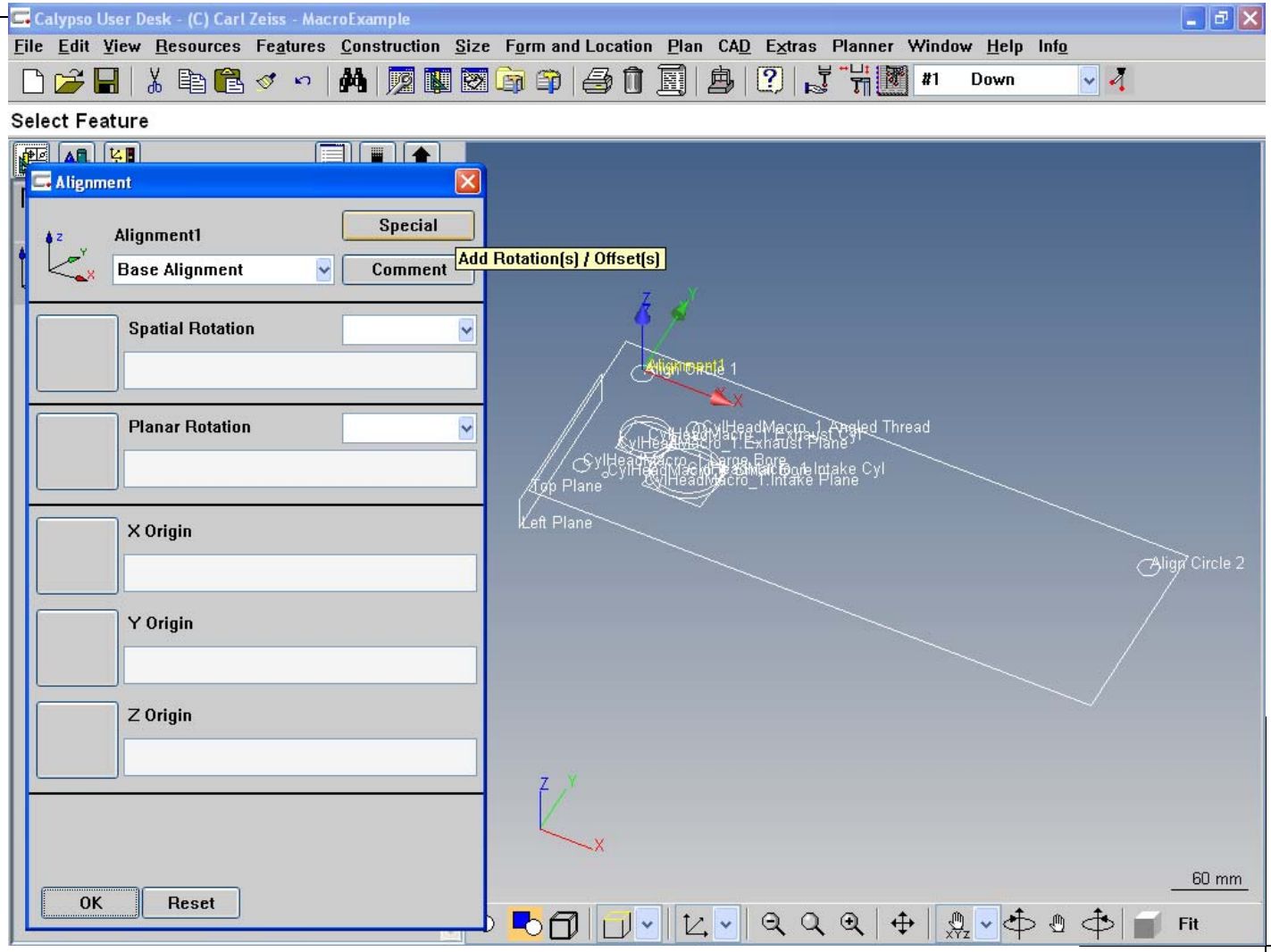
In the secondary alignment, click the special button...



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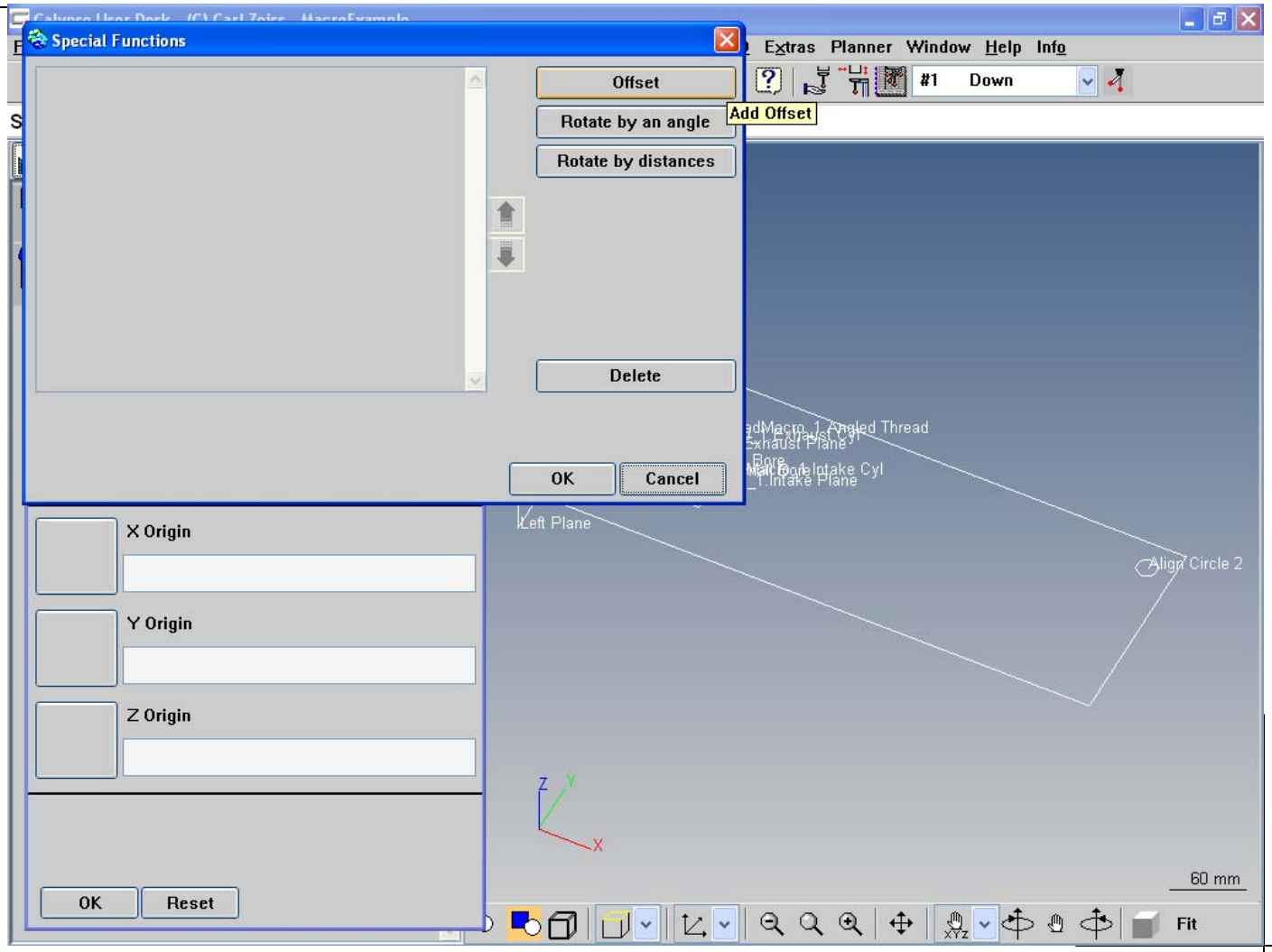
…and choose the method needed to offset your next macro.

Macros can be shifted in any combinations of offsets and rotations.



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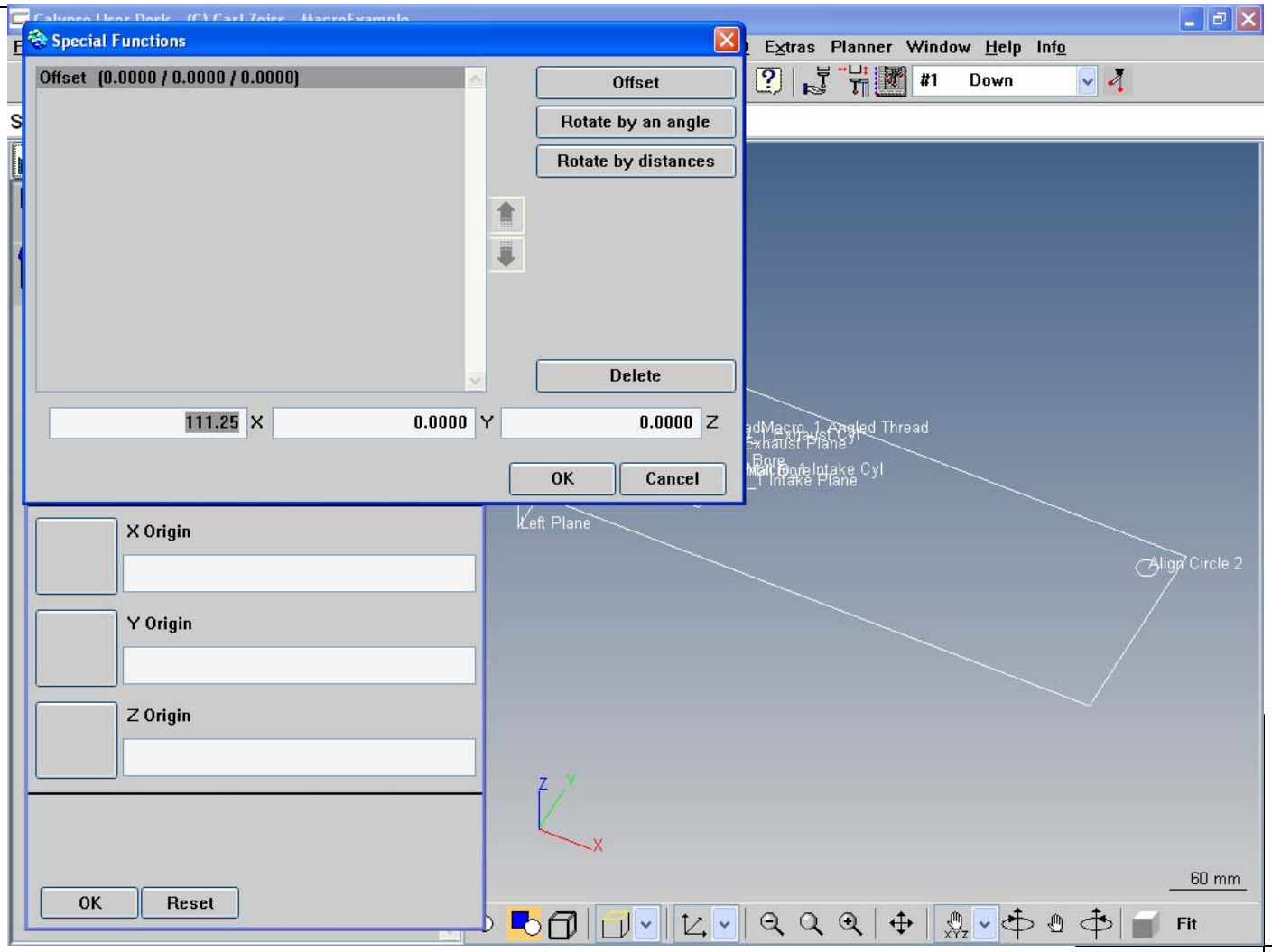
LUNCH 'N LEARN

In our case, we need to offset by 111.25mm in the X-direction.

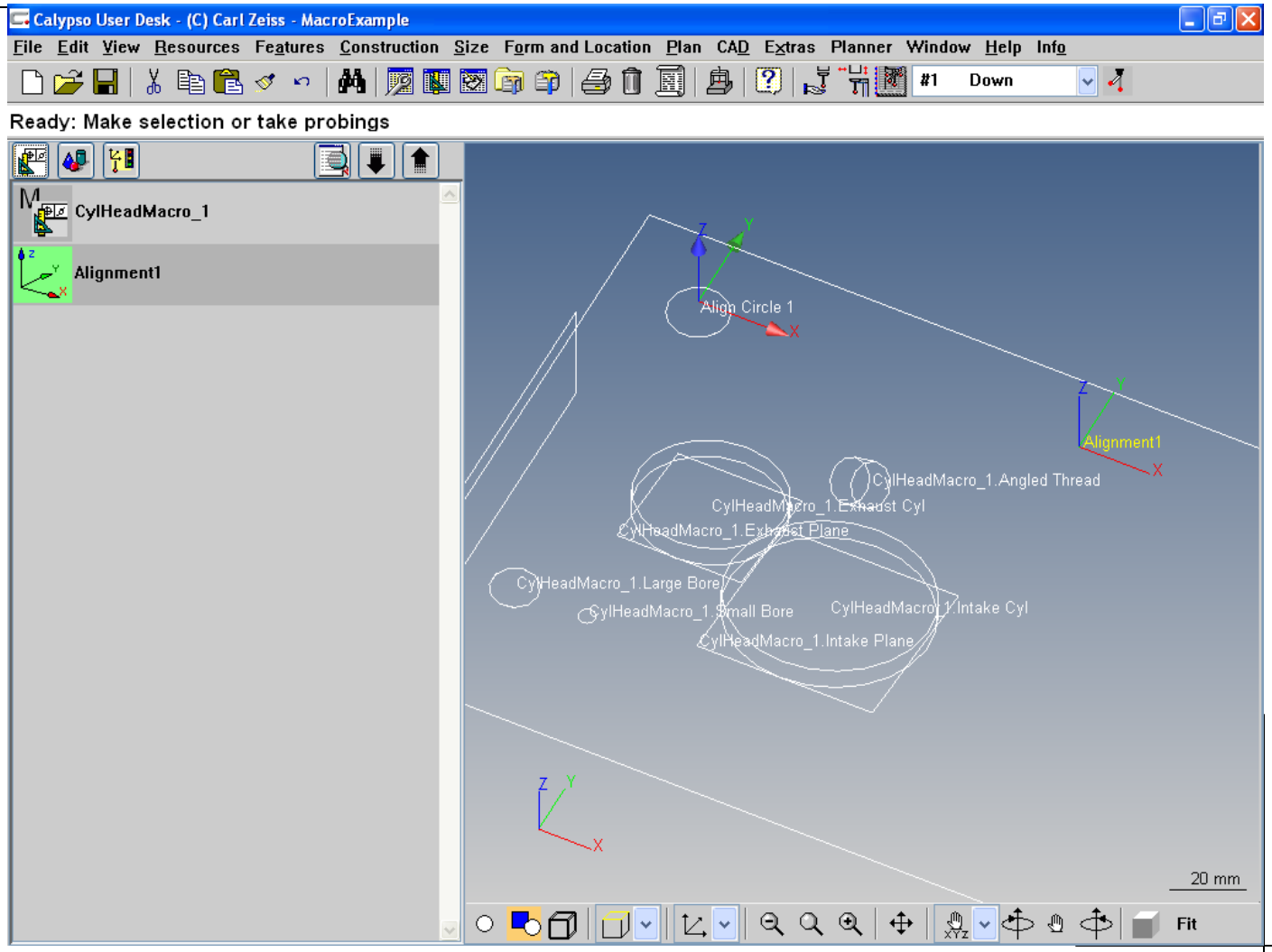


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

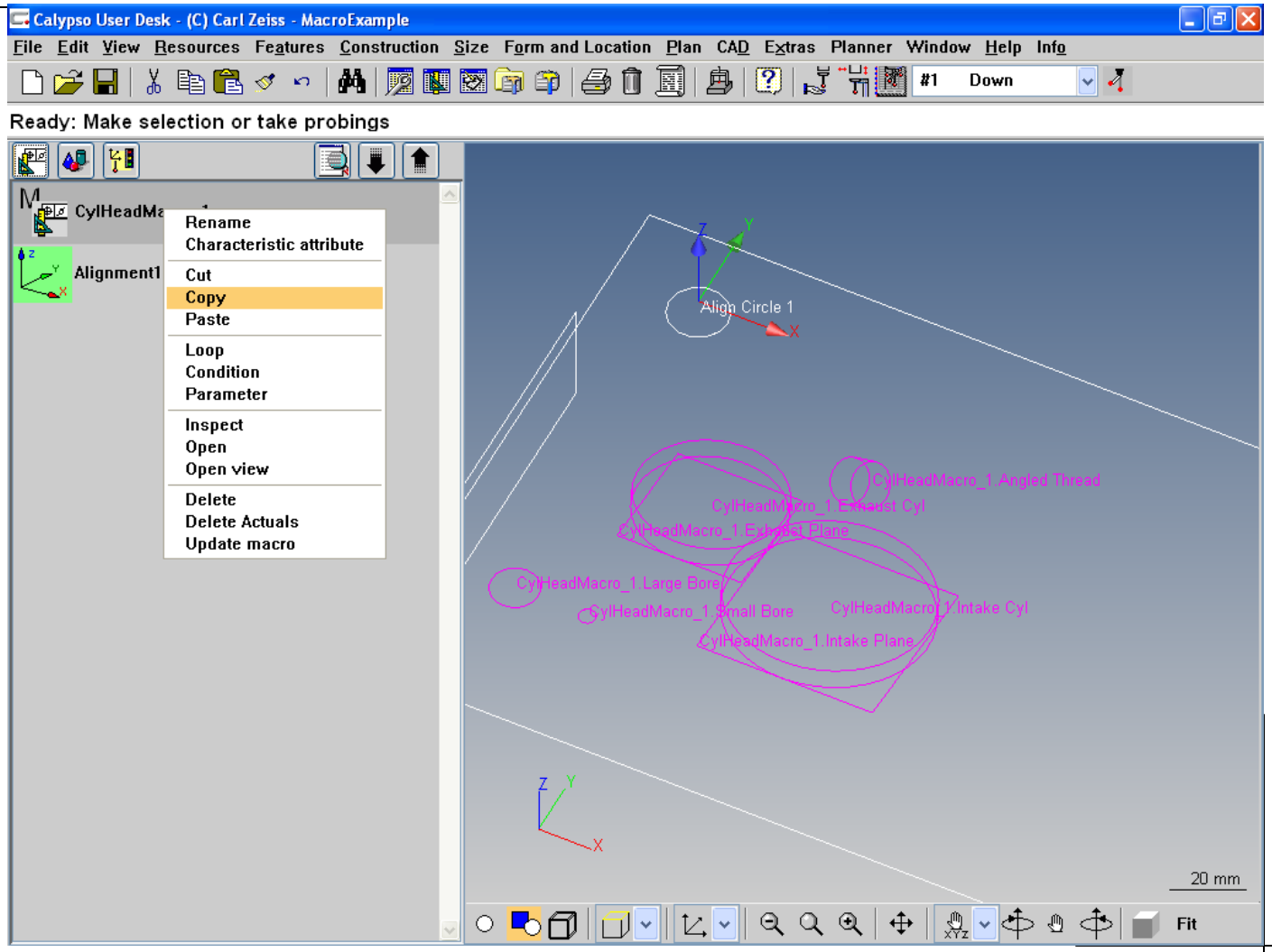
Now with our new alignment created...



J&H Machine Tools

LUNCH 'N LEARN

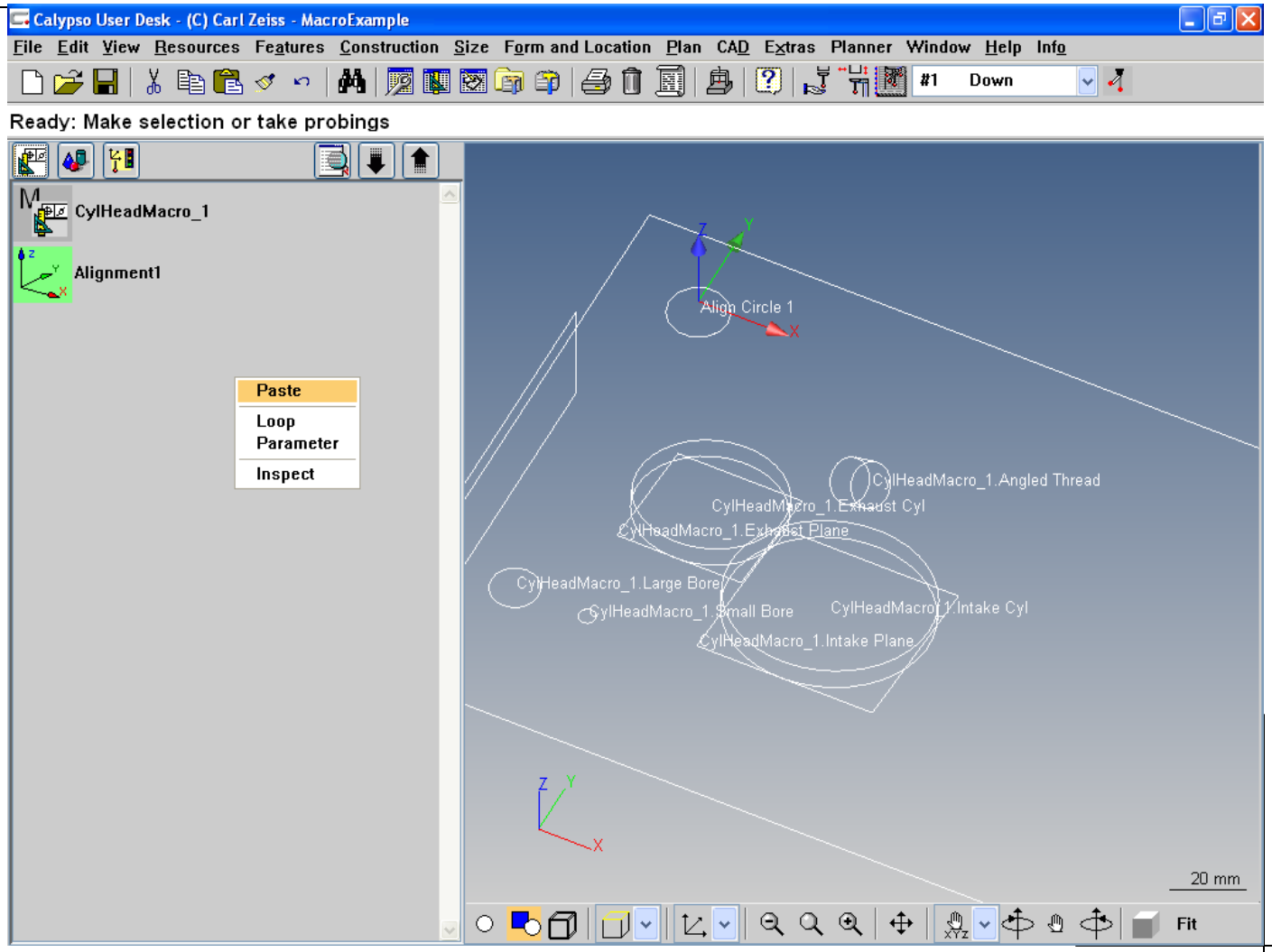
...we can copy-paste our Macro...



J&H Machine Tools

LUNCH 'N LEARN

...we can copy-paste our Macro...

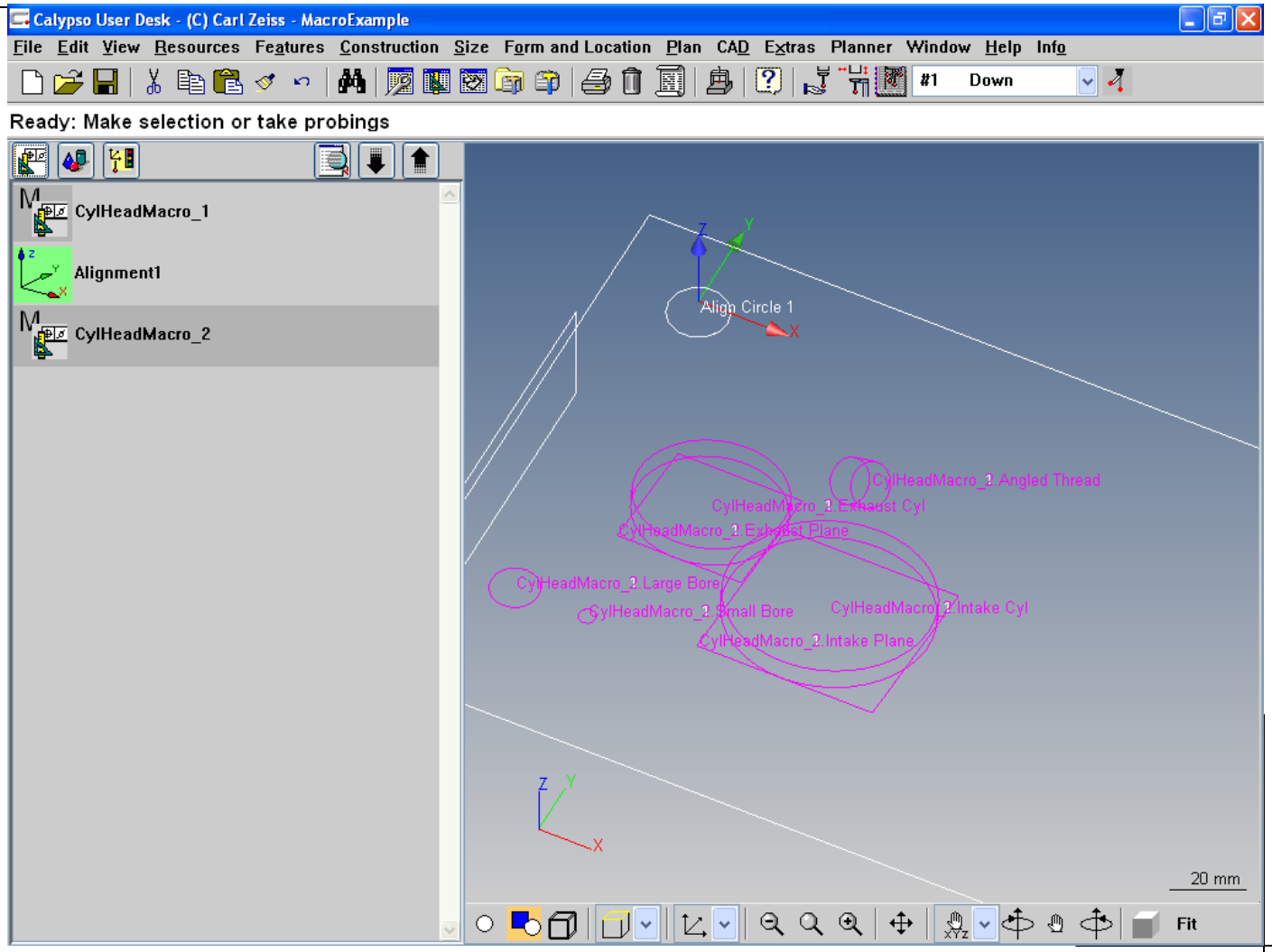


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

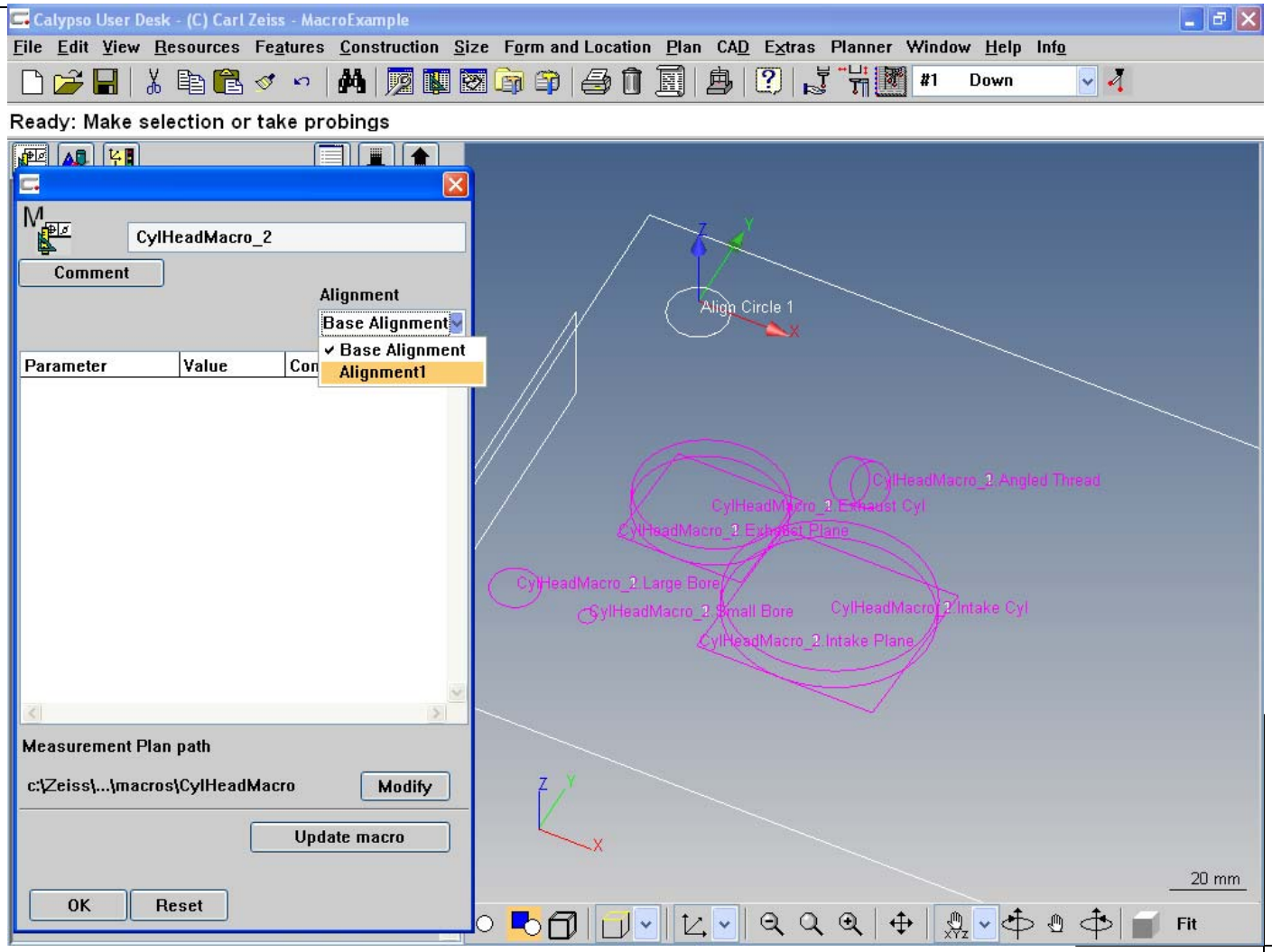
...open it up...



J&H Machine Tools

LUNCH 'N LEARN

…and change the Alignment setting to our new Secondary Alignment.



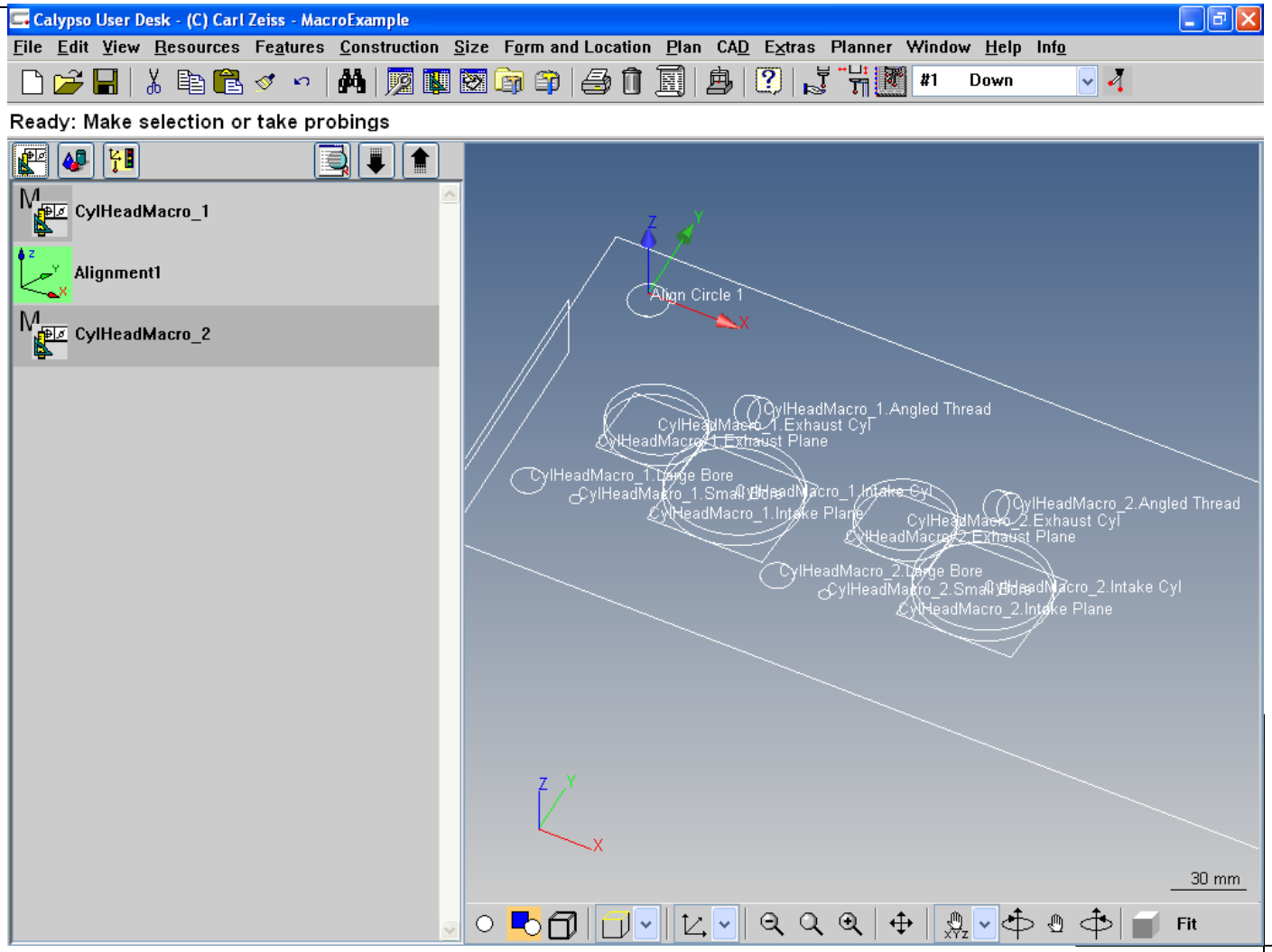
J&H Machine Tools

LUNCH 'N LEARN

ZEISS

As shown, this shifts our new Macro into the desired position.

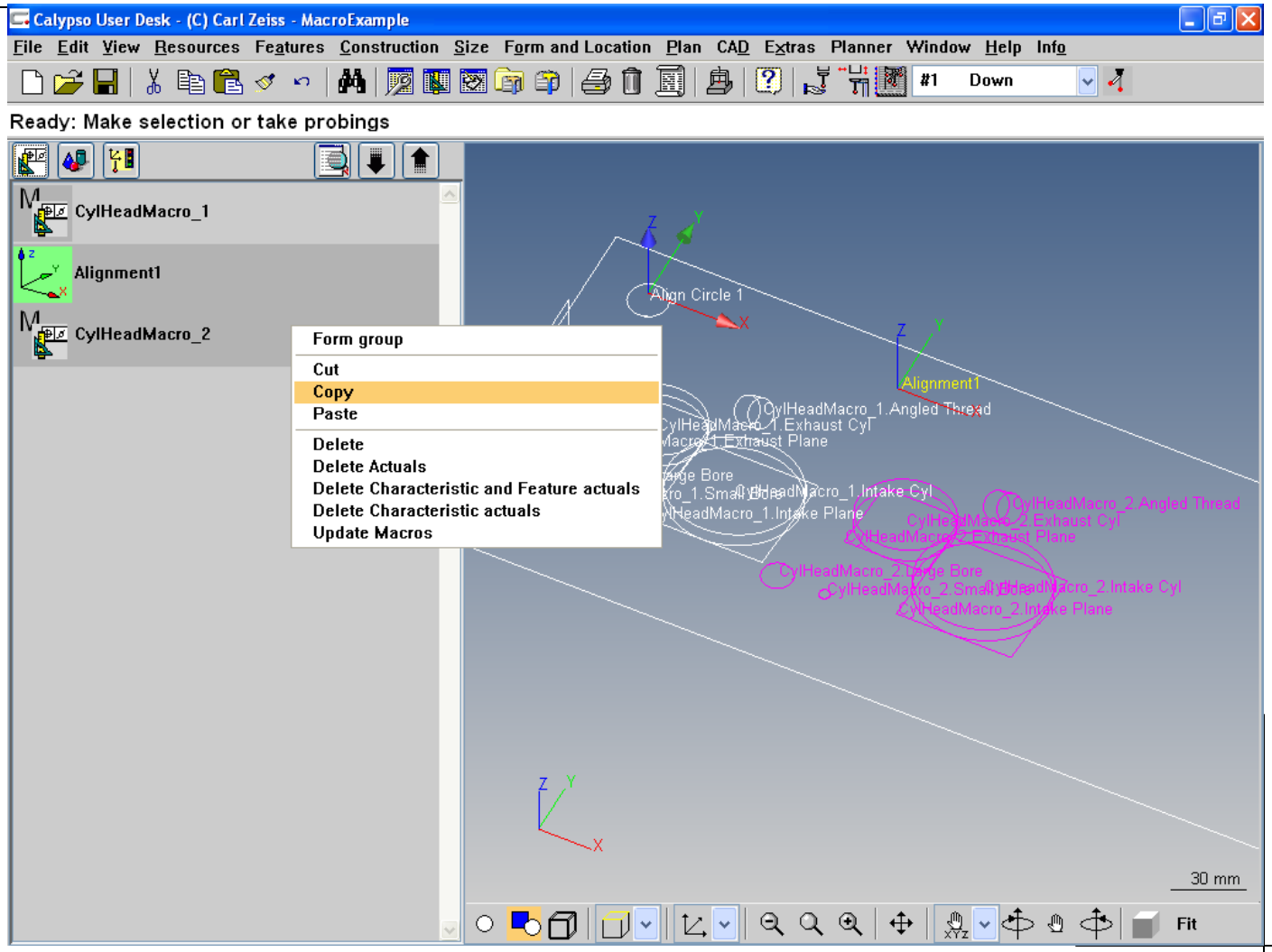
Now there are two sets of our Macro features and characteristics, offset from each other just like on the part.



J&H Machine Tools

LUNCH 'N LEARN

To continue creating additional shifted Macros in the same pattern, simply copy-paste both the Macro and its secondary alignment.

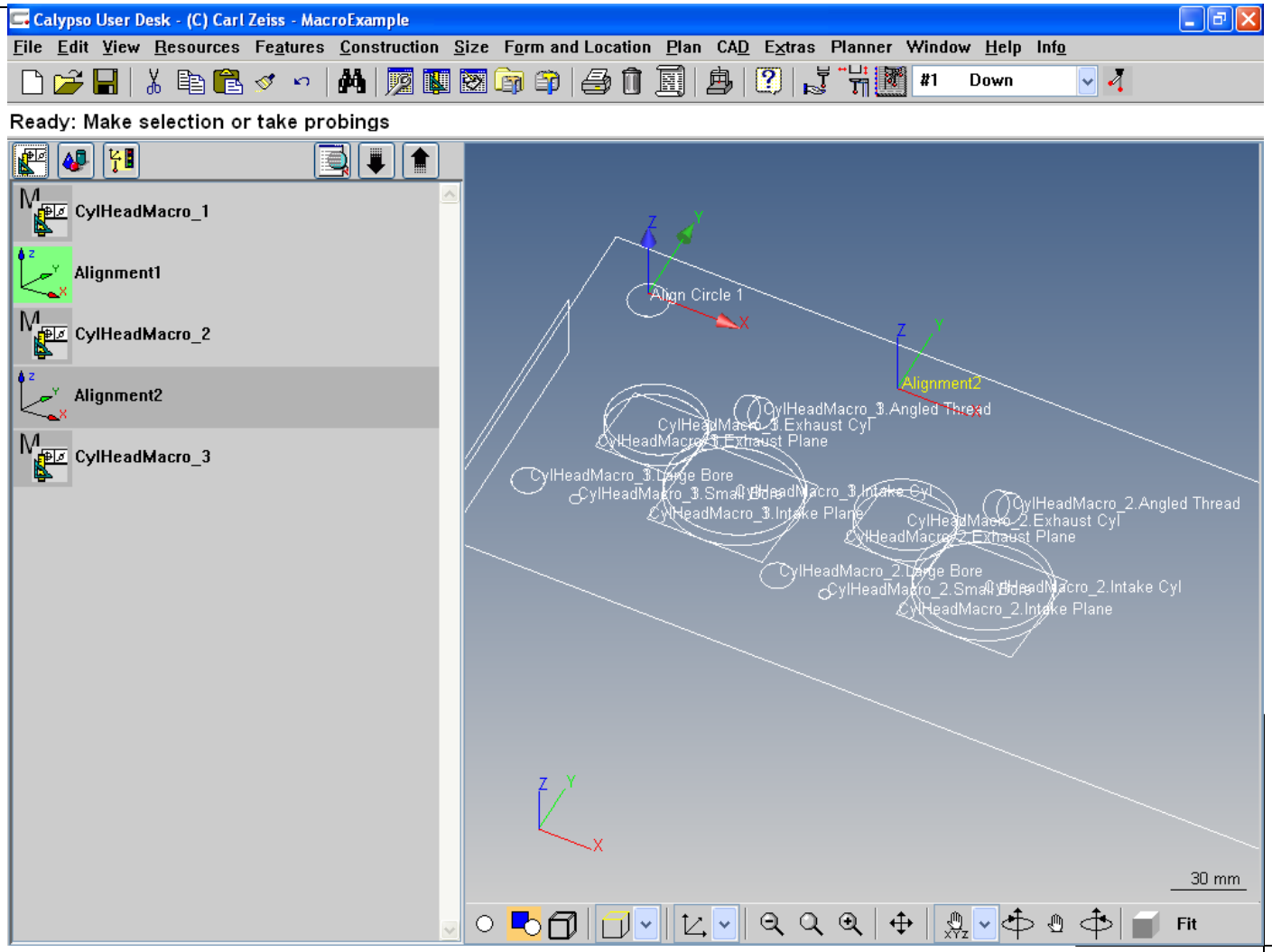


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

To continue creating additional shifted Macros in the same pattern, simply copy-paste both the Macro and its secondary alignment.

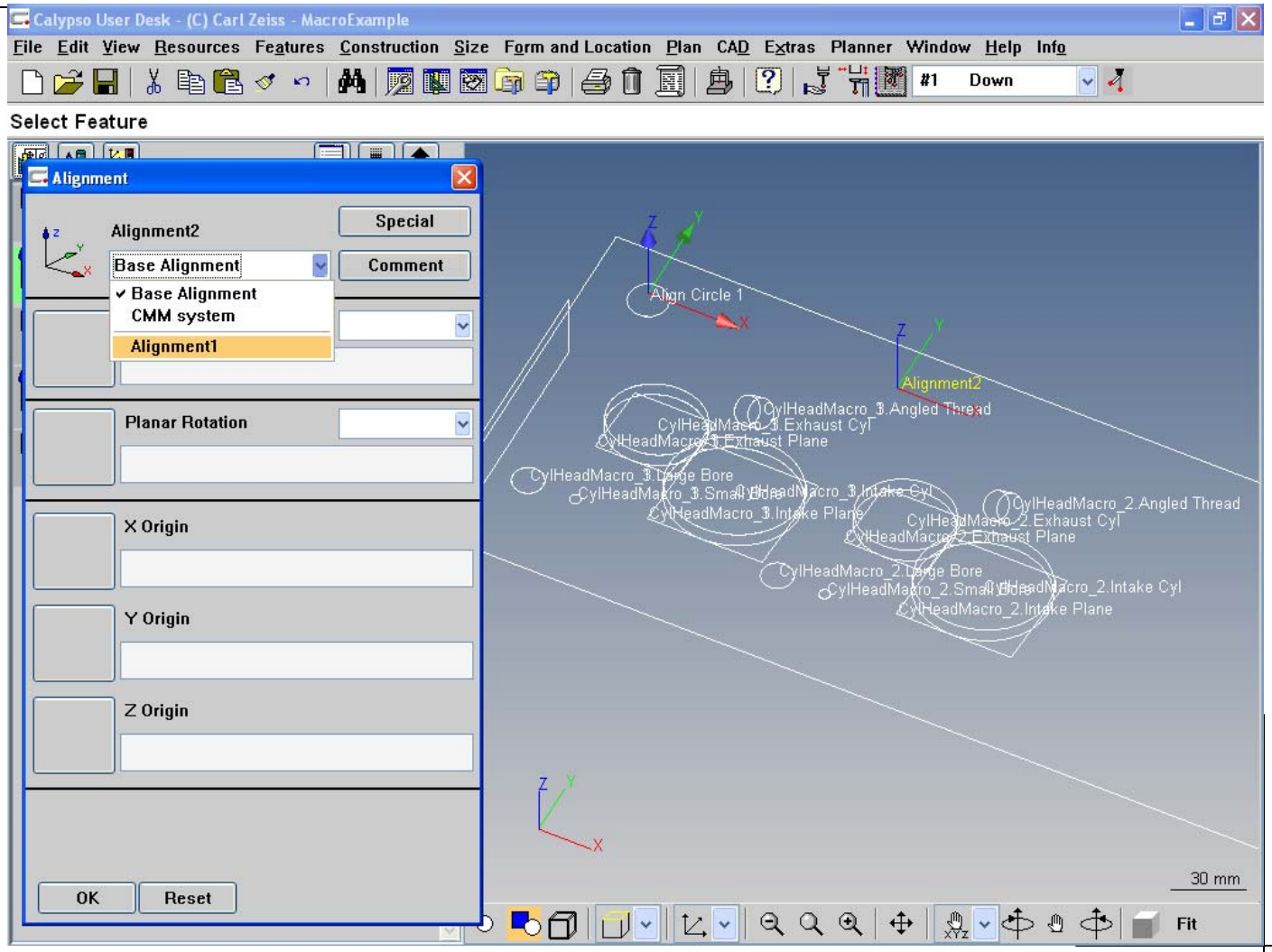


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

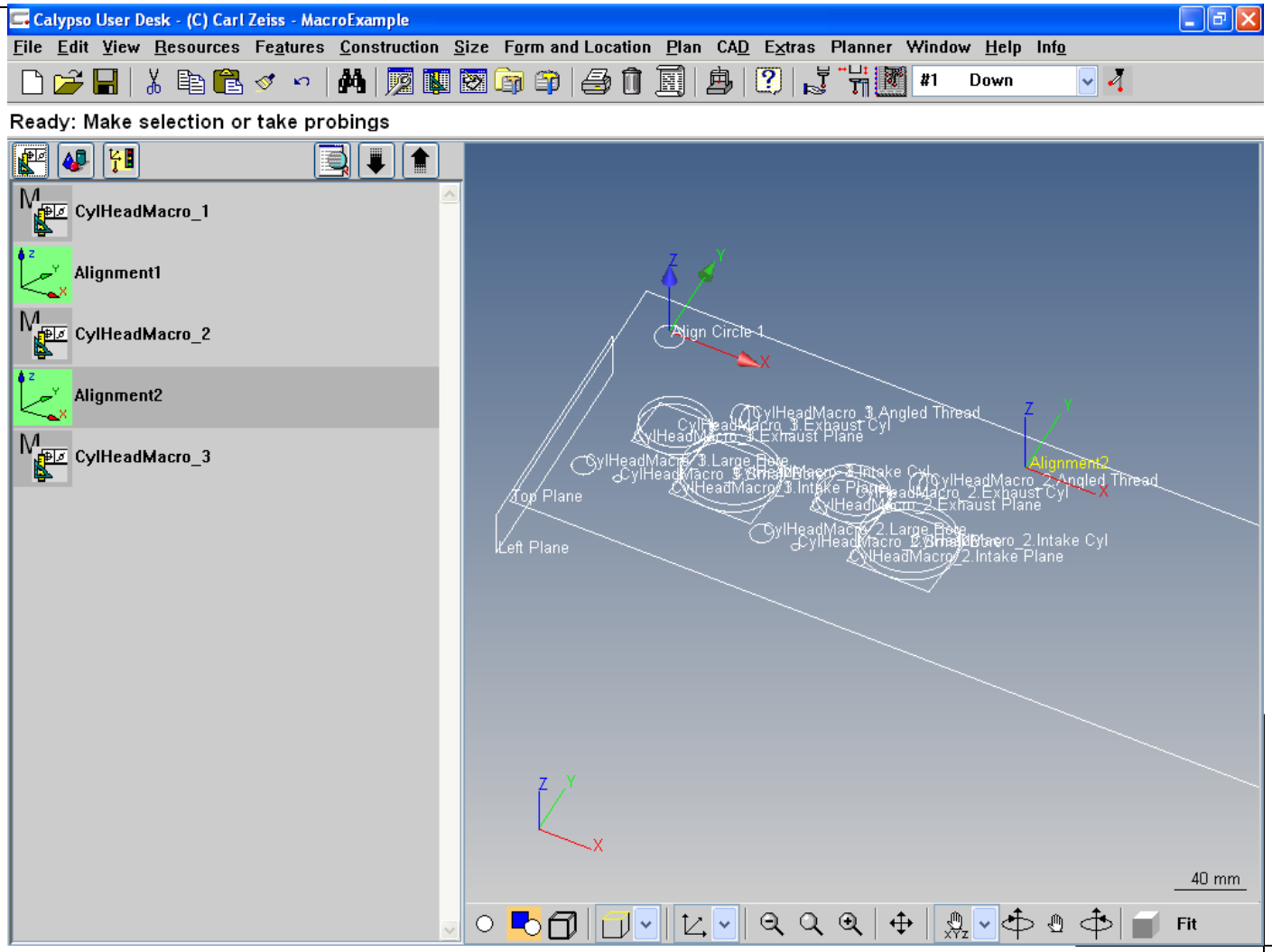
Change the reference of your second alignment to your first alignment.



J&H Machine Tools

LUNCH 'N LEARN

This shifts your second alignment 111.25mm in the X-direction from your first alignment.

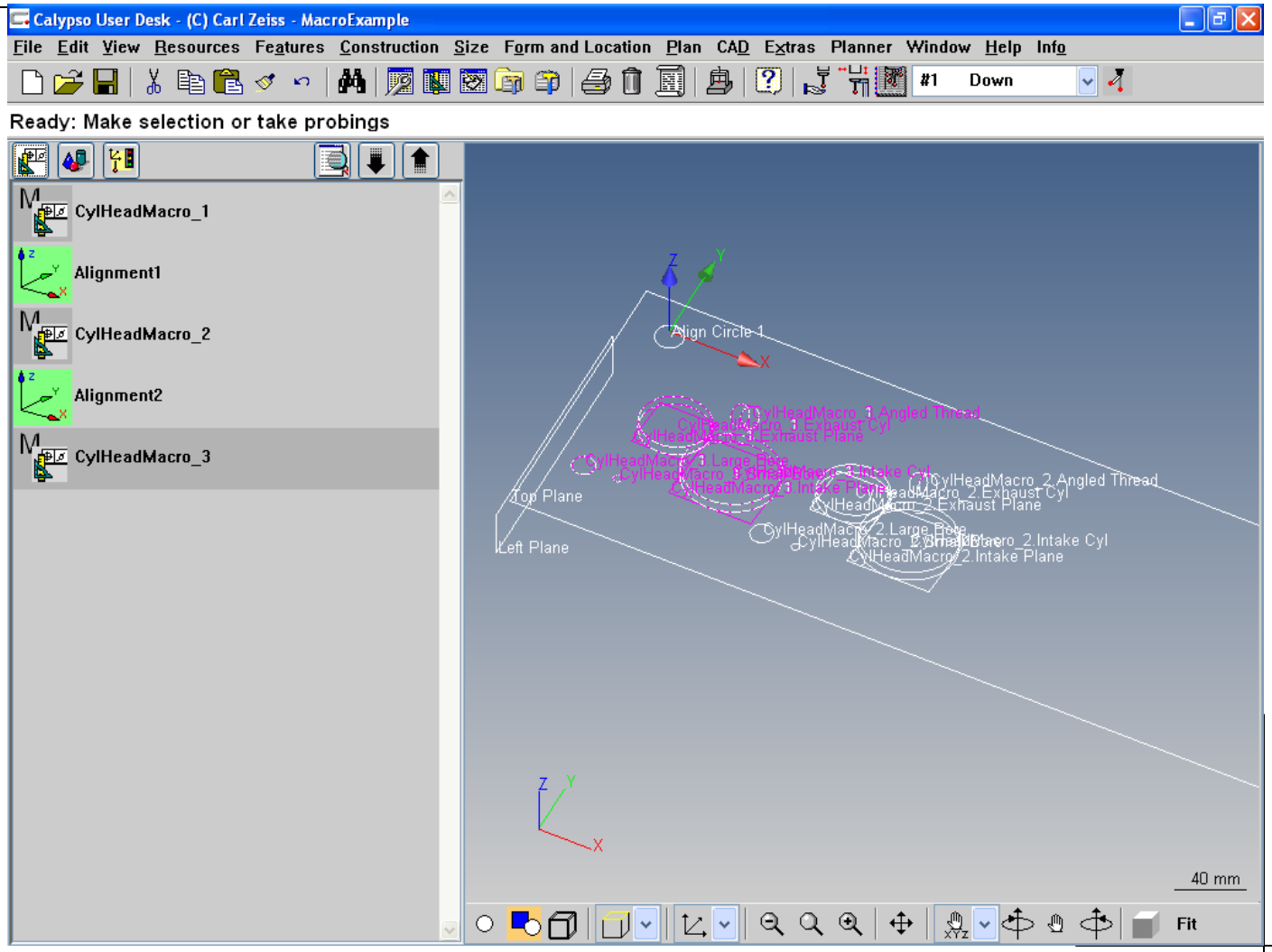


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

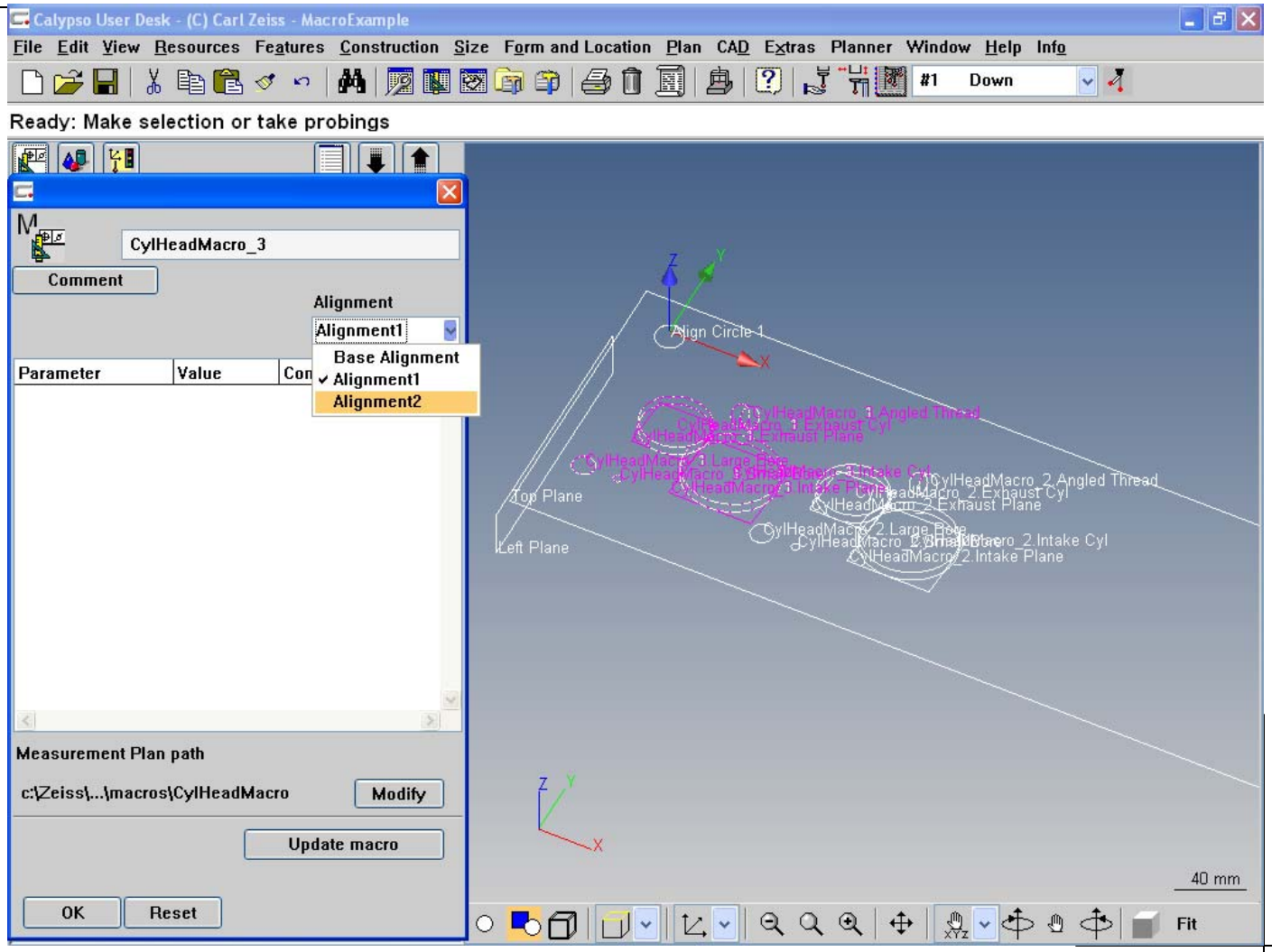
Now open your third Macro...



J&H Machine Tools

LUNCH 'N LEARN

…and change its Alignment setting to the newly created alignment.

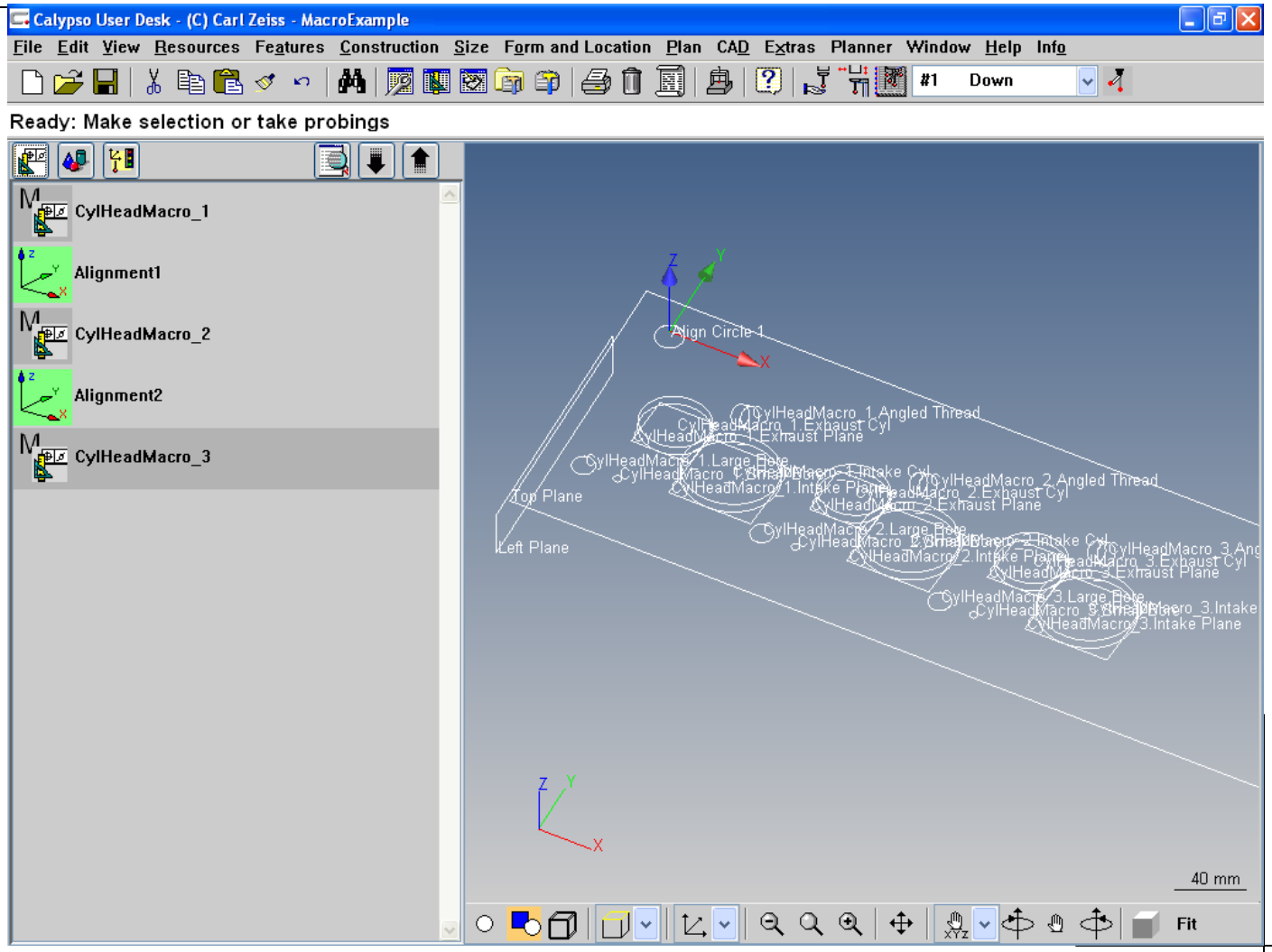


J&H Machine Tools

LUNCH 'N LEARN

Viola!

Now repeat as many times as necessary within a repeating pattern.



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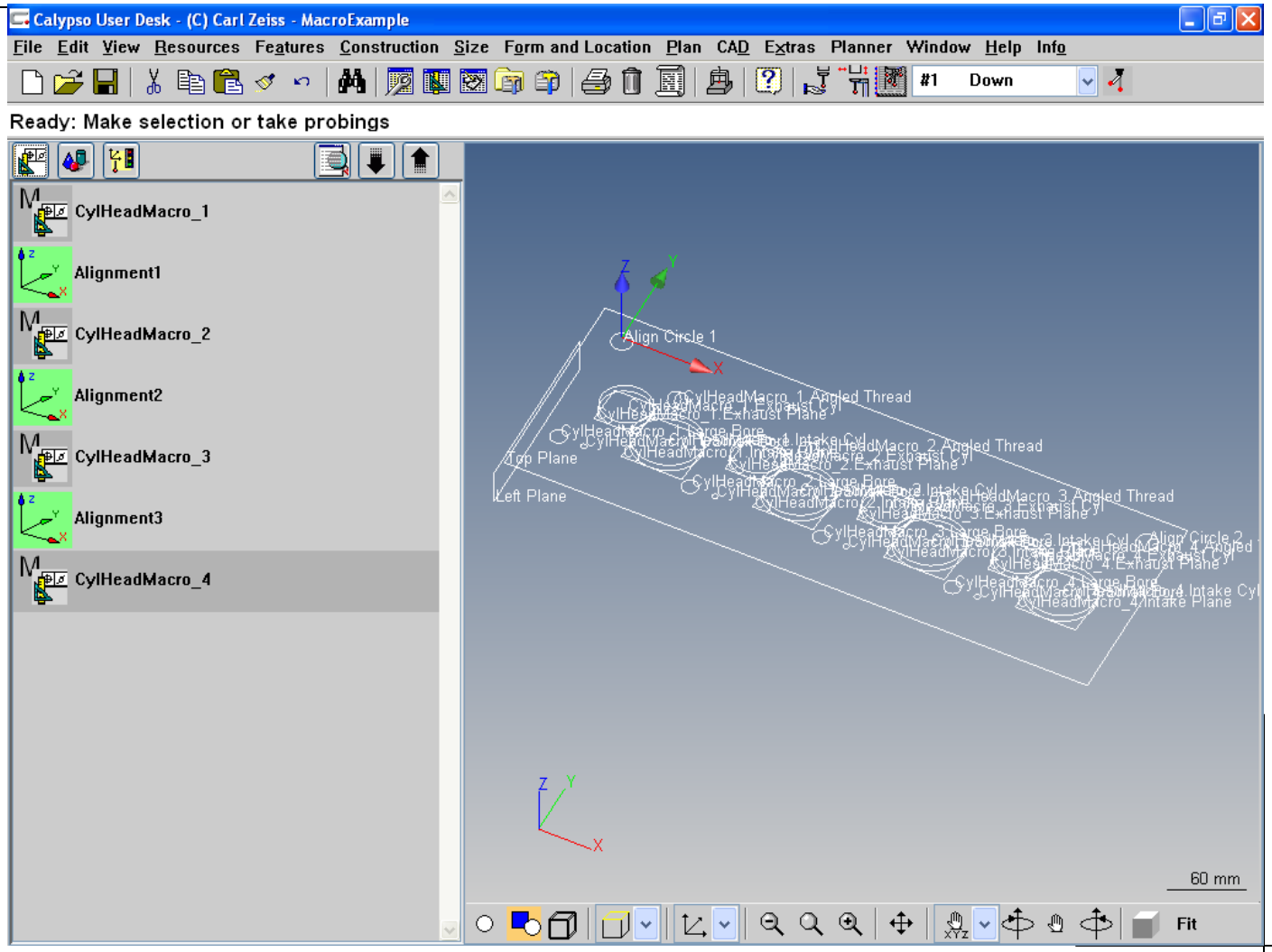
LUNCH 'N LEARN

ZEISS

Completed!



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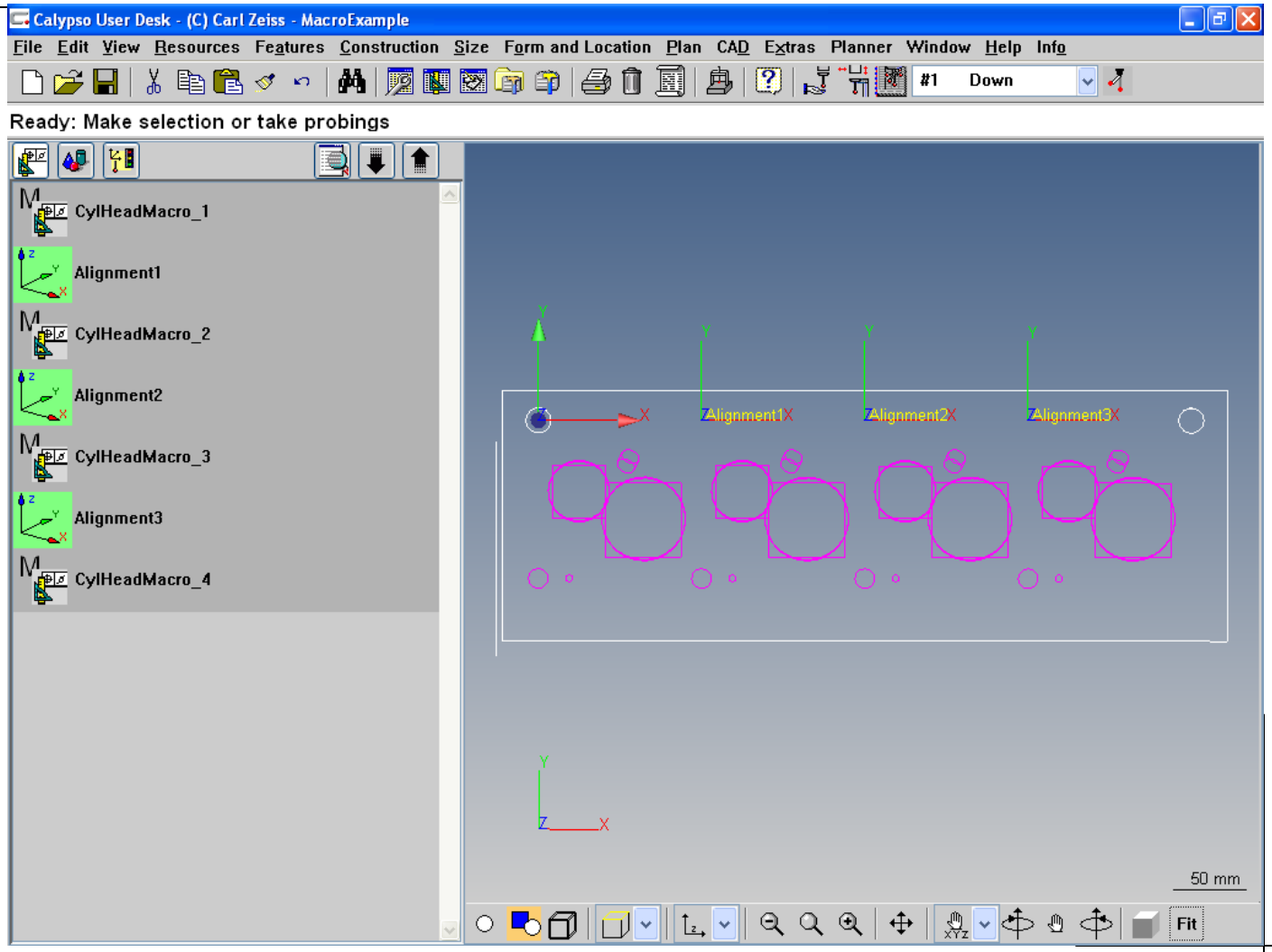
LUNCH 'N LEARN

ZEISS

As you see, each Macro has its own Alignment, with the first Macro's alignment being the Base Alignment, and all others being a Secondary Alignment.



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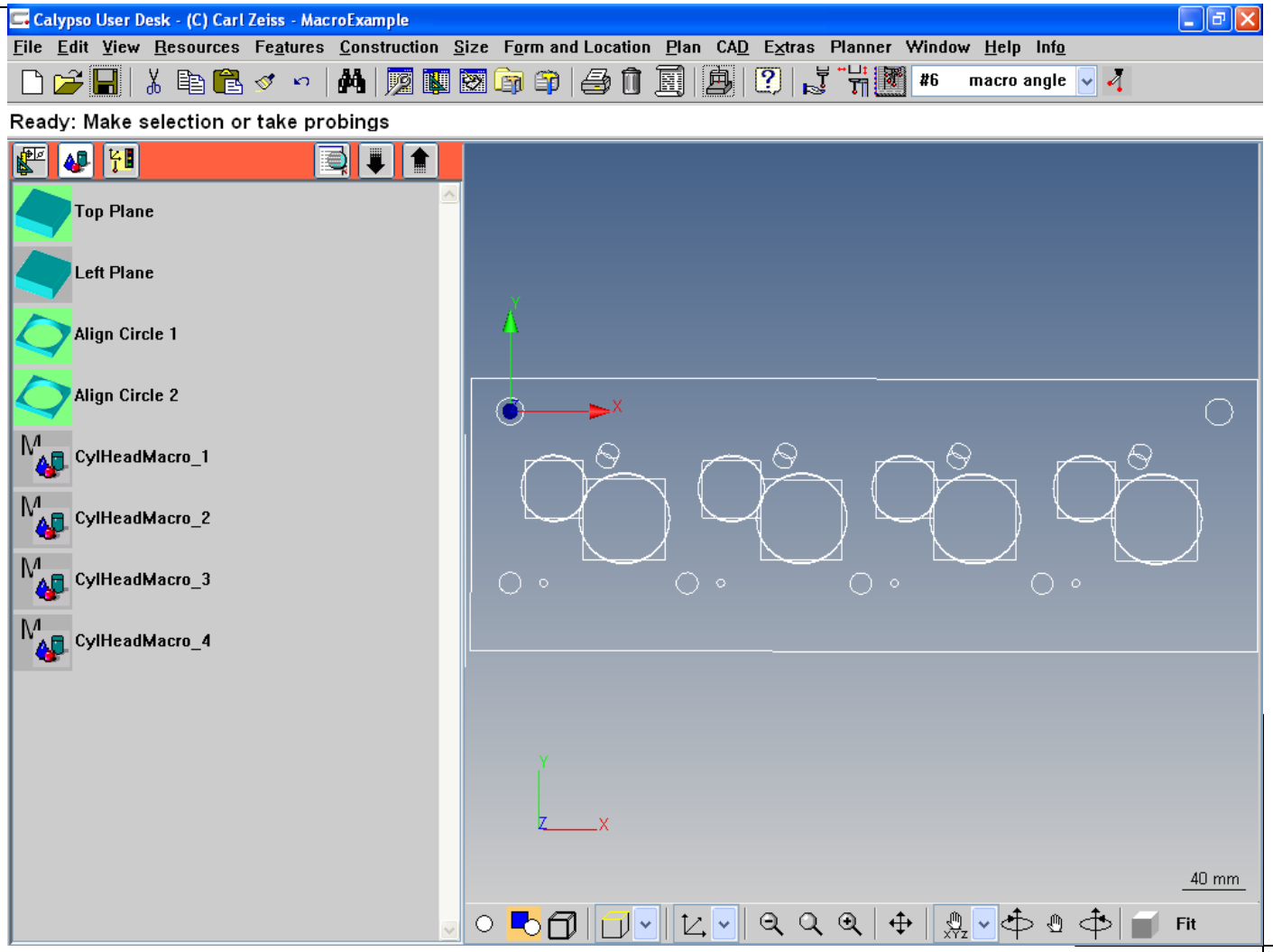
LUNCH 'N LEARN

Each Macro exists independently in both the feature list and characteristic list.

Deleting one will also delete the other.



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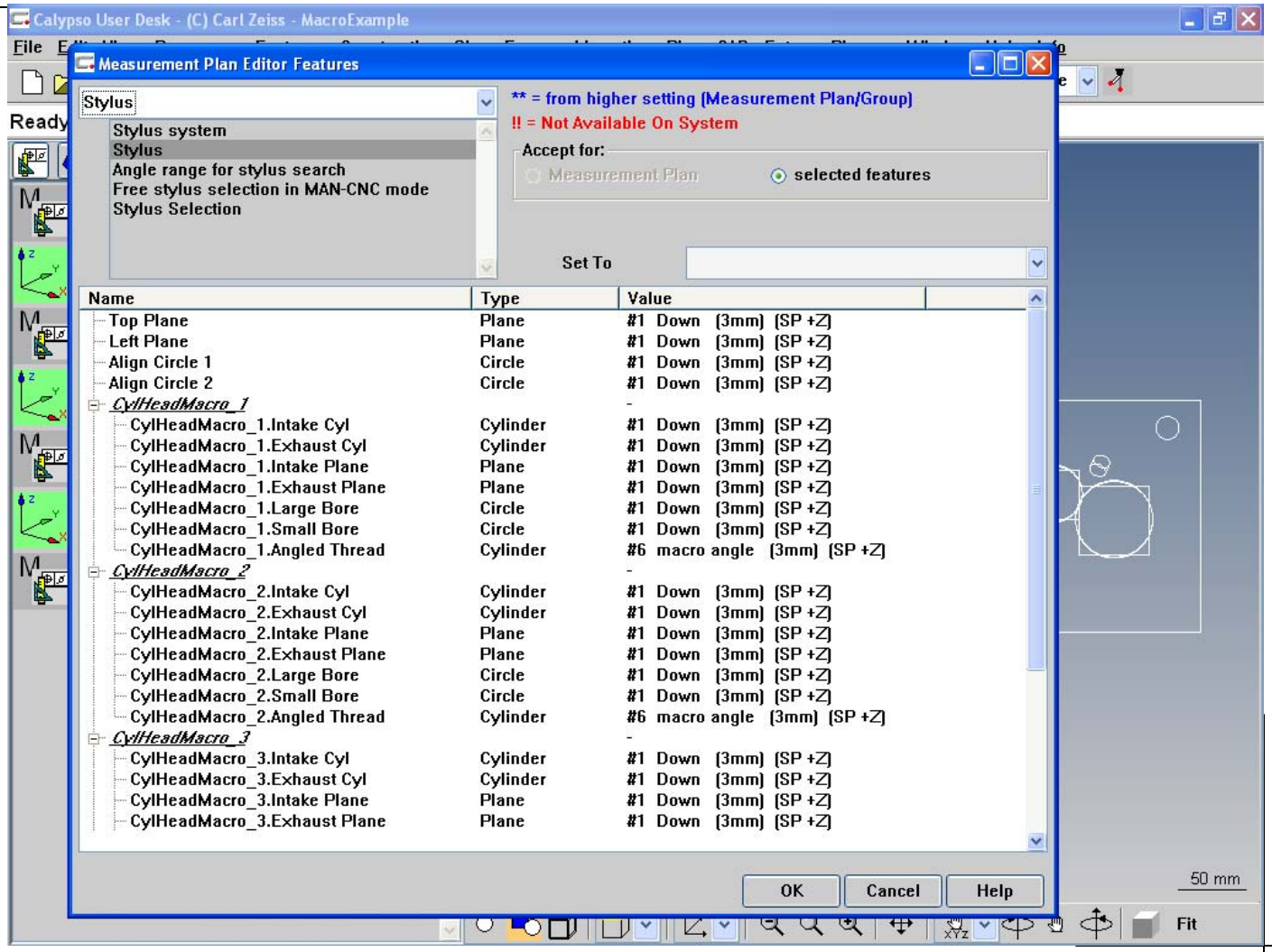
LUNCH 'N LEARN

As seen in the features settings editor, each feature inside of a Macro also exists individually in our Base Program as well. This means we can change individual settings for specific Macro features if needed.



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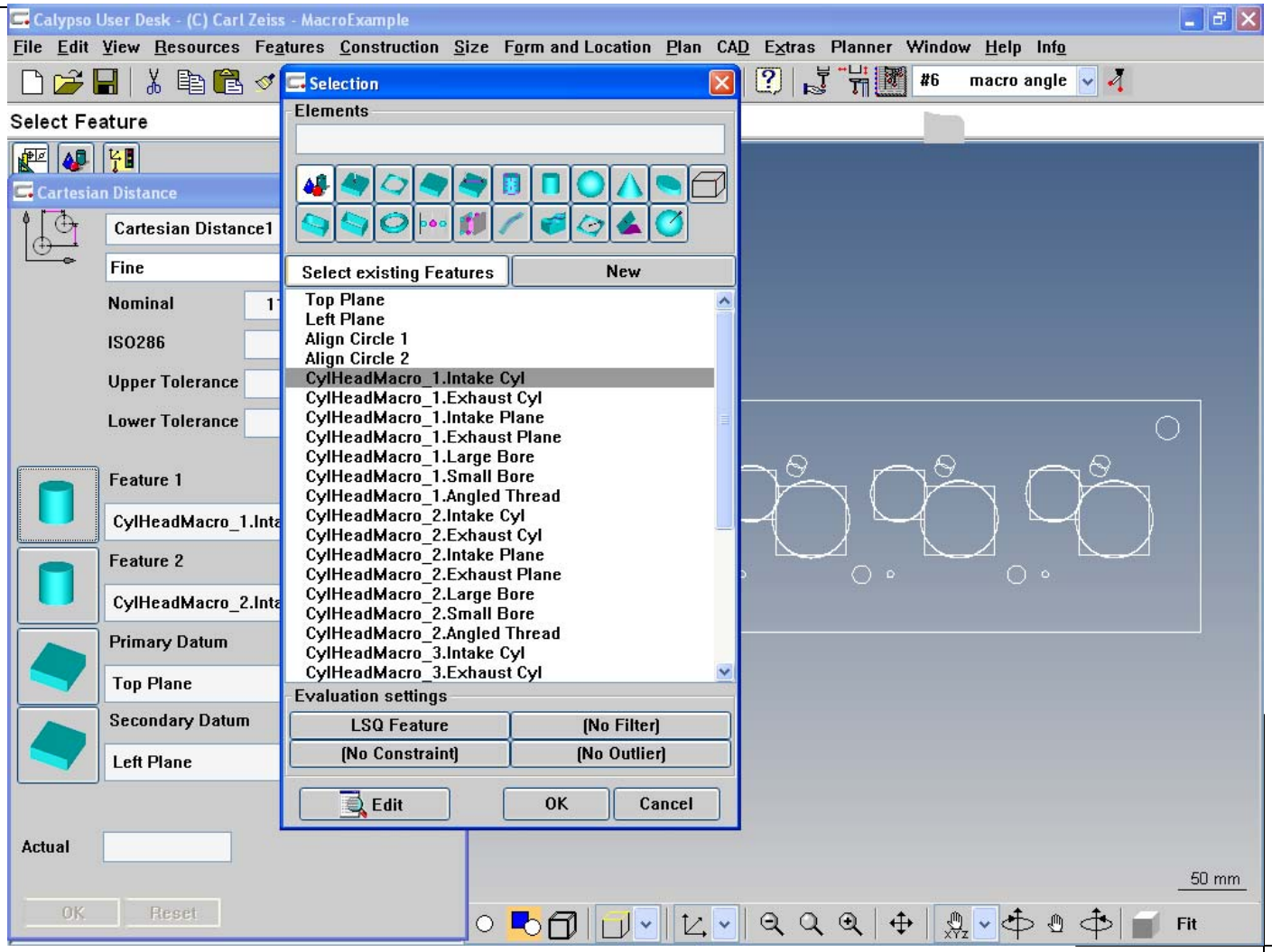
LUNCH 'N LEARN

ZEISS

This also means that we can reference individual Macro features in new characteristics, in recalled features, and in formulas.



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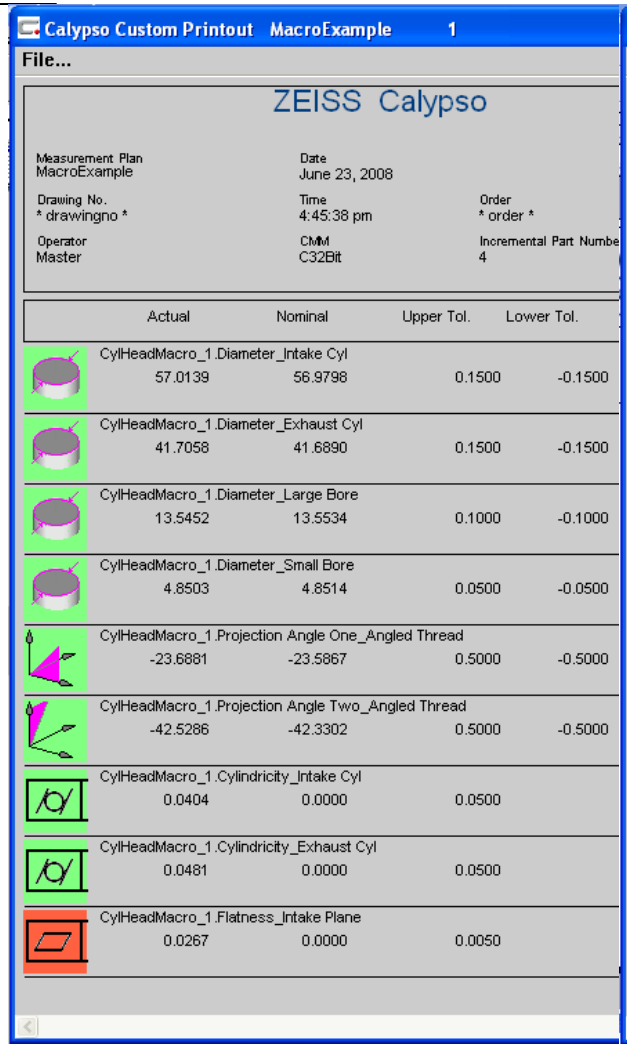
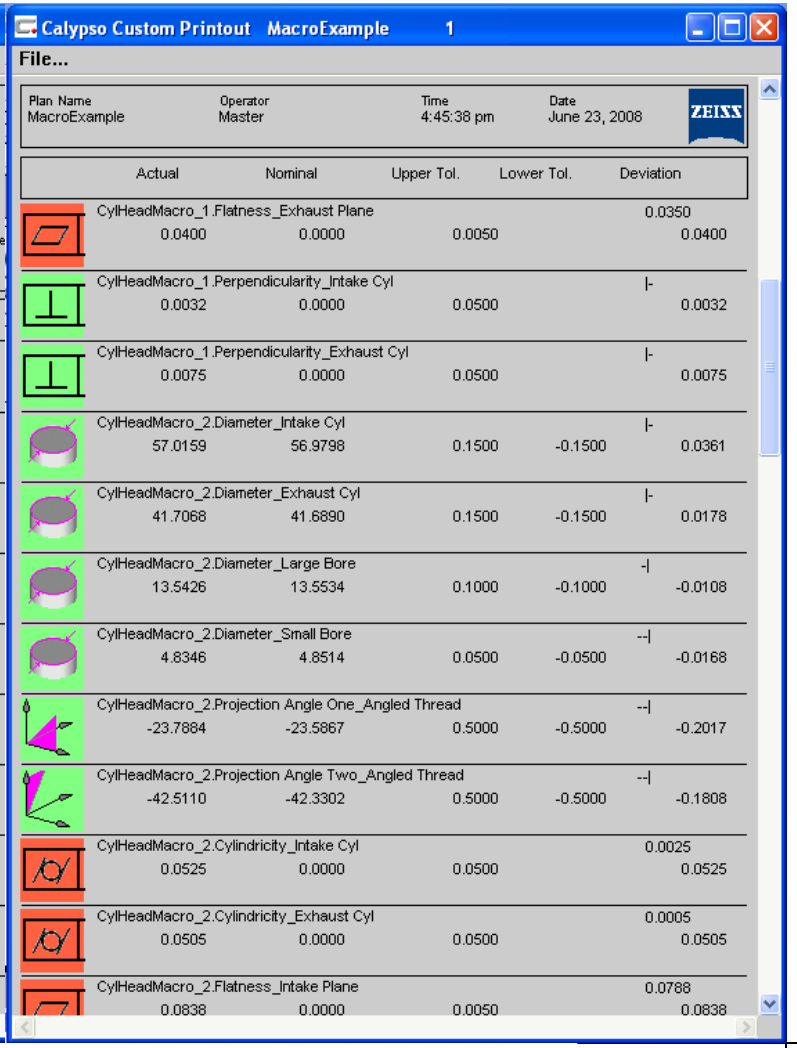
LUNCH 'N LEARN

Each characteristic of a Macro feature is displayed individually in the Calypso printouts as well, using an easily understandable naming method.





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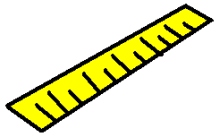
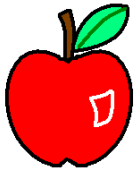
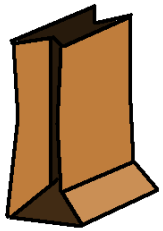




LUNCH 'N LEARN



ZEISS

Editing a Macro

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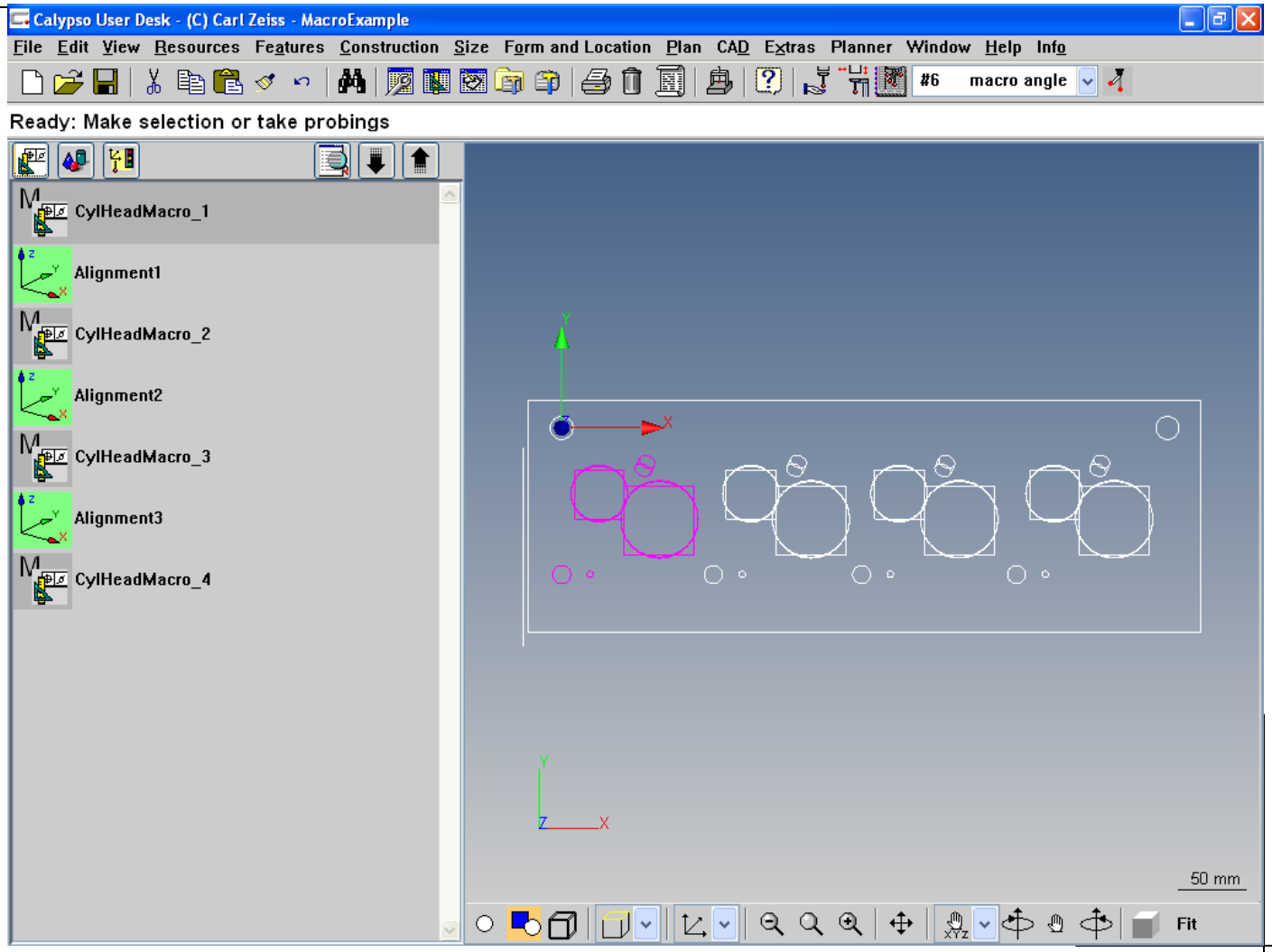
LUNCH 'N LEARN

ZEISS

But what happens if we need to edit a feature or characteristic within the Macro?



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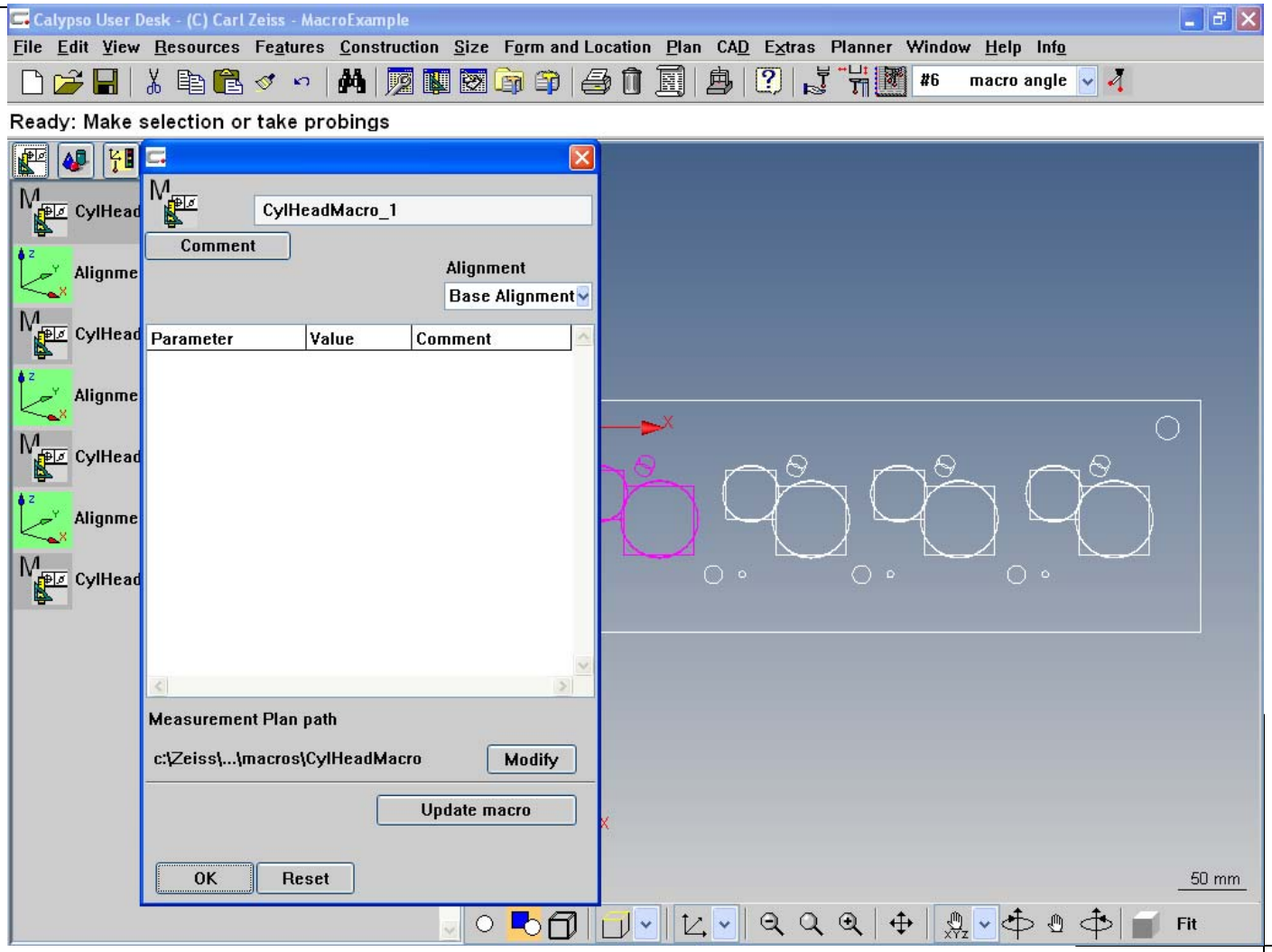
LUNCH 'N LEARN

ZEISS

Can we access the features and characteristics by opening the Macro feature in our program?



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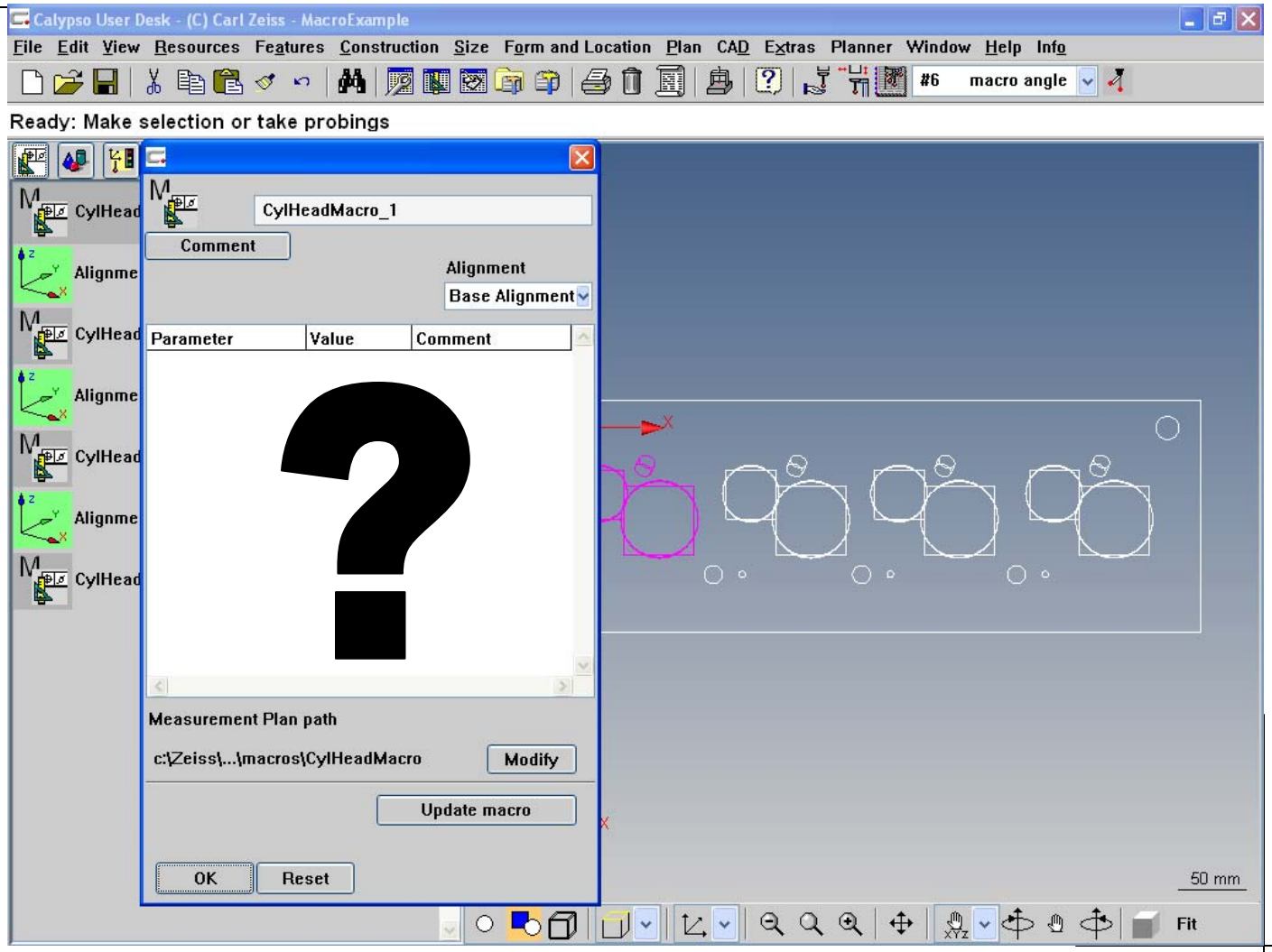
LUNCH 'N LEARN

ZEISS

Can we access the features and characteristics by opening the Macro feature in our program?



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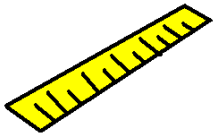
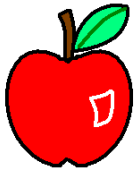
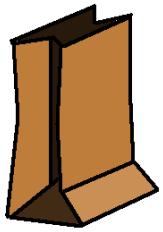




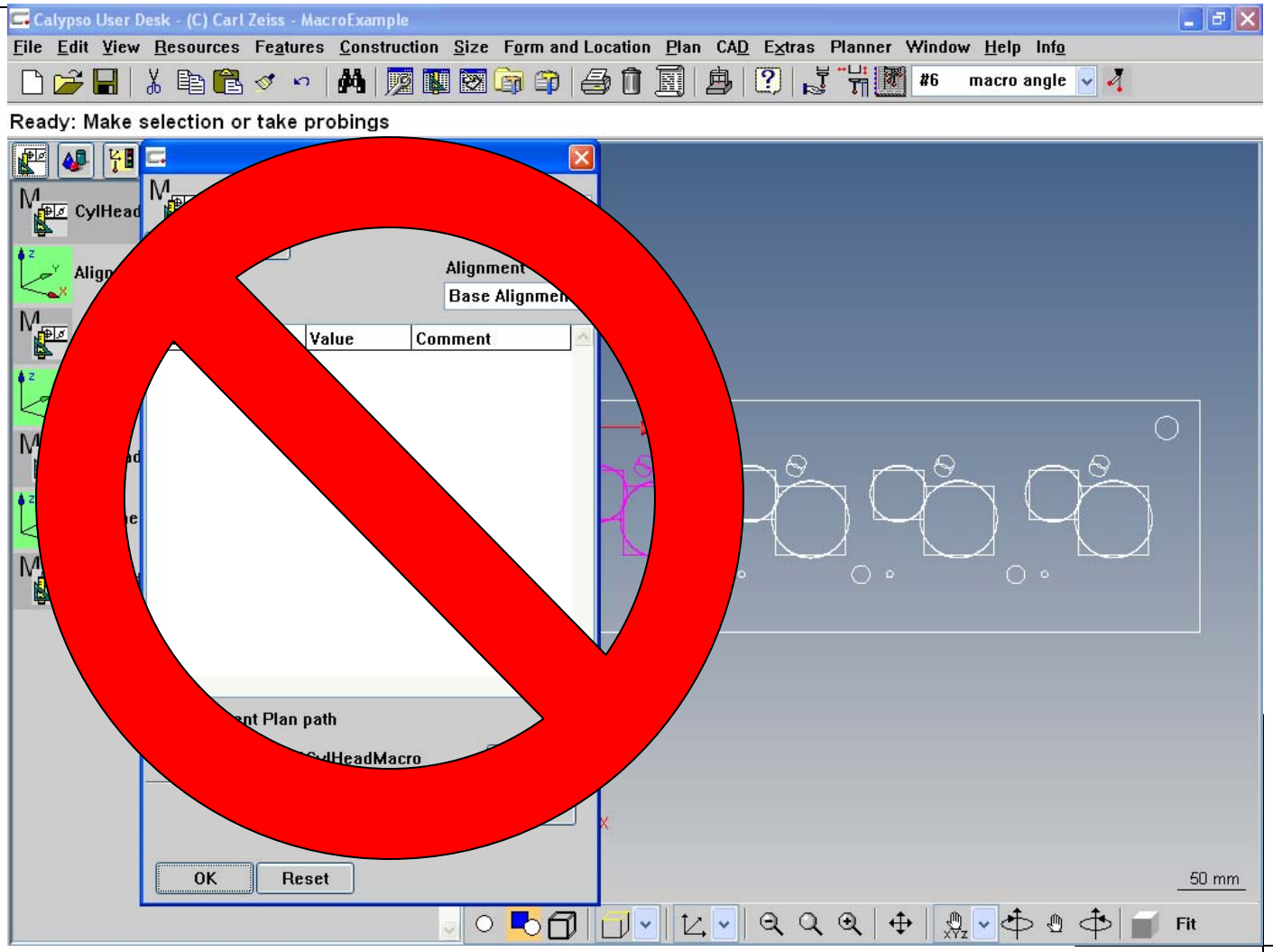


ZEISS

LUNCH 'N LEARN

Can we access the features and characteristics by opening the Macro feature in our program?

Not quite...



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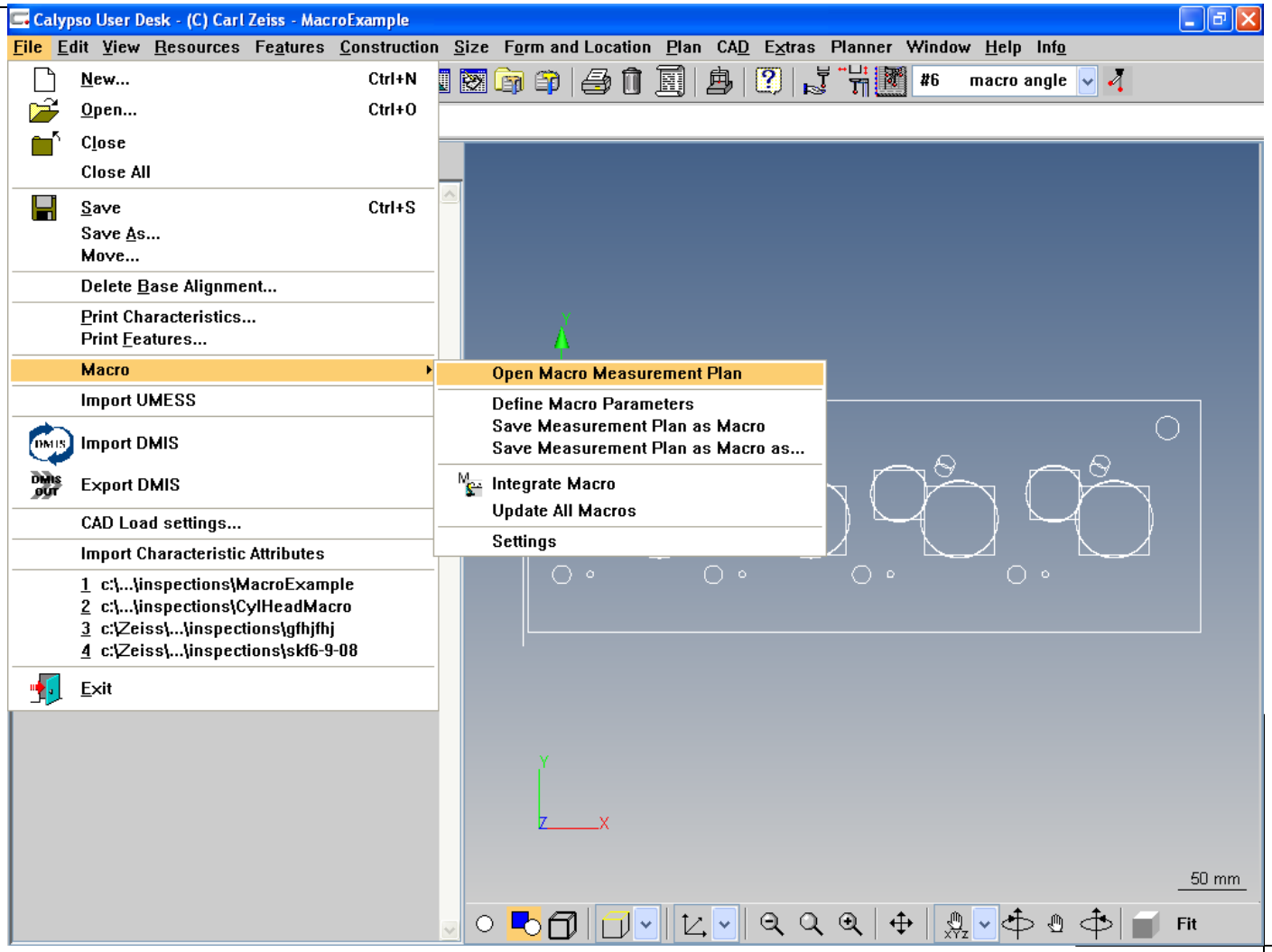
But we can go to Macro>Open Macro Measurement Plan and make the changes to our Macro program.



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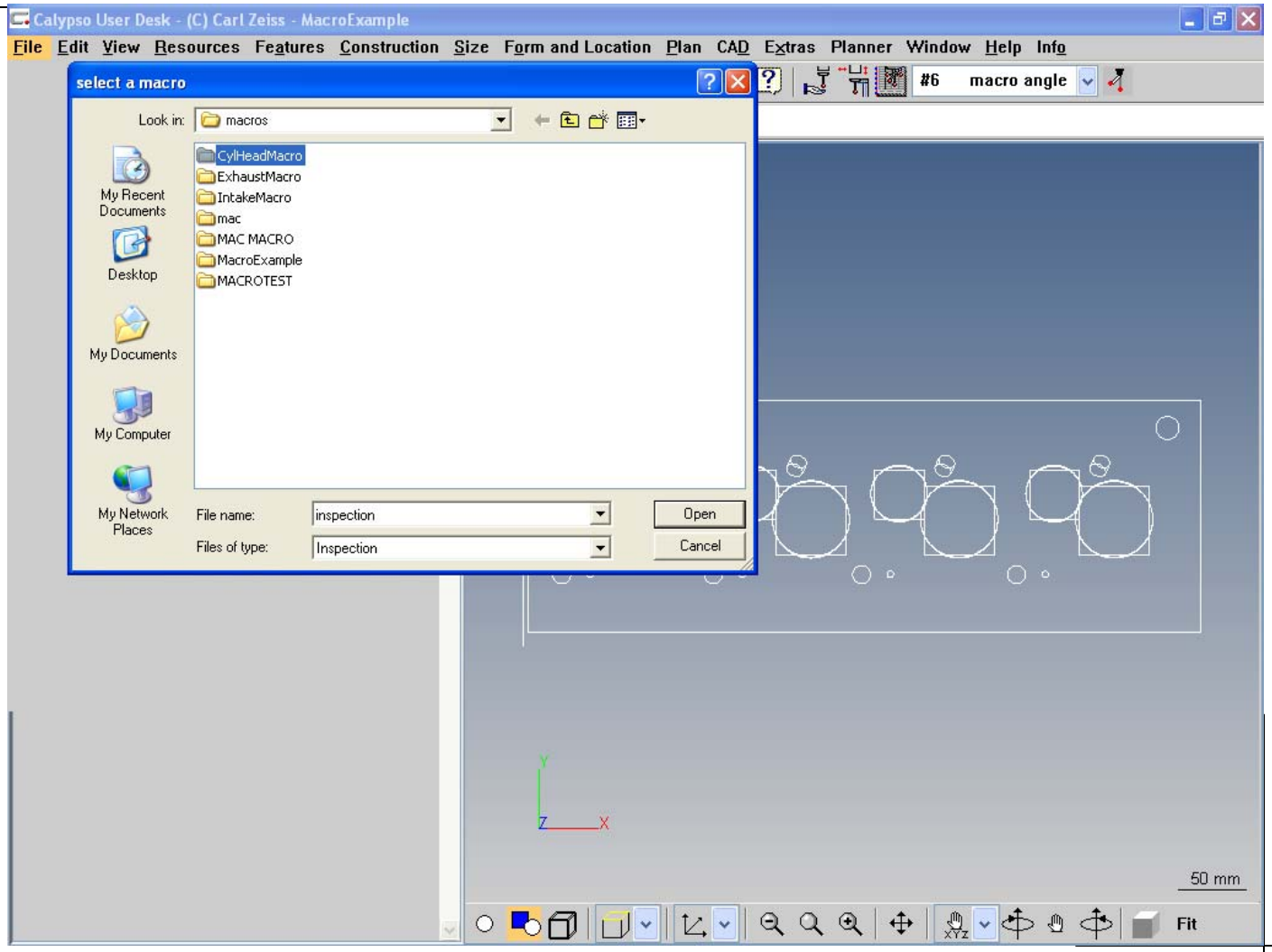
Choose your Macro program...



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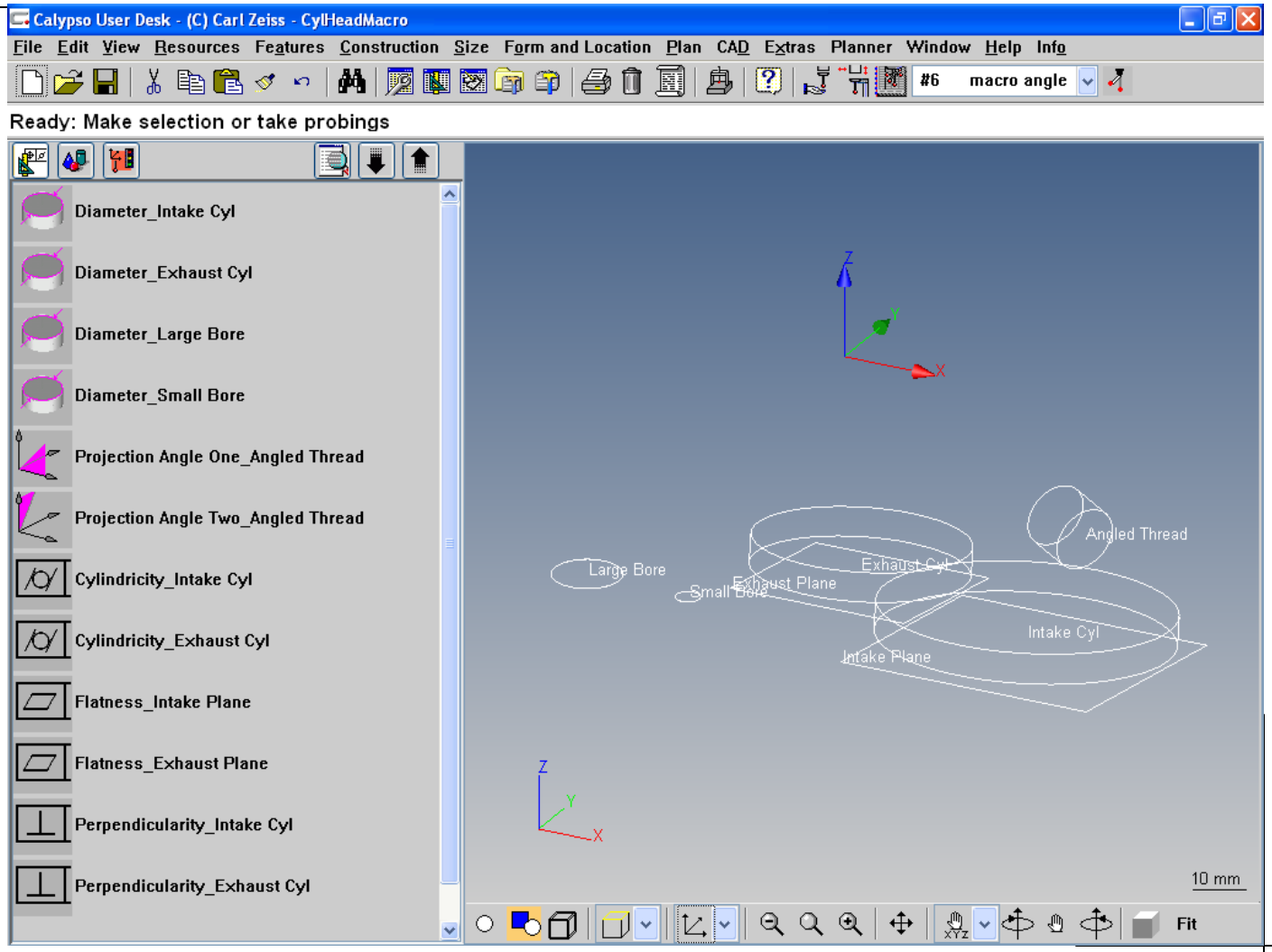
LUNCH 'N LEARN

…open it up and make any changes you need to make.



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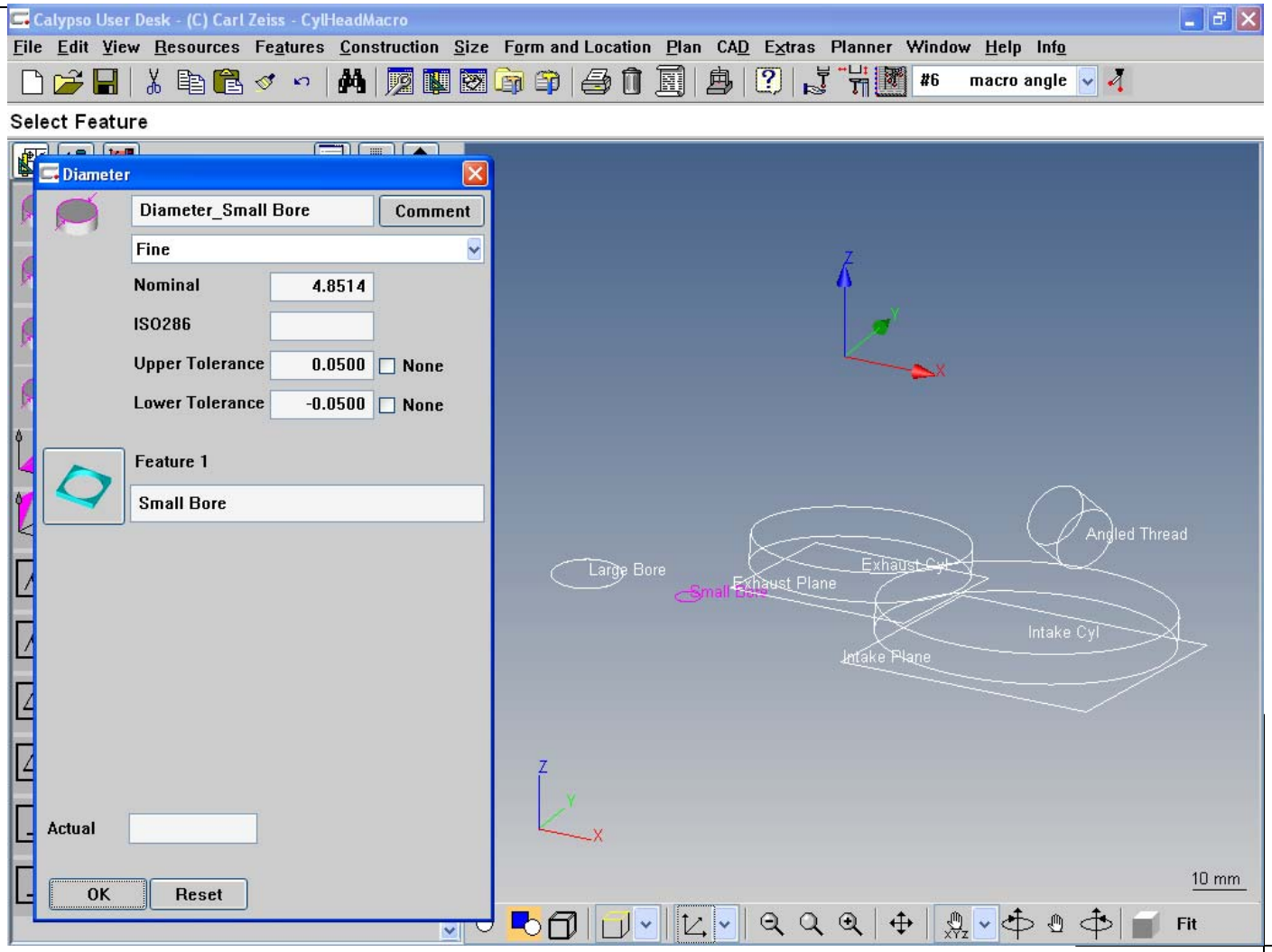
LUNCH 'N LEARN

…open it up and make any changes you need to make.



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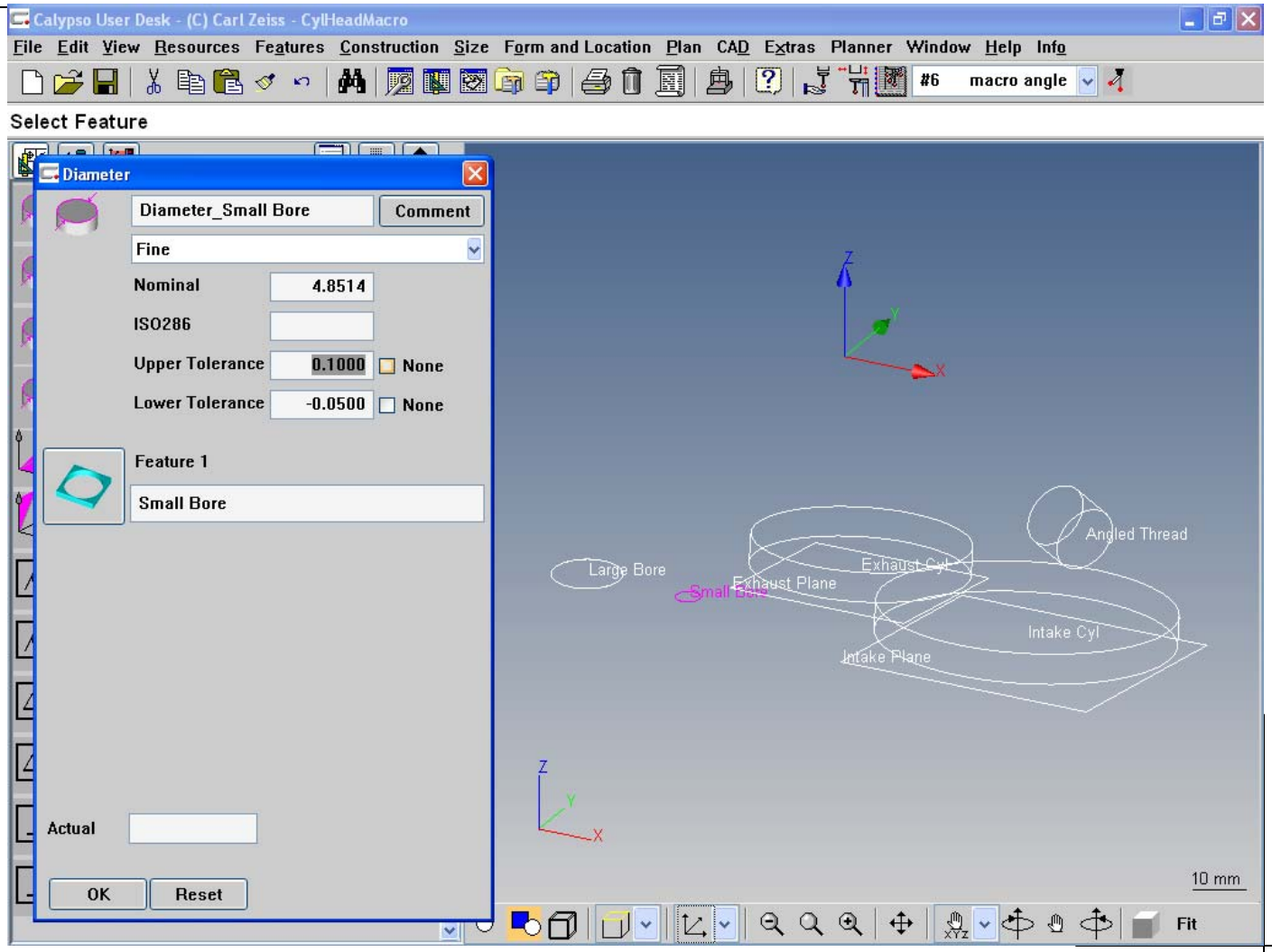
LUNCH 'N LEARN

…open it up and make any changes you need to make.



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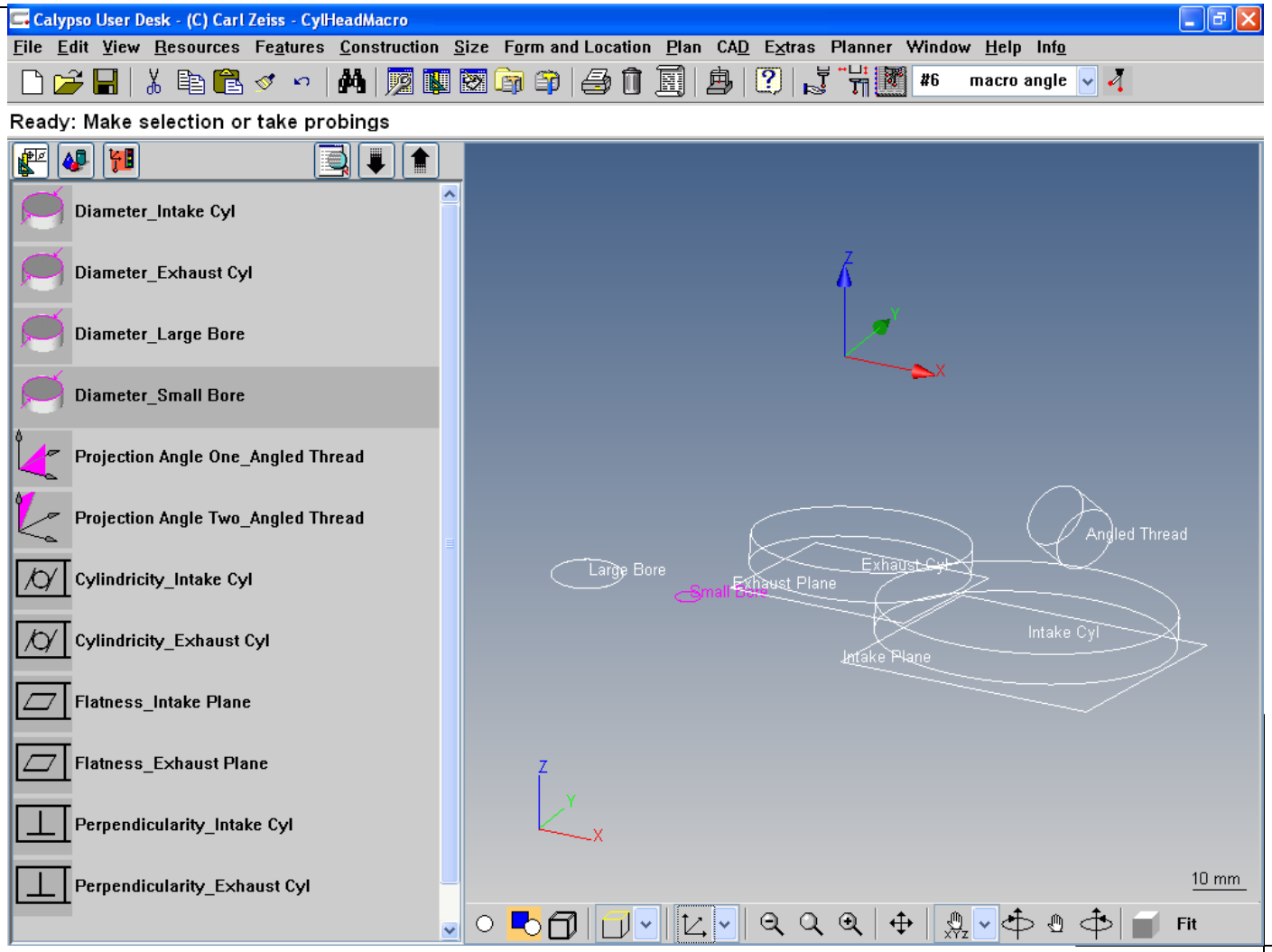
LUNCH 'N LEARN

…open it up and make any changes you need to make.

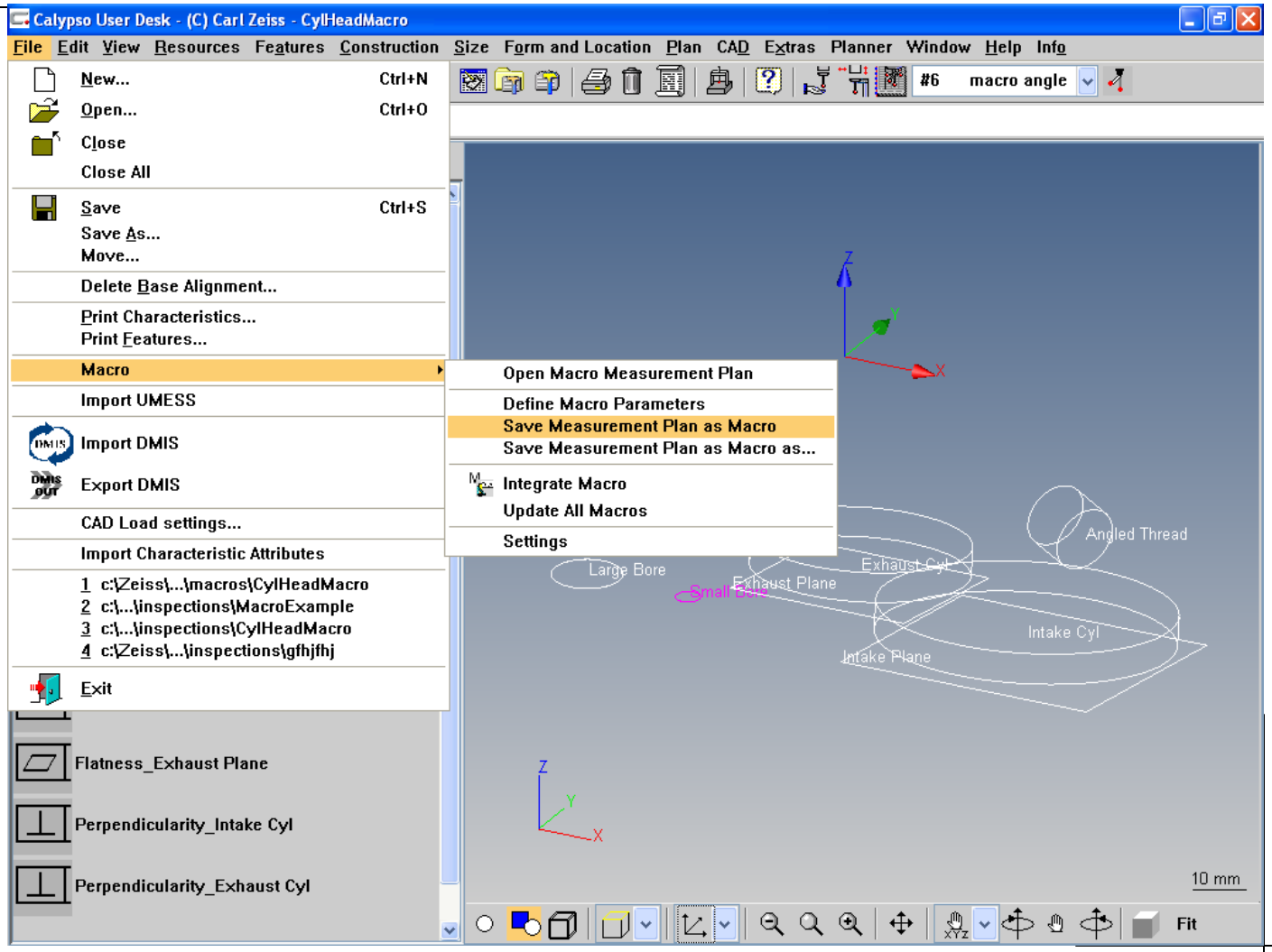


J&H Machine Tools

LUNCH 'N LEARN

ZEISS

Now be sure to save your updated Macro by going to Macro>Save Measurement Plan as Macro.



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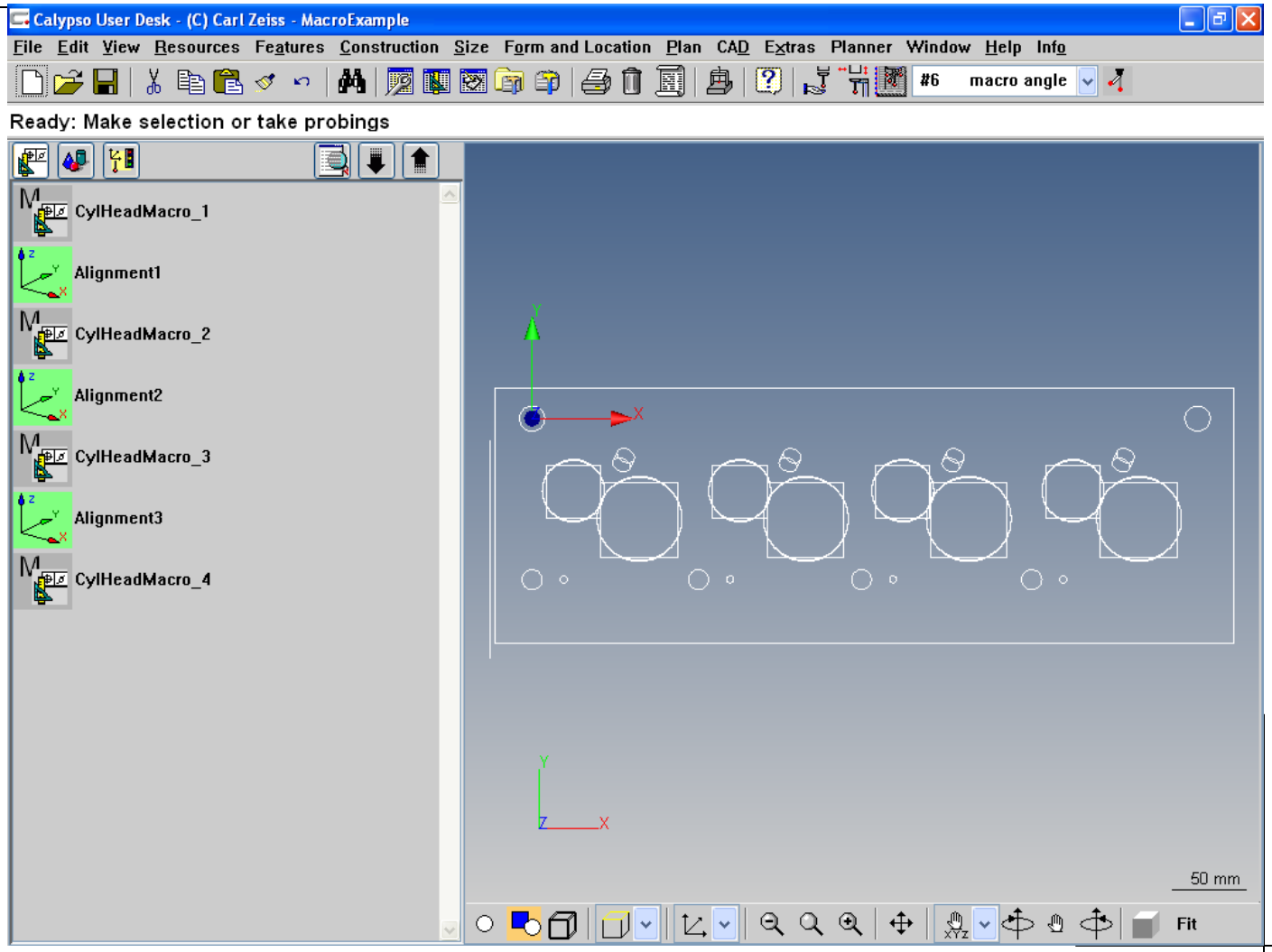
Back in our Base Program, we need to update all of our Macros with the most recent revised version.



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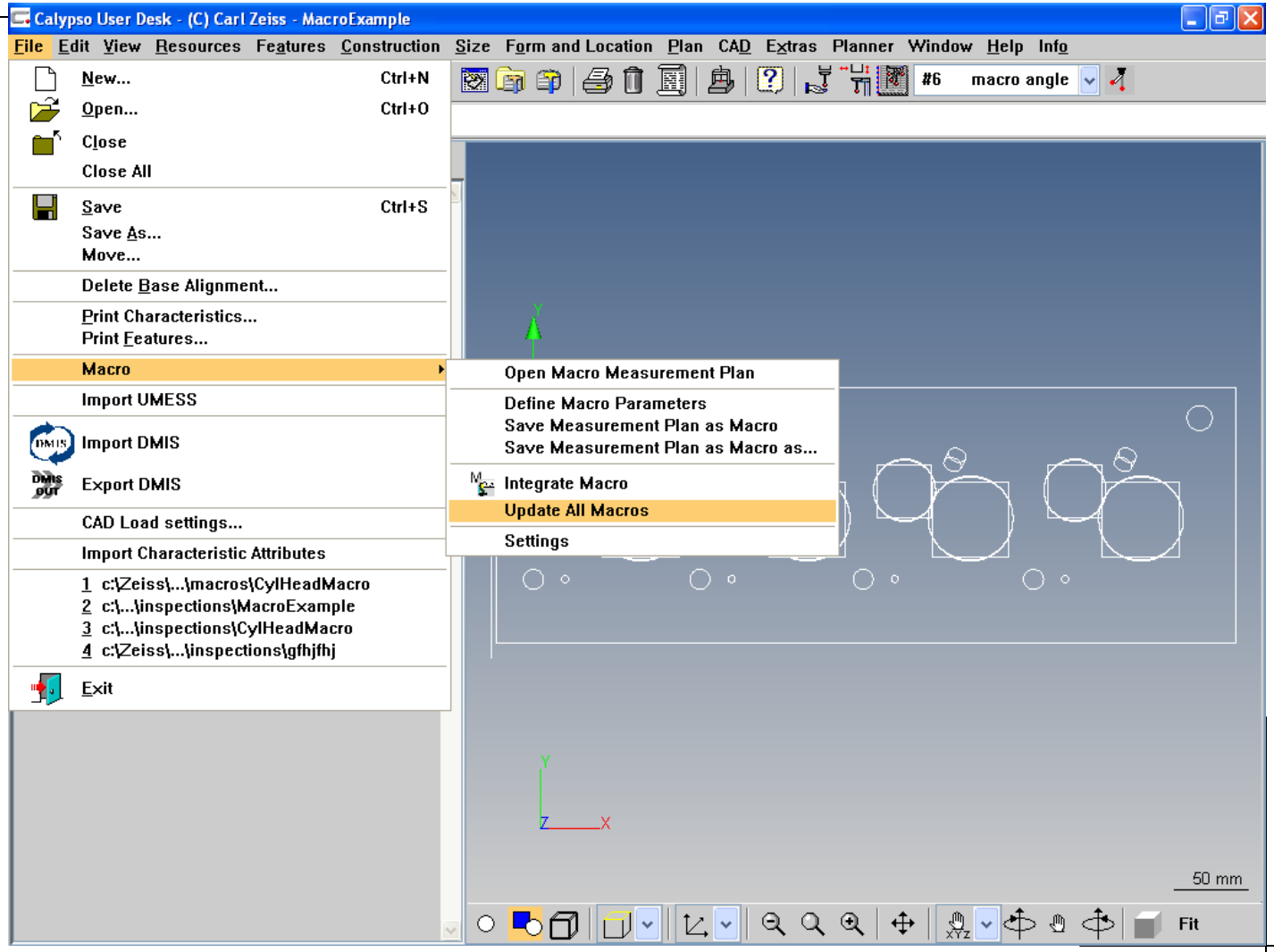
LUNCH 'N LEARN

The easiest and fastest way to do this is to go to Macro>Update all Macros
This will update all Macros that are used in the current program.



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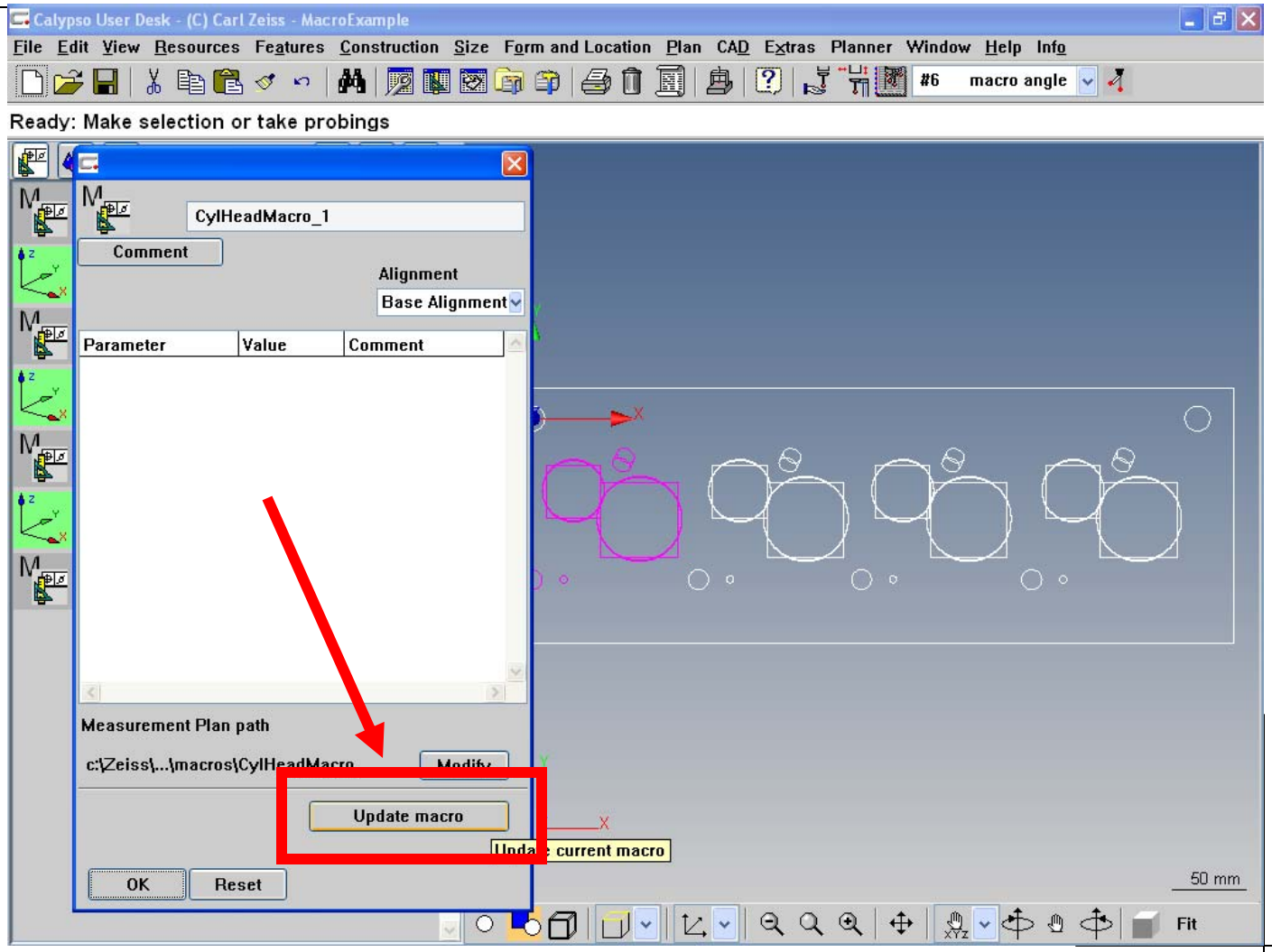
LUNCH 'N LEARN

An alternative way is to open up the single Macro you wish to update and press the "Update Macro" button.



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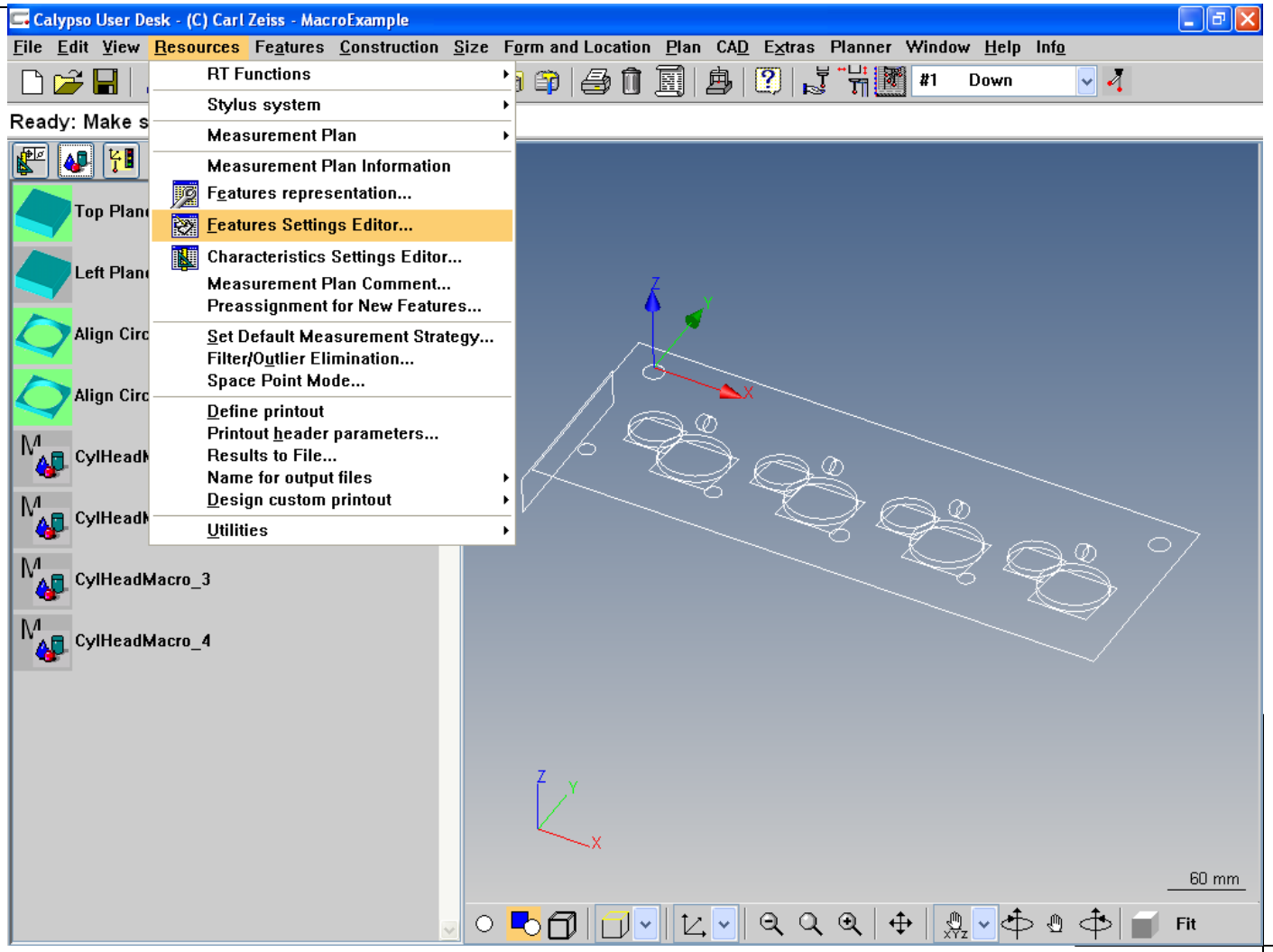
LUNCH 'N LEARN

There is also a way to make all Macros automatically update when a program is run.

In the Features Settings Editor...



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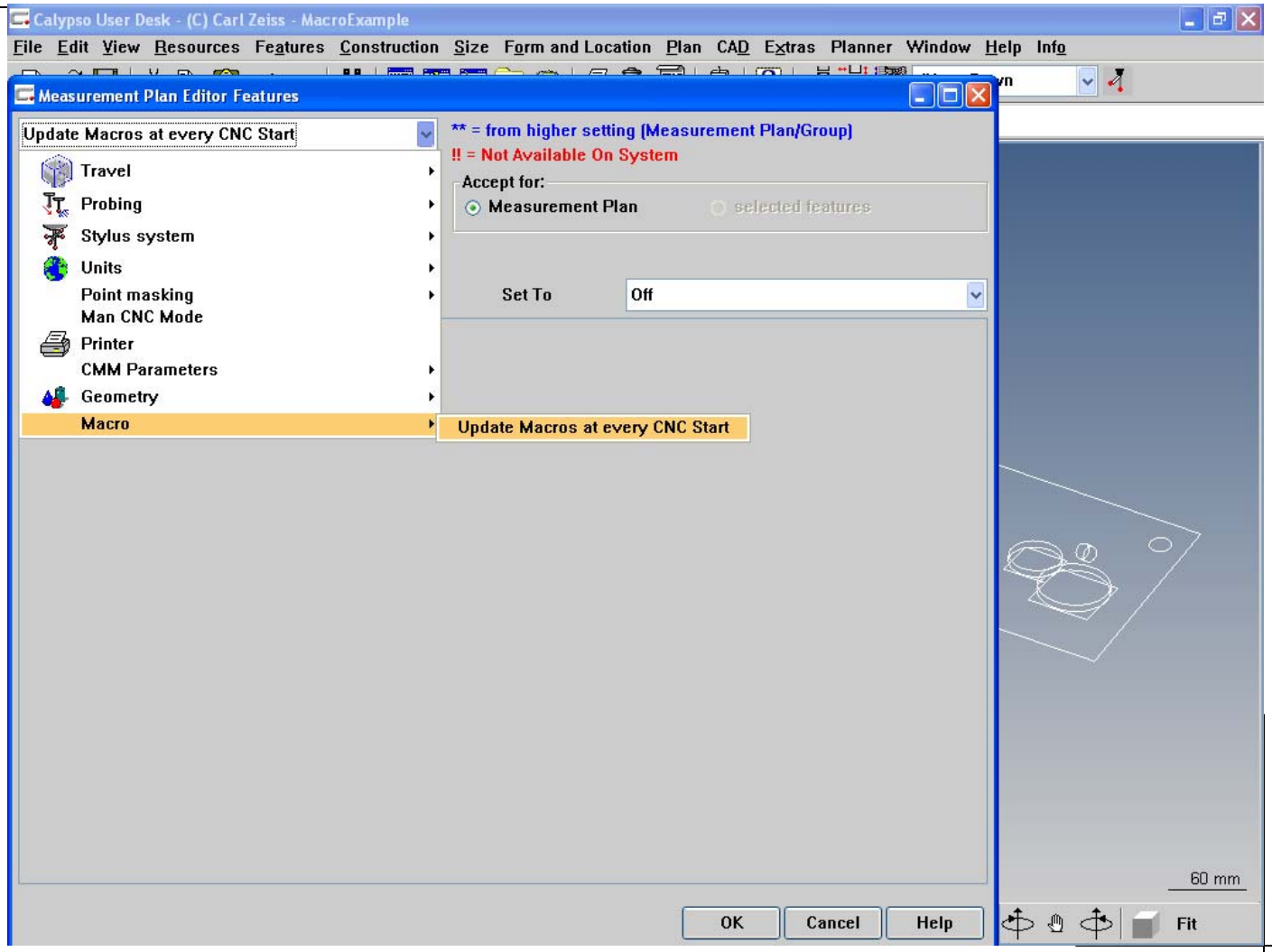
LUNCH 'N LEARN

…under the main drop down choose Macro>Update Macro at every CNC Start.



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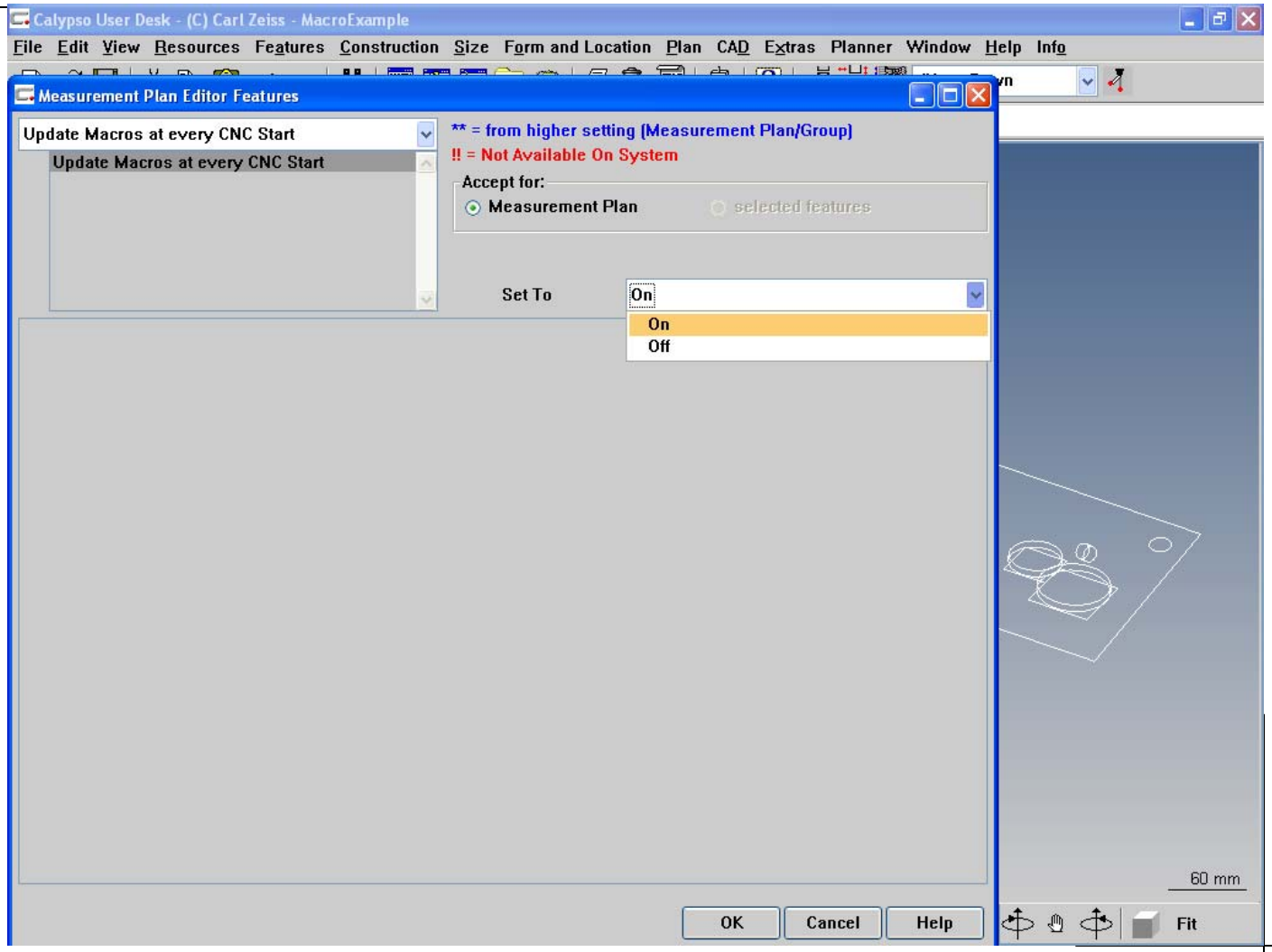
LUNCH 'N LEARN

Then change the *Set to* menu to On. This will make every Macro in your measurement plan automatically update when the measurement plan is run.



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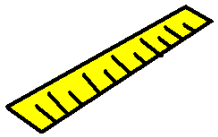
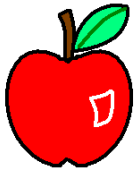
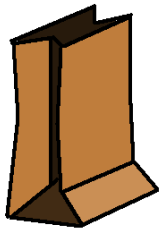




LUNCH 'N LEARN



ZEISS

Macro Settings

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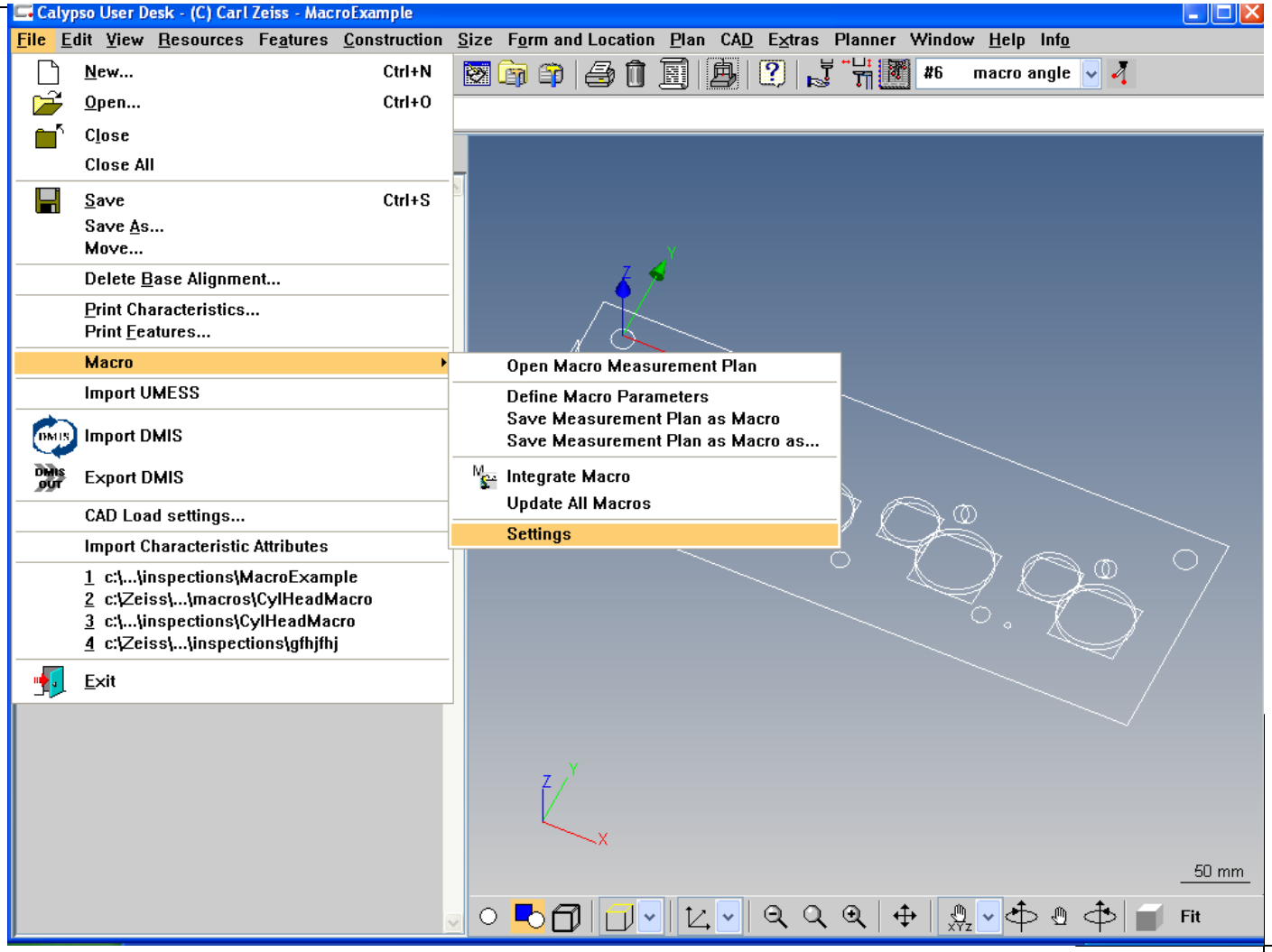
Settings for updating, saving, and naming Macros can be found under Macros>Settings



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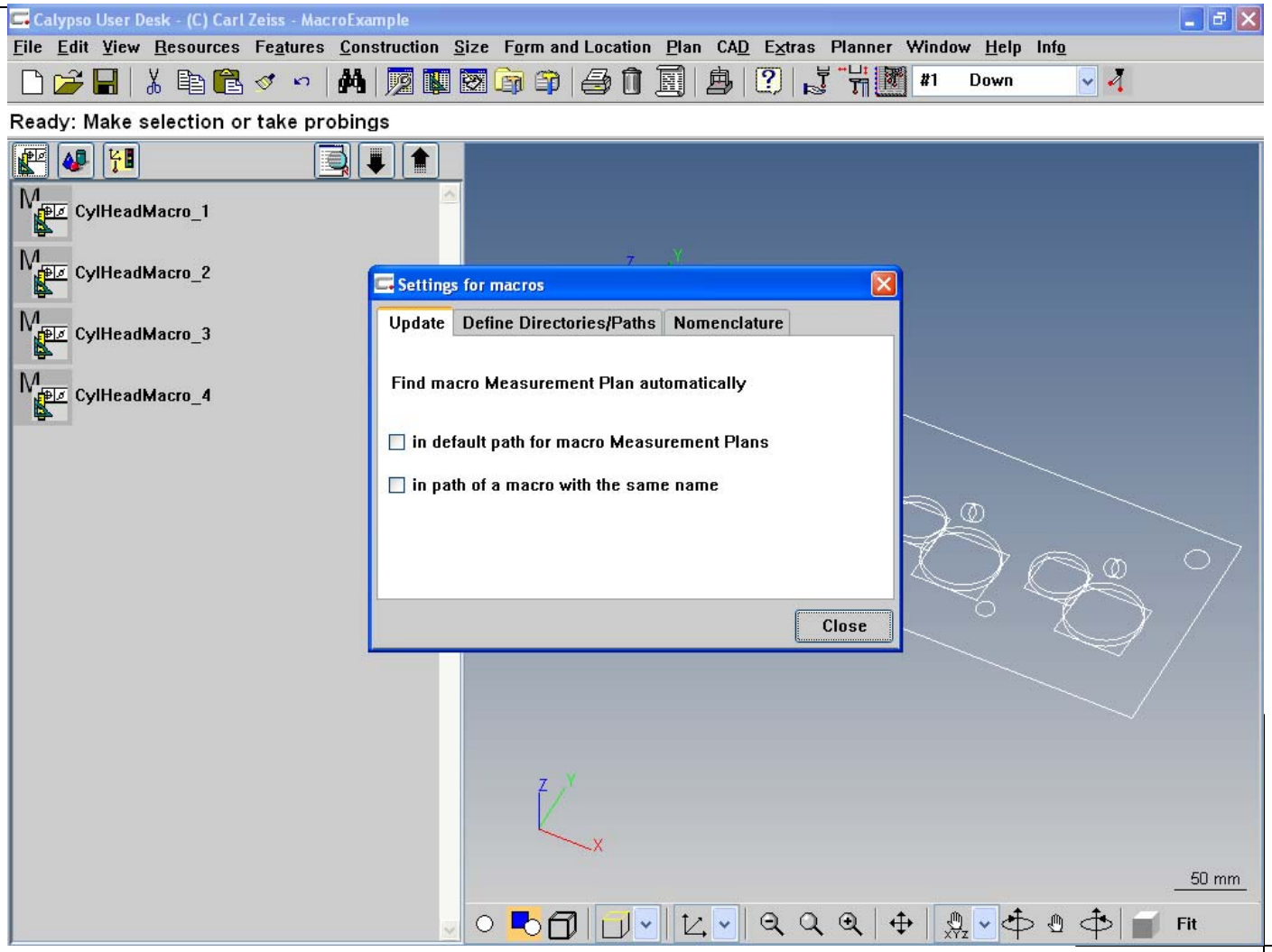
The Update tab in the settings window controls how Calypso automatically looks for an Updated Macro.

Calypso can automatically search in the standard path for macro measurement plans, or it can automatically search for a Macro with the same name.



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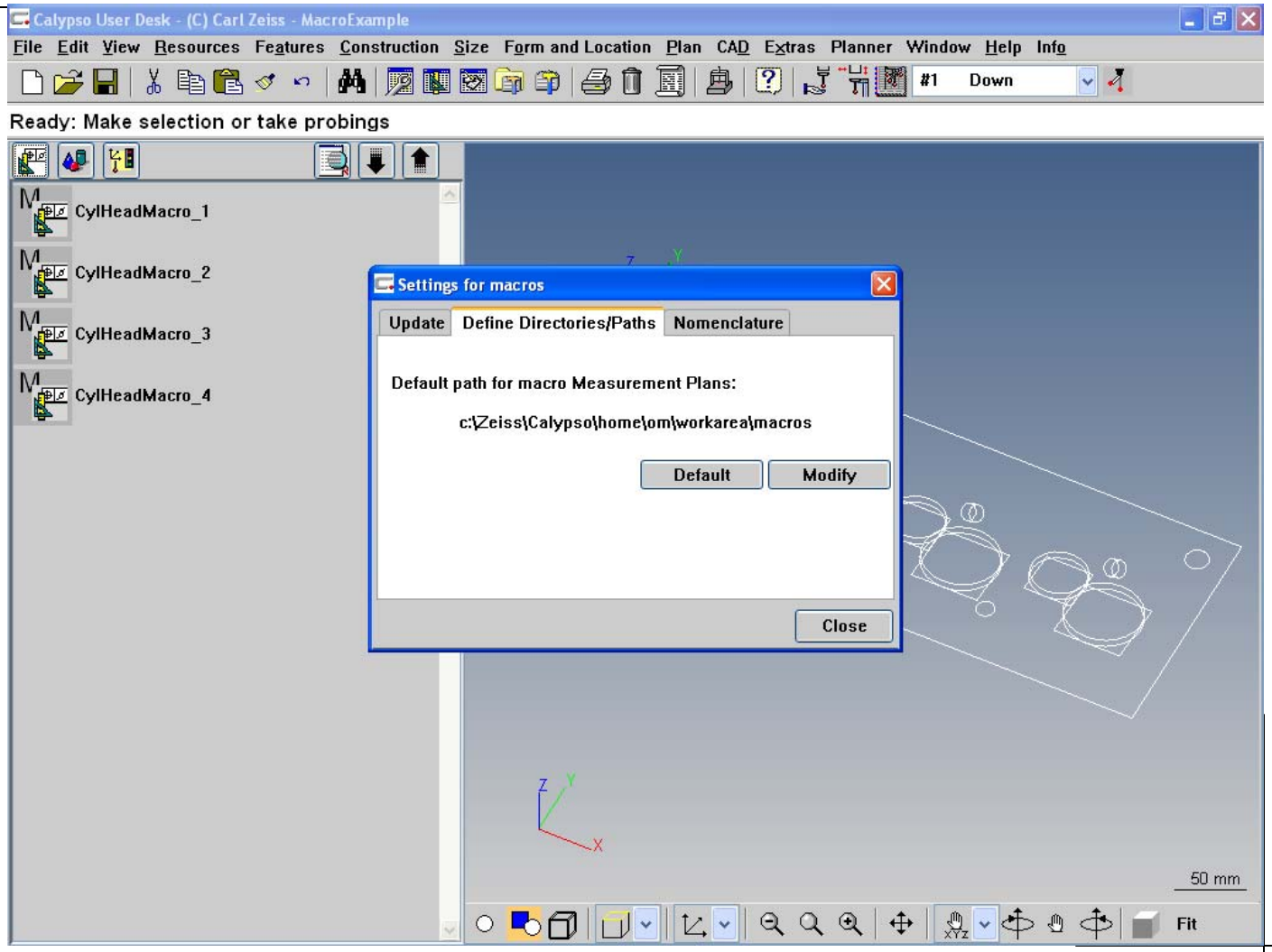
The Define Directories/Paths tab allows you to change the default path for saving and loading Macros.



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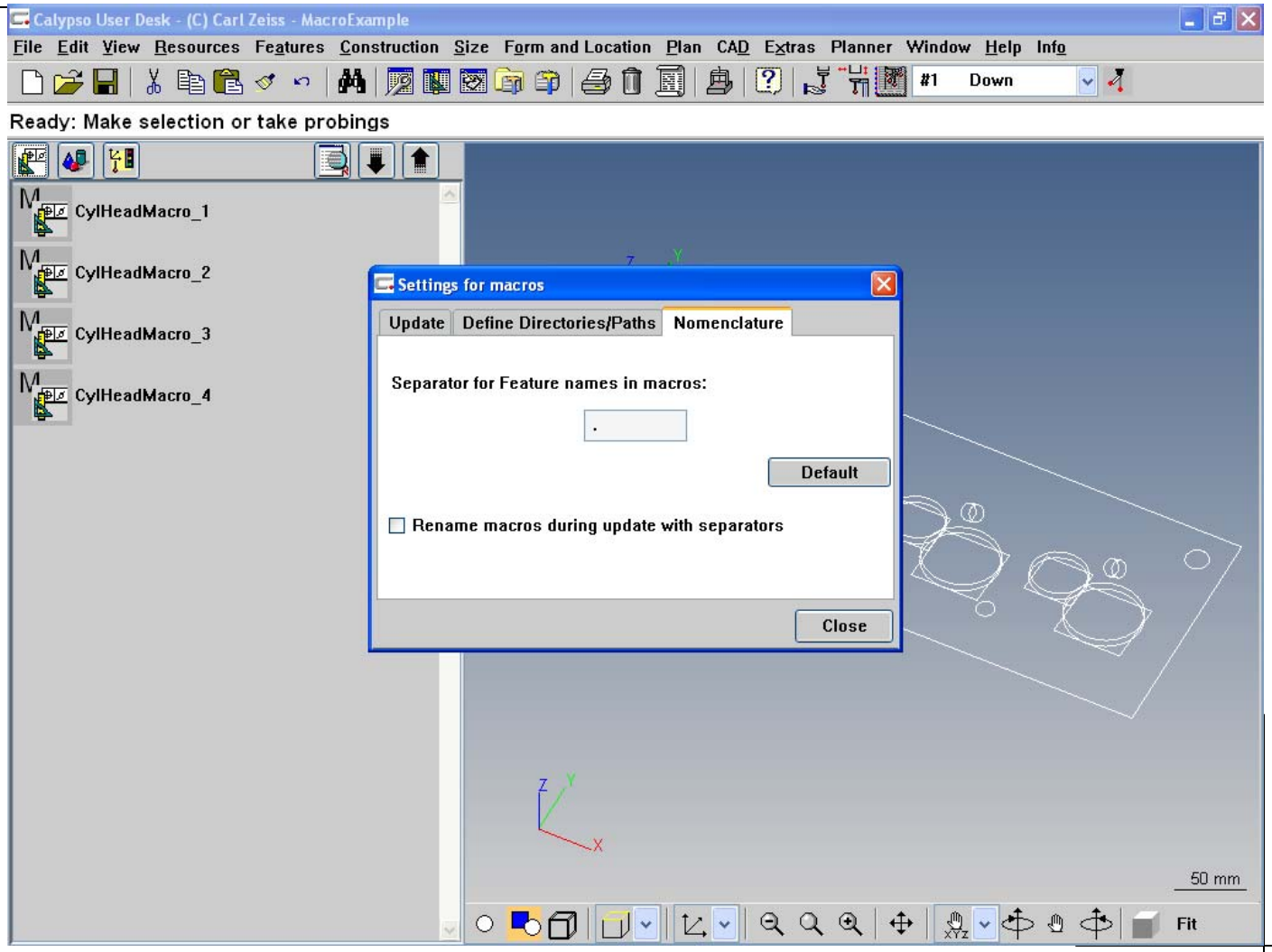
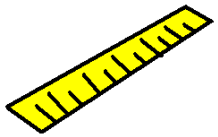
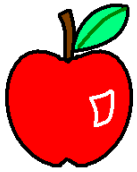
The Nomenclature tab allows you to define the separator symbol for feature names in Macros.



J&H Machine Tools





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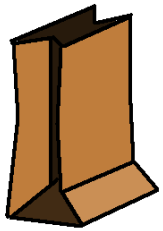

ZEISS

Macro Parameters

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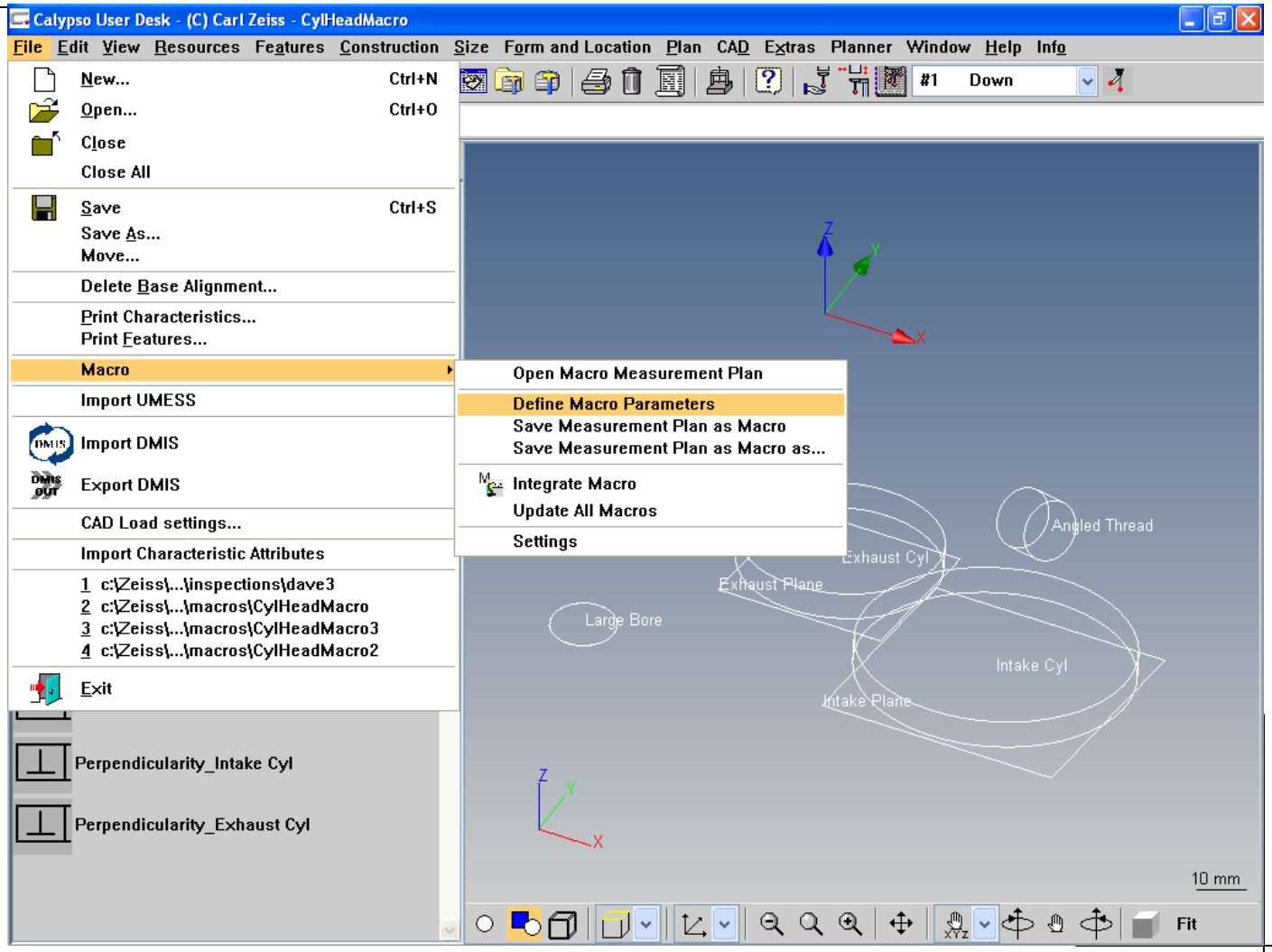
ZEISS

A useful option within Macros is the ability to define Macro parameters. This allows a set of variables to be defined within each specific instance of a Macro. This increases a Macro's flexibility and ease of use.



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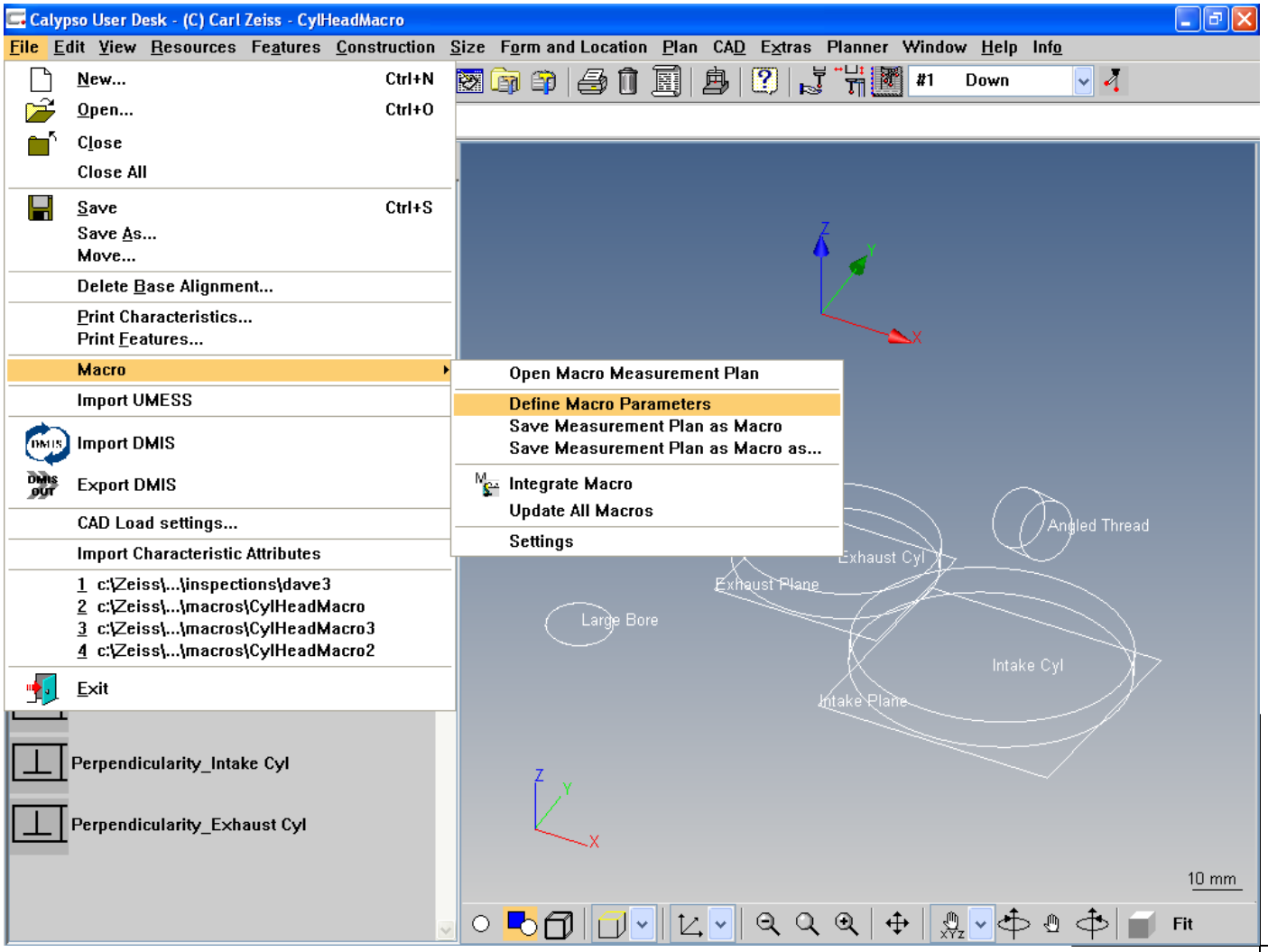
As an example, we will use Macro parameters to create the offset between instances without using secondary alignments.

First we Define our parameter (name the variable) within our Macro program.

Macro>Define Macro Parameters



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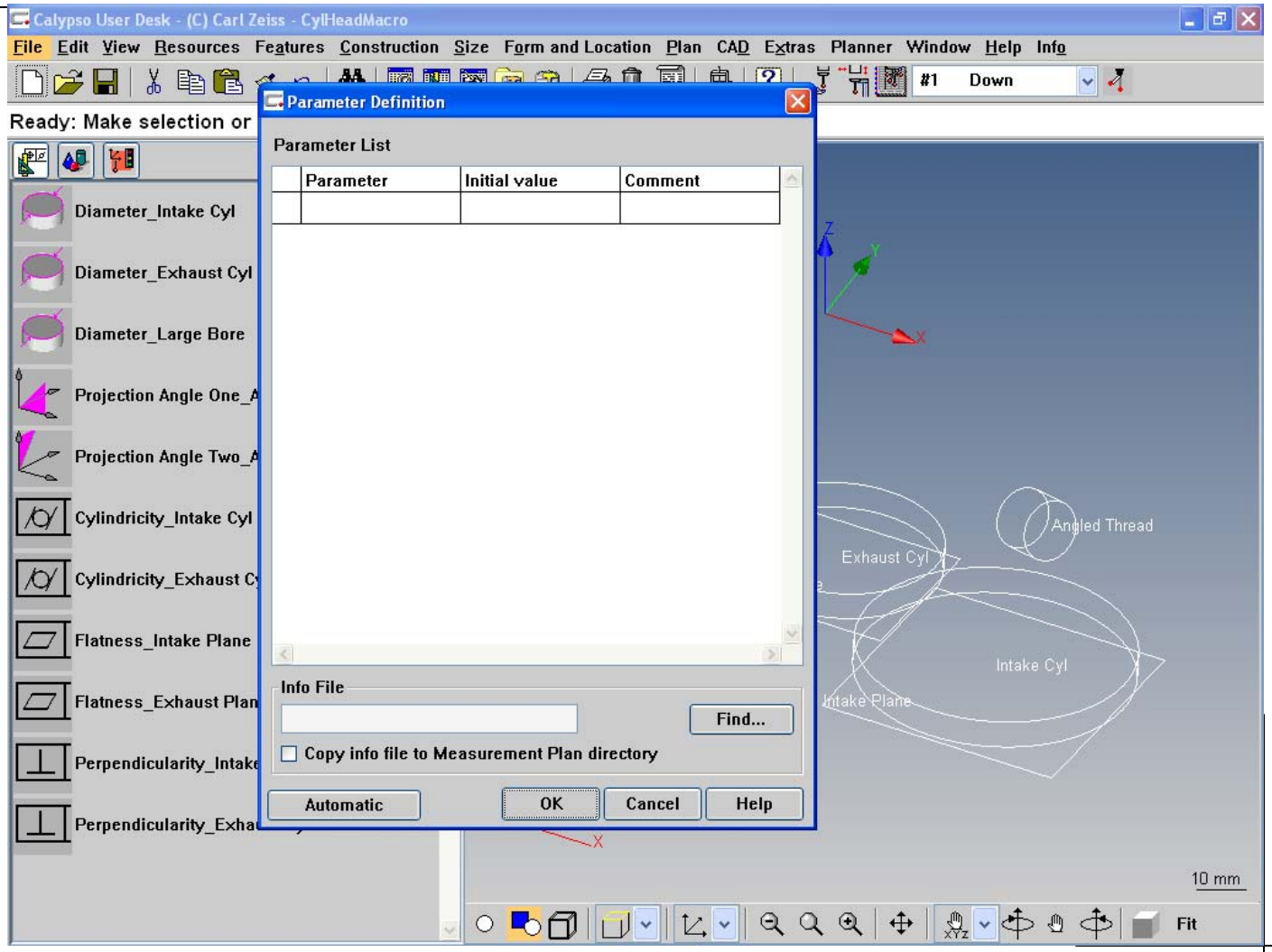
The Parameter is the name of our variable.

Initial value is the value of our variable in the first instance of the Macro.

Comment is optional.



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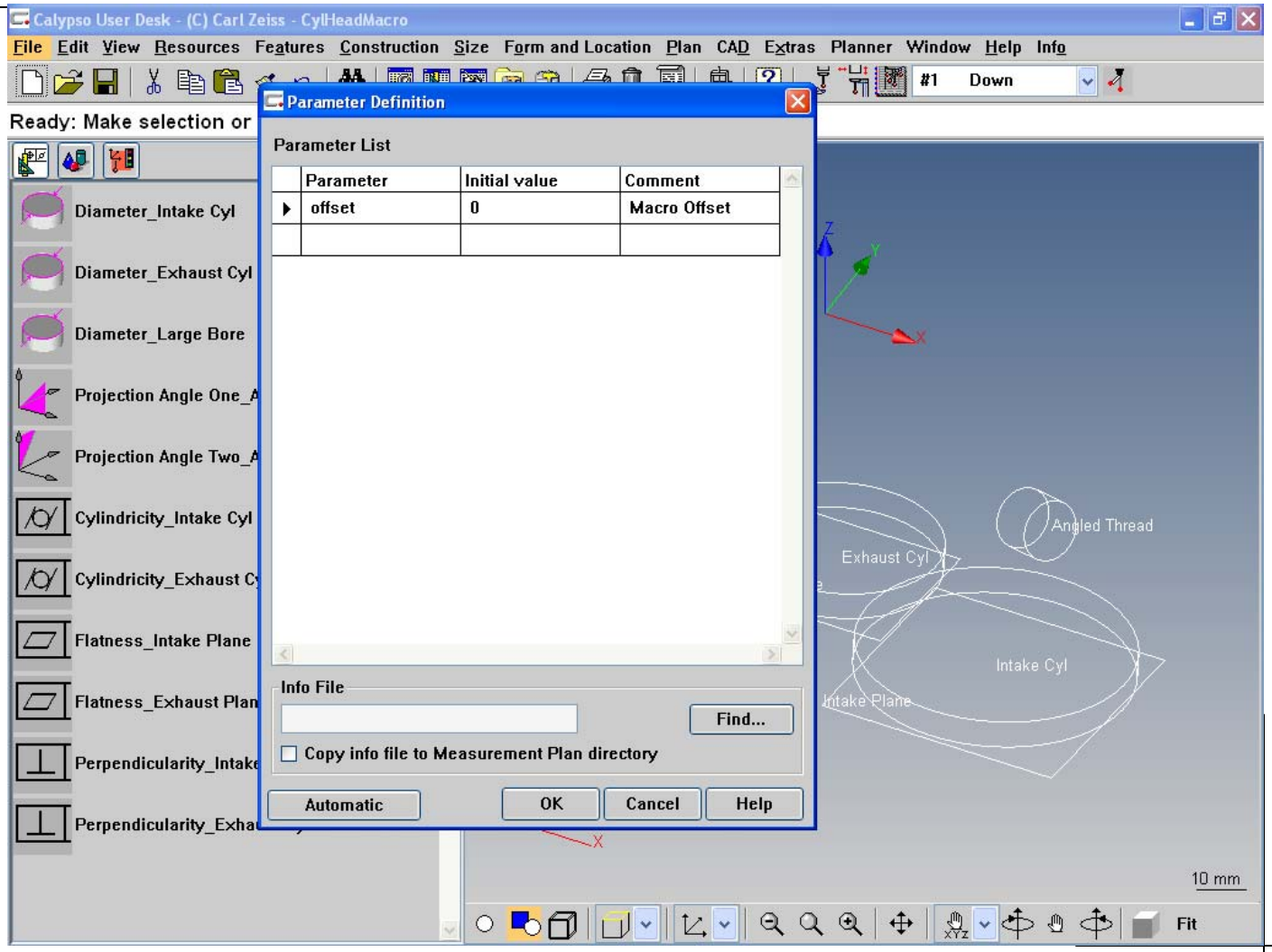
The Parameter is the name of our variable.

Initial value is the value of our variable in the first instance of the Macro.

Comment is optional.



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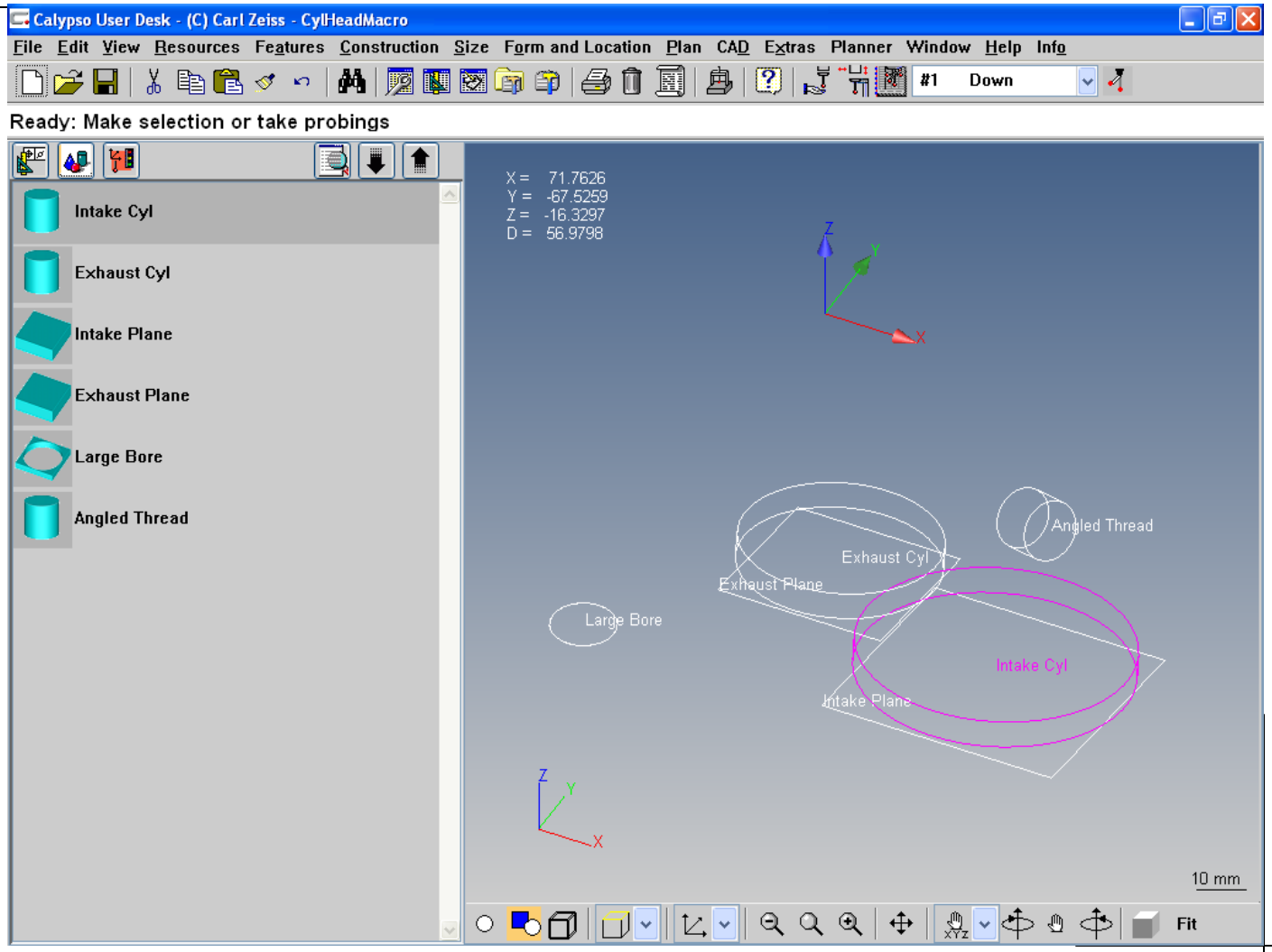
Now, while still in the Macro program, we need to set our offset variable to our X-values of all our features in order to make them shift when desired.



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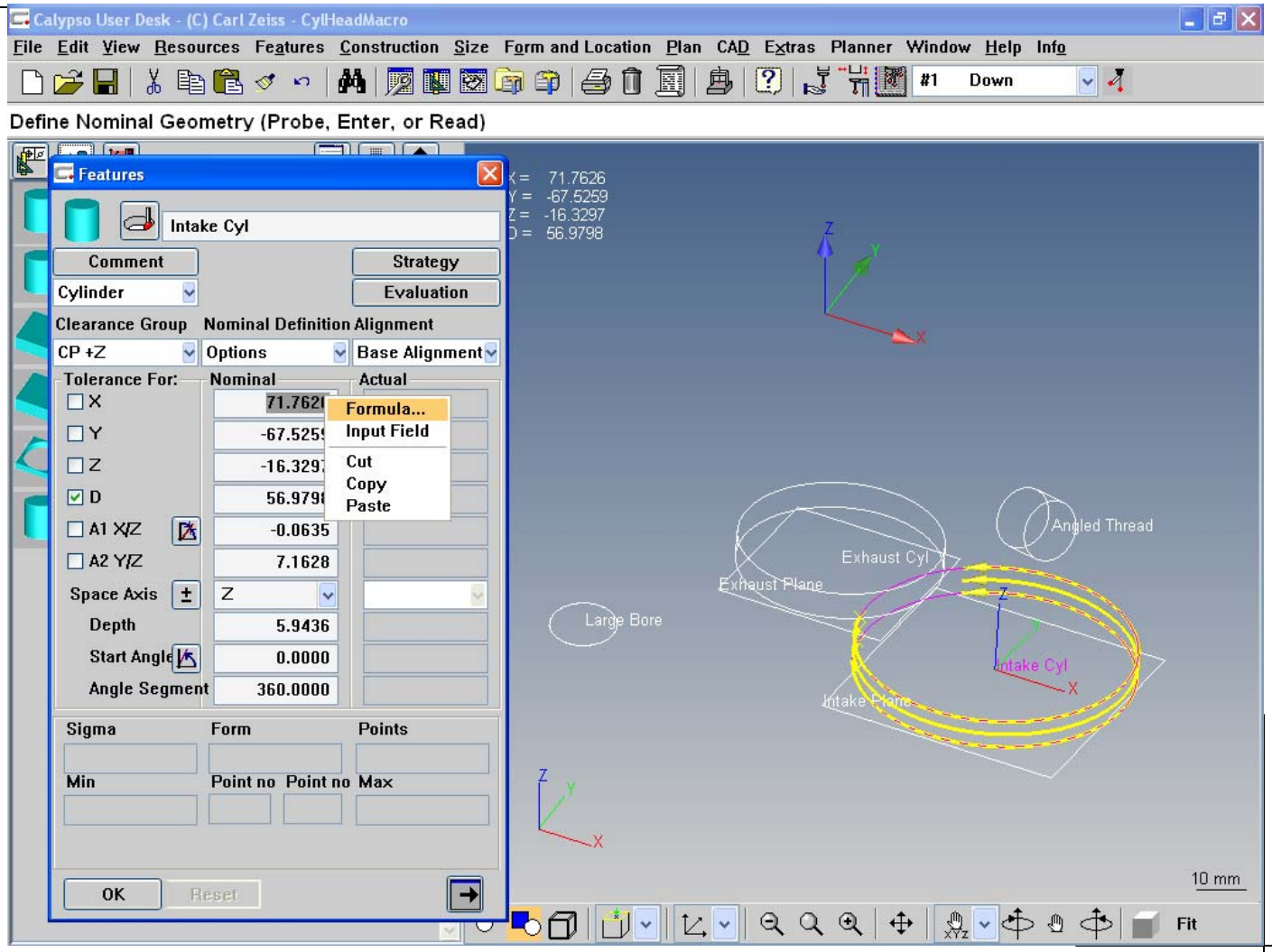
We open each feature and in the Nominal X-value, we create a formula...



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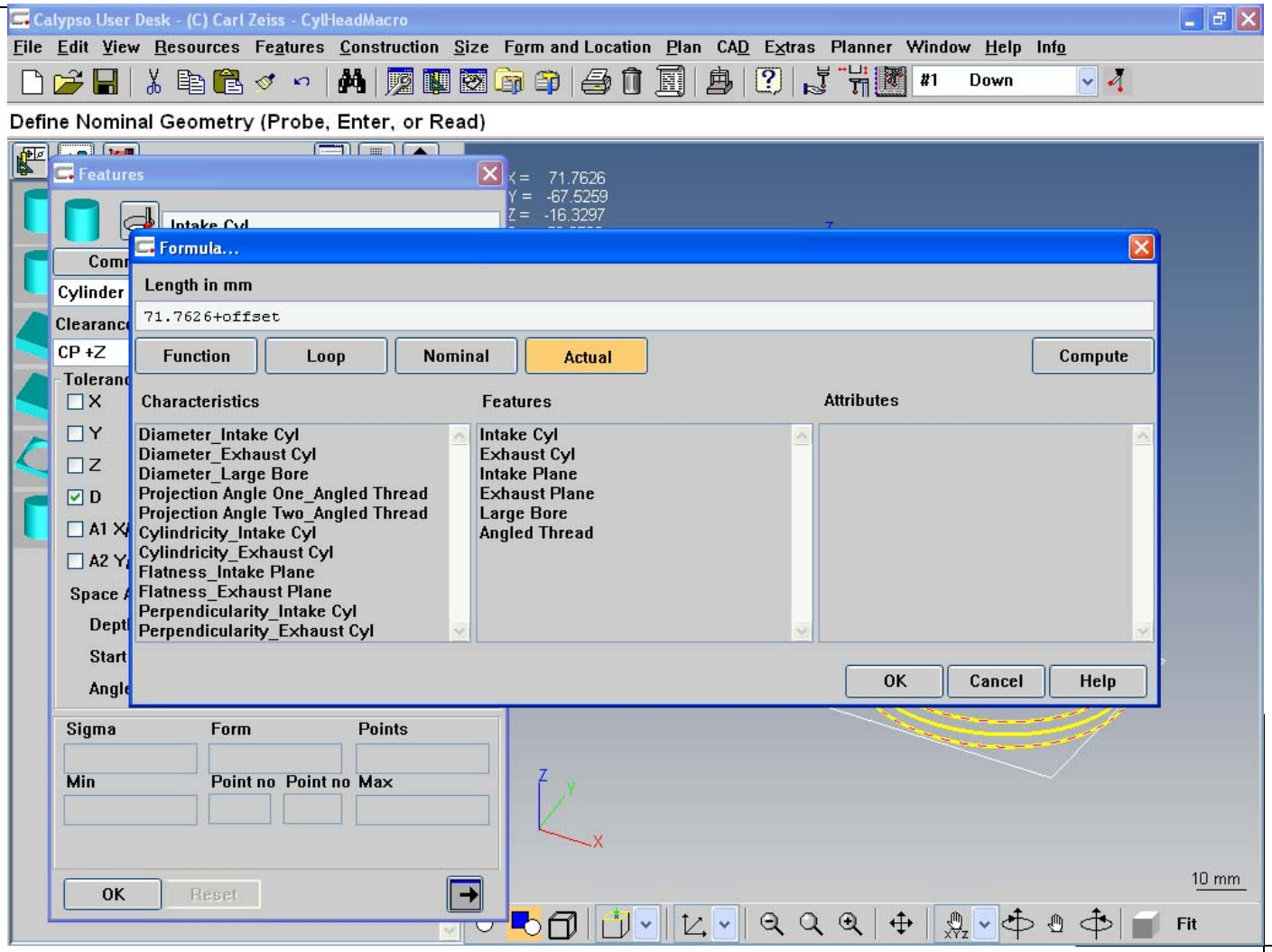
…which reads our current X-value plus our offset variable.



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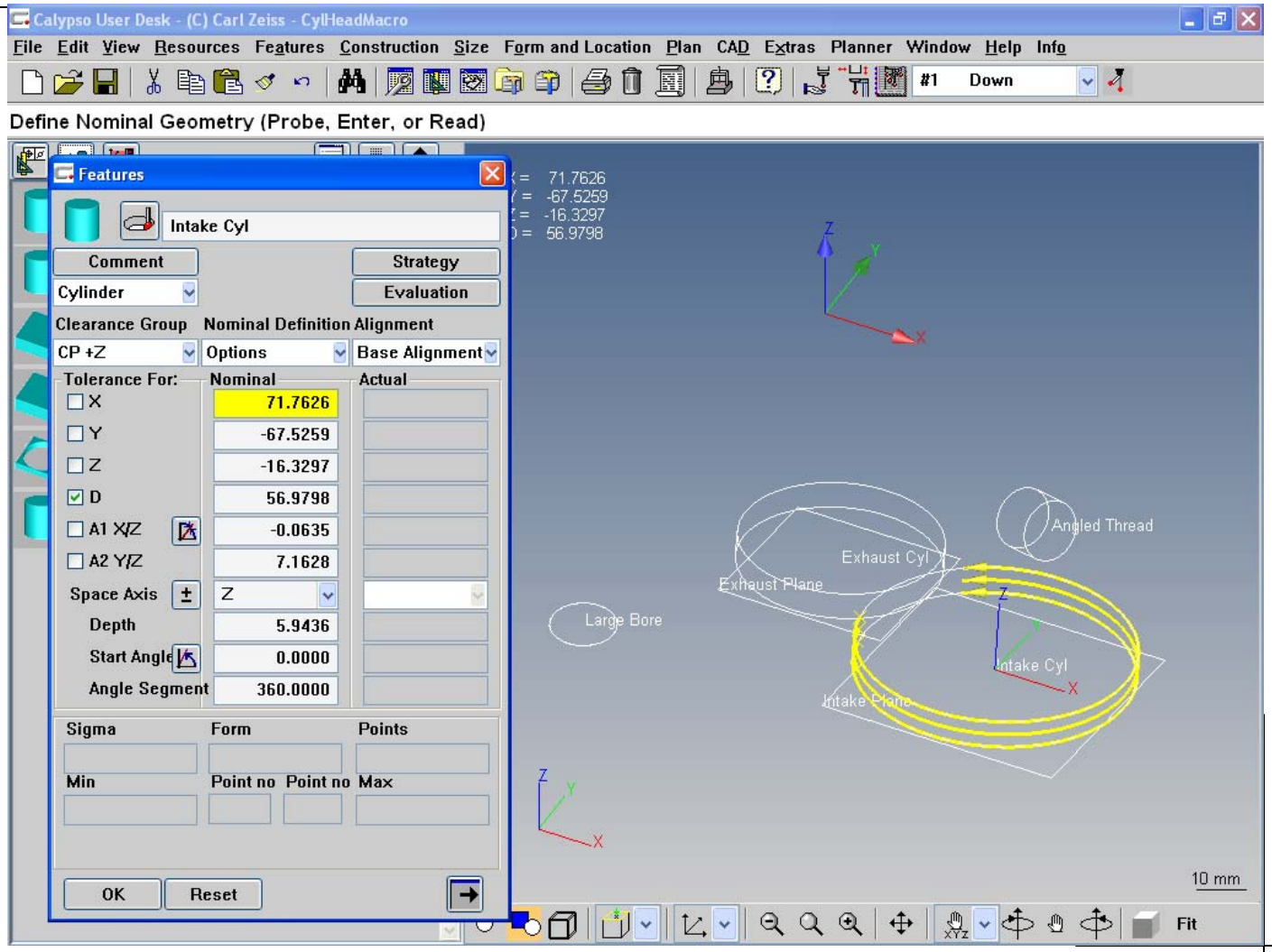
Now the X-position of our feature will vary as we change our offset variable's value in our Base Program. An offset value of 0 will leave the features in their current position, while an offset value of 111.25 mm will shift them to the correct location of the second Macro.



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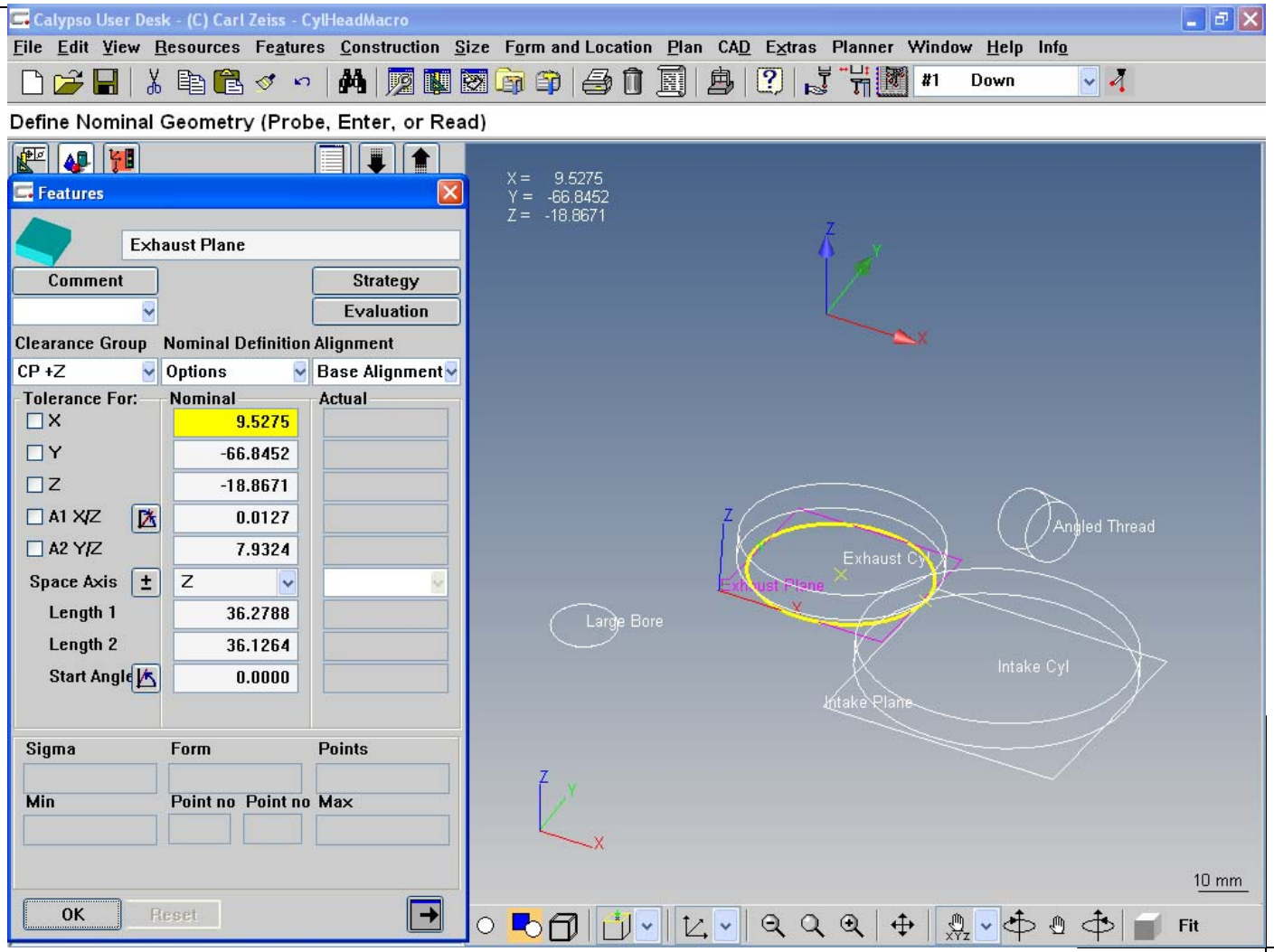
Create the same formula for each feature's X-value in the Macro program...



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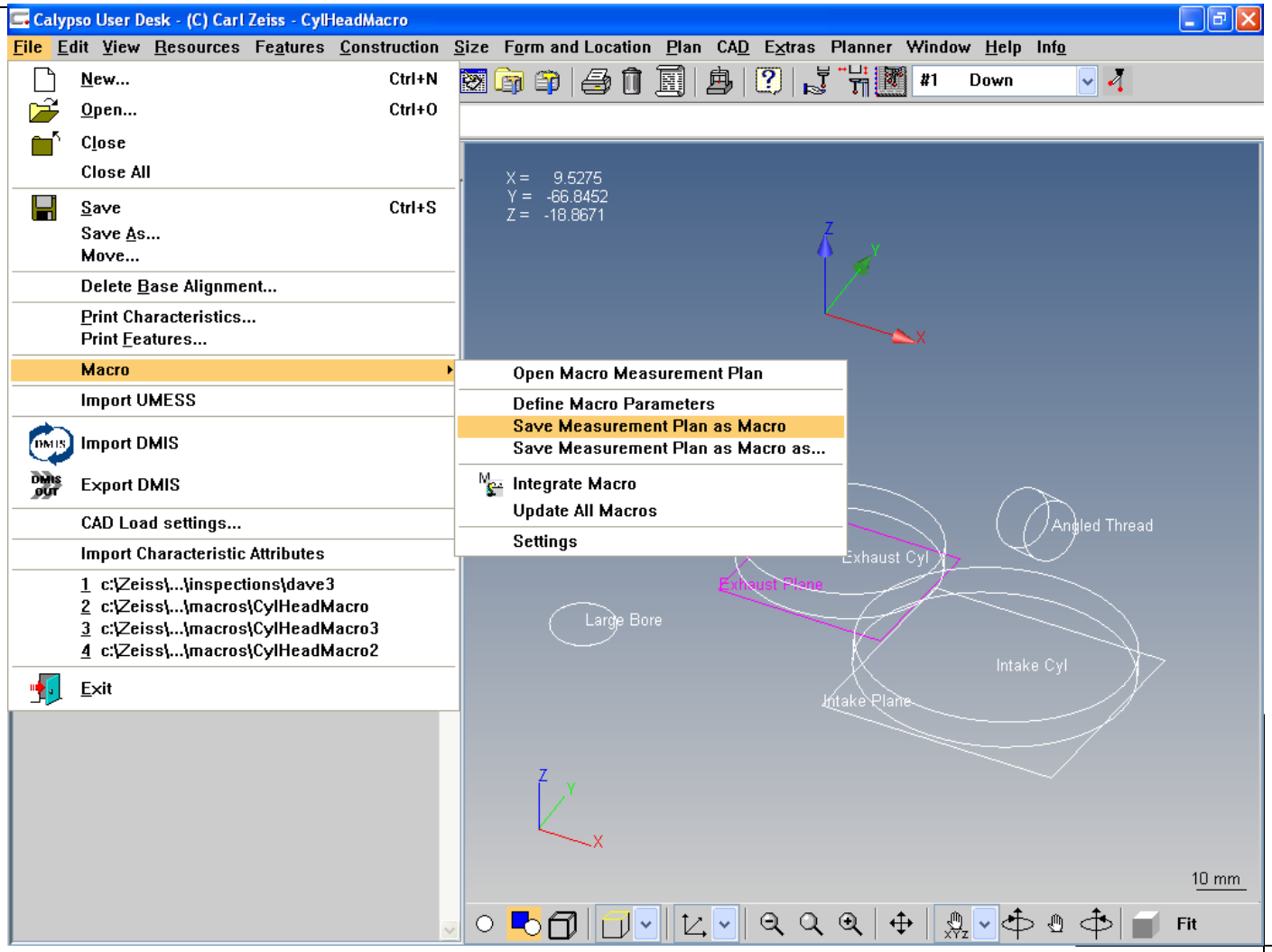
…and save your Macro program.



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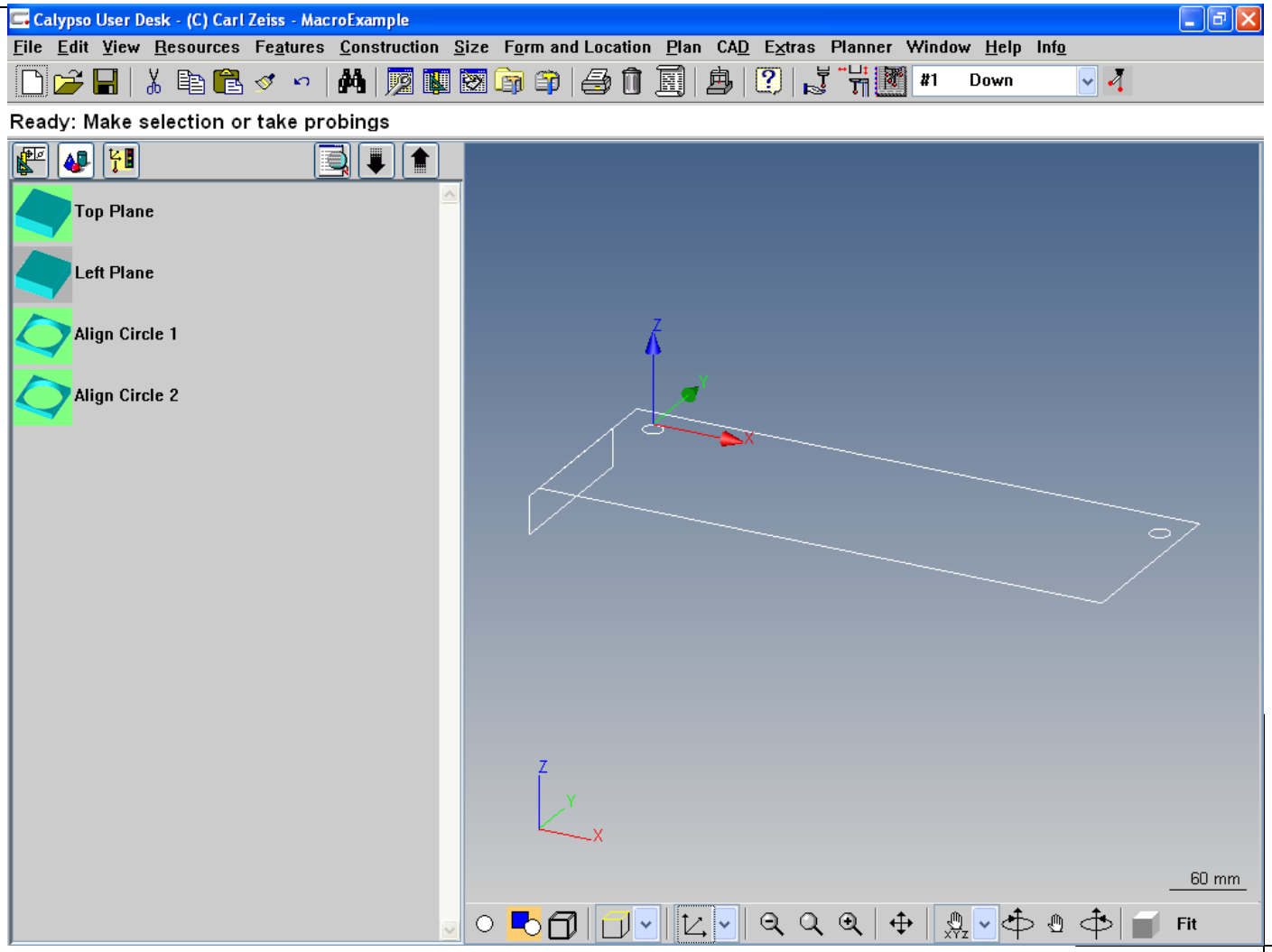
Now back in our blank Base Program...



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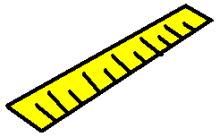
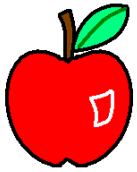
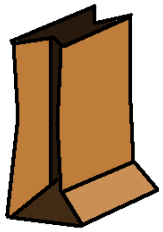


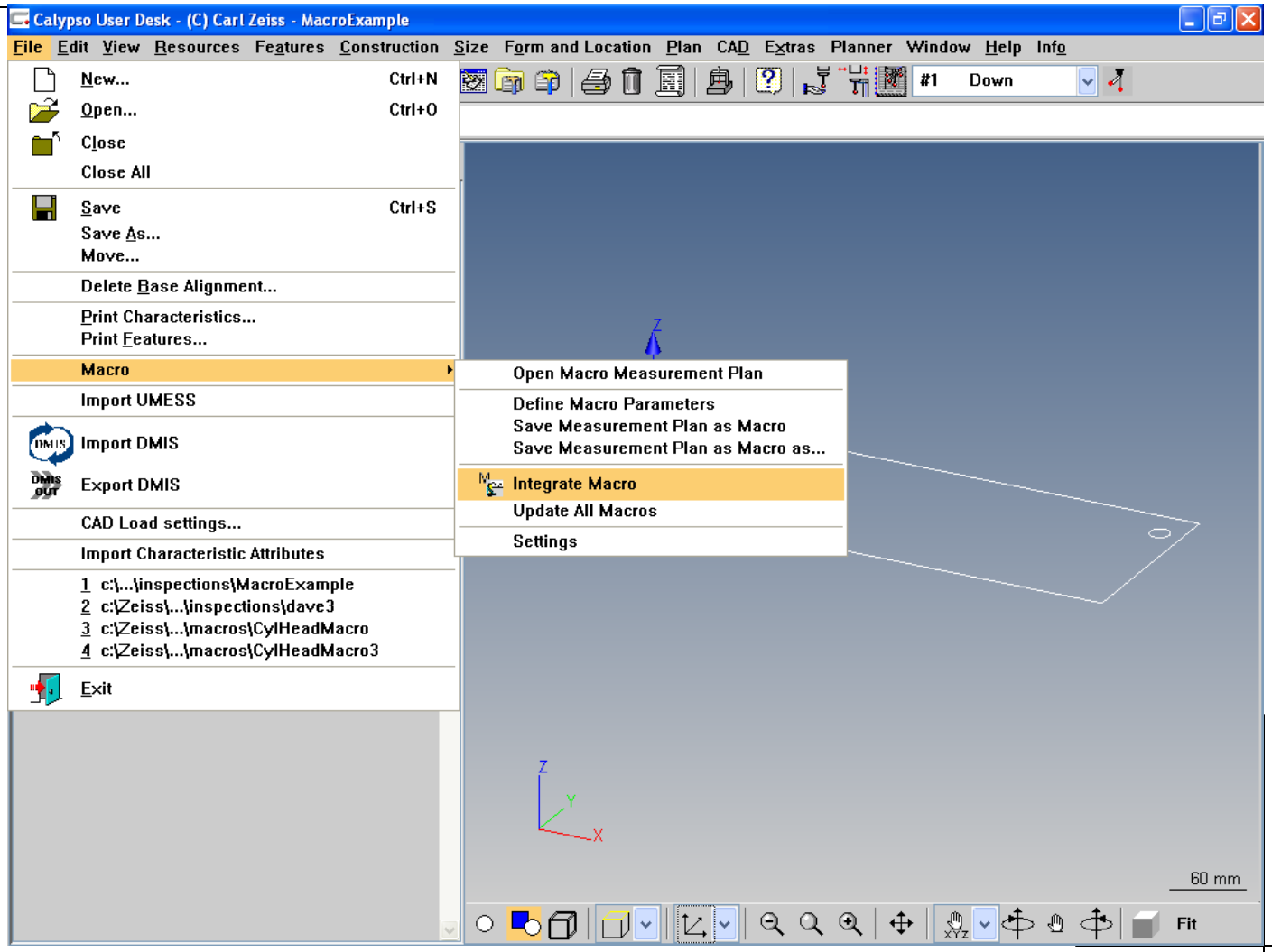




ZEISS

LUNCH 'N LEARN

…we integrate our first Macro...



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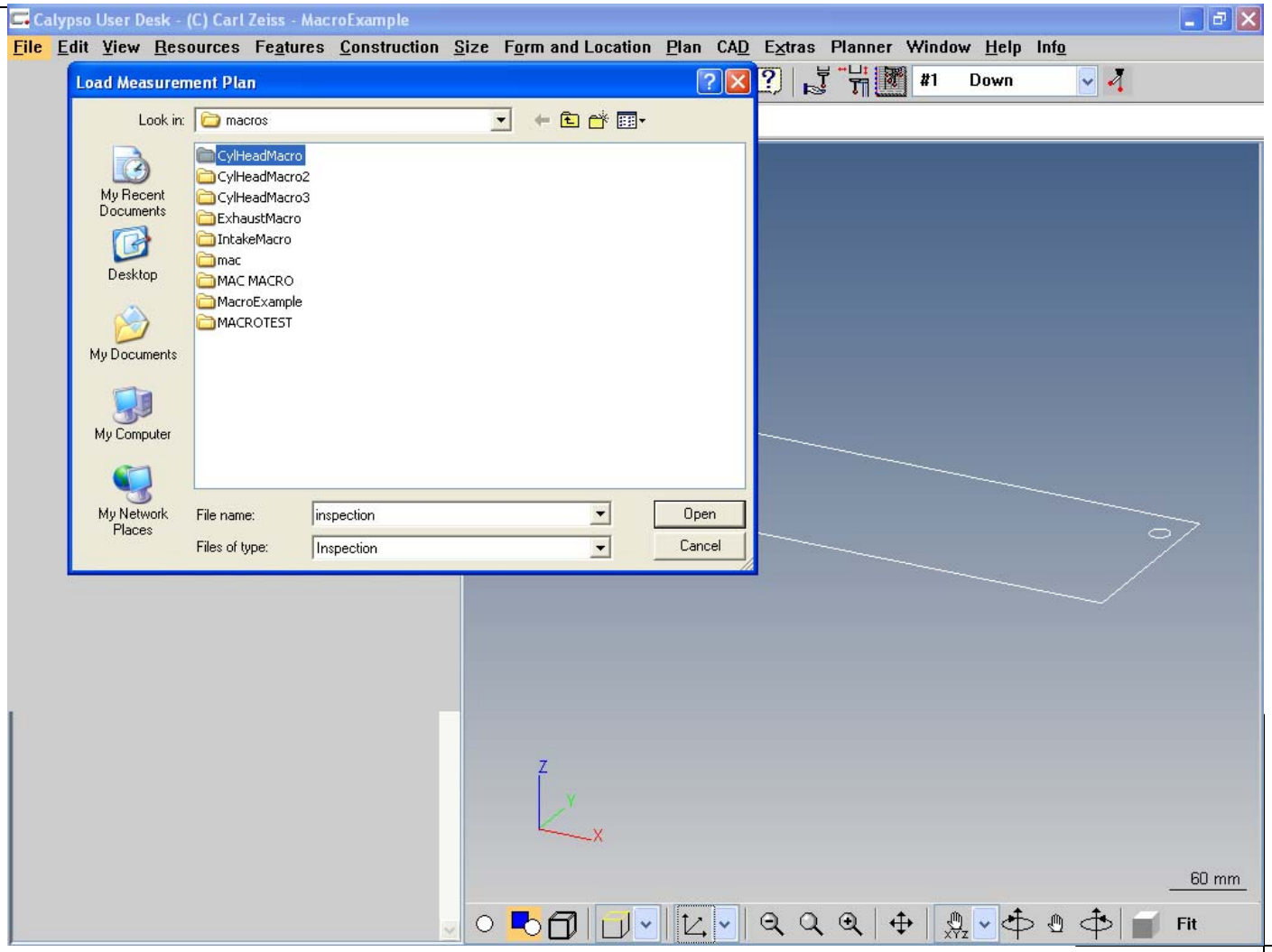
LUNCH 'N LEARN

…we integrate our first Macro...



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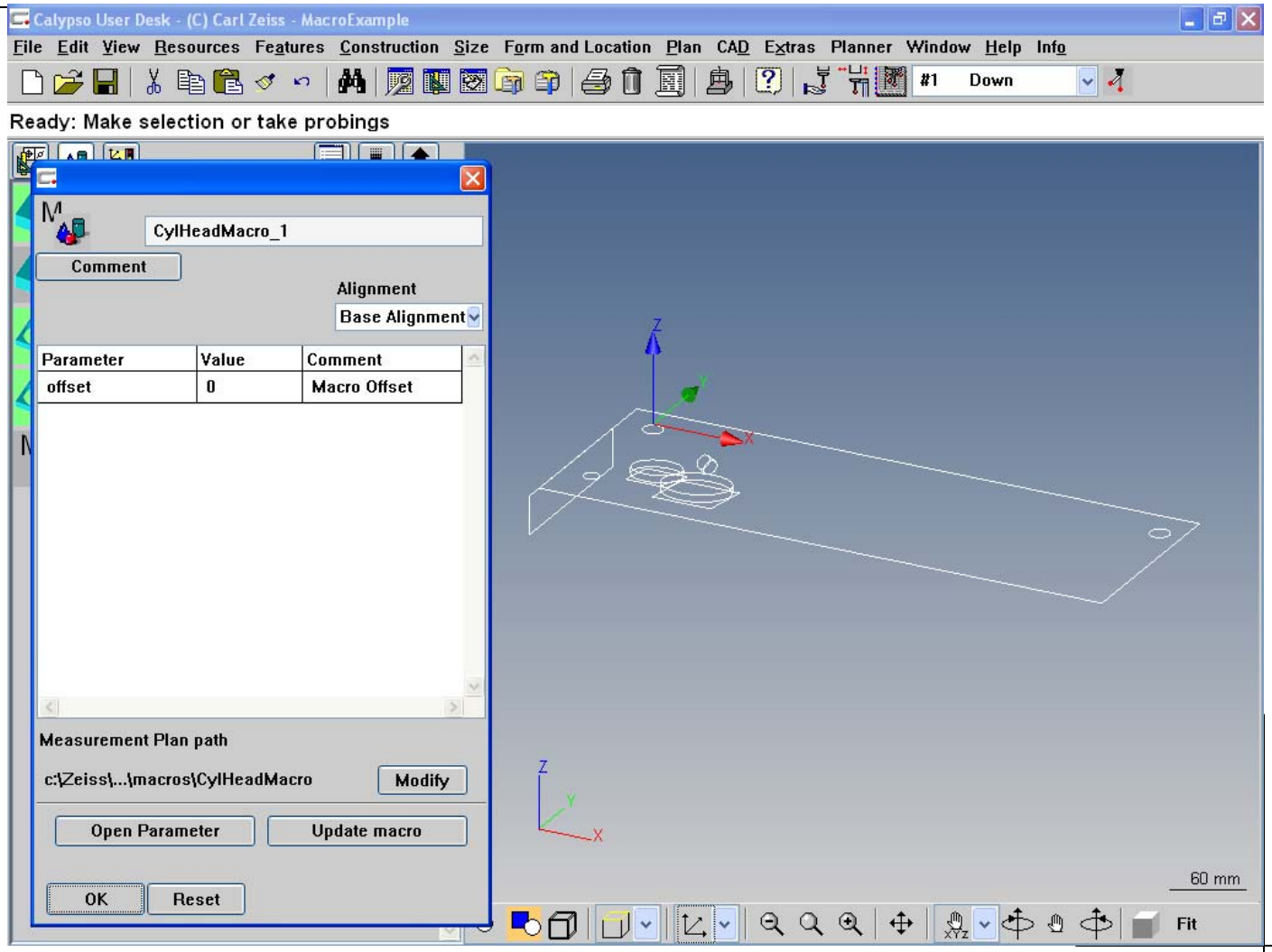
…and make sure our offset variable's value is set to 0.



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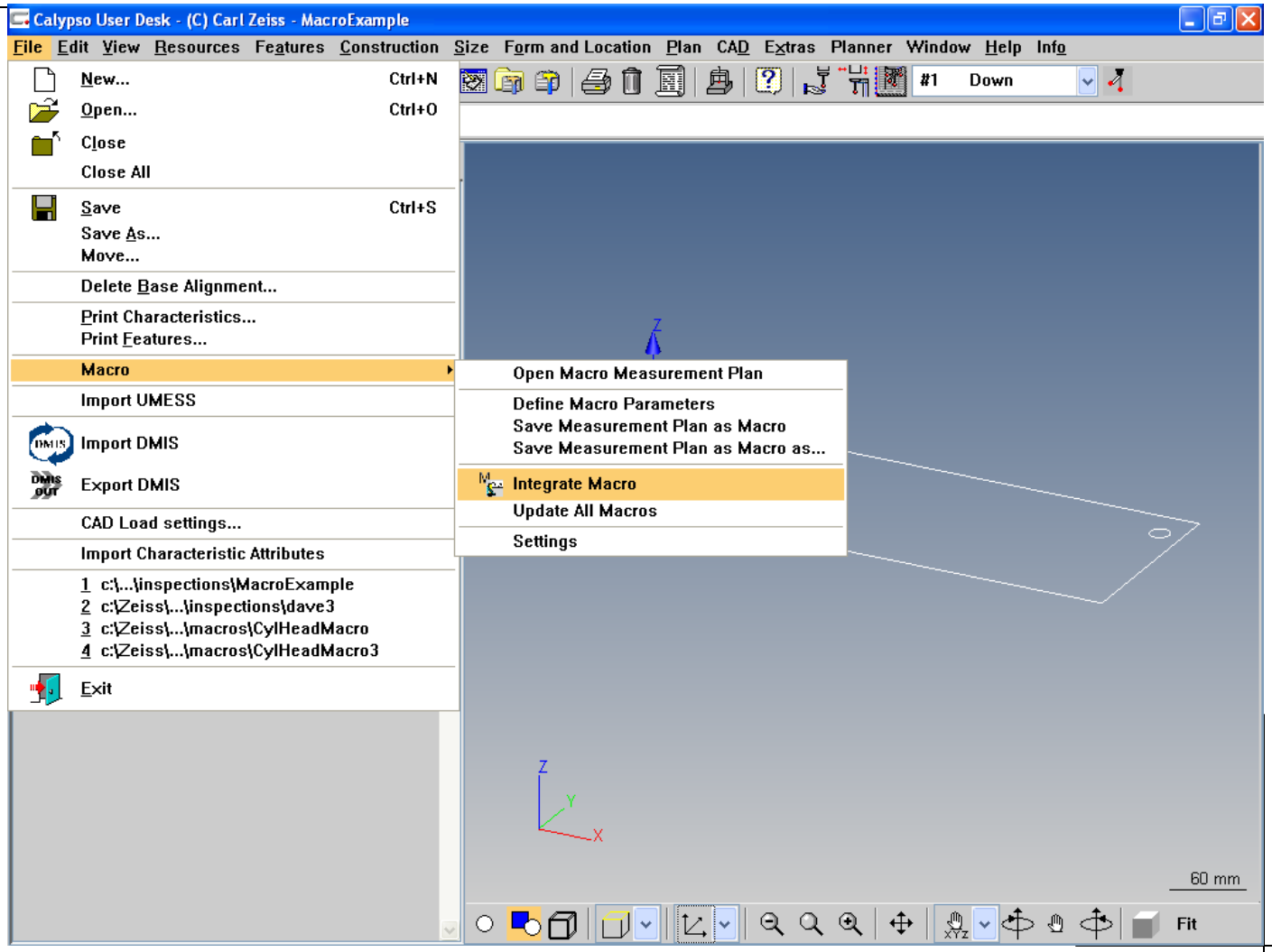
Now integrate the second Macro...



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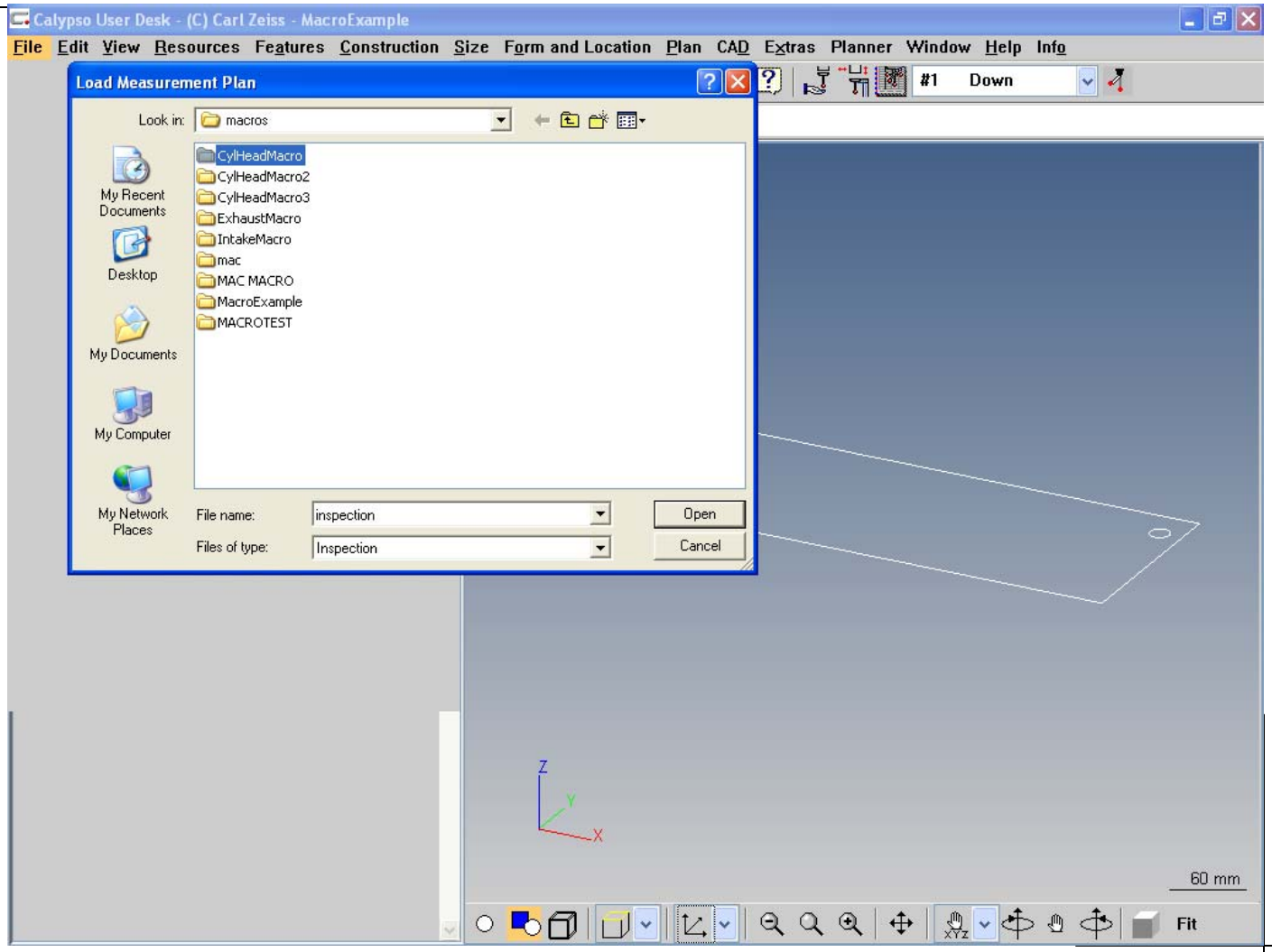
LUNCH 'N LEARN

ZEISS

Now integrate the second Macro...



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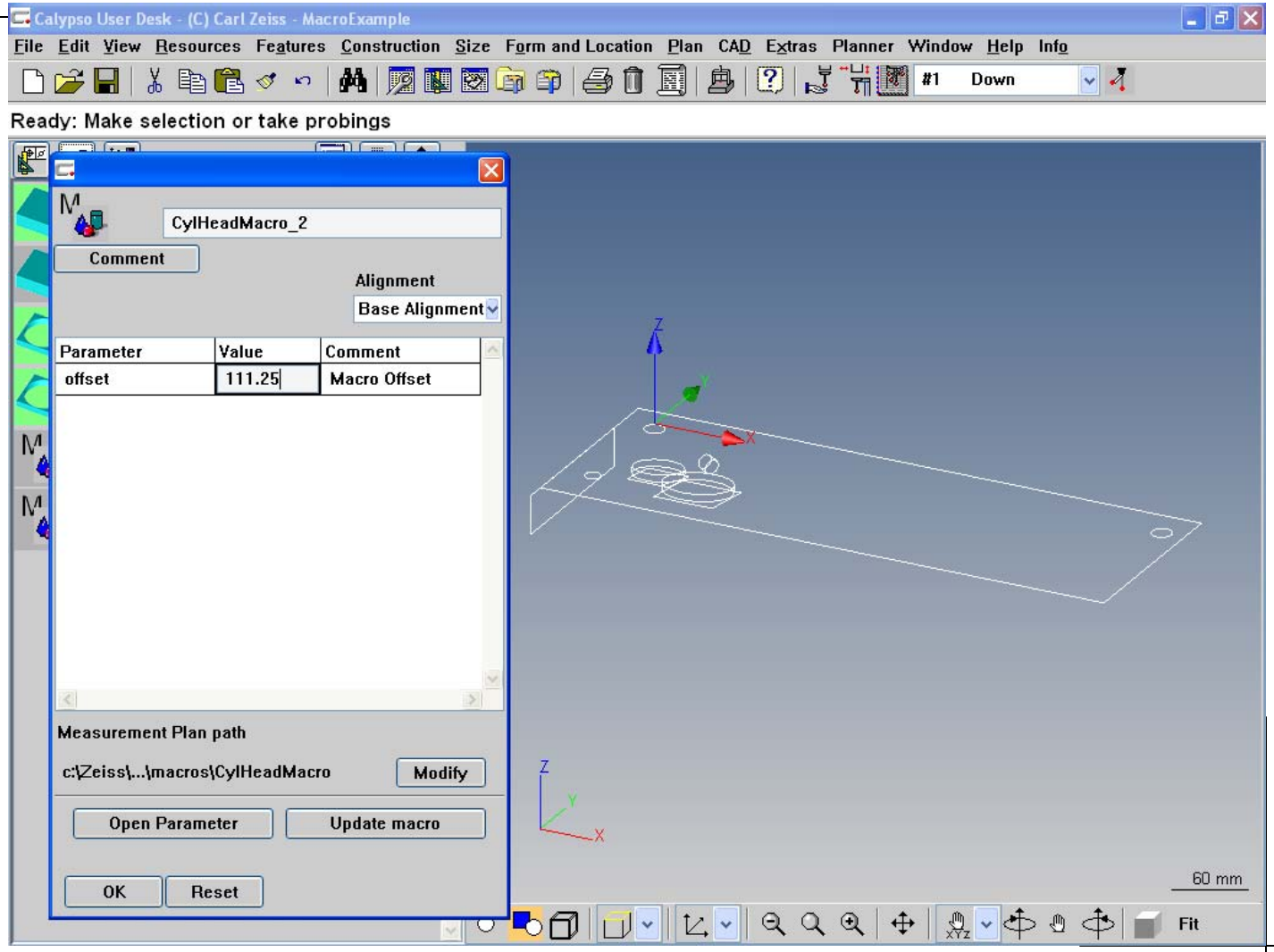
…and set its offset value to 111.25 mm.



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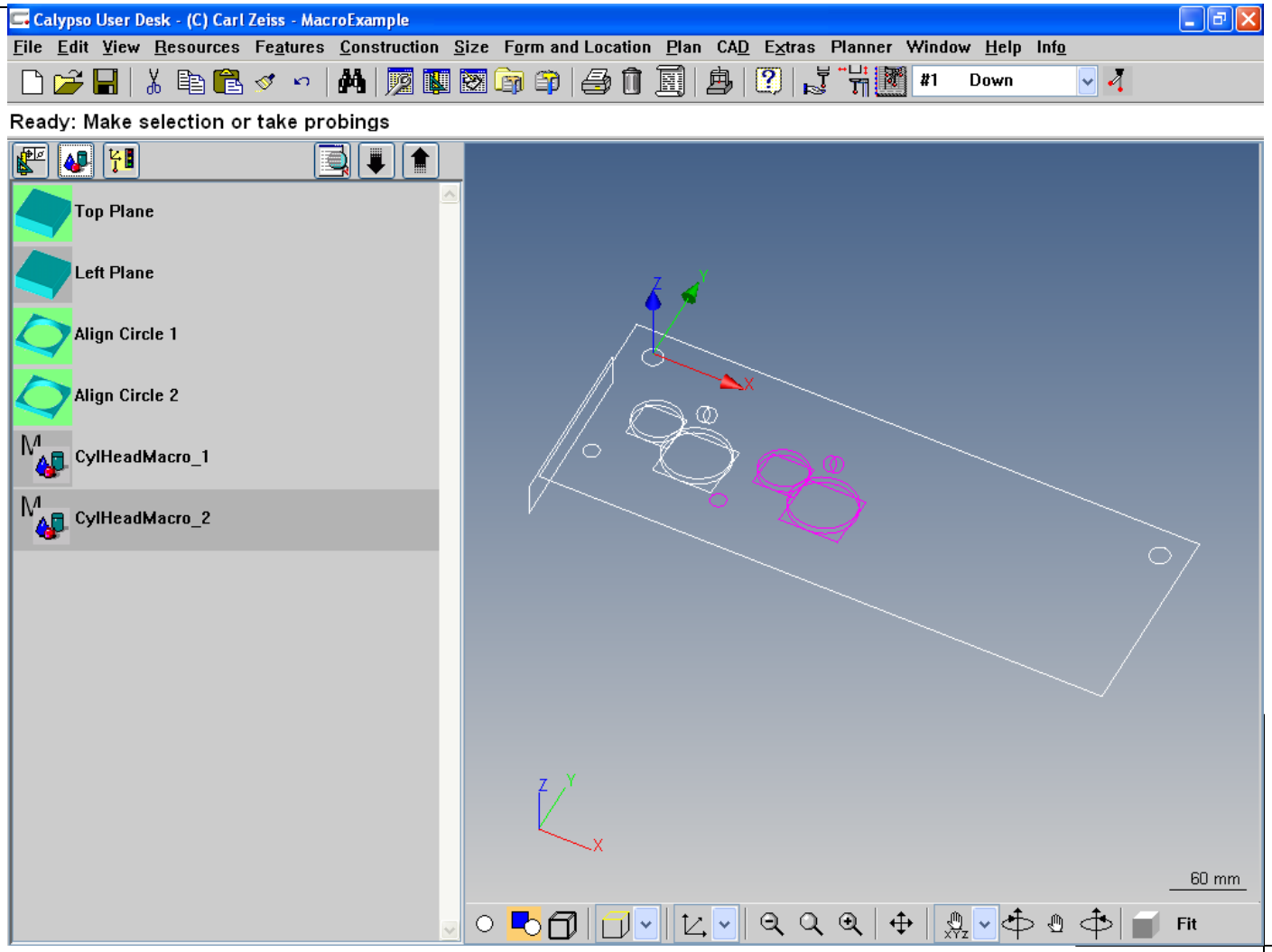
As you can see, our offset variable has cause all of our Macro features to shift by the specified amount, just as planned!



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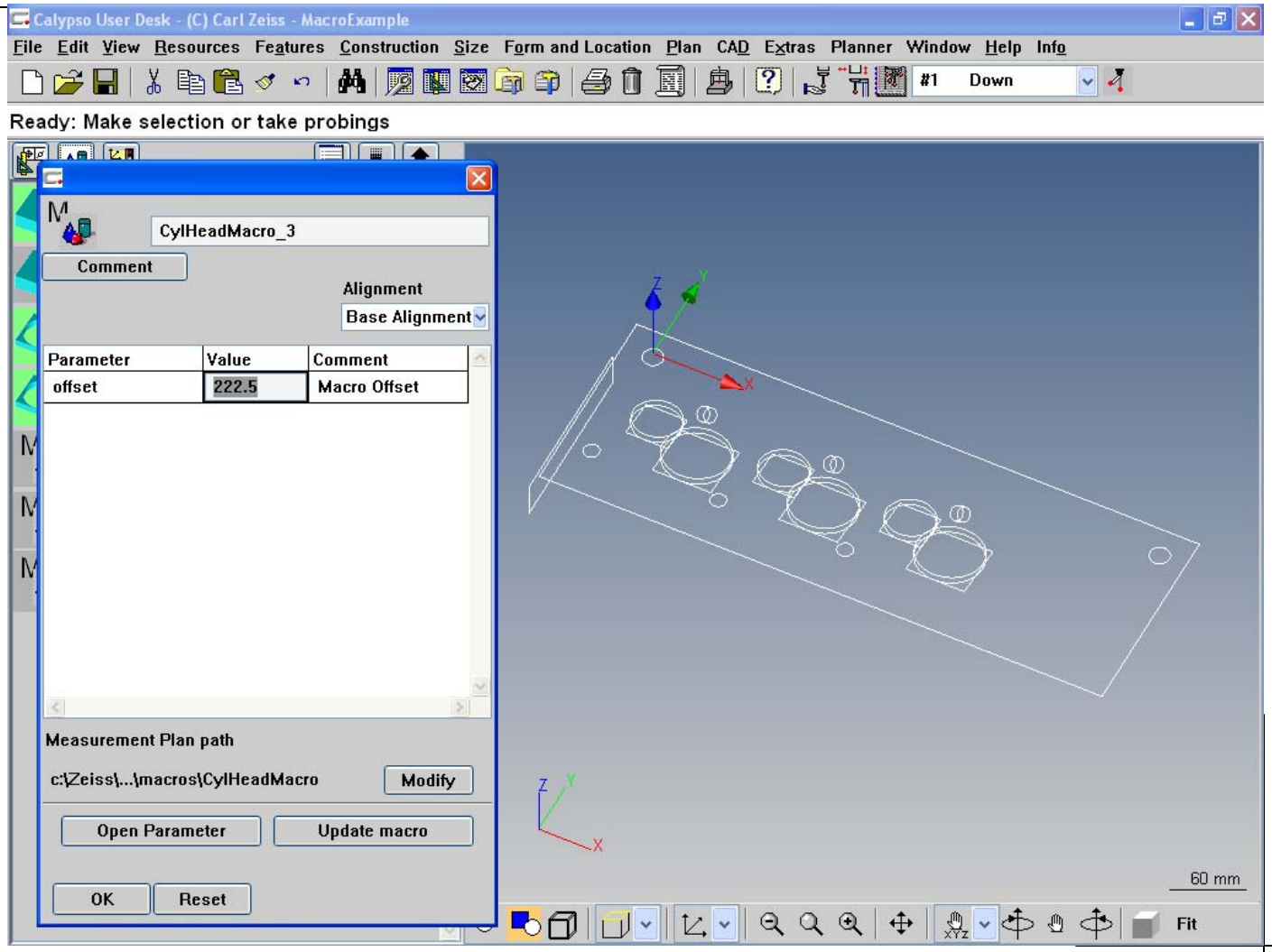
Repeat again with an offset value of 222.50 mm (2*111.25).



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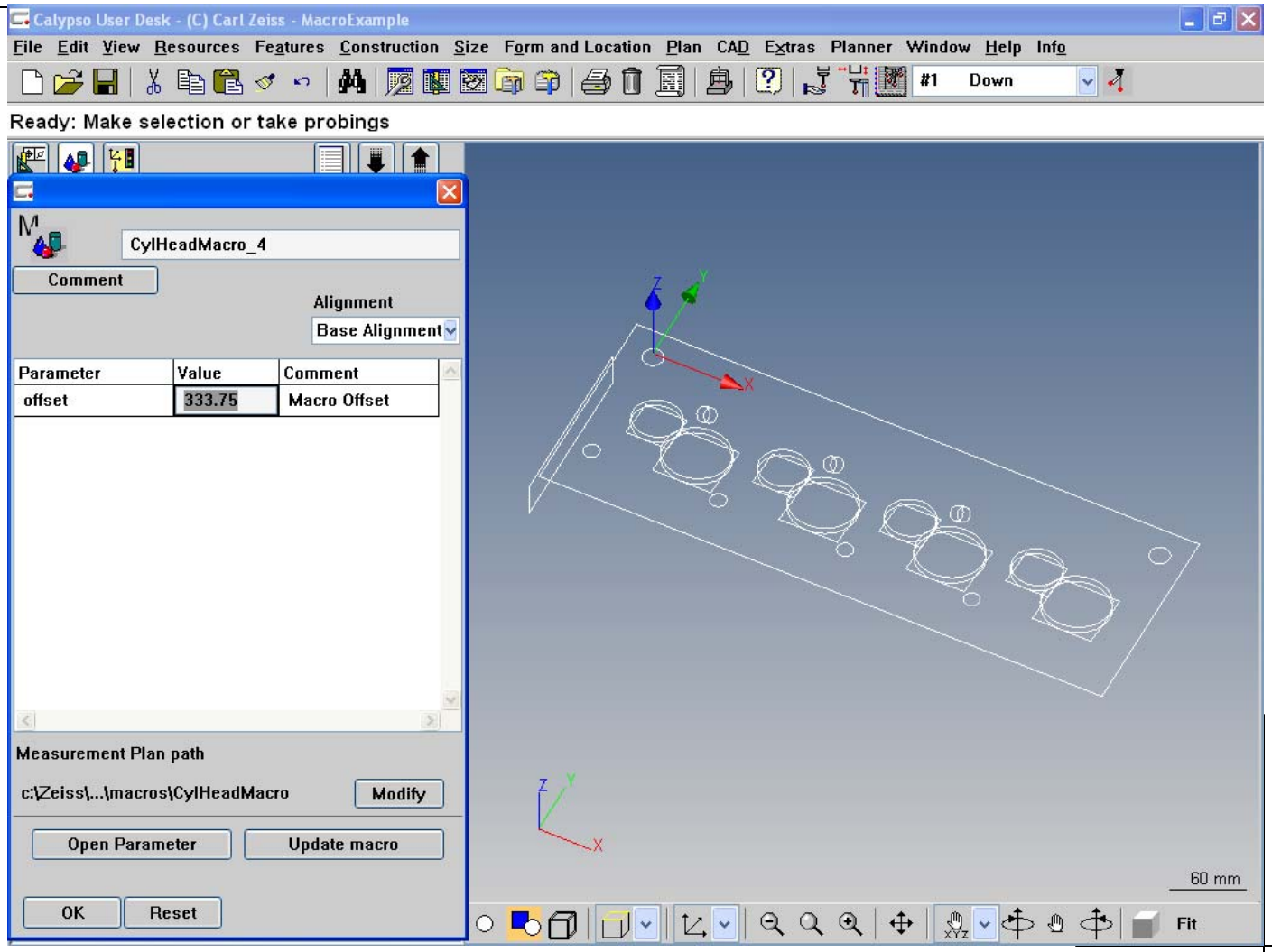
And again with an offset value of 333.75 mm (111.25*3).



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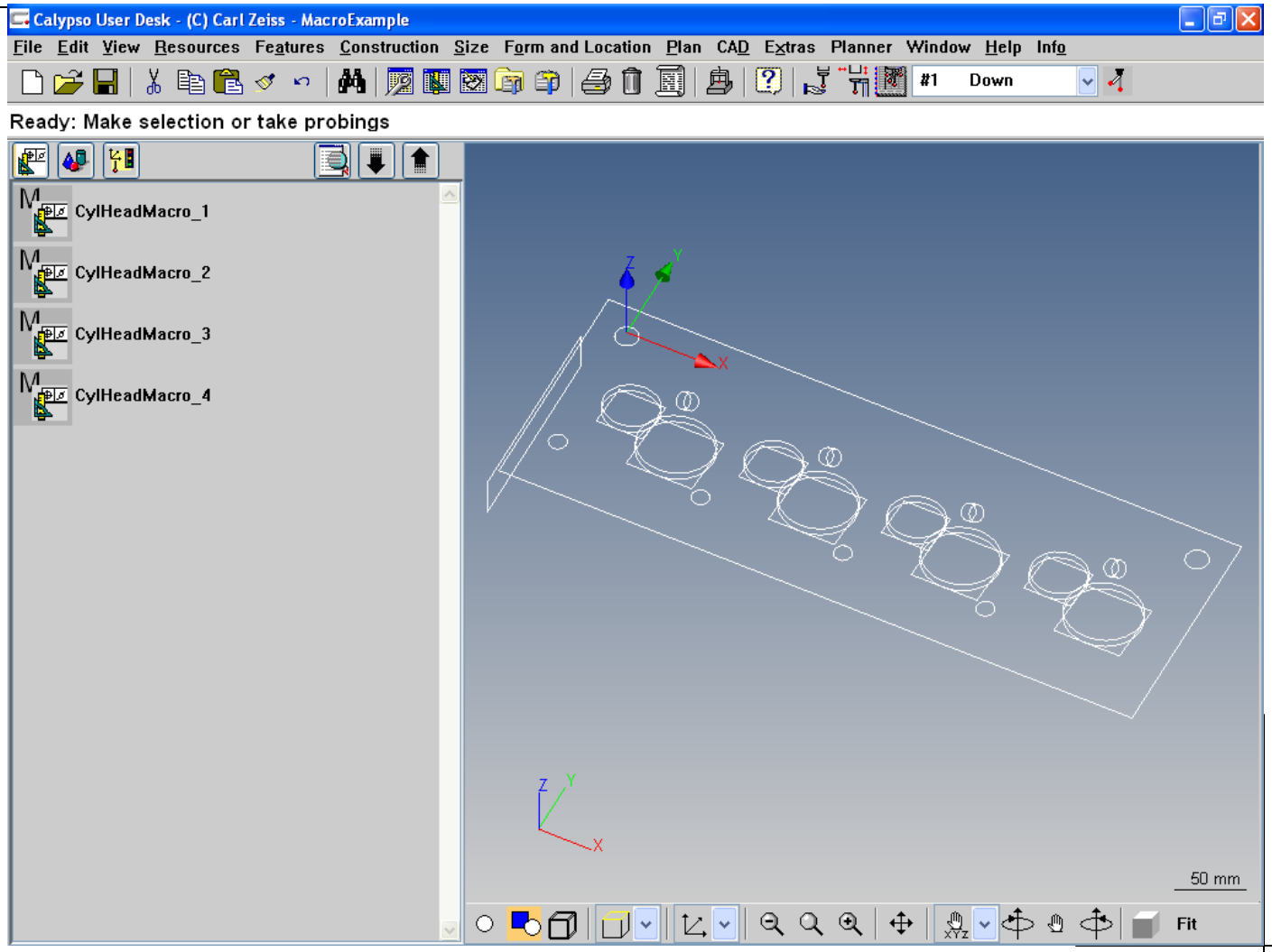
Now we have our full program with four Macros using no secondary alignments.



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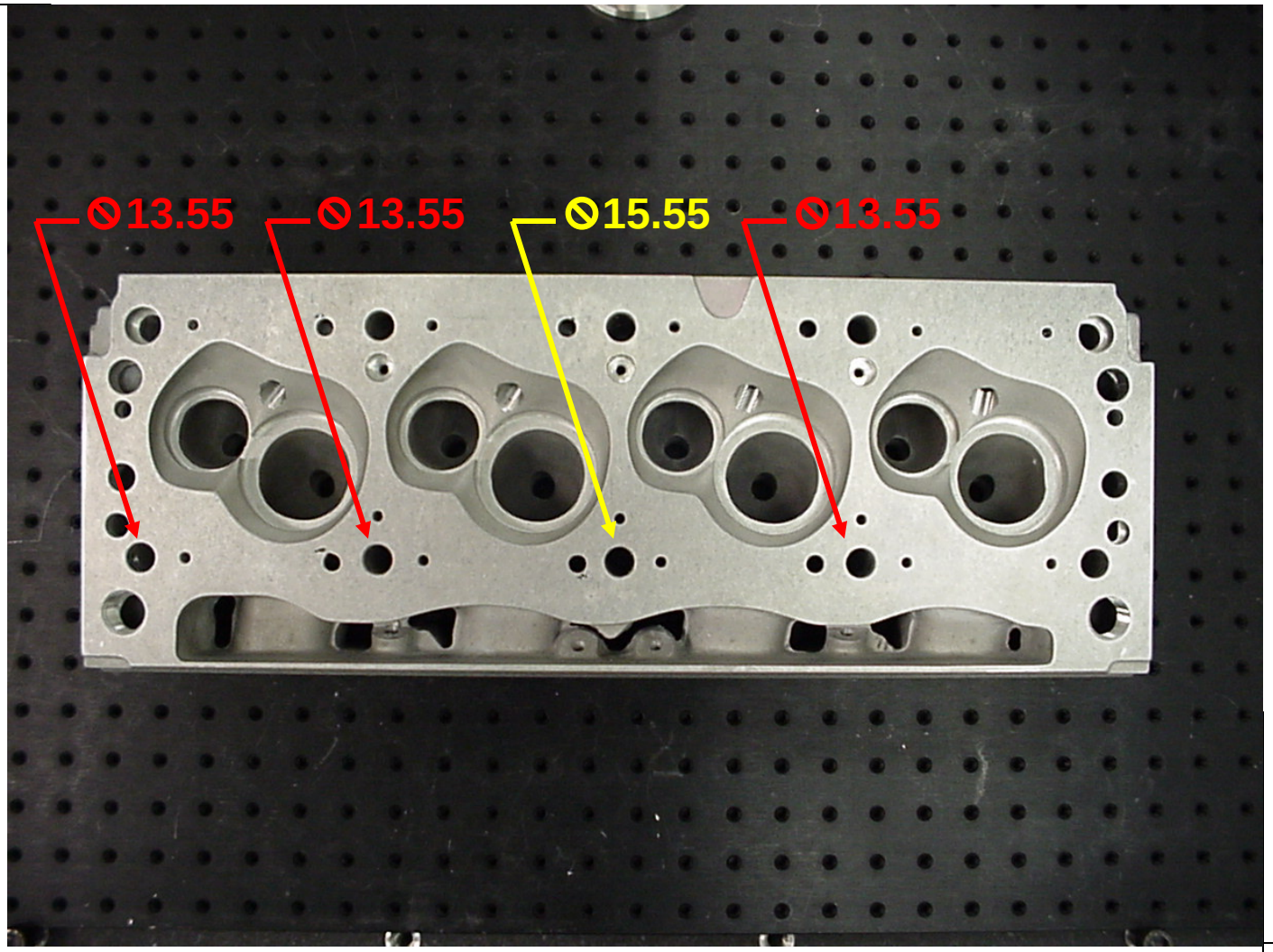
Another use of the Macro Parameters is compensating for inconsistencies between Macro instances.

Let's say that the third Macro instance's Large Bore feature had a diameter of 15.55 instead of the standard 13.55.



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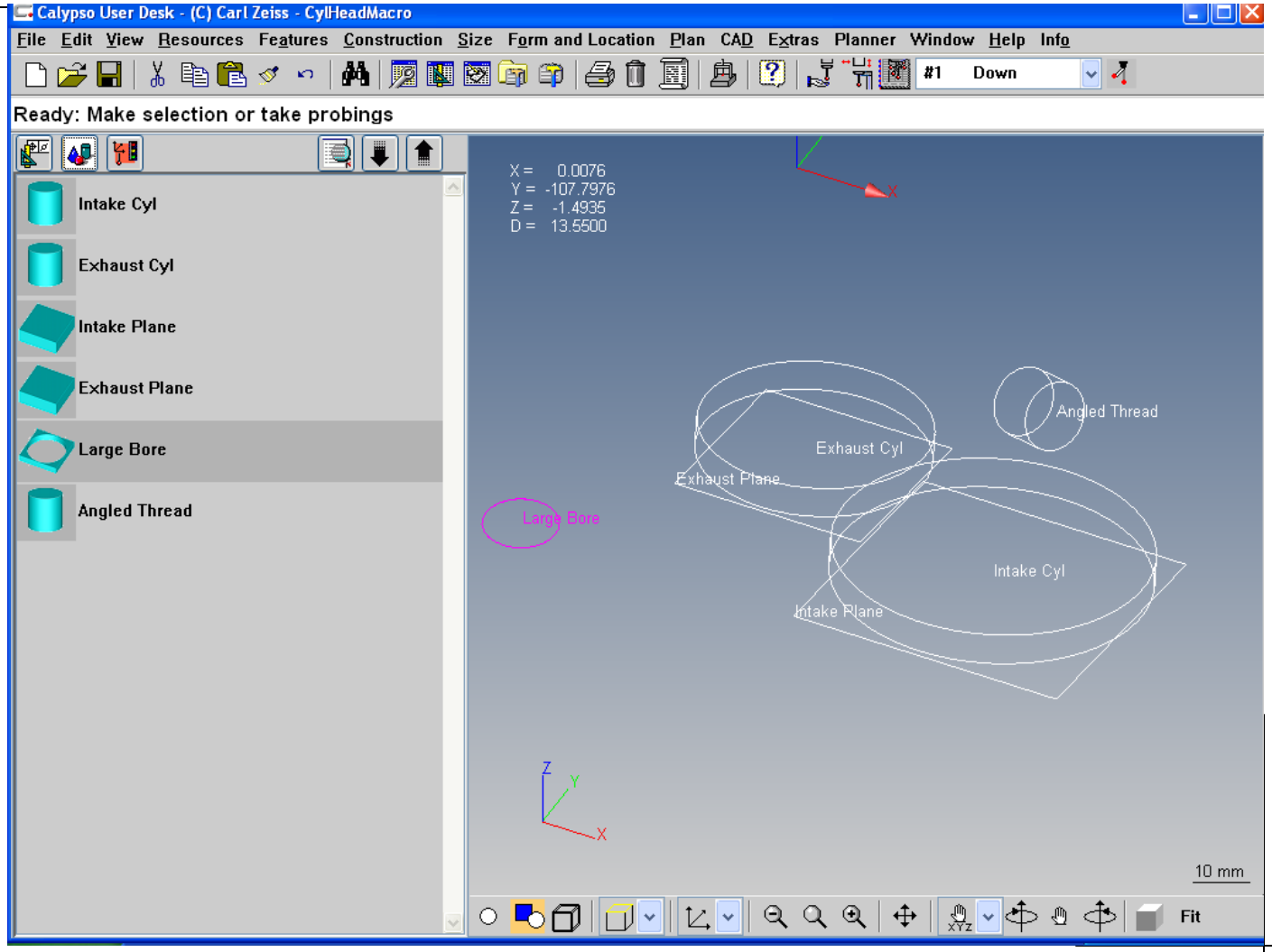
Back in our Macro Program...



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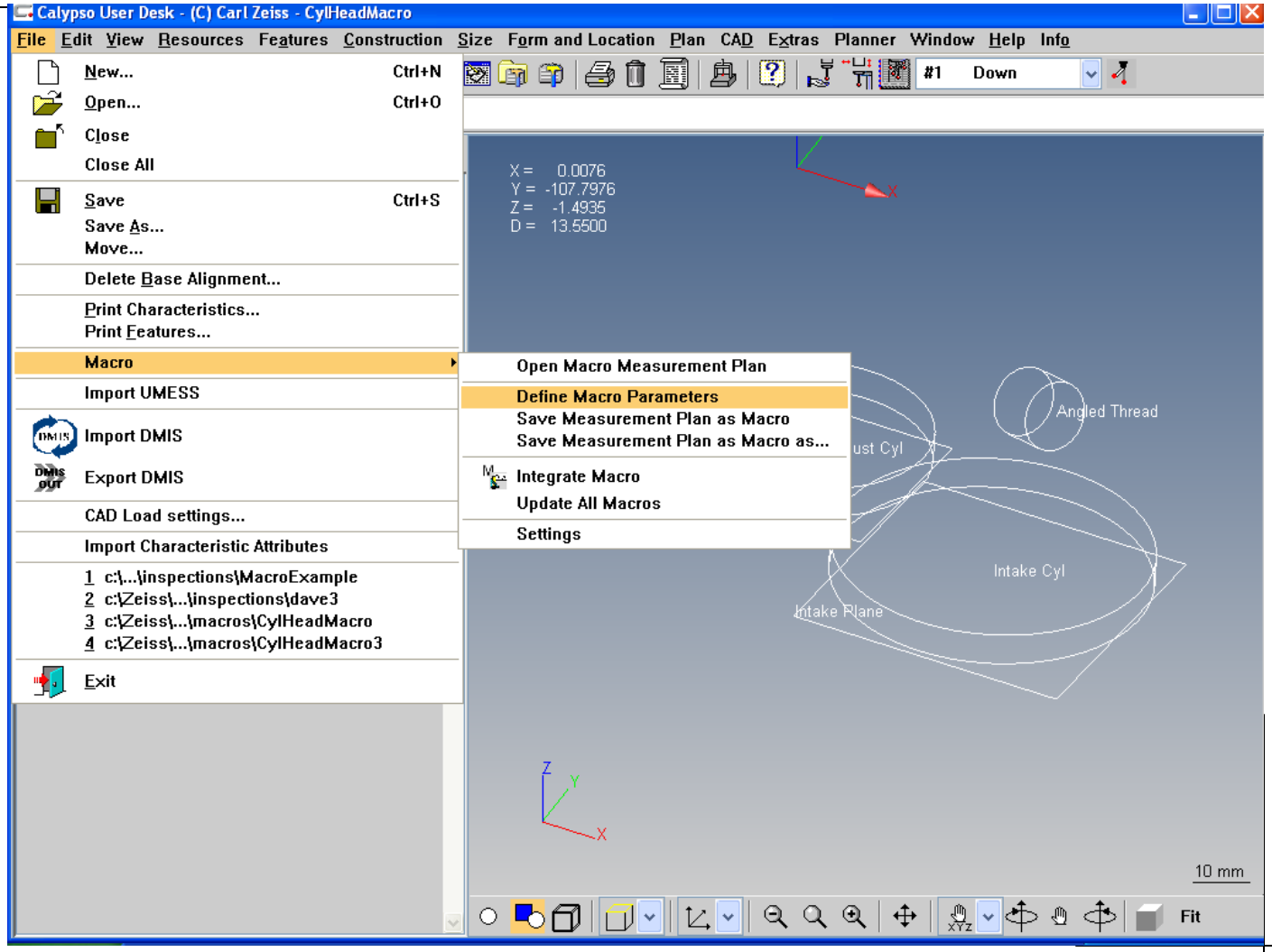
…we define another Macro Parameter.

Macro>Define Macro Parameter



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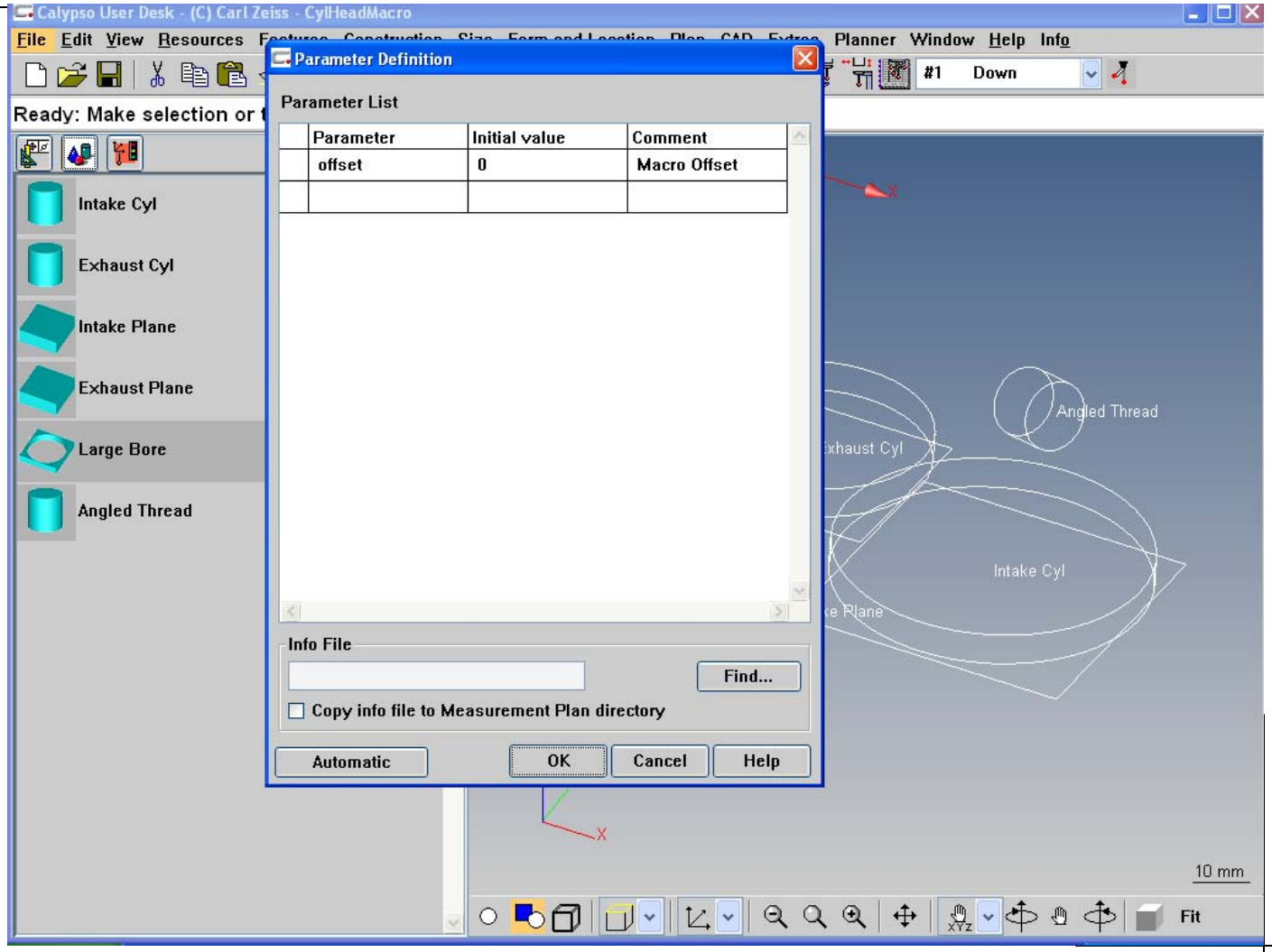
In addition to our offset variable, we will add a diameter change variable.



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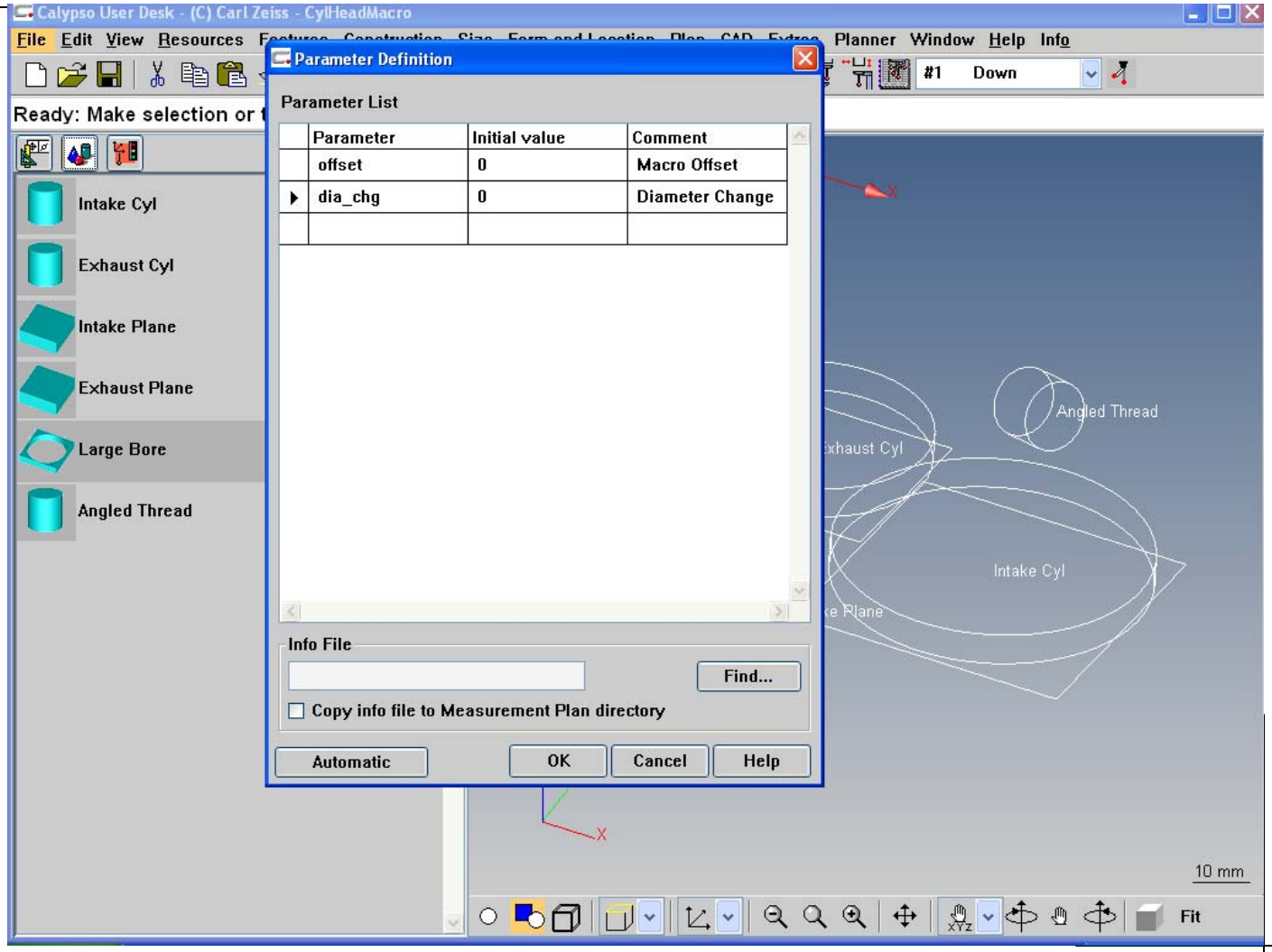
In addition to our offset variable, we will add a diameter change variable with initial value of zero.



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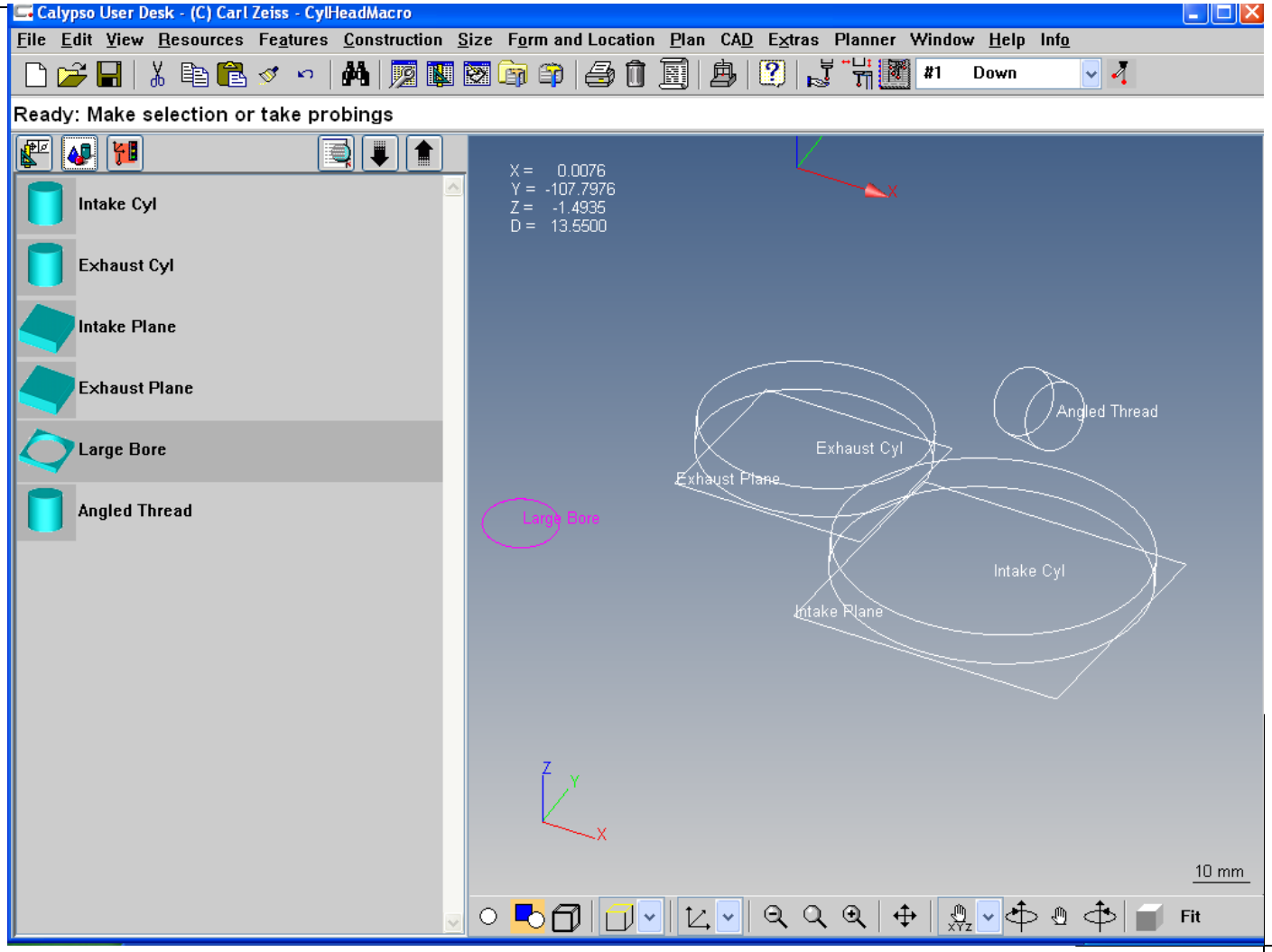
Now we open our Large Bore feature...



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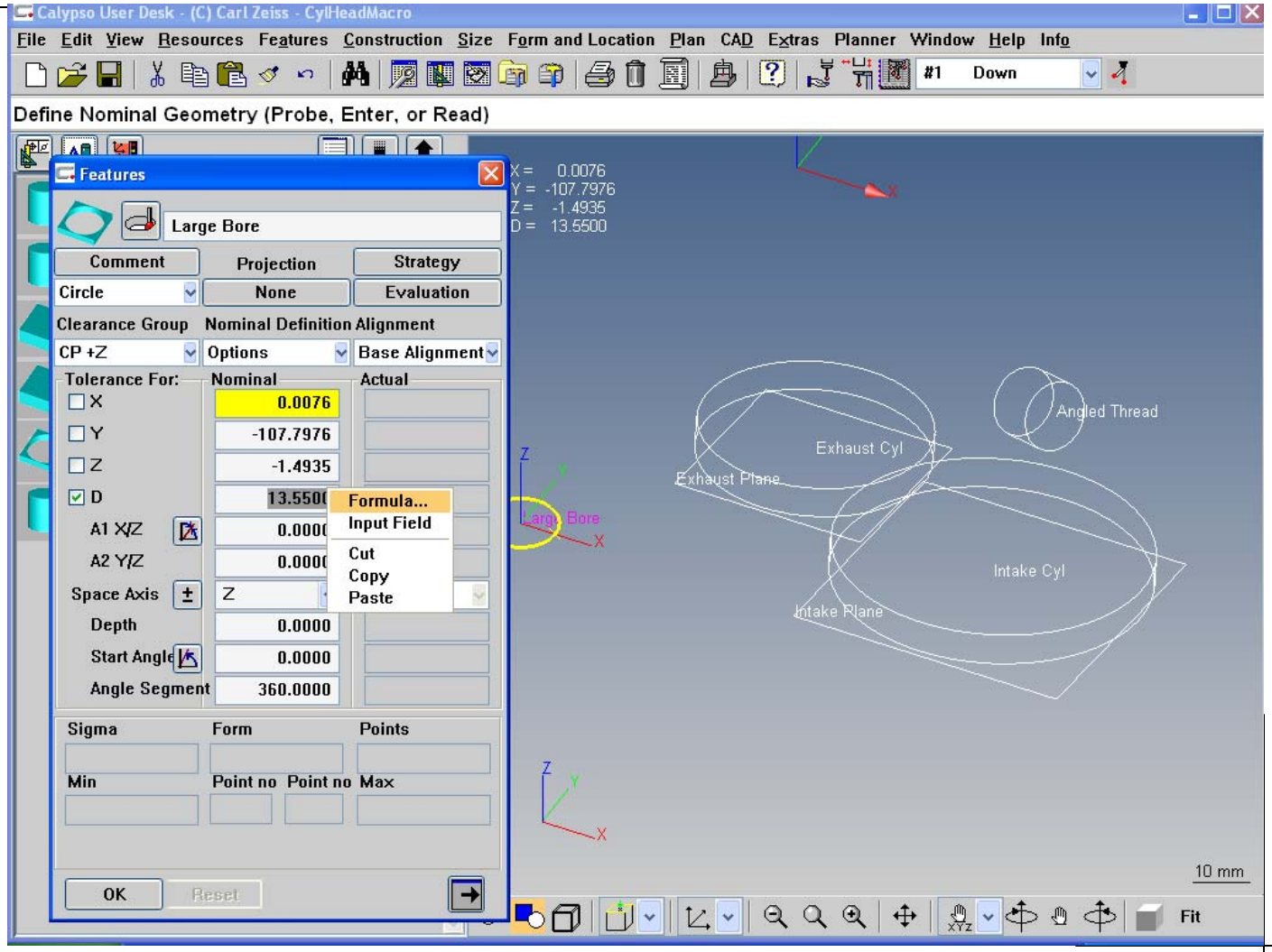
…and set up a formula on its nominal diameter.



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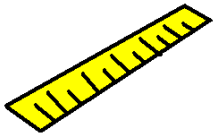

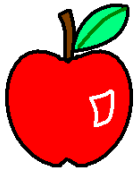

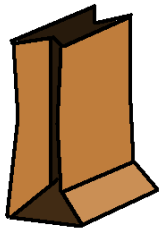

ZEISS

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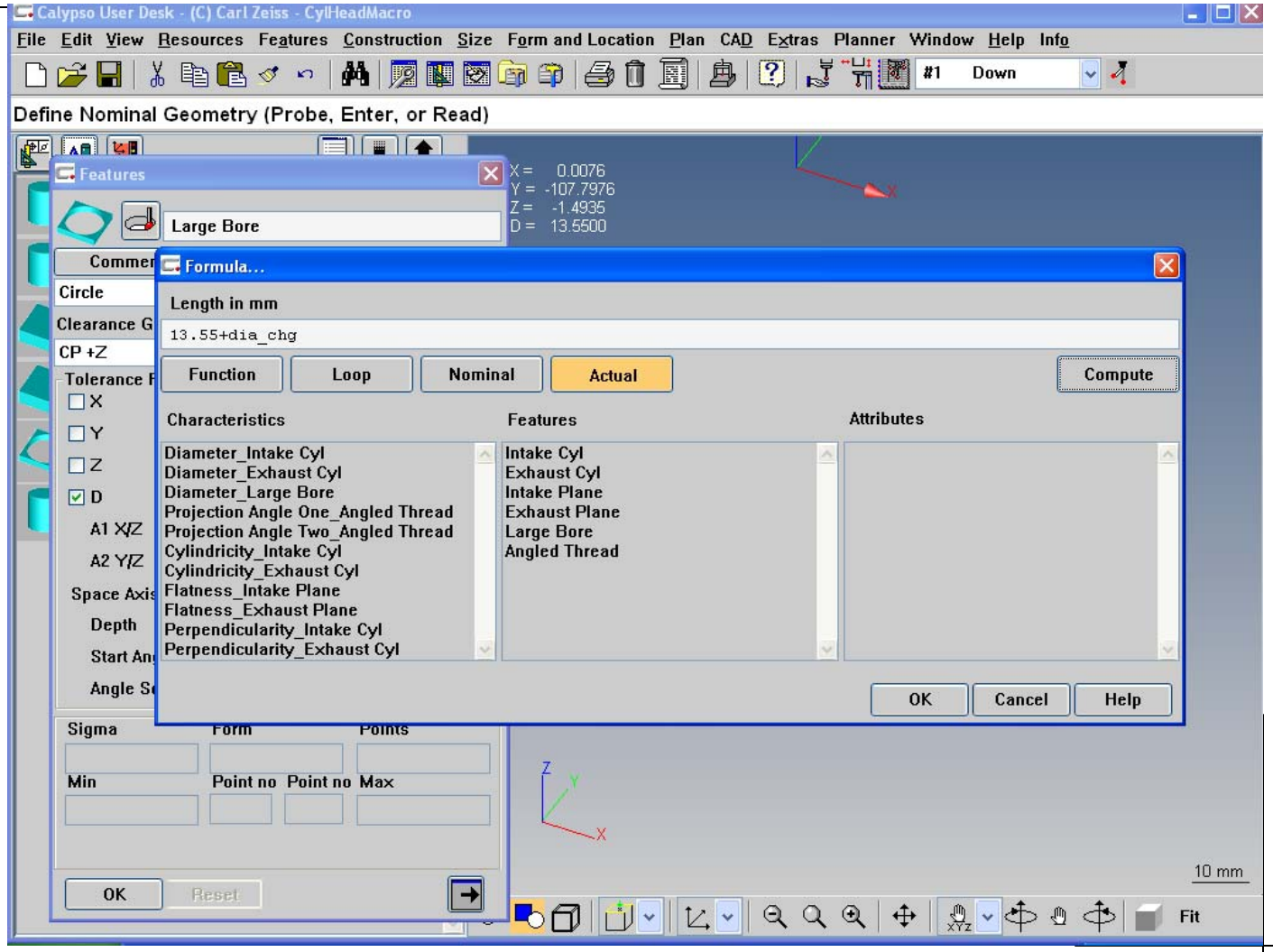
Our formula is the standard diameter (13.55 mm) plus our diameter change variable.



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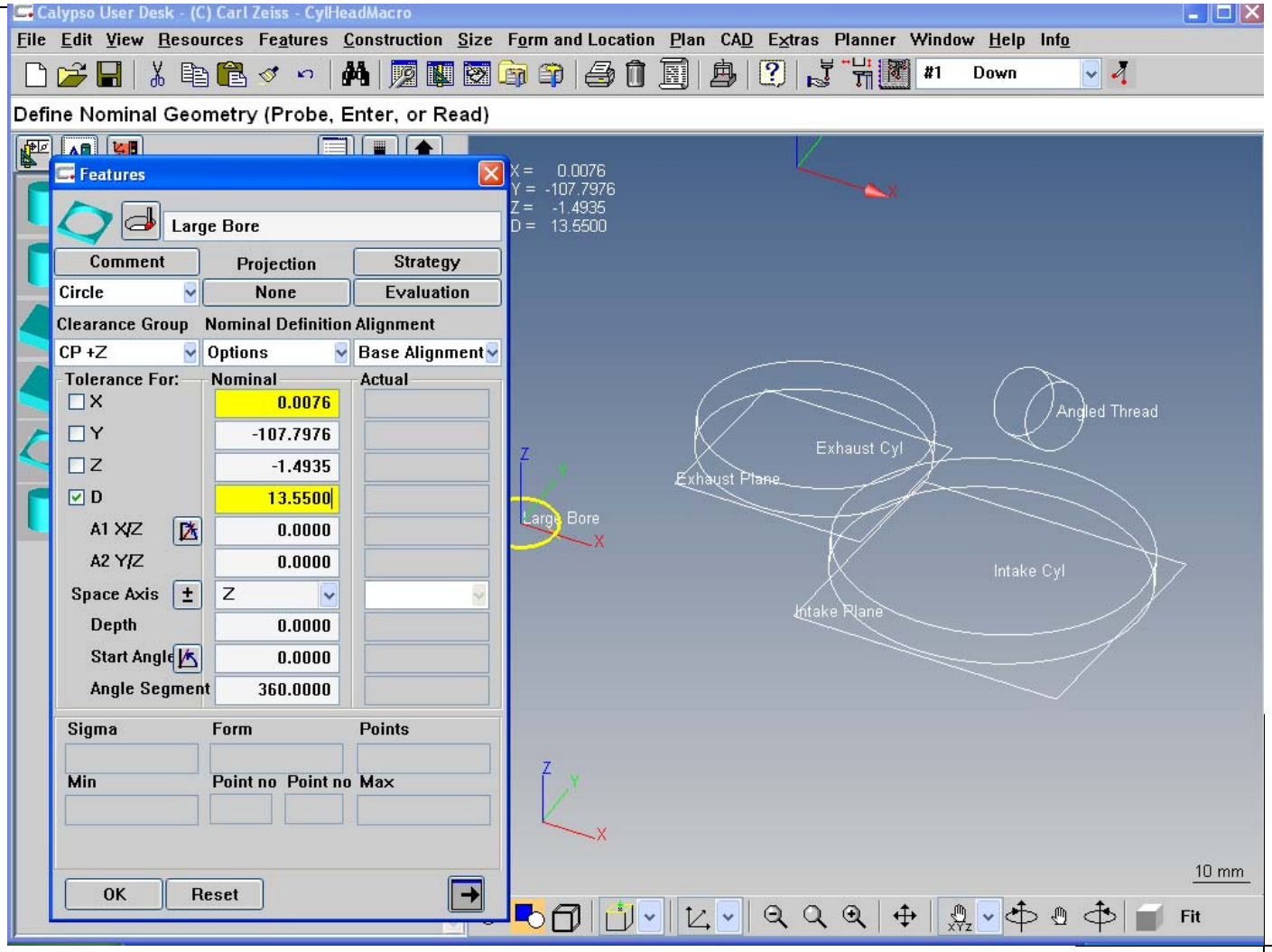
Now our diameter will remain the standard 13.55 mm unless we change the dia_chg variable to a value other than zero.



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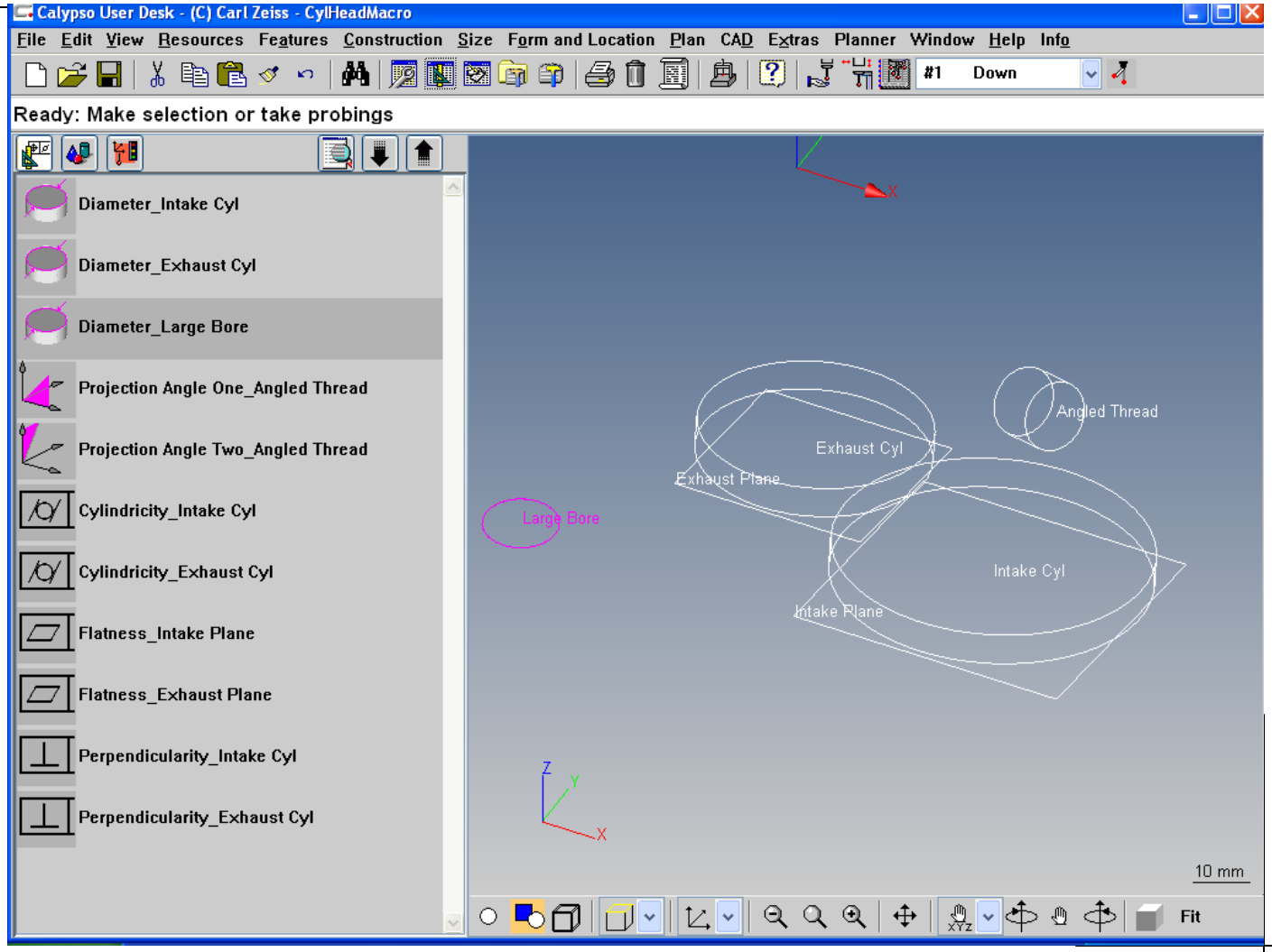
Now we must make sure that our diameter characteristic for the Large Bore is pulling the nominal information from the feature.



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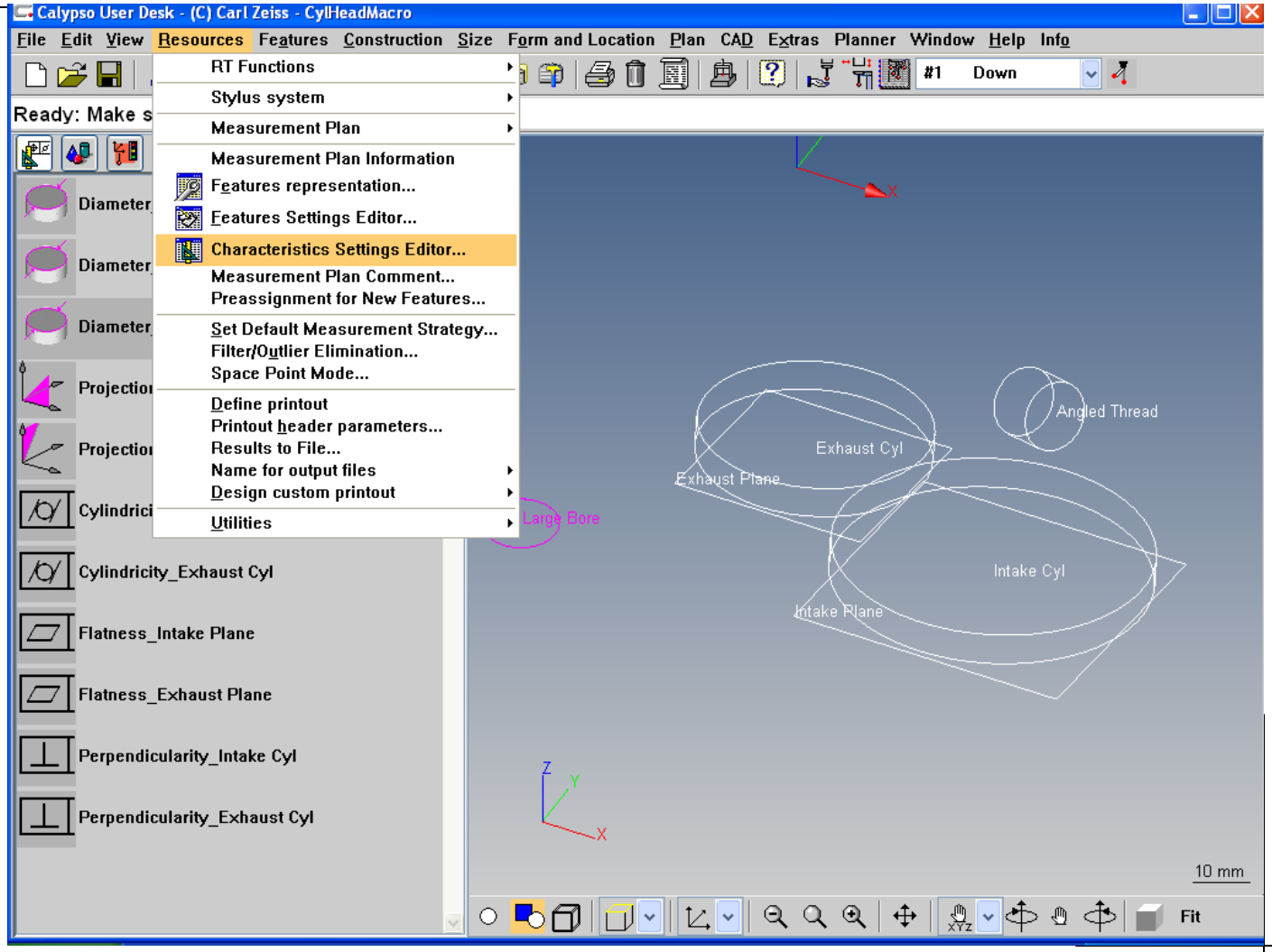
In the Characteristics Settings Editor...



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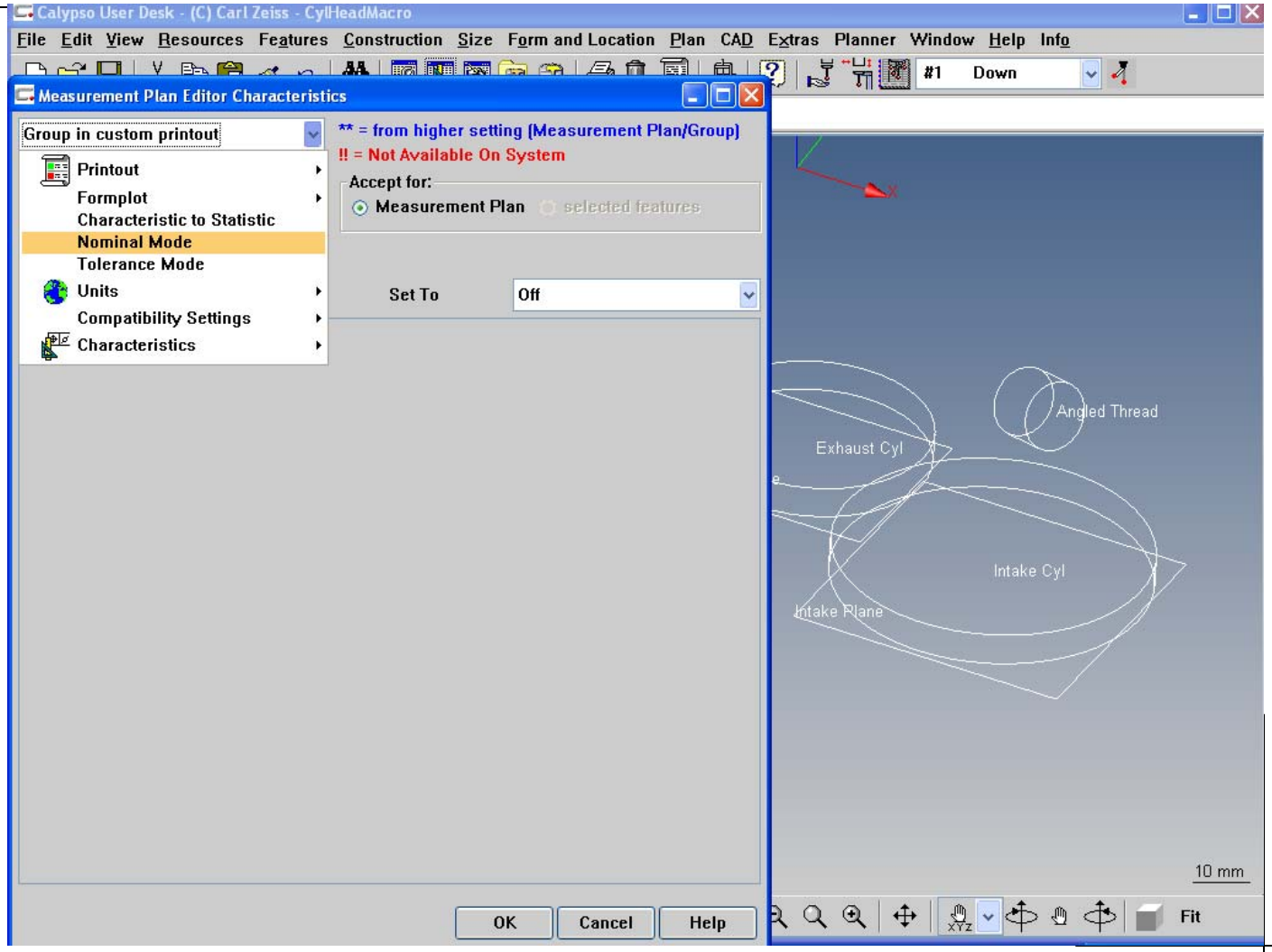
…we choose Nominal Mode from the drop-down menu...



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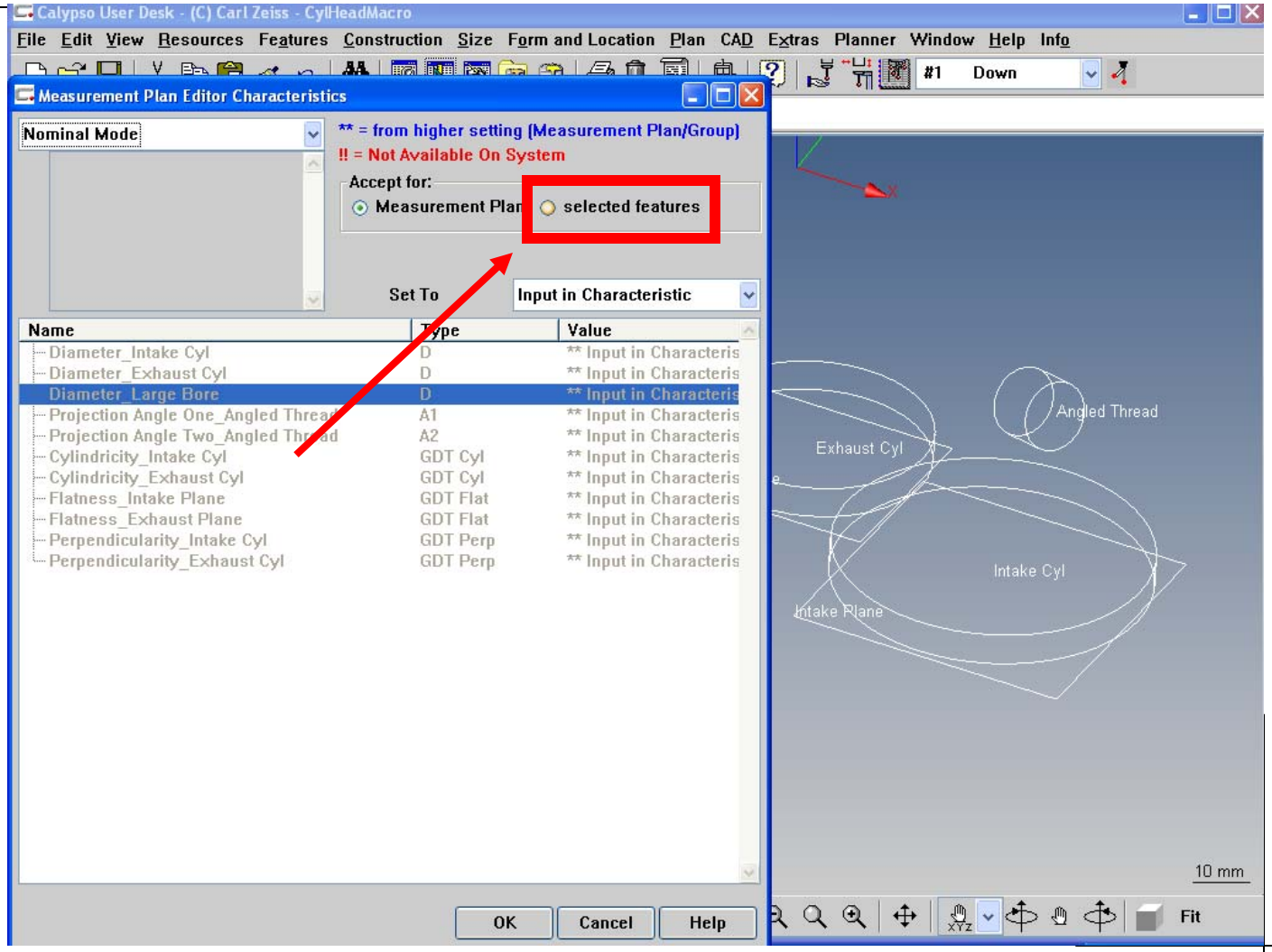
…choose Selected Features...



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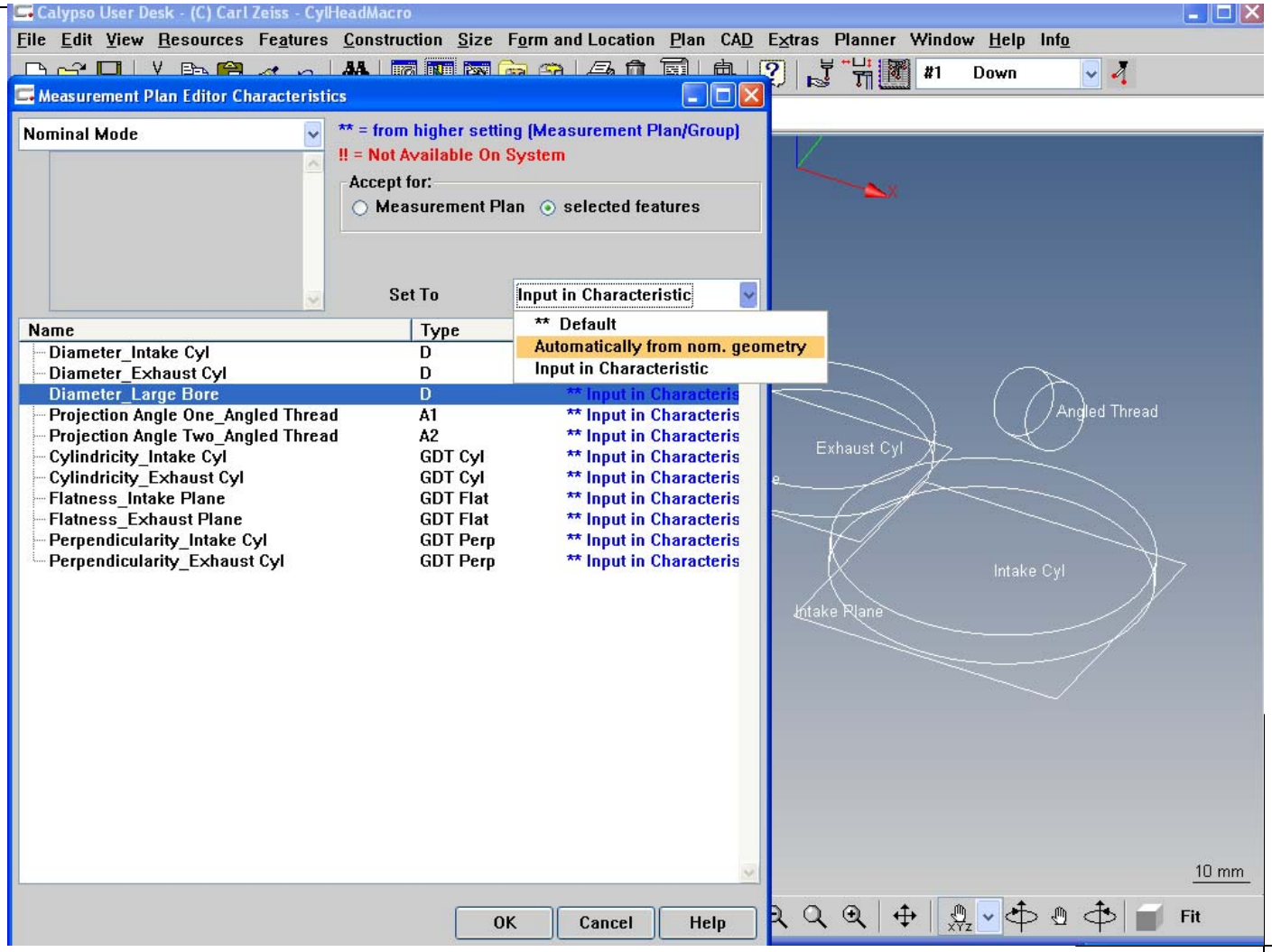
…and with our characteristic selected, switch the mode to *Automatically from nom. Geometry*.



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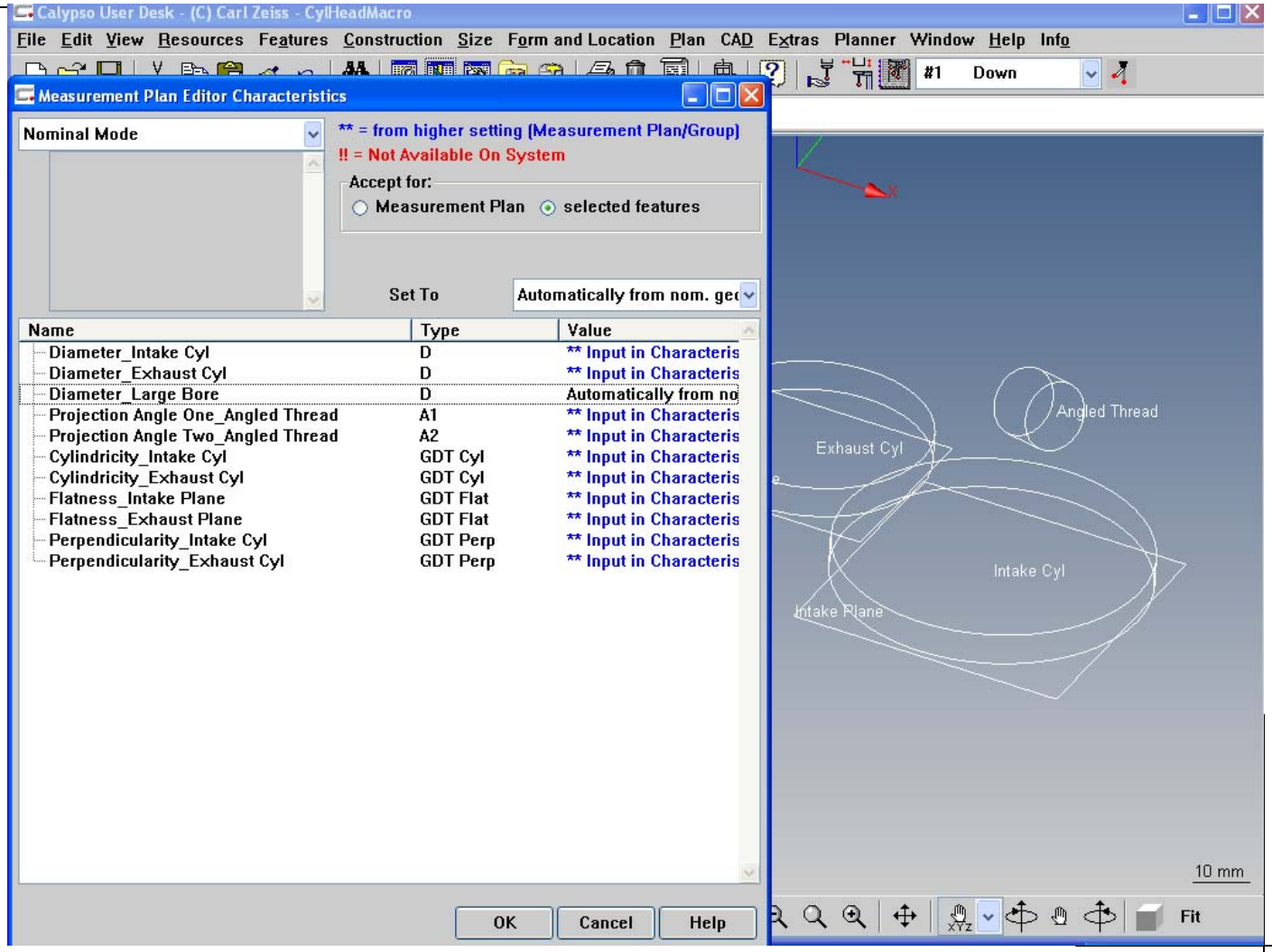
This means that our nominal value for our diameter characteristic will pull directly from the nominal value of the feature, so both the feature and characteristic will have our parameter applied to them.



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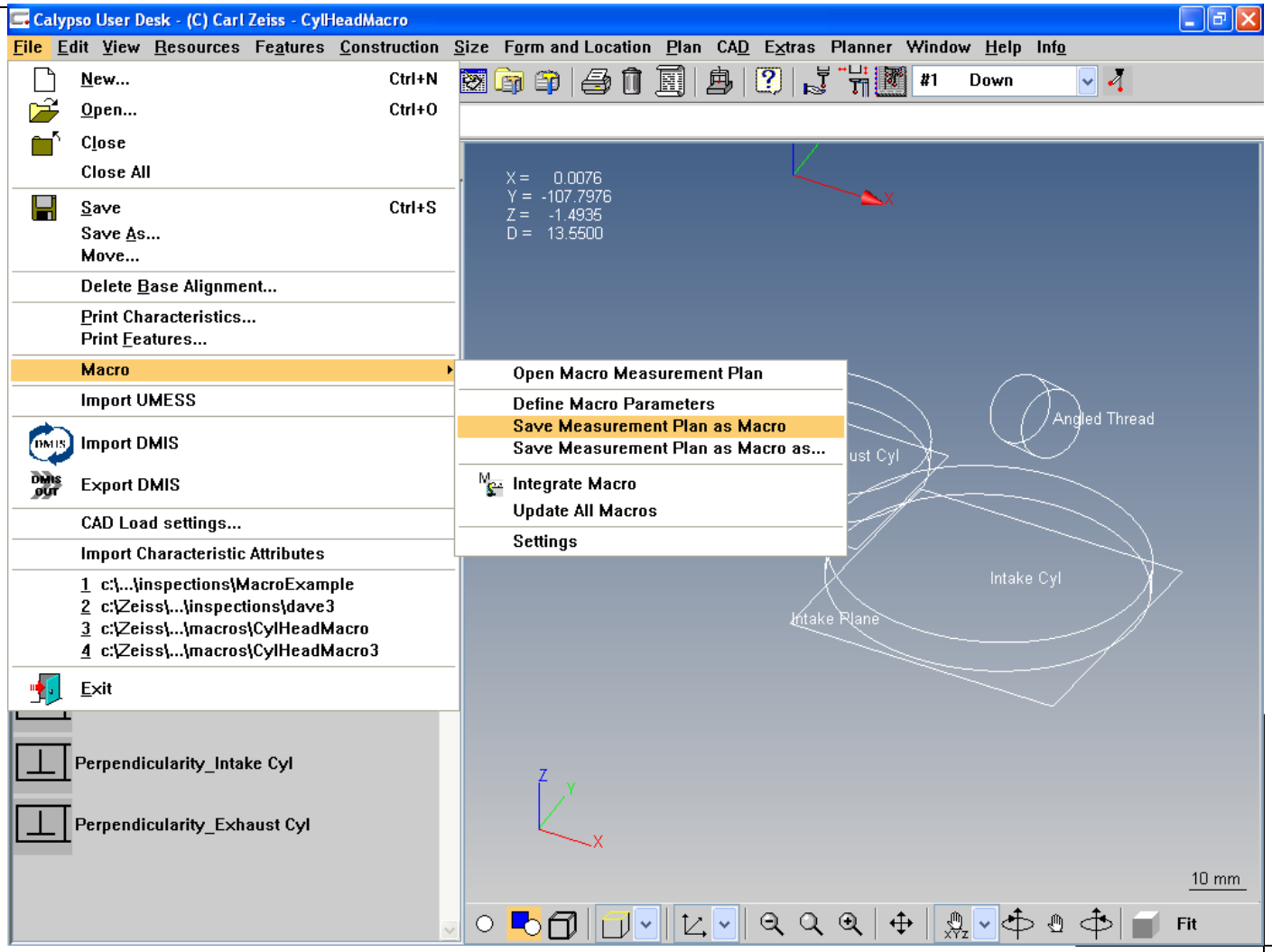
Now, making sure to save our Macro...



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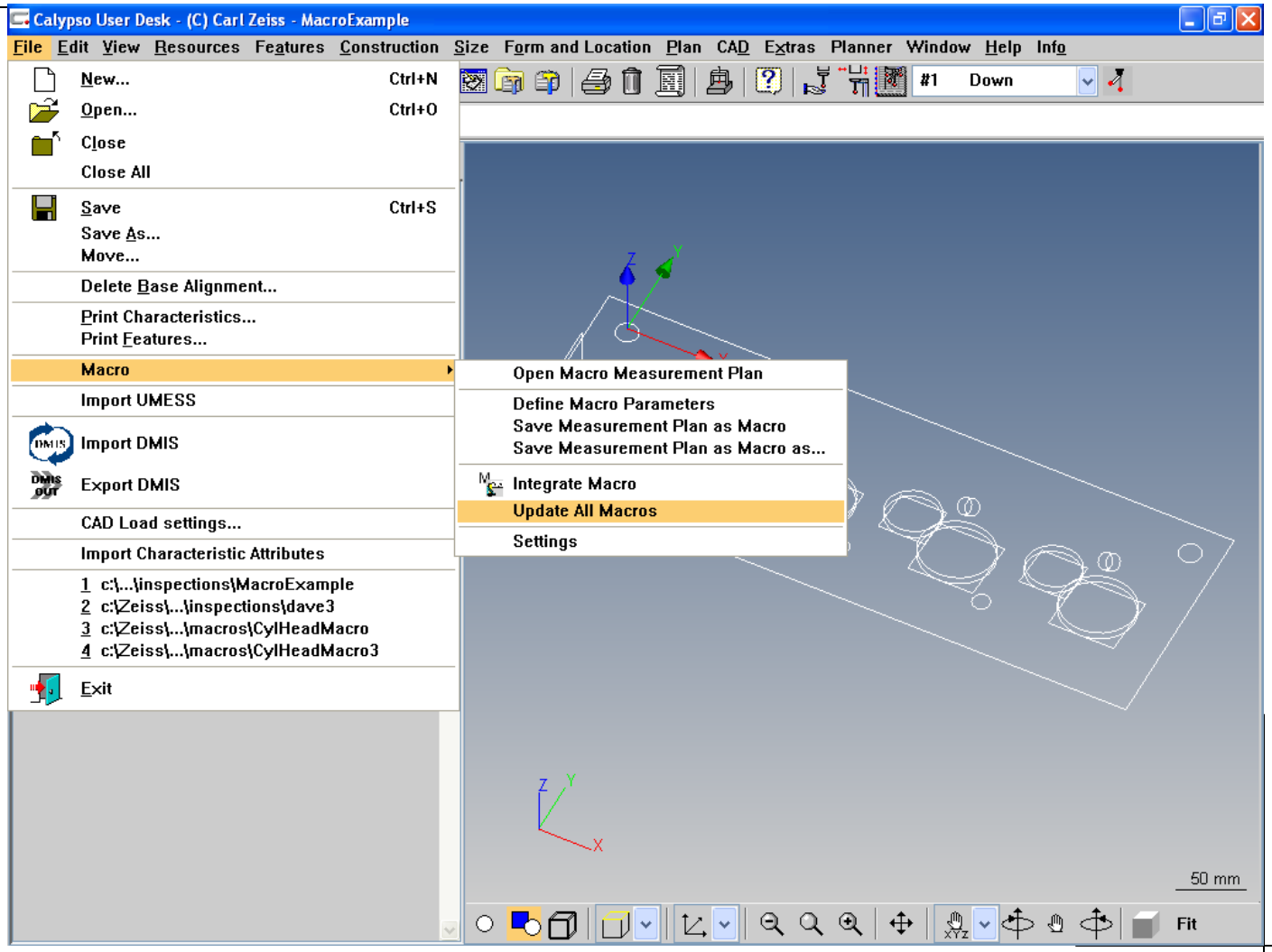
…we switch back to our Base Program and update all of our Macros.



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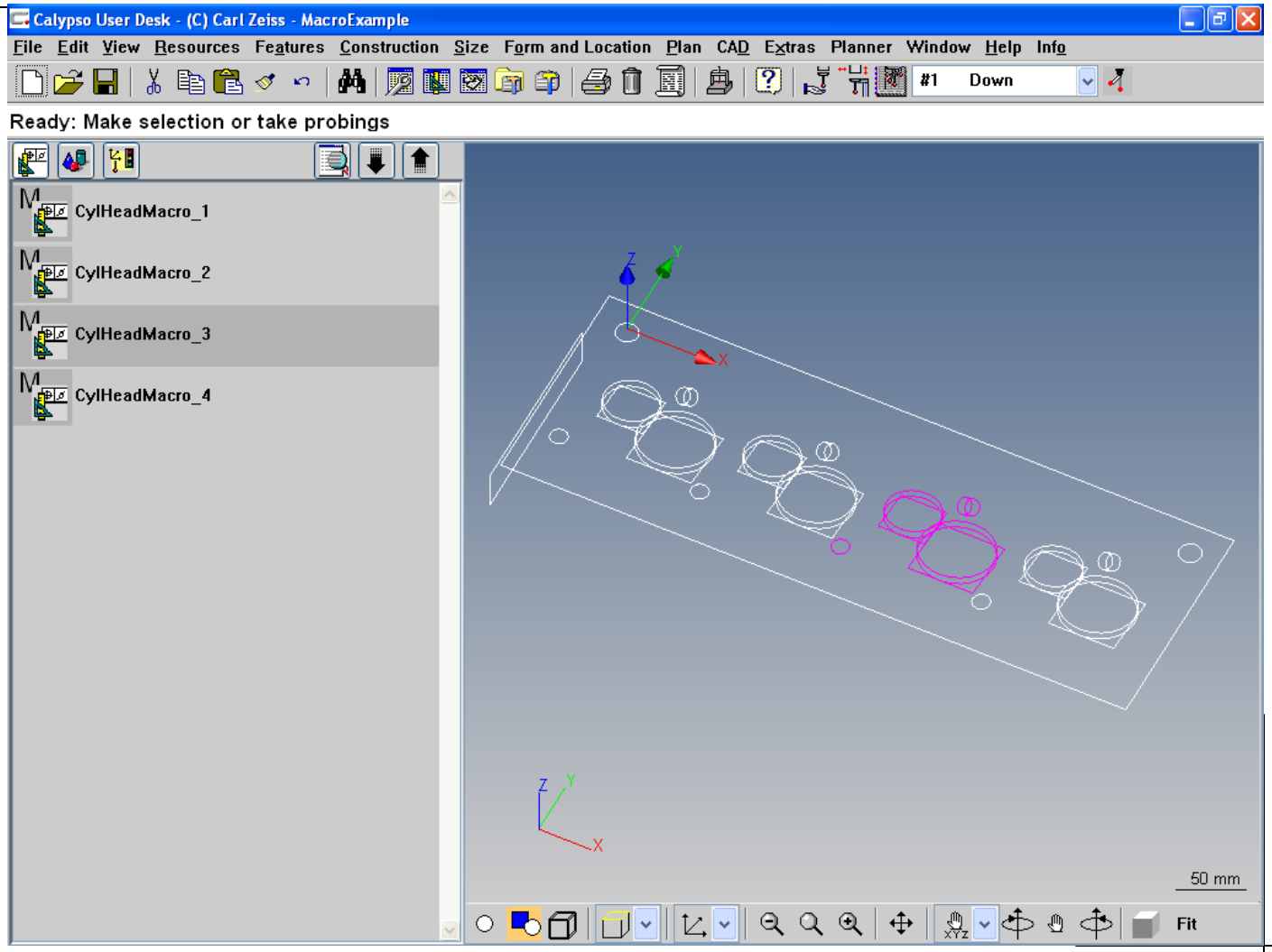
Now to set the third Macro's Large Bore feature to the larger size, we open the third Macro...



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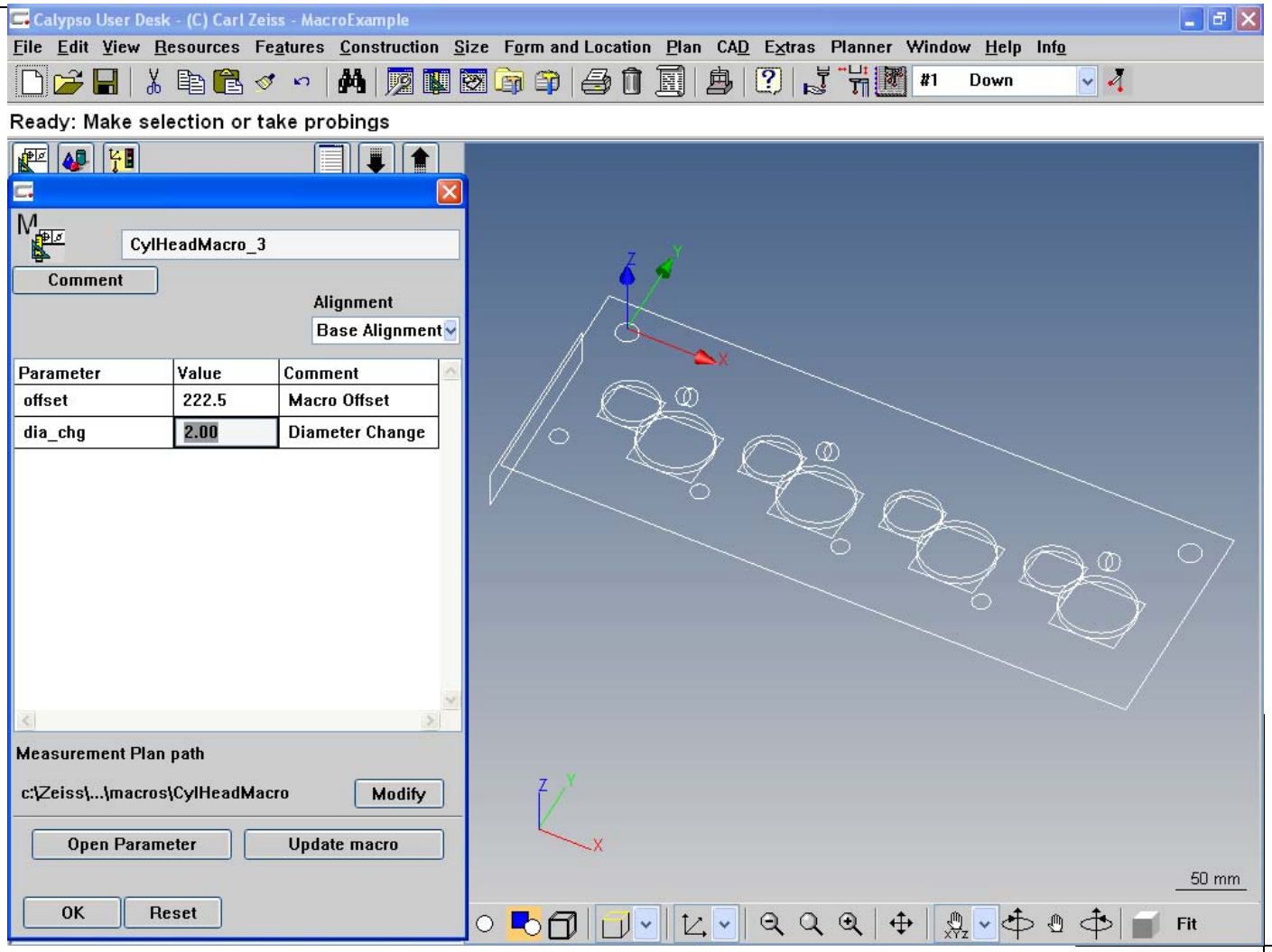
…and set our diameter change variable to 2.00 mm.



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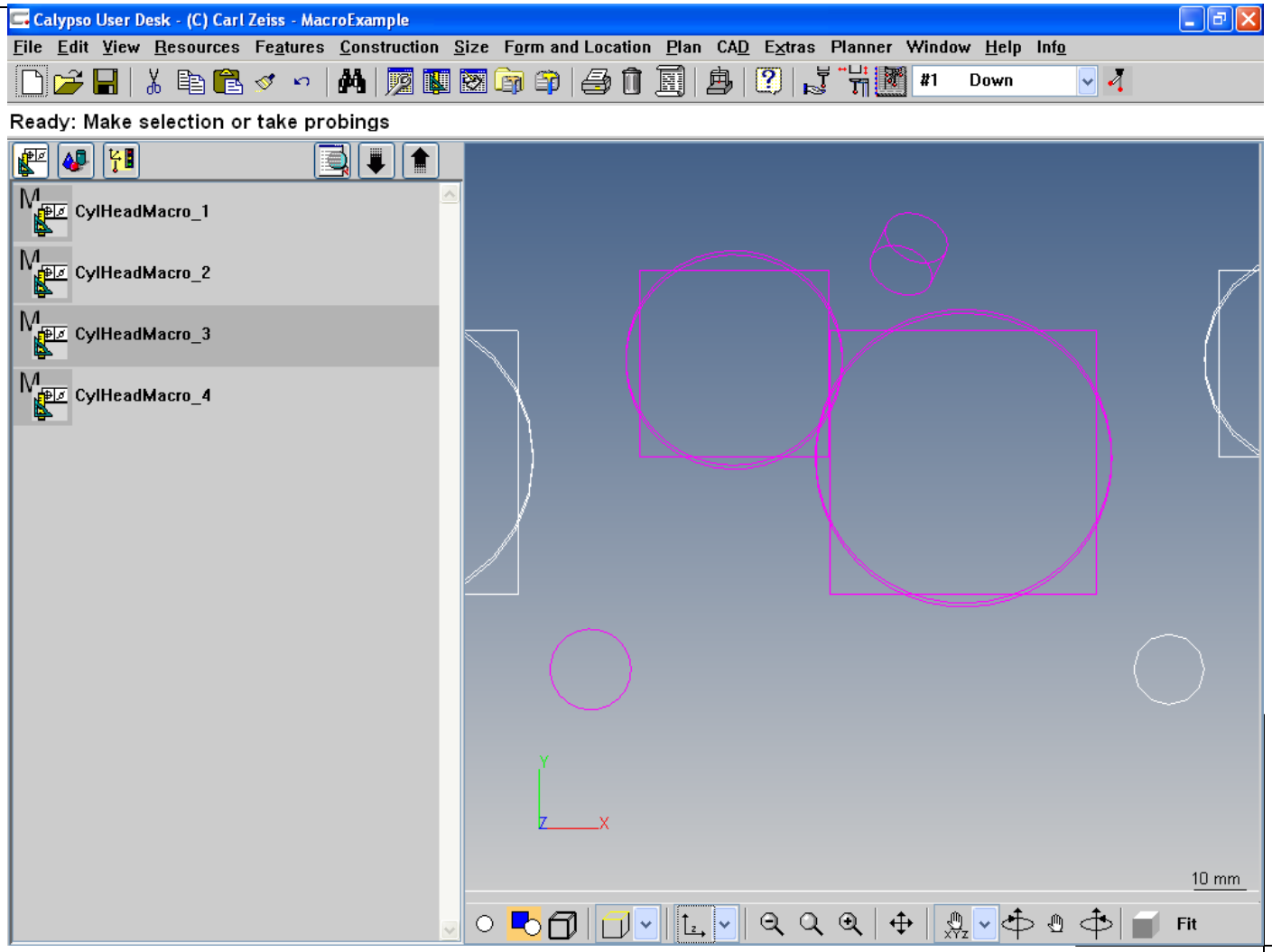
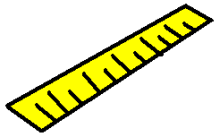
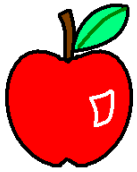
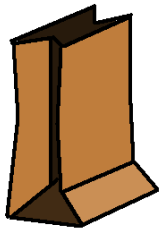
This changes our third Macro's Large Bore feature to a diameter of (13.55+2.00), or 15.55 mm.



J&H Machine Tools







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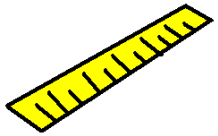
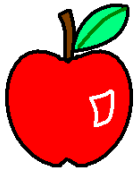
Macros

Macros make it easier for you to create and handle recurring measuring jobs:

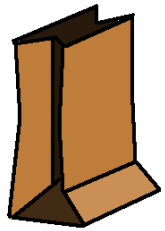
- You can measure several identical components in assemblies.
  (intake/exhaust ports, valve seats in an engine block)
- You can measure multiple features, i.e. features with recurring but varying fundamental quantities.
  (stepped cylinders, rows of holes with increasing radius)
- You can program measuring jobs that are repeated on different workpieces.
  (same macro, different main program)

J&H Machine Tools





LUNCH 'N LEARN



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You've got Questions, We have answers.

Macros