Scripted 3D Drawings

Preface

In the following sections, you will be drawing a number of pieces that demonstrate how to construct and detail 3D models using CADMAX. We suggest that you complete the **3D Learning Guide** prior to proceeding with these exercises.

To construct these drawings, you should understand the following CADMAX concepts:

Keyboard coordinate entry
SET DEPTH
CPL
Command names, functions, and modifiers
Dimensioning
Zooming

NOTE

When working with these drawings, it is frequently beneficial to zoom in on a particular view. This can be accomplished in three different ways:

1. **Use of the function keys**. Clicking on F11 allows you to zoom in on a particular view. This function key replaces WINDOW: ZOOM. Clicking on F10 allows you to see your previous zoom, and replaces WINDOW: PREVIOUS.

2. **Use of the WINDOW command**. WINDOW: ZOOM allows you to zoom in on any area of the screen (F11), while WINDOW: PREVIOUS allows you to go back to your previous zoom (F10).

3. **Use of the nested ZOOM/WINDOW functions**. At the bottom of most of your command detail menus, you will see three functions, ZOOM, WINDOW, and SNAP. These are "nested" functions. Clicking on the WINDOW or SNAP nested function will bring up the corresponding detail menu. You can highlight the function that you need, then click on PREVIOUS MENU to return to your original detail menu.

   Clicking on the ZOOM function, however, will not bring up the WINDOW detail menu. Instead, you may use this function to zoom in on a particular area of the drawing, without first going to the WINDOW command. The arrows on either side of the drawing (<<< and >>>) perform the same task as the WINDOW: PREVIOUS and WINDOW: FORWARD functions, respectively.

Hexbracket

Preface

This section will take you through the process of drawing a hexbracket.

Your entire part, in all views, should look like Figure 1.

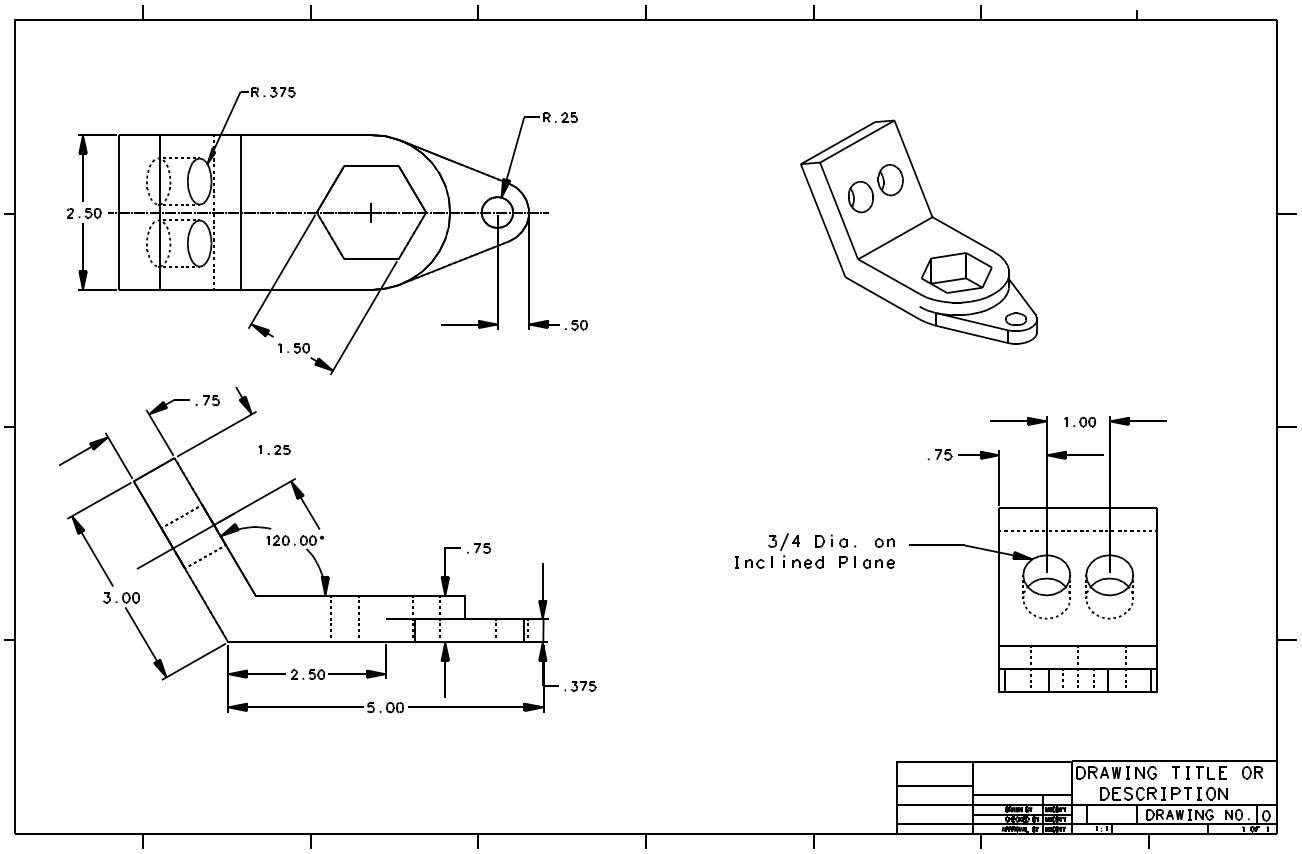


Figure 1

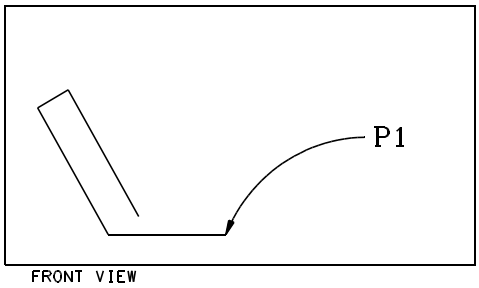


Figure 2

1. Load the drawing 3DSIZE.DWG.

2. Click on the LINE: POINT -TO-POINT.

3. Click on point P1 (the center bottom of the front view) to enter a start point. (See Figure 2.)

4. Type the following coordinates, pressing ENTER after each line:

   ←2.5
   →3, 120Q
   →.75, 30Q
   ←3, 120Q

5. Click on SELECT, then click on the bottom horizontal line in the front view.

6. Click on TRANSFORM: MOVE, and set the -Move Which ? modifier to “orig”.

7. Click anywhere to enter the pick up point, then type ↑.75 and press ENTER to place the put down point.

8. Click on CLEAR.

9. Click on CORNER: BETWEEN-2-CURVES.

10. Set the modifiers as follows:

    -Trim ? to “both”
    -Radius ? to “none”

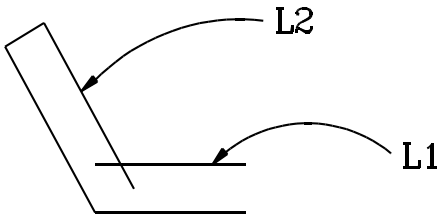


Figure 3

11. Click on lines L1 and L2 as shown in Figure 3.

12. Click on ENCLOSE: SELECT-ALL-IN and, using two clicks, place a rubberband box around the entire piece.

13. Click on SWEEP: LINEAR-SWEEP.

14. Click anywhere to place your pick up point, <Page Down> 2.5 (< > means to press the key by that name), and press ENTER to place your put down point.

15. Click on CLEAR.

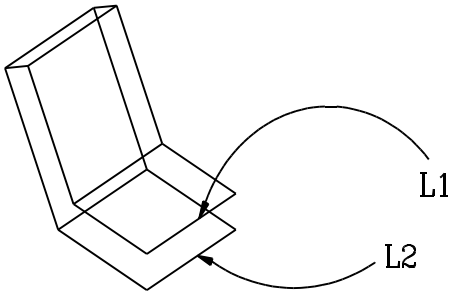


Figure 4

16. Click on POINT: CENTER-MIDPOINT.

17. Click on L1, as shown in Figure 4.

18. Click on ERASE.

19. Click on L1 and L2, as shown in Figure 4, to erase the two lines.

20. Click on CPL: ALIGN-TO-VIEW, then click on the top view to make the CPL parallel to the top view.

21. Click on POLYGON: 3D-POLYGON-IN-PLANE (3D Page 3).

22. Set the modifiers as follows:

    -Number of sides ? to “hexagon”
    -Diameter ? to 1.5
    -Style ? to “outscribed”
    -Center Pt ? to “no”
    -Angle ? to 0
    -Depth ? to -.75

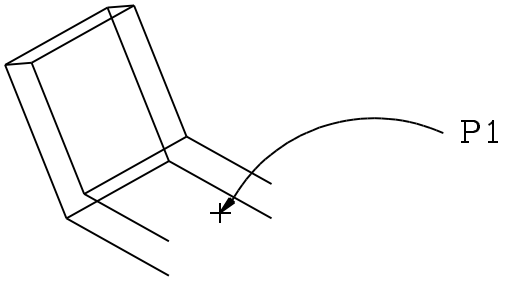


Figure 5

23. In the top or isometric view, click on the point P1. (See Figure 5.)

24. Click on ARC: CENTER-START-ANGLE.

25. Set the modifiers as follows:

    -Angle ? to 180
    -Auto Select ? to “yes”.

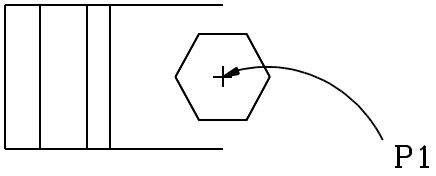


Figure 6

26. Click on point P1 in the top view.

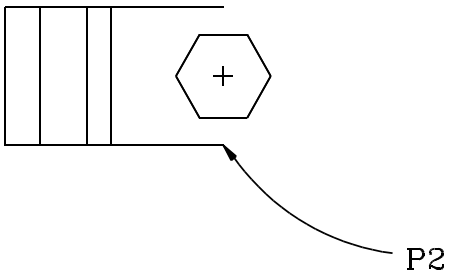


Figure 7

27. Click on point P2 to complete the arc.

28. Click on SWEEP: LINEAR-SWEEP.

29. Click anywhere to place a pick up point, then type ↓.375 and press ENTER to place the put down point.

30. Click on CLEAR.

31. Click on SELECT, click on the Point, then click on TRANSFORM: MOVE.

32. Click anywhere to place a pick up point, then type →2, ↓.375 and press ENTER to place the put down point.

33. Click on CLEAR.

34. Click on CPL: PLACE-BY-3-POINTS.

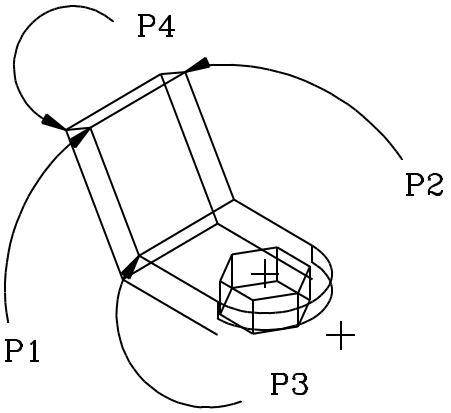


Figure 8

35. Click on point P1, P2, and P3 in the order indicated, as in Figure 8.

36. Click on CIRCLE: CENTER-RADIUS.

37. Set the modifiers as follows:

    -Radius/Diameter ? to .375
    -Circle Plane ? to “CPL/pnts”

38. Type the following, pressing ENTER after every line:

    u .75, v1.25
    <Alt+→> 1 (press Alt and → simultaneously, then type 1)

39. Set the -Auto Select ? modifier to “no”.

40. Click on PROJECT: PERP-TO-PLANE.

41. Click on point P4, as shown previously in Figure 8, then click on CLEAR.

42. Click on CPL: ALIGN-TO-VIEW, then click on the top view.

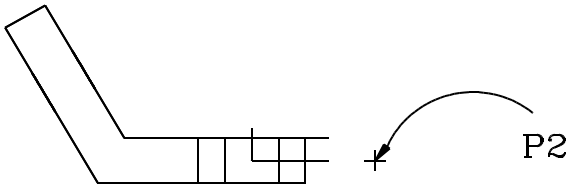


Figure 9

43. Click on CIRCLE: CENTER-RADIUS.

44. Set the -Radius/Diameter modifier to .25.

45. Click on point P2 in any view. (Figure 9 shows point P2 in the front view.)

46. Click on ARC: CENTER-START-ANGLE, and set the -Angle ? modifier to 180.

47. Press ENTER, type <Page Up> .5, then press ENTER again.

48. Click on WINDOW: ZOOM, then click on two points to zoom in on the isometric view.

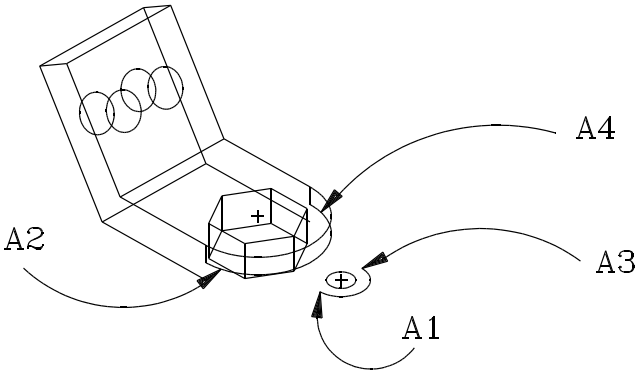


Figure 10

49. Click on PERP TAN: BETWEEN-3D-CURVES (3D Page 3).

50. Click on the points in the following order:

    A1 to pick a side of the arc just added
    A2 to pick the corresponding side of the bigger arc

    A3 to pick the other side of the arc just added
    A4 to pick the corresponding side of the bigger arc

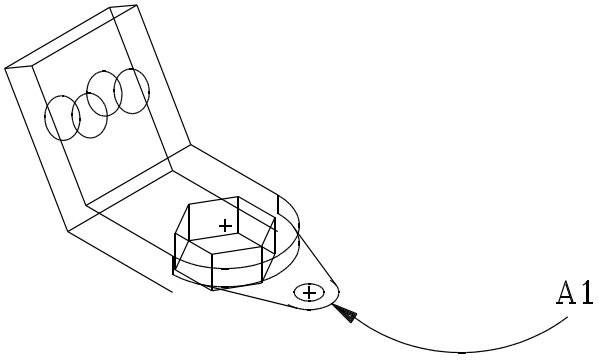


Figure 11

51. Click on ERASE, then click on A1 to remove the arc.

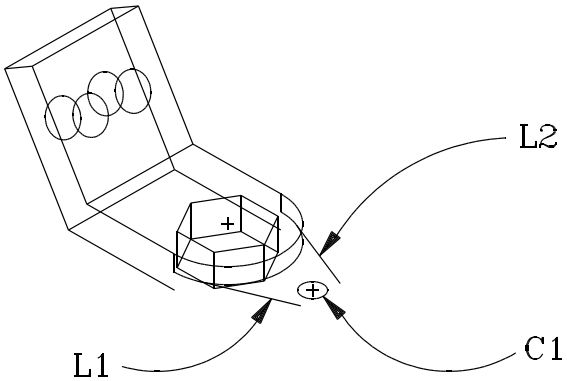


Figure 12

52. Select C1, L1 and L2.

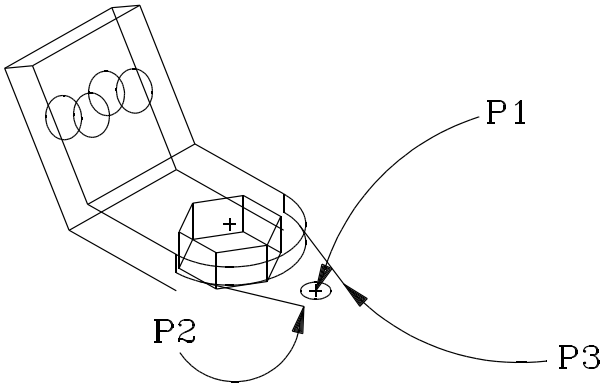


Figure 13

53. Click on ARC: CENTER-START-END.
54. Set the -Auto Select ? modifier to “yes”.
55. Click on points P1, P2, and P3, as shown in Figure 13.

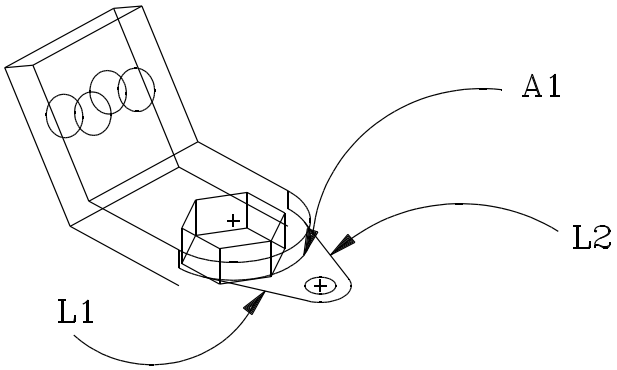


Figure 14

56. Click on POINT: AT-INTERSECTION.
57. Set the -Auto Select ? modifier to “no”.
58. Click on the following points in the exact order indicated:

    L1, A1, L2, A1

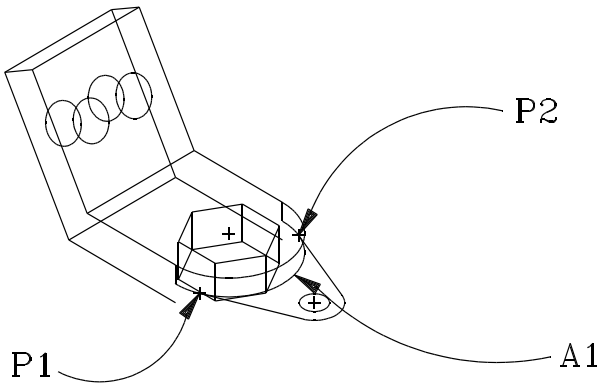


Figure 15

59. Click on TRIM CUT: CUT-LINE-OR-CURVE.
60. Click on A1.
61. Click on point P1.
62. Click on A1.
63. Click on point P2.

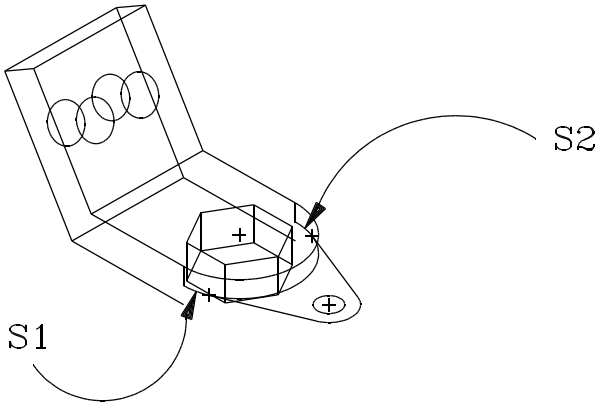


Figure 16

64. Click on SELECT, then click on S1 and S2 (the 1st and 3rd arc segments created by TRIM CUT).

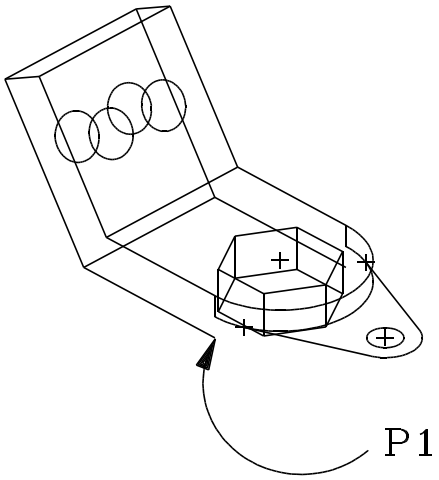


Figure 17

65. Click on PROJECT: PERP-TO-PLANE.

66. Click on point P1, as shown in Figure 17.

67. Click on SELECT: ALL-EDITABLE-LEVELS.

68. Click on SURFACES: MAKE-TRUE-SURFACES.

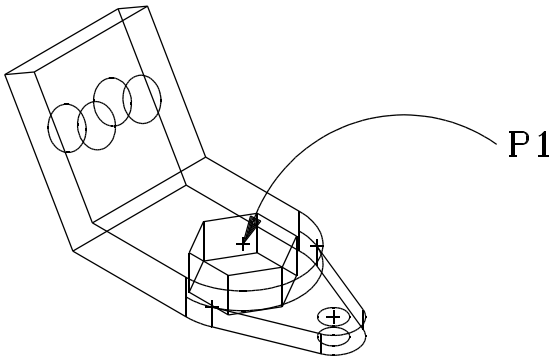


Figure 18

69. Click on UNSELECT, then click on point P1.

70. Click on ERASE.

71. Click on SHOW VIEW: MAKE-VIEW-HIDDEN, set the -Hidden Line Style ? modifier to “invisible”, then click on the isometric view.

72. Press F10 to zoom out to the full view.

73. Set the -Hidden Line Style ? modifier to “dashed”, then click on the front, top, and side views.

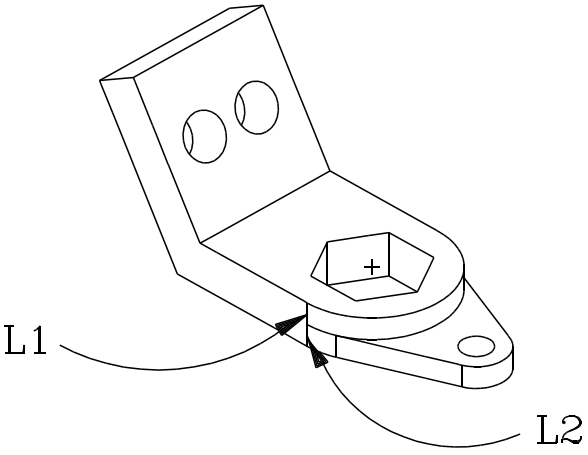


Figure 19

74. Press F10 to zoom back in on the isometric view, click on SELECT: SINGLE-ELEMENT, then click on lines L1 and L2. (See Figure 19.)

75. Click on DYNAMICS: ROLL-TOWARDS-PEN, click twice and roll the drawing until you can see the corresponding lines L1 and L2 on the other side of the part.

76. Click on SELECT: SINGLE-ELEMENT, then click on the corresponding lines L1 and L2.

77. Click on CHANGE VU: PREVIOUS, then click on the isometric view.

78. Click on EDIT VIEW: ERASE-SELECTED, then click on the isometric and front views.

79. Click on CLEAR (in the EDIT VIEW detail menu).

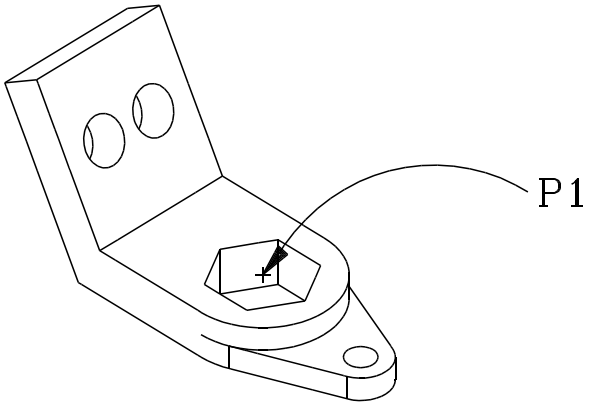


Figure 20

80. Click on point P1 to select it.

81. Click on EDIT VIEW: ERASE-SELECTED, then click on the front, side, and isometric views.

82. Click on CLEAR.

83. Click on SHOW VIEW: DEACTIVATE-ALL-VIEWS, then click on the top view to activate that single view.

84. Click on LINE: 1-PT-CONSTRUCTION.

85. Set the modifiers as follows:

    -System ? to “view”
    -Construction Size ? to “use length”
    -Angle ? to 0
    -Length ? to 7
    -Attribute Name ? to “Centerline”
    -Auto Select ? to “yes”

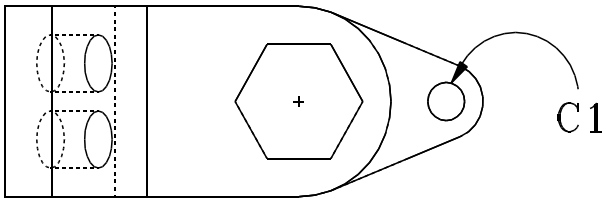


Figure 21

86. Click on SET DEPTH, type /c, then click on C1.

87. Click on 1-PNT-CONSTRUCTION again.

88. Type /z, then press ENTER.

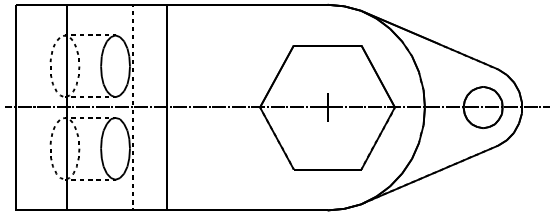


Figure 22

89. Place the centerline in the top view, so that it goes through the object.

90. Set the SET DEPTH to “free”.

91. Click on EDIT VIEW: FORCE-NON-HIDABLE, then click on the top view.

92. Click on CLEAR.

93. Click on SHOW VIEW: DEACTIVATE-ALL-VIEWS, then click on the front view to activate it.

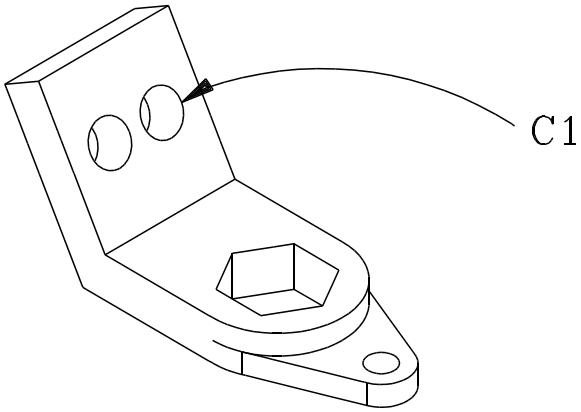


Figure 23

94. Click on LINE: AXIS-OF-CIRCLE.

95. Click on C1 (one of the .375R circles) in the isometric view.

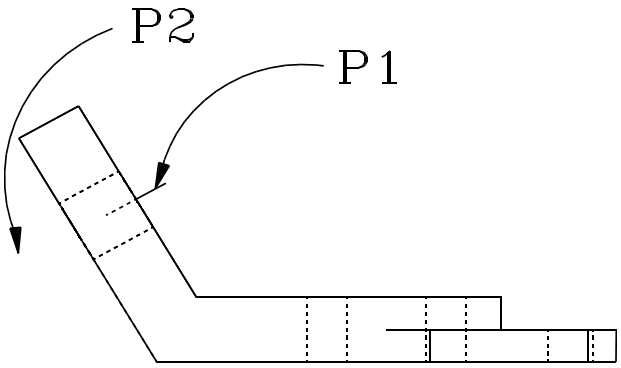


Figure 24

96. Click on TRIM CUT: 1-PT-TRIM-OR-EXTEND.

97. Click on points P1 and P2 as indicated in Figure 24, to extend the line through the object.

98. Click on EDIT VIEW: FORCE-NON-HIDABLE, then click on the front view.

99. Click on CLEAR.

100. Click on SHOW VIEW: ACTIVATE-ALL-VIEWS.

101. Zoom in on the top view.

NOTE: For proper positioning of dimensions, see Figure 1.

102. Click on LIN DIM (3D Page 2).

103. Set the modifiers as follows:

-Dimension Type ? to “horizontal”
-Centered ? to “no”
-Arrow Position to “outside”
-Line Type ? to “broken”
-Extension Lines ? to “both”
-Text Alignment ? to “view-horizontal”
-Text Mode ? to “automatic”
-Plane ? to “view”
-Auto Select to “no”

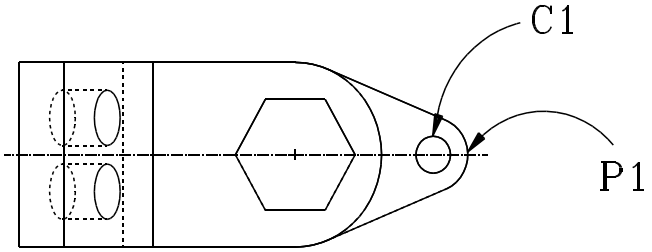


Figure 25

104. Type /c, then press ENTER.

105. Click on C1 (the .25R circle). (See Figure 25.)

106. Click on point P1, the intersection of the centerline and the arc, as shown in Figure 25.

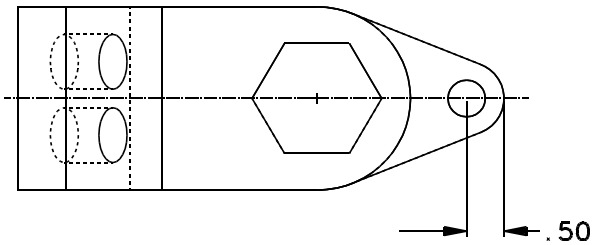


Figure 26

107. Click to place the dimension put down point.

Figure 26 shows you the location of the .50 dimension.

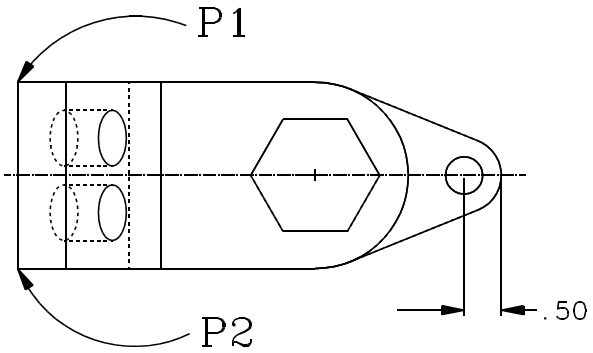
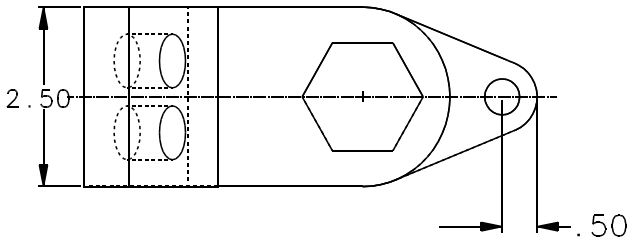


Figure 27

108. Set the modifiers as follows:

-Dimension type ? to “vertical”
-Centered ? to “yes”
-Arrow Position ? to “inside”

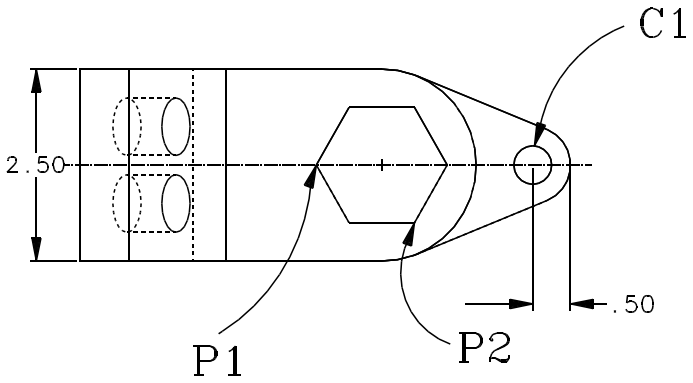
109. Click on points P1 and P2 for the 2.50 vertical dimension. (See Figure 27.)



110. Click to place the dimension put down point.

Figure 28 shows the location of the 2.50 dimension.

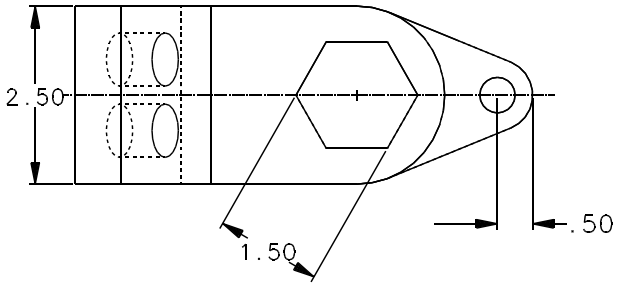
Figure 28



111. Set the -Dimension Type ? modifier to "skewed".

112. Click on points P1 and P2 for the 1.50 polygon dimension. (See Figure 29.)

Figure 29



113. Click to place the dimension put down point.

Figure 30 shows the location of the 1.50 dimension.

Figure 30

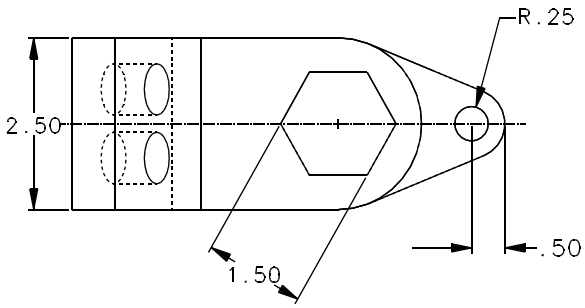


Figure 31

114. Click on RAD DIM.

115. Set the modifiers as follows:

    -Dimension Type ? to “radial”
    -Centered ? to “no”
    -Arrow Position ? to “outside”
    -Style ? to R/⌀

116. Click on C1 (the .25R circle), as shown previously in Figure 28.

117. Click to place the dimension put down point.

Figure 31 shows the location of the R.25 dimension.

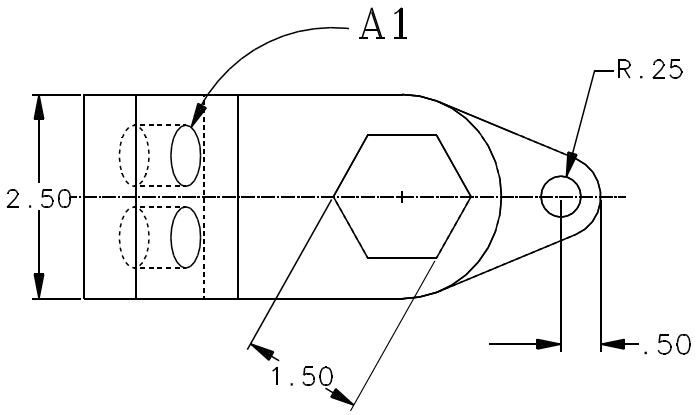


Figure 32

118. Set the modifiers as follows:

    -# Auto Dec Places ? to 3
    -Plane ? to “arc”

119. Click on A1 (the .375 arc).

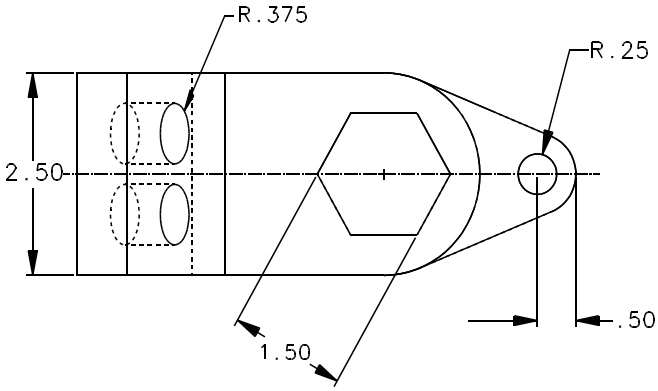


Figure 33

120. Click to place the dimension put down point.

Figure 33 shows the location of the R.375 dimension.

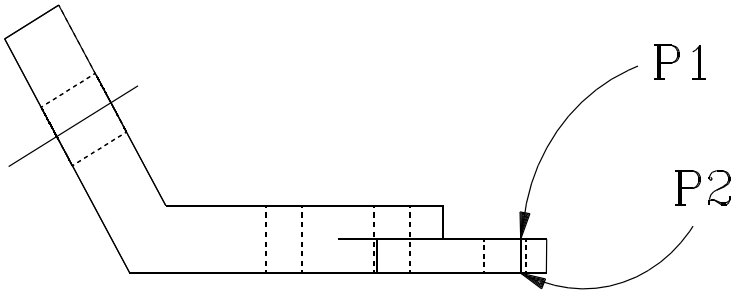


Figure 34

121. Zoom in on the front view.

122. Click on LIN DIM.

123. Set the modifiers as follows:

    -Dimension Type ? to “vertical”
    -Plane ? to “view”

124. In the front view, click on points P1 and P2 for the .375 dimension. (See Figure 34.)

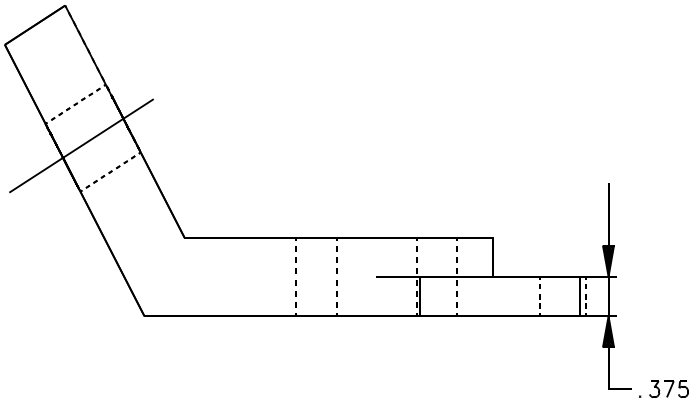


Figure 35

125. Click to place the dimension put down point.

Figure 35 shows the location of the .375 dimension.

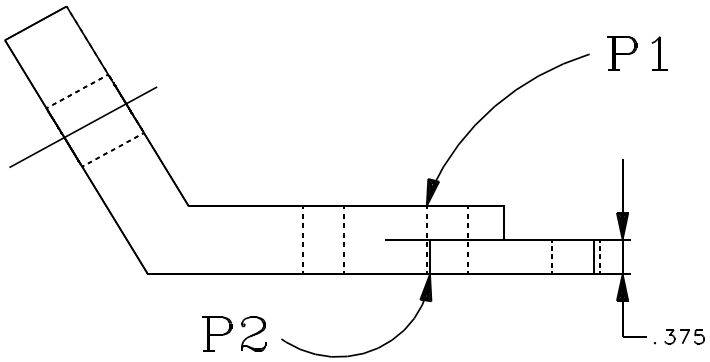


Figure 36

126. Set the modifiers as follows:

    -Extension Lines ? to “none”
    -# Auto Dec Places ? to 2

127. Click on points P1 and P2 for the .75 vertical dimension. (See Figure 36.)

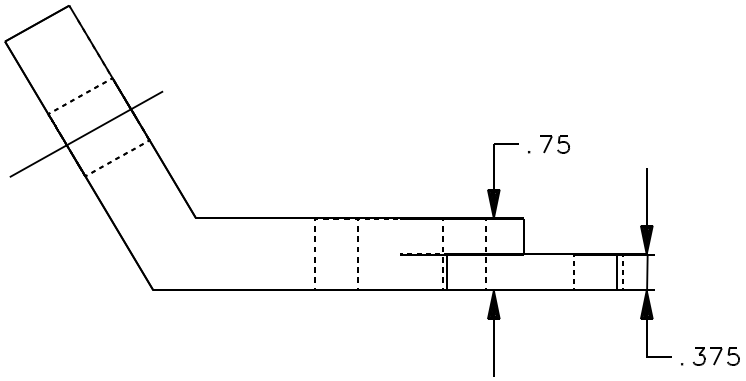


Figure 37

128. Click to place the dimension put down point.

Figure 37 shows the location of the .75 dimension.

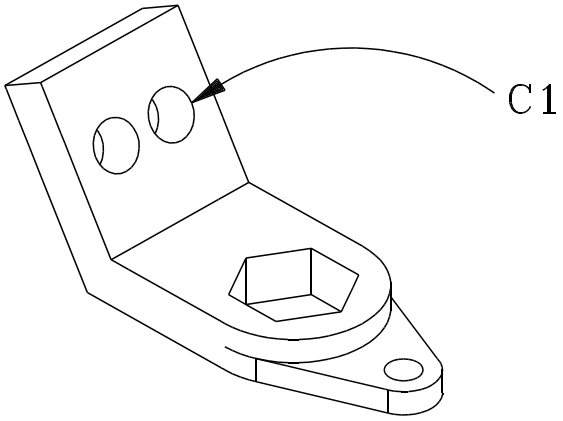


Figure 38

129. Set the modifiers as follows:

    -Dimension Type ? to “skewed”
    -Extension Lines ? to “both”

130. Zoom back out to the full view.

131. Type /c, then press ENTER.

132. Click on C1 (one of the .375R circles on the inclined plane) in any view. (See Figure 38.)

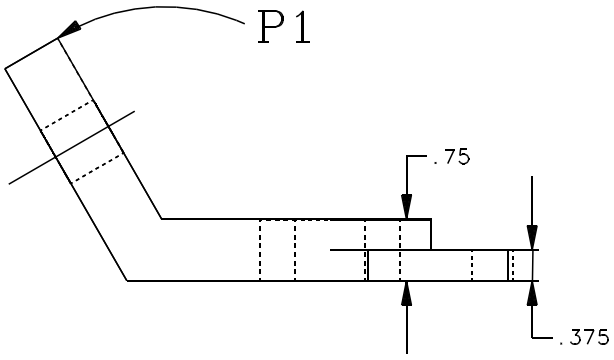
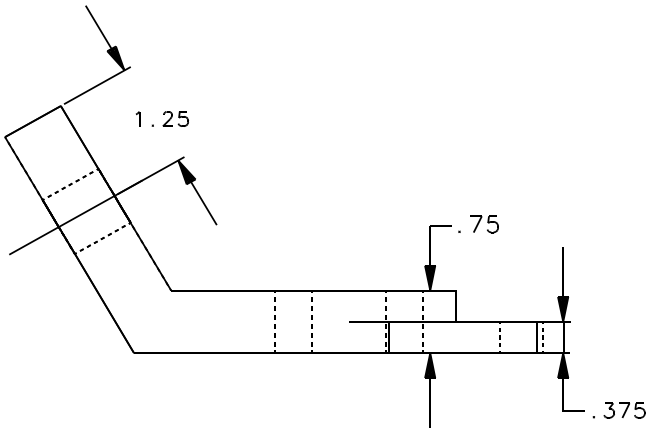


Figure 39

133. Type /z, then press ENTER.

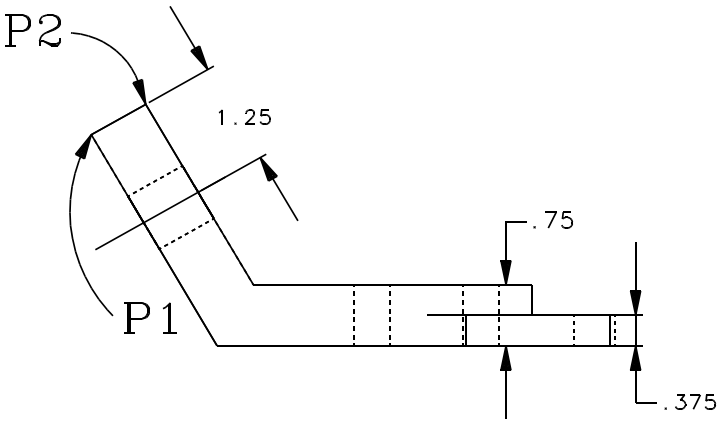
134. Click on point P1 (the top corner) for the 1.25 skewed dimension. (See Figure 39.)



135. Click in the front view to place the dimension put down point.

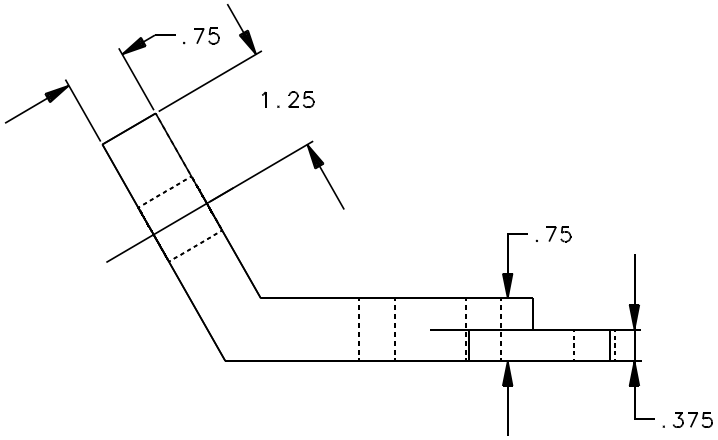
Figure 40 shows the location of the 1.25 dimension.

Figure 40



136. Click on points P1 and P2 for the .75 skewed dimension. (See Figure 41.)

Figure 41



137. Click to place the dimension put down point.

Figure 42 shows the location of the .75 skewed dimension.

Figure 42

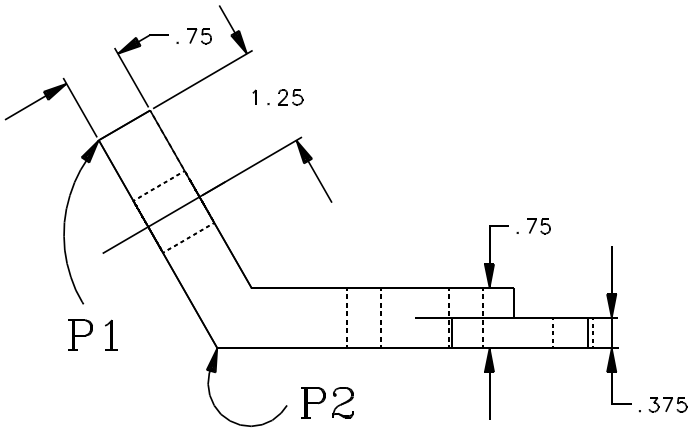


Figure 43

138. Set the modifiers as follows:

    -Centered ? modifier to “yes”
    -Arrow Position ? modifier to “inside”

139. Click on points P1 and P2 for the 3.00 skewed dimension. (See Figure 43.)

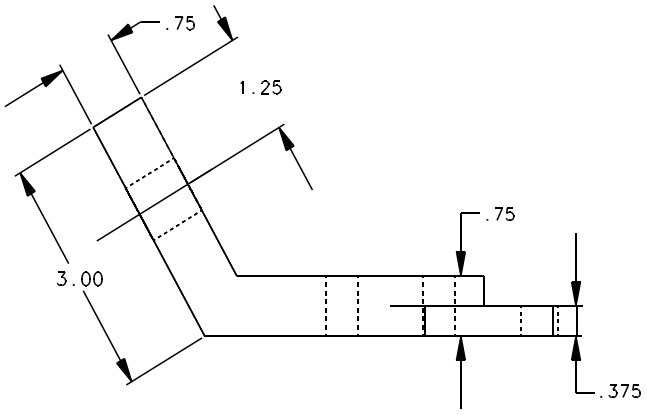


Figure 44

140. Click to place the dimension put down point.

Figure 44 shows the location of the 3.00 dimension.

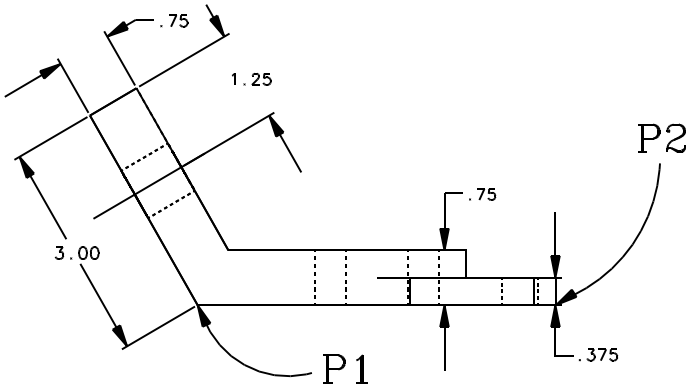
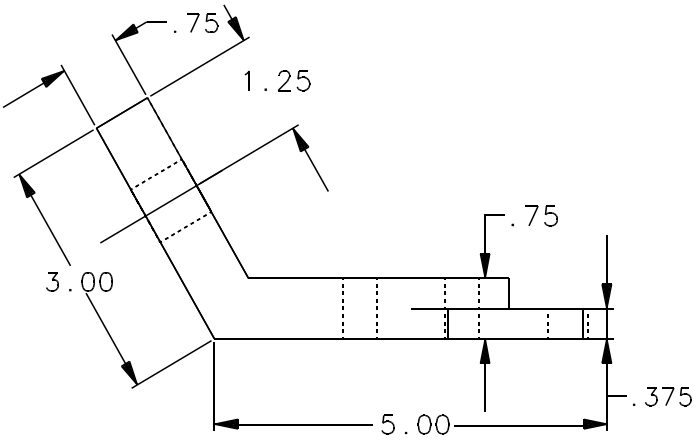


Figure 45

141. Set the -Dimension Type ? modifier to “horizontal”.

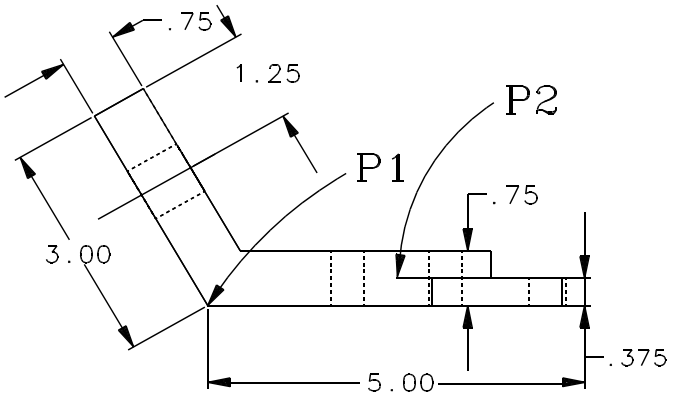
142. Click on points P1 and P2 for the 5.00 dimension. (See Figure 45.)



143. Click to place the dimension put down point.

Figure 46 shows the location of the 5.00 dimension.

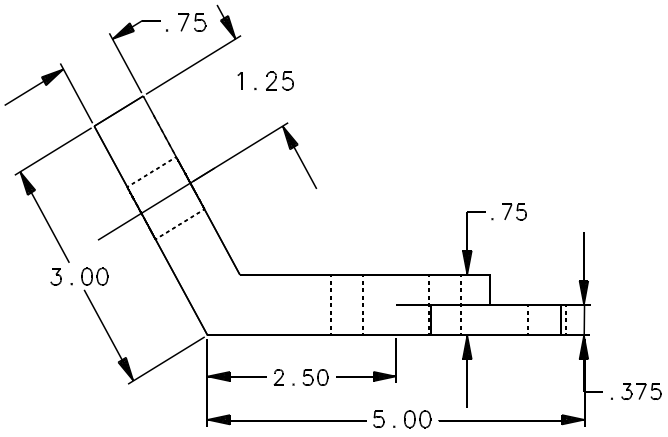
Figure 46



144. Set the -Extension Lines ? modifier to “2nd”.

145. Click on points P1 and P2 for the 2.50 dimension. (See Figure 47.)

Figure 47



146. Click to place the dimension put down point.

Figure 48 shows the location of the 2.50 dimension.

Figure 48

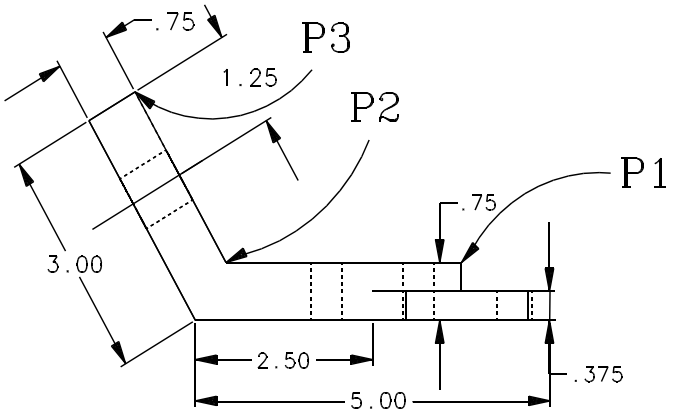


Figure 49

147. Click on ANG DIM: THREE-POINT.

148. Set the -Extension Lines ? modifier to “none”.

149. Click on points P1, P2, and P3 for the 120.00 angle, from right to left (counter-clockwise).

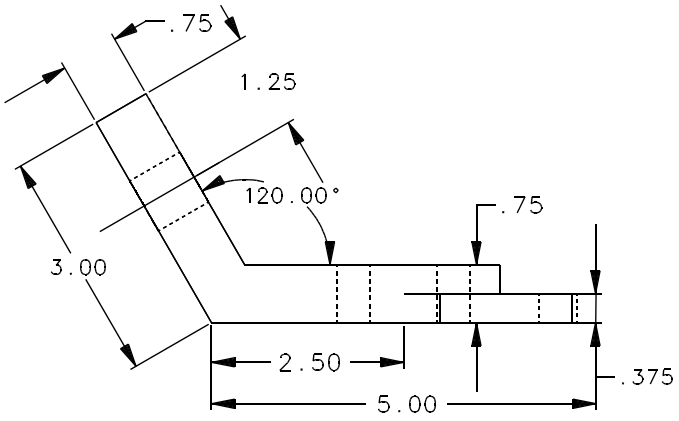


Figure 50

150. Click to place the dimension put down point.

Figure 50 shows the location of the 120.00 degree dimension.

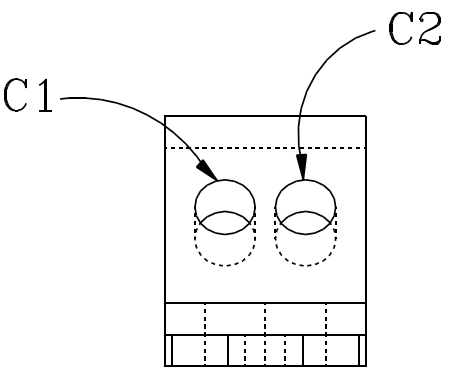


Figure 51

151. Zoom in on the side view.

152. Click on LIN DIM.

153. Set the modifiers as follows:

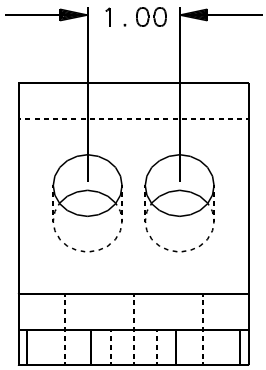
    -Centered to “yes”
    -Arrow Position to “outside”
    -Extension Lines to “both”

154. Type /c, then press ENTER.

155. Click on C1 (one of the .375R circles).

156. Type /c, then press ENTER.

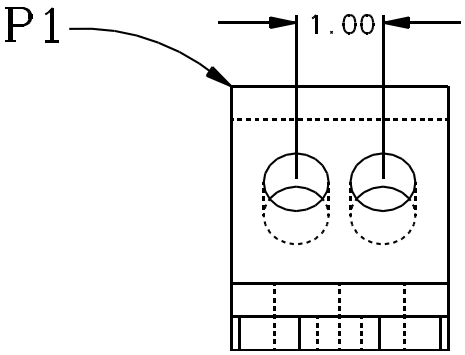
157. Click on C2 (the other .375R circle).



158. Click to place the dimension put down point.

Figure 52 shows the location of the 1.00 dimension.

Figure 52



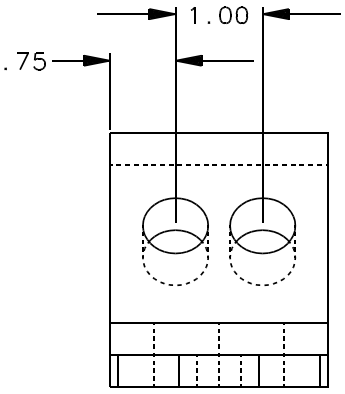
159. Set the -Centered ? modifier to “no”.

160. Type /c, then press ENTER.

161. Click on C1 (the left .375R circle), as shown previously in Figure 50.

162. Click on point P1 (the upper left corner) for the .75 dimension. (See Figure 53.)

Figure 53



163. Click to place the dimension put down point.

Figure 54 shows the location of the .75 dimension.

Figure 54

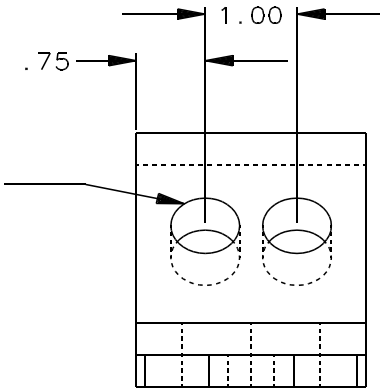


Figure 55

164. Click on LEADER.

165. Set the -Leader Adjustment ? modifier to "horizontal".

166. Click on C1 (the left .375R circle).

167. Click once to place the elbow and click again to place the leader end point.

Figure 55 shows the location of the leader.

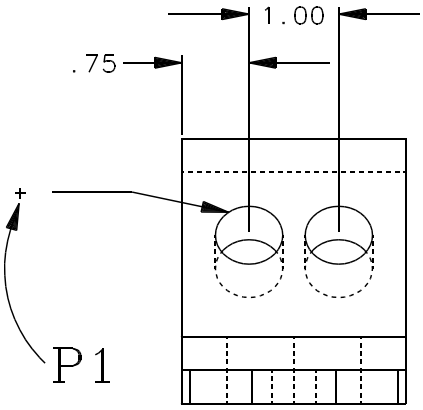


Figure 56

168. Click on CPL: ALIGN-TO-VIEW and click on the side view.

169. Click on TEXT.

170. Set the modifiers as follows:

    -View ? to "one"
    -Justification ? to "right"
    -Text Attr Name ? to "1/8

171. Click on or about point P1 to locate the text.

NOTE: The point in Figure 56 only shows the location and is not in your drawing.

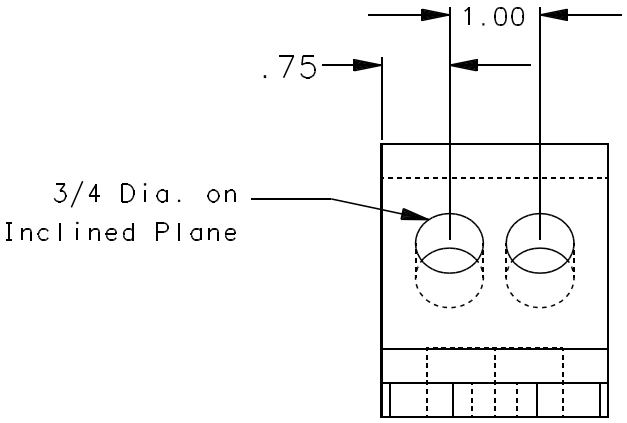


Figure 57

172. Type **3/4 Dia. on**, then press ENTER, type **Inclined Plane**, press ENTER, then press ENTER again to insert the text.

Figure 57 shows the location of the text.

173. Click on WINDOW: SHOW-LARGEST-FAST.

174. Click on LEVELS.

175. Highlight levels 252 and 254, then click on INVISIBLE.

176. Click on OK. The hexbracket drawing is complete!

177. Press F3 on the keyboard to store the drawing.

178. Type in the name “Hexbrket” for the drawing, then click on OK.