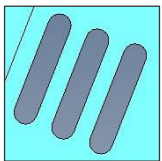# Calypso Sub Clearance Planes

Use of Clearance Planes for navigation is one of Calypso's best features as it greatly simplifies programming and allows the user to re-order programs with no fear of collisions. However, as programmers, we often note that using the main Clearance Planes in Calypso yield moves that we may deem unnecessary. With the use of Sub Clearance Planes we can easily deliver programs that are much more efficient!

## The two most common uses of Sub Clearance Planes are:
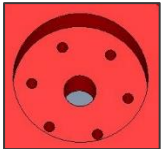
1) A group of feature that are in a recess, we often want to clear only enough to get from feature to feature and not come out of the recess.

2) A group of features situated in such a way that we do not need to clear at all between them. A classic example of this would be a slot (Circle, Line, Circle, and Line).
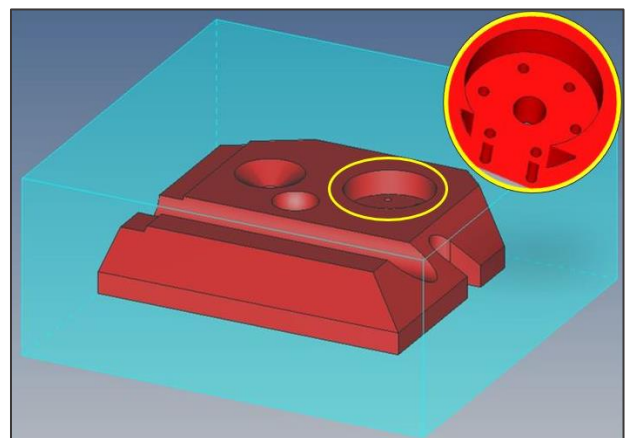
To create a Sub Clearance Plane select **Plan/Navigation…/Sub Clearance** from the drop down menus, this will open the Clearance Groups window.
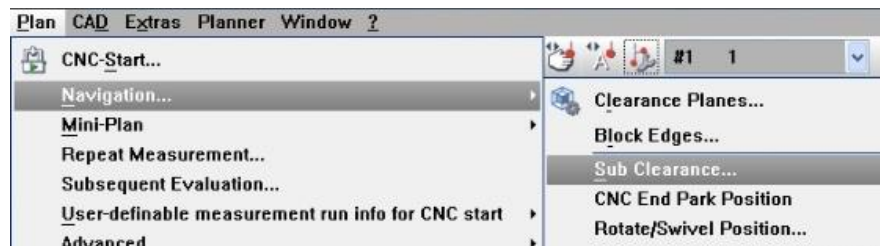

Sub Clearances Planes must have a least two features in a row with the SAME Sub Clearance Plane for the Sub Clearance Plane to work. When there is NOT at least two in a row the Parent Group of the Sub Clearance Plane is the Clearance Plane that will be used.

Creating a Sub Clearance Plane for features in a recess:

The features in this recess we want to measure are: the center diameter, counter bore diameter, the plane at the bottom of the counter bore, and the six diameters that make up the bolt circle diameter. If we do not use a Sub Clearance Plane every time Calypso moves from feature to feature it will have to move to the +Z Clearance Plane for all nine features in the recess. We can improve the program by adding a Sub Clearance Plane that is 2mm below Z zero (top of part) so that the Stylus never comes out of the recess while measuring these nine features.
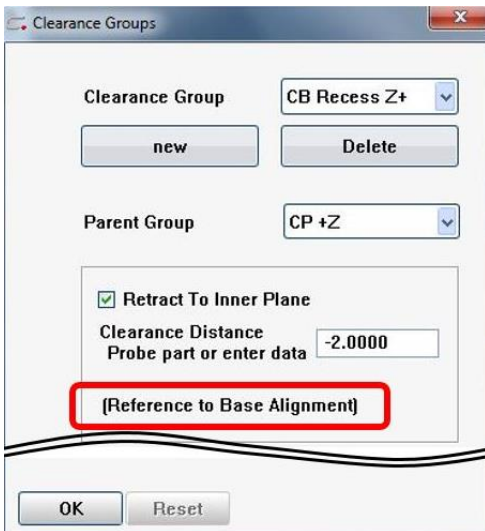
To create the Sub Clearance Plane select **Plan/Navigation…/Sub Clearance** from the drop down menus, this will open the Clearance Groups window. Select [new], in the window that opens type in

then select [OK]. This will bring up

the Parent Group window select CP +Z and now select [OK]. Now check Retract To Inner Plane and type in -2.000 in the box and select [OK] you have now created the Sub Clearance Plane **CB Recess Z+**.

IMPORTANT!
**Retract To Inner Plane is in Reference to the Base Alignment!**
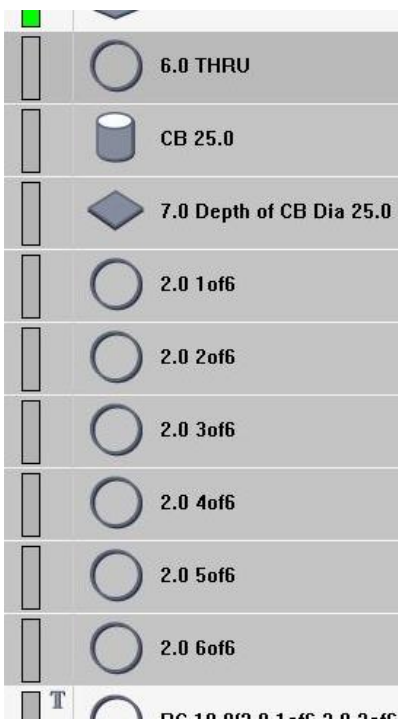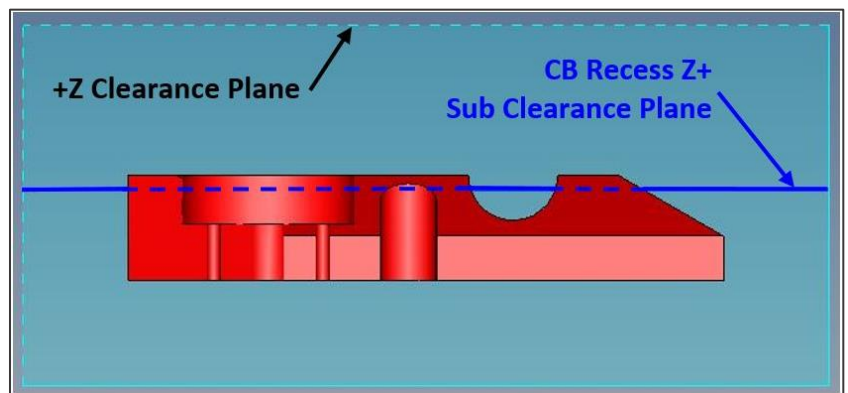
To assign the new Sub Clearance Plane select the features from the Features Tab (remember that **Shift** selects a group and **Ctrl** chooses one at a time) you want to change and then select [icon] Measurement Plan Editor Features from the Toolbar or from the Measurement Tab. From the upper left drop down select **Travel/Clearance Group** then in the drop down on the right select **SCP/CB Recess Z+** this changes the Clearance Plane of the Features from CP +Z to the Sub Clearance Plane (**SCP**) of **CB Recess Z+**.
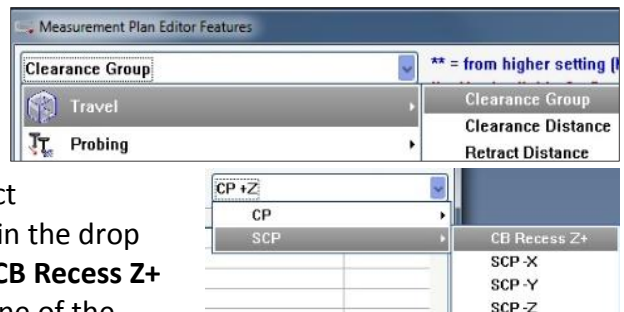
6.0 THRU	Circle	CB Recess Z+
CB 25.0	Cylinder	CB Recess Z+
7.0 Depth of CB Dia 25.0	Plane	CB Recess Z+
2.0 1of6	Circle	CB Recess Z+
2.0 2of6	Circle	CB Recess Z+
2.0 3of6	Circle	CB Recess Z+
2.0 4of6	Circle	CB Recess Z+
2.0 5of6	Circle	CB Recess Z+
2.0 6of6	Circle	CB Recess Z+

## How Sub Clearance Plane CB Recess Z+ will work:

When the Probe goes to measure feature **6.0 THRU** the Parent Group will be used to enter the feature because it is the **FIRST** feature using **CB Recess Z+**. After it has measured the feature it will use **CB Recess Z+** to exit the feature and will continue using this Sub Clearance Plane (**CB Recess Z+**) for all the other features until it exits feature **2.0 6of6**, then it will exit to the Parent Group because it is the LAST feature using **CB Recess Z+**.

2d Line2	2d Line	CP +Z
6.0 THRU	Circle	CB Recess Z+
CB 25.0	Cylinder	CB Recess Z+
7.0 Depth of CB Dia 25.0	Plane	CB Recess Z+
2.0 1of6	Circle	CB Recess Z+
2.0 2of6	Circle	CB Recess Z+
2.0 3of6	Circle	CB Recess Z+
2.0 4of6	Circle	CB Recess Z+
2.0 5of6	Circle	CB Recess Z+
2.0 6of6	Circle	CB Recess Z+
2.0 As Pattern	Circle	CP +Z

> When naming your Sub Clearance Planes use names that make sense and are easy to identify, I also recommend adding the parent group to the name. The idea behind the naming convention for **CB Recess Z+** was **C**ounter **B**ore **Recess Z+** (parent group).

Creating a Sub Clearance Plane for features with NO clearance needed (NULL):

The features we want to measure are the three Slots. Each Slot has four features two Circles and two Lines. To make the program more efficient we are going to add a NULL Clearance Plane for each one of the slots. By doing this Calypso does not have to go to the +Z Clearance Plane for all twelve features it will only go to the +Z Clearance Plane as it moves from slot to slot. Once inside the slot the NULL Clearance Plane will take over and retract will be the only thing happening between each feature. So we are going to create **NULL Z+ 1**, **NULL Z+ 2**, and **NULL Z+ 3** for these slots.
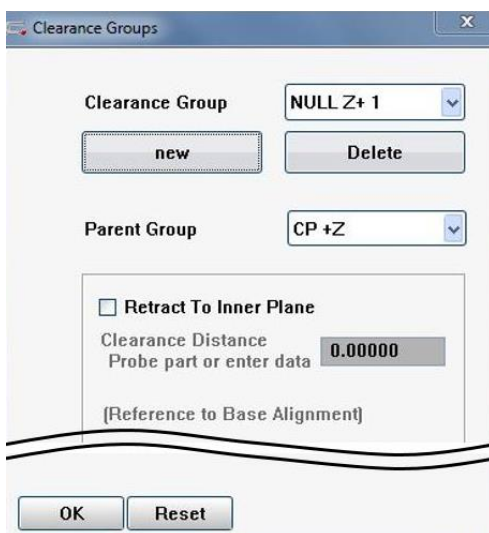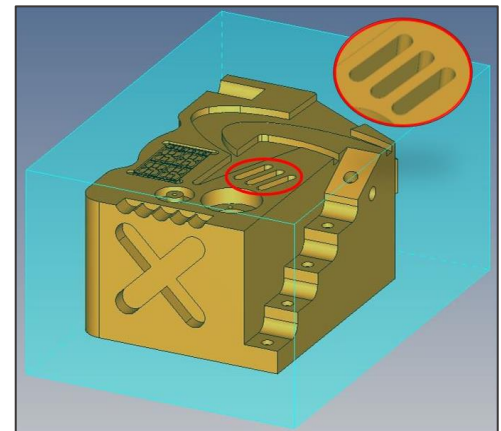
To create the Sub Clearance Plane select **Plan/Navigation…/Sub Clearance** from the drop down menus, this will open the Clearance Groups window. Select [new], in the window that opens type in

Define New Mini-Plan

NULL Z+ 1

then select [OK] this will brings up

the Parent Group window [CP +Z] select CP +Z and now select [OK] (for a NULL Clearance Plane **DO NOT** check Retract To Inner Plane), select [OK] you have now created the Sub Clearance Plane **NULL Z+ 1**. Repeat for **NULL Z+ 2** and **NULL Z+ 3**.
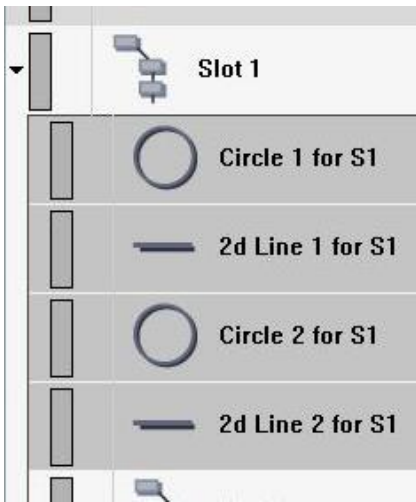
To assign the new Sub Clearance Plane select the features for the first Slot from the Features Tab (remember that **Shift** selects a group and **Ctrl** chooses one at a time) and then

select [icon] **Measurement Plan Editor Features** from the Toolbar or from the Measurement Tab. From the upper left drop down select **Travel/Clearance Group** then in the top drop down on the right select **SCP/NULL Z+ 1** this changes the Clearance Plane of the features from CP +Z to the Sub Clearance Plane (**SCP**) of **NULL Z+ 1**. Repeat the steps for the second slot (**NULL Z+ 2**) and the third slot (**NULL Z+ 3**).
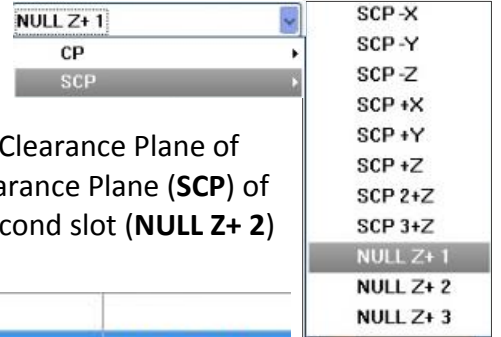
Slot 1		
Circle 1 for S1	Circle	NULL Z+ 1
2d Line 1 for S1	2d Line	NULL Z+ 1
Circle 2 for S1	Circle	NULL Z+ 1
2d Line 2 for S1	2d Line	NULL Z+ 1

How Sub Clearance Plane NULL Z+ 1, NULL Z+ 2, and NULL Z+ 3 will work:

When the Probe goes to measure feature **Circle 1 for S1** the Parent Group will be used to enter the feature because it is the **FIRST** feature using **Null Z+ 1**. After it has measured the feature it will retract and measure **2d Line 1 for S1**, retract and measure **Circle 2 for S1**, retract and measure **2d Line 2 for S1**, when exiting this feature it will use Parent Group because it is the LAST feature using **NULL Z +1**. It will repeat the same pattern for Slot 2 and Slot 3 Starting at the Parent Group and ending with the Parent Group.

Plane3	Plane	CP +Z
Slot 1		
Circle 1 for S1	Circle	NULL Z+ 1
2d Line 1 for S1	2d Line	NULL Z+ 1
Circle 2 for S1	Circle	NULL Z+ 1
2d Line 2 for S1	2d Line	NULL Z+ 1
Slot 2		
Circle 1 for S2	Circle	NULL Z+ 2
2d Line 1 for S2	2d Line	NULL Z+ 2
Circle 2 for S2	Circle	NULL Z+ 2
2d Line 2 for S2	2d Line	NULL Z+ 2
Slot 3		
Circle 1 for S3	Circle	NULL Z+ 3
2d Line 1 for S3	2d Line	NULL Z+ 3
Circle 2 for S3	Circle	NULL Z+ 3
2d Line 2 for S3	2d Line	NULL Z+ 3
Cylinder1	Cylinder	NULL Z+ 3
Plane4	Plane	CP +Z

If you have multiple groups of features (like the three different slots in this example) that you want to use **NULL** Clearance Planes for, it is **ABSOLULTELY NECESSARY** that you use a different **NULL** Clearance Plane for each group of features. This way if the features get re-ordered or Mini Plans are used the program will still run safely.

Sub Clearance Plane Tips:

1) **When using NULL Clearance Planes pay special attention to the probing direction and the order of your features, because <u>RETRACT</u> is the only thing being used between each feature within the NULL Clearance Plane.** For the slots in the example, because they are at an angle, the scan path direction for each feature as well as the order of the features are **VERY IMPORTANT** in avoiding a crash.

2) Sub Clearances Planes must have a least two features in a row with the **SAME** Sub Clearance Plane for the Sub Clearance Plane to work. When there is **NOT** at least two in a row the Parent Group of the Sub Clearance Plane is the Clearance Plane that will be used.

3) Remember that the Retract To inner Plane **ALWAYS** comes from the **BASE ALIGNMENT** zero locations (X zero, Y zero, or Z zero).

4) If you have multiple groups of features (like the three different slots in the example) that you want to use **NULL** Clearance Planes for, it is **<u>ABSOLULTELY NECESSARY</u>** that you use a different **NULL** Clearance Plane for each group of features. This way if the features get re-ordered or Mini Plans are used the program will still run safely.

5) Adding the Parent Group to the name of your Sub Clearance Planes can be a great help especially when you start creating Sub Clearance Planes for multiple axes (Z+, X-, Y+, etc…) in the same program.