CHAPTER 2

Fundamentals I

PROJECT EXERCISE

This project exercise provides step-by-step instructions for creating the design shown in Figure P2–1. The intent is to guide you in applying the concepts and tools presented in Chapters 1 and 2. (Note that these instructions are not necessarily the most efficient way to draw the objects. Your efficiency will improve as you learn more tools, in later chapters.)

In this project, you'll learn how to do the following:

- Create a new design file.
- Set the working units.
- Draw the border using Precision Input.
- Draw the objects using the Place Line, Place Block, Place Circle, and Place Arc tools.

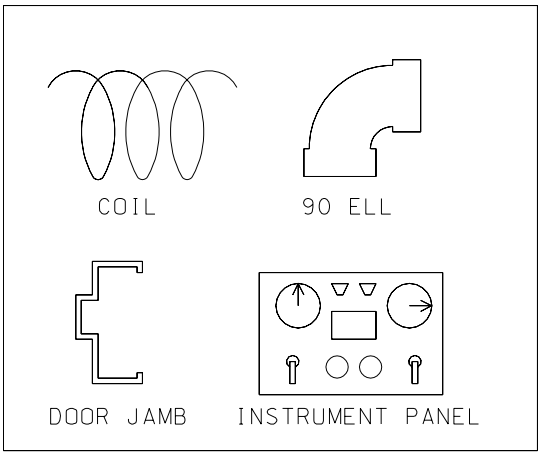


Figure P2–1 Completed project design

Note: As you complete each step in the project procedures, place a check mark by the step to help you keep up with where you are in the project.

CREATE A DESIGN FILE

This procedure has you start MicroStation and create a design file for the project design.

STEP 1: Invoke the MicroStation program.

Example: Under Microsoft Windows XP, find the MicroStation program in the **Start** > **Programs** menu and select it.

STEP 2: In the MicroStation Manager dialog box, click the **New** File icon to open the New dialog box.

STEP 3: If the **Seed** text box does not show Seed2d.dgn as the seed file, click **Browse** and find and select Seed2d.dgn as the seed file.

STEP 4: In the **File Name** field, type **CH2.DGN**.

STEP 5: Click **Save** to create the file and close the dialog box.

STEP 6: In the MicroStation Manager dialog box, select CH2.DGN from the file names list box and click **Open** to open the new file in MicroStation.

SET THE WORKING UNITS AND DRAW A BORDER

This procedure presents the steps to do the following:

- Set the working units.
- Draw the border using the Place Block tool.

STEP 1: In the MicroStation window, select **Design File** from the **Settings** menu.

STEP 2: In the DGN File Settings dialog box, select the **Working Units** category, and set the **Modify Working Unit Settings** as shown in Figure P2–2.

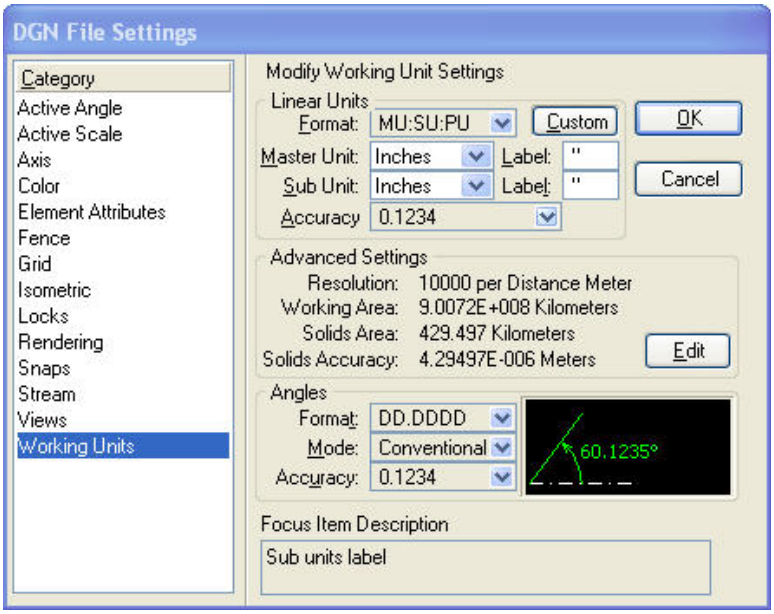


Figure P2–2 Design File Settings dialog box—Working Units ratio setup

STEP 3: Click **OK** to close the DGN File Settings dialog box and save the changes.

STEP 4: Select **Save Settings** from the **File** menu to save the Working Units settings.

STEP 5: Invoke the Place Block tool from the Task Navigation tool box (active task set to Polygons), as shown in Figure P2–3.

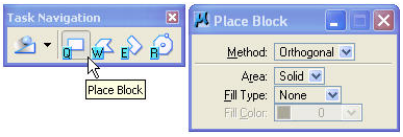


Figure P2–3 Invoking the Place Block tool

MicroStation prompts:

Place Block > Enter first point *(Click in the Key-in window's input field, key-in* **XY=0,0** *as shown in Figure P2–4, and press* ENTER.*)*

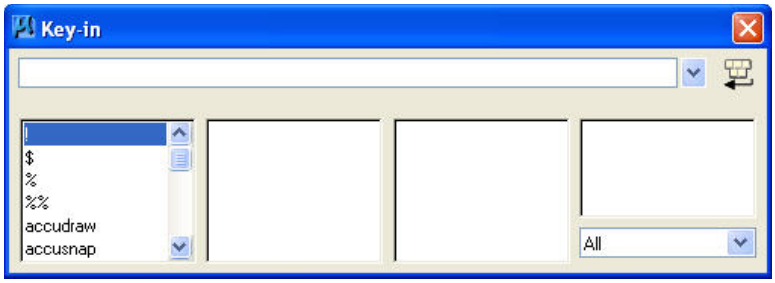


Figure P2–4 Key-in window

Note: If the Key-in window is not open, open it by selecting **Key-in** from the **Utilities** menu.

Place Block > Enter opposite corner *(Key-in* **XY=12,10** *in the Key-in window and press* ENTER.*)*

STEP 6: Invoke the Fit View tool from the View Control bar (located in the lower-left corner of the view window) to display the complete border outline in the selected view. (Detailed explanation regarding the usage of the Fit View tool is provided in Chapter 3.)

STEP 7: Select **Save Settings** from the **File** drop-down menu to save the current settings.

If the procedure was executed correctly, a rectangle should be seen in the view, as shown in Figure P2–5.

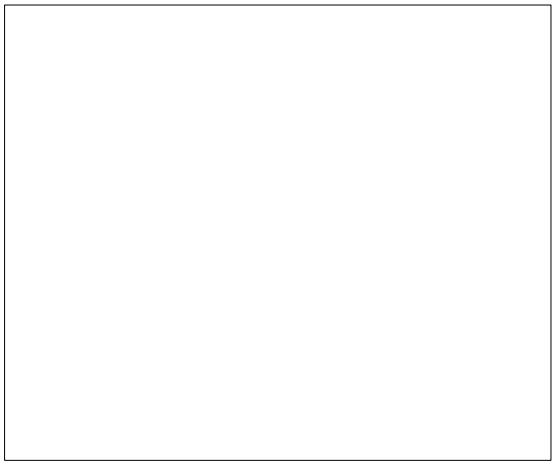


Figure P2–5 Completed border outline

DRAW THE DOOR JAMB

This procedure describes the steps required to draw the door jamb shown in Figure P2–6. The door jamb is drawn with the Place Line tool using rectangular coordinates and polar coordinates.

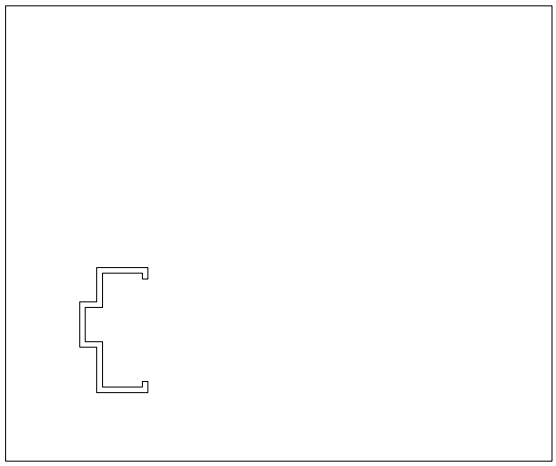


Figure P2–6 Door jamb

STEP 1: Invoke the Place Line tool from the Task Navigation tool box (active task set to Linear), as shown in Figure P2–7.

Figure P2–7 Invoking the Place Line tool

MicroStation prompts:

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=2,1.5**, *and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=2,2.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=1.625,2.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point (*Key-in* **XY=1.625,3.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=2,3.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=2,4.25** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=3.125,4.25** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=3.125,4** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=3,4** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,90** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.875,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.75,270** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.375,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0,–0.75** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0.375,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0,–1** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0.875,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0,0.125** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0.125,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=0,–.25** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DL=–1.125,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

DRAW THE INSTRUMENT PANEL

This procedure describes the steps required to draw the instrument panel shown in Figure P2–8. The instrument panel is drawn with the Place Line, Place Block, Place Circle, and Place Arc tools.

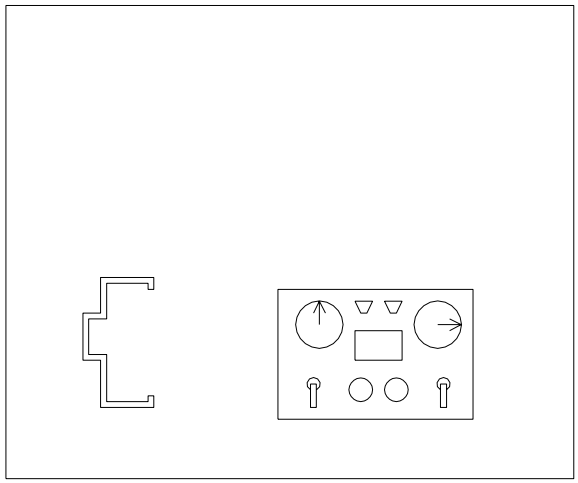


Figure P2–8 Door jamb and instrument panel

STEP 1: To draw the main outline of the instrument panel and the central rectangle block, invoke the Place Block tool.

MicroStation prompts:

Place Block > Enter first point *(Click in the Key-in window's input field, key-in* **XY=5.75,1.25***, and press* ENTER.)

Place Block > Enter opposite corner *(Key-in* **XY=9.875,4** *in the Key-in window and press* ENTER.*)*

Place Block > Enter first point *(Click in the Key-in window's input field, key-in* **XY=7.375,2.5***, and press* ENTER.*)*

Place Block > Enter opposite corner *(Key-in* **XY=8.375,3.125** *in the Key-in window and press* ENTER.*)*

STEP 2: To draw the trapezoidal shapes located in the top of the instrument panel, invoke the Place Line tool.

MicroStation prompts:

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=7.375,3.75***, and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.375,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* X**Y=7.625,3.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=7.375,3.75** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=8,3.75**, *and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.375,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=8.25,3.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=8,3.75** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

STEP 3: To draw the circular gauges with the arrow pointers located in the top of the instrument panel, first invoke the Place Circle tool from the Task Navigator tool box (active task set to Circles), as shown in Figure P2–9, to draw two circles. Select **Center** from the **Method** option menu in the Tool Settings window, set **Radius** to 0.5 Master Units, and turn ON the check box for **Radius**.

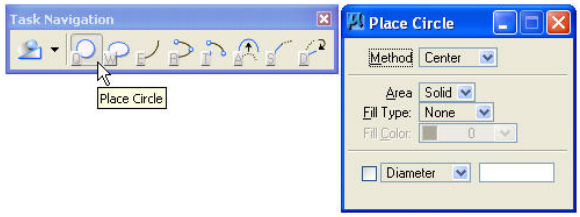


Figure P2–9 Invoking the Place Circle tool

MicroStation prompts:

Place Circle By Center > Identify Center Point *(Click in the Key-in window's input field, key-in* **XY=6.625,3.25**, *and press* ENTER.*)*

Place Circle By Center > Identify Center Point *(Click in the Key-in window's input field, key-in* **XY=9.125,3.25**, *and press* ENTER.*)*

And to draw the arrow pointers, invoke the Place Line tool.

MicroStation prompts:

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=6.5,3.5**, *and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=6.625,3.75** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=6.75,3.5** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=6.625,3.25**, *and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=6.625,3.75** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=9.375,3.375***, and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=9.625,3.25** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point (*Key-in* **XY=9.375,3.125** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence)*

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=9.125,3.25***, and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **XY=9.625,3.25** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

STEP 4: To draw the two circles located in the bottom of the instrument panel, first invoke the Place Circle tool, select **Center** from the **Method** option menu in the Tool Settings window, set **Radius** to 0.25 Master Units, and turn ON the check box for **Radius**.

MicroStation prompts:

Place Circle By Center > Identify Center Point *(Click in the Key-in window's input field, key-in* **XY=7.5,1.875***, and press* ENTER.*)*

Place Circle By Center > Identify Center Point *(Click in the Key-in window's input field, key-in* **XY=8.25,1.875***, and press* ENTER.*)*

STEP 5: Invoke the Place Block tool from the Polygons tool box to draw the switches located in the bottom of the instrument panel.

MicroStation prompts:

Place Block > Enter first point *(Click in the Key-in window's input field, key-in* **XY=6.4375,1.5***, and press* ENTER.*)*

Place Block > Enter opposite corner (Key-in **XY=6.5625,2** *in the Key-in window and press* ENTER.*)*

Place Block > Enter first point *(Click in the Key-in window's input field, key-in* **XY=9.1875,1.5***, and press* ENTER.*)*

Place Block > Enter opposite corner *(Key-in* **XY=9.3125,2** *in the Key-in window and press* ENTER.*)*

STEP 6: Invoke the Place Arc tool from the Task Navigator tool box (active task Circles), and select **Center** from the **Method** option menu in the Tool Settings window.

MicroStation prompts:

Place Arc By Center > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=6.5625,1.875***, and press* ENTER.*)*

Place Arc By Center > Identify Arc Center *(Click in the Key-in window's input field, key-in* **XY=6.5,2***, and press* ENTER.*)*

Place Arc By Center > Enter point to define sweep angle *(Click in the Key-in window's input field, key-in* **XY=6.4375,1.875***, and press* ENTER.*)*

Place Arc By Center > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=9.3125,1.875***, and press* ENTER.*)*

Place Arc By Center > Identify Arc Center *(Click in the Key-in window's input field, key-in* **XY=9.25,2,***and press* ENTER.*)*

Place Arc By Center > Enter point to define sweep angle *(Click in the Key-in window's input field, key-in* **XY=9.1875,1.875***, and press* ENTER.*)*

DRAW THE 90-DEGREE ELL

This procedure describes the steps required to draw the 90-degree ell shown in Figure P2–10. The 90-degree ell is drawn with the Line and Arc tools.

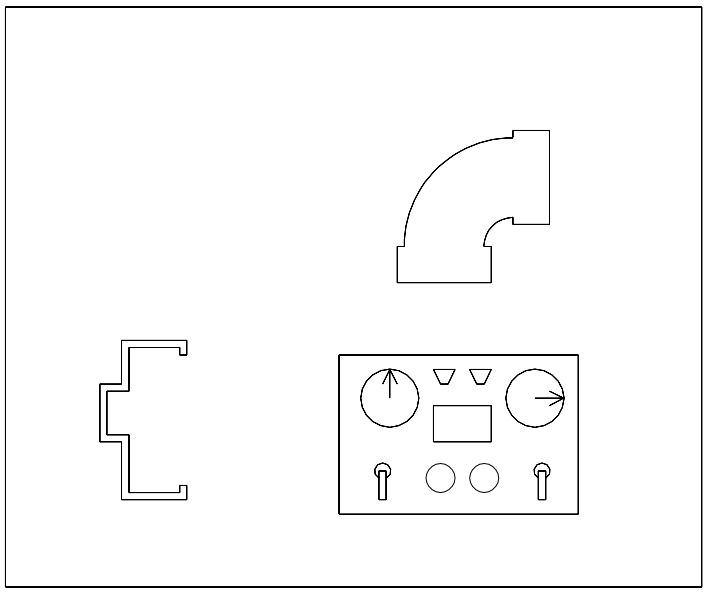


Figure P2–10 Door jamb, instrument panel, and 90-degree ell

STEP 1: To draw the lower lines of the 90-degree ell, invoke the Place Line tool.

MicroStation prompts:

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=8.25,5.875***, and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.625,270** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=1.625,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* DI=0.625,90 *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* DI=0.125,0 *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

STEP 2: To draw the large outer arc, invoke the Place Arc tool and select **Center** from the **Method** option menu in the Tool Settings window.

MicroStation prompts:

Place Arc By Center > Identify First Arc Endpoint (*Click in the Key-in window's input field, key-in* **XY=8.75,7.75**, *and press* ENTER.*)*

Place Arc By Center > Identify Arc Center *(Click in the Key-in window's input field, key-in* **DL=0,-1.8750**, *and press* ENTER.*)*

Place Arc By Center > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=6.875,5.875**, *and press* ENTER.*)*

STEP 3: To draw the upper lines of the 90-degree ell, invoke the Place Line tool.

MicroStation prompts:

Place Line > Enter first point *(Click in the Key-in window's input field, key-in* **XY=8.75,7.75**, *and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,90** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.625,0** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=1.625,270** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.625,180** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Key-in* **DI=0.125,90** *in the Key-in window and press* ENTER.*)*

Place Line > Enter end point *(Click the Reset button to terminate the line sequence.)*

STEP 4: To draw the smaller outer arc, invoke the Place Arc tool, and select **Center** from the **Method** option menu in the Tool Settings window.

MicroStation prompts:

Place Arc By Center > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=8.75,6.375**, *and press* ENTER.*)*

Place Arc By Center > Identify Arc Center *(Click in the Key-in window's input field, key-in* **DL=0,–0.5**, *and press* ENTER.*)*

Place Arc By Center > Enter point to define sweep angle *(Click in the Key-in window's input field, key-in* **XY=8.25,5.8750***, and press* ENTER.*)*

DRAW THE COIL

This procedure describes the steps required to draw the coil shown in Figure P2–11. The coil is drawn with the Arc tool.

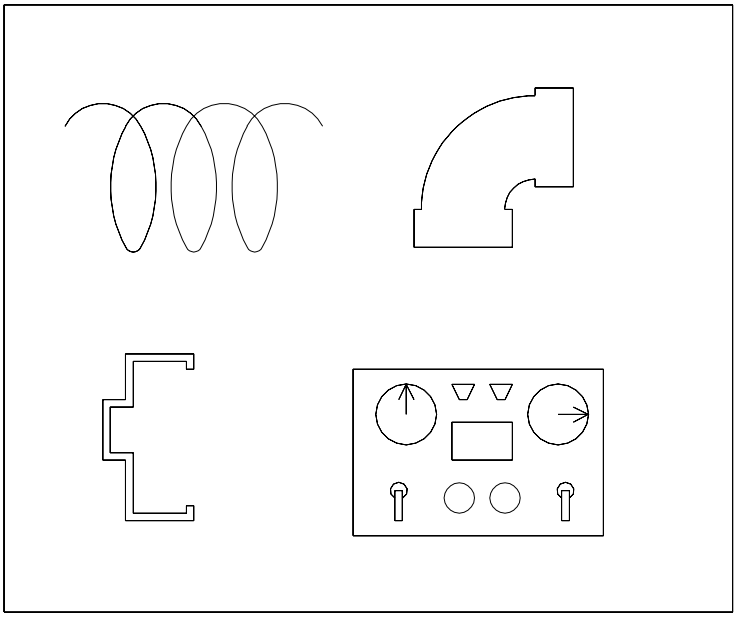


Figure P2–11 Door jamb, instrument panel, 90-degree ell, and coil

STEP 1: To draw the coil, invoke the Place Arc tool and select **Edge** from the **Method** option menu in the Tool Settings window.

MicroStation prompts:

Place Arc By Edge > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=1,7.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Point on Arc Radius *(Click in the Key-in window's input field, key-in* **XY=1.625,7.625** *and press* ENTER.*)*

Place Arc By Edge > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2.25,7.25***, and press* ENTER.*)*

Place Arc By Edge > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2.25,7.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Point on Arc Radius *(Click in the Key-in window's input field, key-in* **XY=2.5,6.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2.25,5.25***, and press* ENTER.*)*

Place Arc By Edge > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2.25,5.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Point on Arc Radius *(Click in the Key-in window's input field, key-in* **XY=2.125,5.1750***, and press* ENTER.*)*

Place Arc By Edge > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2,5.25***, and press* ENTER.*)*

Place Arc By Edge > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2,5.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Point on Arc Radius *(Click in the Key-in window's input field, key-in* **XY=1.75,6.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2,7.25***, and press* ENTER.*)*

Place Arc By Edge > Identify First Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=2,7.25***, and press* ENTER.*)*

Place Arc By Edge > Identify Point on Arc Radius *(Click in the Key-in window's input field, key-in* **XY=2.6250,7.6250***, and press* ENTER.*)*

Place Arc By Edge > Identify Second Arc Endpoint *(Click in the Key-in window's input field, key-in* **XY=3.25,7.25***, and press* ENTER.*)*

This completes the first loop of the coil. To draw the second and third loops, refer to the following table for the coordinates.

First arc endpoint	Point on arc radius	Second arc endpoint
XY=3.25,7.25	XY=3.500,6.250	XY=3.25,5.25
XY=3.25,5.25	XY=3.125,5.175	XY=3.00,5.25
XY=3.00,5.25	XY=2.750,6.250	XY=3.00,7.25
XY=3.00,7.25	XY=3.625,7.625	XY=4.25,7.25
XY=4.25,7.25	XY=4.500,6.250	XY=4.25,5.25
XY=4.25,5.25	XY=4.125,5.175	XY=4.00,5.25
XY=4.00,5.25	XY=3.750,6.250	XY=4.00,7.25
XY=4.00,7.25	XY=4.625,7.625	XY=5.25,7.25

STEP 3: Invoke the **Save Settings** from the **File** drop-down menu.

Congratulations! You have just successfully applied several MicroStation concepts in creating a design.

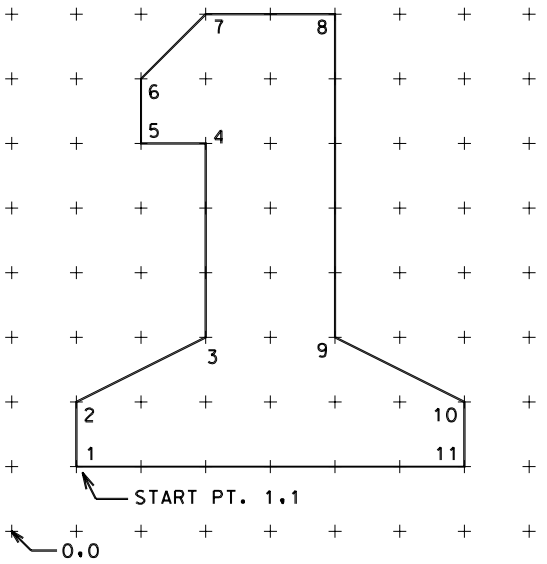
DRAWING EXERCISES 2–1 THROUGH 2–6

In Exercises 2–1 through 2–3, write down the coordinates necessary to draw the objects shown above the tables and then use the coordinates to draw the object. The coordinates are already entered in Exercise 2–1 as an example.

Note: Do not draw the dimensions or text.

Exercise 2–1

Draw the object using absolute coordinate key-ins (**XY=**<x,y>).



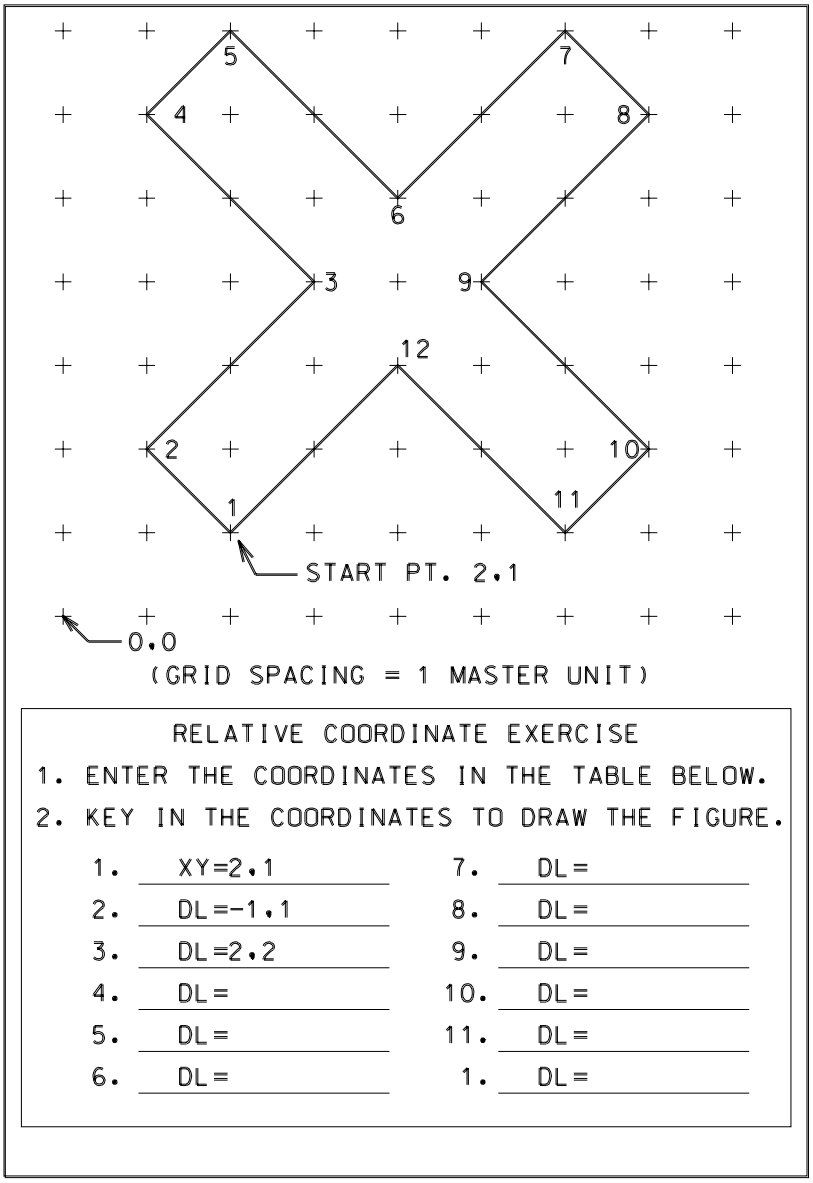
ABSOLUTE COORDINATE EXERCISE

KEY IN THESE COORDINATES TO DRAW THE FIGURE.

1.	XY=1,1	7.	XY=3,8
2.	XY=1,2	8.	XY=5,8
3.	XY=3,3	9.	XY=5,3
4.	XY=3,6	10.	XY=7,2
5.	XY=2,6	11.	XY=7,1
6.	XY=2,7	1.	XY=1,1

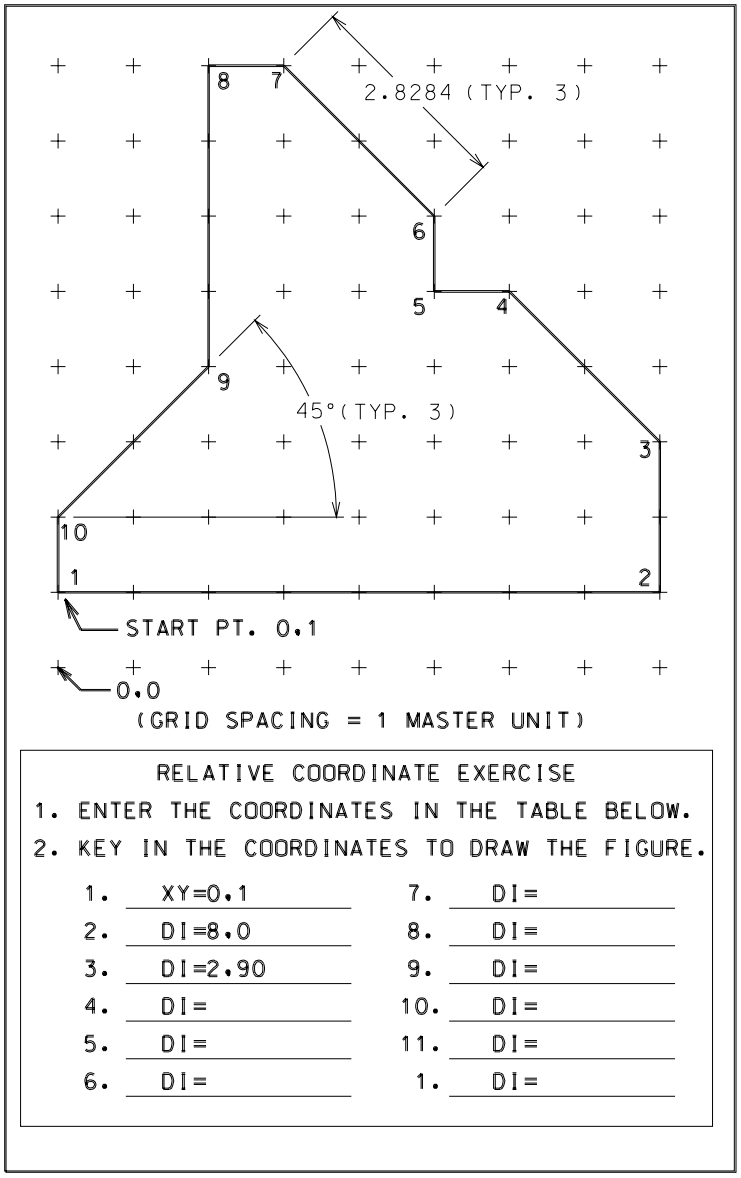
Exercise 2–2

Draw the object using relative coordinate key-ins (**DL=**<x,y>).



Exercise 2–3

Draw the object using polar coordinate key-ins (**DI=**<x,y>).



RELATIVE COORDINATE EXERCISE

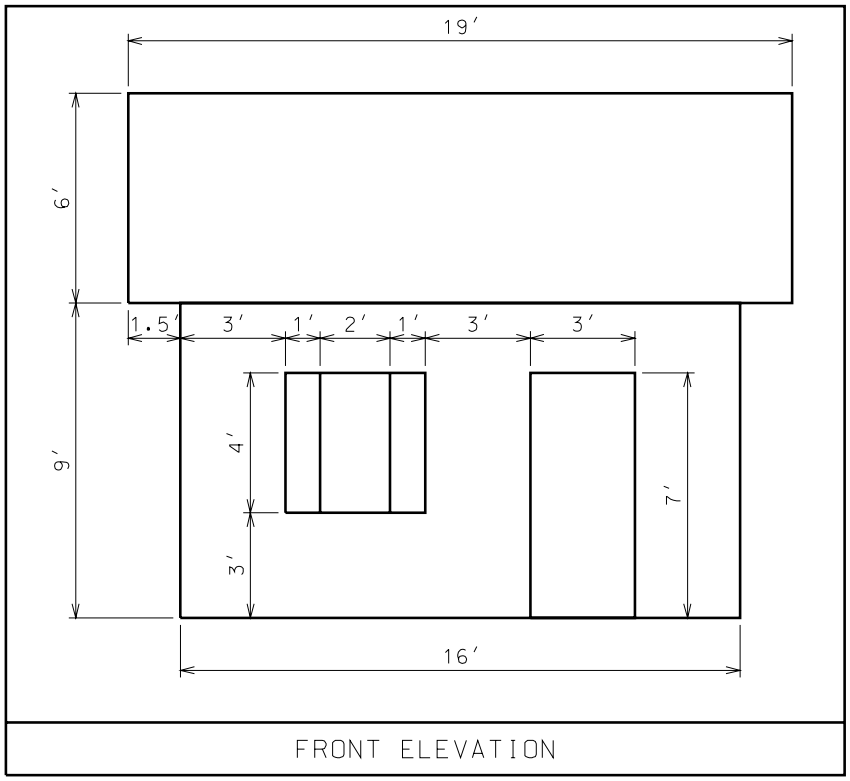
1. ENTER THE COORDINATES IN THE TABLE BELOW.
2. KEY IN THE COORDINATES TO DRAW THE FIGURE.

1.	XY=0,1	7.	DI=
2.	DI=8,0	8.	DI=
3.	DI=2,90	9.	DI=
4.	DI=	10.	DI=
5.	DI=	11.	DI=
6.	DI=	1.	DI=

Exercise 2–4

Use the following table to set up the design file to draw the front elevation and select the best Precision Input method to use for each placement of the object.

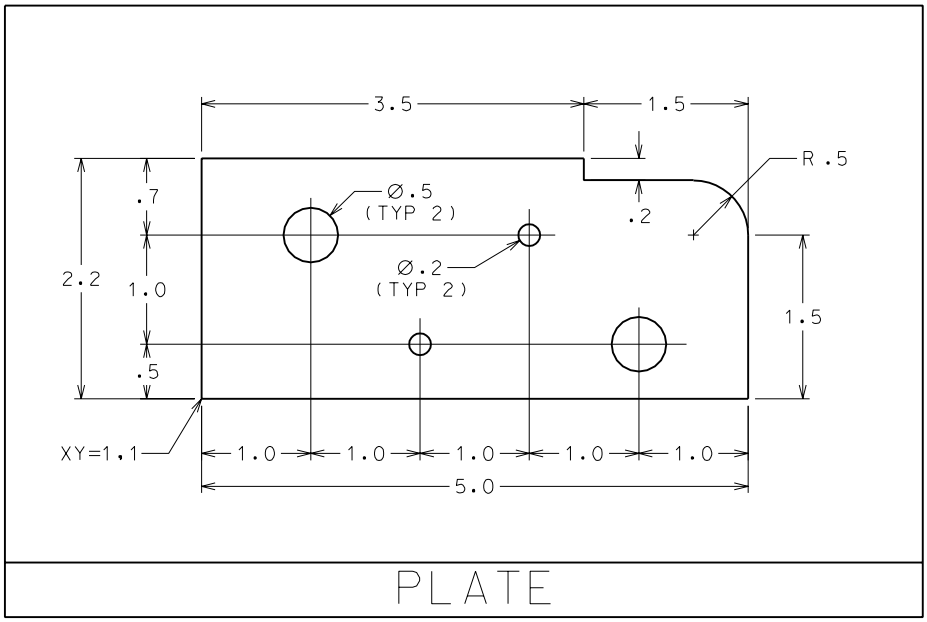
Setting	Value
Seed File	Seed2D.DGN
Working Units	Master Units: Feet and Sub Units: Inches

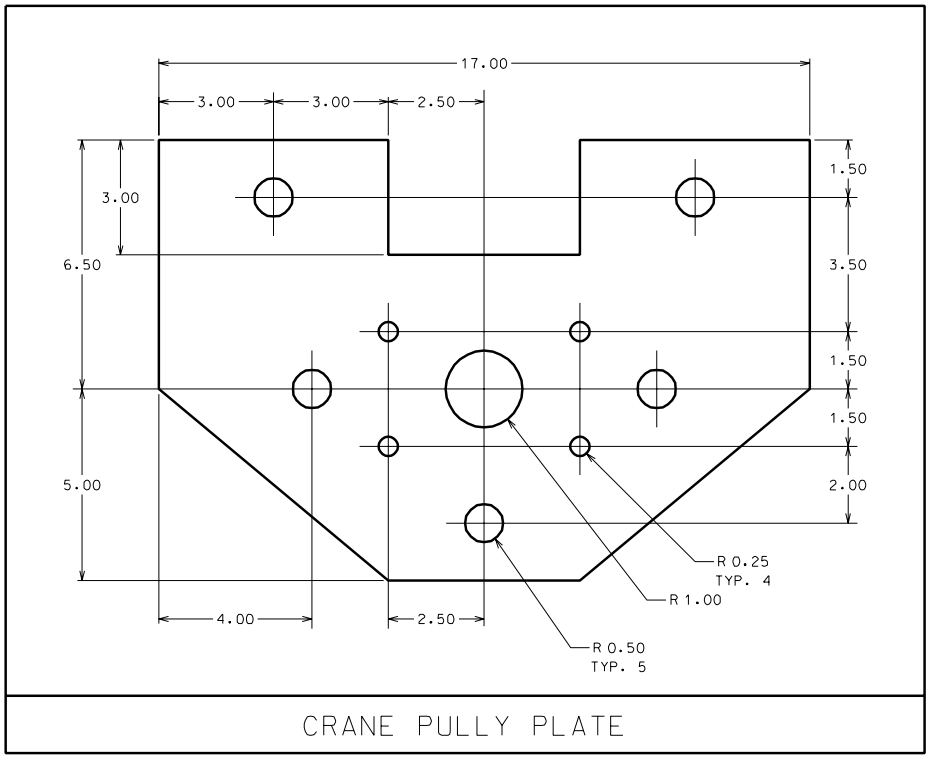


Exercise 2–5 and 2–6

Use the following table to set up the design files for Exercises 2–5 and Exercise 2–6 and select the best Precision Input method to use for each placement of the object.

Setting	Value
Seed File	Seed2D.DGN
Working Units	Master Units: Inches




17.00
3.00
3.00
2.50
3.00
6.50
5.00
1.50
3.50
1.50
1.50
2.00
R 0.25
TYP. 4
R 1.00
R 0.50
TYP. 5
4.00
2.50
CRANE PULLY PLATE