

Instruction Manual

How to Use Punch and Die Sets Offered by Auber Instruments

Version 1.1
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The Punch and Die Sets that we offered are made to use with a Manual [Hydraulic Knockout Punch Driver](#). In this instruction manual, we demonstrate the process of creating a 1/16 DIN sized hole on an instrument panel made of 3 mm thick aluminum. The procedures used here can be applied to the Punch & Die Sets of different size and shape.

1. Components of a Punch & Die Set



Figure 1. A punch & die set (Auber part #: pd-4545).

The picture in Figure 1 shows an assembled punch & die set for punching holes of 1/16 DIN sized (45 mm x 45 mm) panel instrument. It consists of a draw stud, die (in 2 pieces), a punch, and a counter nut. The configuration is common to other punch & die sets. The draw stud has threads on both ends. The wider end has M20 x 1.5 thread, which matches with most of the hydraulic knockout punch driver. The thinner end has M18 x 1.5 thread, which matches with the counter nut. The diameter of the shaft is 22 mm, which requires a 22 mm (or 7/8") pilot hole to be made on the panel before you can actually use the punch to knockout a hole. In some punch & die sets for smaller panel cutouts, the studs are 11 mm in diameter. For these studs, user can use either an 11 mm, or 7/16" drill bit to make pilot hole before punch.

The die assembly consists of two pieces, die and die base. They are held together by three locating pins. The advantage of using two-piece die configuration is the ease of removing the knockout piece. Lifting the die from its base allows the knockout piece to be extracted easily.

The punch and the die should be placed on different sides of the panel to which you want to knockout a hole. Preferably the punch should be placed on the side where masking tape is applied and the reference lines are drawn. After the punch is properly aligned to a right position, screw on the nut until it is finger tight.

2. Parts and Tools

Here a list of parts and tools that will be used in this demo:

- 1 x Punch & die set pd-4545 (for 1/16 DIN sized hole)
- 1 x Front panel of PBox16-D, 3 mm thick aluminum

- 1 x Hydraulic knockout punch driver
- 1 x Hand drill, or drill press
- 1 x 7/16" drill bit*
- 1 x Punch & die for 7/8" or 22 mm hole*
- 1 x T-square ruler
- 1 x Spotting/centering drill
- 1 x Marker pen
- 1 x Masking tape

Note *: These two items are needed to make a pilot hole for the draw stud of the pd-4545 punch & die set. Alternatively, you can also use a 7/8" step drill bit or a 7/8" hole saw to make the pilot hole.

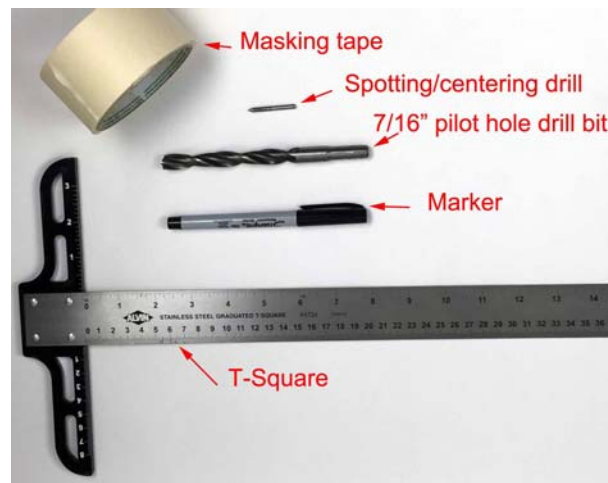


Figure 2. Tools needed: ruler, masking tape, marker, centering drill, pilot hole drill bit.

It is important to select a correct ruler in order to precisely mark the center position of the hole, which is a critical step to get all holes well aligned if multiple holes need to be created. The T-Square ruler is one of the best rulers to use. It allows you to draw lines perpendicular to the edge. The cost is very reasonable comparing to other squaring tools. The one we like is the [Alvin AST series](#). It is made of stainless steel, and has both English and Metric scales.

The masking tape will protect the surface or paint while working on the panel. It can be easily removed afterwards without leaving any residue on the surface. It can be found in any hardware store or supermarket. But if you are going to repaint the surface, you may not need it.

For the marker pen, we like to use the Sharpie Ultra Fine Point. You can remove it with alcohol if you mark it directly on the metal surface.

Centering drill can be important if you want to get all the holes aligned well. It allows you to create a small dent so that when you drill the pilot hole the drill will not slip away. If you don't have one, you can use a very small drill bit instead.

The 7/16" drill bit and the 22 mm punch set are needed to create a pilot hole so that draw stub can be fed through. This process is actually break down into two steps: 1) create a 7/16" hole, 2) use 22 mm punch to create the pilot hole. Alternatively, you can use a 7/8" step drill bit or a 7/8" hole saw to make the pilot hole in one step.

3. Procedures

1) Cover the panel with masking tape.

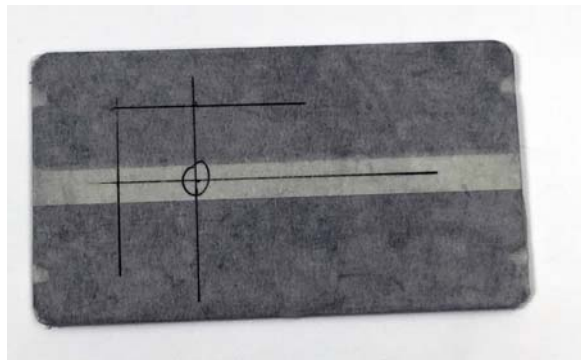
If you are not going to repaint the surface after punching, you should cover the surface with masking tape. Otherwise, the surface will get scratched during punching.

- 2) Find the center for each hole to be punched and mark it. Then draw reference lines across the center (Figure 3).

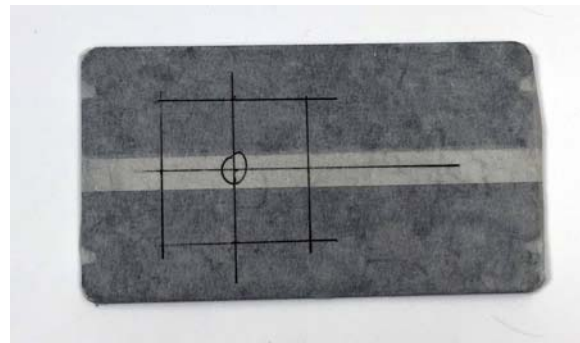


Figure 3. Find the center and draw two reference lines.

For a 1/16 DIN sized hole (45 mm x 45 mm), the distance of each side to the center is 22.5 mm. Mark the 4 points that are 22.5 mm away from the center on the reference lines and draw the sides of a 45 mm by 45 mm square. It is important to draw the sides before you proceed to the next step because they make it easier to: a) check the alignment of multiple holes, b) place the punch in the exact position and orientation as desired. However, if you want to save the time, you can just draw two side lines like Figure 4(a).



(a)



(b)

Figure 4. Draw border lines of the 45 mm x 45 mm square. (a) Only two sides are drawn. (b) A finished square of the 45 mm x 45 mm with 4 sides drawn.

To be more specific, for a square hole, drawing the sides are a must because they are the reference lines for placing the punch. Without these lines, it will be difficult to orient the punch with its edges parallel to the panel's edge. For the round hole, drawing the border is also necessary due to the small gaps between the pilot hole and the draw stub. The gap gives some free play for the hole location. In addition, when creating the pilot hole, your drill bit may slip off from the original center. The reference line will help you to correct these errors before too late.

- 3) Drill a dent in the center.

You only need to make a small dent so that the drill bit won't slip away during drilling.

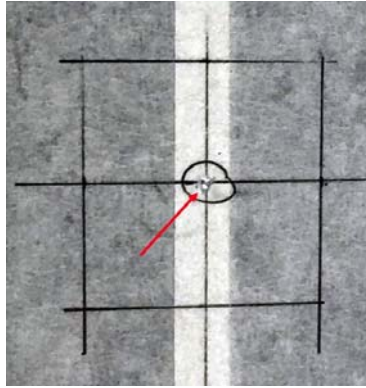


Figure 5. Make a small dent in the center (indicated by the red arrow).

4) Create a 7/8" (22 mm) pilot hole.

This step can be done in two ways: a) drill a 7/8" (22 mm) hole with a 7/8" step drill bit or a 7/8" hole saw; or b) if you have our 22 mm punch & die set, you can drill a 7/16" hole first and then use the 22 mm punch set to create the pilot hole. We will show you how to do it using the second way.

- a. Drill a small pilot hole on a drill press with a 7/16" drill bit (see Figure 6(a)).
- b. Install the of the 22 mm die on the hydraulic knockout punch driver (Figure 6(b)).
- c. Add the penal plate, the 22 mm punch, and the nut in sequence. You just need to screw to a finger tight (Figure 6(c)). Now you can close the valve on the hydraulic driver and start to pump the pressure. When the panel material is knocked out, you should be able to feel a decrease in the resistance. Keep pumping the driver until the punch is all the way through the panel. But DON NOT force the punch to go further if you feel some resistance again otherwise you may DAMAGE the teeth of the punch. Release the pressure from the pump.
- d. Unscrew the nut and remove the die and the panel plate. Now you have created a 22 mm pilot hole for the draw stud.



Figure 6(a). Drill a small pilot hole on a drill press with a 7/16" drill bit.



(b)



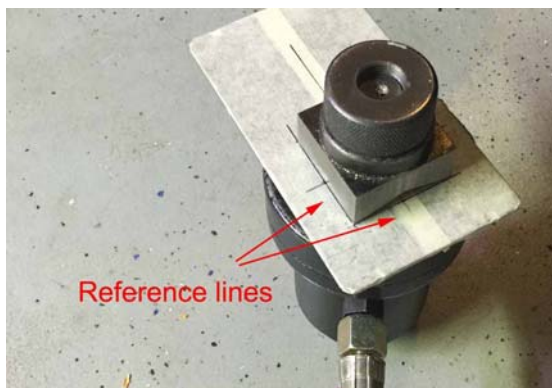
(c)

Figure 6. (b) Install the of the 22 mm die on the hydraulic knockout punch driver. (c) Assemble and panel, punch, and nut onto the draw stud.

- 5) Punch the 1/16 DIN sized hole.
 - a. Install the draw stud and the 1/16 DIN die on the hydraulic knockout punch driver (see Figure 6(a)).
 - b. Then add the panel, the 1/16 DIN punch, and then screw on the top secure nut. Make sure the punch is in alignment with the edge lines as shown in Figure 6(b). While holding the punch in the right place, use the other hand to tight up the screw nut. You just need to screw it to a finger tight.
 - c. Close the valve on the driver and start to pump the pressure. When the panel material is knocked out, you should be able to feel a decrease in the resistance. Keep pumping the driver until the punch is all the way through the panel. But DON NOT force the punch to go further if you feel some resistance again otherwise you may DAMAGE the teeth of the punch. Release the pressure from the pump.
 - d. Then, unscrew the nut and remove the die and panel plate (Figure 7(c)). Due to the size of the punch, the thickness of the plate, the friction between the punch and panel plate, it might be difficult to hand separate them especially when the sheet metal is thick. You can remove them altogether from the draw stud first, and then use a rubber hammer to knock the punch through the plate.



Figure 7(a). Install the 1/16 DIN die on the hydraulic knockout punch driver.



(b)



(c)

Figure 7. (b) Assemble the panel, punch, and the nut onto the draw stud. (c) Remove the top section of the die so that the knockout piece can be extracted.

- 6) A finished panel with a 1/16 DIN hole is shown in Figure 8. The edges are as clean as a factory punched panel, but you may need to de-bur the edges using a file. Then you can remove the masking tape.



Figure 8. This is a picture of punched panel (top) compared with a factory pre-punched panel (bottom).

4. Useful Hints

- 1) The shaft of the draw stud has a very tight tolerance against the die and punch. Add some grease will help it to move easier. For a square-shaped punch set, the shaft has two flat surfaces for alignment. If you have difficulty in sliding on the die or the punch to the shaft, try rotating the die/punch 180°. You may get a better fit.
- 2) For a square-shaped hole, always draw the edges on the sheet metal to help positioning the punch.
- 3) For thick sheet metals or large punch sets, the sheet metal is likely to stick to the punch after the hole is made. You can use a rubber hammer to knock the punch out.

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