

## Touchless Turned Lamp

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A decorative lamp with an elegant basic design is turned that illuminates when you are in the area. It lights up in the dark without the need to look for a switch. All parts can be turned out of 1" (25mm) stock. The options to pierce the lamp screen for the light to come through are only limited by your imagination.

### ***Design and Wood Selection***

As shown in 'Components of Lamp' the frame (FRAME) holds two screens (SCREENS). The SCREENS can have the same shape, with the front SCREEN being perforated for the light to pass through. For an attractive design the FRAME and the foot (FOOT) are of the same wood and contrast with the wood of the SCREENS and the post (POST). An LED strip is connected to the inner edge of the square FRAME between the two SCREENS. The turned POST is drilled through to connect the LED strip in the FRAME to the electronics contained in the FOOT. The FOOT of the lamp contains the battery pack which needs to be accessed for replacement. With the weight of the batteries in the FOOT, the lamp has a secure standing. The LED light does not pose a fire hazard for the wooden body of the lamp.

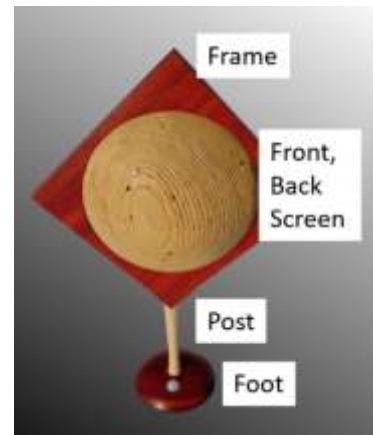
In my opinion, the lamp has its appeal because of the integrated motion sensor instead of being operated via a switch or a smartphone. Another solution could be a fixed timer, which would, however, quickly drain the batteries and would have to be placed inside the body with difficult access. An external power cord affects the artistic aspect of the lamp, although it can have other advantages, such as not requiring batteries.

For the project as outlined below, all turning can be completed on a midi lathe. The following 1" (25mm) dry hardwood is needed:

- 1 piece of 7"x7" (178mm x 178mm) (FRAME and FOOT),
- 2 pieces of 6"x 6" (152mm x 152mm) (SCREENS) and
- 5 1/4" (133mm) long, 1" (25mm) square (POST).

### ***Turning the Screens***

The turning of the SCREENS is similar to the turning of a simple open, cross grained bowl, except that the rim of the SCREEN must fit snugly into the recess of the FRAME and that there is no 'foot'. To enable the 1" (25mm) blanks to be mounted on the lathe, glue sacrificial spigots on to the center of the squares using carpenter's glue and wood clamps (Photo 2). The spigots have been prepared before to fit the jaws opening of your chuck in a near closed position. Rough out the square blanks outside the 6" (152mm) diameter circle with a bandsaw. On the lathe with the spigot clamped in the chuck true up the SCREEN blank to 6" (152mm). Turn the outside of the SCREEN blank to a shallow, smooth shape. Leave a small tenon to fit the jaws of your chuck (Photo 3). Reverse mount the blank and clamp it on to the new tenon for turning the inside of the SCREEN. Leave the tailstock for support as long as you have sufficient space to turn safely. Turn the rim flat for about a width of 1/8" (3mm) for the contact with the FRAME. Aim for a consistent thickness of the SCREEN and continue the smooth shape into its center (Photos 4-6).



**1 COMPONENTS OF LAMP**

The thickness itself depends on the type of piercing you consider. Reverse mount the SCREEN blank one more time and clamp it into large plate jaws unless you have a vacuum chuck available to you. By keeping the RPM below 1000 turn off the temporary tenon and complete the smooth shape on the outside of the SCREEN. If you are aiming for a thin thickness, you may need to temporarily take the SCREEN out of the jaws to check it with calipers. After sanding the outside, you have an opportunity to sketch a design for piercing with the SCREEN still being mounted (Photos 7-9). Do the same for the second SCREEN. To function as a decorative lamp, aim for at least 10% of the front SCREEN to be pierced as a guide for your design.



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**2 GLUE SACRIFICIAL SPIGOTS ON TO THE CENTER OF THE SQUARE SCREEN BLANKS.**

**3 TRIM THE BLANK TO A 6" DIAMETER. TURN THE OUTSIDE OF THE SCREEN BLANK SIMILAR AS THE OUTSIDE OF A BOWL. LEAVE A SMALL TENON TO FIT THE JAWS OF YOUR CHUCK.**

**4 REVERSE MOUNT THE SCREEN BLANK AND CLAMP ON TO THE NEW TENON TO TURN THE INSIDE.**

**5 LEAVE ON THE TAILSTOCK FOR SUPPORT AS LONG AS YOU CAN TURN SAFELY.**

**6 FINISH THE INSIDE WITHOUT THE SUPPORT OF THE TAILSTOCK.**

**7 REVERSE MOUNT THE SCREEN AND CLAMP INTO LARGE PLATE JAWS.**

**8 TURN AWAY THE TEMPORARY TENON AND ESTABLISH A SMOOTH SHAPE.**

**9 ON THE FRONT SCREEN THERE IS AN OPPORTUNITY TO SKETCH A DESIGN FOR PIERCING.**

### ***Turning the Frame and the Foot***

An 8" (203mm) or larger plywood disc is attached to the lathe drive using a face plate or connected to a chuck via a glued-on spigot. The square sawn and planed FRAME is mounted flat on the plywood disc, centered by the live center or drill bit in the drill chuck of the tail stock. A seam of hot glue along the four sides holds the FRAME securely in place for the turning (Photo 10).

Drill a 5/8" (16mm) hole through the center. Then hollow out a 3 1/2" (89mm) diameter and 5/8" (16mm) deep cavity to accommodate later the electronic parts as listed below. You only need a parting tool and a small bowl gouge for the turning of the cavity. Make sure the cavity has straight sides and a flat top. Cut out the 5 1/2" (140mm) wide FOOT with a parting tool, carefully reducing the RPM just before the tool cuts through. Use the parting tool to cut an about 1/8" (3mm) deep recess in the FRAME for one of the SCREENS to be placed in later. Check that this SCREEN has a snug fit in to the recess (Photos 11-12). To separate the FRAME from the plywood disc, place the assembly in a microwave for a few seconds to melt the glue or use a heated knife. To turn the recess on the opposite side of the FRAME remount it by using a jam chuck, possibly supported by hot glue (Photos 13-14). When the FRAME is completely turned mark the front, back, and top and bottom corners. Most of the hot glue can be removed of the FRAME with a heated kitchen knife for example. The residual hot glue can be cleaned with rubbing alcohol and a crepe block (a sandpaper cleaner) before sanding carefully (Photo 15).



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**10 MOUNT THE SQUARE FRAME BLANK ON A PLYWOOD DISC USING THE TAILSTOCK TO CENTER. GLUE THE FRAME WITH SEAMS OF HOT GLUE ALL AROUND. DRILL THROUGH WITH A 5/8" BIT FOR THE SHAFT OF THE LAMP POST.**

**11 HOLLOW OUT THE 3 1/2" X 5/8" ELECTRONICS CAVITY. MAKE SURE THE CAVITY HAS STRAIGHT SIDES AND A FLAT TOP.**

**12 CUT OUT THE 5 1/2" DIAMETER FOOT WITH A PARTING TOOL, CAREFULLY REDUCING THE RPM JUST BEFORE THE PARTING TOOL CUTS THROUGH. CUT A SMALL RECESS TO FIT ONE OF YOUR SCREENS.**

**13. REVERSE MOUNT THE FRAME ON TO A 5 ½" JAM CHUCK. CUT A SMALL RECESS TO FIT THE SECOND SCREEN.**

**14. AIM FOR SNUG FIT OF THE SCREEN.**

**15 MOST OF THE HOT GLUE CAN BE CLEANED WITH A KITCHEN KNIFE. THE RESIDUAL GLUE CAN BE REMOVED WITH RUBBING ALCOHOL AND A CREPE BLOCK, BEFORE SANDING CAREFULLY.**

The design of this lamp has the POST connected to the bottom corner of the FRAME, which requires a cable hole into that corner. Secure the top edge of the frame with a table vise, preferably protected by a piece of cloth against possible dents. For the 3/16" (5mm) hole of the LED cable I use a small jig to center the drill bit on the edge of the frame (Photos 16-17).



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**16 SECURE THE TOP EDGE OF THE FRAME WITH A TABLE VISE. FOR THE 3/16" HOLE OF THE LED CABLE I USE A SMALL JIG TO CENTER THE DRILL BIT ON THE EDGE OF THE FRAME.**

**17 THE JIG CONSISTS OF A CENTER HOLE AND A SQUARE EDGE THAT IS CUT OUT AFTERWARDS BY BANDSAW. WITH 2 SMALL SIDES GLUED ON IT SLIDES ON TO THE EDGE OF THE 1" FRAME**

Now let's move over to the cut-out FOOT that still requires the top side to be shaped. First, drill a 7/8" (22mm) hole into the FOOT up from the bottom side, about 3/16" (5mm) off the edge of the electronics cavity (Photo 18). Plug the drilled hole with a dowel to prevent tear-out whilst turning. Any waste wood would work for the 7/8" (22mm) turned dowel. Some chuck jaws fit inside the electronics cavity by extension grip, alternatively a 3 ½" (89mm) jam chuck is required to clamp the FOOT from the bottom side. The top side of the FOOT is ready for turning. Pay attention to the wall thickness, particularly at the 3 ½" (89mm) diameter. A small hole in the 7/8" (22mm) dowel can be a welcome guide to the wall thickness within this area (Photos 19-20). Also check the fit of the motion sensor (see below) to decide if further turning is required. To function properly the screen of the motion sensor needs to stick out somewhat of surface of the FOOT (Photo 21).



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**18 FIRST DRILL THE OPENING FOR THE SCREEN OF THE MOTION SENSOR FROM THE INSIDE OF THE ELECTRONICS CAVITY.**

**19 PLUG THE DILLED HOLE WITH A DOWEL TO PREVENT TEAR-OUT WHILST TURNING. CLAMP THE FOOT AT THE STRAIGHT SIDE OF THE ELECTRONICS CAVITY BY EXTENSION OF CHUCK JAWS OR WITH A 3 ½" JAM CHUCK.**

**20 TURN THE OUTSIDE OF THE FOOT. PAY ATTENTION AT THE AVAILABLE THICKNESS NEAR THE OUTER DIAMETER OF THE ELECTRONICS CAVITY. A SMALL HOLE IN THE DOWEL CAN GIVE GUIDANCE.**

**21 THE SCREEN OF THE MOTION SENSOR DOES NOT NEED MUCH EXPOSURE TO FUNCTION PROPERLY.**

### ***Turning the Post***

The POST connects the FOOT to the FRAME and allows for an electric cable inside. The top side of the POST has to match the square corner of the FRAME at a 45-degree angle, while the bottom side must fit into the 5/8" (16mm) hole of the FOOT, with a flange sitting on the outside of the FOOT.

Clamp the 1" (25mm) square, side grain blank for the POST into pen blank type jaws centered with the tailstock at the opposite end. Drill a 3/16" (5mm) hole about halfway through the blank with a drill chuck. Reverse the blank and repeat the same from the opposite side. This way you reduce the risk of drill bit drift given you have a long drill bit that could accomplish the action in one go (Photo 22).

With the POST still being a square blank, mark and cut out a small rectangular corner at one end using a bandsaw and keep the cut-out corner piece (Photo 23). Re-attach the corner piece by hot glue and mount the POST to the lathe with the bottom side facing to the tail stock. For a secure hold inside the center hole a cone tip live center works best. A small steb center is ideal for the drive side. After roughing the POST blank, turn the bottom side to fit inside the opening of the FOOT and a flange for good connection with the FOOT. Remove the POST for an actual check of fit into the FOOT. Remount it back between centers and shape the top side of the POST by gently reducing the thickness of the two wings that are to hold the sides of the square FRAME. Shape the rest of the POST to taste leaving a minimum of 7/16" (11mm) stem thickness (Photos 24-25).



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**22 CLAMP THE SQUARE BLANK FOR THE POST INTO PEN BLANK TYPE JAWS CENTERED WITH THE TAILSTOCK. DRILL A 3/16" HOLE ABOUT HALFWAY THROUGH THE BLANK WITH A DRILL CHUCK. REVERSE THE BLANK AND REPEAT THE SAME FROM THE OPPOSITE END.**

**23 MARK A TRIANGULAR CORNER ON ONE SIDE OF THE SQUARE BLANK AND CUT OUT BY BAND SAW OR BY HAND SAW.**

**24 RE-GLUE THE CORNER PIECE IN PLACE WITH HOT GLUE AND CLAMP THE BLANK BETWEEN CENTERS. TURN THE BOTTOM SIDE OF THE POST TO FIT INSIDE THE OPENING OF THE FOOT. ON THE TOP SIDE GENTLY REDUCE THE THICKNESS OF THE WINGS THAT HOLD THE SIDES AT THE BOTTOM EDGE OF THE FRAME.**

**25 A COMPARISON OF THE WINGS BEFORE AND AFTER THE TURNING OF THE POST.**

**26 ALTERNATIVE APPROACH TO DRILL THE 3/16" HOLE IF NO PEN BLANK JAWS ARE AVAILABLE.**

### ***Assembly of the parts***

Start by laying out the FRAME, POST and FOOT and insert the LED cable, for example a DC5V SMD2835 1M USB LED Strip. About 3' (1m) of LED strip goes around twice the inside of the FRAME conveniently for maximum light intensity.

Glue the LED strip in place with spray adhesive, starting from the location of the cable hole. Once the available area inside the FRAME is covered the LED strip can be cut to convenient length in between any two LEDs. This is a good time to check the function of the LEDs by temporarily connecting the strip to the battery pack, see below. A reflective foil can be added to the inside of the back SCREEN for improved light intensity (Photos 27-29).

Attach the POST to the FOOT with epoxy. Make sure the contact surfaces are free of oil or other finish. To attach the POST to the FRAME with epoxy clamp the FRAME upside down into a table vise (Photo 30). Make sure that the opening of the motion sensor points to the front side of the lamp.

Check the fit of both SCREENs once more time before gluing. The front SCREEN can be glued with a few dots of hot glue from the inside of the FRAME with the SCREEN in place. Add a few dots of glue on the recess and place the back SCREEN into place in one go.



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**27 LAYOUT OF THE FRAME, POST AND FOOT WITH THE CABLE OF THE LED STRIP INSERTED.**

**28 YOU NEED ABOUT 3' OF LED STRIP TO GO AROUND TWICE ON THE INSIDE OF THE FRAME. GLUE IN PLACE WITH SPRAY ADHESIVE.**

**29 OPTIONAL: FOR BETTER LIGHT INTENSITY ADD REFLECTIVE FOIL ON THE INSIDE OF THE BACK SCREEN.**

**30 ATTACH THE FOOT TO THE POST AND THE POST TO THE FRAME WITH EPOXY, WHILST THE FRAME IS CLAMPED UPSIDE DOWN.**

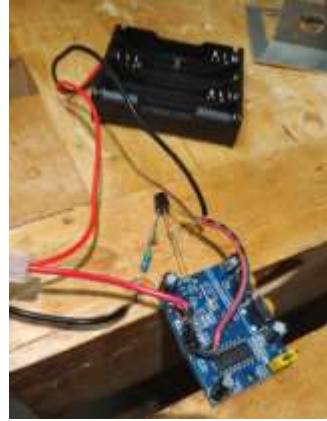
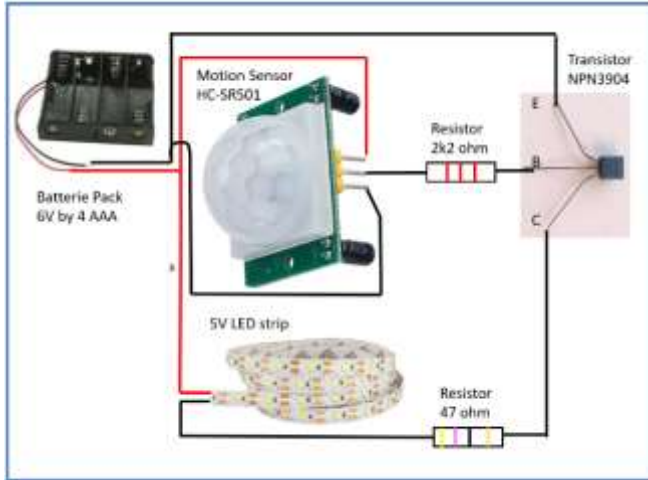
### ***Electronics***

Unfortunately, I could not find a readymade kit that includes a small battery pack and a motion sensor to feed an LED strip. However, the electronic parts and soldering kit are not expensive, and soldering is not very difficult to teach yourself - being a crafts person. I got to a fit-for-purpose solution without any soldering background, so there is hope. Working with low voltage electronics is relatively safe. Here is a just a summary whilst you can find step by step illustrations for the soldering on <https://kaimuenzer.com/Woodturning/tips/> .

For the touch-less operation of the lamp you need the very common infrared motion sensor module, HC-SR501. A flat 4 AAA battery cage is required to fit into the electronics cavity of the FOOT. An example of the components and wiring is given in the circuit diagram 31 and (Photo 32).

Check that the connected electronic parts fit within the cavity of the FOOT. With the lamp upside down clamped in the vise put the electronics in place and connect the cable of the LED strip. After checking its function glue the wired components in place with dots of hot glue (Photo 33).

For improved stability of the standing lamp and to cover the electronics you can screw a piece of mouse pad under the FOOT. Remember that you need access to replace the batteries (Photo 34).



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**31 CIRCUIT DIAGRAM WITH COMPONENTS.**

**32 SOLDERING THE COMPONENTS TOGETHER.**

**33 ELECTRONICS CRAMPED INSIDE THE FOOT WITH EASY ACCESS TO AAA BATTERIES.**

**34 CUT OUT MOUSEPAD CONNECTED TO BOTTOM WITH SMALL BRASS SCREWS.**

Now it is time to give yourself a pad on the back and place the new lamp somewhere to enjoy the light when someone walks into the room!