



# Instructions for Making PSI's Chess Piece Set

Congratulations on your purchase of the PSI Chessman Template Set. These templates will allow you to make a full thirty two piece chess set. The templates are designed to be used with a PSI CML-DUP style manual duplicator to duplicate exact profiles of the chess pieces in the chess set. We strongly recommend using a light and dark contrasting wood for your chess pieces. Making chess pieces out of tropical / exotic woods will create a truly unique chess set.

What you need to get started

### 1) Lathe:

A mini or midi lathe with the ability to mount the PSI CML-DUP style duplicator.

### 2) Lathe Duplicator:

We strongly recommend using the PSI #CML-DUP style lathe duplicator. This manual duplicator gives you the ability to follow the rather deep complex patterns on the Chessmen Templates. Lathes and supported duplicators are listed in the chart below:

PSI Brands	Duplicator	Other Bands	Duplicator
CML, CML2,3,4	CML-DUP	Ryobi Mini Lathe	CML-DUPR
TCL	CML-DUPT	Jet Midi Lathes	CML-DUPJ
TCLPLUS	CML-DUPT2	Delta Midi Lathes	CML-DUPJ
TCLPRO	CML-DUPJ2	Universal Retrofit	CML-DUPU

### 3) Template Set #CHESSTMP:

The template set consists of 5 steel templates that include:

- a) King+Queen 
- b) 2 up Bishop 
- c) 2 up Knight  Template wings
- d) 2 up Rook 
- e) 2 up pawn  Fig. 1

### 4) Project Wood

Select wood that will do your turned chess pieces justice. Tropical exotic hardwoods are an excellent choice but domestic hardwoods will work just fine. Use the chart below for selecting your wood sizes:

Template	Wood Dia.	Length of Wood Blank	No Wood pcs per species
King+Queen	1-1/2"	9"	1
2 up Bishop	1-1/2"	8"	1
2 up Knight	1-1/4"	7"	1
2 up Rook	1-1/4"	6"	1
2 up Pawn	1-1/4"	6"	4
Total Len. Per species		59"	

You may have to cut a 12" blank down to a smaller size since it may not fit in the duplicator on certain lathes.

### 5) Other Tools:

Bandsaw : required for final cutting of Knight, Bishop and Rook - install a 1/8" blade for fine cutting

Drill Press: w/ 3/8" drill bit (flat bottom bit or Forstner Bit recommended) for drilling top of rook

1" or 1-1/2" Sanding Drum: Used in Drill press for final finishing of Knight

### 6) Felt:

Optional: Apply to bottom of chess pieces to protect chess board  
PSI Item #CHESSFLT

### Setting up the duplicator

The objective here is to have the cutter and follower align at the exact center point of the templates and the turning throughout the length of the cut. All of the Chessman templates are designed so they can be placed in the Duplicator's template holder without re-adjusting the duplicator setup - so it is only necessary to set up the duplicator once. This setup can done with any of the templates.

- a) Insert the Lathe's headstock spur into the morse taper hole in the headstock and live center into the tailstock. Loosen the bolts that connect the duplicator to the lathe so the duplicator can be moved if necessary.
- b) Place a 9" spindle between centers and slide the duplicator attachment to the right far enough to assure the cutter will cut a full 9".
- c) Place any template into the template holder. Slide the template to the left towards the headstock. Position the template's left wing extension in front of the point of the spur center. Tighten the template down to secure it in place.
- d) Slide the cutter/follower assembly to the left and push the follower forward until it rests on the face of the template's wing. This represents the center point of your turning

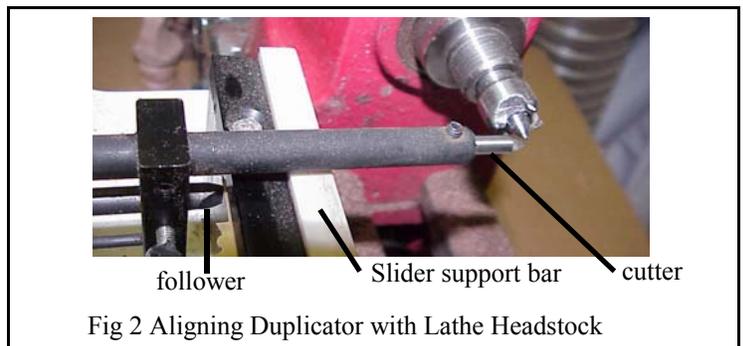


Fig 2 Aligning Duplicator with Lathe Headstock



Fig. 3 Aligning Duplicator with tailstock end of Lathe

- e) With the follower touching the template wing, locate the cutter point relative to the point of the spur center. The objective is to have the point of the cutter align precisely with the point of the spur center (fig 2).

Adjust the cutter height by adjusting the white plastic slider support bar up or down.

Adjust the cutter in or out by: 1) sliding the cutter in or out in its holder, or 2) sliding the follower in or out in its holder. Once the left side is aligned, use a similar procedure on the right

side where the cutter will align with the live tailstock center (fig 3). Raise or lower the bar on the right side being careful not to interfere with the height on the left side. Since the relative position of the follower and cutter has now been set, they should not be changed in their holders - with the follower resting on the right template wing, rotate the entire duplicator base in or out until the cutter aligns with the tailstock center. When aligned secure all allen screws and knobs.

**General procedure for preparing the turning spindles Using a spur center in the headstock**

Bandsaw cross cuts into the end of your spindle (corner to corner). Make the cuts approximately 1/8" deep. Mark an "X" on the tailstock end by drawing lines from corner to corner. Center punch where the lines cross for positioning in the tailstock. (fig 4).

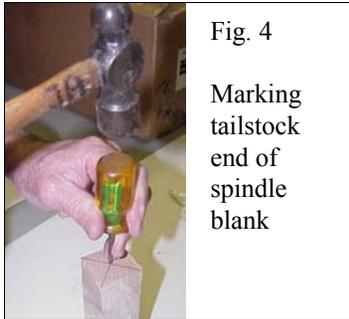


Fig. 4  
Marking tailstock end of spindle blank

Remove the spur center from the lathe and tap it into the cut end of the spindle blank. Use a rubber or wooden mallet to avoid damaging the spur center. It should be secure so the wood will not spin through when turning.

Insert the spur center with spindle blank into the headstock. Secure the tailstock live center into the center of the "X" on the other end of the spindle. Spin the wood with the duplicator mechanism in place to make sure the wood corners clear the cutter when the duplicator cutter is pulled back. If the cutter is hit by the wood it will be necessary to bandsaw the corners off of the spindle.

**Mounting using a 4 jaw chuck**

As an alternative, you can mount the spindle in the headstock using a self centering 4 jaw chuck - this method is preferred because it will be easier to finish the pieces and make rounded tops when positioned in the chuck.

**Installing the Template**

Position the template in the duplicator template holder. Slide



Fig 5  
Mounting spindle blank in 4 jaw chuck at headstock

the template so the left wing of the template extends approximately to the point of the spur center. Secure the template firmly in the holder by tightening down the philips screws on the top of the template holder bar. The front edge of the wing of the template should extend slightly beyond the front of the holder bar on both the right and left hand sides of the template.

**Turning the chess piece - General directions King, Queen, Knight, Rook, Pawn**

These pieces are all symmetric with similar bases and are

generally turned the same. Note that the Bishop, Knight and Rook will require finishing with other tools.



Fig 6  
Duplicated king and queen spindle

Proceed turning and following using the instructions provided with your duplicator.

As you turn and duplicate be aware of the following:

- 1) You can run the lathe at a higher speed when you rough the turning square down to the template.
- 2) Leave at least 1/2" of square spindle at each end, do NOT round the spindle at the ends! Leaving the ends square will make it easier to cut the piece off at the base later and will facilitate finishing and cutting the pieces apart when you complete turning and finishing. It will also facilitate finishing the round tops of the King, Queen, Bishop and Pawn provided you chucked up the spindle in a 4 jaw chuck.
- 3) Since the chess profiles have intricate beads, it is important to make sure all of the profile elements have been duplicated onto your spindle.
- 4) When turning and prior to sanding Do NOT turn the wood down to the template at the center where the heads of the pieces meet since this is the centerline of the turning and doing so will prematurely cause the turning to disengage from the lathe
- 5) Make your final cutting pass at the lathe's highest speed - cut slowly for a smooth finish .

**Finishing**

Finish the chess pieces 2 up and proceed as you would any other turning. Start with coarser sandpaper and continue with finer sandpapers. Progressing from 180 grit thru 400 and up is typical. Pay extra attention to sand into the deep crevices



Fig. 7  
Sanding and rounding Pawn mounted in 3 jaw chuck

between beads.

Apply a final finish with waxes or lacquers. Once finished, you can cut the pieces apart in the middle by cutting with the duplicator cutter all the way down to the template (optionally



Fig. 8  
Queen finished while mounted in 3 jaw chuck

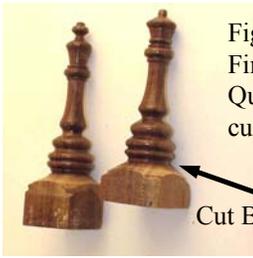


Fig. 8  
Finished King &  
Queen ready to  
cut at base

Cut Base Here

you can use a parting tool) - do this at a slower speed and hold the piece that is attached at the tailstock end with your hand. If using a chuck, you can now round (with

sandpaper) and finish the top of the chess piece while the piece spins in the chuck. You will have to remount the piece that came from the tailstock end - position it carefully in the chuck until it appears to turn on center before final finishing.

### Cutting off at the Base

Lay the squared end on the bed of the bandsaw and push the piece through the bandsaw blade with a guide to assure that the base of the piece is square and flat. If necessary, sand the base flat with a belt sander

### Special Bishop Instructions

Use an 8" spindle to turn the 2 up bishop. Proceed much the same as the other pieces. However, before cutting off the pieces at the base - cut the slit in the top part as indicated on the template in figure 20.

### Special Rook Instructions

Use a spindle a minimum of 6" long to turn the 2 up rook. Sand and finish the rooks the same as the other pieces. Final finishing with the hole and cross cuts at the top are challenging operations and are optional (the design is quite acceptable without these final operations.) However, if you wish to drill and cut the top of the Rook, use the following instructions.

Fig. 9  
Rook finished  
without  
drilling and  
cutting top



Locate the center of the top of the piece. Secure the piece in a drill press and drill a 3/8" hole about 1/4" deep into the top. Refer to the pattern in figure 21. Cross cut 2 ea 1/8" slits across the top of the piece using a bandsaw. Sand off rough edges and hand finish with an appropriate spray or polish. Buffing with a high speed buffing wheel is a good option here.

### Special Instructions for the Knight

This is the most challenging and rewarding of all of the pieces. Start with a spindle blank 7" long. Leave at least 1-1/2" beyond the end of the template for cutting out the form of the horse head. Duplicate the piece to the edge of the template and leave

Fig. 10  
The turned  
Knight



the balance of the spindle square as shown in figure 10. Mark and cut the square part of the spindle to be 1" square as



Fig. 11  
Cutting a 1"  
square in  
preparation  
to cut the  
Knight

indicated below in figure 11.

Trace or copy the image of the Knight (fig 18) onto the front



Fig. 12  
Marking the Knight Cutting Pattern

and side as shown below in figure 12.

Cut the pieces apart at the base as shown below. Use the square ends to support the work. Sand the base flat with a belt sander



Fig. 13  
Cutting the  
Knights off  
at the base

The head is cut out by cutting the side and front patterns with a bandsaw (use a fine cutting 1/8" blade if possible). This is known as 3-D cutting and is very effective in creating a "sculpted" 3-D figure. We **STRONGLY** recommend that you **PRACTICE** this cutting process several times on scrap wood before cutting the turned spindle blank. Follow the sequence in figure 14 to assure you the best results. This sequence will keep all of the cutouts from the figure attached together while being bandsawed. This will greatly simplify cutting and assure you a minimum of sanding and a generally better finished chess piece.

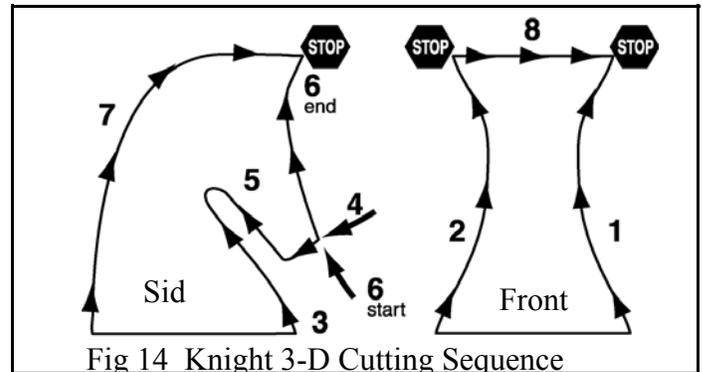


Fig. 15  
Bandsawing  
the front/  
side profiles

After the Knight is bandsawn out, you will find that all of the surfaces are rough and require some sanding and contouring. Use



a 1" or 1-1/2" sanding drum (fig. 16) on all surfaces for best results.

### Final touches and other issues

#### 1) Making your pieces shorter:

You will notice that there are 2 beads at the base of every piece. With a bandsaw you can cut your piece below the upper bead to reduce the overall height of your chess piece about 1/4"

#### 2) Bottom felt:

For easiest application, use a pressure sensitive felt for the bottom of your chess pieces. #CHESSFLT.

#### 3) Wood spindles:

For best results, use a hardwood with a very consistent grain. Many tropical exotic woods are appropriate. Use contrasting colored woods for the opposing board pieces. Use black or very dark woods for one species and light or colored wood for the other. PSI offers a wood starter pak with six 1-1/2"square x 12" spindles in Walnut and Maple item #CHESSWD.

#### 4) Duplicating options:

If your wood is shorter or you prefer making the pieces one at a time, simply use the template pattern on the left side towards the headstock. If you use this option and your spindle is also mounted in a 4 jaw chuck, you will avoid having to re-mount the pieces on the right side for finishing.

#### 5) Making a chess board:

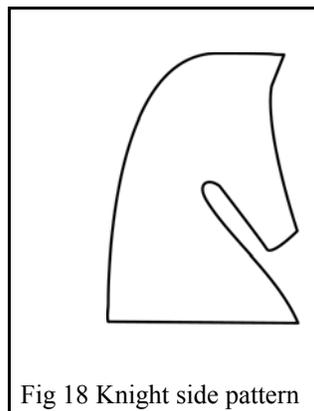


Fig 18 Knight side pattern

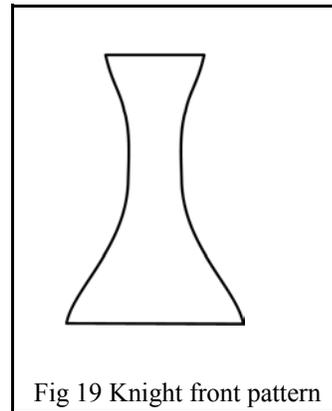


Fig 19 Knight front pattern

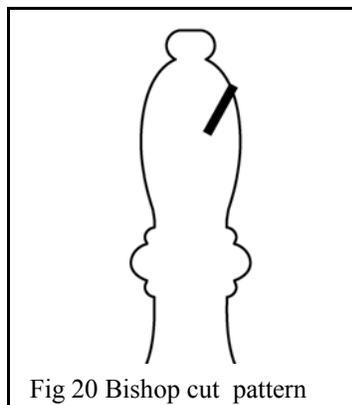


Fig 20 Bishop cut pattern

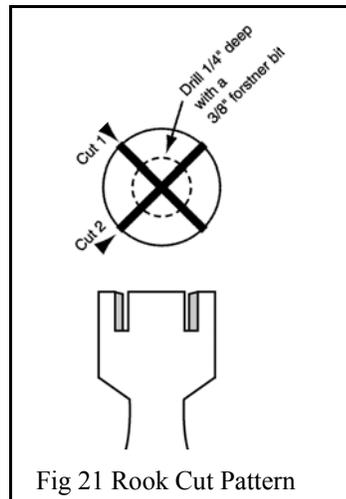


Fig 21 Rook Cut Pattern

PSI offers a set of chessboard squared made from walnut and maple. The squares are precision cut to 1-3/4" square. Order item #CHESSQ.

### Safety

- When setting up your duplicator make sure all screws nuts and bolts are tightened securely prior to turning.
- Make sure all work pieces and templates are secure in their holders
- Clear all accumulated dust and debris from the lathe, the cutting tool and the duplicator mechanisms
- Do not force the tool when turning and duplicating, let the cutter do the work



Fig. 22 Set of all 5 finished pieces